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DISCLAIMER

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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 vehicle(s) 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 2003 Chevrolet Tahoe involved in a single-vehicle crash and the child occupants who were seated in CRSs. This single vehicle crash occurred in July 2017 in Arizona. The crash site was the eastbound lanes of a divided state highway. The posted speed limit was 105 km/h (65 mph). The Chevrolet was being driven by an unbelted 33-year-old female. There were five additional occupants in the vehicle. The front-row center seat was occupied by a belted 4-year-old female seated in a booster safety seat. The front-row right seat was occupied by a belted 80-year-old male. The second-row left seat was occupied by a belted 70-year-old female. The second-row center seat was occupied by a 12-month-old female in a CRS. The second-row right seat was occupied by a 3-year-old female seated in a forward-facing CRS. The Chevrolet was traveling northbound at an unknown speed when the driver lost control due to speed and wet roadway conditions. The vehicle departed the roadway, struck and penetrated a metal guardrail, and then rolled down an embankment into a canyon. The vehicle caught fire with flames visible near the driver's door and roof. Five occupants were able to exit the vehicle with the help of passersby and the police. The front-right occupant was trapped in the vehicle. Police officers arrived on the scene and attempted to extinguish the fire, but they were unsuccessful. The fire department was able to extinguish the fire and transported the front-right occupant tothe hospital, where he later passed away.

17. Key Words	18. Distribution Statement
child restraint system, CRS, rollover, fire, injury, fatality	Document is available to the public from the National Technical Information Service, www.ntis.gov.

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Vehicle: 2003 Chevrolet Tahoe
Location: Arizona
Crash Date: July 2017

BACKGROUND

This report documents the remote vehicle fire/child restraint system (CRS) investigation of a post-crash fire in a 2003 Chevrolet Tahoe (**Figure 1**) involved in a single-vehicle crash and the child occupants who were seated in CRSs. The investigation was intended to determine the events leading to the fire, how quickly the fire spread to the occupant compartment, the magnitude of the fire, how quickly EMS and other responders arrived on- scene, occupant restraint usage, demographics, injury data, and CRS data. The crash was identified during a review of Fatality Analysis Reporting System crash reports. The criteria for the crash type include an impact not involving the rear plane, fire which 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 case was initiated by the SCI group of the National Highway Traffic Safety Administration in July 2019.

Figure 1. The 2003 Chevrolet Tahoe (police image).

This single vehicle crash occurred in the late afternoon in July 2017 in an unincorporated area of Arizona. The crash site was the eastbound lanes of a divided state highway. The curved asphalt roadway consisted of two lanes in both directions, separated by a grass-covered median. The roadway was wet, and it was raining at the time of the crash. To the east, there was a metal guardrail followed by a steep descending embankment. The posted speed limit was 105 km/h (65 mph). The Chevrolet was being driven by an unbelted 33-year-old female. There were five additional occupants in the vehicle. The front-row center seat was occupied by a belted 4-year-old female seated in a booster safety seat. The front-row right seat was occupied by a belted 80-year-old male. The second-row left seat was occupied by a belted 70-year-old female. The second-row center seat was occupied by a 12-month-old female in a CRS. The second-row right seat was occupied by a 3-year-old female in a forward-facing CRS. The Chevrolet was traveling northbound at an unknown speed when the driver lost control due to her speed and wet roadway conditions. The vehicle departed the roadway to the right, struck and penetrated the metal guardrail, and then rolled down an embankment into a canyon. The vehicle caught fire shortly after the crash with flames visible near the driver's door and roof. Five occupants were able to exit the vehicle with the help of passersby and the police. The front-right occupant was trapped in the vehicle. The first responding police officer used water from a nearby stream in an attempt to extinguish the fire. A passerby notified emergency services using the police radio and

retrieved the officer's fire extinguisher, which apparently did not function. A second police officer arrived and tried to put out the fire with an extinguisher but was unsuccessful. Using nearby water sources, several people tried to put out the fire but it kept re-igniting. The fire department arrived on scene and after several attempts were able to extinguish the fire and extricate the remaining occupant.

The driver sustained non-incapacitating injuries that included left leg and arm fractures and was transported by ambulance to an area hospital. The front-row right adult passenger sustained neck and rib fractures. He was transported to a local hospital and from there to a trauma center. He was hospitalized for 20 days before passing away. The second-row left adult passenger sustained left leg and arm fractures and was transported by ambulance to an area hospital. There were no reported injuries for the three child passengers, but they were transported by ambulance to an area hospital, presumably for examination.

SUMMARY

Crash Site

The crash site was in the eastbound travel lanes of a divided State highway (**Figure 2**). The two eastbound lanes curved to the right, and there was a downhill grade. Each travel lane was approximately 3.6 m (12 ft) wide and were separated by a dotted white striped line. A depressed grass median separated the eastbound traffic lanes from the westbound traffic lanes. To the south, there was a north/south intersecting roadway controlled by a stop sign. On the east side of this roadway was a metal W-beam guardrail that curved to the right and bordered the eastbound roadway. The guardrail separated the roadways from a steep downhill embankment. The speed limit was 105 km/h (65 mph).

Figure 2. Eastbound approach (Google Maps image).

The weather at the nearest reporting station was 17 C° (64 F°), 88 percent humidity, and cloudy; the winds were out of the north at 11 km/h (7 mph). The police reported heavy rain at the time of the crash. A crash diagram is included at the end of this report.

Pre-Crash

The Chevrolet was traveling eastbound at an unknown speed. One of the passengers in the vehicle reported to the police that the driver was going fast and was trying to pass another vehicle. The driver lost control of the vehicle; it began a clockwise rotation, crossed the intersecting roadway, and departed the roadway to the east.

Crash

After departing the roadway, the left-rear plane of the Chevrolet struck and penetrated the guardrail (Event 1). A large section of the guardrail was displaced as the vehicle traveled to the east (**Figure 3**). The vehicle continued rotating as it traveled down a very steep embankment and then began a right-side-leading rollover (Event 2). The vehicle rolled four quarter turns before coming to rest in an upright orientation facing north **(Figure 4**). A fire began in the engine compartment shortly after the vehicle came to rest (Event 3).

Post-Crash

Five occupants were able to exit the vehicle with the help of passersby and the police. The front-right occupant was trapped in the vehicle. The first responding police officer used water from a nearby stream in an attempt to extinguish the fire. A passerby notified emergency services using the police radio and retrieved the officer's fire extinguisher, which apparently did not function. A second police officer arrived and tried to put out the fire with an extinguisher, but his effort was unsuccessful. Using nearby water sources, several people tried to put out the fire but it kept re-igniting. Two separate fire departments responded to the crash. The first responding agency handled fire suppression. The second responding fire department arrived shortly after the first. They handled the extrication of the trapped occupant and carried the occupant to the ambulance. SCI obtained a fire incident report that documented dispatch, arrival, and departure times for fire personnel. This agency was dispatched four minutes after the crash and arrived on the scene 13 minutes later. The last unit was cleared approximately 2-1/2 hours after the crash.

Figure 3. Guardrail impact, looking north (police image).

Figure 4. Final rest position, looking east (police image).

2003 CHEVROLET TAHOE

Description

The 2003 Chevrolet Tahoe sport utility vehicle (SUV) was identified by the Vehicle Identification Number 1GNEK13Z73Rxxxxxx. The vehicle was originally equipped a 5.3-liter, 8-cylinder, flexible-fuel engine, a 4-speed automatic transmission, and 4-wheel drive. According to a State environmental official, the vehicle had been converted to use propane. Their database didn't have any information as to when the conversion took place. The vehicle manufacturer's recommended tire size was P265/70R16 tires. The Chevrolet was configured with seating for six occupants. The front row was equipped with a split bench seat with adjustable head restraints at the outboard positions. The seat track position is not known. The second row was equipped with a 60/40 split bench with folding backs.

Figure 5. Left-plane damage, the 2003 Chevrolet Tahoe (police image).

Vehicle History
A CARFAX report indicated that the vehicle had two previous owners. It was initially purchased in 2003, sold in 2008, and then sold to the driver in 2010. There were no reports of any additional crashes.

Exterior Damage
The Chevrolet sustained moderate left-plane damage from the impact to the guardrail (**Figure 5**). The damage began at the left rear bumper corner and extended forward. The estimated Collision Deformation Classification (CDC) was 08LBEW2.

The Chevrolet sustained damage to all planes during the rollover (**Figure 6**). The estimated CDC was 00TDDO3.

There was burn damage on the hood and along the base of the windshield, extending into the passenger compartment.

Figure 6. Rollover damage, the 2003 Chevrolet Tahoe (police image).

NHTSA Recalls and Investigations
There were no related recalls or investigations for this vehicle. The most recent database query occurred in April 2020.

Interior Damage
The Chevrolet sustained moderate damage from intrusions and fire. The vehicle sustained intrusions of the roof, roof side rails, windshield header, and both A-pillars. There was burn damage along the center and right instrument panel (**Figure 7**).

Figure 7. Right-front row seating area, the 2003 Chevrolet Tahoe (police image).

Manual Restraint Systems
The front row was equipped with driver and front-right passenger lap and shoulder seat belts. The front-row center seat was equipped with a lap belt, according to the owner's manual. The second row was equipped with lap and shoulder seat belts for all three positions.

The police reported that all occupants were using their seat belts, but medical records indicated the driver was unbelted. The front-row center seat belt was used in conjunction with a booster seat. The second-row center seat belt was used to anchor the stay-in-place base of a CRS. The second-row right seat belt was used to anchor a forward-facing CRS.

Supplemental Restraint Systems

The Chevrolet was equipped with multiple-stage frontal air bags for the driver and front-right passenger positions. The driver's frontal air bag deployed during the crash. The front-right passenger's frontal air bag does not appear to have deployed.

Child Restraint System

Dorel Safety 1st Store'n Go Backless Booster CRS: The 4-year-old in the front-row center position was seated in a Dorel Safety 1st Store'n Go backless booster CRS (**Figure 8**). The CRS was a belt-positioning booster that was designed to be used with a lap and shoulder belt but was being used incorrectly with only the lap belt in this seat position. The seat was designed to be used for children weighing from 18 to 45 kg (40 to 100 lbs) and whose height was from 109 to 144 cm (43 to 57 in). It is not known if the child met the height and weight requirements.

Figure 8. Dorel Safety 1st Store'n Go backless booster CRS (police image).

Unknown make/model CRS: The 12-month-old in the second-row center position was seated in an unknown make/model CRS. The CRS was equipped with a stay-in-vehicle base that was still present in the vehicle after the crash.

Unknown make/model forward-facing CRS: The 3-year-old in the second-row right position was seated in an unknown make/model forward-facing CRS. The CRS was anchored to the vehicle using the vehicle's lap and shoulder seat belt.

2003 CHEVROLET TAHOE OCCUPANTS

Driver Demographics

Age/sex:	33 years/female
Height:	157 cm (62 in)
Weight:	97 kg (213 lbs)
Eyewear:	Unknown
Seat type:	Split bench
Seat track position:	Unknown
Manual restraint usage:	Lap and shoulder belt not used
Usage source:	Medical report
Air bags:	Frontal air bag, deployed
Alcohol/drug data:	No apparent influence, per police report
Egress from vehicle:	Exited under own power
Transport from scene:	Ambulance
Type of medical treatment:	Hospitalized for 3 days

Driver Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Displaced bimalleolar fracture, right medial malleolus	854441.2	Foot controls	Possible
2	Lung contusion, upper mid and lower zones	441406.2	Door	Probable
3	Lacerations, left index finger and thumb (degloving type)	714004.2	Ground	Probable
4	Lacerations (one 10 cm long, one 8 cm long with bridge of skin between), deep, starting proximally mid humerus and coursing anterolaterally proximal to the elbow	710602.1	Ground	Probable

Source: emergency room records, radiology, and cardiopulmonary.

Driver Kinematics

The 33-year-old female driver was seated in an unknown posture and was unbelted, according to emergency room records. The driver lost control of the vehicle, and it began a clockwise rotation. The driver was actively braking and steering. She was displaced to the left during rotation. At impact with the guardrail, she was displaced to the left. As the vehicle overturned, she was displaced in multiple directions with her left chest contacting the left door and her left arm being partially ejected outside the left-side window. She sustained a left foot fracture as her foot engaged the floor controls. She was able to exit the vehicle under her own power.

Front-Row Center Occupant Demographics

Age/sex:	4 years/female
Height:	Unknown
Weight:	Unknown
Eyewear:	Unknown
Seat type:	Split bench
Manual restraint usage:	Lap belt used with booster seat
Usage source:	Police report
Egress from vehicle:	Assisted from vehicle by passersby
Transport from scene:	Ambulance
Type of medical treatment:	Unknown

Front-Row Center Occupant Injuries
According to the police report, this passenger did not sustain any injuries.

Front-Row Center Occupant Kinematics
The 4-year-old female front-row center occupant was seated in a booster seat, and, according to the police, was using the manual lap belt. She remained in place during vehicle rotation and the impact with the guardrail. She was likely displaced in multiple directions during the rollover but remain belted. She was assisted from the vehicle by passersby.

Front-Row Right Occupant Demographics

Age/Sex:	80 years/male
Height:	Unknown
Weight:	Unknown
Eyewear:	Unknown
Seat type:	Split bench
Manual restraint usage:	Lap and shoulder belt used
Usage source:	Police report
Air bags:	Frontal air bag, not deployed
Alcohol/drug data:	None
Egress from vehicle:	Extricated by EMS
Transport from scene:	Ambulance to hospital, then transferred to trauma center
Type of medical treatment:	Hospitalized for 20 days before passing away

Front-Row Right Occupant Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Contusion, right upper lung	441402.3	Right door panel	Possible
2	Type II dens fracture C2	650216.2	Right door panel Roof	Possible Possible
3	Comminuted fractures, right lateral rib 2 and right rib 1	450202.2	Right door panel	Possible
4	Minor head trauma (EMS)	100099.9	Unknown	Unknown
	Police reported smoke inhalation but hospital indicated shortness of breath but no skin burns and no lung issues.			

Source: emergency room records and radiology report.

Front-Row Right Occupant Kinematics

The 80-year-old male front-row right passenger, seated in an unknown posture, was wearing the available lap and shoulder belt. He was displaced to the left during rotation. At impact with the guardrail, he was displaced to the left. As the vehicle overturned, he was displaced in multiple directions but reportedly remained belted in place. His right thorax contacted the right-door panel during the rollover. He was trapped in place by vehicle components as the vehicle came to rest. Attempts to extricate him by police and passersby were unsuccessful. EMS used hydraulic spreaders to open the door and carried the occupant up the embankment. The fire department noted that he was transported by ground ambulance due to the weather. He was transported to a local hospital, where he was evaluated and then transferred by an ambulance to a local trauma center. He was hospitalized for 20 days before passing away.

Second-Row Left Occupant Demographics

Age/sex:	70 years/female
Height:	160 cm (63 in)
Weight:	65 kg (145 lbs)
Eyewear:	Unknown
Seat type:	Split bench
Manual restraint usage:	Lap and shoulder belt used
Usage source:	Police report
Alcohol/drug data:	None
Egress from vehicle:	Exited with some assistance
Transport from scene:	Ambulance
Type of medical treatment:	Transported, treatment not known

Second-Row Left Occupant Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Left arm fracture	751800.2	Door side panel	Possible
2	Left leg fracture	852002.2	Door side panel	Possible

Source: police report.

Second-Row Left Occupant Kinematics

The 70-year-old female second-row left passenger was seated in an unknown posture and was wearing the available lap and shoulder seat belt. She was displaced to the left during rotation. At impact with the guardrail, she was displaced to the left. As the vehicle overturned, she was displaced in multiple directions but reportedly remained belted in place. She sustained fractures to the left arm and leg from contact to the left door panel during the rollover. She was able to exit the vehicle under her own power. By the time police had arrived, she made her way up to the roadway.

Second-Row Center Occupant Demographics

Age/sex:	12 months/female
Height:	Unknown
Weight:	Unknown
Eyewear:	Unknown
Seat type:	Split bench
Manual restraint usage:	Lap and shoulder seat belt used to anchor CRS.
Usage source:	On-scene images
Egress from vehicle:	Removed by adult passenger
Transport from scene:	Ambulance
Type of medical treatment:	Transported, unknown if treated

Second-Row Center Occupant Injuries

According to the police report, this passenger did not sustain any injuries.

Second-Row Center Occupant Kinematics

The 12-month-old female second-row center passenger was seated in an unknown orientation in an unknown type CRS. It appears that she remained restrained throughout the crash events and was not injured.

Second-Row Right Occupant Demographics

Age/sex:	3 years/female
Height:	Unknown
Weight:	Unknown
Eyewear:	Unknown
Seat type:	Split bench
Manual restraint usage:	Lap and shoulder belt used to anchor CRS
Usage source:	On-scene images
Egress from vehicle:	Removed by adult passenger
Transport from scene:	Ambulance
Type of medical treatment:	Transported, unknown if treated

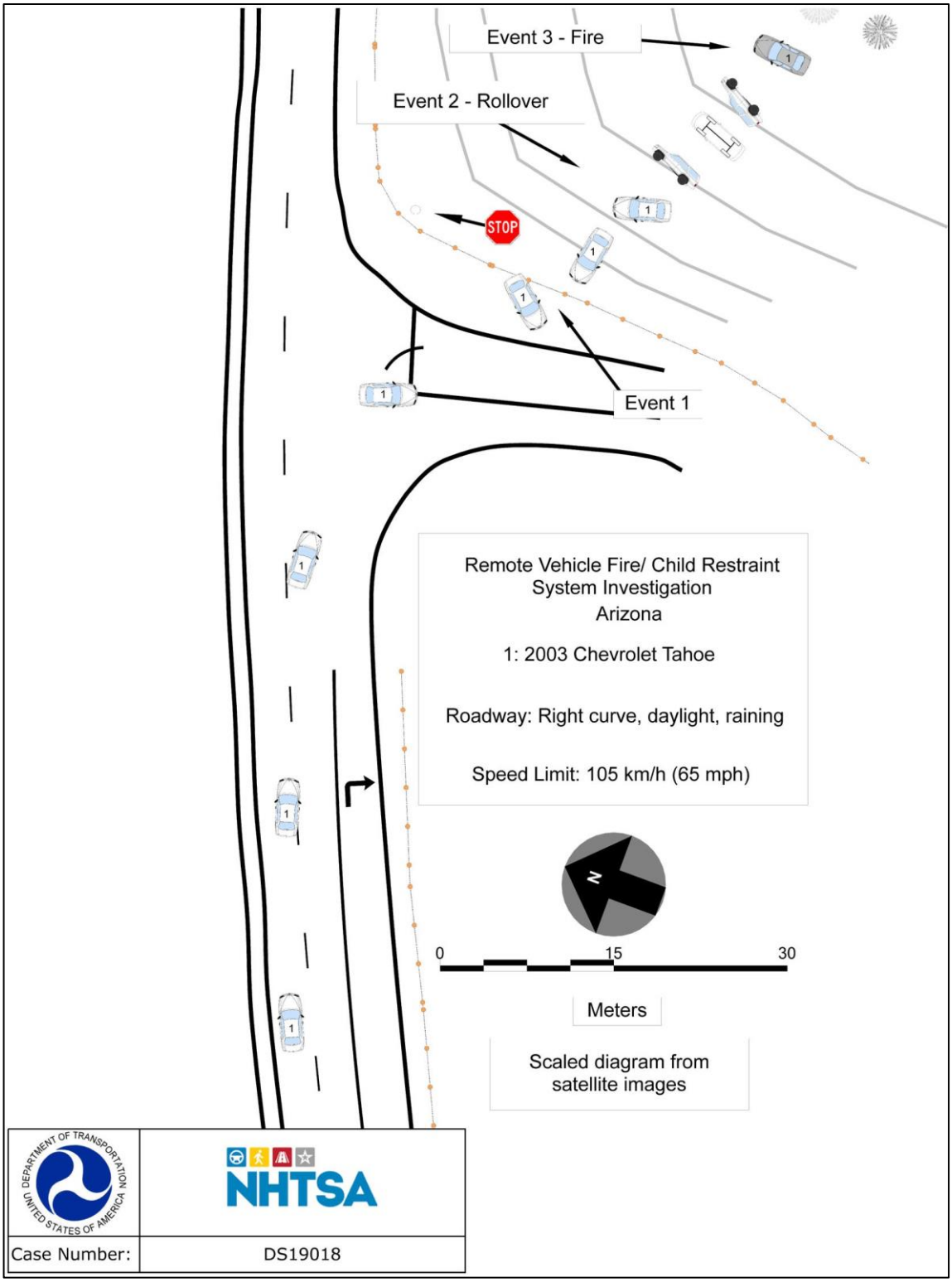
Second-Row Right Occupant Injuries

According to the police report, this passenger did not sustain any injuries.

Second-Row Right Occupant Kinematics

The 3-year-old female second-row right passenger was seated in a forward-facing CRS. She remained in place throughout the crash events and was not injured.

CRASH DIAGRAM



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