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SCI/NASS COMBINATION CASE REPORT

CASE NUMBER - NASS-1999-08-167C

LOCATION - Pennsylvania

VEHICLE - 1998 JAGUAR XJ8L

CRASH DATE - September, 1999

Submitted:

January 18, 2001

Revised:

June 15, 2001



Contract Number: DTNH22-94-D-17058

Prepared for:

U.S. Department of Transportation

National Highway Traffic Safety Administration

National Center for Statistics and Analysis

Washington, D.C. 20590-0003

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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

1. <i>Report No.</i> NASS-1999-08-167C		2. <i>Government Accession No.</i>		3. <i>Recipient's Catalog No.</i>	
4. <i>Title and Subtitle</i> SCI/NASS Combination Case Report Vehicle - 1998 Jaguar XJ8L Location - Pennsylvania			5. <i>Report Date:</i> January 18, 2001		
			6. <i>Performing Organization Code</i>		
7. <i>Author(s)</i> Special Crash Investigations Team #2			8. <i>Performing Organization Report No.</i> Task # 0233		
9. <i>Performing Organization Name and Address</i> Transportation Research Center Indiana University 222 West Second Street Bloomington, Indiana 47403-1599			10. <i>Work Unit No. (TRAIS)</i>		
			11. <i>Contract or Grant No.</i> DTNH22-94-D-17058		
12. <i>Sponsoring Agency Name and Address</i> U.S. Department of Transportation (NRD-32) National Highway Traffic Safety Administration National Center for Statistics and Analysis Washington, D.C. 20590-0003			13. <i>Type of Report and Period Covered</i> Technical Report Crash Date: September, 1999		
			14. <i>Sponsoring Agency Code</i>		
15. <i>Supplementary Notes</i> SCI/NASS combination investigation of a side air bag deployment crash involving a 1998 Jaguar XJ8L, with manual safety belts and dual front and side air bags, and a 1995 Nissan Maxima					
16. <i>Abstract</i> This report covers a SCI/NASS combination investigation of a side air bag deployment crash that involved a 1998 Jaguar XJ8L (case vehicle) and a 1995 Nissan Maxima. This crash is of special interest because the Jaguar was equipped with seat back-mounted side air bags in the front seat positions and the front right passenger's side air bag deployed as a result of the collision events. The Jaguar was also equipped with driver and front right passenger front air bags that also deployed. The Jaguar's unrestrained front right passenger (29-year-old male) sustained back and abdominal injuries and was hospitalized. The Jaguar was traveling east negotiating a left curve in the eastbound lane of a wet, two-lane, undivided county roadway and lost control on the wet surface, going into a counterclockwise rotation and crossing the centerline into the westbound lane. The Nissan was traveling west in the westbound lane of the same roadway negotiating a right curve. The right side of the Jaguar was impacted by the front of the Nissan, causing the Jaguar's two front air bags and the front right passenger's side air bag to deploy. The Jaguar came to rest in the westbound lane heading in a southerly direction. The Nissan came to rest in the westbound lane heading in a westerly direction. The Jaguar's front right passenger was transported via ambulance and hospitalized for three days. He sustained injuries that included a fracture of the L2 lumbar vertebra right transverse process, right abdomen and right flank contusions, right iliac crest contusion and a facial laceration to the right side. The Jaguar's unrestrained driver (25-year-old male) sustained police-reported "C" (possible) injuries, described only as neck pain. The driver was transported by ambulance but his specific injuries and treatment status are unknown. Both vehicles were towed from the scene due to damage.					
17. <i>Key Words</i> Side Air Bag Deployment			Motor Vehicle Traffic Crash Injury Severity		18. <i>Distribution Statement</i> General Public
19. <i>Security Classif. (of this report)</i> Unclassified	20. <i>Security Classif. (of this page)</i> Unclassified		21. <i>No. of Pages</i> 7	22. <i>Price</i> \$2,000	

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This combination SCI/NASS crash investigation concerns a 1998 Jaguar XJ8L (case vehicle) and a 1995 Nissan Maxima. The crash occurred in September 1999, at 2:39 p.m., in Pennsylvania and was investigated by the applicable police department. This crash is of special interest because the Jaguar was equipped with seat back-mounted side air bags and the front right passenger's side air bag deployed as a result of the collision events. The Jaguar was also equipped with front air bags that also deployed. The unrestrained front right passenger (29-year-old male) sustained a fracture of the transverse process on lumbar vertebra L2, plus contusions and abrasions on his right abdomen as a result of intruding right side components, and was hospitalized for three days. The unrestrained driver (25-year-old male) sustained unknown minor injuries. The NASS researcher inspected the scene and both vehicles in October 1999. This report is based on the Police Crash Report, the coded NASS forms, scene and vehicle inspections, occupant kinematic principles, and this contractor's evaluation of the evidence.

CRASH CIRCUMSTANCES

The Jaguar was traveling east in the eastbound lane negotiating a curve left on a two-lane, two-way, undivided county roadway (**Figure 1**). The Nissan was traveling west in the westbound lane negotiating a right curve on the same roadway. The bituminous roadway had a positive slope of over 2% for eastbound traffic at the point of the crash. It was daylight with rain at the time of the crash and the road surface was wet. The posted speed limit was 32 km.p.h. [20 m.p.h.]. The roadway was divided by a double yellow line and bordered by a solid white fog line with a W-beam guardrail along the south edge. According to the Police Crash Report, the Jaguar driver lost control on the wet surface and went into a counterclockwise yaw and crossed over the centerline into the westbound lane. It is not known if the Jaguar's driver attempted any avoidance actions. The driver of the Nissan braked (unknown if lock-up) in an attempt to avoid the crash with the Jaguar.

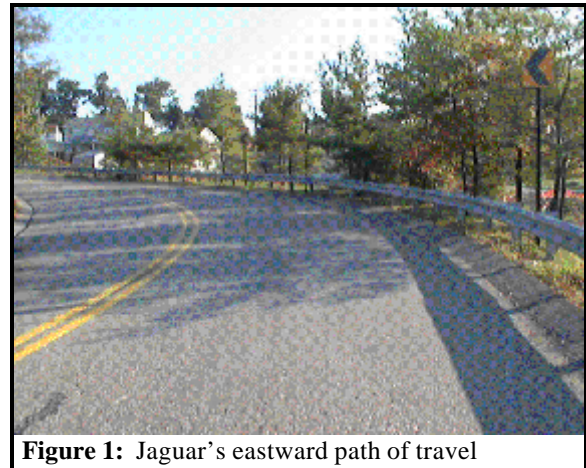


Figure 1: Jaguar's eastward path of travel

The crash occurred in the westbound lane. The front of the Nissan impacted the right side of the Jaguar, causing the Jaguar's driver and front right passenger front air bags and the front right passenger's seat back-mounted side air bag to deploy. The Jaguar came to rest on the roadway, in the westbound lane heading in a southerly direction. The Nissan came to rest in the westbound lane, heading in a westerly direction. Both vehicles were towed from the scene due to damage.

The case vehicle was a rear wheel drive 1998 Jaguar XJ8L, five-passenger, four-door sedan (VIN: SAJHX6246WC-----) equipped with a 4.0 liter V8 engine and an automatic transmission with a console-mounted selector lever. Braking was achieved by a power-assisted, four wheel disc anti-lock system. The Jaguar's wheelbase was 299 centimeters [117.9 inches]. The Jaguar's recorded mileage is unknown due to the damaged electronic odometer.

The Jaguar's contact with the Nissan involved the right side from just behind the right front axle to the rear wheel well (**Figure 2**). The maximum crush to the Jaguar's right side was 63 centimeters [24.8 inches] and was located between C3 and C4 (**Figure 3**). The wheelbase on the right side was shortened 25 centimeters [9.8 inches] with the left side being lengthened 9 centimeters [3.5 inches]. The glazing in the Jaguar's front and rear right side doors disintegrated. The two right doors and the right B-pillar intruded, causing deformation to the front right seat cushion and seat back.



Figure 2: Jaguar's right side damage, looking forward

The CDC for the Jaguar's single impact was determined to be: **02-RYEW-4 (70)**. The WinSMASH reconstruction program, damage-only algorithm with crush profiles from both vehicles, was used. The Total, Longitudinal, and Lateral Delta Vs for the Jaguar are, respectively: 34 km.p.h. [21 m.p.h.], -12 km.p.h. [-7.5 m.p.h.], and -32 km.p.h. [-20 m.p.h.]. The crash severity for the Jaguar was moderate.

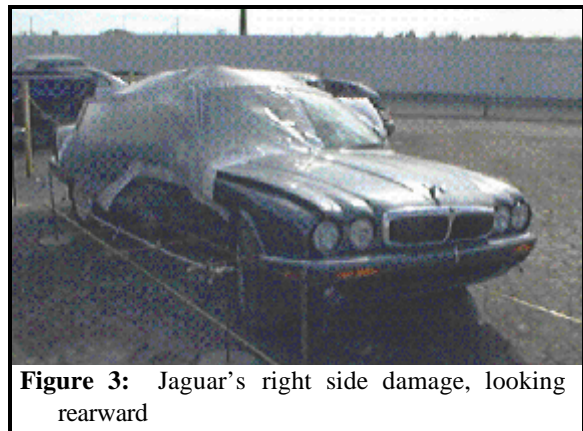


Figure 3: Jaguar's right side damage, looking rearward

An examination of the Jaguar's interior revealed evidence of contact by the front right passenger to the roof (hair), right side roof rail (scuffed), right side door hardware (scuffing with blood), right B-pillar (scuffed) and the right side door panel (scratched). The Jaguar's driver and front right passenger knee bolsters showed no evidence of scuffing or deformation.

AUTOMATIC RESTRAINT SYSTEM

The Jaguar was equipped with front air bags and seat back-mounted side air bags at the driver and front right passenger seat positions, for a total of four air bags. Both front air bags and the right side seat back-mounted air bag deployed as a result of the right side impact. The two front seats were equipped with safety belt pretensioners and the NASS researcher indicated that they did actuate.

The Jaguar's driver front air bag deployed from the steering wheel hub where it was mounted (**Figure 4**). The driver's front air bag had a single module cover which opened upwards. Its overall dimensions were 24 centimeters [9.5 inches] at the top and 15 centimeters [5.9 inches] at the bottom and 17 centimeters [6.7 inches] vertically. The flap appear to be made of thick vinyl/leather type material. The driver's air bag was 50 centimeters [19.7 inches] in diameter and had two tethers. The driver's air bag had two vent ports located at the 11 and 1 o'clock positions. The driver's front air bag and cover flap revealed no visible evidence of direct contact. It should be noted that the driver air bag's front and back surfaces were covered with mud at the time of the inspection.



Figure 4: Looking down at Jaguar's deployed driver front air bag

The Jaguar's front right passenger front air bag deployed from the middle of the instrument panel just above the glove compartment where it was mounted. The front right passenger air bag had a single module cover which opened upwards. Its overall dimensions were 40 centimeters [15.75 inches] horizontally and 12 centimeters [4.7 inches] vertically. The flap appear to be made of thick vinyl/leather type material. The front right passenger air bag was not tethered and had two vent ports at the 9 and 3 o'clock positions. The air bag's front face was approximately 60 centimeters [23.6 inches] horizontally and 40 centimeters [15.75 inches] vertically.

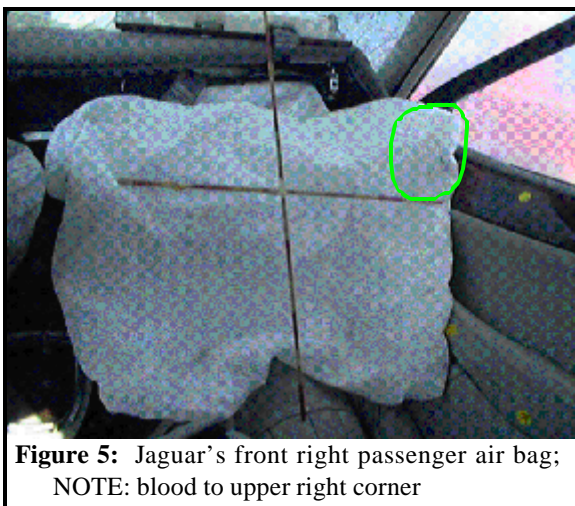


Figure 5: Jaguar's front right passenger air bag;
NOTE: blood to upper right corner

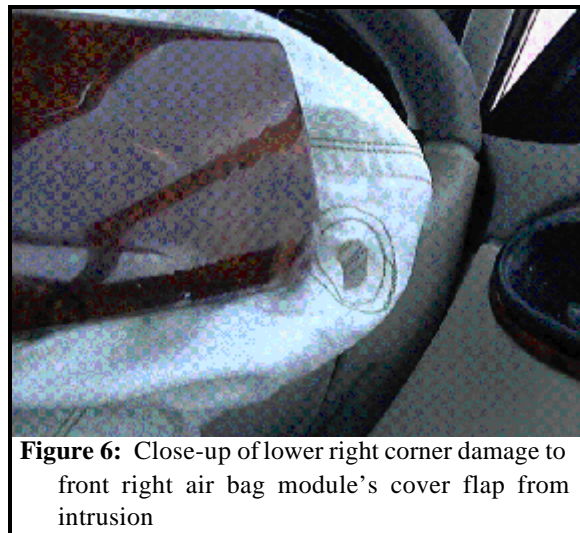


Figure 6: Close-up of lower right corner damage to front right air bag module's cover flap from intrusion

An inspection of the Jaguar's front right passenger air bag revealed blood on the front upper right corner (**Figure 5**). The NASS investigator indicated that the front right air bag's cover flap had been damaged, but was not specific. It appears that there was damage to the bottom right corner due to intrusion by the right side door panel (**Figure 6**).

The Jaguar's front right side air bag deployed from along outside seam of the front right bucket seat back where it was mounted (**Figures 7, 8**). The side air bag's dimensions were 30 centimeters [11.8 inches] horizontally and 28 centimeters [11 inches] vertically and it was not tethered and had no vent ports. An inspection of the Jaguar's front right side air bag revealed no visible evidence of direct contact from the front right passenger.

The Jaguar's driver seat back-mounted side air bag did not deploy in the right side impact.

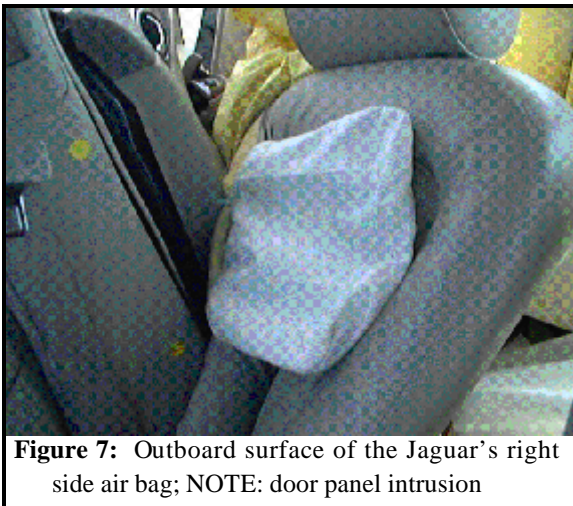


Figure 7: Outboard surface of the Jaguar's right side air bag; NOTE: door panel intrusion

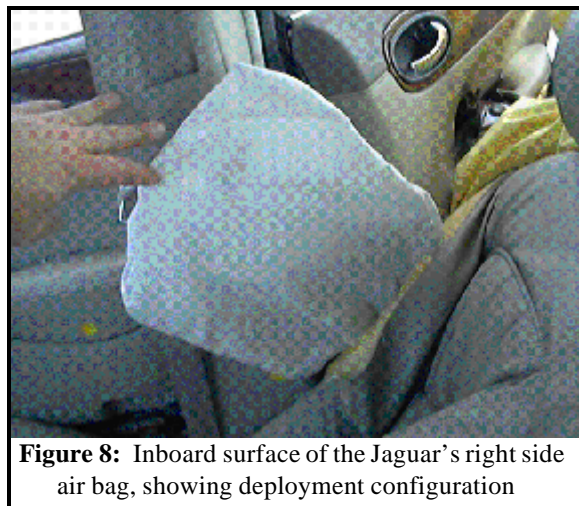


Figure 8: Inboard surface of the Jaguar's right side air bag, showing deployment configuration

CASE VEHICLE FRONT RIGHT PASSENGER

The Jaguar's front right passenger (29-year-old male, unknown race/ethnic origin, unknown height/weight) was not using his available, manual, three-point, lap-and-shoulder safety belt system. He was transported by ambulance to a trauma facility where he was hospitalized for three days.

The front right passenger was probably seated in an upright posture, with his feet on the floor and both hands on his lap. His seat track was located between its middle and forward-most position, with the seat back slightly reclined. The loss of control and counterclockwise rotation caused the front right passenger to move slightly forward and to the right. The Jaguar's impact with the Nissan caused this seat position's front and side air bags to deploy. The impact caused the front right passenger to move further rightward and slightly forward and upward, toward the 2 o'clock direction of principal force. The right front door glazing shattered, showering him with glass and causing minor lacerations to the right side of his face.

He probably encountered the deployed front air bag off center to the right with his face and chest, leaving

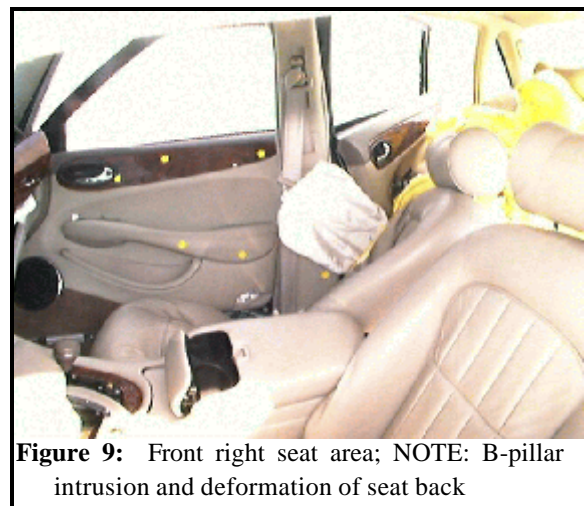


Figure 9: Front right seat area; NOTE: B-pillar intrusion and deformation of seat back

blood spots at the air bag’s upper right corner. He probably encountered the deployed side air bag with the right side of his thorax. The combination of his rightward momentum and the intruding right side components deflated the side air bag. The intruding door panel and B-pillar caused his seat cushion to be bent downward and his seat back to be bent inward and rearward (**Figure 9**). He was struck by the intruding door panel, causing contusions and abrasions on his right side, and he sustained a fracture of the right transverse process of the L2 vertebra, probably due to contact with the intruding B-pillar. There is no knowledge of his position at final rest.

CASE VEHICLE’S FRONT RIGHT PASSENGER INJURIES

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1.	Fracture, right transverse process, L2 vertebra	650620.2 moderate	Right B-pillar	probable	Discharge Summary
2.	Laceration, right face NFS	290600.1 minor	Flying glass	certain	Discharge Summary
3.	Contusion right hip	890402.1 minor	Right door panel	certain	Discharge Summary
4.	Contusion right flank	590402.1 minor	Right door panel	certain	Discharge Summary

CASE VEHICLE DRIVER

The Jaguar’s driver (25-year-old male, unknown race/ethnic origin, unknown height/weight) was not using his available, manual, three-point, lap-and-shoulder safety belt system. He sustained police-reported “C” (possible) injuries and was transported to a local hospital. The police report notes that he complained of neck pain, but his specific injuries and treatment status are not known.

The Jaguar's driver was probably seated in an upright posture with his back against the seat back, his left foot was on the floor, his right foot on the brake, and both hands on the steering wheel. His seat track was located in its middle position, the seat back was slightly reclined, and the tilt steering was adjusted in the center position. It is not known if he attempted any avoidance maneuvers. The loss of control with counterclockwise rotation probably caused him to move slightly forward and to the right. The Jaguar's impact with the Nissan caused this seat position’s front air bag to deploy. The driver moved further forward and rightward, toward the 2 o’clock direction of force. He probably contacted the deploying driver’s front air bag slightly off-center to the right. There is no knowledge of his position at final rest.

OTHER VEHICLE

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The other vehicle was a front wheel drive 1995 Nissan Maxima, five-passenger, four-door sedan (VIN: JN1CA214XWK-----). The Nissan was equipped with a 4-speed automatic transmission, 3.0 liter V6 engine and a four-wheel anti-lock braking system. The Nissan's wheelbase was 270 centimeters [106.3 inches] and the odometer reading was 105,012 kilometers [65,253 miles].

Damage to the Nissan from impacting the Jaguar involved the entire front (Figures 10, 11). The CDC was determined to be 12-FDEW-1 (10). The WinSMASH reconstruction program, damage-only algorithm with crush profiles from both vehicles, was used. The Total, Longitudinal, and Lateral Delta Vs for the Nissan are, respectively: 49 km.p.h. [30 m.p.h.], -48 km.p.h. [-29 m.p.h.], and -9 km.p.h. [-6 m.p.h.].

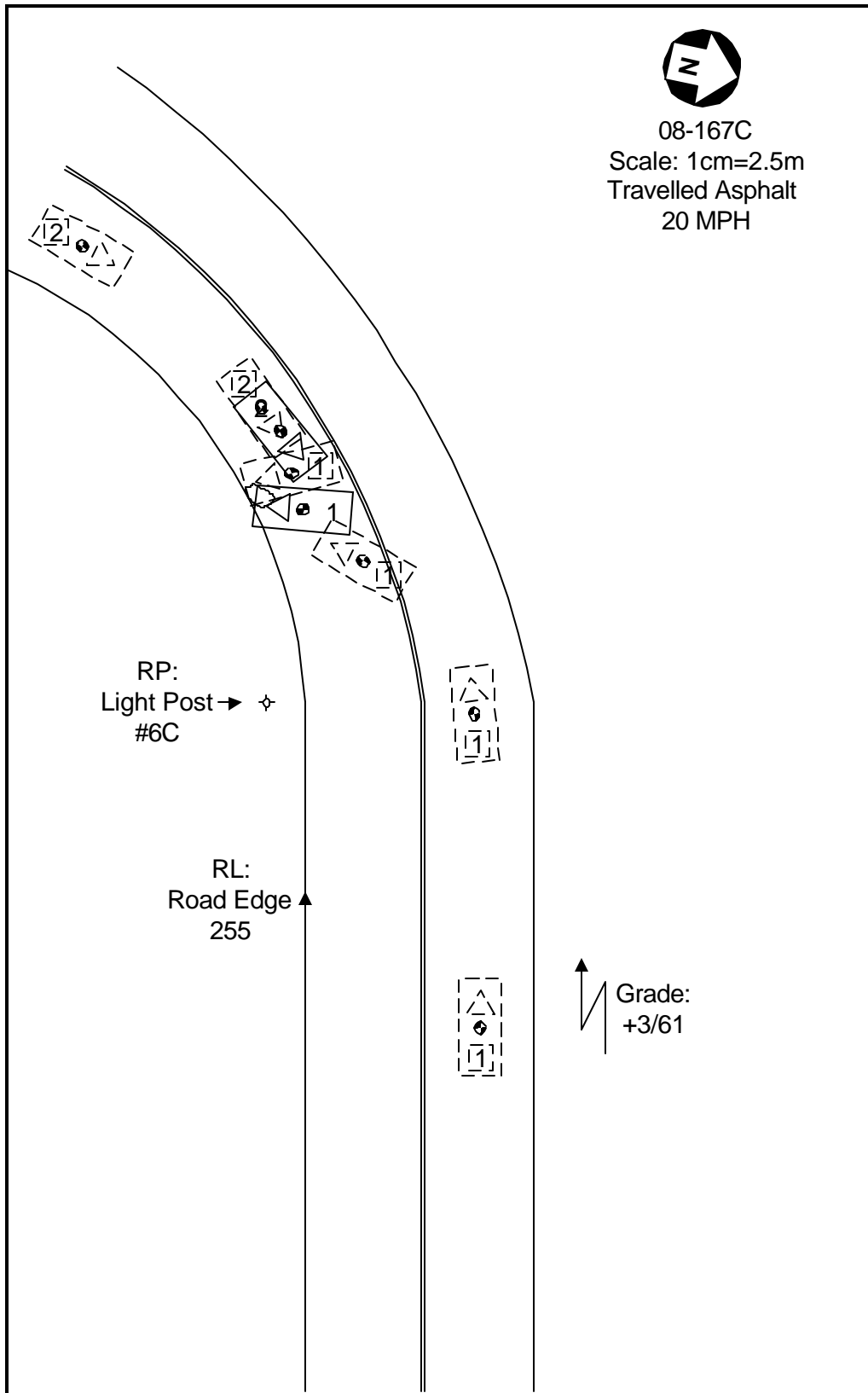


Figure 10: Reference line view of Nissan's front end deformation viewed from left



Figure 11: Frontal view of damage to the Nissan's front end from impacting Jaguar's right side

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¹The north arrow on the NASS scene diagram is reversed.