

Remote, Redesigned Air Bag Special Study

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Dynamic Science, Inc., Case Number (1999-048-135C)

1999 Toyota Camry

Alabama

September, 1999

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16. Abstract This remote investigation was focused on the redesigned air bag system deployment of a 1999 Toyota Camry four-door sedan. This single vehicle, single occupant crash took place during the early morning hours of a fall day in September, 1999. The crash took place on a westbound two-lane, divided roadway with a posted speed limit of 105 km/h. The bituminous roadway was dry at the time of the crash. The north and south edges of the roadway are bordered by bridge rails. Prior to the bridge there is a crossover separation in the median. Perpendicular to this separation there is an intersecting two-lane roadway. Vehicle 1, a 1999 Toyota Camry driven by a 34-year-old female (66 kg/145 lbs,160/63 in), was traveling in the right hand lane at a driver report speed of 105 km/h (65 mph) approaching the intersecting street. According to the driver, a non-contact vehicle had entered the crossover—presumably from the eastbound roadway. A non-contact vehicle entered the westbound roadway. The driver of Vehicle 1 braked and steered to the right. The driver lost control of the vehicle and the vehicle struck the right side bridge rail with its front end (11FDEW1). Vehicle 1 sustained a longitudinal delta V of -14 km/h (-8.7 mph) and a lateral delta V of 5 km/h (3.1 mph). Both the driver and passenger front air bags deployed at this point. Vehicle 1 rotated off the bridge rail in a clockwise motion and came to rest in the center of the westbound lanes. The restrained driver sustained contusions to her right shoulder, left inner forearm, and her left hip. She was able to exit the vehicle on her own and was later transported to a local hospital where she was treated and released. Vehicle 1 was towed from the scene due to damage.			
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Summary

This remote investigation was focused on the redesigned air bag system deployment of a 1999 Toyota Camry four-door sedan. This single vehicle, single occupant crash took place during the early morning hours of a fall day in September, 1999. The crash took place on a westbound two-lane, divided roadway with a posted speed limit of 105 km/h. The bituminous roadway was dry at the time of the crash. The north and south edges of the roadway are bordered by bridge rails. Prior to the bridge there is a crossover separation in the median. Perpendicular to this separation there is an intersecting two-lane roadway.

Vehicle 1, a 1999 Toyota Camry driven by a 34-year-old female (66 kg/145 lbs, 160/63 in), was traveling in the right hand lane at a driver report speed of 105 km/h (65 mph) approaching the intersecting street. According to the driver, a non-contact vehicle had entered the crossover—presumably from the eastbound roadway.

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Figure 1. Path to point of impact.



Figure 2. Point of impact with guard rail.

Crash Events

The non-contact vehicle entered the westbound roadway. The driver of Vehicle 1 braked and steered to the right. The driver lost control of the vehicle and the vehicle struck the right side bridge rail with its front end (11FDEW1). Vehicle 1 sustained a longitudinal delta V of -14 km/h (-8.7 mph) and a lateral delta V of 5 km/h (3.1 mph). Both the driver and passenger front air bags deployed at this point. Vehicle 1 rotated off the bridge rail in a clockwise motion and came to rest in the center of the westbound lanes.

The restrained driver sustained contusions to her right shoulder, left inner forearm, and her left hip. She was able to exit the vehicle on her own and was later transported to a local hospital where she was treated and released.

Vehicle 1 was towed from the scene due to damage.

Table 1. Delta V

	Case Vehicle	
	km/h	mph
Total	15	9.3
Longitudinal	-14	-8.7
Lateral	5	3.1

Exterior of Case Vehicle

Table 2. Vehicle Information

Model year, make and model	1999 Toyota Camry
VIN	4T1BG22K8XUxxxxxx
CDC	11FDEW1



Figure 3. Exterior, Vehicle 1.



Figure 4. Exterior, Vehicle 1.

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	157	0	2	3	5	10	8
	61.8	0	0.8	1.2	2	3.9	3.1

Interior of Case Vehicle

The interior of the case vehicle was undamaged as a result of the moderate frontal crash. The case vehicle maintained its integrity and there were no intruding components. The interior was void of any remarkable areas of occupant contact evidence—though there was a fluid spill on the right side of the steering wheel rim. This vehicle is equipped with front bucket seats and adjustable head restraints. The front left seat was in the middle track position.



Figure 5. Interior, front left.



Figure 6. Interior, front right.

Case Vehicle Occupant Protection Systems

The 1998 Toyota Camry was equipped with redesigned air bag systems.

The driver’s air bag is housed in the steering wheel hub. The double, horizontal module cover flaps are asymmetric in design and opened at their designated tear points. The circular air bag is equipped with two tether straps and two exhaust vent port holes. The rigid plastic knee bolster was undamaged and did not reveal any detectable occupant contacts.



Figure 7. Driver front air bag.

The front, right passenger air bag is located on the instrument panel (top mount). The module deployment door is rectangular in shape and is equipped with double horizontal cover flaps that are symmetrical in design. Upon deployment, the encased air bag fully deployed. The air bag had a single tether and was undamaged.

Both front-seat shoulder belts have crash pretensioners and seat belt force limiters. The front left seat belt was equipped with an adjustable anchorage that was in the full up position. The front right seat belt was equipped with an adjustable anchorage that was in the mid position.

Case Vehicle Occupant Demographics

Occupant 1
 Age/Sex: 34/Female
 Seated Position: Front left
 Seat Type: Bucket
 Height (cm/in.): 160 63
 Weight (kg/lbs.): 66 146
 Pre-existing Medical Condition: None noted
 Body Posture: Normal, upright
 Hand Position: At the 11 and 1 o'clock positions on steering wheel
 Foot Position: Right foot on brake, left on floor
 Restraint Usage: Lap and shoulder belt used properly
 Air bag: Driver's air bag deployed as a result of the frontal impact

Occupant Injuries

Table 4. Injuries

Injury	Injury Severity (AIS)	Injury Mechanism
Contusion, right shoulder	1	Air bag
Contusion, left inner forearm	1	Air bag
Contusion, left hip	1	Lap belt

Occupant Kinematics

The 34-year-old female driver of the 1998 Toyota Camry was seated in a normal, upright fashion and was wearing the available lap and shoulder belts. The bucket seat was adjusted to the middle track position. The driver's right foot was on the brake and both hands were on the steering wheel.

She responded to the 11 o'clock direction of force by moving forward and to the left. She loaded the lap and shoulder belt webbing which prohibited extended movement of her upper and lower torso. This movement caused the contusion to her left hip. At impact, the driver's air bag deployed. The deploying air bag struck the inner part of the driver's left forearm—causing a contusion, and the driver's right shoulder—causing a contusion.

Scene Diagram

