National Transportation Safety Board

Washington, DC 20594

Highway Accident Brief

Intersection Collision Involving Motorcoach and Transit Bus, Flushing, New York, September 18, 2017

Accident Number:	HWY17MH015
Accident Type:	Intersection collision
Location:	Northern Boulevard (New York State Route 25A) and Main Street, Flushing, New York
Date and Time:	September 18, 2017, 6:16 a.m.
Vehicle 1:	2015 MCI motorcoach operated by Dahlia Group Inc.
Vehicle 2:	2015 New Flyer XD40 bus operated by New York City Transit Authority
Fatalities:	3
Injuries:	Multiple

Crash Description

On September 18, 2017, about 6:16 a.m., a 2015 Motor Coach Industries (MCI) 56-passenger motorcoach, operated by Dahlia Group Inc., collided with a 2015 New Flyer 35-passenger transit bus, operated by the New York City Transit Authority, in Flushing, New York. The crash occurred at the intersection of Northern Boulevard (New York State Route 25A [NY-25A]) and Main Street, about 0.8 mile from the motorcoach carrier's base of operations.[1]

The motorcoach—occupied only by the driver—was traveling east on Northern Boulevard and failed to stop for a red traffic signal at the intersection with Main Street (figure 1). Meanwhile, the transit bus—occupied by the driver and 16 passengers—was executing a right turn on a green right-turn traffic signal from northbound Main Street onto eastbound Northern Boulevard. The motorcoach was traveling 60–61 mph when it struck the left rear side of the transit bus, causing the transit bus to rotate 120 degrees counterclockwise and then strike two cars parked along the right curb of Northern Boulevard.[2] One of the parked vehicles—a 2009 Honda—was unoccupied; the other—a 2002 Toyota—was occupied by a driver and a front passenger. The motorcoach then departed the south side of Northern Boulevard; crossed over the sidewalk; and struck a building

[1] Northern Boulevard and NY-25A are used interchangeably throughout this brief.

[2] The motorcoach speed was derived from multiple sources of information, including the Garmin forward-facing video camera mounted on its windshield and exemplar testing using a similar bus driven on the same route. The indicated speed, reported to the whole mile-per-hour, was used to calculate an approximate acceleration between each data point to evaluate potential throttle input.

on the southeast corner of the intersection, where it came to rest. Three pedestrians were on the sidewalk at the time of the collision, one of whom ran out of the way.

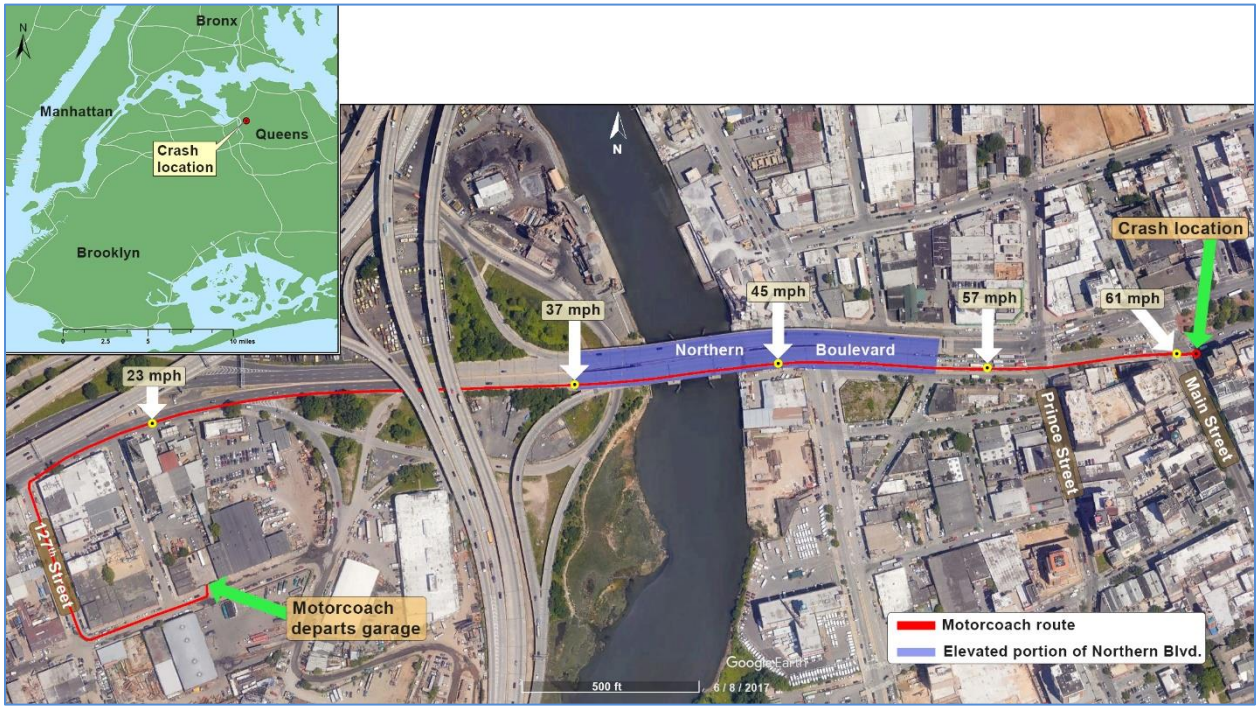

Figure 1. Path of motorcoach from beginning of trip to crash location, highlighting elevated portion of Northern Boulevard over Flushing River and motorcoach speeds increasing from 23 to 61 mph.

Driver, Passenger, and Pedestrian Injuries

The three persons fatally injured included the motorcoach driver, one passenger on the transit bus, and one pedestrian. The transit bus driver and five bus passengers were seriously injured, while 10 bus passengers received minor or no injuries. One pedestrian and the two occupants of the parked car were also injured. All fatal and serious injuries were consistent with blunt force trauma.

Motorcoach Trip Route

Data from telematic systems on the motorcoach and the transit bus and security video footage were used to establish the timeline of events, including respective vehicle location tracking, lane positions, and precrash speeds. The motorcoach was equipped with a TracManager global positioning system (GPS) to record time, longitude, latitude, speed, and route.[3] Telematic systems data from the motorcoach were used to establish the timeline of events leading to the crash. Precollision trip events were also reconstructed from the Garmin GPS device, which provided video and audio from its forward-facing camera. The Garmin GPS coordinates appear to

[3] See the vehicle data recorders factual report in the NTSB public docket for this investigation (HWY17MH015).

be delayed by about 2 seconds relative to the video images. Adjustments were made to the times based on the video images of the motorcoach path of travel.[4]

National Transportation Safety Board (NTSB) investigators also used video from a surveillance camera mounted on a building at the southwest corner of the intersection to analyze the movement of the motorcoach and the transit bus and to interpret certain collision dynamics.[5]

Data indicate that the driver boards the motorcoach and starts the engine at 6:11 a.m. Within 1 minute, he pulls out of the parking area and turns right onto 127th Place Road, where he stops to close the roll-up gate to the parking lot. At 6:13 a.m., he reboards the bus. Surveillance video from the carrier's lot shows that the motorcoach side marker lights are lit as the driver pulls away from the parking lot. At 6:15 a.m., he turns right onto Northern Boulevard and proceeds onto the elevated portion of NY-25A as it crosses the Flushing River. The ascending 5.5 percent grade to the bridge begins about 1,200 feet (just under 0.23 mile) after the turn onto Northern Boulevard. The motorcoach is traveling east in lane 3 at approximately 30 mph (the posted speed limit). The Garmin audio records a metal rattling noise before the vehicle reaches the elevated portion of the road.

At 6:15:41 a.m.—3 seconds after the metal rattling sound—the driver utters a single-word remark and then the motorcoach increases its speed.[6] At 6:15:49 a.m., the speed increases to 37 mph as the motorcoach passes a school bus and a car merging on the right from the Van Wyck Expressway ramp. The motorcoach maintains its position in lane 3 as the ramp transitions to becoming the fourth lane of Northern Boulevard. At 6:15:50 a.m., more audible metal rattling sounds are recorded from inside the cabin. At 6:15:54 a.m., at a speed of 40–42 mph, the motorcoach reaches the vertical crest of the bridge. Its speed continues to increase as it travels downhill. At 6:16:02 a.m., as the road grade levels, the motorcoach speed is recorded as 50 mph.

The Garmin video shows the traffic signal visible at the Prince Street intersection. At 6:16:03 a.m., a driver exclamation is recorded as the motorcoach is traveling 53 mph. The motorcoach continues travel in lane 3 and enters the Prince Street intersection at 57 mph through a red traffic signal; the signal turns green as the motorcoach is in the middle of the intersection (figure 2).

[4] From the video, the geographic coordinates appear to be delayed from the vehicle's actual position by 1.7 to 2.5 seconds. The difference in travel distance during the 1-second intervals, as calculated by the geographic coordinates relative to the reported speed, indicates that it could be overrepresented or underrepresented. The video images and displayed data, nonetheless, provide an accurate account of the travel of the motorcoach up until 0.6 to 0.7 second before impact and were used to establish a timeline and analyze certain aspects of vehicle performance. For additional information, see the accident reconstruction factual report in the NTSB public docket for this investigation (HWY17MH015).

[5] The surveillance camera is mounted on a building near the Northern Boulevard split (Flushing Bay Promenade), west of the Van Wyck Expressway, about 565 feet from where the motorcoach turned onto NY-25A.

[6] NTSB investigators conducted exemplar testing. The calculated rate of acceleration indicated that the motorcoach was at full throttle while traveling on the uphill portion of Northern Boulevard.

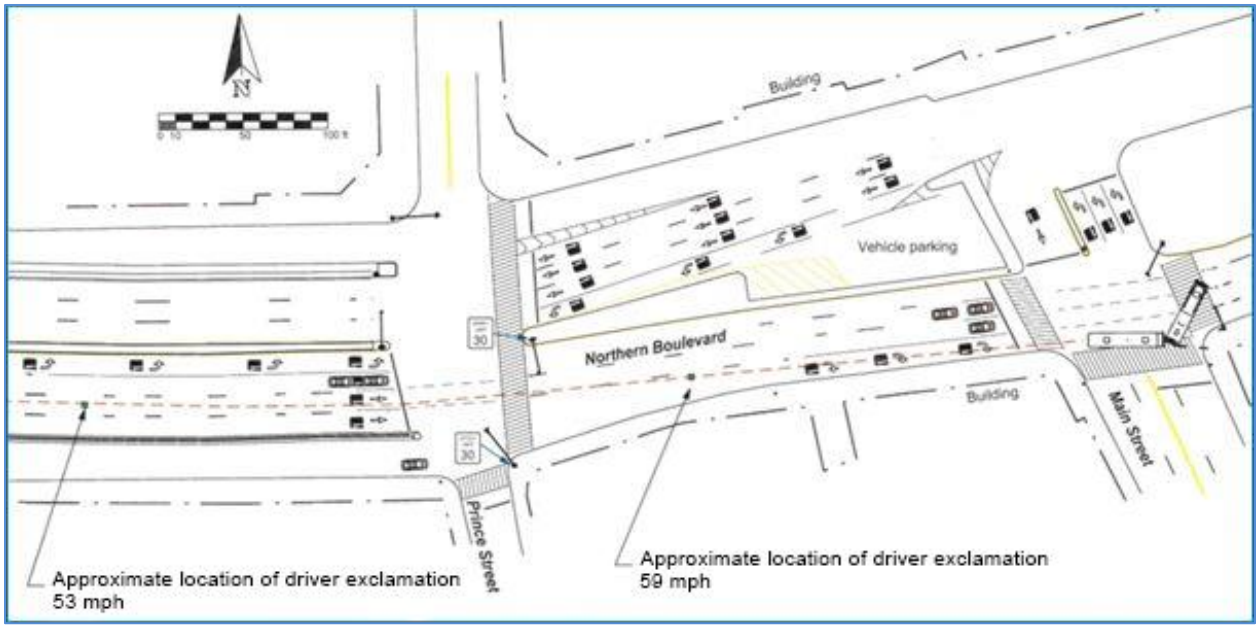

Figure 2. Depiction of motorcoach path of travel through Prince Street and Main Street intersections, with approximate location of driver exclamations noted.

At 6:16:06 a.m.—3 seconds after the first exclamation—the driver exclaims a second time as he approaches the Main Street intersection and moves to the right (from lane 3 to lane 4) in response to stopped vehicles in lanes 2 and 3. This steering maneuver is the only known action the driver takes after experiencing unintended vehicle acceleration. Vehicle data show no brake application. The motorcoach enters the Main Street intersection at 60 mph.

The Garmin video ends as the motorcoach enters the Main Street intersection, estimated to be about 0.6 second before the collision with the transit bus. As noted earlier, the transit bus had entered the intersection and was progressing through its right turn onto Northern Boulevard (figure 2). The video and onboard telematics system indicate a final vehicle speed of 60–61 mph. The motorcoach driver makes an unintelligible remark prior to the end of the video. Table 1 summarizes the motorcoach trip events.

Table 1. Timeline of events for motorcoach crash trip derived from accident reconstruction data, September 18, 2017.

Time (a.m.)	Time to Collision	Motorcoach Speed (mph)	Event
6:11	5:08	< 10	Driver starts engine
6:12	0:04:08	< 10	Motorcoach pulls out of parking lot; driver stops and closes lot gate
6:15	0:01:08	30	Motorcoach turns onto Northern Boulevard, traveling east
6:15:39	0:00:31	30	Motorcoach travels uphill (full throttle; *metal rattling sounds recorded*)
6:15:41	0:00:29	30	Driver remarks
6:15:42	0:00:28	32	Motorcoach begins to accelerate
6:15:49	0:00:21	36	Motorcoach overtakes school bus and car (merging from right ramp)
6:15:50	0:00:20	37	(*metal rattling sounds*)
6:15:54	0:00:16	40–42	Motorcoach reaches approximate crest of bridge, shifts one lane
6:15:55	0:00:15	40	Motorcoach travels downhill
6:15:59	0:00:11	45	Red traffic signal visible ahead on Prince Street
6:16:02	0:00:08	50	Motorcoach travels on level road; red traffic signal on Prince Street; vehicles in lanes 1 and 2; motorcoach shifts to right lane to avoid cars
6:16:03	0:00:07	53	Driver exclaims
6:16:06	0:00:04	57–59	Motorcoach enters Prince Street intersection (red traffic signal); signal turns green; driver exclaims
6:16:08	0:00:02	60	Traffic signal at Main Street is red; transit bus enters Main Street intersection
6:16:10 **Crash**	0:00:00	60–61	Transit bus initiates right turn onto Northern Boulevard; motorcoach driver utters unintelligible remark

Highway Factors

Prince Street and Main Street cross Northern Boulevard east of the river, where five traffic signal indicators face eastbound traffic. Immediately preceding the collision, traffic signals at both Prince and Main Streets indicated red lights. The speed limit on NY-25A is appropriately marked with two 30-mph signs facing eastbound traffic. The signs are located at the intersection of Northern Boulevard and Prince Street, about 480 feet in advance of the crash location. Speed studies by the New York City Department of Transportation indicated that the 85th percentile speed on Northern Boulevard was less than 35 mph.[7] NTSB investigators assessed the elevated portion of Northern Boulevard and determined that the lane lines were faded and obscured at the time of the crash. The city refreshed the lane lines on January 4, 2018.

Motorcoach Driver

NTSB investigators considered whether factors related to the motorcoach driver's mental or physical state led to his failure to stop at the red lights. Specifically, investigators found no evidence that his experience, training, route familiarity, or precrash activities were factors in the collision. The driver held a New York commercial driver's license with a nonstudent passenger endorsement. Further—though not a requirement for Dahlia Group—he had undergone annual, recurrent, and remedial training as a condition of his former employment with the New York Metropolitan Transit Authority.[8] He was driving a familiar route (the crash occurred about 0.8 mile from the motorcoach carrier's base of operations). The reconstruction of his precrash activities indicated that he had sufficient opportunity for sleep; and the review of medical records indicated that the driver did not suffer from acute or chronic sleep restriction. Moreover, the circumstances of the crash sequence did not suggest that he experienced a lapse of attention or a delayed response as would be associated with fatigue.

The Garmin GPS recording indicates that the motorcoach driver is conscious and aware of the hazardous conditions preceding the crash but is unable to control the vehicle speed. Records from the driver's cell phone service provider indicated that he was not using his phone for text or voice communication near the time of the crash. Investigators identified no potential sources of distraction external to the vehicle near the crash site. Results from the postmortem toxicology analysis of the driver's blood and urine specimens were negative for precrash medications and alcohol or other drugs (illicit, prescription, or over-the counter).[9] The treatment records reviewed

[7] (a) These vehicle spot speed studies were conducted on November 21, 2017, east of the elevated portion of Northern Boulevard, and on January 10, 2018, west of the elevated portion of Northern Boulevard. (b) The 85th percentile speed is the speed at which 85 percent of vehicles travel at or below; 15 percent of vehicle traffic is traveling above that speed.

[8] The motorcoach driver first obtained a commercial driver's license in February 1996. He began working for the Metropolitan Transit Authority on August 14, 2012, but was terminated on April 10, 2015, for making a false report, gross misconduct, and failing to make notification that he was arrested and charged with driving under the influence in Connecticut.

[9] The toxicology report from the Federal Aviation Administration Bioaeronautical Sciences Research Laboratory identified ketamine (3,946 micrograms per milliliter) and norketamine, which were applied postcrash by first responders. Toxicology test results were negative for ethanol, amphetamines, opiates, marijuana, cocaine, phencyclidine, benzodiazepines, barbiturates, antidepressants, and antihistamines.

by the NTSB medical officer indicate that during resuscitation the driver was given ketamine and norketamine, which were identified in the postcrash toxicology results.

The NTSB concludes that the motorcoach driver was qualified and was not impaired by alcohol or other drugs at the time of the crash.

Vehicle Factors

NTSB investigators examined all major vehicle mechanical and operational systems on the transit bus and the motorcoach, which included the steering, braking, suspension, power train, and electrical systems. Overall vehicle crash damage was documented, to include any damage or anomalies discovered within the major vehicle and operational systems.

Transit Bus

The transit bus sustained a severe impact at the left-rear and engine compartment area. No mechanical or operational issues were found.

Motorcoach

The motorcoach sustained severe damage from the high-speed frontal impact. NTSB investigators considered whether a mechanical or electrical issue on the motorcoach could have resulted in its unintended acceleration but found no evidence of a runaway engine, electrical malfunction, brake fade or brake deficiencies, or issues with an open throttle.[10] Because the motorcoach failed to stop at the red light on Northern Boulevard, investigators conducted additional component testing of the brake system and accelerator pedal, as described below:

- Testing of the accelerator pedal included inspection of the spring-returned roller actuating mechanism for roughness, catching or sticking, and roller defects.

- Testing of the contact rotary position sensor included observation of electrical resistance at the wide-open throttle and closed throttle accelerator pedal positions.

Results indicated no defects such as roughness, sticking, or broken components that would indicate a defective actuating mechanism. Additionally, there were no indications of diagnostic trouble codes from the engine control module, which would indicate uncontrolled acceleration.

NTSB investigators performed a functional check of the brake system. Inspection of the individual brake components revealed that the brakes appeared to be in good condition and had been properly maintained. The antilock brake system sensors, modulators, and wiring were in place and intact at all wheel locations. No precrash brake system defects or deficiencies were identified. No precollision braking tire evidence was found at the scene, and no witness statements

[10] In the case of a runaway engine, the engine draws extra fuel from other than the primary fuel source (for example, engine oil) and overspeeds at increasingly higher rpms, producing up to 10 times the engine's rated output until destroyed by mechanical failure or seizure of the bearings from lack of lubrication.

indicated that the brakes had been applied prior to the collision. A surveillance video of the crash shows no illumination of the motorcoach brake lights until the vehicle comes to rest.

Following the assessment of the mechanical and operating condition of the motorcoach, the NTSB concludes that the circumstances of this crash are inconsistent with unintended acceleration due to vehicle factors.

Pedal Misapplication and Driver Intent

Pedal misapplication is characterized as a sudden, unintended acceleration due to a vehicle operator depressing the accelerator pedal instead of, or in addition to, the brake pedal.[11] Pedal misapplication typically involves an error by the driver in response to the sudden need to slow down or the driver becoming misaligned with the normal driving position, being distracted, or responding to a sudden, unexpected event. Essentially, the operator misapplies the accelerator pedal when intending to depress the brake pedal.

In this crash, the motorcoach was traveling on an incline at 30 mph when the driver first uttered a remark. Testing from an exemplar motorcoach indicated that full acceleration of the pedal is required to travel up the hill at this speed. Driver confusion would have been very unlikely because there was no need for him to move his foot between the accelerator and brake pedals. As the motorcoach continued toward the crest of the bridge and then descended toward the intersection, its speed continued to increase. A driver who mistakenly depresses the accelerator pedal for the brake pedal typically creates variable speed due to pumping of the pedal (which is thought to be the brake). The NTSB concludes that the circumstances of this crash are inconsistent with pedal misapplication.

The evidence is also inconsistent with intentional acceleration of the motorcoach into the transit bus. The motorcoach driver made one remark and two exclamations throughout the drive, one of which was just prior to making an evasive steering maneuver around stopped vehicles at the Main Street intersection. Additionally, in interviews with NTSB investigators, the driver's wife described him as happy, having experienced no recent stressful events or medical issues. The NTSB concludes that the motorcoach driver's actions are inconsistent with a deliberate intent to crash his vehicle.

Alternative Responses to Braking

In addition to examining potential reasons for the motorcoach driver's failure to avoid colliding with the transit bus, NTSB investigators also examined two alternative responses that might have been available to the driver to prevent or mitigate the crash:

- The driver could have turned off the engine by pulling out the key—which would have terminated propulsion and decreased vehicle speed.

[11] NTSB. 2009. *Pedal Misapplication in Heavy Vehicles*, NTSB/SIR-09/02. Washington, DC: National Transportation Safety Board.

- The driver could have shifted into neutral and applied the parking brakes—which would have caused the air inside the drive axle brake chambers to exhaust, allowing the spring brake actuators to automatically apply the brakes via a mechanical means, thus slowing the vehicle. To avoid the crash at the motorcoach speed of 61 mph, the driver would have had to apply the parking brakes prior to reaching the Prince Street intersection.[12]

Pedal Obstruction

NTSB investigators considered the possibility that an object became lodged beneath or between both the brake and the accelerator pedals, resulting in uncontrolled acceleration and the inability to apply the brakes (figure 3). At the scene of the crash, investigators found a metal thermos near the control pedals. When interviewed, the driver's wife stated that he had taken his thermos for the trip. The thermos could potentially explain the metal rattling heard on the Garmin audio just before the driver's first remark.

Figure 3: Pedal obstruction test using exemplar motorcoach and metal thermos, showing one lodging position among several possible thermos and pedal combination scenarios.

Investigators examined the audio recording to determine if a dropped thermos could have created the sound, but the results were inconclusive. Metallurgists from the NTSB Office of Research and Engineering examined marks on the thermos to determine if they could have been caused by contact with the vehicle control pedals; no physical evidence was present to indicate this type of interference. Investigators also obtained a similar thermos and attempted to lodge it in the pedals of an exemplar motorcoach. They found that it was possible to position the thermos

[12] Results from exemplar testing indicated that a brake application overrides throttle input and stops the vehicle while the engine is accelerating. Upon activation of the brake push–pull valve, an exemplar motorcoach traveling 61 mph would travel about 570 feet before coming to a complete stop. To ensure stopping before Main Street, the last opportunity to apply the brakes would have been prior to reaching the Prince Street stop line.

beneath and between the pedal controls such that it prevented brake application while depressing the throttle.

The surveillance video that captured the motorcoach colliding with the bus does not show any brake lights from the motorcoach until it comes to rest.[13] Likewise, the engine control module data provide no indication of a hard brake application. It is possible that an engine control module would not record a brake attempt if the pedal was obstructed, thus preventing the driver from fully depressing it. Results of exemplar brake testing indicate that only a small brake application is required to register on the brake application gauge (about 1 degree movement of the brake pedal to the floorboard). With less than 1 degree of pedal movement, the data might not indicate braking even if a driver attempted to apply the brakes. The NTSB concludes that though an obstructed brake pedal could not be discounted as a factor in the crash, it also could not be determined as causal to the crash.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the Flushing, New York, crash was the driver's unintended acceleration of the motorcoach and inability to brake for reasons that could not be conclusively determined from the information available.

Adopted: February 11, 2019

For more details about this crash, visit the NTSB public docket and search for NTSB accident ID HWY17MH015. The docket includes such information as police reports, photographs, driver and witness statements, data on previous crashes, and highway engineering reports.

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." 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. 49 *United States Code*, Section 1154(b).

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[13] The surveillance video was mounted about 565 feet from where the motorcoach turned onto NY-25A.