

Remote, Redesigned Air Bag Special Study

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Dynamic Science, Inc., Case Number (1998-082-805E)

1999 Pontiac Grand Am

Washington

August/1998

Technical Report Documentation Page

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| 16. Abstract <p>This remote investigation focused on the redesigned air bag system deployment of a 1999 Pontiac Grand Am 2-door coupe. This minor injury crash occurred in August, 1998 in the afternoon. The weather was clear and the concrete roadway was dry. The crash occurred on a bridge of a two-way, divided, interstate highway. The roadway contains eight travel lanes; four northbound lanes, and four southbound lanes. The road is bordered by concrete walls with metal railings on both edges. The speed limit for this road is 97 kmph (60 mph). There are no traffic controls and the road is level at the area of impacts. Vehicle 1, a 1999 Pontiac Grand Am 2-door coupe (case vehicle) driven by a 29 year old male (188 cm/74 in, 91 kg/200 lbs), was traveling south in southbound lane 3 at a driver estimated speed of 89-97 kmph (55-60 mph). The driver was in the process of passing a tractor with two trailers which was in lane 2. The driver was restrained by the available manual lap/shoulder restraint. The front right seat was occupied by a 24 year old female (173 cm/ 68 in, 82 kg/ 180 lbs) who was also restrained by the available manual lap/shoulder restraint. Vehicle 2, a 1996 Peterbilt tractor towing one trailer driven by a 32 year old male, was traveling south at an unknown speed in southbound lane 4 to the left of, and just behind Vehicle 1. It is unknown if the driver was restrained. There were no other occupants in Vehicle 2. As Vehicle 1 was in the process of passing the truck in lane 2, the tractor-trailer began moving into Vehicle 1's lane. This forced the driver of Vehicle 1 to accelerate and move to the left and attempt to move in front of Vehicle 2. As Vehicle 1 entered lane 4, the front plane of Vehicle 2 (unknown CDC) impacted the left plane of Vehicle 1 (12LZMW2) - (event 1). This impact caused Vehicle 1 to rotate counter-clockwise and exit the left roadside where the front plane (01FDEW1) impacted the concrete wall and bridge railing (event 2). Vehicle 1 continued rotating and the back plane (06BREW1) also struck the concrete wall (event 3). It appears that the right plane of Vehicle 1 (06RPGS3) was then sideswiped by the left plane of Vehicle 2 (unknown CDC) - (event 4). A barrier equivalent speed was calculated for event 2 for Vehicle 1, utilizing WinSMASH, as 18 kmph (11 mph). As a result of the second event frontal impact, the supplemental restraint system (driver's and passenger's frontal redesigned air bags) of the case vehicle deployed. Vehicle 1 came to final rest in the left southbound travel lane facing northeast. Vehicle 2 was brought to a controlled stop by the driver. The driver of Vehicle 1 was reported by police to be uninjured. The front right passenger of Vehicle 1 was reported by police to have sustained non-incapacitating injuries. Both occupants were treated by paramedics at the scene but were not transported to a hospital. Both occupants sought medical attention later from their personal physicians. The driver of Vehicle 2 was reportedly uninjured and was not transported. Vehicle 1 was disabled and was towed from the scene. Vehicle 2 was not disabled and was driven from the scene.</p> | | | | | |
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Summary

This remote investigation focused on the redesigned air bag system deployment of a 1999 Pontiac Grand Am 2-door coupe. This minor injury crash occurred in August, 1998 in the afternoon. The weather was clear and the concrete roadway was dry. The crash occurred on a bridge of a two-way, divided, interstate highway. The roadway contains eight travel lanes; four northbound lanes, and four southbound lanes. The road is bordered by concrete walls with metal railings on both edges. The speed limit for this road is 97 kmph (60 mph). There are no traffic controls and the road is level at the area of impacts.

Vehicle 1, a 1999 Pontiac Grand Am 2-door coupe (case vehicle) driven by a 29 year old male (188 cm/74 in, 91 kg/200 lbs), was traveling south in southbound lane 3 at a driver estimated speed of 89-97 kmph (55-60 mph). The driver was in the process of passing a tractor with two trailers which was in lane 2. The driver was restrained by the available manual lap/shoulder restraint. The front right seat was occupied by a 24 year old female (173 cm/ 68 in, 82 kg/ 180 lbs) who was also restrained by the available manual lap/shoulder restraint.

Vehicle 2, a 1996 Peterbilt tractor towing one trailer driven by a 32 year old male, was traveling south at an unknown speed in southbound lane 4 to the left of, and just behind Vehicle 1. It is unknown if the driver was restrained. There were no other occupants in Vehicle 2.



Figure 1. Exterior, Vehicle 1 (impact 2)



Figure 2. Exterior, Vehicle 1 (impact 3)

Crash Events

As Vehicle 1 was in the process of passing the truck in lane 2, the tractor-trailer began moving into Vehicle 1's lane. This forced the driver of Vehicle 1 to accelerate and move to the left and attempt to move in front of Vehicle 2. As Vehicle 1 entered lane 4, the front plane of Vehicle 2 (unknown CDC) impacted the left plane of Vehicle 1 (12LZMW2) - (event 1). This impact caused Vehicle 1 to rotate counter-clockwise and exit the left roadside where the front plane (01FDEW1) impacted the concrete wall and bridge railing (event 2). Vehicle 1 continued rotating and the back plane (06BREW1) also struck the concrete wall (event 3). It appears that the right plane of Vehicle 1 (06RPGS3) was then sideswiped by the left plane of Vehicle 2 (unknown CDC) - (event 4).



Figure 3. Crash scene, Vehicle 1 approach path.

A barrier equivalent speed was calculated for event 2 for Vehicle 1, utilizing WinSMASH, as 18 kmph (11 mph).

As a result of the second event frontal impact, the supplemental restraint system (driver's and passenger's redesigned frontal air bags) of the case vehicle deployed.

Vehicle 1 came to final rest in the left southbound travel lane facing northeast. Vehicle 2 was brought to a controlled stop by the driver.

The driver of Vehicle 1 was reported by police to be uninjured. The front right passenger of Vehicle 1 was reported by police to have sustained non-incapacitating injuries. Both occupants were treated by paramedics at the scene but were not transported to a hospital. Both occupants sought medical attention later from their personal physicians. The driver of Vehicle 2 was reportedly uninjured and was not transported.

Vehicle 1 was disabled and was towed from the scene. Vehicle 2 was not disabled and was driven from the scene.

Table 1. Delta V

| | Case Vehicle | |
|---------------|--------------|------|
| | km/h | mph |
| Total | Unk | Unk |
| Longitudinal | Unk | Unk |
| Lateral | Unk | Unk |
| Barrier speed | 18 | 11.2 |

Exterior of Case Vehicle

Table 2. Vehicle Information

| | |
|----------------------------|-----------------------|
| Model year, make and model | 1999 Pontiac Grand Am |
| VIN | 1G2NE12E5XM |
| CDC | 01FDEW1 |



Figure 4. Exterior, Vehicle 1 (1999 Pontiac Grand Am)



Figure 5. Exterior, Vehicle 1 (1999 Pontiac Grand Am)

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 | 129 | 13 | 16 | 9 | 7 | 6 | 1 |
| | 50.8 | 5.1 | 6.3 | 3.5 | 2.8 | 2.4 | 0.4 |

Interior of Case Vehicle

The interior of the Pontiac Grand Am sustained minor damage from occupant contact. There were no areas of intrusion into the passenger compartment. There was occupant contact evidence to the passenger's air bag, left and right instrument panel, mirror, and seat belts.

The case vehicle was equipped with bucket seats with folding backs in the front left and front right seating positions. The front left seat was adjusted between the middle and rear most track positions. The front right seat was adjusted to the middle track position. Both front seats were equipped with adjustable head restraints which were not damaged. The rear of the vehicle was equipped with non-adjustable bench seats in all three seating positions.

Case Vehicle Occupant Protection Systems

The Pontiac Grand Am 2-door coupe was equipped with a redesigned air bag system 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 symmetrical I-configuration cover flaps which were not damaged in the crash. The circular air bag was equipped with two tether straps and two vent ports. No contact evidence was found on the air bag and the bag was not damaged.

The front right air bag was housed in the top-instrument panel position. The single air bag module cover flap was a rectangular configuration and was not damaged in the crash. The rectangular air bag was equipped with one tether strap and no vent ports. Contact evidence consisting of "two small brown dots" was found in the lower right quadrant of the front of the bag. The air bag was not damaged.



Figure 6. Driver's frontal air bag.

Case Vehicle Occupant Demographics

Table 4. Case Vehicle Occupant(s) Demographics

| | Occupant 1 | Occupant 2 |
|---------------------------------|---|--|
| Age/Sex: | 29/Male | 24/Female |
| Seated Position: | Front left | Front right |
| Seat Type: | Bucket with folding back - cloth covered | Bucket with folding back - cloth covered |
| Height (cm/in.): | 188 74 | 173 68 |
| Weight (kg/lbs): | 91 200 | 82 180 |
| Pre-existing Medical Condition: | None noted | None noted |
| Body Posture: | Normal - upright facing forward | Normal - upright facing forward |
| Hand Position: | On steering wheel - 9 & 3 o'clock positions | R- arm rest L- Holding glasses on lap |
| Foot Position: | On floor or foot controls | On floor |
| Restraint Usage: | Manual lap & shoulder restraint | Manual lap & shoulder restraint |
| Air bag: | Deployed redesigned air bag system | Deployed redesigned air bag system |

Occupant Injuries

Table 5. Injuries

| Occupant # | Injury | Injury Severity (AIS) | Injury Mechanism |
|------------|---------------------------|-----------------------|------------------------|
| 1 | No injuries | | |
| 2 | Right side neck contusion | 1 | Seat belt webbing |
| 2 | Left side chest contusion | 1 | Seat belt webbing |
| 2 | Left knee contusion | 1 | Right instrument panel |
| 2 | Left shin abrasion | 1 | Right instrument panel |

Occupant Kinematics

The driver of the Pontiac Grand Am was seated in a normal upright posture in the front left position of the vehicle. He was wearing the manual lap/shoulder restraint. The front right passenger was also seated in a normal upright posture and was wearing the manual lap/shoulder restraint. Seat belt usage was determined through visual inspection by the researcher, examination of injury patterns, and observations by the investigating police officer at the scene of the crash. The driver reported that he accelerated in an attempt to avoid Vehicle 2, so the occupants should not have been out of position prior to impact.

At impact with the wall, the occupants reacted to the 30 degree principle direction of force by moving forward and to the right. As the lap/shoulder restraints locked, further frontal movement of the occupants was prevented. Impact with the locked lap/shoulder restraints caused the neck and chest contusions to the front right occupant. The front right occupant also appears to have come into contact with the right instrument panel-causing the left knee contusion and left shin abrasion. The driver did not sustain any injuries but did complain of “neck pain” and “lower back spasms”. Neither occupant was transported to a hospital from the scene, but both visited their personal physicians at a later time.

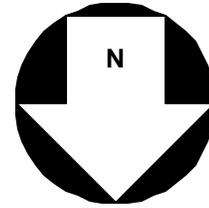


Figure 7. Interior, case vehicle. Occupant 01 seating position.



Figure 8. Interior, case vehicle. Occupant 02 seating position.

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NOT TO SCALE
NO ACCESS PER
STATE PATROL

