MARINE CASUALTY REPORT

LOSS OF THE
MOTOR TOWING VESSEL
MAJORIE McALLISTER
IN THE ATLANTIC OCEAN
ON NOVEMBER 2, 1969

U.S. COAST GUARD
MARINE BOARD of INVESTIGATION REPORT
and COMMANDANT'S ACTION

ACTION BY
NATIONAL TRANSPORTATION SAFETY BOARD

DEPARTMENT OF TRANSPORTATION
WASHINGTON D.C. 20591

RELEASED

M/V MARJORIE McALLISTER
SINKING WITH LOSS OF LIFE IN THE ATLANTIC OCEAN
NOVEMBER 2, 1969

TABLE OF CONTENTS

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This casualty was investigated by a U.S. Coast Guard Marine Board of Investigation convened at New York, N.Y., on November 7, 1969. A representative of the National Transportation Safety Board attended a portion of these proceedings as an observer. We have reviewed the investigative record and considered those facts which are pertinent to the Board's statutory responsibility to make a determination of cause or probable cause and to make recommendations to prevent recurrence of such a casualty.

SYNOPSIS

At approximately 0049 on November 2, 1969, the uninspected motor towing vessel MARJORIE McALLISTER disappeared approximately 17 miles south of Cape Lookout, N.C. At the time of her disappearance, she was en route from New York, N.Y., to Jacksonville, Fla. The vessel was making the voyage without a tow. Very high wind and sea conditions existed at the time of this casualty. All six crewmembers are missing and presumed dead.

The National Transportation Safety Board finds that the probable cause of the loss of this vessel was foundering. Extremely adverse weather, flooding of the engineroom, and the sudden capsizing of the vessel were the causes of the foundering and the loss of all hands. Other contributing factors were:

a. The master's decision to proceed south into the storm in lieu of seeking refuge in the Chesapeake Bay area;

b. The apparent change in course to proceed into Morehead City, which created a following sea condition;

c. The design of the vessel in regard to its freeboard, the area of the freeing ports, and the location of vents, without permanent closing devices on the weather deck where boarding seas could accumulate sufficiently to inundate the vents;

d. The fact that all three generators were located at the same level in one engineroom, thereby greatly increasing the probability of losing all sources of power at the same time;

e. The loss of electrical power as a result of partial flooding, which would have caused a loss of steerage and rendered the automatic electric bilge pump inoperative;

f. The combination of adverse conditions which greatly increased the possibility that the operating personnel were unable to place the two emergency bilge pumps in operation;

g. The fact that the door between the engineroom and the towing winch enclosure was routinely latched open while the tug was underway, thus exposing the engineroom to boarding seas.

SUMMARY OF FACTS

The vessel departed New York City at approximately 1100 on October 30, 1969, with approximately 87,000 gallons of diesel fuel, 4,000 gallons of potable water, 8,000 gallons of wash water, and 900 gallons of lube oil on board. Her reported draft was 14 feet 6 inches forward and 17 feet 6 inches aft. This would constitute a normal condition for the anticipated voyage. The first contact with the dispatcher at the owner's office in New York City occurred at approximately 1000 on November 1, 1969, via radio telephone. At that time, the vessel reported its position was 50 miles south of Chesapeake Light, speed–13.6 knots, weather–easterly winds of 25 knots, and 8-foot seas. The master did not report any problems. The dispatcher advised the master that one of the other company tugs, the A.J. McALLISTER, had sought refuge in Morehead City, N.C., due to high winds and mountainous seas. The master was also informed that gale warnings were posted from Florida to Cape Hatteras. The master's response to this information was that the weather was not too bad in his present position, that he intended to continue south, and that he might go into Morehead City if necessary.

The next and final communications between the MARJORIE McALLISTER and the operator's New York City office occurred at approximately 1630 on November 1, 1969. The master reported his position as being 14 to 17 miles south of Diamond Shoals, N.C., and that he was due off Cape Lookout at 2400. He reported southeasterly winds of about 23 miles per hour.

At 0025, on November 2, 1969, the MARJORIE McALLISTER reported to the U.S. Coast Guard Group, Fort Macon, N.C., via radiotelephone that she was taking on water in her engineroom and was experiencing electrical problems. The vessel gave her position as 6 miles west of Cape Lookout Shoals Buoy 14. She indicated no Coast Guard assistance was needed but requested that the Coast Guard station stand by on 2182 kHz.

At 0049, the vessel again contacted the Fort Macon Coast Guard Station and requested assistance. She gave her position as being west of Buoy 14 on Loran Line 1970. At the request of the MARJORIE McALLISTER, an unsuccessful attempt was made to shift frequencies from 2182 kHz to 2670 kHz. Numerous subsequent attempts by Fort Macon Station to reestablish radio contact on both 2182 kHz and 2670 kHz were unsuccessful. The salvage vessel CURB, located approximately 60 miles away, overheard the conversations between the MARJORIE McALLISTER and the Fort Macon Coast Guard Station. When the CURB's master realized a radio contact problem existed, he called the MARJORIE McALLISTER and volunteered to relay her position and any other pertinent information to the Coast Guard. The MARJORIE McALLISTER acknowledged this transmission and asked the CURB to stand by. This was the final transmission heard from the MARJORIE McALLISTER.

As a result of the request for assistance and lack of further radio contact, an extensive air and surface search was initiated. Equipment and debris, identified as coming from the MARJORIE McALLISTER, were recovered during the morning of November 3, 1969, in the general vicinity of the vessel's last reported position. Included in the recovered items were a fully inflated 12-man liferaft, two ring buoys, and life preservers. Two naval vessels equipped with special electronic detecting devices and divers assisted the Coast Guard aircraft and ships during the search. Efforts to locate the sunken vessel were unsuccessful. No bodies have been recovered.

The MARJORIE McALLISTER was a welded steel, single-screw, diesel-propelled, 3,600 hp. towing vessel built in 1968 in St. Louis, Mo. She was 198.3 gross tons, 111.5 feet in length, 30.0 feet in breadth, and 10.51 feet in depth. The vessel had automated controls so that the machinery could be controlled directly from the pilothouse or the automation control panel located in the upper engineroom port side aft, in addition to local control in the lower engineroom.

This vessel was not subject to U.S. Coast Guard inspection and certification. However, it was classed by the American Bureau of Shipping for Class A-1 towing service, which is unrestricted ocean service. The vessel also had been surveyed by the American Bureau of Shipping and assigned a load line in accordance with the International Convention on Load Lines, 1966. However, since its keel was laid prior to July 21, 1968, the effective date of the 1966 Load Line Convention, she was built to meet the 1930 International Load Line Convention requirements.

The MARJORIE McALLISTER was divided into four watertight compartments. Watertight bulkheads were located at frames 6, 14, 40, and 54. The only bulkhead with any type of opening was the one at frame 40, which had a watertight door to provide access between the main engineroom and the steering engineroom. This door was normally secured in the open position. The main engineroom compartment extended from frame 14 to frame 40. The steering engineroom extended from frame 40 to frame 54. These two compartments encompassed over two-thirds of the length of the vessel (86.5 feet).

There were five watertight doors in the superstructure at the freeboard or main weather deck: two on each side of the vessel and one in the after bulkhead of the upper level of the engineroom. The forward doors on each side led into the crew's quarters. The after doors, both port and starboard, led into the upper level of the engineroom. The door in the after bulkhead of the upper level engineroom provided access between the engineroom and the towing winch enclosure. It was usually kept in an open position by means of a self-engaging holdback. The towing winch area was enclosed on three sides but completely open at the after end. Two forced-draft ventilators, which were the primary supply source of air for the engineroom, were located port and starboard at frame 32 in the forward end of the towing winch enclosure.

There was one sea chest located at frame 34 in the engineroom bilge well under the main reduction gear. The ballast and firemain systems were serviced from this sea chest via one 6-inch line with a single sea valve. No other systems were serviced by the sea chest. The main engine was cooled by a closed fresh water system. The vessel was equipped with one automatic electric bilge pump. It was actuated by a water level sensor located in the engineroom bilge well. If the pump failed to activate, a high-water-level alarm would sound on the bridge, in the chief engineer's quarters, and in the engineroom. The vessel also was equipped with two manually started bilge pumps which were powered by the diesel generator engines. Each pump served a dual purpose. One could function as a ballast pump and the other as a firemain pump. Both had to be primed and manually started. When the pumps were used to pump bilges, several changes in valve openings and closures had to be made. They were infrequently used as bilge pumps since they only served as backup or emergency pumps to the automatic electric bilge pump.

The vessel's lifesaving equipment consisted of one 12-man inflatable liferaft, two ring buoys with attached water lights, and 12 life preservers. All of the equipment was Coast Guard approved. The liferaft, two ring buoys, and six of the life preservers were all in excess of the mandatory requirements for this type of vessel. The liferaft was stowed on the after end of the second deck and was secured with a hydrostatic release. The ring buoys were stowed, one on each side of the vessel, outboard of the handrails on the second deck. The life preservers were stowed throughout the crew's quarters and in the upper level of the engineroom.

The master of the MARJORIE McALLISTER possessed an expired license endorsed for master of uninspected motor fishing vessels of not over 500 gross tons upon coastwise waters not to exceed 50 miles offshore and tributary waters from Eastport, Maine, to Port Isabel, Tex. His experience consisted of approximately 20 years as pilot of fishing vessels operating out of Beaufort-Morehead City, and approximately 5½ years experience on tugboats. His tugboat experience included approximately 2½ years as master but was primarily limited to harbors and other inland waters. This was his first coastwise offshore voyage on a tugboat.

Subsequent to the delivery trip from New Orleans to New York in November 1968, the MARJORIE McALLISTER had made two other coastwise voyages: one from Chester, Pa.,

o Mobile, Ala., with a section of the tanker SS MANHATTAN in tow, and one from New York to Wilmington, N.C., with a dredge and two dump scows in tow. The remainder of her work had been primarily in harbors and other inland waters. She had not previously encountered weather as severe as that reported along the coast during her last voyage.

The weather forecast for the area between Virginia Beach, Va., and Cape Fear, N.C., November 1, 1969, predicted winds of 30 to 40 knots with rough seas, heavy surfs, and above-normal tides from Cape Hatteras, N.C., southward. Gale warnings for this area were posted at 0430 on November 1, 1969. At 1200, on November 1, 1969, gale warnings were posted for the entire coast from Virginia Beach, Va., to Charleston, S.C.

The weather reported by the Diamond Shoals light tower off Cape Hatteras at 2122 on November 1, 1969, was heavy rain, wind southeasterly at 40 knots and seas southeast, 20 feet. At the same time, Frying Pan Shoals light tower off Cape Fear reported winds southeast, 60 knots, gusting to 65 to 70 knots, seas southeast 15 to 25 feet. At midnight on November 1, 1969, the salvage vessel CURB, located approximately 60 miles southwest of the last known position of the MARJORIE McALLISTER, logged its weather as wind northeast, force 10 (48 to 55 knots), height of seas, 30 to 35 feet. At 0300, November 2, 1969, the CURB's log indicated winds of force 13 (in excess of 70 knots).

ANALYSIS

When there is virtually no detailed evidence to evaluate, it becomes necessary to analyze the casualty on the basis of known design details, operating practices, and possible failures. A fault tree diagram (see Attachment A) has been utilized to array the design, operating practices, and failures data in a sequential event format. This type of diagram serves to ensure an orderly and thorough analysis of all reasonably possible causal factors. It is an accepted technique utilized in the aerospace field for pre-accident design safety analysis. The Events and Causal Factors Diagram (see Attachment B) presents the critical path of the sequence of events, as derived from the fault tree, which culminated in the loss of the vessel. This diagram reduces the detailed fault tree diagram by displaying only the most probable sequence of events.

The premise that the vessel sank as opposed to other possible explanations of its disappearance is adequately substantiated by the following facts: debris positively identified as coming from the vessel was found in the area of the vessel's last reported position; an intensive air and surface search did not find the vessel or any evidence that the vessel was still afloat; the sudden discontinuance of radio communications from the vessel; the radio report from the vessel that she was flooding rapidly.

The sinking of a vessel is the direct result of a loss of buoyancy. Such loss of buoyancy could be caused solely by flooding of the vessel or by a combination of flooding and capsizing. In considering flooding only, there are three probable causes: a breach in the hull,

a sea-valve or pipe-fitting failure, or the ingress of water through one or more designed openings in the hull.

A breach in the hull could be caused by the vessel's striking an object. This type of breach could be caused by the vessel's grounding or striking bottom, striking an obstruction or pinnacle, or striking some floating object such as debris. Within the radius of approximately 10 miles from the vessel's last reported position and the position where identifiable debris was later recovered, the minimum charted depth of water is 60 feet. Such a depth precludes the possibility of grounding or striking the bottom. Even with the presence of 30-foot waves, the minimum depth of water in the troughs would be sufficient to prevent the vessel from striking bottom. The bottom in the general area of the casualty is sandy and basically smooth. There are no known pinnacles or protrusions in the area. Although there are several wrecks located in the area, none are known to have less than 60 feet of water over the top of them. No wrecks which could be considered an obstruction to a vessel the size of the MARJORIE McALLISTER were located by the search vessels subsequent to the casualty. Although striking floating debris is a possibility, none was found in the area by any of the search vessels and airplanes other than what was identified as originating from the MARJORIE McALLISTER. The construction of the bottom and wing tanks provided additional protection against flooding through a breach in the hull caused by striking an object, since both the hull and tank tops would have to be pierced or fail.

Another cause of a breach in the hull could be the creation of stresses within the structural members of the hull which exceed the strength of the members, thus causing material failure. The structural standards and scantlings to which the vessel was constructed, in addition to the fact that the vessel was less than 1 year old, minimize the probability of a structural failure. Also, if the master knew or suspected that a fracture of the hull was the cause of the flooding in the engineroom, he probably would have considered it necessary to request immediate assistance.

The probability of a valve or pipe-fitting failure is greatly reduced by the fact that there was only one sea chest. This sea chest had one sea valve and one 6-inch line which serviced the salt water ballast and fire main system. The engine cooling system was a closed fresh water system. The sanitary system utilized fresh water only. The fact that the vessel was only 1 year old minimizes the possibility of valve or fitting failures, either of a mechanical or corrosive nature.

There are numerous potential sources of flooding which must be examined when considering the ingress of water through designed openings in the hull. The two flush hatches in the weather deck, one forward which provides access to a small miscellaneous storage compartment and one aft which serves as a secondary means of access to the steering engine compartment, were potential sources. Both hatches require the use of a T-bar to open or close them from the weather deck. Both can be manually opened or closed by hand from within the compartment. Both would normally be dogged down in the closed position while the vessel is underway at sea. The engineer, when checking the steering gear, routinely enters and exits the compartment through the watertight door located in the after engine-

room bulkhead. There is no reason to believe that either of these hatches was open at the time of the casualty.

Flooding could have occurred through the portholes and doors located in the living quarters. Under the existing weather conditions, these portholes and doors would normally be secured in the closed position. Their location forward and just above the weather deck makes them highly susceptible to being struck by water and spray breaking over the bow. Even if one of them was left open, or was broken, it is highly unlikely it would go unnoticed long enough to allow sufficient water to enter the hull and appreciably reduce the stability of the vessel. The crew occupied or transited these compartments regularly.

The doors, windows, and portholes located in the bridge and superstructure area could have been another source of flooding. Since this area is continuously occupied by watch standers, the likelihood that any of these openings would be inadvertently left open is remote. If the seas were striking the bridge structure with sufficient force and frequency to break the windows and portholes and substantially flood the vessel, it would be unrealistic to believe the master would not mention such a condition when he reported his vessel was experiencing difficulties.

The remaining designed openings to be considered are those which lead into the engineroom. The portholes and doors located on both the port and starboard sides of the upper engineroom were normally kept closed and secured during adverse weather. The third door leading into the upper engineroom from the weather deck was located on the portside in the bulkhead between the upper engineroom and the towing winch enclosure. This door was normally secured in the open position with a holdback hook. The upper engineroom space was usually hot and the after door was habitually kept open to provide additional ventilation. For many hours prior to the vessel's arrival off Cape Lookout Buoy 14, the southeasterly seas were on the port bow. This would subject the weather deck and superstructure doors, hatches, and portholes (except for the after door into the engineroom) to the seas and spray breaking over the bow. With the seas forward of the beam, the towing winch enclosure would still provide shelter for the after engineroom door.

Assuming that the master, upon arrival off Buoy 14, decided to seek refuge in Morehead City, the necessary change in course would radically alter the effects of the storm upon the vessel. The assumption is strongly supported by the following facts: (a) during radio or telephone conversation with his company the morning of November 1, the master had advised the dispatcher that he might seek shelter in Morehead City (company policy left such decisions up to the master); (b) the master, both mates, and the deckhand all lived within approximately 20 miles of Morehead City; (c) the last reported position of the vessel lies along the trackline normally used by vessels approaching Morehead City from the north. Once the vessel changed course to proceed toward Morehead City, the southeasterly seas would be striking the vessel from astern. The combination of the 20- to 30-foot following seas and the low freeboard astern of approximately 2.5 feet would result in seas breaking over the stern. On a previous voyage, the vessel had shipped seas over the stern under less severe conditions. Once water was on the deck, the 30-inch-high bulwarks, in combination

with the limited area of the freeing ports, would tend to trap the water so that as the vessel pitched, the water would flow forward into the towing winch enclosure. With the door to the engineroom open, large quantities of water could flow into the engineroom space. This sequence of events could repeat itself until sufficient quantities of water had entered the engineroom to greatly reduce the stability of the vessel. Such an ingress of water might well go unnoticed, since there was no regular watch stander in the engineroom. The loss of stability might not be recognized immediately by personnel on watch on the bridge, since the vessel would be pitching and rolling extensively under such adverse wind and sea conditions. In addition, the location of the automation control panel just inside the door would make it very vulnerable to damage by water entering through the door. The open grating in the upper engineroom space would not appreciably impede the flow of water down on top of the generators and main engines and into the bilges. Such a shower of water might well cause the generators to trip off the line.

The final designed openings to be considered are the two ventilation ducts to the engineroom. Both of these ducts terminate 4 feet above the weather deck in the forward end of the towing winch enclosure. They were not fitted with permanent closing devices. A sequence of events, very similar to what could have caused flooding through the after engineroom door, could have caused flooding through the ventilation ducts. The only difference would be that a greater amount of water would have to accumulate in the towing winch enclosure, since the height of the vent openings were 4 feet above the deck while the sill height of the door was only 2 feet. An analytical study conducted by the Merchant Marine Technical Division, U.S. Coast Guard, substantiates the fact that this sequence of events could cause flooding in the engineroom. Based upon assumptions closely approximating the conditions which apparently existed at the time of the casualty, computations and analyses were made which led to the conclusions that: (a) retention of water on deck would not be sufficient to cause the vessel to capsize; (b) sufficient water would be trapped in the towing winch enclosure to allow downflooding through the ventilation ducts into the engineroom.

Flooding could have occurred through both the after door and the ventilation ducts. Initial flooding through the door could have reduced the vessel's stability sufficiently so that even if the door was then closed and dogged down, subsequent waves breaking over the stern would place sufficient quantities of water on deck to fill up the forward end of the towing winch enclosure and cause flooding through the vents.

The second possible cause of loss of buoyancy would consist of a combination of capsizing and flooding. The sequence could be capsizing followed by flooding, or flooding followed by capsizing, and further flooding until the vessel ultimately sank. In this incident, the evidence clearly indicates that some degree of flooding in the engineroom occurred first.

In addition to flooding, several other factors could have contributed to the capsizing of the vessel. Retention of water on deck would raise the center of gravity of the vessel and thus reduce its stability. Taking into account the deck area, the height of the bulwarks, the area of the freeing ports, and the rolling and pitching of the vessel, the quantity of water

which would remain on deck could not, by itself, reduce the vessel's stability sufficiently to cause the vessel to capsize.

A sudden shift of a large weight, such as cargo or heavy topside machinery, would adversely affect the vessel's stability. Since the MARJORIE McALLISTER carried no cargo, and was equipped only with the towing winch, as far as heavy machinery on deck was concerned, it is unlikely that an event of this nature was a causal factor.

Another possible causal factor would be the loss of steerage. Several factors could cause a loss of steerage: (a) damage to or physical loss of the rudder itself; (b) a failure within the mechanical portion of the system; (c) loss of way as the result of a main engine failure; (d) a broken tail shaft or loss of the propeller; and (e) loss of electrical power. Although any of these events could have occurred, there was no evidence or indication of such failures except for the loss of electrical power. The vessel did report it was experiencing electrical problems.

There are three events which could occur and cause a loss of electrical power to the steering system. One would be damage to or severance of the transmission lines from the main switchboard to the steering system, or from the automation control panel to the steering system. The possibility of water damage exists; however, water damage to the generators or the automation control panel would be more probable.

Another cause would be loss of the electrical controls of the system. Damage of a mechanical nature to the various switches and mechanism could cause such a failure. Short circuits or water damage to the switchboard could also be a causal factor. Because the main switchboard was located in the upper engineroom, water entering through the after door could have splashed the switchboard. This possibility is reduced by the fact that the switchboard is located on the starboard or far side from the door, and the walkway between the door and the switchboard is open grating. Water striking the automation control panel, however, is highly probable, due to the location of the panel directly inside the after door. Immersion of the switchboard or the control panel is a very remote possibility. The entire engineroom would have to be flooded before the level of water reached either board. By then, the vessel would have capsized or sunk, due to loss of stability.

The third cause would be a loss of all sources of the main power supply. In order for this to happen, all three generators would have to fail, or the two main generators would have to fail and the crew be unable to reach and/or start the manually started auxiliary generator. The most likely causes of generator failures would be either loss of their diesel propulsion or shorting out of the generators themselves. The latter event easily could have occurred under the conditions which existed at the time. Water entering the engineroom either through the door and/or the ventilation ducts would cascade over the generators and other machinery in the lower engineroom. The generators could also become submerged by the rising water as the bilges filled and the quantity of water in the engineroom increased. The fact that the auxiliary generator was located at the same level and just forward of the

starboard main generator made all three generators vulnerable to flooding in the same compartment.

The loss of electrical power alone would not preclude operating the emergency bilge pumps, since they are driven directly by the generator's diesel engines. However, under the adverse conditions which existed—loss of lights, heavy rolling and pitching, water in the engineroom, and perhaps a lack of familiarity with the valve openings and closings which would be necessary to align the bilge pumping system properly—it is very possible operating personnel would be unable to place these two pumps in operation.

Another causal factor which must be considered is the possibility of human error. Did any action taken or decisions made by the personnel involved contribute to the casualty either directly or indirectly? The master's decision to proceed into the storm, despite the fact that he had received considerable information concerning the intensity and extent of the storm, could be considered imprudent and contrary to the principles of good seamanship. His apparent decision to change course and seek refuge in Morehead City, N.C., required him to place the huge seas on his stern and quarter. Such a maneuver is usually contrary to the principles of good seamanship for a vessel with a very low freeboard aft. Normally, a vessel experiencing difficulty in heavy seas will head into, not away from, the seas.

A third human error factor was the habit of latching open the after engineroom door while the vessel was underway. In view of the location of the door on the main deck and the propensity of the vessel to take seas on its main decks, good seamanship would require the door to be closed. Although there is no direct evidence the door was open at the time of the casualty, the following facts greatly increase the possibility that the door was open: the habit of leaving it open; the vessel had been heading into the seas for several hours before the casualty, hence the door would be protected from seas breaking over the bow; the master could not visually check the status of the door from the bridge; and there was no continuous watch in the engine spaces.

All three possible decisions or actions could have been contributory factors in this casualty and could be categorized as human errors. This raises the question as to what would have precipitated the faulty decisions. One possibility is that the master lacked sufficient knowledge in regard to the handling characteristics of the vessel, vessel stability, ballasting conditions, and evaluation of weather data. He lacked offshore towing vessel experience. A licensing program for operating personnel of towing vessels would be one method for correcting this problem.

Another problem pertains to the question of what criteria or standards a master has upon which to base his decision. In this case, he had a certificate issued by the American Bureau of Shipping, which stated his vessel was fit for unrestricted ocean towing service. The validity of the classification is, of course, based upon the assumption that the material condition of the vessel and its equipment will be properly maintained and that the integrity of all watertight closures will be maintained.

Mariners realize that an "unrestricted" ocean service classification does not mean the vessel will survive every possible form of ocean weather. However, on the other hand, the word "unrestricted" ocean service is essentially indefinite. The master is not provided with guidelines as to the severity of weather conditions his vessel may be expected to withstand. Knowledge of the weather conditions assumed in the calculations to determine the sufficiency of the designed stability would be useful as a guideline for the master. Unfortunately, explicit, assumed weather conditions are not included in such calculations. A standard wave is used in computing still water bending moments to determine the necessary structural strength of the vessel. A standard wave is expressed in terms of length and height. The wave length equals the length of the vessel, and the wave height equals $6L^{\cdot 6}$ for vessels under 625 feet in length. The Intergovernmental Maritime Consultative Organizations' recommendations concerning the effects of dynamic forces upon the stability of the vessel are followed for small vessels such as this vessel. Nevertheless, the words "unrestricted ocean towing service" do not constitute usable guidelines for the operator.

Under the provision of the 1966 International Load Line Act, a trim and stability booklet is provided the vessel and does give specific instructions in regard to proper ballasting and loading of the vessel. The MARJORIE McALLISTER did not have such a booklet, since it was built under the provisions of the 1930 International Load Line Convention.

In summary, based upon the analysis of the evidence available and the deduction of the most probable forms of system failure, the following sequence of events most likely occurred. Due to the extremely adverse weather conditions, the master made a decision to seek shelter at Morehad City, N.C.; the change in course to proceed toward Morehead City created a following sea situation; seas broke over the stern and rushed forward into the towing winch enclosure; water entered the engineroom either through the open door or the ventilation ducts or both; the water short-circuited the generators, causing a loss of electrical power; the loss of electrical power to the vessel's electric bilge pump stopped or precluded automatic dewatering of the engineroom; the inability of the crew to place the emergency bilge pumps in operation made dewatering impossible; shortly after the power failure, the vessel lost all steerage, since there were no auxiliary methods of steering; loss of all pumps and steerage, plus the fact that the ventilation ducts had no permanent closures, rendered the vessel helpless to combat the effects of the storm; the vessel continued to flood rapidly until it suddenly capsized; the suddenness of the capsizing precluded the crew from abandoning the vessel; the vessel sank, and all hands went down with the vessel. The batteries which provided emergency power for the radio, and which were located in the engineroom, became ineffective when that space was flooded.

This casualty highlights the fact that current inspection laws and regulations are not addressed to this type of vessel. Under current statutes, diesel-powered towing vessels under 300 gross tons are not subject to inspection and certification by the U.S. Coast Guard. The MARJORIE McALLISTER was classed by the American Bureau of Shipping for unrestricted ocean towing service and was issued a valid load line certificate under the provisions of the International Load Line Convention, 1966. However, as previously indicated, she was built to meet the 1930 Load Line Convention requirements. There is no evidence that, at

the time of the casualty, she was in violation of any of the requirements of her classification or load line certificate.

The Board noted in the M/V SOUTHERN CITIES report the need for some type of control over the seaworthiness of offshore towing vessels. Subsequent to the SOUTHERN CITIES casualty, several other towing vessels have been lost. Within the past 2 years, at least six other uninspected towing vessels (M/V THERESA F., January 9, 1969; M/V C. R. HADEN, January 29, 1969; M/V LARRY, October 31, 1969; M/V ICE FLOW, December 21, 1969; M/V INTREPID, February 19, 1970; and the M/V AIMEE R., April 25, 1970) have foundered. All except the C. R. HADEN were less than 6 years old. The probable causes of the founderings varied, but appropriate design and inspection requirements might have prevented some or all of these casualties. (See attachment C for a summary of the cases.)

Inspection laws and regulations, which take into consideration the unique aspects of towing vessels, are needed to insure a greater degree of safety for these vessels and their crews. In the Safety Board's special study of towing vessel safety (August 29, 1969), the Board noted that the number of founderings, capsizings, and floodings of uninspected towing vessels is 250 percent greater than the number of these casualties involving all inspected vessels.

Although in this case a fault tree analysis has been utilized after the fact to determine the most probable causal factors of the casualty, it can also be used effectively for pre-casualty evaluation of design. For example, exactly the same type of analysis could have been done prior to construction of the vessel to determine whether flooding could occur under heavy sea conditions, and what the consequences of flooding might be. As a result, the need for changes in design (larger freeing ports, greater freeboard, more effectively protected ventilators, placement of generators in different spaces, protected electric control boards) or operating procedures (keep watertight door closed) could have been found, and decisions to preclude the occurrence of this type of casualty could have been made. This method of fault tree analysis is one of a number of systematic design analysis methods which have grown up in the aerospace field. Such methods are also capable of being applied to predict accident-causing system failures in the marine field. The fault tree anlysis, Attachment A, is an example of this desirable procedure in connection with Recommendation 2. The relationship of events and causal factors is charted in Attachment B.

PROBABLE CAUSE

The National Transportation Safety Board finds that the probable cause of the loss of this vessel was foundering. Extremely adverse weather, flooding of the engineroom, and the sudden capsizing of the vessel were the causes of the foundering and the loss of all hands. Other contributing factors were:

a. The master's decision to proceed south into the storm in lieu of seeking refuge in the Chesapeake Bay area;

2. The Coast Guard, American Bureau of Shipping, and the organized ship design professions consider the usefulness of the fault tree or similar systems analysis technique as a predictor of potential failures and accidents, and as a guide to needed design requirements, during the design and plan approval stages of ship construction.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD:

Adopted this 5th day of May, 1971:

[redacted], Chairman

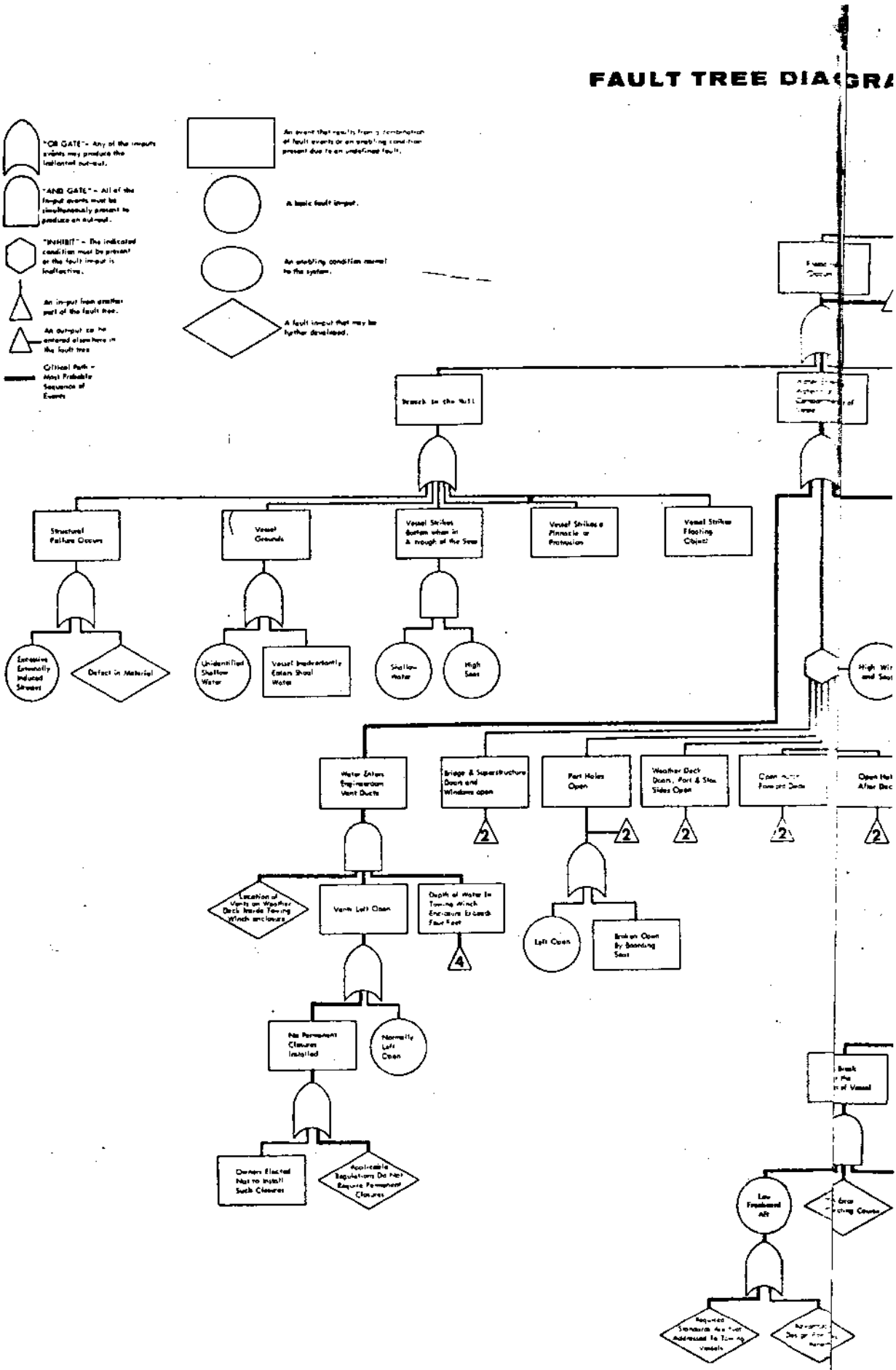
[redacted], Member

[redacted], Member

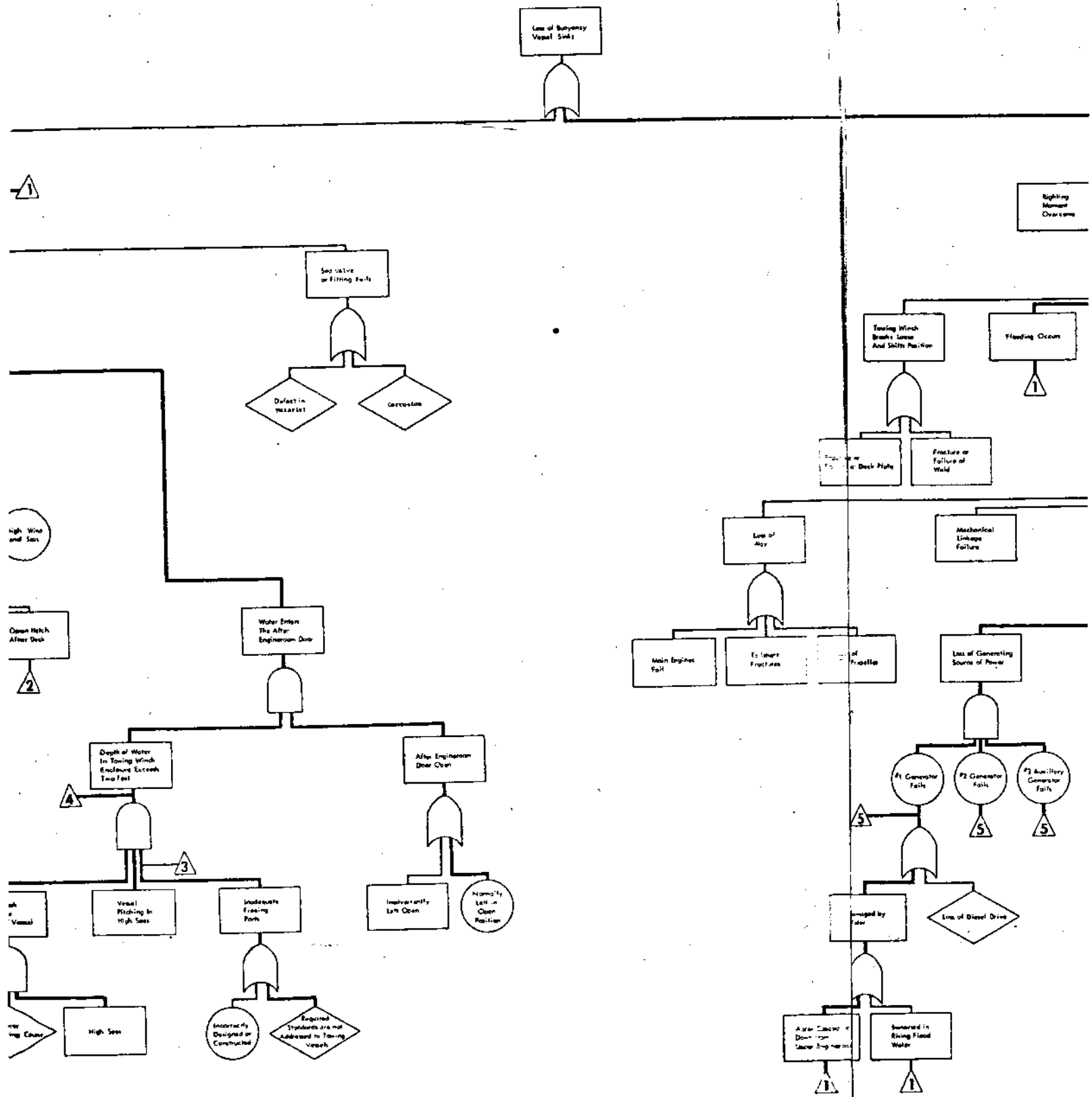
[redacted], Member

[redacted], Member

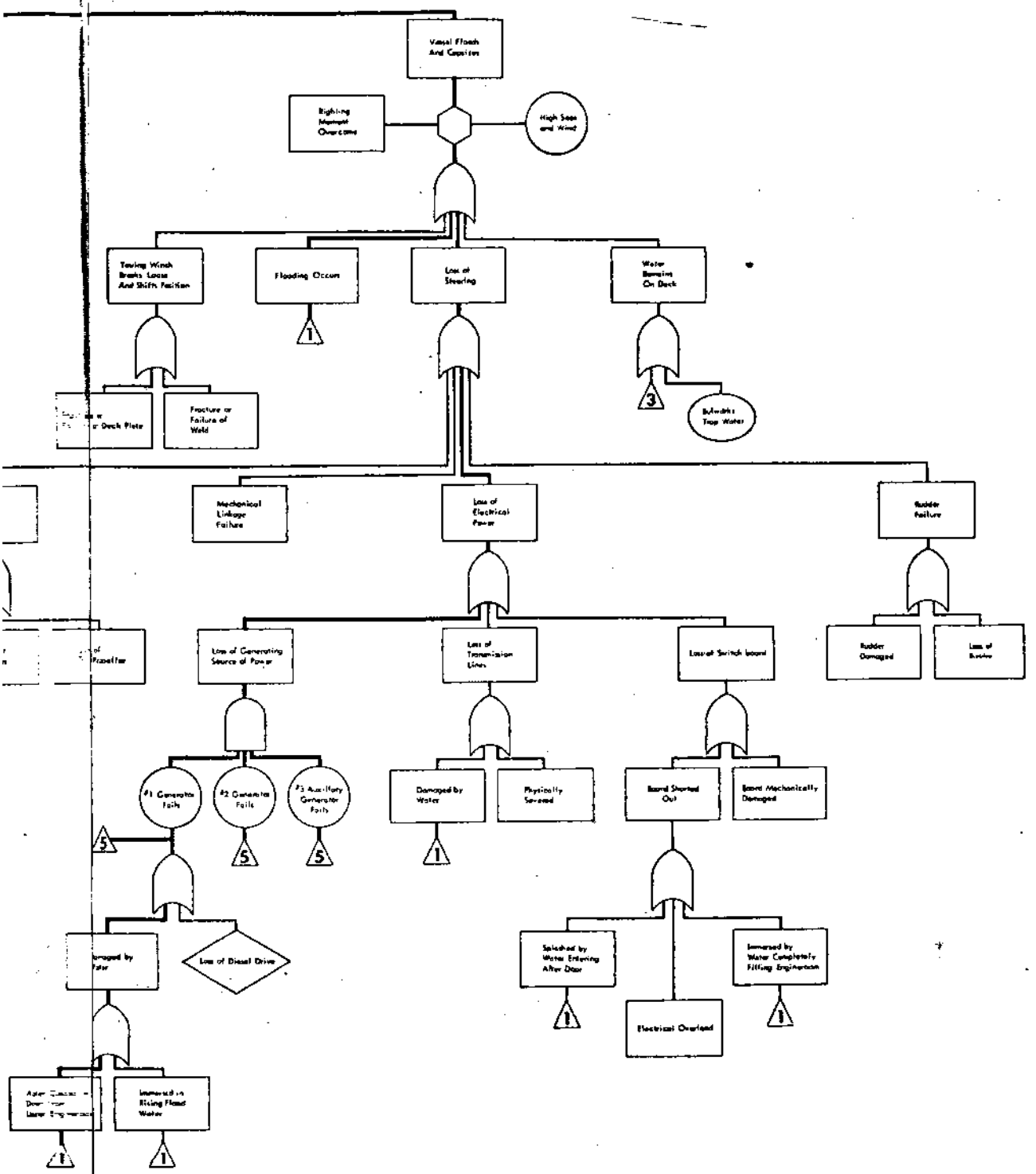
FAULT TREE DIAGRA

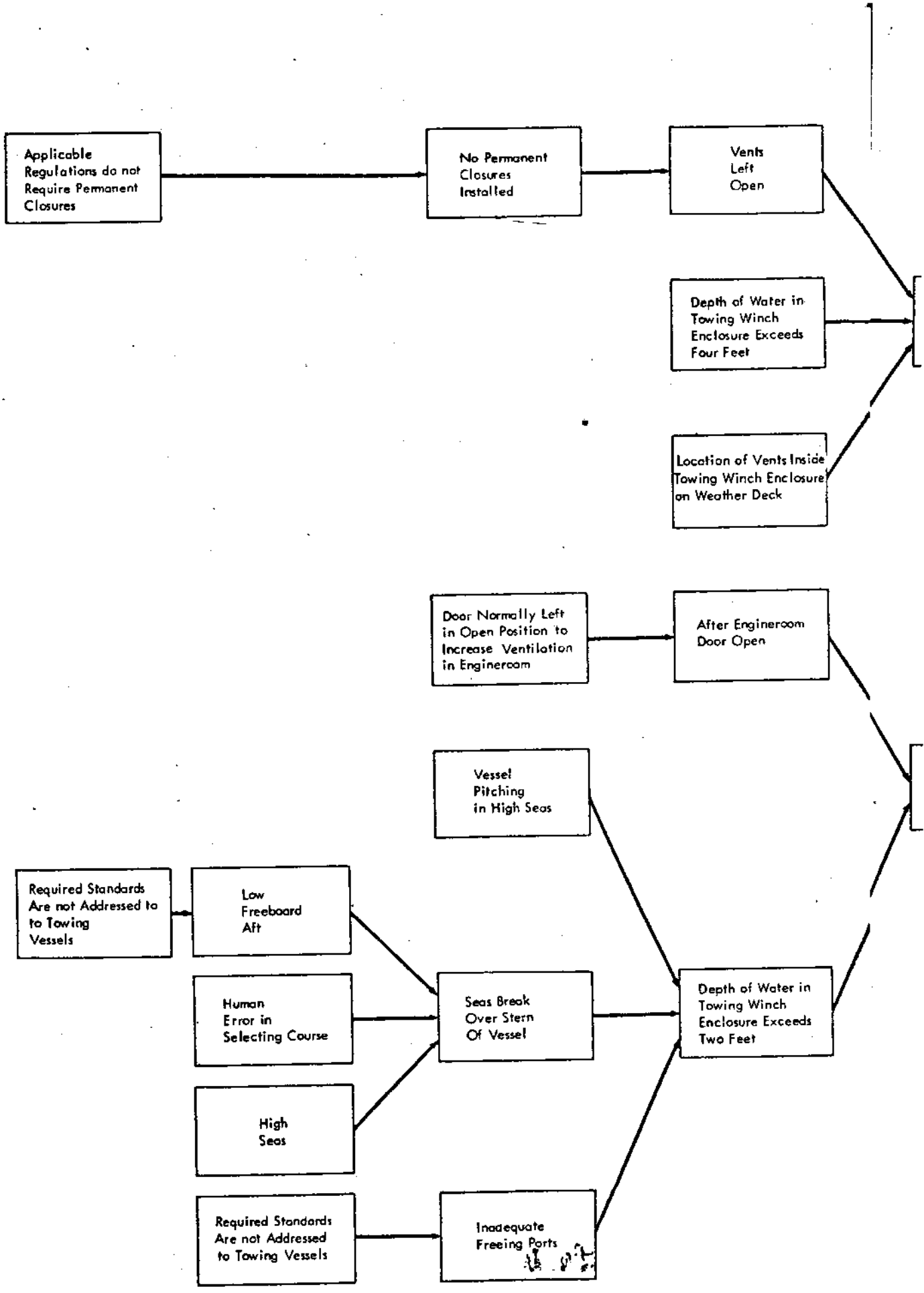


AM - CAUSE & EFFECT ANALYSIS OF TOWING VESSEL MARJORIE McALLISTE

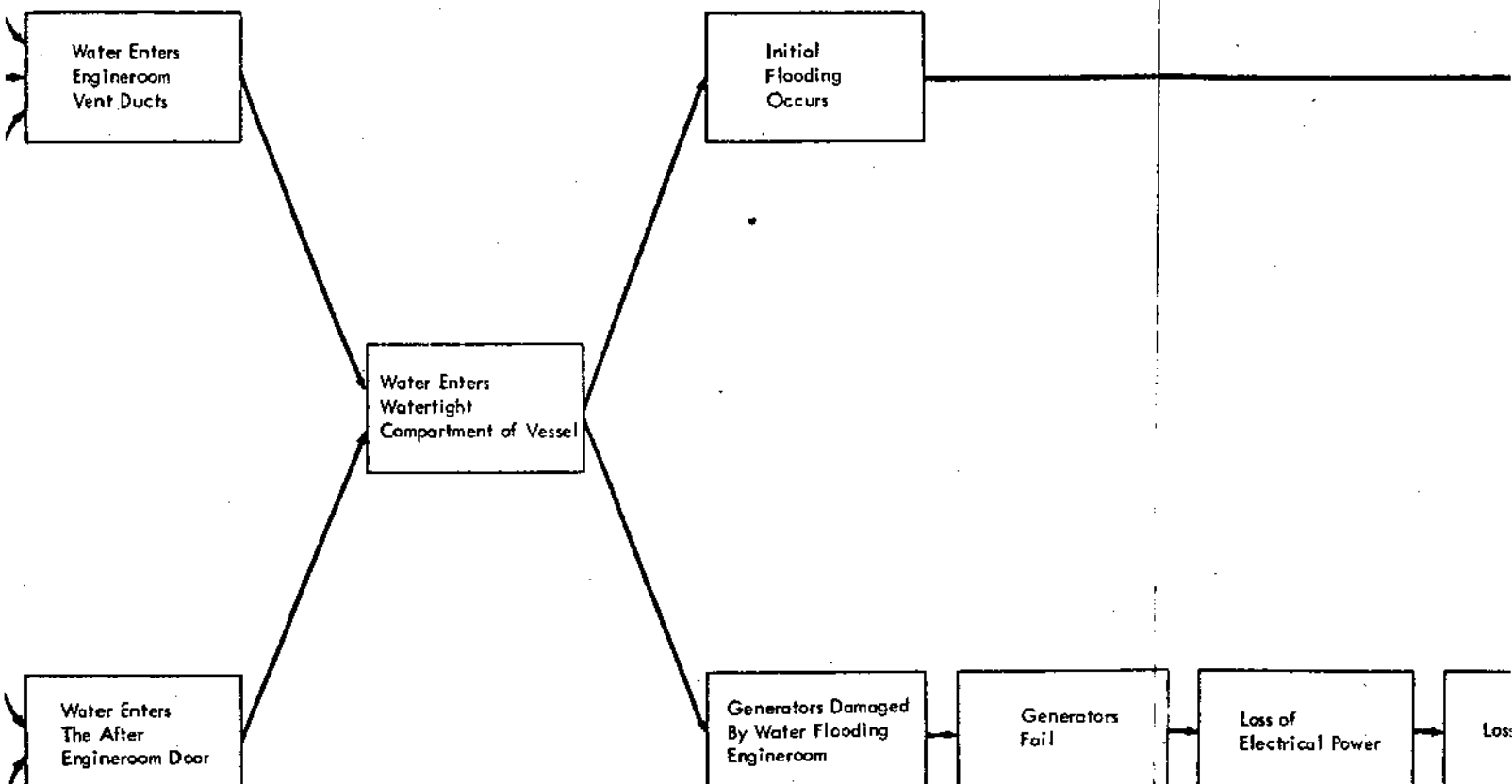


ATTACHMENT A

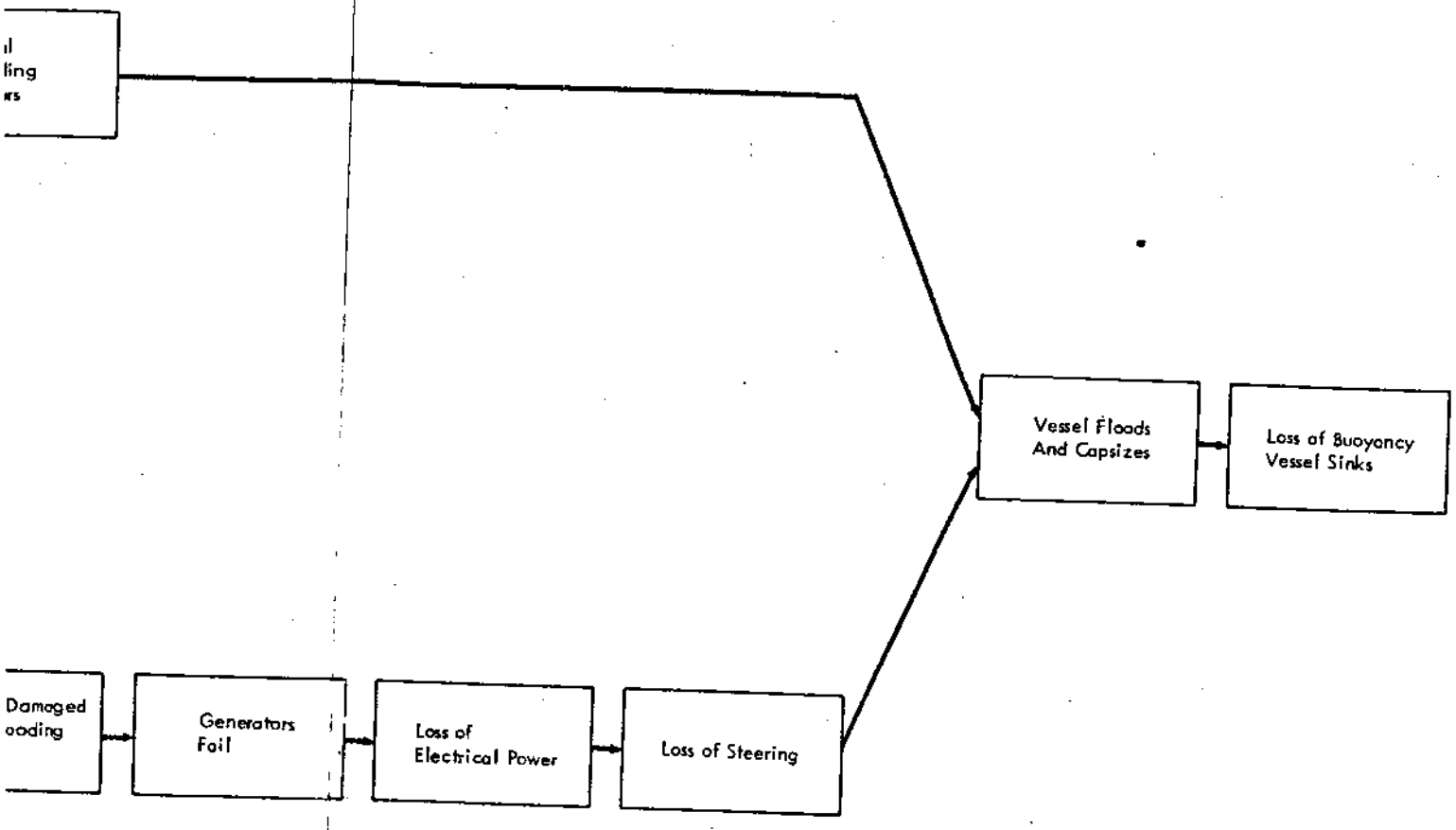



Applicable Regulations do not Require Permanent Closures
No Permanent Closures Installed
Vents Left Open
Depth of Water in Towing Winch Enclosure Exceeds Four Feet
Location of Vents Inside Towing Winch Enclosure on Weather Deck
Door Normally Left in Open Position to Increase Ventilation in Enginerom
After Enginerom Door Open
Vessel Pitching in High Seas
Required Standards Are not Addressed to to Towing Vessels
Low Freeboard Aft
Human Error in Selecting Course
High Seas
Seas Break Over Stern Of Vessel
Depth of Water in Towing Winch Enclosure Exceeds Two Feet
Required Standards Are not Addressed to Towing Vessels
Inadequate Freeing Ports

EVENTS & CASUAL FACTORS DIAGRAM



ATTACHMENT B



TOWBOAT CASUALTIES IN WHICH INSPECTION MIGHT HAVE PREVENTED THE CASUALTY

1. On 9 January 1969, the M/V THERESA F., a steel-hulled towing vessel of 196.5 gross tons, 132 feet in length, built in 1968, capsized and sank while approaching the Southwest Passage of the Mississippi River. At the time, the THERESA F. was towing the barge FREEPORT I astern on a shortened hawser. The cause of the casualty was a combination of the angle of strain on the hawser and the increase in strain imposed upon the THERESA F. when the barge sheered to starboard. This action caught the master unaware and resulted in tripping and capsizing the THERESA F.

2. On 29 January 1969, the M/V C. R. HADEN, a 143-gross-ton steel towboat, 81 feet long, built in 1943, developed a leak in the engineroom and subsequently sank 129 miles SW of Gold Beach, Oregon, without injury or loss of life. Weather at the time of the casualty was wind 35 to 45 knots, 5-foot seas, and 15-foot swells. The exact cause of the leak was undeterminable.

3. On 31 October 1969, the M/V LARRY, a 148-gross-ton steel towing vessel, 68.2 feet in length, flooded and sank in Bristol Bay, Alaska, while towing a tank barge astern. The vessel, built in 1966, had been constructed by welding two LMC's together. There was no permanent bilge piping installed. Rubber hoses were led over the side of the vessel. The vessel was taking water from an undetermined source, possibly as a result from hull damage suffered when the vessel grounded 2 days earlier. The weather at the time of the casualty was 40-knot winds and 10- to 12-foot seas.

4. On 21 December 1969, the M/V ICE FLOW, a 134-gross-ton steel towing vessel, 71.5 feet in length, built in 1967, foundered in the Gulf of Mexico due to progressive flooding. Flooding of the rudder compartment, believed due to a grounding 3 days previous, flooded the engineroom through a flexible rubber hose coupling which led from the rudder compartment to the stack vent pipe. This was compounded by the fact that the engineroom watertight door was inoperable.

5. The M/V INTREPID, a 199.5-gross-ton steel towboat, 115.2 feet in length, built in 1965, sank on 19 February 1970, in the Gulf of Alaska, with the master and one crewmember missing and presumed dead. The weather at the time of the casualty was 50-knot winds and 20-foot seas. The cause of the casualty was the flooding of the lazaretto, presumed to have been through hull fractures, at a rate in excess of the bilge pump capacity.

6. On 25 April 1970, the M/V AIMEE R., a 52-gross-ton steel tug, 54 feet in length, built in 1964, capsized and sank in the Gulf of Mexico. The weather at the time of the casualty was 7-foot seas and 50-knot winds. The cause of the casualty was flooding from an undetermined source. The vessel capsized before attempts could be made to dewater the vessel.

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

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

•5943/MARJORIE McALLISTER
A-5 Bd
4 NOV 1970

Commandant's Action

on

The Marine Board of Investigation convened to investigate the circumstances surrounding the sinking with loss of life of the M/V MARJORIE McALLISTER in the Atlantic Ocean on 2 November 1969

1. The record of the Marine Board of Investigation convened to investigate subject casualty has been reviewed, and the record, including the Findings of Fact, Conclusions and Recommendations is approved subject to the following comments and the final determination of the cause by the National Transportation Safety Board.

2. The towing vessel M/V MARJORIE McALLISTER, while on a voyage from New York, N. Y., to Jacksonville, Florida, disappeared in a position approximately 17 miles south of Cape Lookout, North Carolina on 2 November 1969. The crew of six is missing and presumed dead.

3. Gale warnings were forecast north of Cape Hatteras with E to SE winds reaching 25 to 40 knots late in the afternoon on 1 November. By midnight on 1 November the wind was NE Force 10 (48 - 55 knots) in the area where the MARJORIE McALLISTER disappeared. This was based on a report by a vessel located approximately 60 miles SW of the MARJORIE McALLISTER.

4. On 1 November at 1000 EST the Master of the MARJORIE McALLISTER, using radiotelephone, reported to the owners that the position of the vessel was 50 miles south of Chesapeake Light. The Master was advised that one of the company's tugs had sought refuge in Moorehead City, North Carolina, to escape the reported heavy weather and mountainous seas on the coast. The Master was also advised that gale warnings were forecast along the entire coast. At this time the Master conveyed his intentions of possibly continuing to Moorehead City. The last voice communication heard by the vessel owner's New York office was at 1630 on 1 November. At that time the MARJORIE McALLISTER reported her position to be 14 to 17 miles south of Diamond Shoals, N. C., and that she was due off Cape Lookout, N. C., at 2400.

5. At 0025 EST on 2 November, the MARJORIE McALLISTER reported to the U. S. Coast Guard Group, Fort Macon, N. C., that the vessel was taking on water and experiencing electrical problems in a position six miles west of Cape Lookout Shoals Lighted Whistle Buoy 14 (LL No. 175). The Master reported that no assistance was required but requested the Coast Guard Group, Fort Macon to stand by on 2182 KHz. The vessel next established communication with Group Fort Macon at 0049 and requested assistance. The position was reported as being west of Buoy 14 on Loran Line 1970. The vessel and Fort Macon attempted to shift frequencies from 2182 KHz to 2670 KHz at 0055 because of radio interference. During this attempted radio frequency change communications between the vessel and Fort Macon were lost and attempts to reestablish communications after this time were unsuccessful. A salvage vessel approximately sixty miles from the MARJORIE McALLISTER had overheard her communications with the Coast Guard. Realizing that there was a problem in maintaining radio contact the Master of the salvage vessel called the MARJORIE McALLISTER and asked for her position and any other information that the vessel wished to have passed on to the Coast Guard. The MARJORIE McALLISTER acknowledged this transmission and requested the salvage vessel to stand by. This was the last transmission heard from the MARJORIE McALLISTER.

6. In view of the request for assistance and the unsuccessful attempts to reestablish communications, the Coast Guard initiated an extensive surface and air search. Debris and vessel's equipment recovered in the area of the last reported position of the MARJORIE McALLISTER was identified as coming from that vessel. The search included the assistance of naval vessels with sonar and metal detecting capabilities. A number of dives were made by professional divers. The search was continued until 7 November with negative results.

REMARKS

1. Although there were no survivors of this casualty there was sufficient evidence to establish that the MARJORIE McALLISTER sank during extremely adverse weather conditions as a result of being overwhelmed by high winds and seas.

2. In concurrence with Conclusion No. 1 of the Marine Board of Investigation it is highly probable that down flooding of water occurred through the engine room ventilators in the towing winch enclosure. The design of the towing winch enclosure would have formed a natural trap for the water from seas breaking on the after deck, enabling the water to rise momentarily above the level of the engine room vents. The theory of water in the ventilation system is supported to some degree by the electrical problems reported by the MARJORIE McALLISTER. The International Load Line Convention, 1966 recognized the need for permanent ventilation closures and increased freeing port areas on vessels less than 328 feet in length. The MARJORIE McALLISTER was subject to the International Load Line Convention, 1930 which required ventilation closures of only a temporary nature.

3. Concurring with Conclusion No. 2 of the Marine Board of Investigation it is considered that the amount of freeboard, the freeing port area and the location of vents, louvers and doors were not in general suitable for ocean or coastwise service.

ACTION CONCERNING THE RECOMMENDATIONS

1. The Coast Guard has consistently and strongly supported legislative efforts dedicated to the several aspects of towboat safety. During the course of hearings on the subject in 1968, the Coast Guard indicated that an operator licensing program would be a significant first step toward reversing the casualty trend on towboats and that once the program was in effect, both the impact on maritime safety, as well as any need for supplemental legislation, could be more accurately assessed.

2. This casualty amply demonstrates that, although a licensing program would address one of the most significant causes of casualties on uninspected vessels - personnel fault - mandatory inspection is necessary to encompass solutions to the full range of towboat risk problems.

3. Accordingly, the Coast Guard will undertake a review of pending legislative proposals in light of recent casualties which have occurred to towing vessels operating on oceans and coastwise waters.

[redacted]

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

Address reply to:
COMMANDER
Fifth Coast Guard District
Federal Bldg.
431 Crawford St.
Portsmouth, Va. 23705

5943 M/V MARJORIE
McALLISTER Marine
Board of Investigation
24 June 1970

From: Marine Board of Investigation
To: Commandant, Coast Guard (MVI)

Subj: M/V MARJORIE McALLISTER Official Number 517185, Uninspected Motor Towing Vessel; loss at sea off Cape Lookout, North Carolina on 2 November 1969, with loss of life

1. In the early morning hours of 2 November 1969, the M/V MARJORIE McALLISTER, with a six man crew on a voyage from New York, N. Y. to Jacksonville, Florida, without tow, disappeared in a position approximately 17 miles south of Cape Lookout, North Carolina (Lat 34° 18.4' N, Long 76° 31.6' W) after advising the U. S. Coast Guard Group Fort Macon, Atlantic Beach, North Carolina at 0049 local time, that they were taking on water fast and also experiencing electrical problems. U.S.C. & G.S. Chart Number 1110 encompasses the area. An extensive air and sea search, with Coast Guard, Navy and commercial units participating, failed to locate either the vessel or any of its crew. Debris identified as belonging to the MARJORIE McALLISTER was recovered in the general area. Attempts to locate the vessel to date, have been unsuccessful.

2. The M/V MARJORIE McALLISTER, Official Number 517185, homeport New York, N. Y., was a welded steel, single screw, diesel propelled towing vessel, built in 1968 at St. Louis Ship Division of Pott Industries, Inc., St. Louis, Missouri, for McAllister Brothers, Inc. of New York, N. Y. and was the first of a two ship contract of identical design. She was 198.73 gross tons 111.5 feet in length, 30.0 feet in breadth and 10.5' registered depth. The contract to build the MARJORIE McALLISTER specified that among other things the vessel when delivered be admeasured under 200 gross tons. During construction it became evident that without changes in design the vessel would be well over the specified tonnage. After considerable discussion and correspondence between Marine Consultants and Designers, Inc., the vessel designer, St. Louis Ship, Commander, Second Coast Guard District and Commandant, U. S. Coast Guard alterations to the original plans whereby a transverse frame was deepened six inches and certain spaces were exempted as water ballast in tonnage computations resulted in successfully reducing the tonnage to under 200 gross tons. These spaces as noted on the certificate of admeasurement are the forepeak, the tanks aft of the forepeak port and starboard, midship tanks port and starboard and the tanks aft port and starboard. Propulsion was by a 3600 horsepower, twenty cylinder General Motors Diesel engine with pilothouse controls, and a kort nozzle. The MARJORIE McALLISTER, being a diesel propelled towing vessel of under 300 gross tons, was not subject to U. S. Coast Guard inspection and certification. On 7

April 1969 the vessel was classed by the American Bureau of Shipping for class A-1 towing service (unrestricted ocean). The vessel had also been surveyed by the American Bureau of Shipping on 9 November 1968 and assigned load lines with a summer freeboard of 2' 3-3/4" in accordance with the International Convention on Load Lines, 1966.

3. A stability test was conducted in New Orleans, La., by the builders on 19 Nov. 1968. Results of this inclining experiment, which were made available to the board, show that for three common operating conditions (full, light, or harbor) the GM was in excess of 2.94 feet. The reduction in GM due to free surface effect in all three conditions was less than 0.3 feet. Under full load conditions all of the vessel's tanks are topped off except no salt water ballast is included. In a light condition the vessels tanks would be at 90% capacity with an additional 48.6 tons of salt water in the forepeak tank for trim. The remaining condition referred to as harbor condition is with the double bottom tanks topped off, wing tanks and wash water at 90% capacity, potable water at 50% capacity and 11.0 tons in the forepeak tank. Other conclusions developed as a result of the inclining experiment show the vessel to have a positive righting arm at 75° heel including a reduction made for free surface effect. Additional studies conducted by the vessels owners immediately after the casualty revealed that the vessel would have a 1.25 foot positive righting arm at a 70° heel and that the vessel would be required to heel between fifteen and eighteen degrees to submerge the deck edge.

4. The M/V MARJORIE McALLISTER was constructed with four transverse watertight bulkheads at frames 6, 14, 40 and 54, which extended from the bottom shell to the underside of the weatherdeck plating. The only opening in any of these bulkheads was a watertight door at frame 40 leading into the steering engineroom. This door was usually hooked back in the open position. The spacing of the transverse frames was 27 inches between frames 14 and 40. Forward and aft of this section the spacing was 24 inches. Scantlings consisted of 1 inch plating at the sheer strake and the rest of the hull, 7/16 inch. Bulkheads were 3/8 inch plate at the bottom and 5/16 inch plate at the top. All of the deep floors were 3/8 inch plate. The compartmentation of the vessel from forward to aft consisted of the following: the forepeak ballast tank extended from the stem to frame 6, with a capacity of 16.05 tons. Aft of this frame to frame 14 were port and starboard ballast tanks which extended from the keel to the 14'06" level. Capacity of these tanks was 15.73 tons. Above these tanks were Bos'n stores and two independent 2000 gallon potable water tanks. The engineroom spacing encompassed the entire hull between frames 14 and 40. The innerbottom tanks consisted of fuel oil tanks between frames 14 and 30 with a capacity of 49,300 gallons. Aft of these tanks were the innerbottom ballast tanks, which extended from frame 30 to frame 40, port and starboard. The capacity of the ballast tanks was 9.84 tons. Wing tanks extended the entire length of the engineroom area. Between frames 14 and 20, port and starboard, were wash water tanks with a capacity of 8,000 gallons. These tanks were segregated by cofferdams forward and aft. The remainder of the wing tanks were fuel oil tanks extending from frame 20 to frame 40 with a capacity of 45, 990 gallons. The remaining ballast tanks were located in the steering gear room which ran the entire length of the compartment between frame 40 and 54, port and starboard, approximately 8 feet off the centerline. The capacity of these tanks was 12.80 tons. The area aft of frame 54 to the stern was a void space. The maximum fuel capacity was 95,290 gallons. Fuel consumption without a tow at normal operating speed was about 2500 gallons per day.

5. The one sea chest was located below the main reduction gear at frame 34. Because of the various fuel oil and ballast tanks, this was the only section of the hull which could be considered to be not double hulled. A six inch line with a single sea valve was located in the sea chest to service the main ballast and the fire pumping systems. Cooling of the main engine was accomplished by a closed fresh water system. Also located in this area was the sensor for the automatic electric bilge pump. The sensor was located approximately 18 inches above the bottom of the bilge well and the bilge pump would automatically commence pumping when water reached this level. Failure of this pump to activate would cause a high water level bilge alarm to sound in the wheel house and the Chief Engineer's quarters when the water reached a level of approximately 24 inches. Additional bilge pumps were located on the diesel generator engines which were started manually in the event the automatic bilge pump failed to operate.

6. The vessel was equipped with two (2) 75 KW automatic starting and automatic changeover AC diesel driven generators. A third generator, used mostly to carry the load while the vessel was in port, was 30 KW and was manually started. The source of emergency power was a 12 volt battery syster located in the upper engineroom, port side, for the voice radio communications system. The main electrical distribution panel was located on the starboard side in the upper engineroom. As this vessel was fully automated and had pilothouse controls, it was possible to start and stop the 75 KW generators from the pilot house or from the automation board located in the upper engineroom. The automation board was located on the port side by the after bulkhead, immediately adjacent to the after weather deck door located in the towing winch enclosure. The generators also could be started by local control at the board in the lower engineroom. Notification of any malfunctions of either the generators, steering engine, bilge pump, air pressure, low lube oil, etc., was by ringing of alarm bells located in the wheelhouse, engineroom, and the engineer's stateroom. Various colored light signals would also indicate a malfunction of this equipment. Normal operating practice was for one generator to be on the line at all times with a changeover to the otner every two days. Failure of the main generator necessitated starting the 30 KW generator manually in the engineroom.

7. On the main weather deck level, there were five watertight doors leading into the deck house. The forward port door led to a passageway in the crew quarters; the after port door led to the upper engineroom. The starboard forward door led to the galley and the after starboard door to the upper engineroom. Also leading into the upper engineroom was the remaining watertight door which was located in the towing winch enclosure on the after end of the deck house, port side. The towing winch enclosure which encompasses an area approximately 12'.0 in depth, 8' high and 20' wide, was an extension of the deck house with the after end completely open. All of these doors which were equipped with port lights and rubber gaskets, were secured by means of individual dogs operable on either side. The coaming or sill to the lower edge of the door frame was 24 inches in heigut. All of the doors were of one-piece steel construction with the exception of the port and starboard doors to the upper engineroom at frame 27 which were two piece dutch-door type construction. The door in the after end of the deck house in the towing winch enclosure

was usually hooked back in an open position by means of a self engaging holdback. On the second deck there was a dogged flush square corner type door with a large window leading into the Captain's area. A similar type door was located on the after end of the pilot house leading out onto the top of the Captain's cabin. The size of the window in these two doors was approximately 24 inches high and 18 inches wide. Both of these doors could be secured by individual dogs on either side of the door. The large windows in the wheel house were heat treated glass about 3/8 inches in thickness. The only other openings in the hull structure were two flush quick opening type watertight scuttles which could be operated from either above or below decks by means of a T-wrench. One scuttle was located on the port side of frame 8 and the other on frame 43, starboard side. A non-watertight door located on the centerline led from the messroom to the upper engineroom. The engineroom receives its primary supply of air from two forced draft ventilators located port and starboard at frame 32 in the forward end of the towing winch enclosure. The ventilator trunks are 24 inches in diameter; four feet in height and are capped by a vent fan housing of approximately the same size. The lower edge of the vent fan housing extends below the upper edge of the ventilator trunk forcing the air to come from below; over the upper edge of the ventilator trunk and thence to the engineroom where it is distributed by means of branch duct work. These ducts had mechanical closures at the end of each branch. Air supplied to the main engine was by a pipe approxiamtely 21 inches in diameter located in the after end of the stack on the centerline at frame 30 on the second deck. Uncovered louvres in the stack approximately 3 feet by four feet in size and 3 feet above the second deck permitted the entrance of air to the engine intake and also provided natural exhaust ventilation from the lower and upper engineroom. Ventilation for the deck house was by intake vent on the second deck at frame 11 with the exhaust vent terminating at the after end of the pilothouse on the upper deck at frame 19. The galley range exhaust was located on the starboard side of the second deck at frame 24. The exhaust ventilation for the steering gear room was located on the starboard side of the second deck at frame 36.

8. Lifesaving equipment aboard the vessel all of which was Coast Guard approved consisted of one Elliot 12 man inflatable liferaft (Serial Number CSR/12mn/532 approval No. 160.051/10/1 Lot No. 58 dated May 23, 1968), two ring buoys with water lights attached and twelve adult life perservers. The life raft was stowed on the after end of the second deck and secured with a hydraulic release. The two ring buoys were stowed outboard of the hand rails on the port and starboard side of the second deck. The twelve life perservers were stowed throughout the crews quarters and in the upper engine room. The vessel's name and homeport were marked on the two ring buoys. Neither the life raft nor the life perservers were marked with either the vessel's name or homeport. Identification of the life raft was made with the aid of a billing invoice submitted by the vessels owners.

9. Navigation equipment consisted of a Decca compass with automatic pilot, radar and Loran. Voice radio communications equipment covering the frequency bands of 1600-23,000 KHZ, 156-158 MHZ, 2900-3100 MHZ and 9320-9500 MHZ was located in the wheelhouse. A federal Communications Commission License for a ship radio telephone and radio navigation station was issued to the vessel on Dec 19, 1968.

10. A list of the six missing crewmembers is as follows:

[redacted] Master

License: Master of Uninspected Motor Fishing Vessels of not over 500 Gross Tons upon Coastwise Waters not to exceed (50) fifty miles offshore and tributary waters from Eastport, Maine to Port Isabel, Texas. Date of issue 6 March 1963 at Wilmington, N. C. Lic. No. [redacted] Issue No. 1-1. There is no record of this license having been renewed.

[redacted] Mate

License: Master of Uninspected Motor Fishing Vessels of not over 500 Gross Tons upon Coastwise waters, not to exceed 50 miles offshore and tributary waters from Eastport, Maine to Port Isabel, Texas. Date of issue 7 March 1968 at Wilmington, North Carolina. Serial Number [redacted] Issue No. 2-2.

[redacted] Mate

[redacted] Engineer

[redacted] ny Unlic. Rating with engine room

[redacted]

License: Chief Engineer - Steam Any Horsepower - issued at Albany, New York on 11 Sept 1967.

[redacted] Deckhand

[redacted] Cook

[redacted] Cabin Steward, Messman, Utilityman, Cook (FH)

[redacted]

11. The weather forecast for Friday, 31 Oct 1969 in the area from Virginia Beach southward to Cape Fear, N.C. was easterly winds 15 to an occasional 28 knots becoming East and SE 15-25 knots. Small Craft warnings were posted. On Saturday 1 Nov 1969 at 0430 EST gale warnings were put in effect from Cape Hattaras southward with winds of 30 to 40 knots. Rough seas and heavy surf with rain or showers were also forecast for this area by the U. S. Weather Bureau. Small craft warnings continued in effect north of Cape Hatteras with E. to SE winds 20-30 knots. The small craft warning was changed to gale warning at noon on Saturday 1 Nov 1969 with increasing E to SE winds reaching 25 to 40 knots late in the afternoon. Rough seas and above normal tides with cloudy skies and rain or showers were also forecast at 2122 EST on 1 Nov 1969. Reported weather from Diamond Shoals light tower was overcast with heavy rain; wind SE 40 knots seas SE - 20 feet. The weather as logged at midnight 1 Nov 1969 by the salvage vessel CURB then located approximately 60 miles SW of the MARJORIE McALLISTER was wind NE - Force 10. The Masters log book entry made at 0300 onboard the CURB indicated winds force 13. This was described by the Master of the CURB as being 85 to 90 knots. The height of the seas in this area was between 30 to 35 feet. Frying Pan Shoals Light Tower weather report for 2125 EST 1 Nov 1969 was winds SE - 60 gusting to 65-70. Seas and swell were from the SE, 15-25 feet.

12. At approximately 1100, 30 October 1969 the MARJORIE McALLISTER, with a crew of 6 departed New York Harbor without tow enroute directly to Jacksonville, Florida. The vessel had on board approximately 87,000 gallons of diesel fuel, 4000 gallons of potable water, 8000 gallons of wash water, and 900 gallons of lube oil. The reported draft on departure was 14'06" forward and 17'06" aft. On Saturday, 1 Nov 1969, the Master reported to the dispatcher in the owners New York office via the Norfolk Marine Operator. The call which was received at approximately 1000 EST reported that the vessel's position was fifty miles South of Chesapeake Light, that the speed was 13.6 knots at 135 RPM's and the weather was easterly winds of 25 knots and 8 foot seas. Captain [redacted] also reported that all was well at that time. The dispatcher advised Captain [redacted] that one of the company tugs the A. J. McALLISTER weather bound in Morehead City, N. C. had reported that there were mountainous seas on the coast. The dispatcher also advised the Master of the posted gale warnings all the way up the coast. Captain [redacted] acknowledged this information by stating the weather in his present position was not too bad and that he planned to continue and might go into Moorehead City, N.C. Captain [redacted] and two of the crew lived approximately 20 miles from Moorehead City at Williston, N. C.. The next voice communications from the vessel via the Norfolk Marine Operator, received by the New York office was at 4:30 P.M. EST on Saturday 1 Nov 1969. In this report Captain [redacted] reported the vessel's position as being 14 to 17 miles south of Diamond Shoals, N. C. and due off Cape Lookout, N. C. at about 2400. Winds were reported by the vessel as being 35 miles per hour from the Southeast. This was the last report received from the vessel by its owners.

13. The next known transmission from the vessel was at 0025 EST 2 Nov 1969 when the vessel contacted the U. S. Coast Guard Group at Fort Macon, N. C. and reported they were taking on water and experiencing electrical problems in position six miles west of Bouy 14. In response to the inquiry from Fort Macon about the need for Coast Guard assistance their reply was negative although they did request the Coast Guard to standby on 2182 KHZ. At 0049 EST the MARJORIE McALLISTER again contacted the Fort Macon Coast Guard station and requested assistance. The vessel reported her position as being west of Buoy 14 on LORAN line 1970 and also that there were 6 persons on board. At 0055 EST the vessel and Fort Macon attempted to shift frequencies to 2670 KHZ as the transmission on 2182 KHZ was unreadable. During this shift in frequencies all communication with the vessel was lost. Repeated attempts by Group Fort Macon to reastablish communications on both 2182 KHZ and 2670 KHZ were unsuccessful. At this time the salvage vessel CURB O.N. 254289 with [redacted] Lic No. [redacted] as Master was approximately sixty miles away from the MARJORIE McALLISTER. Captain [redacted] had overheard the vessel's communications with the Coast Guard and realized there was a problem in maintaining their radio contact. He therefore called the MARJORIE McALLISTER, and asked for their position with any other information they wished to have passed on to the Coast Guard. The MARJORIE McALLISTER acknowledged this transmission and requested the CURB to standby. This was the last transmission heard by the salvage vessel CURB. Capt. [redacted] stated that his communication with the MARJORIE McALLISTER was loud and clear and that whoever he was talking to on the MARJORIE McALLISTER was perfectly calm and showed no evidence of fright or panic.

14. Because of the vessel's failure to reestablish radio communications, the Group Commander Fort Macon at 0106 EST, 2 Nov 1969 notified the Fifth Coast Guard District Rescue Coordination Center at Portsmouth, Virginia of the vessels plight. Upon receipt of this information a search for the vessel was initiated by Coast Guard aircraft and surface vessels. The first search unit (CG HC 1349) arrived on the scene of the last reported position at 0245 EST and commenced the search. USCGC CHILULA (WMEC 153) arrived at 0555 EST, assumed duties as on scene commander and commenced a coordinated search. Additional Coast Guard search units consisting of the USCGC LAUREL (WLB 291) two helicopters and another fixed wing aircraft were utilized as the search expanded. On the morning of 3 Nov 1969 several commercial party vessels recovered debris in the general area (Lat 34° 38.5 N, Long 76° 17.5 W) of the MARJORIE McALLISTER's last known position. The vessels recovered a 12 man inflatable life raft in a fully inflated condition, a ring buoy with MARJORIE McALLISTER's name, life perservers, and a large hawser. There was also a large oil slick in this position. Shortly thereafter another ring buoy also marked with the missing vessel's name was recovered by the CHILULA. As the search continued some of debris recovered in the same general area was a loaf of bread, a hat, pieces of wood, wooden gratings, a wheelhouse stanchion and an additional towing hawser. The depth of water in this area was approximately 17 fathoms. The assistance of navy vessels, aircraft with metal detecting capabilities and divers was requested by Commander Fifth Coast Guard District because of the possibility of the vessel being close by with the crew entombed

in her. Two vessels the USS RECOVERY (ARS-43) and USS ABILITY (MSO-519 were dispatched to the scene. ABILITY with its special underwater search equipment located a strong sonar contact in the general area of the vessels reported position. RECOVERY proceeded to this location and made an investigation with the aid of its divers. A total of three dives were made in 90 feet of water with negative results. Meanwhile the extensive Coast Guard air and sea search continued with little success except for collecting additional debris including life perservers, pieces of wood, settee cushions, , etc. in the vicinity of the last known position. RECOVERY conducted additional dives in position Lat 34 18.5 N Long 37.0 W after ABILITY had recorded a strong contact. Results of this contact was negative and the active search was suspended on 7 Nov 1969 at 1000 EST.

15. During the search and rescue effort 10,045 square miles of ocean were searched by sea and air. Thirteen square miles of area near Cape Lookout Shoals was searched by sonar plus 54 linear miles, 400 yards on either side of the search axis. Coast Guard aircraft flew 96.9 hours, CHILULA steamed 5 days and 9 hours, LAUREL 4 days and 5 hours, RECOVERY 3 days 22 hours, and ABILITY 3 days 18 hours. Seven hours and 36 minutes of diving time was also recorded using 21 divers also commercial fishing vessels in the area contributed an unknown amount of time in the search

16. During the vessel's brief span of operation she made two offshore coast wise voyages other than the delivery trip from New Orleans, La. to New York and a number of dumping trips off the East Coast. Captain [redacted] had not been aboard in any capacity during any of these offshore voyages. One offshore voyage was the tow of a section of the tanker MANHATTAN from Philadelphia to Mobile, Ala. The other voyage was towing a dredge and two dump scows from New York, N.Y. to Wilmington, N. C. Neither of these voyages exposed the vessel to weather as severe as that reported along the coast during her last voyage. Witnesses who had sailed in the vessel on these voyages were of the opinion that the vessel seemed to behave as any other tug in the weather experienced, although a former master expressed the opinion that the vessel had a tendency to keep water on the after deck longer than other tugs in which he had sailed.

CONCLUSIONS

1. The loss at sea of the M/V MARJORIE McALLISTER on 2 November 1969 was due to sinking in the vicinity of her last reported position, Lat 34° 18' N Long. 76°31' W. after taking on water in heavy weather. The Masters decision to continue on his voyage into an area where known adverse weather conditions prevailed (instead of seeking shelter at Norfolk, Va.) undoubtedly contributed to the casualty. This course of action increased the probabilities of the vessel being overwhelmed by the mountainous seas and high winds in the area where the casualty occurred. The vessel would have become even more vulnerable if the Master actually changed course for Morehead City, North Carolina in accordance with his previously expressed intentions. The low freeboard of the vessel would allow the quartering seas to break on the after deck and in the towing winch enclosure. With these areas shipping water it would be possible for the engine room to flood through the after watertight door, if it were open or damaged, or through the engine room vents, if the level of water building up in the towing winch enclosure became high enough. Such a course change would also increase the possibility of taking heavy spray into the engine room through the stack louvers. In addition, it would increase the possibility of impaired buoyancy or stability due to great amounts of sea water accumulating on the after deck and in the towing winch enclosure. The six crewmembers are missing and presumed dead. They were apparently unable to save themselves due to severity of the weather and the suddenness of the foundering.

2. The possibility of the entrance of water due to a structural defect in the hull is quite remote. The vessel was relatively new and in apparently good condition. The vessel was essentially double hulled due to the number of double bottom tanks and wing tanks throughout most of the vessel. The closed fresh water engine cooling system and the limited number of branch lines and valves from a single sea chest reduced the probability of flooding due to failure of salt water piping or fittings. Although the scantlings, construction, and basic design of the vessel appear suitable for ocean service, certain features such as the low freeboard, low forecastle, open foredeck, pilothouse windows, and the location of vents, louvers, and doors on the weather decks are more compatible with a tug in harbor or inland service. The vessel was equipped with the required amount of approved lifesaving equipment and there is no evidence that the failure of any of this equipment contributed to the casualty.

3. There is no evidence that the Master of the MARJORIE McALLISTER was serving under the authority of any license issued by the Coast Guard. There is no evidence of misconduct, negligence, inattention to duty, incompetence, or violations of law on the part of any of the crewmembers holding merchant marine documents.

4. a. There is evidence of a violation of 46 USC 672(i) in that [redacted] and [redacted] were employed and served on board the MARJORIE McALLISTER without a certificate of service issued by the Coast Guard.

b. There is evidence of a violation of 46 USC 643(1) in that the employment of the crewmembers of the MARJORIE McALLISTER was not reported to the Coast Guard (on form CG-735T).

c. A report concerning the above violations has been forwarded to the Commander, Fifth Coast Guard District.

5. There is no evidence that the Coast Guard or any other governmental agency contributed to the casualty. The weather forecasts and broadcasts were timely, adequate, and indicative of the adverse weather conditions along the East Coast of the United States. The joint search effort by Coast Guard, Navy and commercial units was carried out in a professional manner. There is no evidence that any uncharted or incorrectly charted area or objects were involved.

6. This casualty may have been prevented if the MARJORIE McALLISTER had sought shelter after the Master became aware of the heavy weather ahead or if she had been designed in such a manner as to be able to withstand the extremely adverse wind and sea conditions without shipping large quantities of water while underway. A vessel design that would have allowed the vessel to remain hove to without power in seas of the type encountered may also have prevented the casualty. In particular the casualty might have been prevented if the air intakes to the engineroom had been located at a point other than in a partially enclosed space into which seas from the stern or quarter could break and build up. Although the means by which the water entered the vessel have not been precisely determined it is possible that the casualty could also have been prevented by the elimination of the after watertight door from the towing winch enclosure to the engineroom.

RECOMMENDATIONS

1. It is recommended that action be taken to require licensing by the Coast Guard of Masters of towing vessels.

2. It is further recommended that the Coast Guard seek legislation for the inspection of all towing vessels operating in ocean or coastwise service.

[redacted]

W. G. RODEN
Captain, U. S. Coast Guard
Chairman

[redacted]

E. E. STEWART
Commander, U. S. Coast Guard
Member

[redacted]

J. W. DAWLEY
Commander, U. S. Coast Guard
Member and Recorder