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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 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 investigation of a 2011 Chevrolet Express 3500 American Emergency Vehicles (AEV) Type III ambulance involved in a crash with a 2002 Audi A6 3.0 Quattro and its subsequent rollover. This two-vehicle crash occurred in the morning in May 2018 in a four-leg intersection in an urban area of California. The ambulance was driven by a belted 21-year-old female. The three other occupants of the ambulance were an unbelted 27-year-old male firefighter, an unbelted 25-year-old male paramedic, and a 74-year-old female patient restrained on a patient cot being transported to a local hospital in an emergency status with the lights and siren activated. The Audi was being driven eastbound by a belted 30-year-old male. The two vehicles entered the intersection simultaneously, and the front plane of the Audi struck the right plane of the ambulance. The ambulance subsequently overturned, left-side leading, one quarter-turn, and came to rest in the intersection on its left side. All occupants of both vehicles were transported by ambulances to local hospitals. The patient transported by the ambulance was declared deceased at the hospital, and, although she sustained multiple injuries during the crash, her cause of death was attributed to pre-existing conditions. The other occupants of both vehicles were treated and released.

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Special Crash Investigations
Ambulance Crash Investigation
Case Number DS18014
Vehicle: 2011 Chevrolet Express 3500 Type III Ambulance
Location: California
Crash Date: May 2018

BACKGROUND

This report documents the investigation of a 2011 Chevrolet Express 3500 American Emergency Vehicles Type III ambulance (**Figure 1**) involved in a crash with a 2002 Audi A6 3.0 Quattro and the ambulance's subsequent rollover. The investigation was intended to determine what role the manual restraints may have played in the injury mechanisms for the patient, driver, and passengers of the ambulance. The Special Crash Investigations (SCI) group of the National Highway Traffic Safety Administration initiated the investigation in May 2018 in response to an online news report of the crash. Permission to inspect the two involved vehicles was obtained through the state police department, whose multidisciplinary accident investigation team officers attended the SCI vehicle inspections in June 2018. The Chevrolet's Event Data Recorder (EDR) was supported by the Bosch CDR system, and the vehicle's EDR was imaged during the vehicle inspection. For unknown reasons, the EDR report did not capture any events or contain any crash data, likely due to the relatively low delta V caused by the vehicle-to-vehicle impact.

Figure 1. The 2011 Chevrolet Express 3500 Type III Ambulance.

This two-vehicle crash occurred in the morning in May 2018 in a four-leg intersection in an urban area of California. The ambulance was driven southbound in the northbound lanes by a belted 21-year-old female. The three other occupants of the ambulance were an unbelted 27-year-old male firefighter, an unbelted 25-year-old male paramedic, and a 74-year-old female patient restrained on a patient cot. The ambulance was transporting the patient to a local hospital in an emergency status with the lights and siren activated. The Audi was driven eastbound by a belted 30-year-old male. The two vehicles entered the intersection simultaneously, and the front plane of the Audi struck the right plane of the ambulance. The ambulance subsequently overturned, left-side-leading, one quarter-turn, and came to rest in the intersection on its left side. All occupants of both vehicles were transported by ambulances to local hospitals. The patient transported by the ambulance was declared deceased at the hospital, and, although she sustained multiple injuries during the crash, her cause of death was attributed to pre-existing conditions. The other occupants of both vehicles were treated and released. Both vehicles were towed due to damage and placed on a police hold.

SUMMARY

Crash Site

The crash site was the four-way intersection of a divided north/south roadway and a divided east/west roadway in a mixed-use urban area in California (**Figure 2**). The southbound roadway included a right raised curb measuring 15 cm (6.0 in) high, a right-turn lane measuring 4.2 m (13.8 ft) wide, three through lanes each measuring 3.3 m (11.0 ft) wide, a left-turn lane measuring 3.3 m (11.0 ft) wide and a raised concrete median measuring 1.7 m (5.5 ft) wide and 15 cm (6.0 in) high. The turn lanes were bordered by solid white painted stripes and the through lanes were bordered by dashed white painted stripes. The three northbound lanes were configured similarly, measuring 3.3 m (11.0 ft) in width and separated by dashed white painted stripes. The posted speed limit for this roadway was 56 km/h (35 mph).

Figure 2. Crash site, southbound approach for the 2011 Chevrolet Express 3500 Type III Ambulance.

Figure 3. Final rest position of the 2011 Chevrolet Express 3500, looking north (police photo).

The eastbound roadway included two through lanes and two left turn lanes, each measuring 3.5 m (11.5 ft) in width and a raised concrete median measuring 0.8 m (2.6 ft) in width and 15 cm (6.0 in) in height. The posted speed limit was 48 km/h (30 mph). Both roadways were straight and level. The intersection was controlled by overhanging three-phase traffic signals and white painted stop lines. Conditions at the time of the crash were daylight, clear, and dry. A crash diagram is included at the end of this report.

Pre-Crash

The ambulance was traveling southbound in the first northbound lane from the right at an unknown speed because heavy traffic stopped in the southbound lanes was blocking the ambulance's path through the intersection. The ambulance entered the intersection against a red traffic signal with lights and siren activated. After entering the intersection, the driver of the ambulance steered diagonally to the right with the intention of returning to the southbound lanes on the south leg of the intersection and continuing southbound. The Audi was traveling eastbound in the second lane from the right at an unknown speed when it entered the intersection with a green traffic signal.

Crash

The crash included two events. Initially, the front plane of the Audi struck the right plane of the ambulance in an angled configuration (Event 1). The area of impact to the ambulance was aft of its longitudinal center of gravity, causing it to initiate a clockwise rotation during which the left

side tires engaged the ground causing a left-side-leading rollover (Event 2). The ambulance rolled one quarter-turn and came to rest on its left side and facing southwest on the south edge of the intersection approximately 15 m (50 ft) southwest of the area of impact. The Audi traveled in a post-impact forward trajectory and came to rest approximately 7 m (23 ft) north of the area of impact facing east.

For the ambulance in Event 1, the missing vehicle algorithm of the WinSMASH program calculated a total delta v of 15 km/h (9 mph), longitudinal delta v of -10 km/h (-6 mph), lateral delta v of -11 km/h (-7 mph), and a barrier equivalent speed (BES) of 25 km/h (15 mph). The results fit the model and appeared reasonable. For the Audi in Event 1, the WinSMASH program calculated a total delta v of 44 km/h (28 mph), longitudinal delta v of -34 km/h (-21 mph), lateral delta v of 29 km/h (18 mph), and a BES of 29 km/h (18 mph). The results fit the model and appeared reasonable. The Collision Deformation Classification (CDC) for the ambulance in Event 1 was 02RBEW1 and the CDC for the rollover was 00LYAO1. The CDC for the Audi in Event 1 was 11FDEW2.

Post-Crash

The ambulance was at rest on its left side at the center median ending at the south aspect of the intersection (**Figure 3**). Police, fire, and EMS responders arrived within 11 minutes of the crash. All occupants of both vehicles were transported by ambulances to local hospitals. Both vehicles were towed due to damage and placed on hold. The patient was declared deceased at the hospital and the other occupants of both vehicles were treated and released.

2011 CHEVROLET EXPRESS 3500 TYPE III AMBULANCE

Description

The 2011 Chevrolet Express 3500 was manufactured in November 2010 as an incomplete cab/chassis and completed in February 2011 as a Type III ambulance by AEV. The Vehicle Identification Number (VIN) was 1GB3G2CL8B1xxxxxx, and the vehicle mileage was unknown. The chassis was a rear-wheel-drive platform using dual rear wheels on a single axle and powered by a 6.6-liter, 8- cylinder, diesel engine linked to an automatic transmission. It was equipped with hydraulic brakes and an antilock braking system.

Secondary manufacturing of the vehicle consisted of installation of the patient compartment module and installation of emergency services operational equipment (warning lights, sirens, and radio communications). As a Type III certified ambulance, the vehicle was configured with a forward cab and rear patient compartment equipped for the treatment of medical emergencies in a mobile environment. The cab was configured for the seating of two occupants with forward-facing box-mounted seats featuring manual seat track and seat back recline adjustments. The seats were configured with three-point lap and shoulder seat belts and integral head restraints.

Vehicle Weight, Payload, and Tire Data

The Chevrolet chassis was placarded with a curb weight of 4,406 kg (9,715 lb), and a gross vehicle weight rating (GVWR) of 5,579 kg (12,300 lb) distributed as front 2,087 kg (4,600 lb) and rear 3,901 kg (8,600 lb). The vehicle had a payload capacity of 1,270 kg (2,800 lb) and a stated optional equipment weight of 347 kg (765 lb). The vehicle manufacturer's recommended tire size was LT225/75R16 with recommended cold tire pressures of 450 kPa (65 psi) for the

front and rear. At the time of the SCI inspection, the vehicle was equipped with Hankook Dynapro HT tires of the recommended size manufactured in 2014.

Figure 4. Right plane damage, the 2011 Chevrolet Express 3500.

Exterior Damage

The ambulance sustained minor severity damage to the right plane caused by the vehicle-to- vehicle impact. Direct damage began 55 cm (21.6 in) aft of the right rear wheel and extended 180 cm (70.9 in) forward. The damage was confined to the right side of the patient compartment. The CDC for the ambulance in Event 1 was 02RBEW1 (**Figure 4**).

The vehicle sustained minor damage to the left plane caused by the rollover. Direct damage to the left plane began at the lower aspect of the box and extended vertically 220 cm (86.6 in) upward ending at the roof rail. The damage extended longitudinally from the leading edge of the roof rail 80 m (31.5 in) rearward causing minor crush and the CDC for the ambulance in Event 2 was 00LYAO1 (**Figure 5**).

Figure 5. Left plane damage, the 2011 Chevrolet Express 3500.

Event Data Recorder

The ambulance was supported by the Bosch CDR system and the vehicle's EDR was imaged during the vehicle inspection using the DLC (data link connector) method with software version 17.7.2 used to collect the data and version 19.4.2 used to report the data. The vehicle was configured with an air bag control module that recovered no events and reported no crash data. The complete EDR report is included in this report as **Appendix A**.

Interior Damage

The ambulance's interior sustained minor severity damage caused by the impact forces, occupant contacts, and post-crash activities. No intrusions were documented. The windshield was removed during post-crash activities. The patient compartment revealed damage and displaced cargo caused during the rollover. The back doors were jammed shut and had been sprung by emergency responders.

Manual Restraint Systems

The ambulance was equipped with driver and front passenger lap and shoulder seat belts. The front row belts were equipped with continuous loop belt webbing, sliding latch plates, emergency locking retractors (ELR), and adjustable upper D-ring anchors adjusted to the full-up position. The police report indicated the driver was belted at the time of the crash. The driver's

seat belt revealed evidence of historical usage but no evidence of loading. The driver was not injured and her kinematics suggested she was belted. The front right seat position was unoccupied at the time of the crash.

Seating in the patient compartment module accommodated up to three crew members and one patient cot. The seating configuration included a rear-facing, high-back attendant seat at the forward wall, an inward-facing, two-passenger squad bench seat on the right side wall, and a single patient cot secured by a Stryker dual position floor mount cot fastener. The rear-facing attendant seat was configured with a manual lap belt. The squad bench seat was configured with 5-point harness style lap and shoulder seat belts. The belts revealed evidence of historical usage but not of occupant loading. The police report indicated the occupants seated on the attendant seat and bench seat were unbelted.

Supplemental Restraint Systems

The ambulance's supplemental restraint systems included an air bag control module (ACM) and driver and passenger frontal air bags. There were no air bag deployments in the crash.

Figure 6. Patient compartment, the 2011 Chevrolet Express 3500.

Patient Compartment

The patient compartment was a walk-through design with interior dimensions of 366 cm (144.0 in) long, 180 cm (70.9 in) wide, and 178 cm (70.1 in) high (**Figure 6**). Double rear doors served for the loading and unloading of the cot, as well as entry for the crew. The right wall was configured with a single door located on the forward aspect and a squad bench on the middle and rear aspects. A squad bench safety net separated the right door from the squad bench. The left wall was configured with metal and glass storage cabinets extending from floor to ceiling. The floor area was configured with a cot fastener system using a Stryker rail clamp and an antler style stabilizer.

Patient Cot

The patient was restrained on a patient cot of an unknown make and model. The cot was not present or available at the time of the vehicle inspection. No further data was available.

Rollover Mitigation

The ambulance was manufactured as an incomplete vehicle and was not given a safety rating by NHTSA. The vehicle was struck on the right plane by the other vehicle, causing it to initiate a clockwise rotation and a left-side-leading rollover. The vehicle rolled one quarter-turn and came to rest on its left side. The estimated roll distance was 15 m (49 ft).

NHTSA Recalls and Investigations

A search last queried in July 2020 using the Chevrolet's VIN revealed no open recalls.

2011 CHEVROLET EXPRESS 3500 TYPE III AMBULANCE OCCUPANTS

Driver Demographics (Occupant 1)

Age/sex:	21 years/female
Height:	165 cm (65 in)
Weight:	57 kg (125 lb)
Eyewear:	Unknown
Seat type:	Box mounted with integral head restraint
Seat track position:	Middle track
Manual restraint usage:	Lap and shoulder seat belt
Usage source:	Vehicle inspection
Air bags:	Frontal air bag not deployed
Alcohol/drug data:	None
Egress from vehicle:	Exited with assistance through left side window
Transport from scene:	Ambulance to hospital
Type of medical treatment:	Treated and released

Driver Injuries

The driver's medical records indicated she was not injured.

Driver Kinematics

The belted 21-year-old female ambulance driver, seated in an unknown posture, was actively steering the vehicle. At impact with the other vehicle, the driver was displaced to the right in response to the direction of force. The ambulance rotated clockwise and overturned left-side-leading. The driver was displaced to the left at impact with the ground. According to her medical records, the driver's left flank and chest contacted the left door handle, causing pain to the left chest and abdomen. Her medical records revealed no injury occurred. Throughout the crash, she was held in place by the vehicle's lap and shoulder belt. She exited the vehicle with assistance through the left side window opening and was transported by ambulance to a local hospital, where she was examined and released.

Firefighter Demographics (Occupant 2)

Age/sex:	27 years/male
Height:	180 cm (71 in)
Weight:	91 kg (200 lb)
Eyewear:	Unknown
Seat type:	Rear-facing attendant seat with integral head restraint
Seat track position:	Not adjustable
Manual restraint usage:	Manual lap belt not used
Usage source:	Vehicle inspection
Air bags:	None available
Egress from vehicle:	Exited without assistance through right side door
Transport from scene:	Ambulance to hospital
Type of medical treatment:	Treated and released

Firefighter Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
1	Fractures, non-displaced, right anterior-lateral ribs R5- R6	450202.2	Metal cabinet	Probable
2	Laceration, minor, right head	110602.1	Metal cabinet	Probable
3	Abrasion, right chest	410202.1	Metal cabinet	Probable

Source: medical records.

Firefighter Kinematics

The unbelted firefighter was seated in the rear-facing attendant seat located in the forward left aspect of the patient compartment. At the time of the crash, he was giving medical attention to the patient. At impact with the other vehicle he was displaced to his left in response to the direction of force. During the rollover, he was displaced to his right in response to the rotation of the vehicle. His head, right chest, and right abdomen contacted metal cabinets on the left wall of the patient compartment, causing fractures to right ribs R5 and R6 and a minor laceration to the right temporal aspect of the scalp. He exited the patient compartment unassisted through the right-side door and then assisted the ambulance driver through the left-side window opening. He was transported by ambulance to a local hospital, where he was treated and released.

Paramedic Demographics (Occupant 3)

Age/sex:	25 years/male
Height:	196 cm (77 in)
Weight:	100 kg (220 lb)
Eyewear:	Unknown
Seat type:	Inward-facing bench seat with non-adjustable head restraint
Seat track position:	Not adjustable
Manual restraint usage:	Manual 5-point harness not used
Usage source:	Vehicle inspection
Air bags:	None available
Egress from vehicle:	Exited without assistance through rear doors
Transport from scene:	Ambulance to hospital
Type of medical treatment:	Treated and released

Paramedic Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
1	Abrasion, left elbow	710202.1	Patient cot	Probable
2	Contusion, right lower leg	810402.1	Patient cot	Probable

Source: medical records.

Paramedic Kinematics

The unbelted paramedic was seated on an inward-facing squad bench seat on the right aspect of the patient compartment. At the time of the crash, he was giving medical attention to the patient. At impact with the other vehicle he was displaced rearward relative to his position in the vehicle in response to the direction of force. During the rollover, he was displaced forward in response to the rotation of the vehicle. After the vehicle came to rest, he remained in the patient compartment to give aid to the patient. When emergency responders arrived, the occupant exited the patient compartment without assistance through the rear doors.

Patient Demographics (Occupant 4)

Age/sex:	74 years/female
Height:	163 cm (64 in)
Weight:	37 kg (81 lb)
Eyewear:	Unknown
Seat type:	Patient cot
Seat track position:	NA
Manual restraint usage:	Manual belt restraints used
Usage source:	Vehicle inspection
Air bags:	None available
Egress from vehicle:	Carried though rear doors while unconscious
Transport from scene:	Ambulance to hospital
Type of medical treatment:	Declared deceased upon arrival

Patient Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Fractures, anterior, left rib L2- L4 with small amount of hemorrhage; lateral right rib R2, anterior-lateral R3 with hemorrhage; anterior right rib R3-R4 with small amount of hemorrhage	450203.3	Belt restraint	Possible

2 3	Multiple abrasions/contusions, face (forehead, lateral to left eye, left orbital area, right orbital area, chin, nose, right forehead, right lateral forehead, right eyebrow, lower lip, right cheek	210202.1 210402.1	Other occupant	Possible
4	Abrasions, contusions chest	410202.1	Belt restraint	Possible
5	Contusion, right upper arm	710402.1	Patient cot	Possible
6	Abrasion, left upper arm	710202.1	Other occupant	Possible
7	Abrasion, right forearm	710202.1	Patient cot	Possible
8	Contusions, left dorsal hand	710402.1	Other occupant	Possible

Source: medical records.

Patient Kinematics

The patient was placed in a supine position on a patient cot. At impact with the other vehicle she was displaced to her left in response to the direction of force. During the rollover she was displaced to her right in response to the rotation of the vehicle. The patient was probably contacted by the other two unbelted occupants in the patient compartment. She sustained bilateral rib fractures, possibly caused by manual belt restraints. When the vehicle came to rest on its left side the patient was in an unknown posture until she was removed from the patient compartment by emergency responders. She was transported by ambulance to her original destination hospital while in cardiac arrest and not producing a pulse. She arrived at the hospital ER in a similar state and was pronounced deceased 30 minutes after the crash. The investigating coroner's report indicated the cause of death was respiratory insufficiency due to bronchopneumonia and not due to injuries caused during the crash.

2002 AUDI A6 3.0 QUATTRO

Description

The 2002 Audi A6 3.0 Quattro was a 4-door sedan identified by the VIN WAULT64B02Nxxxxxx. It was configured with a 3.0-liter, 6-cylinder, gas engine; an automatic transmission; all-wheel drive; and ABS.

Exterior Damage

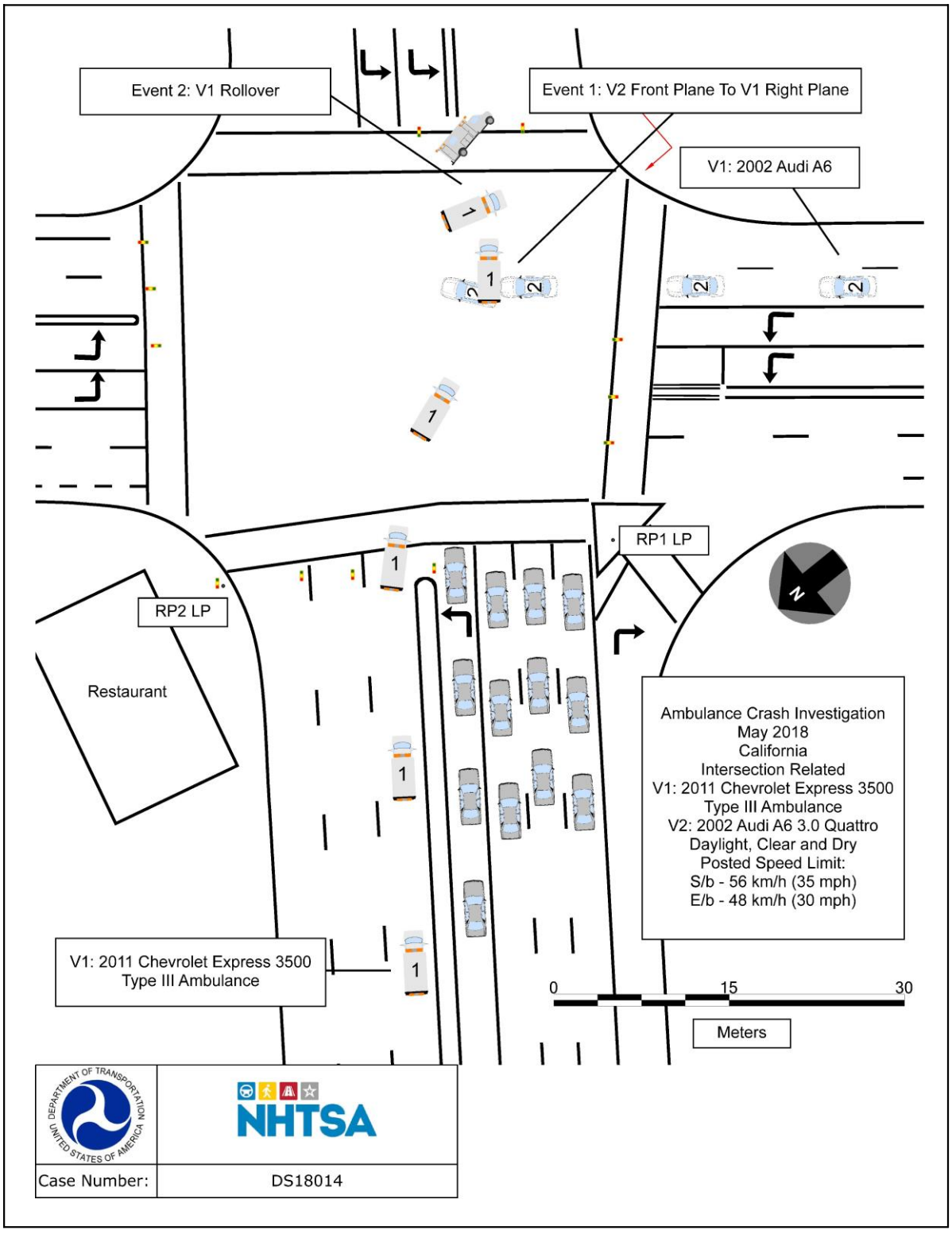
The Audi sustained direct damage to the front plane and induced damage extending to the left, right, and top planes. The front bumper fascia, backing bar, and grille were displaced (**Figure 7**). The hood and right front fender were crumpled and the right front tire was restricted. Direct damage to the bumper fascia extended from bumper corner to bumper corner and measured 160 cm (63.0 in). The damage extended vertically from frame level to belt line. The backing bar was used to measure crush. Thirteen measurements in 10.0 cm (3.9 in) increments were taken at bumper level by the Nikon Total Station and the Faro Blitz program computed crush measurement in six increments as follows: C_1 = 17 cm (6.7 in), C_2 = 21 cm (8.3 in), C_3 = 24 cm (9.5 in), C_4 = 27 cm (10.6 in), C_5 = 33 cm (13.0 in), and C_6 = 35 cm (13.8 in). Maximum crush measured 35 cm (8.3 in) at the front right bumper corner. The observed principal direction of force was 320 degrees and the CDC for the Audi was 11FDEW2.

Figure 7. The 2002 Audi A6 3.0 Quattro.

Occupant Data

The driver of the Audi was a belted 30-year-old male who was transported by ambulance for treatment of suspected serious injuries.

CRASH DIAGRAM



APPENDIX A: 2011 Chevrolet Express 3500 Event Data Recorder Report[1]

[1] The EDR report contained in this technical report was imaged using the current version of the Bosch CDR software at the time of the vehicle inspection. The CDR report contained in the associated Crash View application may differ relative to this report.

IMPORTANT NOTICE: Robert Bosch LLC and the manufacturers whose vehicles are accessible using the CDR System urge end users to use the latest production release of the Crash Data Retrieval system software when viewing, printing or exporting any retrieved data from within the CDR program. Using the latest version of the CDR software is the best way to ensure that retrieved data has been translated using the most current information provided by the manufacturers of the vehicles supported by this product.

CDR File Information

User Entered VIN	1GB3G2CL8B1******
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	DS18014_V1_ACM.CDRX
Saved on	
Imaged with CDR version	Crash Data Retrieval Tool 17.7.2
Imaged with Software Licensed to (Company Name)	NHTSA
Reported with CDR version	Crash Data Retrieval Tool 19.4.2
Reported with Software Licensed to (Company Name)	NHTSA
EDR Device Type	Airbag Control Module
Event(s) recovered	None

Comments

No comments entered.

Data Limitations

Recorded Crash Events:

There are two types of recorded crash events. The first is the Non-Deployment Event. A Non-Deployment Event records data but does not deploy the air bag(s). The minimum SDM Recorded Vehicle Velocity Change, that is needed to record a Non-Deployment Event, is five MPH. A Non-Deployment Event may contain Pre-Crash and Crash data. The SDM can store up to one Non-Deployment Event. This event can be overwritten by an event that has a greater SDM recorded vehicle velocity change. This event will be cleared by the SDM, after approximately 250 ignition cycles. This event can be overwritten by a second Deployment Event, referred to as Deployment Event #2, if the Non-Deployment Event is not locked. The data in the Non-Deployment Event file will be locked, if the Non-Deployment Event occurred within five seconds of a Deployment Event. A locked Non Deployment Event cannot be overwritten or cleared by the SDM.

The second type of SDM recorded crash event is the Deployment Event. It also may contain Pre-Crash and Crash data. The SDM can store up to two different Deployment Events. If a second Deployment Event occurs any time after the Deployment Event, the Deployment Event #2 will overwrite any non-locked Non-Deployment Event. Deployment Events cannot be overwritten or cleared by the SDM. Once the SDM has deployed an air bag, the SDM must be replaced.

Data:

-SDM Recorded Vehicle Velocity Change reflects the change in velocity that the sensing system experienced during the recorded portion of the event. SDM Recorded Vehicle Velocity Change is the change in velocity during the recording time and is not the speed the vehicle was traveling before the event, and is also not the Barrier Equivalent Velocity. For Deployment Events, the SDM will record 220 milliseconds of data after Deployment criteria is met and up to 70 milliseconds before Deployment criteria is met. For Non-Deployment Events, the SDM can record up to the first 300 milliseconds of data after algorithm enable. Velocity Change data is displayed in SAE sign convention.

-The CDR tool displays time from Algorithm Enable (AE) to time of Deployment command in a Deployment event and AE to time of maximum SDM recorded vehicle velocity change in a Non-Deployment event. Time from AE begins when the first air bag system enable threshold is met and ends when Deployment command criteria is met or at maximum SDM recorded vehicle velocity change. Air bag systems such as frontal, side, or rollover, may be a source of an enable. The time represented in a CDR report can be that of the enable of one air bag system to the Deployment time of another air bag system.

-Maximum Recorded Vehicle Velocity Change is the maximum square root value of the sum of the squares for the vehicle's combined "X" and "Y" axis change in velocity.

-Event Recording Complete will indicate if data from the recorded event has been fully written to the SDM memory or if it has been interrupted and not fully written.

-SDM Recorded Vehicle Speed accuracy can be affected by various factors, including but not limited to the following:

- -Significant changes in the tire's rolling radius
- -Final drive axle ratio changes
- -Wheel lockup and wheel slip

-Brake Switch Circuit Status indicates the open/closed state of the brake switch circuit.

-Pre-Crash data is recorded asynchronously. The 0.5 second Pre-crash data value (most recent recorded data point) is the data point last sampled before AE. That is to say, the last data point may have been captured just before AE but no more than 0.5 second before AE. All subsequent Pre-crash data values are referenced from this data point.

-Pre-Crash Electronic Data Validity Check Status indicates “Data Invalid” if:
    -The SDM receives a message with an “invalid” flag from the module sending the pre-crash data
    -No data is received from the module sending the pre-crash data
    -No module is present to send the pre-crash data
-Pre-crash data associated with this event will always be for the first event even if it is not recorded.
-Driver’s and Passenger’s Belt Switch Circuit Status indicates the status of the seat belt switch circuit.
-The Time Between Non-Deployment to Deployment Events is displayed in seconds. If the time between the two events is greater than five seconds, “N/A” is displayed in place of the time. If the value is negative, then the Deployment Event occurred first. If the value is positive, then the Non-Deployment Event occurred first.
-If power to the SDM is lost during a crash event, all or part of the crash record may not be recorded.
-The ignition cycle counter relies upon the transitions through OFF->RUN->CRANK power-moding messages, on the GMLAN communication bus, to increment the counter. Applying and removing of battery power to the module will not increment the ignition cycle counter.
-If more than one event is recorded, use the follow to determine which event the Multiple Event Data is associated with:
    -If a Deployment event and not locked Non-Deployment event are recorded, the Multiple Event Data is associated with the Deployment event.
    -If a Deployment event and a locked Non-Deployment event are recorded, then the Multiple Event Data is associated with both events.
    -If a Deployment event and Deployment event #2 are recorded, then the Multiple Event Data is associated with both events.
-All data should be examined in conjunction with other available physical evidence from the vehicle and scene

Data Source:
All SDM recorded data is measured, calculated, and stored internally, except for the following:
-Vehicle Status Data (Pre-Crash) is transmitted to the SDM, by various vehicle control modules, via the vehicle’s communication network.
-The Belt Switch Circuit is wired directly to the SDM.

Hexadecimal Data:
Data that the vehicle manufacturer has specified for data retrieval is shown in the hexadecimal data section of the CDR report. The hexadecimal data section of the CDR report may contain data that is not translated by the CDR program. The control module contains additional data that is not retrievable by the CDR tool.

01006_SDMCG_r004

Hexadecimal Data

$01	00	00	00	00	00	00	00
$02	00	00	00	00	00	00	00
$03	00	00	00	00	00	00	00
$04	00	00	00	00	00	00	00
$05	80	66	00	00	00	00	00
$06	C5	00	00	00	00	00	00
$0A	00	00	00	00	00	00	00
$0B	00	00	00	00	00	00	00
$0C	00	00	00	00	00	00	00
$0D	00	00	00	00	00	00	00
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**National Highway
Traffic Safety
Administration**

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