

CRASH DATA RESEARCH CENTER

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CALSPAN ON-SITE CHILD SAFETY SEAT CRASH INVESTIGATION

CALSPAN CASE NO: CA05-044

VEHICLE: 1998 DODGE CARAVAN

LOCATION: MARYLAND

CRASH DATE: MARCH 2005

Contract No. DTNH22-01-C-17002

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The crash investigation process is an inexact science which requires that physical evidence such as skid marks, vehicular damage measurements, and occupant contact points are coupled with the investigator's expert knowledge and experience of vehicle dynamics and occupant kinematics in order to determine the pre-crash, crash, and post-crash movements of involved vehicles and occupants.

Because each crash is a unique sequence of events, generalized conclusions cannot be made concerning the crashworthiness performance of the involved vehicle(s) or their safety systems.

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<p>16. Abstract This on-site investigative effort focused on the performance of a forward facing child safety seat (FFCSS) and the resulting fatal outcome to a 4-year-old female passenger of a 1998 Dodge Caravan. The Dodge was occupied by a restrained 20-year-old male driver, a restrained 21-year-old male right front passenger, a restrained 43-year-old female second row left passenger, a 44-year-old male second row right passenger, a 4-year-old female third row left passenger restrained in the FFCSS, and an unrestrained 16-year-old third row right passenger. The Dodge was involved in a severe rear-end collision with a 2005 Ford E350 ambulance. As a result of the crash and subsequent intrusion, the 4-year-old female sustained critical level (AIS-5) injuries and was transported to a local hospital where she expired two days post-crash. The driver and front right passenger were not injured. The 43-year-old second row left passenger and the 44-year-old male second row right passenger sustained minor and moderate injuries respectively and were transported to a hospital where they were admitted. The 16-year-old third row right passenger sustained serious injuries and was transported to a hospital where she was hospitalized for an unknown number of days.</p>			
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CALSPAN ON-SITE CHILD SAFETY SEAT CRASH INVESTIGATION
SCI CASE NO.: CA05-044
VEHICLE: 1998 DODGE CARAVAN
LOCATION: MARYLAND
DATE OF CRASH: MARCH 2005

BACKGROUND

This on-site investigative effort focused on the performance of a forward facing child safety seat (FFCSS) and the resulting fatal outcome to a 4-year-old female passenger of a 1998 Dodge Caravan (**Figure 1**). The Dodge was occupied by a restrained 20-year-old male driver, a restrained 21-year-old male right front passenger, a restrained 43-year-old female second row left passenger, a 44-year-old male second row right passenger, a 4-year-old female third row left passenger restrained in the FFCSS, and an unrestrained 16-year-old third row right passenger.



Figure 1. Subject vehicle 1998 Dodge Caravan.

The Dodge was involved in a severe rear-end collision with a 2005 Ford E350 ambulance. As a result of the crash and subsequent intrusion, the 4-year-old female sustained critical level (AIS-5) injuries and was transported to a local hospital where she expired two days post-crash. The driver and front right passenger were not injured. The 43-year-old second row left passenger and the 44-year-old male second row right passenger sustained minor and moderate injuries respectively and were transported to a hospital where they were admitted. The 16-year-old third row right passenger sustained serious injuries and was transported to a hospital where she was hospitalized for an unknown number of days.

This crash was identified through weekly sampling of Police Accident Reports (PAR) by the National Automotive Sampling System (NASS). The PAR was forwarded to the Crash Investigation Division (CID) of the National Highway Traffic Safety Administration (NHTSA) by the Calspan Special Crash Investigations (SCI) team due to the presence of the CSS in the 1998 Dodge Caravan. The Dodge Caravan and the child safety seat were located and cooperation was established with the salvage facility and the family of the child to inspect in the CSS. An on-site investigation was assigned to the Calspan SCI team on July 14, 2005. The vehicle inspection, CSS inspection, and the interview were conducted during the week of July 19, 2005.

SUMMARY

Crash Site

This rear-end crash occurred during the daylight hours on an east/west interstate roadway. The weather conditions at the time of the crash were reported as clear and the travel lanes were dry. The roadway consisted of three asphalt surfaced eastbound lanes with an asphalt shoulder. The east/westbound lanes were separated by a depressed grass median with a W-beam median barrier. A yellow fog line bordered the north road edge and a yellow fog line bordered the south road edge. The posted speed limit within the vicinity of the crash site was 89 km/h (55 mph). Due to the heavy traffic and the passage of time between the crash date and the case assignment, there was no physical evidence remaining at the scene. The scene schematic is included as **Figure 11** of this report.

Vehicle Data

1998 Dodge Caravan

The subject vehicle in this crash was a 1998 Dodge Caravan. The Dodge was manufactured on 08/97 and was identified by Vehicle Identification Number (VIN) 2B4GP44G8WR (production number deleted). The odometer reading at the time of the SCI inspection was 286,794 kilometers (178,205 miles). The vehicle was a five-door minivan that was equipped with a 3.3-liter, six-cylinder engine linked to a four-speed automatic transmission. The service brakes were front disc and rear drum. The vehicle was equipped with OEM five-spoke plastic wheel covers over steel rims with P215/65R15 tires. The tires on the Dodge were Goodyear Weather Handler. The manufacturer recommended front and rear tire pressure was 241 kPa (35 PSI). The specific tire data at the time of the SCI inspection was as follows:

Position	Measured Tire Pressure	Measured Tread Depth	Damage
Left Front	296 kPa (43 PSI)	5 mm (6/32")	None
Left Rear	0 kPa	5 mm (6/32")	Cut inner sidewall
Right Front	296 kPa (43 PSI)	5 mm (6/32")	None
Right Rear	255 kPa (37 PSI)	3 mm (4/32")	None

The interior of the Dodge consisted of cloth surfaced front bucket seats with integrated head restraints. The second row consisted of a two passenger bench seat left side wide with height adjustable head restraints that were adjusted to the full down position at the time of the SCI inspection. The third row was a three passenger bench seat with height adjustable head restraints for the outboard seats. The left head restraint was not installed at the time of the SCI inspection. The right head restraint was in the full-up position at the time of the inspection.

2005 Ford E350 Ambulance

The striking vehicle in this crash was a 2005 Ford E350 chassis with a type III ambulance body. The VIN number that identified the vehicle was 1FDWE35P75H (production number omitted). The Ford was manufactured as an incomplete vehicle cab on chassis cutaway. The vehicle was powered by a 6.0-liter eight cylinder diesel engine, linked to a four speed automatic transmission. The service brakes were four wheel discs with ABS.

The Ford was under repair at the time of the SCI inspection; therefore, minimal data was obtained.

Crash Sequence

Pre-Crash

The 20-year-old male driver of the Dodge was operating the vehicle eastbound in the center lane. A 2000 Honda Accord was traveling ahead of the Dodge and slowed for traffic ahead. The driver of the Dodge observed the slowing traffic and applied the brakes. A 50 year-old female was operating the 2005 Ford E350 ambulance in the center lane approaching the Dodge. The 44-year-old male second row right passenger stated that he turned rearward and observed the oncoming ambulance. He noticed that the ambulance did not have its emergency lights or siren activated and that it appeared to be traveling at a steady highway speed.

Crash

The front of the 2005 Ford E350 ambulance impacted the rear of the 1998 Dodge Caravan in slight off-set configuration. The front of the Ford impacted and overrode the rear bumper system of the Dodge resulting in contact and deformation to the tailgate and left quarter panel area. **Figure 2** is the approximate area of impact on the interstate.

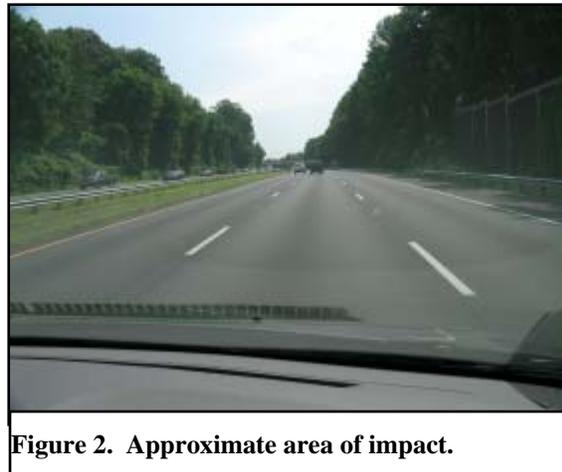


Figure 2. Approximate area of impact.

The resultant directions of force were 12 o'clock for the Ford and 6 o'clock for the Dodge. The Ford was under repair at the time of the SCI inspection; therefore, the WINSMASH barrier equivalent algorithm was used to calculate a delta-V for this impact. Additionally, the average crush profile of the bumper and above bumper locations was used for the delta-V inputs. The total delta-V for the Dodge was 52 km/h (32.3 mph) with longitudinal and lateral components of 52 km/h (32.3 mph) and 0 km/h, respectively.

The Dodge was deflected forward and to the right and was driven to the shoulder where it came to rest. The Ford continued its forward trajectory and struck the rear of the 2000 Honda Accord. The Honda subsequently traveled forward and struck the rear of a 1996 Honda Accord.

Post-Crash

The 21-year-old male front right occupant exited the vehicle through the right front door and removed the 4-year-old female from the vehicle. He transferred the 4-year-old to a witness of the crash. This witness held the 4-year-old female for a short period and then transferred the child to the 44-year-old male passenger. Police and Emergency Medical Services (EMS) personnel responded to the crash site. The 4-year-old female sustained critical injuries and was transported to a local hospital where she expired two days post-

crash. The driver and front right passenger were not injured. The 43-year-old second row left passenger and the 44-year-old male second row right passenger sustained minor to moderate severity injuries and were transported to a hospital where they were hospitalized for eleven and five days respectively. The 16-year-old third row right passenger sustained serious injuries and was hospitalized for an unknown number of days.

Vehicle Damage

Exterior – 1998 Dodge Caravan

The 1998 Dodge Caravan sustained severe damage to the rear plane as a result of the impact with the 2005 Ford E350 ambulance. **Figures 3 and 4** are views of the damage to the Dodge. The front of the Ford contacted and overrode the rear bumper system of the Dodge resulting in deformation to both levels. Due to the override damage pattern, crush was documented at the bumper beam and the lower aspect of the tailgate. The direct contact damage at the bumper beam was 141 cm (55.5”) and began 63 cm (24.8”) right of the centerline and extended to the left corner. The maximum crush was 65 cm (25.6”) located at the left corner of the bumper beam. The residual crush was documented along the full width of the deformed bumper beam (Field L) of 133 cm (55.5”). Six equidistant crush measurements were documented at this level and were as follows: C1 = 65 cm (25.6”), C2 = 58 cm (22.8”), C3 = 48 cm (18.9”), C4 = 28 cm (11.0”), C5 = 12 cm (4.7”), C6 = 0 cm.

The above bumper crush was captured by measuring a crush profile 11 cm (4.5”) above the lower the edge of the tailgate. The six crush measurements were as follows: C1 = 79 cm (31.2”), C2 = 85 cm (33.5”), C3 = 87 cm (34.2”), C4 = 81 cm (31.9”), C5 = 39 cm (15.3”), C6 = 36 cm (14.2”). The Collision Deformation Classification (CDC) for this impact was 06-BDEW-6. Additional damage included a 3 cm (1.0”) reduction of the left wheelbase, deformation of the left quarter panel and roof. The backlight and both quarter windows were disintegrated. The front and side doors remained closed and operational. The latch released from the striker of the tailgate; however, it was jammed in a closed position.



Figure 3. Overall view of the rear damage.



Figure 4. Lateral view of the crush.

2005 Ford E350 Ambulance

The 2005 Ford E350 ambulance sustained unknown severity frontal damage. The repairs to the frontal structure of the vehicle were started prior to the SCI inspection; therefore, there was not measurable crush. The estimated CDC was 12-FDEW-1. **Figures 5 and 6** are of the dismantled Ford.



Figure 5. Dismantled frontal structure



Figure 6. 2005 Ford E350 ambulance.

Interior – 1998 Dodge Caravan

The interior of the Dodge sustained moderate damage from occupant contact. The occupant contact points consisted of deformed front seatbacks from loading by the driver and front right passenger. The inboard aspects of the seatbacks were deformed rearward and rotated inboard. The second row passengers loaded the seatback which was evidence by slight deformation to the outboard aspects. The second row bench seat was disengaged from the floor anchors which resulted from loading by the third row seat cushion. The Dodge sustained severe damage from passenger compartment intrusion (**Figure 7**). The intrusions are identified in the following table:



Figure 7. Third row intrusion and displaced third row bench seat.

Seat Position	Intruded Component	Magnitude	Direction
Third row	Left seatback	46 cm (18")	Longitudinal
Third row	Center seatback	43 cm (17")	Longitudinal
Third row	Right seatback	33 cm (13")	Longitudinal
Third row	Left seat cushion	19 (7.5")	Longitudinal
Third row	Center seat cushion	14 cm (5.7")	Longitudinal

Seat Position	Intruded Component	Magnitude	Direction
Third row	Right seat cushion	8 cm (3.2")	Longitudinal
Third row	Left tailgate (at beltline)	84 cm (33")	Longitudinal
Third row	Center tailgate (at beltline)	84 cm (33")	Longitudinal
Third row	Right tailgate (at beltline)	78 cm (30.7")	Longitudinal

Frontal Air Bag System – 1998 Dodge Caravan

The Dodge was equipped with first generation frontal air bags for the driver and front right passenger positions. The frontal air bag system did not deploy in this crash.

Manual Safety Belt Systems – 1998 Dodge Caravan

The 1998 Dodge Caravan was equipped with three-point lap and shoulder belt systems for the six outboard positions. The driver’s safety belt consisted of a sliding latch, height adjustable D-ring that was in the full-down position, and retracted onto an Emergency Locking Retractor (ELR). The driver utilized his safety belt in the crash.

The front right safety belt consisted of a light weight locking latch plate, height adjustable D-ring that was in the full-up position, and an ELR. This safety belt was used by the 21-year-old male front right passenger.

The second row safety belts retracted onto ELR’s and utilized light weight locking latch plates. Both safety belts were equipped with height adjustable D-rings. The left D-ring was in the full-down position and the right was in the full-up position. The second row safety belts were used by the 43-year-old female left passenger and the 44-year-old male right passenger.

The third row of the Dodge was equipped with outboard lap and shoulder belts and a center lap belt. The outboard belts were equipped with light weight locking latch plates with ELR’s. The center lap belt was equipped with a locking latch plate and no retractor. The left safety belt was used to install the forward facing child safety seat that was occupied by the 4-year-old female passenger. This safety belt was cut by the family of the child passenger several days following the crash to retrieve the child safety seat. The cut was located 102 cm (40.0") above the stop button. Loading evidence was noted on the safety belt webbing which consisted of plastic transfers from the child safety seat. These transfers were located from 11-28 cm (4.5-11.0"), 33-46 cm (12.8-18.0"), and 66-76 cm (26-30") above the stop button. An



Figure 8. Third row left safety belt transfers and loading evidence.

abrasion was noted full width 6 cm (2.3”) on the D-ring. **Figure 8** is an overall view of the transfers and loading evidence on the third row left safety belt.

The third row right seating position was occupied by the 16-year-old female passenger. She did not use the safety belt in the crash. The 44-year-old passenger stated to the SCI investigator that she was initially restrained and unbuckled the safety belt prior to the crash.

Child Safety Seat – 1998 Dodge Caravan

The 4-year-old female was restrained by the integrated five-point harness system of a forward facing child safety seat in the third row right position of the Dodge. The child safety seat was a Graco Ultra Cargo with a model number of 8487BLU. The manufacture date was 10/14/02 (**Figure 9**). The safety seat was designed to be used with the integrated harness system or as belt positioning booster seat. The safety seat was installed in the Dodge with the lap and shoulder belt routed through the forward facing belt slots. Due to the passenger compartment intrusion, the safety seat was compressed against the seatback of the second row seat. This compression resulted in numerous stress/loading marks to the plastic shell. The stress marks were located full width on the top and bottom aspects across the seat cushion area and the lower belt positioning booster seat belt path (**Figure 10**). Stress/loading marks were also noted on the outboard aspects of the safety seat. The forward facing belt path exhibited loading marks that resulted from interaction with vehicle’s lap and shoulder belt system. No fractures were present on the safety seat.



Figure 9. Graco child safety seat.



Figure 10. Stress marks on the seat cushion aspect.

The safety seat was labeled for use under the following guidelines:
This child restraint is designed for use With the harness system by children who:

- Weigh between 9 and 18 kgs (20 and 40 lbs).
- Are between 69 and 109 cm (27 and 43”) in height and
- Are at least one year old and can sit upright unassisted, and
- Who shoulders are below the harness slots.

This child restraint is designed for use WITHOUT the harness system by children who:

- Weigh between 14 and 36 kgs (30 and 80 lbs), and
- Are between 89 and 138 cm (35 and 54”), and
- Whose ears are below top of booster seat

It is **VERY IMPORTANT** to read the Owner’s Manual and the vehicle owner’s manual.

Occupant Demographics/Data – 1998 Dodge Caravan

Driver

Age/Sex: 20 year old/Male
 Height: 188 cm (74”)
 Weight: 109 kg (240 lb)
 Seat Track Position: Unknown position (moved post-crash)
 Eyewear: None
 Restraint Use: Manual lap and shoulder belt
 Usage Source: Vehicle inspection
 Egress from Vehicle: Unassisted through left door
 Mode of Transport from
 Scene: Transported by ambulance to a hospital
 Type of Medical Treatment: Not treated

Driver Injuries

Injury	Injury Severity AIS90/Update 98	Injury Source
Not injured	N/A	N/A

Source – Passenger interview

Driver Kinematics

The 20-year old male driver of the 1998 Dodge Caravan was seated in an upright driving posture and was restrained by the manual safety belt system. At impact, the driver initiated a rearward trajectory and loaded the seatback which deflected rearward. He was not injured as a result of the crash; however, he was transported to a local hospital for evaluation.

Front Right Passenger Demographics

Age/Sex: 21-year-old/Male
Height: 183 cm (72")
Weight: 102 kg (225 lb)
Seat Track Position: Unknown position (moved post-crash)
Restraint Use: Manual lap and shoulder belt
Usage Source: Vehicle inspection
Egress from Vehicle: Exited without assistance
Mode of Transport from Scene: Not transported
Type of Medical Treatment: Not injured

Front Right Passenger Injuries

Injury	Injury Severity (AIS 90, Update 98)	Injury Source
Not injured	N/A	N/A

Source – Passenger interview

Front Right Passenger Kinematics

The 21-year-old male right front passenger was seated in an upright posture and was restrained by the manual safety belt system. At impact, he initiated a rearward trajectory and loaded the seatback. The front right passenger was not injured as result of the crash.

Second Row Left Passenger

Age/Sex: 43-year-old/Female
Height: 168 cm (66")
Weight: 61 kg (135 lb)
Seat Track Position: N/A, fixed
Eyewear: None
Restraint Use: Lap and shoulder belt
Usage Source: Vehicle inspection
Egress from Vehicle: Exited through right rear door
Mode of Transport from Scene: Ambulance to hospital
Type of Medical Treatment: Hospitalized for five days

Second Row Left Passenger Injuries

Injury	Injury Severity AIS90/Update 98	Injury Source
Damaged right facial nerves, NFS	Moderate (131699.2,9)	Child safety seat shell
Mandible fracture with right facial fractures, NFS	Minor (250600.1,1)	Child safety seat shell
Damaged right optic nerve, NFS	Minor (230299.1,1)	Child safety seat shell

Source – Passenger interview

Second Row Left Passenger Kinematics

The 43-year-old female second row left passenger was seated in an upright posture and was restrained by the lap and shoulder belt. Prior to the impact, the second row right passenger turned and faced outboard to her right and observed the oncoming ambulance. He alerted the 43-year-old female who turned inboard prior to the impact. At impact, her head was turned clockwise as she initiated a rearward trajectory and loaded the seatback. The intrusion displaced the child safety forward against the rear of the second row seatback. The 43-year-old female passenger contacted the child safety seat with her face/head which resulted in the mandible fracture with right facial fractures, damaged right optic nerve, and the damaged right facial nerves.

She was assisted out of the vehicle and was transported to a local hospital where she was hospitalized for five days.

Second Row Right Passenger

Age/Sex: 44-year-old/Male
 Height: 183 cm (72")
 Weight: 95 kg (210 lb)
 Seat Track Position: N/A, fixed
 Eyewear: None
 Restraint Use: Lap and shoulder belt
 Usage Source: Vehicle inspection
 Egress from Vehicle: Unknown
 Mode of Transport from Scene: Ambulance to hospital
 Type of Medical Treatment: Hospitalized for 11 days

Second Row Right Passenger Injuries

Injury	Injury Severity AIS90/Update 98	Injury Source
Fracture of the transverse processes L1-L4, NFS	Moderate (650620.2,8)	Second row seatback
Right forehead laceration, NFS	Minor (290600.1,7)	Flying glass
Left lower leg contusion	Minor (890402.1,2)	Right lower leg

Source – Passenger interview

Second Row Right Passenger Kinematics

The 44-year-old male second row right passenger was restrained by the lap and shoulder belt system. Prior to the impact, he turned and was facing outboard and observed the oncoming ambulance. At impact with the ambulance, he initiated a rearward trajectory and loaded the seatback which resulted in fractures of the transverse processes L1-L4. His lower right leg contacted his left shin resulting the in the left lower leg abrasion. He was contacted by the disintegrated glazing that was dispersed within the vehicle which resulted in the right forehead laceration. The 44-year-old male exited the vehicle through

the right rear door where the 4-year-old female passenger was transferred to him. He was transported to a local hospital where he received initial treatment and discharged himself. The 44-year-old male returned to the hospital the following day and was hospitalized for 11 days.

Third Row Left Passenger

Age/Sex: 4-year-old/Female
 Height: Unknown
 Weight: Unknown
 Seat Track Position: N/A, fixed
 Eyewear: None
 Child Restraint Use: Forward facing child seat restrained by integrated five-point harness
 Usage Source: Vehicle inspection
 Egress from Vehicle: Removed by the driver
 Mode of Transport from Scene: Ambulance to hospital
 Type of Medical Treatment: Expired two days post crash

Third Row Left Passenger Injuries

Injury	Injury Severity AIS90/Update 98	Injury Source
Severe brain swelling/edema with basilar cisterns foramen magnum obliterated with global loss of gray-white matter differentiation	Critical (140666.5,1) (140666.5,2)	Seatback and head restraint
Intraventricular hemorrhage of the posterior horns of the bilateral lateral ventricles (left greater than right)	Severe (140678.4,1) (140678.4,2)	Seatback and head restraint
Intraparenchymal hemorrhage in the left thalamus	Severe (140638.4,2)	Seatback and head restraint
Diffuse subarachnoid hemorrhage of the left frontal region	Serious (140684.3,2)	Seatback and head restraint
Multiple depressed comminuted fractures of the lateral frontal bone	Serious (150404.3,5)	Seatback and head restraint
Multiple comminuted fractures of the bilateral parietal bones and left coronal suture line	Serious (150404.3,1) (150404.3,2)	Seatback and head restraint

Injury	Injury Severity AIS90/Update 98	Injury Source
Severely comminuted left distal femur fracture with extension into the growth plate (Salter Harris II)	Serious (851801.3,2)	Seatback
Pancreatic transection	Moderate (542820.2,7)	Acceleration
Linear fracture of the occipital bone	Moderate (150402.2,6)	Seatback and head restraint
Supraorbital region fracture	Moderate (251202.2,9)	Seatback and head restraint
Minimally displaced left talus fracture	Moderate (853200.2,2)	Seatback
Non-displaced left first, fourth, and fifth metatarsal fractures and a left second metatarsal buckle fracture	Moderate (852200.2,2)	Seatback
Ecchymosis of the left dorsal foot	Minor (890402.1,2)	Seatback
Ecchymosis of the left eye	Minor (297402.1,2)	Seatback and head restraint
Abrasion to the back	Minor (690202.1,9)	Child safety seat

Source – Medical Records

Third Row Left Passenger Kinematics

The 4-year-old female child passenger was seated in a Graco Child Safety Seat (CSS) and was restrained by the integrated five-point harness system. The CSS was secured to the vehicle by the manual 3-point lap and shoulder belt system. At impact, the 4-year-old female responded to the 6-o’clock direction of force and loaded the shell of the child safety seat with her back which resulted in the back abrasion. As she initiated the rearward trajectory, the CSS and the third row seat were displaced forward by the intrusion. This amplified her loading of the CSS shell and resulted in a second collision of her internal organs against her body cavity. Her pancreas was transected from the acceleration of the crash forces and from possible contact with the forward aspect of her vertebral column.

The forward displacement of the third row seat against the second row seat back displaced the child in a forward direction as she rebounded from her initial rearward trajectory. She contacted the rear aspect of the second row seatback and head restraint with her face and head. This contact resulted in the severe brain swelling/edema with obliteration of the basilar cisterns and foramen magnum with global loss of gray-white matter. Additionally, she sustained intraventricular hemorrhage of the posterior horns of the bilateral lateral ventricles (left greater than right), intraparenchymal hemorrhage in the left thalamus, diffuse subarachnoid hemorrhage of the left frontal region, multiple

depressed comminuted fractures of the lateral frontal bone, multiple comminuted fractures of the bilateral parietal bones and left coronal suture line, a linear fracture of the occipital bone, supraorbital region fracture, and the left eye ecchymosis.

Her lower extremities were captured between the child safety seat and second row seatback. This resulted in the severely comminuted left distal femur fracture, fractures of the left talus, left first, fourth, and fifth metatarsals, and of the left second metatarsal (buckle fracture), and the ecchymosis of the left dorsal foot.

The 4-year-old female was removed from the vehicle by the front right passenger. She was transported to a local hospital where expired two days post-crash.

Third Row Right Passenger

Age/Sex: 16-year-old/Female
 Height: Unknown
 Weight: Unknown
 Seat Track Position: N/A, fixed
 Eyewear: None
 Restraint Use: None used
 Usage Source: Vehicle inspection
 Egress from Vehicle: Unknown
 Mode of Transport from Scene: Ambulance to hospital
 Type of Medical Treatment: Hospitalized unknown number of days

Third Row Right Passenger Injuries

Injury	Injury Severity AIS90/Update 98	Injury Source
Right femur fracture, NFS	Serious (851800.3,1)	Right side panel
Spleen laceration, NFS	Moderate (544220.2,2)	Second row seatback

Source – Passenger interview

Third Row Right Passenger Kinematics

The 16-year-old female passenger was seated in the third row right position and was not restrained. At impact, she loaded the intruding seatback and contacted and loaded the right side panel which resulted in the right femur fracture. The forward displacing third row seat allowed her to contact the rear of the second row seatback resulting in the spleen laceration. She was transported to a local hospital and was hospitalized for an unknown length of time.

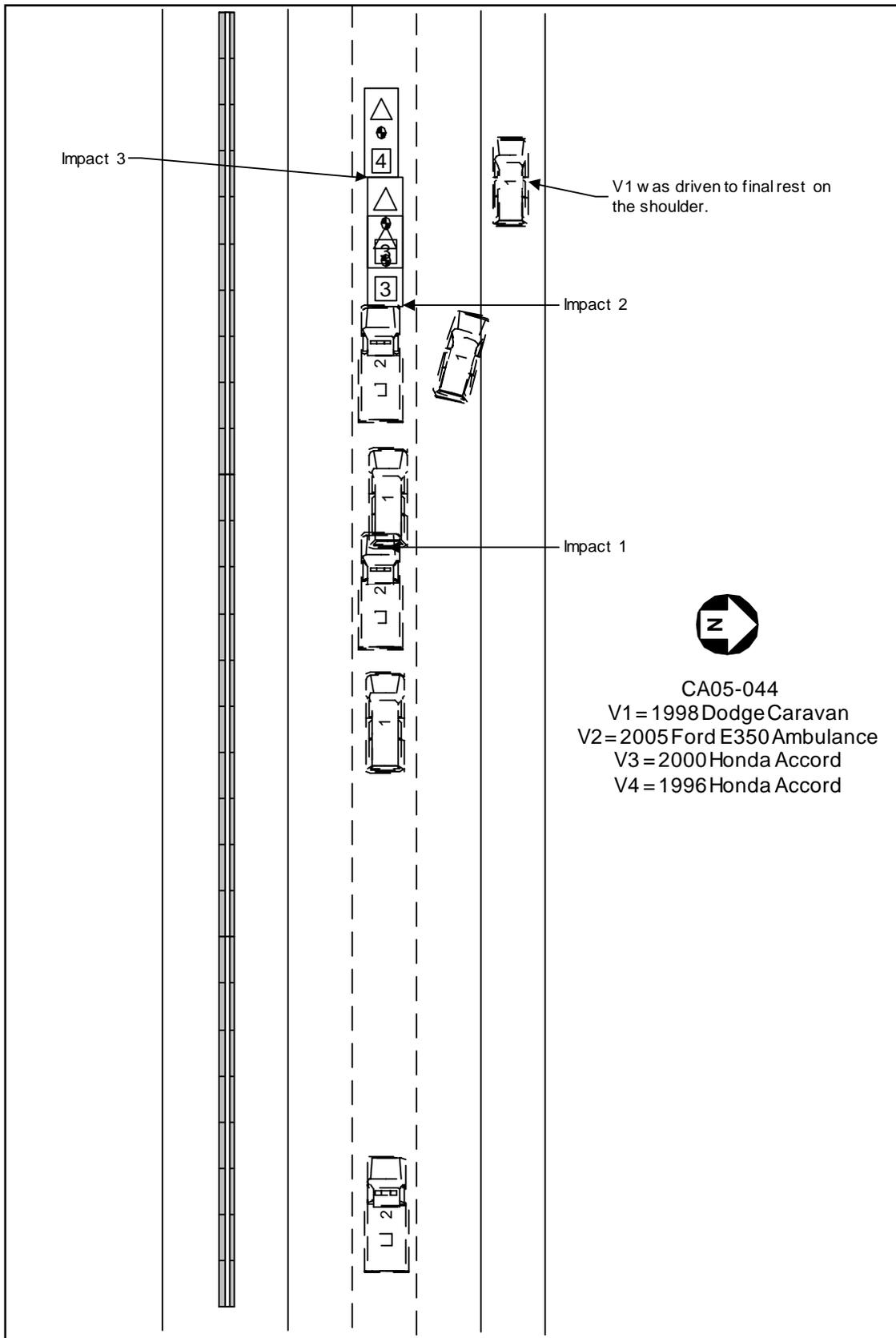


Figure 11: Scene Schematic