

Remote, Redesigned Air Bag Special Study

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Dynamic Science, Inc., Case Number (1999-081-801E)

1999 Pontiac Grand Am

Washington

August/1999

Technical Report Documentation Page

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<p>16. Abstract</p> <p>This remote investigation focused on the redesigned air bag system deployment of a 1999 Pontiac Grand Am 4-door sedan. This minor injury crash occurred in August, 1999 in the afternoon. The weather was clear and the bituminous roadway was dry. The crash occurred on a two-way, undivided roadway. The road contains four travel lanes; two northbound lanes, and two southbound lanes. The speed limit for this road is 72 kmph (45 mph). There are no traffic controls and there is a >2% southbound uphill grade at the area of impact. Vehicle 1, a 1999 Pontiac Grand Am 4-door sedan (case vehicle) driven by a 38 year old female (165 cm/65 in, 57 kg/125 lbs), was traveling south in the left southbound travel lane at a driver estimated speed of 72 kmph (45 mph). The driver was restrained by the available manual lap/shoulder restraint. The front right seat was occupied by a 9 year old male (135 cm/53 in, 33 kg/73 lbs) who was also restrained by the available manual lap/shoulder restraint. Vehicle 2, a 1997 Ford Ranger compact pickup truck driven by a 28 year old male, was traveling north in the right northbound travel lane at an unknown speed. It is unknown if the driver was restrained. There were no other occupants in Vehicle 2. As the two vehicles were approaching each other, Vehicle 1 crossed the painted double yellow center line and entered northbound traffic. The driver of Vehicle 2 attempted to avoid the impact by applying the brakes (with lock-up), leaving approximately 7.6 meters (25 feet) of skid marks. The front plane of Vehicle 1 (12FDEW2) struck the front plane of Vehicle 2 (72FDEW2) in the right northbound travel lane. A Delta V was calculated for Vehicle 1, utilizing the Missing Vehicle Algorithm of WinSMASH, as 26 kmph (16 mph). As a result of the frontal impact, the supplemental restraint system (driver's and passenger's frontal redesigned air bags) of the case vehicle deployed. Both vehicles were disabled due to damage sustained in the crash and were towed from the scene. Both occupants of Vehicle 1 sustained non-incapacitating injuries and were transported from the scene to a hospital where they were treated and released. The driver of Vehicle 2 reportedly sustained non-incapacitating injuries of an unknown nature and severity. He was transported from the scene to a hospital where his course of treatment is not known.</p>			
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Summary

This remote investigation focused on the redesigned air bag system deployment of a 1999 Pontiac Grand Am 4-door sedan. This minor injury crash occurred in August, 1999 in the afternoon. The weather was clear and the bituminous roadway was dry. The crash occurred on a two-way, undivided roadway. The road contains four travel lanes; two northbound lanes, and two southbound lanes. The speed limit for this road is 72 kmph (45 mph). There are no traffic controls and there is a >2% southbound uphill grade at the area of impact.

Vehicle 1, a 1999 Pontiac Grand Am 4-door sedan (case vehicle) driven by a 38 year old female (165 cm/65 in, 57 kg/125 lbs), was traveling south in the left southbound travel lane at a driver estimated speed of 72 kmph (45 mph). The driver was restrained by the available manual lap/shoulder restraint. The front right seat was occupied by a 9 year old male (135 cm/53 in, 33 kg/73 lbs) who was also restrained by the available manual lap/shoulder restraint.

Vehicle 2, a 1997 Ford Ranger compact pickup truck driven by a 28 year old male, was traveling north in the right northbound travel lane at an unknown speed. It is unknown if the driver was restrained. There were no other occupants in Vehicle 2.



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



Figure 2. Exterior, Vehicle 2 (Ford Ranger)

Crash Events

As the two vehicles were approaching each other, Vehicle 1 crossed the painted double yellow center line and entered northbound traffic. The driver of Vehicle 2 attempted to avoid the impact by applying the brakes (with lock-up), leaving approximately 7.6 meters (25 feet) of skid marks. The front plane of Vehicle 1 (12FDEW2) struck the front plane of Vehicle 2 (72FDEW2) in the right northbound travel lane.

A Delta V was calculated for Vehicle 1, utilizing the Missing Vehicle Algorithm of WinSMASH, as 26 kmph (16 mph).

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

Both vehicles were disabled due to damage sustained in the crash and were towed from the scene.

Both occupants of Vehicle 1 sustained non-incapacitating injuries and were transported from the scene to a hospital where they were treated and released. The driver of Vehicle 2 reportedly sustained non-incapacitating injuries of an unknown nature and severity. He was transported from the scene to a hospital where his course of treatment is not known.



Figure 3. Crash scene, Vehicle 1 approach path.

Table 1. Delta V

	Case Vehicle		Other Vehicle	
	km/h	mph	km/h	mph
Total	26	16.2	26	16.2
Longitudinal	-26	-16.2	-26	-16.2
Lateral	-4	-2.5	5	3.1
Barrier speed	29	18	23	14.3

Exterior of Case Vehicle

Table 2. Vehicle Information

Model year, make and model	1999 Pontiac Grand Am
VIN	1G2NE52E2XM
CDC	12FDEW2



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	143	10	16	28	33	28	16
	56.3	3.9	6.3	11	13	11	6.3

Interior of Case Vehicle

The interior of the Pontiac Grand Am sustained no damage from occupant contact. There were no areas of intrusion into the passenger compartment. There was occupant contact evidence present to the driver's frontal air bag and the glove compartment door.

The case vehicle was equipped with bucket seats with adjustable head restraints in the front left and front right seating positions. The front left seat was adjusted to the forward most track position. The front right seat was adjusted to the rear most track position. The rear of the vehicle was equipped with bench seats in all three seating positions.

Case Vehicle Occupant Protection Systems

The Pontiac Grand Am 4-door sedan 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 vent ports and no tether straps. Contact evidence which was described by the researcher as an "unknown smear" and also an "unknown ring shape" was found on the lower half of the front of the bag. The bag was not damaged.



Figure 6. Driver's frontal air bag.

The front right air bag was housed in the top-instrument panel position and was concealed by a single inverted D-shaped cover flap which was not damaged in the crash. The rectangular air bag was not equipped with vent ports or tether straps. No contact evidence was found on air bag and the bag was not damaged.

Case Vehicle Occupant Demographics

Table 4. Case Vehicle Occupant(s) Demographics

	Occupant 1	Occupant 2
Age/Sex:	38/Female	9/Male
Seated Position:	Front left	Front right
Seat Type:	Bucket - cloth covered	Bucket - cloth covered
Height (cm/in.):	165 65	135 53
Weight (kg/lbs):	57 125	33 73
Pre-existing Medical Condition:	None noted	None noted
Body Posture:	Normal - upright in seat, facing forward	Normal - upright in seat, facing forward
Hand Position:	Both on steering wheel	Unknown
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	Chin abrasion	1	Driver's air bag
1	Bilateral knee contusions	1	Knee bolster
1	Nose abrasion	1	Driver's air bag
2	Neck abrasion	1	Shoulder belt webbing
2	Abdominal contusion	1	Lap belt webbing

Occupant Kinematics

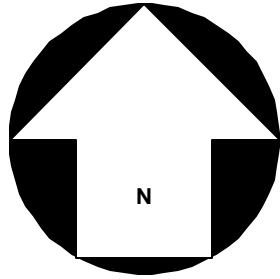
The driver of the Pontiac Grand Am was seated in a normal upright posture in the front left position of the vehicle. She was wearing the manual lap/shoulder restraint. The front right passenger was also seated in a normal upright posture and was wearing the manual lap/shoulder restraint. Seat belt usage was determined through visual inspection by the researcher, the lack of prominent frontal contact evidence in the vehicle, and observations by the investigating police officer at the scene of the crash. There did not appear to be any indication of pre-impact avoidance maneuvers, so the occupants should not have significantly moved prior to the impact.



Figure 7. Driver's air bag contact evidence.

At impact, the occupants reacted to the 0 degree principle direction of force by moving forward and loading the lap/shoulder restraints. As the restraints locked, further forward movement of the occupants was prevented. The driver had moved far enough forward to impact the deploying driver's frontal air bag-causing the chin and nose abrasions. Several areas of discoloration were found on the front of the air bag (see figure 7). The driver's knees came into contact with the knee bolster-causing the bilateral knee contusions. The front right passenger's loading of the locked lap/shoulder restraint caused the right side neck abrasion and abdominal contusion. Both occupants of Vehicle 1 were transported from the scene to a hospital where they were treated and released.

Scene Diagram



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NEGATIVE GRADE 4/122

