Remote, Redesigned Air Bag Special Study

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Dynamic Science, Inc., Case Number (1998-073-132C)

1998 Plymouth Breeze

Indiana

October/1998

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16. Abstract

This remote investigation focused on the redesigned air bag system deployment of a 1998 Plymouth Breeze 4-door sedan. This moderate injury crash occurred in October, 1998 in the early morning. The weather was clear and the bituminous roadways were dry. The crash occurred in a four-legged intersection. The east/west roadway is a two-way undivided roadway and is comprised of two travel lanes. The speed limit for this road is 48 kmph (30 mph). It is controlled by overhead traffic signals. The road is level at the area of impact. The intersecting north/south roadway is also a two-way undivided roadway and is comprised of two travel lanes. The speed limit and grade are not known for this roadway. It is controlled by overhead traffic signals. Vehicle 1, a 1995 Ford Windstar minivan driven by a 17 year old female (158 cm/62 in, 52 kg/115 lbs), was traveling east in the eastbound travel lane at an unknown speed approaching the intersection. The driver was preparing to make a left turn at the intersection. The overhead traffic signal was in the green phase at this time. The driver was restrained by the available manual lap/shoulder restraint. The front right seat was occupied by a 15 year old male (170 cm/67 in, 68 kg/150 lbs) who was also restrained by the available manual lap/shoulder restraint. Vehicle 2, a 1998 Plymouth Breeze 4-door sedan (case vehicle) driven by a 44 year old female (165 cm/65 in, 73 kg/160 lbs), was traveling west in the westbound travel lane approaching the intersection at an unknown speed. The driver was preparing to travel straight through the intersection. The overhead traffic signal was in the green phase at this time. The driver was restrained by the available manual lap/shoulder restraint. There were no other occupants in Vehicle 2. The driver of Vehicle 1 failed to see Vehicle 2 approaching and initiated the left turn in the path of the oncoming vehicle. The front plane of Vehicle 2 (12FYEW2) struck the front plane of Vehicle 1 (01FYEW1) in the intersection. Vehicle 1 came to rest in the intersection facing northeast. Vehicle 2 came to rest in the intersection facing west. A Delta V was calculated for Vehicle 2, utilizing the Damage Only Algorithm of WinSMASH, as 22 kmph (14 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. Neither occupant of Vehicle 1 was reported by police as being injured and neither was transported from the scene. Both occupants sought treatment later at a medical facility for minor injuries. The driver of Vehicle 2 reportedly sustained incapacitating "A" injuries and was transported from the scene by land to a trauma center where she was hospitalized for two days. Both vehicles were disabled due to damage sustained in the crash and were towed from the scene.

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Summary

This remote investigation focused on the redesigned air bag system deployment of a 1998 Plymouth Breeze 4-door sedan. This moderate injury crash occurred in October, 1998 in the early morning. The weather was clear and the bituminous roadways were dry. The crash occurred in a four-legged intersection. The east/west roadway is a two-way undivided roadway and is comprised of two travel lanes. The speed limit for this road is 48 kmph (30 mph). It is controlled by overhead traffic signals. The road is level at the area of impact. The intersecting north/south roadway is also a two-way undivided roadway and is comprised of two travel lanes. The speed limit and grade are not known for this roadway. It is controlled by overhead traffic signals.

Vehicle 1, a 1995 Ford Windstar minivan driven by a 17 year old female (158 cm/62 in, 52 kg/115 lbs), was traveling east in the eastbound travel lane at an unknown speed approaching the intersection. The driver was preparing to make a left turn at the intersection. The overhead traffic signal was in the green phase at this time. The driver was restrained by the available manual lap/shoulder restraint. The front right seat was occupied by a 15 year old male (170 cm/67 in, 68 kg/150 lbs) who was also restrained by the available manual lap/shoulder restraint.

Figure 1. Exterior, Vehicle 1 (Ford Windstar)

Figure 2. Exterior, Vehicle 2 (Plymouth Breeze)

Vehicle 2, a 1998 Plymouth Breeze 4-door sedan (case vehicle) driven by a 44 year old female (165 cm/65 in, 73 kg/160 lbs), was traveling west in the westbound travel lane approaching the intersection at an unknown speed. The driver was preparing to travel straight through the intersection. The overhead traffic signal was in the green phase at this time. The driver was restrained by the available manual lap/shoulder restraint. There were no other occupants in Vehicle 2.

Crash Events

The driver of Vehicle 1 failed to see Vehicle 2 approaching and initiated the left turn in the path of the oncoming vehicle. The front plane of Vehicle 2 (12FYEW2) struck the front plane of Vehicle 1 (01FYEW1) in the intersection. Vehicle 1 came to rest in the intersection facing northeast. Vehicle 2 came to rest in the intersection facing west.

A Delta V was calculated for Vehicle 2, utilizing the Damage Only Algorithm of WinSMASH, as 22 kmph (14 mph).

Figure 3. Crash scene. Vehicle 2 approach path.

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.

Neither occupant of Vehicle 1 was reported by police as being injured and neither was transported from the scene. Both occupants sought treatment later at a medical facility for minor injuries. The driver of Vehicle 2 reportedly sustained incapacitating "A" injuries and was transported from the scene by land to a trauma center where she was hospitalized for two days.

Both vehicles were 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	22	13.7	17	10.6
Longitudinal	-22	-13.7	-16	-9.9
Lateral	4	2.5	-6	-3.7
Barrier speed	20	12.4	18	11.2

Exterior of Case Vehicle

Table 2. Vehicle Information

Model year, make and model	1998 Plymouth Breeze
VIN	1P3EJ46C8WN
CDC	12FYEW2

Figure 4. Exterior, Vehicle 2 (1998 Plymouth Breeze)

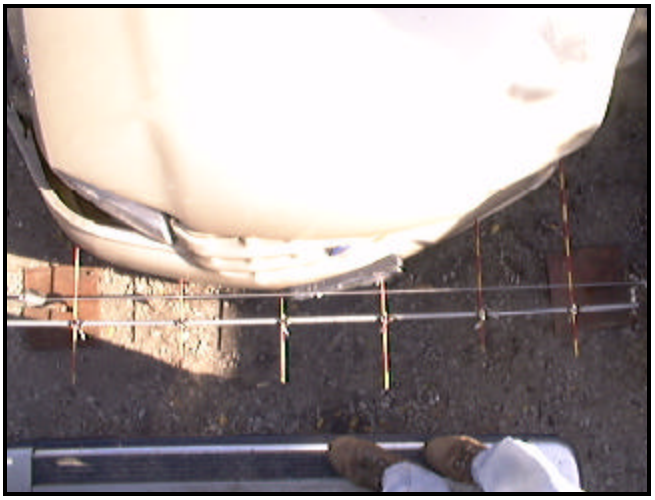

Figure 5. C' Measurements, Vehicle 2 (Plymouth Breeze)

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	145	32	21	12	7	2	2
	57.1	12.6	8.3	4.7	2.8	0.8	0.8

Interior of Case Vehicle

The interior of the Plymouth Breeze sustained no damage from occupant contact. There were no areas of intrusion into the passenger compartment. There was no visible evidence of occupant contact in the vehicle.

The case vehicle was equipped with bucket seats with adjustable head restraints in the front left and front right seating positions. Both front seats were adjusted between the middle and rear most track positions. The rear of the vehicle was equipped with bench seats with no head restraints in all three seating positions. The back seats were not adjustable.

Case Vehicle Occupant Protection Systems

The Plymouth Breeze 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.

Figure 6. Interior, case vehicle. Driver's air bag.

The front left air bag was housed in the steering wheel hub and was concealed by asymmetrical H-configuration cover flaps which were not damaged. The circular air bag was equipped with four tether straps and one vent port. 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. The rectangular air bag was equipped with two tether straps and no vent ports. No contact evidence was found on the air bag and the bag was not damaged.

Case Vehicle Occupant Demographics

Table 4. Case Vehicle Occupant(s) Demographics

	Occupant 1	
Age/Sex:	44/Female	
Seated Position:	Front left	
Seat Type:	Bucket - cloth covered	
Height (cm/in:):	165	65
Weight (kg/lbs).:	73	160
Pre-existing Medical Condition:	None noted	
Body Posture:	Unknown	
Hand Position:	Unknown	
Foot Position:	Unknown	
Restraint Usage:	Manual lap & shoulder restraint	
Air bag:	Deployed redesigned air bag system	

Occupant Injuries

Table 5. Injuries

Injury	Injury Severity (AIS)	Injury Mechanism
Right fibula fracture	2	Foot controls
Right tibia shaft fracture	2	Foot controls
Chest skin contusion	1	Shoulder belt webbing

Occupant Kinematics

The driver (case occupant) of the Plymouth Breeze was seated in an unknown posture in the front left position of the vehicle. She was wearing the manual lap/shoulder restraint. There were no other occupants in Vehicle 2. Seat belt usage was determined through visual inspection by the researcher, the lack of frontal contact evidence in the vehicle, and observations by the investigating police officer at the scene of the crash. No evidence of pre-impact avoidance maneuvers was found at the scene of the crash, so the occupant should not have moved significantly prior to impact.

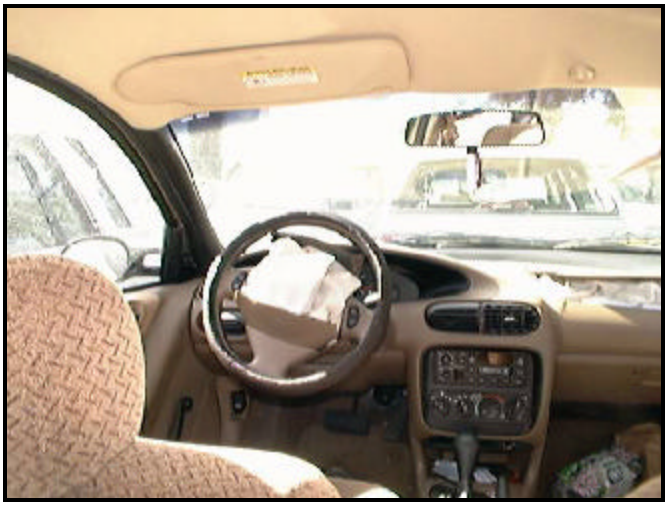

Figure 7. Interior, case vehicle. Case occupant seating position.

At impact, the case occupant reacted to the 350 degree principle direction of force by moving forward and slightly left, loading the manual lap/shoulder restraint. As the restraints locked, further frontal movement of the occupant was prevented. The case occupant's right leg experienced heavy loading against the floor and foot controls-causing the fibula and tibia fractures. The occupant's chest loaded the shoulder belt webbing-causing the chest contusion. No evidence of occupant contact was found on the air bag, but it is presumed that she contacted the bag somewhat in this moderate frontal impact. This may have contributed to the chest contusion. The case occupant was transported from the scene to a trauma center where she was hospitalized for two days.

Scene Diagram