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16. Abstract This report documents the on-site investigation of the alleged air-bag-related injuries sustained by the driver of a 2018 Volkswagen Passat. The crash occurred during night in January 2019 in Tennessee. Conditions were dark without illumination, clear, and dry. The Volkswagen was being driven by an unbelted 63-year-old male. According to the ODI notification, while accelerating from a stop, the driver lost control in a left curve, and the vehicle struck a wood utility pole. The notification stated that the vehicle's engine hesitated or stalled prior to rapid acceleration, which caused the crash. Frontal and side air bags deployed, and the driver was transported to a local hospital for treatment for complaints of pain to his neck and back. The investigation did not reveal any speed-control-related issues, history of engine stalling, or unintended acceleration. The crash dynamics and the driver's kinematics during the crash suggested that, while multiple body regions possibly contacted the deployed frontal air bag, his injuries were more likely attributable to his unbelted status at impact. The vehicle inspection and EDR report suggested that the vehicle's supplemental restraint systems performed as designed given the crash severity.			
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**Special Crash Investigations
Alleged Air Bag Injury Investigation
Office of Defects Investigation
Case Number: DS19005
Vehicle: 2018 Volkswagen Passat
Location: Tennessee
Crash Date: January 2019**

BACKGROUND

This report documents the on-site investigation of the alleged air-bag-related injuries sustained by the unbelted driver of a 2018 Volkswagen Passat (**Figure 1**). According to the Office of Defects Investigation (ODI) notification, the driver was accelerating from a stop when he lost control of the vehicle that struck a utility pole, causing air bag deployments. The driver reported injuries later confirmed to be fractures to vertebrae. The investigation was intended to include a crash reconstruction, assessment of manual restraint usage, air bag deployment data, crashworthiness functions, and assessment of vehicle speed control status at the time of the crash. The investigation did not reveal any speed-control-related issues, history of engine stalling, or unintended acceleration. The crash dynamics and the driver's kinematics during the crash suggested that, while multiple body regions possibly contacted the deployed frontal air bag, his injuries were more likely attributable to his unbelted status at impact. The vehicle inspection and the EDR report suggested that the vehicle's supplemental restraint systems performed as designed given the crash severity.



The case was initiated by the ODI of the National Highway Traffic Safety Administration in response to a notification. The Special Crash Investigations (SCI) group assigned the case to Dynamic Science, Inc., in March 2019. The SCI team obtained permission to inspect the Volkswagen through the original equipment manufacturer (OEM), which had possession of the vehicle at its service center. Two representatives of the OEM, the driver, and a family member who sent the notification were present for the inspection. The Volkswagen was supported by the Bosch Crash Data Retrieval (CDR) system and the vehicle's event data recorder (EDR) was imaged as part of the inspection. A full vehicle systems scan was performed by the OEM and a driver interview was obtained at the time of the inspection.

The crash occurred at night in January 2019 in Tennessee. Conditions were dark without illumination, clear and dry. The Volkswagen was being driven eastbound by an unbelted 63-year-old male. According to the notification, while accelerating from a stop, the driver lost control due to the engine hesitating or stalling prior to a rapid acceleration that occurred in a left curve, where the vehicle struck a wood utility pole. Frontal and side air bags deployed and the driver

was transported for complaints of pain to his neck and back. The notification stated the vehicle's engine stalled or hesitated prior to a rapid acceleration which caused the crash. The vehicle was towed due to damage and was later moved to an OEM service center.

SUMMARY

Crash Site

The crash site was a two-lane, east/west, county- maintained roadway (**Figure 2**). The surface was paved with asphalt in traveled and polished condition. The lanes each measured 2.9 m (9.5 ft) wide and were separated by a double yellow painted stripe and bordered by solid white painted fog lines. The roadside ground was grass-covered. The roadway alignment and profile varied in the eastbound approach to the area of impact (POI). At 91 m (300 ft) west of the POI, the roadway was straight and ascended at a positive slope of 1.6 percent; at 61 m (200 ft) west of the POI, it ascended at a positive slope of 0.4 percent; and at 30 m (100 ft) west of the POI, it ascended at a positive slope of 2.1 percent and began to curve left at a radius measuring 82 m (269 ft) at the right fog line. The roadway continued to curve left to the area of departure and POI, where the profile descended at a negative slope of -1.6 percent with a super-elevation measuring positive 2.6 percent. A wire fence aligned parallel to the roadway was located 2.0 m (6.6 ft) right of the right fog line. At the time of the crash site inspection, a newly erected wood utility pole measuring 32 cm (12.6 in) in diameter stood 2.7 m (8.9 ft) right of the right fog line that appeared to be the location of the pole. The ground around the pole had a descending negative slope measuring -100 percent. Conditions at the time of the crash were dark without illumination, clear, and dry. The posted speed limit was 48 km/h (30 mph). A crash diagram is included at the end of this report.



Figure 2. Crash site looking east.

Pre-Crash

The driver of the Volkswagen stated during the SCI interview that he started from a stopped position downhill from the area of impact. He was traveling eastbound, and the nearest stop sign west of the area of impact was located at an intersection 122 m (400 ft) west of the utility pole. The driver stated that, when he accelerated, the vehicle initially stalled or hesitated and then “sped off” in the left curve of the roadway, where he lost control and crashed. The driver indicated that he lived near the area of the crash and was familiar with the roadway. He indicated he was not distracted at the time of the crash and was not using cruise control. The driver stated that he was wearing the lap and shoulder seat belt in a correct manner, but evidence obtained during the vehicle inspection and from the EDR report indicated the driver was unbelted.

The EDR data included 5.0 seconds of pre-crash engine rpm, vehicle speed, accelerator (%) and service brake activation. The pre-crash data indicated that during the 5.0 seconds prior to impact the acceleration was constant at 0 percent, braking activation was “On” beginning at T-3 seconds to 0 seconds, engine rpm decreased gradually from a maximum of 2,752 to 1,280 at impact, and

vehicle speed decreased gradually from a maximum of 68 km/h (42 mph) to 31 km/h (19 mph) at impact. The 5.0 seconds of EDR pre-crash data does not suggest erratic rpm fluctuation or rapid acceleration as indicated in the notification; it rather suggests the opposite. The Volkswagen was equipped with crash avoidance technology including forward collision warning (FCW) without automatic braking. The driver indicated he received no crash avoidance warnings or signals prior to impact.¹ Based on available data, it appears that, while negotiating the left curve at night and with no illumination present, the driver failed to maintain control, and that the vehicle departed the roadway on the right edge. At the time of the departure, the driver was braking, and the vehicle's pre-crash stability was unknown. The table below documents the EDR-reported vehicle speeds and calculated travel distances during the 5.0 seconds of recorded pre-crash data.

Time -sec	Vehicle Speed		Distance Traveled			
	km/h	mph	Incremental m	ft	Cumulative m	ft
5	68	42	NA	NA	NA	NA
4.5	68	42	9.4	30.8	9.4	30.8
4	66	41	9.3	30.4	18.7	61.2
3.5	64	40	9.1	29.7	27.7	90.9
3	63	39	8.8	29	36.5	119.9
2.5	60	37	8.5	27.9	45	147.8
2	55	34	7.9	26	53	173.8
1.5	45	28	6.9	22.7	59.9	196.5
1	42	26	6	19.8	65.9	216.3
0.5	37	23	5.5	18	71.4	234.3
0	31	19	4.7	15.4	76.1	249.7

Crash

The front plane of the Volkswagen struck a wire fence (Event 1) and wood utility pole (Event 2) on the roadside to the right of the roadway and came to rest near the POI. The fence yielded and, based on on-scene images, the utility pole was fractured approximately 90 cm (35 in) above ground. At impact with the pole, the driver and passenger frontal air bags deployed, the driver and front passenger seat belt pretensioners actuated, and both IC air bags deployed at 51 milliseconds (ms). The vehicle came to rest near the POI.

In Event 2, the WinSMASH barrier algorithm calculated a total delta V of 19 km/h (12 mph), longitudinal delta V of -19 km/h (-12 mph), lateral delta V of 0 km/h and a barrier equivalent speed (BES) of 19 km/h (12 mph). The pole fractured and yielded resulting in a borderline reconstruction. The WinSMASH results are included here for informational purposes and appear reasonable. The EDR reported a maximum longitudinal delta V of -35 km/h (-21.7 mph) at 295 ms and a maximum lateral delta V of -6 km/h (-3.7 mph) at 295 ms.

¹ The FCW system is designed to mitigate vehicle-to-vehicle rear-end crashes.

Post-Crash

The Volkswagen's automatic crash notification was activated and likely notified emergency responders of the crash. The driver did not remember specifically how responders were notified, but they arrived within 10 minutes of the crash. The driver exited the vehicle unassisted, and upon their arrival he was transported to a local hospital, where he was admitted overnight and then transferred to another hospital for further treatment. The vehicle was towed due to damage.

2018 VOLKSWAGEN PASSAT

Description

The 2018 Volkswagen Passat was a 4-door, 5-passenger sedan identified by the Vehicle Identification Number 1VWBA7A3XJCxxxxxx. The EDR-reported odometer reading was 7,810 km (4,853 mi). The Volkswagen was a leased vehicle that had been acquired new and was driven for roughly three months. It was configured with a 4-cylinder, 2.0 liter, gasoline engine; an automatic 6-speed transmission; a front-wheel drive; an antilock braking system; an electronic stability control; a rear visibility system; daytime running lights; and a tilt steering. The Volkswagen was equipped with crash avoidance (CA) systems including FCW without auto braking, and blind spot detection. The driver indicated that the CA systems were on at the time of the crash.

The front row included a pair of bucket seats with adjustable head restraints. The driver's head restraint was set 3 cm (1.2 in) above the seat back, the seat track was set between middle and full-rear and the seat back recline was nearly upright.

Exterior Damage

The Volkswagen sustained moderate severity crush damage to the front plane (**Figure 3**) caused by the pole impact and suspected minor overlapping damage caused by the fence impact. Direct damage to the front bumper fascia began at the front right bumper corner and extended 50 cm (19.7 in) to the left. Much of the crush damage was located right of the bumper backing bar, affecting the less rigid bumper corner, right front fender, and right front wheel well. The field L extended from bumper corner to bumper corner and measured 178 cm (70.1 in). Twenty-one measurements were taken using the Nikon total station and the Faro Blitz program calculated six crush measurements as follows: $C_1 = 0$ cm, $C_2 = 0$ cm, $C_3 = 2$ cm (0.8 in), $C_4 = 1$ cm (0.4 in), $C_5 = 2$ cm (0.8 in), and $C_6 = 40$ cm (15.7 in). Maximum crush located at the front right bumper corner and the Collision Deformation Classification (CDC) for the Volkswagen in Event 2 was 12FREW2.

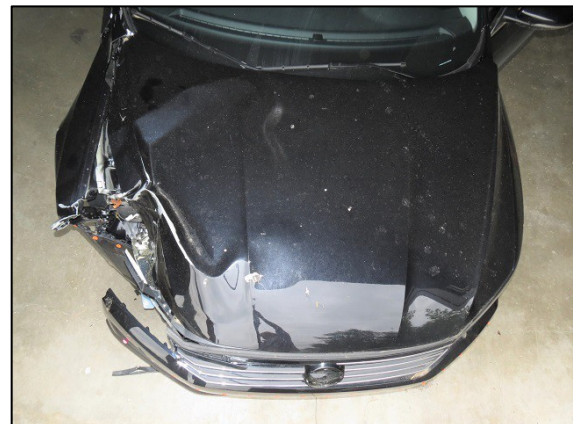


Figure 3. Front plane crush, the 2018 Volkswagen Passat.

Event Data Recorder

The Volkswagen was configured with an air bag control module with EDR capability. The SCI investigator imaged the EDR during the vehicle inspection using the vehicle's own power source

and the data link connector (DLC) method with Bosch CDR software version 18.0.2. The EDR data is reported using software version 19.4.2. The EDR captured the pole impact as a single deployment event that was recorded successfully. The EDR data limitations state that non-deployment events require a minimum delta V of 8 km/h (5 mph) within a 150 ms period in either a longitudinal and lateral direction and it was presumed the fence impact velocity changes, as well as time between impacts, fell below those parameters. The EDR report included system status; deployment command data; pre-crash data; longitudinal and lateral crash pulse; longitudinal, lateral and normal acceleration; and hexadecimal data. The report stated the driver was “Not Belted.” The report did not include diagnostic trouble codes (DTCs). The complete EDR report is included in this technical report as **Appendix A**.

OEM Diagnostic Log

The attending OEM representatives conducted a full systems scan using proprietary tools to create a diagnostic log. The log data included general information, a diagnostic session, a first system test with DTC memory entries, additional system tests with DTC memory entries, and function tests. The primary purpose of the scan was to identify any outstanding DTCs associated with the alleged unpredictable acceleration issue. DTCs relating to crash response and air bag deployments were present, but after reviewing the log the representative concluded no abnormalities existed in the vehicle systems that could be considered contributory to the crash.

The OEM representatives indicated that, prior to the SCI inspection, they test-drove the Volkswagen and were unable to replicate any occurrences of engine hesitation, stalling, or unusually rapid increase in RPMs as alleged in the notification.

Interior Damage

The Volkswagen’s interior sustained damage caused by deployed front and IC air bags, and pretensioned front row seat belts. The vehicle did not sustain any integrity loss or intrusion.

Manual Restraint Systems

The Volkswagen was equipped with a three-point, continuous lap and shoulder seat belt for the driver and front right occupant. The seat belts for the front row had belt load limiters to reduce the forces acting on a body during a crash. The belts were configured with retractor pretensioners that actuated at an EDR-reported time of 51 ms. The driver was not belted and his seat belt was locked in the unused position by the actuated pretensioner. The EDR reported a driver seat belt status of “Not Belted.” The adjustable D-ring was set in the full-up position and the sliding latch plate revealed slight evidence of historical usage.

Supplemental Restraint Systems

The Volkswagen was equipped with advanced frontal air bags, seat-mounted side impact air bags for the driver and passenger, and combination side-impact/roll-sensing IC air bags for both rows.



Figure 4. Driver’s deployed frontal air bag, the 2018 Volkswagen Passat.

According to the driver, he obtained it new and had leased it for approximately three months prior to the crash; the air bags were OEM and had not been serviced or replaced. At impact with the pole, the driver's frontal (**Figure 4**) and both IC air bags deployed at an EDR-reported time of 51 ms. The driver's frontal air bag deployed in the first stage (the second stage did not deploy) from the steering wheel hub. It appeared to have deployed normally, and neither the air bag nor cover flaps revealed damage or evidence of driver contact.

The vehicle owner's manual states that the frontal air bags are supplemental restraints intended to be used in combination with the vehicle's lap and shoulder seat belt, not as a substitute for using the belt. It states further that the air bag system works most effectively and efficiently when used in combination with a seat belt, and the force at which frontal air bags deploy can cause serious injury to those who are not properly restrained in a front crash. The manual states that during a crash the risk of injury is much higher to an occupant who is unrestrained. The evidence in this crash suggests that the unbelted status of the driver was a likely contributor to his injuries. The driver's seat belt pretensioner actuated in combination with the frontal air bag deployment, which suggested the functionality of both was appropriate to the crash severity.

The left and right IC air bags deployed from their respective roof side rails over the front and second rows of seats. The deployed IC air bags were unremarkable. It is unknown whether the IC air bags had contributing or mitigating effect on the driver's injuries. His unbelted status possibly contributed to his injury severity because he likely was displaced from his seated position and interacted with the frontal air bag and other interior components differently than if he had been belted. In addition to his documented injuries, the driver alleged to have sustained a concussion. He did not recall contacting specific components in the interior during the crash and was unable to identify specific injury mechanisms.

NHTSA Recalls and Investigations

A recall search last queried in August 2020 using the vehicle's VIN revealed no open or past recalls.

2018 VOLKSWAGEN PASSAT OCCUPANT

Driver Demographics

Age/sex:	63 years/male
Height:	185 cm (73 in)
Weight:	95 kg (210 lb)
Eyewear:	Prescription eyeglasses
Seat type:	Bucket with adjustable head restraint
Seat track position:	Middle to full-rear
Manual restraint usage:	Lap and shoulder belt not used
Usage source:	Vehicle inspection, EDR report
Air bags:	Front and IC air bags deployed, seat-mounted side impact air bag not deployed
Alcohol/drug data:	None
Egress from vehicle:	Exited unassisted
Transport from scene:	Ambulance to hospital
Type of medical treatment:	Treated, transferred to another hospital, admitted overnight

Driver Injuries

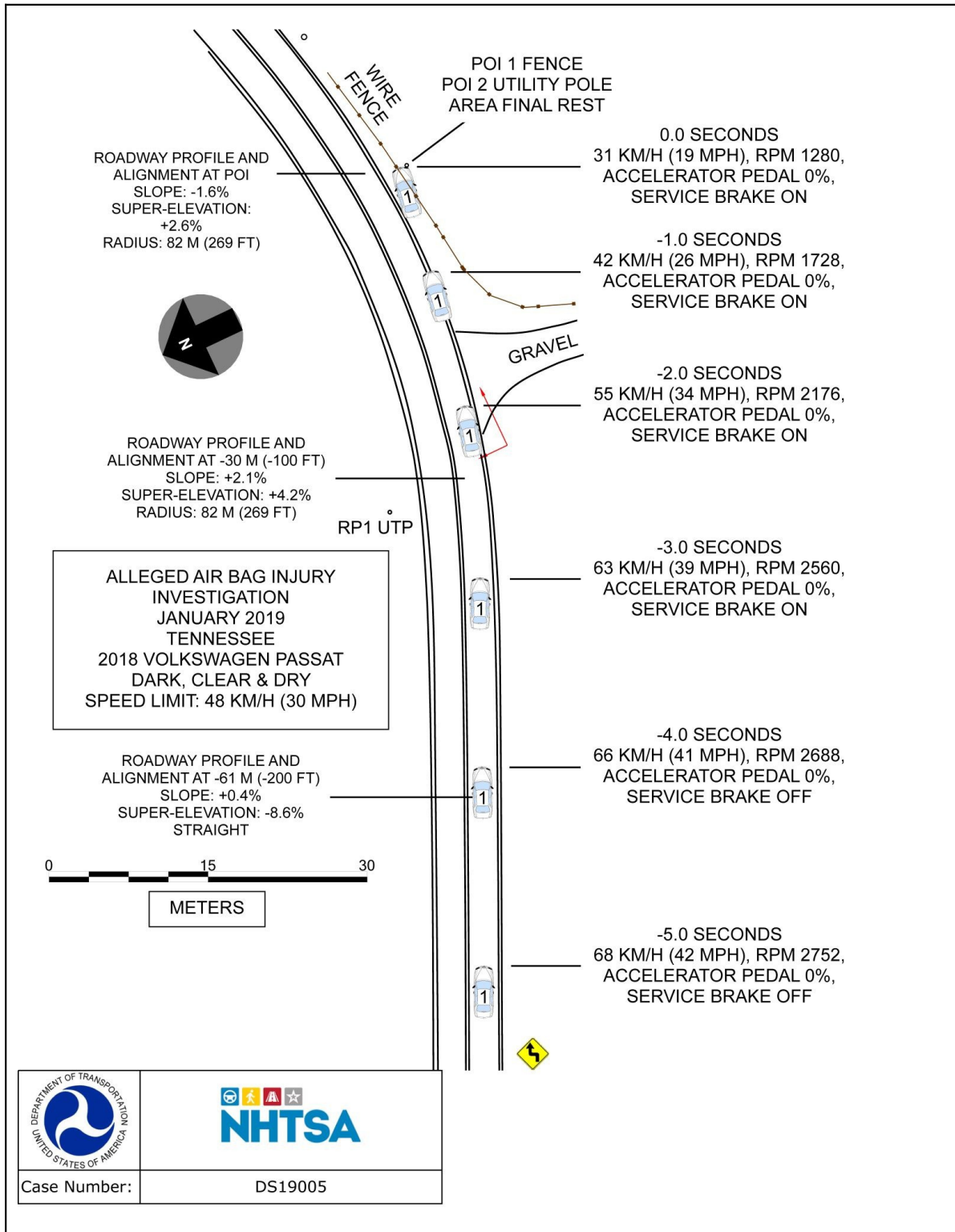
Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Compression fracture of the spine, L1, major (>20% loss of anterior height)	650634.3	Tandem; this occupant's seat cushion, frontal air bag	Probable Possible
2	Transverse process fracture of the spine, C2	650220.1	Frontal air bag	Possible
3	Abrasions, right ventral forearm	710202.1	Frontal air bag	Probable

Source: medical records.

Driver Kinematics

The unbelted 63-year-old male driver was seated in an upright posture and, for undetermined reasons, departed the roadway on the right edge while actively braking and steering. At impact with the utility pole, the driver was displaced forward and slightly right in response to the 12 o'clock direction of force. The driver's pelvis and lower extremities likely loaded his seat cushion, and his chest and abdomen likely loaded the deployed frontal air bag causing a compression fracture to the lumbar spine at L1. Neither the seat cushion nor frontal air bag revealed evidence of occupant contact. His right forearm probably loaded the right aspect of the air bag causing an abrasion, and his neck and head possibly hyper-extended forward over the air bag and steering wheel rim causing a transverse process fracture of the cervical spine at C2. Given the driver's unbelted status and the crash severity, it seems likely that he was displaced from his seated position. It was not known if his head contacted interior components but he allegedly sustained a concussion. His medical records did not identify any evidence of head injury. Following the crash, the driver exited the vehicle without assistance and awaited the arrival of responders. He was transported by ambulance to a local hospital, where he was treated for approximately 3 hours. The driver was then transferred by ambulance to a trauma hospital in another city, where he was admitted overnight.

CRASH DIAGRAM



APPENDIX A: Event Data Recorder (EDR) Report for 2018 Volkswagen Passat²

² The EDR report contained in this technical report was imaged using the current version of the Bosch CDR software at the time of the vehicle inspection. The CDR report contained in the associated Crash View application may differ relative to this report.

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

CDR File Information

User Entered VIN	1VWBA7A3XJC*****
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	DS19005_V1_ACM.CDRX
Saved on	
Imaged with CDR version	Crash Data Retrieval Tool 18.0.2
Imaged with Software Licensed to (Company Name)	NHTSA
Reported with CDR version	Crash Data Retrieval Tool 19.4.2
Reported with Software Licensed to (Company Name)	NHTSA
EDR Device Type	Airbag Control Module
Event(s) recovered	Record 1 (CRC Check Failed - Saved Without VIN Sequence Number)

Comments

No comments entered.

Data Limitations

AIRBAG CONTROL MODULE (ACM) DATA LIMITATIONS:

General Information:

These limitations are intended to assist you in reading the event data that has been imaged from the vehicle's Airbag Control Module (ACM). They are not intended to provide specific information regarding the interpretation of this data. Event data should be examined in conjunction with other available physical evidence from the vehicle and scene.

Note: The ACM's current DTC status will be altered if the ACM is powered-up without the vehicle periphery connected. This situation might occur when the CDR tool is connected directly to the ACM (e.g. for bench top imaging). It will not affect the stored EDR data, but may result in additional DTCs within the ACM.

Note: During bench top imaging, make sure the ACM is not moved, tilted or turned over while connected to and powered by the CDR Interface Module. Also, after a CDR imaging process, wait one minute after power is removed from the ACM before attempting to move the module. Not following these general ACM guidelines for bench top imaging could cause new events to be recorded in the ACM.

Recorded Crash Events:

This ACM is capable of recording up to 6 events of front, side, rear or rollover within its memory. Each record contains 5 seconds of pre-crash data and at least 300ms of post-crash data. Deployment events are locked into memory and cannot be overwritten. Non-deployment events can be overwritten by subsequent deployment or non-deployment events. The oldest non-deployment event will be overwritten first. Some ACMs stop overwriting of older non-deployment events by more recent non-deployment events after a certain number of events (more than 1000). Under these conditions, the storage of deployment events is still available. The event counter is incremented for each event and stored within the data record.

Deployment events are recorded, when a non-reversible restraint system was commanded to deploy. Recording of non-deployment events requires a minimum delta-V of 8km/h within a 150ms period in either longitudinal or lateral direction. Reversible restraint systems (e.g. active headrests) that have been commanded to deploy also trigger recording of a non-deployment event. Time Zero of an event is determined by the ACM's algorithms based on the acceleration and/or pressure sensors or a deployment command. Post-crash data (e.g. deployment time of restraint systems) is reported relative to Time Zero.

The ACM supports recording of multiple events. In case of a rapid sequence of events (e.g. a combined frontal and side event), the ACM will record the data within a common EDR entry (a so-called parallel event). In this case, the post-crash data is reported relative to Time Zero of the initial event. If the initial event has already ended and another event happens within a time period of 5s from Time Zero of the initial event, the ACM will record a multi-event consisting of two or more separate EDR entries.

If power to the ACM was lost during an event, all or part of the event data record may not have been recorded.

Data:

The reported data elements may vary by vehicle model, model year or vehicle configuration. Part of the pre-crash data has been transmitted to the ACM by various vehicle control modules via the vehicle's communication network.

Time-continuous pre-crash data is recorded at two samples per second for 5 seconds before Time Zero. The main data elements are:

- Speed Vehicle Indicated: is reported as displayed by the vehicle's instrument cluster. The vehicle speed is evaluated as an average of wheel speeds and transmitted via the vehicle communication network to the ACM. Its data accuracy may be affected by various factors, such as significant changes in tire size from the factory settings, wheel lock-up or slip.
- Accelerator Pedal: is the ratio of the accelerator pedal's position compared to the fully depressed position (in percent). The pedal position sensor is wired to the Engine Control Module.
- Service Brake Activation: is the status of the brake pedal switch. The switch is wired to the Engine Control Module.
- Engine RPM (Combustion Engine): as reported by the Engine Control Module.
- Steering Input: as reported by the wheel angle sensor.
- ABS Activity: as reported by the Electronic Stability Control Module.
- Stability Control: as reported by the Electronic Stability Control Module.

The pre-crash status is recorded 1 second before Time Zero. The main data elements are:

- Safety Belt Status: as evaluated by the belt-switches that are wired to the ACM.
- Seat Track Position Switch: as evaluated by the seat track position sensors that are wired to the ACM.
- Airbag Warning Lamp, Status: as commanded by the ACM.
- Occupant Size Classification, Front Passenger: as reported by the occupant classification system.
- Frontal Airbag Disable Indicator Status: as commanded by the ACM.

Pre-crash and post-crash data are recorded asynchronously. The data element "Time from Last Speed Data Sample (Precrash) to Time Zero" indicates the time delay between the most recent pre-crash data sample and Time Zero (0 to 500ms).

Post-crash data is recorded after Time Zero up to 300ms. The Vehicle Roll Angle may be recorded for 5 seconds post-crash. The main data elements are:

- Event Type: indicates the event type depending on the algorithm that triggered the recording criteria first (deployment or Delta-V threshold).
- Multi-Event, Number of Events: determines the chronological order of records being part of a multi-event.
- Time from Previous / Initial Event to Current Event: indicates the time difference between records of multi-events.
- Delta-V Longitudinal / Lateral: are recorded every 10ms from Time Zero to 250ms. Delta-V reflects the change in velocity that the ACM experienced during the recorded time period. It does not necessarily correlate with vehicle traveling speed.
- Longitudinal / Lateral / Normal Acceleration: are recorded every 10ms from Time Zero to 250ms (if supported by the ACM). The reported range of acceleration may vary between ACM models.
- Clipping Time, Longitudinal / Lateral Acceleration Sensor: depending on the severity of the event, the measuring range of the longitudinal or lateral accelerometers may be exceeded. The data elements "Clipping Time, Longitudinal / Lateral Acceleration Sensor" indicate the time within an event when the measurement first exceeded the design range of the sensor. As a result, subsequent Delta-V values may be underestimated.
- Vehicle Roll Angle: is recorded every 100ms from 1 second before and up to 5 seconds after Time Zero. Due to mechanical limitations of the roll rate sensor, high accelerations, which can occur during front, side or rear crashes, can disturb the oscillating angular rate sensing element. This results in the roll rate data being temporarily invalid for a short period of time (at or shortly after Time Zero).
- Time to Deployment: indicates the time at which the ACM commanded the deployment of the associated restraint system.
- Disposal: indicates whether the ACM commanded the disposal of the propellant from the associated restraint system. "No Disposal" indicates that the restraint system was commanded to deploy for occupant restraint purposes.
- Date and Time at Event: is reported as the date and time of the vehicle's clock at the time of an event. Since the vehicle clock may be adjusted manually, the reported values may not reflect the actual date and time of a given event. As with the other data elements reported herein, these parameters should be examined in conjunction with other available physical evidence from the vehicle and scene.
- Complete File Recorded: indicates if the event data has been completely recorded to the ACM's memory or if the recording process has been interrupted before completion.

The status "Data not Available" is reported if the ACM was unable to store the data element (e.g. due to missing communication). "Invalid Data" is reported if the ACM was unable to store valid data for the data element (e.g. range exceeded, communication failure, sensor failure).

Data Sign Convention:

Data Element Name	Positive Sign Notation Indicates
Longitudinal Acceleration	Forward
Delta-V, Longitudinal	Forward
Maximum Delta-V, Longitudinal	Forward
Lateral Acceleration	Left to Right
Delta-V, Lateral	Left to Right
Maximum Delta-V, Lateral	Left to Right
Normal Acceleration	Downward
Vehicle Roll Angle	Left to Right Rotation
Steering Input	Left Turn

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 system.

12001_VWGDefault_r002

System Status at Event (Record 1, Most Recent)

Event Counter at Event (Counts)	1
Multi-Event, Number of Events	1. Event
Time from Initial Event to Current Event (msec)	0.0
Time from Previous Event to Current Event (msec)	0.0
Vehicle Mileage (km)	7,810
Operating Time (min)	12,578
Ignition Cycle at Event (Cycles)	651
Ignition Cycle at Download (Cycles)	657
Maximum Delta-V, Longitudinal (MPH [km/h])	-21.7 [-35]
Time, Maximum Delta-V, Longitudinal (msec)	295.0
Clipping Time, Longitudinal Acceleration Sensor (msec)	Clipping Not Reached
Maximum Delta-V, Lateral (MPH [km/h])	-3.7 [-6]
Time, Maximum Delta-V, Lateral (msec)	295.0
Clipping Time, Lateral Acceleration Sensor (msec)	Clipping Not Reached
Time, Maximum Delta-V, Resultant (msec)	300.0
Time from Last Speed Data Sample (Precrash) to Time Zero (msec)	474
Vehicle Identification Number (VIN)	1VWBA7A3XJC*****
Supply Voltage (Before Event) (V)	14.0
Complete File Recorded	Completed Successfully

Deployment Command Data (Record 1, Most Recent)

Pretensioner, Time to 1st Stage Deployment, Driver (msec)	51
Sill-End Pretensioner, Time to Deployment, Driver (msec)	56
Frontal Airbag, Time to 1st Stage Deployment, Driver (msec)	51
Side Airbag, Time to Deployment 1st Stage, Driver (msec)	Not Deployed
Side Curtain/Tube Airbag, Time to Deployment, Driver Side (msec)	51
Pretensioner, Time to 1st Stage Deployment, Front Passenger (msec)	51
Sill-End Pretensioner, Time to Deployment, Front Passenger (msec)	56
Frontal Airbag, Time to 1st Stage Deployment, Front Passenger (msec)	Not Deployed
Frontal Airbag, Time to 2nd Stage Deployment, Front Passenger (msec)	Not Deployed
Frontal Airbag, 2nd Stage Disposal, Front Passenger	Not Deployed
Side Airbag, Time to Deployment 1st Stage, Front Passenger (msec)	Not Deployed
Side Curtain/Tube Airbag, Time to Deployment, Passenger Side (msec)	51

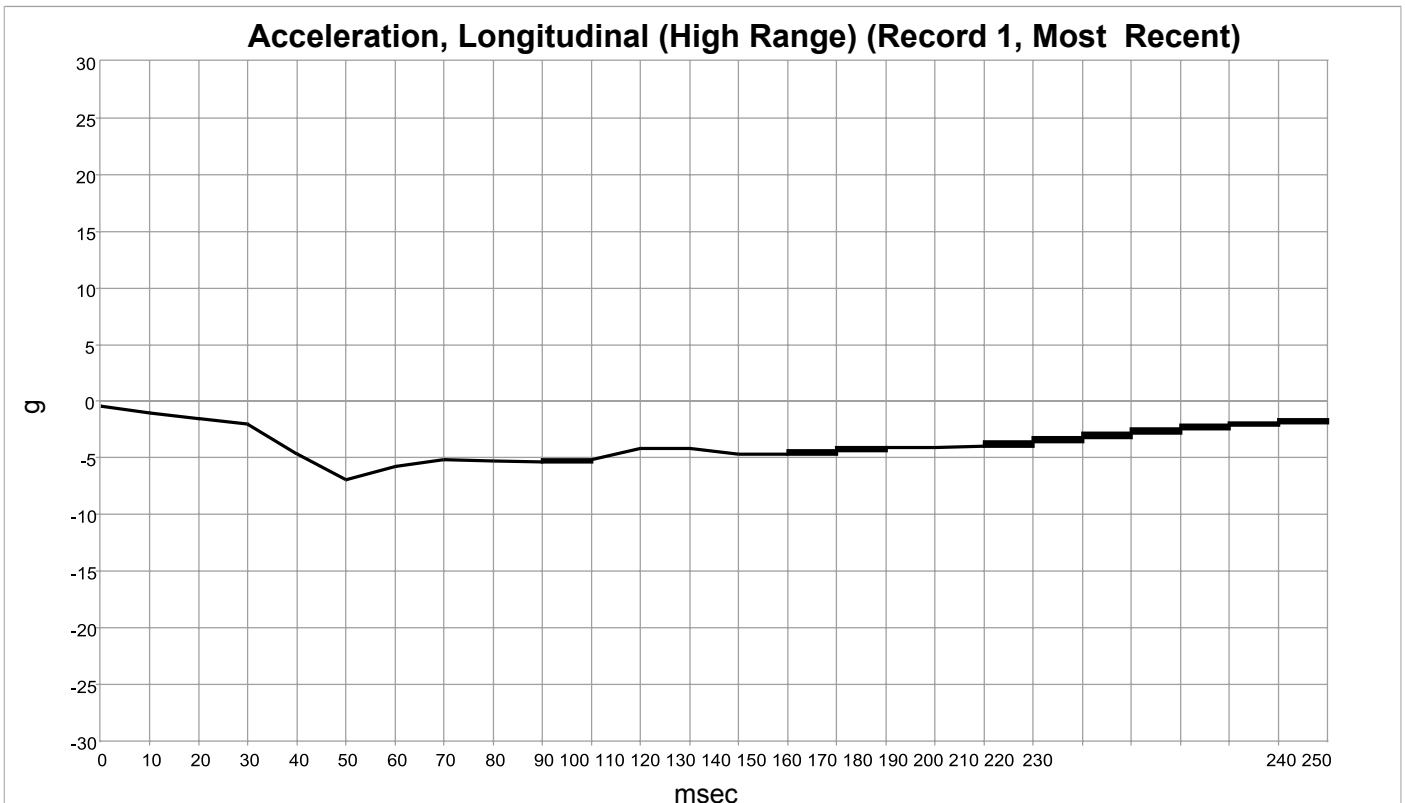
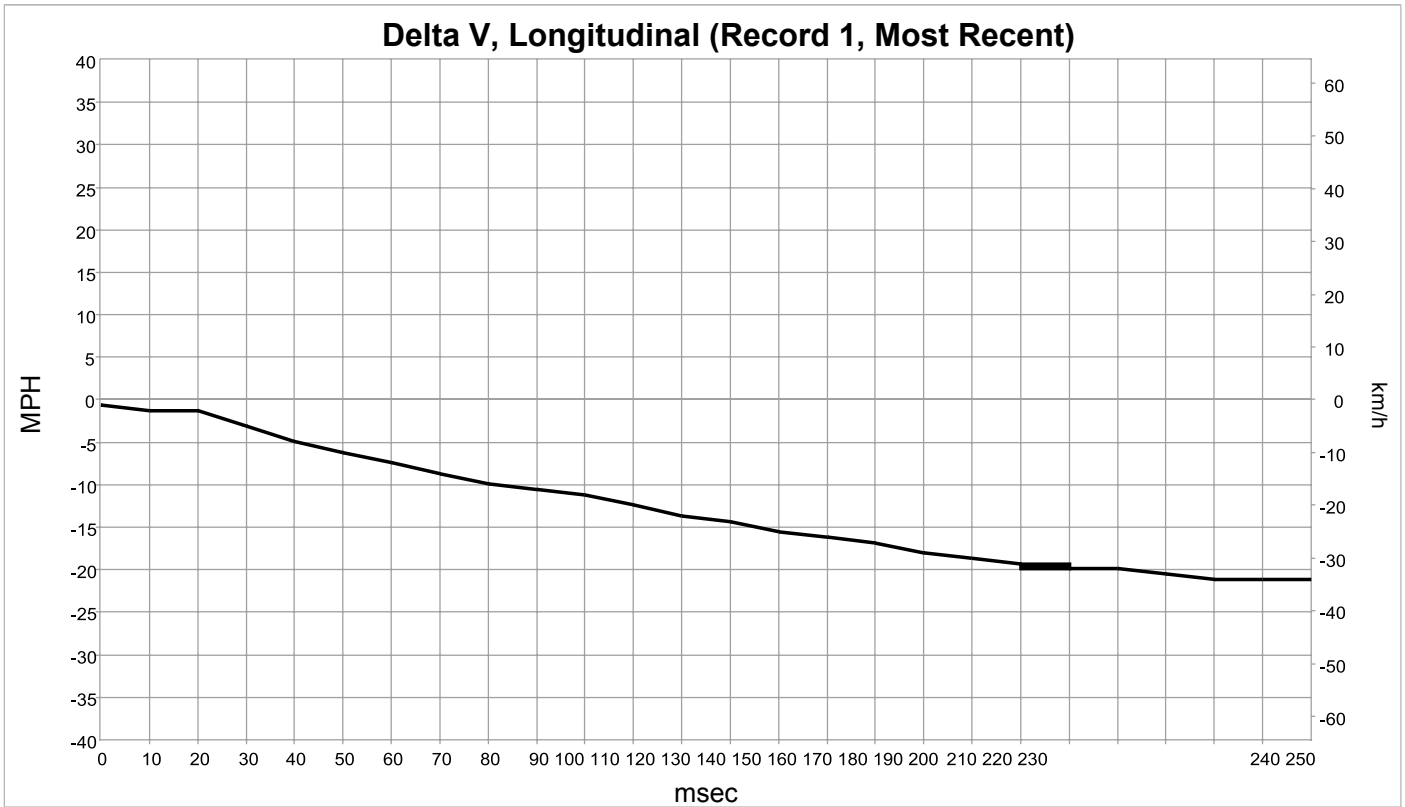
Pre-Crash Data -1 Sec (Record 1, Most Recent)

Safety Belt Status, Driver	Not Belted
Safety Belt Status, Front Passenger	Not Belted
Occupant Size Classification, Front Passenger	Empty
Frontal Airbag Disable Indicator Status, Passenger	On
Airbag Warning Lamp, Status	Off

Pre-Crash Data -5 to 0 sec (Record 1, Most Recent)

Time (sec)	Engine RPM (Combustion Engine) (RPM)	Speed, Vehicle Indicated (MPH [km/h])	Accelerator Pedal (%)	Service Brake Activation
-5.0	2,752	42 [68]	0	Off
-4.5	2,752	42 [67]	0	Off
-4.0	2,688	41 [66]	0	Off
-3.5	2,624	40 [65]	0	Off
-3.0	2,560	39 [63]	0	On
-2.5	2,496	37 [60]	0	On
-2.0	2,176	34 [55]	0	On
-1.5	1,920	28 [45]	0	On
-1.0	1,728	26 [42]	0	On
-0.5	1,600	23 [37]	0	On
0.0	1,280	19 [31]	0	On

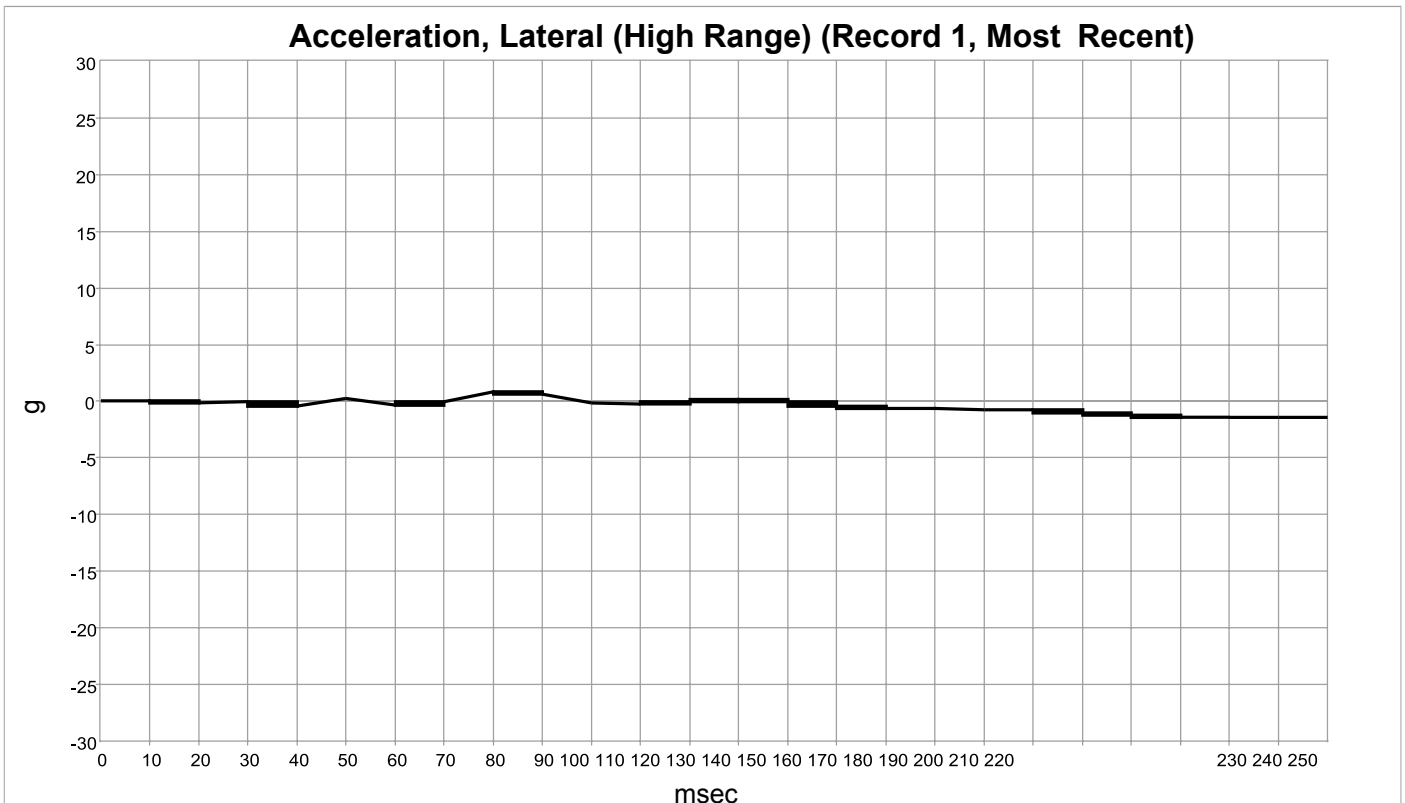
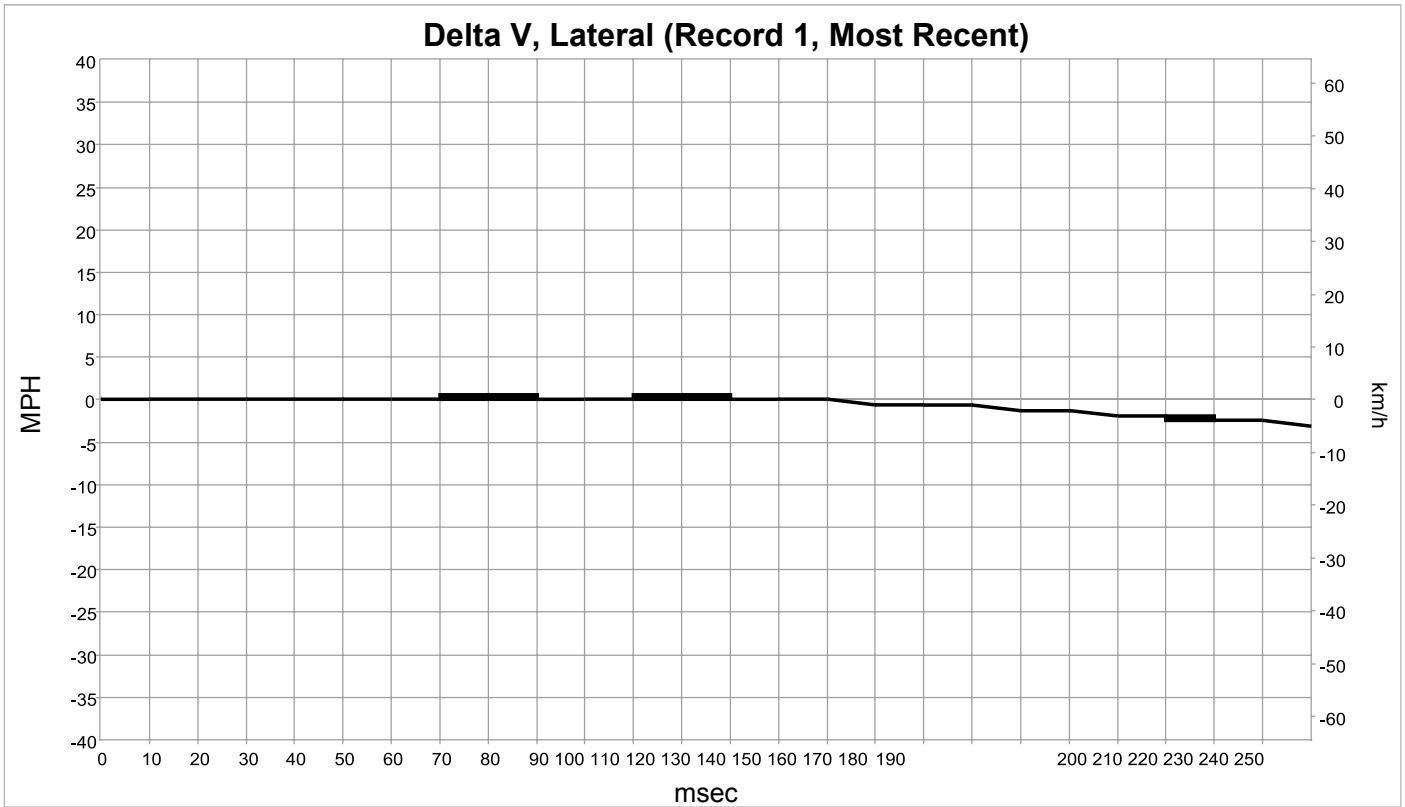
Longitudinal Crash Pulse (Record 1, Most Recent)



Longitudinal Crash Pulse (Record 1, Most Recent)

Time (msec)	Delta-V, Longitudinal (MPH [km/h])	Longitudinal Acceleration High Range (g)
0	-0.6 [-1]	-0.46
10	-1.2 [-2]	-1.06
20	-1.2 [-2]	-1.53
30	-3.1 [-5]	-2.02
40	-5.0 [-8]	-4.66
50	-6.2 [-10]	-6.93
60	-7.5 [-12]	-5.78
70	-8.7 [-14]	-5.14
80	-9.9 [-16]	-5.23
90	-10.6 [-17]	-5.32
100	-11.2 [-18]	-5.14
110	-12.4 [-20]	-4.17
120	-13.7 [-22]	-4.13
130	-14.3 [-23]	-4.64
140	-15.5 [-25]	-4.69
150	-16.2 [-26]	-4.39
160	-16.8 [-27]	-4.11
170	-18.0 [-29]	-4.07
180	-18.6 [-30]	-3.96
190	-19.3 [-31]	-3.60
200	-19.9 [-32]	-3.17
210	-19.9 [-32]	-2.76
220	-20.5 [-33]	-2.43
230	-21.1 [-34]	-2.14
240	-21.1 [-34]	-1.89
250	-21.1 [-34]	-1.59

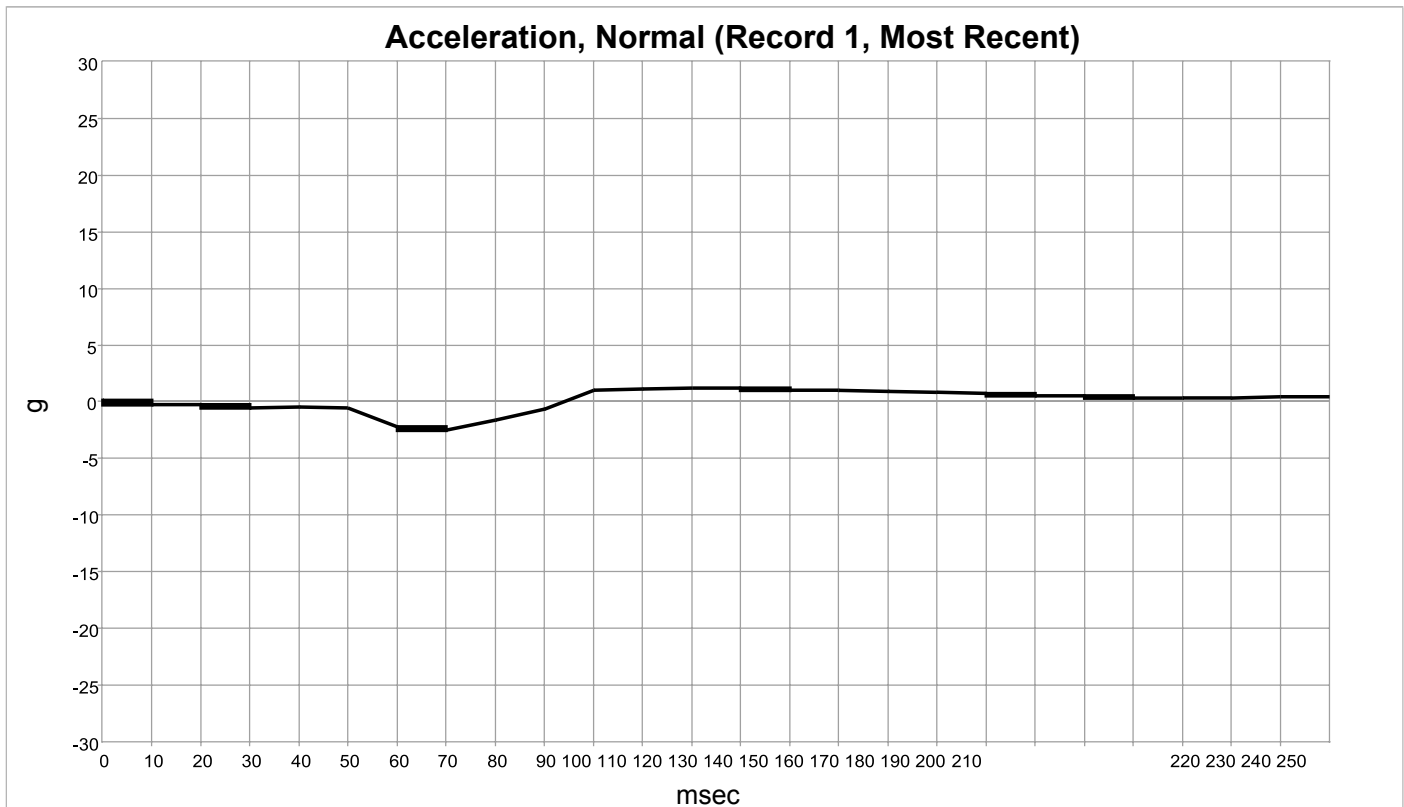
Lateral Crash Pulse (Record 1, Most Recent)



Lateral Crash Pulse (Record 1, Most Recent)

Time (msec)	Delta-V, Lateral (MPH [km/h])	Lateral Acceleration High Range (g)
0	0.0 [0]	0.07
10	0.0 [0]	0.01
20	0.0 [0]	-0.19
30	0.0 [0]	-0.08
40	0.0 [0]	-0.41
50	0.0 [0]	0.20
60	0.0 [0]	-0.37
70	0.0 [0]	-0.06
80	0.6 [1]	0.85
90	0.0 [0]	0.68
100	0.0 [0]	-0.12
110	0.0 [0]	-0.28
120	0.6 [1]	-0.06
130	0.0 [0]	0.10
140	0.0 [0]	-0.09
150	0.0 [0]	-0.43
160	-0.6 [-1]	-0.64
170	-0.6 [-1]	-0.66
180	-0.6 [-1]	-0.72
190	-1.2 [-2]	-0.78
200	-1.2 [-2]	-0.99
210	-1.9 [-3]	-1.24
220	-1.9 [-3]	-1.40
230	-2.5 [-4]	-1.45
240	-2.5 [-4]	-1.42
250	-3.1 [-5]	-1.42

Normal Acceleration (Record 1, Most Recent)



Time (msec)	Normal Acceleration (g)
0	0.1
10	-0.2
20	-0.2
30	-0.5
40	-0.4
50	-0.5
60	-2.2
70	-2.5
80	-1.6
90	-0.6
100	1.0
110	1.1
120	1.2
130	1.2
140	1.0
150	1.0
160	0.9
170	0.8
180	0.7
190	0.5
200	0.5
210	0.3
220	0.3
230	0.3
240	0.4
250	0.4

Hexadecimal Data

```
FA10    01

FA12    01 00 00 07 F1 00 00 07 F9

FA11    02 00 04

FA13    00 01 00 04 00 00 00 05 00 08 00 06 FF FF 00 07
        FF FF 00 0C 00 D4 00 0D 00 86 00 0E FF FF 00 0F
        FF FF 00 16 64 26 03 16 80 06 80 00 7F EC 7F F7
        7F D6 80 13 7F DA 7F F9 80 54 80 43 7F F3 7F E3
        7F F9 80 09 7F F6 7F D4 7F BF 7F BD 7F B7 7F B1
        7F 9C 7F 83 7F 73 7F 6E 7F 71 7F 71 00 17 64 26
        03 16 7F D1 7F 95 7F 66 7F 35 7E 2D 7D 4A 7D BD
        7D FD 7D F4 7D EB 7D FD 7E 5E 7E 62 7E 2F 7E 2A
        7E 48 7E 64 7E 68 7E 73 7E 97 7E C2 7E EB 7F 0C
        7F 29 7F 42 7F 60 00 19 64 26 03 16 80 7D 7D 7A
        7B 7A 69 66 6F 79 89 8A 8B 8B 89 89 88 87 86 84
        84 82 82 82 83 83 00 1F 64 26 03 16 7E 7D 7D 7A
        77 75 73 71 6F 6E 6D 6B 69 68 66 65 64 62 61 60
        5F 5F 5E 5D 5D 5D 00 20 64 26 03 16 7F 7F 7F 7F
        7F 7F 7F 7F 80 7F 7F 7F 80 7F 7F 7E 7E 7E 7D
        7D 7C 7C 7B 7B 7A 00 21 5C 00 22 79 00 23 76 00
        24 76 00 25 78 00 28 FF 00 29 FF 00 2D 01 00 2E
        00 00 00 2F 01 DA 00 30 00 00 00 33 00 33 00 38
        FF FF 00 39 FF FF 00 3B FF 00 3D FF FF 00 3E 00
        33 00 3F 00 33 00 41 FF FF 00 42 00 33 00 43 00
        33 00 47 00 00 4B 00 00 4D 00 00 4F 00 00 51 01
        00 5B 44 43 42 41 3F 3C 37 2D 2A 25 1F 00 5C 00
        00 00 00 00 00 00 00 00 00 00 00 5D 2B 2B 2A 29
        28 27 22 1E 1B 19 14 00 5F 00 00 00 00 01 01 01
        01 01 01 01 03 67 00 38 03 68 00 38 03 CF 00 8C
        03 DD 59 4E 46 03 DE 18 08 01 03 E8 A5 03 E9 02
        8B 03 EA 02 91 03 EB 68 03 EC 0E 03 ED 1C 03 EE
        13 03 EF 21 03 F0 17 03 F1 03 0D 03 F2 00 31 22
        03 F3 31 56 57 42 41 37 41 33 58 4A 43 2A 2A 2A
        2A 2A 2A 03 FB 04 03 FD 00 01 03 FE 08 93 E6 E7

FA14    00 00

FA15    00 00

FA16    00 00

FA17    00 00

FA18    00 00
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November 2021



U.S. Department
of Transportation
**National Highway
Traffic Safety
Administration**

