

TRANSPORTATION RESEARCH CENTER

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REMOTE AIR BAG REPORT

CASE NUMBER - IN97-012

LOCATION - Oklahoma

VEHICLE - 1994 FORD ASPIRE

CRASH DATE - June, 1996

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June 18, 1998

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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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15. <i>Supplementary Notes</i> Remote air bag deployment investigation involving a 1994 Ford Aspire, four-door sedan, with manual safety belts and dual front air bags, and a 1991 Ford Tempo GL, four-door sedan					
16. <i>Abstract</i> This report covers a remote investigation of an air bag deployment crash that involved a 1994 Ford Aspire (case vehicle) and a 1991 Ford Tempo GL (vehicle #2). This crash is of special interest because the case vehicle's unrestrained driver (39-year-old female) sustained fatal thoracic cavity injuries as a result of impacting the driver air bag. The case vehicle was traveling westbound on a two-lane, undivided, US route. Vehicle #2 was also traveling west on the same roadway, immediately in front of the case vehicle. The front of the case vehicle impacted the back of vehicle #2, causing the case vehicle's driver and right front passenger supplemental restraints (air bags) to deploy. The Longitudinal Delta v for the case vehicle was estimated to be approximately -21 km.p.h. (-13 m.p.h.). The case vehicle's driver was seated with her seat track located near its forward-most position. It is unknown if the case vehicle was equipped with a tilt steering wheel. This seat adjustment is consistent with the driver's short stature and indicates that her pre-crash seated position was very close to the steering wheel. She was not wearing her available, active, three-point, lap and shoulder belt. The case vehicle's driver was transported to a hospital via ambulance, where she was pronounced dead approximately two-and-a-half hours post-crash. She sustained, according to her medical records, fatal thoracic cavity injuries (i.e., specifically, a hemopneumothorax--1400 cubic centimeters), caused by the blunt impact compression of her chest from her deploying driver air bag. In addition, she sustained chest wall abrasions and contusions and a chin contusion from her air bag. Further, she sustained lacerations on the inside of her mouth, caused by the victim's teeth when her chin was impacted by the air bag. Finally, she sustained a displaced fracture of her left inferior pubic ramus, caused by the steering wheel rim. The attending physician suspected (i.e., believed that her injuries were compatible with) a laceration (dissection) of her thoracic aorta.					
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BACKGROUND

This remote investigation was brought to the NHTSA's attention on April 8, 1997 through the NHTSA Auto Safety Hotline. This crash is of special interest because the case vehicle's driver (39-year-old female) sustained a fatal thoracic cavity injury as a result of contacting her deploying driver side air bag. The Hotline informant was interviewed on April 9, 1997. Color photocopies of photographs of both vehicles, the fatal victim's ambulance and hospital records and the Police Crash Report were received on April 28, 1997. The medical examiner's report was received in late May 1997.

CRASH CIRCUMSTANCES

The crash occurred in June 1996 at 8:53 a.m., in Oklahoma, and was investigated by the applicable city police agency. The case vehicle (1994 Ford Aspire) was westbound on a two-lane, undivided, US route, intending to continue straight ahead. Vehicle #2 (1991 Ford Tempo) was also traveling west on the same roadway, immediately in front of the case vehicle. Vehicle #2 stopped because a noncontact vehicle was stopped ahead, waiting to turn left. The front of the case vehicle impacted the back of vehicle #2, causing the case vehicle's driver and right front passenger air bags to deploy. The available evidence indicates that the case vehicle was braking just prior to the impact. This was a low severity impact for both vehicles. The case vehicle's driver was transported to a hospital via ambulance, where she was pronounced dead two-and-one-half hours post crash. The Police Crash Report is silent with regard to the disposition of the vehicles. According to the Hotline informant, vehicle #2 was driven away from the scene shortly after the crash, and the case vehicle was driven away later.

CASE VEHICLE

The case vehicle was a front wheel drive 1994 Ford Aspire, four-door sedan (VIN: KNJLT06H4R6-----). Four-wheel anti-lock brakes were an option for this model, but it is not known if this vehicle was so equipped. The available photographs do not provide good views of the direct contact area on the front plane because the hood is raised and the grille has been removed. The entire front bumper was rotated slightly upward (see **Figures 2 and 3**), and the left headlight assembly showed slight rearward displacement (see **Figure 4**). The headlights and parking lights were intact and there was no evidence of direct or induced damage to the structures behind the grille. In combination with the photographs of vehicle #2, the available evidence indicates that, at the moment of impact, the case vehicle was braking hard, causing the front end to be lowered. The grille of the case vehicle engaged vehicle #2's back bumper, with the leading edge of the hood scraping across the top of vehicle #2's bumper. The upper edge of the case vehicle's front bumper face engaged the lower edge of vehicle #2's back bumper face, causing the bumpers to rotate as the case vehicle's bumper slipped under vehicle #2. Under this scenario, the case vehicle sustained front underride and vehicle #2 sustained back override. The case vehicle's CDC was estimated from the available photographs as **12-FCEW-1**. The SMASH reconstruction program, CDC only algorithm, was used on the case vehicle's impact. The Total, Longitudinal, and Lateral Delta Vs are respectively: 21 km.p.h. (13 m.p.h.), -21 km.p.h. (-13 m.p.h.), and 0 km.p.h. (0 m.p.h.).

Because the case vehicle was not inspected and because the fatally-injured driver of the case vehicle was the sole occupant, there is no information about pre-crash seat adjustments or posture. The available photographs indicate that the driver's bucket seat was adjusted near its forward-most position (see **Figure**

6). This seat adjustment is consistent with the driver’s short stature and indicates that her pre-crash seated position was very close to the steering wheel. The driver’s air bag was located in the steering wheel hub, and the front right passenger air bag was located in the top of the instrument panel. The available photographs do not show any indications of problems with either of the air bags.

CASE VEHICLE OCCUPANT

The case vehicle’s driver [39-year-old female, not pregnant, approximately 152 centimeters, 113 kilograms (60 inches, 250 pounds)] was not restrained by her available, manual, three-point lap-and-shoulder safety belt system. There was no other occupant in the case vehicle. Her physical stature and seat track adjustments were such that she was seated very close to the air bag module in the steering wheel hub.

CASE VEHICLE DRIVER INJURIES

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1	Thoracic cavity injury ¹ with right hemopneumothorax, 1400 ccs	442202.3 serious	Air bag, driver's side	Certain	Post-mortem examination
2	Fracture, slightly displaced, left inferior pubic ramus	852604.3 serious	Steering wheel rim, bottom	Probable	Emergency room records
3	Lacerations inside of mouth, not further specified	243099.1 minor	Air bag, driver's side	Certain	Post-mortem examination
4	Contusion chin	290402.1 minor	Air bag, driver's side	Certain	Post-mortem examination
5	Contusions, anterior chest, one above breasts and one below breasts (epigastric area)	490402.1 minor	Air bag, driver's side	Certain	Post-mortem examination
6	Abrasions chest wall, location not specified	490202.1 minor	Air bag, driver's side	Certain	Emergency room records
7	Contusion {bruise} right ankle	890402.1 minor	Foot controls (e.g., brake pedal)	Probable	EMS treatment record

The available evidence indicates that the driver braked just prior to the impact. This avoidance maneuver caused her to move forward. This pre-impact movement, in combination with the nonuse of her safety belts, resulted in the driver being immediately on top of the air bag module at the time of deployment. The impact caused the air bags to deploy and thrust the driver forward and upward against the steering

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According to the emergency room physician, it was suspected that this patient sustained a lacerated {dissected} thoracic aorta; however, because no invasive examination of this patient was performed, this lesion was never confirmed. The emergency room radiologist (via X-ray) indicated the presence of a hemopneumopericardium in addition to a large right pleural effusion (i.e., hemorrhage). This is consistent with the emergency room physician’s suspicion of a probable pericardial tamponade (hemopericardium). According to the physician, blood loss caused the on-set of bradycardia which resulted in a ventricular fibrillation and subsequent tachycardia with the end result of this patient being asystolic (cardiopulmonary arrest), at which time the “code” was commenced.

wheel. The lower portion of the steering wheel rim engaged her pelvis, causing a displaced fracture of her left inferior pubic ramus. With her chest against the steering wheel, she sustained the full force of the deploying air bag, which caused contusions and abrasions to her chest wall. The expanding air bag compressed her chest, causing a right hemopneumothorax (and suspected dissection of the thoracic aorta). The air bag struck her under the chin, causing a contusion on the chin. In addition, the air bag forced her mouth closed causing her teeth to lacerate the inside of her mouth.

The case vehicle's driver was semi-conscious and moaning when the driver of vehicle #2 approached her shortly after the crash. When the ambulance arrived, she was unresponsive to verbal commands and exhibited short, shallow, rapid breathing and a weak pulse. At the hospital, she suffered full cardiac arrest about one hour after arrival. Resuscitation efforts were unsuccessful, and she was pronounced dead two-and-a-half hours after the crash.

VEHICLE #2

Vehicle #2 was a 1991 Ford Tempo GL, four-door sedan (VIN: 2FAPP36X6MB-----). The entire back bumper was rotated slightly downward (see **Figures 8 and 9**). There was a scrub mark centered on the top surface of the back bumper (see **Figure. 7**) that was a light blue color matching the color of the case vehicle. The other features of the back plane show no damage. The floor of the trunk had an area of minor buckling. The CDC for vehicle #2 was estimated from the available photographs as **06-BCLW-1**. The SMASH reconstruction program, CDC only algorithm, was used on vehicle #2's impact. The Total, Longitudinal, and Lateral Delta Vs are respectively: 16 km.p.h. (10 m.p.h.), +16 km.p.h. (+10 m.p.h.), and 0 km.p.h. (0 m.p.h.).

SELECTED PHOTOGRAPHS



Figure 1: Case vehicle's front (case photo #01)

SELECTED PHOTOGRAPHS (Continued)



Figure 2: Case vehicle's left side; note: bumper rotated upward (case photo #02)



Figure 3: Case vehicle's right side; note: bumper rotated upward (case photo #03)

SELECTED PHOTOGRAPHS (Continued)

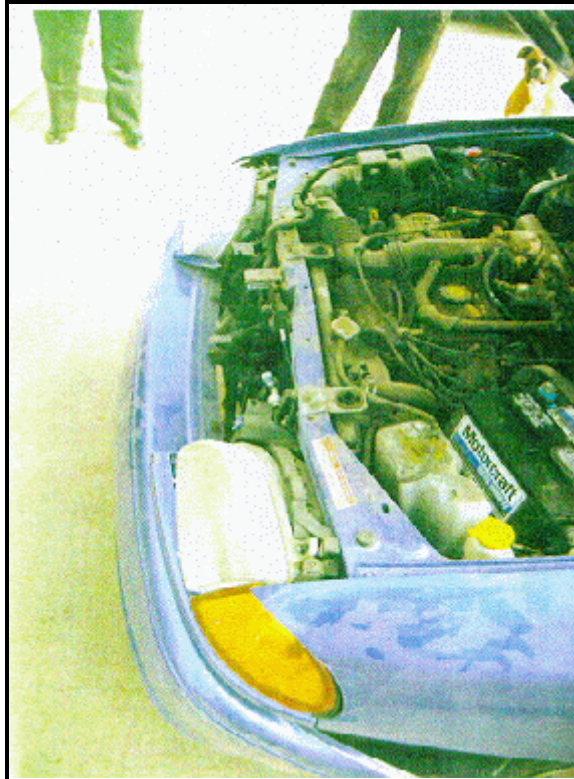


Figure 4: Case vehicle's front and engine compartment, looking down from left; note: left headlight displaced rearward (case photo #04)

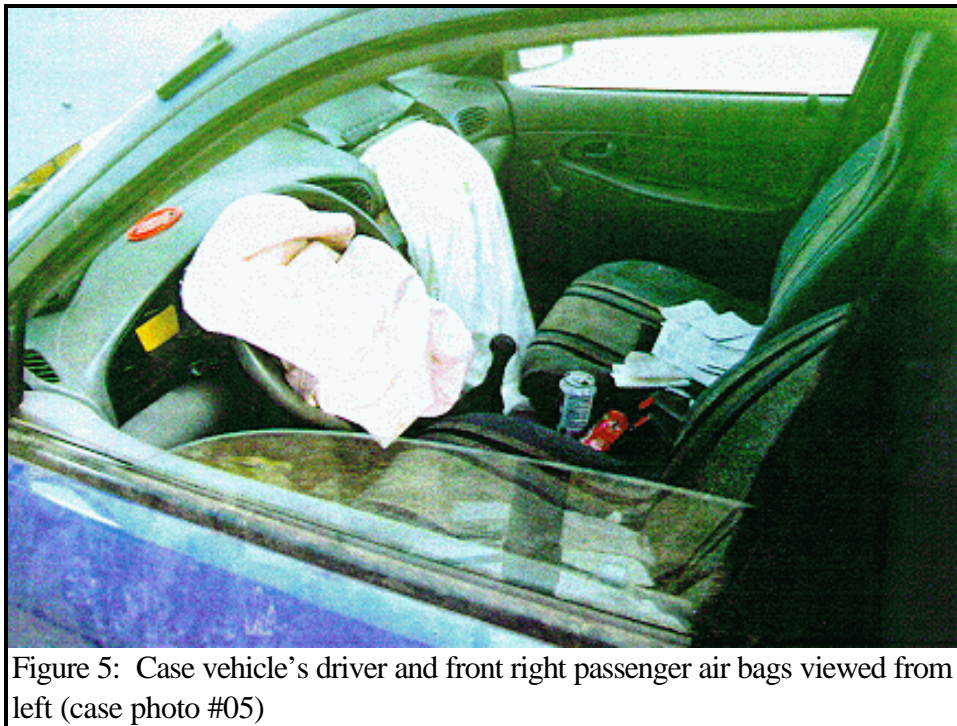


Figure 5: Case vehicle's driver and front right passenger air bags viewed from left (case photo #05)

SELECTED PHOTOGRAPHS (Continued)



Figure 6: Case vehicle's front seating area; note: driver's seat adjusted near its forward-most position (case photo #06)



Figure 7: Vehicle #2's back; note: blue scrub mark at center of bumper (case photo #07)

SELECTED PHOTOGRAPHS (Continued)



Figure 8: Vehicle #2's back and left side; note: bumper rotated downward (case photo #08)



Figure 9: Vehicle #2's right rear corner; note: bumper rotated downward (case photo #09)