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REMOTE AIR BAG RELATED CHILD PASSENGER FATALITY INVESTIGATION SCI TECHNICAL SUMMARY REPORT

VERIDIAN CASE NO. CA00-049

SUBJECT VEHICLE - 1997 MITSUBISHI GALANT

LOCATION - STATE OF ILLINOIS

CRASH DATE - MAY 1999

Contract No. DTNH22-94-D-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 are 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.

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16. *Abstract* This remote investigation focused on a two vehicle crash that involved a 1997 Mitsubishi Galant (subject vehicle) and a 1992 Ford Taurus. The Galant was occupied by a 31-year-old male driver and a 7-year-old male front right passenger. Neither occupant of the Galant was restrained. The Galant was equipped with frontal air bags that deployed as a result of an intersection collision with the Ford Taurus, which turned across the path of the Galant. Both occupants of the Galant initiated forward trajectories in response to the frontal impact with the Taurus. The driver of the Galant contacted the deployed driver's air bag and sustained police reported incapacitating injuries. The front right child passenger was displaced forward by pre-crash braking and probably had his arms extended in an effort to brace. His left arm was struck by the air bag cover flap which caused a transverse fracture at the mid level with deformity. He was struck in the neck and chest by the expanding air bag and redirected rearward. He sustained a wide separation of C1 and the occipital bone, a spleen laceration, a large anterior neck abrasion, a chin abrasion, and a lip laceration. The driver was transported to a local hospital however, his admission status was not reported. The 7-year-old front right passenger was transported to a local trauma center and transferred to a regional children's hospital where he expired two days following the crash. The driver of the Ford Taurus sustained police visible injuries and was transported to a local hospital. Her admission status was not reported.			
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LOCATION - STATE OF ILLINOIS
CRASH DATE - MAY 1999

BACKGROUND

This remote investigation focused on a two vehicle crash that involved a 1997 Mitsubishi Galant (subject vehicle) and a 1992 Ford Taurus. The Galant **(Figure 1)** was occupied by a 31-year-old male driver and a 7-year-old male front right passenger. Neither occupant of the Galant was restrained. The Galant was equipped with frontal air bags that deployed as a result of an intersection collision with the Ford Taurus, which turned across the path of the Galant. Both occupants of the Galant initiated forward trajectories in response to the frontal impact with the Taurus. The driver of the Galant contacted the deployed driver's air bag and sustained police reported incapacitating injuries. The front right child passenger was displaced forward by pre-crash braking and probably had his arms extended in an effort to brace. His left arm was struck by the air bag cover flap which caused a transverse fracture at the mid level with deformity. He was struck in the neck and chest by the expanding air bag and redirected rearward. He sustained a wide separation of C1 and the occipital bone, a spleen laceration, a large anterior neck abrasion, a chin abrasion, and a lip laceration. The driver was transported to a local hospital however, his admission status was not reported. The 7-year-old front right passenger was transported to a local trauma center and transferred to a regional children's hospital where he expired two days following the crash. The driver of the Ford Taurus sustained police visible injuries and was transported to a local hospital. Her admission status was not reported.

Figure 1. 1997 Mitsubishi Galant

This crash was identified through a search of the Fatality Analysis Reporting System (FARS) for child fatalities that occurred in vehicles equipped with air bags. The crash occurred in May 1999 and was assigned to the Veridian Special Crash Investigations Team on November 3, 2000 as a remote investigation effort. Police photographs and an postmortem examination report were obtained, which provide the basis for this narrative report.

SUMMARY

Crash Site

This two vehicle crash occurred during the daytime hours of May 1999. At the time of the crash, it was daylight with no adverse conditions as the asphalt road surfaces were dry. The crash occurred at a residential 3-leg (T) intersection of a four-lane undivided north/south roadway and a two-lane east/west roadway **(Figure 2)**. Police reported the north/south roadway to be 14 m (46') wide and

Figure 2. View of intersection looking northwest

the east/west roadway to be 9 m (28') wide. The west leg intersected the north/south roadway at an approximate 45 degree angle. Railroad tracks crossed the north/south roadway at an angle approximately 21 m (70') to the north of the intersection. The roadside environment consisted of concrete curbs, sidewalks, residential driveways, lawn areas, and trees. Traffic control at the scene consisted of a stop sign for eastbound traffic. The posted speed limit for the north/south roadway was 56 km/h (35 mph). The scale police diagram **(Figure 3)** depicts the intersection configuration.

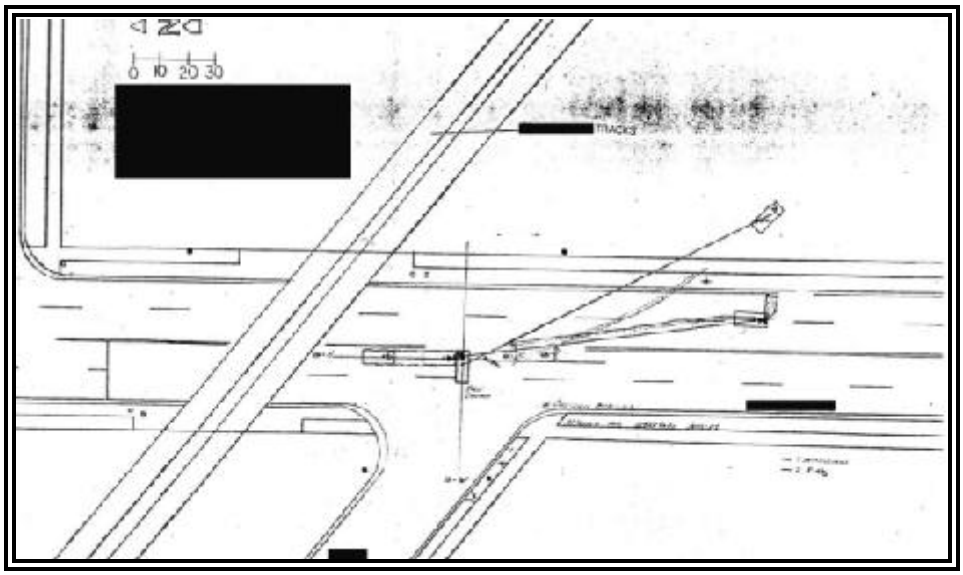

Figure 3. Police scale diagram showing impact and final rest positions

Pre-Crash

The 31-year-old male driver of the 1997 Mitsubishi Galant was operating the vehicle southbound on approach to the 3-leg intersection at a police estimated speed of 56 km/h (35 mph) **(Figure 4)**. The 45-year-old female driver of the Taurus stated that she approached the intersection and stopped at the stop sign with the left turn signal activated **(Figure 5)**. The driver of the Taurus initiated a left turn, but due to a medical condition, she lost consciousness and did not recall attempting the turn. The driver of the Galant realized the impending harmful event and braked with sufficient force to lock the front wheels. Skid marks were noted in the Galant's trajectory in the on-scene police photographs and the investigating officer documented the lengths on the scale police diagram. The approximate length of the left front tire mark was 10 m (32'), and the approximate length of the right front was 8 m (25').

Figure 4. Southbound approach for 1997 Mitsubishi Galant

Figure 5. Eastbound approach for 1992 Ford Taurus

Crash

As the Mitsubishi Galant entered the intersection, the front area impacted the left front side area of the Ford Taurus **(Figure 6)**. The center area of the front bumper of the Galant impacted the left front wheel of the Taurus. The grille area of the Galant engaged the front left fender of the Taurus above the left front wheel. The resultant directions of force the Galant and the Taurus were in the 12 o'clock and 9 o'clock sectors, respectively. Impact resulted in moderate damage to both vehicles. The impact induced deceleration was sufficient to deploy the frontal air bag systems in both vehicles. The damage algorithm of the WinSMASH program computed a total velocity change of 18.1 km/h (11.3 mph) for the Galant based on an estimated crush profile. The longitudinal and latitudinal aspects for the Galant were -17.8 km/h (-11.1 mph) and -3.1 km/h (-2.0 mph), respectively. The damage algorithm of the WinSMASH program computed a total velocity change of 16.7 km/h (10.4 mph) for the Taurus based on an estimated crush profile. The longitudinal and latitudinal aspects for the Taurus were -2.9 km/h (-1.8 mph) and 16.5 km/h (10.2 mph), respectively. The forward momentum of the Galant caused the Taurus to rotate clockwise (CW) approximately 420 degrees in the intersection. The Galant continued in a forward direction past the Taurus and drifted left into the northbound travel lanes. It came to rest facing south in the northbound lanes adjacent to the curb **(Figure 7)**. The Taurus subsequently traveled across the northbound lanes and over the curb edge in a tracking mode. It came to rest facing southeast on a lawn area **(Figure 8)**.

Figure 6. Point of impact showing pre-impact skid marks from the Galant

Figure 7. Look back view: Final rest position for the Mitsubishi Galant

Figure 8. Look back view: Final rest position for the Ford Taurus

Post-Crash

According to a witness, the driver of the Galant was found in the vehicle holding the front right child passenger. It was not known how the occupants exited the vehicles. The driver of the Mitsubishi Galant was transported to a local hospital, however, his admission status was not reported. The 7-year-old front right passenger was transported to a local trauma center and transferred to a regional children's hospital where he expired two days following the crash. The driver of the Ford Taurus was transported to a local hospital. Her admission status was not reported.

SUBJECT VEHICLE - 1997 Mitsubishi Galant

The 1997 Mitsubishi Galant was identified by the Vehicle Identification Number (VIN): 4A3AJ56G0VE (production sequence omitted). The vehicle was a 4-door sedan equipped with front wheel drive, automatic transmission, and a 2.4 liter, 4-cylinder engine. The vehicle was also equipped with a power driver's seat, power steering, tilt steering wheel, a sunroof, and alloy wheels. The police report listed a family member as the owner of the vehicle. The seating was configured with reclining front bucket seats with adjustable head restraints, and a rear bench seat with a 60/40 split folding back.

VEHICLE DAMAGE

Exterior Damage - *1997 Mitsubishi Galant*

The 1997 Mitsubishi Galant sustained moderate frontal damage as a result of the impact with the Ford Taurus **(Figure 9)**. The direct contact damage involved the entire frontal plane of the vehicle. The outboard corners of the bumper fascia were bowed outward on both sides from the bumper engagement with the wheel of the Taurus. The outboard side portions of the fascia were separated from both fenders. The left headlamp assembly was displaced. Paint transfers from the Taurus were noted along the entire width of the leading edge of the hood and the hood was buckled rearward at the designated fold points. The bumper fascia was cracked approximately 3 cm (1") to the left of center from engagement against the left front wheel of the Taurus that was turned counterclockwise (CCW) **(Figure 10)**. The estimated maximum crush of 25 cm (10") was located in that area. The Collision Deformation Classification (CDC) for the impact with the Taurus was 12-FDEW-1. Six crush measurements were estimated along the bumper and were as follows: C1 = 0 cm, C2 = 12 cm (5"), C3 = 25 cm (10"), C4 = 20 cm (8"), C5 = 12 cm (5"), C6 = 0 cm.

Figure 9. Frontal damage to Mitsubishi Galant

Figure 10. Frontal damage showing maximum crush

Interior Damage - *1997 Mitsubishi Galant*

Interior damage to the 1997 Mitsubishi Galant appeared to be minimal and was attributed to occupant contact. There appeared to be no intrusion. The windshield was cracked in two places above the front right passenger's air bag cover flap. It was also cracked below the rear view mirror mount. The rear view mirror was separated from the windshield. The rear left/center seat back was noted to be folded forward in the police photographs. A 4-spoke tire iron was lying on the rear aspect of the folded seat back. The remaining contents of the trunk were not specified.

Exterior Damage- ***1992 Ford Taurus***

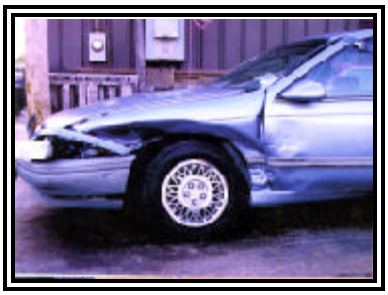

Figure 11. Side damage to the Ford Taurus

The 1992 Ford Taurus sustained moderate damage as a result of the impact with the Mitsubishi Galant **(Figure 11)**. The direct damage was concentrated above the side body line. Direct contact damage began at the leading edge of the left front door and extended forward to the left front bumper corner. Pocketing was noted in the sheet metal forward and above the left front wheel. The top of the left front wheel was displaced inward toward the right side of the Taurus, and scuff marks were noted on the left front tire. The left headlamp assembly and grille fascia were displaced. The Collision Deformation Classification (CDC) for the impact with the Galant was 09-LFEW-2. Six crush measurements were estimated above the side body line and were as follows: C1 = 10 cm (4"), C2 = 20 cm (8"), C3 = 25 cm (10"), C4 = 13 cm (5"), C5 = 5 cm (2"), C6 = 0 cm. The crush profile does not represent the damage pattern for this configuration due to the involvement of the left front tire and suspension components.

AIR BAG SYSTEM - 1997 Mitsubishi Galant

Figure 12. Deployed frontal air bag system in the Galant

The 1997 Mitsubishi Galant was equipped with air bags for the driver and front right passenger positions that deployed as a result of the impact with the 1992 Ford Taurus **(Figure 12)**. The driver's air bag was housed in the center of the steering wheel with asymmetrical H-configuration module cover flaps. Two vent ports were visible in the police photographs on the top aspect of the driver's air bag.

Figure 13. Deployed front right passenger's air bag in the Galant

The front right passenger's air bag deployed from the right mid-instrument panel area with a single cover flap design hinged at the top aspect **(Figure 13)**. The cover flap was rectangular in shape. A vent port was visible in the police photographs on the right aspect of the front right passenger's air bag.

OCCUPANT DEMOGRAPHICS - 1997 Mitsubishi Galant

Driver

Age/Sex:	31-year-old male
Height:	Not reported
Weight:	68 kg (150 lb)
Seat Track Position:	Mid-to-full rear (per police photographs)
Manual Restraint Use:	Unrestrained
Usage Source:	Police report
Eyewear:	Unknown
Type of Medical Treatment:	Transported to by ambulance to a local hospital, however, the admission status was not reported

Driver Kinematics

Police photographs indicate the front left seat track was adjusted to a mid-to-full rear position, with the seat back reclined to approximately 30 degrees. It was not known if the seat track and seat back were in these positions prior to impact. The adjustable head restraint was in a fully lowered position.

The driver of the 1997 Mitsubishi Galant was seated in a presumed upright posture. The driver was not restrained by the available 3-point lap and shoulder belt system. His lack of belt usage was supported by the police crash report. At impact with the Ford Taurus, the driver's air bag deployed. The driver initiated a forward trajectory and loaded the air bag which offered protection from the frontal crash forces. The driver was transported by ambulance to a local hospital for police reported incapacitating injuries. His admission status was not reported.

Front Right Passenger

Age/Sex:	7-year-old male
Height:	132 cm (52")
Weight:	29 kg (65 lb)
Seat Track Position:	Mid-to-full rear (per police photographs)
Manual Restraint Use:	Unrestrained
Usage Source:	Police report, injury data
Eyewear:	Unknown
Type of Medical Treatment:	Transported by ambulance to a local trauma center and transferred to a regional children's hospital where he expired two days following the crash

Front Right Passenger Injuries

Injury	Injury Severity (AIS 90/Update 98)	Injury Mechanisms
Wide separation of C1 and occipital bone	Moderate (650208.2,6)	Front right passenger's air bag
Laceration of spleen	Moderate (544220.2,2)	Front right passenger's air bag
Transverse fracture at mid-level of left arm with deformity	Moderate (751800.2,2)	Front right passenger's air bag cover flap
Anterior right chin abrasion	Minor (290202.1,8)	Front right passenger's air bag
Large anterior neck abrasion extending to the inferior chin	Minor (390202.1,5)	Front right passenger's air bag
2.0 x 1.0 cm (0.8 x 0.5") lip laceration	Minor (290602.1,8)	Front right passenger's air bag

Injury source: Postmortem examination report

Front Right Passenger Kinematics

Police photographs indicate the front right seat track was adjusted to a mid-to-full rear position, with the seat back reclined to approximately 30 degrees. It was not known if the seat track and seat back were in these positions prior to impact. The adjustable head restraint was in a fully lowered position.

The 7-year-old male front right passenger was not restrained by the available 3-point lap and shoulder belt system. Belt non-usage was reported by the police and supported by the injuries sustained. The front right passenger initiated a forward trajectory due to pre-impact braking which placed him out-of-position forward in the deployment zone of the front right passenger's air bag. At impact with the Ford Taurus, the 7-year-old front right passenger most likely had his arms extended in an effort to brace. As the front right passenger's air bag deployed, the cover flap appears to have struck his left arm resulting in a transverse fracture at the mid level of the arm with deformity. The air bag expanded against his neck and chest and redirected him rearward. He sustained a large separation between C1 and the occipital bone, a laceration of the spleen, a large abrasion on the anterior aspect of the neck which extended to the inferior part of the chin, and an abrasion on the anterior aspect of the right chin. He was transported by ambulance to a local trauma center and transferred to a regional children's hospital where he expired two days following the crash.

A post-exam was performed on the 7-year-old, however, the exam was evasive in that it was an external exam only. The narrative referenced hospital reports for additional injury description. Therefore, additional injuries may have been present that were not reported or discovered during the post-exam.