

# National Transportation Safety Board

Office of Highway Safety

Washington, DC 20594



HWY23MH006

## **SURVIVAL FACTORS**

Group Chair's Factual Report

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## **A. CRASH**

Location: Delray Beach, Palm Beach County, Florida  
Date: February 8, 2023  
Time: 8:06 p.m. (EST)

## **B. SURVIVAL FACTORS GROUP**

Group Chairman	Jason Zeitler National Transportation Safety Board Washington, D.C.
Group Member	John Humm, PhD National Transportation Safety Board Washington, D.C.
Group Member	Lieutenant Louis Skebaris Delray Beach Police Department 300 West Atlantic Avenue, Delray Beach, FL 33444
Group Member	Captain Jon Woertz Delray Beach Fire Rescue 501 West Atlantic Avenue, Delray Beach, FL 33444

## **C. SUMMARY**

For a summary of the crash, refer to the *Crash Summary Report of the Investigation*, in the docket for this investigation.

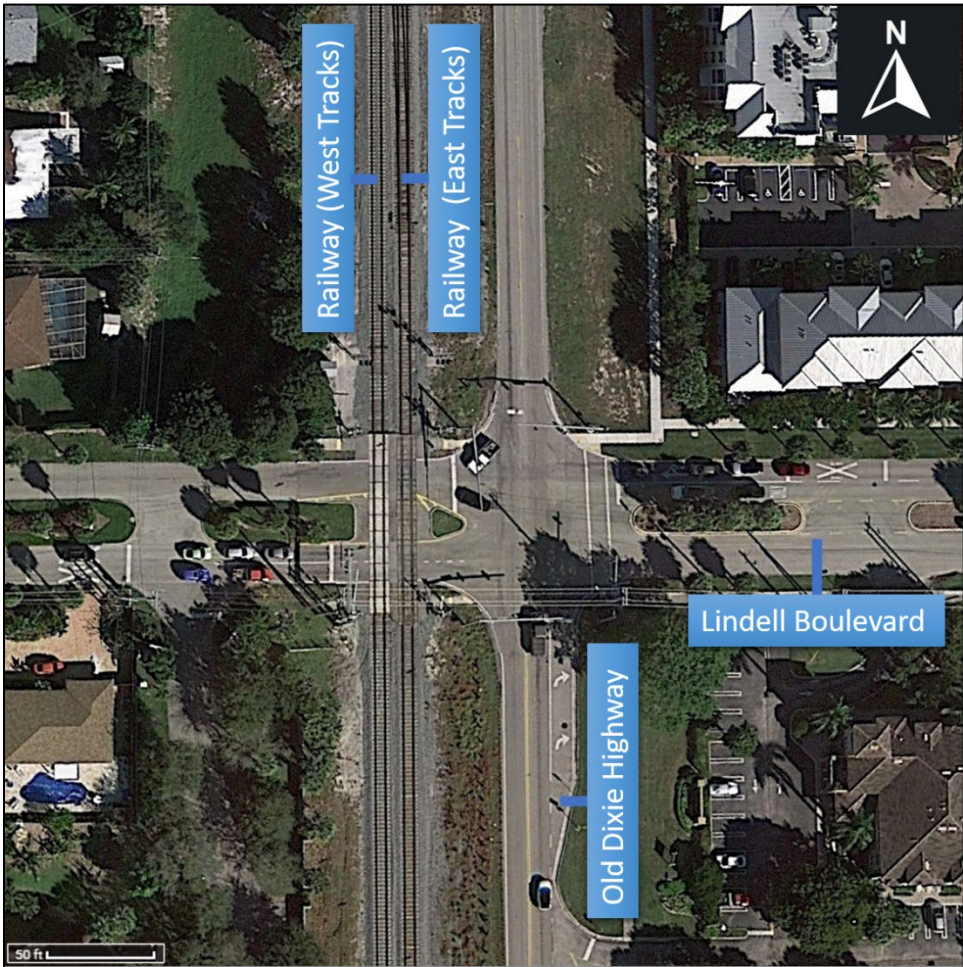
## **D. DETAILS OF THE SURVIVAL FACTORS INVESTIGATION**

The Survival Factors Group investigation collected evidence from the vehicles, occupants, and the emergency response for the collision. Vehicle information focused on the interiors and survival aspects, such as seats, seatbelts, and emergency evacuation. Occupant information included age, gender, and injury severity. Emergency response information focused on agencies and equipment used, and timeliness of the response. Interviews were conducted with several first responders.

**1.0 Scene**

**1.1 Crash Location - Lindell Boulevard & Old Dixie Highway**

A daytime inspection of the scene was conducted on February 11-13, 2023. The scene was located west of the intersection of Old Dixie Highway and Lindell Boulevard, as observed in Figure 1. The collision occurred in the westbound lanes of Lindell Boulevard and the eastmost Florida East Coast Railway (FECR) track (Track #1), in the city of Delray Beach, Palm Beach County, Florida. The collision involved a 2015 Nissan Rouge SV (Nissan) and a Brightline train (train). A northbound Acura TLX (Acura) was struck by debris from the collision.



**Figure 1: Aerial View of Lindell Boulevard and Old Dixie Highway**

Source: Google Earth (Modified)

A nighttime inspection of the scene was conducted on February 13, 2023, at approximately 8:00 p.m. EST. The subject intersection was dark. The only artificial lighting present at the intersection of Lindell Boulevard and Old Dixie Highway was one streetlight located on the southeast corner of the intersection. There was no

artificial lighting at the intersection of the FECR railway and Lindell Boulevard, nor the northbound or southbound leadup on Old Dixie Highway to the intersection of Lindell Boulevard. During the nighttime inspection, terrestrial photographs and video were taken by NTSB investigators. Video footage of a northbound and southbound Brightline train were captured. An overview of the crash scene location can be observed in Figure 2. In Figure 2, the Delray Beach Police Department (DBPD) and Delray Beach Fire Rescue (DBFR) are still present on scene, and the Nissan's final rest position can be observed.



**Figure 2: Aerial of Crash Scene Post-Impact**  
Source: Delray Beach Police Department

### 1.1.1 Lindell Boulevard

Lindell Boulevard traveled eastbound and westbound. Westbound Lindell Boulevard, east of Old Dixie Highway, consisted of a left-turn lane and a combination through/right-turn lane. Westbound Lindell Boulevard, west of Old Dixie Highway consisted of a single through lane. Eastbound Lindell Boulevard, east of Old Dixie

Highway, consisted of two through lanes that were free from center delineation markings. Eastbound Lindell Boulevard, west of Old Dixie Highway, consisted of a combination through/left-turn lane and a combination through/right-turn lane. Raised medians separated eastbound and westbound travel lanes of Lindell Boulevard, both, east and west of Old Dixie Highway.

### **1.1.2 Old Dixie Highway**

Old Dixie Highway traveled northbound and southbound. Northbound Old Dixie Highway, south of Lindell Boulevard, consisted of a through/left-turn lane and a right-turn lane. Northbound Old Dixie Highway, north of Lindell Boulevard, consisted of a through lane. Southbound Old Dixie Highway, south of Lindell Boulevard, consisted of a through lane. Southbound Old Dixie Highway, north of Lindell Boulevard, consisted of a combination left/through/right-turn lane. Northbound and southbound travel lanes of Old Dixie Highway were not separated by a median, both, north and south of Lindell Boulevard.

### **1.1.3 Florida East Coast Railway (FECR)**

The FECR, which ran parallel to Old Dixie Highway, traveled northbound and southbound. The FECR consisted of an east track (Track #1) and a west track (Track #2). The DOT crossing inventory number for the crossing was 272498Y. The railroad milepost was 319.36. There was a 24-hour Quiet Zone for this crossing, which was established on June 2, 2018<sup>1</sup>. The train occupied the Track #1 when the crash event occurred.

The rail crossing was equipped with eastbound and westbound vehicle and pedestrian gate arms with gate arm lamps, alternating red flashing signals, and signage containing an emergency phone number and DOT crossing information. The westbound emergency signage, as observed in Figure 3, measured 9x12 inches, was retroreflective, and contained white and black characters and a blue background. The emergency signage was located behind to the flashing signals, and the base of the emergency signage measured approximately 91 inches above the ground. The eastbound and westbound signage was not visible from the Nissan's perspective while positioned on the tracks. The eastbound emergency signage had similar dimensions as the westbound signage.

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<sup>1</sup> **Survival Factors Attachment:** US DOT Crossing Inventory Form - OBM No. 2130-0017 - Revision Date: 11/04/2022.

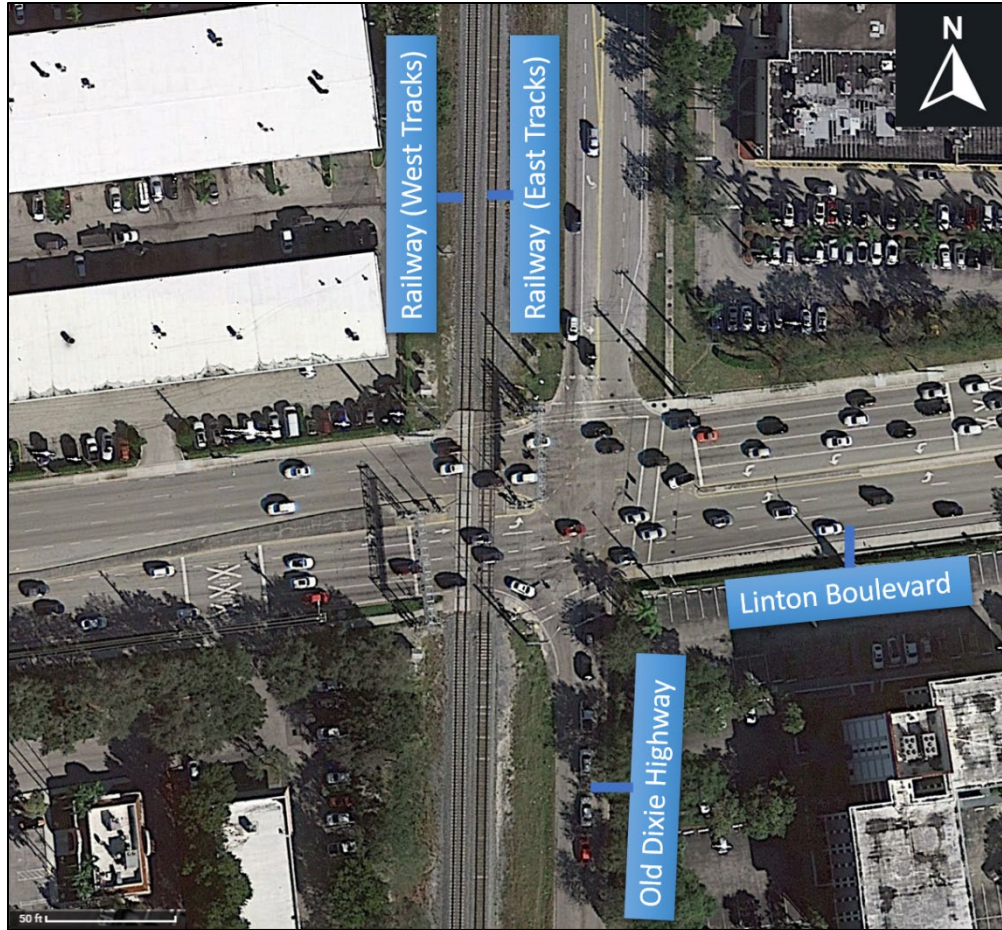


**Figure 3: Westbound Lindell Boulevard Emergency Signage**

## **1.2 Adjacent North Crossing - Linton Boulevard & Old Dixie Highway**

The crossing located north of the subject crossing was inspected. A daytime inspection of the adjacent north crossing was conducted on February 13, 2023. The adjacent north crossing was located just west from the intersection of Old Dixie Highway and Linton Boulevard, as observed in Figure 4. The DOT crossing inventory number for this crossing was 272497S.





**Figure 4: Aerial View of Linton Boulevard and Old Dixie Highway**

Source: Google Earth (Modified)

The rail crossing was equipped with eastbound and westbound vehicle and pedestrian gate arms with gate arm lamps, alternating red flashing signals, and signage containing an emergency phone number and DOT crossing information. The westbound emergency signage, as seen in Figure 5, measured 9x12 inches, was retroreflective, and contained white and black characters and a blue background. The emergency signage was located aft to the flashing lights, and the emergency signage measured approximately 96 inches above the ground. The eastbound emergency signage had similar dimensions as the westbound signage.



**Figure 5: Westbound Linton Boulevard Emergency Signage**

### **1.3 Adjacent South Crossing - Hidden Valley Boulevard & Old Dixie Highway**

The crossing located south of the subject crossing was inspected. A daytime inspection of the scene was conducted on February 13, 2023. The adjacent south crossing was located just west from where Old Dixie Highway intersects Hidden Valley Boulevard, as observed in Figure 6. The DOT crossing inventory number for this crossing was 272499F.

The rail crossing was equipped with eastbound and westbound vehicle and pedestrian gate arms, flashing lights, and signage containing an emergency phone number and DOT crossing information. The westbound emergency signage, as seen in Figure 7, measured 9x12 inches, was retroreflective, and contained white and black characters and a blue background. The emergency signage was located behind the flashing lights, and the emergency signage measured approximately 90 inches above the ground. The eastbound emergency signage had similar dimensions as the westbound signage.



**Figure 6: Aerial View of Hidden Valley Boulevard and Old Dixie Highway**  
Source: Google Earth (Modified)



**Figure 7: Westbound Hidden Valley Boulevard Emergency Signage**

## 2.0 Vehicles:

### 2.1 2015 Nissan Rouge SV



**Figure 8: Aerial Photograph of Nissan Post-Collision**

A witness of the collision reported that the Nissan was traveling southbound on Old Dixie Highway prior to the collision. The Nissan performed a right turn, to turn west onto Lindell Boulevard. The Nissan came to a stop, and the front axle came to a rest on the eastmost FECR rail.

As the collision between the front-right of the Nissan and the front of the Brightline train occurred, the Nissan came to a final rest, overturned on its right side, on the southwest corner of Lindell Boulevard and Old Dixie Highway. The engine from the Nissan was located southeast across the street from the Nissan's final rest location. Post-collision, the train stopped an unknown distance south of the subject intersection.

The 2015 Nissan Rouge SV AWD was inspected on February 12-14, 2023, at Westway Towing, located in Boca Raton, Florida. The Nissan sustained significant front-end damage from the collision and damage consistent with extrication attempts from first responders, as observed in Figure 8. The engine and most of the Nissan's engine compartment separated from the vehicle at the vehicle's firewall. There was no supplemental restraint or inflatable restraint activation observed for any of the vehicle's

airbags or pyrotechnic pretensioners. The Nissan was equipped with a push-to-start/stop switch. The Nissan's headlight setting was positioned in the "off" setting during the inspection, as seen in Figure 9. When interviewed by NTSB investigators, both police and rescue first responders stated that they did not modify the headlight position of the vehicle during rescue operations. <sup>2</sup>



**Figure 9: Nissan Headlight Switch - Off**

The Nissan's roof was separated from the Nissan. A closer inspection of the vehicle's A, B, C, and D pillars revealed damage to each pillar that was consistent with cutting, as part of the extraction process by Delray Beach Fire Rescue (DBFR). When interviewed, DBFR confirmed that the roof was removed during extrication of the driver. Prior to extrication, the driver was located in the rear-right seating area of the Nissan and was impaled by a portion of the fiberglass gate arm that entered the vehicle through the rear-right of the Nissan.<sup>3</sup> The front-passenger of the Nissan was located on the ground, south of the Nissan lying supine on the grass with her head facing northeast and her feet to the southwest.<sup>4</sup>

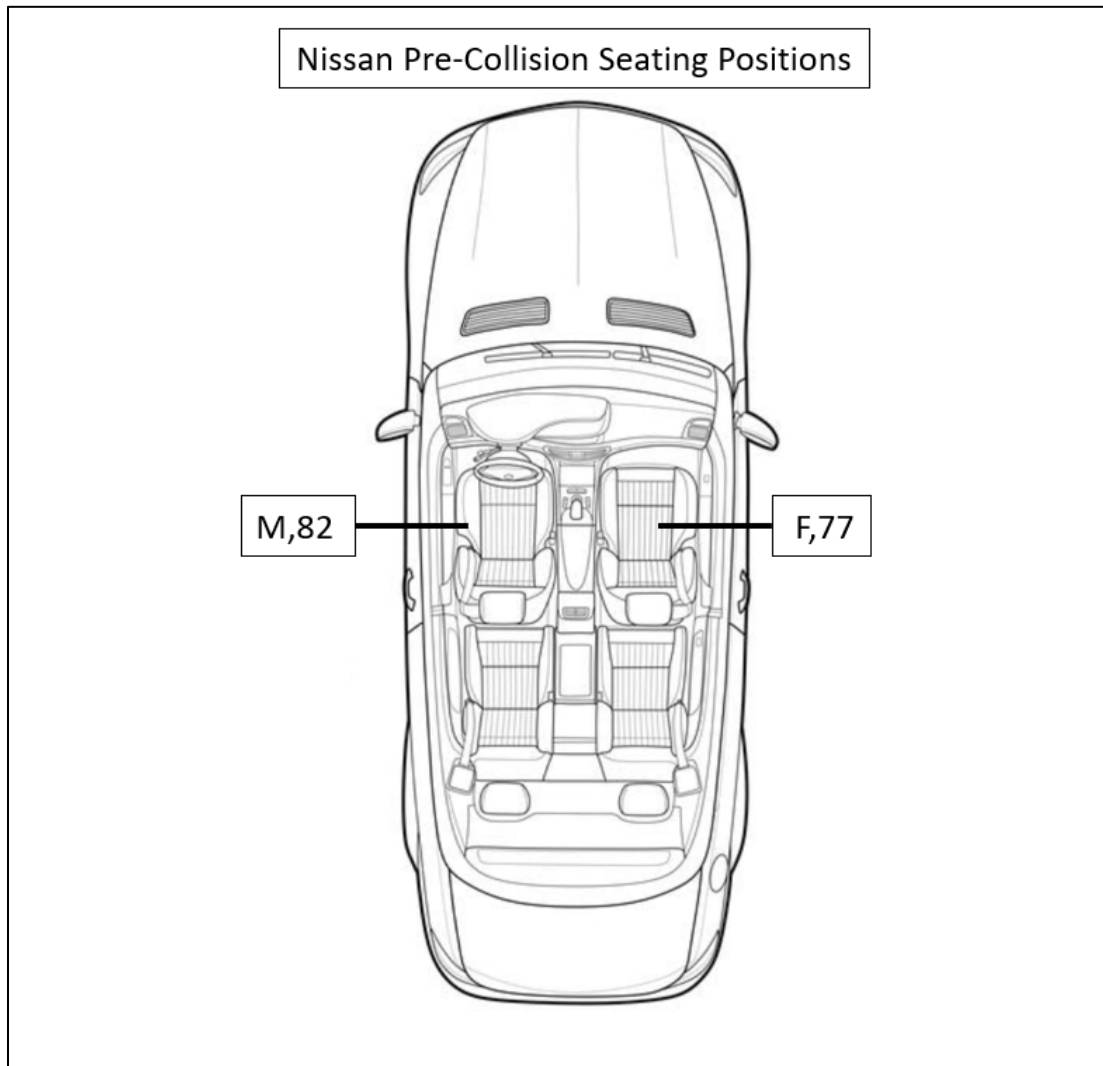
Through witness testimony and occupant kinematic analysis, it was determined that the male was seated in the driver's seat area and the female was seated in the front-passenger seat area during impact, as seen in Figure 10.

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<sup>2</sup> **Survival Factors Attachment:** NTSB Interview of Delray Beach Police Department's Incident Commander and **Survival Factors Attachment:** NTSB Interview of Delray Beach Fire Rescue's Incident Commander.

<sup>3</sup> Per obtained photographs from DBPD.

<sup>4</sup> Per Medical Examiner Forensic Investigator.



**Figure 10: Nissan - Pre-Collision Seating Positions**

All the Nissan's seatbelts were inspected. The driver's seatbelt was found retracted but possessed the ability to extend and retract, as it was not locked. The inertia wheel to the driver's seatbelt was in working condition. The driver's buckle was folded underneath of the bottom of the center console but was able to be inspected after applying downward pressure on the buckle to free it from its obstructed state. The driver's buckle was in working condition.

The front-passenger seatbelt's upper webbing was separated from the lower webbing. Upon closer inspection, the seatbelt was cut during extrication efforts to remove the roof. The cuts observed on the B-pillar and the front-passenger seatbelt were the at the same height as the lowest cut-mark observed on the B-pillar, as observed in Figure 11. There were three cuts attempted during rescue on the passenger-side B-pillar during extrication attempts. During the first two cut attempts, rescue encountered resistance from the portions of the seatbelt mechanism, which

required additional higher cuts on the B-pillar to aid with the extrication efforts. The lower webbing to front-passenger seatbelt was caught in the damaged front-right door. An inspection of the three rear seatbelts did not result in any evidence that was consistent with seatbelt usage by a passenger involved in a significant collision.



**Figure 11: Nissan Front-Passenger Seatbelt**

There was no airbag or pyrotechnic pretensioner deployment for either occupant. The airbag control module (ACM) of the Nissan was downloaded for further examination. During a review of the Bosch Crash Data Retrieval (CDR) report, it was discovered that there were no events recorded by the ACM. A deployment event would have been expected to have been recorded by the ACM given the significant lateral acceleration experienced by the Nissan during the collision sequence. There were currently no GPS or infotainment modules onboard the subject Nissan that were supported for download.

The Nissan's occupant compartment and internal structure was predominantly intact not encroached upon, except for the front-passenger floorboard and seating area. There was no intrusion present in the driver's seat or floorboard area. The driver's seat headrest was not attached, and the seatback was torqued counterclockwise.

There was intrusion present in the front-passenger floorboard area. This intrusion was present in an upward direction that was approximately 4-6 inches in

height. The intrusion was partially concealed by a floormat that was present. The front-passenger seat was partially deformed with the front-left and rear-left seat portion bent downward and the front-right and rear-right seat portion were rotated upward. There was slight inward intrusion from the front-passenger door, which likely occurred during the final portion of the crash sequence as the Nissan overturned onto its right side. There was no occupant compartment intrusion present in the rear-right seating or floorboard area. The rear-right door to the vehicle was propped open, possibly from extrication efforts during the removal of the male occupant, as he came to a final rest in this location of the vehicle. There was no occupant compartment intrusion present in the rear-left seating or floorboard area. While the roof was removed during extrication efforts, there does not appear to be any downward intrusion from the roof into the occupant compartment. The rear liftgate was still present on the Nissan in the DBPD bodycam footage and was later removed from the vehicle by rescue during occupant extraction.

#### **Nissan driver's seat measurements and observations:**

- The seatback angle measured 54.5 degrees from vertical.
- The seat pan angle measured 10.5 degrees from horizontal.
- The seat torque angle measured 12 degrees counterclockwise.
- The seat-pan torque angle measured 8 degrees counterclockwise.
- The headrest was not attached.

#### **Nissan front-passenger measurements and observations:**

- The seatback angle measured 63 degrees from vertical.
- The seat pan angle measured 19 degrees from horizontal.
- The seat torque angle measured 9 degrees counterclockwise.
- The seat-pan torque angle measured 8 degrees counterclockwise.
- The headrest measured 13 degrees from horizontal.

### **2.1.1 Driver**

Per DBFR's EMS Report, the male was located inside of the Nissan and was impaled by a railroad crossing arm. The male was unresponsive, had a respiratory rate of zero, had no eye movement, no verbal or vocal response, and no motor response.<sup>5</sup>

A physical exam was conducted but it was noted in the EMS Report that due to the instability of the vehicle and for scene preservation, the patient was unable to be accessed. The report states that the front, side, and "other" airbag deployment was observed on the Nissan, which was not consistent with the physical evidence observed during the inspection of the Nissan. The male was pronounced deceased at the scene and was not transported to a hospital.

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<sup>5</sup> DBFR Patient Record.  
SURVIVAL FACTORS  
GROUP CHAIR'S FACTUAL REPORT



### **2.1.2 Front-Passenger**

Per DBFR's EMS Report, the female was ejected and discovered approximately six feet from the Nissan. The female was unresponsive, had no pulse, no eye movement, was not breathing, and had obvious deformities present throughout her body. A four-lead EKG was performed, and the female was determined to be in asystole. The female was determined to be deceased at the scene. The report states that the front, side, and "other" airbag deployment was observed on the Nissan, which is not consistent with the physical evidence observed during the inspection of the Nissan. The female was not transported to a hospital.

A survivability study was conducted, in which a collision simulation was performed to study the forces the front-passenger likely underwent during the collision. The purpose of the study was to understand if the lack of seatbelt usage during the collision sequence played a significant role in the injury outcome of the front-passenger.

## **2.2 Autopsy**

February 9, 2023 - The two decedents were transported to the Palm Beach County Medical Examiner's Office. According to staff, the decedents only underwent external examinations, photographs, toxicology, and x-ray imaging. No autopsies were performed on any of the decedents. The external examination reports, photographs, toxicology reports, and x-ray imaging were requested.

## **2.3 External Examination and Injuries**

On February 9, 2023, an external examination was performed on the driver and front-passenger. The driver's and front-passenger's cause of death were multiple blunt force injuries, and the manner of death was determined by the medical examiner to be an accident.

## **2.4 Brightline Train**

An interior and exterior inspection of the Brightline train was conducted on the morning of February 11, 2023. The inspection occurred at the Brightline Maintenance Facility, located in West Palm Beach, Florida. During the inspection, train's audible and visual components were tested. The Brightline train's horn and lights were activated, which was recorded. Photographs of the damaged exterior of the train were taken. The train had begun repairs prior to the NTSB's arrival, as observed in Figure 12, which was reportedly halted upon notification of the NTSB's investigation.

The nose of train was removed prior to the NTBS's arrival but was preserved at the maintenance facility for inspection. The nose, which measured approximately six feet long and two feet tall, sustained crush damage as observed in Figure 13. The train's left sidesteps, and other miscellaneous components were damaged during the collision. The parts were preserved and made available during the inspection of the train.



**Figure 12: Brightline Train Post-Collision**



**Figure 13: Damaged Nose of the Brightline Train**

The train was occupied by 66 passengers in addition to crew members. None of the passengers or crew members of the train sustained any injuries. Figure 14 shows the available view from the interior of the Brightline train, looking outward.



**Figure 14: View from the Interior of the Brightline Train**

### 3.0 Interviews

The Survival Factors Group conducted interviews with the law enforcement and Fire Rescue/EMS incident commander (IC).<sup>6 7</sup> No occupants of the Nissan were interviewed as no one from the Nissan survived the collision. The train conductor was interviewed by NTSB Human Performance Group.

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<sup>6</sup> **Survival Factors Attachment:** NTSB Interview of Delray Beach Police Department's Incident Commander.

<sup>7</sup> **Survival Factors Attachment:** NTSB Interview of Delray Beach Fire Rescue's Incident Commander.

## **E. EMERGENCY RESPONSE**

### **4.0 Law Enforcement**

#### **4.1 Delray Beach Police Department Response**

First Call Received:	20:06:50
Call Taker Finished:	20:07:08
First Unit Dispatched:	20:07:28
First Unit Enroute:	20:07:28
First Unit to Arrive:	20:09:57
Last Unit to Clear:	02:00:41 (02/09/2023) <sup>8</sup>

The DBPD computer aided dispatch (CADs) report was obtained through a subpoena. The CADs report indicated the first officer was dispatched within approximately 38 seconds of receiving the initial 911 notification, or 20 seconds after the call taker completed typing the first call. The first officer was enroute at the same time the call was dispatched. The first officer arrived on scene approximately three minutes after the first 911 notification was received. The DBPD was the only law enforcement agency that responded to the incident. DBPD's primary roles in the subject collision were identifying and isolating victims and witnesses, providing initial first aid (if required), scene security, traffic control, preservation of evidence, conducting a traffic crash investigation, and performing a criminal investigation to warrant or rule out criminal charges.

### **5.0 Fire and Rescue**

#### **5.1 Delray Beach Fire Rescue Response**

First call received:	20:06:50
Call Taker Finished:	20:07:08
Dispatched:	20:07:36
Enroute:	20:08:08
Arrival:	20:12:00
At Patient:	20:13:00
In Service (cleared call):	21:29:44 <sup>9</sup>

The DBFR CADs report was obtained through a subpoena. The CADs report showed that the DBFR was dispatched within 50 seconds of the first 911 notification, or within 30 seconds of the first call taker's intake of the first 911 notification. The DBFR

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<sup>8</sup> **Survival Factors Attachment:** Law Enforcement CADs Report.

<sup>9</sup> **Survival Factors Attachment:** Fire Rescue/EMS CADs Report.

arrived at the crash scene within approximately two minutes and 30 seconds from the time they were dispatched to collision. The DBFR extricated the Nissan's driver and pronounced both Nissan occupants deceased on scene. No train passengers, train employees, or Acura occupants sustained any injuries during the collision, and no one was transported to a hospital. DBFR was the only Fire Rescue/EMS agency to participate in the rescue and EMS efforts of the subject collision.

## **6.0 Hospitals**

There were no surviving occupants from the 2015 Nissan Rouge SV. There were no injuries reported from any of the passengers or crew members of the Brightline train. No hospitals were known to be utilized during this incident. The nearest Level 1 Trauma center was Delray Beach Medical Center, which was located 4.3 miles west of the collision scene.

## **F. DOCKET MATERIAL**

The following attachments and photographs are included in the docket for this investigation:

### List of Attachments:

**Survival Factors Attachment:** US DOT Crossing Inventory Form - OBM No. 2130-0017 - Revision Date: 11/04/2022

**Survival Factors Attachment:** NTSB Interview of Delray Beach Police Department's Incident Commander

**Survival Factors Attachment:** NTSB Interview of Delray Beach Fire Rescue's Incident Commander

**Survival Factors Attachment:** Law Enforcement CADs Report

**Survival Factors Attachment:** Fire Rescue/EMS CADs Report

Submitted by:

Jason Zeitler  
Senior Survival Factors Investigator