

Remote / Vehicle to Vehicle / Front to Front  
Dynamic Science, Inc. / Case Number: DS97015  
1994 Nissan Sentra  
Washington  
August 1994

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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 collision occurred in Washington in August, 1994 at 1552 hours. Vehicle 1, a 1994 Nissan Sentra driven by a 58 year-old male (163 cm / 64 in., 52 kg / 115 lbs.), was traveling southbound approaching a four-leg intersection. The driver shoulder belt was in use, but the driver lap belt was not in use. Vehicle 2, a 1989 Honda Civic CRX driven by a 51 year-old female was traveling northbound at a police estimated speed between 51 km/h (32 mph) and 56 km/h / (35 mph), also approaching the intersection. As Vehicle 2 entered the intersection, Vehicle 1 began a left-hand turn. The front-right of Vehicle 1 was struck by the front of Vehicle 2. Vehicle 1 sustained a longitudinal delta v of -17 km/h (10.5 mph). The airbag in Vehicle 1 was deployed by the longitudinal force of this impact. Vehicle 1 was pushed into a counterclockwise rotation and came to rest in the roadway facing south-southwest. Vehicle 2 was pushed into a clockwise rotation and also came to rest in the roadway facing southwest, a short distance south of Vehicle 1.</p> <p>Upon arrival of the investigating police officer, the driver of Vehicle 1 was not breathing, had fixed pupils and only a slight possible pulse. CPR was initiated, but failed to revive him. The driver of Vehicle 1 sustained a superficial abrasion to his mid-forehead, a small abrasion to the bridge of his nose, two small contusions to his anterior left knee, fractures of right anterior ribs 2-5, fracture of left anterior rib 4, fractures of left posterior ribs 1-3, a sternal fracture, a two-inch splenic laceration, and bilateral hemothoraces.</p> <p>His death was attributed to the rib fractures and bilateral hemothoraces with severe atherosclerotic cardiovascular disease as a contributing factor.</p>					
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Dynamic Science, Inc.  
Accident Investigation  
Case Number: DS97015

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## BACKGROUND:

Description: This case was initiated in response to a report of a driver fatality in an airbag related crash.

Vehicle 1, a 1994 Nissan Sentra was driven by a 58 year-old male who was restrained by a shoulder belt, but not by a lap belt.

Investigation Type: Remote  
Crash location: Washington  
Crash Date: August, 1994  
Notification Date: June 19, 1997

## SUMMARY:

This collision occurred in Washington in August, 1994 at 1552 hours. Vehicle 1, a 1994 Nissan Sentra driven by a 58 year-old male (163 cm / 64 in., 52 kg / 115 lbs.), was traveling southbound approaching a four-leg intersection. The driver shoulder belt was in use, but the driver lap belt was not in use. Vehicle 2, a 1989 Honda Civic CRX driven by a 51 year-old female was traveling northbound at a police estimated speed between 51 km/h (32 mph) and 56 km/h / (35 mph), also approaching the intersection. As Vehicle 2 entered the intersection, Vehicle 1 began a left-hand turn. The front-right of Vehicle 1 was struck by the front of Vehicle 2. Vehicle 1 sustained a longitudinal  $\Delta v$  of -17 km/h (10.5 mph). The airbag in Vehicle 1 was deployed by the longitudinal force of this impact. Vehicle 1 was pushed into a counterclockwise rotation and came to rest in the roadway facing south-southwest. Vehicle 2 was pushed into a clockwise rotation and also came to rest in the roadway facing southwest, a short distance south of Vehicle 1.



**Figure 1.** Final rest - Vehicle 2 can be seen in the foreground and Vehicle 1 is behind Vehicle 2.

Upon arrival of the investigating police officer, the driver of Vehicle 1 was not breathing, had fixed pupils and only a slight possible pulse. CPR was initiated, but failed to revive him. The driver of Vehicle 1 sustained a superficial abrasion to his mid-forehead, a small abrasion to the bridge of his nose, two small contusions to his anterior left knee, fractures of right anterior ribs 2-5, fracture of left anterior rib 4, fractures of left posterior ribs 1-3, a sternal fracture, a two-inch splenic laceration, and bilateral hemothoraces. His death was attributed to the rib fractures and bilateral hemothoraces with severe atherosclerotic cardiovascular disease as a contributing factor.

# Scene Diagram

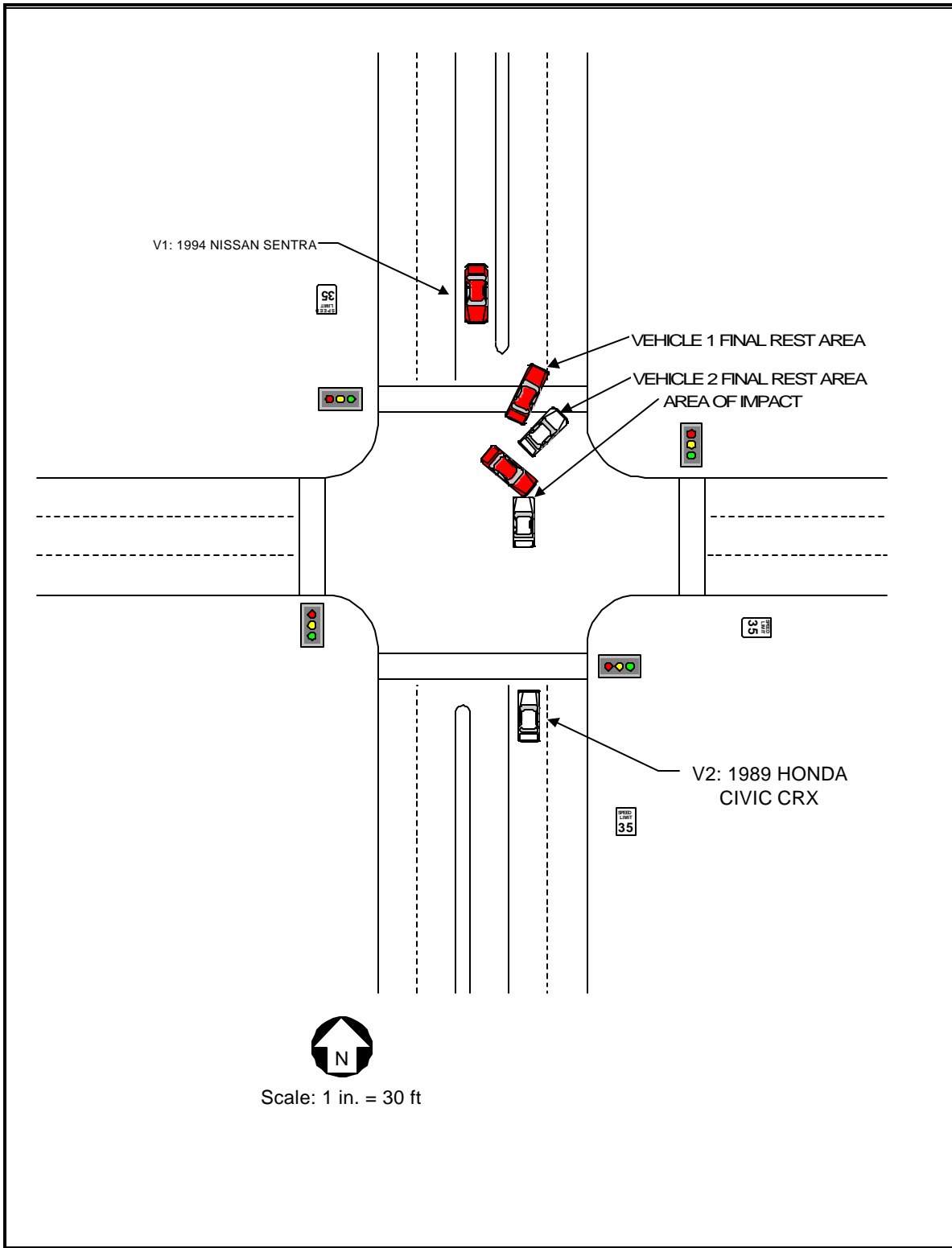


Figure 2. Scene diagram

## DETAILED INFORMATION:

### Vehicles

#### Vehicle 1

Description:	1994 Nissan Sentra four-door sedan
VIN:	1N4EB31F1RCXXXXXX
Odometer:	Unknown
Engine:	Four cylinder 1.6 L
Reported Defects:	None
Cargo:	None reported
Damage Description:	Moderate damage to front and front-right with bumper shifted to the left.
CDC:	01FZEW2 (Impact #1)
Delta V: (Impact #1)	Total            22.2 km/h (14.4 mph)  Longitudinal    -17.0 km/h (-11.0 MPH)  Latitudinal    -14.3 km/h (-9.2 MPH)  Energy          39,536 joules (29,160 ft-lb)

This vehicle is equipped with two rows of seats. The front seats are both bucket seats. The driver's seat back appears to be reclined slightly rearward from its full upright position. There does not appear to be any intrusion or integrity loss. This case was initiated in response to a report of an airbag-related driver fatality. This case is being conducted as a remote investigation.



**Figure 3.** Vehicle 1 - Exterior

## Vehicle 2

Description:	1989 Honda Civic CRX
VIN:	JHMED8358KSXXXXXX
Odometer:	Unknown
Engine:	Unknown
Reported Defects:	None
Cargo:	None reported
Damage Description:	Moderate damage to front and front-left with bumper shifted slightly to the right.
CDC:	12FYEW2 (Impact #1)
Delta V: (Impact #1)	Total            26.8 km/h (16.7 mph)
	Longitudinal    -37.0 km/h (-22.9 MPH)
	Latitudinal      2.0 km/h (1.2 MPH)
	Energy            31,433 joules (23,183 ft-lb)

This vehicle is equipped with two rows of seats. The front seats are both bucket seats. The driver's seat back appears to be inclined slightly rearward from its full upright position. There does not appear to be any intrusion or integrity loss. The 51 year-old female driver of Vehicle 2 was transported for medical treatment.



**Figure 4.** Vehicle 2 - Exterior



## Occupants

### Vehicle 1:

Age / Sex:	58 male
Seated Position:	Front left
Seat Type:	Bucket
Height:	163 cm (64 in.)
Weight:	52 kg (115 lbs.)
Occupation:	Unknown
Pre-existing Medical Condition:	Severe atherosclerotic cardiovascular disease of the three main coronary arteries
Alcohol / Drug Involvement:	None
Driving Experience:	Unknown
Body Posture:	Upright, otherwise unknown
Hand Position:	Unknown
Foot Position:	Unknown
Restraint Usage:	Motorized shoulder belt, no lap belt / Frontal airbag deployment

## Injuries and Injury Mechanisms

### Vehicle 1

	<u>INJURY</u>	<u>OIC CODE</u>	<u>ICD-9</u>	<u>SOURCE</u>
Driver:	Forehead laceration, ½ in.	290602.1,7	910.8	Unknown
	Abrasion, bridge of nose	290202.1,4	910.0	Air bag
	Contusion, left knee	890402.1,2	924.11	Instrument panel, left
	Fracture R anterior ribs 2-5, fracture L posterior ribs 1-3, left and right hemothorax	450232.4,3 <sup>1</sup>	807.17	Air bag (R), seatback (L)
	Fracture, sternum	450899.1,4	807.2	Unknown
	Laceration, spleen	544220.2,2	865.00	Unknown

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<sup>1</sup>>3 ribs on one side and <= 3 ribs on the other side with hemo -/pneumothorax

## Occupant Kinematics

The driver of Vehicle 1 was apparently seated with his seat adjusted to a position where the lower rim of the steering wheel was slightly rearward of the front edge of the seat cushion. The seat cushion was covered with what appears to be a terrycloth towel. The driver was restrained by the motorized shoulder harness, but was not wearing the manual lap belt in conjunction with the shoulder harness. During the impact, the driver likely moved forward and to his right, with his lower torso submarining to some extent. With his left shoulder restrained by



**Figure 5.** Vehicle 1 - Interior

the shoulder harness, his upper body twisted in a counterclockwise direction, allowing the right side of his chest to strike the airbag as it deployed, resulting in the right anterior rib fractures, sternal fracture, and right side hemothorax. The force of the deploying airbag may have projected him rearward with his back left striking the driver's seatback, resulting in the left posterior rib fractures and left side hemothorax. The primary cause of his injuries appears to be his interaction with the deploying airbag. Abrasions on his forehead may have been caused by the interaction of eyewear to the deploying airbag, but it is unknown if eyewear was worn.