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Special Crash Investigations: Remote Move-Over-Law Crash Investigation; Vehicle: 2017 Ford Explorer; Location: South Dakota; Crash Date: January 2021

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Technical Report Documentation Page

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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 case data are based on information available to the Special Crash Investigation team on the date this report was submitted.

16. Abstract
The crash occurred in the morning in January 2021 in South Dakota where the struck vehicle was a fully marked 2017 Ford Explorer State Highway Patrol vehicle. The driver was a belted 34-year-old male trooper. The front-right seat was occupied by a belted 23-year-old female civilian and the second-row-right seat was occupied by an unbelted 25-year-old male trooper recruit. The 23-year-old female had been involved in a previous crash. The State Highway Patrol vehicle had responded to an earlier crash in the westbound lanes and was parked partially in the left eastbound lane with its left tires in the left shoulder and its blue and amber overhead emergency lights activated. The striking vehicle was a 2017 Buick Enclave driven by a belted 31-year-old female. The Buick driver said she was initially looking at the crash in the westbound lanes. When she looked forward, she saw the parked State Highway Patrol vehicle but was unable to stop in time. The Buick's front plane struck the Ford's back-right plane. The Ford was displaced to the left and came to rest in the median facing northeast. The Buick was displaced to the right and came to rest in the right eastbound lane facing west. All three Ford occupants sustained "B" non-incapacitating injuries and were transported by ambulance to a local trauma center. They were all treated and released. The Buick driver was not injured or transported. She was cited for careless driving, failure to stop for an emergency vehicle, and causing an accident involving a stopped emergency vehicle. Both vehicles were towed due to damage.

17. Key Words move-over law, crash, injury, emergency lights	18. Distribution Statement This document is available to the public from the National Highway Traffic Safety Administration, National Center for Statistics and Analysis, https://crashstats.nhtsa.dot.gov.

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Table of Contents

Special Crash Investigations
Remote Move-Over-Law Crash Investigation
Case No. DS22003
Vehicle: 2017 Ford Explorer
Location: South Dakota
Crash Date: January 2021

Background

This report documents the remote investigation of a crash selected by the Special Crash Investigations (SCI) group of the National Highway Traffic Safety Administration to be included in its "Move-Over Law" investigations. The investigation used data obtained from local authorities including the police report and on-scene police photos. The source materials were used to document the facts of the case and reconstruct the causal factors of the crash relative to South Dakota's Move-Over Law. This investigation was started by SCI in response to a notification sent by the SCI team in October 2021 containing the State crash report, on-scene photos, and an online news release. The case was assigned on the same day.

The crash occurred in the morning in January 2021 in South Dakota. The crash site was in the eastbound left lane of a two-lane divided interstate highway. The asphalt roadway was straight and level, and the posted speed limit was 129 kmh (80 mph). The struck vehicle was a fully marked 2017 Ford Explorer State Highway Patrol vehicle. The driver was a belted 34-year-old male trooper. The front-right seat was occupied by a belted 23-year-old female civilian and the second-row-right seat was occupied by an unbelted 25-year-old male trooper recruit. The State Highway Patrol vehicle had responded to an earlier crash that had occurred in the westbound lanes and was parked partially in the left eastbound lane with its left tires on the left shoulder and its blue and amber overhead emergency lights activated. The 23-year-old female had been involved in the previous crash. The striking vehicle was a 2017 Buick Enclave driven by a belted 31-year-old female. The Buick was traveling eastbound in the left lane. The Buick driver said she was initially looking at the crash in the westbound lanes. When she looked forward, she saw the parked State Highway Patrol vehicle but was unable to stop in time. The Buick's front plane (Figure 1) struck the Ford's back-right plane (Figure 2).

Figure 1. 2017 Buick Enclave, looking east (police photo)

Figure 2. 2017 Ford Explorer, looking northwest (police photo)

The Ford was displaced to the left and came to rest in the median. The Buick was displaced to the right and came to rest in the right eastbound lane. All three Ford occupants sustained "B" non-incapacitating injuries and were transported by ambulance to a local trauma center. They were all treated and released. The Buick driver was not injured. She was cited for careless driving, failure to stop for an emergency vehicle, and causing an accident involving a stopped emergency vehicle. Both vehicles were towed from the scene due to damage.

Police investigators imaged the event data recorders (EDRs) for both vehicles and gave PDF versions of the reports to SCI in April 2022. The complete reports (minus hexadecimal data) are included in this report as Appendix A and B.

Summary

Crash Site

The crash site was the eastbound lanes of a divided interstate highway (Figure 3). The asphalt roadway was straight, level, and dry. The roadway had two eastbound lanes each measuring approximately 3.8 m (12.4 ft) wide separated by a dashed white painted stripe and bordered by a solid yellow painted fog line on the left and a solid white painted fog line on the right. The roadway had grooved asphalt shoulders with milled-in rumble strips. Bordering the left shoulder was a depressed grass-covered median. Based on the on-scene images provided by the police, the pavement and lane lines appeared to be in good condition. The posted speed limit was 129 km/h (80 mph). The weather at the nearest reporting station was -3 ºC (26 º F), 88 percent humidity, and the winds were out of the south southwest at 20 km/h (12.4 mph). Conditions were daylight and cloudy. A crash diagram is included at the end of this report.

Figure 3. Final rest area, looking east (police photo)

Pre-Crash

The Ford State Highway Patrol vehicle had responded to a separate crash that had occurred earlier in the day in the westbound lanes. The Ford was parked partially in the left eastbound lane with its left tires in the left shoulder and its blue and amber overhead emergency lights activated. The driver was a belted 34-year-old male State trooper. The front-right seat was occupied by a belted 23-year-old female who had been involved in the previous crash. The second-row-right seat was occupied by a 25-year-old male State trooper recruit. The Buick was driven by a belted 31-year-old female. The Buick was traveling eastbound in the left lane. The Buick driver said she was initially looking at the crash in the westbound lanes. When she looked forward again,

she saw the parked State Highway Patrol vehicle but was unable to stop in time. The vehicle was traveling at an EDR reported speed of 97 km/h (60.2 mph) 5.0 seconds before impact. The Buick's pre-crash speeds and distances traveled are shown in the table below. The EDR said the brake switch circuit state was "on" from -5.0 seconds to -0.5 seconds.

Time	Vehicle Speed		Distance Traveled			
			Incremental		Cumulative	
-sec	km/h	mph	m	ft	m	ft
5	97	60	NA	NA	NA	NA
4.5	97	60	13.4	44	13.4	44
4	97	60	13.4	44	26.8	88
3.5	95	59	13.2	43.2	40	131.2
3	95	59	13.2	43.2	53.2	174.4
2.5	93	58	13	42.5	66.1	216.9
2	93	58	13	42.5	79.1	259.4
1.5	93	58	13	42.5	92	301.9
1	92	57	12.7	41.8	104.8	343.7
0.5	92	57	12.7	41.8	117.5	385.5

Crash

The Buick's front plane struck the Ford's back plane (Event 1). The Buick's EDR reported a maximum longitudinal delta V of -46 km/h (-28.5 mph) at 200 ms and a maximum lateral delta V of 9 km/h (5.5 mph) at 96 ms. The driver's frontal air bag and both inflatable curtain (IC) air bags deployed. Both front-row seat belt pretensioners actuated at this time.

The Ford's EDR reported a maximum longitudinal delta V of 35 km/h (21.7 mph) at 185 ms. The driver and passenger outboard seat-mounted side impact air bags and both IC air bags deployed at 36.5 ms. Both front-row retractor pretensioners actuated at this time.

The Buick was displaced to the right as it began a counterclockwise rotation. The vehicle traveled diagonally and came to rest in the right travel lane. The Buick was moved out of the travel lane prior to police arrival by a tow truck. The Ford was displaced to the left as it began a counterclockwise rotation. The vehicle traveled into the median and came to rest in the snow-covered median facing northeast (Figure 4).

Figure 4. Final rest for the 2017 Ford Explorer, looking northeast (police photo)

Post-Crash

The Ford's three occupants sustained "B" non-incapacitating injuries and were removed from the vehicle by the fire department. They were transported by ambulance to a local trauma center where they were treated and released. The Buick driver was not injured. She was cited for careless driving, failure to stop for an emergency vehicle, and causing an accident involving a stopped emergency vehicle. Both vehicles were towed from the scene due to damage.

Move-Over Discussion

South Dakota's Move-Over Law (32.31-6.1) states that upon approaching from any direction any stopped, authorized emergency vehicle making use of red visual signals meeting the requirements of this title, the driver of every other vehicle shall come to a complete stop before reaching the stopped emergency vehicle and may, unless otherwise directed, proceed with caution only after ascertaining that it is safe to do so.[1] Upon approaching from any direction any

[1] https://sdlegislature.gov/Statutes/32-31-6.1

stopped vehicle making use of amber, yellow, or blue warning lights, the driver of every other vehicle shall:

(1) If driving on an interstate highway or other highway with two or more lanes traveling in the same direction as the vehicle, merge into the lane farthest from the vehicle at least 300 feet before the vehicle and proceed with caution, unless otherwise directed; or

(2) If driving on a two-lane highway, at least 300 feet before the vehicle, slow to a speed that is at least 20 mph less than the posted speed limit or 5 mph when the speed limit is posted at 20 mph or less and proceed with caution, unless otherwise directed.

The violation of the law is a Class 2 misdemeanor. The Buick driver was cited for a violation of the Move-Over Law.

2017 Ford Explorer

Description

The struck vehicle was a 2017 Ford Explorer SUV configured as a State Highway Patrol vehicle. It was identified by the police using the Vehicle Identification Number (VIN) 1FM5K8AT2HGxxxxxx. The vehicle had a 3.5-liter, 6-cylinder gasoline engine, 6-speed automatic transmission, 4-wheel drive, and 4-wheel antilock brake system. It had five doors and seating for five. The exterior color was shadow black with gold-colored lettering that read "STATE TROOPER" on the rear hatch and on both rear-quarter panels.

Lighting (Move-Over Data)

Type of lighting:	Roof mounted light bar, 4-way flasher
Lighting status on other emergency vehicles:	N.A.
Lighting source:	Strobe
Lighting color:	Blue/amber (rear), red (front)
First responder directional arrows/signals in use:	No
Supplemental traffic controls:	None
Location of supplemental traffic controls:	None
Retroflective tape power unit/cargo body:	No tape
Secondary collisions from first harmful event:	No

Exterior Damage

The State Police Ford had moderate back-plane damage from the impact with the Buick's front plane (Figure 5). The Field L extended from the left-bumper corner to the right-bumper corner. There was direct damage that began at the right bumper and extended along the right plane to the C-pillar and right-rear door. There was induced damage and buckling to the roof and the right-rear tire was displaced forward. The rear hatch glazing and right-rear window glazing was disintegrated. The collision deformation classification was 06BREE6.

Figure 5. Back right, looking northeast, 2017 Ford Explorer (law enforcement image)

Event Data Recorder

The Ford had a restraints control module with EDR capabilities. The EDR could record two events. Each record has 5 seconds of pre-crash data and at least 300 ms of post-crash data. The pre-crash data includes vehicle speed, accelerator pedal percentage, service brake, engine rpm, and antilock brake system activity. The vehicle was parked with the engine running at the time of the crash. The EDR reported the driver's and passenger's seat belt status as "buckled."

The EDR was imaged by the police using the Bosch Crash Data Retrieval (CDR) software/tool version 19.6.3. A single event was recovered for ignition cycle 1,348. The event occurred during the initial rear-plane impact with the Buick's front plane. The EDR reported a maximum longitudinal delta V of 35 km//h (21.7 mph) at 185 ms. The driver and passenger outboard seat-mounted side impact air bags and both IC air bags deployed at 36.5 ms. Both front-row retractor pretensioners actuated at this time.

NHTSA Recalls and Investigations

Searches in the NHTSA recall database (www.nhtsa.gov/recalls) in May 2022 and September 2024 using the Ford's VIN revealed no unrepaired recalls other than a fascia issue opened in January 2024.

Interior Damage

The Ford sustained minor interior damage. The side and back windows were disintegrated from impact forces. The tailgate and right-rear door were jammed shut. The left-front door was removed by EMS to extricate the driver. Based on police photos, it appeared that there may have been a small amount of intrusion at the second-row-right seat position but this could not be verified.

Manual Restraint Systems

The Ford had lap and shoulder seat belts for all seat positions. The front-row seat belts had retractor pretensioners. According to the EDR report, both front-row retractor pretentions actuated. The EDR report said that both front-row seat belts were buckled. The police report said that the front-left seat belt was not used, the front-right seat belt was used, and the status of the second-row-right seat belt was unknown. The medical report for the second-row-right seat occupant said this occupant was unbelted.

Supplemental Restraint Systems

The Ford's supplemental restraint systems included driver's and front passenger's frontal air bags, front-row outboard seat-mounted side impact air bags, a driver's knee air bag, and front- and second-row IC air bags. Both IC and both front-side impact air bags deployed during the impact with the Buick.

2017 Ford Explorer Occupants

Driver Demographics

Age/sex:	34 years/male
Height:	Unknown
Weight:	94 kg (207 lb)
Eyewear:	Unknown
Seat type:	Bucket
Seat track position:	Unknown
Manual restraint usage:	Lap and shoulder seat belt available, used
Usage source:	EDR report
Air bags:	Frontal, seat-mounted, and IC air bags available; seat-mounted and IC air bags deployed
Alcohol/drug data:	Negative for alcohol
Egress from vehicle:	Removed by fire department
Transport from scene:	Ambulance
Type of medical treatment:	Treated and released

Driver Injuries

Inj. No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Thoracic myofascial strain, strain of muscle, back wall of thorax	640478.1	Seat back	Certain

Source: Emergency department, radiology

Driver Kinematics

The 34-year-old male driver was seated in an upright posture and was belted. He was working on a report from a previous crash. At impact with the Buick, the Ford was displaced forward, and the driver contacted the head restraint with his head and the seat back with his back. He said that he struck his head but did not lose consciousness. He sustained police-reported “B” non-incapacitating injuries and was transported by ambulance to a local hospital where he was treated and released.

Front Passenger Demographics

Age/sex:	23 years/female
Height:	Unknown
Weight:	Unknown
Eyewear:	Unknown
Seat type:	Bucket
Seat track position:	Unknown
Manual restraint usage:	Lap and shoulder belt used
Usage source:	EDR, police report

Air bags:	Frontal, seat-mounted, and IC air bags available; seat-mounted and IC air bags deployed
Alcohol/drug data:	Negative for alcohol
Egress from vehicle:	Removed by fire department
Transport from scene:	Ambulance
Type of medical treatment:	Treated and released

Front Passenger Injuries

Inj. No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Abrasion, right back of hand	710202.1	IC air bag	Probable
2	2 cm (0.8 in) laceration, scalp	110602.1	Head restraint	Probable
	Self-reported loss of consciousness	Not codeable		

Source: Emergency department, radiology

Front Passenger Kinematics

The 23-year-old female front-right occupant was seated in an unknown posture and was wearing her seat belt. She was waiting for transport from an earlier crash. At impact with the Buick, the Ford was displaced forward, and her head contacted the head restraint. Her right hand contacted the deploying right IC air bag. She sustained police-reported “B” non-incapacitating injuries and was transported by ambulance to a local hospital where she was treated and released.

Second-Row-Right Occupant Demographics

Age/sex:	25 years/male
Height:	Unknown
Weight:	Unknown
Eyewear:	Unknown
Seat type:	Folding bench
Seat track position:	NA
Manual restraint usage:	Lap and shoulder belt available, not used
Usage source:	Ambulance report
Air bags:	IC air bag available; deployed
Alcohol/drug data:	Negative for alcohol
Egress from vehicle:	Removed by fire department
Transport from scene:	Ambulance
Type of medical treatment:	Treated and released

Second-Row-Right Occupant Injuries

Inj. No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Concussive with loss of consciousness of less than 30 minutes	161003.2	Other interior object (metal restraint cage)	Certain
2	Abrasion/hematoma left posterior scalp	110402.1	Other interior object (metal restraint cage)	Certain

Source: Emergency department, radiology

Second-Row-Right Occupant Kinematics

The 25-year-old male second-row-right occupant was seated in an unknown posture. He was unrestrained according to an ambulance report. At impact with the Buick, the Ford was displaced forward, and his head contacted the metal restraint cage behind the second-row seat. He sustained police-reported “B” non-incapacitating injuries and was transported by ambulance to a local hospital where he was treated and released.

2017 Buick Enclave

Description

The striking vehicle was a 2017 Buick Enclave SUV. It was identified by police using the VIN 5GAKVCKD1HJxxxxxx. The vehicle had a 3.6-liter, 6-cylinder gasoline engine, 6-speed automatic transmission, and all-wheel-drive.

Exterior Damage

The Buick sustained moderate front-plane damage from the impact to the Ford's back plane (Figure 6). The Field L extended from the left-bumper corner to the right-bumper corner. There was direct damage that began at the left-bumper corner and extended along the left plane to the B-pillar and left-front door. There was direct damage to the grille, hood, and left door. The left-front tire was partially detached. The collision deformation classification was 12FLEE6.

Figure 6. 2017 Buick Enclave, oblique view (police photo)

Striking Vehicle Driver (Move-Over Data From Police)

Police injury severity:	No injuries
Speeding related:	No
Condition (impairment) at time of crash:	None
Police reported alcohol presence:	None
Alcohol test:	None given
Alcohol test result:	None
Police reported other drug presence:	No
Method of drug determination by police:	None
Other drug test result	None given
Physical/mental conditions:	Unknown
Driver fatigue:	Unknown
Driver's distraction/inattention to driving:	N.A.
Driver's distractions:	N.A.
Driver illness:	No illness
Driver's license type/status:	Full driver license
Graduated driver licensing status:	N.A.
Violations charged:	Failure to stop for emergency vehicle Careless driving

Striking vehicle driver sight line to the struck firstresponder vehicle clear:	Yes
Striking vehicle driver sight line to the struck firstresponder vehicle obscured:	No
Driver notes:	None

Event Data Recorder

The Buick had an air bag control module that had EDR capabilities. The EDR could record up to two events. Each record has 5 seconds of pre-crash data and at least 300 ms of post-crash data. The pre-crash data includes acceleration pedal percentage, service brake (brake switch circuit state), engine rpm, engine throttle percentage, and vehicle speed. The EDR reported the driver's seat belt status as "buckled."

The EDR was imaged by the police using Bosch CDR software/tool version 19.6.3. A single event was recovered for ignition cycle 3,993. The event occurred during the initial front-plane impact with the Ford's back plane. The EDR reported a maximum longitudinal delta V of -46 km/h (-28.5 mph) at 200 ms and a maximum lateral delta V of 9 km/h (5.5 mph) at 96 ms. The driver's frontal air bag and both IC air bags deployed. Both front-row seat belt pretensioners actuated at this time.

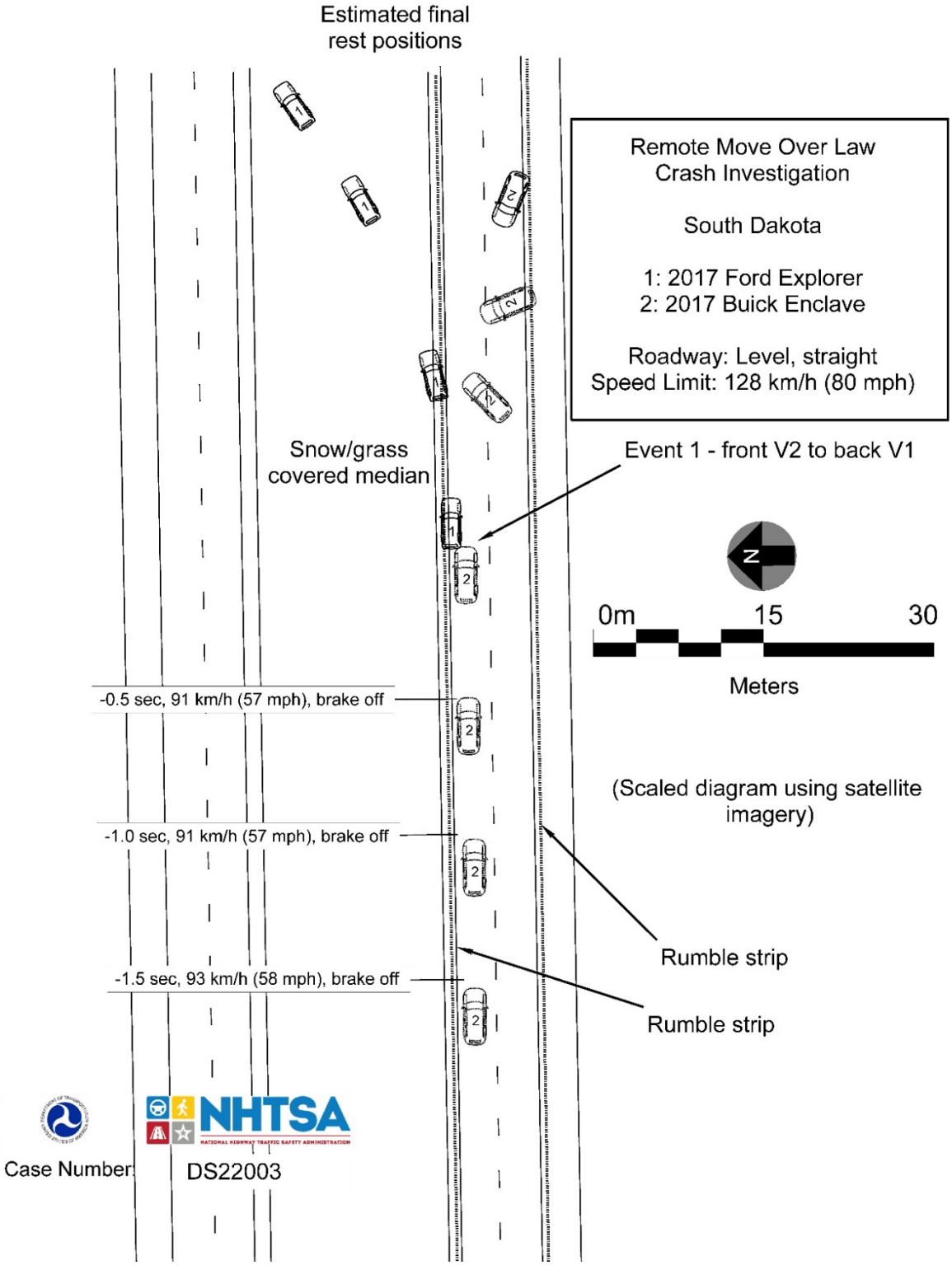
NHTSA Recalls and Investigations

Searches in the NHTSA recall database (www.nhtsa.gov/recalls) in April 2022 and September 2024 using the Buick Enclave's VIN revealed no unrepaired recalls. In 2023 there was an air bag related recall that occurred after this crash.

Occupant Data

According to the police report, the belted 31-year-old female Buick driver was not injured or transported.

Crash Diagram



Appendix A: 2017 Ford Explorer EDR Report

The Bosch CDR report in this report was imaged by the investigating police department. Only a PDF copy of the Bosch CDR report was provided by the police and the hexadecimal data contained in the report has been deleted due to the potential personal identifiable information contained in the 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	1FM5K8AT2HGDxxxxxx
User	xxxx
Case Number	xxxx
EDR Data Imaging Date	xxx
Crash Date	xxx
Filename	1FM5K8AT2HGDxxxxxx_ACM.CDRX
Saved on	xxx
Imaged with CDR version	Crash Data Retrieval Tool 19.6.3
Imaged with Software Licensed to (Company Name)	xxx
Reported with CDR version	Crash Data Retrieval Tool 19.6.3
Reported with Software Licensed to (Company Name)	xxxx
EDR Device Type	Airbag Control Module
ACM Adapter Detected During Download	No
Event(s) recovered	locked side event

Comments

Through DLC at crash scene

The retrieval of this data has been authorized by the vehicle's owner, or other legal authority such as a court order or search warrant, as indicated by the CDR tool user on Friday, January 29 2021 at 12:57:52.

Data Limitations

Data Imaging:

CAUTION: When imaging data directly from the RCM on a bench top, make sure the RCM is placed on a flat surface without any movement (static) while connected to and powered by the CDR interface. Not following the above guideline for bench top imaging could risk inducing new events to be recorded in the RCM and possibly overwriting a Non airbag deployment.

Note that the RCM Adapter Detected during Download parameter equal to " Yes" indicates that the EDR data was collected directly from the RCM. When equal to "No", it indicates that the EDR data was collected through the OBD II from the vehicle.

Restraints Control Module (RCM) Recorded Crash Event(s):

The RCM can store up to two crash events. Event types are categorized as follow:

1. Non deployment trigger event is an event in which EDR recording trigger threshold is met or exceeded (minimum of 5 mph (8kph) Accumulated Delta Velocity within 150ms interval), but no device(s) have deployed. The data from such event can be overwritten by subsequent events.

2. Airbag deployment event is an event in which frontal, side or curtain airbags have deployed. Note that such event cannot be overwritten or cleared from the Restraints Control Module (RCM). Once the RCM has deployed any airbag device(s), the RCM must be replaced.

3. Some RCM may also categorize Non airbag deployment event. This type is an event in which non airbag devices such as pretentioners, knee bolster etc… have deployed. Note that such event can be overwritten given a subsequent "deployment" event.

"Time zero" or Event Beginning of any event (First Record or Second Record) is defined as the first Algorithm wake up during that event. So all the Pre-Crash, At Event, Delta V Data, deployment times etc… are relative to "Time zero".

It is possible that conditions in a crash may result in an incomplete event data record.

EDR Data Elements Overview/Interpretation in CDR Report:

Under CDR File Information Section

- Event(s) recovered indicates if an event was detected and recorded by RCM. If no event is detected, it will indicate "none". If a trigger or non airbag deployment event is detected, it will indicate "unlocked event". If an airbag deployment is detected, it will indicate "locked frontal event", or "locked side event", or "locked rollover event".

Under System Status at Event Section

- Complete file recorded indicates if data from the recorded event has been fully written to the RCM memory.
- If the RCM detected a peripheral crash sensor was lost during an event, the crash sensor would be identified as well as the time it was lost during that event relative to Time zero. If no loss of a peripheral crash sensor, nothing would be displayed. Note in some vehicles, loss of a peripheral crash sensor may lead to the loss of another peripheral crash sensor due to shared communication.

Under Deployment Data Section

- If the RCM commanded a deployment during an event, the deployment device(s) would be identified as well as the time the RCM commanded its deployment relative to Time zero. If no device was commanded to deploy by the RCM, nothing (no deployment device (s)) would be displayed.

Under Pre-Crash Data -5 to 0 sec

- Steering Wheel Angle if Applicable: positive value indicates left turn, and negative value would indicate right turn.
- Stability Control Lateral Acceleration if Applicable: Lateral Acceleration (Y-direction) is the acceleration along the lateral axis of the vehicle, reported as positive when accelerating to the left.
- Stability Control Longitudinal Acceleration if Applicable**:** Longitudinal Acceleration (X-direction) is the acceleration along the longitudinal axis of the vehicle, reported as positive when accelerating in a forward direction.
- Stability Control Yaw Rate if Applicable: The Yaw Axis is the vertical axis of the vehicle, generally perpendicular to the plane of the road. A positive Yaw Rate is counter-clockwise when observing the vehicle from above.
- Stability Control Roll Rate if Applicable: The Roll Axis is the longitudinal axis of the vehicle, generally aligned with the primary axis of motion of the vehicle. A positive Roll Rate is counter-clockwise when observing the vehicle from the front.

Under Longitudinal Crash Pulse

- Delta-V, longitudinal: SAE J211 sign convention, negative value generally indicates a front crash and positive value generally indicates a rear crash. Longitudinal delta-V reflects the change in forward velocity that the sensing system experienced from Time zero. It is not the speed the vehicle was traveling before the event. Note that the vehicle speed is recorded separately. This data should be examined in conjunction with other available physical evidence from the vehicle and scene when assessing occupant or vehicle longitudinal delta-V.

Under Lateral Crash Pulse

- Delta-V, lateral: SAE J211 sign convention, Positive value generally indicates a driver side crash and negative value generally indicates a passenger side crash.

Under Rollover Sensor Data (if Applicable)

- Vehicle roll angle if applicable: The Roll Axis is the longitudinal axis of the vehicle, generally aligned with the primary axis of motion of the vehicle. A positive Roll Angle is counter-clockwise when observing the vehicle from the front.

Data Sources:

The Restraints Control Module (RCM) contains all recorded data on any event. Data collected from the RCM comes from multiple sources:

1. Internal to the RCM such as internal sensors for delta Velocity data, rollover angle data if applicable, etc… which are measured, calculated and stored internally.

2. External to the RCM but with a direct connection such as buckle switches, peripheral crash sensors, seat track switch(s) etc… which are measured, calculated and stored internally.

3. External Modules to the RCM such as Powertrain Control Module, Brake Control Module, etc… Theses modules communicate to the RCM via Vehicle Communication Network. The RCM stores the received data internally.

02013_RCM-RC7P_r001

System Status at Time of Retrieval

VIN As Programmed into RCM at Factory	1FM5K8AT2HGDxxxxxx
Current VIN (From PCM)	1FM5K8AT2HGDxxxxxx
Ignition Cycle, Download (First Record)	1,348
Ignition Cycle, Download (Second Record)	N/A
Restraints Control Module Part Number	HB5T-14B321-AA
Restraints Control Module Serial Number	7046745237220000
Restraints Control Module Software Part Number (Version)	GR3T-14C028-AA
Driver Side/Center Frontal Restraints Sensor Serial Number	000C2A6B
Driver, Row 1, Side Restraint Sensor 1 Serial Number	0000000F
Driver, Row 2, Side Restraint Sensor 2 Serial Number	00022A6B
Passenger Frontal Restraints Sensor Serial Number	002C2A6A
Passenger, Row 1, Side Restraint Sensor 1 Serial Number	0000004F
Passenger, Row 2, Side Restraint Sensor 2 Serial Number	00062A6D
Steering Wheel Location	Left Hand Drive

System Status at Event (First Record)

Complete File Recorded (Yes,No)	Yes
Multi-Event, Number of Events	1
Time From Event 1 to 2 (msec)	0
Lifetime Operating Timer at Event Time Zero (sec)	11,228,515
Key-On Timer at Event Time Zero (sec)	16,395
Vehicle Voltage at Time Zero (V)	14.3
Energy Reserve Mode Entered During Event (Yes, No)	No

Faults Present at Start of Event (First Record)

No Faults Recorded

Deployment Data (First Record)

Pretensioner (Retractor) Deployment, Time to Fire, Driver (msec)	36.5
Pretensioner (Retractor) Deployment, Time to Fire, Right Front Passenger (msec)	36.5
Side Airbag Deployment, Time to Deploy, Driver (msec)	36.5
Side Airbag Deployment, Time to Deploy, Right Front Passenger (msec)	36.5
Side Airbag/Curtain Airbag Deployment, Time to Deploy, Driver Side (msec)	36.5
Side Airbag/Curtain Airbag Deployment, Time to Deploy, Passenger Right Side (msec)	36.5
Maximum Delta-V, Longitudinal (MPH [km/h])	21.82 [35.12]
Time, Maximum Delta-V Longitudinal (msec)	185.0
Driver, side sensor 2 (2nd row), Safing Deployment	Yes
Passenger, side sensor 2 (2nd row), Discriminating Deployment	Yes
Passenger, side sensor 2 (2nd row), Safing Deployment	Yes
RCM, side Driver (lateral), Safing Deployment	Yes
RCM, side Passenger (lateral), Safing Deployment	Yes

Pre-Crash Data -1 sec (First Record)

Ignition cycle, Crash	1,346
Frontal Air Bag Warning Lamp, On/Off	Off
Safety Belt Status, Driver	Buckled
Seat Track Position Switch, Foremost, Status, Driver	Not Forward
Seat Track Position Switch, Foremost, Status, Front Passenger	Not Forward
Safety Belt Status, Front Passenger	Buckled
Brake Telltale	Off
ABS Telltale	Off
ESC/TC Telltale	Off
ESC/TC Off Telltale	Default Mode
Powertrain Wrench Telltale	Off
Powertrain Malfunction Indicator Lamp (MIL) Telltale	Off

Pre-Crash Data -5 to 0 sec [2 samples/sec] (First Record) - Table 8 of 2

Time (sec)	Speed, Vehicle Indicated (MPH [km/h])	Speed, Vehicle Indicated, Quality Factor	Accelerator Pedal, % Full	Accelerator Pedal, % Full, Quality Factor	Service Brake, On/Off	Service brake, Quality Factor	Engine RPM	ABS Activity (Engaged, Non-Engaged)
- 5.0	0.0 [0]	OK	0.0	OK	Off	OK	644	Non-engaged
- 4.5	0.0 [0]	OK	0.0	OK	Off	OK	680	Non-engaged
- 4.0	0.0 [0]	OK	0.0	OK	Off	OK	676	Non-engaged
- 3.5	0.0 [0]	OK	0.0	OK	Off	OK	654	Non-engaged
- 3.0	0.0 [0]	OK	0.0	OK	Off	OK	684	Non-engaged
- 2.5	0.0 [0]	OK	0.0	OK	Off	OK	676	Non-engaged
- 2.0	0.0 [0]	OK	0.0	OK	Off	OK	660	Non-engaged
- 1.5	0.0 [0]	OK	0.0	OK	Off	OK	692	Non-engaged
- 1.0	0.0 [0]	OK	0.0	OK	Off	OK	676	Non-engaged
- 0.5	0.0 [0]	OK	0.0	OK	Off	OK	652	Non-engaged
0.0	0.0 [0]	OK	0.0	OK	Off	OK	674	Non-engaged

Pre-Crash Data -5 to 0 sec [2 samples/sec] (First Record) - Table 9 of 2

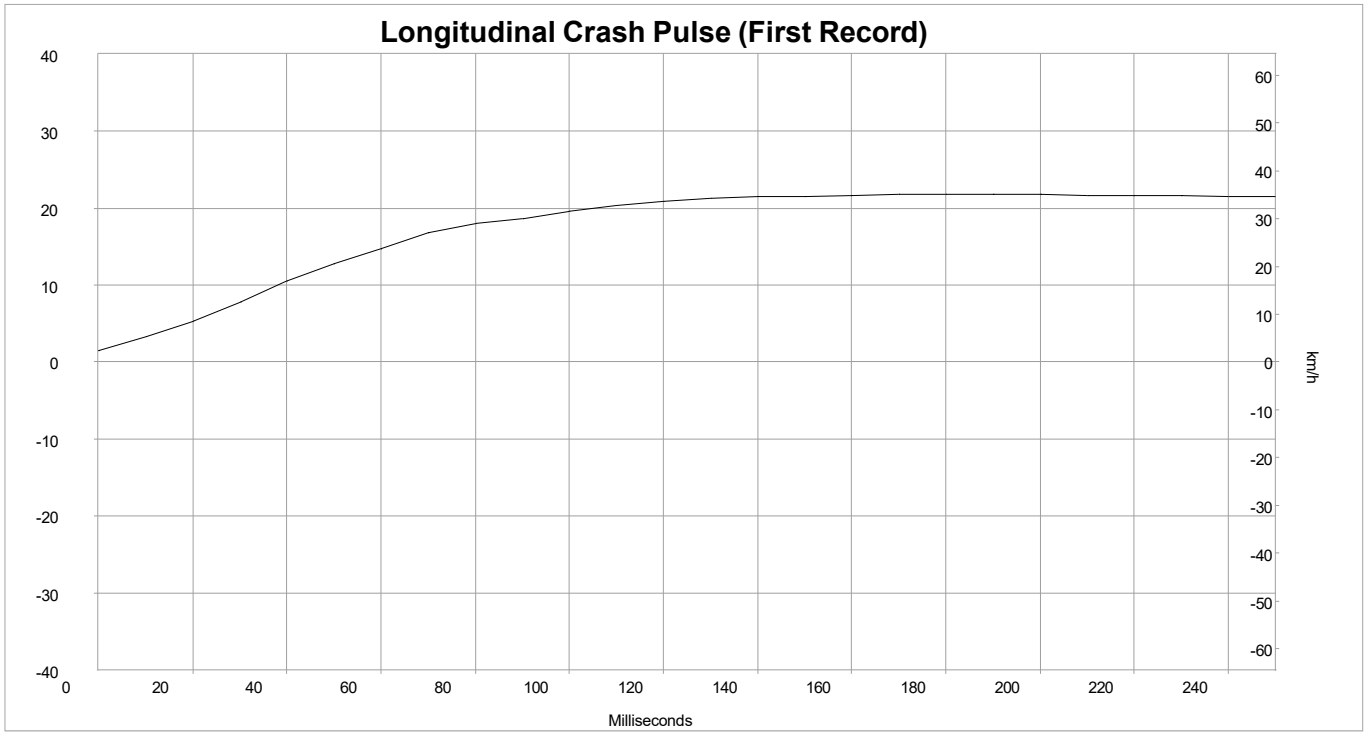
Time (sec)	Brake Powertrain Torque Request 1	Brake Powertrain Torque Request 2	Traction Control via Brakes	Wheel Torque (N-m)	Speed Control Status	Driver Gear Selection (Auto Trans)	Occupant Size Classification, Front Passenger (Child size Yes/No [Hex value])
- 5.0	No	No	No	-128	Standby	Park	No [$08]
- 4.5	No	No	No	-164	Standby	Park	No [$08]
- 4.0	No	No	No	-204	Standby	Park	No [$08]
- 3.5	No	No	No	-156	Standby	Park	No [$08]
- 3.0	No	No	No	-168	Standby	Park	No [$08]
- 2.5	No	No	No	-200	Standby	Park	No [$08]
- 2.0	No	No	No	-168	Standby	Park	No [$08]
- 1.5	No	No	No	-176	Standby	Park	No [$08]
- 1.0	No	No	No	-204	Standby	Park	No [$08]
- 0.5	No	No	No	-140	Standby	Park	No [$08]
0.0	No	No	No	-156	Standby	Park	No [$08]

Pre-Crash Data -5 to 0 sec [10 samples/sec] (First Record)

Time (sec)	Stability Control Lateral Acceleration (g)	Stability Control Longitudinal Acceleration (g)	Stability Control Yaw Rate (deg/sec)	Stability Control Roll Rate (deg/sec)	Steering Wheel Angle (deg)
- 5.0	-0.04	-0.01	-0.06	-0.28	12.1
- 4.9	-0.05	-0.01	-0.13	-0.28	12.1
- 4.8	-0.04	-0.01	0.01	-0.47	12.1
- 4.7	-0.05	-0.01	-0.06	-0.36	12.1
- 4.6	-0.05	-0.01	-0.03	-0.28	12.1
- 4.5	-0.04	-0.01	-0.06	-0.28	12.1
- 4.4	-0.04	-0.01	-0.08	-0.31	12.1
- 4.3	-0.05	-0.01	-0.01	-0.36	12.1
- 4.2	-0.05	-0.01	0.00	-0.36	12.1
- 4.1	-0.04	-0.01	-0.13	-0.15	12.1
- 4.0	-0.04	-0.01	0.01	-0.31	12.1
- 3.9	-0.04	-0.01	-0.06	-0.55	12.1
- 3.8	-0.05	-0.01	-0.06	-0.28	12.1
- 3.7	-0.04	-0.01	-0.01	-0.23	12.1
- 3.6	-0.04	-0.01	-0.08	-0.28	12.1
- 3.5	-0.04	-0.01	-0.13	-0.39	12.1
- 3.4	-0.05	-0.01	-0.01	-0.28	12.1
- 3.3	-0.05	-0.01	-0.03	-0.31	12.1
- 3.2	-0.04	-0.01	-0.01	-0.28	12.1
- 3.1	-0.04	-0.02	-0.06	-0.31	12.1
- 3.0	-0.04	-0.01	-0.01	-0.31	12.1
- 2.9	-0.05	-0.01	0.01	-0.31	12.1
- 2.8	-0.04	-0.01	-0.06	-0.44	12.1
- 2.7	-0.04	-0.02	-0.01	-0.31	12.1
- 2.6	-0.05	-0.01	-0.08	-0.28	12.1
- 2.5	-0.04	-0.01	-0.08	-0.28	12.1
- 2.4	-0.04	-0.02	0.03	-0.47	12.1
- 2.3	-0.05	-0.02	0.03	-0.31	12.1
- 2.2	-0.05	-0.01	-0.08	-0.19	12.1
- 2.1	-0.04	-0.01	-0.06	-0.19	12.1
- 2.0	-0.04	-0.01	0.01	-0.31	12.1
- 1.9	-0.05	-0.01	-0.03	-0.44	12.1
- 1.8	-0.05	-0.01	-0.10	-0.44	12.1
- 1.7	-0.05	-0.01	-0.01	-0.28	12.1
- 1.6	-0.04	-0.01	-0.10	-0.44	12.1
- 1.5	-0.04	-0.01	-0.06	-0.47	12.1
- 1.4	-0.05	-0.01	-0.03	-0.52	12.1
- 1.3	-0.05	-0.01	-0.01	-0.28	12.1
- 1.2	-0.04	-0.01	-0.13	-0.28	12.1
- 1.1	-0.04	-0.01	-0.01	-0.39	12.1
- 1.0	-0.04	-0.01	-0.10	-0.36	12.1
- 0.9	-0.05	-0.01	-0.06	-0.28	12.1
- 0.8	-0.05	-0.01	0.00	-0.36	12.1
- 0.7	-0.04	-0.01	-0.13	-0.28	12.1
- 0.6	-0.05	-0.02	0.01	-0.39	12.1
- 0.5	-0.05	-0.02	-0.06	-0.28	12.1
- 0.4	-0.05	-0.01	-0.08	-0.31	12.1
- 0.3	-0.04	-0.01	-0.10	-0.28	12.1
- 0.2	-0.04	-0.01	-0.06	-0.44	12.1
- 0.1	-0.04	-0.01	-0.06	-0.55	12.1
0.0	0.05	0.21	-0.10	-0.15	12.1

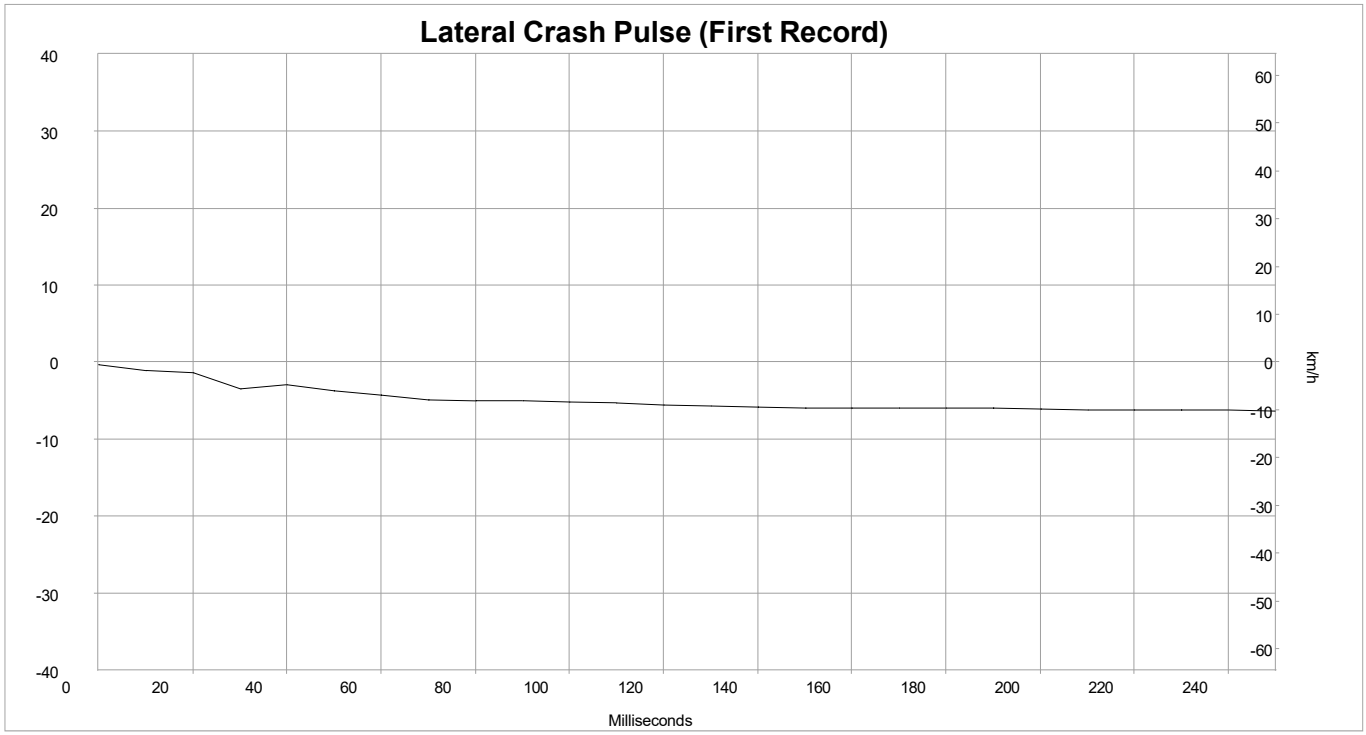
Post-Crash Data 0 to 5 sec [4 samples/sec] (First Record)

Time (sec)	Impact Event Feedback Status
0.00	Normal
0.25	Normal
0.50	Normal
0.75	Normal
1.00	Normal
1.25	Normal
1.50	Normal
1.75	Normal
2.00	EventInProgress
2.25	EventInProgress
2.50	EventInProgress
2.75	EventInProgress
3.00	EventInProgress
3.25	EventInProgress
3.50	EventInProgress
3.75	EventInProgress
4.00	EventInProgress
4.25	EventInProgress
4.50	EventInProgress
4.75	EventInProgress
5.00	EventInProgress



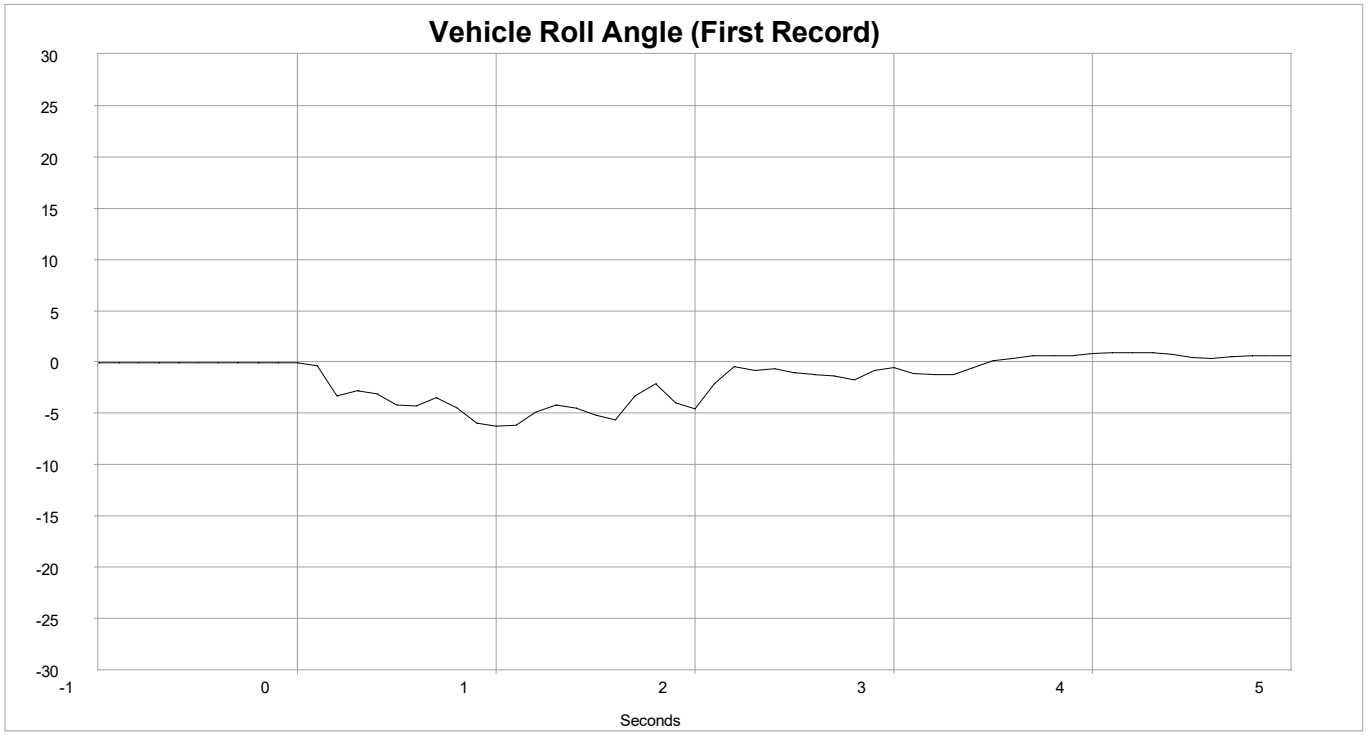
Longitudinal Crash Pulse (First Record)

Time (msec)	Delta-V, longitudinal (MPH)	Delta-V, longitudinal (km/h)
0	1.46	2.35
10	3.30	5.31
20	5.31	8.54
30	7.74	12.45
40	10.58	17.02
50	12.71	20.46
60	14.78	23.79
70	16.80	27.03
80	17.98	28.93
90	18.70	30.09
100	19.58	31.51
110	20.36	32.76
120	20.84	33.54
130	21.21	34.14
140	21.52	34.63
150	21.57	34.72
160	21.72	34.96
170	21.77	35.04
180	21.82	35.11
190	21.80	35.08
200	21.77	35.03
210	21.73	34.97
220	21.69	34.90
230	21.63	34.81
240	21.57	34.71
250	21.51	34.62



Lateral Crash Pulse (First Record)

Time (msec)	Delta-V, Lateral (MPH)	Delta-V, Lateral (km/h)
0	-0.30	-0.48
10	-1.05	-1.69
20	-1.34	-2.16
30	-3.44	-5.53
40	-2.90	-4.66
50	-3.72	-5.99
60	-4.27	-6.87
70	-4.97	-8.00
80	-5.08	-8.17
90	-4.99	-8.03
100	-5.16	-8.30
110	-5.28	-8.50
120	-5.63	-9.06
130	-5.74	-9.24
140	-5.88	-9.46
150	-5.99	-9.64
160	-6.01	-9.67
170	-5.97	-9.61
180	-6.01	-9.68
190	-6.02	-9.69
200	-6.08	-9.78
210	-6.16	-9.92
220	-6.18	-9.95
230	-6.22	-10.01
240	-6.26	-10.07
250	-6.29	-10.12



Vehicle Roll Angle (First Record)

Time (sec)	Vehicle Roll Angle (deg)
-1.0	-0.01
-0.9	-0.01
-0.8	-0.01
-0.7	-0.01
-0.6	-0.01
-0.5	-0.01
-0.4	-0.01
-0.3	-0.01
-0.2	-0.01
-0.1	-0.01
0.0	-0.01
0.1	-0.35
0.2	-3.25
0.3	-2.82
0.4	-3.10
0.5	-4.14
0.6	-4.26
0.7	-3.52
0.8	-4.48
0.9	-5.98
1.0	-6.27

Time (sec)	Vehicle Roll Angle (deg)
1.1	-6.09
1.2	-4.87
1.3	-4.22
1.4	-4.42
1.5	-5.14
1.6	-5.68
1.7	-3.33
1.8	-2.15
1.9	-3.96
2.0	-4.57
2.1	-2.09
2.2	-0.49
2.3	-0.86
2.4	-0.64
2.5	-1.00
2.6	-1.24
2.7	-1.31
2.8	-1.74
2.9	-0.84
3.0	-0.58
3.1	-1.16

Time (sec)	Vehicle Roll Angle (deg)
3.2	-1.20
3.3	-1.20
3.4	-0.54
3.5	0.18
3.6	0.35
3.7	0.67
3.8	0.63
3.9	0.64
4.0	0.79
4.1	0.91
4.2	0.98
4.3	0.98
4.4	0.74
4.5	0.45
4.6	0.39
4.7	0.50
4.8	0.60
4.9	0.60
5.0	0.60

Disclaimer of Liability

The users of the CDR product and reviewers of the CDR reports and exported data shall ensure that data and information supplied is applicable to the vehicle, vehicle's system(s) and the vehicle ECU. Robert Bosch LLC and all its directors, officers, employees and members shall not be liable for damages arising out of or related to incorrect, incomplete or misinterpreted software and/or data. Robert Bosch LLC expressly excludes all liability for incidental, consequential, special or punitive damages arising from or related to the CDR data, CDR software or use thereof.

Appendix B: 2017 Buick Enclave EDR Report[2]

[2] The Bosch CDR report contained in this technical report was imaged by the investigating police department. Only a PDF copy of the Bosch CDR report was provided by the police and the hexadecimal data contained in the report has been deleted due to the potential personal identifiable information in the 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	5GAKVCKD1HJxxxxxx
User	xxx
Case Number	xxx
EDR Data Imaging Date	xxx
Crash Date	xxx
Filename	5GAKVCKD1HJxxxxxx_ACM.CDRX
Saved on	xx
Imaged with CDR version	Crash Data Retrieval Tool 19.6.3
Imaged with Software Licensed to (Company Name)	xxxx
Reported with CDR version	Crash Data Retrieval Tool 19.6.3
Reported with Software Licensed to (Company Name)	xxx
EDR Device Type	Airbag Control Module
Event(s) recovered	Deployment

Comments

Through DLC at crash scene

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 times for subsequent deployment type events, during the same ignition cycle, will record the deployment times as N/A.
-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.

01048_SDM11P-autoliv_r013

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
Ignition Cycle, Download (Ignition Cycles at Investigation)	3993
End Model Part Number	00CF83A3
System Type	Autoliv
Software Module Identifier 1	00CF62F5
Software Module Identifier 2	0160D378
Manufacturing Traceability Data, Component Identifier	AS
Manufacturing Traceability Data, Part Number/Broadcast Code	9651
Manufacturing Traceability Data, Supplier Code	E
Manufacturing Traceability Data, Traceability Number	050295103
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	01CB8459C
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	01CB751D8
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	01CB20D6F
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	01CB24AD7
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	01CB33794
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	01CB7A7C1
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)	3993
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)	Not 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	Empty
Occupant Size Right Front Passenger Child (Passenger Classification Status)	No (Not Applicable)
Passenger Air Bag ON Indicator Status	Off
Passenger Air Bag OFF Indicator Status	On
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	3927
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]	-29 [-46]
Time, Maximum Delta-V (Time From FSR Time Zero to Maximum Longitudinal SDM Recorded Vehicle Velocity Change)(msec)	200
Maximum Delta-V, Lateral (Maximum Lateral SDM Recorded Vehicle Velocity Change for FSR Event) MPH [km/h]	6 [9]
Time Maximum Delta-V, Lateral (Time From FSR Time Zero to Maximum Lateral SDM Recorded Vehicle Velocity Change)(msec)	96

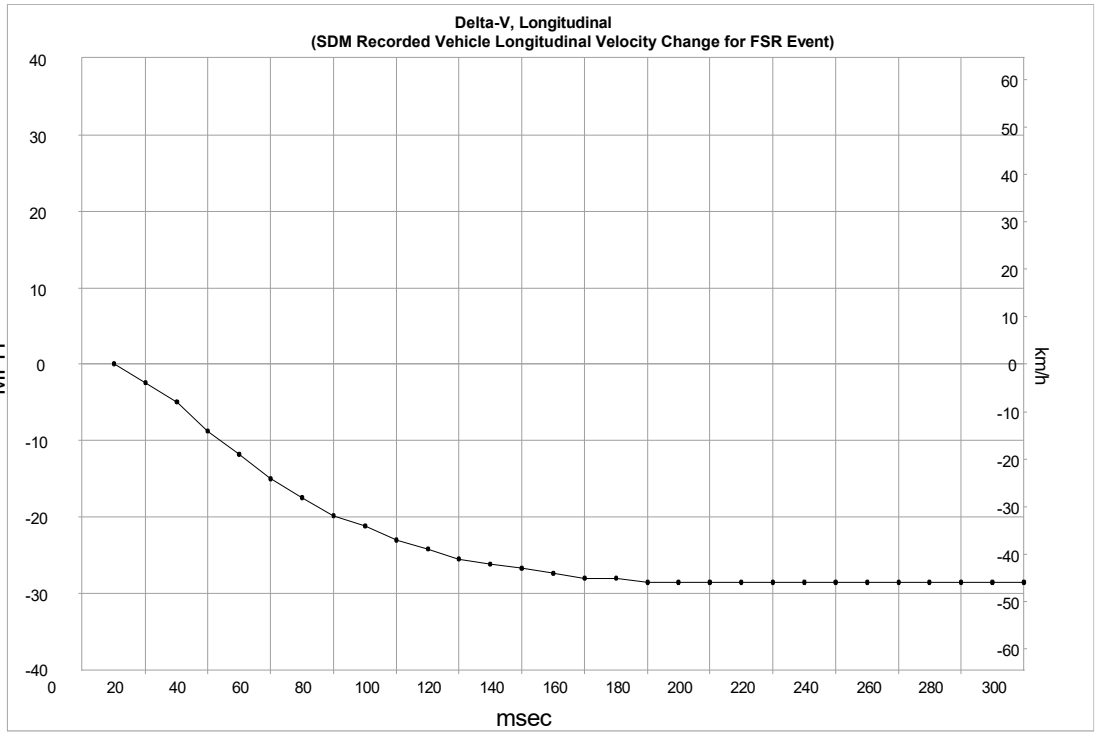
DTCs Present at Time of Event (Event Record 1)

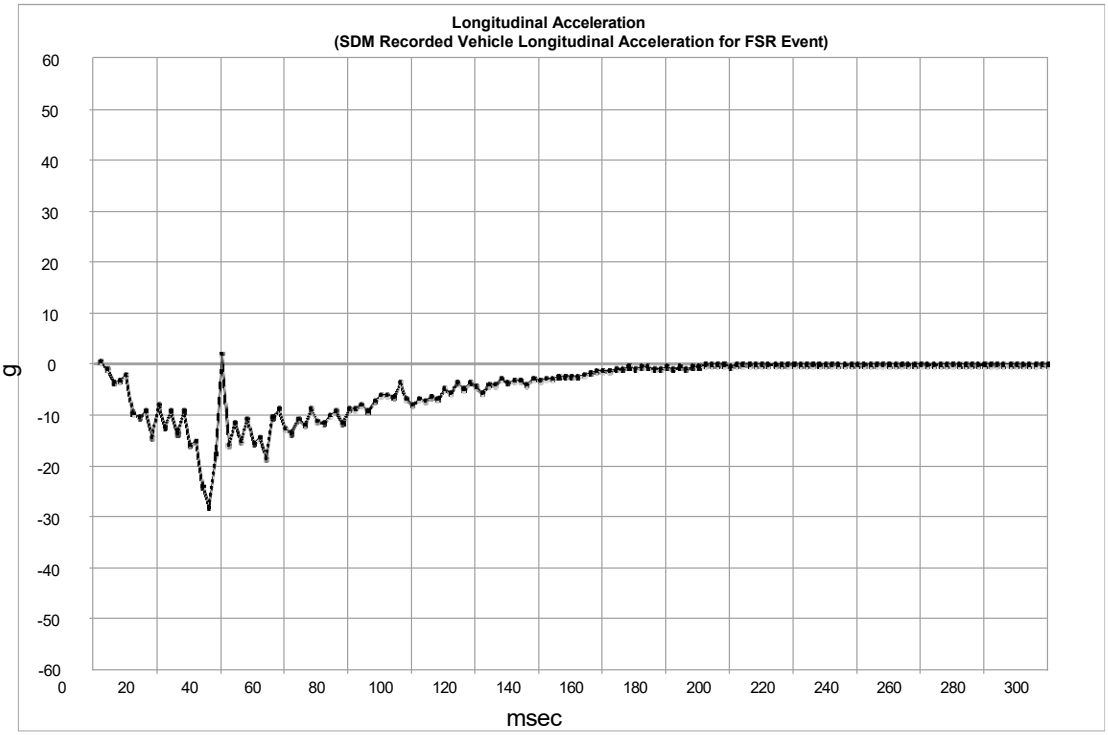
B0052-00

Event Data (Event Record 1)

Driver 1st Stage Deployment Loop Commanded	Yes
Passenger 1st Stage Deployment Loop Commanded	No
Driver 2nd Stage Deployment Loop Commanded	Yes
Passenger 2nd Stage Deployment Loop Commanded	No
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)	23
Frontal Air Bag Deployment, Time to 2nd Stage, Driver (Driver 2nd Stage Time From Time Zero to Deployment Command Criteria Met) (msec)	28
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)	Data Not Available
Frontal Air Bag Deployment, Time to 2nd Stage, Right Front Passenger (Passenger 2nd Stage Time From Time Zero to Deployment Command Criteria Met) (msec)	Data Not Available
Side air bag deployment, time to deploy, driver (Driver Thorax/Curtain Time From Time Zero to Deployment Command Criteria Met) (msec)	28
Side air bag deployment, time to deploy, right front passenger (Passenger Thorax/Curtain Time From Time Zero to Deployment Command Criteria Met) (msec)	28
Pretensioner Deployment, Time to Fire, Driver (Driver Pretensioner Time From Time Zero to Deployment Loop #1 or Loop #2 Command Criteria Met) (msec)	15
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)	15

Longitudinal Crash Pulse (Event Record 1)





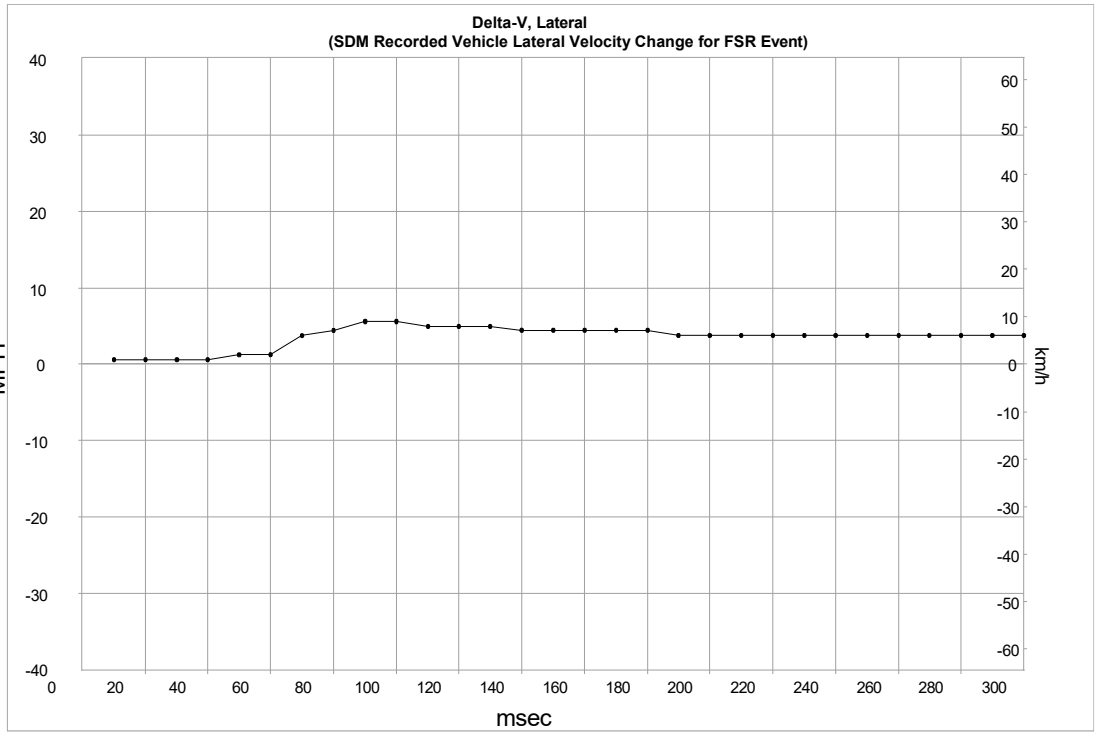
Longitudinal Crash Pulse (Event Record 1)

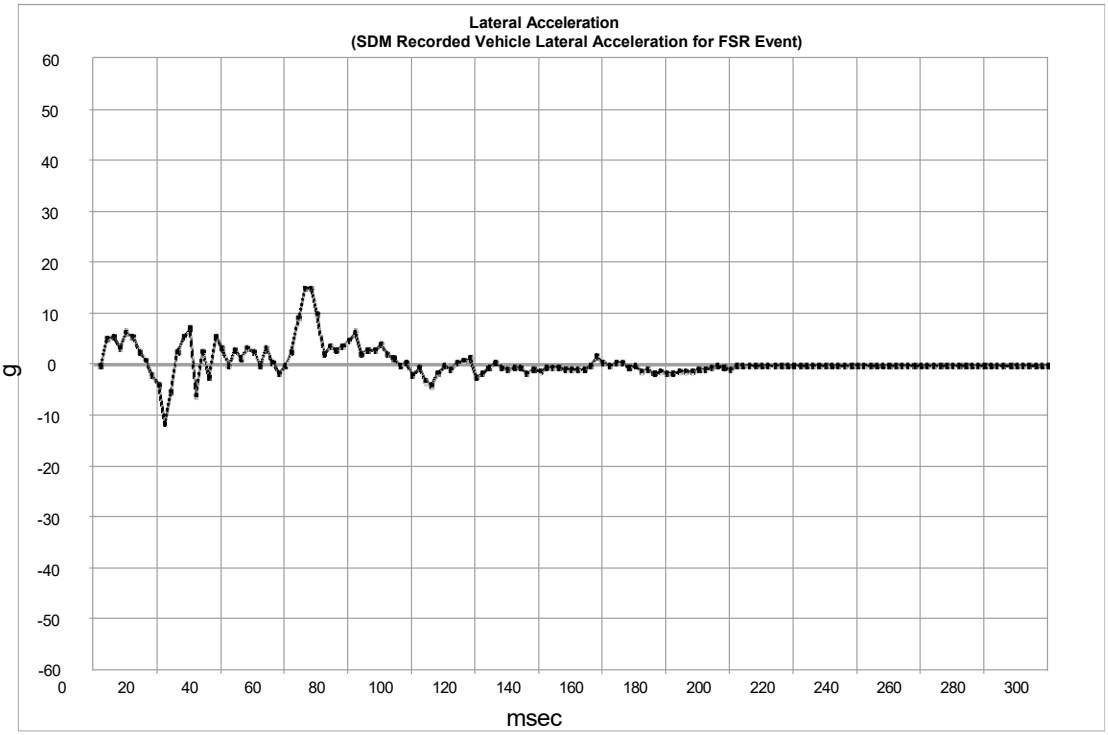
Time (msec)	Delta-V, Longitudinal (SDM Recorded Vehicle Longitudinal Velocity Change for FSR Event) (MPH)	Delta-V, Longitudinal (SDM Recorded Vehicle Longitudinal Velocity Change for FSR Event) (km/h)
10	0.0	0.0
20	-2.5	-4.0
30	-5.0	-8.0
40	-8.7	-14.0
50	-11.8	-19.0
60	-14.9	-24.0
70	-17.4	-28.0
80	-19.9	-32.0
90	-21.1	-34.0
100	-23.0	-37.0
110	-24.2	-39.0
120	-25.5	-41.0
130	-26.1	-42.0
140	-26.7	-43.0
150	-27.3	-44.0
160	-28.0	-45.0
170	-28.0	-45.0
180	-28.6	-46.0
190	-28.6	-46.0
200	-28.6	-46.0
210	-28.6	-46.0
220	-28.6	-46.0
230	-28.6	-46.0
240	-28.6	-46.0
250	-28.6	-46.0
260	-28.6	-46.0
270	-28.6	-46.0
280	-28.6	-46.0
290	-28.6	-46.0
300	-28.6	-46.0

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	0.2	102	-7.0	202	-0.2
4	-1.0	104	-7.4	204	-0.2
6	-3.8	106	-6.6	206	-0.2
8	-3.4	108	-7.0	208	-0.2
10	-2.2	110	-5.0	210	-0.2
12	-9.8	112	-5.8	212	-0.2
14	-10.6	114	-3.8	214	-0.2
16	-9.4	116	-5.0	216	-0.2
18	-14.6	118	-3.8	218	-0.2
20	-8.2	120	-4.6	220	-0.2
22	-12.6	122	-5.8	222	-0.2
24	-9.4	124	-4.2	224	-0.2
26	-13.8	126	-4.2	226	-0.2
28	-9.4	128	-3.0	228	-0.2
30	-16.2	130	-3.8	230	-0.2
32	-15.4	132	-3.4	232	-0.2
34	-24.2	134	-3.4	234	-0.2
36	-28.2	136	-4.2	236	-0.2
38	-17.8	138	-3.0	238	-0.2
40	1.8	140	-3.4	240	-0.2
42	-16.2	142	-3.0	242	-0.2
44	-11.8	144	-3.0	244	-0.2
46	-15.4	146	-2.6	246	-0.2
48	-11.0	148	-2.6	248	-0.2
50	-15.8	150	-2.6	250	-0.2
52	-14.6	152	-2.6	252	-0.2
54	-18.6	154	-2.2	254	-0.2
56	-10.6	156	-1.8	256	-0.2
58	-9.0	158	-1.4	258	-0.2
60	-13.0	160	-1.4	260	-0.2
62	-13.8	162	-1.4	262	-0.2
64	-11.0	164	-1.0	264	-0.2
66	-12.2	166	-1.0	266	-0.2
68	-9.0	168	-0.6	268	-0.2
70	-11.4	170	-1.0	270	-0.2
72	-11.8	172	-0.6	272	-0.2
74	-10.2	174	-0.6	274	-0.2
76	-9.4	176	-1.0	276	-0.2
78	-11.8	178	-1.0	278	-0.2
80	-9.0	180	-0.6	280	-0.2
82	-9.0	182	-1.0	282	-0.2
84	-8.2	184	-0.6	284	-0.2
86	-9.4	186	-1.0	286	-0.2
88	-7.4	188	-0.6	288	-0.2
90	-6.2	190	-0.6	290	-0.2
92	-6.2	192	-0.2	292	-0.2
94	-6.6	194	-0.2	294	-0.2
96	-3.8	196	-0.2	296	-0.2
98	-7.0	198	-0.2	298	-0.2
100	-8.2	200	-0.6	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	0.6	1.0
20	0.6	1.0
30	0.6	1.0
40	0.6	1.0
50	1.2	2.0
60	1.2	2.0
70	3.7	6.0
80	4.3	7.0
90	5.6	9.0
100	5.6	9.0
110	5.0	8.0
120	5.0	8.0
130	5.0	8.0
140	4.3	7.0
150	4.3	7.0
160	4.3	7.0
170	4.3	7.0
180	4.3	7.0
190	3.7	6.0
200	3.7	6.0
210	3.7	6.0
220	3.7	6.0
230	3.7	6.0
240	3.7	6.0
250	3.7	6.0
260	3.7	6.0
270	3.7	6.0
280	3.7	6.0
290	3.7	6.0
300	3.7	6.0

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	-0.6	202	-0.2
4	5.0	104	-3.4	204	-0.2
6	5.4	106	-4.2	206	-0.2
8	3.0	108	-1.8	208	-0.2
10	6.2	110	-0.2	210	-0.2
12	5.4	112	-1.0	212	-0.2
14	2.2	114	0.2	214	-0.2
16	0.6	116	0.6	216	-0.2
18	-2.2	118	1.0	218	-0.2
20	-4.2	120	-2.6	220	-0.2
22	-11.8	122	-1.8	222	-0.2
24	-5.4	124	-0.6	224	-0.2
26	2.2	126	0.2	226	-0.2
28	5.4	128	-0.6	228	-0.2
30	7.0	130	-1.0	230	-0.2
32	-6.2	132	-0.6	232	-0.2
34	2.2	134	-0.6	234	-0.2
36	-2.6	136	-1.8	236	-0.2
38	5.4	138	-1.0	238	-0.2
40	3.0	140	-1.4	240	-0.2
42	-0.2	142	-0.6	242	-0.2
44	2.6	144	-0.6	244	-0.2
46	1.0	146	-0.6	246	-0.2
48	3.0	148	-1.0	248	-0.2
50	2.2	150	-1.0	250	-0.2
52	-0.2	152	-1.0	252	-0.2
54	3.0	154	-1.0	254	-0.2
56	0.2	156	-0.2	256	-0.2
58	-1.8	158	1.4	258	-0.2
60	-0.2	160	0.2	260	-0.2
62	2.2	162	-0.2	262	-0.2
64	9.0	164	0.2	264	-0.2
66	15.0	166	0.2	266	-0.2
68	15.0	168	-0.6	268	-0.2
70	9.8	170	-0.2	270	-0.2
72	1.8	172	-1.4	272	-0.2
74	3.4	174	-1.0	274	-0.2
76	2.6	176	-1.8	276	-0.2
78	3.4	178	-1.4	278	-0.2
80	4.6	180	-1.8	280	-0.2
82	6.2	182	-1.8	282	-0.2
84	1.8	184	-1.4	284	-0.2
86	2.6	186	-1.4	286	-0.2
88	2.6	188	-1.4	288	-0.2
90	3.8	190	-1.0	290	-0.2
92	1.8	192	-1.0	292	-0.2
94	1.0	194	-0.6	294	-0.2
96	-0.2	196	-0.2	296	-0.2
98	0.2	198	-0.6	298	-0.2
100	-2.2	200	-1.0	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	0	On	2112	17	60 [97]
-4.5	0	On	2112	17	60 [96]
-4.0	0	On	2048	17	60 [96]
-3.5	0	On	2048	17	59 [95]
-3.0	0	On	2112	17	59 [95]
-2.5	0	On	2560	21	58 [94]
-2.0	0	On	2880	21	58 [93]
-1.5	0	On	2816	21	58 [93]
-1.0	0	On	2816	21	57 [92]
-0.5	0	On	2816	21	57 [91]

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	-11 [-15]	Off
-1.5	No	No	No	-11 [-15]	Off
-1.0	No	No	No	-26 [-35]	Off
-0.5	No	No	No	-35 [-48]	Off

DOT HS 813 649
October 2024

U.S. Department
of Transportation

**National Highway
Traffic Safety
Administration**

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