CRASH DATA RESEARCH CENTER

Calspan Corporation
Buffalo, NY 14225

NOT-IN-TRAFFIC SURVEILLANCE

CALSPAN REMOTE FALLING VEHICLE INCIDENT INVESTIGATION

SCI CASE NO.: CA09014

VEHICLE: 2006 TOYOTA AVALON

LOCATION: KENTUCKY

INCIDENT DATE: MARCH 2009

Contract No. DTNH22-07-C-00043

Prepared for:

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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 are 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 remote investigation focused on the circumstances involved in a falling vehicle incident that resulted in moderate severity (AIS-2) injuries to a 44-year old male victim. The victim was attempting to inspect the undercarriage of his 2006 Toyota Avalon to determine the source of an oil leak when the vehicle rolled off the OEM jack causing the Toyota to fall onto the chest of the victim. The incident occurred at the victim's residence on a level concrete surface during daylight hours.			
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BACKGROUND

This remote investigation focused on the circumstances involved in a falling vehicle incident that resulted in moderate severity (AIS-2) injuries to a 44-year old male victim. The victim was attempting to inspect the undercarriage of his 2006 Toyota Avalon **(Figure 1)** to determine the source of an oil leak when the vehicle rolled off the OEM jack causing the Toyota to fall onto the chest of the victim. The incident occurred at the victim's residence on a level concrete surface during daylight hours.

Figure 1. Overall view of an exemplar Toyota Avalon.

This incident was identified through an Internet news search by the Calspan Special Crash Investigations (SCI) team on March 6, 2009. The notification was forwarded to NHTSA for review and the case was assigned for remote follow-up on the same day. Telephone contact was established with the responding police agency and the Emergency Medical Service (EMS) that provided medical transport to the victim. The police did not file any type of a report and the EMS could not release the Patient Care Report (PCR) due to HIPAA regulations. The EMS Captain agreed to visit the victim and provide him with the SCI investigator's contact information for the victim to contact SCI. The victim contacted the SCI team and consented to a detailed interview. An exemplar Toyota Avalon and the OEM jack were inspected and documented for this remote investigation. The Final Report will be linked to the Electronic Data System.

SUMMARY

Incident Site

This falling vehicle incident occurred at the victim's residence during daylight hours at the mouth of his garage and driveway. The weather conditions were reported as scattered clouds with calm winds and a temperature of -2 degrees C (28 degrees F). The victim, the investigating police officer, and the responding Fire Captain all stated that the garage floor and the driveway were surfaced with concrete. They further stated that these surfaces were level and that the driveway was straight from the house to the street. The victim's residence was a single family home with a two-car attached garage.

Vehicle

The involved vehicle in this falling vehicle incident was a 2006 Toyota Avalon four-door sedan with the Touring Edition package. **Figure 2** is a view of an exemplar Toyota Avalon. The vehicle was powered by a 3.5 liter V-6 engine linked to a five-speed automatic transmission with a console mounted shifter. The Toyota was designed on a front-wheel drive platform and had a specified weight of 1,615 kg (3,560 lbs). The Toyota was equipped with a P215/55R17 tires mounted on OEM alloy wheels. The victim stated that he had purchased new tires for the vehicle several weeks prior to his incident. He also had the oil changed at a local repair shop five days prior to this incident. The victim further stated that the Avalon was equipped with a cartridge-type oil filter. He estimated the mileage on the vehicle at the time of the incident at 90,000 km (56,000 miles). The victim also stated that he had never used the OEM jack prior this incident.

Figure 2. Exemplar Toyota Avalon.

Victim

The victim was a 44-year old male with a stated height of 175 cm (69”) and weight of 98 kg (215 lb). Although the victim stated that he is mechanically inclined and served as a jet engine mechanic in the military, he no longer performs his own vehicle maintenance.

Victim’s Injuries

Injury	Injury Severity	Injury Source
Fracture of right ribs 3-5 and a single left rib	Moderate (450220.2,3)	Vehicle unitized frame
Linear contusion across mid chest	Minor (490402.1,4)	Vehicle unitized frame
Thermal burn of the right wrist	Minor (792002.1,2)	Vehicle exhaust system

Source: Victim Interview

Incident

Pre-Incident

The victim stated that he returned to his residence on the evening of this incident and drove the Avalon into the garage adjacent to his wife’s minivan. As he exited the vehicle, he noted a large oil trail on the driveway that led to the parked position of his vehicle. The victim opened the hood of the Avalon and checked the engine oil dipstick to determine the extent of oil lost. He then decided to examine the undercarriage of the vehicle to determine to source of the leak. The victim backed the Toyota partially out of the garage in order to obtain more room to access the vehicle. He stated that the rear axle of the vehicle was out of the garage on the driveway. The automatic transmission was placed in the park-position. The victim stated that he did not set the foot activated parking brake. A non-scaled schematic of the Incident Site is attached as **Figure 10**.

The victim initially retrieved a pair of steel car ramps and positioned the ramps in front of the vehicle forward of the front tires. As he attempted to drive the Avalon onto the ramps, he determined that the front bumper clearance was too low for the vehicle to drive onto the ramps.

The victim retrieved the OEM jack from the trunk of the Toyota. He further stated to the SCI investigator that he had never used this jack before. He positioned the jack at the designated jacking point on the forward aspect of the right sill **(Figure 3)**. The victim jacked the Avalon to a height where the right front tire was off the concrete surface. None of the tires were removed from the vehicle. As he crawled under the Toyota, his wife handed him a flashlight that he grasped with his right hand. Almost immediately, and without touching the undercarriage of the Avalon, the victim heard a "cracking" noise and the vehicle rolled slightly rearward causing the jack to fall over and the vehicle to drop back onto the tires, compressing the right side suspension. The victim estimated that he was under the vehicle for approximately five seconds prior to the fall.

Figure 3. OEM jack positioned at proper jack point on the exemplar vehicle.

Incident

As the vehicle rolled off the jack, the uni-body frame of the vehicle fell onto the victim and rested on his chest. He stated that his arms were at his sides and his head was turned to his left looking toward the front of the vehicle. The victim's wife began to panic and he tried to remain calm to talk her through the re-jacking procedure. This required her to remove the jack from under the vehicle and lower it prior to repositioning the jack under the sill. His wife was unsuccessful at completing this task.

Post-Incident

The victim's wife then called the 9-1-1 emergency response number to summon help. She ran to the neighbor's residence and called for the neighbor; however, he was not home. The victim's wife then called her brother who lived approximately 0.6 km (1 mile) from the victim's residence. At this point in time, the victim stated that he began to lose consciousness. Within minutes of the call, the brother and an adult nephew arrived on-scene and used the OEM jack to raise the vehicle. They had to lower the scissors jack prior to placing it back under the sill. As they raised the Toyota to a reasonable height, they pulled the victim out from under the vehicle and he regained consciousness without resuscitative efforts. The victim was alert and leaning against the vehicle as the police and EMS arrived on-scene approximately ten minutes after the 9-1-1 call was placed.

The victim was evaluated at the scene and prepared for transport to a regional trauma center. On arrival, he was examined for internal injury. He sustained fractures of right ribs 3-5 and a single left rib fracture. The victim also sustained a linear contusion across his anterior chest and a superficial burn of the right wrist from contact with the vehicle's

exhaust system. He was released from the trauma center approximately seven hours after the incident. The Avalon was subsequently towed to a local service center where the oil leak was diagnosed as a ruptured rubber flex joint in the oil line.

Exemplar Vehicle Jack/Clearances

The exemplar OEM jack was a typical scissors-type jack with a center mounted jack-screw to raise and lower the saddle. The base of the jack **(Figure 4)** was 9x12 cm (3.5x4.75”). With the jack properly positioned, the narrow width of the jack base was parallel to the wheelbase of the vehicle. The top saddle of the jack was U-shaped and engaged a designated cutout at the bottom of the sill. An arrow molded into the outer plastic sill panel identified the designated jacking point on the vehicle **(Figure 5)**. The jack had a maximum lifting height of 36 cm (14”).

Figure 4. Base of the exemplar jack.

Figure 5. Proper jacking location on the right sill of the exemplar vehicle.

The frame of the exemplar Toyota Avalon had a ground clearance height of 15 cm (6”) with the vehicle resting on all four tires. The OEM jack was positioned at the designated jack point on the forward aspect of the right sill and the exemplar vehicle was raised to a point where the right front tire was approximately 3 cm (1”) off the pavement. In this position, the ground clearance at the same location on the frame was (9.5”). The jack was raised to full height and the clearance increased to a maximum height of (11”). (Note: These exemplar measurements were obtained by jacking the exemplar vehicle on a level surface.) It should be noted that although the parking brake was set on the exemplar vehicle, the jack appeared to be unstable at this maximum height. **Figures 6 and 7** are views of the exemplar jack fully extended.

Figure 6. Full extended height of the exemplar jack.

Figure 7. Full extended height under the exemplar vehicle.

The jack was labeled with a Safe Working Load of 1,000 kg (2,204 lb). The vehicle curb weight of the Avalon was 1,615 kg (3,560 lb). The jack was also labeled with the following Caution:

TO AVOID PERSONAL INJURY, DO
NOT GET BODILY UNDER A VEHICLE
THAT IS SUPPORTED BY A JACK.
USE VEHICLE SUPPORT STANDS.
CONSULT OWNER'S MANUAL
PRIOR TO JACKING.

Figures 8 and 9 are of the Warning labels on the OEM exemplar jack.

Figure 8. Safe Working Load of the exemplar jack.

Figure 9. Caution label on the exemplar vehicle jack.

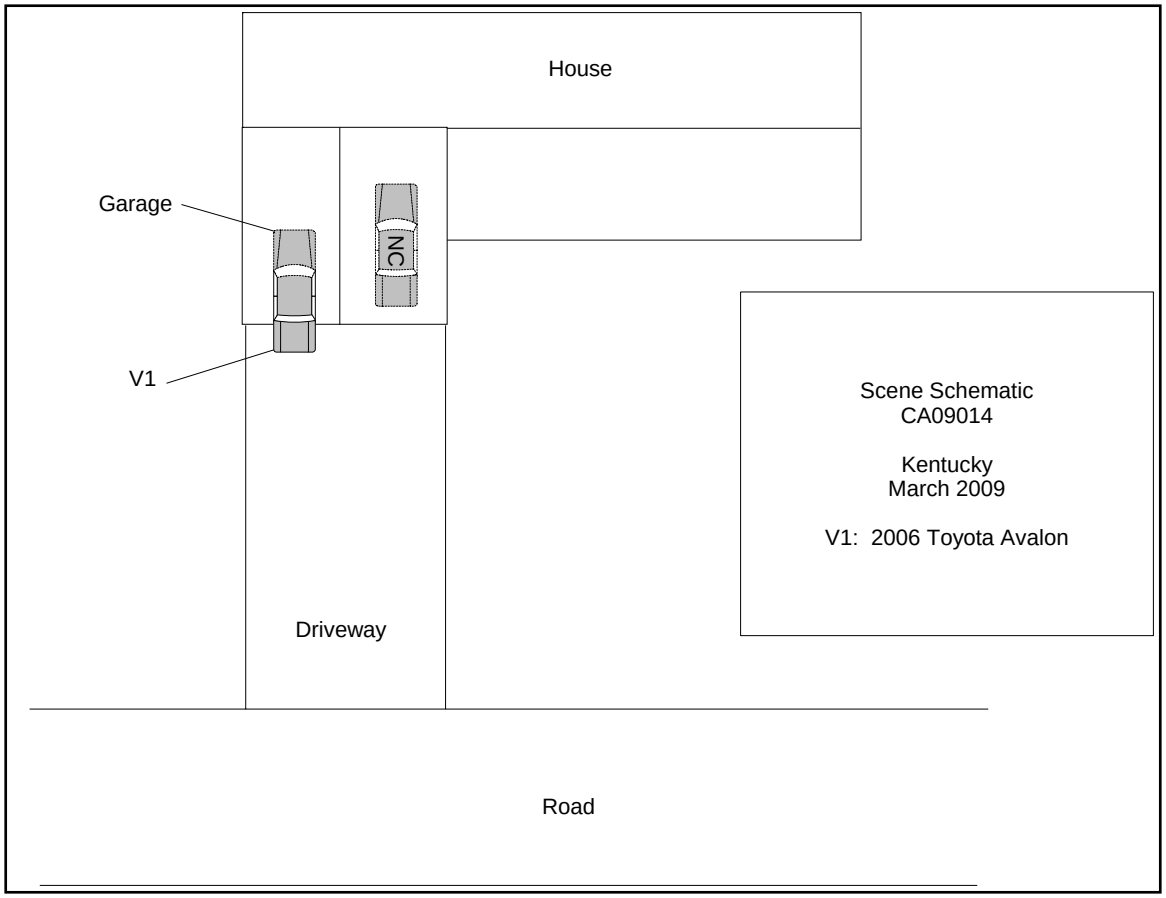

Figure 10 – Incident Schematic