



AVIATION



HIGHWAY



MARINE



RAILROAD



PIPELINE

Issued April 24, 2023

MIR-23-07

Fire aboard Scrap Metal Barge *CMT Y Not 6*

On May 23, 2022, about 0030 local time, the towing vessel *Daisy Mae* was towing the loaded, 300-foot-long scrap metal barge *CMT Y Not 6* northbound in the Delaware Bay when a fire was discovered on board the barge.¹ The fire burned for 26 hours before it was extinguished by responding fire boats. No pollution or injuries were reported. Damage to the *CMT Y Not 6* was estimated at \$7 million.



Figure 1. Towing vessel *Daisy Mae* pulling the *CMT Y Not 6* barge with scrap metal cargo on fire. (Source: US Coast Guard)

¹ (a) In this report, all times are eastern daylight time, and all miles are statute miles. (b) Visit [nts.gov](https://www.nts.gov) to find additional information in the [public docket](#) for this NTSB investigation (case no. DCA22FM019). Use the [CAROL Query](#) to search investigations.

Casualty type	Fire/Explosion
Location	Delaware Bay, about 12 mi east-northeast of Bowers, Delaware 39°7.04' N, 75°11.25' W
Date	May 23, 2022
Time	0030 eastern daylight time (coordinated universal time -4 hrs)
Persons on board	5 (<i>Daisy Mae</i>), 0 (<i>CMT Y Not 6</i>)
Injuries	None
Property damage	\$7 million est.
Environmental damage	None
Weather	Visibility 10 mi, clear, winds north-northwest 9 kts, seas 1-3 ft, current northwest 1.4 kts, air temperature 70°F, water temperature 65°F, morning twilight 0511, sunrise 0541, sunset 2017
Waterway information	Bay, width 15-20 mi, depth 17-35 ft (at casualty site)

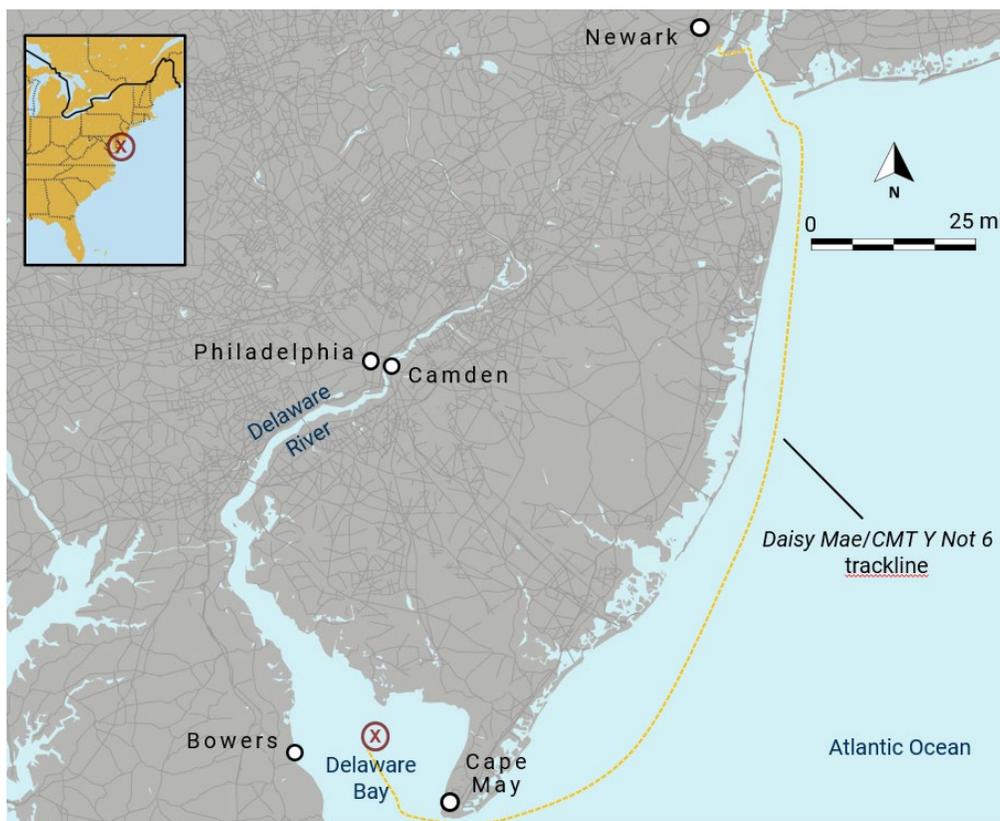


Figure 2. Area where the *CMT Y Not 6* scrap barge caught fire, as indicated by a red X. (Background source: Google Maps)

1. Factual Information

1.1 Background

The 83-foot-long, welded-steel towing vessel *Daisy Mae* was built by Rodriguez Shipbuilding in Coden, Alabama, in 2017. The 3,400-hp vessel was owned by Coeymans Marine Towing (CMT) and operated from their facility in Coeymans, New York.

The *CMT Y Not 6* was a 300-foot-long deck barge also owned by CMT. The company purchased the barge in February 2022 and welded 10-foot-high bin walls onto the deck to better accommodate loose cargo. In March 2022, CMT bareboat chartered the barge to Camden Iron & Metal, an affiliated entity of Eastern Metal Recycling USA (EMR), from Camden, New Jersey.²

EMR specialized in the buying, selling, and processing of a variety of ferrous and nonferrous scrap metals. At the time of the casualty, the company operated 54 scrap metal facilities within the United States, including facilities in Camden and Newark, New Jersey.

1.2 Event Sequence

About 1800 on May 21, 2022, the towing vessel *Daisy Mae* approached the barge *CMT Y Not 6* alongside EMR's Newark facility and began to prepare to tow it astern. EMR had loaded the barge from shore with more than 7,050 tons of a type of scrap metal they referred to as "shredder feed." Shredder feed is a lower grade of ferrous scrap metal defined in the industry as heavy melting steel. It consists of a variety of different metal scraps, including end-of-life vehicles that have been crushed (with free-flowing liquids—gasoline, oil, paint, anti-freeze, lubricants—removed), household appliances, and various other ferrous metal pieces greater than one-quarter inch in thickness.³ The shredder feed was to be transported via barge by the *Daisy Mae* to EMR's Camden facility, where it would be offloaded and processed through the company's industrial shredder. The shredding process would remove any nonmetallic material and produce a consistent shredded metal commodity that could easily be charged into a foundry's furnace.

At 1900, the *Daisy Mae*, with the *CMT Y Not 6* in tow astern, departed the dock. The *Daisy Mae* crew consisted of a captain and mate who alternated the navigation

² A bareboat charter agreement involves an owner leasing a barge or towboat without a crew, with less fuel and stores, and with minimum restrictions on the use of the vessel.

³ Institute of Scrap Recycling Industries, Inc., *ISRI Scrap Specifications Circular*, July 2022, <http://www.scrap2.org/specs/II/>.

watch in the wheelhouse, two able seamen (AB) who supported the navigation watch in the wheelhouse and made rounds of the vessel, and an engineer who maintained the tug's mechanical equipment. The crewmembers worked 6-hours-on, 6-hours-off shifts, except for the engineer, who worked during the day. The captain indicated that he had conducted similar scrap metal tow operations from the same area "a hundred times" over his career and he had no concerns with this tow.

Four hours later, after navigating out of New York Harbor, the crew of the *Daisy Mae* turned the vessel south to follow the New Jersey coast. The tow wire was let out to 700 feet, and the tow hugged the coastline, averaging 5 to 6 knots.

For the next 21 hours, the towing vessel and barge continued in a southerly direction. The captain, who stood the 0600-1200 and 1800-2400 watches, described the transit as "pretty noneventful as far as weather," and the mate described it as "relatively calm and... just...mundane." The captain described the seas to be 3-4 feet, with the winds out of the southwest at 15 knots. He also reported light rain, not hard enough to "put on the bridge window wiper," and they encountered no squalls.

About 2030 on May 22, the tow was south of Cape May. The captain, who was navigating the *Daisy Mae* at the time, steered the vessel to starboard in a westerly direction toward the Delaware Bay entrance.

At 2330, the mate relieved the captain in the wheelhouse. The tow was traveling in a northwest direction, in the "tugboat alley," adjacent to the main shipping channel (Delaware River Channel). Both the captain and mate reported seeing lightning over land "way in the distance," but nothing near the tow. Also at this time, the AB coming on watch began a round of the vessel's engine room spaces.

An hour later, at 0030 on May 23, after exiting the *Daisy Mae's* engine room, the AB on watch looked aft at the barge and saw smoke and a glow emanating from the pile of scrap metal in the darkness. He did not hear anything unusual coming from the barge. The AB reported to the wheelhouse and notified the mate on watch. The mate also saw a glow coming from the aft port side of the scrap pile. The mate said that within 30 seconds of first noticing the glow and smoke, he saw flames coming from the same area of the barge, which at that point was about 600 feet behind the vessel. The mate sounded the vessel's general alarm to alert the crew. The captain immediately reported to the wheelhouse, where he noticed the fire on the barge getting larger "very, very fast."

The mate navigated the vessel away from the shipping channel and shortened the tow wire to 300 feet to better control the barge. The captain notified the *Daisy Mae's* general manager of the fire. The general manager in turn reported the fire to the US Coast Guard.

At 0110, a Coast Guard small boat and two local municipality fire boats arrived on scene and began fighting the fire. At this point, the fire on the barge had grown to an “inferno,” as described by the mate. The barge was towed into shallower water, and more tow wire was let out so that its weight lay on the bottom to hold the barge on location. Aided by four additional fire boats from neighboring municipalities, firefighting efforts continued for the next 24 hours before the fire was finally extinguished.



Figure 3. The scrap metal fire aboard the *CMT Y Not 6* on the morning of May 23. Inset shows molten metal leaking out of a starboard-side freeing port. (Source: Coast Guard)

1.3 Additional Information

1.3.1 Damage

The *Daisy Mae* towed the *CMT Y Not 6* to EMR's Camden facility, arriving on May 26. The scrap steel was offloaded, and a damage inspection of the barge was conducted. Surveyors documented that most of the damage to the barge was concentrated aft, including sagging of the main deck between 12-18 inches and the buckling of the bin walls and side shell plating in that area. Several of the barge's internal longitudinal and transverse bulkheads also showed damage. The total damage to the barge was estimated at \$7 million. The *Daisy Mae* sustained no damage.

1.3.2 Postfire Examination

The NTSB, Coast Guard, and EMR personnel examined the *CMT Y Not 6* and its scrap metal cargo for the source of the fire once the barge arrived in Camden. EMR had already removed most of the scrap and piled it on the pier. Much of the material that was removed and what remained on the barge showed signs of fire damage and of being exposed to extreme heat during the fire. Much of the metal had liquefied, and the molten metal had then hardened into large pieces. Several flammable nonmetallic materials, including plastics, rubber tires, and electrical components, were visible within the scrap metal cargo. NTSB and Coast Guard investigators found no conclusive evidence within the debris pointing to the source of the fire. Investigators did not identify any metal cuttings or borings within the undamaged scrap.



Figure 4. Cargo removed from *CMT Y Not 6* postfire. The left photo shows scrap metal unaffected by the fire; rubber tires and other nonmetallic materials are visible. Inset is a washing machine drum shrouded in plastic. The right photo shows the scrap metal exposed to the fire, with large metal pieces of solidified molten metal.

1.3.3 Weather

Weather information from three shore-based weather observation stations within a 24-mile radius of the vessel's location about the time the captain and mate turned over the navigational watch showed the presence of lightning. Dover Air Force Base, located in Dover, Delaware, on the west side of Delaware Bay, indicated "lightning distant

southeast” at 2311 (the weather observation stations define “distant” as beyond 10 to 30 miles). Millville Municipal Airport, located in Millville, New Jersey, about 11 miles inland north of the bay, indicated “lightning distant southeast at 2319.” Cape May County Airport, located in Wildwood, New Jersey, on the east entrance of the bay, indicated “lightning immediately north” at 2345. Weather radar imagery reviewed following the casualty showed light precipitation over the casualty site at the time the fire was discovered, with no lightning within 30 miles. The captain, mate, and AB on watch indicated there was no lightning in the immediate area of the *Daisy Mae* and barge at any time during the transit.

1.3.4 Scrap Metal

The Newark EMR facility received the shredder feed scrap metal that was loaded onto the *CMT Y Not 6* barge from a variety of suppliers. These suppliers had entered into an agreement with the facility whereby they promised to ensure that all material was free from “prohibited materials,” including free-flowing liquids, nonmetallic materials, explosives, corrosive materials, pressurized containers, flammable materials, and others. Additionally, EMR’s Inbound Scrap Quality Control Program outlined the process of visually inspecting incoming scrap metal for these prohibited materials. EMR scale operators and quality assurance personnel were responsible for visually inspecting incoming loads and determining if prohibited materials were present. According to the process, if prohibited material was identified, it should have been removed, or the entire load should have been turned away. Once the material was loaded onto a barge, a third-party surveyor would calculate the total weight of the material but would not conduct a detailed inspection of the type of material loaded. According to EMR representatives, the facility followed industry guidelines that defined the grade of material and the cleanness of the scrap. The guidelines stated that “all grades shall be free of dirt, nonferrous metals, or foreign material of any kind” but also that the “accidental inclusion of negligible amounts” of foreign material would be acceptable if it could be shown that the removal of the forging material was unavoidable in the customary preparation and handling of the scrap metal.⁴

According to regulations (Title 40 *Code of Federal Regulations* Part 261), scrap metal that is to be recycled, such as what was transported aboard the *CMT Y Not 6*, is not considered a solid waste and therefore is not subject to hazardous waste regulations for handling and transporting. When asked about hauling different types of cargo, the CMT general manager indicated that there was no difference between hauling scrap metal and hauling cargo such as sand or gravel. The International Maritime Solid Bulk Cargoes

⁴ Institute of Scrap Recycling Industries, Inc., *ISRI Scrap Specifications Circular*, July 2022, <http://www.scrap2.org/specs/II/>.

Code, which aims to facilitate the safe stowage and shipment of certain types of solid bulk cargoes by providing information on the dangers associated with their shipment, lists scrap metal as a “Group C” cargo, which is unlikely to liquify, does not possess chemical hazards, is noncombustible, and has a low fire risk.

The maritime insurance industry is generally aware of the risk associated with the carriage of scrap metal. For example, one firm identified that “hazardous materials can be present in the cargo, which can ignite or explode, causing damage to the vessel and environmental damages, as well as personal injury or even death.”⁵ Insurance companies recommend checking the temperature of the cargo regularly, ensuring the load does not include self-heating materials, and appointing a qualified cargo surveying company to assist the vessel’s master (captain) before and during loading.⁶

1.3.5 Other Scrap Metal Fires

In January 2022, one of EMR’s shoreside piles caught fire. The company said the pile contained heavy melting steel scrap metal, which was a more “homogenous commodity” than the lower-grade shredder feed that was on the *CMT Y Not 6*. The shoreside fire department extinguished the fire after 30 hours. Since the January 2022 fire, the company has installed around-the-clock surveillance at its shoreside facility, and personnel use thermal imagery cameras to monitor the scrap metal pile temperatures. If a pile has an increased temperature, the hot spot is pulled apart using a material handler and allowed to cool.

Following the *CMT Y Not 6* fire, the vice president of EMR operations, who had more than 20 years of experience in the scrap metal industry, told investigators that he did not know the cause of the January 2022 shoreside pile fire, but he highlighted the fire dangers associated with lithium-ion batteries and their increasingly prolific use: “It’s becoming more of a problem every month, every year in our industry.” He noted that nonconventional scrap metal, such as a piece of scrap metal guard rail, could have a lithium-ion battery on the back that could go unnoticed during the screening process due to its small size and location. The vice president said that he had no knowledge of previous scrap metal fires aboard vessels during his more than 8 years with EMR.

Two international vessels carrying scrap metal experienced cargo fires in 2022: one occurred in Southampton, United Kingdom, in January, and the other was in Ghent, Belgium, in June. Both fires were extinguished while the vessels were dockside, and

⁵ MS Amlin, “Scrap Metal Cargoes: An Underestimated Risk,” in *Chart Magazine*, (August 15, 2019), <https://www.msamlin.com/en/chart-hub/english/scrap-metal-cargoes-an-underestimated-risk.html>.

⁶ *Self-heating* occurs when an exothermic chemical or biological process within a material increases the temperature of the material without the application of an external heat source. If self-heating increases the temperature of the vapors to above the ignition point of the material with sufficient oxygen present, self-ignition will occur.

there was minimal vessel damage. In one instance, the vessel's cargo hold fire suppression system aided in extinguishing the fire.

On April 24, 2017, the Hong Kong-flagged cargo ship *Tai Yuan*, with a crew of 11 aboard, was waiting to resume loading scrap metal in Fukuoka City, Japan, when a fire was discovered in the aft cargo hold, which had been filled with scrap metal 2 days before. The fire was fought using multiple water hoses from shore, but the onboard cargo hold carbon dioxide fixed fire-extinguishing system was not used. Despite firefighting efforts, the next day, as the fire continued to burn, the vessel foundered and became a total loss. An oil spill occurred; there were no fatalities or injuries reported.

The Japan Transport Safety Board (JTSB), which investigated the casualty, examined the scrap that was raised from the aft cargo hold. They identified, along with the scrap metal, a mix of dry-cell batteries, lithium batteries, button-cell batteries, kerosene cans, a large mixture of insulation materials, plastic, rubber, and vinyl products, as well as paper. The JTSB determined that, "it was not possible to determine the circumstances leading up to the fire," but that it was "somewhat likely that a spark created by contact between metal objects, a battery, etc., was the source of the fire, and the course ignited the combustible material."⁷

⁷ Japan Transport Safety Board, "Marine Accident Investigation Report MA2018-10," (October 25, 2018), https://www.mlit.go.jp/jtsb/eng-mar_report/2018/2017tk0007e.pdf.



Figure 5. Photos from JTSB report showing the scrap metal raised from the cargo hold and the nonmetal material mixed in with the scrap metal. (Background source: JTSB)

2. Analysis

The unmanned barge *CMTY Not 6* was loaded with more than 7,050 tons of scrap metal cargo that was to be recycled. The captain and crew of the towing vessel *Daisy Mae* were not involved with the loading or sorting of the nonhazardous cargo. The transport of this type of cargo by barge from one facility to another was not uncommon, having been completed by the captain many times, without incident, throughout his career.

While underway in the open waters of Delaware Bay, the crew of the towing vessel *Daisy Mae* saw a fire in the scrap metal on board the barge 600 feet behind the towing vessel. The crew quickly notified their company management of the fire. They shortened the tow wire to the barge for better control and moved the vessel away from any marine traffic. Considering the *Daisy Mae's* distance from the barge and need to keep the tow line attached to control the barge, the *Daisy Mae* crew took the appropriate steps to prevent and fight the fire.

The postcasualty inspection of *CMTY Not 6* revealed structural damage consistent with a high-temperature fire concentrated in the aft section of the barge. The scrap metal cargo in that area also exhibited signs of a high-temperature fire. Much of the scrap metal had melted from the heat and then solidified when the fire was extinguished, creating large metal pieces. The magnitude of the fire and the destruction of the cargo in the area where the fire was first identified prevented investigators from determining a conclusive origin of the fire. However, investigators found flammable nonmetallic materials, such as plastic, rubber, insulation, and electrical components, within the nondamaged cargo. It is likely that these materials were present throughout the cargo and, once exposed to an ignition source, caught fire and then fueled and sustained the fire.

Investigators considered several potential ignition sources. The Dover Air Force Base weather observation station indicated potential lightning near the barge about an hour before crewmembers discovered the fire. Due to the large amount of energy present in a lightning strike, it can be an ignition source. However, the captain, mate, and AB on watch stated there was no lightning in the immediate area of the *Daisy Mae* and barge at any time. Also, when crewmembers discovered the fire, weather observations indicated that the closest lightning strike was more than 30 miles away. Therefore, it is unlikely that a lightning strike caused the ignition.

A spark between metal objects was a potential ignition source for the scrap metal fire aboard the cargo vessel *Tai Yuan* in Japan in 2017. Normal vessel motion during the *CMTY Not 6*'s ocean transit could have been sufficient to cause the metal cargo to continuously shift and interact in a manner to create a spark between metallic objects. This spark may have ignited known combustible materials contained in the cargo.

Self-heating of metallic materials (metallic borings, shavings, turnings, and cuttings) or nonmetallic materials (such as linseed oil rags, coal dust, hay, wood chips, manure, and latex) is another potential ignition source. The risk increases if the material is stacked or piled and/or the material has been wet and not properly dried. Self-ignition is often indicated by more damage to the center of a stack or pile of the material than to the outside. Industry underwriters cite self-heating from materials such as metal cuttings and borings as a potential source of ignition within scrap metal. Although none of these materials were identified following the fire, their potential presence in the scrap metal could not be ruled out.

The scrap metal cargo included end-of-life vehicles and appliances. Improperly prepared vehicles and appliances within the scrap metal that could have contained small amounts of flammable liquids or other prohibited materials also could have been an ignition source.

Another potential source of ignition was damaged lithium-ion batteries, although suppliers screened the cargo for prohibited materials such as lithium-ion batteries before it was loaded on board the barge. EMR's vice president of operations

acknowledged the fire dangers associated with lithium-ion batteries, their increasingly prolific use in a wide range of products, and the difficulty in identifying them during the screening process. A battery-initiated fire was cited as a possible cause in the *Tai Yuan* casualty report.

Combustible materials found within the fire debris suggest numerous potential fuel sources for the fire. Numerous ignition sources were also present: mechanical sparking from shifting metallic cargo, self-heating of metallic or nonmetallic material, improperly prepared vehicles and appliances, and damaged batteries could not be eliminated as ignition sources.

Due to the severity of the fire on the barge, which destroyed materials in its area of origin, investigators were not able to determine its exact cause.

3. Conclusions

3.1 Probable Cause

The National Transportation Safety Board determines that the probable cause of the fire aboard the deck barge *CMT Y Not 6* was the ignition of a combustible material by an undetermined source, such as sparking from shifting metallic cargo, self-heating of metallic or nonmetallic cargo, improperly prepared vehicles and appliances, or damaged lithium-ion batteries.

3.2 Lessons Learned

Monitoring Scrap Cargo

Although scrap metal cargo is typically nonhazardous and poses a low fire risk, there have been recent vessel fires involving such cargo. Even with supplier acceptance agreements and quality assurance personnel visually inspecting scrap metal, metallic and nonmetallic hazardous materials often are present within shoreside scrap metal piles and could be loaded onto vessels. These often-flammable materials elevate the fire risk and can lead to intense fires. Qualified cargo-surveying personnel can assist the vessel's captain before and during loading operations to limit the presence of hazardous, combustible material in scrap metal. Thermal imagery is an effective tool that could be used to identify hot spots in scrap metal cargo at shoreside facilities. Once scrap metal is loaded onto a barge, it is difficult for a towing vessel crew to visually inspect the cargo while underway.

Vessel	<i>Daisy Mae</i>	<i>CMTYNot 6</i>
Type	Towing/Barge (Towing vessel)	Towing/Barge (Barge)
Owner/Operator	Coeymans Marine Towing (Commercial)	Coeymans Marine Towing/Camden Iron & Metal (Commercial)
Flag	United States	United States
Port of registry	Coeymans, New York	Coeymans, New York
Year built	2017	1998
Official number (US)	1276338	1063184
IMO number	N/A	N/A
Classification society	Towing Vessel Inspection Bureau (Third-party organization)	American Bureau of Shipping
Length (overall)	140.0 ft (42.7 m)	300.0 ft (91.4 m)
Breadth (max.)	42.0 ft (12.8 m)	100.0 ft (30.5 m)
Draft (casualty)	11.5 ft (3.5 m)	12.0 ft (3.7 m)
Tonnage	783 GRT	4,492 GRT
Engine power; manufacturer	2 x 3,000 hp (2,237 kW); GE 7FDL12 diesel engines	N/A

NTSB investigators worked closely with our counterparts from **Coast Guard Marine Safety Detachment Lewes and Sector Delaware Bay** throughout this investigation.

Established in 1967, the National Transportation Safety Board (NTSB) is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space; determine the probable causes of these accidents and events; issue safety recommendations; conduct transportation research; and offer information and other assistance to family members and survivors for any accident investigated by the agency. The NTSB makes public its actions and decisions through investigation reports, safety research reports, and statistical reviews.

The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, “accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties ... and are not conducted for the purpose of determining the rights or liabilities of any person” (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB’s statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)).

For more detailed background information on this report, visit the NTSB investigations website and search for NTSB accident ID DCA22FM019. Recent publications are available in their entirety on the NTSB website. Other information about available publications also may be obtained from the website or by contacting—

National Transportation Safety Board
Records Management Division, CIO-40
490 L’Enfant Plaza, SW
Washington, DC 20594
(800) 877-6799 or (202) 314-6551