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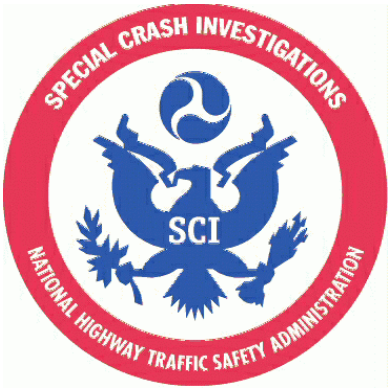
REMOTE AIR BAG DEPLOYMENT REPORT

CASE NUMBER - IN01-001
LOCATION - Texas
VEHICLE - 1991 FORD LTD CROWN VICTORIA
CRASH DATE - November 1998

Submitted:

August 12, 2002



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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 be 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.

Technical Report Documentation Page

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16. *Abstract*

This report covers a remote investigation of an air bag deployment crash involving a 1991 Ford LTD Crown Victoria (case vehicle) and a 1989 Mitsubishi Mirage (other vehicle). This crash is of special interest because the case vehicle's unrestrained driver (84-year-old female) sustained critical chest injuries from her deploying driver air bag module's cover flap, resulting in her death. The case vehicle had been traveling west in the inside westbound lane of a four-lane, undivided city street and was entering a partially controlled four-leg intersection, intending to turn left and travel in a southerly direction. The Mitsubishi was traveling east in the inside lane of the same city street and was entering the intersection, intending to continue traveling in a easterly direction. The case vehicle's driver made no known avoidance maneuvers. The crash occurred within the intersection. The front left half of the case vehicle impacted the front left of the Mitsubishi, causing the case vehicle driver's air bag to deploy. The case vehicle rotated approximately 10 degrees counterclockwise, the Mitsubishi was deflected southward and was pushed approximately 10 degrees clockwise, and the two vehicles came to rest still in contact with one another. Both vehicles were towed from the scene due to disabling damage. The case vehicle driver was not using the available three-point lap-and-shoulder safety belt system. She was probably seated in a normal driving posture with the split bench seat adjusted close to full forward. The deploying driver's air bag module cover flaps contacted her chest and abdomen, causing lacerations of the myocardium, a laceration of the interventricular septum, rib and sternum fractures, multiple lacerations of the liver, and other injuries. The deploying air bag caused abrasions and contusions on her face and upper chest. She was pronounced dead approximately 50 minutes post-crash. The case vehicle's restrained front right passenger (91-year-old male) did not sustain any injuries.

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This remote report was brought to the NHTSA's attention on January 18, 2001 by an attorney representing the family of the deceased driver of the case vehicle. This crash involved a 1991 Ford LTD Crown Victoria (case vehicle) and a 1989 Mitsubishi Mirage (other vehicle). The crash occurred in November, 1998, at 3:29 p.m., in Texas and was investigated by the applicable city police department. This crash is of special interest because the unrestrained case vehicle driver (84-year-old female) sustained critical chest injuries from her deploying driver air bag module's cover flap, resulting in her death. This contractor was unable to interview the case vehicle driver or the front right passenger because of the driver's death. This summary is based on the Police Crash Report, an interview with the investigating police officer, police on-scene vehicle photographs, photographs of the damaged case vehicle provided by the attorney, occupant kinematic principles, the driver's autopsy records, and this contractor's evaluation of the evidence.

CRASH CIRCUMSTANCES

The case vehicle had been traveling west in the inside westbound lane of a four-lane, undivided city street and was entering a partially controlled four-leg intersection, intending to turn left and travel in a southerly direction (there were two lanes in both the east and westbound directions; there was no traffic control for east-west traffic and there were STOP signs for the intersecting north-south roadway). The Mitsubishi was traveling east in the inside lane of the same city street and was entering the intersection, intending to continue traveling in a easterly direction. The case vehicle's driver made no known avoidance maneuvers prior to the crash. The driver of the Mitsubishi locked-up her brakes and tried to steer to the right in an attempt to avoid the crash. The Mitsubishi deposited 11.6 meters [38 feet] of straight-line skid marks prior to impact (**Figure 1**). The crash occurred within the intersection of the two roadways (**Figure 2**).

Figure 1: On-scene view looking east at case vehicle's (left) and Mitsubishi's (right) final rest positions and braking skid marks from Mitsubishi; Note: Mitsubishi deflected slightly southward while rotating slightly clockwise (case photo #01)

Figure 2: On-scene view looking west at case vehicle's (right) and Mitsubishi's (left) final rest positions; Note: case vehicle rotated counter-clockwise post-impact (case photo #03)

The front left half of the case vehicle (**Figures 3** and **4**) impacted the front left of the Mitsubishi (**Figure 5**), causing the case vehicle driver's air bag to deploy. The case vehicle rotated approximately 10 degrees counterclockwise and came to rest heading in a south-southwesterly direction. The Mitsubishi was deflected southward and was pushed approximately 10 degrees clockwise prior to coming to rest heading east-southeastward. The vehicles remained in contact with each other at final rest (**Figure 6**).

CASE VEHICLE

The case vehicle was a rear wheel drive 1991 Ford LTD Crown Victoria six-passenger, four-door sedan (VIN: 2FACP73F6MX------), equipped with a 5.0 liter V8 engine and an automatic transmission with a column-mounted selector lever. The case vehicle was not equipped with anti-lock brakes. Its wheelbase was 290 centimeters [114.3 inches]. Its odometer reading is not known. The case vehicle was reported as having been towed due to damage, but there are not clear images that show disabling damage, except that the driver's air bag was deployed.

Based on the available photographs, the case vehicle's contact with the Mitsubishi involved the left half of the case vehicle's front plane. Direct damage extended approximately from the center to the front left corner on the bumper and grille, with induced damage extending across the entire front. Portions of the grille were broken away, but the headlight and turn signal assemblies were intact (**Figure 3**). The case vehicle's left front fender sustained induced damage as it was pushed rearward (**Figure 5**). All glazing appears to have remained intact and no doors came open.

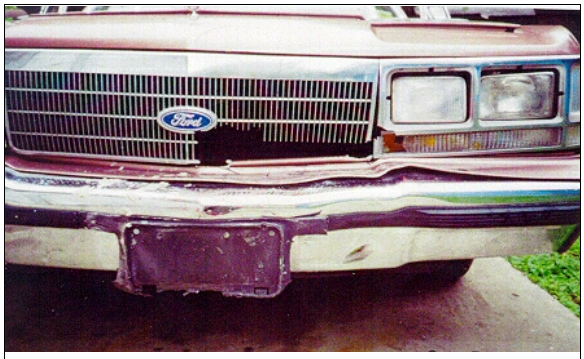

Figure 3: Case vehicle's damaged front bumper and grille (case photo #07)

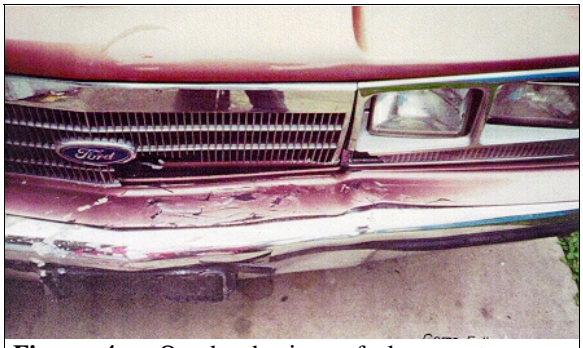

Figure 4: Overhead view of damage to case vehicle's front bumper and grille (case photo #08)

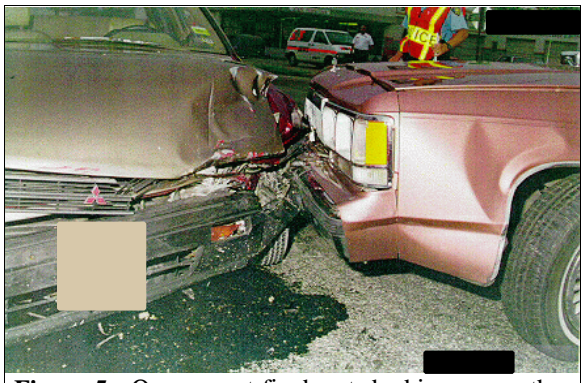

Figure 5: On-scene at final rest, looking across the case vehicle's front from the left and showing the Mitsubishi's front left area (case photo #05)

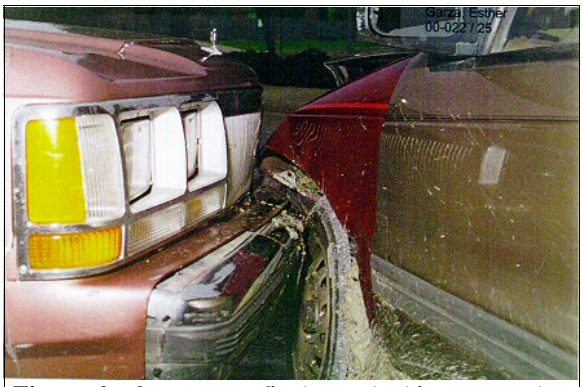

Figure 6: On-scene at final rest, looking across the case vehicle's front from the right and showing the Mitsubishi's left front wheel (case photo #04)

Based on the available photographs, the CDC for the case vehicle was estimated as: **01-FYEW-1 (30)**. Maximum crush was estimated at 8 centimeters [3 inches]. The WinSMASH reconstruction program, CDC-only algorithm based on photographs of both vehicles, was used. The Total, Longitudinal, and Lateral Delta Vs are, respectively: 14 km.p.h. [8.7 m.p.h.], -12 km.p.h. [-7.5 m.p.h.], and -7 km.p.h. [-4.3 m.p.h.]. This is a borderline reconstruction, but the results appear reasonable.

The case vehicle was equipped with a single air bag for the driver's seat position. The air bag was located in the steering wheel hub. Police photographs of the case vehicle indicate that the driver air bag module's cover flaps appear to have opened at the designated tear points and also that there was no visible

evidence of damage during the deployment to the air bag's fabric. There are no clear pictures of the air bag module's cover flaps. Because this case is a remote investigation, it is unknown if the driver's air bag was designed with tethers and/or vent ports, and the air bag's dimensions are also unknown. However, the photographs do show faint blood smears to the driver's air bag (**Figure 7**), but there is no other obvious evidence of occupant contact to the case vehicle's interior surfaces.

CASE VEHICLE DRIVER

The case vehicle driver (84-year-old female, white, Hispanic, 142 centimeters, 49 kilograms [56 inches, 108 pounds]) was not using her available, active, three-point, lap-and-shoulder safety belt system. There was no evidence of belt pattern bruising and/or abrasions on the driver's body mentioned in the autopsy.

The driver's exact posture immediately prior to the crash is unknown, but she was probably seated in an upright posture with her back against the seat back, her left foot on the floor, her right on the accelerator, and both of her hands on the steering wheel (i.e., driver was turning left at the intersection). Based on the available photographs, her seat track appears to have been adjusted close to its forward-most position (**Figure 8**), the seat back was upright and the tilt steering wheel appears to have been adjusted at its middle position.

Figure 7: Case vehicle's deployed driver air bag showing blood spots on fabric (case photo #15)

Figure 8: On-scene view looking across case vehicle's front seating area; Note: close proximity of bench seat to instrument panel (case photo #14)

The case vehicle driver made no known pre-crash avoidance maneuvers. As a result and independent of the non-use of her available safety belts, her pre-impact body position did not change just prior to impact. The case vehicle's impact with the Mitsubishi caused her to move forward and slightly rightward, toward the 30 degree direction of force, as the vehicle decelerated. Either one or both of the deploying driver air bag module's cover flaps contacted the driver's chest and upper abdomen, causing lacerations to her heart and liver and fractures of the ribs and sternum. Immediately following, the air bag contacted her chest, neck, and face, causing multiple abrasions and contusions. She was propelled rearward into her seat back as the case vehicle rotated slightly counterclockwise. The driver's facial interaction with the deploying air bag resulted in the bending and breaking of her prescription eyeglasses and caused one of her earrings to be propelled rearward where it came to rest on the rear shelf near the case vehicle's backlight. According to the available information, at final rest the driver was laying to the right.

The driver was transported by ambulance to a hospital and was pronounced dead approximately 50 minutes post-crash.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1	Lacerations myocardium, 5 cm (2.0 in), gaping, posterior right ventricle with hemomediastinum	441012.5 critical	Driver module's cover flap	Probable	Autopsy
2	Laceration, 1 cm (0.4 in) superior interventricular septum, just below tricuspid valve	441300.5 critical	Driver module's cover flap	Probable	Autopsy
3	Laceration, 2 cm (0.8 in) left anterior pericardium[1]	441602.2 moderate	Driver module's cover flap	Probable	Autopsy
4	Laceration right parietal pleura with right hemothorax	441802.3 serious	Driver module's cover flap	Probable	Autopsy
5	Fractured right ribs, several, anteriorly in association with lacerations {tears} right parietal pleura	450220.2 moderate	Driver module's cover flap	Probable	Autopsy
6	Fracture, transverse, sternum at left 4th rib	450804.2 moderate	Driver module's cover flap	Probable	Autopsy
7	Lacerations, multiple to liver including one 8 cm (3.1 in) into parenchyma of central left lobe and involving both superior and inferior surfaces of liver [2-5 cm (0.8-2.0 in)]	541824.3 serious	Driver module's cover flap	Possible	Autopsy
8	Contusions around right eye including lower right eyelid and right zygoma area	297402.1 minor	Air bag, driver's	Certain	Autopsy
9	Abrasions, deep, whole face including nose, around mouth, right cheek, and anterior and undersurface of chin	290202.1 minor	Air bag, driver's	Certain	Autopsy
10	Contusions intermixed with abrasions above involving nose, around mouth, right cheek, and anterior and undersurface of chin	290402.1 minor	Air bag, driver's	Certain	Autopsy
11	Abrasions, superficial, anterior axillary fold and across upper anterior chest	490202.1 minor	Air bag, driver's	Certain	Autopsy

[1] There was 1 liter of partly clotted blood present in the right pleural, pericardial, and peritoneal spaces. The amount of blood in each of the spaces separately was not reported.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
12	Contusions, faint, anterior axillary fold and across upper anterior chest	490402.1 minor	Driver module's cover flap	Probable	Autopsy
13	Contusions, faint, over epigastruim (i.e., upper middle abdomen)	590402.1 minor	Air bag, driver's	Probable	Autopsy
14	Avulsion {avulsive laceration}, up to 5 cm (2.0 in) on dorsal surface of right hand and forearm, not further specified	790802.1 minor	Unknown contact mechanism	Unknown	Autopsy
15	Contusions {ecchymoses} around right forearm, wrist, and hand, not further specified	790402.1 minor	Air bag, driver's	Probable	Autopsy

FRONT RIGHT PASSENGER

The case vehicle's front right passenger (91-year-old male, white, Hispanic, 165 centimeters, 73 kilograms [65 inches, 160 pounds]) was restrained by his available, active, three-point, lap-and-shoulder safety belt system. He was probably seated in an upright posture with his back against the seat back and his feet on the floor. His seat track appears to be located near the forward-most position, and the seat back was upright. The front right passenger did not sustain any injuries as a result of this crash.

OTHER VEHICLE

The other vehicle was a front wheel drive 1989 Mitsubishi Mirage four-door, five passenger sedan (VIN: JA3CU26X7KU------), equipped with a four-cylinder, 1.2 liter engine. The Mitsubishi was not equipped with anti-lock brakes. Its wheelbase was 246 centimeters [96.7 inches]. Its odometer reading is not known. The Mitsubishi was towed due to disabling damage.

The Mitsubishi's contact with the case vehicle involved approximately the left half of the front plane, with light contact at the center and heavy contact at the front left corner (**Figure 5**). As the vehicles reached maximum engagement and rotated, the contact extended around to the left front fender and the left front wheel area (**Figure 6**). The leading edge of the hood was pushed rearward and downward with the middle of the hood buckling upward. The leading edge of the left front fender was pushed rearward and inward, restricting the left front tire. The left headlight assembly was shattered and the left portions of the grille were broken away. The left end of bumper was pushed rearward, causing the right end to be levered forward and apparently separated from its mounting.

Based on the available photographs, the CDC for the Mitsubishi was estimated as: **11-FYEW-2 (340)**. Maximum crush was estimated as 30 centimeters [11.8 inches]. The WinSMASH reconstruction program, CDC-only algorithm based on photographs of both vehicles, was used. The Total, Longitudinal and Lateral Delta Vs are, respectively: 24 km.p.h. [14.9 m.p.h.], -23 km.p.h. [-14.3 m.p.h.] and +8 km.p.h [+5.0 m.p.h.]. This is a borderline reconstruction, but the results appear reasonable.