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REMOTE AIR BAG DEPLOYMENT REPORT

CASE NUMBER - IN99-102
LOCATION - OKLAHOMA
VEHICLE - 1998 FORD CROWN VICTORIA LX
CRASH DATE - October 1998

Submitted:

February 16, 2001

revised:
October 30, 2001

Contract Number: DTNH22-94-D-17058

Prepared for:

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National Highway Traffic Safety Administration
National Center for Statistics and Analysis
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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 redesigned air bag report involving a 1998 Ford Crown Victoria LX, with manual safety belts and dual, redesigned front air bags, and a 1996 Chrysler Town & Country minivan

16. *Abstract*

This report covers a remote investigation of an air bag deployment crash that involved a 1998 Ford Crown Victoria LX (case vehicle) and a 1996 Chrysler Town & Country minivan (other vehicle). This crash is of special interest because the Ford was equipped with redesigned air bags that deployed as a result of collision events and the restrained front right passenger (81-year-old male) sustained fatal head injuries. The Ford's restrained driver (58-year-old male) was reportedly uninjured and the restrained right back passenger (56-year-old female) sustained police-reported non-incapacitating injuries to the head and arm. The Ford was traveling south in the outside southbound lane of a two-lane roadway that was part of a four-lane divided turnpike. The Chrysler was traveling north in the outside northbound lane of a two-lane roadway that was part of the same turnpike. The vehicle-to-vehicle impact occurred in the outside southbound lane when the Chrysler, sliding on its left side facing north, had its left front fender slide onto the top of the Ford's right front fender and hood. The Chrysler's front left grille and leading hood edge contacted the Ford's front right windshield header and upper right A-pillar. That collision was the only involvement of the Ford in a crash sequence totaling seven events. The Ford's front right passenger was restrained by his available, active, three-point, lap-and-shoulder safety belt system. He may have been struck by the Chrysler's front left bumper corner penetrating the Ford's greenhouse area. His "Head Trauma" was the cause of death (103 minutes post-crash) and, as he was transported directly to a funeral home, he was likely pronounced dead at the crash scene. Seat position and posture of the Ford's driver and right back passenger are unknown, as is the steering wheel position for the driver. Police indicated the driver was not injured and was not transported to a medical facility. The right back passenger was transported by ambulance to a medical facility. Her specific injuries and treatment status are not known.

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BACKGROUND

IN99-102

This case was brought to the NHTSA's attention by a review of the 1998 Fatality Analysis Reporting System (FARS) in June 1999. The crash involved a 1998 Ford Crown Victoria LX (case vehicle) and a 1996 Chrysler Town & Country minivan (other vehicle). The crash occurred in October 1998, at 1205 p.m., in Oklahoma, and was investigated by the applicable highway patrol district. This crash is of special interest because the Ford was equipped with redesigned air bags that deployed as a result of collision events and the restrained front right passenger (81- year-old male) sustained fatal head injuries. The Ford's restrained driver (58-year-old male) was reportedly uninjured and the restrained right back passenger (56-year-old female) sustained police-reported non-incapacitating injuries to the head and arm. The Police Crash Report was received in December 1999, the Certificate of Death was obtained in February 2000, and insurance company photographs were secured in March 2000. This report is based on the Police Crash report, the death certificate, insurance company photographs, occupant kinematic principles, and this contractor's evaluation of the evidence.

CRASH CIRCUMSTANCES

The Ford was traveling south in the outside southbound lane of a two-lane roadway that was part of a four-lane, divided turnpike. The Chrysler was traveling north in the outside, northbound lane of a two-lane roadway that was part of the same four-lane, divided turnpike. It was daylight, the weather was clear, and no vision obstructions were noted. The roadway was concrete, dry, straight, level, and no defects defined. Pavement markings are not known (no scene photographs). Posted speed limit was 121 km.p.h. (75 m.p.h.). Traffic density is not known.

The vehicle-to-vehicle impact occurred in the outside southbound lane. Previously, however, the Chrysler (other vehicle) had drifted right from its outside northbound lane and contacted the east guardrail with its right side for a distance of 23 meters (74 feet). The Chrysler's driver then steered left and overcorrected, causing the vehicle to begin a counterclockwise yaw and depositing 42 meters (136 feet) of tire marks from the east shoulder, across both northbound lanes, and midway into a 5-meter (15-foot) median. From an estimated 45 degree counterclockwise yaw, the Chrysler traveled an additional 34 meters (112 feet) while rolling three quarter-rolls to its right and completing a full 360 degree counterclockwise rotation. At impact with the Ford (case vehicle), the Chrysler was on its left side heading north and its left front fender slid up onto the top of the Ford's right front fender and hood. The Chrysler's front left grille and leading hood edge contacted the Ford's front right windshield header and upper right A-pillar. After separating from the Ford, rolling two quarter-rolls leftward onto its right side, and sliding along a bridge's west railing in a northerly direction, the Chrysler then dropped 15 feet to the ground from the bridge, ejected its driver through the sliding left rear door, and came to rest atop a fence, on its wheels, and facing east. Thus, this crash sequence had seven events: the east guardrail, first rollover to the right, vehicle-to-vehicle, second rollover to the left, the bridge railing, the ground, and a fence. Prior to the vehicle-to-vehicle impact, the Ford deposited 17 meters (54 feet) of pre-impact skid marks, then another 53 meters (175 feet) of straight line brake marks to final rest. The Ford was facing south in the outside southbound lane at final rest.

The case vehicle was a rear wheel drive, 1998 Ford Crown Victoria LX, six-passenger, four-door sedan (VIN: 2FAFP74W4WX------) equipped with a 4.6 liter, V-8 gasoline engine and a four-speed automatic transmission with an unknown shift lever location. Four-wheel anti-lock brakes were an option for this vehicle, but it is not known if the Ford was so equipped. The case vehicle's original wheelbase was 291 centimeters (114.7 inches). No odometer reading was reported. The Ford was towed from the crash scene due to disabling damage.

Figure 1: Ford front right damage; Note: direct contact to right side of front header (case photo #01)

Direct damage to the Ford began at its front right and extended to its front windshield header's right side and the right upper A-pillar (**Figure 1**). The front right quarter of the front bumper fascia and reinforcement bar were pushed rearward against the right front tire, the front right headlamp assembly was shattered, the front right grille was missing, the front right plane of the right front fender was pushed rearward, the top of the hood's right side near the seam and the top of the right front fender were depressed downward, the right front wheel was pushed into the lower A-pillar, the upper A-pillar was pushed rearward, as was the right side of the front header, and the right side of the windshield was contacted (in the storage lot, the windshield glazing positioned atop the rear of the front hood does not lend itself to estimates of its immediate post-impact condition). Visible induced damage includes a tenting of the right forward portion of the roof and missing right rocker panel cover. The Ford's right front door is missing, but it is suspected that may be the result of extrication efforts (the upper A-pillar was snipped near the top of the instrument panel). Missing backlight glazing may also be indirect damage from the front roof damage or from extrication efforts. Possible further induced damage along the case vehicle's right side and roof was obscured by a tarpaulin. A CDC for the only event (third of seven) of this crash sequence involving the case vehicle was estimated from insurance photographs: **12-FZAW-7 (010)**.

The WinSMASH reconstruction program barrier algorithm, with a CDC-only estimated crush profile from available photographs, was used to estimate the Barrier Equivalent Speed (BES). This WinSMASH run provided a borderline reconstruction and the results appear high. The BES was estimated as 82.6 km.p.h. (51.3 m.p.h.) for the Ford. This was a severe crash (40-55 km.p.h. [25 to 34 m.p.h.]) for the Ford.

Figure 2: Ford's front right passenger deployed air bag; Note: arrow highlights blood stains at fabric's lower right corner (case photo #05)

Insurance company photographs verify the deployment of the case vehicle's front right passenger air bag (**Figure 2**). None of the available photographs

provide much of a view for any other seat position in the Ford. The front right passenger air bag module appears to have been located in a mid-mount location on the right side of the instrument panel and was equipped with a single cover flap that opened along its tear points. The shape of the passenger's air bag fabric is estimated to have been rectangular. It is not known if that air bag was equipped with tethers or vent ports. Blood stains can be seen on the air bag fabric's front right and along its right side (**Figure 3**).

CASE VEHICLE FRONT RIGHT PASSENGER

The Ford's front right passenger (81-year-old male, White, Non-Hispanic, unknown height and weight) was reportedly wearing his available, manual, three-point, lap-and-shoulder safety belt system. His pre-crash seat adjustments and posture are not known. As the Police Crash Report indicates he was transported from the crash scene directly to a funeral home, it is likely he was pronounced dead at the scene. His time of death was officially reported as 103 minutes post-crash. The cause of death for the Ford's front right passenger, as listed on the Certificate of Death, was "Head Trauma." No autopsy was performed.

Figure 3: Ford's front right passenger seating area; Note: blood-stained air bag, cut safety belt, air bag module cover, and open glove compartment (case photo #06)

The restrained front right passenger was likely seated in a normal passenger posture with his back against the seat back and his feet on the floor. The position of his hands is not known. As the Ford braked prior to impact with the Chrysler, his body would have moved forward. The Police Crash Report's scene diagram indicated no travel path deviation by the Ford post-crash. Given the non-horizontal attitude of the Chrysler at impact with the Ford, it is likely that the Chrysler's front bumper penetrated into the passenger compartment and struck the Ford's front right passenger. His post-impact posture is not known.

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.	Head injuries, NFS	115999.7 unknown	Front of other motor vehicle	Probable	Death Certificate

The Ford's driver (58-year-old male; race, ethnicity, height, and weight unknown) was reportedly wearing his available, manual, three-point, lap-and-shoulder safety belt system. His pre-crash seat adjustments, steering wheel position, and posture are not known. His pre-crash, crash, and post-crash movements would have mirrored those of his front right passenger. He was reportedly uninjured and was not transported to a medical facility. Subsequent treatment status, if any, is unknown.

CASE VEHICLE RIGHT BACK PASSENGER

The Ford's back right passenger (55-year-old female; race, ethnicity, height, and weight unknown) was reportedly wearing her available, manual, three-point, lap-and-shoulder safety belt system. Her pre-crash seat adjustments and posture are not known. Her pre-crash, crash, and post-crash movements would have mirrored those of the front right passenger. She was transported from the crash scene by ambulance to a medical facility. Police assessed her injuries as non-incapacitating to the head and arm. Her specific injuries and treatment status are not known.

OTHER VEHICLE

The Other Vehicle was a front wheel drive, 1996 Chrysler Town & Country LXi, four-door, extended minivan (VIN: 1C4GP64L8TB------) equipped with a 3.8 liter, V-6 gasoline engine with a four-speed automatic transmission and a shift lever at an unknown location. Four-wheel anti-lock brakes are standard for this Chrysler model. Its original wheelbase was 303 centimeters (119.3 inches). No odometer reading was reported. The Chrysler was towed from the crash scene due to disabling damage.

Figure 4: Chrysler's non-horizontal front damage; Note: left side damage from sliding on pavement (case photo #08)

Direct damage to the Chrysler involved all planes except the back plane. Event #1 was the right side of the Chrysler contacting the east guardrail (**Figure 6**). Resultant direct damage included lateral crush to the right front fender, the right front door, the right rear door, and the right rear quarterpanel. Event #2 was a complex rollover sequence. After reaching a 45 degree counterclockwise yaw in the median, the Chrysler rolled right three quarter-rolls about its longitudinal axis while completing a full 360 counterclockwise rotation (**Figure 5**). Resultant direct damage included lateral crush to the left front fender, the left front door, the left rear door, and the left back quarterpanel. Event #3 was the front left plane of the Chrysler, while on its left (driver's) side and heading north, impacting the front right area of the southbound Ford in a non-horizontal crash configuration (**Figures 1 and 4**). Resultant direct damage included rearward displacement of the front left bumper corner fascia and reinforcement bar, the front left headlamp

assembly, the front left grille, and the front left hood edge, with the front left fender's sheet metal peeled rearward, the left front tire and wheel pushed rearward into the lower A-pillar, the forward edge of the left front door shoved rearward, the left front door's sheet metal creased with a lateral indentation, and the left rear sliding door's forward edge dislodged from the B-pillar and its top half (surrounding the glazing) bent outward. Event #4 was a second rollover, to the right as the Chrysler separated from the Ford. Event #5 was another non-horizontal impact, this time with a bridge rail that was contacted by the Chrysler's right and undercarriage surfaces (**Figures 5 and 6**). Resultant direct damage was the lateral creasing of the right front door, and unknown damage, if any, to the undercarriage. Event #6 consisted of the four tires and wheels, plus the undercarriage, striking the ground after dropping approximately 4.6 meters (15 feet) off the bridge rail (**Figures 5 and 6**). Possible direct damage to the tires, wheels, and undercarriage is unknown (no obvious damage is visible in available photographs). Event #7 was the Chrysler striking a fence (**Figure 5**). Resultant direct damage was paint transfer, sheet metal scratching, and minimal denting to the left back quarterpanel. Indirect damage to the Chrysler included the front right bumper corner detached from the reinforcement bar, missing front right headlamp assembly, splintered windshield glazing, disintegrated glazing (LF, LR, LR2, Backlight, RR2, RR, and RF), displaced right rear taillight assembly, and sheet metal waffling to the back tailgate. The estimated vehicle-to-vehicle CDC (Event #3) for the Chrysler was **00-FYMW-4**. No WinSMASH reconstruction program was run because of the non-horizontal collision between the two involved vehicles. A visual crash severity estimate from available photographs of the Chrysler was moderate (24-40 km.p.h. [15 to 25 m.p.h.]). The Chrysler's driver (75-year-old male; race, ethnicity, height, and weight not known) was reportedly restrained by his available, manual, three-point, lap-and-shoulder safety belt system. Police assessed his injuries as fatal, with involvement of the head, trunk (external), trunk (internal), arm, and leg. He was transported from the crash scene by ambulance to a medical facility. His specific injuries, treatment status (if any), and time of death are not known.

Figure 5: Chrysler's left side and roof damage (case photo #11)

Figure 6: Chrysler's right side and right roof rail damage; Note: bridge rail damage at right front door and deflated right rear tire (case photo #13)