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**Special Crash Investigations:
On-Site Reported Unintended
Acceleration Crash Investigation;
Vehicle: 2009 Hyundai Santa Fe;
Location: Pennsylvania;
Crash Date: July 2017**

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Special Crash Investigations
On-Site Reported Unintended Acceleration Crash Investigation
Office of Defects Investigation
Case No: CR20038
Vehicle: 2009 Hyundai Santa Fe
Location: Pennsylvania
Crash Date: July 2017

Background

This report documents the reported unintended acceleration of a 2009 Hyundai Santa Fe (Figure 1) that resulted in an underride crash with a tractor-trailer. The unbelted 65-year-old male driver, unbelted 65-year-old male front passenger, and unbelted 72-year-old male second-row-right passenger were all fatally injured due to blunt force injuries sustained as a result of the underride. The investigating law enforcement agency provided notification of the crash to the National Highway Traffic Safety Administration's Special Crash Investigations (SCI) group in October 2020. The notification was sent to the Office of Defect Investigations (ODI) who requested an inspection of the vehicle in December 2020. In conjunction with a law firm representing the deceased and technical representatives for the vehicle manufacturer, a joint inspection of the vehicle took place in August 2021.



Figure 1. Right-front oblique view of the Hyundai

The crash occurred when the westbound Hyundai entered a four-leg intersection on the red phase of the traffic signal and struck the right plane of a tractor-trailer accelerating north through the intersection. The Hyundai underrode the trailer, shearing off its roof, and continued west. The Hyundai's front plane then struck the back plane of a 2013 Scion tC that was traveling north, parallel to the tractor-trailer, but had turned left to travel west. After separation from the second impact, the Hyundai struck a utility pole and came to an uncontrolled rest on the sidewalk of the westbound lanes between a light pole and building. The Scion rotated clockwise approximately 180° and struck a building on the north roadside, coming to rest on the sidewalk against the

building. The Hyundai's three occupants were fatally injured and pronounced deceased at the crash site. The drivers of the tractor-trailer and Scion were not injured.

The on-site SCI investigation consisted of an inspection to document the vehicle's exterior and interior damage, identify any points of occupant contact, and inspect the manual restraint and supplemental restraint systems. The vehicle's foot controls and throttle control systems were examined and documented. The 2009 Hyundai was not equipped with an event data recorder supported by a commercially available data retrieval tool. The component manufacturer participating in the vehicle inspection retrieved data from the vehicle's powertrain control module (PCM) and shared that data with NHTSA/ODI. After a review, it was determined that the data were not useful to the crash analysis. The Scion was sold for salvage and not available for inspection. Due to the time between the crash and SCI's investigation, the trailer's location and disposition were unknown. The crash site was inspected by the SCI team and the environment documented by images and a total station mapping system. The SCI investigation determined the probable cause of the crash to be the driver's misapplication of the foot controls as verified by physical and videographic evidence of the crash.

Crash Summary

Crash Site

The crash occurred on an afternoon in July 2017. The police-reported environmental conditions were clear, daylight, and dry. The National Weather Service reported a temperature of 25 °C (77° F), 64 percent relative humidity, 16 km/h (10 mph) westerly winds, and fair sky. The crash occurred at the four-leg intersection of two multi-lane roadways in an urban-industrial area. The intersection was controlled by overhead tri-color traffic signals. The intersection's east/west roadway (Figures 2 and 3) consisted of five lanes (three westbound and two eastbound) divided by a double yellow centerline. The crossing north/south roadway consisted of three lanes (two northbound and one southbound) divided by a double yellow centerline. The traffic lanes measured 3.2 m (10.4 ft) and were bordered by solid white fog lines. Commercial businesses were in each quadrant of the intersection. The posted speed limit was 64 km/h (40 mph).

Pre-Crash

The Hyundai was occupied by an unbelted 65-year-old male driver, unbelted 65-year-old male front passenger, and unbelted 72-year-old male right-rear passenger. The police investigation determined that the Hyundai turned from a side street to head west, approximately 865 m (2,838 ft) prior to the intersection where the crash occurred. During its approach the Hyundai traveled with increasing speed. Several security cameras mounted to buildings at the intersection captured the Hyundai traveling above the roadway's speed limit and making several lane changes, as the driver swerved around slower traffic approaching the intersection.



Figure 2. Viewing west of the crash scene, looking toward Event 1



Figure 3. Viewing east of the crash scene, looking back

When the traffic light turned from green to red, traffic forward and next to the Hyundai braked to a stop; the brake lights were seen in the video. Westbound traffic stopped across all three westbound lanes. The Hyundai steered left from the second lane to the third lane and then steered back to the right between the stopped non-contact vehicles in these lanes. The approximate speed of the Hyundai based on a time-distance calculation from the video was 129 to 137 km/h (80 to 85 mph). The video showed that the Hyundai's brake lights did not illuminate prior to impact. At

the intersection, the northbound traffic consisted of the Freightliner tractor with an attached 53-foot trailer in the right lane and the Scion tC in the left-turn-only lane.

Crash

As their traffic signal turned green, the northbound vehicles entered the intersection. The Scion began a left turn onto the westbound lanes. The tractor-trailer continued straight and was approximately three-quarters of the way through the intersection when the Hyundai passed between the two stopped vehicles and underrode the trailer's right side without applying the brakes (Figure 4).



Figure 4. Camera view of Hyundai rear prior to impact (yellow arrow points to the rear of the Hyundai) Security camera image

The Hyundai's greenhouse structures, above the beltline level, completely separated during the underride crash (Event 1). The Hyundai emerged from the other side of the trailer and then struck the back plane of the turning Scion (Event 2). The force of this impact displaced the Scion forward and to its right. It separated from the Hyundai with a clockwise rotation, sliding through the right westbound lane, mounting the sidewalk, and striking a building (Event 3) approximately 43 m (141 ft) from its initial point of impact (Figure 5).

The Hyundai's momentum then propelled the vehicle an additional 114 m (374 ft) west where the front-left corner of the Hyundai struck a light pole (Event 4). The force of this impact fractured the left-front wheel rim and separated the wheel from the axle and rotated the Hyundai

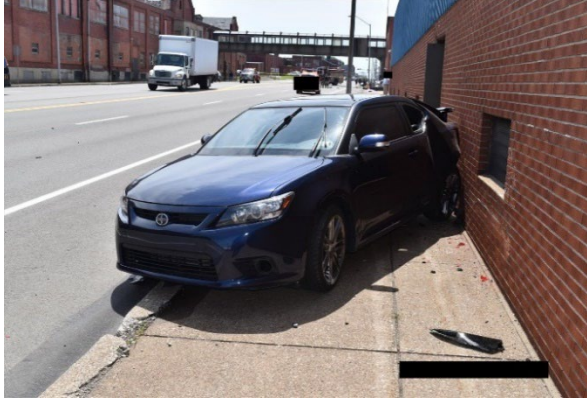


Figure 5. Final rest of the Scion looking west (On-scene police image)



Figure 6. Final rest of the Hyundai looking east (On-scene police image)

counterclockwise striking the building with its right side (Event 5). It came to rest wedged between the light pole and building 128 m (420 ft) from the intersection (Figure 6).

After the crash, the Freightliner crossed through the intersection and came to a controlled stop in the northbound lane (Figure 7).

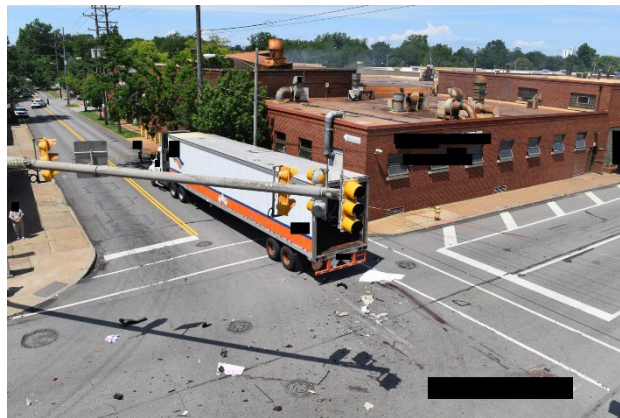


Figure 7. Overview of the Freightliner looking northeast (On-scene police image)

Post-Crash

Police and EMS responded to the crash site. The Hyundai driver and both passengers were ejected from the vehicle and fatally injured. They were pronounced deceased at the crash site. The Scion and tractor-trailer drivers were uninjured and not transported by EMS. The Hyundai was towed to a secure location by the police. The Scion was towed, but not retained. It was later deemed a total loss by its insurer and sold. The tractor-trailer was released at the conclusion of the on-scene police investigation.

2009 Hyundai Santa Fe

Description

The 2009 Hyundai Santa Fe (Figure 8) was an SUV manufactured in November 2009 and identified by the Vehicle Identification Number (VIN) 5NMSH73E79Hxxxxxx. The Hyundai was an all-wheel-drive platform powered by a 3.3-liter, gasoline engine linked to an automatic transmission on a 270 cm (106.3 in) wheelbase. The gross vehicle weight rating was 2,400 kg (5,291 lb), with gross axle weight ratings of 1,368 kg (3,015 lb) front and 1,032 kg (2,275 lb) rear. The vehicle manufacturer's recommended tire size was P235/60R18 with recommended cold tire pressures of 207 kPa (30 psi) front and rear. At the time of the SCI inspection, the Hyundai had Mastercraft Courser HSX tires of the manufacturer's recommended size at all four axle positions. All four tires' treads were 6 mm (8/32 in) or greater.



Figure 8. Left side view of the Hyundai

The Hyundai's interior had seating for five (2 front/3 rear), with front-row bucket seats and a second-row bench seat with split forward-folding seatbacks. The front-row seats had adjustable head restraints, while the three second-row positions each featured integrated head restraints. All seating surfaces were leather. Manual restraint systems in the Hyundai included 3-point lap and shoulder safety belts for all five seating positions. Supplemental restraint systems included front safety belt retractor pretensioners, dual-stage frontal air bags, and roof side rail-mounted inflatable curtain (IC) air bags. Only the frontal air bags deployed during the crash. Due to the catastrophic nature of the crash, pretensioner actuation could not be determined.

Vehicle History

A vehicle history report showed the Hyundai had two owners over its lifetime. It was reported it arrived at a dealership in September 2009 and that the first owner purchased it in December 2009. The odometer at that time was 8,207 km (5,100 miles). This owner had the vehicle for 7 years, 5 months and traded it in at 191,124 km (118,762 miles). One crash (without air bag deployment) was reported during this ownership, along with consistent routine maintenance. The driver involved in the crash documented by this report purchased the vehicle in July 2017 with 191,446 km (118,962 miles). The crash occurred four days after its purchase.

NHTSA Recalls and Investigations

A search of the NHTSA recall database (www.nhtsa/recall) made in October 2020 (date of assignment) and May 2023 (date of this report) using the VIN for this specific 2009 Hyundai Santa Fe revealed there were no unrepaired recalls. When searching the NHSTA website by year/make/model of this vehicle, one open investigation regarding the vehicle speed control was found. This NHTSA investigation #DP21003 was opened in November 2021 and remains active.

Exterior Damage

The Hyundai's top, front, right, and left planes were damaged in the crash sequence. All the vehicle's structures above the estimated 112 cm (44 in) clearance height of the trailer sheared and were displaced rearward during the underride (Figure 9). The hood separated from the hinges and was pushed back and up into the windshield and instrument panel. The A- to D-pillars sheared on the lower edge of the trailer. The deformed roof and separated components remained imbedded in the trailer interior and around the trailer's right-side frame (Figure 10). The collision deformation classification (CDC) assigned to the damage pattern was 12FDGW9. The crash dynamics were beyond the scope of the WinSMASH program. The damage pattern was rated severe.



Figure 9. Left front oblique view of Hyundai



Figure 10. The separated greenhouse of the Hyundai removed from trailer (On-scene police image)

The front plane (Figure 11) sustained overlapping damage from its impact to the Scion's back plane (Event 2) and then from the light pole located near the vehicle's final rest (Event 4). A crush profile of the combined damage pattern was measured across the front bumper reinforcement bar. The residual crush was C1= 2 cm (0.8 in), C2 = 8 cm (3.2 in), C3 = 11 cm (4.3 in), C4 = 12 cm (4.8 in), C5 = 11 cm (4.3 in), C6 = 6 cm (2.4 in). The maximum crush was 12 cm (4.8 in) and was located 12 cm (4.8 in) right of centerline. The estimated direct contact damage from the Event 2 vehicle-to-vehicle impact involved the center and right aspects of the front plane. The CDC assigned to the damage pattern was 12FZEW1. For reference purposes, the barrier equivalent speed of this damage was 20 km/h (12 mph).

The direct contact damage from the light pole (Event 4) was an estimated 26 cm (10 in) wide and was located at the front-left corner beyond the end of the bumper reinforcement. The impact force fractured the left-front wheel rim and separated it from the axle. The CDC was 12FLEE3. Analysis of the corner impact could not be performed because the damage was beyond the scope of the WinSMASH program.



Figure 11. Front view of the Hyundai

The Event 5 impact to the building consisted of minor abrasions to the right-side body panels. The CDC was 03RBEW1.

Power Train Control Module and Throttle Body

Due to the manufacture date, the Hyundai did not have an event data recorder. It had a PCM located in the left central aspect of the engine compartment (Figure 12). Delphi manufactured the module on February 7, 2009.¹ At the SCI investigation, representatives from Delphi retrieved hexadecimal data from the PCM using a proprietary scan tool (Figure 13). The retrieved hexadecimal data were translated to a readable format and shared to all parties involved in the investigation. After review, it was determined that the translated data were not useful for the purposes of crash reconstruction. A time history of when the data were recorded was not provided or could not be determined. The data neither supported nor refuted the reported unintended acceleration.

The throttle body was examined during the inspection. The butterfly valve was found in the closed position. The spring-loaded valve was manually exercised at inspection and was operational. It closed via spring pressure.

¹ Delphi Technologies, Auburn Hills, MI. www.delphiautoparts.com

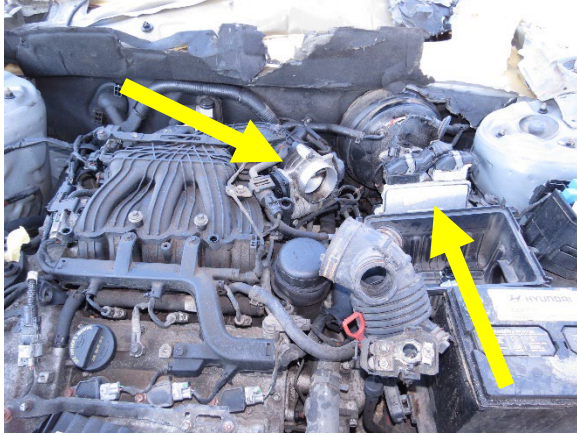


Figure 12. Overhead view of the engine compartment showing the PCM (right arrow) and throttle body (left arrow)



Figure 13. Image of the Hyundai's PCM during the proprietary imaging

Interior Damage

The interior damage to the Hyundai was catastrophic. The underride event deformed the instrument panel back and down into the passenger's compartment. The steering wheel and column separated from the vehicle. All seatbacks deformed rearward. The driver's and front passenger's head restraints were separated from the seatbacks. Due to the rearward displacement of the pillars, all seat belts were lacerated and ripped. Due to the injuries and catastrophic nature of the crash, contact points were inconclusive.

Manual Restraint Systems

The Hyundai had 3-point continuous loop lap and shoulder seat belt systems for all five seat positions. All had sliding latch plates and the front row had adjustable D-rings. Both front seat belt systems had retractor pretensioners; however, actuation of the pretensioners is unknown. Based on the inspections of all the seat belt systems, it was clear that all occupants were unbelted. The driver's seat belt latch plate was still latched at inspection with the lap belt webbing gathered in the latch plate and pulled taut across the seat bight. The shoulder belt webbing was blood-stained and torn at the location of the D-ring from the displacement and separation of the B-pillar and greenhouse structure. The driver's lower body remained in the vehicle and was found across the front row, not entangled in the belt webbing. Based on this assessment, it indicated the driver was sitting on the lap webbing with the shoulder belt behind his back. Both the front and the second-row-right passengers' seat belts were ripped apart during Event 1. The front passenger's seat belt was found tangled up in the second-row-right seat belt. The belts showed no sign of usage that could be related to the occupants.

Supplemental Restraint Systems

The Hyundai had dual-stage driver's and passenger's frontal air bags, front seat-mounted side impact air bags, and roof side rail-mounted IC air bags for the front and second row. During Event 1 the frontal air bags did deploy, but they were ripped out of the vehicle during the underride event. The deployed base/tether section of the driver's frontal air bag was found with the separated steering wheel (Figure 14). The deployed passenger's frontal air bag was found in

the debris of the second-row-right seat position (shown in Figure 15). The seat-mounted and IC air bags did not deploy.



Figure 14. Image of the Hyundai's deployed driver's frontal air bag and deformed steering wheel rim



Figure 15. Image of the Hyundai's deployed passenger's frontal air bag separated from the instrument panel

Foot Controls

Observation of the driver's toe pan area (Figure 16) revealed evidence that the driver was probably misapplying his foot to the pedals. There was no evidence of intrusion within the toe pan and the foot controls remained operational.



Figure 16. Driver's toe pan and foot controls

At the time of the SCI investigation, the driver seat was in an estimated mid-track position measuring 50 cm (19.8 in) from the seat edge to the brake pedal's centerline. The accelerator and brake pedal were separated by 13 cm (5.1 in) measured from centerline to centerline (6 cm [2.4 in] apart from edge to edge). The pedals were offset by 5 cm (1.9 in) with the accelerator pedal offset forward of the brake with respect to the vehicle. The brake pedal was trapezoidal in shape



Figure 17. The driver's right footwear with pedal imprint



Figure 18. Image of the Hyundai's accelerator pedal

measuring 10 cm (3.9 in) across the top, 7 cm (2.7 in) tall and 8 cm (3.1 in) across the bottom. The accelerator pedal was rectangular and measured 12 cm (4.7) tall and 4 cm (1.6 in) wide.

At inspection, the SCI investigator observed that the driver's right footwear (size 12 flip-flop) was lying in the floor space. The footwear's underside showed evidence of a pedal imprint (Figure 17). The imprint was centered on the ball of the foot, measured 4 cm (1.6 in) across and extended 10 cm (3.9 in) from the tip. Further examination found that the imprint matched the accelerator (Figure 18). The right footwear was applied to the corresponding pedal at the time of the crash. During the frontal crash, the driver would have responded forward, loading the accelerator with his foot. The imprint was evidence of his kinematic loading. Additionally, the security camera footage (Figure 4) showed there was no brake light illumination prior to impact.

2009 Hyundai Santa Fe Occupant Data

Driver Demographics

Age/sex:	65 years/male
Height:	Unknown
Weight:	Unknown
Eyewear:	Unknown
Seat type:	Bucket seat with adjustable head restraint
Seat track position:	Estimated mid-track
Manual restraint usage:	None
Usage source:	Vehicle inspection
Air bags:	Frontal, seat-mounted and IC available; frontal deployed
Alcohol/drug involvement:	Not tested/not reported; source: police crash report
Egress from vehicle:	Body transected; upper portion was ejected from vehicle
Transport from scene:	Transported to coroner's office
Medical treatment:	None, fatal

Driver Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
1	Head, shoulders, and arms decapitated from rest of body	413000.6	Tandem IPC Primary: Left Air Bag-Steering wheel hub Secondary: Front – Steering wheel (combination rim and hub/spoke) Tertiary: Exterior of Other Motor Vehicle - Undercarriage	Possible Possible Certain
2	Massive destruction to the spinal cord and column	613000.6	Tandem IPC Primary: Left Air Bag-Steering wheel hub Secondary: Front – Steering wheel (combination rim and hub/spoke) Tertiary: Exterior of Other Motor Vehicle - Undercarriage	Possible Possible Certain

Source: Coroner's report (external) and on-scene images

Driver Kinematics

The 65-year-old male was driving the Hyundai with the seat track adjusted to an estimated mid-track position. He was not restrained by the manual seat belt system. At the time of the SCI inspection, the driver's latch plate remained engaged in the buckle and the lap belt webbing was pulled taut across the seatback and gathered in the latch plate, suggesting the driver was sitting on the seat belt system. The upper portion of the shoulder belt webbing was torn from separation of the B-pillar.

The initial frontal crash deployed the frontal air bags for the driver and passenger positions. The driver responded to the frontal crash forces by initiating a forward trajectory. His face and torso possibly loaded the deployed air bag prior to its separation from engagement with the side and undercarriage of the semi-trailer. His right foot most likely loaded the accelerator pedal evidenced by the patterned transfer on the sole of his footwear. As the Hyundai underrode the semi-trailer and the greenhouse area of the vehicle sheared, his head, upper extremities and upper

torso were engaged by this deformation. It resulted in a transection of his torso at the level of the abdomen. The driver's head and torso with both shoulders and arms were ejected from the vehicle, coming to rest at the rear aspect of the final rest position of the semi-trailer. His lower body remained in the passenger compartment of the Hyundai, lying across the front row with his right hip on the console area at the vehicle's final rest.

Front Passenger Demographics

Age/sex: 65 years/male
 Height: Unknown
 Weight: Unknown
 Eyewear: Unknown
 Seat type: Bucket seat with adjustable head restraint
 Seat track position: Estimated mid-track
 Manual restraint usage: None
 Usage source: Vehicle inspection
 Air bags: Frontal and IC available; frontal deployed
 Egress from vehicle: Fully ejected
 Transport from scene: Transported to coroner's office
 Medical treatment: None, fatal

Front Passenger Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
1	Blunt force trauma, NFS	099999.9	Tandem IPC Primary: Right Air Bag-Right top instrument panel Secondary: Front – Right instrument panel Tertiary: Exterior of Other Motor Vehicle - Undercarriage	Possible Possible Certain
2	*Open fracture of right elbow, NFS	751801.3	Isolated IPC Other Vehicle or Object - Ground	Probable

Source: Coroner's report (external) and *on-scene images

Front Passenger Kinematics

The Hyundai's 65-year-old front-right passenger was seated in an estimated mid-track position. Based on the SCI vehicle inspection, he was not wearing the manual seat belt system. The belt system was found intact and extended from the B-pillar due to the deformation to the vehicle.

At impact with the semi-trailer, the frontal air bag system deployed as the passenger initiated a forward trajectory in response to the 12 o'clock direction of force. His lower extremities probably loaded the mid/lower instrument panel and the toe pan as his head and torso engaged the deployed air bag. Due to the vehicle's velocity at impact, nearly simultaneously to his forward loading, the greenhouse structure of the vehicle intruded into his occupant space and began to separate from the vehicle as the Hyundai began to underwrite the semi-trailer.

He remained in the Hyundai as the right-front door was separated from the structure. Following the Hyundai's impact with the Scion (Event 2), the front-right passenger was fully ejected from the vehicle onto the roadway where his body traveled on a diagonal trajectory to the right road edge. It came to rest wrapped around a fire hydrant. Due to the severity of his injuries, he was pronounced deceased at the scene of the crash.

Second-Row-Right Passenger Demographics

Age/sex:	72 years/male
Height:	Unknown
Weight:	Unknown
Eyewear:	Unknown
Seat type:	Split bench with folding back
Seat track position:	Fixed/non-adjustable
Manual restraint usage:	None
Usage source:	Vehicle inspection
Air bags:	IC available; none deployed
Egress from vehicle:	Fully ejected
Transport from scene:	Transported to coroner's office
Medical treatment:	None, fatal

Second-Row-Right Passenger Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
1	Massive head injury with missing frontal skull and exposed brain*	113000.6	Isolated IPC Exterior of Other Motor Vehicle - Undercarriage	Certain
2	Torso twisted three times with exposed intestines	513000.6	Isolated IPC Exterior of Other Motor Vehicle - Undercarriage	Certain

Source: Coroner's report (external) and *on-scene images

Second-Row-Right Passenger Kinematics

The 72-year-old second-row-right passenger of the Hyundai was not restrained by the manual seat belt system. The second-row seat belt systems remained intact, although the vehicle's structure was severely deformed and torn away.

At initial impact with the semi-trailer (Event 1), the unbelted right-rear passenger initiated a forward trajectory and possibly loaded the front-row seatback with his lower extremities and torso. As the Hyundai engaged the side and undercarriage of the semi-trailer and the greenhouse area of the vehicle was torn away, the passenger's frontal scalp and face contacted the semi-trailer resulting in a massive head injury with disruption of the skull and exposure of brain tissue. He also sustained a large mid-face laceration that extended to bone.

Following the Event 2 impact with the Scion, the right-rear passenger was ejected from the vehicle and was thrown onto the roadway to final rest. He was declared deceased at the scene of the crash.

2015 Freightliner Cascadia Tractor-Trailer

The Freightliner (Figure 19) was not available for inspection and all information was derived from the police report, VIN decoder, and on-scene photographs. The truck-tractor was identified by the VIN 3AKGGEDV0FSxxxxxx. It was powered by a 12.8-liter, I6 diesel, Detroit DD13 engine and had drum air brakes. The gross vehicle weight rating was 14,969 kg (33,001 lb) and above. The tractor was connected to a 4.1 m (13.4 ft) tall by 16.2 m (53.0 ft) long trailer that was transporting less than 2,268 kg (5,000 lb) of product.

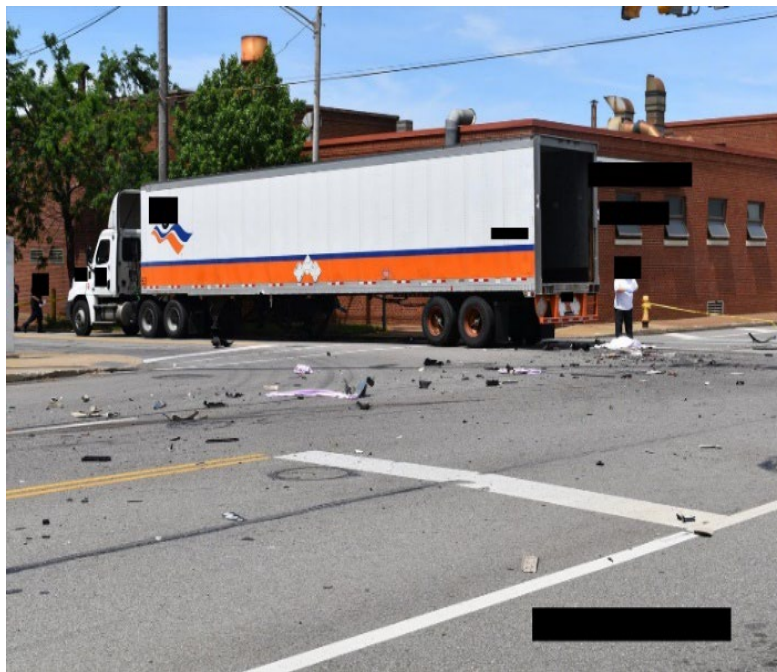


Figure 19. Left-rear oblique view of the semi truck's final rest position looking northeast (On-scene police image)

Trailer Exterior Damage



Figure 20. Right view of the trailer damage (On-scene police image)



Figure 21. Trailer exterior damage looking from the left plane (On-scene police image)

The trailer VIN was not documented by the police. The 16.2 m (53.0 ft) trailer was struck on the center aspect of its right plane approximately 7 meters (21 feet) from the front of the trailer. The roof rack from the Hyundai pierced the trailer's wall and dispersed glass and metal fragments into the trailer, displacing one of the trailer's loads forward and to the left. The hood and everything from the belt line up was pushed up against the exterior frame rail of the trailer (Figure 20). A deep fracture ran laterally across the bottom of the trailer caused by the A-, B-, C-, and D-pillars cutting across during the underride sequence (Figure 21). The estimated truck damage classification was 03RTFRB.

Freightliner Occupant Data

The belted, 63-year-old male Freightliner driver was the only occupant of the tractor. He was uninjured and exited the vehicle under his own power.

2013 Scion tC

Description

The Scion (Figure 22) was not available for inspection and all information was derived from the police report, VIN decoder, and on-scene photographs. The two-door coupe was identified by the VIN JTKJF5C76D3xxxxxx. It was powered by 2.5-liter, 4-cylinder, inline gasoline engine linked to a manual transmission with front-wheel drive.

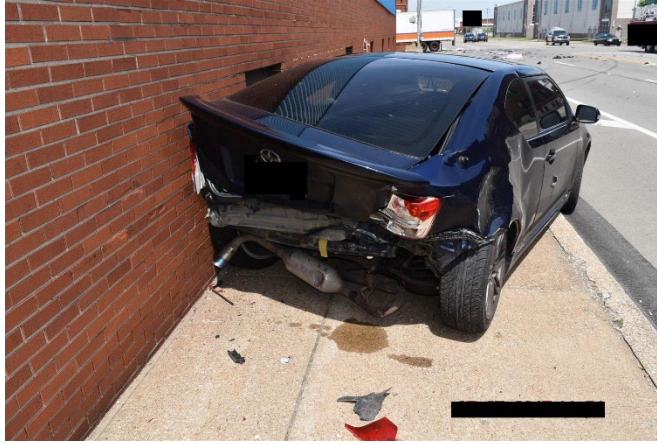


Figure 22. Facing east, showing final rest position of the Scion and rear impact with Event 2 (On-scene police image)

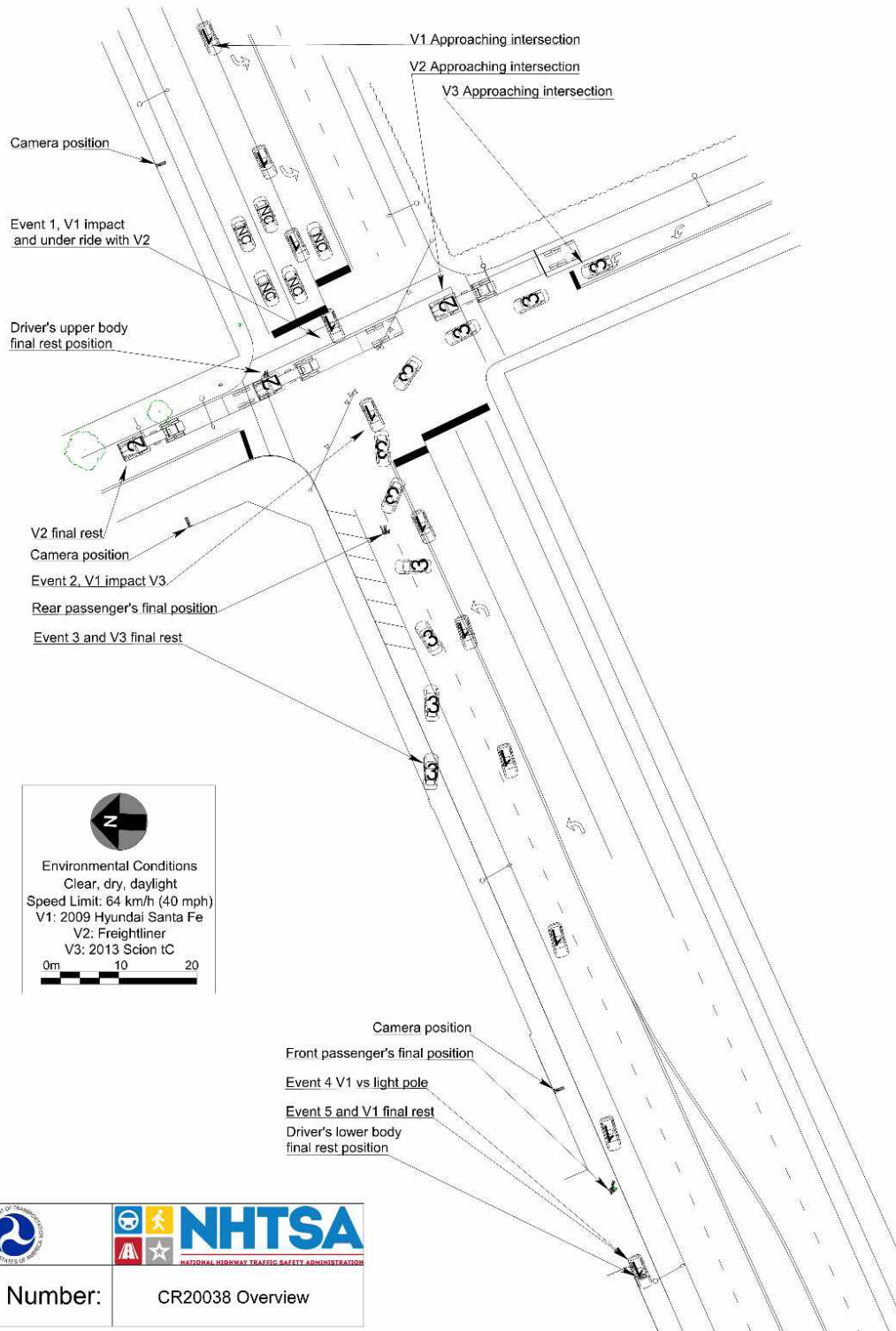
Exterior Damage

The Scion (Figure 22) was struck on its back plane/right and center aspect by the Hyundai (Event 2). The estimated CDC of the impact damage was 05BZEW2. The impact's force displaced the vehicle west and caused the Scion to rotate clockwise approximately 180 degrees as it separated from the impact. The Scion departed the road's north side and impacted a commercial building's brick wall with its left-rear corner (Event 3). The estimated CDC of this impact damage was 07BLEN99.

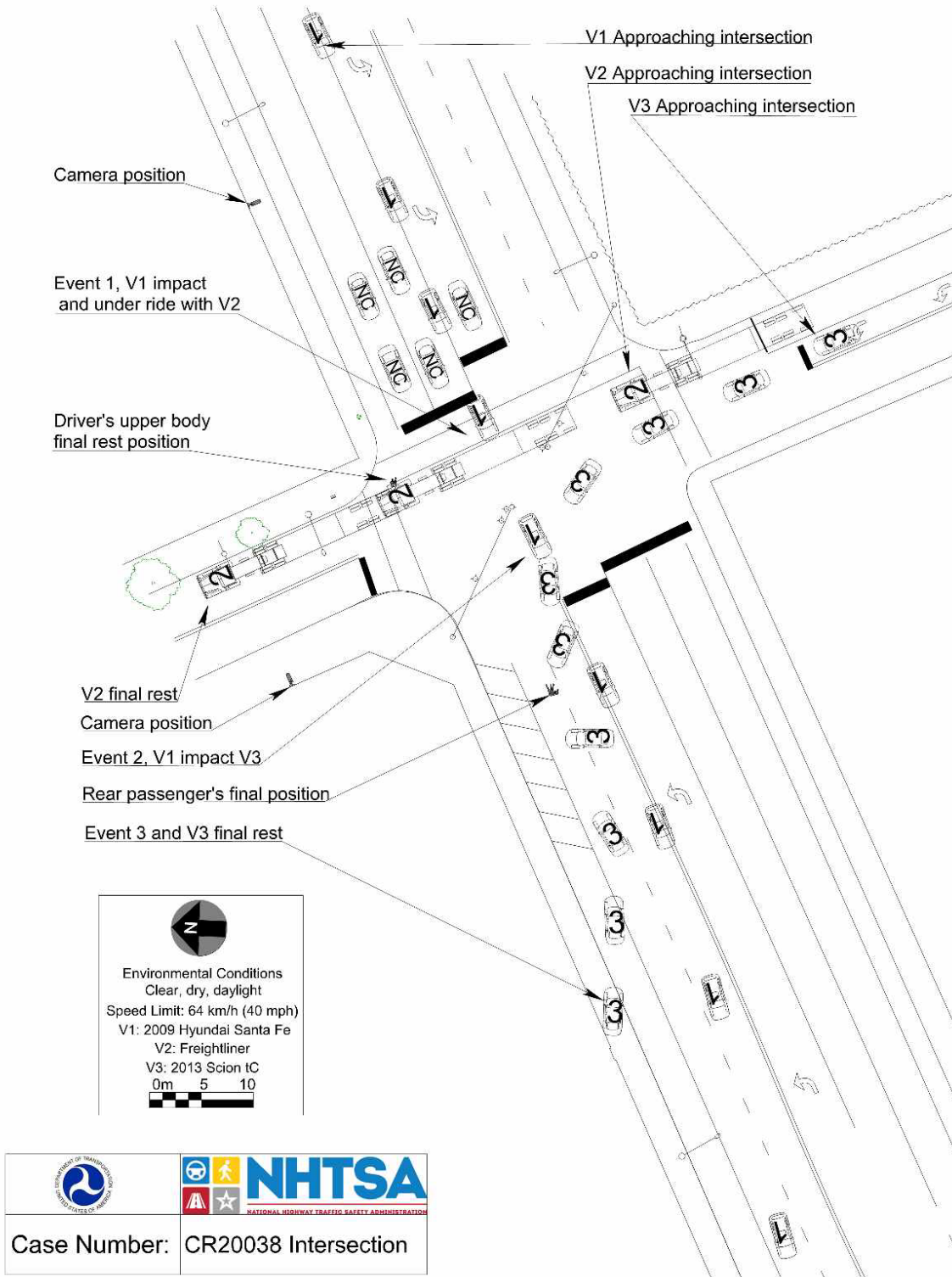
Scion Occupant Data

The police reported that the belted 18-year-old male Scion driver was uninjured and refused medical transport.

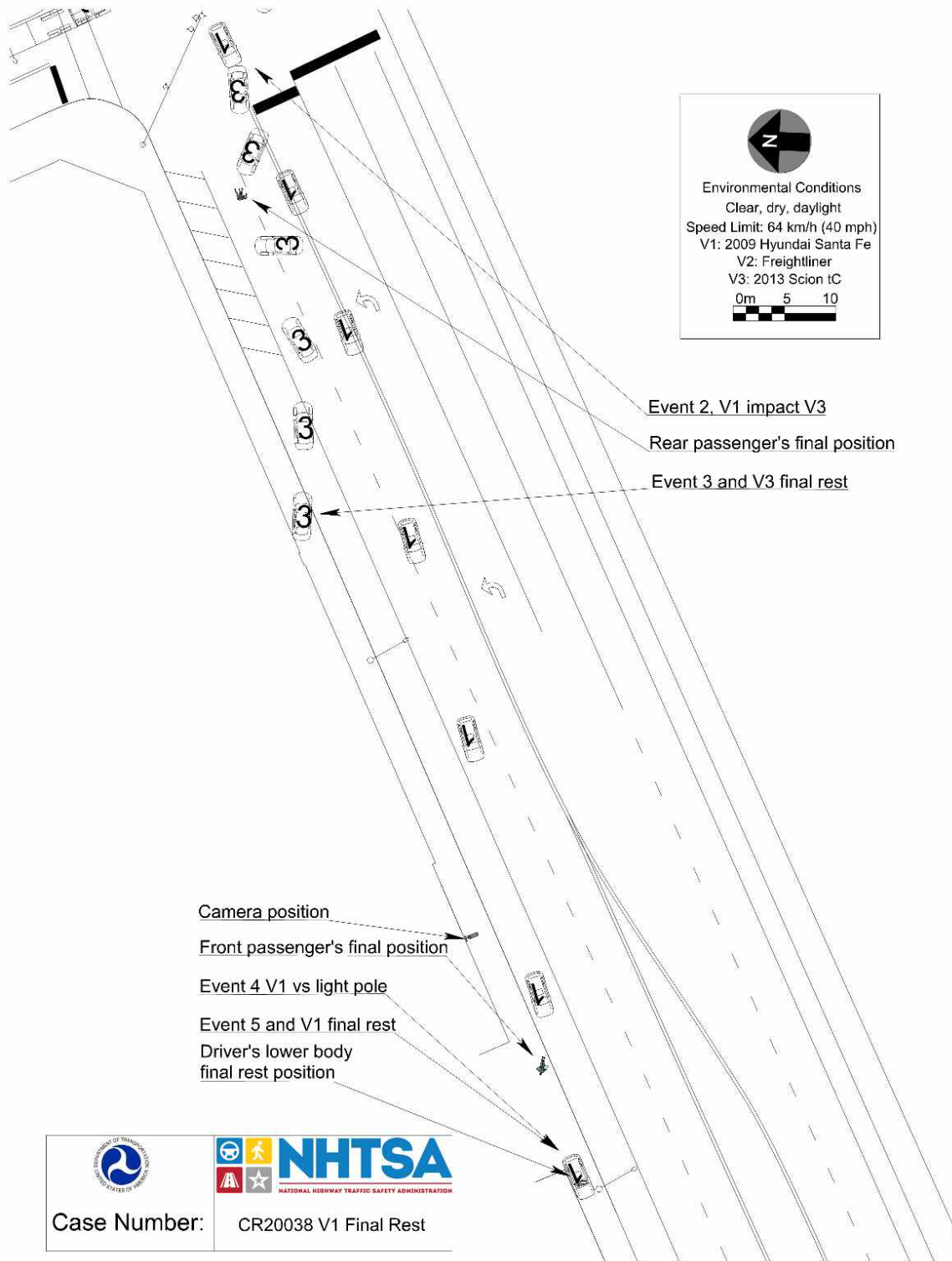
Crash Diagram – Overview



Crash Diagram – Intersection



Crash Diagram – Final Rest



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U.S. Department
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**National Highway
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