

**TRANSPORTATION SCIENCES
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**VERIDIAN REMOTE CHILD SAFETY SEAT INVESTIGATION
VERIDIAN CASE NO. CA01-001
VEHICLE: 1993 FORD TAURUS
LOCATION: MINNESOTA
CRASH DATE: NOVEMBER 2000**

Contract No.
DTNH22-94-D-07058

Prepared For:

U.S. Department of Transportation
National Highway Traffic Safety Administration
Washington, D.C. 20590

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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.

TECHNICAL REPORT STANDARD TITLE PAGE

1. <i>Report No.</i> CA01-001	2. <i>Government Accession No.</i>	3. <i>Recipient's Catalog No.</i>	
4. <i>Title and Subtitle</i> Veridian Remote Child Safety Seat Investigation Vehicle: 1993 Ford Taurus Location: Minnesota		5. <i>Report Date:</i> March 2001	
		6. <i>Performing Organization Code</i>	
7. <i>Author(s)</i> Crash Data Research Center		8. <i>Performing Organization Report No.</i>	
9. <i>Performing Organization Name and Address</i> Transportation Sciences Crash Data Research Center Veridian Engineering P.O. Box 400 Buffalo, New York 14225		10. <i>Work Unit No.</i> C01115.0326.(0000-0009)	
		11. <i>Contract or Grant No.</i> DTNH22-94-D-07058	
12. <i>Sponsoring Agency Name and Address</i> U.S. Department of Transportation National Highway Traffic Safety Administration Washington, D.C. 20590		13. <i>Type of Report and Period Covered</i> Technical Report Crash Date: November 2000	
		14. <i>Sponsoring Agency Code</i>	
15. <i>Supplementary Notes</i> Remote investigation of an intersection crash that involved a 1993 Ford Taurus occupied by two children restrained in child safety seats in the rear seat of the Taurus.			
16. <i>Abstract</i> This remote investigation focused on the installation and performance of two child safety seats that were positioned in the rear seat of a 1993 Ford Taurus. The child safety seats were occupied by two males, ages 18 months and 3 years. The Taurus was involved in a minor-to-moderate severity intersection-type crash with a 1994 Ford Taurus that was turning left at the intersection. The driver of the 1993 Taurus was not wearing the manual belt system. He sustained contusions of both hands from bracing/loading of the steering wheel rim. The pregnant front right passenger was restrained by the manual belt system. She reported a contusion of the left upper thigh from loading of the lap belt webbing. The children remained secure in the child safety seats and were not injured.			
17. <i>Key Words</i> Intersection crash Child safety seats Proper usage		18. <i>Distribution Statement</i> General Public	
19. <i>Security Classif. (of this report)</i> Unclassified	20. <i>Security Classif. (of this page)</i> Unclassified	21. <i>No. of Pages</i> 6	22. <i>Price</i>

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BACKGROUND

This remote investigation focused on the installation and performance of two child safety seats that were positioned in the rear seat of a 1993 Ford Taurus. The child safety seats were occupied by two males, ages 18 months and 3 years. The Taurus was involved in a minor-to-moderate severity intersection-type crash with a 1994 Ford Taurus that was turning left at the intersection. The driver of the 1993 Taurus was not wearing the manual belt system. He sustained contusions of both hands from bracing/loading of the steering wheel rim. The pregnant front right passenger was properly restrained by the manual belt system. She reported a contusion of the right upper thigh from loading of the lap belt webbing. The children were secured in the child safety seats and were not injured.

The November crash was identified through a press release dated December 21, 2000, that highlighted Chrysler's "Fit for a Kid" program. The crash was initially assigned to the Veridian Special Crash Investigation team on Tuesday, January 2, 2001, as an on-site investigation. During the preliminary SCI telephone follow-up of the crash, it was determined that the 1993 Ford Taurus was repaired prior to case assignment, therefore the investigation was downgraded to a remote (telephone follow-up) effort. Data for this remote investigation was obtained from the front right passenger of the 1993 Ford Taurus, the Chrysler "Fit for a Kid" child passenger safety technician, the insurance carrier for the 1994 Ford Taurus, and the police crash report. There were no photographs available of the vehicles or of the child safety seats.

SUMMARY

Crash Site

This crash occurred at an urban four leg intersection during daylight hours. Both roadways consisted of two travel lanes that were straight and level with a posted speed limit of 48 km/h (30 mph). Traffic flow through the intersection was controlled by an overhead signal system.

Vehicle Data - 1993 Ford Taurus

The subject vehicle in this crash was a 1993 Ford Taurus GL, 4-door sedan. The vehicle was identified by vehicle identification number 1FALP5244PG (production number omitted). At the time of the crash, the odometer reading was approximately 96K km (60K miles). The Taurus was equipped with a 3.8 liter V-6 engine linked to a 4-speed automatic overdrive transmission. The vehicle's safety equipment included frontal air bags for the driver and front right passenger positions, 3-point lap and shoulder belts for the four outboard positions, and lap belts for the center front and rear positions. It should be noted that the frontal air bag system in the 1993 Taurus did not deploy during this crash.

Based on an exemplar vehicle inspection, the rear outboard 3-point lap and shoulder belt systems consisted of a continuous loop webbing with sliding latchplates and emergency (inertia) locking retractors. This configuration would require the use of a locking clip positioned within 2.5 cm (1.0") of the latchplate to properly secure a child safety seat.

Crash Sequence

Pre-Crash

The 1993 Ford Taurus was traveling in a southerly direction on the two lane roadway on an approach to the 4-leg intersection. The overhead signal system was in a green phase for north/southbound traffic flow. The driver of the 1993 Ford Taurus proceeded into the intersection to continue southbound, traveling at a passenger estimated speed of 40-48 km/h (25-30 mph).

The 1994 Ford Taurus was traveling in a northerly direction on the same roadway. This driver apparently failed to detect the southbound 1993 Taurus and initiated a left turn across the 1993 Taurus' path of travel. There were no reported avoidance actions initiated by either driver.

Crash

The front left area of the 1994 Ford Taurus impacted the left front side area of the 1993 Ford Taurus. The impact resulted in probable directions of force of 10 o'clock for the 1993 Taurus and 01 o'clock for the 1994 Taurus. Although no photographs of the vehicles were available, the struck 1993 Ford Taurus reportedly sustained damage to the left front fender, front bumper corner and hood. Velocity changes were probably within the 13-16 km/h (8-10 mph) range for the involved vehicles. It was reported by the front right passenger of the 1993 Taurus and the insurance carrier for the 1994 Taurus that the frontal air bags systems in the vehicles did not deploy.

Post-Crash

Both vehicles came to rest within the boundaries of the intersection. The driver of the 1993 Ford Taurus attempted to open the left front door, however, the door was restricted by damage. The pregnant front right passenger unbuckled her manual belt system and opened the right front door and exited the vehicle. The driver slid across the interior and exited through the right front door. Both children positioned in child safety seats in the rear on the 1993 Ford Taurus remained in the vehicle during the driver's initial post-crash assessment of the crash.

A local police office arrived on-scene within minutes of the crash. He instructed the driver of the 1993 Ford Taurus to move his vehicle out of the intersection. Following this instruction, the driver removed both children from the child safety seats and left the seats in the vehicle. The 1994 Ford Taurus sustained disabling damage and was towed from the scene. The 1993 Ford Taurus was driven from the scene and repaired within 13 days of the crash for \$2,884.03.

Child Safety Seats

The two child passengers of the 1993 Ford Taurus were positioned and secured in child safety seats (CSS). The children's mother, the front right passenger of the Taurus at the time of the crash, was concerned regarding the proper installation and use of the child safety seats. She consulted an acquaintance from her day care center who is a NHTSA/AAA Certified Child Passenger Safety Technician through Chrysler's "Fit for a Kid" program. This program provides child safety seats checks to the public through Chrysler, Dodge, and Jeep dealerships by a Certified Child Passenger Safety Technician. The technician is an employee of the dealership who received the 32 hour course certification. The service is provided at no cost to the public for any make, model vehicle.

The certified technician performed the inspection, installation, and instruction to the mother in March 2000, approximately eight months prior to this crash. At the time of the inspection, the youngest of the two children involved in this crash was under the age of one year and was restrained in a rear facing convertible seat. The technician correctly installed the convertible seat in the rear facing position and instructed the mother on the proper installation and use characteristics of this CSS when turned to the forward facing configuration.

The make and model of this particular CSS was unknown, as the seat was replaced by the insurance carrier prior to the assignment of the investigation. The parent and CSS technician both stated the CSS was a convertible-type seat with a tray shield. The mother of the child passenger noted during the SCI interview that the convertible seat was in the upright position with the integral harness straps routed through the upper slots of the CSS and adjusted snug to the shoulders of the child. She used the "one finger rule" to measure the slack in the harness straps at the level of the shoulders.

The second child involved in this crash was a 3 year old male. He was restrained in a Graco high-back booster seat with the integral 5-point lap and shoulder harness system. The child safety seat was identified by Model No. 44812CRT and was manufactured on 03/01/2000. This child safety seat was positioned in the rear right position of the 1993 Ford Taurus and secured with the vehicle's 3-point lap and shoulder belt system. This belt system consisted of a continuous loop belt webbing with a sliding latchplate and an emergency locking retractor, thus requiring the use of a locking clip at the latchplate.

The mother of the children noted during the SCI interview that the family owns two vehicles, with two child seats dedicated to each vehicle. Therefore, the child safety seats remained in the vehicle without the need to remove and reinstall on an as-needed basis.

Occupant Demographics
Driver - 1993 Ford Taurus

Age/Sex: 27 year old male
 Height: 188.0 cm (74.0")
 Weight: 136.1 kg (300 lb)
 Manual Restraint
 Usage: None
 Usage Source: Front right passenger interview
 Type of Medical
 Treatment: None

Driver Injuries

Injury	Injury Severity (AIS 90/Update 98)	Injury Mechanism
*Bilateral hand contusions between the thumb and the index finger *	Minor (790402.1,3)	Bracing/loading against the steering wheel rim

* Source: Interview; not medically treated

Driver Kinematics

The driver of the 1993 Ford Taurus was not restrained by the manual belt system, as reported by the front right passenger of the vehicle. He was probably seated in a full rear track position with both hands positioned on the steering wheel rim. At impact, he initiated a forward and left trajectory in response to the estimated 10 o'clock impact force. His hands loaded the steering wheel rim which resulted in bilateral contusions of the hands, located between the thumb and the index finger. His head reportedly contacted the left upper A-pillar/windshield header area although no injury resulted from this contact sequence.

He exited the vehicle from the right front door and refused medical treatment. Following the on-scene police investigation, the driver drove the vehicle and his family from the crash scene.

Front Right Passenger

Age/Sex: 28 year old female, 7 months pregnant
 Height: 160.0 cm (63.0")
 Weight: 93.5 kg (206 lb)
 Manual Restraint
 Usage: 3-point lap and shoulder belt system
 Usage Source: Interview (this passenger)
 Type of Medical
 Treatment: None

Front Right Passenger Injuries

Injury	Injury Severity (AIS90/Update 98)	Injury Mechanism
*Contusion of the right anterior upper thigh	Minor (890402.1,1)	Lap belt webbing

* *Source: Passenger interview*

Front Right Passenger Kinematics

The front right passenger was seated in a normal upright posture and restrained by the manual 3-point lap and shoulder belt system. She was 7 months pregnant at the time of the crash and stated that she had the lap belt positioned under her abdomen, at the level of the upper thighs and the shoulder belt webbing positioned across her chest. At impact, the passenger probably initiated a forward and lateral trajectory to her left as she responded to the left side impact crash forces. She loaded the manual belt webbing that restricted her motion and prevented her from contact with interior components. Her loading force against the belt webbing resulted in a contusion of the right anterior thigh.

Following the crash, the front right passenger unbuckled her belt system and exited the vehicle unassisted from the right front door. She refused medical treatment at the scene and did not seek follow-up treatment for the crash related injury.

Rear Left Child Passenger

Age/Sex: 18 month old male
Height: 76.2 cm (30.0")
Weight: 11.3 kg (25.0 lb)
Restraint
Type/Usage: Reported as properly restrained in a forward facing convertible child safety seat with the integral 3-point harness and tray shield
Usage Source: Front right passenger (mother) interview
Type of Medical
Treatment: None, not injured

Rear Left Child Passenger Injuries

Injury	Injury Severity (AIS90/Update 98)	Injury Mechanism
Not injured	N/A	N/A

Rear Left Child passenger Kinematics

The 18 month old male child passenger was positioned in a forward facing convertible seat that was secured to the rear left position of the 1993 Ford Taurus. The child safety seat was reported by the mother as properly secured to the vehicle by the 3-point lap and shoulder belt system and the use of a locking clip

at the latchplate. The child was restrained in the safety seat by the integral 3-point harness with a tray shield locked in front of the child. The harness straps were adjusted snug to the child’s chest as stated by the mother of the child. She followed the “one finger rule” that allowed for the thickness of one finger to be placed between the harness straps and the shoulders of the child. Additionally, the chest clip was positioned at the level of the armpit.

At impact, the child would have responded to the presumed 10 o’clock direction of force by initiating a forward and lateral trajectory to his left. Given the proper use of the child safety seat, the integral harness would have prevented excursion of the child from the seat, thus mitigating contact with interior components. The harness straps distributed the crash forces across his torso and abdominal regions and as a result, the child was not injured.

He was subsequently removed from the child safety seat at the scene of the crash by his parents. Following the completion of the on-scene police investigation, the child was repositioned in the child safety seat in the Ford Taurus and driven to the family’s residence. He was not examined or treated by medical personnel for possible injury.

Rear Right Child Passenger

Age/Sex: 3 year old male
 Height: 91.4 cm (36.0")
 Weight: 16.8 kg (37.0 lb)
 Restraint Type/
 Usage: Reported as secured in a Graco high-back booster child safety seat and restrained by the integral 5-point harness
 Usage Source: Front right passenger (mother) interview
 Type of Medical
 Treatment: None, not injured

Rear Right Passenger Injuries

Injury	Injury Severity (AIS90/Update 98)	Injury Mechanism
Not injured	N/A	N/A

Rear Right Passenger Kinematics

The rear right 3 year old male child passenger was positioned in a Graco high-back booster seat (Model No. 44812CRT) and restrained within the safety seat by the integral 5-point lap and shoulder belt system. The booster seat was secured to the vehicle by the 3-point lap and shoulder belt routed through the belt path of the safety seat and held firmly by the use of a locking clip at the latchplate.

At impact, the child would have responded forward and to his left. He loaded the 5-point harness which distributed the crash forces across his body and restrained him within the safety seat. As a result of the proper use of the child safety seat, the 3 year old child passenger was not injured.

