Remote, Redesigned Air Bag Special Study

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Dynamic Science, Inc., Case Number (1999-081-028C)

1999 Pontiac Grand Am

Washington

March/1999

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient Catalog No.
1999-081-028C		

4. Title and Subtitle	5. Report Date
	December 10, 1999
	6. Performing Organization Report No.

7. Author(s)	8. Performing Organization Report No.
Dynamic Science, Inc.	

9. Performing Organization name and Address	10. Work Unit No. (TRAIS)
Dynamic Science, Inc. 530 College Parkway, Ste. K Annapolis, MD 21401	11. Contract or Grant no. DTNH22-94-D-27058

12. Sponsoring Agency Name and Address	13. Type of report and period Covered [Report Month, Year]
U.S. Dept. of Transportation (NRD-32) National Highway Traffic Safety Administration 400 7th Street, SW Washington, DC 20590	14. Sponsoring Agency Code

15. Supplemental Notes

16. Abstract

This remote investigation focused on the redesigned air bag system deployment of a 1999 Pontiac Grand Am 4-door sedan. This moderate injury crash occurred on March, 1999 in the early morning. It was dark and raining at the time but the road was illuminated by street lights. The crash occurred on a two-way, undivided, bituminous roadway. The roadway is comprised of three travel lanes; one northbound lane, one southbound lane, and one center turn lane. The speed limit for this road is 48 kmph (30 mph). There are no traffic controls and the road is level at the area of impacts. Vehicle 1, a 1999 Pontiac Grand Am 4-door sedan (case vehicle) driven by a 28 year old male, was traveling north in the northbound travel lane negotiating a leftward curve in the roadway at a “high rate of speed” according to the investigating police officer. The front right seat was occupied by a 25 year old male. Neither occupant was wearing the available manual lap/shoulder restraints. The driver lost control of the vehicle around the curve and Vehicle 1 departed the right roadside where it struck a wooden utility pole (event 1) with its front plane (12FYEW3). Vehicle 1 then rotated counter-clockwise approximately 90 degrees and struck a concrete wall (event 2) with its right-rear wheel (03RBWN1). Vehicle 1 came to rest engaged with the concrete wall facing west. A Delta V was calculated for event 1, utilizing the Damage Only Algorithm of WinSMASH, as 46 kmph (29 mph). As a result of the first event frontal impact, the supplemental restraint system (driver’s and passenger’s redesigned air bags) of the case vehicle deployed. The driver of Vehicle 1 sustained incapacitating “A” level injuries in the crash and was transported by land to a hospital where he was treated and released. The passenger of Vehicle 1 sustained non-incapacitating “C” level injuries in the crash and was also transported by land to a hospital where he was treated and released. Vehicle 1 was disabled due to damage sustained in the crash and was towed from the scene.

17. Key Words	18. Distribution Statement
Redesigned air bag system, moderate injuries	

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No of pages	22. Price

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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 moderate injury crash occurred in March, 1999 in the early morning. It was dark and raining at the time but the road was illuminated by street lights. The crash occurred on a two-way, undivided, bituminous roadway. The roadway is comprised of three travel lanes; one northbound lane, one southbound lane, and one center turn lane. The speed limit for this road is 48 kmph (30 mph). There are no traffic controls and the road is level at the area of impacts.

Vehicle 1, a 1999 Pontiac Grand Am 4-door sedan (case vehicle) driven by a 28 year old male (193 cm/76 in, 98 kg/215 lbs), was traveling north in the northbound travel lane negotiating a leftward curve in the roadway at a "high rate of speed" according to the investigating police officer. The front right seat was occupied by a 25 year old male (170 cm/67 in, 86 kg/190 lbs). Neither occupant was wearing the available manual lap/shoulder restraints.

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

Figure 2. Exterior, Vehicle 1 (Pontiac Grand Am)

Crash Events

The driver lost control of the vehicle around the curve and Vehicle 1 departed the right roadside where it struck a wooden utility pole (event 1) with its front plane (12FYEW3). Vehicle 1 then rotated counter-clockwise approximately 90 degrees and struck a concrete wall (event 2) with its right-rear wheel (03RBWN1). Vehicle 1 came to rest engaged with the concrete wall facing west.

A Delta V was calculated for event 1, utilizing the Damage Only Algorithm of WinSMASH, as 46 kmph (29 mph).

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

Figure 3. Crash scene, approach to impact with pole.

The driver of Vehicle 1 sustained incapacitating "A" level injuries in the crash and was transported by land to a hospital where he was treated and released. The passenger of Vehicle 1 sustained non-incapacitating "C" level injuries in the crash and was also transported by land to a hospital where he was treated and released.

Vehicle 1 was disabled due to damage sustained in the crash and was towed from the scene.

Table 1. Delta V

	Case Vehicle	
	km/h	mph
Total	46	28.6
Longitudinal	-46	-28.6
Lateral	-8	-5
Barrier speed	46	28.6

Exterior of Case Vehicle

Table 2. Vehicle Information

Model year, make and model	1999 Pontiac Grand Am
VIN	1GSNE52T8XC
CDC	12FYEW3

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	111	16	61	74	51	23	0
	43.7	6.3	24	29.1	20.1	9.1	0

Interior of Case Vehicle

The interior of the Pontiac Grand Am sustained damage from intrusion and occupant contact. There was a substantial amount of intrusion to the left toe pan and instrument panel. The intruded values are reported in Table 4. There was occupant contact evidence present to the windshield, passenger's frontal air bag, and automatic transmission lever.

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

Table 4. Intrusions

Intruded Component	Location of Intrusion	Intruded Value cm/in.		Dominant Crush Direction
Toe Pan	Front Left	18	7.1	Longitudinal
Center Instrument Panel	Front Center	14	5.5	Longitudinal
Left Instrument Panel	Front Left	2	0.8	Longitudinal

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 that were not damaged in the crash. The circular air bag was equipped with two vent ports and no tether straps. 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 and was concealed by a single rectangular shaped cover flap which was not damaged in the crash. The rectangular air bag was not equipped with vent ports or tether straps. Contact evidence consisting of a scuff/transfer was found on the front of the bag. The air bag was not damaged.

Figure 6. Interior, case vehicle. Passenger's frontal air bag contact evidence.

Case Vehicle Occupant Demographics

Table 5. Case Vehicle Occupant(s) Demographics

	Occupant 1	Occupant 2
Age/Sex:	28/Male	25/Male
Seated Position:	Front left	Front right
Seat Type:	Bucket - cloth covered	Bucket - cloth covered
Height (cm/in:):	193 76	170 67
Weight (kg/lbs).:	98 215	86 190
Pre-existing Medical Condition:	None noted	None noted
Body Posture:	Unknown	Lying back in seat in a reclined position
Hand Position:	Unknown	Unknown
Foot Position:	Unknown	Unknown
Restraint Usage:	None used	None used
Air bag:	Deployed redesigned air bag system	Deployed redesigned air bag system

Occupant Injuries

Table 6. Case Vehicle Occupant(s) Injuries

Occupant #	Injury	Injury Severity (AIS)	Injury Mechanism
1	Left ankle dislocation	2	Toe pan
1	Nose abrasion	1	Air bag
1	Chest contusion	1	Air bag
1	Bilateral upper leg contusions	1	Steering wheel rim
2	Facial laceration	1	Windshield
2	Tooth fracture	1	Windshield

Occupant Kinematics

The driver of the Pontiac Grand Am was seated in an unknown posture in the front left position of the vehicle. The passenger was seated in a reclined position in the front right position of the vehicle. Neither occupant was wearing the available manual lap/shoulder restraints. Seat belt usage was determined through visual inspection by the researcher, the presence of substantial frontal contact evidence, and statements by the interviewee. The investigating police officer at the scene also reported that no belts were worn. No avoidance maneuvers were performed prior to impact.

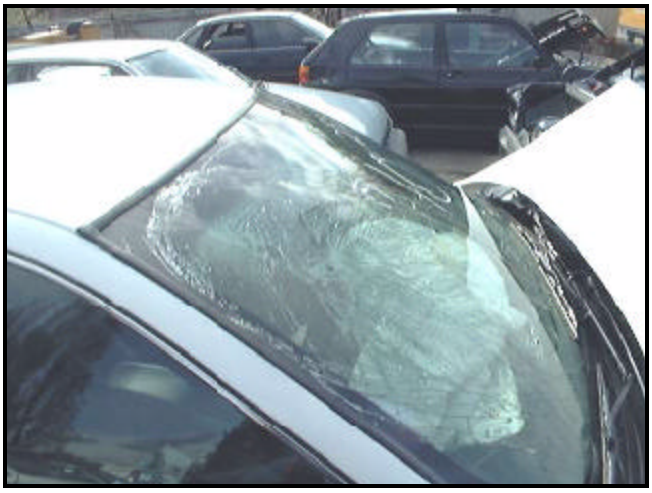

Figure 7. Case vehicle, windshield contact evidence.

At impact, the occupants reacted to the 10 degree principle direction of force by moving forward and slightly right. As the driver moved forward, his left foot was driven into the intruding toe pan-causing the left ankle dislocation. The driver's upper legs struck the bottom of the steering wheel at this time-causing the bilateral upper leg contusions. He also engaged the deploying driver's frontal air bag-causing the nose abrasion and chest contusion. The passenger, possibly due to being out of position, overrode the passenger's frontal air bag and struck the windshield with substantial force. His face contacted the windshield-causing the facial laceration and fractured tooth. Both occupants were transported from the scene to a hospital where they were treated and released.

Scene Diagram