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REMOTE AIR BAG DEPLOYMENT REPORT

CASE NUMBER - IN98-024

LOCATION - Texas

VEHICLE - 1994 PONTIAC FIREBIRD

CRASH DATE - December 1994

Submitted:

April 10, 2002



Contract Number: DTNH22-94-D-17058

Prepared for:

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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. <i>Abstract</i> This report covers an remote investigation of an air bag deployment crash that involved a 1994 Pontiac Firebird (case vehicle) and a 1980 Mercury Grand Marquis (other vehicle). This crash is of special interest because the case vehicle's unrestrained front right passenger (4-year-old male) sustained severe spinal cord injuries as a result of impacting the deploying front right passenger air bag's cover flap. The case vehicle was traveling south in the inside southbound lane of a five-lane undivided roadway and intended to continue traveling south (i.e., two southbound lanes and two northbound lanes with a bi-directional, center left turn lane). The other vehicle was traveling north in the inside northbound through lane of the same roadway and attempted to turn left from the through lane across the path of the case vehicle into a driveway. The front of the case vehicle impacted the right side of the other vehicle, causing the case vehicle's driver and front right passenger air bags to deploy. The front right passenger in the case vehicle was not wearing his available, active, three-point, lap-and-shoulder safety belt. According to his medical records he sustained a disruption of the C1-C2 vertebral junction with complete cord syndrom resulting in ventilator-dependant quadriplegia, and other injuries. The case vehicle's driver (22-year-old male) was not wearing his available, active, three-point, lap-and-shoulder safety belt and sustained police-reported "C" (possible) injuries as a result of this crash. The driver's specific injuries and treatment status are not known. Both vehicles were towed due to disabling damage.					
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This remote report investigation was brought to the NHTSA's attention on October 20, 1998 by an attorney representing the seriously injured front right passenger. This crash involved a 1994 Pontiac Firebird (case vehicle), and a 1980 Mercury Grand Marquis (other vehicle). The crash occurred in December 1994, at 1:25 p.m., in Texas and was investigated by the applicable city police department. This crash is of special interest because the case vehicle's front right passenger (4-year-old male) sustained permanent debilitating injuries (ventilator-dependant quadriplegia) from his deploying front right passenger air bag. This summary is based on the Police Crash Report, on-scene photographs and a video tape recording of the case vehicle at a tow yard, occupant medical records, occupant kinematic principles, and this contractor's evaluation of the evidence.

CRASH CIRCUMSTANCES

The case vehicle was traveling south in the inside southbound through lane of a five-lane, undivided city roadway (i.e., two northbound and two southbound through lanes and one bi-directional, center left turn lane) and intended to continue traveling southbound. The other vehicle was traveling north in the inside northbound through lane of the same roadway and attempted to turn left into a driveway, across the path of the case vehicle. The case vehicle's driver braked, attempting to avoid the crash. The crash occurred in the inside southbound lane within the three-leg driveway intersection.

The front of the case vehicle impacted the right front door panel of the other vehicle, causing the case vehicle's driver and front right passenger air bags to deploy. Both vehicles came to rest near the point of impact (**Figure 1**). The other vehicle was partially blocking both southbound travel lanes. Both vehicles were towed due to disabling damage.



Figure 1: On-scene view of the two vehicles at final rest (case photo #05)

CASE VEHICLE

The case vehicle was a rear wheel drive 1994 Pontiac Firebird, four-passenger, two-door lift back (VIN: 2G2FS22S3R2-----), equipped with a 3.4 liter V6 engine and an automatic transmission with a console-mounted selector lever. Braking was achieved by a four-wheel anti-lock braking system which is a standard feature on this model vehicle. Its wheelbase was 257 centimeters [101.1 inches]. The odometer reading is not known.

The interior of the case vehicle was fitted with adjustable front bucket seats with adjustable head restraints and manual three-point lap-and-shoulder safety belts in the four outboard seat positions. The vehicle was equipped with knee bolsters for the driver and front right passenger seat positions. It is unknown if the front safety belt systems were equipped with manually operated height adjusters for the D-rings. The rear seat was a bench with separate back cushions.

The case vehicle's direct contact with the right side of the other vehicle extended across the entire

rounded front bumper fascia. The deformation was heavier on the right, with the front right headlight assembly broken away and the right front fender sustaining induced damage. The plastic front bumper fascia had been compressed and rebounded, and the leading edge of the hood was scratched and bent. Neither of the front tires were physically restricted from the front end damage and there was no glazing damage.

Based on the on-scene photographs and tow yard video, the case vehicle's CDC was estimated as: **12-FDEW-1 (350)**. The WinSMASH reconstruction program, CDC only algorithm, was used, based on visually estimated CDCs for the two vehicles. The preliminary Total, Longitudinal, and Lateral Delta Vs are respectively: 22 km.p.h. [13.7 m.p.h.], -22 km.p.h. [-13.7 m.p.h.], and +4 km.p.h. [+2.5 m.p.h.]. These results should be regarded as borderline but reasonable. The case vehicle was towed due to damage.

The case vehicle's driver air bag was located in the steering wheel hub. The video tape shows that the air bag module's cover flaps opened at the designated tear points, with no obvious damage to the air bag or the cover flaps.

The front right passenger's air bag was located in the top of the instrument panel. The video tape shows that the air bag module's single cover flap opened at the designated tear points and there was no obvious damage to the air bag or the instrument panel structures surrounding the module (**Figure 2**). This module was of the type where the cover flap is entirely separate from the rest of the module, with the cover flap attached by a single wide mesh tether. (An example of this type of cover flap, taken from a different vehicle, is shown in **Figure 3**.) The video does not provide good views of the module's cover flap, but it appears that the cover flap was entirely separated from the mesh tether and stuffed back into the module area. The cover flap appears to be bent, approximately at the middle. It is not known whether the apparent damage was a result of the deployment or post-crash handling.

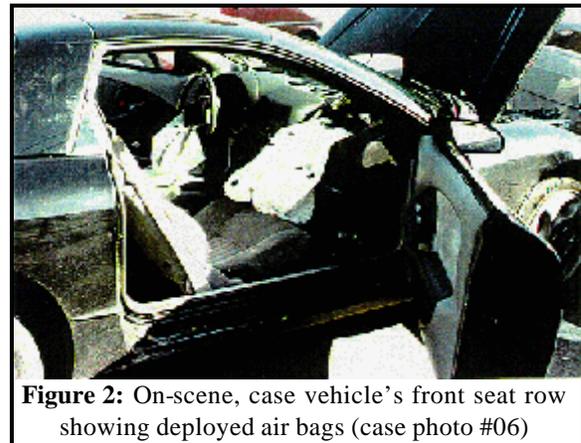


Figure 2: On-scene, case vehicle's front seat row showing deployed air bags (case photo #06)

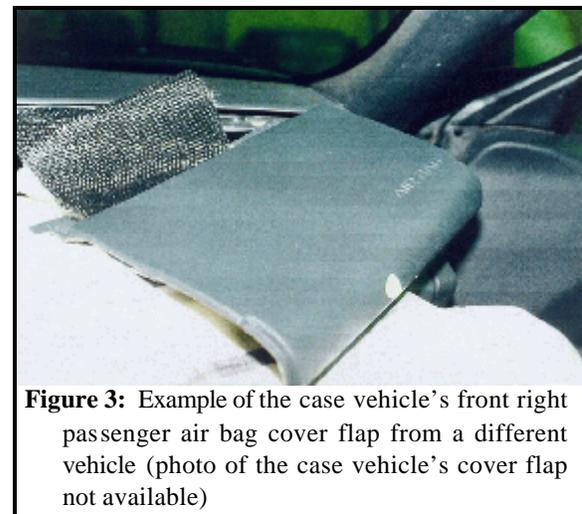


Figure 3: Example of the case vehicle's front right passenger air bag cover flap from a different vehicle (photo of the case vehicle's cover flap not available)

CASE VEHICLE'S FRONT RIGHT PASSENGER

The case vehicle's front right passenger (4-year-old male, white, unknown if Hispanic, 102 centimeters, 20 kilograms [40 inches, 44 pounds]) was not wearing his available, active, three-point, lap-and-shoulder safety belt. He was unconscious at the scene and was transported via ambulance to a local

hospital. He was subsequently transferred to a pediatric trauma center via helicopter and was hospitalized for 37 days. He was discharged to a long-term care facility with ventilator-dependant quadriplegia.

The front right passenger’s posture immediately prior to the crash is unknown. The case vehicle's driver braked, attempting to avoid the crash. As a result of this attempted avoidance maneuver and the non-use of his available safety belts, the front right passenger moved forward just prior to impact and was probably very close to the front right air bag module. The case vehicle's impact with the other vehicle caused the front right passenger to move further forward, pitching him slightly upward and to the left towards the 350 degree direction of force, and caused the front right air bag to deploy. The passenger was probably struck on the underside of his jaw by the module cover flap, causing bilateral subcondylar fractures of the mandible, dislocating the left temporomandibular joint and forcing his head rearward causing hyperflexion of the cervical spine. His interaction with the deploying air bag probably caused him to be lifted up and propelled upward and rearward as the air bag reached maximum expansion. He was probably pushed back into his seat and then rebounded forward. According to the Emergency Room summary, the passenger was found laying on the floor in the front right footwell, bleeding from the mouth, nose and left ear. There was heavy blood staining on the front edge of the front right seat’s upholstery and on the floor mat.

FRONT RIGHT PASSENGER’S INJURIES

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1	Complete cord syndrome ¹ , with dislocation of C1-C2	640274.6 maximum	Front right air bag cover flap	Possible	Hospitalization records
2	Nonanatomic brain injury, unconscious, GCS ² =3-4, unresponsive ³ , eyes were deviated upward and sluggish	160824.5 critical	Front right air bag cover flap	Possible	Emergency room records
3	Dislocation of left temporomandibular joint with swelling	251604.2 moderate	Front right air bag cover flap	Possible	Emergency room records
4	Fracture of mandible, subcondylar, bilateral	250608.2 moderate	Front right air bag cover flap	Possible	Hospitalization records
5	Contusion {bruise} left face, not further specified	290402.1 minor	Front right air bag cover flap	Possible	Emergency room records

¹ The injury was described as “complete C1 spinal cord injury with C1-2 disruption”

² This patient’s Glasgow Coma Scale score equaled 3 initially, but raised to 4, just prior to transfer.

³ This patient’s eyebrows “twitched/flinched” when painful stimuli was applied to his forehead; otherwise, he was flaccid with no response to painful stimuli below his neck.

The case vehicle driver (22-year-old male, white, unknown if Hispanic, height and weight unknown) was not wearing his available, active, three-point, lap and shoulder belt. The driver sustained police-reported "C" (possible) injuries in the crash. His specific injuries and treatment status are not known.

The driver braked, attempting to avoid the crash. As a result of this attempted avoidance maneuvers and the non-use of his available safety belts, the driver moved forward just prior to the impact. The case vehicle's impact with the other vehicle caused him to move further forward and slightly to the left, toward the 350 degree direction of force. The driver's interaction with the deploying air bag probably caused him to be propelled rearward as the air bag reached maximum expansion. The final rest position of the case vehicle driver is not known, but he was probably in his seat near his original seating position.

OTHER VEHICLE

The other vehicle was a rear wheel drive 1980 Mercury Grand Marquis, six-passenger, four-door sedan (VIN: 0Z66F-----), equipped with a 5.0 liter V8 engine and an automatic transmission. Its wheelbase was 270 centimeters [114.1 inches]. The odometer reading is not known.

The other vehicle's CDC was estimated from photographs (see **Figure 1**) as **02-RPEW-2 (60)**. The WinSMASH reconstruction program, CDC-only algorithm based on visually estimated CDCs for both vehicles, was used. The preliminary Total, Longitudinal, and Lateral Delta Vs are respectively: 20 km.p.h. [12.4 m.p.h.], -10 km.p.h.[-6.2 m.p.h.], and -17 km.p.h. [-10.6 m.p.h.]. These results should be regarded as borderline but reasonable. The Mercury was towed due to damage.



Figure 4: On-scene, left side of the other vehicle at final rest (case photo #08); see also **Figure 1**