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REMOTE AIR BAG RELATED CHILD FATALITY INVESTIGATION

VERIDIAN CASE NO. CA98-067

VEHICLE - 1995 TOYOTA COROLLA

LOCATION - GEORGIA

CRASH DATE - JUNE 1998

Contract No. DTNH22-94-07058

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 of the involved vehicle(s) or their safety systems.

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This remote investigation focused on the fatal injury mechanisms of a 6 year old female front right seated passenger in a 1995 Toyota Corolla. The Toyota Corolla was involved in an intersection collision with a 1994 Pontiac Grand Prix. The Toyota Corolla was equipped with a Supplemental Restraint System (SRS) that consisted of driver and front right passenger air bags that deployed as a result of the crash. The front right passenger was unrestrained and was displaced forward due to pre-crash braking directly into the path of the deploying air bag. The child sustained a fatal cervical injury as a result of her interaction with the passenger air bag. The driver of the vehicle was not injured in the crash.

The Field Operations Branch of the National Highway Traffic Safety Administration (NHTSA) was informed of the crash by the local police jurisdiction in November, 1998. NHTSA in-turn assigned an investigation of the crash to the Special Crash Investigation team at Veridian. Due to the lapse in time between the crash date and the disposal of the subject vehicle, a remote investigation was conducted.

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BACKGROUND

This remote investigation focused on the fatal injury mechanisms of a 6 year old female front right seated passenger in a 1995 Toyota Corolla. The Toyota Corolla was involved in an intersection collision with a 1994 Pontiac Grand Prix. The Toyota Corolla was equipped with a Supplemental Restraint System (SRS) that consisted of driver and front right passenger air bags that deployed as a result of the crash. The front right passenger was unrestrained and was displaced forward due to pre-crash braking directly into the path of the deploying air bag. The child sustained a fatal cervical injury as a result of her interaction with the passenger air bag. The driver of the vehicle was not injured in the crash.

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SUMMARY

Crash Site

This two-vehicle crash occurred during the afternoon hours in June 1998. At the time of the crash, it was daylight and the weather was not a factor. The crash occurred at the three-leg intersection of a straight and level north/south two lane road and an east/west two lane road. The east/west roadway intersected the north/south roadway from the west. A stop sign for eastbound traffic controlled the intersection. The speed limit in the area of the crash was 48 km/h (30 mph). Figure 1 is the police investigator's sketch of the crash site.

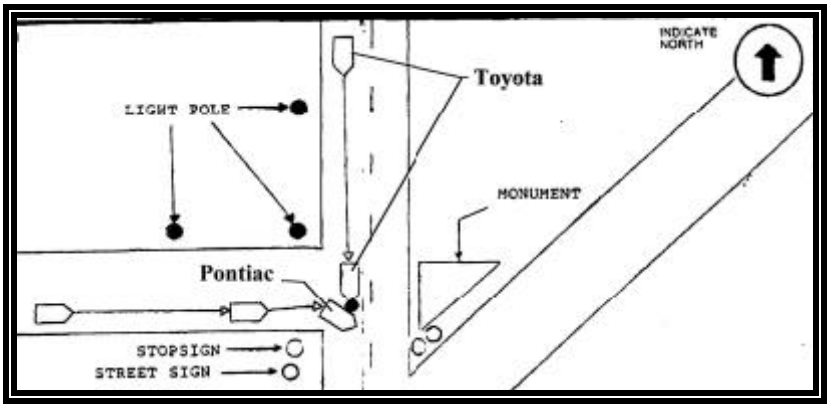

Figure 1: Police Diagram.

Pre-Crash

The 1995 Toyota Corolla was southbound driven by a 35 year old unrestrained male. The front right passenger was an unrestrained 6 year old female (height and weight unknown). A 9 month old male was the left rear occupant. The infant was properly restrained by a child safety seat. The right rear position was occupied by an unrestrained 9 year old female.

The 1994 Pontiac Grand Prix was eastbound on the intersecting roadway driven by an 18 year old restrained female. Reportedly the Pontiac came to a stop at the intersection. The driver then accelerated forward and steered the vehicle to the right intending to travel south. The driver of the Toyota recognized the impending crash, applied and locked the vehicle's brakes in an avoidance maneuver. Five meters (17 ft) of pre-impact skid marks were measured by the investigating police officer.

Crash

The crash occurred with the center and right aspects of the Toyota's front plane striking the left front axle and A-pillar area of the Pontiac, **Figure 2**. The vehicles came to rest in contact with each other approximately at the point of impact. The force of the 12/8 o'clock impact configuration was above the deployment threshold of the Toyota's Supplemental Restraint System. The driver and front right passenger air bags deployed.

Figure 2: On-scene photograph of the vehicle's at final rest.

Post-Crash

Upon arrival, the investigating police officer spoke with the driver of the Toyota. The driver indicated the front right passenger was not restrained by the vehicle's seat belt at the time of the crash. The police officer inspected the front right seat belt in the Toyota. He indicated the belt was stowed and the retractor was locked by the inertial force of the crash confirming the seat belt was not in use.

The driver further reported that immediately following the crash, he exited the vehicle and removed the front right passenger from the Toyota. He carried her into a restaurant located in the southwest intersection quadrant. Upon subsequent arrival of the EMS personnel, the officer directed the EMT to the restaurant. The officer observed the EMT coming from the restaurant with the child. She was not responsive and was bleeding from an area about her nose. Due to the seriousness of her injury, she was transported to a trauma center located approximately 40 miles away. She was pronounced dead approximately 3 hrs and 39 minutes post crash. The drivers of the respective vehicles were transported to a local hospital, examined and released. The rear seated passengers in the Toyota were uninjured.

1995 TOYOTA COROLLA

The 1995 Toyota Corolla was identified by the Vehicle Identification Number (VIN): JT2AE04B5S0 (production sequence deleted). The 4-door sedan was equipped with a 1.6 liter, I-4 engine linked to a 3-speed automatic transmission. The manual restraint system consisted of 3-point lap and shoulder belts for the 4 outboard seat positions. The vehicle's Supplemental Restraint System consisted of driver and front right passenger air bags. The air bags had deployed as a result of the crash. The Toyota was not available for inspection. It was disposed of by the insurance company shortly after the crash.

Figure 3: Left front view of the Toyota's frontal damage.

Figures 3 and 4 are on-scene police photographs depicting the vehicle's damage. Referring to the photographs, the Toyota sustained direct contact to the center and right aspects of the front plane. The direct damage began approximately on the vehicle's center line and extended to the right front bumper corner. The maximum crush was an estimated 20 cm (8 in) at the right front bumper corner. The vehicle's hood was buckled. The radiator core of the Toyota was damaged and leaking. There did not appear to be a reduction in the right wheelbase dimension. There were no glass fractures and all the doors remained operational. The estimated Collision Deformation Classification (CDC) was 12-FZEW-1. Based on the analysis of the available photographs and SCI experience, the delta V of the Toyota as a result of this crash was approximately 16 to 19 km/h (10 to 12 mph).

Figure 4: Right side view of the Toyota at final rest.

Information regarding the post-crash condition was unavailable. It was likely, given the relative low magnitude of the crash, that there was no interior damage as a result of the external crash force.

1994 PONTIAC GRAND PRIX

The 1994 Pontiac Grand Prix was identified by the Vehicle Identification Number (VIN): 1G2WJ52M5RF (production sequence deleted). The 4-door sedan was equipped with a 3.1 liter, V-6 engine linked to a 4-speed automatic transmission. The vehicle's restraint system consisted of manual 3-point lap and shoulder belts in the outboard seat positions and a Supplemental Restraint System that consisted of dual frontal air bags. The air bags did not deploy in the crash. The impact damage was centered on and localized to an area between the left front axle and A-pillar. The lateral deformation was estimated to be less than 2 cm (5 in). The estimated CDC of the Pontiac was 08-LFEW-1.

FRONT RIGHT PASSENGER INJURY

1995 Toyota Corolla

Injury	Injury Severity (AIS 98)	Injury Mechanism
Atlanto-occipital dislocation, NFS	Moderate (650208.2,6)	Deploying front right passenger air bag
Generalized head trauma	Unspecified (115099.7,0)	Deploying front right passenger air bag
Generalized chest trauma	Unspecified (415099.7,0)	Deploying front right passenger air bag

Note: The above injuries were documented in the child's death certificate. Medical records were not available due to a lack of cooperation with the child's family.

FRONT RIGHT PASSENGER KINEMATICS

Prior to the crash, the six year old female (height and weight unknown) was seated unrestrained in the right front of the Toyota. The child initiated a forward trajectory in response to pre-impact braking and became positioned in the path of the right front passenger air bag at the time of deployment. Upon impact, the frontal air bags in the Toyota deployed as a result of the above threshold crash. The expanding front right passenger air bag contacted the occupant in the upper chest, neck and head. The continued expansion of the bag around the child's head and neck hyper extended the head/neck complex causing the reported cervical injury. The child was pronounced deceased approximately 3 hours 39 minutes post-crash.