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REMOTE AIR BAG DEPLOYMENT REPORT

CASE NUMBER - IN99-009
LOCATION - Wisconsin
VEHICLE - 1998 FORD CROWN VICTORIA POLICE INTERCEPTOR
CRASH DATE - April 1998

Submitted:

May 20, 1999

Contract Number: DTNH22-94-D-17058

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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 air bag deployment report involving a 1998 Ford Crown Victoria Police Interceptor, with manual safety belts and dual front redesigned air bags, and a 1986 GMC 9500 Series incomplete chassis truck

16. *Abstract*

This remote report covers an air bag deployment crash that involved a 1998 Ford Crown Victoria Police Interceptor (case vehicle, vehicle #2) and a 1986 GMC 9500 Series incomplete chassis truck (vehicle #1). This crash is of special interest because the case vehicle was equipped with redesigned air bags that deployed as a result of crash events. The restrained driver (24-year-old male) was decapitated. The case vehicle was traveling south in the inside, southbound lane of a four-lane, divided, U.S. trafficway and was approaching a “Tee” intersection (both the north and south roadways had two through lanes). Vehicle #1 was traveling east in the eastbound lane of the intersecting two-lane, undivided roadway and intended to make a left turn and travel north. The front of the case vehicle impacted the left frame rail of vehicle #1, causing the case vehicle's driver and front right passenger supplemental restraints (air bags) to deploy. The case vehicle passed under almost all of vehicle #1's left and right frame rails (under ride impact), with only a small portion of the case vehicle’s right rear corner remaining under vehicle #1 at final rest. This impact sheared off all structures from behind the front bumper to the “C”-pillars of the case vehicle, including both front fenders, the hood, the roof, and the upper “A”-, “B”- and “C”-pillars. The crash severity for the case vehicle was high [greater than 40 km.p.h. (25 m.p.h.)]. The case vehicle driver’s pre-crash seat adjustments, steering wheel adjustments, and posture are not known. He was restrained by his available, active, three-point, lap-and-shoulder safety belt and sustained, in addition to decapitation, flail chest, numerous fractures of the extremities, and a fractured pelvis. He was declared dead at the scene.

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BACKGROUND

This case was brought to the NHTSA's attention by a review of the 1998 Fatality Analysis Reporting System (FARS) in February, 1999. The crash involved a 1998 Ford Crown Victoria (case vehicle) and a 1986 GMC 9500 Series incomplete chassis truck. The crash occurred in April, 1998 at 4:32 a.m., in Wisconsin, and was investigated by the applicable state police. This case is of special interest because the case vehicle was equipped with redesigned air bags that deployed as a result of collision events, and the case vehicle's restrained driver [24-year-old, White (unknown if Hispanic) male] was decapitated because of a severe under ride. The Police Crash Report was received in March, 1999, the autopsy report in April, and the police photographs in May. This report is based on the Police Crash Report, the autopsy report, police photographs, a brief telephone conversation with the investigating officer, occupant kinematic principles, and this contractor's evaluation of the evidence.

CRASH CIRCUMSTANCES

Figure 1: Case vehicle's southbound approach; Note: straight skid marks (case photo #03)

The case vehicle (vehicle #2) was traveling south in the inside (east), southbound lane of a four-lane, divided U.S. trafficway and was approaching a Tee-intersection (both the north and south roadways had two through lanes--**Figure 1**). Vehicle #1 was traveling east in the eastbound lane of the intersecting two-lane, undivided, county roadway and intended to turn left and travel north on the northbound roadway. Ambient conditions were dark, not lighted; the weather was clear, and the pavement was dry. Both roadways were bituminous, straight, and level, with a speed limit of 86 km.p.h. (55 m.p.h.). There was a stop sign for eastbound traffic on the county road. Investigating officers believe the case vehicle's pre-crash travel speed vastly exceeded the posted speed limit, but it was not estimated. The crash occurred within the intersection of the two trafficways, in the inside, southbound lane.

Figure 2: Case vehicle's at-impact deflection marks; Note: case vehicle's at-rest position partially under vehicle #1 (case photo #05)

The front of the case vehicle impacted the left frame rail of vehicle #1, causing the case vehicle's driver and front right passenger supplemental restraints (air bags) to deploy. Pavement gouge marks and post-impact tire marks show that the case vehicle was initially deflected counterclockwise (**Figure 2**), then rotated clockwise as it move underneath Vehicle #1's chassis. The case vehicle under rode almost all of vehicle #1's left and right frame rails with the case vehicle's right rear corner remaining under the right frame rail of vehicle #1 at final rest (**Figure 3** below). The case vehicle was headed southwest at its final rest position. The

distance between the bottom edge of vehicle #1's frame rails and the road surface was approximately 91 centimeters (36 inches). Vehicle #1 rotated counterclockwise and was headed northeast at its final rest position. The crash severity for the case vehicle was high [greater than 40 km.p.h. (25 m.p.h.)]. This was an unsurvivable crash for the case vehicle's occupant.

Figure 3: Southeastward view of case vehicle's right rear corner under vehicle #1's right frame rail; Note: left frame rail in foreground (case photo #23)

CASE VEHICLE (VEHICLE #2)

The case vehicle was a rear wheel drive, 1998 Ford Crown Victoria Police Interceptor, five-passenger, four-door sedan (VIN: 2FAFP71W3WX------), equipped with a 4.6 liter V-8 engine and a four-speed automatic transmission with a column-mounted shift lever. Four-wheel anti-lock brakes were an option for this vehicle, but it is not known if the case vehicle was so equipped. The case vehicle's wheelbase was 291 centimeters (114.7 inches). An odometer reading was not reported. The case vehicle was towed due to disabling damage.

Figure 4: Front of case vehicle (case photo #13)

The case vehicle sustained direct contact damage across its entire front width, consisting of crushing and shearing off of all structures from the headlights to the "C"-pillars (**Figure 4**). The case vehicle passed almost entirely under the left and right frame rails of vehicle #1, with only the right rear corner of the case vehicle remaining under the right frame rail of vehicle #1 at final rest (**Figure 3** above). Case vehicle components that sustained direct contact damage include: the front mesh-metal "deer catcher," left and right headlamp assemblies, the grille, the hood, left and right front fenders, the windshield, the top portion of the firewall, left and right upper "A"-pillars, the roof, left and right front doors, left and right upper "B"-pillars, left and right rear doors and the left and right upper "C"-pillars. The CDC for the case vehicle, estimated from police photographs, is: **12-FDHW-9**. This crash is out-of-scope for the WinSMASH reconstruction program. Investigating officers measured 42.7 meters (140 feet) of pre-impact skid marks for the case vehicle. This indicates

Figure 5: Left side of case vehicle showing passenger compartment intrusion; Note: steering wheel near left front door (case photo #17)

a speed reduction due to braking of approximately 80 km.p.h. (50 m.p.h.). The at-impact energy absorption and travel to final rest indicate a pre-braking travel speed significantly greater than the posted speed limit of 89 km.p.h. (55 m.p.h.).

There was catastrophic destruction of the case vehicle's passenger compartment (**Figure 5** above). The instrument panel was pushed rearward and upward, the toe pan and floor were pushed up, the windshield and roof were pushed rearward, the steering wheel hub and rim were separated from the steering column, the driver and front right passenger seat backs were broken and pushed rearward. The separated steering wheel, deformed and bloodied, was laying on the ground near the sprung-open left front door.

CASE VEHICLE DRIVER

The case vehicle's driver [180 centimeters, 77 kilograms (71 inches, 170 pounds)] was restrained by his available, manual, three-point, lap and shoulder safety belt system. There were no other occupants. The driver's pre-crash seat adjustments, steering wheel position, and posture are not known.

Pre-impact braking probably caused the case vehicle's driver to move forward, but his forward motion was restricted because he was restrained. At impact, he was probably leaning slightly forward, loaded against the lap-and-shoulder safety belt due to braking deceleration. The impact caused the driver and front right passenger air bags to deploy and caused the front components and hood to be crushed rearward as the case vehicle passed under vehicle #1's frame rails. The coroner's report indicates that the driver sustained decapitation, flail chest, fractures of the pelvis and multiple fractures of the extremities, with no further details. The available photographs do not provide sufficient detail to enable a kinematic reconstruction of the specific injury producing mechanisms, other than to note that the entire case vehicle was massively destroyed in this unsurvivable crash. At final rest, the driver's headless body was laying back in the driver's seat position (**Figure 5** above).

CASE VEHICLE DRIVER INJURIES

The following table of the driver's injuries is based on the coroner's report of a non-invasive death examination; there was no autopsy.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1	Decapitation (complete)	311000.6 untreatable	Hood	Possible	Coroner's Report
2	Flail chest (NFS)	450240.4 severe	Unknown	Unknown	Coroner's Report

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
3	Fracture of pelvis (NFS)	852600.2 moderate	Unknown	Unknown	Coroner's Report
4	Fractures of upper extremities (NFS)	751800.2 moderate	Unknown	Unknown	Coroner's Report
5	Fractures of lower extremities (NFS)	815099.7 unknown	Floor	Possible	Coroner's Report

Vehicle #1 was a 1986 GMC 9500 Series cab-over-engine 6 x 4, incomplete straight truck with air brakes (VIN: 1GDT9K4C0GV------). Vehicle #1 was towed due to disabling damage (**Figure 6**). The case vehicle severed vehicle #1's drive shaft (**Figure 7**). The driver [37-year-old, White (unknown if Hispanic) male--height and weight unknown] sustained police-reported "B" (non-incapacitating) injuries but did not seek treatment.

Figure 6: Vehicle #1's damaged left and right frame rails (case photo #37)

Figure 7: Vehicle #1's severed drive shaft (case photo #39)