Remote, Redesigned Air Bag Special Study

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Dynamic Science, Inc., Case Number (1999-075-134C)

1998 Ford Taurus

Colorado

September/1999

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16. Abstract This remote investigation focused on the redesigned air bag system deployment of 1998 Ford Taurus station wagon. This crash occurred in September, 1999 in the afternoon. The weather was clear and the bituminous roadways were dry. The crash occurred in a four leg intersection. The eastbound leg of the intersection is a two-way divided roadway and is comprised of seven travel lanes; three eastbound thru-lanes, one eastbound left-turn lane, and three westbound lanes. Eastbound traffic is separated from westbound traffic by a raised concrete median strip. The speed limit for this road is 72 km/h (45 mph). It is controlled by overhead traffic signals at the intersection. This road has a greater than 2% eastbound downhill grade at this location. The northbound leg of the intersection is a two-way undivided roadway and is comprised of four travel lanes; one northbound right-turn lane, one northbound thru-lane, one northbound left-turn lane, and one southbound lane. The speed limit for this road is 56 km/h (35 mph). It is controlled by overhead traffic signals at the intersection. This road has a greater than 2% northbound uphill grade at this location. Vehicle 1, a 1998 Ford Taurus station wagon (case vehicle) driven by a 53 year old female (170 cm/67 in, 104 kg/230 lbs), was traveling east in eastbound lane #3 approaching the intersection at a police estimated speed of 72 km/h (45 mph). The driver was preparing to travel straight through the intersection. The overhead traffic signal was in the red phase at this time. The driver was restrained by the available manual lap/shoulder restraint. There were no other occupants in Vehicle 1. Vehicle 2, a 1996 Mazda Miata 2-door convertible driven by a 52 year old male, was traveling north in the northbound left-turn lane approaching the intersection at a police estimated speed of 32 km/h (20 mph). 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 22 year old male who also was restrained by the available manual lap/shoulder restraint. As Vehicle 2 was initiating the left turn, Vehicle 1 also entered the intersection. The front plane of Vehicle 1 (01FREE2) struck the front plane of Vehicle 2 (10FLEE3) in the intersection. A Delta V was calculated for this impact for Vehicle 1, utilizing the Damage Only Algorithm of WinSMASH, as 11 km/h (7 mph). As a result of the frontal impact, the supplemental restraint system (driver's and passenger's frontal air bags) of the case vehicle deployed. After impact, Vehicle 1 traveled across the intersection and came to rest in the westbound lanes on the east side of the intersection facing northeast. Vehicle 2 rotated clockwise after impact and came to rest on the south side of the intersection facing southeast. The only injured party in the crash was the driver of Vehicle 2 who was transported to a trauma center where he was treated and released. 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 1998 Ford Taurus station wagon. This crash occurred in September, 1999 in the afternoon. The weather was clear and the bituminous roadways were dry. The crash occurred in a four leg intersection. The eastbound leg of the intersection is a two-way divided roadway and is comprised of seven travel lanes; three eastbound thru-lanes, one eastbound left-turn lane, and three westbound lanes. Eastbound traffic is separated from westbound traffic by a raised concrete median strip. The speed limit for this road is 72 km/h (45 mph). It is controlled by overhead traffic signals at the intersection. This road has a greater than 2% eastbound downhill grade at this location. The northbound leg of the intersection is a two-way undivided roadway and is comprised of four travel lanes; one northbound right-turn lane, one northbound thru-lane, one northbound left-turn lane, and one southbound lane. The speed limit for this road is 56 km/h (35 mph). It is controlled by overhead traffic signals at the intersection. This road has a greater than 2% northbound uphill grade at this location.

Vehicle 1, a 1998 Ford Taurus station wagon (case vehicle) driven by a 53 year old female (170 cm/67 in, 104 kg/230 lbs), was traveling east in eastbound lane #3 approaching the intersection at a police estimated speed of 72 km/h (45 mph). The driver was preparing to travel straight through the intersection. The overhead traffic signal was in the red phase at this time. The driver was restrained by the available manual lap/shoulder restraint. There were no other occupants in Vehicle 1.

Figure 1. Exterior, Vehicle 1 (Ford Taurus)

Figure 2. Exterior, Vehicle 2 (Mazda Miata)

Vehicle 2, a 1996 Mazda Miata 2-door convertible driven by a 52 year old male, was traveling north in the northbound left-turn lane approaching the intersection at a police estimated speed of 32 km/h (20 mph). 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 22 year old male who also was restrained by the available manual lap/shoulder restraint.

Figure 3. Crash scene. Vehicle 1 approach path.

Crash Events

As Vehicle 2 was initiating the left turn, Vehicle 1 also entered the intersection. The front plane of Vehicle 1 (01FREE2) struck the front plane of Vehicle 2 (10FLEE3) in the intersection.

A Delta V was calculated for this impact for Vehicle 1, utilizing the Damage Only Algorithm of WinSMASH, as 11 km/h (7 mph).

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

After impact, Vehicle 1 traveled across the intersection and came to rest in the westbound lanes on the east side of the intersection facing northeast. Vehicle 2 rotated clockwise after impact and came to rest on the south side of the intersection facing southeast.

The only injured party in the crash was the driver of Vehicle 2 who was transported to a trauma center where he was treated and released.

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	11	6.8	16	9.9
Longitudinal	-10	-6.2	-10	-6.2
Lateral	-4	-2.5	12	7.5
Barrier speed	11	6.8	16	9.9

Exterior of Case Vehicle

Table 2. Vehicle Information

Model year, make and model	1998 Ford Taurus
VIN	1FAFP58S2WG
CDC	01FREE2

Figure 4. Exterior, Vehicle 1 (1998 Ford Taurus station wagon)

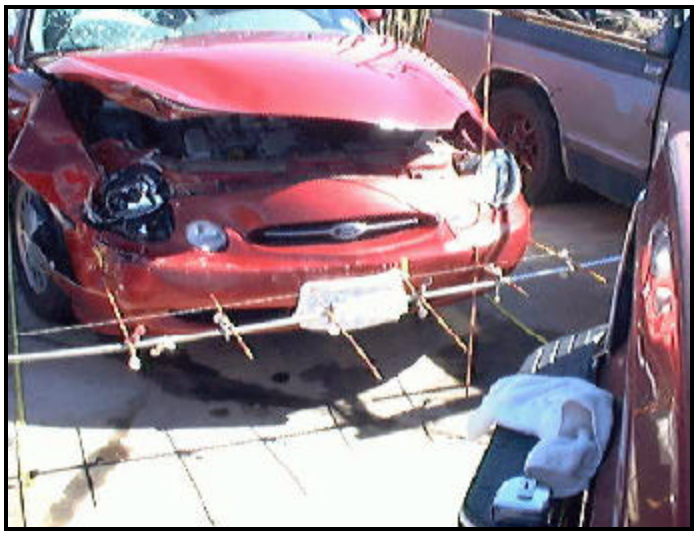

Figure 5. Exterior, Vehicle 1 (1998 Ford Taurus station wagon)

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	139	0	0	2	6	7	19
	54.7	0	0	0.8	2.4	2.8	7.5

Interior of Case Vehicle

The interior of the Ford Taurus sustained no damage from occupant contact. There were no areas of intrusion into the passenger compartment. No evidence of occupant contact was found in the vehicle.

The case vehicle was equipped with split bench seats with separate backs in the three frontal seating positions. The outboard frontal seats were equipped with adjustable head restraints which were not damaged. All three seats were adjusted to the rear most track positions. The rear of the vehicle was equipped with bench seats with folding backs in all three seating positions. The back seats are not adjustable.

Case Vehicle Occupant Protection Systems

The Ford Taurus station wagon 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 asymmetrical H-configuration cover flaps which were not damaged in the crash. The circular air bag was equipped with two vent ports and two 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 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 the air bag and the bag was not damaged.

Figure 6. Driver's frontal air bag.

Case Vehicle Occupant Demographics

Table 4. Case Vehicle Occupant(s) Demographics

	Occupant 1	
Age/Sex:	53/Female	
Seated Position:	Front-left	
Seat Type:	Split bench with separate backs - cloth covered	
Height (cm/in:):	170	67
Weight (kg/lbs).:	104	230
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. Case Vehicle Occupant(s) Injuries

Injury	Injury Severity (AIS)	Injury Mechanism
No injuries		

Occupant Kinematics

The driver (case occupant) of the Ford Taurus was seated in an unknown posture in the front left position of the vehicle. She was wearing the manual lap/shoulder restraint. 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. It is not known if the driver of Vehicle 1 performed any pre-impact avoidance maneuvers.

Figure 7. Interior, Vehicle 1. Case occupant seating position.

At impact, the driver reacted to the 20 degree principle direction of force by moving forward and to the right. As the restraints locked, further forward movement of the driver was prevented. Although there are no associated injuries, it is assumed that the driver engaged the deploying driver's frontal air bag. No evidence was found in the vehicle of contact from the driver. The driver was reportedly uninjured and was not transported from the scene for medical attention.

Scene Diagram