National Transportation Safety Board

Office of <Select Modal Office>

Washington, DC 20594

DCA24MM031

SURVIVAL FACTORS

FACTUAL REPORT

17April 2025

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A. ACCIDENT

Location:	Baltimore, Maryland
Date:	March 26, 2024
Time:	0129 eastern daylight time 0529 coordinated universal time
Vessel:	*Dali*

B. SURVIVAL FACTORS GROUP

Group Chair / IIC	Marcel L. Muise National Transportation Safety Board Washington, District of Columbia
Group Member	Eric Gregson National Transportation Safety Board Baltimore, Maryland
Subject Matter Expert	Detective Corporal Antonio Rodriguez Jr. Maryland Transportation Authority Baltimore, Maryland
Party Coordinator	Captain Eric Nielsen Association of Maryland Pilots Baltimore, Maryland

C. SUMMARY

On March 26, 2024, about 0129 eastern daylight time, the 984-foot-long Singapore-flagged cargo vessel (containership) *Dali* was transiting out of Baltimore Harbor in Baltimore, Maryland, when it experienced a loss of electrical power and propulsion and struck the southern pier supporting the central truss spans of the Francis Scott Key Bridge (Key Bridge). A portion of the bridge subsequently collapsed into the river, and portions of the deck and the truss spans collapsed onto the vessel's forward deck. A seven-person road maintenance crew employed by Brawner Builders—which was contracted by the Maryland Transportation Authority (MDTA)—and one inspector employed by Eborn Enterprises, Inc., a subconsultant to the MDTA, were on the bridge when the vessel struck it. The inspector escaped unharmed, and one of the construction crewmembers survived with serious injuries. The bodies of the six fatally injured construction crewmembers were recovered. One of the 23 persons aboard the Dali was injured.

D. DETAILS OF THE INVESTIGATION

1.0 Background

Dali was a 984-foot-long neo-Panamax containership. The vessel had a crew of 21 on the accident voyage, along with two pilots of the Association of Maryland Pilots. The bridge and engine rooms were staffed for departure. Crew were on deck to work the mooring stations, anchors, tug lines, and pilot ladder as needed.

The 1.7-statute mile-long Francis Scott Key Bridge was owned by MDTA, an agency of the Maryland Department of Transportation. MDTA also operates a 500-officer police department, which includes marine unit boats in Baltimore.[1]

The accident site is within the U.S. Coast Guard's Sector Maryland-National Capitol Region's area of responsibility. The Sector oversees Coast Guard missions in the Chesapeake Bay north of Maryland's border with Virginia, including Baltimore. A Sector command center (SCC), located on Curtis Creek, oversees communications and coordination for these missions, including search and rescue. Station Curtis Bay and Station Annapolis are among the Coast Guard units subordinate to the Sector.

Figure 1. *Dali* underway in 2018. (Source: shipspotting.com)

[1] (a) In this report, all times are eastern daylight time, and all miles are nautical miles (1.15 statute miles). (b) Visit ntsb.gov to find additional information in the public docket for this NTSB investigation (case no. DCA24MM031). Use the CAROL Query to search investigations.

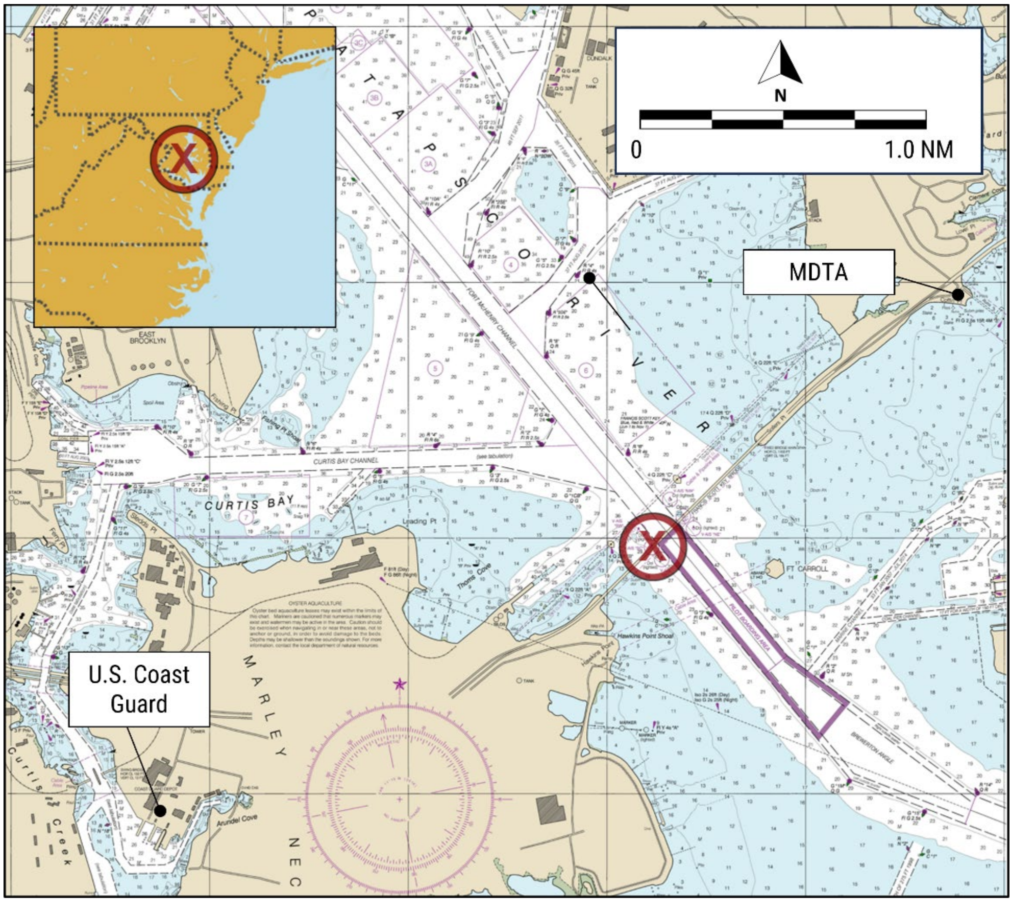

Figure 2. Area where *Dali* contacted the Francis Scott Key Bridge, as indicated by a circled X. (Background source: NOAA)

2.0 Events

The Engineering and the Nautical Operations Group Chairs' factual reports include events preceding *Dali*'s contact with the Francis Scott Key bridge.

The senior pilot aboard *Dali* informed the Association of Maryland Pilots dispatcher by mobile phone at 0126:00 that *Dali* had lost power and requested that the dispatcher arrange to close the bridge to vehicular traffic, and the dispatcher confirmed which bridge was to be closed. This phone call was nine seconds long. The dispatcher then telephoned the MDTA duty officer at 0126:45. This conversation was 22 seconds long, the duty officer asking only one clarifying question ("Where are you … you're on the water right now?").

At 0127:53, the dispatcher relayed the request to stop vehicular traffic to the officers who were stationed at either end of the bridge for traffic calming while a maintenance crew and an inspector repaired potholes. The Bridge Structures Group Chair's factual report discusses the specific locations of workers on the bridge.

The MDTA officer stationed at the north end of the bridge to block traffic in the right lane during the road work moved his vehicle across both lanes, blocking all traffic. The MDTA unit on the south end of the bridge, who had been about to secure traffic on that side for work, blocked the northbound lanes. The MDTA duty officer inquired about the crew working on the bridge, and the officer at the north end replied that he would drive up on the bridge to warn the crew once another officer was on scene to relieve him.

Figure 3. MDTA inspector and car on Span 21 immediately before ship strike. (Source: JB Hunt)

Investigators reviewed camera footage and noted 11 vehicles crossed the bridge between 0129:10 (when *Dali* initially lost propulsion) and 0128:22 (when the MDTA closed the bridge). Once the bridge was closed to traffic, only the maintenance crew and the road maintenance inspector remained on the bridge.

Dali contacted Pier 17 at 0129:10. Span 18, with four vehicles on it, started to collapse eight seconds later, 0129:18 and Span 19 (no vehicles) started to collapse at 0129:20. Span 20 (two vehicles) collapsed at 0129:24, Span 22 (no vehicles) at 0129:27, and, lastly, Span 21 (one vehicle, belonging to the inspector) at 0129:28.

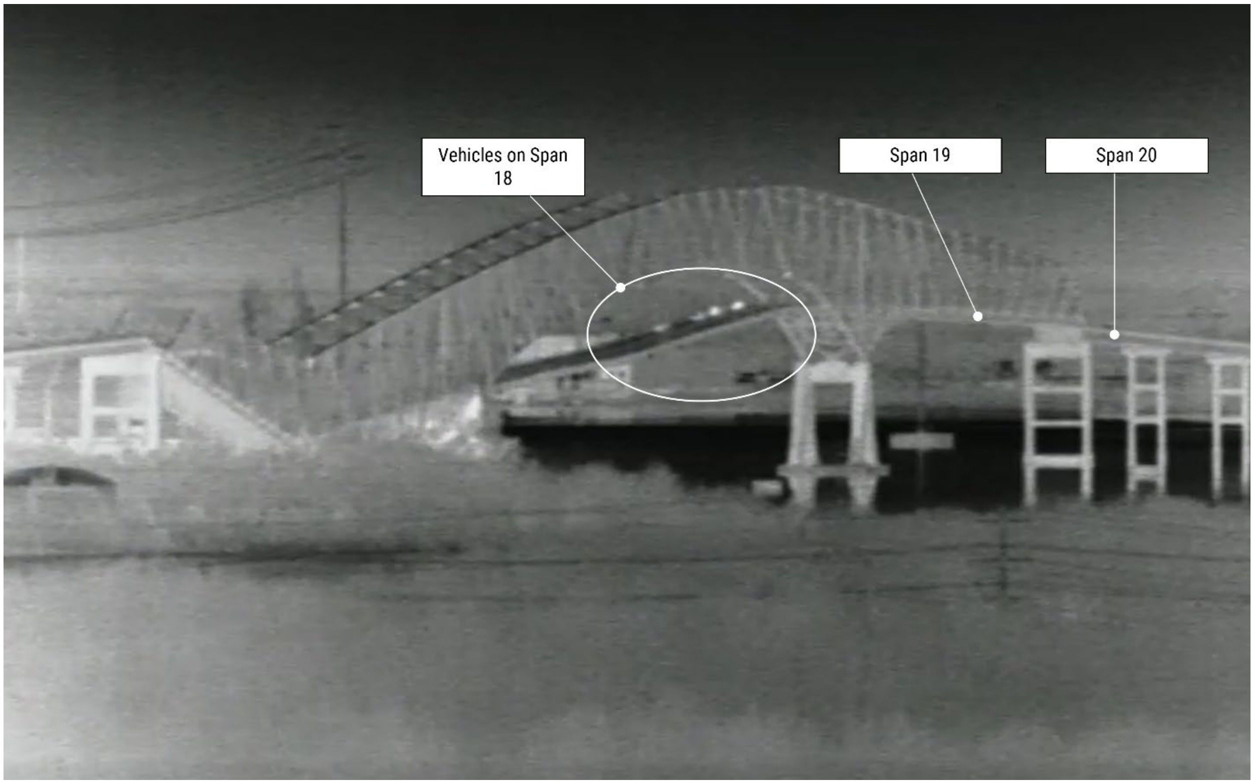

Figure 4. Vehicles on the collapsing Span 18. (Source: Maryland State Police)

After the Association of Maryland Pilots dispatcher called the MDTA, he called the Coast Guard SCC at 0127. During the 84-second-long conversation, the watchstander asked, "About how long do you think before it gets to the bridge, sir?" The dispatcher, watching the bridge being live streamed then stated it was too late. The Coast Guard then contacted the MDTA at 0130:52.

Dali's bosun, who was on the bow at the time of the accident, told investigators that as he was letting go the port anchor, he had to escape from the falling bridge before he was able to reapply the brake on the windlass. As the bridge deck collapsed onto the bow of the *Dali*, another able seafarer sustained a minor injury.

Local assist tugs answered a call from the senior pilot for assistance before the bridge strike. Per AIS data, *Eric McAllister* was the first vessel on scene at 0140, followed by *Bridget McAllister* and *Timothy McAllister*. Immediately following the bridge collapse, the pilots aboard *Dali* also called the Coast Guard by radio and advised there may be people in the water. About 0134, the Coast Guard issued an urgent marine information broadcast, requesting assistance from passing traffic.

The first Coast Guard boat, a Station Curtis Bay Response Boat-Medium, *CG45661,* was on scene at about 0151. Due to the possible mass casualty, SCC dispatched, or requested assistance from, among others, Station Annapolis, the patrol boat *Mako,* and Air Station Atlantic City. *Mako* was later assigned as the On

Scene Coordinator.[2] Other agencies responding included Maryland State Police, Baltimore County Fire Department, Baltimore City Fire Department, Maryland Department of Natural Resources, Anne Arundel County, and Harford County.

The inspector had been walking the length of the bridge, checking on the drying cement. He had reached his own vehicle when he heard "a crumbling thunder noise." He told investigators he had no warning nor heard a whistle signal, although it was loud on scene with vehicles and machinery running. He ran north and made it to the nearest surviving span before the rest of the bridge collapsed, an estimated 17 seconds after the ship strike. The other seven workers were in their vehicles and fell with the bridge. The inspector tried to call the foreman by mobile phone but received no answer. The inspector then called the Maryland State Operation Center (SOC) to report the collapse as he made his way to the MDTA officers at the north abutment.

The surviving Brawner employee told investigators he had no warning before the collapse. He fell to the water inside a truck which started filling with water. He was able to open the window and egress from the vehicle. He floated on debris until he was rescued by MDTA Police *Marine Unit 02* near Pier 20 at 0155.

The Coast Guard had reports of up to 20 people in the water. Multiple agencies searched for survivors until 2027, when the Coast Guard suspended the active search for survivors and transitioned efforts to recovery. Six victims were later recovered by divers.

3.0 Additional Information

3.1 Pipeline

A 24-inch diameter, 200 psi, natural gas pipeline owned by Baltimore Gas and Electric (BGE) was buried 15 feet north of and parallel to the bridge. Construction of the pipeline predated the construction of the bridge. The channel was 42 feet deep in 1973 and was later dredged to 50 feet. At the time of construction, regulations required 30 inches of coverage for this pipeline.[3] Current Pipeline and Hazardous Materials Safety Administration (PHMSA) regulations require pipelines in a navigable waterway have a minimum 4 feet of coverage.[4]

Dali grounded near Pier 18 and there was bridge debris in the water at the site, each posing a potential hazard to the pipeline. The SCC Quick Response Card for ship groundings did not include a line item to notify an affected pipeline operator nor

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[2] The on-scene coordinator is the designated vessel or aircraft assigned to coordinate the activities of all participating search units.

[3] See 35 Federal Register 13257 dated August 19, 1970.

[4] See 49 Code of Federal Regulations 192.327(e).

call 811. A responder from the (PHMSA) informed the NTSB of the pipeline on March 26 and reported that it was secure and not losing pressure. Coast Guard SCC records indicate they were informed of the pipeline by PHMSA at 1359 on the accident date.

3.2 Association of Maryland Pilots Procedure

According to staff at the Association of Maryland Pilots, they had recently revised their internal procedure to require pilots to contact the Coast Guard first during bridge-related emergencies, including bridge jumpers. The pilot aboard any ship could instantly be in contact with the Coast Guard via VHF radio to notify responders. The dispatcher at the pilot station however came across the bridge's phone number while looking up the new number and called it while searching for the new number in his computer.

3.3 Coast Guard Procedure

Coast Guard SCCs are staffed with three to four watchstanders. Watchstanders told the NTSB they do not normally communicate with bridge maintenance crews and would only be informed of anomalies affecting vessel traffic, such as something hanging below the bridge or navigation light discrepancies. Watchstanders also relayed that although they may overhear a ship announcing a departure over VHF, ships would only contact them directly to report a marine casualty or in an emergency.

3.4 Maryland Transportation Authority

The MDTA owned and maintained the bridge and also provided their own police presence on tolled highways and bridges in Maryland. The MDTA inspector on the bridge told investigators he had exchanged phone numbers with officers on scene but that communication that night was mostly face to face. He communicated with the SOC, who gave permission to close a lane of traffic about 2100 and start work. He was the only point of contact on the bridge with MDTA police and the only point of contact with the Brawner maintenance crew.

3.5 Medicolegal

One *Dali* crewmember who had been working his way forward to assist on the bow, before the contact, sustained a minor hand injury.[5] He was treated at University of Maryland Shock Trauma and released.

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[5] The NTSB uses the International Civil Aviation Organization injury criteria in all of its accident reports, regardless of transportation mode. A serious injury is a non-fatal injury that requires hospitalization for more than 48 hours, commencing within 7 days from the date the injury was received; results in a fracture of any bone; causes severe hemorrhages, nerve, muscle, or tendon damage; involves any

Eight workers were on the bridge when it collapsed. The MDTA inspector escaped unharmed. One worker egressed from his truck and was seriously injured. He was transported by a Baltimore City medic to the University of Maryland Shock Trauma Center, where he was treated for a serious injury. The bodies of the remaining workers were recovered over several weeks, all from inside vehicles. Autopsy reports for the fatally injured all list blunt force trauma, drowning, or both as the cause of death.

Table 1. Table of Injuries.

Record	Position	Sex/Age	Injury	Pre-accident locations
1	*Dali* Able Seafarer	M/44	Minor	Ship's bow
2	Brawner employee	M/37	Serious	Vehicle on bridge
3	Brawner employee	M/24	Fatal	Vehicle on bridge
4	Brawner employee	M/35	Fatal	Vehicle on bridge
5	Brawner employee	M/26	Fatal	Vehicle on bridge
6	Brawner employee	M/38	Fatal	Vehicle on bridge
7	Brawner employee	M/49	Fatal	Vehicle on bridge
8	Brawner employee	M/49	Fatal	Vehicle on bridge

3.6 Similar Accidents

3.6.1 Advanced Warning Systems

The Bridge Structures group chair's factual report includes a discussion of advanced warning systems on bridges and several similar accidents investigated by the NTSB.

internal organ; or involves second- or third-degree burns, or any burn affecting more than 5% of the body surface.

3.6.2 Pipeline Response

The NTSB investigated the 2001 anchor strike of an underwater pipeline and subsequent crude oil spill, near San Pedro, California. Among other things, the NTSB found that Vessel Traffic Service watchstanders did not recognize the danger posed to the pipeline by two vessels dragging anchor. The Board also found that defined procedures for informing pipeline and other utility operators of possible incursions would improve the ability to identify and respond to any damage.

The NTSB recommended to the Coast Guard, among other things, to:

> *Develop procedures for Vessel Traffic Services (VTS) to notify pipeline and utility operators following potential incursions on submerged pipelines and utilities within the VTSs' areas of responsibility. (M-24-3)*

In a March 2024 reply, the Coast Guard replied they concurred with the recommendation, noting however:

> *"… this function would be executed better by a Sector Command Center rather than a VTS. The inclusion of other utilities in the notification recommendation introduces many complexities related to locations, charting, ownership, marking, and databases of the same. Determining the capability of Coast Guard resources to accomplish this recommendation will require additional study. The establishment of many new Offshore Renewable Energy Installations will result in the addition of many miles of submerged cables. The Coast Guard will emphasize to DOI and the USACE that these, and other new utilities, be buried to a depth where the emergency anchoring of large commercial ships will not endanger the utility. I will keep the Board updated on the above actions to address this recommendation."*

As of the publication of this report, the NTSB classified the recommendation as "Open – Acceptable Alternate Response.

Submitted by:

Marcel L. Muise
Investigator-in-charge