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Special Crash Investigations: Remote Vehicle Fire/Child Restraint System Investigation; Vehicle: 1999 Dodge Durango; Location: California; Crash Date: June 2016

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15. Supplementary Notes

Each crash represents a unique sequence of events, and generalized conclusions cannot be made concerning the crashworthiness performance of the involved vehicles or their safety systems. This report and associated case data are based on information available to the Special Crash Investigation team on the date this report was published.

16. Abstract

This report documents the remote vehicle fire/child restraint system (CRS) investigation of a post-crash fire in a 1999 Dodge Durango in a single-vehicle rollover crash and CRS usage by four child occupants. The Dodge was driven southbound at a police-estimated speed of 113 km/h (70 mph) by a belted 28-year-old male. The other occupants included a belted 24-year-old female in the front passenger seat, a 2-year-old female, a 1-year-old female, and a 3-year-old male seated in the second row, and a 7-year-old female seated in the third-row right seat. The occupants in the second row were all seated in CRSs, and the occupant in the third row was seated in a booster safety seat. The Dodge's left rear tire flattened, and the vehicle departed the roadway and overturned. During the rollover, the 7-year-old female occupant in the third-row right seat position was fully ejected and struck by the overturning vehicle. She sustained serious head injuries and was declared deceased on-scene. Following the crash, the front-row occupants assisted the second-row occupants from the vehicle before it caught fire from an undetermined source. The fire spread until fully engulfing the occupant compartment. The surviving occupants sustained police-reported "B" severity (visible) injuries and were transported by ambulances to a local hospital. The vehicle was destroyed by fire.

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Special Crash Investigations
Remote Vehicle Fire/Child Restraint System Crash Investigation
Case Number: DS19019
Vehicle: 1999 Dodge Durango
Location: California
Crash Date: June 2016

Background

This report documents the remote vehicle fire/child restraint system (CRS) investigation of a post-crash fire in a 1999 Dodge Durango (Figure 1) in a single-vehicle rollover crash and the CRS usage by four children riding in it. The investigation is intended to examine the events leading to the fire, how quickly the fire spread to the occupant compartment, the magnitude of the fire, the time sequence in which emergency medical services (EMS) and other responders arrived on-scene, occupant restraint usage, demographics, injury data, and CRS usage. The crash was identified during a review of Fatality Analysis Reporting System (FARS) crash reports. The criteria for the crash type include an impact that does not involve the back plane, a fire that spreads to the occupant compartment, and at least one occupant seated in a CRS. The Special Crash Investigations (SCI) team obtained the on-scene images, and the SCI group of the National Highway Traffic Safety Administration initiated the case in August 2019.

Figure 1. The 1999 Dodge Durango (police photo)

The crash occurred during the day in June 2016 on a divided north/south State highway in a rural area of California. The Dodge was being driven southbound at a police-estimated speed of 113 km/h (70 mph) by a belted 28-year-old male. The other occupants included a belted 24-year-old female seated in the front passenger seat, a 2-year-old female, a 1-year-old female, and a 3-year-old male seated in the second row and using CRSs, and a 7-year-old female seated in the third-row right seat using a booster safety seat (BSS). Conditions were daylight, clear visibility, and dry. While the Dodge traveled at a highway speed, its left-rear tire flattened and it departed the roadway on the right edge, where it overturned along its horizontal axis before coming to rest upright on the roadside. During the rollover, the 7-year-old female in the third-row right seat position was fully ejected and struck by the overturning vehicle. She sustained serious head injuries and was declared deceased on-scene.

Following the crash, the front-row occupants assisted the second-row occupants from the vehicle before it caught fire from an undetermined source. The fire fully engulfed the occupant compartment. The surviving occupants sustained police-reported “B” severity (visible) injuries and were transported by ambulances to a local hospital.

Summary

Crash Site

The crash site was a southbound, two-lane, divided State highway in rural California (Figure 2). The roadway was straight and level with a paved asphalt surface in traveled condition. The lanes measured 3.6 m (12.0 ft) and were separated by a dashed white painted stripe. The roadway was bordered on the left by a solid yellow painted stripe and on the right by a solid white fog line. A paved shoulder measuring 3.2 m (10.5 ft) in width included a rumble strip at the fog line. The speed limit was 113 km/h (70 mph). The roadside on the right consisted of level, unpaved ground and scattered sagebrush. Conditions at the time of the crash were daylight, clear, and dry. Weather conditions at the time of the crash were 32.8 °C (91.0 °F), 24 percent humidity, clear visibility, and winds west at 11.3 km/h (7.0 mph). A crash diagram is included at the end of this report.

Figure 2. Crash site, looking south (police photo)

Pre-Crash

The Dodge was traveling south in the second lane from the right at a police-estimated speed of 113 km/h (70 mph) when the left-rear tire delaminated and flattened, causing the driver to lose control of the vehicle. The left-rear tire and wheel deposited marks on the roadway measuring approximately 113 m (370 ft) long during which time the tire de-beaded and separated from the rim. The Dodge initiated a clockwise rotation and departed the roadway on the right edge while in a left-side-leading yaw.

Crash

The Dodge's left-side tires engaged the unpaved ground on the roadside, causing the vehicle to initiate a left-side-leading trip rollover. During the rollover, the 7-year-old female seated in the third-row right position was fully ejected through an unknown opening and was struck by the overturning vehicle. The Dodge overturned (Event 1) four quarter-turns in an estimated rollover distance of 40 m (130 ft) before coming to rest upright on the roadside.

Post-Crash

The fully ejected occupant sustained fatal injuries and was declared deceased on-scene. The other occupants, who sustained police-reported “B” (non-incapacitating) injuries, were transported to a local hospital and released. The Dodge then caught fire that spread to the occupant compartment, fully involving the vehicle and destroying the interior. No occupants were reported to have sustained burn injuries.

1999 Dodge Durango

Description

The 1999 Dodge Durango was a 4-door SUV identified by the VIN 1B4HR28Z8XFxxxxxx. The odometer reading was unknown. It had three rows to seat seven occupants. It had an 8-cylinder, 5.9-liter, gasoline engine; rear-wheel drive; and rear ABS brakes. The front row had bucket seats and adjustable head restraints. The driver's seat track setting was unknown. The second row had a bench seat for three occupants with adjustable head restraints and folding backs. The third row had a bench seat for two occupants with folding backs and adjustable head restraints. The manufacturer recommended tire size was LT265/65R15 for the front and rear. According to driver statements included in the police report, the Dodge had different make/model tires at each position, which he had purchased and used at different times. He did not know the make or age of any of the tires. The left-rear tire was a Wildcat Radial A/T size 31x10.50R15LT[1] that was the correct size. The tire TIN was not legible, and the date of manufacture was unknown. This tire sustained a tread separation, sidewall separation, and sudden loss of pressure prior to the rollover. The other three tires were destroyed by fire and were not identifiable.

Exterior Damage

The Dodge sustained unknown severity crush to the left and right planes and major severity crush to the top plane during the rollover; it sustained damage to all planes caused by the fire. The estimated collision deformation classification (CDC) for the Dodge in Event 1 was 00T99O3.

Child Restraint System Discussion

The 1999 Dodge Durango was not equipped with OEM Lower Anchors and Tethers for Children (LATCH), and it was unknown whether it had been configured with aftermarket LATCH hardware. In the original factory configuration, CRS installation would be achieved using the vehicle's lap and shoulder seat belts. Three children were seated in the second row and using CRSs of unknown types. The left- and right-position seat belt latches were found inserted into their buckles following the fire, suggesting these belts were in use at the time of the crash. The second-row center position buckle had a web-type stalk that appeared to have been destroyed by fire; the buckle and latch plate were not visible in police photos or mentioned in the police report other than a coded entry indicating the center occupant was using a CRS. The third-row right occupant was reportedly using a BSS. The seat belt at that position was buckled following the fire, but its usage is unknown. The third-row occupant was fully ejected during the rollover and sustained fatal injuries. The police report indicated the third-row occupant was restrained, and medical records indicated she was unrestrained. Efforts to confirm the occupant's restraint status were unsuccessful and was therefore determined to be unknown. Children using CRSs are listed on the next page.

[1] "Light Truck High Floatation."

Second-Row Left Occupant — *Unknown CRS*
This was a 2-year-old female in a forward-facing CRS, make and model unknown. After the crash, the lap and shoulder belt was buckled, suggesting it was used to anchor the CRS to the seat.

Second-Row Center Occupant — *Unknown CRS*
This was a 1-year-old female in a rear-facing CRS, make and model unknown. After the crash, the seat belt buckle was not present, and belt usage was determined to be unknown.

Second-Row Right Occupant — *Unknown CRS*
This was a 3-year-old male in a forward-facing CRS, make and model unknown. After the crash, the lap and shoulder belt was buckled, suggesting it was used to anchor the CRS to the vehicle seat.

Third-Row Right Occupant — *Unknown CRS*
The 7-year-old female sat in a forward-facing BSS, make and model unknown. After the crash, the lap and shoulder belt was buckled, suggesting it may have been used in combination with the BSS. Her complete ejection during the crash suggests the belt was either not used or was used incorrectly. Seat belt usage was determined to be unknown.

Vehicle Fire Discussion

The county fire department was alerted two minutes after the crash and arrived in a response time of 10 minutes, 15 seconds. The incident description was a vehicle accident with injuries with primary actions being responding to fire, rescue, and hazardous conditions and providing aid to ambulance EMS crews. Ten fire suppression personnel responded in three engines and three cars. They arrived to find the Dodge fully involved in flames and all occupants out of the vehicle. One engine was assigned to assist EMS crews with patient care and triage. The other two were assigned to contain the vehicle fire and grass fire spreading outward from the vehicle, covering an area estimated at 0.04 hectares (0.1 acres). The fire was extinguished, and the last unit cleared the crash site 60 minutes after arrival. A secondary fire department responded in support of the county department. Based on the fire incident report, no investigation into the fire's origin or cause was undertaken, and those items remained undetermined. No additional data regarding the fire's origin and cause were available.

Rollover Discussion

The Dodge was not given a rollover rating by NHTSA. It was equipped with ABS brakes on the rear. The rollover event in this crash was caused by a combination of factors: vehicle speed, tire damage leading to loss of steering control, and a roadway departure from paved to unpaved surface. At a vehicle speed of approximately 113 km/h (70 mph), the left-rear tire tread delaminated from the casing, causing the tire to flatten and de-bead, creating destabilization. Eventually a section of tread separated completely from the tire (Figure 3) and the driver lost control of steering input, allowing the Dodge to yaw clockwise. It departed the paved road onto unpaved ground while rotating clockwise.

Figure 3. Left-rear tire, the 1999 Dodge Durango (police photo)

The left-side tires furrowed into the ground, causing the vehicle to trip left-side-leading and overturn along its longitudinal axis four quarter-turns over a roll distance of 40 m (130 ft). The Tire Identification Number of the left rear tire was not legible. It was purchased used by the vehicle owner, so the tire's age and history were unknown. The other tires were destroyed during the fire.

NHTSA Recalls and Investigations

A recall search in March 2020 revealed one recall for the Dodge relating to fuel tank straps. The recall date for FCA Recall #842 (NHTSA Recall #99V-342) was December 1, 1999. According to the recall notice, the fuel tank straps may fatigue and separate. If this occurs, the fuel tank will loosen and could leak fuel. Fuel leakage in the presence of an ignition source can result in an underbody fire. Efforts to determine whether this vehicle was serviced in response to the recall and whether fuel leakage was a possible cause of the fire were unsuccessful.

Interior Damage

The Dodge's interior sustained damage caused by impact forces and fire (Figure 4). All windows were disintegrated or removed. The seats and other interior components were destroyed by the fire.

Figure 4. Front and second rows, the 1999 Dodge Durango (police photo)

Manual Restraint Systems

The Dodge had lap and shoulder seat belts for all seven seat positions. According to the police report and medical records, the front-row occupants were belted at the time of the crash. Following the fire, the second-row left and right position seat belt latch plates were found to be buckled, suggesting those belts were used in combination with the CRSs to restrain the children. No data was available for the center position seat belt. The third-row right position latch plate was buckled, suggesting the belt was used by the child in combination with a BSS. However, that child was fully ejected during the rollover, raising doubt over correct seat belt usage. Efforts to obtain additional restraint data were unsuccessful.

Supplemental Restraint Systems

The Dodge had frontal air bags for the front-row occupants. The police reported it was unknown whether the air bags deployed during the crash and they were destroyed in the post-impact fire. Efforts to obtain additional air bag data were unsuccessful.

1999 Dodge Durango Occupants

Driver Demographics

Age/sex:	28 years/male
Height:	175 cm (69 in)
Weight:	104 kg (230 lb)
Eyewear:	Unknown
Seat type:	Bucket with adjustable head restraint
Seat track position:	Unknown
Manual restraint usage:	Lap and shoulder belt used
Usage source:	Police report, medical records
Air bags:	Status unknown
Alcohol/drug data:	None
Egress from vehicle:	Exited under own power
Transport from scene:	Ambulance to hospital
Type of medical treatment:	Treated and released

Driver Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
1 2 3	Abrasion, left neck Abrasion, left shoulder Abrasion, left chest	310202.1 710202.1 410202.1	Shoulder seat belt	Certain
4	Abrasion, left forearm (dorsal)	710202.1	Left door panel	Possible
5 6	Abrasions, bilateral hands	710202.1 710202.1	Unknown	Unknown

Source: medical records.

Driver Kinematics

The belted 28-year-old male driver was seated in an unknown posture. His hands were presumably on the steering wheel while he attempted to regain control of the vehicle. When the vehicle tripped, he was displaced to the left in response to the direction of the rollover. During the rollover, he was displaced in multiple directions but remained held in his seat by the seat belt. He sustained seat-belt-related abrasions to the left neck, shoulder, and chest. Following the crash, he exited the vehicle under his own power and was transported by ambulance to a local hospital, where he was treated and released.

Front-Row Right Occupant Demographics

Age/sex:	24 years/female
Height:	163 cm (64 in)
Weight:	64 kg (140 lb)
Eyewear:	None
Seat type:	Bucket
Seat track position:	Unknown
Manual restraint usage:	Lap and shoulder belt used
Usage source:	Police report, medical records
Air bags:	Status unknown
Alcohol/drug data:	Not available
Egress from vehicle:	Exited under own power
Transport from scene:	Ambulance to hospital
Type of medical treatment:	Treated and released

Front-Row Right Occupant Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
1	Abrasion, right chest	410202.1	Shoulder seat belt	Certain
2	Abrasion, right upper arm	710202.1	Right door panel	Possible

Source: medical records.

Front-Row Right Occupant Kinematics

The belted 24-year-old female was in an unknown posture. When the vehicle tripped, she was displaced to the left in response to the direction of the rollover but remained held in her seat by the seat belt. She sustained a seat-belt-related abrasion to the right chest and an abrasion to the right upper arm, possibly caused by contact with the right door panel. Following the crash, she exited the vehicle under her own power and was transported by ambulance to a local hospital where she was treated and released.

Second-Row Left Occupant Demographics

Age/sex:	2 years/female
Height:	Unknown
Weight:	11 kg (24 lb)
Eyewear:	None
Seat type:	Bench with folding back
Seat track position:	NA
Manual restraint usage:	Forward-facing CRS used with lap and shoulder belt
Usage source:	Police report
Air bags:	NA
Egress from vehicle:	Removed due to age

Transport from scene: Ambulance to hospital
Type of medical treatment: Examined and released

Second-Row Left Occupant Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
1	Contusion, chest	410402.1	CRS harness	Certain
2 3	Abrasions, left upper shoulder, right upper shoulder	710202.1 710202.1	CRS harness	Certain

Source: medical records.

Second-Row Left Occupant Kinematics

The 2-year-old female occupant was seated in a CRS of an unknown type and orientation in the second-row left position. During the rollover, she was displaced in several directions but remained held in her seat by the manual restraints. She sustained minor injuries caused by her loading of the CRS harness, including a contusion to the chest and abrasions to the left and right shoulders. She was removed from the Dodge by the front-row occupants and transported by ambulance to a local hospital, where she was treated and observed for approximately 3 hours before being discharged. Her Glasgow coma score (GCS) was 15 when measured in the hospital ER (highest possible score).

Second-Row Center Occupant Demographics

Age/sex: 1 year/female
Height: Unknown
Weight: 11 kg (24 lb)
Eyewear: None
Seat type: Bench with folding backs
Seat track position: NA
Manual restraint usage: Rearward-facing CRS used, unknown type belt, unknown if used
Usage source: Police report
Air bags: NA
Egress from vehicle: Removed due to age
Transport from scene: Ambulance to hospital
Type of medical treatment: Treated and released

Second-Row Center Occupant Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
1	Fracture, right distal humerus	751331.2	CRS shell	Possible
2 3	Abrasions, left and right upper arms	710202.1 710202.1	CRS harness	Certain
4 5	Abrasions, left and right thighs	810202.1 810202.1	CRS harness	Certain

Source: medical records.

Second-Row Center Occupant Kinematics

The 1-year-old female was seated in a CRS of an unknown type and orientation in the second-row center position. During the rollover, she was displaced in several directions but remained held in her seat by the manual restraints. She sustained a fracture to the right distal humerus, possibly caused by contact with the CRS shell. She sustained abrasions to the arms and thighs, caused by loading of the CRS harness system. She was removed from the Dodge by the front-row occupants and transported by ambulance to a local hospital where she was treated and released.

Second-Row Right Occupant Demographics

Age/sex:	3 years/male
Height:	Unknown
Weight:	20 kg (45 lb)
Eyewear:	Unknown
Seat type:	Bench with folding backs
Seat track position:	NA
Manual restraint usage:	Forward-facing CRS used with lap and shoulder belt
Usage source:	Police report
Air bags:	NA
Egress from vehicle:	Removed due to age
Transport from scene:	Ambulance to hospital
Type of medical treatment:	Treated and released

Second-Row Right Occupant Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
1	Abrasion, right shoulder	710202.1	Shoulder seat belt	Probable

Source: medical records.

Second-Row Right Occupant Kinematics

The 3-year-old male was seated in a CRS of an unknown type and orientation in the second-row right position. During the rollover, he was displaced in several directions but remained held in his seat by the manual restraints. He sustained an abrasion to the right shoulder, probably caused by loading of the shoulder seat belt or CRS harness. He was removed from the Dodge by the front-row occupants and transported by ambulance to a local hospital, where he was treated and released.

Third-Row Right Occupant Demographics

Age/sex:	7 years/female
Height:	130 cm (51 in)
Weight:	28 kg (61 lb)
Eyewear:	Unknown
Seat type:	Bench with folding backs
Seat track position:	NA
Manual restraint usage:	BSS used, lap and shoulder belt, unknown if used
Usage source:	Police report
Air bags:	NA
Egress from vehicle:	Fully ejected
Transport from scene:	Not transported
Type of medical treatment:	None; declared deceased on-scene

Third-Row Right Occupant Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
1	Fractures, open, skull with brain exposed	150206.4	Critical 2-point – exterior of vehicle, ground	Probable
2	Lacerations, cerebrum	140688.3	Critical 2-point – exterior of vehicle, ground	Probable
3	Fractures, ribs NFS	450210.2	Critical 2-point – exterior of vehicle, ground	Probable
4	Fracture, right wrist	751900.2	Critical 2-point – exterior of vehicle, ground	Probable
5	Contusions, face	210402.1	Ground	Probable
6	Laceration, right ear	210602.1	Ground	Probable
7	Contusions, chest	410402.1	Ground	Probable

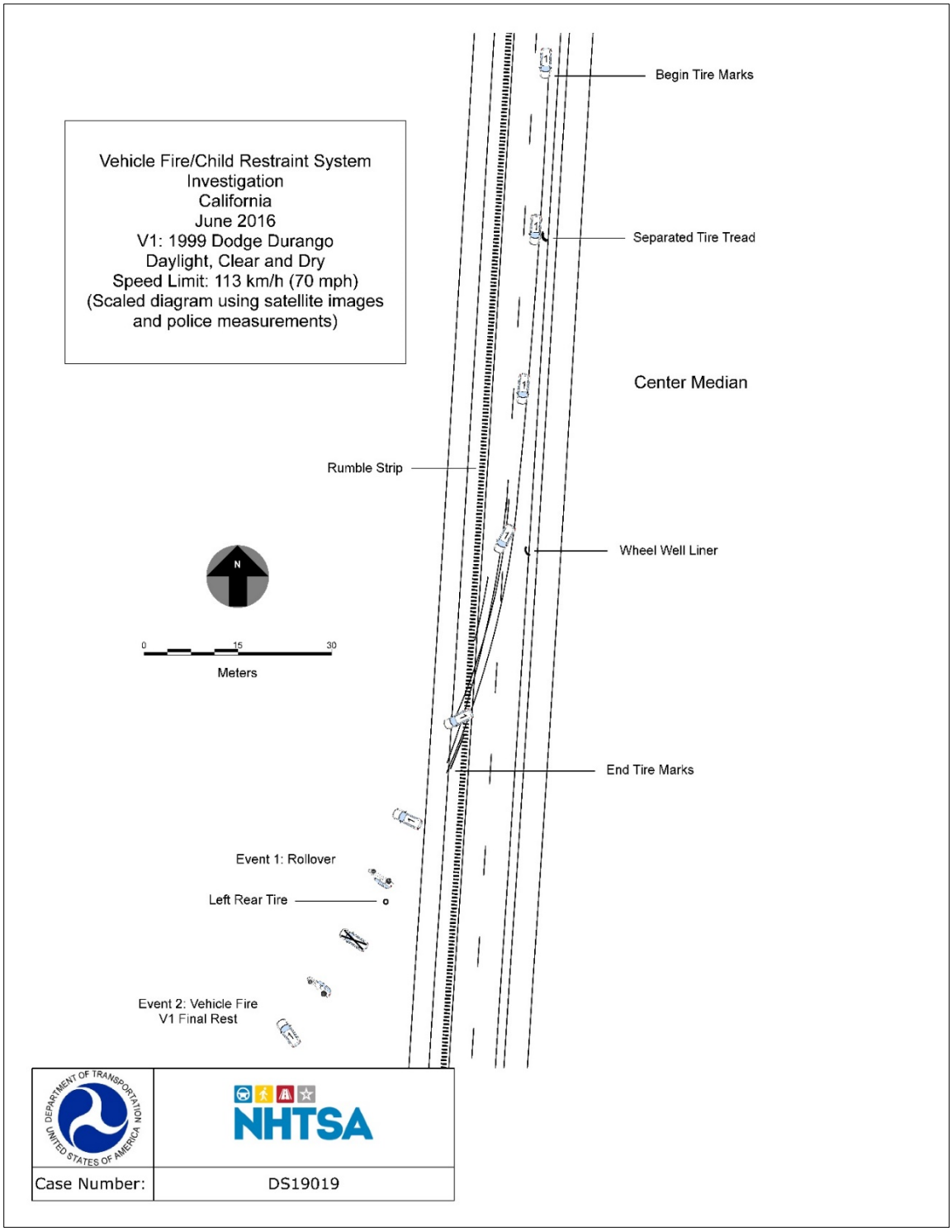
Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
8	Laceration, right upper back	410602.1	Ground	Probable
9	Contusions, back	410402.1	Ground	Probable

Source: autopsy.

Third-Row Right Occupant Kinematics

The 7-year-old female occupant was seated on a booster seat in the third-row right seat and was reported by the police and coroner to be restrained by the available lap and shoulder seat belt. During the rollover, she was fully ejected through an unknown opening, suggesting the seat belt was either used improperly or was not used at all. The vehicle subsequently overturned onto the child, possibly crushing her between the vehicle and ground and causing injuries including an open fracture to the skull, lacerations to the cerebrum, fractures to multiple ribs, fracture to the right wrist, contusions and lacerations to the face, and contusions and lacerations to the chest and back. When the vehicle came to rest, she was not directly contacting the vehicle, but her head and upper body were underneath it and her legs were exposed. Passersby removed her from the vicinity due to the fire. She exhibited no sign of life and was declared deceased on-scene.

Crash Diagram



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