UNITED STATES COAST GUARD

INVESTIGATION INTO THE CIRCUMSTANCES
SURROUNDING THE SINKING OF THE

M/V MISS MAJESTIC

ON LAKE HAMILTON, HOT SPRINGS, ARKANSAS ON
MAY 1, 1999 WITH MULTIPLE LOSS OF LIFE

U.S. Department of Transportation
United States Coast Guard

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SINKING OF THE M/V MISS MAJESTIC, OFFICIAL NUMBER CG002009, ON LAKE HAMILTON, HOT SPRINGS, ARKANSAS, ON MAY 1, 1999, WITH MULTIPLE LOSS OF LIFE

ACTION BY THE COMMANDANT

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

CAUSE OF THE CASUALTY

I concur that the cause of the sinking of the MISS MAJESTIC was flooding through the aft drive shaft housing after the boot seal had dislodged from the shaft housing. Contributing factors were: the removal of the aft shaft housing hinge assembly; the inoperability of the Higgins bilge pump; the absence of a bilge high level alarm; the lack of operational testing of recent repairs to the aft shaft boot seal; the lack of adequate written maintenance manuals or procedures; the ineffective oversight of the vessel's operation by the management of Land & Lakes Tours, Inc.; the vessel operator's failure to recognize the flooding in a timely manner; the poor communications between the vessel mechanic and the Coast Guard inspector; and, the lack of comprehension regarding the Coast Guard inspection program by Land & Lakes Tours, Inc.

COMMENTS ON CONCLUSIONS

Conclusion 2.b: Ms. Helmbrecht did not notice the discharge from the forward electric bilge pump due to the position of its discharge point being hidden from her view and her focus on being a tour guide. She could not have noticed any discharge from the aft electric bilge pumps due to the locations of their discharge points at the stern. She would have noticed any substantial discharge from the Higgins bilge pump discharge point. The presence of a crew member not engaged as a tour guide would likely have led to earlier recognition of the unintentional flooding and resulted in fewer lives being lost.

Comment: I concur with this conclusion. However, early detection of flooding on this vessel is better served by the installation of a bilge high level alarm already required by regulation.

Conclusion 2.c: The Higgins bilge pump did not work because of the missing key from the shaft keyway. The cause of the key being missing can not be determined. It likely sheared or fell out upon the pump ingesting a solid object that broke an impeller vane. An object could have been ingested through the missing section of the strainer screen. This may have happened during the short operation of the Higgins bilge pump on April 29, 1999, or soon after flooding started on May 1, 1999. The assorted damages to the Higgins pump and its attachments indicate it suffered a dramatic shock. If it was operational, the Higgins bilge pump would likely have been able to keep up with flooding, or at least allowed time to beach the MISS MAJESTIC. When the Higgins bilge pump would have begun to discharge, the increase in draft would have been only a couple of inches. The water in the bilge would not have reduced vessel maneuverability appreciably, as it did not a few days before when the pump briefly discharged.

Comment: I concur that the missing key from the shaft keyway contributed to the operational failure of the Higgins bilge pump. Additionally, the pump discharge piping was not connected and secured properly, which would have caused the pump to recirculate water in the bilge rather than pump it overboard. The precise day and time when the pump ceased to function properly cannot be determined from the available evidence.

Conclusion 2.d: The bilge high level alarms were not installed before the casualty. Land & Lake Tours failed to understand the recent regulation and failed to install the alarms before the due date and before the casualty. Contributing to this failure was ineffective communications between CWO3 [redacted] and Mr [redacted] CWO3 [redacted] believed Mr [redacted] had the necessary components to install the alarms, was aware of the March 11, 1999, regulatory deadline and was on track to have the bilge high level alarms installed prior to the deadline; this was not the case. Mr. [redacted] did not realize there was a due date in the regulations and delayed installing the components to avoid the possibility of having to remove items that he believed were not yet found acceptable by CWO3 [redacted] as he recently had to do with vapor detectors. CWO3 [redacted] use of an informal worklist rather than clear CG-835s aggravated the ineffectiveness of communications. A CG-835 would have indicated a higher level of importance and may have included the due date. If bilge high level alarms had been installed and functional, Ms. Helmbrecht would have known of the flooding in time to either beach the vessel or evacuate the passengers. Although the height of bilge high level alarms is not specified by regulation, an alarm would have been installed to sound soon after the Higgins bilge pump would start to discharge, if not sooner. If installed and operational, the alarm would have sounded less than 2 minutes after the vessel entered the water, well before the maneuverability was reduced and freeboard lost.

Comment: I partially concur with this conclusion. Considering the problems with the timely installation of approved vapor detectors which were listed on the CG-835, it is uncertain that including the high bilge level alarm on the CG-835 would have resulted in a more timely installation.

Conclusion 2.e**:** Had the MISS MAJESTIC been fitted with watertight compartmentation or flotation materials, the vessel would have not sunk or sank so slowly that passengers would have had ample time to escape the vessel.

Comment: I concur with this conclusion although, for clarification, it should read as follows: "Had the MISS MAJESTIC been fitted with watertight compartmentation or flotation materials, the vessel would not have sunk or would have sunk so slowly that passengers would have had ample time to escape the vessel."

Conclusion 2.f: Had the windshield and forward vinyl windows been open, most or all of the passengers would have escaped as the vessel sank. External button snaps could not be quickly undone from behind the windshield. The snaps are of a style that often require a concerted effort to release, even from the button side.

Comment: I partially concur with this conclusion, although it assumes physical agility and the absence of panic on the part of the passengers in an emergency situation. I agree that the windshield and forward vinyl window prevented individuals from floating freely up and out of the sinking vessel. However, even if the windshield and canopy were open, there still would have been a bottleneck of individuals trying to escape the vessel. Had the passengers and operator safely abandoned the vessel before it sank, it is likely that more passengers would have survived.

Conclusion 3.b: The donning of life preservers would have prevented escape from under the canopy and resulted in more deaths.

Comment: I partially concur with this conclusion. Had the passengers and operator donned the life preservers and safely abandoned the vessel before it sank, it is likely that more passengers would have survived. However, once the vessel operator recognized the dangerous situation and made the decision to abandon the vessel, donning life preservers would have severely hindered the passengers' ability to maneuver and safely evacuate the vessel. As the vessel sank quickly, the flotation devices would have caused individuals wearing them to float toward the surface, thus entrapping them in the canopy structure. Any person attempting to swim underwater within the vessel would have been severely hampered in their ability to maneuver due to the buoyancy of the life preserver. Nevertheless, once an individual was clear of the vessel structure, a flotation device or life preserver would have aided them in their survival, especially if they were non-swimmers or were incapacitated.

Conclusion 3.c: DUKWs have features which make them inherently less safe than conventional commercial small passenger vessels. These include:

(1) heavy metal chassis and heavy wheel drive systems, with minimal buoyancy
(2) multiple external appendages with moving parts that are part of the watertight envelope
(3) use of a single band clamp on the smooth sealing surface of shaft housings

(4) equivalent of large through hull fittings with no sea valve (the shaft housing penetrations). The shaft housing and boot seal arrangement on DUKWs does not provide an equivalent level of safety to the through hull fitting and shutoff valve requirements in 46 CFR 182.720(d)(3).
(5) thin hull plating, susceptible to quicker holing through wastage and harder to repair
(6) manufactured parts not readily available, largely due to 54 years of no DUKW production

Comment: I concur with this conclusion with the exception of number four (4). 46 CFR 182.720(d)(3) specifically refers to piping penetrations in the hull, such as intakes or discharges. The shaft housing, which is neither an intake nor discharge, should be compared to a shaft or rudder post penetration and therefore does not fall under this regulation.

Conclusion 3.g: By relying on the Coast Guard inspector to provide all guidance necessary for compliance, Land & Lake Tours demonstrated a general lack of responsibility to comply with 46 CFR Subchapter T. The Coast Guard's vessel inspection user fee, and the Coast Guard's partnership approach to vessel safety regulatory compliance, contributed to the over-reliance on the Coast Guard. The following matters were noted during the course of this investigation. These matters have been forwarded to the Commander, Eighth Coast Guard District for further investigation.

(1) There is evidence of violation of 46 CFR 177.500, providing two means of escape from the passenger compartment for rapid evacuation in an emergency, on the part of Land & Lake Tours.

(2) There is evidence of violation of 46 CFR 180.70, the requirement for stowing the ring life buoy such that it is readily available, can be rapidly cast loose, and is fitted with a lifeline, on the part of Land & Lake Tours.

(3) There is evidence of violation of 46 CFR 182.530, the requirement for installing bilge high level alarms by March 11, 1999, on the part of Land & Lake Tours.

(4) There is evidence of violation of 46 CFR 185.400, quarterly training of crewmembers as to their duties in an emergency and the logging of such training, on the part of Land & Lake Tours.

(5) There is evidence of violation of 46 CFR 185.504, the requirement to keep a written count of all passengers and communicate that number to the owner for availability at the vessel's normal berthing location, on the part of Elizabeth Frances Helmbrecht and Land & Lake Tours.

(6) There is evidence of violation of 46 CFR 185.506(b), the requirement to provide a passenger orientation which includes procedures for donning life preservers and emergency evacuation procedures, on the part of Elizabeth Frances Helmbrecht and Land & Lake Tours.

(7) There is evidence of violation of 46 CFR 185.510, the requirement to post or have available emergency instructions to address fire, heavy weather, and man overboard conditions, on the part of Land & Lake Tours.

(8) There is evidence of violation of 46 CFR 185.520, the requirement to conduct and log abandon ship and man overboard drills and training, on the part of Land & Lake Tours.

(9) There is evidence of violation of 46 CFR 176.700, the requirement to obtain the approval of the cognizant OCMI for repairs and alterations which affect the safety of the vessel, such as hull repairs and removal of the aft shaft housing hinge assembly, on the part of Land & Lake Tours.

Comment: I partially concur with the introductory paragraph of this conclusion. The management of Land & Lakes Tours, Inc. was apparently unaware of their responsibilities under 46 CFR Subchapter T regarding the maintenance and operation of their vessels. They apparently relied solely on the Coast Guard inspector to ensure their vessels were safe and failed to recognize their safety responsibilities. However, I do not concur that the Coast Guard's vessel inspection user fee, and the Coast Guard's partnership approach to vessel safety regulatory compliance, contributed to the over-reliance on the Coast Guard by Land & Lakes Tours, Inc. The operator neglected to recognize his responsibilities under 46 CFR Subchapter T.

Conclusion 3.h: The Coast Guard has no national inspection, maintenance and operation standards for DUKW passenger vessels, to attain an equivalent level of safety afforded to conventional vessels through the regulations in 46 CFR Subchapter T. CWO3 [redacted] did not notice the missing hinge assembly for the aft shaft housing partly due a lack of awareness of the importance of DUKW components.

Comment: I partially concur with this conclusion. While I concur that the Coast Guard currently has no national inspection, maintenance and operation standards for DUKWs, it should not be inferred that DUKWs are not inspected to the same level of safety as conventional vessels. There are many unique vessel types that are certificated, and not every one of them has a national inspection policy that addresses its uniqueness. Subchapter T is written so that many unique vessel types can be accommodated under its domain. It is the responsibility of the local Officer in Charge, Marine Inspection (OCMI) to ensure that the vessels he or she certificates are safe. If a situation is uncovered which the OCMI cannot address, he or she can request guidance from a higher authority.

Conclusion 3.i: The inspection files for MISS MAJESTIC are highly misleading, to inspection and investigation persons using them, because deficiencies found were not included in the files or in MSIS. MSO Memphis did not record deficiencies and apply MSDS as intended. A more formal tracking of deficiencies found would likely have led to installation of the bilge high level alarm before May 1, 1999. Formal tracking of deficiencies would have allowed management at the MSO to recognize the alarms were not being installed on time, rather than believing they were.

Comment: I partially concur with this conclusion. Title 46 USC 3313 (b)(1) authorizes a written order to correct a noted deficiency, however at the time of the inspection the alarms were not required by regulation, so no deficiency existed. Based on the owner's actions, the Coast Guard inspector believed that proper action was being taken. If during a subsequent inspection, it appeared that the alarms would not have been installed by March 11, 1999, the issuance of a short term CG-835 would have been appropriate. However, as indicated in my comment regarding conclusion 2d, it is uncertain that including the high bilge level alarm on the CG-835 would have resulted in a more timely installation.

ACTION ON RECOMMENDATIONS

Recommendation 1: It is recommended that the Commandant of the Coast Guard clarify the responsibility of owners for regulatory compliance of their vessels with respect to the vessel inspection user fee, particularly for small passenger vessel owners.

Action: I do not concur with this recommendation. In this case, the vessel owner failed to clearly understand his responsibility for complying with all applicable regulations and for ensuring the safety of his vessels and the passengers they carried. However, the purpose of vessel inspection user fees has been adequately described in the Federal Register (60 FR 13563, March 13, 1995) where it is stated that user fees are collected to offset existing costs and not to heighten services. As stated in the Federal Register, "Fees in this rule are based on existing vessel inspection program requirements and services. The fees are established for the purpose of recovering costs associated with providing Coast Guard vessel inspection services." Wide public distribution of this report will serve to reinforce with vessel owners that payment of a user fee does not have any bearing on compliance with safety regulations.

Recommendation 2: It is recommended that the Commandant of the Coast Guard ensure that every owner of certificated DUKW passenger vessels has a copy of the War Department's Technical Manual.

Recommendation 3: It is recommended that the Commandant of the Coast Guard ensure that every OCMI certificating DUKW passenger vessels has a copy of the War Department's Technical Manual.

Action on recommendations 2 and 3: I concur with these recommendations. Title 46, Code of Federal Regulations, Subchapter T, Subpart B lists the plans and information required to be submitted by an owner for vessel certification. The War Department's Technical Manual could be substituted for some of the required plans, but due to the modification of many aspects of present-day DUKW vessels, the manual is not always applicable. However, because I consider the War Department's Technical Manual to be a valuable resource for the owners of these vessels and for Coast Guard vessel inspection personnel, all known DUKW vessel owners shall be notified on how they can obtain a copy of the manual and each Coast Guard Officer-in-Charge, Marine Inspection (OCMI) shall be provided a copy of the manual.

Recommendation 4: It is recommended that the Commandant of the Coast Guard encourage or require crews to be present at annual inspections of small passenger vessels.

Action: I concur with this recommendation. The authority for action in accordance with this recommendation is already provided by 46 CFR 176.808(g) and 46 CFR 176.810(d). The Coast Guard will consider this recommendation further under recommendation 7.

Recommendation 5: It is recommended that the Commandant of the Coast Guard encourage or require in-water testing of vessel integrity after repairs to the watertight hull and its appendages, especially for DUKWs and other vessels which do not normally reside in the water.

Action: I partially concur with this recommendation. All repairs conducted in drydock should be tested in drydock and then re-examined after the vessel is afloat. However, repairs to an amphibious craft's watertight hull or appendages that cannot be adequately tested out of the water should be tested in water. The Coast Guard will consider this recommendation further under recommendation 7.

Recommendation 6: It is recommended that the Commandant of the Coast Guard encourage or require the testing of bilge pumps with water at every Coast Guard triennial inspection and annual reinspection.

Action: I concur with this recommendation. No further action is required; the authority for action in accordance with this recommendation is already provided by 46 CFR 176.804(h).

Recommendation 7: It is recommended that the Commandant of the Coast Guard establish a working group of industry experts and DUKW operating companies to develop a compilation of best practices with DUKWs, with emphasis on drive trains and hull integrity. The compilation of best practices should be made readily available to the public.

Recommendation 8: It is recommended that the Commandant of the Coast Guard publish policy on DUKWs to allow OCMIs to reassess vessel survivability in the face of risk of flooding from drive train breaches and obtain an equivalent level of safety to that is intended in 46 CFR Subchapter T. The policy should be made readily available to the public, including state agencies that regulate DUKWs operating as passenger vessels on state waters.

Recommendation 9: It is recommended that the Commandant of the Coast Guard publish policy on inspecting unique features of DUKWs, with emphasis on shaft housings and boot seals. The policy should be made readily available to the public, including state agencies that regulate DUKWs operating as passenger vessels on state waters.

Recommendation 10: It is recommended that the Commandant of the 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.

Recommendation 13: It is recommended that the Commandant of the Coast Guard encourage OCMIs to re-evaluate the need for requiring more than one person in the crew of inspected vessels where a member of the crew is engaged in service as a tour guide. This is especially true on vessels where the operating station is forward of the passengers.

Action on recommendations 7 through 10 and 13: I concur with these recommendations insofar as they relate to DUKW vessels. Commandant (G-MOC) shall convene a group of industry and government experts, including DUKW owners and operators and appropriate Coast Guard personnel, to develop comprehensive guidelines relating to the design, maintenance, operation, and inspection of DUKW vessels. When completed, the guidelines will be distributed to all known DUKW owners and operators, to all known state agencies involved with DUKW oversight, and to all appropriate Coast Guard units. In addition, the guidelines will be available on the Coast Guard's Internet site.

Recommendation 11: It is recommended that the Commandant of the Coast Guard re-emphasize the need for MSOs to have complete inspection files, including worklists and a MSIS Marine Safety Deficiency Summary containing all deficiencies found.

Action: I concur with is recommendation. While sufficient policy guidance has been published in the U.S. Coast Guard Marine Safety Manual, Volume II, Chapter 3, all OCMIs will receive a copy of this report as addressed in recommendation 15.

Recommendation 12: It is recommended that the Commandant of the Coast Guard consider engaging the Quality Assurance Staff, G-MO-1, to evaluate consistency among MSOs in DUKW inspection and provide training when needed.

Action: I concur with this recommendation. Commandant (G-MO-1) will participate in the development of the guidance described above and will evaluate the consistency of its application by Coast Guard vessel inspectors when appropriate.

Recommendation 14: It is recommended that a copy of this report be provided to all states with state regulated DUKWs used in commercial passenger service and all state boating law administrators.

Recommendation 15: It is recommended that each OCMI be provided with a copy of this report.

Recommendation 16: It is recommended that the National Transportation Safety Board be provided a copy of this report.

Action on recommendations 14 through 16: I concur with these recommendations. Commandant(G-MOA) will provide copies of this report as recommended.

Recommendation 17: It is recommended that this casualty investigation be closed.

Action: I concur with this recommendation. This investigation is closed.

JAMES M. LOY
Admiral, U.S. Coast Guard
Commandant

U.S. Department of Transportation
United States Coast Guard

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United States Coast Guard
Marine Safety Office

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16732
September 29, 1999

From: Marine Board of Investigation
To: Commandant (G-MOA)

Subj: SINKING OF THE M/V MISS MAJESTIC ON LAKE HAMILTON, HOT SPRINGS, ARKANSAS ON MAY 1, 1999 WITH MULTIPLE LOSS OF LIFE

Summary:

On May 1, 1999, at about 1158 local time, the Coast Guard inspected small passenger vessel M/V MISS MAJESTIC rapidly sank in 60 feet of water about 250 yards west of St. John's Island in Lake Hamilton, near Hot Springs, Arkansas. Flooding of the vessel was not known to those on board before downflooding over the stern was imminent. The vessel sank in less than 30 seconds after the master recognized the vessel was in distress. The vessel's master and seven of the twenty passengers escaped from the vessel after it sank and made it to the surface alive. Thirteen of the twenty passengers were found drowned in or near the vessel as it rested on the bottom. The vessel was salvaged, having sustained only minor damage from the sinking.

Vessel Data:

Name:	MISS MAJESTIC
O.N.:	CG002009
Arkansas State Registration:	AR 3428 GA
Service:	Passenger (46 CFR Subchapter T)
Gross Tons:	less than 5
Net Tons:	less than 5
Length:	31 feet
Breadth:	8 feet
Depth:	4 feet
Propulsion:	Gasoline engine
Horsepower:	140
Owner/operator:	Land & Lakes Tours, Inc. 410 Central Ave. Hot Springs, AR 71901
Master:	Elizabeth Frances Helmbrecht [redacted]
Master License:	Master, DUKW vessels, [redacted] Not more than 250 yards offshore.

SINKING OF THE M/V MISS MAJESTIC ON LAKE HAMILTON, HOT SPRINGS, ARKANSAS ON MAY 1, 1999 WITH MULTIPLE LOSS OF LIFE

Deceased (all passengers)	**Age**	**Home Address**	**Next of Kin**
James Leon Patton	[redacted]	[redacted]	[redacted] Son
Floye Christine Patton	[redacted]	[redacted]	[redacted] Son
Jennifer Diane Patton	[redacted]	[redacted]	[redacted] Brother
Ronald Gene Todd	[redacted]	[redacted]	[redacted] Wife
Thomas Cornelius Todd	[redacted]	[redacted]	[redacted] Mother
Emily Anne Todd	[redacted]	[redacted]	[redacted] Mother
Andrea Marie Beasley	[redacted]	[redacted]	[redacted] Husband
Logan Reed Beasley	[redacted]	[redacted]	[redacted] Father
Melanie Lynn McGuirk	[redacted]	[redacted]	[redacted] Husband
Danna Lynne Morse-Powers	[redacted]	[redacted]	[redacted] Husband
Mary Elaine McGee	[redacted]	[redacted]	[redacted] Brother
Vernon Lee Johnson	[redacted]	[redacted]	[redacted] Sister
Lana Jo Berry	[redacted]	[redacted]	[redacted] Husband

SINKING OF THE M/V MISS MAJESTIC ON LAKE HAMILTON, HOT SPRINGS, ARKANSAS ON MAY 1, 1999 WITH MULTIPLE LOSS OF LIFE

Surviving Passengers and Crew:

[redacted]

Parties in Interest: **Counsel**:

Land and Lakes Tours, Inc; [redacted] President [redacted]

[redacted] (vessel operator) [redacted]

[redacted] (mechanic) [redacted]

[redacted] (mechanic) [redacted]

[redacted]

Survivors of deceased not designated parties in interest:

[redacted] (survived [redacted]

Estate of [redacted]

SINKING OF THE M/V MISS MAJESTIC ON LAKE HAMILTON, HOT SPRINGS, ARKANSAS ON MAY 1, 1999 WITH MULTIPLE LOSS OF LIFE

Findings of Fact:

1. MISS MAJESTIC was built in 1944 as an amphibious truck (DUKW) for the government of the United States.

2. The War Department Technical Manual for DUKWs was published on February 23, 1945, and is 534 pages in length. The figures below are from the Manual and depict important aspects of the design.

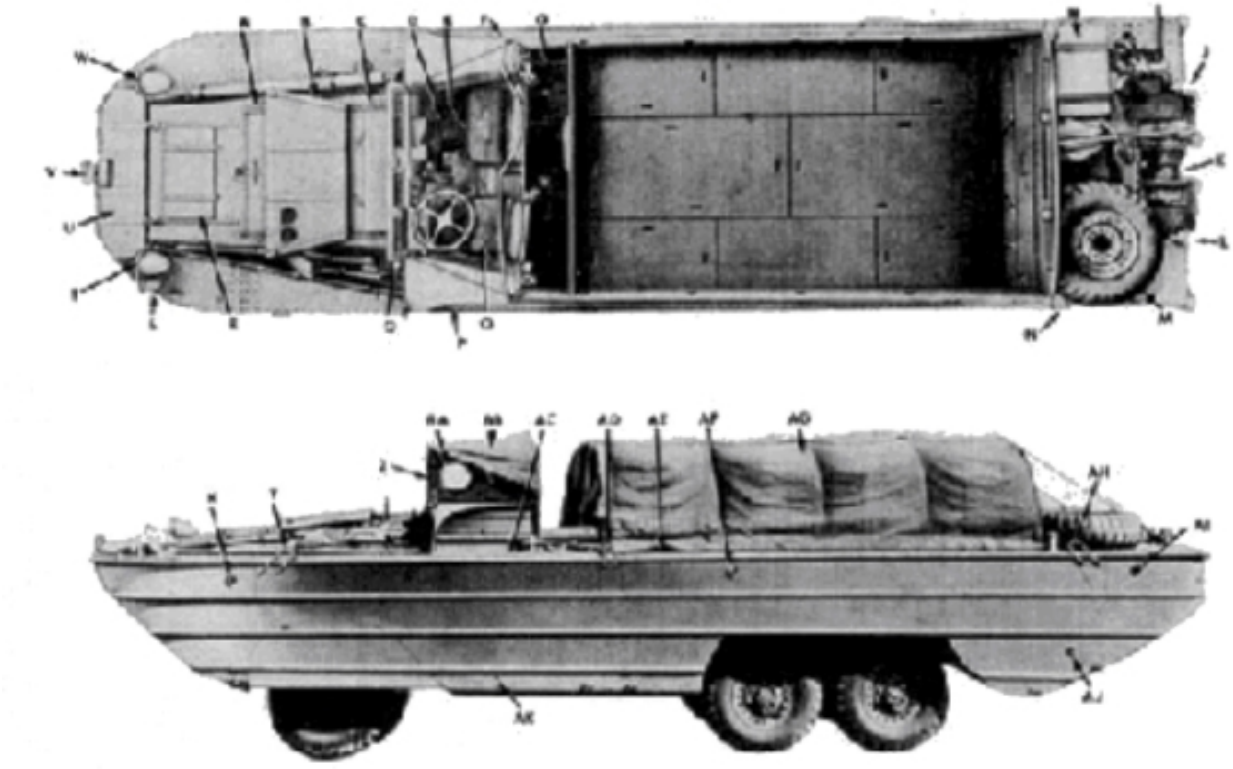
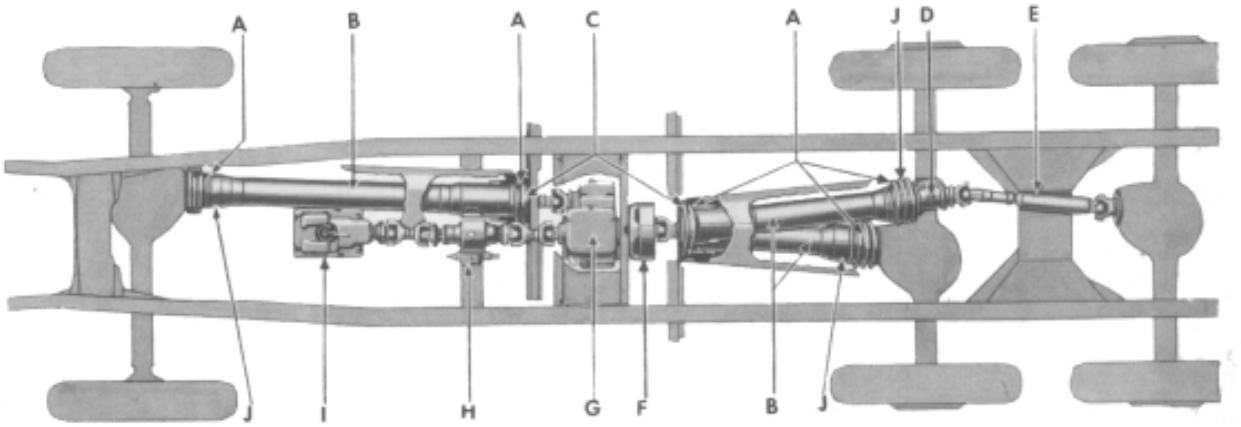


Figure 1: Shows the as-built arrangement and profile. Design clearances above ground were 18 inches to the molded hull and 12 inches to the axles. Design loaded freeboards were 24 inches forward and 16 inches aft. The vessel was fitted with three drive axles, one forward and two aft.

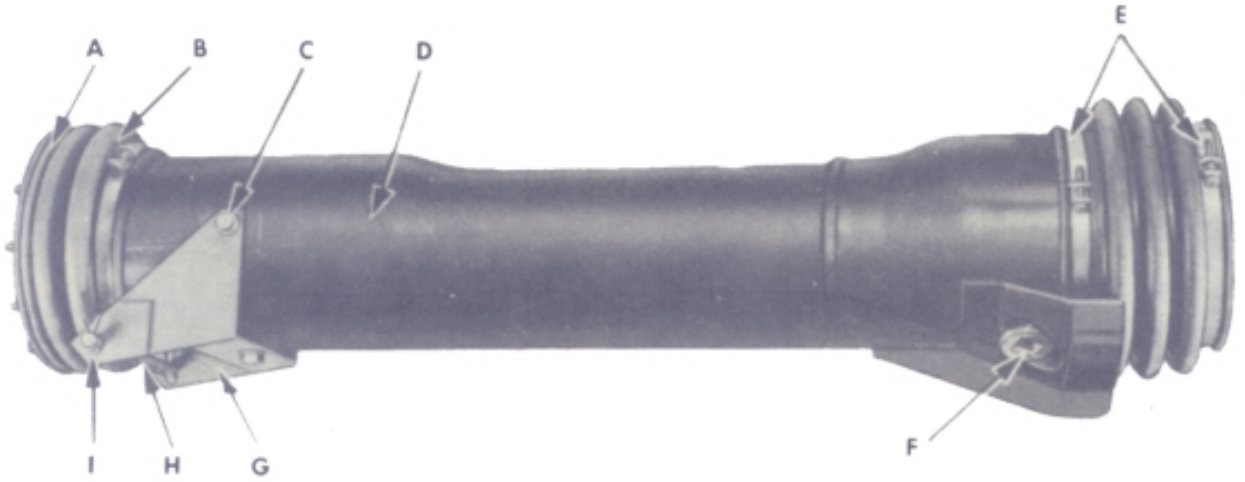
SINKING OF THE M/V MISS MAJESTIC ON LAKE HAMILTON, HOT SPRINGS, ARKANSAS ON MAY 1, 1999 WITH MULTIPLE LOSS OF LIFE



A PROPELLER SHAFT HOUSING SEAL
B PROPELLER SHAFT HOUSING
C HULL BULK HEADS
D PILLOW BLOCK
E PROPELLER SHAFT ASSEMBLY
F HAND BRAKE
G MAIN TRANSFER CASE
H WATER PROPELLER TRANSFER CASE
I TRANSMISSION
J HOUSING DRAIN PLUGS

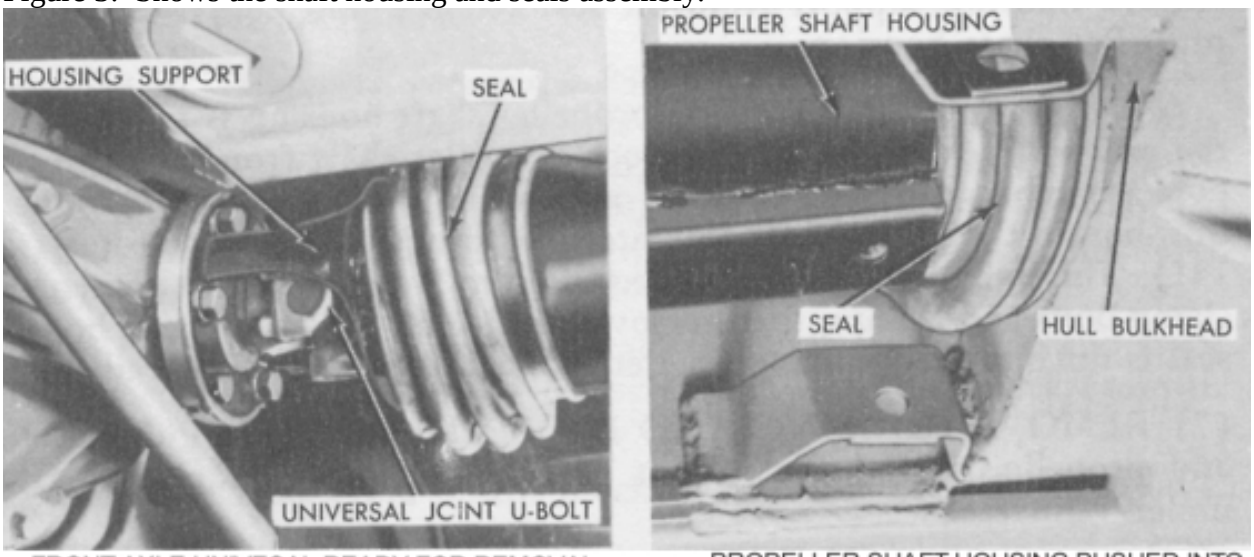
Figure 2: Shows the chassis and drive trains. There were three each 3 inch diameter drain plugs in the molded hull, which also gave access to the engine crankcase, the transmission case, and the transfer case. Each drive shaft was surrounded by a shaft housing, attached to the molded hull and the axle differentials with thin-wall rubber (boot) seals, using a single metal band clamp to secure each boot seal to the shaft housings.

SINKING OF THE M/V MISS MAJESTIC ON LAKE HAMILTON, HOT SPRINGS, ARKANSAS ON MAY 1, 1999 WITH MULTIPLE LOSS OF LIFE



A SEAL RETAINING RING
B HOUSING SEAL
HOUSING TO BULKHEAD (G501-0-3-82800)
HOUSING TO PILLOW BLOCK (G501-03-82802)
HOUSING TO FRONT AXLE AND INTERMEDIATE AXLE(G501-03-82801)
C HINGE CAP SCREW AND LOCK WASHER
D PROPELLER SHAFT HOUSING
E SEAL CLAMP RINGS
F DRAIN PLUG
G HINGE ASSEMBLY
H HINGE PIN
I COTTER PIN

Figure 3: Shows the shaft housing and seals assembly.



FRONT AXLE UNIVESAL READY FOR REMOVAL

PROPELLER SHAFT HOUSING PUSHED INTO BULKHEAD

Figure 4a: Shows the housing support at the differential, now informally called a torque tube saddle or a bird cage. Figure 4b: Shows the hull mounts for the shaft housing hinge assembly, near the end of the shaft housing

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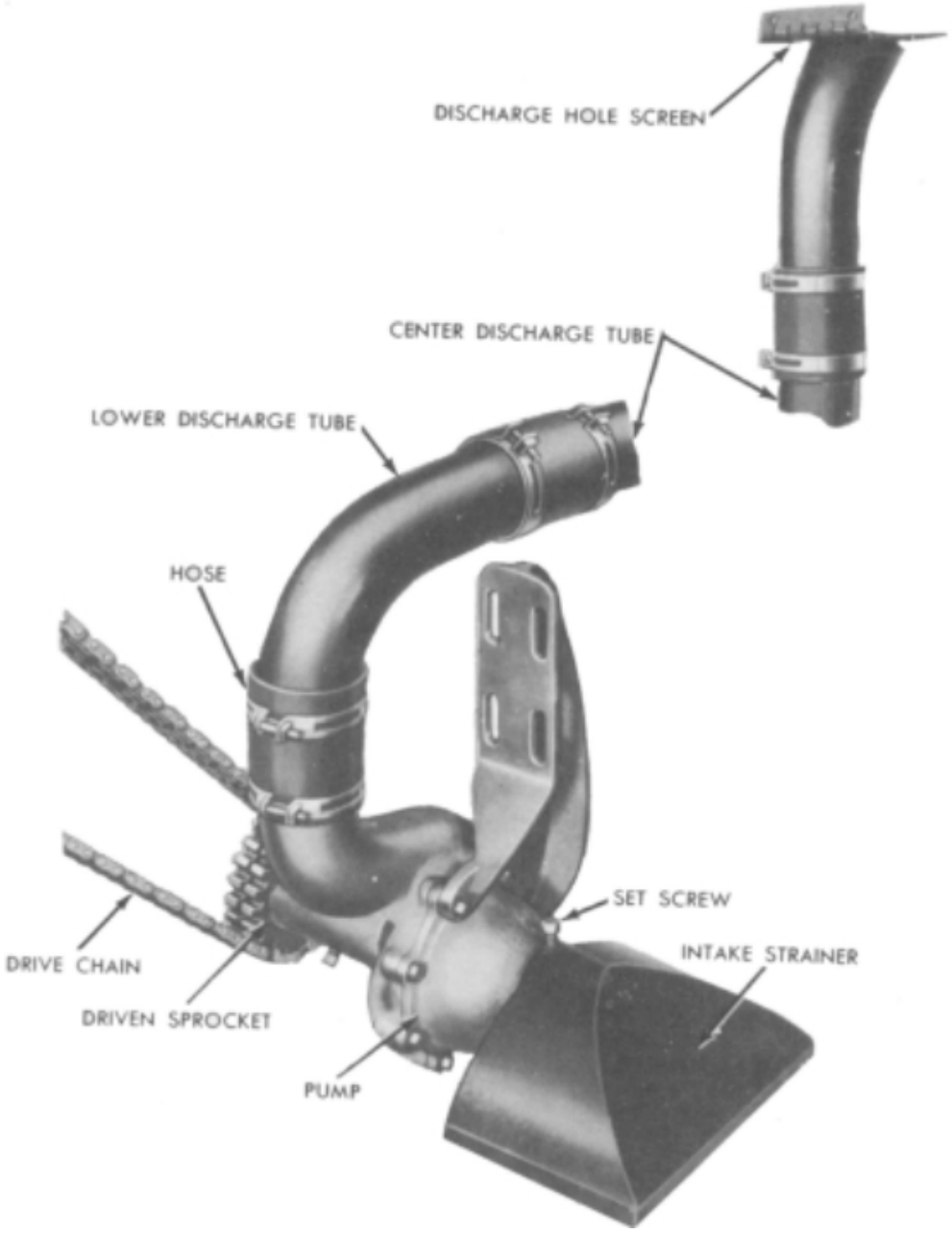

Figure 5: Shows the Higgins bilge pump and its attachments. A Higgins bilge pump was located amidship, port of centerline, and was chain driven (automatic, no operator controls) from the propeller shaft. Bilge piping was originally installed to service three compartments and piped to a bilge pump near the engine.

3. The MISS MAJESTIC had the following fundamental modifications for passenger service. These modifications are typical for DUKWs used in passenger service, although details vary.

a. Installation of 8 rows of school bus type seating, outboard of a centerline aisle for access.

b. Installation of a hinge mounted ladder on centerline at the stern, for boarding the vessel.

c. Raising and lengthening the canopy, making it high enough to allow persons to stand.

d. Installation of roll-up vinyl windows, to provide shelter from the weather.

e. Removal of the forward bilge pump and disabling of original bilge piping.

f. Installation of 3 electric bilge pumps, all operated with a single switch:

1100 gph pump to port of the Higgins bilge pump, discharging near the driver seat.
750 gph pump aft of the port rear wheel well, discharging next to the boarding ladder.
750 gph pump aft of starboard rear wheel well, discharging next to boarding ladder.

g. Removal of the drive train serving the after rear axle, including the differential.

h. Engine changed to V8 and transmission changed to automatic.

Figure 6: MISS MAJESTIC on May 9, 1999

SINKING OF THE M/V MISS MAJESTIC ON LAKE HAMILTON, HOT SPRINGS, ARKANSAS ON MAY 1, 1999 WITH MULTIPLE LOSS OF LIFE

4. In early May 1999, there were about 63 DUKWs across the nation with Coast Guard certificates of inspection for passenger service. They were certificated by seven coastal MSOs and five inland MSOs. The allowed route was typically Rivers or Lakes, Bays and Sounds. Of the ten certificated by MSO Memphis, all operating in Hot Springs, six were owned/operated by Land & Lake Tours and four by National Park Duck Tours. Numerous other DUKWs operate in passenger service, beyond Coast Guard jurisdiction. As an example, there are about 40 Wisconsin Dell Ducks.

5. In early May 1999, a review of the Coast Guard's marine casualty data for the period 1992 to 1998 revealed only twelve reported casualty cases. Most of the cases involved collisions, allisions, steering failures, engine shutdowns and/or pollution. The three unintentional flooding cases involved a fracture caused by impact with the ground upon launching, a broken leaf spring penetrating the hull, and damage caused by an oscillating propeller shaft. No evidence was found to indicate any substantial casualty record for Coast Guard inspected DUKW small passenger vessels, specifically no deaths or sinkings.

6. The owner of the MISS MAJESTIC, Mr. [redacted], first started to operate DUKWs in passenger service, in Hot Springs, in 1958. The vessels were first subjected to Coast Guard jurisdiction in the mid 1970's. The owner does not clearly remember why, but believes it was a consequence of a casualty on another owner's vessel. In 1982 Land & Lakes challenged and was granted exemption by the United States District Court (Western District of Arkansas) from Coast Guard Inspection based on lack of Admiralty jurisdiction. In 1984, the U.S. Court of Appeals for the Eighth Circuit overturned the ruling. The issue under appeal was the Ouachita River being subject to interstate navigation. The appeals court ruled that the waterway was navigable prior to being dammed and commerce laws therefore allowed the Coast Guard jurisdiction on Lake Hamilton, created by damming the Ouachita River.

7. Mr. [redacted] has operated DUKWs inspected and certificated by the Coast Guard since the mid 1980s. Once owning 15 DUKWs, Land & Lake Tours owned 12 DUKWs on May 1, 1999, operating only 3 DUKWs at the time due to market conditions. One of these 3 was MISS MAJESTIC, originally named MISS VELDA ROSE when Mr. [redacted] acquired her in 1962.

8. Mr. [redacted] stated he never envisioned or witnessed rapid flooding of a DUKW in his 41 years of managing DUKW passenger vessels. He never heard of a case where passengers had to evacuate through the windows. He remembers one case where a broken metal band clamp on a boot seal caused flooding but the Higgins bilge pump prevented sinking. He never had a marine surveyor evaluate his DUKWs, including as a condition of insurance.

9. The DUKW tour business in Hot Springs is seasonal due to weather and school schedules. The summer months make up the busy season. Prior to this casualty, both DUKW owners included a waterborne trip around St. John's Island in their DUKW tours. Travelling less than 7 knots, the time in the water to travel about 3 miles was half an hour. Land & Lake Tours has five designated locations on St. John's Island for exit from the water in the case of emergency. Land

& Lake Tours' White & Yellow Ducks brochure (exhibit 28) provides geographical perspective as well as sightseeing and DUKW tour information.

10. On May 1, 1999, MSO Memphis had approximately 20 certificated small passenger vessels for which it issued a Certificate of Inspection (COI). Ten of these vessels were DUKWs in Hot Springs. Neither the Officer in Charge, Marine Inspection (OCMI), nor the Chief of Merchant Vessel Safety Branch (the supervisor of marine inspectors) had ever personally inspected a DUKW. Both persons were unaware of any Coast Guard inspection policy documents specific to DUKWs.

11. Coast Guard regulations applicable to DUKWs in passenger service are found in Title 46 Code of Federal Regulations (CFR) Subchapter T, Small Passenger Vessels, Parts 175-185. Subchapter T underwent a substantial revision in 1996, including the addition of requirements for bilge high level alarms and operating procedures to improve passenger safety. Coast Guard wide inspection policy applicable to small passenger vessels is contained in the Marine Safety Manual, Navigation and Vessel Inspection Circulars (NVICs), and policy letters issued by the Commandant. In addition to Coast Guard inspection, the DUKWs in Hot Springs were inspected by the State of Arkansas and the City of Hot Springs for safety while operating on land.

12. Coast Guard wide inspection policy specific to DUKWs is limited to one paragraph in the Marine Safety Manual, volume II, chapter 10. That policy deals with air-cooled engines. MSO Chicago and MSO St. Louis have promulgated multiple page local OCMI policy documents specific to the inspection and certification of DUKWs. Prior to May 1, 1999, MSO Memphis had no inspection policy documents specific to DUKW small passenger vessels.

13. The 1991 to 1998 vessel inspection records for the MISS MAJESTIC indicate an absence of recorded deficiencies, with the exception of two items which were documented with a form CG-835 in 1995. The Coast Guard's Marine Safety Information System (MSIS) product set Vessel File Marine Inspection Log (VFMI) for the MISS MAJESTIC shows no deficiencies were recorded in MSIS from 1985 to 1998.

14. The latest COI for the MISS MAJESTIC was issued on March 11, 1997. The COI is valid for a period of three years, pending satisfactory completion of an annual Reinspection within 60 days of the anniversary of the issue date. The COI limited the vessel's operation to 250 yards of St. John's Island and 30 minutes of waterborne operation. The longstanding 30 minute limit was due to the absence of toilet facilities and distress signals on board. The reason behind the longstanding 250 yard limit is not evident from the vessel's inspection file. The owner stated that the Coast Guard derived the 250 yard limit, for reasons not known to him. For the allowed route, Subchapter T and the COI require life preservers and one life ring buoy as lifesaving equipment.

15. The last annual Reinspection for the MISS MAJESTIC was conducted by CWO3 [redacted] from MSO Memphis on February 23, 1999. CWO3 [redacted] was accompanied by MK1 [redacted], in the capacity of an inexperienced apprentice.

16. Mr. [redacted] only involvement with the February 23, 1999, inspection was scheduling. He had never operated DUKWs as the driver or done the physical maintenance on them. He had his mechanic, [redacted], handle any matters that came up with the DUKWs, including the inspection of the MISS MAJESTIC and three other DUKWs that day. Mr. [redacted] had no expectation that his mechanics would be familiar with Coast Guard regulations. Although not participating in the inspection, Ms. [redacted] watched the inspection from a distance and assisted by marking the name of the vessel on the life preservers.

17. CWO3 [redacted] eported to MSO Memphis in July 1998 from MSO New Orleans, where he was involved with four total inspections on two DUKWs. Because of this experience, his supervisor at MSO Memphis, Lieutenant [redacted], did not find it necessary to have him visit the DUKWs in Hot Springs with a more experienced inspector. CWO3 [redacted] held marine inspector qualifications for small passenger vessels, barges, and ships (hull and machinery). He had 6 years of experience as a Coast Guard marine inspector. His DUKW inspections in Hot Springs in February 1999 were his first DUKW inspections in approximately 5 years.

18. Inspection records for the February 23, 1999, Reinspection of the MISS MAJESTIC in Hot Springs indicate the inspection took one hour. The record reflects examination of systems and the hull and testing of propulsion and steering equipment. The record indicates only two items needed action. It notes:

> "the owner is in process of installing the required high level bilge alarms required by 11 Mar 99. Owner is researching the availability of Flammable Vapor Detection System required by 11 Mar 99 iaw 46 CFR 182.480; issued CG-835."

The vessel was not in the water during this inspection and none of the bilge pumps were tested with water. CWO3 [redacted] requires vessels to be waterborne for the trienniel inspection for certification and when a specific need exists. Mr. [redacted] recalled that some Coast Guard inspectors in the past observed waterborne operations and put water in the hull to test bilge pumps. CWO3 [redacted] examined the bottom of the vessel from the side of the vessel, since it was not due for a hull exam, and observed nothing that concerned him. CWO3 [redacted] and Mr. [redacted] discussed emergency drills and the need to log training. At the time, CWO3 [redacted] was not aware of any Coast Guard inspection policies specific to DUKW small passenger vessels. He considered the design of the MISS MAJESTIC to have been previously accepted.

19. Not in the inspection file was a nine item worklist issued by CWO3 [redacted] to Mr. [redacted] on February 23, 1999. CWO3 [redacted] used the worklist as a cooperative means to have items not in compliance with the regulations corrected. He deemed most of the items to be minor.

Included on the list, in order to be comprehensive in combination with the CG-835, was the requirement to install a bilge high level alarm. No due date was indicated on the worklist for the bilge high level alarms, but 46 CFR 182.530 was cited. Of the ten items found deficient or needing action (nine on worklist and one CG-835), only three were recorded in the MSIS Marine Safety Deficiency Summary (MSDS) product set, one each for bilge, fire fighting, and lifesaving systems. CWO3 [redacted] indicated that the vessel inspection records do not include his working checklist, a CG840T, worklists and CG835s because they are discarded once the information is put into MSIS. He was not completely familiar with the intended use of MSDS.

20. CWO3 [redacted] also inspected another Land & Lake Tours DUKW, the MISS SANDS, in Hot Springs on February 23, 1999. The records for that inspection state: "Examined bilge system and found owner in process of installing bilge high level warning lights/buzzers for March 11 deadline." CWO3 [redacted] believed that the same provisions for required bilge high level alarms would be used on other Land & Lake Tours DUKWs. He indicated that belief in the inspection records for those other DUKWs, including MISS MAJESTIC. He did not indicate that the installation should be delayed and hence believed the bilge high level alarms would be functional in short order. He had also verbally told his supervisor that the bilge high level alarms would be in on time.

21. Existing vessels, including the MISS MAJESTIC, were required by 46 CFR 182.115(d) to comply with the bilge high-level alarm requirements of 46 CFR 182.530 by March 11, 1999. Mr. [redacted] was not aware his DUKWs were required to have bilge high level alarms until CWO3 [redacted] mentioned the need in conjunction with his February 1999 inspection of DUKWs in Hot Springs. Also required by March 11, 1999, were vapor detectors as required by 46 CFR 182.480. CWO [redacted] discussed the two new pieces of equipment at the February 23, 1999, Reinspection with Mr. [redacted] On February 23, 1999, he issued a CG-835 to install an approved vapor detection system by March 23, 1999. Since the bilge high level alarm was not yet required and he believed Mr. [redacted] could easily fabricate a suitable alarm system by the due date, CWO3 [redacted] included this requirement on the worklist. He did not include the regulatory due date on the worklist. Mr. [redacted] stated he did not realize that the bilge high level alarms were to be installed by March 11, 1999. CWO3 [redacted] acknowledges that Mr. [redacted] might have been confused regarding the approval of bilge high level alarms since their interaction had been focused on vapor detection system requirements.

22. CWO3 [redacted] returned to Hot Springs a couple of times after his February 23, 1999, inspection. During these visits to Hot Springs, CWO3 [redacted] found most of the items on the worklist for MISS MAJESTIC had been completed. The dates he attended MISS MAJESTIC were not recorded.

23. Although inspection records indicate CWO3 [redacted] inspected another Land & Lake Tours DUKW, MISS SUNBAY, in Hot Springs on March 9, 1999, there is no evidence to indicate he attended MISS MAJESTIC that date. The inspection record for MISS SUNBAY states "Owner is in process of installing the required high level bilge alarms required by 11 Mar 99. Owner is

also researching availability of flammable vapor detection system required by 11 Mar 99 iaw 46 CFR 182.480; issued CG-835." As with MISS MAJESTIC on February 23, 1999, CWO3 [redacted] did not issue a CG-835 for bilge high level alarms.

24. Between February 23, 1999 and March 16, 1999, CWO3 [redacted] revisited Land & Lake Tours to find one of the DUKWs had been outfitted with a combined vapor detection and bilge high level alarm monitoring/control unit. Although his actions in this matter were not recorded, the date of this visit may well have been March 9, 1999. CWO3 [redacted] rejected the equipment during his inspection because it did not have a UL rating required for the vapor detection system. By using the manufacturer's website, CWO3 [redacted] later confirmed his suspicion that the combination unit was not UL approved.

25. On March 16, 1999, Land & Lake Tours returned the combination units and ordered UL rated vapor detection systems. Mr. [redacted] remembers that when the new units arrived and were noted to not include bilge high level alarms, he procured parts to fabricate bilge high level alarms. Mr. [redacted] delayed installing them until he could get CWO3 [redacted] to render any necessary approvals, to avoid repeating the difficulties experienced with the vapor detection system approval. Mr. [redacted] planned to discuss approval of bilge high level alarms with CWO3 [redacted] at a visit expected on April 2, 1999. However, CWO3 [redacted] did not visit Land & Lake Tours that day. On April 11, 1999, Mr. [redacted] sent CWO3 [redacted] an email concerning his return to Hot Springs, seeking a delay to allow procurement of enough vapor detectors. CWO3 [redacted] replied that he might not be able to return until May 10, 1999. He did not return to Hot Springs between April 11, 1999, and May 1, 1999, and hence the required bilge high level alarms were not installed. Mr. [redacted] stated that the Coast Guard never directed MISS MAJESTIC be removed from service so he believed the vessel remained suitable for service.

26. Mr. [redacted] was not familiar with inspection regulations applicable to his DUKW small passenger vessels and could not remember if he had a copy of 46 CFR Subchapter T in his office. He expected the Coast Guard to ensure he was informed of needed changes to his inspected vessels, as he had experienced in the past. He expected a high level of Coast Guard service as a consequence of having to pay an annual vessel inspection user fee of $300 for each DUKW. He expected the Coast Guard to tell him where he could obtain required new equipment. He stated that the Coast Guard never told him to report repairs to the hull and hence repairs were made and not reported, as required by 46 CFR 176.700. Mr. [redacted] was also not familiar with the applicable inspection regulations. With respect to the regulations, Mr. [redacted] simply did what the Coast Guard inspector and Mr. [redacted] told him to do. Although not required to participate in any cooperative owners group, Land & Lake Tours was not a member of any group such as the Passenger Vessel Association (PVA). PVA aggressively helps its members comply with existing and changing regulations.

27. The Coast Guard informs the public about new regulations through the Federal Register. Explanations of the need for new regulations are provided in part by addressing public comments

to proposed new regulations. Pages 51430 and 51431 of the Federal Register, Vol. 62, No. 189, published September 30, 1997, address public comments regarding the bilge high level alarm requirement first contained in 46 CFR Subchapter T in 1996. The pertinent text reads:

> "The intent of the requirement is to give the operator an indication when the automatic bilge pumps are running…..The time to discover that your vessel has taken on water is not when you start to "feel" the vessel move differently. In an emergency situation, time is everything and can mean the difference between life and death."

28. Mr. [redacted] stated he is familiar with casualty reporting and drug and alcohol program procedures, addressed in 46 CFR 4 and 46 CFR 16. However, he was unfamiliar with the types of casualties required by regulation to be reported. He noted that the Coast Guard explained the drug and alcohol program regulations about 2 years before the casualty. He also stated that the Coast Guard never told him to report repairs to the hull and hence repairs were made and not reported, as required by 46 CFR 176.700.

29. Elizabeth Frances Helmbrecht was issued her first Coast Guard license to operate inspected vessels on December 11, 1998. Her master license was limited to DUKW vessels restricted to Lake Hamilton, Arkansas, not more than 250 yards offshore. It was issued in Memphis, Tennessee, with an expiration date of December 11, 2003. She had 3 years of experience operating uninspected party barges and had driven school buses for years. She had a commercial driver's license. She had operated a trolley tour in a mill for 4 months. Her DUKW operating experience prior to obtaining her Coast Guard license included a few trips where she operated DUKWs when passengers were not embarked. She has been an employee of Land & Lake Tours since August 1998 and a DUKW master since December 1998.

30. Land & Lake Tours had no organized or formal training program for its DUKW masters, the only crew on the DUKWs during tours. The only training materials held by Land & Lake Tours was Coast Guard license preparation materials from Houston Marine and drug and alcohol program videotapes. Training was conducted on the job by going with more experienced persons and through informal discussions in the office. Discussions involving Ms. Helmbrecht and Mr. [redacted] or Mr. [redacted] addressed contingencies. The mechanics would also informally train new drivers on using vessel controls. Applying her experience as a school bus driver, Ms. Helmbrecht developed an operational checklist with Mr. [redacted] to allow her to do her duties well as a DUKW master. Over time, she became comfortable to the point of not using a written checklist. Her routine before operating a DUKW included checking brakes, lights and hull drain plugs.

31. Land & Lake Tours had no written policy on emergency procedures. No evidence was found to indicate that the emergency instructions required by 46 CFR 185.510 to address fire, heavy weather, and man overboard conditions ever existed. Training consisted of informal discussions in the office. Ms. Helmbrecht had developed a good working relationship with the mechanics, who readily helped her with occasional operational difficulties. Policy amounted to

designation of five places on St. John's Island to exit the water in an emergency, an expectation to rapidly exit the water if the Higgins bilge pump discharged, and an expectation to have the electric bilge pumps turned on at all times while a DUKW was waterborne. Emergency drills were not formally held for the master, the only crew on the DUKWs during tours. However, some unrecorded emergency equipment familiarization was done. Mr. [redacted] stated that drills were not being recorded, per worklist item 1, because corrective actions were focused elsewhere.

32. Land & Lake Tours had no written policy on passenger orientation to be given by DUKW masters. Policy amounted to an expectation to point out the life preservers. New DUKW masters learned by watching more experienced DUKW masters in action. There were no written safety materials given to passengers. DUKW masters generally blend safety information into their personalized narration as a tour guide.

33. Land & Lake Tours had no written maintenance manuals or procedures, with the exception of a GM parts manual for machine parts. Written maintenance records consisted of a few hand written records of the weekly "hard drive" service, which included lubricating drive train components and removing the boot seals from the shaft housings to get at the lubrication points. The maintenance of the DUKWs was left up to the mechanics, experienced in road vehicle repair. Welded hull and shaft housing repairs were performed, without notification to the Coast Guard. Mr. [redacted] basically made money available, having little knowledge of, or involvement with, the maintenance of the DUKWs. Mr. [redacted] and his mechanics were not aware of the existence of a technical manual for DUKWs, which addresses operations and maintenance. Mr. [redacted] did not understand the hinge assembly, believing it to be a skid plate. In his full time service as the main mechanic on Land & Lake Tours' DUKWs for the last 18 months, he was familiar with 4 or 5 boot seal replacements, due to holes or cracks in boots.

34. The War Department Technical Manual for DUKWs, published in 1945, contains operating and maintenance instructions. Portions are not applicable to MISS MAJESTIC due to physical changes made to the vessel, such as engine details. Portions provide valuable insight for the safe operation of existing DUKWs, including the MISS MAJESTIC. The 27 pages of Section XIV on preventative maintenance include specific recommendations for the periods of before, during and after service, as well as maintenance schedules and instructions. Guidance is provided on such items as the inspection of shaft housing seals, checking bilge pump operation, checking the bilge for hull leaks, and lubricating axle shaft universal joints. The 16 pages of Section XXXIV provide guidance on maintaining shafts, housings and their bearings. Pictures show components, such as the shaft housing hinge assembly and its mounting locations on the hull and on the shaft housing.

35. In the absence of mechanical difficulties, a specific master operates a specific DUKW at Land & Lake Tours. Ms. Helmbrecht was assigned MISS MAJESTIC.

36. On April 29, 1999, Ms. Helmbrecht noted the forward electric bilge pump discharging at about half capacity as she was about 3/4 through the waterside portion of a tour. She notified the

owner by radio and sped up to complete the tour without alarming the passengers. Mr. [redacted] met her at the normal exit boat ramp at Water Toys. They noted that the Higgins bilge pump spurted less than a gallon as MISS MAJESTIC approached the boat ramp, indicating water in the bilge but no great amount. He subsequently found a hole in a boot seal to the aft shaft housing. The only other time she had seen the Higgins bilge pump discharge was after a heavy rain in a parking lot.

37. On April 30 and May 1, 1999, mechanic [redacted] replaced both boot seals on the aft shaft housing with boot seals from Land & Lake Tours' stock of unused boot seals, at least some obtained from Memphis Truck Center. He found holes in both boot seals he removed. He had previously driven DUKWs for 11 years and started as mechanic on March 2, 1999. He placed the aft seal in the sun at about 0700 hours on May 1, 1999, to make it more pliable. He finished shortly before 1000, not long before MISS MAJESTIC would start her first tour on May 1, 1999. He checked the tightness of the clamps three times, tried to rotate the housing to verify clamp tightness, and was not rushed. Other DUKWs were available as substitutes if needed. He stated the only way he believes a clamp could have come loose is if it was cocked a bit. He had found cocked clamps that had loosened in the past. He ground down rough spots on the shaft housing from previous hinge assembly mounts, to avoid damaging the forward boot seal. He stated he had not seen a hinge assembly in place in his 11 years dealing with DUKWs. He did not test the watertight integrity of the vessel, as it was not standard practice to do so after working on shaft housings and boot seals. He hadn't seen a DUKW taken to the water to check for leaks in his 11 years dealing with DUKWs. No one checked his work, as it was not standard practice. Mr. [redacted] told Ms. Helmbrecht repairs were done and she trusted him. During testimony, Mr. [redacted] examined the boot seal that had been reattached to the shaft housing and tightened the same number of notches as noted after salvage. From his examination, Mr. [redacted] stated that the boot seal should be tighter and that if the vessel went in the water in the examined condition, there was a good chance the boot seal would slide off the shaft housing. Although boot seal clamps have been noted during shop inspection to be loose after general operation, no evidence was found of instances, known or recorded, where boot seals have detached from the shaft housing while in a waterborne mode.

38. Mr. [redacted] also did the weekly hard drive service on MISS MAJESTIC on April 26, 1999. The weekly hard drive service is normally performed on the DUKW master's day off. Part of that servicing includes disconnecting the aft boot seal from the shaft housing, to allow access for lubrication of the u-joints. The shaft housing is pushed forward into the hull during the process. In order to reattach the aft boot seal, the shaft housing is pulled aft against the tension from stretching the forward boot seal. The aft boot seal is slid over the shaft housing and the metal band clamp tightened. Without a hinge assembly in place, the tension in the two boot seals and their contact points along the shaft housing determine the axial location of the shaft housing. Changing both boot seals for the aft shaft housing takes Mr. [redacted] about 4 hours.

39. On May 1, 1999, Ms. Helmbrecht and 20 passengers arrived at the water's edge on St. John's Island, at about 1150 local time. Her passenger ticket count matched Mr. [redacted] having

conversed using the radio. He did not include in his count one young passenger, because Land & Lake Tours did not charge for children deemed to be infants. Land & Lake Tours generally considered children 2 years of age or younger to be infants.

40. The weather at the time was pleasant, following a cool morning. The air temperature was about 23 degrees Celsius (73 degrees Fahrenheit), water temperature was 68 degrees Fahrenheit at the surface and 59 degrees Fahrenheit at a depth of 60 feet. Winds were less than 10 knots from the south-southeast. There were no white caps. Skies were generally clear. To block the wind, the windshield was left up and the forward facing vinyl panels adjacent to it were buttoned in place, buttons being outside of the protected seating area. The vinyl side curtains were rolled up, leaving large open windows along the sides at the passengers' elbows.

41. Ms. Helmbrecht pointed out the life preservers as her passenger orientation. She did not address evacuation in an emergency. She finds that some masters address evacuation but the topic unduly panics many passengers. She said she gave life preserver donning instructions but multiple surviving passengers say she didn't. The life preservers were stowed above the passengers' heads and large printed markings helped make them obvious to passengers. Ms. Helmbrecht was attentive to passenger weight distribution and focused on their comfort in her role as a tour guide. She and her passengers agreed that there was no other safety item in her passenger orientation, other than lightheartedly stating the Coast Guard would fine her if the passengers smoked. She did turn on all three electric bilge pumps with the single switch on the lower starboard corner of her console, as standard practice.

42. Ms. Helmbrecht stated that she often offers parents to put life preservers on children. Arkansas state law requires children under the age of 13 to wear a life preserver at all times while aboard recreational boats. The Coast Guard leaves it up to the master to decide when people must put on life preservers on inspected small passenger vessels, per 46 CFR 185.508. No one donned a life preserver for this tour. Mr. [redacted] never consciously thought about having children wear life preservers during DUKW tours.

43. Ms. Helmbrecht found the entry into the water, at the normal boat ramp at Doe's on St. John's Island, to be smooth and without generation of a wave. There was no evidence of hitting hard, a bump or a scrape. MISS MAJESTIC was floating normally at the time of becoming waterborne.

44. After operating in the water a few minutes, at least two passengers ([redacted] and [redacted] seated in the second and fifth rows of seats, in the far port seats) independently noticed a garden hose stream of water discharging from the port side near the driver's seat. They thought it was engine cooling water or otherwise part of normal operations and therefore did not mention the discharge to others. The water was coming from the forward electric bilge pump. Ms. Helmbrecht stated that she looked over her shoulder periodically for discharge but did not see any. She was twisted to the right in the driver's seat to face the passengers. The discharge hose is not readily visible from the driver's seat. The Higgins bilge pump did not discharge water over

the side. Discharge from the Higgins bilge pump is normally dramatic and catches the attention of the master and the passengers. The discharge from the aft two electric bilge pumps is generally not visible to the master and most passengers, being located at deck level next to the boarding ladder at the stern.

45. Approximately seven minutes after entering the water and while rounding Catalina Point, Ms. Helmbrecht felt the MISS MAJESTIC react sluggishly, not very responsive to throttle changes, and list to port. [redacted] was on a 26 foot long recreational pontoon boat about 60 yards from MISS MAJESTIC's port quarter. Upon seeing MISS MAJESTIC, he noted her to be exceptionally low in the water. Passenger [redacted] familiar with recreational boats but not DUKWs, splashed his hand in water over the port side after noticing another passenger being able to touch the water. He looked behind him to see water washing on deck at the last row of seats, the eighth row. He heard passengers at the stern joking about water coming on deck.

46. Ms. Helmbrecht turned around and made eye contact with Mr. [redacted] She told him to move to the other (starboard) side to compensate for the list. She attempted to turn the vessel slowly toward shore. Mr. [redacted] and [redacted] noticed water on the last foot of floorboards, at row 6. Mr. [redacted] stood to move as asked and looked aft again. This time he noted water on deck under the last 2 rows of seats and felt water over his feet at the fifth row of seats. He knew something was terribly wrong and did not sit down on the starboard side. He remembers Ms. Helmbrecht attempting to increase the speed of the propeller. She noticed water on deck at the stern and over the floorboards near rows 5 and 6. Ms. Helmbrecht told the passengers to get off the vessel because it was going down. She opened a valve in the nearby fixed fire extinguishing system, believing the gas might displace water and add buoyancy. Mr. [redacted] managed to get a few life preservers down from the overhead stowage. He found the preservers hard to remove from the slide out storage containers against the canopy. He gave them to his wife and daughter. The passengers were generally calm, apparently not aware of the distress, or in shock.

47. In less than 30 seconds from the recognition of distress, the vessel downflooded over the stern and went down by the stern with all 21 persons on board. A notch in the raised coaming had been cut out to provide the aisle between the seats. Downflooding occurred through the notch at first, although some water may have leaked through a deck hatch on the port side aft of the coaming, under the feet of passengers in that location. The bow paused at the surface for less than five seconds, with the bow nearly vertical. Ms. Helmbrecht had never seen water at passengers' feet or seen it entering a DUKW before. She had never heard of such occurring to other masters.

48. As the MISS MAJESTIC rapidly sank, passengers floated up under the canopy and forward to the closed windshield. The windshield and forward vinyl windows prevented people from floating free of the vessel, causing them to bump into each other.

49. After the vessel sank, Ms. Helmbrecht and seven passengers managed to swim through open side windows and make it to the surface, despite disorientation in dark waters and being submerged more than a minute. Many of them were not able to get out of the vessel until it was well submerged. Many of the side windows had clear dimensions of about 24 inches in height and 33 inches in length.

50. The MISS MAJESTIC landed in about two feet deep soft silt, on her wheels, about 250 yards from Catalina Point on St. John's Island. The bow was slightly closer to shore, being uphill from the stern. The vessel appeared to divers to have rolled backward several feet.

51. Mr. [redacted] had another nearby recreational boat operator call 911, at 1158 local time. The Garland County Sheriffs were on scene in about three minutes, at 1201 local. The Hot Springs Police, the Arkansas State Police, Life Mobile, and the Lake Hamilton Volunteer Fire Department also responded. Garland County Sheriffs divers were on scene with dive gear by 1216 local time. They found a silt cloud in the water and a small oil slick (sheen) on the surface.

52. The divers recovered twelve bodies between 1258 and 1545 local time on May 1, 1999. Six deceased passengers were found floating near the driver's seat inside MISS MAJESTIC. Another six deceased passengers were found scattered about the vessel on the bottom of Lake Hamilton, up to 105 feet from the vessel. Specific locations are detailed in the Garland County Sheriff's Department Dive and Rescue team Official Divers Report (exhibit 20). These passengers escaped the vessel alive or floated out of the vessel dead. Garland County Sheriffs lead diver [redacted] indicated that due to the distance from MISS MAJESTIC that some of the deceased were found, it appears that some of them managed to escape the vessel and tried to swim. He noted that disorientation, darkness and reduced buoyancy with depth affect the ability of people to ascertain the direction to the surface.

53. Immediately following the sinking, there was confusion regarding the number of people that went down with the MISS MAJESTIC. The confusion related to Land & Lake Tours recording the number of tickets rather than the number of passengers.

54. The divers recovered the body of a thirteenth passenger, that of James Leon Patton, at 0857 local time on May 2, 1999. All thirteen deaths were caused by drowning. Death certificates for James Leon Patton and Lana Jo Berry also indicate asphyxiation caused by drowning.

55. The divers noted zero visibility at the 60 foot depth. Using Global Positioning System (GPS) equipment, the divers found the MISS MAJESTIC at 34 degrees 26.24 minutes north latitude and 93 degrees 05.64 minutes west longitude.

56. Officer [redacted] and surviving passengers, [redacted] and [redacted] feel strongly that more passengers would have died if passengers had donned life preservers before abandoning MISS MAJESTIC. Officer [redacted] believes that some of the deceased passengers may have survived if they had been able to abandon the vessel with life preservers.

57. The Garland County Sheriff's had a blood sample taken from Ms. Helmbrecht. Results from the State Crime Laboratory in Little Rock, Arkansas, were [redacted] and indicated only [redacted]. These drugs are not part of the group of five tested for DOT drug programs.

58. At 2300 local time, a DOT drug screening specimen was taken from Ms. Helmbrecht. The results from Totally Positive, Inc were [redacted] for the five panel test.

59. MSO Memphis decided to have all DUKW operations in Hot Springs stopped until all DUKW vessels could be specifically examined. However, the owners of both companies in Hot Springs had terminated all tours on their own initiative. Subsequent actions in this matter are separate from this case.

60. On May 6, 1999, Commandant issued a message to all Marine Safety Offices to call attention to inspection issues on DUKWs. Specifically mentioned for scrutiny were water intrusion points, such as shaft housing boot seals.

61. On May 9, 1999, the MISS MAJESTIC was salvaged under the supervision of the U.S. Navy Supervisor of Salvage. As the vessel was lifted from the water, water drained out of the aft shaft housing where the aft boot seal was found disconnected from the shaft housing. The vessel was briefly examined on the barge and on shore then moved to temporary storage at the Arkansas Air National Guard facility at Hot Springs Airport.

62. Examination of the MISS MAJESTIC revealed the following (see exhibits for photographs):

a. Aft shaft housing dislocated, being pushed into the hull forward.
b. Aft shaft housing off and in front of the shaft housing support, with deformed housing.
c. Hinge assembly for positioning shaft housing removed, mounts ground off.(removal is a common practice with some DUKW owners)
d. Welded lap patch on shaft housing where drive shaft rubs when rear end is low. (common location for needing repairs)
e. Boot seal metal band clamp in place on boot seal with 42 notches past the screw head.
f. The boot seal, when put back on shaft housing with 42 notches past the screw head was physically loose. (3 turns of the screw were possible and 2 1/4 turns made the clamp reasonably tight. Mr. Woodall felt an in-water test at a boat ramp would likely have indicated the seal loose. He also stated that there existed a good chance the boot seal would have slid off the shaft housing during operation in that tightened condition.)
g. No raised ring on aft end of shaft housing as on forward end, for keeping boot seals in place.
h. Path for water ingress through shaft housing annulus. (around 3 inch diameter drive shaft, inside a 5 inch diameter shaft housing)
i. Key missing from keyway in Higgins bilge pump shaft/chain drive sprocket, gouged shaft.

j. Leading edge of 1 of 3 vanes on Higgins impeller broken off and missing, scored housing.
k. Higgins strainer housing off of pump housing and in bilge. (strainer housing cracked at set screw intended to hold it on pump housing)
l. Higgins strainer screen missing over part of strainer housing.
m. Upper edge of Higgins inlet pipe fitting located 5 inches above vessel's bottom plating. (page 37 of technical manual states automatic pumping occurs when bilge water depth reaches 5 inches.)
n. Elbow in Higgins discharge piping not held by flexible hose with metal band clamp.
o. U-bolt for securing Higgins bilge pump discharge piping elbow missing.
p. Variety of steel repairs to hull above rear axles. (steel doublers and inserts)
q. Dime size hole in hull above rear axles. (due to wastage of hull plate)
r. Electric bilge pumps actual capacity less than rated for no head.
s. Electric bilge pump switch in the on position.
t. Ring life buoy attached to vessel with bicycle chain and lock, lock open, no lifeline. (chain bought by Bridges, applied by Helmbrecht, in reaction to theft in town. Helmbrecht unlocked the lock before each tour.)
u. Hull drain plugs in place, shaft housing drain plugs in place.
v. Boot seals stretch about 1.5 inches total when aft axle falls due to lack of wheel contact. (driveshaft is splined to allow axial mechanical motion)

63. The requirements in 46 CFR 182.520 for fixed power-driven bilge pumps on the MISS MAJESTIC specify one pump with a capacity of at least 10 gpm. The 3 electric bilge pumps installed had a net design capacity of 44 gpm, with the discharge and suction at consistent heights with one another. The actual capacity was less because the discharge points were about 3 feet higher than the pump suctions. The Higgins bilge pump capacity was about 250 gpm, intended for dewatering more than rain water or leakage around the propeller shaft.

64. Small passenger vessels are required by 46 CFR 182.720(d)(3) to have through hull fittings and shutoff valves that provide an equal degree of safety as that provided by the hull.

65. Small passenger vessels are allowed to have short segments of flexible nonmetallic hose in fixed internal piping systems for the purpose of alignment. In low pressure systems, such as seawater, 46 CFR 182.720(e)(3)(v) allows hose clamps provided there are two at each end. This standard is not intended to apply to piping systems where piping segments intentionally move relative to each other.

66. DUKWs have not been produced since 1945. Mechanical components for DUKWs are not generally readily accessible on the open market. Many owners of DUKWs obtain parts from DUKWs now in a junkyard status. Over time, parts availability has become a challenge. Shaft housing boot seals have been produced as an after-market product. Some after-market boot seals have been impregnated with fabric or neoprene, making them more resistive to tears. Items like shaft housings are no longer readily available. They are repaired by owners, much like the thin wall hulls are repaired. Mr. [redacted] repairs them only by welding. Mr. [redacted] has made

welded hull repairs, including an area on one DUKW where needle-gunning around small holes of wastage have exposed wasted metal up to a foot in size.

SINKING OF THE M/V MISS MAJESTIC ON LAKE HAMILTON, HOT SPRINGS, ARKANSAS ON MAY 1, 1999 WITH MULTIPLE LOSS OF LIFE

Analysis:

1. MISS MAJESTIC operated with about 12 inches of freeboard to the downflooding point at the aisle aft. This figure is based on the picture on the White & Yellow Duck Tours brochure and is generally consistent with the War Department's 16 inches of aft freeboard when loaded. Carriage of passengers aft of the coaming tends to decrease freeboard aft.

2. The volume of flooding to submerge the freeboard to downflooding is then, at most, the length of the vessel times the width of the vessel times the one foot of freeboard, hence 30 x 8 x 1 = 240 cubic feet of volume. Since there are 7.5 gallons in a cubic foot, the reserve buoyancy is at most 1800 gallons.

3. The area of the annulus, that area around the aft drive shaft and inside the shaft housing, is equal to the area of a five inch diameter hole less the area of a three inch diameter hole, interestingly the area of a four inch diameter hole. Engineering texts use a coefficient to account for reduced flow through a pipe and/or an annulus, in accounting for effects such as friction. A coefficient of about 0.5 is appropriate for the shaft housing and driveshaft. This means flooding would take about twice the time as calculated for a simple hole.

4. The head for the shaft housing penetration of the hull is the draft amidships, about 30 inches, less the radius of the shaft housing at its end, about 4 inches. Hence, the head at the start of flooding is about 26 inches. As flooding continues the head decreases. Although the draft increases as the vessel takes on water weight, the inverted shape of the wheel wells result in flooding water depth increasing faster than the draft increases. Hence the head decreases slowly as flooding continues.

5. Using the U.S. Navy Salvors' Handbook for flooding rate through a simple hole:

Q (gpm) = 3600 x A [area of hole in square feet] x H*(1/2) [square root of head in feet]

Hole diameter (inches)	Head (feet)	gpm	time to flood 1800 gallons (minutes)
1	2	28	64
1	3	34	53
2	2	111	16
2	3	136	13
3	2	250	7
3	3	307	6
4	2	444	4
4	3	543	3

6. Given the reduced flow through an annulus in piping, the open area equal to a four inch hole, and a head of about 2 feet, flooding through the shaft housing should have taken about eight minutes to result in downflooding of the MISS MAJESTIC. The flooding rate through the annulus would have been about 220 gpm. This is consistent with the aft boot seal coming off of the shaft housing at the time the vessel entered the water. This is the time when the rear drive axle drops relative to the hull and causes the boot seals to stretch, sliding them off if they are loose. With the aft boot seal off of the shaft housing and the hinge assembly missing, the forward boot seal would pull the shaft housing forward. The forward movement of the shaft housing explains how the shaft housing got in front of the shaft housing support. Once the wheels contact the ground, the shaft housing support moves forward. The impact damage to the shaft housing results from impact with the shaft housing support.

7. The electric bilge pump capacities total less than 34 gpm. Hence, even if they were all running, they could not overcome the 220 gpm rate of flooding. However, the Higgins bilge pump has a capacity of about 250 gpm at full throttle and theoretically would have been capable of overcoming the calculated flood rate.

8. The Higgins bilge pump, if operational, would have begun discharging water when its suction became submerged. Even with the strainer housing not attached to the pump inlet, the bilge water depth needed to be at most 5 inches. At the 220 gpm flooding rate, the water in the bilge reached the floor boards in about 7 minutes, to a depth of about 26 inches. Therefore, discharge would have started about 1.5 minutes after the boot seal became dislodged.

SINKING OF THE M/V MISS MAJESTIC ON LAKE HAMILTON, HOT SPRINGS, ARKANSAS ON MAY 1, 1999 WITH MULTIPLE LOSS OF LIFE

Conclusions:

1. The apparent root cause of this casualty was the unchecked flooding of the MISS MAJESTIC resulting from the aft shaft boot seal dislodging from the shaft housing at the start of waterborne operation.

2. The contributing causes of this casualty are as follows:

a. Boot Seal Installation: The aft shaft housing boot seal came off of the aft shaft housing when the MISS MAJESTIC entered the water. The drop of the axle accentuated the elongated geometry along the shaft housing and resulted in greater tension on the boot seals. The aft shaft housing boot seal may not have come off of the shaft housing if

(1) that end of the shaft housing had a raised ring like the one on the front end, and/or
(2) the aft shaft housing boot seal metal band clamp was tighter, and/or
(3) the aft shaft housing hinge assembly was in place, and/or
(4) the rear differential had been in place not allowing the forward axle to drop; and/or
(5) the aft seal had been operationally tested in water prior to allowing the vessel to return to commercial service.

b. Operator Experience: Ms. Helmbrecht did not notice the discharge from the forward electric bilge pump due to the position of its discharge point being hidden from her view and her focus on being a tour guide. She could not have noticed any discharge from the aft electric bilge pumps due to the locations of their discharge points at the stern. She would have noticed any substantial discharge from the Higgins bilge pump discharge point. The presence of a crew member not engaged as a tour guide would likely have led to earlier recognition of the unintentional flooding and resulted in fewer lives being lost.

c. Higgins Bilge Pump: The Higgins bilge pump did not work because of the missing key from the shaft keyway. The cause of the key being missing can not be determined. It likely sheared or fell out upon the pump ingesting a solid object that broke an impeller vane. An object could have been ingested through the missing section of the strainer screen. This may have happened during the short operation of the Higgins bilge pump on April 29, 1999, or soon after flooding started on May 1, 1999. The assorted damages to the Higgins pump and its attachments indicate it suffered a dramatic shock. If it was operational, the Higgins bilge pump would likely have been able to keep up with flooding, or at least allowed time to beach the MISS MAJESTIC. When the Higgins bilge pump would have begun to discharge, the increase in draft would have been only a couple of inches. The water in the bilge would not have reduced vessel maneuverability appreciably, as it did not a few days before when the pump briefly discharged.

d. High Level Bilge Alarm: The bilge high level alarms were not installed before the casualty. Land & Lake Tours failed to understand the recent regulation and failed to

install the alarms before the due date and before the casualty. Contributing to this failure was ineffective communications between CWO3 [redacted] and Mr. [redacted] CWO3 [redacted] believed Mr. [redacted] had the necessary components to install the alarms, was aware of the March 11, 1999, regulatory deadline and was on track to have the bilge high level alarms installed prior to the deadline; this was not the case. Mr. [redacted] did not realize there was a due date in the regulations and delayed installing the components to avoid the possibility of having to remove items that he believed were not yet found acceptable by CWO3 [redacted] as he recently had to do with vapor detectors. CWO3 [redacted] use of an informal worklist rather than clear CG-835s aggravated the ineffectiveness of communications. A CG-835 would have indicated a higher level of importance and may have included the due date. If bilge high level alarms had been installed and functional, Ms. Helmbrecht would have known of the flooding in time to either beach the vessel or evacuate the passengers. Although the height of bilge high level alarms is not specified by regulation, an alarm would have been installed to sound soon after the Higgins bilge pump would start to discharge, if not sooner. If installed and operational, the alarm would have sounded less than 2 minutes after the vessel entered the water, well before the maneuverability was reduced and freeboard lost.

e. Compartmentation**:** Had the MISS MAJESTIC been fitted with watertight compartmentation or flotation materials, the vessel would have not sunk or sank so slowly that passengers would have had ample time to escape the vessel.

f. Passenger Entrapment: Had the windshield and forward vinyl windows been open, most or all of the passengers would have escaped as the vessel sank. External button snaps could not be quickly undone from behind the windshield. The snaps are of a style that often require a concerted effort to release, even from the button side.

3. Conclusions supporting the root and contributing causes are as follows:

a. Excessive Flooding Rate: The MISS MAJESTIC flooded through the annulus inside the aft shaft housing at an average rate of about 220 gpm, nearly ten times the capacity of the three electric bilge pumps combined.

b. PFD Donning: The donning of life preservers would have prevented escape from under the canopy and resulted in more deaths.

c. DUKW Design Features: DUKWs have features which make them inherently less safe than conventional commercial small passenger vessels. These include:

(1) heavy metal chassis and heavy wheel drive systems, with minimal buoyancy
(2) multiple external appendages with moving parts that are part of the watertight envelope

(3) use of a single band clamp on the smooth sealing surface of shaft housings
(4) equivalent of large through hull fittings with no sea valve (the shaft housing penetrations). The shaft housing and boot seal arrangement on DUKWs does not provide an equivalent level of safety to the through hull fitting and shutoff valve requirements in 46 CFR 182.720(d)(3).
(5) thin hull plating, susceptible to quicker holing through wastage and harder to repair
(6) manufactured parts not readily available, largely due to 54 years of no DUKW production

d. Small Vessel Survivability: The regulations in 46 CFR 179 do not require vessel survivability for small passenger vessels less than 65 feet or carrying 49 or fewer passengers. This case demonstrates a need for survivability on vessels which are not inherently buoyant.

e. MISS MAJESTIC Material Condition: The hole in the bottom located above the rear drive axle was so small that it did not contribute substantially to the casualty. In the course of a normal tour, the small hole would allow enough flooding that an electric bilge pump might discharge water. This hole and the holes discovered in the boot seals likely contributed to the spurt by the Higgins bilge pump two days prior to the casualty.

f. Vessel Maintenance Training: Although there is evidence that [redacted] may have not adequately tightened the metal band clamp attaching the aft boot seal to the aft shaft housing to keep it from coming off in service, there is no evidence that he intentionally or knowingly failed in his duties as the mechanic.

g. Owner/Operator Regulatory Compliance: By relying on the Coast Guard inspector to provide all guidance necessary for compliance, Land & Lake Tours demonstrated a general lack of responsibility to comply with 46 CFR Subchapter T. The Coast Guard's vessel inspection user fee, and the Coast Guard's partnership approach to vessel safety regulatory compliance, contributed to the over-reliance on the Coast Guard. The following matters were noted during the course of this investigation. These matters have been forwarded to the Commander, Eighth Coast Guard District for further investigation.

(1) There is evidence of violation of 46 CFR 177.500, providing two means of escape from the passenger compartment for rapid evacuation in an emergency, on the part of Land & Lake Tours.

(2) There is evidence of violation of 46 CFR 180.70, the requirement for stowing the ring life buoy such that it is readily available, can be rapidly cast loose, and is fitted with a lifeline, on the part of Land & Lake Tours.

(3) There is evidence of violation of 46 CFR 182.530, the requirement for installing bilge high level alarms by March 11, 1999, on the part of Land & Lake Tours.

(4) There is evidence of violation of 46 CFR 185.400, quarterly training of crew members as to their duties in an emergency and the logging of such training, on the part of Land & Lake Tours.

(5) There is evidence of violation of 46 CFR 185.504, the requirement to keep a written count of all passengers and communicate that number to the owner for availability at the vessel's normal berthing location, on the part of Elizabeth Frances Helmbrecht and Land & Lake Tours.

(6) There is evidence of violation of 46 CFR 185.506(b), the requirement to provide a passenger orientation which includes procedures for donning life preservers and emergency evacuation procedures, on the part of Elizabeth Frances Helmbrecht and Land & Lake Tours.

(7) There is evidence of violation of 46 CFR 185.510, the requirement to post or have available emergency instructions to address fire, heavy weather, and man overboard conditions, on the part of Land & Lake Tours.

(8) There is evidence of violation of 46 CFR 185.520, the requirement to conduct and log abandon ship and man overboard drills and training, on the part of Land & Lake Tours.

(9) There is evidence of violation of 46 CFR 176.700, the requirement to obtain the approval of the cognizant OCMI for repairs and alterations which affect the safety of the vessel, such as hull repairs and removal of the aft shaft housing hinge assembly, on the part of Land & Lake Tours.

h. Coast Guard Inspection Policy for DUKWs: The Coast Guard has no national inspection, maintenance and operation standards for DUKW passenger vessels, to attain an equivalent level of safety afforded to conventional vessels through the regulations in 46 CFR Subchapter T. CWO3 [redacted] did not notice the missing hinge assembly for the aft shaft housing partly due a lack of awareness of the importance of DUKW components.

i. MSO Memphis Inspection Documentation: The inspection files for MISS MAJESTIC are highly misleading, to inspection and investigation persons using them, because deficiencies found were not included in the files or in MSIS. MSO Memphis did not record deficiencies and apply MSDS as intended. A more formal tracking of deficiencies found would likely have led to installation of the bilge high level alarm before May 1, 1999. Formal tracking of deficiencies would have allowed management at the MSO to recognize the alarms were not being installed on time, rather than believing they were.

4. With the above exceptions, there is no evidence of actionable misconduct, inattention to duty, or negligent or willful violation of law or regulation on the part of Coast Guard licensed or certificated personnel.

5. With the above exceptions, there is no evidence of failure of Coast Guard inspected or certified equipment or material used in the construction and operation of this vessel.

6. With the above exceptions, there is no evidence that any personnel of the Coast Guard or of any other federal agency, or any other person contributed to this casualty.

SINKING OF THE M/V MISS MAJESTIC ON LAKE HAMILTON, HOT SPRINGS, ARKANSAS ON MAY 1, 1999 WITH MULTIPLE LOSS OF LIFE

Recommendations:

1. It is recommended that the Commandant of the Coast Guard clarify the responsibility of owners for regulatory compliance of their vessels with respect to the vessel inspection user fee, particularly for small passenger vessel owners.

2. It is recommended that the Commandant of the Coast Guard ensure that every owner of certificated DUKW passenger vessels has a copy of the War Department's Technical Manual.

3. It is recommended that the Commandant of the Coast Guard ensure that every OCMI certificating DUKW passenger vessels has a copy of the War Department's Technical Manual.

4. It is recommended that the Commandant of the Coast Guard encourage or require crew to be present at annual inspections of small passenger vessels.

5. It is recommended that the Commandant of the Coast Guard encourage or require in-water testing of vessel integrity after repairs to the watertight hull and its appendages, especially for DUKWs and other vessels which do not normally reside in the water.

6. It is recommended that the Commandant of the Coast Guard encourage or require the testing of bilge pumps with water at every Coast Guard triennial inspection and annual reinspection.

7. It is recommended that the Commandant of the Coast Guard establish a working group of industry experts and DUKW operating companies to develop a compilation of best practices with DUKWs, with emphasis on drive trains and hull integrity. The compilation of best practices should be made readily available to the public.

8. It is recommended that the Commandant of the Coast Guard publish policy on DUKWs to allow OCMIs to reassess vessel survivability in the face of risk of flooding from drive train breaches and obtain an equivalent level of safety to that is intended in 46 CFR Subchapter T. The policy should be made readily available to the public, including state agencies that regulate DUKWs operating as passenger vessels on state waters.

9. It is recommended that the Commandant of the Coast Guard publish policy on inspecting unique features of DUKWs, with emphasis on shaft housings and boot seals. The policy should be made readily available to the public, including state agencies that regulate DUKWs operating as passenger vessels on state waters.

10. It is recommended that the Commandant of the 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.

SINKING OF THE M/V MISS MAJESTIC ON LAKE HAMILTON, HOT SPRINGS, ARKANSAS ON MAY 1, 1999 WITH MULTIPLE LOSS OF LIFE

11. It is recommended that the Commandant of the Coast Guard re-emphasize the need for MSOs to have complete inspection files, including worklists and a MSIS Marine Safety Deficiency Summary containing all deficiencies found.

12. It is recommended that the Commandant of the Coast Guard consider engaging the Quality Assurance Staff, G-MO-1, to evaluate consistency among MSOs in DUKW inspection and provide training when needed.

13. It is recommended that the Commandant of the Coast Guard encourage OCMIs to re-evaluate the need for requiring more than one person in the crew of inspected vessels where a member of the crew is engaged in service as a tour guide. This is especially true on vessels where the operating station is forward of the passengers.

14. It is recommended that a copy of this report be provided to all states with state regulated DUKWs used in commercial passenger service and all state boating law administrators.

15. It is recommended that each OCMI be provided with a copy of this report.

16. It is recommended that the National Transportation Safety Board be provided a copy of this report.

17. It is recommended that this casualty investigation be closed.

[redacted]
G. W. ANDERSON,
Captain, U. S. Coast Guard
Chairman

[redacted]
RICHARD. M. KASER
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Member

[redacted]
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Member and Recorder