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REMOTE AIR BAG DEPLOYMENT REPORT

CASE NUMBER - IN99-029
LOCATION - Ohio
VEHICLE - 1998 PONTIAC SUNFIRE SE
CRASH DATE - April 1998

Submitted:

May 21, 1999

Contract Number: DTNH22-94-D-17058

Prepared for:

U.S. Department of Transportation
National Highway Traffic Safety Administration
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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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Remote air bag deployment investigation involving a 1998 Pontiac Sunfire SE, equipped with manual safety belts and front redesigned air bags, and a wooden utility pole

16. *Abstract*

This report covers a remote investigation of an air bag deployment crash that involved a 1998 Pontiac Sunfire SE (case vehicle) and a wooden utility pole. This crash is of special interest because the case vehicle was equipped with redesigned air bags that deployed as a result of the collision events, and the unrestrained front right passenger (32-year-old female) suffered a transection of her aorta due to blunt force compression of her chest. The case vehicle was traveling east at high speed in the eastbound lane of a two-lane, undivided city street and was approaching a curve to the left. The driver lost control while attempting to negotiate the curve, and the case vehicle went off the road edge to the right (south). The case vehicle was in a slight counterclockwise yaw as a result of the driver's loss of control. The front right corner of the case vehicle impacted a large wooden utility pole, causing the driver and front right passenger supplemental restraints (air bags) to deploy. The right front wheel and suspension snagged against the pole, and the case vehicle pitched and rotated approximately 80 degrees clockwise. The front right door came open as a result of the impact damage. The seat adjustments and seated posture of the case vehicle's front right passenger are not known. She was not restrained by her available, manual, three-point lap-and-shoulder safety belt system, and the front right passenger fell out of the open door onto the roadway. She sustained, according to her medical records, a fatal laceration of her aorta was declared dead at the scene and transported directly to the morgue. The case vehicle's driver (unknown age and sex) fled the scene on foot and has not been identified. The crash severity for the case vehicle was high [greater than 40 km.p.h. (25 m.p.h.)].

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BACKGROUND

IN99-029

This case was brought to the NHTSA's attention by a review of the 1998 Fatality Analysis Reporting System (FARS) in February, 1999. The crash involved a 1998 Pontiac Sunfire SE (case vehicle) that a wooden utility pole. The crash occurred in April, 1998 at 11:29 p.m. in Ohio and was investigated by the applicable city police. This crash is of special interest because the case vehicle was equipped with redesigned air bags that deployed as a result of the collision events, and the case vehicle's unrestrained front right passenger [32-year-old, Black (unknown if Hispanic) female] sustained a transection of her aorta due to blunt force compression of her chest. The Police Crash Report was received in March, 1999, police photographs in April, 1999 and the autopsy report in May, 1999. This report is based on the Police Crash Report, the autopsy report, police on-scene photographs, occupant kinematic principles, and this contractor's evaluation of the evidence.

CRASH CIRCUMSTANCES

The case vehicle was traveling east at high speed in the eastbound lane of a two-lane, undivided city street and was approaching a curve to the left. The speed limit was 56 km.p.h. (35 m.p.h.). It was dark with street lights, light rain was falling, and the roadway was wet. The asphalt surface was old and worn, but there were no specific roadway defects, and there were no traffic controls other than double yellow solid painted lane lines. The driver lost control while attempting to negotiate the curve and the case vehicle went off the road edge to the right (south). As the case vehicle departed the roadway, the right front wheel traveled up onto the adjacent sidewalk by passing through the mouth of a driveway and up the tapered side of the driveway cut (i.e., the wheel was on the sidewalk but did not mount a curb or sustain a wheel impact). The case vehicle was in a slight counterclockwise yaw as a result of the driver's loss of control. There is no evidence that the driver of the case vehicle attempted any avoidance action other than the left-curve steering maneuvers involved in attempting to follow the road.

The crash occurred off the road on the right (south) side (**Figure 1**). The front right corner of the case vehicle impacted a large wooden utility pole, causing the driver and front right passenger supplemental restraints (air bags) to deploy. The right front wheel and suspension snagged against the pole, and the case vehicle pitched and rotated approximately 80 degrees clockwise, coming to rest with all four wheels in the roadway. The front right door came open as a result of the impact damage, and the front right passenger fell out of the open door onto the roadway. She was declared dead at the scene and was transported directly to the morgue. The case vehicle's driver fled the scene on foot and has not been identified. The crash severity for the case vehicle was high [greater than 40 km.p.h. (25 m.p.h.)].

Figure 1: On-scene view of case vehicle's right side at final rest; Note: tire scrub in driveway and blood on street near open door (case photo #06)

The case vehicle was a front wheel drive 1998 Pontiac Sunfire SE, five-passenger, two-door coupe (VIN: 1G2JB124XW7------) equipped with a 2.2 liter I-4 engine and an automatic transmission, with floor-mounted selector lever. Four wheel anti-lock brakes are standard for this vehicle. The case vehicle's wheelbase was 264 centimeters (104.1 inches). The odometer reading is not known. The case vehicle was towed due to disabling damage.

The case vehicle was in a slight counterclockwise yaw (approximately -20 degrees) when it hit the pole. The impact with the pole was at the apex of the front right corner and was assigned to the front plane. The impact was slightly off horizontal due to the front right wheel ramping up the side of the driveway. The front bumper beneath the bumper fascia was not contacted (**Figure 2**). The pole crushed the soft components of the right front fender rearward and inward and pushed the engine hood rearward. The back edge of the hood was forced into the windshield, causing fractures of the windshield. The right front wheel and suspension snagged against the pole (pocketing engagement), causing the wheel to be crushed rearward into the right "A"-pillar and inducing clockwise rotation. The "A"-pillar was displaced rearward, resulting in buckling of the right roof rail, roof, door sill, and floor and further fracturing of the windshield. The damage to the floor caused the front right bucket seat to tilt to the right (**Figure 1** above and **Figure 4**). The leading edge of the front right door was damaged, the door opening was distorted, and the door came open. The left side of the case vehicle and the driver's seating area were essentially undamaged (**Figures 3 & 4**). The CDC, estimated from police photographs is: **01-FRES-5**, with principal direction of force 20 degrees. The WinSMASH reconstruction program, Barrier algorithm with CDC-only estimated crush profile, was executed. This WinSMASH run provides a borderline reconstruction, and the results appear to be low. The total, longitudinal and lateral delta Vs are, respectively: 41 km.p.h (25 m.p.h), -39 km.p.h (24 m.p.h), and -14 km.p.h (-9 m.p.h).

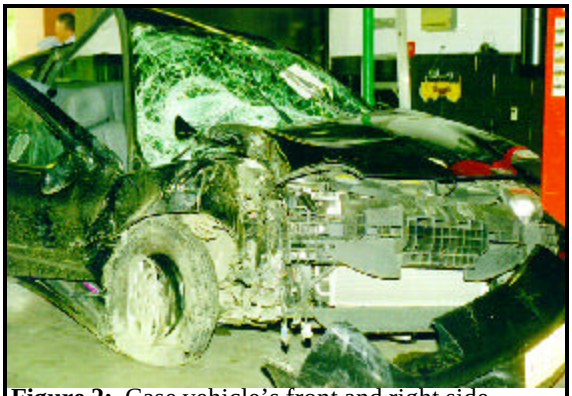

Figure 2: Case vehicle's front and right side showing direct and induced damage (case photo #07)

Figure 3: On-scene view of case vehicle at final rest showing undamaged left side (case photo #05)

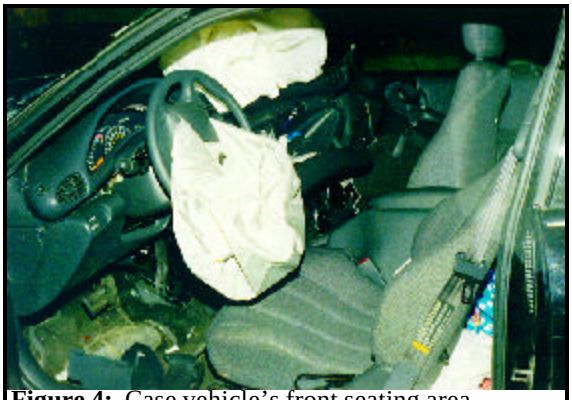

Figure 4: Case vehicle's front seating area viewed through driver's door; Note: displaced front right bucket seat (case photo #09)

The case vehicle's driver fled the scene on foot, and there is no knowledge of this person's characteristics or injuries.

CASE VEHICLE FRONT RIGHT PASSENGER

The case vehicle's front right passenger [173 centimeters, 98 kilograms (68 inches, 217 pounds)] was not restrained by her available, manual, three-point lap-and-shoulder safety belt system. Her seat adjustments and seated posture are not known. She was declared dead at the scene and was transported directly to the morgue. The following discussion of the front right passenger's movements during the crash is based on the injuries reported in the coroner's autopsy report and the principles of occupant kinematics.

The front right passenger was probably seated in a normal riding posture (i.e., facing forward with her back against the seat back and her feet on the floor). The case vehicle's driver was steering left, attempting to negotiate the curve left at high speed. As a result of her nonuse of the available safety belt system and the driver's steering, the front right passenger was probably leaning against the right front door immediately prior to the impact. The impact caused her to move forward, upward, and to the right, toward the +20 degree direction of principal force. Her thorax encountered the deploying front right passenger air bag, off center to the right, causing abrasions to her upper chest. She continued moving forward, upward, and to the right, probably sliding off the air bag to the right as her momentum deflated the bag. The right "A"-pillar and floor pan intruded into the front right seating area as the right front wheel was crushed against the lower "A"-pillar, causing the front right bucket seat to tilt forward and to the right. Her forehead impacted the right "A"-pillar, causing lacerations at the center and right eyebrow areas, and causing mild subarachnoid hemorrhage. Her right knee/distal thigh impacted the bottom of the instrument panel, causing a fracture of the femur immediately above the knee. Her thorax impacted the front of the instrument panel, causing blunt force compression of her chest resulting in almost complete transection of the descending aorta. The distortion of the right side of the passenger compartment caused the right front door to come open. As the car rotated clockwise to final rest, she rebounded to the right and fell partially out of the right front door.

CASE VEHICLE FRONT RIGHT PASSENGER INJURIES

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1.	Transection of descending aorta, almost complete, with hemorrahge not confined to mediastinum (i.e., 1700 cc left and 200 cc right hemothorax)	420218.6 untreatable	Right instrument panel	Probable	Autopsy

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
2.	Abrasions, left upper chest	490202.1 minor	Passenger's air bag	Probable	Autopsy
3.	Mild subarachnoid hemorrhage covering convexity	140684.3 serious	Right "A"-pillar	Possible	Autopsy
4.	Laceration, mid-forehead	290602.1 minor	Right "A"-pillar	Possible	Autopsy
5.	Laceration, right eyebrow	290602.1 minor	Right "A"-pillar	Possible	Autopsy
6.	Fracture, right femur, just above knee (supracondylar)	851822.3 serious	Right instrument panel	Possible	Autopsy

OBJECT CONTACTED

The case vehicle hit a timber utility pole that was approximately 40 - 45 centimeters (16 - 18 inches) in diameter (**Figure 5**). The pole was set in the cement concrete of the sidewalk, approximately 30 centimeters (12 inches) into the sidewalk from the curb. There was gouging on the surface of the pole, but there was no evidence that the pole fractured or that the foundation was disturbed.

Figure 5: On-scene view of wooden utility pole impacted by case vehicle (case photo #10)