

Remote, Redesigned Air Bag Special Study

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Dynamic Science, Inc., Case Number (1998-076-801G)

1998 Nissan Altima

Arizona

August/1998

Technical Report Documentation Page

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| 16. Abstract <p>This remote investigation focused on the depowered air bag system deployment of a 1998 Nissan Altima 4-door sedan. This minor injury crash occurred in August, 1998 in the afternoon. The weather was clear and the bituminous roadway was dry. The crash occurred on a two lane, undivided roadway, however one of the travel lanes was shut down due to road construction. The road was straight and level at the area of impact. The speed limit was 89 km/h (55 mph). Vehicle 1, a 1985 CAT road grader, was being driven northbound on the east road side by a 51 year old male. Since Vehicle 1 is a large piece of construction equipment, it is not believed that the driver was restrained. Vehicle 2, a 1998 Nissan Altima 4-door sedan (case vehicle) was being driven south, in the southbound travel lane, by a restrained 21 year old male approaching Vehicle 1. The front right seat was occupied by a restrained 26 year old male. The rear left seat was occupied by a restrained 33 year old male. The rear right seat was occupied by a restrained 30 year old male. As Vehicle 2 was approaching, the driver of Vehicle 1 attempted a U-turn from the east road side onto the southbound travel lane. The driver of Vehicle 2 applied the brakes, which locked-up, and slid into Vehicle 1. The front plane of Vehicle 2 (12FYEW3) impacted the front plane of Vehicle 1 (unknown CDC) in the southbound travel lane. A Delta V could not be calculated for either vehicle due to Vehicle 1 being a medium/heavy truck, which is beyond the scope of reconstruction. A barrier speed was calculated for Vehicle 2 to be 24km/h (15 mph). As a result of the frontal impact, the supplemental restraint system (driver and passenger side depowered air bags) deployed. After the impact, Vehicle 2 began a 60 degree counter-clockwise rotation, and came to rest beyond the area of impact, on the south road side, facing northeast. Vehicle 1 did not move substantially after the impact. The four occupants of Vehicle 2 sustained minor injuries and were transported directly from the scene to a medical facility by a private vehicle. All four occupants were treated and released. The driver of Vehicle 1 was not injured and did not receive medical attention.</p> | | | |
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Summary

This remote investigation focused on the redesigned air bag system deployment of a 1998 Nissan Altima 4-door sedan. This minor injury crash occurred in August, 1998 in the afternoon. The weather was clear and the bituminous roadway was dry. The crash occurred on a two lane, undivided roadway, however one of the travel lanes was shut down due to road construction. The road was straight and level at the area of impact. The speed limit was 89 km/h (55 mph).

Vehicle 1, a 1985 CAT road grader, was being driven northbound on the east road side by a 51 year old male. Since Vehicle 1 is a large piece of construction equipment, it is not believed that the driver was restrained.

Vehicle 2, a 1998 Nissan Altima 4-door sedan (case vehicle) was being driven south, in the southbound travel lane, by a restrained¹ 21 year old male (178 cm/70 in, 73 kg/160 lbs) approaching Vehicle 1. The right-front seat was occupied by a restrained 26 year old male (175 cm/69 in, 93 kg/205 lbs). The left-rear seat was occupied by a restrained 33 year old male (168 cm/66 in, 73 kg/160 lb). The right-rear seat was occupied by a restrained 30 year old male (175 cm/69 in, 79 kg/175 lbs).



Figure 1. Exterior, Vehicle 1 (CAT Road Grader)



Figure 2. Exterior, Vehicle 2 (Nissan Altima)

¹ SCI changed all occupant restraint use from EDCS.

Crash Events

As Vehicle 2 was approaching, the driver of Vehicle 1 attempted a U-turn from the east road side onto the southbound travel lane. The driver of Vehicle 2 applied the brakes, which locked-up, and slid into Vehicle 1. The front plane of Vehicle 2 (12FYEW3) impacted the front plane of Vehicle 1 (unknown CDC) in the southbound travel lane.

A Delta V could not be calculated for either vehicle due to Vehicle 1 being a medium/heavy truck, which is beyond the scope of reconstruction. A barrier speed was calculated for Vehicle 2 to be 24km/h (15 mph). As a result of the frontal impact, the supplemental restraint system (driver and passenger side depowered air bags) deployed.

After the impact, Vehicle 2 began a 60 degree counter-clockwise rotation, and came to rest beyond the area of impact, on the south road side, facing northeast. Vehicle 1 did not move substantially after the impact.

The four occupants of Vehicle 2 sustained minor injuries and were transported directly from the scene to a medical facility by a private vehicle. All four occupants were treated and released.

The driver of Vehicle 1 was not injured and did not receive medical attention.

Vehicle 2 sustained heavy damage to the hood and engine area, and was towed from the scene due to damage.

Vehicle 1 was not damaged in the crash and did not need to be towed.

Table 1. Delta V

| | Case Vehicle | | Other Vehicle | |
|---------------|--------------|---------|---------------|---------|
| | km/h | mph | km/h | mph |
| Total | Unknown | Unknown | Unknown | Unknown |
| Longitudinal | Unknown | Unknown | Unknown | Unknown |
| Lateral | Unknown | Unknown | Unknown | Unknown |
| Barrier Speed | 24 | 15 | Unknown | Unknown |

Exterior of Case Vehicle

Table 2. Vehicle Information

| | |
|----------------------------|--------------------|
| Model year, make and model | 1998 Nissan Altima |
| VIN | D72V10826 |
| CDC | 12FYEW3 |



Figure 3. Exterior, Vehicle 2 (1998 Nissan Altima)



Figure 4. Exterior, Vehicle 2 (1998 Nissan Altima)

Table 3. Crush Measurements

| Plane of Impact | Field L cm/in. | C1 cm/in. | C2 cm/in. | C3 cm/in. | C4 cm/in. | C5 cm/in. | C6 cm/in. |
|-----------------|-------------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Bumper | | 0 | 0 | 0 | 0 | 0 | 0 |
| Above bumper | | 52/20 | 52/20 | 52/20 | 3213 | 2/1 | 0 |
| Result (avg) | 143/56 | 26/10 | 26/10 | 26/10 | 16/6 | 0 | 0 |

Interior of Case Vehicle

The interior of the Nissan Altima sustained minor damage from intrusion and occupant contact. There was a minimal amount of intrusion of the windshield in the left and center positions. The intruded values are reported in Table 4. There was occupant contact damage to the knee bolster and driver's side air bag.

Table 4. Intrusions

| Intruded Component | Location of Intrusion | Intruded Value cm/in. | | Dominant Crush Direction |
|--------------------|-----------------------|--------------------------|-----|--------------------------|
| Windshield | Left-front | 7 | 2.8 | Longitudinal (rearward) |

| | | | | |
|------------|--------------|---|-----|-------------------------|
| Windshield | Center-front | 6 | 2.4 | Longitudinal (rearward) |
|------------|--------------|---|-----|-------------------------|

This vehicle was equipped with bucket seats with adjustable head restraints (not damaged) in the left-front and right-front seating positions. The rear seat was a bench with folding back(s) for all three seating positions. The left-rear and right-rear seats were equipped with integral head restraints (not damaged) while the center-rear seat had no head restraint system. The left-front seat was adjusted to the middle track position. The right-front seat was adjusted to the forward-middle track position. The rear seats were not adjustable.

Case Vehicle Occupant Protection Systems

The Nissan Altima was equipped redesigned air bags which consisted of front-left and front-right air bag modules which housed air bags and depowered inflator units.

The front-left air bag was housed in the steering wheel hub and was concealed by asymmetrical H-configuration cover flaps. The circular air bag was equipped with two tethers and two vent ports. A small skin transfer was found on the air bag.

The front-right air bag was located in the top-instrument panel position and was concealed by symmetrical H-configuration flaps. The rectangular air bag was not



Figure 5. Interior, Vehicle 2 - Driver side air bag



Figure 6. Interior, Vehicle 2 - Passenger side air bag

equipped with tethers but contained one vent port. There were no indications of damage or contact to either the air bag or the module cover.

Case Vehicle Occupant Demographics

Table 5. Case Vehicle Occupant(s) Demographics

| | Occupant 1 | Occupant 2 | Occupant 3 | Occupant 4 |
|---------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| Age/Sex: | 21/Male | 26/Male | 33/Male | 30/Male |
| Seated Position: | Left-front | Right-front | Left-rear | Right-rear |
| Seat Type: | Bucket | Bucket | Bench with folding back | Bench with folding back |
| Height (cm/in.): | 178 70 | 175 69 | 168 66 | 175 69 |
| Weight (kg/lbs): | 73 160 | 93 205 | 73 160 | 79 175 |
| Pre-existing Medical Condition: | None noted | None noted | None noted | None noted |
| Body Posture: | Normal - upright, back against seat |
| Hand Position: | Steering wheel | Unknown | Unknown | Unknown |
| Foot Position: | Right - brake pedal Left - floor | Floor | Floor | Floor |
| Restraint Usage: | Manual lap & shoulder restraint |
| Air bag: | Depowered air bag deployed | Depowered air bag deployed | None | None |

Occupant Injuries

Table 6. Injuries

| Occupant # | Injury | Injury Severity (AIS) | Injury Mechanism |
|------------|----------------------|-----------------------|------------------|
| 1 | Right knee contusion | 1 | Knee bolster |
| 2 | Cervical strain | 1 | Impact force |
| 3 | Cervical strain | 1 | Impact force |
| 4 | Cervical strain | 1 | Impact force |

Occupant Kinematics

The driver (occupant 01) of the Nissan Altima was in a normal upright posture in the left-front position of the vehicle. He was wearing the manual lap/shoulder restraint. The right-front passenger (occupant 02) was in a normal upright posture and was wearing the manual lap/shoulder restraint. The left-rear (occupant 03) and right-rear (occupant 04) passengers were seated in normal upright postures and were wearing the manual lap/shoulder restraints. Seat belt usage was determined by the lack of prominent contact evidence in this moderate frontal collision and observations of the investigating officer at the scene of the crash. Prior to impact, the driver applied the brakes, which locked-up, sending the vehicle into a longitudinal slide. The occupants reacted to this braking input by moving forward, loading the lap/shoulder restraints.

At impact, the occupants were prevented from any further frontal movement by the locked lap/shoulder restraints. It does appear, however, that the driver (occupant 01) had moved far enough forward to engage the deploying air bag- producing a small skin transfer on the bag. At this point his right knee struck the knee bolster-causing the knee contusion and damaging the knee bolster. There was no evidence of contact with the passenger side air bag by occupant 02. It appears that the cervical strains sustained by case occupants 02, 03, and 04 were caused by the force of the impact, rather than contact with any component of the vehicle's interior.



Figure 7. Interior, Vehicle 2 - Area of contact, occupant 01

Scene Diagram

