Here again we float off into cloud-cuckoo-land. The United States Government, through the Bureau of Navigation and Steamboat Inspection, was trying to lift some of the curse on American shipping. Part of that curse was the large number of native and alien incompetents who were buying their credentials in South Street. Another was the peril involved in so many aliens, unidentifiable and unable to speak, write, or read English. Many of them could not read or write any language. It was highly desirable, to say the least, that the official responsible for engaging seamen should scrutinize their credentials before hiring.

But the Ward Line shipping master, a Greek gentleman, could neither read nor write English. If the American discharges had been printed in Greek it may be doubted whether this modern Ulysses would have been any the wiser. Perhaps he spoke Cuban Spanish, for many of the deck hands were Cubans. We do not know. What we do know is that he was the employee of the Ward Line appointed to select the crews for American-flag ships, and the law of the land, to put it mildly, was interpreted in an elastic manner.

V. SO MUCH for the crew. There could not have been much "inspection" of them, and they acted very much as an uninspected crew would act. What about the boats?

Lifeboats are for saving life, though there have been times in recent years when American shipowners gave the impression that they were designed for rowing races and publicity. To chief officers lifeboats are a headache, a clumsy apparatus for painting the ship's sides and boottopping.

The MORRO CASTLE's steel boats would have been adequate if kept in condition. Like the ship, they were only four years old, yet it was stated by crew members that boats Nos. 3, 9, and 10 had buoyancy tanks rusted into holes. Boat No. 1 had a motor which would not work and the boat had to be rowed.

The general public is ill informed on the subject of lifeboats. Indignation surges up white hot when it transpires that lifeboats are not regularly lowered, operated, inspected, revictualed, and maintained. If you ask, when is this to be done? There is a certain lack of unanimity in the answers. The ship ties up at her pier in New York. The boats on the dock side cannot be lowered. Often neither can those on the offshore side, for the dock as often as not is full of lighters. The crew are mostly off their articles and will not rejoin until sailing morning. Is the chief officer supposed to do this job single-handed?

At the other end of the voyage it is not much better. You say, the law demands it. The ship should lie off in the river or the harbor, and go through boat inspection and drill.

It sounds quite simple. But in a world where ships are run to make

money and keep schedules, and government subsidies are earned only on the number of sea-miles they cover, a world in which wages go on all the time and passengers are irked over an hour's delay, these are counsels of perfection. Lifeboats are heavy. Motor lifeboats are extremely heavy. The present writer, taking over as engineer on a New York-Havana liner twenty-five years ago, discovered that the motor of the lifeboat (No. 1) had never worked in all the ten years of the ship's running. The valves were rusted solid in their seats and the timing had never been adjusted. On arrival in Havana, it took several quarrels with the chief officer and an interview with the master to get the boat into the water for a test. Suppose we had needed that motor-boat in a crisis!

Steel boats, moreover, are the very devil to keep in good condition. Sea air and water corrode mild steel like magic. The average clinker-built wooden lifeboats costs around $250 a year to maintain in condition, but it can be so kept. The steel boat is rusting internally all the time. It is fair without, but within it is full of minute corrosions. You cannot have copper buoyancy tanks, as in a wooden boat, for the salt water sets up electrolytic action between the steel hull and the copper tank.

But boats are only part of the story. These members of the crew, with their lifeboat certificates, are the main thing. With that personnel turnover of 20 percent, what chance had the MORRO CASTLE of boat crews trained and experienced? The answer is, she had no chance at all.

This accounts for the bizarre fact that boat No. 3 (with her rusted tanks) got away with sixteen of the crew, but no passengers. She was certified to carry seventy persons. Boat No. 1 went off with three passengers (evidently resourceful and agile fellows) and twenty-nine of the crew. The general impression we gather from these facts is that the crew had only one thought in mind, which was to save their own skins, and there seemed to be nobody in command to correct that thought. At last, off Sea Girt, all power having failed, the anchor was dropped by the new acting chief officer, Mr. Freeman, and the MORRO CASTLE lay swathed in dense smoke and fumes, shot by the flames consuming the interior of the upper decks, while passengers, huddled by the after rail, dropped into the sea or shinned down ropes. They saw the more resourceful members of the crew rowing away as hard as they could. This is one of the most terrible features of a terrible disaster. Nothing impresses the student of this marine casualty more than the complete disintegration of all conscience in the crew of the ship. Many of the passengers were in a panic, a fact which we can sympathize with and condone. But the crew exhibited an ignoble panic which deprives them of all human forgiveness. Many of them were, quite simply, despicable in their behavior.

Captain Warms, who was to be master for the shortest time on record, followed the immemorial tradition of the sea by being the last

man to leave the doomed ship. He and fourteen of the crew of 231 remained on the forecastle, which was untouched by the fire. When the Coast Guard cutter TAMPA arrived, it was decided to tow the burning hulk to New York. Two tugs were also in attendance, and the dreary procession, moving slowly through heavy seas, reached Asbury Park, where the hawsers parted. The MORRO CASTLE drifted broadside on a sand bar, a few yards off the huge Convention Hall at the foot of Sixth Avenue. Here she stuck fast. The two powerful salvage tugs failed to shift her. This was Saturday evening.

VI. THEN BEGAN one of the most amazing episodes in American maritime history. It was a Saturday in early September, and Asbury Park is a "resort". It lives on tourists, week-enders, conventions, beauty contests of bathing girls, and such-like"attractions". And here was the nation's latest sensation, a glittering cruise liner, full of exactly the kind of people who patronized Asbury Park, catching fire at sea and coming to rest right off Convention Hall Pier. Dead bodies were already washing ashore on the beach. Lifeboats were coming in. Authorities were coming down posthaste from New York. It was an incredible, a stupendous, a miraculous "attraction".

Asbury Park had a commission government headed by a city manager, a gentleman named Carl Bischoff. Mr. Bischoff saw the smoldering MORRO CASTLE from one point of view and one only. To him she was an "attraction", a gold mine forAsbury Park. As thousands of cars streamed through the September night on all the roads of New Jersey, heading for Asbury Park, Mr. Bischoff decided to cash in. Beach and Convention Hall were fenced off and a charge of twenty-five cents a head was made for admission, to stand on the outer galleries of the structure and gape at the still-burning vessel, where people like themselves had been caught in luxurious cabins and burned alive as in furnaces, while the ship fled through the night.

This was understandable enough. Showmanship is part of the American scene. But Mr. Bischoff had other ideas. It struck his forward-looking but simple mind with great force that, since Providence has brought the MORRO CASTLE to beach herself in his front yard, so to speak, finders were keepers. To him she was no tragedy at all, but a gold mine, and he saw no reason why, as city manager or mayor of Asbury Park he should not take possession of her. He was a humane man and a public-spirited citizen. He would have been angry and outraged if he had seen the ghouls that night dragging the bodies of the dead ashore and hacking off their fingers to get the rings. He was sorry for those who had lost their lives or their loved ones in the disaster. But it was hardly likely that another burning liner would ever come ashore in Asbury Park and lie in such a miraculously good location for commercial exploitation. He saw the jam of cars in the streets, the land-office business at the pier, and he wanted to keep the MORRO CASTLE where she was, as a permanent "attraction", a museum as well as a mausoleum for the charred dead.

This attitude of Asbury Park's leading citizen was a symptom. It expressed in dramatic form the prevailing lack of understanding in the public mind concerning ships. When Frank B. Conover, of the New York Board of Underwriters, arrived on the scene, he found Mr. Bischoff in possession. The Board of the Steamboat Inspection Bureau, headed by Mr. Dickerson N. Hoover, and the United States Attorney, all had urgent business on board the MORRO CASTLE. Mr. Bischoff had never heard of such people. He claimed--and this is perhaps the oddest note in a very odd affair--"riparian rights" over the ship. He even threatened to arrest Mr. Conover, the representative of the Federal Government, for disorderly conduct, unlawful entry, and (note this) insubordination. Mr. Bischoff became so much of a deterrent to official business that it was necessary to remove him from the scene. He would have found a kindred spirit in the mortician who joined the crowd of anxious relatives outside the Ward Line offices and handed around his business cards.

VII. THE INQUIRY which sought to discover the cause of this terrible disaster afforded a field day for cranks and headline hunters. There were some witnesses who were sane and contributed useful evidence. Mr. William M. Tripp, the young M.I.T. student already mentioned, impressed everybody with the clarity and honesty of his statements. There was no getting away from the bell sheet, the log he kept of the orders coming down from the bridge. But he could let no light into the darkness surrounding the main question--What set the ship on fire?

It was discovered, you will recall, in a locker in the writing room, on B deck, a locker which normally held stationery, ink, and such like equipment for writing. This is the classic official explanation of where the fire originated. Nobody seems to have questioned it for a moment. So far as can be determined from the blueprints, the writing room extended across the ship, part of it being known as the library. In any case the funnel passed up through B deck at that point. Just forward of the funnel were the main first-class staircase and elevator, both of which were to act as flues for the fire. Above the boiler was the first-class dining room, with its mezzanine, then the lounge and ballroom, also with a mezzanine, and then the writing room and library. Above these public rooms were staterooms on either side, on A deck. The fact that the funnel carrying the gases from six oil-fired boilers passed through this passenger structure was not mentioned by anybody.

But it started in the locker, we are assured, and Captain Warms knew of it shortly before 3 A.M. The call went out at 3:15. At 3:29 the lights went out in the engine room, which was filling with smoke. Nobody inquired how smoke was getting through steel bulkheads from the writing room. Second officer Hackney, promoted from third when Captain Willmott died, saw smoke coming out of the ventilators in the fidley at 2:55. These must have been the fireroom ventilators, but Mr. Tripp

assured him at the time that there was no fire in the engine room. Here is a point which should have been narrowly cross-examined by the board of inquiry.

Unsatisfactory as most of the witnesses were, there were two who not only agreed, and who were innocent of collusion, but whose evidence disposed of the fiction that the ship took fire with miraculous suddenness and was as quickly destroyed as if she were constructed of celluloid. One was a cruise passenger, Mr. John Kempf, by profession a city fireman of Maspeth, Long Island, who was on vacation. He was presumably an expert witness as regards fires. The other was Harriet B. Brown, a stewardess. Mr. Kempf stated that he smelled smoke soon after midnight. Mrs. Brown confirmed this.

Mr. Kempf had a number of uncomplimentary things to say about the skill, discipline, and courage of the ship's crew. He made a special point of the fact that there was no officer visible anywhere to tell the crew what to do or where to go. If it were possible to attribute the fire to arson, the crew rendered first aid to the arsonists by knowing nothing about their duty in an emergency. So did Captain Warms, for that matter, when he drove the ship at 19 knots into a twenty-mile gale. Of course there were exceptions. In several hundred men and women we are bound to find exceptions. Third engineer Arthur Stamper remained on watch until driven from his post by smoke and fumes. Dr. DeWitt Van Zyle, the ship's surgeon, died with the women and children he attempted to save. His body was picked up by a fishing boat.

VIII. WHO, then, was to blame? It is a tradition in American transportation, deriving from the bad old days, when American railroads were less safe than now, to blame the dead engineer. The engineer was generally dead. The Ward Line, however, did not have this consolation. Their engineer, Mr. Eben S. Abbott, was very much alive. He left in No. 1 boat. Captain Warms stated that the engineer appeared on the bridge, suffering from smoke and fumes, and said he could do no more and was leaving the ship. What Captain Warms, who sorely needed sustaining at such a moment, must have thought of his engineer we have no means of learning, but those of us who have been to sea can hazard a guess. We are told, by members of the crew in the boat, that the engineer tore off the braid from his sleeves, with a view to preserving his anonymity when he got ashore.

Obviously such a tragic figure did not create a very favorable impression at the inquiry. His good fortune was that there was no one conducting the interrogations technically competent to ask leading questions.

There was no one, for instance, to correct the public notion that the chief engineer should have been "at his post" in the engine room. His post was on deck. So far as we know, he was doing what he was supposed to do, supervising the firefighting equipment. We are told

that he was ordered by the captain to abandon the ship, which might have a number of differing interpretations, but they would all be conjectures now.

What did emerge from the sorry business was that neither Warms as master nor Abbott as engineer was an inspiring figure. While Warms was chief officer, the reigning authority was evidently Willmott, who by long service, and possibly financial interest in the Line, kept everything in his own hands, including fire and boat drills.

Now, if you take from a lieutenant the authority which properly belongs to his rank, you injure his self-respect and render him indifferent to discipline and efficiency. This point was not made by anyone at the inquiry. The point was not made that a shipmaster of immense seniority and with stock in the company usually keeps things in his own hands. This used to be commonplace in the old British Mercantile Marine, when shipmasters invested in shipping. But in the frenzied hunt for sabotage and arson, vital questions such as the above were never raised.

The aim of the Ward Line in the inquiry was, of course, to evade responsibility for a most shocking disaster. They did not succeed, because negligence was nakedly exposed. All we can be sure of now is that they would have created a better impression in the public mind if they had revealed even common humanity toward the victims of that disaster. But while they were collecting $4,186,000 hull insurance from Lloyd's, $263,000 more than the ship's book value, they attempted to limit their liability to the value of the freight and passenger fares--around $13,000--plus the value of the ship, which was nothing. A year after the tragedy the claims of over four hundred survivors were still pending. Another Ward Liner, the MOHAWK, had by that time made history by going mysteriously haywire while passing the tanker Talisman, and had been rammed and sunk. By September, 1936, the Ward Line had experienced a change of heart. The sum of $890,000 was allocated to the MORRO CASTLE case, and most of the claimants accepted the settlement.

IX. IT WOULD BE EASY to lay undue stress, in a history of this character, on the trial, conviction, and sentences imposed on the captain, chief engineer, and the vice-president in charge of operations in the office. Four years in prison for chief engineer Abbott and suspension of his license, two years for Captain Warms, and temporary suspension of his master's license, and one year's suspended sentence with a fine of $5,000 for Mr. Cabaud. In addition a fine of $10,000 was imposed on the Line. Warms and Abbott appealed and the U. S. Circuit Court of Appeals, after wading through nearly five thousand pages of "transcript of record", reversed the judgment against them.

The whole business was a gesture. It is difficult to believe that the judge who imposed the prison sentences, or the defendants, believed that any time would be served behind bars. It was simply that, when it

became obvious that Moscow was not responsible for the destruction of the MORRO CASTLE, public opinion demanded scapegoats. The gesture was made of sending the ship's officers to jail. The Secretary of Commerce made the gesture of placing naval officers on merchant ships, to render them safe. Less spectacular but more important, Comgress made the gesture of improving the obsolete, understaffed, underpaid Bureau of Navigation and Steamboat Inspection. It could no longer be permitted to imperil human lives. The incompetence of the Bureau was dramatized by appointing Captain George Fried, who had made some highly publicized rescues at sea, as head of a new department of inspection. But by the middle of 1937 the U. S. Senate reported that "it seems clear...no further activity may be expected in connection with the MORRO CASTLE fire".

By that time the captain and engineer had regained their licenses and were again at sea. The name "Ward Line" was permitted to fade from the public memory, and the MORRO CASTLE'S sister ship, the ORIENTE, continued a successful career as a cruise liner.

The historian is left groping through the records for an answer to the original conundrum--What caused the fire? Why did a modern ship burn with such inconceivable rapidity? The reply at first was "arson". We were asked to believe that the criminal, with fiendish ingenuity, after poisoning the master, selected the locker in the writing room (1) because the writing room had no electric fire alarm, (2) he knew the stewards kept illegal and inflammable polishing liquids in the locker (this was never established as a fact), and (3) he chose the hour for his crime when most people on board were either drunk or asleep, or both.

The present writer was at one time chief engineer of oil-fired steamers. The popular notion that fuel oil is a dangerous element is incorrect. Fuel oil is about as volatile and inflammable at room temperature as the oil spread on roads in the fall and spring. It has its hazards, chief of which is explosive gas given off from the oil, gas which is heavy and hangs around in bilges and tanks. Another is the danger of overheating the long uptakes which lead from the furnaces to the funnel, if the burners are neglected.

Like most modern, medium-sized, medium-speed steamers, the MORRO CASTLE had only one real funnel. The after funnel was partly ornament, partly a ventilator. If, through neglect of the burners in the furnaces, the funnel base had become overheated, the heat would have been most intense where the funnel passed through the writing room, behind the cupboard. The writer once discovered his funnel red-hot just above the uptakes, owing to negligence. The ship was a freighter. There was a wide space between the funnel and the accommodation, and only minor damage ensued.

The validity of a theory is based on the number of observed facts it can account for. Most of the theories advanced for the MORRO CASTLE

fire were merely fantastic. They flourished on the obvious unfamiliarity of the interrogators with the actual operation of modern oil-fired turbo-electric ships. The present hypothesis assumes that parts of the steel structure around the funnel had been red-hot for hours and were charring the woodwork, disintegrating the insulation, giving off that smell of smoke which Mr. John Kempf and Mrs. Brown, the stewardess, declared they smelled soon after midnight. Remember that Mr. Hackney, the second officer, saw smoke coming up from the fidley grating and inquired if there was a fire in the engine room, receiving a negative reply from Mr. Tripp. Then, at three o'clock, according to Mr. Hackney, smoke was seen in the writing room, and the door of the locker burst open, belching flames. And from then on they could do nothing to stem the conflagration.

Does anyone believe that a fire generated in a locker with steel bulkheads behind it could be of such fierceness, even if it had contained a "time bomb"? Does anyone believe that such a source could consume a large part of the ship with such speed? The flames roared up stairways and elevator shafts. It made the passageways impassable. But if you assume that the interior structure of the funnel casing, passing up through the ship behind the writing room walls, had been reddening for hours (through negligence), sending the heat along the steel deck beams, plates, and stanchions, all was set for the holocaust, while the ship drove on through the night.

Only a hypothesis, but it does attempt to explain something, which the fumbling, prejudiced conjectures of the day did not.

Who then was to blame? As regards the particular instance, we shall never know. As regards the general picture of the American Merchant Marine, of which the MORRO CASTLE fire was the incandescent center, we may apportion the responsibility. There was the haphazard system of permitting, without adequate supervision, the amalgamation of numerous small lines, each with its special traditions and loyalties, and consigning their operation to an impersonal office management, without sea experience, and controlled by a "holding company." There was the slow ossification of the Bureau of Navigation, whose inspections were in such low repute that underwriters ignored them. And there was the complete absence, among legislators, of any interest in the integrity and character of the men who demanded such lavish generosity when they proposed to build and operate a merchant marine.

Another factor, less immediate but of great importance in the long deterioration of the industry, was the attitude of the American Federation of Labor toward marine unions. The A.F.L. had and has a tradition of craft unionism, but instead of fostering that tradition in seafaring, the A.F.L., through ignorance, indolence, and unintelligence, ignored the great champion of the seamen, Andrew Furuseth, and allowed the craft of the sailor to slide into the depths. Going to sea became the last resource of the dregs of the waterfront, the vicious, the improvident, the incompetent, and the irresponsible.

A further indictment can be made against the American public in general. Until disaster followed disaster, then bludgeoned it into paying attention to realities, that public had consistently failed to take any interest at all in its own merchant marine. Capital would not invest in it, the average citizen would not sail in it, and the working, native-born American would not accept employment in it. Not even the first World War, when American troops had to be ferried to France in British transports and defended by British warships, made any lasting impression on the inland population. Newspapers publicized and over-emphasized every mishap and accident to an American ship. The wages of able seamen and junior officers, and the social prestige of the calling, were so low that parents shied away from the sea as a possible profession for their sons.

It took another great war to change all that. The United States now has an enormous merchant marine. Nothing like the MORRO CASTLE tragedy can ever happen again--ships will take fire on occasion, but there will never recur the staggering incompetence of that fatal Saturday in September, 1934. Or so we hope. It depends on the public, which in the past has been quick to anger, quick to forgive, quick to forget, but slow to do anything about it. The lesson of the MORRO CASTLE is so simple that it may quite possibly be misunderstood. It is that the price of a merchant marine, like the price of liberty, is eternal vigilance.

X. SUPPLEMENT. Mr. J C. Caggill of COMSTS Office of Counsel volunteered the following pertinent background information on the MORRO CASTLE case:

"Without going into the question as to how much was established by the evidence of the case, the following charges were made by the Insurance Company which successfully resisted the effort of the New York and Cuba Mail Line to collect under its P & I policy:

The MORRO CASTLE was manned by an incompetent crew. Captain Willmott was physically unfit to serve as Master.

Warms, the First Officer, who succeeded Willmott as acting Master, was incompetent.

Failure to divide the sailors into equal watches in violation of existing laws.

Failure to hold proper fire and boat drills.

Failure to make proper entries in ship's log in regard to fire and boat drills. A number of fire hydrants were capped and fire hose was not at all times attached to fire hydrants.

Failure to have proper fire quarterdrills and muster rolls.

Failure of libelant's managing offices to inform the Master and Chief Engineer of the capacity of fire pumps.

It was my understanding, as well as I recollect, from the time when I was associated with the Attorneys of the Insurance Company involved, that the men who were assigned in theory as night watchmen were actually engaged in supplying food and drink to the passengers and that there was a strong indication that most of the lifeboats were painted into the chocks, a matter which was not noticed because the same lifeboat was always used for the so-called lifeboat drill. The fire hoses were not only not connected as required by statutes, but in addition, no wrenches or spanners were available in the emergency to connect the hose. It is also said that the fire main had been tapped to provide shower baths for the passengers and consequently was inadequate for the task which was required. Brass five-gallon extinguishers were customarily stored in lockers to prevent tarnishing except on sailing day when the Steamboat Inspectors were on board.

This case history should be incorporated in Leadership Training under the topic, Marine Safety. The above information emphasizes the lack of training, organization and proper equipment on the MORRO CASTLE - all contributing to the casualty. It is an excellent object lesson of what "not to do."

Section 7.2

TITANIC

One of the sea's immortal legends, a tragic saga of incredible folly and incredible courage

(Condensed from an article in the June 1953 issue of "Holiday" Magazine)

Today the hazards of peacetime water-borne travel seem blissfully distant. Yet the most dramatic shipwreck of all and the most costly in human life occurred in what generally can be called the modern era. The TITANIC, which killed 1513 people in April, 1912, was not greatly different from the biggest ships of today. It was the misfortune of her victims that radio was not yet fully appreciated and that devices for detecting obstacles had not reached a practical stage.

The destruction of the TITANIC in two hours and 40 minutes cost $8,000,000. More shocking were the statistics on loss of life. Capt. E. J. Smith, the liner's master, and 78 percent of his crew died. Theirs was the highest casualty rate of any group aboard. Next heaviest loss, 75 percent, was among the third-class passengers; 58 percent of the second-class passengers were lost and 38 percent of the first-class; 75 percent of all the women aboard were saved, but only 52 percent of the children. Of the men in second-class, only 8 percent were saved and of those in third-class, 16 percent.

Survivors told of rowing away to spare themselves the horror of the cries of those in the water. There were stories that the people in the boats sang to shut out the moans of the luckless ones. They did not have to row far or sing low. Within 40 minutes the clamor of the dying ceased; the North Atlantic took no longer to freeze out their lives. Later a vessel called a morgue ship cruised over the water where the TITANIC met her iceberg and found many victims floating in their white life jackets. When the bodies were examined it was found that only one had drowned; the rest had been killed by exposure.

The TITANIC sailed on her maiden voyage April 10, 1912. She was the biggest ship in the world and the White Star Line was very proud of her; they thought she was also the safest. She had double bottoms and her hull was divided into 16 watertight compartments which created the illusion that she was unsinkable. Aboard her were 2224 persons, including many celebrities who considered it a privilege to be present on the maiden voyage of such a ship.

The weather held fair and the TITANIC raced westward from Southampton. Her specialty was speed and she was making it. Three days out she got a wireless message from the CARONIA stating, "Westbound steamers report bergs, growlers and field ice" in the steamer lanes.

The TITANIC held her speed. That afternoon she got another message from the CALIFORNIAN about three icebergs; the TITANIC wireless operator was busy with his accounts and thought it unnecessary to record it. A little later the BALTIC called the TITANIC and reported ice on the steamer track. This time the wireless man wrote down the warning and passed it to the bridge. It reached the master, who, under the most sacred law of the sea, was solely responsible for the other 2223 humans aboard. He showed it to J. Bruce Ismay, chairman and managing director of the line, who was making the maiden voyage. Chairman Ismay read it, put it in his pocket and went for a stroll on deck with no comment between him and skipper. Almost six hours later Captain Smith got around to posting the notice in the chartroom where it could be seen by the other officers concerned with the safety of the ship. In 38 years at sea, Captain Smith had never even seen an accident.

At 10:00 p.m., by which time the TITANIC was expected to be in the ice fields, her 46,000 tons were still hurtling along at 22 knots. At 11:30 p.m. the nearby CALIFORNIAN reported by wireless that she was stuck in the ice. The TITANIC's operator told her he was trying to talk to Cape Race, that she was jamming his signals and requested her to: "Shut up, shut up."

Ten minutes later lookout Frederick Fleet, shivering in his crew's nest, saw the big berg rushing at him. He gave the three yanks on the bell cord which mean "object in the water dead ahead" and confirmed it on the phone to the bridge, specifying iceberg. The first officer, then in command on the bridge, did everything that could be done. He attempted the turn, gave the danger signal to the engine room, ordered Stop and then Full Speed Astern--but it was too late.

The TITANIC struck with so slight a shock that many aboard were not even awakened. With ice spilling on to her foredeck, she slid on past the berg and stopped at last. It was so trifling a blow that card players in the smoking room did not even lay down their hands when they saw the big hill of ice pass the windows.

Captain Smith felt it and thought something might be amiss. He came out of his cabin. For a man who had been receiving iceberg warnings for nearly 15 hours, he asked a remarkable question. "What has the ship struck"?

The seemingly slight collision had ripped open the belly of the TITANIC for about 300 feet. Two hours and 40 minutes later the unsinkable ship had sunk.

Meanwhile the customary performance of confusion, inadequacy, stupidity and selfishness, illuminated by acts of beautiful courage, ensued. The TITANIC legend was born.

The extent of the damage was discovered in a matter of moments and the officers seem to have had no illusions thereafter about keeping the ship afloat. There was no indecision on that score and no stubborn insistence on saving the ship at the risk of the passengers. Almost at once, on hearing that the TITANIC was taking water, Captain Smith ordered his radio shack to call for help.

The distress signal in those days was "CQD". "SOS" had just been contrived as a better signal but was not yet in general use. The operators began tapping "CQD" steadily. Before long they were desperately trying "SOS" as well. Within an hour of the collision the bridge was firing rockets, despite the bad effect of this visual evidence of danger on the passenger's morale, and the process of lowering boats was begun even earlier.

The fact that the lifeboat operations of the TITANIC were horribly mismanaged is inescapable. For the 2224 people aboard, the TITANIC provided lifeboat accommodations for only 1178. This was about half of the passengers she carried on her maiden voyage and only about one third enough, had she been filled to capacity. In two hours and 40 minutes only 711 people managed to get into the boats, which means that 467 people were lost who might have been saved, and 1046 people never had a chance from the moment they left the wharf.

The launching of boats went slowly and badly because no boat drill had been held and boat stations had not been assigned to many of the crew. Able seamen who should have manned the boats boarded them as passengers, and passengers, even women, manned oars and tillers. Many of the boats were only partly filled because it was difficult to convince many of the passengers that the unsinkable TITANIC was going down. The most notorious incident was the launching of lifeboat No. 1, which with a capacity of 40 persons, was put over the side containing only 12.

Later efforts were made to recall some of the half-empty boats to rescue as many as possible of those stranded aboard the ship, but little came of that. Similarly, few people were saved from the water by boats with empty seats. In some cases the boat occupants beat off their drowning fellow humans with oars, and a few attempts by steerage passengers to get to the boat deck were stopped by pistol shots. From accounts of the disaster it appears that these people were not even considered when the boats were being launched.

The bravest of all were some of the men of the black gang who stayed at their hopeless posts deep in the ship keeping the fires going to the last so that the TITANIC might have power to wireless for help. With them were 20 courageous engineers from the firm that built the TITANIC. These shipbuilders made the maiden voyage as observers. Though they were not crew members and therefore not bound to any posts of duty, they promptly went to where they thought they could do the

most good and where they had the least chance of survival, the deep interior of the ship. Every engineer was down there, 122 feet below the boat deck, along with many firemen and stokers, when she dived to the bottom.

Brave too were the ship's eight musicians. The TITANIC began going down by the head very soon after she struck. As the liner dipped inexorably the musicians kept playing lively tunes, a form of music known to that generation as ragtime. Beneath them the holds were flooding and every crewman who could be spared from his normal duty and many who simply abandoned their posts hurried to the open decks where they had at least a fighting chance to save their skins. But the musicians had no such freedom. They remained steadfast to the strange code of show business, employing their talents to maintain morale, while they watched the deck slanting ominously.

As the TITANIC sank, the choice of tunes changed from gay to solemn. Hymns and prayers replaced tin-pan-alley hits and gallant remarks.

The bandsmen played on while the lights were going out and the freezing salt water sloshed around their ankles. They shut their musicians' ears to the frightful discord of animal fear and agony, of steam blowing off, of an enormous funnel cracking loose and smashing down upon the swimmers and of heavy machinery uprooting within the ship as she tilted up to 60 degrees. They played to the last and went down with the ship. A tablet in the Southampton public library commemorates them.

Help was on the way to the TITANIC within a few minutes after the collision. Her first "CQD" was heard by Cape Race and relayed. The steamers MOUNT TEMPLE and LA PROVENCE heard it too, and all over the North Atlantic between New York and the tiny point in space where the TITANIC met doom, ships and shore stations began telling the story with dots and dashes. All nearby vessels but one turned toward the stricken liner and built up steam with double watches in their fire-rooms. Some that answered the cry for help were the CARPATHIA, BALTIC, OLYMPIC, ASIAN, CELTIC, PARISIAN and VIRGINIAN.

The one that did not was the only ship close enough at the moment of the crash to have saved all of the 1513 people who went down with the TITANIC or died in the water. She was the CALIFORNIAN, which lay motionless in the ice no more than 19 miles away, according to testimony at the investigation of the accident, and may have been even closer.

The wireless operator on the Californian, it will be recalled, had been told by the TITANIC to shut up earlier in the evening. He had laid aside his headset shortly after that and had just turned in when the first call for help was flashed. He slept all through the tragic hours following. At the time this appeared to some people to be a

reprehensible business, but no blame could be fairly attached to the radioman, since he could not have been expected to remain on duty 24 hours a day. What seems incomprehensible now is that the CALIFORNIAN had made no provision for his relief. Granted that wireless operators were not plentiful in the infancy of Marconi's invention, someone who could recognize the Morse code for "CQD" or "SOS" could have spelled the regular operator.

Even worse was the CALIFORNIAN's inexplicable conduct when it received information in another form. Testimony at investigations into the sinking showed that the CALIFORNIAN had seen not only the TITANIC's rockets but the lights of the ship itself and that she had done no more than try to talk to the TITANIC with a blinker. CALIFORNIAN officers admitted they had seen a ship which they thought was turning south and moving away; it was evidently an illusion created by the lights of the TITANIC cutting out as she nosed over. The CALIFORNIAN was still idling nearby when the first of the rescue ships arrived at the scene.

Lord Mersey, wreck commissioner in the investigation conducted by the British Board of Trade, minced no words about the CALIFORNIAN's behavior. "The night was clear and the sea was smooth," he pointed out. "When she first saw the rockets, the CALIFORNIAN could have pushed through the ice to the open water without any serious risk and so have come to the assistance of the TITANIC. Had she done so, she might have saved many if not all of the lives that were lost. She made no attempt."

The only ship that reached the TITANIC in time to do any good at all was the Cunarder CARPATHIA and she had to steam from 58 miles away with part of the run through broken ice. The CARPATHIA first sighted a TITANIC boat at 2:35 A.M., after the TITANIC sank. This boat was the only one that carried a light efficient enough to be useful under the circumstances. The CARPATHIA took the first survivors out of the sea at 4:10 A.M. and then proceeded to pick up the rest of the boats.

Despite their hours of exposure to icy air and freezing water, not very many of the survivors needed medical help. Only seven were dead in the boats and only one died after rescue. The CARPATHIA's captain buried them at sea and proceeded to New York, four days away.

During those four days the interested people on shore waited in dread and hope while the press assaulted their minds with a wild mixture of fact and fiction. Wireless facilities were primitive and exact knowledge of who was lost and who saved was not available until the CARPATHIA docked in the North River Thursday night, 18 April. Some 30,000 people waited at the pier, ambulances and stretcher teams were standing by, and news photographers exploded their flashlight powder in the darkness.

The story did not end there but inspired a novel, any number of short stories, and a movie. The TITANIC remains fresh in memory to this day.

Section 7.3

THE NORONIC DISASTER

(Excerpt from Proceedings of the Merchant Marine Council, USCG)

I. INTRODUCTION. Many years have passed since that mournful day in September 1949 when the news of the fiery end of the Canadian steamship NORONIC in Toronto with a ghastly toll of 118 deaths appalled the citizens of Canada and the United States from Coast to Coast. Millions of words have been printed; thousands of questions have been asked, but many still remain unanswered on the details of this terrible marine disaster. Why did 118 passengers lose their lives when the ship was tied to the dock? How did the fire start, and how did it spread so rapidly? With so many passengers dead, how does one explain the lack of any deaths in the crew? Why were all the tragic consequences of the fire breaking out while in port apparently totally unforeseen and unprepared for?

While some of these answers may never be forthcoming, many were revealed by the Canadian Government's official court of investigation. The conclusions and reasoning presented here are based principally upon that court's formal report. The dramatic lessons scorched upon the conscience of North America by that dreadful September catastrophe are still vivid in the minds of all seafarers and are as valuable today as they were in 1949.

The flaming destruction of the NORONIC took place in Canadian waters on September 17, 1949, and the investigation with its sorrowful revelations and condemnatory findings was, officially, a problem of the Canadian Government. Yet, from almost any other viewpoint, this tragedy was deeply imbedded in the heart and soul of the United States, for every one of the 118 passengers, except one, who lost their lives was a citizen of this country.

The NORONIC was a steel-hulled vessel built at Port Arthur, Ontario in 1913. She was powered by five Scotch boilers and a steam reciprocating engine. She was of 6,905 gross tons, 362 feet in length, and had passenger accommodations on three decks for 650 passengers. She was certificated to carry a crew of not more than 200. The three passenger decks were constructed almost entirely of combustible materials with large amounts of combustible furnishings and decorations.

During the summer season, the NORONIC made weekly cruises on the Great Lakes between Windsor, Ontario and Duluth, Minnesota. The season normally ended on Labor Day but, in 1949, a special post-season cruise had been arranged and the ship was to have sailed from Windsor eastward as far as Prescott on the St. Lawrence River, and then return to Windsor.

The cruise was to take about one week. Departure was made on September 14 and the following day was spent in Cleveland, Ohio, where additional passengers were embarked. The NORONIC sailed from Cleveland the evening of September 15, and arrived in Toronto Harbor about 6:00 P.M. on the 16th of September, to remain for the night. During the summer sailing season, no nights were spent in port with passengers on board--the night of September 16th-17th was the first night in the 1949 season that this was done.

II. PASSENGER EXIT. After the ship was moored, the majority of the 524 passengers and a large percentage of the 171 crew members went ashore to enjoy the city. The night was clear and cool with a fresh southwesterly breeze of about 12 miles per hour blowing in from the lake on the ship's port quarter. Although four sideports on the starboard side of "E" deck were open and could be used to pass between the ship and the dock, the only means of ingress or egress, so far as the passengers were concerned or knew, was the gangway amidships on "E" deck. This meant that the route for passengers leaving the vessel from their quarters on the various decks led, ultimately, down a central stairway to an open area on "E" deck and thence to the gangway. Since the gangway had been rigged to "C" deck in other ports, many of the passengers were not well acquainted with the exit route which existed on the night of the fire.

The NORONIC was not equipped with bulkheads which could in any sense be construed as "fire resistant." She was not equipped with fire-stop or draft-stop doors in the open corridors, which extended the length of all passenger decks, in the open wells, which extended vertically between the forward lounges on decks A, B, and C, or in the open stairwells amidships connecting A, B, C, D, and E decks. The material with which the superstructure, bulkheads, panelling, and doors were constructed was principally wood, coated with paint or varnish. As a general practice, the door to each passenger cabin was fitted with a louvered metal grill to aid ventilation. This, of course, also aided the spread of fire.

III. ALARM SYSTEM. There was no automatic fire detection system or fire extinguishing system installed on the NORONIC. The fire alarm system consisted of two independent parts, neither automatic. In various locations throughout the ship were located alarm switches which were activated manually by the breaking of a glass pane over the switch. The activation of any one of these switches rang bells in three locations in the officers' quarters forward on "A" deck, on the port side of "D" deck outside the Steward's office, and in the engine room at "E" deck. However, at only the first two of these bells were there indicators showing the station at which the alarm had been activated.

The second part of the alarm was a system of klaxon horns located at various points throughout the ship by which all persons could

be warned of fire. The system was controlled by a manually-operated master switch in the pilothouse. It was the duty of the officer on watch, upon hearing the bell ring in the officers' quarters, to proceed to the scene indicated as the point where the alarm was given, investigate the fire or cause for alarm, and decide whether it was serious enough for him, upon returning to the pilothouse, to sound the klaxon alarm horns. Obviously this system was subject to uncertainties and delays of a very serious nature even after someone had given positive notice that there was a fire.

IV. FIRE FIGHTING EQUIPMENT. The NORONIC was not equipped with a sprinkler system. With reference to fire hydrants and their water supply, the NORONIC was well equipped with at least 52 fire hydrant stations and ample hose. However, at the time of the fire, no fire pumps were in operation, such pressure as existed at the fire mains coming from the sanitary pump which was on the line and which could not possibly supply more than a few fire hydrants with adequate flow. The vessel was fitted with three fire pumps which were to be placed in operation after the alarm reached the engineroom. Although the Canadian regulations required that pumps should not be fitted in the same space, these three were in fact "fitted in the same space" and, during the course of the fire ultimately failed after the engineering personnel were forced by smoke and flame to leave the machinery spaces.

As for fire extinguishers, the NORONIC had 37 2 1/2-gallon soda-acid, 10 1-quart pyrene, and 3 2-1/2-gallon foam extinguishers. She was in full compliance with the requirements of the regulations in this respect but the main deficiency seems to have been that very few of the crew had ever seen the portable extinguishers used or were familiar with their use.

V. FIRE PATROL. For a fire patrol of the vessel, there were two members of the crew called "Special Officers". Each stood watch and watch, 6 hours on and 6 hours off. Each carried a time clock which was to be punched with keys located at various patrol stations throughout the ship "on the hour." These rounds required about 15 minutes to complete, so that in the ordinary course of events, no effective fire patrol existed for 45 minutes out of every hour. When the ship was in port, these "Special Officers" were expected to maintain a post at the gangplank to keep a surveillance against unruly or disorderly persons coming aboard. Consequently there was quite obviously no fire patrol at all for 45 minutes out of each hour at night in port.

Apparently the chief steward was apprehensive about fire on board, as he had privately arranged for the bellboys on duty at night to patrol the ship. They were to report to him any fire they might discover. Neither the captain nor the first mate appeared to have had any knowledge of this private arrangement.

VI. DRILLS AND ORGANIZATION. In compliance with the regulations, the NORONIC conducted fire drills and a lifeboat drill for the crew once a week. During the season the usual practice was to hold these drills, every Tuesday at about 10:00 A.M., when the ship was usually moored in Duluth. These drills were carried out perfunctorily and with little check to see that all hands took part. During the fire drills hoses were frequently discharged from hydrants outside the cabins but seldom or never from inside hydrants. Apparently passengers never took part in these drills, nor were there any provisions for the crew to assist or instruct the passengers in the event of emergencies. Such organization as existed for emergency action for the crew pertained to situations with the full crew on board. There was no plan for organization of the small portion of the crew which would remain on board if the vessel stayed in port overnight.

The general organization and state of preparedness for emergencies were sadly lacking. Each crew member, upon signing on, was given a card which contained his crew number, the number of the fire hydrant to which he was to report, and the number of his lifeboat. These cards also described the signals to be given on the main whistle or klaxon horn system for fire alarm and for abandon ship stations. In practice, entirely different signals were given for fire drill and boat drill so that each crew member had to deduce for himself what an emergency signal meant when it was sounded.

The crew number on each of these "muster cards" referred to a number for each crew member posted on an over-all "muster list" or chart, copies of which were posted in three places on the ship for inspection and study by the crew. These charts had remained unchanged for at least five years. The master apparently had no knowledge that the charts even existed. Apart from the location of his fire hydrant and his lifeboat, no written instructions were given the individual crew member as to his duties during emergencies, his alternate duties in case he was unable to get to or use his emergency station, or any duties at all regarding the passengers.

Posted instructions for passengers consisted only of a small card hung in each room which gave the number of the lifeboat to which the occupants of the room should go for abandoning ship. With reference to fire, the instructions were:

> FIRE: This steamer is equipped with modern fire prevention apparatus, in addition to which the steamer is patrolled day and night by experienced watchmen for the protection of the passengers. In case of fire promptly notify any member of the crew.

The sense of security engendered by a reading of this card was not in any degree justified by the actual state of emergency organization or preparedness.

VII. PERSONS ON BOARD. Members of the crew actually on duty in the NORONIC at the time the fire started, about 1:30 A.M., were as follows: Four deck crew including the second mate, seven engineers in the machinery spaces, and four bellboys, or a total of 15 from a crew of 171. Of the remainder of the crew who might have remained aboard, or who might already have returned from shore leave, it was impossible to ascertain how many were on hand to help fight the fire, as no positive check was maintained at the gangway. Although no check was made of the coming and going of the 524 passengers, the evidence indicated that by far the greatest part of them were aboard asleep at the time the fire started.

The Master had returned to the ship shortly after 1:25 A.M. He was just fitting the key into the lock of his room when a wheelsman came running up with the news that there was a fire on "C" deck. It seems that one of the passengers had noticed a haze in the after part of the starboard corridor on "C" deck. He traced this haze, which proved to be smoke, to the door of a linen locker. This was a room used for storage of linens, towels, soap, brushes, trash, etc. Evidence was later adduced that passengers had observed maids smoking cigarettes in that linen closet at least twice during the voyage before reaching Toronto. After the fire, the remains of a whiskey bottle, measuring glass, and bottle opener were found in the rubbish in this compartment.

VIII. ATTEMPT TO EXTINGUISH. The passenger found the door of the linen locker locked. He could hear what he described as "a rustle and small crackling." He ran forward crying out that the vessel was on fire. About amidships he met the head bellboy and the two ran back to the locker. The bellboy tried the door, then ran back amidships and down the stairs to the steward's office on "D" deck for the keys. He did not call the steward but returned up to "C" deck. Before opening the door of the locker, he ran past it and out to the lounge for a pyrene fire extinguisher. When the door was finally opened, the bellboy discharged the extinguisher into the room. It was soon apparent that the fire extinguisher was not effective as the flames began to come out into the corridor.

Then they ran back and pulled down the hose from the nearest fire station. The passenger testified that he opened the valve fully but no water came out of the hose. Since there was some pressure on the fire mains from the sanitary pump, this failure to get water may have been due to the passenger's unfamiliarity with the operation of the valve or a kink introduced into the hose in the haste of pulling it from the rack to the fire. By this time flames were on the overhead and creeping up and down the corridor in both directions. This passenger then left the scene, aroused his family and left the ship.

The bellboy, meanwhile, had left the passenger with the hose and

had run forward to the midships lounge where he broke the glass in a fire alarm box. He then ran to the gangway on "E" deck where he found the wheelsman on watch and told him of the fire. The bellboy's estimate of the time which elapsed between the moment he met the passenger and the time he turned in the fire alarm was "about 5 minutes." While this estimate may be wide of the truth, it is obvious that much crucial time was lost before any alarm was made, such failure reflecting the general state of unreadiness and lack of training prevalent in the ship.

IX. ALARM SOUNDED. The gangway watch, upon hearing of the fire, ran up to the officers' quarters where he located the first mate and shouted: "There is a fire on "C" deck!" The mate, who by this time could smell smoke, ran out of his room, saw heavy smoke coming forward from the starboard side of the ship, ran to the wheelhouse and sounded the klaxon horn alarm system. He then pulled the lever which electrically operated the main ship's whistle, intending to give the signal for fire alarm. Unfortunately, the whistle control stuck and the ship's whistle sounded continuously throughout the fire.

The action then taken by the first mate was further illustrative of the lack of organization and training for emergencies. The mate ran aft on "A" deck as far as possible before he was stopped by flames, meanwhile banging on passenger windows and shouting "Fire! Fire!," but without any noticeable response. He then descended to "C" deck, gathered such passengers as could be seen and assisted them off the bow by means of a rope, leaving the ship himself soon thereafter by means of a fire-truck ladder. The actions of the second mate, who came running out of his quarters upon hearing the alarm bell, were approximately the same as those of the first mate, e.e., a few moments running hither and yon knocking and kicking on doors, a momentary attempt to use a hose, and finally going over the side by means of a line.

Neither mate made any attempt to organize crew members into a fire-fighting crew, or to organize an evacuation plan for passengers. However, their shortcomings in the jaws of disaster cannot be too severely criticized in view of the complete lack of planning and foresightedness before the catastrophe.

To return to the actions of the master, as soon as he received word of the fire, he ran aft and down to "C" deck where he observed smoke in the lounge. About this time he heard the klaxon alarm sound and realized there was a real fire at hand. He then ran through the corridor shouting "Fire!," and out to the starboard outside passageway where he shouted to people on the dock to send for the city fire department. He then ran aft, led a fire hose in through an after door, and played water on the fire in the vicinity of the linen locker. At this time he was alone, the passenger and bellboy who had first attempted to fight the fire having departed. In a moment or two, the master turned over this hose to two crew members who appeared on the scene. He then

made a rapid trip forward as far as the social hall and back aft again on the outside port passageway, attempting to rouse passengers by rapping on their windows, again without noticeable response.

For the next few minutes the master ran forward and aft making a few attempts to use a hose which he found already led out and using a nozzle to smash some of the passengers' windows. Finally, he was forced to leave the ship by means of the crew gangway. Aside from turning over his hose at the linen locker to two seamen, the master had made no attempt to organize or lead his crew in fighting the fire, but had acted purely as a seaman or individual attempting to do what he could to resist the overwhelming disaster which was engulfing his ship.

Probably no one will ever know how many of the 524 passengers were actually aboard the NORONIC when the fire began, but all available evidence would indicate that the majority of them were aboard and most of these were probably asleep. Under these circumstances, it is nothing short of a miracle that 406 passengers survived; since the elapsed time from the initial discovery of the fire at 1:30 A.M., until the last moment when humans could still be alive at the bow or stern of the flaming pyre at 1:45 A.M., was only 15 minutes.

As testified by the Canadian court of investigations' technical fire expert, most of the passengers who died were undoubtedly overcome in their rooms by carbon-monoxide gas before flames actually reached them. Studies of fires involving the rapid envelopment of buildings such as hotels, barracks, sanitariums, hospitals, etc., where persons asleep receive no early warning, indicate that many victims are initially overcome by the blast of extremely hot air which strikes them when they frantically throw open a door or window and gasping, inhale the searing air without thinking. Although most of the bodies of the deceased passengers were found in their staterooms, there were a few bodies recovered from the water near where the NORONIC lay. Escape from the flaming hell of the ship had not resulted in final safety for these.

X. PASSENGER TESTIMONY. Considering the complete lack of any plan for the systematic arousing and evacuation of sleeping passengers and the lack of the crew required to effectuate such a plan, the survival of so many of the passengers was indeed miraculous. Of the passengers who later testified at the investigation, none had heard the klaxon alarm, possibly because it was drowned out by the continuous sounding of the ship's whistle. In addition, no passenger believed that he had been awakened by the ship's whistle, although its blast was loud and clear and heard by many other persons. With the 12 mile breeze from the southwest sweeping the fire forward and upward through the open corridors and open wells, it is clear that this fire roared through the vessel structure with such terrifying speed and power that all other sounds and thoughts were swept from the consciousness of those in its path.

By 1:45 A.M., the NORONIC was a brilliant torch, the wheelhouse and hurricane deck almost invisible in the white heat. It is to be hoped that anyone still aboard at that time had died quickly, as further rescue was unthinkable. Amidst the indescribable pandemonium of the scene--the screams and moans of the burned, the shouts and running of would-be rescuers, the wailing of sirens, the myriad flowing streams of white uniforms, stretchers, and ambulances--transcending all, the roaring, crackling, searing, overpowering blaze shattered the darkness with infernal fury. For two more hours, Toronto Fire Department pumpers poured lake water into the hot charnel ship before the fire could be considered under control. Slowly the NORONIC listed to port and settled by the stern to the shallow bottom of the harbor. It was not until 6:00 A.M., that the first fireman could venture aboard the steaming hull to begin the grisly work of recovering and identifying the dead. Simultaneously, like the shock waves from an explosion, the horror and dismay spread across the headlines of the world.

When the final grim reckoning was complete, it developed that not a single member of the ship's complement had been lost. This was undoubtedly due to two principle factors. In dashing about in the initial stages of fire excitement and confusion, the few crew members on duty had rushed through the crew quarters giving alarm. Some also took time to arouse shipmates. The other large factor in the crew's favor was their familiarity with the layout of the vessel and possible avenues of escape. While the cold comparison of the facts that there was no loss of life among the crew and a large loss of life among the passengers, leads automatically to a conclusion of poor or dishonorable fulfillment of duty by the crew, such a condemning conclusion should be well tempered by consideration of the circumstantial factors involved. There was the lack of prior organization spelling out duty toward passengers; the rapid advancement of the fire which discouraged efforts to evacuate passengers; the over-riding compulsion to save one's own life, and the overwhelming fear of being burned by fire to which no mortal is immune.

XI. OFFICIAL REPORT. "The lack of any effective system of patrol for the purpose of fire detection and the lack of any system by which when fire was detected, the information of its presence and location could immediately be sent to some central locality, where personnel, trained in methods of dealing with fire, were available to be sent to the spot immediately, accounts, in any opinion, for the loss of life which ensued." These words in the restrained language of the Minister of Transport's Commissioner who conducted the Canadian Government's official inquiry sum up the principle failures which led to this disaster. Without fire-resistant bulkheads or materials of any kind, without fire doors or fire stops, without a water sprinkling system, the NORONIC, once a fire had been well started, was doomed to burn like a great tinder box. Nevertheless, although conflagration was inevitable, proper organization and training with good leadership would have granted the passengers a fair chance to save their lives. Neither one of these essential ingredients was present when the cruel destiny fate had ordained for the NORONIC finally overtook her.

XII. COAST GUARD INSPECTION. Under the provisions of a United States Statute, the NORONIC, in carrying passengers from United States ports, was subject to inspection by U. S. Coast Guard Marine Inspectors only to the extent of ascertaining that the condition of the vessel, her boilers, and her lifesaving and firefighting equipment were in compliance with the conditions under which she was certified by her own government and as described upon the inspection certificate posted on board. In accordance with this statute and with international agreement, Coast Guard Inspectors had inspected the NORONIC in United States ports on at least two occasions during the 1949 sailing season and found her to be in compliance with the Canadian Government's requirements for this vessel.

XIII. LESSONS FROM CASUALTY. The lessons of this tragic fire were not lost upon this country, nor upon Canada. Within days after the casualty a major special survey of large United States passenger vessels operating on the Great Lakes, all of which were constructed before 1936, was undertaken by the U. S. Coast Guard. During this survey, which lasted two months, every item of fire protection and firefighting equipment, every possibility of fire origination and propogation, and every detail of patrol, detection, and firefighting organization on all of these vessels was further scrutinized. Although all of these large vessels (8 in number) were already equipped with an automatic sprinkling system, and with some form of automatic fire detection system, as a result of this major survey many additional requirements were made in the Fall of 1949. These requirements included rearrangement and extension of some of the sprinkling feeder lines, installation of additional fire stops and closures, elimination of certain openings which could aid the spread of fire, installation of additional detecter stations, relocation of fire patrol routes and punch-clock stations, additional fire extinguishers, and other changes which would tend to increase and strengthen these vessels' overall fire protection. Many important changes to increase fire protection safety in Canadian ships were also made by the Canadian government within a few months of the NORONIC disaster.

As a footnote to the history of fire protection on American vessels, with the NORONIC tragedy in mind, the following incident is recounted. During the summer sailing season of 1950, in one of the largest and most popular American passenger ships on the Great Lakes, the chief engineer was alerted one night by the ringing of the sprinkling system alarm bell. After starting the fire pumps, the chief engineer and other officers proceeded to the zone indicated by the alarm bell indicator which was the vicinity of a large linen locker on "A" deck. Upon opening the door of this locker, they discovered the sprinkler head in the center of the overhead to be flowing freely, and about 6 inches of water on the deck inside the room. Then they noticed a canvas bag used for the stowage of soiled linen standing in the center of the room with about one foot of its top burned off, but all fire extinguished. These officers later stated that the entire cost of all the sprinkling system in that ship (which was built in 1924 and was not of fire-resistant construction)

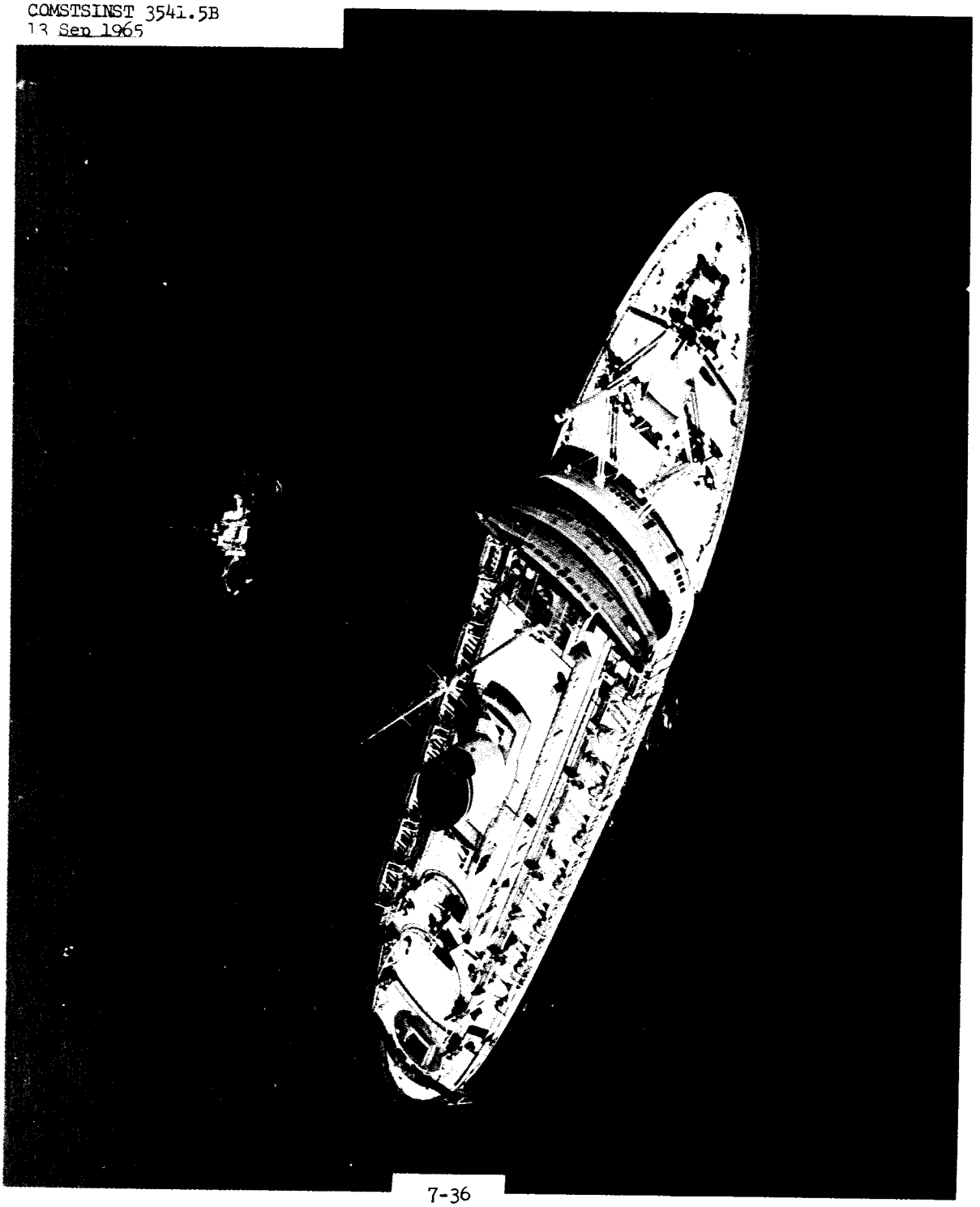
had been paid off in full that night, and not one single human life endangered. One cannot help but imagine what a tremendous difference one pressurized sprinkler head in the linen locker of the NORONIC might have made.

The lessons to be learned by all the world from the NORONIC catastrophe are legion. While the principle blame fell on the ship's officers and crew for their inefficient and ineffective efforts after the fire began, (the master's license was suspended outright for one year, a crushing blow in his professional career), the material factors and conditions which set up the fire should also bear a full share of the blame. In the first place the entire superstructure and practically all of its furnishings were highly combustible. In the second place such provisions as could have been made, even in a highly combustible structure, to deter or prevent the spread of fire were almost nonexistent. In the third place the physical arrangements for detecting and sounding the fire alarm were antiquated and ineffective, and the long freedom from such an emergency had induced a state of laxity and complacency in the ship's officers and management toward this poor arrangement which, otherwise, might not have been tolerated. In the fourth place the organizational arrangements for the entire crew to deal with ordinarily anticipated emergencies were poor and incomplete. Although the vessel normally did not spend any night in port with passengers on board, the failure to create an effective organizational arrangement which would at least keep a sizable portion of the crew on hand to deal with an emergency was inexcusable and (to many ship's officers) beyond belief. As to the effectiveness of the fire patrol system used in the NORONIC, no further comment is necessary.

That no such terrifying disaster as occurred in the NORONIC could occur in any U. S. passenger vessel constructed since 1936 is almost positive. Since that date, construction has been required by the Coast Guard to be highly fire-resistant. Fire protection through fire-resistant construction by which protection is permanently built-in is now required by U.S. marine safety regulations, in place of the older standard of protection through sprinkler systems by which protection is subject to the vagaries of shipboard maintenance and human vigilance. The use of incombustible materials wherever possible for structure, fittings, and furnishings, with an extensive system of fire-resistant bulkheads, fire doors, and fire stops throughout passageways, vertical openings, and other pathways of fire, is now rigidly required in all new passenger vessels with the result that safety in U. S. passenger ships is unsurpassed in the world.

The blazing end of the NORONIC imprinted a dreadful entry in the history of shipping in North America. But in the mind of every ship's officer who has read or will read the story of the NORONIC, the stark necessity of being prepared for the unexpected emergency, the terrible

consequences which can result from a lack of thorough organization and drill of the crew, the nightmare of finding ship's emergency gear inoperable when it is desperately needed; these memories will live and will bear fruit. The horror and suffering of those who died in the holocaust can never be atoned, but the vital lessons for preparedness, organization, and training bequeathed to all mariners by this disaster will long remain as the most fitting testimonial to those whose lives were sacrificed.



Section 7.4

ANDREA DORIA

I. DORIA CASE - ANOTHER COLLISION - This time between two radar-equipped passenger liners in a calm sea with intermittent fog, off Nantucket Lightship. The score: one ship's bow stove in some 75 feet; 50 lives lost, and the rest of about 1700 passengers and crew rescued from the other ship, which later sank. There was praise for acts of heroism and there were also charges of failure to sound the alarm, failure to instruct passengers in how to abandon ship, failure to enforce discipline or to curb panic, and charges that the first lifeboats away from the sinking ship contained mostly crewmen. The usual questions arise regarding: speed in fog; the recommended North Atlantic steamer routes; use of radar; compartmentation, stability, and maintenance of watertight integrity; good seamanship in controlling such casualties; liability, etc. Like all casualties, this collision should never have occurred, but it did! This should never occur in your ship, but it might! How well is your ship and crew organized, trained, and prepared to cope with similar emergencies?

The collision occurred in intermittent fog and a calm sea just before midnight, at 2309 on 25 July 1956, between the Swedish liner Stockholm, outbound from New York, and the Italian liner, Andrea Doria, inbound to New York from Genoa. Both had their radars operating. The 30,000 ton Doria was considered one of the finest passenger ships afloat. She had cost $29 million. Her 697 foot hull was subdivided into 12 watertight compartments by vertical bulkheads rising to the main deck, with a double hull and a double bottom. She was designed to remain afloat even with two compartments flooded. Her 16 large lifeboats, with a total capacity of 2000, were of light metal alloy. The 12,600 ton motorship Stockholm, the largest passenger ship ever built in Sweden, was cruising at full speed, 18 1/2 knots, when the crash came.

The Stockholm hit the Doria's starboard side, just abaft the bridge, and her ice-strengthened bow cut a hole 40 feet wide and penetrated a distance of 40 feet, almost half the Doria's beam and extending through all its 10 decks. The Doria took on a starboard list almost immediately, both ships radioed SOS's, and the Doria reported at 2325 that she was listing so badly that she couldn't lower her lifeboats. The Doria steadily heeled over more, to 25 degrees within half an hour, and to 45 degrees two hours later. The master ordered all lifeboats cleared away immediately after the crash. He did not make an announcement to the passengers because he didn't want to alarm them. The port lifeboats, on the high side, could not be used because of the list, but the starboard boats were cleared away and then the Master claimed to have issued instructions to passengers in Italian and had them repeated in English. He radioed other ships to send lifeboats.

The Stockholm, her bow crushed back 75 feet and #1 hold flooded, was saved from sinking by the immediate closing of her watertight doors. Many ships in the area responded immediately. The USNS PVT WM H. THOMAS arrived first and its skipper assumed charge as on-scene commander of rescue operations. The Stockholm as soon as she had ascertained that there was no immediate danger, launched her lifeboats to take passengers off the Doria. The CAPE ANN, the THOMAS, the ILE de FRANCE, Navy destroyers, Coast Guard cutters, and others all assisted in evacuating personnel from the Doria. The Ile de FRANCE steamed to the scene from 50 miles away at full speed, with her lifeboats cleared away, and launched ten boats from both sides in less than five minutes. Evacuation of the Doria's 1706 passengers and crew was accomplished by their climbing down ladders or sliding down the ship's side into the waiting lifeboats. Fortunately, the sea was calm and the fog cleared. Passengers and crew together formed a human chain to help women, children, and older people down the steep, slippery side. At the most only half of the Doria's boats were launched. The Stockholm limped back to New York under her own power and survivors were landed from the many assisting ships. The Doria's Master and a standby crew remained aboard in an attempt to save the ship by keeping the pumps operating. However, at dawn they left the ship and it sank at 1009, eleven hours after the collision. The death toll finally was established at 50 -- 45 on the Doria and 5 on the Stockholm. Since then two others died from injuries attributed to the mishap, boosting the death toll to 52.

Conflicting stories arose, each ship maintained that the other was at fault. One version is that the Stockholm was North of her course and mistook the Doria for Nantucket Lightship. A contributing factor revealed in the investigation was that the mate on watch was facing aft to answer a phone call from the bow lookout at the most critical moment. In any event, who is to blame and many other questions were not resolved in months of court hearings since legal settlement of damage suits was made out of court several years later. They include such questions as:

Was either or both ships' radar sets operating properly, and if so, why weren't they heeded? Reports indicate that both ships' radars were operating properly.

Why was either, or both ships, running at what may have been excessive speed in fog?

Were fog signals being sounded and, if not, why not?

Why were not the ships a sufficient distance apart on recommended North Atlantic steamer routes? Track C, which both ships were apparently following, close in near Nantucket Lightship to about 20 miles apart. Westbound traffic (the Doria) generally follows the northerly track and eastbound traffic (the Stockholm) follows the southerly track. The collision occurred a few miles South of the northerly, westbound, track. This would indicate that the Stockholm may have been about 15 miles above the southerly, eastbound, track to Europe.

Were both ships holding course and speed and trying to "out bluff" the other, as was hinted?

Did either ship stop or reverse engines to reduce its way?

Once the collision occurred, why did not the Stockholm keep its bow in the gap in the Doria's side in order to plug the hole and transfer personnel?

Why did not the Doria remain afloat with no more than two compartments flooded? Why did it list over so far? Did progressive flooding occur? Were watertight doors closed or were they sprung by the force of the collision? Did improper ballasting contribute to the excessive initial list?

Why could not more of the Doria's lifeboats be lowered? The list should not have prevented all of the boats on the low side from being launched and fully loaded and skates would have assisted launching of the boats on the high side.

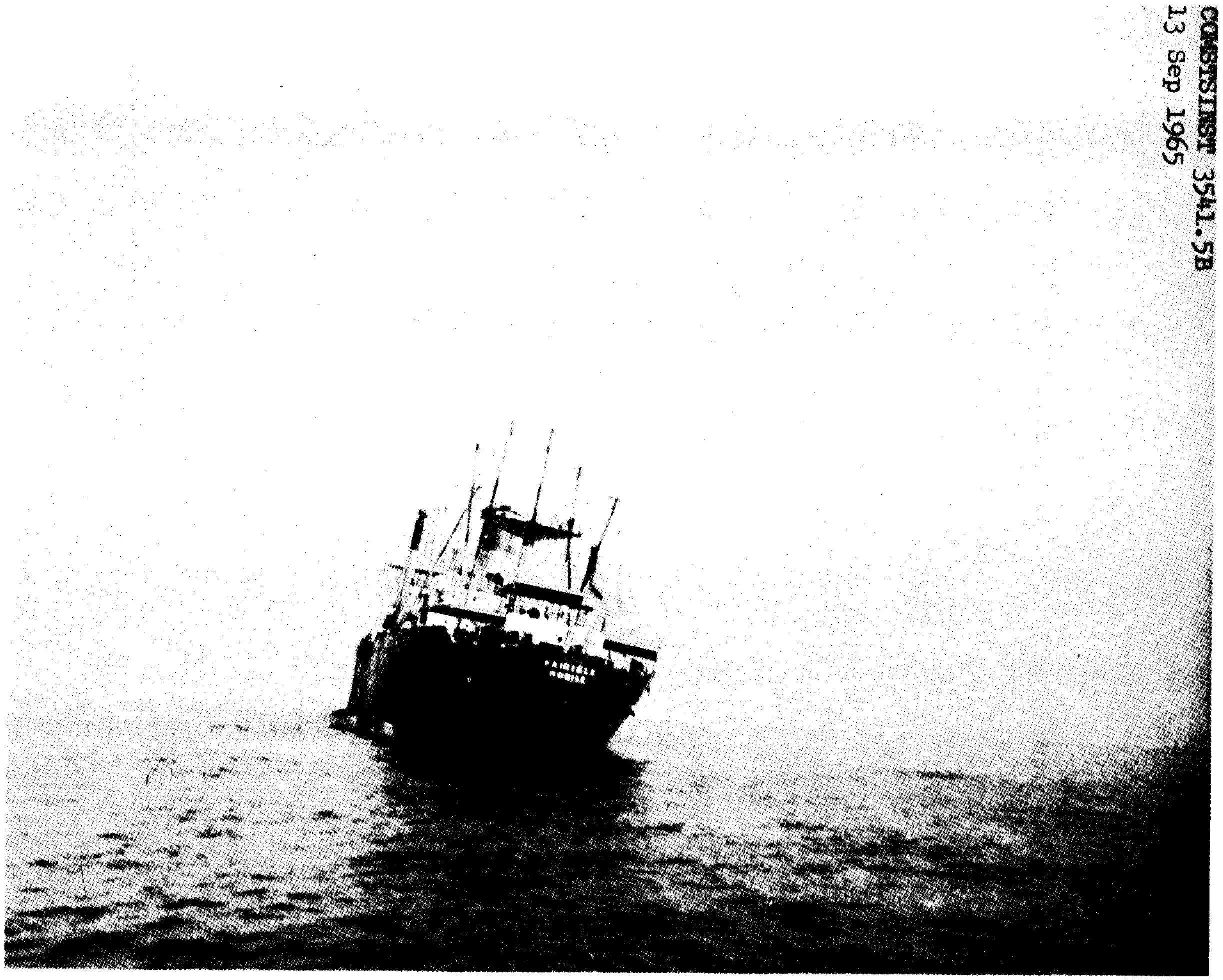
Why was not an alarm sounded and the passengers advised, instructed, and assisted in getting into the boats?

Did officers provide adequate leadership? Was the crew competent?

How can the language barrier in such cases be overcome?

These are the questions that seamen will ask themselves. Strict adherence to the Rules of the Road and constant vigilance will serve to avoid collisions. How well your ship is prepared to cope with casualties which may occur depends upon organization, preparation, training, and drilling. The importance of setting and maintaining cruising condition of readiness in confined or inland waters, in heavy traffic, in heavy weather, in low visibility, or in a combat zone cannot be overemphasized. Watertight doors and fittings must be closed and kept closed while "cruising" condition is in effect. When opened for use or passage, they must be closed immediately afterward. As long as operations are routine and things run smoothly, damage control seems unimportant. But that is the time to prepare, for damage control is 95% preparation. There is no time to organize, prepare, train, and drill after a casualty has occurred and there is little time to ballast or to close watertight doors and fittings. If a casualty should occur, damage control is the only thing which will pull you out of the hole, control the emergency and reduce casualties. Learn from the mistakes of others - you cannot live long enough to make them all yourself. Make sure this casualty doesn't happen to you - but, if it does, be prepared! Use this and other lessons from casualties to check your readiness.

See "Collision Course" by Alvin Moscow.



FAIRISLE *lists sharply to starboard 23rd July 1956, after collision with SAN JOSE II under almost identical conditions to the DORIA'S two days earlier and in the same area. She limped into N.Y. harbor and was beached in Gravesend Bay.*

II. COAST GUARD ACTION SINCE ANDREA DORIA LOSS

(Condensed from Proceedings of the Merchant Marine Council, USCG, January 1958).

A. Background. Action which has been taken by the Office of Merchant Marine Safety of the Coast Guard as a result of the shocking loss of the liner Andrea Doria requires a little background. The Venetian, Marco Polo, returning from China in the 13th century told of the way in which the Chinese divided their junks by bulkheads so as to reduce the risk of foundering. As far as we know, they were the first to employ this principle of watertight subdivision, which is today a continuing matter of vital concern still involving some unresolved problems in its effective and practicable application. In ship safety, as in safety in other fields, progress has to a considerable degree come about because of disaster. It seems that, for the most part, we human beings have been too blind to see a need, or seeing it, lacked the capacity or will to do what was necessary, until that need was forcibly demonstrated by a tragic event.

In 1912 the crack new liner Titanic rammed an iceberg and sank with the loss of 1,517 persons. The 1913-1914 International Safety at Sea Conference, spurred by this event, proposed high standards of watertight subdivision. World War I prevented full development of these standards and possible ratification, despite added evidence of the need for adequate subdivision and stability standards furnished by the loss by collision, in 1914, of the Empress of Ireland, with the loss of 1,024 lives.

The 1929 Safety at Sea Conference, to a considerable extent, stemmed from these two earlier casualties as well as from the number of less dramatic but serious losses occurring in the intervening period. The 1929 Conference adopted standards of subdivision which were somewhat less than those advocated by the 1913-1914 Conference. Damage stability standards were proposed by the U. S. delegation but failed of adoption.

The 1929 Safety at Sea Convention was ratified by the United States in 1936 after the loss of the Mohawk by collision and of the Morro Castle by fire. These disasters focused attention to the inadequate requirements for subdivision and fire protection of U. S. vessels.

The 1948 Safety at Sea Conference did not have behind it the compelling force of recent outstanding sea tragedies or aroused public opinion. However, the regulations adopted represented appreciable increases in the international standard of safety over that provided by the 1929 Convention.

B. Doria. On the night of July 25th, 1956, on a calm sea with intermittent fog, the Italian luxury liner Andrea Doria, inward bound for New York, and the crack Swedish liner Stockholm, outboard bound from that port,

came violently together in the vicinity of Nantucket Island. As a result fifty persons lost their lives and the Andrea Doria capsized and sank the following morning. Only very favorable weather conditions and splendid rescue efforts by other vessels at the scene prevented a very much larger loss of life. The possible extent of such loss is realized when one considers that the Andrea Doria carried some 1,700 persons and that, because of the excessive list, it was possible for her to launch only lifeboats on the starboard side, with normal capacity for about half this number.

To many persons this catastrophe shocking as it was, certainly raised the questions, how could it happen? How did it happen? These questions were considered by Coast Guard together with a third one, namely, what would have been the situation if instead of the Andrea Doria, it had been a U. S. vessel rammed? These questions were surely also in the minds of the chairman and members of the House of Representatives Committee on Merchant Marine and Fisheries, who pursuant to House Resolution 653, appointed a special committee consisting of four of the leading American experts on maritime safety, to inquire into the facts and circumstances surrounding this casualty.

Since this collision had occurred outside of United States territorial waters and since both vessels belonged to foreign nations having regulations recognized and accepted by the United States under terms of the 1948 Safety at Sea Convention, the United States did not have the authority to require the presentation of testimony and evidence by the parties concerned, such as it would have done in the case of U. S. vessels. This limitation restricted information available to this special committee of experts, and to the Office of Merchant Marine Safety of the Coast Guard, lending technical assistance to them.

C. Action. Report No. 2969 containing the results of this committee's investigations which was filed in the House of Representatives January 3, 1957, recommended that action be instituted to accomplish:

1. Greater observance of the recognized routes across the North Atlantic.

2. Reevaluation of the standards of subdivision, damage stability, and ballasting, with the view to the development of realistic provisions for international adoption.

3. Adequate training for deck officers; including a requirement for certification of such officers as radar observers.

4. Installation of bridge-to-bridge direct radio telephone communication.

5. A system of continuing and comprehensive studies by Federal agencies of radio communications in distress cases.

6. The establishment of a mechanism for coordination in the study, development, and application of radio and electronic devices and systems.

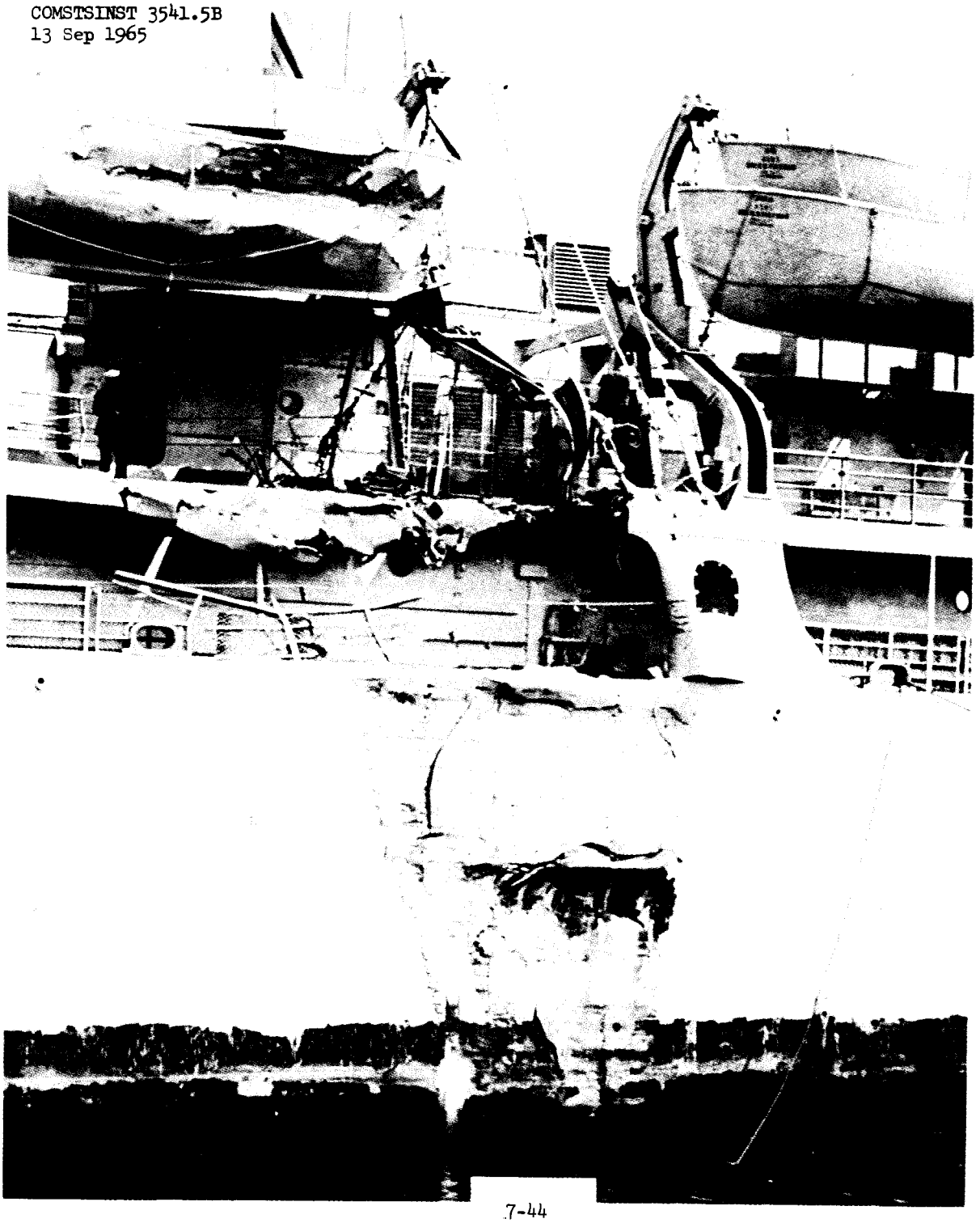
7. Effective provisions for the application of regulation 20 of Chapter I of the 1948 Convention for Safety of Life at Sea, particularly the principle laid down for the dissemination of lessons from casualties.

The several government agencies primarily concerned with these recommendations have undertaken to consider them under the general coordination of the Department of State: Recommendation (1) by the Hydrographic Office, (2) by the Coast Guard, (3) by the Maritime Administration, (4), (5), and (6) by the Radio Technical Commission for Marine Services, and (7) by the Department of State. These agencies presented progress reports to the Committee on Merchant Marine and Fisheries on July 31,1957. At this hearing the House Committee urged prompt taking of initial steps towards the convening of a new International Safety at Sea Convention.

In its discussion of recommendation (2) dealing with subdivision, damage stability, and ballasting, the special expert committee made the following summary statement: "The fact remains that a fine, relatively new ship, built in accordance with the latest international convention, did sink after damage apparently less than she should have been able to withstand. She sank with heavy material loss and heavy loss of life. That this loss of life was not much worse was due only to fortuitous circumstances and superb action on the part of the other ships and seamen in the vicinity. There obviously is need for searching international study of this case with such revision of the current international standards as such study establishes to be desirable."

A committee for Reevaluation of Standards of Subdivision, Damage Stability, and Ballasting has been established, representative of ship operators, shipbuilders, naval architects and the responsible regulatory agencies. This committee will develop proposals which can be advanced at a new International Safety at Sea Conference and which, if adopted, will increase the standard of safety at sea.

Radar plotting training for deck officers has been established by the Maritime Administration, with MSTS assistance, and USCG certifies officers as radar observers.



Section 7.5

USNS GENERAL FREEMAN

On the morning of 21 July 1956, two MSTS vessels, steaming in a dense fog, collided in the sheltered waters of Admiralty Inlet, the entrance to Puget Sound. The bow of the USNS MISSION SAN LUIS OBISPO came in contact with the port side of the USNS GENERAL H. B. FREEMAN. The OBISPO, a civilian-manned T-2 Tanker, was outbound in ballast. The FREEMAN, a civil-service-manned C-4 dependent transport, was inbound from Alaska with 442 passengers.

All damage to the OBISPO was confined to the area between the stem and the forward edge of the hawse pipes, a distance fore and aft of approximately 4 feet. The FREEMAN was damaged over a vertical and horizontal area 32 feet by 32 feet and to a maximum depth of six feet from the outer hull inboard. The hull of the FREEMAN was punctured on the 1st platform and 2nd platform decks, with the lowest hole being 10 inches above the water line. Compartments damaged were a hospital ward, passenger staterooms, and the evaporator room. There were no personnel casualties in either ship.

The general alarm in the FREEMAN was sounded just prior to the collision, and subsequently the damage control organization began securing the damage. The ship was listed to starboard by transfer of fuel and water to give more freeboard on the port side. Plugging, patching and shoring was applied to all holes and weakened areas.

Just 40 minutes after the collision, the damage in the FREEMAN was sufficiently repaired to permit getting underway. The repair parties continued to reinforce the shoring and hull structure and to clear away the damaged area. The vessel gradually increased speed to full ahead, and all repairs were completed within two hours after the collision.

The records will show that marine disasters in the past have occasionally resulted from failure to secure what was considered a very minor casualty. The damage suffered by the FREEMAN did not greatly endanger the ship or those on board, and did not require that emergency repairs be made at high speed in order to prevent a disaster. However, the rapid action taken by all hands in the FREEMAN insured that the existing damage would not get out of hand. It is probable that a major casualty suffered by this ship would not result in a maritime disaster. The excellent training and realistic drills conducted in the FREEMAN give strong evidence of their value in this case.

Section 7.6

EMPIRE WINDRUSH

A. EMPIRE WINDRUSH - (WITHOUT PANIC)- An engineroom explosion, a ship gutted by fire, over 1500 passengers aboard including 294 women, children, and invalid soldiers, yet only four persons lost! This unbelievably small loss of life (and these four lives were lost in the initial explosion, not in the action that followed) can be attributed to one main factor--preparation through organization, training, and drills. Abandon ship was accomplished calmly and without panic in spite of the raging flames, the threat of exploding boilers, and the immediate loss of all power. All women, children, and invalids were embarked in the lifeboats first, then, as the remaining men began jumping overboard, chairs, benches, and anything that would float were thrown overboard for them. This is the story of the loss of the 14,650-ton British troop-transport EMPIRE WINDRUSH in the Mediterranean Sea, 50 miles northeast of Algiers, on the morning of 28 March 1954.

Although there were other factors--the calm sea, nearness of a major port and other ships in the vicinity--no amount of "luck" would have prevented a greater loss of lives if there had not been adequate preparation and training. The crew knew their duties well and the passengers followed directions promptly and orderly. One observer on the scene remarked, "Everything went as though the passengers were going through a lifeboat drill."

It is not known why some of the men had to jump overboard. Perhaps some of the boats were damaged by the explosion or in the subsequent fire or some of the crew may have remained aboard to continue to fight the fire. In any event, it emphasizes the necessity for coping with each casualty according to the individual circumstances. It is for reasons such as this that MSTS transports are equipped with a total lifeboat and life float capacity sufficient to accommodate all persons aboard plus 50 percent. This reserve provides for the emergency evacuation of all passengers and crew even though one-third of the lifesaving equipment is lost, damaged, or cannot be reached in a casualty. It is fortunate amid all the tragedies at sea to have this excellent example of what can be done in an emergency rather than the review of contributing errors.

B. SIMILAR CASUALTY - A similar casualty occurred 2 April 1958 in a Norwegian immigrant ship carrying 1,200 persons in the Indian Ocean.

An engineroom explosion rocked the 9,786 ton SKAUBRYN during the night as she sailed toward Australia through waters east of Africa. The ship soon was an island of flame.

SOS messages brought the CITY OF SYDNEY to the rescue. The 1,011

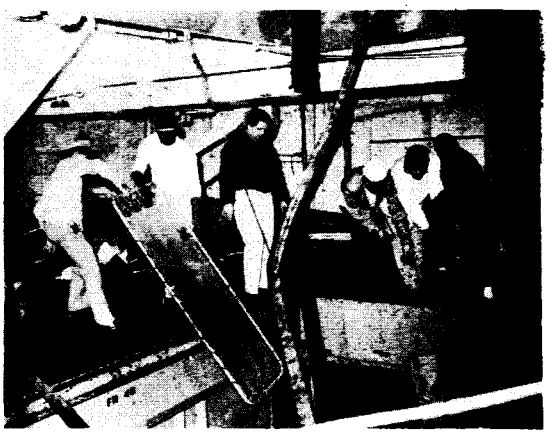
migrants, mostly Germans and Maltese, and the crew, were ordered into the lifeboats by the captain. Of the 1,200 people aboard, 186 were children under ten and 23 were babies. "Everyone behaved wonderfully. No sign of panic," radioed the captain of the rescue ship. Only one casualty was reported--a German who died of a heart attack in a lifeboat--in one of the biggest sea rescues recorded.

The SKAUBRYN remained afloat but was completely fireswept. Black smoke poured from the hull, left drifting in the Indian Ocean. A British warship was sent to the charred hulk to attempt to salvage it or to sink it with gunfire to eliminate it as a hazard to shipping.

Large passenger lifts can safely abandon a doomed ship! Could your ship do as well in a similar emergency?

TRAINING PAYS DIVIDENDS

Marine Carp Counters Arctic Flooding



DEBRIS REMOVAL is supervised by Chief Steward John McLoughlin (dark jacket, center). Lower area of number 2 hold was flooded when *Marine Carp* was damaged by an ice floe.

THE PRACTICAL VALUE of MSTS damage control training was dramatically affirmed when ice opened the side of Lant's USNS *Marine Carp* during MSTS Arctic Operations 1957.

Surrounded by fog, with sea water flooding into the ship through an opening of unknown dimensions, *Marine Carp's* crew had to rely on their ingenuity and a full measure of their damage control training. Under the direction of the transport's master, Capt. Wilfred J. Patnaude, damage control parties isolated the flooding, dewatered damaged compartments, and stemmed the inflow with the speed and efficiency which has characterized their drills.

While in seven-tenths concentration of ice near Goose Bay, Labrador, *Marine Carp* sustained a 6-foot-long break between frames 41 and 42 portside just above her inner bottom. Loaded with Army cargo-handling specialists, the C4 was in a convoy halted by heavy fog.

No collision shock was felt. Flooding of number two lower hold was not discovered until the master-at-arms made his rounds. Damage control parties 1 and 2 immediately rigged dewatering gear using every available pump and eductor.

The ship carries a steam-driven reciprocating general service pump, two electrically driven centrifugal bilge and ballast pumps, and a stationary electrical submersible bilge pump. Each pump has a capacity of 600 gallons per minute. All pumps are located in the engine room and connected to the main drainage system, which serves each compartment's individual branch suction line and valves through the bilge manifolds.

Portable pumping equipment aboard included four emergency electric submersible pumps and eight peri-jet eductors. Additional equipment was furnished by neighboring ships. USS *Edisto* supplied two P–500 pumps, and USCG *Westwind* provided one; a tug loaned a handy-billy.

Rigging the equipment involved numerous problems. Two eductors were discharged to a troop head on the fourth deck. Eductors were rigged to "C" deck, but would not lift. Tandem suction was not effective. Flanges and nipples were made to permit discharge into the overboard soil line on deck four. Five eductors and two submersible pumps were put in action. However, trouble developed.

One of the P–500's loaned to *Marine Carp* became inoperative in only a few hours. The handy-billy also gave out, lessening the discharge to the third deck. The failure of these two pumps enabled the water to reach its maximum height of 13 feet. Prior to the breakdown, the water in number two lower hold had been taken down to 9 feet.

Another P–500 from *Edisto* was taken aboard, and the water level gradually lowered. Before the flooding could be reduced below the 5-foot level, the inflow had to be checked. Capt. Patnaude and several crewmen, in ex-

posure suits borrowed from *Edisto*, descended to the flooded hold to install a shield and seal the break.

Struggling in the 32° F. water, amid a tangle of hoses and debris, the master and his assistants wrestled a 5-foot-long shield into place. Shoring and wedges were placed and the inflow cut to 20 gallons per minute. The pumps removed the rest of the water. Only a token trickle remained.

Shoring on adjacent bulkheads was checked, and with temporary repairs completed, *Marine Carp* was escorted to Lake Melville where her crew began rigging a collision mat. After trying several types without success, they fashioned one that took hold. The seal over the break was removed, and for the first time Capt. Patnaude and his crewmen obtained a clear look at the damage.

At St. John's, Newfoundland, a Coast Guard representative inspected the damage and approved the plan for a seaworthy patch outlined by the master and Lant damage control instructor Joseph J. Kacavich. (Shortly after the flooding was reported to Lant, Mr. Kacavich was dispatched as a technical advisor to *Marine Carp* from USNS *Lindenwald*, where he was conducting Phase I initial training).

CAREFUL SEARCH for submerged debris which could clog the eductors is made by USNS *Marine Carp*'s master, Capt. W. J. Patnaude. Incoming water washed bedding from above spaces.

WORKING EDUCTOR is adjusted by Capt. Patnaude aided by crewmember. Five eductors, 2 submersible pumps, 2 P-500 pumps and a handy billy were used during the unwatering.

A cofferdam of hull plating was welded by welders from *Edisto*. The cofferdam, which was filled with concrete, measured 84″ x 10″ x 96″. Other cofferdams of the same dimensions were located between frames 40 and 41, and between frames 42 and 43. Filled with concrete, the cofferdams reinforced the entire section. Shoring of the cofferdams completed temporary repairs, and *Marine Carp* returned to New York for dry-docking.

Captain Patnaude praised the crew for promptly volunteering aid.

In a report to Lant, Capt. Patnaude emphasized his belief in the values of MSTS damage control training in the following words: "The planning of the final step in stopping the inflow of water, directing the building of the cofferdam with *Edisto*'s welders and the cementing and shoring speak well for the damage control training program. . . ."

AN AVERAGE OF NEARLY THREE SHIPS A DAY COLLIDE. Lloyds of London lists 6,110 ships involved in collisions in the last 6 years—more than a thousand a year. This listing does not include collisions involving ships of less than 500 gross tons. Nor does the figure include collisions in inland waterways.

Last year in U. S. coastal waters and harbors alone more than 500 collisions occurred! This shocking statistic from the records of the Merchant Vessel Inspection Division at U. S. Coast Guard Headquarters excludes ferry boats, towing vessels, fishing craft, foreign registry ships and small craft.

Some of these collisions occurred in fog; others, in clear weather. Some took place in confined waters; others, in the open sea.

The most tragic collision involving MSTS personnel occurred in July 1950 when the freighter *SS Mary Luckenback* and the hospital ship *Benevolence* collided in San Francisco Bay. *Benevolence* was on a post-conversion trial run and due for acceptance by MSTS Pacific Area. Ten Pac personnel, on board as observers, were lost when the newly reconditioned *Benevolence* sank.

Despite the use of modern navigational devices, collisions continue with alarming frequency. The more dramatic collisions periodically draw worldwide attention to the need for good seamanship.

Experienced mariners generally agree that both parties must share some of the blame when two moving ships collide, for a collision usually can be avoided if just one of the ships concerned takes the proper precautions early enough. It has been found that collisions rarely occur when both ships strictly adhere to the International Rules of the Road.

Hundreds of collisions annually can be attributed to the violation of one or more of the following four fundamental rules (which appear in edited form).

- **POWER-DRIVEN VESSELS MEETING END-ON**—When two power-driven vessels in sight of each other are meeting end-on, or nearly end-on, so as to involve the risk of collision, each shall alter her course to starboard, so that each may pass on the port side of the other.

- **SIGNALS BY POWER-DRIVEN VESSELS IN FOG**—A power-driven vessel making way through the water, shall sound (its whistle or siren) at intervals of not more than two minutes a prolonged blast.

- **SPEED IN FOG**—(*a*) Every vessel 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 the danger of collision is over.

- **SOUND SIGNALS FOR PASSING**—(*a*) When vessels are in sight of one another, a power-driven vessel under way, in taking any course authorized or required by the Rules, shall indicate that course by the following signals on her whistle, namely: One short blast to mean, "I am altering my course to starboard." Two short blasts to mean, "I am altering my course to port." Three short blasts to mean, "My engines are going astern."

  (*b*) Whenever a power-driven vessel which, under these Rules, is to keep her course and speed, is in

sight of another vessel and is in doubt whether sufficient action is being taken by the other vessel to avert collision, she may indicate such doubt by giving at least five short and rapid blasts on the whistle.

The International Rules of the Road were agreed upon to cover all instances of ships passing within sight of each other. The Rules, which emphasize judgment and discretion, do not make allowances for radar or any other electronic or mechanical aid to navigation.

The problem of ships failing to adhere to the Rules of the Road because of an over-dependence upon radar was recently discussed by Cdr. Roderick Y. Edwards, USCG, Officer-in-Charge, Marine Inspection, USCG Port of Philadelphia. Commander Edwards' article was published in the *Proceedings of the Merchant Marine Council*, July 1956 issue.

In his article on marine safety on the Delaware River, Cdr. Edwards points out how false attitudes about radar can be factors in collisions. He states:

"There is another aspect of shipboard operation which could stand some scrutiny by executive shore-based personnel and this concerns the over-reliance that has, in some instances, been placed upon radar. . . .

". . . there are still those who believe that the possession of radar places them in a super ship category and exempts them from compliance with the letter and meaning of the Rules of the Road.

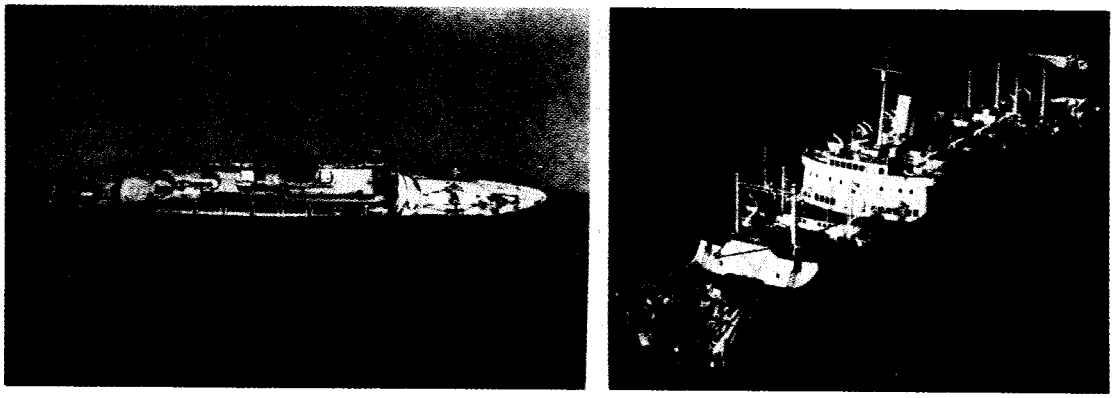
"In some instances the possession of radar, as based on the testimony of those involved, has been considered sufficient justification to cause an otherwise prudent individual to continue navigating under circumstances that warranted either anchoring or a great reduction in speed.

"The finest radar set yet developed, insofar as the safe navigation of a vessel is concerned, is only as good as the interpretative abilities of those in charge of navigation. It is sad, indeed, that a learned Federal judge in commenting on a collision remarked that, 'certainly this collision would not have happened if both vessels did not have radar'."

Over-reliance on radar may be a much greater collision factor than many deck officers realize. Radar by itself will not prevent a collision during conditions of reduced visibility any more than mere possession of eyesight will in clear weather.

Under conditions of reduced visibility radar takes the place of eyes—*but to a limited extent.* A radar pip gives a condensed view only of a wide sea horizon containing a ship or other object. The pip can be an enormous help, but only if the ship's officer knows how to interpret and use it. Radar should always be used in conjunction with human senses, plotting and whatever other information there may be available. *The ship's officer should never let radar interfere with his basic watch-standing duties.*

BATTERED grain hulk, laid up in a Maritime Commission reserve fleet, was opened up on the starboard side by a cargo ship (left). After the ships were separated, the gaping hole revealed damage to living spaces and engine room (right).



MAIN DECK AWASH, the ill-fated Italian liner *Andrea Doria* (left) settles into the sea off Nantucket following a collision with the Swedish liner *Stockholm* (right). The accident occurred in the open sea despite the fact that both ships had radar systems.

The fact that radar is only an aid to navigation is reflected by the refusal of the courts to make allowances for radar in place of *exact* compliance with the Rules of the Road. For example, under the Rules, moderate speed in fog is a mandatory requirement. The courts have defined moderate speed as meaning one of three things:

(1) In extreme fog: don't get underway; if underway, anchor,

(2) in dense fog: proceed at bare steerage way (the minimum speed to maintain rudder control),

(3) in medium fog: proceed at the speed you can stop in within one-half the distance of visibility.

The courts also uphold the ruling that signals are still mandatory during conditions of low visibility, even if each ship has radar. If an unidentified fog signal apparently forward of the beam is heard, all ship's engines must be stopped at once and, preferably, stopped until the other ship's course and position are determined. After stopping engines, both ships must "navigate with caution" regardless of radar.

In addition, passing signals must not be sounded except when ships are actually visible to each other. If a change in course is made to avoid collision because of reliable radar plots, whistle passing signals must not be sounded unless the vessels actually sight each other.

The courts place the responsibility for good seamanship on human judgment, and the ability to interpret the information at hand in conformance with the Rules of the Road. The representatives of the maritime countries at the International Conference on Safety of Life at Sea in 1948 believed, and justly, that radar is only an aid to navigation—and not a form of navigation.

Radar can be an important aid in permitting determination of the other ship's course and speed long before oncoming ships approach each other. With the aid of radar, course and speed can be altered early enough so that the ships in most instances need not even come close enough to involve the risk of collision. *The underlying principle of all collision rules is to make alteration of course and speed early enough and large enough to safely reconcile the situation.*

To make changes in course and speed early enough, another ship's successive bearings and ranges must be plotted carefully. It is worthwhile in most instances to work out the other ship's true course and speed if it can be done without neglect of watch-standing duties.

Basic problems in relative motion can be solved quickly with a maneuvering board. Although some mates complain that plotting true course and speed takes too much time when other ships are close aboard and there is heavy traffic, accuracy and speed in use of the maneuvering board should be a matter of professional pride and satisfaction to the competent mate.

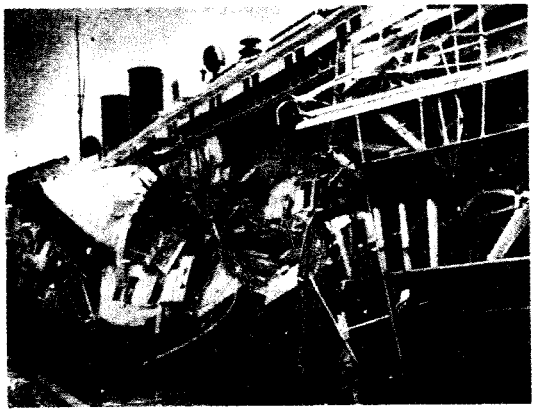
If started soon enough there normally is time to plot true course and speed without neglect of watch-standing duties. Such early plotting is excellent training for junior watch officers. Very often by the time the mate who has been merely watching his radar and marking dots

on the scope finds that the bearing is not changing (remaining constant, or nearly so), he has little time and space left in which to make his course and speed changes. It always pays to plot ahead of time! However, even maneuvering board plots can be in error. The information they provide should be used only as a guide in arriving at the proper decision.

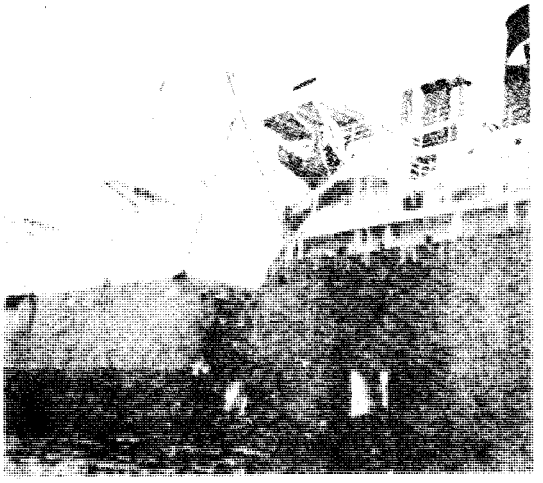
The 3-minute bearing lends itself well to plotting. Three minutes is one-twentieth of an hour, and one-twentieth of a nautical mile (6,020 feet or approximately 2,000 yards) is 100 yards. Each line connecting two bearings dotted on a plot represents a certain number of yards traveled by a ship in three minutes. The ship's speed is that same number in knots. For example, if a ship makes 1,200 yards in three minutes, it is steaming at 12 knots. If it covers 2,000 yards in three minutes, it is making 20 knots.

Nearly all radar manufacturers now market installations which allow for direct plotting on the scope. The methods vary to some extent, but the principle is the same. The early plastic-face plotting board could be held near the scope and the plot worked out without the use of any instruments other than a soft pencil.

Most plotting boards now are built into the face of the radar scope. The compensating curved surface reduces parallax and a semi-reflecting mirror allows the pips to be dotted directly on the surface of the scope with a grease pencil. When plotting, it is important to plot according to the same distance scale to which the radar is set. A program is underway to provide all MSTS ships with reflective plotters.



IMPACT of collision in fog opened up the port side of this Great Lakes steamer. A collision can never be blamed solely on fog.



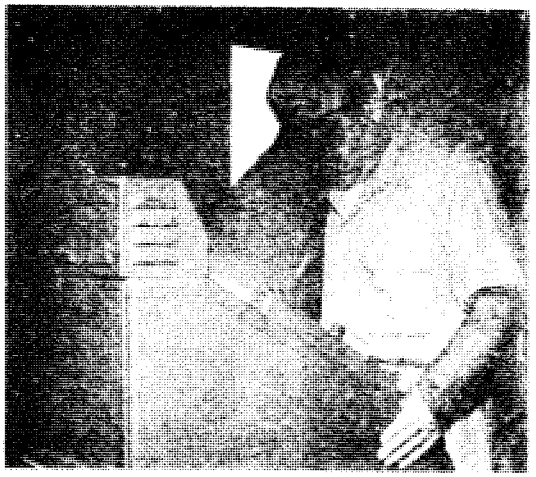
A GAPING HOLE was gouged out of the side of this cargo ship by a tanker during an early morning fog in New York harbor. Worldwide average is nearly three ship collisions daily.

In most ships there is a radar blind sector due to mast, boom, and stack interference. The limits of the blind sector should be determined and posted in the radar room. Sometimes during fog it may be necessary to divert course a few degrees to either side to permit periodic radar coverage of blind sectors.

Collisions often happen despite the most extensive caution. This is when training and preparation pay off! The greatest protection an MSTS ship can have at the time of a collision is to be in one of the two conditions of readiness: *cruising condition* or *emergency condition.* (See COMSTS Instruction 3541.5.)

Cruising condition is set prior to entering or leaving port, in heavy traffic, confined or inland waters, during conditions of low visibility, in heavy weather, and in combat zones. It consists of securing all fittings, manhole covers, sounding tubes and watertight doors below the bulkhead deck, except those in actual use.

Emergency condition is a full "buttoning up." It requires all closures and systems to be secured except those needed for the operation of vital machinery or health of personnel. Fire screen doors, watertight doors and ports must be closed and dogged, and all ventilation secured except that which is necessary for propulsion and the health of personnel. Emergency condition is set when collision is imminent or



RADAR, properly used, is an invaluable navigational aid. However, radar does not prevent accidents. Many ships have reported, "radar working accurately—*just before the collision.*"

VISUAL CHECK must supplement the information provided by electronic equipment. Third Officer Heinz G. Schluter in USNS *Henry Gibbins* uses glasses to identify a pip seen on scope.

when maximum watertight integrity is required.

Setting these conditions of readiness early enough may prevent progressive flooding in the event of a collision. It generally is too late or impossible to make closures after a collision occurs.

Everywhere except in the Panama Canal the master is unconditionally responsible for the safety of his ship. There is no immediate out-

> The responsibilities assigned to various deck officers in preventing collisions is set forth in COMSTS Instruction 3120.2B and in the standard MSTS Damage Control Bill.

side check on the quality of the seamanship which the master demands of his mates, quartermasters and lookouts. The master usually has basic standing orders for his mates. In addition there is much that each officer can do in the course of his duties to promote a safe ship.

The first officer, especially, has the opportunity to correct many conditions that contribute to collisions. His supervision of assistant training officers for damage control and safety is an important safety factor, as is his training of deck officers in safe navigational practices and visual signaling. In the manner he conducts collision and rescue, emergency ship maneuvering, steering engine casualty and fire and abandon ship drills, he can do much to maintain a safe, alert ship.

The second officer is directly responsible to the master for the safe navigation of his ship. In his training of watch standers in the use of navigational equipment and in safe navigational practices, he can sharpen the "eyes" and "hands" of his ship. His own navigational practices and his responsibility for hundreds of details—from recording chart changes to testing equipment—can be positive or negative collision factors.

In the execution of their duties, other deck officers often are able to detect safety hazards that could contribute to collisions.

Even the general public becomes vitally concerned with safety at sea following such dramatic marine disasters as those which involved *Titanic* in 1912, *Vestris* in 1928, *Morro Castle* in 1934, and *Stockholm* and *Andrea Doria* in 1956.

The *Stockholm-Andrea Doria* collision is a tragic example of the cost of collisions. A

MSTS Magazine is indebted to Lt. Alfred Prunski, USCG, Assistant Secretary of the Merchant Marine Council, for his assistance in the preparation of this article. Lieutenant Prunski also is Technical Adviser in revising the Navy film series *International Rules of the Road at Sea.*

TO PREVENT COLLISIONS:

- Know and follow the Rules of the Road.
- Don't rely on radar alone.
- Take bearings and ranges at regular intervals.
- Plot other ships' true course and speed.
- Make your intentions known early and clearly.

TO PREVENT COLLISION LOSS AND DAMAGE:

- Maintain proper watertight integrity.
- Eliminate fire hazards.
- Maintain all emergency equipment ready for use.
- Conduct realistic drills.
- Fully indoctrinate passengers.

TO MINIMIZE COLLISION DAMAGE:

- Sound emergency signals.
- Dispatch all hands to emergency stations.
- Set Emergency Condition if not already set.
- Start fire pumps and emergency diesel generators.
- Secure ventilation ducts and fans.
- Dispatch repair parties promptly.
- Make accurate DC reports to the bridge.
- Plug, patch, shore, pump, etc., as required.

$29,000,000 ship and 50 lives were lost in addition to *Stockholm's* repairs costing nearly $100,000. The collision occurred in calm seas and in heavily traveled sea lanes. The presence of a number of other ships in the area, including USNS *Pvt. William H. Thomas* and USNS *Sgt. Jonah E. Kelley*, was a factor in minimizing suffering and loss of lives.

Costly collisions emphasize the value of such standard safety precautions as:

(1) observing due precautions when in or near a fog bank,

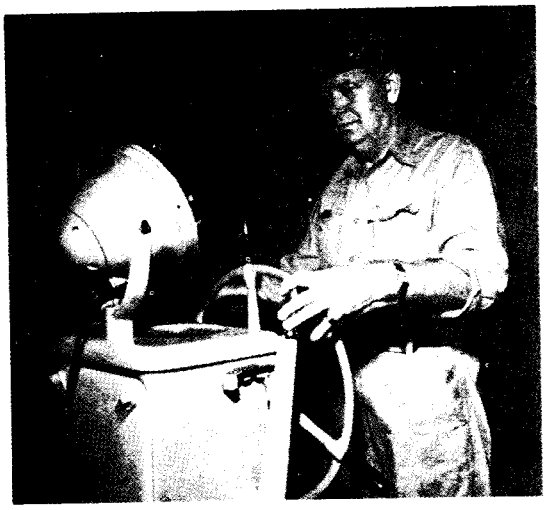
(2) maintaining an alert lookout at all times,

(3) sounding proper signals in fog,

(4) using radar effectively,

(5) considering ship's relation to recognized steamer tracks,

(6) instructing passengers early regarding emergency proceedings and keeping them informed during actual casualties,



QUARTERMASTER Trygve E. Olsen shifts steering control in USNS *Henry Gibbins*. Bridge personnel must know their equipment "blind" as emergencies may leave no time for label reading.

(7) setting and maintaining emergency or cruising conditions of readiness as required,

(8) conducting realistic emergency drills,

(9) testing all emergency damage control equipment regularly,

(10) providing for launching boats under conditions of list by the use of skates.

Section 7.9

THE SUBDIVISION, STABILITY, AND DAMAGE CONTROL OF MERCHANT VESSELS

By
John C. Niedermair - BuShips, U. S. Navy

(A paper presented on 21 April 1950 at Philadelphia Naval Base to the Society of Naval Architects and Marine Engineers at the invitation of the Naval Damage Control Training Center. It contains an excellent analysis of major marine disasters.)

The seaworthiness of ships was recognized as a subject requiring administrative regulation almost two centuries ago. The first known record relating to seaworthiness appeared in Lloyds Registry Book of 1774. Ships were assigned load drafts as a practical limit for safe loading. No record of the basis for these assumptions was given. The first legal requirements for watertight subdivisions appeared in the British Marine Shipping Act of 1854. This act required engineroom forward and after bulkheads, a collision bulkhead forward and for iron screw ships a small watertight compartment enclosing the after extremity of the shaft. This law was not considered sufficient and was repealed in 1862. In 1866, the loss of the British passenger ship LONDON with 233 lives led the British Institution of Naval Architects to make an investigation and the following year to propose that all ships be constructed so that they would remain afloat with one compartment opened to the sea. They strongly urged that passenger ships be subdivided so that they could withstand the flooding of two adjacent compartments. These proposals had no administrative status, however, in 1875 the British Admiralty began to make them effective when it instituted a survey to determine the suitability of merchant vessels for government service. In 1882 Lloyds Register issued rules requiring bulkheads in all ships 280 feet in length and over, the number of bulkheads increasing with the length of the ship.

The scheme of the floodable length curve was first suggested in 1890 by the bulkhead committee appointed by the British Board of Trade. The committee presented no method of determining the floodable length beyond some rough tables and diagrams obtained from experiments with a floating model. Loss of the German steamship ELBE with 335 lives in 1895 led the German Shipowners Society two years later to establish standards of subdivision which, with some modification in 1907, formed the basis of the standards for vessels at the 1914 Conference on Safety of Life at Sea.

The 1914 conference was precipitated by the loss of the TITANIC with 1517 lives in 1912. However, while the TITANIC initiated the 1914 conference her subdivision was not greatly deficient in light of convention requirements established by the later 1929 conference. The TITANIC had

a two compartment standard of subdivision at her full load displacement. She could have withstood four compartments of flooding at the bow but her initial damage was actually five (including the forepeak tank). The Total length of damage was about 250 feet, almost 30% of her length. There were 15 main watertight bulkheads in the ship--two more than required by Lloyds rules of the time. In terms of bulkheads the TITANIC had an equal or greater number than recent ships of comparable size. While the number of bulkheads is not the complete index of subdivision (height and spacing having an influence) yet it does indicate that the TITANIC was not too far from the later standards and that with relatively minor modifications she could have been made to fit the requirements.

The 1914 conference was the first conference of international character held on the safety of life at sea. The advent of the first World War shortly after the convention was signed prevented ratification by many nations and none put its requirements fully into effect. The convention bore fruit indirectly in the investigation of the subdivision of ships taken over for transport during the war by the Welch method of determining floodable length. This method was the basis of subdivision incorporated in the 1914 convention. In 1929, due to dissatisfaction with the results of the 1914 convention and later informal conventions, another formal international conference was called. At this conference agreement was obtained on the minimum and maximum subdivision requirements ranging from vessels primarily engaged in carrying cargo to ships primarily engaged in carrying passengers. Formulas for determining the criterion of service were also agreed upon. The loss of the MOHAWK and MORRO CASTLE in 1934 brought about an investigation culminating in Senate Report No. 184. This report established higher standards than the 1929 convention. It has no official status, yet from a practical point of view it is the standard of modern American merchant ship design. When the United States Maritime Commission was established in 1936, one of its primary considerations was safety in design. As a result the Commission decided to use the Senate Report 184 as the basis for establishing the standards for ships built under its jurisdiction. It was realized that the adoption of such a course might result in increased building costs as well as higher operating costs but it was argued that the operator would not suffer because the Merchant Marine Act provided subsidies whereby the additional costs could be partially absorbed by the government. As a consequence of this policy the American merchant fleet during World War II had the highest standards of safety ever achieved. The success of the war effort was undoubtedly influenced by the fact that American shipping built by the Maritime Commission prior to the war and all shipping built during the war had a subdivision standard of one compartment or more. While a one compartment standard may not prevent loss by enemy attack the higher degree of safety affords the crew a better chance of debarking, consequently saving many more lives. The Maritime Commission deserves much credit for its aggressive efforts in raising the standards of safety for American ships.

The 1929 Convention was the standard to which all nations were

committed for safeguarding lives and property at sea. Actually, the United States exceeded the standard of the Convention in its own merchant marine after the Convention was adopted. In 1948, another Conference was held at London for the purpose of revising the 1929 Convention. The technical developments and improvement of ship construction and equipment, plus the experience gained with the 1929 regulations, formed the basis for the new Conference. The U. S. Delegation submitted a detailed draft of proposals to the Conference based upon standards and practices of ship construction prevailing in the United States at the present time. These proposals covered fire resistant construction, electrical installations, damaged stability, and subdivision. The 1929 Convention contained almost nothing on the first three of these items. The emphasis of that Convention was entirely on subdivision.

At the 1948 Conference the efforts of the U. S. Delegation proved fruitful, for the regulations on fire resistant construction, electrical installations, and damaged stability were accepted. While the efforts of the delegation were successful on the first three major points, they failed on the fourth. The Conference did not support the modifications of the 1929 standards of subdivision. The Conference decided to continue the study of subdivision by the several nations and to exchange results of their studies from time to time. While the new regulations include limits on angle of heel for damaged cases, the criterion for establishing the lengths of compartments is still based upon the 1929 system for subdivision. It is important therefore to continue to promote studies and exchange of information on subdivision so that some day not too far distant the goal set by the U. S. Delegation to the 1948 Conference can be achieved or even exceeded.

In the days of the sailing ship, stability was the direct concern and responsibility of the master. The ability of the ship to carry sail, consequently the ability to make a fast voyage, depended upon the stable character of the ship when loaded with cargo. It therefore was the primary concern of the ship's officers to see that the stowage of the cargo holds was carefully done. With the advent of the steamer the necessity of such care in loading became less obvious. So long as the ship remains practically on an even keel during loading, stability can be easily overlooked in a steamer. This was the situation in the case of the VESTRIS in 1928.

The VESTRIS is a tragic case of a ship that had inadequate stability and inadequate freeboard. When the VESTRIS left New York on November 10, 1928, she was loaded a foot above the winter draft mark and with some evidence of a slight list to port. Ten hours later it was reported that the ship had a list of 3 to 5 degrees to starboard. While the wind had freshened up, it was not sufficient to cause the above list under normal circumstances, therefore, the inference is that the ship had very low stability. Due to the very low freeboard and the list, water entered the ship through the starboard ash ejector and the half doors on the upper deck. The water ran down to the bilges by way of some upper deck hatches