Remote, Redesigned Air Bag Special Study

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Dynamic Science, Inc., Case Number (1998-074-802G)

1998 Ford Crown Victoria

Nebraska

September/1998

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16. Abstract

This remote investigation focused on the redesigned air bag system deployment of a 1998 Ford Crown Victoria 4-door sedan. This minor injury crash occurred in September, 1998 in the evening. The weather was clear and the bituminous roadway was dry. The crash occurred in a three legged, “T” shaped intersection. The eastbound leg of the intersection is a two-way undivided residential street and is comprised of two travel lanes; one eastbound and one westbound lane. The speed limit for this road is 40 kmph (25 mph). There are no traffic controls for this street. The road is level at the location of impacts. The southbound leg of the intersection is a two-way undivided residential street and is comprised of two travel lanes; one southbound and one northbound lane. The street is controlled by a stop sign at the point where the road dead-ends into the east/west street. Vehicle 1, a 1998 Ford Crown Victoria 4-door sedan (case vehicle) driven by a 28 year old male (168 cm/66 in, 66 kg/145 lb), was traveling east in the eastbound travel lane approaching the intersecting road at a driver estimated speed of 56-64 kmph (35-40 mph). Vehicle 1 is a police cruiser and was in the process of pursuing another vehicle with the emergency lights and siren activated. The driver was restrained by the available manual lap/shoulder restraint. There were no other occupants in the vehicle. The suspect vehicle made a sharp left turn onto the intersecting street heading northbound. Vehicle 1 also started the left turn onto the northbound lane. The driver of Vehicle 1 lost control of the vehicle and Vehicle 1 departed the northeast corner of the intersection and entered a group of trees. The front plane of Vehicle 1 (12FREE4) struck a tree (event 1). The right plane of Vehicle 1 (12RBES1) then sideswiped a second tree (event 2) before coming to final rest. Vehicle 1 came to rest engaged with the struck trees facing north. A Delta V was calculated for event 1, utilizing WinSMASH, as 15.5 kmph (9.6 mph). The resultant Delta V was not included in the data file because the front bumper was equipped with add-on push bars which altered the stiffness of the front plane. The barrier speed result of 15.5 kmph (9.6 mph) was included in the data file. No Delta V was calculated for the second event due to the impact being a sideswipe configuration which is beyond the scope of WinSMASH reconstruction. As a result of the first event frontal impact, the supplemental restraint system (driver’s and passenger’s frontal redesigned air bags) of the case vehicle deployed. The driver of Vehicle 1 sustained minor injuries in the crash but was not transported from the scene and did not seek medical attention at a later time. Vehicle 1 became disabled due to damage sustained in the crash and was towed from the scene.

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Summary

This remote investigation focused on the redesigned air bag system deployment of a 1998 Ford Crown Victoria 4-door sedan. This minor injury crash occurred in September, 1998 in the evening. The weather was clear and the bituminous roadway was dry. The crash occurred in a three legged, "T" shaped intersection. The eastbound leg of the intersection is a two-way undivided residential street and is comprised of two travel lanes; one eastbound and one westbound lane. The speed limit for this road is 40 kmph (25 mph). There are no traffic controls for this street. The road is level at the location of impacts. The southbound leg of the intersection is a two-way undivided residential street and is comprised of two travel lanes; one southbound and one northbound lane. The street is controlled by a stop sign at the point where the road dead-ends into the east/west street.

Figure 1. Exterior, Vehicle 1 (Ford Crown Victoria)

Vehicle 1, a 1998 Ford Crown Victoria 4-door sedan (case vehicle) driven by a 28 year old male (168 cm/66 in, 66 kg/145 lb), was traveling east in the eastbound travel lane approaching the intersecting road at a driver estimated speed of 56-64 kmph (35-40 mph). Vehicle 1 is a police cruiser and was in the process of pursuing another vehicle with the emergency lights and siren activated. The driver was restrained by the available manual lap/shoulder restraint. There were no other occupants in the vehicle.

Crash Events

The suspect vehicle made a sharp left turn onto the intersecting street heading northbound. Vehicle 1 also started the left turn onto the northbound lane. The driver of Vehicle 1 lost control of the vehicle and Vehicle 1 departed the northeast corner of the intersection and entered a group of trees. The front plane of Vehicle 1 (12FREE4) struck a tree (event 1). The right plane of Vehicle 1 (12RBES1) then sideswiped a second tree (event 2) before coming to final rest. Vehicle 1 came to rest engaged with the struck trees facing north.

A Delta V was calculated for event 1, utilizing WinSMASH, as 15.5 kmph (9.6 mph). The resultant Delta V was not included in the data file because the front bumper was equipped with add-on push bars which altered the stiffness of the front plane. The barrier speed result of 15.5 kmph (9.6 mph) was included in the data file. No Delta V was calculated for the second event due to the impact being a sideswipe configuration which is beyond the scope of WinSMASH reconstruction.

As a result of the first event frontal impact, the supplemental restraint system (driver's and passenger's frontal redesigned air bags) of the case vehicle deployed.

The driver of Vehicle 1 sustained minor injuries in the crash but was not transported from the scene and did not seek medical attention at a later time.

Vehicle 1 became disabled due to damage sustained in the crash and was towed from the scene.

Table 1. Delta V

	Case Vehicle	
	km/h	mph
Total	15.5	9.6
Longitudinal	-15.5	-9.6
Lateral	0	0
Barrier speed	15.5	9.6

Exterior of Case Vehicle

Table 2. Vehicle Information

Model year, make and model	1998 Ford Crown Victoria
VIN	2FAFP71W4WX
CDC	12FREE4 (event 1), 12RBES1 (event 2)

Figure 2. Exterior, Vehicle 1 (1998 Ford Crown Victoria)

Figure 3. Direct damage, Vehicle 1 (1998 Ford Crown Victoria)

Table 3. Crush Measurements

Plane of Impact	Field L cm/in.	C1 cm/in.	C2 cm/in.	C3 cm/in.	C4 cm/in.	C5 cm/in.	C6 cm/in.
Bumper	142	7	8	10	11	11	19
	55.9	2.8	3.1	3.9	4.3	4.3	7.5

Interior of Case Vehicle

The interior of the Ford Crown Victoria showed no evidence of occupant contact. There were no areas of intrusion into the passenger compartment.

The case vehicle was equipped with bucket seats with adjustable head restraints which were not damaged in the front left and front right seating positions. Both front seats were adjusted to the rear most track positions. The rear of the vehicle was equipped with bench seats with no head restraints in all three seating positions.

Figure 4. Interior, case vehicle. Driver's frontal air bag.

Case Vehicle Occupant Protection Systems

The Ford Crown Victoria 4-door sedan was equipped with a redesigned air bag system which consisted of front left and front right air bag modules which housed air bags and depowered inflator units.

The front left air bag was housed in the steering wheel hub and was concealed by a singular inverted D-shaped cover flap which was not damaged in the crash. The circular air bag was equipped with two vent ports and no tether straps. No contact evidence was found on the bag and the bag was not damaged.

The front right air bag was housed top-instrument panel position and was concealed by a singular inverted D-shaped cover flap which was not damaged in the crash. The rectangular air bag was equipped with one vent port and no tether straps. No contact evidence was found on the bag and the bag was not damaged.

Figure 6. Interior, case vehicle. Driver's frontal air bag cover flap.

Case Vehicle Occupant Demographics

Table 4. Case Vehicle Occupant Demographics

	Occupant 1	
Age/Sex:	28/Male	
Seated Position:	Front left	
Seat Type:	Bucket, cloth covered	
Height (cm/in:):	168	66
Weight (kg/lbs).:	66	145
Pre-existing Medical Condition:	None noted	
Body Posture:	Normal, upright facing forward	
Hand Position:	Both on steering wheel rim	
Foot Position:	On floor or foot controls	
Restraint Usage:	Manual lap & shoulder restraint	
Air bag:	Deployed redesigned air bag system	

Occupant Injuries

Table 5. Injuries

Injury	Injury Severity (AIS)	Injury Mechanism
Abrasion left shoulder (4"X3")	1	Air bag

Occupant Kinematics

The driver (case occupant) of the 1998 Ford Crown Victoria was seated in a normal upright posture in the front left position of the vehicle. He was wearing the manual lap/shoulder restraint. There were no other occupants in the vehicle. Seat belt usage was determined through visual inspection by the researcher, the lack of front contact evidence in the vehicle, and statements by the driver. Prior to impact, the driver reported that he steered the vehicle to the right and applied the brakes (with lock-up). The locked manual lap/shoulder restraint held the occupant in the seat prior to impact.

At impact, the driver reacted to the 360 degree principle direction of force by moving forward and loading the manual lap/shoulder restraint. Due to the locked restraint system, the driver did not move far enough forward to impact the interior of the vehicle. It appears that as the driver's frontal air bag deployed, the bag engaged the driver's left arm-causing the left elbow abrasion. No evidence was present in the vehicle consistent with occupant contact. The driver did not require medical attention for this injury.

Figure 7. Interior, case vehicle

Figure 8. Interior, case vehicle

Scene Diagram