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REMOTE AIR BAG DEPLOYMENT REPORT

CASE NUMBER - IN99-027

LOCATION - New York

VEHICLE - 1998 LEXUS ES300

CRASH DATE - July 1998

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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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15. <i>Supplementary Notes</i> Remote air bag deployment investigation involving a 1998 Lexus ES300 that had manual safety belts with pretensioners, dual redesigned front air bags and seat back-mounted side air bags, and a large tree.					
16. <i>Abstract</i> This report covers a remote investigation of an air bag deployment crash that involved a 1998 Lexus ES300 (case vehicle) and a large tree. This crash is of special interest because the case vehicle was equipped with redesigned air bags that deployed as a result of collision events, and the unrestrained driver [50-year-old male; White (non-Hispanic); height and weight unknown] was killed. The case vehicle was originally traveling southwest in the southwestbound lane of a two-lane, undivided, county roadway. As the case vehicle was completing a right-hand curve, it drifted onto the left (west) shoulder, the driver overcorrected via right steering and crossed both travel lanes onto the right (east) shoulder, he overcorrected a second time with left steering and began to approach the centerline where he, for a third time, overcorrected by steering right and causing a clockwise rotation. The case vehicle exited the right (east) road edge and shoulder, straightened its trajectory, and struck a large tree head-on. The front right of the case vehicle impacted the tree, causing the case vehicle's driver and front right passenger air bags to deploy. The case vehicle rotated clockwise and rebounded from the tree. Steering is the only avoidance maneuver mentioned by the investigating officer. The driver's pre-crash posture, seat adjustments, or steering wheel position are not known. He was not wearing his available, active, three-point, lap and shoulder safety belt and sustained, according to his death certificate, blunt chest trauma with a lacerated aorta. He was transported by ambulance to a medical facility and was pronounced dead 14 minutes after arrival at the emergency room (47 minutes post-crash). The case vehicle driver had a BAC of 0.30 mg/dl. The case vehicle was also equipped with seat back-mounted side air bags in the front outboard seat positions that did not deploy and with safety belt pretensioners that appear to have engaged, but the safety belt system was not in use.					
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TABLE OF CONTENTS

	<u>Page No.</u>
BACKGROUND	1
CRASH CIRCUMSTANCES	1
CASE VEHICLE	2
CASE VEHICLE DRIVER	3
CASE VEHICLE DRIVER'S INJURIES	4
OBJECT CONTACTED	4
 SELECTED PHOTOGRAPHS	
Figure 1: Southbound view of case vehicle's travel path	1
Figure 2: Case vehicle at final rest position	1
Figure 3: Front right damage to case vehicle	2
Figure 4: Case vehicle driver's seating area	2
Figure 5: Case vehicle driver's lower seating area	3
Figure 6: Case vehicle's interior from right front door	3

Additional photographs are available in SCI EDCS case IN99-027

This case was brought to the NHTSA's attention by a review of the 1998 Fatality Analysis Reporting System (FARS) in February 1999. The crash involved a 1998 Lexus ES300 (case vehicle) and a large tree. The crash occurred in July 1998, at 6:59 p.m., in New York, and was investigated by the applicable county sheriff's department. This crash is of special interest because the case vehicle was equipped with redesigned air bags that deployed as a result of collision events, and the case vehicle's unrestrained driver (50-year-old male) was killed. The Police Crash Report was received in March 1999, police photographs were obtained in June and the death certificate in August. This report is based on the Police Crash Report, the death certificate, police photographs, occupant kinematic principles, and this contractor's evaluation of the evidence.

CRASH CIRCUMSTANCES

The case vehicle was originally traveling southwest in the southwestbound lane of a two-lane, undivided, county roadway (**Figure 1**). It was daylight and clear. The roadway was bituminous, dry, straight, and level with no defects. The posted speed limit was 64 km.p.h. (40 m.p.h.). A pre-crash speed estimate of 90 km.p.h. (56 m.p.h.) for the case vehicle was reported by the investigating officer. The officer also coded the "apparent contributing factors" section of the Police Crash Report as *unsafe speed* and *alcohol involvement*. Traffic control devices present were a SPEED LIMIT regulatory sign for southwestbound traffic (Manual on Uniform Traffic Control Devices, R2-1), a single broken yellow centerline with a single solid yellow "no passing" line for northbound traffic, and a single solid white edge line on each side of the roadway. All were clearly visible. The Police Crash Report and accompanying scene diagram indicated that, as the southwestbound case vehicle was completing a right-hand curve, it drifted onto the left (west) shoulder, the driver overcorrected via right steering and crossed both travel lanes onto the right (east) shoulder. He overcorrected a second time with left steering and began to approach the centerline where he, for the third time, overcorrected by steering right and causing a clockwise rotation. The case vehicle exited the right (east) road edge and shoulder, straightened its trajectory, and struck a large tree head-on. Just prior to the tree impact, the case vehicle narrowly missed striking a utility pole with its left side. Steering is the only avoidance maneuver mentioned by the investigating officer. The crash occurred off the right (east) roadside.



Figure 1: Southbound view of case vehicle's travel path; Note: left side rotational tire marks on pavement (case photo #02)



Figure 2: Case vehicle at final rest position; Note: large tree impacted (case photo #04)

The front right of the case vehicle impacted a large tree (**Figure 2**, above), causing the case vehicle's

driver and front right passenger air bags to deploy. At maximum engagement, the case vehicle rotated approximately 30 degrees clockwise and rebounded nearly 0.9 meters (three feet) from the tree. It was facing south-southeast at final rest. The crash severity for the case vehicle was high [greater than 40 km.p.h. (25 m.p.h.)].

CASE VEHICLE

The case vehicle was a front wheel drive, 1998 Lexus ES300, five-passenger, four-door sedan (VIN: JT8BF28G0W0-----), equipped with a 3.0 liter, V-6 gasoline engine and a four-speed automatic transmission with a console-mounted shift lever. This vehicle was equipped with four-wheel anti-lock brakes. The case vehicle was also equipped with seat back-mounted side air bags that did not deploy and safety belt pretensioners that appear to have engaged, but the driver was not using the safety belt system. Its wheelbase was 267 centimeters (105.1 inches). An odometer reading was not reported. The case vehicle was towed from the scene due to disabling damage.

The case vehicle sustained direct contact damage to the right two-thirds of the frontal plane (**Figure 3**). Damaged components included: the air dam, front bumper and fascia, grille, engine compartment brackets, radiator, and hood were all displaced rearward; not known is damage to the left front headlamp assembly, the right front headlamp is still intact. Induced damage included the left front and right front fenders pulled inward; the right front tire and wheel displaced rearward into the lower right A-pillar; the rear edge of the hood contacted the bottom portion of the windshield, folding and splintering it; both upper A-pillars were slightly buckled; the right side of the roof was slightly buckled forward of the B-pillar; the right roof rail rearward of the B-pillar was slightly buckled; the right side of the sun roof was buckled; and the right upper C-pillar was slightly buckled. Glazing for the right front door is not visible post-impact, but it is unknown if it was shattered (kernelized) or simply is in the “down” position (no broken glass can be seen on the ground or in the front right passenger seating area); all other glazing, except the windshield, was in place. Based on police photographs, the CDC for the case vehicle was estimated as: **12-FZEW-3**, with a principal direction of force of 360 degrees (000). The WinSMASH reconstruction program, CDC-only algorithm, provided a borderline reconstruction, but the results appear reasonable. The case vehicle’s estimated



Figure 3: Front right damage to the case vehicle;
Note: scrape marks to tree and windshield damage from rear edge of hood (case photo #07)

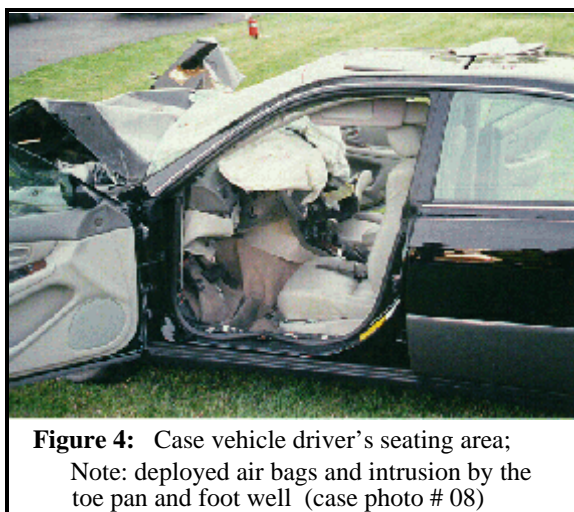


Figure 4: Case vehicle driver's seating area;
Note: deployed air bags and intrusion by the toe pan and foot well (case photo # 08)

Total, Longitudinal, and Lateral Delta Vs are, respectively: 52.6 km.p.h. (32.7 m.p.h.), -52.6 km.p.h. (-32.7 m.p.h.), and 0.0 km.p.h. (0.0 m.p.h.).

Interior damage to the case vehicle consisted of intrusion by the lower left instrument panel, the center instrument panel, the left toe pan, and the left foot well (**Figure 4**, above and **Figure 5**). The bottom of the left front door rubber gasket was slightly tented. The steering column was pushed up and the steering wheel rim was deformed (**Figure 6**). There was a substantial driver contact scuff to the left, underneath side of the steering column. The right side instrument panel intruded into the front right passenger's seating area. The glove compartment was open but it is unknown if crash forces or a post-impact document search was the cause.



Figure 5: Case vehicle driver's lower seating area; Note: toe pan and foot well intrusion and contact to the left side of the steering column (case photo #10)



Figure 6: Case vehicle's interior from right front door; Note: steering wheel deformation and deployed air bags (case photo #12)

CASE VEHICLE DRIVER

The case vehicle's driver [50-year-old male; White (non-Hispanic); height and weight not known] was not restrained by the available, active, three-point, lap and shoulder safety belt. He was the sole occupant in the case vehicle. His pre-crash seat adjustments, steering wheel position, and posture are not known. He was pronounced dead in a hospital emergency room 47 minutes post-crash. The following discussion of the driver's injuries is based on a death certificate, on-scene police photographs, and occupant kinematic principles.

The case vehicle's driver was probably seated in a normal driving posture with his back against the seat back, at least one hand on the steering wheel, and his feet on a foot control or the floor. There was significant pre-crash steering by the case vehicle's driver in attempting to avoid this crash. The crash sequence began as the case vehicle was completing a right-hand curve. The driver's body would have leaned slightly to the left as the right-hand curve was traveled. The case vehicle then drifted off the left (west) roadside as the right-hand curve was completed, compelling the driver to steer right in an attempt to regain his original travel lane. The driver overcorrected, which would have increased the driver's lean

to the left, and the case vehicle crossed both travel lanes to the right (east) shoulder. The driver overcorrected a second time, steering left, which resulted in his body shifting to its right. As the case vehicle began to regain the southbound travel lane, the driver, for the third time, overcorrected by steering right and his unrestrained body shifted back left. This steering input initiated a clockwise rotation which carried the case vehicle off the right (east) shoulder and increased the left lean of his body. After exiting the right (east) shoulder, there was no divot in the grass that would have resulted from the case vehicle bottoming out as it traveled down a slight embankment. Simultaneously, the driver had again steered left which arrested the case vehicle’s clockwise rotation and enabled the tree impact to be head-on, causing the case vehicle’s driver and front right passenger air bags to deploy. These maneuvers resulted in the driver moving forward, slightly upwards, and to the right. At impact, the driver would have moved further forward and upward into the air bag, likely deflating it due to his not being restrained, and loading both the bottom and the right side of the steering wheel. This contact with the steering wheel likely resulted in the death certificate-reported injuries of blunt chest trauma with a lacerated aorta. Police photographs show a significant scrape on the left underneath side of the steering column. The case vehicle then rotated clockwise and rebounded backwards, causing the driver to move left and forward. When the case vehicle came to rest, the driver rebounded, himself, striking the right side of the driver’s seat back. Police photographs indicate the driver was slumped to his right, laying across the center console on the front right passenger’s seat, at final rest.

He was transported to a medical facility by ambulance and pronounce dead 14 minutes after arrival (47 minutes post-crash). A blood test yielded a Blood Alcohol Concentration (BAC) of 0.30 mg/dl.

CASE VEHICLE DRIVER INJURIES

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1.	Lacerated aorta, NFS	420206.4 severe	Steering wheel	Probable	Death Certificate
2.	Blunt chest injury, NFS (“blunt chest trauma”)	415099.7 unknown	Steering wheel	Probable	Death Certificate

OBJECT CONTACTED

The case vehicle impacted a large tree with a diameter of approximately 61 centimeters (24 inches). There was slight surface scraping and peeling of the tree’s bark in the area of impact, but there is no evidence that the tree fractured or moved.