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ON-SITE OFFICE OF DEFECTS INVESTIGATION POTENTIAL UNINTENDED ACCELERATION INVESTIGATION

CASE NUMBER - IN10003
LOCATION - TEXAS
VEHICLE - 2006 LEXUS RX-330
CRASH DATE - January 2010

Submitted:

June 22, 2010

Contract Number: DTNH22-07-C-00044

Prepared for:

U.S. Department of Transportation
National Highway Traffic Safety Administration
National Center for Statistics and Analysis
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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 on-site investigation focused on a 2006 Lexus RX-330, which may have experienced an Unintended Acceleration (UA) that may have led to a loss of control by the driver. The National Highway Traffic Safety Administration (NHTSA) was notified of this crash by the police department that investigated the crash. The police were concerned that the vehicle may have experienced an unintended acceleration. The driver of the Lexus was a restrained 64-year-old male driver. Just prior to the crash sequence, he was traveling east on a divided state highway, which traversed parallel to a frontage road where the crash sequence took place. Based on the police crash report, the driver called his wife on a cellular telephone and told her that he was feeling ill and was on the way home. The time this call was placed is not known. At approximately 0940 hours witnesses observed the vehicle weaving in and out of traffic and passing vehicles at speeds of approximately 129 km/h (80 mph). The driver exited the divided highway to the frontage road and immediately departed the right (south) side of the roadway. The vehicle reentered the roadway and departed the left (north) side of the roadway. It traveled up an embankment and impacted five wooden guardrail posts (events 1-5) on the back side of a guardrail and a metal support pole (event 6) for a large traffic sign. During the crash sequence the driver's frontal air bag and knee air bag deployed and both rollover/side impact inflatable curtain (IC) air bags deployed. The driver was transported by ambulance to a hospital where he was pronounced deceased 39 minutes following the crash. The Lexus was not subject to a recall related to UA. Inspection of the vehicle revealed no evidence of entrapment of the accelerator pedal by the floor mat. The vehicle's Event Data Recorder (EDR) recorded the brake as "off" throughout the 5 seconds of pre-crash recording for the two recorded events. The accelerator was recorded as "full" throughout both pre-crash recordings with the exception of the last second of the last recorded event where it was recorded as "off." Inspection of the brake rotors and pads revealed no evidence of prolonged brake application.

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This on-site investigation focused on a 2006 Lexus RX-330 (**Figure 1**), which may have experienced an Unintended Acceleration (UA) that may have led to a loss of control by the driver. This crash was brought to our attention by the National Highway Traffic Safety Administration (NHTSA) on January 22, 2010. The NHTSA was notified of this crash by the police department that investigated the crash. The police were concerned that the vehicle may have experienced an unintended acceleration. This investigation was assigned on January 22, 2010. The crash involved the Lexus, which departed the roadway and impacted multiple fixed objects. The crash occurred in January, 2010, at 0954 hours, in Texas. The Lexus was inspected on January 28, 2010, and the Air Bag Control Module (ACM), which contains the Event Data Recorder (EDR) was removed. The crash scene was inspected on January 29, 2010. This report is based on the police crash report, police on-scene photographs, vehicle inspection, crash scene inspection, Event Data Recorder (EDR) data, driver's autopsy report and medical records, conversations with the investigating police detective, occupant kinematic principles, and evaluation of the evidence.

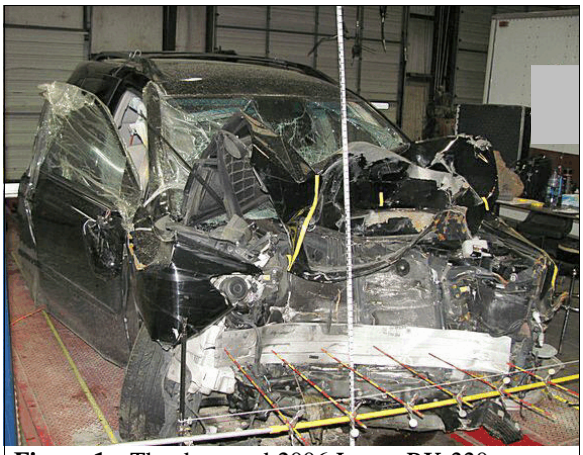


Figure 1: The damaged 2006 Lexus RX-330

CRASH CIRCUMSTANCES

Crash Environment: This crash occurred on a 2-lane, undivided, one-way, frontage road for a divided state highway during daylight hours and cloudy, dry conditions. The frontage roadway traversed in an easterly direction and approached a 4-leg intersection. The roadway had two through lanes and was curved to the right. The roadway was bordered on the right by a bituminous shoulder 2.3 m (7.5 ft) in width and on each side by 8 cm (3.1 in) high curbs. Each lane was 4 m (13.1 ft) in width. Roadway pavement markings consisted of broken white center lines, solid white right edge line, and a solid yellow left edge line. The roadway pavement was dry bituminous and the speed limit was 64 km/h (40 mph). The traffic density was moderate and the site of the crash was suburban commercial/residential. The Crash Diagram is on page 14 of this report.

Pre-Crash: The driver of the Lexus was a restrained 64-year-old male driver. Just prior to the crash sequence, he was traveling east on the divided state highway, which traversed parallel to the frontage road where the crash took place. Based on the police crash report, the driver called his wife on a cellular telephone and told her that he was feeling ill and was on the way home. The time this call was placed is not known. At approximately 0940 hours witnesses observed the vehicle weaving in and out of traffic and passing vehicles at speeds of approximately 129 km/h (80 mph). The driver exited the divided highway onto the 1-lane exit ramp for the frontage road and passed two vehicles on the right. The crash sequence began when the Lexus entered the frontage road and immediately departed the right (south) side of the roadway (**Figure 2**).

Crash: The Lexus traveled approximately 200 m (656 ft) through the grass on the right (south) side of the roadway passing through some small saplings and low hanging tree branches (**Figure 3**) as it approached reentry on the frontage road (**Figure 4**). The vehicle reentered the roadway where it traveled across the two eastbound lanes and departed the left (north) side of the roadway (**Figure 5**). The vehicle traveled diagonally along the positive 13% grade of an embankment toward the elevated divided highway where the left corner of the front plane (**Figure 6**) impacted five 18 cm (7.1 in) diameter wooden guardrail posts (events 1-5, **Figure 7**) of a W-beam steel guardrail, which was protecting the south side of the divided highway. The Lexus continued along an easterly path and was redirected to the southeast off the back side of the guardrail. The front plane of the vehicle (**Figure 8**) impacted an 85 cm (33.5 in) diameter metal support pole (event 6, **Figure 9**) for a large traffic sign. During the crash sequence the driver's frontal air bag and knee air bag deployed and both rollover/side impact inflatable curtain (IC) air bags deployed. The impact with the metal pole initiated an approximate 280 degree counterclockwise rotation of the Lexus. The vehicle then traveled on its wheels down the negative 38% grade of the embankment to the frontage road where it came to final rest on the left U-turn lane heading south (**Figure 10**).

Figure 2: Exit ramp from state highway entering the frontage road; arrow shows the area of initial roadway departure

Figure 3: Path of travel of Lexus on south side of roadway; arrow shows small saplings and low hanging tree branches Lexus passed through prior to reentering roadway

Figure 4: Arrow shows area Lexus reentered roadway, arrow in background shows location of impacts

Figure 5: Lexus departs left (north) side of roadway and approaches impacts

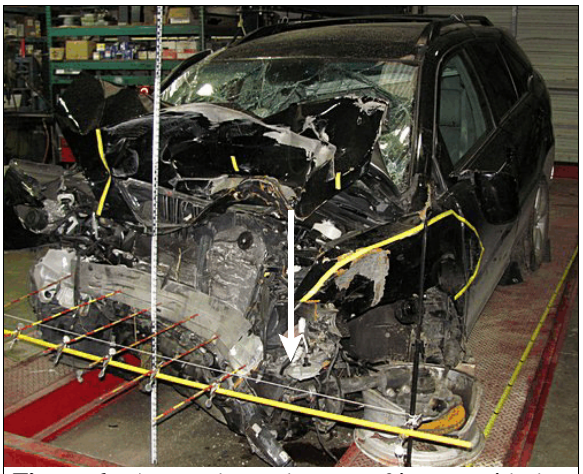


Figure 6: Arrow shows the area of impact with the guardrail posts on the front left corner; yellow tape shows extent of contact down left fender

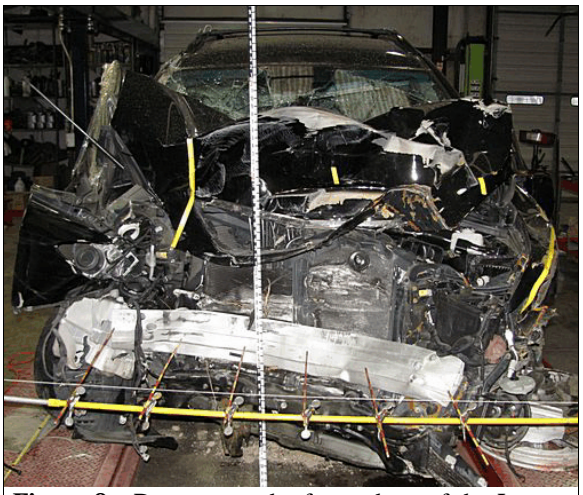


Figure 8: Damage on the front plane of the Lexus from the impact with the metal support pole of a large traffic sign

Figure 7: Approach to impact with guardrail posts, arrow on left shows left side tire track; arrow on right shows right side tire track

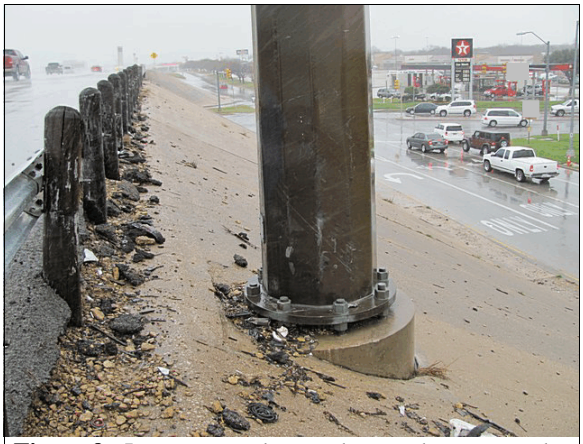


Figure 9: Impact scratches on the metal support pole

Figure 10: Police photo showing final rest position of the Lexus

Post-Crash: The police were notified of the crash by passersby at 0954 hours and arrived on scene at 1001 hours. The driver of the Lexus was transported by ambulance to a hospital where he was pronounced deceased. The vehicle was towed due to damage.

CASE VEHICLE

The 2006 Lexus RX-330 was a front wheel drive, 5-passenger, 4-door sport utility vehicle (VIN: 2T2GA31U26C-------) equipped with a 3.3-liter, V-6 engine, 5-speed automatic transmission, 4-wheel anti-lock brakes with electronic brake force distribution, traction control, electronic stability control, rollover sensing, and a tire pressure monitoring system. The front row was equipped with bucket seats, adjustable head restraints, lap-

and-shoulder safety belts, driver and front passenger frontal air bags, seat-mounted side impact air bags, driver knee air bag, and rollover/side impact IC air bags that provided protection for the front and second rows. The second row was equipped with a bench seat with folding backs, lap-and-shoulder safety belts, adjustable head restraints in the outboard seating positions and Lower Anchor and Tethers for Children (LATCH) in the outboard seating positions. A tether anchor was also present for the second row center seat position. This vehicle was not subject to a recall related to UA.

CASE VEHICLE DAMAGE

Exterior Damage: The Lexus sustained front plane damage during the impacts with the five wooden guardrail posts. The impacts occurred at the front left corner of the vehicle. There was overlapping damage and the front bumper fascia was missing. The left front wheel was also engaged during these impacts (**Figure 11**), which broke the left front suspension and separated the tire from the rim. Based on the damaged components that were present, the direct damage on the front plane was estimated to be approximately 15 cm (5.9 in) in length. There was no evidence that the bumper bar was engaged by any of the wooden posts. Due to the overlapping deformation from the subsequent impact with the metal support pole it was not possible to measure a crush profile. The direct damage extended down the left fender and onto the front portion of the left front door ending 200 cm (78.7 in) forward of the left rear axle.

Figure 11: Damage on the left front wheel, suspension, and fender from the impacts with the guardrail posts

Figure 12: Top view of the front crush profile; the baseline is positioned 43 cm (16.9 in) short of the overall length due to the position of the vehicle on the hydraulic lift

The Lexus also sustained front plane damage from the impact with the metal support pole. The front bumper, grille, and hood were directly damaged. The direct damage began 52 cm (20.5 in) left of the vehicle's centerline and extended 95 cm (37.4 in) across the front plane. The crush measurements were taken on the bumper bar and the maximum residual crush was 89 cm (35 in) occurring at C_4 (**Figure 12**). The crush profile was reasonable since the guardrail post impacts did not involve the bumper bar. The vehicle's right side wheelbase was reduced 27 cm (10.6 in). It was not possible to determine the reduction of the left side wheelbase since the left front wheel and suspension were detached. The induced damage involved both fenders, the windshield, both

A-pillars, both front doors and their door frames. The table below presents the front crush profile from the metal pole impact.

Units	Event	Direct Damage		Field L	C_1	C_2	C_3	C_4	C_5	C_6	Direct	Field L
		Width CDC	Max Crush								±D	±D
cm	6	95	89	105	33	59	84	89	77	70	-5	0
in		37.4	35.0	41.3	13.0	23.2	33.1	35.0	30.3	27.6	-2.0	0.0

Damage Classification: The five impacts with the wooden guardrail posts (events 1-5) produced overlapping damage on the left fender, left front wheel, and left front door (**Figure 11**). One Collision Deformation Classification (CDC) was assigned to describe the totality of the damage from the guardrail posts and was 12FLEE6. The CDCs for the remaining overlapping guardrail post impacts were assigned as 12FLEE99, with 99 indicating an unknown extent zone.

The CDC for the front plane impact with the metal support pole (event 6) was 12FDEW5 (0 degrees). Since there was no evidence that the guardrail posts engaged the bumper bar (**Figure 12**), the Damage Algorithm of the WinSMASH program was used to calculate a Delta V for this impact. The total Delta V was 89 km/h (55.3 mph). The longitudinal and lateral velocity changes were -89 km/h (-55.3 mph) and 0 km/h, respectively. Based on the damage on the vehicle from the metal support pole impact, the results appeared reasonable.

The manufacturer's recommended tire size was P235/55R18. The Lexus was equipped with the recommended size tires. The vehicle's tire data are shown in the table below.

Tire	*Measured Pressure*		*Vehicle Manufacturer's Recommended Cold Tire Pressure*		*Tread Depth*		*Damage*	*Restricted*	*Deflated*
	kPa	psi	kPa	psi	milli-meters	32nd of an inch			
LF	Flat	Flat	207	30	unk	unk	Sidewall cut,[1] tire separated from rim	No	Yes
LR	221	32	207	30	7	9	None	No	No
RR	207	30	207	30	7	9	None	No	No
RF	Flat	Flat	207	30	6	8	Bead separated	Yes	Yes

Vehicle Interior: The inspection of the interior of the Lexus revealed several areas of occupant contact. A scuff was present on the center instrument panel probably from contact by the driver's right forearm and hand. The lower instrument panel right of the steering wheel was deformed,

[1] Based on police on-scene photograph

which appeared to be from the driver's right knee loading through the knee air bag. There was no deformation of the steering wheel rim. However, the energy absorbing steering column was displaced forward approximately 4 cm (1.6 in). The left shear capsule was displaced from the shear plate and the movement was approximately 4 cm (1.6 in). The right shear capsule could not be accessed or visualized.

All the doors remained closed and operational. However, once the front doors were opened, they could not be closed again due to induced damage on the doors and door frames. The status of all the window glazing prior to the crash was either closed for operable windows or fixed for all others. The windshield was in place and cracked from impact forces. None of the other window glazings were damaged. The passenger compartment sustained longitudinal intrusions of the instrument panel and the left and right toe pans. The intrusion of the instrument panel and toe pan into the driver's space was estimated to be in a range of 3-8 cm (1-3 in).

ACCELERATOR PEDAL, FLOOR MAT, AND BRAKE COMPONENTS

The condition of the accelerator pedal, brake pedal, and driver's floor mat at the time of the SCI inspection is shown in **Figure 13**. The driver's floor mat was secured by the floor mounted attachments and was not free to move. It was laying flat against the toe pan. There was no evidence of interaction between the floor mat and accelerator pedal. The product number on the back of the floor mat was not legible. There was a Lexus logo on the front of the floor mat. The accelerator pedal was rotated to the left and displaced partially over the brake pedal from the damage to the cowl and toe pan. The accelerator pedal was freed from the brake pedal and when depressed, it moved smoothly forward and returned without binding. This test was conducted three times and no binding was detected. There were no heavy abrasions on the face of the accelerator pedal. Abrasions that were present appeared to be related to normal usage (**Figure 14**). The floor mat and carpet were moved aside and the Denso accelerator pedal assembly was photographed (**Figures 15** and **16**). The brake pedal had a normal wear pattern. The inspection of the rear brake rotors and pads revealed no evidence of overheating (**Figures 17** and **18**)

Figure 13: Condition of accelerator pedal, brake pedal, and floor mat at the time of the SCI inspection

Figure 14: Close view of the accelerator pedal

Figure 15: The left side of the Denso accelerator pedal mechanism housing

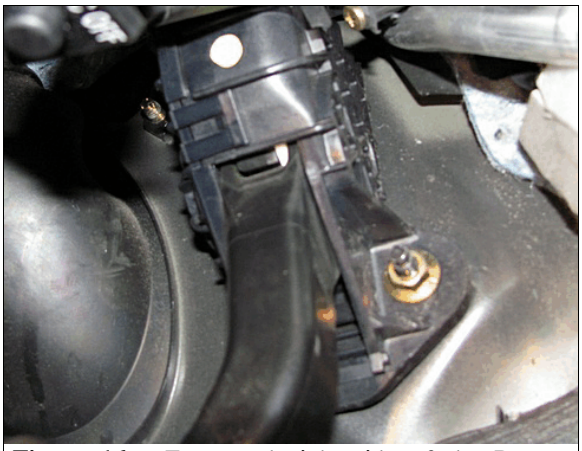


Figure 16: Front and right side of the Denso accelerator pedal mechanism housing

Figure 17: The left rear brake rotor and caliper

Figure 18: The right rear brake rotor and caliper

EVENT DATA RECORDER

The Air Bag Control Module (ACM) was removed from the vehicle and submitted to the NHTSA for imaging of the EDR data with the Toyota prototype readout tool and version 1.1.0 of the readout tool software. The data was subsequently read and reported using version 1.4.1.0 of the readout tool software. The EDR data indicated that four events were detected. Two frontal events related to this crash were recorded. A minor third frontal event was recorded but it was not related to this crash since the EDR reported an occupant present in the front right seat position. The fourth event was not recorded. The EDR recorded the driver's safety belt switch status as "Belted" and the driver's seat position as "RW" (RW is understood to mean rearward). The transmission shifter position was recorded as "Other,"which is understood to indicate that the transmission was not in the park, neutral, reverse positions nor was it invalid data.

The event associated with the deployment of the driver's frontal air bag was indicated on the EDR report as the "Latest/Frozen" event. This event was likely associated with the guardrail post impacts. The time from the pre-crash data was recorded as 700 ms. The time from the previous event was recorded as 1620 ms. The deployment time for the driver's frontal air bag was

recorded as 22 ms. The deployment stage was indicated as "Hi," which is understood to indicate a stage 2 deployment. The EDR recorded 150 ms of velocity change data in 10 ms increments. The velocity change was recorded as 0.4 mph (0.6 km/h) at 10 ms following the impact trigger increasing to 4.4 mph (7.1 km/h) at 50 ms. The velocity change values continued to increase to 10.5 mph (16.9 km/h) at 150 ms, which was the limit of the recording. The vehicle was equipped with a rollover sensor and the maximum roll angle occurring within 2 sec from the impact trigger was recorded as 25.7 degrees. The following table presents the pre-crash speed, brake, accelerator, and engine RPM data reported by the EDR for this event. A row was added to convert mph to km/h.

Seconds	-5	-4	-3	-2	-1	-0.3
Speed (mph)	78.3	78.3	78.3	78.3	68.3	60.9
Speed (km/h)	126	126	126	126	109.9	98
Brake	Off	Off	Off	Off	Off	Off
Accelerator	Full	Full	Full	Full	Off	Off
Engine (rpm)	4000	4000	4000	3200	4000	2800

The EDR also recorded 150 ms of velocity change data for the next most recent event. The velocity change was recorded as 0.5 mph (0.8 km/h) at 10 ms following the impact trigger increasing to 1.5 mph (2.4 km/h) at 50 ms. The velocity change values continued to increase to 2.0 mph (3.2 km/h) at 150 ms. The time from the previous event, which was not recorded by the EDR was 2900 ms. The following table presents the pre-crash speed, brake, accelerator, and engine rpm data reported by the EDR report for this event. A row was added to convert mph to km/h.

Seconds	-5	-4	-3	-2	-1	-0.1
Speed (mph)	78.3	78.3	78.3	78.3	78.3	78.3
Speed (km/h)	126	126	126	126	126	126
Brake	Off	Off	Off	Off	Off	Off
Accelerator	Full	Full	Full	Full	Full	Full
Engine (rpm)	4400	4000	4000	4000	4000	3200

AUTOMATIC RESTRAINT SYSTEM

The Lexus was equipped with a Certified Advanced 208-Compliant (CAC) frontal air bag system and a driver's knee air bag. Based on the Holmatro Rescuer's Guide to Vehicle Safety Systems, the frontal air bag sensors were located on the inner fenders. The driver's frontal air bag and knee air bag deployed in this crash. The manufacturer has certified that the vehicle is compliant to the Advanced Air Bag portion of the Federal Motor Vehicle Safety Standard (FMVSS) No. 208.

Figure 19: The driver's frontal air bag

The Lexus was also equipped with a side air bag system that consisted of roof rail-mounted rollover/side impact IC air bags and front seat-mounted side impact air bags. Based on the Holmatro Rescuer's Guide to Vehicle Safety Systems, the IC air bag inflators were located within the roof side rails between the B-and C-pillars. The side impact sensors were located within the lower B-and C-pillars. Both IC air bags deployed during this crash. The seat-mounted side impact air bags did not deploy.

Figure 20: The deployed driver's knee air bag

The driver's frontal air bag was located within the steering wheel hub. The module cover was a three flap configuration constructed of pliable vinyl. An inspection of the cover flaps revealed that they opened at the designated tear points and were undamaged. The deployed air bag (**Figure 19**) was 56 cm (22 in) in diameter and had two I-shaped vent ports, each 5 cm (2 in) in length on the back of the air bag at the 11 and 1 o'clock positions. There were what appeared to be two internal tethers, which were sewn in a circular configuration to the center of the air bag. Inspection of the air bag revealed no damage. There were a few scuffs and blood transfer on the bottom of the air bag.

Figure 21: The deployed left IC air bag

The driver's knee air bag was located within the lower left instrument panel and deployed through a rectangular module cover. The module cover was 25 cm (9.8 in) in width and 6 cm (2.4 in) in height. It opened at the designated tear points and was undamaged. The deployed knee air bag (**Figure 20**) was 58 cm (22.8 in) in width and 26 cm (10.2 in) in height. While the driver's

knees loaded the air bag during the crash, there was no discernable evidence of contact on the air bag and the air bag was not damaged.

The IC air bags were located along the roof side rails inside the headliner and extended from the A-pillar to the C-pillar. There were no external vent ports. The deployed left IC air bag (**Figure 21**) was 166 cm (65.4 in) in width and 40 cm (15.7 in) in height. It was attached to the A-pillar by a 7 cm (2.8 in) nylon rope. There was also a fabric panel at the front of the IC air bag that was 22 cm (8.7 in) in width. There was no gap between the front of the air bag and the window frame. The IC air bag extended 7 cm (2.8 in) below the beltline in the front row and 10 cm (3.9 in) below the beltline in the second row. Inspection of the left IC air bag revealed no discernable evidence of occupant contact and no damage. The right IC air bag was of the same dimensions and features as the left, and also revealed no discernable evidence of occupant contact.

MANUAL RESTRAINT SYSTEM

The Lexus was equipped with lap-and-shoulder safety belts for all the seating positions. The driver's safety belt consisted of continuous loop belt webbing, an Emergency Locking Retractor (ELR), a sliding latch plate, and an adjustable upper anchor that was located in the full-up position. The front passenger safety belt was similar except the upper anchor was in the middle position. Both front seats were equipped with retractor mounted pretensioners. The driver's pretensioner actuated during the crash. The front passenger pretensioner did not actuate. The second row lap-and-shoulder safety belts were similar to the front passenger safety belt except that they were equipped with switchable ELR/Automatic Locking Retractors (ALR).

The inspection of the driver's safety belt assembly revealed heavy load abrasions on the belt webbing approximately 18 cm (7.1 in) in length and a heavy load abrasion on the D-ring (**Figure 22**). The stop button was also pulled out of the belt webbing and there was a load abrasion on the latch plate belt guide. The retractor was jammed and the length of belt webbing extending out of the retractor was 145 cm (57.1 in) as measured from the stop button hole to the D-ring. This evidence indicated that the driver was restrained by the lap-and-shoulder belt in this crash.

Figure 22: Load marks on the driver's D-ring and safety belt webbing

CASE VEHICLE DRIVER KINEMATICS

The driver of the Lexus [64-year-old male, (184 cm (72.5 in) and 90 kg (198 lb)] was seated in an unknown posture. The seat track was located between the middle and rear positions. The position of the seat back is not known. It was found reclined approximately 50 degrees.

Prior to the impacts with the guardrail posts, the Lexus ascended an embankment, which had a 13% positive grade along the vehicle's path of travel. The driver's upper torso was possibly

displaced to the right to some degree as the vehicle approached the initial impact. The impact on the front plane with the five guardrail posts displaced the driver forward opposite the 12 o'clock direction of force and he loaded the safety belt. The impact with the metal support pole was severe and also displaced the driver forward opposite the 12 o'clock direction of force. He loaded the safety belt, which produced heavy abrasions on the belt webbing and D-ring (**Figure 22**). The driver loaded through the deployed frontal air bag and his chest contacted the steering wheel, which displaced the energy absorbing steering column forward and separated the left shear capsule. The driver's knees also loaded the knee air bag and his head contacted the top of the center instrument panel. The driver sustained contusions of the cerebrum, intraventricular hemorrhage, subarachnoid hemorrhage, and multiple facial abrasions, contusions, and lacerations from contacting the top of the center instrument panel. The contact with the steering wheel fractured multiple bilateral ribs with hemothorax and hemoperitoneum. The driver also sustained a lacerating crush injury of the cervical spinal cord with fracture of C_3, which was an indirect injury from contact with the steering wheel. The driver rebounded back into his seat and remained restrained in his seat position as the vehicle rotated counterclockwise off the metal pole and traveled on its wheels down the embankment to final rest. He was found by passersby slumped over to the right with his right arm extended toward the glove box.

CASE VEHICLE DRIVER INJURIES

The driver was transported by ambulance to a hospital where he was treated in the emergency room and pronounced deceased 39 minutes following the crash. The table below presents the driver's injuries and injury sources.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source	Source Confidence	Source of Injury Data
1	Lacerating crush injury of cervical spinal cord with fracture C_3 and wide separation of disc space with hyper mobility of neck and extensive soft tissue hemorrhage anterior neck	maximum 640276.6,6	Steering wheel hub and/or spokes and rim (indirect injury)	Probable	Autopsy
2	Contusions cerebrum, small multifocal: parietal and occipital lobes and inferior temporal lobe, not further specified	serious 140620.3,3	Center instrument panel	Probable	Autopsy
3	Hemorrhage, intraventricular, not further specified	moderate 140675.2,9	Center instrument panel	Probable	Autopsy
4 5	Hemorrhage, subarachnoid, parietal and occipital lobes with diffuse congestion	moderate 140694.2,1 140694.2,2	Center instrument panel	Probable	Autopsy

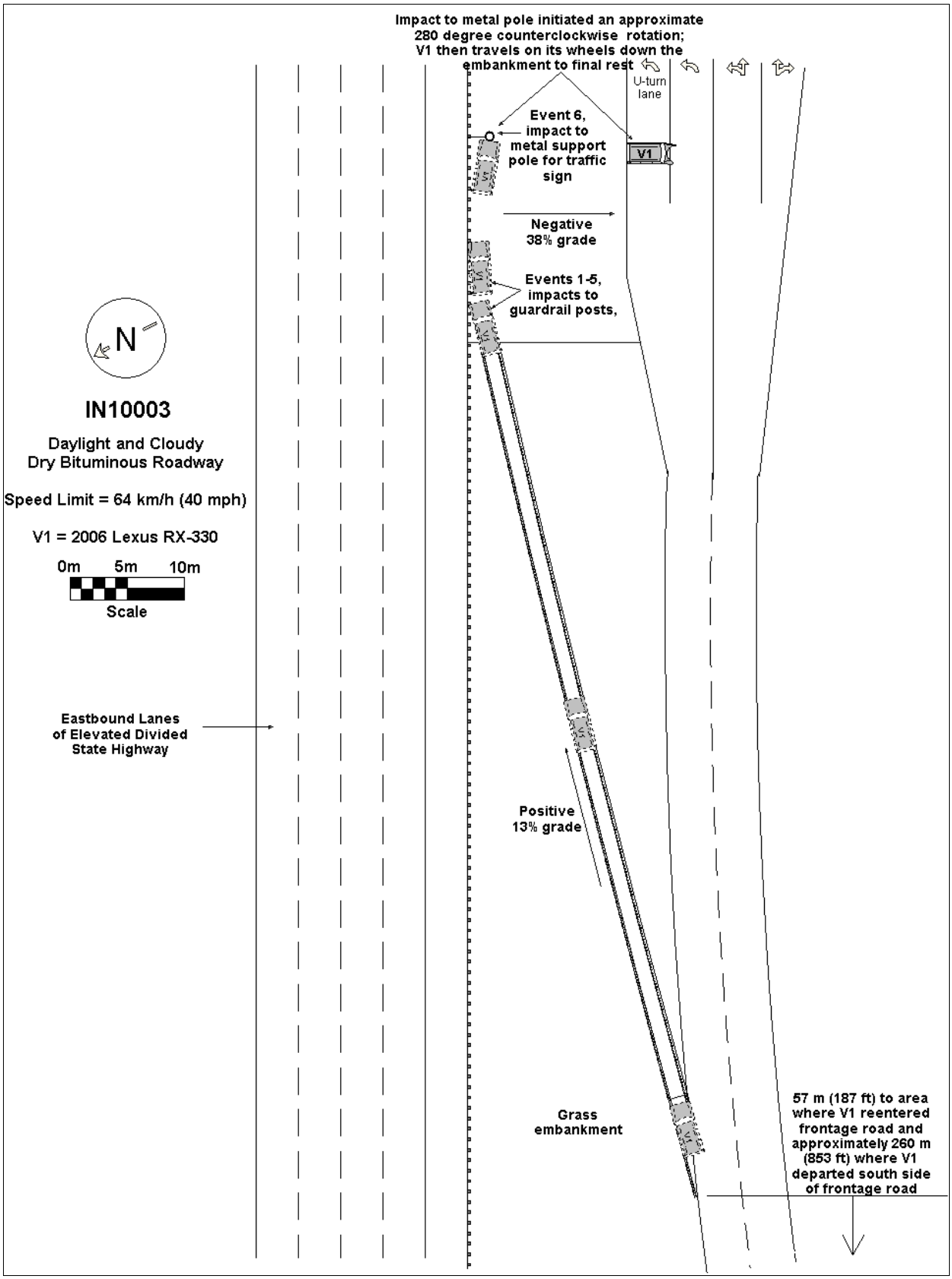
Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source	Source Confidence	Source of Injury Data
6 7	Swelling, cerebrum, marked, with normal gyral pattern to hemispheres, not further specified	serious 140660.3,1 140660.3,2	Center instrument panel	Probable	Autopsy
	Concussive brain injury with loss of consciousness from crash to death[2]	Not coded	Center instrument panel	Probable	Emergency room records
8	Contusion, 1 cm (0.4 in) myocardium of left anterior ventricle	minor 441002.1,4	Steering wheel hub and/or spokes and rim	Certain	Autopsy
9	Contusions bilateral lungs: right middle and lower lobes, left upper and lower lobes	severe 441412.4,3	Steering wheel hub and/or spokes and rim	Certain	Autopsy
10	Fractured ribs: right anterior 2nd-4th, posterior 10th-12th; left anterior 2nd-5th, lateral 5th and 6th, posterior 10th and 11th	serious 450203.3,3	Steering wheel hub and/or spokes and rim	Certain	Autopsy
11	Hemothorax: right 600 ml, left 800 ml; as well as hemoperitoneum 600 ml	severe 442201.4,3	Steering wheel hub and/or spokes and rim	Certain	Autopsy
12 13	Contusion, subgaleal, central parietal scalp	minor 110402.1,1 110402.1,2	Center instrument panel	Possible	Autopsy
14 15	Lacerations, 3.2 cm (1.25 in) center left parietal scalp; 3.8 cm (1.5 in) right parietal scalp	minor 110602.1,1 110602.1,2	Noncontact injury: flying glass, windshield glazing	Probable	Autopsy
16	Abrasion above right eyebrow, not further specified	minor 210202.1,7	Center instrument panel	Probable	Autopsy
17	Laceration, 1.9 cm (0.75 in) center forehead, not further specified	minor 210602.1,7	Center instrument panel	Probable	Autopsy
18 19	Contusion right supraorbital and abrasion and contusion left supraorbital	minor 210402.1,1 210402.1,2	Center instrument panel	Probable	Autopsy

[2] Patient was unresponsive with pupils fixed and dilated, no spontaneous respirations or movement, GCS=3, and PEA pulseless electrical activity

The following term is defined in DORLAND'S ILLUSTRATED MEDICAL DICTIONARY as follows:

pulseless electrical activity: continued electrical rhythmicity of the heart in the absence of effective mechanical function; it may be due to uncoupling of ventricular muscle contraction from electrical activity or may be secondary to cardiac damage with respiratory failure and cessation of cardiac venous return. Called also *electromechanical dissociation*.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source	Source Confidence	Source of Injury Data
20 21	Abrasion and contusion, 3.8 cm (1.5 in) right cheek, not further specified	minor 210202.1,1 210402.1,1	Air bag, driver's	Probable	Autopsy
22 23	Abrasions and contusions chin: 1.9 cm (0.75 in) linear abrasion center chin; 4.4 cm (1.75 in) right chin; 3.8 cm (1.5 in) left lower lip and chin	minor 210202.1,8 210402.1,8	Steering wheel rim	Probable	Autopsy
24 25	Abrasion and contusion mid chest (epigastric), not further specified	minor 410202.1,4 410402.1,4	Steering wheel hub and/or spokes and rim	Certain	Autopsy
26 27	Abrasion and contusion center and left upper abdomen, not further specified	minor 510202.1,7 510402.1,7	Steering wheel rim	Certain	Autopsy
28 29	Abrasion and contusion over right hip and flank, not further specified	minor 510202.1,1 510402.1,1	Lap portion of safety belt system	Probable	Autopsy
30	Abrasion, 8.3 cm (3.25 in) left upper back, not further specified	minor 410202.1,6	Seat back, driver's	Probable	Autopsy
31	Contusion, 5.1 cm (2 in) right upper back, below abrasion	minor 410402.1,6	Seat back, driver's	Probable	Autopsy
32 33	Abrasions and contusions (bruising) left upper arm, not further specified	minor 710202.1,2 710402.1,2	Left instrument panel	Possible	Emergency room records
34	Abrasion, 5.1 cm (2 in) posterior right shoulder, above contusion	minor 710202.1,1	Seat back, driver's	Probable	Autopsy
35	Contusions, multiple, from 1.3 to 5.1 cm (0.5-2.0 in) dorsum right hand and fingers	minor 710402.1,1	Center instrument panel	Certain	Autopsy
36	Abrasion, 23.5 cm (9.25 in) right upper thigh extending around onto right buttock	minor 810202.1,1	Lap portion of safety belt system	Probable	Autopsy
37	Abrasions x 2, 2.5 cm (1 in) left posterior knee, not further specified	minor 810202.1,2	Seat cushion, driver's	Probable	Autopsy


Impact to metal pole initiated an approximate 280 degree counterclockwise rotation; V1 then travels on its wheels down the embankment to final rest
U-turn lane
Event 6, impact to metal support pole for traffic sign
V1
Negative 38% grade
Events 1-5, impacts to guardrail posts,
N
IN10003
Daylight and Cloudy
Dry Bituminous Roadway
Speed Limit = 64 km/h (40 mph)
V1 = 2006 Lexus RX-330
0m 5m 10m
Scale
Eastbound Lanes of Elevated Divided State Highway
Positive 13% grade
Grass embankment
57 m (187 ft) to area where V1 reentered frontage road and approximately 260 m (853 ft) where V1 departed south side of frontage road