



UNITED STATES COAST GUARD

REPORT OF INVESTIGATION INTO THE CAPSIZING OF THE SMALL PASSENGER VESSEL LADY D RESULTING IN THE LOSS OF FIVE LIVES AND MULTIPLE SERIOUS INJURIES

ON 03/06/2004



MISLE ACTIVITY NUMBER: 2029161



16732

AUG 19 2009

**INVESTIGATION INTO THE CAPSIZING OF THE SMALL PASSENGER VESSEL
LADY D RESULTING IN THE LOSS OF FIVE LIVES AND MULTIPLE SERIOUS
INJURIES ON MARCH 6, 2004**

ACTION BY THE COMMANDANT

The record and the report of the Formal 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.

ACTION ON RECOMMENDATIONS

Recommendation 1: To address the unsafe condition of issuing licenses to mariners without adequate documentation of critical skills, the Commandant, U.S. Coast Guard, should consider the advisability of adopting a system to better verify experience and skills in merchant marine license applications where the international Standards for Training, Certification and Watchkeeping (STCW) convention does not currently apply. Such system should be directed toward verifying various key competencies, consistent with the intent of STCW, including assessing weather conditions and dynamic environmental factors on small craft.

Action: We do not concur with this recommendation. The existing methods of testing and assessing mariners are sufficient. The master of the LADY D passed a comprehensive, U.S. Coast Guard approved, 104-hour course of study (including examination) at the Community College of Baltimore County. The existing courses for an Operator of Uninspected Passenger Vessel (OUPV) license contain instruction and testing for assessing weather conditions and dynamic environmental factors, and related subjects, including: (1) Characteristics of Weather Systems, (2) Vessel Maneuvering and Handling, (3) Emergency Procedures, and (4) Vessel Handling in Rivers & Estuaries.

Recommendation 2: To address the unsafe condition of licensed mariners with limited skill and experience operating in foul weather, the Commandant, U.S. Coast Guard, should consider the advisability of eliminating the regulatory allowance for self-documenting sea time (46 CFR 10.211(a)) on vessels under 200 Gross Tons.

Action: We do not concur with this recommendation. We agree with the endorsement and reasoning of the District Commander that there is insufficient evidence in this case to support a conclusion that eliminating self-certification of sea time would have improved the master's skill in operating a vessel in severe weather.

Recommendation 3: To address the unsafe condition that passenger weights may have exceeded the safety margin and thereby reduced passenger vessel righting energy, the Commandant, U.S. Coast Guard, should study the existing assumed passenger weights used throughout regulatory

stability criteria and revise standards to a level commensurate with the average weight of persons in today's society.

Action: We concur with this recommendation. In response to a similar recommendation from the National Transportation Safety Board (NTSB), we published a Federal Register notice (71 FR 24732) on April 26, 2006, recommending use of a voluntary interim weight standard of 185 pounds per person for a mix of men and women. Subsequently, on August 20, 2008, we published a Notice of Proposed Rulemaking (73 FR 49244) which included a proposed revision to the assumed average weight per person for use in stability calculations. The NPRM comment period closed on March 20, 2009. Comments are currently being reviewed in preparation of the next regulatory action.

Recommendation 4: To address the unsafe condition of enclosed canopies impeding egress, the Commandant, U.S. Coast Guard, should consider providing guidance for the use of enclosed canopies on all lightweight pontoon passenger vessels that will allow passengers to quickly egress in the event that a capsizing occurs. Canopy supports should be positioned to allow a majority of passenger's unobstructed egress. Side windows or curtains, if installed, should be able to be opened with minimal force by one person.

Action: We concur with this recommendation. This recommendation addresses the issue of passenger entrapment in an emergency, which was identified as a contributing factor for the death and injuries that occurred on the LADY D casualty. It also echoes Recommendation No. 10 of the Marine Board Report of the Sinking of the M/V MISS MAJESTIC that stated: "It is recommended that the Commandant of the U.S. Coast Guard develop policy on the use of canopies and similar structures on small passenger vessels, with specific consideration of the escape provisions of 46 CFR 177.500." To that recommendation, the Commandant concurred only as it related to DUKW type amphibious vehicles and led to the promulgation of Navigation and Vessel Inspection Circular (NVIC) 01-01 that included guidelines relating to the design, operation, maintenance, and inspection of these vessels. 46 CFR 177.55 "Means of escape" provides satisfactory regulatory requirements for rapid evacuation in an emergency and allows the OCMI to accept alternative means of escape. Noting the similarity of passenger area arrangements and the use of enclosed canopies on both the MISS MAJESTIC and the LADY D, we will develop guidance, similar to that in NVIC 01-01, explaining the need for side windows or curtains used as means of escape to be positioned to allow a majority of passengers unobstructed egress and capable of being easily opened by one person for all small passenger vessels with enclosed canopies.

Recommendation 5: To address the potentially unsafe condition that mariners may not have the means to receive time-sensitive weather information, the Commandant, U.S. Coast Guard, should study whether all passenger vessels that do not carry a VHF radio onboard are equipped with a NOAA weather radio or other continuous marine weather communication device to receive weather warnings and alerts. Currently vessels that do not travel more than 1000 feet from shore are not required to have a VHF radio.

Action: We concur with this recommendation. On August 20, 2008, we published a Notice of Proposed Rulemaking (NPRM) (73 FR 49244) which included a proposed addition to the

requirements of 46 CFR 185.304 "Navigation underway" by which the masters of small passenger vessels not greater than 65 feet in length would be required to have satisfactory means available to obtain or monitor the latest marine broadcast. In the meantime, we intend to work with the National Weather Service to encourage passenger vessels and others not required to carry a VHF radio to carry a NOAA Weather Radio (NWR) receiver and to encourage manufacturers of VHF radios to offer models incorporating Specific Area Message Encoding (SAME)-equipped NWR receiving capability integral to the radio. We will also consider whether we should request the Federal Communications Commission to rescind the small passenger vessel 1000-foot navigation exemption on carrying marine a VHF radio expressed in 47 CFR 80.933.

Recommendation 6: To address the unsafe condition that stability may be mistakenly deemed adequate based on sister vessel status, the Commandant, U.S. Coast Guard, should consider revising 46 CFR 178.320(c). Specifically, we recommend that sister-vessel status be granted only after a deadweight survey provides verifying evidence that the vessels share common characteristics. Where a deadweight survey cannot be completed, all passenger vessels certificated to carry less than 49 passengers, regardless of type, construction, or route, should be required to have a stability test. The simplified stability test, a more conservative test than a full stability incline test, is a low cost method for verifying that a vessel is fit for service on its intended route. Requiring all passenger vessels certificated to carry less than 49 passengers regardless of type, construction, or route would serve as an additional enhancement to ensure safety.

Action: We partially concur with this recommendation. While a natural reading of current regulations implies that all pontoon vessels under 65 feet in length operating on protected waters must undergo a pontoon simplified stability test, it has long been our practice to dispense with the test when the vessel's stability can be safety determined by other means.

We do not agree that a pontoon vessel must undergo a deadweight survey to establish sister vessel status. A deadweight survey can only be used for this purpose when the parent vessel has undergone an inclining experiment or a deadweight survey to determine its lightship characteristics. To establish sister vessel status with a vessel which has undergone a simplified stability test, it must be clearly established that the vessels are identical in all respects via some combination of builder attestation, plan review, visual examination, and physical measurement. Specifically, it must be verified that the vessels share the same form, arrangement, materials, construction, dimensions, outfit and displacement.

We do agree that the investigation clearly supports revision of 46 CFR §178 to clarify the vessel types and conditions under which one vessel's stability characteristics can be determined based on the known stability characteristics of another vessel. On August 20, 2008, we published a Notice of Proposed Rulemaking (NPRM) (73 FR 49244) which included a proposed revision to 46 CFR 178.320 that would allow Officers in Charge, Marine Inspection, to dispense with the requirement to conduct a simplified stability proof test when other means are available to determine whether the vessel has adequate stability. For pontoon vessels, the NPRM proposes that stability letters for vessels that undergo a pontoon simplified stability test (PSST) be issued by the Marine Safety Center (MSC). By extending the proposed protocol of MSC issuance of

stability letters to all pontoon passenger vessels, MSC's professional expertise regarding pontoon vessel stability would be invoked in the consideration of a PSST dispensation. If this approach is adopted, the level of risk of an unsafe condition from a pontoon passenger vessel's stability being mistakenly deemed adequate would be acceptably low.

The NPRM comment period closed on March 20, 2009. Comments are currently being reviewed in preparation of the next regulatory action.

Recommendation 7: To address the unsafe condition wherein operators do not understand the limits against which their vessels' stability has been evaluated, the Commandant, U.S. Coast Guard, should consider the need to provide explicit guidance on assessing dynamic environmental conditions to the operators of small passenger vessels, and at a minimum should consider whether the phrase "reasonable operating conditions" on Certificates of Inspection can be replaced with the projected operating environmental conditions used for assessing adequate stability.

Action: We do not concur with this recommendation. It is not possible to accurately enumerate all combinations of safe environmental conditions on a given passenger vessel's COI. Instead, we have traditionally restricted small passenger vessels to operation in "reasonable operating conditions." Defining reasonable operating conditions involves the judgment of a professional mariner having a certain degree of experience in the operation of a given size and type of vessel, and direct knowledge of the conditions to which the vessel is subject at any particular moment. Limiting wind speeds and wave heights alone cannot adequately define a safe operating envelope for any vessel. Many other conditions involving the vessel, its changing environment, and its response to that environment, must be constantly observed, monitored, interpreted, and responded to by the master in order to evaluate the advisability of embarking on a voyage, or continuing on a voyage when conditions progressively deteriorate. We cannot overemphasize the need for due diligence on the part of the Master with respect to weather conditions and other factors, and must avoid placing unnecessary and inappropriate limits on his or her discretion.

Recommendation 8: To address the unsafe condition that critical weather information may not be relayed to mariners in a timely fashion, the Commandant of the U.S. Coast Guard should forward copy of this report to the National Weather Service for use in improving the accuracy and advanced notice of warnings of severe marine weather conditions.

Action: We concur with this recommendation. We have placed an item covering this casualty and means to improve dissemination of critical weather information to mariners on the agenda of the quarterly meeting of the U.S. Coast Guard/National Weather Service Coordination Liaison Group (UNCLOG) and will include this report on the agenda as well.

Recommendation 9: To address the unsafe condition in water taxi management contributing to the causes of this accident, the Commandant of the U.S. Coast Guard should consider forwarding a copy of this report to the Passenger Vessel Association and appropriate U.S. Coast Guard advisory committees for consideration and action by similar watertaxi operations outside the Sector Baltimore Area of Responsibility. We particularly direct the attention of water taxi operators to:

- a. The need to evaluate the specific boathandling skills of licensed personnel given the proof-of-skill issues identified in this report;
- b. The need to provide unambiguous policy regarding dynamic stability and the master's responsibility to assess all factors potentially affecting the safety of each distinct transit/voyage; and
- c. The need for passenger accountability practices as outlined in the report and later implemented by Seaport Taxi, Inc.

Action: We partially concur with this recommendation. We will provide a copy of this report to the Passenger Vessel Association and appropriate Coast Guard advisory committees for consideration of the issues raised in this recommendation with the following clarification with respect to item b.: As noted elsewhere in this report, we do not believe it is possible to provide unambiguous policy regarding a vessel's "dynamic stability." It is appropriate, however, to share the findings of this investigation with managers of water taxi services, and for them to impress on vessel Masters their responsibility to continuously monitor and assess dynamic environmental conditions. Masters must use their best professional mariner judgment and knowledge of their vessel's dynamic response to those conditions to evaluate the advisability of embarking on a voyage, or continuing on a voyage when conditions progressively deteriorate.

Recommendation 10: To address the unsafe condition wherein operators do not understand the maximum operating environment against which their vessel's stability has been evaluated, the Commander, Coast Guard Sector Baltimore should, pending the Commandant's action on Recommendation number Seven above, remind small passenger vessel operators in the Baltimore Area of Responsibility of the importance of assessing dynamic environmental factors and their impact on the stability of vessels.

Action: We concur with this recommendation and note the comments of the District Commander.

Fifth Coast Guard District Recommendation 11: To address the potentially unsafe condition involving other pontoon vessels operating with passenger capacities based on a simplified stability test that was improperly conducted, or based on the capacity of another vessel with substantially different stability characteristics, the Commandant, U.S. Coast Guard, should conduct an assessment of the stability of the existing pontoon passenger vessel fleet to identify vessels that may have an elevated risk of capsize as a result of these errors. Where necessary, the Commandant, U.S. Coast Guard, should direct the OCMI's to take appropriate measures to mitigate the elevated risk.

Action: We concur with this recommendation. This marine casualty focused our attention on pontoon vessel stability. A series of actions were taken since this casualty occurred to identify, assess, and address areas of concern. These include validation of stability standards and review of the adequacy of the Pontoon Simplified Stability Test (PSST); updates to PSST field guidance; direction to all Officers in Charge, Marine Inspection to review vessels believed to be at potentially elevated risk; initiation of a passenger weight regulatory project; and, publication of voluntary guidance in the Federal Register as an interim measure until the regulatory project can be completed.

Actions to validate the information upon which existing pontoon vessels' stability is based continue. After thorough review of the entire fleet of certificated pontoon vessels, we found that stability tests for many pontoon vessels contained errors which could have eroded the conservative nature of the PSST. Each vessel was categorized based on our level of confidence in the validity of its stability information. Field commanders were notified of vessels that were considered potentially to be at elevated risk, and advised to take appropriate action to ensure each vessel operates in compliance with applicable stability standards. While concerns over some vessels' stability information has been resolved administratively via review of additional stability records, other vessels have been required to conduct a new PSST using strict engineering protocols. Many of these tests have resulted in a significant reduction in the vessel's authorized passenger capacity. Through these actions, we have learned a great deal about pontoon vessels' unique stability characteristics and intend to incorporate lessons learned in future regulation and policy.



D. S. FISH
By direction



16732
18 May 2009

**INVESTIGATION INTO THE CAPSIZING OF THE
SMALL PASSENGER VESSEL LADY D
RESULTING IN THE LOSS OF FIVE LIVES
AND MULTIPLE SERIOUS INJURIES ON MARCH 6, 2004**

ACTION BY THE DISTRICT COMMANDER

The final report of the Coast Guard Sector Baltimore investigation into the subject casualty has been reviewed by the Commander, Fifth Coast Guard District. Its detailed findings, analysis, conclusions and recommendations reflect a focused, comprehensive and insightful investigative effort; moreover, I concur that the report accurately identifies and seeks to address significant operational and materiel safety issues. The report, together with a specific Fifth District endorsement for each of its recommendations, is being forwarded to the Commandant, U. S. Coast Guard, for program-level consideration as appropriate.

SECTOR-LEVEL RECOMMENDATIONS

Recommendation 1: To address the unsafe condition of issuing licenses to mariners without adequate documentation of critical skills, the Commandant, U.S. Coast Guard, should consider the advisability of adopting a system to better verify experience and skills in merchant marine license applications where the international Standard for Training, Certification and Watchkeeping (STCW) convention does not currently apply. Such system should be directed toward verifying various key competencies, consistent with the intent of the STCW, including assessing weather conditions and dynamic environmental factors on small craft.

Endorsement: Concur – It is fundamental that professional mariners should possess the skills and knowledge required to safely operate vessels for which they are licensed, including both an awareness of the severe weather patterns that may be encountered along a route where they are operating and an understanding of the effect severe weather will have on the vessel type being operated. In this regard, the principal responsibility for ensuring safe operation in all conditions lies with the licensed mariner. However, Coast Guard consideration of whether more explicitly identifying, defining and verifying certain key competencies, including those relating to assessing small vessel stability characteristics and the potential impact of adverse weather conditions, is consistent with the Coast Guard role of promoting marine safety. In view of feedback from Sector Baltimore and elsewhere in the Fifth District, I believe there is a basis for concern that the effects of dynamic environmental conditions are poorly understood by some professional mariners, particularly those mariners holding the lower-level licenses commonly employed on small passenger vessels.

Recommendation 2: To address the unsafe condition of licensed mariners with limited skill and experience operating in foul weather, the Commandant, U.S. Coast Guard should consider the advisability of eliminating the regulatory allowance for self-documenting sea time (per 46 CFR 10.211(a)) on vessels under 200 Gross Tons.

Endorsement: Non-Concur – There is insufficient evidence in this case to support a conclusion that eliminating self-certification of sea time would have improved the master’s skill in operating a vessel in severe weather. The Investigating Officers determined that the master of the Lady D had limited experience operating in severe weather based on a review of the 360 days the master self-certified to apply for a license, in that a review of the records from 1996 through 1999 shows no operation during the cold weather months of December through February. However, the report does not address whether the master may have accumulated severe weather experience during the warm weather months of those years and/or over the following four years (including possible experience from the date of his hire by Seaport Taxi in July 2002 until the accident on March 6, 2004). It is not clear that the master of the Lady D had inadequate severe weather experience, and it would appear premature to conclude that moving away from self-certification of sea time would prove a safety enhancement in this respect.

Recommendation 3: To address the unsafe condition that passenger weights may have exceeded the safety margin and thereby reduced passenger vessel righting energy, the Commandant, U.S. Coast Guard, should study the existing assumed passenger weights used throughout regulatory stability standards and revise standards to a level commensurate with the average weight of persons in today’s society.

Endorsement: Concur – The rationale for this recommendation is fully explained in the Commandant’s Notice of Proposed Rulemaking (73 FR 49244) that recommends a new test weight of 185 pounds.

Recommendation 4: To address the unsafe condition of enclosed canopies impeding egress, the Commandant, U.S. Coast Guard, should consider providing guidance for the use of enclosed canopies on all lightweight pontoon passenger vessels that will allow passengers to quickly egress in the event that a capsizing occurs. Canopy supports should be positioned to allow a majority of passengers unobstructed egress. Side windows or curtains, if installed, should be able to be opened with minimal force by one person.

Endorsement: Non-Concur – The relevant focus is vessel stability. If there is a finding that pontoon passenger vessels are inherently more at risk of capsizing than conventional small passenger vessels, the elevated risk should be addressed through implementation of amended and/or new regulations, policies or procedures. With respect to issues related to vessel egress, the current provisions of 46 C.F.R. §177.500 appear sufficient. These provisions afford the Coast Guard an adequate basis of authority to require an effective means of escape from a pontoon vessel for passengers who have donned lifejackets, and Officers in Charge of Marine Inspection (OCMIs) should ensure that inspectors consider whether additional egress requirements above the specified minimum are appropriate given unique aspects of vessel design and/or equipment.

Recommendation 5: To address the potentially unsafe condition that mariners may not have the means to receive time-sensitive weather information, the Commandant, U.S. Coast Guard, should study whether all passenger vessels that do not carry a VHF radio onboard should be required to carry a NOAA weather radio or other continuous weather communication device to receive weather warnings and alerts. Currently, vessels that do not travel more than 1,000 feet from shore are not required to have a VHF radio.

Endorsement: Concur – A NOAA weather radio or other continuous weather communications device that receives warnings and alerts is a comparatively low-cost means of providing valuable additional information to the master. This information would augment the master’s own observations and other sources of information that should be taken into account in evaluating the advisability of embarking on a voyage, continuing on a voyage when conditions deteriorate, and/or seeking a harbor of safe refuge.

Recommendation 6: To address the unsafe condition that stability may be mistakenly deemed adequate based on sister vessel status, the Commandant, U.S. Coast Guard, should consider revising 46 CFR 178.320(c). Specifically, we recommend that sister-vessel status be granted only after a deadweight survey provides verifying evidence that the vessels share common characteristics. Where a deadweight survey cannot be completed, all passenger vessels certificated to carry less than 49 passengers, regardless of type, construction, or route, should be required to have a stability test. The simplified stability proof test, a more conservative test than a full stability incline test, is a low cost method for verifying that a vessel is fit for service on its intended route. Requiring the test for all passenger vessels certificated to carry less than 49 passengers regardless of type, construction, or route would serve as an additional enhancement to ensure safety.

Endorsement: Non-Concur – On the one hand, the thrust of this recommendation is on target, and the investigation clearly supports revision of 46 CFR §178.320(c) to include the term “sister-vessel,” the criteria for determining sister-vessel status, and how sister vessel status can be used by an OCMI to dispense with the simplified stability proof test. On the other hand, requiring a deadweight survey to be performed in all cases on a vessel before sister-vessel status is accorded appears excessive and may unnecessarily constrain the discretion and professional judgment of the OCMI.

Recommendation 7: To address the unsafe condition wherein operators do not understand the limits against which their vessels’ stability have been evaluated, the Commandant, U.S. Coast Guard, should consider the need to provide explicit guidance on assessing dynamic environmental conditions to the operators of small passenger vessels, and at a minimum should consider whether the phrase “reasonable operating conditions” on Certificates of Inspection can be replaced with the projected operating environmental conditions for assessing adequate stability.

Endorsement: Concur – Specific guidance should be provided to pontoon vessel owners and operators that clearly delineates the limitations of the intact stability standards when applied to their vessels and recommends safe operating conditions (presumably by reference to the Beaufort Scale or terms used by the National Weather Service when issuing marine forecasts and warnings). Such guidance would be particularly beneficial to owners and operators of small

vessels who elect to demonstrate regulatory compliance by conducting a simplified stability test, in lieu of submitting design stability calculations that would require the assistance of a naval architect or someone well versed in small vessel stability and the limitations of the federal intact stability standards.

Recommendation 8: To address the unsafe condition that critical weather information may not be relayed to mariners in a timely fashion, the Commandant, U.S. Coast Guard, should forward a copy of this report to the National Weather Service for use in improving the accuracy and advance notice of warnings of severe weather conditions.

Endorsement: Concur – The Lady D mishap compellingly demonstrates how critical early warning of impending severe weather can be in certain cases for small vessel operators.

Recommendation 9: To address the unsafe condition in water taxi management contributing to the causes of this accident, the Commandant, U.S. Coast Guard, should consider forwarding a copy of this report to the Passenger Vessel Association and appropriate U.S. Coast Guard advisory committees for consideration and action by similar water taxi operations outside the Sector Baltimore Area of Responsibility. We particularly direct the attention of water taxi operators to:

- a. The need to evaluate the specific boathandling skills of licensed personnel given the proof-of-skills issue identified in this report;
- b. The need to provide unambiguous policy regarding dynamic stability and the master's responsibility to assess all factors potentially affecting the safety of each distinct transit/voyage; and
- c. The need for passenger accountability practices as outlined in the report and later implemented by Seaport Taxi, Inc.

Endorsement: Concur – The report provides an excellent basis for the development and analysis of case studies and best safety practices involving water taxi management.

Recommendation 10: To address the unsafe condition wherein operators do not understand the maximum operating environment against which their vessel's stability has been evaluated, the Commander, Coast Guard Sector Baltimore should, pending the Commandant's action on Recommendation number Seven above, remind small passenger vessel operators in the Baltimore Area of Responsibility of the importance of assessing dynamic environmental factors and their impact on the stability of vessels.


Endorsement: Concur – While District-level endorsement of a recommendation addressed to Sector Baltimore is not necessary, I note that Sector Baltimore has already completed several reviews of small passenger vessel stability for its fleet of responsibility, both at the Sector Commander's initiative and pursuant to higher-level program guidance, including the pontoon vessel bulletin issued by the Commandant, U.S. Coast Guard, in March 2006. In many cases, new stability tests required by Sector Baltimore have resulted in significant reductions in passenger allowances or new route restrictions. Moreover, as part of each stability review, Sector Baltimore marine inspectors emphasize the significance and inherent limits of the simplified stability proof test, as well as owner / mariner responsibility for carefully considering

how dynamic environmental conditions might exceed the heeling moment considered during stability tests. I note further that all other Sectors within the Fifth District with pontoon vessels in their fleets of responsibility have taken similar measures to raise awareness of factors affecting stability.

ADDITIONAL RECOMMENDATION

Based on the District-level review of the report of investigation, one recommendation in addition to those developed by the Investigating Officers is appropriate:

Recommendation 11: To address the potentially unsafe condition involving other pontoon vessels operating with passenger capacities based on a simplified stability test that was improperly conducted, or based on the capacity of another vessel with substantially different stability characteristics, the Commandant, U.S. Coast Guard, should conduct an assessment of the stability of the existing pontoon passenger vessel fleet to identify vessels that may have an elevated risk of capsize as a result of these errors. Where necessary, the Commandant, U.S. Coast Guard, should direct the OCMI's to take appropriate measures to mitigate the elevated risk. [Note: As is the case with several other significant recommendations developed by the Sector Baltimore Investigating Officers, Coast Guard-wide implementation of this additional recommendation is already well underway.]


FRED M. ROSA, JR.
Rear Admiral, U.S. Coast Guard

Copy: Commandant, U.S. Coast Guard (CG-545)
Commander, U.S. Coast Guard Atlantic Area (Ap)
Commander, U.S. Coast Guard Sector Baltimore (sp)



16732
28 February 2009

**INVESTIGATION INTO THE CAPSIZING OF THE M/V LADY D
RESULTING IN FIVE LOSSES OF LIFE AND MULTIPLE
SERIOUS INJURIES ON MARCH 6, 2004**

ACTION BY THE SECTOR COMMANDER

I have reviewed the record and the report of investigation of the subject casualty in accordance with COMDTINST M16000.10A, Chapter A6, Section B. The record and the report, including the findings of fact, analysis, conclusions, and recommendations are approved subject to the following comments, and forwarded to the Commander, Fifth Coast Guard District, as required by paragraph 2.e of the Marine Information Safety and Law Enforcement (MISLE) Incident Investigation and Enforcement Process Guide dated September, 2008.

ACTION ON RECOMMENDATIONS

Recommendation #1. To address the unsafe condition of issuing licenses to mariners without adequate documentation of critical skills, the Commandant, U.S. Coast Guard, should consider the advisability of adopting a system to better verify experience and skills in merchant marine license applications where the international Standard for Training, Certification and Watchkeeping (STCW) convention does not currently apply. Such system should be directed toward verifying various key competencies, consistent with the intent of the STCW, including assessing weather conditions and dynamic environmental factors on small craft.

Action: I concur, and recommend favorable consideration by the Commandant.

Recommendation #2. To address the unsafe condition of licensed mariners with limited skill and experience operating in foul weather, the Commandant, U.S. Coast Guard should consider the advisability of eliminating the regulatory allowance for self-documenting sea time (per 46 CFR 10.211(a)) on vessels under 200 Gross Tons.

Action: I concur, and recommend favorable consideration by the Commandant.

Recommendation #3. To address the unsafe condition that passenger weights may have exceeded the safety margin and thereby reduced passenger vessel righting energy, the Commandant, U.S. Coast Guard should study the existing assumed passenger weights used throughout regulatory stability criteria and revise standards to a level commensurate with the average weight of persons in today's society.

Action: I concur, and I note that in the extended time since this recommendation was made, the Commandant has substantively taken this action, as identified in various Notices of Proposed Rulemaking. I therefore recommend favorable consideration by the Commandant.

Recommendation #4. To address the unsafe condition of enclosed canopies impeding egress, the Commandant, U.S. Coast Guard should consider providing guidance for the use of enclosed canopies on all lightweight pontoon passenger vessels that will allow passengers to quickly egress in the event that a capsizes occurs. Canopy supports should be positioned to allow a majority of passengers unobstructed egress. Side windows or curtains, if installed, should be able to be opened with minimal force by one person.

Action: I concur, and recommend favorable consideration by the Commandant. Within the Sector Baltimore Area of Responsibility, I have directed marine inspectors under my command to discuss egress issues with the owners and operators of pontoon vessels during annual inspections.

Recommendation #5. To address the potentially unsafe condition that mariners may not have the means to receive time-sensitive weather information, the Commandant, U.S. Coast Guard, should study whether all passenger vessels that do not carry a VHF radio onboard should be required to carry a NOAA weather radio or other continuous weather communication device to receive weather warnings and alerts. Currently, vessels that do not travel more than 1,000 feet from shore are not required to have a VHF radio.

Action: I concur, and recommend favorable consideration by the Commandant. I note that vessels with routes restricted to 1,000 feet from shore are typically the smallest and therefore most easily affected by rapidly changing weather conditions. Within the Sector Baltimore Area of Responsibility, I have directed marine inspectors under my command to discuss the issue of continuous weather communications with affected operators.

Recommendation #6. To address the unsafe condition that stability may be mistakenly deemed adequate based on sister vessel status, the Commandant, U.S. Coast Guard, should consider revising 46 CFR 178.320(c). Specifically, we recommend that sister-vessel status be granted only after a deadweight survey provides verifying evidence that the vessels share common characteristics. Where a deadweight survey cannot be completed, all passenger vessels certificated to carry less than 49 passengers, regardless of type, construction, or route, should be required to have a stability test. The simplified stability proof test, a more conservative test than a full stability incline test, is a low cost method for verifying that a vessel is fit for service on its intended route. Requiring the test for all passenger vessels certificated to carry less than 49 passengers regardless of type, construction, or route would serve as an additional enhancement to ensure safety.

Action: I concur, and I note that in the extended time since this recommendation was made, the Commandant has substantively taken equivalent action, as identified in various changes to Coast Guard policy. I therefore recommend favorable consideration by the Commandant.

Recommendation #7. To address the unsafe condition wherein operators do not understand the limits against which their vessels' stability has been evaluated, the Commandant, U.S. Coast Guard, should consider the need to provide explicit guidance on assessing dynamic environmental conditions to the

operators of small passenger vessels, and at a minimum should consider whether the phrase “reasonable operating conditions” on Certificates of Inspection can be replaced with the projected operating environmental conditions for assessing adequate stability.

Action: I concur, and I note that in the extended time since this recommendation was made, the Commandant has substantively taken this initiative, as identified in various Notices of Proposed Rulemaking. I therefore recommend favorable consideration by the Commandant.

Recommendation #8. To address the unsafe condition that critical weather information may not be relayed to mariners in a timely fashion, the Commandant, U.S. Coast Guard, should forward a copy of this report to the National Weather Service for use in improving the accuracy and advance notice of warnings of severe weather conditions.

Action: I concur, and recommend favorable consideration by the Commandant.

Recommendation #9. To address the unsafe condition in water taxi management contributing to the causes of this accident, the Commandant of the U.S. Coast Guard should consider forwarding a copy of this report to the Passenger Vessel Association and appropriate U.S. Coast Guard advisory committees for consideration and action by similar water taxi operations outside the Sector Baltimore Area of Responsibility. We particularly direct the attention of water taxi operators to:

- a. The need to evaluate the specific boathandling skills of licensed personnel given the proof-of-skills issued identified in this report;
- b. The need to provide unambiguous policy regarding dynamic stability and the master’s responsibility to assess all factors potentially affecting the safety of each distinct transit/voyage; and
- c. The need for passenger accountability practices as outlined in the report and later implemented by Seaport Taxi, Inc.

Action: I concur, and recommend favorable consideration by the Commandant. Within the Sector Baltimore Area of Responsibility, I have directed marine inspectors under my command to discuss these issues with managing operators, for both pontoon and conventional hulls.

Recommendation #10. To address the unsafe condition wherein operators do not understand the maximum operating environment against which their vessel’s stability has been evaluated, the Commander, Coast Guard Sector Baltimore should, pending the Commandant’s action on Recommendation number Seven above, remind small passenger vessel operators in the Baltimore Area of Responsibility of the importance of assessing dynamic environmental factors and their impact on the stability of vessels.

Action: I concur, and I note that in the extended time since this recommendation was made, the Commandant has substantively taken this initiative, as identified in various Notices of Proposed Rulemaking. As noted in Section 1.9 of the Report of Investigation, I have directed and completed several reviews of small passenger vessel stability for this unit’s fleet of responsibility, reassessing stability rigorously, including a second comprehensive review

28 February 2009

following the Commandant's pontoon vessel alert message of March 2006. In many cases, new stability tests have resulted in significant reductions in passenger allowances or new route restrictions. As part of each stability review, Sector Baltimore marine inspectors discuss the limits of the simplified stability proof test, the concept of the safety margin built into the stability tests, and convergence of dynamic environmental conditions, and the owner and mariner responsibility for carefully considering how dynamic environmental conditions might exceed the heeling moment considered during stability tests. I continue to have significant reservations that the effects of dynamic environmental conditions are poorly understood by mariners, in particular mariners holding the lower level licenses commonly employed on small passenger vessels.



Brian D. Kelley

Captain, U.S. Coast Guard

Commander, Coast Guard Sector Baltimore



UNITED STATES COAST GUARD

**REPORT OF INVESTIGATION INTO THE
CIRCUMSTANCES SURROUNDING THE
CAPSIZING OF THE
LADY D
RESULTING IN FIVE LOSSES OF LIFE
AND MULTIPLE SERIOUS INJURIES
ON MARCH 6TH, 2004**



**MISLE Activity Number: 2029161
Originating Unit: Sector Baltimore
Misle Case Number: 165934**

INCIDENT BRIEF

On March 6, 2004, at approximately 1600 hours Eastern Standard Time, the water taxi *Lady D* (MD 8246BC), a small passenger vessel inspected and authorized by the U.S. Coast Guard to carry passengers, capsized in the Northwest Harbor of the Patapsco River in Baltimore, MD five minutes into its 15 minute transit. The vessel departed Ft. McHenry en route to Fells Point when



Figure 1: The *Lady D* survivors aboard the capsized hull.

it encountered heavy winds, rain and seas and subsequently capsized at the approximate location of 39.16.35 N latitude and 076.34.64 W longitude in the Northwest Harbor. On board were a total of twenty-five persons consisting of two crewmembers and twenty-three passengers. Of the twenty-five individuals onboard, both crewmembers and twenty passengers were rescued from the capsized vessel. Many of the individuals onboard the water taxi received minor injuries. All were treated at local hospitals. A surviving child passenger sustained brain damage as a result of the

capsizing. This child currently requires the in home assistance of a nurse and physical therapist. Two of three passengers recovered while unconscious died later at a local hospital. The three remaining passengers were recovered deceased approximately ten days later in the vicinity of the capsizing.

The vessel was salvaged, and, having sustained major damages from the capsizing was declared a total loss at \$35,000. The canopy has not been recovered.

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1.0 Findings of Fact

Undertaken pursuant to the Coast Guard's investigative authorities under Title 46, United States Code part 6301, this investigation documents the Coast Guard's findings about the capsizing of the *Lady D* on March 6th, 2004 resulting in the loss of five lives. Through a course of intensive investigation, interviewing, documentary evidence collection, and analysis, the Coast Guard has established the underlying facts and drawn conclusions about the complex web of causes which resulted in this accident. The report begins by documenting these basic facts in Section 1.0, then presents the analysis of causes in Section 2.0, draws conclusions in Section 3.0, and presents recommendations to prevent similar accidents in the future in Section 4.0. Throughout our investigation, we have taken the position that major accidents are rarely if ever caused by any one single factor, either mechanical or human. Instead, these accidents arise from the unpredicted convergence of multiple factors, each one necessary, but alone insufficient. Rather than focus on an individual or piece of equipment, this investigation focuses on the system that placed the *Lady D* at Fort McHenry on the afternoon of March 6th, 2004.

1.1 *Lady D* Vessel Details

Name: *Lady D*
O.N.: MD8246BC
Registration: CG050322
Flag: USA
Start of Construction: Fall, 1995
Year Built: Keel Laid-March, 18 1996¹(*) Delivery Date- March, 28 1996
Type: Pontoon vessel
Service: Passenger, more than six (46 CFR Subchapter T)
Gross Tons: 2
Length: 36 Feet 2 inches
Beam: 8 Feet 3 inches
Propulsion: Outboard 90 HP, gasoline
Communications: VHF Radio (marine)
Owner: Living Classrooms Foundation
Operator: Seaport Taxi, LLC



Figure 2: A vessel similar to the *Lady D*

¹ Information entered in the U. S. Coast Guard's operational database (launched in 2001) reports the keel laid date as March 18, 1996. Based on this date, the vessel falls under the regulations of Title 46, Code of Federal Regulations (CFR), Subchapter T, specifically "New T" regulations. However, the information is incorrect. The vessel's files provide substantial evidence that construction began in the fall of 1995 as evidenced by a site visit to the ship yard by a USCG marine inspector. Based on this information the vessel is subject to the provisions under the regulations of Title 46, Code of Federal Regulations (CFR), Subchapter T, specifically "Old T." See Exhibit #114 (ECN 2029161 #114 BKP) at page 3.

Surviving Passengers

Age

Home Address

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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[REDACTED]

[REDACTED]

[REDACTED]

Crewmembers

License/Cert

Age

Home Address

[REDACTED]

MML # [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

MML # [REDACTED]

[REDACTED]

[REDACTED]

1.3 The Crewmembers

██████████ is a █████-year-old male, licensed merchant mariner. ██████████ started working for Seaport Taxi in 2002, and at the time of the accident on March 6th, he was acting as Master of the *Lady D*. ██████████ held USCG license No. ██████████ issue number 1, obtained in Baltimore, MD. The licensee was endorsed for Master of steam or motor vessels of not more than 50 Gross Registered Tons (GRT) upon inland waters and also authorized ██████████ to engage in commercial assistance towing. ██████████ license expired on April 30, 2007 and he has permanently relinquished all rights to obtain or renew his credentials.

██████████ is a █████-year-old male, licensed merchant mariner. ██████████ started working for Seaport Taxi in 2003, and was acting as the lone crewmember aboard the *Lady D* at the time of the casualty. ██████████ holds USCG license No. ██████████ issue number 1, obtained in Baltimore, MD. The license is endorsed for Master of steam, motor or auxiliary sail vessels of not more than 50 GRT upon inland waters and authorizes ██████████ to engage in commercial assistance towing. ██████████ has a vision waiver on his license and must wear corrective lenses. ██████████ license expires November 20, 2008. Although ██████████ holds a license, no license was required in order to act as crewman on the *Lady D*.

1.3.1 Mariner Licensing Requirements

Pursuant to Title 46 Code of Federal Regulations (CFR) part 10.457, in order to hold a license of *Master, 50 GRT Inland* a mariner must complete a comprehensive exam consisting of four modules: Rules of the Road, Navigation General, Chart Navigation, and Deck - Navigation General – Safety. Questions pertaining to weather and seamanship to include vessel handling, are found in the Navigation General and Deck General modules of the license exam. A minimal score of 70% on each module must be obtained for satisfactory completion. Additionally, a mariner is required to provide proof of 360 days of sea service to obtain a *Master, 50 GRT Inland* license. As authorized by 46 CFR 10.211(a), for sea service on vessels of under 200 GRT, prospective masters may attest to their own service, i.e., sea-service can be proven by means of self-generated trip or vessel logs.

1.3.2 ██████████ Training and Experience

At the time of the accident, ██████████ was a relatively junior merchant mariner, having received his first license in March, 2002 just as he started work for Seaport Taxi. He completed the *Operator of Uninspected Passenger Vessel (OUPV)* course in March of 2001 at the Community College of Baltimore County. This course has a curriculum approved by the U.S. Coast Guard thereby satisfying the examination requirements for original issuance of an OUPV license, a lower grade license than the *Master, 50 GRT Inland* license. In February 2002, Captain Deppner completed a Coast Guard approved curriculum course at the Community College of Baltimore County required to upgrade his *OUPV* training to *Master, Not More Than 100 Gross Tons* and completed training required to qualify for the *Assistance Towing* endorsement on his license.

A review of ██████████ license file reveals that all of his required sea-service time was self-documented aboard two recreational boats between 1996 and 1999. ██████████ continued to operate recreational boats between 1999 and 2002, but the specific hours were not documented in the license file because he had already documented the 360 days required. Examining his self-reported experience month by month, ██████████ experience appears to be consistent with recreational boating, principally confined to the fair weather months of May through October. During his four years of documentation, no hours were recorded during the cold weather months of December, January, or February.

It should be noted that knowledge of vessel handling is different than skill; while the former can be obtained through training, the latter can only be developed through experience and practice. Although tests and proof of required training can evaluate to the mariner's knowledge, only the sea-service requirements of Coast Guard's licensing program provide evidence of the necessary skill. ██████████ more-experienced Fleet Captain, ██████████, described ██████████ skills as good, but limited to smaller single-propeller boats: "*██████████ a competent captain at the level he's at...He handles a small boat well. He's a good captain. He's reliable... If I tell him what to do on a little single screw boat, it's done. He knows how to do it.*"² Working for Seaport Taxi as a retirement job, ██████████ primarily worked weekends when passenger loads were higher, and was reportedly quite good at handling crowds. On this schedule he had worked in various weather conditions, but does not appear to have had direct experience with extreme weather events. Further, ██████████ self-reported experience was entirely aboard conventional hulls that handle differently than pontoon boats in heavy weather (see this report at pages 7-8).

² See Exhibit #43 (ECN2029161#043) at pages 12 and 13.

1.4 History of the Vessel

Susquehanna Santee Boatworks located in the town of Willow Street, Pennsylvania, began construction of the *Lady D* in the fall of 1995. A pontoon vessel with an aluminum hull, it measured 2 gross tons³, was 36-feet, 2-inches in length, and had an 8-foot 3-inch beam. It was powered by a 90-horsepower Honda outboard engine. The vessel was built for Harbor Shuttle of Baltimore, Maryland and was intended to serve as a water taxi on protected waters. The *Lady D* was built in anticipation of being inspected by the Coast Guard as a small passenger vessel under the regulations of Title 46, Code of Federal Regulations (CFR), Chapter I, Subchapter T.

Coast Guard Activities Baltimore, later renamed and henceforth referred to as Coast Guard Sector Baltimore, issued a stability letter for the *Lady D* to Harbor Shuttle on March 29, 1996. The stability of a vessel is defined as its ability to float upright and its ability to right itself after being heeled over. Under guidelines in the Coast Guard's Marine Safety Manual (MSM), the Officer in Charge of Marine Inspection (OCMI) could assure a vessel possesses adequate stability in one of two fashions: 1) by conducting a simplified stability test; or 2) by referencing the satisfactory stability of a sister ship. Detailed analysis of the *Lady D*'s stability is addressed in Section 2.2 of this report.

When the stability letter was issued, Sector Baltimore considered the *Lady D* to be a sister ship to the M/V *Raven* O.N. MD3789C. The term "sister ship" is common nautical terminology signifying that vessels are considered identical in terms of construction and stability characteristics. The *Raven*, was considered a sister ship to the M/V *Fells Point Princess*, O.N. MD7290AN, later renamed, and henceforth referred to as the M/V *Patricia P*. The *Patricia P* underwent a stability test on August 12, 1992.

Although the Marine Safety Manual has guidelines for determining sister ship status, Sector Baltimore did not use these specific guidelines in establishing the relationship between the *Lady D* and the *Raven*. This is not entirely surprising given that this section of the manual was directed toward full stability incline testing rather than simplified stability proof testing. A "full" stability test involves the review of a vessel's technical plans and inclining the vessel using weights and detailed measurement of the vessel's waterline to determine the vessel's vertical center of gravity. This information is necessary to assure the vessel will have adequate stability in all probable loading conditions, and is typically reserved for larger vessels; see 46CFR170.175. The simplified stability proof test is a simplified inclining experiment conducted without detailed calculation that estimates the vertical center of gravity using standard assumptions about probable loading, heeling forces, and the hull form of smaller vessels; see 46 CFR 178.310. For additional information, see Section 2.2 of this report.

Sector Baltimore granted sister ship status based on the request of the boat company, the ship yard, and general information that the *Lady D* was built along the same specifications as the

³ Tonnage is a measure of the size or cargo capacity of a ship. The term derives from the taxation paid on tuns of wine, and was later used in reference to the weight of a ship's cargo; however, in modern maritime usage, "tonnage" specifically refers to a calculation of the volume or cargo volume of a ship. Tonnage calculated under the regulations at 46 CFR part 69 is generally based on tons of 100 cubic feet each.

Raven and the *Patricia P*. The reputation and the past history of the companies making this request were also considered in the decision to grant sister ship status.

Since the *Lady D* was considered a sister ship to the *Raven* and the *Patricia P*, Sector Baltimore determined that the vessel had satisfactory stability for the carriage of not more than twenty-five total persons on protected waters. This finding is documented in Sector Baltimore's Stability Letter for the *Lady D* dated March 29, 1996.

In March, 1996, the Commandant of the Coast Guard published revisions to the regulations governing small passenger vessels, including the *Lady D*. These rules, codified at Title 46 CFR Chapter I, Subchapter T, generally govern the design, construction, outfitting, safety gear, manning, and safe operation of small passenger vessels. As with all regulatory changes, the Commandant made allowances for vessels designed, built, and previously operated under the "Old T" regulations. Vessels like the *Lady D* which were already under construction when the revision was enacted were to be regulated under the old Subchapter T rules, rather than the new Subchapter T rules.

As previously established, the *Lady D* was regulated by old Subchapter T, therefore 46 CFR 177.13-1 applies, which refers to applicable requirements of Subchapter S. According to Subchapter S in 46 CFR 171.030(a)(2), a stability test was required on the *Lady D* only if Sector Baltimore questioned the vessel's stability. Specifically, the regulations stated that a stability test was only required for vessels that were certificated to carry more than 49 passengers or whose stability was questioned by the OCMI.

At the time of certification, Sector Baltimore did not question the stability of the *Lady D* largely because of the time-tested stability of her sister ships proven service. Specifically, the *Patricia P* had operated for four years carrying 25 passengers without stability related casualties. Absent specific reason to question the stability of the *Lady D*, Sector Baltimore acted within its authority and in accordance with the regulations by not requiring a stability test on the *Lady D*.

Sector Baltimore first issued the *Lady D* a Certificate of Inspection (COI) on March 29, 1996. At that time the vessel was under the ownership of Harbor Shuttle in Baltimore, Maryland and operated as a passenger vessel (water taxi). In 2000, Living Classrooms Foundation, a nonprofit organization based in Baltimore, Maryland, purchased Harbor Shuttle. The *Lady D* was one of several vessels acquired as part of this purchase. Seaport Taxi, a component of Living Classrooms, operated eleven water taxis in Baltimore. All of these water taxis had COIs for operation as small passenger vessels. These vessels provided transportation throughout the Inner Harbor in Baltimore, Maryland. Details of the eleven Seaport Taxi water taxis are:

Vessel	Hull Type	Delivered	Passengers	Length ⁴
<i>Eagle</i> (MD4747E)	Pontoon	March 1995	69	45 feet
<i>Lady B</i> (MD3266BD)	Pontoon	July 1996	41	37 feet
<i>Lady D</i> (MD8246BC)	Pontoon	March 1996	24	36 feet
<i>Migeni</i> (O.N. 1062892)	Pontoon	February 1998	76	50 feet
<i>Patricia P</i> (MD7290AN)	Pontoon	June 1986	24	36 feet

⁴ Vessel lengths, as listed on the Coast Guard's Certificates of Inspection, are rounded to the nearest whole foot.

Vessel	Hull Type	Delivered	Passengers	Length ⁵
<i>Patrick Duffy</i> (MD4616E)	Pontoon	September 1994	49	45 feet
<i>Phoenix</i> (MD2924BD)	Pontoon	December 1996	71	47 feet
<i>Raven</i> (O.N. 1133223) ⁶	Pontoon	September 2002	98	54 feet
<i>W. B. Morgan</i> (MD7455AJ)	Pontoon	January 1983	23	32 feet
<i>Donovan's Reef</i> (MD3471BH)	Pontoon	August 1998	62	58 feet
<i>Revenge</i> (MD6503AY)	Pontoon	May 1991	38	37 feet

On April 26, 2001, the *Lady D* underwent a Coast Guard attended dry dock inspection in Baltimore, where the vessel was hauled out of the water and the hull was inspected.⁷ During the inspection four requirements were issued by the Coast Guard: (1) rebuild the forward deck structure; (2) tighten all loose bolts for the aft deck beams; (3) repair the cracked welds on the boarding ladder and; (4) repair the aft portion of the starboard pontoon. All of these requirements were successfully completed prior to placing the vessel back in service.

A Coast Guard inspector last attended the *Lady D* on March 27, 2003, for an annual inspection for certification. During this inspection, there were no deficiencies found with the vessel.⁸ The COI was endorsed for 25 total persons on a rivers route on the Patapsco River from Tindec Wharf to Locust Point to the Inner Harbor, not more than 1,000 feet from shore under reasonable operating conditions. The *Lady D* was scheduled to have an annual inspection on March 8, 2004.

The maintenance of the *Lady D* was conducted by Seaport Taxi personnel and local marinas. According to Mr. [REDACTED], the Director of Seaport Taxi at the time of the casualty, the oil was changed on a regular basis depending on the engine hours, and regular maintenance was accomplished on an as needed basis to maintain the operating condition of the vessel. Prior to operating each day, the captain onboard the vessel would inspect the vessel and note any problems for correction. The inspection included checking navigation, lifesaving, and the overall vessel condition. Records of inspection were kept in the Seaport Taxi Office and either Mr. [REDACTED] or Mr. [REDACTED], Fleet Captain of Seaport Taxi, followed up on any repairs that were necessary. Both Mr. [REDACTED] and Mr. [REDACTED] conducted additional inspections to ensure the safe operation of the vessels.

According to both Harbor Shuttle and Seaport Taxi, there were no alterations made to the *Lady D*, outside of having the front deck reconstructed and reinforced and some welding done on both the aft pontoon and the engine pods due to deterioration. Welding or other structural repairs were done at a local marina. According to Coast Guard records, the *Lady D* had no alterations that would have significantly affected the stability of the vessel.

The *Lady D*'s COI required it to have at least twenty-five adult life preservers and three child size life preservers onboard. Additional child size life preservers were to be carried when needed so that the vessel would have an approved life preserver for each child on board. The adult

⁵ Vessel lengths, as listed on the Coast Guard's Certificates of Inspection, are rounded to the nearest whole foot.

⁶ This is not the same M/V *Raven* to which the *Lady D* was sistered.

⁷ See MISLE Vessel Inspection Activity #1373646, dated 26 April 2001.

⁸ See MISLE Vessel Inspection Activity #1768360, dated 27 March 2003.

lifejackets were stored underneath the bench seats of the water taxi and the child lifejackets were located in the forward part of the vessel on the port side.

1.4.1 Vessel Operating Route

The entire northerly branch of the Patapsco River is known as the Northwest Harbor.⁹ Northwest Harbor is entered between Fort McHenry and Lazaretto Point, 8.2 miles above the mouth of Patapsco River (at the Chesapeake Bay). Northwest Harbor consists of the Inner Harbor, the West Channel, and the East Channel. East Channel, a dredged channel with a project depth of 49 feet, extends north from the entrance for about 0.7 mile to a turning basin. West Channel, with a project depth of 40 feet, branches northwest from East Channel for about 0.8 mile to a second turning basin in the vicinity of Fells Point. Above the West Channel turning basin, depths of 25 to 21 feet can be carried to the head of navigation for the Northwest Harbor at the Inner Harbor.

Baltimore Harbor nautical chart, NOAA Chart #12281, identifies *Locust Point* as a small promontory directly across from *Fells Point* at the turning basin in the Northwest Harbor. This is effectively the end of the deep draft shipping channel, and all waters extending to the west are commonly referred to as the “inner harbor.” The same chart, however, identifies both *North Locust Point terminal* on the small peninsula (located immediately to the west of Ft. McHenry) and *South Locust Point terminal* on the south side of the peninsula, on the middle branch of the Patapsco River. The small peninsula containing *Locust Point* and both *Locust Point terminals* is unnamed, and may be inconsistently referred to overall as *Locust Point*.

In the context of water taxi operations, however, only two water taxi docks provide access to neighborhood known as Locust Point: the Baltimore Water Taxi docks at Tide Point and the Seaport Taxi docks at the Museum of Industry.¹⁰ Located at 1415 Key Highway, the Baltimore Museum of Industry docks at Locust Point are significantly to the west of the small promontory noted on chart #12281. We further note that Tindeco Wharf is almost due north of the turning basin at the end of East Channel, and the Canton Cove Marina (39-16.7 N, 076-34.8W) is also east of the promontory. Transits to Tindeco Wharf or Canton Cove Marina from Fells Point or the Baltimore Museum of Industry would necessitate transiting at least a part of the West Channel.

On March 6, 2004, the Lady D’s COI was endorsed with the following route restriction: “Patapsco River from Tendeo Wharf to Locust Point to the Inner Harbor, not more than 1,000 feet from Shore under Reasonable Operating Conditions.”¹¹ The following route limitations (ordered by vessel length) were in effect for the 11 Seaport Taxi vessels:

Vessel	Length	COI Date	COI Route Limitation
<i>W. B. Morgan</i> (MD7455AJ)	32 feet	08 Jun 2000	“Patapsco River not more than 1,000 feet from shore between Fort McHenry and Lazaretto Point to the head of navigation.”

⁹ See the NOAA Coast Pilot # 3, Chapter 15.

¹⁰ See “Locust Point Today,” 2002, available online at www.arch.umd.edu/URSP/Research/studiorpts/locustpnt-spr02/2%20LP%20Today%20web%201.pdf

¹¹ It is noted that Tindeco Wharf has 2 common spellings within Baltimore. Both “Tindeco” and “Tendeco” are accepted; we choose the more common spelling of Tindeco for this report. COI spellings have not been changed.

Vessel	Length	COI Date	COI Route Limitation
<i>Lady D</i> (MD8246BC)	36 feet	28 Feb 2002	“Patapsco River from Tendeco Wharf to Locust Point to the Inner Harbor, not more than 1,000 feet from Shore under Reasonable Operating Conditions.”
<i>Patricia P</i> (MD7290AN)	36 feet	31 May 2002	“Patapsco River between Fells Point, Canton Cove Marina and the Maryland Science Center, not more than 500 feet from shore.”
<i>Lady B</i> (MD3266BD)	37 feet	27 Feb 2002	“Patapsco River Between Fort McHenry and Lazaretto Point to the head of navigation, not more than 1,000 feet from shore.”
<i>Revenge</i> (MD6503AY)	37 feet	27 Feb 2002	“Patapsco River, from Tendeco Pier to Locust Point to Inner Harbor, Baltimore, MD, not more than 1,000 feet from Shore.”
<i>Patrick Duffy</i> (MD4616E)	45 feet	31 May 2002	“Patapsco River between Fort McHenry and Lazaretto Point to the head of navigation, not more than 1,000 feet from shore.”
<i>Eagle</i> (MD4747E)	45 feet	28 Feb 2002	“Patapsco River, Back River, Middle River, and Seneca Creek, not more than one mile from Land. Hawk Cove not to extend past a line from Brier Point to the North end of Hard-Miller Island.”
<i>Phoenix</i> (MD2924BD)	47 feet	21 Jan 2003	“Patapsco River between Fort McHenry (stet.) and Lazaretto Point to the head of navigation, not more than 1,000 feet from shore.”
<i>Migeni</i> (O.N. 1062892)	50 feet	26 May 2000	“Patapsco River between Fort McHenry and Lazaretto Point to the head of navigation, not more than 1,000 feet from shore.”
<i>Raven</i> (O.N. 1133223)	54 feet	14 Nov 2002	“Patapsco River between Fort McHenry and Lazaretto Point to the head of navigation, not more than 1,000 feet from shore.”
<i>Donovan’s Reef</i> (MD3471BH)	58 feet	23 May 2001	“Patapsco River between Fort McHenry and Lazaretto Point to the head of navigation, not more than 1,000 feet from shore.”

The COIs for three of the five Seaport Taxi vessels less than 40 feet in length did not include the phrase “Lazaretto Point to the Head of Navigation”¹² (the exceptions are the *Lady B*, MD3266BD, and the *W. B. Morgan*, MD7455AJ). One additional COI (for the *Patricia P*) contained route terminology allowing transit to the Canton Cove Marina.

Five of the six COIs for Seaport Taxi vessels greater than 40 feet in length do contain the “Lazaretto Point to the Head of Navigation” terminology (the exception is the *Eagle* MD4747E). The language on the COI of the *Eagle* includes the phrase “Patapsco River, Back River, Middle River, and Seneca Creek...” which is of greater geographical extent than the routes on the other six Seaport Taxi vessels greater than 40 feet in length.

¹² “Head of Navigation” is a term used to describe the farthest point above the mouth of a river that can be navigated by ships. This term can be somewhat subjective in many areas, as this point may vary greatly with the size of the vessel being contemplated for navigation.

Sector Baltimore conducted a Port Risk Assessment Workshop for the Port of Baltimore, Maryland on February 21 & 22, 2001. The port risk assessment process uses a select group of waterway users/stakeholders in each port to evaluate waterway risk factors and the effectiveness of various vessel traffic management improvements. Although the report does not provide conclusions directly bearing on this accident, it does document the consensus expert opinion that prevailing winter winds come from the Northwest in the Port of Baltimore.¹³ Prevailing summer winds typically come from the opposite direction. Because the inner harbor and Fells Point areas of Southwest Harbor have a limited “fetch,”¹⁴ wind-driven waves would normally be expected to be more limited in these areas. Because the West Channel and East Channel provide longer fetches, aligned with the prevailing Northwest and Southeast winds, wind-driven waves would normally be expected to be much worse in these areas, particularly in the vicinity of Fort McHenry, which is located near the mouth of the East Channel, and faces a very long fetch for summer southeast winds, virtually uninterrupted from the Key Bridge up the Fort McHenry channel. Although no direct evidence exists that Sector Baltimore took official note of the differences in expected wind and wind-driven waves on East Channel and West Channel compared to the inner harbor, we conclude that this was likely common knowledge. See Section 1.7 for additional findings regarding the sea-state and weather.

The mariners operating the *Lady D* and other Seaport Taxi vessels report that they were not clear as to the precise limitations surrounding the phrase “Locust Point” on the COI. The precise wording on the routes of the various vessels varied, leading the Seaport Taxi Fleet Captain, Mr. [REDACTED] to assume the wording was unimportant. In testimony he stated “*frankly, my assumption is that it just... whoever typed it [the COI route], that’s what they looked at. They looked at the chart and said, oh, it’s this point here. You know, I don’t think there’s any rhyme.*”¹⁵ For this reason, Seaport Taxi developed its own route boundary line, applicable to all vessels in the fleet, which met their interpretation of the limits on the various COIs, to include transits to the Ft. McHenry docks.

In the context of a water taxi operator, the term “*Locust Point*” on the *Lady D*’s COI meant, and would generally have been understood by licensed mariners to mean, the area around the Tide Point and the Seaport Taxi dock at the Baltimore Museum of Industry. We further conclude that the original geographic intent of the Seaport Taxi fleet COI routes was to limit water taxis of less than 40 feet in length to a route ranging from the inner harbor docks to the Tindecos Wharf docks. Based on the use of the phrase “Lazaretto Point to the head of navigation” on the COI for all vessels over 40 feet in length, and the absence of this phrase on the COIs for three of five vessels under 40 feet in length we conclude that a general policy limiting the operation of the smaller pontoon vessels existed at Sector Baltimore.

A review of 33 Sector Baltimore MISLE data system reports following Seaport Taxi’s purchase of these five smaller water taxis reveals no documentation to suggest that Sector Baltimore purposely reduced or limited the routes of these “under 40-foot” vessels. Vessel inspection narratives, however, consistently refer to these five vessels as operating primarily in the Inner

¹³ See the PAWSA Workshop Report, pg. 17, available at <http://www.navcen.uscg.gov/mwv/projects/pawsa/WorkshopReports/Baltimore.pdf>

¹⁴ Fetch is the length of water over which a given wind has blown.

¹⁵ See Exhibit #43 (ECN2029161#043) at pages 38 and 39.

Harbor. There is no evidence to conclude whether Sector Baltimore explicitly conveyed the “under-40-foot” policy to Seaport Taxi, other than by discussing the route during inspections, or intervened in other ways to assure that Seaport Taxi would not improperly assign smaller vessels to the Fort McHenry route. The routes on two of the smaller vessels allowed transits to Lazaretto Point, and all of the vessels were allowed to transit to Canton / Tindecó Wharf. This last transit would be relatively protected when departing from Fells Point, but requires transit of the West Channel when departing from the Baltimore Museum of Industry – it is unclear which transit was intended, or whether both were acceptable.

The two COIs allowing transits to Lazaretto Point, when considered alongside the three COIs containing the ambiguous Canton / Tindecó Wharf route, are not consistent, and may have opened the opportunity for ambiguous interpretation of the routes. Sector Baltimore has since changed and standardized the geographic route demarcation language on all vessels in this area of operation.

There is a great disparity between the routes on the COIs and the testimony of Mr. [REDACTED] who stated that Seaport Taxi did not understand the route limitations on the COIs and had established its own separate route limitations. We conclude that the mixed-route Seaport Taxi fleet posed a management burden on Seaport Taxi, requiring close management of the vessels making the voyage to Fort McHenry. The “bus stop” rotation of all Seaport Taxi vessels through each of the various Seaport Taxi docks was not possible. The burden for compliance with the route, regardless of fleet management concerns, rests entirely with the operating company. We conclude that Seaport Taxi did not appropriately review and implement the route limitations on their fleet of vessels.

1.5 Environmental Conditions

The marine forecast issued by the National Weather Service prior to the casualty for the area covering the Chesapeake Bay from Sandy Point to Pooles Island was as follows:

1030 until 1700 EST, Saturday, March 6, 2004:

“Small Craft Advisory

This afternoon...South winds 15 knots becoming Southwest 20 knots by late afternoon. Waves 1 foot building to 2 feet.

Tonight Northwest winds 10 to 15 knots. Waves 2 feet.”

The Patapsco River and Northwest Harbor, Baltimore, MD are included in this location but there was no specific weather information for the Patapsco River and Northwest Harbor for this time period.

At 1605 EST Saturday March 6, 2004, the National Weather Service in Sterling, Virginia issued a Special Marine Warning for:

Chesapeake Bay from Pooles Island to Sandy Point, MD
Chesapeake Bay from Drum Point MD to Smith Point, VA
Chesapeake Bay from Sandy Point to North Beach, MD
Chesapeake Bay from North Beach to Drum Point, MD

At 1605 EST, the National Weather service Doppler radar indicated a strong thunderstorm about 11 miles northwest of North Beach, MD moving east at 50 MPH. North Beach is located approximately 35 miles south of Baltimore, MD. Other strong storms were located near Baltimore and Cove Point, MD, moving east as well.

The Special Marine Warning (SMW) advised that mariners can expect wind gusts to near 50 knots, high waves, dangerous lightning and heavy downpours. Boaters should seek a safe harbor immediately until this storm passes. Mariners should seek a safe harbor immediately and take the necessary precautions to safeguard life and property.

According to the National Weather Service, a Belfort Instrument Company DigiWx sensor was located at the end of the dock at the Baltimore Marine Center, approximately 0.54 nautical miles north of the casualty site. The instrument measured sustained winds of 28 knots with a maximum gust of 41 knots at the approximate time of the casualty. The Baltimore Washington International (BWI) Airport Automated Surface Observing System, located approximately eight nautical miles southwest of the casualty, reported sustained winds of 27 knots with a maximum gust of 41 knots at 1559 EST. Press reports exist showing anecdotal evidence of gusts exceeding 50 mph (approximately 43 knots) and arising suddenly as a violent change in wind speed.¹⁶

At the time of the casualty the water temperature was 40 degrees Fahrenheit and the air temperature was 55 degree Fahrenheit.

¹⁶ See the Baltimore Sun analysis by Shyam Patel: Sun staff, Mar 8, 2004

1.6 Voyage Details

On the afternoon of March 5th, 2004, approximately 24 hours before the accident, the National Weather Service issued a *Small Craft Advisory* for the Chesapeake Bay, including the Baltimore Inner Harbor; that advisory was in effect the entire day of March 6th.¹⁷ The National Weather Service issues *Small Craft Advisories* when the following are expected to occur: 1) sustained winds of between 25 and 30 knots in coastal areas; 2) sustained winds of between 20 and 30 knots in harbors, bays, and sounds; or 3) seas or waves of 5 to 7 feet or greater.¹⁸ When the National Weather Service expects more severe weather, it issues a *Special Marine Warning*.¹⁹ No SMW was issued or in effect prior to the accident.²⁰ Routine public, aviation, and marine forecasts on the morning of March 6th did not mention a potential for thunderstorms, although the *Small Craft Advisory* remained in effect.²¹

On March 6, 2004, the *Lady D* was operating as a water taxi in the Northwest Harbor of the Patapsco River in Baltimore, Maryland. The vessel was on a rivers route in a continuous back and forth schedule between Fells Point, Tindeco Wharf and Fort McHenry, located at the mouth of East Channel. Fort McHenry is a National Park consisting of a National Monument and Historic Shrine that is a popular tourist spot in the Baltimore area. The *Lady D* was the only Seaport Taxi on this route for this particular day. The transit time between Fells Point/Tindeco Wharf and Fort McHenry is approximately fifteen minutes, with the *Lady D* arriving at each stop approximately every thirty to forty-five minutes. In addition to the *Lady D*, there were four other Seaport Taxis operating on various routes in the Inner Harbor of Baltimore. Details of those vessel operations are:

Vessel	Length	Capacity	Route	Operator
<i>Lady D</i> (MD8246BC)	36 feet	24 passengers	Fort McHenry – Fells Point / Tindeco Wharf	Captain [REDACTED]
<i>Eagle</i> (MD4747E)	45 feet	69 passengers	Harbor Place – Fells Point / Tindeco Wharf	Captain [REDACTED]
<i>Patrick Duffy</i> (MD4616E)	45 feet	49 passengers	Route not documented	Captain [REDACTED]
<i>Phoenix</i> (MD2924BD)	47 feet	71 passengers	Route not documented	Captain [REDACTED]
<i>Migeni</i> (O.N. 1062892)	50 feet	76 passengers	Route not documented	Captain [REDACTED]

The *Lady D* used the fireboat dock at Fort McHenry on the day of the casualty. This dock was also used by the Baltimore City Fire Department. In September 2003, Hurricane Isabel caused damages to Seaport Taxi's own dock and it had yet to be repaired prior to this casualty. Seaport

¹⁷ See Exhibit #069 (ECN 2029161#069) at page 4.

¹⁸ See Exhibit #069 at page. 20.

¹⁹ *ibid.*

²⁰ See Exhibit #069 at page. 2.

²¹ See Exhibit #069 a page 6.

Taxi's dock was approximately 200 feet from the fireboat dock and was also located at Fort McHenry.



Figure 3: The March 6, 2004, squall line of showers and strong winds photographed in Washington D.C.

Photo Credit: Mr. Kevin Ambrose

Captain ██████ was the ██████ Captain for Seaport Taxi on March 6, 2004. Seaport Taxi defines the ██████ Captain as the most experienced captain operating a taxi for a given day and expects this person to assist in passing information to all other captains. On this day, ██████ was operating the water taxi *M/V Eagle* on a different route than the *Lady D* in the Inner Harbor of Baltimore, Maryland.

█████ ██████ the ██████ for Seaport Taxi at the time of the casualty, was in the Seaport Taxi office on March 6, 2004. ██████ general office duties included payroll, marketing,

answering phones in the office, and assisting the captains on the water. Equipped with a computer in the office, ██████ was able to monitor the weather over the internet. Additionally, ██████ could listen and communicate via VHF and UHF radio with taxis that were operating. On March 6, 2004, about 1545, ██████ noticed a pronounced black or dark gray line of clouds consistent with the predicted arriving cold front, and decided to check the National Weather Service radar using the internet.²² The National Weather Service does not guarantee the timeliness of weather images on the internet,²³ and there is no evidence to suggest that ██████ was aware that a time lag of several minutes might exist. The automated weather alert system *WeatherBug*²⁴ was active on ██████ computer, but had not alerted because there was no *Severe Weather Advisory* from the National Weather Service.

█████ ██████, who was taking classes toward ██████ Merchant Mariner's license, had served in unlicensed positions aboard passenger schooners, and had discussed weather with the port captains but had no formal training in the use of online weather software, evaluated the radar picture.²⁵ Based on this quick review, ██████ decided the storm would not affect the water taxi's area of operation because of a perceived two mile break of "blues and greens" (denoting lighter precipitation) in the Doppler radar image of the approaching storm, leaving the heaviest weather to the north and south of Baltimore's Inner Harbor. Immediately after making an initial radio broadcast about the storm, ██████ noted lightning, and she recalls making a second

²² See Exhibit #045 (ECN 2029151#045) at pages 10 and 11.

²³ <http://www.weather.gov/disclaimer.php>

²⁴ See http://www.aws.com/aws_2005/pdf/WeatherBug_Fact_Sheet_01-05.pdf for more details on *WeatherBug*.

²⁵ See Exhibit #045 at pages 38 and 39.

broadcast to that effect. According to witness testimony, these broadcasts were entirely advisory, and each vessel Captain was to evaluate and make decisions about weather on their own. By company policy, operations shall be ceased in the presence of lightning.

On the day of the accident, [REDACTED] woke after a full night's rest and watched the weather channel while preparing for work.²⁶ From this, [REDACTED] learned that a weak cold front with some rain would be moving through the Baltimore area, and that clear skies would follow the front, likely in the afternoon. He did not check any weather forecast again during the day. Instead, [REDACTED] relied upon weather updates from the Seaport Taxi senior captain, fleet captain, manager, or office.

Environmental conditions changed rapidly between 2 p.m. and 4 p.m. on the day of the accident; National Weather Service forecasters had not anticipated thunderstorms and associated wind gusts developing along the cold front that was moving across Maryland at that time.²⁷ While forecasters had expected the front to weaken, the instability which causes thunderstorms was increasing quickly.²⁸ Numerous witnesses report seeing the approaching storm between 1430 and 1500; as early as 1500, [REDACTED] noted winds picking up.²⁹ A competitor water taxi company, Ed Kane's Water Taxis, suspended operations about 1530 in view of the approaching front.³⁰

At approximately 1545 on March 6, 2004, the *Lady D* arrived at the Fort McHenry dock. [REDACTED] who was serving as the crewman aboard the *Lady D* noticed the same squall line to the west that [REDACTED] and Ed Kane's Water Taxis were seeing. [REDACTED] checked the wind speed with his hand-held anemometer, and remembers the winds at about 15 knots. [REDACTED] and [REDACTED] did not discuss the readily apparent squall line, nor did they check with any weather reporting service. Had they done so, they would not have received any warning other than the existing Small Craft Advisory. Two passengers testified to seeing lightning before the vessel departed at 1600; neither [REDACTED] nor [REDACTED] testified to seeing lightning.

Mr. [REDACTED] was assigned as the Seaport Taxi dock coordinator that day. He was to assist passengers getting from Fort McHenry to the water taxi. Once the vessel docked, Mr. [REDACTED] let passengers board the *Lady D*; there was no debarkation of passengers during the 1600 arrival at Fort McHenry because the 1600 trip is usually to pick up passengers prior to the Fort closing. Within ten to fifteen minutes, twenty-three passengers were onboard. Mr. [REDACTED] advised the remaining passengers at Fort McHenry to wait until the water taxi returned in approximately 30 minutes.

At approximately 1600, the *Lady D* departed the Fort McHenry dock en route to Fells Point with 25 total persons onboard including [REDACTED] and [REDACTED] as the crewmember.

²⁶ See Exhibit #040 (ECN 2029151#040) at page 3.

²⁷ See Exhibit #069 at page 5.

²⁸ See Exhibit #069 at page 6.

²⁹ See Exhibit #008 (ECN 2029161#008) at page 16-17.

³⁰ See the Baltimore Sun article, "Wind, waves, twists of fate bring death," published March 14, 2004, by [REDACTED] and [REDACTED] of the Sun Staff

██████████ was located at the operating station on the starboard bow while ██████████ walked throughout the vessel. Ten adults and three children were seated on the port side of the vessel, and nine adults and one child were seated on the starboard side. The average weight of the persons onboard was 168 pounds and the total passenger weight was 4200 pounds.

The vessel passenger area consisted of two large bench seats located on both the port and starboard sides of the vessel, oriented running fore and aft. Outboard of the bench seats were large glass windows capable of being opened and closed.

According to ██████████ while he was backing the vessel from the pier, the wind was picking up from the southwest. Using the wind to assist, he turned the vessel to starboard and proceeded on a course for Fells Point at six knots.

According to witnesses, the weather started to deteriorate as the vessel was departing the dock. The sky became dark as the storm approached. According to passengers, within approximately one to two minutes of the *Lady D* departing Fort McHenry, winds started to rapidly increase and a hard rain started. Passengers also stated that there were a few windows open at first, but were closed by the passengers due to the heavy rains.



Figure 4: Spontaneous U.S. Navy Rescue Effort

Located immediately adjacent to Ft. McHenry, Navy Reserve personnel had heard thunder earlier and were evaluating the approaching squall line. The Navy personnel recognized the squall line as the volatile leading edge of a thunderstorm, and wondered aloud why the *Lady D* was coming out from the shelter provided by Ft. McHenry and operating in such weather.³¹ These same personnel would witness the capsizing minutes later and launch a spontaneous and heroic rescue effort.³²

Chapman's Piloting, Seamanship & Small Boat Handling, a recognized and authoritative boating reference, advises: "Ahead of a thunderstorm the wind may be either steady or variable, but as the *roll cloud* [the highly volatile and confused winds at the leading edge] draws near, the wind weakens and becomes unsteady. As the roll cloud passes overhead, violent shifting winds, accompanied by strong downdrafts, may be expected. The wind velocity may reach 60 knots. Heavy rain and sometimes hail begins to fall just abaft the roll cloud. However, the weather quickly clears after the passage of the storm, which brings cooler temperatures and lower humidity."³³ This description matches the description of the March 6th squall line, including the

³¹ See Exhibit #077 (ECN 2029161#077) at page 3.

³² See Exhibit #077 at page 7.

³³ Maloney, Elbert S., *Chapman's Piloting, Seamanship, and Small Boat Handling*, 55th edition, at page 246.

fall of hail and rapid clearing – the seas and winds were again gentle 15 to 20 minutes after the capsizing. One photo attributed to the squall line taken in Washington D.C. shows clouds which lack the fully formed “anvil head” typically associated with a strong thunderstorm, however.

At 1600 the only water taxis still operating in the harbor as the squall line was approaching were Seaport Taxis, to include the *Lady D*. [REDACTED] aboard the *Eagle*, noticed the winds coming from the west and southwest going toward northeast, with wind-driven waves intensifying. Subsequently [REDACTED] got on his radio and told all the Seaport Taxi captains via VHF Ch. 71 to “*hit the bulkhead*,” meaning the water taxis in open water should seek shelter from the weather. [REDACTED] overheard on the radio that one of the captains advised all the other captains about the approaching storm. It may also have been about this time that [REDACTED] issued her broadcast noting the lightning she was seeing and the onset of a thick rain squall.

In previous years, Seaport Taxi gave very detailed instructions to its Masters regarding operation in various weather conditions, but had found this system to be interfering with the Master’s responsibility to review all relevant factors and assure the safety of the vessel and passengers. Accordingly, their policy was very general (cease operating in low visibility or when lightning is present), and formally placed the responsibility where it belonged: with the Master.³⁴ In fact, [REDACTED] had, on other occasions, halted operations on his own authority.³⁵ Nevertheless, the company did have an informal policy that inserted, the senior operators ([REDACTED]³⁶) into the halt-operations decision process. Although the Masters clearly had authority to halt operations at any time, they could also be instructed to do so. As [REDACTED] testified: “*Instructions [come from] from the Director, from [REDACTED] And the Captains also back him up on that decision. Or sometimes the Captains will let him know what it’s really like out there and he goes with their recommendations, if they feel that its safe to operate in that type of wind.*”³⁷ Other witnesses testified similarly; [REDACTED] testified that the senior operators “*call the shots.*”³⁸ This intrusion into the decision process, in contravention of the formal policy but intended to support the Masters with more experienced advice, created an implicit approval/permission process which [REDACTED] may have relied upon, or deferred to, in lieu of using his own judgment.

After hearing this radio message from [REDACTED], [REDACTED] responded to [REDACTED] by stating that the *Lady D* had already left the dock at Fort McHenry. According to [REDACTED], the *Lady D* was located “*pretty much in the middle of the river*” when [REDACTED] advised him to seek shelter. [REDACTED] gave two possible locations for [REDACTED] to seek shelter, the Baltimore Marine Center or at Henderson’s Wharf. Both of these locations were located on the opposite shore of the river from Fort McHenry, but prior to reaching Fells Point. [REDACTED] responded by agreeing with [REDACTED] about the instructions.

³⁴ See Exhibit #043 at page 48. The timing for the policy change is unclear, but well before the accident.

³⁵ See Exhibit #008 at page 20.

³⁶ See Exhibit #088 at page 21.

³⁷ See Exhibit #045 at page 49.

³⁸ See Exhibit #088 at page 21.

██████████ attempted to get to the Baltimore Marine Center, since he believed this area would provide some protection from the weather. According to ██████████, he was having difficulty controlling the *Lady D* due to the heavy winds, meaning he could not make headway and hold a course. The *Lady D* was supposed to be heading northwest towards the Baltimore Marine Center but according to ██████████, the wind was pushing the *Lady D* in an easterly direction.

Within minutes, a much stronger gust of wind from the west (presumably the thunderstorm's *Roll Cloud*) swept into the area, accompanied by an intense rain; the front was so distinct that it was described by Navy witnesses as a 'line' or 'wall' of rain, accompanied by a wind-driven chop or wave.³⁹ When the front reached the *Lady D*, it seemed to cover the windows, presumably on the port side of the vessel. As a result, ██████████ unsuccessfully attempted to turn into the wind as vessels are generally more controllable and safe when wind and waves are encountered by the bow. ██████████ was unable to control the vessel or keep the bow into the winds and waves, and believes the vessel began to go in a circular motion. ██████████ stated that the wind was pushing the *Lady D* in an easterly direction towards the Francis Scott Key Bridge, away from the intended destination of Fells Point. ██████████ also remembers the *Lady D* being forced into a circular motion. According to passengers, the *Lady D* began to roll in the waves, estimated at almost four feet in height, with the intense winds forcing the water taxi in a circular motion greatly hindering the Captain's ability to control the movement of the *Lady D*.

At approximately 1603, the *Lady D* heeled over slightly to the starboard side. At the direction of ██████████ most of the passengers got up from their seats and moved to the port side, leveling the vessel. According to some passengers, ██████████ then advised them that lifejackets were underneath the seats, but did not direct them to don the lifejackets.

Less than a minute later the *Lady D* abruptly heeled over to starboard and capsized. According to the crewmembers and passengers, this capsizing occurred in seconds with no time to prepare. As U.S. Navy Chief Petty Officer ██████████ an eyewitness, testified: "*It looked like he was about to make a left hand turn [into the wind], and it looked like he was trying to turn around and go back up into the inner harbor or at least make a left hand turn, and...the wind lifted the pontoon... the pontoon was raised up due to the water or wind, or a combination of both, and that caused it to raise up.*"⁴⁰

The capsizing threw the passengers seated on the port side of the vessel onto the starboard side, inflicting some injuries. The passengers and crewmembers onboard the water taxi tried to quickly exit. According to passengers, many were able to swim out from underneath the capsized water taxi through the windows or cabin doors. Since the windows were closed due to the heavy rains, several passengers broke the windows to escape. According to the passengers, visibility was very limited underneath the capsized water taxi. With the assistance of passengers and crew who initially egressed, additional trapped passengers were able to exit from underneath the vessel. The *Lady D* continued to drift southeast towards the Francis Scott Key Bridge.

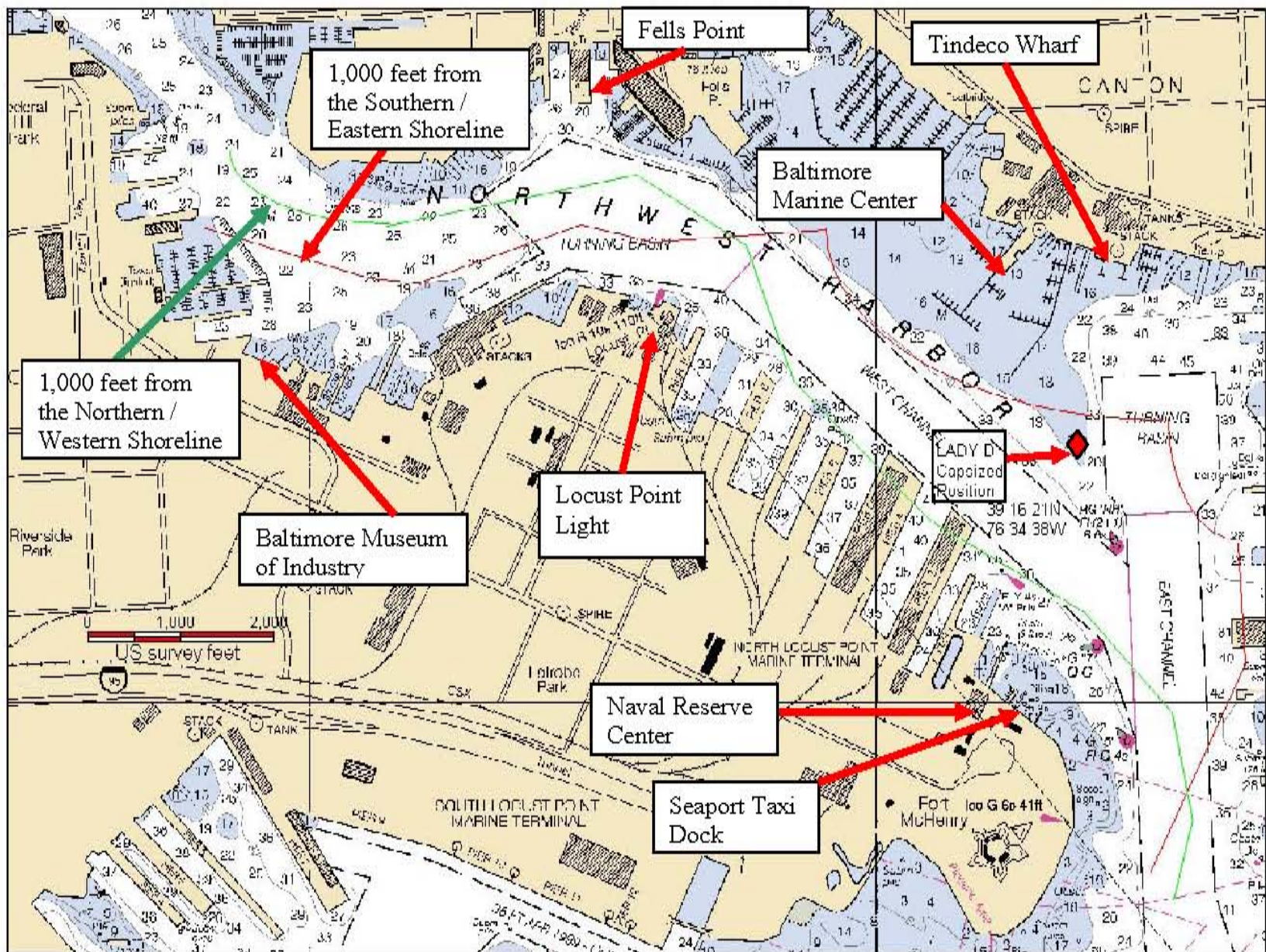
³⁹ See Exhibit #077 at page 3.

⁴⁰ See Exhibit #077 at pages 4 to 6.

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After advising [REDACTED] to hit the bulkhead, [REDACTED] pulled into Fells Point, where the *Lady D* was supposed to arrive. [REDACTED] did not see the *Lady D* so he tried to contact [REDACTED] on Ch. 71 of VHF radio, on UHF radio, and on [REDACTED] cell phone, but was unsuccessful. Mr. [REDACTED] saw law enforcement vessels in the area where the *Lady D* was presumed to have been and called on Ch. 71 VHF advising the other taxis on the water and the office that there was a problem near Lazaretto Point. [REDACTED] disembarked all of his passengers at Fells Point, picked up Mr. [REDACTED] at Henderson's Dock and headed towards the Fort McHenry area.

Charts of the Incident Area



1.7 Post Casualty Recovery Efforts

The capsizing of the *Lady D* was witnessed by Senior Chief [REDACTED] U.S. Navy, and others at the Naval Reserve Center directly next to Fort McHenry. 9-1-1 was dialed and Navy Reserve members prepared to assist the vessel. After witnessing the capsizing from outside the building, one member prepared to launch the Assault Craft Unit 2-27 (ACU-2), a U.S. Navy landing craft. This craft is normally utilized for training and was located on the Northwest Branch of the Patapsco River directly in front of the Naval Reserve Center.

Within three to five minutes after the capsizing, approximately 12-16 Navy members were onboard the ACU-2 and were underway heading towards the capsized water taxi. According to the Navy personnel, the weather at this time consisted of high winds, heavy rains, and rough seas. Navy personnel stated that within three minutes of leaving the Naval Reserve Center, they arrived on scene and while approaching the capsized *Lady D*, noticed several individuals on top of the water taxi's pontoons. The coxswain of the landing craft came in bow first with the loading ramp facing the *Lady D*. A line was used to secure the landing craft to the engine of the *Lady D* and the bow ramp was lowered to allow *Lady D*'s passengers to be transferred onboard.

A few of the Navy personnel jumped into the water to assist passengers in getting aboard the landing craft. Once aboard the landing craft, the *Lady D*'s passengers notified the Navy personnel that there were still some passengers unaccounted for. The coxswain of the Navy landing craft positioned the ramp of the landing craft underneath the *Lady D* and lifted it up, allowing three unconscious persons to surface from underneath the vessel. Navy personnel were able to recover two of them, and a Baltimore City Police marine unit later recovered the third. Of the three unconscious persons recovered, two were later pronounced dead.

In addition to the Navy landing craft, a Baltimore City Police marine unit and a Baltimore City Fireboat responded to assist the capsized water taxi. A Baltimore City firefighter from the Fort McHenry Station noticed the capsized water taxi and, along with his partner on duty, quickly got Fireboat #1 underway. The fireboat arrived on scene within a few minutes. The firefighters saw the Navy landing craft already on scene assisting water taxi passengers. One of the firefighters, upon hearing that individuals from the water taxi were unaccounted for, jumped into the water to assist in locating them. The firefighter was able to retrieve one of the three persons that resurfaced when the Navy landing craft lifted the capsized water taxi. While boarding the fireboat, the firefighter lost control of the unconscious person. This person was later retrieved by the Baltimore City Police marine unit that was near the scene.

One of the unconscious individuals on the landing craft was placed on Fireboat # 1, given CPR by Navy personnel, and transported to an awaiting ambulance that was located at Fort McHenry. The fireboat went back on scene and transported a second unconscious person from the Navy landing craft to shore. Both of these individuals were taken to local hospitals by ambulances.

According to the Baltimore City Police marine unit, the unconscious person that they recovered was taken to their local police station and transferred to a hospital.

In addition to the above rescue personnel involved, several local, state, and Coast Guard resources assisted with the search and rescue efforts. Coast Guard Sector Baltimore received notification of the casualty at approximately 1614 from another agency on scene and launched Search and Rescue assets.

Once all the visible passengers from the water taxi were located and recovered the Navy landing craft returned to the Naval Reserve Center. The crew of the ACU-2 estimated they were on scene for approximately thirty minutes. Concurrent to the response, the Naval Reserve Center established a triage area to treat injured passengers. Once on shore, all of the water taxi passengers were given immediate medical treatment and then transported to area hospitals for a medical evaluation.

When [REDACTED] and Mr. [REDACTED] arrived at the scene of the casualty, they saw the Navy vessel and several other emergency vessels in the area. A debris field was located in the Fort McHenry and Clinton Street dock area. They searched the area looking for any survivors and picked up any debris including life preservers that belonged to the *Lady D*. They continued to search until dark, which was approximately 1700.

The capsizing occurred in the vicinity of the deep draft vessel channel with depths averaging approximately 35 feet. This added depth made the search for victims more difficult. During the rescue efforts, the capsized water taxi and the ACU-2 drifted in a southeast direction in the Northwest Harbor towards the Francis Scott Key Bridge.

With the help of Tyco Marine's remote operated vehicle (ROV) capable of scanning the bottom of the channel, the Baltimore City Fire Department Dive Team recovered the remaining three passengers, all deceased, approximately ten days after the casualty. These victims were found southeast of where the capsizing of the water taxi occurred in the Northwest Branch of the Patapsco River.

Twenty-five adult and ten child life preservers, all with *Lady D* stenciled on them, were retrieved in various locations following the casualty.

1.8 Drug and Alcohol Testing

Pursuant to 46 CFR Part 4.06, post casualty drug and alcohol testing was conducted on both crewmembers onboard the *Lady D*. The results were as follows:

[REDACTED]

Following the casualty, Captain Deppner submitted to post casualty drug and alcohol testing at the University of Maryland Medical Center at approximately 1900 hours on March 6, 2004. According to the toxicology report, the results of [REDACTED] tests were [REDACTED].

[REDACTED] submitted to chemical testing in accordance with USCG/DOT regulations on March 10, 2004. The sample collection was made at Americorp in Baltimore, MD. Testing analysis was conducted by Advanced Toxicology Network in Memphis, TN, and the test was confirmed [REDACTED] by the Medical Review Officer, Dr. [REDACTED] of Choice Point Medical Review Services.

The National Transportation Safety Board (NTSB) conducted both an alcohol and drug test from a blood specimen that was collected from [REDACTED] at 1900 hours on March 6, 2004, at the University of Maryland Medical Center. The blood sample was analyzed at the Civil Aerospace Medical Institute in Oklahoma City, OK. According to the forensic toxicology report, verified by [REDACTED], PhD, the tests were confirmed [REDACTED] for the presence of drugs and/or alcohol.

[REDACTED]

Following the casualty, [REDACTED] submitted to post casualty drug and alcohol testing at the University of Maryland Medical Center at approximately 2100 hours on March 6, 2004. According to the toxicology report, the results of [REDACTED] tests were [REDACTED].

[REDACTED] submitted to chemical testing in accordance with USCG/DOT regulations on March 8, 2004. The sample collection was made at Americorp in Baltimore, MD. Testing analysis was conducted by Advanced Toxicology Network in Memphis, TN, and the test was confirmed [REDACTED] by the Medical Review Officer, Dr. [REDACTED], of Choice Point Medical Review Services.

The National Transportation Safety Board (NTSB) conducted both an alcohol and drug test from a blood specimen that was collected from [REDACTED] at 2100 hours on March 6, 2004, at the University of Maryland Medical Center. The blood sample was analyzed at the Civil Aerospace Medical Institute in Oklahoma City, OK. According to the forensic toxicology report, verified by [REDACTED], PhD, the tests were confirmed [REDACTED] for the presence of drugs and/or alcohol.

In addition to the crewmembers several passengers onboard the *Lady D* also underwent chemical testing while at the hospital.

Chemical testing results of deceased passengers

Andrew Roccella underwent a postmortem examination at the Office of the Chief Medical Examiner for the State of Maryland on March 15, 2004. Toxicology testing for both alcohol and drugs was conducted with the results being [REDACTED] as confirmed by Dr. [REDACTED], Associate Pathologist. According to the Medical Examiner, the cause of death was both drowning and hypothermia. There was no evidence of injury to the external body.

Corrine Schillings underwent a postmortem examination at the Office of the Chief Medical Examiner for the State of Maryland on March 16, 2004. Toxicology testing for both alcohol and drugs was conducted with the results being [REDACTED] as confirmed by Dr. [REDACTED], Assistant Medical Examiner. According to the Medical Examiner, the cause of death was both drowning and hypothermia. There was no evidence of injury to the external body.

Lisa Pierce underwent a postmortem examination at the Office of the Chief Medical Examiner for the State of Maryland on March 9, 2004. Toxicology testing for alcohol was conducted with the results being [REDACTED] as confirmed by Dr. [REDACTED], Assistant Medical Examiner. According to the Medical Examiner, the cause of death was both drowning and hypothermia with complications. The complications included abrasions on the right thigh and right arm, with contusions on the arms, right hand, and right thigh.

Joanne Pierce underwent a postmortem examination at the Office of the Chief Medical Examiner for the State of Maryland on March 7, 2004. Toxicology testing for both alcohol and drugs was conducted with the results being [REDACTED] as confirmed by Dr. [REDACTED], Assistant Medical Examiner. According to the Medical Examiner, the cause of death was both drowning and hypothermia. There was no evidence of injury to the external body.

Daniel Bentrem underwent a postmortem examination at the Office of the Chief Medical Examiner for the State of Maryland on March 15, 2004. Toxicology testing for both alcohol and drugs was conducted with the results being [REDACTED] as confirmed by Dr. [REDACTED], Associate Pathologist. According to the Medical Examiner, the cause of death was both drowning and hypothermia. There was evidence of an abrasion on the right cheek and an abrasion on the forehead.

1.9 Post Casualty Corrective Actions Taken to Date

By The Commander, U.S. Coast Guard Sector Baltimore

1. Following this casualty, Sector Baltimore reviewed the stability data for similar pontoon vessels inspected within its area of responsibility. For any pontoon vessel that did not have data indicating that the vessel met the stability requirements of 46 CFR 178.340, Sector Baltimore required the vessel to undergo a simplified stability test. Sector Baltimore required all of Seaport Taxi's vessels to conduct new stability tests. On April 14, 2004, the *Patricia P* underwent a simplified stability test in accordance with 46 CFR 178.340. The vessel passed the test for the carriage of 15 total persons. Because the *Lady D* was notably lighter and had a lower vertical center of gravity (VCG) than the other two vessels, we infer that the *Lady D* would likely have passed a pontoon vessel simplified stability test for the carriage of at least 15 people, and possibly more (see MSC Memo P010065/H1-0403040 dated 04 February 2005).
2. For more immediate notification of National Weather Service watches and warnings, Sector Baltimore purchased a NOAA weather radio for use in the Sector Command Center. The weather radio has both an audible and a visible alert that activates immediately in the case of any severe weather watches and warnings.
3. The Commander, Sector Baltimore has presented Captain Deppner with the key findings of this report.

By The Commandant of the Coast Guard

1. After the capsizing of the *Lady D*, the Commandant's Quality Assurance and Traveling Inspection Staff conducted a survey of all U.S. Ports having similar type vessels and conducted data analysis regarding possible safety issues. They subsequently sent an email to all Coast Guard Areas, Districts and Field Units summarizing the data received and providing some guidance to address field concerns and questions. Included in the guidance was a specific note for OCMI's to ensure they understand and can defend the COI's they've issued to pontoon boats in their respective areas of responsibility. It was also noted that each field unit has the option to place "*reasonable operating conditions*" on each pontoon vessel COI if this statement is not already written on the COI. The Certificate of Inspection for the *Lady D* stated the following for the "Route Permitted and Conditions of Operation: *RIVERS – Patapsco River from Tendeco Wharf to Locust Point to the Inner Harbor, not more than 1000 feet from shore under reasonable operating conditions.*"
2. The Quality Assurance and Traveling Inspection Staff determined the size and scope of the pontoon vessel fleet throughout the country, reviewed all casualty data, and with assistance from the Marine Safety Center, evaluated current pontoon stability testing procedures and requirements.
3. October 7, 2004, the Commandant issued Policy Letter 04-10, *Evaluation of Stability and Subdivision Requirements for Small Passenger Vessels Inspected under 46 CFR Subchapter T*. This policy letter provides guidance on the applicability of simplified stability proof tests, limited

types of vessels that may use the simplified stability test procedures, and amplifies the existing regulations in 46 CFR 178.340 with more detailed stability test procedures for certain pontoon vessels.

4. In April of 2005, the Commandant completed a study of the U.S. Domestic Intact Stability and Subdivision Requirements for Twin Hull Pontoon Passenger Boats of less than 65 feet in length. This study compared several recognized standards for pontoon boats and recommended parameters which limit the applicability of the pontoon vessel simplified stability test, including draft of the vessel and various hull dimension ratios.

5. In March 2006, the Commandant issued a pontoon vessel alert message which directed all Officers in Charge of Marine Inspection to take the following actions:

- Conduct a pontoon vessel simplified stability test in accordance with the new guidelines on each untested vessel as soon as possible in order that necessary amendments to the vessel's Certificates of Inspection could be made;
- For vessels that no longer hold Certificates of Inspection, make every effort to notify appropriate parties such as the owner, operator, and state or local authorities having jurisdiction over the vessel, in order to convey the potential safety concerns involved;
- If not already completed, ensure that all pontoon vessels operating in the Sector (not only those identified as being without a proper test) have undergone an appropriate pontoon vessel simplified stability test, and that the route is properly documented on the vessel's Certificate of Inspection;
- If the OCMI suspects that a pontoon vessel's weight has changed without proper documentation and Coast Guard oversight, conduct a new pontoon vessel simplified stability test;
- When conducting pontoon vessel simplified stability tests, apply the existing average (140 lb.) passenger weights as outlined in regulation; and
- Do not dispense with simplified stability proof tests for new pontoon vessels unless the form, arrangement, materials, construction, measurements (dimensions and weights) and particularly outfit of each vessel is closely monitored and demonstrated by the builder or outfitter to be identical to the original vessel.

6. The Commandant commenced a rulemaking project to determine an appropriate average per person weight to utilize in determining vessel stability. In a notice published in the Federal Register on April 26, 2006 the Coast Guard recommended voluntary interim measures for small passenger vessels to follow in order to account for increased passenger and vessel weight when determining the number of passengers permitted. On November 2, 2006 the Coast Guard published supplemental guidance for owners and operators of small passenger vessels to avoid operation in environmental conditions that are inappropriate for their vessels.

7. On August 20, 2008, a notice of proposed rulemaking (NPRM) was published in which the Coast Guard proposed to update regulations to more accurately reflect today's average weight per person in the loading of passenger vessels so that intended safety levels are maintained. The NPRM also proposed changes that would explicitly call attention to the OCMI's prerogative to

consider a vessel's use in weather conditions, thereby emphasizing the OCMI's authority to include operational limits on a COI. Further, the NPRM proposed revisions intended to clarify and update the Coast Guard's stability regulations, adding among other things, more specific requirements for a vessel owner to show that the vessel meets intact, subdivision and damage stability standards.

By Seaport Taxi, Inc.

1. Seaport Taxi voluntarily requested that the M/V *Patricia P* have its Certificate of Inspection deactivated.
2. At the time of the casualty, there was some confusion as to the exact number of passengers that were onboard the *Lady D*. It was later discovered that passenger counts were not being conducted in accordance with 46 CFR 185.504. To correct this Seaport Taxi provided a box ashore at each taxi depot; once accurate passenger counts were taken, copies of this tally were placed into the box prior to departing the depot. In the event of an accident, passenger tallies could quickly be retrieved specific to the transit/voyage in question.
3. Seaport Taxi voluntarily placed wind and sea state restrictions on some of its vessels. The following lists the restrictions: Three of the vessels, the M/V *Raven* (O.N. 1133223), M/V *Phoenix* (MD2924BD), and M/V *Migeni* (O.N. 1062892), are not to operate when the sustained winds are greater than 30 miles an hour or when wind gusts are greater than 35 miles per hour for 15 consecutive seconds. These vessels are also not to operate when seas are greater than two feet in height. The M/V *Patrick Duffy* (MD4616E) and M/V *Eagle* (MD4747E) are not to operate when sustained winds are greater than 25 miles an hour or when wind gusts are greater than 30 miles per hour for 15 consecutive seconds, or seas are greater than two feet in height. Seaport Taxi met with all its captains and stressed the importance of observing the weather and to remind them they must suspend operations when lightning is observed.
4. Seaport Taxi voluntarily equipped each vessel with an emergency alert NOAA weather radio.
5. On April 26, 2004, Seaport Taxi requested Sector Baltimore deactivate the COIs for their entire fleet of vessels. On November 1, Seaport Taxi ceased to exist. The Living Classroom Foundation has formally partnered with Harbor Boating, Inc., formerly Ed Kane's Water Taxi. Harbor Boating remains independent but is now the key waterborne transportation vehicle for the Inner Harbor in Baltimore, Maryland. None of Living Classrooms pontoon boats were placed into service by Harbor Boating. All vessels previously owned by Seaport Taxi, other than the *Lady D*, were sold.

By The National Transportation Safety Board

On December 20, 2004, the National Transportation Safety Board issued a safety recommendation to the Coast Guard regarding the calculation of passenger weight during stability testing. The recommendation stated:

Revise your guidance to Officers in Charge, Marine Inspection to determine the maximum occupant capacity of small passenger pontoon vessels either (1) by dividing the vessel's simplified stability proof test weight by the per-person weight allowance for an average adult stipulated in Federal Aviation Administration Advisory Circular 120-27D (174 pounds per person, assuming summer clothing and a 50-50 gender mix), or (2) by restricting (at the time of loading) the actual cumulative weight of passengers and crew to the vessel's simplified stability proof test weight.

2.0 Analysis

2.1 Weather

We take official notice of the National Weather Service's report, *Service Assessment: Baltimore Inner Harbor Thunderstorm Event, March 6, 2004*. At the time of the incident, a Small Craft Advisory was in effect for the Chesapeake Bay region, including the Baltimore Harbor. This Small Craft Advisory was issued the previous day and remained in effect during the time period of the casualty. According to the National Weather Service, a Small Craft Advisory is "an advisory in Coastal Waters and Nearshore forecasts for sustained winds, frequent gusts, or sea/wave conditions, exceeding defined thresholds specific to geographic areas."⁴¹ For the Baltimore area, these thresholds are a condition of observed or forecasted winds of 18 to 33 knots. Small Craft Advisories may also be issued for hazardous sea conditions or lower wind speeds that may affect small craft operations. Small Craft Advisories are sometimes issued up to 12 hours ahead of conditions. When the Coast Guard receives a Small Craft Advisory from the National Weather Service this advisory is broadcasted upon receipt. This advisory is then broadcasted at least every 12 hours by the Coast Guard.

On March 6, 2004, the National Weather Service issued a Special Marine Warning at approximately 1605, minutes after the casualty. The Special Marine Warning included portions of the Chesapeake Bay and Patapsco River including the Baltimore Harbor. This warning was forwarded via message traffic from the National Weather Service to the Coast Guard Communications Center in Chesapeake, Virginia, then forwarded by message traffic to affected Coast Guard units including Sector Baltimore. This message was time stamped at 1610. According to Coast Guard Sector Command Center personnel, the message was received within five minutes of it being sent by the Coast Guard Communications Center.

According to witnesses, the weather quickly deteriorated that afternoon. Shortly after leaving the dock at Fort McHenry, the wind picked up dramatically, and the rain started to fall causing the *Lady D* to rock back and forth.

One of the Baltimore City firemen located at Fort McHenry stated, "*in five minutes it went from sunny skies to all hell breaking lose. Winds blew open both the front and back doors of the firehouse, and the rain was coming sideways.*" Another fireman stated, "*the seas went from flat to four feet in five minutes, then back to about a foot 15 minutes later.*"

Due to the conditions reported at the time of the casualty with sustained winds of 28 knots with a maximum gust of 41 knots, the forces and movements generated by the wind and waves overcame the vessel. The Captain of the *Lady D* stated that he attempted to position the vessel into the wind but witnesses stated the wind took control of the vessel and the *Lady D* was forced in a circular motion. Witnesses onshore observed the vessel pushed towards the Key Bridge, providing evidence of powerful wind gusts as the vessel's intended destination was in the opposite direction.

⁴¹ See the NOAA web site at <http://www.weather.gov/om/marine/cwd.htm>

2.2 Vessel Stability

The stability of the *Lady D* was determined to be acceptable by the Officer in Charge, Marine Inspection (OCMI), Baltimore in March of 1996. A stability letter was issued to the *Lady D* based on its sister ship relationship with the *Raven* and the *Patricia P*, formally the *Fells Point Princess*, which underwent a simplified stability proof test on August 12, 1992 to satisfy the stability requirements of 46 CFR Part 171.030.

New regulations for small passenger vessels (46 CFR Subchapter T) were published in the Federal Register on January 10, 1996. At that time, existing vessels were required to comply with the stability requirements that were applicable to the vessel on March 10, 1996 (the old regulations), or, as an alternative, the vessel could have complied with the regulations of 46 CFR 178 (the new regulations). As construction of the *Lady D* began before March 1996, the vessel was considered “existing” and was not required to comply with the new regulations.

Under the old regulations, the *Lady D* was not required to undergo a simplified stability proof test. According to 46 CFR Part 171.030, which was in effect prior to 1996, each mechanically propelled or non-self-propelled vessel that was less than 100 gross tons, less than 65 feet in length, and carried not more than 150 passengers was required to demonstrate compliance with the applicable portions of 46 CFR Subchapter S or perform a simplified stability proof test only if: (1) the stability of the vessel was questioned by the OCMI; or, (2) the vessel was permitted an increased passenger allowance by the OCMI under 46 CFR 176.01-25(b). Although there is no evidence to suggest the OCMI specifically questioned the stability of the *Lady D*, the fact that the OCMI had issued a stability letter based on a sister vessel indicates that stability was of concern. With the stability assured by granting of sister vessel stats, and because *Lady D* was not permitted an increased passenger allowance, the regulations did not require stability calculations or a simplified stability proof test for the *Lady D*.

If the OCMI had questioned the validity of the sister vessel status, or had questioned the stability of the *Lady D* for some other reason, the stability could be verified by (1) submitting calculations demonstrating compliance with the intact stability requirements in Subchapter S, (2) conducting a simplified stability proof test, or (3) demonstrating it was a “sister” to another vessel that had already demonstrated compliance.

To demonstrate compliance with the requirements in 46 CFR Subchapter S, a series of tests are typically conducted and calculations are performed, usually by a naval architect, to determine the vessel’s lightship weight and centers of gravity. With the lightship characteristics defined, the weight of fuel, water, cargo, passengers, etc. are estimated and calculations are performed to determine if the vessel meets the applicable stability criteria. Due to costs involved with hiring a naval architect to perform such calculations and tests, most vessel owners prefer to use the simplified stability proof test to demonstrate compliance with the requirements, if possible. Per 46 CFR 170.175, these tests and calculations can be dispensed with if a sister vessel has undergone a stability test or the vessel’s lightweight characteristics can be accurately estimated and the precise location of the vertical center of gravity is not necessary.

A simplified stability proof test indirectly assesses the intact stability of a vessel to ensure it has, at a minimum, the margin of stability provided for by the criteria in Subchapter S without the need to perform detailed calculations. A simplified stability proof test may be permitted only for a vessel not more than 65 feet in length, carrying not more than 150 passengers on a domestic voyage, carrying not more than 12 passengers on an international voyage, and that has not more than one deck above the bulkhead deck. Rather than performing calculations to demonstrate the vessel meets the minimum stability requirements, weight is physically placed aboard the vessel and moved to represent the application of heeling moments created by wind forces or passenger movement. Through this test, the vessel's ability to withstand reasonable heeling moments it may encounter during operation is assessed.

For a pontoon vessel, the total assumed passenger weight is distributed to simulate normal operating trim and vertical center of gravity.⁴² The weight is then moved to the extreme outboard position on the vessel and the cross sectional area of the pontoon that remains unsubmerged on the low side of the vessel is determined. To pass the test, the cross sectional area that remains above the waterline must be equal to or greater than the cross sectional area that became submerged as a result of the transverse weight shift. If the vessel passes the transverse test, the weight is then moved to the extreme forward and aft positions. The longitudinal test is considered satisfactory as long as the top of the pontoons remain above the waterline.

Prior to 1996, the regulations did not have specific stability standards for pontoon vessels. The Coast Guard's policy, contained in the Coast Guard Marine Safety Manual Volume IV, (COMDTINST M16000.9) Chapter 2, was in effect in 1992 during the test on the *Fells Point Princess* and contained figures that were intended to provide guidance on how to perform simplified stability proof tests on pontoon vessels. Field notes on the *Fells Point Princess* and calculations on the stability test form in 1992 indicate that the test was not conducted in accordance with the Marine Safety Manual guidance for pontoon vessels. Instead of shifting all weight to the extreme outboard edge of the vessel during the test, as specified by the Marine Safety Manual, the weight was only shifted enough to achieve the heeling moment required by the simplified stability proof test form (CG-4006), a Coast Guard job aid used to ensure compliance with mono-hull (not pontoon) simplified stability test requirements. The figures that were in the Marine Safety Manual in 1992 were incorporated into 46 CFR 178.340 in 1996 with the publication of the new Subchapter T regulations, and augmented with more specific requirements.

As a result of the *Lady D* capsizing, the *Patricia P* underwent another simplified stability proof test (along with an inclining experiment) on April 14, 2004, and passed for the carriage of only 15 total persons, which is 10 persons less than allowed by the 1992 test.⁴³ On April 26, 2004, the COI was deactivated at the request of the owner.

⁴² Under the Marine Safety Manual guidance, during a pontoon vessel simplified stability test, weight is distributed to minimize trim, not necessarily to simulate anticipated operating conditions. Revised guidance from the Commandant and the Marine Safety Center in March, 2006, states that the test weight must be placed such that it simulates the anticipated longitudinal center of gravity of the passengers and crew at maximum load.

⁴³ See MISLE Activity 2023457 dated 30 April 2004).

The new Subchapter T regulations implemented in 1996 include provisions that allow the simplified stability test to be dispensed with under certain circumstances. Specifically, 46 CFR 178.320 allows the Officer In Charge, Marine Inspection to dispense with the simplified stability proof test of 46 CFR 178.330 for a vessel not carrying more than 49 passengers where it can be established that, due to the form, arrangement, construction, number of decks, route, and operating restrictions of the vessel, the vessel's stability can be safely determined without such a test. Though the new regulations specifically state in 46 CFR 178.320(c) that the simplified stability proof test may be dispensed with under certain conditions for other vessel types, they do not mention dispensing with the simplified stability proof test requirements applicable to pontoon vessels.

In accordance with Navigation and Vessel Inspection Circular 14-81 "Stability Tests; Waiving of for Sister Vessels," stability tests are not always necessary for sister vessels. If the shipyard provides a letter to attest that two vessels satisfy the sister ship criteria, the entire stability test (inclining experiment and deadweight survey) may be waived. If the builder elects not to certify the vessels are sisters, or if there is doubt regarding the relationship between the vessels, the Marine Safety Center will normally, at a minimum, require that a deadweight survey be performed. If the displacement and longitudinal center of gravity from the survey match the alleged sister vessel, the sister vessel's Vertical Center of Gravity (VCG) may be used.

There were no explicit provisions in the regulations before 1996 and there are no specific provisions in the current regulations for dispensing with simplified stability tests required by 46 CFR 178.330 or 46 CFR 178.340 based on sister ship status. However, the ability to dispense with a stability test can be inferred. There is no technical justification for performing a simplified stability test on a vessel which is known to be a sister to another vessel that has already undergone the same test. As mentioned above, prior to 1996, vessels less than 100 gross tons, less than 65 feet in length, and which carried 150 or fewer passengers were not even required to have a stability test done unless the stability was questioned by the OCMI⁴⁴. If a vessel's stability could be based on a sister vessel or a similarly constructed vessel, this provided reasonable justification for the OCMI not to question its stability.

After the casualty, the stability of the *Lady D* was analyzed by the Coast Guard Marine Safety Center in order to determine what impact the weight of the individuals onboard the vessel had on the casualty. The stability requirements in Subchapter S were applied, including the wind heel criteria in 46 CFR 170.170, the passenger heel criteria in 46 CFR 170.050, and the righting energy criteria in 46 CFR 170.173. The lightship characteristics were determined by weighing the recovered hull of the *Lady D*, estimating its VCG, making corrections for missing gear, and estimating the weight and VCG of the superstructure. These characteristics were validated by inclining the *Patricia P* and *Misty Harbor II*, a similarly constructed pontoon vessel built by the same manufacturer within a few months of the *Lady D*. A comparison of the results indicated the *Lady D* was actually lighter than the *Patricia P*.

The Marine Safety Center's calculations demonstrate that the *Lady D*, as configured at the time of the casualty, likely met the stability requirements of 46 CFR Subchapter S for operation on

⁴⁴ A similar regulation in "new T," 46 CFR 178.320(c), limits the passenger count for vessels dispensing with the test to 49 or fewer.

protected waters routes with a maximum of 25 persons aboard. The 25 person capacity was based on an assumed regulatory passenger weight of 140 pounds per person for a mixture of men, women, and children. According to the stability letter issued to the *Lady D* in 1996, the maximum number of persons allowed onboard was also 25.

As previously stated, the average weight of the persons onboard the *Lady D* at the time of the casualty was 168 pounds, for a total passenger weight of approximately 4200 pounds. This weight is 20% greater than that assumed by both the simplified stability proof test and permitted by Subchapter S. The difference between the assumed and actual passenger weight on board the *Lady D* at the time of the casualty equates to a one-inch decrease in freeboard. Using an assumed weight of 168 pounds per person for 25 persons, the *Lady D* did not meet all of the stability criteria requirements of Subchapter S. Though it met the wind heel and passenger heel criteria, it did not meet the righting energy criteria in 46 CFR 170.173(e) (2) (iii). The Marine Safety Center determined that with an assumed weight of 168 pounds per person the maximum number of persons permitted on the *Lady D* would have been 21, or four less than were onboard at the time of the casualty.

A vessel's intact stability predicts how it will respond when heeling forces, such as wind, waves, and passenger movement, are imposed. These forces result in heeling moments that are opposed by the vessel's righting moment, which tends to force the vessel back to its upright condition and is a function of its weight, or displacement, and the length of its "righting arm." Though the vessel's displacement remains constant when wind and waves force the vessel to heel, a vessel's righting arm is determined by the underwater geometry of the hull and varies as the vessel's heel angle and trim changes. A vessel will heel until it reaches the angle that produces the righting arm, and corresponding moment, necessary to counteract the sum of the heeling moments acting on it. It is said to be at "equilibrium" when the heeling and righting moments are equal. If the sum of the heeling moments exceeds the maximum righting moment, the vessel will capsize.

The "righting arm curve" of a vessel at a particular displacement and VCG is produced by plotting the righting arms against their corresponding angles of heel. The area beneath the righting arm curve represents the "righting energy" that is available to oppose the dynamic heeling forces and is measured in units of foot-degrees.

For vessels operating on protected routes, 46 CFR 170.173(e)(2)(iii) requires at least 10 foot-degrees of righting energy under the portion of the curve that extends from 0 degrees to the smallest of the following angles:

- (A) Angle of maximum righting arm,
- (B) Angle of down flooding, or
- (C) 40 degrees.

Using the passenger weight at the time of the casualty, the Marine Safety Center determined that the *Lady D* most likely had no more than approximately seven-foot degrees of area under the righting arm curve between zero degrees and the angle of maximum righting arm, which is less than the minimum requirement of 10 foot-degrees required.

This criteria is applied to a vessel to predict if it is likely to have the righting energy necessary to counteract heeling forces it may encounter while operating on a protected route under reasonable conditions. Since it only considers a portion of the area under the righting arm curve, an additional undefined factor of safety is provided.

The Marine Safety Center was unable to reliably assess the stability of the vessel under the actual dynamic environmental and loading conditions experienced by the vessel during the casualty due to the uncertainty and complexity of the scenario.

Given the dynamic environmental factors that impacted the casualty, it is not clear if the freeboard/buoyancy gained by reducing the passenger weight by 700 pounds (25 persons x (168 lbs – 140 lbs)) would have prevented the *Lady D* from capsizing. The complex dynamics of large roll motions and capsize are dependent on constantly varying, non-linear properties such as wind profile, wetted surface, water plane, etc. As a result, it is impossible to verify whether the approximate one inch reduction in freeboard resulting from increased passenger loading had any significant effect on the *Lady D*'s probability of survival on the day of the casualty. If concentrated along the port side to counteract the combined forces, moments, and accelerations experienced by the vessel due to the wind, waves, and turning motion, it is possible that the additional passenger weight may have actually improved the vessel's chance of survival by decreasing the likelihood of it pivoting about its starboard pontoon and capsizing.

Because of the myriad of complex and unpredictable forces acting on a vessel, the responsibility for evaluating and ensuring the vessel is operated safely at all times and in all conditions lies with the vessel's master. Per 46 CFR 185.304(a), the master "shall operate the vessel keeping the safety of the passengers and crew foremost in mind by directing the vessel in order to prevent a casualty." In addition, [REDACTED] was required to pay special attention to the current(s) velocity and direction, the tidal state, the prevailing weather conditions, and the vessel's handling characteristics (among other factors). Further, 46 CFR Part 185.315 states that "after loading and prior to departure and at all other times necessary to assure the safety of the vessel, the master shall determine that the vessel complies with all applicable stability requirements in the vessel's trim and stability booklet, stability letter, Certificate of Inspection, and Load Line Certificate as the case may be. The vessel may not depart until it is in compliance with these requirements."

2.3 Operation of the *Lady D*

The only weather related restriction on the *Lady D*'s COI at the time of the casualty was for the vessel to be operated under "reasonable operating conditions." According to Mr. [REDACTED], the Director of Seaport Taxi at the time of the casualty, the only weather restrictions placed on the vessels were during lightning or reduced visibility. All captains were to suspend service until lightning ceased or visibility improved. Mr. [REDACTED] stated that each vessel was operated by a licensed master who should be able to make a judgment based on the conditions at the time, and that he did not want to place too many restrictions on the water taxi captains.

Shortly after leaving the dock at Fort McHenry, the wind picked up dramatically, and the rain started to fall causing the *Lady D* to rock back and forth. Witnesses reported that the weather quickly deteriorated that afternoon. Passengers stated that the *Lady D* began to roll in the waves with the intense winds forcing the water taxi in a circular motion greatly hindering the Captain's ability to control the movement of the *Lady D*. According to [REDACTED], he was having difficulty operating the *Lady D* due to the heavy winds. The *Lady D* heeled over slightly to the starboard side and most of the passengers got up from their seats and moved to the port side of the vessel, leveling the vessel. [REDACTED] did not attempt to seek safe refuge or delay his transit prior to receiving the call to seek shelter. At no time did either [REDACTED] or [REDACTED] or require the passengers to don their lifejackets.

There is no evidence in testimony to suggest [REDACTED] considered halting operations or consciously considered the visible weather conditions that caused other companies to halt operations. According to [REDACTED], he stated the *Lady D* was located "in the middle of the river" when he received the call from [REDACTED] to seek shelter from the weather conditions. Due to the *Lady D*'s position in the Northwest Harbor, [REDACTED] attempted to maneuver the *Lady D* towards Baltimore Marine Center located on the opposite side of the shore from Fort McHenry. The distance between Fort McHenry and Fells Point is 1.06 nautical miles. The distance between Fort McHenry and Baltimore Marine Center is 0.62 nautical miles. Baltimore Marine Center was closer to the *Lady D*'s location and may have offered some shelter from the wind and sea conditions. Transit time between Fort McHenry and Fells Point is 12-14 minutes at a normal speed of six knots. The time to Baltimore Marine Center was almost half that of Fells Point. Since [REDACTED] was located approximately in the middle of the channel, he decided to proceed to shelter that was closest to his current position. The dock at Fort McHenry did not offer the shelter from the weather that Baltimore Marine Center offered.

According to 46 CFR 185.100 a vessel must be operated in accordance with applicable laws and regulations and in such a manner as to afford adequate precaution against hazards that might endanger the vessel and the persons being transported. The master shall operate the vessel keeping the safety of the passengers and crew foremost in mind by directing the vessel in order to prevent a casualty. Additionally special attention should be paid to: the current (s) velocity and direction of the transiting area; tidal state; prevailing visibility and weather conditions as outlined in 46 CFR 185.304(a)(1)(2) and (3) respectively. Lastly, the master of a vessel shall require passengers to don life jackets when possible hazardous conditions exist, including, but not limited to: during severe weather as prescribed in 46 CFR 185.508(a)(2). Once apparent that the vessel was in danger, the passengers did not have an opportunity to put on life preservers.

The route permitted and conditions of operation on the COI of the *Lady D* were "the Patapsco River from Tindeco Wharf to Locust Point to the Inner Harbor, not more than 1000 feet from shore under reasonable operating conditions." Based on available evidence, we conclude that the *Lady D* was not operating within its COI limitations on the day of the casualty. Due to the fact that the *Lady D* traveled in a northwest direction from Fort McHenry towards Fells Point, the vessel was within the 1000 feet restriction.

Evidence suggests that [REDACTED] did not operate the *Lady D* in accordance with the above mentioned regulations to prevent a casualty or afford adequate precaution against hazards that might endanger the *Lady D* or the passengers and crew being transported.

3.0 Conclusions

1. **Unsafe Decision Initiating the Accident.** This accident was initiated by [REDACTED] [REDACTED] unsafe decision to depart the dock at Fort McHenry in the face of a visible squall line approaching. By departing the dock, [REDACTED] directly placed the *Lady D* in the path of the squall. This unsafe decision may have been based on several underlying factors, including:

- a. [REDACTED] erroneous assessment of the threat posed by the squall line, an error not committed by other operators, including Ed Kane's Water Taxi;
- b. [REDACTED] reliance on an early morning weather broadcast, along with the unlicensed Seaport Taxi office personnel review of weather alerts, to evaluate weather hazards;
- c. The absence of a *Special Marine Warning* from the National Weather Service, which would have activated the Seaport Taxi weather-watch, and might have prompted a different assessment of the approaching squall line;
- d. The absence of clearly defined "*reasonable operating conditions*" on the vessel's Certificate of Inspection, based on stability and route limits, which might have prompted [REDACTED] special attention to the current(s) velocity and direction, the tidal state, the prevailing weather conditions, and the vessel's handling characteristics (among other factors); and
- e. The absence of a "*hit the bulkhead*" message at the time of departure from one of the senior captains. An unstated and ambiguous Seaport Taxi informal policy inserted the senior captains into the "go/no-go" decision-making process (both for support and for validation/tacit-approval).

[REDACTED] did not consider returning to the pier at Fort McHenry, and prior to [REDACTED] "*hit the bulkhead*" message [REDACTED] did not question the safety of the vessel, passengers, or crew while transiting during increasingly bad weather. We conclude that if not for the "*hit the bulkhead*" message, [REDACTED] may have attempted to proceed with his transit as normal.

2. [REDACTED] **Assessment of the Squall Line.** As previously noted, [REDACTED] [REDACTED] erroneous assessment of the threat posed by the approaching squall line was a contributing factor to his decision to leave the dock. The Coast Guard takes special interest in the human performance of licensed merchant mariners in order to improve the licensing system. Because this squall line did not fit the classic definition of a thunder squall, [REDACTED] was forced to derive his assessment from first principles⁴⁵ rather than refined rules based on personal experience, a level of human performance notorious for high error rates.⁴⁶ We have concluded that [REDACTED] had formed a hypothesis that the weather front would be gentle, turning to fine weather in the afternoon, based on a single data-point: the morning National Weather Service public forecast. Faced with information later in the day to the contrary, most notably thunder claps and the visible gray-black squall line, [REDACTED] discounted that

⁴⁵ First principles are so clear that they cannot be proved by more manifest truths; almost universally received; and so strongly impressed on our minds that we conform ourselves to them, whatever may be our avowed opinions. Where no accepted practice or procedure exists, a problem must be solved by beginning with first principles; in this case with first principles of boathandling and physics.

⁴⁶ James Reason, *Human Error*, Cambridge University Press, 1990, at pages 86-95.

information, focusing instead on data that confirmed his early morning hypothesis, notably the sunshine and higher temperatures of the early afternoon. Several factors enabled [REDACTED] in making this confirmation-bias error, including:

- a. [REDACTED] apparent lack of awareness that the National Weather Service had issued a *Small Craft Advisory*;
- b. [REDACTED] limited understanding of the vessel's stability limitations and limited skills and experience in assessing dynamic environmental factors, as documented in the limited amount of weather and stability training required or tested by the U.S. Coast Guard license exam and community college program;
- c. [REDACTED] limited experience in severe weather, as documented in [REDACTED] self-documented sea-time records;
- d. The U.S. Coast Guard licensing program's reliance on self-attested sea-time as evidence of experience relevant to the managing of dynamic environmental factors;
- e. [REDACTED] reliance on weather information from and the judgment of more experienced Seaport Taxi senior captains;
- f. Seaport Taxi's safe-operating-weather policy which focused only on lightning and reduced visibility and may therefore have unintentionally downplayed other weather risks;
- g. [REDACTED] practice of checking weather forecasts only at the start of the day; and
- h. The failure of the National Weather Service's forecasters to recognize that weather conditions were changing rapidly, and to update/change their forecast (because they did not recognize such a change was needed).

3. Sequence of Events. [REDACTED] unsafe decision initiated a chain of negative events, which led to the capsizing of the *Lady D*. The first of these negative events occurred as [REDACTED] experienced difficulty in controlling the vessel, and forced him to initiate emergency maneuvers to maintain control. The basic sequence of events for this accident are as follows:

- a. [REDACTED] decided to depart the dock in the face of the approaching squall;
- b. The procedures and processes designed to safeguard against erroneous departure decisions, both at Seaport Taxi and aboard the *Lady D*, failed, and the vessel sailed.
- c. [REDACTED] decided to continue his voyage instead of returning to the dock despite the difficulty he experienced as he departed the dock due to wind;
- d. [REDACTED] initiated his "hit the bulkhead" message; the Seaport Taxi safeguard against sailing into a squall was now working, but too late.
- e. The *Lady D's residual righting energy decreased* as the wind speed and wave heights increased. The vessel was just barely controllable.
- f. [REDACTED] moved passengers to the port side to counteract the excessive starboard heeling moment caused by the dynamic environmental forces acting on the vessel.
- g. [REDACTED] decided to proceed to the Baltimore Marine Center rather than allow the winds to push him (i.e., "ride out" the gusts as [REDACTED] did), and appears to have attempted to initiate a turn to port.

- h. The *Lady D's* righting energy and range of stability were exceeded, and the vessel capsized as strong gusts and wind-driven waves caught it while turning.
- i. Passengers were limited in their ability to egress the vessel and hurt during capsizing. As a result five passengers died and several were seriously injured.

4. **Capsize.** The *Lady D* capsized when the cumulative effect of all the dynamic forces acting on the vessel created an overturning moment that exceeded the available righting moment. Among these contributing dynamic forces were:

- a. The sudden, severe wind, which heeled the vessel to starboard;⁴⁷
- b. Wind-driven waves, perhaps as much as four feet in height, which would have created sudden, dramatic changes in the vessel's waterplane area and righting energy;
- c. [REDACTED] turn to port, attempting to bring the bow into the wind, which further heeled the vessel to starboard (as a result of normal turning forces);
- d. The sudden shift of passengers to the starboard (low) side from the port (high) side as the vessel heeled severely and neared capsizing;
- e. The 700 pounds of excess passenger weight; and
- f. The dynamic force of the wind on the underside of the vessel as the port pontoon raised out of the water;

The relative contributions of these factors cannot be determined with any degree of confidence. In addition, it is possible that no single factor, by itself, would have been sufficient to capsize the vessel.

5. **Rescue.** Second-order defensive systems intended to rescue passengers once they entered the water, including the U.S. Navy response, performed well and resulted in the rescue of passengers within minutes of the accident.

6. **Deaths and injuries.** Five passengers died, several were severely injured, and many more received minor injuries because there is no effective way to protect passengers against injury and immersion once capsizing occurs. Contributing factors causing this inability to defend passengers included:

- a. The reluctance of [REDACTED] and [REDACTED] to instruct passengers to don life preservers while still inside the *Lady D* resulted in a positive outcome as passengers were able to more easily maneuver and evacuate from the capsized vessel than if they were wearing personal flotation devices (PFD). Buoyant PFDs can make egress difficult and can contribute to passenger entrapment under similar circumstances;
- b. The inadequate time, deck-space, and ability to position passengers outside the vessel cabin with life preservers once the threat posed by the squall line became clear;
- c. The difficulty in constructing vessels with precautions to protect passengers during capsizing, leading to blunt force traumas as passengers rolled inside the capsizing vessel;

⁴⁷ As previously stated, when a vessel meets the intact stability standard, it does not qualify that vessel as safe to operate in a 43 knot wind; instead, it is safe to operate where wind speeds are much less but other dynamic and unpredictable conditions are present.

- d. The construction of the windows and doors on the *Lady D* such that they were difficult to open. Doors and windows were closed and hindered egress after the capsize; and
- e. The relatively cold air and water temperatures, which can cause shock and hypothermia, particularly for passengers with small body sizes.

Based on the inability to control these factors, the U.S. Coast Guard relies upon vessel stability standards, route restrictions and prudent decisions by operators as the only direct means of defending against capsize-related drowning and injury.

7. [REDACTED] **Turn into the Wind.** As previously noted, [REDACTED] unadvisable turn to port, intended to reduce the sail area of the vessel by placing the wind on the bow rather than the port side, was one of the contributing to the vessel's heeling moment which led the *Lady D* to capsize. As previously noted, we do not believe any single factor, including the turn to port, would alone have been sufficient to cause the capsize. We have concluded that several factors led [REDACTED] to attempt the turn, including:

- a. [REDACTED] over generalization of the rule that a vessel should take high winds on the bow to reduce sail area and the threat of capsize;
- b. [REDACTED] limited experience handling a large sail-area vessel in high winds which led to the over generalization error;
- c. The complexity and difficulty in assessing the totality of factors impacting the vessel's residual righting energy (and therefore determine when the vessel was at risk of capsize); and
- d. [REDACTED] timing of this maneuver (the maneuver might have been effective if undertaken before the squall hit, but is dangerous once in the wind).

[REDACTED] aboard another Seaport Taxi, when likewise hit by the squall, decided to leave the wind on his stern, allowing the wind to push him where it wanted, rather than attempt any maneuver which might bring the winds on his beam.

8. **Effect of the *Lady D's* Reduced Ability to Right Itself.** Based on the information available, we have concluded that there was no growth in the *Lady D's* lightship displacement (i.e., in the weight of the vessel itself) due to added structures on the vessel, water incursion into the pontoons, water saturation, or added gear. However, the Coast Guard simplified stability proof test relied upon an outdated, 140 pound-per-person regulatory standard in assessing maximum safe passenger load, despite the increase over time in the average passenger's weight. Due to the additional passenger weight on the day of the casualty, the *Lady D's* draft increased and reserve buoyancy decreased. As a result, the *Lady D's* righting energy was reduced. The Marine Safety Center was unable to determine the extent to which the overall effect of this loading condition may have increased or decreased the probability of capsize. Witness accounts indicate the port pontoon came out of the water even though the passenger load was concentrated along the port side in an effort to prevent it from doing so. This may have permitted the wind to apply a significant force to the large surface area on the underside of the vessel's deck. In this specific scenario, the vessel may have capsized sooner or under less severe conditions on the day of the casualty had it been operating with less passenger weight.

9. Improper Procedures for the *Lady D* Stability Assessment. The Coast Guard did not conduct the pontoon Simplified Stability Test in accordance with the guidance available at the time, but we have concluded that the vessel did meet the minimum stability requirements then in effect for a load of 25 passengers. Accordingly, while the use of improper test procedures is a safety concern discovered by this investigation, it cannot be considered a causative factor. Specifically:

- a. As authorized in regulations (46 CFR 171.030(a) (2)), the Coast Guard did not require or perform a simplified stability proof test on the *Lady D*. One was performed, however, on a sister vessel, the *Fells Point Princess* in 1992, which provided the basis for the *Lady D*'s stability letter, and thus the determination of the maximum number of persons to be carried. The stability test performed on the *Fells Point Princess* was not conducted in accordance with Coast Guard guidance available at the time of the test;
- b. If the simplified stability proof test completed on the *Fells Point Princess* had been done in accordance with Coast Guard guidance available at the time, the *Fells Point Princess*, and therefore the *Lady D*, would have likely passed for the carriage of at least 15 persons;
- c. The USCG performed stability calculations after the casualty and determined that the *Lady D* would likely have met the intact stability requirements in 46 CFR Subchapter S with 25 persons onboard, which she was authorized to carry. The 25 person capacity was based on an assumed regulatory passenger weight of 140 pounds per person for a mixture of men, women, and children, for operation on a protected route; and
- d. The *Lady D* had 700 more pounds in passenger weight onboard at the time of the casualty than assumed in current regulatory calculations and stability test criteria. While reducing the passenger load by 700 pounds would have allowed the vessel to meet the stability requirements in 46 CFR Subchapter T, the vessel's draft would only have been decreased by one inch. Based on the dynamic nature of the capsizing, it is impossible to determine the degree to which a small decrease in draft may have increased the vessel's chance of survival.

10. *Lady D* Route Restrictions. We conclude there is a substantive difference in the route limitations imposed on the smaller Seaport Taxi vessels as compared the larger Seaport Taxi vessels.

11. Factors Affecting Human Performance.

- a. There is no evidence that drugs or alcohol contributed to this casualty.
- b. There is no evidence that fatigue contributed to this casualty.
- c. There is no evidence to suggest that any social or psychological factor interfered with [REDACTED] performance of duties or contributed to his decision to depart the dock at Fort McHenry or to turn into the wind.

12. Evidence of Potential Violation of Federal Law or Regulation. There is evidence to suggest that the following laws or regulations may have been violated:

a. **Route limitations on the Certificate of Inspection on the *Lady D*.** By operating the *Lady D* on the route to Fort McHenry, ██████████ may have committed an act of misconduct. There is further evidence to suggest that Seaport Taxi management may have violated the regulations governing the operation of inspected passenger vessels by assigning the *Lady D* this route.

b. **Decision to Depart the Dock and Decision to Continue the Voyage.** There is evidence to suggest that ██████████ may have been negligent in his assessment of the *Lady D*'s ability to operate in severe weather conditions, and therefore in his decision to depart the dock in the face of an approaching squall and to continue the voyage even though he had to back into the wind in order to maintain control of the vessel. Several mitigating factors also exist, including ██████████ lack of experience, restricted license, the weather forecast products, and the implicit Seaport Taxi process which inserted Senior Captains into the "go/no-go" decision process. We have informed ██████████ of the key findings of this report.

Because ██████████ has permanently relinquished all right to obtain or renew merchant mariner credentials, there is no need to refer this evidence of possible violations for appropriate remedial enforcement action.

4.0 Recommendations

4.1 To the Commandant of the Coast Guard

1. To address the unsafe condition of issuing licenses to mariners without adequate documentation of critical skills (Section 3.0, Conclusion 2.b.), the Commandant, U.S. Coast Guard, should consider the advisability of adopting a system to better verify experience and skills in merchant marine license applications where the international Standards for Training, Certification and Watchkeeping (STCW) convention does not currently apply. Such system should be directed toward verifying various key competencies, consistent with the intent of STCW, including assessing weather conditions and dynamic environmental factors on small craft.

2. To address the unsafe condition of licensed mariners with limited skill and experience operating in foul weather (Section 3.0, Conclusion 2.c.), The Commandant, U.S. Coast Guard, should consider the advisability of eliminating the regulatory allowance for self-documenting sea time (46 CFR 10.211(a)) on vessels under 200 Gross Tons.

3. To address the unsafe condition that passenger weights may have exceeded the safety margin and thereby reduced passenger vessel righting energy (Section 3.0, Conclusion 9.a.), the Commandant, U.S. Coast Guard, should study the existing assumed passenger weights used throughout regulatory stability criteria and revise standards to a level commensurate with the average weight of persons in today's society.

4. To address the unsafe condition of enclosed canopies impeding egress (Section 3.0, Conclusions 6.a. and 6.d.), the Commandant, U.S. Coast Guard, should consider providing guidance for the use of enclosed canopies on all lightweight pontoon passenger vessels that will allow passengers to quickly egress in the event that a capsizing occurs. Canopy supports should be positioned to allow a majority of passenger's unobstructed egress. Side windows or curtains, if installed, should be able to be opened with minimal force by one person.

5. To address the potentially unsafe condition that mariners may not have the means to receive time-sensitive weather information (Section 3.0, Conclusion 1.c. and 2.a.), the Commandant, U.S. Coast Guard, should study whether all passenger vessels that do not carry a VHF radio onboard should be required to carry a NOAA weather radio or other continuous marine weather communication device to receive weather warnings and alerts. Currently vessels that do not travel more than 1000 feet from shore are not required to have a VHF radio.

6. To address the unsafe condition that stability may be mistakenly deemed adequate based on sister vessel status (Section 3.0, Conclusion 9.a.), the Commandant, U.S. Coast Guard, should consider revising 46 CFR 178.320(c). Specifically, we recommend that sister-vessel status be granted only after a deadweight survey provides verifying evidence that the vessels share common characteristics. Where a deadweight survey cannot be completed, all passenger vessels certificated to carry less than 49 passengers, regardless of type, construction, or route, should be required to have a stability test. The simplified stability test, a more conservative test than a full

stability incline test, is a low cost method for verifying that a vessel is fit for service on its intended route. Requiring all passenger vessels certificated to carry less than 49 passengers regardless of type, construction, or route would serve as an additional enhancement to ensure safety.

7. To address the unsafe condition wherein operators do not understand the limits against which their vessels' stability has been evaluated (Section 3.0, Conclusion 1.d.), the Commandant, U.S. Coast Guard, should consider the need to provide explicit guidance on assessing dynamic environmental conditions to the operators of small passenger vessels, and at a minimum should consider whether the phrase "reasonable operating conditions" on Certificates of Inspection can be replaced with the projected operating environmental conditions used for assessing adequate stability.

8. To address the unsafe condition that critical weather information may not be relayed to mariners in a timely fashion (Section 3.0, Conclusion 1.c. and 2.h.), the Commandant of the U.S. Coast Guard should forward copy of this report to the National Weather Service for use in improving the accuracy and advanced notice of warnings of severe marine weather conditions.

9. To address the unsafe condition in water taxi management contributing to the causes of this accident, (Section 3.0, Conclusions 1, 2, 3, 6, and 12), the Commandant of the U.S. Coast Guard should consider forwarding a copy of this report to the Passenger Vessel Association and appropriate U.S. Coast Guard advisory committees for consideration and action by similar watertaxi operations outside the Sector Baltimore Area of Responsibility. We particularly direct the attention of water taxi operators to:

- a. The need to evaluate the specific boathandling skills of licensed personnel given the proof-of-skill issues identified in this report;
- b. The need to provide unambiguous policy regarding dynamic stability and the master's responsibility to assess all factors potentially affecting the safety of each distinct transit/voyage; and
- c. The need for passenger accountability practices as outlined in the report and later implemented by Seaport Taxi, Inc.

4.2 To the Commander, U.S. Coast Guard Sector Baltimore

10. To address the unsafe condition wherein operators do not understand the maximum operating environment against which their vessels' stability has been evaluated (Section 3.0, conclusion 1.d.), the Commander, Coast Guard Sector Baltimore should, pending recommendation number eight above, remind small passenger vessel operators in the Baltimore Area of Responsibility of the importance of assessing dynamic environmental factors and their impact on the stability of vessels.