

Remote, Redesigned Air Bag Special Study

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Dynamic Science, Inc., Case Number (1999-049-110K)

1999 Ford Contour

Texas

June/1999

Technical Report Documentation Page

1. Report No. 1999-049-110K	2. Government Accession No.	3. Recipient Catalog No.	
4. Title and Subtitle		5. Report Date February 24, 2000	
		6. Performing Organization Report No.	
7. Author(s) Dynamic Science, Inc.		8. Performing Organization Report No.	
9. Performing Organization name and Address Dynamic Science, Inc. 530 College Parkway, Ste. K Annapolis, MD 21401		10. Work Unit No. (TRAIS)	
		11. Contract or Grant no. DTNH22-94-D-27058	
12. Sponsoring Agency Name and Address U.S. Dept. of Transportation (NRD-32) National Highway Traffic Safety Administration 400 7th Street, SW Washington, DC 20590		13. Type of report and period Covered [Report Month, Year]	
		14. Sponsoring Agency Code	
15. Supplemental Notes			
<p>16. Abstract This remote investigation focused on the redesigned air bag system deployment of a 1999 Ford Contour 4-door sedan. This crash occurred in June, 1999 in the evening. The weather was clear and the concrete roadways were dry. The crash occurred in a four-leg intersection. The southbound leg of the intersection is a two-way divided roadway and is comprised of seven travel lanes; three southbound thru-lanes, one southbound left-turn lane, and three northbound lanes. Southbound traffic is separated from northbound traffic by a raised concrete median strip. The speed limit for this road is 56 kmph (35 mph). It is controlled by overhead traffic signals. The road is level at the area of impact. The eastbound leg of the intersection is a two-way undivided roadway and is comprised of two travel lanes; one eastbound lane, and one westbound lane. The speed limit for this road is 48 kmph (30 mph). It is controlled by overhead traffic signals. The road is level at the area of impact. Vehicle 1, a 1999 Ford Contour 4-door sedan (case vehicle) driven by a 23 year old male (170 cm/67 in, 86 kg/190 lbs), was traveling south in the southbound left-turn lane approaching the intersection at an unknown speed. The driver was in the process of eluding a police cruiser with emergency signals activated and was attempting to avoid stopped traffic and travel straight through the intersection. The overhead traffic signal was in the red phase at this time. The driver was restrained by the available manual lap/shoulder restraint. The front right seat was occupied by an unrestrained 24 year old male (unknown ht/wt). Vehicle 2, a 1982 Nissan Maxima 4-door sedan driven by a 27 year old male, was traveling east in the eastbound travel lane approaching the intersection at an unknown speed. The driver was preparing to travel straight through the intersection. The overhead traffic signal was in the green phase at this time. The front right seat was occupied by a 27 year old male. The back left seat was occupied by a 27 year old male. None of the occupants of Vehicle 2 were restrained. Vehicle 1 entered the intersection against the red traffic signal and struck Vehicle 2, which was already in the center of the intersection. The front plane of Vehicle 1 (81FDEW2) struck the left plane of Vehicle 2 (89LYEW6). A Delta V was calculated for Vehicle 1, utilizing the Damage Only Algorithm of WinSMASH as 62 kmph (39 mph). As a result of the frontal impact, the supplemental restraint system (driver's and passenger's frontal redesigned air bags) of the case vehicle deployed. Vehicle 1 came to rest in the south side of the intersection facing southeast. Vehicle 2 came to rest still engaged with Vehicle 1 facing northeast. Both occupants of Vehicle 1 were reportedly uninjured in the crash and were not transported from the scene for medical attention. All three occupants of Vehicle 2 sustained substantial injuries and were transported from the scene to a trauma center. Both front seat occupants were hospitalized while the back seat occupant was treated and released. Both vehicles were disabled due to damage sustained in the crash and were towed from the scene.</p>			
17. Key Words Redesigned air bag system, high speed / no injury		18. Distribution Statement	
19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No of pages	22. Price

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Summary

This remote investigation focused on the redesigned air bag system deployment of a 1999 Ford Contour 4-door sedan. This crash occurred in June, 1999 in the evening. The weather was clear and the concrete roadways were dry. The crash occurred in a four-leg intersection. The southbound leg of the intersection is a two-way divided roadway and is comprised of seven travel lanes; three southbound thru-lanes, one southbound left-turn lane, and three northbound lanes. Southbound traffic is separated from northbound traffic by a raised concrete median strip. The speed limit for this road is 56 kmph (35 mph). It is controlled by overhead traffic signals. The road is level at the area of impact. The eastbound leg of the intersection is a two-way undivided roadway and is comprised of two travel lanes; one eastbound lane, and one westbound lane. The speed limit for this road is 48 kmph (30 mph). It is controlled by overhead traffic signals. The road is level at the area of impact.

Vehicle 1, a 1999 Ford Contour 4-door sedan (case vehicle) driven by a 23 year old male (170 cm/67 in, 86 kg/190 lbs), was traveling south in the southbound left-turn lane approaching the intersection at an unknown speed. The driver was in the process of eluding a police cruiser with emergency signals activated and was attempting to avoid stopped traffic and travel straight through the intersection. The overhead traffic signal was in the red phase at this time. The driver was restrained by the available manual lap/shoulder restraint. The front right seat was occupied by an unrestrained 24 year old male (unknown ht/wt).

Vehicle 2, a 1982 Nissan Maxima 4-door sedan driven by a 27 year old male, was traveling east in the eastbound travel lane approaching the intersection at an unknown speed. The driver was preparing to travel straight through the intersection. The overhead traffic signal was in the green phase at this time. The front right seat was occupied by a 27 year old male. The back left seat was occupied by a 27 year old male. None of the occupants of Vehicle 2 were restrained.



Figure 1. Exterior, Vehicle 1 (1999 Ford Contour)



Figure 2. Exterior, Vehicle 2 (1982 Nissan Maxima)

Crash Events

Vehicle 1 entered the intersection against the red traffic signal and struck Vehicle 2, which was already in the center of the intersection. The front plane of Vehicle 1 (81FDEW2) struck the left plane of Vehicle 2 (89LYEW6).

A Delta V was calculated for Vehicle 1, utilizing the Damage Only Algorithm of WinSMASH as 62 kmph (39 mph).

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



Figure 3. Crash scene. Vehicle 1 approach path.

Vehicle 1 came to rest in the south side of the intersection facing southeast. Vehicle 2 came to rest still engaged with Vehicle 1 facing northeast.

Both occupants of Vehicle 1 were reportedly uninjured in the crash and were not transported from the scene for medical attention. All three occupants of Vehicle 2 sustained substantial injuries and were transported from the scene to a trauma center. Both front seat occupants were hospitalized while the back seat occupant was treated and released.

Both vehicles were disabled due to damage sustained in the crash and were towed from the scene.

Table 1. Delta V

	Case Vehicle		Other Vehicle	
	km/h	mph	km/h	mph
Total	62	38.5	58	36
Longitudinal	-58	-36	-10	-6.2
Lateral	-21	-13	57	35.4
Barrier speed	27	16.8	84	52.2

Exterior of Case Vehicle

Table 2. Vehicle Information

Model year, make and model	1999 Ford Contour
VIN	1FAFP6639XK
CDC	81FDEW2



Figure 4. Exterior, Vehicle 1 (1999 Ford Contour)



Figure 5. Exterior, Vehicle 1 (1999 Ford Contour)

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	135	41	33	27	23	18	16
	53.1	16.1	13	10.6	9.1	7.1	6.3

Interior of Case Vehicle

The interior of the Ford Contour sustained minor damage from occupant contact. There was intrusion of the left toe pan. There was occupant contact evidence present to the windshield, glove box door, right side interior surface, seat belt webbing, and both air bags.

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

Table 4. Intrusions

Intruded Component	Location of Intrusion	Intruded Value cm/in.		Dominant Crush Direction
Toe pan	Front left	12	4.7	Longitudinal

Case Vehicle Occupant Protection Systems

The Ford Contour 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 symmetrical H-configuration cover flaps which were not damaged in the crash. The circular air bag was equipped with two vent ports and two tether straps. Contact evidence consisting of a small scuff mark was found on the upper right quadrant of the front of the bag. Two tears were found on the lower half of the back of the bag from an unknown source.

The front right air bag was housed in the top-instrument panel position and was concealed by a single 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. Contact evidence consisting of blood was found on the lower right quadrant of the front of the bag. The air bag was not damaged.



Figure 6. Driver's frontal air bag.

Case Vehicle Occupant Demographics

Table 5. Case Vehicle Occupant(s) Demographics

	Occupant 1	Occupant 2
Age/Sex:	23/Male	24/Male
Seated Position:	Front left	Front right
Seat Type:	Bucket - cloth covered	Bucket - cloth covered
Height (cm/in.):	170 67	Unknown
Weight (kg/lbs):	86 190	Unknown
Pre-existing Medical Condition:	None noted	None noted
Body Posture:	Unknown	Unknown
Hand Position:	Unknown	Unknown
Foot Position:	Right presumed to be on accelerator	Unknown
Restraint Usage:	Manual lap & shoulder restraint	None used
Air bag:	Deployed redesigned air bag system	Deployed redesigned air bag system

Occupant Injuries

Table 6. Injuries

Occupant #	Injury	Injury Severity (AIS)	Injury Mechanism
1	Not injured		
2	Not injured		

Occupant Kinematics

The driver of the Ford Contour was seated in an unknown posture in the front left position of the vehicle. He was wearing the manual lap/shoulder restraint. The front right passenger was also seated in an unknown posture but was not wearing the available manual lap/shoulder restraint. Seat belt usage was determined through visual inspection by the researcher, the lack of prominent frontal contact evidence on the left side of the vehicle's interior, and the appearance of substantial frontal contact evidence to the right side of the vehicle's interior. It is not known if any avoidance maneuvers were performed by the driver prior to impact.

At impact, the occupants reacted to the 20 degree principle direction of force by moving forward and to the right. The driver's forward momentum was restrained by the lap & shoulder harness, but the unrestrained passenger moved forward into the windshield and right instrument panel. Skin transfers were found on the right side of the windshield and glove compartment door from contact with the passenger's left hand and left knee. The passenger's right knee struck the right side interior surface-cracking the panel. It appears that both occupants engaged the deploying air bags-leaving a scuff on the driver's bag and blood on the passenger's bag. Neither occupant was reported by police as being injured in the crash and neither occupant was transported to a hospital for medical attention.



Figure 7. Interior, case vehicle. Windshield contact.



Figure 7. Interior, case vehicle. Glove box contact.

Scene Diagram



1cm = 2.5m

CASE: 110K
CONCRETE
DRY
LEVEL
cf .70

