National Transportation Safety Board

Office of Marine Safety

Washington, D.C. 20594

Group Chairman's Factual Report

Operations Group

Stretch Duck 7

February 6, 2020

1. Accident information

Vessel: *Stretch Duck 7*

Accident Number*:* DCA18MM028

Date: July 19, 2018

Time: 19:08 Central Daylight Savings Time (GMT-5)

Location: Table Rock Lake, Stone County, Missouri
36° 35.236' N 093° 19.113' W

Accident type: Sinking with loss of life

Complement: 31 total (2 crew, 29 passengers)

2. Operations and Response Groups

Chairman: Marcel L. Muise, Office of Marine Safety
National Transportation Safety Board (NTSB)

Members: **Operations Group**
Mr. Les Ledet, U.S. Coast Guard
CWO [redacted], U.S. Coast Guard
Sergeant Travis Hitchcock, Missouri State Highway Patrol (MSHP)
Frank English, Ripley Entertainment Inc.

3. Accident summary

About 1908 local time on July 19, 2018, the 33-foot-long amphibious passenger vessel *Stretch Duck 7*, part of a fleet of vessels operated by Ride The Ducks Branson, sank during a storm, with heavy winds that developed rapidly on Table Rock Lake near Branson, Missouri. Of the 31 persons aboard, 17 fatalities resulted. Prior to the accident, the National Weather Service had issued a severe thunderstorm warning for the area advising of wind gusts of 60 mph. The manager-on-duty advised the captain and driver before departing the shoreside boarding facility to complete

the lake portion of the tour before the land tour (which normally occurred first) due to the approaching weather. About 5 minutes after the vessel entered the water, the leading edge of a "derecho" passed through the area generating reported 3- to 5-foot waves and strong winds, with the highest wind gust recorded at 73 mph. The captain changed course, shortening the usual tour around an island, and attempted to exit the lake. However, during the effort to reach land, the vessel took on water and foundered approximately 250 feet away from the exit ramp near the stern of the *Showboat Branson Belle*, a moored paddle wheeler. Personnel from several fire, emergency medical services, and law enforcement agencies, along with the paddle wheeler crew and passengers, rescued and triaged 14 passengers, seven of whom were transported to local hospitals. Loss of the vessel was estimated at $184,000.

4. Investigation

The Operations Group interviewed thirteen individuals over seven days. These included Ride the Ducks of Branson (RTD) captains, deckhands, and management. The group studied the DVR records for *Stretch Duck 17, Stretch Duck 27,* and *Stretch Duck 54* and visited the Ride the Ducks facility (the duck dock) in Branson.[1] MSHP shared interviews they conducted with survivors and the *Stretch Duck 7* captain immediately after the incident and provided area familiarization by water. The *Showboat Branson Belle* provided access to their facility and vessel.

Investigators also examined the *Stretch Duck 7* after it was recovered from the lakebed. This included, among other things, witnessing a drop test of the still intact starboard side curtain, bilge pump tests, and stem to stern assessment of the *Stretch Duck 7* with party members.

5. Background

5.1 General

Stretch Duck 7, an amphibious, 6-wheel drive vehicle, was built in 1944 by General Motors Corporation for the U.S. Government. The hull construction was of welded steel with 14-gauge side shell, 12-gauge bottom plating, and 10-gauge bow. The vessel was acquired by Ozark Scenic Tours Inc. in 1982 and was modified in 1996 by increasing the overall length by 15 inches, moving

[1] RTDI in this report refers Ride the Ducks International LLC. RTD refers to the owner/operator of *Stretch Duck 7*, Branson Duck Vehicles, LLC and Ripley Entertainment Inc. (dba Ride the Ducks). Ripley Entertainment, dba Ride the Ducks was listed as both the owner and operator on the vessel's certificate of inspection while RTDI was listed on the state registration.

the captain's station forward for better visibility, and adding buoyancy. The stern was also lowered to flush deck level requiring modification to the entry door at the stern. The vessel was inspected by the Coast Guard as a small passenger vessel (46 CFR Subchapter T) and shoreside operation was regulated by the Federal Motor Carrier Safety Administration (FMCSA).[2]

5.2 Vessel particulars

Vessel Name	***Stretch Duck 7***
Owner/Operator	Ripley Entertainment Inc. dba Ride the Ducks
Flag	United States
Type	Small passenger vessel
Built	1944
Official number	248292
State registration	MO 4463BK
Construction	Welded steel
AVM Hull number	35311427
Operator DOT number	609062
Draft	5 feet 2.375 inches
Length	33 feet
Engine	Chevrolet 427 gasoline
Horsepower	235
Beam	8 feet
Gross tonnage	4
Displacement	8 long tons

5.3 Operations

5.3.1 DUKW

Ride the Ducks International, LLC (RTDI) started converting and operating former military amphibious vessels for the tourism industry in 1971. These vehicles were built by General Motors Corporation for the U.S. Army between 1942 and 1945, based on a 2 ½ ton, six-wheel

[2] FMCSA, an agency of the U.S. Department of Transportation, regulates commercial carriers including trucking and bus operations.

drive truck chassis, drive train, and engine. Over 21,500 of these vehicles were manufactured, commonly referred to by their GMC designation, DUKW, pronounced "Duck."[3]

As part of RTDI's conversion, the majority of the vessel's hull and its systems were replaced including drive train, suspension, tires, wheels, axles, and wiring. The drives were converted from 6-wheel to 4-wheel. Many of these vessels were stretched in the 1990's and 2000's. The captain's station was moved forward 18 inches, 15 inches of length was added amidships, the hull was deepened in the stern area, and the stern was lowered to flush deck level. These modifications improved maneuverability and visibility for the driver, increased reserve buoyancy, and reduced trim according to an RTD manager. Vessels modified in this manner were known as "Stretch Ducks" and the original design before stretching were referred to as "Fleet Ducks." Later models of stretched ducks, known locally as "Master Jigs", were updated with completely new hulls, increased beam, and higher gunwales.[4] A total of 56 Fleet Ducks were updated and converted to Stretch Ducks or Master Jig Ducks, in the time period from 1996 to 2005 by Amphibious Vessel Manufacturers (AVM). About 2005, AVM commenced building a newer version of the amphibious vessel known as "Truck Ducks". These were completely new vessels with no original DUKW parts, built on an M35, 2 ½ ton truck chassis.[5] Chance Rides in Wichita took over this business from AVM in 2008 and built Truck Ducks until 2014.

The original DUKW design included a high capacity bilge pump, driven by a chain off the tail shaft, known as a "Higgins Pump." With a capacity of about 250 gallons per minute (gpm), when the engine and propeller are engaged at full throttle, the pumps were designed to ensure the DUKW's survivability in three-foot seas or surf and 15 mph winds according to NVIC 1-01.[6] Parts for Higgins Pumps eventually became increasingly difficult to obtain. To alleviate this problem, RTDI sought and obtained approval from the Coast Guard to remove the Higgins Pumps after enclosing all the through-hull penetrations in a single water tight sea chest.[7] Should a transmission shaft boot fail as it did in the *Miss Majestic* accident, only the sea chest would flood. A bilge alarm

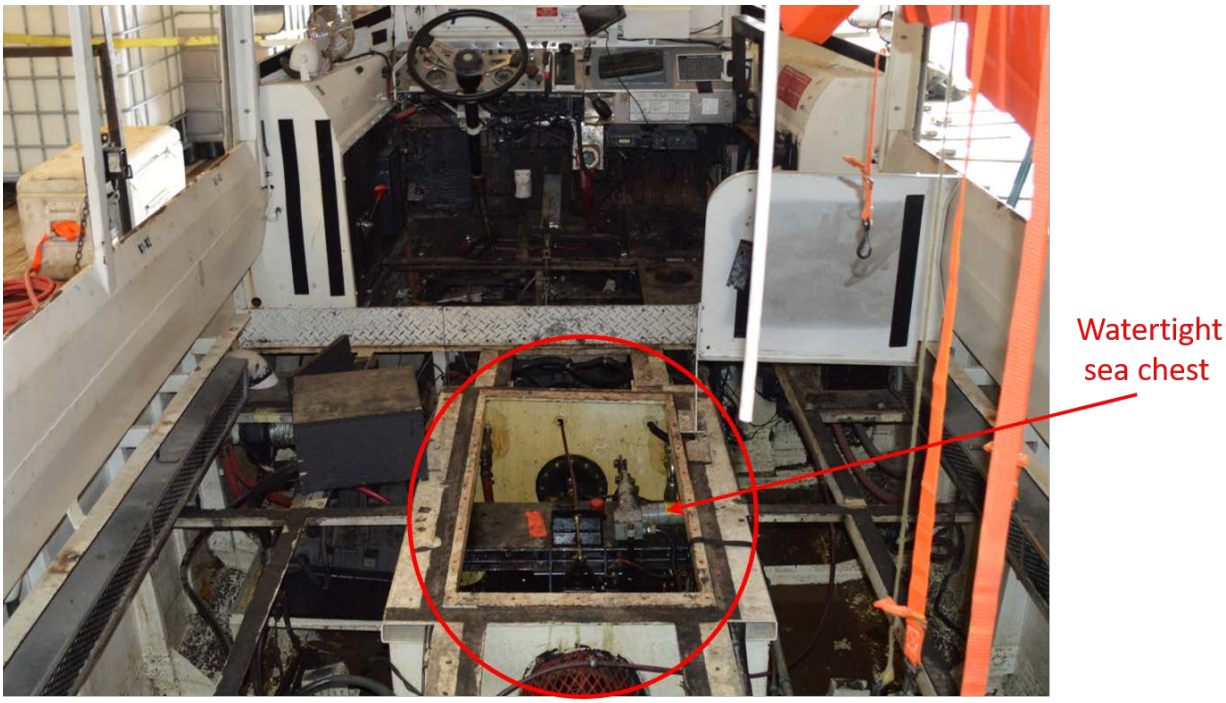
[3] The acronym DUKW came from General Motors Corporation nomenclature in which the "D" indicated the first year of manufacture (1942), the "U" indicated a utility amphibious vehicle, the "K" indicated all-wheel drive, and the "W" indicated two powered rear axles.
[4] *Stretch Duck 54* was a Master Jig Duck.
[5] The M35 is 6x6 2.5-ton medium duty truck. It replaced the WWII CCKW "Deuce and a half" for the U.S. military which the DUKW is also based on.
[6] See Section 8.4 of this report for discussion of NVIC 1-01.
[7] Sea chests on ships are larger penetrations in a ship's hull providing suction for systems such as cooling, fire, and ballast water instead of many smaller hull penetrations. The sea chest on a Stretch Duck is dry, enclosing hull penetrations for the two drive shafts, propeller shaft, and keel cooler.

was included inside the sea chest and three separate electric bilge pumps were installed in the bilges with a combined capacity of 100 gpm.

Although *Stretch Duck 7* was classified as an open boat with no subdivision, the bilge wells around the axle and shaft tunnel created separate spaces where bilge water could accumulate. These areas were the engine compartment forward of the front axle, the midship section, and each side of the shaft tunnel aft of the rear axle. Each of these four spaces as well as the sea chest were equipped with bilge alarms that provided audio and visual signals at the captain's station. Three bilge pumps, each rated for 2000-gph (33.3-gpm) were located in each of the rear spaces as well as the midship section, for a total rated capacity of 6000-gph (100-gpm). As set forth in 46 CFR Table 182.520(A), the minimum required bilge pumping capacity for a Coast Guard inspected small passenger vessel the same size as the *Stretch Duck 7* is 10 gpm. In general, because amphibious vehicles such as the *Stretch Duck 7* typically have more hull penetrations through which water can possibly ingress, the minimum requirement has been modified by the Coast Guard. Specifically, NVIC 1-01 states that sufficient bilge pumping capacity should be provided "which can offset uncontrolled flooding of the largest penetration in the hull…" As a general matter, for vessels like the *Stretch Duck 7*, for which the Coast Guard approved removal of the Higgins Pump and the installation of the watertight sea chest, the risk of progressive flooding through the hull penetrations was significantly reduced. Under the additional guidelines in NVIC 1-01, the minimum required total bilge pumping capacity for the *Stretch Duck 7* is approximately 52 gpm. With a combined rated pumping capacity of 100 gpm, the pumps on *Stretch Duck 7* exceeded the requirements by nearly a factor of 2. The Coast Guard approved this arrangement for the *Stretch Duck 7* by letter dated June 14, 2005. Additionally, moving all the penetrations to inside the sea chest met the NTSB recommendation of the *Miss Majestic* Marine Accident Report to "dewater the craft at the volume of the largest remaining penetration."

RTDI installed transparent plastic side curtains, which were electrically raised and lowered from the captain's station. Each side curtain could be released with the top dropping straight down the side of the vessel by individual operating handles. The port curtain could be released from a handle directly above the driver's seat near the top of the port side curtain, and the starboard curtain could be released from a corresponding location on the starboard side. The bottom of the curtains were held in place in brackets but could be manually removed from the track to hang free on the outside of the vessel. This configuration resulted from lessons learned from the *Miss Majestic's*

accident, in which the bottom of the curtains had been snapped in place. To improve passenger egress from the vessel, the stanchions supporting the canopy on the *Stretch Duck 7* were relocated by RTDI to line up with the seatbacks and not hamper evacuation over the side.



***Stretch Duck 7's* sea chest after the vessel's salvage. The sea chest is the watertight box on the centerline, indicated by the red circle and arrow. (Photo by MSHP)**

5.3.2 Ride the Ducks International LLC

RTDI was incorporated in 1971, providing duck boat tours in the Branson, Missouri area.[8] The company commenced stretching and building vessels about 1995 under their subsidiary, AVM, for RTDI franchises throughout the country and other independent operators. RTDI partnered with Herschend Family Entertainment in 2001 which became the sole owner in 2004.[9] Chris Herschend owned the company between 2012 and December 2017 until Ripley Entertainment Inc. bought the RTD operation in Branson. RTD operated separate from RTDI from that time until the time of the accident. Ripley did not make any major changes in RTD's management, personnel, policies or procedures after the purchase. Their fleet included 22 vessels at the time of the accident, 21 of which had valid Coast Guard Certificates of Inspection.

[8] The transcript of NTSB's December 1999 forum on amphibious vessels contains a detailed history of DUKW and RTDI.

[9] At the time of the accident, Herschend Family Entertainment also owned *Ride the Ducks Atlanta* and the *Showboat Branson Belle*.

5.3.3 U.S. Coast Guard documentation

The Coast Guard issued stability letters to small passenger vessels based on either an incline experiment or simplified stability test. The letter specified among other things, the approved route, the maximum persons allowed, and minimum freeboard. A Certificate of Inspection (COI) was issued to each vessel after the vessel has been inspected and determined to be fit for route and service by the local Officer in Charge, Marine Inspection (OCMI).

The Coast Guard issued a stability letter on March 19, 2009 for *Stretch Duck 7*. The letter was based on a February 2007 incline experiment on *Stretch Duck 1* and complied with the new weight allowance of 185 lbs. per person.[10] The previous letter was based on a 1996 simplified stability test and 160 lbs. per person calculation. The stability letter permitted operation on Protected Waters with a maximum 40 people onboard (including 38 passengers), a maximum sea of 2.5 feet, and maximum vessel speed of 6.9 knots.[11] Maximum draft at the stern was 5 feet, 2.375 inches. DUKW were considered "open boats" for the purpose of Coast Guard regulations.[12]

Stretch Duck 7's COI listed operating conditions including:

> **"The vessel shall not be operated waterborne when winds exceed thirty-five (35) miles per hour, and/or the wave height exceeds two (2) feet."** Also, among other restrictions was **"This vessel shall maintain a minimum of twelve (12) inches of freeboard from the waterline to the bilge discharge."**

The 2.5-foot wave height restriction in the vessel's 2009 stability letter was based on the Coast Guard's assessment of structural considerations, rather than stability and watertight integrity of the vessel. Until February 2018, the *Stretch Duck 7*'s COI did not include a wave height restriction, but instead included a general prohibition that the vessel should not be operated waterborne "when a potential for downflooding exists due to waves." In February 2017, the local

[10] The Assumed Average Weight Per Person (AAWPP) was increased from 160 pounds to 185 in 2010. See Federal Register (FR) 73, no. 236 (December 8, 2008): 78064.
[11] "*Protected waters* means sheltered waters presenting no special hazards such as most rivers, harbors, lakes, etc. See Title 46 CFR 170.050(j).
[12] "*Open boat* means a vessel not protected from entry of water by means of a complete weathertight deck, or by a combination of a partial weathertight deck and superstructure that is structurally suitable for the waters upon which the vessel operates." See Title 46 CFR 175.400.

Coast Guard inspection office issued a new COI with the operational wave height restriction of 2.0-feet noted above.

5.4 *Stretch Duck 7* crew

Stretch Duck 7's COI allowed for 38 people onboard including the captain. An additional crewmember was required at night, when operating on Lake Taneycomo. RTD employed drivers, providing they held a commercial driver's license (CDL), who operated the vehicle during the land portion of the tour. This allowed the captain to narrate the tour rather than drive on roads at the same time. The deckhand/driver that was aboard *Stretch Duck 7* on the accident voyage last renewed his CDL on September 18, 2015. The license was valid for three years and was valid at the time of the accident.

The captain held a Coast Guard Merchant Mariner's Credential (MMC) endorsed as "master of steam or motor vessels of not more than 100 gross registered tons (Domestic Tonnage) above mile 225 on the White River and impoundments in Missouri and Arkansas." His license was renewed in January 2018, was valid for five years, and was valid at the time of the accident. He tested for and received his first license, Master 100 Gross Tons, at the Coast Guard Regional Exam Center in St. Louis, Missouri in 1993, prior to being employed by RTD as a captain in 2001. RTD later created an in-house approved course and test that qualified prospective captains for an MMC.

The *Stretch Duck 7* captain was also employed as a trainer for drivers. Other captains, drivers, and trainers in interviews consistently expressed high regard for his competency and safety awareness. One captain/trainer stated, "he would be the best, most experienced guy that we have. If there's somebody else, I don't know who it would be. This is what (the *Stretch Duck 7 captain's)* done for his life over 20 years. He's a very technical guy. That's part of why they have him, I guess, training CDL drivers. Know how to take this Duck, how to -- don't push the gas pedal that way or whatever. I mean, he used to, he used to build Ducks, worked in the shop, I understand some years ago. A very, very knowledgeable guy."[13] Another trainer shared, "I think he's very professional. I think he's very safety conscious as far as his -- he's been on the water for years. He was at the pirate cruise we used to have on Lake Taneycomo, which was probably the first and maybe the oldest entertainment type thing that we had here as far as boating goes. He was a captain on the

[13] Hoot, Captain Ronald, interview by Operations Group, July 25, 2018.

Polynesian Princess, which was a boat very similar to the one that's down here. He was a good captain."[14]

Training records provided by RTD include several competency assessments for the *Stretch Duck 7's* captain. The records include satisfactory annual check rides and testing for familiarity with various company policy and procedures. Emergency procedures included man overboard, fires, mechanical breakdown, and severe weather on land among other contingencies.

RTD used a consortium to meet the pre-employment and random drug testing requirements of Title 46 CFR Part 16. The *Stretch Duck 7* captain's last test was completed on February 5, 2018. Post-accident specimens were sent to the Federal Aviation Administration's Civil Aerospace Medical Institute (CAMI) for testing for both driver and captain. The results of those tests were negative for illicit drugs and alcohol as well as for inhibiting prescription and over-the-counter medications.[15]

5.4 Safety Management

NVIC 1-01 recommended that owner/operators include four elements in their operations manual, "incorporating training standards, maintenance standards, operational standards and emergency response plans." RTD's management system included policy and procedures contained in manuals originally provided by RTDI to meet these guidelines. Stop work authority, document control, audits, monthly safety meetings, and competency assurance were also elements included in their system. The RTD Operations Manual authorized random audits targeting cleanliness, maintenance, safety, compliance, and documentation.

Document control was accomplished using a RTDI intranet site referred to as "Duck Central". The site was accessible to former RTDI franchisees and other vehicle customers including RTD. The site consisted of company manuals, approved drawings, vessel service bulletins, announcements, and discussions.

RTD personnel interviewed after the accident described their familiarity with the company's policies and procedures. Senior captains that were also trainers all stated they taught to the 2012 Operations Manual in initial and annual training. Topics were chosen additionally for

[14] Davidson, Captain John, interview by Operations Group, July 25, 2018.
[15] Testing included more than 1300 substances, see http://jag.cami.jccbi.gov/toxicology/default.asp?offset=0 for a complete listing.

discussion in monthly meetings. All RTD captains had read the manual and most stated they were familiar with it. A driver stated he reviewed it annually and was quizzed on it and another driver who had just completed a captain's license examination told investigators she had studied the manual "a lot." Other captains interviewed however had only read it once or had not looked at it in years. One driver, who was not a captain, stated he had not read it and another former driver had not reviewed it in three years since assuming a shoreside management position."

RTDI encouraged local operations to develop their own procedures and submit for approval to include additional training, tour routes, communications, and emergency response. Additional Branson-specific information was published in a 2017 Safety Procedure Manual. This document addressed higher level safety topics including identifying safety critical positions, maintenance by position, and drug testing, among other subjects.

5.4.1 Training

At the time of the accident, RTD had a Coast Guard-approved course to license new captains. The approved course included training units on emergency procedures and understanding of COI restrictions. The approved course curriculum included approximately 278 hours of instruction, which included 124 hours of classroom training and 154 hours of practical and on-water training. The curriculum included performance and enabling objectives for a variety of topics, with approximately 89 hours of the course dedicated to water emergency and other related on-water training. The entire course took place over a period of approximately 8 weeks. Included in this training was basic weather and meteorology for mariners, including specific training on recognizing approaching storms, and observing waves, wind and current. 46 CFR 11.910 specifies examination subjects for deck officer endorsements. Among these is "Weather charts and reports" which is required for all candidates except those on Rivers routes. Additional RTD's approved course material includes traditional marine weather warnings such as small craft advisories and gale warning. Completion of the approved course and exam qualified employees to apply for a "USCG Limited captain's" license from the Coast Guard, without taking any additional Coast Guard examination. In order to qualify for the license, the individual must also successfully complete a separate boating safety course, obtain a first aid and CPR certification, and pass a physical and drug tests, among other requirements. Once these requirements were satisfied and proper documentation submitted to the Coast Guard, the Coast Guard would issue the captain's license." As of November 14th, 2018, RTD's approval from the Coast Guard read as follows:

"Any applicant who has successfully completed your Limited Master (RITDKB-254) course and presents your Certificate of Training within one year of the

completion of training will satisfy the service requirements of 46 CFR 11.456(a), and the examination requirements of 46 CFR 11.456(c) for original issuance, renewal, or reissuance of a credential as Limited Master of Vessels of less than 25 Gross Registered Tons Limited to Amphibious Vehicles (DUKWS) upon the White River Impoundments in Missouri and Arkansas. Applicants are required to present evidence of completing 50 round trips on each of the routes described above; meet the safe boating course requirements of 46 CFR 11.456(b); and the First Aid and CPR certification requirements of 46 CFR 11.456(d). This does not authorize a Raise in Grade (RIG) or increase in scope without OCMI approval."[16]

Drivers received condensed training relative to new captains. RTD trainers and drivers interviewed stated new deckhands received emergency training, including jettisoning the side curtains. As an experienced master, *Stretch Duck 7's* captain conducted the waterborne emergency training for drivers. The Coast Guard provided guidance for minimum training for deckhands on small passenger vessels in NVIC 1-91. At the time of the accident, the Coast Guard did not however issue MMC's to deckhands and therefore did not approve the training they received. RTD implemented a duck-specific training curriculum and program for its drivers. The training curriculum included training of drivers to assist in most of the on-water emergencies contained in the guideline of NVIC 1-91, including emergencies involving severe weather and abandon ship

RTDI's 2017 Authorized Operator Manual contained the training program for both new employees and annual refresher training for existing employees. All operators were required to partake in an annual check ride and participate in quarterly drills, which typically took about six to eight hours.

5.4.2 Maintenance

Maintenance procedures included pre-and post-inspection checklists for drivers and captains, and post-trip inspection checklists for maintenance crews. Annual Department of Transportation (DOT) inspections and 250-road hour maintenance was also prescribed.

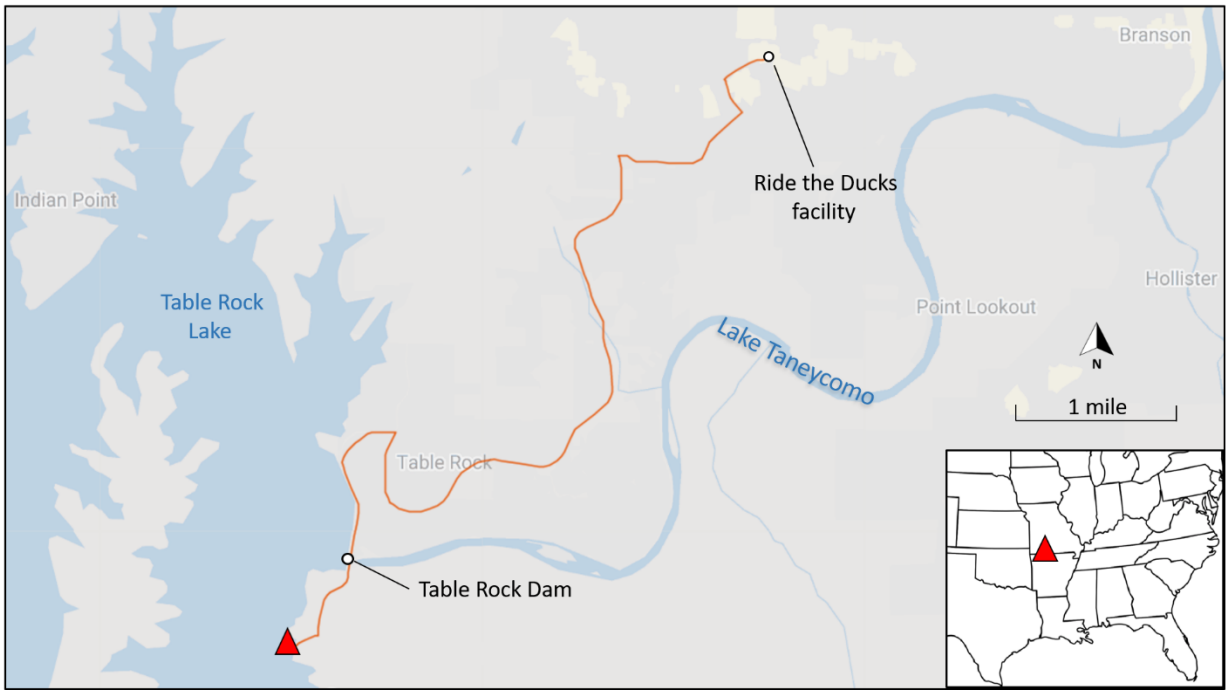
[16] U.S Coast Guard, National Maritime Center. Retrieved on November 19, 2018 from https://www.dco.uscg.mil/Portals/9/NMC/pdfs/courses/courses.pdf

Preventative and corrective maintenance was documented in Asset Works, a computerized maintenance system.

The vessel was examined after its salvage. Investigators noted a missing lifering light. No other regulatory or NVIC 1-01 deficiencies were noted. Investigators also obtained company required checksheets and computer records for the *Stretch Duck 7* for 2018 and found them completed for every day of operation. Deficiencies logged by crews were addressed. The post-trip checksheets had a section for maintenance staff feedback. *Stretch Duck 7's* 2018 records included adjusting turn signal levers, mirrors, and engine timing and repairing a public address switch, earlier in the season.

5.4.3 Operations

RTD typically took passengers on an approximate 90-minute tour from the Branson "duck dock" via Highway 76 across Table Rock Dam to Baird Mountain, then to Table Rock Lake and back to Branson. The underway (waterborne) portion of the trip took 15 to 20 minutes. Crews and boats completed up to five trips daily. Several managers rotated as the Manager on Duty (MOD) at the duck dock, managing the dispatch of the amphibious vessels.



Vicinity of Branson, Missouri. The orange track is the route taken on the accident voyage and the red triangle indicates the location of the incident. Table Rock Lake and Lake Taneycomo were both created by dams on the White River.

The MOD monitored the weather via "StreamerRT", an online subscription service from "EarthNetworks", as well as anemometers located at the Branson airport and aboard the *Showboat Branson Belle* facility on Table Rock Lake. The weather was available to crews at the duck dock on a 50-inch monitor in their break room. It was not abnormal to complete the water portion of a tour first when weather was expected although vessel crews did not make that decision on their own. The company had however postponed trips earlier in the week due to thunderstorms according to the general manager.[17] One driver recalled a captain calling the MOD for updates after experiencing heavy weather on Baird Mountain to seek guidance on whether to cancel the water portion or wait for the weather to clear.[18]

The 2012 RTDI Operations Manual discussed weather several times. The "Operating Procedures" section recommends local franchises develop procedures to ensure daily information including weather is communicated to vessel crews. The "Water Procedures" section specifically states, among other things, "Company policy is to forego water entry if… Severe weather is approaching the area."

The MOD communicated with the vessels and with ticketing personnel on separate channels. *Stretch Duck 7* was equipped with a single radio that could be used to communicate on VHF marine channels (e.g. 13 and 16) or could be switched to VHF repeater channels. The duck boats used the VHF repeater channels while on the road portion so the tour. This system enabled the company employees at the duck dock to call duck boats individually using a designated number and vice versa. The designated frequency did not permit other duck boats to communicate among each other or hear radio communications between another duck boat and the duck dock.

During the water portion of the tour, the captain typically switched the radio to a marine band VHF channel. This enabled the captains to call and communicate with any concerned marine traffic prior to entering the water. It also enabled them to communicate with any vessel while conducting the water borne portion of the tour. While utilizing the marine channel, duck boats were not able to communicate with the duck dock by radio. Once out of the water the vessel crews had to manually switch the radio back to the designated frequency repeater channel to communicate with land-based personnel.

[17] Stretch Duck 27 Captain trainee, interview by Operations Group, July 22, 2018, Branson, Missouri.
[18] Ibid

Before entering the water, the captains typically switched the radio to marine band VHF channel 13. This enabled the captains to conduct a securité call, to communicate with any concerned marine traffic, and to alert other vessels in the area prior to entering the water. Just after entering the water, the captain would switch the radio to scan mode, which would allow the captain to monitor channels 13, 16, 72, 6, and to receive incoming calls from the duck dock on the repeater channel. The radio remained in scan mode during the entire voyage. While in the scan mode, the radio would receive any incoming communications from the duck dock, and other vessels communicating on the marine channels. Under this system, if the captain picked up the radio to transmit an outgoing communication, the radio would automatically be dialed into the company repeater, and that outgoing communication would be transmitted to land-based personnel at the duck dock. To communicate with another vessel by marine channel while on the water, the captain would have to affirmatively remove the radio from scan mode and dial it into the desired marine channel. Once the duck was out of the water, the vessel crews manually switch the radio out of scan mode, and back to the designated repeater channel to communicate with land-based personnel only.

Regarding safety briefs, RTDI had a script for the crews to recite during the tour. Crews and managers that were interviewed explained that on rare occasions, passengers would request to wear PFDs on the water. Type II infant lifejackets were added in February 2011 with Coast Guard approval. Title 46 CFR 185.506 prescribes minimum content for these passenger safety orientations. NVIC 1-01 contains additional duck boat specific lime items. RTD's brief included the location of egress points and lifesaving equipment, a demonstration of donning life jackets and informing them "that all passengers will be required to don life jackets when possible hazardous conditions exist, as directed by the master."

The center seat in the last row of passenger seating was the only seat equipped with a seat belt to prevent passengers from being thrown forward in the aisle when entering the water. The driver and narrator seat had seat belts as well. [19]

[19] These seats were empty on the *Stretch Duck 7*. The NTSB recommended to the USCG, RTDI, and Passenger Vessel Association (PVA) ensure occupants are not wearing seat belts while underway, following the 2015 *Duck 6* highway collision in Seattle. The PVA is the national trade association for US-flag passenger vessels of all types, including APVs.

5.4.4 Emergency response

RTD had procedures for abandonment, curtain release, bilge alarm, and severe weather among other critical tasks. The Operations Manual, dated 2012, also described procedures for land and waterborne emergencies. These included collision, medical issues, mechanical failure, fires, alarms, abandonment, and severe weather.

When a duck boat departed the duck dock, a passenger headcount, including infants, was written on the Branson Jock Trip Sheet, and listed onboard the vessel on an erasable board in the captain's station."[20] Staff documented the headcount as 31 on the *Stretch Duck 7's* accident voyage. Donning PFDs, raising the side curtains, and immediately heading for shore were prescribed mitigation steps for both bilge alarms and severe weather.

RTD personnel and first responders could not recall participating in mass rescue exercises together, although SSCFPD stated they had practiced transferring patients on the water from the *Showboat Branson Belle.*

5.5 Waterway

Table Rock Lake is an over 40,000-acre lake in southwest Missouri. It was created by the completion of Table Rock Dam on the White River in 1958. The dam is eight miles upriver of the City of Branson.[21] RTD's duck boats entered and exited the water during the 2018 season from boat ramps at the *Showboat Branson Belle's* facility on Table Rock Lake. The vessels typically entered at the south ramp, rounded a small island 1000 feet offshore known locally as "Duck Island", and exited the water at the north ramp. The lake's bottom drops off quickly from the shore in this area.

6. Accident narrative

The captain and driver aboard *Stretch Duck 7* on July 19th, were commonly assigned to this same vessel. On the day of the accident, they completed the pre-trip inspection together in the morning and noted no deficiencies. They made four trips with *Stretch Duck 7* between 1000 and 1600 each with between 22 and 32 passengers.

[20] Counting only tickets sold was an issue in the *Miss Majestic* response as there was an infant onboard with no ticket.
[21] U.S. Army Corps of Engineers. Retrieved November 16, 2018 from https://www.swl.usace.army.mil/Missions/Recreation/Lakes/Table-Rock-Lake/Dam-and-Lake-Information/.

At 1120 the NWS' Storm Prediction Center issued a Severe Thunderstorm Watch for the area, valid until 2100. S*tretch Duck 26* left the duck dock with 30 passengers at 1730, followed by *Stretch Duck 27* and *Stretch Duck 17* at 1800 with 34 and 26 passengers respectively. RTD's General Manager was the captain and driver of *Stretch Duck 27*, accompanying a narrator/captain trainee, and stated in an interview he was aware that a severe thunderstorm watch was in effect. In a post-accident interview, the captain of *Stretch Duck 17* told investigators he stopped atop Baird Mountain, looked in the direction the storm was expected from, and saw nothing. Only later after rounding Duck Island, he saw a disturbance in the water in the distance which at first, he thought were boats. He indicated that the sky was still clear at this time.

Stretch Duck 7 loaded for its fifth and final trip of the day at 1830.[22] At 1832 the NWS Weather Forecast Office issued a Severe Thunderstorm Warning. The captain made a verbal reference to the driver about the weather radar upon boarding. The operations supervisor was the MOD that afternoon. He attended the vessel during the passenger loading and advised the captain to conduct the water portion of the tour first due to weather. One passenger told investigators that staff had told him before boarding that the water portion would be first, as they were expecting weather. The passengers loaded from the port aft door and filled the front seats first. Upon departing the facility, the captain conducted a safety brief for the landside transit that included a reminder that no smoking was allowed, described methods for egress, and told passengers to keep their hands inside the vehicle among other things. The driver proceeded along the route while the captain narrated the tour en route to the lake.

Just before entering the lake, the captain of *Stretch Duck 26* was unable to engage the propeller shaft and stopped its tour at the boat launch. The crew and passengers waited there for a replacement (*Stretch Duck 54),* while *Stretch Duck 27* and *Stretch Duck 17* started their water tours ahead of them. *Stretch Duck 7* arrived at the launch about 1850 just prior to *Stretch Duck 54* entering the water (with the passengers from Stretch Duck 26). In a post-accident interview, the captain of *Stretch Duck 54* described the lake as "just like a little pond. I mean, glass. It was just crystal clear. The water was perfect." *Stretch Duck 54's* driver likewise described entering the water as"…the weather was good. The water was calm. It was even glassy. I remember looking

[22] Prior to the 2018 season, the last scheduled daily trip was at 1800.

back after we put in and you could actually see the reflection of the trees in the water. I had never seen this lake that calm before."[23]

The captain of *Stretch Duck 7* gave another safety brief at the south ramp that included the location of the various PFDs, egress points, and location of the life rings. He donned a PFD to demonstrate for the passengers. He then took the driver's seat at the captain's station and the driver sat directly behind him, on the port side.

Duck entrance ramp, south of *Showboat Branson Belle*. Picture taken days after the accident.

Stretch Duck 7 entered the water about 1855 under a clear sky and in calm water. The captain proceeded on his tour, allowing younger passengers in turn to take the helm. Although *Stretch Duck 27* and *Stretch Duck 17* had rounded Duck Island to the west, the captain of *Stretch Duck 54*, recognizing an approaching squall line to the north, chose to cut the trip short at about

[23] Stretch Duck 54 Captain, interview by Operations Group, July 22, 2018, Branson, Missouri.

1900 and proceeded toward the exit ramp. In post-accident viewing of the vessel's onboard digital video recording system, white caps were seen at 19:00:35. They did not call the duck dock or other duck boats regarding the storm. *Stretch Duck 7* took an even more direct route, not venturing out as far into the lake as the *Stretch Duck 54*, the captain taking the helm back at about 1900. Winds and waves increased, and both *Stretch Duck 54* and *Stretch Duck 7* lowered their side curtains. *Stretch Duck 27* and *Stretch Duck 17* exited the water before the storm arrived, then lowered their curtains. *Stretch Duck 27*'s passengers noticed lightning and the driver observed a "dark cloud over to the west-northwest" while exiting. *Stretch Duck 27* experienced high winds after departing the lake on the return trip to the facility as they reached the dam. Their narrator witnessed a jet ski operator get thrown into the water.[24] *Stretch Duck 17*'s captain pulled off the road at the Dewey Short Visitor Center instead of crossing the dam in high winds.

The *Showboat Branson Belle,* moored at the vessel's home facility on Table Rock Lake, had started boarding passengers at 1850 for their scheduled 2000 sailing. The relief captain stated the winds increased from 5 - 6 mph to over 50 mph, in about 90 seconds. The showboat had doubled up on mooring lines after their last voyage, anticipating weather. The strong wind and swell however, directly on the stern, caused the vessel to surge and pin their gangway in place. The crew of the showboat stopped boarding passengers and operated astern propulsion to free the gangway and disconnect the utility shore ties.[25] They also had to use their fore and aft tunnel thrusters at between 50% and 75% power to thrust towards shore to keep the vessel in position alongside the dock.

According to video recordings, bilge alarms sounded on both *Stretch Duck 54* and *Stretch Duck 7* at about 1904 as they proceeded towards the north exit ramp. The alarm lights located on the dashboards, indicating which alarms were active, were not visible on the videos and investigators were unable to determine which sections of the bilge were accumulating water at this time. The *Showboat Branson Belle's* paddle wheels were recorded operating in astern direction (reverse) on the *Stretch Duck 54*'s camera at 1906 as they came abeam the paddle wheeler's stern.[26] *Stretch Duck 54*'s captain made radio contact with the crew on the showboat's bridge. The relief

[24] The jet ski was among several incidents fielded by Stone County 911 operators.
[25] The *Showboat Branson Belle* had two captains who alternated trips on the vessel. The captain for the next voyage was ashore in his office preparing for the next sailing. He asked the other captain, referred to here as the relief captain to check on the vessel as the weather approached. An extra senior deckhand if aboard is referred to as the mate.
[26] RTDI installed cameras on the vehicles at the Branson location in early September 2015.

captain on the bridge of the showboat replied that they were not getting underway and just running astern propulsion to maintain their position. *Stretch Duck 54* passed astern of the showboat and exited the water about 1907. The showboat's anemometer peaked at 73 mph about this time.

The north exit ramp, seen from the vicinity of the sinking after the accident

The *Stretch Duck 7* following behind and slightly west of *Stretch Duck 54* pitched into the wind and waves. At 19:02:09 the captain closed the hood on the bow engine compartment and turned to starboard towards the exit ramp, around the stern of the showboat which positioned the weather on the port bow of the duck boat. Investigators later found the two side engine compartment exhaust vents open. The captain was heard ordering passengers to move to one side of the vessel and was seen pointing to the port side seconds before the video ended.[27] The starboard quarter first dipped below the water's surface on a witness video. A *Showboat Branson Belle* crewmember described the sinking to investigators, "…it took maybe ten seconds until it was

[27] The DVR hardware including SD card and hard drive were mounted under a port forward passenger seat.

under. And it looked like, as soon as it flooded on that starboard side just a little bit, it all went to the stern and then it kind of went down like that, right? So it went down with the bow out of the water. It wasn't at, like, a big angle."[28]

7. Regulatory background

7.1 General

At the time of the accident, small passenger vessels in the United States were regulated primarily by the Coast Guard. This regulatory oversight included annual inspections, 5-year hull exams (dry docking), vessel plan review, stability testing, and licensing of the crew. Amphibious vessels such as *Stretch Duck 7* were also regulated by the National Highway Traffic Safety Administration (NHTSA) and Federal Motor Carrier Safety Administration (FMCSA).

7.2 U.S. Coast Guard

7.2.1 Statutory and regulatory

Congress first granted authority for inspection and certification of U.S. flag domestic small passenger vessels in the Small Passenger Vessel Act of 1956 following, among others, the capsize of the *Pelican* in 1951 with the loss of 45 lives.[29] The law has been amended several times with the most recent major revision in 1993.

Title 46 CFR Subchapter T is applicable to vessels less than 100 gross tons carrying six or more but less than 150 passengers, if at least one is for hire.[30] These regulations were first promulgated in 1957 with major revisions in 1963 and 1996. The last major revision of this Subchapter followed the passage of the Passenger Vessel Safety Act of 1993.[31] The Coast Guard issued guidance specifically for the inspection and certification of amphibious vessels following the *Miss Majestic* accident though no relevant changes to Subchapter T were introduced.

The regulations were written to give local OCMI discretion and flexibility due to the great variety of vessel routes, size, construction material, and service nationwide. The Coast Guard issued the COI valid for five years after an inspection of the vessel. An annual inspection of the

[28] Spain, Garrett, *Showboat Branson Belle* deckhand, interview by Response Group, July 21, 2018, Branson, Missouri.
[29] See Public Law 84-519
[30] Subchapter T was split in 1997 creating Subchapter K for small passenger vessels carrying over 150 passengers or over 40 overnight passengers.
[31] The Passenger Vessel Safety Act was included as Title V of the Coast Guard Authorization Act of 1993, See Public Law 103-206

vessel and equipment along with 5-year hull exams (drydock exams) were required to maintain the certificate.

Coast Guard Sector Upper Mississippi inspectors, by routine, attended RTD vessels in Branson during the winter overhaul. Prior to these inspections, RTD would strip the vessel of seats and deck plates to provide inspectors access to the hull, machinery, and through-hull penetrations. Inspectors conducted sea trials with maintenance personnel on each boat in this condition to verify watertight integrity and machinery operations. The vessels were then outfitted for the season and checked by inspectors on a return visit. Coast Guard inspectors also witnessed emergency drills during this return visit. Each vessel was credited with a biennial hull exam if due, because the scope of a hull exam was covered annually for amphibious vessels which need no dry docking.

Investigators reviewed Coast Guard inspection records for the *Stretch Duck 7* for six years before the accident. Marine inspectors during the December 2014 annual exam issued two deficiencies.[32] One of these was a small hole in the hull in the starboard forward wheel well, later attributed to a maintenance error. The second was related to the Lovett 1200 bilge pumps carried on board. The inspector discovered less than adequate pump discharge volumes. The bilge pumps were subsequently replaced with Rule 2000 pumps, and discharge piping was replaced to meet the required volumes. The same year, the keel cooler hull penetrations were moved to inside the sea chest, as required when the Higgins Pumps that the vessel was originally outfitted with, were removed.[33] These were the only documented deficiencies since 2012 and were cleared before the operating season.

Stretch Duck 7's COI was renewed in January 2017 and the vessel credited with a hull exam. Coast Guard inspectors again attended the vessel in November 2017 and credited the vessel with an annual inspection. The last documented attendance was in February 2018 to inspect the relocation of the headlights.

[32] Two observations were documented in this inspection regarding cracked navigation light lens and engine compartment louvre latches. Both were corrected during the inspection.
[33] See MSC Approval Letter E1-0504811.

Stretch Duck 7's COI did not require a deckhand although some other OCMI's around the nation may require this.[34]

7.2.2 Other guidance

The Coast Guard published NVIC 1-01 in December 2000 following the loss of the *Miss Majestic*. The Coast Guard Marine Board of Investigation had recommended that the Coast Guard and industry together document best practices and guidelines for inspection and operation of these vessels. The circular detailed hazards unique to duck boats and made recommendations to industry and marine inspectors on how to best apply the regulations. The NVIC was written for the most part specifically for DUKW vessels although industry and inspectors do apply its guidance to other amphibious vessels.[35]

The NVIC recommends among other things, four bilge pumps, extra bilge alarms, an operations manual, route restrictions, and detailed inspection of through hull penetrations. It discussed stability, egress, and manning as well. It also included a part by part discussion of 46 CFR Subchapter T for DUKW specific compliance.

7.3 Highway

At the time of the accident, NHTSA regulated motor carriers under the National Traffic and Motor Vehicle Safety Act. Duck boats met the definition of a bus in Title 49 CFR 571.3(b). Manufacturers were required to submit to NHTSA data showing compliance with the Federal Motor Vehicle Safety Standards (FMVSS.)[36] On February 8, 2018, RDTI registered as a manufacturer.

Individual states, rather than NHTSA, were responsible for titling or registering motor vehicles and for regulating their operation on United States public roads. In 2000, RTD first registered the *Stretch Duck 7* with the state of Missouri. Duck boats in Missouri are registered as boats, are not inspected, and do not have license plates.

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[34] During the fatal highway accidents in 2015 in Seattle and 2016 in Boston, neither *Penelope Pru's* or *Duck 6* respectively, had deckhands onboard. The *Penelope Pru's* COI required a deckhand, but only outside of daylight hours. At the time of the 2010 fatal collision on the Delaware River, the *DUKW* 34 had a deckhand as required by its COI.

[35] See NTSB Recommendation M-02-4 issued after the *Miss Majestic* sinking.

[36] Title 49 CFR Parts 523–595, set forth the *FMVSSs* and how they are applied. Which *FMVSSs* apply to a particular vehicle depends on factors including the type of vehicle, date of manufacture, and intended use of the vehicle.

7.4 Previous accidents and recommendations

7.4.1 *Stretch Duck 7* history

Investigators reviewed the last six years of Coast Guard documentation for the *Stretch Duck 7*. In June 2015, the vessel lost propulsion on entry into the water with 34 passengers onboard. The casualty was attributed to the captain entering the water too quickly, creating a larger than normal splash, and resulting in water entering the engine intakes. The vessel moored safely, and no injuries resulted.[37]

7.4.2 Sinking of the *Miss Majestic*, 1999

On May 1, 1999, the amphibious passenger vehicle *Miss Majestic*, with an operator and 20 passengers on board, entered Lake Hamilton near Hot Springs, Arkansas, on a regular excursion tour. Shortly after entering the water, the vehicle listed to port and rapidly sank by the stern in 60 feet of water. One passenger escaped before the vehicle submerged but the remaining passengers and the operator were trapped by the vehicle's canopy roof and drawn under water. During the vehicle's descent to the bottom of the lake, 6 passengers and the operator were able to escape and, upon their reaching the water's surface, were rescued by pleasure boaters. The remaining 13 passengers, including 3 children, lost their lives.

The NTSB adopted five recommendations in its Marine Accident Report[38], four of which are classified “Closed-Unacceptable Action”. These include:

> **M-00-5: To operators and manufacturers/refurbishers of amphibious passenger vessels: Without delay, alter your amphibious passenger vessels to provide reserve buoyancy through passive means, such as watertight compartmentalization, built-in flotation, or equivalent measures, so that they will remain afloat and upright in the event of flooding, even when carrying a full complement of passengers and crew.**

This recommendation was made ahead of the release of the Marine Accident Report. Although the recommendation is classed overall as “Closed – Unacceptable Action – No Response Received”, 14 of 29 addressees did reply and are either “Closed – Acceptable Action” or “Closed – Acceptable Alternate Action.” The majority of those replying indicated that adding foam or

[37] See MISLE Case ID 729271.
[38] See MAR 16-01.

compartmentalization was impracticable. These included RTDI. The remainder are "Closed – Unacceptable Action – No Response Received" or "Closed – No Longer Applicable."[39]

M-02-1: To the States of New York and Wisconsin[40], as well as the U.S. Coast Guard: Require that amphibious passenger vehicle operators provide reserve buoyancy through passive means, such as watertight compartmentalization, built-in flotation, or equivalent measures, so that the vehicles will remain afloat and upright in the event of flooding, even when carrying a full complement of passengers and crew.

M-02-2: To the States of New York and Wisconsin, as well as the U.S. Coast Guard: Until such time that owners provide sufficient reserve buoyancy in their amphibious passenger vehicles so that they will remain upright and afloat in a fully flooded condition (by M-02-1), require the following:

(1) removal of canopies for waterborne operations or installation of a Coast Guard-approved canopy that does not restrict either horizontal or vertical escape by passengers in the event of sinking,

(2) reengineering of each amphibious vehicle to permanently close all unnecessary access plugs and to reduce all necessary through-hull penetrations to the minimum size necessary for operation,

(3) installation of independently powered electric bilge pumps that are capable of dewatering the craft at the volume of the largest remaining penetration to supplement either an operable Higgins pump or a dewatering pump of equivalent or greater capacity,

(4) installation of four independently powered bilge alarms,

(5) inspection of the vehicle in water after each time a through-hull penetration has been removed or uncovered,

[39] See https://www.ntsb.gov/safety/safety-recs/_layouts/ntsb.recsearch/Recommendation.aspx?Rec=M-00-005 for a list of those addressed by the recommendation.
[40] Recommendations were made to various states where DUKW operate as passenger vessels, in State waters, outside of the USCG's jurisdiction.

(6) verification of a vehicle's watertight condition in the water at the outset of each waterborne departure, and

(7) compliance with all remaining provisions of Navigation and Vessel Inspection Circular 1-01.

M-02-3: to the States of New York and Wisconsin, as well as the U.S. Coast Guard: Where canopies have been removed on amphibious passenger vehicles for which there is no adequate reserve buoyancy, require that all passengers don lifejackets before the onset of waterborne operations.

Recommendations M-02-1 through M-02-3 were issued to regulatory agencies. M-02-1 specifically is similar to M-00-5 that was previously addressed to manufacturers and operators. New York replied that the one duck boat operation there had ceased operating. Wisconsin has maintained that they lack the statutory authority to implement the recommendations.[41] The Coast Guard replied "We do not concur with this recommendation. Requirements for subdivision, damage stability and watertight integrity for small passenger vessels of less than 100 gross tons are given at Title 46, Code of Federal Regulations, Part 179 (46 CFR 179). There are no subdivision or damage stability requirements for vessels less than 65 feet in length carrying fewer than 50 passengers on protected waters. For amphibious vessels that present additional flooding, sinking and egress risks, guidance on attaining an equivalent level of safety has been promulgated through Navigation and Vessel Inspection Circular (NVIC) I-01 [sic]. An equivalent level of safety is required by 46 CFR 175.550. WC believe that sufficient requirements and guidance are in place to provide to amphibious passenger vessels a level of safety equivalent to other passenger vessels of similar size and capacity. We intend to take no further action on this recommendation and request that it be closed." Safety Recommendation M-02-1 was classified Closed Unacceptable Action

The Coast Guard replied to M-2-02 that it concurred with the intent of this recommendation and cited NVIC l-01 as its approach to the unique design and operational risks of APVs, which is to establish a level of safety equivalent to that of other small passenger vessels of similar size and service. The Coast Guard reemphasizes that APV safety is accomplished in part through a

[41] A RTDI franchise has since started operating on Georgia state waters.

combination of design requirements and operational restrictions, and risk management is incorporated by considering the entire vehicle and its equipment as a complete safety system. The Safety Board requested that the Coast Guard clarify to what extent the industry, operator by operator, was in compliance with all items in Safety Recommendation M-02-2, including the item that states, "compliance with all remaining provisions of NVIC 1-01." In doing so, the Safety Board emphasized the first item, which it believed to be safety critical, "[the] removal of canopies for waterborne operations or installation of a Coast Guard—approved canopy that does not restrict either horizontal or vertical escape by passengers in the event of sinking." Because the Coast Guard had only reiterated the position it has held since 2002 and has again stated that it will take no further action on this issue, Safety Recommendation M-02-2 was classified Closed Unacceptable Action.

M-02-4: To the U.S. Coast Guard: Develop and promulgate guidance for all amphibious passenger vehicles similar in purpose to the Navigation and Vessel Inspection Circular 1-01.

The Coast Guard replied that they concurred with this recommendation and that NVIC 1-01 contained supplemental information for other types of amphibious passenger vessels (APV's). The NTSB in 2007 categorized it as "Closed – Acceptable Action" as NVIC 1-01 had become the standard for inspection of APV's nationwide.

7.4.3 Collision of the *DUKW 34* and *Caribbean Sea, 2010*

On Wednesday, July 7, 2010, the empty 250-foot long sludge barge *The Resource*, being towed alongside the 78.9-foot-long tugboat *Caribbean Sea*, collided with the anchored *DUKW 34* in the Delaware River. *DUKW 34* carried 35 passengers and 2 crewmembers. On board the *Caribbean Sea* were five crewmembers. As a result of the collision, *DUKW 34* sank in about 55 feet of water. Two passengers were fatally injured, and 26 passengers suffered minor injuries. No one on the *Caribbean Sea* was injured. The NTSB in its Marine Accident Report MAR-11-02 issued seven recommendations, one of which was duck boat related.

M-11-005: Review Ride The Ducks International's existing safety management program and develop improved means to ensure that your company's safety and emergency procedures are understood and adhered to by employees in safety-critical positions.

This recommendation was issued to RTDI, formerly the franchisor of Ride the Ducks in Branson and Philadelphia, among others. In 2015, the recommendation was classed "Closed – Unacceptable Response – No Response Received."

7.4.4 Highway collision of the *Duck 6,* 2015

On Thursday, September 24, 2015, *DUCK 6* was traveling north on the Washington State Route 99 Aurora Bridge in Seattle, Washington. The *DUCK 6* driver heard a loud noise at the left front of the APV; the vehicle drifted to the right and then veered left suddenly. The APV crossed the center line into the southbound lanes of oncoming traffic and struck a 2009 Motor Coach Industries vehicle. Three other vehicles were damaged during the crash event. As a result of this crash, five motorcoach passengers died. Seventy-one motorcoach and APV occupants reported injuries ranging from minor to serious.

The NTSB issued ten recommendations in its Highway Accident Report 16-02. Three of these were issued to NHTSA, two of which remain open. Two were issued to the Coast Guard, both of which are "Open – Acceptable Response". Three were issued to RTDI of which one is "Closed – Unacceptable Action" and two are "Open – Acceptable Response". One was issued to Ride the Ducks of Seattle which is "Closed – Acceptable Action" and one to the Passenger Vessel Association which is "Open – Initial Response Received."

These recommendations address maintenance, recalls, service bulletins, driver distraction, and use of seat belts.

7.4.5 Highway Collision of *Penelope Pru*, 2016

On April 30, 2016 a motor scooter with two occupants overtook the Truck Duck *Penelope Pru* in downtown Boston on the left and stopped in front of it in the same right turn lane. The duck boat carried 41 passengers and 1 captain/driver. Both vehicles began their right turn when the traffic signal changed to green. The duck boat accelerated at a faster rate, overtook the scooter, and knocked both riders to the street. The motor scooter's driver was fatally injured.

The NTSB investigated the accident and published a factual report with no recommendations.

7.4.6 Other incidents

The United Kingdom's Marine Accident Investigation Branch (MAIB) Report 32/2014 into the sinking of two duck boats in 2013, contain several safety recommendations regarding amphibious passenger vessels.

The Transport Safety Board of Canada's report M02C0030 into the sinking of the APV *Lady Duck* in 2002 contains several recommendations. Although the *Lady Duck* was not a duck boat, the recommendations address safety management and buoyancy issues with small passenger vessels.