

ODI Unintended Acceleration Investigation / Vehicle to Vehicle  
Dynamic Science, Inc. / Case Number: DS07035  
2007 Toyota Camry  
California  
July 2007

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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 This three-vehicle crash occurred at 0735 hours in July 2007. The crash took place on an interstate highway. The case vehicle was a 2007 Toyota Camry that was being driven by a 68-year-old male. The first other vehicle was a 2002 Mazda 626 that was being driven by a 27-year-old male. The second other vehicle was a 1993 Honda Accord that was being driven by a 39-year-old male. The 2007 Toyota Camry was traveling southbound on the interstate at speeds reported to be in excess of 161 km/h (100 mph). Witnesses reported seeing the Camry traveling southbound on the interstate and using both roadway shoulders to pass other vehicles for at least 13 km (8 miles). The driver indicated that he tried to brake and also tried to put the vehicle into neutral. Some witnesses reported seeing smoke coming from the Camry. They also noted that the Camry had the emergency flashers on and they could see the brake lights flashing. The Camry struck two barriers/walls while avoiding traffic before becoming involved in this collision. The Camry rear-ended the Mazda, sending it into the median. The Camry then struck the Honda Accord, causing the Accord to spin out and then burst into flames. The driver of the Honda Accord was killed in the fire. The driver of the Camry sustained head lacerations and a fractured right leg. The driver of the Mazda sustained minor facial lacerations. The case vehicle was towed from the scene due to damage and was placed on a police hold.					
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**Dynamic Science, Inc.**  
**Crash Investigation**  
**Case Number: DS07035**

**TABLE OF CONTENTS**

Background .....	1
Summary .....	2
Crash Site .....	2
Pre-crash .....	2
Crash .....	2
Post-crash .....	3
Vehicle Data - 2007 Toyota Camry .....	3
Parking Brake Discussion .....	9
Floor Mat/Accelerator Discussion .....	10
Vehicle Data - 2002 Mazda 626 .....	14
Vehicle Data - 1993 Honda Accord .....	15
Occupant Demographics .....	16
Injuries .....	18
Occupant Kinematics .....	19
Attachment 1. Floor Mat Warning .....	20
Attachment 2. Satellite View of Scene .....	21
Attachment 3. Scene Diagram .....	22

## BACKGROUND

This on-site defects investigation was initiated in response to a report of a vehicle being involved in an unintended acceleration related crash. The crash was identified by the National Highway Traffic Safety Administration (NHTSA) from an online news article. DSI was assigned the case on August 17, 2007. DSI contacted the investigating police agency and obtained permission to inspect the case vehicle. Field work was completed August 21, 2007. One of the investigating officers was present during the inspection.

This three-vehicle crash occurred at 0735 hours in July 2007. The crash took place on an interstate highway. The subject vehicle was a 2007 Toyota Camry that was being driven by a 68-year-old male (**Figures 1-2**). The first other vehicle was a 2002 Mazda 626 that was being driven by a 27-year-old male. The second other vehicle was a 1993 Honda Accord that was being driven by a 39-year-old male. The 2007 Toyota Camry was traveling southbound on the interstate at speeds reported to be in excess of 161 km/h (100 mph). Witnesses reported seeing the Camry traveling southbound on the interstate and using both roadway shoulders to pass other vehicles for at least 13 km (8 miles). The driver indicated that he tried to brake and also tried to put the vehicle into neutral. Some witnesses reported seeing smoke coming from the Camry. They also noted that the Camry had the emergency flashers on and they could see the brake lights flashing. The Camry struck two barriers/walls while avoiding traffic before becoming involved in the subsequent collision. The Camry rear-ended the Mazda, displacing it into the median. The Camry then struck the Honda Accord, causing the Accord to rotate CCW. Both the Toyota and Honda caught fire at final rest. The driver of the Honda Accord was fatally injured. The driver of the Camry sustained head lacerations and a fractured/dislocated right ulna. The driver of the Mazda sustained minor facial lacerations. The vehicles were towed from the scene due to damage and were placed on a police hold.



**Figure 1.** Subject vehicle, 2007 Toyota Camry



**Figure 2.** Exemplar view, 2007 Toyota Camry

## SUMMARY

### Crash Site

This crash took place on a 5-lane interstate highway (**Figure 3**). The 2007 Toyota Camry was involved in several vehicle to object impacts before reaching the scene of this crash. The locations of these impacts are not known. The locations of the vehicle to vehicle impacts were on the southbound interstate highway (see the attached satellite image and the scene diagram). The roadway at this location was comprised of five asphalt travel lanes that were separated from northbound traffic lanes by a concrete center divider. The east/west roadway was curved slightly to the left. The northernmost lane was bordered by a solid painted yellow line, an asphalt shoulder and a concrete center divider. The southernmost lane was bordered by a solid painted white edge line, an asphalt shoulder, and an ascending dirt embankment. The roadway was dry and level. The temperature at the nearest reporting station was 17 degrees C (62 degrees F). The speed limit was 105 km/h (65 mph).



**Figure 3.** Southbound travel lanes

### Pre-Crash

The 2007 Toyota Camry was traveling southbound on the interstate at speeds in excess of 161 km/h (100 mph). The first other vehicle was a Honda Accord. The second other vehicle was a 2002 Mazda 626 (**Figure 4**). All three vehicles were traveling southbound and witnesses reported seeing the Camry traveling on the interstate and using both roadway shoulders to pass other vehicles for at least 13 km (8 miles). The driver indicated that he tried to brake and also tried to put the vehicle into neutral. There was evidence that the driver was braking for an extended period of time (see Service Brake Inspection discussion later in this report). There was also evidence that the driver tried to stop the vehicle by applying the parking brake (see Parking Brake Inspection section). The driver reported that he attempted to turn off the vehicle by pushing the power button several times. The vehicle was equipped with a Smart Key system<sup>1</sup>. In order to turn off the power while moving at speed requires the driver to press and hold the power button down for three seconds. The driver was unaware of this feature.

### Crash

At some point, the case vehicle came into contact with one or more concrete walls/barriers. There were two distinct impacts, one to the right side and one to the left (Events 1 and 2). One witness stated that he observed the Toyota pass his vehicle on the left side at a speed estimated to be greater than 161 km/h (100 mph). He indicated he observed the Toyota possibly contact the concrete center divider with its left side. He then observed a plume of smoke come from the Toyota but it continued southbound and out of view. There were no witness statements in regards to the damage on the right

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<sup>1</sup>Smart key system allows the vehicle to be started using the Engine Start button on the instrument panel if the keys are in the proximity (i.e., in a driver's pocket) of the vehicle.

side of the Toyota. As the case vehicle continued southbound, the vehicle came upon slower moving traffic. The Toyota Camry struck the left rear of the Mazda 626 (Event 3), displacing the Mazda into the center median (Event 4). The driver's frontal air bag and knee air bag in the Camry likely deployed at this point. The Camry continued southbound and then struck the rear of the Honda Accord (Event 5), causing the Accord to rotate CCW to final rest. The Accord then caught fire (Event 6). The Camry also caught on fire during the crash sequence (Event 7). The fire in the Toyota began in the engine compartment causing damage to the engine and the forward area of the passenger compartment.



**Figure 4.** Mazda 626

### Post-Crash

The driver of the Camry sustained head lacerations and a fractured/dislocated right ulna. He was transported to an area hospital and hospitalized for an unknown number of days. The driver of the Mazda sustained minor facial lacerations. The driver of the Honda Accord was fatally injured. He sustained multiple blunt force injuries to the head, neck, thorax, and abdomen. He also sustained post-mortem thermal burn injuries over his entire body. The Toyota was towed from the scene due to damage and was placed on a police hold.

### VEHICLE DATA - 2007 Toyota Camry

The 2007 Toyota Camry XLE was identified by the Vehicle Identification Number (VIN): 4T1BK46K27Uxxxxxx. The vehicle's odometer could not be read, as there was no power to the instrument panel. The Toyota Camry was a four-door sedan that was equipped with a 3.5 liter, 6-cylinder engine, Vehicle Stability Control (VSC) with Traction Control and ABS, a Direct Tire Pressure Monitor System, front wheel drive, an automatic transmission, a tilt/telescopic steering wheel, and a Smart Key System with push button start (**Figure 5**). The Camry was configured with Michelin Energy P215/60R16 tires. The vehicle manufacturer's recommended cold tire pressure was 207 kPa (30 psi). The tire manufacturer's recommended maximum tire pressure was 303 kPa (44 psi).

Position	Measured Pressure	Measured Tread Depth	Restricted	Damage
LF	Tire Flat	6 mm (8/32 in)	No	Holed
LR	Unknown	6 mm (8/32 in)	No	None
RR	Tire Flat	6 mm (8/32 in)	No	Debeaded
RF	193 kPa (28 psi)	6 mm (8/32 in)	No	None

The seating in the Toyota Camry was configured with leather covered front bucket seats with adjustable head restraints, and a rear bench seat with a folding back and adjustable head restraints for all three seating positions. The driver's seat was adjusted 58 cm (22.8 in) rearward of the lower A-pillar. The driver and front right passenger seat backs were slightly reclined.

## Vehicle Damage

### Exterior Damage - 2007 Toyota Camry

There were at least four impacts to the Toyota Camry during the overall crash sequence. Two of the impacts involved roadside objects such as concrete barriers or walls. The specific sequence of the first two impacts is not known.

The Camry sustained minor left side damage as a result of an impact with a concrete barrier (**Figure 6**). The direct damage began 54 cm (21.3 in) rear of rear axle and extended forward 327 cm (128.7 in) forward. The direct damage extended vertically into the A-pillar area and along the left roof rail. The Collision Deformation Classification (CDC) for this impact was 12LDAS2.

The Toyota Camry sustained minor right side damage as a result of an impact with a concrete barrier or wall (**Figure 7**). The direct damage began 8 cm (3.1 in) forward of the rear axle and extended 113 cm (44.5 in) rearward. The CDC for this impact was 12RZAS2.



**Figure 5.** Push start button



**Figure 6.** Left side impact with roadside object



**Figure 7.** Right side impact with roadside object



The Camry sustained moderate damage to the front end as a result of the two vehicle to vehicle impacts (**Figure 8**). The two impacts overlapped and could not be separated. The crush profile and CDC encompasses both frontal impacts. Six crush measurements were documented at the bumper level as follows: C1 = 28 cm (11.0 in), C2 = 34 cm (13.4 in), C3 = 37 cm (14.6 in), C4 = 44 cm (17.3 in), C5 = 41 cm (16.1 in), C6 = 40 cm (15.7 in). The combined CDC for these impacts was 12FDEW3.



**Figure 8.** Frontal damage from impacts with two vehicles

The right rear door was jammed shut post crash. The Toyota also sustained damage due to an engine fire that began after the vehicle came to rest. The damage included the engine compartment externally and portions of the instrument panel internally.



**Figure 9.** Right instrument panel damage

### **Interior Damage -2007 Toyota Camry**

The 2007 Toyota Camry sustained moderate interior damage as a result of occupant contacts, air bag deployments, and the engine fire (**Figures 9-11**). The right instrument panel was burnt and melted. There was scorching damage to the center console, the steering wheel, the front right seat bottom, both A-pillars, and along the windshield header.

### **Manual Restraints -2007 Toyota Camry**

The 2007 Toyota Camry was configured with manual 3-point lap and shoulder belts for each seating position. Both front seat safety belts were equipped with retractor pretensioners and adjustable D-rings that were in the full down position. The driver's safety belt was configured with a sliding latch plate and an Emergency Locking Retractor (ELR). At the time of the vehicle inspection, the driver's retractor was locked in the used position as a result of pretensioner actuation. The remaining safety belts were configured with sliding latch plates and switchable ELR/Automatic Locking Retractors (ALR).



**Figure 10.** Left A pillar/header scorching

## Supplemental Restraint System - 2007 Toyota Camry

The 2007 Toyota Camry was equipped with a Certified Advanced 208-Compliant (CAC) air bag system. A CAC vehicle is certified by the manufacturer to be compliant to the Advanced Air Bag portion of Federal Motor Vehicle Safety Standard (FMVSS) No. 208. The Camry was also equipped with a knee air bag for the driver position, side curtain air bags, and seat back mounted side air bags for the front seat positions. The driver's frontal and knee air bags deployed.

The driver's frontal air bag deployed from the center of the steering wheel hub through H-configuration module cover flaps (**Figure 12**). Each flap measured 8 cm (3.1 in) in height and 12 cm (4.7 in) in width. The deployed frontal air bag measured 60 cm (23.6 in) in diameter in its deflated state. The air bag was tethered by two internal straps. Two circular vent ports were located at the 11 and 1 o'clock aspect on the rear of the air bag. There were no indications of contact or damage to the air bag.

The driver's knee air bag deployed from the lower instrument panel through H-configuration module cover flaps (**Figure 13**). The top flap measured 24 cm (9.4 in) wide by 3 cm (1.2 in) high. The bottom flap measured 24 cm (9.4 in) by 3.5 cm (1.4 in) high. The deployed knee bag measured 52 cm (20.5 in) wide by 24 cm (9.4 in) high. There were no indications of contact or damage to the air bag.

### Service Brake Discussion

The vehicle brake components were removed by the investigating officer during his initial inspection. The components were brought back to the vehicle for the SCI inspection. All the brake pads exhibited wear that was consistent with the brakes being applied for a long period of time while the vehicle was at speed (**Figures 14-25**). Both rear brakes were degraded to the metal. There were also indications of excessive temperature. According the investigator, brake pressure was still present on the discs.



**Figure 11.** Right A pillar/header scorching damage



**Figure 12.** Driver's frontal air bag



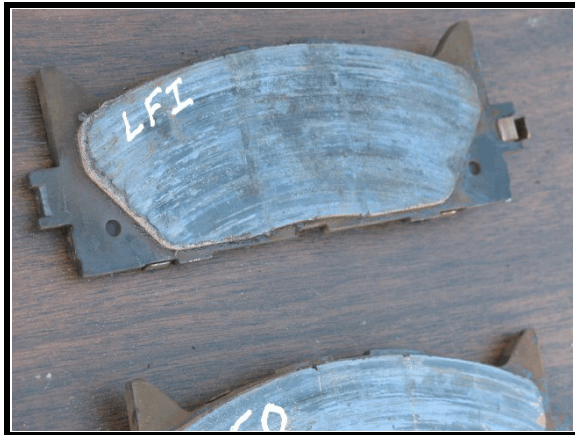
**Figure 13.** Driver's knee air bag



**Figure 14.** Left front outer pad



**Figure 15.** Right front outer pad



**Figure 16.** Left front inner pad



**Figure 17.** Right front inner pad



**Figure 18.** Left front disc



**Figure 19.** Right front disc



Figure 20. Right rear outer pad



Figure 21. Left rear outer pad



Figure 22. Right rear inner pad

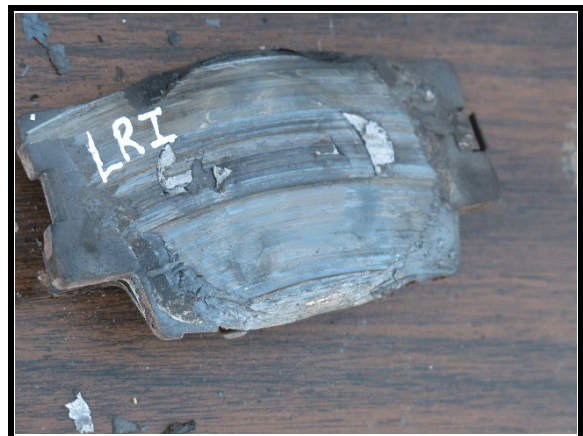


Figure 23. Left rear inner pad

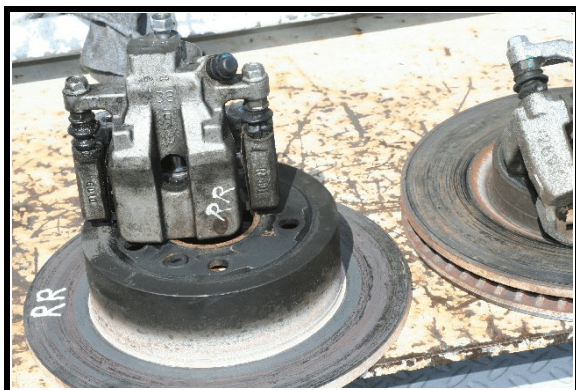


Figure 24. Right rear disc



Figure 25. Left rear disc

## Parking Brake Discussion

The driver reported that he had applied the parking brake at some point during the crash sequence. The parking brake pedal was found in the fully depressed position during the initial police inspection. Wear patterns were present on both the left and right parking brake pads, indicating that they had been depressed during the crash (**Figures 26-28**).



**Figure 26.** Parking brake in full down position (as found at scene)



**Figure 27.** Left rear parking brake pad



**Figure 28.** Right rear parking brake pad

## Floor Mat/Accelerator Discussion

The 2007 Toyota Camry was equipped with a fabric floor mat. The floor mat was secured to the floorboard by plastic retention devices near the front of the driver's seat. A rubberized all-weather mat had been installed on top of the original equipment carpet mat and was unsecured by the two retention devices (**Figure 29**). The all-weather mat had a stamped warning (Attachment 1) that stated the following: DO NOT PLACE ON TOP OF EXISTING FLOOR MATS.

The rubberized mat and the accelerator assembly had been removed prior to the vehicle inspection. The investigating officer had, however, taken photos of the mat and the accelerator assembly prior to their removal. The mat in the police photos appeared to be shifted forward and to the right of its designed location (**Figure 30**). There was some scuffing found on the bottom right of the accelerator pedal that was possibly due to pedal/mat interaction. There was also some scuffing found on the top right portion of the mat. The distance from the rear of the mat to the top right cutout was 58.5 cm (23 in). The distance from the front seat mounting bolt to the bottom of the accelerator pedal in the depressed position was 64 cm (25.2 in). For the accelerator pedal to engage the floor mat, the mat would have to be at least 5.5 cm (2.2 in) forward of the seat mounting bolt. Based on the police image in **Figure 31**, this would appear to be the case.



**Figure 29.** Overview of mat position (police photo)



**Figure 30.** Mat position (police photo)



**Figure 31.** Carpet mat and left mat retention device

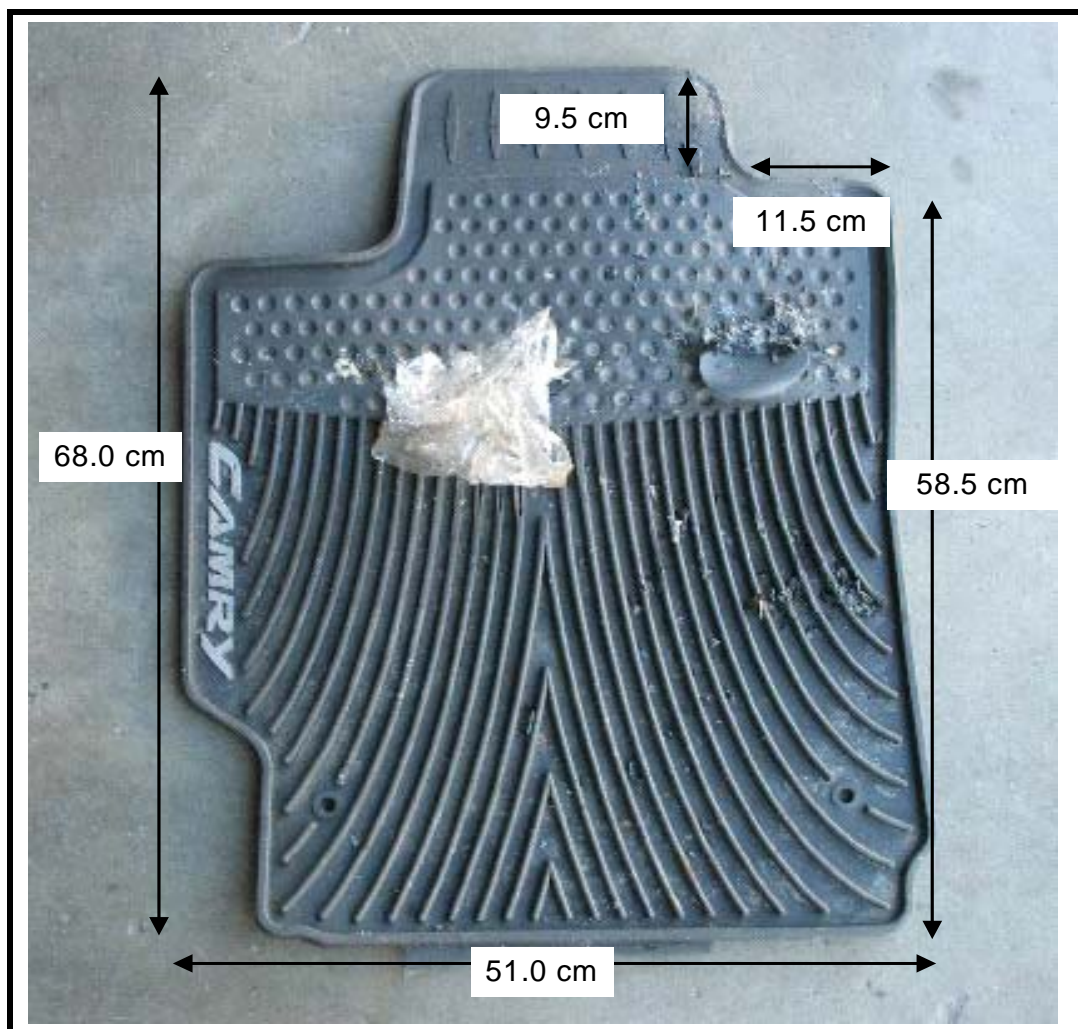


Figure 32. All-weather mat dimensions



**Figure 33.** Possible mat scuff on accelerator pedal



**Figure 34.** Top right corner of mat





**Figure 35.** Top right corner of mat



**Figure 36.** Top right corner of mat

**VEHICLE DATA - 2002 Mazda 626**

Description:	2002 Mazda 626 four door sedan	
VIN:	Unknown	
Odometer:	Unknown	
Engine:	Unknown	
Reported Defects:	None noted	
Cargo:	Unknown	
Damage Description:	Moderate rear end damage from impact with the Toyota Camry. Minor front end damage from impact with center median.	
CDC:	Impact 1: 06BLEW2 Impact 2: 01FRES1	
Delta V:	Total	Unknown
	Longitudinal	Unknown
	Latitudinal	Unknown
	Energy	Unknown



**Figure 37.** Frontal damage, Mazda 626



**Figure 38.** Rear damage, Mazda 626

**VEHICLE DATA - 1993 Honda Accord**

Description:	1993 Honda Accord	
VIN:	Unknown	
Odometer:	Unknown	
Engine:	Unknown	
Reported Defects:	None noted	
Cargo:	Unknown	
Damage Description:	Per police report, major rear end damage from impact with the Toyota Camry. Per fire department report, the fuel tank and fuel delivery system were compromised at the moment of impact with the Toyota Camry. Fuel escaped the system and began to vaporize. Burn/char patterns indicated that the vaporizing fuel and heat source (sparks) combined with air to create a flammable mixture and were ignited in the general area of the two rear quadrants of the vehicle.	
CDC:	Unknown	
Delta V:	Total	Unknown
	Longitudinal	Unknown
	Latitudinal	Unknown
	Energy	Unknown

**OCCUPANT DEMOGRAPHICS - 2007 Toyota Camry**

	Driver
Age/Sex:	68/Male
Seated Position:	Front left
Seat Type:	Bucket
Height:	193 cm (76 in)
Weight:	113 kg (250 lbs)
Alcohol/Drug Involvement:	None
Body Posture:	Unknown
Hand Position:	Unknown
Foot Position:	Unknown
Restraint Usage:	Lap and shoulder belt available, used
Air bag:	Steering wheel mounted frontal air bag, deployed. Lower instrument panel mounted knee air bag, deployed. The side curtain and seat back side air bags did not deploy.

**OCCUPANT DEMOGRAPHICS - 2002 Mazda 626**

	Driver
Age/Sex:	27/Male
Seated Position:	Front left
Seat Type:	Bucket
Height:	165 cm (65 in)
Weight:	70 kg (155 lbs)
Alcohol/Drug Involvement:	None
Body Posture:	Upright
Hand Position:	Unknown
Foot Position:	Unknown
Restraint Usage:	Lap and shoulder belt used, per police report
Air bag:	Air bag available, did not deploy

**OCCUPANT DEMOGRAPHICS - 1993 Honda Accord**

	Driver
Age/Sex:	39/Male
Seated Position:	Front left
Seat Type:	Unknown
Height:	188 cm (74 in)
Weight:	79 kg (175 lbs)
Alcohol/Drug Involvement:	None
Body Posture:	Unknown
Hand Position:	Unknown
Foot Position:	Unknown
Restraint Usage:	Unknown
Air bag:	Deployed, per police report

**INJURIES - 2007 Toyota Camry**

Driver: Injuries obtained from the police report.

<u>Injury</u>	<u>OIC Code</u>	<u>Injury Mechanism</u>	<u>Confidence Level</u>
Fracture/dislocation, right ulna	753204.3,1	Steering wheel rim	Possible
Lacerations, forehead	290600.1,7	Unknown	Unknown

**INJURIES - 2006 Mazda 626**

Driver: Injuries obtained from Police Report.

<u>Injury</u>	<u>OIC Code</u>	<u>Injury Mechanism</u>	<u>Confidence Level</u>
Multiple lacerations, minor (superficial), face, left	290602.1,2	Flying glass	Probable
Complaint of pain to back and neck			

**INJURIES - 1993 Honda Accord**

Driver: Injuries obtained from autopsy report. The cause of death was blunt force injuries to the head and trunk. The medical examiner indicated that the burn injuries were post-mortem. There were a number of injuries that were directly related to the thermal injuries, including: bone loss and underlying epidural hemorrhage, bilateral foot amputations, and contraction fractures of left humerus, left radius, and left ulna.

<u>Injury</u>	<u>OIC Code</u>	<u>Injury Mechanism</u>	<u>Confidence Level</u>
Subdural hemorrhage, cerebrum; large (>50 cc, adult)	140656.5,9	Unknown	Unknown
Fracture, sternum	450804.2,4	Unknown	Unknown
Transection, spinal cord, with fracture and dislocation, T4	640468.5,7	Unknown	Unknown
Laceration, thoracic aorta, major (circumferencial)	420210.5,4	Unknown	Unknown

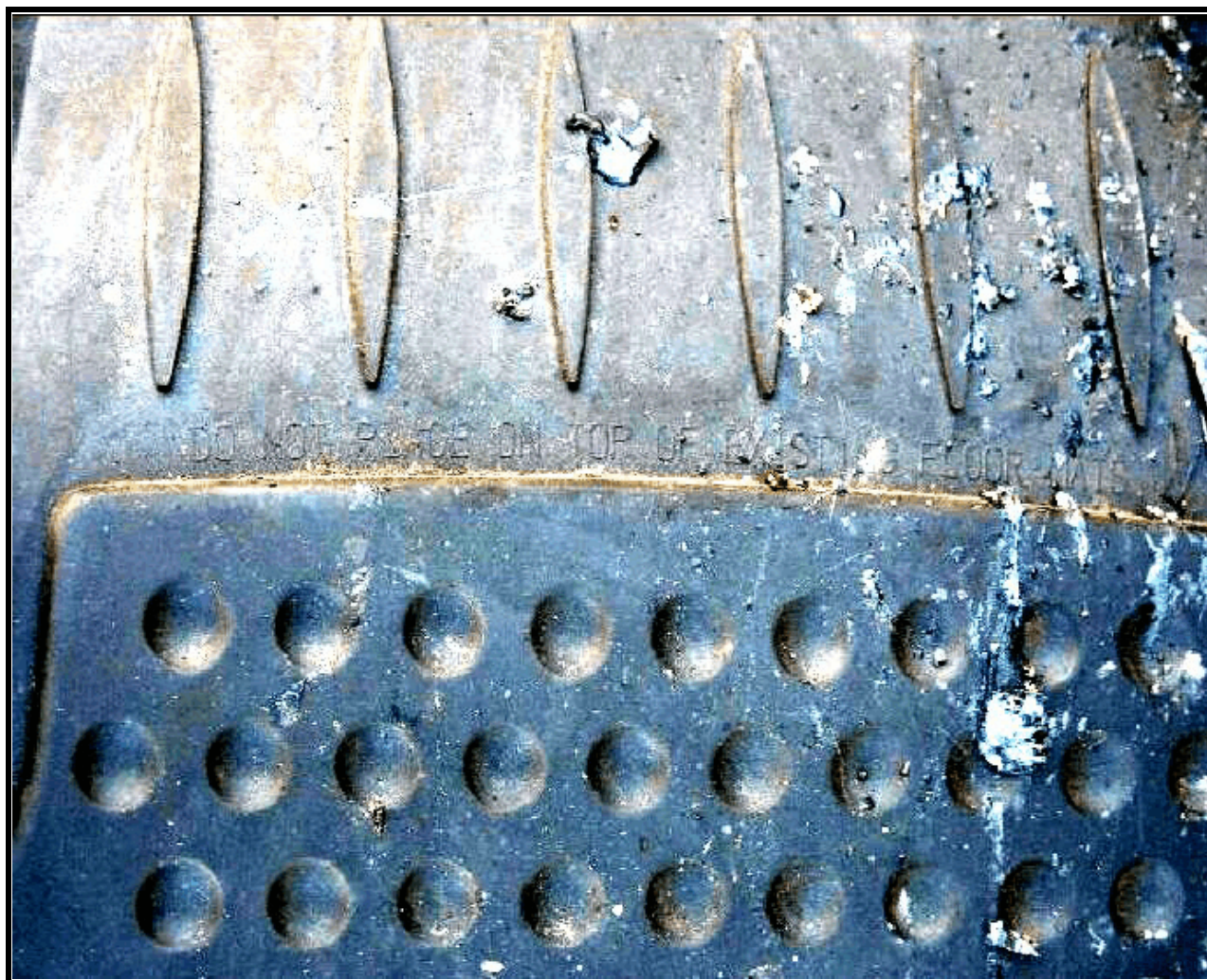
Multiple lacerations, liver, moderate, ranging from 0.5 to 3.0 inches in length; blood loss < 20% by volume	541824.3,1	Unknown	Unknown
Lacerations, complex (pulpification), spleen	544228.5,2	Unknown	Unknown
Multiple fractures, ribs, bilateral; R6-R9, L5-L11	450240.4,3	Unknown	Unknown
Multiple lacerations, lung, left, with hemothorax, contusions	441414.3,2	Unknown	Unknown

### **Occupant Kinematics - 2007 Toyota Camry**

#### **Driver**

The 68-year-old male driver was seated in an unknown posture and was restrained by the 3-point lap and shoulder belt. The seat track was positioned to between the middle and rear most track position. The driver was actively braking and steering while the vehicle was in motion for an extended period of time. At some point, the subject vehicle impacted multiple barriers. There were two distinct impacts, one to the right side and one to the left. These were of a sideswipe configuration and there was little driver movement. As the Camry continued on, the vehicle approached slower moving traffic. The Camry first struck the left rear of the Mazda 626. At impact, the frontal and knee air bags deployed and safety belt pretensioner actuated. The driver initiated a forward trajectory and he loaded the safety belt and likely came into contact with the deployed air bag. The Camry continued traveling southbound until striking the rear of the Honda Accord. The driver initiated a forward trajectory and his right leg engaged the lower instrument panel/center console area. The driver sustained a fracture/dislocation to the right ulna, due to possible contact with the steering wheel rim. He also sustained facial lacerations during the crash sequence. He was transported to a local hospital. His admission status is not known.

**Attachment 1. Floor Mat Warning**



**Figure 39.** Stamped warning on rubberized all-weather mat



**Attachment 2. Satellite view of scene**



Attachment 3. Scene Diagram

