

Remote, Redesigned Air Bag Special Study

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Dynamic Science, Inc., Case Number (1999-079-802E)

1998 Toyota Camry 4-door sedan

California

August/1999

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<p>16. Abstract</p> <p>This remote investigation focused on the redesigned air bag system deployment of a 1998 Toyota Camry 4-door sedan. This serious injury crash occurred in August, 1999 in the afternoon. The weather was clear and the bituminous roadway was dry. The crash occurred in a four-leg intersection. The southbound leg of the intersection is a two-way undivided roadway and is comprised of five travel lanes; two southbound thru-lanes, one southbound left-turn lane, and two northbound lanes. The speed limit for this road is 56 kmph (35 mph). It is controlled by overhead traffic signals. The road was level at this location. The northbound leg of the intersection is a two-way undivided roadway and is comprised of five travel lanes; two northbound thru-lanes, one northbound left-turn lane, and two southbound lanes. The speed limit for this road is 56 km/h (35 mph). It is controlled by overhead traffic signals. The road was level at this location. Vehicle 1, a 1998 Toyota Camry 4-door sedan (case vehicle) driven by a 52 year old female (170 cm/67 in, 57 kg/125 lbs), was traveling south in the southbound left-turn lane approaching the intersection at an unknown speed. The driver was preparing to make a left turn at the intersection. The overhead traffic signal was in the green phase at this time. The driver was restrained by the available manual lap & shoulder restraint. There were no other occupants in Vehicle 1. Vehicle 2, a 1992 Mazda 929 4-door sedan driven by a 21 year old female, was traveling north in the right northbound lane approaching the intersection at an unknown speed. The driver was preparing to travel straight through the intersection. The overhead traffic signal was in the green phase at this time. The front right seat was occupied by a 43 year old female. It is unknown if either occupant was restrained. The driver of Vehicle 1 initiated the left turn in the path of Vehicle 2 and was struck. The front plane of Vehicle 1 (01FYEW1) struck the left plane of Vehicle 2 (11LYEW2) in the intersection. A Delta V was calculated for the case vehicle, utilizing the Damage Only Algorithm of WinSMASH, as 21 km/h (13 mph). As a result of the frontal impact, the supplemental restraint system (driver's and passenger's frontal redesigned air bags) of the case vehicle deployed. Vehicle 1 came to rest in the northeast corner of the intersection facing east. Vehicle 2 came to rest in the northeast corner of the intersection facing north. All three occupants were transported from the scene to a hospital where they were treated and released. Both vehicles were disabled due to damage sustained in the crash and were towed from the scene.</p>			
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Summary

This remote investigation focused on the redesigned air bag system deployment of a 1998 Toyota Camry 4-door sedan. This serious injury crash occurred in August, 1999 in the afternoon. The weather was clear and the bituminous roadway was dry. The crash occurred in a four-leg intersection. The southbound leg of the intersection is a two-way undivided roadway and is comprised of five travel lanes; two southbound thru-lanes, one southbound left-turn lane, and two northbound lanes. The speed limit for this road is 56 km/h (35 mph). It is controlled by overhead traffic signals. The road was level at this location. The northbound leg of the intersection is a two-way undivided roadway and is comprised of five travel lanes; two northbound thru-lanes, one northbound left-turn lane, and two southbound lanes. The speed limit for this road is 56 km/h (35 mph). It is controlled by overhead traffic signals. The road was level at this location.

Vehicle 1, a 1998 Toyota Camry 4-door sedan (case vehicle) driven by a 52 year old female (170 cm/67 in, 57 kg/125 lbs), was traveling south in the southbound left-turn lane approaching the intersection at an unknown speed. The driver was preparing to make a left turn at the intersection. The overhead traffic signal was in the green phase at this time. The driver was restrained by the available manual lap & shoulder restraint. There were no other occupants in Vehicle 1.

Vehicle 2, a 1992 Mazda 929 4-door sedan driven by a 21 year old female, was traveling north in the right northbound lane approaching the intersection at an unknown speed. The driver was preparing to travel straight through the intersection. The overhead traffic signal was in the green phase at this time. The front right seat was occupied by a 43 year old female. It is unknown if either occupant was restrained.



Figure 1. Exterior, Vehicle 1 (Toyota Camry)



Figure 2. Exterior, Vehicle 2 (Mazda 929)

Crash Events

The driver of Vehicle 1 initiated the left turn in the path of Vehicle 2 and was struck. The front plane of Vehicle 1 (01FYEW1) struck the left plane of Vehicle 2 (11LYEW2) in the intersection.

A Delta V was calculated for the case vehicle, utilizing the Damage Only Algorithm of WinSMASH, as 21 km/h (13 mph).

As a result of the frontal impact, the supplemental restraint system (driver’s and passenger’s frontal redesigned air bags) of the case vehicle deployed.

Vehicle 1 came to rest in the northeast corner of the intersection facing east. Vehicle 2 came to rest in the northeast corner of the intersection facing north.



Figure 3. Crash scene. Vehicle 1 approach path.

All three occupants were transported from the scene to a hospital where they were treated and released.

Both vehicles were disabled due to damage sustained in the crash and were towed from the scene.

Table 1. Delta V

	Case Vehicle		Other Vehicle	
	km/h	mph	km/h	mph
Total	21	13	17	10.6
Longitudinal	-18	-11.2	-16	-9.9
Lateral	-10	-6.2	6	3.7
Barrier speed	15	9.3	23	14.3

Exterior of Case Vehicle

Table 2. Vehicle Information

Model year, make and model	1998 Toyota Camry 4-door sedan
VIN	JT2BG22K1W0
CDC	01FYEW1

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.
Bumper	138	9	18	13	7	4	3
	54.3	3.5	7.1	5.1	2.8	1.6	1.2



Figure 4. Exterior, Vehicle 1 (1998 Toyota Camry)



Figure 5. Exterior, Vehicle 1 (1998 Toyota Camry)

Interior of Case Vehicle

The interior of the Toyota Camry sustained minor damage from occupant contact. There were no areas of intrusion into the passenger compartment. There was occupant contact evidence present to the driver's air bag, mirror, windshield, and front header.

The case vehicle was equipped with bucket seats with adjustable head restraints in the front left and front right seating positions. The front left seat was adjusted between the middle and rear most track positions. The front right seat was adjusted to the rear most track position. The rear of the vehicle was equipped with bench seats in all three seating positions which were not adjustable. The outboard rear seats were equipped with adjustable head restraints while the center rear seat was not equipped with a head restraint system.

Case Vehicle Occupant Protection Systems

The Toyota Camry 4-door sedan was equipped with a redesigned air bag system which consisted of front left and front right air bag modules which housed air bags and depowered inflator units.



Figure 6. Interior, case vehicle. Driver's frontal air bag.

The front left air bag was housed in the steering wheel hub and was concealed by asymmetrical H-configuration cover flaps which were not damaged in the crash. The circular air bag was equipped with four tether straps and two vent ports. Contact evidence consisting of a “very light gray scuff” was found on the upper left quadrant of the front of the bag. The air bag was not damaged.

The front right air bag was housed in the top-instrument panel position and was concealed by symmetrical H-configuration cover flaps which were not damaged in the crash. The rectangular air bag was not equipped with tether straps or vent ports. No contact evidence was found on the bag and the air bag was not damaged.

Case Vehicle Occupant Demographics

Table 4. Case Vehicle Occupant(s) Demographics

	Occupant 1	
Age/Sex:	52/Female	
Seated Position:	Front left	
Seat Type:	Bucket - leather covered	
Height (cm/in.):	170	67
Weight (kg/lbs):	57	125
Pre-existing Medical Condition:	None noted	
Body Posture:	Normal upright posture - not bracing	
Hand Position:	On steering wheel - unknown positions	
Foot Position:	On floor or foot controls	
Restraint Usage:	Manual lap and shoulder restraint	
Air bag:	Deployed redesigned air bag system	

Occupant Injuries

Table 5. Case Vehicle Occupant(s) Injuries

Injury	Injury Severity (AIS)	Injury Mechanism
Fractured sternum	2	Driver's air bag
Chest skin contusion	1	Driver's air bag
Right forearm skin contusion	1	Driver's air bag

Occupant Kinematics

The driver (case occupant) of the Toyota Camry was seated in a normal upright posture in the front left position of the vehicle. She was wearing the manual lap and shoulder restraint. Seat belt usage was determined through visual inspection by the researcher and the lack of prominent frontal contact evidence in the vehicle's interior. The driver reported that no pre-impact avoidance maneuvers were performed, so the case occupant should not have been out of position prior to impact.

At impact, the driver responded to the 1 o'clock direction of force by moving forward and to the right, loading the manual lap and shoulder restraint. As the restraints locked, further forward movement of the case occupant was prevented. It appears that the driver came into contact with the deploying driver's frontal air bag-causing the fractured sternum, chest contusion, and forearm contusion. A small grayish scuff was found on the front of the bag (see Figure 7). It is believed that loading of the shoulder belt contributed to the sternum fracture. The case occupant was transported from the scene to a hospital where she was treated and released.



Figure 7. Interior, case vehicle. Air bag contact.

Scene Diagram

