

Remote, Redesigned Air Bag Special Study
Dynamic Science, Inc., Case Number (1998-048-070C)
1998 Ford Taurus 4-door sedan
Alabama
August/1998

Technical Report Documentation Page

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16. Abstract This remote investigation focused on the redesigned air bag system deployment of a 1998 Ford Taurus 4-door sedan. This minor injury crash occurred in August 1998 in the afternoon. The weather was clear and the bituminous roadway was dry. The crash occurred in a four legged intersection. The westbound leg of the intersection is a two-way undivided roadway and is comprised of six travel lanes; three westbound lanes, one westbound left-turn lane, and two eastbound lanes. 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 southbound leg of the intersection is a two lane divided highway on/off ramp and is comprised of one southbound lane and one northbound lane. The travel lanes are separated by a concrete barrier. There was a downhill grade at this location. The speed limit is 40 km/h (25 mph) for this road. It is controlled by overhead traffic signals. Vehicle 1, a 1998 Ford Taurus 4-door sedan (case vehicle) driven by a 33 year old male (185 cm/73 in, 79 kg/175 lbs.), was traveling westbound in lane two approaching the intersection at an unknown speed, preparing to travel straight through the intersection. The driver was restrained by the available manual lap/shoulder restraint. The front right seat was occupied by a 35 year old male (183 cm/72 in, 95 kg/210 lbs.) who was restrained by the available manual lap/shoulder restraint. Vehicle 2, a 1995 Pontiac Grand Am 4-door sedan driven by a 51 year old female, was traveling southbound approaching the intersection at an unknown speed, preparing to make a left turn at the intersection. It is unknown if the driver was restrained, however the police accident report states that the occupant was wearing the automatic door mounted lap/shoulder restraint. There were no other occupants in Vehicle 2. Vehicle 2 entered the intersection of a solid green traffic signal and initiated the left turn. Vehicle 1 entered the intersection on a solid red traffic signal. The front plane of Vehicle 1 (12FDEW1) struck the left side of Vehicle 2 (09LFEW3) in the intersection. The driver of Vehicle 1 reports that he became distracted just prior to impact due to looking up at the overhead street signs as well as talking to occupant 02. A Delta V was calculated for each vehicle utilizing the Missing Vehicle Algorithm of WinSMASH. Vehicle 1 sustained a longitudinal Delta V of -15 km/h (-9 mph). Vehicle 2 sustained a latitudinal Delta V of 19 km/h (12 mph). As a result of the frontal impact, the supplemental restraint system (driver and passenger side redesigned air bags) deployed. The single air bag of Vehicle 2 did not deploy. Vehicle 2 was rotated clockwise 45 degrees as a result of the impact and came to rest in the intersection facing southwest. Vehicle 1 appears to have remained in contact with Vehicle 2 and came to rest in the intersection facing west. The driver of Vehicle 1 sustained minor injuries in the crash. He was not transported to a medical facility from the scene, but he took himself to a trauma center at a later time and was treated and released. The passenger of Vehicle 1 sustained minor injuries in the crash and was transported to a trauma center where he was treated and released. The driver of Vehicle 2 sustained minor injuries in the crash and was transported 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 Ford Taurus 4-door sedan. This minor injury crash occurred in August 1998 in the afternoon. The weather was clear and the bituminous roadway was dry. The crash occurred in a four legged intersection. The westbound leg of the intersection is a two-way undivided roadway and is comprised of six travel lanes; three westbound lanes, one westbound left-turn lane, and two eastbound lanes. 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 southbound leg of the intersection is a two lane divided highway on/off ramp and is comprised of one southbound lane and one northbound lane. The travel lanes are separated by a concrete barrier. There was a downhill grade at this location. The speed limit is 40 km/h (25 mph) for this road. It is controlled by overhead traffic signals.

Vehicle 1, a 1998 Ford Taurus 4-door sedan (case vehicle) driven by a 33 year old male (185 cm/73 in, 79 kg/175 lbs.), was traveling westbound in lane two approaching the intersection at an unknown speed, preparing to travel straight through the intersection. The driver was restrained by the available manual lap/shoulder restraint. The front right seat was occupied by a 35 year old male (183 cm/72 in, 95 kg/210 lbs.) who was restrained by the available manual lap/shoulder restraint.

Vehicle 2, a 1995 Pontiac Grand Am 4-door sedan driven by a 51 year old female, was traveling southbound approaching the intersection at an unknown speed, preparing to make a left turn at the intersection. It is unknown if the driver was restrained, however the police accident report states that the occupant was wearing the automatic door mounted lap/shoulder restraint. There were no other occupants in Vehicle 2.



Figure 1. Exterior Vehicle 1 (Ford Taurus)



Figure 2. Exterior Vehicle 2 (Pontiac Grand Am)

Crash Events

Vehicle 2 entered the intersection of a solid green traffic signal and initiated the left turn. Vehicle 1 entered the intersection on a solid red traffic signal. The front plane of Vehicle 1 (12FDEW1) struck the left side of Vehicle 2 (09LFEW3) in the intersection. The driver of Vehicle 1 reports that he became distracted just prior to impact due to looking up at the overhead street signs as well as talking to occupant 02.

A Delta V was calculated for each vehicle utilizing the Missing Vehicle Algorithm of WinSMASH. Vehicle 1 sustained a longitudinal Delta V of -15 km/h (-9 mph). Vehicle 2 sustained a latitudinal Delta V of 19 km/h (12 mph). As a result of the frontal impact, the supplemental restraint system (driver and passenger side redesigned air bags) deployed. The single air bag of Vehicle 2 did not deploy.

Vehicle 2 was rotated clockwise 45 degrees as a result of the impact and came to rest in the intersection facing southwest. Vehicle 1 appears to have remained in contact with Vehicle 2 and came to rest in the intersection facing west.

The driver of Vehicle 1 sustained minor injuries in the crash. He was not transported to a medical facility from the scene, but he took himself to a trauma center at a later time and was treated and released. The passenger of Vehicle 1 sustained minor injuries in the crash and was transported to a trauma center where he was treated and released.

The driver of Vehicle 2 sustained minor injuries in the crash and was transported 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	15	9.3	19	11.8
Longitudinal	-15	-9.3	-3	-1.9
Lateral	-3	-1.9	19	11.8
Barrier speed	16	9.9	19	11.8

Exterior of Case Vehicle

Table 2. Vehicle Information

Model year, make and model	1998 Ford Taurus 4-door sedan
VIN	1FAFP52U7WA
CDC	12FDEW1



Figure 3. Exterior Vehicle 1 (1998 Ford Taurus)



Figure 4. Exterior Vehicle 1 (1998 Ford Taurus)

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	155	15	4	2	3	5	12
	61	5.9	1.6	0.8	1.2	2	4.7

Interior of Case Vehicle

The interior of the Ford Taurus sustained minor damage from occupant contact. There were no areas of intrusion into the passenger compartment. There was occupant contact evidence to the left window, left door panel, left and center instrument panels, steering wheel hub, left sun visor, and right door panel.

The case vehicle was equipped with bucket seats in the front left and front right seating positions. The front left seat was adjusted between the middle and rear most track positions. The front right seat was adjusted to the rear most track position. Both front seats were equipped with adjustable head restraints which were not damaged. The rear of the vehicle was equipped with bench seats with folding backs. There were no head restraints in any of the three seating positions.

Case Vehicle Occupant Protection Systems

The Ford Taurus 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 asymmetrical H-configuration cover flaps. The circular air bag was equipped with two tethers and two vent ports. Saliva was found on the air bag from contact with the driver's face. The bag was not damaged.

The front right air bag was located in the top-instrument panel position. The single air bag module cover flap was an irregularly shaped rectangular configuration. The rectangular air bag was equipped with two tethers but no vent ports. There were several small cuts apparent in the bag which were caused by broken glass. There was no evidence of occupant contact to the bag.



Figure 5. Driver side air bag - Vehicle 1



Figure 6. Passenger side air bag - Vehicle 1



Figure 7. Passenger side air bag flap - Vehicle 1

Case Vehicle Occupant Demographics

Table 4. Case Vehicle Occupant(s) Demographics

	Occupant 1		Occupant 2	
Age/Sex:	33/Male		35/Male	
Seated Position:	Front left		Front right	
Seat Type:	Bucket - cloth covered		Bucket - cloth covered	
Height (cm/in):	185	73	183	72
Weight (kg/lbs):	79	175	95	210
Pre-existing Medical Condition:	None noted		None noted	
Body Posture:	Normal - upright, facing forward, back against seat		Normal - upright, facing forward, back against seat	
Hand Position:	L - steering wheel hub R - steering wheel rim		Unknown	
Foot Position:	On floor or foot controls		On floor	
Restraint Usage:	Manual lap & shoulder belt		Manual lap & shoulder belt	
Air bag:	Deployed redesigned air bag system		Deployed redesigned air bag system	

Occupant Injuries

Table 5. Case Vehicle Occupant(s) Injuries

Occupant #	Injury	Injury Severity (AIS)	Injury Mechanism
1	Metacarpus fracture (Avulsion fracture base of left thumb)	2	Air bag cover flap
1	5 cm (2 in) forehead abrasion	1	Air bag
2	Thoracic spine strain	1	Impact force
2	Cervical spine strain	1	Impact force

Occupant Kinematics

The driver (occupant 01) of the Ford Taurus was seated in a normal upright posture in the front left position of the vehicle. He was wearing the manual lap/shoulder restraint. The right-front passenger (occupant 02) was also seated in a normal upright posture and was wearing the manual lap/shoulder restraint. Seat belt usage was determined by visual inspection by the researcher, the lack of prominent frontal contact evidence, and observations of the investigating officer at the scene of the crash. Prior to impact, the driver applied the brakes (with lockup) and steered the vehicle slightly to the left in an attempt to avoid the crash, sending the vehicle into a longitudinal slide. The occupants reacted to this braking input by moving forward and slightly right, loading the lap/shoulder restraints.



Figure 8. Source of injury - Vehicle 1, Occupant 1

At impact, the occupants were prevented from any further frontal movement by the locked lap/shoulder restraints. It does appear however, that the driver (occupant 01) had moved far enough forward to engage the deploying air bag-causing the facial abrasion. A saliva transfer was found on the bag. The driver reported that his left hand was resting on the steering wheel hub at the time of the crash, and the air bag flaps appear to have contacted his left thumb-causing the metacarpus fracture. There was no evidence of contact with the passenger side air bag by occupant 02. It appears that the cervical and thoracic spine strains sustained by case occupant 02 were caused by the force of the impact, rather than contact with any component of the vehicle's interior.

Scene Diagram

