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Special Crash Investigations: On-Site Seat Belt Pretensioner Fire Investigation; Vehicle: 2016 Infiniti QX60; Location: South Carolina; Crash Date: October 2019

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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 submitted.

16. Abstract

This on-site investigation documented the passenger compartment fire in a 2016 Infiniti QX60 involved in a side impact crash with a deer. The Infiniti had several safety systems including front seat belt pretensioners, advanced frontal air bags, seat-mounted side impact air bags and combination (side impact/rollover) inflatable curtain air bags in the roof side rails. The Infiniti was occupied by three belted adults and two belted children. A deer ran out from a wooded area and struck the left side of the Infiniti in the left lane of a divided roadway. The impact deployed the left seat-mounted side impact and left IC air bags as well as actuating the left lower anchor and B-pillar-mounted retractor pretensioners. The fire originated within the floor at the base of the left B-pillar behind the left lower anchor pretensioner. The adult in the second row right seat reported in her interview she saw the flames and smoke immediately after the crash. The Infiniti came to a controlled stop on the left shoulder and all occupants safely exited the vehicle through the right doors. The fire spread up the left B-pillar into left rear door panel, onto the left front seatback, and up to the headliner. A passing motorist put most of the fire out.

The investigation and inspection determined the fire originated at the base of the left B-pillar. It was hypothesized the fire was most likely caused by superheated exhaust gases of the left lower anchor pretensioner igniting combustible products close to its rear aspect, adjacent to the left B-pillar.

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Background

This on-site investigation documented the passenger compartment fire in a 2016 Infiniti QX60 (Figure 1) that was involved in a side impact crash with a deer. The Infiniti had several safety systems including front seat belt pretensioners, advanced frontal air bags, seat-mounted side impact air bags, and combination (side impact/rollover) inflatable curtain (IC) air bags in the roof side rails.

Figure 1. Left plane damage to the 2016 Infiniti QX60

Five belted people occupied the Infiniti: a 37-year-old female driver, a 72-year-old male front right passenger, a 6-year-old female secured in an unknown type of child restraint system in the second row left position, a 10-year-old female in the second row center position, and a 71-year-old female in the second row right position. A deer ran out of a wooded area and struck the left side of the Infiniti in the left lane of a divided roadway. The impact deployed the left seat-mounted side impact and left IC air bags as well as actuating the left lower anchor and B-pillar-mounted retractor pretensioners. The fire originated within the floor at the base of the left B-pillar (Figure 2). The adult in the second row right seat reported in her interview she saw flames and smoke immediately after the crash. The Infiniti came to a controlled stop on the left shoulder and everyone safely exited through the right doors. The fire spread up the left B-pillar, into the left rear door panel, onto the left front seatback, and up to the headliner. A passing vehicle towing a boat stopped and the driver got a fire extinguisher from the boat. He put out most of the fire before the local fire department arrived and extinguished the remaining fire. Although local police also responded to the call, there was no police investigation or formal report of this crash and fire.

Figure 2. Interior view of the left B-pillar area and the fire damage

The chief of the responding fire department notified the National Highway Traffic Safety Administration of the vehicle fire in October 2019. The notification was forwarded to the Special Crash Investigations (SCI) group and assigned for on-site investigation in November 2019. The on-site investigation, coordinated with a vehicle manufacturer's representative and an insurance company fire consultant, was conducted in November 2019. The on-site investigation included the inspection and documentation of the Infiniti's exterior damage, documentation of the fire damage to determine origin and cause, and a thorough inspection and removal of the front seat belt retractor pretensioners and lower anchor pretensioners. Additionally, the Infiniti's event data recorder (EDR) was imaged using the Bosch Crash Data Retrieval tool and current software. The crash site was inspected and photographed. An interview was conducted with the owner (second row right passenger) of the vehicle prior to the on-site investigation.

Through the course of the investigation, inspection, and the process of elimination, it was determined that the fire originated at the base of the left B-pillar. It is hypothesized that it was most likely caused by superheated exhaust gases of the left lower anchor pretensioner igniting combustible products associated with vehicle's components that were located in close proximity to its rear aspect, adjacent to the left B-pillar.

Summary

Crash Site

The crash occurred on a two-lane divided roadway (Figure 3) during daylight at dusk. The National Weather Service reported the conditions at the time of the crash as fair with a temperature of 15 ºC (59 ºF), 88 percent humidity, calm winds and no precipitation. The roadway consisted of two lanes in each direction, separated by an unprotected grass median. The travel lanes were bordered by paved shoulders with wooded roadsides. All paved surfaces were asphalt. In the vicinity of the crash the travel lanes were straight and level. The posted speed limit was 89 km/h (55 mph).

Figure 3. South-facing view along the roadway in the area of the crash. Image taken from the right lane for safety reasons.

Pre-Crash

The driver and her family were en route to Florida for a 3-day vacation on a cruise ship. They occupied five seat positions and had their luggage stowed in the rear cargo area behind the second row seat. The rear seat passengers were watching a movie on the integrated DVD entertainment system. They had left home and were traveling west/southwest in the left lane of the four-lane divided highway at an EDR-recorded speed of 107 to 108 km/h (66 to 67 mph). They had traveled about 20 to 25 minutes since leaving home. Light conditions were transitioning from daylight to dusk. Without warning they heard a thud. There were no avoidance actions taken by the driver as the EDR recorded the brake status as off and no significant change in steering input.

Crash

A deer attempted to cross the highway from east to west and ran into the Infiniti's left side. The side impact originated on the left front fender and extended onto the driver's door as the deer was deflected. As a result, the driver's lower anchor and B-pillar-mounted retractor pretensioners actuated and the driver's seat-mounted side impact and left IC air bags deployed. Almost immediately after actuation and deployment, the second row right passenger smelled smoke and saw flame on the floor near the lower left B-pillar/floor (Event 2). She yelled to stop the car. She reported to investigators that the driver panicked and the right front passenger grabbed the

steering wheel, telling the driver to gently apply brakes. The second row right passenger used her cell phone to call the emergency response system. She stated that all occupants were on Bluetooth speaker with the 911 operator. The vehicle came to a controlled stop on the left shoulder at the median.

Post-Crash

The driver unbuckled her seat belt and tried to open her door, but it was jammed closed. The front row right passenger unbuckled his seat belt and opened the right front door. He grabbed the right arm of the driver and pulled her across the center console and assisted her through the right front door, but giving her a dislocated right shoulder. The second row right passenger unbuckled her seat belt system and unbuckled the CRS harness and seat belt of the two children in the second row left and center positions. She opened the right rear door and helped them get out. The second row right passenger opened the rear lift gate and removed the luggage from the cargo area. They walked away from the Infiniti into the median, where they waited for the first responders.

A passing vehicle towing a boat stopped and the driver got a fire extinguisher from the boat. He put out most of the fire before the fire department arrived. The firefighters used water to extinguish the remaining fire. The Infiniti was towed to a local yard and transferred to a regional insurance vehicle salvage facility, where it was inspected for this investigation. The driver was transported to a local hospital where she was treated for her post-crash shoulder injury and released.

2016 Infiniti QX60

Description

The vehicle was a 2016 Infiniti QX60 sport utility/crossover (Figure 4) manufactured in February 2016 and identified by the VIN 5N1AL0MNXGCxxxxxx. At the time of the crash the vehicle's odometer reading was 56,960 km (35,394 mi). The unibody chassis supported a 3.5-liter, V-6 gasoline engine linked to a continuously variable transmission and front-wheel drive. The brakes were power-assisted hydraulic disc with ABS. Additional features included traction control, electronic stability control, and a tire pressure monitoring system. The gross vehicle weight rating was 2,715 kg (5,986 lb) with gross axle weight ratings of 1,325 kg (2,921 lb) front and 1,415 kg (3,120 lb) rear. The Infiniti had 235/55R20 all-season tires mounted on OEM multi-spoke alloy wheels. Driver-assist features included adaptive cruise control, adaptive headlights, crash imminent braking, blind spot detection, forward collision warning, lane departure warning, lane keeping support, rear visibility system, and parking assist. Other features included a roof rack with two lateral load bars and a multi-panel sunroof over the first and second rows.

Figure 4. Left side view of the Infiniti

The Infiniti had three rows of seating (2/3/2) for seven people. The front row bucket seats had power adjustments and adjustable head restraints. A fixed center console separated them and contained the transmission shifter and a center armrest over a storage compartment. The second row seat was a split bench with folding seat cushions and seatbacks; all three had adjustable head restraints. All head restraints for the front and second rows were in the full-down positions. The third row seat was a split bench with adjustable head restraints. It was folded down for storage of luggage. All seating surfaces were leather.

Manual safety systems consisted of manual 3-point lap and shoulder seat belts for all seven positions, with sliding latch plates and adjustable D-rings for the first and second rows. Supplemental restraint was provided by a Certified Advanced 208-Compliant frontal air bag system that included front row retractor and lower anchor pretensioners. The front seatbacks contained side impact air bags and IC air bags mounted in the roof side rails and concealed by the headliner. The IC air bags were dual-sensing for side impact and rollover protection. The deer impact deployed the left seat-mounted side impact and left IC air bags and actuated the

driver's seat belt pretensioners. No supplemental safety components on the right side of the vehicle actuated or deployed.

Vehicle History

The Infiniti was purchased new in 2016 from an Infiniti dealership in South Carolina by the second row right passenger and her husband. She stated during the SCI interview it was a "great car" with no prior crashes, damage, or service history. She had the Infiniti detailed and cleaned prior to this trip.

There was no aftermarket equipment installed in the vehicle. It had a DVD entertainment system that included monitors in the aft aspects of the front row head restraints. None of the occupants smoked or used e-cigarettes. There were no additional electronic devices in the vehicle other than four cell phones carried by the driver and three passengers. The Owner stated that all phones were carried personally, were not being charged, were retained post-crash and that all were in proper working condition. She further stated that there were no food wrappers, paper, or other combustibles in the vehicle at the time of the crash.

Exterior Damage

The deer ran into the left side of the Infiniti (Figure 5); the initial contact appeared to be a leg scuff at the corner of the front bumper fascia. As the deer struck the left front fender, it rotated counterclockwise by the forward velocity of the Infiniti. The deer dented the left front fender and driver's door. The direct contact damage began 341 cm (134.3 in) forward of the left rear axle position and ended 124 cm (48.8 in) forward of the referenced axle. A crush profile was documented at the level of the mid door along the damaged plane and was as follows: C1 = 0 cm, C2 = 9 cm (3.5 in), C3 = 6 cm (2.4 in), C4 = 6 cm (2.4 in), C5 = 6 cm (2.4 in), C6 = 0 cm. The Collision Deformation Classification (CDC) assigned to the damage pattern was 11LYES1. The damage to the left rear door jammed the door closed. There was no change in wheelbase dimensions or restrictions to the left side tires. The sideswipe/yielding animal impact was outside the scope of the WinSMASH program. For reference, the calculated barrier equivalent speed of the damage was 13 km/h (8 mph).

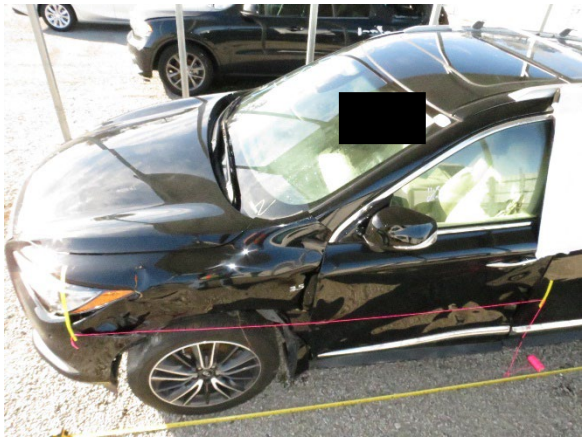


Figure 5. Left plane damage to the Infiniti

Event Data Recorder

The Infiniti had an air bag control unit (ACU) that performed the diagnostic, sensing, and deployment command functions for the vehicle's supplemental restraint systems. The ACU had event data recorder capabilities, supported by the Bosch Crash Data Retrieval tool. During the vehicle inspection, communication between the CDR tool and the module could not be established through the vehicle's diagnostics link connector and electrical bus. The module was removed and imaged via a direct-to-module connection with software version 19.1.1 and auxiliary 12-volt power. The EDR data is attached at the end of this report as Appendix A and is reported with software version 21.5.

The EDR for this vehicle can record and store up to two different types of events, non-deployment and deployment. Non-deployment events are when vehicle conditions meet the EDR recording threshold, but do not command deployment of passive safety systems or devices. Deployment events result when vehicle conditions are met and the ACM commands deployment or actuation of air bags and pretensioners. Non-deployment events can be overwritten by subsequent events, whereas deployment events are locked and cannot be overwritten.

For each event, the EDR records 5.0 seconds of pre-crash data that describe various vehicle performance parameters such as speed, accelerator pedal position, brake status, engine rpm, and steering wheel angle. These performance parameters are recorded asynchronously in 0.5-second intervals.

The imaged data contained one record designated as a deployment event. The ignition cycle counter at the time of the recording was 2,929 and 2,943 at the time of the SCI inspection. The disparity in the counter was attributed to the post-crash movement and insurance processing of the vehicle. At the time of the event, the driver and front passenger seat belts were buckled, the air bag warning lamp was off, and there were no diagnostic trouble codes. The maximum recorded longitudinal delta V was -1 km/h (-1 mph) at 60 milliseconds. The maximum lateral delta V was 1 km/h (1 mph) at 12.5 milliseconds. The driver's seat belt pretensioner, left seat-mounted side impact air bag, and left IC air bag were commanded to actuate and deploy at 36 milliseconds. The manufacturer representative stated that a pressure sensor in the cavity of the left front door was the data source for the actuation/deployment command.

The recorded pre-crash data is shown in the following table.

Time (sec)	Speed km/h (mph)	Accelerator Pedal, % Full	Engine rpm	Motor rpm	Service Brake (On, Off)	Steering Input (deg)
-5.0	108 (67)	10.5	1,600	1,600	Off	4
-4.5	108 (67)	10.5	1,600	1,600	Off	6
-4.0	108 (67)	10.5	1,600	1,600	Off	4
-3.5	106 (66)	10.5	1,600	1,600	Off	4
-3.0	106 (66)	10.5	1,600	1,600	Off	4
-2.5	106 (66)	13	1,600	1,600	Off	2
-2.0	106 (66)	13	1,600	1,600	Off	2
-1.5	106 (66)	13.5	1,600	1,600	Off	2

Time (sec)	Speed km/h (mph)	Accelerator Pedal, % Full	Engine rpm	Motor rpm	Service Brake (On, Off)	Steering Input (deg)
-1.0	106 (66)	15.5	1,600	1,600	Off	4
-0.5	106 (66)	17	1,600	1,600	Off	2
0.0	106 (66)	17.5	1,600	1,600	Off	2

The data trends indicated that the driver was traveling at a speed of 106 km/h (66 mph) 3.5 seconds prior to the crash. No pre-crash avoidance maneuvers were attempted.

Interior Damage

Damage to the interior related to air bag deployment, actuation of the pretensioners, and the subsequent fire. There was no intrusion into the occupant space resulting from the crash force and no apparent occupant contacts in the vehicle's interior. The left IC air bag deployed as intended through the separation of the headliner from the roof side rail. The left seat-mounted side impact air bag deployed as intended through the forward seam on the lateral aspect of the seatback. There was no deployment-related damage to the air bags. Refer to the *Vehicle Fire Damage* section of this report for details regarding the interior fire.

Manual Restraint Systems

The Infiniti had continuous-loop, 3-point lap and shoulder seat belts for the seven seat positions. All seat belts were configured with sliding latch plates. The driver belt retracted onto an emergency locking retractor (ELR) while the other belt systems used switchable ELR/automatic locking retractors. Each front-row retractor was also designed with a dual-mode electric motor that functioned in a pre-collision mode to apply a pre-safe tension to the seat belt system. When the seat belt was unbuckled, the webbing was stowed by the motorized retraction of the belt webbing. The first row and the outboard positions of the second row had adjustable D-rings; all were adjusted to the full-up positions. All seat belts in the first and second row were in use at the time of the crash.

Each front row seat belt system had lower anchor and retractor pretensioners. These may actuate in crashes involving frontal, side impact, and rollover configurations. The driver seat belt pretensioners actuated during the side impact event with the deer. The lower anchor pretensioner, mounted under the carpet between the sill and the driver’s seat adjacent to the base of the B-pillar, stroked 8 cm (3.1 in). The retractor pretensioner actuated, tensioning and locking the seat belt webbing. Additional detail regarding the pretensioners is located in the *Vehicle Fire Damage* section of this report.

Supplemental Restraint Systems

The Infiniti had the CAC driver’s and passenger’s frontal air bags, front-seat-mounted side impact air bags and roof side rail-mounted IC air bags. Only the driver seat-mounted side impact air bag and left IC air bag deployed in the crash. These air bags were damaged in the fire (Figures 6 and 7).

Figure 6. Lateral view of the Infiniti's deployed left seat-mounted side impact and IC air bags

Figure 7. Left lateral view of the Infiniti's deployed left IC air bag at the second row

Vehicle Fire Damage

The Infiniti's interior was inspected using a sequential, step-by-step process focused on determining the origin and cause of the fire. Initial observations indicated the fire was focused below the left B-pillar, behind the driver seat and the floor-mounted anchor pretensioner, with a prominent v-pattern. The components consumed by the fire included the left B-pillar trim panel, the forward aspect of the second door panel, a portion of the driver seat belt webbing, and portions of the side and IC air bags. Heat and smoke damage were observed at the upper aspect of the left B-pillar, across the headliner, and along the outer aspect of the driver seat (Figures 6 and 7).

At initial inspection the vehicle's floor mats were found stacked together on the third row seat. Each row had an OEM carpeted mat and a rubber weather-proof mat. Each set of mats were contoured to fit the floor/seat configuration at the appropriate row (Figures 8 and 9). The carpet mat was placed on top of the rubber weather-proof mat. It was observed that the carpeted floor mats were in good condition and were absent of any fire damage.

Figure 8. View of the Infiniti's OEM rubber floor mat

Figure 9. View of the Infiniti's OEM carpeted floor mats

Figure 10. View of the Infiniti's OEM second row rubber floor mat damaged by the fire

Fire damage was present at the left end of the second row rubber mat. A 6 cm (2.4 in) long section of the mat at its extreme left end was consumed by the fire (Figure 10). This section would have been positioned adjacent to the B-pillar. The carpeted mat directly on top of the consumed section had no observable damage (Figure 11).

Figure 11. View of the Infiniti's undamaged OEM second row carpeted floor mat

Figure 12. Overall view of the Infiniti's fire damage

To improve access to the fire-damaged area (Figure12), the electronic driver seat was moved 18 cm (7.1 in) forward, from its mid-to-rear at-crash track position, and tilted forward. During the inspection, fire debris was removed layer-by-layer to gain access to wiring harnesses, the retractor pretensioner, and the lower anchor pretensioner. The fire debris consisted of melted plastic and glass, as the consumed materials at the mid-pillar and left second door panel fell onto the floor and became fused (Figure 13). After the passengers got out, the driver seat belt webbing became involved in the fire. A portion of the webbing was recovered from the debris. The carpet and insulation surrounding this debris field was cut and removed. There was a heat-stressed area immediately behind the B-pillar at the floor level, but there was no damage to the wiring harness to suggest that the fire had initiated in the harness (Figure 14).

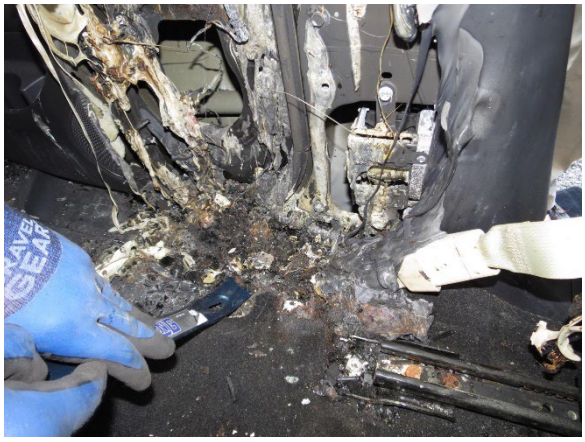


Figure 13. Close-up view of the fire debris and damage at the base of the Infiniti's B-pillar

Figure 14. View after the removal of the fire debris at the base of the Infiniti's B-pillar

The retractor pretensioner was removed from its mounted location in the pillar (Figures 15 and 16). The retractor pretensioner was a ball-and-tube design manufactured by Takata and identified by the following nomenclature.

1118510AC WG09M100FA9 MASTER PSB30-019 A# 5Z11 00040

A region of discoloration was noted in the B-pillar cavity after the removal of the retractor (Figure 16). The discoloration was located behind the mounted location of the retractor and to the aft aspect of the cavity.

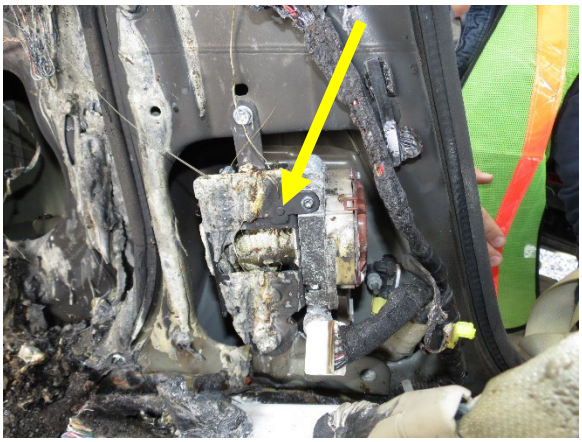


Figure 15. Image showing the mounting location of the Infiniti's left retractor pretensioner (yellow arrow)

Figure 16. Image showing the Infiniti's left B-pillar cavity, discoloration in the cavity and aft of the retractor location

The retractor (Figure 17) was motorized for pre-safe capabilities. The pre-safe motor was located beneath the webbing spool. The ball-and-tube pretensioner design consisted of a J-tube filled with ball bearings capped with a pyrotechnic charge. During its actuation, the gas generated by the pyrotechnic charge forced the series of ball bearings in the J-tube to interact with the teeth of a gear mounted to the dominate end of the retractor spool. As the bearings were displaced along the tube, the gear wound the spool to remove the webbing slack from the seat belt. In its mounted orientation, the dominate end of the retractor (location of J-tube and pyrotechnic charge) was located at the forward aspect of the B-pillar.

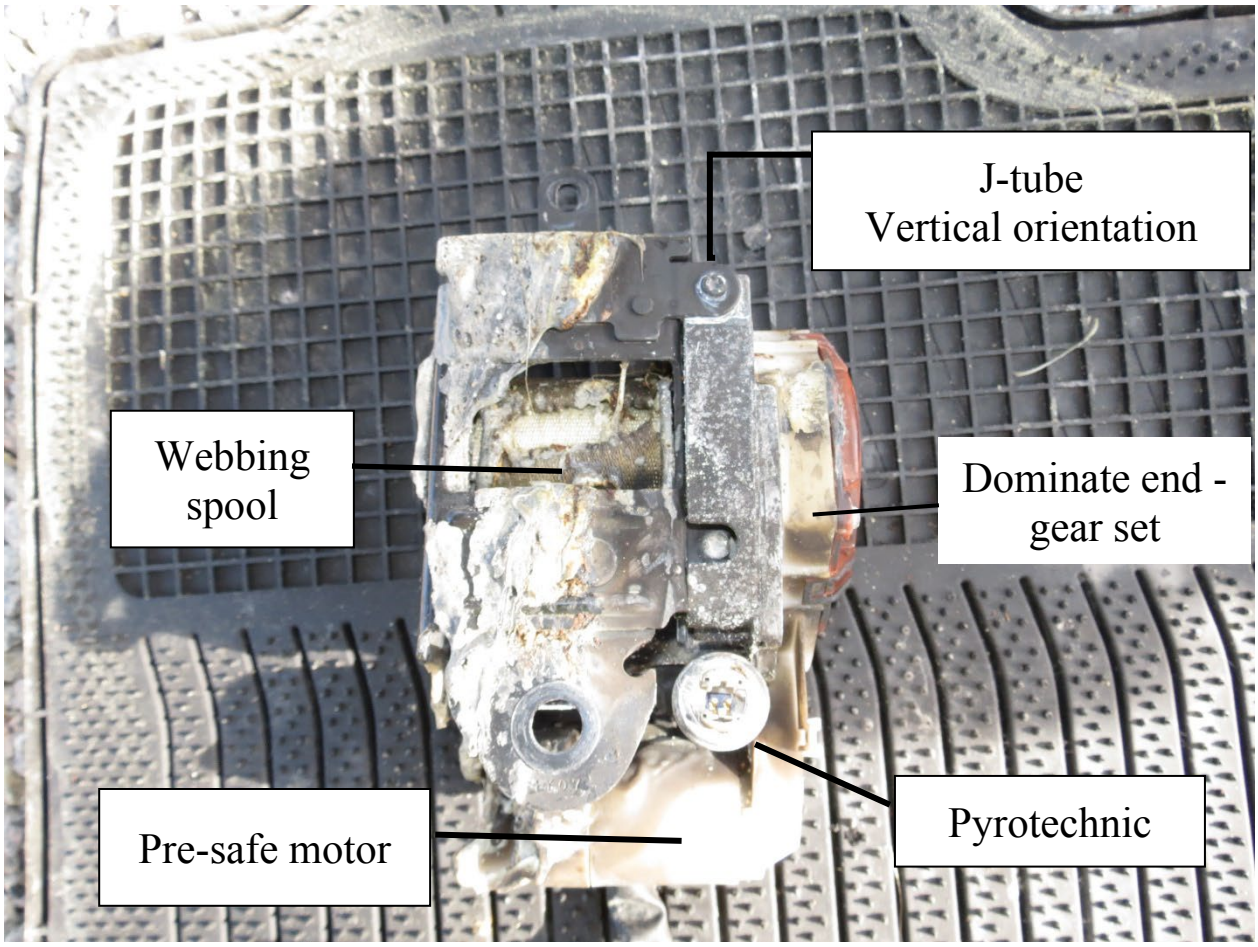


Figure 17. Close-up image showing the left retractor pretensioner after removed from the Infiniti. (interior surface shown)

Upon examination, heat stress and discoloration were noted on aft, interior, and bottom surfaces of the left retractor.

The undamaged right retractor was also removed and examined for comparison (Figures 18 - 20). A plastic cover on the exterior the left retractor melted during the fire, separated, and was recovered from the bottom/aft aspect of the left B-pillar cavity. The plastic component separated from the non-dominant (aft aspect) of the retractor (Figure 19).

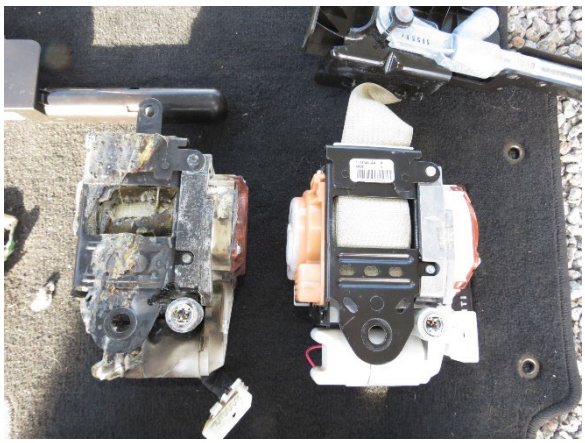


Figure 18. Image showing the left and right retractor pretensioners (interior surface shown) removed from the Infiniti

Figure 19. Image showing the left and right retractor pretensioners (aft surface shown) removed from the Infiniti

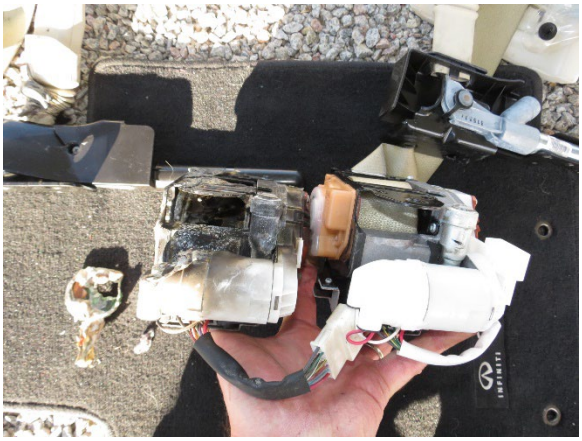


Figure 20. Image showing the left and right retractor pretensioners (bottom surface shown) removed from the Infiniti

The driver's lower anchor pretensioner was located to the left of the driver's outer seat track, beneath the carpet. It was mounted with a longitudinal orientation and actuated in a forward direction, which compressed the convoluted sleeve at the seat belt's anchor. The pretensioner was positioned in a tray, surrounded by polystyrene foam and secured to the floor. For reference, the position of the lower anchor location in an exemplar vehicle is shown in Figure 21 and the unactuated right lower anchor pretensioner from the involved Infiniti is shown in Figure 22. The right lower anchor pretensioner was removed during the SCI inspection for comparison purposes.

Figure 21. Interior view of the left lower anchor pretensioner location in an exemplar Infiniti

Figure 22. Interior image showing the right lower anchor pretensioner prior to its removal from the involved Infiniti

The mounted location of the right lower anchor pretensioner is shown in Figure 23.

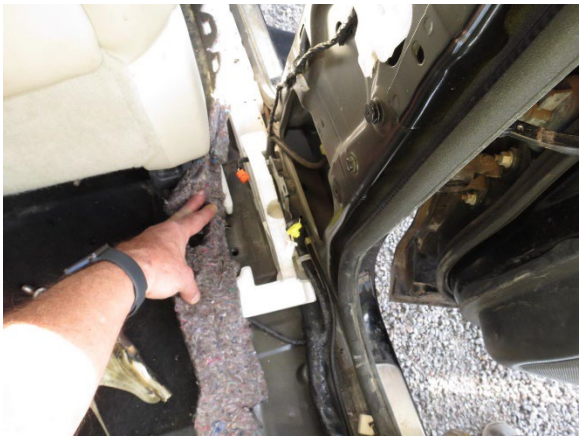


Figure 23. Interior view of the Infiniti's right lower anchor pretensioner location

The left lower anchor pretensioner is shown in Figures 24 and 25 prior to its removal. A significant fire damage pattern was located aft of the lower anchor pretensioner. The combustible materials surrounding the rear aspect of the left pretensioner were consumed during the fire. The combustible materials surrounding the rear aspect of the left lower anchor, below the level of the carpet were damaged or consumed by the fire. This included insulation, polystyrene foam, and a small area of the carpet. The SCI investigator observed that this was the lowest area of fire damage, located in a protected area beneath the top surface of the carpet.

Figure 24. Interior image showing the left lower anchor and fire damage in the Infiniti

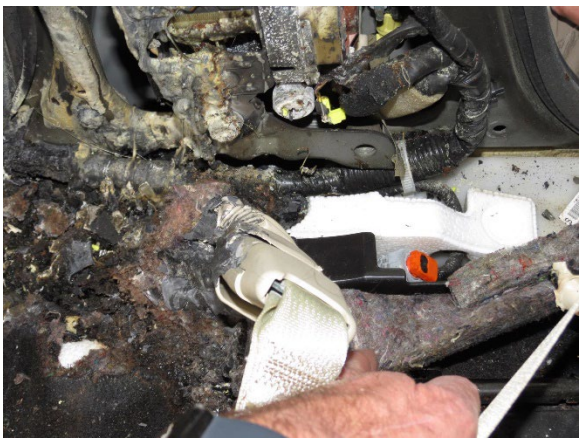


Figure 25. Interior image showing the left lower anchor and fire damage in the Infiniti

Figure 26 is a comparison view of the left and right lower anchor pretensioners removed from the Infiniti.

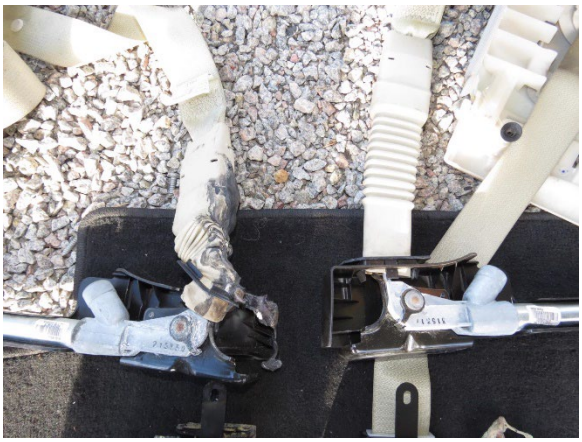


Figure 26. View of the Infiniti's driver and right passenger anchor pretensioners

Supplemental Inspections of the Seat Belt Pretensioners

An inspection of the retractor, lower anchor pretensioner and seat belt components was scheduled for April 2020 at an engineering firm contracted to the involved insurance company, in conjunction with the vehicle manufacturer and NHTSA. The purpose of the inspection was to conduct CT scans of the retractor and lower anchor pretensioner. This inspection was canceled due to the travel restrictions associated with the COVID 19 pandemic. Over the course of the 2020 calendar year, several virtual status meetings were held to discuss a course of action. In December 2020 it was agreed that the components would be shipped to the component manufacturer for tear-down and inspection.

In February 2021 the left seat belt retractor pretensioner and the left lower anchor pretensioner were disassembled and inspected at Joyson Safety System, Auburn Hills, Michigan. The lab inspection was conducted by Joyson representatives and shared virtually through a Zoom

meeting. The virtual inspection was attended by representatives of the Infiniti's owner and the insurance company, the vehicle manufacturer, the component manufacturer, SCI, and NHTSA.

The first stage of the examination focused on the retractor. A stepwise disassembly of the retractor was conducted to examine the internal components of the retractor mechanism and the pretensioner pyrotechnic assembly. The disassembled components are listed below with commentary.

- The electronic control unit was removed from the back side of the retractor. It appeared undamaged from the heat or flame of the fire.
- The plastic cover housing over the gear set on the forward aspect of the retractor was removed. There was no external evidence of discoloration, heat, or fire damage to the housing and the interior gear set was intact and undamaged.
- The pretensioner assembly had actuated and was observed to have a typical appearance, as compared to components actuated in a test environment. During actuation, the exhaust of the pyrotechnic drove a piston and a series of ball bearings through the J-tube. The ball bearings interact with a ring gear attached to the webbing spool, thus removing slack and tightening the seat belt webbing. The ball bearings exit the J-tube and are collected in the cavity of the assembly. At inspection, 11 bearings had exited the tube. (Eight or nine bearings are observed in a typical crash test according to the component manufacturer.) There are 17 ball bearings total. There was no evidence of jamming or overshoot. The seal between the pyrotechnic charge and the J-tube remained intact. A pinhole near the mid-point of the J-tube was located on the interior surface on the tube and vented into the retractor. A small area of exhaust residue was observed on the backing plate and its presence was typical. Examination of the ring gear that interacted with the ball bearings was unremarkable.
- The pre-safe motor was removed and examined. The outer casing of the motor was heat-stressed and discolored, but was otherwise unremarkable. The motor freely turned and the electrical connections were intact.
- The torsion bar was removed from the center of the spool. At examination it was observed to be intact and did not have the appearance of loading.
- A portion of the seat belt webbing was wound on the spool. The webbing was charred and burned. The first wrap of webbing had burned through. The webbing was removed from the spool; it measured approximately 56 cm (22.0 in) long.

Overall, the retractor exhibited heat stress on the bottom and aft exterior surfaces (with respect to its mounted orientation in the vehicle). After disassembly and inspection, the retractor and its pretensioner component appeared to have operated as intended.

The examination of the lower anchor pretensioner exhibited fire damage at its rear aspect at the junction with the mounting bracket and accordion sleeve surrounding the pull cable. The pyrotechnic remained crimped and visually sealed. The accordion sleeve appeared fully compressed. All melted/burned debris was external to the pretensioner assembly.

- Disassembly involved removing the rivet that secured the pretensioner to the mounting bracket. After removal of the bracket, the pretensioner tube was cut open for inspection

of the interior surfaces of tube, piston, and cable. All interior components and surfaces appeared normal, as compared to previously tested components.
- The front seal was intact, without signs of forward blow-by (leakage).
- Witness marks on the interior surface of the tube appeared normal.
- There was a complete burn of the pyrotechnic.
- The draw cable attached to the piston was routed rearward through the casting and upward around the casted guide to its connection with the seat belt. The component manufacturer reported that the pretensioner did vent through the rear aspect of the casting along the cable guide.
- The cable passed through a conical-shaped seal manufactured from EPDM rubber located at the aft aspect of the casting. This seal was designed to prevent/reduce exhaust gases from escaping through the aft aspect of the casting and also served as a spark arrestor. During the inspection, the draw-cable was cut and the seal was removed from the casting and inspected.

In summary, inspection of the lower anchor pretensioner found no abnormalities. The component manufacturer reported that there appeared to be no evidence of significant exhaust and the interior witness marks were within normal limits.

Discussion

Through a systematic process of comparison examination and reconstruction of the fire damage, in conjunction with a detailed examination of the fire debris and inspection of the disassembled components, it was observed and concluded by SCI that:

- A distinct pattern of fire damage indicated the fire originated near or below the base of the left B-pillar, progressed vertically, and radiated outward from that location.
- The nature of the fire damage in the left B-pillar and melting of the left B-pillar trim indicated the fire did not originate in the left B-pillar cavity.
- Electrical wiring and harnesses in the fire area were damaged on their exterior surfaces only, and were not directly involved in the fire or its area of origin.
- An area of significant fire damage was located immediately aft of the left lower anchor pretensioner, with the lowest level of damage below the carpeted surface of the vehicle interior.
- Polystyrene foam and insulation in the floor immediately behind the lower anchor pretensioner were consumed by the fire and were the lowest level of fire damage.

The SCI team hypothesize the observed fire damage patterns, evidence, and circumstances were consistent only with a fire that originated within the floor below the left B-pillar, adjacent to the left lower anchor pretensioner. The SCI team concluded that superheated exhaust gases expelled from the left lower anchor pretensioner during actuation ignited combustible materials (polystyrene foam and insulation) close to the pretensioner. There was no other possible ignition source in the area. As these materials advanced to a free-burning stage, the fire began to proliferate through the carpet, and extended to the left B-pillar. The fire then began to naturally spread to other combustible surfaces in the Infiniti.

2016 Infiniti QX60 Occupants

Driver Demographics

Age/sex:	37 years/female
Height:	170 cm (67 in)
Weight:	100 kg (220 lb)
Eyewear:	None
Seat type:	Forward-facing bucket seat
Seat track position:	Between middle and rearmost
Manual restraint usage:	3-point lap and shoulder
Usage source:	Vehicle inspection, EDR, interview
Air bags:	Frontal, seat-mounted, and IC air bags available; seat-mounted and IC air bags deployed
Alcohol/drug involvement:	None
Egress from vehicle:	Assisted out right front door by the front right passenger
Transport from scene:	Ambulance
Medical treatment:	Treated and released for injuries not associated to the crash

Driver Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Shoulder dislocation, Post-crash related	n/a	n/a	n/a

Source: interviewee (vehicle owner).

Driver Kinematics

The driver was seated in a mid-to-rear track position with the adjustable head restraint in the full-down position. She was restrained by the manual seat belt system evidenced by the post-crash spool-out of the webbing and the EDR data. The vehicle impact by the deer did not displace the driver from her driving position. The deployment of the seat-mounted and IC air bags filled the void between the driver's position and the left door and glazing. The pretensioner actuation tightened the seat belt webbing to minimize potential driver motion. She was not injured in this crash. Post-crash, the front right passenger pulled her arm to assist her from the vehicle and over the center console. This effort resulted in a dislocation of the driver's shoulder. She was treated at a local hospital for her injury and released.

Front Right Passenger Demographics

Age/sex:	72 years/male
Height:	180 cm (71 in)
Weight:	86 kg (190 lb)
Eyewear:	Unknown
Seat type:	Forward-facing bucket seat
Seat track position:	Between middle and rearmost
Manual restraint usage:	3-point lap and shoulder

Usage source:	Vehicle inspection, EDR, interview
Air bags:	Frontal, seat-mounted, and IC air bags available; not deployed
Alcohol/drug involvement:	None
Egress from vehicle:	Exited under own power
Transport from scene:	Private vehicle
Medical treatment:	Not injured

Front Right Passenger Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	None	n/a	n/a	n/a

Source: interviewee (vehicle owner).

Front Right Passenger Kinematics

The front row right passenger was seated in a mid-track position with the head restraint adjusted to the full-down position. He was restrained by the manual seat belt system. This passenger was not displaced by the low-severity crash forces and was not injured. His supplemental safety systems were not commanded to actuate or deploy in this left side impact crash.

Second Row Left Passenger Demographics

Age/sex:	6 years/female
Height:	Unknown
Weight:	20 kg (45 lb)
Eyewear:	None
Seat type:	Unknown forward-facing CRS seat belted to a forward-facing split bench seat with folding back
Seat track position:	Rearmost
Manual restraint usage:	CRS harness
Usage source:	Interview
Air bags:	IC air bag available; deployed
Alcohol/drug involvement:	None
Egress from vehicle:	Assisted out right rear door by the right rear passenger
Transport from scene:	Private vehicle
Medical treatment:	Not injured

Second Row Left Passenger Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	None	n/a	n/a	n/a

Source: interviewee (vehicle owner).

Second Row Left Passenger Kinematics

This 6-year-old female child passenger was restrained by the integral 5-point harness system in an unknown forward-facing CRS. At impact with the deer the left IC air bag deployed. She was not injured by the deployment or displaced from the confines of the CRS. Post-crash, she was assisted from the vehicle by the second row right adult passenger and did not require medical treatment.

Second Row Center Passenger Demographics

Age/sex:	10 years/female
Height:	Unknown
Weight:	39 kg (85 lb)
Eyewear:	None
Seat type:	Forward-facing split bench with folding back
Seat track position:	Rearmost
Manual restraint usage:	3-point lap and shoulder
Usage source:	Interview
Air bags:	None
Alcohol/drug involvement:	None
Egress from vehicle:	Assisted out right rear door by the right rear passenger
Transport from scene:	Private vehicle
Medical treatment:	Not injured

Second Row Center Passenger Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	None	n/a	n/a	n/a

Source: interviewee (vehicle owner).

Second Row Center Passenger Kinematics

This 10-year-old female child passenger was seated in the second row center position and was restrained by the 3-point lap and shoulder seat belt system. She was not displaced from her pre-crash position and was not injured during the crash. Post-crash, she was assisted from the vehicle by the second row right adult passenger.

Second Row Right Passenger Demographics

Age/sex:	71 year/female
Height:	157 cm (62 in)
Weight:	71 kg (157 lb)
Eyewear:	None
Seat type:	Forward-facing split bench with folding back
Seat track position:	Rearmost
Manual restraint usage:	3-point lap and shoulder
Usage source:	Interview
Air bags:	IC air bag available, not deployed

Alcohol/drug involvement: None
Egress from vehicle: Exited under own power
Transport from scene: Private vehicle
Medical treatment: Not injured

Second Row Right Passenger Injuries

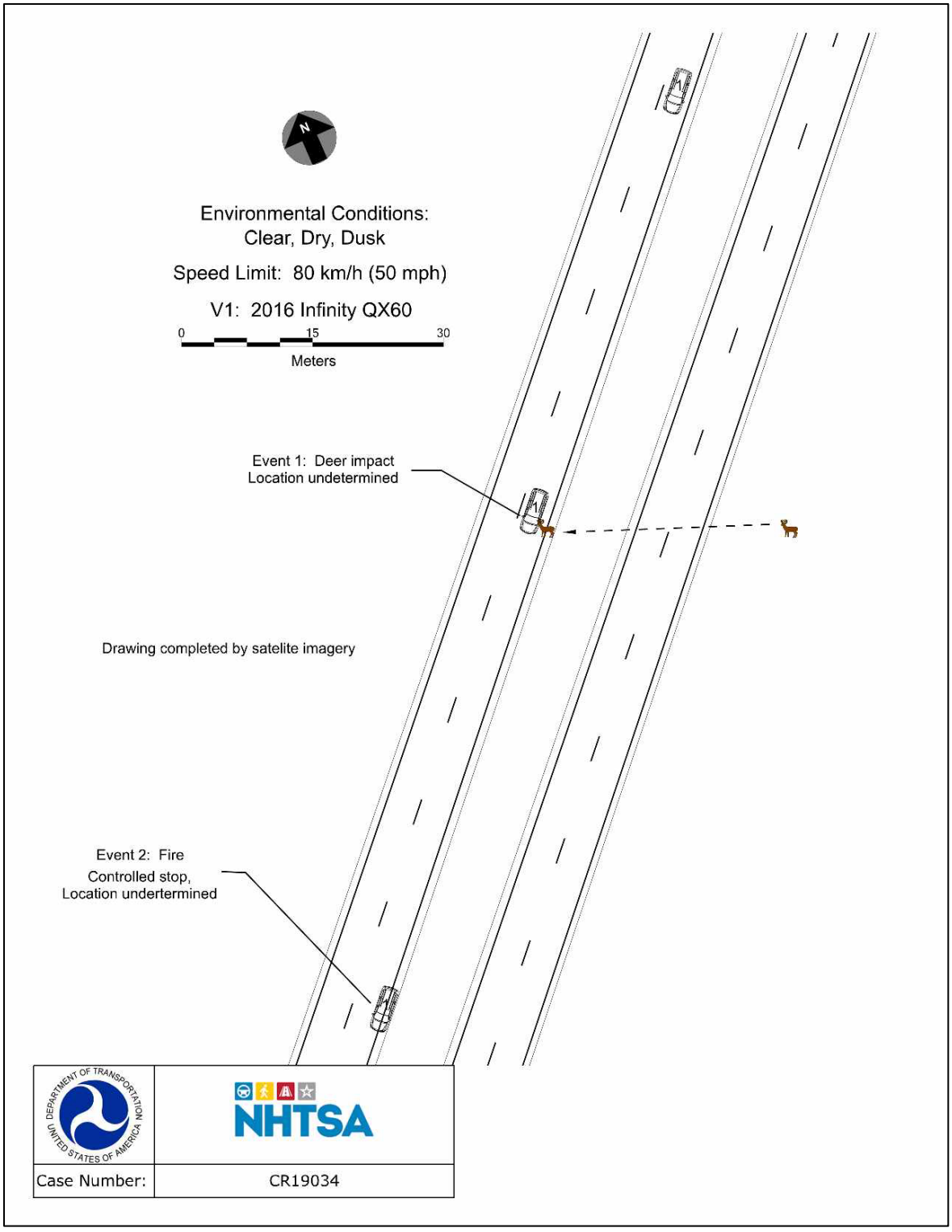
Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	None	n/a	n/a	n/a

Source: interviewee (vehicle owner).

Second Row Right Passenger Kinematics

The adult second row right passenger was seated in a rearmost track position with the head restraint adjusted to the full down position. She was restrained by the manual seat belt system. This passenger was not displaced from her pre-crash position and was not injured in the crash. Post-crash, she immediately opened the right rear door and assisted the two second row child occupants from the vehicle.

Crash Diagram



Appendix A: Event Data Recorder Report for 2016 Infiniti QX60[1]

[1] The EDR 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 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	5N1AL0MNXGC******
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	CR19034_V1_ACM.CDRX
Saved on	
Imaged with CDR version	Crash Data Retrieval Tool 19.1.1
Imaged with Software Licensed to (Company Name)	Company Name information was removed when this file was saved without VIN sequence number
Reported with CDR version	Crash Data Retrieval Tool 21.5
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.
- "VIN retrieval from other ECU " indicates VIN data retrieval from other ECU when CDR connect to vehicle by using OBD system if available.
- "VIN retrieval from ACU " indicates VIN data retrieval from ACU. It will not be available for all vehicles.
- "Motor RPM" indicates RPM of motor used for vehicle drive on electric or hybr id vehicles. In case of ICE vehicles, this indicates input shaft revolution that is input to Gearbox. This data will not be available for all vehicles.
- "Motor RPM2" indicates RPM of motor used for vehicle drive on electric vehicles. 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_r010

DTCs at Time of Retrieval

DTC	Status	Description
B1422	Current	SIDE COLLISION DETECTION
B1430	Current	FRONT PRE-TEN LH CIRCUIT [OPEN]
B0021	Current	CURTAIN AIRBAG MODULE LH CIRCUIT [OPEN]
B1432	Current	FRONT PRE-TEN2 LH CIRCUIT [OPEN]
B0020	Current	SIDE AIRBAG MODULE LH CIRCUIT [OPEN]
B00D5	Current	PASSENGER AIRBAG INDICATOR CIRCUIT [VB-SHORT], [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)
B0001	Current	DRIVER AIRBAG MODULE CIRCUIT [OPEN]
B0002	Current	DRIVER AIRBAG MODULE 2ND CIRCUIT [OPEN]
B00A0	Past	OCCUPANT DETECTION SENSOR [POWER FAIL]
B1422	Past	SIDE COLLISION DETECTION

System Status at Event (Event Record 1)

Life Time Counter (sec)	4606159
Complete File Recorded (Yes/No)	Yes (Complete)
Ignition Cycle, Crash	2929
Ignition Cycle, Download	2943
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])	-1 [-1]
Time, Maximum Delta-V, Longitudinal (msec)	60
Maximum Delta-V, Lateral (MPH [km/h])	1 [1]
Time, Maximum Delta-V, Lateral (msec)	12.5
Maximum Acceleration, Longitudinal (g)	-6
Time, Maximum Acceleration, Longitudinal (msec)	50
Maximum Acceleration, Lateral (g)	10.5
Time, Maximum Acceleration, Lateral (msec)	12.5
Seat Track Position Switch, Foremost, Status, Driver (Yes/No)	N/A
Occupant Size Classification, Right Front Passenger, Child (Yes/No)	No

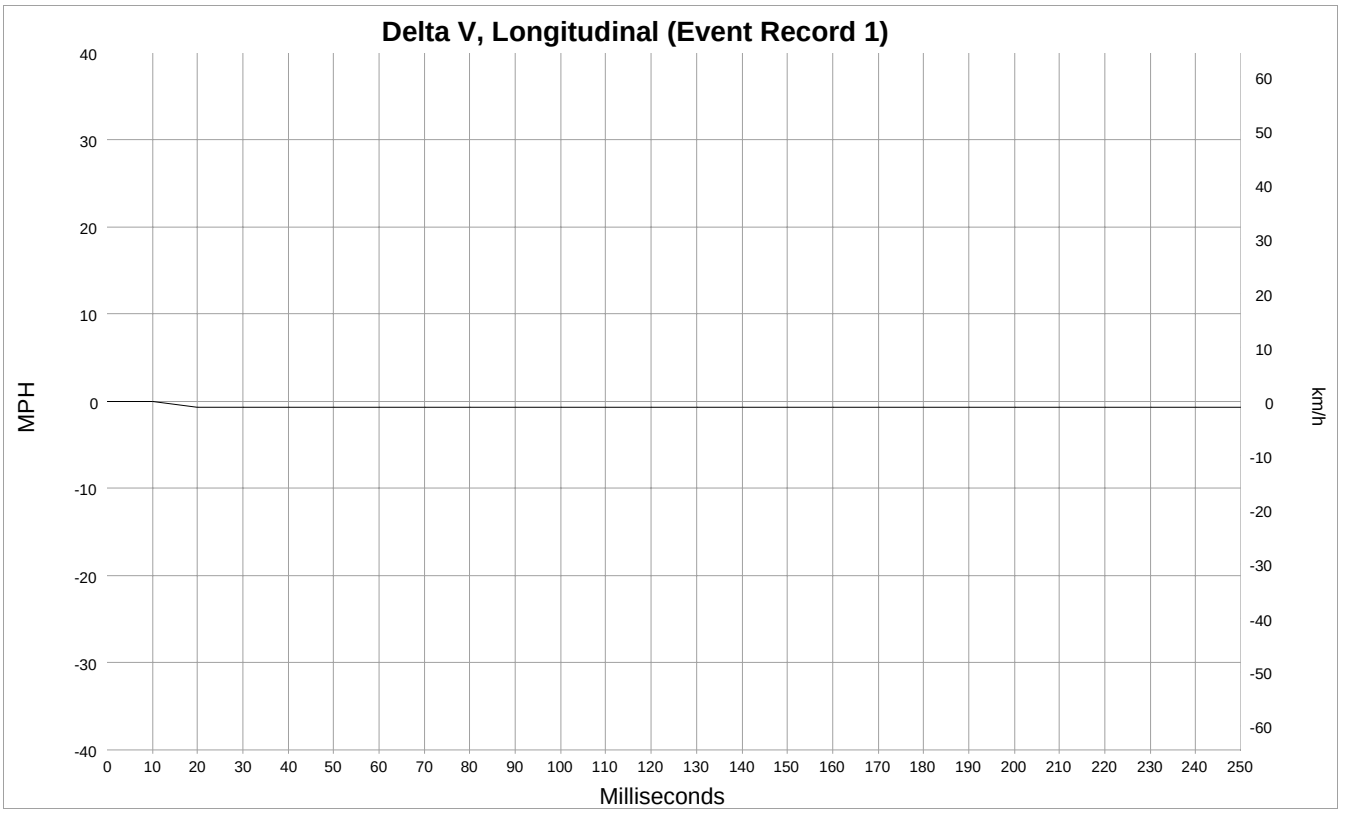
Deployment Command Data (Event Record 1)

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)	36
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)	36
Side Curtain/Tube Air Bag Deployment, Time to Deploy, Right Side (msec)	N/A
Pretensioner Deployment, Time to Fire, Driver (msec)	36
Pretensioner Deployment, Time to Fire, Right Front Passenger (msec)	N/A

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

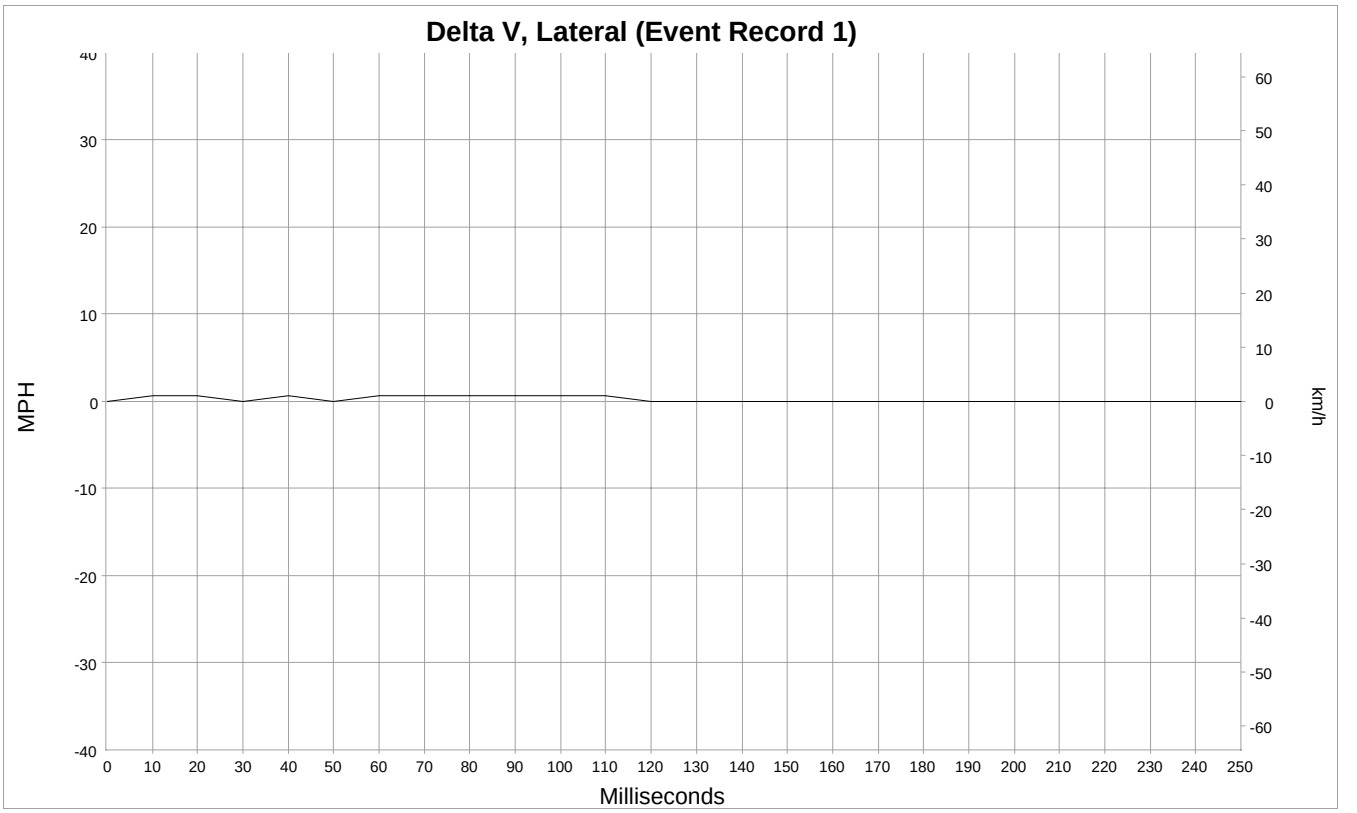
(the most recent sampled values are recorded prior to the event)

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	67 [108]	10.5	1600	1600	Off (Brake Not Activated)	4
-4.5	67 [108]	10.5	1600	1600	Off (Brake Not Activated)	6
-4.0	67 [108]	10.5	1600	1600	Off (Brake Not Activated)	4
-3.5	66 [107]	10.5	1600	1600	Off (Brake Not Activated)	4
-3.0	66 [107]	10.5	1600	1600	Off (Brake Not Activated)	4
-2.5	66 [107]	13	1600	1600	Off (Brake Not Activated)	2
-2.0	66 [107]	13	1600	1600	Off (Brake Not Activated)	2
-1.5	66 [107]	13.5	1600	1600	Off (Brake Not Activated)	2
-1.0	66 [107]	15.5	1600	1600	Off (Brake Not Activated)	4
-0.5	66 [107]	17	1600	1600	Off (Brake Not Activated)	2
0.0	66 [107]	17.5	1600	1600	Off (Brake Not Activated)	2



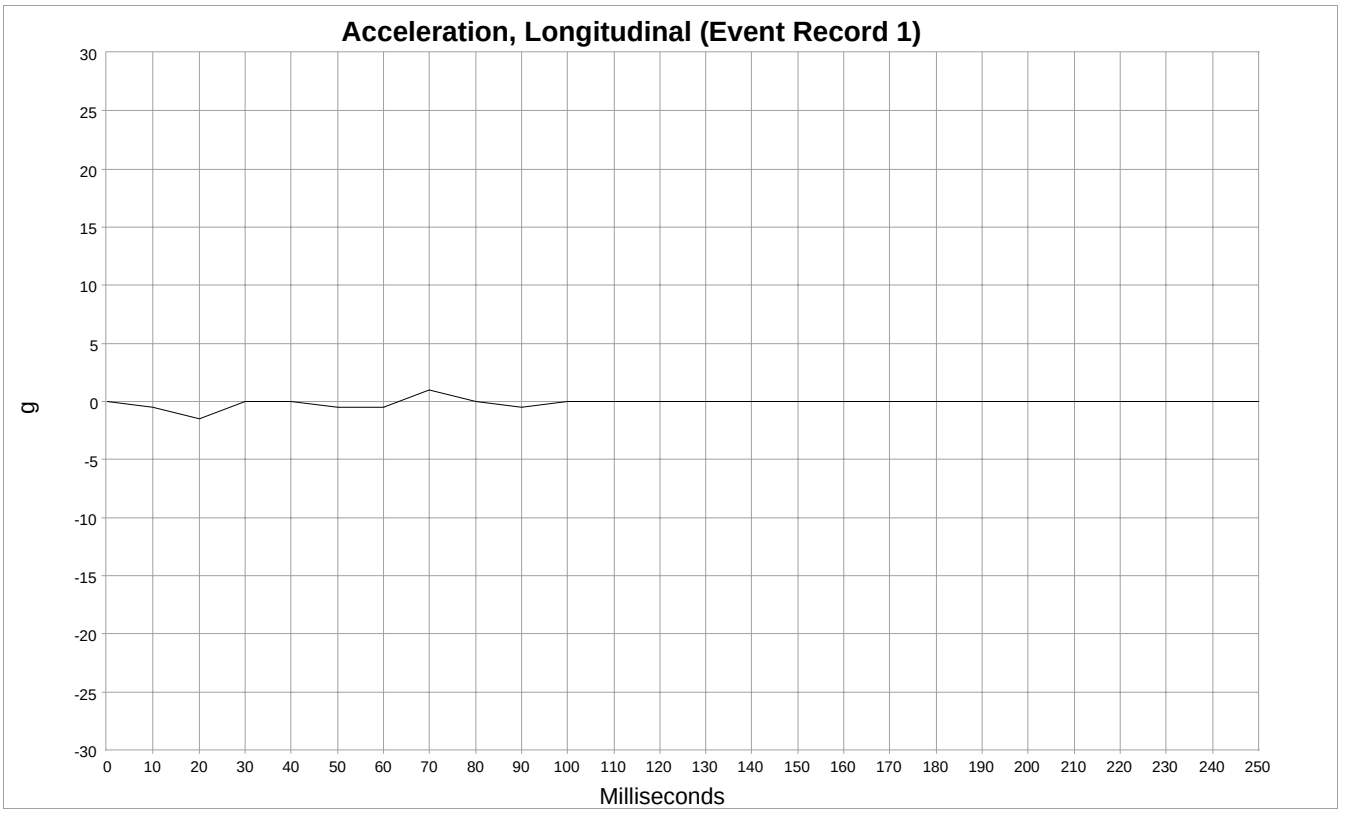
Longitudinal Delta V (Event Record 1)

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



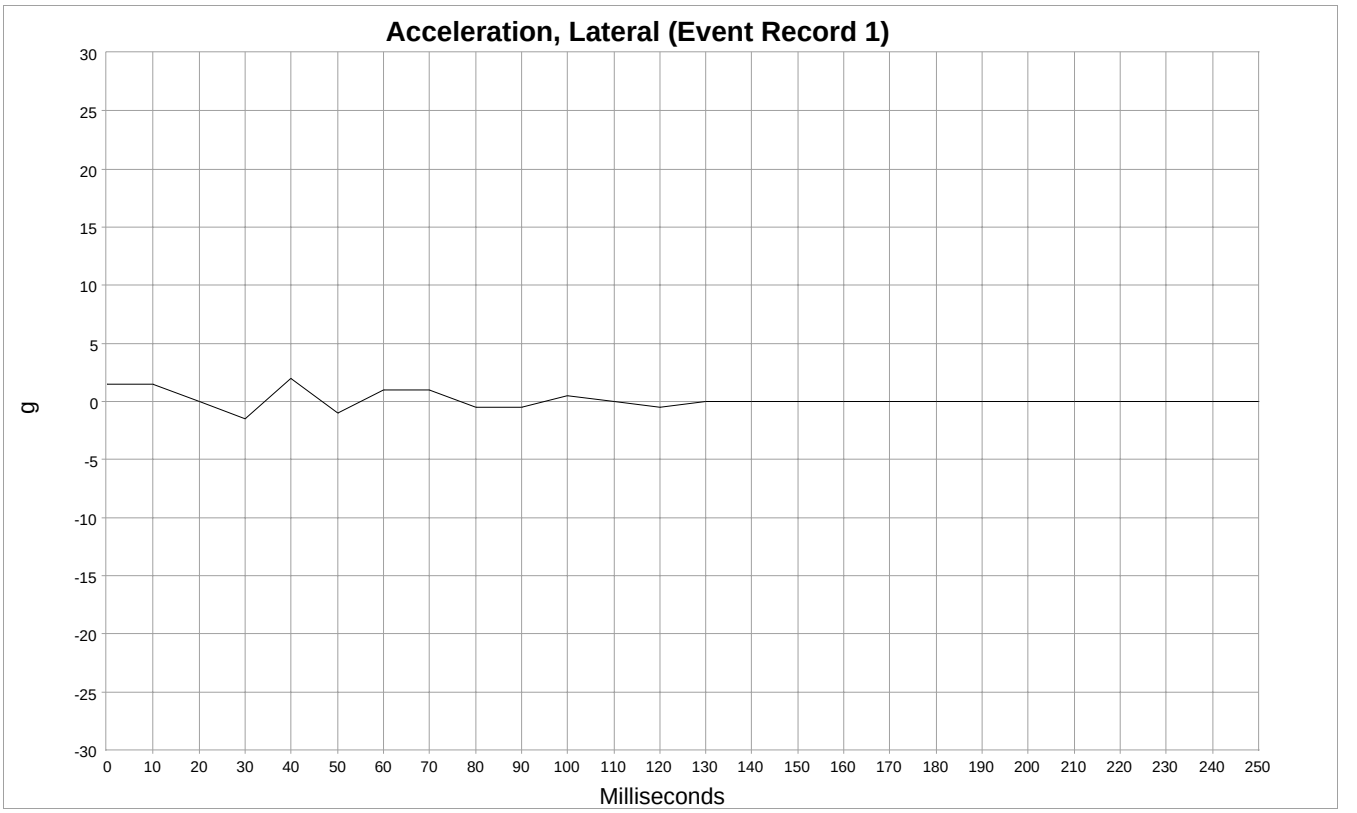
Lateral Delta V (Event Record 1)

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



Longitudinal Acceleration (Event Record 1)

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



Lateral Acceleration (Event Record 1)

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

Hexadecimal Data

61 01 FF C0 00 94 22 00 94 30 13 80 21 13 94 32 13 80 20 13 80 D5 15 80 94 88 80 96 88 80 91
88 80 97 88 80 92 88 80 93 88 80 98 88 D0 00 01 80 01 13 80 02 13 14 01 03 CC FF 03 1F

61 02 80 A0 00 00 00 01 02 00 00 27 00 94 22 00 00 00 01 39 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 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

61 03 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 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 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

61 04 00 00 00 C3 00 00 14 00 00 00 00 00 00

61 06 12 FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF 24 24 FF FF FF FF FF FF FF FF 0E 36
FF 34 FF FF FF FF FF 0E 36 19 30 FF 24 FF FF FF FF FF 24 24 00 00 00 00 00 00 00 00 00 00 00
00 00 FF FF FF FF FF FF 25 FF 00 00 00 00 FF FF FF FF FF 1A FF 0F 03 FF 00 36 0E 00 0C 03 00
FF 2B 8F 8E 8C 8C 55 55 55 55 00 00 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 00 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 18 00
6C 00 6C 00 6C 00 6B 00 6B 00 6B 00 6B 00 6B 00 6B 00 6B 00 6B 00 15 00 15 00 15 00 15 00 15
00 1A 00 1A 00 1B 00 1F 00 22 00 23 01 01 01 01 01 01 01 01 01 01 0B 71 0B 7F 00 01 00 00
01 FF 00 00 01 00 00 24 00 24 00 24 00 03 03 00 FD 04 FE 02 02 FF FF 01 00 FF 00 00 00 00 00
00 00 00 00 00 00 00 00

61 1B 00 FF FD 00 00 FF FF 02 00 FF 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 01 01
00 01 00 01 01 01 01 01 01 00 00 00 00 00 00 00 00 00 00 00 00 00 00 01 05 00 20 00 20 00 20
00 20 00 20 00 20 00 20 00 20 00 20 00 20 00 20

61 1C 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 FE FF FD FF FE FF FE FF FE FF FF FF FF FF FF FF FE FF FF FF FF F4 14 15 05 00 20 00 20
00 20 00 20 00 20 00 20 00 20 00 20 00 20 00 20 00 20 01 FF 01 FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF 00 46 48 CF

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
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

61 83 39 4E 47 34 41 08 31 52 30 00 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

0x04001EA6 00 00

0x04001EA4 00 00

0x04001EA8 00 00

0x04001EB8 00 47

0x04001EB6 00 00

0x04001EC0 00 47

0x04001EBE 00 00

0x04001EAC 00 47

0x04001EAA 00 00

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0x04002032 FF FF

0x04002030 FF FF

0x04002034 FF FF

0x04002044 FF FF

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0x0400204C FF FF

0x0400204A FF FF

0x04002038 FF FF

0x04002036 FF FF

0x04001E3C 00 03 80 5A

0x04001FC8 FF FF FF FF

59 02 09 94 22 00 09 94 30 13 09 80 21 13 09 94 32 13 09 80 20 13 09 80 D5 15 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 80 01 13 09 80 02 13 09

59 02 09 80 A0 00 08 94 22 00 08

59 0F 08

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August 2022

U.S. Department
of Transportation

**National Highway
Traffic Safety
Administration**

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