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ON-SITE POTENTIAL SAFETY-RELATED DEFECT INVESTIGATION

CASE NUMBER - IN98-022
LOCATION - KANSAS
VEHICLE - 1998 PONTIAC GRAND PRIX GT
CRASH DATE - September, 1998

Submitted:

January 25, 1999

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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15. *Supplementary Notes* On-site safety-related defect investigation involving a 1998 Pontiac Grand Prix GT, four-door sedan, with manual belts and dual front air bags			
16. *Abstract* This report covers an on-site safety-related defect investigation of an inadvertent air bag deployment incident that involved a 1998 Pontiac Grand Prix GT (case vehicle). This incident is of special interest because the case vehicle was equipped with redesigned air bags, and the air bags deployed inadvertently without impact, resulting in minor injuries to the case vehicle's driver. The inadvertent deployment was verbally confirmed by a General Motors analyst after deciphering the Sensing Diagnostic Module (SDM) printout. The case vehicle was traveling south in the northbound lane of a two-lane, undivided, country roadway and was in the process of overtaking and passing another vehicle in the southbound lane, when the air bags deployed inadvertently. The driver and front right passenger in the vehicle being overtaken witnessed the deployment and verified the fact that the case vehicle did not strike anything in the roadway. The case vehicle's driver brought the vehicle safely to a stop back in the southbound lane. The witnesses in the noncontact vehicle also stopped to offer assistance. The case vehicle was parked on the roadside, and the driver was driven to a gas station to call for help. The case vehicle's driver (29-year-old female) was seated with her seat track located between its middle and rearmost positions, and the steering wheel was located between its middle and upmost positions. She was restrained by her available, active, three-point, lap and shoulder belt and sustained, according to her interview and medical records, minor injuries which included: strains to her cervical and thoracic spine, contusions to both thumbs, and abrasions (friction burns) to her left cheek, chin, bilateral forearms and under her right arm.			
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BACKGROUND

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This on-site investigation was brought to NHTSA's attention on September 22, 1998 by an attorney representing the case vehicle's driver. This incident involved a 1998 Pontiac Grand Prix (case vehicle). The incident occurred in September, 1998, at 7:25 a.m., in Kansas and was investigated by the applicable highway patrol office. This incident is of special interest because the case vehicle was equipped with redesigned air bags, and the air bags deployed inadvertently without impact, resulting in minor injuries to the case vehicle's driver. The inadvertent deployment was verbally confirmed by a General Motors analyst after deciphering the Sensing Diagnostic Module (SDM) printout. This contractor inspected the scene and case vehicle on October 7, 1998. This contractor interviewed the driver of the case vehicle on October 9, 1998. This report is based on the Police Incident Report; interviews with the case vehicle's driver, eye witnesses, a GM analyst, and the investigating police officer; scene and vehicle inspections; occupant kinematic principles; and this contractor's evaluation of the evidence.

INCIDENT CIRCUMSTANCES

The case vehicle was traveling south (**Figure 1**) in the northbound lane of a two-lane, undivided, county roadway and was in the process of overtaking and passing another vehicle, intending to continue in her southward direction of travel. During the passing maneuver both the case vehicle's driver and front right passenger air bags deployed inadvertently.

Figure 1: Case vehicle's southbound travel path in northbound lane while passing other vehicle (case photo #02)

The inadvertent deployment was witnessed by the driver and front right passenger of the noncontact vehicle the case vehicle was overtaking. According to one of the witnesses when the air bags deployed they heard a crack or pop sound followed by a puff of smoke that came from either the undercarriage or exhaust. The witnesses differed on where the puff of smoke came from. The witnesses confirmed the fact that the case vehicle did not strike (**Figure 2**) anything in the roadway. The witness stated that the driver of her vehicle (boyfriend) walked back in the roadway and looked along the roadside for a possible struck object and found nothing.

Figure 2: Case vehicle's undamaged front viewed at bumper height; Note: bug splatter across bumper (case photo #07)

The inadvertent deployment occurred in a undeveloped rural farming area. The roadway had a sight negative grade (-1.4%) for southbound traffic. At the time of the incident the bituminous roadway was dry. There was a solid white line along the west edge of the southbound lane and the east edge of the northbound lane (**Figure 1**). There was a dashed yellow line separating the

southbound travel lane with a solid yellow line separating the northbound lane, indicating legal passing for southbound traffic. This contractor walked the area around the area the deployment occurred and saw nothing of substance that could have impacted the case vehicle's undercarriage, causing the inadvertent deployment.

The case vehicle's driver was able to bring the vehicle to a safe stop back in the southbound lane. The driver of the noncontact vehicle stopped to offer assistance and subsequently drove the case vehicle onto the west roadside and parked it. The good samaritan then drove the case vehicle's driver to a gas station to call for help.

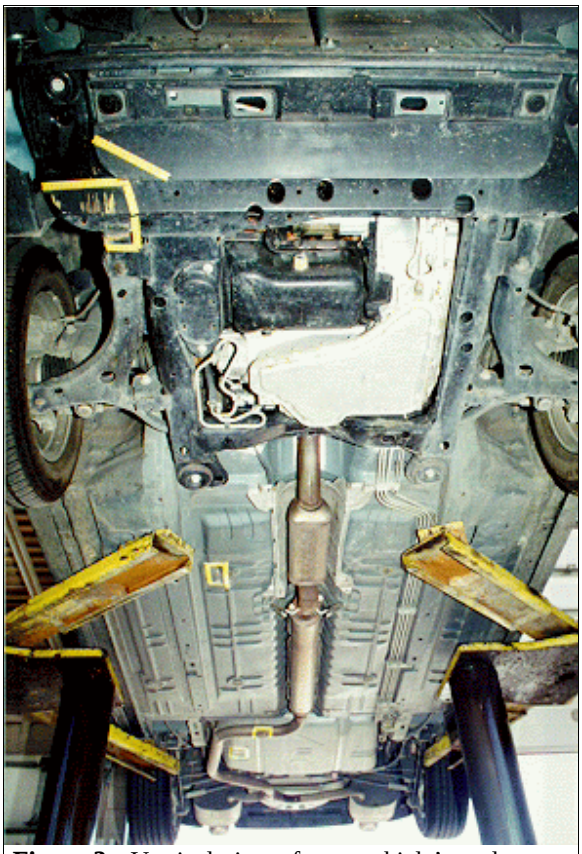

Figure 3: Vertical view of case vehicle's undercarriage with tape highlighting areas of minor contact (case photo #14)

Figure 4: Close-up view of most severe dent to case vehicle's undercarriage, specifically the tail pipe (case photo #22)

CASE VEHICLE

The case vehicle was a front wheel drive 1998 Pontiac Grand Prix, five-passenger, four-door sedan (VIN: 1G2WP52K3WF------) equipped with a 3.8L, MFI, V-6 engine, power-assisted rack and pinion steering, and a four-speed automatic transmission. Braking was achieved by power-assisted four wheel anti-lock system. The case vehicle's wheel base was 281 centimeters (110.5 inches), and the odometer reading at inspection was 17,319 kilometers (10,762 miles). The case vehicle was towed from the scene back to the car dealership from which it was purchased, but not due to damage.

The interior of the case vehicle had front bucket seats with adjustable head restraints and a floor-mounted center console containing the transmission shifter. There was a bench seat with separate back cushions and integral head rest for the outboard positions in the rear. The case vehicle was equipped with manually operated height adjusters for the front "D"-rings. Examination of the interior showed the only evidence of contact was a make-up smear to the driver's air bag.

Inspection of the case vehicle's exterior revealed no deformation to the front (**Figure 2** above) or side planes. A close inspection to the case vehicle's undercarriage did reveal three indentations (**Figures 3** and **4** above and **Figures 5** and **6**), the most severe being approximately 1 centimeter deep (0.4 inches) to the tail pipe (**Figure 4** above). The indentations appeared be along the same longitudinal line, most likely having occurred at the same time by the same object. The three contacts appeared to have occurred fairly recently having no rust but only dirt on them (**Figure 4** above and **Figures 5** and **6**). The only other damage observed consisted of normal scratches and scrapes to the air dam, primarily to the right side, from contact with one or more concrete parking stop blocks.

Figure 5: Contact mark to case vehicle's right undercarriage, forward of center (case photo #19)

Figure 6: Close-up of minor contact to case vehicle's gas tank (case photo #20)

AUTOMATIC RESTRAINT SYSTEM

Prior to this contractor's on-scene investigation, a General Motors (GM) analyst inspected the case vehicle and downloaded information that was recorded on the vehicle's Sensing Diagnostic Module (SDM). The SDM revealed that the system was clean (i.e., no faults or warning codes) at the time of the deployment. According to the GM analyst responsible for decoding the encrypted printout, it appears that the case vehicle's accelerometer misinterpreted the data and inadvertently deployed the case vehicle's frontal air bags. The air bags were commanded to deploy 31.5 milliseconds into the event. The analyst added that the firing time was 26.5 milliseconds longer than what typically had been seen in the inadvertent deployments which had occurred previously in smaller GM vehicles (i.e., J-cars) that were involved in a nationwide recall. He added that this was the first case they had come across involving a larger GM vehicle (e.g., W-class). The SDM recorded a maximum change in velocity of 3.5 km.p.h. (2.2 m.p.h.). The air bags deployed on ignition cycle 1494. The SDM also recorded an event that happened 12 ignition cycles previous to this event. It should be noted that an "event" by GM's definition is any deceleration occurrence that is greater than "**2g's**"and is recorded on the vehicle's SDM. The SDM is located under the carpet of the front right passenger's seat with the data retrieval adapter located under the lower instrument panel on the driver side.

Figure 7: Case vehicle's deployed air bags; Note: make-up smear (tape) to driver air bag and deformation to front right air bag module's cover flap from striking the windshield (case photo #27)

Concerning the case vehicle's redesigned supplemental restraints, an inspection of the driver air bag module's cover flaps revealed that the cover flaps opened at the designated tear points, and there was no evidence of damage to the cover flaps. Inspection of the driver's air bag revealed a 3 x 5 centimeter (1.2 x 2.0 inch) makeup transfer to the center portion near the top (**Figure 7**). There were also black patterned transfers to the bottom portion from the underside of the cover flaps. The front right passenger's air bag was located in the top of the instrument panel. An inspection of the air bag module's cover flap and air bag revealed that the cover flap opened at the designated tear points, and there was evidence of damage to the cover flaps **(Figure 7)** from striking and cracking the windshield. The driver's air bag was designed without any tethers, and the front right passenger's air bag was designed with two tethers, each 7.5 centimeters (3.0 inches) wide. The driver's air bag had two vent ports, approximately 2.5 centimeters (1.0 inches) in diameter, located at the 9 and 3 o'clock positions. The deployed driver's air bag was round with a diameter of 65 centimeters (25.6 inches). The front right passenger air bag had two vent ports, approximately 3.5 centimeters (1.4 inches) in diameter, located at the 10 and 2 o'clock positions. The deployed front right air bag was rectangular with a height of approximately 51 centimeters (20.1 inches) and a width of approximately 59 centimeters (23.2 inches).

CASE VEHICLE DRIVER

The case vehicle's driver [29-year-old female, 165 centimeters and 59 kilograms (65 inches, 130 pounds)] was restrained by her available, active, three-point, lap and shoulder belt. The inspection of the driver's seat belt webbing, "D"-ring, and latch plate showed no evidence of loading. This contractor would not have expected to see loading evidence since there was no collision.

Immediately prior to the inadvertent deployment of the air bags, the case vehicle's driver was seated upright with her back against the seat back, her left foot on the floor, her right foot on the accelerator, and both hands on the steering wheel. Her seat track was located between its middle and rearmost positions, and the seat back was in the upright position. The tilt steering wheel was located between its middle and upmost positions. The inadvertently deploying driver air bag contacted the driver's face, knocking her head and upper torso rearwards into her seat back and/or integral head restraint.

The driver was transported back to the dealership by the responding Highway Patrol officer. She sustained minor injuries and went to a chiropractor the following day and followed up with an osteopathic physician. The injuries sustained by the case vehicle's driver included: strains to her cervical and thoracic spine, abrasions to left cheek and chin, contusions to both thumbs, and

friction burns to bilateral forearms and under her right arm. All of her injuries are attributed to the deployment of her redesigned driver air bag.