

On-Scene / Vehicle to Vehicle / Front to Side
Dynamic Science, Inc. / Case Number: DS97009
1994 Mazda 626
California
August/1997

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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.

Technical Report Documentation Page

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16. Abstract The collision occurred in California in May 1997 at 1910 hours. Vehicle 1, a 1994 Mazda 626 driven by a 32-year-old female (155 cm / 61 in. - 54 kg / 120 lbs.) , was traveling eastbound approaching an intersection at an unknown speed. The right front seat was occupied by a 4-month-old male (66 cm / 26 in. - 9 kg / 20 lbs.) seated in a Century 2000 STE convertible child seat. The child seat was in the rear-facing position. The left rear seat was occupied by a 6-year-old female and the right rear seat was occupied by a 7-year-old female. The vehicle belongs to a relative and is used by this driver only occasionally. Vehicle 2, a 1997 Nissan XE pickup truck driven by a 20-year-old male, was traveling northbound at an unknown speed approaching the same intersection. The right front of this vehicle was occupied by a 19-year-old male. As both vehicles entered the intersection, the driver of Vehicle 2 braked. There was no pre-impact braking for Vehicle 1. The two vehicles struck corner to corner. The airbags in Vehicle 1 deployed at this time. The passenger airbag struck the back of the child seat which in turn impacted the back of the child's head. There was no airbag deployment for Vehicle 2. Vehicle 1 was redirected to the left; Vehicle 2 to the right. There was a second, sideslap type impact. Vehicle 1 continued through the intersection at a 45 degree angle, overran a curb, and came to rest on a lawn on the northeast corner of the intersection. Vehicle 2 was forced out of the intersection and came to rest facing east in the eastern leg of the intersection. According to the driver of Vehicle 1, the car was filling with smoke immediately after the collision. She unlatched the right front occupant and exited on the left side of the vehicle. She placed the child on the ground. There were some attempts at resuscitation by paramedics but the injuries were too severe and the child expired shortly thereafter. The driver sustained minor seatbelt type contusions. The left rear occupant sustained a contusion to the nose. The right rear occupant was not injured. The driver of Vehicle 2 did not sustain any injuries, nor was the right front occupant injured. The driver was arrested for vehicular manslaughter and driving under the influence.					
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Dynamic Science, Inc.
Accident Investigation
Case Number: DS97009

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BACKGROUND:

Description: This case was initiated in response to a report of a child fatality in a rear facing child seat in an airbag related crash.

Vehicle 1, a 1994 Mazda 626 was driven by a 32-year-old female. The right front seat was occupied by a 4-month-old male seated in a Century 2000 STE convertible child seat.

Investigation Type:	On-Scene
Crash Location:	California
Crash Date:	May, 1997
Notification Date:	May 14, 1997
Field Work Completed:	July 20, 1997

SUMMARY:

The collision occurred in California in May 1997 at 1910 hours. Vehicle 1, a 1994 Mazda 626 driven by a 32-year-old female (155 cm / 61 in. - 54 kg / 120 lbs.) , was traveling eastbound approaching an intersection at an unknown speed. The right front seat was occupied by a 4-month-old male (66 cm / 26 in. - 9 kg / 20 lbs.) seated in a Century 2000 STE convertible child seat. The child seat was in the rear-facing position. The left rear seat was occupied by a 6-year-old female and the right rear seat was occupied by a 7-year-old female. The vehicle belongs to a relative and is used by this driver only occasionally. Vehicle 2, a 1997 Nissan XE pickup truck driven by a 20-year-old male, was traveling northbound at an unknown speed approaching the same intersection. The right front of this vehicle was occupied by a 19-year-old male. As both vehicles entered the intersection, the driver of Vehicle 2 braked. There was no pre-impact braking for Vehicle 1. The two vehicles struck corner to corner. The airbags in Vehicle 1 deployed at this time. The passenger airbag struck the back of the child seat which in turn impacted the back of the child's head. There was no airbag deployment for Vehicle 2. Vehicle 1 was redirected to the left; Vehicle 2 to the right. There was a second, sideslap type impact. Vehicle 1 continued through the intersection at a 45 degree angle, overran a curb, and came to rest on a lawn on the northeast corner of the intersection. Vehicle 2 was forced out of the intersection and came to rest facing east in the eastern leg of the intersection.

According to the driver of Vehicle 1, the car was filling with smoke immediately after the collision. She unlatched the right front occupant and exited on the left side of the vehicle. She placed the child on the ground. There were some attempts at resuscitation by paramedics but the injuries were too severe and the child expired shortly thereafter. The driver sustained minor seatbelt type contusions. The left rear occupant sustained a contusion to the nose. The right rear occupant was not injured. The driver of Vehicle 2 did not sustain any injuries, nor was the right front occupant injured. The driver was arrested for vehicular manslaughter and driving under the influence.

DETAILED INFORMATION**Vehicles**Vehicle 1

Description:	1994 Mazda 626 Lx-6 4 door sedan	
VIN:	YVGE22D4R5XXXXXX	
Odometer:	86284 km (53616 miles)	
Engine:	2.4 L 4 cyl	
Reported Defects:	None	
Cargo:	Child seat	
Damage Description:	Moderate contact to the right front bumper corner; sideslap type damage to the right rear door and quarter panel.	
CDC:	01FREW1 (Impact #1) 03RZEW1 (Impact #2)	
Delta V: (Impact #1)	Total	21 km/h (13 MPH)
	Longitudinal	-16 km/h (-10 MPH)
	Latitudinal	-14 km/h (-9 MPH)
	Energy	43832 joules (23844 ft-lb)



Figure 1. Exterior, Vehicle 1

This vehicle is equipped with two rows of seats. The front seats are both bucket seats. The seat tracks were just forward of the mid position and the seatbacks were slightly reclined. The driver's and passenger's airbags had no tethers and both had two vents. The passenger airbag had a maximum deployed excursion of 73 cm (28 in). There was a 48 cm (18.9 in) long scuff on the airbag from contact with the child seat. There was no intrusion nor any integrity loss.

Vehicle 2

Description:	1997 Nissan XE King Cab	
VIN:	1N6SD16S3VCXXXXXX	
Odometer:	513 miles	
Engine:	2.4 liter - 4 cyl	
Reported Defects:	None	
Cargo:	None	
Damage Description:	Moderate longitudinal and lateral crushing to the left front bumper and the left fender area. Sideslap type damage to left side along truck bed.	
CDC:	10LFEW2 (Impact #1) 09LZEW1 (Impact #2)	
Delta V: (Impact #1)	Total	17 km/h (11 MPH)
	Longitudinal	-11 km/h (7 MPH)
	Latitudinal	13 km/h (8 MPH)
	Energy	13135 joules (97687 ft-lb)

This vehicle is equipped with bucket seats in front and fold-down jump seats in the rear. The vehicle is equipped with a driver's airbag which did not deploy.



Figure 2. Exterior, Vehicle 2

Occupants

<u>Vehicle 1</u>	<u>Occupant 1</u>	<u>Occupant 2</u>
Age/Sex:	32/Female	4 month / Male
Seated Position:	Left front	Right front
Seat Type:	Bucket	Bucket
Height:	155 cm (61 in.)	66 cm (26 in.)
Weight:	54 kg (120 lbs.)	9 kg (20 lbs.)
Occupation:	Unknown	None
Pre-existing Medical Condition:	None noted	None noted
Alcohol/Drug Involvement:	None	None
Driving Experience:	> 10 years	NA
Body Posture:	Upright, normal	Supine, facing rear of vehicle in child seat
Hand Position:	Unknown	Unknown
Foot Position:	Unknown	Unknown
Restraint Usage:	Lap and shoulder used correctly	Lap and shoulder used incorrectly with child seat
	Airbag deployment (frontal)	Airbag deployment (frontal)

<u>Vehicle 1</u>	<u>Occupant 3</u>	<u>Occupant 4</u>
Age/Sex:	6/Female	7/Female
Seated Position:	Left rear	Right rear
Seat Type:	Bench with folding back	Bench with folding back
Height:	Unknown	Unknown
Weight:	Unknown	Unknown
Occupation:	NA	NA
Pre-existing Medical Condition:	None noted	None noted
Alcohol/Drug Involvement:	None	None
Driving Experience:	NA	NA
Body Posture:	Unknown	Unknown
Hand Position:	Unknown	Unknown
Foot Position:	Unknown	Unknown
Restraint Usage:	Lap and shoulder used correctly	Lap and shoulder used correctly

<u>Vehicle 2</u>	<u>Occupant 1</u>	<u>Occupant 2</u>
Age/Sex:	20/Male	19/Male
Seated Position:	Left front	Right front
Seat Type:	Bucket with folding back	Bucket with folding back
Height:	188 cm (74 in.)	Unknown
Weight:	66 kg (145 lbs.)	Unknown
Occupation:	Unknown	Unknown
Pre-existing Medical Condition:	None noted	None noted
Alcohol/Drug Involvement:	Yes	None noted
Driving Experience:	Unknown	NA
Body Posture:	Upright, normal	Unknown
Hand Position:	Unknown	Unknown
Foot Position:	Right foot on brake	Unknown
Restraint Usage:	Lap and shoulder used correctly	Lap and shoulder used correctly

Injuries and Injury Mechanisms

Vehicle 1

	<u>INJURY</u>	<u>OIC CODE</u>	<u>ICD-9</u>	<u>SOURCE</u>
Driver:	Shoulder contusion	790402.1,2	923.10	Seat belt
	Chest contusion	490402.1,2	922.1	Seat belt
	Abdomen contusion	590402.1,2	922.2	Seat belt
Occupant 2:	Brain laceration, parietal	140688.4,2	851.6	Child seat back
	Brain laceration, temporal	140688.4,2	851.6	Child seat back
	Contusion, parietal lobe	140404.3,2	851.4	Child seat back
	Cortical contusions	140402.3,6	851.4	Child seat back
	Multiple irregular skull fractures	150404.3,2	800.15	Child seat back
	Fracture, anterior left floor of frontal fossa	150402.2,2	800.15	Child seat back
	Linear fractures (right side)	150200.3,1	800.15	Child seat back
	Fracture, front to back in floor of right temporal bone	150200.3,1	800.15	Child seat back
	Contusion, nose	290402.1,4	920	Unknown
	Contusion, left cheek	290402.1,2	920	Unknown
	Abrasion, near nose	290202.1,2	910	Unknown
	Abrasion, left side of neck	390202.1,2	910	Child seat restraint
	Oblique abrasion, right cheek	290202.1,1	910	Unknown
	Dislocation, left wrist	751430.2,2	833.0	Child seat back

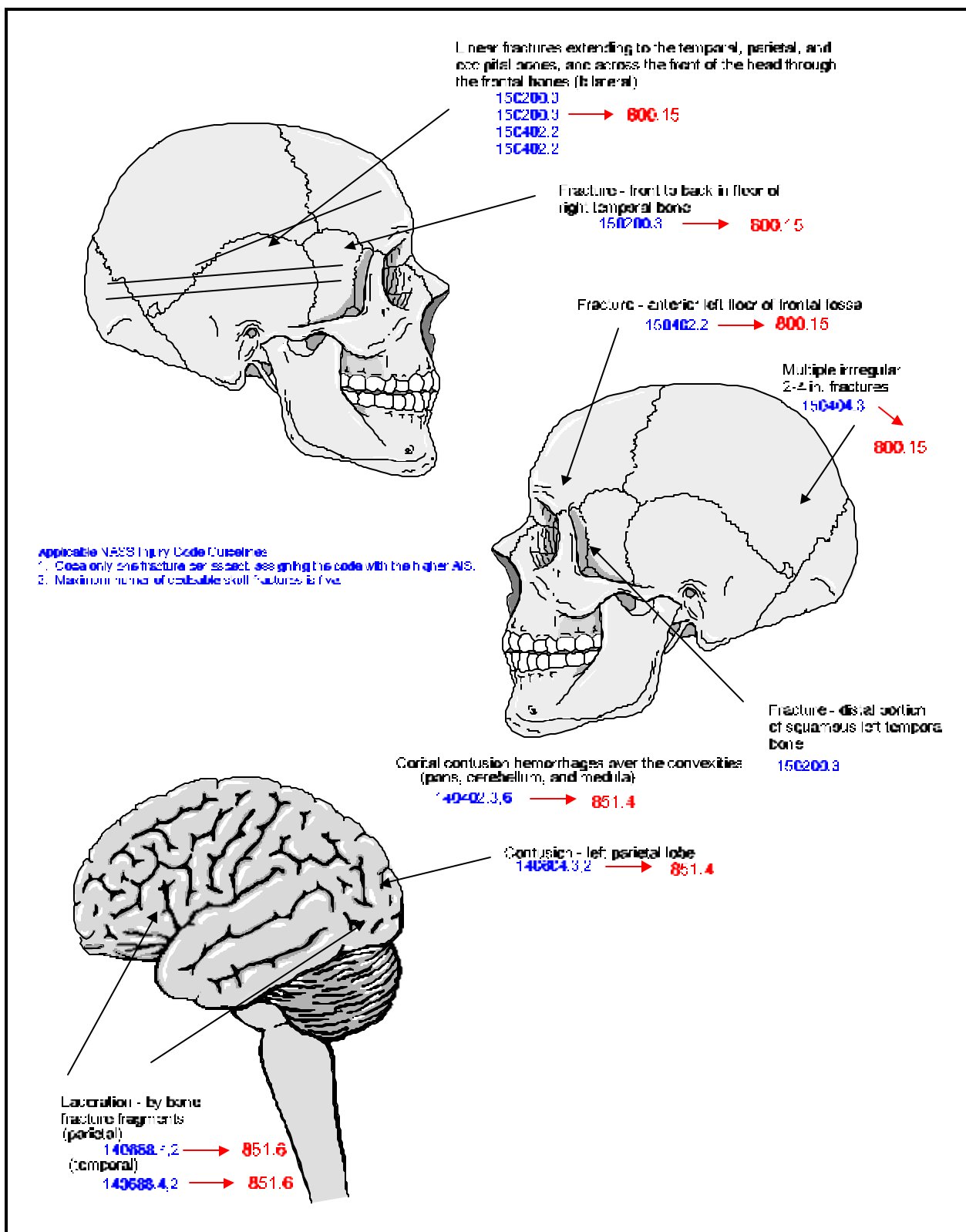


Figure 3. Head injuries, right front occupant

Vehicle 1

	<u>INJURY</u>	<u>OIC CODE</u>	<u>ICD-9</u>	<u>SOURCE</u>
Occupant 3:	Nose contusion	290402.1,8	920	Unknown
Occupant 4:	None			

Vehicle 2

	<u>INJURY</u>	<u>OIC CODE</u>	<u>ICD-9</u>	<u>SOURCE</u>
Occupant 1:	No injuries recorded			
Occupant 2:	No injuries recorded			

Occupant Kinematics

The 32-year-old female driver of the case vehicle was seated in a forward facing fashion. She was seated in a fabric covered bucket seat was adjusted to between the forward most and middle track positions. She was using the available lap and shoulder belt. At impact, the driver's air bag deployed. The driver responded to the 1 o'clock direction of force by exhibiting a forward trajectory and loading the manual restraint system—causing the contusions to her shoulder, chest, and abdomen.

The 4-month-old male occupant of the right front seat was improperly restrained in a Century 2000 STE convertible child seat. The child seat was in the rear-facing position. The seat was secured in the vehicle using the lap and shoulder belt. The lap and shoulder belt was routed through the child seat using the slots intended for the forward facing position. This is an emergency locking retractor type seatbelt with a sliding latch. It requires the use of a locking clip which was not used in this case. This child seat is designed for use with children from birth to 18 kg (40 lbs). The child was belted into the child seat using the T-shield arrangement, but the shoulder harnesses were routed through the top slots rather than the lower ones proper for a child of this age.

The right front seat was forward of the mid-track position. The child seat was situated near the module cover. At impact, the passenger side airbag deployed. The module cover and deploying airbag struck the rear of the child seat, breaking off a 15 cm (5.9 in) vertical plastic rib on the left side - facing the back of the child seat. The child seat was loaded rearward by the cover and the airbag forcing the seatback into the back of the child's head. This child's injuries were caused by the back of the child seat.

The 6-year-old female second seat left occupant was seated in a forward facing fashion. She was seated on a fabric-covered bench seat with folding backs. She was using the available lap and shoulder belt. At impact, this occupant responded to the 1 o'clock direction of force by exhibiting a forward trajectory and loading the manual restraint system. This occupant sustained a nose contusion from an unknown source.

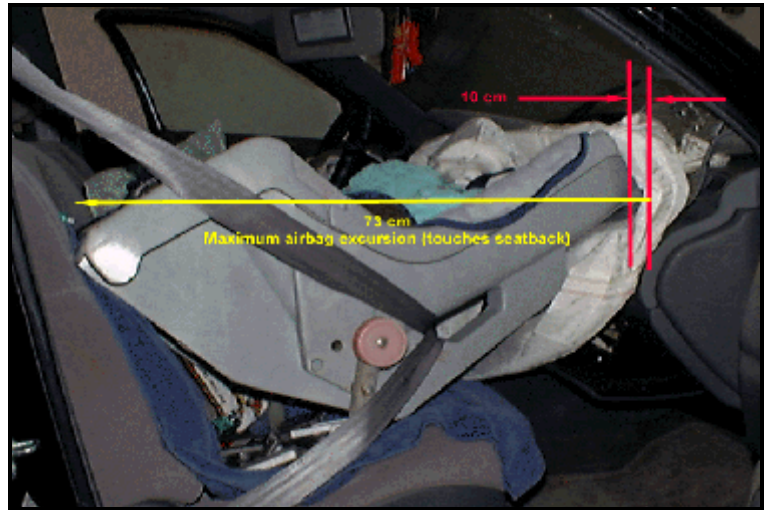


Figure 4. Century 2000 STE child seat, in case vehicle



Figure 5. Century 2000 STE child seat, various views

The 7-year-old female second seat right occupant was seated in a forward facing fashion. She was seated on a fabric-covered bench seat with folding backs. She was using the available lap and shoulder belt. At impact, this occupant responded to the 1 o'clock direction of force by exhibiting a forward trajectory and loading the manual restraint system. She did not sustain any injuries.

Scene diagram

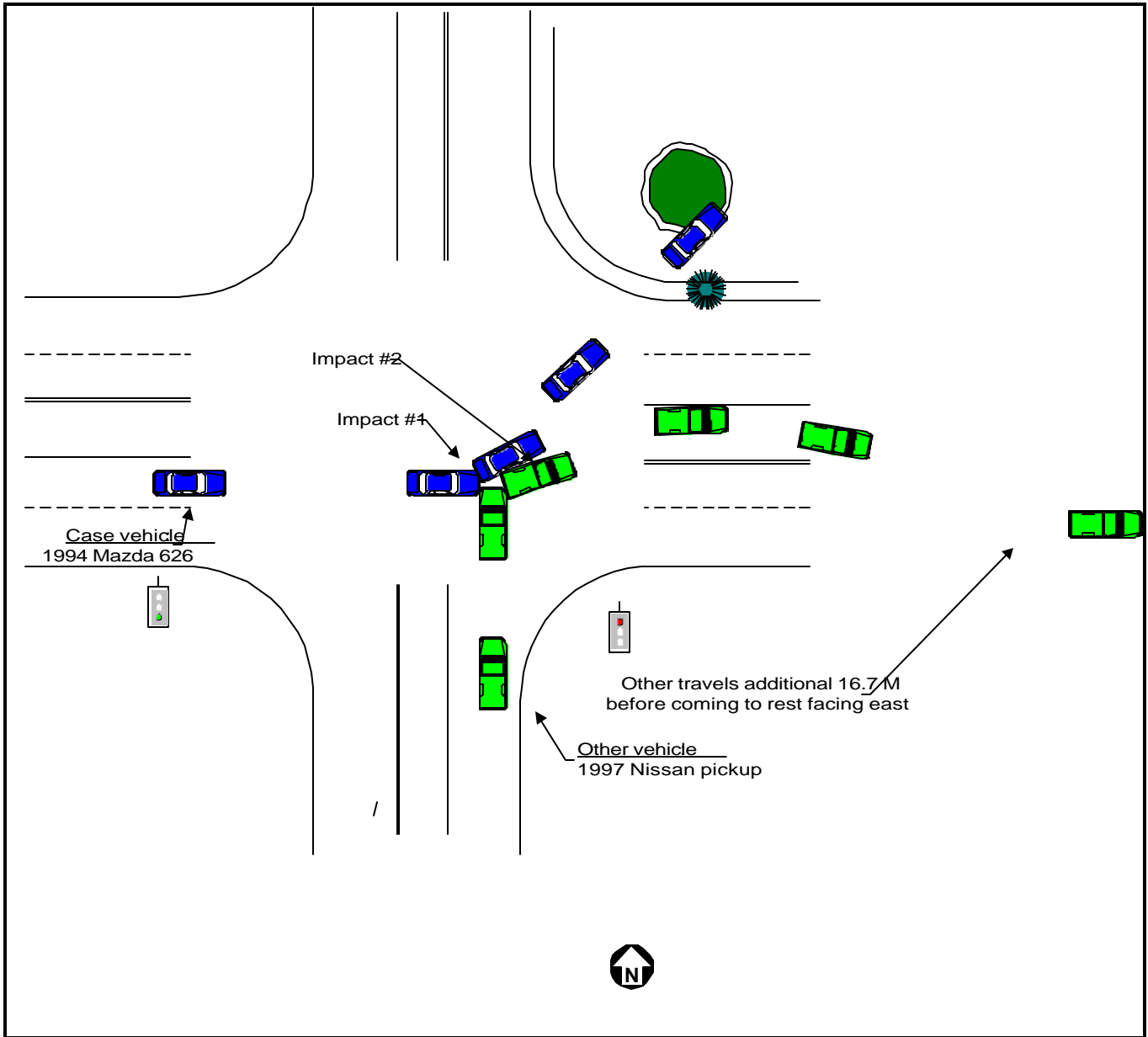


Figure 6. Scene diagram

Collision Measurements (police)

ITEM	RP	RL
Start of V-1 R/F locked wheel skid/pre-impact	1.8m (6'2") W	1.8m (6'1") N
End of V-1 R/F Locked wheel skid/pre-impact	1.5m (5'2") W	4.8m (15'10") N
Start of V-1 L/R locked wheel skid/pre-impact	3.1m (10'5") W	3.3m (10'9") N
End of V-1 L/R locked wheel skid	2.5m (8'4") W	5.5m (18'0") N
Start of V-1 L/F locked wheel skid/pre-impact	3.1m (10'4") W	8.9m (13'2") N
End of V-1 L/F locked wheel skid at impact w/V-2	2.9m (9'6") W	4.9m (16'5") N
Area of impact (AOI#1) V-1 versus V-2	2.9m (9'9") W	5.7m (18'8") N
Center of Red Plastic debris	3.1m (10'5") W	6m (20'0") N
End of tire scuff V-1 L/F post-impact	3.9m (13'0") E	8.7m (28'8") N
Start of Antifreeze trail from V-1	4m (13'2") E	8.3 m (27'3") N
End of Antifreeze trail from V-1	27.2m (89'6") E	4m (13'4") N
POR V-1 L/R	24m (78'9") E	4.6m (15'1") N
POR V-1 L/F	26m (88'0") E	4.6m (15'1") N
POR V-1 R/F	26m (88'0") E	2.9m (9'6") N
POR V-1 R/R	24m (78'9") E	2.9m (9'6") N
Start of Antifreeze trail from V-2	1.2m (4'1") E	9.7m (32'0") N
V-2 L/F impact with north curb 5th Ave.	5.7m (19'1") E	RL
V-2 R/F impact with north curb 5th Ave.	7.9m (26'0") E	RL
POR L/R V-2	10.6m (35'0") E	24m (78'0") N
POR R/R V-2	12m (39'6") E	22.8m (75'0") N
POR R/F V-2	13.5m (44'6") E	25m (82'3") N
Start of V-1 Rim Scuff w/pavement	12.8m (42'0") E	7.9m (26'0") N
End of V-1 Rim Scuff w/pavement	16.7m (55'0") E	5.3m (17'4") N
Small Tree	9.6 (31'8") E	18.4 (60'4") N