

Remote, Redesigned Air Bag Special Study

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Dynamic Science, Inc., Case Number (1999-49-004F)

1999 Chevrolet Blazer Tahoe

Texas

January/1999

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15. Supplemental Notes This remote investigation was focused on the redesigned air bag system deployment of a 1999 Chevrolet Blazer Tahoe Sport Utility Vehicle. This two-vehicle crash occurred during the afternoon hours of a winter weekend day in January, 1999. The crash took place within a four-leg intersection and the concrete roadway surface was dry and free of defects. The north and southbound roadway consists of three through travel lanes and a left turn lane only. A raised curbed center median delineates the north and southbound travel lanes. The east and westbound travel lanes have an identical lane and median configuration as the north and southbound legs of the intersection. The northbound leg of the intersection has a positive grade (>2%) while the southbound leg has a negative grade. There are overhead traffic signals present and they were functioning properly. The entire intersection is bordered by curbing and the posted speed limit is 56 km/h (35 mph). Vehicle 2, a 1999 Chevrolet Blazer Tahoe Sport Utility Vehicle, was driven by a 63 year-old-male (185 cm/ 73 in., 109 kg/ 240 lbs.) who was in an upright position and wearing the available three-point lap and shoulder belt. The driver of Vehicle 2 (Blazer) was traveling westbound in lane 1 approaching the four-leg intersection at a driver estimated speed of 32-48 km/h (20-30 mph). He entered the intersection while the overhead traffic signal was in the green signal phase. Vehicle 1, a 1994 Ford Taurus four-door sedan was being operated by a 79 year-old-male (183 cm/ 72 in, 84 kg/185 lbs.). He was in an upright seated position and was reportedly wearing the available three-point lap and shoulder belt. Driver 1 was in the left turn lane of the southbound travel lanes when he initiated a left turn in an attempt to proceed eastbound. As Vehicle 1 and 2 entered the intersection, the frontal plane of Vehicle 2 (11FYEW2) impacted the front, right corner of Vehicle 1 (01FZEW1) in an obtuse angle front to front impact configuration. The calculated delta V for Vehicle 2 was 12.8 km/h (8 mph) with a longitudinal delta V of -12 km/h (-7.4 mph) which is at the low end of the threshold necessary for air bag deployment. Vehicle 1's delta V was calculated at 18.5 km/h (11.5 mph) with a longitudinal delta V of -14.1 km/h (-8.8 mph). The frontal impact also deployed the air bag system in Vehicle 1. Vehicle 1 rotated counterclockwise approximately 90 degrees before coming to rest facing northeast. Vehicle 2 was deflected to the right and continued in its forward trajectory before coming to rest facing north. The driver of Vehicle 2 (1999 Blazer Tahoe) was uninjured in the crash. The driver of Vehicle 1 sustained fractured ribs to the left side (AIS-2), a 15.2 cm diameter contusion to his right hip (AIS-1), contused chest (AIS-1), right wrist contusion and a right hand abrasion to the dorsal aspect (AIS-1). An ambulance arrived on-scene approximately 7 minutes following the crash and transported the driver of Vehicle 1 to a local hospital.					
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Summary

This remote investigation was focused on the redesigned air bag system deployment of a 1999 Chevrolet Blazer Tahoe Sport Utility Vehicle. This two-vehicle crash occurred during the afternoon hours of a winter weekend day in January, 1999. The crash took place within a four-leg intersection and the concrete roadway surface was dry and free of defects. The north and southbound roadway consists of three through travel lanes and a left turn lane only. A raised curbed center median delineates the north and southbound travel lanes. The east and westbound travel lanes have an identical lane and median configuration as the north and southbound legs of the intersection. The northbound leg of the intersection has a positive grade (>2%) while the southbound leg has a negative grade. There are overhead traffic signals present and they were functioning properly. The entire intersection is bordered by curbing and the posted speed limit is 56 km/h (35 mph).

Vehicle 2, a 1999 Chevrolet Blazer Tahoe Sport Utility Vehicle, was driven by a 63 year-old-male (185 cm/ 73 in., 109 kg/ 240 lbs.) who was in an upright position and wearing the available three-point lap and shoulder belt. The driver of Vehicle 2 (Blazer) was traveling westbound in lane 1 approaching the four-legged intersection at a driver estimated speed of 32-48 km/h (20-30 mph). He entered the intersection while the overhead traffic signal was in the green signal phase.

Vehicle 1, a 1994 Ford Taurus four-door sedan was being operated by a 79 year-old-male (183 cm/ 72 in, 84 kg/185 lbs.). He was in an upright seated position and was reportedly wearing the available three-point lap and shoulder belt. Driver 1 was in the left turn lane of the southbound travel lanes when he initiated a left turn in an attempt to proceed eastbound.



Figure 1. Pre-impact trajectory of Vehicle 1 showing point of impact in foreground



Figure 2. Pre-impact trajectory of Vehicle 2 approaching intersection



Figure 3. View showing frontal damage to Vehicle 2 (1999 Blazer)



Figure 4. View showing frontal damage to Vehicle 1 (1994 Taurus)

Crash Events

As Vehicle 1 and 2 entered the intersection, the frontal plane of Vehicle 2 (11FYEW2) impacted the front, right corner of Vehicle 1 (01FZEW1) in an obtuse angle front to front impact configuration. The calculated delta V for Vehicle 2 was 12.8 km/h (8 mph) with a longitudinal delta V of -12 km/h (-7.5 mph) which is at the low end of the threshold necessary for air bag deployment. Vehicle 1's delta V was calculated at 18.5 km/h (11.5 mph) with a longitudinal delta V of -14.1 km/h (-8.8 mph)¹ The frontal impact also deployed the air bag system in Vehicle 1.

Vehicle 1 rotated counterclockwise approximately 90 degrees before coming to rest facing northeast. Vehicle 2 was deflected to the right and continued in its forward trajectory before coming to rest facing north. The driver of Vehicle 2 (1999 Blazer Tahoe) was uninjured in the crash. The driver of Vehicle 1 sustained fractured ribs to the left side (AIS-2), a 15.2 cm diameter contusion to his right hip (AIS-1), contused chest (AIS-1), right wrist contusion and a right hand abrasion to the dorsal aspect (AIS-1). An ambulance arrived on-scene approximately 7 minutes following the crash and transported the driver of Vehicle 1 to a local hospital.

Table 1. Delta V

	Case Vehicle		Other Vehicle	
	km/h	mph	km/h	mph
Total	12.8	8	18.5	11.5
Longitudinal	-12.0	-7.5	-14.1	-8.8
Lateral	4.4	2.7	-11.9	-7.4



Figure 5. Close-up frontal view of 1999 Blazer Tahoe



Figure 6. Three-quarter view of Vehicle 2 (Blazer)

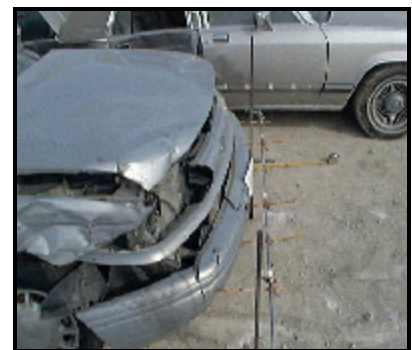


Figure 7. Perpendicular view of Vehicle 1 (1994 Ford Taurus)

¹ Calculated utilizing the Damage Only mode of the WinSmash 1.2.1 program

Exterior of Case Vehicle

Table 2. Vehicle Information

Model year, make and model	1999 Chevrolet Blazer Tahoe
VIN	1GNEC13R6XJ
CDC	11FYEW2

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.
Front Bumper	174	8	13	25	15	2	0
	68.5	3.1	5.1	9.8	5.9	0.8	0

Interior of Case Vehicle

The interior of the 1999 Chevrolet Blazer Tahoe was devoid of interior deformation due to intrusion or occupant contacts. There was a minor scuff mark noted to the nylon fabric of the driver’s air bag. The passenger compartment remained intact and no integrity was lost. All vehicle glazing remained intact and was undamaged. The case vehicle is equipped with front bucket seats with adjustable head restraints. The second seat consists of a bench seat with folding backs. There are adjustable head restraints available at the outboard positions of the second seat. The front, left seat track and the front, right seat tracks were adjusted at their rear most track positions.



Figure 8. View showing the driver's seated position

Case Vehicle Occupant Protection Systems

The 1999 Chevrolet Blazer Tahoe Sport Utility Vehicle was equipped with redesigned air bag systems. The system's inflatable restraint sensing and diagnostic module is mounted on the floor immediately adjacent to the transmission tunnel, to the left. The diagnostic module, black box is located underneath the front, left bucket seat. There are two inflatable restraint discriminating sensors located on the lower radiator support bracket. The SIR ready lamp indicator is located in the instrument panel cluster.

The driver's air bag is housed in the steering wheel hub and encases the nylon air bag unit. The double, vertical, module cover flaps are symmetrical in design and opened at their designated tear points. The circular air bag is equipped with four internal tether straps and two exhaust vent port holes. The vent ports are located at the 11 and 1 o'clock positions respectively. The rigid plastic knee bolster was undamaged and did not reveal any damage or detectable occupant contacts.

The front, right passenger instrument panel module air bag is located above the glove compartment box (mid-mount). The module deployment door is rectangular in shape and is equipped with double horizontal cover flaps that are symmetrical in design. The module cover flaps opened at their designated tear points and were undamaged. The nylon air bag was undamaged, untethered and was equipped with two exhaust vent port holes. The vent ports were located at the 10 o'clock and 2 o'clock directions respectively.



Figure 9. View showing deployed driver's air bag



Figure 10. View showing deployed passenger air bag

Case Vehicle Occupant Demographics

	Occupant 1	
Age/Sex:	63/Male	
Seated Position:	Front, Left	
Seat Type:	Bucket, Leather covered	
Height (cm/in.):	185	72.83
Weight (kg/lbs):	109	240.3
Pre-existing Medical Condition:	None Reported	
Body Posture:	Normal/ Upright Details Unknown	
Hand Position:	Both hands on steering wheel rim exact o'clock positions unknown	
Foot Position:	Right foot on brake pedal and the left foot on the floor	
Restraint Usage:	Manual-three-point lap and shoulder belt used in a proper fashion	
Air bag:	Driver air bag deployed as a result of the frontal impact	

Occupant Injuries

Table 4. Injuries

Injury	Injury Severity (AIS)	Injury Mechanism
No Injuries Sustained		

Occupant Kinematics

The 63 year-old-male driver of the 1999 Chevrolet Blazer Tahoe was fully restrained by the available three-point manual lap and shoulder belt. He was reportedly in an upright position and facing forward with his right foot depressing the brake pedal.

He responded to the 340 degree principle direction of force by moving forward and to her left. He loaded the applied lap and shoulder belt webbing which prohibited extended forward movement of his upper and lower torso. As his upper torso was restricted from further forward movement, his head pitched downward probably contacting the deploying air bag. The driver rebounded back into his respective seated position and was uninjured during the crash.

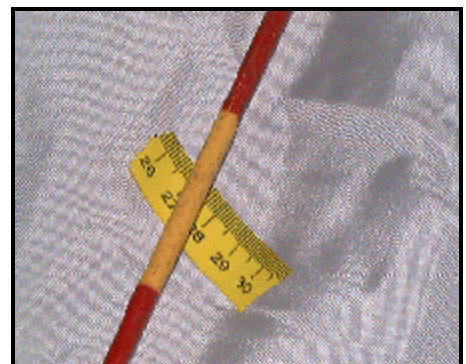
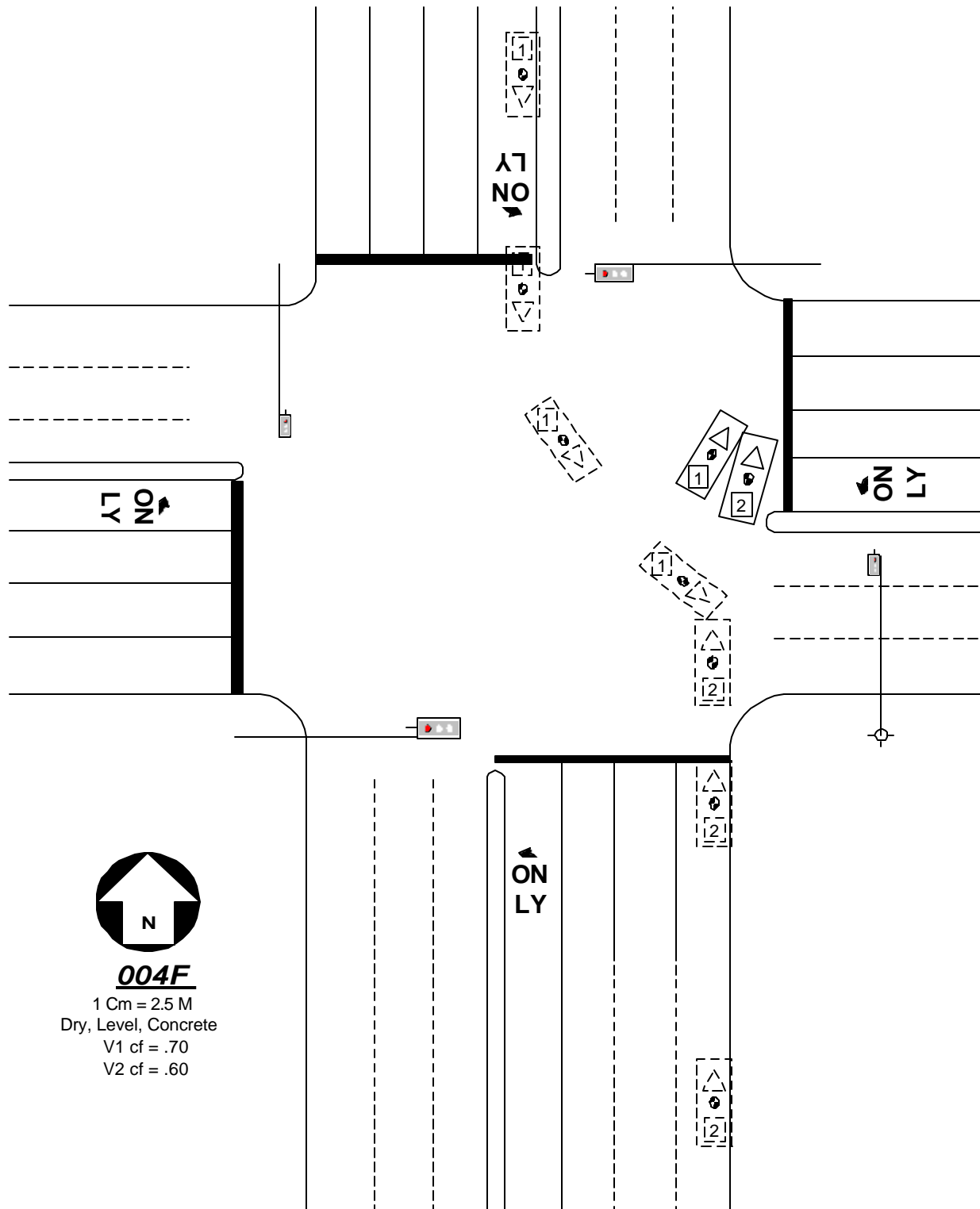


Figure 11. Close-up view showing possible occupant contact to driver's air bag

Scene Diagram



004F
 1 Cm = 2.5 M
 Dry, Level, Concrete
 V1 cf = .70
 V2 cf = .60