Remote, Redesigned Air Bag Special Study
Dynamic Science, Inc., Case Number (1998-048-081C)
1998 Mitsubishi Mirage
Alabama
September, 1998

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16. Abstract

This remote investigation focused on the redesigned air bag system deployment of a 1998 Mitsubishi Mirage 4-door sedan. This minor injury crash occurred in September, 1998 in the evening. The weather was clear and the bituminous roadway was dry. It was dark at the time but the road was illuminated by street lights. The crash occurred in a four legged intersection. The speed limit is 72km/h (45 mph) for this road. It is controlled by overhead traffic signals. Vehicle 1, a 1989 Chevrolet Spectrum 4-door sedan driven by a 41 year old male, was traveling northbound in lane one approaching the intersection at a police estimated speed of 64 km/h (40 mph), preparing to travel straight through the intersection. The driver was restrained by the available manual lap/shoulder restraint. Police indicated that the driver of Vehicle 1 was under the influence of alcohol at the time of the crash. His blood alcohol content registered at .07%. There were no other occupants in the vehicle. Vehicle 2, a 1998 Mitsubishi Mirage 4-door sedan (case vehicle) driven by a 23 year old female (155 cm/61 in, 68 kg/150 lbs.), had just pulled onto westbound lane two from a parking lot and was preparing to travel straight through the intersection at a police estimated speed of 64 km/h (40 mph). The driver was restrained by the available manual lap/shoulder restraint. The front right seat was occupied by a 21 year old female (unknown ht/wt) who was restrained by the available manual lap/shoulder restraint. The back right seat was occupied by a 23 year old female (unknown ht/wt) who was restrained by the available manual lap/shoulder restraint. Vehicle 1 entered the intersection on a solid red traffic signal. Vehicle 2 entered the intersection on a solid green traffic signal. Vehicle 2 entered the path of Vehicle 1 and was struck. The front plane of Vehicle 1 struck the left plane of Vehicle 2 in the intersection. A Delta V was calculated for each vehicle utilizing the Missing Vehicle Algorithm of WinSMASH. Vehicle 1 sustained a total Delta V of 23 km/h (14 mph). Vehicle 2 sustained a total Delta V of 19 km/h (12 mph). As a result of the impact, the supplemental restraint system (driver and passenger side air bags) of Vehicle 2 deployed. Vehicle 1 did not have air bags installed. Vehicle 1 appears to have rotated counter-clockwise slightly after impact and came to rest in the intersection facing northwest. Vehicle 2 continued through the intersection after impact and came to rest in the northwest corner of the intersection facing northwest. The driver of Vehicle 1 was not injured in the crash. The driver of Vehicle 2 sustained minor injuries in the crash and was transported by land to a trauma center where she was treated and released. The front right passenger of Vehicle 2 was not injured but complained of abdominal pain. She was transported by land to a trauma center where she was treated and released. The back right passenger of Vehicle 2 sustained minor injuries in the crash and was transported by land to a trauma center where she was treated and released.

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Summary

This remote investigation focused on the redesigned air bag system deployment of a 1998 Mitsubishi Mirage 4-door sedan. This minor injury crash occurred in September, 1998 in the evening. The weather was clear and the bituminous roadway was dry. It was dark at the time but the road was illuminated by street lights. The crash occurred in a four legged intersection. The northbound leg of the intersection is a two-way divided roadway and is comprised of three travel lanes; one northbound lane, one northbound left-turn lane, and one southbound lane. The lanes are divided by a painted asphalt median strip. The speed limit is 72 km/h (45 mph) for this road. It is controlled by overhead traffic signals. There was an uphill grade at this location. The westbound leg of the intersection is a two-way divided roadway and is comprised of seven travel lanes; three westbound lanes, one westbound left-turn lane, and three eastbound lanes. The travel lanes are separated by a raised concrete median. There was an uphill grade at this location. The speed limit is 72km/h (45 mph) for this road. It is controlled by overhead traffic signals.

Figure 1. Exterior, Vehicle 1 (Chevrolet Spectrum)

Vehicle 1, a 1989 Chevrolet Spectrum 4-door sedan driven by a 41 year old male, was traveling northbound in lane one approaching the intersection at a police estimated speed of 64 km/h (40 mph), preparing to travel straight through the intersection. The driver was restrained by the available manual lap/shoulder restraint. Police indicated that the driver of Vehicle 1 was under the influence of alcohol at the time of the crash. His blood alcohol content registered at .07%. There were no other occupants in the vehicle.

Figure 2. Exterior, Vehicle 2 (Mitsubishi Mirage)

Vehicle 2, a 1998 Mitsubishi Mirage 4-door sedan (case vehicle) driven by a 23 year old female (155 cm/61 in, 68 kg/150 lbs.), had just pulled onto westbound lane two from a parking lot and was

preparing to travel straight through the intersection at a police estimated speed of 64 km/h (40 mph). The driver was restrained by the available manual lap/shoulder restraint. The front right seat was occupied by a 21 year old female (unknown ht/wt) who was restrained by the available manual lap/shoulder restraint. The back right seat was occupied by a 23 year old female (unknown ht/wt) who was restrained by the available manual lap/shoulder restraint.

Crash Events

Vehicle 1 entered the intersection on a solid red traffic signal. Vehicle 2 entered the intersection on a solid green traffic signal. Vehicle 2 entered the path of Vehicle 1 and was struck. The front plane of Vehicle 1 (01FDEW1)[1] struck the left plane of Vehicle 2 (11LFEW99) in the intersection.

A Delta V was calculated for each vehicle utilizing the Missing Vehicle Algorithm of WinSMASH. Vehicle 1 sustained a total Delta V of 23 km/h (14 mph). Vehicle 2 sustained a total Delta V of 19 km/h (12 mph). As a result of the impact, the supplemental restraint system (driver and passenger side air bags) of Vehicle 2 deployed. Vehicle 1 did not have air bags installed.

Vehicle 1 appears to have rotated counter-clockwise slightly after impact and came to rest in the intersection facing northwest. Vehicle 2 continued through the intersection after impact and came to rest in the northwest corner of the intersection facing northwest.

The driver of Vehicle 1 was not injured in the crash.

The driver of Vehicle 2 sustained minor injuries in the crash and was transported by land to a trauma center where she was treated and released. The front right passenger of Vehicle 2 was not injured but complained of abdominal pain. She was transported by land to a trauma center where she was treated and released. The back right passenger of Vehicle 2 sustained minor injuries in the crash and was transported by land to a trauma center where she was treated and released.

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	19	11.8	23	14.3
Longitudinal	-16	-9.9	-17	-10.6
Lateral	9	5.6	-14	-8.7
Barrier speed	24	14.9	18	11.2

[1]SCI revised CDC

Exterior of Case Vehicle

Table 2. Vehicle Information

Model year, make and model	1998 Mitsubishi Mirage
VIN	J81RG5178K7
CDC	11LFEW99

Figure 3. Exterior, Vehicle 2 (1998 Mitsubishi Mirage)

Figure 4. Exterior, Vehicle 2 (1998 Mitsubishi Mirage)

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.
Vehicle under repair	999	99	99	99	99	99	99

Vehicle 2 was under repair and stripped down at the time of inspection so crush measurements could not be taken. A CDC was ascertained from inspection of the removed damaged parts.

Interior of Case Vehicle

The interior of the Mitsubishi Mirage sustained minor damage from occupant contact. There were no areas of intrusion into the passenger compartment. The was evidence of occupant contact to the front left air bag, front right air bag, and front roof header.

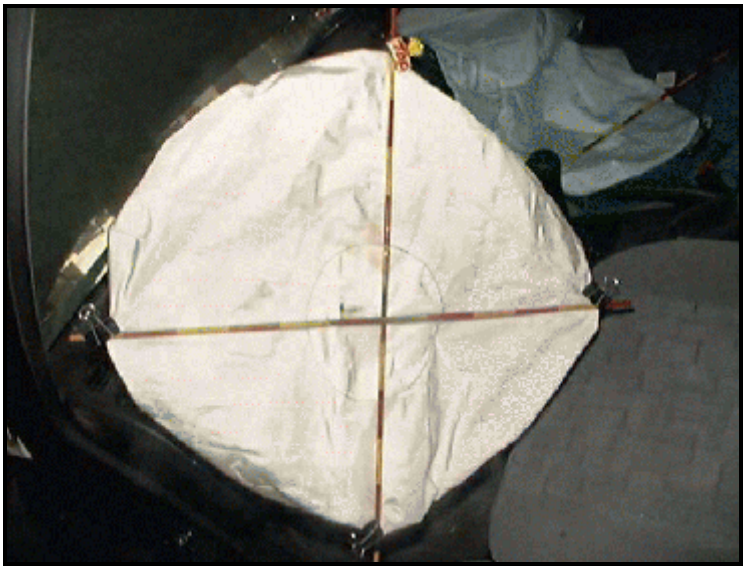

Figure 5. Interior, Vehicle 2, driver's side redesigned air bag

The case vehicle was equipped with bucket seats in the front left and front right seating positions. The front left seat track position is not known due to post crash movement by the repair facility. The front right seat was adjusted to the forward most track position. Both front seats were equipped with adjustable head restraints which were not damaged in the crash. The rear of the vehicle was equipped with bench seats. The back left and back right seats were equipped with integral head restraints which were not damaged in the crash. The back center seat was not equipped with a head restraint system.

Case Vehicle Occupant Protection Systems

The Mitsubishi Mirage 4-door sedan was equipped with a redisigned 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 a single inverted "D" shaped cover flap. The circular air bag was equipped with two tethers and two vent ports. Two makeup transfers were found on the bag from contact with the driver's face.

The front right air bag was housed in the mid-instrument panel position and was concealed by a single rectangular shaped cover flap. The rectangular air bag was equipped with one vent port and no tethers. A makeup transfer was found on the bag from contact with the front right passenger's face.

Figure 6. Interior, Vehicle 2, passenger's side redesigned air bag

Case Vehicle Occupant Demographics

Table 4. Case Vehicle Occupant(s) Demographics

	Occupant 1	Occupant 2	Occupant 3
Age/Sex:	23/Female	21/Female	23/Female
Seated Position:	Front left	Front right	Back right
Seat Type:	Bucket - cloth covered	Bucket - cloth covered	Bench - cloth covered
Height (cm/in:):	155 61	Unk	Unk
Weight (kg/lbs).:	68 150	Unk	Unk
Pre-existing Medical Condition:	None noted	None noted	None noted
Body Posture:	Unknown	Unknown	Unknown
Hand Position:	Unknown	Unknown	Unknown
Foot Position:	Unknown	Unknown	Unknown
Restraint Usage:	Manual lap & shoulder belt	Manual lap & shoulder belt	Manual lap & shoulder belt
Air bag:	Deployed redesigned air bag system	Deployed redesigned air bag system	None available

Occupant Injuries

Table 5. Case Vehicle Occupant(s) Injuries

Occupant #	Injury	Injury Severity (AIS)	Injury Mechanism
1	Multiple thorax skin contusions	1	Air bag
1	Cervical spine strain	1	Air bag
3	Multiple unspecified skin contusions	1	Unknown source

Occupant Kinematics

The driver (occupant 01) of the Mitsubishi Mirage was seated in an unknown posture in the front left position of the vehicle. She was wearing the manual lap/shoulder restraint. The front right passenger (occupant 02) was seated in an unknown posture and was wearing the manual lap/shoulder restraint. The back right passenger (occupant 03) was seated in an unknown posture and was wearing the manual lap/shoulder restraint. Seat belt usage was determined by visual inspection by the researcher, the lack of prominent contact evidence, and observations by the investigating officer at the scene of the crash. Pre-impact maneuvering by the driver is not known, so pre-impact occupant movement is also unknown.

At impact, the occupants reacted to the 330 degree principal direction of force by moving forward and to the left. Extensive movement of the occupants was prevented by the locked lap/shoulder restraints. It appears that the driver (occupant 01) had moved far enough forward to engage the deploying air bag-causing the multiple thorax skin contusions. The seat belt webbing may also have contributed to the bruising. The cervical spine strain also appears to have been caused by the head contact with the deploying air bag (makeup transfers). The front right passenger (occupant 02) is believed to have contacted the deploying front right air bag judging from the contact evidence (makeup transfer) found on the bag, but she did not sustain any injuries. The back right passenger (occupant 03) sustained unspecified multiple skin contusions. The source of these injuries is not known.

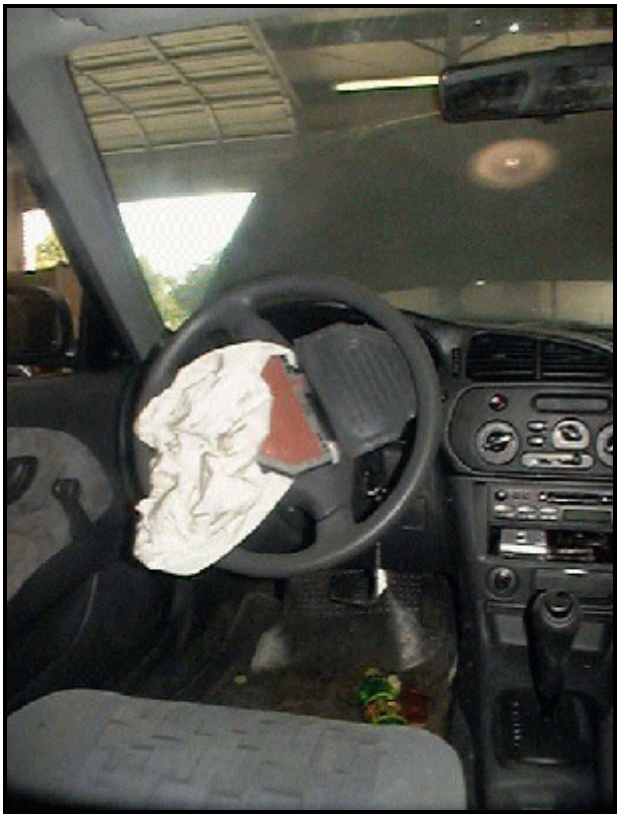

Figure 7. Interior, case vehicle

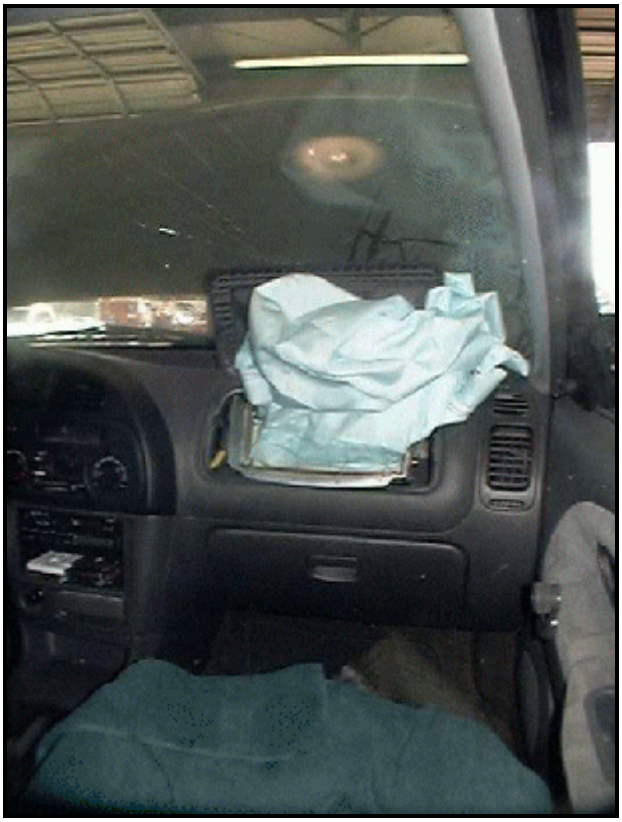

Figure 8. Interior, case vehicle

Scene Diagram