TRANSPORTATION SCIENCES
CRASH RESEARCH SECTION

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VERIDIAN REMOTE ALLEGED INADVERTENT DEPLOYMENT INVESTIGATION
VERIDIAN CASE NO. CA99-017
VEHICLE: 1995 PLYMOUTH NEON
LOCATION: NEW JERSEY
CRASH DATE: MAY 1999

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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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16. *Abstract* This remote investigative effort focused on a driver's allegation of an inadvertent deployment of the frontal air bag system in a 1995 Plymouth Neon. The driver initiated a left turn at a 3-leg T intersection and reported to the investigating officer that the bags deployed without impact. The local NASS team inspected the vehicle and noted several areas of possible contact to the undercarriage. At the scene of the event, a raised manhole may have contributed to the undercarriage contact. The driver and the front right passenger of the vehicle sustained minor soft tissue injuries from the deployment of the air bag system.			
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TABLE OF CONTENTS

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BACKGROUND

This remote investigative effort focused on a driver's allegation of an inadvertent deployment of the frontal air bag system **(Figure 1)** in a 1995 Plymouth Neon. The driver initiated a left turn at a 3-leg T intersection and reported to the investigating officer that the frontal air bags deployed without impact. The local NASS team inspected the vehicle and noted several areas of possible contact to the undercarriage. At the scene of the event, a raised manhole may have contributed to the undercarriage contact. The driver and the front right passenger of the vehicle sustained minor soft tissue injuries from the deployment of the air bag system.

Figure 1. Deployed frontal air bags in the 1995 Neon.

The incident occurred in May, 1999, during daylight hours. The NASS team leader initially identified the police crash report (PCR) during routine sampling at a local jurisdiction on May 25. The PCR was forwarded to NHTSA and the Office of Defects Investigation for review. The NASS team inspected the vehicle and documented several undercarriage damage areas and obtained an interview with the owner (passenger) of the vehicle. This remote investigation was subsequently assigned to the Veridian Special Crash Investigation Team on May 27.

SUMMARY

Vehicle Data/History

The involved 1995 Plymouth Neon was equipped with frontal air bags for the driver and passenger positions. This system consisted of front mounted electro-mechanical sensors **(Figure 2)** with a safeing sensor and a diagnostic control module. The vehicle was identified by vehicle identification number 1P3ES47C6SD (production number deleted). At the time of the NASS inspection, the odometer reading was 197,943 km (123,000 miles). The Neon was purchased by the current owner in September, 1998, as a high mileage used vehicle. The previous history of the vehicle was unknown. At the time of purchase, the Neon was equipped with P185/70-13 radial tires mounted on OEM steel wheel rims.

Figure 2. Engine compartment of the Neon which houses the frontal crash sensors.

The day prior to this event, the owner/driver experienced a flat front right tire. The tire/wheel was temporarily replaced with the space saver spare tire and wheel which was of a smaller diameter that the

original P185/70-13 radial tire. This temporary use spare resulted in a lower ride height of the vehicle at the front right axle position. This spare tire was in use at the time of this deployment event **(Figure 3)**.

Figure 3. Space saver spare on the front right position.

Figure 4. Three - leg T intersection.

Scene

The event occurred at a 3-leg T intersection **(Figure 4)** in a urban residential area. The driver was initially traveling on a two-lane urban collector roadway that was straight with a negative grade of approximately 1 percent. Asphalt shoulders bordered both travel lanes. She initiated a left turn onto a narrow two lane street. There were no shoulders, however, concrete curbs bordered the asphalt travel lanes. A segment of asphalt had been removed from the mouth of the intersecting street which created a elevation change between the roads. As a result of the resurfaced collector roadway, a pavement sag resulted at the mouth of the intersection **(Figure 5)**. The posted speed limit in the area was 40 km/h (25 mph).

A raised manhole was located at the mouth of the intersecting street in the path of left turning traffic. An asphalt "ramp" was built around the perimeter of the manhole **(Figure 6)** in an attempt to prevent vehicle contact with the manhole. The iron rim of the manhole protruded approximately 2.5 cm (1.0") above the asphalt ramp. **Figure 6** is a look back view of the raised manhole with the exposed rim.

Figure 5. Look back view of the raised manhole and pavement edge.

Figure 6. Raised manhole in the left turn path of the Plymouth Neon.

During the NASS inspection of the scene, the researchers observed local traffic initiate left turns onto the intersecting roadway. Most traffic traveled over the raised manhole area which resulted in compression of the front left suspension. None of the vehicles "bottomed-out" on the asphalt ramp or the manhole rim.

Event

The 18 year old female driver of the Plymouth Neon was traveling in a westerly direction on the collector roadway en route to her residence. She decelerated the Plymouth Neon in preparation for a left turn (southbound) onto the local residential street. The driver resides approximately 0.4 km (0.25 mile) south of this intersection, therefore the vehicle is driven over this area on a daily basis. As she initiated the left turn, the driver reported the frontal air bag system inadvertently deployed without impact. She brought the vehicle to a controlled stop near the intersection.

The driver was an 18 year old female. She sustained superficial contusions and abrasions of the anterior forearms, bilaterally with swelling of the hands from contact with the deploying front left air bag. The front right passenger was an adult female. She sustained an abrasion of the dorsal aspect of the right forearm from the expanding front right passenger air bag. Both occupants refused medical treatment.

OCCUPANT INJURIES

Driver Injuries

Injury	Injury Severity (AIS 90)	Injury Mechanism
Contusions and abrasions of anterior forearms, bilaterally	Minor (790402.1,3) (790202.1,3)	Deploying driver air bag

Right Front Passenger Injuries

Injury	Injury Severity (AIS 90)	Injury Mechanism
Abrasion of dorsal aspect of right forearm	Minor (790202.1,1)	Deploying front right air bag

NASS Vehicle Inspection

The local NASS team leader and a researcher who has a automotive repair background inspected the Neon in its post-deployment (unrepaired) state. The vehicle was located in the owner's driveway and the inspection occurred eight days following the event. Their inspection of the vehicle yielded the following contact evidence:

- The front bumper fascia **(Figure 7)** was abraded in two areas on the right aspect **(Figure 8)**. The first abrasion consisted of vertically oriented abrasions to the lower face of the fascia. The second area of abrasions were laterally oriented on the bottom surface of the fascia at the right corner. These abrasions appeared to have been previous to this event. There was no compression of the energy absorbing bumper system associated with these abrasion patterns.

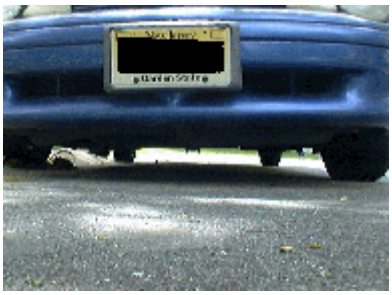

Figure 7. Front bumper fascia of the Neon.

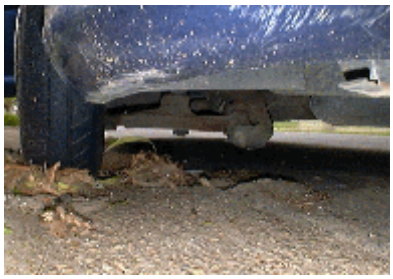

Figure 8. Abrasions to the bumper fascia.

- The lower air deflector affixed to the lower radiator support panel was abraded, fractured, and partially separated from the radiator support panel **(Figure 9)**. The mid point of the deflector was resting on the driveway and had pulled through a mounting plug located right of center. In this state, the deflector would have dragged on the road surface, therefore it was believed that this resulted from contact with the raised manhole at the scene of this event. The deflector was formed to fit around a forward engine mount that was bolted to the radiator support panel. This mount appeared to be a cast iron component with a rubber isolator incorporated into the unit. The forward aspect of the engine mount was abraded from recent contact **(Figure 9)**. There was no deformation to the lower radiator support panel.

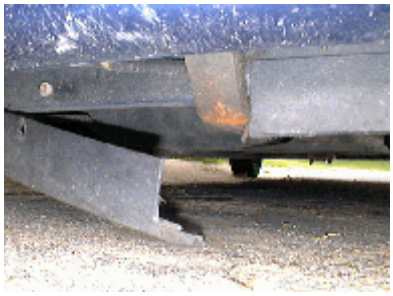

Figure 9. Abraded engine mount and the fractured air deflector.

- The most noteworthy undercarriage damage involved the forward mounting bracket for the front right lower control arm. The steel bracket was welded to the engine cradle/cross member of the Neon. The lower control arm/bushing was retained in the bracket by a bolt that was originally in a horizontal position. Although there was minimal abrasion contact to the inboard leading edge of the bracket, the forward aspect of the bracket was rotated approximately 30 degrees in a downward direction **(Figure 10)**. In addition, the impact that rotated the mounting bracket resulted in torsional bending of the leading edge of the lower control arm. The team could not determine fully if this damage was related to contact with the manhole.

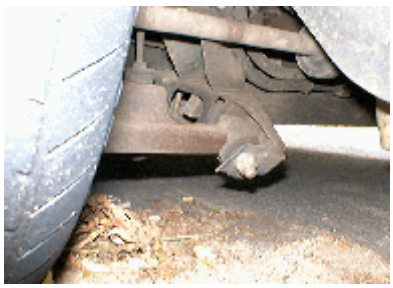

Figure 10. Rotated control arm bushing mount.

Conclusions

The NASS researchers noted that there was no evidence of vehicle undercarriage contact to the manhole rim, cover, or asphalt build-up around the unit. It was possible that the protruding cast iron rim of the manhole could have snagged an undercarriage component without yielding evidence of contact (i.e., abrasion, gouging).

The abrasive damage to the bumper fascia was ruled out as possible contact in this event by the NASS researchers. They concluded that the damage appeared "old" to the pliable material with a layer of road film overlying the damage.

The center engine mount abrasion appeared to be recent damage. In addition, the separated air deflector was dragging on the pavement surface which supported this as recent damage. The bottom aspect of the lower control arm mounting bracket appeared to have been abraded recent to the vehicle inspection. This, and the center engine mount damage, probably resulted from contact with the protruding manhole rim as the vehicle initiated the left turn. The front right suspension of the Neon would have compressed during the left turn maneuver. The height was originally compromised by the lower profile space saver spare tire that was installed of the front right of the vehicle.

Although the engine mount contact was minor in severity, the snagging of the control arm bracket could have produced a sufficient longitudinal pulse to deploy the frontal air bag system. If the vehicle was susceptible to an oversensitive deployment threshold, these contacts would have provided a sufficient pulse for deployment.