

Remote, Redesigned Air Bag Special Study

**FOR NHTSA'S INTERNAL USE ONLY**

Dynamic Science, Inc., Case Number (1998-073-090G)

1998 Chevrolet Lumina

Indiana

June/1998

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<p>16. Abstract</p> <p>This remote investigation focused on the redesigned air bag system deployment of a 1998 Chevrolet Lumina 4-door sedan. This crash occurred in June, 1998 in the morning. The weather was clear and the bituminous roadway was dry. The crash occurred in a four-leg intersection. The eastbound leg of the intersection is a two-way undivided straight and level roadway, and is comprised of one eastbound and one westbound travel lane. The speed limit for this road is 48 kmph (30 mph). It is controlled by a stop sign at the intersection. The southbound leg of the intersection is a two-way undivided straight and level roadway, and is comprised of one southbound and one northbound travel lane. The speed limit for this road is 48 kmph (30 mph). There are no traffic controls for this road at the intersection. Vehicle 1, a 1992 Pontiac Grand Am 2-door coupe driven by a 16 year old female (170 cm/67 in, 54 kg/120 lb), was traveling west in the westbound travel lane approaching the intersection at an unknown speed. The front right seat was occupied by a 16 year old female (168 cm/66 in, 57 kg/125 lb). It is unknown if either occupant was restrained at the time. Vehicle 2, a 1998 Chevrolet Lumina 4-door sedan (case vehicle) driven by a 47 year old male (185 cm/73 in, 91 kg/200 lb) was traveling south in the southbound travel lane approaching the intersection at a driver estimated speed of 48 kmph (30 mph), preparing to travel straight through the intersection. The driver was restrained by the available manual lap/shoulder restraint. The driver of Vehicle 1 reported that she was lost and did not see the stop sign at the intersection. Vehicle 1 entered the intersection in the path of Vehicle 2 and was struck. The front plane of Vehicle 2 (12FYEW1) struck the right plane of Vehicle 1 (unknown CDC) in the intersection. A Delta V was calculated for this event for Vehicle 2, utilizing the Missing Vehicle Algorithm of WinSMASH, as 17 kmph (11 mph). As a result of the frontal impact, the supplemental restraint system (driver and passenger side redesigned air bags) of the case vehicle deployed. Vehicle 1 rotated counter-clockwise approximately 40 degrees after impact and came to rest in the center of the intersection facing southwest. Vehicle 2 rotated clockwise approximately 10 degrees after impact and came to rest in the center of the intersection facing south. None of the occupants in either vehicle sustained any injuries nor were transported from the scene for medical attention. Both vehicles became disabled due to damage sustained in the crash and were towed from the scene.</p>			
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**Summary**

This remote investigation focused on the redesigned air bag system deployment of a 1998 Chevrolet Lumina 4-door sedan. This crash occurred in June, 1998 in the morning. The weather was clear and the bituminous roadway was dry. The crash occurred in a four-leg intersection. The eastbound leg of the intersection is a two-way undivided straight and level roadway, and is comprised of one eastbound and one westbound travel lane. The speed limit for this road is 48 kmph (30 mph). It is controlled by a stop sign at the intersection. The southbound leg of the intersection is a two-way undivided straight and level roadway, and is comprised of one southbound and one northbound travel lane. The speed limit for this road is 48 kmph (30 mph). There are no traffic controls for this road at the intersection.

Vehicle 1, a 1992 Pontiac Grand Am 2-door coupe driven by a 16 year old female (170 cm/67 in, 54 kg/120 lb), was traveling west in the westbound travel lane approaching the intersection at an unknown speed. The front right seat was occupied by a 16 year old female (168 cm/66 in, 57 kg/125 lb). It is unknown if either occupant was restrained at the time.

Vehicle 2, a 1998 Chevrolet Lumina 4-door sedan (case vehicle) driven by a 47 year old male (185 cm/73 in, 91 kg/200 lb) was traveling south in the southbound travel lane approaching the intersection at a driver estimated speed of 48 kmph (30 mph), preparing to travel straight through the intersection. The driver was restrained by the available manual lap/shoulder restraint.



**Figure 1.** Exterior, Vehicle 2 (Chevrolet Lumina)



**Figure 2.** Crash scene. Vehicle 2 approach path.

## ***Crash Events***

The driver of Vehicle 1 reported that she was lost and did not see the stop sign at the intersection. Vehicle 1 entered the intersection in the path of Vehicle 2 and was struck. The front plane of Vehicle 2 (12FYEW1) struck the right plane of Vehicle 1 (unknown CDC) in the intersection.

A Delta V was calculated for this event for Vehicle 2, utilizing the Missing Vehicle Algorithm of WinSMASH, as 17 kmph (11 mph).

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

Vehicle 1 rotated counter-clockwise approximately 40 degrees after impact and came to rest in the center of the intersection facing southwest. Vehicle 2 rotated clockwise approximately 10 degrees after impact and came to rest in the center of the intersection facing south.

None of the occupants in either vehicle sustained any injuries nor were transported from the scene for medical attention.

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

**Table 1. Delta V**

	Case Vehicle		Other Vehicle	
	km/h	mph	km/h	mph
Total	17	10.6	20	12.4
Longitudinal	-17	-10.6	-4	-2.5
Lateral	3	1.9	-20	-12.4
Barrier speed	15	9.3	21	13

## ***Exterior of Case Vehicle***

**Table 2. Vehicle Information**

Model year, make and model	1998 Chevrolet Lumina
VIN	2G1WL52M3W9
CDC	12FYEW1



Figure 3. Exterior, Vehicle 2 (Chevrolet Lumina)



Figure 4. Exterior, Vehicle 2 (Chevrolet Lumina)

**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	130	0	6	13	13	6	0
	51.2	0	2.4	5.1	5.1	2.4	0

### *Interior of Case Vehicle*

The interior of the Chevrolet Lumina showed no indication of occupant contact. There were no areas of intrusion into the passenger compartment.

The case vehicle was equipped with split bench seats with separate backs in the front row. The outboard front seats were equipped with adjustable head restraints which were not damaged while the front center seat was not equipped with a head restraint system. The front left seat was adjusted to the rear most track position. The front right seat was adjusted between the middle and rear most track position. The back row of the case vehicle was equipped with bench seats with no head restraints in any of the three seating positions.

### *Case Vehicle Occupant Protection Systems*

The Chevrolet Lumina 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 two tether straps. The bag showed some signs of contact with the driver's face. 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 cover flap which was not damaged in the crash. The rectangular air bag was equipped with two vent ports and no tether straps. The air bag was not damaged.

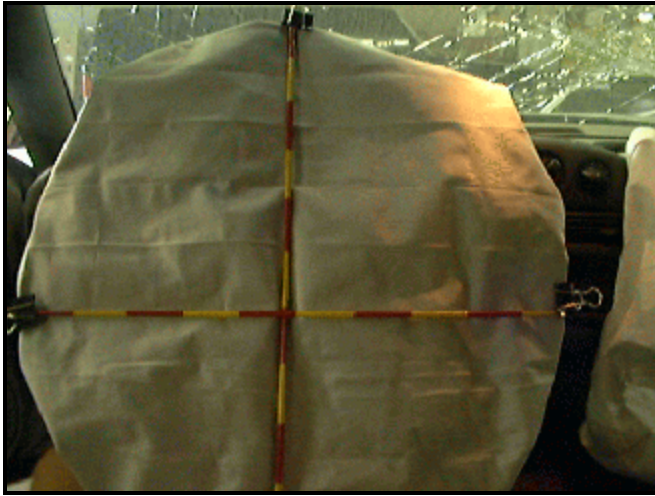


Figure 5. Interior, case vehicle. Driver's side air bag.

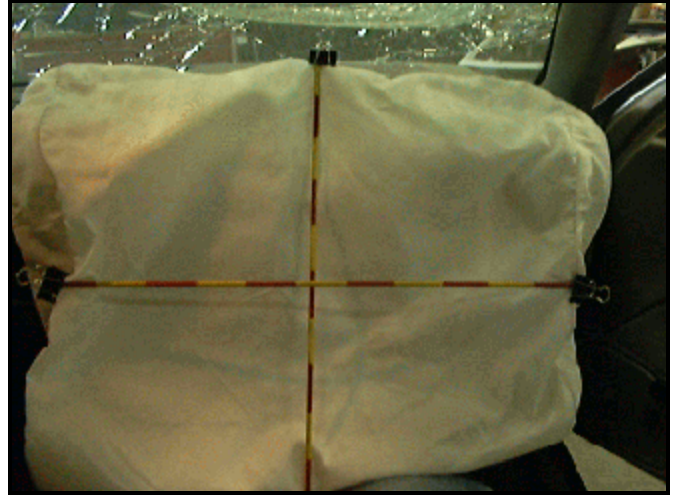


Figure 6. Interior, case vehicle. Passenger's side air bag.

***Case Vehicle Occupant Demographics***

**Table 4. Case Vehicle Occupant Demographics**

	Occupant 1	
Age/Sex:	47/Male	
Seated Position:	Front left	
Seat Type:	Bench with separate backs, cloth covered	
Height (cm/in.):	185	73
Weight (kg/lbs):	91	200
Pre-existing Medical Condition:	None noted	
Body Posture:	Normal, upright facing forward in seat	
Hand Position:	One on wheel, one on controls	
Foot Position:	On floor or foot controls	
Restraint Usage:	Manual lap & shoulder restraint	
Air bag:	Deployed redesigned air bag system	

***Occupant Injuries***

**Table 5. Injuries**

Injury	Injury Severity (AIS)	Injury Mechanism
Not injured		

### ***Occupant Kinematics***

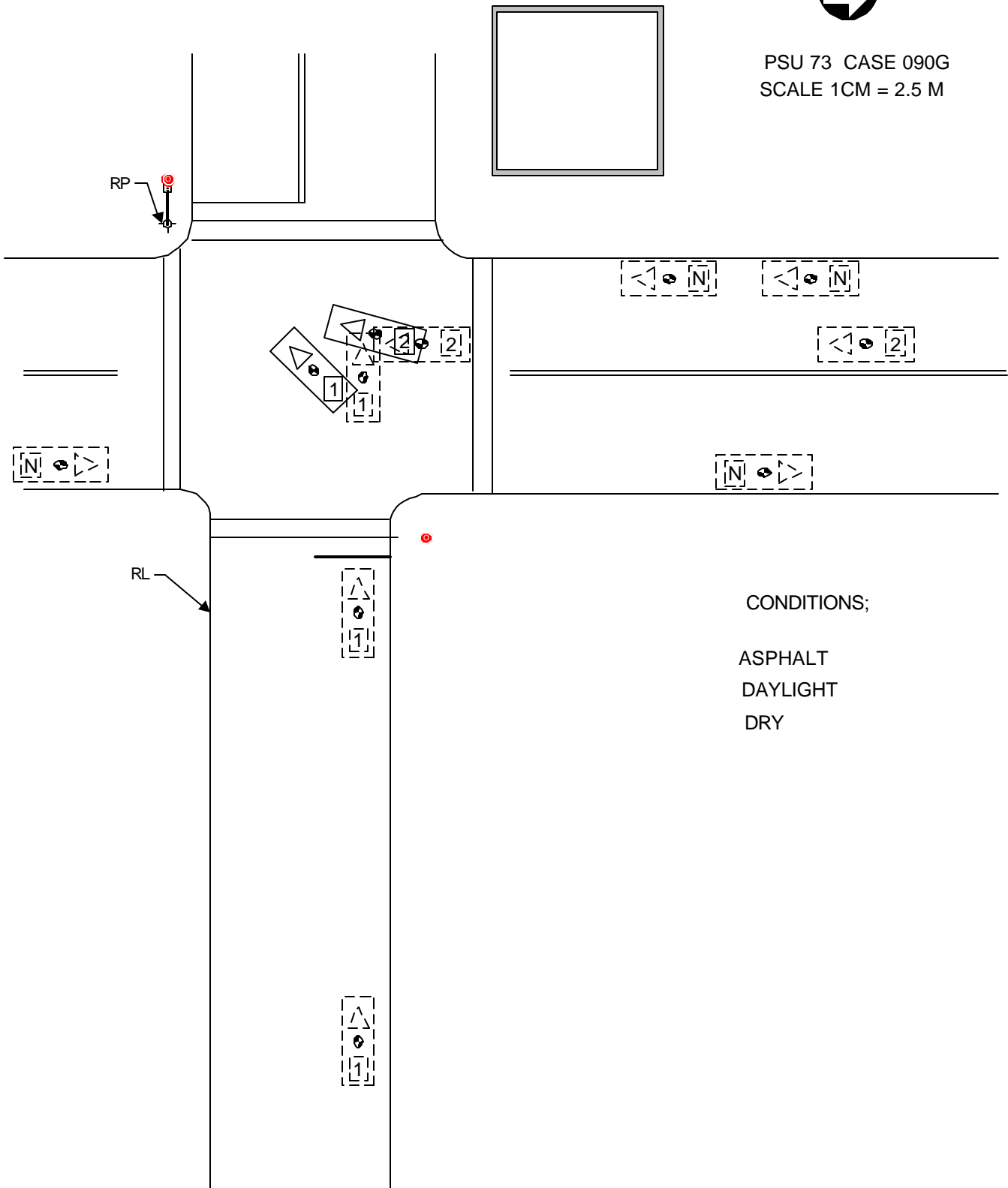
The driver (case occupant) of the Chevrolet Lumina was seated in a normal upright posture in the front left position of the vehicle. He was wearing the manual lap/shoulder restraint. Seat belt usage was determined through visual inspection by the researcher and the lack of frontal contact evidence in the vehicle. There was no indication of pre-impact braking and the driver reported that he did not have time to initiate any avoidance actions so the occupant should not have significantly moved prior to impact.

At impact, the driver reacted to the 350 degree principle direction of force by moving forward and slightly left loading the lap/shoulder restraint. As the restraints locked, further forward movement of the driver was prevented. It appears that the occupant's face came into contact with the deploying driver's side air bag-causing no injuries. The driver reported that he was uninjured in the crash and was not transported from the scene for medical attention.

Scene Diagram



PSU 73 CASE 090G  
SCALE 1CM = 2.5 M



CONDITIONS;

ASPHALT  
DAYLIGHT  
DRY