SURVIVAL FACTORS GROUP CHAIRMAN'S FACTUAL REPORT

MULTIPLE VEHICLE ACCIDENT
Chattanooga, TN

HWY15MH009

(23 pages)

NATIONAL TRANSPORTATION SAFETY BOARD
OFFICE OF HIGHWAY SAFETY
WASHINGTON, D.C.

SURVIVAL FACTORS GROUP CHAIRMAN'S FACTUAL REPORT

A. CRASH INFORMATION

Location:	Interstate 75 (I-75) milepost 11.7 Hamilton County, Tennessee
Vehicle #1:	2007 Peterbilt 379 truck-tractor in combination with a 2005 Great Dane refrigerated semitrailer
Operator #1:	Cool Runnings Express, Inc.
Vehicle #2:	2010 Toyota Prius
Vehicle #3:	2010 Scion tC
Vehicle #4:	2003Maxda Tribute
Vehicle #5:	2005 GMC Savana G1500 Cargo Van
Vehicle #6:	2001 Ford F-150 pickup
Vehicle #7:	2007 Chevrolet Uplander LS
Vehicle #8:	2014 Cadillac CTS
Vehicle #9	2015 Toyota Tundra pickup
Date:	June 25, 2015
Time:	Approximately 7:10 p.m. eastern daylight time (EDT)
NTSB #:	**HWY15MH009**

B. SURVIVAL FACTORS GROUP

Thomas Barth, Ph.D., Survival Factors Investigator, Group Chairman
NTSB Office of Highway Safety
490 L'Enfant Plaza East, S.W., Washington, DC 20594

Officer Tom Seiter
3410 Amnicola Highway
Chattanooga Police Department
Chattanooga, TN 37406

C. CRASH SUMMARY

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

D. DETAILS OF THE SURVIVAL FACTORS INVESTIGATION

The survival factors investigation collected evidence pertaining to survivability, safe design, and safe operation of the vehicles. This report is organized into 4 sections. The first section has vehicle information, the second has occupant information, the third covers the law enforcement response, and the fourth covers emergency response and hospital care. Interviews were conducted during the investigation. The notes or transcripts from interviews as well as all other supporting information are contained in attachments to this report. Footnotes in the report indicate the attachments which can be found in the accident docket. The docket also contains survival factors photos. A list of the attachments and photos are provided at the end of the report.

1. Vehicle Information

There were nine total vehicles involved in the crash. The truck-tractor and semitrailer were moved from the scene to Denton Wrecker Service located at 7740 Lee Highway, Ooltewah, TN 37421. The passenger vehicles were moved from the scene to Chattanooga Police Department impound lot located at 3410 Amnicola Highway, Chattanooga, TN 37406. All of the vehicles were mapped using a FARO 3D laser scanner.[1] This report provides descriptions and damage to the vehicles focused on the survival factors perspective. The vehicles were also inspected and documented by the Vehicle Group.[2]

1.1. 2007 Peterbilt 379 (Caterpillar engine) in combination with a 2005 Great Dane refrigerated semitrailer (empty)

The truck tractor had Vehicle Identification Number (VIN): IXP5DB9X07DXXXXXX and the semitrailer had VIN: 1GRAA06266BXXXXXX.[3] The exterior, driver controls, and equipment such as steering components, wheels and tires, suspension and brakes were documented in the Vehicle Factors Group Chairman's Factual report, available in the accident docket.

1.1.1. Cab and Front Seats

The driver and passenger seats were suspended, high-back seats with folding armrests. They were equipped with 3-point, inertial locking restraints with a push button buckle. Both restraints were found to be in functional condition. Labels on the restraints identified the manufacturer as Immi, and the labels stated that the restraints conformed to Federal Motor Vehicle Safety Standard (FMVSS) 209 and FMVSS 302, dated May-06. The driver seatbelt part number label was illegible, and the passenger seatbelt part number label was mostly illegible, except for the Lot ID #: 561207. The aft lower portion of the seat had a mounting bracket for the seatbelts with a label that read as follows on the driver side:

> "R59230003290 M0003-00999 A 232602-01 BELT BAR&NUT ASY –P/B GREY 04/26/06 09:34:52".

[1] See the Forensic Research and Evidence Documentation Group Chairman's Factual Report contained in the accident docket.
[2] See the Vehicle Group Chairman's Factual Report contained in the accident docket.
[3] Last 6 digits of VIN replaced with X.

The passenger seat label was the same, with the exception of the number: R59230003337. The seats and seatbelts exhibited normal wear and corrosion, and did not exhibit evidence resulting from the collision. There was a dirt smudge or drop of dried fluid on the driver headrest with an unknown origin.

The driver area, including steering wheel, dashboard, and footwell appeared normal and without evidence of the collision. The driver visor and the headliner in this region had some drops of dried fluid of an unknown origin. The control knobs and manual gear shifter appeared normal for the age of the vehicle.

1.1.2. Sleeper Berth

The sleeper berth had a large quantity of personal effects which had been removed by the Chattanooga Police Department (CPD). The sleeper berth compartment included a fold up bed, cabinets, and a small refrigerator. The fold up bed was constructed of an aluminum tray hinged along the aft edge with an upholstered cushion on top. There was storage and utility equipment under the bed. There were two restraint buckles mounted on the forward edge of the tray, and D-rings mounted on the aft wall of the berth and above the access port between the berth and the cab. A sleeper berth restraint harness was not found in the truck.

The Title 49 Code of Federal Regulations (CFR) Part 393, Subpart G – Miscellaneous Parts and Accessories, Paragraph 393.76 has various requirements for sleeper berths. CFR 393.76 (h) requires occupant restraint as follows:

> *CFR 393.76 (h) Occupant Restraint. A motor vehicle manufactured on or after July 1, 1971, and equipped with a sleeper berth must be equipped with a means of preventing ejection of the occupant of the sleeper berth during deceleration of the vehicle. The restraint system must be designed, installed, and maintained to withstand a minimum total force of 6,000 pounds applied toward the front of the vehicle and parallel to the longitudinal axis of the vehicle.*
>
> *[39 FR 14711, Apr. 26, 1974; 39 FR 17233, May 14, 1974, as amended at 53 FR 49401, Dec. 7, 1988]*

Title 49 CFR 395 contains the hours of service of driver regulations. CFR 395.1 (g) provides rules for driver rest using a sleeper berth. Use of the sleeper berth restraint is not specified in the federal regulations, and no other laws or regulations were found governing the use of sleeper berth restraints. Fleet Owner magazine published an article in March 2013 describing the risks for occupants using a sleeper berth during a collision.[4] The article reverenced a University of Kentucky study published by Dr. Terry Bunn, and stated that the study's results indicated that lack of use of the sleeper berth restraint is the primary injury factor.[5] The Bunn study evaluated 708 semi truck collisions in which there was a driver and a passenger over the age of 21 in the sleeper berth. Several risk factors were studied for occupants

[4] http://fleetowner.com/print/safety/sleeper-berth-occupants-risk
[5] http://www.mc.uky.edu/kiprc/SelectedPublications.html

using a sleeper berth during a collision.[6] The non-significant risk factors were the seating location in the truck (driver seat or sleeper berth), age and gender. The significant risk factors were use occupant restraints (both driver seat and sleeper), and the location of first contact with the truck in the collision, either front or side.

1.2. 2010 Toyota Prius

1.2.1. Vehicle Damage

The 2010 Toyota Prius had VIN: JTDKN3DU8A0XXXXXX. The front bumper and grill were displaced from the car. The driver door had a large dent in the middle of the exterior panel, and the glass and interior panel were intact. The driver seatbelt buckle was found buckled with the webbing cut. The B-pillar also showed evidence of being cut away. Both front and side airbags were deployed. The steering wheel and shaft up to the adjuster mechanism was found displaced from the steering column. The dashboard was crushed upwards and in contact with the windshield, which was shattered. The foot well was found intact and the knee bolster airbag was deployed. The rear seats were displaced forward and into the driver seat. The interior portion of the driver seat and center console was in turned displaced forward as well. The front passenger seat was also displaced forward. The dashboard was displaced aft and towards the front passenger seat. The left rear door was displaced and heavily damaged, and still partially attached to the B-pillar. The exterior panel of the left rear quarter panel was delaminated and there were blood splatters on the inside surface of this panel in the vicinity of the fuel door. The window mechanism and interior panel and arm rest for the left rear passenger door had blood deposits.

The Prius airbag module was downloaded and the crash data retrieval was successful.[7] The data indicated that the side and passenger curtain shield airbags received a deployment command, while the frontal airbags did not. The driver seatbelt was buckled, the shifter was in drive, and the brakes were applied at the time of the event. The data indicated no existence of diagnostic trouble codes. Velocity versus time data was obtained for the Engine Control Unit (ECU) sensor, the lateral B-Pillar sensor, and the lateral C-Pillar sensor.

The rear portion of the car was heavily crushed forward and the rear deck lid was displaced. The battery compartment and back of the rear seats were exposed. The metal cover over the battery pack was crushed and partially displaced forward. The battery pack itself was partially damaged but not ruptured, as shown in Figure 1.

Factual information about the Prius hybrid/electrical system and its safety are provided in the following section. Investigative questions and interviews with first responders asked about any special procedures or treatment associated with the Prius. The CPD, TriComm VFD, and CFD indicated that they were aware of special procedures for alternative energy vehicles, but that no special procedures were deemed necessary for the Prius.

[6] "Motor vehicle injuries among semi truck drivers and sleeper berth passengers", Bunn T., Slavova S., Robertson M., Journal of Safety Research 44 (2013) 51-55, 2013 National Safety Council and Elsevier.
[7] See the Recorders Group Chairman's Factual Report contained in the accident docket.

Figure 1. Cargo Area of the Prius with Damaged Battery Pack

1.2.2. Hybrid Electric Vehicle Information

The 2010 Prius is the 3rd generation of the Hybrid Synergy Drive gasoline-electric hybrid vehicles introduced in North America. Toyota introduced the 1st generation in 2000, the 2nd generation in 2003, and the 3rd generation in 2009. Toyota publishes Emergency Response Guides for hybrid and alternative fuel vehicles at http://techinfo.toyota.com.

The 1.8 liter gasoline powered engine was rated at 98 horsepower (hp) and the electric motor was rated at 80 hp. The Prius had an automatic transmission with power to the front wheels that used an electrically controlled continuously variable transaxle. The Prius had a curb weight of 3,080 pounds, a fuel capacity of 11.9 gallons and a 201.6 Volt sealed Nickel Metal Hydride (NiMH) battery pack. The battery pack consisted of 28 modules each at 7.2 Volts and a weight of 2.3 pounds for a total of 90 pounds and a capacity of 1.3 kWh. The battery pack dimensions were 11.7 inches front to back, 23.2 inches wide, and 4.6 inches tall.

The 2010 Prius utilized four electrical systems with nominal voltages of 650, 201.6, 27, and 12 Volts. The high voltage electrical systems consisted of the 201.6 Volt battery pack (DC), which powered a 201.6 volt Air Conditioning (AC) compressor and had a boost converter to power the electric motor at 650 Volts. The 27 Volt DC system operated a solar ventilation system and the 12 Volt DC system operated all the other electrical systems.

The Toyota Emergency Response Guide (ERG)[8] provided information about identifying a Prius, the major hybrid component locations and descriptions, emergency response information including extrication/fire/recovery, and roadside assistance. The ERG indicated that the battery pack is recyclable by contacting the nearest Toyota dealer and that each NiMH module is non-

[8] Toyota Prius Hybrid 2010 Model 3rd Generation Emergency Response Guide, 2009 Toyota Motor Corporation, 10 Prius ERG REV – (09/21/09) accessed from http://techinfo.toyota.com.

spillable and in a sealed case. The ERG noted that the electrolyte used in the NiMH module is an alkaline mixture of potassium and sodium hydroxide, and that it is absorbed into the battery cell plates and will not normally leak even in a collision.

The ERG had a section on the High Voltage Safety System (HVSS). It noted that the high voltage power cables are colored orange and are routed from the battery pack, under the floorpan, to the inverter/converter. It described features of the HVSS which included short circuit protection, 12 Volt normally open relays that stop electrical flow from leaving the HV battery pack with the vehicle is off, insulated positive and negative power cables, and a ground fault monitor.

The ERG section for emergency response gave the instructions for responders to follow their standard operating procedures for vehicle incidents, with some exceptions for the Prius. The exceptions were in the areas of Extrication, Fire, Overhaul, Recovery, Spills, First Aid, and Submersion. Note that Sections 3 and 4 of this report documents the first responder actions.

Extrication and Fire

The Extrication section had methods for immobilizing, disabling, stabilizing and accessing the vehicle. Warnings noted that the high voltage system may remain powered for up to 10 minutes after the vehicle is shut off or disabled. The Fire section referred to practices as recommended by the National Fire Protection Association (NFPA) and others, and provided information about attacking a battery pack fire. The NFPA published the 2014 Hybrid and Electric Vehicle Emergency Field Guide.[9]

Overhaul, Recovery, Spills, First Aid, and Submersion

These sections had similar vehicle preparations as the Extrication section, and included statements that the HV battery cover should never be breached or removed due to risk of electrical burns, shock, or electrocution. They provided further information about safety with the NiMH electrolyte, which is noted as the only substance different from common automotive fluids. The Submersion section noted that a submerged Prius does not have high voltage potential on the metal vehicle body. It recommended that a submerged vehicle be removed from the water and drained due to responders potential inability to disable a submerged vehicle.

1.3. 2010 Scion tC

The 2010 Scion had VIN: JTKDE3B75A0XXXXXX. The front of the Scion, forward of the front wheels and hood, sustained minor damage as compared to the rest of the vehicle. There were scrapes and dents on each side of the front bumper and the grill was displaced. Both front wheels and tires were intact, the right was flat and left remained inflated. The aft portion of both front fenders were buckled inward. The windshield was missing. The roof was cut off at the A pillars just above the level of the dashboard, approximately half way up the B pillars, and approximately half way up the C pillars. The front doors and rear hatch were removed. The interior and back half of the vehicle sustained extensive fire damage. The rear of the vehicle was crushed forward, with the aft portion of the right rear wheel displaced inboard and the right wheel displaced forward with the front portion of the wheel displaced inboard.

[9] www.evsafetytraining.org

The steering wheel was removed and the fire damage obscured the deployment status of the airbags. The driver seatback frame was deformed aft on the left side. The driver seatbelt connector was found in the buckle, with the belt webbing burned away. Portions of the front passenger seat were removed and the seatbelt connector was found in the buckle with the belt webbing burned away. Portions of the rear seats cushions and upholstery were intact and the seatbelt connectors were found in the buckles. Portions of seatbelt webbing were intact. Portions of the front seats were displaced into the rear seat area. Portions of the cargo compartment were crushed forward into the rear seats.

The Scion airbag module was downloaded and the crash data retrieval was successful.[10] The data indicated that the driver and passenger frontal airbags did not receive a deployment command. The driver and passenger seatbelts were buckled. The data indicated no existence of diagnostic trouble codes. Velocity change data was obtained.

The Scion was subject to the fuel system integrity requirements of FMVSS 301. This standard involves lateral and rear dynamic impacts to the vehicle and checks for a compromised fuel system. The standard was upgraded with changes to the impact test procedure with a phased in application from vehicle model years from 2005 to 2009.[11] The rear impact portion of the standard previous to model year 2005 consisted of a Moving Rigid Barrier (MRB) with a mass of 4,000 pounds impacting the full width of the vehicle at speeds up to 30 miles per hour (mph). The upgraded test changed to a Moving Deformable Barrier (MDB) with a mass of 3,015 pounds, impacting the vehicle with a 70% overlap at 50 mph.

1.4. 2003 Mazda Tribute

The 2003 Mazda Tribute had VIN: 4F2CZ96103KMXXXXX. The aft half of the vehicle was crushed forward, with the cargo area and rear seating area displaced into the front seating area. The left (driver side) of the vehicle was crushed inboard with the front portion of the roof buckled downward and a portion of the left rear door overlapping a portion of the left front door. Portions of the right front of the vehicle crushed aft and inward. Occupant space for all seat positions was compromised. No airbags were deployed and no data was downloaded from the Mazda airbag module.[12] Seatbelt webbing was cut and responders noted that the occupant was wearing the seatbelt.

1.5. 2005 GMC Savana G1500 Cargo Van

The 2005 GMC had VIN: 1GTFG15X551XXXXXX. The right rear portion of the van sustained damage as well as minor damage to the right side door. The windshield was cracked. The left rear and right front tires were deflated. The interior consisted of two front bucket seats fitted with three point seatbelts. The vehicle had front airbags that were not deployed. The seatbelts were functional. There was no interior damage that could clearly be attributed to the crash. The vehicle was old with pre-existing damage and wear. The right front passenger trim panel beneath the airbag was partially dislodged, however, this appeared to be a condition

[10] See the Recorders Group Chairman's Factual Report contained in the accident docket.
[11] Jia-Ern Pai, Evaluation of FMVSS No. 301, Fuel System Integrity, as Upgraded in 2005 to 2009, NHTSA Technical Report, DOT HS 812 038, June 2014.
[12] See the Recorders Group Chairman's Factual Report contained in the accident docket.

existing prior to the collision. There was no partition or barrier between the front seats and the back of the van, which was filled with gutter repair equipment.

The GMC airbag module was downloaded and data from a non-deployment event was retrieved. The data indicated that the driver belt was not buckled, and provided a pre-impact vehicle speed of 29 miles per hour 1 second prior to the event and a brake status as "on" .[13]

1.6. 2001 Ford F150

The 2001 Ford had VIN: 1FTRW07W61KFXXXXX. The Ford sustained substantial damage along the entire left side. The left front wheel was displaced, the left front and rear doors were crushed inwards, and front left corner of the truck bed was deformed aft. The right rear corner of the truck bed was crushed forward and to the right. The windshield was cracked and the driver's door window frame was deformed downward with the glass broken out. The front driver and passenger airbag were deployed. The driver airbag had blood stains distributed in areas over the entire front (occupant facing surface), with the largest stain on the left edge at around the 9 O'clock position. The passenger airbag had a blood stain on the right side where it contacted the dashboard. The doors on the left side of the Ford were not operable, and the doors on the right functioned.

The driver three point seatbelt webbing was cut and contained blood stains. The belt contained load marks and frayed webbing in at a distance of about 36 inches from the left hip anchor point. The seatbelt connector was found in the buckle. The driver seatback was displaced aft and to the right, with a seatback angle of approximately 140 degrees. The driver seatback was in contact with the left rear seat cushion. There were blood stains on the driver seat concentrated on the upper right corner and headrest. The rear seat contained blood stains more excessive than the driver seat. These were found in the middle and upper seatback of the left rear seat, on the middle-left and upper portion of the center seat, and the middle-right of the right rear seat. The left side of the driver footwell was crushed inward and buckled up approximately 5 inches in the region under the brake pedal. The driver door and left front fender impinged laterally into the driver area several inches, causing the plastic trim panel under the steering wheel to buckle and become partially detached. The driver interior door handle trim panel was displaced. The left rear door and B-pillar were displaced several inches laterally into the occupant compartment. The interior door trim panels on the left rear door and B-pillar were also damaged and partially displaced.

The Ford F150 airbag module was downloaded and the crash data retrieval was successful.[14] The data indicated that the driver and passenger frontal airbags and seatbelt pretensioners did receive a deployment command. The data indicated no existence of diagnostic trouble codes. Longitudinal acceleration and longitudinal cumulative velocity change data was obtained.

[13] See the Recorders Group Chairman's Factual Report contained in the accident docket.
[14] See the Recorders Group Chairman's Factual Report contained in the accident docket.

1.7. 2007 Chevrolet Uplander

The Chevrolet Uplander had VIN: 1GNDV23W37DXXXXXX. The Chevrolet was heavily damaged on the back and front. The back was crushed in and down, the all space aft of the rear wheels destroyed. The front was crushed in with the hood buckled upwards at approximately the area above the front axles. The front doors were operational, the front door windows and windshield were intact, but the windshield was cracked in the right lower corner. The left rear sliding door was functional and glass intact. The right rear sliding door was not functional and glass was broken out.

The frontal and seat mounted airbags were not deployed. The three point driver and front passenger seatbelts were found unbuckled and functional, and the belt pre-tensioners had not fired. The driver seatbelt had a web abrasion at a location from about 67 to 74 inches from the label at the outboard hip anchor point. The front passenger seat had web abrasion at a location from about 63 to 71 inches from the label at the outboard anchor point. Both seatbelt connectors also showed evidence of web friction. The driver seatback was displaced back into the rear seats at an angle of 130 degrees. The driver seat contained dirt and probable blood stains on the upper portion of the driver seatback and headrest. There was also a probable blood stain in the middle forward region of the driver seat cushion. The passenger seatback was also displaced aft at an angle of approximately 145 degrees. There was glass and debris on the front seats. There were no obvious impact marks or damage to the interior dashboard or steering wheel. There was some splatter of an unknown fluid on the console above the rear view mirror above the center of the windshield. The driver foot well was crushed in several inches in the region of the parking brake pedal. The parking brake pedal was displaced aft and upwards.

The airbag controller, also known as the System Diagnostics Module (SDM) was removed from the vehicle in order to facilitate collection of data. The front impact sensors were located behind the front grill. Both were dislodged from their mounting location but remained attached to their electrical connector. One of the two, however, had a ruptured case. More information concerning the airbag system is provided in the following sections.

1.7.1. Airbag System Information

A General Motors (GM) contractor traveled to the scene to assist with obtaining information from the Chevrolet Uplander airbag system. A meeting was conducted by telephone with NTSB investigators, CPD officers and the GM contractor in Chattanooga speaking with engineering staff from GM.[15] The objective of the meeting was to determine the best method for obtaining the most information from the airbag system on the damaged vehicle, and to develop an understanding of the Uplander airbag system crash discrimination and airbag module data collection. Information from the meeting is summarized and reorganized below. The airbag system connection points and the vehicle fuse box were found to be damaged or cut by first responders. The Chevrolet airbag module was downloaded at the NTSB laboratory, and while some crash event data was retrieved, it could not be identified as associated to this crash event.[16]

[15] Survival Factors Attachment 1: Chevrolet Uplander Airbag System Meeting Notes
[16] See the Recorders Group Chairman's Factual Report contained in the accident docket.

Uplander Safety System Information

The Uplander has frontal airbags and seat mounted lateral side airbags. The airbag controller, also known as the System Diagnostics Module (SDM) is located under the right front seat. The front impact sensors are mounted on the upper radiator support strut, in the region between the midline and the headlight, with two sensors, one on each side of the strut. The SDM receives input from the two impact sensors, the two front airbag inflators, left and right front seat belt pretensioners, left and right lateral airbag sensors, left and right lateral seat mounted airbag inflators, and the right front seat sensor.

The front impact sensors are micro machined mechanical paddle type sensors that function as a cantilevered spring producing a change in capacitance. The two front impact sensors function independently, and the system needs one of the two to deploy. The front impact sensors only read the forward longitudinal axis (X).

The System Diagnostics Module (SDM) preserves all recorded crash event data. The data recorded is a sampled subset of the sensor outputs used by the SDM to discriminate an event. Diagnostic fault codes indicate the status of sensors and other inputs to the SDM read at the start of an ignition cycle or when power is applied to the SDM. When a crash event is triggered, the diagnostic fault codes associated with the event are recorded. When no crash event is triggered, diagnostic fault codes are retained, but are not associated to a particular ignition or power cycle. The fuse box, including SDM connections for the Uplander were cut during the first response, and sensors were damaged in the crash.

Impact Sensor Crash Descrimination and Deployment Criteria – Frontal Impact

The sensor system has inputs from the front crash sensors and the SDM. The front crash sensors have a must deploy latching system, such that if they read a threshold value (approximately 12 G's) they latch with a command to deploy, and the SDM will concur with this.

The SDM uses a front impact event progression time that begins when the sensor reads above 1.5 G's for a period of 1.25 milliseconds. If the value exceeds 1.5 G's, the count goes up, if it drops below 1.5 G's the count goes down. When the count reaches 80 the system will not deploy because the vehicle has been going through accelerations that could be moving the occupants out of position. The sampling rate of the system is 0.625 milliseconds. The system data report provides a segment every 10 milliseconds. The reporting system has a front end filter, but the value was not specified. Another criterion will prevent the system from deploying unless the sensors have reached a minimum deployment threshold of 3.5 G's.

1.8. 2014 Cadillac CTS

The Cadillac CTS had VIN: 1G6AU5S88E0XXXXXX. The primary damage was at the front of the car with the front crushed aft and the hood buckled upward in the region above the front axle. There was damage to the back with the truck lid crushed in. There was also damage on the left and right sides with scrapes and dents on both rear quarter panels and the left rear door.

The Cadillac had frontal airbags, a driver knee bolster airbag and side curtain airbags, all of which were deployed, except the passenger frontal airbag.[17] Scuff marks were found on the center-lower surface of the knee bolster airbag. The driver seatback was at an approximate 150 degree angle. The driver seatbelt was found unbuckled with pre-tensioner deployed and inertia reel locked. Web abrasions were found approximately 30 inches from the left hip anchor point.

The Cadillac airbag module was downloaded and the crash data retrieval was successful.[18] The system indicated that the data was sent to OnStar. Two events were recorded separated by 0.23 seconds. The system data for the first event included the following. The algorithms were active for side, rollover, rear, but not for frontal. Event severity status was not reached for the frontal airbags, side airbags, and rollover, but it was reached for rear impact. Data indicated that the driver seatbelt was buckled. The front passenger seat was indicated as empty and not buckled. The airbag and tire pressure warning lights were off. The high voltage disable notification was on, and the deployment commanded in energy reserve mode was not.

The driver and passenger frontal airbags were not commanded to deploy, but the driver front passenger seatbelt pre-tensioners did receive a deployment command. The other systems that did not receive a deployment command were driver and front passenger thorax loop, the row 2 left and right thorax loops, the roof rail and head curtain left and right side loops, and the driver and front passenger knee loop. Longitudinal velocity change, longitudinal acceleration, lateral velocity change and lateral acceleration were all obtained.

The system data for the second event was the same with the following exceptions. The frontal algorithm was active, event severity status was obtained for frontal pretensioner, frontal stage 1, frontal stage 2, and was not obtained for left and right sides or rear. The frontal airbag warning lamp was on. The deployment commanded in energy reserve mode was on. The driver airbag first and second stage airbag deployment commands were given. The left and right row 1 roof rail and head curtain loops and driver knee loop were commanded.

1.9. 2015 Toyota Tundra

The Toyota Tundra had VIN: 5TFAW5F14FXXXXXXX. The damage was concentrated at the rear of the vehicle. The tailgate, rear bumper, and left rear quarter panels were crushed forward in the region aft of the rear wheels. The rear wheels were not damaged and remained inflated. The left rear taillight lens was broken out, and the right remained intact. The truck bed had a cover that was damaged and partially displaced. No evidence of damage was found at the interior of the Toyota Tundra.

The Toyota Tundra airbag module was downloaded and the crash data retrieval was successful.[19] The data indicated that no airbag deployment commands were given for the system, which included the driver and passenger frontal airbags, driver and front passenger seatbelt pretensioners, and driver and passenger side curtain airbags. The system listed the following equipment as not applicable: driver and front passenger active head restraints, driver and passenger side airbags, and rear window airbag. The data indicated no existence of diagnostic

[17] See Recorders Group Chairman's Factual Report contained in the accident docket.
[18] See the Recorders Group Chairman's Factual Report contained in the accident docket.
[19] See the Recorders Group Chairman's Factual Report contained in the accident docket.

trouble codes. Longitudinal velocity change and lateral acceleration data was obtained. The event data indicated that the driver and front passenger seatbelts were connected, and the front passenger occupant sensor indicated that an occupant, not child, was present.

2. Occupant Information

A total of 9 vehicles and 18 people involved in the crash. There were 9 drivers and 9 passengers, with a total of 6 fatal, 4 transported from scene to hospital, and 8 refused treatment. Of the 4 transported to hospital, 3 were treated and released. Table 1 below provides a summary of the injured, and the sections that follow provide more detail. Some victims were interviewed, and a summary of the interview is provided in the section for that vehicle's occupants.[20]

Table 1: Occupant Injury Summary[21]

	Uninjured	Minor	Serious	Fatal
2007 Peterbilt Driver	1	0	0	0
2007 Peterbilt Passenger	1	0	0	0
2010 Toyota Prius Driver	0	0	0	1
2010 Scion tC Driver	0	0	0	1
2010 Scion tC Passengers	0	0	0	3
2003Maxda Tribute	0	0	0	1
2005 GMC Cargo Van Driver	1	0	0	0
2005 GMC Cargo Van Passenger	1	0	0	0
2007 Chevrolet Uplander Driver	0	1	0	0
2007 Chevrolet Uplander Passenger	0	1	0	0
2001 Ford F-150 Driver	0	0	1	0
2014 Cadillac CTS Driver	0	1	0	0
Toyota Tundra Driver	1	0	0	0
Toyota Tundra Passengers	3	0	0	0
Total	**8**	**3**	**1**	**6**

2.1. 2007 Peterbilt Truck Tractor Occupants

The driver was 40 year old male. Seat belt use for the driver at the time of the crash was inconclusive. The passenger was a 38 year old female. She wrote a statement to the Chattanooga Police Department after that accident that said: "I was lying in back, felt a sudden stop, threw me from sleeper."[22] The driver and passenger refused medical treatment on scene and did not indicate injury in police statements. They denied injury during NTSB interviews.

[20] Complete victim interview transcripts provided in Survival Factors Attachment 2: Victim Interviews and Statements.

[21] The NTSB classifies serious injuries as any injury which: (1) Requires hospitalization for more than 48 hours, commencing within 7 days from the date of the injury was received; (2) results in a fracture of any bone (except simple fractures of fingers, toes, or nose); (3) causes severe hemorrhages, nerve, muscle, or tendon damage; (4) involves any internal organ; or (5) involves second- or third-degree burns, or any burns affecting more than 5 percent of the body surface. (Title 49 CFR Section 830.2)

[22] See the Survival Factors Attachment 2: Victim Interviews and Statements.

2.2. 2010 Toyota Prius

The Prius driver, a 37 year old male, was fatally injured. The seat belt connector tongue was found buckled into the seat belt buckle. The autopsy report was obtained from the Office of the Hamilton County Medical Examiner. The decedent had a length of 71.5 inches and weighed 166 pounds. The cause of death was blunt force injuries sustained in a multi-vehicle collision. Toxicology tests were negative and blood carboxyhemoglobin saturation was less than 5%.

A summary of the pathological diagnosis included the following: 1. Blunt force head and neck injuries with comminuted skull fractures with brain lacerations, multiple non-patterned abrasions; 2. Blunt force torso injuries with bilateral rib fractures, subtotal transection of the aorta, rupture of the left hemidiaphragm, laceration of the lungs, spleen and kidney, wide disruption of the pelvis at the symphysis and sacroiliac joints; 3. Blunt force extremity injuries with fracture of the right ankle, multiple non-patterned abrasions and contusions and tempered glass (dicing) injuries on the right wrist.

2.3. 2010 Scion tC

2.3.1. Driver

The driver, a 31 year old female, was fatally injured and ejected from the vehicle. The seat belt connector tongue was found buckled into the seat belt buckle. The autopsy report was obtained from the Office of the Hamilton County Medical Examiner. The decedent had a length of 64.5 inches and weighed 144.5 pounds. The cause of death was blunt force injuries sustained in a multi-vehicle collision with ejection. Toxicology tests were negative and blood carboxyhemoglobin saturation was less than 5%.

A summary of the pathological diagnosis included the following:

1. Blunt force head and neck injuries with complete altanto-occipital disarticulation with crushing of the spinal cord, laminated and tempered glass injuries of forehead, linear abrasion, left side of face and ear, hair singed, left side of head, multiple non-patterned abrasions;

2. Blunt force torso injuries with serial right anterior rib fractures, sternal fracture, lung contusions, spleen contusions, pelvic disruption at bilateral sacroiliac joints, multiple tempered glass (dicing) injuries on the left upper chest, sliding abrasions on the right upper chest;

3. Blunt force extremity injuries with a deep laceration of the posterolateral aspect of the left forearm, flash burns at the anterior aspect of the legs and lateral aspect of the right arm and anterior aspect of the right forearm, sliding abrasions at the posterolateral aspect of the left arm, both wrists, both hands, and posterolateral aspect of the left leg.

2.3.2. Front Seat Passenger

The front seat passenger, a 50 year old female, was fatally injured. The seat belt connector tongue was found buckled into the seat belt buckle. The autopsy report was obtained from the Office of the Hamilton County Medical Examiner. The decedent had a length of approximately 65 inches and weighed 102 pounds. The cause of death was blunt force injuries

sustained in a multi-vehicle collision with post-crash fire. Toxicology tests were negative and blood carboxyhemoglobin saturation was less than 5%.

A summary of the pathological diagnosis included the following:

1. Blunt force head and neck injuries with altanto-occipital disarticulation and fractures of spinous process and cervical arch of C-4 and C-5;

2. Blunt force torso injuries with fracture of the spinous process at T-1, fractures of the left clavicle and scapula, bilateral rib fractures and rupture of the left hemidiaphragm;

3. Thermal injuries with extensive charring primarily to anterior surfaces and forearms and hands, thermal fractures of both forearms, no soot in airways.

2.3.3. Left Rear Seat Passenger

The left rear passenger was an 11 year old female and was fatally injured. The seat belt connector tongue was found buckled into the seat belt buckle. The autopsy report was obtained from the Office of the Hamilton County Medical Examiner. The decedent had a length of approximately 55 inches and weighed 79 pounds. The cause of death was blunt force injuries sustained in a multi-vehicle collision with post-crash fire. Toxicology tests were negative and blood carboxyhemoglobin saturation was less than 5%.

A summary of the pathological diagnosis included the following:

1. Blunt force head and neck injuries with altanto-occipital laxity with surrounding hemorrhage;

2. Blunt force torso injuries with fracture of the left forearm;

3. Thermal injuries with extensive charring primarily anterior and extremities, fuel splash burns on both legs, thermal delaminating facture of the skull, thermal fractures of both distal forearms, edema foam without soot in airways.

2.3.4. Right Rear Seat Passenger

The left rear passenger was a 9 year old female and was fatally injured. The seat belt connector tongue was found buckled into the seat belt buckle. The autopsy report was obtained from the Office of the Hamilton County Medical Examiner. The decedent had a length of approximately 53 inches and weighed 53 pounds. The cause of death was blunt force injuries sustained in a multi-vehicle collision with post-crash fire. Toxicology tests were negative and blood carboxyhemoglobin saturation was less than 5%.

A summary of the pathological diagnosis included the following:

1. Blunt force head and neck injuries with basilar skull fracture through posterior fossae and impact point behind right ear, bilateral temporal scalp lacerations;

2. Thermal injuries with skin sooting with deep charring of right arm and leg, fuel splash burns on right side of torso and the medial aspect of the left leg, thermal facture of the right wrist, edema foam and clotted blood without soot in airways.

2.4. 2003 Mazda Tribute

The driver of the Mazda, a 36 year old male, was fatally injured. The seat belt connector tongue was found buckled into the seat belt buckle. The autopsy report was obtained from the Office of the Hamilton County Medical Examiner. The decedent had a length of approximately 71.5 inches and weighed 240.5 pounds. The cause of death was blunt force injuries sustained in a multi-vehicle collision. Toxicology tests were negative and blood carboxyhemoglobin saturation was less than 5%.

A summary of the pathological diagnosis included the following:

1. Blunt force head and neck injuries with complete altanto-occipital disarticulation with crushing of the spinal cord, multiple non-patterned lacerations and abrasions;

2. Blunt force torso injuries with transection of the spine at T-4/5, subtotal transection of the aorta, bilateral serial rib fractures, subtotal avulsion of the heart, lacerations of the heart, lungs and liver, disruption of the pelvis at the symphysis and bilateral sacroiliac joints, multiple abrasions and contusions;

3. Blunt force extremity injuries with fractures of the right humerus, ulna and radius, multiple non-patterned abrasions, tempered glass (dicing) injuries at the anteromedial aspect of both arms and back of left hand.

2.5. 2005 GMC Savana G1500 Cargo Van

The driver of the GMC, a 31 year old male, was not injured. The passenger of the GMC, a 41 year old male, was not injured.

2.6. 2001 Ford F150

The driver of the Ford, a 24 year old male, was injured and transported to Erlanger hospital. He suffered serious injuries. He had an open fracture with significant tissue loss of the left elbow, an open left triceps tear, a 3 to 4 centimeter full thickness burn to the left postlat heel, a 3 to 4 centimeter left posterior scalp laceration. He was transported by Hamilton County EMS to Erlanger Hospital in Medic Unit 3. The EMS run sheet reported that the call was received at 7:10:19 pm, they were enroute at 7:12:41 pm, onscene at 7:24:45 pm, at the patient at 7:25:00 pm, departed the scene at 7:40:43 pm, at the hospital at 8:00:31 pm, and transferred care at 8:04:00 pm.

The driver of the Ford was interviewed on June 30, 2015 at Erlanger Hospital.[23] He was asked what he remembered from the accident and said that just before the accident he looked in the rear view mirror and saw a truck or something barreling down on him. He didn't remember anything else until waking up in an ambulance. He said he thought he'd been in a lane close to the wall before the accident. He recalled his treatment and being taken in for surgery for his elbow. He described his injuries.

[23] See Survival Factors Attachment 2: Victim Interviews and Statements.

2.7. 2007 Chevrolet Uplander

The driver of the Chevrolet, the 57 year old male, was injured and transported to Memorial hospital. He suffered minor injuries including a forehead laceration, lower back contusions, contusions to the right ribs and chest, and contusions to the left arm and left leg. He was 172 inches tall and about 240 lbs.

The passenger of the Chevrolet, the 55 year-old female, was injured and transported to Memorial hospital. She suffered minor injuries including contusions to the back, left hip and ribs, and abrasions to the left upper arm. She was 61 inches tall and 163 lbs.

The driver and passenger of the Chevrolet were interviewed by telephone on July 1, 2015.[24] They were asked if they remembered the circumstances of the crash. They recalled that it occurred just after the area that traffic was merging to one lane and after they came over a hill and could see traffic ahead. They had slowed down, and were in stop and go traffic when they heard some noise. The driver looked in the rear view mirror and saw cars coming toward them, and some being pushed away. They realized they were going to get rear ended. The driver said he did not recall which vehicles hit them from behind, but remembered there was a burgundy or red pick-up truck in front of them, and that it ended up beside them after the crash. They noted that they were both wearing seatbelts and that the airbags did not deploy. They said that the driver's seatback broke from the crash. The passenger was asked if she had any trouble evacuating and noted that she pressed the seatbelt release button a couple of times and that they were concerned of fire. The driver said he also pressed the seatbelt release button more than once and noticed fire off to his right. He said the steering wheel constrained his legs a bit, but he got out. Someone on scene helped them get away from the vehicles. They were transported in one ambulance together to the hospital.

2.8. 2014 Cadillac CTS

The driver of the Cadillac, a 60 year old male, was injured and transported to Erlanger hospital. He suffered minor injuries including a closed head injury (concussion), contusions of the right hip, and abrasions to the right knee and left hip. He was 70 inches tall and about 210 lbs.

The Cadillac driver was interviewed at the Chattanooga Police Department (CPD) vehicle impound lot on July 1, 2015.[25] He had no memory of the event. He recalled going to his car from a hotel before the crash and then being in Erlanger Hospital. He described his injuries and said that he always wears his seatbelt.

2.9. 2015 Toyota Tundra

The driver of the Toyota was a 41 year old male, the front seat passenger was a 39 year old female, and the rear seat passengers were a 12 year old male and a 6 year old female. None of the occupants of the Toyota were injured.

[24] Survival Factors Attachment 2: Victim Interviews and Statements.
[25] Survival Factors Attachment 2: Victim Interviews and Statements.

3. Law Enforcement Information

3.1. Hamilton County

3.1.1. Public Service Answering Point (PSAP) and Dispatch Center

The Hamilton County 911 call center dispatched the law-enforcement, fire, and EMS services except for the Tennessee Department of Transportation (TDOT). Although collocated at the Hamilton County 911 call center, different agencies have dispatch logs with details specific to their agency. The incident detail reports for the CPD and TDOT were obtained.[26] Refer to other sections of this report for information about the call logs for fire and EMS agencies.

Some basic events from the 911 call log are provided here, and other details are provided in other sections of this report pertaining to specific agencies and their incident reports. The first 911 call about the crash was answered by the PSAP at 7:09:54 pm and the incident log was created at 7:10:19 pm and the location of the crash was noted as 1100 I-75 northbound, at Volkswagen Drive/Lee Highway. It was reported that there were at least 4 vehicles involved and possible explosions from one of the vehicles by 7:11 pm. Advanced Life Support (ALS) was enroute at 7:11:59 pm. Multiple fatalities were reported at 7:13:24 pm. Engine H1244 from TriCommVFD was reported to be fighting the vehicle fire at 7:15:16 pm. Two additional ALS unites were requested at 7:16:37 pm, and an estimate of 8 to 9 patients was given at 7:17:35 pm. By 7:21 pm the patient count was updated with 3 fatalities and 4 injured including 1 critical and the event was upgraded to an accident critical situation. At 7:22:15 it was noted that there were no entrapped victims. Six fatalities were reported at 7:35:20 pm. A crime scene was declared at 8:27:17 pm and at 8:34 pm the event was changed to a traffic control situation. The incident log was closed at 7:32 am on June 26th, 2015.

3.2. Chattanooga Police Department

The Chattanooga Police Department (CPD) had jurisdiction for this crash. The CPD had 18 units respond and the first 2 arrived on scene at 7:17 pm and a third arrived at 7:20 pm. The CPD secured the scene, coordinated the response with other agencies and controlled traffic. The CPD conducted the investigation of the vehicles other than the tractor trailer and the Tennessee Highway Patrol (THP) conducted the tractor trailer investigation.

3.3. Tennessee Department of Transportation and Other Law Enforcement

The TDOT incident detail report provided information about the management of the construction zone, traffic control signs, traffic management, and some other aspects of the response conducted by the TDOT and other supporting law enforcement agencies.[27] Details of the construction zone and traffic control signs are addressed in the Highway Group Chairman's Factual Report.[28]

[26] Survival Factors Attachment 3: Law Enforcement Incident Detail Reports.
[27] Survival Factors Attachment 3: Law Enforcement Incident Detail Reports.
[28] See the Highway Group Chairman Factual Report, available in the accident docket.

Other event information included in the TDOT incident detail report includes the following. TDOT HELP (roadside assistance) units 7216 and 7217 arrived on scene at 7:34 pm.[29] At 7:40 pm the THP trooper assumed scene command for the tractor trailer investigation and a CPD officer assumed scene command for the investigation of the other vehicles. Maintenance queue trucks were dispatched. At 8:30 pm work was being conducted to clear vehicle caught in closures at the scene, and at 8:39 pm an emergency lane closure was conducted in order to relocate road construction equipment. Atlanta Police Department was notified at 9:37 pm in case traffic queues extended into Georgia. The Collegedale Police Department initiated traffic control measures at the I-75 northbound exit 11 at 9:57 pm. A non-injury vehicle collision was reported at I-75 northbound milepost 9.8 at 11:10 pm. The CPD and THP investigation were noted to have concluded at 3:11 am (June 26th), and was followed by deceased retrieval operations. The 6 fatalities were confirmed at 4:35 am. Debris removal and sweeping operations began at 4:56 am. At 6:00 am 4 vehicles had been removed and the other 4 and the tractor trailer were in process. The incident was cleared at 7:02 am.

3.3.1. Medical Examiner

The deceased were taken to the Hamilton County forensics center. The Hamilton County medical examiner performed autopsies on all of the deceased. A contracted laboratory performed toxicology tests for all deceased. The results for each victim are summarized in section 2 of this report.

4. Fire and EMS Information

4.1. Tri Community Volunteer Fire Department

The Tri-Community Volunteer Fire Department (TriCommVFD) station number 4 located at 9515 Lee Highway was approximately 1 mile from the accident site. TriCommVFD was under contract to provide fire services for the town of College Dale. TriCommVFD Engine 1244 was the first fire unit to arrive on scene at 7:14:34 pm. The captain of Engine 1244 became the initial Incident Commander (IC), and was interviewed by the NTSB.[30] He indicated that they could see light colored smoke when they left the station and turned onto Lee Highway, and then it turned dark as they approached about 0.5 miles from the scene. As they arrived the smoke turned lighter again and they saw people using fire extinguishers to fight the car fire. He assigned the fire fighters to do a quick knock down of the car fire while he conducted an initial scene assessment. A man in fatigues, possibly from the National Guard was there and reported that there were fatalities. The IC also saw people self evacuating from vehicles. He then assigned an EMT fire fighter from his engine to assist one victim, the driver of the Ford F150 pickup. He attempted to get a headcount, but had trouble differentiating victims from bystanders. Shortly after, a TriCommVFD Chief arrived in a supervisor vehicle (Unit 1203), and IC was transferred to him. A Hamilton County EMS supervisor also arrived and assisted with triage. He described the other TriCommVFD units on scene, which he said were 2 other engines, a pumper truck, a medical truck, and a heavy rescue truck. He described the other TriCommVFD units involved and general information about training and the experience of the fire fighters.

[29] Tennessee HELP program: http://tn.gov/tdot/topic/help-program-contact
[30] SF Attachment 4: Fire and EMS Interviews.

4.1.1. TriCommVFD Alternative Energy Vehicle Considerations

TricommVFD was asked about their involvement at the scene with the Toyota Prius as an alternative energy vehicle with a stored energy battery pack. They responded that they did not conduct operations other than having fire fighters check for other occupants. TriCommVFD was asked about procedures for alternative vehicles involved in crashes. They responded that the FD would only be called out for a crash with injuries or fatalities. In a crash with no injuries or where no rescue or extrication was involved, the police and or towing company would handle the vehicle. In a crash were vehicle operations are required, fire fighters are aware of alternative vehicle labeling and follow appropriate precautions or instructions.

TriComm VFD was asked about training and procedures regarding alternative fuel vehicles and responded that their training and procedures are the same as the Chattanooga Fire Department because they are jointly managed.

4.2. Chattanooga Fire Department

The Chattanooga Fire Department (CFD) had jurisdiction for the crash. The battalion chief was interviewed by the NTSB.[31] He was the ranking fire official on scene but allowed the chief from TriCommVFD to retain incident command to avoid disruptions. The CFD had 5 total units respond: the battalion chief was in a supervisor vehicle (205-CFD), a rescue truck (Squad 7), a multipurpose ladder truck (Quint 7), and two other supervisors that were not involved in the initial response (41-CFD and 45-CFD). The fire chief and the captain from the rescue truck were also interviewed by the NTSB. They noted that the rescue truck had two EMT's and a fire fighter on board and the multipurpose ladder truck had two EMT's and two fire fighters on board. They checked in with the IC and were assigned to help with extrication of victims. They found that all victims had been extricated by this time or were deceased. They assisted in checking the other vehicles, helped with equipment and lights, and helped extricate deceased. They provided information about the communication and organization of the scene and information about training.

The CFD provided the incident report and Incident Computer Aided Dispatch (CAD) report for this crash.[32] The CFD incident report provided a narrative of the accident and noted that a dispatched rescue unit (Squad 13) was cancelled after responders were aware that all surviving victims had been extricated. It was also noted that the responders from Squad 7 assisted in the extrication of the deceased victim from the Mazda Tribute.

The CFD units Squad 7, Quint 7, and 205-CFD were enroute at 7:13:32 pm, 7:13:35 pm, and 7:16:39 pm respectively. Quint 7 and Squad 7 were on scene within a minute of each other by 7:23:42 pm, and 205-CFD was on scene at 7:27:45 pm.

4.2.1. CFD Alternative Energy Vehicle Considerations

CFD was asked to provide information about alternative energy vehicle procedures and training. They responded that their procedures for alternative energy vehicles remain similar to

[31] SF Attachment 4: Fire and EMS Interviews
[32] SF Attachment 5: Fire Incident Reports

other vehicles, but with the difference of recognition of hazards associated with each type. They cited the example that crews would pay attention to and avoid high voltage lines that connect the battery. They noted that the available training for these types of vehicles is limited due to the variety of different vehicles and the location of different hazards on each type of vehicle. They noted that there is no standardization between types of cars, and this makes it difficult for responders to know the construction of the variety of vehicles on the road. They noted that there are computer applications available to help with referencing a vehicle, but there is too little time to do detailed research while on scene at an emergency. They noted that fire suppression is a primary concern for any vehicle type, and that the appropriate suppression techniques would be used.

They were asked about the control and release of vehicles at the scene. Specifically, they were asked about what happens after the FD has conducted rescue or fire operations and if there are procedures to communicate or transfer safety concerns to whomever is taking control of the vehicle (such as the police department or towing company). They responded that there are procedures to make the vehicle safe before control is relinquished to the police department or the towing company. It was noted that they could potentially de-energize the vehicle if it can be done safely and would communicate any hazards that may still be present. If the battery pack had ruptured and hazardous materials were released, the appropriate absorbent would be applied to the spill and disposed of before they left the scene.

They were asked about high energy storage capacity electric vehicles, if one was damaged in a crash and the stranded energy needed to be dissipated on scene, would they have the knowledge and equipment to take appropriate action, and if not, how the situation would be handled. They responded that the FD would attempt to locate the disconnect for the battery pack, and that they do not have the equipment to determine if the vehicle has been fully discharged. They would have to do some research and get appropriate assistance for such a case.

4.3. Hamilton County EMS

Hamilton County EMS responded to this crash. The Hamilton County ambulances were all advanced life support units with a paramedic on board. Three ambulances transported patients from the scene and two ambulances were used to transport the deceased from the scene. Two supervisors from Hamilton County EMS were also on scene. The first arriving supervisor, a lieutenant, was interviewed by the NTSB.[33] The lieutenant arrived in a supervisor vehicle at 7:14 pm while the car on scene was still on fire. Details of the EMS response times are provided in table 2 below. He indicated that he was aware there were two ambulances and another supervisor. He had been informed by dispatch that 9 ambulances had been requested, and he conducted his own assessment. After determining that there were multiple fatalities and not as many injured as suspected, he revised the ambulance need to 3. He described getting help from the bystander in fatigues with one victim and the actions of fire fighters and medics caring for and transporting others. He described how and where victims were transported and noted the communication through the medical communication (Medcom) system with the trauma centers. He had one ambulance standing by in case another victim required transport, and this unit eventually was used to transport deceased to the medical examiner's office.

[33] SF Attachment 4: Fire and EMS Responder Interviews

The Hamilton County EMS provided a summary of the EMS response times. These and the age and gender of the patient or patients transported are provided in table 2.

Table 2: Hamilton County EMS Response

	Medic 3	Medic 11	Medic 14
Call Received (time EDT)	7:10 pm	7:14 pm	7:18 pm
Unit Dispatched (time EDT)	7:11 pm	7:14 pm	7:19 pm
Unit Responded (time EDT)	7:12 pm	7:17 pm	7:22 pm
Unit On-Scene (time EDT)	7:24 pm	7:33 pm	7:39 pm
Patient Transported (time EDT)	7:40 pm	7:40 pm	8:37 pm**
Patient1: Age/Gender	24 / male	55 / female	60 / male
Patient 2: Age/Gender	na	57 / male	na

** Transport was delayed due to the patient originally denying injuries. EMS Medic 14 was on standby at the scene.

The first supervisor to arrive, a lieutenant, arrived at 7:14 pm, and the second, a Captain, arrived at 7:24 pm. The other EMS units on scene were used to transport the deceased to the Hamilton County forensics center.

4.4. Hospitals

Patients were transported to two area hospitals, Erlanger Health System, also known as Erlanger Hospital on East 3rd Street in Chattanooga and CHI Memorial Hospital on de Sales Avenue in Chattanooga. CHI stands for Catholic Health Initiatives, which is a multi-state Catholic health system that operates the hospital. Erlanger Hospital is the only level one trauma center in the area. It received two patients, the driver of the Ford pickup and the driver of the Cadillac. CHI Memorial Hospital received two patients, the driver and passenger of the Chevrolet. The charge nurse from Erlanger Hospital was interviewed by the NTSB.[34] The charge nurse described how the dispatch center operates and that coordination with the other hospitals is done using the Medcom system. The Erlanger Hospital has medivac capability with 5 helicopters. She noted that the hospital has a divert status plan if they reach capacity, but the hospital did not have an issue with capacity for this crash.

E. DOCKET MATERIAL

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

LIST OF ATTACHMENTS

Survival Factors Attachment 1 - Chevrolet Uplander Airbag System Meeting Notes
Survival Factors Attachment 2 - Victim Interviews and Statements
Survival Factors Attachment 3 - Law Enforcement Incident Detail Reports
Survival Factors Attachment 4 - Fire and EMS Interviews

[34] SF Attachment 4: Fire and EMS Responder Interviews

Survival Factors Attachment 5- Fire Incident Reports

LIST OF PHOTOGRAPHS

Survival Factors Photo 1 - Vehicle 1, Peterbilt Driver Area
Survival Factors Photo 2 - Vehicle 1, Peterbilt Sleeper Berth, Passenger Side
Survival Factors Photo 3 - Vehicle 1, Perterbilt Sleeper Berth Driver Side
Survival Factors Photo 4 - Vehicle 2, Toyota Prius Interior
Survival Factors Photo 5 - Vehicle 2, Toyota Prius Battery Pack
Survival Factors Photo 6 - Vehicle 2, Toyota Prius, High Voltage Service Plug
Survival Factors Photo 7 - Vehicle 3, Scion tC Interior
Survival Factors Photo 8 - Vehicle 3, Scion tC Rear
Survival Factors Photo 9 - Vehicle 4, Mazda Tribute
Survival Factors Photo 10 - Vehicle 5, GMC Savana Interior
Survival Factors Photo 11 - Vehicle 6, Ford F-150, Front Seats
Survival Factors Photo 12 - Vehicle 6, Ford F-150, Back Seats
Survival Factors Photo 13 - Vehicle 7, Chevrolet Uplander Front Seats
Survival Factors Photo 14 - Vehicle 7, Chevrolet Uplander Front
Survival Factors Photo 15 - Vehicle 8, Cadillac CTS Interior

END OF REPORT

Thomas Barth, Ph.D.
Senior Survival Factors Investigator