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NASS/SCI COMBINATION CASE REPORT

CASE NUMBER - NASS-2002-48-074J
LOCATION - Alabama
VEHICLE - 2001 LEXUS LS 430
CRASH DATE - May 2002

Submitted:

May 30, 2003

revised:
August 21, 2003

Contract Number: DTNH22-01-C-07002

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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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16. *Abstract*

This report covers a NASS/SCI combination investigation of a crash involving a 2001 Lexus LS 430 that ran off road and impacted an earthen embankment and a timber utility pole. This crash is of special interest because the case vehicle was equipped with multiple advanced occupant protection systems. The case vehicle's restrained driver (34-year-old female) and the restrained second seat middle passenger (4-year-old female) both sustained police-reported "A" (incapacitating) injuries. The case vehicle had been stopped and headed east, parallel to the road, in a driveway on the south side of an east-west, two-lane, suburban local roadway. The driver was not able to provide an account of what happened, except that she had been feeling unwell and may have blacked out. The case vehicle accelerated from its stopped position, went obliquely across the road in a northeasterly direction and departed the north road edge. Its front left corner impacted an earthen embankment that was immediately adjacent to the road. The case vehicle continued along the embankment in a non-horizontal attitude and the front left corner of the case vehicle impacted a timber utility pole. The case vehicle traveled a short distance beyond the pole and came to rest on the north side of the road headed east. The pole did not sustain any significant damage. The case vehicle was towed due to disabling damage. The case vehicle was equipped with dual frontal air bags, seat back-mounted side air bags in the two front seats and roof rail-mounted curtain wall air bags, for a total of six air bags. Only the driver's front air bag deployed. The four outboard seat positions were equipped with retractor pretensioners that did actuate. The driver sustained contusions and abrasions on her left foot. The four-year old was seated in the rear center position, restrained by the vehicle's three-point and lap-and-shoulder. She sustained abrasions on the right side of her neck and throat.

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This SCI/NASS combination investigation was brought to the NHTSA's attention on May 15, 2002 by NASS/CDS sampling activities. The crash involved a 2001 Lexus LS 430 (case vehicle) that ran off road and collided with an embankment and a timber utility pole. The crash occurred in May 2002 at 2:02 p.m., in Alabama, and was investigated by the applicable municipal police agency. This crash is of special interest because the case vehicle was equipped with multiple advanced occupant protection systems. The case vehicle's restrained driver (34-year-old female, white, non-Hispanic) and the restrained rear seat middle passenger (4-year-old female, white, non-Hispanic) both sustained police-reported "A" (incapacitating) injuries. The NASS-EDCS case record was forwarded to this contractor on January 24, 2003 and updated on May 30, 2003. This report is based on the police crash report, NASS scene and vehicle inspections, the coded NASS case, and this contractor's evaluation of the evidence.

CRASH CIRCUMSTANCES

The case vehicle had been stopped and headed east, parallel to the road, in a driveway on the south side of an east-west, two-lane, suburban local roadway. It was daylight with no adverse weather conditions, the asphalt road surface was straight, level, dry and free of defects, and the speed limit was 72 km.p.h. [45 m.p.h.]. The driver was not able to provide an account of what happened, except that she had been feeling unwell and may have blacked out. A passing motorist said he observed the stopped vehicle and the driver was not in an upright posture. As the witness passed, the case vehicle accelerated and went obliquely across the road in a northeasterly direction.

Figure 1: Case vehicle's east bound approach toward left side departure and impacts with the earthen embankment and the timber utility pole

Figure 2: Lookback from approximate area of case vehicle's final rest

The case vehicle departed the north road edge and its front left corner impacted an earthen embankment that was immediately adjacent to the road (**Figure 1**). The vehicle traveled along the embankment for a short distance and got into a non-horizontal attitude with the left side wheels riding up the slope. The rear bumper cover was torn loose on the right, probably due to scraping along the ground. The case vehicle continued along the embankment in a non-horizontal attitude and the front left corner of the case vehicle impacted a timber utility pole, causing the driver's front air bag to deploy (**Figure 2**). The case vehicle traveled a short distance beyond the pole and came to rest on the north side of the road headed east. The pole did not sustain any significant damage.

The case vehicle was a 2001 Lexus LS 430 rear wheel drive, four-door, five-passenger sedan (VIN: JTHBN30F610------), equipped with a 4.3 liter V8 engine, an automatic transmission with a console-mounted selector lever, four-wheel anti-lock brakes and traction control. Its wheelbase was 293 centimeters [115.2 inches]. The odometer reading is unknown due to the non-functional electronic instrument panel and the driver could not provide an estimate.

CASE VEHICLE DAMAGE

The Lexus sustained direct contact damage at the front left corner of the bumper and along the left side (**Figure 3**). This area of damage was caused by the vehicle's first impact with the embankment (event #1) and its impact with the timber utility pole (event #3). The impact with the embankment could not be measured due to the overlapping damage from the pole impact. The CDC for the first impact with the embankment was determined to be **12-FLLW-1 (350)**. This impact was out of scope for the WinSMASH reconstruction program, but the severity for the case vehicle was judged to be moderate. The impact with the pole was a narrow engagement involving the front left corner of the vehicle, extending down the left side with the left front wheel and tire snagging against the pole. Direct contact with the pole was measured as 23 centimeters [9.1 inches] wide at the front left corner and extended down the left side 75 centimeters [29.5 inches]. The leftmost area of the bumper cover was torn and scraped, and the left headlight and turn signal assembly was slightly displaced but intact. The leading edge of left front fender was crushed slightly inward, displaced slightly rearward and sustained induced buckling in the wheel well area. The left front wheel assembly was pushed rearward and rotated with the leading edge outward and the trailing edge of the tire inward and jammed against the back of the wheel well (**Figure 4**). The wheelbase was shortened by 28 centimeters [11.0 inches] on the left side and 4 centimeters [1.6 inches] on the right. The CDC for the utility pole impact (event #3) was determined to be **12-FLEE-3 (0)**. This impact was out of scope for the WinSMASH reconstruction program, but the severity for the case vehicle was judged to be moderate. While the case vehicle was traveling along the embankment in a non-horizontal attitude, the right edge of the back bumper cover snagged on the ground, pulling the bumper cover loose but not tearing

Figure 3: Overlapping damage from embankment and pole impacts at front left corner

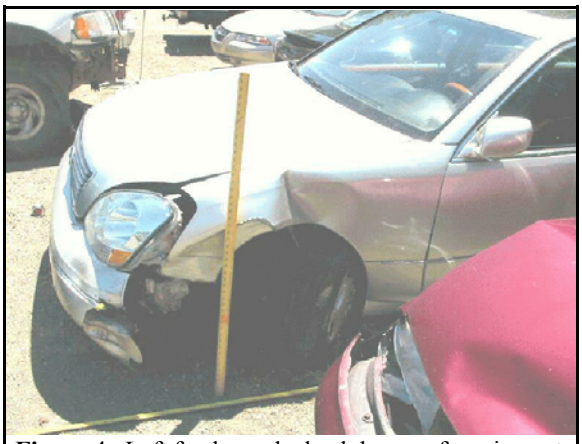


Figure 4: Left fender and wheel damage from impact with pole

it off (event #2) (**Figure 5**). The CDC for this impact could not be completely determined, but a partial undercarriage CDC was coded as **00-U999-99 (non-horizontal)**. The left front tire was deflated and the wheel was restricted. The right rear tire was deflated, with grass and mud embedded in the wheel cover and tire. The front right tire also had grass and mud embedded, but it was not otherwise damaged. The left rear tire was entirely undamaged. All of the doors remained closed and operational and there was no glazing damage.

Figure 5: Case vehicle's back right corner, bumper cover torn loose but not pulled off

Inspection of the case vehicle interior revealed that there were no intrusions and no points of occupant contact readily discernible.

There was a child safety seat in the rear right seat position, but it was not in use. The child seat was a Cosco "Eddie Bauer" model 02-880-EBN, with date 07/11/2001 HB4C. The vehicle was equipped with Lower Anchor and Tether for Children (LATCH) system features. The child seat was not equipped with the LATCH lower anchor system but a tether was in use, attached to the vehicle's LATCH tether anchor. The vehicle's safety belt system was not used to secure the child safety seat.

AUTOMATIC RESTRAINT SYSTEM

The case vehicle was equipped with driver and front right passenger front air bags, seat back-mounted side impact air bags for the two front outboard seats, and left and right roof rail-mounted curtain wall air bags for a total of six air bags. Only the driver's front air bag deployed.

The case vehicle was also equipped with retractor pretensioners at the four outboard seat positions and all four pretensioners actuated. The driver's safety belt was locked with a substantial amount of webbing drawn out off the spool, indicating that the belt was in use when the pretensioner actuated (**Figure 6**). At the three other outboard positions, the webbing was fully retracted and locked, indicating that the pretensioner actuated and the belt system was not in use at these positions.

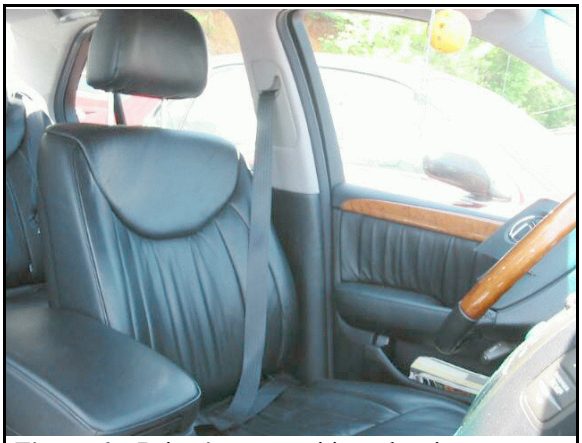


Figure 6: Driver's seat position, showing retractor pretensioner actuated when the safety belt was in use (note webbing not retracted)

The driver's air bag was mounted in the steering wheel hub, with the module cover flaps in the H configuration. The cover flaps opened at

the designated tear points and there was no damage to the flaps or the air bag. The cover flap center seam measured 15 centimeters [5.9 inches] horizontally, with the upper flap measuring 6 centimeters [2.4 inches] and the lower flap 7 centimeters [2.8 inches] vertically. The deployed air bag was round with a diameter of 65 centimeters [25.6 inches]. There was a small smudge of unknown origin in the lower left quadrant (**Figure 7**).

CASE VEHICLE DRIVER

The case vehicle driver (34-year-old female, white, non-Hispanic, 170 centimeters, 62 kilograms [67 inches, 137 pounds]) was restrained by the available, manual, three-point, lap-and-shoulder safety belt system. The interview information indicates that she has no recollection of the crash and apparently blacked out. Her exact posture is not known and she may have been slumped over or leaning. It is not known if she had her hands on the steering wheel. Her seat track was adjusted between the middle and forward most positions and the tilt steering wheel was at the center position.

Figure 7: Front of driver's air bag

The case vehicle accelerated from a stopped position along the south side of the road, ran obliquely across the road and departed the north road edge where it impacted an earthen embankment. The driver has no recollection of what happened and apparently did not attempt any avoidance actions. The impact with the embankment was a shallow, swiping-type engagement at the front left corner of the vehicle. The driver probably moved slightly forward in response to this impact. The left wheels rode up the embankment, causing the case vehicle to tip to the right and the right edge of the rear bumper cover scraped against the ground, causing the bumper cover to be pulled loose. The driver probably moved rightward as the vehicle tipped, but was held in place by the safety belt system. The case vehicle's front left corner then impacted the timber utility pole and the left front wheel snagged against the pole, causing the driver's air bag to deploy and the retractor pretensioner to actuate. The driver probably moved forward in response to the deceleration, but the safety belt system held her in place. Because she was restrained by her safety belt, she did not contact the air bag with the full force of her inertia and did not sustain any air bag induced injuries. Because she was cushioned by the air bag, she did not load heavily into the safety belt and did not sustain any safety belt injuries. As she was jostled by the several impacts and the tilting of the car, she sustained contusions and abrasions on her left ankle from contact with the foot controls. Her posture at final rest is not known.

According to her interview, the driver was removed from the vehicle while unconscious and was transported via ambulance to a hospital. The injuries she sustained as a result of the crash were very minor, but she was hospitalized for two days because of her episode of unconsciousness. This appears to have been the result of a pre-existing medical condition and not related to any crash injury.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1.	Left ankle abrasion	890202.1 minor	Foot controls	Probable	Emergency Room
2.	Left ankle contusion	890402.1 minor	Foot controls	Probable	Emergency Room

REAR CENTER PASSENGER

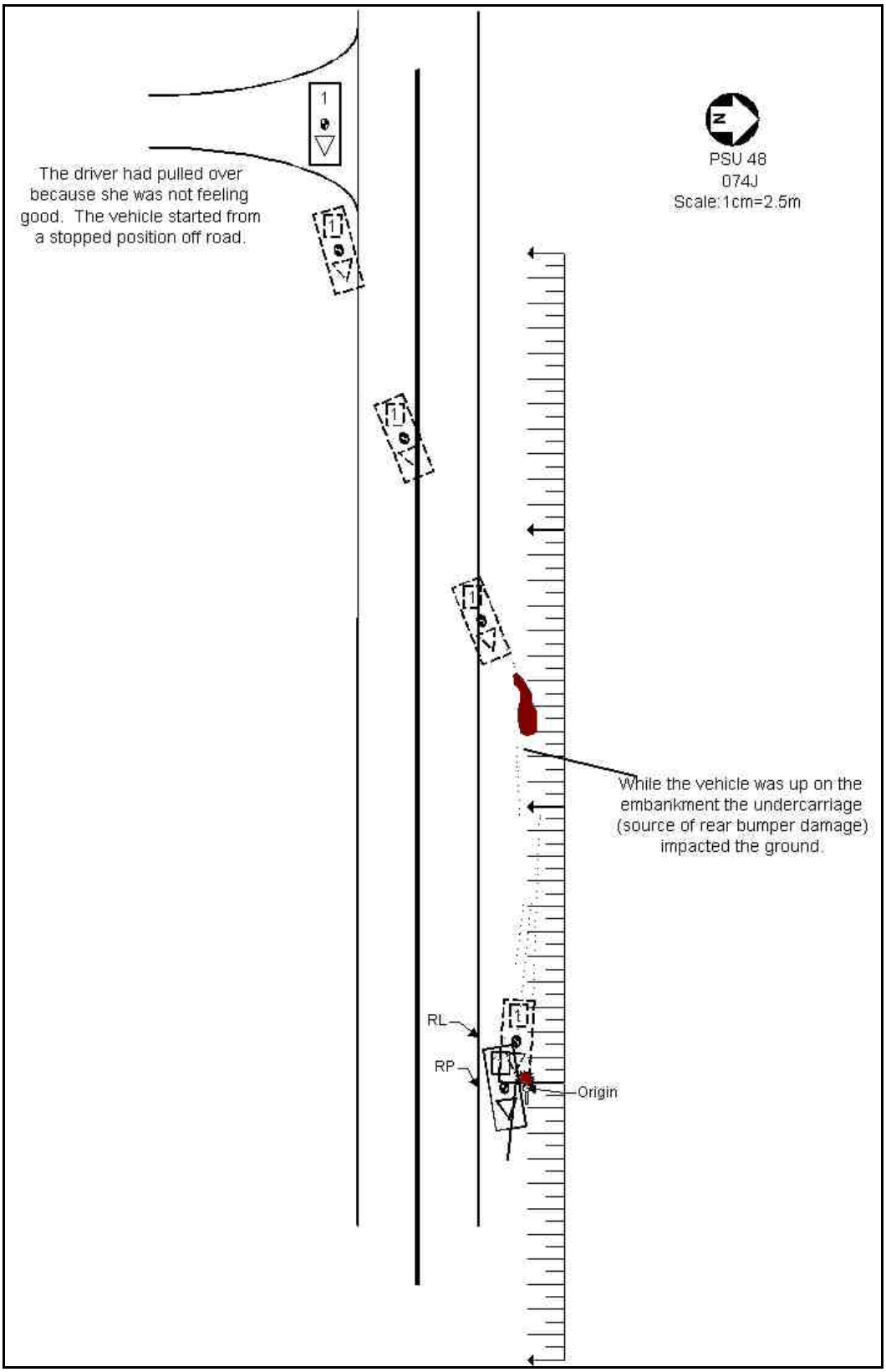
The case vehicle's second row center passenger (4-year-old female, white, non-Hispanic, 91 centimeters, 17 kilograms [36 inches, 37 pounds]) was restrained by the available, manual, three-point, lap-and-shoulder safety belt system. The safety belt system was installed such that the torso portion of the belt crossed from her right shoulder to her left hip. Her exact posture is not known, but she was probably more-or-less upright, with her back against the seat back, her legs on the seat cushion and her feet dangling over the front of the seat.

When the case vehicle impacted the embankment, the child probably moved slightly forward, loading the safety belt webbing. As the left wheels rode up the embankment and caused the car to tilt downward to the right, the child probably moved slightly to the right such that the torso portion of the safety belt webbing was engaged against the right side of her neck. When the case vehicle impacted the utility pole, the child moved forward and sustained an abrasion along the right side of her neck and throat. Her posture at final rest is not known.

REAR CENTER PASSENGER INJURIES

The second row center passenger was transported via ambulance to a hospital, where she was treated and released.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1.	Abrasion, right neck/throat	390202.1 minor	Safety belt webbing	Probable	Emergency Room


1
The driver had pulled over because she was not feeling good. The vehicle started from a stopped position off road.
N
PSU 48
074J
Scale:1cm=2.5m
While the vehicle was up on the embankment the undercarriage (source of rear bumper damage) impacted the ground.
RL
RP
Origin