

**TRANSPORTATION SCIENCES
CRASH RESEARCH SECTION**

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**REDESIGNED AIR BAG SPECIAL STUDY (RABSS)
SCI TECHNICAL SUMMARY REPORT**

NASS RABSS CASE NO. 1998-12-805G

RABSS VEHICLE - 1998 FORD TAURUS SE

LOCATION - STATE OF MICHIGAN

CRASH DATE - OCTOBER, 1998

Contract No. DTNH22-94-D-07058

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The crash investigation process is an inexact science which requires that physical evidence such as skid marks, vehicular damage measurements, and occupant contact points are coupled with the investigator's expert knowledge and experience of vehicle dynamics and occupant kinematics in order to determine the pre-crash, crash, and post-crash movements of involved vehicles and occupants.

Because each crash is a unique sequence of events, generalized conclusions cannot be made concerning the crashworthiness performance of the involved vehicle(s) or their safety systems.

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16. <i>Abstract</i> This investigation focused on a two vehicle crash involving a 1998 Ford Taurus SE 4-door sedan (subject vehicle) and a 1990 Oldsmobile Cutlass Ciera 4-door sedan. The Ford Taurus was equipped with redesigned frontal air bags for the driver and right passenger positions which deployed as a result of an oblique angle collision with the Oldsmobile Cutlass Ciera. The Oldsmobile driver was operating the vehicle northbound when she failed to observe the southbound Ford as she turned left (west) into a private driveway. As the Oldsmobile crossed the southbound lanes, the right front side surface was impacted by the front left area of the Ford resulting in moderate damage to both vehicles. The restrained 17 year old female driver of the Ford Taurus initiated a forward trajectory in response to the 12 o'clock impact force and loaded the manual restraint and deployed redesigned driver air bag. She was uninjured in the collision.			
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BACKGROUND

This investigation focused on a two vehicle crash involving a 1998 Ford Taurus SE 4-door sedan (subject vehicle) and a 1990 Oldsmobile Cutlass Ciera 4-door sedan. The Ford Taurus was equipped with redesigned frontal air bags for the driver and right passenger positions which deployed as a result of an oblique angle collision with the Oldsmobile Cutlass Ciera. The Oldsmobile driver was operating the vehicle northbound when she failed to observe the southbound Ford as she turned left (west) into a private driveway. As the Oldsmobile crossed the southbound lanes, the right front side surface was impacted by the front left area of the Ford resulting in moderate damage to both vehicles. The restrained 17 year old female driver of the Ford Taurus initiated a forward trajectory in response to the 12 o'clock impact force and loaded the manual restraint and deployed redesigned driver air bag. She was uninjured in the collision.

This crash was initially selected for investigation by the National Automotive Sampling System (NASS) as case number 98-12-805G for the Redesigned Air Bag Special Study. The Crash Investigation Division of the National Highway Traffic Safety Administration (NHTSA) assigned the Special Crash Investigation (SCI) team at Veridian the task of case review and final report preparation.

SUMMARY

Crash Site

This two vehicle crash occurred during the evening hours of October, 1998. At the time of the crash, it was daylight with no adverse conditions as the roads were dry. The crash occurred in the outboard southbound lane of a straight and level five lane east/west asphalt roadway (**see Figure 7 - page 4**). The urban roadway was bordered by barrier curbs, sidewalks and private driveways. No traffic control was present at the scene which had a posted speed limit of 72 km/h (45 mph).

Pre-Crash

The 73 year old female driver of the 1990 Oldsmobile Cutlass Ciera was operating the vehicle northbound (**Figure 1**) on the inboard lane of the five lane roadway when she entered the center turn lane and proceeded to turn left (west) into a private driveway. The 17 year old female driver of the 1998 Ford Taurus was operating the vehicle southbound (**Figure 2**) in the outboard lane when she observed the Oldsmobile cross her path of travel. Upon recognition of the impending harmful event, the Ford driver steered right in avoidance remaining in the outboard southbound lane prior to the collision.

Crash

As the Oldsmobile crossed the southbound lanes of the five lane urban roadway, the right front side surface was impacted by the front left area of the Ford resulting in moderate damage to both vehicles. The damage algorithm of the WinSMASH program computed velocity changes of 25.0 km/h (15.5 mph) for

the subject vehicle and 29.7 km/h (18.5 mph) for the struck Oldsmobile. Respective longitudinal components were -24.6 km/h (-15.3 mph) and -14.9 km/h (-9.3 mph). The impact induced deceleration was sufficient to deploy the Ford's redesigned frontal air bag system. At this point, both vehicles were re-directed in a southwesterly direction and came to rest in close proximity to the point of impact facing southwest.



Figure 1. Northbound approach for the 1990 Oldsmobile Cutlass Ciera.



Figure 2. Southbound approach for the 1998 Ford Taurus SE.

Post-Crash

The driver of the Ford Taurus exited the vehicle under her own power. The exit status of the Oldsmobile occupants were unknown. Treatment was rendered at the scene by fire department personnel and emergency medical technicians (EMTs). Both drivers were uninjured as the front right passenger of the Oldsmobile was transported by ambulance to a local hospital for treatment and released. Both vehicles were towed from the scene due to disabling damage.

RABSS VEHICLE

The 1998 Ford Taurus SE was identified by the Vehicle Identification Number (VIN): 1FAFP53SXWG (production sequence deleted). The vehicle was a 4-door sedan equipped with front wheel drive and a 3.0 liter, V-6 engine. The vehicle's odometer reading was 14,690 km (9,128 miles) at the time of the crash. The police report did not specify the owner of the vehicle. The seating was configured with front bucket and rear bench seats (with folding backs). The surrogate interview reported no previous crashes or maintenance on the air bag system (original equipment). No cell phone was present or in-use at the time of the collision.

VEHICLE DAMAGE

Exterior Damage

The 1998 Ford Taurus SE sustained moderate frontal damage as a result of the impact with the Oldsmobile Cutlass Ciera (**Figure 3**). The direct contact damage began at the front left bumper corner and extended 85.0 cm (33.5 in) inboard. The impact deformed the full frontal width resulting in a combined direct and induced damage length (Field L) of 132.0 cm (52.0 in). Six crush measurements were documented at the level of the bumper: C1= 17.0 cm (6.7 in), C2= 21.0 cm (8.3 in), C3= 26.0 cm (10.2 in), C4= 11.0 cm (4.3



Figure 3. Frontal damage to the 1998 Ford Taurus SE.

in), C5= 1.0 cm (0.4 in), C6= 0 cm. The Collision Deformation Classification (CDC) for this impact to the Ford was 12-FYEW-2 with a principal direction of force of (-)10 degrees. An indentation was documented to the center portion of the bumper attributed to the front right bumper corner of the Oldsmobile. The hood was displaced up and rearward from engagement against the side surface of the Oldsmobile. Induced damage was noted to the fenders which were deformed slightly rearward. No reduction in the vehicle's wheelbase was sustained. The windshield was fractured from (exterior) impact forces and the (interior) front right air bag module cover flap. All tempered glazing remained undamaged.



Figure 4. Front right damage to the 1990 Oldsmobile Cutlass Ciera.

The 1990 Oldsmobile Cutlass Ciera 4-door sedan sustained moderate frontal damage as a result of the impact with the Ford Taurus (**Figure 4**). The direct contact damage began at the front right bumper corner and extended 64.0 cm (25.2 in) rearward. The impact resulted in a combined direct and induced damage length (Field L) of 113.0 cm (44.5 in). The CDC for this impact to the Oldsmobile was 02-RFEW-3 with a principal direction of force of (+)60 degrees. The right fender was deformed laterally to the left which restricted the right front wheel/tire (not deflated). End structure shifting to the left measured approximately 18.0 cm (7.1 in). The hood was deformed up and to the left from the

impact force.

Interior Damage

There was no damage to the interior surfaces of the Ford Taurus from intrusions or occupant contact.

REDESIGNED AIR BAG SYSTEM

The 1998 Ford Taurus SE was equipped with redesigned frontal air bags for the driver and front right passenger positions. The air bags had deployed as a result of the crash. The driver air bag was housed in the center of the steering wheel with a horizontally oriented flap tear seam (H-configuration). No contact evidence was identified on the air bag or exterior surface of the module cover flaps. The flaps were nearly symmetrical in shape as the upper flap measured 15.0 cm (5.9 in) in width and 8.0 cm (3.1 in) in height while the lower flap measured 15.0 cm (5.9 in) in width and 6.0 cm (2.4 in) in height. Multiple black vinyl transfers were noted across the face of the air bag from expansion within the module. The NASS researcher measured the diameter of the driver air bag at 56.0 cm (22.0 in) in its deflated state (**Figure 5**). The bag was tethered by two internal straps and vented by two ports located at the 11 o'clock and 1 o'clock sectors on the rear aspect of the air bag.

The front right passenger air bag deployed from the right top instrument panel area with a single cover flap design hinged at the forward aspect (*right mid-windshield area fractured by the module cover flap*). No contact evidence was identified on the air bag or exterior surface of the module cover flap. The cover flap was rectangular in shape and measured 40.0 cm (15.7 in) in width and 25.0 cm (9.8 in) in height. The NASS researcher measured the passenger air bag at 62.0 cm (24.4 in) in width and 56.0 cm (22.0 in) in height in its deflated state (**Figure 6**). No internal tether straps or vent ports were present. No cutoff switch was found for the front right air bag.



Figure 5. 1998 Ford Taurus SE redesigned driver air bag.



Figure 6. 1998 Ford Taurus SE redesigned passenger air bag.

DRIVER DEMOGRAPHICS

Age/Sex:	17 year old female
Height:	168 cm (66 in)
Weight:	57 kg (125 lb)
Seat Track Position:	Middle position
Manual Restraint Use:	3-point lap and shoulder belt system
Usage Source:	NASS vehicle inspection, surrogate interview, police report
Eyewear:	None
Type of Medical Treatment:	None

Driver Injuries

<i>Injury</i>	<i>Severity (AIS 90)</i>	<i>Injury Mechanism</i>
None	N/A	N/A

Driver Kinematics

The 17 year old female driver of the 1998 Ford Taurus SE was properly restrained by the available 3-point manual lap and shoulder belt system, seated in an upright posture with the seat track adjusted to the middle position. Belt usage was confirmed by the lack of significant interior contacts and injury. At impact, she initiated a forward trajectory in response to the 12 o'clock impact force and loaded the manual restraint and deployed redesigned driver air bag. The driver was uninjured in the collision. The combination of restraint options provided protection against further contact to the steering wheel hub/rim and potential serious injury.

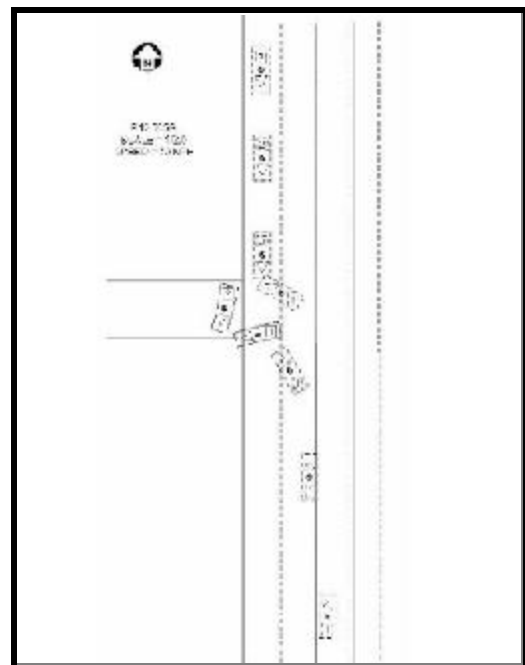


Figure 7. NASS Scene Diagram.