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15. Supplementary Notes

Each crash represents a unique sequence of events, and generalized conclusions cannot be made concerning the crashworthiness performance of the involved vehicles or their safety systems. This report and associated case data are based on information available to the Special Crash Investigation team on the date this report was published.

16. Abstract

This report documents the on-site investigation of the side impact crash involving a 2014 Infiniti QX60 Hybrid. The crash occurred at a four-leg intersection when the Infiniti was struck on the left side by a 2012 Ford Flex. Crash forces redirected the Infiniti toward the north, where it tripped and rolled two quarter-turns, right side-leading, coming to rest on its roof on the roadside of the northeast intersection quadrant, facing west. The occupants of the Infiniti were a belted 30-year-old male driver, a belted 31-year-old female front row right passenger, a belted 10-year-old female second row left passenger, and a 6-year-old male second row right passenger restrained in a booster child restraint system. Inflatable supplemental restraints in the Infiniti deployed in the crash, including the driver's seat-mounted side impact air bag and both roof side-rail-mounted inflatable curtain air bags. The driver and both child occupants in the second row were not injured. However, the front row right occupant sustained police-reported non-incapacitating (B-level) injuries and was transported by ambulance to a local hospital.

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Background

This report documents the on-site investigation of the side impact crash of a 2014 Infiniti QX60 Hybrid (Figure 1). The crash occurred at a four-leg intersection when the Infiniti was struck on the left side by a 2012 Ford Flex. Crash forces redirected the Infiniti toward the north, where it tripped and rolled two quarter-turns, right-side-leading. The Infiniti came to final rest on its roof on the roadside of the northeast intersection quadrant, facing west. At the time of the crash, occupants of the Infiniti were a belted 30-year-old male driver, a belted 31-year-old female front row right passenger, a belted 10-year-old female second row left passenger, and a 6-year-old male second row right passenger restrained in a booster child restraint system (CRS). Inflatable supplemental restraints in the Infiniti deployed in the crash, including the driver seat-mounted, side impact air bag and both roof side rail-mounted inflatable curtain (IC) air bags. The driver and both children in the second row were not injured as a result of the crash. However, the front row right occupant sustained police-reported non-incapacitating (B-level) injuries and was transported by ambulance to a local hospital for evaluation and treatment.

Figure 1. Front left oblique view of the Infiniti at the time of the SCI vehicle inspection

This crash was identified by the National Highway Traffic Safety Administration in July 2018 and forwarded to the Special Crash Investigations (SCI) team at Crash Research & Analysis, Inc., on the same day. The SCI team located the involved vehicles at regional vehicle salvage facilities, and the crash was assigned for an on-site investigation. Cooperation was established with the vehicles' insurers, and the on-site investigation took place in July 2018. On-site activities included exterior and interior inspections of the Infiniti to measure deformation and intrusion, document the evidence of occupant contact, and examine the manual and supplemental

restraint systems. The booster CRS was also inspected, and an exterior inspection of the Ford was conducted. Both the Infiniti and the Ford were equipped with Event Data Recorders (EDRs) supported by the Bosch Crash Data Retrieval (CDR) tool, and data were imaged from each vehicle during the SCI inspection process. The crash site was documented using photographs and a total station mapping system.

Summary

Crash Site

This crash occurred at the intersection of a two-lane east/west roadway and a two-lane north/south roadway in a rural setting. The crash occurred in the afternoon when reported weather conditions in the locale included partly cloudy skies, a temperature of 31 ºC (88 ºF), 61-percent relative humidity, and a southwest breeze of 11 km/h (7 mph). The Infiniti was northbound, while the Ford was eastbound.

For the Infiniti's travel trajectory on approach to the intersection, the two-lane roadway was straight. There was a railroad crossing less than 40 m (131.2 ft) south of the intersection, and the roadway had a slight negative grade from the railroad crossing to the intersection. The north/south lanes were nominally 3.0 m (9.8 ft) wide, delineated by a double-solid yellow centerline and bordered by single-solid white fog lines with grassy roadsides. For northbound traffic, the intersection was controlled by a stop sign and a red-flashing overhead electronic beacon (Figure 2).

Figure 2. Northbound view of the Infiniti's pre-crash approach to the intersection and crash site

Figure 3. Eastbound view of the Ford's pre-crash approach to the intersection and crash site

For the Ford's eastbound travel trajectory on approach to the intersection, the two-lane roadway was straight and level. The east/west lanes were nominally 3.3 m (10.8 ft) wide, delineated by a double-yellow centerline that permitted passing for westbound traffic. Single solid white fog lines marked the roadway edges, bordered by grassy roadsides. East/west traffic on approach to the intersection was alerted by a cautionary, yellow-flashing, overhead electronic beacon, but otherwise uncontrolled (Figure 3).

Speed in all directions was regulated by a posted limit of 89 km/h (55 mph). All roadside areas were grassy, with depressed ditches for drainage. Utility poles were positioned along the east/west roadway and in the northwest and southeast intersection quadrants. Several utility boxes, including fiber optic and underground cable, were located 5.3 m (17.4 ft) from the road edge on the roadside of the northeast intersection quadrant. A crash diagram is included at the end of this report.

Pre-Crash

The Infiniti traveled north on the two-lane roadway, driven by a belted 30-year-old male and occupied by a belted 31-year-old female front row right passenger, a belted 10-year-old second row left passenger, and a 6-year-old male passenger restrained in a booster CRS in the second row right position. Specifics concerning their pre-crash activities and route of travel remain unknown. The Infiniti crossed over the railroad tracks, and its driver brought the vehicle to a controlled stop at the mouth of the intersection in response to the stop sign and the flashing red electronic traffic controls.

The Infiniti remained stopped for an unknown time period before it accelerated into the intersection. Data imaged from the Infiniti's EDR indicated that the vehicle was stopped with the brake pedal depressed for the first five pre-crash data intervals (approximately two seconds). The brake pedal was then released, and the accelerator pedal depressed at 2.5 seconds prior to algorithm enable (AE). The driver apparently did not see or otherwise detect the approaching Ford as he attempted to proceed through the intersection. The Infiniti accelerated from its stationary position and achieved a speed of 23 km/h (14 mph) at 0.5 seconds prior to AE. The driver apparently detected the approaching Ford immediately prior to the crash, as he released the accelerator pedal and provided a right steering input immediately prior to the crash.

The Ford traveled eastbound on the east/west two-lane roadway, approaching the intersection from the west. It was driven by a 69-year-old female, with an 86-year-old male front right passenger and a 35-year-old male second row right passenger. According to the police crash report, all three occupants were belted. Specifics concerning their pre-crash activities and route of travel remain unknown. As the Ford approached the intersection, the driver observed the flashing yellow cautionary electronic signal and intended to proceed east through the intersection. Data imaged from the Ford's EDR indicated that the vehicle's ignition had been turned on and that it had been under operation for 590 seconds at the time of the crash event, equivalent to 9.8 minutes. It was traveling at a consistent speed of 96 km/h (59.7 mph) with the cruise control engaged over the first four seconds of the pre-crash data interval. The Ford's driver detected the Infiniti attempting to cross its path and initiated avoidance braking and left steering. The brake pedal was depressed, and the ABS was engaged for the final two pre-crash data intervals, and the Ford's speed had slowed to 77 km/h (47.8 mph) at AE.

Crash

The front plane of the Ford struck the left plane of the Infiniti in a perpendicular T-configuration in the intersection (Event 1). At impact, the heading angle of the Infiniti was approximately 325 degrees, while the heading angle of the Ford was approximately 55 degrees. In conjunction with the vehicles' speeds, this produced resultant directions of force in the 9-o'clock sector for the Infiniti (280 degrees) and 12-o'clock sector for the Ford (10 degrees). As the vehicles engaged, they were redirected toward the northeast intersection quadrant.

The Infiniti was displaced northeast by the momentum of the Ford. The vehicles separated, with a slight counterclockwise rotation induced about their vertical axis. As the Infiniti translated laterally, its higher center of gravity initiated a right roll about its longitudinal axis. Crash forces pushed the Infiniti into a right-side-leading rollover (Event 2). Its trajectory was evidenced by corresponding gouges and scrapes in the roadway surface at the northeast intersection quadrant.

The Infiniti completed two quarter turns and slid off the roadway into the depressed grass roadside, where it came to rest on its top plane, facing northwest (Figure 4).

The Ford departed the northeast intersection quadrant at a low speed and entered the depressed grass area. As the Ford came to final rest facing northeast in the roadside, it struck a yellow metal utility box with the left corner of its front plane (Event 3, Figure 5).

Figure 4. East-facing view of the rollover trajectory for the Infiniti into the grass roadside

Figure 5. Northeast view of the Ford's trajectory into the roadside and yellow utility box impact (Event 3)

Post-Crash

The local emergency response system received calls reporting the crash. Law enforcement, fire department, and emergency medical service personnel responded to the crash scene. The occupants of the Infiniti all exited the vehicle without assistance prior to the arrival of emergency personnel. The driver and both child occupants denied injury at the crash scene and refused medical care. The 31-year-old female front row right occupant was transported by ambulance to a local hospital for evaluation and treatment of reported non-incapacitating (B-level) injuries. The other occupants of the Infiniti traveled with her to the hospital in the same ambulance.

The three occupants of the Ford were assisted from the vehicle by emergency response personnel and then transported by ambulance to a local hospital for evaluation and treatment of reported non-incapacitating (B-level) injuries. A local towing service recovered the vehicles from the crash site and removed them to a local yard. Their respective insurers subsequently deemed both vehicles total losses, and they were transferred to the regional vehicle salvage facilities, where they were located for this SCI investigation.

2014 Infiniti QX60 Hybrid

Description

The 2014 Infiniti QX60 Hybrid (Figure 6) was identified by the vehicle identification number (VIN) 5N1CL0MM0ECxxxxxx. The electric odometer was inoperable at the time of the SCI inspection. The Infiniti was an all-wheel drive platform, powered by a 2.5-liter, inline, 4-cylinder, gasoline engine linked to a continuously variable speed transmission, with power-assisted 4-wheel disc brakes with antilock (ABS). Due to the jammed status of the left front door by direct crash damage, there was no access to view the manufacturer placards at the time of the SCI inspection. Therefore, the date of manufacture, gross vehicle weight rating, gross axle weight ratings, and recommended tire size/cold tire pressure remain unknown. At the time of the SCI inspection, the Infiniti was equipped with Michelin Latitude Tour tires of size P235/65R18 at all four axle positions. The tires had matching tire identification numbers (TINs) of B9MB 02BX xx16. All four tires had at least 5 mm (7/32 in) of tread, remained inflated, and were not damaged or restricted in relation to the crash.

Figure 6. Left front oblique view of the 2014 Infiniti QX60 Hybrid during the SCI vehicle inspection

The leather-surfaced interior of the Infiniti was configured for the seating of up to seven occupants (2/3/2), with front row bucket seats and second and third row split-bench seats with split forward-folding seatbacks. All seat positions were equipped with adjustable head restraints and 3-point lap and shoulder seat belt systems. Supplemental restraint systems included front seat belt lower anchor and retractor pretensioners, with six inflatable supplemental restraints. In this crash, the front seat belt pretensioners actuated, and the driver's seat-mounted side impact air bags and both IC air bags deployed.

Exterior Damage

The Infiniti sustained damage to its left, right, and top planes associative to the events of the crash. Damage from the initial, focal impact by the front plane of the Ford was centered in the "P-zone" of the left plane. Direct contact damage began immediately rearward of the left A-pillar and extended 180 cm (70.9 in) rearward to immediately forward of the left C-pillar. The center of the direct damage pattern was 12 cm (4.7 in) rearward of the center of the deformed left wheelbase dimension. In the damage pattern was a distinct lateral crush profile that matched the

contour of the Ford's front plane. Both left doors of the Infiniti were jammed shut, with crush to the door panels and B-pillar. The backlight, left front, and left rear glazing were all disintegrated by the crash forces and deformation of their door frames.

A residual crush profile was documented to the mid-door level of the Infiniti's left plane (Figure 7). The combined direct and induced damage width (Field-L) was 215 cm (84.6 in), beginning at the left A-pillar extending to the C-pillar and centered 17 cm (6.7 in) rearward of the center of the deformed left wheelbase dimension. Resultant measurements included: C1 = 0 cm (0 in), C2 = 18 cm (7.1 in), C3 = 28 cm (11.0 in), C4 = 28 cm (11.0 in), C5 = 29 cm (11.4 in), and C6 = 0 cm (0 in). Maximum crush was 29 cm (11.4 in), observed in the center aspect of the left rear door (Figure 8) and located 92 cm (36.2 in) forward of the left rear axle position. A collision deformation classification (CDC) of 09LPEW3 was assigned to the Infiniti's left plane damage profile. The damage algorithm of the WinSMASH model was used to calculate the severity of the crash. The Infiniti's total calculated vehicle velocity change (delta V) was 39 km/h (24.2 mph). Specific longitudinal and lateral components of the calculated delta V were -7 km/h (-4.3 mph) and 38 km/h (23.6 mph), respectively. These results were reasonable.

Figure 7. Left plane damage to the Infiniti as observed at the time of the SCI vehicle inspection

Figure 8. Overhead perspective of the SCI documentation of the Infiniti's left plane damage

The Infiniti sustained minor right plane and top plane damage from the two-quarter turn rollover (Event 2). Right plane damage consisted of minor scratches and abrasions to body surfaces, with minor lateral crush and damage to the right roof side rail. The majority of the rollover damage was discernable on the top plane, including body scratches and abrasions to the hood and roof concentrated in two distinct areas: the windshield header and the rear right corner of the roof (Figure 9). Vertical crush to the windshield header area was less than 5 cm (2.0 in). However, crush at the junction of the right roof side rail and upper D-pillar measured 10 cm (3.9 in) laterally and 12 cm (4.7 in) vertically. The CDC assigned to the Infiniti for the rollover damage was 00TDDO3. No WinSMASH calculations could be calculated as the rollover event type was beyond the model's scope.

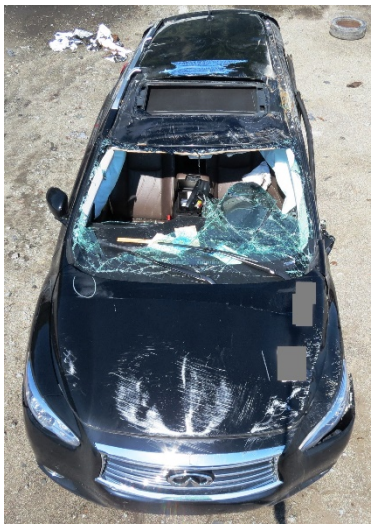


Figure 9. View of the Infiniti's rollover damage

Event Data Recorder

The 2014 Infiniti QX60 Hybrid was equipped with an air bag control unit (ACU), commonly referred to as an air bag control module (ACM), which had EDR capabilities. The Infiniti's ACU was mounted to the center tunnel of the vehicle, between the front seats. It monitored three-dimensional acceleration and commanded the actuation of pretensioners and deployment of inflatable supplemental restraint systems. During the SCI vehicle inspection, the Infiniti's EDR data were imaged using the Bosch CDR tool and software version 17.7.2, via a direct-to-module connection, and using an external power supply. The imaged data, later read using software version 21.0, are included in Appendix A.

The EDR could store a combination of up to two crash event records for either of the two event types, termed "non-deployment event" or "deployment event." By definition, a non-deployment event was any event that enabled the algorithm but did not meet the threshold for commanded actuation or deployment of a safety device. A deployment event actuated pretensioners and/or deployed inflatable restraints. Non-deployment events were subject to being overwritten by subsequent events of greater severity or typing, whereas air bag deployment event types could not be interrupted or overwritten. If power supply to the ACU was lost following a crash event, all or part of the data may not have been recorded to the EDR's memory.

The EDR had the capacity to record up to 250 milliseconds of data once the minimum threshold was achieved in longitudinal or lateral event types. Associated to the recording of each respective event was a 5-second pre-crash buffer that recorded pre-crash data points in 0.5-second intervals. Data recorded included vehicle speed (mph), accelerator pedal (% full), engine speed (rpm), engine speed (rpm), motor speed (rpm), service brake (on/off) status, and steering input (degrees) data. Additional data samples, including seat belt status of the front row occupants and system status data, were recorded at the time of an event.

The imaged data contained one event, termed Event Record 1, which had occurred on ignition cycle number 6,666. The ignition cycle at the time of data collection was 6,668, which confirmed

that the imaged data were related to the crash under investigation. The event file was completely recorded to memory. At the time of Event Record 1, the seat belt status of the driver and front right passenger both were reported as "On (fastened)."

In relation to the event, the driver's pretensioners, the driver's seat-mounted side impact air bag, and the left IC air bag were commanded to actuate/deploy at one millisecond after AE. The front right passenger's pretensioners and the right IC air bag were commanded to actuate/deploy at 253 milliseconds after AE. The maximum longitudinal delta V for Event Record 1 was -8 km/h (-5 mph) at 300 milliseconds after AE, while the maximum lateral delta V was 31 km/h (19 mph) at 117.5 milliseconds after AE. Roll angle data indicated that the Infiniti initiated its right roll in 200 milliseconds after AE, as the angle increased from 10 degrees at 0.2 seconds after AE to a maximum of 230 degrees at 1.8 seconds after AE. The roll angle returned to 180 degrees at 3.5 seconds after AE and remained steady, indicative that the Infiniti had come to final rest.

Associated with Event Record 1 were the following recorded pre-crash buffer data.

Time	Vehicle Speed	Accelerator Pedal (% Full)	Service Brake	Steering Wheel Angle (degrees)
-5.0	0 km/h (0 mph)	0	ON	2
-4.5	0 km/h (0 mph)	0	ON	2
-4.0	0 km/h (0 mph)	0	ON	2
-3.5	0 km/h (0 mph)	0	ON	2
-3.0	0 km/h (0 mph)	0	ON	2
-2.5	0 km/h (0 mph)	37.5	OFF	2
-2.0	4 km/h (2 mph)	80	OFF	10
-1.5	9 km/h (6 mph)	79.5	OFF	14
-1.0	16 km/h (10 mph)	76	OFF	14
-0.5	23 km/h (14 mph)	76	OFF	12
0.0	27 km/h (17 mph)	0	OFF	-18

The pre-crash data supported that the driver had been stopped at the intersection prior to the crash. The brake pedal status, accelerator pedal status, and steering angle data all indicate that the driver detected the approaching Ford immediately prior to the crash. He released the accelerator pedal, likely to apply the brake pedal, and steered the vehicle right in an attempt to avoid the imminent impact by the Ford.

Interior Damage

The Infiniti sustained interior damage that included integrity loss, intrusion, and occupant contact. The tempered left front and left rear door glazing panels were disintegrated by the forces associated with the initial impact by the Ford. Rollover forces resulted in the disintegration of the tinted/tempered roof glazing and tempered backlight glazing panels, as well as the full height/width fracture of the laminated windshield glazing. The left side doors remained closed and were jammed shut by the left plane impact damage, while the right doors remained closed during the crash and were operational at the time of the SCI vehicle inspection.

Multiple intrusions into the occupant compartment of the Infiniti were documented during the SCI vehicle inspection. Associative to the first impact event with the Ford were the following lateral intrusions: 24 cm (9.4 in) of the left front door, rear lower quadrant; 18 cm (7.1 in) of the left rear door, forward lower quadrant; 18 cm (7.1 in) of the left lower B-pillar; 14 cm (5.5 in) of the left upper B-pillar; and 7 cm (2.8 in) of the left lower C-pillar. The left front door and left B-pillar had intruded such that they were engaged against the driver's seat and had displaced the seat cushion and seatback to the right, which also induced deformation to the driver's seat and to the center console of the vehicle. The left rear door was engaged against the seat cushion of the second row left position, the intrusion of which had deformed the seat.

Figure 10 depicts the lateral intrusion of the left front door and corresponding deformation to the driver's area, while Figure 11 depicts the lateral intrusion of the left rear door and the deformation sustained by the second row left seat position and driver's seatback.

Figure 10. Intrusion of the left front door of the Infiniti that resulted in lateral deformation to the driver's seat

Figure 11. Left rear door and left B-pillar intrusion in the Infiniti that resulted in deformation to the second row left seat cushion, driver's seat, and center console

Figure 12. Deformation to the greenhouse structure of the Infiniti as viewed forward-facing from the third row

Figure 13. Driver contact to the left front door panel and underside of the steering column in the Infiniti

Additional intrusions in the Infiniti resulted from the secondary rollover event, which included both lateral and vertical intrusions. Lateral intrusions from the rollover included 15 cm (5.9 in) of the right roof side rail at the third row, 8 cm (3.1 in) of the right upper C-pillar, and 6 cm (2.4 in) of the right upper B-pillar. Vertical intrusions included 10 cm (3.9 in) of the right roof side rail at the third row and 4 cm (1.6 in) of the windshield header at the front row right position. Slight vertical deformation of the roof biased to the right side was discernable when the interior of the Infiniti was viewed from the rear of the vehicle, facing forward (Figure 12).

The SCI inspection of the interior of the Infiniti revealed a minor scuff to the underside of the steering column from the driver's right knee and subtle scuffing on the left front door from the driver's left leg (Figure 13). There were multiple discolorations on the roof, all of which were related to the post-crash egress of the occupants. No other contacts were discernable.

Manual Restraint Systems

The Infiniti was equipped with 3-point continuous loop lap and shoulder seat belt systems for all five seat positions. The front seat belts used cinching latch plates and were configured with adjustable D-rings. The second row outboard seat belts used sliding latch plates and also were configured with adjustable D-rings. The driver's seat belt retracted onto an emergency locking retractor (ELR), while all other systems used switchable ELR/automatic locking retractors (ALR). Both front seat belt systems were equipped with lower anchor and retractor pretensioners. Data imaged from the Infiniti's EDR reported an actuation command for both pretensioner systems in the crash.

At the time of the inspection, the SCI investigator found the driver seat belt system hanging loosely against the B-pillar, with the webbing extended in a used position. The lower anchor and retractor pretensioners were actuated, and the webbing was locked in position with the D-ring in its lowest height position. Examination of the webbing identified an area of loading on the webbing in the likely location of the latch plate (Figure 14), with corresponding loading evidence discernable in the belt path on the latch plate. It was apparent to the SCI investigator that the driver's seat belt system was in use at the time of the crash.

Figure 14. Latch plate loading evidence on the webbing of the Infiniti driver's seat belt system

Figure 15. Loading evidence to the front right passenger's seat belt system in the Infiniti

The front right passenger's seat belt system was also found hanging loosely against the B-pillar, with the webbing extended in a used position. The lower anchor and retractor pretensioners were actuated, and the webbing was locked in position with the D-ring in its lowest height position. Examination of the webbing identified an area of loading on the webbing in the likely location of the latch plate, and the shoulder portion of the webbing from the location of the latch plate extending toward the B-pillar was waffled (Figure 15). It was apparent to the SCI investigator that the front right passenger's seat belt system was in use at the time of the crash.

The second row left seat belt system was found slightly extended from the retractor. The retractor spooled freely, and the SCI investigator pulled the webbing to expose its full length. Minor loading evidence was visible in the belt path on the sliding latch plate, and a portion of the webbing was stretched/waffled (Figure 16). It was apparent to the SCI investigator that the second row left seat belt system was in use at the time of the crash.

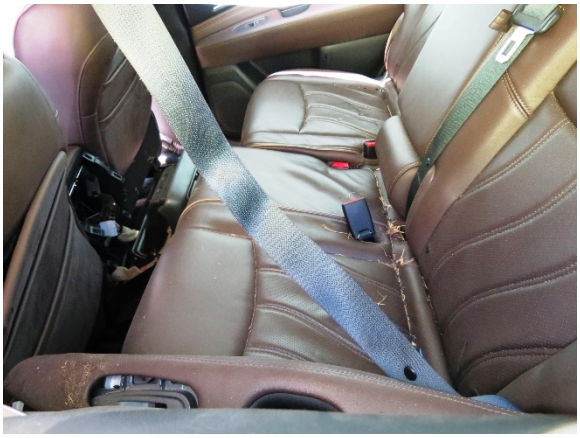


Figure 16. Stretched portion of the Infiniti's second row left seat belt webbing, evidentiary of its use

Figure 17. Loading evidence to the second row right seat belt system in the Infiniti

The second row right seat belt system was found hanging loosely against the C-pillar, with the webbing slightly extended. Webbing spooled freely from the retractor, and it was exposed for inspection. Subtle loading evidence was discernable in the belt path on the latch plate, with a corresponding transfer on the webbing. The shoulder portion of the webbing also appeared stretched/waffled (Figure 17). It was apparent to the SCI investigator that the second row right seat belt system was in use at the time of the crash

Supplemental Restraint Systems

The Infiniti was equipped with supplemental restraints, including a Certified Advanced 208-Compliant (CAC) frontal air bag system, front seat-mounted side impact air bags, and dual-sensing (side impact and rollover) IC air bags. The CAC system consisted of dual-stage air bags for the driver and front right passenger positions, front seat track position sensors, front seat belt buckle switch sensors, front lower anchor and retractor pretensioners, and a front right occupant classification sensor. The driver's frontal air bag was mounted in the hub of the four-spoke steering wheel, while the passenger's frontal air bag was a top-mounted design in the right instrument panel. The front row side impact air bags were mounted in the outboard aspect of each front seat, adjacent to the respective B-pillars, and provided supplemental protection for lateral (side) crash forces. The IC air bags were mounted to the roof side rails and concealed by

the vehicle's headliner, designed to provide outboard protection for all three of the Infiniti's seating rows. The supplemental restraints (air bags and pretensioners) were controlled and monitored by the ACU. In this crash, the front lower anchor and retractor pretensioner actuated, and the driver's seat-mounted and both IC air bags deployed.

Figure 18. Left-facing view of the driver's deployed seat-mounted air bag in the Infiniti

Figure 19. View of the deployed left IC air bag for the driver and second row positions in the Infiniti

Figure 20. Forward-facing view of the deployed right IC air bag in the Infiniti from the third row

The driver's seat-mounted side impact air bag deployed forward through the outboard edge stitching of the seatback. In its deflated state, the approximate dimensional measurements of the air bag were 68 cm (26.8 in) tall and a maximum of 25 cm (9.8 in) wide. A 4 cm (1.6 in) diameter vent port was located on the center outboard aspect of the air bag. There was no damage or discernable occupant contact to the Infiniti's deployed driver's seat-mounted air bag. Figure 18 depicts the air bag at the time of the SCI vehicle inspection.

The IC air bags deployed downward from their respective roof side rail mounting locations through the edge of the headliner. In their deflated states, the air bags extended the full distance from the A-pillar to the D-pillar. A 12 cm (4.7 in) fabric tether provided rigidity at the base of the upper A-pillar. The IC air bags provided vertical coverage that extended below the beltline,

measuring 50 cm (19.7 in) at the front row, 32 cm (12.6 in) at the B-pillar, 63 cm (24.8 in) at the second row, 40 cm (15.7 in) at the C-pillar, and 45 cm (17.7 in) at the third row. The left IC air bag had some post-crash evidence adjacent to the driver's position, with some mud or dirt in the area of the left B-pillar. The air bag was clean adjacent to the second row left and third row left positions. The right IC air bag was clean along its entire length. There was no discernable crash-related occupant contact to either of the deployed IC air bags.

Figure 19 depicts the deployed driver's seat-mounted and left IC air bags at the time of the SCI inspection, while Figure 20 depicts the deployed right IC air bag.

Child Restraint System

At the time of the crash, a booster CRS was in use for the restraint of the second row right occupant. The CRS remained in the Infiniti at the time of the SCI vehicle inspection. It was a Graco Model# 1920048 Turbo NB booster CRS, manufactured in China on June 23, 2017, by Graco Children's Products of Exton, PA. Figure 21 depicts the CRS at the time of the SCI inspection. It was used without the back support and had the following ratings for use under such condition: approximate age 4-10 years, for children weighing 18-45 kg (40-100 lbs) and measuring 101-145 cm (40-57 in) in height.

Figure 21. View of Graco booster CRS at the time of the SCI inspection

Figure 22. View of the left aspect of the CRS and stress marks to the shell

Figure 23. Loading stress marks on the lower left corner of the CRS base

Inspection of the CRS revealed that the belt paths on both sides of the CRS were clean, with no discernable loading striations. An area of light stress marks to the polymer base was visible on the left aspect of the CRS, below the belt path (Figure 22). This loading was focused on the bottom left corner of the CRS base (Figure 23) and was consistent with the left lateral impact forces of the crash.

NHTSA Recalls and Investigations

A VIN-based query of NHTSA's recall database (www.nhtsa.gov/recalls) for the 2014 Infiniti QX60 Hybrid indicated that there were no open recalls and no open investigations pertaining to this specific vehicle as of the date of this report.

2014 Infiniti QX60 Hybrid Occupants

Driver Demographics

Age/sex:	30 years/male
Height:	Unknown
Weight:	Unknown
Eyewear:	Unknown
Seat type:	Forward-facing bucket seat with adjustable head restraint
Seat track position:	Middle
Manual restraint usage:	3-point lap and shoulder seat belt with retractor and lower anchor pretensioners (actuated)
Usage source:	Vehicle inspection, EDR data
Air bags:	Frontal, seat-mounted side impact, and IC air bags available; seat-mounted and IC air bags deployed
Alcohol/drug data:	None (no test given)
Egress from vehicle:	Exited vehicle without assistance
Transport from scene:	Not medically transported
Type of medical treatment:	None, refused evaluation

Driver Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
N/A	None	N/A	N/A	N/A

Source: police crash report.

Driver Kinematics

The 30-year-old male was seated in the driver's seat of the Infiniti. He had adjusted the seat to a middle track position, with the seatback slightly reclined and the adjustable head restraint 7 cm (2.8 in) upward. The driver used the available 3-point lap and shoulder seat belt system for manual restraint. His use of the seat belt system was determined by the post-crash SCI inspection of the Infiniti's manual restraints and corroborated by the EDR data imaged from the vehicle's ACU.

The driver operated the Infiniti northbound and brought the vehicle to a controlled stop at the mouth of the controlled intersection. He waited for the traffic to clear, then released the brake pedal, and depressed the accelerator pedal to direct the Infiniti through the intersection. He detected the approaching Ford immediately prior to impact and released the accelerator pedal while steering right in a panic reaction to the imminent crash.

At impact by the Ford, the Infiniti's driver seat belt pretensioners actuated, and the driver's seat-mounted side impact and left IC air bags deployed. The driver initiated a left lateral trajectory, and his body loaded the seat belt system while his left flank contacted and loaded the deployed air bags. There was no discernable evidence on the air bags to support such contact and loading, but the driver's lack of injury supported the effectiveness of these safety restraint systems.

The driver's left leg contacted and scuffed the left front door panel, but he did not sustain corresponding injury. The driver remained to the left and restrained by the seat belt system as the Infiniti translated to the right by the momentum of the Ford and the related crash forces. As the Infiniti was pushed into a right side-leading rollover, the driver initially remained left by the centrifugal forces. As the vehicle contacted the ground with its top and slid off the road edge, the driver was redirected by the force of gravity. His body again loaded the seat belt system, and his right knee contacted and scuffed the underside of the steering column. He did not sustain injury in relation to these kinematics or contact.

The driver remained restrained by his seat belt and became suspended upside down as the Infiniti came to final rest on its top plane. He maneuvered his body and unbuckled the seat belt system and crawled out of the overturned vehicle with the other occupants. The driver denied injury at the crash site, refused medical treatment, and was not medically transported from the crash scene.

Front Row Right Occupant Demographics

Age/sex:	31 years/female
Height:	Unknown
Weight:	Unknown
Eyewear:	Unknown
Seat type:	Forward-facing bucket seat with adjustable head restraint
Seat track position:	Middle
Manual restraint usage:	3-point lap and shoulder seat belt with retractor and lower anchor pretensioners (actuated)
Usage source:	Vehicle inspection, EDR data
Air bags:	Frontal, seat-mounted side impact, and IC air bags available; IC air bag deployed
Alcohol/drug data:	None (no test given)
Egress from vehicle:	Exited vehicle without assistance
Transport from scene:	Ambulance to a local hospital
Type of medical treatment:	Evaluation for reported non-incapacitating (B-level) injuries

Front Row Right Occupant Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
N/A	Unknown	N/A	N/A	N/A

Source: requests for medical records denied by non-cooperative facility.

Front Row Right Occupant Kinematics

The 31-year-old female front right passenger was seated in the front row right position of the Infiniti. She had adjusted the seat to a middle track position, with the seatback slightly reclined and the adjustable head restraint 5 cm (2.0 in) upward. The front right passenger used the available 3-point lap and shoulder seat belt system for manual restraint.

Her use of the seat belt system was determined by the post-crash SCI inspection of the Infiniti's manual restraints and corroborated by the EDR data imaged from the vehicle's ACU. At impact by the Ford, the front right passenger initiated a left lateral trajectory. Her body loaded the seat belt system, the retractor of which was engaged in ELR mode. The front row right occupant's left flank certainly contacted the center console, though there was no evidence discernable at the time of the SCI inspection to support such contact. Her torso likely extended over the center armrest, and her left leg likely contacted the right aspect of the center stack.

As the Infiniti began to roll right by the forces associated with the crash, the front right passenger's lower anchor and retractor pretensioners actuated, and the right IC air bag deployed. The actuation of the pretensioners removed some of the slack in the seat belt system and prevented the front right passenger's displacement about the interior during the rollover. Centrifugal and gravitational forces redirected the front row right occupant right and downward, and she became suspended upside down as the vehicle came to rest.

She maneuvered her body and unbuckled the seat belt system. She then crawled out of the overturned vehicle with the other occupants. Emergency response personnel evaluated her at the crash scene and transported her by ambulance to a local hospital for the treatment of reported non-incapacitating (B-level) injuries. Requests for records documenting her injuries and treatment course were denied by the non-cooperative facility.

Second Row Left Occupant Demographics

Age/sex:	10 years/female
Height:	Unknown
Weight:	Unknown
Eyewear:	Unknown
Seat type:	Forward-facing bench seat with adjustable head restraint
Seat track position:	Middle
Manual restraint usage:	3-point lap and shoulder seat belt
Usage source:	Vehicle inspection
Air bags:	IC air bag available; deployed
Alcohol/drug data:	None (no test given)
Egress from vehicle:	Exited vehicle without assistance
Transport from scene:	Not medically transported
Type of medical treatment:	None, refused evaluation

Second Row Left Occupant Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
N/A	None	N/A	N/A	N/A

Source: police crash report.

Second Row Left Occupant Kinematics

The 10-year-old female second row left occupant was seated on the second row split-bench seat in the Infiniti. The seat was adjusted to a middle track position, with the seatback slightly

reclined and the adjustable head restraint 2 cm (0.8 in) upward. The second row left occupant used the available 3-point lap and shoulder seat belt system for manual restraint. Her use of the seat belt system was determined by the post-crash SCI inspection of the Infiniti's manual restraints.

At impact by the Ford, the Infiniti's left IC air bag deployed, and the ELR of the second row left seat belt system engaged. The second row left child occupant initiated a left lateral trajectory, and her body loaded the seat belt system. Her upper torso and head were likely of sufficient height to interact with the deployed IC air bag; however, there was no discernable contact on the air bag to support such contact. The presence of the air bag mitigated injury to the child's head. Her left flank and left leg likely contacted the intruding left rear door panel. However, no contact evidence was discernable during the vehicle inspection. She experienced these kinematics, but she did not sustain injury.

She remained to the left and restrained by the seat belt system as the Infiniti translated to the right by the momentum of the Ford and the related crash forces. As the Infiniti was pushed into a right side-leading rollover, she initially remained left by the centrifugal forces. As the vehicle contacted the ground with its top and slid off of the road edge, she was redirected by the force of gravity. Her body again loaded the seat belt system. She did not sustain injury in relation to these kinematics.

She remained restrained by the seat belt system and became suspended upside down as the Infiniti came to final rest on its top plane. She maneuvered her body and unbuckled the seat belt system, then crawled out of the overturned vehicle with the other occupants. She denied injuries at the crash site, her parents refused medical treatment on her behalf, and she was not medically transported from the crash scene.

Second Row Right Occupant Demographics

Age/sex:	6 years/male
Height:	Unknown
Weight:	Unknown
Eyewear:	Unknown
Seat type:	Booster CRS positioned on forward-facing bench seat with adjustable head restraint
Seat track position:	Between middle and full rearward
Manual restraint usage:	3-point lap and shoulder seat belt
Usage source:	Vehicle inspection
Air bags:	IC air bag available; deployed
Alcohol/drug data:	None (No test given)
Egress from vehicle:	Exited vehicle without assistance
Transport from scene:	Not medically transported
Type of medical treatment:	None, refused evaluation

Second Row Right Occupant Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
N/A	None	N/A	N/A	N/A

Source: police crash report.

Second Row Right Occupant Kinematics

The 6-year-old male second row right occupant was restrained by the Infiniti's available 3-point lap and shoulder seat belt system in a Graco backless booster CRS positioned on the split-bench seat of the Infiniti's second row, with the seat adjusted to a track position between middle and rearmost and the seatback slightly reclined. The adjustable head restraint was positioned fully downward. His restraint usage was determined by the post-crash SCI inspection of the Infiniti's manual restraints and the CRS.

At impact by the Ford, he initiated a left lateral trajectory. His body loaded the seat belt system and booster CRS, which provided a moment of force on the left aspect of the CRS. This loading force resulted in stress marks/discoloration to the lower left rear corner of the CRS base. He did not sustain injury in relation to his leftward kinematic response or loading.

He remained to the left and restrained by the seat belt system in the CRS as the Infiniti translated to the right by the momentum of the Ford and the related crash forces. As the Infiniti was pushed into a right side-leading rollover, he was redirected to the right by the centrifugal forces and then downward by gravitational forces. He likely contacted the deployed right IC air bag with his head, but he did not sustain injury, and there was no corresponding contact evidence discernable on the air bag at the time of inspection.

He remained restrained by the seat belt system in the CRS and became suspended upside down as the Infiniti came to final rest on its top plane. With assistance from other occupants, he maneuvered his body, unbuckled the seat belt system, and crawled out of the overturned vehicle. The child denied injuries, his parents refused medical treatment on his behalf, and he was not medically transported from the crash scene.

2012 Ford Flex

Description

The 2012 Ford Flex (Figure 24) was manufactured in January of 2012 and identified by the VIN 2FMGK5CC7CBxxxxxx. Its electric odometer reading was 202,509 km (125,833 mi) at the time of the SCI inspection. The Ford was a 4-door crossover that had a 300 cm (118.1 in) wheelbase. It was powered by a 3.5-liter, V-6, gasoline engine linked to an automatic transmission. The Ford's gross vehicle weight rating was 2,708 kg (5,970 lb), with gross axle weight ratings of 1,311 kg (2,890 lb) front and 1,420 kg (3,130 lb) rear. The vehicle manufacturer's recommended tire size was P235/60R18, with recommended cold tire pressures of 240 kPa (35 PSI) for all four axle positions. At the time of the SCI inspection, the Ford was equipped with Uniroyal Laredo tires of the recommended size at all four axle positions, with matching TINs Y97A Y8UU xx15."All four tires had at least 3 mm (4/32 in) of tread, remained inflated, and were not damaged or restricted in relation to the crash. The Ford was equipped with the Select (SEL) level trim package. Its cloth-surfaced interior was configured for the seating of up to seven occupants, with multiple manual and supplemental restraint systems available.

Figure 24. Front left oblique view of the Ford at the time of the SCI inspection

Exterior Damage

The Ford sustained front plane damage from the events of the crash. The observed damage was related to the impact with the Infiniti. The Ford did not sustain damage from the minor contact with the utility box. Damage from first event with the Infiniti spanned the Ford's entire front plane width. The undeformed end with was 160 cm (63.0 in). In the damage pattern was deformation to the hood, both front fenders, grille, bumper beam, and bumper fascia. Both headlight assemblies were fractured/disintegrated. Underhood components were also damaged/displaced. At the time of the SCI inspection, damage was documented to the exposed bumper beam, which had a width of 130 cm (51.2 in). A residual crush profile documented to the bumper beam using a total station mapping system produced the following resultant crush measurements: C1 = 28 cm (11.0 in), C2 = 31 cm (12.2 in), C3 = 34 cm (13.4 in), C4 = 36 cm (14.2 in), C5 = 31 cm (12.2 in), and C6 = 23 cm (9.1 in). Maximum crush measured 36 cm (14.2

in) and was located immediately right of the vehicle's centerline. The corresponding CDC assigned to the Ford was 12FDEW2.

Figure 25 depicts the Ford's front plane damage, while Figure 26 depicts the damage profile from an overhead perspective.

Figure 25. Front plane view of the Ford at the time of the SCI vehicle inspection

Figure 26. Overhead view of the damage profile to the Ford's front plane

The damage algorithm of the WinSMASH model was used to calculate the severity of the crash. The total calculated vehicle deltaV of the crash for the Ford was 43 km/h (26.7 mph). Specific longitudinal and lateral components of the calculated delta V were -42 km/h (-26.1 mph) and -7 km/h (-4.3 mph), respectively. Based on SCI expertise and observed vehicle damage, these results were reasonable.

The secondary impact of the Ford with the metallic utility box was a low-speed, very minor severity impact. It occurred as the Ford came to rest with its front plane pitched down into the depressed grass roadside. The impact resulted in deformation to the utility box, but it likely was of insufficient magnitude to produce corresponding deformation to the Ford. The impact overlapped the existing front plane damage from the impact with the Infiniti. The location of the impact in relation to the Ford's front plane was determined based on the orientation and trajectory of the Ford and its known final rest position. The minor severity impact resulted in a CDC to the Ford of 12FLLN1. No WinSMASH calculations could be computed for the impact due to the lack of corresponding deformation, yielding object, and overlapping damage that were beyond the scope of the model.

Event Data Recorder

The 2012 Ford Flex was equipped with a restraints control module (RCM) mounted to the center tunnel, beneath the center console. The RCM monitored the diagnostic functions of the vehicle's restraint systems (air bags and seat belt pretensioners) and controlled the deployment/actuation of those devices dependent upon crash event severity. The RCM also had EDR capabilities to record crash event data for longitudinal, lateral, and non-horizontal events. Data were imaged from the Ford's RCM during the SCI inspection through the diagnostic link connector (DLC) using the Bosch CDR tool and current software version (17.7.2). The data, later read using software version 21.0, are included at the end of this report as Appendix B.

The EDR component of the RCM could record non-deployment or deployment event types. By definition, non-deployment events are those in which the recording threshold is met or exceeded, but no supplemental restraint devices (air bags) were deployed. Deployment events were those in which frontal, seat-mounted, or IC air bags were commanded to deploy. Non-deployment events could be overwritten by subsequent events, whereas deployment events became locked and could not be overwritten. The RCM had the capacity to store up to two events.

At AE and recognition of a crash event, the EDR had the capacity to record up to 250 milliseconds of longitudinal and lateral delta V data in 10 millisecond intervals. Roll angle data were recorded at 0.1-second intervals for one second prior and five seconds after AE. Associated to each event was a 5-second pre-crash buffer that recorded numerous vehicle operational parameters (vehicle speed, accelerator pedal position, service brake, and other data).

The data were imaged on ignition cycle 21,888 and reported one event, which was a locked frontal deployment event type. It occurred on ignition cycle 21,887, when the key-on timer read 590 seconds. The key-on timer data indicated that the Ford had been running for just under 10 minutes of continuous operation when the crash occurred. The air bag warning lamp was off, telltales were all off, and there were no diagnostic trouble codes present at the time of the event. Based on SCI expertise, the locked frontal event was related to the SCI reconstructed first crash event with the left plane of the Infiniti.

Both the driver and the front right passenger seat belt status were reported as “buckled” for the recorded crash event. Pre-crash data for the recorded event included the following:

Time	Vehicle Speed km/h (mph)	Accelerator Pedal (%-full)	Service Brake	Engine rpm	ABS Activity	Steering Angle (deg)
-5.0	96.0 (59.7)	0	Off	1,600	Non-engaged	0.4
-4.5	96.0 (59.7)	0	Off	1,600	Non-engaged	-1.1
-4.0	96.0 (59.7)	0	Off	1,600	Non-engaged	-1.1
-3.5	96.0 (59.7)	0	Off	1,600	Non-engaged	-1.1
-3.0	96.0 (59.7)	0	Off	1,600	Non-engaged	-1.1
-2.5	96.0 (59.7)	0	Off	1,600	Non-engaged	-1.1
-2.0	96.0 (59.7)	0	Off	1,600	Non-engaged	0.4
-1.5	96.0 (59.7)	0	Off	1,600	Non-engaged	1.9
-1.0	96.0 (59.7)	0	Off	1,600	Non-engaged	13.9
-0.5	94.0 (58.4)	0	On	1,600	Engaged	10.9
0.0	77.0 (47.8)	0	On	1,400	Engaged	0.4

The maximum recorded longitudinal vehicle velocity change of the recorded event was -39.94 km/h (-24.81 mph), which was reported at 245 milliseconds after AE. The maximum recorded lateral vehicle velocity change was -8.48 km/h (-5.27 mph), reported 85 milliseconds after AE.

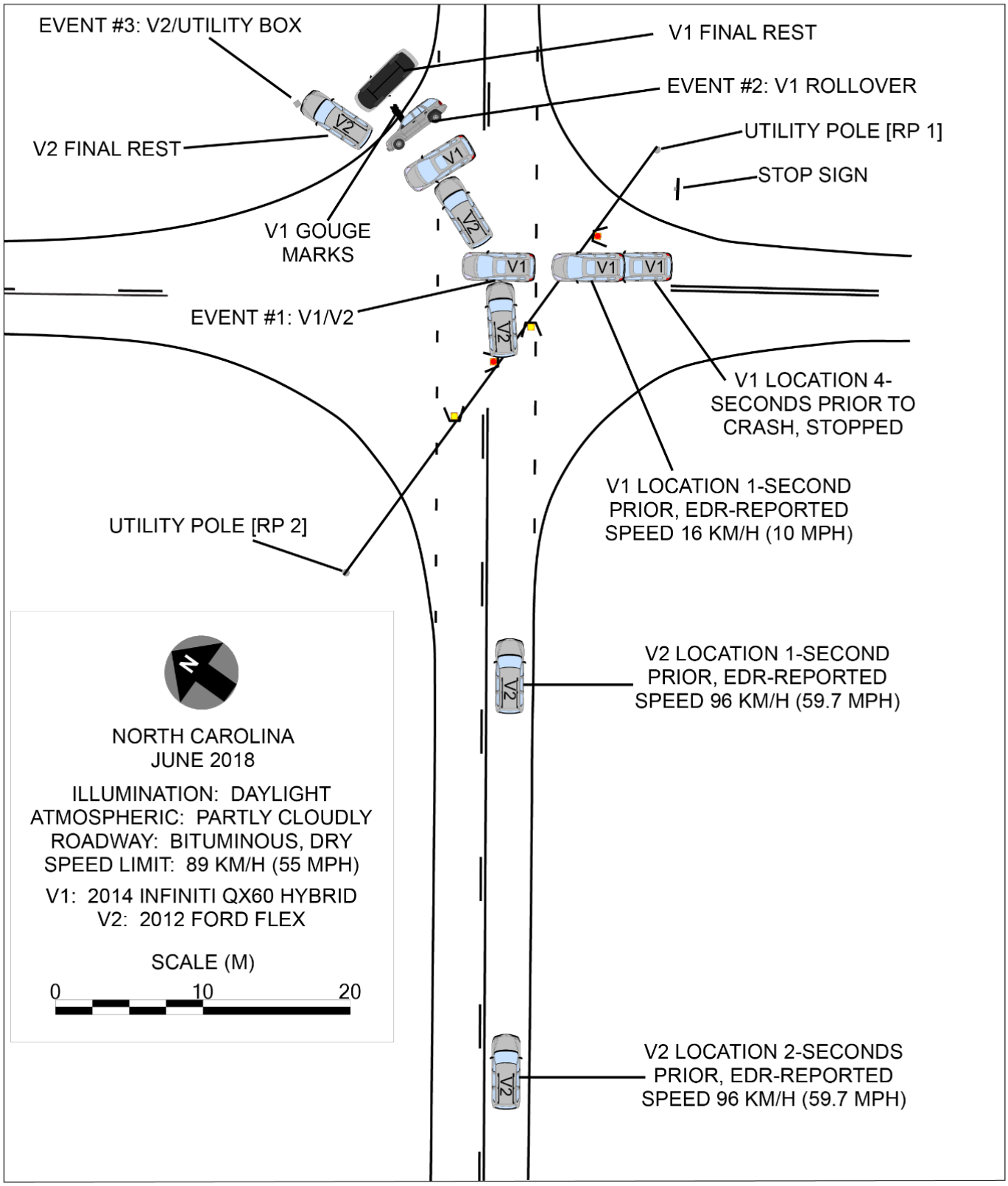
The recorded deployment event produced the following commands:

Device	Time (milliseconds)
Pretensioner (retractor), driver	8.5
Pretensioner (buckle), driver	13.5
Pretensioner (retractor), right front	8.5
Frontal air bag, 1st stage, driver	20.5
Frontal air bag, 2nd stage, driver	26.5
Frontal air bag, 1st stage, right front	20.5
Frontal air bag, 2nd stage, right front	30.5
Adaptive steering column, driver	23.5
Adaptive load limiter, right front	54.5

Occupant Data

The 2012 Ford Flex was driven by the 69-year-old female, with an 86-year-old male front right passenger and a 35-year-old male second row right passenger. According to the police crash report and corroborated by the imaged EDR data, all three of the Ford's occupants were belted by their manual restraint systems at the time of the crash. Specifics concerning their pre-crash activities and route of travel remain unknown. All three occupants were transported by ambulance to a local hospital following the crash for evaluation and treatment of reported non-incapacitating (B-level) injuries.

Crash Diagram



Case Number:	CR18020

Appendix A: Event Data Recorder Report for 2014 Infiniti QX60 Hybrid[1]

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

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

CDR File Information

User Entered VIN	5N1CL0MM0EC******
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	CR18020_V1_ACM.CDRX
Saved on	
Imaged with CDR version	Crash Data Retrieval Tool 17.7.2
Imaged with Software Licensed to (Company Name)	NHTSA
Reported with CDR version	Crash Data Retrieval Tool 21.0
Reported with Software Licensed to (Company Name)	NHTSA
EDR Device Type	Airbag Control Module
Event(s) recovered	Event Record 1

Comments

No comments entered.

Data Limitations

General Information:

Data limitations are intended to assist in reading event data that has been imaged from the vehicle's Air bag Control Unit (ACU). Event data should be considered in conjunction with other available physical evidence from the vehicle and scene.

Airbag Control Unit (ACU)

- The Air bag Control Unit (ACU) can store two types of events: Non-Deployment Events and Deployment.
  - A Non-Deployment Event is a crash or other physical occurrence which causes the ACU algorithm to be activated, but in which deployment thresholds are not reached.
  - A Deployment Event is a crash or other physical occurrence which causes ACU deployment thresholds to be reached or exceeded. Depending on the vehicle model, one or more of the following may be activated during a Deployment Event: front air bags, seat-mounted side airbags, roof-mounted or door-mounted curtain air bags, pretensioners, or pop-up roll bars.

- The ACU can record up to two events. If additional events occur subsequently, the older of the two events already recorded (i.e. the one which occurred first) is overwritten.
  - A Non-Deployment Event can be overwritten by another Non-Deployment event, or by a Deployment Event.
  - A Deployment Event has higher priority than a Non-Deployment Event, and cannot be interrupted or overwritten by another event.
  - The data pertaining to a Deployment Event is locked after being recorded. However, a second event can still be recorded subsequently in the portion of the event memory which is not locked.

- Event data includes both pre-crash data and crash data.
  - If the power supply to the ACU is lost during an event, all or part of the event data may not be recorded.
  - In addition to the recording of event data, the ACU has the ability to perform diagnostics and record Diagnostic Trouble Codes (DTCs).

Data Element Sign Convention:

The following table provides an explanation of the sign convention for data elements in the CDR report.

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
Vehicle Roll Angle	Left to Right Rotation
Steering Input	Left Turn

- "Life Time Counter (sec)" indicates the elapsed time, in seconds, from the vehicle's first ignition activation until the start of the first recorded event. The counter is incremented whenever the vehicle's ignition is on. The counter is reset to 0 if the ACU is replaced.
- "Complete File Recorded" indicates whether a complete EDR data set has been stored after the event. "Yes" indicates that a complete data set has been recorded. "No" indicates that only a portion of the data set has been recorded, for example due to the power to the ACU being lost during the event.
- "Multi-Event, Number of Events (1, 2)" indicates the number of events which are stored during a given ignition cycle. A Multi-Event occurs whenever the time between Event 2 trigger threshold and Event 1 trigger threshold is less than or equal to 5 seconds during the same ignition cycle, and "2" will be recorded in this case. Otherwise, "1" will be recorded.
- "Air Bag Warning Lamp (On, Off)" indicates whether the ACU was in trouble mode or in normal operation mode at the time of the event. "On" indicates that the air bag warning lamp was illuminated at the time of the event, and the ACU was in trouble mode. "Off" indicates that the air bag warning lamp was not illuminated at the time of the event, and the ACU was in normal operation mode.
- "Frontal Air Bag Suppression Switch Status" indicates whether front passenger air bag deployment was suppressed at the time of the event. "On" indicates that the front passenger air bag was suppressed at the time of the event (deployment inhibited). "Off" indicates that the front passenger air bag was not suppressed at the time of the event (deployment enabled). This data will not be available for all vehicles.
- "Delta-V, Longitudinal" indicates the cumulative change in velocity along the longitudinal direction.
- "Acceleration, Longitudinal" indicates the rate of change of velocity with time along the longitudinal direction.
- "Delta-V, Lateral" indicates the cumulative change in velocity along the lateral direction.
- "Acceleration, Lateral" indicates the rate of change of velocity with time along the lateral direction.
- "Engine Throttle, % full" indicates the position of the accelerator pedal as a percentage of the fully depressed position.
- "Service Brake (On, Off)" indicates whether the service brake is activated ("On") or not activated ("Off").
- "Steering Input (deg)" indicates the angular displacement of the steering wheel measured in degrees. -250 deg indicates a 250 degree turn to the right of the steering wheel, 0 deg indicates the straight-ahead steering wheel position, and 250 deg indicates a 250 degree turn to the left of the steering wheel.
- The notation "CLP" indicates that the measurement captured by a sensor exceeded the design range of the sensor.
- "Seat Track Position Switch, Foremost, Status, Driver (Yes/No)" indicates whether the driver's seat is positioned within a designated threshold value of the most forward adjustment position. "Yes" indicates that the driver's seat is positioned within a designated threshold value of the most forward adjustment position. For all other adjustment positions, "No" is displayed. This data will not be available if the seat track position switch is not installed in the vehicle.
- "Occupant Size Classification, Right Front Passenger, Child (Yes/No)" indicates whether or not the right front passenger is classified as a child (as defined in 49 CFR part 572, subpart N or smaller). This data will not be available for all vehicles.
- "e-pedal ON/OFF Status" indicates whether "e-pedal" is activated (ON), or not activated (OFF). This data will not be available for all vehicles.
- "ABS Warning lamp, on/off" indicates whether "Anti-lock Brake System" was in trouble mode or in normal operation mode at the time of the event. This data will not be available for all vehicles.
- "AEB/FCW switch status ON/OFF (from ADAS)" indicates whether the switch of "Automatic Emergency Braking or Forward Collision Warning controlled by ADAS unit" was ON, or OFF at the time of the event. This data will not be available for all vehicles.
- "AEB Warning lamp (from ADAS)" indicates whether "Automatic Emergency Braking controlled by ADAS unit" was in trouble mode or in normal operation mode at the time of the event. This data will not be available for all vehicles.
- "ABS regulation status" indicates whether "Anti-lock Brake System" was activated (ABS in regulation), or not activated (no ABS regulation). This data will not be available for all vehicles.
- "VDC switch status ON/OFF" indicates whether the switch of "Vehicle Dynamic Control" in ON, or OFF. This data will not be available for all vehicles.
- "VDC status/warning" indicates whether "Vehicle Dynamic Control" was in normal operation mode and not activated (No failure and no control), in trouble mode and not activated (Failure), or in normal mode and activated (In active control). This data will not be available for all vehicles.
- "Adaptive Cruise Control status" indicates whether "Intelligent Cruise Control status" was activated (ACC activated), waiting (ACC waiting), suspended (ACC suspended), or not activated (No display request). This data will not be available for all vehicles.
- "AEB operating capability" indicates whether "Automatic Emergency Braking" was in trouble mode (Impossible to execute request) or in normal operation mode (Braking fully operational). This data will not be available for all vehicles.
- "AEB Brake request (from ADAS)" indicates whether "Automatic Emergency Braking controlled by ADAS unit" was activated (Brake Torque AEB Maximum), or not activated (No Brake Request). This data will not be available for all vehicles.

Hexadecimal Data:
All data that has been specified for retrieval is shown in the Hexadecimal Data section of this report. However, the Hexadecimal Data section may contain data that is not translated by the CDR tool.

Data Sources:
- Crash data is measured internally in the ACU.
- Pre-crash data is not measured internally in the ACU, but is transmitted from other control units through the Controller Area Network (CAN).
- Pre-crash data and crash data are asynchronous.

0701_Nissan001_r008

DTCs at Time of Retrieval

DTC	Status	Description
B1422	Current	SIDE COLLISION DETECTION
B00D5	Current	PASSENGER AIRBAG INDICATOR CIRCUIT [VB-SHORT], [OPEN]
B1430	Current	FRONT PRE-TEN LH CIRCUIT [OPEN]
B1423	Current	ROLLOVER DETECTION
B1424	Current	ROLLBAR DETECTION
B1431	Current	FRONT PRE-TEN RH CIRCUIT [OPEN]
B1433	Current	FRONT PRE-TEN2 RH CIRCUIT [OPEN]
B0020	Current	SIDE AIRBAG MODULE LH CIRCUIT [OPEN]
B0094	Current	CRASH ZONE SENSOR [DISCONNECT]
B0096	Current	B-PILLAR SATELLITE SENSOR RH [DISCONNECT]
B0091	Current	B-PILLAR SATELLITE SENSOR LH [DISCONNECT]
B0097	Current	C-PILLAR SATELLITE SENSOR RH [DISCONNECT]
B0092	Current	C-PILLAR SATELLITE SENSOR LH [DISCONNECT]
B0093	Current	DOOR SATELLITE SENSOR LH [DISCONNECT]
B0098	Current	DOOR SATELLITE SENSOR RH [DISCONNECT]
U1000	Current	(CAN COMMUNICATION FAILER)
B1422	Past	SIDE COLLISION DETECTION
B00A0	Trouble Diag. Record	OCCUPANT DETECTION SENSOR [POWER FAIL]

System Status at Event (Event Record 1)

Life Time Counter (sec)	7991562
Complete File Recorded (Yes/No)	Yes (Complete)
Ignition Cycle, Crash	6666
Ignition Cycle, Download	6668
Multi-Event, Number of Events (1, 2)	1
Time from Event 1 to 2 (sec)	N/A
Safety Belt Status, Driver	On (Fastened)
Safety Belt Status, Right Front Passenger	On (Fastened)
Frontal Air Bag Warning Lamp (On, Off)	Off
Frontal Air Bag Suppression Switch Status	Off (AS airbag deploy)
Maximum Delta-V, Longitudinal (MPH [km/h])	-5 [-8]
Time, Maximum Delta-V, Longitudinal (msec)	300
Maximum Delta-V, Lateral (MPH [km/h])	19 [31]
Time, Maximum Delta-V, Lateral (msec)	117.5
Maximum Acceleration, Longitudinal (g)	21.5
Time, Maximum Acceleration, Longitudinal (msec)	22.5
Maximum Acceleration, Lateral (g)	34.5
Time, Maximum Acceleration, Lateral (msec)	40
Seat Track Position Switch, Foremost, Status, Driver (Yes/No)	N/A
Occupant Size Classification, Right Front Passenger, Child (Yes/No)	No

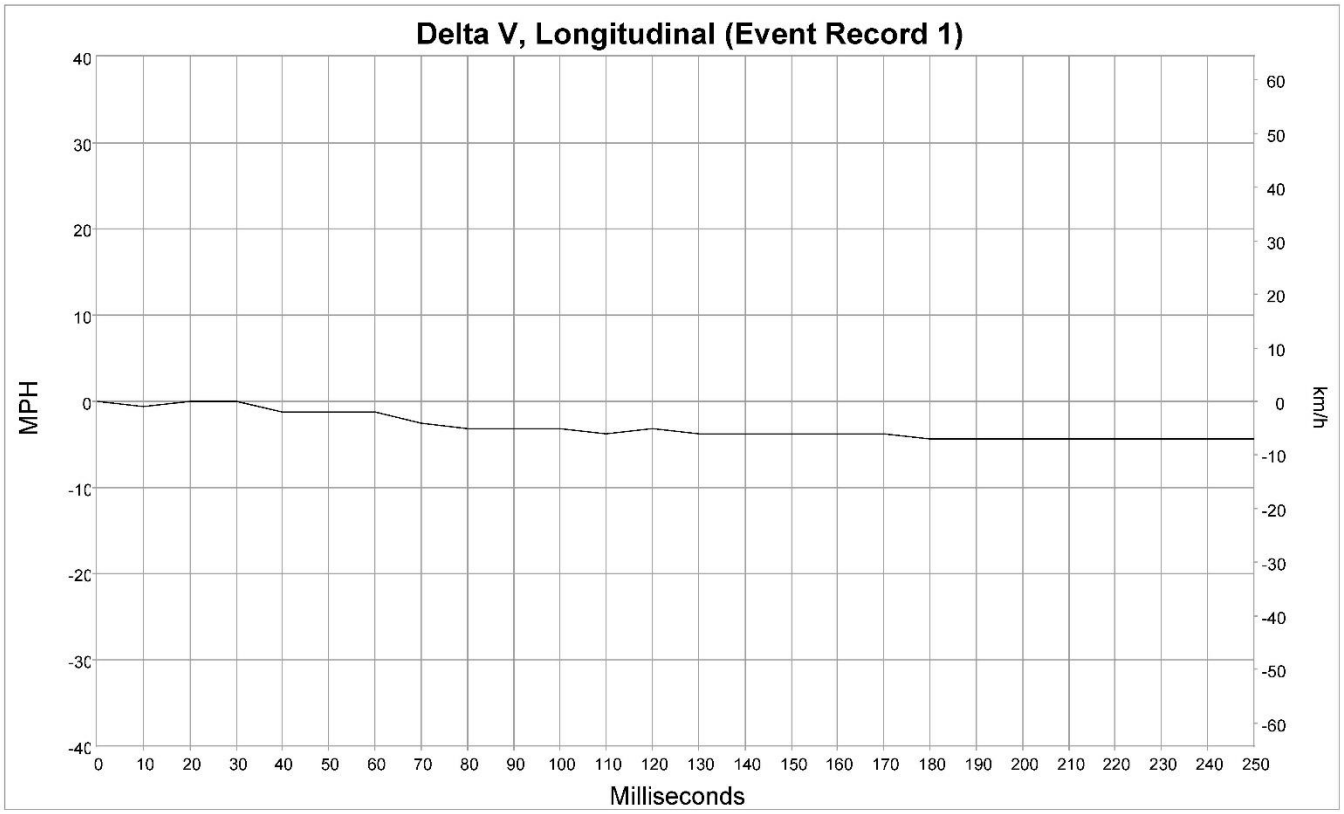
Deployment Command Data (Event Record 1)

Frontal Air Bag Deployment, Time to Deploy/First Stage, Driver (msec)	N/A
Frontal Air Bag Deployment, Time to Deploy/First Stage, Passenger (msec)	N/A
Frontal Air Bag Deployment, Time to 2nd Stage, Driver (msec)	N/A
Frontal Air Bag Deployment, Time to 2nd Stage, Right Front Passenger (msec)	N/A
Side Air Bag Deployment, Time to Deploy, Driver (msec)	1
Side Air Bag Deployment, Time to Deploy, Right Front Passenger (msec)	N/A
Side Curtain/Tube Air Bag Deployment, Time to Deploy, Driver Side (msec)	1
Side Curtain/Tube Air Bag Deployment, Time to Deploy, Right Side (msec)	253
Pretensioner Deployment, Time to Fire, Driver (msec)	1
Pretensioner Deployment, Time to Fire, Right Front Passenger (msec)	253

Pre-Crash Data -5 to 0 sec [2 samples/sec] (Event Record 1)

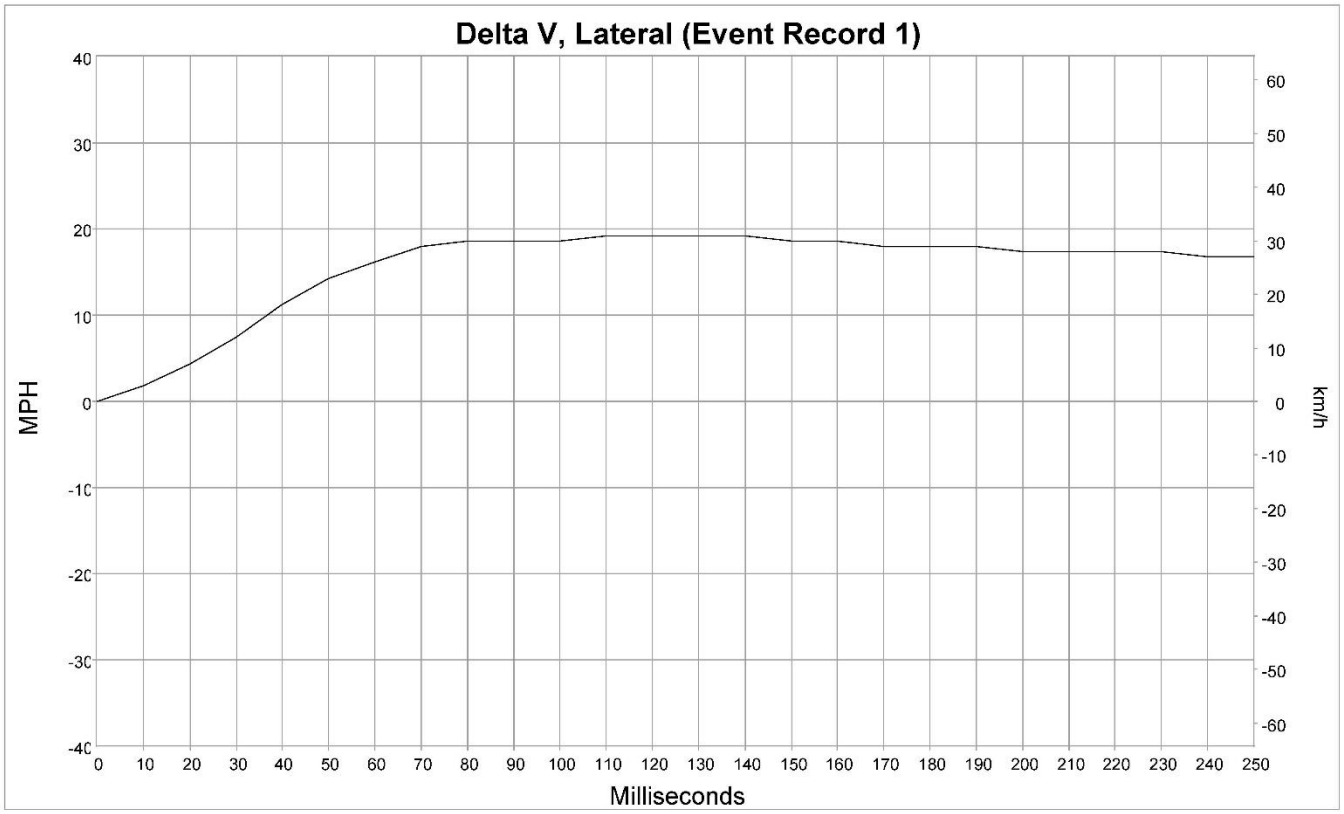
(the most recent sampled values are recorded prior to the event)

Time Stamp (sec)	Speed, Vehicle Indicated (MPH [km/h])	Accelerator Pedal, % full	Engine RPM	Motor RPM	Service Brake (On, Off)	Steering Input (deg)
-5.0	0 [0]	0	1100	0	On (Brake Activated)	2
-4.5	0 [0]	0	1100	0	On (Brake Activated)	2
-4.0	0 [0]	0	1100	0	On (Brake Activated)	2
-3.5	0 [0]	0	1100	0	On (Brake Activated)	2
-3.0	0 [0]	0	1100	0	On (Brake Activated)	2
-2.5	0 [0]	37.5	1050	100	Off (Brake Not Activated)	2
-2.0	2 [4]	80	1350	400	Off (Brake Not Activated)	10
-1.5	6 [9]	79.5	2150	1000	Off (Brake Not Activated)	14
-1.0	10 [16]	76	1750	1750	Off (Brake Not Activated)	14
-0.5	14 [23]	76	2350	2400	Off (Brake Not Activated)	12
0.0	17 [27]	0	2500	2500	Off (Brake Not Activated)	-18



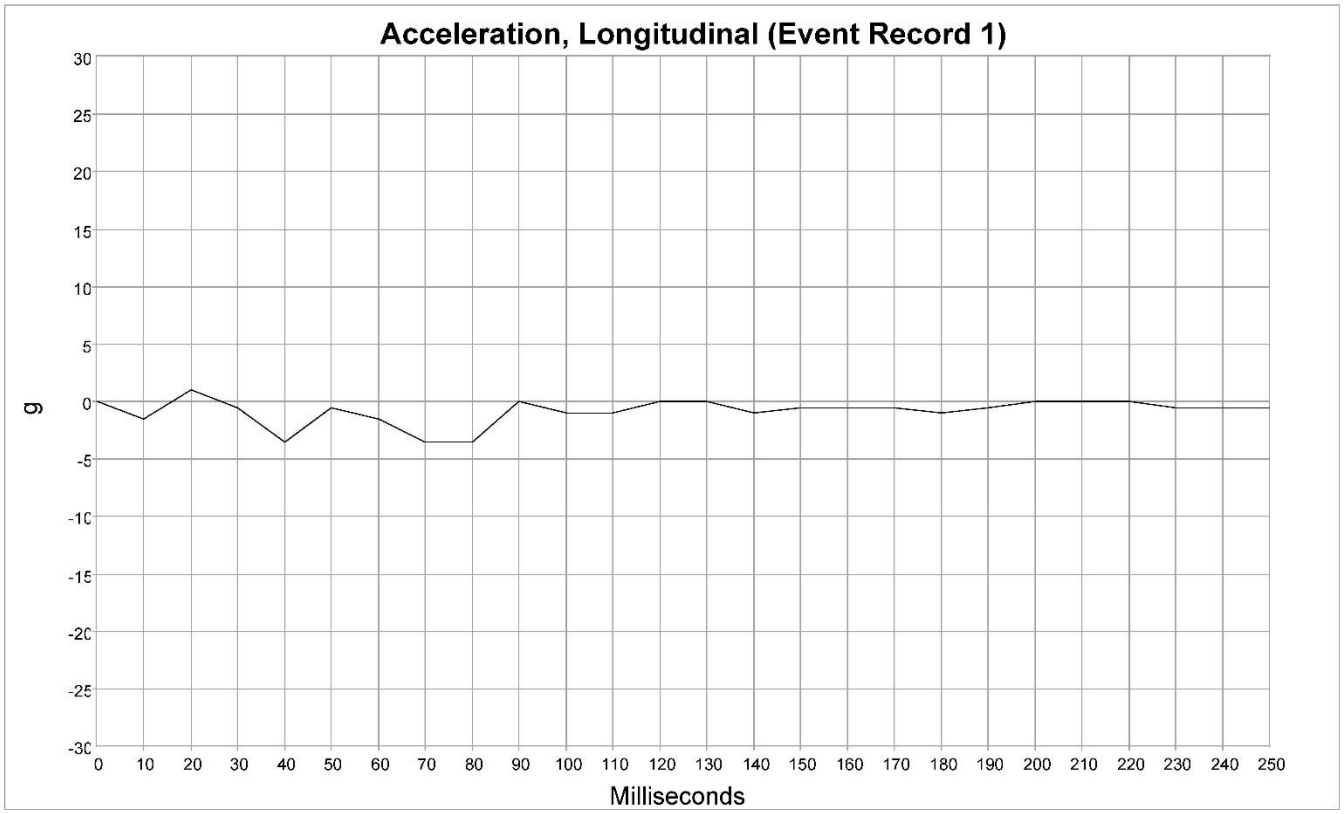
Longitudinal Delta V (Event Record 1)

Time (msec)	MPH [km/h]
0	0 [0]
10	-1 [-1]
20	0 [0]
30	0 [0]
40	-1 [-2]
50	-1 [-2]
60	-1 [-2]
70	-2 [-4]
80	-3 [-5]
90	-3 [-5]
100	-3 [-5]
110	-4 [-6]
120	-3 [-5]
130	-4 [-6]
140	-4 [-6]
150	-4 [-6]
160	-4 [-6]
170	-4 [-6]
180	-4 [-7]
190	-4 [-7]
200	-4 [-7]
210	-4 [-7]
220	-4 [-7]
230	-4 [-7]
240	-4 [-7]
250	-4 [-7]



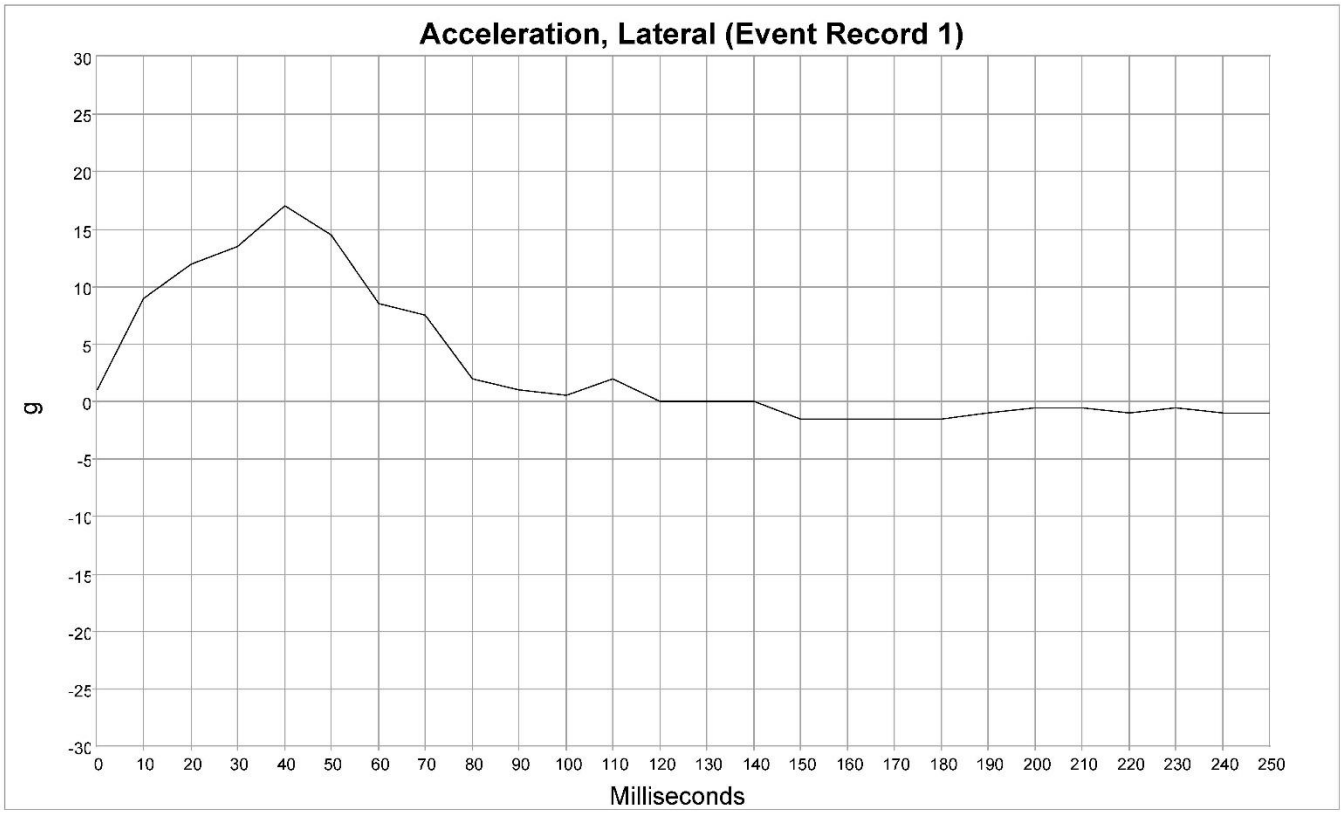
Lateral Delta V (Event Record 1)

Time (msec)	MPH [km/h]
0	0 [0]
10	2 [3]
20	4 [7]
30	7 [12]
40	11 [18]
50	14 [23]
60	16 [26]
70	18 [29]
80	19 [30]
90	19 [30]
100	19 [30]
110	19 [31]
120	19 [31]
130	19 [31]
140	19 [31]
150	19 [30]
160	19 [30]
170	18 [29]
180	18 [29]
190	18 [29]
200	17 [28]
210	17 [28]
220	17 [28]
230	17 [28]
240	17 [27]
250	17 [27]



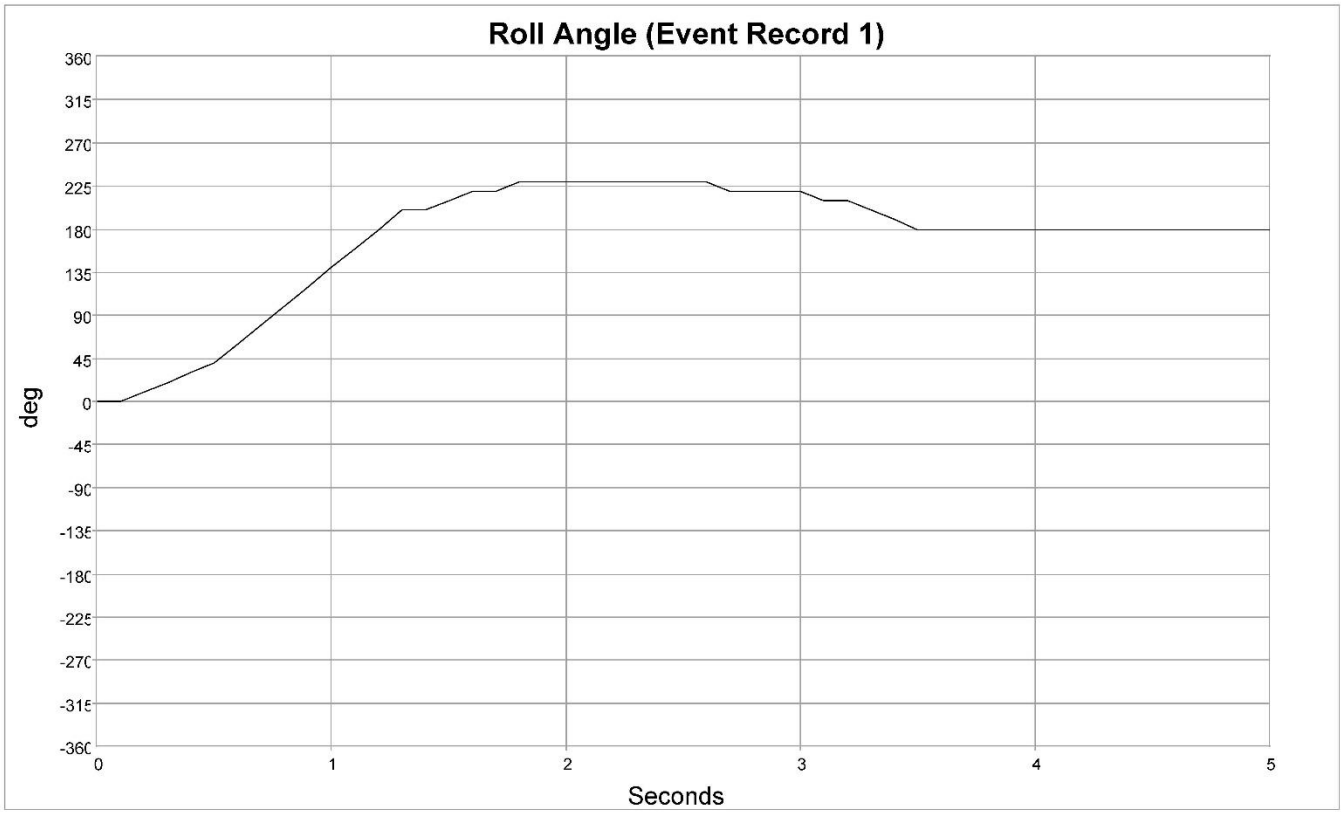
Longitudinal Acceleration (Event Record 1)

Time (msec)	g
0	0
10	-1.5
20	1
30	-.5
40	-3.5
50	-.5
60	-1.5
70	-3.5
80	-3.5
90	0
100	-1
110	-1
120	0
130	0
140	-1
150	-.5
160	-.5
170	-.5
180	-1
190	-.5
200	0
210	0
220	0
230	-.5
240	-.5
250	-.5



Lateral Acceleration (Event Record 1)

Time (msec)	g
0	1
10	9
20	12
30	13.5
40	17
50	14.5
60	8.5
70	7.5
80	2
90	1
100	.5
110	2
120	0
130	0
140	0
150	-1.5
160	-1.5
170	-1.5
180	-1.5
190	-1
200	-.5
210	-.5
220	-1
230	-.5
240	-1
250	-1



Roll Angle (Event Record 1)

Time (sec)	deg
0.0	0
0.1	0
0.2	10
0.3	20
0.4	30
0.5	40
0.6	60
0.7	80
0.8	100
0.9	120
1.0	140
1.1	160
1.2	180
1.3	200
1.4	200
1.5	210
1.6	220
1.7	220
1.8	230
1.9	230
2.0	230
2.1	230
2.2	230
2.3	230
2.4	230
2.5	230
2.6	230
2.7	220

2.8	220
2.9	220
3.0	220
3.1	210
3.2	210
3.3	200
3.4	190
3.5	180
3.6	180
3.7	180
3.8	180
3.9	180
4.0	180
4.1	180
4.2	180
4.3	180
4.4	180
4.5	180
4.6	180
4.7	180
4.8	180
4.9	180
5.0	180

Hexadecimal Data

61 01 FF C0 00 94 22 00 80 D5 15 94 30 13 94 23 00 94 24 00 94 31 13 94 33 13 80 20 13 80 94
88 80 96 88 80 91 88 80 97 88 80 92 88 80 93 88 80 98 88 D0 00 01 14 01 00 0C FF 03 1F

61 02 94 22 00 00 00 01 3F 00 00 00 01 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
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00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

61 03 80 A0 00 00 00 01 02 00 00 27 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
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00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
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61 04 00 00 02 C9 00 00 14 00 00 00 00 00 00

61 06 24 FF 08 FF FF FF FF FF FF FF FF FF FF FF FF FF FF 03 03 FF FF FF FF FF FF FF 93 01 06
21 FF FF FF FF FF FF 01 06 02 02 19 02 FF FF FF FF FF 03 03 09 00 00 13 13 13 FF 7E 34 7E 34
00 09 FF FF FF FF FF FF 02 07 00 00 00 00 FF FF FF 00 FF FF 93 04 05 93 03 06 01 03 00 05 03
FF FF 90 68 8C 8B 55 55 55 55 55 55 00

61 19 00 00 80 00 00 00 80 00 00 00 80 00 00 00 40 00 00 00 40 00 00 00 40 00 00 00 80 00 00
00 80 00 00 19 00 00 00 05 00 00 FF FF CC CD 00 00 40 00 00 00 40 00 00 19 00 00

61 1A 00 FF 00 00 FE FE FE FC FB FB FB FA FB FA FA FA FA FA F9 F9 F9 F9 F9 F9 F9 F9 F8 78 00
00 00 00 00 00 00 00 00 00 00 00 00 04 00 09 00 10 00 17 00 1B 00 00 00 00 00 00 00 00 00 00
00 4B 00 A0 00 9F 00 98 00 98 00 00 00 00 00 00 00 01 01 01 01 01 01 1A 0A 1A 0C 00 01 00 00
01 FF 00 00 01 00 00 01 00 01 FD 01 FD 02 12 18 1B 22 1D 11 0F 04 02 01 04 00 00 00 FD FD FD
FD FE FF FF FE FF FE FE

61 1B 00 FD 02 FF F9 FF FD F9 F9 00 FE FE 00 00 FE FF FF FF FE FF 00 00 00 FF FF FF 00 03 07
0C 12 17 1A 1D 1E 1E 1E 1F 1F 1F 1F 1E 1E 1D 1D 1D 1C 1C 1C 1C 1B 1B 1F 2F 00 16 00 16 00 16
00 16 00 16 00 15 00 1B 00 2B 00 23 00 2F 00 32

61 1C 00 00 00 00 00 00 00 00 00 00 00 00 01 02 03 04 06 08 0A 0C 0E 10 12 14 14 15 16 16 17
17 17 17 17 17 17 17 17 16 16 16 16 15 15 14 13 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12
12 FF FF FF FF FF FF FF FF FF FF FF FF FF FB FF F9 FF F9 FF FA 00 09 2B 09 45 10 00 00 00 00
00 00 00 00 00 00 00 02 00 08 00 14 00 23 00 30 00 32 01 FF 01 FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF 00 79 F1 0A

61 1D 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F
7F 7F 7F 7F 7F 7F 7F 7F

61 1E 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F
7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF

61 1F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F
7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F
7F 7F FF 7F FF 7F FF 7F FF 7F FF 7F FF 7F FF 7F FF 7F FF 7F FF 7F FF 7F FF 7F FF FF FF FF FF
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FF FF FF FF FF FF FF FF FF FF FF FF FF

61 83 33 4A 45 30 41 08 31 52 30 00 00 00 00 00 00 00 00 00 00 31 20 20 83

0x04001E40 07 FF FF FF

0x04001FCC FF FF FF FF

0x04001EA2 00 00

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0x04001FC8 FF FF FF FF

59 02 09 94 22 00 09 80 D5 15 09 94 30 13 09 94 23 00 09 94 24 00 09 94 31 13 09 94 33 13 09 80 20 13 09 80 94 88 09 80 96 88 09 80 91 88 09 80 97 88 09 80 92 88 09 80 93 88 09 80 98 88 09 D0 00 01 09

59 02 09 94 22 00 08

59 0F 08 80 A0 00 08

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: Event Data Recorder Report for 2012 Ford Flex [2]

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

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

CDR File Information

User Entered VIN	2FMGK5CC7CB******
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	CR18020_V2_ACM.CDRX
Saved on	
Imaged with CDR version	Crash Data Retrieval Tool 17.7.2
Imaged with Software Licensed to (Company Name)	NHTSA
Reported with CDR version	Crash Data Retrieval Tool 21.0
Reported with Software Licensed to (Company Name)	NHTSA
EDR Device Type	Airbag Control Module
ACM Adapter Detected During Download	No
Event(s) recovered	locked frontal event

Comments

No comments entered.

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 .

Data Limitations

Restraints Control Module Recorded Crash Events:

Deployment Events cannot be overwritten or cleared from the Restraints Control Module (RCM). Once the RCM has deployed any airbag device, the RCM must be replaced. The data from events which did not qualify as deployable events can be overwritten by subsequent events. The RCM can store up to two deployment events.

Airbag Module Data Limitations:

- Restraints Control Module Recorded Vehicle Forward Velocity Change reflects the change in forward velocity that the sensing system experienced from the point of algorithm wake up. It is not the speed the vehicle was traveling before the event. Note that the vehicle speed is recorded separately five seconds prior to algorithm wake up. This data should be examined in conjunction with other available physical evidence from the vehicle and scene when assessing occupant or vehicle forward velocity change.
- Event Recording Complete will indicate if data from the recorded event has been fully written to the RCM memory or if it has been interrupted and not fully written.
- If power to the Airbag Module is lost during a crash event, all or part of the crash record may not be recorded.
- For 2011 Ford Mustangs, the Steering Wheel Angle parameter indicates the change in steering wheel angle from the previously recorded sample value and does not represent the actual steering wheel position.

Airbag Module Data Sources:

- Event recorded data are collected either INTERNALLY or EXTERNALLY to the RCM.

  - INTERNAL DATA is measured, calculated, and stored internally, sensors external to the RCM include the following:
    > The Driver and Passenger Belt Switch Circuits are wired directly to the RCM.
    > The Driver's Seat Track Position Switch Circuit is wired directly to the RCM.
    > The Side Impact Sensors (if equipped) are located on the side of vehicle and are wired directly to the RCM.
    > The Occupant Classification Sensor is located in the front passenger seat and transmits data directly to the RCM on high-speed CAN bus.
    > Front Impact Sensors (right and left) are located at the front of vehicle and are wire directly to the RCM.

  - EXTERNAL DATA recorded by the RCM are data collected from the vehicle communication network from various

sources such as Powertrain Control Module, Brake Module, etc.

02007_RCM-RC6_r002

System Status at Time of Retrieval

VIN as programmed into RCM at factory	2FMGK5CC7CB******
Current VIN from PCM	2FMGK5CC7CB******
Ignition cycle, download (first record)	21,888
Ignition cycle, download (second record)	N/A
Restraints Control Module Part Number	BA83-14B321-AC
Restraints Control Module Serial Number	7117119100000000
Restraints Control Module Software Part Number (Version)	BL84-14C028-AB
Left/Center Frontal Restraints Sensor Serial Number	15923F64
Left Side Restraint Sensor 1 Serial Number	6E825A52
Left Side Restraint Sensor 2 Serial Number	157F0F37
Right Frontal Restraints Sensor Serial Number	15949224
Right Side Restraint Sensor 1 Serial Number	77B25752
Right Side Restraints Sensor 2 Serial Number	159042F9

System Status at Event (First Record)

Recording Status	Locked Record
Complete file recorded (yes,no)	Yes
Multi-event, number of events (1,2)	1
Time from event 1 to 2 (msec)	N/A
Lifetime Operating Timer at event time zero (seconds)	12,627,705
Key-on Timer at event time zero (seconds)	590
Vehicle voltage at time zero (Volts)	13.851
Energy Reserve Mode entered during event (Y/N)	Yes
Time Passenger Front Satellite Sensor Lost Relative to Time Zero (msec)	19.0

Faults Present at Start of Event (First Record)

No Faults Recorded

Deployment Data (First Record)

Frontal airbag deployment, time to first stage deployment, driver (msec)	20.5
Frontal airbag deployment, time to 2nd stage, driver (msec)	26.5
Pretensioner (buckle) deployment, time to fire, driver (msec)	13.5
Pretensioner (retractor) deployment, time to fire, driver (msec)	8.5
Frontal airbag deployment, time to first stage deployment, front passenger (msec)	20.5
Frontal airbag deployment, time to 2nd stage, front passenger (msec)	30.5
Pretensioner (buckle) deployment, time to fire, right front passenger (msec)	8.5
Adaptive Load Limiter deployment, time to fire, passenger (msec)	54.5
Adaptive Steering Column deployment, time to deploy, driver (msec)	23.5
Maximum delta-V, longitudinal (MPH [km/h])	-24.81 [-39.94]
Time, maximum delta-V longitudinal (msec)	245
Maximum delta-V, lateral (MPH [km/h])	-5.27 [-8.48]
Time, maximum delta-V lateral (msec)	85
Left or center front, satellite Sensor discriminating deployment	Yes
Left or center, front satellite Sensor safing	Yes
Right, front satellite sensor safing	Yes
RCM, front sensor discriminating deployment	Yes
RCM, front sensor safing	Yes
Longitudinal Delta-V Time Zero Offset	2.5 ms
Lateral Delta-V Time Zero Offset	2.5 ms
Roll Angle Time Zero Offset	72.5 ms

Pre-Crash Data -1 sec (First Record)

Ignition cycle, crash	21,887
Frontal air bag warning lamp, on/off	Off
Occupant size classification, front passenger (Child size Yes/No [Hex value])	No [$10]
Safety belt status, driver	Driver Buckled
Seat track position switch, foremost, status, driver	Not Forward
Safety belt status, front passenger	Passenger Buckled
Brake Telltale	Off
ABS Telltale	Off
Stability Control Telltale	Off
Speed Control Telltale	On
Powertrain Wrench Telltale	Off
Powertrain Malfunction Indicator Lamp (MIL)Telltale	Off

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

Times (sec)	Speed vehicle indicated MPH [km/h]	Accelerator pedal, % full	Service brake, on/off	Engine RPM	ABS activity (engaged, non-engaged)	Stability control (engaged, non-engaged)	Traction Control via Brakes (engaged, non-engaged)	Traction Control via Engine (engaged, non-engaged)
- 5.0	59.7 [96.0]	0	Off	1,600	non-engaged	non-engaged	non-engaged	non-engaged
- 4.5	59.7 [96.0]	0	Off	1,600	non-engaged	non-engaged	non-engaged	non-engaged
- 4.0	59.7 [96.0]	0	Off	1,600	non-engaged	non-engaged	non-engaged	non-engaged
- 3.5	59.7 [96.0]	0	Off	1,600	non-engaged	non-engaged	non-engaged	non-engaged
- 3.0	59.7 [96.0]	0	Off	1,600	non-engaged	non-engaged	non-engaged	non-engaged
- 2.5	59.7 [96.0]	0	Off	1,600	non-engaged	non-engaged	non-engaged	non-engaged
- 2.0	59.7 [96.0]	0	Off	1,600	non-engaged	non-engaged	non-engaged	non-engaged
- 1.5	59.7 [96.0]	0	Off	1,600	non-engaged	non-engaged	non-engaged	non-engaged
- 1.0	59.7 [96.0]	0	Off	1,600	non-engaged	non-engaged	non-engaged	non-engaged
- 0.5	58.4 [94.0]	0	On	1,600	engaged	non-engaged	non-engaged	non-engaged
0.0	47.8 [77.0]	0	On	1,400	engaged	non-engaged	non-engaged	non-engaged

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

Times (sec)	Steering Wheel Angle (degrees)	Stability Control Lateral Acceleration (g)	Stability Control Longitudinal Acceleration (g)	Stability Control Yaw Rate (deg/sec)	Stability Control Roll Rate (deg/sec)
- 5.0	0.4	0.05	0.018	0.0	0.25
- 4.9	-1.1	0.042	0.021	0.0	-0.62
- 4.8	-1.1	0.061	-0.012	-0.37	-0.87
- 4.7	-1.1	0.013	-0.037	-0.5	-0.62
- 4.6	-1.1	-0.001	-0.014	-0.62	-0.62
- 4.5	-1.1	-0.007	0.018	-0.12	0.0
- 4.4	-1.1	0.007	0.018	-0.37	0.12
- 4.3	-1.1	0.018	-0.027	-0.25	0.12
- 4.2	-1.1	0.017	-0.041	-0.25	-0.5
- 4.1	-1.1	0.015	-0.009	-0.5	-0.62
- 4.0	-1.1	0.005	0.008	0.0	-0.75
- 3.9	-1.1	0.031	0.018	-0.5	-0.87
- 3.8	-1.1	0.054	-0.001	-0.5	-2.25
- 3.7	-1.1	0.03	-0.022	-0.37	-1.12
- 3.6	-1.1	-0.003	-0.017	0.0	0.0
- 3.5	-1.1	-0.007	-0.001	-0.25	0.87
- 3.4	-1.1	0.006	0.018	0.0	0.75
- 3.3	-1.1	0.044	0.003	0.0	-1.0
- 3.2	-1.1	0.035	-0.022	-0.37	-0.62
- 3.1	-1.1	-0.001	-0.024	-0.5	-0.75
- 3.0	-1.1	0.005	-0.001	-0.5	0.0
- 2.9	-1.1	-0.008	-0.009	-0.5	1.25
- 2.8	-1.1	0.037	0.028	0.0	-1.0
- 2.7	-1.1	0.035	-0.027	0.0	-1.37
- 2.6	-1.1	0.016	-0.029	-0.25	-0.12
- 2.5	-1.1	-0.003	-0.014	0.0	0.0
- 2.4	0.4	0.015	0.018	-0.25	-0.12
- 2.3	0.4	0.031	0.011	-0.25	0.0
- 2.2	0.4	0.035	-0.004	0.0	-0.25
- 2.1	0.4	0.024	-0.027	0.0	0.37
- 2.0	0.4	0.008	-0.014	0.0	1.0
- 1.9	1.9	0.021	0.008	0.25	-0.62
- 1.8	1.9	0.02	0.016	0.0	1.0
- 1.7	1.9	0.031	0.003	0.37	-0.37
- 1.6	1.9	0.05	-0.037	0.0	-0.25
- 1.5	1.9	0.018	-0.024	0.37	-0.25
- 1.4	3.4	0.038	0.0	0.37	-0.25
- 1.3	6.4	0.063	0.008	0.87	-0.12
- 1.2	13.9	0.134	-0.009	2.25	2.62
- 1.1	15.4	0.178	-0.041	3.87	3.12
- 1.0	13.9	0.187	-0.135	4.5	1.0
- 0.9	10.9	0.137	-0.569	3.0	1.37
- 0.8	4.9	0.144	-0.695	2.0	-3.25
- 0.7	22.9	0.268	-0.816	2.5	1.75
- 0.6	25.9	0.158	-0.903	6.87	4.0
- 0.5	10.9	0.194	-0.924	4.5	-4.87
- 0.4	-1.1	0.076	-0.861	-0.5	-2.25
- 0.3	3.4	0.101	-0.9	-3.87	-4.75
- 0.2	-1.1	-0.014	-0.895	-2.5	-2.25
- 0.1	-2.6	-0.05	-0.91	-0.62	-0.25
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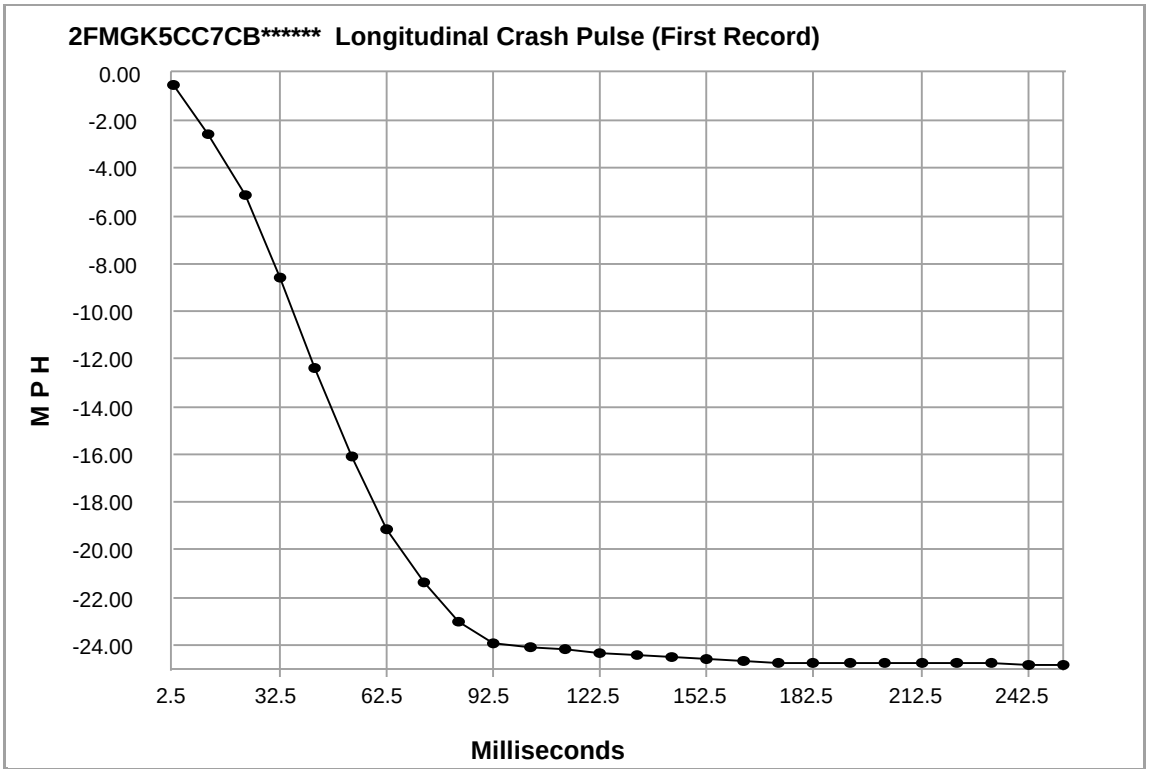
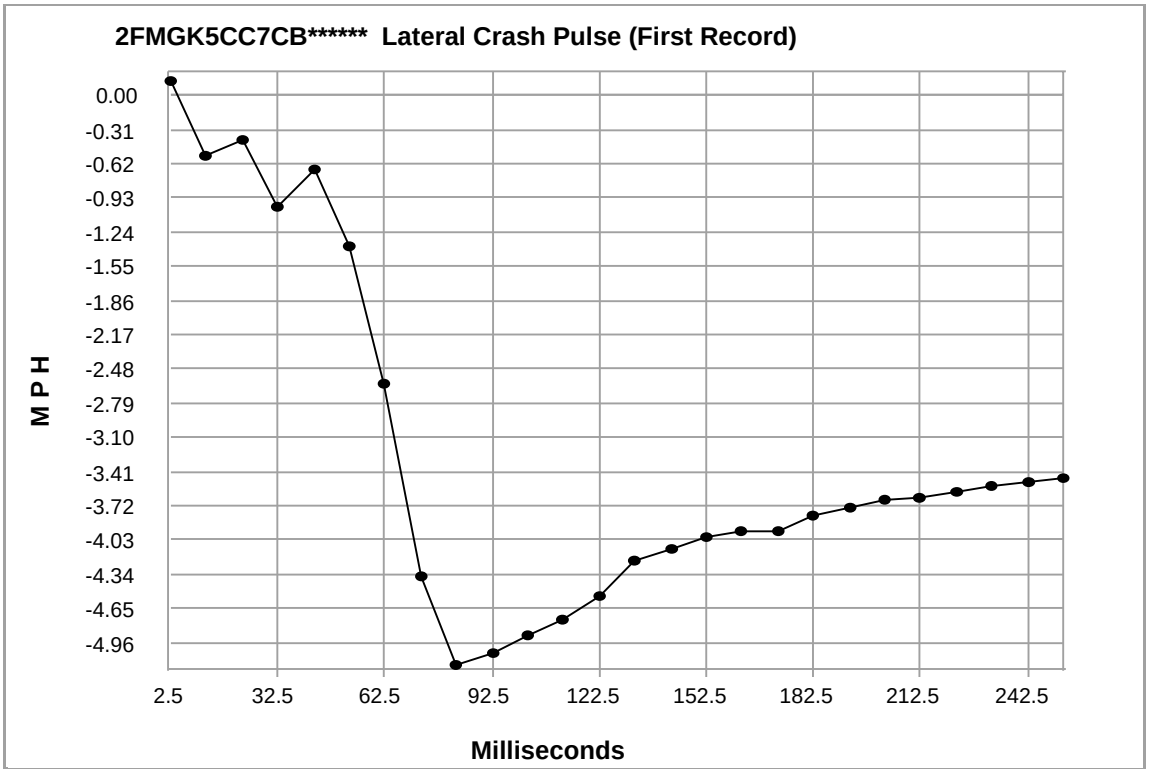


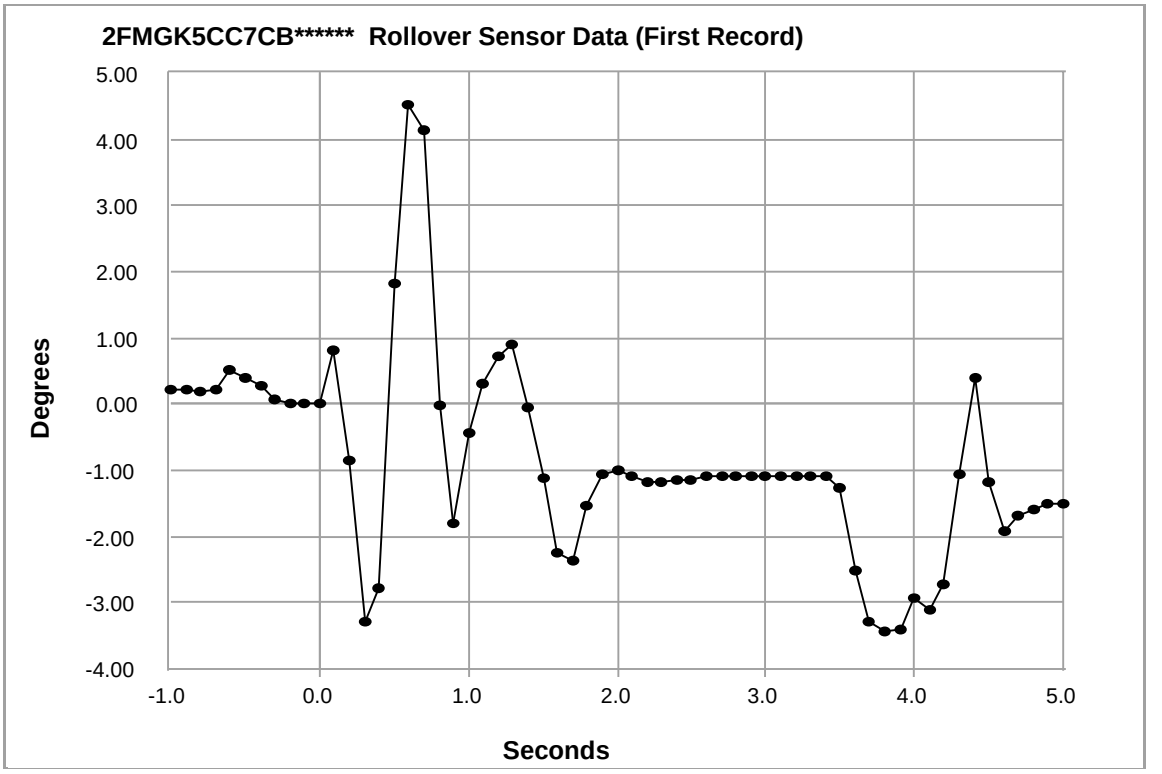
Longitudinal Crash Pulse (First Record)

Time (msec)	Delta-V, longitudinal (MPH)	Delta-V, longitudinal (km/h)
2.5	-0.48	-0.77
12.5	-2.58	-4.15
22.5	-5.10	-8.20
32.5	-8.55	-13.76
42.5	-12.40	-19.95
52.5	-16.13	-25.96
62.5	-19.17	-30.85
72.5	-21.36	-34.37
82.5	-23.02	-37.04
92.5	-23.93	-38.52
102.5	-24.10	-38.78
112.5	-24.18	-38.92
122.5	-24.38	-39.23
132.5	-24.41	-39.28
142.5	-24.48	-39.40
152.5	-24.57	-39.54
162.5	-24.66	-39.68
172.5	-24.75	-39.83
182.5	-24.77	-39.87
192.5	-24.74	-39.82
202.5	-24.75	-39.82
212.5	-24.74	-39.82
222.5	-24.73	-39.81
232.5	-24.77	-39.86
242.5	-24.81	-39.93
252.5	-24.80	-39.91



Lateral Crash Pulse (First Record)

Time (msec)	Delta-V, lateral (MPH)	Delta-V, lateral (km/h)
2.5	0.13	0.21
12.5	-0.56	-0.90
22.5	-0.41	-0.65
32.5	-1.02	-1.64
42.5	-0.68	-1.09
52.5	-1.36	-2.20
62.5	-2.61	-4.20
72.5	-4.37	-7.03
82.5	-5.16	-8.30
92.5	-5.06	-8.15
102.5	-4.90	-7.89
112.5	-4.76	-7.66
122.5	-4.54	-7.31
132.5	-4.21	-6.78
142.5	-4.12	-6.63
152.5	-4.00	-6.44
162.5	-3.95	-6.36
172.5	-3.95	-6.36
182.5	-3.82	-6.14
192.5	-3.74	-6.02
202.5	-3.66	-5.89
212.5	-3.65	-5.87
222.5	-3.60	-5.79
232.5	-3.54	-5.70
242.5	-3.50	-5.63
252.5	-3.47	-5.59



Rollover Sensor Data (First Record)

Time (sec)	Vehicle roll angle (degrees)
-1.0	0.2
-0.9	0.22
-0.8	0.18
-0.7	0.21
-0.6	0.53
-0.5	0.4
-0.4	0.27
-0.3	0.08
-0.2	0.0
-0.1	0.0
0.0	0.0
0.1	0.81
0.2	-0.85
0.3	-3.29
0.4	-2.78
0.5	1.81
0.6	4.54
0.7	4.13
0.8	-0.01
0.9	-1.81
1.0	-0.45

Time (sec)	Vehicle roll angle (degrees)
1.1	0.3
1.2	0.74
1.3	0.91
1.4	-0.05
1.5	-1.13
1.6	-2.25
1.7	-2.37
1.8	-1.55
1.9	-1.06
2.0	-1.0
2.1	-1.09
2.2	-1.17
2.3	-1.17
2.4	-1.16
2.5	-1.15
2.6	-1.08
2.7	-1.08
2.8	-1.08
2.9	-1.08
3.0	-1.08
3.1	-1.08

Time (sec)	Vehicle roll angle (degrees)
3.2	-1.08
3.3	-1.08
3.4	-1.09
3.5	-1.28
3.6	-2.51
3.7	-3.3
3.8	-3.45
3.9	-3.42
4.0	-2.94
4.1	-3.12
4.2	-2.72
4.3	-1.05
4.4	0.4
4.5	-1.17
4.6	-1.93
4.7	-1.67
4.8	-1.61
4.9	-1.52
5.0	-1.52

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.

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Event Record 1


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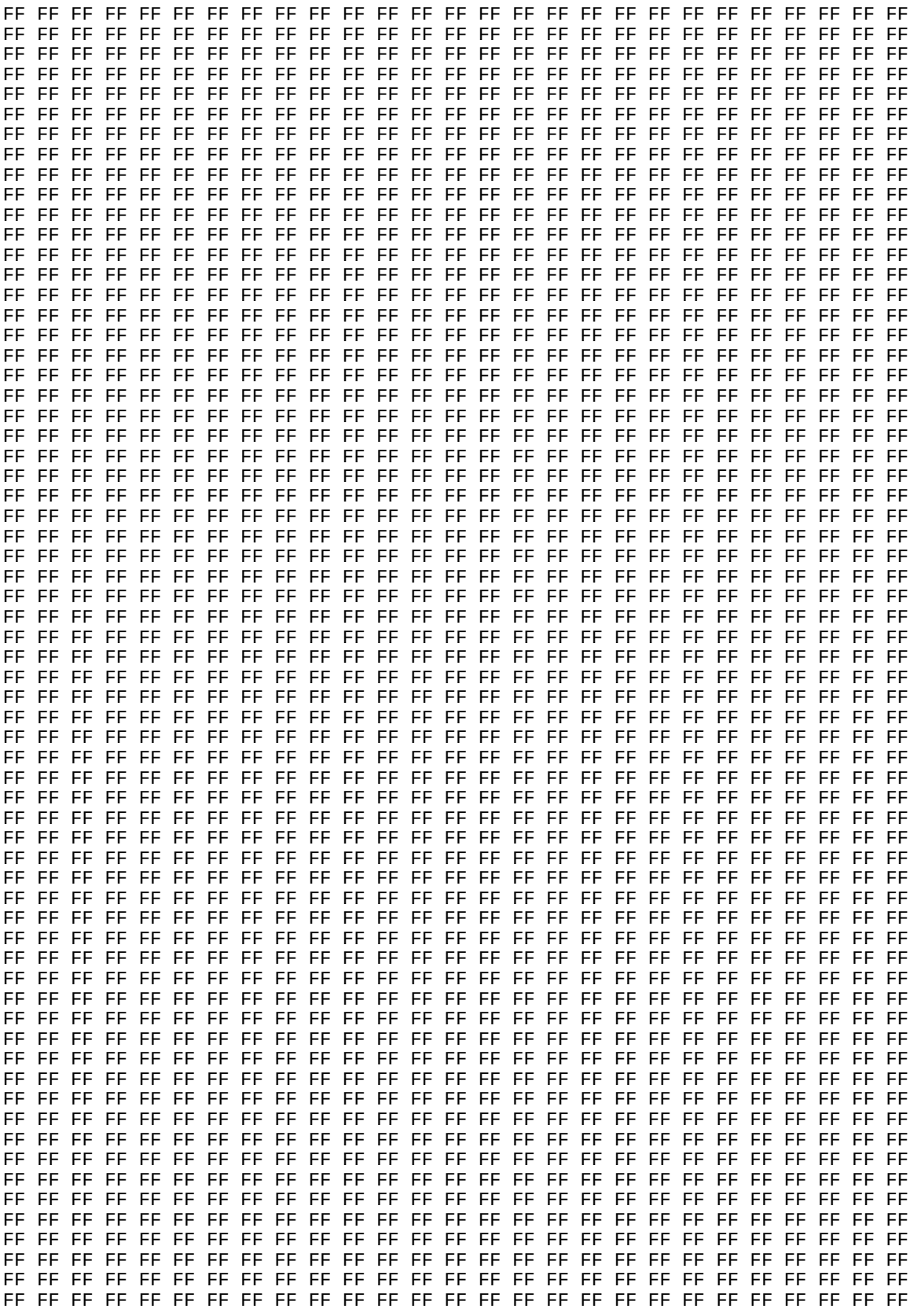

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Event Record 2

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Administration**

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