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Baltimore Bridge Collapse: Frequently Asked Questions (FAQ)

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Contents

Introduction	1
Who Owns and Controls the Ship?	1
How Do Ships Navigate Through Harbors?	1
How Common Is It for Ships to Lose Power?	2
Could Tug Escorts Have Prevented the Collapse of the Bridge?	2
How Is Port Traffic Affected?	3
When Will the Port Reopen?	4
How Is Road Traffic Affected?	4
Has Anything Like This Happened Before?	5
Who Is in Charge of the Safety Investigation?	6
What Is the Federal Government’s Role in Rebuilding the Bridge?	6
Will Baltimore Want a Higher Bridge Like Other Ports?	7
What Is the Coast Guard’s Role in Bridge Permitting?	8

Figures

Figure 1. Map of Baltimore Transportation Facilities	5
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Tables

Table 1. Air Drafts of Bridges at Select Container Ports	7
--	---

Contacts

Author Information	8
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Introduction

At about 1:30 a.m. on March 26, 2024, the MV *Dali*, a container ship departing the Port of Baltimore, struck a support tower of the Francis Scott Key Bridge in Baltimore, MD, causing the bridge to collapse into the Patapsco River. The bridge is a segment of Interstate 695—Baltimore’s beltway—and spans the Patapsco shipping channel into the harbor.¹

A pothole repair crew of eight was on the bridge at the time of the collision. Two have survived; one with injuries. Authorities were able to stop traffic over the bridge right before the vessel strike. There were 23 mariners aboard the ship, and none sustained injury. A Unified Command and Joint Information Center have been established by the U.S. Coast Guard and Maryland state officials to coordinate their response and disseminate information on the incident.²

Who Owns and Controls the Ship?

The *Dali* is being chartered (leased) by Maersk, a Danish shipping firm that provides container shipping services worldwide in addition to other types of shipping. The ship is managed by the Synergy Marine Group³ and owned by Grace Ocean Private Ltd., both based in Singapore.⁴ The ship’s crew are from India. It is flagged and homeported in Singapore and was *classed* (meaning certified as meeting construction and maintenance standards) by a Japanese firm, Nippon Kaiji Kyokai (ClassNK).⁵ The multitude of nationalities involved in operating and administering the ship is typical of the industry.

The ship was built in 2015 by Hyundai Heavy Industries in South Korea with a MAN-manufactured engine. It is almost 950 feet in length and about 160 feet in breadth with a capacity to carry 10,000 TEUs of containers (a TEU is a 20-foot container). It could be considered an average-sized container ship today but would be considered a large ship compared with the fleet in the late 1970s when the bridge was built. The ship had sailed from Asia through the Panama Canal and had called at Norfolk and New York before its Baltimore port call. When it struck the bridge, the ship was departing Baltimore for Sri Lanka.

How Do Ships Navigate Through Harbors?

A preliminary report stated that the ship lost power as it was approaching the bridge, meaning the ship may have lost propulsion. Two Baltimore harbor pilots were aboard the ship; harbor pilots navigate ships in and out of harbors because they have expertise with local navigation conditions. Even when harbor pilots are at the helm, the captain of the ship and the shipping line (Maersk) remain responsible for the safety of the vessel. Tugs typically assist in moving ships into and out of their berths (docking and undocking) and rarely escort ships through harbors as an emergency

¹ For a map showing the location of port terminals in relation to the bridge, see Moran Towing Co., Port Baltimore map, <https://www.morantug.com/Customer-Content/www/ports-and-operations/PortMap/Baltimore.pdf>.

² Key Bridge Response 2024, <https://www.keybridgeresponse2024.com/>.

³ Synergy Marine Group, “About Us,” <https://www.synergymarinegroup.com/about/about-us/>.

⁴ Lloyd’s Register of Ships, 2022-2023 edition. The ship’s International Maritime Organization (IMO) identification number is 9697428.

⁵ ClassNK, “Introduction,” <https://www.classnk.com/hp/en/about/aboutNK/index.html>.

safety measure. This ship released the tugs before reaching the bridge, as is reportedly normal in the harbor.⁶

How Common Is It for Ships to Lose Power?

Loss of propulsion is a known and recorded occurrence in shipping. An annual review of marine incidents for vessels with a connection to the European Union (EU; EU-registered or EU-owned vessels or incidents occurring in EU waters) found that loss of propulsion surpassed vessel-to-vessel collisions as the leading cause of marine casualties from 2014 to 2022.⁷

Could Tug Escorts Have Prevented the Collapse of the Bridge?

Some observers have raised the question whether tugs escorting the ship through the bridge could have prevented the ship from hitting one of the towers.⁸ After the ship reportedly lost power, the pilot called for tug assistance moments before striking the bridge, but by then it was too late for the tugs to reach the ship again.⁹ Tugs have the ability to push ships in a desired direction and even stop ships over some distance, but they must have sufficient engine power and have other design features specifically for this purpose.¹⁰

Some harbors require tug escorts but they appear to be exclusively for tankers of liquid bulk cargoes, such as oil, chemicals, or liquid natural gas (LNG). The requirements are not intended to specifically prevent bridge strikes but rather to prevent any event that might result in a spill, such as a tanker grounding. Tug escorts are a federal requirement in Prince William Sound, Alaska, and in Puget Sound, Washington.¹¹ The State of California requires tug escorts of tankers in its harbors per state regulation.¹² However, requiring tug escorts can introduce additional risk exposure simply due to the mere presence of more vessels on the water.¹³ For instance, in January 2023, one of five tugs assisting an empty tanker into the Port of Corpus Christi accidentally got

⁶ John Konrad, “Ship Lost Control Before Hitting Baltimore Bridge,” *gCaptain*, March 26, 2024, <https://gcaptain.com/ship-lost-control-before-hitting-baltimore-bridge/>.

⁷ European Maritime Safety Agency, “Annual Overview of Marine Casualties and Incidents 2023,” June 15, 2023, p. 40, <https://www.emsa.europa.eu/publications/reports/item/5052-annual-overview-of-marine-casualties-and-incidents.html>.

⁸ Bruce Buls, “Key Bridge Mistake,” *WorkBoat*, April 1, 2024, <https://www.workboat.com/key-bridge-mistake>; Tony Munoz, “A Remedy for Ship Accidents: Tug Escorts,” *The Maritime Executive*, March 30, 2024, <https://maritime-executive.com/editorials/a-remedy-for-ship-accidents-tug-escorts>.

⁹ National Transportation Safety Board (NTSB) preliminary timeline of the incident: NTSB, “Contact of Cargo Vessel Dali with Francis Scott Key Bridge and Subsequent Bridge Collapse,” March 27, 2024, <https://www.nts.gov/investigations/Pages/DCA24MM031.aspx>.

¹⁰ Iain Braidwood and Robert G. Allan, “A Risk Profile for Escorted Tankers and Their Resistance to Collision Damage,” in *Royal Institution of Naval Architects, Damaged Ship IV*, May 16-17, 2018, <https://static1.squarespace.com/static/58ffe2e66b8f5b40c0cec664/t/5c8172af971a1811b3000599/1551987382686/Braidwood+Allan+RINA+Damaged+Ships.pdf>.

¹¹ 33 C.F.R. Part 168.

¹² California Code of Regulations, Title 14, Division 1, Subdivision 4, §§851.20-851.32.

¹³ Pamela Glass, “Tug Escort Rules in Ports May Be Reviewed After the Key Bridge Collapse,” *WorkBoat*, April 3, 2024, <https://workboat.com/coastal-inland-waterways/tug-escort-rules-in-ports-may-be-reviewed-after-the-key-bridge-collapse>.

caught in the tanker's propeller.¹⁴ The National Transportation Safety Board's (NTSB's) forthcoming report on the MV *Dali* strike may provide insights into the safety benefits and drawbacks of tug escorts.

In 2000, the U.S. Supreme Court distinguished federal regulations concerning the safe operation of tankers in harbors from nonfederal requirements that can be imposed if they do not conflict with federal requirements and are based on "the peculiarities of local waters."¹⁵ State proposals concerning ship safety could also interfere with international treaties that have established global standards. While local requirements for tug escorts are allowed, ports may be reluctant to require them because of their cost and the heightened competition for containerized cargo.

How Is Port Traffic Affected?

The Port of Baltimore was the 17th busiest port by total tonnage in the United States in 2021, the most recent year for which data are available.¹⁶ It was the 10th busiest by dry bulk tonnage and the 15th busiest container port in TEUs. According to the Maryland Port Administration, the port ranks "first among the nation's ports for autos and light truck volume, roll on/roll off farm and construction machinery, and imported gypsum."¹⁷ It is also "responsible for nearly \$3.3 billion in personal wages and salaries, \$2.6 billion in business revenue[,] and nearly \$400 million in state and local tax revenue annually."¹⁸

Containers currently at the port awaiting export could be moved to other ports by truck or rail; one of the Port of Baltimore's two container terminals is served by on-dock rail access. Dry bulk—such as coal,¹⁹ the largest commodity by volume handled by the port—and roll on/roll off machinery may be more difficult to move through other ports, as specialized facilities are needed for loading and unloading. The closest large ports to Baltimore are Wilmington, DE; Philadelphia, PA; and Camden, NJ, all of which may be accessed via the Chesapeake and Delaware Canal provided the vessels have a shallow enough draft. Another nearby port, not draft restricted, is the port of Norfolk near the entrance to the Chesapeake Bay.

Currently, large commercial vessels are unable to enter or exit the Port of Baltimore. The U.S. Coast Guard shipyard at Hawkins Point²⁰ on Curtis Bay is also upriver from the bridge, and six vessels of the U.S. Department of Transportation's Ready Reserve Force (available to provide surge sealift capacity to the Department of Defense, if needed) were berthed in Baltimore as of January 2024 and presumably are currently unable to exit the port.²¹

¹⁴ NTSB, "Collision Between Tugboat *Mark E Kuebler* and Tanker *Nisalah*, MIR-24-04, February 21, 2024, <https://www.nts.gov/investigations/AccidentReports/Reports/MIR2404.pdf>.

¹⁵ *United States v. Locke*, 529 U.S. 89 (2000).

¹⁶ Bureau of Transportation Statistics, "Port Performance Freight Statistics," January 2024, https://www.bts.gov/sites/bts.dot.gov/files/2024-01/2024_Port_Performance_Report_0.pdf.

¹⁷ Maryland Port Administration, "Maryland's Port of Baltimore Announces Cargo Volume Growth Through Third Quarter," December 7, 2023, <https://content.govdelivery.com/accounts/MDMPA/bulletins/37ed137#:~:text=The%20port%20is%20first%20among,and%20local%20tax%20revenue%20annually.>

¹⁸ *Ibid.*

¹⁹ U.S. Energy Information Administration, "What Are the Energy Impacts from the Port of Baltimore Closure?" March 28, 2024, <https://www.eia.gov/todayinenergy/detail.php?id=61663>.

²⁰ U.S. Coast Guard, "Coast Guard Yard," <https://www.dcms.uscg.mil/Our-Organization/Assistant-Commandant-for-Engineering-Logistics-CG-4-/Logistic-Centers/Surface-Forces-Logistics-Center/Coast-Guard-Yard/>.

²¹ U.S. Department of Transportation Maritime Administration, "National Defense Reserve Fleet Inventory for the Month Ending January 31, 2024," February 2, 2024, https://www.maritime.dot.gov/sites/marad.dot.gov/files/2024-02/2024_01%20Public%20NDRF%20Inventory.pdf.

When Will the Port Reopen?

The U.S. Army Corps of Engineers (USACE) is managing bridge debris removal for the congressionally authorized 50-foot-deep navigation channel, initially using existing USACE Baltimore Harbor and Channels project funds.²² USACE is employing both federal and contracted assets and expertise (e.g., U.S. Navy Supervisor of Salvage and Diving team and heavy-lift cranes). USACE released a tentative timeline on April 4, 2024, which would see the opening of a 35-foot-deep and 280-foot-wide temporary channel by the end of April and the reopening of the permanent 50-foot-deep and 700-foot-wide federal navigation channel by the end of May.²³

A temporary alternate channel opened on April 1, 2024, to the northeast of the (blocked) main channel, with a controlling depth of 11 feet and vertical clearance of 95 feet.²⁴ A second temporary channel was opened on April 2 to the southwest, with a controlling depth of 14 feet and a vertical clearance of 124 feet.²⁵ The vertical clearance between the water level (considering tides, generally measured at mean high water) and the underside of a bridge deck is also referred to as a bridge's "air draft."

How Is Road Traffic Affected?

The Key Bridge first opened to traffic in 1977, spanning the Patapsco River connecting Interstate 695 on the southeastern side of Baltimore (see **Figure 1**). It had annual average daily traffic of over 30,000 vehicles in 2023, including over 3,000 trucks per day. It was less heavily used than the Fort McHenry and Baltimore Harbor Tunnels running under the Patapsco River farther north.

Highway traffic has been rerouted through the Baltimore Harbor or Fort McHenry Tunnels or on Interstate 695 to the north of Baltimore City. Some larger vehicles, including all double-trailers, and most shipments of hazardous materials are not permitted in the tunnels, and trucks are not allowed through the Baltimore Harbor Tunnel.

²² U.S. Army Corps of Engineers (USACE), "Baltimore Harbor & Channels, MD & VA," March 1, 2023, <https://usace.contentdm.oclc.org/digital/collection/p16021coll11/id/541>.

²³ USACE, "U.S. Army Corps of Engineers Develops Tentative Timeline to Reopen Fort McHenry Channel Following Key Bridge Collapse," April 4, 2024; <https://www.nab.usace.army.mil/Media/News-Releases/Article/3731790/us-army-corps-of-engineers-develops-tentative-timeline-to-reopen-fort-mchenry-c/>.

²⁴ Key Bridge Response 2024, "Update 5 Multimedia Release: First Vessel Passes Through Temporary Alternate Channel Around Key Bridge Wreckage," April 1, 2024, <https://www.keybridgeresponse2024.com/post/update-5-multimedia-release-first-vessel-passes-through-temporary-alternate-channel-around-key-brid>.

²⁵ Key Bridge Response 2024, "Update 6 Multimedia Release: Unified Command Opens Second Temporary Alternate Channel Around Key Bridge Wreckage for Commercially Essential Vessels," April 2, 2024, <https://www.keybridgeresponse2024.com/post/update-6-multimedia-release-unified-command-opens-second-temporary-alternate-channel-around-key-bri>.

Figure I. Map of Baltimore Transportation Facilities



Source: Created by CRS using data from the U.S. Census Bureau and ESRI.

Notes: The Fort McHenry and Baltimore Harbor Tunnels are marked in brown, and the location of the Key Bridge is marked in red. The Key Bridge location forms part of the southeastern edge of Interstate 695.

Has Anything Like This Happened Before?

Other bridges have collapsed, including as a result of vessel strikes, leading to disruptions in maritime and highway transportation.

In May 1980, the bulk freighter *MV Summit Venture* struck a support column of the Sunshine Skyway Bridge in Tampa, FL, causing a large portion of the bridge span to collapse and resulting in 35 fatalities. Federal investigators concluded that the probable causes of the collision were the unexpectedly sudden and severe weather, the absence of a severe weather warning, and the failure of the pilot to change course when weather obscured the channel markers.²⁶ The Tampa incident led to the publication of new bridge design guidance for withstanding vessel impacts, but it is not yet known whether the Key Bridge—built before this guidance existed—could have withstood the *Dali*'s impact even if it conformed to current design best practices.

In May 2002, the towboat *Robert Y. Love* and the two barges it was pushing veered off course and struck a support column of a bridge carrying Interstate 40 over the Arkansas river in Oklahoma, also causing a section of the bridge to collapse and resulting in 14 fatalities. Federal investigators concluded that the probable cause of the incident was the captain's loss of consciousness, possibly as the result of an unforeseeable, abnormal heart rhythm.²⁷ The inability of motorists to detect the collapsed bridge in time to stop their vehicles contributed to the loss of life.

²⁶ NTSB, "Marine Accident Report: Ramming of the Sunshine Skyway Bridge by the Liberian Bulk Carrier *Summit Venture* Tampa Bay, Florida, May 9, 1980," <https://www.ntsb.gov/investigations/AccidentReports/Reports/MAR8103.pdf>.

²⁷ NTSB, "U.S. Towboat *Robert Y. Love* Allision with Interstate 40 Highway Bridge Near Webbers Falls, Oklahoma May 26, 2002," <https://www.ntsb.gov/investigations/AccidentReports/Reports/HAR0405.pdf>.

Who Is in Charge of the Safety Investigation?

The U.S. Coast Guard shares responsibilities with the NTSB to investigate major safety incidents. Under the NTSB's governing statutes²⁸ and regulations,²⁹ the agency shall investigate any "major marine casualty," defined as one that results in the loss of six or more lives, the loss of a vessel larger than 100 gross tons, property damage initially estimated as at least \$0.5 million, or a release of hazardous materials deemed to be a serious threat.³⁰ The U.S. Coast Guard is directed to conduct a preliminary investigation to determine whether a major marine casualty event has occurred and notify the NTSB accordingly. The NTSB has stated that it will take 12 to 24 months to fully investigate this incident and has released an initial timeline of the incident.³¹

What Is the Federal Government's Role in Rebuilding the Bridge?

Rebuilding the Key Bridge would require permits from federal agencies, and these authorizations would normally require review under the National Environmental Policy Act (NEPA). However, replacement of a damaged or destroyed bridge may be granted a "categorical exclusion" (CE) exempting it from further NEPA reviews if certain conditions are met. To qualify for a CE, work must begin within two years of an emergency declaration and occur "within the existing right-of-way and in a manner that substantially conforms to the preexisting design, function, and location as the original (which may include upgrades to meet existing codes and standards as well as upgrades warranted to address conditions that have changed since the original construction)."³²

After the Interstate 35W bridge in Minneapolis collapsed in 2007, a new bridge was completed in 11 months, which was 3 months ahead of schedule. The Federal Highway Administration (FHWA) credits a project scope that qualified for a CE with accelerating project delivery. In Florida, a new Sunshine Skyway Bridge took five years to complete, but traffic was able to resume at reduced capacity on a parallel span that did not collapse.

Federal funding may also be available for bridge replacement. FHWA's Emergency Relief (ER) Program receives approximately \$100 million per year from the Highway Trust Fund. Congress has periodically provided additional funds to respond to specific incidents. Any damages or insurance payouts recouped by a bridge owner would be used to offset any ER funds awarded. Before submitting a standard ER application, state transportation officials can submit a streamlined application for "Quick Release" funds to cover emergency operations; the State of Maryland has applied for and received \$60 million in such funds for the Key Bridge collapse.

Under the ER Program, federal funds can cover 90% of project costs for interstate highways and 80% for other federal-aid highways. Although the Key Bridge is a segment of Interstate 695, the portion that includes the bridge is a state highway, so the maximum federal share could be 80%. However, if the total expenses Maryland incurs to deal with disaster-damaged roads in FY2024 exceed the state's total federal-aid highway formula funds (\$828,287,771 for FY2024), the maximum federal share could increase to 90%. In the past, Congress has made exceptions

²⁸ 49 U.S.C. §1131.

²⁹ 49 C.F.R. Part 850.

³⁰ 49 C.F.R. §850.5(e).

³¹ NTSB, "NTSB Media Briefing 2 - Francis Scott Key Bridge Struck by Cargo Ship Dali," <https://www.youtube.com/watch?v=FczgLhdqw0M>.

³² 23 C.F.R. §771.118(c)(11)(ii)(A).

allowing ER funds to cover 100% of costs for specific projects, as it did for the Interstate 35W bridge project (see P.L. 110-56).

Will Baltimore Want a Higher Bridge Like Other Ports?

In addition to dredging deeper channels to allow for larger ships, some ports have had to build new bridges with higher clearances to allow ships to pass under. The ports of Long Beach and New York are examples of harbors where either a bridge was entirely replaced or the deck of the existing bridge was raised to accommodate taller vessels. Savannah, GA, plans to raise the deck of the Talmadge Memorial Bridge another 20 feet in 2025. As shown in **Table 1**, the Francis Scott Key Bridge in Baltimore had a relatively high clearance relative to bridges in other seaports. Also, the Chesapeake Bay Bridge, which most ships calling at Baltimore would also need to pass under (those ships sailing up the Chesapeake Bay), has an air draft that is three feet less than that of the Key Bridge.

Though a higher bridge may not be sought in this case, the issue points to the higher costs that larger ships impose on the public. While larger ships increase economies of scale at sea, they impose higher port costs largely borne by the public and not the shipping lines. This includes the cost of deeper channels, taller bridges, and higher capacity ship-to-shore cranes and other cargo handling equipment, as well as greater concentration of cargo flow, which accentuates port-area congestion.

Table 1. Air Drafts of Bridges at Select Container Ports

Port	Bridge	Air Draft in Feet
Baltimore, MD	Francis Scott Key	185
	Chesapeake Bay	182
Charleston, SC	Arthur Ravenel Jr.	185
Jacksonville, FL	Napoleon B. Broward	169
Long Beach, CA	Gerald Desmond	155
Los Angeles, CA	Vincent Thomas	185
Mobile, AL	Cochrane-Africatown	140
New Orleans, LA	Crescent City	150
New York/New Jersey	Bayonne and Verrazano-Narrows	215
Philadelphia, PA	Benjamin Franklin	135
	Delaware Memorial	188
San Francisco/Oakland, CA	Golden Gate	220
	San Francisco-Oakland Bay	220
Savannah, GA	Talmadge Memorial	185
Seattle, WA	West Seattle	140
South Jersey (Camden-Gloucester), NJ	Walt Whitman	150
	Delaware Memorial	188
Tampa, FL	Sunshine Skyway	155

Port	Bridge	Air Draft in Feet
Wilmington, DE	Delaware Memorial	188

Source: Bureau of Transportation Statistics, “Air Drafts by Limiting Bridge for Select Container Ports,” https://data.bts.gov/dataset/Air-Drafts-by-Limiting-Bridge-for-Select-Container/25e5-bvnb/data_preview; San Francisco area bridge information.

What Is the Coast Guard’s Role in Bridge Permitting?

Bridges to be built over navigable waterways must submit their design plans to the Coast Guard so that the agency can ensure the bridge does not impose a safety hazard for navigators.³³ The Coast Guard and the FHWA have signed a memorandum of agreement that is intended to expedite and coordinate their roles in bridge permitting.³⁴ In addition to reviewing new bridge design plans, the Coast Guard’s Office of Bridge Programs funds alterations to the support structure of bridges found to interfere with navigation and regulates the operation of drawbridges to accommodate the needs of bridge users and navigators.³⁵

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³³ 33 U.S.C. §401, §491, and §525; 33 C.F.R. Subchapter J.

³⁴ “Memorandum of Agreement Between the United States Coast Guard and The Federal Highway Administration to Coordinate and Improve Bridge Planning and Permitting,” https://www.dco.uscg.mil/Portals/9/USCG_FHWA_MOA_Jan2014.pdf.

³⁵ U.S. Coast Guard, “Office of Bridge Programs,” <https://www.dco.uscg.mil/Office-of-Bridge-Programs/>.

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