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CALSPAN ON-SITE SIDE IMPACT INFLATABLE OCCUPANT PROTECTION SYSTEM CRASH INVESTIGATION
SCI CASE NO.: CA10038

VEHICLE: 2010 NISSAN VERSA SEDAN

LOCATION: NORTH CAROLINA

CRASH DATE: OCTOBER 2010

Contract No. DTNH22-07-C-00043

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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 are 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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BACKGROUND

This on-site investigation focused on the side impact inflatable occupant protection system for this side impact crash of a 2010 Nissan Versa sedan **(Figure 1)**. The Nissan was involved in a driveway intersection crash with a 2005 Toyota Tacoma pickup truck. The Nissan was equipped with a Certified Advanced 208-Compliant (CAC) frontal air bag system, side impact Inflatable Curtain (IC) air bags, and front seatback-mounted side impact air bags. The manufacturer of the Nissan has certified that the vehicle was compliant with the advanced air bag portion of Federal Motor Vehicle Safety Standard (FMVSS) No. 208. The CAC system included dual-stage frontal air bags for the driver and front right passenger positions, seat track positioning sensors, retractor pretensioners, safety belt buckle switches, and a front right occupant weight sensor. The Nissan exited a parking lot driveway and initiated a left turn onto a five-lane roadway. The left plane of the Nissan was impacted by the front plane of the Toyota. The Nissan was redirected into an arcing trajectory to the right. The Nissan departed the roadway and the front of the vehicle impacted a ditch wall, where the Nissan came to rest. The driver's frontal air bag, left IC and left side impact air bag deployed in the Nissan during the crash sequence. The restrained 65-year-old female driver of the Nissan was transported to a regional trauma center where she was admitted for treatment of her injuries.

Figure 1: Left side view of the 2010 Nissan Versa.

The Nissan Versa was identified through a visit to a regional vehicle salvage facility on November 16, 2010. Based on the impact location and the severity of damage to the Nissan, this case was assigned by the Crash Investigation Division (CID) of the National Highway Traffic Safety Administration for an on-site investigation on November 19, 2010. The on-site portion of this investigation was initiated on November 23, 2010 and involved the inspection and documentation of the Nissan, the Toyota and the crash site, and a partial interview with the driver of the Nissan. The Event Data Recorders (EDRs) for the Nissan and the Toyotas were imaged at a later date using proprietary hardware provided by the manufacturers. The output data is summarized in this report. The records department of the treating hospital refused to provide the medical records for the driver of the Nissan. The driver also refused to sign a medical authorization for the release of the records.

CRASH SUMMARY

Crash Site

This crash occurred during daylight hours at the intersection of an undivided five-lane north/south roadway and a parking lot driveway that intersected the roadway on the east side. The northbound traffic was separated from the southbound traffic by a center turn lane. The roadway and the parking lot driveway were both straight and had level grades. The environmental conditions were clear and dry at the time of the crash. The outboard lanes of the roadway were 3.5 m (11.5 ft) in width, the inboard lanes were 3.9 m (12.8 ft) in width, and the center turn lane was 3.1 m (10.2 ft) in width. The roadway was bordered by narrow asphalt shoulders that were 0.6 m (2 ft) in width. Grass roadsides extended outboard of the shoulders for 2 m (6.6 ft) before sloping downward at a 35 percent grade into drainage ditches that were approximately 1.8 m (5.9 ft) in depth and 5.1 m (16.7 ft) in width. The speed limit of the roadway was 72 km/h (45 mph).

In the area of the crash, there were three parking lot driveways that extended to the east of the roadway. The driveway on which the Nissan was exiting was 9.4 m (30.8 ft) in width. There were no traffic controls regulating access from the driveway to the roadway. Between the parking lot driveway on which the Nissan was traveling and the next driveway to the north was a grassy area that measured 22.7 m (74.4 ft) parallel to the roadway. Adjacent to the roadway in this field was the drainage ditch described above. The parking lot did not have a posted or advisory speed limit. A Crash Schematic is included as **Figure 9** of this report.

Pre-Crash

Figure 2: Pre-crash trajectory of the Nissan.

The driver of the Nissan was traveling westbound on the parking lot driveway, on a trajectory toward the roadway. Based on the EDR data, the Nissan was initially stopped. The driver then accelerated the vehicle forward for five seconds pre-crash. The throttle pedal position recorded one second (T-1) prior to Algorithm Enable (AE) was 44 percent. The brake pedal switch was recorded as "Off" for all 5 seconds of recorded pre-crash data. The Nissan had accelerated to a speed of 18 km/h (11 mph) at AE. The driver of the Toyota was operating his vehicle northbound in lane two of the five-lane roadway. The Toyota's EDR was not supported with pre-crash data; therefore speed and pedal positions are unknown. **Figure 2** depicts the Nissan's approach to the roadway. The driver of the Nissan entered the roadway and the initiated a left turn across the travel; path of the Toyota.

Crash

The front plane of the Toyota impacted the left plane of the Nissan (Event 1) in the area of the left front door. The directions of force were within the 10 o'clock sector for the Nissan and the 1 o'clock sector for the Toyota. The force of the impact actuated the front row retractor pretensioners, deployed the driver's frontal air bag, the left side impact air bag and the left IC air bag in the Nissan. The driver's frontal air bag in the Toyota also deployed.

The force of the impact redirected the Nissan to its right as it momentarily traveled in a northerly direction in the center left turn lane. The Nissan subsequently turned in a clockwise direction and entered the driveway located north of the crash site. The Nissan traveled approximately 67 m (220 ft) and continued to the right in a decreasing radius turn. The Nissan continued arcing southward onto the grassy roadside dividing the parking lot driveways. The Nissan traveled down the grade into the ditch. The front of the Nissan impacted the west ditch wall, imprinting the soft soil slightly with the front bumper (Event 2). The Nissan came to rest in the ditch facing west.

The impact forces rotated the Toyota counterclockwise. The Toyota came to rest straddling the center left turn lane approximately 7.5 m (24.6 ft) north of the initial impact facing southwest.

Post-Crash

Police, Emergency Medical Services (EMS) and tow personnel responded to the crash site. EMS personnel pried open the left front door of the Nissan and cut the hinges in order to evaluate and remove the driver due to perceived serious injuries. The right doors of the Nissan remained operational post-crash. The driver of the Nissan was transported by ground ambulance to a regional trauma center where she was admitted for treatment of her injuries. The driver of the Toyota was transported by ground ambulance to a local hospital where he was treated for police reported incapacitating injuries. Both vehicles were towed from the scene due to disabling damage. The vehicles were transferred from their respective tow yards to a regional vehicle salvage facility where they were inspected for this investigation.

2010 NISSAN VERSA

Description

The 2010 Nissan Versa was a 4-door sedan that was manufactured in September 2009 and was identified by the Vehicle Identification Number (VIN): 3N1BC1AP5AL (production sequence deleted). The odometer reading at the time of the crash was 5,082 km (3,158 mi). The front-wheel drive Nissan was powered by a 1.8-liter, inline 4-cylinder engine, linked to a 4-speed automatic transmission. The braking system consisted of power-assisted front disc and rear drum brakes. The Nissan was equipped with an indirect Tire Pressure Monitoring System (TPMS). The driver reported in the interview that the TPMS warning light was not illuminated prior to the crash. All windows were closed at the time of the crash. The Nissan was equipped with four Continental ContiProContact tires, size P185/65R15. This matched the manufacturers recommended tire size. The tires were mounted on OEM 38 cm (15 in) steel wheels with plastic wheel covers. The vehicle manufacturer recommended cold tire pressure was 228 kPa (33 PSI) for the front and the rear. The specific tire data at the time of the SCI inspection was as follows:

Position	Measured Tire Pressure	Measured Tread Depth	Restricted	Tire/Wheel Damage
Left Front	172 kPa (25 PSI)	6 mm (8/32 in)	No	None
Left Rear	207 kPa (30 PSI)	7 mm (9/32 in)	No	None
Right Rear	207 kPa (30 PSI)	7 mm (9/32 in)	No	None
Right Front	193 kPa (28 PSI)	6 mm (8/32 in)	No	None

The interior of the Nissan was equipped with cloth-surfaced five-passenger seating. The front bucket seats were separated by a center console and were equipped with height adjustable head restraints. At the time of the SCI inspection, both front head restraints were in the full-down position. The driver's seat track was jammed and was located 4 cm (1.6 in) forward of the full-rear position. The seat cushion had been compressed laterally 4 cm (1.6 in) and the seat track had been displaced 6 cm (2.4 in) by the lateral intrusion of the left front door. The front left seat back was at an angle of 23 degrees aft of vertical. The front right seat track was in the full-rear position, with a seatback angle of 23 degrees aft of vertical. The second row consisted of a three passenger bench seat with split 60/40 split folding backs. The rear bench seat included adjustable head restraints for the outboard seating positions. These restraints were in the full-down position.

The interior occupant safety systems consisted of 3-point lap and shoulder belts for all five designated seating positions, front safety belt retractor pretensioners, dual-stage CAC frontal air bags, front seatback-mounted side impact air bags and roof side rail-mounted side impact IC air bags that provide protection for the four outboard seating positions.

Exterior Damage

The left side of the Nissan sustained moderate severity damage from the initial impact with the Toyota **(Figure 3)**. The left front door of the Nissan was repositioned to the vehicle for the damage measurements. The direct contact damage began 55 cm (21.7 in) forward of the left rear axle and extended forward 174 cm (68.5 in). The maximum crush was 40 cm (15.7 in), located at the forward aspect of the left front door, 182 cm (71.7 in) forward of the left rear axle. The combined direct and induced damage (Field L) began 7 cm (2.8 in) forward of the left rear axle and extended 312 cm (122.8 in) forward. The residual crush profile was measured at the lower door level and was as follows: C1 = 0 cm, C2 = 17 cm (6.7 in), C3 = 25 cm (9.8 in), C4 = 17 cm (6.7 in), C5 = 1 cm (0.4 in), C6 = 0 cm.

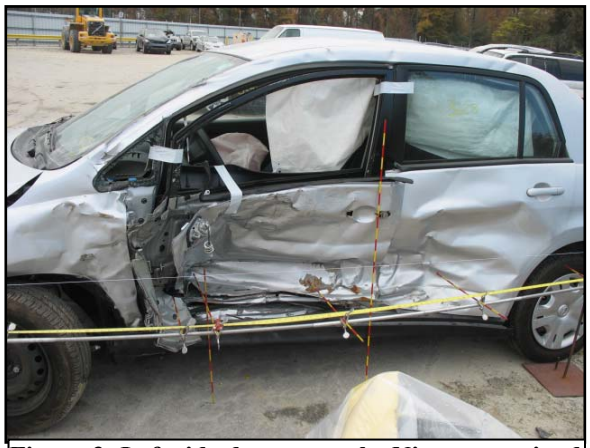

Figure 3: Left side damage to the Nissan sustained in the initial impact event.

The sill height of the Nissan was 28 cm (11 in). The maximum crush height was 51 cm (20.1 in), and the Door Sill Differential (DSD) measured 33 cm (13 in). The damage algorithm of the WinSMASH program was used to calculate the severity of the crash (delta-V). The total delta-V for the Nissan was 35 km/h (21.8 mph). The Nissan's longitudinal and lateral components were -18 km/h (-11.2 mph) and 30 km/h (18.6 mph), respectively. The left front door deformed and intruded into the passenger compartment. Both left side doors were jammed shut post-crash. The windshield was fractured by the impact forces, with more significant damage extending vertically along the left A-pillar. The left front door glazing was disintegrated by the impact forces. The left rear window and quarter glazing were undamaged. Induced damage was also present on the left roof side rail, extending from the windshield header to the C-pillar area. The left wheelbase was not reduced in length. Direct damage attributed to the front plane of the Toyota was present on the left A-pillar of the Nissan which extended 26 cm (10.2 in)

above the belt line. The Collision Deformation Classification (CDC) assigned for this impact was 10LPAW3.

The front plane of the Nissan sustained minor severity damage in the second impact (Event 2) as the vehicle came to rest against the ditch wall. The combined direct and induced damage (Field L) extended the full width of the front bumper fascia. The direct damage began 44 cm (17.3 in) right of the vehicle centerline and extended 74 cm (29.1 in) to the left bumper corner. The maximum crush was located at the front left bumper corner (C1). The residual crush profile measured at the bumper level was as follows: C1 = 5 cm (2 in), C2 = 3 cm (1.2 in), C3 = 2 cm (0.8 in), C4 = 1 cm (0.4 in), C5 = 1 cm (0.4 in), C6 = 1 cm (0.4 in). The CDC assigned for this impact was 12FDEW1.

Interior Damage

The Nissan sustained moderate severity interior damage that was attributed to passenger compartment intrusion, occupant contact and air bag deployment. The driver loaded the left door with her left leg, the left side of her abdomen and her left lower arm depositing scuff marks and fracturing the plastic door panel. The steering wheel was rotated 170 degrees CCW and was locked in place at the time of the SCI inspection. The steering column was adjustable for height and was adjusted 3 cm (1.2 in) below the full-up position at the time of the SCI inspection.

There was a scuff mark attributed to the driver's left hand on the forward upper quadrant of the front left door panel located 11-17 cm (4.3-6.7 in) below the window sill and 35-43 cm (13.8-16.9 in) forward of the B-pillar. A scuff mark on the armrest (rear upper quadrant) was attributed to the left side of the driver's abdomen and was located 26-31 cm (10.2-12.2 in) below the window sill and 18-42 cm (7.1-16.5 in) forward of the B-pillar. Fractured plastic on the forward lower quadrant of the front left door was attributed to contact from the driver's left lower leg and foot and was located 42-55 cm (16.5-21.7 in) below the window sill and 58-72 cm (22.8-28.3 in) forward of the B-pillar.

The driver's seat cushion was compressed laterally 4 cm (1.6 in) as a result of the intrusion of the front left door. The intrusion deformed the driver's seat track 6 cm (2.4 in) to the right. **Figure 4** depicts the damage to the front left seat and the intrusion into the driver's seating position.

Figure 4: Front left seat damage and passenger compartment intrusion in the Nissan.

The A-pillar of the Nissan intruded laterally 2 cm (0.8 in). The maximum crush to the Nissan was located aft of the A-pillar, and the greatest extent of interior lateral intrusion was to the forward lower quadrant of the front left door. This intrusion measured 30 cm (11.8 in). The lateral intrusion to the rear lower quadrant of the front left door measured 12 cm (4.7 in), and 15 cm (5.9 in) at the left front door sill. The driver's seat intruded 6 cm (2.4 in) to the right. The B-pillar intruded laterally 7 cm (2.8 in). In the second row, the forward lower quadrant of the left door intruded laterally by 6 cm.

Manual Restraint Systems

The Nissan was equipped with 3-point manual lap and shoulder belts for the five designated seating positions. All belt systems utilized continuous loop webbing and sliding latch plates. The front upper D-rings were height adjustable and were both in the full-down position at the time of the SCI inspection. The driver's belt retracted onto an Emergency Locking Retractor (ELR). The front right passenger and all three seat belts retracted onto switchable ELR/Automatic Locking Retractors (ALR). The front belt systems utilized retractor pretensioners which actuated during this crash sequence. The length of locked and exposed webbing front from the left front belt system measured 197 cm (77.6 in). The webbing was gathered into the upper D-ring. The front right belt was pulled taut against the B-pillar. The front left belt was in use at the time of the crash, evidenced by a 2 cm (0.8 in) frictional abrasion attributed to the latch plate located 72-74 cm (28.3-29.1 in) above the lower floor anchor.

Supplemental Restraint Systems

The Nissan was equipped with a Certified Advanced 208-Compliant (CAC) frontal air bag system that consisted of dual-stage driver and front right passenger air bags, seat track positioning sensors, a front right occupant weight sensor, retractor pretensioners, and safety belt buckle switches. The manufacturer of the Nissan has certified that this vehicle was compliant with the advanced air bag portion of the Federal Motor Vehicle Safety Standard (FMVSS) No. 208. The driver's frontal air bag deployed during this crash sequence. The front right passenger seat was unoccupied at the time of the crash and the front right frontal air bag did not deploy.

The driver's air bag was concealed within the center hub of the three-spoke steering wheel by five triangular cover flaps. A 7 cm (2.8 in) circular Nissan medallion was attached to the lower left aspect of the upper right flap. The upper flaps were 8 cm (3.1 in) wide and 5 cm (2 in) in height. The lower outboard flaps measured 8 cm (3.1 in) in width and 4 cm (1.6 in) in height. The lower center flap was 3 cm (1.2 in) in width at the upper tear seam, 7 cm (2.8 in) in width at the lower aspect of the flap, and 5 cm (2 in) in height. The flaps opened as designed and were not damaged.

The driver's frontal air bag **(Figure 5)** was 60 cm (23.6 in) in diameter in its deflated state. It was tethered by two tethers at the 12 and 6 o'clock positions of a circular tether seam in the center of the face of the air bag that measured 16 cm (6.3 in) in diameter. The driver's frontal air bag was vented by two vent ports on the upper rear aspect of the air bag at the 10 and 2 o'clock positions. Due to the position of the steering wheel, the driver's frontal air bag was nearly inverted at the time of the inspection. The air bag was labeled with the nomenclature:
2418253AJ
160909T1122
21 09 09 M

Figure 5: Driver's frontal air bag in the Nissan.

The face of the driver's air bag contained two scuff marks attributed to deployment transfers. One extended in a diagonal line from 6-10 cm (2.4-3.9 in) below the upper aspect of the air bag and 4-9 cm (1.6-3.5 in) right of the vertical centerline of the air bag. The second was located 19-23 cm (7.5-9.1 in) above the lower aspect of the air bag and 10-15 cm (3.9-5.9 in) right of the vertical centerline of the air bag. There were multiple droplets of blood concentrated in the upper left quadrant of the front of the air bag, 3-7 cm (1.2-2.8 in) below the upper aspect of the air bag and 6 cm (2.4 in) left of the vertical centerline of the air bag.

The front right air bag was concealed within the upper aspect of the right instrument panel. The front right seat was not occupied during this crash, therefore the frontal CAC air bag did not deploy.

The Nissan was equipped with side impact air bags mounted in the upper outboard aspects of the front seatbacks and roof side rail-mounted side impact IC air bags. The left side impact air bag and left IC deployed during this crash. The right IC and right side impact air bag did not deploy.

Figure 6: Driver's side impact air bag in the Nissan.

The deployed side impact air bag **(Figure 6)** measured 38 cm (15 in) in height. The forward edge of the bag had a curved shape and measured 16 cm (6.3 in) and 15 cm (5.9 in) in width at the upper and lower aspects, respectively, and 10 cm (3.9 in) in width at the center. The left side air bag deployed from a 32 cm (12.6 in) tear seam in the outboard aspect of the left seatback. There was no damage or occupant contact evidence present on this air bag.

The deployed left IC measured 148 cm (58.3 in) in length. It measured 42 cm (16.5 in) in height at the front and rear seating positions and was tethered to the left A-pillar by a webbing strap that was 38 cm (15 in) in length. Vertically, the IC air bag extended below the belt line at the front and rear outboard seating positions. The left IC provided head protection from the left C-pillar forward to a location 38 cm (15 in) aft of the left A-pillar. The IC was labeled with the nomenclature "6105534D SI/PA 6.6". There was a scuff mark attributed to the driver's head on the inboard side of the left IC. This scuff mark was located 16-26 cm (6.3-10.2 in) rear of the front edge of the IC and 14-24 cm (5.5-9.4 in) above the lower edge of the IC. **Figure 7** depicts the inboard side of the left IC.

Figure 7: Inboard side of the left IC, including driver's head contact in the Nissan.

Event Data Recorder

The EDR in the Nissan was imaged using the Nissan Consult III proprietary scan tool. The data was obtained through the Diagnostic Link Connector (DLC) with 12-volt power provided through the battery connections. The EDR recorded seven seconds of pre-crash data and six seconds of post-crash data associated with the frontal air bag algorithm wake-up at T0. The data indicated the brake switch state was "Off" at the -5 second interval pre-crash and remained "Off" throughout the pre-crash time period and for the six seconds of post-crash recording. The throttle pedal position was recorded as 0 percent at the -6 second interval pre-crash and was progressively applied from 10% to 44% from the -5 second to -1 second interval pre-crash. The vehicle speed increased during acceleration period from 0 km/h to 18 km/h (11.2 mph) at AE. The engine RPM's progressively increased with throttle input to a peak of 2178 at the -1 second pre-crash time interval. The frontal (longitudinal) delta V was 22 km/h (13.7 mph) at 90 milliseconds. The lateral delta V was 16 km/h (10 mph) at 50 milliseconds. There was no recorded data associated with the deployment of the side impact air bag system.

2010 Nissan Versa Occupant Data

Driver Age/Sex:	65-year-old/Female
Height:	168 cm (66 in)
Weight:	Unknown
Eyewear:	Prescription glasses
Seat Type:	Bucket
Seat Track Position:	Rear-track, 4 cm (1.6 in) forward of full-rear
Manual Restraint Usage:	Lap and shoulder
Usage Source:	SCI vehicle inspection
Air Bags:	Frontal, left side and IC deployed
Egress from Vehicle:	Removed from vehicle by EMS
Mode of Transport from Scene:	Ground ambulance
Type of Medical Treatment:	Admitted to a regional trauma center

Driver injuries

Injury	Injury Severity (AIS 2005/08)	Injury Source	Confidence Level
Contusion, left side of face (cheek area)	Minor (210402.1,2)	Left IC	Certain
Left wrist sprain	Minor (772410.1,2)	Left door, Forward Upper Quadrant	Certain
Left arm contusion, dorsal side, elbow to hand	Minor (710402.1,2)	Left door, Forward Upper Quadrant	Certain
Contusion on outboard side of left leg	Minor (810402.1,2)	Left door armrest, Forward Upper Quadrant	Certain

Source: Partial Driver Interview

Driver Kinematics

The 65-year-old female driver was seated in a rear-track position. Her hands were positioned on the steering wheel and she was turning the wheel to the left to execute the left turn. The driver was restrained

by the 3-point manual lap and shoulder belt system. She did not attempt any avoidance maneuvers prior to the initial impact with the Toyota.

The left side impact actuated the driver's retractor pretensioner and deployed the driver's frontal, left side impact and left IC air bags. The driver initiated a left and slightly forward trajectory in response to the 10 o'clock direction of force. The driver loaded the left door panel with her left hand and wrist, the left side of her abdomen, and her left lower leg, resulting in the leg contusions and sprained wrist. She loaded the left IC with the left side of her head. The outboard side of the IC was backed by the front of the Toyota. This contact deposited a scuff mark and resulted in a facial contusion. As the left door panel intruded laterally into the driver's space, the door panel impacted her left hip. The lateral intrusion of the door panel and sill compressed the driver's seat cushion and displaced the driver's seat laterally to the right. The driver then initiated a rebound trajectory within the front left seating position.

The Nissan then traveled for several seconds on a trajectory arcing to the right. At the end of its travel, the front of the Nissan impacted a drainage ditch bank. The driver of the Nissan initiated a forward trajectory within the front left seating position. She loaded the safety belt with her chest and abdomen and was held in place within the front left seating position.

She was extricated from the vehicle by EMS and was transported by ground ambulance to a regional trauma center where she was admitted for treatment of her injuries. The hospital refused to provide the medical records for this investigation.

2005 TOYOTA TACOMA

Description

The 2005 Toyota Tacoma was manufactured in February, 2005 and was identified by the VIN: 5TEUU42N95Z (production sequence deleted). The 4-wheel drive Toyota was powered by a 4.0-liter, V-6 engine linked to a 5-speed automatic transmission. The braking system consisted of power-assisted front disc and rear drum brakes with four-wheel antilock, braking assist and electronic brakeforce distribution. The left side of the windshield was fractured by the impact forces, all other glazing was undamaged. The driver's frontal air bag deployed as a result of the initial impact with the Nissan. The Toyota was equipped with four Dunlop Radial Rover tires in size P265/70R16, which matched the manufacturers recommended tire size. The vehicle manufacturer recommended cold tire pressure was 200 kPa (29 PSI) for the front and 221 kPa (32 PSI) for the rear. The specific tire data at the time of the SCI inspection was as follows:

Position	Measured Tire Pressure	Measured Tread Depth	Restricted	Tire/Wheel Damage
Left Front	179 kPa (26 PSI)	3 mm (4/32 in)	No	None
Left Rear	200 kPa (29 PSI)	5 mm (6/32 in)	No	None
Right Rear	186 kPa (27 PSI)	5 mm (6/32 in)	No	None
Right Front	186 kPa (27 PSI)	4 mm (5/32 in)	No	None

Exterior Damage

The front plane of the Toyota sustained moderate severity damage as a result of the impact with the Nissan **(Figure 8)**. The bumper and front fascia separated from the vehicle during this crash. There was direct damage present on the lower radiator support, the leading edge of the hood and the left front fender. The direct contact damage and Field L were measured between the frame rail ends of the vehicle. The Field L width was 95 cm (37.4 in). The maximum crush was based on the deformation to the lower radiator support and was located at C3, 38 cm (15 in) right of the left frame rail end. The maximum crush measured 20 cm (7.9 in). A crush profile based on the positions of the frame rail ends and the deformation to the lower radiator support was documented and was as follows: C1 = 1 cm (0.4 in), C2 = 17 cm (6.7 in), C3 = 20 cm (7.9 in), C4 = 19 cm (7.5 in), C5 = 15 cm (5.9 in), C6 = 0 cm. The total delta V for the Toyota was 22 km/h (13.7 mph). The Toyota's longitudinal and lateral components were -21 km/h (-13.1 mph) and -8 km/h (-5 mph), respectively. The CDC assigned for this impact was 01FDEW1.

Figure 8: Frontal and left side damage to the

Toyota Event Data Recorder

The Toyota was equipped with an EDR that recorded deployment related data. The EDR was not supported with pre-crash data. The Toyota's EDR was imaged using the proprietary Toyota hardware and software version 1.4.1.1. The EDR had the capability of recording up to three events lists on the output as Banks. In this crash, Bank 0 was a complete recording. The output data listed the driver's seat position as "Rearward" and his belt status as "Belted". The frontal air bag deployment level was "Hi" and the deployment time was recorded at 10 ms of the impact. The maximum velocity change was 32 mph (19.8 mph) at 153.6 ms of the impact.

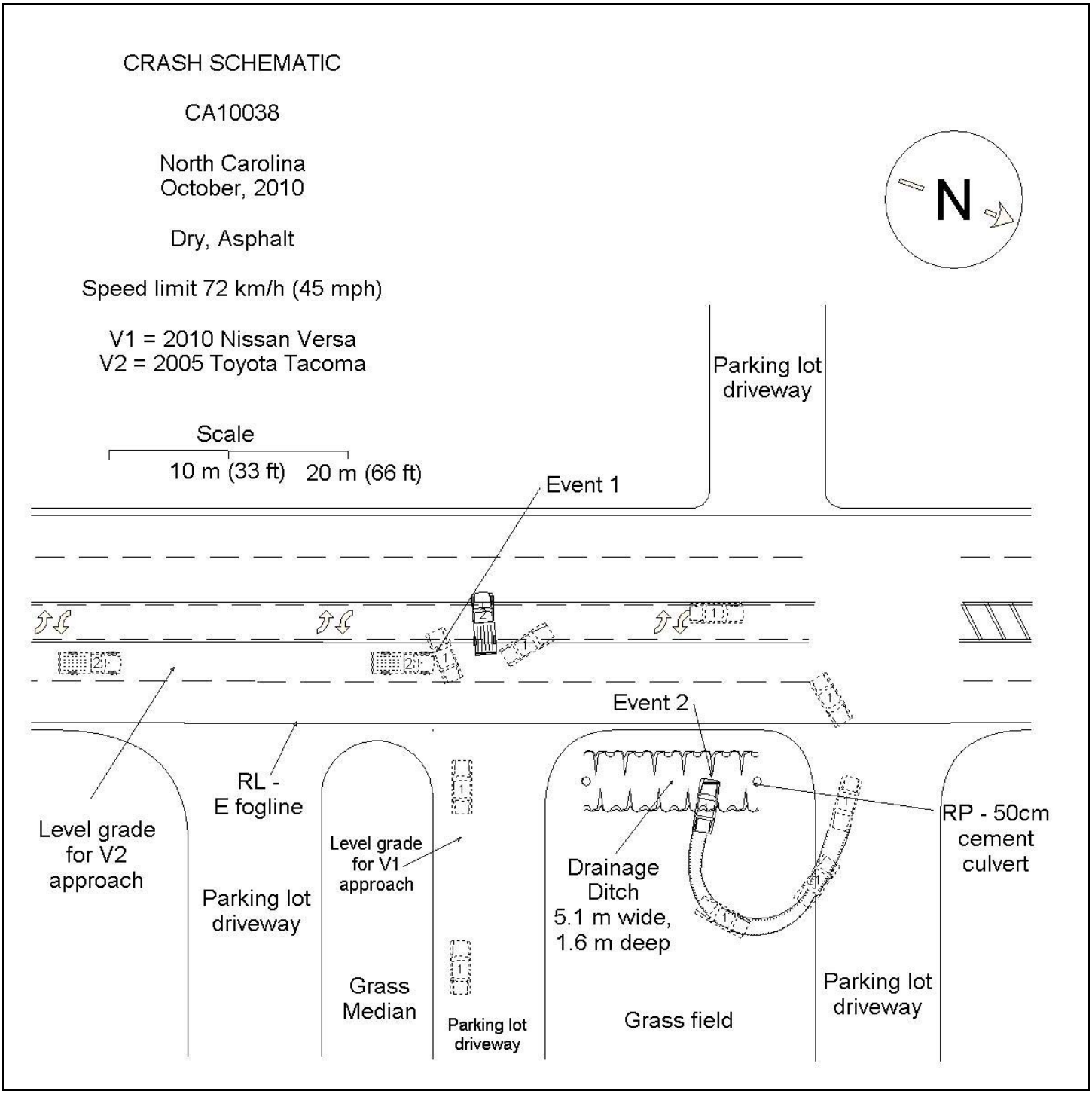

Figure 9: Crash Schematic