

Remote, Redesigned Air Bag Special Study

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Dynamic Science, Inc., Case Number (1998-049-149C)

1998 Ford Contour

Texas

September/1998

**Technical Report Documentation Page**

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16. Abstract  This remote investigation focused on the redesigned air bag system deployment of a 1998 Ford Contour 4-door sedan. This moderate injury crash occurred in September, 1998 in the morning. It was raining at the time and the concrete roadway was wet. The crash occurred on a three lane divided urban roadway. The roadway contains three eastbound and three westbound travel lanes separated by a concrete barrier. The speed limit for this road is 80 kmph (50 mph). There are no traffic controls and the road is level at the area of impact. Vehicle 1, a 1996 Mack medium/heavy truck pulling one trailer driven by a 34 year old male was traveling east in the eastbound left lane and had just stopped in the travel lane due to heavy traffic. There were no other occupants in Vehicle 1. It is unknown if the driver was restrained, however the police accident report states that the driver was wearing the lap/shoulder restraint at the time. Vehicle 2, a 1998 Ford Contour 4-door sedan (case vehicle) driven by a 19 year old male (183 cm/72 in, 100 kg/220 lb), was traveling east in the eastbound left lane at a driver estimated speed of 113 kmph (70 mph) behind Vehicle 1. The driver was restrained by the available manual lap/shoulder restraint. The front right seat was occupied by a 53 year old female (158 cm/62 in, 59 kg/130 lb) who was restrained by the available manual lap/shoulder restraint. The driver of Vehicle 2 failed to react to the stopped Vehicle 1 until too late. The driver applied the brakes, which locked up, and the vehicle went into a longitudinal skid. The front plane of Vehicle 1 (12FZHW7) then struck and underrode the back of Vehicle 1's trailer (unknown CDC) in the left lane. A Delta V could not be computed for either vehicle due to the medium/heavy truck being beyond the scope of WinSMASH reconstruction as well as severe override nature of the impact. As a result of the frontal impact, the supplemental restraint system (driver and passenger side redesigned air bags) of the case vehicle deployed. Vehicle 1 came to rest in the eastbound lane without substantial movement facing east. Vehicle 2 came to rest still engaged with the trailer of Vehicle 1 facing east. The driver of Vehicle 1 was not injured in the crash. The driver of Vehicle 2 sustained non-incapacitating injuries in the crash and was transported by land to a trauma center where he was treated and released. The front right occupant of Vehicle 2 sustained incapacitating injuries in the crash and was transported by land to a trauma center where she was hospitalized for an unknown number of days.				
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***Summary***

This remote investigation focused on the redesigned air bag system deployment of a 1998 Ford Contour 4-door sedan. This moderate injury crash occurred in September, 1998 in the morning. It was raining at the time and the concrete roadway was wet. The crash occurred on a three lane divided urban roadway. The roadway contains three eastbound and three westbound travel lanes separated by a concrete barrier. The speed limit for this road is 80 kmph (50 mph). There are no traffic controls and the road is level at the area of impact.

Vehicle 1, a 1996 Mack medium/heavy truck pulling one trailer driven by a 34 year old male was traveling east in the eastbound left lane and had just stopped in the travel lane due to heavy traffic. There were no other occupants in Vehicle 1. It is unknown if the driver was restrained, however the police accident report states that the driver was wearing the lap/shoulder restraint at the time.

Vehicle 2, a 1998 Ford Contour 4-door sedan (case vehicle) driven by a 19 year old male (183 cm/72 in, 100 kg/220 lb), was traveling east in the eastbound left lane at a driver estimated speed of 113 kmph (70 mph) behind Vehicle 1. The driver was restrained by the available manual lap/shoulder restraint. The front right seat was occupied by a 53 year old female (158 cm/62 in, 59 kg/130 lb) who was restrained by the available manual lap/shoulder restraint.

***Crash Events***

The driver of Vehicle 2 failed to react to the stopped Vehicle 1 until too late. The driver applied the brakes, which locked up, and the vehicle went into a longitudinal skid. The front plane of Vehicle 1 (12FZHW7) then struck and underrode the back of Vehicle 1's trailer (unknown CDC) in the left lane.



**Figure 1.** Exterior, Vehicle 2 (Ford Contour)



**Figure 2.** Crash scene, point of impact.

A Delta V could not be computed for either vehicle due to the medium/heavy truck being beyond the scope of WinSMASH reconstruction as well as severe underride nature of the impact.

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

Vehicle 1 came to rest in the eastbound lane without substantial movement facing east. Vehicle 2 came to rest still engaged with the trailer of Vehicle 1 facing east.

The driver of Vehicle 1 was not injured in the crash. The driver of Vehicle 2 sustained non-incapacitating injuries in the crash and was transported by land to a trauma center where he was treated and released. The front right occupant of Vehicle 2 sustained incapacitating injuries in the crash and was transported by land to a trauma center where she was hospitalized for an unknown number of days.

Vehicle 2 became disabled due to damage sustained in the crash and was towed from the scene. The tractor of Vehicle 1 was driven from the scene by the original driver, however the trailer became inoperable due to crash damage and was towed from the scene.

**Table 1. Delta V**

	Case Vehicle		Other Vehicle	
	km/h	mph	km/h	mph
Total	Unknown	Unknown	Unknown	Unknown
Longitudinal	Unknown	Unknown	Unknown	Unknown
Lateral	Unknown	Unknown	Unknown	Unknown

**Exterior of Case Vehicle**

**Table 2. Vehicle Information**

Model year, make and model	1998 Ford Contour
VIN	1FAFP6631WK
CDC	12FZHW7



**Figure 3.** Exterior, Vehicle 2 (1998 Ford Contour sedan)



**Figure 4.** Exterior, Vehicle 2 (1998 Ford Contour sedan)

**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.
Above bumper	138	Unk	Unk	Unk	Unk	Unk	Unk
	54.3						

## Interior of Case Vehicle

The interior of the Ford Contour sustained substantial damage from intrusion and occupant contact. There was intrusion of the windshield, A-pillar and instrument panel in the front right position of the vehicle. The hood also penetrated into the passenger compartment area. The intruded values are reported in Table 4. There was occupant contact evidence to both air bags, windshield header, center console and parking brake handle.

**Table 4. Intrusions**

Intruded Component	Location of Intrusion	Intruded Value cm/in.		Dominant Crush Direction
Windshield	front right	26	10.2	Longitudinal
Hood	front right	15 - 30	5.9 - 11.8	Longitudinal
A-Pillar	front right	26	10.2	Longitudinal
Center instrument panel	front center	14	5.5	Longitudinal
Right instrument panel	front right	7	2.8	Longitudinal

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

## 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 asymmetrical H-configuration cover flaps which were not damaged. The circular air bag was equipped with two tethers and two vent ports. Contact evidence consisting of blood was found primarily on the right side of the front of the bag and on the top cover flap. The bag was not damaged in the crash.

The front right air bag was housed in the mid-instrument panel position. The single air bag cover flap was a rectangular configuration and was not damaged. The rectangular air bag was equipped with one vent port and no tethers. Contact evidence consisting of blood was found on the top half of the front of the bag. The air bag showed many areas of damage consisting of holes and fraying to the top of the bag from contact with the intruded windshield and hood.



**Figure 5.** Interior, case vehicle. Driver's side air bag.

**Case Vehicle Occupant Demographics**

**Table 5. Case Vehicle Occupant(s) Demographics**

	Occupant 1	Occupant 2
Age/Sex:	19/Male	53/Female
Seated Position:	Front left	Front right
Seat Type:	Bucket - cloth covered	Bucket - cloth covered
Height (cm/in.):	183 72	158 62
Weight (kg/lbs):	100 220	59 130
Pre-existing Medical Condition:	None noted	None noted
Body Posture:	Normal - upright facing forward in seat	Normal - upright facing forward in seat
Hand Position:	On steering wheel, unknown positions	On lap
Foot Position:	On floor or foot controls	On floor
Restraint Usage:	Manual lap & shoulder	Manual lap & shoulder
Air bag:	Deployed redesigned air bag system	Deployed redesigned air bag system



**Figure 6.** Interior, case vehicle. Passenger's side air bag damage (holes & fraying).

**Occupant Injuries**

**Table 6. Injuries**

Occupant #	Injury	Injury Severity (AIS)	Injury Mechanism
1	Contusion right hand	1	Air bag
1	Several minor lacerations right hand	1	Flying glass
1	Contusion forehead	1	Rearview mirror
2	Minor lacerations lip & chin	1	Air bag
2	Contusion forehead & left temple	1	Air bag
2	Abrasion left shoulder & chest	1	Air bag
2	Contusion left knee	1	Instrument panel

## *Occupant Kinematics*

The driver (case occupant 01) and passenger (case occupant 02) of the Ford Contour were seated in normal upright postures in the front left and front right positions of the vehicle. They were both wearing the manual lap/shoulder restraints. Seat belt usage was determined by visual inspection by the researcher, the lack of prominent frontal contact evidence and observations of the investigation police officer at the scene of the crash. Both case occupants reacted to the pre-impact braking by moving forward, loading the manual restraints.

At impact, the occupants reacted to the 360 degree principle direction of force by further loading the manual restraints. The locked lap/shoulder belts prevented further significant movement of the occupants. Case occupant 01 had moved far enough forward to engage the deploying driver side air bag-causing the right hand contusion. Case occupant 02 also had moved far enough forward to engage the deploying passenger side air bag-causing the facial lacerations and contusion. The driver's head struck either the roof or rearview mirror- causing the forehead contusion. The driver's right hand lacerations appear to have been caused by flying glass. The right knee of case occupant 02 struck the glove compartment door-causing the right knee contusion.



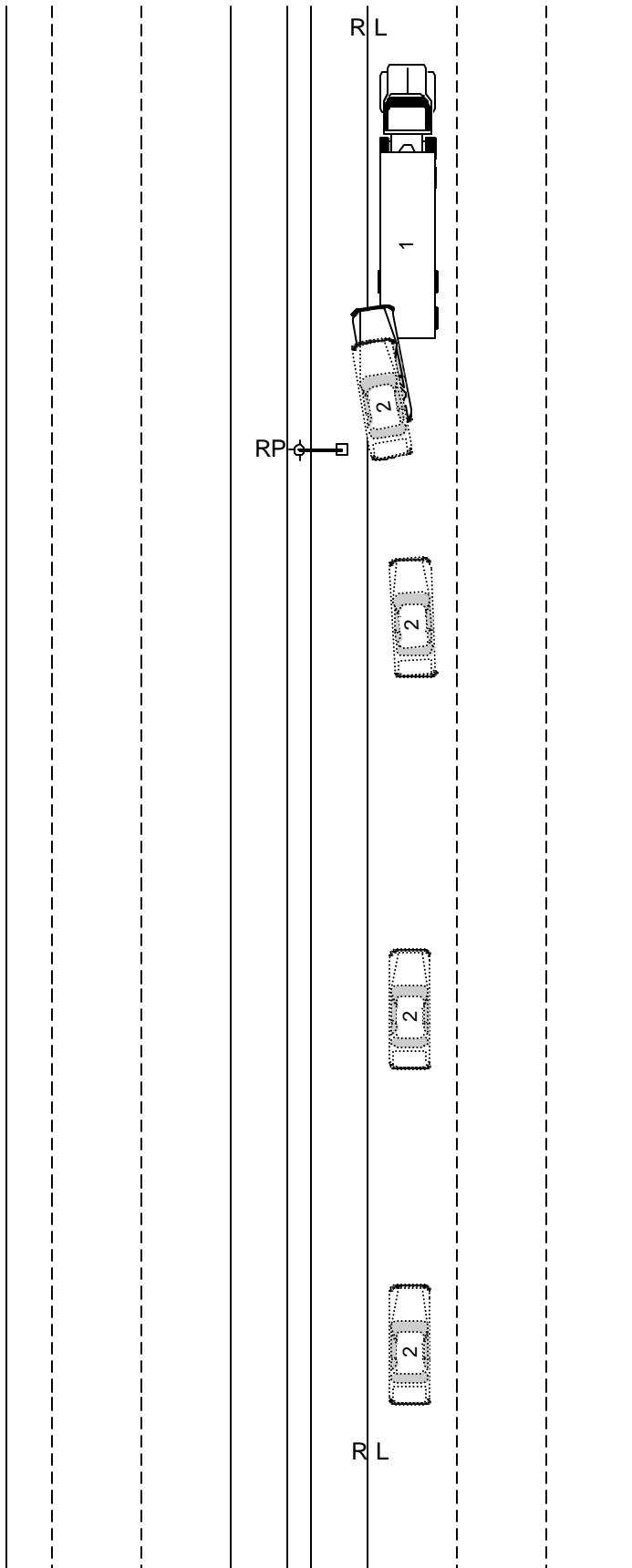
**Figure 7.** Interior, case vehicle. Case occupant 01 position.



**Figure 8.** Interior, case vehicle. Case occupant 02 position.



*Scene Diagram*



Case 49 149C 4



Scale 1c : 2.5m