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Special Crash Investigations

Remote Vehicle Fire

Child Restraint System

Investigation

Vehicle: 2005 Nissan

Armada

Location: Illinois

Crash Date: December 2011

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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.

This report and associated case data are based on information available to the Special Crash Investigation team on the date this report was published.

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16. Abstract This report documents the remote investigation of a crash-related fire in a 2005 Nissan Armada in which a 4-year-old male was seated in a child restraint system (CRS) located in the second-row right seating position. This crash occurred on the north roadside of a two-lane, undivided, rural roadway. The Nissan was a 4-door sport utility vehicle (SUV) equipped with frontal, front-seat-mounted side impact, and inflatable curtain (IC) air bags. An unbelted 24-year-old female driver and a 4-year-old male second-row right passenger, who was seated in an unknown make/model CRS, occupied the vehicle. The Nissan was traveling in the southwest-bound lane. The vehicle initially departed the south side of the roadway for an unknown reason. The driver initiated a right steering maneuver and the vehicle rotated counterclockwise as it crossed the roadway and departed the north side of the roadway into a ditch. The vehicle continued to yaw counterclockwise as it traveled through the ditch and across a yard. It then rolled over right-side leading (Event 1). The top plane of the vehicle struck and displaced a metal post and telephone junction box (Events 2 and 3) during the rollover. The vehicle became airborne following these impacts and the left plane struck a tree (Event 4). The vehicle came to final rest on the left plane heading southeast adjacent to the tree. The driver was partially ejected through the disintegrated left front glazing during the rollover and was trapped between the ground and the left plane of the vehicle. The vehicle then caught fire (Event 5). A passerby fractured the backlight glazing and cut the CRS's harness straps and removed the second-row right passenger from the vehicle. The vehicle was then totally consumed in the fire. The driver sustained fatal injuries and was transported to a local funeral home. The second-row right passenger sustained police-reported "B" (non-incapacitating) injuries and was transported by ambulance to a hospital, then transferred to a children's hospital for treatment of burns and other injuries. The Nissan was towed from the crash scene due to damage.					
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**Indiana University Transportation Research Center
Remote Vehicle Fire Child Restraint System Investigation
Case Number - IN17004
Vehicle - 2005 Nissan Armada
Location – Illinois
Crash Date - December 2011**

BACKGROUND

This report documents the remote investigation of a crash-related fire in a 2005 Nissan Armada (**Figure 1**) in which a 4-year-old male was seated in a child restraint system (CRS) located in the second-row right seating position. This investigation was initiated by the National Highway Traffic Safety Administration in January 2017 and assigned to the Indiana University Transportation Research Center. This single-vehicle rollover crash occurred in Illinois in December 2011 during dark early morning hours and was investigated by a local police agency. Photographs of the crash scene were obtained in February 2017. An SCI interview was conducted with a witness in June 2017. An official of the responding ambulance service was interviewed in June 2017, and the fire chief for the responding fire department was interviewed in August 2017.



Figure 1: Police photo of the damaged 2005 Nissan Armada

This crash occurred on the north roadside of a two-lane, undivided, rural roadway. The Nissan was a 4-door SUV equipped with frontal, front seat-mounted side impact, and inflatable curtain (IC) air bags. An unbelted 24-year-old female driver and a 4-year-old male second-row right passenger, who was seated in an unknown make/model CRS, occupied the vehicle. The Nissan was traveling in the southwest-bound lane. The vehicle initially departed the south side of the roadway for an unknown reason. The driver initiated a right steering maneuver and the vehicle rotated counterclockwise as it crossed the roadway and departed the north side of the roadway into a ditch. The vehicle continued to yaw counterclockwise as it traveled through the ditch and across a yard. It then rolled over right side leading (Event 1). The top plane of the vehicle struck and displaced a metal post and telephone junction box (Events 2 and 3) during the rollover. The vehicle became airborne following these impacts and the left plane struck a tree (Event 4). The vehicle came to final rest on the left plane heading southeast adjacent to the tree. The driver was partially ejected through the disintegrated left front glazing during the rollover and was entrapped between the ground and the left plane of the vehicle. The vehicle then caught fire (Event 5). A passerby fractured the backlight glazing and cut the CRS's harness straps and removed the second-row right passenger from the vehicle. The vehicle was then totally

consumed in the fire. The driver sustained fatal injuries and was transported to a local funeral home. The second-row right passenger sustained police-reported “B” (non-incapacitating) injuries and was transported by ambulance to a hospital, then transferred to a children’s hospital for treatment of burns and other injuries. The Nissan was towed from the crash scene due to damage.

CRASH SUMMARY

Crash Site

This crash occurred during dark early morning hours on the north roadside of a straight, two-lane, undivided, rural roadway. The weather conditions were overcast with 8 kilometers (5 miles) visibility, west-southwest winds at 19 km/h (12 mph), a temperature of 8.9 deg. °C (48 deg. °F), and a dew point of 7.8 deg. °C (46 deg. °F), according to local weather reports. The Nissan’s roadway traversed in a southwest/northeast direction and had one bituminous lane in each direction. Each side of the roadway was bordered by a grass shoulder and a shallow ditch. Two gravel driveways to a commercial business and a gravel driveway to a private residence were located on the north side of the roadway where the crash occurred. A telephone junction box and steel post were located on the east side of the private driveway. An estimated 36 cm (14 in) diameter tree was located on the west side of the private driveway. The roadway surface was dry at the time of the crash. The speed limit was 89 km/h (55 mph). The crash diagram is included at the end of this report.

Pre-Crash

The Nissan was traveling in the southwest-bound lane (**Figure 2**) when the vehicle departed the lane and crossed the northeast-bound lane. The reason for the lane departure is not known. The vehicle’s left side wheels then departed the south side of the roadway. The driver initiated a right steering maneuver and the vehicle reentered the roadway traveling toward the north side of the roadway. The driver then initiated a left steering maneuver, and the vehicle began to rotate counterclockwise as it departed the north side of the roadway at the gravel driveway to a commercial business (**Figure 2**). The vehicle entered a ditch and continued to rotate counterclockwise as it traveled approximately 27 m (89 ft) through the yard of the business. The vehicle was approaching a broadside configuration with the right side leading as it reached the second driveway to the same business.



Figure 2: Police photo showing view back to Nissan’s approach roadway from vehicle’s off-road travel path, view southeast

Crash

The Nissan began to roll over (Event 1), right side leading, at the second driveway and became airborne landing in the side yard of the business. The vehicle traveled approximately 11 m (36 ft) across the second driveway and side yard of the business and the top plane (**Figure 3**) struck and displaced a metal post (Event 2) and a telephone junction box (Event 3) located on the east side of a private gravel driveway (**Figure 4**). The vehicle again became airborne and continued rolling over across an additional approximately 5 m (16 ft) across the driveway where the left plane (**Figure 3**) struck a tree estimated to be 36 cm (14 in) in diameter (Event 4). The vertical extent and angle of the crush damage indicated that the vehicle was in the initial phase of the 7th quarter turn when the impact occurred. The vehicle then came to final rest on its left plane heading southeast adjacent to the tree (**Figure 5**). The driver was partially ejected through the disintegrated left front glazing during the rollover and was entrapped between the ground and the left plane of the vehicle. The vehicle then caught fire (Event 5). It was estimated that the Nissan rolled over 7 quarter turns across a distance of approximately 16 m (52 ft). This was considered an interrupted rollover since the vehicle struck a tree during the final phase of the rollover, stopping the vehicle's motion at the tree.

Post-Crash and Fire-Related Discussion

The resident of a house adjacent to the crash scene heard the crash and immediately came out of his residence to investigate. He stated during the SCI interview that smoke was coming from the vehicle. The vehicle then caught fire. He was unable to identify where the smoke and flames originated. A passerby, who was a volunteer fire fighter, had stopped immediately after the crash occurred and went to the vehicle. He told police that he heard a child crying from inside the



Figure 3: Police photo showing damage to top plane from post impact (left arrow) and damage to left plane from tree impact (right arrow)



Figure 4: Police photo showing metal post and telephone junction box struck during rollover, and final rest position of Nissan, view west



Figure 5: Police photo showing final rest position of the Nissan, view northwest

vehicle. The entrapped driver was crying out for someone to save her baby. The passerby fractured the backlight glazing. He stated that a “burst of heat” came out of the vehicle when the glass was fractured. The passerby then entered the burning vehicle through the backlight and used his knife to cut the harness straps of the CRS and removed the second-row right passenger from the vehicle through the backlight. A second passerby and the resident of the nearby house assisted in helping the first passerby and second-row passenger out of the vehicle. The fire then spread to the entire vehicle in less than a minute according to the first passerby and it was not possible to free the entrapped driver. The vehicle was totally consumed by the fire and the driver perished in the blaze.

The police received notification of the crash at 0600 hours. The local fire department was notified of the crash at 0548 hours based on the SCI interview with the fire chief. The first fire truck arrived on scene at 0602 hours and a second fire engine arrived at 0604 hours. Water was used to extinguish the fire. The fire chief stated it took 3 to 5 minutes to get the fire under control but he couldn’t provide a specific amount of time to completely extinguish the fire. Fire personnel remained on scene to ensure the fire did not re-ignite and they cleared the crash scene at 0834 hours, according to the fire chief.

An official with the local ambulance service stated during the SCI interview that his department was notified of the crash at 0552 hours and arrived on scene at 0557 hours. The ambulance crew transported the second-row right passenger to a hospital, departing the crash scene at 0619 hours and arriving at the hospital at 0628 hours. The passenger was treated in the emergency room, then transferred to a children’s hospital, and admitted for further treatment of burns and other injuries. The fatally injured driver was pronounced deceased by the county coroner 35 minutes following the crash, and was transported to a local funeral home. The Nissan was towed from the crash scene due to damage.

2005 NISSAN ARMADA

Description

The Nissan was a 4-wheel drive, 8-occupant, 4-door SUV with the VIN 5N1AA08B65Nxxxxxx, equipped with a 5.7-liter, V-8 engine, 5-speed automatic transmission, 4-wheel antilock brakes with electronic brake force distribution, brake assist, traction control, electronic stability control (ESC) and a tire pressure monitoring system (TPMS). The vehicle was also equipped with dual-stage frontal air bags, front-seat-mounted side impact air bags, side impact IC air bags, and a tilt steering column. The specified wheelbase was 313 cm (123.2 in).

Exterior Damage

Exterior Damage Event 1: The Nissan sustained damage to both side planes and the top plane during the rollover. It appeared that the direct damage extended down the full length of both sides. However, most of the paint was burned off the vehicle, so minor scratches from ground contact could not be discerned. The damage to the top plane resided primarily on the roof. The

hood also appeared to have some direct damage dents related to the rollover.

Damage Classification Event 1: The Collision Deformation Classifications (CDC) was 00TDDO2. The severity of the damage was minor based on the extent of the roof crush.

Exterior Damage Events 2 and 3: The top plane of the vehicle was directly damaged during the rollover when it struck a steel property marker pole and telephone junction box. The damage was located on the top of left fender at the base of the left A-pillar. The hood in this area was probably also damaged, but could not be seen in the police photographs.

Damage Classification Events 2 and 3: The CDC for each event was 00TFLN2. The severity of the damage was minor.

Exterior Damage Event 4: The left plane was damaged when it struck an estimated 36 cm (14 in) diameter tree during the rollover and just prior to coming to final rest. The direct damage was located on the left front door beginning at the B-pillar.

Damage Classification Events 4: The CDC was 00LPEN3. The severity of the damage was moderate based on the likely extent of occupant compartment intrusion of the left front door and sill.

Exterior Damage Event 5: The vehicle sustained fire damage to the entire vehicle. Some paint remained on the left fender and quarter panel since these surfaces were on the ground during the fire. The fire damage was severe since all the combustible material was consumed in the fire with the exception of the left front and rear tires. The source of the fire is not known.

Event Data Recorder

The 2005 Nissan Armada was not supported by the Bosch Crash Data Retrieval Tool.

Interior Damage

The interior of the Nissan sustained moderate damage from intrusion of the left front door and sill. All combustible material in the Nissan's interior was consumed in the fire.

Manual Restraint Systems

The front and second rows of the Nissan are typically equipped with 3-point lap and shoulder seat belts. The status of the seat belts could not be determined due to the extent of damage from the fire and the lack of sufficient photographic coverage of the vehicle's interior. The police crash report stated that the driver was not belted.

Supplemental Restraint Systems

The Nissan was equipped with multi-stage frontal air bags, front-seat-mounted side impact air bags, and side impact IC air bags. The air bags were consumed during the fire.

Child Restraint System

The CRS was consumed in the fire. The make, model, and type of the CRS are not known.

2005 NISSAN ARMADA OCCUPANTS

Driver Demographics

Age/Sex: 24 years/female
Height: 168 cm (66 in)
Weight: 73 kg (160 lbs)
Eyewear: Unknown
Seat Type: Bucket
Seat Track Position: Unknown
Manual Restraint Usage: None
Usage Source: Police crash report
Air Bags: Frontal, seat-mounted side impact, and IC air bags;
unknown if deployed, destroyed in fire
Alcohol/Drug Involvement: None
Egress From Vehicle: Entrapped
Transport From Scene: Transported to funeral home
Medical Treatment: None, fatally injured

Driver Injuries

Injury No.	Injury	AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
1	Incineration (burned beyond recognition), not further specified	912032.6	Noncontact injury: fire	Certain

Source: Coroner Records.

Driver Kinematics

The unbelted driver was displaced in multiple directions during the rollover. The left plane impact to the tree redirected the driver to the left and she was partially ejected from the vehicle through the left front window and entrapped between the left plane of the vehicle and the ground. The driver sustained fatal injuries and was pronounced deceased by the county coroner 35 minutes following the crash and transported to a local funeral home.

Second Row Right Occupant Demographics

Age/Sex: 4 years/male
Height: Unknown
Weight: Unknown
Eyewear: None
Seat Type: Split bench with folding backs
Seat Track Position: Fixed
Manual Restraint Usage: Child restraint system
Usage Source: Police crash report
Air Bags: Inflatable curtain, unknown if deployed
Alcohol/Drug Involvement: None
Egress From Vehicle: Removed by passerby
Transport From Scene: Ambulance
Medical Treatment: Hospitalized unknown number of days

Second Row Right Occupant Injuries

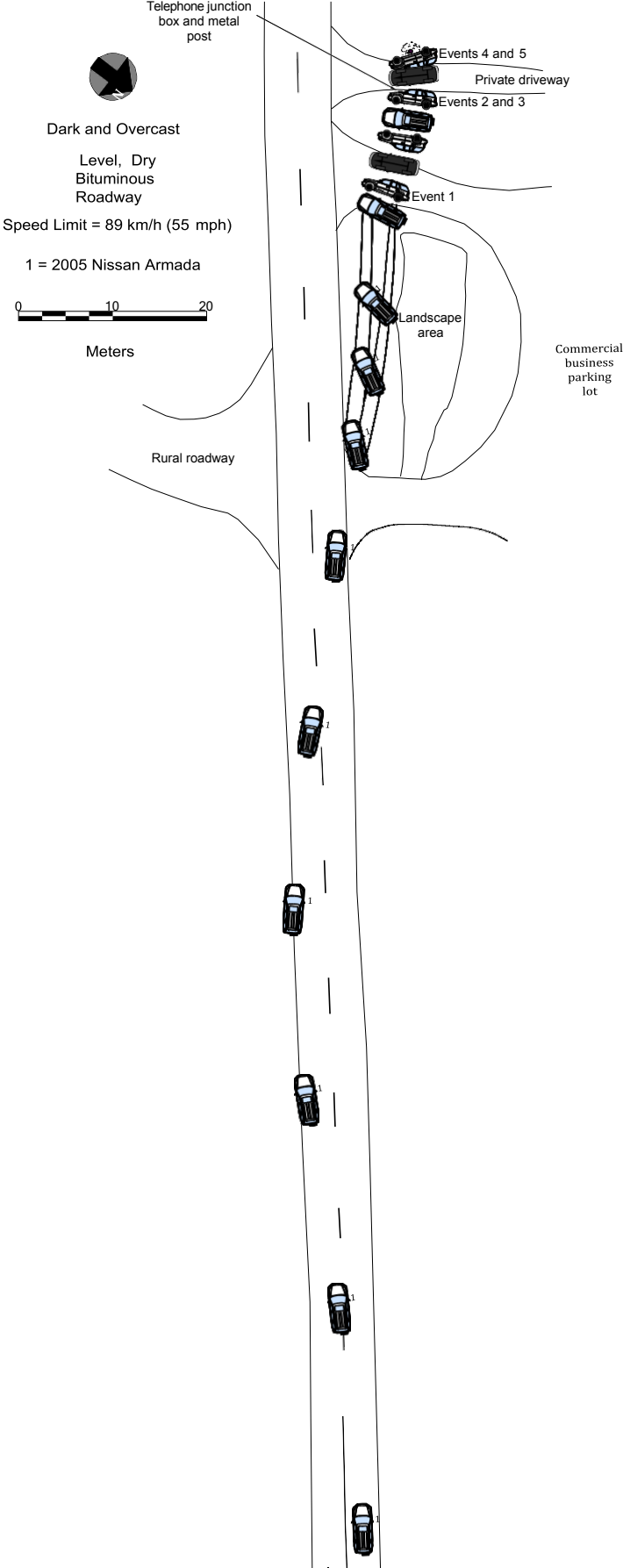
Injury No.	Injury	AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
1	Second-degrees burns of 20 percent total body surface area that included: left ear, left cheek, left chest area, circumferential bilateral hands and distal forearms, bilateral knees, bilateral proximal lower legs, and posterior right calf areas, and singed nasal hairs, not further specified	912020.4	Thermal burns	Certain
2 3	Abrasion right forehead and right cheek with swelling right temple, not further specified	210202.1 210202.1	Unknown Unknown	Unknown

Sources: Emergency room records and EMS treatment record (from initial treatment facility to transferred to facility). Injury Numbers 1 through 3 came only from emergency room records.

Second Row Right Occupant Kinematics

The second-row right occupant was restrained in an unknown make and model CRS. The occupant was displaced in multiple direction in the CRS during the crash but remained restrained in the CRS. A passerby fractured the backlight glazing, entered the vehicle and used his knife to cut the CRS harness straps and removed the occupant from the vehicle. The second-row right occupant was transported by ambulance to a hospital where he was treated in the emergency room, then transferred to a children's hospital and hospitalized for an unknown number of days for treatment of second-degree burns and abrasions.

Crash Diagram



Case Number:

IN17004

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