

Remote, Redesigned Air Bag Special Study
FOR NHTSA'S INTERNAL USE ONLY
Dynamic Science, Inc., Case Number (DS99033)
1999 Dodge Neon
California
November/1998

Technical Report Documentation Page

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<p>16. Abstract</p> <p>The case vehicle, a 1999 Dodge Neon four-door driven by an unrestrained 16-year-old male (173 cm/68 in., 57 kg/125 lbs.), was traveling eastbound in the first lane adjacent to the right turn lane (possibly in the right turn lane to some extent) approaching the intersection. The front right seat was occupied by an unrestrained 16-year-old female (147 cm/58 in., 45 kg/100 lbs.). The case vehicle entered the intersection and possibly hit a dip in the roadway. The driver appears to have lost control at this point and veered slightly to the right. The case vehicle departed the roadway on the right side and struck the curb on the southeast corner (12FRWN3). The case vehicle continued on and struck a metal pole with its front right (12FREE6). The case vehicle sustained an estimated longitudinal delta v of -57.5 km/h (-35.7 mph) and a lateral delta v of -5.0 km/h (-3.1 mph) from this impact. Both front air bags likely deployed at this point. Prior to a fire consuming the vehicle, a witness stated that both air bags had indeed deployed; the police indicated that the driver air bag was visibly deployed. The case vehicle rotated about the pole in a clockwise fashion and returned to the roadway. The case vehicle continued to rotate as it traveled eastbound. The front right door came off approximately 10 m (33 ft) east of the intersection. The case vehicle then came to rest facing southwest in the second eastbound lane. A fire broke out in the engine compartment but it soon engulfed most of the vehicle and as a result the vehicle front portion and interior were completely burned. The front right occupant sustained fourth degree thermal burns over 90% of her body; the autopsy revealed the burns to be post-death.</p> <p>The driver of the case vehicle sustained abrasions/lacerations to both hands, abrasions to the lower legs, and an abrasion to the center of his chest. After the crash, he exited the vehicle and sat down on a nearby curb for approximately 1 minute. After that time, he fled from the scene. He was located approximately five hours later. He was interviewed and booked by the police and later transported to a local hospital. The front right occupant was found outside of the right side of the case vehicle. Witnesses approached the vehicle and attempted to move the occupant away from the vehicle, but were unable to move her more than a foot before being driven away by the extreme heat. Both the police and the witnesses indicated the occupant had already expired before becoming involved in the vehicle fire. She sustained a lacerated aorta, comminuted, depressed and basal skull fractures of the frontal, temporal and sphenoid bones. There were bilateral fractures of ribs 1 and 2, bilateral femoral fractures, and compound fractures of the left distal tibia and fibula.</p>			
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Summary

This remote investigation focused on the redesigned air bag system deployment of a 1999 Dodge Neon four-door. The case was generated through the Fatal Accident Reporting System. The front right occupant of the Dodge Neon was fatally injured. The case was conducted as a remote investigation.

This crash occurred during the early morning hours in November, 1998. The crash occurred in a four-leg intersection. The eastbound roadway approaching the intersection is comprised of two eastbound travel lanes, an eastbound right turn lane, an eastbound left turn lane, and two westbound travel lanes. The eastbound lanes are separated from the westbound lanes by a painted median. The roadway surface is asphalt and there were no defects indicated. The intersection is controlled by tri-color traffic signals in all directions. It was dark at the time of the crash, but the streetlights were on. The speed limit is 56 km/h (35 mph).



Figure 1. Final rest, Case vehicle. Facing west.

Crash Events

The case vehicle, a 1999 Dodge Neon four-door driven by an unrestrained 16-year-old male (173 cm/68 in., 57 kg/125 lbs.), was traveling eastbound in the first lane adjacent to the right turn lane (possibly in the right turn lane to some extent) approaching the intersection. The front right seat was occupied by an unrestrained 16-year-old female (147 cm/58 in., 45 kg/100 lbs.). As the case vehicle entered the intersection it possibly hit a dip in the roadway. The driver appears to have lost control at this point and veered slightly to the right. The Dodge Neon departed the roadway on the right side and struck the curb on the southeast corner (12FRWN3).

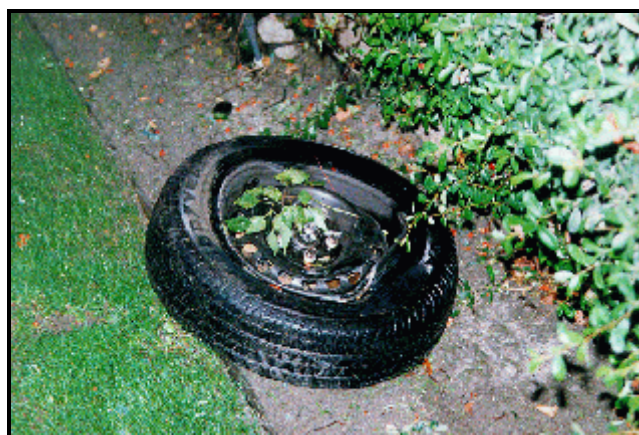


Figure 2. Right front tire, damaged from impact with curb and pole.

The case vehicle continued on and struck a metal pole with its front right (12FREE6). The case vehicle sustained an estimated longitudinal Δv of -57.5 km/h (-35.7 mph) and a lateral Δv of -5.0 km/h (-3.1 mph)¹ from this impact. Both front air bags likely deployed at this point. Prior to a fire consuming the vehicle, a witness stated that both air bags had indeed deployed; the police indicated that the driver air bag was visibly deployed.

The case vehicle rotated about the pole in a clockwise fashion and returned to the roadway. The case vehicle continued to rotate as it traveled eastbound. The front right door came off approximately 10 m (33 ft) east of the intersection. The case vehicle then came to rest facing southwest in the second eastbound lane.

A fire broke out in the engine compartment but it soon engulfed most of the vehicle and as a result the vehicle front portion and interior were completely burned. The front right occupant sustained fourth degree thermal burns over 90% of her body; the autopsy revealed the burns to be post-death.

The driver of the case vehicle sustained abrasions/lacerations to both hands, abrasions to the lower legs, and an abrasion to the center of his chest. After the crash, he exited the vehicle and sat down on a nearby curb for approximately 1 minute. After that time, he fled from the scene. He was located approximately five hours later. He was interviewed and booked by the police and later transported to a local hospital.



Figure 3. Front right of case vehicle



Figure 4. View showing location of front right occupant after the vehicle came to rest. Moved approximately one foot from the vehicle by witnesses.

¹Calculated using WinSmash, barrier option. CDC estimated from photos. Stiffness values calculated from NCAP test number 2709 as $d_0=30.78/d_1=9.52$.

The front right occupant was found outside of the right side of the case vehicle. Witnesses approached the vehicle and attempted to move the occupant away from the vehicle, but were unable to move her more than a foot before being driven away by the extreme heat. Both the police and the witnesses indicated the occupant had already expired before becoming involved in the vehicle fire. She sustained a lacerated aorta, comminuted, depressed and basal skull fractures of the frontal, temporal and sphenoid bones. There were bilateral fractures of ribs 1 and 2, bilateral femoral fractures, and compound fractures of the left distal tibia and fibula.

Table 1. Delta V

	Case Vehicle	
	km/h	mph
Total	57.7	35.9
Longitudinal	-57.5	-35.7
Lateral	-5.0	-3.1



Figure 5. Exterior, case vehicle. Right side.



Figure 6. Exterior, case vehicle. Right rear.

Exterior of Case Vehicle

Table 2. Vehicle Information

Model year, make and model	1999 Dodge Neon, four-door
VIN	Unknown
CDC	Impact 1: 12FRWN3 Impact 2: 12FREE6

Interior of Case Vehicle

This vehicle sustained heavy damage to the right side. The right front door was torn off and fell onto the roadway. There was substantial right side intrusion from the A-pillar, front right instrument panel, right toe pan, right floor rail, and right roof. All the glazing in the vehicle was missing. The front right side glass and the rear right side glass were likely disintegrated due to the impact. The windshield would also have sustained damage due to the impact. The remaining windows likely sustained damage due to the fire.

The vehicle was equipped with cloth-covered bucket seats in the front right and front left seating positions. The rear seats were 60/40 split bench seats.

Case Vehicle Occupant Protection Systems

The case vehicle was equipped with “Next-Generation Driver & Front Passenger Air Bags” that deployed during the impact with the pole. The front seating positions were equipped with three-point lap and shoulder belts equipped with height adjusters. Neither front seat belt was in use at the time of the crash. This is based on lack of belt related injuries on the driver and the final position of the front right occupant (outside of the vehicle).

Case Vehicle Occupant Demographics

	Occupant 1	Occupant 2
Age/Sex:	16/Male	16/Female
Seated Position:	Front left	Front right
Seat Type:	Bucket (cloth covered)	Bucket (cloth covered)
Height (cm/in.):	173 68	147 58
Weight (kg/lbs):	57 125	45 100
Pre-existing Medical Condition:	None noted	None noted
Body Posture:	Normal, upright-based on uniform contacts	Unknown
Hand Position:	Unknown	Unknown
Foot Position:	Unknown	Unknown
Restraint Usage:	Lap and shoulder belt available, not used	Lap and shoulder belt available, not used
Air bag:	Deployed upon impact	Deployed upon impact

Occupant Injuries

Table 3. Injuries (Occ. #1)

Injury	Injury Severity (AIS)	Injury Mechanism
1/4 in. laceration, top of right hand	790602.1,1	Windshield
Abrasions, top of right hand	790802.1,1	Windshield
Abrasions, top of left hand	790802.1,2	Windshield
Abrasion, lower right leg	890202.1,1	Left instrument panel
Bilateral abrasions to lower legs	890202.1,1 890202.1,2	Left instrument panel
Abrasion, middle of chest	490202.1,4	Air bag
Complaint of pain to right shoulder area and right side of head above the ear	Not codeable	

Table 4. Injuries (Occ. #2)

Injury	Injury Severity (AIS)	Injury Mechanism
Rupture/laceration, (1.5 cm), thoracic aorta, distal to the arch. Right hemothorax	420216.5,4	Right side, instrument panel and door
Comminuted and depressed fractures of the frontal / temporal bones – coded under vault	150404.3,??	Right side, possibly A-pillar
Comminuted and depressed fracture of the sphenoid bones - coded under base	150200.3,8	Right side, possibly A-pillar
Subarachnoid hemorrhage, bilateral cerebral hemispheres, base of brain and brain stem	140466.3,6	Right side, possibly A-pillar
Bilateral rib fractures (ribs 1 and 2)	450220.2,3	Right side, instrument panel and door
Left tibia fracture, compound, distal	853405.3,2	Lower right instrument panel
Left fibula fracture, compound, distal	851605.2,2	Lower right instrument panel
Bilateral femur fractures	851800.3,1 851800.3,2	Loading from knee/lower leg contact with instrument panel

Occupant Kinematics

The driver of the case vehicle was likely seated in a normal upright position in the cloth-covered bucket seat. He was not wearing the available lap and shoulder belt. Both hands were likely on the steering wheel. The police did not indicate any pre-crash braking. The driver moved slightly forward during the impact with the curb. As the case vehicle struck the pole, the driver pitched forward towards the 5 degree² principal direction of force and engaged the deploying air bag with his chest—causing the abrasion. Both hands came off the steering wheel and contacted the windshield—causing abrasions to the tops of both hands. As the driver continued forward, his lower legs engaged the lower instrument panel—causing the bilateral lower leg abrasions. As the case vehicle began its sharp clockwise rotation, the driver would have moved towards the left, loading the left door to some extent. After the vehicle came to rest, the driver was able to exit the vehicle on his own. He ultimately fled the scene.

The front right occupant of the case vehicle was likely seated in a normal upright position in the cloth-covered bucket seat. She was not wearing the available lap and shoulder belt. The police did not indicate any pre-crash braking. This occupant moved slightly forward during the impact with the curb. As the case vehicle struck the pole, this occupant pitched forward towards the 5 degree principal direction of force and possibly engaged the right side of the passenger air bag. Her lower legs/knees engaged the lower instrument panel—causing the direct injuries to the lower legs and the indirect femur fractures. It appears that this occupant’s head and torso went to the right and engaged the intruding A-pillar and the right side door panel causing the head and torso injuries. As the case vehicle began its sharp clockwise rotation, this occupant would have moved towards the left. This motion is significant in that it likely held her in place after the right front door fell off. As the vehicle came to rest, this fatally injured occupant then slumped to the right and fell out of the vehicle.

²Actual PDOF = 5 degrees, but EDCS requires increments of 10 degrees

Scene Diagram

