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National Highway Traffic Safety Administration

NHTSA

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Special Crash Investigations: On-Site Side Air Bag Non-Deployment Crash Investigation; Vehicle: 2008 Audi A6; Location: District of Columbia; Crash Date: July 2018

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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 non-deployment of the side impact air bags in a 2008 Audi A6 in an intersection crash with a 2016 Chevrolet Equinox. The Audi was traveling north on a one-way street approaching a four-leg intersection, driven by a belted 55-year-old male driver, with a belted 44-year-old female front right passenger. The Chevrolet was eastbound approaching the same intersection. As the Audi traveled through the intersection, the front of the Chevrolet struck the right side of the Audi. None of the air bags in the Audi deployed. The Audi's driver was not injured, but the passenger was transported by ambulance to a hospital, with police-reported possible (C-level) injuries to her head and neck. It was concluded that the vehicle's air bag systems had functioned as intended in this minor severity crash.

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Background

This report documents the non-deployment of the side impact air bags in a 2008 Audi A6 (Figure 1) in an intersection crash with a 2016 Chevrolet Equinox. The Audi had front seat belt pretensioners and certified advanced 208-compliant (CAC) frontal, front seat-mounted side impact, and inflatable curtain (IC) air bags. The Audi was traveling north on a one-way street approaching a four-leg intersection, driven by a belted 55-year-old male, with a belted 44-year-old female front right passenger. The Chevrolet was eastbound approaching the same intersection. As the Audi traveled through the intersection, the front of the Chevrolet struck the right side of the Audi. None of the air bags in the Audi deployed. The Audi driver was not injured, but the front right passenger was transported by ambulance to a hospital, with police-reported possible (C-level) injuries to her head and neck.

Figure 1. Right front oblique view of the Audi (image supplied by an insurance vehicle salvage facility)

The driver/owner of the Audi notified the National Highway Traffic Safety Administration of the crash in July 2018. The notification was identified for further research and forwarded to NHTSA's Crash Investigation Division. An on-site investigation was assigned to the Special Crash Investigations (SCI) team at Crash Research & Analysis, Inc., in July 2018. The SCI team contacted and established cooperation with the insurer of the Audi in order to inspect the vehicle. NHTSA notified the Volkswagen Group of America regarding the crash, and it participated in the inspection. The on-site investigation included the exterior and interior inspections of the Audi to measure the deformation and intrusion, to document the evidence of interior occupant contact,

and to examine and assess the manual and supplemental restraint systems. Due to its date of manufacture, this Audi was not equipped with an Event Data Recorder (EDR) supported by the Bosch Crash Data Retrieval (CDR) tool/software. A technical representative from Volkswagen who participated in the vehicle inspection extracted data using a proprietary tool and software.

The SCI investigator inspected the Chevrolet to document its exterior damage. The Chevrolet had an EDR supported by the Bosch CDR tool, which was imaged during the SCI inspection. The SCI investigator also documented the crash site using photographs and a total station mapping system.

The proprietary data extracted by the Audi technician were communicated to NHTSA and shared with the SCI investigator. No crash data were stored in the vehicle's air bag control modules, and there were no diagnostic trouble codes. The air bag warning lamp in the instrument cluster performed the diagnostic checks at ignition and then cycled off. It was concluded that the vehicle's air bag systems had functioned as intended in this minor severity crash.

Summary

Crash Site

The crash occurred at a signalized four-leg intersection in an urban environment at night in Washington, DC (Figure 2). At the time of the crash, the national weather service reported conditions as fair with a temperature of 28 ºC (82 ºF), a relative humidity of 45 percent, and southerly winds of 16 km/h (10 mph). The police reported the conditions as clear and dry. The roadways and intersection were illuminated by overhead lighting. The intersection had a four-lane, one-way roadway that provided traffic flow in the northerly direction and a three-lane, divided, east/west roadway. Both roadways were posted with 40 km/h (25 mph) speed limits. The profiles and grades of the roadways were straight and level. The one-way roadway consisted of four travel lanes and a left parking shoulder. The right two lanes were designated and marked with painted arrows as right turn only lanes. The left two lanes were designated as straight through lanes marked with painted directional arrows. All travel lanes were surfaced with asphalt. Both edges of the northbound roadway were bordered by concrete curbs. The divided roadway consisted of three lanes in both the east and westbound travel directions, separated by a curbed median and bordered by curbs. The right westbound lane was designated for right turn and straight through traffic, while all other lanes of the divided roadway channeled traffic flow straight through the intersection. The right westbound travel lane was constructed of concrete, while the remaining travel lanes were in asphalt. In the area of the intersection, all travel lanes were delineated by solid white lane lines. Traffic flow through the intersection was controlled by tri-color traffic lights mounted on poles at the quadrants of the intersection. Painted pedestrian crosswalks were present at the north, south, and west legs of the intersection. A crash diagram is included at the end of this report.

Figure 2. Northerly view of the Audi's approach to the intersection

Pre-Crash

The Audi was traveling north in the left-through lane approaching the intersection on a green traffic signal. It was driven by a belted 55-year-old male, with a belted 44-year-old female front right passenger. The Audi driver stated that the traffic volume was heavy as the right-through lane had standing traffic. On his approach to the intersection, an emergency vehicle, with its lights and siren activated, was traveling northbound, approaching his position. In an attempt to yield to the emergency vehicle, he accelerated into the intersection with the intention of steering

right once through the intersection to allow the emergency vehicle to pass him on the left. The driver was not sure of the status of the traffic light when he entered the intersection, as his attention was directed to the emergency vehicle approaching from behind.

The Chevrolet was traveling west approaching the same intersection. It was driven by a belted 54-year-old male with a belted 56-year-old female front right passenger. The driver stated to the investigating police officer that he approached and entered the intersection on a green signal phase with the intention of traveling straight through the intersection. The EDR-recorded travel speed of the Chevrolet was 31 km/h (19 mph) at 5 seconds prior to algorithm enable (AE). The driver maintained minimal throttle as the vehicle's speed increased to 37 km/h (23 mph) at 0.5 seconds prior to AE. The EDR did not record a braking application. Reconstruction of the crash and analysis of the damage patterns indicated that the Chevrolet driver may have steered to the right in an attempted avoidance maneuver.

Crash

The left and center aspects of the Chevrolet's front plane struck the right plane of the Audi. The impact damage to the Audi extended across nearly the entire length of the right plane. The vehicles then separated along their approximate travel paths and traveled to final rest.

Post-Crash

The final rest positions of the vehicles were not documented by the investigating law enforcement agency. There was no physical evidence to support the specific location and heading of the vehicles at final rest. Following the crash, the Audi occupants unbuckled their seat belts, opened their doors, and exited the vehicle under their own power. The Audi driver did not report injury at the scene; however, he rode with the front right passenger as she was transported by ambulance to the emergency room of a local hospital and evaluated for injury. The driver stated during the interview that the female passenger sustained a mild concussion without loss of consciousness. The front right passenger of the Chevrolet was also transported to the local hospital for evaluation. Both vehicles were towed from the scene, considered total losses by their insurance companies and transferred to regional insurance vehicle salvage facilities, where they were inspected for this investigation.

2008 Audi A6

Description

The 2008 Audi A6 (Figure 3) was identified by the Vehicle Identification Number (VIN) WAUAH74F78Nxxxxxx and designation of 3.2. It was manufactured in August 2008. The front-wheel-drive platform was built on a 284 cm (111.9 in) wheelbase and powered by a 3.2-liter gasoline engine linked to a 6-speed automatic transmission with a console-mounted shift lever. The gross vehicle weight rating was 2,305 kg (5,082 lb) with gross axle weight ratings of 1,190 kg (2,623 lb) front and 1,175 kg (2,590 lb) rear. The service brakes were power-assisted, 4-wheel disc with ABS, electronic brakeforce distribution, and emergency braking assist. Additional features included traction control, a tire pressure monitoring system, and electronic stability control. The vehicle manufacturer's recommended tire size and cold tire pressure were P245/40R18 at 260 kPA (38 PSI) in front and 290 kPA (42 PSI) in rear. At the time of the crash, the Audi had Kumho ECSTA LX Platinum tires of size P245/50ZR18, mounted on OEM multi-spoke alloy wheels. All had adequate tread. None sustained damage or were restricted.

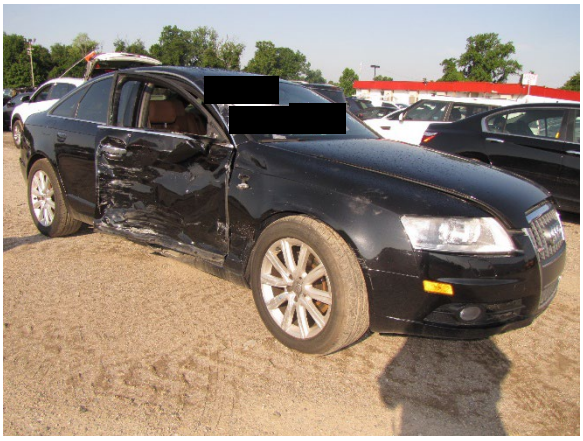


Figure 3. Right front oblique view of the Audi A6

The Audi had seating of up to five occupants (2/3), with front-row, power-adjustable bucket seats and a second-row bench seat with split forward-folding seat backs. All seats were equipped with adjustable head restraints. The driver's was positioned 1 cm (0.4 in) above the seat back, while the front row right was adjusted 3 cm (1.0 in) above the seat back. All seating surfaces were leather. Safety systems included 3-point manual seat belts for the five seat positions, with the front seat belt pretensioners and the CAC frontal, front seat-mounted side impact, and IC air bags.

Vehicle History

The driver reported during the SCI interview that he bought the Audi in 2012 and was its second owner. There was one prior crash, which did not require maintenance to the air bag systems. The only service to the vehicle beyond routine service (such as oil changes and brake replacement) was mechanical maintenance to a drive axle, which was completed by a dealership.

NHTSA Recalls and Investigations

A query of the www.NHTSA.gov/recalls database using the Audi's VIN identified one open recall for this specific vehicle as of the date of this report, identified by NHTSA Recall No. 18V427 and the manufacturer recall no. 69R7. It pertained to the potential rupture of the passenger's frontal air bag inflator and was opened on June 28, 2018. Potential side air bag non-deployment was unrelated to the conditions listed in the recall.

Exterior Damage

The Audi sustained damage distributed along nearly the full length of the right plane (Figure 4). Direct contact damage began on the right front fender/bumper fascia at the leading edge of the right front wheel opening, 38 cm (14.8 in) forward of the right front axle position. It extended rearward across the right doors onto the lower C-pillar, before ending at the aft edge of the right quarter panel, forward of the taillight lens. The damage consisted of abrasions to the painted surface with blue paint transfers from the Chevrolet on the right front alloy wheel, with isolated dents on the right rear door and quarter panel. The total length of the direct and induced contact damage was 387 cm (152.2 in). Although the damage was sideswiping in nature, there was engagement at the right front door and sill. The door was crushed to a maximum depth of 8 cm (3.1 in), and the sheet metal was torn at the lower aft aspect of the door skin. The maximum crush was located 40 cm (15.7 in) aft of the right front axle on the forward aspect of the right front door. The sill was crushed and torn immediately below this area. A crush profile documented using a total station over the total length of the contact damage produced the following resultant measurements: C1 – C4 = 0, C5 = 8 cm (3.1 in), and C6 = 0. The collision deformation classification (CDC) assigned to the Audi's damage profile was 02RDEW1.

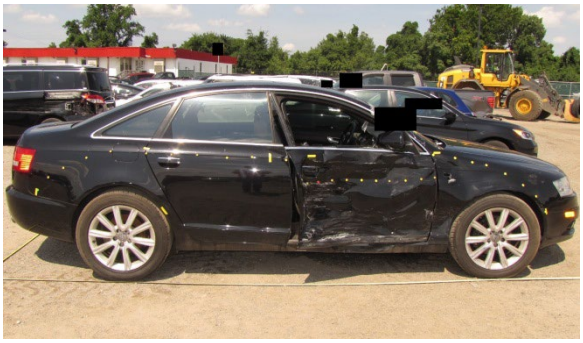


Figure 4. Damage to the right plane of the Audi A6

The severity of the crash (delta V) was calculated by the WinSMASH program. The calculated total delta V for the Audi was 18 km/h (11 mph) with longitudinal and lateral components of -12 km/h (-7 mph) and -14 km/h (-9 mph). The collision met the parameters of the program, and the results were considered reasonable.

Event Data Recorder

The Audi had an air bag control module (ACM) that controlled the sensing, diagnostic, and command functions for the vehicle's air bag systems. The ACM did not have EDR capabilities and was not supported by the Bosch CDR tool/software due to the vehicle's date of manufacture. Audi support with the Bosch tool began with the 2015 model year.

During the joint inspection of the Audi, the vehicle manufacturer's technical representative used a propriety interface and software through the diagnostic link connector to interrogate the Audi's systems. He reported that there were no diagnostic trouble codes present, and no crash data were stored in the ACM or associated modules. The representative further reported that the instrument panel air bag indicator light cycled on at ignition as diagnostics were performed and cycled off as designed. It was the conclusion of the representative that the vehicle's air bag systems performed as intended during the crash. The severity of the crash did not meet the deployment criteria for side air bag deployment.

Interior Damage

The interior of the Audi sustained minor damage that was attributed to occupant contact. There was no damage/intrusion associated with the exterior deformation (Figure 5). Exterior deformation was limited to minor severity crush to the right front door and sill; therefore, it did not cause intrusion to the occupant compartment. The front right passenger contacted the speaker grille on the forward lower quadrant of the right front door and a second speaker grille on the forward mid aspect of the door panel immediately forward of the door pull handle. Both contacts fractured the polymer components. Glazing damage was limited to the disintegration of the right front door glazing. At the time of the crash, this glazing panel was closed. An aftermarket tint film had been applied to the interior surface of the AS3 glazing.

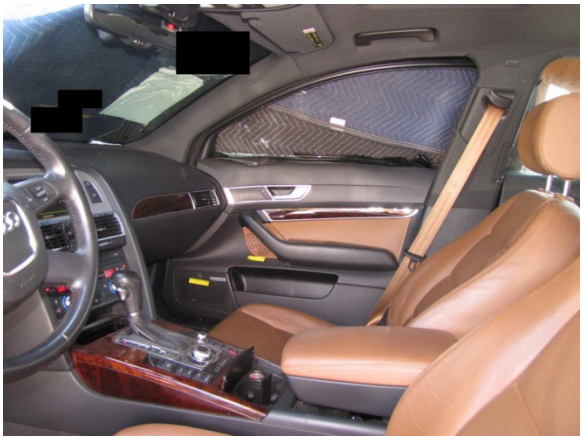


Figure 5. Lateral view across the interior of the Audi, documenting the lack of intrusion and the non-deployed status of the right side impact air bags

Manual Restraint Systems

The Audi was configured with 3-point continuous-loop lap and shoulder seat belts with sliding latch plates for the five designated seat positions. The driver's seat belt retracted onto an emergency locking retractor (ELR), while all other seat belts were configured with switchable ELR/automatic locking retractors (ALR). Both front row D-rings were adjustable, with the driver's in the full-down position and the front row right adjusted to the full-up position at the

time of the vehicle inspection. The front row seat belt systems were equipped with retractor pretensioners.

Historical use indicators suggested that the occupants of the Audi were habitual seat belt users. Both front seat belt webbings displayed frayed edges, indicative of frequent use. The driver's latch plate had a V-groove (Figure 6) worn into the polymer surface from the webbing edge due to frequent use over the life of the vehicle. There were minimal frictional abrasions on the latch plates from occupant loading during the crash. The vehicle's seat belt pretensioner systems did not actuate in this crash. The Audi data confirmed that no pretensioners or air bags actuated/deployed.

Figure 6. Frictional abrasions to the driver's latch plate and the V-groove from historical usage

Figure 7. Non-deployed side impact air bags in the front row right position of the Audi

Supplemental Restraint Systems

The Audi had the CAC frontal air bag system that consisted of dual-stage driver's and passenger's frontal air bags. In addition to the air bags, the CAC system included seat belt buckle switch sensors, seat track position sensors, and a front-right-seat cushion occupant sensing system. The driver's frontal air bag was concealed in the hub of the four-spoke steering wheel. The passenger's frontal air bag was incorporated into the mid-aspect of the right instrument panel. The supplemental side impact air bag system consisted of front seat-mounted air bags and roof side rail-mounted IC air bags (Figure 7). The IC air bags were designed to protect both front and second row outboard occupants.

Side Air Bag Non-Deployment Discussion

The air bag systems were monitored and controlled by a center tunnel-mounted ACM that had crash sensing, fault detection, and diagnostic capabilities. Additional satellite sensors were located in the outer aspects of the upper radiator support and in the lower B-pillars. None of the Audi's supplemental restraint systems deployed in this minor severity side impact crash.

Observations of the properties and extent of the impact damage indicated that the crash resulted in a low deceleration profile to the Audi that extended over an elongated time frame. It was

likely that the threshold for side air bag deployment was not met. Additionally, the low deceleration profile was consistent with the lack of injuries sustained by the Audi's occupants.

The Audi technician's inspection of the vehicle found no fault or diagnostic trouble codes related to the crash. The air bag warning lamp functioned properly at ignition, indicating that the air bag diagnostics were executed. The lamp then cycled off, indicating an "air bag ready" status. It was the conclusion of the technician that the air bag systems functioned as intended during the crash.

2008 Audi A6 Occupant

Driver Demographics

Age/sex:	55 years/male
Height:	180 cm (71 in)
Weight:	93 kg (205 lb)
Eyewear:	None
Seat type:	Forward-facing bucket seat with reclining seat back
Seat track position:	Between middle and rear [6 cm (2.5 in) forward of full-rear]
Manual restraint usage:	3-point lap and shoulder seat belt
Usage source:	Vehicle inspection, driver interview
Air bags:	Frontal, seat-mounted side, and IC air bags available; none deployed
Alcohol/drug data:	None
Egress from vehicle:	Unassisted
Transport from scene:	None, accompanied passenger in ambulance from scene
Type of medical treatment:	None, not injured

Driver Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Not injured	N/A	N/A	N/A

Source: driver interview.

Driver Kinematics

The Audi driver was seated in a normal driving posture with the seat adjusted 6 cm (2.5 in) forward of full-rear, the seat back reclined 30 degrees aft of vertical, and the adjustable head restraint set 1 cm (0.5 in) above the seat back. In this position, the horizontal distance between the center of the driver's frontal air bag module and the seat back was 67 cm (26.5 in), measured 41 cm (16.0 in) above the seat bight. The driver was restrained by the manual seat belt system. Restraint use was determined from the historical use indicators on the belt system and the subtle frictional abrasions on the polymer surface of the latch plate from webbing interaction.

At impact with the Chevrolet, the Audi driver initiated a forward and right lateral trajectory in response to the 2 o'clock direction of force. He loaded the seat belt system as the ELR retractor locked and held the driver in position, preventing him from contact with interior components. His right lateral leg and thigh probably contacted the center console, which, though, was not supported by contact evidence or injury. The driver was not injured in the crash.

Post-crash, the Audi driver checked the condition of his front row right occupant. He also unbuckled his seat belt, opened the left front door, and exited the vehicle unassisted. Although not injured, he rode by ambulance with the front right passenger to the emergency room of a local hospital, where he refused medical treatment.

Front Row Right Occupant Demographics

Age/sex:	44 years/female
Height:	173 cm (68 in)
Weight:	75 kg (165 lb)
Eyewear:	None
Seat type:	Forward-facing bucket seat with reclining seat back
Seat track position:	Mid to forward track position [15 cm (5.9 in) forward of full-rear]
Manual restraint usage:	3-point lap and shoulder seat belt
Usage source:	Vehicle inspection, driver interview
Air bags:	Frontal, seat-mounted side, and IC air bags available; none deployed
Alcohol/drug data:	None
Egress from vehicle:	Unassisted
Transport from scene:	Ambulance
Type of medical treatment:	Treated and released

Front Row Right Occupant Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	No codable injury (only a reported complaint of pain)	None	N/A	N/A

Source: emergency room records.

Front Row Right Occupant Kinematics

The front row right occupant was seated in a mid-to-forward track position, with the seat adjusted 15 cm (5.9 in) forward of full-rear, the seat back reclined 30 degrees aft of vertical, and the adjustable head restraint set 3 cm (1 in) above the seat back. The occupant was restrained by the manual seat belt system, determined by the historical wear on the seat belt system, the subtle frictional abrasions to the polymer surface of the latch plate, and the driver interview.

At impact with the Chevrolet, the occupant initiated a forward and right trajectory in response to the 2 o'clock impact force. She loaded the manual seat belt system. The seat belt system restricted her forward movement and prevented potential contact with frontal components. However, her right lower leg and right lateral knee contacted the right front door panel, evidenced by two fractures of the polymer panel at the locations of the speaker covers (Figure 8). Both fracture sites were small in diameter and were in the proximity of the leg and knee locations. No injury resulted from these contacts. The occupant's head probably contacted the upper right B-pillar, due to its exposure by the seat track position and seat back adjustment. There was no contact evidence to the B-pillar area.

Figure 8. Front row right occupant lower extremity contact damage to the right front door panel

Following the crash, the occupant unbuckled her seat belt and exited the vehicle unassisted. She complained of head and neck pain after the crash. An ambulance transported her to a local hospital, where she was examined for reported head and neck pain. No codable injury was identified after examination, and she was released within hours of the crash.

2016 Chevrolet Equinox

Description

The 2016 Chevrolet Equinox was an SUV (Figure 9) identified by the VIN 2GNALBEK9G1xxxxxx. It was manufactured in April 2016 and equipped with the LT trim level. The Chevrolet was powered by a 2.4-liter gasoline engine linked to a 6-speed automatic transmission with front-wheel drive. The GVWR was 2,250 kg (4,960 lb), with GAWRs of 1,175 kg (2,590 lb) in front and 1,240 kg (2,733 lb) in rear. The service brakes were power-assisted, 4-wheel disc with ABS. Additional standard equipment included electronic stability control, traction control, and a tire pressure monitoring system. The vehicle manufacturer's recommended tire size and cold pressure were P225/65R17 at 240 kPa (35 PSI). At the time of the crash, the Chevrolet had Michelin Latitude Tour all-season radial tires of the recommended size with matching tire identification numbers. The tires were mounted on OEM multi-spoke alloy wheels. The outer sidewall of the left front tire was cut, and the tire was flat. The left rear and both right side tires were not damaged or restricted.

Figure 9. Left front oblique view of the 2016 Chevrolet Equinox

The Chevrolet had seating for up to five occupants (2/3) with front row bucket seats and a second-row, three-passenger split bench seat with folding seat backs. The front and outboard second row positions had adjustable head restraints. Safety systems included manual 3-point lap and shoulder seat belts for the five seat positions, CAC frontal air bag system, front seat-mounted side impact air bags, and dual-sensing (side impact and rollover) roof side rail-mounted IC air bags. Additionally, the front row seat belts had retractor pretensioners. During this crash sequence, the retractor pretensioners actuated, and both frontal and both IC air bags deployed.

Exterior Damage

The exterior damage to the Chevrolet was isolated to the front plane's left and center aspects. Direct contact damage began at the vehicle's centerline and extended 64 cm (25.2 in) to the front left corner. The bumper fascia had separated from the vehicle and was discarded prior to the SCI inspection. Components involved in the damaged area were the bumper fascia, the bumper beam, the grille, the hood face, and the left front fender. The damage deformed the full width of the

bumper beam, resulting in a combined direct and induced length (Field L) of 119 cm (47 in). Maximum crush was 26 cm (10.2 in), located 15 cm (6.0 in) left of the vehicle's centerline. A crush profile documented using a total station along the bumper beam produced the following resultant (less freespace) measurements: C1 = 4 cm (1.6 in), C2 = 20 cm (7.9 in), C3 = 26 cm (10.2 in), C4 = 24 cm (9.4 in), C5 = 14 cm (5.5 in), and C6 = 2 cm (0.8 in). Figure 10 depicts the Chevrolet's front damage pattern. The CDC assigned to this damage profile was 11FYEW2. The delta V calculated by the WinSMASH was 22 km/h (12 mph) with longitudinal and lateral components of -19 km/h (-12 mph) and 11 km/h (7 mph). The collision met the parameters of the program, and the results were considered reasonable.

Figure 10. Front plane damage to the 2016 Chevrolet

Event Data Recorder

The Chevrolet had an air bag sensing and diagnostic module (SDM) mounted to the center tunnel between the front seats. The SDM had EDR capabilities to record crash data. The SCI investigator imaged the EDR using the Bosch CDR tool with software version 17.7.2, via a connection through the diagnostic link connector. The imaged data, reported using software version 21.3, are included at the end of this report.

The SDM monitored and measured tri-axial acceleration and roll rate data. A frontal (longitudinal), side (lateral), and/or rollover (vertical) crash pulse could trigger the recording of a distinct crash event. The minimum threshold to trigger the recording of an event was a calculated vehicle velocity change of 8 km/h (5 mph). The EDR could record two different event types and store a combination of up to three events. Recognized events were termed "non-deployment" or "deployment," and up to two different deployment events and one locked non-deployment event could be stored. Non-deployment events could be overwritten after approximately 250 ignition cycles, whereas deployment events became locked and could not be overwritten.

The imaged data contained one record, which was designated as a deployment event. The ignition cycle counter at the time of the recording and data imaging was 4,995, indicating that the recorded data were related to the crash. At the time of the event, the right front seat was

occupied, and both front seat belts were buckled. The air bag warning lamp was off, and there were no diagnostic trouble codes. The seat belt pretensioners actuated, and the front and IC air bags deployed as a result of the crash. The maximum EDR-recorded longitudinal delta V was -20 km/h (-12 mph) at 150 milliseconds. The maximum lateral delta V was 10 km/h (6 mph) at 150 milliseconds.

A 5.0-second pre-crash buffer that described various vehicle performance parameters (including vehicle speed, accelerator pedal position, brake status, throttle position, and engine rpm) was recorded for each crash event. These performance parameters were recorded asynchronously at 0.5-second intervals.

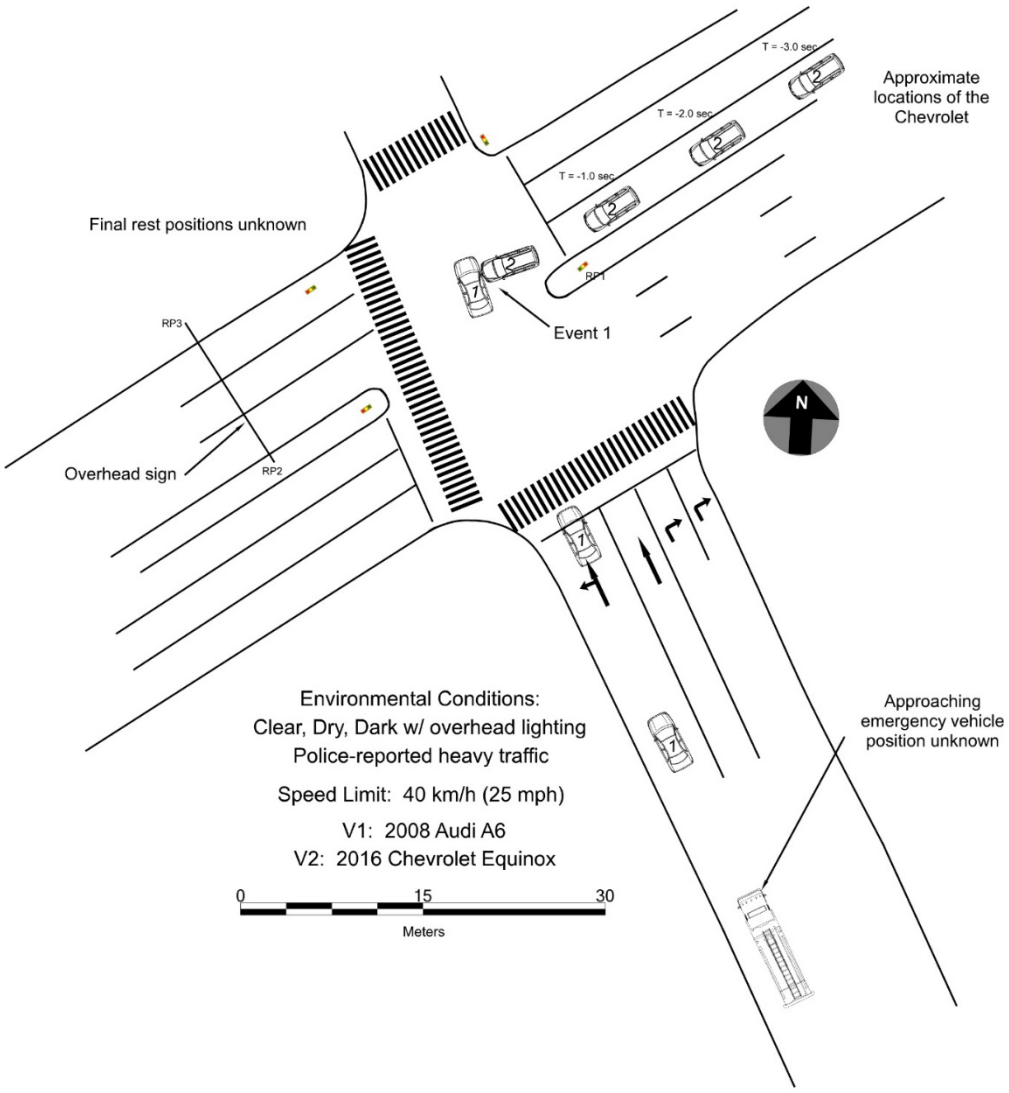
Time sec.	Speed km/h (mph)	Accelerator Pedal Percent	Throttle Percent	Engine rpm	Service Brake Status
-5.0	31 (19)	5	22	1,536	Off
-4.5	32 (20)	7	25	1,600	Off
-4.0	32 (20)	8	26	1,664	Off
-3.5	33 (21)	8	25	1,728	Off
-3.0	34 (21)	7	24	1,728	Off
-2.5	35 (22)	6	21	1,728	Off
-2.0	35 (22)	4	18	1,664	Off
-1.5	36 (22)	3	16	1,280	Off
-1.0	36 (22)	8	26	1,344	Off
-0.5	37 (23)	5	26	1,280	Off

The data trends indicated that the Chevrolet approached the intersection with minimal acceleration. There did not appear to be a recorded avoidance maneuver to the encroaching Audi. The status of the accelerator pedal percentage and brake switch remained constant. Steering wheel angle was not a recorded parameter.

Occupant Data

The Chevrolet was driven by a 54-year-old male, with a 56-year-old female front right passenger. The police-reported seat belt use was coded as unknown. The EDR reported that both front seat belts were buckled. The Chevrolet's driver was not injured in the crash. The female passenger was transported to a local hospital by ambulance for reported back pain.

Crash Diagram



DEPARTMENT OF TRANSPORTATION UNITED STATES OF AMERICA	NHTSA
Case Number:	CR18023

Appendix A: Event Data Recorder Report for 2016 Chevrolet Equinox[1]

[1] The EDR report contained in this technical report was imaged using the version of the Bosch CDR software current at the time of the vehicle inspection. The CDR report contained in the associated Crash Viewer 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	2GNALBEK9G1******
User	
Case Number	
EDR Data Imaging Date	08/07/2018
Crash Date	
Filename	CR18023_V2_ACM.CDRX
Saved on	Tuesday, August 7 2018 at 12:25:38
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 21.3
Reported with Software Licensed to (Company Name)	NHTSA
EDR Device Type	Airbag Control Module
Event(s) recovered	Deployment

Comments

No comments entered.

Data Limitations

Recorded Crash Events:

There are two types of recorded crash events for Front, Side, and Rear (FSR) 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 [8 km/h]. A Non-Deployment Event contains Pre-Crash and Crash data. The oldest Non-Deployment event can be overwritten by a Deployment Event, if all three records are full and the Non-Deployment Event is not locked. A Non-Deployment Event can be overwritten by a more recent Non-Deployment Event if all three records are full and the Non-Deployment is older than approximately 250 ignition cycles. Also, a Non-Deployment event can be recorded if one of the following occurs without the Deployment of any of the frontal air bags, side air bags, or roll bars:

-Pretensioner(s) only Deployment
-Head Rest Deployment
-Battery Cut-Off Deployment

The second type of SDM recorded crash event for FSR Events is the Deployment Event. It also contains Pre-Crash and Crash data. Deployment Events cannot be overwritten or cleared by the SDM.
Rollover Events contains Pre-Crash and Crash data. Rollover event follow the same rules as FSR Deployment events. The SDM can store up to three Events.

Data:

For FSR Events, 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 and Non-Deployment Events, the SDM will record up to 300 milliseconds of data after time zero. The SDM will also record up to 300 milliseconds of Vehicle Acceleration data after time zero.
For Rollover Events, the SDM may record Lateral Acceleration, Vertical Acceleration, and Roll Rate data, if the SDM is rollover capable. This data reflects what the sensing system experienced during the recorded portion of the event. For Rollover Deployment Events, the SDM will record up to 700 milliseconds of data before the Deployment criteria is met and 290 milliseconds after the Deployment criteria is met.
-Deployment loops may be displayed as being deployed in a Non-Deployment event record, if a Deployment event is qualified during the Non-Deployment event. That is, if two or more events are occurring at the same time and one is a Non-Deployment event and one of the others is a Deployment event, and the Deployment event is qualified while the Non-Deployment is still active, the deployed loops may be recorded in the Non-Deployment event record.
-Time between events is recorded in 10 msec intervals and is displayed in seconds for a maximum time of 655.33 seconds.
-The Maximum SDM Recorded Vehicle Velocity Change may occur between the recorded 10 millisecond sample points of the SDM Recorded Vehicle Velocity Change.
-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 Time Zero. That is to say, the last data point may have been captured just before Time Zero but no more than 0.5 second before Time Zero. 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
-Pre-Crash Electronic Data Validity Check Status indicates "Data Not Available" if:
-No data is received from the module sending the pre-crash data
-For diesel powered vehicles, the data displayed as Throttle Position (%) is actually the data for the Air Inlet Flap Position. This is not the same as the throttle position for a gasoline powered engines.
-Belt Switch Circuit Status indicates the status of the seat belt switch circuit.
-The ignition cycle counter will increment when the power mode cycles from OFF/Accessory to RUN. Applying and removing of battery power to the module will not increment the ignition cycle counter.
-Ignition Cycles Since DTCs Were Last Cleared can record a maximum value of 253 cycles and can only be reset by a scan tool.
-Dynamic Deployment Event Counter tracks the number of Deployment events that have occurred during the SDM's lifetime.
-Dynamic Event Counter tracks the number of qualified events (either Deployments, Non-deploy, or Rollover events) that have occurred during the SDM's lifetime.
-For Deployment Events, DTC B0052 (Deployment commanded) shall be recorded with the remainder of the data for this event even though it occurred after Event Enable.
-Once a firing loop has been commanded to be deployed, it will not be commanded to be deployed again during the same ignition cycle. Firing loop deployment times for subsequent deployment type events, during the same ignition cycle, will not be recorded. Also, forced timer loops, will not be shown as being commanded to deploy. Loops without their own independent deployment calibration are called "forced timer loops." Examples of a forced timer loops are Pretensioner Deployment Loop #2 and Knee Deployment Loop.
-The GM parameter name is displayed in parentheses after the NHTSA Part 563 parameter name.
-The reported range of the longitudinal and lateral acceleration values is approximately ± 50 g.
-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 by the Body Control Module, via the vehicle's communication network.
-The Belt Switch Circuit is wired directly to the SDM.

Data Element Sign Convention:
The following table provides an explanation of the sign notation for data elements that may be included in this CDR report. Directional references to sign notation are all from the perspective of the driver when seated in the vehicle facing the direction of forward vehicle travel.

Data Element Name	Positive Sign Notation Indicates
Longitudinal Acceleration	Forward
Longitudinal Velocity Change	Forward
Lateral Acceleration	Left to Right
Lateral Velocity Change	Left to Right
Vertical Acceleration	Downward
Roll Rate	Clockwise Rotation

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.

01042_SDM10P-autoliv_r020

System Status at Time of Retrieval

Dynamic Deployment Event Counter	1
Multi-Event, Number of Events (Dynamic Event Counter)	1
Dynamic OnStar Notification Event Counter	1
Vehicle Identification Number (VIN)	2GNALBEK9G1******
Ignition Cycle, Download (Ignition Cycles at Investigation)	4995
End Model Part Number	00CF83A6
System Type	Autoliv
Software Module Identifier 1	00CF62CF
Software Module Identifier 2	01658277
Software Module Identifier 3	00CF2D7D
Manufacturing Traceability Data, Component Identifier	AS
Manufacturing Traceability Data, Part Number/Broadcast Code	9654
Manufacturing Traceability Data, Supplier Code	E
Manufacturing Traceability Data, Traceability Number	050377013
ESS # 1 Traceability Data, Component Identifier	AU
ESS # 1 Traceability Data, Part Number/Broadcast Code	2577
ESS # 1 Traceability Data, Supplier Code	E
ESS # 1 Traceability Data, Traceability Number	01C76463C
ESS # 2 Traceability Data, Component Identifier	AT
ESS # 2 Traceability Data, Part Number/Broadcast Code	2577
ESS # 2 Traceability Data, Supplier Code	E
ESS # 2 Traceability Data, Traceability Number	01C7817B7
ESS # 3 Traceability Data, Component Identifier	AH
ESS # 3 Traceability Data, Part Number/Broadcast Code	2577
ESS # 3 Traceability Data, Supplier Code	E
ESS # 3 Traceability Data, Traceability Number	01C7F3822
ESS # 4 Traceability Data, Component Identifier	AJ
ESS # 4 Traceability Data, Part Number/Broadcast Code	2577
ESS # 4 Traceability Data, Supplier Code	E
ESS # 4 Traceability Data, Traceability Number	01C771318
ESS # 5 Traceability Data, Component Identifier	DA
ESS # 5 Traceability Data, Part Number/Broadcast Code	4936
ESS # 5 Traceability Data, Supplier Code	E
ESS # 5 Traceability Data, Traceability Number	01C712D0F
ESS # 6 Traceability Data, Component Identifier	DB
ESS # 6 Traceability Data, Part Number/Broadcast Code	4936
ESS # 6 Traceability Data, Supplier Code	E
ESS # 6 Traceability Data, Traceability Number	01C6D8DF2
ESS # 7 Traceability Data, Component Identifier	00
ESS # 7 Traceability Data, Part Number/Broadcast Code	0000
ESS # 7 Traceability Data, Supplier Code	E
ESS # 7 Traceability Data, Traceability Number	000000000
ESS # 8 Traceability Data, Component Identifier	00
ESS # 8 Traceability Data, Part Number/Broadcast Code	0000
ESS # 8 Traceability Data, Supplier Code	E
ESS # 8 Traceability Data, Traceability Number	000000000

System Status at Event (Event Record 1)

Event Record Type	Deployment
OnStar Deployment Status Data Sent	Yes
Complete file recorded (Event Recording Complete)	Yes
Crash Record Locked	Yes
OnStar SDM Recorded Vehicle Velocity Change Data Sent	Yes
Deployment Event Counter	1
Multi-Event, Number of Events (Event Counter)	1
OnStar Notification Event Counter	1
Time From Event 1 to 2 (Time Between Events) (seconds)	Data Not Available
Ignition Cycle, Crash (Ignition Cycles at Event)	4995
Algorithm Active: Frontal	Yes
Algorithm Active: Side	Yes
Algorithm Active: Rollover	Yes
Algorithm Active: Rear	No
Concurrent Event Flag Set	No
Event Severity Status: Frontal Pretensioner	Yes
Event Severity Status: Frontal Stage 1	Yes
Event Severity Status: Frontal Stage 2	Yes
Event Severity Status: Left Side	No
Event Severity Status: Right Side	No
Event Severity Status: Rear	No
Event Severity Status: Rollover	No
Safety Belt Status, Driver (Driver Belt Switch Circuit Status)	Buckled
Safety Belt Status, Right Front Passenger (Passenger Belt Switch Circuit Status)	Buckled
Center Front Row Belt Switch Circuit Status (If Equipped)	Data Not Available
Left Row 3 Belt Switch Circuit Status (If Equipped)	Data Not Available
Center Row 3 Belt Switch Circuit Status (If Equipped)	Data Not Available
Right Row 3 Belt Switch Circuit Status (If Equipped)	Data Not Available
Passenger Seat Occupancy Status	Occupied
Occupant Size Right Front Passenger Child (Passenger Classification Status)	No (Adult)
Passenger Air Bag ON Indicator Status	On
Passenger Air Bag OFF Indicator Status	Off
Low Tire Pressure Warning Lamp Status 0.5 Seconds Prior to Time Zero	Off
Frontal Air Bag Warning Lamp (SIR Warning Lamp Status 0.5 Seconds Prior to Time Zero)	Off
SIR Warning Lamp ON/OFF Time Continuously (seconds)	655330
Number of Ignition Cycles SIR Warning Lamp was ON/OFF Continuously	4904
Ignition Cycles Since DTCs Were Last Cleared 0.5 Seconds Prior to Time Zero	253
Maximum Delta-V, Longitudinal (Maximum Longitudinal SDM Recorded Vehicle Velocity Change for FSR Event) MPH [km/h]	-12 [-20]
Time, Maximum Delta-V (Time From FSR Time Zero to Maximum Longitudinal SDM Recorded Vehicle Velocity Change)(msec)	150
Maximum Delta-V, Lateral (Maximum Lateral SDM Recorded Vehicle Velocity Change for FSR Event) MPH [km/h]	6 [10]
Time Maximum Delta-V, Lateral (Time From FSR Time Zero to Maximum Lateral SDM Recorded Vehicle Velocity Change)(msec)	150

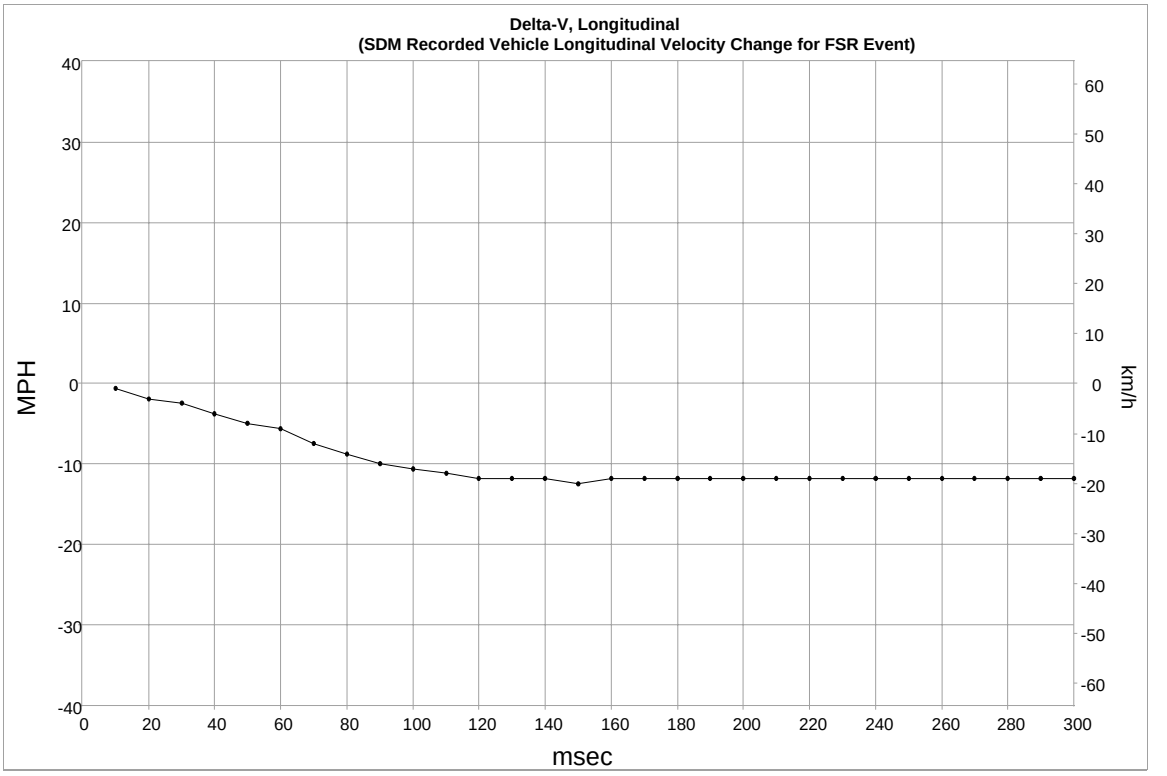
DTCs Present at Time of Event (Event Record 1)

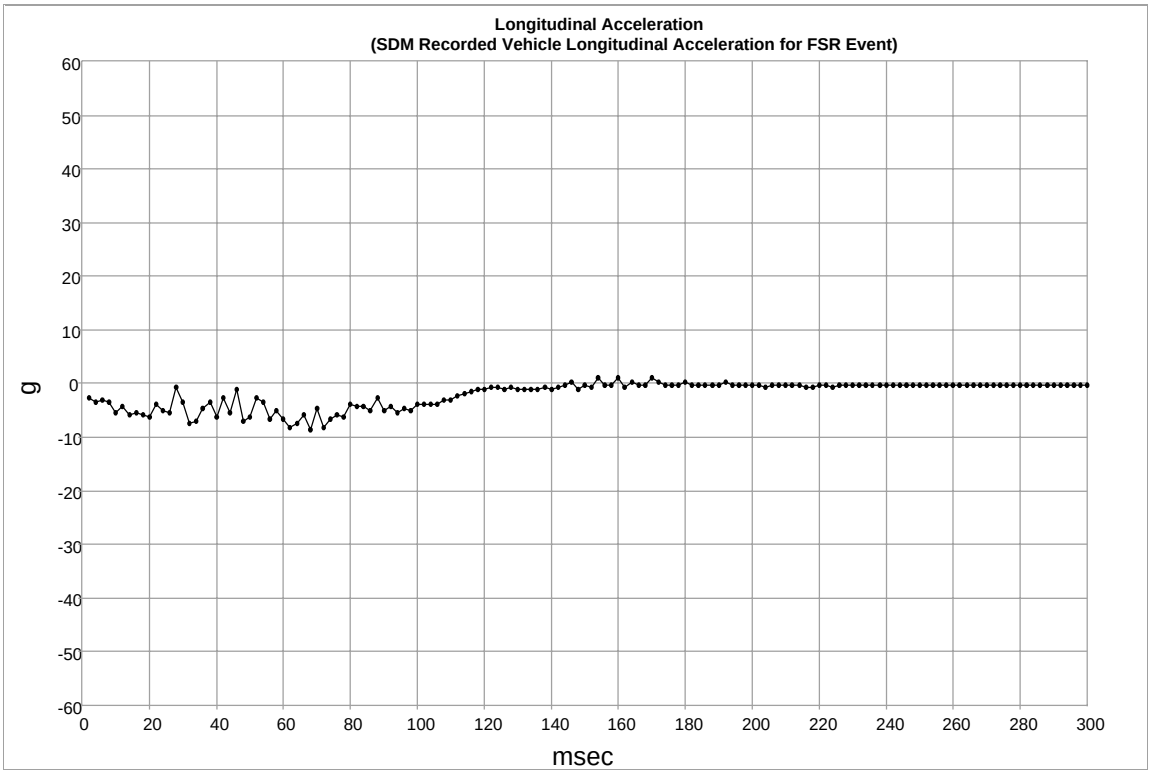
B0052-00

Event Data (Event Record 1)

Driver 1st Stage Deployment Loop Commanded	Yes
Passenger 1st Stage Deployment Loop Commanded	Yes
Driver 2nd Stage Deployment Loop Commanded	Yes
Passenger 2nd Stage Deployment Loop Commanded	Yes
Driver Pretensioner Deployment Loop #1 Commanded	Yes
Passenger Pretensioner Deployment Loop #1 Commanded	Yes
Driver Pretensioner Deployment Loop #2 Commanded	Yes
Passenger Pretensioner Deployment Loop #2 Commanded	Yes
Driver Thorax Loop Commanded	No
Passenger Thorax Loop Commanded	No
Left Row 1 Roof Rail/Head Curtain Loop Commanded	Yes
Right Row 1 Roof Rail/Head Curtain Loop Commanded	Yes
Frontal Air Bag Deployment, Time to 1st Stage Deployment, Driver (Driver 1st Stage Time From Time Zero to Deployment Command Criteria Met) (msec)	33
Frontal Air Bag Deployment, Time to 2nd Stage, Driver (Driver 2nd Stage Time From Time Zero to Deployment Command Criteria Met) (msec)	36
Frontal Air Bag Deployment, Time to 1st Stage Deployment, Right Front Passenger (Passenger 1st Stage Time From Time Zero to Deployment Command Criteria Met) (msec)	33
Frontal Air Bag Deployment, Time to 2nd Stage, Right Front Passenger (Passenger 2nd Stage Time From Time Zero to Deployment Command Criteria Met) (msec)	38
Side air bag deployment, time to deploy, driver (Driver Thorax/Curtain Time From Time Zero to Deployment Command Criteria Met) (msec)	136
Side air bag deployment, time to deploy, right front passenger (Passenger Thorax/Curtain Time From Time Zero to Deployment Command Criteria Met) (msec)	136
Pretensioner Deployment, Time to Fire, Driver (Driver Pretensioner Time From Time Zero to Deployment Loop #1 or Loop #2 Command Criteria Met) (msec)	20
Pretensioner Deployment, Time to Fire, Right Front Passenger (Passenger Pretensioner Time From Time Zero to Deployment Loop #1 or Loop #2 Command Criteria Met) (msec)	20

Longitudinal Crash Pulse (Event Record 1)





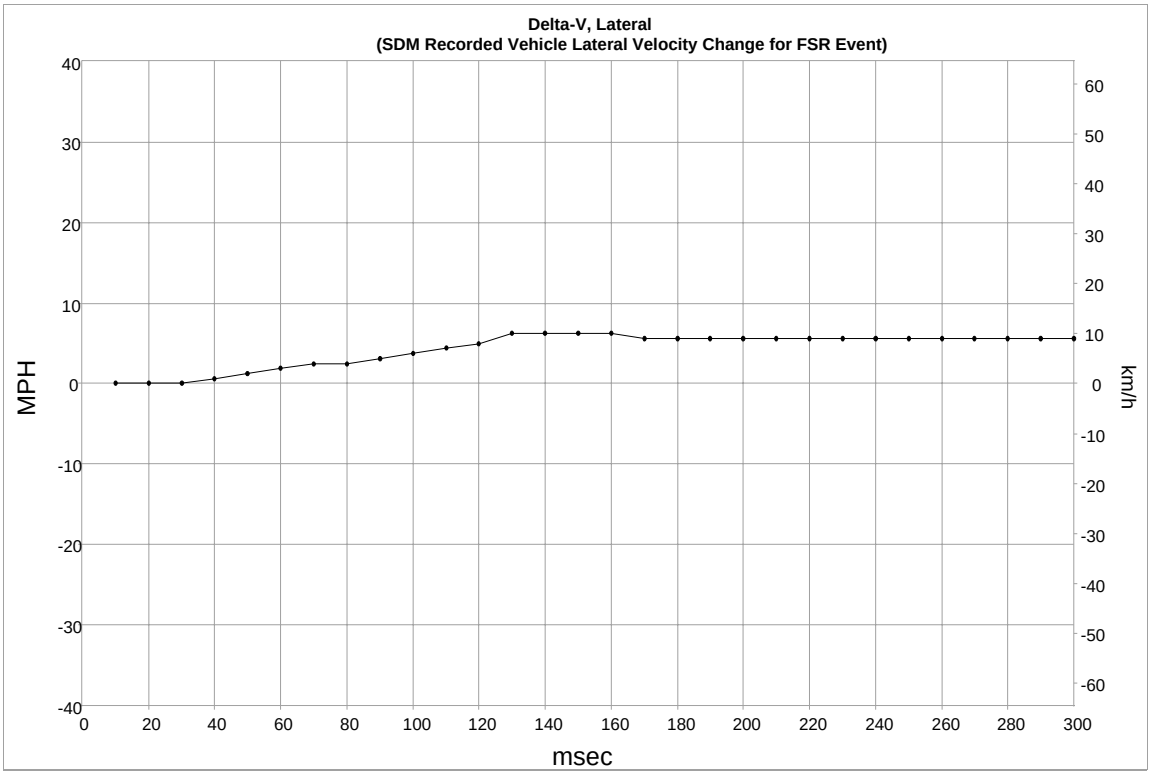
Longitudinal Crash Pulse (Event Record 1)

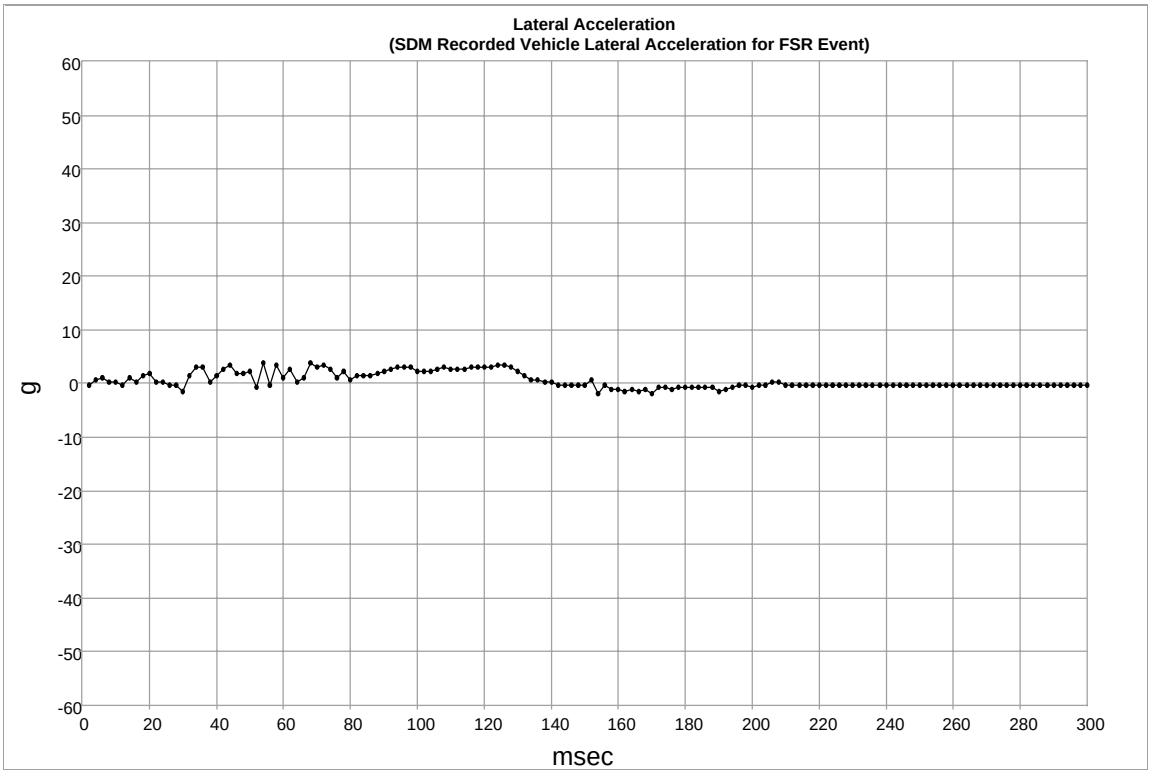
Time (msec)	Delta-V, Longitudinal (SDM Recorded Vehicle Longitudinal Velocity Change for FSR Event) (MPH)	Delta-V, Longitudinal (SDM Recorded Vehicle Longitudinal Velocity Change for FSR Event) (km/h)
10	-0.6	-1.0
20	-1.9	-3.0
30	-2.5	-4.0
40	-3.7	-6.0
50	-5.0	-8.0
60	-5.6	-9.0
70	-7.5	-12.0
80	-8.7	-14.0
90	-9.9	-16.0
100	-10.6	-17.0
110	-11.2	-18.0
120	-11.8	-19.0
130	-11.8	-19.0
140	-11.8	-19.0
150	-12.4	-20.0
160	-11.8	-19.0
170	-11.8	-19.0
180	-11.8	-19.0
190	-11.8	-19.0
200	-11.8	-19.0
210	-11.8	-19.0
220	-11.8	-19.0
230	-11.8	-19.0
240	-11.8	-19.0
250	-11.8	-19.0
260	-11.8	-19.0
270	-11.8	-19.0
280	-11.8	-19.0
290	-11.8	-19.0
300	-11.8	-19.0

Longitudinal Crash Pulse (Event Record 1)

Time (msec)	Longitudinal Acceleration (SDM Recorded Vehicle Longitudinal Acceleration for FSR Event) (g)	Time (msec)	Longitudinal Acceleration (SDM Recorded Vehicle Longitudinal Acceleration for FSR Event) (g)	Time (msec)	Longitudinal Acceleration (SDM Recorded Vehicle Longitudinal Acceleration for FSR Event) (g)
2	-2.6	102	-3.8	202	-0.2
4	-3.4	104	-3.8	204	-0.6
6	-3.0	106	-3.8	206	-0.2
8	-3.4	108	-3.0	208	-0.2
10	-5.4	110	-3.0	210	-0.2
12	-4.2	112	-2.2	212	-0.2
14	-5.8	114	-1.8	214	-0.2
16	-5.4	116	-1.4	216	-0.6
18	-5.8	118	-1.0	218	-0.6
20	-6.2	120	-1.0	220	-0.2
22	-3.8	122	-0.6	222	-0.2
24	-5.0	124	-0.6	224	-0.6
26	-5.4	126	-1.0	226	-0.2
28	-0.6	128	-0.6	228	-0.2
30	-3.4	130	-1.0	230	-0.2
32	-7.4	132	-1.0	232	-0.2
34	-7.0	134	-1.0	234	-0.2
36	-4.6	136	-1.0	236	-0.2
38	-3.4	138	-0.6	238	-0.2
40	-6.2	140	-1.0	240	-0.2
42	-2.6	142	-0.6	242	-0.2
44	-5.4	144	-0.2	244	-0.2
46	-1.0	146	0.2	246	-0.2
48	-7.0	148	-1.0	248	-0.2
50	-6.2	150	-0.2	250	-0.2
52	-2.6	152	-0.6	252	-0.2
54	-3.4	154	1.0	254	-0.2
56	-6.6	156	-0.2	256	-0.2
58	-5.0	158	-0.2	258	-0.2
60	-6.6	160	1.0	260	-0.2
62	-8.2	162	-0.6	262	-0.2
64	-7.4	164	0.2	264	-0.2
66	-5.8	166	-0.2	266	-0.2
68	-8.6	168	-0.2	268	-0.2
70	-4.6	170	1.0	270	-0.2
72	-8.2	172	0.2	272	-0.2
74	-6.6	174	-0.2	274	-0.2
76	-5.8	176	-0.2	276	-0.2
78	-6.2	178	-0.2	278	-0.2
80	-3.8	180	0.2	280	-0.2
82	-4.2	182	-0.2	282	-0.2
84	-4.2	184	-0.2	284	-0.2
86	-5.0	186	-0.2	286	-0.2
88	-2.6	188	-0.2	288	-0.2
90	-5.0	190	-0.2	290	-0.2
92	-4.2	192	0.2	292	-0.2
94	-5.4	194	-0.2	294	-0.2
96	-4.6	196	-0.2	296	-0.2
98	-5.0	198	-0.2	298	-0.2
100	-3.8	200	-0.2	300	-0.2

Lateral Crash Pulse (Event Record 1)





Lateral Crash Pulse (Event Record 1)

Time (msec)	Delta-V, Lateral (SDM Recorded Vehicle Lateral Velocity Change for FSR Event) (MPH)	Delta-V, Lateral (SDM Recorded Vehicle Lateral Velocity Change for FSR Event) (km/h)
10	0.0	0.0
20	0.0	0.0
30	0.0	0.0
40	0.6	1.0
50	1.2	2.0
60	1.9	3.0
70	2.5	4.0
80	2.5	4.0
90	3.1	5.0
100	3.7	6.0
110	4.3	7.0
120	5.0	8.0
130	6.2	10.0
140	6.2	10.0
150	6.2	10.0
160	6.2	10.0
170	5.6	9.0
180	5.6	9.0
190	5.6	9.0
200	5.6	9.0
210	5.6	9.0
220	5.6	9.0
230	5.6	9.0
240	5.6	9.0
250	5.6	9.0
260	5.6	9.0
270	5.6	9.0
280	5.6	9.0
290	5.6	9.0
300	5.6	9.0

Lateral Crash Pulse (Event Record 1)

Time (msec)	Lateral Acceleration (SDM Recorded Vehicle Lateral Acceleration for FSR Event) (g)	Time (msec)	Lateral Acceleration (SDM Recorded Vehicle Lateral Acceleration for FSR Event) (g)	Time (msec)	Lateral Acceleration (SDM Recorded Vehicle Lateral Acceleration for FSR Event) (g)
2	-0.2	102	2.2	202	-0.2
4	0.6	104	2.2	204	-0.2
6	1.0	106	2.6	206	0.2
8	0.2	108	3.0	208	0.2
10	0.2	110	2.6	210	-0.2
12	-0.2	112	2.6	212	-0.2
14	1.0	114	2.6	214	-0.2
16	0.2	116	3.0	216	-0.2
18	1.4	118	3.0	218	-0.2
20	1.8	120	3.0	220	-0.2
22	0.2	122	3.0	222	-0.2
24	0.2	124	3.4	224	-0.2
26	-0.2	126	3.4	226	-0.2
28	-0.2	128	3.0	228	-0.2
30	-1.4	130	2.2	230	-0.2
32	1.4	132	1.4	232	-0.2
34	3.0	134	0.6	234	-0.2
36	3.0	136	0.6	236	-0.2
38	0.2	138	0.2	238	-0.2
40	1.4	140	0.2	240	-0.2
42	2.6	142	-0.2	242	-0.2
44	3.4	144	-0.2	244	-0.2
46	1.8	146	-0.2	246	-0.2
48	1.8	148	-0.2	248	-0.2
50	2.2	150	-0.2	250	-0.2
52	-0.6	152	0.6	252	-0.2
54	3.8	154	-1.8	254	-0.2
56	-0.2	156	-0.2	256	-0.2
58	3.4	158	-1.0	258	-0.2
60	1.0	160	-1.0	260	-0.2
62	2.6	162	-1.4	262	-0.2
64	0.2	164	-1.0	264	-0.2
66	1.0	166	-1.4	266	-0.2
68	3.8	168	-1.0	268	-0.2
70	3.0	170	-1.8	270	-0.2
72	3.4	172	-0.6	272	-0.2
74	2.6	174	-0.6	274	-0.2
76	1.0	176	-1.0	276	-0.2
78	2.2	178	-0.6	278	-0.2
80	0.6	180	-0.6	280	-0.2
82	1.4	182	-0.6	282	-0.2
84	1.4	184	-0.6	284	-0.2
86	1.4	186	-0.6	286	-0.2
88	1.8	188	-0.6	288	-0.2
90	2.2	190	-1.4	290	-0.2
92	2.6	192	-1.0	292	-0.2
94	3.0	194	-0.6	294	-0.2
96	3.0	196	-0.2	296	-0.2
98	3.0	198	-0.2	298	-0.2
100	2.2	200	-0.6	300	-0.2

Rollover Crash Pulse (Event Record 1)
SDM Recorded Vehicle Roll Rate

Contains No Recorded Data

Rollover Crash Pulse (Event Record 1)
Lateral Acceleration (SDM Recorded Vehicle Lateral Acceleration for Rollover Event)

Contains No Recorded Data

Vertical Crash Pulse (Event Record 1)
Normal Acceleration (SDM Recorded Vehicle Vertical Acceleration for Rollover Event)

Contains No Recorded Data

Pre-Crash Data -5.0 to -0.5 sec (Event Record 1)

Times (sec)	Accelerator Pedal, % Full (Accelerator Pedal Position)	Service Brake (Brake Switch Circuit State)	Engine RPM (Engine Speed)	Engine Throttle, % Full (Throttle Position)	Speed, Vehicle Indicated (Vehicle Speed) (MPH [km/h])
-5.0	5	Off	1536	22	19 [31]
-4.5	7	Off	1600	25	20 [32]
-4.0	8	Off	1664	26	20 [32]
-3.5	8	Off	1728	25	21 [33]
-3.0	7	Off	1728	24	21 [34]
-2.5	6	Off	1728	21	22 [35]
-2.0	4	Off	1664	18	22 [35]
-1.5	3	Off	1280	16	22 [36]
-1.0	8	Off	1344	26	22 [36]
-0.5	5	Off	1280	26	23 [37]

Pre-Crash Data -2.0 to -0.5 sec (Event Record 1)

Times (sec)	Cruise Control Active	Cruise Control Resume Switch Active	Cruise Control Set Switch Active	Engine Torque (lb-ft [N-m])	Reduced Engine Power Mode Indicator
-2.0	No	No	No	4 [5]	Off
-1.5	No	No	No	0 [0]	Off
-1.0	No	No	No	10 [13]	Off
-0.5	No	No	No	42 [57]	Off

Hexadecimal Data

```
DPID $11
FF F0 00 FC C0 7C 00

DPID $15
01 02 03 04 05 06 07

DPID $16
08 09 0A 0D 0E 00 00

DPID $17
00 00 00 00 00 00 00

DPID $32
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DOT HS 813 261
February 2022

U.S. Department
of Transportation

**National Highway
Traffic Safety
Administration**

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