National Transportation Safety Board
Office of Highway Safety
Washington, DC 20594

HWY23MH004

SURVIVAL FACTORS

Group Chair's Factual Report

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A. CRASH INFORMATION

Location: Williamsburg, York County, Virginia
Date: December 16, 2022
Time: 1:36 a.m. Eastern Standard Time (EST)
Vehicle 1: 2000 Eldorado passenger bus with an International 3400 chassis
Vehicle 2: 2022 Freightliner Cascadia Truck-Tractor and 2020 Great Dane Semitrailer (combination)

B. SURVIVAL FACTORS GROUP

SURVIVAL FACTORS GROUP

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Group Member	Captain Justin LuDuc York County Fire & Life Safety 301 Goodwin Neck Road Yorktown, VA 23692

C. CRASH SUMMARY

For a summary of the crash, refer to the *Crash Information and Summary Report*, 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 emergency response for the collision. Vehicle information focused on the interiors and survival aspects, such as seats, seatbelts, and emergency evacuation. Occupant information, including age, gender, and injury severity. Emergency response information focused on agencies and equipment used, and timeliness of the response. Interviews were conducted with several bus occupants and first responders.

1.0 Crash Location:

An inspection of the scene was conducted on the morning of December 18, 2022. The collision occurred in the eastbound lanes of Interstate 64, near mile marker 240, located near Williamsburg, in York County, Virginia.

The final rest positions of the three decedents (B02, B03, and B04) from the bus were in close proximity to each other along the north shoulder of the roadway and the left lane (Lane 1). The final rest positions of decedents B03 and B04 were on the eastbound paved north shoulder, near or touching the guardrail posts. Decedent B02's final rest position was reportedly in the active portion of the left lane (Lane 1) of the eastbound lanes. The final rest position was supported by physical evidence located at the scene. Decedent B02 was moved from Lane 1 to the north shoulder of the roadway, by a bus passenger, to avoid a subsequent collision by oncoming traffic.

In Figure 1, the approximate impact location is marked with a red "x", the rest positions of the descendants are marked in red squares, and the final rest locations of the bus, the bus roof, and the Freightliner (herein referred to as truck-tractor) and semitrailer are marked and labeled in black and white, respectively.

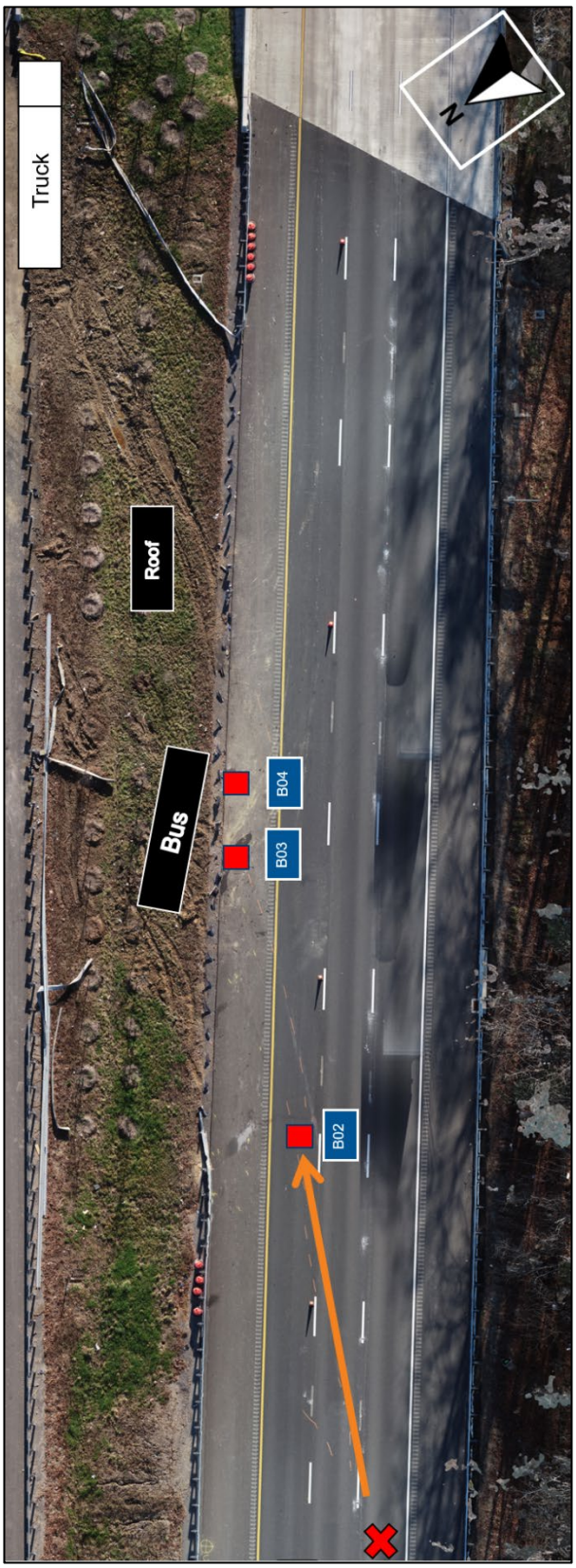

Figure 1: Collision Scene Overview

2.0 2000 Eldorado Bus

2.1 General

The bus was a two-stage manufactured medium-sized bus.[1] The first stage consisted of a 2000 International 3400 chassis, manufactured in May of 2000. The second stage of the bus was an Aero Elite 320 bus body manufactured in November of 2000, by Eldorado National Company. The bus body serial number was ENRMN3213Y0970706. Eldorado National Company was later acquired by Forest River Bus in 2020. The bus was a single-deck rigid bus with a fully customized interior. The seating configuration consisted of a driver's seat and a perimeter seating configuration for the passenger compartment. The bus was occupied by 22 passengers and one driver during the collision, which resulted in three deaths and injuries ranging from serious to minor.

The bus was inspected between December 18th and 21st, 2022, at Scotty's Auto & Fleet Collision Repair, in Toano, VA. Regarding the bus orientation, "left" refers to the driver's side of the vehicle, while "right" refers to the passenger side of the vehicle.

Figure 2: Photograph of crash-involved bus - Pre-Collision Condition
(Source: Facebook)

The Aero Elite 320 model consisted of published specifications listed in Table 1. The reported maximum passenger capacity for the Aero Elite 320 was 33

[1] A vehicle built in two or more stages is one in which an incomplete vehicle, such as a chassis-cab or cut-away chassis built by one manufacturer, is completed by another manufacturer who adds work-performing or cargo-carrying components to the vehicle. See NHTSA - Vehicles Built in Two or More Stages.

passengers[2]; however, this was for a non-perimeter seating configuration. Despite the Eldorado brochure stating that the maximum seating capacity for the Aero Elite 320 was 33 passengers, the brochure also included a thumbnail of a floorplan for a 35-passenger seating configuration for this model.[2] The standard body equipment for an Aero Elite consisted of grey rubber floors, 3/4-inch plywood sub flooring, tinted 31-inch glass windows, floor seat track, and fiberglass molded front and rear caps[2].

Table 1: Eldorado Aero Elite 320 Specifications

Eldorado Aero Elite 320[2]		
Maximum Passenger Capacity	33	Passengers
Interior Height 6" from Sidewall	75	Inches
Interior Height at Center Aisle	79	Inches
Interior Width	91	Inches
Entrance Door	30	Inches
Overall Height	120	Inches
Overall Length	396	Inches
Overall Width (W/O Mirrors)	96	Inches
Wheelbase	218[3]	Inches

Optional equipment that could be ordered when customizing a 2000 Aero Elite 320 included front or rear lifts, plywood flooring, AM/FM radio, backup alarm, backup camera, battery compartment, interior mirrors, egress windows, rear heater, rear in-wall air-conditioner, reverse backup sensors, roof escape hatch, spare tire, wheel covers, and tinted T-slide windows. Due to Eldorado National Company's (now Forest River Bus) retention policy, all documents relating to the subject bus, including the bus body, construction, and ordered options have been purged.

2.2 Exterior

The pre-collision condition of the bus can be observed in Figure 3. The right side of the bus contained a folding door entranceway, and at least four passenger compartment side windows (Figure 2 and Figure 3). The left-side of the bus had at least four passenger compartment side windows, in addition to the driver's side-window. The exterior skin of the bus is black in color and has customized company information that stated, "Futrell's Party Bus", a phone number, logo, and the phrase "Let's Party."

[2] See Survival Factors Attachment: *Eldorado Aero Elite Product Brochure*.
[3] VIN Placard.

Figure 3: Photograph of crash-involved bus - Pre-Collision Condition
(Source: Daily Press)

The post-collision condition of the bus can be observed in Figure 4. The roof and sidewalls of the bus separated from and became detached from the vehicle. The sidewall was a double-skin constructed sidewall. The exterior skin was made of galvanized steel that was less than 0.2 inches thick. The interior skin of the sidewall consisted of mainly fiberglass, and in some cases, interior paneling as well. The interior and exterior skins were separated by insulation. The exterior skin was attached to the interior skin as well as the waist rail and seating rail by rivets.

Figure 4: Bus - Damaged Right C-Channel & Buckled Floorboard

The bus had contact damage on the front bumper of the vehicle. The hood and both headlight assemblies were not attached to the vehicle. Significant crush damage

was observed on the rear of the bus, most notably, on the right frame C-channel, both upper and lower flange (Figure 4). The chassis frame was displaced to the right.

The rear-right floorboard area was contacted by the truck-tractor's front and buckled forward and upward, which compromised the rear of the bus body and the rearmost-right pillar. During the collision sequence, the rear structure and the roof of the bus separated from the rest of the vehicle, compromising the occupant compartment. After separation, a portion of the rear and the roof remained joined together, and came to a final rest, upside down in the grassy median of the crash scene, separated from the rest of the bus, as observed in Figure 5. In Figure 5, the red arrows denote the roof and the yellow arrows denote the rear structure that separated from the remainder of the bus.

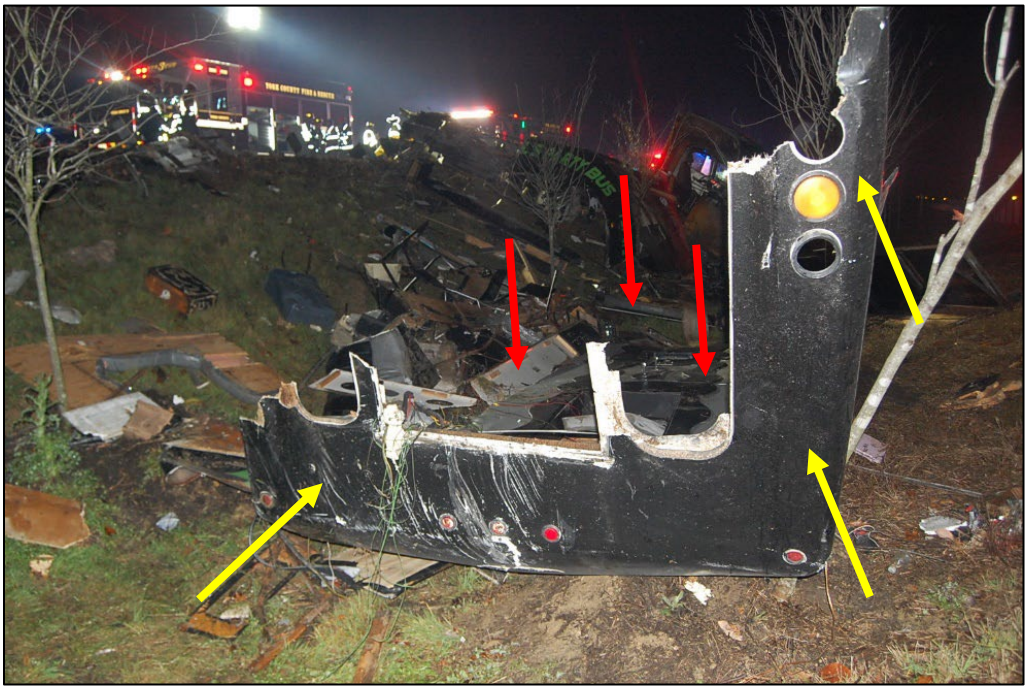

Figure 5: Bus - The Rear and Roof at Final Rest
(Source: VSP)

The bus's roof separated from the rear of the bus (Figure 6). The structural integrity of the occupant compartment was compromised, the interior and exterior skins comprising the sidewall failed at many locations. Most of the sidewall components separated from the bus's various rails. The bus's stairwell, entrance door, and surrounding frame to the entrance door separated from the bus's cab, body, and compromised the vehicle's structural integrity. With the rear, roof, sidewalls, and other components separated from the bus, no portion of the occupant compartment structure or substructure remained to contain passengers in the compartment. All passengers were ejected from the bus.

Figure 6: Bus - Damaged Observed from Rear-Left

There was notable corrosion to various metal portions of the bus's frames, rails, and undercarriage. There was also rotting wood discovered throughout the vehicle's floor and roof. Small portions of the bus's frames and rails were observed with a green coating (Figure 7). The green coating was what remained of the anti-corrosion primer applied during the construction of the bus body.[4] In addition to the anti-corrosion primer to the substructure of the bus, the undercarriage of the bus was treated with a separate anti-corrosion barrier treatment. While the anti-corrosion primer does not require yearly maintenance and reapplication, the anti-corrosion barrier treatment to the undercarriage does require maintenance and reapplication every six to 12 months.[4] There was no information obtained during the investigation as to the reapplication of the anti-corrosion treatment or if it was maintained according to manufacturer specifications.

The bus was equipped with an emergency exit roof hatch (Figure 8). Due to the weight and the current condition of the roof, the emergency exit roof hatch was unable to be tested for proper functionality. Due to crash damage, not all side windows were recovered for evaluation, and the number of emergency egress windows is unknown. The right-side of the bus contained at least four passenger compartment side windows. The left-side of the bus had at least four passenger compartment side windows, in addition to the driver's side-window. Two of the recovered passenger compartment side windows were designed for emergency egress.

[4] Forest River Bus Staff.

Figure 7: Bus - Corroded Components

Figure 8: Bus - Roof with Emergency Exit Hatch

The bus was reportedly traveling much slower than the posted speed limit.[5] The gross vehicle weight rating of the bus was 21,440 pounds.[6] To determine if the bus was

[5] See Docket for further information.
[6] Affixed vehicle placard.

overloaded and if its weight was a contributing factor for its reduced speed, NTSB investigators coordinated with law enforcement to have portable calibrated vehicle scales delivered to the tow yard. Prior to weighing the bus, all debris from the bus that was present at the tow yard was placed back onto the bus. A scale was placed under each of the bus's tires on each side of the vehicle (Figure 9). A total of four scales were used to weigh the bus. A weight was first recorded for the bus, debris, and components, except for the bus's roof. The roof was added onto the vehicle last, in efforts to determine the total weight of the vehicle, in addition to the total weight of the roof alone. The total weight of the roof was approximately 1,250 pounds. However, several speaker components were missing from the roof at the time it was weighed. The total weight of the bus was approximately 16,300 pounds; this does not account for the weight of the bus's occupants.

Figure 9: Bus – Scale Weight Measurements

2.3 Interior

During the removal of the bus from the scene, the bus's debris was loaded onto the bus by towing personnel. During the inspection of the bus, the debris was removed from the vehicle and sorted. Only the passenger-side bench seat remained affixed to the bus's floorboard (Figure 10). In addition to the roof and sidewalls separating from the vehicle, a stairwell, two mounted interior dancing poles, and multiple interior walls became detached from the vehicle as well. The bus's floor was lined with two layers of homestyle tile flooring. Various LED lights and connectors were in the passenger compartment area behind where the seats and benches previously resided.

Figure 10: Bus - Post-Collision Interior View from Rear of Bus

2.3.1 Driver's Seat and Seatbelt

The International chassis of the bus was not equipped with a supplemental inflatable restraint system and no airbag deployment or pyrotechnic pretensioner deployment was observed. The driver's seating area was equipped with a three-point retractable lap and shoulder seatbelt. The upper-right portion of the driver's seat mount was not connected to the vehicle and the driver's seat was loose upon touch. There were no identifying tags or information available on the vehicle or from the bus owner regarding make/model of driver's seat. The seat-pan measured to be 23-degrees from the horizon and the seat back angle with respect to the seat-pan was measured to be 117-degrees.

The driver's seatbelt was inspected. The driver's seatbelt was not functional prior to the subject collision. The seatbelt was found in a retracted position but was not locked. While examining the seatbelt, the seatbelt mechanism possessed the ability to extend and retract. The inertia wheel was tested and found to be functioning. The seatbelt buckle did not function as designed; as the seatbelt release was missing from the buckle prior to the collision (Figure 12). The lower portion of the driver's seatbelt webbing was connected to a bracket. The bracket was disconnected from a subsequent bracket that was attached to the manufacturer's lower anchor point (Figure 11). The two brackets should have been connected by a hex bolt; however, the hex bolt was missing. The brackets were free from fractures, witness marks, or other collision related damage. The bus driver stated in a written statement provided to VSP that he was not wearing his seatbelt while operating the bus.

Figure 11: Bus - Driver's Seat and Seatbelt

Figure 12: Bus – Damaged Seatbelt Buckle

2.3.2 Passenger Compartment Seatbelts

The passenger compartment seating consisted of a perimeter seating arrangement. None of the passenger seating contained any sort of passenger restraint system or seatbelt. Seatbelts were not required in the passenger compartment of the bus per FMVSS 571.208. The state of Virginia requires that *"Any driver, and any other person at least 18 years of age and occupying the front seat, of a motor vehicle equipped or required by the provisions of this title to be equipped with a safety belt system, consisting of lap belts, shoulder harnesses, combinations thereof or similar devices, shall wear the appropriate safety belt system at all times while the motor vehicle*

is in motion on any public highway".[7] With the exception of the driver, no seatbelts were required for bus occupants per Virginia state law.

2.3.3 Passenger Seating

The seating configuration observed in the bus was modified from the original vehicle design. While the build documents were purged by Eldorado National Company due to exceeding retention policies, the two floor seat tracks observed in the floorboard of the bus and the two seating rails are consistent with forward facing seating, and not consistent with a perimeter seating configuration.

In Figure 13, the driver's side floor seat track can be observed and is accented with yellow arrows. The blue arrows in Figure 13 show the driver's side seat rail that contained an inboard C-channel. The floor seat track and the seat rail were two connection points that were originally used to properly install and anchor a passenger seat into the bus using a seat slider connection device when the bus was originally constructed. The perimeter seating arrangement that was later installed into the bus did not utilize either floor seat track, or either seat rail during the installation of the modified seating arrangement.

Figure 13: Bus – Floor Seat Track and Seat Rail

[7] § 46.2-1094. Occupants of front seats of motor vehicles required to use safety lap belts and shoulder harnesses; penalty.

The bench seats that are visible in Figure 14 are the only seat frame and seat pan that did not separate from the bus during the collision sequence. The outboard side of the seat rail contained slotted holes that allowed the exterior skin of the vehicle to be attached and secured (Figure 14 – green arrows). All perimeter seat pans were affixed to a custom metal frame comprised of 1-inch by 1-inch steel. The red arrow in Figure 14 accents an approximate six-inch metal extension that was welded to the custom seat frame below the bench seat pans. In Figure 15, a closer view of the metal-extension can be observed. The metal extension was welded to the custom seat frame and the other end of the metal extension appears to have once been welded to the inboard C-channel of the seat rail as a connection or anchor point.

Figure 14: Bus - Seat Rail and Exterior Skin

Figure 15: Bus - Seat Frame Extension

The passenger seat pans and seat backs, in addition to various metal frames, were located amongst the debris and collected to aid in the reconstruction of the pre-crash passenger seating configuration of the vehicle. The seat pans and frames were assembled outside of the vehicle. After confirming that the seating configuration was accurate using pre-crash video that showed the interior of the bus, the seating components were installed into the interior of the damaged bus. The reconstructed pre-crash seating configuration can be seen below in Figure 16 and Figure 18.

The passenger compartment consisted of custom seats pans, benches, and seatbacks that were mounted on top of a metal frame approximately 13 - 14 inches above the bus's floor. The seats and benches were comprised of leather-like material which encapsulated approximately 4.5 - 5.5 inches of foam and 0.75 inches of plywood. The approximate seating configuration and measurements obtained during the inspection of the bus can be observed in Figure 17.

Figure 16: Bus - Reconstructed Interior and Seating Configuration

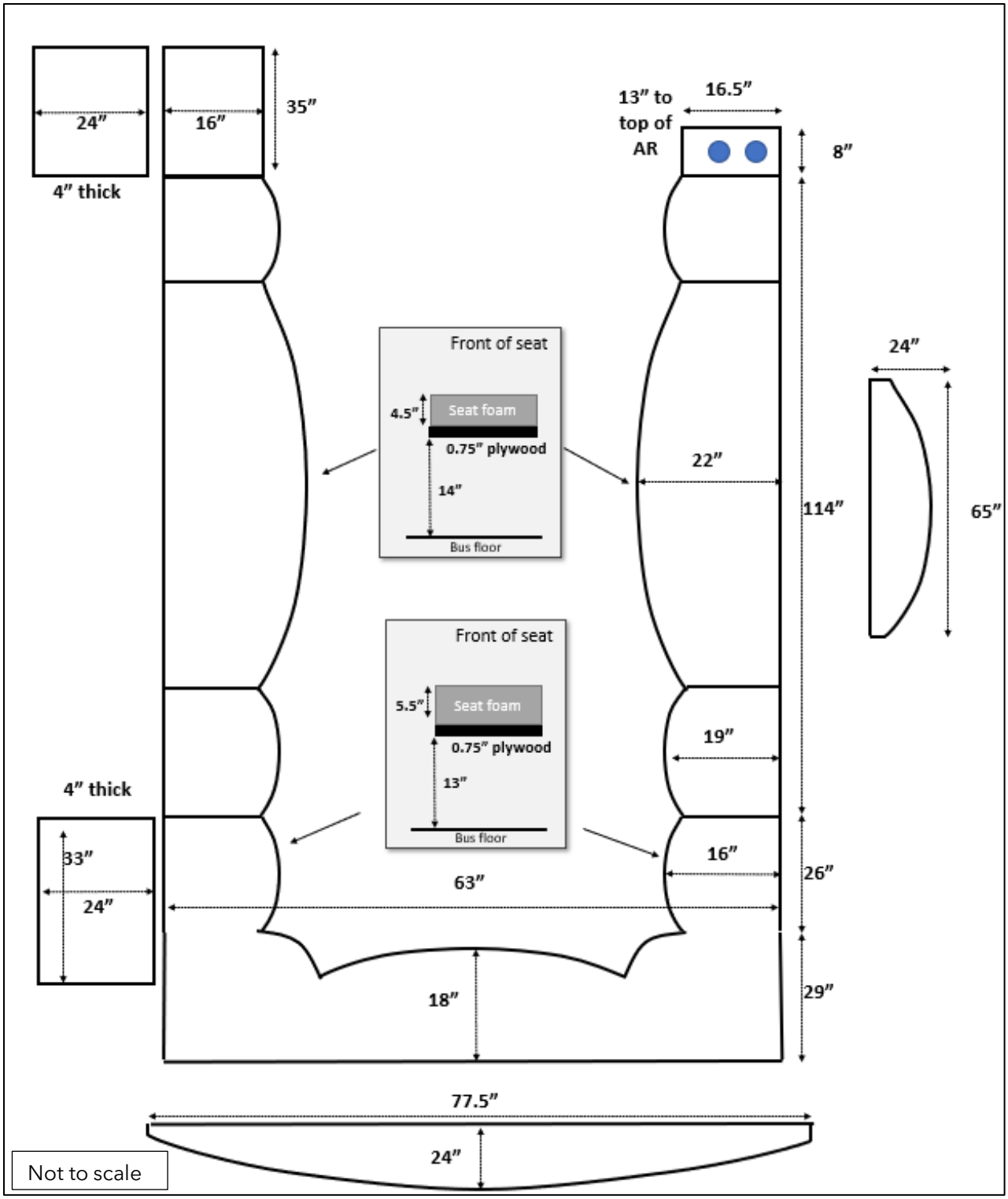

Figure 17: Bus - Seating Arrangement and Measurements

Figure 18: Bus - Aerial View of Reconstructed Seating Arrangement

For identification purposes, all bus (B) occupants were assigned an occupant code B01-B23. All passengers were ejected from the bus during the collision. There was no known official passenger manifest or documented seating arrangement. At least one bus passenger, B09, reportedly left the collision scene, on foot, flagged down a passing motorist, and was driven to Riverside Doctors' Hospital (RDH) by the unknown motorist. It is unknown if any other occupants left the scene on foot or by any other undocumented methods. Through interviews with bus passengers at Riverside Regional Medical Center (RRMC), a seating chart with corresponding injuries was developed, which can be seen below in Figure 19.[8]

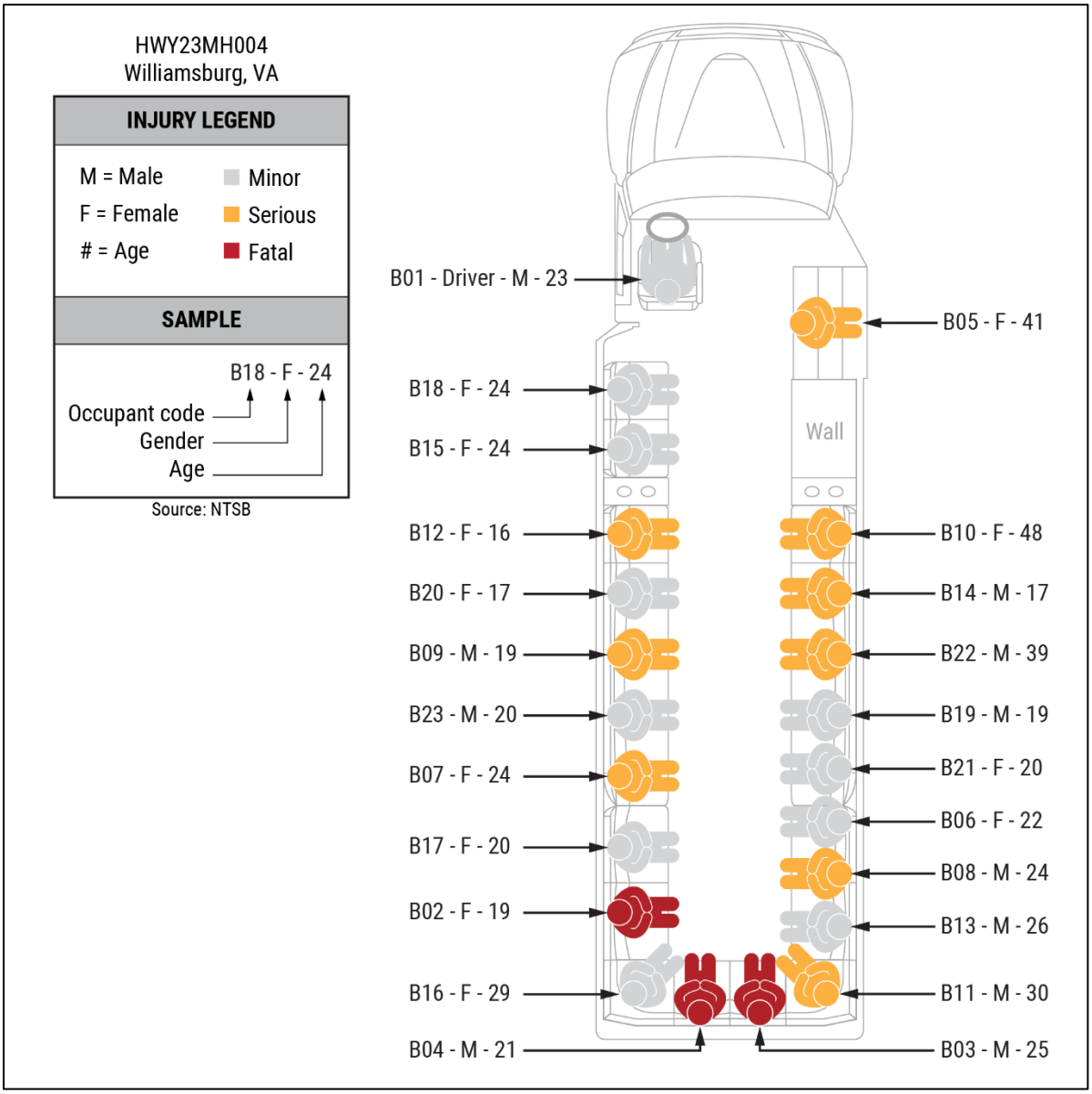

Figure 19: Bus – Seating Chart and Corresponding Injuries of Occupants

[8] Seating chart does not depict the actual postures of the occupants, which is unknown.

2.4 Occupant Information and Injuries

The bus was occupied by 22 passengers and one driver. Three occupants were fatally injured, and the remaining bus occupants received injuries that ranged from serious to minor. Occupants were triaged using a simple triage and rapid treatment (START) method. This method is used for triaging mass casualty incidents utilizes a color-coding system to quickly identify and label the patient's apparent medical condition. Patients are color-coded black for injuries incompatible with life, red for severe injuries with high potential for survival with immediate treatment, yellow for serious injuries but not life-threatening, and green for minor injuries.[9]

Three hospitals were utilized for the treatment of the bus passengers. RRMC, RDH, and Sentara Williamsburg Regional Medical Center (SWRMC). Below is a summary of the bus occupants' injuries, injury level, transport, and respective hospital where medical treatment was rendered. See section **6.0 Hospitals** for further information regarding the treating facilities and section **5.0 Emergency Response** for details regarding the transporting agency/vehicles.

Table 2: Bus - Occupant Injury Summary

Injuries	Driver	Passengers	Total
Minor	1	9	10
Serious	0	10	10
Fatal	0	3	3
Total	1	22	23

2.4.1 B01 – Minor Injuries

The bus driver (B01) was a 23-year-old male. He was triaged on scene, assigned a green tag, and was transported by MCI-4 to RDH for his minor injuries. Transport time from the scene to the hospital was approximately nine minutes and 14 seconds. He was ejected and received an anterior left tibia laceration, contusion to the left hip, and abrasions to his right knee and left hip.

2.4.2 B02 – Fatal

Bus passenger (B02) was a 19-year-old female. She was ejected and sustained fatal injuries as a result of the collision. The patient was triaged on scene and assigned a black tag. The Medical Examiner conducted an external examination of the decedent and noted a skull fracture with avulsion to the right lateral frontal bone extending

[9] https://www.ncbi.nlm.nih.gov/books/NBK459369/.

inferiorly and laterally through the orbit. Fluid was noted from the right ear. Fractures to the mandible and maxilla were also observed at approximately the midline. Abrasions were seen bilaterally at the scapula, on the left lateral lumbar area, and bilaterally just below the knees.

2.4.3 B03 – Fatal

Bus passenger (B03) was a 25-year-old male. He was ejected from the bus and his head was entrapped underneath a deformed guardrail post. He sustained fatal injuries as a result of the collision. The patient was triaged on scene and assigned a black tag. The Medical Examiner conducted an external examination of the decedent and noted a mandible fracture along with a 12" laceration and partial decapitation. Abrasions were observed superior to the right orbit, over the right clavicle, along the spine of the right scapula, at the right upper thigh, and just inferior to the right knee.

2.4.4 B04 – Fatal

Bus passenger (B04) was a 21-year-old male. He was ejected and sustained fatal injuries as a result of the collision. The patient was triaged on scene and assigned a black tag. The Medical Examiner conducted an external examination of the decedent and noted a 3" laceration with skull fracture to the right lateral portion of the frontal bone. Abrasions were observed above the right orbit, along the frontal portion of the mandible, above the right scapula, at the left lateral lumbar area, and inferior to the right knee.

2.4.5 B05 – Serious Injuries

Bus passenger (B05) was a 41-year-old female. She was triaged on scene, assigned a red tag, and was transported by WCFC Medic-10 to RRMC for her serious injuries. The transport time from the scene to the hospital was approximately 17 minutes and 39 seconds. She was ejected and received a fracture to the left orbit (acute displaced, medial wall), right medial malleolus (closed displaced), and an abrasion to her lower extremities.

2.4.6 B06 – Minor Injuries

Bus passenger (B06) was a 22-year-old female. She was triaged on scene, assigned a green tag, and was transported by MCI-3 to SWRMC for her minor injuries. The transport time from the scene to the hospital was approximately 13 minutes and 51 seconds. She was ejected and received a posterior scalp laceration, right posterior thigh (proximal to the knee) laceration, edema to the head (near right zygoma), and an abrasion to her right and left ankles.

2.4.7 B07 – Serious Injuries

Bus passenger (B07) was a 24-year-old female. She was triaged on scene, assigned a yellow tag, and was transported by YCFLS Medic-3 to SWRMC but was transferred to RRMC for her serious injuries. The transport time from the scene to the hospital was approximately 11 minutes and 22 seconds. She was ejected and received a possible subdural hematoma, fracture of the right toe (closed nondisplaced proximal phalanx), fracture involving distal end of fibula, posterior tibia and medial malleolus on the right side, and an abrasion to the left knee.

2.4.8 B08 – Serious Injuries

Bus passenger (B08) was a 24-year-old male. He was triaged on scene, assigned a yellow tag, and was transported by JCCFD Medic-31 to RRMC. The transport time from the scene to the hospital was approximately 18 minutes and 15 seconds. He remained in the hospital for over 48 hours. He was ejected and sustained knee abrasions and lacerations, and a scalp hematoma.

2.4.9 B09 – Serious Injuries

Bus passenger (B09) was a 19-year-old male. He left the scene on his own and was transported to RDH by an unknown motorist. He was treated at RDH but was transferred to RRMC for his serious injuries. He was ejected and received a laceration, avulsion, and large gaping wound to the sacrum, fractured sacrum, fractured left humerus, abrasions to left wrist, right hand, and both knees.

2.4.10 B10 – Serious Injuries

Bus passenger (B10) was a 48-year-old female. She was triaged on scene, assigned a yellow tag, and was transported by YCFLS Medic-5 to RRMC. The transport time from the scene to the hospital was approximately 19 minutes and 17 seconds. She remained in the hospital for over 48 hours. She was ejected and received a grade 5 left AC joint separation, dislocation of the right ulna styloid, abrasion to the right orbit and forehead, and a hematoma to the left hand.

2.4.11 B11 – Serious Injuries

Bus passenger (B11) was a 30-year-old male. He was triaged on scene, assigned a yellow tag, and was transported by YCFLS Medic-411 to RRMC where he remained

for over 48-hours. The transport time from the scene to the hospital was approximately 18 minutes and 41 seconds. He was ejected and received a laceration to his right elbow, hip, and left gluteal region, and a dependent atelectasis to both lungs. The dependent atelectasis was possibly a previous injury.

2.4.12 B12 – Serious Injuries

Bus passenger (B12) was a 16-year-old female. She was triaged on scene, assigned a green tag, and was transported by MCI-4 to RDH but was transferred to RRMC for her serious injuries. The transport time from the scene to the hospital was approximately 9 minutes and 14 seconds. She was ejected and received a laceration to her liver (grade IV), a laceration to her right eyebrow, and an abrasion to her pelvis and lower back.

2.4.13 B13 – Minor Injuries

Bus passenger (B13) was a 26-year-old male. He was triaged on scene, assigned a green tag, and was transported by MCI-3 to SWRC but was transferred to RRMC for his injuries. The transport time from the scene to the hospital was approximately 13 minutes and 51 seconds. He was ejected and received a laceration to the head, right knee, and right foot.

2.4.14 B14 – Serious Injuries

Bus passenger (B14) was a 17-year-old male. He was triaged on scene, assigned a yellow tag, and was transported by JCCFD Medic-21 to RRMC for serious injuries. The transport time from the scene to the hospital was approximately 20 minutes. He was ejected and his lower extremities from the pelvis down were entrapped below the roof of the bus. He received an avulsion fracture to his left patella.

2.4.15 B15 – Minor Injuries

Bus passenger (B15) was a 24-year-old female. She was triaged on scene, assigned a green tag, and was transported to MCI-3 to SWRMC. The transport time from scene to the hospital was approximately 13 minutes and 51 seconds. She was ejected and received an abrasion to her right arm and abdomen, and contusions to both knees.

2.4.16 B16 – Minor Injuries

Bus passenger (B16) was a 29-year-old female. She was triaged on scene, assigned a green tag, and was transported by MCI-3 to SWRMC for her minor injuries. The transport time from scene to the hospital was approximately 13 minutes and 51 seconds. She was ejected and received an abrasion to her thorax, lower back, and pelvis, a contusion to her right tibia, both an abrasion and contusion to her right hip, and a hematoma to her left tibia.

2.4.17 B17 – Minor Injuries

Bus passenger (B17) was a 20-year-old female. She was triaged on scene, assigned a green tag, and was transported by MCI-3 to SWRMC for her suspected minor injuries. The transport time from scene to the hospital was approximately 13 minutes and 51 seconds. She was ejected and received an abrasion to her left and right hip, left ankle, and both knees, and an avulsion to her left toenail (fifth toe).

2.4.18 B18 – Minor Injuries

Bus passenger (B18) was a 24-year-old female. She was triaged on scene, assigned a green tag, and was transported by MCI-4 to RDH for her minor injuries. The transport time from the scene to the hospital was approximately 9 minutes and 14 seconds. She was ejected and received a fractured nasal bone, laceration to her scalp, and an abrasion to her face, both hands, both knees, and both feet.

2.4.19 B19 – Minor Injuries

Bus passenger (B19) was a 19-year-old male. He was triaged on scene, assigned a green tag, and was transported by MCI-4 to RDH for his minor injuries. The transport time from the scene to the hospital was approximately 9 minutes and 14 seconds. He was ejected and received an abrasion to his mid-spine (T7) to his right rib.

2.4.20 B20 – Minor Injuries

Bus passenger (B20) was a 17-year-old female. She was triaged on scene, assigned a green tag, and was transported by MCI-4 to RDH for her minor injuries. The transport time from the scene to the hospital was approximately 9 minutes and 14 seconds. She was ejected and received an abrasion to her right hip, right leg, and left knee.

2.4.21 B21 – Minor Injuries

Bus passenger (B21) was a 20-year-old female. She was triaged on scene, assigned a green tag, and was transported by MCI-4 to RDH for her minor injuries. The transport time from the scene to the hospital was approximately 9 minutes and 14 seconds. She was ejected and received an abrasion to her right eye and back, and a contusion to her forehead, right hand, and left hip.

2.4.22 B22 – Serious Injuries

Bus passenger (B22) was a 39-year-old male. He was triaged on scene, assigned a green tag, and was transported by MCI-3 to SWRMC for his injuries. The transport time from scene to the hospital was approximately 13 minutes and 51 seconds. He was ejected and received a mild fracture to his L1 endplate and an abrasion to his right tibia.

2.4.23 B23 – Minor Injuries

Bus passenger (B23) was a 20-year-old male. He was triaged on scene, assigned a green tag, and was treated by MCI-3 to SWRMC for his minor injuries. The transport time from scene to the hospital was approximately 13 minutes and 51 seconds. He was ejected and received and abrasion to his right sacrum, right posterior thorax, right elbow, right arm, left hand, and a laceration to his left hand.

2.5 Autopsy

On December 16, 2022, the three decedents were transported to the Virginia Office of Chief Medical Examiner Tidewater. According to staff, the decedents did not undergo a complete autopsy, but rather only an external examination. No internal examinations were performed on any of the decedents. External examination reports were received and contained sketches of the external injuries to the decedents. It is not clear if a manual manipulation was conducted to assess the musculoskeletal structures in including the thorax, spine, and extremities.

3.0 2022 Freightliner Cascadia Combination Vehicle

3.1 General

The subject vehicle was a 2022 Freightliner Cascadia in combination with a 2020 Great Dane semitrailer. The truck-tractor was manufactured in May of 2021. The truck-tractor was inspected between January 11th and 12th, 2023, at Scotty's Auto & Fleet

Collision Repair, which was located at 8017-C Hankins Industrial Park Road, Toano, VA 23168.

An undamaged exemplar truck-tractor and the damaged subject truck-tractor can be observed in Figure 20. Regarding the truck-tractor's orientation, "left" refers to the driver's side of the vehicle, while "right" refers to the passenger side of the vehicle.

Figure 20: Truck-Tractor - Exemplar (Left)[10] and Subject Vehicle (Right)

3.2 Exterior

The truck-tractor had significant damage to the front of the vehicle. The hood and both headlight assemblies were damaged during the collision sequence and separated from the vehicle (Figure 21). The truck-tractor was equipped with a moose-guard[11] on the front of the vehicle, which was crushed inward during impact. There was black transfer above the left A-pillar of the truck-tractor which was consistent with contact from the rear of the bus. Multiple marker and identification lights were cracked and or damaged. The marker and identification lights were located above the windshield area and spanned the width of the truck-tractor.

The entire width of the windshield was cracked and damaged, and the lower-right portion was torn. The integrity loss of the windshield at the tear allowed small pieces of debris from the bus to enter the truck-tractor.

A 2022 Freightliner Cascadia included several standard safety features which includes Detroit Assurance 5.0, Active Brake Assist 5 (ABA 5), adaptive cruise control, and other crash mitigation systems.[12] ABA 5 was designed to identify and mitigate potential collisions with moving or stationary vehicles in the truck-tractor's path.[12] If the system detected a potential obstacle, it was designed to issue audio and visual warnings as well as partial and full braking, if necessary.[12] Inspection of the subject truck-tractor revealed that a forward-looking radar unit and camera system, which was

[10] Source: Vanguard Truck Center.
[11] A metal guard that provides front-end protection against large wildlife.
[12] https://demanddetroit.com/assurance/detroit-assurance-on-highway/standard-features/.

advertised as standard equipment, were not present on the vehicle. See the docket for further information regarding the lack of the equipment.

Figure 21: Truck-Tractor - Front Damage and Contact Points

3.3 Interior

The interior of the truck-tractor was in disarray from personal effects which reportedly belonged to the driver. The overall occupant compartment remained intact and with minimal intrusion, except for the windshield was intruded by the rear of the bus during impact (Figure 22). Black fiberglass penetrated the lower-right portion of the truck-tractor's windshield. The fiberglass material found inside of the truck-tractor was consistent with the materials that encompassed the rear of the bus.

The steering wheel cover belonging to the truck-tractor separated from the steering wheel of the vehicle. The truck was not equipped with a supplemental inflatable restraint system or pyrotechnic pretensioners. The sleeper berth area of the cab contained a bed and a small living space. This area was also in disarray during the truck-tractor's inspection as there were garbage and person effects scattered throughout the entire cab.

Figure 22: Truck-Tractor - Interior Overview and Fiberglass Bus Debris

3.3.1 Seatbelts

The cab of the truck-tractor was equipped with a three-point lap and shoulder seatbelt for both the driver and passenger seat positions. The driver's seatbelt was found in the buckled position during the post-collision inspection (Figure 23). The seatbelt was extended while buckled; however, it possessed the ability to retract and extend, as it was not locked. There was no indication that the seatbelt was in use by the driver during the collision sequence.

Figure 23: Truck-Tractor - Driver's Seat and Seatbelt Position

The passenger's three-point lap and shoulder seatbelt were inspected. Upon closer examination of the passenger D-ring, there was no seatbelt webbing present (Figure 24). The webbing was located underneath the right-side of the passenger seat. The webbing continued underneath the seat and exited the left-side of the passenger seat. The seatbelt was latched, and the upper webbing was found torn and separated from the remaining portion of the seatbelt. The seatbelt was used to secure equipment belonging to the driver, that was located in the passenger seat during impact and severed when the truck-tractor experienced substantial forward speed loss during the collision sequence.

Figure 24: Truck-Tractor - Passenger Seatbelt Condition

3.3.2 Occupant Information

The driver was the solo-occupant of the truck-tractor during the crash. The driver initially reported that he had a co-driver, which was later ruled out (see the docket for further information). There were no other occupants in the truck during the collision sequence. The passenger seat was filled with the driver's personal belongings, which were secured with the passenger's seatbelt that was damaged during impact.

3.4 Occupant Injuries

The truck-tractor driver (T01) was a 61-year-old male. He was triaged on scene, assigned a yellow tag, and was transported by JCCFD Medic-11 to RRMC for serious injuries. The transport time from scene to the hospital was approximately 17 minutes. He was not ejected from the truck-tractor and received a fracture to the left radius (distal 1/3) and a closed fracture to the nasal bone.

4.0 Interviews

4.1.1 Bus Occupants

Eight of the surviving 19 bus passengers provided a recorded audio statement to NTSB staff.[13] Additionally, five of surviving bus passengers and the driver provided written statements to VSP.[14] Passengers B15 and B17 provided both a recorded audio statement to the NTSB and a written statement to VSP. Passenger B15 provided two written witness statements to VSP. The two written statements from B15 were completed with the assistance of VSP. A total of 11 passengers and the bus driver provided either a statement to the NTSB, VSP, or both.

Bus occupants that provided a recorded audio statement to the NTSB:[15]

- B06
- B07
- B08
- B10
- B11
- B12
- B15
- B17

Bus occupants that provided a written witness statement to VSP:

- B01
- B15
- B16
- B17
- B22
- B23

Bus occupants that provided both audio recorded and written statements:

- B15
- B17

According to the bus passengers, the bus transported the occupants from Norfolk, VA to an event in Richmond, Virginia. On the return trip, bus passengers reported that most were asleep when the crash occurred. Some passengers described feeling like they were struck by two different semi-tractor-trailers, while other

[13] See Survival Factors Attachment: *NTSB Interviews of Bus Passengers*.
[14] See Survival Factors Attachment: *Virginia State Police Written Witness Statements*.
[15] Nomenclature of bus occupants and location is shown in Figure 19.

passengers stated that they felt like they were only struck once prior to being ejected from the bus. All interviewed bus passengers stated that they were ejected onto an asphalt or a grassy surface after impact.

According to the bus driver (B01), he was driving in the far-right lane (lane 3) and not wearing a seatbelt. He stated that he checked his driver's side mirror and saw the truck-tractor approaching at a fast speed. The driver estimates the truck-tractor's speed to be approximately 80 miles per hour. The driver stated that he began to change lanes but heard a "big bang" prior to tumbling around on the bus and ending up ejected on the ground.[16]

4.1.2 Truck-Tractor Driver

For information related to the truck-tractor driver, please see the Human Performance Group Chair Factual Report.

4.1.3 First Responders

As part of the evaluation of the first responder response, the Survival Factors Group interviewed:

- Sergeant of VSP[17]
- First arriving Trooper of VSP
- Battalion Chief of York County Fire & Life Safety[18]
- Captain of York County Fire & Life Safety

A summary of the first responders' statements can be located in the succeeding Emergency Response section of this report.

5.0 Emergency Response

5.1 911 Calls/Notifications

VSP provided 911 audio related to the collision. The recordings included nine 911 calls that were made to various first responder agencies regarding the reporting of the subject collision. Below is a synopsis of the calls and this set of audio files are related to the subject collision:

[16] Video footage from the truck-tractor does not show any lane-change maneuver from the bus.
[17] See Survival Factors Attachment: *NTSB Interviews of VSP*.
[18] See Survival Factors Attachment: *NTSB Interviews of YCFLS*.

1. Caller stated she was involved in an accident in a party bus with 12-13 occupants. Caller was not sure where she was. Caller stated that people are hurt and there is someone "under the bus". Female caller passes the phone to the driver of the bus. He states that a "tractor trailer smacked the back of us".
2. Caller stated there is a semi in the median. Dispatcher stated that units are already enroute.
3. This audio file is a duplicate of call #1.
4. Caller stated she is eastbound (mile marker) 242 and that a bad crash was a about a mile before. Caller stated that there were injuries and three people laying on the ground.
5. Caller stated that vehicles are in the median and believes the vehicles are westbound.
6. Caller stated he's on 64 westbound and a crash occurred near (mile marker) 238.
7. Caller stated that there was an accident past mile marker 242 and there were several people in the roadway.
8. Caller stated that a tractor trailer crashed in the median near mile marker 241.
9. Call listed as a "follow up call from family member". Caller stated she attempting to locate which hospital her daughter was transported to.

5.2 Law Enforcement Response

VSP was the only law enforcement agency that responded to the collision. VSP did not request assistance or mutual aid from neighboring law enforcement agencies. The police incident commander (IC) was a VSP Sergeant. VSP's primary roles in the subject collision were identifying and isolating victims and witnesses, scene security, traffic control, preservation of evidence, conducting a traffic crash investigation, and performing a criminal investigation.

According to the computer-aided dispatch (CADs) report, VSP was first notified about the traffic collision by a 911-caller at approximately 1:38 am.[19] VSP was dispatched and was enroute to the traffic collision at 1:39 am. The first arriving Trooper 652 of VSP arrived at the crash scene approximately five minutes after the first 911 call reporting of the traffic collision, at 1:43 am. The CADs report showed that two VSP units (509 and 652) were dispatched initially. Approximately seven minutes later, VSP Sergeant 319 was dispatched to the scene. Trooper 652 requested that VSP's

[19] Survival Factors Attachment: *Law Enforcement CADs Report*.

reconstruction unit respond five minutes after arriving on scene. The CADs report shows four additional VSP units were dispatched to the scene between 34 and 51 minutes after the initial 911 notification was received. The final three units that responded to the scene, responded several hours after the collision occurred and their response times can be viewed in Table 3. In total, ten units from VSP responded to the collision scene between 1:39 am and 6:00 am on December 16, 2022.

Table 3: VSP Units and Response Times[20]

Unit	Dispatched	Enroute	On Scene
652	1:39	1:39	1:43
509	1:39	1:39	1:48
319	1:46	1:46	2:16
414	2:13	2:13	2:35
1939	2:16	2:16	2:56
1437	2:29	2:29	3:35
272	2:30	2:30	3:32
944	4:15	4:15	5:14
732	5:23	5:23	7:51
146	6:00	6:00	6:22

5.3 Fire Rescue and EMS Response

5.3.1 Overview and Background

York County Fire & Life Safety (YCFLS), James City County Fire Department (JCCFD), and Williamsburg City Fire Department (WCFD) responded to the traffic collision, which was later determined to be a mass casualty event. The incident commander (IC) that spanned control over the three responding departments was YCFLS's Battalion Chief (BC). Second-in-command, assisting the BC, was a YCFLS Captain assigned to Rescue-3.

The primary rescue and EMS agency was YCFLS. According to the IC, JCCFD played an integral role in the rescue operations for this incident, which will be described further below. WCFD aided the response with Medic-10 that was utilized in the transport of seriously injured B05 to RRMC for medical treatment.

YCFLS and JCCFD are managed by different dispatch centers. They share call notes and run both rescue and EMS departments. YCFLS and JCCFD were initially dispatched by their respective dispatching centers. JCCFD then switched to a common dispatching channel with YCFLS for seamless communication between the two

[20] Times listed are AM.

agencies. York County dispatch center became the primary dispatch that controlled communications for the subject collision. VSP's dispatch center was independent from YCFLS's center, however, the two agencies were in close contact during this incident.

According to the CADs report for the responding rescue and EMS agencies, the first 911 notification of this incident was at approximately 1:38 am.[21] Rescue and EMS agencies were first notified about the traffic collision at 1:39 am. Agencies were enroute to the traffic collision at 1:41 am. JCCFD Engine-21 was the first rescue and EMS agency on scene and arrived at 1:47 am.

YCFLS has six stations across York County. All six stations are equipped with advanced life support (ALS) personnel and ambulance, and some EMT-intermediates that have basic life support (BLS) capabilities. All York County fire apparatuses have ALS equipment and capabilities. These ALS equipped vehicles include the ladders, rescues, towers, and medics. The BLS personnel were generally used to operate the vehicles.

5.4 Incident Response

Initially, the YCFLS BC stated that they received notification of the subject incident as a traffic crash with unknown injuries. York County's standard response to a vehicle collision with unknown injuries or incidents involving an extrication on the interstate include two engines, two medics, and one rescue unit. To minimize call hold time and provide relevant information, York County attempts to dispatch within 60 seconds of receiving a 911 call and provides the responding units with the current status of the event. After receiving additional details and information, the responding units were provided updates. The initial response of equipment, personnel, and specialties were from YCFLS and JCCFD.

Shortly after YCFLS and JCCFD responded with the initial resources, YCFLS BC received multiple notifications that the incident was more severe than initially reported and possibly required an extrication. YCFLS BC requested that Station 4 respond. A squad from Station 4 was dispatched to the scene. The squad contained a combination engine/rescue with heavy equipment and a medic. Station 4 was YCFLS's technical rescue unit. At this time, YCFLS BC responded to the scene from Station 5.

Due to conflicting collision locations reported by 911 callers, a duplicate traffic crash was dispatched at a nearby location on the interstate to the subject collision. This prompted the additional resources from YCFLS and JCCFD that included two engines and two medics, in addition to the resources described previously. After the duplicate collision was ruled out, the additional resources were diverted to the subject collision.

[21] See Survival Factors Attachment: *Fire Rescue and EMS CADs Report.*

JCCFD Engine-21 was the first rescue and EMS unit to arrive on scene and conducted an assessment of the scene to evaluate resources, personnel, and specialists required for the severity of the subject incident. During the scene assessment, JCCFD Engine-21 requested two additional ambulances, which the dispatch center rerouted from the resources sent to the duplicate call. YCFLS BC overruled the dispatch center and sent all the duplicate call resources (Engine-513, Engine-11, Medic-5, and Medic-11) and two additional ambulances. The two additional ambulances were dispatched to the scene (WCFD Medic-10 and JCCFD Medic-31).

At this time, four engines, seven medics, one rescue, a combo engine/rescue, and YCFLS BC were enroute or already arrived at the scene. Due to the large number of response personnel, YCFLS BC-1 (BC/IC counterpart) JCCFD's BC and EMS supervisor self-initiated a response to assist. YCFLS BC/IC arrived on scene and requested a mass casualty bus to respond. Bus MCI-3 responded from Station 6, which is located at the lower portion of the county. JCCFD's BC also requested bus MCI-4, which was located at RDH, to respond to the scene. The mass casualty buses (MCI-3 and MCI-4) were equipped with cots and seats to assist with transporting persons with minor injuries and the walking wounded. YCFLS began creating a transport plan and per the regional mass casualty plan, BC-1 contacted the closest hospital, RDH, and informed them of the mass casualty event, number of patients, and triage color total.

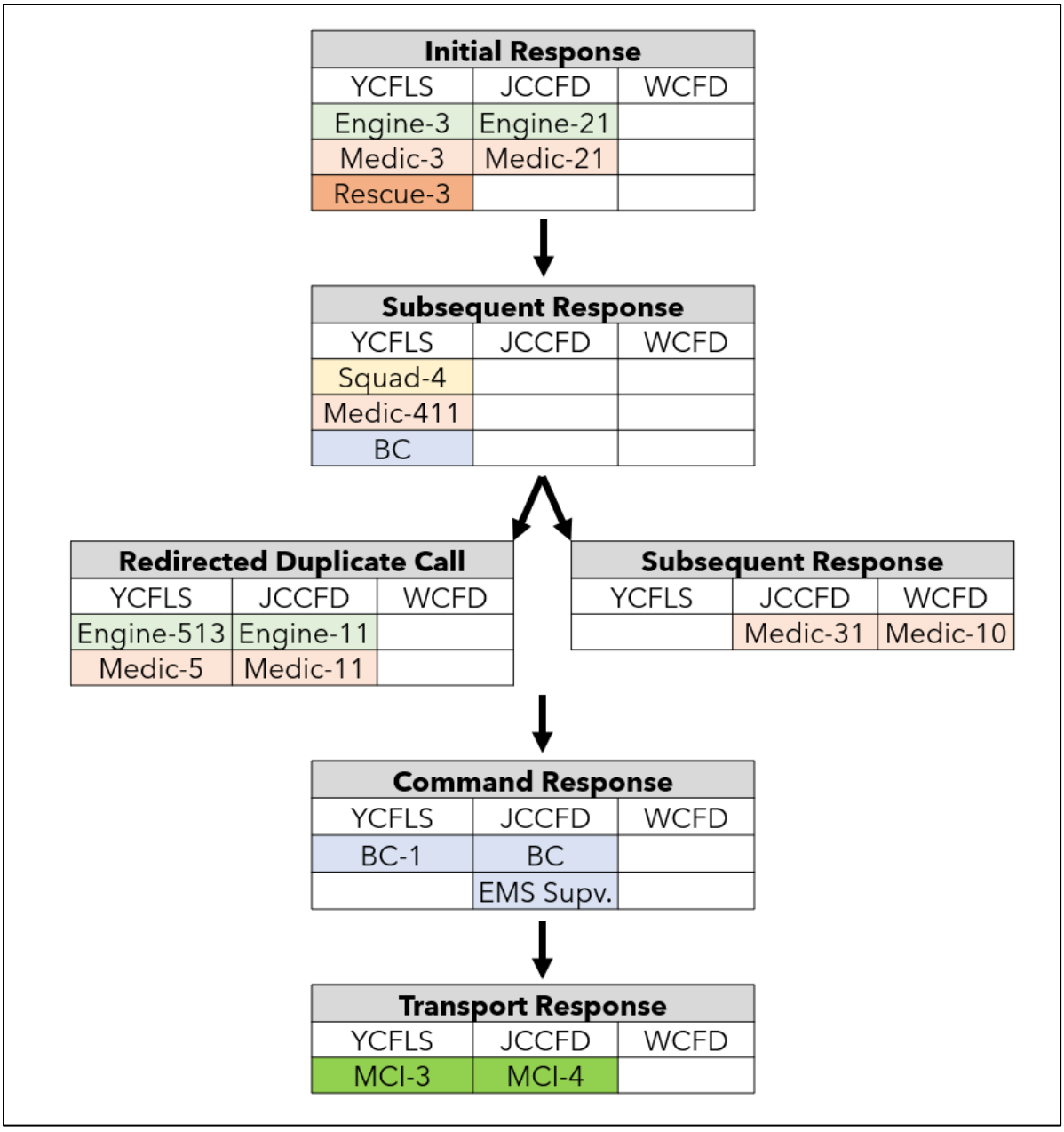

Figure 25: Rescue and EMS Response Overview

RDH received the mass casualty information from YCFLS and coordinated the information with the surrounding hospitals RRMC and SWRMC. RDH deferred their mass casualty incident medical control to RRMC, a Level 2 trauma center. YCFLS BC/IC then tasked JCCFD's EMS Supervisor to function as the hospital liaison and transportation officer to coordinate the mass casualty information and response with RRMC. After the hospitals coordinated their response, RRMC stated that they would accept all red and yellow triaged patients, and to send half of the 13 green triaged patients to RDH and the remaining to SWRMC. All red and yellow triaged patients were taken to RRMC by an ambulance (Table 4). MCI-3 transported seven green triaged

patients to SWRMC. MCI-4 transported six green triaged patients to RDH. B09 left the scene on foot and was transported to RDH by an unknown motorist.

There was one bus passenger trapped by vehicle wreckage. B14 was trapped underneath the roof of the bus, was talking, but stated he could not feel his legs. YCFLS Captain of Rescue-3 and JCCFD Medic-21 attempted to free B14 using spreaders to lift the vehicle and debris but was unsuccessful. YCFLS Captain and Medic-21 crew began removing debris and lifted a portion of the roof while pulling B14, freeing him. B14 immediately stood up and walked to the ambulance (Medic-21) without issue and was transported to RRMC where he was diagnosed with a minor injury to his patella.

York County Office of Emergency Management (YCOEM) provided a mass casualty incident response guide and a mass casualty position checklist. Both documents were dated March 2017. YCOEM stated that they were currently in the process of updating their mass casualty plans. A majority of recommended steps and procedures in the provided plans were adequately followed, addressed, and implemented into the Fire Rescue and EMS response.

6.0 Hospitals

Three hospitals were utilized to treat the injured during this mass casualty incident. Figure 26 shows a graphical location of each hospital's location with regards to the crash scene's location.

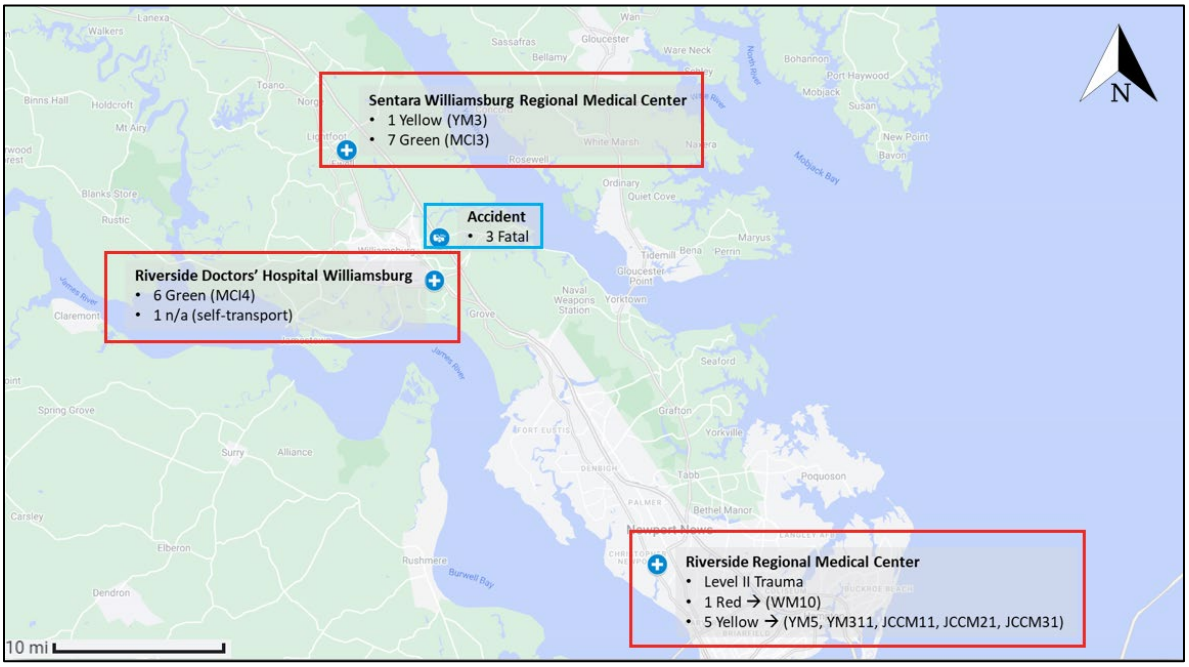

Figure 26: Image of the Treating Hospitals in Relation to the Scene
(Modified Google Maps)

The closest Level 2 Trauma Center to the collision scene was RRMC. RRMC was located approximately 25 miles southeast of the collision scene. RDH was the closest hospital to the scene and was located approximately eight miles south of the collision scene. SWRMC was located approximately nine miles northwest of the collision scene. RRMC was utilized to tend to the most severely injured surviving occupants of the collision that were triaged as either color red or yellow. The remaining triaged green coded occupants were transported to RDH and SWRMC, which were not trauma centers. The notifications and coordination between EMS and the hospitals are described in the Fire Rescue and EMS Response section. A synopsis of the occupant injury severity, treating hospital, triage color, and medical transportation can be observed in Table 4.

Table 4: Injury Severity, Hospital, Triage, and Transport Information

ID	Injury Severity	Primary Hospital	Secondary Hospital	Triage Tag	Transport	Arrive	Transport Time
T01	Serious	RRMC	n/a	Yellow	James City Medic-11	2:43:00	0:17:00
B01	Minor	RDH	n/a	Green	RDH MCI-4	3:04:00	0:09:14
B02	Fatal	n/a	n/a	Black	n/a	n/a	n/a
B03	Fatal	n/a	n/a	Black	n/a	n/a	n/a
B04	Fatal	n/a	n/a	Black	n/a	n/a	n/a
B05	Serious	RRMC	n/a	Red	Williamsburg Medic-10	2:34:58	0:17:39
B06	Minor	SWRMC	n/a	Green	York County MCI-3	3:08:37	0:13:51
B07	Serious	SWRMC	RRMC	Yellow	York County Medic-3	2:23:12	0:11:22
B08	Serious	RRMC	n/a	Yellow	James City County Medic-31	2:56:00	0:18:15
B09	Serious	RDH	RRMC	n/a	Unknown motorist	unknown	unknown
B10	Serious	RRMC	n/a	Yellow	York County Medic-5	2:30:56	0:19:17
B11	Serious	RRMC	n/a	Yellow	York County Medic-411	2:43:02	0:18:41
B12	Serious	RDH	RRMC	Green	RDH MCI-4	3:04:00	0:09:14
B13	Minor	SWRMC	RRMC	Green	York County MCI-3	3:08:37	0:13:51
B14	Serious	RRMC	n/a	Yellow	James City County Medic-21	2:41:00	0:20:00
B15	Minor	SWRMC	n/a	Green	York County MCI-3	3:08:37	0:13:51
B16	Minor	SWRMC	n/a	Green	York County MCI-3	3:08:37	0:13:51
B17	Minor	SWRMC	n/a	Green	York County MCI-3	3:08:37	0:13:51
B18	Minor	RDH	n/a	Green	RDH MCI-4	3:04:00	0:09:14
B19	Minor	RDH	n/a	Green	RDH MCI-4	3:04:00	0:09:14
B20	Minor	RDH	n/a	Green	RDH MCI-4	3:04:00	0:09:14
B21	Minor	RDH	n/a	Green	RDH MCI-4	3:04:00	0:09:14
B22	Serious	SWRMC	n/a	Green	York County MCI-3	3:08:37	0:13:51
B23	Minor	SWRMC	n/a	Green	York County MCI-3	3:08:37	0:13:51

E. DOCKET MATERIAL

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

List of Attachments:

SF Attachment: Eldorado Aero Elite Brochure

SF Attachment: NTSB Interviews of Bus Passengers

SF Attachment: Virginia State Police Written Witness Statements

SF Attachment: NTSB Interviews of VSP

SF Attachment: NTSB Interviews of YCFLS

SF Attachment: Law Enforcement CADs Report

SF Attachment: Fire Rescue and EMS CADs Report

Submitted by:

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