Child Safety Seat Investigation
Dynamic Science, Inc. / Case Number: DS07038
2001 Nissan Quest
California
September 2007

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The crash investigation process is an inexact science which requires that physical evidence such as skid marks, vehicular damage measurements, and occupant contact points be coupled with the investigator's expert knowledge and experience of vehicle dynamics and occupant kinematics in order to determine the pre-crash, crash, and post-crash movements of involved vehicles and occupants.

Because each crash is a unique sequence of events, generalized conclusions cannot be made concerning the crashworthiness performance of the involved vehicle(s) or their safety systems.

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16. Abstract

This on–site investigation focused on two child safety seats in the second row of a 2001 Nissan Quest minivan. The Nissan was involved in a crash with a 1984 Chevrolet Silverado pickup. The Nissan Quest minivan was being driven by a 36-year-old female. The second row left seat was occupied by a 19-month-old male seated in a forward facing child safety seat. The second row right seat was occupied by a 3-year-old male seated in a booster safety seat. The Nissan was traveling east, and the Chevrolet was traveling west. The Chevrolet initiated a left turn at the intersection and the front end of the Nissan impacted the right side of the Chevrolet. Both vehicles came to rest near the southeast corner of the intersection. The driver of the Nissan sustained an unspecified fracture to the right lower leg and other injuries, and was transported to a local hospital. The 19-month-old second row left occupant sustained a contusion to the left clavicle area. He was transported by air ambulance to a local children's hospital where he was treated and released. The 3-year-old second row right occupant was displaced in a forward trajectory from his booster seat into the front row and contacted the windshield with his head. He sustained abrasions to the left forehead and left mastoid, and a contusion to the right medial leg. He was transported by air ambulance to a local children's hospital where he was hospitalized for one day.

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Crash Investigation
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Background

This on–site investigation focused on two child safety seats in the second row of a 2001 Nissan Quest minivan (**Figure 1**) that was involved in a crash with a 1984 Chevrolet Silverado pickup. The subject vehicle was a 2001 Nissan Quest minivan that was being driven by a 36-year-old female. The second row left seat was occupied by a 19-month-old male seated in a forward facing Dorel High Back booster seat. The second row right seat was occupied by a 3-year-old male seated in an Evenflo Big Kid booster seat. The Nissan was traveling east, and the Chevrolet was traveling west. The Chevrolet initiated a left turn at the intersection and the front end of the Nissan impacted the right side of the Chevrolet. Both vehicles traveled short distances, contacted the curb near the southeast corner of the intersection, and came to rest at the curb. The driver of the Nissan sustained an unspecified fracture to the right lower leg and minor abrasions, contusions and lacerations. She was transported to a local hospital, treated and released. The 19-month-old second row left seat occupant sustained a contusion to the left clavicle area. He was transported by air ambulance to a local children's hospital, treated and released. The 3-year-old second row right seat occupant was unrestrained and was displaced in a forward trajectory from his booster seat, and his head contacted the windshield. He sustained a forehead abrasion, a contusion to the left eye, a contusion to the back of the head, and a contusion to the right medial leg. He was transported by air ambulance to a local children's hospital where he was admitted for one day.

Figure 1. Subject vehicle, 2001 Nissan Quest

This child safety seat investigation was initiated in response to an online news article that reported injuries to a child may have been due to the improper use of child restraints. DSI was assigned the case on October 11, 2007. Copies of the police report and on-scene photos were obtained on October 3, 2007. The subject vehicle was being held in a tow facility and the booster seat was located in the vehicle. The Nissan and the booster seats were inspected on October 11, 2007. The 1984 Chevrolet Silverado was inspected on October 19, 2007, and the crash scene was inspected on November 2, 2007.

Summary

Crash Site

This crash occurred within a four-leg intersection on an east/west arterial roadway. The roadway was configured with two travel lanes in each direction and left turn lanes leading to the intersection. The intersection was comprised of a residential roadway to the south, and an interstate entrance/exit ramp to the north. This intersection was uncontrolled for east and westbound traffic. Traffic entering the east/west roadway from either the interstate ramp or the residential street was controlled

by posted stop signs and painted surface stop lines. The east/west roadway was comprised of an asphalt surface, and was bordered on both sides by raised concrete curbs and sidewalks. The travel lanes were separated by single dashed stripes, with double yellow stripes separating the east and westbound travel lanes and turn lanes. The roadway was level at the area of impact. Curb parking was allowed along the north and south roadway curbs. The temperature at the time of the crash was 31 degrees C (88 degrees F). Conditions were mostly cloudy with no precipitation, and the roadway was dry. The speed limit at this location was 56 km/h (35 mph).

Figure 2. Eastbound approach for the Nissan Quest.

Pre Crash

The Nissan was traveling eastbound in the second lane from the right at an unknown speed (**Figure 2**). The Chevrolet was traveling westbound in the left turn lane at an unknown speed (**Figure 3**). The driver of the Nissan reportedly observed the Chevrolet approach the intersection. She indicated she was attentive and not distracted. She also indicated that as she approached the intersection, she saw the Chevrolet preparing to turn left, but thought it would stop since she was also entering the intersection. The Chevrolet initiated a left turn and entered the path of the Nissan. The driver of the Nissan indicated in the interview that she braked but was unable to avoid contact with the Chevrolet.

Figure 3. Westbound approach for the Chevrolet Silverado

Crash

The front end of the Nissan impacted the right side of the Chevrolet. As the vehicles were engaged they initiated a clockwise rotation. Following the impact, the Nissan traveled approximately 10.1 meters (33.1 ft.) before impacting a curb on the south roadway edge with its front end, where it came to final rest facing south. The Chevrolet traveled approximately 9.9 meters (32.5 ft.) before striking a curb near the southeast corner with its right front tire, where it came to final rest.

Post Crash

The driver of the Nissan exited the vehicle unassisted. She was transported by ground ambulance to a local hospital, where she was treated and released. The 19-month-old second row left occupant was removed from his child seat and exited the vehicle with assistance due to his age. He was transported by air ambulance to a local children's hospital where he was treated and released. The 3-year-old second row right occupant had been displaced from the second row to the front row during the crash. He was removed from the vehicle with assistance due to his age and injuries. He was transported by air ambulance to a local children's hospital. He arrived awake and alert with a Glasgow Coma Score (GCS) of 14. This score was assigned due to his inability to respond completely to verbal questions. He was admitted for one day.

The 51-year-old driver of the Chevrolet Silverado was located outside of his vehicle by responding law enforcement. An investigating police officer suspected the presence of alcohol in the driver's system. The driver was unable to complete a field sobriety test as demonstrated. He submitted to a BAC test which resulted in a reading of 0.10%. He was arrested and taken into police custody. The 57-year-old front right seat occupant was transported by ground ambulance to a local hospital and treated.

Both vehicles were towed from the scene due to damage. The Nissan was later declared to be a total loss by the insurance company.

Vehicle Data - 2001 Nissan Quest

The 2001 Nissan Quest minivan was identified by the Vehicle Identification Number (VIN): 4N2ZN15T31Dxxxxxx. The milage was unavailable due to the electronic odometer and absence of power to the vehicle. The Nissan was equipped with a 3.3 liter, 6-cylinder engine, front wheel drive, and an automatic transmission. The Nissan was configured with different make/model tires for each position. The left front tire was a Firestone FR680 P215/70R15. The tire manufacturer's maximum tire pressure was 276 kPa (40 psi). The left rear tire was a Uniroyal Tigerpaw AS6000 All Season P215/R7015. The tire manufacturer's maximum tire pressure was 276 kPa (40 psi). The right rear tire was a Yokohama Avid Touring P215/70R15. The tire manufacturer's maximum tire pressure was 241 kPa (35 psi). The right front tire was a Steel Belted Radial M+S P215/70R15. The tire manufacturer's maximum tire pressure was 241 kPa (35 psi). The specific tire information was as follows:

Position	Measured Pressure	Measured Tread Depth	Restricted	Damage
LF	221 kPa (32 psi)	5 mm (6/32 in)	No	None
LR	Tire flat	2 mm (2/32 in)	No	Tire abraded
RR	138 kPa (20 psi)	2 mm (3/32 in)	No	None
RF	145 kPa (21 psi)	6 mm (8/32 in)	No	None

The Nissan's interior was configured with seating for 7 passengers. The front row seating in the was configured with fabric-covered bucket seats with folding backs and adjustable head restraints the for the two outboard seating positions. The second row seating was configured with a bench seat with folding backs and adjustable head restraints for the two outboard seating positions. The third row seating was configured with bench seats with folding backs and adjustable head restraints for the two outboard seats. There was no head restraint for the middle seat position.

Vehicle Damage - 2001 Nissan Quest

Exterior Damage

The 2001 Nissan Quest sustained moderate front end damage as a result of the impact with the Chevrolet (**Figures 4-5**). The bumper fascia and backing material, and the right front fender were displaced from the vehicle. There was direct damage to the front bumper, grille and hood. The hood was buckled and had contacted and cracked the windshield glazing.

Figure 4. Crush gauge set a bumper level

The direct damage to the front end was distributed across the front bumper and measured 124 cm (48.8 in). There were uneven crush patterns between bumper level and above bumper level. In accordance with National Automotive Sampling System (NASS) protocols, two sets of crush measurements were taken and crush averaging was applied.

Figure 5. Gauge set at upper radiator support

Six crush measurements were taken at bumper level as follows: C1 = 29 cm (11.4 in), C2 = 31 cm (12.2 in), C3 = 21 cm (8.3 in), C4 = 13 cm (5.1 in), C5 = 4 cm (1.6 in), C6 = 0 cm. Maximum crush at bumper level was located between C1 and C2 and measured 43 cm (16.9 in). The grille was

completely fractured; therefore six crush measurements were taken at the upper radiator support as follows: C1 = 30 cm (11.8 in), C2 = 30 cm (11.8 in), C3 = 32 cm (12.6 in), C4 = 38 cm (15.0 in), C5 = 48 cm (18.9 in), C6 = 58 cm (22.8 in). Maximum crush at the upper radiator support level was located at C6 and measured 58 cm (22.8 in). The average crush measurements for the upper and lower measurements were as follows: C1 = 29 cm (11.4 in), C2 = 31 cm (12.2 in), C3 = 21 cm (8.3 in), C4 = 26 cm (10.2 in), C5 = 26 cm (10.2 in), C6 = 29 cm (11.4 in). The maximum crush measurement was 58 cm (22.8 in). The Collision Deformation Classification (CDC) for the frontal impact was 11FDEW3.

The Damage Only algorithm of the WinSmash program computed a total delta V of 25 km/h (15.5 mph), based on the Nissan's front end crush profile. The longitudinal and lateral components were –22 km/h (-13.7 mph) and 6.0 km/h (8.1 mph), respectively.

The Nissan's front end impacted the curb at the southeast corner of the intersection in a second impact. The resulting crush was masked by the initial impact and the partial CDC was estimated to be 12FRL99.

Interior Damage

The 2001 Nissan Quest sustained minor interior damage as a result of passenger compartment intrusion and occupant contact. The windshield glazing sustained cracking from three sources during the crash. The trailing edge of the vehicle's hood contacted the windshield which resulted in cracked glazing as well as longitudinal intrusion into the passenger compartment by the glazing. The windshield also sustained stress cracking during the vehicle to vehicle impact. Lastly, the upper left windshield was cracked due to contact from the second row right occupant. There was no other glazing damage due to impact or occupant contact. The specific passenger compartment intrusion was as follows:

Position	Intruded Component	Magnitude of Intrusion	Direction
Front right	Windshield glazing	16 cm (6.3 in)	Longitudinal

Manual Restraints - 2001 Nissan Quest

The 2001 Nissan Quest was equipped with 3-point manual lap and shoulder belts for the six outboard seat positions. The third row middle seat position was equipped with a manual lap belt. The front row safety belts were configured with adjustable D-rings. The driver side was in the full up position, and the right passenger side was between the full up and middle position. The first row safety belts were configured with sliding latch plates and Emergency Locking Retractors (ELR). They were configured with retractor pretensioners, both of which actuated as a result of the longitudinal deceleration of the Nissan during the impact with the Chevrolet. Both front row safety belts were found locked in the stowed position at the time of the vehicle inspection (**Figure 6**).

The second row safety belts were configured with sliding latch plates and switchable ELR/Automatic Locking Retractors (ALR). The left safety belt was used to secure a forward facing child safety seat.

Both belts were in the ELR mode at the time of the vehicle inspection.

The third row outboard safety belts were configured with sliding latch plates and switchable ELR/ALR. The third row middle seat was configured with a lap belt and locking latch plate. The outboard belts were in the ELR mode at the time of the inspection.

Lower Anchors and Tether for Children (LATCH)

The second row seating was equipped with upper and lower LATCH hardware for both outboard seat positions. The third row seating was equipped with upper and lower LATCH hardware for all three seat positions.

Supplemental Restraint Systems - 2001 Nissan Quest

The 2001 Nissan Quest was equipped with frontal air bags. The air bags deployed as a result of the longitudinal deceleration of the Nissan during the impact with the Chevrolet (**Figure 6**).

Figure 6. The left and right frontal air bags deployed

The driver's air bag deployed from the center of the steering wheel hub through asymmetrical H-configuration module cover flaps. The top flap measured 11 cm (4.3 in) in height and 16 cm (6.3 in) in width. The bottom flap measured 3 cm (1.2 in) in height and 15 cm (5.9 in) in width. The deployed driver's air bag measured 60 cm (23.6 in) in diameter in its deflated state. The air bag was tethered by a single internal strap. There was a circular stitching pattern in the front center of the air bag that measured 16 cm (6.3 in) in diameter. There were two vent ports, one on either side near the top cover flap. There was a reddish color stain that was a suspected occupant contact. The stain was located 18 cm (7.1 in) from the bags front center, in the upper left quadrant. There were faint black streak markings that were suspected occupant contacts. These markings were located on the front of the bag in the lower left quadrant. The driver reportedly sustained a forehead contusion which was consistent with contact with the air bag.

The front right passenger's air bag deployed from a mid-mount module with a rectangular cover flap that was hinged at the forward aspect. The module cover flap measured 37 cm (14.6 in) in width and 19 cm (7.5 in) in height. The deployed front right passenger's air bag measured 37 cm (14.6 in) in width seam to seam and 50 cm (19.7 in) in height. The air bag had two vent ports, one on each side near the upper corners. There were several black streak markings that are suspected to have been caused during the deployment. There was suspected dried blood within an area 24 cm (9.5 in) x 12 cm (4.7 in).

Child Safety Seats

Dorel High Back Booster Child Seat

Figure 7. Dorel High Backed Booster

A forward facing child safety seat was positioned on the second row left seat (**Figure 7**). The data for this seat was obtained from police photographs, which revealed that the seat was a Dorel High Back Booster. The child seat was designed to be used forward facing only. The child seat was configured with a 5-point harness system with a retainer clip. The child seat was configured with LATCH (Lower Anchors and Tethers for Children) hardware. There were two lower anchor assemblies on the bottom and an upper tether on the back. The manufacturer recommended that the seat be used only by children more than one year of age, and weighing between 22 - 40 pounds (10.1 - 18.0 kg), and whose height is between 34 - 43 inches (85.1 - 110 cm). The manufacturer recommended that the child seat can be secured by either lap belt only, lap and shoulder belt, or LATCH only.

A 19-month-old male occupant was seated in the child safety seat. The child was 71 cm (28 in) tall and weighed 10.4 kg (23 lbs.). The child met the age and weight recommendations, but he was 15 cm (6 in) shorter than the height recommendation. The internal harness straps were routed through the top set of slots. The seat was secured using the vehicle's 3-point manual lap and shoulder belt, which was routed through forward facing ports in the seat shell. It was reported by the police that the seat was properly secured at the time of their arrival on-scene; however, the child had already been removed from the seat by that time. The mother reportedly assisted the child with the child seat restraint prior to the trip, and then started a DVD movie for the children to watch. Based on evidence obtained from the vehicle inspection, the police report, the on-scene photos, the child's injuries, and the interview, the SCI Investigator was unable to determine whether the child was properly restrained. The safety belt was switched to ALR mode when the seat was installed in the vehicle. The child seat, harness straps and safety belt were examined and did not reveal any evidence of occupant loading.

Evenflo Big Kid Deluxe Booster Seat

A forward facing child seat was positioned on the second row right seat (**Figure 8**). The seat was an Evenflo Big Kid Deluxe high back belt positioning booster seat. The model number was 3371689A and the date of manufacture was April 11, 2007. The booster seat was to be used forward facing only and was not configured with integrated harness straps. The seat was configured with pivoting armrests, retractable drink/snack holders, and 5-position height and seat depth adjustments.

Figure 8. Evenflo Big Kid Deluxe booster seat

The booster seat was designed to be used with or without the removable back support. The manufacturer recommended that the back support be used by children weighing between 30 - 100 pounds (13.6 - 45.3 kg), and whose maximum height is 57 inches (145.0 cm). The seat could be used without the back support by children who weighed between 40 - 100 pounds (18.0 - 45.3 kg), and whose maximum height was 57 inches (145.0 cm). The booster seat was designed as a belt positioning booster to be used in combination with the vehicle's lap and shoulder belt. Belt usage instructions and height/weight restriction labels were affixed to the seat.

A 3-year-old male child was seated in the Evenflo booster seat. The child was 76 cm (30 in) tall and weighed 18.6 kg (41 lbs.). He met the seat manufacturer's height and weight guidelines. At the time of the crash, the child was not wearing the vehicle's lap and shoulder belt. It was reported by an investigating police officer that upon her arrival, the booster seat was unoccupied and lying in the floor of the second row. The second row left safety belt was reportedly unbuckled at that time. On-scene photos show the safety belt unbuckled and latch plate routed through the right side positioning slot. The mother reportedly assisted the child with the belt restraints prior to the trip, and then started a DVD movie for the children to watch. It was reported that the 3-year-old had a habit of unbuckling his safety belt while seated in the booster seat. The booster seat was examined and did not exhibit evidence of damage or occupant contact. The safety belt webbing and latch plate were examined and did not exhibit evidence of occupant loading.

Occupant Demographics - 2001 Nissan Quest

	Driver	Occupant 2	Occupant 3
Age/Sex:	36/Female	19 month/Male	3/Male
Seated Position:	Front left	Second row left	Second row right
Seat Type:	Bucket seat	Bench seats with folding back	Bench seats with folding back
Height:	165 cm (65 in)	71 cm (28 in)	76 cm (30 in)
Weight:	69 kg (150 lbs.)	10.4 kg (23 lbs.)	19 kg (42 lbs.)
Alcohol/Drug Involvement:	None	N/A	N/A
Body Posture:	Upright	Unknown	Unknown
Hand Position:	Both hands on steering wheel	Unknown	Unknown
Foot Position:	Right foot on brake, left on floor	Unknown	Unknown
Restraint Usage:	Lap and shoulder belt available, not used	Lap and shoulder belt used to secure child safety seat	Lap and shoulder belt available, not used
Air bag:	Steering wheel mounted frontal air bag, deployed	N/A	N/A

Occupant Kinematics - 2001 Nissan Quest

Driver Kinematics

The 36-year-old female driver was seated in an upright posture and was unrestrained. The driver's safety belt retractor pretensioner actuated as a result of the longitudinal deceleration of the Nissan during the impact with the Chevrolet and was locked in the stowed position. The seat was adjusted to the full forward position. The driver's seat back was reclined at a 35-degree angle from vertical, and the seat cushion was 26 degrees from horizontal. At impact, the driver had both hands on the steering wheel, the right foot on the brake pedal and the left foot on the floor. The driver stated that prior to impact she braked hard in an attempt to avoid contact with the Chevrolet.

At impact with the Chevrolet, the frontal air bags deployed. The driver initiated a forward and slightly left trajectory. She probably contacted the deployed driver's air bag; there was residual contact evidence located on the front of the bag and the driver sustained a contusion to the forehead. There was a skin oil transfer on the left window glazing, which was possibly the result of contact from the driver's forehead, left hand or arm. Her right foot was on the brake and she sustained an unspecified fracture to her right lower leg, probably due to contact with the foot controls. There was no intrusion from the floor or toe pan. She also sustained a laceration to her right hand, an abrasion to her right elbow and contusions to her right wrist and hand. During the interview with the SCI Investigator, the driver indicated she did not recall contacting any components within the vehicle with her right arm or hand.

As the vehicle rotated in a post-impact clockwise direction, the driver was displaced to the left. At this time she likely contacted the left door panel and glazing. The vehicle traveled a short distance, then its front end contacted the curb. This was a low delta V event and resulted in minor damage to the vehicle. On-scene photographs indicate the vehicle came to rest at the point of the second impact, with its front tires in contact with the curb. The driver was able to exit her vehicle under her own power. She was transported by ground ambulance to a local hospital where she was treated and released.

Second Row Left Occupant Kinematics

The 19-month-old male child was restrained in a Dorel High Back forward facing child safety seat by the five-point harness. The child safety seat was secured in the second row left position using the vehicle's manual 3-point safety belt; the belt's retractor was switched to ALR mode. The child safety seat was secured to a bench seat with a folding back. The seat back was reclined at a 26-degree angle from vertical; the seat bottom was at a 25-degree angle from horizontal. At impact, the child and the booster seat were displaced slightly forward and to the left. He sustained a contusion to the left clavicle area from contact with the child safety seat harness. As the vehicle rotated in a clockwise direction, the child was displaced slightly left. The vehicle sustained a minor second impact with the raised curb. During this impact, the child was displaced slightly forward. Throughout the crash sequence, this child remained generally in place, due to the installation of his child seat. He was removed from his child seat with some assistance , due to his age. He was

transported by air ambulance to a local hospital, where he was treated and released.

Second Row Right Occupant Kinematics

The second row right seat position was occupied by a 3-year-old male child. The child was seated in an Evenflo Big Kid Deluxe high back booster seat. The booster seat was placed on a bench seat with a folding back. The seat back was reclined at a 26-degree angle from vertical; the seat bottom was at a 25-degree angle from horizontal. He was initially restrained by the vehicle's 3-point safety belt, but at some point during the trip the child unbuckled the safety belt. At the time of the impact with the Chevrolet, the child was in an unknown posture and unrestrained.

On-scene photographs indicated that the shoulder belt webbing was routed through the right side positioning slot. The latch plate may have caught on the positioning slot and prevented the belt from retracting further. The belt webbing unspooled when the booster moved from the seat cushion to the floor.

Prior to the initial impact, the driver of the Nissan braked hard. At that time, the 3-year-old probably was displaced in a forward trajectory from the booster. The booster seat was displaced from the seat cushion to the floor. The child possibly contacted the front row right seat back, which deflected him slightly left. At impact the child continued forward and left, and he contacted the upper left windshield with his head. The impact with the windshield caused an abrasion to left forehead and left mastoid area. As the vehicle rotated clockwise, the child was displaced to the left. He probably contacted the deployed frontal passenger air bag during this time. He sustained a contusion to the medial right leg; the mechanism for this injury was not determined. The vehicle traveled a short distance and was involved in a second minor impact with the curb. The child's posture at that point was unknown, except that he was in the front row and probably in an unnatural position. The child's kinematics and contacts could not be confirmed during the driver interview.

He was removed from the vehicle with assistance due to his age and injuries. A local firefighter who was first on the scene reported that upon his arrival, the child was out of the booster seat. The firefighter reported that he did not observe any seat belt type abrasions on the child, but did observe a laceration on the back of the child's head and glass fragments in his hair. The injury was later described as an abrasion in the official medical records.

The 3-year-old was transported by air ambulance to a local children's hospital and admitted for one day.

Occupant Injuries - 1991 Nissan Quest

Driver: Injuries obtained from emergency room records and interview.

Injury	AIS Code	Injury Mechanism	Confidence Level
Contusion, forehead	290402.1,7	Air bag	Probable
Right leg/ankle fracture NFS	852002.2,1	Brake/foot controls	Probable
Abrasion, elbow	790202.1,1	Other occupant	Possible
Laceration, right hand	790600.1,1	Other occupant	Possible
Contusions, right wrist and hand	790402.1,1 790402.1,1	Other occupant	Possible

Second row left occupant: Injuries obtained from emergency room records and interview.

Injury	AIS Code	Injury Mechanism	Confidence Level
Contusion, left clavicle/shoulder	790402.1,2	CSS harness	Certain

Second row right occupant: Injuries obtained from discharge summary, history and physical report, radiology reports, and interview.

Injury	AIS Code	Injury Mechanism	Confidence Level
Abrasion, left forehead	290202.1,2	Windshield	Probable
Abrasion, left mastoid	190202.1,2	Windshield	Possible
Contusion, right medial leg	890402.1,1	Unknown	Unknown

Vehicle Data - 1984 Chevrolet Silverado

The 1990 Chevrolet Silverado pickup was identified by the Vehicle Identification Number (VIN): 1GCGC24M0EJxxxxxx. The vehicle's mileage was 158,128 km (98,259 miles). The Silverado was a 2x4 pickup with a standard cab that was equipped with a 5.7 liter, 8-cylinder engine and an automatic transmission. The Silverado was configured with Cooper Discover H/T LT235/85R16 tires. The tire manufacturer's maximum tire pressure was 448 kPa (65 psi). The specific tire information is as follows:

Position	Measured Pressure	Measured Tread Depth	Restricted	Damage
LF	283 kPa (41 psi)	10 mm (12/32 in)	No	None
LR	255 kPa (37 psi)	10 mm (12/32 in)	No	None
RR	Tire flat	10 mm (12/32 in)	No	Tire debeaded
RF	Tire flat	9 mm (11/32 in)	No	Tire abraded

The seating in the Chevrolet Silverado pickup was configured with a fabric-covered bench seat without head restraints. There was a fabric seat cover installed on the seat back and bottom.

Vehicle Damage - 1984 Chevrolet Silverado

Exterior Damage

The 1984 Chevrolet Silverado sustained moderate right side damage as a result of the impact with the Nissan (**Figure 9**). The direct damage began 126 cm (49.6 in) rearward of the right front axle, and extended 218 cm (85.8 in) rearward to the right rear tire. The combined direct and induced damage measured 300 cm (118.1 in). Six crush measurements were taken at mid-door level as follows: C1 = 0 cm, C 2 = 2 cm (0.8 in), C3 = 3 cm (1.2 in), C4 = 9 cm (3.5 in), C5 =11 cm (4.3 in), C6 = 0 cm. Maximum crush at mid-door level was located between C4 and C5 and measured 15 cm (5.9 in). The CDC for the side impact was 02RZEW2.

Figure 9. 1984 Chevrolet Silverado

The Chevrolet sustained damage to the rear axle (**Figure 10**). The rear tires were deformed 10 degrees to the right. The drive shaft was detached at the front end. The right rear wheel was deformed approximately 28 cm (11.0 in) rearward of the original wheelbase. The right rear tire was debeaded and flattened.

Figure 10. Right rear axle and wheel were moved rearward

The Damage Only algorithm of the WinSmash program computed a total delta V of 26 km/h (16.2 mph), based on the vehicle's right side crush profile. The longitudinal and lateral components were -9 km/h (-5.6 mph) and -24 km/h (-14.9 mph), respectively.

The Chevrolet impacted the curb with its right front tire and rim. This was a swiping type impact. The right front tire was abraded and gouged in the sidewall. The right front rim was bent and scuffed. The CDC for the curb impact was 06RFWS2.

Attachment 1. Scene Diagram