



UNITED STATES COAST GUARD

**INVESTIGATION INTO THE CIRCUMSTANCES
SURROUNDING THE SINKING OF THE**

F/V LADY MARY

**65 NM SOUTHEAST OF CAPE MAY, NEW JERSEY ON
MARCH 24, 2009, WITH MULTIPLE LOSS OF LIFE**



MISLE ACTIVITY NUMBER: 3439089



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**SINKING OF THE F/V LADY MARY 65 NM SOUTHEAST OF CAPE MAY, NEW
JERSEY ON MARCH 24, 2009 WITH MULTIPLE LOSS OF LIFE**

ACTION BY THE COMMANDANT

The record and the report of the Marine Board of Investigation convened to investigate the subject casualty have been reviewed. The record and the report, including the findings of fact, analysis, conclusions, and recommendations are approved subject to the following comments.

COMMENTS ON FACTS

1. EPIRB Activation and the Coast Guard Response. The text of the fifth paragraph of the Executive Summary and, to a lesser extent section B.10.d., imply that the sole reason there was a delay in the Coast Guard's response was because of an error in the registration of the EPIRB which prevented the identification of the EPIRB as being registered to the LADY MARY. This is inaccurate. In addition to the lack of registration information, the 0540 EPIRB transmission also had no location information. If that transmission had included location information, the Coast Guard would have been able to respond as soon as the information was passed on to the appropriate Response Coordination Center, even without having any registration information. In this particular instance, it was not until 0707 that any location information was identified, at which time it was passed on and the response was initiated.

COMMENTS ON ANALYSIS AND CONCLUSIONS

1. Conclusion D.b(1): Of the LADY MARY's seven man crew, there was one survivor. Four crewmembers were recovered deceased. Two deckhands remain missing and are presumed dead.

Comment: On August 13, 2010, a human remain was recovered by a fishing vessel approximately 65 miles east southeast of Cape May, New Jersey. Results of DNA analysis performed by the University of North Texas and confirmed by the Ocean County, New Jersey, Medical Examiner identified the human remain as that of Deckhand 4, one of the two deckhands originally reported as missing. As a result, the record of this incident will be amended to indicate that five crewmembers have been recovered deceased and one deckhand remains missing and is presumed dead.

2. Conclusion D.c(1): The LADY MARY's EPIRB operated properly on the morning of March 24th; however, the start of the rescue mission was delayed by one hour and twenty-seven minutes (0540-0707) because the EPIRB was improperly registered in NOAA's National Beacon Registration database.

Comment: As already discussed in paragraph 1 under the Comments on Facts, the implication that the sole reason there was a delay in the Coast Guard's response was because

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of an error in the registration of the EPIRB which prevented the identification of the EPIRB as registered to the LADY MARY is inaccurate. In addition to the lack of registration information the 0540 EPIRB transmission had no location information. If that transmission had included location information, the Coast Guard would have been able to respond as soon as the information was reported to the Response Coordination Center, even without having any registration information. In this particular instance, it was not until 0707 that any location information was identified, at which time it was reported and the response was initiated.

ACTION ON RECOMMENDATIONS

Recommendation 1: The Commandant should expand the watertight and weathertight integrity requirements in 46 CFR 28.560 to cover all documented commercial fishing industry vessels operating beyond three nautical miles. 46 CFR 28.560 establishes a standard for watertight and weathertight closures and coamings on all decks and bulkheads exposed to the weather, but it doesn't apply to commercial fishing industry vessels that are less than 79 feet in length. No standards exist for fishing vessels like the LADY MARY, who are smaller but operate in the same areas and face the same dangers. Developing standards for watertight and weathertight integrity would prevent unsafe conditions which could lead to downflooding.

Action: I concur with the intent of this recommendation. Extending watertight and weathertight integrity requirements to documented commercial fishing industry vessels under 79 feet in length would likely help prevent the occurrence of flooding, capsizing, and sinking of these vessels. The Coast Guard Authorization Act of 2010 (CGAA) includes language that calls for the establishment of Alternate Safety Compliance Programs (ASCPs) for existing vessels 50 feet or greater in length that are 25 years or older, or are substantially altered after July 1, 2012. These programs must be developed by 2017 and implemented by 2020. Such programs are currently being evaluated in consultation with the Commercial Fishing Safety Advisory Committee (CFSAC). It will be Coast Guard strategy to include stability, subdivision, and watertight and weathertight integrity requirements wherever possible into these ASCPs. In addition, I've directed the Office of Commercial Vessel Compliance to task the Commercial Fishing Vessel Safety Advisory Committee to make a recommendation to the Coast Guard regarding extending the applicability of 46 CFR 28.560 to all commercial fishing vessels operating beyond three nautical miles.

Recommendation 2: The Commandant should establish a requirement for the periodic inspection of watertight and weathertight openings on all documented commercial fishing industry vessels operating beyond three nautical miles, as well as a requirement to record who conducted the inspection, how it was done, and when it was completed. Requiring owners, individuals in charge, crew members, or other qualified persons to systematically inspect and record the condition of openings serves to emphasize their importance and establishes accountability. It would also permit the early detection of potential gaps in watertight integrity and allow time for repairs to prevent unsafe conditions.

Action: I concur with the intent of this recommendation. It is incumbent upon the owner/operator to ensure the seaworthiness of the vessel. The Coast Guard Authorization Act of 2010 includes a requirement for keeping a record of equipment maintenance on vessels operating beyond three miles of the baseline. I believe examination and maintenance of watertight/weathertight closures should be considered for inclusion under this requirement and have included the issue in a rulemaking project currently underway to incorporate the new requirements of the 2010 Authorization Act into the fishing vessel safety regulations in 46 CFR Part 28.

Recommendation 3: The Commandant should amend 46 CFR 28.65(b)(9) to include weathertight closures on the list of especially hazardous conditions, in addition to watertight closures. Missing and inoperable watertight closures are deemed especially hazardous conditions that could result in voyage termination. Yet, no mention is made of weathertight closures, even though their ineffectiveness could also result in an especially hazardous condition. Amending 46 CFR 28.65(b) to include missing and inoperable weathertight closures would give the Coast Guard the authority to require this unsafe condition be corrected before allowing a voyage to continue.

Action: I concur with this recommendation. Pursuant to 46 CFR 28.65(a), a Coast Guard Boarding Officer is authorized to take reasonable steps necessary to ensure the safety of individuals on board the vessel if the vessel is observed being operated in an unsafe manner and it is determined that an especially hazardous condition exists. While missing or inoperable weathertight closures could already be considered a hazardous condition as defined in 46 CFR 28.65(b), such as if it allowed flooding or uncontrolled leakage in any space, I do believe there is value in giving consideration to specifically listing it as an especially hazardous condition and will have it considered in a future rulemaking. As an interim measure, I direct the Office of Commercial Vessel Compliance to include checking weathertight closures as part of Commercial Fishing Vessel Examiner and Boarding Officer training and qualifications, and to ensure Examiners and Boarding Officers understand that inadequate weathertight closures may be cause for termination.

Recommendation 4: The Commandant should reemphasize the importance of having Boarding Officers verify the operability and effectiveness of watertight and weathertight closures, with a focus on those closures located at or below the main deck. Boarding Officers need to be able to recognize this unsafe condition and have it corrected before allowing a voyage to continue, especially onboard commercial fishing industry vessels that are less than 79 feet in length, because the regulations do not include any provisions for watertight integrity on these vessels. Underway checks would detect gaps in watertight integrity or unsafe operating practices, such as routinely keeping a watertight closure open.

Action: I concur with the intent of this recommendation. Coast Guard Boarding Officers already verify the safety of the vessel on which they conduct a boarding, which necessarily includes a general check for functioning watertight closures as possible, and can discuss best practices with vessel crew. However, due to the nature of underway Law Enforcement Boardings and the hazards associated with them, it may not always be practicable or safe to

comprehensively check operability and effectiveness of all closures. This recommendation is further addressed by the actions associated with recommendation (3).

Recommendation 5: The Commandant should instruct dockside Safety Examiners to verify the operability and effectiveness of watertight and weathertight closures, with a focus on those closures located at or below the main deck. Safety Examiners need to verify the operability and effectiveness of watertight and weathertight closures as part of the dockside safety examination. Checking the closures dockside would allow for the early identification and correction of unsafe conditions. Issuance of a Safety Decal or Certificate of Compliance should be contingent upon the soundness of the closures.

Action: I concur with this recommendation. Commercial Fishing Vessel Safety (CFVS) Examiners are aware of the importance of properly working closures, and verify the operability and effectiveness of watertight and weathertight closures, both above and below deck, as part of a dockside safety exam. Examiners currently stress to fishermen the importance of maintaining a vessel's watertight/ weathertight integrity during operations at-sea. I will direct the Office of Commercial Vessel Compliance to ensure closures are addressed during examiner training and qualification programs, and during outreach activities with fishermen, and that decals are not issued to vessels with inoperable closures below the main deck.

Recommendation 6: The Commandant should develop subdivision standards for all documented commercial fishing industry vessels operating beyond three nautical miles. 46 CFR 28.580 establishes subdivision standards, but it doesn't apply to commercial fishing industry vessels that are less than 79 feet in length. No standards exist for fishing vessels like the LADY MARY, who are smaller but operate in the same areas and face the same dangers. Developing standards for subdivision would limit the effects of unintentional flooding and allow vessels in a damaged condition to remain afloat longer.

Action: I concur with the intent of this recommendation. The Coast Guard Authorization Act of 2010 (CGAA) directs the Coast Guard to establish requirements for new commercial fishing vessels 50 feet and greater in length to meet survey and classification rules and vessels 79 feet or greater in length to be assigned a loadline. Additionally, new vessels less than 50 feet in length and built after January 1, 2010, must at a minimum meet construction standards established for recreational vessels. In order to comply with these requirements, new vessels will have to meet any existing subdivision standards associated with those class rules, loadline requirements, and construction standards. The CGAA also requires development of ASCPs for existing vessels 50 feet or greater in length that are 25 years or older or that are substantially altered after July 1, 2012. These programs must be developed by 2017 and implemented by 2020. I plan to include subdivision requirements where possible in these alternative compliance programs.

Recommendation 7: The Commandant should expand the freeing port requirements in 46 CFR 28.555 to cover all documented commercial fishing industry vessels operating beyond three nautical miles. 46 CFR 28.555 establishes a standard for freeing ports in bulwarks, but it doesn't apply to commercial fishing industry vessels that are less than 79 feet in length. No standards exist for fishing vessels like the LADY MARY, who are smaller but operate in the same areas and face the same dangers. Expanding the freeing port requirements would establish minimum

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openings to allow sea water to rapidly drain from the deck, which would reduce the potential for free surface effect, loss of freeboard, and unintentional downflooding.

Action: I concur with the intent of this recommendation, but do not believe a simple expansion of freeing port requirements is appropriate. However, the Coast Guard will consider potential changes to freeing port requirements for vessels engaged in various fisheries as part of any ASCPs developed for vessels 50 feet or greater as required by the Coast Guard Authorization Act of 2010 (CGAA). In addition, I direct the Office of Commercial Vessel Compliance to refer this issue to the Commercial Fishing Vessel Safety Advisory Committee for its consideration and recommendations.

Recommendation 8: The Commandant should add closed or blocked freeing ports to the list of especially hazardous conditions in 46 CFR 28.65(b)(9). Amending 26.65(b) to include closed or blocked freeing ports would give the Coast Guard the authority to require this unsafe condition be corrected before allowing a voyage to continue.

Action: I concur with the intent of this recommendation. If this condition is found on a vessel when boarded at sea, and it cannot be corrected on the spot to ensure safety of the crew it may constitute an especially hazardous condition. I direct the Office of Commercial Vessel Compliance to include checking the condition of freeing ports as a part of Commercial Fishing Vessel Examiner and Boarding Officer training and qualifications, and to ensure Examiners and Boarding Officers understand that closed or blocked freeing ports may be cause for termination.

Recommendation 9: The Commandant should work with the Commercial Fishing Safety Advisory Committee to develop freeing port cover design concepts which retain catch onboard while still allowing rapid clearing of sea water from the main deck. Blocking main deck freeing ports with solid steel covers is a dangerous practice, but a seemingly routine practice on some commercial fishing industry vessels. Alternative engineering controls are needed to allow water to run freely off the main deck, while at the same time retaining catch on deck.

Action: I concur with this recommendation. A proposal will be submitted to the Commercial Fishing Safety Advisory Committee to research existing designs and concepts for freeing port covers that enable catch to be retained onboard the vessel while allowing for rapid drainage of seawater. If the Advisory Committee identifies existing designs or new ones that can be easily constructed and added on a vessel, I will direct the Office of Commercial Vessel Compliance to publish a safety advisory that passes information on those designs to the commercial fishing industry and consider requiring such designs where covers are fitted in a future rule making.

Recommendation 10: The Commandant should expedite the rulemaking project(s) required by the Coast Guard Authorization Act of 2010, to require individuals in charge of commercial fishing industry vessels to pass an approved training program, and, to establish the requirements for these training programs. According to the Coast Guard Authorization Act of 2010, the approved training programs must focus instruction on seamanship, stability, navigation, damage control, personal survival, emergency drills and communications, and weather. The Captain of the LADY MARY, who was the individual in charge, did not demonstrate proficiency in many of these subjects. The training would produce individuals in charge with better awareness of

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unsafe conditions and improved decision making capabilities. This provision of the Act must be implemented as soon as possible if future casualties are to be averted.

Action: I concur with this recommendation. A rulemaking project that addresses this recommendation is currently underway.

Recommendation 11: The Commandant should ensure that approved training programs for individuals in charge also include detailed information about the hazards of making vessel modifications without a stability analysis, the importance of maintaining watertight integrity, the use of Digital Selective Calling (DSC) features on VHF radios, the safety benefits of the Automatic Identification System (AIS), the importance of confirming Emergency Position Indicating Radio Beacon (EPIRB) registration information as correct and keeping it up to date, the hazards associated with fatigue, and the hazards associated with drug use. The Captain of the LADY MARY did not demonstrate proficiency in these topics. Education and awareness of these topics would prevent unsafe conditions from developing, therefore the Coast Guard should incorporate these topics into the approved training program without delay.

Action: I concur with this recommendation. The Coast Guard is already working with the Commercial Fishing Vessel Safety Advisory Committee, National Maritime Center, and others in the development of the associated requirements and competencies to be included in the curricula of the training programs being developed. The topics included in this recommendation will be passed on to those groups for consideration as these efforts continue.

Recommendation 12: The Commandant should develop a prototype training program for individuals in charge of fishing vessels that meets the intent of the Coast Guard Authorization Act of 2010, and Recommendations 10 and 11 above, while the training program requirements are in the process of being codified. There are several benefits to establishing a prototype training program in advance of the Final Rule. The prototype could be published online or on paper, which would provide individuals in charge with some education and awareness of these critical topics before approved training programs are established. Better trained individuals in charge would help to prevent unsafe conditions from developing, which would result in fewer casualties. The Commercial Fishing Safety Advisory Committee or other groups could provide feedback on the prototype training program, which would be useful to help improve the requirements.

Action: I concur with the intent of this recommendation. We are working with the Commercial Fishing Vessel Safety Advisory Committee and the National Maritime Center to develop the requirements and competencies to be included in a curriculum for such a program. After the requirements for a curriculum are developed and implemented, actual training programs specifically designed to fulfill the new requirements will have to be developed and implemented by one or more training organizations, which are then approved by the Coast Guard. However, while we are waiting for such programs to be implemented and approved, I direct the Office of Commercial Vessel Compliance to ensure all Commercial Fishing Vessel Safety Examiners emphasize and support existing safety training programs and courses that address the topics included in the new curriculum and are available to individuals in charge of fishing vessels.

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Recommendation 13: The Commandant should establish specific, and stringent, training program criteria for recognizing and giving credit for recent past experience in fishing vessel operation, as allowed by the Coast Guard Authorization Act of 2010. In the case of the LADY MARY, the on-the-job training (OJT) program, which is likely common to the industry, did not produce a competent and safety minded Captain. Therefore, OJT alone should not form the basis for allowing individuals in charge to receive credit for an approved training program.

Action: I concur with this recommendation. The Coast Guard is working with the Commercial Fishing Vessel Safety Advisory Committee and the National Maritime Center to develop guidelines and criteria for awarding credit for recent past experience in fishing vessel operations.

Recommendation 14: The Commandant should establish a requirement for all commercial fishing industry vessel crew members to pass an approved basic safety training program prior to working onboard, and, establish the requirements for these training programs. The Captain of the LADY MARY provided little, if any, training to the crew on how to use life saving equipment, make emergency broadcasts, launch distress signals, take action to mitigate flooding, manage damage control procedures, abandon ship, or take action for cold water survival. Yet by regulation, he was the only person responsible for making sure the crew understood how and when to use the survival equipment. In this case six crewmen died, one with a survival suit in his hands. This matter is too important to leave solely in the hands of individuals in charge, so crewmen should complete a basic survival training program taught by a trained instructor at least once before working on fishing vessels.

Action: I concur with the intent of this recommendation and will take it under consideration for a future rulemaking. I agree that all crewmembers should complete some type, or receive a minimal amount, of formal safety and survival training before working on a commercial fishing vessel. Instruction and drills on emergency contingencies are currently required for crewmembers, but only on documented vessels that operate beyond the boundary line. Provisions in the Coast Guard Authorization Act of 2010 require that this same training be required for crew members aboard all vessels operating beyond three miles of the baseline. However, this required training does not cover all aspects of safety equipment use and testing and survival techniques. Making more comprehensive safety training mandatory for all individuals prior to employment on fishing vessels, which has been recommended by the Commercial Fishing Vessel Safety Advisory Committee, is a discretionary requirement under the Coast Guard's authority to implement safety rules and will require a rulemaking project to implement. At this time, my focus is on implementing enhanced training requirements prescribed by the Coast Guard Authorization Act of 2010. In addition, I will direct the Office of Commercial Vessel Compliance to continue to encourage vessel owners/operators to voluntarily require such training of their crews.

Recommendation 15: The Commandant should add a paragraph to 46 CFR 28.65 to establish that an especially hazardous condition exists if a crew cannot demonstrate familiarity with their duties and responses to the contingencies listed in 46 CFR 28.270(a). Simply operating an uninspected fishing vessel in compliance with the life saving carriage requirements of 46 CFR 28 is meaningless unless the Captain and crew know how to use the equipment that is available to them. Familiarity with assigned duties and responses can only be achieved through safety

orientations and with practice in the form of regular drills; otherwise the result may be ineffective or missing actions, as seen during the abandonment of the LADY MARY. Adding failure to comply with 46 CFR 28.270 to the list of especially hazardous conditions would give the Coast Guard the authority to require this unsafe condition be corrected before allowing a voyage to continue.

Action: I concur with the intent of this recommendation. While it may not be practicable for Coast Guard Boarding Officers to assess crew member competencies during underway boardings, the implementation of the provisions of the Coast Guard Authorization Act of 2010 to log training and drills, and to demonstrate emergency drills during dockside examinations will provide the Coast Guard the opportunity to assess familiarity with duties and responses to the contingencies.

Recommendation 16: The Commandant should amend 46 CFR 28 to require the individual in charge of a commercial fishing industry vessel to keep a record of safety orientations, instruction and drills. The Coast Guard Authorization Act of 2010 requires a record of instruction and drills, but safety orientations must also be recorded. Requiring individuals in charge to keep a record of safety orientations, instructions and monthly drills would emphasize their importance and establish accountability.

Action: I concur with this recommendation. The recommended action is being undertaken in a rulemaking project that will consider implementing this requirement for commercial fishing vessels operating beyond 3 nautical miles from the baseline, or coastline of the Great Lakes.

Recommendation 17: Boarding Officers and dockside Safety Examiners should conduct three point Emergency Position Indicating Radio Beacon (EPIRB) Unique Identifier Number (UIN) registration checks. The three point check should compare the UIN registered in the National Beacon Registration (NBR) database with the UIN on the decal and the actual UIN coded into the EPIRB. For Safety Examiners, confirmation should occur before a Commercial Fishing Vessel Safety Decal or Certificate of Compliance is issued. This would ensure that emergency contact information is positively linked with an EPIRB and is instantly retrievable in the NBR Database upon detection of an alert.

Action: I concur with this recommendation. Commercial Fishing Vessel Safety (CFVS) Examiners and Boarding Officers are already required to ensure that Emergency Position Indicating Radio Beacons (EPIRBs) are installed to function as designed, that they are properly registered with a NOAA/COSPAS-SARSAT decal attached, and they log Unique Identifier Number (UIN) information. In addition, they check that the UIN and vessel name on the decal match the information on the device and vessel. CFVS Examiners also emphasize the need for vessel owners/operators to maintain up-to-date EPIRB information during dockside examinations. The Coast Guard will send a notice out to all CFVS Examiners and Boarding Officers re-emphasizing the proper check procedures.

Recommendation 18: The Radio Technical Commission for Maritime Services (RTCM) should add internal Global Positioning System (GPS) capability to the technical and performance standards found in the "RTCM Recommended Standards for 406 MHz Satellite Emergency

Position Indicating Radio Beacons (EPIRBs).” The COSPAS-SARSAT system could take up to ninety minutes to identify the location of an activated EPIRB if no position data is transmitted with the distress alert, even if it is correctly registered in the NBR database. Adding internal GPS capabilities to the Recommended Standards for EPIRBs would economically incorporate the best available technology to eliminate a potentially deadly delay.

Action: I concur with this recommendation. The Radio Technical Commission for Maritime Services (RTCM) adopted RTCM 11000.3, Standard for 406 MHz Satellite Emergency Position-Indicating Radiobeacons (EPIRB), June 12, 2012, which requires an integral GPS/GNSS. The Coast Guard is preparing a letter to the Federal Communications Commission recommending that this new standard be incorporated as a mandatory requirement under 47 CFR Part 80.

Recommendation 19: NOAA should automate their internal process for entering Unique Identifier Numbers in the National Beacon Registration database. NOAA should automate their internal process to eliminate the potential for transcription and/or key stroking errors when entering UINs into the NBR database. This would ensure that every UIN entered into the database is accurate and positively correlated to a vessel and its emergency contact information.

Action: I concur with the intent of this recommendation. This investigation identified a situation where the Unique Identifier Number was incorrectly recorded in the National Beacon Registration database; however, NOAA is best suited to determine what actions are appropriate to prevent a similar occurrence in the future. Therefore, I direct a copy of this investigation report be forwarded to NOAA recommending they review its findings with respect to the beacon registration error and take corrective action as they determine appropriate.

Recommendation 20: Sector Delaware Bay should reevaluate their procedures for qualifying Communication Watch Standers and Operational Unit Controllers. Sector Delaware Bay should review their procedures to ensure only Communication Watch Standers who fully understand Coast Guard policies and know the capabilities of the radio equipment they are guarding, stand the watch. Additionally, the Sector should review their procedures to make certain they employ Operational Unit Controllers that have the skills needed to effectively supervise the watch. This would result in better case management and fewer execution errors in the broadcasting of UMIBs.

Action: I concur with the intent of this recommendation. A Sector Communications Review performed in 2012 by Commandant (CG-6) confirmed the findings of this investigation. Sectors will be directed to complete the recommended actions of that review.

Recommendation 21: The Commercial Fishing Safety Advisory Committee should explore the possibility of establishing incentives for commercial fishing industry vessels to voluntarily undergo third party surveys which address watertight integrity, internal subdivision, and other preventative safety measures. A third party, non-regulatory, survey would have helped raise Smith & Smith Inc.’s awareness to the potential hazards associated with the LADY MARY’s watertight integrity, and pre-casualty loaded condition, including the cumulative effect of the modifications, consumables and catch. Providing incentives would encourage owners of commercial fishing industry vessels to voluntarily undergo a survey, raising their awareness of

unsafe conditions and allowing them to correct the conditions and prevent casualties from occurring.

Action: I concur with this recommendation. A request will be submitted to the Commercial Fishing Safety Advisory Committee asking them to consider this recommendation.

Recommendation 22: The Commandant should actively promote implementation of the Crew Endurance Management (CEM) System to identify and control crew endurance risk factors onboard commercial fishing industry vessels. Fatigue likely contributed to the Captain and crew's reduced situational awareness and operational decision making capabilities. Promoting the use of the Crew Endurance Management System would give crew members of commercial fishing industry vessels the opportunity to reduce their risk of fatigue-related accidents.

Action: I concur with the intent of this recommendation. While I find there is insufficient evidence to determine that fatigue was an actual factor in this particular incident, I concur there is a value in considering the effects fatigue can play in marine casualties and accidents in the commercial fishing industry and how the implementation of crew endurance management principles could address the associated risk factors and improve overall safety. Therefore, I direct the Office of Commercial Vessel Compliance to request the Commercial Fishing Safety Advisory Committee develop an action plan that promotes and implements crew endurance management principles within the commercial fishing industry.

Recommendation 23: The Commandant should seek authority to mandate a licensing program for individuals in charge of all documented commercial fishing industry vessels operating beyond three nautical miles. A licensing program would make certain that individuals in charge pass at least one drug test, had relevant sea-going experience and possess minimum competency standards.

Action: I concur with the intent of this recommendation. The Coast Guard and the Commercial Fishing Vessel Safety Advisory Committee have recommended to Congress that the Coast Guard be granted the statutory authority to implement licensing requirements for commercial fishermen. In the absence of such authority, the Coast Guard Authorization Act of 2010 did include a provision that gives the Coast Guard the authority to implement requirements for competency training for individuals in charge of a commercial fishing vessel. While not as extensive as the requirements associated with obtaining a merchant mariner credential or license, these requirements, when developed and implemented will address many of the same topics and issues, including some of those that were found to be factors in this casualty.

Recommendation 24: The Commandant should require pre-employment, random, and reasonable cause drug testing for those crew members who are in safety sensitive positions onboard documented commercial fishing industry vessels operating beyond three nautical miles. Because individuals in charge and crew are not required to hold Merchant Mariner Credentials, the only instance when they are drug tested is after a casualty. Instituting a pre-employment, random, and reasonable cause drug testing program covering all crew members who are in safety sensitive positions would reduce the risk to crews and vessels.

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Action: I concur with this recommendation. Based on the findings of this and previous marine casualty investigations involving commercial fishing vessels, I concur it is worth undertaking an effort to develop and implement requirements for a drug testing program that applies to commercial fishing vessels and their crews and direct the appropriate Coast Guard program offices to initiate such a project. In the meantime, I direct the Office of Commercial Vessel Compliance to continue to educate fishermen on the dangers of working on or operating a vessel when impaired for any reason and to conduct testing whenever required or allowed under 46 CFR Part 4 and 33 CFR Part 95.

Recommendation 25: The Commandant should amend 46 CFR 28.245(c) to remove the provision which allows satellite communication capability to substitute for radiotelephone transceivers. Satellite phones cannot be relied upon to instantly alert the Coast Guard and other vessels of a distress, since the user would have to directly dial the intended recipient. Radios on the 2-4 MHz band give fishing vessels operating beyond line-of-sight radio communications the ability to broadcast a distress and communicate directly with many Coast Guard stations and vessels at once. Radios are also able to receive distress calls and monitor Urgent Marine Information Broadcasts and weather warnings.

Action: I concur with the intent of this recommendation. On July 20, 2012, the Deputy Commandant for Operations approved a decision to discontinue the Sector Medium Frequency Distress and Safety System. Distress alerting on voice in the 2-4 MHz band has in fact become unreliable and will only worsen. Although satellite telephones cannot alert nearby ships, satellite terminals recognized by the Global Maritime Distress and Safety System, or otherwise having certified distress alerting capability and backup power, are far more reliable than radios in the 2-4 MHz band. The Coast Guard will consider amending 46 CFR 28.245(c) to remove the provision which allows HF radiotelephones and replace it with mobile satellite terminals certified for distress alerting, or other reliable means of distress communications such as an HF radiotelephone equipped with digital selective calling and interconnected to GPS.

Recommendation 26: The Commandant should educate fishermen on the drawbacks of using satellite communication capability to substitute for radiotelephone transceivers. For the same explanation offered in Recommendation 25 above, satellite phones cannot be relied upon to instantly alert the Coast Guard and other vessels of a distress; therefore commercial fishermen need to be informed of the shortcomings of using satellite capability as a means for emergency communications.

Action: I concur with the intent of this recommendation. We will educate fishermen on the drawbacks of using radiotelephone transceivers not having DSC and GPS capability or satellite phones not having a recognized distress alerting capability, and recommend instead either a distress alert-capable satellite terminal or a DSC-capable HF radiotelephone interconnected to a GPS, having backup power capability.

Recommendation 27: The Commandant should work with the National Marine Fisheries Service to establish a Memorandum of Understanding that allows the issuance of Urgent Marine Information Broadcasts over the Vessel Monitoring System. The VMS is a satellite based system which allows two-way communications with vessels operating beyond line of sight radio

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horizons. Establishing a MOU that permits use of the VMS for disseminating UMIBs to offshore fishing vessels would help get critical information to fishing vessels by establishing another means of communication.

Action: I concur with this recommendation. The Coast Guard will work with the National Marine Fisheries Service to establish an agreement that will allow the issuance of Urgent Marine Information Broadcasts over Vessel Monitoring Systems where such a capability exists.

Recommendation 28: The Commandant should reemphasize the importance of COMDTINST 16130.2E, section 2.6.1.3, which says that Urgent Marine Information Broadcasts should give both a latitude and longitude and a geographic description, and those units that issue UMIBs should work with the National Marine Fisheries Service to identify the geographic descriptions of common fishing areas for inclusion in the UMIBs. UMIBs that contain recognizable geographic descriptions in addition to latitude and longitude would help fishermen quickly identify information which applies to them and take appropriate action, such as rendering assistance to a vessel in distress.

Action: I concur with this recommendation. As a result of this investigation, I will issue a Lessons Learned to all Area, District, and Sector commands emphasizing the importance of including as much information about a situation as is reasonable in the text of an Urgent Marine Information Broadcast (UMIB) in accordance with section 2.6.1.3 of COMDTINST 16130.2E. This includes providing both latitude and longitude and geographic description of the distress location. In addition, it will recommend that they work with the National Marine Fisheries Service to identify the geographic descriptions of common fishing areas for inclusion in UMIBs.

Recommendation 29: The Commandant should amend 46 CFR 28.265 to require that emergency instructions be written and posted in languages understood by the crew. Posting Emergency Instructions and Procedures for Making a Distress Call in languages understood by the crew is an essential step in making sure everyone on board understands their roles and the procedures to be taken during an emergency situation. An understanding of roles and procedures would result in better organization and less confusion, and would increase chances of survival during life threatening situations.

Action: I concur with this recommendation. I believe it is important that crew members of a commercial fishing vessel be able to understand the posted emergency instructions required by 46 CFR 28.265 and that ensuring they are in languages understood by the crew can increase the likelihood that they do. Therefore, I will see that this issue is included in a future rulemaking project to amend the requirements for commercial fishing industry vessels found in 46 CFR Part 28.

Recommendation 30: The Commandant should educate commercial fishing industry vessel owners about the benefits of installing Automatic Identification System transceivers, and encourage their use. Though not a factor in this casualty, commercial fishing vessels share the same waters as deep draft merchant vessels; sometimes in close proximity. Automatic Identification System transceivers and vigilant watch keeping would create early awareness and minimize the chance of collision.

Action: I concur with this recommendation. A current rulemaking project proposes to mandate the use of the Automatic Identification System (AIS) in all U.S. navigable waters, by most self-propelled vessels of 65 feet or more, including commercial fishing vessels. In preparation, the Coast Guard has already been encouraging the use of AIS by all segments of the marine industry, including commercial fishing. As a means to continue to educate and prepare the commercial fishing industry vessel owners who will likely have to comply with this new requirement, as well as encourage others to install AIS equipment voluntarily, the Coast Guard will publish and disseminate an informational flier through our public website, our District Commercial Fishing Vessel Safety (CFVS) Coordinators and CFVS Examiners in the field, referencing this incident as an example of the benefits of installing Automatic Identification System (AIS) transceivers or AIS search and rescue transmitters (AIS SARTS).

Recommendation 31: The National Oceanic and Atmospheric Administration should demarcate Limited Access Areas on nautical charts. Identifying the boundaries of Limited Access Areas, which typically have a dense concentration of fishing vessels during open seasons, provides a ready reference for commercial fishermen, merchant mariners, and the Coast Guard. The demarcation would be particularly useful as a reference when issuing UMIBs and BNTMs, as well as for voyage and SAR planning purposes.

Action: I do not concur with this recommendation. Limited Access Areas (and other areas that have dense concentrations of fishing vessels) are seasonal and can be changed frequently and on very short notice and thus are not appropriate for marking on nautical charts. Ready references on the existence, seasonality and location of such areas are already available for and used by the Coast Guard and commercial fishermen. Even so, as this recommendation is addressed to the National Oceanic and Atmospheric Administration (NOAA), I will forward it with a copy of this report to NOAA for its consideration and action as appropriate.

Recommendation 32: Districts should publish a Broadcast Notice to Mariners, when appropriate, for geographic regions expected to have a dense concentration of fishing vessels. Though not a factor in this case, timing Broadcast Notice to Mariners with the dates and locations of concentrated activity would help prevent close quarter situations from developing between deep draft merchant vessels and commercial fishing industry vessels.

Action: I concur with this recommendation. Broadcast Notice to Mariners (BNM) is the method by which important navigation safety information is disseminated in the most expedient manner. This information includes, but is not limited to, information regarding aids to navigation maintained by or under the authority of the Coast Guard, weather, search and rescue (SAR) information, military exercises, marine obstructions, ice reports, changes in channel conditions, and important bridge information. In general, these transmissions include information vital to mariners operating in or approaching the coastal waters of the United States, its territories, and possessions. Commandant has delegated the responsibility of issuing BNMs to the District Commanders. The District Commander has broad discretion in determining the content of BNMs. I will forward this recommendation to each Coast Guard District Commander along with a copy of this report for their consideration advising them that they should consider issuing BNMs if/when they've determined that doing so will contribute to safe navigation.

Recommendation 33: The Commandant should establish stability requirements for all documented commercial fishing industry vessels operating beyond three nautical miles. 46 CFR 28 Subpart E establishes stability requirements for commercial fishing vessels over 79 feet in length. No standard exists for fishing vessels like the LADY MARY, who are smaller but operate in the same areas and face the same dangers. Establishing stability requirements for all documented commercial fishing industry vessels which operate beyond three nautical miles would raise the overall level of safety and awareness by individuals in charge; most notably by prompting stability calculations, the issuance of a stability letter, and instructions for what to do with substantially altered vessels.

Action: I concur with this recommendation. Extending stability requirements to fishing vessels 79 feet or less in length operating beyond three nautical miles has also been recommended by the Commercial Fishing Vessel Safety Advisory Committee (CFVSAC) and was pursued by the Coast Guard in a past discretionary regulatory project, which also included proposals to require stability training for owners, masters, and engineers of commercial fishing vessels. However, that project was later withdrawn in order to focus on implementing the legislative mandates of the Coast Guard Authorization Act (CGAA) of 2010. Implementation of the provisions of the CGAA will require new vessels 50 feet and greater in length to meet survey and classification rules and vessels 79 feet or greater in length to be assigned a loadline. The applicability of these requirements will address recommendations for new vessels build after July 1, 2012. Also, new vessels less than 50 feet in length and built after January 1, 2010, must at a minimum meet construction standards established for recreational vessels. The CGAA also requires development of ASCPs for existing vessels 50 feet or greater in length that are 25 years or older or that are substantially altered after July 1, 2012. These programs must be developed by 2017 and implemented by 2020. We plan to include stability requirements where possible in these ASCPs. Any further changes deemed appropriate once the provisions of the CGAA are implemented will be included in a follow-on rulemaking project. In the meantime, the Coast Guard will continue to stress the Coast Guard's concern and address stability during dockside examinations, as well as continue to conduct and support safety training programs covering stability for fishermen.

Recommendation 34: The National Institute for Occupational Safety and Health should conduct an analysis to compare the safety benefits of scheduling longer rest periods to the costs of additional underway time, and share this information with commercial fishing industry vessels. NIOSH should conduct this analysis and share the results with commercial fishermen so that they have a full appreciation of the risks and a better understanding of the potential consequences of sacrificing rest with the intent of shortening the voyage.

Action: I concur with this recommendation. I direct a copy of this investigation report be forwarded to the National Institute of Occupational Safety and Health recommending they review its findings and take action as they determine appropriate.

Recommendation 35: The National Marine Fisheries Service and Coast Guard Safety Examiners should educate the owners of commercial fishing industry vessels which are required to use the Vessel Monitoring System (VMS) about the benefits of selecting a unit with a Panic Button.

Selecting a VMS unit with the optional Panic Button would provide redundancy for communicating a distress. It would allow commercial fishermen to instantly send a distress signal with GPS coordinates to a VMS vendor operations center that would then relay the alert to the Coast Guard. It is especially important to inform commercial fishermen utilizing satellites phones in lieu of radiotelephones about the benefits of this feature when selecting a VMS vendor and unit.

Action: I concur with this recommendation. It is important to make clear, however, that the Vessel Monitoring System (VMS) unit with a Panic Button as a means to transmit a distress signal does not replace the need for EPIRB, radiotelephone, satellite telephone, and associated capabilities for transmitting a distress signal. I will direct the office of Commercial Vessel Compliance to have an informational flier prepared and published for use by Commercial Fishing Safety Examiners and posted on the Coast Guard's Commercial Fishing Vessel Safety website that provides information on the benefits of VMS units with Panic Buttons.

Recommendation 36: If not doing so already, dockside Safety Examiners should educate owners and individuals in charge of commercial fishing industry vessels on the hazards of making vessel modifications without a stability analysis, the importance of maintaining watertight integrity, the use of Digital Selective Calling (DSC) features on VHF radios, the Coast Guard's Rescue 21 system, the safety benefits of the Automatic Identification System (AIS), the importance of verifying correct Emergency Position Indicating Radio Beacon (EPIRB) registration information, the hazards associated with fatigue, and the hazards associated with drug use. The Shore Manager and Captain of the LADY MARY were uninformed on these matters and it led to tragic consequences. The courtesy safety examination is a good forum for discussing these topics and if done well, it would help eliminate unsafe conditions and result in owners and individuals in charge with better knowledge and understanding for decision making.

Action: I concur with this recommendation. Commercial Fishing Vessel Safety (CFVS) Examiners already educate owners and individuals in charge of commercial fishing industry vessels on most, if not all of these issues; however, their current ability to do so is limited by the fact that dockside examinations are currently voluntary, so they often do not have the ability to reach all members of the industry. The impending implementation of the dockside examination requirements contained in the Coast Guard Authorization Act (CGAA) of 2010 will help ensure that our education efforts reach a greater number of owners and crew in the fishing industry.

Recommendation 37: Dockside Safety Examiners should verify that any VHF radio with Digital Selective Calling (DSC) features on a commercial fishing industry vessel has been programmed with the appropriate Maritime Mobile Service Identity (MMSI) number, and, where possible, connected to the vessel's Global Positioning System (GPS) unit. DSC radios imputed with the MMSI numbers and GPS are the simplest and fastest method for most fishing vessels to initiate a Coast Guard rescue. Inputting these two features into the radios has the added benefit of providing the Coast Guard with an identity and exact location of the distress. Safety Examiners should specifically inform individuals in charge of its benefit and require the inputs before issuing a Safety Decal or a Certificate of Compliance.

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Action: I concur with this recommendation. Commercial Fishing Vessel Safety (CFVS) Examiners will continue to verify the operability of VHF radios and point out that Digital Select Calling (DSC) features will not transmit the proper distress signal if the MMSI number has not been programmed into the radio during Dockside Safety Examinations. Furthermore, when speaking with fishermen CFVS Examiners regularly emphasize the added benefit of having the vessel's communication equipment connected to the vessel's GPS unit in the event of a search and rescue scenario. In addition, we will continue to post and distribute information and reference material to members of the commercial fishing industry on the proper installation and testing of VHF radios with DSC, programming the MMSI number, and connecting to GPS.

Recommendation 38: The Commandant should add a new provision to 46 CFR part 28 stating that all documented fishing vessels are subject to the regulations contained in 46 CFR Subchapter G (Documentation and Measurement of Vessels). Amending 46 CFR 28 to include this provision would direct owners and individuals in charge to Subchapter G and would remind them of the need to inform an authorized measurement organization of their intent to structurally alter their vessel or change the use of a space within the vessel. This may prompt a tonnage survey which would prevent latent unsafe conditions.

Action: I concur with the intent of this recommendation. The fact that an owner of a commercial fishing vessel has gone through the process of having his or her vessel's documentation issued and periodically renewed routinely reminds them that they are subject to the regulations contained in 46 CFR Subchapter G. As such, I see little value in referencing that fact in 46 CFR Part 28. However, I do believe there is value in continuing to educate owners and individuals in charge of commercial fishing vessels on the importance of understanding the effects of modifications, alterations and other changes made to their vessels on their stability and operational capabilities. I direct the Office of Commercial Vessel Compliance to ensure that Commercial Fishing Vessel Safety (CFVS) Examiners include this topic in their discussions with fishing vessel owners and operators when they conduct dockside safety examinations.

Recommendation 39: Dockside Safety Examiners should work with owners and individuals in charge of a commercial fishing industry vessel to assess whether any modifications have been made to the vessel, and if so, remind the individual that tonnage remeasurement may be required under the provisions of 46 CFR 69.19. For the same reasons explained in Recommendation 38 above, dockside Safety Examiners should inform owners and individuals in charge of the need to inform the Coast Guard or an authorized measurement organization whenever they intend to structurally alter their vessel or change the use of a space within the vessel.

Action: I concur with this recommendation. When conducting dockside safety examinations, Commercial Fishing Vessel Safety (CFVS) Examiners will assess whether modifications have been made to fishing vessels and assess when remeasurement may be required. In addition, for vessels greater than 79 feet in length, they will assess if modifications constitute a substantial alteration as outlined in 46 CFR 28.501 and if additional stability requirements apply in addition to the requirement for a new tonnage survey.

Recommendation 40: Dockside Safety Examiners should require the individual in charge and the crew of a commercial fishing industry vessel to demonstrate familiarity with their duties and

responses to the contingencies listed in 46 CFR 28.270(a) prior to issuing a Safety Decal or a Certificate of Compliance. It is impossible for Safety Examiners to evaluate the crew's response to emergencies or their familiarity with emergency duties if the crew is not present for safety examinations. Requiring crews to demonstrate their skills would give Safety Examiners an opportunity to provide vital feedback that increases the knowledge and competencies of those who face the greatest risk.

Action: I concur with the intent of this recommendation. A typical Dockside Safety Examination (DSE) already includes a requirement that emergency drills be demonstrated as part of the requirements for issuance of the Commercial Fishing Vessel Safety (CFVS) Decal; however, crewmembers participating in dockside emergency drills in the presence of CFVS Examiners are not always those who will get underway aboard the fishing vessel. As such, dockside drills do not necessarily demonstrate the underway crew's familiarity with the duties and responsibilities for contingencies listed. The Coast Guard Authorization Act (CGAA) of 2010 includes a requirement for documenting required training and emergency drills that will allow Commercial Fishing Vessel Safety Examiners to check that the specific individuals in charge and crewing fishing vessels are receiving training and participating in drills.

Recommendation 41: The Commandant should ensure that Fisheries Management Council meetings in all regions are attended by Coast Guard representatives from both the Living Marine Resources program and the Prevention program. If not already doing so, representatives from the Coast Guard Prevention program should actively participate in Fisheries Management Council meetings in order to share information, such as marine casualty data, lessons learned and best practices.

Action: I concur with this recommendation. It is already Coast Guard policy that the advisory, non-voting seat on each Fishery Management Council is filled by a representative from the Coast Guard's Living Marine Resources program and its representatives attend all applicable Regional Fishery Management Council meetings. In addition, while representatives from the Coast Guard's Prevention Program had often attended Fisheries Management Council meetings in the past, I will make it a requirement for future meetings.

Recommendation 42: The Commandant should work with the National Institute for Occupational Safety and Health (NIOSH) to implement a Scientific Safety Assessment Process for individual fisheries before developing alternative safety compliance programs required by the Coast Guard Authorization Act of 2010. NIOSH has proposed a six step plan to assess the safety of individual fisheries. This process would identify the specific risks associated with individual fisheries, which is vital information for developing alternative safety compliance programs to mitigate those risks.

Action: I concur with this recommendation. As noted in the recommendation, the National Institute for Occupational Safety and Health (NIOSH) has already developed a proposed safety and risk assessment plan for individual fisheries for consideration by the National Oceanographic and Atmospheric Administration (NOAA) under National Safety Standard 10. I believe a similar plan or process will be useful in the development of the Alternate Safety Compliance Programs

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(ASCPs) required by the Coast Guard Authorization Act of 2010 and will seek to have NIOSH's collaboration in the development of these programs.

Recommendation 43: The Commandant should educate owners and individuals in charge of commercial fishing industry vessels about the limited scope of safety examinations. 46 CFR Subchapter C did not address many of the unsafe preconditions that factored into the sinking of the LADY MARY and the loss of six crew members. Informing owners and individuals in charge of the limited scope of the safety examination would prevent a false sense of security and remove the perception that no further action is needed after a safety decal is issued.

Action: I concur with this recommendation. Commercial Fishing Vessel Safety Examiners do discuss this issue with personnel from the commercial fishing industry, particularly in regards to hull integrity and material condition of the vessel. The need for this issue to be included in their interaction with the owners and individuals in charge of commercial fishing vessels during dockside examinations will be re-emphasized with the Coast Guard's CFV Examiners and include guidance on recommending condition surveys be conducted to ensure the overall condition of the vessels.

Recommendation 44: Captain [REDACTED] should receive a Public Service Award for his exceptional efforts in leading multiple dives on the sunken LADY MARY to examine the vessel and to recover a missing crew member, and for providing video and still photographs which were invaluable to the investigation of the casualty.

Action: I concur with this recommendation. Captain [REDACTED] was awarded the Distinguished Public Service Award by the Commander of the Coast Guard's Atlantic Area on November 16, 2011.

Recommendation 45: The Commandant should close this investigation.

Action: This investigation is closed.

[REDACTED]

PETER V. NEFFENGER
Vice Admiral, U.S. Coast Guard
Deputy Commandant for Operations



16732
March 2, 2011

MEMORANDUM

From: [REDACTED]
CDR Kyle P. McAvoy
Chairman, Marine Board of Investigation

[REDACTED]
LCDR [REDACTED]
Member, Marine Board of Investigation

[REDACTED]
LCDR [REDACTED]
Recorder, Marine Board of Investigation

To: Commandant (CG-5)

Thru: (1) Commandant (CG-545)
(2) Commandant (CG-54)

Subj: SINKING OF THE F/V LADY MARY WITH THE LOSS OF SIX LIVES, 60 NM ESE
OF CAPE MAY, NEW JERSEY ON MARCH 24, 2009

Ref: (a) Marine Board of Investigation Convening Letter, dated March 30, 2009
(b) Coast Guard Marine Safety Manual, Volume V, COMDTINST 16000.10A

1. In accordance with reference (a), the enclosed Report of Investigation is submitted for your review.
2. The report conforms to reference (b), as applicable. The basic compilation of the report includes Findings of Fact, Analysis, and Conclusion sections, and it ends with proposed Recommendations intended to prevent similar casualties from occurring in the future.
3. The Marine Board held three public hearings in 2009. During the hearings, twenty witnesses testified and 153 exhibits were entered into the official record. After the public hearings, the Marine Board drew upon various experts to assist with the analysis, including forensic specialists at the National Transportation Safety Board, the USCG Marine Safety Center, the USCG SAR School in Yorktown, VA, and mechanical engineers at Old Dominion University in Norfolk, VA.
4. While the Marine Board is grateful to many individuals and organizations whose expertise and dedication proved vital in bringing this investigation to a close, the following people and organizations deserve a special thank you and Bravo Zulu acknowledgement:
 - a) The Captain and crew of the NOAA Survey Vessel THOMAS JEFFERSON. Captain Tod Schattgen and his crew located the sunken LADY MARY with precision accuracy, and then remained underway to host the first Remotely Operated Vehicle (ROV) attempts to view the sunken LADY MARY.

Subj: SINKING OF THE F/V LADY MARY WITH THE LOSS OF SIX LIVES, 60 NM ESE OF CAPE MAY, NEW JERSEY ON MARCH 24, 2009

- b) Captain Dennis Tully and his staff at the New Jersey State Police (NJSP) Marine Services Bureau. Captain Tully and his officers volunteered use of their ROV to obtain the first underwater look of the LADY MARY. To ensure success, they constructed a special housing unit for their ROV, dubbed the "dog house," to ensure successful launching and retrieval of the ROV and got underway on the USCGC WILLOW for three days to operate the ROV and collect video evidence.
- c) The Captain and crew of the USCGC WILLOW. CDR Owen Gibbons and his crew hosted Board members and the NJSP as they deployed their ROV to obtain the first views of the wreck site. The crew of WILLOW enthusiastically worked to ensure the rigging and launching of the "dog house" and all its associated gear was successful and the WILLOW's engineers tirelessly worked to make sure the vessel's dynamic position system was up to the task of holding station in less than desirable conditions.
- d) Captain [REDACTED] and his team of divers. Captain [REDACTED] and his team fully documented the wreck site with still photography and video, and recovered the remains of one of the missing crew members from inside the fish hold. Their efforts proved vital to the Board's ability to understand and complete this investigation.
- e) The Military Sealift Command, Captain [REDACTED] and Captain [REDACTED] and the crews of the USNS GRASP and USNS APACHE for delivering outstanding logistical support. The Board greatly appreciated the expertise of all involved and we are grateful for the hospitality offered by the Captains and crews.
- f) CWO2 [REDACTED] and the USN Mobile Diving and Salvage Unit Two in Little Creek, Virginia for recovering the rudder and other evidence from the wreck site. Especially impressive was the sheer eagerness and determination with which they pursued the mission.
- g) And last, but certainly not least, LT [REDACTED], USCGR, whose unrelenting passion and pursuit of the truth was an inspiration to the entire Board.

4. I am available to answer any questions regarding this report.

#

Enclosure: (1) Report of Investigation regarding the sinking of the Uninspected Fishing Vessel LADY MARY, Official Number 520834, with Six Lives Lost 60 NM ESE of Cape May, New Jersey on March 24, 2009

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APPENDICES

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- (c) List of Tables
- (d) Timeline
- (e) National Transportation Safety Board Materials Laboratory Factual Report
- (f) U.S. Coast Guard Marine Safety Center Post Sinking Stability Analysis
- (g) Official Record: List of Witnesses & List of Exhibits
- (h) Marine Board of Investigation Convening Letter
- (i) Marine Safety Alert – EPIRB and PLB Registration; July 13, 2009

A. EXECUTIVE SUMMARY

On March 18, 2009, the Captain and crew of the Fishing Vessel LADY MARY got under way from Cape May, NJ, en route the Elephant Trunk Sea Scallop Access Area. The LADY MARY was a 71' uninspected commercial fishing vessel. The vessel and the crew of 7 (the Captain and 6 deckhands), made the transit to the Elephant Trunk, which is approximately 60 nautical miles east of the entrance to the Delaware Bay off the Mid-Atlantic Coast, and spent the next 5 days fishing for scallops. By midnight on March 23, 2009, the vessel had approximately 10,500 pounds of scallops onboard which was 2,000 pounds short of their targeted catch for the trip.

Between 0001 and 0103 on March 24th (all times in this report are Eastern Standard Time), the crew stopped dragging, brought the scallop dredge on board, and set it on the main deck but did not empty it. After 0103, the LADY MARY drifted for approximately four hours. Sometime between 0001 and 0500, the crew opened the hatch cover to the steering lazarette and rigged the space for dewatering using an independent electric bilge pump that was stored in the compartment. The independent pump was routinely used to dewater the lazarette, but the discharge line was not connected to a through hull fitting; it was routed up and out through the access hatch and over the transom. Thus, when the pump was rigged, the lazarette hatch cover could not be closed.

At approximately 0500, the lone survivor, who was asleep in the forward bunkroom, was awoken by another deckhand, who said the vessel was in trouble and they were sinking. The two crewmen exited the forward bunk room and proceeded aft out of the deckhouse. On their way, they walked through knee-deep water that had already collected within the interior passageway. When they exited the deckhouse out onto the main deck, they found approximately one third of the main deck awash and the vessel listed about 30° to port. They also found two other crew members out on the weather deck and the Captain in the wheelhouse.

Three LADY MARY crew members, including the Captain, managed to don survival suits and one of the crew members launched the life raft. Just before 0514, someone on board transmitted what sounded like a frantic Mayday, which was heard by several fishing vessels in the Elephant Trunk, but the transmission lasted barely a second and was described as hysterical and distorted. The captain of one fishing vessel that heard the apparent Mayday called and asked for a vessel name and position but there was no response. Approximately 10 to 15 minutes after the two deckhands left the LADY MARY's forward bunk room, the vessel sank, without capsizing, in 210 feet of water.

While the LADY MARY's Emergency Position Indicating Radio Beacon (EPIRB) operated properly after the vessel sank and sent a distress signal at 0540, the rescue mission was delayed by one hour and twenty-seven minutes due to an improper registration. At approximately 0820, the first Coast Guard helicopter arrived on-scene and recovered the three crew members in survival suits; only one of those three crew members survived. Multiple Coast Guard aircraft, two Coast Guard Cutters, and four

Good Samaritan fishing vessels participated in a two-day search for the remaining crew members, but none were found during those searches.

Since the lone survivor was awoken after the LADY MARY was in a state of progressive flooding, there were no eye witnesses to the events which led to the sinking. However, based on pictures and video of the sunken vessel, the testimony of the survivor, and evidence retrieved from the wreck, a number of events could be ruled out. Through investigation, and based on a preponderance of the evidence, it was determined that the LADY MARY was not involved in a collision. The sinking likely began when seawater shipped onto the main deck and began downflooding the open lazarette. Once the downflooding began, there was an associated loss of freeboard and it became easier for additional seawater to ship onto the deck and exacerbated the situation. This spiraling process submerged the aftermost end of the vessel significantly below the waterline, enabled still more seawater to ship onto the main deck, accelerated the downflooding, and eventually led to uncontrollable progressive flooding.

The investigation revealed that the LADY MARY's sinking and the loss of the crew was not due to one single factor, but rather a combination of numerous unsafe preconditions and a few unsafe decisions. For example, there were a number of modifications made to the vessel over the years and their cumulative effect subtly lowered existing safety margins. Additionally, a lack of training, lack of experience, language barriers, fatigue, vessel loading, drug use, insufficient watertight integrity, compromised vessel subdivision, and weather, all played a role. The unsafe decisions made on the morning of March 24th included the decisions to drift, to leave the lazarette hatch open, and to leave two freeing ports blocked by solid covers.

Unfortunately, the investigation also revealed that the LADY MARY's sinking was a survivable event. The vessel was outfitted with a full complement of functioning life saving equipment and there was time for the Captain or crew to broadcast a coherent Mayday, press one of the Digital Selective Calling (DSC) alert buttons, and/or launch a flare. Due to the lack of sufficient training, the Captain and the crew were unprepared to deal with emergency situations and that negatively affected their ability to take actions to provide for their survival.

While there were defenses available to prevent unsafe conditions from developing onboard the LADY MARY, they either failed or were missing, and thus were not able to alter the course of these catastrophic and tragic events. There were some defenses that could have been used onboard the vessel by the Captain and crew, and some that could have been used by the vessel owner to improve the workplace before the vessel got underway. In addition, there were a number of regulatory defenses which could have also been used by outside organizations to help prevent unsafe preconditions from developing.

The Marine Information for Safety and Law Enforcement (MISLE) activity number associated with this Investigation is 3439089.

B. FINDINGS OF FACT

1. LADY MARY Particulars and Nomenclature¹

a. Particulars

Name:	LADY MARY (ex: MR. CHOPER)
Official Number:	520834
Homeport/Hailing Port:	Cape May, NJ
Service:	Fishing
Document Endorsement:	Fishery
Gross Tonnage:	105 GRT
Net Tonnage:	71 NRT
Registered Length:	71.2 Feet
Registered Breadth:	21.2 Feet
Registered Depth:	12.0 Feet
Length Overall:	75.7 Feet
Constructed By:	Graham Boats, Inc., Pascagoula, MS
Year Built:	1969
Hull Number:	128
Hull Material:	Steel
Construction:	Welded
Modified By:	Sea-Fab, Inc. Pascagoula, MS
Year Modified:	2001
Propulsion:	Diesel, Single Screw, Caterpillar D-353 Marine Engine
Horsepower:	425
Last Drydock:	Gillikin Marine Railways, Beaufort, NC February – May 2006
CFVSE Decal Number:	144738
Date Issued:	July 21, 2008
Owner/Operator:	Smith & Smith Inc. 148 Park Avenue Bayboro, NC 28515

¹ Exhibit 13, 19, 35, 47, 54, 73 & Transcript 936-937



Figure 1: LADY MARY, August 2006



Figure 2: LADY MARY, July 2006



Figure 3: LADY MARY, July 2006

b. Nomenclature



Figure 2: Port Profile and Nomenclature

2. LADY MARY Crew and Owner Particulars

This section describes the crew of the LADY MARY during the last voyage, including their positions, responsibilities and experience. This section also identifies other key personnel working for Smith & Smith, Inc, which was the owner of the LADY MARY.

a. Key Personnel

Name	LADY MARY Position * March 18 to March 24, 2009	Smith & Smith Inc. Position	Age †
Mr. Royal “Bobo” Smith, Jr.	██████████	President	██
Mr. Timothy “Timbo” Smith	██████████	Vice President	██
Mr. Tarzon “Bernie Mac” Smith	██████████		██
Mr. Frankie Credle	██████████		██
Mr. Franklin Reyes	██████████		██
Mr. ██████████ §	██████████		██
Mr. ██████████	██████████		
Mr. ██████████		Shore Manager	
Mr. ██████████	██████████		

Table 1: LADY MARY crew, Smith & Smith Inc. Officers²

* With the exception of the Captain, the LADY MARY positions are not “formal” Smith & Smith, Inc., or LADY MARY titles. They were created by the Marine Board to facilitate the protection of personal information throughout the text of this report. Therefore, within this report, key personnel will be referred to by their position title. The only exception is Deckhand 6, who will be referred to as the Survivor.

† Only the ages of those crew members who died in the casualty are listed.

§ ██████████ worked under the alias ██████████

‡ The Previous Captain was not a crew member during the March 18-24, 2009 voyage.

b. Crew Responsibilities and Experience

(1) The Captain of the LADY MARY, who was also a son of the Smith & Smith Inc. Shore Manager, was responsible for operating the vessel, controlling the fishing gear, overseeing deck operations, establishing the work/rest rotations, conducting new crew orientation, conducting drills while underway, and writing/maintaining the crew lists. In

² Exhibits 13, 39 & Transcript 370-371, 413-415, 845,987, 1179

addition, the Survivor testified that the Captain would make a round of the engine room every two to three hours.³

(2) In March 2009, the Captain started his second year as the LADY MARY's captain. His experience operating the LADY MARY included on-the-job training under the tutelage of the Previous Captain. During that period, the Previous Captain progressively gave the Captain more and more time at the helm.⁴

(3) Deckhand 1, also a [REDACTED] of the Shore Manager, was responsible for cutting scallops along with all of the other deckhands. He was also the cook, and the Shore Manager testified that Deckhand 1 was responsible for underway repairs. In port, Deckhand 1 performed the LADY MARY's oil changes. Deckhand 1 would usually be in the wheelhouse when the Captain was resting. The Survivor testified that the main reason Deckhand 1 was in the wheelhouse was to act as a lookout, but if the conditions were rough then he would steer the vessel while the Captain was resting.⁵

(4) When not sailing onboard the LADY MARY, Deckhand 1 was the regular captain of the fishing vessel MARY ELIZABETH (Official Number 506003), a 64 foot, wood hull vessel. Deckhand 1 served as the captain of the MARY ELIZABETH since 2001.⁶

(5) Deckhand 2, a [REDACTED] of the Shore Manager and thus an [REDACTED] of the Captain and Deckhand 1, was responsible for cutting scallops. The Survivor testified that Deckhand 2 would occasionally be in the wheelhouse when the Captain was resting.⁷

(6) Deckhand 2 was the [REDACTED] of the LADY MARY for six months prior to the Previous Captain. During that time, Deckhand 2 bent the tip of the starboard boom, which ran up and aft from the base of the starboard outrigger.⁸

(7) Deckhand 3 was responsible for cutting scallops. The Shore Manager testified that Deckhand 3 also assisted with underway repairs and did most of the wire splicing on board.⁹

(8) The Shore Manager worked with Deckhand 3 for 30 or 40 years. The Survivor testified that Deckhand 3 was a regular member of the LADY MARY's crew. In March 2009, Deckhand 3 was living onboard the LADY MARY.¹⁰

(9) Deckhand 4 was responsible for cutting scallops. The Shore Manager did not know Deckhand 4 but had seen him working around the docks in Cape May, NJ, so he believed

³ Transcript 370, 551, 848, 1179-1180, 1182, 1188, 1202-1203

⁴ Transcript 398, 414-415, 441-442

⁵ Exhibit 39 & Transcript 396-397, 546, 1179-1180, 1201, 1271

⁶ Transcript 534, 846

⁷ Exhibit 66, Transcript 370, 397, 1179-1180

⁸ Transcript 517-518, 857-858

⁹ Transcript 370, 1179-1180, 1217

¹⁰ Transcript 399, 1178, 1184

Deckhand 4 had experience scalloping. Deckhand 4 sailed on the LADY MARY two or three times with the Previous Captain, and a couple of times with the Captain in 2008.¹¹

(10) Deckhand 5 was responsible for cutting scallops. This was Deckhand 5's first voyage on the LADY MARY. During 2008, Deckhand 5 had worked for Deckhand 1 on the MARY ELIZABETH. When the decision was made to bring two more crewmembers on the LADY MARY for the March 2009 voyage, Deckhand 1 made the decision to bring Deckhand 5 on board. The Shore Manager knew Deckhand 5 under an alias, because that was the name listed on the tax documents which he provided. As a result, Deckhand 5's name was erroneously reported as the alias immediately following the sinking.¹²

(11) The Survivor was responsible for cutting scallops. He began working in the fishing industry in 2003. During that year he worked on a New England scallop vessel and other vessels that fished for squid. The Survivor worked on the LADY MARY continuously since 2004 and estimated that he made four to seven trips on the vessel each year. The Survivor also made two trips on the MARY ELIZABETH.¹³

(12) The crew for LADY MARY would normally consist of five members; however a recent change in National Marine Fisheries Service (NMFS) regulations lifted the crew size restriction for scallop vessels working in Sea Scallop Access Areas and imposed a catch limit instead. Both regulations were designed to limit the scallop harvest. The crew size restriction was designed to regulate how fast scallops could be harvested in a given voyage (less crew meant fewer scallops cut), and the catch limit simply limited the amount of catch¹⁴. Since the restriction had been lifted, the Shore Manager testified that during the 2009 scallop season the plan was to use a larger crew of seven, alternating trips between the LADY MARY and the MARY ELIZABETH rather than having two smaller crews working at the same time. This would allow each member of the seven person crew to make more money.¹⁵

¹¹ Transcript 370, 1179-1180, 1184-1185

¹² Transcript 370, 534, 1179-1180, 1185-1187

¹³ Transcript 362-363, 370, 397-398, 553,

¹⁴ 50 CFR 648.51

¹⁵ Transcript 670-671, 706-707, 942, 1172-1173

3. The March 18 to March 24 Voyage

This section describes the final voyage of the Fishing Vessel LADY MARY and includes background details about the voyage plan, vessel loading, forecasted and actual weather, recorded courses and speeds, operations during the days and hours leading up to the sinking, and abandoning the vessel.

a. Voyage Plan

(1) On March 18, 2009, the LADY MARY departed Cape May, New Jersey between 1000 and 1100 with seven crew members onboard.¹⁶

(2) Prior to leaving port, a scallop vessel is required to notify the National Marine Fisheries Service (NMFS) of their intentions via the Vessel Monitoring System (VMS). This notification is called an activity declaration. [See Section B12 for additional information regarding the VMS.] On March 18, 2009, at 1017, the LADY MARY sent an activity declaration, reporting that they were departing on a trip to the Elephant Trunk Sea Scallop Access Area. The Elephant Trunk Sea Scallop Access Area is shown in the Figure below.

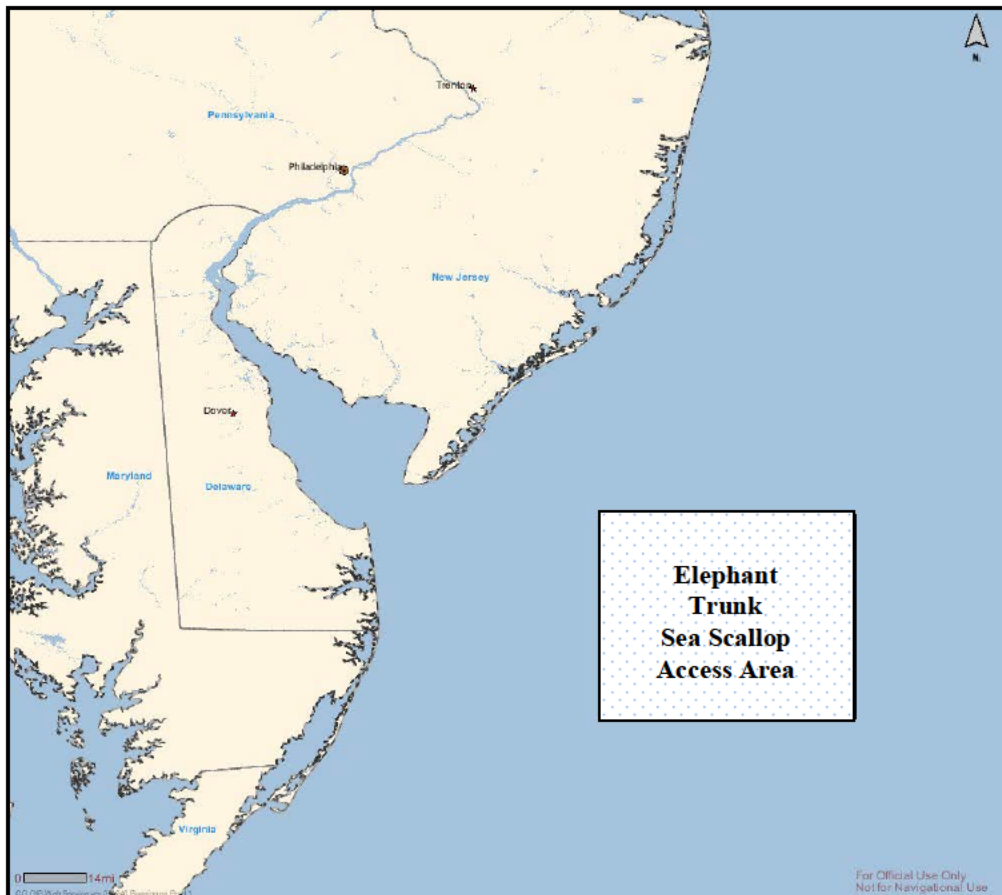


Figure 3: Overview showing Elephant Trunk Sea Scallop Access Area

¹⁶ Exhibit 58 & Exhibit G

(2) The trip was to be conducted under the limited access scallop permit category and it was considered one of the LADY MARY's original allocated trips for 2009. Under a limited access scallop permit, a vessel is allowed to catch 18,000 lbs of scallops per trip.¹⁷ [See Section B.14.g for additional information regarding the LADY MARY's scallop permit.]

(3) The LADY MARY was allotted five trips into Sea Scallop Access Areas each year since 2003. Since NMFS allowed these trips to be broken up, the Shore Manager had always directed the LADY MARY's crew to catch only 200 bags of scallops (approximately 10,000 lbs) during original allocated trips. The purpose of the 200 bag limit was twofold. The Shore Manager testified that the crew would get too fatigued and their hands would swell from cutting scallops if they tried to catch 18,000 lbs in one trip. Secondly, the 200 bag limit was a business decision to ensure that the crew did not exceed the 18,000 lb NMFS limit. If they did exceed that limit, it would have subjected the LADY MARY's catch to seizure by NMFS. Therefore, after catching 10,000 lbs, the LADY MARY would "break" the trip and then return to the Sea Scallop Access Area on a NMFS authorized "compensation trip" to catch the remainder of their authorized 18,000 lb limit.¹⁸

(4) For the trip that began on March 18, 2009, the Shore Manager decided that the LADY MARY would catch 250 bags of scallops. This was 50 bags (approximately 2,500 lbs) more than a typical trip for the vessel. This decision was made to try and get a little more money to help pay a repair bill from earlier in March for work done on the vessels power take off (PTO), and to help pay for an outstanding fine. The Survivor testified that he and the crew were aware of the plan to catch 250 bags of scallops during the voyage.¹⁹

(5) The Shore Manager testified that the Captain was responsible for creating a list of the crew member names before the LADY MARY left the dock. This was kept onboard in case they were boarded while underway. This was the only paperwork completed before the vessel departed.²⁰

b. Loaded Condition

(1) On February 9, 2009, the LADY MARY was loaded with 8.5 tons of ice and on February 10, 2009, the LADY MARY took on 3,625 gallons of fuel. The Shore Manager testified that the vessel probably had 500 or 600 gallons of fuel onboard prior to that delivery. He was always in charge of fueling the LADY MARY. He would not fill the fuel tanks to the top, but to a mark on the fuel tank sight gauge about 1.5 or 2 feet from the overhead. The Shore Manager testified that he did not refuel the LADY MARY before the trip began on March 18, 2009.²¹

¹⁷ Exhibit G & Transcript 570-571, 574-575, 661

¹⁸ Transcript 651, 680-682, 941-942, 1173-1174, 1266-1267

¹⁹ Transcript 404, 550, 942, 1173-1174

²⁰ Transcript 1177, 1202-1203

²¹ Exhibit C & Transcript 884, 958, 1289-1292

(2) When the LADY MARY left the dock on March 18, 2009, there was one scallop dredge onboard and “everything was full of ice” (referring to the bins in the fish hold). The specific levels of ice were further clarified by the Survivor, as indicated below.

	#1 Hold		#2 Hold		#3 Hold		#4 Hold
18 March 2009	P	Full Ice	P	2' Ice	P	Full Ice	Full Ice
	S	Full Ice	S	2' Ice	S	Full Ice	
23 March 2009	P	Nearly Full Ice	P	80 Bags (Full)	P	20 Bags, 2' Ice	Full Ice
	S	Nearly Full Ice	S	80 Bags (Full)	S	20 Bags, 2' Ice	

Table 2: LADY MARY’s loaded conditions upon departure and the day before the sinking

(3) The fore peak water tank, which supplied fresh water for the crew, was full when the LADY MARY left the dock on March 18, 2009. There was also another water tank under the forward crew bunk room, just forward of the engine room, but this tank was not used and the Shore Manager testified that it was probably empty.²²

(4) The aft ballast tanks were empty when the vessel left the dock, but the Captain would fill those while underway as needed. The water in the aft ballast tanks would be drained when the vessel got back to the dock and was not usually drained at sea. The aft ballast tanks were drained by opening a two inch valve and letting the water run into lazarette, and then pumping it overboard using the independent, locally rigged bilge pump housed in the lazarette. The Survivor testified that the Captain would add water to the aft ballast tanks during a voyage, and that there was water in those tanks on March 23. The Previous Captain testified that he would never put water in the aft ballast tanks because it would make the boat feel “awkward.” He said the LADY MARY held a lot of water in those tanks, and if they were full, the vessel would be “like a washing machine with the water moving around in her.” If the aft ballast tanks were empty, the Previous Captain testified that the vessel would perform great.²³

(5) When the Survivor went to bed at approximately midnight on March 23, the LADY MARY had loaded approximately 200 bags of scallops in the fish hold. The locations of these bags are indicated in the Table above, along with the levels of ice at that time. There were also approximately 10 to 12 additional bags of cut scallops on deck, which had not yet been counted. Based on the amount of scallops the LADY MARY had been catching during their trip (42-45 bags per day on the productive days), the Survivor did not feel that the remainder of the catch (to reach the 250 bag target) could have been obtained while he was sleeping. It was his understanding that the LADY MARY would continue catching scallops throughout the day of March 24, and that would enable them to reach their 250 bag target and then return to port.²⁴

(6) The Previous Captain testified that he had loaded 18,000 lbs of scallops on the LADY MARY during a number of trips. The most he had ever loaded on the vessel was 22,000

²² Transcript 883-884, 958-959, 1292

²³ Transcript 410, 419, 440-441, 532, 887, 960, 1195-1196, 1292, 1500-1501, 1508

²⁴ Exhibit F & Transcript 404-405, 549-550

or 23,000 lbs of scallops. He estimated that the LADY MARY could probably hold 25,000 lbs of scallops.²⁵

c. Weather Synopsis

(1) The Shore Manager testified that the LADY MARY would not start a voyage under weather conditions which included gale force winds. The vessel would delay the start of the trip. Once the LADY MARY was underway, weather reports were obtained by listening to the weather channel on the vessel's radio, or through the Vessel Monitoring System (VMS) unit. The Captain decided how to handle bad weather during the voyages, and there was no consultation with the Shore Manager in this regard.²⁶

(2) The closest National Oceanic and Atmospheric Administration (NOAA) weather buoy to the site of the LADY MARY sinking was buoy number 44009, approximately 48 miles west of the vessel's last reported position. The buoy is located southeast of the Delaware Bay entrance. The buoy was on station March 23 and March 24, 2009 and providing some weather information, but the wind speed and direction indicators were not in operation at the time.²⁷

(3) The National Weather Service (NWS) Ocean Prediction Center divides offshore waters into marine zones for the purpose of issuing weather forecasts. The Elephant Trunk Sea Scallop Access Area, where the LADY MARY was working from March 18 – March 24, 2009, is located entirely within the Hudson to Baltimore Canyon zone. The LADY MARY's VMS track lines from March 23 and March 24, indicate the vessel was working in the southwestern corner of the Hudson to Baltimore Canyon zone.²⁸

(4) The Hudson to Baltimore Canyon weather forecast issued at 2300 on March 23, 2009 read as follows: "Overnight...N to NW winds 20-25 knots early...Increasing to 25-30 knots. Seas 5-8 feet early...Building to 6-10 feet late. Highest winds and seas E. Tuesday [24 MAR 2009]...N winds 20-30 knots early...Diminishing to N to NE 15-25 knots late...Highest E. Seas becoming 4-7 feet...Except E portion 7-11 feet...Highest E." This forecast was very similar to all of the Hudson to Baltimore Canyon forecasts which had been issued since 2300 on March 21, 2009.²⁹

(5) The Table shown on the next page contains a compilation of weather data from multiple sources, for March 24, 2009.³⁰

²⁵ Transcript 524-525

²⁶ Transcript 1178-1179

²⁷ Exhibit 72 & Transcript 1445-1447

²⁸ Transcript 1442-1445

²⁹ Exhibit 67, 92 & Transcript 1447-1448

³⁰ Exhibit 67, 92

Time	Location/Area	Observation
0050	Buoy 44009	Significant wave height: 7 feet Dominant wave period: 7 seconds Average wave period: 4.7 seconds Air temperature: 37.5 degrees F Water temperature: 41 degrees F
0150	Buoy 44009	Significant wave height: 7.25 feet Dominant wave period: 6 seconds Average wave period: 4.7 seconds Air temperature: 36.5 degrees F Water temperature: 41 degrees F
0200	38° 35.7'N, 073° 41.5'W (site of sunken LADY MARY)	Significant wave height: 6.5 feet Sea state: 6-9 feet Direction of wind waves: 018 degrees True Period of wind waves: 5.5 seconds Primary wave direction: 018 degrees True Primary wave period: 5.7 seconds Wind: N at 19 knots
0250	Buoy 44009	Significant wave height: 7.25 feet Dominant wave period: 6 seconds Average wave period: 4.7 seconds Air temperature: 36 degrees F Water temperature: 41 degrees F
0350	Buoy 44009	Significant wave height: 7 feet Dominant wave period: 6 seconds Average wave period: 4.7 seconds Air temperature: 35 degrees F Water temperature: 41 degrees F
0450	Buoy 44009	Significant wave height: 7.25 feet Dominant wave period: 6 seconds Average wave period: 4.9 seconds Air temperature: 34 degrees F Water temperature: 41 degrees F
0500	Hudson to Baltimore Canyon (ANZ084)	Significant wave height: 6-9 feet (About 7 feet in vicinity of LADY MARY)
0550	Buoy 44009	Significant wave height: 6.5 feet Dominant wave period: 6 seconds Average wave period: 4.7 seconds Air temperature: 33 degrees F Water temperature: 41 degrees F
0652	38° 35.7'N, 073° 41.5'W (site of sunken LADY MARY)	Sunrise (daylight savings time)
0750	Hudson to Baltimore Canyon (ANZ084)	Winds throughout the entire zone were N to NNW at 20-25 knots.
0800	38° 35.7'N, 073° 41.5'W (site of sunken LADY MARY)	Significant wave height: 7.5 feet Sea state: 6-9 feet Direction of wind waves: 023 degrees True Period of wind waves: 6 seconds Primary wave direction: 033 degrees True Primary wave period: 6.8 seconds Wind: N at 22.5 knots

Table 3: Weather synopsis for March 24, 2009

(6) The weather condition data for the location of the sunken LADY MARY at 0200 and 0800 was generated using the McIDAS-V software package developed by the Space Science and Engineering Center at the University of Wisconsin-Madison. The significant wave heights for the Hudson to Baltimore Canyon zone and the location of the LADY MARY at 0500 were taken from a National Weather Service Wind and Wave Analysis of the East Coast.³¹ The winds for the Hudson to Baltimore Canyon zone at 0750 were determined using the National Weather Service's satellite scatterometer. This is a microwave instrument on a satellite that uses the observed sea surface roughness to interpret what the surface winds are at that time.³²

(7) The fishing vessel KATHRYN MARIE, which will be referred to as Fishing Vessel L for the remainder to the report, was approximately 4 NM to the west northwest of LADY MARY when it sank. The captain of Fishing Vessel L testified that the weather around 0430 on March 24, 2009 was rough with winds out of the North or Northwest at 20 to 30 knots. He also testified that by daylight, the winds were about 35 knots with 10-12 foot seas.³³

(8) The Survivor testified that just prior to abandoning the LADY MARY on March 24, 2009, when the vessel was listed and he was on the open deck, the waves were hitting the LADY MARY on the high side, which was the starboard side. He estimated that the waves were as high as 12 feet. He could not recall what direction the wind was coming from, but estimated that it was blowing as fast as 35 miles per hour (mph) or more.³⁴ (Note: 35 mph equates to approximately 30 knots.)

(9) The helicopter crew, which arrived on scene around 0820 on March 24, described the weather as follows: winds out of the north at 20 to 25 knots and gusting higher, air temperature 40° F, seas 5-15 feet with white caps, cloud ceiling 10,000 feet, and good visibility.³⁵

d. Courses and Speeds

(1) The Vessel Monitoring System (VMS) is a satellite-based method to monitor fishing vessel activity for the purposes of data collection and enforcement of fisheries requirements. The VMS within the United States is run by NOAA's National Marine Fishery Service (NMFS). The LADY MARY was required to have a VMS unit onboard, and was required to transmit position reports every 30 minutes. The vendor for the LADY MARY's VMS unit was Boatracs.³⁶ [See Section B12 for additional information regarding the Vessel Monitoring System.]

³¹ Exhibit 67

³² Exhibit 92 & Transcript 1443-1444

³³ Transcript 992-993, 998

³⁴ Transcript 382-384

³⁵ Transcript 15, 32-33, 67

³⁶ Transcript 563-568

(2) The LADY MARY's VMS position report dates and times, and calculated courses and speeds made good, from 2024 on March 23, 2009 until 0510 on March 24, 2009 are contained in the adjacent Table.³⁷

(3) The Figure shown on the next page pictorially shows the track lines listed in Table 3. The positions in the diagram are labeled in Greenwich Mean Time (GMT) which was 4 hours ahead of the LADY MARY's local time on March 24, 2009. The arrows on each track line represent the direction of travel. The black track lines indicate speeds made good of less than 2 knots, the red track lines are 2-5 knots, and the blue track lines are 5-10 knots.³⁸

e. Operations Prior to the Sinking

(1) During the first two days of the voyage, the LADY MARY was not catching many scallops. On the third day, March 20, 2009, the vessel found a more productive location and started catching 18-20 bushels of unshucked scallops per drag, which equated to approximately 42-45 bags of shucked scallops per day.³⁹

(2) On March 23, 2009, the Survivor worked his normal 18 hour day, from 0600 to 2400. After his watch ended, he had something to eat and then went to bed. Deckhand 1, who was on the same watch rotation, went to bed at the same time.⁴⁰

(3) The Survivor testified that when he went to bed the night of March 23, 2009, the rest of the crew was cutting scallops in the shucking house. The Survivor provided conflicting testimony as to whether there were any scallops loaded on the main deck - one time he said that there were not a lot of scallops on the deck, and another time he said that there were no scallops loaded on the deck.⁴¹ During a follow up interview with the Survivor, he clarified that there were scallops on deck and that the crew was cutting them. Specifically, Deckhand 3 and Deckhand 4 were cutting scallops and the Captain was in the wheelhouse.⁴² The Survivor also testified that when he went to bed, all operations seemed to be normal and all mechanical equipment was working properly.

Date	Time	SMG (kts)	CMG (deg)
3/23/2009	2024	1.83	018
3/23/2009	2054	2.10	000
3/23/2009	2124	3.10	014
3/23/2009	2155	3.99	168
3/23/2009	2225	5.37	224
3/23/2009	2230	4.61	208
3/23/2009	2300	5.18	212
3/23/2009	2331	0.86	179
3/24/2009	0001	4.05	307
3/24/2009	0033	1.09	278
3/24/2009	0103	1.50	194
3/24/2009	0136	1.38	200
3/24/2009	0206	1.35	201
3/24/2009	0238	1.58	189
3/24/2009	0308	1.69	205
3/24/2009	0338	1.38	191
3/24/2009	0409	1.54	208
3/24/2009	0439	1.47	211
3/24/2009	0510	-	-

Table 4: Speeds and Courses Made Good

³⁷ Exhibit 58

³⁸ Exhibit 57 & Transcript 570, 618-619

³⁹ Transcript 536, 549-550

⁴⁰ Transcript 364, 372, 527-528

⁴¹ Transcript 372-373, 394-395, 527-528

⁴² Exhibit 122

The Survivor noticed that the waves were getting a little rough, but the scallop dredge was out, the outriggers were down, and the Captain was operating the vessel as he normally would.⁴³

(4) The Survivor could hear the main winch operating from his bunk. The Survivor testified that after going to bed the night of March 23, 2009, he did not hear any unusual sounds.⁴⁴

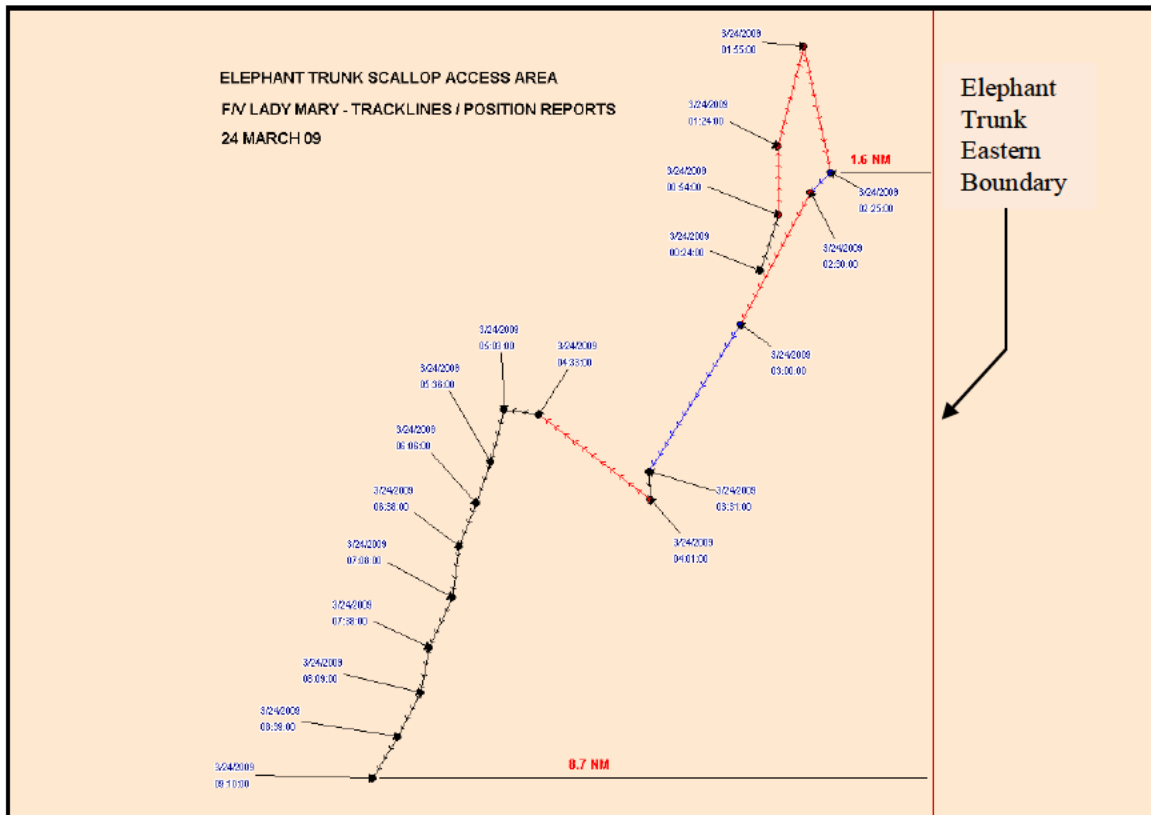


Figure 4: Track line of the LADY MARY's final hours

f. Abandoning the LADY MARY

(1) The Survivor's bunk was located in the forward bunk room, and was oriented longitudinally on the starboard side of the LADY MARY. The Survivor shared the forward bunk room with Deckhand 1 and Deckhand 5. There were three survival suits stored in that space. The Survivor testified that he was woken up by Deckhand 1 at approximately 0500 on March 24, 2009. Deckhand 1 told him that there was a problem and the vessel was sinking. The Survivor also testified that just before being woken up, he could feel the vessel listing to the point where he was on the verge of falling out of his bunk.⁴⁵

⁴³ Transcript 372-373, 395, 400, 406

⁴⁴ Transcript 529

⁴⁵ Transcript 364-365, 375, 393, 529-530

(2) When the Survivor was awoken, the lights were on, the engine was running, and the vessel was listing to port. The Survivor testified that he looked in Deckhand 5's bunk but did not see anyone there. In their hurry to leave the bunk room, the Survivor and Deckhand 1 did not bring their survival suits with them.⁴⁶

(3) The Survivor and Deckhand 1 left the bunk room and went up a ladder into the galley, where water was just starting to enter the space. They proceeded aft through the port side main deck passageway and the water level was just below their knees. They passed by the upper bunk room, but the Survivor stated that he did not have time to look inside and see if anyone was there. They exited the deckhouse through the aft shucking house door out onto the main deck, and sea water was entering the deckhouse through that same door.⁴⁷ The next two Figures show the internal and external escape routes.

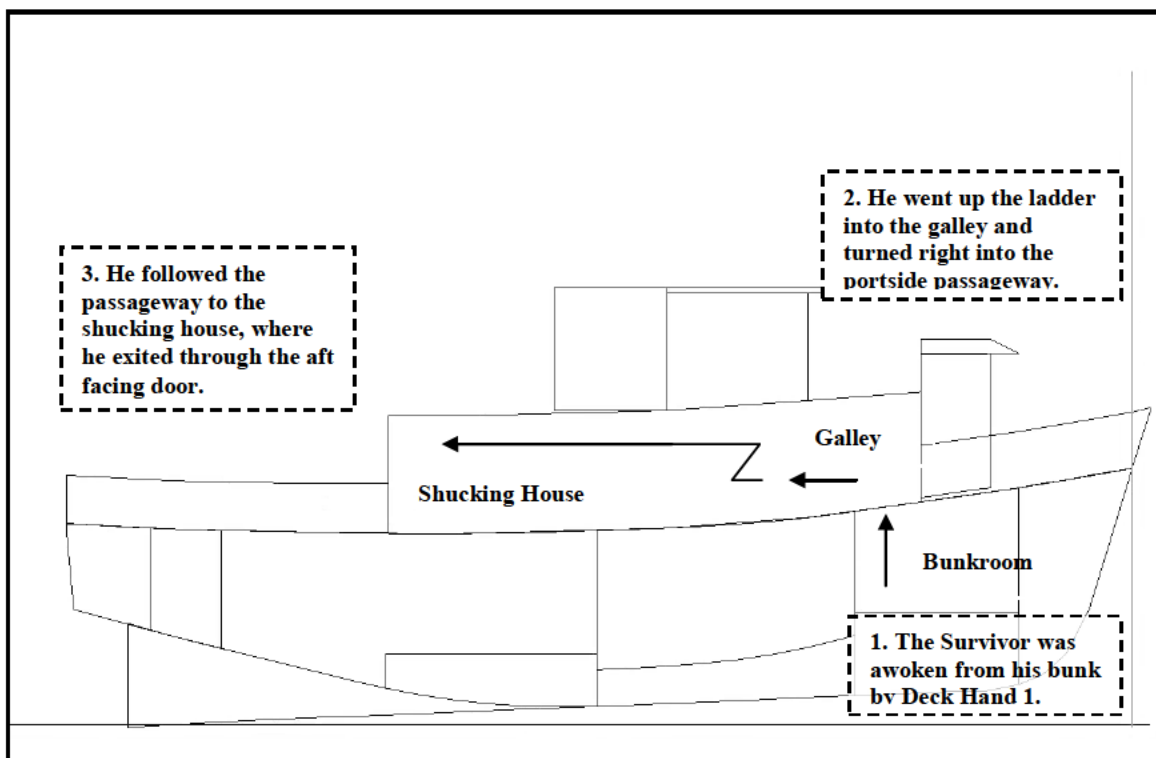


Figure 5: The Survivor's escape route from inside the LADY MARY

(4) After the Survivor and Deckhand 1 exited through the shucking house door out onto the main deck, they went up the ladder on the starboard side of the main deck to the winch deck. The Survivor saw Deckhand 3 standing next to that ladder on the main deck, screaming and banging a metal object against the ladder. The Survivor could not fully understand what Deckhand 3 was screaming, but it seemed to be a desperate plea to the Captain to control the vessel and level it out. At the top of the ladder, the Survivor saw Deckhand 4 standing near the starboard side winch. The Survivor testified that both

⁴⁶ Transcript 364-365, 373-374, 380

⁴⁷ Transcript 376-377, 380

Deckhand's 3 and 4 had normal work clothes on. The Survivor did not see Deckhand 2 or Deckhand 5 on the morning of March 24, 2009.⁴⁸



Figure 6: The Survivor's exterior escape route

(5) After climbing the ladder from the main deck to the winch deck, the Survivor stood outside “in the state of shock” for a period of time. The Survivor did not recall how long he stood outside on the winch deck, it may have been just a few minutes, or it may have been ten minutes. While the Survivor was outside, he noted that the LADY MARY's lights were on and the engine was running, but the vessel did not seem like it was moving, and, the sun had not risen yet. The vessel was listed to port so that the entire main deck rail on the port side was in the water, roughly a 30° list. About one third of the main deck had taken on water and the Survivor did not see the scallop dredge on the deck or hanging from the rigging. The Survivor testified that the outriggers were down, and he believed that the stabilizers were in the water. When he looked out onto the water, the Survivor saw other fishing vessels in the area, approximately 1.5 to 2 miles away.⁴⁹

(6) The Survivor testified that after he stood outside on the winch deck, he went into the wheel house to get a survival suit. Inside the wheel house, he saw the Captain, dressed in his normal work clothes, holding on to the helm like he was trying to maneuver the

⁴⁸ Transcript 373, 377-379, 393-394

⁴⁹ Transcript 373-374, 381-384, 387, 389-390

vessel. Deckhand 1 was talking with the Captain, but the Survivor is not sure what they were talking about or what they were doing. They may have been arguing.⁵⁰

(7) The Survivor took a survival suit from the wheelhouse and went back to the winch deck so that he could put it on. On the winch deck, the Survivor saw Deckhand 4 holding a survival suit in his hand. Deckhand 4 appeared to be panicking and asked the Survivor for help with the survival suit. At this point, the water level had risen to the port side winch. The Survivor donned his survival suit on the starboard side of the winch deck. He had trouble getting the suit on due to the list of the vessel. By the time the Survivor had finished putting his survival suit on, the water level had reached the starboard side winch. The Survivor grabbed a life ring and handed it to Deckhand 4. At this point, the LADY MARY lost power and the lights went out, and the Survivor jumped into the water on the port side.⁵¹

(8) At some point before he abandoned the vessel, the Survivor saw Deckhand 1 with his survival suit on, as well as another person, perhaps the Captain, in a survival suit. The Survivor did not try to use the radio before he abandoned ship, and he did not see the Captain use the radio. The Survivor did not see anyone use flares on the morning of March 24, 2009, and while the Survivor had heard the vessel's general alarm three times between March 18th and March 23rd, he did not hear any alarms the morning of the 24th.⁵²

(9) As the Survivor jumped in the water, he saw Deckhand 4 leaning against the starboard winch, holding on. Once in the water, the Survivor remembered his survival suit training and rolled on his back with his face up. He felt water coming into his survival suit and was worried about being sucked down by the sinking vessel. The Survivor paddled away from the vessel on his back.⁵³

(10) The Survivor paddled about 25 feet away from the LADY MARY. There was a little light and he was able to watch the vessel sink below the surface. The Survivor estimated that there were five minutes between when he jumped in the water, and when the vessel sank. The last visible part of the vessel he saw was the top of the starboard side rigging, from the top of the starboard outrigger to the top of the starboard aft corner of the rigging.⁵⁴

(11) As the LADY MARY went under, the Survivor found an 8 foot long board and grabbed onto that to help with floatation. He believes the board helped save his life. While in the water, the Survivor heard someone yelling, but he did not know who it was. He yelled back, but didn't get a response. The Survivor saw the inflated life raft, and tried to swim to it, but the wind and waves kept pushing it further away. He gave up trying to reach the life raft and decided to reserve his energy. The Survivor estimated that he was in the water for 45 minutes to one hour before it was daylight. The Survivor

⁵⁰ Exhibit 122 & Transcript 365, 378-379, 384-385, 391

⁵¹ Transcript 365-366, 379, 385-386

⁵² Transcript 388, 391-392, 538-539, 551

⁵³ Transcript 366-367, 386-387

⁵⁴ Transcript 367, 387-388

estimated that he was in the water for approximately two hours before the Coast Guard helicopter arrived.⁵⁵ [See Section B4 for additional information regarding the Rescue.]

⁵⁵ Transcript 367-368, 406

4. Search and Rescue

This section describes the efforts of the Coast Guard assets and the other fishing vessels involved in the LADY MARY search and rescue case, and in recovering items and debris found in the area of the sinking.

a. Initial Notification to the Coast Guard

(1) At 0707 on March 24, 2009, the U.S. Coast Guard Rescue Coordination Center (RCC) in Portsmouth, VA received an audible alarm from its Search and Rescue Satellite Aided Tracking (SARSAT) computer. The audible alarm was accompanied by a text message alerting the watch standers that a 406 Megahertz (MHz) Emergency Position Indicating Radio Beacon (EPIRB) was detected by a polar orbiting satellite. The automated notification came from the U.S. Mission Control Center (USMCC). The text message provided information from the EPIRB including the EPIRB's Unique Identifier Number (UIN), which was ADCD023C3542C01, a code that indicated that the United States was the EPIRB's country of origin, the beacon's manufacturer, serial number, and type (it was a Category I), and, the fact that the beacon contained a 121.5 MHz homing signal.⁵⁶

(2) The actual UIN encoded into the LADY MARY's EPIRB, and received by the RCC, was ADCD023C3542C01. The UIN manually entered into the National Beacon Registration (NBR) Database System by a National Oceanic and Atmospheric Administration (NOAA) contractor was ADCD023C3542Q01. Due to the mismatch in the 13th character, the automated computer system could not correlate the LADY MARY's EPIRB signal with a UIN from the registration database. As such, none of the LADY MARY's emergency contact information provided by the Shore Manager on the "Official 406 MHz Registration Form" was available to the RCC watch standers. The SARSAT text message stated, "USMCC Registration Database Information-Registration Data Is Not Available," and the alert was thought to have come from an unregistered beacon, however, that was not the case. [See section B10 for more details regarding the EPIRB.]⁵⁷

(3) The satellite system could not positively fix the position of the transmission, so the 0707 SARSAT text message contained two "Probable Solutions" (or probable positions) of the EPIRB. The "A" Solution, with a 56% probability, was approximately 65 NM southeast of Cape May, NJ in position 38° 33.6' N, 073° 40.9' W. The "B" Solution, with a 44% probability, was located in the Midwestern U.S. At 0715, the RCC received another SARSAT text message which indicated that a separate polar orbiting satellite detected the EPIRB and resolved its position to the "A" Solution, but registration data was still "not available."⁵⁸

⁵⁶ Exhibit 53 (page 44-45) & Transcript 96-100,

⁵⁷ Exhibit 4, 53 & Transcript 778, 819-821

⁵⁸ Exhibit 53 & Transcript 96-100

(4) At 0720, not knowing if the alert was a false alarm or a legitimate distress, the RCC directed Coast Guard Air Station Atlantic City to respond to the EPIRB located at the “A” Solution position. At 0745, Coast Guard Rescue Helicopter 6530 launched with four crewmembers onboard: the Pilot, Co-pilot, Flight Mechanic and Rescue Swimmer. The helicopter arrived on scene at approximately 0820.⁵⁹

b. The Rescue

(1) The helicopter crew described the weather on scene as: winds out of the north at 20 to 25 knots and gusting higher, air temperature 40° F, seas 5-15 feet with white caps, cloud ceiling 10,000 feet, and good visibility. The aircrew observed a fleet of approximately 15 to 20 fishing vessels in the area, along with a commercial tank ship.⁶⁰

(2) Since there were numerous fishing vessels in the area, the helicopter crew suspected an inadvertent EPIRB activation, so they flew towards the fishing fleet with their direction finding (DF) equipment on. The DF equipment picked up an intermittent homing signal on the 121.5 MHz frequency. The crew could not acquire a 406 MHz signal, even though the helicopter was equipped for it and the equipment was not reported as malfunctioning. The helicopter crew followed the 121.5 MHz signal to an inflated life raft and a debris field. The helicopter arrived at the life raft at 0836 and the Pilot decided to circle it, using the DF equipment to confirm that it was the source of the signal. As the Pilot flew the helicopter, the Co-pilot watched the needle on the DF equipment and it remained pointed towards the raft during the entire circle. Based on these results, the Pilot believed the raft contained the source of the 121.5 MHz homing signal.⁶¹

(3) The Rescue Swimmer was lowered to the water by a harness. Once in the water, he disconnected from the hoist cable and swam to the life raft, but did not find anyone inside. The Rescue Swimmer did see two paddles, a big survival kit, and a blue case, but he could not say for certain whether or not the EPIRB was in the life raft. The Rescue Swimmer recorded the life raft’s make, model and serial number to help identify the owner, since there were no obvious markings that would have linked it to the



Figure 7: Recovered LADY MARY life raft

LADY MARY. In accordance with standard procedures, the Rescue Swimmer punctured the life raft with his knife in an attempt to scuttle it and prevent it from becoming the source of another report. The life raft deflated but did not sink. Seeing that the life raft was still afloat, the Pilot flew the helicopter directly over the top and attempted to

⁵⁹ Transcript 14-15, 50, 102-103

⁶⁰ Transcript 15, 32-33, 67

⁶¹ Transcript 15-16, 22-24, 34-35, 53, 65, 299

submerge it with rotor wash. That attempt was also unsuccessful. After the Rescue Swimmer was recovered, the Pilot climbed up in altitude to increase the range of the helicopter's VHF radio and reestablish communications with Coast Guard Sector Delaware Bay who had been monitoring and maintaining communications with the helicopter. The Co-Pilot passed the life raft make, model and serial number to the Sector.⁶²

(4) While the Co-Pilot was radioing the Sector, the Rescue Swimmer spotted a red survival suit about 200 yards away. At the same time, the Pilot started identifying a debris field on a track line ahead of the helicopter, which was pointed into the wind. The Pilot flew to the survival suit as the Rescue Swimmer dressed out for a second harness deployment. The Rescue Swimmer was lowered to the water and swam to a person, who turned out to be the lone survivor. While preparing for a basket hoist of the Survivor, the Rescue Swimmer asked the Survivor how many people were on the boat and if they had donned survival suits. The Survivor, whose first language is Spanish, replied in broken English with "seven" and "yes". Based upon this, the Rescue Swimmer believed there were seven people on board and that everyone had put on a survival suit, and he radioed this information to the helicopter. The Survivor was hoisted by basket into the helicopter.⁶³

(5) After recovering the Survivor, the Pilot saw "something red" floating in the water a couple of hundred yards ahead. The Rescue Swimmer was recovered, gave the Survivor a blanket and assessed his condition. After recovering the Rescue Swimmer, the Pilot air taxied directly to the red object, noting a debris field that included a life ring, lines and wood along the way. The red object was another survival suit, but from the helicopter there did not appear to be anyone inside the survival suit. The Rescue Swimmer was deployed by harness a third time, and found an individual face down with his legs tangled in lines. The Rescue Swimmer turned the person over and tried to get a response, but there was none. The Rescue Swimmer untangled the person and put him in the rescue basket. The person was hoisted into the helicopter.⁶⁴

(6) During the basket hoist of the second person, the Pilot saw another red object in the water a couple of hundred yards ahead. Since the helicopter was very low on fuel, the Pilot decided not to bring the Rescue Swimmer back into the cabin. He remained attached to the hoist cable and boomed out as the Pilot air taxied to the object, which was another survival suit. Since the rescue basket was occupied from the last recovery, and the helicopter was running low on fuel, the Rescue Swimmer did not disconnect from the hoist cable when he was lowered to the water. While at first there did not appear to be anyone in the survival suit, once fully lowered, the Rescue Swimmer found a third person face down in the survival suit. The Rescue Swimmer turned the individual over and tried to get a response but there was none. The Rescue Swimmer then put a rescue sling around the third person, and they were "double lifted" into the helicopter. At that point

⁶² Exhibit 5 & Transcript 17-18, 40-41, 65, 68, 81-85

⁶³ Transcript 18-19, 36-37, 65-66

⁶⁴ Transcript 19-20, 66

the helicopter did not have any fuel left to remain on scene; there was only enough for the return trip.⁶⁵

(7) The helicopter departed the scene at 0847, in a 20-25 knot head wind at 1,000 feet. The Pilot decided to land at Air Station Atlantic City because there was not enough fuel to land at the hospital, deliver everyone, and then return to base.⁶⁶

(8) Once back in the helicopter, the Rescue Swimmer noted that rigor mortis had set in extensively on the third person recovered, but it was less pronounced in the second person recovered. Neither person had a pulse. The Rescue Swimmer decided to do CPR on the second person recovered, so he unzipped the survival suit to gain access to the chest area. Then he cut the survival suit to allow the water to drain out. There was so much water in the suit that the Rescue Swimmer informed the pilots because he was concerned about the equipment on the helicopter. The Rescue Swimmer performed CPR on the second person for the entire return trip to Air Station Atlantic City. Ambulances and medics met the helicopter when it landed at approximately 0930.⁶⁷

(9) During the return trip to the Air Station, the Pilot asked if anyone knew the name of the vessel that had sunk. The Flight Mechanic replied that the survival suits read "LADY MARY." The Flight Mechanic confirmed the name of the vessel with the Survivor. The Survivor also told the Flight Mechanic that the boat had sunk at 0500. The Co-pilot passed this information to Sector Delaware Bay on VHF Channel 83A.⁶⁸

(10) The Rescue Swimmer testified that the states of the survival suits on the three individuals picked up by the helicopter on March 24th were all the same. The survival suits were zipped up to about mid-throat level, or about five inches short of the end. The mouth flaps were not secured and the air bladders behind the head and neck were not inflated. The Captain and Deckhand 1 had a lot of water inside their suits.⁶⁹

(11) On the morning of March 24th, as the three individuals were being recovered by the Rescue Swimmer, the helicopter was hovering about 50 feet above the water. During this time, the Co-pilot made at least four call-outs on VHF Channel 16, informing mariners that a boat had sunk and that four persons were unaccounted for. During these radio calls, the helicopter crew could see multiple fishing vessels to the North, but no one responded.⁷⁰

(12) The Pilot reported that the conditions on scene the morning of March 24th were very favorable for locating survival suits in the water. The Pilot felt that there was an outstanding probability that they would have seen a survival suit in those conditions.⁷¹

⁶⁵ Transcript 20, 41, 51, 56, 66-67, 86

⁶⁶ Transcript 21, 29, 45

⁶⁷ Exhibit 2 & Transcript 21, 32, 69, 72-73, 79-80, 87

⁶⁸ Exhibit 3 & Transcript 44-45, 73, 92

⁶⁹ Transcript 71-75

⁷⁰ Transcript 25-26, 59-62

⁷¹ Transcript 43

(13) The Cold Water Exposure Model (CESM) uses physiological data to predict Functional and Survival Times for cold water immersion based upon core body temperatures. The times are dependant in part upon an individual's physical characteristics, clothing, and weather and sea conditions. Functional Time is the predicted number of hours (after initial exposure) until a person's core temperature decreases to 93.2 degrees F. At that point, the model predicts the end of Functional Time and the person is incapacitated by hypothermia and at the limit of self-help capability. Survival Time, which extends beyond Functional Time, is the predicted number of hours until a person's core body temperature falls to 82.4 degrees F. This corresponds with the end of a moderate hypothermia state, and the person will lose consciousness. An immersed unconscious person is unable to maintain an airway, which results in drowning.⁷²

c. Additional Search Efforts and Debris Recovery

(1) Multiple aircraft from Coast Guard Air Stations Atlantic City and Elizabeth City conducted additional searches for the missing crew of the LADY MARY. These aircraft included Rescue Helicopters 6584, 6507, 6003 and 6559, and Search and Rescue Airplanes 2005 and 2003. Three of those aircraft took off less than 20 minutes from the time the first helicopter returned to Atlantic City (approximately 0930). A fourth aircraft took off 45 minutes after the first helicopter returned. The total number of aircraft sorties was 14.⁷³

(2) At 0938, the USCGC FINBACK got underway to assist with the search efforts.⁷⁴ At the same time, the USCGC DEPENDABLE was diverted from their patrol to the scene of the LADY MARY sinking to assist with search and rescue efforts. The DEPENDABLE arrived on scene at 1126, and assumed the duties of On Scene Commander. During their time on scene, the DEPENDABLE searched for people and debris in the water, communicated with aircraft searching in the area, broadcast UMIBs on VHF 16 and communicated with fishing vessels in the area. At 1142, the DEPENDABLE recovered the LADY MARY's life raft from the water. The EPIRB was recovered at 0200 on March 25th, in position 38° 21.0'N and 073° 55.1'W. The DEPENDABLE also recovered a life ring, a large wooden box and some miscellaneous debris during their search. The DEPENDABLE remained on scene until 1951 on March 25th, when they were released from the case.⁷⁵

(3) In the early evening of March 24th, four Good Samaritan fishing vessels volunteered to assist with the search for the LADY MARY crew.⁷⁶

⁷² COMDTINST M16130.2E, Section 3.7.1.2

⁷³ MISLE Case # 445650

⁷⁴ MISLE Case # 445650

⁷⁵ Exhibit 64

⁷⁶ Exhibit 64

(4) During the search for the LADY MARY and her crew, Coast Guard vessels and aircraft executed 18 search patterns in an area exceeding 3,600 square miles, and logged nearly 70 search hours.⁷⁷

⁷⁷ Exhibit 64

5. Communications

This section describes the particulars of the Very High Frequency (VHF) and High Frequency/Medium Frequency (HF/MF) maritime distress channels, Coast Guard communications infrastructure, the communication capabilities of the LADY MARY, the satellite phone calls made from the LADY MARY, a VHF Mayday call on the morning of March 24, 2009, and the Coast Guard communications related to the sinking of the LADY MARY.

a. Distress Frequency Specifications

(1) VHF Channel 16 (156.800 MHz) is an international distress, safety, and calling frequency. The Coast Guard maintains a listening watch on this channel, as should any vessel equipped with a VHF marine radio.⁷⁸ The range of a VHF transmission is a function of transmitter power, receiver sensitivity and the distance to the radio horizon. VHF signals propagate under normal conditions as a near line-of-sight phenomenon, although the theoretical distance to the radio horizon is slightly extended over the geometric line-of-sight as radio waves are weakly bent toward the Earth by the atmosphere. There are also some weather driven conditions which can increase the range of VHF transmissions but these are highly unpredictable.⁷⁹

(2) VHF Channel 70 (156.525 MHz) is the dedicated Digital Selective Calling (DSC) frequency. The DSC service allows mariners to transmit preformatted digital distress messages to the Coast Guard or other rescue authorities around the world. The distress messages can be sent in a second or less. If the radio is properly registered with a Maritime Mobile Service Identity (MMSI) number and interfaced with the vessel's GPS, a DSC distress message will transmit vital vessel information and the vessel's position at the push of a button. Otherwise, information can be manually entered into a DSC distress message before it is transmitted. A DSC radio can also be used to relay distress messages to the Coast Guard. After 1999, all radios made or sold in the U.S. were required to have a minimum DSC capability.⁸⁰

(3) 2182 kHz is also an international distress, safety, and calling frequency. Transmissions on this frequency propagate as a ground wave phenomenon and typically follow the contour of the Earth for approximately 120 miles before ground resistance causes them to dissipate.⁸¹

b. Coast Guard Communication Capabilities

(1) In March 2009, Coast Guard Sector Delaware Bay Command Center staffed a 24-hour watch team comprised of five people. The team was led by a Sector Duty Officer (SDO), who stood a 24 hour rotation cycle that commenced around 0745 daily. The

⁷⁸ USCG Navigation Center (www.navcen.uscg.gov)

⁷⁹ Exhibit 88 & Transcript 1433- 1436

⁸⁰ USCG Navigation Center (www.navcen.uscg.gov)

⁸¹ Transcript 1405-1406

watch consisted of two Operational Unit Controllers (OUC), who reported to the SDO, and two Communications Watch Standers, who reported to the OUCs. The two Communications Watch Standers were responsible for monitoring both VHF Channel 16 and MF 2182 kHz, and their responsibilities were divided geographically; one monitoring the Delaware Bay and Delaware River, the other monitoring the shore [of the Atlantic]. The OUC's and the Communications Watch Standers stood twelve hour watches which turned over between 0600-0630 and 1800-1830 daily.⁸²

(2) The Communications Watch Standers continuously monitored these channels using eleven towers. The towers consisted of two legacy high-level VHF towers (one in Fortescue, NJ and one in Roxanna, DE), six Rescue 21 towers (three along the NJ coast - Manasquan, Tuckerton and Cape May, and three along the Delaware River/Bay - Salem, Swedesboro and Burlington), one tower that was shared with Coast Guard Sector Hampton Roads, VA (Berlin, MD), and two "HF towers" (one in Atlantic City, NJ and one in Cape May, NJ). All of the Channel 16 and the 2182 kHz communications transmitted or received on these towers were recorded. Rescue 21 is the Coast Guard's advanced communications system that is designed to improve the ability to assist mariners in distress and is currently being installed in stages across the United States.⁸³

(3) The Atlantic City "HF tower" (Atlantic City's 2182 kHz capability) had an outage on the morning of March 24, 2009 due to a hardware line failure, thus Sector Delaware Bay could not transmit, receive, or change the frequency on that radio until it was repaired at 1100 that same day. All of the other VHF and HF towers listed in the paragraph above were operable.⁸⁴

(4) At a distance of approximately 58 NM, the VHF and "HF" towers in Cape May were the closest towers to where the LADY MARY sank. For comparison purposes, the theoretical distance from the Cape May tower to the radio horizon was 22.16 NM. For a vessel with a 30 foot radio antenna, the theoretical distance to the radio horizon (from the vessel) would be 6.73 NM, and for a 60 foot radio antenna, the distance would be approximately 11 NM.⁸⁵ So, for example, a vessel with a 30 foot antenna would combine with the Cape May tower to cover a theoretical distance of 28.89 NM for reliable VHF communications (22.16 + 6.73).

c. LADY MARY Communication Capabilities

(1) There were three VHF radios on the LADY MARY. Two of the radios were located in the new wheelhouse and were attached to the overhead above the helm. Both of these radios had a red button on the front which looked like the distress button found on a DSC enabled radio. The third VHF radio was located in the LADY MARY's old wheelhouse, and could be heard from the galley. During the 2007 and 2008 CFVS exams, the Safety Examiner noted that the radios had a three hour emergency power supply. The Shore

⁸² Transcript 153-154, 268, 287

⁸³ Transcript 265, 268-269

⁸⁴ Exhibit 22 & Transcript 266-267, 272-273

⁸⁵ Exhibit 88 & Transcript 1426, 1432-1433

Manager testified that the backup power was not automatically supplied; a crew member had to manually activate it.⁸⁶

(2) There was a laminated radio call instruction sheet located in the new wheelhouse, below one of the VHF radios, that included directions on how to issue Maydays, distress calls, and other radio calls.⁸⁷

(3) The LADY MARY did not have a single side band (SSB) radio. The Shore Manager testified that there used to be one on the boat “but something happened to it” so he took it off and did not replace it because the vessel had a functioning satellite phone, as allowed by 46 CFR 28.245(c).⁸⁸

(4) The National Marine Fisheries Service (NMFS) required the LADY MARY to have a Vessel Monitoring System (VMS) unit onboard and to transmit position reports at least twice per hour. The vendor for the LADY MARY’s VMS unit was Boatracs. The unit on board was designated as mobile communication terminal number 869208, and it was activated on November 6, 2003. The VMS unit could also be used to send and receive personal messages via email, but the LADY MARY’s crew did not use this capability for personal correspondence because they had a satellite phone. The VMS unit did not have an optional panic button installed or activated, which is a feature offered by Boatracs for a one-time fee of less than \$100. If a VMS unit has a panic button installed and activated, and an operator hits the button, a priority message is relayed to the Boatracs Network Operations Center (NOC) which is a 24 hour watch in Toronto, Canada. If the NOC receives a message, they look in their files for a pre-planned emergency response submitted by a vessel owner.⁸⁹ [See Section B12 for additional information regarding the VMS.]

d. LADY MARY Satellite Phone Calls

(1) There were 12 satellite phone calls from the LADY MARY during the March 18 to March 24, 2009 voyage. These calls went to three phone numbers; the Shore Manager, the Captain’s children’s mother’s cell phone, and the home phone of the Captain’s children’s grandmother. The last phone call from the LADY MARY, recorded on the bill for the vessel’s satellite phone, was on March 24, 2009, at 0117. The call lasted 27 seconds and the number dialed was the home phone of the Captain’s children’s grandmother.⁹⁰

(2) The Captain’s children’s grandmother testified that she answered a phone call on March 24, 2009, sometime between 0445 and 0500, and that it sounded like the Captain. She could not fully understand the muffled voice, but recalled him saying, “hey,” before fading out into static. She did not hear any background noises. She also testified that

⁸⁶ Exhibit 34, 35, Exhibit 108 (Image 9764) & Transcript 1234-1235, 1244

⁸⁷ Transcript 1203

⁸⁸ Exhibit 34, 35 & Transcript 962

⁸⁹ 50 CFR 648.10, Exhibit 57 (page 15), 77 & Transcript 563-566, 597, 634-637, 1286

⁹⁰ Exhibit 116 & Transcript 1286-1287, 1358-1362

when the Captain was out at sea, he would call her house any chance that he had, and he would call anytime of the day or night.⁹¹

(3) The home phone records for the Captain's children's grandmother's house show the 0117 incoming phone call described in paragraph B.5.d(1) above, but show the next incoming call at 0833 on March 24, 2009.⁹²

e. Mayday

(1) On March 24, 2009, Fishing Vessel L was operating in the Elephant Trunk Sea Scallop Access Area. The captain of Fishing Vessel L testified that around 0430 that morning, he was on the back deck of his vessel when he heard what sounded like a "Mayday" on VHF Channel 16 that lasted barely a second. The captain further described the transmission as "very frantic," "very scared," and "barely audible," and from someone that sounded like they had a heavy accent. The captain looked to another crew member standing next to him and asked if that sounded like a Mayday, to which the crew member responded that it did. The captain then ran to the wheelhouse, where he heard the fishing vessel PAUL & MICHELLE captain say "Come back with that; come back with that more clearly." [The fishing vessel PAUL & MICHELLE will be referred to as Fishing Vessel P for the remainder of the report.] Then someone with a southern accent (which is identified in paragraph B.5.e(6) below) said that he couldn't understand what had been said. Then, the captain of Fishing Vessel L got on the radio and said, "it sounded like a Mayday," but nobody responded to him.⁹³

(2) The captain of Fishing Vessel L testified that he and his crew member looked around after the apparent Mayday, but did not see any flares. The captain approximated that there were 20 vessels within a six mile radius of his vessel at the time. Afterwards, the captain calculated that his vessel's 0430 position was three or four miles west northwest of the LADY MARY's sunken position. On the afternoon of March 24th, the captain of Fishing Vessel L reported the possible Mayday to the Coast Guard. The captain used his VHF radio to report the Mayday, and successfully spoke with Sector Delaware Bay even though he was 60 NM offshore at the time. Fishing Vessel L was equipped with a single side band (SSB) radio, but that radio was not kept on.⁹⁴

(3) On March 24, 2009, Fishing Vessel P was operating in the Elephant Trunk Sea Scallop Access Area. Between 0500 and 0530, the vessel was approximately 4 NM to the west of the LADY MARY's position. The captain of Fishing Vessel P reported that he heard "a desperate voice like a Mayday call" on VHF Channel 16 between 0500 and 0530. The captain attempted to contact the vessel in distress, but there was no response. Fishing Vessel P was equipped with a single side band (SSB) radio, but the captain only used that radio when he needed to make a long range call. He was not monitoring the SSB radio on March 24th. The captain did not know that a vessel had sunk until he

⁹¹ Transcript 1359-1360, 1362-1365

⁹² Exhibit 117

⁹³ Transcript 990-992, 995, 1001, 1004-1005

⁹⁴ Transcript 991-993, 995-996, 998-999

overheard the captain of Fishing Vessel L talking with the Coast Guard on VHF Channel 16 during the afternoon of March 24th.⁹⁵

(4) On the morning of March 24, 2009, at approximately 0500, the captain of a third fishing vessel, the GOOD NEWS II, which will be referred to Fishing Vessel H for the remainder of the report, reported that he heard a “Mayday, Mayday – Coast Guard, Coast Guard” on VHF Channel 16. The captain described the radio call as very hysterical and distorted. The captain stated in an interview that he did not respond to the radio call, but he did hear another vessel respond. Fishing Vessel H had a SSB radio on board, but that was not typically monitored while underway. The captain heard some Coast Guard VHF information broadcasts around 0800 that morning, but could not make out what was being said.⁹⁶

(5) Beginning at 0514, Coast Guard Sector Delaware Bay recorded the following conversation from the Cape May VHF tower:⁹⁷

05:14:52: “I don’t know what that man’s problem is. I can’t understand him.”

05:15:01: “... sounded like a ma...”

05:15:03: “... nobody’d ever understand what he’s saying.”

05:15:28: “...for what...”

05:15:32: “...[indecipherable] ██████, the old mate off of the, first mate on the Captain Morris, I mean Miss Morris.”

05:15:48: “Yeah, I got ya. I, I, I caught your voice. Sure did captain, sure did now.”

05:15:59: “...when you...”

(6) The Marine Board identified the 05:14:52, 05:15:03 and 05:15:32 transmissions as the captain of Fishing Vessel H. In an interview, the captain stated that the 05:15:32 transmission was talking about his first mate.⁹⁸

(7) The possible Mayday was not relayed to the Coast Guard.⁹⁹

(8) Coast Guard Sector Delaware Bay did not record a Mayday broadcast or any discussion of a collision on any of their VHF towers on the morning of March 24, 2009, and they did not receive a DSC alert from the LADY MARY.¹⁰⁰

f. Coast Guard Broadcasts

(1) As previously discussed in paragraphs B.4.a(1) and a(3), the RCC received a 406 MHz EPIRB distress alert at 0707 on March 24, 2009, that resolved to position

⁹⁵ Exhibit 57, 91

⁹⁶ Exhibit 101

⁹⁷ Exhibit 46

⁹⁸ Exhibit 101

⁹⁹ Exhibit 46 & Transcript 294-295

¹⁰⁰ MISLE Case # 445650, Exhibit 46 & Transcript 149-150, 274-275, 289

38° 33.6' N, 073° 40.9' W at 0715, which was approximately 65 NM southeast of Cape May, NJ.¹⁰¹

(2) At 0726 the RCC issued an Enhanced Group Call (EGC) directed at ships with Inmarsat equipment and within a 200 NM radius of 38° 33' N, 073° 41' W. The call notified mariners that a distress alert was received from that position, and requested they keep a sharp lookout, check their communications and other electronic equipment for accidental activation, and make reports to the RCC. No vessels replied and no further EGC's were made.¹⁰²

(3) At 0800, the RCC instructed Sector Delaware Bay to begin issuing Urgent Marine Information Broadcasts (UMIB). At 0801 Sector Delaware Bay broadcasted the first UMIB on VHF Channel 16 which stated:

*“At 0800 local time, the Coast Guard received an unknown distress call on 121.5. The name, position, and nature of distress are unknown. Any vessel or station receiving the distress call or any vessel with any additional information about the initial distress call is requested to contact this or any other Coast Guard unit. Signed Commander, United States Coast Guard Sector Delaware Bay.”*¹⁰³

(4) Sector Delaware Bay repeated the broadcast at 0822 and 0850. After Rescue Helicopter 6530 arrived on scene and found people in the water, the UMIB was updated to reflect this information. The first updated UMIB was issued at 0857. After that time, there were differences between the recorded VHF calls and the Sector Delaware Bay logs, as shown in the Table to the right.¹⁰⁴

Time	Recorded UMIB	Logged UMIB
0801	X	X
0822	X	X
0850	X	X
0857	X	X
0900		X
0930	X	
0948	X	X
1005	X	
1032	X	X
1101	X	
1124	X	X

Table 4: Search & Rescue UMIBs

(5) After the 1124 UMIB, the recorded VHF broadcasts and the logged broadcasts matched. The broadcasts continued, approximately twice per hour, until 1900, then spaced out to roughly an hour apart. The UMIB was suspended at 2053 on March 25, 2009.¹⁰⁵

(6) In addition, at 1035, Sector Delaware Bay began issuing Safety Marine Information Broadcasts (SMIB) on VHF Channel 16, which informed mariners that the F/V LADY MARY had sunk, and posed a possible hazard to navigation. The SMIBs gave an estimated position of the LADY MARY based on the last VMS report received. The first

¹⁰¹ Exhibit 53 & Transcript 96

¹⁰² MISLE Activity #3438930 & Transcript 96, 108, 127

¹⁰³ Exhibit 21, 22; MISLE Activity # 3438964 & Transcript 149-154, 167

¹⁰⁴ Exhibit 21, 22, 46 & Transcript 156-157

¹⁰⁵ Exhibit 21, 22, 46

SMIB was recorded by Sector Delaware Bay, but was not logged. Three more SMIBs were issued on VHF Channel 16 at 1351, 1451 and 1631. These three SMIBs were recorded and logged.¹⁰⁶

(7) The Coast Guard Telecommunication Manual requires that UMIBs are issued upon receipt and then every 15 minutes for a one hour period. After the first hour, UMIBs are issued with scheduled broadcasts (which occur every four hours) and at additional times directed by the originator. UMIBs may be broadcast on VHF Channel 16 and 2182 kHz if they are less than one minute long. If UMIBs are longer than one minute, a preliminary announcement is made on the distress frequency, and then the message is continued on a working frequency. The manual states that SMIBs should be broadcast upon receipt, with scheduled broadcasts, and at additional times directed by the originator. For SMIBs, a preliminary announcement is made on the distress frequency, and then the message is continued on a working frequency.¹⁰⁷

(8) The Sector Delaware Bay OUCs decided when to use 2182 kHz for broadcasting UMIBs. The decision depended upon the distance between the coastline and the location where the distress was believed to have originated. The OUC who was on watch the morning of March 24th testified that the UMIBs were broadcast on VHF Channel 16 and HF 2182 kHz.¹⁰⁸

(9) The LADY MARY Search and Rescue (SAR) case was the first real case for one of the Sector Delaware Bay Communications Watch Standers. He distinctly remembered that the OUC directed him to transmit the UMIB on 2182 kHz, but he broadcast the UMIB only on VHF Channel 16 because he felt “overwhelmed,” and his normal routine was to only use VHF Channel 16. The Communications Watch Stander did not realize it was policy to broadcast UMIBs on 2182 kHz for all distresses suspected to originate 30 NM or more offshore. If he had known “that information prior to this case [he] would have automatically simulcast the broadcast on 2182 kHz and 16 VHF.” The Communications Watch Stander claimed that since this was his first real case, he was so busy he “could not even think to ask for help.”¹⁰⁹

(10) The Sector Delaware Bay 2182 kHz recordings from March 24, 2009 do not contain any UMIBs.¹¹⁰

(11) Based on a HF propagation report (predictive model), between 0800 and 0900 on March 24, 2009, it was probable that a 2182 KHz radio transmission from the Coast Guard’s Cape May, NJ tower would have been heard in the vicinity of the LADY MARY by a suitably equipped vessel, if its equipment was on and functional.¹¹¹

¹⁰⁶ Exhibit 22, 46

¹⁰⁷ Coast Guard Telecommunication Manual, COMDTINST M2000.3D

¹⁰⁸ Transcript 148, 159-161, 270

¹⁰⁹ Exhibit 80 & Transcript 270

¹¹⁰ Exhibit 46

¹¹¹ Exhibit 87 & Transcript 1401-1403, 1421-1423

6. Post Rescue Crew Recovery, Identification and Testing

This section describes the recovery of the LADY MARY's crew members, the identification of those crew members, along with their autopsy and drug testing results.

a. Crew Recovery and Identification

(1) There were seven crew members on board the LADY MARY when it sank. Three of those crew members were recovered the same morning by Rescue 6530.¹¹²

(2) The first person picked up by the helicopter was the Survivor. He was wearing a survival suit and under the suit were the clothes that he had been sleeping in. The second and third person recovered during the rescue were non responsive and the survivor identified them as Deckhand 1 and the Captain. The identities of these individuals were later confirmed by the wife of Deckhand 1 at the Medical Examiner's office.¹¹³

(3) A doctor pronounced Deckhand 1 deceased on March 24, 2009 at 1001 at U.S. Coast Guard Air Station Atlantic City. The Medical Examiner signed the Certificate of Death the following day and identified the cause of death as, "asphyxia due to drowning."¹¹⁴

(4) A Medical Investigator with the Atlantic County Department of Public Safety pronounced the Captain deceased on March 24, 2009 at 1006 at U.S. Coast Guard Air Station Atlantic City. The Medical Examiner signed the Certificate of Death the following day and identified the cause of death as "asphyxia due to drowning."¹¹⁵

(5) Deckhand 1 was a ■■■ year old African-American male, 5' 7" tall and weighing approximately 190 pounds at the time of death.¹¹⁶ He was wearing a cut survival suit (see Section B4) "with a large amount of clear water" inside when he was received by the Medical Examiner's office. Underneath the survival suit, Deckhand 1's clothes were soaked; he was wearing thermal underwear, boxer shorts, and a sleeveless undershirt. An autopsy was performed, and the pathological findings were consistent with asphyxia due to drowning. The exterior of the body showed no evidence of injuries.¹¹⁷

(6) The Captain was a ■■■ year old African-American male, 6' 1½" tall and weighing approximately 180 pounds at the time of death.¹¹⁸ The Captain was wearing a survival suit with "a large amount of clear water" inside when he was received by the Medical Examiner's office. Underneath the survival suit, the Captain's clothes were soaked; he was wearing a long sleeve shirt, a second shirt, and denim pants with a belt, boxer shorts, and socks. No autopsy was performed, but the findings of an external examination were

¹¹² Exhibit 36, 39 & Transcript 66-67, 364, 369

¹¹³ Exhibit 36, 39 & Transcript 66-67, 364, 369

¹¹⁴ Exhibit 39, 40

¹¹⁵ Exhibit 36, 37

¹¹⁶ Exhibit 36

¹¹⁷ Exhibit 39

¹¹⁸ Exhibit 36

consistent with asphyxia due to drowning. The exterior of the body showed no evidence of injuries.¹¹⁹

(7) On May 12, 2009, an underwater dive team found a body, without a survival suit, in the fish hold of the sunken LADY MARY.¹²⁰ The body was recovered and delivered to the Acting Southern Regional Medical Examiner's office at Shore Memorial Hospital in Somers Point, Cape May, NJ the same day. An autopsy was performed on May 13, 2009, and the crew member was identified as Deckhand 2.¹²¹

(8) Deckhand 2 was an African-American male, 6' 0" tall and weighing approximately 200 pounds at the time of death. He was wearing a tee shirt, sweat pants, underwear and socks when he was received by the Medical Examiner's office. He was not wearing footwear other than socks.¹²²

(9) The autopsy of Deckhand 2 showed no evidence of injuries. The skull and musculoskeletal system showed no evidence of fractures. The Medical Examiner listed the cause of death as drowning.¹²³

(10) On May 20, 2009, the fishing vessel JOHN & NICOLAS picked up a body in their trawl net in position 38° 33.377' N, 073° 29.984' W.¹²⁴ The body was delivered to the Acting Southern Regional Medical Examiner's office at Shore Memorial Hospital in Somers Point, Cape May, NJ on May 21, 2009. An autopsy was performed that same day, and the crew member was identified as Deckhand 3.¹²⁵

(11) Deckhand 3 was an African-American male, 6' 1" tall and weighing approximately 200 pounds at the time of death. He was wearing a tee shirt and boxer shorts when he was received by the Medical Examiner's office.¹²⁶

(12) The autopsy of Deckhand 3 showed no evidence of injuries, and the Medical Examiner listed the cause of death as drowning.¹²⁷

(13) The two remaining crew members on the LADY MARY at the time of sinking were Deckhand 4 and Deckhand 5.¹²⁸ Deckhand 4 was last seen on the starboard winch deck of the LADY MARY by the Survivor as he prepared to abandon ship. At that time, the vessel had listed to port and the water level was up to the winch deck. The Survivor testified that Deckhand 4 had a survival suit in his hand but was panicking, "like in the state of terror." The Survivor handed Deckhand 4 a life ring just prior to abandoning

¹¹⁹ Exhibit 36, 37

¹²⁰ Transcript 1009-1010

¹²¹ Exhibit 66

¹²² Exhibit 66

¹²³ Exhibit 66

¹²⁴ MISLE Activity #3479964

¹²⁵ Exhibit 65

¹²⁶ Exhibit 65

¹²⁷ Exhibit 65

¹²⁸ Transcript 987

ship. The Survivor testified that after he abandoned ship and was in the water, he saw Deckhand 4 still on the vessel, near the starboard winch, without the survival suit donned.¹²⁹

(13) Deckhand 5 was last seen by the Survivor working on deck, cutting scallops with the rest of the crew, just before midnight on March 23, 2009. When the Survivor was awoken on the morning of March 24, 2009, he did not see Deckhand 5 in the lower berthing area. The Survivor also did not see Deckhand 5 on deck as he was preparing to abandon the vessel.¹³⁰

b. Toxicology Reports

(1) After the bodies of the LADY MARY crew members were recovered, they were tested for presence of dangerous drugs. The [REDACTED] both tested [REDACTED] for Delta-9 THC, which is the principle psychoactive ingredient of marijuana/hashish, and Delta-9 Carboxy THC (THCC), which is the inactive metabolite (breakdown product) of marijuana that forms in the body shortly after ingestion.¹³¹ [See Section B9 for a detailed discussion regarding the drug testing results.]

(2) [REDACTED]. Independent chemical testing conducted by the Federal Aviation Administration Forensic Toxicology Research Team confirmed the test results for both individuals.¹³²

(3) [REDACTED] detected in the bodies of Deckhand 2 or Deckhand 3.¹³³

(4) The Survivor was tested for alcohol and dangerous drugs at the AtlantiCare Regional Medical Center on March 24, 2009 at 1027. [REDACTED].¹³⁴

¹²⁹ Transcript 365-366, 386-387

¹³⁰ Transcript 372-373, 380, 533

¹³¹ Exhibit 37, 40 & Transcript 339-340

¹³² Exhibit 37, 40, 81, 82

¹³³ Exhibit 65, 66

¹³⁴ Exhibit 42

7. LADY MARY Detailed History and Specifications

This section contains the details of the LADY MARY's history, including the modifications and repairs made under the ownership of Smith & Smith Inc. This section also addresses the Coast Guard examinations and boardings involving the vessel.

a. Construction and Original Ownership

(1) The LADY MARY was built in 1969 at Graham Boats Inc. in Pascagoula, MS. The vessel's original name was the MR. CHOPER. The vessel was constructed as a single deck, single mast, raked stem, square stern, shrimp boat in accordance with the Graham Boats Plan, dated 6-22-68 for a 76' X 21' X 12' shrimp boat. The builder's hull number was 128.¹³⁵

(2) The MR. CHOPER was first admeasured in May 1969 by Marine Consulting and Surveying Inc. The original measurements and tonnages were 125 GRT and 85 NT, with a registered length of 71.2', breadth of 21.2', and depth of 12'. The MR. CHOPER was documented for Fishery service in June 1969, with Official Number 520834, and with Mead Mill Trawlers Inc. of Pascagoula, MS as the original owner.¹³⁶

(3) Between May 1969 and November 5, 2001, the MR. CHOPER was owned by the vessel's builder under various company names and there were no changes or modifications to the vessel's regulatory tonnages or dimensions.¹³⁷

b. Change of ownership, Tonnage Modifications and Remeasurement

(1) On November 5, 2001, the MR. CHOPER was purchased by Smith & Smith Inc. and renamed the LADY MARY. Smith & Smith Inc. owned the vessel continuously from November 5, 2001 thru March 24, 2009.¹³⁸

(2) After purchasing the LADY MARY, Smith & Smith Inc. made modifications to reduce the vessel's tonnage so it would meet the fishing permit requirements of the 10/10/20 rule.¹³⁹ The rule was established by the National Marine Fisheries Service (NMFS) to maintain the conservation goals of the Fisheries Management Plans by maintaining the relative size and horsepower of the commercial vessel fleet, and is based on the vessel which was first permitted by NMFS. For the lifetime of a specific NMFS fishery permit, the rule states that the vessel carrying the permit cannot increase their length, gross tonnage or net tonnage more than 10% over the original specifications, and the vessel cannot increase their horsepower more than 20%. When a vessel with a

¹³⁵ Exhibit 47

¹³⁶ Exhibit 13, 47

¹³⁷ Exhibit 13, 47

¹³⁸ Exhibit 13

¹³⁹ Exhibit 47 & Transcript 878-881

scallop permit is replaced by another vessel, the new vessel must fall within the requirements of the 10/10/20 rule.¹⁴⁰

(3) The baseline vessel for the LADY MARY's scallop permits (for the purposes of the 10/10/20 rule) was the MISS ABBY ANN SMITH, Official Number 533010. The baseline specifications for the MISS ABBY ANN SMITH were: 80.2' Length Overall (LOA), 100 Gross Register Tons (GRT), 68 Net Tonnage (NT), and 425 Engine Horsepower (hp). The MISS ABBY ANN SMITH sank in January of 2000 and the permits were transferred to the fishing vessel BAY 1971, whose owner had a 5% ownership in Smith & Smith Inc. In July of 2003, the permits were transferred to the LADY MARY. When the permits were transferred to the LADY MARY, there was a one-time size upgrade to 105 GRT and 71 NT, from 100 and 68 respectively.¹⁴¹

(4) The modifications to reduce the LADY MARY's tonnage, in order to get her to within acceptable limits for the scalloping permits, included the installation of deep side frames on Frames 2A, 3 and 3B from the tank top to the underside of the deck, the installation of deep side frames on Frames 13B and 15 to within 5' of the centerline, and the conversion of the forepeak tank to a ballast tank. In addition, paperwork submitted to the American Bureau of Shipping (ABS) stated that the midship fuel tank was also converted to a ballast tank. The tank conversions included alterations to the associated piping and pumps so that they were not connected to any other systems. In conflict with the ABS paperwork, the Shore Manager testified that the aft fuel tanks were converted into ballast tanks as a part of the tonnage modifications (instead of the midship fuel tank). On November 28, 2001, Marine Consulting and Surveying Inc. of Mobile, AL submitted an Application for Tonnage Admeasurement to ABS detailing these alterations and the associated calculations, and requested a confirmatory survey. On December 6, 2001, ABS issued the vessel a Tonnage Certificate that established the new tonnages as 105 GRT and 71 NRT. The registered length, breadth and depth remained unchanged.¹⁴²

(5) On December 28, 2001, the Coast Guard National Vessel Documentation Center issued a Certificate of Documentation (COD) to the LADY MARY. The owner was listed as Smith & Smith Inc., the tonnages were listed as 105 GRT and 71 NRT, and the registered length, breadth and depth remained unchanged.¹⁴³

c. Vessel Modifications made by Smith & Smith Inc.

(1) After the boat was modified in Pascagoula, MS, the Shore Manager sailed the boat to Cape May, NJ, where a number of additional modifications were made to the vessel from 2002-2003.¹⁴⁴

¹⁴⁰ Transcript 668-669, 673-674 & NOAA/NMFS Application for Vessel Replacement, Upgrade, and Confirmation of Permit History

¹⁴¹ Exhibit 136

¹⁴² Exhibit 47, 48 & Transcript 878-883

¹⁴³ Exhibit 13

¹⁴⁴ Exhibit 97 & Transcript 846, 850, 873-874

(2) The first modification made to the LADY MARY was to enclose a large portion of the main deck to create a “shucking house”. The purpose of the shucking house was to keep the scallops in an air conditioned space during the summer months, and prevent them from drying out and losing value.¹⁴⁵ The forward end of the new enclosure began at the aft end of the existing wheelhouse, with the sides and the aft end of the new enclosure built around the existing deckhouse. All the bulkheads of the new enclosure were constructed from 3/16” steel plate and framed with angle iron spaced on two foot centers. The sides of the new enclosure were placed on top of the existing gunwale and welded to the cap rail. Since the gunwale was sloped downward around amidships, the forward height of the plate added was about 3’, and the aft height of the plate added was about 4.5’. Prior to the new shucking house addition, there was an open weather deck walkway around the existing deckhouse that was about 2.5’ wide on each side. The aft end of the new shucking house ran all the way across the main deck, spanning the full beam of the vessel. The Shore Manager testified that there was a six foot wide door opening on the port side of the aft bulkhead of the new shucking house, but the Navy divers measured this opening as 3’3” wide. The door was made from a sheet of plywood and mounted on a slide.¹⁴⁶

(3) The new shucking house encompassed one existing main deck freeing port on each side. On the port side the Shore Manager welded a plate into the existing freeing port but left a small drain hole. The intent was to keep water from entering the shucking house during rough weather while still allowing water to drain out after washing the shucking house deck. On the starboard side, the Shore Manager connected the freeing port to the scallop cutting trough, which was located against the bulkhead. When the crew was cutting scallops they would throw the shells into the trough, which had running water, and the shells would be washed overboard through the freeing port. The Shore Manager testified that there was also one additional hole on each side of the shucking house to further allow wash down water to drain out. On the port side, this extra hole used to be an overboard discharge from the bathroom, but the bathroom was moved to the starboard side.¹⁴⁷

(4) After the shucking house was added on the main deck, a new wheelhouse was constructed on the upper deck above the shucking house. The new wheelhouse was framed with angle iron on two foot centers. The bulkheads were made from 1/2” plywood and the roof was made from 3/16” plywood. The length of the new upper wheelhouse was about 13’. The new house had eight windows across the front, one on each side, and one in the back.¹⁴⁸ The new wheelhouse was still under construction in November 2003, as shown in the below photos. Steel plates were also added to the old wheel house windows during this time period, to protect them from breaking in rough weather.¹⁴⁹

¹⁴⁵ Transcript 846-847

¹⁴⁶ Exhibit A, 9, 89 & Transcript 851-854, 860

¹⁴⁷ Exhibit 6 & Transcript 944-945, 948-949, 952-953

¹⁴⁸ Transcript 847, 860-864

¹⁴⁹ Exhibit 97, Transcript 1232-3



Figure 8: LADY MARY, September 27, 2003



Figure 2: LADY MARY, November 3, 2003

(5) Before the vessel was purchased by Smith & Smith Inc., the main haul back winch was located on the main deck, on centerline, and aft of the existing deckhouse. The winch was a 504 double drum McElroy. This winch was not onboard when the vessel was purchased by Smith & Smith Inc. in 2001. After the shucking house was added to the LADY MARY, two 504 McElroy single drum winches were placed on the top of the shucking house, just aft of the new wheelhouse, and canted outboard to line up with the blocks hanging from the gallows as shown in Figure 3. The winches were placed on top of the shucking house, purportedly to improve safety, by ensuring that the crew would not come in contact with the scallop dredge cable during operations.¹⁵⁰ An aft facing console was installed between the two winches, with controls for the winches and engines.¹⁵¹

¹⁵⁰ Transcript 848, 865-869

¹⁵¹ Exhibit 104, Transcript 1117

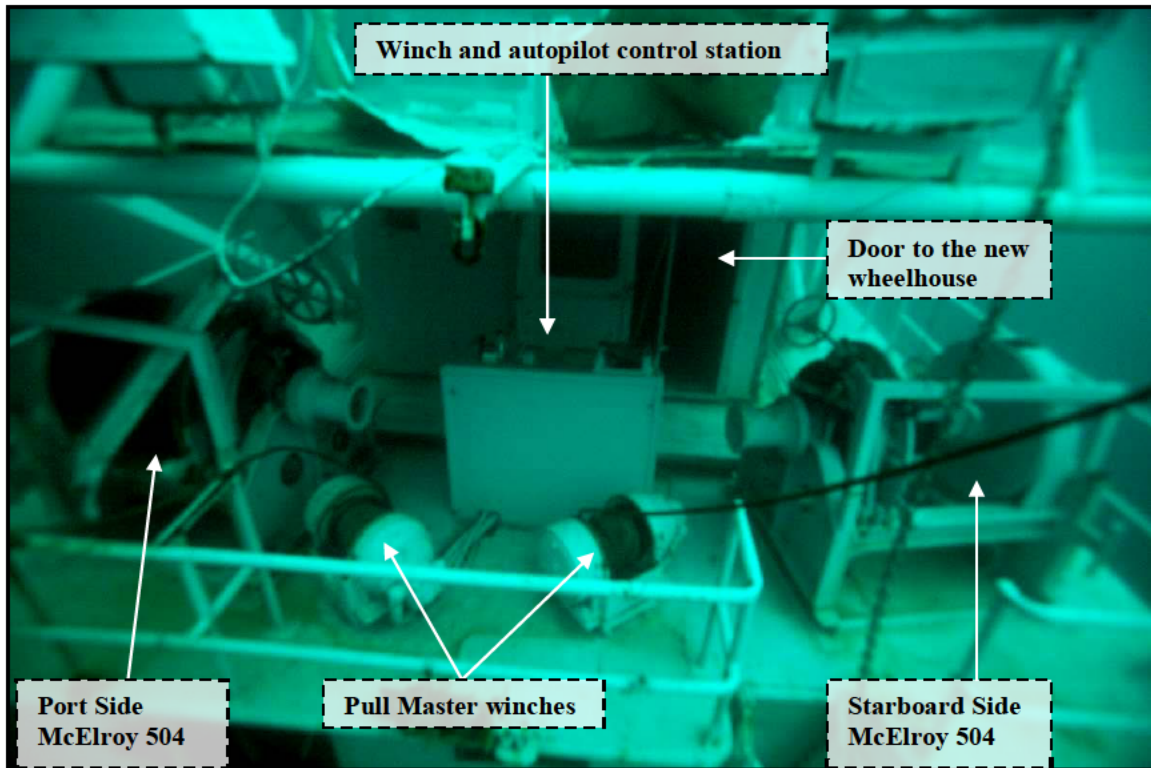


Figure 3: Winch deck of the sunken LADY MARY

(6) Smith & Smith Inc. also added cement to the ballast tank (the former midship fuel tank) which was located under the fish hold. The cement filled the tank to a level just below the bottom of the shaft casing (which ran through the ballast tank), about 8” from the top of the tank. The tank was closed by a manhole cover bolted over a rubber gasket. The Shore Manager reported that the weight of the cement ballast was 20,000 lbs because that was the amount quoted by the cement truck driver and billed by the company. After adding the cement ballast, the LADY MARY’s draft increased by four inches and the speed slowed down by about 1.5mph.¹⁵² The Shore Manager reported that the purpose of the cement ballast was to increase the vessel’s stability. He also reported that before the cement ballast was added, the LADY MARY would move when you stepped onto the deck from the dock. After the cement ballast was added, the vessel would not move when you stepped onboard.¹⁵³

(7) After this 2002-2003 modification period, the Shore Manager felt the vessel was safe, and stable, and did not have the LADY MARY examined by a surveyor or an engineer because it was not a regulatory requirement.¹⁵⁴

(8) The LADY MARY did not begin scalloping until the modifications described above were completed, and then the vessel operated for six months under the direction of

¹⁵² Exhibit A & Transcript 848-850, 876, 892-893, 902, 917

¹⁵³ Transcript 875, 1228-1229

¹⁵⁴ Transcript 877-878

Deckhand 2. During that time, Deckhand 2 bent the tip of the starboard boom, which ran up and aft from the base of the starboard outrigger.¹⁵⁵

(9) Despite the fact that he felt vessel was stable after the modifications discussed above, the Shore Manager also testified that after six months of operations he replaced the LADY MARY's outriggers to reduce their weight and further improve stability. This work was done while the vessel was moored in Cape May, NJ. The original outriggers were 60' long with lattice type construction, and the new outriggers were 29' long. While both sets of outriggers were constructed of steel, the new ones were less than half of the weight of the original ones. Both sets of outriggers were attached to the vessel at the same place. The new outriggers came from another boat which was out of service.¹⁵⁶

(10) In September 2004, a Simrad AP-35 autopilot system was installed on the LADY MARY. This work was done in Cape May, NJ by a marine electronics company.¹⁵⁷ Prior to the autopilot installation, the vessel could be steered by either the manual helm in the new wheelhouse or the manual helm in the old wheelhouse. When the autopilot system was installed a control unit was placed in the new wheelhouse, a jog lever was added to the aft console (located aft of the new wheelhouse between the winches and facing aft), and a rudder feedback unit was added to the steering system. No other modifications were made to the steering system at that time. The jog lever on the aft console had full control of the autopilot system and could either be used to steer a certain course or control the angle of the rudder. After that modification, the Captain had the ability to pilot the vessel from the aft console while also controlling, recovering, or deploying the scallop dredge. The steering controls in the new wheelhouse did not turn the jog lever on the aft console. The autopilot system was tied into the LADY MARY's magnetic compass, but it was not tied into the vessel's GPS units.¹⁵⁸

(11) Sometime after the autopilot system was added, the single steering hydraulic ram was upgraded to a larger size. The larger ram was installed by Smith & Smith Inc., but the specifications of the new ram could not be found. The same hydraulic pump was used after the ram was upgraded. The Shore Manager estimated that the range of the rudder was from 40 degrees starboard to 40 degrees port, and the rudder would not go as far as 50 degrees on either side.¹⁵⁹

¹⁵⁵ Transcript 857-858, 876-877

¹⁵⁶ Transcript 847, 856-857, 859, 876-877, 902-903, 918-919, 1227-1228

¹⁵⁷ Exhibit 90 & Transcript 929-931, 1368-1369

¹⁵⁸ Transcript 1116-1118, 1368-1376, 1488

¹⁵⁹ Transcript 929-930, 1116, 1129-1130, 1165-1166

(12) The Shore Manager testified that in late summer 2006, a ramp was added on to the stern of the LADY MARY while she was moored in Cape May, NJ. See the adjacent Figure. The stern ramp was constructed of 5/16" steel plate, and was 16' wide by 6' tall. The bottom of the stern ramp was supported by 4" X 4" schedule 80 steel supports. These supports were welded directly to the transom, without doublers, and braced with gussets. An additional 1" X 6" flat bar was added on each side of the vessel from the rub rail on the aft corner to the bottom corner of the stern ramp. The purpose of these flat bars was to



Figure 4: LADY MARY stern ramp, August 25, 2008

keep the dredge from catching on the roller pins at the bottom corners of the stern ramp. The Shore Manager stated that the purpose of the ramp was to guide the scallop dredge over the transom and onto the main deck during the haul-back. The Shore Manager reported that the LADY MARY's draft increased about 1" due to the addition of the ramp. He felt this was a safer alternative to lifting the dredge and chain bag over the port side bulwarks because the stern ramp haul-back operation did not involve lifting the dredge into the air and prevented the dredge from swinging and spinning.¹⁶⁰

(13) The bottom corners of the stern ramp were attached with wire rope to the aftermost end of the boom (rigging). These were referred to as stays, and their purpose was to hold the rigging in place when picking up heavy loads. When towing the scallop dredge, the dredge cable would rub on the port stay during turns to starboard, causing wear to the port stay and eventually breaking it. The harder the turn to starboard, the harder the dredge cable would rub on the stay. The Shore Manager tried installing a roller on the bottom section of the port aftermost boom, but it did not solve the problem. In February 2009, the Shore Manager added a 20' section of stainless steel pipe to cover the port stay and prevent chaffing.¹⁶¹

(14) The Shore Manager installed a second generator on the LADY MARY as a backup. The new generator was a 2-71 Detroit Diesel, rated at 20 kW, and it was mounted on the starboard side of the engine room, near the aft bulkhead. Technicians from a marine engine repair/maintenance company assisted with the hook up of the new generator.¹⁶²

¹⁶⁰ Transcript 855-856, 908-910, 914-917, 1298

¹⁶¹ Transcript 1101-1102, 1104-1105, 1496-1497

¹⁶² Transcript 926, 964-966, 1324

(15) In March 2009, before the LADY MARY's final voyage, four steel plates were welded onto the vessel's main deck. Each plate was 4' X 4' and 5/16" thick. The Shore Manager added these plates to protect the main deck from the scallop dredge.¹⁶³

d. Drydocking at Gillikin Marine Railways

(1) On February 28, 2006, the LADY MARY was hauled out of the water at Gillikin Marine Railways in Beaufort, NC. The stern ramp had been added to the LADY MARY before the drydocking occurred. During the drydock period, the hull was sandblasted and four coats of paint were applied. The coats of paint included Devco 302 Zinc, 235 Buff, 229 White and 283 Blue. The Shore Manager testified that the propeller was removed and reconditioned. The rudder was also removed and the stuffing box packing glands were replaced. The rudder was not sandblasted, but it was cleaned and repainted. There was no work done on the rudder stock flange (the rudder connection point underneath the aft end of the hull). Inside the lazarette, a section of the tube and the flange on top of the tube were both replaced. The shaft cutless bearing was also replaced during the drydock period.¹⁶⁴

(2) There were also some modifications made to the LADY MARY during the 2006 drydock period. A yard welder added four inch extensions to the outer edge of the existing "rolling shocks" (bilge keels), and also extended the "rolling shocks" aft. The welder increased the surface area of the rudder using 1/2" X 10" X 4" A 36 steel plate. This was done at the request of the Shore Manager, who wanted a larger rudder so that the LADY MARY would have "more turning power". The Shore Manager testified that four struts were also added during the drydock period. These struts were intended to support the skeg in the vicinity of the rudder shoe, and to prevent loss of the rudder in the case of grounding. The struts ran from the aft end of the skeg to the bottom of the hull. The Shore Manager also testified that a new keel cooler was added to support the installation of a second generator. This was the last time the LADY MARY was drydocked.¹⁶⁵

e. Recent Repairs

(1) In July 2008, a National Marine Fisheries Service Observer sailed onboard the LADY MARY. At the end of the trip, the Observer logged that the vessel "had to come in early because the rudder malfunction and other problems they didn't tell me about."¹⁶⁶

(2) In August 2008, the Shore Manager contacted the marine electronics company which installed the autopilot. He reported that it "won't steer properly to west," and a technician determined that the magnetic compass was not turning properly due to worn

¹⁶³ Transcript 956-957

¹⁶⁴ Exhibit 54, 125 & Transcript 927-936, 938

¹⁶⁵ Exhibit 54, 125 & Transcript 926-936, 938

¹⁶⁶ Exhibit 127

pivots; a common result of normal wear and tear. The compass was taken off the vessel and rebuilt, and then reinstalled and calibrated.¹⁶⁷

(3) On March 6, 2009, a marine electronics technician visited the LADY MARY and performed service on the WindPlot system. WindPlot is an electronic chart system which receives data from a GPS unit, and plots the vessel's positions on NOAA nautical charts or bathymetric charts. The technician found 96,000 tracks on one of the LADY MARY's computers, which was too many for the system. The technician deleted the tracks from the computer and copied some basic track information from another vessel.¹⁶⁸

(4) The LADY MARY's power take-off (PTO), which ran the hydraulic pumps for the fishing gear, broke during the first scalloping trip of the 2009 season. On March 11, 2009, a marine engine technician went onboard to examine the PTO. He took the PTO assembly off of the engine and found that the clutch unit had worn out, the pilot bearing was loose and the hub on the front of the engine was worn out. He ordered the necessary parts and reassembled the PTO later that month. The technician felt that the PTO damage was normal wear and tear due to engine vibrations.¹⁶⁹

f. General Arrangements

(1) The LADY MARY had three decks; a lower deck, a main deck, and an upper deck. Beginning at the bow of the vessel, the first compartment on the lower deck was a fore peak water tank. This was used to store fresh water for the crew. The second compartment was the forward bunk room, with a water tank located below. The third compartment was the engine room, which was surrounded by fuel tanks on each side. The Shore Manager referred to the engine room fuel tanks as saddle tanks. The fourth compartment was the fish hold, which was partitioned into seven transverse fish bins using plywood, insulation, and 2" x 8" boards. There was a cement filled tank located below the fish hold. Aft of the fish hold were two more water tanks, divided by a mid-ship longitudinal bulkhead. The final compartment on the lower deck was the lazarette. See the Figure on the next page for an approximate profile view sketch.¹⁷⁰

(2) On the main deck, beginning at the bow of the vessel, the first compartment was the old wheelhouse. The second compartment was the galley and the third compartment was the aft bunk room. There was a longitudinal passageway outboard of the galley and the aft bunk room on both the port and starboard sides, although only the port side passageway provided access into those spaces. The fourth and final compartment was the shucking house. Aft of the shucking house the main deck was open.¹⁷¹

¹⁶⁷ Exhibit 113 & Transcript 1391-1393

¹⁶⁸ Exhibit 113 & Transcript 1385-1386, 1389

¹⁶⁹ Exhibit 68 & Transcript 940, 1324-1326

¹⁷⁰ Exhibit A, F, 122 & Transcript 882-883, 888-890, 894

¹⁷¹ Exhibit A, 89 & Transcript 421-422, 853-854

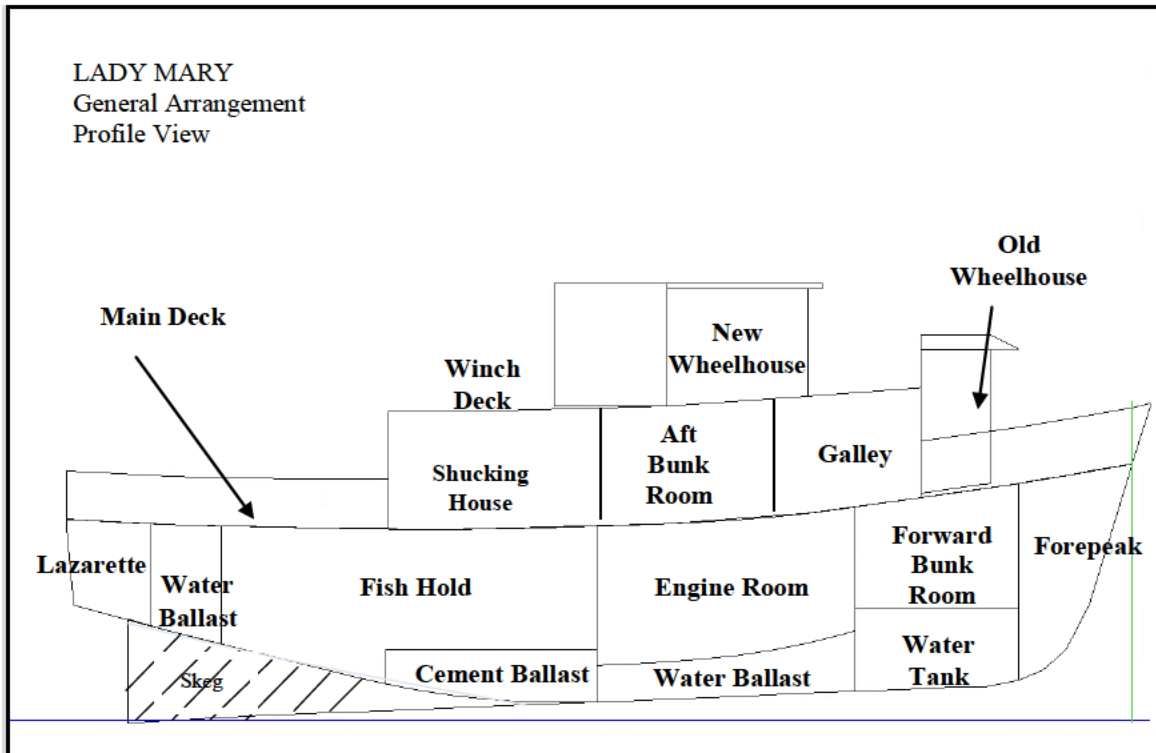


Figure 9: LADY MARY Profile View

(3) The upper deck consisted of the new wheelhouse and the winch deck. The aft portion of the wheelhouse contained a small bunk space for the Captain. The winch deck included the scallop dredge winches and an aft facing console, with controls for the engine, the auto pilot, and the winches.¹⁷²

g. Hull Details & Subdivision

(1) The plans for the LADY MARY state that the hull thickness was $\frac{1}{4}$ " , although the Shore Manager testified that the thickness was $\frac{5}{16}$ ".¹⁷³

(2) The LADY MARY had five transverse bulkheads below the main deck. The first bulkhead was the forepeak bulkhead. This formed the aft boundary of the forepeak tank, and was watertight.¹⁷⁴

(3) The second transverse bulkhead was the forward engine room bulkhead. It divided the forward bunk room/water tank from the engine room. The Previous Captain testified that this bulkhead was watertight, but the Shore Manager testified that the watertight door in the bulkhead had a hole cut out and was fitted with an air conditioner.¹⁷⁵

¹⁷² Exhibit A & Transcript 847-848, 861

¹⁷³ Exhibit 33 & Transcript 905

¹⁷⁴ Exhibit 33 & Transcript 420, 470

¹⁷⁵ Exhibit 33 & Transcript 421, 470, 900

(4) The third transverse bulkhead was the aft engine room bulkhead, which separated the engine room and the fish hold. The Shore Manager testified that this bulkhead was watertight. The Previous Captain testified that this bulkhead allowed water to pass through where the shaft entered the engine room.¹⁷⁶

(5) The fourth transverse bulkhead was the aft fish hold bulkhead. The fish hold was the longest compartment below the main deck. The fourth bulkhead formed the forward boundary of the port and starboard water tanks, which were originally constructed as fuel tanks. The Shore Manager testified that this bulkhead was watertight. The Previous Captain testified that this bulkhead allowed water to pass through because there were pipes running through the bulkhead.¹⁷⁷

(6) The fifth and final transverse bulkhead was the lazarette bulkhead, which divided the lazarette from the port and starboard water tanks. The Shore Manager testified that there was a 1½” (approximate) drain pipe running from the lazarette, “underneath the fish hold, into the engine room”. This drain pipe had a gate valve for isolation located in the engine room. The Shore Manager also testified that there were 2” ball valves at the bottom of the port and starboard water tanks to drain these tanks into the lazarette.¹⁷⁸

h. Main Deck Downflooding & Drainage

(1) The Shore Manager testified that the LADY MARY’s main deck forward of the old wheelhouse was watertight with no hatches. The ABS paperwork from the 2001 tonnage measurement stated that a man hole access plate was added to the forepeak tank, but did not identify the location of the access.¹⁷⁹

(2) The old wheelhouse had a watertight door on each side, and each door had four dogs. Just aft of the watertight doors were two openings into the deckhouse addition, one on the port side and one on the starboard side. These openings were oriented transversely on the forward end of the addition, and appeared to be covered with Plexiglas, or a similar material. There was a freeing port on each side of the vessel, just forward of the deckhouse addition, used to drain water from the forward weather deck area.¹⁸⁰

(3) On the starboard side, just above the main deck and just forward of the new wheelhouse, there was an overboard discharge outlet for the bathroom.¹⁸¹

(4) The engine room had two access points. The forward access was a watertight door, as described above in paragraph B.3.g(3). The aft engine room access point was located just inside the entrance to the aft bunk room. The Shore Manager testified that this was an opening in the main deck with a hinged grate to cover it and a ladder down into the

¹⁷⁶ Exhibit 33 & Transcript 471, 519-520, 888

¹⁷⁷ Exhibit 33 & Transcript 471, 520, 881, 883, 888

¹⁷⁸ Exhibit 33 & Transcript 885-888

¹⁷⁹ Transcript 895

¹⁸⁰ Exhibit 6, 9, 97 (Page 1), Exhibit 108 (Image 9748 & 9753) & Transcript 943, 952

¹⁸¹ Exhibit 9 & Transcript 951-952

engine room. The bottom of the ladder was on the centerline of the vessel, just aft of the main engine.¹⁸²

(5) The Previous Captain testified that there was a non watertight wooden door between the shucking house and the aft bunk room/engine room access point.¹⁸³

(6) As discussed in paragraph B.3.c(3) above, the shucking house had overboard openings in four locations, two on each side of the vessel just above the main deck. As discussed in paragraph B.3.c(2), there was a door opening on the aft end of the shucking house. The door was made from a sheet of plywood, and the opening had an 11” coaming.¹⁸⁴

(7) A 76” X 68” raised hatch to the fish hold was located on the centerline of the vessel and was divided by the aft bulkhead of the shucking house, with 24” of the hatch length inside the shucking house and 52” outside. The hatch coaming extended 26” above the main deck and the aft section of the hatch had a cover that sat on top of the coaming. The aft section of the hatch was not latched down while the vessel was at sea, but it was heavy and usually took two crew members to lift it.¹⁸⁵

(8) The LADY MARY’s main deck bulwarks were approximately 3.5’ high and contained four freeing ports for the aft section of the main deck, two on each side. The freeing ports were 21” long and there was a metal plate chained near each freeing port. When the crew brought up a load of scallops, they slid these metal plates into guide rails which held the plates over the freeing port openings. This prevented scallops from being washed overboard.¹⁸⁶



Figure 10: Port forward freeing port

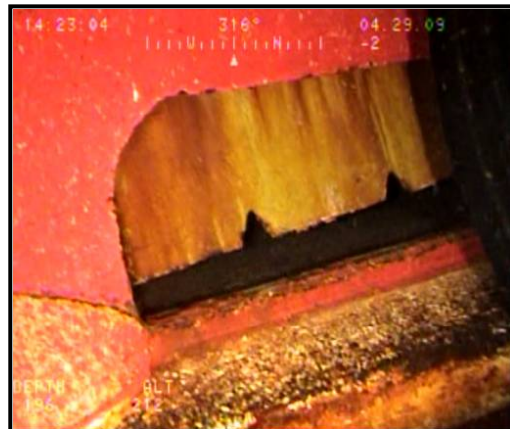


Figure 11: Starboard forward freeing port

¹⁸² Transcript 897-899

¹⁸³ Transcript 421

¹⁸⁴ Exhibit 89 & Transcript 860, 944-945, 948

¹⁸⁵ Exhibit 89, 108 (Image 9781), 110 (Image 69) & Transcript 455, 913-914

¹⁸⁶ Exhibit 6, 9, 44, 45, 89 & Transcript 423, 537, 951



Figure 13: Port aft freeing port



Figure 12: Starboard aft freeing port

(9) At the aft end of the main deck, right next to the transom, was a circular access hatch leading into the lazarette. The hatch was on the port side of the vessel and was not flush with the main deck; it was raised up on a rectangular access trunk with the aft end higher than the forward end. The Previous Captain testified that the lazarette hatch cover was made of metal, and was like a heavy lid with a handle that would sit on top of the opening. He also testified that the cover was not latched down, but the Survivor testified that it did have a way to be secured. The lazarette hatch cover was missing from the sunken vessel.¹⁸⁷



Figure 14: Open lazarette access point located just forward of the transom, port side.

¹⁸⁷ Exhibit 110 (12May Image 7673 & 12May Still 22) & Transcript 453-454, 1069

i. Through Hull Penetrations Below the Main Deck

(1) The LADY MARY had four overboard discharge outlets below the main deck on the port side, all located underneath the forward section of the new wheelhouse. The forward outlet was connected to an automatic bilge pump in the engine room. The next outlet was a drain for the bathroom. The two aft outlets were not in use, and were closed off with ball valves inside the hull.¹⁸⁸

(2) There were three keel coolers, one for the main engine and one for each of the two generators. The main engine keel cooler was located on the starboard side of the hull, below the chine. At least one of the generator keel coolers was on the port side of the hull, but the Shore Manager's testimony was unclear as to which side the other generator keel cooler was on. The Shore Manager testified that during the 2006 drydock period, one of the generator keel coolers was installed and the two existing keel coolers were sandblasted, examined and found to be intact.¹⁸⁹

(3) The Shore Manager testified that the propeller shaft stuffing box was located at the aft end of the engine room, just aft of the main propulsion engine clutch and below the engine room access ladder. The Previous Captain, however, testified that the shaft stuffing box was located in the aft end of the fish hold. The stuffing box was the water tight protection for the propeller shaft through hull penetration. The Shore Manager testified that from the stuffing box, the propeller shaft ran aft through the cement filled tank which was below the fish hold. Within the tank, the propeller shaft was encased in a pipe that ran just above the level of the cement. The Shore Manager testified that the propeller shaft pipe (or casing) was not visible above the fish hold deck, but the vessel plans (Exhibit 33) indicate there may have been a small section of the pipe running through the aft end of the fish hold prior to entering the cement filled tank.¹⁹⁰

(4) The rudder stock entered the lazarette through a bottom plate penetration with packing at the top. The Shore Manager testified that the top of the rudder stock casing was at chest level [approximately four feet high]. The Shore Manager did not remember when the rudder stock packing was last replaced.¹⁹¹

j. Machinery Specifications

(1) The LADY MARY's main propulsion engine was a 353 Caterpillar, which was regulated at 425 horsepower. The Shore Manager testified that the engine's idle speed was 500 revolutions per minute (RPM), the typical speed while recovering the dredge was 900 RPM, and the maximum RPM on the main engine was 1250.¹⁹²

¹⁸⁸ Exhibit 6 & Transcript 943-946

¹⁸⁹ Exhibit 44 & Transcript 926-927, 954, 966

¹⁹⁰ Exhibit 33 & Transcript 449, 891-893, 901

¹⁹¹ Transcript 1113-1114, 1162

¹⁹² Exhibit 73 (page 3), Exhibit 112 & Transcript 937, 1144, 1335

(2) When Smith & Smith Inc. purchased the vessel, there was one generator onboard. This was a 4-71 Detroit Diesel, rated at 60 kilowatts (kW) and installed on the port side of the engine room, near the forward bulkhead. The Shore Manager installed a second generator on the starboard side of the engine room, near the aft bulkhead. This was a 2-71 Detroit Diesel, rated at 20 kW. The Shore Manager testified that when the price of fuel went up, the crew stopped using the 4-71 while underway, and only used the 2-71. The 2-71 would power everything they needed, except the cooking stove.¹⁹³

(3) The main winches used to haul back the scallop dredge were McElroy 504 winches. These winches are no longer in production, but a marine engine technician testified that McElroy 504 winches were typically configured with a 10,000 Series Char-Lynn motor. The technician also testified that in his opinion, this type of winch would stop if it were overloaded, either because the relief valve would open or because the friction plate would slip.¹⁹⁴

(4) The LADY MARY also had two Pullmaster winches installed between the McElroy winches. (See Figure 3 within section c, above) The Shore Manager and the Previous Captain referred to these winches as “gearmatics” or “pull masters.” These were used to maneuver the scallop dredge onto the main deck. The testimony and the collected evidence agreed that these winches provided about 12,000 pounds of line pull, but there was a conflict regarding which series they were. One series provided equal speed in both directions, and the other series provided a rapid reverse capability.¹⁹⁵

(5) The main winches and the “gearmatic” winches were all hydraulically driven. There were two hydraulic pumps, one for the port side winches and one for the starboard side winches, which could not be cross connected. The hydraulic pumps were run by a power take-off (PTO) from the main engine. There was a spring loaded control lever located on the aft console which used air pressure to engage a SP-114 twin disc clutch and put the PTO in gear to turn the hydraulic pumps. The spring loaded control lever automatically returned to the neutral position after use. A marine engine technician testified that the PTO had a horsepower (hp) rating between 90 hp and 130 hp.¹⁹⁶

¹⁹³ Transcript 926, 964-966

¹⁹⁴ Transcript 865-866, 1343, 1345

¹⁹⁵ Exhibit P & Transcript 435, 1148, 1275, 1343, 1345

¹⁹⁶ Transcript 521, 940, 1335-1338, 1341

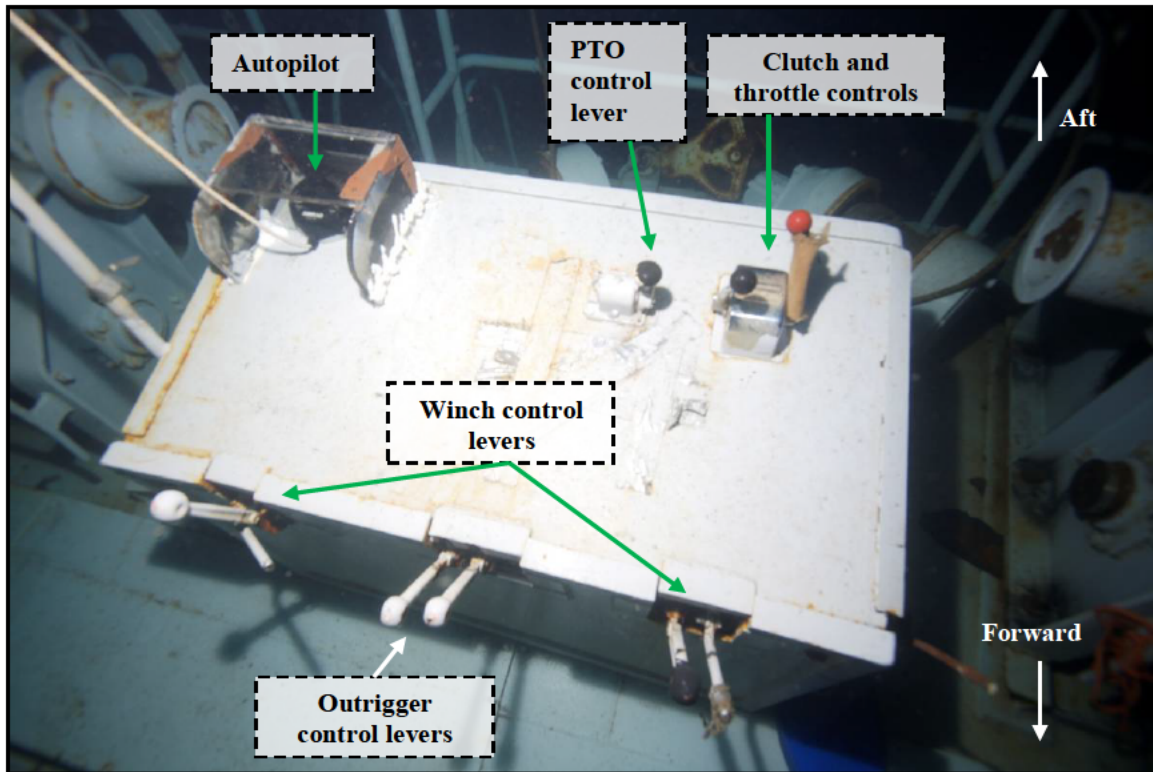


Figure 15: Aft console

(6) The marine engine technician testified that the typical relief valve setting for the main winch hydraulic pumps was between 2300 and 2500 pounds per square inch (psi). He also testified that those pumps were gear pumps, designed to supply 40 gallons per minute.¹⁹⁷

(7) The main winches and the “gearmatic” winches were all connected to an electrically driven backup pump. The Shore Manager testified that he could never get the backup system to work. The backup system would slowly recover the scallop dredge if the PTO failed, but it could not be used to regularly work the main winches. The backup system could also raise and lower the outriggers.¹⁹⁸

(8) The marine engine technician who worked on both the PTO repairs discussed above in paragraph e(4), and who testified regarding the McElroy 504 winches, testified that from his perspective, the condition of the LADY MARY was average when compared to other fishing vessels he had worked on. The marine technician had approximately 30 years of experience working on fishing vessels and had worked on various LADY MARY projects for three years.¹⁹⁹

¹⁹⁷ Transcript 1336, 1342, 1347

¹⁹⁸ Exhibit 112 & Transcript 521, 963, 1327

¹⁹⁹ Transcript 1326, 1328

(9) The outriggers were raised up and down using PL-5 Pull Master winches mounted at the base of the outrigger.²⁰⁰

(10) The LADY MARY's steering system was connected to a hydraulic pump which was belt driven by the main engine. The backup steering pump was connected to the 4-71 generator.²⁰¹

k. Scallop Fishing Gear

(1) The main winches used to haul back the scallop dredge were discussed in paragraph B.7.j(3) above. The scallop dredge cable on the port side main winch was 24 millimeter (0.945 inch) diameter wire, and it was 1,200 feet long. There was no cable installed on the LADY MARY's starboard side main winch at the time of sinking.²⁰²

(2) From the main winch, the scallop dredge cable ran back to a ten ton block which was attached to the gallows and suspended outboard of the bulwarks at the port aft corner of the vessel. This block was the directional towing point for the scallop dredge.²⁰³

(3) The end of the scallop dredge cable ran through a swivel, which was shackled to the tongue of the dredge, and looped back around and spliced into itself.²⁰⁴

(4) The scallop dredge consisted of a triangular framework of steel and chain with a 10.5 foot opening, towing a steel mesh bag with a twine top that terminated at a steel bar called the club stick. The dredge weighed somewhere between 2,500 and 3,500 pounds without catch. A 10.5 foot dredge could hold approximately 25 bushels of scallops.²⁰⁵ See the Figures on the next page.

²⁰⁰ Exhibit 74 & Transcript 1012, 1153

²⁰¹ Transcript 1116, 1163, 1165

²⁰² Exhibit 109 (Image 11), Exhibit O & Transcript 870, 1216-1217

²⁰³ Exhibit 10, 114 & Transcript 869-870, 913

²⁰⁴ Exhibit 108 (Images 62, 63)

²⁰⁵ Transcript 426, 436, 684-685, 704, 914-915

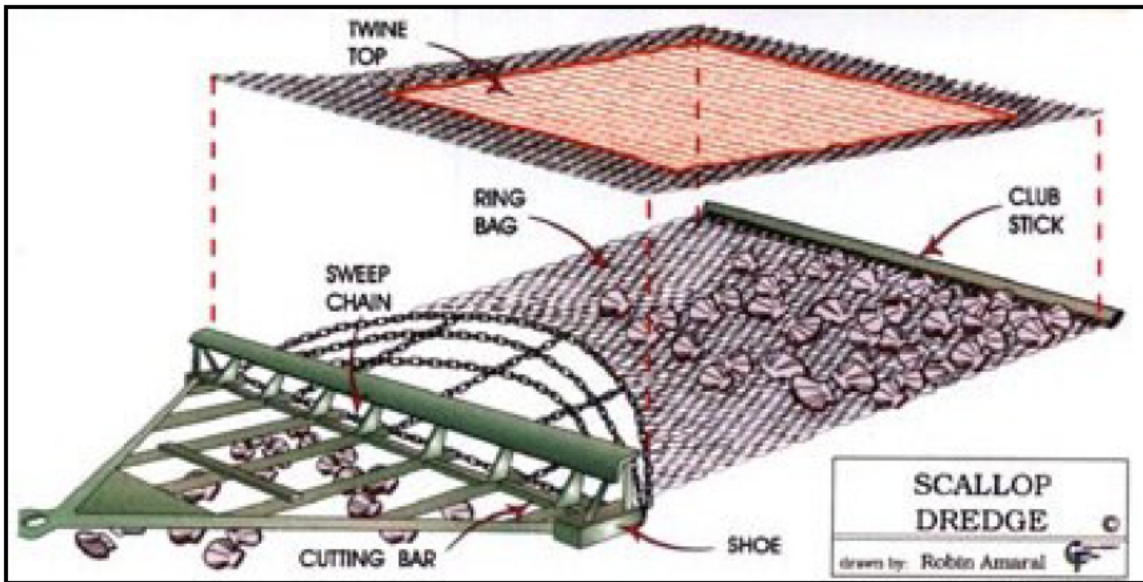


Figure 16: Diagram of a typical scallop dredge (From “*Bottom Tending Gear Used in New England*” by Ronald Smolowitz; obtained from www.fishingnj.org/diascall.htm)

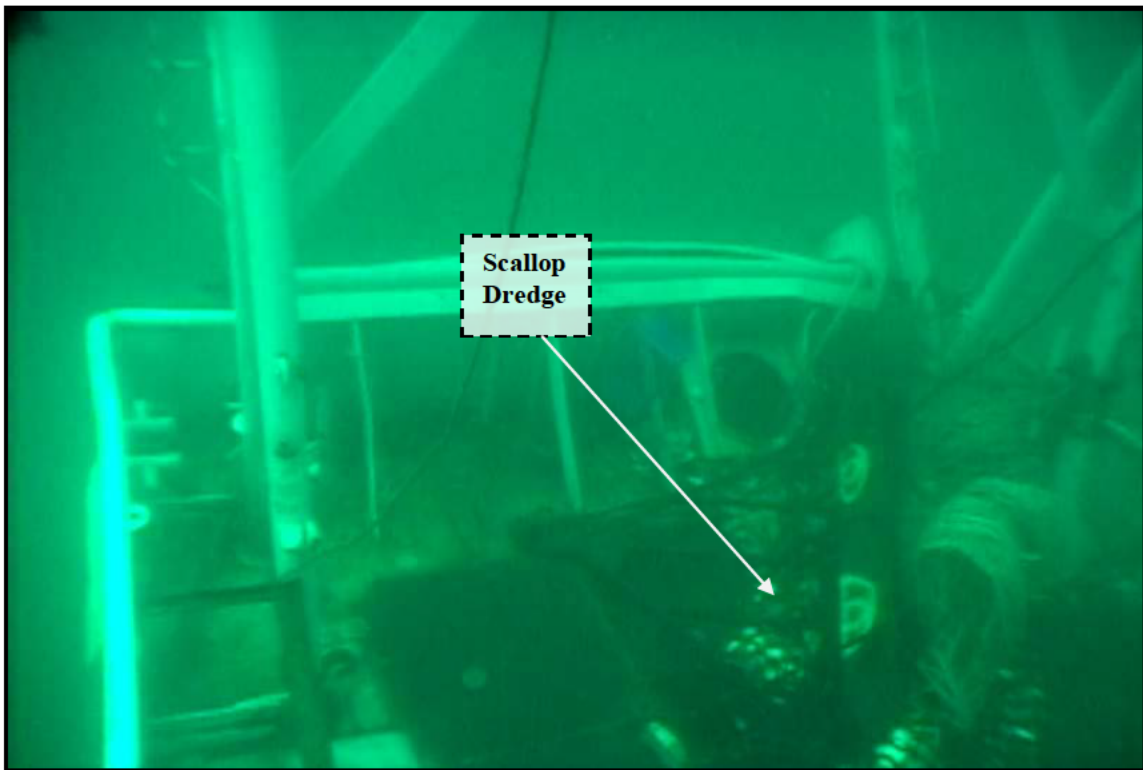


Figure 17: LADY MARY scallop dredge

(5) After the scallop dredge was full, it was brought up out of the water to the block, where the crew hooked into the dredge with the cable from one of the gearmatic winches. This cable was used to pull the dredge in and over the port side rail to the middle of the

main deck. The cables would then be adjusted to set the dredge down on the deck, where a vertical steel plate kept it from shifting around while the crew dumped out the catch.²⁰⁶

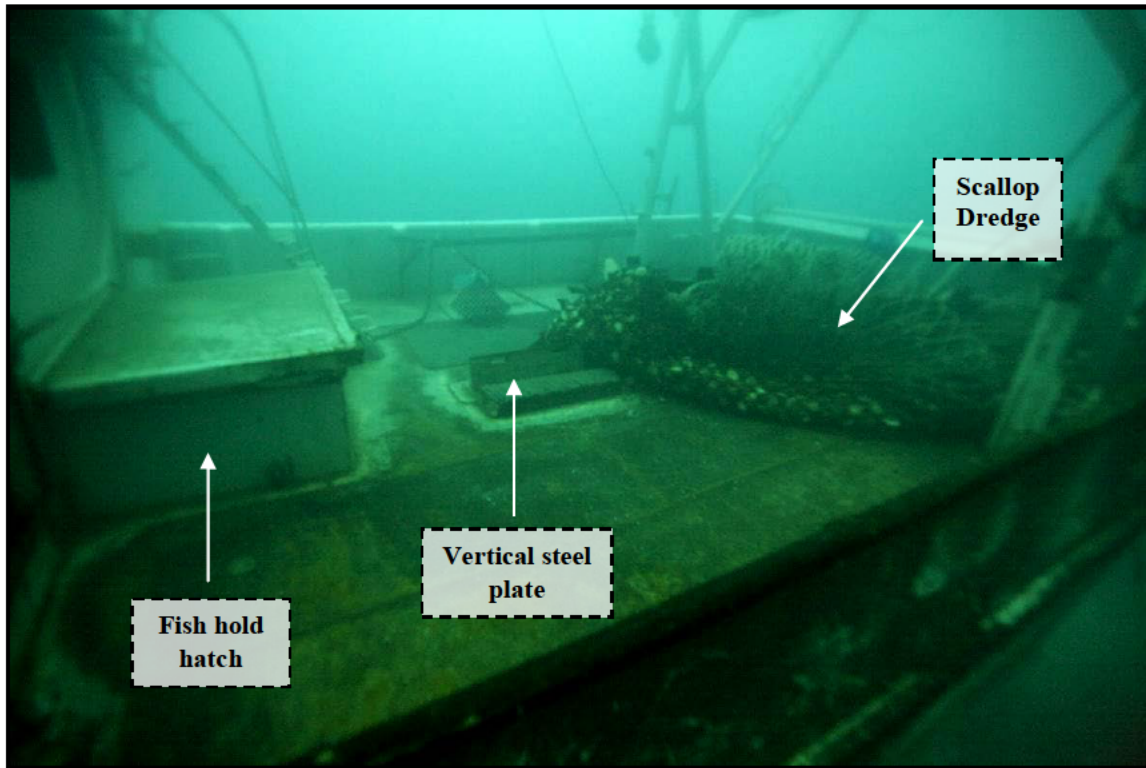


Figure 18: Main deck of LADY MARY

I. Bilge & Wash Down Systems

(1) The LADY MARY had a fixed bilge pump in the engine room that was connected to a manifold. The manifold had suction lines to the lazarette, the fish hold, and the engine room. The manifold was also connected to the seacock, which was a raw water valve on the hull of the vessel which supplied water to the scallop cutting trough in the shucking house. The fixed bilge pump was electric and powered by the generator. The Survivor testified that he knew how to use this system through experience.²⁰⁷

(2) In addition to the system described in the paragraph above, the vessel also had three independent automatic bilge pumps, one located in the lazarette, one in the fish hold and one in the engine room. The engine room independent automatic bilge pump was located at the aft end of the space, under the shaft. The Shore Manager testified that the independent automatic bilge pump in the lazarette had to be plugged in before it would operate automatically. The plug was located in the lazarette, close to the overhead in the aft port corner of the space. To reach the plug, a crew member had to go down into the lazarette; it couldn't be reached from the hatch. When the aft water tanks were emptied into the lazarette, the water drained into the engine room through the 1 ½" drain pipe and

²⁰⁶ Transcript 436, 534, 909, 1148

²⁰⁷ Transcript 451, 507, 542, 944-945, 963-964, 968

got pumped out automatically, or the lazarette automatic pump was turned on to pump the space out more quickly, and was the preferred method.²⁰⁸

(3) There were two pumps to provide water for the vessel's two wash down hoses.²⁰⁹

m. Alarms

(1) The LADY MARY had an audible general alarm connected to an indicating panel in the new wheelhouse and a flashing red light in the engine room. The general alarm produced an extremely loud horn-like sound throughout the vessel, and the Shore Manager testified "I guarantee it will wake them up." The general alarm was triggered by the engine alarms, such as the low oil pressure alarm, and the high water alarms. The general alarm could also be manually activated or silenced from the panel in the new wheelhouse. The Previous Captain testified that there were three high water alarms, located in the lazarette, the fish hold and the engine room, but the Shore Manager testified that there were two high water alarms, located in the lazarette and the engine room.²¹⁰

(2) The previous LADY MARY Captain testified that he would test the general alarm once or twice per trip, and that it always worked. The Commercial Fishing Vessel Safety Examiner tested the high water alarms during his exams in 2007 and 2008, and they operated properly. The Survivor had heard the general alarm three times during the March 18 – March 24, 2009 trip, but he did not hear any alarms on the morning of the sinking.²¹¹

n. Communication Equipment

(1) The LADY MARY's communication equipment consisted of three VHF radios, a satellite phone in lieu of a single side band radio, and a VMS unit with email capabilities. At least one of the VHF radios was connected to a three hour emergency power supply from a battery. The communications equipment met the requirements of 46 CFR 28.245.²¹²

(2) The Shore Manager testified that the LADY MARY had a single side band radio onboard at one time. The radio was removed when it stopped working because the vessel had a satellite phone onboard, which was an allowable substitute.²¹³ See the Figure on the next page. [See Section B5 for additional information regarding the communications equipment.]

²⁰⁸ Transcript 451-452, 946-947, 964, 1197-1199, 1503-1505

²⁰⁹ Transcript 963-964

²¹⁰ Transcript 449, 538, 1188-1189, 1191-1196

²¹¹ Exhibit 34, 35 & Transcript 219, 244, 448-449, 538-539

²¹² Exhibit 35 & Transcript 597, 962, 1234-1236, 1239, 1244

²¹³ Transcript 962

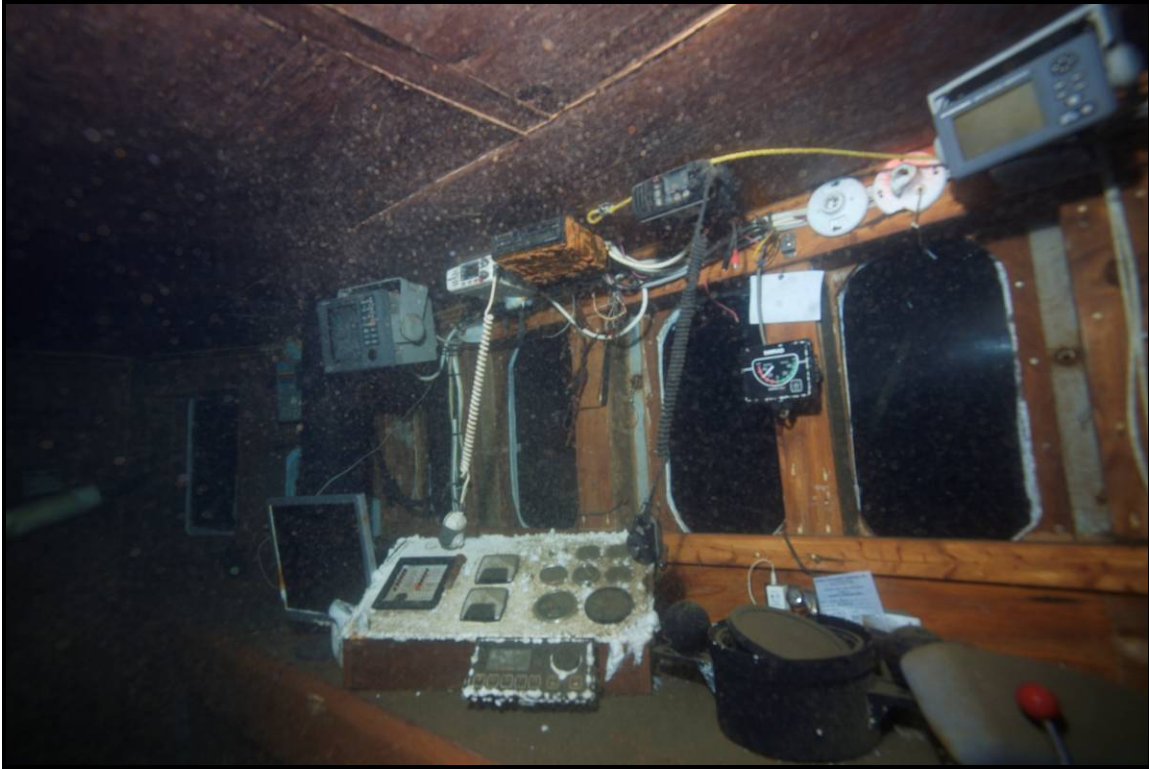


Figure 19: The new wheelhouse

o. Navigation Equipment

(1) The LARY MARY was equipped with two Furuno GP-37 GPS units. The units were externally powered and were capable of storing many track points, user generated waypoints, and user routes in volatile random access memory (RAM). Internal backup batteries preserved the data in instances when ship's power was lost, provided the voltage of the internal batteries did not fall below 1.5V. Both GPS units were recovered by U.S. Navy divers in mid October 2009 and delivered to the NTSB Vehicle Recorders Division for analysis. The voltages measured across the internal backup batteries were 0.85V and 0.04V, so data recovery was not possible.²¹⁴

(2) There were two WindPlot II charting systems on the LADY MARY, which were installed on separate computers located in the new wheelhouse. WindPlot II is an electronic chart system which receives data from a GPS unit and plots the vessel's positions on NOAA nautical charts or bathymetric charts. One of the computers was recovered by U.S. Navy divers, along with a dongle (a device used by some proprietary vendors as a form of copy protection) containing the WindPlot II system. The NTSB Vehicle Recorders Division extracted and cleaned the hard drive, and sent it to an outside vendor for rebuilding and data recovery. Approximately 6500 track files were recovered, each containing up to 600 way points, but the most recent track file recovered was from February 17, 2009.²¹⁵

²¹⁴ Exhibit 105, 134 & Transcript 1236

²¹⁵ Exhibit 134 & Transcript 1237, 1240-1241, 1385-1389

(3) The LADY MARY was also equipped with a fathometer, a magnetic compass, and two radars in the new wheelhouse. The two radars were independent of each other, with separate antennas.²¹⁶

p. Lifesaving Equipment

(1) The Survivor testified that there were four survival suits stored in the new wheelhouse and an additional three survival suits were kept in the forward bunk room. The Shore Manager also testified that the vessel was equipped with seven survival suits, but he said that there were five brand new suits stored in the new wheelhouse and two in the aft bunk room. In addition, he testified that before the March 18 – March 24, 2009 trip, Deckhand 1 brought an additional survival suit onboard from the F/V MARY ELIZABETH. There were no life jackets on board the LADY MARY.²¹⁷

(2) The Survivor, the Captain and Deckhand 1 were all recovered wearing survival suits. The Survivor's suit was sent to a Coast Guard approved live saving servicing company and passed a pressure test. The report stated that the suit was in good condition, with

“one very small leak in the seam of the zipper.” The Captain's survival suit was cut when it was removed for the Medical Examination and could not be tested, but appeared to be in good condition. The Survivor's suit and the Captain's suit were Sterns Cold Water Immersion Suits, labeled as Adult Universal size. Deckhand 1's survival suit was disposed of in a biohazard bin at the Medical Examiner's office, and

could not be recovered for examination.²¹⁸



Figure 20: The Captain's and Survivor's survival suits

(3) The LADY MARY was equipped with a Viking eight person inflatable life raft which included a SOLAS A emergency equipment pack. The life raft was stored in a cradle on the weather deck, between the old wheelhouse and the new wheelhouse. The painter was 36 meters long (118 feet) and its maximum stowage height was 25 meters (82 feet). The life raft was manufactured in June 2006 and was last inspected by a Coast Guard

²¹⁶ Exhibit 105, 106 & Transcript 1236-1240, 1391

²¹⁷ Transcript 365, 533, 1251-1252, 1254

²¹⁸ Exhibit 2, 3, 36, 98

approved servicing station on January 19, 2009. The life raft was connected to its cradle by a Hammar brand hydrostatic release unit (HRU).²¹⁹ [See Section B11 for additional information regarding the HRU.]

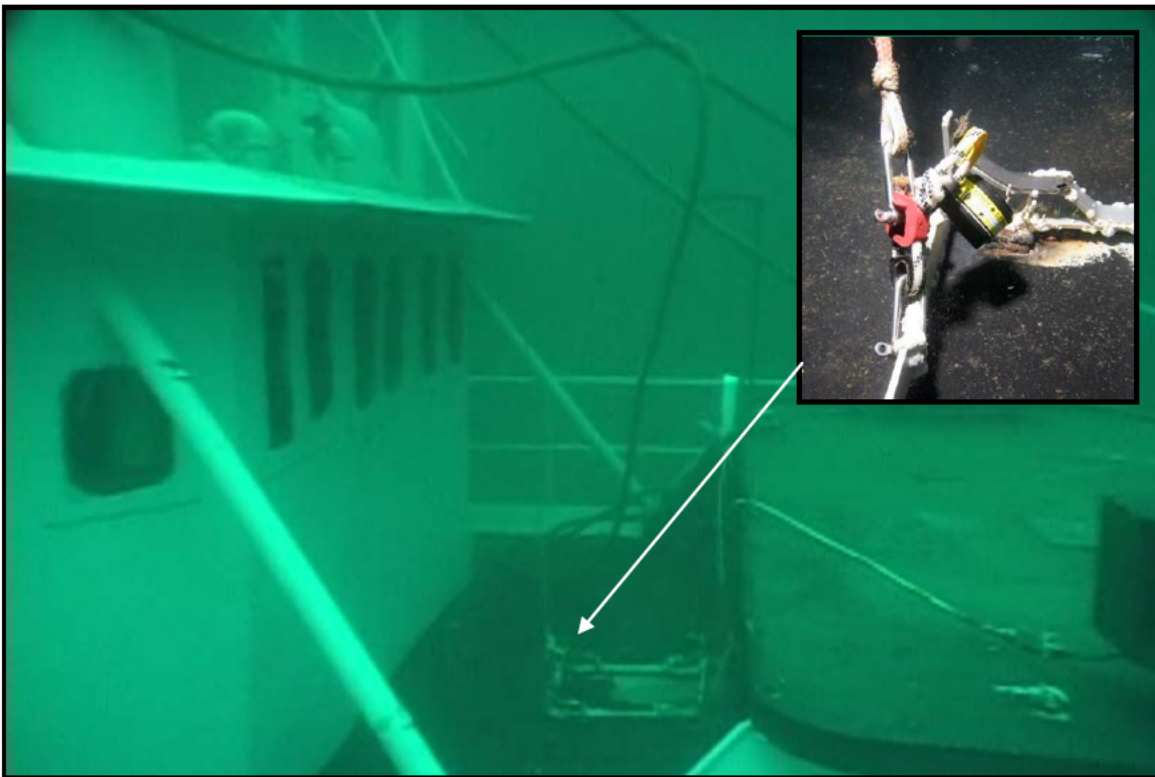


Figure 21: Empty life raft cradle and HRU.

(4) The Coast Guard Rescue Helicopter 6530 located the LADY MARY's inflated life raft at 0836 on March 24, 2009. The Rescue Swimmer was lowered to the water and swam to the raft to look inside. He observed two paddles, a survival kit, and a blue case, but could not identify what was inside of the blue case. He also observed the ballast bags under the life raft. The USCGC DEPENDABLE recovered the life raft later that day.²²⁰

(5) There were three life rings onboard the LADY MARY during the CFVSE in 2007 and 2008. One of the life rings was found floating among the debris and was recovered by the USCGC DEPENDABLE on March 25, 2009. Another life ring, with line attached, was found in the shucking house of the sunken vessel.²²¹

(6) The LADY MARY was equipped with an ACR Electronics RLB-32 Emergency Position Indicating Radio Beacon (EPIRB). The EPIRB was stored above the life raft, and slightly to port. The EPIRB was recovered by the USCGC DEPENDABLE on March 25, 2009.²²² [See Section B10 for additional information regarding the EPIRB.]

²¹⁹ Exhibit 9, 18, 44, 85, 103

²²⁰ Exhibit 64 & Transcript 68, 87

²²¹ Exhibit 1, 34, 35, 64, 108 (Image 9791)

²²² Exhibit 4, 44, 64

q. Distress Signals

(1) The Shore Manager testified that the LADY MARY had the required number of flares onboard, stored in a cabinet in the new wheelhouse. One orange handheld flare was photographed by commercial divers just inside the watertight door to the old wheelhouse on the port side. One end of the flare was sticking up above the door coaming.²²³

r. Fire Fighting Appliances

(1) The Shore Manager testified that there were seven portable fire extinguishers onboard the LADY MARY, but he did not specify their exact size or type. The Commercial Fishing Vessel Safety Examiner observed nine portable fire extinguishers onboard the vessel in 2007, and ten in 2008.²²⁴

²²³ Exhibit 110 (Image 255) & Transcript 1031-1032, 1201-1202, 1212, 1255

²²⁴ Exhibit 34, 35 & Transcript 1261-1262

8. LADY MARY Owner

This section describes Smith & Smith Inc., including the business, the management team, the safety culture, and the crew hiring and training practices.

a. Smith & Smith Inc.

(1) Smith & Smith Inc. was formed on July 27, 1998, when the Shore Manager filed Articles of Incorporation with the North Carolina Secretary of State. The Secretary of State Corporate ID number assigned to the company was 0465863. Under the initial Articles of Incorporation, Smith & Smith Inc. was authorized to issue 100,000 shares of common stock. The Shore Manager was named as the Initial Registered Agent and the sole Director of the Board at the time of incorporation.²²⁵

(2) On September 2, 1999, the Shore Manager submitted an Annual Report to the North Carolina Secretary of State. The Shore Manager was listed on the report as the Registered Agent and the company's Secretary-Treasurer, and he signed the report. The Captain was listed as the President of the company and Deckhand 1 was listed as the Vice President. The annual report identified the nature of the company's business as Commercial Fishing.²²⁶

(3) On August 4, 2008, the Shore Manager submitted another Annual Report to the North Carolina Secretary of State. The Shore Manager signed the report and listed his title as Vice President.²²⁷

(4) Smith & Smith Inc. owned only one vessel, the LADY MARY, which was not insured when it sank.²²⁸

b. Experience, Roles and Responsibilities of the Management Team

(1) The Shore Manager, who was [REDACTED] years old in 2009, began surf fishing and flounder fishing with his father when he was 17 or 18 years old. This equates to 46 or 47 years of experience working in the commercial fishing industry. The Shore Manager worked as a vessel captain for 44 of those years. He and his family began scallop fishing 25 years ago.²²⁹ The other two members of the Smith & Smith Inc. management team were the Captain and Deckhand 1, and their experience is discussed in section B.2.a.

(2) The Shore Manager testified that he would discuss decisions regarding the LADY MARY's crew complement, sailing schedules, catch targets, modifications, and maintenance and repairs with the Captain and Deckhand1. The final approval for these decisions usually rested with the Shore Manager, though, because he had considerably

²²⁵ Exhibit 30 & Transcript 845-846

²²⁶ Exhibit 31

²²⁷ Exhibit 32

²²⁸ Transcript 845, 1099

²²⁹ Transcript 845, 905, 1175

more fishing experience. The Previous Captain verified the Shore Manager's role. The Previous Captain testified that the Shore Manager also arranged and paid for maintenance and repairs to the LADY MARY, and that the repairs were always addressed right away. In addition, the Shore Manager would usually schedule servicing of the lifesaving equipment and courtesy Coast Guard Commercial Fishing Vessel Safety Examinations (CFVSE). In the Shore Manager's absence, this was done by Deckhand 1.²³⁰

(3) The Shore Manager would usually meet the LADY MARY at the dock when the vessel returned from a scallop trip. After the catch was offloaded, either the Shore Manager or Deckhand 1 would pay the crew.²³¹

(4) The Shore Manager delegated responsibility for underway operations to the LADY MARY Captain. This included the responsibility for scalloping operations, establishing watch schedules and rest rotations, and conducting drills. The Captain was also responsible for writing up crew lists and providing orientation for new crew members prior to getting underway.²³²

(5) Deckhand 1 was never in charge of the LADY MARY while underway. However, Deckhand 1 signed the Coast Guard CFVSE reports as the LADY MARY vessel representative in 2007 and 2008. Deckhand 1 worked with the Coast Guard examiner during these visits and corrected any problems noted during the exam. The Previous Captain testified that during his time working for Smith & Smith Inc., Deckhand 1's management role was continually increasing.²³³

(6) The LADY MARY did not have a minimum manning standard and a search of the Coast Guard's MISLE database indicated that during 2009, no one involved in the management or operation of the LADY MARY possessed a Merchant Mariners' Credential.

c. Crew Hiring Practices

(1) The Shore Manager was responsible for hiring the LADY MARY crew. Since he regularly spent time on the docks, the Shore Manager testified that he knew the reputation of potential crewmen working on other fishing vessels and at local fish houses. Atypical hiring inquiry would be initiated by the potential crewmember, who would say "Hey Captain [referring to the Shore Manager], do you need a man?" The Shore Manager would then answer either "yes," or "no." There was no paperwork involved in hiring crew members for the LADY MARY.²³⁴

(2) The Previous Captain was hired by the Shore Manager in a manner similar to the one described above. The Previous Captain was running another fishing vessel when he first

²³⁰ Transcript 499-500, 511, 1173-1175, 1200-1201

²³¹ Transcript 518-519

²³² Transcript 1179-1182, 1188, 1202-1203

²³³ Exhibit 34, 35 & Transcript 231, 238, 248, 512, 1179

²³⁴ Transcript 1175-1177

met the Shore Manager. The Previous Captain approached the Shore Manager during the years the LADY MARY was being modified in Cape May, NJ, and asked about a position on the vessel. In the wintertime of 2002, the Shore Manager asked the Previous Captain if he would like to take the LADY MARY out and the Previous Captain agreed. The Previous Captain estimated that he sailed as captain of the LADY MARY approximately 30 to 35 times before the Shore Manager relieved him of his duties in December 2007. The Shore Manager testified that he replaced the Previous Captain because the Previous Captain had violated a NMFS regulation and the LADY MARY had subsequently incurred a fine. The Previous Captain testified that he did not understand why he was relieved of his duties on the LADY MARY, specifically after his last trip in December 2007. However, the Previous Captain also testified that he “knew that boat was going to be his [the Captain’s],” eventually.²³⁵

²³⁵ Exhibit D, E & Transcript 414-417, 442, 464, 911-912

9. Human Factors

This section describes human factors that influenced the LADY MARY's operations. Human Factors is concerned with the application of what we know about people, their abilities, characteristics, and limitations to the design of equipment they use, environments in which they function, and jobs they perform.²³⁶

a. Captain's Experience, Temperament, and Operational Decisions

(1) The Previous Captain, who provided on-the-job training to the Captain, worked on scallop vessels since 1981 and had been a scallop vessel captain since 1991. The Previous Captain took training courses in survival, lifesaving, and CPR. He also testified that he took a "captain's training" course in the mid 1980's, although he did not elaborate on the curriculum and could not remember the official course name or facility. He began working on the LADY MARY after the 2002-2003 modification period discussed in section B.7.c.²³⁷

(2) The Captain's experience operating the LADY MARY included on-the-job training under the tutelage of the Previous Captain, where the Previous Captain progressively gave the Captain more and more time at the helm. Additionally, the Previous Captain gave the Captain a manual about being "a captain," but was not sure if he ever read it. The Previous Captain testified that the Captain "didn't really listen a whole lot to me." When the Shore Manager replaced the Previous Captain in December 2007, the Previous Captain did not think the Captain was ready to take over the LADY MARY.²³⁸

(3) The Previous Captain testified that the Captain sometimes pushed the limits operationally and, "did things that I would never do," and would "go past where he should go." For example, the Previous Captain testified that the Captain would set out the LADY MARY's dredge in a position where the seas and wind would smash into the bow in such a way that could wash "the guys off the deck."²³⁹

(4) The Previous Captain testified that the Captain would have trouble in difficult operational situations, such as very rough weather or when he encountered new or different circumstances. When they sailed together, these difficult situations were resolved with the Previous Captain relieving the Captain. Sometimes this would result in arguments, or even physical battles, because the Captain "was going to do it his way," and "thought he was doing what he should do." A couple of times the Previous Captain was fearful of the Captain. When asked to assess the Captain's temperament, the Previous Captain testified that he felt the Captain had an anger management problem and stated that, "you couldn't tell him much. You could tell him a little bit."²⁴⁰

²³⁶ <http://www.hfes.org/Web/EducationalResources/HFEdefinitionsmain.html>

²³⁷ Transcript 414-415, 519, 876-877

²³⁸ Transcript 398, 414-415, 441-442, 460, 464-469, 509

²³⁹ Transcript 464, 467

²⁴⁰ Transcript 464-466, 468-469

(5) The Previous Captain testified that during the Captain's on-the-job training, there was one occasion when the Captain left the scallop dredge swinging in the air over the main deck. The entire crew was on deck and the swinging dredge posed a serious safety hazard, so the Previous Captain intervened to correct the situation. This led to a violent argument between the Captain and the Previous Captain.²⁴¹

(6) The Shore Manager testified, however, that the Captains skills were sufficient. The Shore Manager got underway with the Captain before the 2008 fishing season and observed the Captain's performance in skippering the LADY MARY. He stated that the Captain "did it good. He did it real good." The Shore Manager said that he had to show the Captain how to regulate the cable a little bit for different depths of water, however he felt that once the Captain got the hang of that he would fine.²⁴²

(7) In March 2009, the Captain started his second year as the LADY MARY's captain.²⁴³

(8) The Survivor testified that the Captain was not as experienced as the Previous Captain. The Survivor felt that the Captain had good knowledge but he lacked experience and sometimes had trouble maneuvering the LADY MARY in rough weather. The Survivor also testified that the Captain did not have a good way of communicating with others when he was angry, and he would take his anger out on objects and throw things.²⁴⁴

(9) In an interview, the Survivor stated that the Captain and Deckhand 1 "fought all the time."²⁴⁵

(10) Underway operational decisions were handled by the Captain. For example, the Captain decided how to handle bad weather during the LADY MARY's voyages and there was no consultation with the Shore Manager in this regard. The Survivor testified that if the weather was too rough, with winds of 30 to 35 miles per hour or higher, the Captain may decide to return to shore. The Survivor testified that during his tenure on the LADY MARY this happened approximately three times; once under the Previous Captain and twice under the Captain. The Previous Captain, however, testified that he never came back to the dock because of weather.²⁴⁶

(11) The Captain was responsible for controlling all of the fishing gear; no one else from the crew operated the scallop dredge winches. The LADY MARY was laid out so that the Captain could singlehandedly operate the vessel and the winches from the aft control station on the winch deck.²⁴⁷

²⁴¹ Transcript 457-458

²⁴² Transcript 911-912

²⁴³ Transcript 398

²⁴⁴ Transcript 398-399, 554-556

²⁴⁵ Exhibit 122

²⁴⁶ Transcript 508-509, 543-544, 1178-1179

²⁴⁷ Transcript 436-437, 546, 848, 1179-1180

(12) The Captain would typically drag for scallops using a cable length that was about three times the water depth, or slightly more. Regulating the length of the cable could improve the catch amounts. For example, if the Captain recovered the dredge and noticed that the tongue was shining (from being rubbed on the bottom) then this would indicate that there was too much cable out.²⁴⁸

(13) The LADY MARY's captain determined the vessel speed while towing the scallop dredge. While the Previous Captain towed scallop dredges at speeds around three or four knots early in his career, and between 4.2 and 5.3 knots more recently, he testified that the Captain tended to tow the scallop dredge faster than he did. In an interview, the Survivor stated that the Captain would generally tow the scallop dredge at about four miles per hour but the speed could be varied up or down depending on how fast the crew was cutting scallops. A NMFS Scallop Fisheries Management Specialist testified that a scallop vessel would tow their dredge at speeds between 3.5 and 5.1 knots. If you did not make at least 3.5 knots, the scallop dredge would bog down in the sand or mud and would not catch scallops.²⁴⁹

(14) The Captain would typically tow the scallop dredge for 45 minutes to one hour before recovering it, but this could be shorter when working in a Sea Scallop Access Area where there were numerous scallops. The Captain decided what to do with the scallop dredge once it was full. The Survivor testified that it was not common to leave a full scallop dredge on deck and the usual process was to empty the dredge and put it right back in the water. The Shore Manager, however, testified that if the weather was bad and/or the crew was tired, and if the weather was cool enough to ensure the scallops would stay fresh, the Captain might decide to leave a full scallop dredge on deck. An additional factor that would affect this decision was whether or not the scallops could be left on deck with the freeing ports closed (a necessary condition to ensure the scallops on deck did not wash overboard). The Shore Manger testified that if the seas were too rough to close the scuppers, it was better to leave the scallops in the dredge and on deck.²⁵⁰

(15) When the Captain was ready to haul back the dredge he would shift to manual steering and put the LADY MARY in a slight turn to port, about ten degrees. The port turn would keep the scallop dredge from bumping into the vessel during the recovery. The vessel was usually kept in gear during a haul back. The Shore Manager testified that the process of recovering a dredge from 200' of water, dumping the catch on deck, and preparing the dredge to go back in the water should take at least 15 minutes, however, he had heard the crew talking about accomplishing all of that in five or ten minutes.²⁵¹

(16) The vessel outriggers were always down when the vessel was underway, but the use of the birds (stabilizers) depended on the prevailing weather conditions. If the winds got up to 35 miles per hour, the Previous Captain testified that he would drop the starboard bird in the water (assuming the dredge was being towed from the port block). If the

²⁴⁸ Transcript 871-872

²⁴⁹ Exhibit 122 & Transcript 448, 719-720

²⁵⁰ Exhibit 122 & Transcript 373, 437, 447, 547-548, 1207-1209

²⁵¹ Transcript 1122, 1135-1136

winds were “storm winds,” he would put both birds in the water, and he testified that he would put the birds approximately 30’ underwater when they were deployed.²⁵²

b. Crew’s Experience

(1) When he was not sailing onboard the LADY MARY, Deckhand 1 was the regular captain of the fishing vessel MARY ELIZABETH (Official Number 506003), and served as the captain of the MARY ELIZABETH since 2001.²⁵³

(2) Deckhand 2 was the captain of the LADY MARY for six months prior to the Previous Captain.²⁵⁴

(3) Deckhand 3 had worked with the Shore Manager for 30 or 40 years. The Survivor testified that Deckhand 3 was a regular member of the LADY MARY’s crew.²⁵⁵

(4) The Shore Manager did not know Deckhand 4 but believed he had experience scalloping. Deckhand 4 sailed on the LADY MARY two or three times with the Previous Captain and a couple of times with the Captain in 2008.²⁵⁶

(5) While Deckhand 5 had previously worked for Deckhand 1 on the MARY ELIZABETH, this was Deckhand 5’s first voyage on the LADY MARY.²⁵⁷

(6) The Survivor had been working in the fishing industry since 2003, and worked on the LADY MARY continuously since 2004. He estimated that he made four to seven trips on the vessel each year. The Survivor also made two trips on the MARY ELIZABETH.²⁵⁸

c. Sleep/Rest Rotations

(1) There were no regulatory limitations on watches or work periods for the LADY MARY, and no requirements pertaining to rest periods. The Shore Manager did not tell the Captain how to run his watch schedule, or how much sleep the crew should be getting. These decisions were left up to the Captain.²⁵⁹

(2) During the LADY MARY’s voyage from March 18 – March 24, 2009, the Survivor worked for 18 hours each day from 0600 to 2400, and then slept for the remaining six hours. Deckhand 1 was on the same schedule as the Survivor. The Survivor testified that two crew members would go to sleep at one time, for six hours. During a follow up interview, the Survivor clarified that every three hours two people would go to sleep for

²⁵² Transcript 411, 516-517, 867, 920-921, 923-924

²⁵³ Transcript 534, 846

²⁵⁴ Transcript 517, 857

²⁵⁵ Transcript 399, 1184

²⁵⁶ Transcript 1184-1185

²⁵⁷ Transcript 534, 1185-1187

²⁵⁸ Transcript 362-363, 397-398, 553

²⁵⁹ Transcript 1180-1182

six hours. The Survivor also reported that the whole crew would be awake during rough weather to act as lookouts.²⁶⁰

(3) The Captain did not have a set sleep schedule like the rest of the crew. When he felt tired, he would stop the vessel for three or four hours while he slept. The Survivor testified that if the seas were calm, he might drop the anchor or leave the full scallop dredge on the bottom as an anchor. Deckhand 1 would usually be in the wheelhouse when the Captain was resting. The Survivor testified that the main reason Deckhand 1 was in the wheelhouse was to act as a lookout, but if the conditions were rough then he would steer the vessel while the Captain was resting. Deckhand 2 would occasionally be in the wheelhouse when the Captain was resting. The Shore Manager testified that the Captain sometimes opted not to keep anyone in the wheelhouse when he was resting, but the Survivor testified that there was always someone in the wheelhouse. The Survivor testified that the Captain's last rest period was around 1600 or 1700 on March 23, 2009.²⁶¹

d. Working Language

(1) The working language onboard the LADY MARY was English. The Captain, Deckhand 1, Deckhand 2 and Deckhand 3 only spoke [REDACTED]. Deckhand 4 spoke [REDACTED]. Deckhand 5 and the Survivor spoke [REDACTED]. Translators were utilized during the Survivor's official testimony.²⁶²

(2) Instructions were communicated to the crew in English. The Survivor would try to understand the instructions as best he could, but usually he would just follow a daily routine based on his past experience. There were times when the Survivor did not understand, and he testified that he would ask questions when that happened. All of the signs and instructions on the LADY MARY were written in English. The Survivor testified that he could read a little English and that Deckhand 4 could read English. He did not know if Deckhand 5 could read English. The Survivor received his initial LADY MARY safety training and ship familiarization from the Previous Captain, in English, when he reported onboard for the first time.²⁶³

e. Communications with the Shore Manager

(1) When the LADY MARY was underway, the Shore Manager would communicate only with the Captain. This was done using the vessel's satellite phone. The Shore Manager testified that the Captain would call "just to talk," and the Captain usually would not call to ask questions. Sometimes the Shore Manager told the Captain not to call unless something was wrong.²⁶⁴

²⁶⁰ Exhibit 122 & Transcript 364, 371-372, 395

²⁶¹ Transcript 370, 396-397, 405, 409, 1271-1272

²⁶² Transcript 361, 407, 509, 1189-1190

²⁶³ Transcript 407-409, 509, 544

²⁶⁴ Transcript 972, 1181

(2) The Shore Manager testified that he would use the computer to check the LADY MARY's location prior to going to bed each evening. This was done using a website called www.wheremyboat.com. If the Shore Manager felt the boat was getting too close to the line [referring to the boundary of the Sea Scallop Access Area], he would send the vessel an email through the VMS unit.²⁶⁵

f. Drug Use

(1) The LADY MARY's crew was not subject to pre-employment, periodic or random chemical testing requirements. The crew was subject to chemical testing if they were directly involved in a serious marine incident.

(2) The Shore Manager specifically told the LADY MARY's crew not to use any type of alcohol or drugs while onboard. The Survivor testified that he never saw anyone use drugs or alcohol onboard the vessel, but he didn't know what other crew members may have been doing in their rooms.²⁶⁶

(3) Post mortem blood tests for the [REDACTED] both tested [REDACTED] for Delta-9 THC, which is the principle psychoactive ingredient of marijuana/hashish, and Delta-9 Carboxy THC (THCC), which is the inactive metabolite (breakdown product) of marijuana that forms in the body shortly after ingestion. The test results were as follows:²⁶⁷

	Delta-9 THC	Delta-9 Carboxy THC
[REDACTED]	[REDACTED] ng/mL	[REDACTED] ng/mL
[REDACTED]	[REDACTED] ng/mL	[REDACTED] ng/mL

Table 5: THC levels found in the [REDACTED]

(4) [REDACTED] Independent chemical testing conducted by the Federal Aviation Administration Forensic Toxicology Research Team confirmed the test results for both individuals.²⁶⁸

(5) Marijuana is a Drug Enforcement Administration Schedule I hallucinogen. Pharmacologically, marijuana has depressant and reality distorting effects. It can affect a person's perception of time and distance, motor coordination and the ability to react. In an emergency situation, a person under the influence of marijuana would typically take longer to understand the problem, their critical thinking would be impaired, and they may under- or over-respond.²⁶⁹

(6) Delta-9 THC peak concentrations are usually detected in the blood just after beginning of smoking (ranging from 50-270 ng/mL), and then decrease to less than 5 ng/mL after 2 hours. Since THCC is a metabolite of Delta-9 THC, the peak

²⁶⁵ Exhibit K & Transcript 1267-1268
²⁶⁶ Transcript 545
²⁶⁷ Exhibit 37, 40 & Transcript 339-340
²⁶⁸ Exhibit 37, 40, 81, 82
²⁶⁹ Exhibit 37, 40 & Transcript 339-340, 348, 351

concentrations of this drug (ranging from 10-101 ng/mL) are attained 32 to 240 minutes after smoking, and may be detected in the blood for up to one day or more. In chronic marijuana users, both Delta-9 THC and THCC may be present substantially longer. As a comparison, after passive inhalation of marijuana smoke, Delta-9 THC levels have been reported up to 2 ng/mL, but THCC is usually not detectable. A Forensic Toxicologist testified that under normal circumstances, passive inhalation would not result in a level of Delta-9 THC at 2 ng/mL. This would only occur under very severe circumstances, which would be a prolonged (an hour or more) exposure in a completely smoke-filled environment, such as a room or car, and testing within minutes after that exposure.²⁷⁰

(7) Based on the anatomical source of the Captain's blood sample, the sample could have been diluted and the reported concentrations could have been falsely low. Deckhand 1's blood sample was considered to be a good, uncontaminated sample. A Forensic Toxicologist did not see any evidence of improper testing of these samples.²⁷¹

(8) There is not a good correlation between the amount of marijuana in a person's system, and the degree of impairment or the time of ingestion. [REDACTED]

(9) [REDACTED]

g. Emergency Equipment and Training

(1) The Shore Manager testified that he checked all of the LADY MARY's life saving equipment once a month, including checking the survival suit zippers and survival suit light batteries. The Shore Manager was responsible for ensuring the LADY MARY had the correct number of survival suits on board, and that they were the right size for the crewmembers. The Shore Manager testified that he was bigger than all of the crew members, so he knew that if he could fit in the survival suit, then the crew could too.²⁷⁴

(2) The Captain was responsible for orientation and familiarization for new crew members. The Captain was also responsible for conducting fire drills, man overboard drills and drills for donning survival suits.²⁷⁵

(3) The Survivor received a basic orientation and safety training when he first reported aboard the LADY MARY. This training was provided by the Previous Captain, who

²⁷⁰ Exhibit 37, 40 & Transcript 355-356

²⁷¹ Transcript 341-343, 353, 359

²⁷² Transcript 341, 356-357

²⁷³ Transcript 349

²⁷⁴ Transcript 1255-1261

²⁷⁵ Transcript 1188

went through everything and made him understand. The Previous Captain also provided training on how to use the VHF radio to send a Mayday.²⁷⁶

(4) The Survivor received training from the Coast Guard CFVS Examiner on how to don a survival suit and how to use a fire extinguisher. The Survivor also received training from the Captain on survival suits and life rings. During his time on the LADY MARY, the Survivor did not receive training regarding the EPIRB, life raft, first aid or fishing gear safety. He did not receive any training regarding the bilge pumps either, but he was familiar with their operation.²⁷⁷

(5) There were instructions on launching the life raft (written in English) posted in the galley and in the wheel house. The Coast Guard CFVS Examiner provided other lifesaving and firefighting instructions, which were kept in a cabinet in the wheelhouse.²⁷⁸

(6) The National Marine Fisheries Service (NMFS) placed an observer onboard the LADY MARY for three voyages. Prior to sailing with the vessel, the NMFS observers completed a pre trip vessel safety checklist which required a safety orientation, safety instructions or safety drills. In August 2006, the observer commented, "Captain said he was going to conduct a safety drill. We waited all day on some crew members and ended up sailing at night, so no safety drill was conducted." In January 2007, the observer commented, "Crew has performed numerous drills, though not recently due to crew familiarity. Have all worked together for three years and know their responsibilities." In July 2008, the observer noted that safety drills were regularly conducted on the vessel, but that drills would not be conducted while the observer was onboard.²⁷⁹

h. Stern Ramp Factors

(1) Smith & Smith Inc. added a stern ramp on the LADY MARY to guide the scallop dredge over the transom and onto the main deck. The Shore Manager felt this was a safer alternative to lifting the dredge and chain bag over the port side bulwarks, because the stern ramp haul-back operation did not involve lifting the dredge into the air and prevented the dredge from swinging and spinning.²⁸⁰

²⁷⁶ Transcript 408-409, 551-552

²⁷⁷ Transcript 541-542

²⁷⁸ Transcript 544, 1201-1202

²⁷⁹ Exhibit 127

²⁸⁰ Transcript 908-910



Figure 22: Stern view from April 2003



Figure 23: Stern view from October 2008

(2) The Previous Captain only used the stern ramp twice. The first day that he used it, the vessel caught just as many scallops as normal. On the second day, the scallop dredge flipped over a few times during the haul-back, and the Previous Captain felt that the stern ramp recovery was taking too long and losing him money. The Previous Captain decided not to use the stern ramp any more.²⁸¹

(3) The Captain preferred to recover the loaded scallop dredge over the port side bulwarks, rather than using the stern ramp because that is what he was used to.²⁸²

(4) There was a 1" X 6" flat bar on each side of the vessel, from the rub rail on the aft corner to the bottom corner of the stern ramp. The purpose of these flat bars was to keep the dredge from catching on the roller pins at the bottom corners of the stern ramp when the dredge was being deployed over the side bulwarks. If the dredge caught on the roller pins, it would flip over.²⁸³

(5) In an interview, the Survivor stated that it was not uncommon for the scallop dredge and the dredge towing wire to come in contact with the stern ramp or get caught under the stern ramp during recovery. Sometimes the scallop dredge was even brought on deck while the dredge towing wire remained stuck on the stern ramp.²⁸⁴



Figure 24: Stern ramp showing flat bar

²⁸¹ Transcript 434, 910-911

²⁸² Transcript 911-913

²⁸³ Exhibit 107 & Transcript 1485-1486

²⁸⁴ Exhibit 122

(6) The port stern ramp stay wire (connecting the aft lower corner of the stern ramp to the aft corner of the rigging) had broken many times due to chaffing from the dredge towing wire. The Shore Manager installed a small section of pipe on the aft side of the A frame to reduce chaffing and prevent additional stay wire breaks, but the pipe was not long enough. Before the 2009 scallop season, the Shore Manager installed a 20 foot stainless steel pipe that fit over the stay wire like a sleeve. Again, this was to reduce chaffing and prevent additional stay wire breaks.²⁸⁵

(7) In an interview, the Survivor stated that when he went to bed at midnight on March 23rd, the port stay wire was broken but not tied off to any cleat. In an interview with a fisherman who berthed his vessel next to the LADY MARY just prior to the LADY MARY's March 18-24, 2009 underway period, the fisherman confirmed that the port stay wire was broken, but also mentioned that it was securely tied off.²⁸⁶

i. Additional Human Factors

(1) After the 2002-2003 modification period (as discussed in B.7.c(1)-(7)), the Shore Manager felt the vessel was safe and stable, and he did not have the LADY MARY examined by a surveyor or an engineer because that was not a regulatory requirement.²⁸⁷

(2) When asked about the LADY MARY's handling characteristics, the Previous Captain said that "She was a good boat." The vessel handled great in head seas, and good in stern seas. A stern sea would not usually come up the stern ramp, but would get underneath the stern ramp and lift up the vessel. The Previous Captain did not report anything unusual about the LADY MARY's handling characteristics. He testified that the vessel could sit in the trough with 15 or 16 foot seas and his coffee cup would not spill. He also felt that the vessel had plenty of horsepower and was responsive to turns.²⁸⁸

(3) When the scallop dredge was being towed from the port side block, it was preferable to turn the LADY MARY to port. The Previous Captain testified that he would never put the seas on the starboard side during a tow and then make a turn to port. He felt that any turn while towing a scallop dredge was very risky in rough weather.²⁸⁹

(4) As discussed in B.7(h)8, the LADY MARY had metal plates which were used to close the freeing ports when scallops were on the main deck. This prevented the catch from washing overboard. The Previous Captain testified that he would always make sure at least one freeing port was open and the Shore Manager testified that the crew only closed the freeing ports on the port side because that was the side the dredge was recovered on.²⁹⁰

²⁸⁵ Exhibit 108 (Image 51), 110 (Image 36), 122 & Transcript 1104-1106, 1484-1485, 1495-1496

²⁸⁶ Exhibit 122, 138

²⁸⁷ Transcript 877-878

²⁸⁸ Transcript 428-429, 432-434

²⁸⁹ Transcript 429-432

²⁹⁰ Transcript 422-423, 537, 951

(5) The Previous Captain testified that the LADY MARY had an anchor, but it was not connected to a chain or winch, so it was never used. As an alternative to using an anchor, a common practice in the scallop industry involved using the scallop dredge as an anchor, a process called laying on the dredge or laying up. When laying up, the LADY MARY would list to the side the dredge was on and would pivot around to put her stern to the sea. The Survivor testified that the Captain would only lay on the dredge if the winds were less than 15 or 20 miles per hour, and he would use the aft ballast tanks to level the vessel's list. The Previous Captain testified that he only attempted to lay on the LADY MARY's dredge one time. He had about 250 bushels of scallops on deck, the freeing ports were closed and the shucking house door was closed. The vessel pivoted stern to the sea and a wave went up the stern ramp. This flooded the aft deck and caused the vessel to list. The Previous Captain waded through the water to open the freeing ports. He testified that he never lay on the dredge again.²⁹¹

(6) As discussed in Section B7, the aft water tanks drained into the lazarette. There was a 1 ½" (approximate) drain pipe running from the lazarette, "underneath the fish hold, into the engine room". The Shore Manager testified that when the water tanks were draining into the lazarette, the pipe to the engine room would not drain the water fast enough. This is why the independent automatic bilge pump was installed in the lazarette. He also testified that the gate was always left open.²⁹²

(7) In an interview the Survivor stated that the LADY MARY's lazarette space routinely had to be dewatered while underway. In calm weather the space was pumped out every two to three days, but in rough weather the space was pumped out every day. The crew would not pump out the space during the rough weather but would wait for it to calm down before opening the space. The crew used the independent automatic bilge pump to dewater the lazarette instead of the fixed bilge pumping system connected to the engine room manifold. All of the crew members knew how to rig the pump to dewater the space. The Survivor did not know the source of the water ingress. The lazarette hatch would normally be kept closed if it was not being dewatered. The hatch cover was not attached to the vessel.²⁹³

²⁹¹ Transcript 410, 423-425, 474-476, 547

²⁹² Exhibit 33 & Transcript 885-888, 1199-1200

²⁹³ Exhibit 122 & Transcript 887

10. Emergency Position Indicating Radio Beacon (EPIRB)

This section describes the particulars of the LADY MARY's EPIRB, how it operated, the details regarding its registration, and an overview of the satellite system which detected the EPIRB signal.

a. EPIRB Specifications

(1) In accordance with 46 CFR 28.150 and 46 CFR 25.26-5, the LADY MARY was required to have an automatically activated Category I 406 MHz EPIRB on board, stowed in a manner so that it would float-free if the vessel sank.

(2) During the LADY MARY's final voyage, the requirements described above were met with an ACR Electronics EPIRB, mounted in a hydrostatic release bracket located just forward of the new wheelhouse. Some of the EPIRB specifications were affixed directly to the beacon by the manufacturer. The full details of the EPIRB specifications are listed in the Table at the bottom of the page.²⁹⁴

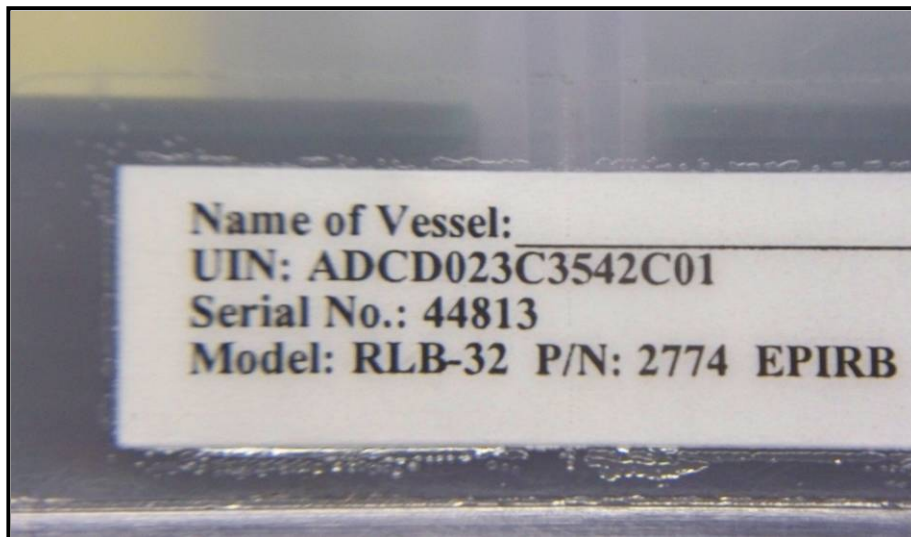


Figure 25: Specifications affixed directly on the EPIRB by the manufacturer

Brand name	ACR Electronics
Model	RLB-32
Unique Identification Number	ADCD023C3542C01
Serial Number	44813
FCC ID Type Approval Number	B668L2ACR-RLB-32
Battery Expiration Date	9/2011

Table 6: Detailed ACR EPIRB specifications

(3) This model EPIRB is sold as a package with the mounting bracket and the hydrostatic release unit (HRU). The EPIRB can be automatically or manually activated. For

²⁹⁴ Exhibits 4, 52 & Transcript 798

automatic activation, the HRU frees the EPIRB from its bracket once the unit submerges to a depth of approximately three meters. The EPIRB then floats to the surface and begins transmitting. In this case, if the EPIRB is removed from the water, it will deactivate after about 12 seconds. For manual activation, the EPIRB is removed from the bracket, and then either placed in the water or turned on with the thumb switch. To use the thumb switch, the switch is pushed up, which breaks an Activation Indicator Plastic Pin, and is therefore a positive indication of a manual activation.²⁹⁵

(4) Once the EPIRB is out of the bracket, and either wet or manually activated, the unit will wait 50 seconds, and then begin transmitting a distress signal on 121.5 and 406 MHz frequencies. The 121.5 MHz frequency is the Search and Rescue homing frequency, and the 406 MHz frequency is monitored in the U.S. by the NOAA Search and Rescue Satellite-Aided Tracking (SARSAT) system.²⁹⁶

(5) The EPIRB on the LADY MARY did not have an internal GPS transponder or an external GPS interface. This was an optional feature offered at the time of purchase. When an EPIRB is equipped with a GPS, the distress alert sent by the unit will include a self identified position, along with the unique identification number of the unit. If a 406MHz EPIRB is not equipped with a GPS, the location of the unit is identified by the satellite system which detects the signal. The CFR does not require a Category 1 406MHz EPIRB to be equipped with a GPS.²⁹⁷



Figure 26: LADY MARY EPIRB

b. EPIRB Registration

(1) In accordance with 47 CFR 80, the LADY MARY's EPIRB was required to be registered with NOAA SARSAT. Instructions for registering an EPIRB are found on the Official 406 MHz EPIRB Registration Form, which is included with the unit by the manufacturer, available on the web at www.sarsat.noaa.gov, and included in the ACR Product Support Manual.

(2) The Shore Manager registered the LADY MARY's EPIRB by filling in the form provided by the manufacturer. NOAA received an official 406 MHz EPIRB Registration Form for the LADY MARY in January 2007. This is indicated by a date stamp on the form. The top right hand corner of the registration form included printed information

²⁹⁵ Exhibits 4, 51 & Transcript 804-805

²⁹⁶ Exhibit 51 & Transcript 798, 837

²⁹⁷ Exhibit 51 & Transcript 796, 798

about the EPIRB unit. This printed information was placed on the form by the manufacturer prior to sale of the EPIRB. The printed information identified the serial number as ACR 44813 and the beacon unique identifier number (UIN) as ADCD023C3542C01.²⁹⁸

(3) The Registration Form also asks the submitter to enter the EPIRB UIN by hand in the Information section in the top, center area of the form. On the LADY MARY's January 2007 form, the submitter entered a UIN that closely matched the printed information, but the thirteenth character (third to last) was not clear.²⁹⁹

(4) On the LADY MARY's January 2007 registration form, the submitter checked the block to indicate that this registration was a replacement for a previously registered EPIRB. The form asks for the old EPIRB UIN, and the submitter wrote ADCD023(digit illegible)3542C01, but then crossed this out by hand. Above the crossed out UIN, the submitter wrote ADCD04E21D42001.³⁰⁰

This is the digit that was erroneously entered into the NBR database as a zero.

Official 406 MHz EPIRB Registration Form

Mail or Fax to: NOAA/SARSAT E/SP3, Room 3320, FB-4, 5200 Auth Road, Suitland, MD 20746-4304 Fax No. 301-568-8649

EPIRB Information

Beacon ID (Unique Identifier Number)

A	D	C	D	0	2	3	C	3	5	4	2	0	0	1
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

(15 digit character ID provided by EPIRB manufacturer)

ACR Model: RLB-32 CAT I
UIN: ADCD023C3542C01
Serial No.: 44813

Category I (Automatic Deployment)
 Category II (Manual Deployment)

EPIRB Manufacturer
Model No. 44813

EPIRB Registration

New EPIRB Registration
 Renewal of EPIRB Registration
 Change of EPIRB Information or Ownership

Replacement of EPIRB Decal
 Check here if this EPIRB is a replacement for a previously registered EPIRB.
Please enter the old EPIRB unique ID number ~~ADCD023C3542C01~~ ADCD04E21D42001

Registration Form

Road, Suitland, MD 20746-4304 Fax No. 301-568-8649

Identifier Number

5	4	2	0	0	1
---	---	---	---	---	---

EPIRB manufacturer

ACR Model: RLB-32 CAT I
UIN: ADCD023C3542C01
Serial No.: 44813

EPIRB Manufacturer
Model No. 44813

Figure 27: The top of the EPIRB Registration Form

²⁹⁸ Exhibit 23 & Transcript 808-809, 811-812

²⁹⁹ Exhibit 23 & Transcript 811

³⁰⁰ Exhibit 23

(5) Once a registration form is received by NOAA, the form is processed by a contractor who enters the information into the National Beacon Registration (NBR) database. After an EPIRB is registered, standard procedures call for a proof of registration decal and a confirmation letter to be sent to the owner identified on the registration form, in this case Smith & Smith Inc. The proof of registration decal will have an expiration date that is two years from the registration date. Neither NOAA SARSAT nor the Shore Manager produced the confirmation letter which accompanied the decal issued pursuant to the January 2007 registration form.³⁰¹

(6) The LADY MARY's EPIRB had three COSPAS-SARSAT decals affixed to the side, one on top of the other. Each decal is printed with the vessel name, a proof of registration expiration date and the EPIRB's UIN. The first and bottommost of the three decals had an expiration date of 01/08/2009, and an UIN of ADCD023C3542001.³⁰² This decal indicates that the contractor hired by NOAA erroneously registered the LADY MARY's UIN in the NBR database. The thirteenth character (third to last) should have been the letter "C".³⁰³ A CFV Safety Examiner visited the LADY MARY on July 24, 2007 and recorded the information from this decal on his examination checklist.³⁰⁴

(7) On November 10, 2008 NOAA SARSAT mailed a letter to Smith & Smith Inc. reminding them that it had been almost two years since the EPIRB was registered, and that it was nearing time to re-register the beacon. A form with the registration information, as it was recorded in the NBR database, also accompanied this letter.³⁰⁵ The letter and registration form incorrectly identified the LADY MARY's EPIRB UIN as ADCD023C3542001. The registration form was returned to NOAA SARSAT with the words "No Changes" hand written at the top of the page.³⁰⁶

(8) On November 25, 2008, NOAA SARSAT mailed another letter to Smith & Smith Inc. This letter thanked them for renewing the EPIRB's registration and indicated that the information was entered into the NBR database. The letter included a new printout of the recorded information and a new decal. The decal mailed with this letter was affixed to the LADY MARY's EPIRB, on top of the other two decals, and had an expiration date of 11/24/2010. This decal lists the UIN of ADCD023C3542001, which is the same incorrect UIN that was originally entered into the NBR database in January 2008.³⁰⁷



Figure 28: EPIRB Proof of Registration Decal

³⁰¹ Exhibit 23 & Transcript 786-787, 809

³⁰² Exhibit 63

³⁰³ Exhibits 23, 63 & Transcript 786-787, 819

³⁰⁴ Exhibit 34

³⁰⁵ Exhibit 25 & Transcript 788-790, 809

³⁰⁶ Exhibit 24, 25 & Transcript 809-810

³⁰⁷ Exhibit 26, 63 & Transcript 810-811, 819

(9) The middle decal on the EPIRB was also issued to the LADY MARY, but the UIN on this decal was ADCD04E21D42001 and the proof of registration expiration date was 10/10/2009. This UIN is the same number that was hand written on the January 2007 registration form as the vessel's old EPIRB UIN.³⁰⁸ Only two decals should have been issued to the LADY MARY over the life of the new EPIRB. Neither the Shore Manager nor NOAA SARSAT produced records or testimony explaining the issuance of the second, middle decal with the UIN ADCD04E21D42001.³⁰⁹ A CFV Safety Examiner visited the LADY MARY on July 21, 2008 and recorded the information from this decal on his examination checklist.³¹⁰

c. COSPAS-SARSAT System

(1) NOAA utilizes a series of satellites to monitor weather and environmental conditions over the Earth. These satellites also contain search and rescue equipment which will detect and relay 406 MHz distress alerts from EPIRBs, Emergency Locator Transmitters (for aviation use), and Personal Locator Beacons (for land-based use). These satellites are the main component of the SARSAT system. The Russian Federation operates a similar satellite system, known as COSPAS. The COSPAS acronym stands for **C**osmicheskaya **S**istema **P**oiska **A**varyinyh **S**udov, which are the Russian words for Space

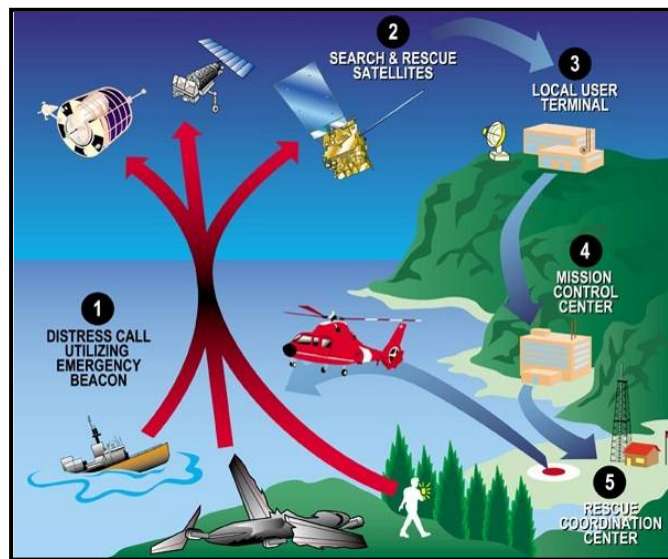


Figure 29: COSPAS-SARSAT System Overview
(www.sarsat.noaa.gov)

System for the Search of Vessels in Distress. An international agreement allows joint use of the search and rescue capabilities of both systems, and forms the COSPAS-SARSAT system. There are two types of satellites within the COSPAS-SARSAT system, geostationary and orbiting. A geostationary satellite is located in a fixed position relative to the Earth, and an orbiting satellite moves in relation to the Earth. Both types of satellites relay distress alerts to unmanned land based Local User Terminals (LUT), which then forward the information to Mission Control Centers (MCC). Distress alerts are a digital message which contains the beacon's fifteen character UIN that was programmed into the device by the manufacturer.³¹¹

³⁰⁸ Exhibit 23 & 63

³⁰⁹ Transcript 814

³¹⁰ Exhibit 35

³¹¹ Transcript 765-768, 776-777 & www.sarsat.noaa.gov

(2) The Geostationary (GEO) satellites hold a constant fixed orbit 22,000 miles over the Earth. Two GEO satellites provide continuous coverage over the area between 75 degrees North latitude and 75 degrees South latitude, and between Western Europe and Guam (throughout North America). Due to the coverage area of the GEO satellites, they will usually detect a distress alert before the orbiting satellites.³¹²

(3) Since the position of a GEO satellite is fixed in relation to the Earth, it does not have the ability to independently locate the position of a distress alert. The GEO satellite will simply relay the distress alert information to a LUT. If a beacon is fitted with an optional GPS, however, then the beacon can determine the position and the GEO satellite can forward that additional information to a LUT.³¹³

(4) The Low-Earth Orbiting (LEO) satellites orbit 600 miles above the Earth. For most positions on the Earth, there is typically a LEO satellite within view every 60 to 75 minutes. In some cases, however, a beacon could be activated for as long as 90 minutes before it is detected by a LEO satellite.³¹⁴

(5) When a LEO satellite receives a distress alert, it measures and stores the Doppler shifted frequency, the UIN and the time of measurement from the activated beacon. This information is transmitted to a LUT, which calculates the location of the activated beacon.³¹⁵

(6) When a MCC receives information from a LUT about an activated beacon, a computerized system automatically decodes the signal and checks the UIN against the NBR registration database. The registration information is then automatically forwarded to the appropriate RCC for action. If the distress alert is from an EPIRB and includes location information, then the responsible USCG RCC is the one which covers the geographic area of that location. If there is no position for an EPIRB distress alert, then the alert is sent to the USCG RCC which covers the area where the vessel is home ported. There is no human intervention in the decoding, cross-referencing and forwarding of alerts to a RCC.³¹⁶

(7) If the MCC computerized system cannot match a UIN originating from a distress alert to a UIN in the NBR database, then the distress alert is classified as coming from an “unregistered” beacon. The term “unregistered” could mean that the owner did not register the beacon in the database, or, it could mean that the registration information was improperly entered in the database and is thus not retrievable during cross checking.³¹⁷

(8) When a distress alert from an “unregistered” beacon is detected by a GEO satellite, it is not forwarded to a RCC unless beacon determined position data was transmitted with

³¹² Transcript 775-776

³¹³ Transcript 778, 783-784, 803-804

³¹⁴ Transcript 770, 781, 805-806

³¹⁵ Transcript 768-769, 777 & www.sarsat.noaa.gov

³¹⁶ Transcript 775-777, 780

³¹⁷ Transcript 778, 820

the alert. The location of a distress alert from an “unregistered” beacon without a GPS interface must be resolved by a LEO satellite before notification to a RCC can occur.³¹⁸

d. EPIRB Activation and Operation

(1) The USCG Cutter *DEPENDABLE* recovered an EPIRB at 0200 on March 25, 2009, while involved in the *LADY MARY* search and rescue case. The EPIRB had the name *LADY MARY* hand written on one side, and a NOAA SARSAT proof of registration decal with the name *LADY MARY* on another side. The lanyard was not unwound and the Activation Indicator Plastic Pin on the EPIRB was intact (indicating that the thumb switch had not been pushed up) when the EPIRB was recovered.³¹⁹ However, it cannot be determined if the EPIRB was removed from the bracket by a member of the crew, or if the EPIRB floated free from the vessel on its own after the sinking.³²⁰

(2) The *LADY MARY*'s 406 MHz EPIRB transmission was first detected by a GEO satellite. A LUT received notification of this transmission from the GEO satellite at 0540 on March 24, 2009, and notified the Spanish MCC. The United States MCC received notification of this transmission from the Spanish MCC at 0541.³²¹ The UIN programmed into the EPIRB by the manufacturer and received by the SARSAT system did not match the UIN that was associated with the *LADY MARY* in the registration database. As a result, the transmission received by the GEO satellite at 0540 was recorded as an unregistered EPIRB transmission, and there was no actionable information.³²²

(3) A LEO satellite detected the transmission from the *LADY MARY*'s EPIRB, and sent the information to a LUT at 0656 on March 24, 2009. The LUT calculated two possible locations of the EPIRB, and notified the Canadian MCC. The Canadian MCC then sent a message to the United States MCC at 0705, and the United States MCC processed the report. Since there were two possible positions of the EPIRB, the United States MCC notified both the USCG Atlantic Area RCC and the Air Force RCC at 0707. Another LEO satellite resolved the position of the *LADY MARY*'s EPIRB at 0702. This notification was sent through the SARSAT system to the United States MCC, which then notified the RCC's at 0715.³²³

(4) The *LADY MARY*'s EPIRB was sent to Imanna Laboratories for a functional verification test. The company used Imanna Laboratory Test Alpha and a modified version of its Test Bravo procedures. The procedures are taken from the requirements of the Radio Technical Commission for Maritime Services (RTCM) Standards for 406 MHz Satellite EPIRBs, and the COSPAS-SARSAT 406 MHz distress beacon type approval

³¹⁸ Transcript 778, 780, 802

³¹⁹ Exhibit 4, 51,64, 99

³²⁰ Transcript 1078

³²¹ Exhibit 62, Transcript 829, 831-833

³²² Transcript 819-821

³²³ Exhibit 53, 62 & Transcript 96, 827-828

standard. The results of the test indicated that the LADY MARY's EPIRB functioned as intended.³²⁴

³²⁴ Exhibit 52

11. The Sunken LADY MARY

This section describes the methods and resources used to obtain information about the sunken LADY MARY. This section also details the condition of the vessel as she was found resting on the bottom of the Atlantic Ocean.

a. Location of the Sunken LADY MARY

(1) On March 27, 2009, the National Oceanic and Atmospheric Administration (NOAA) Office of Coast Survey agreed to assist with locating the sunken LADY MARY. Based on the LADY MARY's track lines obtained through the Vessel Monitoring System (VMS), an approximate position of the wreck was determined.

(2) On April 1, 2009, the NOAA survey vessel THOMAS JEFFERSON got underway from Norfolk, VA. The THOMAS JEFFERSON arrived on scene the morning of April 2, 2009, and used their side scan sonar equipment to survey a few square miles around the last known position of the LADY MARY. At 1715 that day, a possible contact was located. The THOMAS JEFFERSON felt this contact was the LADY MARY because it was in the right location based on the VMS track lines, it was the correct dimensions, and the sonar image showed outriggers on the wreck. In addition, the wreck was not surrounded by scour marks or sunken into the ocean floor, which indicated that it had not been on the bottom for long.



Figure 30: Side scan sonar image of LADY MARY

b. Unsuccessful Remote Operated Vehicle Operation

(1) On March 27, 2009, the Marine Board of Investigation (MBI) requested that the Deployable Operations Group (DOG) provide a Remote Operated Vehicle (ROV) to examine the sunken LADY MARY. The DOG selected two ROV's for the mission, one from Maritime Safety and Security Team (MSST) Boston and one from MSST New York.

(2) On the morning of April 3, 2009, Coast Guard Station Cape May shuttled one member of the MBI, four MSST personnel and the two ROVs offshore to meet the THOMAS JEFFERSON. The THOMAS JEFFERSON brought the ROVs to the wreck site and served as a platform for the underwater operations. Numerous attempts were made to view the LADY MARY with the ROVs, but none of them were successful because the operating conditions exceeded the capabilities of the MSST ROVs. This was due to a combination of many factors including the on-scene wave height, the need for

dynamic position keeping abilities, the ROV capabilities, and the need for a pre constructed weighting system to assist the ROV in getting down to the ocean floor. The teams attempted to find on scene solutions but were not successful.

c. Successful Remote Operated Vehicle Operation

(1) After the unsuccessful use of the Coast Guard ROV's, the Marine Board of Investigation contacted the New Jersey State Police (NJSP) Marine Division to inquire about the use of their larger, more powerful ROV. They volunteered to assist with the investigation, but did not have an adequate platform for offshore operations. The MBI requested that D5 provide their 225 foot buoy tender as a platform for the NJSP ROV, but it was not available. On April 10, 2009, D5 sent a message to LANTAREA requesting a platform with position keeping capabilities for the ROV operations. On April 17, 2009, LANTAREA sent a message requesting Department of Defense forces to provide the support platform. This request was denied. On April 23, 2009, LANTAREA directed Coast Guard District 1 to provide an asset to assist, and the USCGC WILLOW was selected for the mission.

(2) Due to the nature of the operation and the distance from shore, the NJSP requested that a ROV field technician accompany the team underway to provide onsite repair support, if needed, as well as additional operational support. The Coast Guard contracted with Deep Ocean Engineering to provide one technician for the mission.

(3) On April 28, 2009, three members of the NJSP, one Army Corps of Engineer representative (to provide ROV sonar assistance), two members of the MBI, the NTSB investigator and the Deep Ocean Engineering technician embarked the WILLOW at Naval Weapons Station Earle, NJ. The NJSP ROV and accompanying support trailer was loaded onboard the WILLOW, and the vessel got underway. The WILLOW was on scene the next morning.

(4) Based on the latitude and longitude identified by the THOMAS JEFFERSON, the WILLOW used its dynamic positioning capabilities to establish and maintain station above the wreck. The WILLOW lowered the NJSP ROV into the water in a pre constructed "doghouse," a weighted metal cage designed to bring the ROV and its tether directly down to the desired water depth, to allow better control of the tether while the ROV was on the bottom, and to facilitate easier recovery of the ROV. Just over 10 minutes after the ROV entered the water, the wreck was sighted directly below the ROV. The ROV remained in the water for over 5 hours and obtained invaluable video documentation of the exterior of the sunken LADY MARY. The ROV team disembarked the WILLOW on the morning of April 30, 2009.

d. Commercial Dive Operations

(1) On behalf of the Shore Manger and his legal counsel, a team of commercial divers further surveyed the sunken LADY MARY and searched the vessel's interior for missing crew members. The lead diver of the team had 30 years of wreck diving experience. The

commercial dive team conducted dives on May 12, 2009, May 31, 2009 and June 28, 2009.³²⁵ Members of the dive team took high quality photographs and video of the LADY MARY, and shared these with the MBI. The extensive documentation efforts by the commercial dive team allowed for a detailed analysis of various areas of the LADY MARY.

e. U.S. Navy Dive Operations

(1) Due to the damage revealed by the NJSP ROV and the commercial divers, the MBI decided that recovery of certain items from the LADY MARY would be extremely useful in the investigation. Salvage of the entire vessel was considered, but the costs of this option outweighed the perceived benefits. The MBI obtained estimates for commercial companies to recover the LADY MARY items, but these costs were all very high. After extensive negotiations, the Navy's Mobile Diving and Salvage Unit Two (MDSU-2) agreed to use the LADY MARY as one of their semi-annual training operations.

(2) On August 24, 2009, the USNS GRASP got underway from Little Creek, VA with MDSU-2 and a MBI member onboard. The vessel returned on August 27 due to an approaching Tropical Storm.

(3) Beginning on August 31, 2009, a second attempt was made to recover the LADY MARY items. The GRASP set two mooring buoys, but developed a leak in the port anchor windlass before establishing their four point mooring. The vessel returned to Little Creek, VA on September 4.

(4) On September 5, 2009, the GRASP got underway again. MDSU-2 conducted one unsuccessful dive on September 6. Due to bad weather, the vessel returned on September 8. Due to the vessel's schedule, no further attempts could be made to recover the items.

(5) The MBI searched for another vessel to support the MDSU-2 recovery efforts. On October 9, 2009, the USNS APACHE got underway from Little Creek, VA with MDSU-2 and a MBI member onboard. The vessel successfully established a three point mooring, and MDSU-2 conducted multiple dives on the sunken LADY MARY. The divers recovered the rudder, the life raft hydrostatic release unit, the bridge CPU, a thumb drive from the CPU, and two GPS units. The divers also obtained measurements from the LADY MARY's main deck to assist with the stability analysis. Attempts to cut the propeller shaft were unsuccessful. The MBI had requested recovery of the stern ramp, but the APACHE did not have the ability to recover such an object, so this was not attempted. The APACHE returned to Little Creek, VA on October 14.

(6) On October 16, Coast Guard Integrated Support Command Portsmouth delivered the LADY MARY evidence to the NTSB office in Washington DC. The NTSB attempted to recover data from the electronics and conducted a forensic analysis of the rudder damage. The results of the analysis are included in Exhibits 126 and 134.

³²⁵ Transcript 1008-1009, 1014-1016

f. Description of Vessel and Debris Field

(1) The sunken LADY MARY was located in position 38° 35.713'N, 073° 41.463'W. The heading of the vessel was approximately 350 degrees true, and the depth of water was 210'. The vessel was resting on her keel, and listed to port with the chine resting on the ocean floor. The angle of the main deck, as the vessel rested on the bottom, was 50° from the horizontal.³²⁶

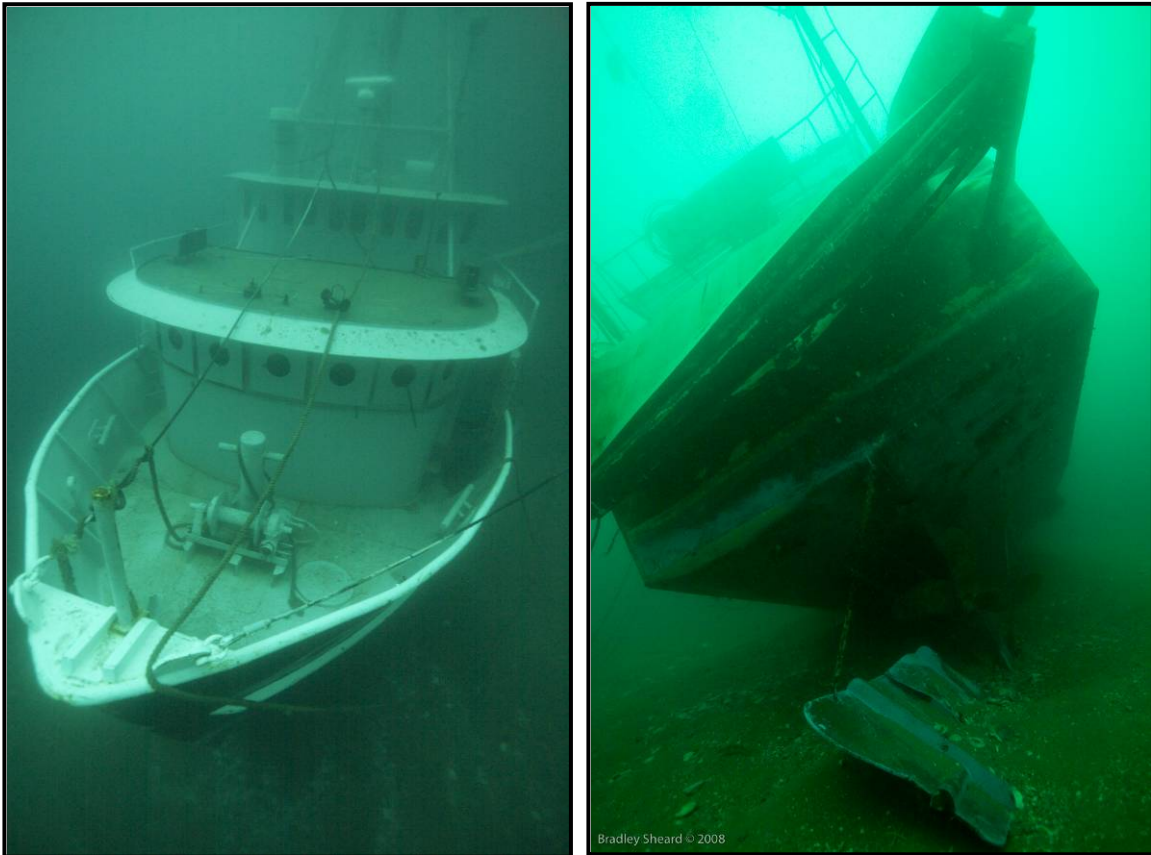


Figure 31: Bow and stern views of the sunken LADY MARY

(2) Beginning at the bow of the LADY MARY, there was no anchor visible anywhere on the foc'sle of the vessel. The Shore Manager testified that there was an anchor onboard when the vessel departed Cape May on March 18, 2009.³²⁷ When the LADY MARY sank, both of the watertight doors to the old wheelhouse were dogged shut. The lead commercial diver testified that his team could not open the starboard door and that the port door was only held closed by one dog (out of four total dogs). The commercial diver testified that one of his team members opened the port door and entered the old wheelhouse. From inside the old wheelhouse, the diver swam aft into the galley and then checked the forward portion of the port passageway. The aft portion of the port passage

³²⁶ Exhibit 43, 76 & Transcript 1092-1093

³²⁷ Exhibit 110 (Images 8, 10), Exhibit 111 (12May Image 7685) & Transcript 1060, 1486-1487

way was examined by entering the space from the shucking house doorway on the main deck.³²⁸



Figure 32: Port bow of the sunken LADY MARY



Figure 33: Starboard bow of the sunken LADY MARY

(3) The commercial diver testified that the LADY MARY's outriggers were in good condition. The port outrigger was down, with the port stabilizer (bird) hanging only a couple of feet below the end of the outrigger. The starboard outrigger was up, but it was not resting in the cradle attached to the mast – it was aft of the cradle. The starboard bird

³²⁸ Exhibit 44, Exhibit 110 (Image 255), Exhibit 111 (12May Stills 53, 58) & Transcript 1030-1032, 1061

was found resting on the main deck of the vessel, attached to the end of the outrigger with a long length of chain and wire.³²⁹

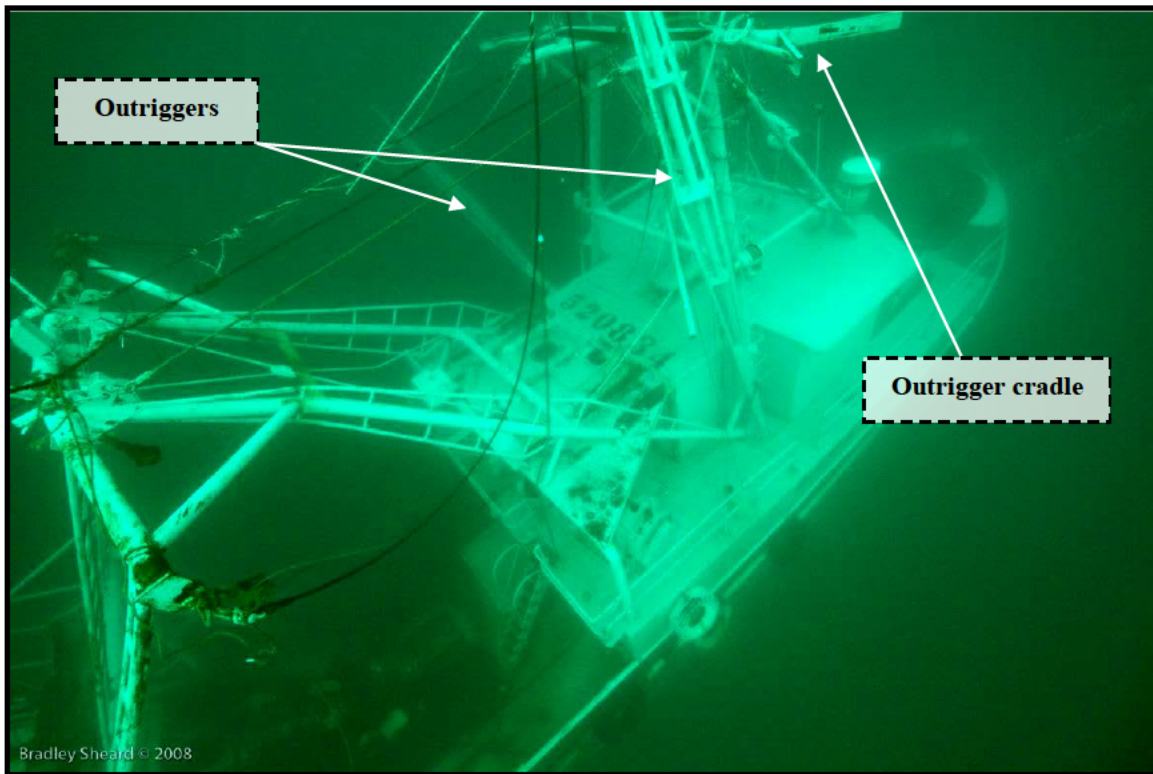


Figure 34: View of the sunken LADY MARY from above

(4) On the weather deck, between the old wheelhouse and the new wheelhouse, was a life raft cradle with a hydrostatic release unit attached. The hydrostatic release unit was recovered by a Navy diver, who found that the white line leaving the unit was cut before he moved the unit. The weak link for the hydrostatic release was still intact and a lifesaving equipment expert testified that since the weak link is intact, the life raft was not automatically released from the LADY MARY. An empty EPIRB bracket was also found above of the empty life raft cradle, slightly to port of the cradle. The EPIRB cover, the EPIRB, and the EPIRB hydrostatic release were not found on the sunken vessel, and the bracket's ejector arm had been activated. The lifesaving equipment expert testified that the EPIRB's hydrostatic release unit operated, but he could not determine if the EPIRB was manually removed from its bracket.³³⁰

³²⁹ Exhibits 43-45, Exhibit 109 (Images 12, 66), Exhibit 111 (12May Images 7642-43, 7653, 7655-56, 7706, 7709, 7711 & 12May Still 48) & Transcript 1012-1013, 1040, 1065

³³⁰ Exhibit 44, 51, 85, 86, Exhibit 109 (Images 13, 15, 18, 21) & Transcript 1074-1078

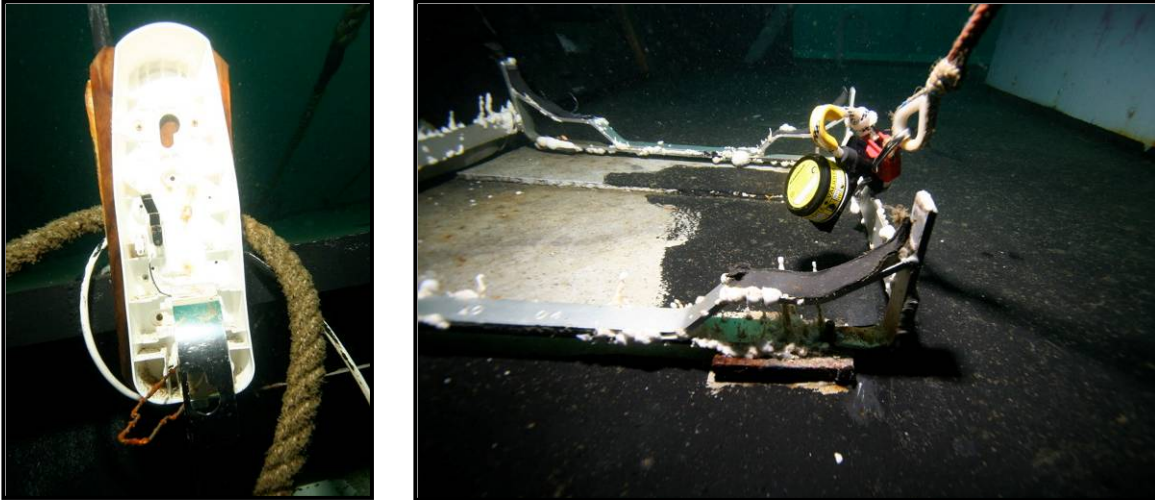


Figure 35: Empty EPIRB bracket and life raft cradle with hydrostatic release unit

(5) The commercial diver testified that the door to the new wheelhouse was open and that one of his divers saw a survival suit inside this space, still in the bag. The rudder angle indicator in the new wheelhouse was pointing to port. The Shore Manager testified that the increments labeled on the rudder angle indicator were 20 and 40 degrees.³³¹

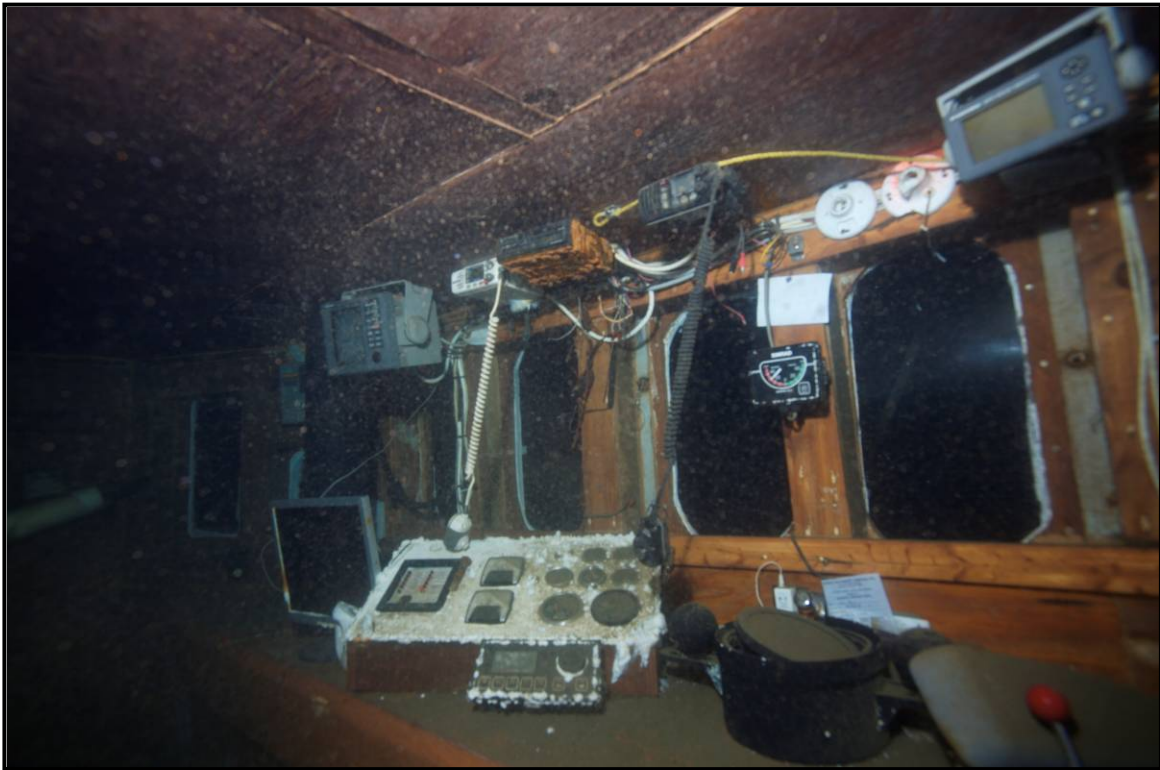


Figure 36: New wheelhouse

(6) On the winch deck, just aft of the control console, were the two Pullmaster winches. The wire on the port winch drum was neatly wound, but the wire on the starboard winch

³³¹ Exhibit 111 (12May Still 68) & Transcript 1031, 1034, 1058, 1128-1129

drum was loose, disorganized, and crossed over itself a number of times. Outboard of the Pullmaster winches were the two McElroy 504 main winches. The port main winch drum was full and the starboard was empty.³³²

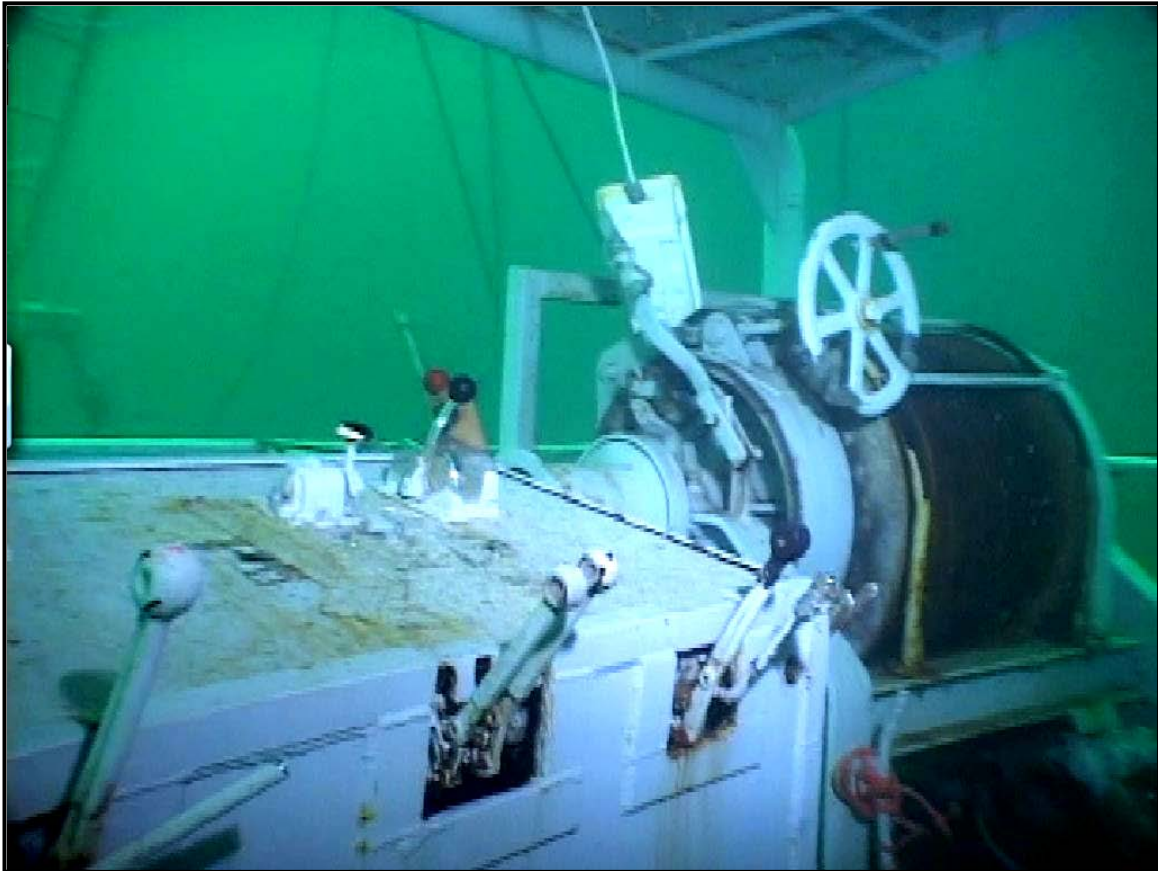


Figure 37: View from winch deck, looking aft at console and port side McElroy winch

(7) The lead commercial diver testified that one of his team members attempted to look into the forward bunkroom of the *LADY MARY*, and got a partial view of the space but could not go inside this space because of obstructions. His team members also checked the bunkroom located in the upper wheelhouse and the bunkroom on the main deck, just aft of the galley. The divers did not see crewmembers in any of the bunkrooms. The divers were not able to check the engine room.³³³

³³² Exhibit 108 (Images 9776, 9780) & Exhibit 109 (Image 11)

³³³ Exhibit 74, Exhibit 137, & Transcript 1032-1033

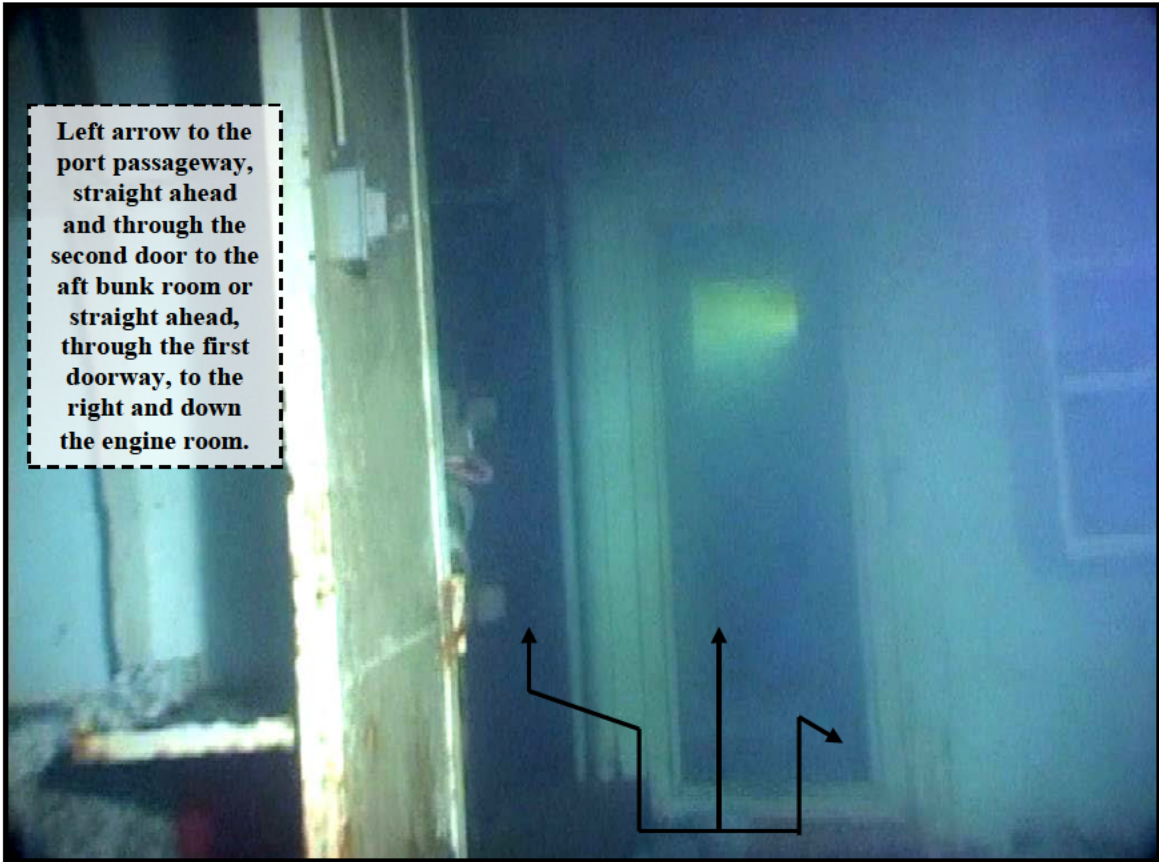


Figure 38: View looking into the superstructure from the aft shucking house door



Figure 39: Looking down into the engine room

(8) The aft door to the shucking house was missing. The lead commercial diver testified that one of his divers found a survival suit in the shucking house. The survival suit was out of the bag and was located forward of the fish hold hatch near the starboard passageway.³³⁴



Figure 40: Fish hold hatch and aft shucking house bulkhead with missing door & air conditioner

(9) The aft half of the fish hold hatch, located on the main weather deck, was closed. The forward half of the fish hold hatch, located inside the shucking house, was open. A hose led down into the fish hold and came back out, but it was just a loop of the hose, and it was not attached to anything in the hold. The Shore Manager testified that the hose was one of two deck hoses used for salt water wash downs. The commercial diver testified that it was very hard to see anything inside the fish hold due to poor visibility, and it appeared to be a “mess of debris”. Deckhand 2 was located inside the fish hold (see section B6).³³⁵

³³⁴ Exhibit 111 (12May Stills 91, 93, 94) & Transcript 1031, 1034-1035, 1052

³³⁵ Exhibit 74, Exhibit 110 (Images 6, 33, 36, 69), Exhibit 111 (12May Image 7680 & 12May Still 87) & Transcript 1038-1039, 1063, 1069-1070, 1491-1492



Figure 41: Survival suit in shucking house

(10) The LADY MARY's port side keel coolers were not visible, since that part of the hull was resting in the sand. The starboard side keel coolers were visible, and appeared to be intact.³³⁶



Figure 43: Forward half of fish hold hatch

(11) The scallop dredge was found on the main deck, in the aft port corner of the deck. The tongue of the dredge was close to the centerline of the vessel and pointing towards the aft starboard corner of the deck. The dredge net contained scallops, but the cable used to dump the dredge was not attached; it was secured to the port side vertical post. The Shore Manager estimated that the dredge contained 10 or 12 bushels of scallops. The lead commercial diver testified that he did not observe any unusual nicks, scrapes, gouges or paint transfers on the dredge.³³⁷



Figure 42: Scallop dredge on aft end of main deck

³³⁶ Exhibits 43-45

³³⁷ Exhibit 44, Exhibit 110 (Image 69), Exhibit 111 (12May Images 7673-7675 & 12May Stills 24-25) & Transcript 1029-1030, 1051, 1149

(12) The scallop dredge towing cable was not tight between the port winch drum and the tongue of the dredge. The cable left the winch drum and hung over the side of the LADY MARY just above the ocean floor, and then curved back up to a point right below the port side towing block (but did not run through the block at this point). The towing block was a ten ton block. The cable then looped back down about 6 or 7 feet, to a point almost even with the top of the main deck gunwale, and then ran back up and passed through the block. This 6-7 foot loop was twisted a number of times. After passing through the block, the cable ran up and over the block support and then down to the dredge tongue on the main deck. The lead commercial diver testified that he traced the dredge cable between the drum and the dredge and did not observe damages or unusual marks. The pictures show a few light colored markings on the dredge cable near the twisted section, which appears to be the same color as the block support. In an interview, the Survivor said that the twist in the dredge cable was not uncommon and was usually caused by the dredge spinning during recovery. The Shore Manager testified that in his experience, he had not seen this kind of twist in the dredge cable.³³⁸



Figure 15: Main deck showing scallop dredge and cable

³³⁸ Exhibit 43, 45, Exhibit 108 (Image 69, 71), Exhibit 109 (Image 10), Exhibit 110 (Images 5, 17, 36, 67), Exhibit 111 (12May Images 7657, 7660 & 12May Still 32), Exhibit 114, 122 & Transcript 1013, 1037-1038, 1054-1056, 1061-1062, 1284

(13) The top connection points for the LADY MARY sign above the back of the main deck were broken. As a result, the sign was no longer in a vertical position and was facing downward at an angle.³³⁹

(14) The lazarette was open, and a hose ran from inside of the lazarette, up and aft over the stern ramp. There was a short length (about 2') of orange line tied to the end of the hose which was resting on the stern ramp. The lead commercial diver testified that none of his team members saw what was attached to the other end of the hose inside the lazarette. None of the divers saw the lazarette hatch cover either.³⁴⁰ The Shore Manager testified that the hose leaving the lazarette was attached to an electric pump that was used for dewatering the space. When the pump was not being used, the hose was stored inside the lazarette, wrapped around the top of the ladder, with the lazarette hatch cover on.³⁴¹



Figure 44: Open lazarette with hose

(15) The stern ramp stay wires were no longer attached to the stern ramp. The welded pad eyes which attached the stay wires to the bottom corners of the stern ramp had both fractured and separated from the stern ramp, and are shown in the Figures on the next page. The starboard stay wire and pad eye were hanging free. The port stay wire and pad eye were tied off to a cleat at the base of the aft rigging. The stainless steel pipe, installed to prevent chaffing of the port stay wire, was still covering the wire. The Shore Manager

³³⁹ Exhibit 110 (Images 5, 17, 33)

³⁴⁰ Exhibit 109 (Image 57), Exhibit 110 (Image 73), Exhibit 111 (12May Stills 19, 22) & Transcript 1031

³⁴¹ Transcript 964, 1500-1505

testified that the welded pad eye connecting the stay wire to the stern ramp had never broken before.³⁴²

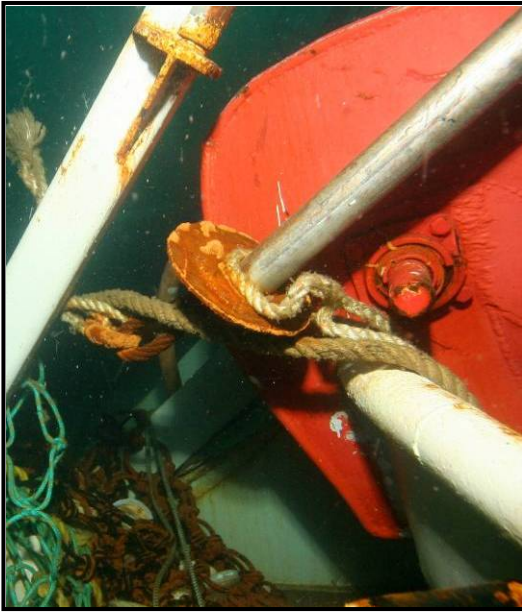


Figure 45: Ends of the port and starboard stay wires

(16) The port side of the LADY MARY's stern ramp was pressed in towards the transom, with the bottom half of the stern ramp almost parallel with the transom on that side. The port flat bar stern ramp support was completely buckled, with the aft end of the bar pushed down below the 4" x 4" hull connection point. The port 4" x 4" stern ramp support was also completely buckled and then pushed through the transom of the vessel creating a hole into the lazarette space. The lead commercial diver testified that this was the only hole in the stern seen by his divers. The port side wall of the stern ramp was completely fractured just below the second external angle iron stiffener. The port side of the transom, above and below the external rub rail, was deflected inwards. Additionally, the bottom port corner of the transom was missing paint, in a pattern that was deeper at the side shell and transom intersection, and then tapered down and across the transom towards the vessel's center line. The localized area of missing paint had a uniform, worn appearance that was lighter in color than the adjacent transom. A vertical bulwark support bracket on the port side of the transom, running from the top of the transom down onto the main deck, was bent towards the lazarette hatch. The starboard side of the transom and the stern ramp was mostly intact, with a partial buckle in the starboard flat bar stern ramp support. The pins holding the bottom stern ramp roller were bent and damaged on both ends. The bar running below the bottom stern ramp roller was bent at the centerline. The bottom edge of the stern ramp, the stern ramp roller and the bar below the roller were missing paint in various locations.³⁴³

³⁴² Exhibit 43, Exhibit 109 (Images 24-26), Exhibit 110 (Images 36, 74, 244-250), Exhibit 111 (12May Still 3), Exhibit 123 & Transcript 1024-1025, 1028, 1053-1054, 1484-1485

³⁴³ Exhibit 43-44, 74, Exhibit 109 (Images 27-32, 51-52, 54, 68), Exhibit 110 (Images 6, 17, 33-34, 36, 72), Exhibit 111 (12May Images 7660, 7663, 7667 & 12May Stills 8-12, 15, 17, 19) & Transcript 1013, 1018-1020, 1024-1026, 1049-1050, 1053, 1064, 1068, 1090-1091



Figure 18: The damaged stern ramp

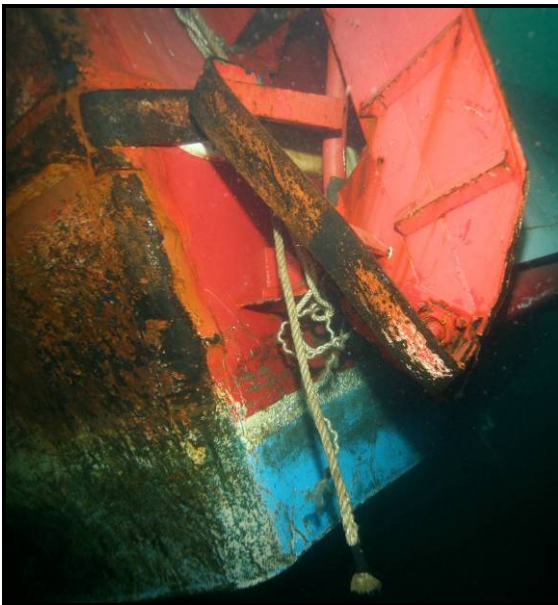


Figure 19: Close up view of the damaged port quarter



Figure 20: View looking up from under the ramp to the punctured transom



Figure 21: Center of the stern ramp, looking to port

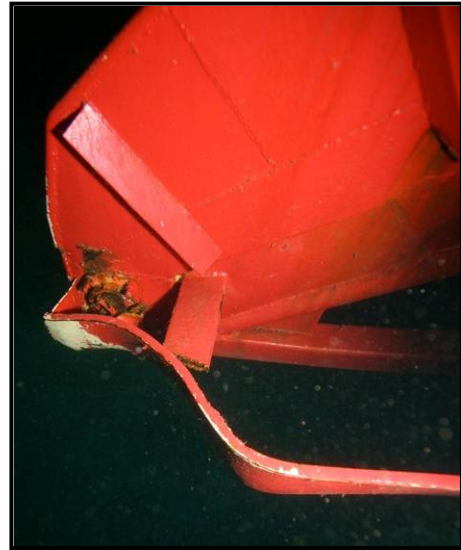


Figure 22: Starboard side flat bar

(17) The LADY MARY's rudder was broken off at the rudder stock flange, just below the hull, and the rudder was lying on the ocean floor beneath the vessel's transom. The rudder stock flange was the connection point between the internal rudder stock which ran through the hull into the lazarette, and the external rudder stock which was part of the rudder. The rudder was still connected to the vessel with a chain. The chain ran from a steel tab attached to the aft end of the bottom of the hull on the centerline, to a hole near the top of the trailing edge of the rudder. The Shore Manager testified that the purpose of this chain was to prevent the rudder from turning too far. The rudder was damaged, with bends and breaks in both the rudder body and the supporting stiffeners. The commercial diver testified that he observed red paint on the edge of the rudder. The rudder was recovered by the Navy's MDSU 2, and a detailed rudder analysis is contained in Appendix (e).³⁴⁴



Figure 23: Top of the rudder stock



Figure 24: Through hull for the rudder stock

³⁴⁴ Exhibit 44-45, 74, Exhibit 109 (Images 33, 36), Exhibit 111 (12May Image 7668 & 12May Still 5) & Transcript 933, 935, 1022-1023, 1027, 1029, 1041-1042, 1050-1051, 1066-1068



Figure 25: Port side view of the rudder



Figure 26: Starboard side view of the rudder

(18) The LADY MARY's rudder shoe was missing. The lead commercial diver testified that one of his team members blew out the sand around the bottom of the keel, and found there was no rudder shoe attached to the aft end of the keel. In addition, the aftermost starboard strut, between the skeg and the hull, had a large chunk missing just above where it attached to the keel.³⁴⁵

(19) There was damage to the LADY MARY's propeller and propeller shaft. There were blue paint marks on all four of the propeller blades and the propeller nut. There were dents and tears in some of the blades. The entire propeller was canted, with the top blade moved aft and the bottom blade moved forward. The tip of the bottom blade was forward of the aft end of the keel. The lead commercial diver testified that the propeller shaft was bent downward. He did not see any indication that the shaft was broken.³⁴⁶

³⁴⁵ Exhibit 109 (Images 70-72) & Transcript 1015-1017, 1045-1046, 1090

³⁴⁶ Exhibit 44-45, Exhibit 109 (Images 39, 41, 43-45, 47-48, 73, 75), Exhibit 111 (12May Stills 4-6) & Transcript 1022-1023, 1043-1044, 1067



Figure 27: Propeller and rudder stock

(20) The lead commercial diver testified that he and his team did not see any damage to the LADY MARY's hull forward of the transom (see paragraph 16 above). There was a small dent in the hull on the starboard bow, but the lead diver felt that this was a preexisting dent. The lead diver also testified that he and his team did not observe any paint transfers on the LADY MARY, with the exception of the coloring that he observed on one edge of the rudder, as described in paragraph 17 above.³⁴⁷

(21) There are some items resting in the sand around the vessel, which are presumed to have fallen off the LADY MARY. Directly off the port beam, there was a paperback book, a yellow and black flashlight, and a black ring (about 1' diameter) which appeared to be made of rubber. Off the aft port corner of the vessel, there was a Snapple bottle. Approximately 20' astern of the transom and about 15' to the port of the centerline was a white metal post, about 1' long, and further back was a rolled yellow extension cord. Directly astern of the center of the transom was a black rubber mat with circular holes. There was a computer keyboard located next to part of the rudder which was closest to the vessel. Off the aft starboard corner of the vessel was a large rolling battery charger, and a corroded steel plate (about 1' square) buried in the sand.³⁴⁸

³⁴⁷ Exhibit 111 (12May Images 7645-7646) & Transcript 1022, 1026-1027, 1029, 1040-1041

³⁴⁸ Exhibit 43-45, Exhibit 109 (Image 69), Exhibit 110 (Image 27) & Transcript 1037

12. Vessel Tracking Systems and Vessel Traffic Density

This section describes the known vessel traffic that was present in the vicinity of the LADY MARY on March 24, 2009, and the methods used to track the vessel traffic.

a. Vessel Monitoring System and Fishing Vessels

(1) The Vessel Monitoring System (VMS) is a satellite-based method used to monitor fishing vessel activity for the purposes of data collection and enforcement of fisheries requirements. The VMS within the United States is run by NOAA's National Marine Fisheries Service (NMFS).³⁴⁹

(2) The NMFS requires VMS units to be installed on Northeast fishing vessels who are permitted to catch scallops, multi-species or ground fish, herring, lung fish (certain conditions), surf clams, ocean quahogs or Maine mahogany quahogs. Other Northeast fishing vessels, such as those catching lobster or shrimp, are not required to install VMS units. In 2009, there were about 5,000 federally permitted vessels in the Northeast, and approximately 26% of those had a VMS unit.³⁵⁰

(3) When a vessel is required to participate in the VMS, they must install a VMS transceiver onboard. These VMS units will send and receive NMFS required messages, and the VMS units are also polled to identify the vessel position every 30 minutes or every 60 minutes. The polling interval depends on the vessel's fishery. Northeast vessels with a scallop permit, such as the LADY MARY, are polled at approximately 30 minute intervals. A vessel's VMS unit must be turned on at all times, unless the vessel receives a letter of exemption from NMFS to turn the unit off at the dock. The last time the LADY MARY's VMS unit was turned off was during the vessel's haul out in Beaufort, NC in 2006.³⁵¹

(4) Within the Northeast region of the United States, there are three approved vendors of VMS units; Boatracs, SkyMate and Thrane & Thrane. The vendor for the LADY MARY's VMS unit was Boatracs. The VMS unit on the LADY MARY was designated as mobile communication terminal number 869208, and could also be used to send and receive personal messages via email. Boatracs does not have its own satellite system to communicate with fishing vessel VMS units; they use an independent satellite provider called Qualcomm. Boatracs uses software to automatically retrieve VMS position reports from the Qualcomm network operations center every couple of minutes.³⁵²

(5) The LADY MARY's VMS unit did not have a GPS unit built in, and the Qualcomm Automatic Satellite Position Reporting (QASPR) methodology was used to identify the vessel's location. The QASPR methodology triangulates the position of the transmitting terminal by utilizing two geosynchronous satellites and an earth station. The time stamp

³⁴⁹ Transcript 563-564

³⁵⁰ Transcript 618

³⁵¹ Exhibit 54 & Transcript 564-565, 571, 573

³⁵² Exhibit 57 (page 15), 128 & Transcript 566-568, 593, 597, 634-636

associated with these position reports indicates the time that a signal was successfully received by an earth station and also the time that the position was triangulated. The time stamp of a position report is extremely accurate and is not affected by the time delay between Qualcomm and Boatracs. The accuracy of the QASPR methodology, and therefore the accuracy of the LADY MARY's reported positions, is 300m. For GPS based VMS units, which have an internal GPS and calculate their own position, the position accuracies are 100m.³⁵³

(6) The LADY MARY's VMS unit did not have an optional panic button installed or activated. This is a feature offered by Boatracs for a one-time fee of less than \$100. If a VMS unit has a panic button installed and activated, and an operator hits the button, a priority message is sent to Qualcomm. Qualcomm then sends a priority message to the Boatracs Network Operations Center (NOC), a 24 hour watch in Toronto, Canada. Once the NOC receives the message, they look in their files for the pre-planned emergency responses which are submitted by the vessel owner.³⁵⁴

(7) The VMS position reporting intervals are not exactly 30 minutes every time, they can vary a couple of minutes on either side of the 30 minute interval. This is done so that the vessel does not know exactly when the position is being reported. In addition to the regular position reporting interval, supplemental position reports are generated anytime the vessel sends or receives a NMFS message or a personal message using the VMS unit. After a supplemental position report is generated, the 30 minute interval will restart from the time of that unscheduled report. Furthermore, if NMFS feels there is a need to monitor a vessel's positions more frequently, they can request that the VMS vendor reduce the reporting interval down to 5 minutes. It typically takes 2 hours between the time a reduced interval is requested and the time NMFS begins receiving reports at the reduced interval.³⁵⁵

(8) Approximately 2% of the required VMS position reports are not received by NMFS. If there are indications of distress, NMFS will take action immediately. Otherwise, NMFS will not take action to contact a non-reporting vessel until the reporting interval exceeds four hours. The first step to contact a non-reporting vessel is to send a message via the VMS unit. If that does not correct the reporting problem, NMFS will search their files for owner contact information, and try to resolve the missing reports that way. Between the LADY MARY's trip start on March 18, 2009 and the morning of March 24, 2009, NMFS missed one VMS position report from the LADY MARY. The missed position report occurred on March 21, 2009 at approximately 1300.³⁵⁶

(9) When NMFS receives a position report from a VMS vendor, the information only includes the date, time, latitude and longitude of the report. NMFS then utilizes a monitoring system, called SmarTrac, to track the vessel data. The SmarTrac application takes two consecutive position reports, and calculates the vessel's course made good

³⁵³ Exhibit 128 & Transcript 565, 567-568

³⁵⁴ Exhibit 57 (page 15) & Transcript 636-637

³⁵⁵ Transcript 564-565, 587-589, 597-598, 754

³⁵⁶ Exhibit 58 & Transcript 652-654

(CMG) and speed made good (SMG) between those positions, which does not always reflect the actual course and speed. The actual course will not always be a straight line between two position reports.³⁵⁷

(10) Prior to leaving port, the LADY MARY was required to notify NMFS of their intentions via the VMS. This notification is called an activity declaration, and it is formatted as a 12 character code after the vessel's crew enters the trip details into the VMS unit. The vessel's VMS vendor will return an acknowledgement message to the vessel after they receive a valid activity declaration. While not required, NMFS strongly recommends that vessels wait for the confirmation message before getting underway. The LADY MARY submitted an activity declaration on March 18, 2009 at 1017. Boatracs returned a confirmation message to the LADY MARY at 1030 the same day.³⁵⁸

(11) Once a vessel crosses the demarcation line, NMFS sends the vessel a trip start message via the VMS, with the time they crossed the line and a unique ID number for their trip. The LADY MARY's trip start was March 18, 2009 at 1101, which NMFS confirmed via a message on March 20, 2009.³⁵⁹

(12) Once the LADY MARY entered the Elephant Trunk Sea Scallop Access Area on March 18, 2009, the vessel did not leave the Access Area at any point in time during the voyage. The contours of the ocean bottom in the Elephant Trunk Area are on a general northeast/southwest orientation, so scallop vessels tend to follow the contours when fishing. A majority of the LADY MARY's track lines from this trip follow the northeast/southwest pattern. The Northeast VMS program manager from the NMFS Office of Law Enforcement testified that there was nothing unusual about the LADY MARY's track lines for this trip.³⁶⁰

³⁵⁷ Transcript 564, 566, 582

³⁵⁸ Exhibit G & Transcript 570-571, 575-577, 579

³⁵⁹ Exhibit G & Transcript 578-580

³⁶⁰ Exhibit 57 & Transcript 574, 606-607, 648

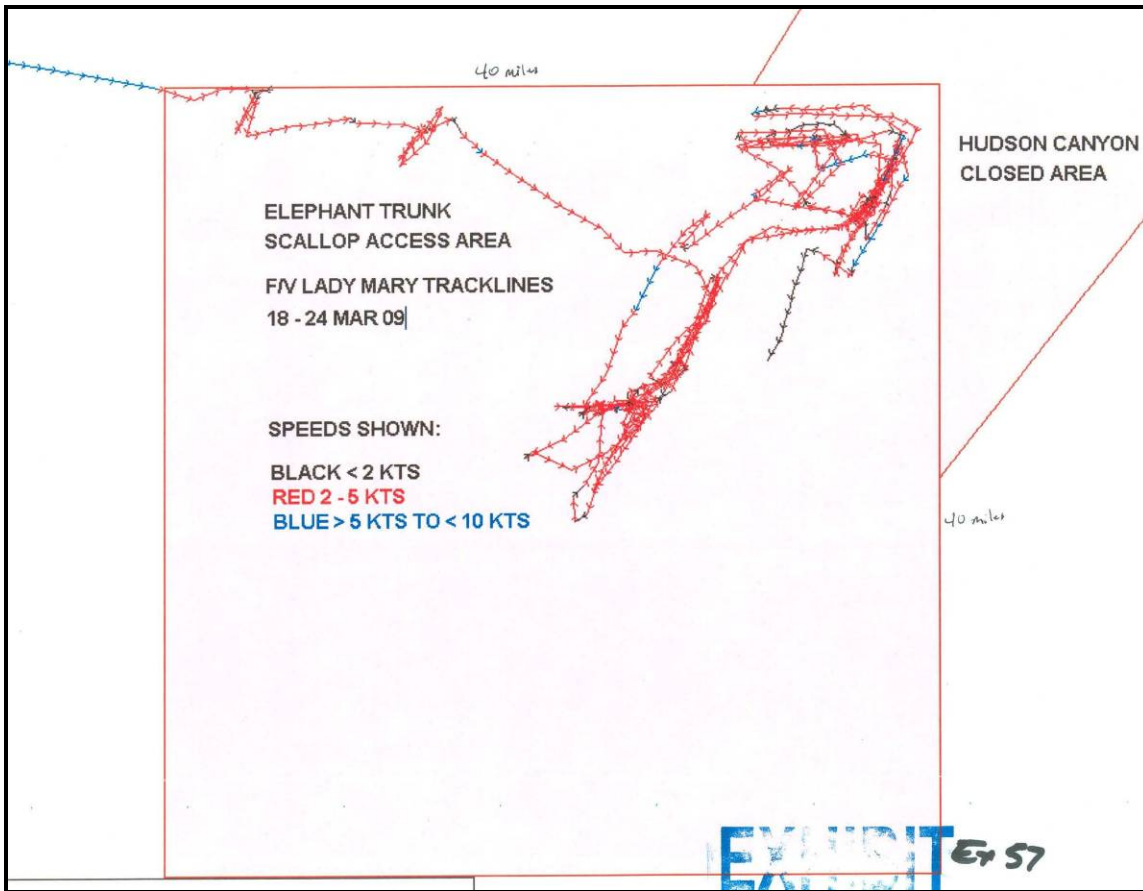


Figure 46: LADY MARY track lines within the Elephant Trunk, March 18-24, 2009

(13) Scallop vessels must file a VMS scallop catch report with NMFS each day by 0900. The report must list the pounds of scallops caught for the previous calendar day, even if the amount is zero. The LADY MARY entered the Elephant Trunk Sea Scallop Access Area at 1508 on March 18, 2009 and the first catch report was required to be submitted on the morning of March 19. The LADY MARY filed the following catch reports:

Date	Time	Scallops reported (lbs)
3/19/2009	1010	400
3/20/2009	0932	2000
3/21/2009	0924	2000
3/22/2009	0919	0
3/23/2009	0938	0

Table 7: Catch reports

The Northeast VMS Program Manager from the NMFS Office of Law Enforcement testified that it seemed unusual that the LADY MARY reported catching no scallops during a 48 hour period.³⁶¹

³⁶¹ Exhibit 57 (page 14) & Transcript 602-603, 1479-1483

(14) The LADY MARY's VMS position report dates, times and calculated courses and speeds made good from 2225 on March 23, 2009 until 0510 on March 24, 2009 were as follows³⁶²:

Date	Time	SMG (kts)	CMG (deg)
3/23/2009	2225	5.37	224
3/23/2009	2230	4.61	208
3/23/2009	2300	5.18	212
3/23/2009	2331	0.86	179
3/24/2009	0001	4.05	307
3/24/2009	0033	1.09	278
3/24/2009	0103	1.50	194
3/24/2009	0136	1.38	200
3/24/2009	0206	1.35	201
3/24/2009	0238	1.58	189
3/24/2009	0308	1.69	205
3/24/2009	0338	1.38	191
3/24/2009	0409	1.54	208
3/24/2009	0439	1.47	211
3/24/2009	0510	-	-

Table 8: Speeds and courses made good

(15) On the morning of March 24, 2009, around the time of 0510, there were 22 fishing vessels within a 6.5 NM radius of the LADY MARY's position. The Figure on the next page shows that the closest vessel at this time was the fishing vessel ALEXANDRIA DAWN, which will be referred to as Fishing Vessel A for the remainder of the report. The VMS data for Fishing Vessel A, whose 0521 position was 0.74 NM from the LADY MARY's 0510 position, showed speeds made good of less than 0.5 knots between 0023 and 0601 on March 24, 2009. The courses made good during this time period were not consistent, and ranged between 114 and 307 degrees true. Similar to the LADY MARY, Fishing Vessel A had a non-GPS based VMS unit, so the accuracy of the position was within 300 meters.³⁶³ [See Section B13 for details on the examination of Fishing Vessel A.]

³⁶² Exhibit 58

³⁶³ Exhibit 57 (page 3-4), 59, 61 & Transcript 585, 605, 755

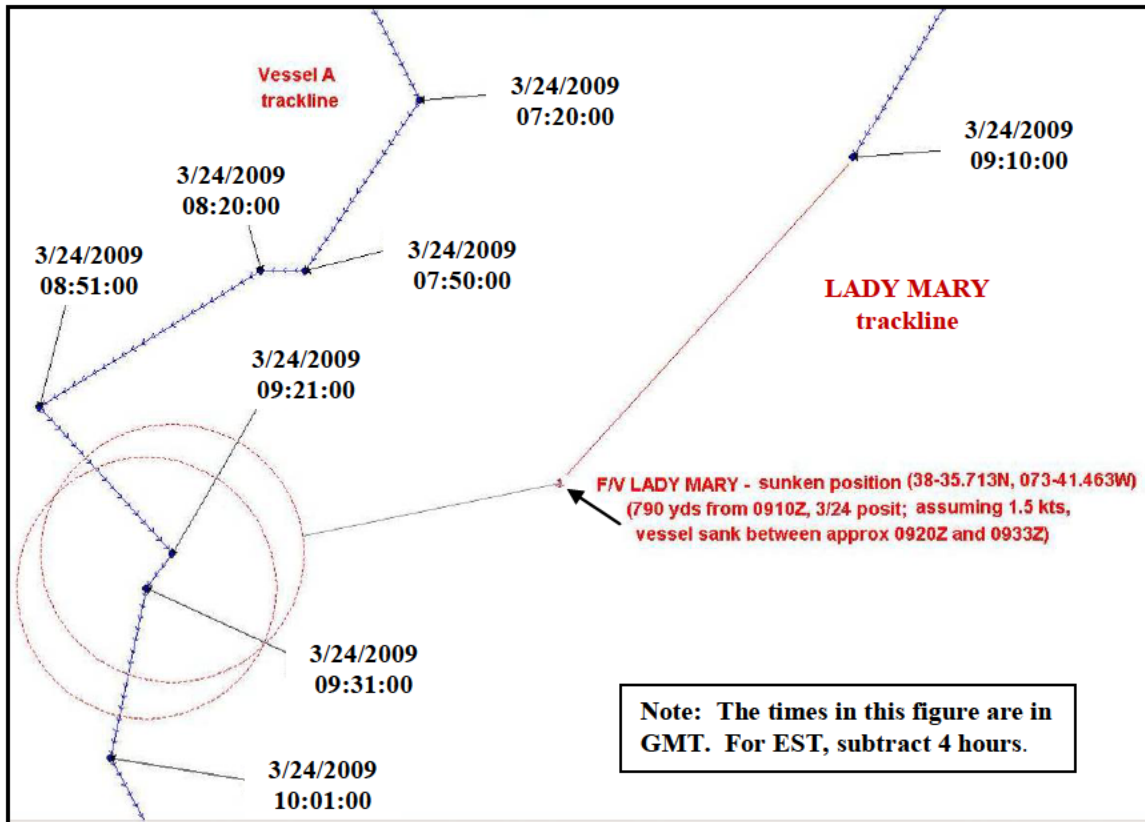


Figure 47: LADY MARY's final VMS position & sunken position compared to Fishing Vessel A track

(16) An additional examination of the VMS positions reported to the NMFS showed one other fishing vessel close to the LADY MARY's positions during the period from 2110 on March 23, 2009 to 0600 on March 24, 2009; this was the fishing vessel ELIZABETH & NIKI, which will be referred to as Fishing Vessel Y for the remainder of the report. Based on the course made good and speed made good for both vessels, the LADY MARY and Fishing Vessel Y were at their closest point of approach (CPA) at approximately 2148 on March 23. At this time, the LADY MARY was on a northbound course, and Fishing Vessel Y was southbound. Fishing Vessel Y had a GPS equipped VMS unit, so the navigational error associated with Fishing Vessel Y's positions was 100 meters (0.05 NM). The combined navigation error between the two vessels was 0.21 NM. The VMS positions for the two vessels were not from the same times, but based on dead reckoning, and accounting for the navigational errors, the closest point of approach between the two vessel track lines was just short of 110 meters (120 yards).³⁶⁴ [See Section B13 for details on the examination of Fishing Vessel Y.]

³⁶⁴ Exhibit 60, 94 & Transcript 736-737, 747-748, 1475-1479

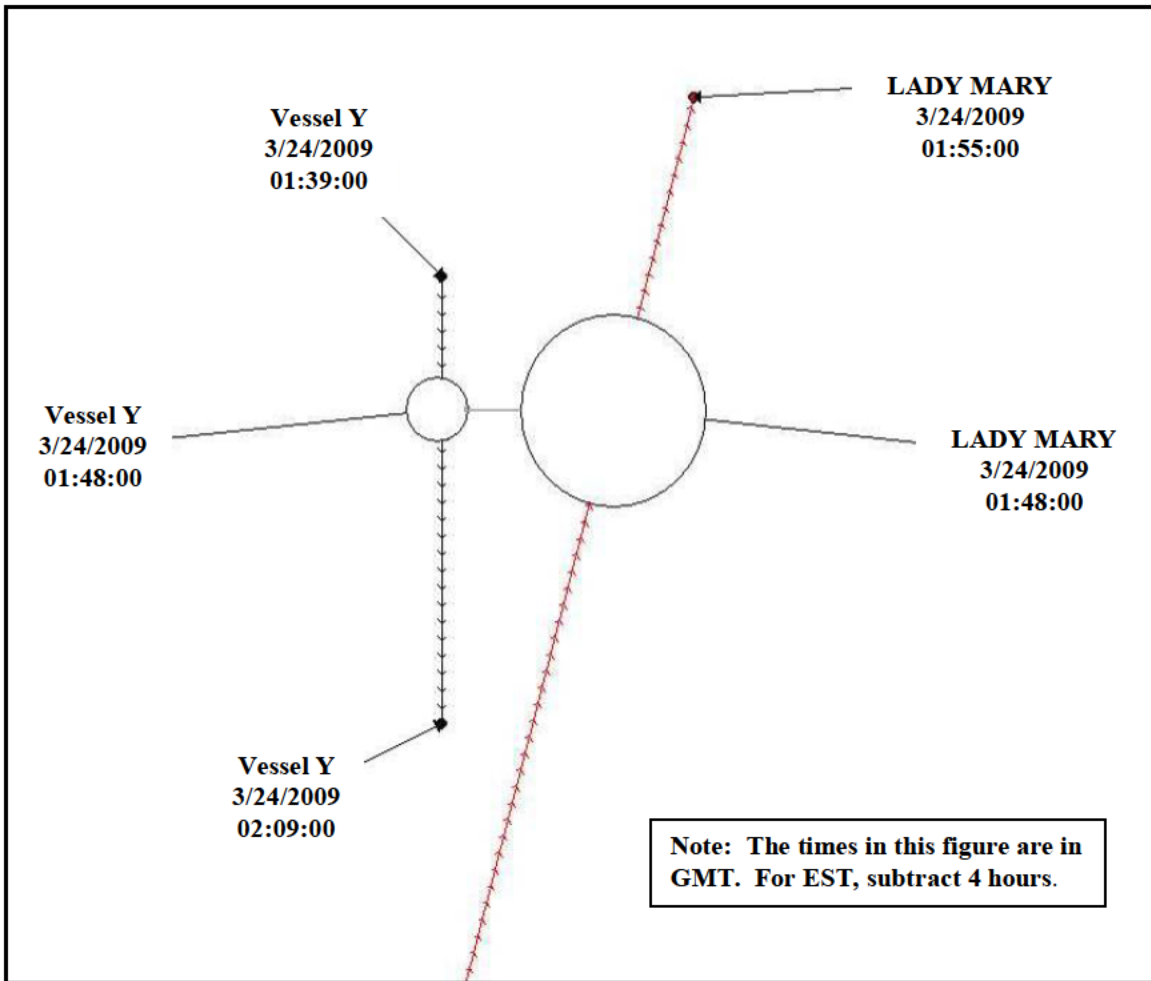


Figure 48: LADY MARY & Vessel Y tracks

(17) The LADY MARY participated in the Boatracs position alarm service, a courtesy offering to Boatracs customers. If the LADY MARY's VMS unit stopped providing positions for 3 to 4 hours, Boatracs would notify the designated point of contact. On March 24, 2009, Boatracs did not act on the LADY MARY's position alarm because they had already received the news of the vessel sinking.³⁶⁵

b. Automatic Identification System and Deep Draft Vessels

(1) The Automatic Identification System (AIS) is a maritime navigation safety communications system. The system was developed by the International Maritime Organization (IMO) as a means for communicating navigation safety information, such as vessel identity, course and speed, to other ships and shore stations. The purpose of sharing this information is for collision avoidance, as well as monitoring and tracking of vessels.³⁶⁶

³⁶⁵ Exhibit 57 (page 15)

³⁶⁶ 47 CFR 80.5 & Transcript 1515

(2) The Safety of Life At Sea Convention (SOLAS) mandates the use of AIS on all passenger ships, all cargo ships 500 or more gross tons, and all ships 300 or more gross tons engaged on international voyages. In addition, the Code of Federal Regulations (CFR) requires the use of AIS on all commercial self-propelled vessels 65 or more feet on international voyages, except passenger vessels and fishing vessels. Within vessel traffic service areas, the CFR also requires the use of AIS on all commercial self-propelled vessels 65 or more feet in length (except fishing vessels, and passenger vessels with less than 151 passengers), all towing vessels of 26 or more feet in length with more than 600 horsepower, and all passenger vessels with more than 150 passengers.³⁶⁷

(3) Each AIS station consists of a VHF transmitter and multiple VHF receivers. An AIS station transmits a signal to other AIS stations, while simultaneously receiving and managing the signals from other stations within its proximity. The communications integrity of AIS is very robust - the system uses Self-Organizing Time Division Multiple Access (SOTDMA) technology to synchronize the transmission schedules of stations and avoid transmission overlaps. This means that an AIS station will determine its own transmission schedule (time slot) based on the knowledge of future actions by other stations and when there are open time slots. When a station does broadcast its transmission, it also reserves a time slot for its next transmission. The AIS uses two VHF channels to allow for redundancy and avoid interference problems. If an AIS station does start to get overloaded with signals then the station will drop the transmissions with lower signal strength. These are usually the transmissions from stations that are further away.³⁶⁸

(4) A ship AIS station will transmit dynamic position messages and static voyage related messages. The dynamic position messages are sent every 2 to 10 seconds when a vessel is underway, and include the Maritime Mobile Service Identity (MMSI) number (a unique identification number), time, navigation status, position, heading, course over ground, speed over ground, rate of turn and position accuracy. Static voyage related messages are sent every 6 minutes, and include the MMSI number, vessel name, IMO number, radio call sign, ship type, ship dimensions, type of positioning device, destination and estimated time of arrival.³⁶⁹

(5) Since AIS signals are VHF communication signals, they do have range limitations based on the heights of the transmitting and receiving antennas. However, AIS transmissions are digital and are sent in short bursts of only 20 milliseconds. For these reasons, AIS transmissions usually travel about double the distance of a VHF voice transmission.³⁷⁰

(6) The Coast Guard has a shore based network for monitoring AIS transmissions throughout the nation, and archives all of the information at the Operations Systems Center. The Coast Guard's AIS receiver sites were specifically designed with higher

³⁶⁷ SOLAS Chapter V, Regulation 19.2 & 33 CFR 164.46

³⁶⁸ Transcript 1516, 1520-1523

³⁶⁹ Transcript 1517-1518

³⁷⁰ Transcript 1520-1521

sensitivity than normal AIS receivers, which means that they can detect more signals from a further distance.³⁷¹

(7) On March 24, 2009, there were two Coast Guard shore stations receiving AIS data from the vicinity of the LADY MARY - the Cape May site and the Tuckerton site. Based on a report density plot and average signal level plot for the Cape May site for that day, the location of the sunken LADY MARY appears to be just outside the site's coverage. Based on plots for the Tuckerton site, the location of the sunken LADY MARY appears to be just on the fringe of the site's coverage. This means that some AIS messages were received from the vicinity of the LADY MARY on March 24, 2009, but perhaps not all of them. A Coast Guard navigation systems expert testified that if there was an AIS equipped vessel transmitting in that area on March 24th, it was likely that the Coast Guard would have received at least one AIS report from the vessel.³⁷²

(8) The MBI requested archived AIS data for the vicinity of the LADY MARY from 1000 (local) on March 23, 2009 to 0600 (local) on March 24, 2009. The data request covered a geographical area greater than 20 miles square, centered on the position of the sunken LADY MARY. The archived AIS data showed only one vessel close to the LADY MARY's VMS track lines (see section B12(a) above) during the time period examined. This vessel was the CAP BEATRICE. The MBI also requested all of the archived AIS data for the CAP BEATRICE for March 24, 2009 and March 25, 2009.³⁷³ In addition to the archived AIS data for March 24, 2009, the MBI also requested any AIS data for the LADY MARY's vicinity from the Coast Guard's Research and Development Center, who was running an AIS prototype satellite project at the time of the sinking. The satellites did not capture any additional AIS data.

(9) The Coast Guard received AIS transmissions from the CAP BEATRICE (MMSI number 636091332) at 0459, 0500, 0506 and 0508 on March 24, 2009. The dates, times, speed over ground (SOG) and course over ground (COG) for those positions were as follows:

Date	Time	SOG (kts)	COG (deg)
3/24/2009	04:59:47	19.7	252
3/24/2009	05:00:23	19.7	249
3/24/2009	05:06:30	19.6	244
3/24/2009	05:08:00	19.8	243

The latitude and longitude positions reported in these transmissions were derived by the positioning system on the vessel; in this case a differentially corrected Global Positioning System (GPS) unit. The accuracy of these four positions was listed as "high", which means the accuracy was within 10 meters. The times of each of these positions were also derived by the vessel's GPS unit. This means that the times are extremely accurate as

³⁷¹ Transcript 1523-1525, 1530-1531

³⁷² Exhibit 115 & Transcript 1528-1530, 1541-1542

³⁷³ Exhibit 78

well, because GPS receivers function based on time differentials, and so they set their time to the GPS satellite atomic clocks.³⁷⁴

(10) A combined plot of the LADY MARY VMS track lines and the CAP BEATRICE AIS track lines was made, including circles around each position to represent the navigational error of those reports as shown in the Figure below. As mentioned in section B.12.a above, the LADY MARY was equipped with a non-GPS VMS unit, so its navigational error was 300 meters (0.16 NM). As mentioned in the paragraph above, the navigational error of the CAP BEATRICE was 10 meters (0.005 NM). The combined plot shows that the track lines of the two vessels did not intersect. The distance between the 0500 CAP BEATRICE position, and a 0500 dead reckoned position of the LADY MARY was 1.28 NM, or 1.11 NM after subtracting the navigational errors. The distance between the 0506 CAP BEATRICE position, and a 0506 dead reckoned position of the LADY MARY was 2 NM.³⁷⁵

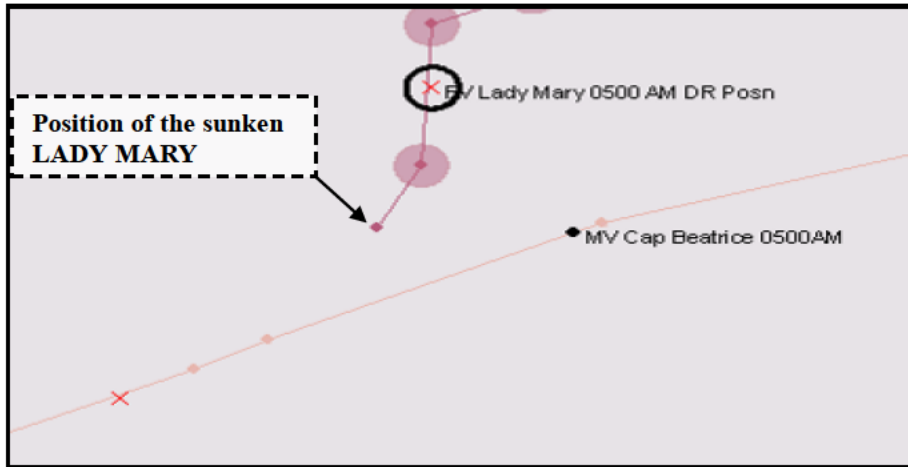


Figure 49: LADY MARY and CAP BEATRICE 0500 positions, 1.28 NM apart

(11) The regulations require that a vessel's AIS unit should be operational at all times while the vessel is navigating or at anchor. While some makes and models of AIS units can be manually turned off by the vessel, they do not typically turn off the units because of the threat of fines and/or detention. An AIS unit will log each time that the power is turned off. The units will internally record the last twelve instances of being turned off. A servicing technician from Maritime Electronics Co Inc. took pictures of the CAP BEATRICE's AIS unit on/off log during a visit to the vessel in July 2009. The picture shows that the unit was last turned off on June 2, 2007.³⁷⁶

³⁷⁴ Exhibit 78 & Transcript 1546-1548, 1550-1553

³⁷⁵ Exhibit 79

³⁷⁶ Exhibit 132 & Transcript 1533-1536, 1538-1539

c. U.S. Navy Vessels

(1) The U.S. Navy Commander of Submarine Force Atlantic reported that there was no U.S. Navy submarine activity in the vicinity of the LADY MARY at the time of sinking.³⁷⁷

d. Underwater Acoustic Data

(1) The MBI checked with a variety of sources to see if any underwater acoustic data was recorded in the vicinity of the LADY MARY on March 24, 2009. No data was available.

³⁷⁷ Exhibit 121

13. Examination of Other Vessels

Based on Automatic Identification System (AIS) and Vessel Monitoring System (VMS) data from the Elephant Trunk Sea Scallop Access Area on March 23 and March 24, 2009, there were three vessels with track lines which passed relatively close to the LADY MARY. Due to the fact that there was some damage observed on the sunken LADY MARY [see Section B11 for additional information regarding the damage]; these vessels were physically examined for any reciprocal damage which could have been indicative of a collision or dredge entanglement. This section describes the physical examinations of these other vessels.

a. Motor Vessel CAP BEATRICE

(1) The CAP BEATRICE (IMO Number 9330537) is a 28,616 gross ton, 729 foot, Liberian flagged containership. On March 16, 2009 the vessel departed Antwerp, Belgium for the Port of Philadelphia with 20 crewmembers and one passenger onboard.³⁷⁸ As described in Section B12 of this report, on the morning of March 24, 2009 the CAP BEATRICE passed close enough to the LADY MARY to warrant further investigation into a possible collision between the two vessels.

(2) On May 24, 2009, the Coast Guard and NTSB went onboard the CAP BEATRICE in Big Stone Anchorage, Delaware Bay. At the same time, the New Jersey State Police Dive Team South inspected the underwater portion of the bulbous bow. The CAP BEATRICE drafts at the time were 7.3 meters forward and 11.1 meters aft. The upper portion of the bulbous bow was out of the water and clearly visible from the dive team boat. Typical symmetrical scoring marks left in the paint by the anchor chain were found on top of the bulbous bow. There were no dents, insets, punctures, fractures, or paint transfers indicative of a collision anywhere on the bulbous bow of the CAP BEATRICE, or adjacent hull areas, nor were there any indications of recent repairs.³⁷⁹

b. Fishing Vessel A

(1) Fishing Vessel A was selected for further investigation because its 0521 position the morning of March 24, 2009 was 0.74 nautical miles southwest of the 0510 position of the LADY MARY. [See section B12 for additional details regarding the VMS positions.] Coast Guard Investigating Officers went onboard Fishing Vessel A on May 7, 2009 in Montauk, New York. They did not find any fresh paint on the hull, or evidence of hull, or topside, damage indicative of a collision. The Investigating Officers did not find any evidence that the dredge towing wire was recently renewed. The captain and mate were asked about the sinking. The captain was asleep when it happened. The mate was at the helm at 0500 on March 24, 2009, but he did not see the LADY MARY or hear any radio transmissions. The captain and mate first learned of the sinking about eight or nine hours after it occurred.³⁸⁰

³⁷⁸ MISLE Case 445650

³⁷⁹ MISLE Case 445650

³⁸⁰ MISLE Case 445650, Exhibit 57-61, 69, 76 & Transcript 742-743

c. Fishing Vessel Y

(1) Fishing Vessel Y was selected for further investigation because it was in a meeting, or near meeting, situation with the LADY MARY on the evening of March 23, 2009. Using dead reckoning based on the course made good and speed made good for both vessels, and accounting for possible VMS navigational error, their closest point of approach was calculated just under 110 meters (120 yards) at 2148 on March 23. [See section B12 for additional details regarding the VMS positions.] On August 24, 2009, a Coast Guard Investigating Officer viewed Fishing Vessel Y's hull, steering gear, propeller and dredge while it was out of the water at the Fair Haven Shipyard in New Bedford, MA. The Investigating Officer did not find any fresh paint on the hull, or evidence of hull, or topside, damage indicative of a collision. The Investigating Officer did not find any evidence that the dredge towing wire was recently renewed. The Investigating Officer also interviewed the captain and crew of Fishing Vessel Y and the interviews did not result in any additional evidence regarding the LADY MARY sinking.³⁸¹

³⁸¹ MISLE Case 445650, Exhibit 58, 94; Transcript 1475-1478

14. The Regulatory Environment

This section outlines the federal and international regulations and requirements applicable to the LADY MARY. This section also addresses the methods used to verify that these requirements were met.

a. Uninspected Vessel and Commercial Fishing Vessel Requirements

(1) The LADY MARY was an uninspected vessel, subject to the requirements of 46 CFR Subchapter C. This Subchapter includes regulations specific to Commercial Fishing Industry Vessels, which are found in Part 28. The Subchapter C requirements applicable to the LADY MARY are listed in the following Table:

Regulation Cite	Brief description of requirements for LADY MARY	Compliance?	Applicable Evidence
25.25-5	Life preserver (or survival suit) for everyone onboard At least one approved ring life buoy	Yes	Transcript 1251-2 Exhibit 1
25.25-7	Marking of lifesaving equipment	Yes	Exhibits 1, 2, 3
25.25-9	Life preservers (survival suits) must be readily accessible and life buoys must be immediately available	Yes	Transcript 1251-2
25.25-11	Lifesaving equipment must be in serviceable condition	Yes	Exhibits 1, 2, 3, 5, 18, 98
25.25-13	Life preservers (survival suits) require an approved light	Yes	Exhibits 2,3
25.26-5	Category 1 406 MHz EPIRB onboard and stowed in a manner so that it will float-free if the vessel sinks	Yes	Exhibits 4, 85, 103
25.26-50	EPIRB tested after installation and then monthly EPIRB battery replaced after use and before expiration	Unknown Yes	Exhibit 4
25.30-5	Hand portable fire extinguishers shall be of an approved type	Yes	Exhibits 34, 35
25.30-10	Hand portable fire extinguishers shall be of the "B" type and have a metallic name plate	Yes	Exhibits 34, 35
25.50-1	Must meet applicable garbage discharge, waste management plan & placard requirements of 33 CFR 151	Yes	Exhibits 34, 35
26.03-4	Adequate and up-to-date charts and publications onboard	Yes	Exhibits 34, 35
26.15-1	Must stop if hailed by a CG vessel	Yes	Exhibit 93
28.70	Approved equipment/material must be in accordance with Subchapter Q	Yes	Exhibits 1 – 5

Regulation Cite	Brief description of requirements for LADY MARY	Compliance?	Applicable Evidence
28.80	Casualties not reported to CG must be reported to Marine Index Bureau	Unknown	
28.90	Crew must report injuries to Captain or to the vessel owner	Unknown	
28.105	Required lifesaving equipment must be approved	Yes	Exhibits 1-5
28.110	One survival suit for each person onboard and suits readily accessible	Yes	Transcript 1251-4
28.115	Three orange ring life buoys of at least 24 inches; one with 90 ft line	Yes	Exhibits 34, 35
28.120	Inflatable life raft with SOLAS A pack; life boat may be substituted	Yes	Exhibit 5, 18
28.125	Life raft must be stowed to float free and automatically inflate if vsl sinks; hydrostatic release must be approved	Yes	Exhibits 34, 35, 85
28.130	Equipment in survival craft must be good quality, effective and secured	Yes	Exhibit 5
28.135	Lifesaving equipment marked with vessel name (block capital letters) & approved retroreflective material (except life raft)	Yes	Exhibits 1, 2, 3, 34, 35
28.140	Lifesaving equipment ready for use, in good working order & accessible; inspected and/or serviced annually (EPIRB tested monthly); life raft serviced at approved facility; escape routes must not be obstructed	Yes Yes Unknown Yes Unknown	Exhibits 34, 35 Exhibit 18 Exhibit 18
28.145	Three parachute flares, six hand flares & three smoke signals	Yes	Exhibits 34, 35
28.150	EPIRB, as per 46 CFR 25.26	Yes	Exhibits 4, 52
28.155	Excess fire detection and protection equipment can not endanger vessel or crew; must meet industry standard	Unknown	
28.160	Portable fire extinguishers: three A-II, one B-II or C-II, four B-II, two C-I, one C-II	Yes	Exhibits 34, 35
28.165	Injury placard posted in visible area	Yes	Exhibits 34, 35
28.210	First aid manual and medicine chest; one individual certified in first aid and one in CPR (can be same person)	Yes	Exhibits 34, 35
28.215	Exposed machinery must have covers guards or railing; exhaust pipes must be insulated/guarded to prevent burns	Yes	Exhibits 34, 35

Regulation Cite	Brief description of requirements for LADY MARY	Compliance?	Applicable Evidence
28.255	Relevant charts and publications; Inland Navigation Rules	Yes	Exhibits 34, 35
28.230	Magnetic steering compass and deviation table	Yes	Exhibit 108
28.235	Anchor and chain/cable/rope	Unknown	
28.240	Audible general alarm system; flashing red light & sign in noisy spaces; tested weekly	Yes Unknown	Exhibits 34, 35 & Transcript 1188-1189, 1191-1196
28.245	VHF radiotelephone; radiotelephone for 2-4 MHz band (or satellite communication capability); installed in safe, accessible, protected location and meet 47 CFR 80; provided with emergency source of power	Yes	Exhibits 34, 35, 108
28.250	Visual and audible high water alarms for engine room, fish hold, lazarette	Yes	Exhibits 34, 35 & Transcript 449
28.255	Bilge pump and piping for all watertight compartments; stop valve, check valve and strainer for bilge suction lines; must meet 33 CFR 151 and 155	Yes Unknown Unknown	Exhibits 34, 35 & Transcript 451
28.265	Emergency instructions posted	Yes	Exhibits 34, 35
28.270	Drills and instruction at least once a month; trainer must be trained; new crew member safety orientation	No Unknown Yes	Transcript 541-2 Transcript 408-9

Table 9: Table of Subchapter C requirements applicable to LADY MARY

(2) The LADY MARY was not required to meet the Load Line requirements prescribed in 46 CFR Subchapter E, the Subdivision and Stability requirements prescribed in 46 CFR Subchapter S, or the Stability requirements prescribed in 46 CFR Part 28 Subpart E.

b. Documentation and Measurement Requirements

(1) The Subchapter G requirements applicable to the LADY MARY are listed in the Table on the next page (major provisions only).

(2) 46 CFR 67.39 contains citizenship requirements for corporations which own U.S. vessels. This regulation required that Smith & Smith Inc. be incorporated under the laws of the U.S., that the Chief Executive Officer be a U.S. citizen, that the chairman of the board of directors be a citizen, that a majority of the directors be citizens, and that at least 75 percent of the stock interest in the corporation is owned by citizens.

Regulation Cite	Brief description of requirements for LADY MARY	Compliance?	Applicable Evidence
67.7	Vessel must be documented	Yes	Exhibit 13
67.21	Vessel must carry fishery endorsement on COD	Yes	Exhibit 13
67.105	Gross and net tonnage and dimensions of the vessel must be determined whenever there is a change in those items	No	
67.121	Official number must be permanently affixed to an interior structural part of the hull	Unknown	
67.123	Vessel must be clearly marked on the bow and on the stern	Yes	Exhibit 43, 44, 45
67.313	Current COD must be onboard	Yes	Exhibit 34, 35
69.19	Remeasurement and adjustment of tonnage for vessels with previously assigned tonnages	No	

Table 10: Measurement and documentation requirements

c. Navigation Requirements

(1) The LADY MARY was required to comply with the Inland Navigation Rules when located inside of the demarcation lines established by 33 CFR Part 80, and the International Regulations for Preventing Collisions at Sea, 1972, when located outside of the demarcation lines.

d. Federal Communications Commission Requirements

(1) In accordance with the special note at the end of 46 CFR 28.245(h), the LADY MARY was required to have a Ship Radio Station License issued by the Federal Communications Commission and meet pertinent requirements in 47 CFR Part 80.

e. Commercial Fishing Vessel Safety Examinations

(1) On July 21, 2008 a Coast Guard Examiner conducted a Commercial Fishing Vessel Safety Examination (CFVSE) of the LADY MARY in Cape May, New Jersey. No deficiencies or particularly hazardous conditions were noted and Commercial Fishing Vessel Safety Decal Number 144738 was issued. The decal was valid for two years “provided the vessel safety equipment remains serviceable and the operating conditions” are not exceeded. Deckhand 1 signed the examination checklist as the vessel’s representative.³⁸²

(2) The crew of the LADY MARY was not on board during the 2008 CFVSE. The Examiner verified that drills and safety orientations were being conducted through a

³⁸² Exhibit 35

question and answer session with Deckhand 1. The Examiner testified that he was trained to take notice of any major vessel modifications. He does not usually ask a vessel representative to identify modifications since he is generally familiar with the boats he is examining. The Examiner was onboard the LADY MARY after the major modifications, described in section c above, were completed.³⁸³

(3) The same Examiner conducted the LADY MARY's previous CFVSE on July 24, 2007. No deficiencies or particularly hazardous conditions were noted and Decal Number 116761 was issued. Deckhand 1 signed the examination checklist as the vessel's representative.³⁸⁴

(4) The same Examiner also conducted a CFVSE in June of 2006 due to an at sea boarding conducted by Sector Delaware Bay. The vessel was found to be in compliance with currently applicable laws and regulations and Decal Number 06-133742 was issued.³⁸⁵

(5) While CFVSE's are voluntary from the Coast Guard perspective, in order for a fishing vessel to take a NMFS Observer on board to witness their fishing operations, a fishing vessel must have successfully passed a CFVSE and have a valid decal. A NMFS specialist testified that fishing vessels really cannot decline to take a NMFS Observer aboard when selected. The specific federal regulations covering this are found in 50 CFR 648.11 and in general, state that all sea scallop vessels issued a general scallop permit, when notified of the requirement to carry an observer on a specified trip, may not fish for, take, retain, possess, or land any scallops without carrying an observer unless that vessel's management team has been notified that the vessel has received a waiver of the observer requirement for that trip.³⁸⁶

f. Law Enforcement Boarding

(1) On February 17, 2009, the USCGC IBIS boarded the LADY MARY approximately five NM offshore of Wildwood, New Jersey. The examination lasted 50 minutes and the Boarding Officer issued one violation for an EPRIB hydrostatic release which expired in January of 2009. The Shore Manager purchased a new EPRIB hydrostatic release on February 28, 2009. No other deficiencies were noted in the Activity Summary Report from the boarding. The report did not identify what, if any, other safety systems the Boarding Team examined. The report noted that there were four adults on board and that the catch consisted of 800 pounds of scallops and 20 pounds of monk fish. This was the last Coast Guard contact with the LADY MARY before the sinking.³⁸⁷

³⁸³ Transcript 219-220, 222, 233-234

³⁸⁴ Exhibit 34

³⁸⁵ MISLE Activity #2713402

³⁸⁶ Transcript 222, 249, 258, 698-699, 50 CFR 600.746

³⁸⁷ MISLE Activity # 3420427, Exhibit 17, & Exhibit 93

g. Protection of Living Marine Resources Requirements

(1) The National Marine Fisheries Service (NMFS) is the lead federal agency responsible for conserving, protecting and managing living marine resources and marine habitats within the Exclusive Economic Zone. Their role includes reviewing, approving, implementing and administering the Fisheries Management Plans prepared by eight Regional Fishery Management Councils. Along the East Coast of the United States, sea scallops are managed as a single fishery under the Atlantic Sea Scallop Fishery Management Plan. Conservation methods employed by the Plan include setting annual total allowable catch limits, fishing gear restrictions, creating access areas with limited entry and controlling entry into the scallop fishery.³⁸⁸

(2) The LADY MARY's first fishing permit on file with NMFS was a General Sea Scallop permit which started on September 25, 2002. Beginning in 2003, the vessel continuously held a Full Time Limited Access, Small Dredge Sea Scallop Permit. The most recent scallop permit started on March 1, 2009 and would have expired on February 28, 2010. The permit was in good standing when the vessel sunk on March 24, 2009. In addition to sea scallops, the LADY MARY was permitted to catch 13 other types of fish.³⁸⁹

(3) During the 2009 fishing season, a vessel with a General Sea Scallop permit was allowed to catch up to 400 pounds of scallops per day in any location, but they could never have more than 400 pounds of scallops on board. During the 2009 fishing season, a vessel with a Full Time Limited Access Sea Scallop permit was allocated five trips into Sea Scallop Access Areas and 35 days at sea in open areas (areas outside of the Sea Scallop Access Areas). The total catch allowed during a Sea Scallop Access Area trip was 18,000 pounds. A Small Dredge designation meant that a vessel could only fish with one scallop dredge of no more than 10.5 feet in width.³⁹⁰

³⁸⁸ 50 CFR 648 and www.nmfs.noaa.gov

³⁸⁹ Exhibit 16, 73 & Transcript 703

³⁹⁰ 50 CFR 648.51, 684.53, 648.60 & Transcript 659, 661, 703-704

C. ANALYSIS

1. Identifying the Initiating Event and the Subsequent Events

This section contains the analysis used to identify the event(s) which triggered the sinking of the LADY MARY and the subsequent events that ultimately led to the deaths of six crewmen. Due to the nature of the casualty and its consequences, there was sufficient evidence to rule out a number of possible scenarios and to determine that an unknown initiating event prompted the crew to open the lazarette access hatch and rig the space to be dewatered (pumped out). There was not conclusive evidence, however, to identify the specific event. Even though the exact nature of the initiating event could not be determined, a sequence of subsequent events was identified. That sequence would have likely been the same, regardless of the event that caused the crew to remove the lazarette access hatch to dewater the space.

** Note – Throughout the Causal Analysis section of this report, italicized text refers to deductive determinations made by the Marine Board of Investigation based on analysis of the available evidence. These determinations are embedded within the flow of text for ease of reading.*

a. Possible scenarios related to the sinking

(1) The Survivor did not recall anything unusual regarding the LADY MARY's operations or equipment before he went to bed at midnight on March 23rd, which was the end of his regularly scheduled work period.³⁹¹ When the Survivor was awoken by Deckhand 1 on the morning of March 24th, the LADY MARY was listed to port and sea water had already entered the deckhouse. Additionally, approximately one third of the open main deck area was awash, the water level in the port side main deck passageway was knee deep, and water was beginning to enter the galley.³⁹² This means that *the initiating event occurred while the Survivor was asleep, sometime between 0001 and 0500 on March 24th.*

(2) Despite the fact that the Survivor was asleep when the initiating event occurred, he provided a number of details about the vessel's condition which were useful in eliminating certain possibilities. Prior to abandoning ship, the Survivor donned his survival suit near the main scallop dredge winches located on the upper deck. He remained on the deck until the water level rose up to the winches, at which point he jumped into the water. He paddled away from the vessel and then watched it sink below the surface. The last visible part of the vessel he saw was the top of the starboard side rigging.³⁹³ During the post casualty ROV and dive surveys, the LADY MARY was found resting on the ocean floor in an upright position with the scallop dredge and the

³⁹¹ Findings of Fact B.3.e(2) & e(4)

³⁹² Findings of Fact B.3 f(1), f(2) & (3)

³⁹³ Findings of Fact B.3 f(7), f(9) & f(10)

starboard stabilizer resting on the main deck.³⁹⁴ These facts led to the determination that *the LADY MARY did not capsize.*

(3) The Survivor did not report any type of explosion, fire, or smoke between the time he woke up on March 24th and the time he abandoned ship.³⁹⁵ The ROV video, the commercial divers, and the U.S. Navy divers did not reveal any fire related evidence on the sunken vessel³⁹⁶ which means that *a fire and/or explosion did not contribute to the LADY MARY sinking.*

(4) The LADY MARY was found in 210 feet of water in an area with no charted geographic features shallow enough to cause vessel grounding. The NOAA survey vessel THOMAS JEFFERSON used their side scan sonar to examine the bottom during their search for the LADY MARY. The survey did not identify any noteworthy underwater features in the area.³⁹⁷ Therefore, *the LADY MARY was not involved in a grounding which later led to the sinking of the vessel.*

(5) Based on the scenarios eliminated within paragraphs C.1.a(1) – a(4) above, *the LADY MARY sank either due to flooding (meaning a breach of the hull) or downflooding (meaning the entry of seawater through any opening into the hull or superstructure of an undamaged vessel due to heel/trim/submergence of the vessel³⁹⁸).*

(6) A breach of the LADY MARY's hull could have occurred within any one of the six compartments below the main deck, but a few of these were quickly eliminated. During the ROV and dive surveys, there were no visible hull breeches in the areas of the fore peak water tank, the forward bunk room and the water tank located below the forward bunk room, or the water tanks located between the fish hold and the lazarette. The entire exterior of these spaces was visible, with the exception of a very small section of the water tank located below the forward bunk room.³⁹⁹ In addition, the Survivor did not indicate that there was water in his bunk room (the forward bunk room) when he was awoken.⁴⁰⁰ Therefore, for all of these reasons, *if there were flooding, it would have had to occur in the engine room, the fish hold, or the lazarette.*

(7) The below chart indicates the remaining scenarios which could have contributed to the LADY MARY sinking. Since none of these scenarios could quickly be ruled out, an in-depth analysis of additional evidence was carried out, and is discussed in the sections which follow.

³⁹⁴ Findings of Fact B.11 f(1), f(3) & f(11)

³⁹⁵ Findings of Fact B.3 f(1) – f(9)

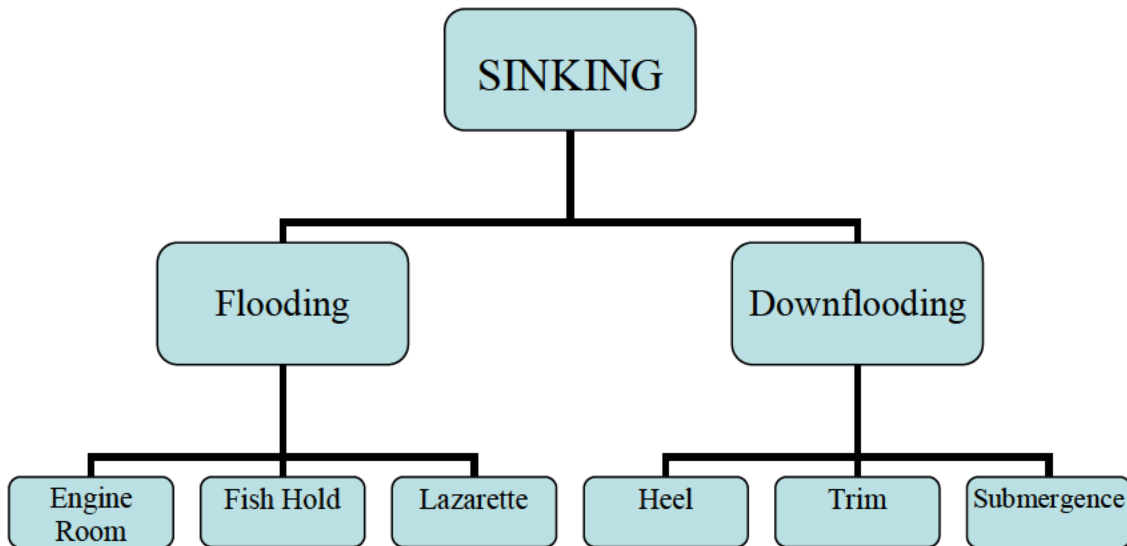
³⁹⁶ Findings of Fact B.11 f(1) – f(20)

³⁹⁷ Findings of Fact B.11.a(2) & f(1)

³⁹⁸ 46 CFR 28.510 – Definition of downflooding

³⁹⁹ Finding of Fact B.11.f(20)

⁴⁰⁰ Findings of Fact B.3 f(1) – f(3)



b. Analysis of VMS evidence

(1) As discussed in Finding of Fact Section B12, two vessel tracking systems provided data pertinent to this casualty, the Vessel Monitoring System (VMS) and the Automatic Identification System (AIS).

(2) Based on data received from the VMS, the National Marine Fisheries Service (NMFS) provided known GPS positions for the LADY MARY at approximately 30 minute intervals. NMFS also provided the calculated courses made good (CMG) and speeds made good (SMG) between each GPS position. The same type of information was also provided for other fishing vessels in the vicinity of the LADY MARY on March 23rd and 24th.⁴⁰¹ Since CMG and SMG is a simple linear calculation of time and distance, it cannot be assumed that the vessels followed those exact paths, but the calculated CMGs and SMGs, do provide useful data for analysis.

(3) Throughout the March 18 – March 24, 2009 voyage, NMFS only missed one VMS position report from the LADY MARY (on March 21st)⁴⁰² which means that *the LADY MARY's VMS unit was functioning properly up until the time of the sinking*. Throughout the voyage, a majority of the LADY MARY's SMGs were between two and five knots.⁴⁰³ Testimony from three different witnesses agreed that scallop dredges are towed at speeds between three and five knots and last about 45-60 minutes, with less time needed in a plentiful scallop location. Recovery of the scallop dredge was done at slower speeds and took somewhere between five and fifteen minutes.⁴⁰⁴ Since the VMS positions were usually 30 minutes apart, and did not necessarily coincide with dredge deployment or recovery, it was determined that *track line segments between two and five knots generally represented active scalloping periods*.

⁴⁰¹ Findings of Fact B.12.a(1) – a(3), a(7), a(9) & a(15)

⁴⁰² Finding of Fact B.12.a(8)

⁴⁰³ Exhibit 57

⁴⁰⁴ Findings of Fact B.9.a(13), a(14) & a(15)

(4) When the survivor went to bed at 0000 on March 24th, the scallop dredge was deployed and the LADY MARY was actively fishing.⁴⁰⁵ Between 0001 and 0033, the LADY MARY's CMG was 307 degrees true and her SMG was 4.1 knots. Between 0033 and 0103, the LADY MARY's CMG was 278 degrees true and her SMG was 1.1 knots, which was a significant reduction in SMG. After 0033, the LADY MARY SMGs remained below two knots⁴⁰⁶ which implies that *no more drags were initiated after 0033 and that the final drag for scallops concluded between 0001 and 0103.*

(5) Between 0103 and 0510, the LADY MARY had just over four hours of position reports which resulted in very consistent SMGs that ranged from 1.4 to 1.7 knots. The associated CMGs for this period were also very consistent, ranging from 189 to 211 degrees true.⁴⁰⁷

(6) Using the North American Mesoscale (NAM) model and the Hybrid Coordinate Ocean Model (HYCOM) software, a drift model was created to predict the behavior of a vessel experiencing weather conditions similar to those reported in the Elephant Trunk Sea Scallop Access Area on the morning of March 24th. The model covered a 4.17 hour period, beginning at the LADY MARY's 0103 position. The actual LADY MARY positions closely matched the model's predicted drift path and the actual 0510 position fell clearly within the particle distribution/probability grid determined by the drift model.⁴⁰⁸ Based on these results, it was determined that *the LADY MARY was drifting between 0103 and 0510 on March 24th.*

(7) Scallop vessels sometimes use their dredge as an anchor; a process known as "laying up" or "laying on the dredge." Based on the above determination that the LADY MARY was drifting after 0103, *the vessel could not have been laying on the dredge during this time period.* This is also supported by the fact that the Survivor testified the Captain would only lay on the dredge if the winds were less than 15-20 miles per hour, which was not the case on the morning of March 24th.⁴⁰⁹ Since the dredge was found on the main deck of the sunken vessel, but was deployed at 0000,⁴¹⁰ and no more scallop drags were initiated after 0033⁴¹¹, it was determined that *the LADY MARY did not lay on the dredge after the final drag concluded and the final haul back of the scallop dredge also occurred between 0001 and 0103.*

(8) The NMFS VMS program manager (Northeast Region) used the LADY MARY's final VMS position at 0510 and her sunken position to calculate a possible time range of sinking. He computed the distance between the 0510 position and the sunken position as 790 yards. Accounting for the possible navigational error of the VMS system (325 yards), the distance between the two points was somewhere between 465 yards and 1,115

⁴⁰⁵ Finding of Fact B.3.e(3)

⁴⁰⁶ Findings of Fact B.3.d(2) & B.12.a(14)

⁴⁰⁷ Findings of Fact B.3.d(2) & B.12.a(14)

⁴⁰⁸ Exhibit 120

⁴⁰⁹ Finding of Fact B.9.i(5) & Analysis C.1.b(6)

⁴¹⁰ Findings of Fact B.3.e(3) & B.11.f(11)

⁴¹¹ Analysis C.1.b(4)

yards. [Note: The VMS program manager computed distances using yards, which are quoted here, while other locations in this report use metric units.] Using a speed of 1.5 knots, which was the vessel's final computed SMG, he found that the vessel would have taken 9 to 23 minutes to cover the distance between the two points. This would indicate that the time of sinking was between 0519 and 0533.⁴¹²

(9) The Marine Board independently plotted the LADY MARY's sunken position, and her 0439 and 0510 VMS positions, on a Universal Plotting Sheet. Using a speed of 1.5 knots between the 0510 position and the sunken position, and assuming the vessel traveled in a straight line between the two positions, the calculated time of sinking was 0525.

(10) The calculations in paragraphs C.1.b(8) and b(9) above used a constant speed of 1.5 knots, but if the LADY MARY was in a state of flooding before or after 0510, the drift speed would likely be slower and the vessel would have taken longer to get to the position of sinking. The above calculations also assume that the vessel sank straight down through the water column, which is unlikely, but the calculations do provide a reasonable approximation since the water depth was only 210 feet.

(11) On the morning of March 24th, there were three fishing vessels operating in the Elephant Trunk Sea Scallop Access Area who heard a frantic, apparent "Mayday" on VHF Channel 16, and either participated in or heard the conversation immediately following the apparent "Mayday."⁴¹³ While the USCG Cape May VHF tower did not record any Mayday call on the morning of March 24th, it did record a partial conversation discussing the Mayday call. The voices from the recorded conversation were confirmed to be from two of the three fishing vessel captains who discussed the call. These radio transmissions were recorded between 0514 and 0515.⁴¹⁴ Based on the timing of the recorded conversation and the location of the vessels participating, along with the possible time of sinking calculated in paragraphs C.1.b(8) and b(9) above, it was determined that *a Mayday call was broadcast from the LADY MARY on VHF Channel 16 just before 0514 on March 24th.*

(12) The LADY MARY's EPIRB signal was first detected at 0540. Since the EPIRB had a 50 second delay between the time of activation and the time when it transmitted a signal⁴¹⁵, *the EPIRB was at the surface of the ocean and activated at 0539.* If the EPIRB was automatically released from its bracket, this would have happened when the unit submerged to a depth of 3 meters below the surface⁴¹⁶ and would indicate that the vessel sank before 0539. If the EPIRB was manually removed from the bracket, there is no way to know if the unit activated before or after the vessel sank.

⁴¹² Exhibit 76

⁴¹³ Findings of Fact B.5.3(1) – e(4)

⁴¹⁴ Findings of Fact B.5.e(5) - e(8)

⁴¹⁵ Findings of Fact B.10.a(4) & d(2)

⁴¹⁶ Finding of Fact B.10.a(3)

(13) The last VMS position report was received at 0510. Based on the 30 minute schedule established by NMFS, the next report should have been around 0540.⁴¹⁷ This means that *the LADY MARY's VMS unit did not have power at 0540 and may have been underwater at that time.*

(14) Accounting for all of the information in paragraphs C.1.b(8) - b(13) above, it was determined that *the LADY MARY sank between 0519 and 0539 on March 24th, 2009.*

(15) The VMS information showed numerous fishing vessels in the vicinity of the LADY MARY the night of March 23rd and the morning of March 24th. During that period, two of those fishing vessels were close enough to the LADY MARY to merit further examination. At around 2148 on March 23rd, Fishing Vessel Y could have been within 120 yards of the LADY MARY (based on dead reckoning between VMS positions).⁴¹⁸ However, this was before the Survivor went to bed and he did not report any type of encounter or collision with Fishing Vessel Y.⁴¹⁹ A Coast Guard investigator visited Fishing Vessel Y to examine the hull and fishing gear, and to conduct interviews with available crew members. No evidence was found to indicate that Fishing Vessel Y played any role in the LADY MARY's sinking⁴²⁰ so it was determined that *Fishing Vessel Y had no influence on the events that sank the LADY MARY.*

(16) At 0510, when the last VMS position report was transmitted from the LADY MARY, Fishing Vessel A was operating to the southwest, a little more than 0.75 nautical miles away.⁴²¹ A Coast Guard investigator visited Fishing Vessel A in May of 2009 to examine the hull and fishing gear, and to conduct interviews with available crew members. No evidence was found to indicate that Fishing Vessel A played any role in the LADY MARY's sinking⁴²² so it was determined that *Fishing Vessel A had no influence on the events that sank the LADY MARY.*

c. Analysis of AIS evidence

(1) On the night of March 23rd and the morning of March 24th, the LADY MARY was operating on the fringe of the Coast Guard's shore based AIS detection capability. Despite the distance from shore, a Coast Guard navigation systems program analyst testified that if there was an AIS equipped vessel transmitting in the vicinity of the LADY MARY, it was likely that the Coast Guard would have received at least one report from that vessel.⁴²³ Based on this information, *it is unlikely that an undetected AIS vessel was operating in the vicinity of the LADY MARY on the morning of March 24th.*

(2) The Coast Guard Operations Systems Center (OSC) provided all of the available archived AIS data covering the area within a 10 mile radius of the LADY MARY's

⁴¹⁷ Findings of Fact B.12.a(3), a(7) & a(14)

⁴¹⁸ Findings of Fact B.12.a(15) & a(16)

⁴¹⁹ Findings of Fact B.3.e(2) & e(3)

⁴²⁰ Finding of Fact B.13.c(1)

⁴²¹ Finding of Fact B.12.a(15)

⁴²² Finding of Fact B.13.b(1)

⁴²³ Finding of Fact B.12.b(7)

sunken position. The data spanned from 1000 on March 23rd to 0600 on March 24th, and provided tracking information on numerous vessels. Based on the data provided, there were a number of AIS equipped vessels within a 10 mile radius, but there was only one vessel that was in the vicinity of the LADY MARY's track lines and warranted additional investigation. Specifically, the M/V CAP BEATRICE was in the vicinity of the LADY MARY around 0500 on March 24th.⁴²⁴

(3) Four AIS positions were received from the CAP BEATRICE while she was in the vicinity of the LADY MARY. The times of these positions were 0459, 0500, 0506 and 0508.⁴²⁵ Vessels are required to use AIS whenever they are navigating or at anchor. While some makes and models of AIS units can be manually turned off by the vessel's crew, it is not typically done due to the threat of fines and/or detention. If an AIS unit is turned off, the unit will internally record when that occurred. AIS units will also record the last twelve instances of being turned off. A servicing technician determined that the CAP BEATRICE's AIS unit was last turned off on June 2, 2007.⁴²⁶ Based on this information, in conjunction with the information in paragraph C.1.c(1) above, it was determined that *the CAP BEATRICE's AIS was on and operating on the morning of March 24th and the reason the Coast Guard only received four position reports from the time period in question was likely due to the vessel's distance from shore.*

(4) Coast Guard specialists at the Coast Guard's training center in Yorktown, VA, created a combined plot from the AIS data for the CAP BEATRICE and the VMS data for the LADY MARY. The time accuracy of the AIS and VMS fixes was extremely precise. The location accuracy of the AIS positions was within 10 meters and the location accuracy of the VMS positions was 300 meters. Circles were drawn around each of the plotted positions to represent their potential inaccuracy. The combined plot shows that the track lines of the two vessels did not intersect and the distance between the 0500 CAP BEATRICE position and a 0500 dead reckoned position of the LADY MARY, was 1.28 nautical miles (1.11 nautical miles after subtracting the potential inaccuracies). The distance between the 0506 CAP BEATRICE position and a 0506 dead reckoned position of the LADY MARY was 2 nautical miles.⁴²⁷

(5) In addition to the combined plot described in the paragraph above, a Universal Plotting Sheet was used to examine the distance between the LADY MARY and the CAP BEATRICE in closer detail. The 0439 and 0510 VMS fixes of the LADY MARY were plotted, along with the 0500 and 0506 AIS fixes of the CAP BEATRICE (See the Figure on the next page). Based on paragraph C.1.b(6) above, which determined that the LADY MARY was drifting between 0103 and 0510, it means that the vessel's track line was relatively straight and the vessel's speed was relatively constant. Therefore, a straight track line was drawn between the 0439 and 0510 fixes, and then subdivided into 31 equal segments, each segment representing the approximate distance traveled in one minute.

⁴²⁴ Finding of Fact B.12.b(8)

⁴²⁵ Finding of Fact B.12.b(9)

⁴²⁶ Finding of Fact B.12.b(11)

⁴²⁷ Findings of Fact B.12.a(5), b(9) & b(10)

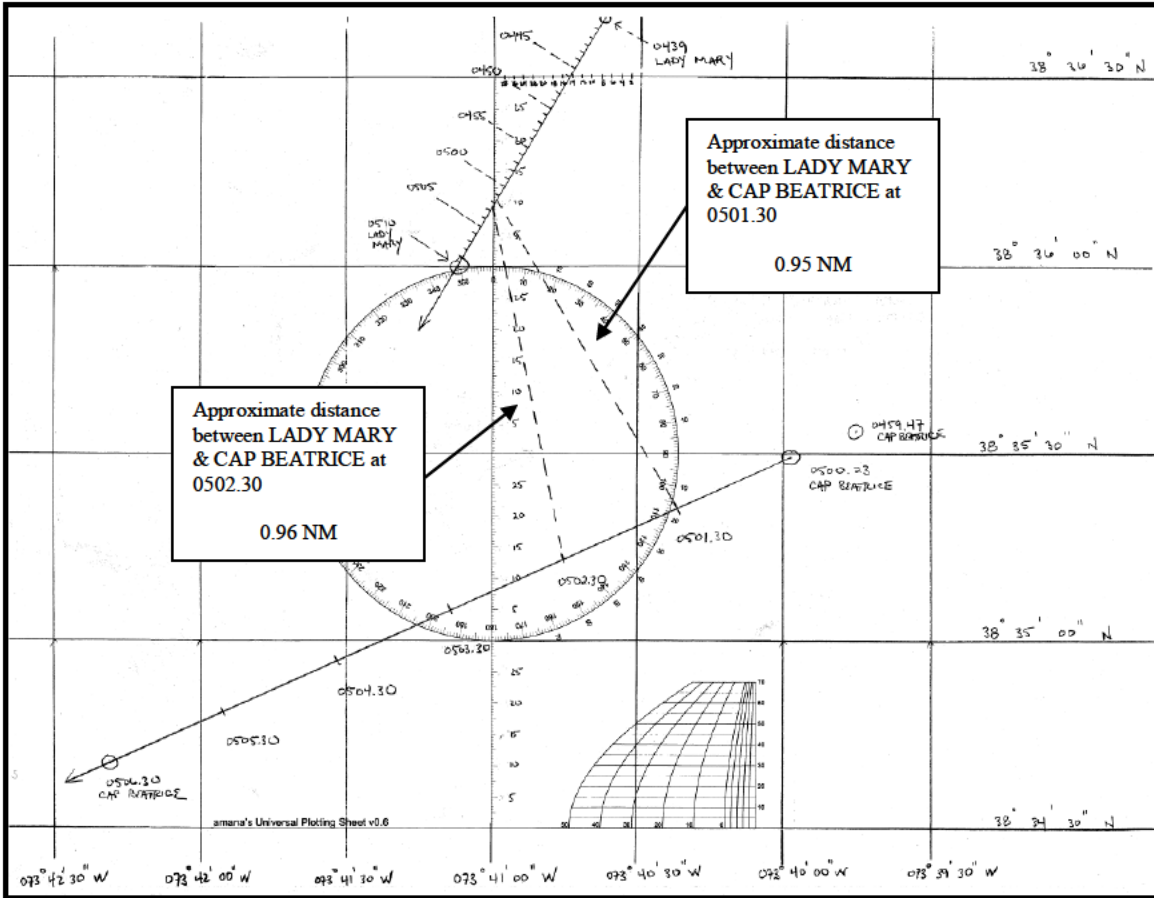


Figure 50: Universal Plotting Sheet, CAP BEATRICE & LADY MARY

(6) The AIS data for the CAP BEATRICE indicated the vessel’s course over ground (COG) at the instant each fix was taken, as well as the vessel’s heading. The COG at 0500 was 249 degrees true, and the heading at that time was 253 degrees. The COG at 0506 was 244 degrees, and the heading was 245 degrees. The COG, which reflects the actual direction that the vessel was traveling at the time of the fix, varied by 5 degrees between the two fixes. This means that the CAP BEATRICE probably made a small course adjustment to the south between the two fixes. However, since the distance between the two fixes was small and the fixes represent real time positions, a straight line provides a fairly accurate representation of the path traveled by the vessel. A simple calculation can help illustrate that it is highly unlikely that the CAP BEATRICE deviated to any great extent from her course made good track line between 0500 and 0506. If, for example, the vessel was to stray ½ nautical mile off of the CMG track line after the 0500 fix, she would have had to increase her speed by approximately 12.5% in order to arrive at the 0506 position. That kind of deviation is highly unlikely for a deep draft container ship at sea. The CAP BEATRICE was traveling almost exactly the same speed for each of the four fixes (only a 0.2 knot variation), so the track line between the 0500 and 0506 fix was subdivided into 6 equal segments, each segment representing the approximate distance traveled in one minute. It is noted that the time of the 0500 fix was actually

05:00:23, and the time of the 0506 fix was actually 05:06:30, so the segments labeled on the plot represent times that are 30 seconds past each minute mark.⁴²⁸

(7) A comparison of the plotted positions reveals that *the closest point of approach between the LADY MARY and the CAP BEATRICE occurred between 0501 and 0502*. At the closest point of approach, the track lines were approximately 0.95 nautical miles apart. Taking into account the maximum possible inaccuracies of the AIS and VMS data, *the closest point of approach between the two vessels was approximately 0.78 nautical miles, or 1,564 yards*. Even if the closest point of approach was calculated based on a dead reckoned position from the 0459 fix, using the vessel's heading of 253 degrees true (which is a projected course from a specific instant and is not the actual course traveled), the distance between the two vessels was still 0.69 nautical miles, or 1,397 yards. Based on the analysis of the VMS and AIS data described above, it was determined that *the CAP BEATRICE did not collide with the LADY MARY*.

d. Vessels not tracked by VMS or AIS

(1) Other vessels (those not tracked by VMS or AIS) could also have been operating in the vicinity of the LADY MARY between the time the Survivor went to bed at midnight on March 23rd and the approximate time it sank on March 24th.

(2) A letter from the U.S. Navy Commander of Submarine Force Atlantic confirmed that there was no U. S. Navy submarine activity in the area of the LADY MARY around the time of sinking.⁴²⁹ Follow on conversations with a representative of that staff also verified that no U. S. Navy surface assets were in that vicinity either. Based on this evidence, it was determined *a Department of Defense vessel was not involved in the sinking of the LADY MARY*.

(3) There was no evidence of tug and barge traffic transiting that far offshore on the morning of March 24th.

(4) There was no evidence of a recreational yacht, fishing vessel without VMS or AIS, non-compliant VMS or AIS vessel, or, a vessel engaged in illegal activity in the vicinity of the LADY MARY on the morning of March 24th.

(5) Between 0001 and 0519 (the latter being the earliest calculated time that the LADY MARY may have sank) on March 24th, there were no recorded or reported radio conversations from the Elephant Trunk which discussed any type of collision or other negative interaction between two vessels. The only communication from the LADY MARY on the morning of March 24th was a 0117 satellite phone call (which lasted only 15 seconds) and the Mayday call on VHF Channel 16 just before 0514.⁴³⁰ *So if there was another vessel, which had an influence on the LADY MARY's sinking, there was no evidence that the crew communicated this interaction to shore or to other vessels.*

⁴²⁸ Finding of Fact B.12.b(9)

⁴²⁹ Finding of Fact B.12.c(1)

⁴³⁰ Findings of Fact B.5.d(1), B.5.e(8) & Analysis C.1.b(11)

e. Study of evidence from the sunken LADY MARY

(1) Evidence obtained from the sunken LADY MARY was a critical part in identifying likely initiating and subsequent events. This evidence included video obtained with a Remote Operated Vehicle (ROV), extremely high quality photographs and video from a commercial dive team, video and evidence obtained by a U.S. Navy Mobile Dive & Salvage Unit (MDSU), and an NTSB forensic analysis of the recovered evidence.⁴³¹

(2) Prior to viewing the sunken vessel, one preliminary theory as to the vessel's fate, was that the scallop dredge got, "hung up" while being towed, causing the vessel to heel, take on water, and sink. The ROV revealed that the scallop dredge was on the main deck and was full. The gearmatic hooks were not connected into the scallop dredge; they were attached in what appeared to be a normal stowage position.⁴³² As determined in paragraphs C.1.b(7) and b(14) above, the final haul back of the scallop dredge occurred sometime between 0001 and 0103, and the vessel sank between 0519 and 0539. *If the scallop dredge did get hung up, causing the LADY MARY to list and take on water, then there were four hours to recover, dewater, and/or, make a notification, and it would not have immediately influenced the sinking. This means that there would have been sufficient time to dewater any spaces and recover from a possible hang up.*

(3) The Survivor testified that it was not common to leave a full scallop dredge on deck and that the usual process was to empty the dredge and put it right back in the water. However, the Shore Manager testified that if the weather was bad and/or the crew was tired, and, if the weather was cool enough to ensure that the scallops would stay fresh, the Captain might decide to leave a full scallop dredge on deck.⁴³³ *So while it wasn't typical to leave a full scallop dredge on the main deck, it was an acceptable practice on board the LADY MARY.* In the early morning of March 24, 2009, the weather was cool and the crew was likely tired.⁴³⁴

(4) The port outrigger on the sunken LADY MARY was in the down position, with the port stabilizer (bird) hanging just a few feet below the end of the outrigger. The starboard outrigger was in a vertical position relative to the vessel, but it was not resting in the mast cradle where it would normally be located; it was found aft of the mast cradle. There was a long length of wire and chain leading from the tip of the starboard outrigger to the starboard stabilizer (bird), which was sitting on the main deck near the fish hold hatch.⁴³⁵

(5) While the LADY MARY always sailed with her outriggers down, the use of the stabilizers depended on the weather conditions and the direction of travel. In general, the Previous Captain would use one stabilizer, the starboard stabilizer (which was on the side opposite from the dredge), when the wind got above 35 miles per hour. He would lower

⁴³¹ Findings of Fact B.11.c(4), d(1), e(5) & e(6)

⁴³² Finding of Fact B.11.f(11)

⁴³³ Finding of Fact B.9.a(14)

⁴³⁴ Findings of Fact B.3.d(7)-d(9), B.9.c(2) & c(3)

⁴³⁵ Finding of Fact B.11.f(3)

both stabilizers into the water when there were “storm winds”. The Previous Captain also said that he would lower the stabilizers 30 feet under the water.⁴³⁶ Based on the conditions of the outriggers and stabilizers found on the sunken vessel, and the information about their standard method of use, it was determined that *just before the LADY MARY sank, both outriggers were down, but only the starboard stabilizer was in the water. The starboard outrigger was deflected up and aft during the sinking.*

(6) There was no anchor visible on the LADY MARY or in close proximity to the sunken vessel, yet testimony revealed that the vessel usually had an anchor onboard.⁴³⁷

(7) The main engine control levers in both the new wheel house and at the aft console, and the rudder angle indicator in the new wheel house, were photographed by the commercial divers. The winch controls, also located at the aft console, were photographed as well.⁴³⁸ While the positions of the controls could be determined from the underwater pictures and videos, and they may reveal accurate information about the engine and winch operational status at the time of sinking, their position may be misleading due to several unknowns. The controls could have been moved after the vessel lost power, or set to various positions by the Captain when he was trying to maneuver the unresponsive vessel just prior to her sinking, or a crew member could have bumped the controls while abandoning ship.⁴³⁹ The lever to engage the PTO is spring loaded, so it returns to the neutral position after use and therefore does not indicate the status of the PTO.⁴⁴⁰ In addition, the controls could have been displaced by the movement of loose objects during the sinking. The rudder angle indicator in the new wheelhouse was also visible, but could be misleading for the same reasons.

(8) The divers examined the inside of the sunken LADY MARY, including the new wheel house, the captain’s bunk room, the old wheelhouse, the galley, the port and starboard main deck passageways, the aft bunk room, and the shucking house. They partially examined the fish hold and the lazarette, and they looked down into the forward bunk room and the engine room, but could not enter these spaces.⁴⁴¹ This means that *all of the LADY MARY’s spaces which were accessible to the divers were examined during the underwater surveys.*

(9) The scallop dredge cable was not tight between the main winch and the scallop dredge on the sunken LADY MARY, and there were several twists located near the towing block. The scallop dredge was not in the middle of the main deck where it would usually be located; it was in the port aft corner of the deck.⁴⁴² Since the Survivor said that LADY MARY sank stern first with a port list,⁴⁴³ it was determined that *the scallop dredge slid to the port aft corner of the deck during the sinking.* As the scallop dredge

⁴³⁶ Finding of Fact B.9.a(16)

⁴³⁷ Finding of Fact B.11.f(2)

⁴³⁸ Findings of Fact B.11 f(5) & f(6)

⁴³⁹ Findings of Fact B.3 f(6) & f(7)

⁴⁴⁰ Finding of Fact B.7.j(5)

⁴⁴¹ Findings of Fact B.11 f(2), f(5), f(7) & f(9)

⁴⁴² Findings of Fact B.7 k(5), B.11.f(11) & f(12)

⁴⁴³ Findings of Fact B.3 f(5), f(7) & f(10)

slid closer to the towing block, *this movement probably released some tension in the cable, allowing the cable to twist and develop slack.*

(10) The lazarette access hatch was open and the hatch cover was not visible anywhere on the vessel or in close proximity to it. The discharge hose from the independent electric bilge pump in the lazarette extended up through the access hatch and over the transom onto the stern ramp.⁴⁴⁴ The Survivor could not recall if the lazarette access hatch was closed before he went to bed at midnight on March 23rd, but he said that the crew would not pump out the space during rough weather, they would wait for the weather to “calm down” before opening the lazarette hatch.⁴⁴⁵ Since the weather was significant on the morning of March 24th,⁴⁴⁶ *it is unlikely that the crew opened the LADY MARY’s lazarette for a routine dewatering evolution.* This means that *something happened between midnight on March 23rd and 0500 on March 24th to prompt the crew to open the lazarette hatch and rig the space for pumping;* which aligns with the determination in paragraph C.1.a(1).

(11) There was damage to the LADY MARY’s rudder, propeller, propeller shaft, transom and stern ramp. This damage is discussed in greater detail in the section below. Other than the stern area of the vessel, there was no extraordinary visible hull damage.⁴⁴⁷

(12) The port and starboard stay wires, which connected the bottom corners of the stern ramp to the aft corners of the rigging, were both detached from the stern ramp. The stay wires themselves were not broken; the pad eyes had broken off of the stern ramp corners. The starboard stay wire was hanging free, but the bottom end of the port stay wire had been tied off to a cleat at the base of the port boom.⁴⁴⁸ The Survivor stated that the port stay wire was broken before the LADY MARY started the voyage on March 18th. Just prior to the LADY MARY’s departure on March 18th, there was another fishing vessel tied up next to the LADY MARY, and the captain of that vessel confirmed that the port stay wire was broken before the trip began.⁴⁴⁹ This means that *the port stay wire did not break when the stern ramp was damaged.*

(13) The aft most section of the rigging, which was the top connection point for the stern ramp stays, protruded further astern than any other part of the LADY MARY.⁴⁵⁰ Due to this arrangement, *if the LADY MARY’s stern ramp, propeller, and/or rudder were damaged by some type of impact with a vessel with a large freeboard, the aft most section of the rigging likely would have been damaged as well.* The pictures and the videos of the sunken vessel, however, did not reveal any damage to the aft most section of the rigging.⁴⁵¹

⁴⁴⁴ Finding of Fact B.11.f(14)

⁴⁴⁵ Finding of Fact B.9.i(7)

⁴⁴⁶ Findings of Fact B.3.c(4), c(5) & c(8)

⁴⁴⁷ Findings of Fact B.11 f(16) – f(20)

⁴⁴⁸ Finding of Fact B.11.f(15)

⁴⁴⁹ Findings of Fact B.9 h(6) & h(7)

⁴⁵⁰ Finding of Fact B.7.c(13)

⁴⁵¹ Exhibits 43 - 45, 74 & 108-111

f. National Transportation Safety Board forensic analysis

- (1) The National Transportation Safety Board (NTSB) Vehicle Recorders Division examined the two GPS units and the computer which were recovered from the sunken LADY MARY. There was no recoverable data on either GPS unit. The computer hard drive contained approximately 6500 track lines and associated waypoints, but these were all from the time period between August 21, 2008 and February 17, 2009.⁴⁵²
- (2) The NTSB conducted a forensic analysis of the LADY MARY's rudder and issued an extremely detailed report containing a description of the rudder damage, the cuts made to the rudder for examination, and specific observations relative to documentary photographs that were taken of the sunken LADY MARY. Since the report is contained in Appendix (e), this section does not repeat all of the details thoroughly discussed in the report, but rather captures major findings.
- (3) The examination of the rudder's port side revealed significant mechanical damage, defined as damage that is produced by forceful interaction with another object.
- (4) The rudder had a large indentation between the center and lower stiffeners and part of the indentation was holed. The port side of the rudder had four areas "devoid" of paint, which were the same size and orientation as the propeller blades. The lower stiffener on the port side of the rudder was bent. Copper and zinc, the major elements found in brass alloys, were present in that bent section. In correlation with traces of these brass alloys being present on the rudder, pictures of the LADY MARY's propeller revealed blue smeared paint that was similar in color to the rudder on all four blades. All of this evidence indicates that *the damage to the LADY MARY's rudder was due to an impact with the propeller. The large indentation and hole were caused by the hexagonally shaped propeller nut, the locking bar for the nut and the round propeller shaft.*
- (5) According to the NTSB report, the fracture faces in the rudder plate associated with the large indentation and the hole show an incline angle of approximately 45 degrees. This indicates that *the angle of the relative motion between the rudder plate and the propeller was about 45 degrees. This relative motion could have been the rudder moving towards the propeller, or the propeller (in combination with the vessel) moving toward the rudder, with the rudder held in place by a separate constraining force.*
- (6) There was a fracture in the rudder's lower rear plate, just aft of the stock. There was also paint missing from the trailing edge of the skeg. Visual comparison of these damages indicated that *there was contact between the lower rear plate of the rudder and the trailing edge of the skeg.*
- (7) The forensic analysis noted that there was buckling of the rudder stock and plate, and that *a significant compressive force was needed to achieve the buckling of the rudder.*

⁴⁵² Exhibit 134

(8) The upper end of the rudder stock had fatigue cracks on the port and starboard sides, and the features of those cracks indicated that there had been ongoing fatigue for a significant amount of time. These cracked areas indicate that *the LADY MARY's rudder was likely loose in its shoe for some time preceding the sinking.*

(9) The forensic analysis also noted that the fracture face at the upper end of the rudder stock displayed features which indicated a mixed mode overload event involving bending and torsion. The fracture features indicated that the fracture progressed from the starboard side of the stock to the port side and that the rudder was rotating clockwise when the fracture occurred (i.e., turning to the port side as if to initiate a port turn). This means that *the LADY MARY did not lose its rudder due to fatigue, but an outside force twisted and bent the rudder stock, causing it to break off.* Additionally, the rudder angle indicator in the new wheel house showed the rudder position as hard over to the port side (as if making a turn to port)⁴⁵³ which matches the direction of the fracture.

(10) The commercial divers observed red paint on the edge of the rudder⁴⁵⁴ but the NTSB examination of the rudder revealed that this was one of the underlying layers of paint. The forensic analysis included preparing a cross sectional view of the paint layers on the rudder, which included (from the outer surface layer to the innermost layer) blue, grey, grey with white flecks, white, dull red and grey. The NTSB analysis did not note any paint on the rudder from an external source.

(11) The only mechanical damage observed on the starboard side of the rudder was damage which was initiated on the port side. There were two areas on the starboard side of the rudder which were missing paint. One of these areas was at the apex of a bend in the rudder stock just below the center stiffener, where the paint displayed markings that indicated it had been “stretched”. The second area which was missing paint was located at the bottom of the rudder stock. This section was examined closely but there was no mechanical damage to the exposed area of the rudder stock. This means that *it is highly likely that the area of missing paint at the bottom of the rudder stock was caused during post casualty recovery and movement of the rudder.*

(12) Based on the lack of mechanical damage to the rudder's starboard side and the lack of paint on the rudder from an external source,⁴⁵⁵ *it is highly unlikely that the damage to the LADY MARY's rudder and propeller was created by a collision with another ship.*

(13) In addition to examining the rudder, the NTSB also viewed the photographs and video of the propeller and stern ramp damage. The forward face of the propeller hub was deflected at a 30 degree angle from its normal orientation, with the top of the propeller located aft of where it would usually be, and the bottom blade of the propeller located forward of the trailing edge of the skeg. There was enough deflection of the propeller assembly that it would have prevented any further propeller rotation, since the propeller

⁴⁵³ Finding of Fact B.11.f(5)

⁴⁵⁴ Finding of Fact B.11.f(17)

⁴⁵⁵ Analysis C.1.f(10) & f(11)

blades would have struck the skeg. The pictures of the propeller imply that *the aft end of the LADY MARY's propeller shaft was bent downward.*

(14) The lower propeller blade was bent and fractured at the trailing edge. This damage to the propeller blade matched up with the downward deformation of the rudder's port side lower stiffener. Also, the blue paint smear on the lower propeller blade which extended from the trailing edge to the leading edge of the blade, had radially oriented surface lines which indicated a limited counter clockwise rotation of the propeller. There were no concentrically oriented smear marks or surface lines that indicated the propeller was engaged and turning when the rudder and propeller were forced together. This implies that *when the LADY MARY's rudder and propeller first came into contact, the propeller was not turning.*

(15) Examination of the stern ramp photographs and video revealed that *the fractures and damage to the stern ramp were caused by a force exerted in a relative forward direction to the ramp.*

g. Marine Safety Center stability analysis

(1) The LADY MARY had a tonnage survey in November 2001.⁴⁵⁶ After that survey, between 2002 and 2006, there were a number of modifications made to the vessel.⁴⁵⁷ Since the LADY MARY was not required to meet the Load Line or stability requirements found in the Code of Federal regulations, the vessel did not have any additional surveys, stability tests, or analyses conducted after the modifications were complete.⁴⁵⁸ In order to gain better insight on the LADY MARY's stability characteristics, the Coast Guard Marine Safety Center (MSC) developed an approximate computer model using vessel information obtained from a historical lofting plan, commercial and U.S. Navy dive survey measurements, photographs, and the Shore Manager's testimony. The complete MSC analysis is contained in Appendix (f), but this section describes the major findings.

(2) The LADY MARY's displacement and center of gravity were not known. Therefore, Exhibits 9, 33, C, & F, and testimony from various witnesses, were used to create the computer model and to generate a loaded condition. The impact of the vessel modifications, and changes to consumables such as fuel, were estimated within the model.

(3) The LADY MARY's loaded freeboard in the pre-casualty condition was estimated to be 1.3 feet. The freeboard is the distance from the water line to the level of the main deck; it does not include the height of the bulwark.

(4) While transverse stability characteristics and weather conditions play a significant role in any flooding or downflooding scenario, a vertical center of gravity (VCG) is needed to do the analysis. Unfortunately, there was not enough information to determine

⁴⁵⁶ Finding of Fact B.7.b(4)

⁴⁵⁷ Findings of Fact B.7.c(1) – c(15)

⁴⁵⁸ Finding of Fact B.7.c(7)

a VCG to allow the computer model to assess the vessel's transverse stability characteristics (i.e., the resistance to roll and ability to recover from a roll) and thus what the impact of wind and waves may have been on the vessel. Despite these limitations, however, the computer model was useful in examining three possible scenarios and their impact on the LADY MARY's freeboard and trim.

(5) The first scenario examined was flooding of the steering lazarette, with progressive flooding into the engine room. If the lazarette was completely flooded, with no progressive flooding into the engine room, the computer model showed that the LADY MARY would have likely trimmed down by the stern and the aft end of the main deck would be approximately 5" below the water line (which equates to the water line being approximately 3'1" from the top of the bulwark since the bulwark was approximately 3.5' high⁴⁵⁹). As the engine room flooded, the aft trim would decrease and the vessel would level out while uniformly submerging deeper into the water.

(6) The sunken LADY MARY was found with the steering lazarette access hatch open,⁴⁶⁰ which was a major consideration for the second scenario examined. That scenario involved the LADY MARY shipping sea water onto the main deck, and then subsequently downflooding into the lazarette and the engine room. In the model, if the main deck was filled with sea water that was retained by the bulwarks, the aft end of the main deck submerged more than 1' below the water line. Then, combining this condition with a flooded lazarette would drive the after end of the main deck more than 2.5' below the water line (which equates to the water line being approximately 1' below the top of the bulwark on the transom). Once progressive flooding filled the engine room (i.e., water on deck retained by the bulwarks and a full lazarette and engine room), the model indicated that the LADY MARY would sink. It is important to remember that the analysis was for calm water and did not include any list (or roll), or any external forces applied due to wind or waves.

(7) The third scenario was the flooding of the engine room alone and this condition did not significantly affect the trim of the LADY MARY. When the model's engine room was completely flooded, it indicated that the freeboard of the vessel would reduce to a point where the main deck was nearly awash at the mid-ship area but the vessel's downflooding points would remain significantly above the water line.

(8) The MSC analysis also examined the effects of the modifications made by Smith & Smith Inc. The weight of each modification was estimated and then removed from the computer model. Once all of the modification weights were removed, there was an approximate 5% reduction in the vessel's overall weight which increased the freeboard by approximately four inches. The same three scenarios, as discussed above, were re-run on the lighter model. The model produced similar results during all of the scenarios, but consistently provided an extra four inches of freeboard. The lighter model also indicated the vessel would sink in the second scenario after flooding the main deck, the lazarette and the engine room.

⁴⁵⁹ Finding of Fact B.7 h(8)

⁴⁶⁰ Finding of Fact B.11.f(14)

(9) The Survivor testified that the LADY MARY was listed to port while he was abandoning ship on the morning of March 24th, and there were also strong winds and large waves at that time.⁴⁶¹ The stability analysis could not account for the wind, waves, and port list, which *would have likely amplified the negative consequences of any flooding or downflooding scenarios discussed above.*

(10) While the LADY MARY was not required to meet the stability requirements found in 46 CFR Part 28, the MSC analysis assessed the vessel's compliance for comparison purposes. The LADY MARY would have likely required a VCG of 10.5 feet above the baseline (or approximately 3 feet below the main deck) to meet the regulations. Due to the amount of structure located above that point, it is doubtful that the VCG met that criterion. *If the LADY MARY was subject to the stability section of 46 CFR Part 28, it most likely would not have met a sufficient number of the stability requirements to comply.*

(11) As previously discussed, the LADY MARY underwent substantial alterations which increased the vessel's lightweight displacement by approximately 5%.⁴⁶² *If the LADY MARY was subject to 46 CFR Part 28, Subpart E, then according to 28.501 the Smith & Smith Inc. management team would have been required to have a qualified individual develop stability instructions for the crew, or to comply with the remaining elements of 46 CFR Subpart E – Stability.*

h. Additional stability analysis

(1) The LADY MARY had four freeing ports on the main deck aft of the superstructure.⁴⁶³ If the vessel had been subject to 46 CFR 28.555(c), approximately 2.6 ft² of freeing port area would have been required on each side due to the length of the main deck bulwark. Based on estimated measurements,⁴⁶⁴ it appears that the LADY MARY met this requirement. In 46 CFR 28.555(i), freeing port covers are required to readily permit the outboard flow of water from the main deck. The LADY MARY's freeing ports had steel plates which slid into retaining brackets and were used as freeing port covers. These steel plates would not have complied with the regulations. When the LADY MARY sank, two freeing port covers were open, one was completely closed and one was 75% closed.⁴⁶⁵ *The closed freeing ports significantly hindered the LADY MARY's ability to shed water from the main deck.*

(2) The LADY MARY's crew was planning to catch 250 bags (12,500 pounds) of scallops on the voyage which commenced on March 18, 2009. This was more than the typical catch amount of 200 bags (10,000 pounds);⁴⁶⁶ however the Previous Captain testified that the vessel had carried larger cargo loads in the past. Specifically, the

⁴⁶¹ Findings of Fact B.3.c(8) & f(5)

⁴⁶² Analysis C.1.g(8)

⁴⁶³ Finding of Fact B.7 h(8)

⁴⁶⁴ Exhibit 89

⁴⁶⁵ Finding of Fact B.7 h(8)

⁴⁶⁶ Finding of Fact B.3.a(4)

Previous Captain said that he had loaded 18,000 pounds of scallops on the LADY MARY during a number of trips, and had once loaded 22,000 or 23,000 pounds of scallops.⁴⁶⁷ *The LADY MARY's load of scallops on the morning of March 24th was typical of what the vessel usually carried.*

(3) The Survivor testified that as he abandoned the vessel he waded through knee deep water in the port side main deck passageway, and that water had already started to enter the galley and that one third of the main deck was awash.⁴⁶⁸ This means that *the LADY MARY was already progressively flooding when the Survivor was awoken around 0500 on the morning of March 24th.*

i. Flooding and downflooding scenarios related to the sinking

(1) As determined in paragraph C.1.a(5) above, the LADY MARY sank either due to flooding or downflooding. Based on the analysis in sections C.1.b through C.1.g above, some of the specific flooding and downflooding scenarios could be ruled out.

(2) When discussing the LADY MARY's through hull penetrations located below the water line, the Shore Manager did not describe any penetrations to the fish hold.⁴⁶⁹ Internally, there was a 1 ½" drain pipe that ran from the lazarette to the engine room, which would have run through the fish hold.⁴⁷⁰ The propeller shaft ran through the ballast tank located below the fish hold, but the shaft was enclosed in a casing (or pipe) within the tank. According to a lofting plan obtained with the tonnage files, there may have been a small section of the shaft which ran through the fish hold, but this also would have been enclosed in a shaft casing.⁴⁷¹ There was no visible damage on the outside of the hull in the vicinity of the fish hold.⁴⁷² While the fish hold could have been a source of flooding on the morning of March 24th, there was no available evidence to indicate that this was the case. Therefore, *the fish hold was probably not a source of flooding on the morning of March 24th.*

(3) There was no visible damage to the outside of the hull in the vicinity of the engine room.⁴⁷³ The Shore Manager testified that the engine room had two through hull penetrations and three keel coolers located on the exterior of the engine room hull.⁴⁷⁴ The starboard keel cooler was intact, but the port side keel coolers were not visible.⁴⁷⁵ The stability analysis demonstrated that if the engine room flooded, it would have caused the LADY MARY to submerge without a noticeable trim.⁴⁷⁶ When the survivor awoke

⁴⁶⁷ Finding of Fact B.3.b(6)

⁴⁶⁸ Findings of Fact B.3.f(3) & f(5)

⁴⁶⁹ Findings of Fact B.7.i(1) – i(4)

⁴⁷⁰ Finding of Fact B.7.g(6)

⁴⁷¹ Finding of Fact B.7.i(3)

⁴⁷² Finding of Fact B.11.f(20)

⁴⁷³ Finding of Fact B.11.f(20)

⁴⁷⁴ Findings of Fact B.7.i(1), i(2) & l(1)

⁴⁷⁵ Finding of Fact B.11.f(10)

⁴⁷⁶ Analysis C.1.g(7)

around 0500, the lights were still on and the engine was still running,⁴⁷⁷ so *the engine room could not have been completely flooded when the Survivor was awoken. The vessel was already in a state of progressive flooding at that time*, and was trimmed aft with one third of the main deck awash.⁴⁷⁸ Putting all of this information together demonstrated that *the engine room was probably not a source of flooding on the morning of March 24th*.

(4) Based on the above two paragraphs, and the fact that the water tanks and the forward bunk room were also ruled out as sources of flooding,⁴⁷⁹ the only remaining space to flood due to a breach in the hull would have been the lazarette. *If the LADY MARY flooded due to a breach in the hull, then it is likely that the breach occurred in the lazarette.*

(5) The examination of the sunken LADY MARY revealed a hole in the transom which was created when the stern ramp was damaged.⁴⁸⁰ *Since this hole breeched the watertight integrity of the lazarette, it would have been a source of flooding if the stern ramp damage occurred on the surface.* Additionally, the rate of flooding would be dependent on the distance of the hole below the waterline and the cross sectional area permitting water to flow through the hole (the damaged stern ramp support was occupying part of the hole). *The Marine Board only identified two possible scenarios which could be linked to stern ramp damage on the surface while the LADY MARY was underway - a collision, or damage from the scallop dredge and dredge cable.*

(6) Based on the lack of damage to the LADY MARY's hull forward of the transom,⁴⁸¹ the lack of mechanical damage to the starboard side of the rudder (the side which was not in contact with the propeller),⁴⁸² the lack of damage to the aft most section of the rigging,⁴⁸³ the determination that the LADY MARY's propeller was not moving when the damage to the propeller and rudder occurred,⁴⁸⁴ the determination that the CAP BEATRICE did not collide with the LADY MARY,⁴⁸⁵ the determinations that Fishing Vessel's A and Y did not have an influence on the events which sank the LADY MARY,⁴⁸⁶ the lack of communications discussing an interaction with another vessel,⁴⁸⁷ the determinations that there were no DOD vessels in the vicinity and that it is highly unlikely that a tug and barge was involved in any event which initiated the LADY MARY sinking,⁴⁸⁸ the lack of any other VMS or AIS vessels in the vicinity,⁴⁸⁹ and the lack of evidence revealing the presence of any non-VMS or AIS vessels in the vicinity of

⁴⁷⁷ Findings of Fact B.3 f(1) & f(2)

⁴⁷⁸ Analysis C.1.h(3)

⁴⁷⁹ Analysis C.1.a(6)

⁴⁸⁰ Finding of Fact B.11.f(16)

⁴⁸¹ Finding of Fact B.11.f(20)

⁴⁸² Analysis C.1.f(11)

⁴⁸³ Analysis C.1.e(13)

⁴⁸⁴ Analysis C.1.f(14)

⁴⁸⁵ Analysis C.1.c(7)

⁴⁸⁶ Analysis C.1.b(15) & b(16)

⁴⁸⁷ Analysis C.1.d(5)

⁴⁸⁸ Analysis C.1.d(2) & d(3)

⁴⁸⁹ Analysis C.1.b(15) & c(2)

LADY MARY, *it is highly unlikely that the LADY MARY's sinking was due to a collision with another vessel or contact with another vessel's gear/equipment.*

(7) The Survivor testified that the scallop dredge sometimes got hung up on the stern ramp during recovery. Pictures of the LADY MARY showed that the flat bar on the port side of the stern ramp had extensive wear and tear, attributed to impacts from the scallop dredge.⁴⁹⁰ Also, the Shore Manager installed a chaffing bar to prevent the scallop dredge cable from breaking the port stay, which had happened many times before.⁴⁹¹ These facts demonstrate that *the scallop dredge frequently came in contact with the stern ramp and the stern ramp port stay.* However, the nature of the damage to the stern ramp, as observed on the ocean floor, did not correlate well with damage that may have been produced by the scallop dredge and/or the scallop dredge cable. At the request of the Marine Board, engineers from Old Dominion University estimated the pulling power of the main scallop winches, and determined there was not enough force available to create the damage seen on the LADY MARY's stern ramp. In addition, the force which damaged the stern ramp had a relative forward motion in relation to the vessel,⁴⁹² and it was difficult to compute how the scallop dredge or dredge cable could develop a significant component of force in that direction. This all led to the conclusion that *the stern ramp was not damaged by the LADY MARY's scalloping equipment.*

(8) The two paragraphs above ruled out the possible scenarios related to stern ramp damage on the surface. Therefore, *the LADY MARY's stern ramp was damaged when the vessel struck the ocean floor.*

(9) The LADY MARY's rudder and propeller were subjected to significant forces to buckle, twist and bend the rudder stock and cause it to break off, and also to push the rudder into the propeller (or vice versa), puncturing the rudder plate as well as bending the propeller shaft.⁴⁹³ *The two most likely sources of a force of that magnitude would be from a collision with another vessel on the surface, or from the LADY MARY's collision with the ocean floor.* Since the evidence does not support a surface collision, it was highly unlikely that the LADY MARY collided with another vessel,⁴⁹⁴ and since the propeller was not turning when it came in contact with the rudder,⁴⁹⁵ *it was determined that the damages to the rudder and the propeller were caused when the vessel struck the ocean floor.*

(10) Since it was determined that the LADY MARY's stern ramp, transom, rudder and propeller were not damaged on the surface,⁴⁹⁶ and thus *the hole in the transom was not present on the ocean surface,* other sources of lazarette flooding were considered. The Survivor stated that the lazarette space routinely had to be dewatered while underway. In calm weather the space was pumped out approximately every three days, but in rough

⁴⁹⁰ Finding of Fact B.9 h(5)

⁴⁹¹ Finding of Fact B.9 h(6)

⁴⁹² Analysis C.1.f(15)

⁴⁹³ Analysis C.1.f(4), f(5), f(7), f(9) & f(13)

⁴⁹⁴ Analysis C.1.i(6)

⁴⁹⁵ Analysis C.1.f(14)

⁴⁹⁶ Analysis C.1.i(8) & i(9)

weather the space was pumped out every day.⁴⁹⁷ This means *there was already a source of flooding in the lazarette, even before the LADY MARY's March 2009 voyage. The lazarette flooding could have been from an undetected crack or hole in the hull, a leak in the rudder shaft packing, a leak from one of the aft water tanks, and/or a leak through the lazarette hatch gasket/seal.* These were all feasible scenarios, and none of them could be ruled out.

(11) The Survivor stated that the crew would not open the hatch in rough weather to dewater the lazarette.⁴⁹⁸ Based on this standard practice, the weather conditions at the time,⁴⁹⁹ and paragraph C.1.e(10) above, *an event occurred sometime between midnight on March 23rd and 0500 on March 24th to prompt the crew to open the lazarette and rig the space for pumping.* This meant that the lazarette was open with no protection to prevent against downflooding into the space.

(12) The MSC stability analysis showed that if the LADY MARY's lazarette was completely flooded, the vessel would have trimmed down by the stern with the aft end of the main deck approximately 5" below the water line. While the computer model showed that the LADY MARY would not sink with only a flooded lazarette (again, a model of the vessel with no list, no wind, and no waves),⁵⁰⁰ *it would have been a dangerous situation.* Since the electric bilge pump was plugged into an outlet in the lazarette,⁵⁰¹ a flooded lazarette would have also shorted out the pump once the water reached the level of the outlet. Additionally, with the vessel trimmed down by the stern, the after end of the stern ramp would have been underwater, creating an easier means for any seas approaching from the stern to ride up the ramp and onto the main deck, further compounding the situation. As time progressed, a flooded lazarette would also drain into the engine room via the 1½ inch drain,⁵⁰² further submerging the vessel. *While it is conceivable that the crew could have recovered from a completely flooded lazarette, it would have required lining up the engine room manifold and energizing the fixed bilge pumping system.*

(13) The MSC stability analysis demonstrated that with a flooded lazarette, water retained on the main deck, and progressive flooding into the engine room, the vessel would sink.⁵⁰³ The Survivor's description of the LADY MARY when he awoke on the morning of March 24th was that the vessel was listing to port, with one third of the main deck flooded and sea water in the port passage way and beginning to enter the galley.⁵⁰⁴ *This means it is likely that the lazarette was completely flooded at that time since the lazarette access hatch is on the port side near the transom. It is also likely that the engine room was flooding when the survivor awoke, not only due to the drain line from the lazarette, but also through the engine room access, which was a flush deck opening in*

⁴⁹⁷ Finding of Fact B.9.i(7)

⁴⁹⁸ Finding of Fact B.9.i(7)

⁴⁹⁹ Finding of Fact B.3.c(5)

⁵⁰⁰ Analysis C.1.g(4) & g(5)

⁵⁰¹ Finding of Fact B.7.l(2)

⁵⁰² Finding of Fact B.7.g(6)

⁵⁰³ Analysis C.1.g(6)

⁵⁰⁴ Findings of Fact B.3 f(3), B.3 f(5) & Analysis C.1.h(3)

the main deck just aft of the galley and on the vessel's port side. Therefore, at the time when the Survivor was awoken, the LADY MARY was already progressively flooding.

j. The initiating event and the subsequent events

(1) Based on the analysis conducted in sections C.1.a through C.1.h above, *the event which initiated the LADY MARY's sinking was an unknown incident which caused the crew to open the lazarette hatch and rig the space for pumping. This unknown event occurred between 0001 and 0500 on March 24th.*

(2) With the LADY MARY drifting,⁵⁰⁵ the winds 25-30 knots and the waves at least 6-10 feet,⁵⁰⁶ and the lazarette hatch open, *the next event (subsequent event 1) was determined to be sea water washing onto the main deck.* There are a number of things that could have facilitated sea water gaining access to the main deck, including a heel due to weather conditions combined with the LADY MARY's loaded profile, water washing in through the open aft freeing ports because of the low freeboard, a list due to a cargo shift, or simply one, two, or a series of successive waves large enough to exceed the main deck bulwark or roll up the vessels stern ramp and over the transom.

(3) With a significant quantity of sea water on the LADY MARY's main deck, the vessel's freeboard would have decreased and the two closed forward freeing ports (assuming an aft trim due to water in the lazarette) would have inhibited the vessel's ability to shed water if they were not already below the water line. With the lazarette hatch open, the water on the main deck was free to down flood into the lazarette. Then, *if the lazarette wasn't completely flooded, it quickly filled to capacity and would also disable the bilge pump located in the space. Additionally, due to the volume of water on the main deck, sea water may have gained access to the deck house through the aft shucking house door, compounding the situation.*

(4) With the lazarette flooded and water retained on the main deck by the bulwarks, the MSC analysis modeled that the aft end of the main deck would be about 2.5' below the waterline.⁵⁰⁷ The next event (subsequent event 2) was a list to port and progressive flooding. (Note: the list to port could have commenced within subsequent event 1, depending on several factors including whether or not water was already inside the deckhouse.) This is likely the stage at which the Survivor was woken up and made his way out to the weather deck. *By the time the Survivor exited the deckhouse out onto the main deck the downflooding was likely uncontrollable and the LADY MARY could not be saved.*

(5) *Subsequent event 3 was the sinking of the LADY MARY.* If the crew members had not already abandoned the vessel, they entered the water when she sank.

⁵⁰⁵ Analysis C.1.b(6)

⁵⁰⁶ Findings of Fact B.3.c(4), c(5), c(7) & c(8)

⁵⁰⁷ Analysis C.1.g(6)

(6) *The final event (subsequent event 4) was the tragic loss of the Captain, Deckhand 1, Deckhand 2, Deckhand 3, Deckhand 4, and Deckhand 5.*

(7) The below table summarizes the initiating and subsequent events:

Initiating Event	Unknown event which resulted in water in the lazarette & prompts the crew to open the lazarette for dewatering
Subsequent Event 1	Water washing onto the main deck & lazarette flooding (if it was not already full)
Subsequent Event 2	List (if not already present) & progressive flooding
Subsequent Event 3	Vessel sinking & crew in the water
Subsequent Event 4	Loss of crew

2. Failed Defenses Associated with the Subsequent Events

Defenses are safeguards intended to protect the crew by preventing reasonably foreseeable hazards, creating awareness and/or allowing time for corrective actions. This section identifies the defenses which failed to prevent or substantially reduce the negative consequences of this casualty, specifically focused on the defenses that could have been employed after the initiating event occurred. A failed defense could be something that was inadequate, disabled, removed or unreasonable. A failed defense could also be a defense which did not exist.

a. Subsequent Event 1 - Water Washing onto the Main Deck and Lazarette Downflooding

(1) The LADY MARY was drifting when sea water washed onto the main deck.⁵⁰⁸ Since the starboard stabilizer was in the water before the vessel sank,⁵⁰⁹ and the wind and seas were both coming from a northerly direction,⁵¹⁰ *it is highly likely that the vessel drifted with the starboard beam facing the wind and seas.* Given the vessel's loaded condition,⁵¹¹ this was a very vulnerable position, since the entire length of the vessel was subject a beam sea. *The amount of sea water on the main deck could have been reduced, or eliminated, by steering a defensive course towards or away from the wind and seas, or through active station keeping.*

(2) The freeing ports were a defense designed to shed water from the main deck but two of the four freeing ports on the aft deck were blocked with removable steel covers.⁵¹² *Disabling this defense caused sea water to remain on the main deck much longer than it should have and could have initiated a list. Once water was on the main deck, a defense would have been to remove the covers as quickly as possible (assuming that area of the main deck was still above the water line).*

(3) After water shipped onto the main deck, the lazarette down flooded.⁵¹³ *Once the water was on deck, there was nothing preventing it from down flooding into the lazarette because the hatch cover, the only viable line of defense, had been removed.*

(4) The lazarette had two bilge pumps which were defenses against flooding of the space. The first pump was an independent electric bilge pump powered through an electrical outlet and cord located inside the space. The second dewatering system was a fixed bilge pump located in the engine room and connected to a four way manifold. The fixed system had to be energized and lined up from within the engine room.⁵¹⁴ The divers

⁵⁰⁸ Analysis C.1.j(2)

⁵⁰⁹ Analysis C.1.e(5)

⁵¹⁰ Findings of Fact B.3.c(4), c(5), c(7) & c(8)

⁵¹¹ Analysis C.1.g(3)

⁵¹² Analysis C.1.h(1)

⁵¹³ Analysis C.1.j(3)

⁵¹⁴ Findings of Fact B.7.l(1) & l(2)

could not get into the engine room to view the manifold,⁵¹⁵ so *it was not possible to determine if the fixed system was used to help dewater the lazarette.*

(5) The MSC stability analysis demonstrated that if the LADY MARY's lazarette was completely flooded, the vessel would be trimmed down by the stern with the aft end of the main deck at least 5" below the water line. The analysis did not account for a possible list, wind, or waves.⁵¹⁶ A flooded lazarette with no list would not sink the vessel, *but it would have further reduced safety margins to dangerously low levels. In that condition, the only viable defense would have been timely and effective action to close and dewater the lazarette, fully open the freeing ports, and steer a defensive course or station keep in a manner to prevent more water from landing on deck.*

(6) The lazarette had a high water alarm which was connected to the vessel's general alarm. Both the Shore Manager and the Survivor testified that the alarm was extremely loud. The Survivor did not hear the general alarm on the morning of the sinking.⁵¹⁷ *It was not possible, however, to determine if the alarm was broken or intentionally disabled (silenced or disconnected).* If the alarm had activated properly and then was silenced, it may have been silenced prematurely without sufficient action by a crew member. If the alarm did not work or was disconnected, it did not serve its purpose because it did not notify the entire crew. Regardless of the reason, *the alarm defense failed because the crew did not get additional time to assess the situation and to take corrective action.*

b. Subsequent Event 2 – List and Progressive Flooding

(1) At some point the LADY MARY developed an unrecoverable port list that caused deck edge immersion.⁵¹⁸ *Within the likely sequence of events up to this point, no additional viable defenses appeared readily available which could have prevented that list.*

(2) There was a 1 ½ inch drain pipe which ran from the bottom of the lazarette into the engine room. There was a gate valve on the pipe to stop the flow of water but the valve was intentionally left open to allow water to drain out of the lazarette into the engine room, where it was automatically pumped overboard by the engine room bilge pump.⁵¹⁹ Once the lazarette was flooded, this drain pipe allowed progressive flooding into the engine room at an estimated rate of 108 gallons/minute (assuming a six foot head of hydrostatic pressure).⁵²⁰ *The progressive flooding via the drain pipe could have been prevented by leaving the gate valve closed when not in use, but this defense was probably disabled.*

⁵¹⁵ Finding of Fact B.11.f(7)

⁵¹⁶ Analysis C.1.g(4) & g(5)

⁵¹⁷ Findings of Fact B.7 m(1) & m(2)

⁵¹⁸ Analysis C.1.j(4)

⁵¹⁹ Findings of Fact B.7.g(6) & B.9.i(6)

⁵²⁰ U.S. Navy Salvor's Handbook

c. Subsequent Event 3 - Vessel Sinking and Crew in the Water

(1) When the LADY MARY sank there were at least 22 vessels within a 6.5 mile radius.⁵²¹ *The crew had a number of methods to communicate with other vessels (or shore) in an emergency, yet all of these defenses failed.* If the crew had been able to communicate their situation to just one other vessel, the chances of survival for the Captain and Deckhand 1, and possibly Deckhands 2-5, would have improved significantly. *The crew had the time and ability to shoot a flare or broadcast by voice a coherent Mayday to any vessel within its VHF radio horizon but did not. They also could have pressed the distress button on either of the wheelhouse VHF radios to instantly alert nearby vessels and the Coast Guard of their distress via Rescue 21.* There were other less reliable means of communicating to shore as well, such as using the email system or the satellite phone, but they were not used either.⁵²²

(2) When the Survivor was awoken on the morning of March 24th, the LADY MARY was already in a state of progressive flooding, the deck edge was immersed with water in the shucking house and beginning to enter the galley. At that point, there were no defensive measures available to prevent the vessel from sinking.⁵²³ *Once the vessel was lost, the only remaining defenses were those which could have allowed for the successful rescue of the crew.*

(3) Once the LADY MARY was in a state of progressive flooding and could not be saved, the only defense to keep the crew out of the water was the life raft. The life raft was manually launched by someone in the crew,⁵²⁴ which means *there was likely sufficient time available to control and enter the life raft.* When the life raft was spotted by the rescue helicopter, it was fully inflated but there was no one inside,⁵²⁵ which means *the defense failed. Either no one managed to get into the life raft, or the crew members who did make it into the raft, fell out or climbed out.*

d. Subsequent Event 4 – Loss of Crew

(1) The LADY MARY was equipped with seven survival suits,⁵²⁶ a critical defense to prevent exposure once in the water. The Captain, Deckhand 1 and the Survivor managed to don survival suits, however they did not fully close the zippers and the neck flaps on the suits and they did not inflate the head and neck bladders.⁵²⁷ Failing to properly don the survival suits allowed 41 degree Fahrenheit (F) seawater to fill the suits very quickly upon entering the water⁵²⁸ thus stripping away essential body heat much faster than if they were properly donned. The Survivor mitigated his heat loss by climbing onto a

⁵²¹ Finding of Fact B.12.a(15)

⁵²² Findings of Fact B.5.c(4) & d(1)

⁵²³ Analysis C.1.h(3), i(13) & j(4)

⁵²⁴ Finding of Fact B.11.f(4)

⁵²⁵ Finding of Fact B.4.b(3)

⁵²⁶ Finding of Fact B.7.p(1)

⁵²⁷ Finding of Fact B.4.b(10)

⁵²⁸ Findings of Fact B.3.c(5) & B.4.b.(10)

board and keeping his upper body out of the water.⁵²⁹ The Cold Water Exposure Model showed that *statistically, Deckhand 1 had a Survival Time which extended past the time of the Coast Guard Rescue, but this assumed a best case scenario. The Captain did not have a Survival Time which extended past the time of the Coast Guard Rescue due to his physical characteristics.*⁵³⁰ *The improper donning of the survival suits was a failed defense.*

(2) Deckhands 2 and 3 did not don survival suits.⁵³¹ Just before the vessel sank, the Survivor saw Deckhand 4 on the upper deck without a survival suit. The Survivor did not see Deckhand 5 at all on the morning of the sinking.⁵³² The conditions in the vicinity of the sunken LADY MARY on March 24th were very favorable for locating a survival suit in the water,⁵³³ but no additional crew members were located. Therefore, it was determined that *Deckhands 4 and 5 did not don survival suits. Failing to get into survival suits was an execution error that reduced the chances of survival for Deckhands 2, 3, 4 and 5, to almost nil. Once immersed, the four men quickly succumbed to cold shock and/or cold incapacitation and drowned.*

(3) The EPIRB was another important defense intended to prevent the loss of life after the sinking. This defense failed because it did not work quickly enough. The EPIRB's distress signal was detected right around the time of sinking, but due to a registration error, the signal could not be correlated with the EPIRB's identification number or the LADY MARY's emergency contact information. The error resulted in a one hour and 27 minute delay in passing actionable information to the Coast Guard.⁵³⁴ *Without the delay, the chances of survival for the Captain and Deckhand 1 would have increased substantially.*

(4) The survival times for Deckhands 2, 3, 4 and 5, were very short because they did not don survival suits.⁵³⁵ *This means that even if the EPIRB's signal was immediately detected, it still could not have prevented the deaths of Deckhands 2, 3, 4, and 5.*

e. Other Failed Defenses – Direction Finding Equipment

(1) The 406 MHz direction finding equipment on board Rescue Helicopter 6530 malfunctioned during the search for the LADY MARY.⁵³⁶ *This failed defense did not impede the search for the Survivor, the Captain, and Deckhand 1 because Rescue 6530 acquired the 121.5 MHz homing signal from the EPIRB, which led them to the life raft and those crew members recovered.*⁵³⁷

⁵²⁹ Finding of Fact B.3.f(11)

⁵³⁰ Exhibit 130 & Finding of Fact B.4.b(13)

⁵³¹ Findings of Fact B.6.a(7) & a(11)

⁵³² Findings of Fact B.3 f(4) & f(9)

⁵³³ Finding of Fact B.4.b(12)

⁵³⁴ Findings of Fact B.10.b(6), c(7), c(8), d(2) & d(3)

⁵³⁵ Analysis C.2.d(2)

⁵³⁶ Finding of Fact B.4.b(2)

⁵³⁷ Findings of Fact B.4.b(2) & b(4) – (6)

f. Other Failed Defenses - Urgent Marine Information Broadcasts (UMIB)

(1) The Coast Guard issued UMIBs which were intended to notify vessels in the vicinity of the LADY MARY sinking so that they could assist in the search and rescue. Most of the UMIBs were issued by Sector Delaware Bay. The broadcasts were made on VHF Channel 16⁵³⁸ but that frequency does not always extend to the area where the LADY MARY sank, so this was a failed defense. The Sector's broadcasts should have been made on the 2182 KHz frequency to be reliably heard 65 NM offshore.⁵³⁹ *This failure occurred because the Sector employed a watch stander who did not fully understand USCG policy, did not recognize the effective range of the Cape May VHF tower's radio horizon, or did not remember the information.* The person in charge of the radio watch stander did not recognize the broadcasting error either,⁵⁴⁰ which meant that *none of the Sector Delaware Bay UMIBs reliably reached their intended audience.*

(2) Sector Delaware Bay made some additional errors in broadcasting the UMIBs related to the LADY MARY case. The first three UMIBs issued by Sector did not contain the EPIRB signal's latitude and longitude, or a description of the location of the distress alert even though it was known at the time of broadcasts.⁵⁴¹ Omitting the position of the distress meant that *even those who did hear the UMIB could not ascertain its relevance to their location, rendering the broadcast ineffective.* In addition, the UMIBs were not issued according to the Coast Guard's required schedule during the first hour of broadcasting.⁵⁴²

(3) For various reasons discussed earlier in this report,⁵⁴³ Sector Delaware Bay was not directed to issue UMIBs until 0800, which was at least two hours and 20 minutes after the LADY MARY sank.⁵⁴⁴ *Even if a Good Samaritan vessel had heard the first UMIB and responded, it is unlikely that they would have arrived on scene much before the Coast Guard Rescue Helicopter 6530 arrived at 0818.* In addition, many of the fishing vessels operating in the vicinity of the sunken LADY MARY either did not have or did not use radios capable of picking up a 2182 KHz broadcast.⁵⁴⁵ So even if the UMIBs were broadcast on 2182 kHz, they still may not have been heard in the vicinity of the LADY MARY. So, *while Sector Delaware Bay made a number of execution errors in issuing their UMIBs, it is highly unlikely that those errors contributed to the loss of the LADY MARY's crewmembers.*

(4) The Coast Guard Rescue helicopter 6530 made four UMIBs during their time on scene. These broadcasts were made on VHF Chanel 16, and the helicopter was within sight of numerous fishing vessels at the time they were made. No one responded to the

⁵³⁸ Findings of Fact B.5 f(3), f(4), f(5) & f(9)

⁵³⁹ Findings of Fact B.5.b(4) & f(9), COMDTINST M2300.7A (Radiotelephone Handbook) & COMDTINST M16130.2E (SARMAN)

⁵⁴⁰ Findings of Fact B.5 f(8) & f(10)

⁵⁴¹ Findings of Fact B.5 f(3) & f(4)

⁵⁴² Findings of Fact B.5 f(3), f(4) & f(7)

⁵⁴³ Analysis C.2.d(3)

⁵⁴⁴ Finding of Fact B.5.f(3) & Analysis C.1.b(14)

⁵⁴⁵ Findings of Fact B.5.c(3), e(2), e(3) & e(4)

helicopter's UMIBs,⁵⁴⁶ which means this was another failed defense. *It is unclear why these broadcasts were not heard, or why no fishing vessels responded to them.*

⁵⁴⁶ Finding of Fact B.4.b(11)

3. Preconditions, Unsafe Acts/Decisions, and Associated Failed Defenses

The sinking of the LADY MARY was not due to just one factor, but rather an alignment of unsafe acts and decisions made in the presence of hazardous conditions. This section describes those hazardous conditions, and unsafe acts and decisions, that likely influenced the initiating event and subsequent events described earlier in section C1. Since the hazardous (or unsafe) conditions existed prior to the casualty, they are termed *preconditions*. This section also notes additional unsafe conditions onboard the LADY MARY which did not appear to contribute to the vessel's sinking but were identified during the analysis. In some cases, unsafe conditions were not readily apparent onboard the vessel, and are referred to as *latent unsafe conditions* or *latent unsafe preconditions*, as appropriate. This section also discusses defenses which may have helped neutralize the unsafe acts, decisions, or preconditions, with a primary focus on those that could have been implemented after the vessel was underway and the preconditions were in place.

a. Precondition - Captain's Training, Experience and Disposition

(1) The Captain received most of his instruction to operate the LADY MARY through on-the-job training under the tutelage of the Previous Captain between 2004 and 2007, and had about 15 months of experience as a captain.⁵⁴⁷ In contrast, the Previous Captain was a scallop vessel captain for 18 years, the Shore Manager was a fishing vessel captain for 44 years with 25 years of experience in the scallop vessel industry, and Deckhand 1 was a scallop vessel captain for 8 years.⁵⁴⁸

(2) There were conflicting views regarding the Captain's abilities to operate the LADY MARY. The Previous Captain did not think the Captain was ready to take over the vessel in December 2007, and testified that the Captain, "did things that I would never do" and that he would, "go past where he should go." The Previous Captain also testified that the Captain would have trouble when it got real rough or when he encountered new or different circumstances.⁵⁴⁹ The Survivor provided testimony that supported this evaluation and added that the Captain had good knowledge but lacked experience and he sometimes had trouble maneuvering the LADY MARY in rough weather.⁵⁵⁰ The Shore Manager had a different assessment of the Captain's skills. He evaluated the Captain's specific underway performance on the LADY MARY and stated, "he did it good. He did it real good."⁵⁵¹ These conflicting views were taken into account, and it was determined that *the Captain of the LADY MARY lacked the experience and ability to handle rough weather and new situations, thus establishing a latent unsafe precondition.*

(3) The Previous Captain testified that the Captain, "didn't really listen a whole lot to me," and that, "you couldn't tell him much. You could tell him a little bit." The Previous Captain felt the Captain had an anger management problem and the two often

⁵⁴⁷ Findings of Fact B.2.b(2), B.9.a(2)

⁵⁴⁸ Findings of Fact B.9.a(1), B.8.b(1), B.9.b(1)

⁵⁴⁹ Findings of Fact B.9.a(3) & a(4)

⁵⁵⁰ Finding of Fact B.9.a(8)

⁵⁵¹ Finding of Fact B.9.a(6)

argued, once allegedly becoming a physical confrontation onboard the LADY MARY.⁵⁵² The Survivor testified that the Captain did not have a good way of communicating with others when he was angry and he would take his anger out on objects and throw things. The Survivor also stated that the Captain and Deckhand 1 “fought all the time.”⁵⁵³ This led to the determination that *the Captain was not a receptive trainee, he did not readily accept advice or criticism, and he had difficulty controlling his temper. These factors were latent unsafe preconditions which impeded the Captain’s ability to learn in an on-the-job training environment and hindered his ability to accept assistance from the other, more experienced crew members.*

b. Precondition – Lack of Crew Training

(1) The Captain was responsible for conducting safety orientations for new deckhands and conducting monthly drills onboard to ensure the crew knew what actions to take in an emergency.⁵⁵⁴ The training was supposed to include topics such as donning survival suits, launching life rafts, making radio distress calls, and activating the general alarm. Based on testimony from the Survivor, very few drills were actually conducted onboard the vessel.⁵⁵⁵ On July 21, 2008, the Coast Guard conducted a courtesy safety examination. Only Deckhand 1 was present for the examination, and the Examiner verified that drills and safety orientations were being done through a “question and answer session.”⁵⁵⁶ Also, based on information from NMFS observers who got underway with the LADY MARY, no drills were conducted on an August 2006 trip, a January 2007, or a July 2008 trip.⁵⁵⁷

(2) During the sinking of the LADY MARY, the Captain and the crew missed opportunities to provide for their survival. No one sounded the general alarm, no one launched a flare, there was no DSC alert, the life raft was manually launched⁵⁵⁸ but none of the crew members were inside it when the rescue helicopter arrived,⁵⁵⁹ survival suits were either not donned or not properly donned, and no one issued an actionable mayday call on the radio.⁵⁶⁰

(3) Based on the previous two paragraphs, it was evident that *the LADY MARY’s Captain and crew were not well trained for emergency situations, and therefore lacked the knowledge and experience to take crucial lifesaving actions when they were most needed. The crew’s lack of training was a latent unsafe precondition. Additionally, this information led to the determination that the LADY MARY was not in compliance with 46 CFR 28.270, which requires monthly lifesaving and firefighting drills and instruction.*

⁵⁵² Findings of Fact B.9.a(4) & a(5)

⁵⁵³ Finding of Fact B.9.a(9)

⁵⁵⁴ Findings of Fact B.2.b(1) & B.9.g(2)

⁵⁵⁵ Findings of Fact B.14.a – Table; monthly drills

⁵⁵⁶ Findings of Fact B.14.e(1) – e(4)

⁵⁵⁷ Findings of Fact B.9.g(6)

⁵⁵⁸ Finding of Fact B.11.f(4)

⁵⁵⁹ Finding of Fact B.4.b(3)

⁵⁶⁰ Findings of Fact B.4.b(10), B.5.e(1) – e(8)

c. Precondition - Fatigue and Sleep/Rest Rotations

(1) *It is likely that the LADY MARY's Captain and crew were fatigued and asleep for a significant period of time on the morning of March 24th.* The following paragraphs provide an explanation of this statement.

(2) During the LADY MARY's voyage from March 18th – March 24th, each of the deckhands worked 18 hour days per the schedule established by the Captain,⁵⁶¹ and the Captain would rest sporadically for about three or four hours at a time when operations permitted. The Survivor testified that the Captain's last rest period was around 1600 or 1700 on March 23rd.⁵⁶² Based on the long work hours for consecutive days, *the LADY MARY's Captain and crew were likely fatigued on the morning of the vessel sinking, which was a latent unsafe precondition.*

(3) When the Survivor and Deckhand 1 went to bed at midnight on March 23rd, at least two other deckhands were awake and cutting scallops.⁵⁶³ The LADY MARY completed her last haul back before 0103 on the morning of March 24th, but the scallop dredge was not emptied at that time. Therefore, *it is highly likely that the crew finished cutting all of the scallops which remained on deck after the Survivor and Deckhand 1 went to bed.* Since there were no additional haul backs, *there would have been a lull in the workload sometime before 0500.*

(4) At 0117 on the morning of March 24th, a satellite phone call was placed from the LADY MARY to the house where the mother of the Captain's children lived.⁵⁶⁴ Based on where the phone call was directed to, *it was likely placed by the Captain, which means he was awake at 0117 while the vessel continued to drift.* Since the phone call was approximately four hours before the sinking, and there were no immediate follow-on communication attempts (the first radio communications indicating possible distress on the vessel occurred at approximately 0514), *the LADY MARY was not in distress at 0117.*

(5) The Survivor testified that after he was awoken on the morning of March 24th, he saw Deckhand 3 on the main deck, wearing work clothes.⁵⁶⁵ After the sinking, however, the bodies of Deckhand 2 and Deckhand 3 were recovered in clothing that was consistent with sleeping attire, vice working attire.⁵⁶⁶ Thus, *Deckhand 2 and Deckhand 3 were likely asleep just prior to the LADY MARY sinking on the morning of March 24th.*

(6) Since the Survivor and Deckhand 1 were asleep just before 0500 on March 24th, Deckhand 2 and Deckhand 3 were likely asleep at that time, and there was a lull in the workload combined with fatigue amongst the remaining crew members, *it is likely that the entire crew was asleep for some period of time between 0117 and 0500 on the morning of March 24th.* If that was true, then no one was monitoring the status of the

⁵⁶¹ Findings of Fact B.3.e(2), B.9.c(2)

⁵⁶² Finding of Fact B.9.c(3)

⁵⁶³ Finding of Fact B.3.e(3)

⁵⁶⁴ Finding of Fact B.5.d(1)

⁵⁶⁵ Finding of Fact B.3.f(4)

⁵⁶⁶ Finding of Fact B.6.a(8) & a(11)

lazarette or keeping a navigational watch which in turn means no one was available to take immediate actions, such as opening the freeing ports or replacing the lazarette hatch if the main deck took on a significant amount of seawater. *If the entire crew was asleep, then their lack of awareness on the morning of March 24th created an unsafe precondition.*

d. Precondition - Working Language

(1) The working language on board the LADY MARY was English, but Deckhand 5 and the Survivor only spoke Spanish. English was Deckhand 4's second language.⁵⁶⁷ The non-English speaking deckhands probably did not understand many of the verbal instructions issued onboard the vessel and just followed a regular routine while underway. *It is highly likely that the language barrier reduced the effectiveness of any training which did take place onboard the LADY MARY. The language barrier was a latent unsafe precondition which negatively affected the ability of the non-English speaking crew members to fully understand what was happening during the sinking, and what they needed to do to survive. This was especially true for Deckhand 5, since this was his first trip on the vessel.*

e. Precondition - Drug Use

(1) The Shore Manager had an informal drug and alcohol policy. Specifically, he told the crew not to use any type of alcohol or drugs while onboard. The Survivor testified that he never saw anyone use drugs or alcohol onboard,⁵⁶⁸ but the [REDACTED] both tested [REDACTED] for marijuana.⁵⁶⁹

(2) [REDACTED]

(3) Since there is no good correlation between the amount of marijuana in a person's system and the time of use, or the possible degree of impairment, the Forensic Toxicologist could not conclude if [REDACTED] was physically or mentally impaired at the time of the sinking.⁵⁷⁰

[REDACTED]

⁵⁶⁷ Finding of Fact B.9.d(1)
⁵⁶⁸ Finding of Fact B.9.f(2)
⁵⁶⁹ Finding of Fact B.9.f(3)
⁵⁷⁰ Finding of Fact B.9.f(9)
⁵⁷¹ Findings of Fact B.9 f(8)

f. Precondition - Vessel Modifications & Loading

(1) The LADY MARY, while originally designed as a Gulf Coast shrimp boat, was modified numerous times while under the ownership of Smith & Smith Inc.⁵⁷² The modifications as detailed in section B7, included changes to the vessel's tonnage, structure, fishing gear, machinery, steering gear, rudder, ballast tanks, fuel tanks, outriggers, and bilge keels. A modeled stability analysis estimated that the cumulative effect of the modifications reduced the vessel's freeboard by about four inches.⁵⁷³ *In its modified condition, the vessel required more skillful handling and seamanship.*

(2) While the full effect of the modifications to the LADY MARY may never be known, the loss of freeboard can be quite significant. As noted in Coast Guard Navigation and Vessel Inspection Circular 5-86 (NVIC 5-86) which is entitled, "Voluntary Standards for U.S. Uninspected Commercial Fishing Vessel's," the loss of freeboard, especially on smaller vessels decreases available vessel righting energy, exposes the deck area more readily for sea water to ship onto deck with the potential of becoming trapped, and depending on available paths for water to down flood into the hull, downflooding may occur more readily.⁵⁷⁴

(3) While the recommended practices in NVIC 5-86 focus on vessels greater than 79 feet in length, that is because the background analysis for the NVIC revealed a greater reliability in the application of the recommended practices for vessels of those lengths, and, there is a general concession in the NVIC that the recommended practices may not be conservative enough for vessels smaller than that. The NVIC points out that the smaller the vessel, the more significant the effects of minimum freeboard, excess water on deck, and reduced freeing port area.⁵⁷⁵

(4) On the morning of March 24th, the LADY MARY had 200 bags (10,000 pounds) of scallops in the fish hold, and approximately 10-12 additional bags were either on the main deck or were stowed in the fish hold after the Survivor and Deckhand 1 went to bed.⁵⁷⁶ Since the target catch for the trip was 250 bags of scallops (50 more than usual), *the LADY MARY had not yet reached their target, but held more scallops on the morning of March 24th than during the Captain's previous voyages, but only by 500-600 pounds.* In that condition, the LADY MARY's freeboard was estimated to be only 1.3 feet.⁵⁷⁷

(5) Based on the information in the paragraphs above, *the LADY MARY's pre-casualty loaded condition on the morning of March 24th was a latent unsafe precondition.*

⁵⁷² Finding of Fact B.7.a(1) & B.7.c(2) – c(15)

⁵⁷³ Analysis C.1.g(8)

⁵⁷⁴ Navigation and Vessel Inspection Circular 5-86 (NVIC 5-86)

⁵⁷⁵ NVIC 5-86

⁵⁷⁶ Finding of Fact B.3.b(5)

⁵⁷⁷ Analysis C.1.g (3)

g. Precondition - Stern Ramp

(1) A stern ramp was added to the LADY MARY to provide a safer alternative for retrieving the loaded scallop dredge. The Captain, however, still preferred to recover the scallop dredge over the port rail,⁵⁷⁸ so the modification provided no additional benefit. When towing and recovering the scallop dredge on the port side, there were routinely problems with the stern ramp. The dredge towing cable broke the port stern ramp stay wire many times and the scallop dredge or dredge cable sometimes got caught on the stern ramp.⁵⁷⁹

(2) According to historical pictures of the LADY MARY, the aft end of the stern ramp was approximately one foot above the surface of the water without any catch onboard the vessel. *Once the vessel was loaded, depending on the sea state and the orientation of the vessel, the stern ramp provided a possible avenue for waves to wash up and onto the main deck.*

(3) For the reasons described in the two paragraphs above, *the LADY MARY's stern ramp was an unsafe precondition.*

h. Precondition - Lazarette

(1) The LADY MARY's lazarette routinely needed to be dewatered while the vessel was underway. In calm weather the space needed to be pumped out approximately every three days and in rough weather the space needed to be pumped out daily.⁵⁸⁰ The crew did not know how the water entered the lazarette but regardless of the source, *the routine flooding of the lazarette was an unsafe precondition.*

(2) The preferred method of dewatering the lazarette was to use an independent electric bilge pump.⁵⁸¹ The bilge pump discharge hose extended up through the lazarette hatch, which meant *the hatch could not be closed while the space was being dewatered with the independent pump. The inability to maintain a watertight or weathertight boundary in a vulnerable area was an unsafe precondition.* Since the pump was plugged into an outlet inside the space, *when the lazarette flooded to the height of the outlet, the water would have shorted out the pump, creating a latent unsafe precondition (i.e., a flooded lazarette with the preferred pumping arrangement disabled).*

i. Precondition - Freeing Ports

(1) The bulwark freeing ports on the after main deck had covers made from steel plates that were held in place by retaining brackets on the sides of the freeing ports.⁵⁸² The covers were used to prevent scallops from being washed overboard when they were

⁵⁷⁸ Finding of Fact B.9 h(3)

⁵⁷⁹ Findings of Fact B.9 h(5) & h(6)

⁵⁸⁰ Finding of Fact B.9.i(7)

⁵⁸¹ Findings of Fact B.7.1(2) & B.9.i(6)

⁵⁸² Findings of Fact B.7 h(8)

unloaded on the main deck and before they were cut. *Since the freeing port covers were solid, they would not readily permit the out flow of water from the main deck, and were a latent unsafe precondition.*

(2) Since the forward port freeing port was closed, and the forward starboard freeing port was approximately 75% closed, any seawater shipped on deck would not drain as quickly as if they were fully open and seawater retained on deck, especially for smaller vessels, can have negative effects. As noted in NVIC 5-86, “Water on deck should be viewed as a liability which is to be avoided if at all possible” since it essentially has four detrimental effects with regard to stability. It adds to the vessel’s displacement, it raises the vessel’s Vertical Center of Gravity (VCG), it creates a potential free surface effect, and, it may increase the rolling acceleration and the roll angle of the vessel.⁵⁸³

(3) Additionally, NVIC 5-86 points out that freeing port area, freeboard, and the potential volume of water that can be trapped on deck are correlated and must be considered for a vessel’s anticipated sea conditions. Generally, NVIC 5-86 notes that vessels with less freeboard have worse performance in stormy weather and that they are more seriously affected by water on deck since the probability of complete flooding is greater with smaller vessels because, “the volume which can be flooded is quite large relative to the total volume of the vessel.” The NVIC also points out that water on deck may cause unsymmetrical rolling and may lead to earlier deck edge immersion for smaller vessels.⁵⁸⁴

(4) As noted in the NVIC, one counter action to dampen the rolling motion of the vessel is bilge keels. While the LADY MARY did have bilge keels, and they were extended in both length and depth at the vessels 2006 dry dock period,⁵⁸⁵ since so much about the LADY MARY’s stability characteristics are unknown, it cannot be determined what magnitude of effect the bilge keels would have had. This is further compounded by other roll dampening strategies that were reduced such as the decrease in the outrigger lengths. By reducing the length of the outrigger, the magnitude of the moment provided by a stabilizer in the water to resist a roll, was also reduced.

j. Precondition - Downflooding paths

(1) *The downflooding path between the main deck and the engine room was relatively unobstructed, which was a latent unsafe precondition.* To get to the engine room, sea water crossed three thresholds; one in the aft shucking house doorway, one before the small lobby outside of the aft bunk room, and one just before the main deck opening to the engine room. The shucking house door was made of plywood and therefore not watertight or weathertight.⁵⁸⁶ The door leading to the bunkroom lobby may have been weathertight or watertight (since it was an exterior door to the deckhouse prior to the

⁵⁸³ NVIC 5-86

⁵⁸⁴ NVIC 5-86

⁵⁸⁵ Finding of Fact B.7.d(2)

⁵⁸⁶ Finding of Fact B.7.c(2)

modifications), but it was left open. There was no cover over the engine room opening, or if there was, this cover was also left open.

(2) The fish hold hatch cover was divided by the aft shucking house bulkhead. The interior portion of the hatch, forward of the shucking house bulkhead, did not have a cover. The exterior portion of the hatch, aft of the shucking house bulkhead, had a cover but it was not watertight.⁵⁸⁷ Since the fish hold was the largest compartment on the LADY MARY, flooding of this space would have been a dangerous, if not catastrophic, event. This means *the lack of a watertight hatch on the fish hold was a latent unsafe precondition*.

(3) NVIC 5-86 summarizes the need to preserve watertight integrity stating that, “The importance of providing watertight closures that can be quickly and easily maintained cannot be over emphasized. The NVIC acknowledges that some locations may require frequent access (such as a fish hold or engine room), but they should be “capable of being closed rapidly and be of substantial construction to withstand the pounding of large waves.” Additionally, if a deckhouse volume is to be considered as buoyant volume, then the doors to that space should be quick acting watertight doors. Lastly, use of quick acting water tight doors below the main deck will help prevent progressive flooding which in turn may provide the needed reserve buoyancy to keep a vessel afloat.⁵⁸⁸

k. Precondition - Internal Subdivision

(1) The LADY MARY was designed with 5 watertight bulkheads for internal subdivision.⁵⁸⁹ In March 2009, at least one of these bulkheads was not intact. The forward engine room bulkhead had a watertight door and part of the door had been removed and replaced with an air conditioning unit. Also, the forward lazarette bulkhead (which was the after most bulkhead of two water tanks) was penetrated by a 1½ inch gravity drain line from the lazarette to the engine room. The line had a gate valve to stop the flow of water, but the valve was always kept open which compromised the watertight integrity of the lazarette.⁵⁹⁰ As a result, *the watertight integrity was compromised for three of the LADY MARY’s compartments, which was a latent unsafe precondition*.

(2) NVIC 5-86 also speaks of the need to maintain bulkhead watertight integrity and that all through bulkhead penetrations should be designed to maintain the integrity of the bulkhead. Doors through the bulkhead should be quick acting watertight doors, electrical penetrations should be run through stuffing boxes, pipes should be equipped with bulkhead stop valves, and if a door is the only means of ventilation for a space, alternative means of ventilation should be installed to keep the door closed as needed.⁵⁹¹

⁵⁸⁷ Finding of Fact B.7 h(7)

⁵⁸⁸ NVIC 5-86

⁵⁸⁹ Findings of Fact B.7.g(2)

⁵⁹⁰ Findings of Fact B.7.g(6) & B.9.i.(6)

⁵⁹¹ NVIC 5-86

l. Precondition – Lack of a High Frequency Radio

(1) The LADY MARY did not have a radio onboard capable of operating in the Medium or High Frequency range, which was allowed by the regulations because the vessel's satellite phone was an authorized replacement for the HF radio.⁵⁹² A satellite phone, however, is not designed to receive radio broadcasts. This meant that *when the vessel was operating outside of the range of shore based VHF towers, there was no way to receive critical information broadcasts, such as an Urgent Marine Information Broadcast from the Coast Guard. This was a latent unsafe precondition.*

m. Precondition - Emergency Position Indicating Radio Beacon

(1) The EPIRB was improperly registered in NOAA's National Beacon Registration database,⁵⁹³ which was a latent unsafe precondition. This hazardous condition resulted in a 1 hour and 27 minute delay in passing actionable information to the Coast Guard.

n. Precondition - Weather

(1) The weather predictions for the Elephant Trunk Sea Scallop Access Area matched the observed conditions in that vicinity on the evening of March 23rd and the morning of March 24th.⁵⁹⁴ This means *it is likely that the LADY MARY's crew knew that the weather was deteriorating overnight.* The Captain had the authority to end a voyage early if needed due to weather and the Survivor testified that this had happened three times before.⁵⁹⁵ The Survivor also reported that the whole crew would be awake during rough weather to act as lookouts.⁵⁹⁶ Since the Survivor and Deckhand 1 went to bed at their normally scheduled time,⁵⁹⁷ *the Captain was probably not concerned about the pending weather prediction or the need to end the trip early. However, the weather conditions were significant enough to be considered a precondition.*

o. Unsafe Acts and Decisions

(1) There are a few acts and decisions, outlined in the paragraphs below, made during the LADY MARY's operations on the morning of March 24th which when combined with the given preconditions, were considered as unsafe and led to the initiating and subsequent events.

(2) *The decision to dewater the lazarette using the independent electric bilge pump located in that space was an unsafe decision.* That decision meant that the lazarette space was opened up and left open, thus making it extremely susceptible to downflooding, especially considering the preconditions of weather, the Captain's experience, the potential level of crew fatigue, the potential lack of awareness due to [REDACTED], the

⁵⁹² Finding of Fact B.5.c(3)

⁵⁹³ Findings of Fact B.10.b(2) – (9)

⁵⁹⁴ Findings of Fact B.3.c(3) - c(9)

⁵⁹⁵ Finding of Fact B.9.a(10)

⁵⁹⁶ Findings of Fact B.9.c(2)

⁵⁹⁷ Finding of Fact B.3.e(2)

vessel's minimal freeboard due to the various modifications and the loaded catch onboard, the stern ramp's potential to help ship water on deck, and the blocked freeing ports.

(3) *The decision to let the LADY MARY drift while the lazarette was open, and apparently pumping down, was also unsafe.* That decision meant that the vessel could not be quickly maneuvered if needed, thus leaving the vessel vulnerable to adverse seas such as broadside waves that could swamp the vessel or seas approaching the stern that could ship onto the deck via the stern ramp due to the vessel's modified and loaded condition. Drifting also likely increased the potential for a watchstander to accidentally fall asleep since there was less activity to remain busy.

(4) *The final unsafe decision was to leave one main deck freeing port closed and one freeing port 75% closed, with no catch on deck that needed to be retained.* That decision hindered the LADY MARY's ability to shed water quickly from the main deck if needed.

(5) *The unsafe acts and decisions made on the morning of March 24th were human errors, and more specifically planning errors. The Captain and the crew intended to execute the decisions and actions described above, but the decisions and actions were inappropriate for the situation at hand due to the preconditions.* The error was not how the plan was executed, but rather in the plan itself.

(6) When dealing with a new situation, the human mind attempts to find patterns and select a "pre-packaged" action rather than analyze each situation and calculate the optimal solution. As a result, people develop biases, or the tendencies to apply certain responses, regardless of the situation⁵⁹⁸. *On the morning of March 24th, the unsafe acts and decisions made onboard the LADY MARY were all due to biases.* The Captain and the crew executed the standard responses they were accustomed to, despite the presence of numerous unsafe and latent unsafe preconditions, such as deteriorating weather and a fully loaded vessel.

p. Failed Defenses Associated with the Preconditions, Unsafe Acts/Decisions

(1) *A primary defense for the unsafe acts and decisions, as well as for many of the preconditions, would have been awareness of the situation, which would have enabled the crew to take alternative actions or make different decisions, once they realized things were not going well.* Unfortunately, awareness generally takes training and experience and once the LADY MARY was in danger on the morning of March 24th it was too late to obtain either. Extra knowledge, experience, or training may have helped the crew to better understand the potential negative consequences associated with the deteriorating weather, the Captain's rough weather seamanship, emergency procedures, the impact of the modifications on the vessel's handling characteristics, leaving the lazarette cover off, leaving freeing ports blocked, the improper maintenance of watertight or weathertight boundaries, and to better understand distress communications and proper use of

⁵⁹⁸ MSM Vol. V, Part B, Chapter 4, paragraph c.7.e.2.a

lifesaving equipment. [Additional discussion regarding training is contained within Section C4 of this report.]

(2) *There were a few defenses, as alluded to above, available to help prevent seawater from gaining access to the main deck, from staying on the deck, and from down flooding into the lazarette.* The first would have been to avoid drifting in the existing weather conditions and to maintain a vessel orientation which would have reduced or eliminated the chances of taking water on deck. A second would have been to keep all of the freeing ports open which would have allowed seawater to more rapidly flow off of the deck. And finally, if the fixed bilge pumping system connected to the engine room manifold had been used to dewater the lazarette, the lazarette hatch could have been kept in place. An alternative defense would have been to ensure a crew member was constantly monitoring the situation, and if water shipped onto the deck and began to cause problems, he could have taken action (if he knew what to do) or alerted someone. While this may have been done on the morning of March 24, 2009, the possibility of that crewmember accidentally falling asleep, as discussed in Section (d) above, cannot be overlooked.

(3) Additional downflooding (e. g., through the shucking house door and into the engine room) could have been prevented by closing all of the available openings, whether water or weather tight, or not. This would have included the shucking house door, the aft bunk room door and the 1½” gate valve on the gravity drain line between the lazarette and the engine room. *If these openings had been closed, this would have been a defense which slowed, or even prevented downflooding into the engine room. This may have given the crew time to take adequate dewatering measures after water washed onto the main deck, and thereby save the vessel.*

q. Additional Unsafe Conditions

(1) On the morning of March 24th, the closest point of approach (with navigational errors) between the LADY MARY and the CAP BEATRICE was approximately 0.78 nautical miles.⁵⁹⁹ While this separation was large enough to prove that the two vessels did not collide, it was also small enough to cause concern. The CAP BEATRICE transited through the Elephant Trunk Sea Scallop Access Area during a time when the area was open for fishing and was densely populated by fishing vessels. *The vessel went through the area at a speed of almost 20 knots, and passed close to the LADY MARY, as well as other fishing vessels. This was an unsafe condition.*

(2) The NTSB analysis identified two cracked areas on the rudder stock which were typical of fatigue that had been ongoing for a significant amount of time and were consistent with an unsupported rudder or a rudder that was loose in its shoe.⁶⁰⁰ *While this did not contribute to the LADY MARY's sinking, this was a latent unsafe condition because it could have eventually caused the rudder stock to break from normal use.*

⁵⁹⁹ Analysis C.1.c(7)

⁶⁰⁰ Analysis C.1.f(8)

(3) The LADY MARY's aft water tanks were used to ballast the vessel. Once water was added to these tanks, the method to drain them was to open the valves on the tanks and allow the water to flow into the lazarette space.⁶⁰¹ The water was then pumped out using the independent electric bilge pump in the lazarette space. The drain line between the lazarette and the engine room, which was normally kept open, would have also allowed some of this water to flow into the engine room. This was the only ballast onboard the vessel that could have been used to control the list. *For the reasons discussed above, this deballasting arrangement was a latent unsafe condition.*

⁶⁰¹ Findings of Fact B.7.1(2) & B.9.i(6)

4. Workplace Factors, Organizational Factors, and Associated Failed Defenses

This section focuses on the management environment in the workplace (onboard the LADY MARY), as well as the organizations governing the LADY MARY's operations, which included Smith & Smith Inc., and various regulatory agencies. The purpose of examining the workplace factors and organizational factors is to determine how and why the preconditions were created onboard the vessel. Since Smith & Smith Inc. was a small company, the Captain, Deckhand 1 and the Shore Manager all had roles within the workplace and at the organizational level. This section also examines the defenses associated with the management and oversight of the LADY MARY. While the previous section focused on defenses that could have been implemented after the vessel was underway to neutralize the preconditions, this section discusses the defenses which could have prevented the unsafe preconditions from developing in the first place.

a. Human Resources - Training

(1) The Captain received on-the-job training for his position, which was conducted onboard the LADY MARY.⁶⁰² While an excellent training technique, especially because it spanned approximately three years time, the Captain's temperament may have impeded his ability to learn in this type of environment.⁶⁰³ In addition, there was no minimum qualification standard imposed by regulations or by Smith & Smith Inc. for the Captain; the Shore Manager screened the Captain to ensure a basic competency level.⁶⁰⁴ As a result of these factors, the Captain lacked the experience and ability to handle rough weather and new situations.⁶⁰⁵ *When coupled with other unsafe preconditions, such as fatigue, [REDACTED], compromised water tight integrity, and the vessel's modified and loaded condition, the Captain's lack of skill placed the LADY MARY in jeopardy.*

(2) *The Captain's on-the-job training was a failed defense as he could have used additional on-the-job training time, or alternatively, some type of formal instruction to address heavy weather ship handling, fundamentals of stability and subdivision, emergency communications, and operation of lifesaving gear. The fact that there were no minimum competency standards, was a missing defense.* If the Captain had a greater level of experience or training, this could have helped prevent some of the other unsafe preconditions from developing. For example, with more training and experience, the Captain may have recognized the dangers of opening the lazarette hatch in rough weather, or leaving the freeing ports closed, and he may have been able to correct these situations.

(3) The LADY MARY's crew was not well trained for emergency situations,⁶⁰⁶ *which was probably why they missed opportunities to provide for their survival during the sinking.* There was a regulatory requirement for monthly lifesaving and firefighting drills

⁶⁰² Findings of Fact B.2.b(2), B.9.a(2) & Analysis C.3.a(1)

⁶⁰³ Findings of Fact B.9.a(2)-(5)

⁶⁰⁴ Findings of Fact B.9.a(6)

⁶⁰⁵ Findings of Fact B.9.a(3)-(5), a(8)

⁶⁰⁶ Analysis C.3.a(1-3), b(1-3)

and instruction onboard the LADY MARY, however the vessel was not in compliance with this regulation.⁶⁰⁷ The training which did occur was haphazard, inconsistent and incomplete.⁶⁰⁸ *This was probably because neither the Captain, nor Smith & Smith Inc. placed a strong emphasis on the mandatory training. It is highly likely that they did not recognize the importance of emergency training.*

(4) *The regulatory requirement in 46 CFR 28.270 was a defense designed to train crew members in safety issues, but this defense failed. If there was a requirement to log drills and training, this may have encouraged the LADY MARY's Captain to provide more regular training. Another defense to ensure crew training may have been a requirement for individual mariners to attend formalized training sessions, and obtain a certificate to document completion. While additional training for emergency situations may not have prevented the initiating event or the subsequent events, it could have improved the crew's chances of survival through any number of simple actions.*

b. Human Resources – Staffing

(1) As described in the section above, the Captain's lack of experience indicated that there were issues with training within Smith & Smith Inc., but it also meant that *the decision to put the Captain in charge was ill-considered. The decision was likely influenced by the fact that the Captain was the Shore Manager's [REDACTED], and it may have been influenced by the release of the Previous Captain.*

(2) In a small, family-run business such as Smith & Smith, Inc., it is easy to see how personal relationships could influence business decisions. *A possible defense to this would have been to consult with an outside party regarding the decision to hire the Captain. The Shore Manager and Deckhand 1 could have chosen an independent evaluator, or sought an independent opinion, to evaluate the Captain's skills and provide an objective assessment of his skills. A formal training course also could have provided an objective assessment.*

(3) The Shore Manager was responsible for hiring the LADY MARY's crew and he had very relaxed hiring procedures. A typical hiring inquiry would be initiated by the potential crewmember who would ask the Shore Manager if he needed someone. The Shore Manager would reply yes or no based on vessel's needs and the person's reputation, and that was the extent of the hiring process. The prospective employee's training, qualifications or language skills were not evaluated, and their identification was not checked.⁶⁰⁹ As a result, the Shore Manager was not aware of the true identity of one crew member when the vessel sank, and there were language barriers hindering training and communication with at least two of the crew members.⁶¹⁰

⁶⁰⁷ 46 CFR 28.270, Findings of Fact B.14.a – Table; monthly drills & Analysis C.3.b(1)-(3)

⁶⁰⁸ Findings of Fact B.9.g(2) & Analysis C.3.b(1)

⁶⁰⁹ Findings of Fact B.8.c(1)

⁶¹⁰ Findings of Fact B.2.b(10), B.9.d(1)(2) & Analysis C.3.d(1)

(4) *The Shore Manager could have employed a more formal hiring process which involved asking a potential crew member for identification, previous experience, relevant training, references and/or an application. These hiring practices would not prevent a mistaken identity due to false information presented by a prospective employee; however they could have provided the Shore Manager with a better understanding of each crew member's experience and abilities.*

c. Operations – Scheduling

(1) There were no regulatory limitations on watches or work periods for the LADY MARY, and no requirements pertaining to rest periods. Smith & Smith Inc. delegated the authority to establish the crew's rest and work schedule to the Captain.⁶¹¹ The company relied solely on the Captain's judgment to ensure the crew was sufficiently rested to work and to stand a vigilant watch if needed.⁶¹² The Captain did not have a consistent sleep schedule, and testimony revealed that he got even fewer hours of sleep than the crew did.⁶¹³ Due to the very long work days, the Captain and the crew were likely fatigued on the morning of the vessel sinking. *This unsafe precondition was created because the Captain and Smith & Smith Inc. failed to recognize the importance of rest and the impacts of fatigue.*

(2) *A defense to reduce fatigue onboard the LADY MARY would have been to schedule longer rest periods during the voyage. This could have been initiated by the Captain, by Smith & Smith Inc., or by a regulation. The difficulty in implementing longer rest periods though, is that this reduces the crew's work periods, and there is a perception that it automatically reduces the productivity of the crew. This is not always true because often a well rested crew member can work faster and more efficiently than a fatigued crew member.⁶¹⁴ Additional training and education on the topic of fatigue, may have convinced the Captain to schedule longer rest periods. If longer rest periods resulted in more days underway however, then this may have reduced the profits, in which case it would be very difficult to convince the Captain to change the schedule. A possible defense would be to conduct a cost/benefit type of analysis, to determine the actual cost of remaining underway for additional time and compare it to the safety benefits from scheduling longer rest periods.*

d. Operational Culture - Norms

(1) Smith & Smith Inc. had an informal policy, articulated by the Shore Manager, which prohibited the use of drugs and alcohol onboard the LADY MARY.⁶¹⁵ However, the [REDACTED], who were also two of the highest ranking members of the Smith & Smith Inc. organization, ignored that policy and [REDACTED] while the vessel was

⁶¹¹ Findings of Fact B.2.b(1)

⁶¹² Findings of Fact B.9.c(1)

⁶¹³ Findings of Fact B.9.c(3)

⁶¹⁴ Crew Endurance Management Practice, A Guide for Maritime Operations, USCG Research and Development Center Report CG-D-01-03

⁶¹⁵ Finding of Fact B.9.f(2)

underway.⁶¹⁶ This placed the crew and the vessel at risk, and demonstrated that *the drug policy was not enforced*. This also showed a lack of respect for company policy and for maintaining basic safety standards, which means that *the [REDACTED] may have had a lackadaisical attitude toward other safety management aspects as well*.

(2) *The drug and alcohol policy for Smith & Smith Inc. was a defense against the use of marijuana onboard the LADY MARY, but this defense failed. Another defense would have been a regulation designed to prevent or detect drug use onboard the vessel before a casualty occurred, but this defense did not exist.* There were no licensing requirements or mandatory drug testing requirements for the Captain or crew in safety sensitive positions.

e. Operations - Measurements

(1) The LADY MARY was modified numerous times while under the ownership of Smith & Smith Inc.⁶¹⁷ Many of the modifications were intended to improve the safety of the crew such as moving the winches to the upper deck to keep the scallop dredge cable above the crew, and adding the stern ramp to eliminate the need to pick the dredge up in the air where it could swing around.⁶¹⁸ *The cumulative effects of the modifications, however, lowered the vessel's freeboard and thus created a latent unsafe precondition.* In addition to a lower freeboard, the stern ramp modification provided a possible avenue for waves to wash up and onto the main deck. The modification concepts were developed and approved by Smith & Smith Inc. The Shore Manager either performed the modification work himself, or hired someone when the work required specific expertise or equipment. After the work was completed, the Shore Manager did not have the LADY MARY examined by a surveyor or an engineer because he was not aware of any regulatory requirement to do so. The Shore Manager testified that he knew the boat was safe and stable but this was based on his experience as a fishing vessel captain, not on a formal analysis.⁶¹⁹

(2) The LADY MARY was required to meet 46 CFR Subchapter G regarding documentation and measurement of vessels.⁶²⁰ The provisions of 46 CFR 69.19 require owners to immediately report the intent to structurally alter their vessel or change the use of a space within their vessel. This allows the measurement organization (in this case ABS) to decide if the changes require a remeasurement of the vessel's tonnage. *In the LADY MARY's case, this also could have provided an opportunity for an independent surveyor to recognize the potentially negative effects of the modifications.* After the tonnage survey in 2001, there is no evidence that anyone from Smith & Smith Inc. reported any of the LADY MARY's subsequent modifications, *likely because the Shore Manager was not aware of any requirements to do so.* In addition, the Coast Guard

⁶¹⁶ Findings of Fact B.9 f(3) & Analysis C.3.e(3)

⁶¹⁷ Findings of Fact B.7.a-c

⁶¹⁸ Findings of Fact B.7.c(5), c(12), c(13), B.9 h(1)

⁶¹⁹ Finding of Fact B.9.i(1)

⁶²⁰ 49 CFR 69.3

CFVS Examiner did not recognize that substantial changes had been made to the vessel. As a result, this defense failed.

(3) In general, the Coast Guard's policy is to require remeasurement of a vessel when it undergoes a change which results in an increase or decrease by more than 5% in gross or net tonnage.⁶²¹ The LADY MARY was calculated to be 105 Gross Tons in 2001, which means a change of more than 5.25 tons would have required remeasurement of the vessel.⁶²² Without detailed vessel plans or access to the vessel itself, it was not possible to calculate the precise change in the vessel's tonnage resulting from the modifications. *It is highly likely, however, that the modifications to the LADY MARY increased the gross tonnage by more than 5% and would have required a new tonnage certificate.* This is because the modifications to the LADY MARY included adding 20,000 pounds of cement to the water ballast tank located under the fish hold. The most recent tonnage certificate indicated that this tank was exempt from the vessel's tonnage, and that the tank's tonnage was 3.79. Once the tank was filled with cement, it would not have been exempt from tonnage, and this was just one of many modifications.⁶²³ *Since the LADY MARY did not get remeasured, this regulatory defense also failed.*

(4) The NMFS also regulated the LADY MARY's tonnage. The vessel was not allowed to increase the gross tonnage or net tonnage by more than 10% over the specifications of the originally permitted vessel, and the vessel could only increase the tonnage one time over the life of the permit.⁶²⁴ When the scallop permit was transferred to the LADY MARY, there was a one-time size upgrade of gross tonnage and net tonnage,⁶²⁵ so under NMFS requirements, *the LADY MARY was not allowed any further increases in tonnage. While this was not a defense intended to prevent unsafe modifications, it could have acted in that manner if Smith & Smith Inc. had abided by the requirement.*

(5) Since the LADY MARY was less than 79 feet in length, the vessel was not required to meet stability, subdivision or load line requirements.⁶²⁶ *If these requirements had applied to the vessel, they would have been a possible defense.* The Coast Guard MSC stability analysis concluded that in the pre-casualty loaded condition, it was unlikely that the LADY MARY would have met the intact stability criteria in 46 CFR 28.570.

(6) The LADY MARY was not insured and was not required to be, so the vessel did not have a Condition and Valuation survey.⁶²⁷ *If the LADY MARY had been surveyed by a professional for insurability purposes, this would have been another defense.* The independent analysis may have recognized the substantial nature of the cumulative modifications and the surveyor may have mandated a closer examination of the details.

f. Operations – Production Quotas

⁶²¹ 46 CFR 67.105, 46 CFR 69.19 & NVIC 11-93, encl 1

⁶²² Findings of Fact B.7.b(5)

⁶²³ USCG Marine Safety Center Technical Note 1-99, ch. 7

⁶²⁴ 50 CFR 648.4

⁶²⁵ Findings of Fact B.7.b(2)-(4)

⁶²⁶ 46 CFR 28.500

⁶²⁷ Findings of Fact B.8.a(4)

(1) The LADY MARY held more scallops on the morning of March 24th than during the Captain's previous voyages, but only by 500-600 pounds. The Shore Manager had set the target catch for the trip at 250 bags of scallops, which was 50 more than usual, to try and get a little more money to help pay a repair bill from earlier in March and to help pay for an outstanding fine.⁶²⁸ *This was one of many factors which contributed to the unsafe pre-casualty loaded condition.*

(2) As already mentioned in section C.4.e(1) above, the LADY MARY did not have any kind of stability analysis or survey. *If there was a formal assessment of the vessel, this defense would have given the Shore Manager and the Captain critical information regarding how much catch the vessel could safely hold.* This information could have been used to set the target catch amount for each voyage.

g. Operations – Maintenance

(1) The LADY MARY's lazarette space leaked and routinely had to be dewatered but this situation was not corrected by the Shore Manager or by any other parties of Smith & Smith Inc.⁶²⁹ A breach of a vessel's watertight envelope should be corrected, or at a minimum the source of the leak should be identified before the vessel begins another voyage. The Survivor indicated that this was an ongoing problem onboard the LADY MARY and the source was not confirmed⁶³⁰ which means *the leak was not addressed in a timely manner.* There could have been a variety of reasons for the leak, including damage to the hull from the scallop dredge, a leak in the rudder shaft packing, or a damaged or missing lazarette hatch cover gasket. Regardless of the cause, *the uncorrected problem demonstrated a lack of concern for safety and a lack of awareness of the importance of watertight integrity.*

(2) The Previous Captain testified that the Shore Manager always addressed repairs right away.⁶³¹ This means that *either the Shore Manager did not know about the leak in the lazarette, or he did not think that it needed to be repaired. If the Shore Manager did not know about the leak, then one possible defense would have been to have the Captain maintain a log to track items which needed repairs. If the Shore Manager and the Captain did not think that the lazarette leak needed to be repaired, then the unsafe precondition existed due to an awareness issue. The only defense to improve their appreciation for the importance of watertight integrity would be training or education. It is unknown whether the CFVS Examiner asked if there were any leaks during his exams, but this could have been another defense.* This, of course, would have relied on the honesty of the crew during the exam.

⁶²⁸ Findings of Fact B.3.a(4)

⁶²⁹ Findings of Fact B.7 h(9), B.9.i(6)(7)

⁶³⁰ Findings of Fact B.9.1(7)

⁶³¹ Findings of Fact B.8.b(2)

(3) The LADY MARY's stern ramp was not being used.⁶³² Therefore, it was not providing any additional benefit, there were reoccurring problems with it, and it provided a path for water to wash up onto the main deck. The Shore Manager typically addressed repairs right away and had repaired the broken port stern ramp stay wire many times,⁶³³ but he did not repair it before the voyage which began on March 18th. When the same component of a vessel breaks repetitively, it indicates some sort of systemic problem and the big picture really should be examined to identify the underlying issue. There was no evidence to indicate that the Shore Manager ever reconsidered the need for the stern ramp and whether it should be removed.

h. Operations – Safety Management

(1) There were multiple unsafe preconditions onboard the LADY MARY which compromised the watertight subdivision and allowed downflooding paths to remain relatively unobstructed. These included the cut out in the forward engine room bulkhead door, the open valve on the drain line between the lazarette and the engine room, the plywood shucking house door, the open aft bunkroom door, the open (or nonexistent) engine room door, the non watertight aft fish hold hatch, the lack of a cover on the forward fish hold hatch and the open lazarette hatch.⁶³⁴ *These unsafe conditions demonstrated a clear lack of concern for watertight subdivision and watertight integrity.*

(2) *The defense to prevent the watertight integrity issues described above would be training and education.* This would have raised awareness of the topic, and then the Captain or the Shore Manager may have taken action to reestablish watertight integrity and implemented practices to maintain it while the vessel was underway.

i. Material Resources - Suitability

(1) As discussed in Section C3, the independent electric bilge pump in the lazarette and the freeing port cover plates on the main deck created various unsafe preconditions. These items were not newly installed, which means that *it is highly likely that no one from Smith & Smith Inc. recognized that they were unsafe.*

(2) *Training and education would be the appropriate defense to prompt someone from Smith & Smith Inc. to recognize the hazards associated with the independent lazarette bilge pump and the freeing port cover plates.* Once Smith & Smith Inc. was aware of the situation, the lazarette pump could have been replaced with a pump that was connected to a through hull overboard discharge and hard wired to a power source, eliminating the outlet and the need to open the hatch during pumping operations. The freeing port cover plates could have been replaced by grates or netting (with any requisite increase in area to compensate for the partial blockage), thus allowing water to drain from the main deck while still retaining the catch onboard.

⁶³² Findings of Fact B.9 h(1-3)

⁶³³ Findings of Fact B.9 h(6)

⁶³⁴ Analysis C.3.f, h, i, j, k

(3) The EPIRB was improperly registered in NOAA's National Beacon Registration database,⁶³⁵ which was a latent unsafe precondition. This precondition existed due to an error made by the contractor who entered the beacon information into the database. One of the handwritten characters on the beacon registration form was unclear, and the contractor misread the character as a "0" instead of a "C."⁶³⁶

(4) *There was a defense available to prevent the error described in the paragraph above. Prior to sale of the EPIRB, the manufacturer printed the beacon's unique identifier number (UIN) on the registration form. The printed information was located right next to the handwritten UIN.⁶³⁷ It was unclear why the contractor relied on the handwritten characters to register the beacon, but this may have been due to the small size of the printed information.*

(5) *There were defenses in place which could have detected the EPIRB registration mistake prior to the activation of the device, but these defenses failed. The first line of defense was the LADY MARY's own management team, who affixed the original registration decal with the incorrect UIN to the EPIRB in January 2007. The management team then mistakenly confirmed the UIN as correct, renewed the registration and affixed a new decal with the same wrong UIN to the EPIRB in November 2008.⁶³⁸ The management team was not the only one who failed to notice the incongruent UIN's listed on the registration decal and on the abbreviated specifications label also affixed to the EPIRB. The incongruence was missed by the CFVS Examiner in July 2007 and July 2008 and by Coast Guard Boarding Officers during an underway boarding of the LADY MARY in February 2009.*

(6) *If the EPIRB had an internal GPS transponder, this would have been a defense to circumvent the improper registration of the EPIRB. If installed, an internal GPS would have provided the USMCC with a position of the initial alert from the EPIRB, and would have eliminated the delay in notification. This was an option made available by the manufacturer, but it was not a regulatory requirement and it was not contained in the LADY MARY's EPIRB.*

j. Organizational Climate and Procedures

(1) On paper, the Captain, Deckhand 1 and the Shore Manager all had key roles within Smith & Smith Inc. In practice, the Shore Manager really made most of the decisions within the company because he had considerably more fishing experience than the other two.⁶³⁹ This means that *the Shore Manager's decisions set the stage for the LADY MARY's operations and conditions.* For example, he set the objectives for the vessel and decided how much money to spend on maintenance and repairs.

⁶³⁵ Findings of Fact B.10.b(2) – (9) & Analysis C.3.m(1)

⁶³⁶ Findings of Fact B.10.b(3)

⁶³⁷ Findings of Fact B.10.b(3)(4)

⁶³⁸ Findings of Fact B.10.b(5)-(9)

⁶³⁹ Findings of Fact B.8.b(1)(2)

(2) The Shore Manager also made decisions regarding the management of personnel and equipment, and translated the organizational strategies into plans to carry out the operations and into concrete activities.⁶⁴⁰ *In general, the Shore Manager was conscientious and safety minded when making decisions regarding the LADY MARY since he made a number of changes that enhanced the safety of the crew, such as moving the winches to the upper deck to keep the scallop dredge cable away from the crew, and ensured that the vessel met the regulations and had all of the proper lifesaving gear onboard, and he immediately corrected deficiencies when identified.*⁶⁴¹

k. External Oversight - Regulations

(1) The regulations in 46 CFR Part 28 allowed the LADY MARY to substitute a satellite phone for the required radio capable of transmitting and receiving in the 2-4 MHz band.⁶⁴² Satellite phones, however, do not have the ability to receive urgent marine information broadcasts from the Coast Guard or meteorological warnings and forecasts. In addition, satellite phones are one-to-one, which means a vessel would need to dial the Coast Guard directly to notify them of a distress. Radios, on the other hand, allow an unlimited number of people to listen in to a transmission at the same time. *The Shore Manager testified that the LADY MARY had a single side band radio at one time, but when it broke he did not replace it, which was a latent unsafe condition.*

(2) *The only defense to change the practice of substituting satellite phones for 2-4 MHz capable radios would be to remove this provision from the regulations.*

(3) The regulations did not require the LADY MARY to have a formal survey or stability analysis.⁶⁴³ As mentioned in section C.4.e above, an independent check of the vessel modifications may have provided a defense against the unsafe pre-casualty loaded condition on the morning of March 24th. *Smith & Smith Inc. could have opted to hire an engineer on their own, or the NMFS could have required this to be done. Alternatively, another approach to establish this as a defense may be to update the Coast Guard regulations to make this a requirement for vessels less than 79 feet in length.*

(4) According to the testimony and evidence, *the LADY MARY was in full compliance with the applicable provisions of 46 CFR Subchapter C when the vessel sank, with the exception of the provision for drills and instruction.* The focus of the regulations in Subchapter C, for vessels such as the LADY MARY, is lifesaving equipment. There are a handful of provisions which address some preventative measures, such as machinery guards, alarms, navigational charts and equipment,⁶⁴⁴ *but for the most part, the regulations for the LADY MARY provided defenses which were only for use after a casualty occurred.* The vessel was not required to meet any requirements related to subdivision, stability or watertight integrity.

⁶⁴⁰ Findings of Fact B.8.b(1)-(4), B.8.c(1)(2)

⁶⁴¹ Findings of Fact B.8.b(2), B.8.g(1)

⁶⁴² 46 CFR 28.245

⁶⁴³ 46 CFR 28.500

⁶⁴⁴ Findings of Fact B.14.a(1)

(5) The Coast Guard's CFVS Exams were only designed to check that vessels comply with the equipment provisions of Subchapter C; the exams do not require a live demonstration of the crew's skills. As evidenced earlier in this report, *having the proper lifesaving gear onboard a vessel does not automatically guarantee that a crew member will be rescued after a casualty.*

(6) Safety is defined as a freedom from danger, risk or injury. Based on the two paragraphs above, *the Coast Guard's Commercial Fishing Vessel Safety Exams check some aspects of a vessel's safety, but they are not actually a comprehensive check of whether a vessel is free from danger, risk or injury. The LADY MARY successfully passed at least three Coast Guard CFVS Exams, which probably gave the Shore Manager a false sense of security that the LADY MARY was "safe". After the Coast Guard examined the vessel, the Captain, the crew and the Shore Manager may have been under the impression that no further action was needed to ensure the vessel's safety. If this was the case, then the CFVSE program is a failed defense.*

D. CONCLUSIONS

This section contains the final investigative conclusions.

a. The Casualty

(1) The LADY MARY sank between 0519 and 0539, approximately 60 NM ESE of Cape May, New Jersey on March 24, 2009.

(2) The LADY MARY did not capsize, nor did the vessel sink due to a fire or explosion.

(3) There was no evidence that any other vessel was at fault for the chain-of-events that eventually sank the LADY MARY.

(4) The damage observed on the LADY MARY's rudder, propeller, and stern ramp, with the exception of the port stern ramp stay, occurred when the vessel struck the ocean floor.

(5) The final drag and haul back of the scallop dredge concluded between 0001 and 0103 on the morning of March 24th. The LADY MARY drifted between 0103 and 0510.

(6) The LADY MARY's load of scallops on the morning of March 24th was typical of what the vessel usually carried.

(7) Between 0001 and 0500 the crew opened the lazarette hatch and rigged the space for dewatering. It is unlikely that this was part of a routine operation.

(8) After the lazarette was opened, sea water likely shipped onto the main deck and downflooded the space between 0117 and 0500.

(9) The loss of buoyancy due to the flooding lazarette, coupled with an inability to rapidly shed water from the main deck due to partially blocked freeing ports, submerged the main deck significantly below the static waterline and enabled additional seawater to ship onto the main deck. This combination of factors facilitated a port list and allowed water to enter the deck house through the non-watertight shucking house door.

(10) Due to a lack of watertight integrity and ineffective internal subdivision, the engine room, and eventually the other watertight compartments, flooded.

(11) When the Survivor awoke at approximately 0500 the flooding was uncontrollable and the LADY MARY could not be saved.

(12) A frantic Mayday was broadcast from the LADY MARY on VHF Channel 16 just before 0514 on March 24, 2009.

b. The Crew

(1) Of the LADY MARY's seven man crew, there was one survivor. Four crewmembers were recovered deceased. Two deckhands remain missing and are presumed dead.

(2) The Survivor donned a survival suit and preserved his body heat by first floating on his back and then by getting his torso out of the water. These actions kept him relatively dry and doing so lengthened his survival time.

(3) The Captain's and Deckhand 1's survival times were significantly shorter because they did not sufficiently preserve their body heat and eventually drowned. The loss of body heat was likely due to a combination of cold water immersion⁶⁴⁵ and improperly donned survival suits which allowed water entry.

(4) Since neither Deckhand 2 nor Deckhand 3 donned a survival suit, they died shortly after the LADY MARY sank.

(5) It is highly likely that Deckhands 4 and 5 did not don survival suits and also died shortly after the LADY MARY sank.

(6) The sinking was survivable because the vessel was outfitted with a full complement of functioning life saving equipment and there was time for the Captain or crew to broadcast a coherent Mayday, press one of the DSC alert buttons, or launch a flare.

(7) The Captain and the crew were unprepared to deal with emergency situations, which negatively affected their ability to broadcast a successful mayday, launch flares, successfully don survival suits, or successfully utilize the life raft.

c. EPIRB

(1) The LADY MARY's EPIRB operated properly on the morning of March 24th; however, the start of the rescue mission was delayed by one hour and twenty-seven minutes (0540-0707) because the EPIRB was improperly registered in NOAA's National Beacon Registration database.

(2) Without the delay, the chances of survival for the Captain and Deckhand 1 would have increased.

(3) Without the delay, it is likely that Deckhands 2, 3, 4 and 5 still would have perished because they did not have survival suits on.

d. Coast Guard Actions

⁶⁴⁵ COMDTINST M16130.2E

(1) The first three UMIBs issued by Sector Delaware Bay did not contain the position and geographic location of the activated EPIRB even though that information was known at the time. This rendered the broadcasts meaningless to anyone who heard them.

(2) The UMIBs broadcast by Sector Delaware Bay should have been made on the 2182 KHz frequency in order to be reliably heard 65 NM offshore in the vicinity of the LADY MARY.

(3) The Communications Watch Stander handling the LADY MARY case on the morning of March 24th had trouble managing several activities at once and did not seek assistance. He either did not fully understand USCG policy regarding the effective range of the VHF tower, or did not remember that information.

(4) While Sector Delaware Bay made a number of execution errors in issuing their UMIBs, it is highly unlikely that these errors contributed to the loss of the LADY MARY's crewmembers.

(5) With the exception of the UMIB errors, as noted in the paragraphs above, all of the Coast Guard actions pertaining to the LADY MARY were appropriate and in accordance with standard operating procedures.

e. Vessel History

(1) The vessel modifications completed in 2001, which brought the vessel's tonnage into compliance with the NMFS 10-10-20 rule, did not contribute to the casualty.

(2) Between 2001 and 2009, there were a number of vessel modifications intended to increase crew comfort, vessel productivity and safety. The members of Smith & Smith Inc. relied on their industry experience and personal judgment to oversee these vessel modifications. While in general, the Shore Manager was conscientious and safety minded when making decisions regarding the LADY MARY, the cumulative effect of these modifications subtly lowered existing safety margins.

(3) Prior to the March 2009 voyage, the LADY MARY's lazarette routinely leaked due to an unknown source.

f. Preconditions

(1) Taken alone, any one of the unsafe preconditions probably would not have caused the LADY MARY to sink. When taken in some form of combination, however, and when coupled with the unsafe decisions detailed in the section below, the preconditions led to the vessel sinking and the loss of the crew.

(2) The following unsafe preconditions existed onboard the LADY MARY, and may have contributed to the casualty:

- (a) Captain's lack of experience and ability to handle rough weather and new situations;
- (b) Captain's non-receptive demeanor and difficulty controlling his temper;
- (c) Captain and crew's lack of training for emergency situations;
- (d) Captain and crew's likely fatigue;
- (e) Captain and crew's lack of awareness, which was due to the fact that they were likely asleep for some time period between 0117 and 0500;
- (f) Language barrier for at least three of the crew members;
- (g) ██████████ marijuana use during the March 18th - 24th period;
- (h) Vessel's pre-casualty loaded condition, including cumulative effects of modifications, consumables and catch on the morning of March 24th ;
- (i) Stern ramp, which provided a possible avenue for waves to wash onto the main deck;
- (j) Routine flooding of the lazarette, which required regular dewatering while underway;
- (k) Independent electric bilge pump in the lazarette, which could not be used without removing the hatch cover and was plugged into an outlet located within the space;
- (l) Solid freeing port covers, which did not readily permit the main deck to drain;
- (m) Relatively unobstructed downflooding path between the main deck and the engine room;
- (n) Lack of a watertight hatch on the fish hold;
- (o) Compromised watertight integrity for three of the LADY MARY's compartments;
- (p) Lack of a radio to receive critical information broadcasts when operating outside of the range of shore based VHF towers;
- (q) Improper EPIRB registration; and the
- (r) Weather.

(3) The following unsafe conditions were identified during the investigation, but did not contribute to the LADY MARY's sinking:

- (a) A large deep draft vessel transited through a densely populated fishing area at a speed of almost 20 knots;
- (b) The rudder had fatigue cracks due to a missing rudder shoe, or being loose in the rudder shoe; and
- (c) The aft water tanks drained into the lazarette space.

g. Unsafe decisions

- (1) The decision to dewater the lazarette using the independent electric bilge pump was unsafe because it required the lazarette hatch to remain open.
- (2) The decision to leave one main deck freeing port closed and one freeing port 75% closed, with no catch on deck that needed to be retained, was unsafe.

(3) The decision to let the LADY MARY drift given the preconditions and the unsafe decisions described in paragraphs g(1) and (2) above, was unsafe.

(4) The unsafe acts and decisions made on the morning of March 24th were human errors, and more specifically planning errors. The Captain and the crew intended to execute the decisions and actions described above, but the decisions and actions were inappropriate for the situation at hand due to the preconditions.

(5) On the morning of March 24th, the unsafe decisions made onboard the LADY MARY were all due to biases, which revealed a lack of knowledge, judgment and aptitude on the part of the Captain and the crew.

h. Missing and failed defenses

(1) A number of missing or failed defenses, if employed, likely would have interrupted the sequence of events that sank the LADY MARY and killed six crew.

(2) The following missing or failed operational defenses could have, or may have, been employed onboard the LADY MARY on the morning of the sinking:

- (a) Maintaining a vessel orientation to reduce or eliminate chances of taking water on deck;
- (b) Opening the freeing ports, before or after water shipped on the main deck;
- (c) Closing the lazarette hatch cover, before or after water shipped on the main deck;
- (d) Using the fixed engine room bilge pumping system to dewater the lazarette;
- (e) Constantly monitoring the vessel's condition and situation;
- (f) Closing the aft shucking house door;
- (g) Closing the aft bunk room door;
- (h) Closing the valve on the lazarette drain pipe;
- (i) Using flares to alert other vessels of distress;
- (j) Using VHF voice communications, DSC to alert vessels (or shore) of distress;
- (k) Properly using lifesaving equipment, including survival suits and life raft; and
- (l) Establishing longer rest periods during the voyage.

(3) The high water alarms were engineering defenses which failed to alert the entire crew of the flooding on the morning of March 24th. It was not possible to determine if the alarms were broken, silenced, or disconnected.

(4) In addition to the missing and failed defenses listed above, the direction finding equipment in Coast Guard Rescue 6530 did not receive the 406 MHz signal from the EPIRB. While this defense was identified during the investigation, it did not contribute to the casualty.

(5) The following missing or failed training defenses could have, or may have, been used onboard the LADY MARY prior to the morning of the sinking:

- (a) On-the-job training for the Captain;
- (b) Formal instruction for the Captain, involving topics related to his duties;
- (c) Conducting the required instruction, drills and safety orientations;
- (d) Awareness of the potential hazards associated with the unsafe conditions and situations;
- (e) Sufficient training for the Captain and crew on how to handle emergency situations;
- (f) Awareness of the importance of rest and the impacts of fatigue; and
- (g) Awareness of the importance of watertight integrity and subdivision.

(6) The following missing or failed workplace defenses could have, or may have, been used to prevent unsafe preconditions from developing onboard the LADY MARY:

- (a) Emphasizing the importance of completing mandatory instruction, drills and safety orientation;
- (b) Obtaining consultation or assessment from an outside (non-family) party regarding the decision to put the Captain in charge;
- (c) Creating a formal hiring process for crew members;
- (d) Emphasizing the importance of rest and the impacts of fatigue;
- (e) Enforcing or adhering to the Shore Manager's drug policy;
- (f) Requiring a log to track items for repair;
- (g) Installing a safer lazarette bilge pumping arrangement;
- (h) Repairing breaches of the vessel's watertight integrity and subdivision;
- (i) Emphasizing the importance of watertight integrity and subdivision; and
- (j) Carefully checking EPIRB registration decals prior to affixing them to the beacon.

(7) There were a number of organizational defenses which were missing, and if they had existed prior to the casualty, they could have been used to prevent unsafe preconditions from developing onboard the LADY MARY. These missing defenses included establishing requirements for:

- (a) Logs to document instruction, drills and safety orientations;
- (b) The crew to be present for CFVSEs;
- (c) Minimum competency standards for the Captain or the crew;
- (d) Formalized training for the Captain or the crew;
- (e) A method to prevent or detect drug use onboard the vessel;
- (f) Stability provisions pertaining to the vessel;
- (g) A formal survey or stability assessment;
- (h) Insurance; and
- (i) An internal GPS transponder on the EPIRB.

(8) There were a number of organizational defenses, in the form of regulatory requirements, which were applicable but failed to help prevent unsafe preconditions from developing onboard the LADY MARY. These failed defenses included requirements for:

- (a) Conducting instruction, drills and safety orientations for the crew (46 CFR 28.270);
- (b) Obtaining tonnage remeasurement after vessel modifications (46 CFR 69.19);
- (c) Keeping the vessel at the same tonnage (50 CFR 648.4);
- (d) Printing the EPIRB UIN on the registration form (47 CFR 80.1061); and
- (e) Installing a 2-4 MHz radio or a satellite phone onboard (46 CFR 28.245).

(9) A missing organizational defense was an analysis to compare the safety benefits of scheduling longer rest periods to the costs of additional underway time.

(10) The Coast Guard had opportunities to detect the incorrect EPIRB registration, but did not. This was another missing organizational defense.

(11) The existing regulations in 46 CFR Subchapter C were an organizational defense which did a good job of addressing survivability and measures to survive a casualty, but did not address casualty prevention measures for the LADY MARY.

(12) The Coast Guard's CFVSE program was an organizational defense which likely gave the Shore Manager a false sense of security that no further action was needed to ensure the vessel's safety.

E. SAFETY AND ADMINISTRATIVE RECOMMENDATIONS

This section contains Safety Recommendations aimed at improving the system and preventing reoccurrence. In addition, there are two Administrative Recommendations pertaining to the Investigation. The recommendations are not ranked in order of importance. Also, many recommendations refer to an individual in charge of a commercial fishing industry vessel. In the LADY MARY's case, the Captain was the individual in charge.

1. The Commandant should expand the watertight and weathertight integrity requirements in 46 CFR 28.560 to cover all documented commercial fishing industry vessels operating beyond three nautical miles.

46 CFR 28.560 establishes a standard for watertight and weathertight closures and coamings on all decks and bulkheads exposed to the weather, but it doesn't apply to commercial fishing industry vessels that are less than 79 feet in length. No standards exist for fishing vessels like the LADY MARY, who are smaller but operate in the same areas and face the same dangers. Developing standards for watertight and weathertight integrity would prevent unsafe conditions which could lead to downflooding.

2. The Commandant should establish a requirement for the periodic inspection of watertight and weathertight openings on all documented commercial fishing industry vessels operating beyond three nautical miles, as well as a requirement to record who conducted the inspection, how it was done, and when it was completed.

Requiring owners, individuals in charge, crew members, or other qualified persons to systematically inspect and record the condition of openings serves to emphasize their importance and establishes accountability. It would also permit the early detection of potential gaps in watertight integrity and allow time for repairs to prevent unsafe conditions.

3. The Commandant should amend 46 CFR 28.65(b)(9) to include weathertight closures on the list of especially hazardous conditions, in addition to watertight closures.

Missing and inoperable watertight closures are deemed especially hazardous conditions that could result in voyage termination. Yet, no mention is made of weathertight closures, even though their ineffectiveness could also result in an especially hazardous condition. Amending 46 CFR 28.65(b) to include missing and inoperable weathertight closures would give the Coast Guard the authority to require this unsafe condition be corrected before allowing a voyage to continue.

4. The Commandant should reemphasize the importance of having Boarding Officers verify the operability and effectiveness of watertight and weathertight closures, with a focus on those closures located at or below the main deck.

Boarding Officers need to be able to recognize this unsafe condition and have it corrected before allowing a voyage to continue, especially onboard commercial fishing industry vessels that are less than 79 feet in length, because the regulations do not include any provisions for watertight integrity on these vessels. Underway checks would detect gaps in watertight integrity or unsafe operating practices, such as routinely keeping a watertight closure open.

5. The Commandant should instruct dockside Safety Examiners to verify the operability and effectiveness of watertight and weathertight closures, with a focus on those closures located at or below the main deck.

Safety Examiners need to verify the operability and effectiveness of watertight and weathertight closures as part of the dockside safety examination. Checking the closures dockside would allow for the early identification and correction of unsafe conditions. Issuance of a Safety Decal or Certificate of Compliance should be contingent upon the soundness of the closures.

6. The Commandant should develop subdivision standards for all documented commercial fishing industry vessels operating beyond three nautical miles.

46 CFR 28.580 establishes subdivision standards, but it doesn't apply to commercial fishing industry vessels that are less than 79 feet in length. No standards exist for fishing vessels like the LADY MARY, who are smaller but operate in the same areas and face the same dangers. Developing standards for subdivision would limit the effects of unintentional flooding and allow vessels in a damaged condition to remain afloat longer.

7. The Commandant should expand the freeing port requirements in 46 CFR 28.555 to cover all documented commercial fishing industry vessels operating beyond three nautical miles.

46 CFR 28.555 establishes a standard for freeing ports in bulwarks, but it doesn't apply to commercial fishing industry vessels that are less than 79 feet in length. No standards exist for fishing vessels like the LADY MARY, who are smaller but operate in the same areas and face the same dangers. Expanding the freeing port requirements would establish minimum openings to allow sea water to rapidly drain from the deck, which would reduce the potential for free surface effect, loss of freeboard, and unintentional downflooding.

8. The Commandant should add closed or blocked freeing ports to the list of especially hazardous conditions in 46 CFR 28.65(b)(9).

Amending 26.65(b) to include closed or blocked freeing ports would give the Coast Guard the authority to require this unsafe condition be corrected before allowing a voyage to continue.

9. The Commandant should work with the Commercial Fishing Safety Advisory Committee to develop freeing port cover design concepts which retain catch onboard while still allowing rapid clearing of sea water from the main deck.

Blocking main deck freeing ports with solid steel covers is a dangerous practice, but a seemingly routine practice on some commercial fishing industry vessels. Alternative engineering controls are needed to allow water to run freely off the main deck, while at the same time retaining catch on deck.

10. The Commandant should expedite the rulemaking project(s) required by the Coast Guard Authorization Act of 2010, to require individuals in charge of commercial fishing industry vessels to pass an approved training program, and, to establish the requirements for these training programs.

According to the Coast Guard Authorization Act of 2010, the approved training programs must focus instruction on seamanship, stability, navigation, damage control, personal survival, emergency drills and communications, and weather. The Captain of the LADY MARY, who was the individual in charge, did not demonstrate proficiency in many of these subjects. The training would produce individuals in charge with better awareness of unsafe conditions and improved decision making capabilities. This provision of the Act must be implemented as soon as possible if future causalities are to be averted.

11. The Commandant should ensure that approved training programs for individuals in charge also include detailed information about the hazards of making vessel modifications without a stability analysis, the importance of maintaining watertight integrity, the use of Digital Selective Calling (DSC) features on VHF radios, the safety benefits of the Automatic Identification System (AIS), the importance of confirming Emergency Position Indicating Radio Beacon (EPIRB) registration information as correct and keeping it up to date, the hazards associated with fatigue, and the hazards associated with drug use.

The Captain of the LADY MARY did not demonstrate proficiency in these topics. Education and awareness of these topics would prevent unsafe conditions from developing, therefore the Coast Guard should incorporate these topics into the approved training program without delay.

12. The Commandant should develop a prototype training program for individuals in charge of fishing vessels that meets the intent of the Coast Guard Authorization Act of 2010, and Recommendations 10 and 11 above, while the training program requirements are in the process of being codified.

There are several benefits to establishing a prototype training program in advance of the Final Rule. The prototype could be published online or on paper, which would provide individuals in charge with some education and awareness of these critical topics before approved training programs are established. Better trained individuals in charge would help to prevent unsafe conditions from developing, which would result in fewer

casualties. The Commercial Fishing Safety Advisory Committee or other groups could provide feedback on the prototype training program, which would be useful to help improve the requirements.

13. The Commandant should establish specific, and stringent, training program criteria for recognizing and giving credit for recent past experience in fishing vessel operation, as allowed by the Coast Guard Authorization Act of 2010.

In the case of the LADY MARY, the on-the-job training (OJT) program, which is likely common to the industry, did not produce a competent and safety minded Captain. Therefore, OJT alone should not form the basis for allowing individuals in charge to receive credit for an approved training program.

14. The Commandant should establish a requirement for all commercial fishing industry vessel crew members to pass an approved basic safety training program prior to working onboard, and, establish the requirements for these training programs.

The Captain of the LADY MARY provided little, if any, training to the crew on how to use life saving equipment, make emergency broadcasts, launch distress signals, take action to mitigate flooding, manage damage control procedures, abandon ship, or take action for cold water survival. Yet by regulation, he was the only person responsible for making sure the crew understood how and when to use the survival equipment. In this case six crewmen died, one with a survival suit in his hands. This matter is too important to leave solely in the hands of individuals in charge, so crewmen should complete a basic survival training program taught by a trained instructor at least once before working on fishing vessels.

15. The Commandant should add a paragraph to 46 CFR 28.65 to establish that an especially hazardous condition exists if a crew cannot demonstrate familiarity with their duties and responses to the contingencies listed in 46 CFR 28.270(a).

Simply operating an uninspected fishing vessel in compliance with the life saving carriage requirements of 46 CFR 28 is meaningless unless the Captain and crew know how to use the equipment that is available to them. Familiarity with assigned duties and responses can only be achieved through safety orientations and with practice in the form of regular drills; otherwise the result may be ineffective or missing actions, as seen during the abandonment of the LADY MARY. Adding failure to comply with 46 CFR 28.270 to the list of especially hazardous conditions would give the Coast Guard the authority to require this unsafe condition be corrected before allowing a voyage to continue.

16. The Commandant should amend 46 CFR 28 to require the individual in charge of a commercial fishing industry vessel to keep a record of safety orientations, instruction and drills.

The Coast Guard Authorization Act of 2010 requires a record of instruction and drills, but safety orientations must also be recorded. Requiring individuals in charge to keep a record of safety orientations, instructions and monthly drills would emphasize their importance and establish accountability.

17. Boarding Officers and dockside Safety Examiners should conduct three point Emergency Position Indicating Radio Beacon (EPIRB) Unique Identifier Number (UIN) registration checks.

The three point check should compare the UIN registered in the National Beacon Registration (NBR) database with the UIN on the decal and the actual UIN coded into the EPIRB. For Safety Examiners, confirmation should occur before a Commercial Fishing Vessel Safety Decal or Certificate of Compliance is issued. This would ensure that emergency contact information is positively linked with an EPIRB and is instantly retrievable in the NBR Database upon detection of an alert.

18. The Radio Technical Commission for Maritime Services (RTCM) should add internal Global Positioning System (GPS) capability to the technical and performance standards found in the “RTCM Recommended Standards for 406 MHz Satellite Emergency Position Indicating Radio Beacons (EPIRBs).”

The COSPAS-SARSAT system could take up to ninety minutes to identify the location of an activated EPIRB if no position data is transmitted with the distress alert, even if it is correctly registered in the NBR database. Adding internal GPS capabilities to the Recommended Standards for EPIRBs would economically incorporate the best available technology to eliminate a potentially deadly delay.

19. NOAA should automate their internal process for entering Unique Identifier Numbers in the National Beacon Registration database.

NOAA should automate their internal process to eliminate the potential for transcription and/or key stroking errors when entering UINs into the NBR database. This would ensure that every UIN entered into the database is accurate and positively correlated to a vessel and its emergency contact information.

20. Sector Delaware Bay should reevaluate their procedures for qualifying Communication Watch Standers and Operational Unit Controllers.

Sector Delaware Bay should review their procedures to ensure only Communication Watch Standers who fully understand Coast Guard policies and know the capabilities of the radio equipment they are guarding, stand the watch. Additionally, the Sector should review their procedures to make certain they employ Operational Unit Controllers that have the skills needed to effectively supervise the watch. This would result in better case management and fewer execution errors in the broadcasting of UMIBs.

21. The Commercial Fishing Safety Advisory Committee should explore the possibility of establishing incentives for commercial fishing industry vessels to voluntarily undergo third party surveys which address watertight integrity, internal subdivision, and other preventative safety measures.

A third party, non-regulatory, survey would have helped raise Smith & Smith Inc.'s awareness to the potential hazards associated with the LADY MARY's watertight integrity, and pre-casualty loaded condition, including the cumulative effect of the modifications, consumables and catch. Providing incentives would encourage owners of commercial fishing industry vessels to voluntarily undergo a survey, raising their awareness of unsafe conditions and allowing them to correct the conditions and prevent casualties from occurring.

22. The Commandant should actively promote implementation of the Crew Endurance Management (CEM) System to identify and control crew endurance risk factors onboard commercial fishing industry vessels.

Fatigue likely contributed to the Captain and crew's reduced situational awareness and operational decision making capabilities. Promoting the use of the Crew Endurance Management System would give crew members of commercial fishing industry vessels the opportunity to reduce their risk of fatigue-related accidents.

23. The Commandant should seek authority to mandate a licensing program for individuals in charge of all documented commercial fishing industry vessels operating beyond three nautical miles.

A licensing program would make certain that individuals in charge pass at least one drug test, had relevant sea-going experience and possess minimum competency standards.

24. The Commandant should require pre-employment, random, and reasonable cause drug testing for those crew members who are in safety sensitive positions onboard documented commercial fishing industry vessels operating beyond three nautical miles.

Because individuals in charge and crew are not required to hold Merchant Mariner Credentials, the only instance when they are drug tested is after a casualty. Instituting a pre-employment, random, and reasonable cause drug testing program covering all crew members who are in safety sensitive positions would reduce the risk to crews and vessels.

25. The Commandant should amend 46 CFR 28.245(c) to remove the provision which allows satellite communication capability to substitute for radiotelephone transceivers.

Satellite phones cannot be relied upon to instantly alert the Coast Guard and other vessels of a distress, since the user would have to directly dial the intended recipient. Radios on the 2-4 MHz band give fishing vessels operating beyond line-of-sight radio

communications the ability to broadcast a distress and communicate directly with many Coast Guard stations and vessels at once. Radios are also able to receive distress calls and monitor Urgent Marine Information Broadcasts and weather warnings.

26. The Commandant should educate fishermen on the drawbacks of using satellite communication capability to substitute for radiotelephone transceivers.

For the same explanation offered in Recommendation 25 above, satellite phones cannot be relied upon to instantly alert the Coast Guard and other vessels of a distress; therefore commercial fishermen need to be informed of the shortcomings of using satellite capability as a means for emergency communications.

27. The Commandant should work with the National Marine Fisheries Service to establish a Memorandum of Understanding that allows the issuance of Urgent Marine Information Broadcasts over the Vessel Monitoring System.

The VMS is a satellite based system which allows two-way communications with vessels operating beyond line of sight radio horizons. Establishing a MOU that permits use of the VMS for disseminating UMIBs to offshore fishing vessels would help get critical information to fishing vessels by establishing another means of communication.

28. The Commandant should reemphasize the importance of COMDTINST 16130.2E, section 2.6.1.3, which says that Urgent Marine Information Broadcasts should give both a latitude and longitude and a geographic description, and those units that issue UMIBs should work with the National Marine Fisheries Service to identify the geographic descriptions of common fishing areas for inclusion in the UMIBs.

UMIBs that contain recognizable geographic descriptions in addition to latitude and longitude would help fishermen quickly identify information which applies to them and take appropriate action, such as rendering assistance to a vessel in distress.

29. The Commandant should amend 46 CFR 28.265 to require that emergency instructions be written and posted in languages understood by the crew.

Posting Emergency Instructions and Procedures for Making a Distress Call in languages understood by the crew is an essential step in making sure everyone on board understands their roles and the procedures to be taken during an emergency situation. An understanding of roles and procedures would result in better organization and less confusion, and would increase chances of survival during life threatening situations.

30. The Commandant should educate commercial fishing industry vessel owners about the benefits of installing Automatic Identification System transceivers, and encourage their use.

Though not a factor in this casualty, commercial fishing vessels share the same waters as deep draft merchant vessels; sometimes in close proximity. Automatic Identification System transceivers and vigilant watch keeping would create early awareness and minimize the chance of collision.

31. The National Oceanic and Atmospheric Administration should demarcate Limited Access Areas on nautical charts.

Identifying the boundaries of Limited Access Areas, which typically have a dense concentration of fishing vessels during open seasons, provides a ready reference for commercial fishermen, merchant mariners, and the Coast Guard. The demarcation would be particularly useful as a reference when issuing UMIBs and BNTMs, as well as for voyage and SAR planning purposes.

32. Districts should publish a Broadcast Notice to Mariners, when appropriate, for geographic regions expected to have a dense concentration of fishing vessels.

Though not a factor in this case, timing Broadcast Notice to Mariners with the dates and locations of concentrated fishing vessel activity would help prevent close quarter situations from developing between deep draft merchant vessels and commercial fishing industry vessels.

33. The Commandant should establish stability requirements for all documented commercial fishing industry vessels operating beyond three nautical miles.

46 CFR 28 Subpart E establishes stability requirements for commercial fishing vessels over 79 feet in length. No standard exists for fishing vessels like the LADY MARY, who are smaller but operate in the same areas and face the same dangers. Establishing stability requirements for all documented commercial fishing industry vessels which operate beyond three nautical miles would raise the overall level of safety and awareness by individuals in charge; most notably by prompting stability calculations, the issuance of a stability letter, and instructions for what to do with substantially altered vessels.

34. The National Institute for Occupational Safety and Health should conduct an analysis to compare the safety benefits of scheduling longer rest periods to the costs of additional underway time, and share this information with commercial fishing industry vessels.

NIOSH should conduct this analysis and share the results with commercial fishermen so that they have a full appreciation of the risks and a better understanding of the potential consequences of sacrificing rest with the intent of shortening the voyage.

35. The National Marine Fisheries Service and Coast Guard Safety Examiners should educate the owners of commercial fishing industry vessels which are required to use the Vessel Monitoring System (VMS) about the benefits of selecting a unit with a Panic Button.

Selecting a VMS unit with the optional Panic Button would provide redundancy for communicating a distress. It would allow commercial fishermen to instantly send a distress signal with GPS coordinates to a VMS vendor operations center that would then relay the alert to the Coast Guard. It is especially important to inform commercial fishermen utilizing satellites phones in lieu of radiotelephones about the benefits of this feature when selecting a VMS vendor and unit.

36. If not doing so already, dockside Safety Examiners should educate owners and individuals in charge of commercial fishing industry vessels on the hazards of making vessel modifications without a stability analysis, the importance of maintaining watertight integrity, the use of Digital Selective Calling (DSC) features on VHF radios, the Coast Guard's Rescue 21 system, the safety benefits of the Automatic Identification System (AIS), the importance of verifying correct Emergency Position Indicating Radio Beacon (EPIRB) registration information, the hazards associated with fatigue, and the hazards associated with drug use.

The Shore Manager and Captain of the LADY MARY were uninformed on these matters and it led to tragic consequences. The courtesy safety examination is a good forum for discussing these topics and if done well, it would help eliminate unsafe conditions and result in owners and individuals in charge with better knowledge and understanding for decision making.

37. Dockside Safety Examiners should verify that any VHF radio with Digital Selective Calling (DSC) features on a commercial fishing industry vessel has been programmed with the appropriate Maritime Mobile Service Identity (MMSI) number, and, where possible, connected to the vessel's Global Positioning System (GPS) unit.

DSC radios imputed with the MMSI numbers and GPS are the simplest and fastest method for most fishing vessels to initiate a Coast Guard rescue. Inputting these two features into the radios has the added benefit of providing the Coast Guard with an identity and exact location of the distress. Safety Examiners should specifically inform individuals in charge of its benefit and require the inputs before issuing a Safety Decal or a Certificate of Compliance.

38. The Commandant should add a new provision to 46 CFR part 28 stating that all documented fishing vessels are subject to the regulations contained in 46 CFR Subchapter G (Documentation and Measurement of Vessels).

Amending 46 CFR 28 to include this provision would direct owners and individuals in charge to Subchapter G and would remind them of the need to inform an authorized measurement organization of their intent to structurally alter their vessel or change the use of a space within the vessel. This may prompt a tonnage survey which would prevent latent unsafe conditions.

39. Dockside Safety Examiners should work with owners and individuals in charge of a commercial fishing industry vessel to assess whether any modifications have been made to the vessel, and if so, remind the individual that tonnage remeasurement may be required under the provisions of 46 CFR 69.19.

For the same reasons explained in Recommendation 38 above, dockside Safety Examiners should inform owners and individuals in charge of the need to inform the Coast Guard or an authorized measurement organization whenever they intend to structurally alter their vessel or change the use of a space within the vessel.

40. Dockside Safety Examiners should require the individual in charge and the crew of a commercial fishing industry vessel to demonstrate familiarity with their duties and responses to the contingencies listed in 46 CFR 28.270(a) prior to issuing a Safety Decal or a Certificate of Compliance.

It is impossible for Safety Examiners to evaluate the crew's response to emergencies or their familiarity with emergency duties if the crew is not present for safety examinations. Requiring crews to demonstrate their skills would give Safety Examiners an opportunity to provide vital feedback that increases the knowledge and competencies of those who face the greatest risk.

41. The Commandant should ensure that Fisheries Management Council meetings in all regions are attended by Coast Guard representatives from both the Living Marine Resources program and the Prevention program.

If not already doing so, representatives from the Coast Guard Prevention program should actively participate in Fisheries Management Council meetings in order to share information, such as marine casualty data, lessons learned and best practices.

42. The Commandant should work with the National Institute for Occupational Safety and Health (NIOSH) to implement a Scientific Safety Assessment Process for individual fisheries before developing alternative safety compliance programs required by the Coast Guard Authorization Act of 2010.

NIOSH has proposed a six step plan to assess the safety of individual fisheries. This process would identify the specific risks associated with individual fisheries, which is vital information for developing alternative safety compliance programs to mitigate those risks.

43. The Commandant should educate owners and individuals in charge of commercial fishing industry vessels about the limited scope of safety examinations.

46 CFR Subchapter C did not address many of the unsafe preconditions that factored into the sinking of the LADY MARY and the loss of six crew members. Informing owners and individuals in charge of the limited scope of the safety examination would prevent a

false sense of security and remove the perception that no further action is needed after a safety decal is issued.

44. Captain [REDACTED] should receive a Public Service Award for his exceptional efforts in leading multiple dives on the sunken LADY MARY to examine the vessel and to recover a missing crew member, and for providing video and still photographs which were invaluable to the investigation of the casualty.

45. The Commandant should close this investigation.

Appendix (a)

LIST OF ACRONYMS

ABS	American Bureau of Shipping
AIS	Automatic Identification System
BNTM	Broadcast Notice to Mariners
CESM	Cold Water Exposure Model
CFR	Code of Federal Regulations
CFVS	Commercial Fishing Vessel Safety
CFVSE	Commercial Fishing Vessel Safety Examination
CMG	Course Made Good
COD	Certificate of Documentation
COMDTINST	Commandant Instruction
COSPAS	Cosmicheskaya Sistema Poiska Avariynih Sudov (Russian for Space System for the Search of Vessels in Distress)
CPA	Closest Point of Approach
CPR	Cardiopulmonary Resuscitation
CPU	Central Processing Unit
D5	District 5
deg	Degree
DF	Direction Finding
DOG	Deployable Operations Group
DSC	Digital Selective Calling
EGC	Enhanced Group Call
EPIRB	Emergency Position Indicating Radio Beacon
F	Fahrenheit
FCC	Federal Communications Commission
F/V	Fishing Vessel
GEO	Geostationary
GMT	Greenwich Mean Time
GPS	Global Positioning System
GRT	Gross Register Tons (refers to the gross tonnage assigned under the regulatory measurement system)
HF	High Frequency
hp	Horsepower
HRU	Hydrostatic Release Unit
HYCOM	Hybrid Coordinate Ocean Model

ID	Identification
IMO	International Maritime Organization
kHz	Kilohertz
kts	Knots
kW	Kilowatt
LANTAREA	Atlantic Area
lbs	Pounds
LEO	Low-Earth Orbiting
LOA	Length Overall
LUT	Local User Terminal
MBI	Marine Board of Investigation
MCC	Mission Control Center
MDSU-2	Mobile Diving and Salvage Unit Two
MF	Medium Frequency
MHz	Megahertz
MISLE	Marine Information for Safety and Law Enforcement
MMSI	Maritime Mobile Service Identity
mph	miles per hour
MSST	Maritime Safety and Security Team
M/V	Motor Vessel
N	North
NAM	North American Mesoscale
NBR	National Beacon Registration
NJSP	New Jersey State Police
NM	Nautical Mile
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOC	Network Operations Center
NRT	Net Register Tons (refers to the net tonnage assigned under the regulatory measurement system)
NT	Net Tonnage
NTSB	National Transportation Safety Board
NVDC	National Vessel Documentation Center
NWS	National Weather Service
ON	Official Number
OUC	Operational Unit Controller
psi	Pounds per square inch
PTO	Power Take-off
QASPR	Qualcomm Automatic Satellite Position Reporting

RAM	Random Access Memory
RCC	Rescue Coordination Center
ROV	Remote Operated Vehicle
RPM	Revolutions Per Minute
RTCM	Radio Technical Commission for Maritime Services
SAR	Search and Rescue
SARSAT	Search and Rescue Satellite-aided Tracking
SSAI	Science Systems and Applications, Incorporated
SSB	Single Side Band
SDO	Sector Duty Officer
SMG	Speed Made Good
SMIB	Safety Marine Information Broadcast
SOLAS	Safety of Life at Sea Convention
SOTDMA	Self-Organizing Time Domain Multiple Access
THC	Tetrahydrocannabinol
THCC	Carboxy-THC
UIN	Unique Identifier Number
UMIB	Urgent Marine Information Broadcast
USCG	United States Coast Guard
USCGC	United States Coast Guard Cutter
USMCC	United States Mission Control Center
USNS	United States Naval Ship
V	Volts
VHF	Very High Frequency
VMS	Vessel Monitoring System
W	West

Appendix (b)

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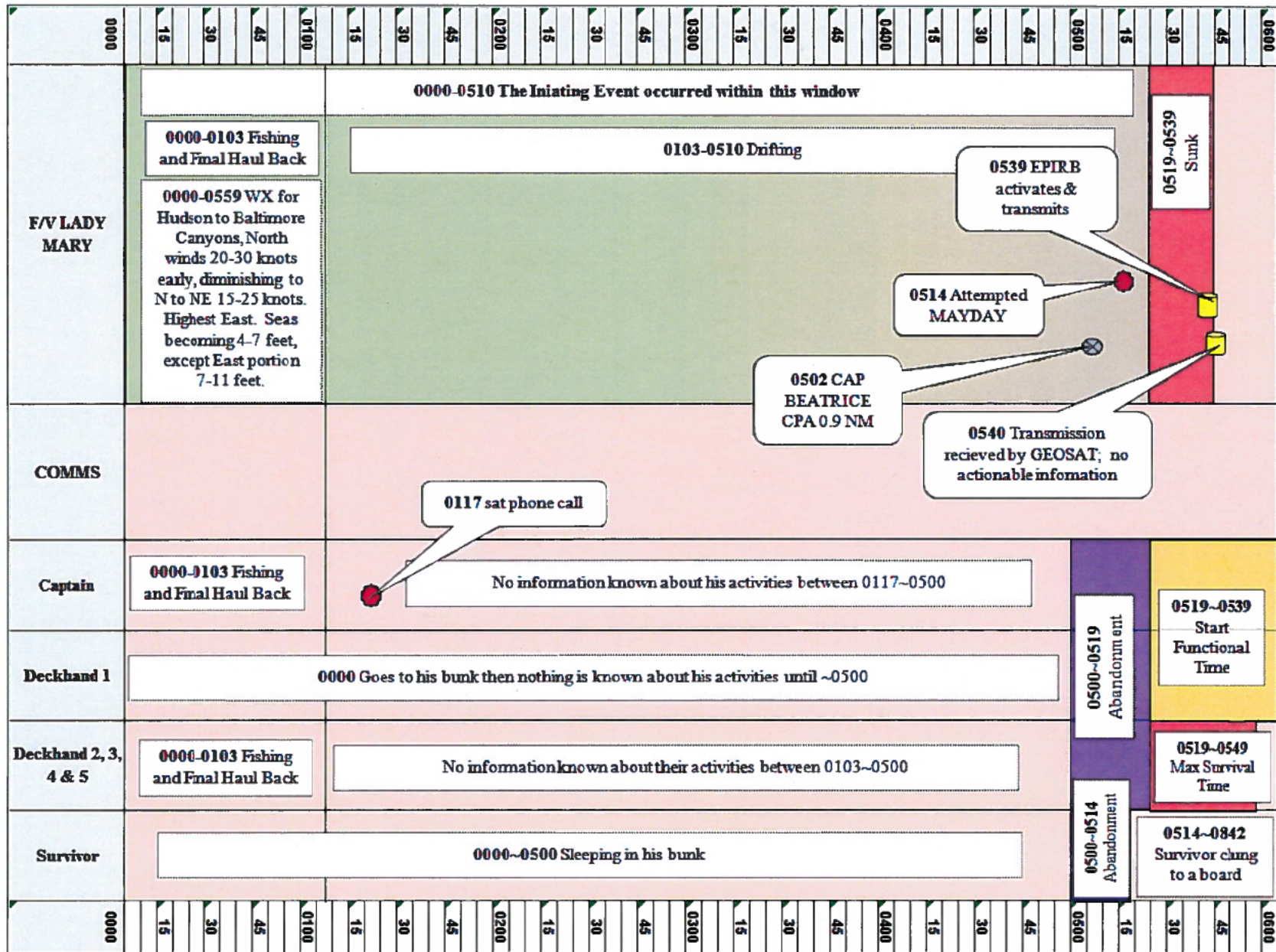
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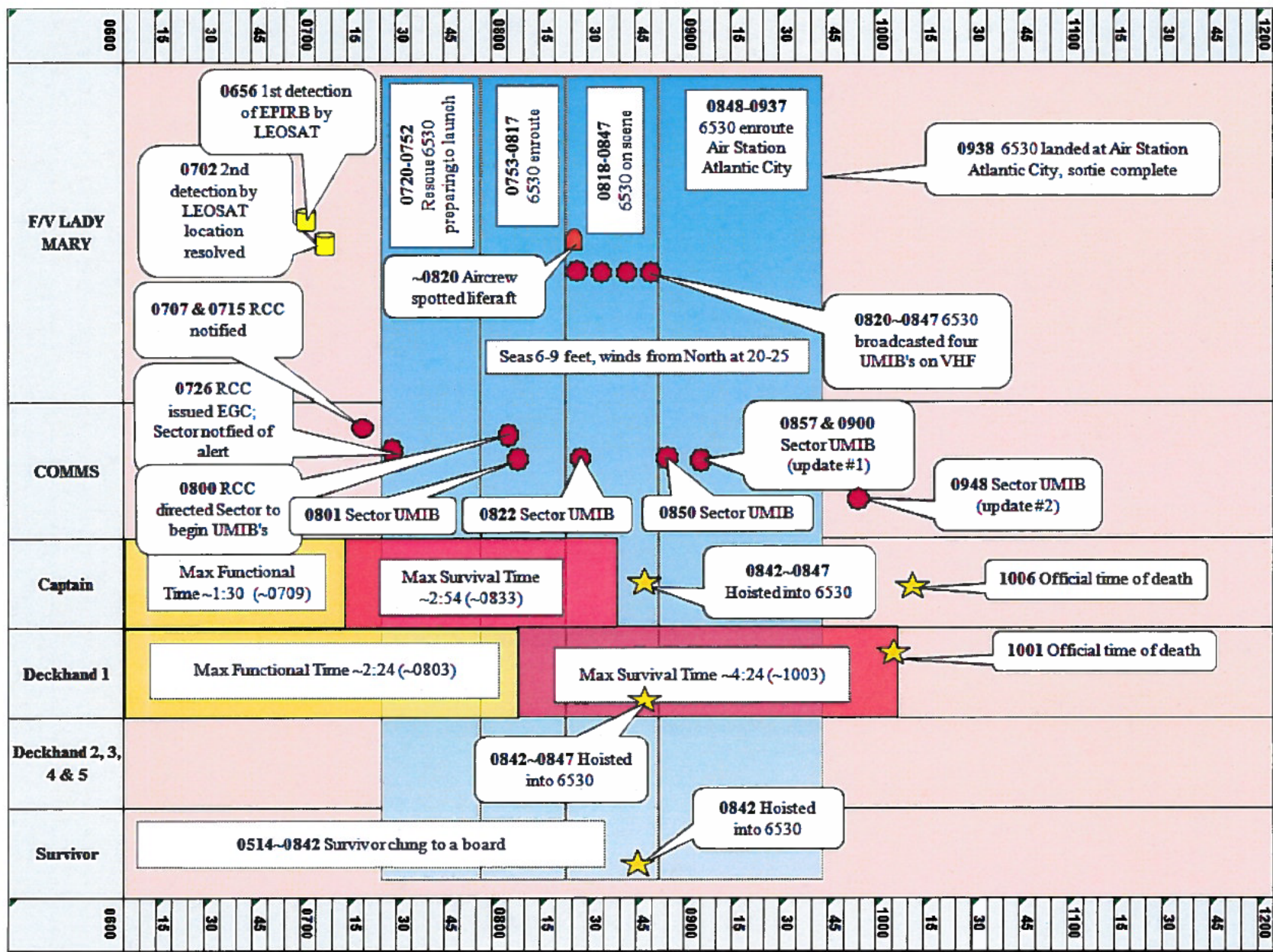
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Appendix (d)





Appendix (e)

NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering
Materials Laboratory Division
Washington, D.C. 20594



April 16, 2010.

MATERIALS LABORATORY FACTUAL REPORT

Report No. 10-006

A. ACCIDENT

Place : Cape May, New Jersey.
Date : March 24, 2009.
Vehicle : F/V Lady Mary.
NTSB No. : DCA09LM010.
Investigator : [REDACTED], OMS.

B. COMPONENTS EXAMINED

1. Rudder recovered from the fishing vessel "Lady Mary".
2. Dive photographs of the propeller.
3. Dive photographs of the ramp.

C. DETAILS OF THE EXAMINATION

The rudder recovered from the Lady Mary was received on a pallet and wrapped in tarps. The upper tarp was removed and the rudder lifted up to be oriented as installed on the vessel for Figures 1, 2, and 3. Figure 1 illustrates the port side of the rudder with the forward (FWD) and up (UP) directions indicated. Figure 2 illustrates the starboard side of the rudder with the FWD and UP directions indicated. Figure 3 illustrates the rudder looking directly aft with the UP direction indicated. Although the rudder itself was found a short distance aft of the vessel, it was still connected to the vessel by the chain identified in all three figures and later in Figure 25. The rudder was recovered by US Navy divers operating from a Military Sealift Command vessel with a US Coast Guard representative on board. Dive photographs were taken by a commercial diver, prior to the rudder recovery.

The pivot point of the rudder is a 4-inch diameter steel bar, approximately 81 inches long, which is identified as a rudder stock. The upper end of the stock is normally inserted into, and welded, to a flange which is bolted to a mating flange located under the vessel's stern, below the lazarette¹. The lower end is normally located in a bearing assembly, commonly referred to as a shoe, which is welded to a rearward extension of the keel, commonly referred to as a skeg. A 1/2-inch thick steel plate, approximately 28 inches x 79 inches overall was welded to the rear of

¹ A lazarette is a below deck storage compartment at the rear of a boat often giving access to the inboard portion of the rudder assembly.

the stock and at its upper edge where it contacted the flange. A 1/2-inch thick steel plate approximately 8 inches x 74 inches was welded forward of the stock, and at its upper edge where it contacted the flange. The addition of the front plate produces what is referred to as a balanced rudder². Three 1/2-inch thick steel plates were welded on each side of the rudder to provide lateral rigidity and are identified as stiffeners. The upper and lower stiffeners extended from the forward edge, around the stock to the rear edge and were approximately 40 inches x 4 inches. The central stiffener extended from the interface of the front plate and the stock to the rear edge and was approximately 32 inches x 4 inches. Two sacrificial zinc anodes were observed between the stiffeners on each side of the rudder and residual welds, observed in the vicinity of the anodes, were consistent with them being replaced over the years.

Rudder examination, port side

Examination of the port side of the rudder revealed significant mechanical damage³. The rear plate, between the center and lower stiffeners, displayed a large indentation. A portion of the rear plate below the lower stiffener had been fractured and deformed to the starboard side. The center and lower stiffeners had been deformed. The upper end of the stock displayed a corroded fracture face. A weld extending from aft of the upper end of the stock to above the upper stiffener was observed and is located below, and parallel to, the orange dashed line in Figure 1. The forward edge of the front plate displayed a well defined corner and an adjacent weld, consistent with it being fabricated from two pieces. The port side examination also revealed a small amount of buckling⁴ as highlighted by the yellow dashed line in Figure 1 which is a continuation of the straight upper portion of the stock.

The indentation on the rear plate is contained within the red box in Figure 1. The indentation was located between the center stiffener and the lower stiffener, and offset to the rear of the centerline of the stock. A closer view of the indentation is illustrated in Figure 4 with the forward and up directions indicated. The plate, stock, and center stiffener are identified. The examination revealed that the upper quadrant of the indentation described the arc indicated by the yellow dashed line. Above the arc was an indentation that displayed the straight edge indicated by the white arrow with the curved end indicated by the black arrow. The indentation was at its deepest on the straight line and tapered to nothing as it approached the arced indentation. On the torn edge at the lower portion of the indentation, within the red box, the examination revealed a flat surface area with the straight rear edge

² On a balanced rudder, there will be a certain portion of the blade area forward of the rudder stock (pivot point) which will decrease some of the force necessary to pivot the rudder. However, the portion of the blade forward cannot be too great a percentage of the rudder area as this will make steering unstable, with constant attention to the helm being required. In general, the balanced rudder will have an area forward of the pivot point of up to 20% of the total rudder area.

³ Mechanical damage is produced by forceful interaction with another object.

⁴ Buckling produces a bulge, bend, bow, kink or other wavy condition by compressively stressing a beam, column, plate, bar or sheet.

indicated by the red arrow. Adjacent to the flat area was the indentation indicated by the purple arrow. Examination of the weld that originally joined the flat plate to the stock revealed that the weld bead, indicated by the green arrow, had remained with the stock and the originally welded edge of the plate displayed a slight taper, indicated by the blue arrow. The yellow arrow indicates the weld bead on the right side which remained with the plate. The edge of the plate that was originally located between the welds displayed transverse parallel lines with smooth arced contours consistent with the edge being flame cut. The flame cut edge being evident and the slight taper to the edge of the plate is consistent with little to no weld penetration.

A view of the indentation on the starboard side looking forward is illustrated in Figure 5 with the stock and rear plate identified. The displaced material displayed a bulbous appearance with fractures to the rear and below being consistent with a relative upward motion of the indenter into the rudder, or a relative downward motion of the rudder onto the indenter. The fracture faces in the plate, indicated by the red arrows, were inclined at approximately 45-degrees, and displayed surface lines oriented along the thickness, consistent with an overload event. The green arrow and the yellow arrow indicate the weld bead similarly indicated in Figure 4. The black arrow indicates the original surface of the stock located between the weld beads, consistent with little to no penetration of the welds on both sides.

As illustrated in the port side view in Figure 1, the area below the indentation was devoid of paint. To the rear of the indentation a rough band, also devoid of paint, was observed. The band tapered as distance from the indentation increased and pointed to an area devoid of paint on the underside and at the rear of the center stiffener. The rear half of the center stiffener, indicated by the purple arrow, had been deformed upwards with the degree of deformation decreasing as it progressed forward. Below the indentation another rough band, devoid of paint, was observed. The band, indicated by the yellow arrow, terminated at the lower stiffener where the stiffener was fractured. To the rear of the fracture the lower stiffener had been deformed downwards until it touched the rear plate below it. The lower stiffener forward of the band had only been deformed slightly downwards. Forward of the indentation the paint had been removed from the stock, as indicated by the light green arrow in Figure 1 and a band of paint had been removed from the forward plate, as indicated by the dark green arrow in Figure 1. Above the indentation the center stiffener had been deformed upwards, as indicated by the red arrow in Figure 1.

Directly below the lower stiffener fracture the rear plate had been fractured and further forward it had been separated from the stock. The fracture and the separation are contained within the yellow box in Figure 1 and are illustrated in Figure 6 with the plate, the stock and the lower stiffener identified. Examination of the fracture revealed that the rear edge, indicated by the red arrow in Figure 6, was well defined, straight and extended from slightly below the stiffener almost to the bottom edge of the plate, where it was curved to starboard. The port side edge of

the fracture face indicated by the red arrow displayed no indications of deformation and the surface of the fracture face displayed lines through the thickness of the plate, features consistent with a shearing⁵ action. Examination of the plate and its original weld to the stock revealed features similar to those previously described for little to no penetration of the weld. In this case, both weld beads remained on the stock and both sides of the plate adjacent to the edge displayed a slight taper, where the weld had originally been fused to the plate. The port side weld bead is indicated by the purple arrow in Figure 6 and the edge of the plate is indicated by the black arrow. The yellow arrow indicates the lower portion of the rear plate, between the sheared face and the flame cut edge, which had been deformed toward the starboard side, inducing the twist observed in that portion.

A closer view of the area within the red box in Figure 6 is illustrated in Figure 7 with the rear plate and the lower stiffener identified. The fractured edges of the lower stiffener are indicated by the blue arrow and the white arrow. The surface of the stiffener between the fractured edge indicated by the white arrow and the white dashed line had been mechanically deformed. Forward of the fracture face indicated by the red arrow, as in Figure 6, the surface of the rear plate had been flattened and the forward edge of the flattened area, indicated by the yellow arrow, was a straight line. The examination revealed that the line indicated by the yellow arrow, and the edge indicated by the red arrow, terminated at the similar locations indicated by the green arrows. The width of the flattened area was found to be reasonably uniform from the green arrow to the lower edge of the rear plate. The flattened area and the sheared face were consistent with the rear plate impacting a flat edge at an angle where the sheared face contacted a corner of the flat edge first.

The examination of the port side of the rudder also revealed faint indications of a multi-pass weld located on the stock, consistent with the stock being fabricated from two pieces. The indications were oriented circumferentially below the lower stiffener but were mostly obscured by the blue paint. In the same location, on the starboard side of the rudder and indicated by the red arrow in Figure 2, the indications were more pronounced and are illustrated in Figure 8 with the stock, the lower stiffener, the front plate and the rear plate identified. The numerous weld passes are located between the black arrows. The red arrow indicates the starboard side of the fracture contained within the red box in Figure 6.

The lower end of the rudder stock is normally located in the shoe and is the lower pivot point for the rudder. Examination of the lower end of the stock revealed displaced material at the lower edge, predominantly on the port side. The port side of the lower end of the stock is illustrated in Figure 9 with the forward direction indicated. In the area between the red arrows the material at the end of the stock had been displaced upwards and outwards and the stock side material between the yellow arrows had been displaced downwards and inwards. The black arrows

⁵ Shearing occurs when a load or stress displaces adjacent portions of a component by sliding (a scissor action).

indicate a band of surface staining which was approximately $1\frac{3}{4}$ inches wide and continuous around the stock with the exception of the area indicated by the blue arrow. Diameter measurements were taken at the locations indicated in Figure 9 and were found to range between 3.997 inches and 4.054 inches as illustrated.

Examination of the upper end of the stock revealed that approximately 60% of the area consisted of a fracture occupying approximately 280-degrees of the circumference and centered in the forward direction. The remaining 40% was flat and displayed a dull red coating, consistent with red primer. The upper end of the stock, with portions of the front and rear plates was removed for examination by sawing along the red dashed line in Figure 1, from the leading edge to an existing crack approximately $3\frac{1}{2}$ inches aft of the stock. Examination of the fracture face on the existing crack revealed corrosion and blue paint, consistent with the crack being in existence when the rudder was painted blue.

Examination of the fracture face at the upper end of the stock revealed a rough grainy surface, consistent with an overload event, which was inclined at various angles to the exterior surface of the stock and two small discolored areas with smooth black surfaces. The stock fracture face is illustrated in Figure 10 with the forward direction, the port side and the starboard side indicated. The front plate and the rear plate are also identified. Closer examination of the fracture face revealed the three distinct zones separated by the white, red and green dashed lines in Figure 10. The white zone contained the relatively straight surface lines indicated by the white dashed lines, consistent with a fracture propagating from the starboard side to the port side. The curved surface line indicated by the white dashed line would be consistent with the stock rotating in the direction indicated by the blue arced arrow. The next surface line is indicated by the curved red dashed line, also consistent with rotation in the direction indicated by the blue arced arrow. In the red zone adjacent to the white dashed line, converging surface lines known as chevrons were observed. The chevrons, adjacent to the red arrows, indicate the fracture origin thereby indicating that the fracture propagated in the opposite direction as indicated by the larger red arrow. Similar chevrons are adjacent to the green arrows in the green zone and indicate that the fracture propagated in the direction indicated by the large green arrow. The propagation direction indicated by the large red and green arrows support the direction of rotation indicated by the blue arrow, which, with the overload event features, is consistent with a mixed mode overload failure mechanism involving bending and torsion. At the location indicated by the green dashed line the fracture changed direction and propagated vertically downwards for approximately $\frac{3}{8}$ -inch to intersect with the fracture feature indicated by the red arrow in Figure 10, consistent with it being the final separation of the stock from the flange.

The portions of front and rear plates removed with the upper end of the stock displayed the plate edge and weld features previously described and are also illustrated in Figure 10. The purple arrow on both portions indicates the edge of each plate which displayed the flame cut features consistent with a lack of weld

penetration. On the front plate, starboard side, the orange arrow indicates a weld bead and on the port side the white arrow indicates a small portion of a weld bead that remained. On the rear plate, port side, the orange arrow indicates a slight taper where a weld bead had been originally fused to the plate. The overhead view in Figure 10 indicates that a degree of twist had been imparted to the rear plate, consistent with the stock rotating in the direction indicated by the blue arrow while the plate was still attached to the flange.

A port side view of the fractured end of the stock is illustrated in Figure 11 with the stock, the front plate and the rear plate identified. The yellow dashed line represents the original surface of the flange so that the blue arrow indicates the portion of the stock that was originally inserted into it and welded in place. The slight curvature evident in the side view is consistent with deformation, from the rear plate towards the front plate, during extraction from the flange. On the port side, the area between the yellow dashed line and the orange dashed line did not contain any weld bead with the exception of the small piece indicated by the unmarked white arrow (the portion of weld is also indicated by the white arrow in Figure 10). The orange dashed line indicates the edge of the weld on the plates which is known as the toe (a toe is identified later in Figure 14). The toe of the weld on the rear plate, the orange dashed line, aligns with the toe of the weld remaining on the stock, the red dashed line. The red dashed line was continued around the stock to reveal that the edge of the fracture matched it, consistent with the fracture initiating at the stock's interface with the flange.

The discolored areas indicated by the yellow and red arrows in Figure 10 were centered almost in direct opposition and perpendicular to the axis of the plates. Examination of the areas revealed cracks that initiated on the outer edge of the stock in the toe of the weld, on the red dashed line previously described and illustrated in Figure 11, and terminated in multiple arced crack arrest marks, consistent with reverse bending fatigue. The areas displayed an oxidized surface with a glass-like smoothness, typical of fatigue that had been ongoing for a significant amount of time and consistent with an unsupported rudder or a rudder that was loose in its shoe. The remains of ratchet marks⁶ were located on both fatigue zones. The fatigue zones indicated by the yellow and red arrows in Figure 10 are illustrated in the left and right images respectively in Figure 12 with the glass-like surface indicated by the yellow arrow, distinct arced crack arrest marks indicated by the green arrows and the remains of ratchet marks indicated by the purple arrows. The black arrow indicates damage to the edge of the fracture that had obliterated the fracture origin.

The central portion of the port side lower stiffener had been deformed downwards, as illustrated in Figure 1. The examination revealed that that a portion

⁶ Ratchet marks are slight vertical steps in the fracture that link slightly offset planes of fatigue cracking at a fatigue origin area. Ratchet marks generally are aligned in the direction of cracking and taper off as distance from the origin is increased and a unified crack front is produced.

of what had been the outer edge of the stiffener had been displaced upwards on to what had originally been the upper surface and the displaced material displayed a brass colored surface that initiated at the black arrow in Figure 1 and continued forward. The portion of the lower stiffener within the white dashed line in Figure 1 was removed for closer examination. The examination revealed that the initiation location consisted of an arced indentation that had continued forward. The arced initiation location and an area forward of it are illustrated in Figure 13. The initiation location is indicated by the black arrow, the edge material deformed onto the upper surface of the stiffener is indicated by the red arrows and the brass coloration is indicated by the yellow arrows. The removed sample was placed in a scanning electron microscope (SEM) and energy dispersive spectrometer (EDS) analysis of the deformed surface revealed a significant presence of copper and traces of zinc⁷.

To illustrate the weld features previously described, the weld joining the rear plate to the stock, indicated by the black arrow in Figure 11, was machined flat, ground to a fine finish and chemically etched⁸ to reveal a sectional view of the weld. The sectional view is illustrated in Figure 14 with the stock, the rear plate, the port weld, the starboard weld and the void between them identified. The presence of the void between the welds illustrates a lack of penetration of the welds which would allow the flame cut edges on the plate to be observed if the plate had been separated from the stock, as previously observed. The examination of this welded joint also revealed that cracks had originated at the corners between the weld and the rear plate and had propagated along the weld to plate interface, commonly referred to as the heat affected zone, to terminate at the red arrows. A weld toe is also identified.

A paint chip was removed from the port side of the rudder and one edge finely ground to produce a sectional view illustrating the various layers. The sectional view is illustrated in Figure 15 with the outer surface identified and the six layers numbered starting at the first application. Layer 1 was a grey color consistent with it being a primer coating. Layer 2 was a dull red, layer 3 was white, layer 4 was grey with white flecks, layer 5 was grey, and layer six was the final blue coating.

Rudder examination, starboard side.

Examination of the starboard side of the rudder illustrated in Figure 2 revealed that the only mechanical damage observed had been initiated on the port side and has been described previously. The yellow arrow in Figure 2 indicates an area where paint was missing. The area was located at the apex of a bend and is better illustrated in Figure 3 looking aft. The green arrow in Figure 2 indicates another area where paint was missing and various layers exposed. The area was wider at the bottom and tapered inward as distance from the bottom increased.

⁷ Copper and Zinc are not normally found in significant quantities in steel but are the major elements in brass alloys, one of which is used to produce propellers.

⁸ The weld was etched with 2% Nital, a solution of 2% nitric acid in ethanol.

There was no mechanical damage to the exposed stock and it was considered probable that the feature was produced when the rudder was lifted to the vertical position and scraped along the tarp covering the pallet it arrived on.

Rudder examination, looking aft.

Examination of the rudder looking aft revealed a significant buckle in the stock, buckling of the rear plate between the center and lower stiffeners, buckling and deformation of the front plate between the upper and lower stiffeners, and tearing of the front plate from the lower stiffener. The rudder, looking aft, is illustrated in the left image in Figure 3 with the stock, the upper stiffener, the center stiffener and the lower stiffener identified. Above the center stiffener the stock was relatively straight, below the center stiffener the stock had been severely buckled, consistent with it being subjected to a significant compressive force. To illustrate the amount of buckling in the stock, a straight edge was placed parallel to the upper portion of the stock and a scale was placed between the stock, below the lower stiffener, and the straight edge as illustrated in Figure 3. The red dashed line in Figure 3 represents a continuation of the straight portion of the stock above the center stiffener and crossed the scale at $5\frac{3}{4}$ inches.

Buckling of the front plate between the upper and lower stiffeners had fractured the weld between it and the stock. The fracture extended from slightly above the center stiffener to the lower stiffener and is illustrated in the inset in Figure 3. Examination of the weld revealed the similar lack of penetration features observed in previously examined welds. The black arrows in the inset indicate the weld bead and the blue arrow indicates the stock material, consistent with a lack of penetration of the weld. The red arrow indicates the paint at the uppermost bend of the buckle where the paint was flaking off in rectangular shaped flakes with sides that were oriented circumferentially and longitudinally, consistent with the paint being unable to expand with the stock. The tearing of the weld at the lower stiffener, indicated by the purple arrow in Figure 3 also displayed the features previously observed and noted for little to no weld penetration.

The contour of the forward edge of the front plate, between the upper and lower stiffeners was interrupted by the deformation to starboard indicated by the green arrow in Figure 3, consistent with the buckling of the front plate being interrupted by contact with another object that either resisted the buckling forces or acted upon the buckle after it had formed. The deformation was located where the rough band indicated by the green arrow in Figure 1 intersected the forward edge of the front plate.

Examination of propeller photographs.

Examination of the images containing the propeller revealed a four (4) bladed propeller that rotated clockwise, when viewed from the rear, for forward movement of the vessel. One propeller blade, and adjacent hull structure, displayed significant

mechanical damage. The propeller is illustrated in Figure 16, viewed from above and right, with the four blades identified by their final resting position as upper blade, lower blade, left blade and right blade. The leading and trailing edges of the upper blade are also identified. The propeller was found oriented at an angle to the surrounding structure in such a way that an outer portion of the damaged lower blade was located adjacent to, and forward, of the rear edge of the vertical steel plate at the aft end of the lower keel and indicated by the yellow arrow. The yellow arrow also indicates a portion of the edge of the vertical steel plate on which the paint had been removed. In Figure 16 the hub of the propeller, the nut that retains the propeller on the propeller shaft, and the locking bar that locks the nut to the shaft are also identified. It was noted that the flat surface of the locking bar, the round propeller shaft, and the hexagonal shape of the nut provided a combination of features consistent with the combination of features observed in the indentation on the port side of the rudder and illustrated in Figure 4.

One of the images examined illustrated the bending that had been applied to the propeller shaft in order to orient the propeller as illustrated in Figure 16. The image is illustrated in Figure 17 with the hub, right blade, and upper blade identified. In Figure 17 the green dashed line indicates the forward face of the hub, which normally rotates parallel to the rear edge of the structure indicated by the red dashed line. The angle between the dashed lines was measured at approximately 30-degrees.

The damage to the lower propeller blade consisted of a fractured and inwardly bent leading edge and a lightly smeared surface containing blue paint similar in color to the rudder. The smeared surface extended from the damage at the leading edge to the trailing edge. The outer portion of the damaged lower blade, and the adjacent vertical steel plate, are illustrated in Figure 18 with the lower blade and its trailing and leading edges identified. The red arrow indicates the fracture and the bending at the leading edge consistent with the downward deformation observed on the lower stiffener (see Figure 1) which would force the propeller to rotate clockwise until the rudder contacted the vertical steel plate. The green arrows indicate the edges of the smeared area and the area between the green arrows displayed radially oriented surface lines oriented slightly toward the trailing edge consistent with a limited counter clockwise rotation of the propeller. The purple arrow indicates an indentation on the trailing edge of the propeller blade consistent with it contacting the adjacent vertical steel plate and arresting the counterclockwise rotation of the propeller. The lower propeller blade was located adjacent to the vertical steel plate indicated by the yellow arrow in Figure 18 and in Figure 16. The edge of the plate also indicated by the yellow arrow was vertical at its upper end and inclined rearwards at its lower end. The indicated edge was devoid of paint when compared to the adjacent edge indicated by the black arrow, and by the black arrow in Figure 16. Removal of the paint at that location would be consistent with it being the shearing edge that produced the fracture illustrated in Figures 6 and 7.

As illustrated in Figure 16 the vessel structure below the propeller was still embedded in the sea bed. The sea bed was cleared away to reveal that the skeg, and the shoe, were missing. The remaining structure is illustrated in Figure 19 with a black arrow indicating the plate edge similarly indicated in Figure 18. One of the welds that originally joined the skeg to the structure is indicated by the purple arrow and the bead being intact is consistent with the general weld quality previously noted. The red arrow indicates a portion of the support structure that had been deformed forward, possibly by the escaping skeg.

Examination of ramp photographs.

The ramp on the Lady Mary assists the recovery of the scallop dredge and is essentially an inclined flat plate, with vertical sides, that is installed at the rear of the vessel. Rollers are installed at the upper and lower edges of the flat plate. A steel structure below the ramp maintains the inclination and attaches the ramp to the rear of the vessel. The rear ends of the ramp are also connected to the superstructure by the port and starboard stays. A port side view of the Lady Mary's ramp, taken prior to the accident, is illustrated in Figure 20 with the major structural elements identified. A side bar, installed as a guide for the dredging cable, extends from the port side of the vessel, inwards to the rear of the ramp and is supported by three lateral bars. The upper lateral bar and the center lateral bar can be seen in the image and are indicated by the blue and green arrows respectively. Reportedly, the starboard stay was a steel cable and the port stay was a steel cable surrounded by a stainless steel pipe. The stainless steel pipe could rotate on the cable and was installed to protect the stay from abrasion by the dredge cable during fishing operations.

A dive photograph of the lower port side of the ramp is illustrated in Figure 21 with the side bar, the round tube and the rub rail identified for comparison with Figure 20. The upper lateral bar, indicated by the blue arrow in Figure 20, is similarly indicated. The side bar, between the upper lateral bar and the transom, had been buckled inwards and the round tube was now oriented vertically, consistent with the ramp being forced toward the transom. The outer end of the ramp was now located below the square tube's attachment to the transom, which is indicated by the purple arrow in Figure 21 and Figure 20. The area within the yellow box is illustrated later in Figure 23.

The upper portion of the port side of the ramp is illustrated in Figure 22 with the round tube, the rub rail and the ramp side identified. A visible portion of the round tube was vertical, as illustrated in figure 21, and another visible portion was almost perpendicular to the transom, consistent with a buckled being located out of sight, under the ramp. The upper lateral bar is indicated by the blue arrow, as in Figures 20 and 21, and its inner end had separated from its original location indicated by the rusty band on the adjacent round tube. The ramp side had been fractured, as indicated by the red arrows, and buckled, as indicated by the yellow arrow, consistent with relative forward motion imparted to the ramp. The port side

support bearing for the upper roller displays the geometry typical of a four-bolt flange mounted bearing with the flange cracked at the locations indicated by the black arrows indicative of the roller being moved in the direction indicated by the orange arrow.

The portion of the lower port side ramp contained within the yellow box in Figure 21 is illustrated in Figure 23 with the side bar, the center lateral bar and the lower lateral bar identified. Although the outer face of the side bar displays traces of white paint and red paint a majority of the surface appears to be rusty (see also Figures 20 and 21) and the traces of paint display an orientation parallel to the axis of the bar, consistent with something being scraped along it. The rear edge of the ramp side indicated by the yellow arrow also appears to be devoid of paint. The lower roller, its port side bearing and its shaft, protruding through the bearing, are also identified. The roller shaft appears to be misaligned in the bearing and the upper fasteners on the bearing flange consisted of the hex head bolt indicated by the blue arrow and by a distinctly different fastener indicated by the black arrow. Although Figure 20 illustrates that the port stay was attached in this vicinity, the only indication of something else being there is the rusty patch and residual weld bead located adjacent to the lower lateral bar and indicated by the green arrow.

For comparison with the lower port side illustrated in Figure 23 the lower starboard side is illustrated in Figure 24 with the side bar and the lower lateral bar identified. The outer face of the side bar displays white and red paint that appears intact consistent with the port side being the most used side during fishing operations. The side bar had been buckled outwards separating it from the lower lateral bar, consistent with forward movement of the ramp. The lower roller bearing, also identified in Figure 24, appears to have been fractured and is missing the portion of the flange between the blue arrows. The yellow arrow indicates what could be the bearing. Although Figure 20 illustrates that the port stay was attached in this vicinity, the only indication of something else being there is the rusty patch and residual pieces of weld bead located adjacent to the lower lateral bar and indicated by the green arrow.

A view of the Lady Mary from the rear and at rest on the sea bed is illustrated in Figure 25. The rudder and its chain, illustrated in Figures 1, 2 and 3, are identified. The propeller, illustrated in Figure 16, is identified. The ramp, illustrated in Figure 20, is identified and slight buckling of the fore and aft edges of the ramp are indicated by the blue and purple arrows respectively. A portion of the structure below the center of the lower roller had been deflected downwards and is indicated by the yellow arrow. The end of the starboard stay is identified in Figure 25 and can be seen, separated from the ramp and hanging in the water. Its intended location, according to Figure 20, is indicated by the black arrow. The port stay, identified in Figure 25, was found tied to the rigging and is also illustrated in that location in Figure 22. Its intended location is indicated by the red arrow in

Figure 25. Recovering and tying back the port stay would take time and be inconsistent with a task to be performed during the reportedly rapid sinking event.

A closer view of the deflected structure indicated by the yellow arrow in Figure 25 is illustrated in Figure 26 with the lower roller and the ramp identified. The yellow arrow indicates the deflected structure and the white arrow indicates a portion of the underlying support structure that had been buckled and forced between the structure and the roller, also consistent with the ramp being forced in a forward direction.

The dive photographs also revealed that the port side square tube identified in Figure 20 had penetrated the transom, entering the lazarette. The penetration is illustrated in Figure 27 with the transom and the square tube identified. Adjacent major structure, namely the round tube, is identified and the gusset plate between it and the square tube is indicated by the yellow arrow, as in Figure 20. In order to illustrate the location of the penetration, the rub rail identified in Figures 20, 21, and 22 is identified and the attachment of the square tube to the transom is indicated by the purple arrow, as in Figure 20. The square tube had been subjected to a compressive load bending it around the transom attachment plate, as indicated by the green arrow, and the remainder of the square tube then penetrated the transom as indicated by the blue arrow.

The dive photographs did not include a clear view inside the lazarette but did include the exterior view of the lazarette hatch illustrated in Figure 28. The hose identified in Figure 28 was inserted into the lazarette and tied down by the rope indicated by the yellow arrow. Other dive photographs located the other end of the hose at the forward port corner of the ramp, reportedly consistent with the process to dewater the lazarette.


Mechanical Engineer

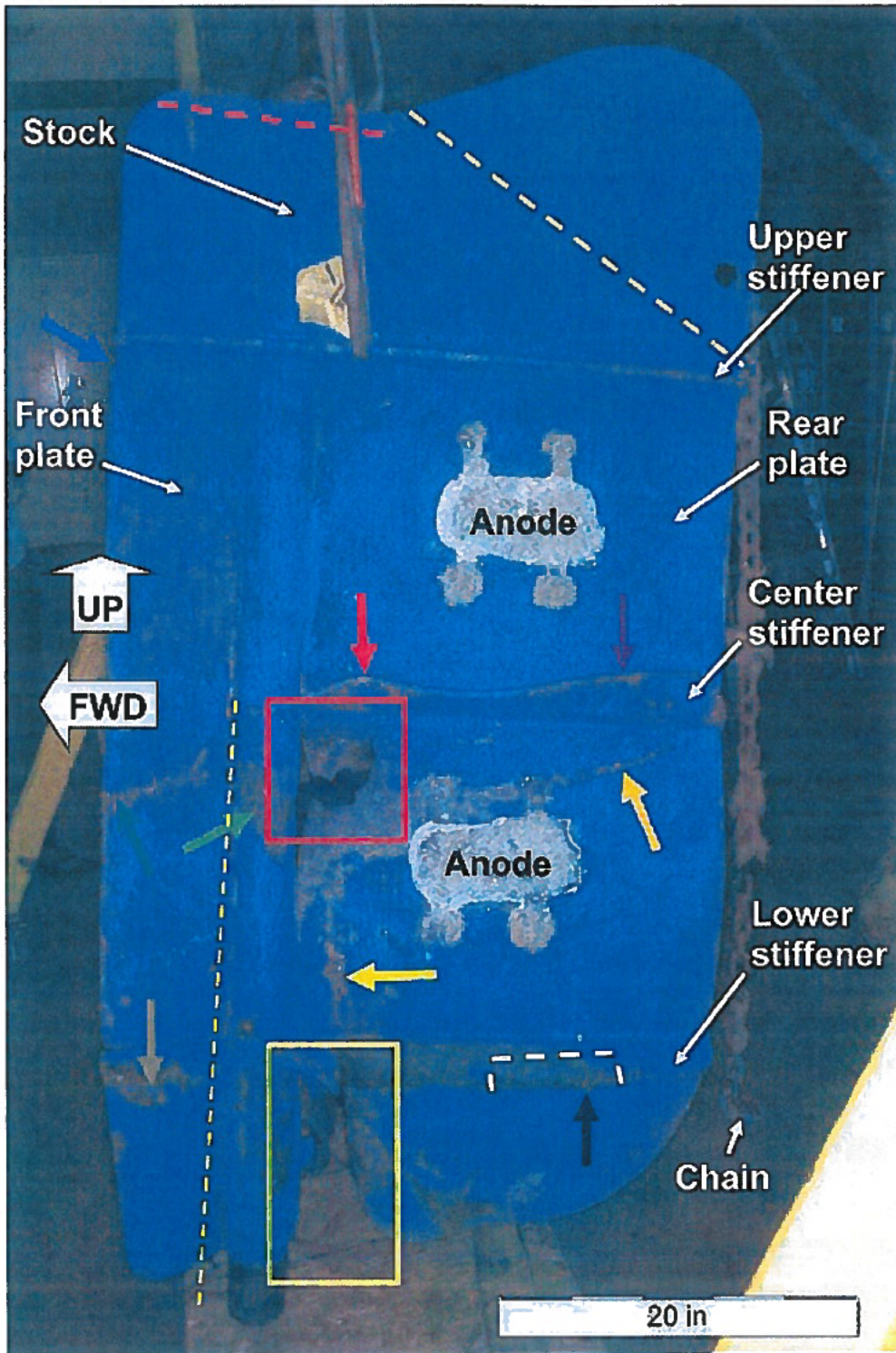


Figure 1. The port side of the rudder as received for examination.

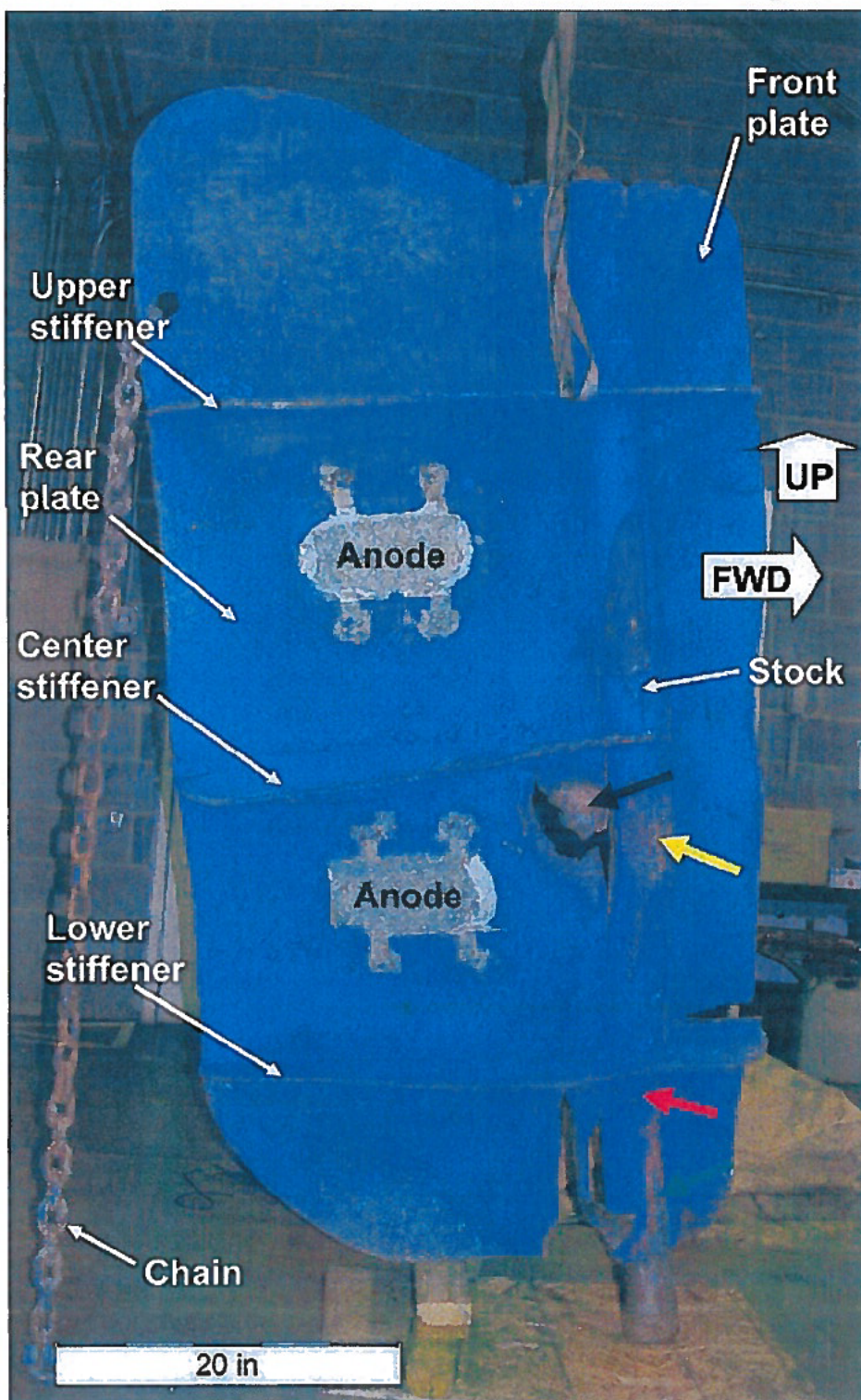


Figure 2. The starboard side of the rudder as received for examination.

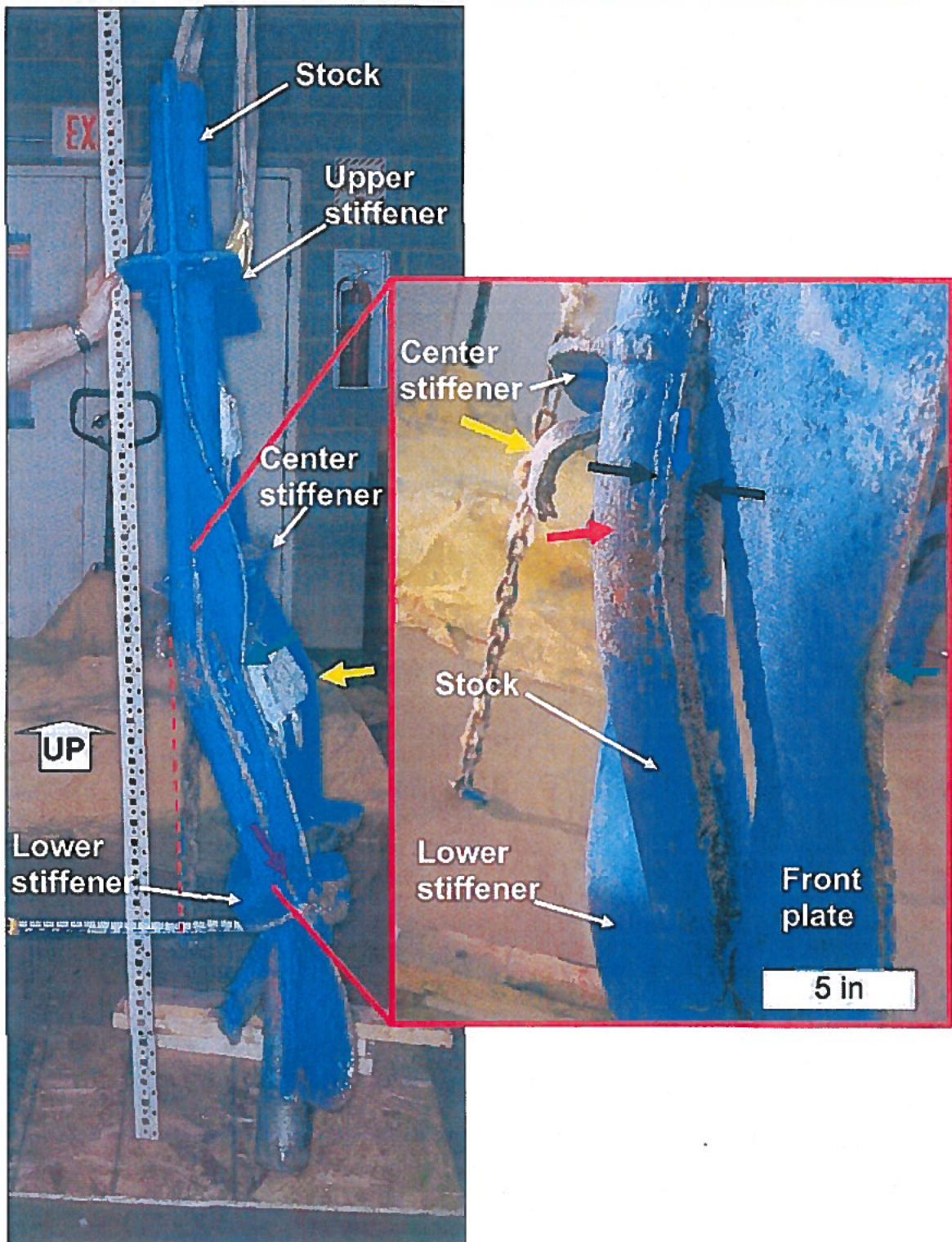


Figure 3. The rudder, as received for examination, looking aft (left) with an inset of the area indicated.

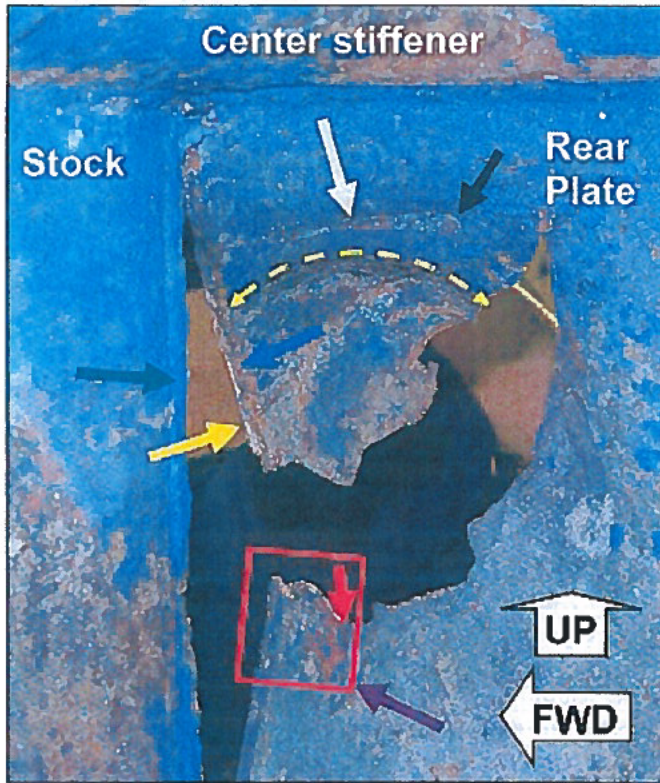


Figure 4. A port side view of the rudder indentation located within the red box in Figure 1.

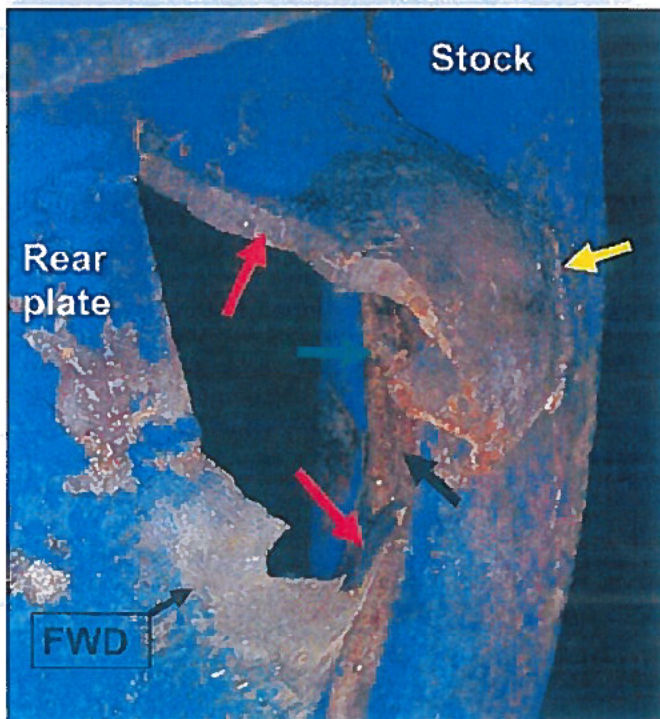


Figure 5. A starboard side view of the rudder indentation, also indicated by the yellow arrow in Figure 2.

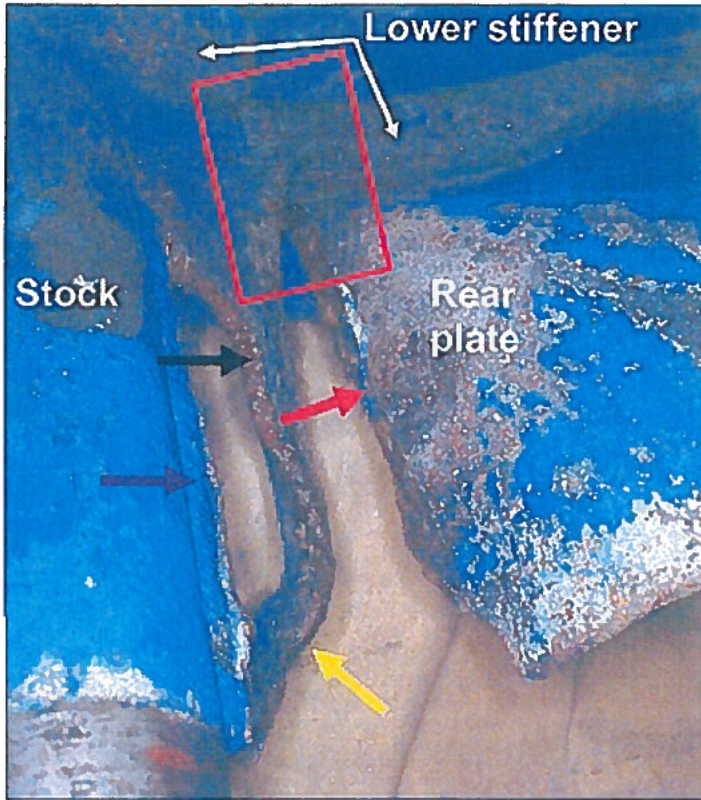


Figure 6. The damage to the rudder below the lower stiffener and contained within the yellow box in Figure 1.

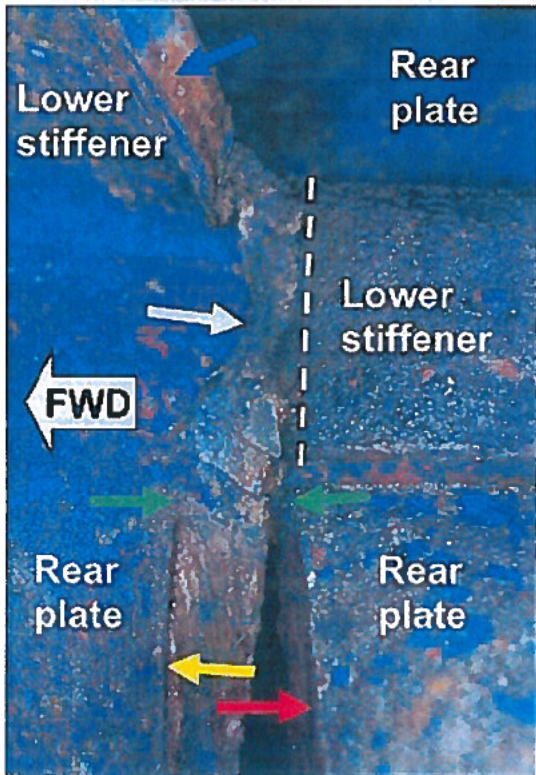


Figure 7. A closer view of the area contained within the red box in Figure 6 above.

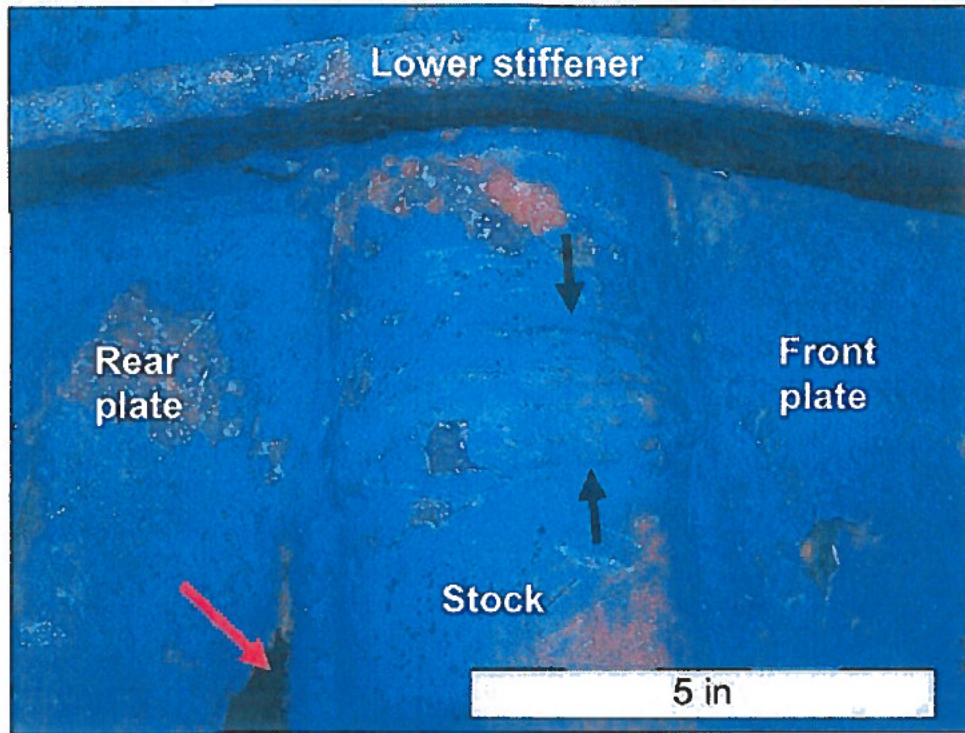


Figure 8. The multi-pass weld observed in the area indicated by the red arrow in Figure 2.

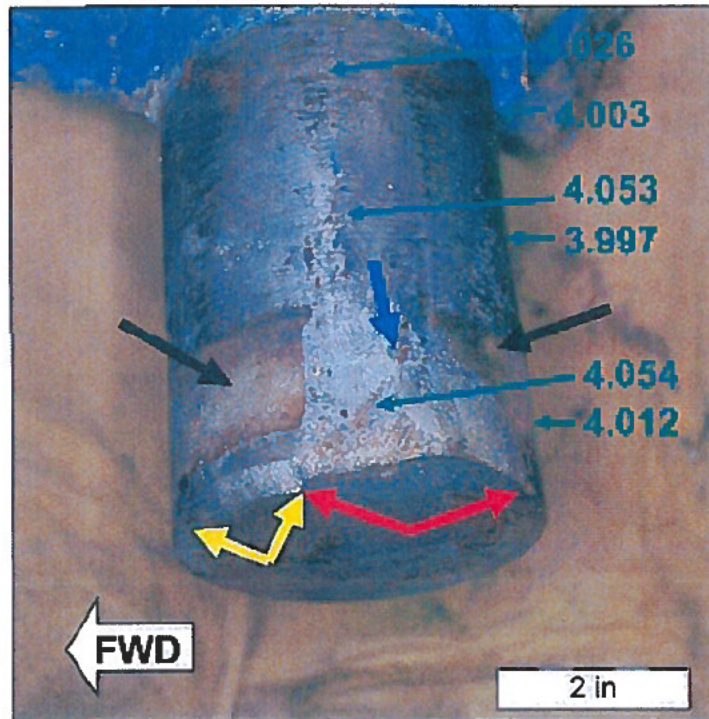


Figure 9. The bottom end of the rudder stock, port side.

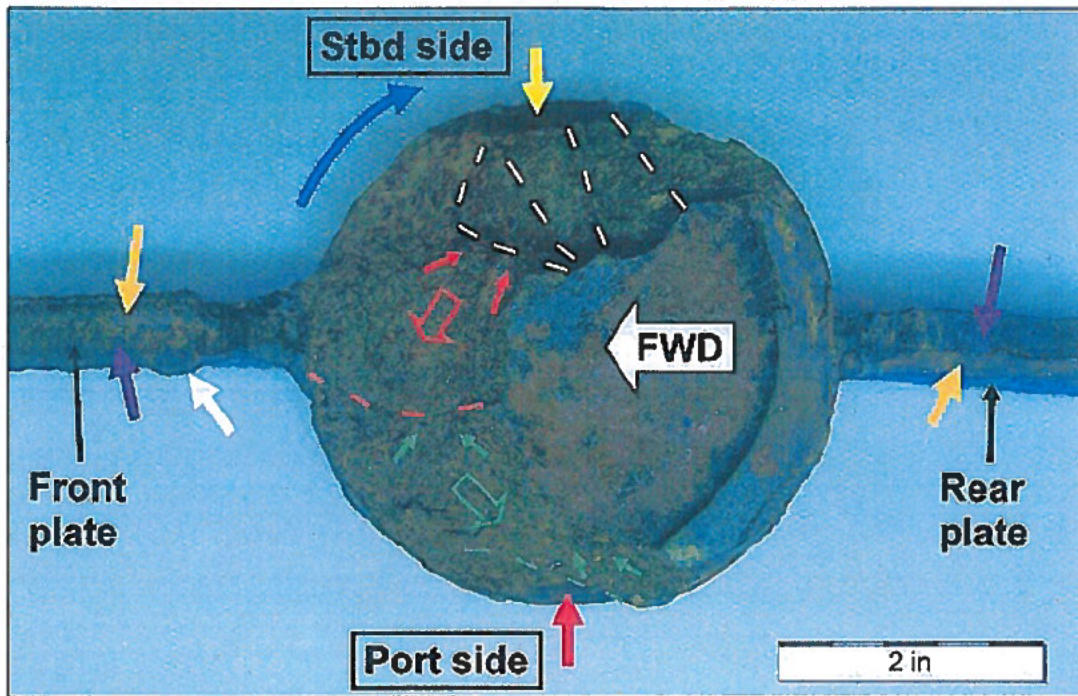


Figure 10. The upper end of the rudder stock removed from the rudder.

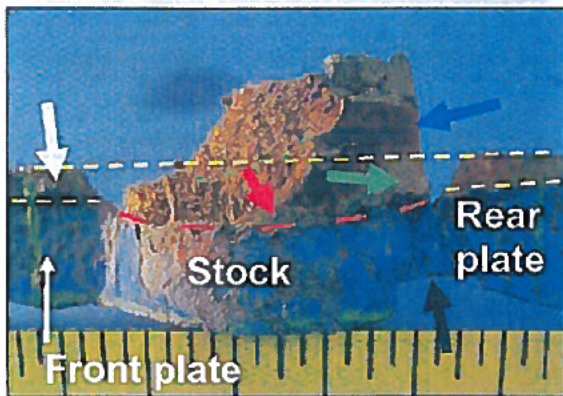


Figure 11. A port side view of the upper end of the rudder stock.

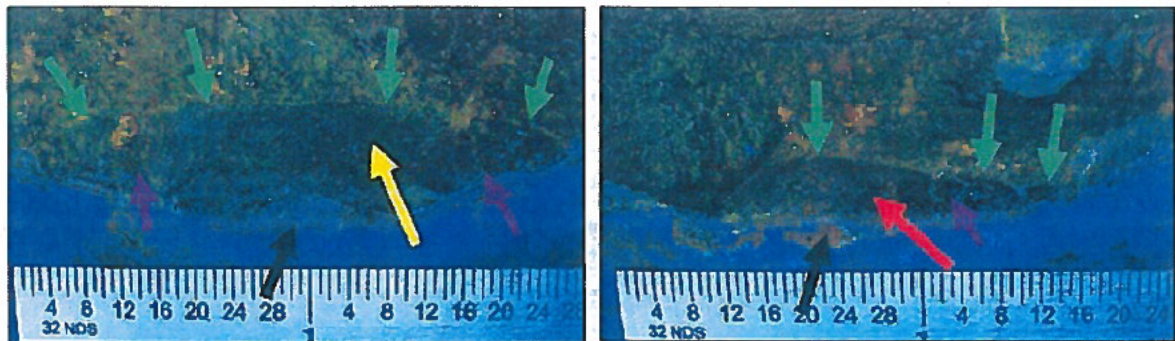


Figure 12. The fracture feature indicated by the yellow arrow in Figure 10 (left) and the fracture feature indicated by the red arrow in Figure 10 (right).

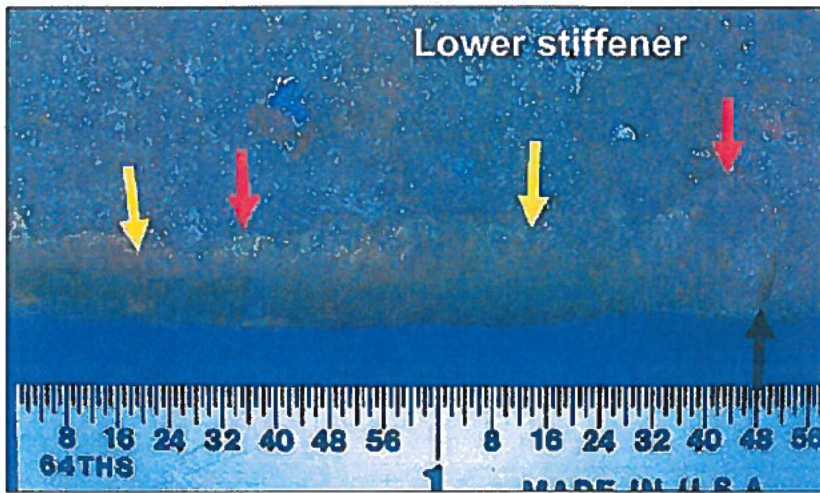


Figure 13. A portion of the sample removed from the port lower stiffener, indicated by the white dashed box in Figure 1.

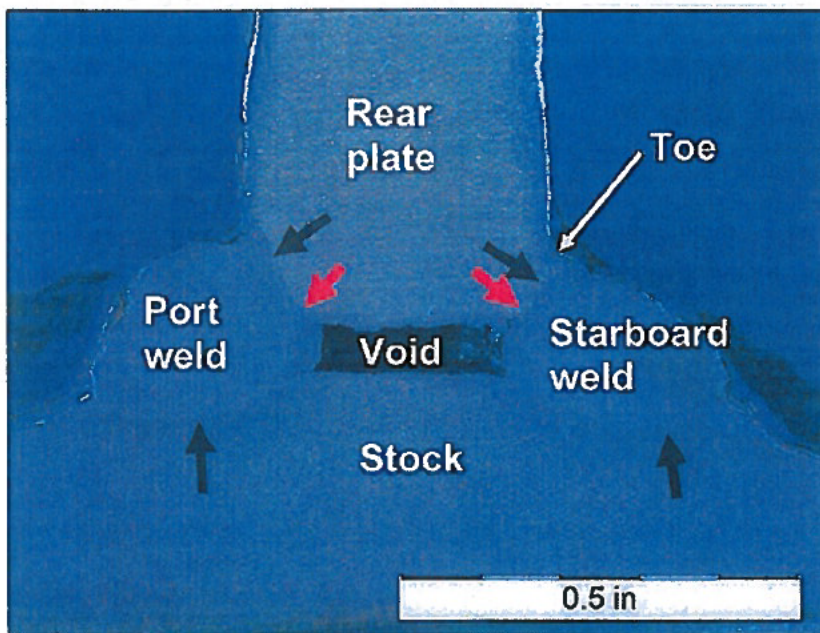


Figure 14. A sectional view of the weld at the stock to rear plate interface indicated by the black arrow in Figure 11.

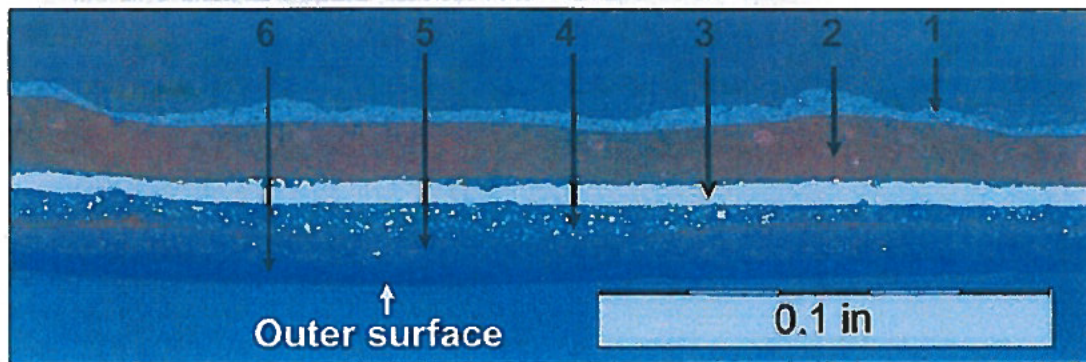


Figure 15. A cross sectional view of a paint chip removed from the rudder.

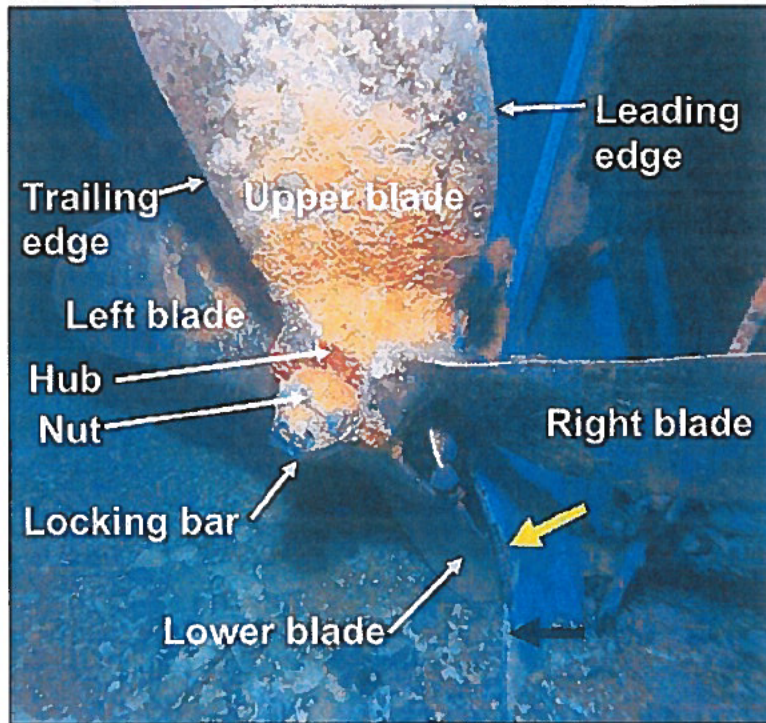


Figure 16. Underwater view of the Lady Mary's propeller.

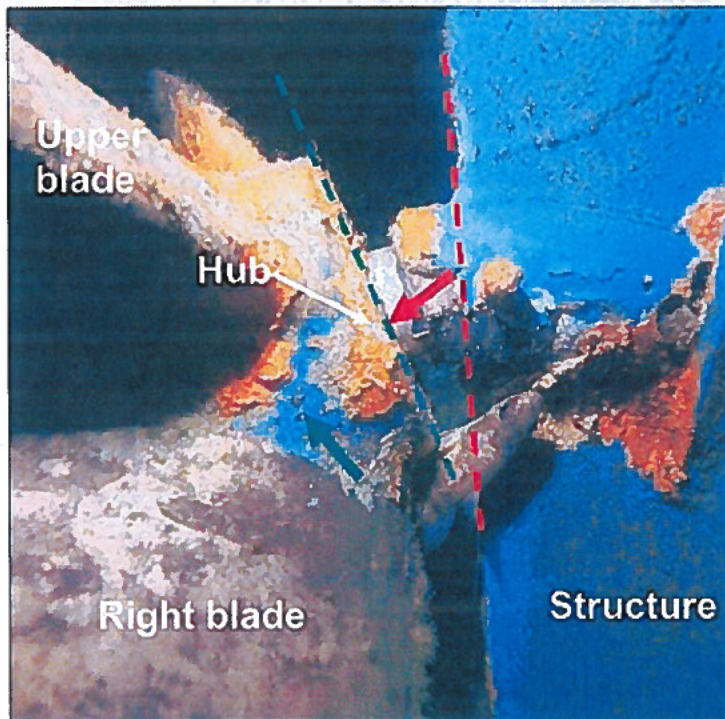


Figure 17. A side view of the propeller on its propeller shaft.

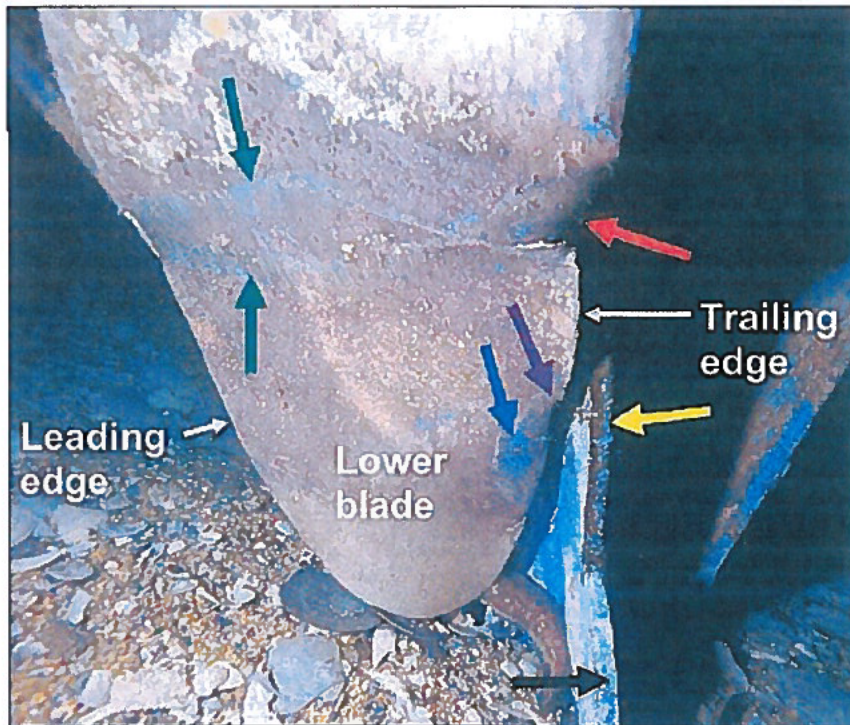


Figure 18. The outer portion of the lower propeller blade.



Figure 19. The structure at the rear of the vessel where the skeg is normally attached.

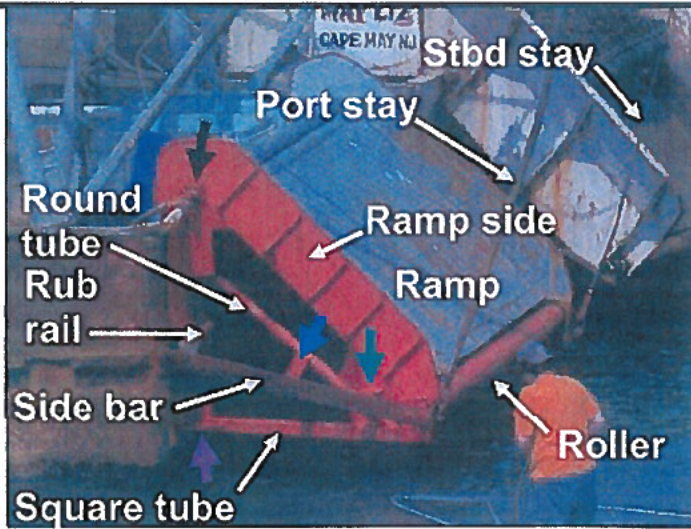


Figure 20. A port side view of the Lady Mary's ramp, taken before the accident.

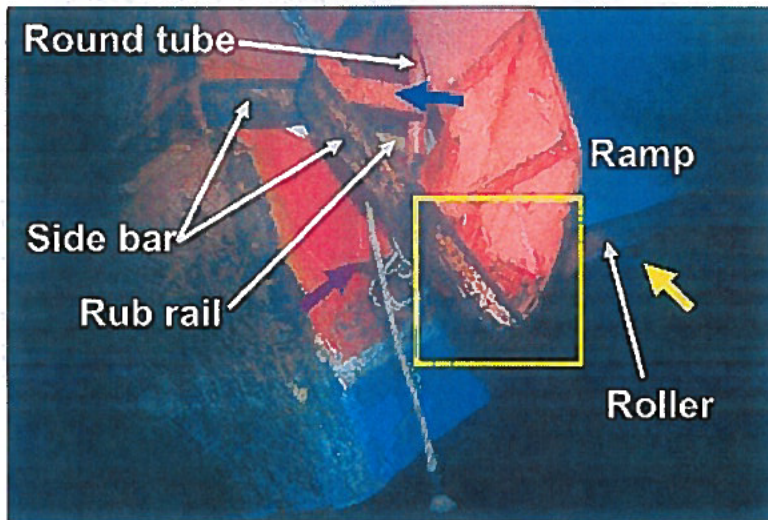


Figure 21. The lower port side of the ramp.

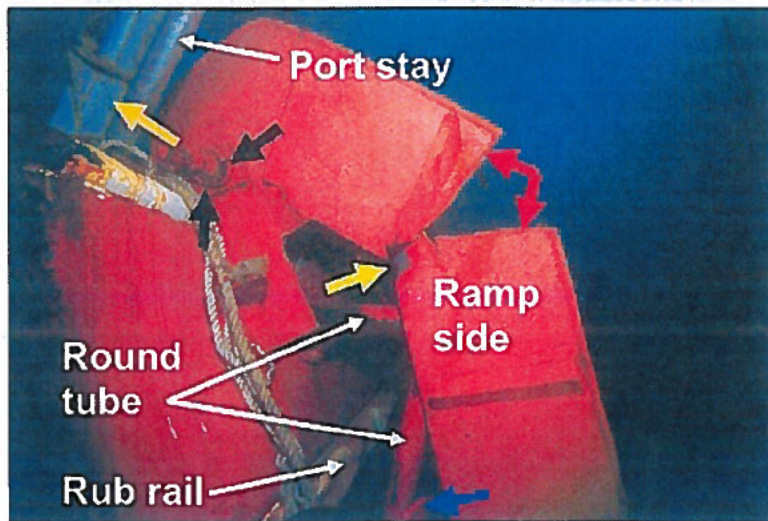


Figure 22. The upper port side of the ramp.

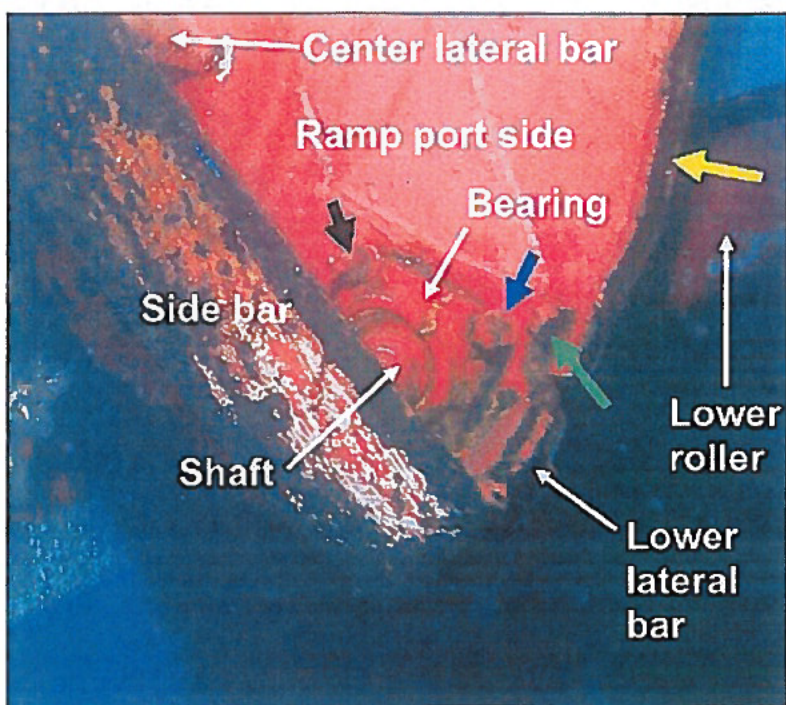


Figure 23. A closer view of the lower port side of the ramp contained within the yellow box in Figure 22.

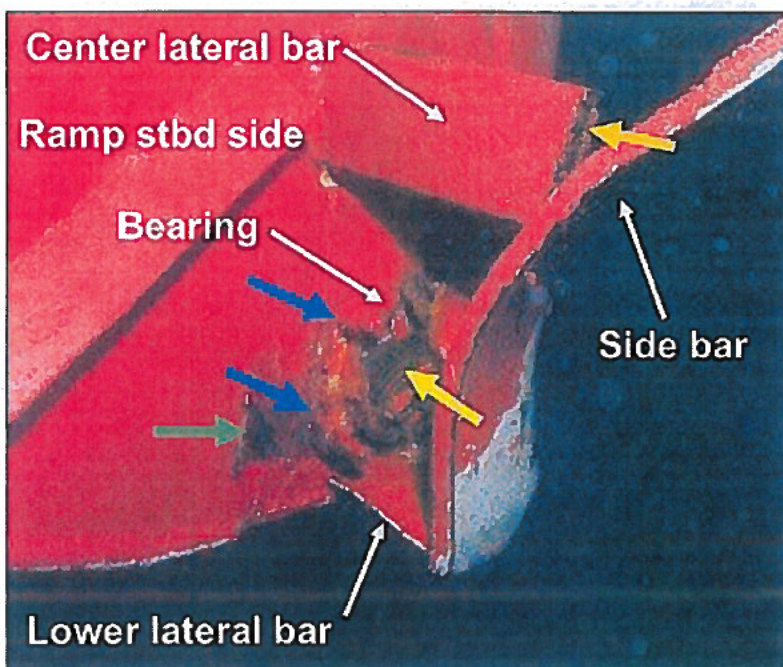


Figure 24. The lower starboard side of the ramp.

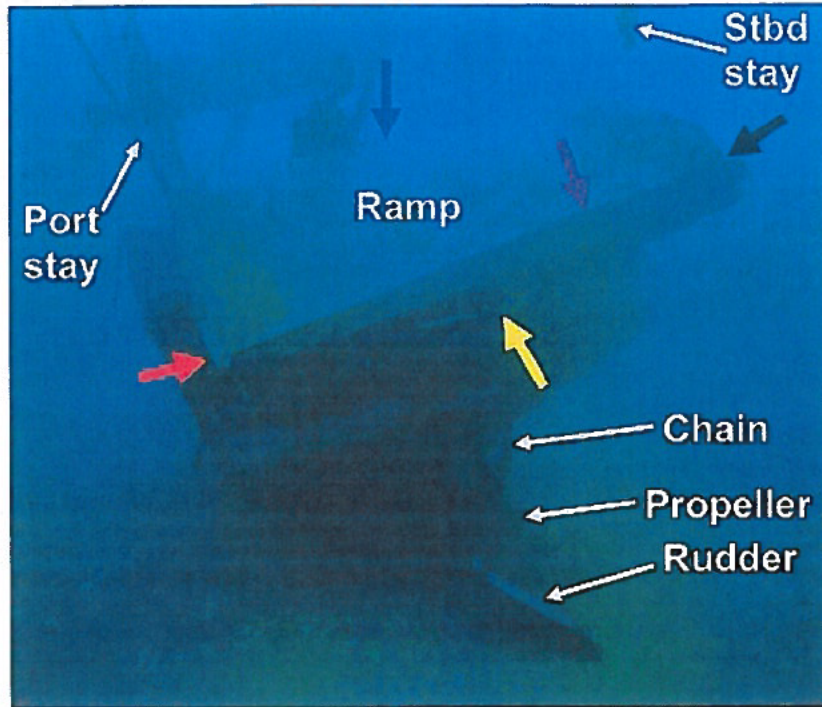


Figure 25. The rear of the submerged vessel.

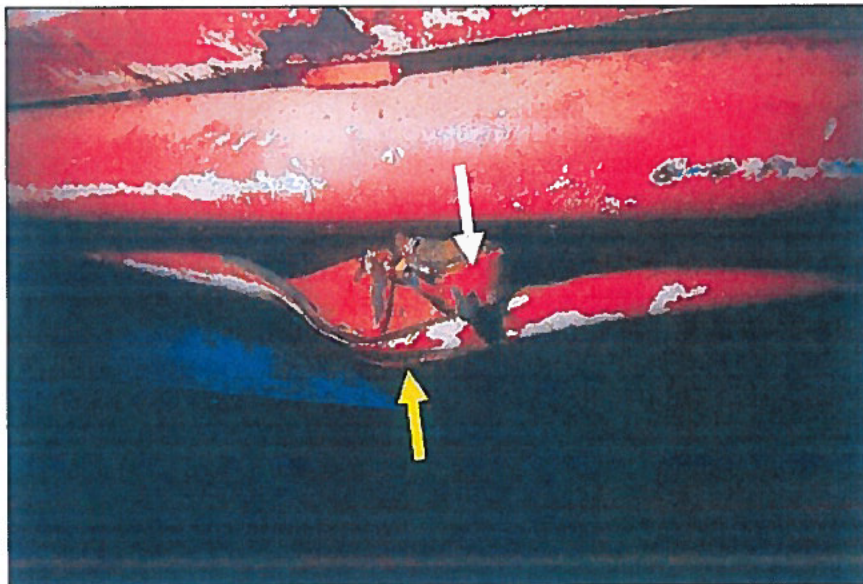


Figure 26. A closer view in the area indicated by the yellow arrow in Figure 25.

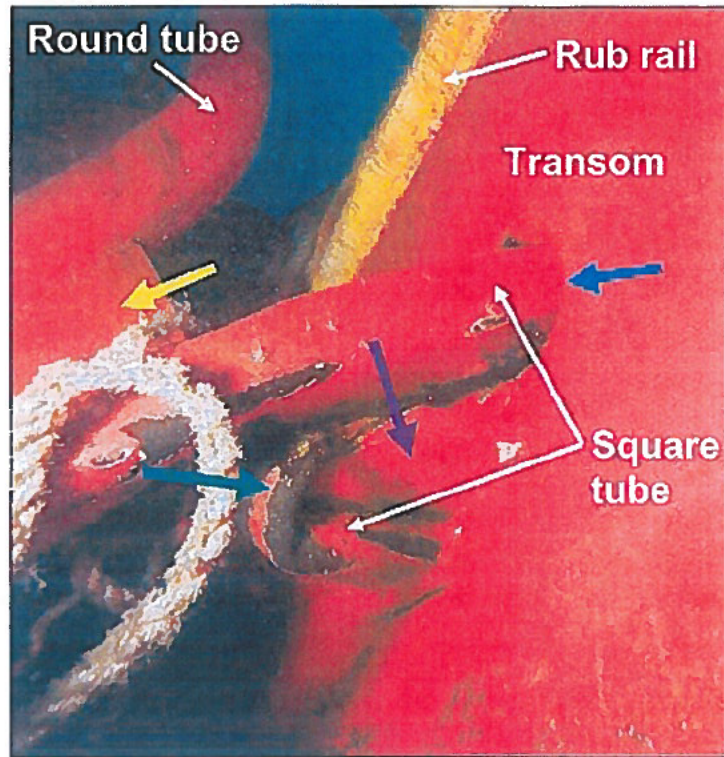


Figure 27. The penetration into the lazarette by the port side square tube.

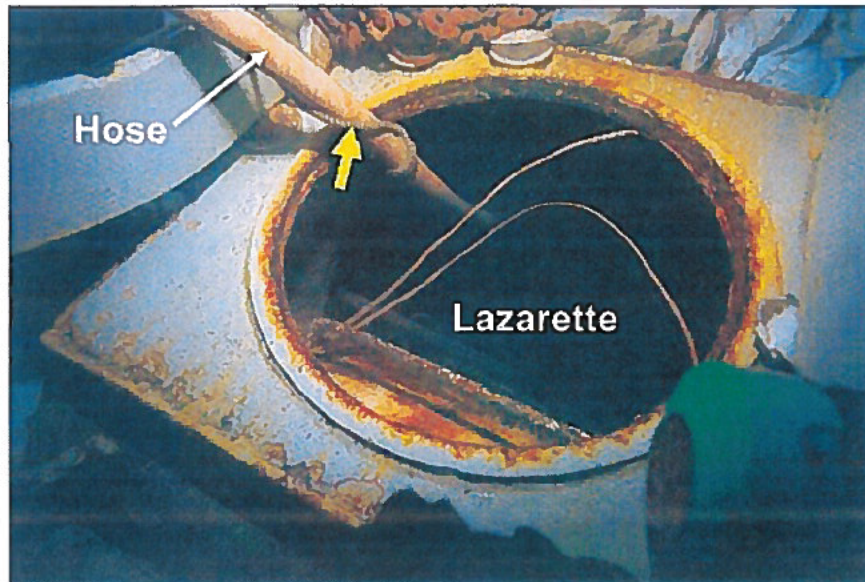


Figure 28. The access hatch to the lazarette.

Appendix (f)

U.S. Department of
Homeland Security

United States
Coast Guard



Commanding Officer
United States Coast Guard
Marine Safety Center

2100 2nd St., SW
Washington, DC 20593
Staff Symbol: MSC-1
Phone: (202) 475-3401
Fax: (202) 475-3920

16732/P014993
Serial: A0-1000347
17 Feb 2010

MEMORANDUM

From: [REDACTED]
S. P. McGee, CDR
CG MSC-1

Reply to Mr. [REDACTED]
Attn of: [REDACTED]

To: K. P. McAvoy, CDR
Chairman, Marine Board of Investigation

Subj: POST SINKING STABILITY ANALYSIS FOR THE LADY MARY O.N. 520834

Ref: (a) Your memo of 27 May 2009
(b) Conversations between LCDR [REDACTED] and Mr. [REDACTED]

1. As requested in ref (a) and (b) we performed a technical analysis of the stability of the fishing vessel LADY MARY and investigated potential scenarios that may have led to her sinking.
2. It was not possible for us to accurately quantify the stability characteristics for LADY MARY at the time of the casualty. To do so would have required knowledge of the vessel's displacement and center of gravity, which are unavailable. Instead, based on the computer model and a load condition derived from a photograph, we assessed the impact on freeboard and trim of three different flooding scenarios. These scenarios indicated that a combination of water on deck, with flooding in the lazarette progressing forward into the engine room could have resulted in sinking. Finally, although not required, based on the aft trim and associated small downflooding angles in the pre-casualty condition, it is unlikely that the vessel would have met the intact stability criteria in 46 CFR 28.570.
3. If you have questions or need additional information, please contact Mr. Brian Thomas of our staff.

#

Enclosure: (1) Explanation of Analysis & Assumptions

EXPLANATION OF ANALYSIS & ASSUMPTIONS

1 General Comments Regarding Our Stability Analysis

- The model's hull geometry was taken from an undated construction drawing for the LADY MARY (ex MR. CHOPPER) from Graham Boats of Pascagoula, MS.
- Creative Systems General HydroStatics (GHS) software version 11.50 was used for our analysis.
- All longitudinal references in this report were measured from a forward perpendicular (FP) drawn at the forward most point on the main deck. Vertical references and drafts were measured from a baseline (BL) drawn at the lowest most point on the skeg.
- All weights were reported in long tons (LT). One long ton is equivalent to 2240 pounds.
- Downflooding occurs when water enters the hull or superstructure of a vessel through an opening that is not watertight.
- Downflooding points were assumed to be located at the four corners of the fish hold and at the bottom of the door sill for door on the aft end of the deck house.

Name	Longitudinal (ft Aft of FP)	Transverse (ft S/P of CL)		Vertical (ft Above BL)
Fish Hold Fwd	50.8	3.1 S	2.6 P	15.8
Fish Hold Aft	57.1	3.1 S	2.6 P	15.8
Aft Door	52.8	3.2 P	6.5 P	14.5

Table 1: Downflooding Point Locations

- While the fishing vessel stability standards contained in 46 CFR Subchapter C, Subpart E are applicable to fishing vessels over 79 feet in length, they have been used in the past as a reasonable standard for smaller fishing vessels. Although the LADY MARY's registered length is 71 feet and the stability requirements of 46 CFR Subchapter C, specifically 46 CFR 28.570, were not applicable to this vessel due to its length, those criteria were used in this analysis as an objective reference standard for intact stability.
- As requested in reference (b), the effects of icing were not considered in this analysis.
- The model's engine room was assigned a permeability of 85%. All others spaces and tanks in the model were assumed to be 95% permeable.
- The impact of wind and waves were not considered in this analysis.

2 Model Development

The computer model used throughout this analysis was created using the deck and chine lines from the construction drawing shown in Figure 1. Compartmentation was added to the model using the bulkhead locations in the drawing. A deck house was added for reference from measurements taken from the photograph in Figure 5, but the deck house was not considered to provide any buoyancy. Bulwarks were added to match those in Figure 1. Figures 2 and 3 show the computer model MSC created from the available information.

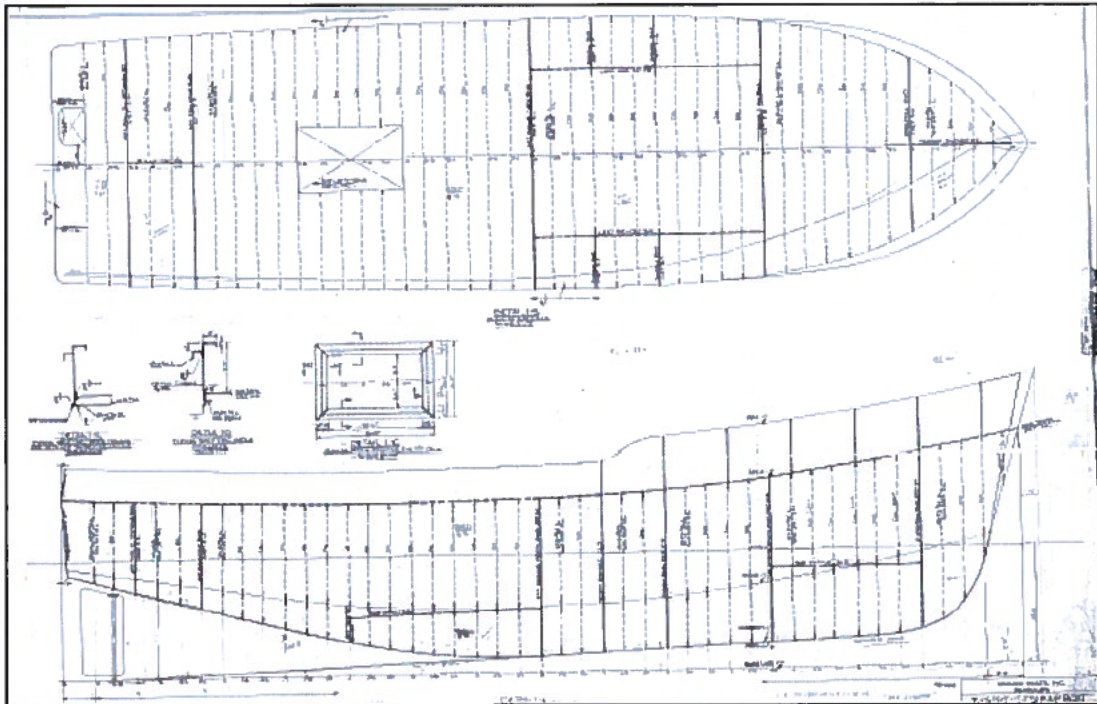


Figure 1: Construction Drawing for the LADY MARY (ex. MR. CHOPER)

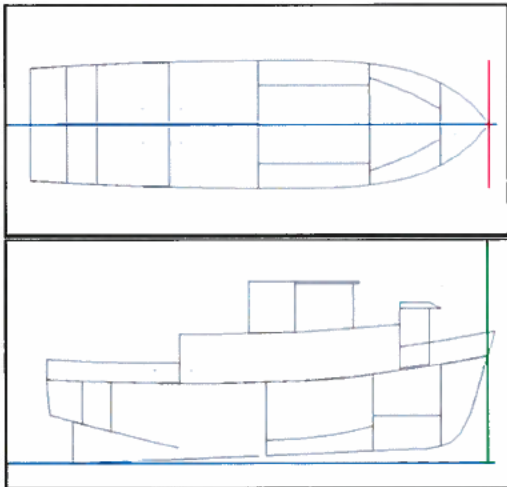


Figure 2: Profile and Plan View of MSC's Computer Model

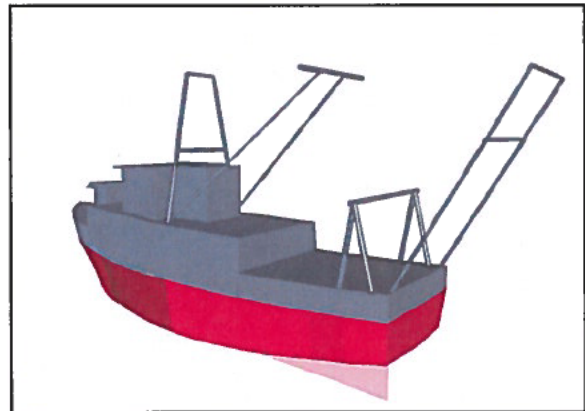


Figure 3: 3-D View of MSC's Computer Mod

3 Pre-Casualty Condition Estimation

To conduct an intact stability analysis, it is necessary to know the vessel's hull shape as well as its displacement and centers of gravity. In this case, because there are no records of any inclining experiment or deadweight survey, our model's displacement and longitudinal center of gravity were estimated using freeboards measured from the photo shown in Figure 5 as a starting point.



Figure 5: Profile of the LADY MARY in 2006

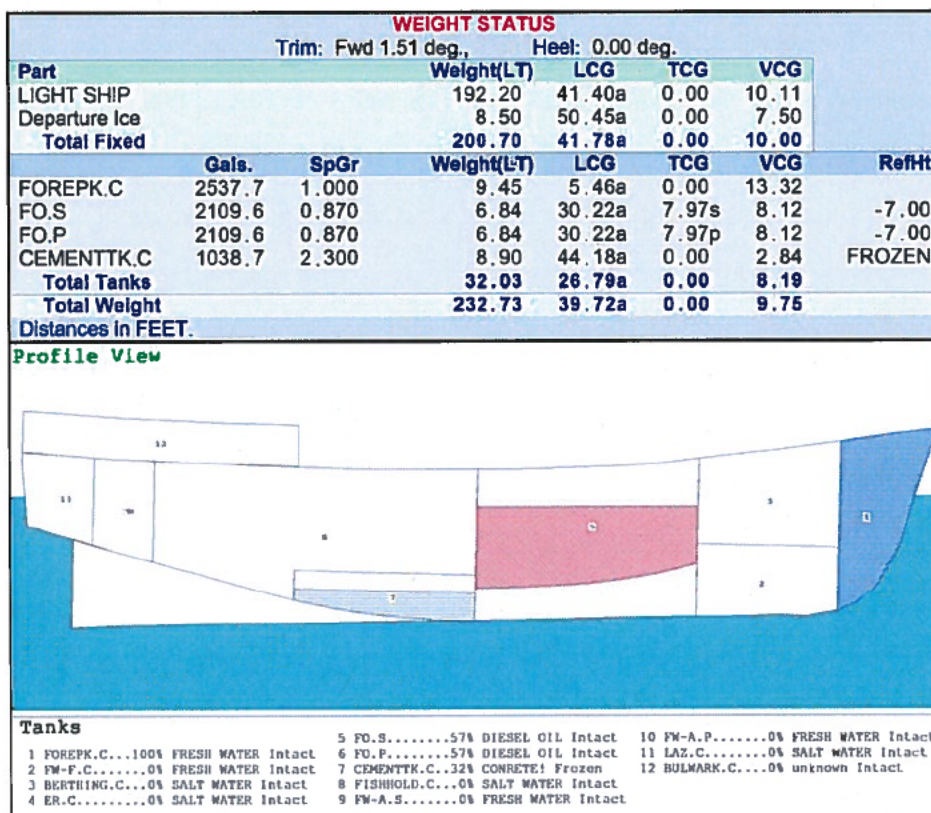


Figure 4: Load Condition Assumed from the Photograph in Figure 5

Based upon information from the Marine Board, the load condition described in Figure 4 was approximated to match freeboards taken from the photograph in Figure 5. The condition includes 8.5 long tons of ice and approximately 20,000 pounds of cement ballast. To estimate the loading at the time of the casualty, the loads were changed to reflect alterations to the vessel and changes in loading that were assumed to have occurred between the time the photo was taken and the time of the casualty. In particular, 4 steel deck plates were added to the aft deck, scallops were added to the main deck and fish hold, the aft ballast tanks were filled and finally, fuel and fresh water were reduced. The details of the assumed pre-casualty load condition are contained in Figure 6.

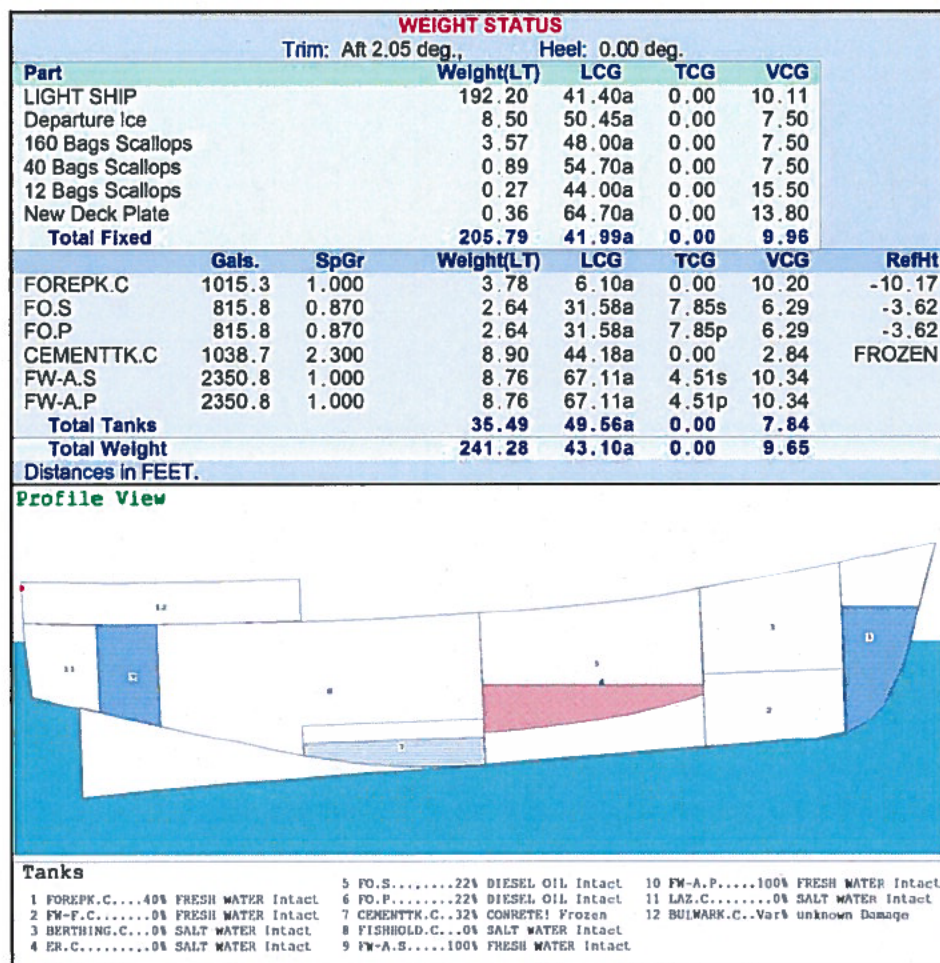


Figure 6: Estimated Pre-Casualty Loading

4 Intact Stability Assessment

It is impossible to completely analyze the vessel's intact or damaged stability without knowing the LADY MARY's vertical center of gravity (VCG). However, based on the estimated draft and trim at the time of the casualty, it is possible to draw some basic conclusions from our model. First, the door on the aft end of the deck house results in down flooding angles less than 30° through the range of operational trim. A downflooding angle less than 30° would prevent the

model from meeting the intact stability criteria in 46 CFR 28.570 regardless of vertical center of gravity. If the aft door is considered weathertight and the ballast is removed from the aft ballast tanks, the model has zero trim, and requires a VCG of 10.5 feet above baseline, or 3 feet below the main deck, to pass the criteria in 46 CFR 28.570. In our opinion, a VCG located 3 feet below the main deck is unlikely given the vessel's construction and outfitting.

5 Flooding Scenarios

At the request of the Marine Board, three different sinking scenarios were evaluated. Because we have no information regarding the LADY MARY's VCG at the time of the casualty, it was not possible to assess transverse stability. Instead, the model measured the impact of flooding on the model's freeboard and trim. In reality, many of the conditions in the following three scenarios have significant aft trim that would negatively impact the vessel's transverse stability. Many of the figures depicting different damage conditions have red dots near the lazarette and transom bulwark. In the case of the lazarette, the dot represents the point in the tank where water ingress begins. The dot on the aft bulwark represents the point where water would spill over the bulwark as the vessel trims by the stern.

5.1 Scenario 1: Flooding in the Lazarette

The first flooding scenario begins in the lazarette and flooding progresses through a drain pipe into the engine room. Table 2 lists the steps in the scenario with the freeboard and heights of each downflooding point. Conditions 1-3 and 1-4 were created to model progressive flooding of the engine room.

#	Condition	Minimum Freeboard (ft)	Door Sill Height (ft)	Fish Hold Hatch Height (ft)
1-1	Pre-Casualty	1.3	2.5	3.6
1-2	Lazarette Flooded to the Waterline	-0.4	1.6	2.5
1-3	1-2 + 6000 Gallons in the Engine Room	-0.2	1.2	2.3
1-4	1-2 + Engine Room Flooded 100%	-0.4	0.5	1.7

Table 2: Scenario 1 Summary

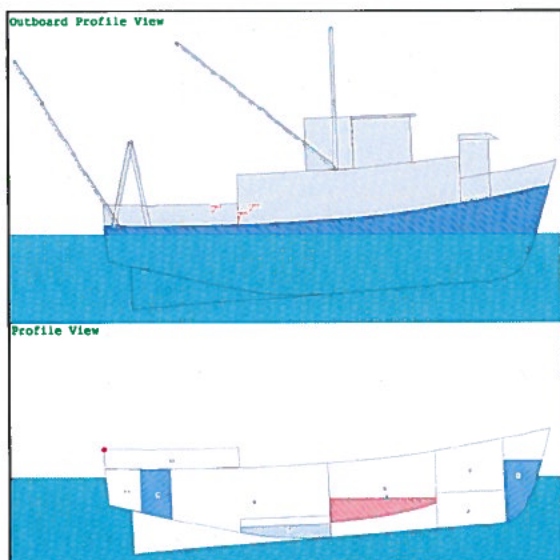


Figure 7: Estimated Pre-Casualty Condition (1-1)

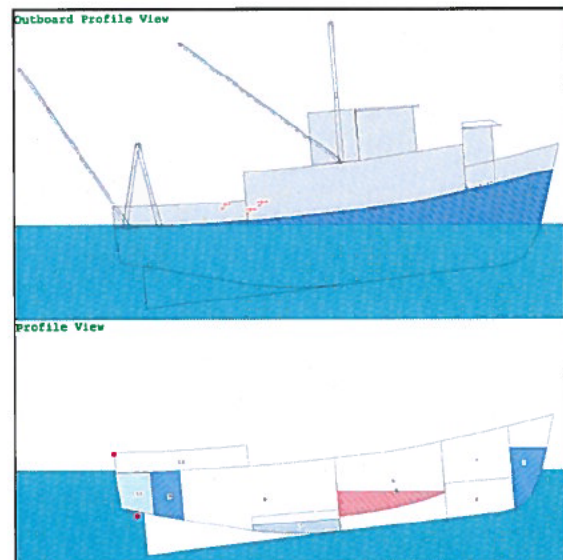


Figure 8: Lazarette Flooded 100% (1-2)

Figure 7 displays the model in the estimated pre-casualty loading, condition 1-1. The lazarette is permitted to flood to the waterline in condition 1-2, shown in Figure 8. The flooding in the lazarette causes the model to trim by the stern, submerging the deck edge at the transom. As the flooding begins to progress forward to the engine room, in condition 1-3 the stern trim is initially reduced, however the overall reduction in freeboard brings the downflooding points closer to the waterline. Condition 1-3 is shown in Figure 9. Condition 1-4 models the vessel with both the engine room and lazarette completely flooded and is shown in Figure 10. With both spaces flooded, the model comes to nearly even trim with the aft door sill only 6 inches above the static waterline.

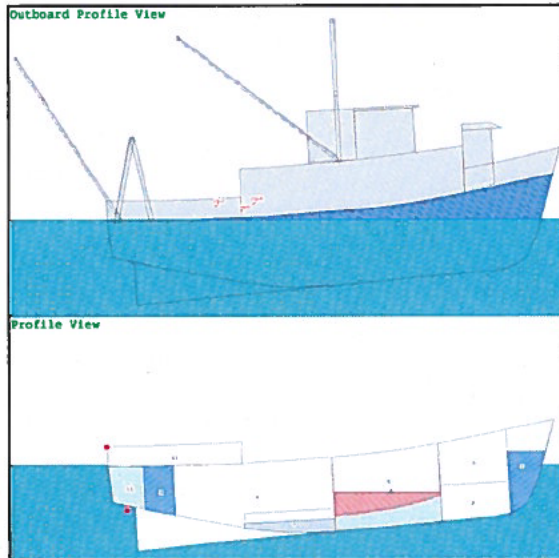


Figure 9: Lazarette Flooded Progressing to Engine Room (1-3)

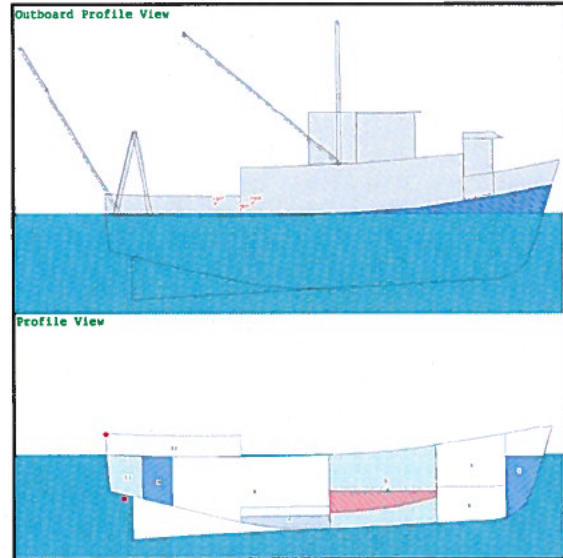


Figure 10: Lazarette and Engine Room Flooded 100% (1-4)

5.2 Scenario 2: Green Water on the Aft Deck

The conditions in scenario 2 were developed to model the effects of taking a wave over the transom and retaining water on the aft deck. The Marine Board has indicated that there is evidence suggesting that the hatch into the lazarette was open at the time of the casualty. Accordingly, condition 2-3 was created to model the effect of downflooding from the aft deck into the lazarette. Finally, condition 2-4 models progressive flooding forward into the engine room.

#	Condition	Minimum Freeboard (ft)	Door Sill Height (ft)	Fish Hold Hatch Height (ft)
2-1	Pre-Casualty	1.3	2.5	3.6
2-2	Green Water on Aft Deck	-1.1	1.2	2.1
2-3	2-2 + Lazarette Flooded	-2.6	0.5	1.2
2-4	2-3 + Engine Room Flooded	Model Sinks		

Table 3: Scenario 2 Summary

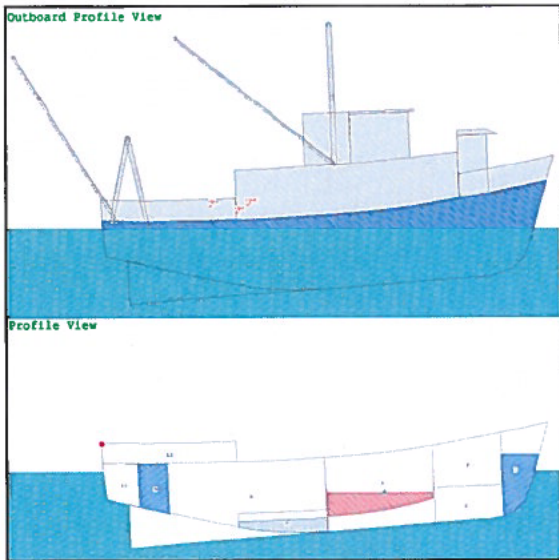


Figure 11: Estimated Pre-Casualty Condition (2-1)

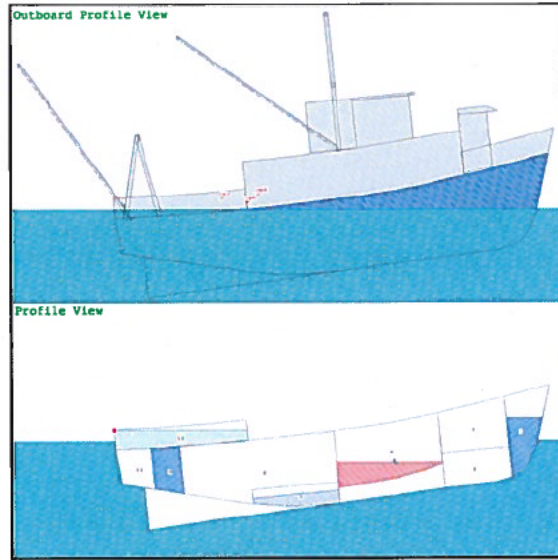


Figure 12: Aft Deck Full of Green Water (2-2)

Condition 2-1, displayed in Figure 11, models the pre-casualty condition and is identical to the loading shown in condition 1-1. In Figure 12, the aft deck bulwarks are filled with water. As the model trims aft, the water is permitted to spill out over the transom. The spill point is labeled with a dot in the lower image in Figure 12 and 13. The water on the aft deck creates a large aft trimming moment, putting the transom more than a foot below the static waterline.

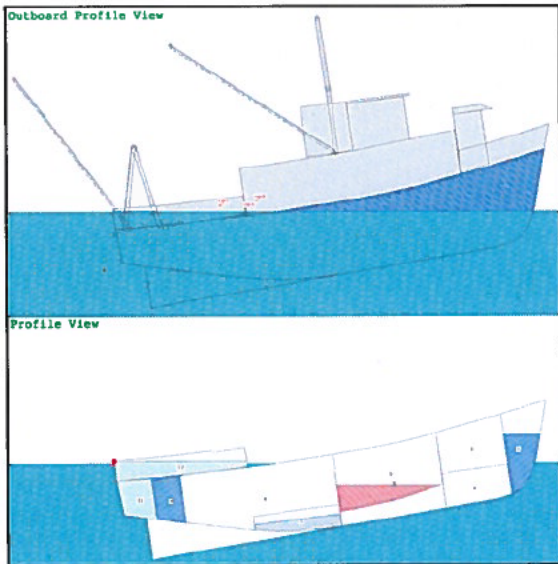


Figure 13: Aft Deck and Lazarette Flooded

Figure 13 shows the model with the aft deck and lazarette flooded. In this condition the model's transom is more than 2.5 feet below the static waterline. In addition, the aft door sill is only 6 inches above the static waterline. With such a small margin to downflooding, it is likely that the effect of wind and waves would have led to flooding through the aft door. Condition 2-4 models the progression of flood water forward into the engine room which results in sinking.

Scenario 3: Flooding in the Engine Room

The third scenario models the effect of flooding in the engine room alone.

#	Condition	Minimum Freeboard (ft)	Door Sill Height (ft)	Fish Hold Hatch Height (ft)
3-1	Pre-Casualty	1.3	2.5	3.6
3-2	3000 Gallons in Engine Room	1.3	2.3	3.5
3-3	9000 Gallons in Engine Room	1.0	1.9	3.2
3-4	Engine Room Flooded 100%	0.3	1.5	2.7

Table 4: Scenario 3 Summary

Figure 14 shows the estimated pre-casualty condition (3-1) which is identical to conditions in conditions 1-1 and 2-1. As the engine room begins to flood the model trims forward, this effect can be seen in the heights of downflooding points between conditions 3-1 and 3-2. The addition of 3000 gallons to the engine room does not reduce the freeboard at the transom although it does put the aft door sill and fish hold hatch closer to the waterline. However, as the flooding in the engine room increases the weight of flood water, it ultimately causes the model to ride approximately 1 foot lower in the water when compared with the pre-casualty condition. Figure 15 shows the model with the engine room completely flooded. Note that in Figure 15, although there is positive freeboard at the stern, near amidships the main deck is essentially awash. With the engine room fully flooded, the reductions in freeboard would have increased the risk of flooding, but when compared to the previous scenarios the risk of downflooding is relatively modest.

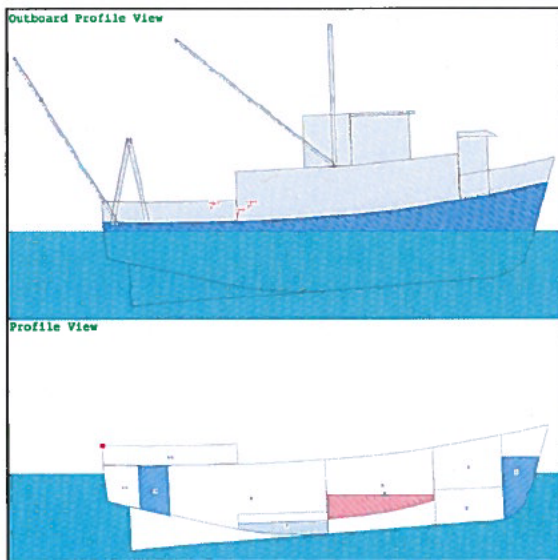


Figure 14: Estimated Pre-Casualty Condition (3-1)

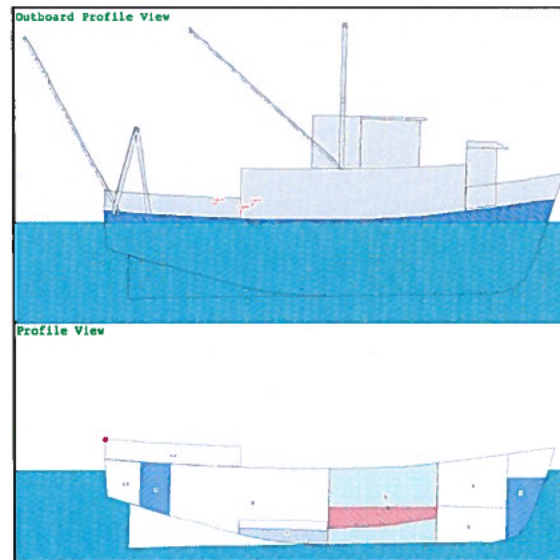


Figure 15: Engine Room 100% Flooded (3-4)

6 The Impact of Weight Additions

To estimate the impact of recent modifications to the vessel, the Marine Board requested that the previous three scenarios be run with weights removed to simulate the reversal of the modifications. Figure 16 details the pre-casualty condition with the modifications removed. Of note, but not readily apparent from the figure, is that the cement ballast and the scallops on deck

were removed. Because there are no detailed drawings for the stern ramp or aft deck house, the estimates of their weight are based solely on plate dimensions provided by the Marine Board.

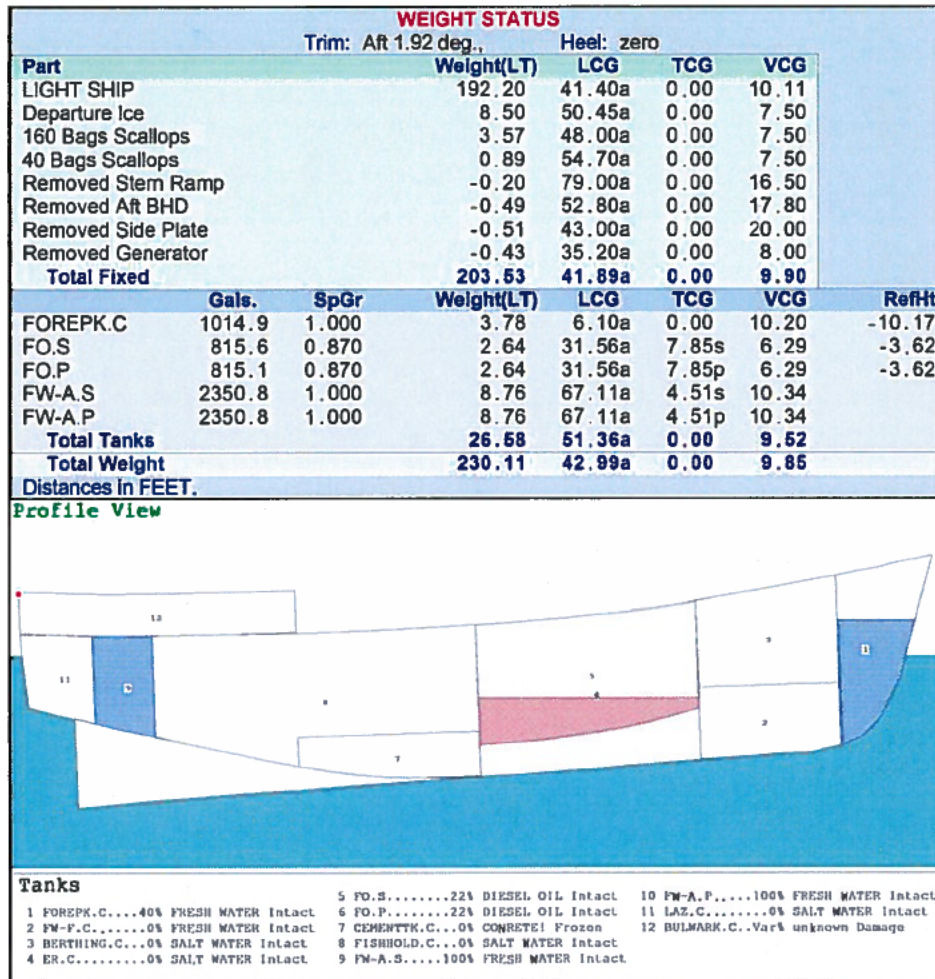


Figure 16: Estimated Pre-Casualty Condition with Modifications Reversed

In the pre-casualty condition, the 5 percent reduction in weight from removing the modifications increases the model's freeboard by approximately 4 inches. When scenarios 1 through 3 are repeated, the 4 inch rise is consistent through all the results. Although 4 additional inches of freeboard would have reduced the probability of catastrophic downflooding, it is important to note that in condition 2-4 the downflooding points are still below the water line, and the model sinks.

7 Conclusions

It was not possible for us to accurately quantify the stability characteristics for LADY MARY at the time of the casualty. To do so would have required knowledge of the vessel's displacement and center of gravity, which are unavailable. Instead, based on the computer model and a load condition derived from the photograph in Figure 5, we assessed the impact on freeboard and trim of three different flooding scenarios. These scenarios indicated that a combination of water on deck, with flooding in the lazarette progressing forward into the engine room could have resulted

in sinking. Finally, based on the aft trim and associated small downflooding angles in the pre-casualty condition, it is unlikely that the vessel would have met the intact stability criteria in 46 CFR 28.570.

Appendix (g)

WITNESSES

Date	Witness	Transcript
<p>Day 1 14 April 2009</p>	<p>LCDR [REDACTED] Pilot, USCG Air Station Atlantic City Atlantic City, New Jersey</p>	<p>13-63</p>
	<p>AST3 [REDACTED] Rescue Swimmer, USCG Air Station Atlantic City Atlantic City, New Jersey</p>	<p>64-94</p>
	<p>OS1 [REDACTED] SAR Controller, LANT Area/D5 Portsmouth, Virginia</p>	<p>95-146</p>
	<p>IS1 [REDACTED] Operational Unit Controller Sector Delaware Bay Philadelphia, Pennsylvania</p>	<p>147-187</p>
<p>Day 2 15 April 2009</p>	<p>No Witness Testimony</p>	
<p>Day 3 04 May 2009</p>	<p>Mr. [REDACTED] Auxiliary, Sector Delaware Bay Philadelphia, Pennsylvania</p>	<p>210-263</p>
	<p>OSC [REDACTED] SAR Chief, Sector Delaware Bay Philadelphia, Pennsylvania</p>	<p>264-285</p>
	<p>LT [REDACTED] Command Duty Officer, Sector Delaware Bay Philadelphia, Pennsylvania</p>	<p>286-325</p>
<p>Day 4 05 May 2009</p>	<p>Dr. [REDACTED] President and CEO of DRUGSCAN Warminster, Pennsylvania</p>	<p>336-361</p>
	<p>Survivor</p>	<p>362-412, 526-556</p>
	<p>Previous Captain</p>	<p>413-525</p>

Date	Witness	Transcript
<p style="text-align: center;">Day 5 05 May 2009</p>	<p>Mr. [REDACTED] NOAA, Office of Law Enforcement Gloucester, Massachusetts</p>	<p>562-656, 735-758</p>
	<p>Mr. [REDACTED] NOAA, Gloucester Regional Office Gloucester, Massachusetts</p>	<p>656-735</p>
<p style="text-align: center;">Day 6 07 May 2009</p>	<p>Mr. [REDACTED] NOAA Search and Rescue Satellites Suitland, Maryland</p>	<p>764-845</p>
	<p>Shore Manager</p>	<p>845-974</p>
<p style="text-align: center;">Day 7 02 November 2009</p>	<p>Captain F/V "L"</p>	<p>989-1007</p>
	<p>Captain [REDACTED]</p>	<p>1007-1039, 1089-1095</p>
	<p>LT [REDACTED] USCG Life Saving and Fire Division Washington, DC</p>	<p>1072-1084</p>
<p style="text-align: center;">Day 8 03 November 2009</p>	<p>Shore Manager</p>	<p>1099-1318</p>
<p style="text-align: center;">Day 9 04 November 2009</p>	<p>Mr. [REDACTED] Jersey Diesel Tuckahoe, New Jersey</p>	<p>1322-1357</p>
	<p>Relative of Deceased</p>	<p>1358-1366</p>
	<p>Mr. [REDACTED] MARTEK Marmora, New Jersey</p>	<p>1367-1398</p>
	<p>Mr. [REDACTED] Auxiliary, USCG CAMSLANT Chesapeake, Virginia</p>	<p>1400-1439</p>

Date	Witness	Transcript
Day 10 05 November 2009	LTJG [REDACTED] NWS Ocean Prediction Center Kent Springs, Maryland	1441-1473
	Mr. [REDACTED] NOAA, Office of Law Enforcement Gloucester, Massachusetts	1474-1473
	Shore Manager	1484-1512
	Mr. [REDACTED] USCG Navigation Systems Division Washington, DC	1512-1563

EXHIBITS SUBMITTED BY THE U. S. COAST GUARD

- Exhibit 01: Life Ring
- Exhibit 02: Survival Suit, Captain
- Exhibit 03: Survival Suit, Survivor
- Exhibit 04: LADY MARY EPIRB
- Exhibit 05: LADY MARY Life Raft
- Exhibit 06: Poster, LADY MARY Port Side
- Exhibit 07: Poster, LADY MARY Port Quarter
- Exhibit 08: Poster, LADY MARY Port Bow
- Exhibit 09: Poster, LADY MARY Starboard Side
- Exhibit 10: Poster, LADY MARY Port Quarter (2)
- Exhibit 11: Diagram (Hand Drawn), Starboard Side LADY MARY
- Exhibit 12: Diagram (Hand Drawn), Overhead View of Stern Deck
- Exhibit 13: LADY MARY Documentation History
- Exhibit 14: Certificate of Death, Captain
- Exhibit 15: Certificate of Death, Deckhand 1
- Exhibit 16: LADY MARY NOAA Permit Ownership

- Exhibit 17: Sea Gear Marine Supply Invoices
- Exhibit 18: Marine Safety Corporation Invoices
- Exhibit 19: MR CHOPER Tonnage Certificate
- Exhibit 20: NOAA Broken Trip Report
- Exhibit 21: Uncorrelated UMIB Log
- Exhibit 22: Communications Log
- Exhibit 23: Official 406 MHz Registration Form
- Exhibit 24: Official 406 MHz Registration Form with "No Changes" Written on Top
- Exhibit 25: SARSAT Beacon Registration Letter Dated November 10, 2008
- Exhibit 26: SARSAT Beacon Registration Letter Dated November 25, 2008
- Exhibit 27: Marine Investigation Board Letter of Designation Dated March 30, 2009
- Exhibit 28: Shore Manager Party of Interest Designation Letter Dated March 27, 2009
- Exhibit 29: Smith and Smith Party of Interest Designation Letter Dated April 16, 2009
- Exhibit 30: Smith and Smith 1998 North Carolina Articles of Incorporation
- Exhibit 31: Smith and Smith 1999 North Carolina Annual Report
- Exhibit 32: Smith and Smith 2008 North Carolina Annual Report
- Exhibit 33: Lofting LADY MARY
- Exhibit 34: 2007 Commercial Fishing Vessel Safety Examination
- Exhibit 35: 2008 Commercial Fishing Vessel Safety Examination
- Exhibit 36: Report of Investigation by Medical Examiner, Captain
- Exhibit 37: Report of External Examination, Captain
- Exhibit 38: NMS Litigation Support Package 09068446, Captain
- Exhibit 39: Report of Investigation by Medical Examiner, Deckhand 1
- Exhibit 40: Report of Post Mortem Examination, Deckhand 1
- Exhibit 41: NMS Litigation Support Package 09068482, Deckhand 1
- Exhibit 42: Drug Test Results, Survivor
- Exhibit 43: ROV Video DVD #1
- Exhibit 44: ROV Video DVD #2
- Exhibit 45: ROV Video DVD #3
- Exhibit 46: VHF / HF / Slides on CD
- Exhibit 47: LADY MARY Application for Re-Admeasurement

Exhibit 48: LADY MARY Tonnage Admeasurement
Exhibit 49: JENNY G Tonnage Admeasurement
Exhibit 50: LADY MARY Documentation History
Exhibit 51: ACR EPIRB Instructions
Exhibit 52: Imanna EPIRB Test Report
Exhibit 53: SARSAT LOG
Exhibit 54: Gillikin Marine Railways Invoices
Exhibit 55: Poster, LADY MARY Stern
Exhibit 56: Dr. [REDACTED] CV
Exhibit 57: VMS Nearby Vessel Tracks
Exhibit 58: VMS Trip Report 652711
Exhibit 59: VMS Generic Vessel Data
Exhibit 60: VMS Tracks Vessel A
Exhibit 61: LADY MARY VMS Back Data
Exhibit 62: EPIRB Beacon Location Data
Exhibit 63: EPIRB Decals
Exhibit 64: USCG Message Traffic
Exhibit 65: Autopsy Report Deckhand 3
Exhibit 66: Autopsy Report Deckhand 2
Exhibit 67: NTSB Hindcast
Exhibit 68: Jersey Diesel Invoice
Exhibit 69: F/V "A" Boatracs Back Data
Exhibit 70: FV "Y" Boatracs Back Data
Exhibit 71: LADY MARY Boatracs Back Data
Exhibit 72: NWS Marine Forecast
Exhibit 73: Federal Fishing Permit Application
Exhibit 74: Two [REDACTED] DVD's
Exhibit 75: Supplemental Report Captain
Exhibit 76: Corrected Screenshot of the LADY MARY
Exhibit 77: LADY MARY Boat Tracs Messages
Exhibit 78: AIS Data

- Exhibit 79: CAP BEATRICE and LADY MARY Tracklines with Navigational Error
- Exhibit 80: Watchstander Statement
- Exhibit 81: CAMI Report for Captain
- Exhibit 82: CAMI Report for Deckhand 1
- Exhibit 83: Satellite Phone Record
- Exhibit 84: Rudder
- Exhibit 85: Life Raft Hydrostatic Release Unit
- Exhibit 86: Statement from USN Diver
- Exhibit 87: HF Propagation Report
- Exhibit 88: VHF Propagation Report
- Exhibit 89: Dimensions
- Exhibit 90: MARTEK Invoice
- Exhibit 91: Written Statement by Captain F/V "P"
- Exhibit 92: Weather Conditions Powerpoint Presentation
- Exhibit 93: 4100 Boarding by the USCGC IBIS
- Exhibit 94: Powerpoint Presentation by Mr. [REDACTED]
- Exhibit 95: Central Processing Unit
- Exhibit 96: Dongle
- Exhibit 97: [REDACTED] Photographs
- Exhibit 98: Email from Marine Safety Corporation
- Exhibit 99: Email from LT [REDACTED], USCGC Dependable OPS Officer
- Exhibit 100: 2008 and 2009 Federal Fishing Permits
- Exhibit 101: Captain of F/V "H" Written Statement
- Exhibit 102: Five Captain [REDACTED] Photographs
- Exhibit 103: Poster HRU
- Exhibit 104: Poster Winch Controls
- Exhibit 105: Poster Inside Wheelhouse
- Exhibit 106: Poster Inside Wheelhouse #2
- Exhibit 107: Poster Stern Ramp
- Exhibit 108: Photographs from Captain [REDACTED] 12 May 2009 Dive
- Exhibit 109: Photographs from Captain [REDACTED] 31 May 2009 Dive

- Exhibit 110: Photographs from Captain [REDACTED] 28 June 2009 Dive
- Exhibit 111: CD of Selected Photographs
- Exhibit 112: Hydraulic Schematic
- Exhibit 113: MARTEK Invoices
- Exhibit 114: Three Photographs by Captain [REDACTED]
- Exhibit 115: Density and Signal Level Reports
- Exhibit 116: Global Star Phone Bill
- Exhibit 117: Comcast Phone Records
- Exhibit 118: Verizon Phone Records Shore Manager
- Exhibit 119: Sprint Phone Record
- Exhibit 120: Drift Pattern
- Exhibit 121: USN Statement
- Exhibit 122: Survivor Interview Notes
- Exhibit 123: [REDACTED] Statement
- Exhibit 124: MDSU 2 Dive Video
- Exhibit 125: [REDACTED] Visit
- Exhibit 126: NTSB Rudder Report
- Exhibit 127: NMFS Observer Trips
- Exhibit 128: Time Stamp Accuracy BOATRACS
- Exhibit 129: Web Extract of FCC Station License
- Exhibit 130: CESM Models
- Exhibit 131: Deckhand 4 Drivers License
- Exhibit 132: AIS Log
- Exhibit 133: McElroy Winch Specifications
- Exhibit 134: NTSB GPS and Hard Drive Factual Report
- Exhibit 135: NOAA Site Survey
- Exhibit 136: NOAA Baseline Letters
- Exhibit 137: May 12 and 31, 2009 Dive Report

EXHIBITS SUBMITTED BY THE PARTY IN INTEREST

- Exhibit A: Diagram (Hand Drawn), LADY MARY Starboard Side Profile
- Exhibit B: Smith and Smith Stock Certificates
- Exhibit C: Ice and Fuel Receipts
- Exhibit D: Notice of Violation
- Exhibit E: NOV Assessment
- Exhibit F: LADY MARY Loaded Condition
- Exhibit G: LARY MARY Vessel Activity Report
- Exhibit H: Scallop Catch Report
- Exhibit I: NOV Settlement
- Exhibit J: Penalty Schedule
- Exhibit K: LADY MARY 'Where Is My Boat' Report
- Exhibit L: Photo EPIRB with ADCD04E21D42001 Registration Number
- Exhibit M: Photo LADY MARY next to MARY ELIZABETH
- Exhibit N: Photo LADY MARY at Cold Springs Harbor
- Exhibit O: Sea Gear Marine Supply Invoice
- Exhibit P: Model H12 Winch Specifications

Appendix (h)

U.S. Department of
Homeland Security

United States
Coast Guard



Commandant
United States Coast Guard

2100 Second Street, S.W.
Washington, DC 20593-0001
Staff Symbol: CG-545
Phone: (202) 372-1029
Fax: (202) 372-1907

16732
30 MAR 09

From: [REDACTED]
RADM B. M. Salerno
COMDT (CG-5)

To: CDR K. P. McAvoy

Subject: MARINE BOARD OF INVESTIGATION CONCERNING THE SINKING OF THE
F/V LADY MARY IN THE ATLANTIC OCEAN ON 24 MARCH 2009 WITH
MULTIPLE LOSS OF LIFE

1. Pursuant to the authority vested in me by 46 USC 6301 and the regulations thereunder, a Marine Board of Investigation consisting of yourself as Chairman, LCDR [REDACTED] USCG, Member, and LCDR [REDACTED] USCG, Recorder, is hereby ordered to convene as soon as practicable to inquire into all aspects of the subject casualty at such times and places as directed by you.
2. The Board will investigate thoroughly the matter hereby submitted to it in accordance with the provisions of 46 USC 6301, et. seq., and the regulations thereunder. Upon completion of its investigation, the Board will report to the Commandant the evidence adduced, the facts established thereby, and its conclusions and recommendations with respect thereto, except that any conclusions or recommendations concerning commendatory actions or misconduct which would warrant further inquiry shall be referred by separate correspondence to the cognizant district commander. A daily summary of significant events shall be transmitted to Commandant (CG-545) while the Board is in formal session.
3. Complete and submit your investigative report to Commandant (CG-545) within six months of the convening date. If this deadline cannot be met, a written explanation for the delay and the expected completion date shall be submitted. You are encouraged to submit interim recommendations intended to prevent similar casualties, if appropriate, early in your investigation.
4. The National Transportation Safety Board (NTSB) is also charged with the responsibility of determining the cause or probable cause of this casualty by the Independent Safety Board Act of 1974 (49 USC 1901, et. seq.) and may designate a representative to participate in this investigation. The NTSB representative may make recommendations regarding the scope of the inquiry, may identify and examine witnesses, and may submit or request additional evidence.

Subject: MARINE BOARD OF INVESTIGATION CONCERNING THE SINKING OF THE
F/V LADY MARY IN THE ATLANTIC OCEAN ON 24 MARCH 2009 WITH
MULTIPLE LOSS OF LIFE

5. Commandant (CG-545) will furnish such funding and technical assistance as may be required by the Board when deemed appropriate and within the requirements for the scope of this investigation. Commander, Fifth Coast Guard District will provide such administrative and legal support as may be required.

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Copy: LANTAREAREA(Api)
CCGD5
Sector Delaware Bay
CG-546
CG-521

**MARINE SAFETY ALERT**

Assistant Commandant for Marine Safety, Security and Stewardship

July 13, 2009
Washington, DC

Alert 04-09

EPIRB and PLB REGISTRATION

This Safety Alert addresses the importance of ensuring your Emergency Position Indicating Radio Beacon (EPIRB) and Personal Locator Beacon (PLB) are properly registered with the National Oceanic and Atmospheric Administration (NOAA).

One of the circumstances surrounding a recent major marine casualty involving an uninspected commercial fishing vessel was the improper registration of the vessel's EPIRB. The Unique Identification Number (UIN) entered into NOAA's registration database was different from the actual UIN programmed into the EPIRB by the manufacturer and transmitted to the Search and Rescue Satellite System after the vessel sank. The improper registration of this vessel's EPIRB delayed the notification to Search and Rescue personnel, and subsequently delayed the launching of rescue assets.

The Search and Rescue Satellite-Aided Tracking (SARSAT) System is composed of stationary and orbiting satellites. For any given location (outside of the Polar Regions), there is continuous coverage by a stationary satellite, and coverage by an orbiting satellite every 60 to 75 minutes on average (which includes the Polar Regions). The stationary satellites can receive all of the information transmitted by an EPIRB or PLB, but they are not capable of determining the position of the beacon unless the beacon has an optional GPS receiver (not all models carry this option). Normally, position identification is accomplished by the orbiting satellites. So, if a beacon is not equipped with the optional GPS, it could take up to 100 minutes for the orbiting satellites to identify the location of the beacon.

In the case of this casualty, the first notification was received by a stationary satellite soon after the vessel sank, but the orbiting satellites were not within range and the improper registration prevented the identification of the vessel's name, homeport and emergency contact information from being forwarded to the Search and Rescue authorities.

As a result of this incident NOAA has commenced an important safety initiative, emailing and mailing all owners/operators of EPIRBs and PLBs registered in the U.S. National Beacon Registration Database, and requesting that they follow the steps listed below. The U.S. Coast Guard supports this initiative, and **strongly recommends** all vessel owners and operators:

1. Confirm that current EPIRB and PLB registrations are correct. Cross-check that the UIN printed by the manufacturer on your EPIRB or PLB matches the UIN printed on the proof-of-registration decal sent to you by NOAA. The manufacturer-provided UIN is usually found on the exterior of the beacon, although in some cases the UIN is printed inside the beacon, under the beacon's battery. You can also cross-check that the above UINs match the NOAA registration database by visiting the National Beacon Registration website at: www.beaconregistration.noaa.gov and choosing one of the links for your existing beacon registration.

If any of the numbers or letters in the UINs are different, your beacon may not be registered properly and you should contact NOAA immediately at: (301) 817-4515 or 1-888-212-SAVE (7283).

2. Update EPIRB and PLB registrations if there are any changes to the vessel information, owner/operator information, emergency contact information, or if your registration information has expired. Registration data must be renewed every two years. Updates and renewals can be made using the same registration methods listed below.
3. Register new or previously unregistered EPIRBs and PLBs with NOAA via the internet at: www.beaconregistration.noaa.gov. *Note: Registration is mandatory and is required by Federal Regulation.*

Alternatively, you can mail the registration form which can be found in the beacon's packaging, or downloaded from the beacon registration website provided above, to the following address:

Beacon Registration
NOAA/NESDIS,
NSOF, E/SP3
4231 Suitland Road
Suitland, MD 20746

The registration form can also be faxed to: (301) 817-4565.

If you have already received a registration safety notification from NOAA and responded accordingly, no further action is required until your next beacon renewal or update.

This safety alert is provided for informational purposes only and does not relieve any domestic or international safety, operational or material requirement. Developed by the Office of Design and Engineering Standards, United States Coast Guard Headquarters, Washington, DC and the NOAA Search and Rescue Satellite-Aided Tracking (SARSAT) Program Office, Suitland, MD.

Office of Investigations and Analysis: <http://marineinvestigations.us>
To subscribe: kenneth.w.olsen@uscg.mil