

Remote Investigation/ Vehicle to Vehicle  
Dynamic Science, Inc. / Case Number: DS01018  
2001 Chrysler Town and Country Minivan  
Arizona  
November 2001

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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.**

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16. Abstract <p>This crash occurred within the confines of a four-leg intersection. All four legs of the intersection are controlled by stop signs. The case vehicle is a 2001 Chrysler Town and Country minivan driven by a restrained 78-year-old female. The front right seat was occupied by a restrained 83-year-old female. The case vehicle was equipped with "Next generation multistage front driver and passenger air bags that feature enhanced inflators" and seat belt pretensioners. Side air bags are available for this vehicle as an option. VinAssist indicated that this was a Multi-Purpose Vehicle (MPV) with side air bags; however, this is not the case. The other vehicle was a 1984 Ford Bronco II 4 x 4 driven by an 18-year-old male.</p> <p>The case vehicle was traveling north on a two-lane roadway approaching the intersection at a police reported speed of 40-48 km/h (25-30 mph). The driver was apparently engaged in a conversation with the passenger regarding her ability to drive. She failed to stop at the stop sign and entered the intersection. The other vehicle was traveling east, approaching the intersection. The driver of this vehicle stopped at the intersection and then proceeded across the intersection at a police reported speed of 8-16 km/h (5-10 mph). The two vehicles impacted corner to corner. The front of the case vehicle (12FYEW1) struck the right front of the other vehicle. The other vehicle was pushed sharply in a counterclockwise direction. There was a second, side-slap type impact between the left rear door of the case vehicle (09LPEW2) and the right side of the other vehicle. The other vehicle was redirected backwards and to the north where it departed the roadway and struck a fire hydrant. The driver of the case vehicle reported that she sustained bruising to her left breast. She did not receive any medical treatment. The front right occupant sustained contusions to both arms and to her left breast. She was transported to a local trauma center where she was treated and released after two hours. The driver of the other vehicle complained of back pain but did not report any injuries. Both vehicles were towed from the scene.</p>					
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**Dynamic Science, Inc.**  
**Crash Investigation**  
**Case Number: DS01018**

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**BACKGROUND:**

## Description:

The case was initiated in response to a report of the front right occupant sustaining incapacitating air bag related injuries in an AOPS equipped vehicle. The crash occurred in November, 2001 at 1643 hours in Arizona. NHTSA was notified via Zone Center 2. DSI was notified on December 18, 2001. This case was originally going to be conducted on-scene, but the case vehicle had been repaired.

Investigation Type:	Remote
Crash Location:	Arizona
Crash Date:	November 2001
Notification Date:	December 2001
Field Work Completed:	N/A

**SUMMARY**

This crash occurred within the confines of a four-leg intersection. All four legs of the intersection are controlled by stop signs. The case vehicle was a four-door 2001 Chrysler Town and Country minivan driven by a restrained 78-year-old female (152 cm/60 in, 52 kg/115 lb). The driver was seated in a normal, upright fashion on the fabric covered bucket seat. She was wearing plastic frame prescription eye glasses at the time of the crash. The seat track was adjusted to the middle position and the seat back was completely upright. The tilt steering wheel was adjusted to between the full up and center position.



**Figure 1.** Front left, case vehicle, impact 1

The case vehicle was equipped with “Next generation multistage front driver and passenger air bags that feature enhanced inflators” and seat belt pretensioners. Side air bags are available for this vehicle as an option. VinAssist indicated that this was a MPV with side air bags; however, this is not the case. DSI contacted the Chrysler Corporation and it was determined that the vehicle was not equipped with side air bags.

The front right seat was occupied by a properly restrained 83-year-old female (168 cm/66 in, 91 kg/200 lbs). This occupant was seated in a normal, upright fashion on the fabric covered bucket seat. She was wearing plastic frame prescription eye glasses at the time of the crash. The seat track was adjusted to the middle position and the seat back was completely upright.

The other vehicle was a 1984 Ford Bronco II 4 x 4 driven by an 18-year-old male.

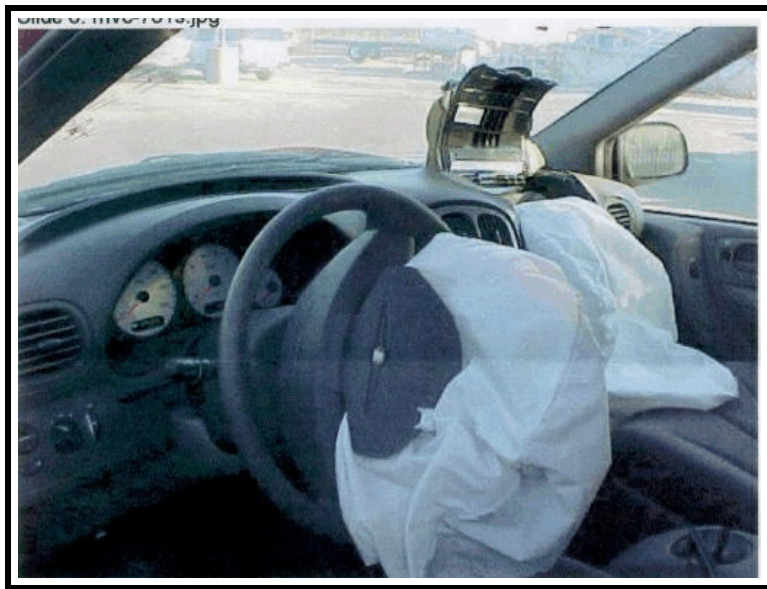
The case vehicle was traveling north on a two-lane roadway approaching the intersection at a police reported speed of 40-48 km/h (25-30 mph). The driver was apparently engaged in a conversation with the passenger regarding her ability to drive. She failed to stop at the stop sign and entered the intersection.

The other vehicle was traveling east approaching the intersection. The driver of this vehicle stopped at the intersection and then proceeded across the intersection at a police reported speed of 8-16 km/h (5-10 mph). DSI calculated the speed at impact as 20.6 km/h (12.8 mph), assuming an acceleration rate of 4.8 ft/sec.

The two vehicles impacted corner to corner. The front of the case vehicle (12FYEW1) struck the right front side of the other vehicle. The case vehicle had 106.0 cm (42.0 in) of direct contact damage<sup>1</sup> on the front end beginning at the left bumper corner. The case vehicle sustained a longitudinal delta V of -15.1 km/h (-9.4 mph) and a lateral delta V of 2.7 km/h (1.7 mph)<sup>2</sup>. Both front air bags deployed at this time. Given the relatively low speed and the restraint status of the



**Figure 2.** Left side, impact 2, case vehicle



**Figure 3.** Driver and front right passenger air bags

<sup>1</sup> Damage estimated from photos as compared to exemplar vehicle

<sup>2</sup> Calculated using missing vehicle algorithm and estimated crush values

occupants, this was likely a stage 1 deployment.

The case vehicle was redirected to the right slightly. The other vehicle was pushed sharply in a counterclockwise direction. There was a second, side-slap type impact between the left rear door of the case vehicle (09LPEW2) and the right side of the other vehicle. The case vehicle sustained a lateral delta V of 16.8 km/h (10.4 mph)<sup>1</sup>. The other vehicle was redirected backwards and to the north where it departed the roadway and struck a fire hydrant. The fire hydrant was damaged and was leaking. The driver of the case vehicle reported that she sustained bruising to her left breast. The police indicated that she also had contusions to her arms, but she stated in the interview that it was her passenger who sustained those injuries. The police coded her injuries as “1–No Injury”. She was able to exit the vehicle on her own. She did not receive any medical treatment.

The front right occupant sustained contusions to both arms and to her left breast. The police reported that she also sustained a contusion to her nose. The police coded her injuries as “4–Incapacitating injury”. She was transported to a local trauma center where she was treated and then released after two hours.

The driver of the other vehicle complained of back pain but did not report any injuries.

Both vehicles were towed from the scene.

DSI contacted the claims adjuster associated with the case vehicle. This vehicle had already been repaired. Several pre-repair photos were available and were obtained.

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<sup>1</sup>Calculated using CDC v. Barrier option

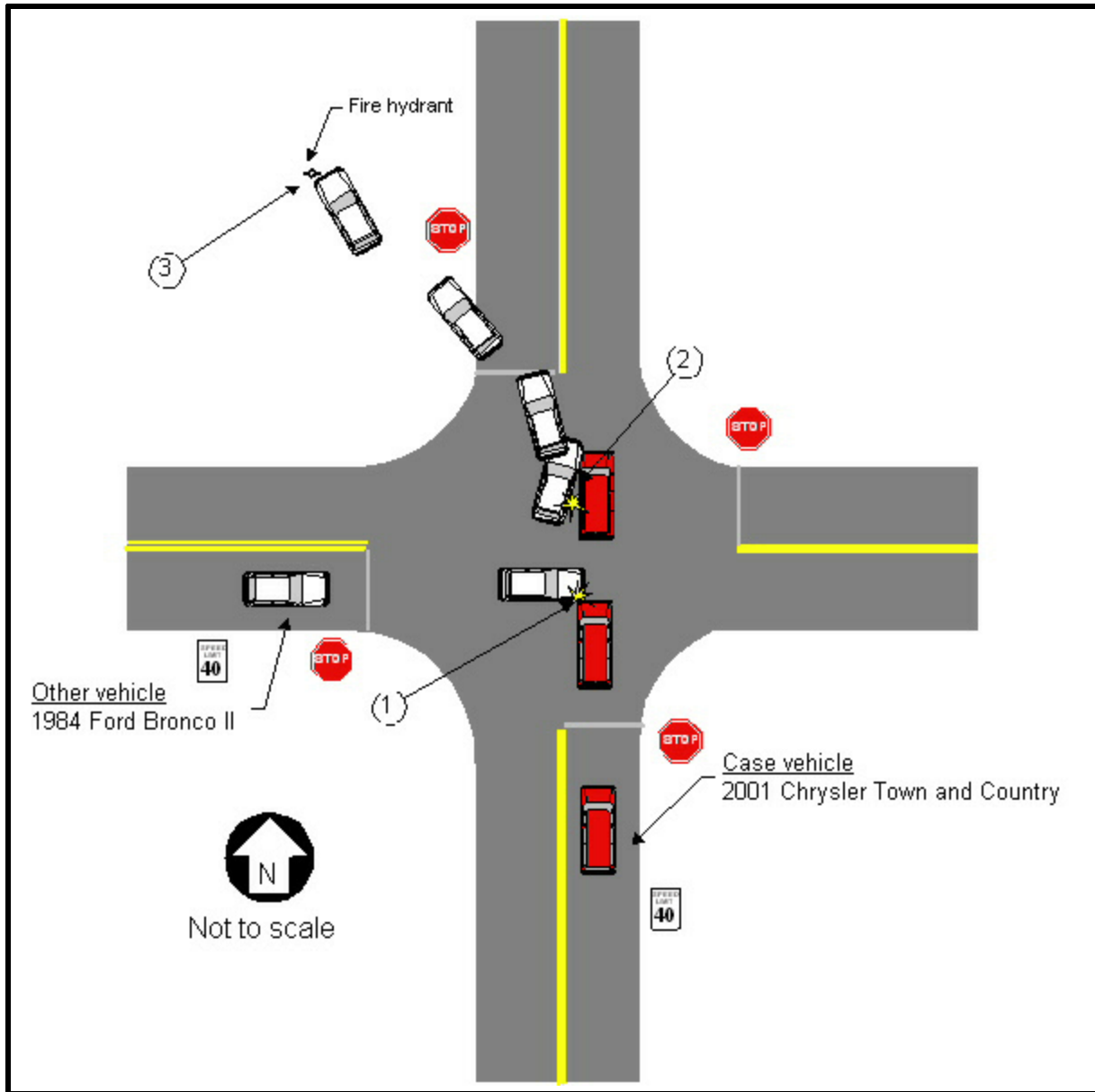
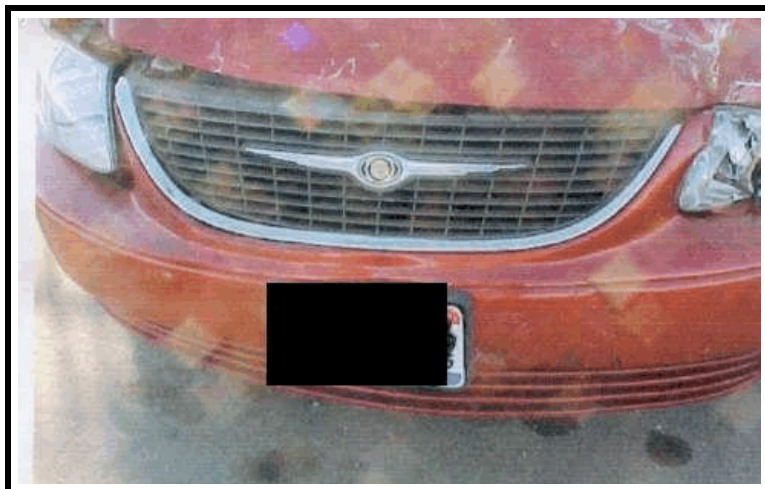


Figure 4. Scene diagram



**DETAILED INFORMATION****Vehicles**Case vehicle

Description:	2001 Chrysler Town and Country van	
VIN:	2C8GP74L21Rxxxxxx	
Odometer:	Unknown	
Engine:	3.8L, 6 cylinder	
Reported Defects:	None	
Cargo:	None	
Damage Description:	Front bumper, hood, grille damaged. Some shifting to the right. Left door damaged. Left rear window disintegrated.	
CDC:	Impact 1: 12FDEW1 Impact 2: 09LPEW2	
Delta V (Impact 1):	Total	15.4 km/h (9.5 mph)
	Longitudinal	-15.3 km/h (-9.4 mph)
	Latitudinal	2.7 km/h (1.7 mph)
	Energy	10,935 joules (8,068 ft-lbs)



**Figure 5.** Front, case vehicle, impact 1



**Figure 6.** Left side, case vehicle, impact 2

Other vehicle

Description:	1984 Ford Bronco II 4 x 4	
VIN:	1FMC414S7EUBxxxxxx	
Odometer:	Unknown	
Engine:	2.8L, 6 cylinder	
Reported Defects:	None noted	
Cargo:	Unknown	
Damage Description:	Unknown	
CDC:	Unknown	
Delta V (Impact 1):	Total	21.7 km/h (13.5 mph)
	Longitudinal	-3.8 km/h (-2.3 mph)
	Latitudinal	-21.4 km/h (-13.3 mph)
	Energy	35,596 joules (26,263 ft-lbs)

**Occupants**

<u>Case vehicle</u>	Occupant 1	Occupant 2
Age/Sex:	78/Female	83/Female
Seated Position:	Front left	Front right
Seat Type:	Fabric covered bucket seat. Seat track adjusted to the middle position.	Fabric covered bucket seat. Seat track adjusted to the middle position.
Height:	152 cm (60 in)	168 cm (66 in)
Weight:	52 kg (115 lbs)	91 kg (200 lbs)
Occupation:	Retired	Retired
Pre-existing Medical Condition:	Unknown	Unknown
Alcohol/Drug Involvement:	None	None
Driving Experience:	>20 years	N/A
Body Posture:	Normal, upright	Normal, upright
Hand Position:	Both hands on steering wheel	Both hands in lap
Foot Position:	Right foot on accelerator, left on floor	Both feet on floor
Restraint Usage:	Lap and shoulder belt available and used. Equipped with pretensioner that did fire at impact.	Lap and shoulder belt available and used. Equipped with pretensioner that did fire at impact.
Air bag:	Next generation multistage steering wheel mounted air bag. Air bag deployed.	Next generation multistage top mount air bag. Air bag deployed.

Other vehicle

Age/Sex:	18/Male
Seated Position:	Front left
Seat Type:	Unknown
Height:	Unknown
Weight:	Unknown
Occupation:	Unknown
Pre-existing Medical Condition:	None noted
Alcohol/Drug Involvement:	None
Driving Experience:	Unknown
Body Posture:	Unknown
Hand Position:	Unknown
Foot Position:	Unknown
Restraint Usage:	Lap and shoulder belt used - per police

**Injuries and Injury Mechanisms****Case vehicle:**

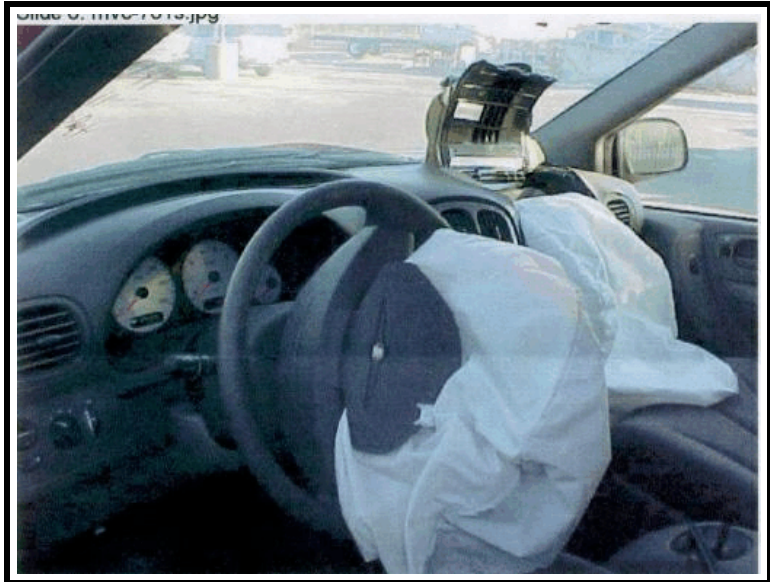
	<u>INJURY</u>	<u>OIC CODE</u>	<u>ICD-9</u>	<u>SOURCE</u>
Driver:	Contusion, left breast	490402.1,2	922.0	Seat belt
FR Occupant:	Contusion, left breast	490402.1,2	922.0	Seat belt
	Bilateral lower arm contusions	790402.1,3	923.10	Air bag

**Other Vehicle:**

	<u>INJURY</u>	<u>OIC CODE</u>	<u>ICD-9</u>	<u>SOURCE</u>
Driver:	Complained of back pain but did not report any injuries			

## Occupant Kinematics

The 78-year-old female driver of the case vehicle was seated in a normal, upright fashion on the fabric covered bucket seat. She was wearing the available lap and shoulder belt. She was wearing plastic frame prescription eye glasses at the time of the crash. The seat track was adjusted to the middle position and the seat back was completely upright. The tilt steering wheel was adjusted to between the full up and center position. Both of her hands were on the steering wheel. She was engaged in an argument with the front right occupant. She was unaware of the pending crash and did not take any



**Figure 7.** Deployed air bags

evasive actions. At impact she responded to the 350 degree direction of force by pitching forward and to the left. She loaded the torso portion of the seat belt-causing the contusion to her left breast. As the vehicle rotated and there was a second impact, the driver responded to the 270 degree direction of force by moving sharply to the left. There were no indications or reports of injury from this movement. The driver likely engaged the door side panel, but did not sustain any injuries.

The 83-year-old female front right occupant was seated in a normal, upright fashion on the fabric covered bucket seat. She was wearing the available lap and shoulder belt. She was wearing plastic frame prescription eye glasses at the time of the crash. The seat track was adjusted to the middle position and the seat back was completely upright. Her hands were in her lap. She was engaged in an argument with the driver. At impact, she responded to the 350 degree direction of force by pitching forward and to the left. She loaded the torso portion of the seat belt-causing the contusion to her left breast. Her lower arms likely engaged the deployed air bag-causing the contusions. As the vehicle rotated and there was a second impact, this occupant responded to the 270 degree direction of force by moving sharply to the left. There were no indications or reports of injury from this movement.

**Attachment 1. Speed Calculation**

<b>CASE NUMBER: DS01018</b>	
Comments: Ending velocity from stop	
<b>** END VEL W/ A RATE, I VEL, DISTANCE **</b>	
$Ve = \sqrt{Vi^2 + 2 \times a \times D}$	Ve = Ending Velocity in FPS.
$Ve = \sqrt{0.00^2 + 2 \times 4.80 \times 37.00}$	Vi = Initial Velocity in FPS.
$Ve = \sqrt{0.00 + 355.20}$	a = Acceleration in FPS <sup>2</sup> .
$Ve = \sqrt{355.20}$	D = The Distance in Feet.
$Ve = 18.84$	2 = A Constant.
<b>INPUTS:</b>	<b>RESULTS:</b>
The Initial Vel in FPS is:	0.00
The Acceleration Rate is:	4.80
The Distance in Feet is:	37.00
	The Ending Vel in FPS is:
	18.84
	The Ending Speed in MPH is:
	12.84

7.50.31