PROCEEDINGS

OF THE MERCHANT MARINE COUNCIL

UNITED STATES COAST GUARD

Vol. 17, No. 9 • September 1960

CG-129

Features

ICEBERG DETECTION BY RADAR

RADAR ANNEX

STANDARDS OF VESSEL INSPECTION

A Special Message

"Where standards differ, there will be opposition
But how can the standards of the world be unified"

THE PHILOSOPHER MO–TI knew nothing of vessel inspection standards when he made the above statement, but the question he raised is as applicable to the world of ideas as it is to the realm of vessel inspection. Different standards in ideals can be resolved only in truth. In the area of vessel inspection standards these differences must be resolved in safety.

Despite our merchant vessel replacement program the United States merchant fleet is increasing in age. Most medical authorities recognize and advocate that when individuals pass the midpoint of their expected life span, they require not only more frequent checkups but more thorough checkups as well. The same can be said for our merchant ships where the need for a more thorough examination of a vessel as it becomes older is readily recognized. With the increase in the age of ships, differences of opinion between the Coast Guard and the maritime industry regarding the physical condition of the vessels are possible, especially as regards the need for structural renewals, the extent of the renewals, and how soon such should be made.

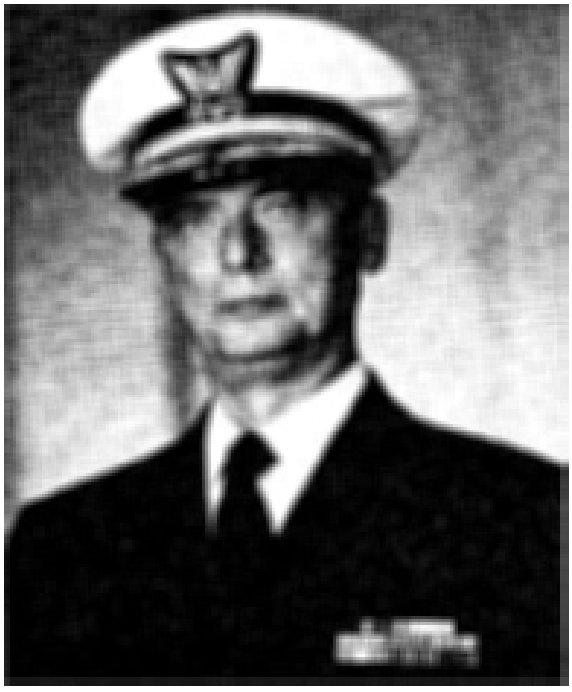
The major differences of opinion regarding the physical conditions of vessels should be alleviated with the publication and distribution of "Notes on Inspection and Repair of Steel Hulls" which has been distributed as Navigation and Vessel Inspection Circular No. 4–60. These notes are intended to summarize in a general way the technical data and background pertaining to the inspection and repair of steel vessels.

The merchant vessel hull repair guide will serve the best interest of the maritime industry and the Coast Guard in the following manner:

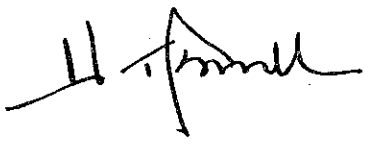
1. It will assist the shipowner and the ship repair industry in that they will have advance information as to Coast Guard recognized guidelines.
2. It should promote uniformity of hull-repair requirements among the various marine inspection offices.

This guide is not designed for nor is it intended to be a substitute for good judgment in the solution of merchant marine inspection problems and should not be interpreted as prohibiting the normal leeway or discretion vested in an inspector or Officer in Charge, Marine Inspection, with regard to his exercise of good judgment in the solution of any particular problem. Constructive criticism or suggestions with regard to the contents and the application of this repair guide will always be welcomed and encouraged.

In general, the Commandant views each marine inspection office as an integrated team and is of the opinion that the shipowners and inspectors should consult, if necessary, on the more important issues or requirements with the Officer in Charge, Marine Inspection. Such consultations carried on in the spirit of cooperation can result only in better relationships and more uniform and efficient inspections.



Solutions to inspection problems involving the physical condition of ships, as well as the conduct of routine periodic inspections, can usually be satisfactorily resolved, provided the relationship between the owner, inspector, and OCMI remain amicable; that the spirit of cooperation exists between all parties; and that the common goal of safety is not forgotten. Everyone stands to gain by such conditions and all should strive to attain them.



H. T. JEWELL,
Rear Admiral, USCG,
Chief, Office of Merchant Marine Safety.

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FRONT COVER

A photo of the MS *California Standard* crossing the San Francisco Bar in February 1960. The Master of the vessel had advised that the Bar was not "too bad." Once committed he had no choice but to continue outward. Through good seamanship and cautious action he brought his vessel through safely with no damage save a lost ladder. *Photo courtesy San Francisco Examiner.*

BACK COVER

Signs of the Times aboard the SS *Louisiana*—Safety Spelled Out in Engine Spaces. *Courtesy Master, SS Louisiana.*

DIST. (SDL NO. 71)

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PACIFIC'S FIRST FULL CONTAINER SHIP

Matson Navigation Company's SS *Hawaiian Citizen* prior to her maiden voyage as the first full-container ship in the Pacific. In honeycombs of steel frames below deck were 211 dry cargo containers and 26 refrigerated units, each 24 feet long, 8½ feet high and 8 feet wide. The newly converted vessel has a total container capacity for 296 aluminum containers below her weather deck and 60 more on it.

PROCEEDINGS

OF THE

MERCHANT MARINE COUNCIL

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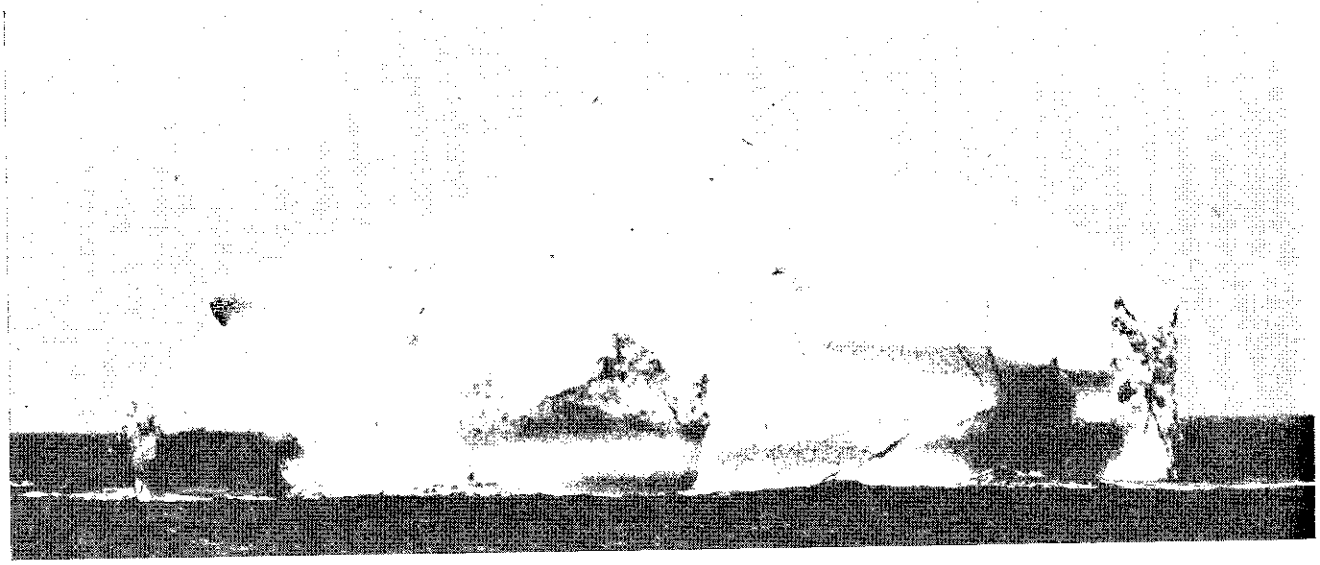
The Merchant Marine Council of The United States Coast Guard

This Copy FOR NOT LESS THAN 20 Readers PASS IT ALONG

ICEBERG DETECTION BY RADAR*

By LTJG THOMAS F. BUDINGER USCGR
INTERNATIONAL ICE PATROL



PROGRAM OF EVALUATION

DURING the last 15 years the International Ice Patrol and various technical branches of the U.S. Coast Guard have been vitally concerned with the reliability of radar as an ice detector. Since the inception of radar as a tool for providing safe navigation, more and more reliance has been placed in this device by both commercial and military ships plying the potential ice areas of the North Atlantic Ocean. As a result of reports of anomalous behavior of radar to iceberg detection, a research program was initiated in 1944. Later research supplemented by investigations conducted by the National Research Council of Canada indicated that growlers, fragments of icebergs, are inconsistent targets and that vessels relying on radar for safe navigation through ice-infested areas might, in so doing, compromise their safety. These studies together with the increased speed of merchant ships and increased usage of radar have emphasized the need for precise and trustworthy information on the reliability of radar as an ice detection instrument; thus, an intensive program of radar evaluation was pursued during the 1959 ice season. This program involved controlled studies by three International Ice Patrol ships and the collection of qualitative data by merchant and military ships operating in ice areas of the North Atlantic Ocean. Sufficient measurements and observations were made to complete an objective evaluation and answer the controversial question: "Can radar be relied upon entirely to provide safe passage through potential iceberg areas of the North Atlantic Ocean?" Unfortunately, the answer is "NO!"

GREATEST NEED FOR RADAR ON GRAND BANKS

The need for radar would appear to be greatest on the Grand Banks, without exaggeration the foggiest area in the Atlantic Ocean. Unfortunately, this is also the area of greatest danger of collision with unexpected ice. In many instances those conditions which give rise to the Grand Banks fog also create subnormal microwave propagation conditions. An additional determent to iceberg detection is the passage of many weather fronts with their associated squalls. The radar echoes from these rain squalls are sufficient in strength to completely mask large growlers. Meteorological investigations revealed that neither the slight attenuation due to fog nor the expected average subnormal refraction conditions are important deterrents to the value of radar when considered in the light of other parameters. Let us examine briefly why safe passage cannot be insured by radar and why, perhaps, the *Hans Hedtoft* met with the tragedy which shocked the world last year.

ICEBERGS ARE POOR RADAR REFLECTORS

Quantitative measurements revealed that the power (echo strength) returned from icebergs is approximately one-sixtieth as great as that returned from ships of comparable size. One of the methods of demonstrating this is shown by fig. 1 wherein a comparison is made between the reflected power curve from the stern of the buoy tender USCGC *Evergreen* and that from a very large iceberg. Other measurements yield comparable results. Figure 2 illustrates a comparison between a small iceberg and the SS *Imperial Sarnia* off Cape Race, Newfoundland. The echo strength from the ship was 200 times greater than that from the small berg. As other measurements indicated that a linear relation exists between the radar cross section and the physical cross section, it follows that this ship reflected about 62 times better than an equivalent size iceberg. The ship blip on the PPI-scope pictures of both figs. 2 and 3 is perceptibly much stronger than that of the other iceberg targets. Figure 3 illustrates strikingly the difference in reflectivity between icebergs and ships. The top photograph shows a comparison between the USNS *Alatna* and an iceberg 34 times greater in cross section. In both cases and many others the blip brilliance was considerably better

*For complete discussion see *International Ice Patrol Observation.* See Patrol Service in the North Atlantic Ocean, Season of 1959. U.S. Coast Guard Bull. No. 45 pp. 49–97, 1959.

for the metal ship target; nevertheless, the icebergs do appear as good targets. In fact, many observations during the past decade establish that in calm or slight seas dangerous ice formations of all types should be detected at ranges varying from 10–15 miles for icebergs to 2–3 miles for small growlers and sea ice. The results of the observations made by many ships and many mariners are shown in fig. 4. Of 191 reports submitted, 138 were sufficiently complete for use in this investigation. Including other observations made in past years a total of 152 *Maximum Range of Detection* observations was used. Figure 4 illustrates the maximum range at which detection of icebergs and growlers of various sizes may be expected. A statistical examination of these 152 observations gives us an equation relating the maximum range of iceberg detection to the physical cross-sectional area illuminated:

$$R^{4.06}=3.78\times10^{13}\,A$$

where R is the maximum range of detection in yards and A is the actual cross-sectional area in square feet illuminated by the radar at maximum range. This fourth power relationship is in remarkable agreement with the theoretical expression as derived from the free space radar equation for the relation between maximum range and illuminated area for some geometric shapes, which is given by

$$R^4=K\times A$$

where K is a function of receiver sensitivity, antenna gain, and transmitted power. Because the characteristics of all the radars used were

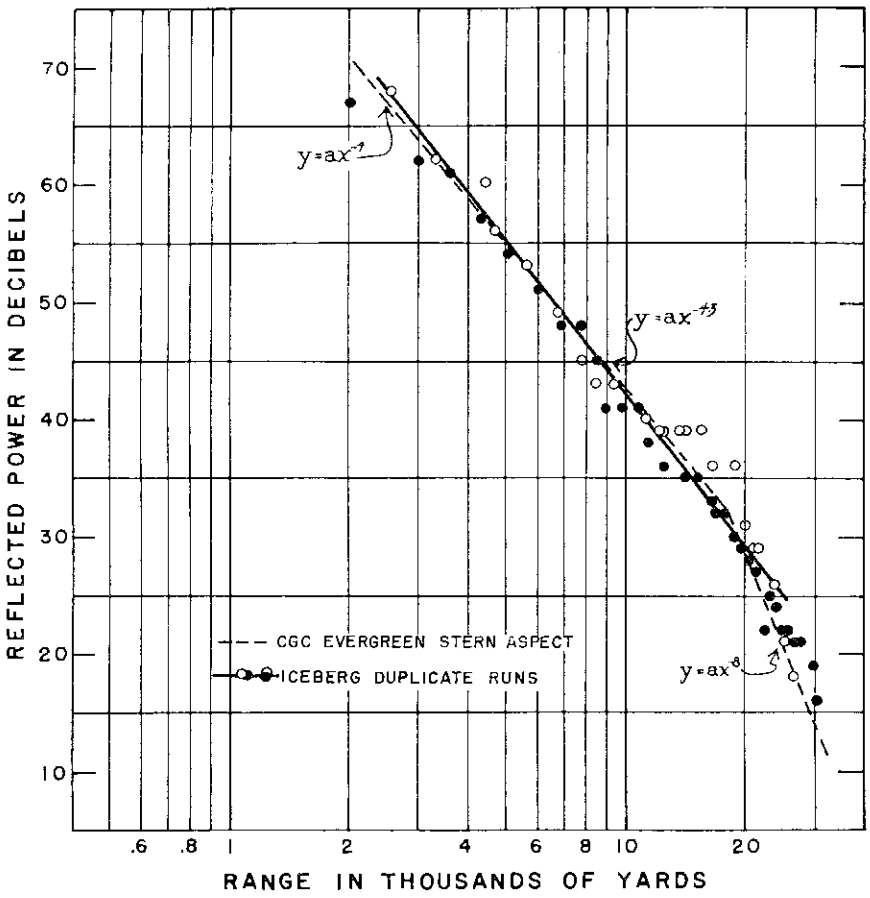


FIGURE 1. Reflected power expressed in decibels above minimum discernible signal plotted as a function of range, logarithmic scale, for a large iceberg (43,900 sq. feet) and the stern of the CGC *Evergreen* (740 sq. feet). The agreement between duplicate runs on the same aspect (165 by 380 feet) and the similarity of iceberg attenuation rate with that observed on a ship target are illustrated by least squares, best fit curves.

ABOUT THE AUTHOR

LIEUTENANT JG THOMAS F. BUDINGER, USCGR, was graduated "Magna Cum Laude" and received a Bachelor of Science Degree (Chemistry) from Regis College, Denver, Colo. in 1954. In 1957 he received a Master's Degree in Oceanography from the University of Washington in Seattle. He made extensive oceanographic studies of the Puget Sound and Gulf of Alaska water areas during his two and one-half years at the University of Washington as a research assistant in the Department of Oceanography.

He entered the Coast Guard in 1957 and served aboard the Coast Guard Polar icebreaker *Westwind* as aerology and oceanography officer during a Dewline (Arctic) and Deepfreeze (Antarctic) Operation.

In 1959, LTJG Budinger, as a member of the International Ice Patrol, acted as Project Officer for Radar Iceberg Detection in conjunction with an intensified Coast Guard program of scientific studies and investigations to determine the reliability of shipboard radar to detect floating ice.

During the patrol activities out of Argentia, Newfoundland, he participated in iceberg demolition tests conducted with the use of 1,000-lb. cluster type petroleum and thermate incendiary bombs—the first systematic attempt of man to destroy icebergs from aircraft. LTJG Budinger improvised an ingenious, simple bombsight which was used during the operation.

He has ben active in the 1960 International Ice Patrol as Aerial Ice Observer and as Bombardier on aerial iceberg destruction tests.

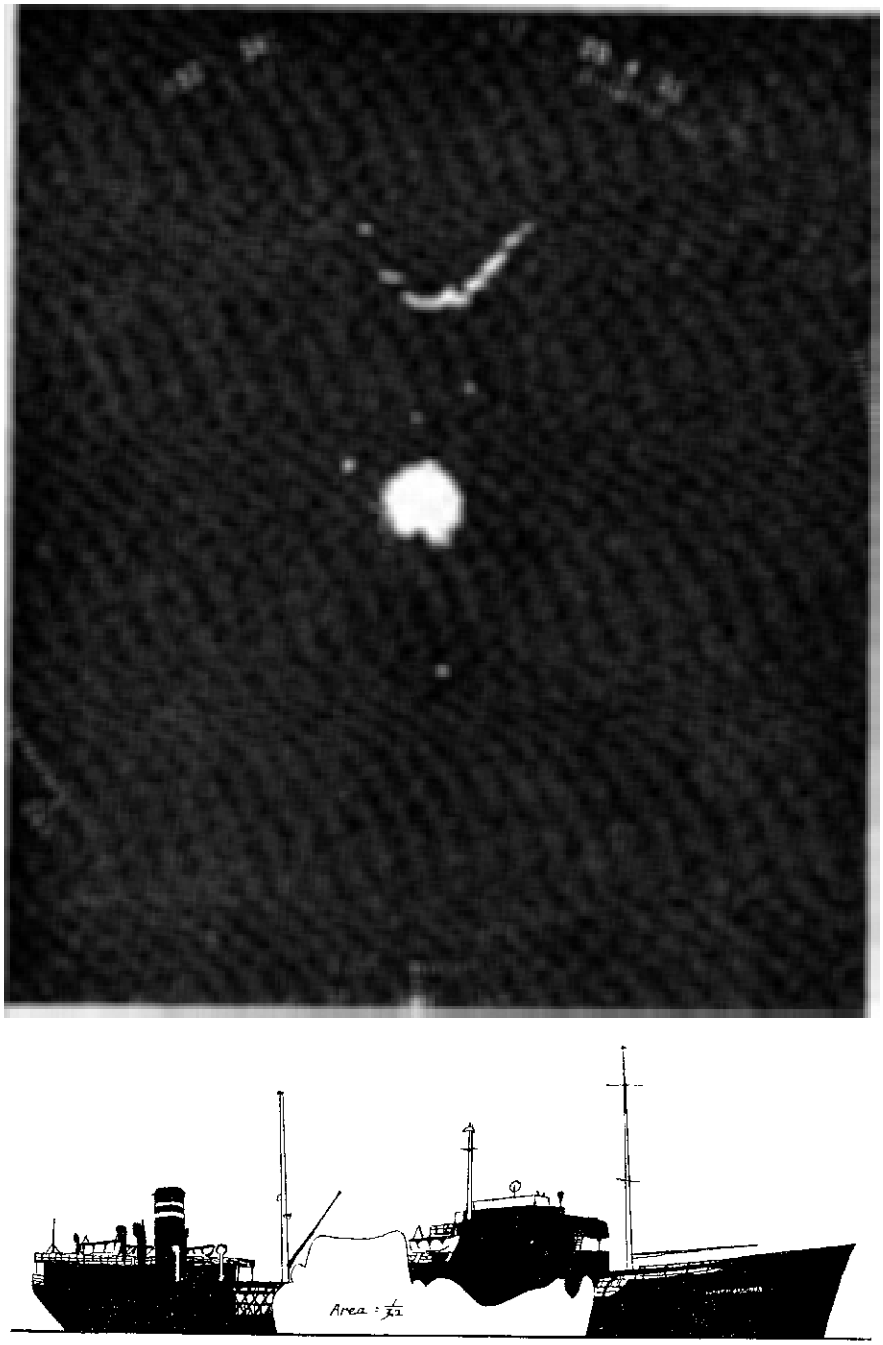


FIGURE 2. Comparison between the blip intensity of a ship, SS *Imperial Sarnia*, with that of an iceberg (27 by 84 feet; 1,460 sq. feet) and Cape Race, Newfoundland (vertical cliffs approx. 300 feet) on the 20-mile scale. The ship is at 295° T; 8,200 yds iceberg at 355° T; 8,200 yds, Cape Race north at 18,000 yds, and other targets are large icebergs.

very similar, this grouping of observations from various makes of radars was justified.

REAL DANGER IS GROWLERS

Either from fig. 4 or the derived equation it can be shown that the maximum detection range from growlers (exposed area of 10 sq. feet to 100 sq. feet) is less than 4 miles. In general, a growler with an average illuminated cross section of 100 sq. feet weighs more than 250 tons. Eighteen recent observations by the USCGC *Northwind* and 26 growler observations made by Hudson Bay Shipping Co. (not shown) indicate that the expected range of detection for growlers is even less than that derived statistically. A maximum of 4 miles detection range is not alarming in itself; however, in view of the facts that growlers do not carry running lights, these iceberg fragments might be obscured by sea clutter, mariners do not watch the scope constantly, and ice is even a poorer reflector than sea water, the danger to a fast moving vessel is immediately apparent.

GROWLERS HIDDEN BY SEA CLUTTER

During the 1959 studies efforts were concentrated on assessing the importance of sea clutter and evaluating the effectiveness of anticlutter devices in combating this sea return clutter. The results of controlled measurements of echo strengths from ice targets and sea chop indicate that sea return from waves of heights greater than 4 feet is sufficient to entirely obscure dangerous growlers. This is illustrated by fig. 5 in which the reflected power curves for a 22-foot growler and a 4.5-foot sea are shown together. During the observations from which this plot was prepared all parameters of radar performance and atmospheric propagation conditions were measured and known not to have affected the results abnormally. These results and similar results obtained from observations taken by three research ships caused some concern as, although they were supported by less precise observations made by many mariners, the fact that seas between 4 and 6 feet in height could effectively obscure growlers as high as 20 feet seemed to conflict with reason. However, theoretical analyses of the reflection characteristics of ice, sea water, and ships established the validity of these observations and helped to explain why icebergs considerably larger than ships reflect so much less energy.

THEORY EXPLAINS POOR REFLECTION

The theoretical reflection coefficient (the amount of radiation reflected compared with the amount of incident radiation) for pure ice for any frequency of radiation between 30 and 30,000 Mc/s is 0.272. The value for sea water is approximately 0.8 and that for steel is nearly 1.0. From these values it is apparent that the intrinsic electrical properties of ice render an ice surface a considerably poorer reflector than a steel or a sea water surface of similar geometry. Of interest here is the fact that the theoretical value for the Grand Banks iceberg ice is 0.32 as derived from arguments of known gas content, density, and an expression derived for the composite dielectric

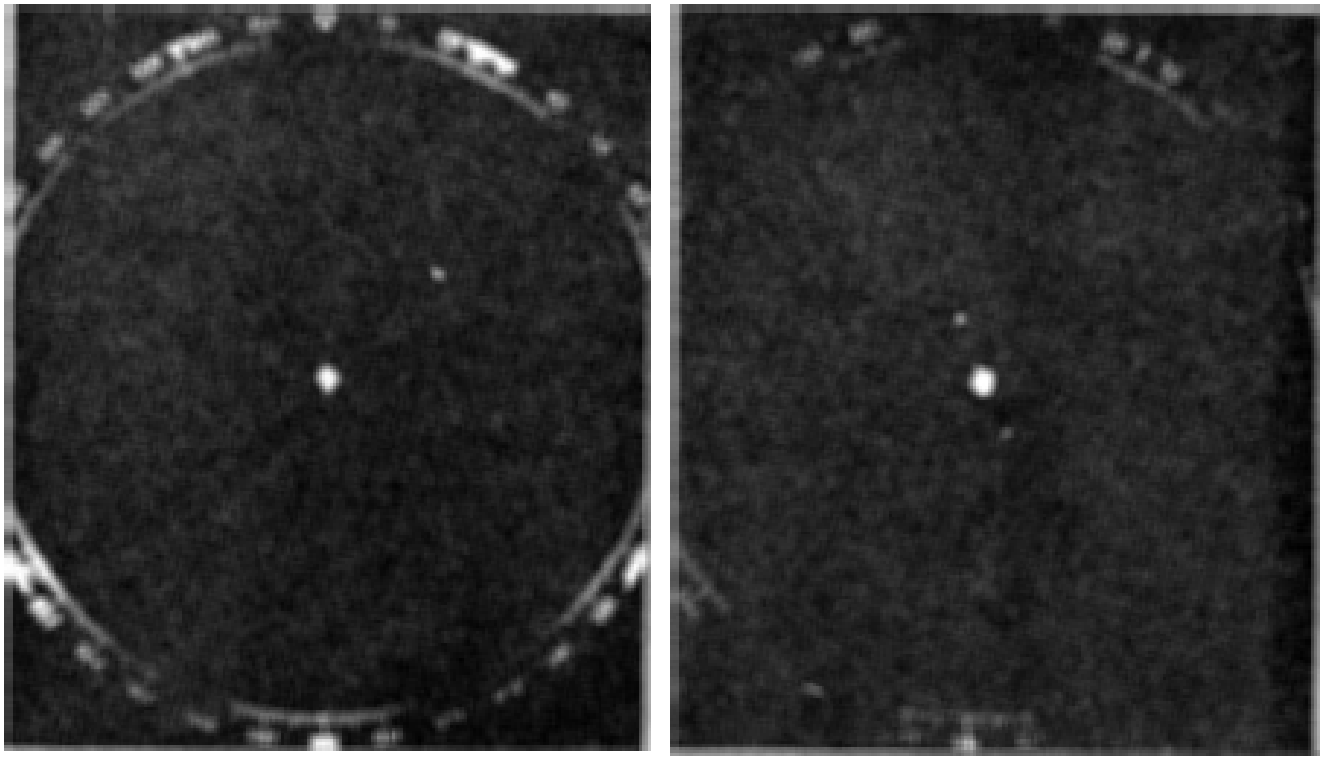


FIGURE 3. Comparison between blip intensities of ships and icebergs. Top radar scope photograph shows an iceberg (010° T; 18,200 yds) and a merchant ship, SS *Mormacpenn* (047° T; 19,000 yds) on the 20-mile range scale. Bottom photograph compares a large iceberg (150° T; 7,000 yds) with the USNS *Alatna* (341° T; 6,000 yds).

constant of a surface consisting of appropriate percentages of air, ice, and water. This is in remarkable accordance with the value of 0.33 derived from a statistical treatment of the 152 maximum range observations, the radar equation, and average iceberg target gain assumptions. It was well established that even a wet, melting iceberg can be expected to have a surface material reflection coefficient considerably less than that of sea water and even wood. These computations, together with the fact that icebergs show less target gain than ships, explain the poor reflection characteristics and emphasize the danger of growlers in sea return.

EFFECTIVENESS OF ANTICLUTTER DEVICES

The masking effect of sea return and weather has been of concern to mariners and radar manufacturers since World War II. Most of the modern radar installations have two types of anticlutter devices which are designed to allow better discernment of a target from heavy sea or weather blips on the PPI-scope. The Ice Patrol studies revealed that the Sensitivity Time Control and Lin-Log devices used with the optimum combination of video and receiver gain are very effective; however, on three different occasions dangerous growlers were not picked up although the radar was in peak performance and the propagation conditions were near normal or only slightly subnormal. In general, Fast Time Constant control was found to be ineffective. It should be remembered that these anticlutter devices were designed to decrease the gain in a particular area of the scope, thereby reducing the brilliant clutter and usually allowing the strong persistent echo of a target to stand out. The STC and FTC actions appear to be useless unless the target echo is stronger than the sea echoes, and in moderate seas a relatively weak echo from a small growler

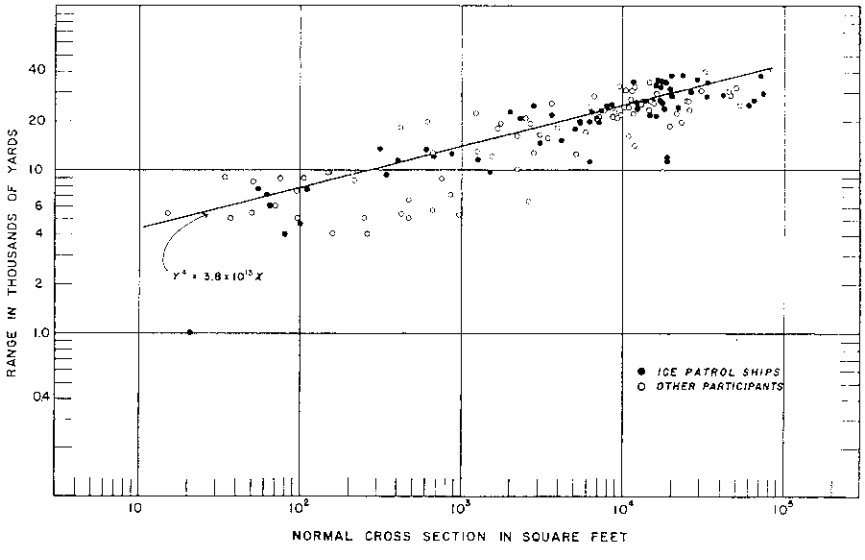
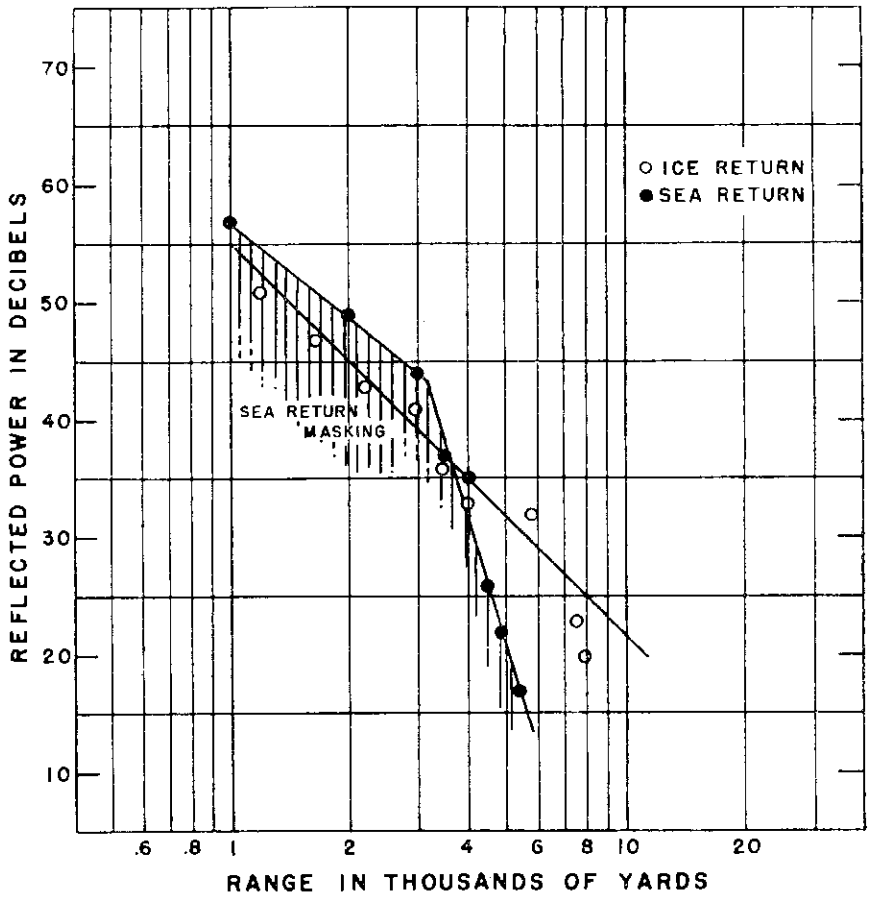


FIGURE 4. Relation between radar maximum range of detection and iceberg physical cross-sectional area illuminated at the maximum range.



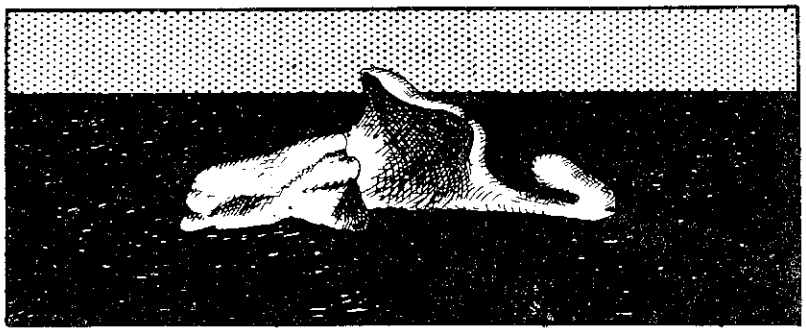


FIGURE 5. Reflected power expressed in decibels above minimum discernible signal plotted as a function of range for a growler (22 by 76 feet; 665 sq. feet) and sea return (4.5 feet high, 200 feet long). The measurements were made during standard propagation conditions under known overall radar performance.

should be expected because of the basic electrical properties of ice.

Evaluation of personnel who have as their primary duty the radar watch on board ships has revealed that the use of anticlutter devices often decreases the radar's effectiveness due to lack of training and experience. It was discovered that vessels are transiting the North Atlantic Ocean with the FTC circuit activated but with operators having little or no knowledge of its function or use. On other vessels sea return is reduced by decreasing the video or receiver gain although STC is available on the set. It was frequently discovered that radio operators, radar operators, merchant officers, and even naval watch officers do not know the function of the anticlutter devices for their radar sets on which they rely so heavily during reduced visibility. This lack of knowledge and improper use of these devices leads one to the conclusion that in many cases it is best not to have them at all. In summary, we can safely say that if an ice target is not picked up beyond the sea return it will not be detected at all. Herein lies the danger of total reliance on radar.

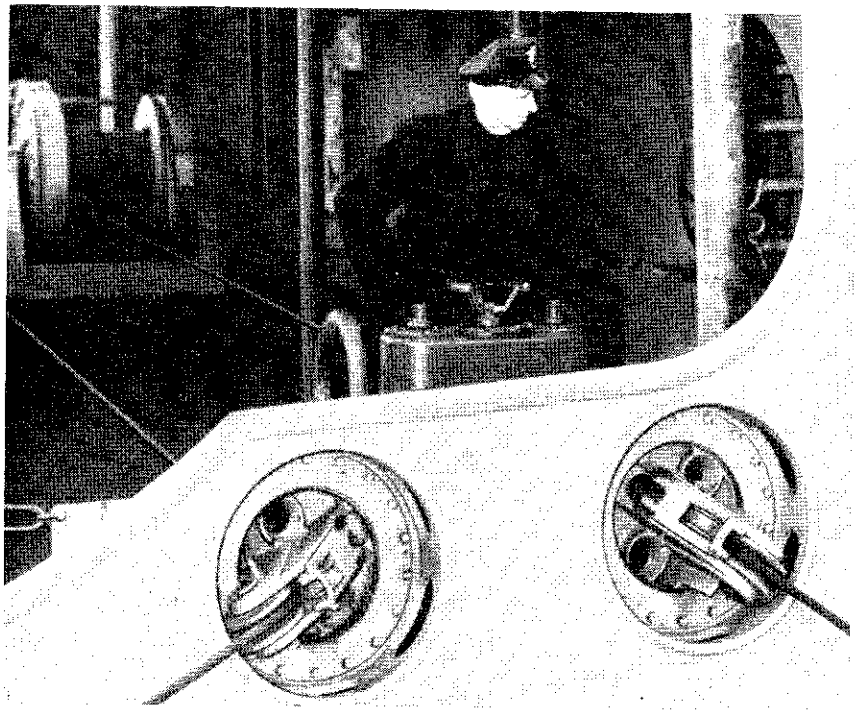
SUMMARY AND RECOMMENDATIONS

It has been established by both observation and basic theory that an intrinsic property of icebergs is poor electromagnetic reflection and that reliance cannot be placed on radar for safe navigation during moderate sea conditions. As part of the evaluation program theoretical and, where practical, observational analyses of the various radar parameters were accomplished. The results indicate that, other than the very poor reflection qualities of ice, iceberg radar response is similar to that of other targets and there is no frequency preference. The maximum range of growler detection is normally not seriously affected by the average subnormal propagation conditions to be expected, as determined by detailed measurements of temperature and humidity distributions, ray diagram analyses, and studies of meteorological conditions which prevail on the Grand Banks. It appears that horizontal polarization is preferred to vertical polarization (circular polarization was not examined). It is extremely important to maintain radars in peak operating condition as experiments revealed that a medium growler might go undetected if a receiver is below normal efficiency by as little as 10 percent. It was observed that the use of sector-scan antenna control does allow a more definite target detection and the use of either 30- or 60-degree scanning probably would be of value in detecting a weak ice target. The proper use of anticlutter devices involves the competency of the operator and it is believed that this is beyond the training and skill of the majority of operators. It is recommended that rather than perfecting new devices which might more confuse the operator, a method be considered of automatically applying various quantities of the anticlutter devices as the sea conditions dictate. Finally, based on the unequivocal conclusions of the studies conducted during the past 15 years:

ALL SHIP MASTERS, MATES, AND OWNERS ARE WARNED THAT SAFE PASSAGE THROUGH ICEBERG AREAS OF THE NORTH ATLANTIC OCEAN CANNOT BE ASSURED BY THE USE OF RADAR ALONE.

MARITIME SIDELIGHTS

UNIVERSAL MOORING CHOCKS FOR ST. LAWRENCE SEAWAY



AN ILLUSTRATION of a universal mooring chock approved by the St. Lawrence Seaway Authority for ships transiting its locks under the new regulations which became effective January 1, 1960. The first bulwark models were recently installed on the ore carrier *Arthur B. Homer*, the largest of its kind, which has 10 of these chocks installed, 5 on each side. *Courtesy Marine News.*

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Developments in inland waterways radar have brought about "revolutionary" changes in river transportation in Europe during the past five years, according to Mr. Eric Tyler, vice president and general manager of Decca Radar, Inc. of New York. Dutch, French, and German authorities are carrying through an intensive program of installing such aids as reflectors on bridges, piers, and buoys. The Comité Centrale du Navigation du Rhin has changed the rules of the road on the Rhine River to permit radar-fitted vessels to remain underway at night and in circumstances where other vessels are obliged to stop and await daylight or weather improvements.

The slick new freighter *SS Mormacpride* has been delivered by its builders, Sun Shipbuilding and Drydock Co., to the owners, Moore-McCormack Lines, Inc. It is presently on its maiden voyage from Milwaukee, Sarnia (Ontario), Detroit, Montreal, Quebec, Boston, Philadelphia, and New York for the major ports in Brazil and Argentina.

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A motion picture is now being prepared by the Atlantic Refining Co. to fully explain the history and function of the unique fuel-washing system installed aboard the *Atlantic Seaman*. Port Engineer W. A. Walls will use the color film when he speaks to the Society of Naval Architects and Marine Engineers in New York.

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Captain Edwin J. Dowling, Master of the MSTS transport vessel *Upshur*, has experimented with stenciled identification numbers of his crews' lifejackets as a measure to avoid confusion over lifeboat assignments during a sea disaster. A large numeral indicates the lifeboat in which the man is assigned and a small number below indicates the man's position code.

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CARGO HANDLING SYMPOSIUM

A 3-day cargo handling exposition and symposium will be held in New York September 27–29, 1960, sponsored by the New York chapter of the U.S. Merchant Marine Academy Alumni Association, the International Cargo Handling Coordination Association, and the American Standards Association. The exhibition and symposium will stress the safe, efficient and expeditious handling of cargo. The following organizations will participate:

Aerobilt Co., Allis-Chalmers, American Export Lines, Arthur Tickle Engineering Works, Atlantic & Gulf Equipment Corp., Automatic Transportation Co., Bailey Refrigeration, Budd Co., Cargocaire, Carrier Corp., Clark Brown Co., Consolidated Inventories Inc., Container Transport International, Dracone Developments, Freuhauf Trailer Co., General Electric Co., Grace Line, Highway Trailer Co., Hyster Co., International Longshoremen's Assoc., Isbrandtsen Co., Jeta, Journal of Commerce, Marine Steel Inc., Merritt-Chapman & Scott, M.S.T.S., National Malleable & Steel Castings Co., N.Y.C. Dept. of Marine & Aviation, N.Y. Port Authority, Paulsen-Webber Cordage, Perolin Co., Philadelphia Hoist, Santini Bros., Seatrain Lines, Silent Hoist Co., States Marine Lines, Strick Trailers, Towmotor Co., Trailmobile Co., Westinghouse Co., Yale and Towne Co.

FORT EUSTIS RADAR OBSERVER COURSE

AN APPROVED Radar Observer Course has been established at the U.S. Army Transportation School at Fort Eustis, Va.

The U.S. Army Transportation School thus becomes the fifth Coast Guard approved school in the United States authorized to instruct the course.

COAST GUARD REQUIREMENT

The need for schools in radar observation has been evident for sometime, particularly with the alarming increase of collisions at sea by ships equipped with radar. Since January 1, 1959, the Coast Guard has required an applicant for an original, raise of grade, or increase in scope of license for service as a deck officer on ocean, coastwise, or Great Lakes vessels of 300 gross tons and over to qualify as a radar observer. This requirement is met by successfully passing an examination given at a Marine Inspection Office or by presenting a certificate of successful completion of a course of instruction at a Maritime Administration Radar Observer School or other Government-operated school approved by the Commandant.

On or after May 1, 1962, every radar-equipped vessel of 300 gross tons and over issued a Certificate of Inspection for the navigation on ocean, coastwise or Great Lakes waters, must have in its required complement of deck officers, including the Master, only officers who have qualified as radar observers.

U.S. ARMY TRANSPORTATION CORPS

The Army has been directly affected by these regulations. In the Transportation Corps are marine officers and warrant officers who are masters, mates, and pilots of Transportation Corps seagoing vessels. Qualifying these ship's officers for the Radar Observers Certificate became a problem to be solved by the Transportation School with the assistance of the Coast Guard.

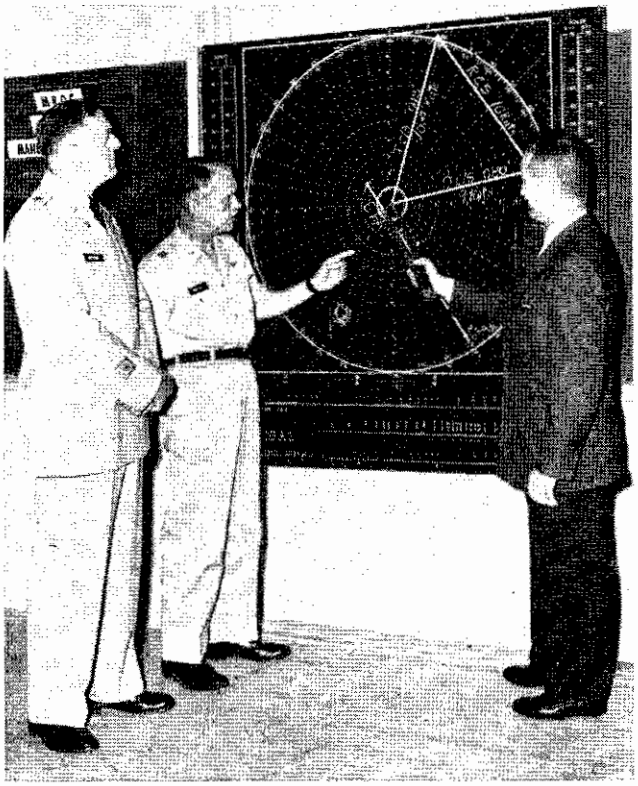
An Army Warrant Officer and civilian instructor at the Transportation School were instrumental in the development of the Marine Radar Observer Course. They are Chief Warrant Officer Carter C. James, Jr., and Mr. Theodore D. Alexander of the Harbor Craft Section under the Watercraft Operations and Maintenance Branch of the Transportation Technical Training Division. The division chief is Lt. Col. Edwin L. Harloff with Lt. Col. Ambrose C. Arthur as assistant for Surface Transportation. Maj. Joseph K. Taylor is branch chief.

Chief Warrant Officer James, the senior instructor of the Harbor Craft Section, reports the purpose of the course is to "increase safety at sea by preventing misuse and misinterpretation of radar."

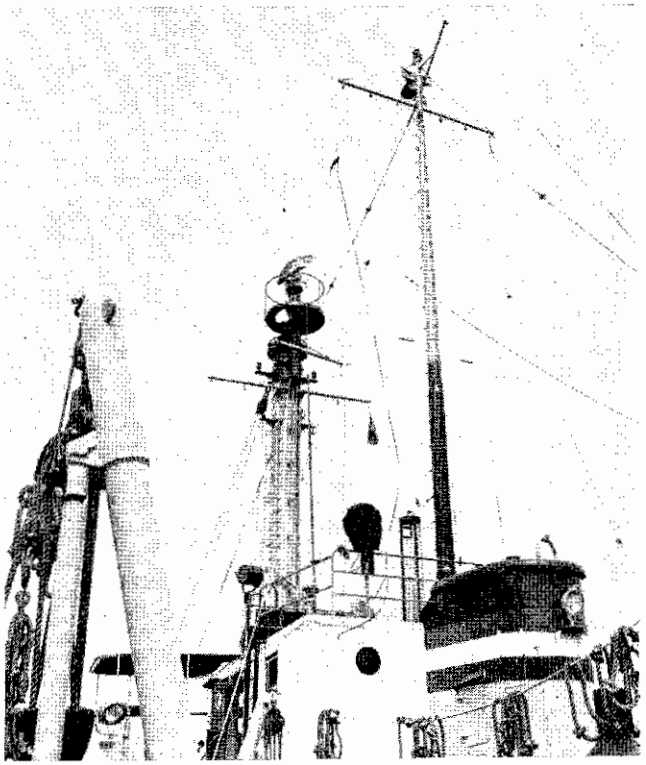
This is, he indicated, the primary cause for collision by radar-equipped ships.

PROPER USE OF RADAR

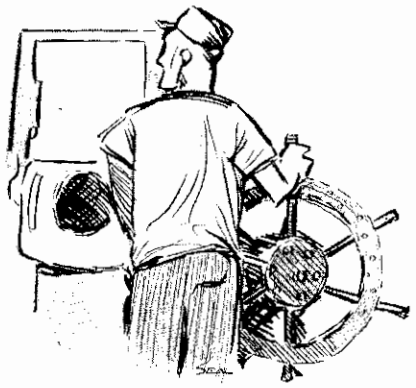
He said the course "teaches proper use of radar in determining a vessel's



MR. THEODORE D. ALEXANDER, principal instructor, demonstrates the use of a giant radar maneuvering board to Lt. Col. A. C. Arthur (left) and Lt. Col. E. L. Harloff (center). The giant board is used to instruct students of the U.S. Coast Guard approved Radar Observers at the U.S. Army Transportation School at Fort Eustis, Va.



RADAR SCANNER tops Army vessels. Army marine students at the U.S. Army Transportation School, Fort Eustis, Va., are instructed in classroom and on actual vessel in the school's U.S. Coast Guard approved Radar Observers Course. (U.S. Army Photos.)



closest point of approach and its true course and speed."

Mr. Alexander, formerly serving in the Army as an instructor and who was the key man in putting the course together, added, "Also, we teach how to take preventive action to avoid collision in case danger of collision is deemed to exist."

The T-School course is 2 weeks in duration, consisting of 80 hours of instruction. Unique at the T-School is the fact that radar observer students are trained on TC vessels, using actual equipment under actual conditions.

In the classroom, they are taught with a land-bound radar installation—where they are first instructed in the principles of radar and its interpretation. Large training aid plotting boards are used here.

Mr. Alexander, in doing leg work for the course for which he is principal instructor, visited the U.S. Maritime Administration Radar Observer School in New York, N.Y. There he observed their course of instruction.

The first Radar Observer Course was given at the T–School in late May and early June. At that time, Capt. L. M. Thayer, commanding officer of the Reserve Training Center in Yorktown, Va., monitored part of the instruction. (One of the texts used in the course was written by Capt. Thayer—Practical Radar Plotting.) Upon completion of instruction, Capt. Thayer administered the final examination in plotting which he had prepared. Also monitoring the course were Comdr. N. L. Fendig and Lt. Myron E. Welsh, both of the Merchant Vessel Personnel Division in U.S. Coast Guard's Headquarters.

Subsequently, the Transportation School was presented a Certificate of Approval from the U.S. Coast Guard, thus recognizing graduation from the school as indication that the requisite training has been acquired.

RADAR ANNEX

At the recent Safety of Life at Sea Conference held in London the participating nations took definite steps to guide mariners in the use of radar.

The international regulations for preventing collisions at sea have been amended and an annex of eight principles for the use of radar to avoid collisions at sea attached to the regulations. These principles are to be used as a guide for the mariner and have been based on the experiences and analyses of past collisions involving radar.

Although the new rules will not go into effect until the requisite number of nations have approved the convention, the SOLAS conference recommended that the radar annex be published for guidance to the mariners as soon as possible.

Recommendations on the use of radar information as an aid to avoiding collisions at sea:

1. Assumptions made on scanty information may be dangerous and should be avoided.

2. A vessel navigating with the aid of radar in restricted visibility must, in compliance with Rule 16(a),[1] go at a moderate speed. Information obtained from the use of radar is one of the circumstances to be taken into account when determining moderate speed. In this regard it must be recognized that small vessels, small icebergs and similar floating objects may not be detected by radar. Radar indications of one or more vessels in the vicinity may mean that "moderate speed" should be slower than a mariner without radar might consider moderate in the circumstances.

3. When navigating in restricted visibility, the radar range and bearing alone do not constitute ascertainment of the position of the other vessel under Rule 16(b) sufficiently to relieve a vessel of the duty to stop her engines and navigate with caution when a fog signal is heard forward of the beam.

4. When action has been taken under Rule 16(c) to avoid a close-quarters situation, it is essential to make sure that such action is having the desired effect. Alterations of course or speed, or both, are matters as to which the mariner must be guided by the circumstances of the case.

5. Alteration of course alone may be the most effective action to avoid close quarters provided that:

a. There is sufficient sea room.

b. It is made in good time.

c. It is substantial. A succession of small alterations of course should be avoided.

d. It does not result in a close-quarters situation with other vessels.

6. The direction of an alteration of course is a matter in which the mariner must be guided by the circumstances of the case. An alteration to starboard, particularly when vessels are approaching apparently on opposite or nearly opposite courses, is generally preferable to an alteration to port.

7. An alteration of speed, either alone or in conjunction with an alteration of course, should be substantial. A number of small alterations of speed should be avoided.

8. If a close-quarters situation is imminent, the most prudent action may be to take all way off the vessel.

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[1] The new proposed Rule 16 referred to in the *Radar Annex* is given below. It should be noted that this new rule will not actually be in effect on an international basis until the convention has been acceded to by the requisite number of nations, which may take several years.

Rule 16

(a) Every vessel, or seaplane when taxiing on the water, shall, in fog, mist, falling snow, heavy rainstorms or any other condition similarly restricting visibility, go at a moderate speed, having careful regard to the existing circumstances and conditions.

(b) A power-driven vessel hearing, apparently forward of her beam, the fog signal of a vessel the position of which is not ascertained, shall, so far as the circumstances of the case admit, stop her engines, and then navigate with caution until danger of collision is over.

(c) A power-driven vessel which detects the presence of another vessel forward of her beam before hearing her fog signal or sighting her visually may take early and substantial action to avoid a close-quarters situation but, if this cannot be avoided, she shall, so far as the circumstances of the case admit, stop her engines in proper time to avoid collision and then navigate with caution until danger of collision is over.

STATISTICAL ANALYSIS

A Statistical Analysis of Selected Marine Collisions Occurring During the Three Fiscal Years 1957, 1958, and 1959 is distributed with this issue of the PROCEEDINGS in the interest of merchant marine safety.

nautical queries

Q. Does a Mercator projection chart correctly picture the shape of an area? Explain your answer.

A. A Mercator chart is conformal, i.e., taking any small area, the shape of the region is the same as on the globe. However, since the scale varies to a considerable extent, the shapes of large areas are greatly distorted.

The distortion of a Mercator chart takes place in both directions, thus maintaining the proper shape of a relatively small area, but increasing its apparent area.

The common conception that a Mercator chart distorts the appearance of the earth's surface is true for charts covering a wide change of latitude because of the apparent increased size of a given area in higher latitudes. Within a narrow range of latitude the shape and relationship are portrayed accurately.

Q. Are all charts oriented so that North is shown at the top of the sheet? Explain your answer.

A. Most Mercator projection charts are so oriented that North is at the top of the sheet, but this rule is not invariable. On other projections, it should be remembered that true North is indicated by the direction of the meridians and not necessarily the top of the chart. Planimetric (plane surveys of local areas) charts frequently indicate North by orientation of the compass rose rather than by the top of the chart.

Q. How should charts be stowed?

A. Charts should be stowed flat in a clean, dry space, avoiding any unnecessary folding or creasing.

Q. Distinguish between small-scale charts and large-scale charts, and state the use of each.

A. Small-scale charts cover large areas and are used by the mariner for offshore navigation, while large-scale charts embrace smaller areas and are used for approaching and entering harbors.

Q. What is the true shape of the earth?

A. The true shape of the earth is that of an *oblate spheroid,* being a nearly spherical body slightly flattened at the poles. Its longer or equatorial axis is 6,884 nautical miles, and its shorter or polar axis measures 6,860.5 nautical miles. The shape is so nearly a sphere that for practical purposes of navigation it is assumed to be a perfect sphere.

Q. Describe how you would use a gnomonic chart to determine a composite great circle track with a limiting latitude.

A. On a great circle chart, draw lines from the points of departure and destination, respectively, tangent to the limiting parallel; transfer these great circles to a Mercator chart in the usual manner, by the coordinates of several points, including in each case the point of tangency to the parallel. Follow the first great circle to the parallel, then follow the parallel; then the second great circle.

Q. List the most common causes of inadequate condenser vacuum.

A. (a) Excessive air leakage into the vacuum system.

(b) Improper functioning of air-removal equipment.

(c) Improper drainage of condensate from condenser.

(d) Insufficient flow of circulating water.

(e) High injection temperature.

(f) Dirty condenser.

Q. Explain why the pressure differential between the main condenser and air ejector intercondenser does not equalize during normal operation.

A. The slight difference in pressure between the main condenser and the air ejector intercondenser is maintained by the loop seal in the interconnecting drain line from the intercondenser. The unequal heights of the water in the two legs of the loop seal will equal the difference in pressure between the two units.

Q. What immediate action should be taken if at any time loss of vacuum is accompanied by a hot or flooded condenser?

A. If at any time loss of vacuum is accompanied by a hot or flooded condenser, the units exhausting into it must be slowed down or stopped until the condensing plant is again put into working order.

Q. What precautions should be observed to prevent the formation of scale in the cylinder jackets of diesel engines equipped with open cooling water systems?

A. The outlet cooling water temperature should not be permitted to exceed 120° F. Large quantities of water should be circulated rapidly and with a small temperature difference, usually 10° F. to 20° F., between the inlet and outlet water in order to prevent the formation of local hot spots and scale. The water circulation should be continued after the engines are stopped until the engines are cool.

Q. What effect do leaky piston rings have upon the working of an engine?

A. Leakage of gas past the piston rings reduces the efficiency of the engine and increases the cylinder liner and piston ring wear by blowing the lubricating oil off the rubbing surfaces.

The efficiency of the engine is reduced owing to a low compression pressure causing bad combustion of fuel, and to leakage of gas, resulting in a reduced mean effective pressure.

Q. (a) What might cause a cylinder liner to become overheated?

(b) What immediate precautions should be taken?

(c) What might happen if these precautions were neglected?

A. (a) Want of cooling water, want of lubrication, or broken rings may cause a cylinder liner to overheat.

(b) If the heating is considered serious, it may become advisable to cut out that particular cylinder altogether by shutting off the fuel before serious damage ensues.

(c) A hot liner may result in fracture below the flange, breakage of piston rings, seized piston, and similar defects.

Q. Explain the purpose and the operation of the modern condensate-cooled gland exhaust condenser.

A. Gland leakoffs are used to withdraw leakage steam from the outer pockets of the main and auxiliary turbine glands and from the vent of the deaerating feed heater to prevent its escape into the engine room, and to conserve heat and minimize the loss of water. The leakoff lines lead to the gland exhaust condenser, which is usually located in the after condenser of the main air ejector. The vapor condenses and drains through a seal to the atmospheric drain tank. The atmospheric vent is usually connected to the suction of a small motor-driven fan (called the "gland exhauster"), which provides a positive discharge through piping to the atmosphere above decks.

MERCHANT MARINE PERSONNEL STATISTICS

MERCHANT MARINE OFFICER LICENSES ISSUED

QUARTER ENDING 30 JUNE 1960

DECK

Grade	Original	Renewal
Master:		
Ocean	41	329
Coastwise	7	47
Great Lakes	3	23
B.S. & L	17	110
Rivers	22	68
Radio Officer Licenses issued	11	86
Chief mate:		
Ocean	37	110
Coastwise	1	2
Mate:		
Great Lakes		
B.S. & L		1
Rivers		
Second mate:		
Ocean	27	81
Coastwise		1
Third mate:		
Ocean	53	71
Coastwise		
Pilots:		
Great Lakes	1	9
B.S. & L	118	40
Rivers	74	30
Master: Uninspected Vessels	9	20
Mate: Uninspected Vessels	28	53
Motorboat Operators	477	677
Total	926	1,758
Grand Total	2,684	

ENGINEER

Grade	Original	Renewal
STEAM		
Chief engineer:		
Unlimited	30	555
Limited	9	114
First assistant engineer:		
Unlimited	32	232
Limited	2	8
Second assistant engineer:		
Unlimited	49	275
Limited		1
Third assistant engineer:		
Unlimited	85	284
Limited		1
MOTOR		
Chief engineer:		
Unlimited	10	92
Limited	33	158
First assistant engineer:		
Unlimited	5	20
Limited	16	18
Second assistant engineer:		
Unlimited	1	17
Limited	3	
Third assistant engineer:		
Unlimited	71	393
Limited	3	1
Chief Engineer: Uninspected Vessels	6	15
Assistant Engineer: Uninspected Vessels	9	7
Total	364	2,191
Grand Total	2,555	

WAIVER OF MANNING REQUIREMENTS

Waivers	Atlantic Coast	Gulf Coast	Pacific Coast	Great Lakes	Total
Deck officers substituted for higher ratings			1		1
Engineer officers substituted for higher ratings	1		1		2
Ordinary seamen for able seamen					
Wiper or coalpassers for qualified member engine dept	1				1
Total Waivers	2		2		4
Number of vessels	2		2		4

INVESTIGATING UNITS

Coast Guard Merchant Marine Investigating Units and Merchant Marine Details investigated a total of 3,365 cases during the 2d quarter of 1960. From this number, hearings before examiners resulted involving 45 officers and 269 unlicensed men. In the case of officers, 0 licenses were revoked, 1 was suspended without probation granted, 6 were suspended with probation granted, 7 cases were dismissed after hearing, and 3 hearings were closed with admonitions. Of the unlicensed personnel, 22 documents were revoked, 14 were suspended without probation, 73 were suspended with probation granted, 26 cases were dismissed after hearing, and 18 hearings were closed with admonitions. Ten licenses and 110 documents were voluntarily surrendered.

ORIGINAL SEAMEN'S DOCUMENTS ISSUED

Type of document	Atlantic Coast	Gulf Coast	Pacific Coast	Great Lakes and Rivers	Total
Staff Officer	44	11	27	5	87
Continuous Discharge Book		23			23
Merchant Mariner's Documents	1,285	534	746	2,457	5,022
AB any waters unlimited	176	37	39	33	285
AB any waters, 12 months	50	9	16	96	171
AB Great Lakes, 18 months	6		5	46	57
AB Tugs and Towboats, any waters	2	6	5		13
AB Bays and Sounds	2				2
AB Seagoing Barges					0
Lifeboatman	150	11	52	5	218
QMED	200	58	55	160	473
Radio Officer	5		5		10
Certificate of Service	1,080	492	714	2,328	4,614
Tankerman	22	70	12	61	165
Total	3,022	1,251	1,676	5,191	11,140

AMVER PROGRAM

The International Safety of Life at Sea Conference 1960 has adopted the following recommendation:

> 47. *Merchant Ship Position Reporting*
>
> The Conference recommends that Contracting Governments should encourage all ships to report their positions when travelling in areas where arrangements are made to collect these positions for search and rescue use. Each Government should arrange that such messages shall be free of cost to the ship concerned.

The adoption of this recommendation constitutes endorsement of the AMVER program by the participating governments at the conference and indicates widespread international recognition.

The following article is indicative of the participation and cooperation of U.S. ships in the AMVER program and is reprinted through the courtesy of *Farrell Lines Safety News:*

We recently visited this facility in New York and observed the operation of the Ship's Plot—Atlantic in the Rescue Coordination Center. Two walls of this room are covered by charts picturing the North Atlantic Ocean on which weather patrol station vessels are situated. The boundary lines of each maritime region are clearly marked and the ship models, which adhere where placed on the plot by magnetic attraction, are fitted with a clip device to hold the complete data regarding that ship in code form. The positions of the ships are updated every 12 hours.

The computer sections works in conjunction with the plot room. This section is equipped with an I.B.M. RAMAC 305 machine computer in addition to other units. This computer has 50 discs capable of storing 5 million characters. Every 12 hours the positions of vessels are automatically advanced along their great circle, rhumb line, or coastal track in the machine. It is easy to understand that the accuracy of position advancement is dependent on the reported speed of the vessel.

The Rescue Coordination Center, Ship's Plot—Atlantic has over 700 ships on their roster. Over 5,000 vessels hailing from 51 nations participate in the program. Our vessels have been very active in cooperating in this program which, in the event of any actual rescue case, permits diversion of the nearest vessel (or vessels) to the scene thereby providing more rapid arrival of assistance and a saving for other vessels in the area not required at the scene.

Knowing that all Farrell Line Vessels have been taking part in this program, not only as a protection to

themselves, but also to aid those who may be in distress, we urge that the reports are conscientiously made in accordance with the instructions for participation. We highly recommend that more masters visit this facility when in New York and observe the efficient and important use made of the position reports submitted.

ARE YOUR DOCUMENTS IN SHAPE

Are your mariner's documents in good shape? After January 1, 1961, no mutilated document will be accepted for employment by Coast Guard Shipping Commissioners.

In most cases this condition is due to age, normal use or faulty lamination. There are a disturbing number of cases, however, where it has been found that the documents have been deliberately tampered with for the purpose of fraudulent use. It is believed that continued use of even slightly mutilated documents invites such fraudulent use when they are lost or otherwise fall into the hands of unscrupulous persons.

To reduce this possibility, a simplified procedure has been established whereby a seaman may obtain a replacement for a mutilated document with a minimum of delay and inconvenience. Henceforth in those cases where the mutilation is a result of age, general use, or faulty lamination, a seaman may upon presentation of the necessary photographs secure a replacement document on an exchange basis, without cost, at any Marine Inspection Office.

It is urged that all holders of mutilated Specially Validated Merchant Mariner's Documents apply for replacements as soon as possible and that persons in charge of the employment of seamen advise all interested parties of the restriction against the employment of holders of mutilated Specially Validated Merchant Mariner's Documents, which becomes effective January 1, 1961.

AMENDMENTS TO REGULATIONS

[EDITOR'S NOTE.—The following regulations have been promulgated or amended since the last issue of the PROCEEDINGS. A complete text of the regulations may be found in the Federal Register indicated at the end of each article. Copies of the Federal Registers containing the material referred to may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D.C.]

Title 33—NAVIGATION AND NAVIGABLE WATERS

Chapter I—Coast Guard, Department of the Treasury

[CGFR 60-57]

SUBCHAPTER K—SECURITY OF VESSELS

PART 124—CONTROL OVER MOVEMENT OF VESSELS

Certain Vessels Exempted From Advance Notice of Time of Arrival of Vessels

The following section has been amended to exempt certain United States vessels from the requirements regarding the advance notice of the vessel's estimated time of arrival to be furnished to the Captain of the Port.

§ 124.10 Advance notice of vessel's time of arrival to Captain of the Port.

(a) The master or agents of every foreign vessel and every documented vessel of the United States except (1) United States vessels engaged in the coastwise trade, (2) United States vessels engaged in the fisheries, or (3) United States yachts, arriving at a United States port or place from a port or place outside the United States or destined from one port or place in the United States to another port or place in the United States shall give at least 24 hours' advance notice of arrival to the Captain of the Port at every port or place where the vessel is to arrive, except as follows:

(Sec. 1, 40 Stat. 220, as amended, 50 U.S.C. 191, E.O. 10173, 15 F.R. 7005, 3 CFR, 1950 Supp., E.O. 10277, 16 F.R. 7537, 3 CFR, 1951 Supp., E.O. 10352, 17 F.R. 4607, 3 CFR, 1952 Supp.)

(Federal Register Document, 60-7063; Filed July 28, 1960, and printed July 29, 1960)

ARTICLES OF SHIPS' STORES AND SUPPLIES

Articles of ships' stores and supplies certified from 1 July to 31 July 1960, inclusive, for use on board vessels in accordance with the provisions of Part 147 of the regulations governing "Explosives or Other Dangerous Articles on Board Vessels" are as follows:

CERTIFIED

The Kleer-Flo Co., 250 West 57th St., New York 19, N.Y., Certificate No. 433, dated 11 July 1960, KLEER-FLO HI-T DEGREASOL.

The Kleer-Flo Co., 250 West 57th St., New York 19, N.Y., Certificate No. 434, dated 11 July 1960, KLEER-FLO HI-T DEGREASOL 2.

The Kleer-Flo Co., 250 West 57th St., New York 19, N.Y., Certificate No. 435, dated 11 July 1960, KLEER-FLO HI-T DEGREASOL 140.

Dunham Chemical Co., 840 North Michigan Ave., Chicago 11, Ill., Certificate No. 436, dated 12 July 1960, DUNHAM D-105.

Alken-Murray Corp., 131 East 23rd St., New York 10, N.Y., Certificate No. 437, dated 12 July 1960, MURRAY OIL CONDITIONER.

ACCEPTABLE COVERED STEEL ARC WELDING ELECTRODES

The following are additions to the list of electrodes which are acceptable to the United States Coast Guard for use in welded fabrications.

Distributors and/or manufacturers	Brand	AWS class	Operating positions and electrode sizes (inch)				
			5/32 and below	3/16	7/32	1/4	5/16
The Lincoln Electric Co., 22801 St. Clair Ave., Cleveland 17, Ohio	JETWELD LH 70	E7018 and E6018.	1	2	2	2	3
Alloy Rods Co., York, Pa. & El Segundo, Calif.	Atom-Arc 8018 CM	E8018-B2	1	2		2	

Alken-Murray Corp., 131 East 23rd St., New York 10, N.Y., Certificate No. 438, dated 12 July 1960, MURRAY SOOT REMOVER.

Dunham Chemical Co., 840 North Michigan Ave., Chicago 11, Ill., Certificate No. 439, dated 20 July 1960, DUNFAST.

Dunham Chemical Co., 840 North Michigan Ave., Chicago 11, Ill., Certificate No. 440, dated 26 July 1960, DUNHAM D-166.

AFFIDAVITS

The following affidavits were accepted during the period from 15 June 1960 to 15 July 1960:

Akron Brass Manufacturing Co., Inc., Wooster, Ohio, FITTINGS.

Mansfield & Green, Inc., 1051 Power Ave., Cleveland 14, Ohio, VALVES.

Automatic Switch Co.,[1] Hanover Park, Florham Park, N.J., VALVES.

Ralph N. Brodie Co., 350 South Columbus Ave., Mount Vernon, N.Y., VALVES.

Alcor Valve Specialties Co., 16 E. Edgewater Ave., Pleasantville, N.J., VALVES.

Byron Jackson Pumps, Inc., P.O. Box 70, Lawrenceburg, Ind., CASTINGS.

Flynn and Emrich Co., 301 Holliday St., Baltimore 2, Md., CASTINGS.

[1] Presently listed for valves, but the company desires new address to be shown as listed herein.

NOTICE

It is now possible to keep your Coast Guard publications up to date by using the column entitled "Marine Safety Publications and Pamphlets" as a ready reference. Following the title of each publication are the dates of the Federal Registers which amend it. With the use of the proper Federal Register, each pamphlet can be kept up to date until a new issue is available.

Changes Published During July 1960

The following publications have been modified by Federal Register:

CG-191 Federal Register, July 8, 1960.

CG-267 Federal Register, July 14, 1960, and July 29, 1960.

CG-239 Federal Register, July 29, 1960.

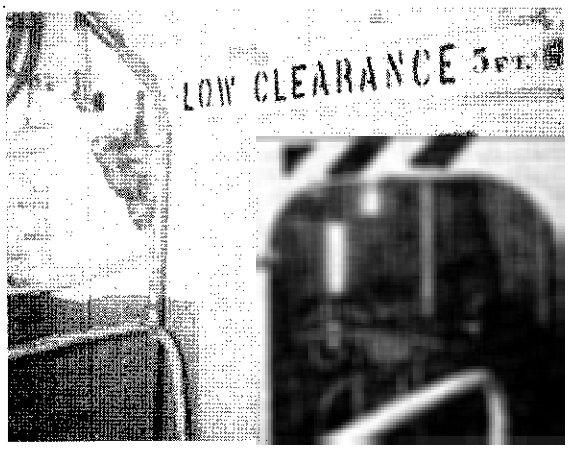
MARINE SAFETY PUBLICATIONS AND PAMPHLETS

The following publications and pamphlets are available and may be obtained upon request from the nearest Marine Inspection Office of the United States Coast Guard. The date of each publication is indicated in parenthesis following its title. The dates of the Federal Registers affecting each publication are noted after the date of each edition.

CG No.	Title of Publication
101	Specimen Examinations for Merchant Marine Deck Officers (7-1-58).
108	Rules and Regulations for Military Explosives and Hazardous Munitions (8-1-58).
115	Marine Engineering Regulations and Material Specifications (3-1-58). F.R. 5-10-58, 4-25-59, 9-5-59, 3-17-60.
123	Rules and Regulations for Tank Vessels (12-1-59). F.R. 3-30-60.
129	Proceedings of the Merchant Marine Council (Monthly).
169	Rules of the Road—International—Inland (5-1-59). F.R. 5-21-59, 6-6-59, 5-20-60.
172	Rules of the Road—Great Lakes (5-1-59). (F.R. 6-1-59, 1-7-60, 3-17-60, 5-20-60.
174	A Manual for the Safe Handling of Inflammable and Combustible Liquids (7-2-51).
175	Manual for Lifeboatmen and Able Seamen, Qualified Members of Engine Department, and Tankerman (6-1-55).
176	Load Line Regulations (9-2-58). F.R. 9-5-59.
182	Specimen Examinations for Merchant Marine Engineer Licenses (12-1-59).
184	Rules of the Road—Western Rivers (5-1-59). F.R. 6-1-59, 6-6-59, 5-20-60.
190	Equipment Lists (4-1-58). F.R. 6-3-58, 7-4-58, 9-27-58, 12-31-58, 3-14-59, 6-20-59, 7-28-59, 9-3-59, 12-17-59, 3-16-60, 6-21-60.
191	Rules and Regulations for Licensing and Certificating of Merchant Marine Personnel (5-1-59). F.R. 5-26-59, 6-20-59, 7-21-59, 8-15-59, 9-5-59, 1-8-60, 3-17-60, 3-30-60, 5-6-60, 7-8-60.
200	Marine Investigation Regulations and Suspension and Revocation Proceedings (7-1-58). F.R. 3-30-60, 5-6-60.
220	Specimen Examination Questions for Licenses as Master, Mate, and Pilot of Central Western Rivers Vessels (4-1-57).
227	Laws Governing Marine Inspection (7-3-50).
239	Security of Vessels and Waterfront Facilities (7-1-58). F.R. 11-1-58, 12-18-58, 12-30-58, 9-19-59, 2-24-60, 3-30-60, 7-29-60.
249	Merchant Marine Council Public Hearing Agenda (Annually).
256	Rules and Regulations for Passenger Vessels (3-2-59). F.R. 4-25-59, 6-18-59, 6-20-59, 7-9-59, 7-21-59, 9-5-59, 1-8-60, 5-6-60.
257	Rules and Regulations for Cargo and Miscellaneous Vessels (3-2-59). F.R. 4-25-59, 6-18-59, 6-20-59, 7-9-59, 7-21-59, 9-5-59, 5-6-60, 5-12-60.
258	Rules and Regulations for Uninspected Vessels (9-1-59). F.R. 3-17-60.
259	Electrical Engineering Regulations (9-2-58). F.R. 6-20-59, 7-21-59, 9-5-59, 1-8-60.
266	Rules and Regulations for Bulk Grain Cargoes (5-1-59).
267	Rules and Regulations for the Numbering of Undocumented Vessels and the Reporting of Boating Accidents (5-1-59). F.R. 7-11-59, 7-18-59, 7-25-59, 9-5-59, 9-17-59, 10-2-59, 10-23-59, 11-19-59, 11-21-59, 12-5-59, 12-29-59, 1-1-60, 1-30-60, 2-13-60, 3-4-60, 3-17-60, 3-18-60, 4-6-60, 4-14-60, 4-20-60, 5-6-60, 5-11-60, 6-25-60, 6-29-60, 7-14-60, 7-29-60.
268	Rules and Regulations for Manning of Vessels (10-2-59). F.R. 12-18-59, 3-17-60, 5-6-60.
269	Rules and Regulations for Nautical Schools (3-1-60). F.R. 3-30-60.
270	Rules and Regulations for Marine Engineering Installations Contracted for Prior to July 1, 1935 (11-19-52). F.R. 12-5-53, 12-28-55, 6-20-59, 3-17-60.
290	Pleasure Craft (7-1-59).
293	Miscellaneous Electrical Equipment List (3-7-60).
320	Rules and Regulations for Artificial Islands and Fixed Structures on the Outer Continental Shelf (10-1-59).
323	Rules and Regulations for Small Passenger Vessels (Not More Than 65 Feet in Length) (6-1-58). F.R. 6-28-58, 11-19-58, 1-6-59, 5-26-59, 6-18-59, 6-20-59, 7-21-59, 9-5-59, 1-8-60.
329	Fire Fighting Manual for Tank Vessels (4-1-58).

Official changes in rules and regulations are published in the Federal Register, which is printed daily except Sunday, Monday and days following holidays. The Federal Register is a sales publication and may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D.C. It is furnished by mail to subscribers for $1.50 per month or $15 per year, payable in advance. Individual copies desired may be purchased as long as they are available. The charge for individual copies of the Federal Register varies in proportion to the size of the issue and will be 15 cents unless otherwise noted on the table of changes.

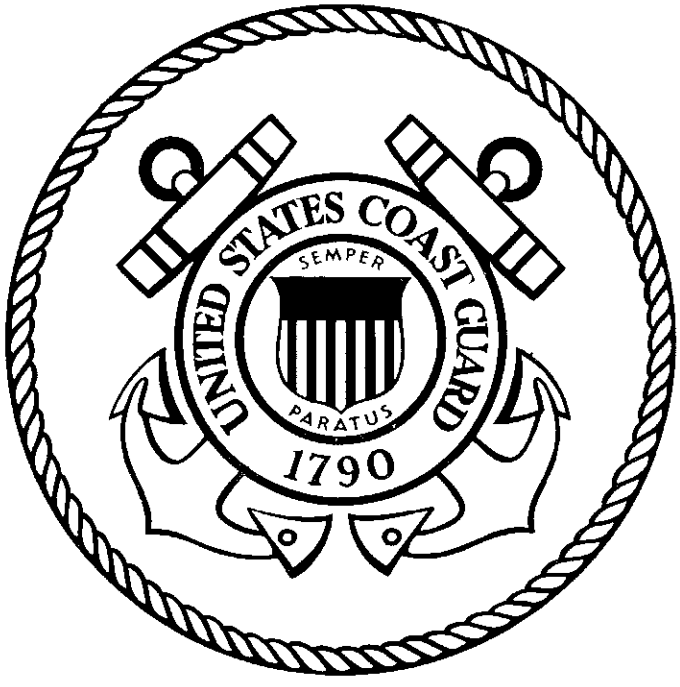
U.S. GOVERNMENT PRINTING OFFICE: 1960



SIGNS OF THE TIMES

SAFETY SPELLED OUT IN ENGINE SPACES

A Statistical Analysis of Selected Marine Collisions Occurring During the Three Fiscal Years 1957, 1958, and 1959



JUNE 1, 1960

UNITED STATES COAST GUARD

ADDRESS REPLY TO:
COMMANDANT
U.S. COAST GUARD
HEADQUARTERS
WASHINGTON 25, D.C.

M

June 1, 1960

FOREWORD

The Coast Guard is continually making case studies of all types of marine casualties with a view toward the determination of causes and the prevention of recurrence. The more spectacular or newsworthy of the marine casualties are usually studied by other executive agencies, the U.S. Congress, and various nongovernment experts as well. Collisions at sea are only a part of the total of marine casualties. Very little has been done in the past to determine causes through a comprehensive analysis of conditions surrounding the collisions regardless of their severity. The difference between a major and a minor collision is usually only a matter of chance. A variation in the point of impact, the cargo, or the number of passengers carried may cause widely differing results. The fact remains that the same types of ships and personnel are involved in both major and minor collisions. Thus a need arose for an intensive review of all conditions leading up to reported collisions without regard for the severity of the consequences or after effects.

In analyzing the results of this statistical study of collisions, the viewer should be apprised of its parameters and limitations. First, the tabulations were extracted from reports which are required to be submitted to the Coast Guard by masters, owners, or operators (46 CFR 136.05); thus, only collisions within the Coast Guard's jurisdiction were considered. Second, since the study was concerned primarily with commercial oceangoing and Great Lakes ships, collisions were eliminated which occurred on the western rivers (Mississippi-Missouri River system) or which involved vessels both of which were under 500 gross tons. For the purpose of the size limitation, tugs with tows were considered as single vessels. Third, because the present reporting system was not intended to list all information if it appeared extraneous to the individual cases, the reports did not in every instance list complete information for this statistical study. Much desirable data was not contained in the reports.

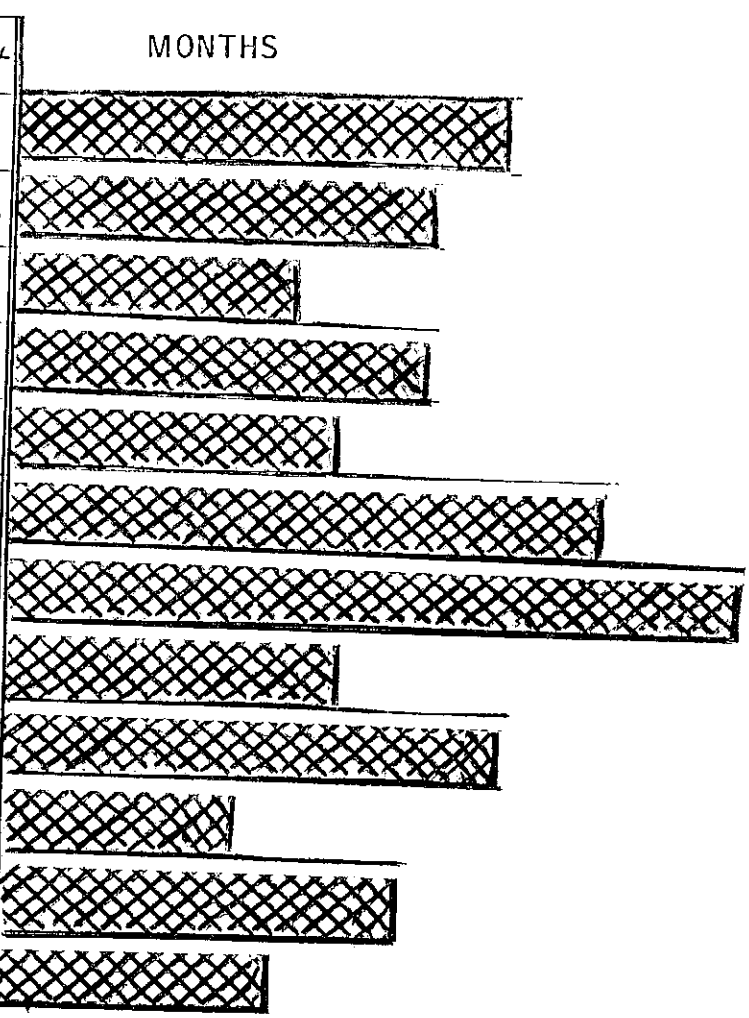
The study is a tabulation of as many of the conditions and circumstances surrounding the collisions as were generally available. It was hoped that this method would point out trends or common denominators while eliminating most of the preconceived opinions of the study group. A total of 199 collisions were considered for the three most recent full fiscal years for which reports were available—1957, 1958, and 1959. Various graphs and tables are included before the tabulations of data for each of the three years' collisions. Although analysis and interpretation are chiefly left to the reader, short comments of the study group are included.

A. C. RICHMOND,
ADMIRAL, U. S. COAST GUARD,
Commandant.

DIST. (SDL NO. 71)

A: a aa b c d (2); remainder (1)
B: n (35); c (16); e (5); f (4); h (3); g (2); remainder (1)
C: a b (less Quonset Pt.) c d e f g i m o u (1)
D: i (5); a b c d e f g h j k l (1)
E: o (New London only) (1)
List 141M
List 111

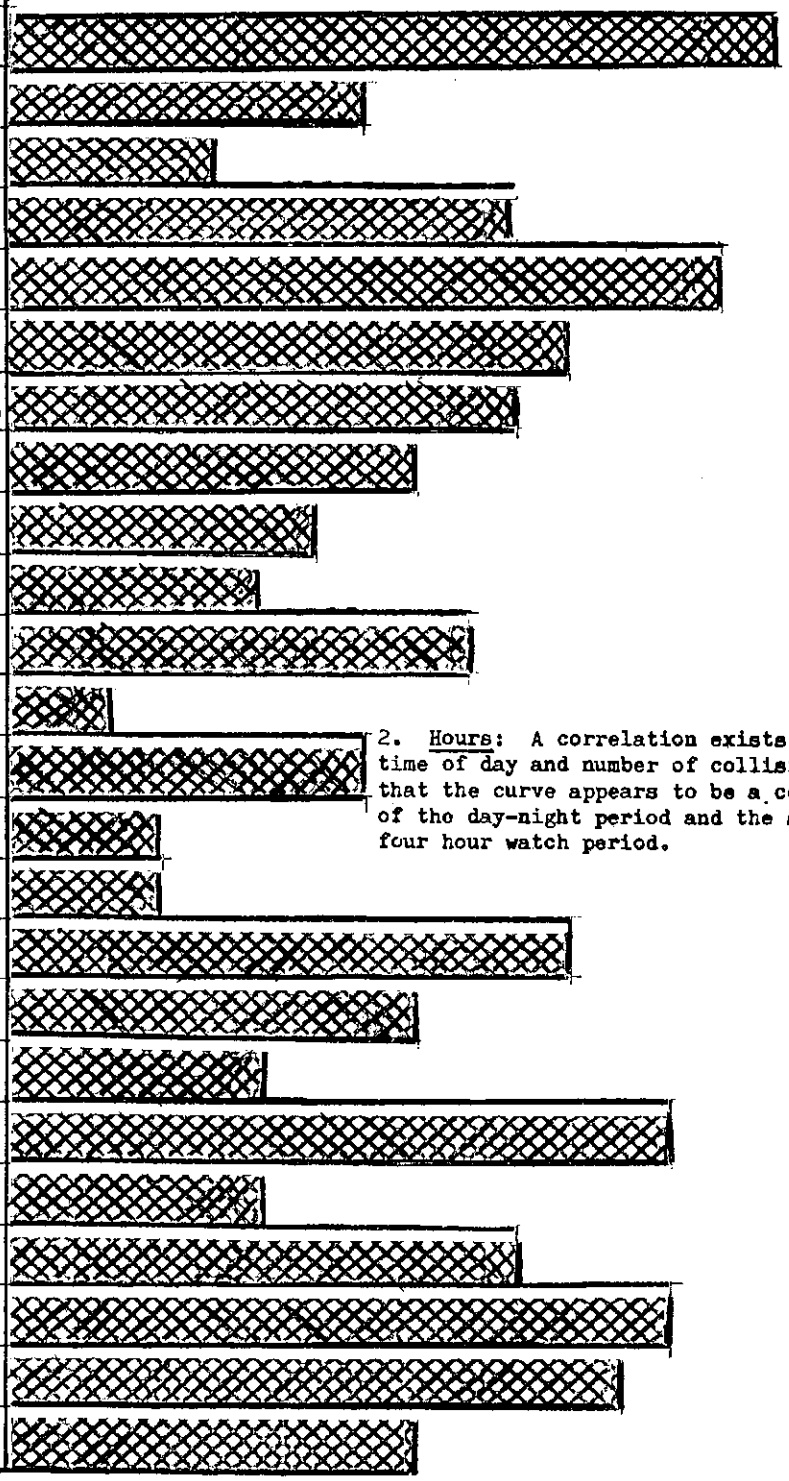
MONTH	FY 1957	FY 1958	FY 1959	TOTAL
JULY	5	9	5	19
AUG.	8	4	5	17
SEPT.	2	3	7	12
OCT.	4	2	11	11
NOV.	0	5	8	13
DEC.	12	2	9	23
JAN.	9	8	12	29
FEB.	6	1	6	13
MAR.	6	7	7	20
APR.	4	2	3	9
MAY	2	6	8	16
JUNE	5	4	2	11
	63	53	83	199



1. *Months:* More collisions occur during winter than summer. Since no pronounced cycle is evident and since the individual years are at variance with each other, the study group concluded there was no great correlation between months and collisions.

HOURS

HOUR (Local Zone)		FY 1957	FY 1958	FY 1959	TOTAL
00		4	9	2	15
01		5	0	2	7
02		2	1	1	4
03		4	4	2	10
04		5	3	6	14
05		2	1	8	11
06		3	4	3	10
07		0	2	6	8
08		0	2	4	6
09		2	2	1	5
10		2	2	5	9
11		0	1	1	2
12		5	1	1	7
13		0	2	1	3
14		0	0	3	3
15		3	4	4	11
16		2	1	5	8
17		0	3	2	5
18		5	1	7	13
19		2	0	3	5
20		4	2	4	10
21		4	3	6	13
22		6	2	4	12
23		3	3	2	8
		63	53	83	199



2. Hours: A correlation exists between time of day and number of collisions in that the curve appears to be a combination of the day-night period and the standard four hour watch period.

U.S./FOREIGN

	FOREIGN	U.S.
U.S.	85	104
FOREIGN	10	

Note: This type of chart represents numbers of collisions on a ship vs. ship basis.

3. *U.S./Foreign:* Because of the limiting parameters of the study it was expected that collisions involving two U.S. vessels would predominate. This tabulation has no significance other than aiding analysis of the others. In the 199 collisions there were 398 ships of which 293 were U.S. and 105 were foreign.

TONNAGE

	UNDER 1,000	1,000-5000	5,000-10,000	OVER 10,000
OVER 10,000	21	14	11	8
5,000-10,000	45	12	12	
1,000-5,000	31	9		
UNDER 1,000	36			

4. *Tonnages:* Although no "traffic" or "population" densities have been considered this table seems to indicate that, except for small vessels, collisions between similar size vessels happen less often than collisions between vessel of different sizes. The "under 1,000 ton" category involved the most vessels (169). The 5 to 10 thousand class was next with 92 ,the 1 to 5 thousand with 75, and last the over 10,000 with 62.

RIG

	OTHERS	TUG W TOW	TANKER	FREIGHTER	PASSENGER
PASSENGER	1	0	3	2	0
FREIGHTER	26	40	21	33	
TANKER	11	20	8		
TUG WITH TOW	9	19			
OTHERS	6				

5. *Rig:* As with sizes (except for freighters), like types seem less likely than unlike types to collide. In decreasing order there were 155 freighters, 107 tugs with tows, 71 tankers, 59 miscellaneous other vessels such as ferries, dredges, Naval or Coast Guard ships and only 6 passenger ships involved in the 199 collisions.

C.G. INSPECTED/OTHER

	NO	YES
YES	98	28
NO	73	

6. *CG Inspected:* Allowing for the numerical superiority of non-Coast Guard inspected ships (foreign flag, diesel tugs, etc.), it appears that ships which are subject to inspection are less inclined to collide with one another than noninspected ships. Similarly, noninspected ships did not collide with each other as often as they did with inspected ships. This, when compared to the previous table (Rig) with only 19 collisions between two tugs with tows, might be explained by the likelihood that similar types of vessel would be involved in similar operations; hence the operators would be better able to know or understand the other ship's maneuvers. There were 154 Coast Guard inspected and 244 non-CG-inspected ships involved in collisions.

RULES/LOCATION/SITUATION

	FY 1957	FY 1958	FY 1959		TOTAL	
INTERNATIONAL	3	5	12		20	APPLICABLE RULES
INLAND	52	43	58		153	
GREAT LAKES	8	5	13		26	
OPEN SEA	6	6	14		26	LOCATIONS
CONGESTED WATERS	30	11	15		56	
NARROW CHANNELS	27	36	54		117	
MEETING	27	31	46		104	SITUATIONS
CROSSING	15	7	18		40	
OVERTAKING	12	9	17		38	
OTHERS	9	6	2		17	

7. *App. rules/Location/Situation:* The study group divided the locations of collisions into three broad categories: "Open sea" meaning plenty of sea-room, deep water and light traffic; "congested waters" meaning harbors or heavily trafficked areas where there was sea room; and "narrow channels" where sea room was restricted as it would be on a river. As would be expected, most of the collisions occurred in locations where Inland Rules applied. The large number of collisions in "narrow channels" explains the preponderance of "meeting situation" collisions.

VISIBILITY

	DAYLIGHT	DARK	TWILIGHT
UNDER 2 MI	31	19	3
2 TO 5 MI	7	12	0
OVER 5 MI	41	80	6

8. *Visibility:* Two elements to the broad condition of "visibility," were considered. These were the distance element—how clear was the atmosphere—and the light element—how much daylight. Tabulation of these two factors against each other indicates that collisions are most likely to occur in *clear* conditions (127) over foggy (only 53) and that darkness with 111 collisions appears more conducive to collisions than daylight with 79. The greatest number of collisions—40%—occurred in darkness where lights could be seen over five miles.

PASSING SIGNALS

	FY 1957	FY 1958	FY 1959		TOTAL
AGREEMENT REACHED	5	12	16		33
AGREEMENT NOT REACHED	53	41	58		152
NOT DETERMINED	5	0	9		14

PASSING SIGNALS

	NOT DETERM'D	NOT SOUNDED	SOUNDED
SOUNDED	3	41	67
NOT SOUNDED	1	72	
NOT DETERM'D	15		

9. *Passing Signals:* The combination of the two tabulations (agreements reached and the sounding of signals) indicates a marked need for using whistle signals as provided by the Rules of the Road. Of the 398 ships involved in the 199 collisions approximately half (178) attempted to exchange the information required, while about half did not; 186 failed to sound signals. For 34 of the collision information was not available. However, 33 collisions occurred even though a passing agreement had been reached.

FIRST KNOWLEDGE

	NOT DETERMINED	SOUND	VISUAL	RADAR
RADAR	2	3	13	11
VISUAL	11	1	138	
SOUND	2	3		
NOT DETERM'D	15			

10. *First knowledge:* First knowledge of the other ship (supported by the visibility tabulations) was overwhelmingly by visual observations. Of the 398 ships involved, 301 first became aware of their collision—partners visually. Only 40 did so by radar, 12 by sound and 45 were undetermined.

Note: The tabulation "undetermined" can be evaluated by considering the source of these data—casualty investigation reports—and the general framework within which the casualties are investigated—the "case method." Where the item of information is not recorded in the report, it is reasonable to assume the investigating officer did not consider it germane to the individual case.

ELECTRONIC NAVIGATION EQUIPMENT

RADAR

	Not Det.	Not Abd.	Abd.
Aboard	19	18	30
Not Aboard	3	6	
Not Determ'd	123		

	Not Det.	Not Used	Used
Used	10	22	20
Not Used	9	10	
Not Determ'd	128		

RADIO TELEPHONE

	Not Det	Not Abd.	Abd
Aboard	41	22	64
Not Aboard	1	2	
Not Determ'd	89		

	Not Det.	Not Used	Used
Used	4	2	15
Not Used	21	34	
Not Determ'd	123		

11. *Electronic Navigation Equipment:*

(a) *Radar*—In the main the reporting system failed to disclose significant information as to whether or not radar was aboard or used. Of the 97 ships known to have radar, 72 used the equipment. Information was lacking as to the installation of this equipment in 268 ships; likewise, information was lacking as to the use of radar in 275.

(b) *Radio Telephones*—Similar conclusions can be drawn for voice radios. More ships were known to have the equipment (191) but fewer (only 36) attempted to use it. The reporting system gave no indication of installation for 180 of the ships and none for its use in 271.

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RULES OF THE ROAD VIOLATED

ARTICLE	FY 1957	FY 1958	FY 1959		TOTAL
2	0	0	1		1
3	0	1	0		1
15	2	2	4		8
16	18	19	27		64
17	0	1	5		6
18 RULE I	27	7	21		55
18 RULE III	5	12	13		30
18 RULE V	0	2	1		3
18 RULE VII	5	1	11		17
19	5	1	7		13
21	1	0	0		1
22	0	6	4		10
23	1	1	0		2
24	6	3	6		15
25	2	10	15		27
26	1	1	1		3
27	1	2	0		3
28	3	0	1		4
29	11	15	18		44

105

12. *Rules of the Road violated:* This tabulation supports the tabulations for passing signals. There appears to be a marked disinclination to adhere fully to the established conventions for avoiding collisions. There may be valid reasons for the inability to reach passing agreement—a cross tabulation of "rules violated" against "locations" may disclose the difficulty of identifying the signalling vessel in congested waters; however the study group draws no conclusion here.

MATERIAL/PERSONNEL FAILURES

	FY 1957	FY 1958	FY 1959		TOTAL
MATERIAL FAILURE	1	1	4		6
NO MATERIAL FAILURE	123	105	162		390
MATERIAL FAILURE NOT DETERMINED	2	0	0		2
PERSONNEL FAILURE	88	84	117		289
NO PERSONNEL FAILURE	36	22	49		107
PERSONNEL FAILURE NOT DETERMINED	2	0	0		2

13. *Material/Personnel Failures:* Tabulating material versus personnel failures indicates an insignificant percentage of collisions due to mechanical breakdowns. Engines, rudders, propellers, lights, etc. are reliable; the problem is almost exclusively the human element.

CAUSE

		PY 1957	FY 1958	FY 1959		TOTAL
A	EXCESS SPEED	21	23	33		77
B	INSUFFICIENT POWER	6	0	3		9
C	WRONG SIDE OF CHANNEL	10	17	31		58
D	FAILURE TO SOUND SIGNALS	13	16	16		45
E	MEETING SITUATION, TURNED LEFT	6	12	9		27
F	CROSSING SITUATION, BURDENED FAILED TO GIVE WAY	6	6	12		24
G	FAILED TO STOP OR BACK	3	12	0		15
H	EVASIVE MANEUVER TOO LITTLE OR TOO LATE	9	8	4		21
I	OVERTAKING VESSEL FAILED TO KEEP CLEAR	8	5	16		29
J	OVERTAKEN VESSEL FAILED TO MAINTAIN COURSE	1	3	2		6
K	WIND, SEA, OR CURRENT WERE FACTORS	3	3	6		12

14. *Causes:* The group listed eleven likely collision causes determined from its combined experience in analyzing and investigating casualties. As data from each report was recorded, the study group listed its own evaluations of the dominant possibilities. The tabulation of these opinions attributes 77 cases to excess speed, 58 to being on the wrong side of the channel and 45 to failures in sounding signals. Significantly, only 12 cases appear where adverse weather or current were dominant causes. This is substantiated by referral to the three years' tabulations of weather and sea or currents which also indicate little correlation.

EFFECTS

	FY 1957	FY 1958	FY 1959		TOTALS
DEATHS	13	12	30		55
INJURIES	37	18	82		137
MONETARY DAMAGE	$8,875,000	$3,424,000	$7,822,000		$20,121,000

15. *Effects:* The data, together with the tables of related variables, are subject to many interpretations. The effects of these 199 collisions over three years were 55 deaths, 137 incapacitating injuries, and property damage in excess of $20 million.

TABULATION OF MARINE COLLISIONS

NOTES.—1. These tabulations were made from collision reports available at CGHQ which were submitted pursuant to 46 CFR 136. 2. "Collisions" with fixed eliminate small craft collisions at least one of the vessels in each collision was required to be over 500 G.T.

SYMBOLS
√ Yes
○ No
— No information

A Excess speed
B Insufficient power
C Wrong side channel
D Failure to sound signals

Identification			Nationality		Size (gross tons)				Rig						Coast Guard inspection	Applicable rules			Location			Visibility						Weather					
																						Distance (miles)			Time			Wind			Current or sea		
Case No.	Month and year	Time (zone)	United States	Foreign	Under 1,000	1,000–5,000	5,000–10,000	Over 10,000	Passenger	Freighter	Tanker	Tug with tow	Other		Coast Guard inspection	International	Inland	Great Lakes	Open sea	Congested waters	Narrow channel	Under 2	2–5	Over 5	Daylight	Dark	Twilight	Strong	Moderate	Light or calm	Strong	Moderate	Calm or slack
1	Jul 56	2240	√		√						√				√		√				√			√				√				√
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3	Jul 56	1052		√	√								F/V		○																	
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4	Jul 56	0535	√					√	√						√																	
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5	Jul 56	0103	√				√			√					√		√			√		√			√				√			√
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7	Aug 56	1233	√				√				√				√																	
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8	Aug 56	2230	√			√				√					√																	
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9	Aug 56	0340	√				√			√					√																	
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10	Aug 56	0630	√				√			√					√																	
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11	Aug 56	1550	√			√					√				√																	
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14	Sep 56	0106		√		√				√					○																	
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OCCURRING DURING FISCAL YEAR 1957

objects or while maneuvering alongside piers were eliminated as irrelevant. 3. The U.S. western rivers (Mississippi River System) were excluded. 4. To Tugs with tows were considered as single vessels for the purposes of this tabulation.)

E Meeting situation, turned left
F Crossing situation, burdened failed give way
G Failed to stop or back
H Evasive maneuver too little or too late
I Overtaking vessel failed keep clear
J Overtaken vessel failed maintain course
K Wind, sea or current factors

Situation					First knowledge: How obtained			First knowledge: Distance off (miles)			Communication		Equipment				Navigating personnel					Collision cause				Losses			
Meeting	Crossing	Overtaking	Anchored or moored	Other	Radar	Visual	Sound	Under 1	1–2	Over 2	Passing signal sounded	Agreement reached	Radar: Aboard	Radar: Used	Radio telephone: Aboard	Radio telephone: Used	Pilot	Master	Mate	Helmsman	Lookout	Material failure	Personnel failure	Rule(s) violated	Comments	Deaths	Injured	Dollars (Thousands)	Case No.
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				Udrwy		√		√			○	○	—	—	—	—	√	√	√	√	○	○	○			0	0	75	15
			√		○	○	○	○	○	○	○	○	—	—	—	—	○	○	○	○	○	○	√						
		√				√			√		√	√	—	—	√	√	√	√	√	√	√	○	√	18–VIII	I	0	0	3	16
						√			√		√	√	-	—	√	√	○	√	√	○	√	○	○						
						√			√		√	○	—	—	√	—	√	√	√	√	√	○	○			0	0	17	17
						√			√		○	○	—	—	—	—	○	√	○	○	○	○	√	18–I	D				
	√					√		√			○	○	—	—	—	—	○	√	○	○	○	○	√	29	C	0	0	7	18
						√		√			√	○	—	—	—	—	○	√	○	○	○	○	○						

TABULATION OF MARINE COLLISIONS

NOTES.—1. These tabulations were made from collision reports available at CGHQ which were submitted pursuant to 46 CFR 136. 2. "Collisions" with fixed eliminate small craft collisions at least one of the vessels in each collision was required to be over 500 G.T

SYMBOLS
√ Yes
○ No
— No information

A Excess speed
B Insufficient power
C Wrong side channel
D Failure to sound signals

Identification			Nationality		Size (gross tons)				Rig					Coast Guard inspection	Applicable rules			Location			Visibility						Weather					
																					Distance (miles)			Time			Wind			Current or sea		
Case No.	Month and year	Time (zone)	United States	Foreign	Under 1,000	1,000–5,000	5,000–10,000	Over 10,000	Passenger	Freighter	Tanker	Tug with tow	Other	Coast Guard inspection	International	Inland	Great Lakes	Open sea	Congested waters	Narrow channel	Under 2	2-5	Over 5	Daylight	Dark	Twilight	Strong	Moderate	Light or calm	Strong	Moderate	Calm or slack
19	Oct 56	1958	—	√			√			√				○																		
			√			√							Ferry	√		√			√				√			√			√			√
20	Dec 56	1240	√		√							√		○																		
				√			√			√				○		√				√			√	√				√			√
21	Dec 56	0230	√		√								Tug	○																		
				√		√				√				○		√			√			√			√			√			√
22	Dec 56	2345	√				√			√				○																		
				√				√			√			√	√			√			√				√			√			√
23	Dec 56	1846	√		√					√				√																		
			√		√							√		○		√			√		√				√			√			√
24	Dec 56	0658	√		√								Ferry	√																		
			√		√								Ferry	√		√				√	√					√			√			√
25	Dec 56	1047	—	√			√			√				○																		
			√		√							√		○		√			√		√			√				√			√
26	Dec 56	2117	—	√	√					√				○																		
				√			√			√				○		√				√	√				√			√			√
27	Dec 56	2140	√		√							√		√																		
			√			√							Ferry	√		√			√		√				√			√			√
28	Dec 56	1839	√				√			√				√																		
			√				√			√				√		√				√			√		√			√			√
29	Dec 56	2253	—	√		√				√				○																		
			√					√			√			√		√				√	√				√			√		√	
30	Dec 56	0022	√		√							√		○																		
				√		√				√				○		√			√		√				√			√			√
31	Dec 56	1234	√				√			√				○																		
				√		√				√				√		√			√		√			√				√			√
32	Jan 57	1223	√		√						√			√																		
				√				√					F/V	○		√		√					√	√				√			√	
33	Jan 57	0513	—	√		√				√				○																		
			√				√		√					√		√		√					√		√				√			√
34	Jan 57	1544	√				√			√				√																		
			√					√	√				Naval	○		√			√		√			√				√			√
35	Jan 57	0043	√				√			√				√																		
				√	√					√				○		√				√			√		√			√		√	
36	Jan 57	1610	√		√							√		○																		
			√		√							√		○		√				√		√	√			√				√	

OCCURRING DURING FISCAL YEAR 1957—Continued

objects or while maneuvering alongside piers were eliminated as irrelevant. 3. The U.S. western rivers (Mississippi River System) were excluded. 4. To (Tugs with tows were considered as single vessels for the purposes of this tabulation.)

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J Overtaken vessel failed maintain course
K Wind, sea or current factors

Situation					First knowledge						Communications		Equipment				Navigating personnel					Collision cause				Losses			
					How obtained			Distance off (miles)																					
Meeting	Crossing	Overtaking	Anchored or moored	Other	Radar	Visual	Sound	Under 1	1-2	Over 2	Passing signal sounded	Agreement reached	Radar		Radio telephone		Pilot	Master	Mate	Helmsman	Lookout	Material failure	Personnel failure	Rule(s) violated	Comments	Deaths	Injured	Dollars (Thousands)	Case No.
													Aboard	Used	Aboard	Used													
		√				√		√			○	○	—	—	—	—	√	○	√	√	√	○	○						
					○	○	○	○	○	○	○	√	○	—	√	√	√	√	○	○	√	○	√	18-VIII, 23, 24, 29		0	5	90	19
√						√		√			√	○	—	—	—	—	○	√	—	—	—	○	√	25, 18-I	C, E				
						√		—	—	—	√	○	—	—	—	—	√	√	√	√	—	○	○			0	0	3	20
√						√				—	○	○	—	—	—	—	○	√	○	○	○	○	√	18-I	D				
						√		—	—	—	○	○	—	—	—	—	√	○	√	√	√	○	√	18-I	D	1	1	10	21
√					√					√	○	○	√	√	√	—	○	√	√	√	√	○	√	16, 29	A				
					√					√	○	○	√	√	—	—	○	√	√	√	√	○	√	16, 18	A, E	0	0	245	22
√					√			√			○	○	√	√			○	√	√	√	√	○	○						
					√			√			○	○	√	√	—	—	○	√	○	√	√	○	√	16, 25	C, G	0	0	31	23
√					√			—	—	—	○	○	√	√	√	√	○	√	√	√	√	○	√	16, 29	A, D				
					√			—	—	—	○	○	√	√	√	○	○	√	√	√	√	○	√	16, 18, 29	A, D, E	0	12	16	24
	√						√	√			○	○	○	○	—	—	√	√	√	√	√	○	○						
							√			√	○	○	√	√	—	—	○	√	○	○	√	○	√	16	G	0	0	3	25
√					√					√	○	○	√	√	○	○	√	√	√	√	√	○	√	16	A	0	0	280	26
					√					√	○	○	√	√	√	○	√	√	√	√	√	○	√	16	G	0	0		
	√						√	—	—	—	○	○	—	—	○	—	○	√	—	—	√	○	√		A, H	0	0	2	27
							√	—	—	—	○	○	—	—	√		○	√	○	√	√	○	√		A, H	0	0		
	√					√		√			○	○	—	—	√	—	√	√	√	√	√	○	○			0	0	992	28
						√		√			○	○	√	○	○	○	√	√	√	√	√	○	√	19	F				
			√		○	○	○	○	○	○	○	○	√	○	—	—	○	○	○	○	○	○	○			0	0	7	29
				Udrwy	√				√		○	○	√	√	—	—	√	√	√	√	√	○	√	29	K				
√					√			√			○	○	√	√	√	○	○	√	○	√	○	○	√	16	A	0	0	19	30
					—	—	—	—	—	—	○	○	○	○	—	—	√	√	√	√	√	○	√	16	A, E				
				Udrwy	√					√	○	○	○	○	—	—	√	√	√	√	√	○	√	16	A	0	0	7	31
			√				√	√			○	○	√	√	—	—	○	○	√	○	√	○	○						
		√				√		√			○	○	√	○	—	—	○	○	√	○	○	○	√	29, 26		0	0	22	32
					—	—	—	—	—	—	○	○	—	—	—	—	—	—	—	—	—	○	○						
		√				√				√	○	○	√	√	—	—	○	√	√	√	√	○	√	24	I	0	0	66	33
					√					√	○	○	√	√	√	—	○	√	√	√	√	○	○						
	√					√		√			√	○	√	√	—	—	√	√	√	√	√	○	√		H	0	0	132	34
						√		√			√	○	√	√	—	—	√	√	√	√	√	○	√	18-III	F, H				
		√				√			√		√	√	—	—	—	—	√	√	√	√	○	○	√	18-VIII	I	0	0	35	35
						√			√		√	√	—	—	—	—	√	√	√	√	○	○	√	18-VIII	J				
						√			√		○	○	—	—	√	—	○	√	—	—	—	○	√	18	D				
√						√			√		○	○	—	—	√	—	○	○	√	—	—	○	√	18		0	0	5	36

TABULATION OF MARINE COLLISIONS

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A Excess speed
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Identification			Nationality		Size (gross tons)				Rig					Coast Guard inspection	Applicable rules			Location			Visibility						Weather					
																					Distance (miles)			Time			Wind			Current or sea		
Case No.	Month and year	Time (zone)	United States	Foreign	Under 1,000	1,000-5,000	5,000-10,000	Over 10,000	Passenger	Freighter	Tanker	Tug with tow	Other	Coast Guard inspection	International	Inland	Great Lakes	Open sea	Congested waters	Narrow channel	Under 2	2-5	Over 5	Daylight	Dark	Twilight	Strong	Moderate	Light or calm	Strong	Moderate	Calm or slack
37	Jan 57	0610	√		√							√		○		√			√				√		√			√			√
			√		√							√		○																	
38	Jan 57	0925	√		√						√			√			√			√	√			√					√			√
			√		√							√		○																	
39	Jan 57	2355		√		√				√				○		√			√				√		√			√				√
				√		√				√				○																	
40	Jan 57	1815	√				√			√				√		√				√		√			√					√		√
			√		√							√		○																	
41	Feb 57	2020	√		√							√		○		√			√		√				√					√		√
			√		√								Tug	○																	
42	Feb 57	2015	√		√							√		○		√			√		√				√					√		√
			√		√								Ferry	√																	
43	Feb 57	0915		√				√		√				○		√			√		√			√			—	—	—	—	—	—
				√				√		√				○																	
44	Feb 57	0040	√			√				√				○		√			√			√			√					√		√
				√	√							√		○																	
45	Feb 57	2250		√		√				√				○		√			√		√				√					√		√
			√		√							√		○																	
46	Feb 57	1657	√				√				√			√		√				√			√		√			√	√			
				√				√		√				○																	
47	Mar 57	0307	√				√				√			○		√			√				√		√			√	√			
				√	√							√		○																	
48	Mar 57	0036	√					√			√			√		√				√		√			√					√		√
				√		√				√				○																	
49	Mar 57	0330	√				√			√				√		√		√				√			√					√		√
			√		√					√				○																	
50	Mar 57	1530	√		√							√		○			√			√		√	√					√			√
			√		√							√		○																	
51	Mar 57	0406		√			√			√				○		√				√		√		√				√			√
				√		√				√				○																	
52	Mar 57	0400		√			√			√				○		√				√		√		√				√			√
			√		√								F/V	○																	
53	Apr 57	2256	√		√							√		○		√			√			√		√				√			√
			√					√			√			√																	
54	Apr 57	1218		√	√					√				○		√			√			√	√					√			√
				√	√					√				○																	

OCCURRING DURING FISCAL YEAR 1957—Continued

objects or while maneuvering alongside piers were eliminated as irrelevant. 3. The U.S. western rivers (Mississippi River System) were excluded. 4. To (Tugs with tows were considered as single vessels for the purposes of this tabulation.)

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Situation					First knowledge						Communications		Equipment			Navigating personnel					Collision cause				Losses			
					How obtained			Distance off (miles)					Radar		Radio telephone													
Meeting	Crossing	Overtaking	Anchored or moored	Other	Radar	Visual	Sound	Under 1	1-2	Over 2	Passing signal sounded	Agreement reached	Aboard	Used	Aboard	Used	Pilot	Master	Mate	Helmsman	Lookout	Material failure	Personnel failure	Rule(s) violated	Comments	Deaths	Injured	Dollars (Thousands)	Case No.
√						√				√	○	○	—	—	√	—	○	○	○	√	○	○	√		D				
						√				√	√	○	—	—	√	—	○	√	√	○	○	○	√	18-III	D	0	0	10	37
	√				—	—	—	—	—	—	○	○	—	—	√	—	—	—	—	—	—	○	√						
					—	—		—	—	—	○	○	—	—	√	—	—	—	—	—	—	○	√			0	0	5	38
√						√				√	√	—	—		—	—	√	√	√	√	○	○	√	18					
						√				√	√			—	—	—	√	√	√	√	○	○	√	18		0	0	35	39
√						√		—	—		√	○	—	—	√	—	○	√	—	√	—	○	√						
						√		√			√	○		—	√	—	○	√	—	√	—	○	√			0	0	27	40
√					√						○	○	√	√	√	—	○	√	—	—	—	○	○		D, A				
						√		√			○	○	○	○	—	—	○	√	—	—	—	○	√	16, 15, 29		0	0	12	41
	√				√			—	—	—	○	○	√	√	√	—	○	√	—	—	—	○	√		H, A				
						√		—	—	—	○	○	○	○	√	√	○	√	—	—	√	○	√		H, A	0	0	3	42
	√				√				√		○	○	√	√	—	—	√	√	√	√	√	○	√						
						√		√			○	○	○	○	—	—	√	√	√	√	○	○	√			0	0	290	43
		√				√			√		○	○	—	—	○	○	√	√	—	—	—	○	○						
						√			√		○	○	√	√	√	—	√	○	○	○	○	○	√	16, 18, 29	A, I	0	0	15	44
			√			√		√			○	○	—	—	√	—	○	√	—	—	√	○	○						
				Udrwy		√		√			○	○	√	○	√	—	○	√	—	—	√	○	√	18	A, B	0	0	46	45
√						√			√		√	○	—	—	—	—	√	√	√	√	√	○	○						
						√			√		√	○	—	—	—	—	√	√	√	√	√	○	√	19		0	0	250	46
	√					√			√		√	○	√	—	—	—	√	√	√	√	√	○	√	29					
						√			√		√	○	–	–	—	–	○	√	√	○	√	○	√	18	B	0	0	30	47
√						√			√		○	○	√	—	√	—	√	—	—	√	√	○	√	18-I	H				
						√			√		√	○	○	○	○	○	√	√	√	√	√	○	√	18-III		10	14	3500	48
		√				√				√	○	○	–	–	—	–	○	○	√	√	√	○	√	18	I				
						√		√			○	○	—	—	√	—	○	√	○	○	○	○	○			0	0	27	49
√						√		√			○	○	—	—	√	—	○	√	○	○	○	○	√		B				
						√		√			○	○	—	—	√	—	○	√	○	○	○	○	○			0	0	7	50
√						√				√	√	○	–	–	—	–	√	√	√	√	○	○	√		D				
						√			√		○	○	—	—	–	–	√	√	√	√	○	○	√			0	0	160	51
√						√		√			√	○	–	–	—	–	√	·	—	√	—	○	○						
						√		√			○	○	—	—	√	—	—	√	—	√	—	○	√	18-I	H, D	0	0	5	52
	√				—	—	—	—	—	—	√	○	—	—	—	—	—	—	—	—	—	○	√	19	F				
						—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	○	○			0	0	6	53
	√					√		—	—	—	√	○	—	—	—	—		√	—	—	—	○	○						
						√		—	—	—	○	○	—	—	√	—	—	√	√	—	—	○	√	19	F	0	0	2	54

558630°—60——3

TABULATION OF MARINE COLLISIONS

NOTES.—1. These tabulations were made from collision reports available at CGHQ which were submitted pursuant to 46 CFR 136. 2. "Collisions" with fixed eliminate small craft collisions at least one of the vessels in each collision was required to be over 500 G.T.

SYMBOLS
√ Yes
○ No
— No information

A Excess speed
B Insufficient power
C Wrong side channel
D Failure to sound signals

Identification			Nationality		Size (gross tons)				Rig					Coast Guard inspection	Applicable rules			Location			Visibility						Weather					
																					Distance (miles)			Time			Wind			Current or sea		
Case No.	Month and year	Time (zone)	United States	Foreign	Under 1,000	1,000–5,000	5,000–10,000	Over 10,000	Passenger	Freighter	Tanker	Tug with tow	Other	Coast Guard inspection	International	Inland	Great Lakes	Open sea	Congested waters	Narrow channel	Under 2	2–5	Over 5	Daylight	Dark	Twilight	Strong	Moderate	Light or calm	Strong	Moderate	Calm or slack
55	Apr 57	0358	—	√	—	√	—	—	—	—	√	—	—	○	—	√	—	—	√	—	—	—	√	—	√	—	—	√	—	—	√
			√	—	√	—	—	—	—	—	—	√	—	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
56	Apr 57	2200	√	—	—	—	√	—	—	√	—	—	—	√	√	—	—	√	—	—	—	—	√	—	√	—	—	—	√	—	—	√
			√	—	√	—	—	—	—	—	—	√	—	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
57	May 57	0113	√	—	—	—	—	√	—	—	√	—	—	√	—	√	—	—	—	√	—	—	√	—	√	—	—	√	—	—	—	—
			√	—	—	—	√	—	—	√	—	—	—	√	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
58	May 57	2040	√	—	√	—	—	—	—	—	—	√	—	○	—	√	—	—	—	√	—	—	√	—	√	—	√	—	—	—	√	—
			√	—	√	—	—	—	—	—	—	√	—	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
59	Jun 57	0157	√	—	—	√	—	—	—	—	—	—	Ferry	√	—	√	—	—	√	—	—	—	√	—	√	—	—	√	—	—	—	√
			—	√	—	√	—	—	—	—	√	—	—	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
60	Jun 57	2123	√	—	√	—	—	—	—	—	—	—	Barge	○	—	√	—	—	—	√	—	—	√	—	√	—	—	—	√	—	—	√
			—	√	—	—	√	—	—	√	—	—	—	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
61	Jun 57	0405	√	—	—	—	√	—	—	√	—	—	—	√	—	—	√	—	√	—	√	—	—	√	—	—	—	√	—	—	—	√
			—	√	—	—	√	—	—	√	—	—	—	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
62	Jun 57	1853	√	—	—	—	√	—	—	—	—	—	Barge	√	—	√	—	—	√	—	—	—	√	√	—	—	•	—	√	—	—	√
			—	√	—	—	—	√	—	√	—	—	—	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
63	Jun 57	2052	√	—	—	—	√	—	—	√	—	—	—	√	—	—	√	—	—	√	—	—	—	—	√	√	—	—	—	—	—	√
			—	√	—	√	—	—	—	√	—	—	—	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

OCCURRING DURING FISCAL YEAR 1957—Continued

objects or while maneuvering alongside piers were eliminated as irrelevant. 3. The U.S. western rivers (Mississippi River System) were excluded. 4. To (Tugs with tows were considered as single vessels for the purposes of this tabulation.)

E Meeting situation, turned left
F Crossing situation, burdened failed give way
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J Overtaken vessel failed maintain course
K Wind, sea or current factors

Situation					First knowledge						Communications		Equipment			Navigating personnel					Collision cause				Losses			
					How obtained			Distance off (miles)					Radar		Radio telephone														
Meeting	Crossing	Overtaking	Anchored or moored	Other	Radar	Visual	Sound	Under 1	1–2	Over 2	Passing signal sounded	Agreement reached	Aboard	Used	Aboard	Used	Pilot	Master	Mate	Helmsman	Lookout	Material failure	Personnel failure	Rule(s) violated	Comments	Deaths	Injured	Dollars (Thousands)	Case No.
√						√			√		√	○	√	○	—	-	√	√	√	√	√	○	√	18–I	E	0	0	22	55
					—	—	—	—	-	-	○	○	—	—	√	-	○	√	○	√	○	○	√	18–I	C, D				
		√				√			√		○	○	-	-	-	—	○	○	√	√	√	○	○			0	0	60	56
						√				√	○	○	√	√		—	○	○	√	√	√	○	√						
				Udrwy		√					○	○				—	√	√	√	√	√	○	√			0	0	33	57
			√			√		—	—	—	○	○	-	-	-	—	○	○	○	○	○	○	○						
√						√			√		○	○	-	-	√	√	○	√	○	○		○	√	18, 28		0	0	7	58
						√				√	○	○	-	-	√	√	○	√	○	○	—	○	√	18, 28	B				
						√		√			○	○	—	—	√	-	○	√	○	○	√	○	√	29		0	1	84	59
		√				√		√			√	○	-	—	—	-	√	√	○	√	√	○	√	24	I				
					—	—		-	-	-	○	○	○	○	○	○	○	○	○	○	○	√	○			0	0	8	60
√						√			√		○	○	-	—	—	—	√	√	√	√	—	○	○						
				Udrwy	-	-	-	-	-	-	—	—	-	-	-	-	—	—	—	—	—	—	—			0	0	27	61
			√		-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—						
			√		-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	○	○			0	0	13	62
				Udrwy	-	—	—	—	—	—	—	—	-	-	√	-	√	√	—	—	—	○	√		K, B				
					-	-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	○	○			0	0	5	63
					-	—	—	—	—	—	—	—	—	—	—	—	-	-		-		○	√						

TABULATION OF MARINE COLLISIONS

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SYMBOLS
√ Yes
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Identification			Nationality		Size (gross tons)				Rig					Coast Guard inspection	Applicable rules			Location			Visibility						Weather					
																					Distance (miles)			Time			Wind			Current or sea		
Case No.	Month and year	Time (zone)	United States	Foreign	Under 1,000	1,000–5,000	5,000–10,000	Over 10,000	Passenger	Freighter	Tanker	Tug with tow	Other	Coast Guard inspection	International	Inland	Great Lakes	Open sea	Congested waters	Narrow channel	Under 2	2–5	Over 5	Daylight	Dark	Twilight	Strong	Moderate	Light or calm	Strong	Moderate	Calm or slack
1	Jul 57	1625	√		√							√		○		√			√				√	√				√			√
			√		√							√		○																	
2	Jul 57	0313	√		√							√		○		√			√			√		√			√			√	
			√			√							LST	○																	
3	Jul 57	1622	—	√		√				√				○		√				√			√	√				√			√
			√		√							√		○																	
4	Jul 57	0200	√		√							√		○		√				√			√					√			√
			√		√							√		○																	
5	Jul 57	2000	√		√								F/V	○	√			√			√					√			√			√
			√				√			√				√																	
6	Jul 57	0040	—	√		√				√				○																		
			√		√							√		○		√				√			√	√				√	√		
7	Jul 57	0630		√				√			√			○																	
			√			√							DE	○		√				√			√	√				√			√
8	Jul 57	1507	√		√							√		○																	
			√		√							√		○		√				√			√	√				√	—	—	—
9	Jul 57	2145	√		√							√		○																	
			√				√				√			√		√				√	—		—		√		—		√	—	—	—
10	Aug 57	1710	—	√		√				√				○																	
			√		√								Tug	○		√				√			√	√				√			√
11	Aug 57	2046	√			√				√				√			√		√				√		√				√			√
			√			√				√				√																	
12	Aug 57	0050	√		√								F/V	○																	
			√			√				√				√	√					√	√				√			√			√
13	Aug 57	0606	√					√			√			√																	
			√			√				√			Ferry	√		√				√	√				√			√			√
14	Sep 57	1700	—	√		√				√				○																	
			√			√							Dredge	√		√				√			√	√				√	√		
15	Sep 57	0946	√		√							√		○																	
			√		√							√		○		√			√			√		√				√			√
16	Sep 57	0545	√			√					√			○																	
			√			√					√			√		√				√			√		√	√		√	√		
17	Oct 57		√				√			√				○	√																
			√		√								F/V	○				√				√		√			√				√
18	Oct 57	1300	√					√		√				√																	
			√			√				√				√			√			√		√	√		√			√			√

OCCURRING DURING FISCAL YEAR 1958

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Situation					First knowledge						Communication		Equipment				Navigating personnel					Collision cause				Losses			
					How obtained			Distance off (miles)					Radar		Radio telephone															
Meeting	Crossing	Overtaking	Anchored or moored	Other	Radar	Visual	Sound	Under 1	1-2	Over 2	Passing signal sounded	Agreement reached	Aboard	Used	Aboard	Used	Pilot	Master	Mate	Helmsman	Lookout	Material failure	Personnel failure	Rule(s) violated	Comments	Deaths	Injured	Dollars (Thousands)	Case No.
√						√		—	—	—	√	○	—	—	√	√	○	○	○	√	○	○	√	18–I	H	0	0	85	1
						√		—	—	—	√	○	—	—	√	√	○	√	○	○	○	○	√	18–I	H				
√					√					√	○	○	√	√	√	√	○	○	√	√	○	○	√	18–III	D, K	0	0	15	2
					√					√	○	○	√	√	√	√	○	√	√	√	√	○	√	19, 22, 23	D				
√						√		√			√	○	—	—	√	—	√	√	√	—	○	○	○			0	0	25	3
						√		√			√	○	—	—	√		—	√	—			○	√	18–III, 25	C				
√						√				√	√	○	○	○	—	—	○	√	√	○	○	○	√	3	C	0	0	11	4
						√				√	√	○	○	○	—	—	○	○	√	○	○	○	√	18–I	C, E				
	√					√		√			○	○	○	○	—	—	○	○	√	○	√	○	√	15, 16	D	0	0	10	5
					√					√	○	○	√	√	—	—	○	√	√	—	√	○	√	16	A, D				
√						√		√			√	√	—	—	—	—	√	○	√	√	√	○	√		A	0	0	7	6
						√			√		√	√		—	√	—	○	○	√	○	√	○	√	33 USC 210	C, K				
√						√		—	—	—	√	√	√	√	√	√	√	√	○	—	○	○	√	—	G	0	0	41	7
						√		—	—	—	√	√	√	√	√	√	○	√	√	√	·	○	√	—	G				
√						√		—	—	—	√	√	—	—	√	—	○	√	○	○	○	○	√	25		0	0	23	8
						√		—	—	—	√	√	—	—	√	—	○	√	○	○	○	○	√	25	E, C				
√						√		·		—	√	√	—	—	—	—	○	√	○	○	○	○	√			0	0	4	9
						√		—	·	—	√	√	—	—	—	—	√	√	—	—	—	○	√	18–I	E, C				
	√					√			√		√	○	—	—	—	—	√	√	√	√	√	○	○			0	0	15	10
						√			√		○	○	—	—	—	—	○	√	√	○	√	○	√	29, 22	F				
√					○	○	○	—	—	—	○	○	√	○	√	√	○	√	○	√	√	○	√	90.2, 90.4	A, H	0	0	50	11
					○	○	○	—	—	—	○	○	√	○	√	√	○	√	○	√	√	○	√	90.2, 90.4	G				
√						√		√			√	○	○	○	√	—	○	√	—	—	—	○	√	16, 25, 29	A, C, E	0	2	15	12
					√				√		√	○	√	√	√	·	○	○	√	○	√	○	√	16	A				
√					√				√		○	○	√	√	√	—	√	√	√	√	√	○	√	16	A	0	0	12	13
							√		—	—	○	○	○	○	√	—	○	√	√	√	√	○	○						
√						√			√		√	√	√	√	√	√	√	√	√	√	○	√	○		E	4	12	400	14
						√			√		√	√	√	—	√	√	○	○	√	√	○	○	○						
		√				√		√			√	○	√	—	—	—	√	—	—	-		○	√	18–VIII		0	0	14	15
							√	√			○	○	—			—	○	√	○	○	○	○	√	18–III	D, J				
		√				√		—	—		√	√	—	—					—	—	—	○	√	27	K	0	0	27	16
						√		—	—	—	√	√	—	—	—	—	—	—	—	—		○	√	27	A, G, K				
	√					√				√	○	○	√	√	—	—	○	○	√	√	√	○	√	22	D, F, G	0	0	52	17
						√		√			○	○	○	○	√	√	○	—	—	—	○	○	√	29	D				
		√				√		—	—	—	√	√	—	—	√	√		√	√	√	√	○	√	22	I	0	0	21	18
						√		—	—	—	√	√		—	√	√	—	√	√	√	√	○	○						

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19	Nov 57	1150	√	√	√	√				√		√		○		√				√	√			√				√			√
			√		√									○																	
20	Nov 57	0809	√					√			√			√		√				√	√			√				√	√		
				√		√				√				○																	
21	Nov 57	2340	√		√								Tug	○		√			√		√				√				√		√
				√			√			√				○																	
22	Nov 57	1215	√				√			√				√		√			√				√	√				√			√
				√	√								Naval	○																	
23	Nov 57	2355		√				√		√				○		√			√		√				√				√	√		
			√				√			√				√																	
24	Dec 57	0600		√		√				√				○		√				√		√			√				√			√
			√		√							√		○																	
25	Dec 57	0040		√			√			√				○		√				√		√			√				√	√		
			√		√							√		○																	
26	Jan 58	1847	√				√			√				√		√			√			√			√				√			√
			√					√					Naval	○																	
27	Jan 58	1545	√				√			√				√		√				√		√	√					√		√		
			√		√								Tug	○																	
28	Jan 58	1051	√					√			√			√		√				√	√		√			√						√
				√				√			√			○																	
29	Jan 58	2210	√				√			√				√		√				√		√		√				√				√
				√			√			√				○																	
30	Jan 58	1724	√				√			√				√		√				√	√		√					√	√		
			√		√							√		○																	
31	Jan 58	0316	√		√							√		○																	
			√					√			√			√		√				√		√		√		√				√		
32	Jan 58	0400		√		√				√				○		√				√		√		√		—	—	—		√		
			√		√								F/V	○																	
33	Jan 58	2305		√	√							√		○		√				√		√		√			√			√		
				√			√			√				○																	
34	Feb 58	1310	√		√							√		○		√			√			√		√			√			√		
			√					√			√			√																	
35	Mar 58	0915		√			√			√				○		√				√	√			√				√		√		
			√				√			√				√																	
36	Mar 58	1520		√			√			√				○		√				√		√	√					√		—		—
			√		√							√		○																	

OCCURRING DURING FISCAL YEAR 1958—Continued

objects or while maneuvering alongside piers were eliminated as irrelevant. 3. The U.S. western rivers (Mississippi River System) were excluded. 4. To (Tugs with tows were considered as single vessels for the purposes of this tabulation.)

E Meeting situation, turned left
F Crossing situation, burdened failed give way
G Failed to stop or back
H Evasive maneuver too little or too late
I Overtaking vessel failed keep clear
J Overtaken vessel failed maintain course
K Wind, sea or current factors

Situation					First knowledge						Communication		Equipment				Navigating personnel					Collision cause				Losses			Case No.
					How obtained			Distance off (miles)					Radar		Radio telephone														
Meeting	Crossing	Overtaking	Anchored or moored	Other	Radar	Visual	Sound	Under 1	1–2	Over 2	Passing signal sounded	Agreement reached	Aboard	Used	Aboard	Used	Pilot	Master	Mate	Helmsman	Lookout	Material failure	Personnel failure	Rule(s) violated	Comments	Deaths	Injured	Dollars (Thousands)	
√						√			—	—	○	○	—	—	—	—	√	√	√	√	√	○	√	16	A, C	0	0	2	19
					√				—	—	○	○	√	√	—	—	○	√	○	○	○	○	√	16, 29	A, C				
√						√		√			√	○	○	○	—	—	○	√	√	—	√	○	√	16	A, G	0	0	34	20
						√		—	—	—	√	○	○	○	—	—	√	√	√	—	√	○	√	16	A, G				
				Udrwy	—	√	—	—	—	—	○	○	—	—	√	○	○	√	○	○	√	○	√	16	A	0	1	5	21
			√		—	—	—	—	—	—	○	○	—	—	—	—	—	—	—	—	—	○	√	15	No fog signal				
						√		√			○	○	—	—	—	—	√	√	√	√	○	○	√	24	I	0	0	9	22
						√		√			○	○	—	—	—	—	○	√	√	√	√	○	○						
			√			√		—	—	—	○	○	√	○	—	—	—	—	—	—	√	○	○			0	0	51	23
				Udrwy	√				√		○	○	√	√	√	○	√	√	—	√	√	○	√	16	A, H				
				Udrwy		√			√		√	○	√	√	—	—	√	√	—	√	√	○	√	25	C	0	0	114	24
			√			√			√		○	○	○	○	—	—	—	√	○	○	○	○	○						
√						√		—	—	—	√	○	—	—	—	—	√	√	√	√	√	○	√			0	0	10	25
						√		—	—	—	√	○	—	—	—	—	—	√		—	—	○	√	18–III 33 CFR 80.16	G				
	√					√		√			√	○	—	—	—	—	√	√	√	√	√	○	√	29		0	0	15	26
						√		√			○	○	√	√	—	—	○	√	√	√	√	○	√	29	D, F				
	√					√				√	√	○	—	—	√	√	√	√	√	√	○	○	○			1	0	40	27
						√				√	○	○	—	—	—	—	○	√	√	√	○	○	√	22	F				
				Udrwy		√		—	—	—	○	○	√	√	√	—	√	√	√	√	√	○	√	16, 29	A	0	0	165	28
			√			√		—	—	—	○	○	√	○	√	—	√	○	○	○	√	○	○						
			√			√		—	—	—	○	○	—	—	—	—	√	√	○	○	○	○	○			0	0	8	29
				Udrwy		√		—	—	—	○	○	—	—	—	—	√	√	√	√	√	○	√		H				
√					√					√	√	○	√	√	√	—	√	√	√	√	√	○	√	16	A	0	0	13	30
						√		√			○	○	○	○	√	—	○	√	○	○	○	○	√	16, 29	A				
√						√				√	√	○	—	—	√	○	○	√	○	○	○	○	√	18–III		0	0	9	31
						√				√	√	○	—	—	√	○	√	√	√	√	√	○	√	25	E				
√						√		√			√	○	√	√	√	—	√	○	√	√	○	○	√	18–V		4	0	54	32
						√		√			○	○	○	○	—	—	○	√	—	—	○	○	√	18–V, 29	D				
		√				√			√		√	√	—	—	√	○	√	√	√	√	○	○	○			0	0	9	33
						√			√		√	√	—	—	—	—	√	√	√	√	√	○	√	24	I				
√						√		—	—	—	√	√	—	—	√	○	○	√	○	—	√	○	√	18–III	D	0	0	125	34
						√		—	—	—	√	√	—	—	—	—	√	√	√	√	○	○	√	18–III	D				
√					√			—	—	—	○	○	√	√	√	○	√	√	√	√	√	○	√	16, 25	C, A	0	0	36	35
					√			—	—	—	○	○	√	√	○	○	√	√	√	√	√	○	√	16, 25	C, A				
√						√		—	—	—	√	○	—	—	√	○	√	√	—	—	—	○	√	18–I	C	0	0	30	36
						√		—	—	—	√	○	—	—	√	○	○	√	—	—	—	○	○						

TABULATION OF MARINE COLLISIONS

NOTES.—1. These tabulations were made from collision reports available at CGHQ which were submitted pursuant to 46 CFR 136. 2. "Collisions" with fixed
eliminate small craft collisions at least one of the vessels in each collision was required to be over 500 G.T.

SYMBOLS
√ Yes
○ No
— No information

A Excess speed
B Insufficient power
C Wrong side channel
D Failure to sound signals

Identification			Nationality		Size (gross tons)				Rig					Coast Guard inspection	Applicable rules			Location			Visibility						Weather					
																					Distance (miles)			Time			Wind			Current or sea		
Case No.	Month and year	Time (zone)	United States	Foreign	Under 1,000	1,000-5,000	5,000-10,000	Over 10,000	Passenger	Freighter	Tanker	Tug with tow	Other		International	Inland	Great Lakes	Open sea	Congested waters	Narrow channel	Under 2	2-5	Over 5	Daylight	Dark	Twilight	Strong	Moderate	Light or calm	Strong	Moderate	Calm or slack
37	Mar 58	0358	√					√			√			√		√				√			√				√				
				√			√			√				○					√			√									
38	Mar 58	2144	√				√			√				√		√			√			√			√			√				
			√				√			√				√																	
39	Mar 58	0000	√				√			√				√		√				√			√				√				
			√		√							√		○																	
40	Mar 58	0045	√		√						√			√		√				√			√				√				
			√		√								F/V	○																	
41	Mar 58	2158	√				√			√				√	√			√			√				√			√				√
			√		√							√		○																	
42	Apr 58	0415	√		√							√		○																	
			√				√			√				○		√				√		√			√			√	√			
43	Apr 58	0640		√			√			√				○																	
			√				√			√				√		√				√	√			√				√	√			
44	May 58	0023	√				√			√				√			√			√			√				√				
				√		√				√				○																	
45	May 58	0310	√					√			√			√		√				√			√								
			√		√							√		○																	
46	May 58	0040	√				√			√				√			√			√			√				√	√			
			√		√							√		○																	
47	May 58	0720	√					√				√		√		√				√	√			√				√				√
				√		√				√				○																	
48	May 58	1007	√			√					√			√			√			√			√	√				√				
			√			√					√			√																	
49	May 58	0031	√		√								Ferry	√		√		√					√		√							√
			√		√								F/V	○																	
50	Jun 58	0810	√		√								F/V	○																	
			√					√			√			√	√			√					√	√			√			√		
51	Jun 58	0712	√					√			√			√		√				√	√			√				√				√
			√		√						√			√																	
52	Jun 58	0440	√		√								Mtbt.	○																	
			√					√			√			√		√		√					√		√				√			
53	Jun 58	0025		√			√			√				○																	
			√		√						√			√		√			√				√							√		

OCCURRING DURING FISCAL YEAR 1958—Continued

objects or while maneuvering alongside piers were eliminated as irrelevant. 3. The U.S. western rivers (Mississippi River System) were excluded. 4. To (Tugs with tows were considered as single vessels for the purposes of this tabulation.)

E Meeting situation, turned left
F Crossing situation, burdened failed give way
G Failed to stop or back
H Evasive maneuver too little or too late
I Overtaking vessel failed keep clear
J Overtaken vessel failed maintain course
K Wind, sea or current factors

Situation					First knowledge						Communication		Equipment		Navigating personnel					Collision cause				Losses			
					How obtained			Distance off (miles)																			
Meeting	Crossing	Overtaking	Anchored or moored	Other	Radar	Visual	Sound	Under 1	1–2	Over 2	Passing signal sounded	Agreement reached	Aboard	Used	Aboard	Used	Pilot	Master	Mate	Helmsman	Lookout	Material failure	Personnel failure	Rule(s) violated	Comments	Deaths	Injured	Dollars (Thousands)	Case No.
√						√				√	√	√		—	√	○	√	√	√	√	√	○	○						
						√				√	√	√			√	○	√	√	√	√	√	○	√	25	C, E	0	0	700	37
	√					√				√	√	○			○	○	√	√		—		○	√	18–III	A				
						√				√	√	○			√	○	√	√		—		○	√	18–III, 22	F	0	0	130	38
						√		—		—	√	○			—	—	√	√		—	—	○	√	18–III	G				
√						√		—		—	√	○			√	○	√	√		—	—	○	√	18–III, 80.34	G	0	3	22	39
						√		—		—	√	○			√	○		—	√			○	○						
√						√		—		—	√	○	—	—	√	○		—		—	—	○				0	0	3	40
						√					○	○	—	—	√	○	—	√		—	—	○	√	25	C, E				
		√				√		√			○	○	○	○	○	○	○	√	√	○	○	○	√	29, 16	A, I	1	0	96	41
						√		√			○	○	○	○	√	○		√		—	—	○	√	29	D				
						√		—		—	○	○	—	—	√			√	—		—	○	√	80.16, 18–I, III, 29.	D				
√						√		—		—	√	○	—	—	○	—	√	√	—			○	○			0	0	38	42
					√			√			○	○	√	√	○	○	√	√		√	√	○	○						
√						√		√			√	○	√	√	○	○	√	√	√	—	√	○	√	80.4	C	0	0	50	43
						√		—		—	√	√	—	—	√	○	○	○	√	√	√	○	○						
√						√		—		—	√	√	—	—	√	○	—	—	—	—	—	○	√	90.5	E	0	0	50	44
						√		—		—	○	○	—	—	√	○	√	—		—	—	○	○						
	√					√		—		—	√	○	—	—	√	○	—	—		—	—	○	√	24	I	0	0	8	45
						√		—		—	√	√	—	—	√	○	○	√	√	—	√	○	○						
√						√		—		—	√	√	—	—	√	○	—	√		—	—	○	√	90.5	E	0	0	35	46
						√		√			√	○	√	√	○	○	√	√	√	√	√	○	√	16	A				
		√				√		√			○	○	√	√	○	○	√	√	√	√	√	○	√	16, 80.6	A, J	0	0	73	47
						√		√			√	○			√	○	○	√	○	√	√	○	√	17	E				
√						√		√			√	○	—	—	√	○	○	√	○	√	—	○	√			0	0	7	48
						√		√			√	○	—	—	√	○	○	○	√	○	√	○	○						
		√				√		√			○	○	—	—	√	○	○	√	○	○	○	○	√	29, 80.6	J	0	0	2	49
			Fshg.			√		√			○	○	○	○	√	○	○	—		—	—	○	√	29	D				
				Udrwy		√				√	○	○	—	—	√	○	○	○	√	○	○	○	√	26	D, G, H	0	0	14	50
						√		√			○	○	√	○	—	—	√	√		√	—	○	√		H				
√					√			—	—	—	○	○	√	√	—	—	—	√	—	—	—	○	√		H	0	0	20	51
						√		√			○	○	○	○	√	○	√	○	√	○	○	○	√	29	D				
	√					√		√			○	○	√	√	√	○	○	○	√		√	○	√	29	D, F, G	0	0	—	52
						√		√			√	○	—	—	—	—	√	√	√	√	√	○	√	18–I	E				
√						√		√			√	○	—	—	—	—	—	—	√	√	○	○	√	18–I	C	2	0	640	53

558630° 60——4

TABULATION OF MARINE COLLISIONS

NOTES.—1. These tabulations were made from collision reports available at CGHQ which were submitted pursuant to 46 CFR 136. 2. "Collisions" with fixed objects craft collisions at least one of the vessels in each collision was required to be over 500 G.T.

SYMBOLS
√ Yes
○ No
— No information

A Excess speed
B Insufficient power
C Wrong side channel
D Failure to sound signals

Identification			Nationality		Size (gross tons)				Rig					Coast Guard inspection	Applicable rules			Location			Visibility						Weather					
																					Distance (miles)			Time			Wind			Current or sea		
Case No.	Month and year	Time (zone)	United States	Foreign	Under 1,000	1,000–5,000	5,000–10,000	Over 10,000	Passenger	Freighter	Tanker	Tug with tow	Other		International	Inland	Great Lakes	Open sea	Congested waters	Narrow channel	Under 2	2–5	Over 5	Daylight	Dark	Twilight	Strong	Moderate	Light or calm	Strong	Moderate	Calm or slack
1	Jul 58	1945	—	√				√		√				○		√				√		√		√				√			√
			√		√							√		○																	
2	Jul 58	0623		√			√			√				○	√			√			√			√				√			√
			√		√								F/V	○																	
3	Jul 58	2029	√				√			√				√			√			√		√	√				√				√
				√		√				√				○																	
4	Jul 58	1858	√					√			√			√		√				√		√	√				√			√	
				√			√			√				○																	
5	Jul 58	0740	√		√								Mtbt.	○		√		√			√			√					√			√
				√		√				√				○																	
6	Aug 58	0553	√					√			√			√		√				√	√			√					√			√
			√			√					√			√																	
7	Aug 58	2232	√					√			√			√		√			√				√		√				√			√
				√		√				√				○																	
8	Aug 58	0700	√				√			√				√			√			√		√		√				√				√
			√		√								Naval	○																	
9	Aug 58	2131		√				√			√			○		√				√			√		√				√			√
			√		√							√		○																	
10	Aug 58	0456	√		√							√		○	√			√					√		√				√			√
				√	√								F/V	○																	
11	Sep 58	1545	√				√			√				√		√				√			√	√				√				√
			√		√							√		○																	
12	Sep 58	0456	√			√				√				√		√				√	√			√				√			√	
			√					√		√				√																	
13	Sep 58	0451	√				√			√				√		√				√			√		√				√			√
			√		√								Mtbt.	○																	
14	Sep 58	0520	√		√							√		○		√				√			√		√				√			√
			√				√			√				√																	
15	Sep 58	1958	√			√				√				√			√			√			√		√			√				√
			√				√			√				√																	
16	Sep 58	1655	√			√				√				√			√			√			√	√				√				√
				√		√				√				○																	
17	Sep 58	0717	√		√								Ferry	√		√			√		√			√					√		√	
			√		√								Ferry	√																	
18	Oct 58	1405		√		√				√				○																		
			√		√							√		○		√				√			√	√				√	—	—	—

OCCURRING DURING FISCAL YEAR 1959

or while maneuvering alongside piers were eliminated as irrelevant. 3. The U.S. western rivers (Mississippi River System) were excluded. 4. To eliminate small (Tugs with tows were considered as single vessels for the purposes of this tabulation.)

E Meeting situation, turned left
F Crossing situation, burdened failed give way
G Failed to stop or back
H Evasive maneuver too little or too late
I Overtaking vessel failed keep clear
J Overtaken vessel failed maintain course
K Wind, sea or current factors

Situation					First knowledge						Communication		Equipment			Navigating personnel					Collision cause			Losses			
					How obtained			Distance off (miles)					Radar		Radio telephone													
Meeting	Crossing	Overtaking	Anchored or moored	Other	Radar	Visual	Sound	Under 1	1–2	Over 2	Passing signal sounded	Agreement reached	Aboard	Used	Aboard	Used	Pilot	Master	Mate	Helmsman	Lookout	Material failure	Personnel failure	Rule(s) violated	Comments	Deaths	Injured	Dollars (Thousands)	Case No.
	√					√			√		√	√	—	–	○	○	√	√	√	√	√	○	○			0	0	20	1
						√			√		√	√	—	—	√	○	○	√	—	—	—	○	√	19	F				
	√					√				√	○	○	√	√	—	—	○	√	√	√	√	○	√	16, 29	A, F	3	0	105	2
						√		√			○	○	√	√	√	○	○	√	○	○	○	○	√	29					
		√				√		—	—	—	√	√	—	—	√	—	○	√	√	—	—	○	○			0	0	30	3
						√		—	—	—	√	√	—	—	√	—	√	√	√	—	—	√	√	22	I				
		√				√		√			○	○	√	○	√	○	√	√	—	—	-	○	√	18-III		0	0	80	4
						√		—	—	—	√	○	√	○	√	○	√	√	—	—	—	○	√	18-VIII	I				
	√					√		√			○	○	○	○	√	○	○	√	√	√	○	○	√		A	0	0	12	5
						√		√			○	○	○	○	○	○	○	√	√	—	○	○	√		A, F				
√							√	√			○	○	√	√	○	○	√	√	√	√	√	○	√	16	A	18	0	1600	6
					—	—	—	—	—	—	○	○	√	√	√	—	○	√	○	√	○	○	√	16, 29	A				
√						√		—	—	—	○	○	—	—	—	—	○	√	√	—	—	○	○		D	0	1	28	7
						√		—	—	—	√	○	—	—	—	—	○	√	—	—	—	○	√	18-I	E				
		√				√		—	—	—	√	√	—	—	√	√	○	√	√	—	√	○	√	25	I	0	0	—	8
						√		—	—	—	√	√	—	—	√	√	○	○	√	√	√	○	○						
		√				√		—	—	—	√	○	√	○	—	—	√	√	—	—	—	○	√	18-VIII	I	0	0	17	9
						√		—	—	—	—	○	—	—	—	—	—	√	—	—	—	○	○						
		√				√				√	○	○	—	—	—	—	—	√	—	—	—	○	○			2	0	—	10
						√				√	○	○	—	—	—	—	—	—	√	—	—	○	√		J				
√					—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	○	○			0	0	43	11
					—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	√	○						
√					√					√	○	○	√	√	○	○	√	√	√	√	√	○	√	16	A, D	0	0	36	12
						√		√			√	○	○	○	○	○	○	√	√	√	√	○	√	16	C, E, A				
	√					√		√			√	○	—	—	√	○	○	√	√	√	√	○	○			0	0	2	13
						√		√			√	○	—	—	—	—	—	—	√	—	—	○	√	19	F				
√						√		—	—	—	√	○	—	—	—	—	○	√	○	○	○	○	√	18-I	C	1	0	59	14
						√		—	—	—	√	○	—	—	—	—	√	√	√	√	√	○	√	18-I	C				
√						√	√			√	√	√	—	—	√	√	○	√	—	—	√	○	√	17	C	0	0	354	15
						√	√			√	√	√	—	—	√	√	—	√	—	—	√	○	√	17	C				
√						√		—	—	—	○	○	—	—	√	○	○	○	√	√	√	○	○			1	1	3	16
						√		—	—	—	√	○	—	—	√	○	√	√	√	√	—	√	○						
√							√	√			○	○	√	○	√	○	○	√	○	√	√	○	√	16	A	0	0	15	17
							√	√			○	○	√	○	—	—	○	√	○	√	√	○	√	16, 18-I	A, K				
√						√		—	—	—	√	√	—	—	√	○	√	○	√	√	○	○	√	29	A	0	1	7	18
						√		—	—	—	√	√	—	—	√	—	○	○	√	—	○	○	√						

TABULATION OF MARINE COLLISIONS

NOTES.—1. These tabulations were made from collision reports available at CGHQ which were submitted pursuant to 46 CFR 136. 2. "Collisions" with fixed eliminate small craft collisions at least one of the vessels in each collision was required to be over 500 G.T.

SYMBOLS
√ Yes
○ No
-- No information

A Excess speed
B Insufficient power
C Wrong side channel
D Failure to sound signals

Identification			Nationality		Size (gross tons)				Rig						Coast Guard inspection	Applicable rules			Location			Visibility						Weather					
																						Distance (miles)			Time			Wind			Current or sea		
Case No.	Month and year	Time (zone)	United States	Foreign	Under 1,000	1,000–5,000	5,000–10,000	Over 10,000	Passenger	Freighter	Tanker	Tug with tow	Other		Coast Guard inspection	International	Inland	Great Lakes	Open sea	Congested waters	Narrow channel	Under 2	2–5	Over 5	Daylight	Dark	Twilight	Strong	Moderate	Light or calm	Strong	Moderate	Calm or slack
19	Oct 58	2250	√		√								Ferry		√		√			√				√			√			—	—	—
			√		√							√			○																	
20	Oct 58	2100		√				√			√				○		√				√			√				√		—	—	—
			√		√							√			○																	
21	Oct 58	1130	√		√								F/V		○	√			√			√			√				√	—	—	—
				√			√			√					○																	
22	Oct 58	0455	√		√							√			○		√			√				√				√		—	—	—
				√			√			√					○																	
23	Oct 58	0825	√		√								TUG		○		√			√		√			√				√			√
			√			√							Ferry		√																	
24	Oct 58	1720	√		√							√			○		√				√		√		√				√	—	—	—
			√		√								F/V		○																	
25	Oct 58	1812		√				√		√					○		√		√			√			√				√			√
			√		√								F/V		○																	
26	Oct 58	0735	√		√							√			○		√				√		√	√					√			√
			√		√							√			○																	
27	Oct 58	2148	√					√			√				√		√				√		√		√			√		—	—	—
				√				√			√				○																	
28	Oct 58	0411	√					√			√				√	√			√			√			√				√			√
			√					√			√				√																	
29	Nov 58	1848	√		√						√				√			√			√			√				√		—	—	—
			√		√							√			○																	
30	Nov 58	0014		√		√				√					○		√				√			√				√			√	
				√			√			√					○																	
31	Nov 58	0125	√			√					√				√			√			√			√				√		√		
			√		√							√			○																	
32	Nov 58	1525	√		√							√			○	√					√		√	√					√			√
			√		√							√			○																	
33	Nov 58	2000		√				√			√				○		√				√			√	√		√					√
			√			√							Ferry		√																	
34	Nov 58	2100	√		√							√			○	√			√					√		√			√			√
				√		√				√					○																	
35	Nov 58	1632	√				√			√					√		√				√			√	√			√				√
			√					√			√				○																	
36	Nov 58	2108	√				√						Dredge		○		√				√			√		√			√		√	
			√		√							√			○																	

OCCURRING DURING FISCAL YEAR 1959—Continued

objects or while maneuvering alongside piers were eliminated as irrelevant. 3. The U.S. western rivers (Mississippi River System) were excluded. 4. To (Tugs with tows were considered as single vessels for the purposes of this tabulation.)

E Meeting situation, turned left
F Crossing situation, burdened failed give way
G Failed to stop or back
H Evasive maneuver too little or too late
I Overtaking vessel failed keep clear
J Overtaken vessel failed maintain course
K Wind, sea or current factors

Situation						First knowledge						Communication		Equipment				Navigating personnel					Collison cause				Losses			
						How obtained			Distance off (miles)					Radar		Radio telephone														
Meeting	Crossing	Overtaking	Anchored or moored	Other	Radar	Visual	Sound	Under 1	1-2	Over 2	Passing signal sounded	Agreement reached	Aboard	Used	Aboard	Used	Pilot	Master	Mate	Helmsman	Lookout	Material failure	Personnel failure	Rule(s) violated	Comments	Deaths	Injured	Dollars (Thousands)	Case No.
						√		√			○	○	—	—	○	○	—	—	—	—	—	○	√	22, 80.3	F, D	0	0	4	19
	√					√		√			√	○	—	—	√	—	—	—	—	—	—	○	√						
√						√			√		√	√	—	—	—	—	√	—	—	—	—	○	○			0	0	2	20
						√			√		√	√	—	—	—	—	○	√	—	—	—	○	√	18.10	C				
	√					√		√			○	○	—	—	√	○	○	√	—	—	√	○	√	16	A, H	0	0	3	21
						√		√			○	○	√	√	—	—	○	√	√	—	√	○	○						
	√					√		—	—	—	○	○	—	—	—	—	—	√	—	—	—	○	√	22	F	0	0	4	22
						√		—	—	—	○	○	—	—	√	—	—	—	—	—	—	○	○						
	√					√		—	—	—	○	○	√	○	√	—	—	—	—	—	—	○	√	16, 29	A	0	3	9	23
					√			—	—	—	○	○	√	√	—	—	—	—	—	—	—	○	○						
		√				√		—	—	—	○	○	—	—	√	√		—	—	—	—	○	○			0	0	5	24
						√		—	—	—	○	○	—	—	√	√	—	—	—	—	—	○	√	18–VIII	I				
√						√		√			○	○	√	√	√	—	○	√	√	√	√	○	√	16	A	0	2	26	25
						√		√			○	○	—	—	√	—	○	√	○	○	√	○	√	16	A				
√						√		—	—	—	√	○	—	—	√		—	√	—	—	—	○	√	18–I		0	0	7	26
						√		—	—	—	○	○	—	—	√	—	—	√	—	—	—	○	√	18–I	C, E				
		√				√		—	—	—	√	○	—	—	√	○	√	√	—	—	—	○	√	18–VIII	I	0	0	75	27
						√		—	—	—	○	○	—	—	√	○	√	√	—	—	—	○	○						
					—	—	—	—	—	—	○	○	√	√	√	—	○	√	√	√	√	○	√	16	A, E	0	0	53	28
√					—	—	—	—	—	—	○	○	√	√	√	—	○	√	√	√	√	○	√	16	A				
√						√		—	—	—	√	○	—	—	√	○	○	√	○	√	○	○	√	17	E	0	1	2	29
						√		—	—	—	—	○	—	—	√	○	○	√	○	○	○	○	√	90.19					
√						√		√			√	√	—	—	√	○	√	—	—	—	—	○	√	18–I	E, K	0	0	53	30
						√		√			√	√	—	—	√	○	√	—	—	—	—	○	○						
√						√			—	—	√	√	—	—	—		—	√	√	√	—	○	√	29	H, K	0	0	3	31
						√			—	—	√	√	—	—	—	—	—	√	—	—	—	○	√	28					
√						√			—	—	○	○	—	—	—	—	—	—	—	—	—	○	√	18–I	E, C, B	0	0	6	32
						√			—	—	○	○	—	—	—	—	—	—	—	—	—	○	√	18–I					
	√					√		√			√	○	—	—	√	—	√	√	√	√	√	○	○			0	17	200	33
						√		√			○	○	—	—	—	—	√	√	√	√	√	○	√	19	F				
		√				√		—	—	—	○	○	—	—	√	—	○	—	—	—	—	○	○			0	0	30	34
						√		—	—	—	√	○	—	—	√	—	○	—	—	—	—	○	√	24	I				
		√				√		—	—	—	√	√	—	—	—	—	√	√	—	—	—	○	√	18–VIII	I	0	0	11	35
						√		—	—	—	√	√	—	—	—	—	√	√	—	—	—	○	○						
√						√				√	√	○	—	—	—	—	○	○	√	√	○	○	√	18–III	E, C	0	0	67	36
						√				√	○	○	—	—	√	—	○	√	—	—	○	○	√	80.3, 80.4					

TABULATION OF MARINE COLLISIONS

NOTES.—1. These tabulations were made from collision reports available at CGHQ which were submitted pursuant to 46 CFR 136. 2. "Collisions" with fixed eliminate small craft collisions at least one of the vessels in each collision was required to be over 500 G.T.

SYMBOLS
√ Yes
○ No
— No information

A Excess speed
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C Wrong side channel
D Failure to sound signals

Identification			Nationality		Size (gross tons)				Rig					Coast Guard inspection	Applicable rules			Location			Visibility						Weather					
																					Distance (miles)			Time			Wind			Current or sea		
Case No.	Month and year	Time (zone)	United States	Foreign	Under 1,000	1,000–5,000	5,000–10,000	Over 10,000	Passenger	Freighter	Tanker	Tug with tow	Other		International	Inland	Great Lakes	Open sea	Congested waters	Narrow channel	Under 2	2–5	Over 5	Daylight	Dark	Twilight	Strong	Moderate	Light or calm	Strong	Moderate	Calm or slack
37	Dec 58	0100	√		√							√		○		√				√			√					√			√
			√		√							√		○																	
38	Dec 58	0800	√				√			√				√		√			√		√			√				√				√
			√		√							√		○																	
39	Dec 58	2225		√			√			√				○		√				√		√			√			√				√
			√		√							√		○																	
40	Dec 58	0902		√				√			√			○			√			√		√		√				√				√
			√					√			√			√																	
41	Dec 58	0624	√										Ferry	√		√			√				√		√			√				√
			√		√								F/V	○																	
42	Dec 58	1807		√				√			√			○		√			√				√		√			√				√
			√		√								Ferry	√																	
43	Dec 58	2245	√				√			√				√		√				√			√		√			√	—	—	—
			√		√							√		○																	
44	Dec 58	0345	√		√					√			Tug	○			√		√				√		√		√		—	—	—
			√			√				√				√																	
45	Dec 58	2054		√			√			√				○		√				√			√		√			√	—	—	—
			√		√							√		○																	
46	Jan 59	1635		√			√				√			○		√				√			√	√			√			—	—	—
			√		√								Tug	○																	
47	Jan 59	0720	√					√			√			√		√				√			√	√		√			—	—	—
			√		√							√		○																	
48	Jan 59	1735	√					√			√			√		√				√			√		√		√		√			
			√				√			√				√																	
49	Jan 59	2003	√					√			√			√		√				√			√		√		√		—	—	—
			√		√							√		○																	
50	Jan 59	2315	√		√							√		○		√				√		√			√			√	—	—	—
			√		√							√		○																	
51	Jan 59	2110		√	√							√		○		√				√			√		√			√		√	
			√		√							√		○																	
52	Jan 59	0523	√				√			√				√	√			√			√				√			√	—	—	—
				√			√			√				○																	
53	Jan 59	0500	√		√							√		○		√				√			√		√			√	√	√	
			√					√			√			√																	

OCCURRING DURING FISCAL YEAR 1959—Continued

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Situation					First knowledge						Communication		Equipment				Navigating personnel					Collision cause				Losses			
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Meeting	Crossing	Overtaking	Anchored or moored	Other	Radar	Visual	Sound	Under 1	1–2	Over 2	Passing signal sounded	Agreement reached	Aboard	Used	Aboard	Used	Pilot	Master	Mate	Helmsman	Lookout	Material failure	Personnel failure	Rule(s) violated	Comments	Deaths	Injured	Dollars (Thousands)	Case No.
√						√		—	—	—	○	○	—	—	√	—	○	○	√	—	—	○	√	18–III		0	0	6	37
						√		—	—	—	√	○	—	—	√	—	○	○	√	—	—	○	√	18–III, 25	C				
	√					√		√			—	○	√	√	—	—	√	√	—	—	√	○	√	16	A	0	0	17	38
						√		√			—	○	—	—	—	—	○	√	—	√	—	○	√	16, 29	A				
√						√		—	—	—	—	—	√	√	—	—	√	—	—	—	—	○	○			0	0	22	39
						√		—	—	—	—	—	√	√	—	—	—	√	√	—	—	○	√	80.10	A, C				
√						√		—			—	—	—	—	—	—	√	√	—	—	—	○	√	80.10	C	0	0	19	40
						√		—	—	—	—	—	—	—	√	—	—	√	—	—	—	○	○						
		√				√		√			○	○	√	—	√	—	—	√	—	—	—	○	√	18–VIII, 24, 29	D, I	0	0	2	41
						√		√			○	○	—	—	√	—	—	√	—	—	—	○	√	29					
	√					√		√			√	○	—	—	—	—	√	√	√	√	√	○	○			0	0	30	42
						√		√			√	○	—	—	—	—	○	√	—	—	—	○	√	19, 18–III	F				
√					—	—	—	—	—	—	√	○	—	—	○	○	√	—	—	—	—	○	○			0	2	19	43
					—	—	—	—	—	—	○	○	—	—	√	○	—	—	—	—	—	○	√	18–V, 80.16	D				
	√				—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	○	○			0	0	5	44
					—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	√	○						
√						√			√		√	○	—	—	—	—	√	√	√	√	√	○	√	18–I, 25, 80.10	C, H	1	1	281	45
						√			√		√	○	—	—	—	—	○	√	—	—	○	○	√	18–I	H				
		√			—	—	—	—	—	—	—	—	—	—	—	—	√	√	—	—	—	○	○			0	0	10	46
					—	—	—	—	—	—	—	—	—	—	√	—	—	√	—	—	—	○	√	18–VIII	I				
		√				√				√	√	○	—	—	√	○	○	√	—	—	—	○	√	18–VIII	I	0	0	14	47
					—	—	—	—	—	—	○	○	—	—	√	○	○	√	—	—	—	○	√	84.2, 84.3					
√						√			√		√	○	—	—	√	—	√	√	√	—	—	○	√	18–I, III	E	0	0	236	48
						√			√		√	○	—	—	√	—	√	√	—	—	√	○	○						
√					—	—	—	—	—	—	—	—	—	—	○	○	√	—	—	—	—	○	○			0	0	65	49
					—	—	—	—	—	—	—	—	√	√	√	—	○	√	—	—	—	○	√	18–I, 29, 80.10	C				
√						√		√			√	○	—	—	√	○	○	√	—	—	—	○	√	18–III, 25	C, D	0	0	2	50
						√		√			√	○	—	—	√	○	—	√	—	—	—	○	√	18–III	D				
√						√				√	○	○	—	—	√	—	√	○	√	√	—	○	√	18–III	D	0	3	16	51
					○	○	○	—	—	—	○	○	—	—	—	—	○	○	○	○	○	○	√	18–I, 25, 29, 80.16	C, D				
√					√					√	○	○	√	√	√	—	○	√	√	—	—	○	√	16	A	0	0	90	52
					√					√	○	○	√	√	√	—	○	√	√	—	—	○	√	16	A				
√						√			√		√	√	—	—	√	—	—	—	√	—	—	○	○		K	0	0	4	53
						√			√		√	√	—	—	—	—	○	√	√	√	√	○	√	29	A				

TABULATION OF MARINE COLLISIONS

NOTES.—1. These tabulations were made from collision reports available at CGHQ which were submitted pursuant to 46 CFR 136. 2. "Collisions" with fixed eliminate small craft collisions at least one of the vessels in each collision was required to be over 500 G.T.

SYMBOLS
√ Yes
○ No
-- No information

A Excess speed
B Insufficient power
C Wrong side channel
D Failure to sound signals

Identification			Nationality		Size (gross tons)				Rig					Coast Guard inspection	Applicable rules			Location			Visibility						Weather					
																					Distance (miles)			Time			Wind		Current or sea			
Case No.	Month and year	Time (zone)	United States	Foreign	Under 1,000	1,000–5,000	5,000–10,000	Over 10,000	Passenger	Freighter	Tanker	Tug with tow	Other	Coast Guard inspection	International	Inland	Great Lakes	Open sea	Congested waters	Narrow channel	Under 2	2–5	Over 5	Daylight	Dark	Twilight	Strong	Moderate	Light or calm	Strong	Moderate	Calm or slack
54	Jan 59	1824	√			√				√				√		√			√				√		√		√		--		—
			√		√							√		√									√								
55	Jan 59	0707	√				√			√				√		√				√			√	√				√	√		
			√		√							√		○									√								
56	Jan 59	1057	√					√			√			√		√				√			√	√			√				√
			√					√					Dredge	○																	
57	Jan 59	1823	√		√							√		○		√				√			√		√		√		√		
			√			√				√				√																	
58	Feb 59	1400	√				√			√				√		√				√	√			√			√		--	—	—
				√			√			√				○																	
59	Feb 59	0535	√		√							√		○		√				√		√		√				√	—	—	—
			√		√							√		○																	
60	Feb 59	2822	√				√				√			√		√				√			√		√		√				
				√	√					√				○																	
61	Feb 59	0500	√		√							√		○		√				√			√		√				√	—	—	—
			√		√							√		○																	
62	Feb 59	0835	√			√							Ferry	√		√			√		√			√					√			√
			√			√							Ferry	√																	
63	Feb 59	0645	√		√							√		○		√			√		√			√					√	—	—	—
			√		√							√		○																	
64	Mar 59	1040	√					√	√					√																		
				√				√			√			○	√			√			√			√				√				√
65	Mar 59	1027		√	√					√				○																		
			√		√							√		○		√				√		√	√			√			√			
66	Mar 59	0535	√			√					√			√																		
				√	√					√				○	√			√				√		√		√			—	—	—
67	Mar 59	1000	√		√							√		○																		
			√		√							√		○		√				√		√	√					√				√
68	Mar 59	1520	√		√							√		○																		
				√		√				√				○		√				√		√	√					√	√			
69	Mar 59	1318	√				√			√				√																		
				√		√				√				○	√			√			√			√					—	—	—
70	Mar 59	0301	√					√	√					√																		
			√					√			√			√	√			√			√				√			√	—		—

OCCURRING DURING FISCAL YEAR 1959—Continued

objects or while maneuvering alongside piers were eliminated as irrelevant. 3. The U.S. western rivers (Mississippi River System) were excluded 4. To (Tugs with tows were considered as single vessels for the purposes of this tabulation.)

E Meeting situation, turned left
F Crossing situation, burdened failed give way
G Failed to stop or back
H Evasive maneuver too little or too late
I Overtaking vessel failed keep clear
J Overtaken vessel failed maintain course
K Wind, sea or current factors

Situation					First knowledge						Communication		Equipment				Navigating personnel					Collision cause				Losses			
					How obtained			Distance off (miles)					Radar		Radio telephone															
Meeting	Crossing	Overtaking	Anchored or moored	Other	Radar	Visual	Sound	Under 1	1–2	Over 2	Passing signal sounded	Agreement reached	Aboard	Used	Aboard	Used	Pilot	Master	Mate	Helmsman	Lookout	Material failure	Personnel failure	Rules(s) violated	Comments	Deaths	Injured	Dollars (Thousands)	Case No.
	√					√		—	—	—			—	—	—	—	—	—	—	—	—	○	○			0	0	31	54
						√		—	—	—	—	—	—	—	—	—	—	—	—	—	—	○	√	19	F				
√						√		—	—	—	√	√	—	—	—	—	√		—	—	—	○	√	18–I, 25	C	0	0	36	55
											√	√	—	—	—	—		√	—	—	√	○	√	18–I, 25	C				
		√				√		—	—	—	√	○	—	—	—	—	√	√	√	√	—	○	√	18–VIII, 24	I	0	2	145	56
						√		—	—	—	√	○	—	—	—	—	—	—	√	—	—	○	○						
√						√		—	—	—	√	○	—	—	√	—	○	√	—	—	—	○	√	18–I	C	0	0	5	57
						√		—	8—	—	√	○	—	—	—	—	○	√	√	√	—	○	√	18–I	C				
√							√	—	—	—	○	○	√	√	—	—	√	√	√	√	√	○	√	16, 25	A, C	0	1	51	58
					√				√		√	○	√	√			√	√	√	√	√	○	√	16, 25	A, C				
√						√		—	—	—	√	○	—	—	—	—	—	√	—	—	—	○	√	18–I, 25	C, D	0	0	7	59
						√		—	—	—	√	○	—	—	—	—		√	—	—	—	○	√	18–III	D				
	√					√		—	—	—	√	○	—	—	—	—	√	√	—	—	—	○	○			0	0	90	60
						√		—	—	—	√	○	—	—			○	√	—	—	—	○	√	18–III, 24	D, F				
√						√		√			√	√	—	—	—	—	—	—	√	—	—	○	√	18–I, 25	C	0	0	13	61
						√		√			√	√	—	—	—	—		√	—	—	—	○	○						
√						√		√			○	○	—	—	—	—	○	√	—	√	√	○	√	16	A	0	0	3	62
						√		√			○	○	—	—	—	—	○	√	—	√	√	○	√	16	A				
√						√				√	○	○	—	—	—	—	○	√	—	—	○	○	√	16, 29	D	0	3	—	63
						√				√	○	○	—	—	—	—	○	√	—	—	○	○	√	15, 16, 29	D				
√					√					√	○	○	√	√	√	○	○	√	√	√	√	○	√	16	A	0	0	1,280	64
					√			—	—		○	○	√	√	√	○	○	√	√	√	√	○	○						
√						√		√			√	√	—	—	—	—	√	—	—	—	—	○	○			0	0	22	65
						√		√			√	√	—	—	√	—	○	√	—	—	—	○	√	25	C, K				
√						√		√			○	○	—	—	√	○	○	—	√	—	—	○	○			0	0	4	66
						√				√	○	○	—	—	√	○	○	—	√	—	—	○	√	2					
√						√		—	—	—	○	√	—	—	√	√	—	√	—	—	—	○	√	25	B, C	0	0	5	67
						√		—		—	○	√	—	—	√	√	—	√	—	—	—	○	○						
	√					√		√			○	○	—	—	√	—	—	—	√	—	—	○	√	19	F	0	0	2	68
						√		√			√	○	○	○	○	○	√	√	—	√	√	○	○						
				Fog			√	—	—	—	○	○	—	—	√	—	○	√	√	—	√	○	√	16	A	0	0	22	69
				Fog	—	—	—	—	—	—	○	○	—	—		—	○	—	—	—	—	○	○						
√					√					√	○	○	√	√	√	○	○	√	√	√	√	○	√	16	A	4	44	1,890	70
					√					√	○	○	√	√	√	○	○	○	√	√	√	○	√	16	A				

TABULATION OF MARINE COLLISIONS

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SYMBOLS
√ Yes
○ No
— No information

A Excess speed
B Insufficient power
C Wrong side channel
D Failure to sound signals

Identification			Nationality		Size (gross tons)				Rig					Coast Guard inspection	Applicable rules			Location			Visibility						Weather					
																					Distance (miles)			Time			Wind			Current or sea		
Case No.	Month and year	Time (zone)	United States	Foreign	Under 1,000	1,000–5,000	5,000–10,000	Over 10,000	Passenger	Freighter	Tanker	Tug with tow	Other	Coast Guard inspection	International	Inland	Great Lakes	Open sea	Congested waters	Narrow channel	Under 2	2–5	Over 5	Daylight	Dark	Twilight	Strong	Moderate	Light or calm	Strong	Moderate	Calm or slack
71	Apr 59	1205	√		√							√		○		√				√			√	√				√	—	—	—
			√		√							√		○																	
72	Apr 59	1819		√			√			√				○		√				√			√		√			√	√		
			√		√							√		○																	
73	Apr 59	0055	√			√					√			√		√				√			√		√			√	√		
			√		√							√		○																	
74	May 59	1925	√		√							√		○		√			√				√		√			√	—	—	—
			√		√							√		○																	
75	May 59	0802	√				√			√				√		√				√			√	√				√			√
			√		√							√		○																	
76	May 59	1425	√			√				√				√			√	√			√			√				√	—	—	—
				√			√			√				○																	
77	May 59	1030	√		√								F/V	○	√			√					√	√				√			√
			√		√							√		○																	
78	May 59	1540	√					√			√			√		√				√			√	√			√				√
				√	√					√				○																	
79	May 59	0541	√			√				√				√			√		√		√			√					√			√
			√		√								F/V	○																	
80	May 59	0442	√					√			√			√		√				√			√		√			√	√		
			√				√			√				√																	
81	May 59	0210	√			√				√				√			√		√				√		√			√			√
			√				√			√				√																	
82	Jun 59	1645	√			√				√				√			√			√			√	√		√					√
			√			√					√			√																	
83	Jun 59	1645	√				√			√				√			√			√			√	√		√					√
				√			√			√				○																	

OCCURRING DURING FISCAL YEAR 1959—Continued

objects or while maneuvering alongside piers were eliminated as irrelevant. 3. The U.S. western rivers (Mississippi River System) were excluded. 4. To (Tugs with tows were considered as single vessels for the purposes of this tabulation.)

E Meeting situation, turned left
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I Overtaking vessel failed keep clear
J Overtaken vessel failed maintain course
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Situation					First knowledge						Communication		Equipment				Navigating personnel					Collision cause				Losses			
					How obtained			Distance off (miles)					Radar		Radio telephone															
Meeting	Crossing	Overtaking	Anchored or moored	Other	Radar	Visual	Sound	Under 1	1–2	Over 2	Passing signal sounded	Agreement reached	Aboard	Used	Aboard	Used	Pilot	Master	Mate	Helmsman	Lookout	Material failure	Personnel failure	Rule(s) violated	Comments	Deaths	Injured	Dollars (Thousands)	Case No.
		√				√		√			√	√	—	—	√	√	—	√	—	√	—	○	√	24	B, I	0	0	10	71
						√		√			√	√	—	—	√	√	—	√	—	√	—	○	○						
√						√		√			√	○	—	—	√	—	√	√	√	√	○	○	√	29		0	0	23	72
						√		√			√	○	—	—	—	—	○	○	√	—	○	○	√	18–I, 25	C, K				
√						√		—	—	—	√	○	—	—	—	—	○	—	√	√	○	○	√	25, 29	C	0	0	20	73
						√		—	—	—	√	○	—	—	—	—	○	—	√	—	○	○	√	18–III, 29					
	√					√		—	—	—	—	—	—	—	—	—	—	—	—	—	—	√	○			0	0	23	74
						√		—	—	—	—	—	—	—	—	—	—	—	—	—	—	○	○						
√						√		—	—	—	√	○	—	—	○	○	√	√	√	√	○	○	√	25	C	0	0	7	75
						√		—	—	—	√	○	—	—	√	○	○	—	√	—	—	○	√	18–III	D				
			√		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	○	○			0	0	8	76
				Udrwy	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	○	√	15	A				
	√					√			√		○	○	—	—	√	○	○	○	○	○	○	○	√	19, 29	F	0	0	40	77
						√			√		○	○	—	—	√	○	—	√	—	—	—	○	○						
		√				√		—	—	—	√	√	—	—	√	—	—	√	√	√	○	○	√	24	I	0	0	—	78
						√		—	—	—	√	√	—	—	√	—	○	√	—	—	—	○	√	18–VIII	J				
	√					√		√			○	○	√	○	√	—	○	—	√	√	√	○	√	15	A	0	0	2	79
						√		√			○	○	○	○	○	○	○	√	—	—	√	○	√	15	A				
		√				√		√			√	○	—	—	—	—	√	√	—	—	—	○	√	18–VIII	I	0	0	40	80
						√		√			○	○	—	—	—	—	√	√	—	—	—	○	○						
		√				√		√			○	○	—	—	√	—	○	√	√	—	√	○	√	22	I	0	0	137	81
					—	—	—	—	—	—	○	○	—	—	√	—	○	√	√	—	√	○	√	26	D				
√						√			√		√	○	—	—	—	—	○	√	√	√	√	○	○			0	0	90	82
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