Remote Investigation / Vehicle to Vehicle
Dynamic Science, Inc. / Case Number: DS99040
1994 Jaguar XJS 2 door coupe
Colorado
April, 1997

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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 collision occurred in Colorado in April, 1997 during the mid-afternoon. The crash took place in a 45E four-leg intersection. The south roadway is comprised of three southbound lanes, a turn lane, and two northbound lanes. The north roadway is comprised of three northbound lanes, a turn lane, and two southbound lanes. The weather was clear and the bituminous roadway was dry and free of defects. The speed limit is 56 km/h (35 mph). Traffic is controlled by tri-color signals that were green at the time of the crash. The case vehiclewas a 1994 Jaguar XJS 2-door coupe equipped with driver side and passenger side front air bags. The Breed manufactured air bags are self contained units incorporating both the crash sensor and the inflator assembly. The passenger side air bag was a single tether design with no visible vent ports. In the fully deployed mode, the excursion of the air bag measured an estimated distance of 55.2 cm (21.7 in) from the instrument panel. The case vehicle was traveling north at an unknown speed in the left turn lane approaching the intersection. The driver was a 73-year-old female. The front right seat was occupied by two male children, ages 4 and 5. The 5-year-old was nearest to the passenger side door and the 4-year-old was nearest to the driver. According to the attorney, they were both using the same lap and shoulder belt. The 5-year-old (107 cm/42 in, 20 kg./44 lbs) child is the case occupant.The other vehicle, a 1992 Honda Civic 3-door driven by a 24-year-old male, was traveling southbound in the middle travel lane at an unknown speed approaching the intersection. As the case vehicle entered the intersection, the driver began a left hand turn. The driver of the other vehicle saw the case vehicle and began braking. The front of the other vehicle (11FDEW1) struck the front of the case vehicle (01FZEW1). The case vehicle sustained a total delta v of 17.4 km/h (11.2 mph), a longitudinal delta v of -15.0 km/h (-9.7 mph), and a lateral delta v of -8.7 km/h (-5.6 mph). The other vehicle sustained a total delta v of 26.8 km/h (17.3 mph), a longitudinal delta v of -23.2 km/h (-14.9 mph), and a lateral delta v of 13.4 km/h (8.6 mph). The impact was of sufficient magnitude and both frontal air bags in the case vehicle deployed and the driver's side front air bag in the other vehicle also deployed. The other vehicle was pushed into a clockwise direction and came to rest facing east. The case vehicle was pushed into a counterclockwise direction and came to rest facing southeast. Both vehicles were towed from the scene due to damage. The driver of the case vehicle sustained skeletal injuries of an unknown nature. The 4-year-old child sustained minor abrasions and contusions. The 5-year-old child sustained a large 2 x 5 cm (0.8 x 1.9 in.) laceration/avulsion that begins over the right eye and extends along the right side of his face. CT scan revealed diffuse brain swelling and a small right temporal lobe contusion. He was found at the scene to be unconscious and unresponsive. He had a Glasgow Coma Scale of 3. All three occupants were transported by ground ambulance for treatment. The 5-year-old child was subsequently admitted and hospitalized for 15 days. At this point, he was discharged and transferred to neurosurgery service. He was in a coma for several months. At this time he is apparently unable to walk, talk, or eat without assistance.

17. Key Words	18. Distribution Statement
Air bag, deployment, injury, accident, fatality, passenger.	

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No of pages	22. Price

Dynamic Science, Inc.
Accident Investigation
Case Number: DS99040

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BACKGROUND:

Description:	This case was initiated in response to a report of a serious passenger air bag related injury to a child. This case is being conducted as a remote investigation. NHTSA was notified by the attorneys representing the injured child on December 15, 1999. DSI was notified on December 15, 1999. The following information was obtained from interviews with the attorneys involved, police reports, and photos from both the police and investigators for the attorneys.
Investigation Type:	Remote
Crash Location:	Colorado
Crash Date:	April, 1997
Notification Date:	December 15, 1999
Field Work Completed:	NA

SUMMARY:

This collision occurred in Colorado in April, 1997 during the mid-afternoon. The crash took place in a 45E four-leg intersection. The south roadway is comprised of three southbound lanes, a turn lane, and two northbound lanes. The north roadway is comprised of three northbound lanes, a turn lane, and two southbound lanes. The weather was clear and the bituminous roadway was dry and free of defects. The speed limit is 56 km/h (35 mph). Traffic is controlled by tri-color signals that were green at the time of the crash.

Figure 1. Final rest

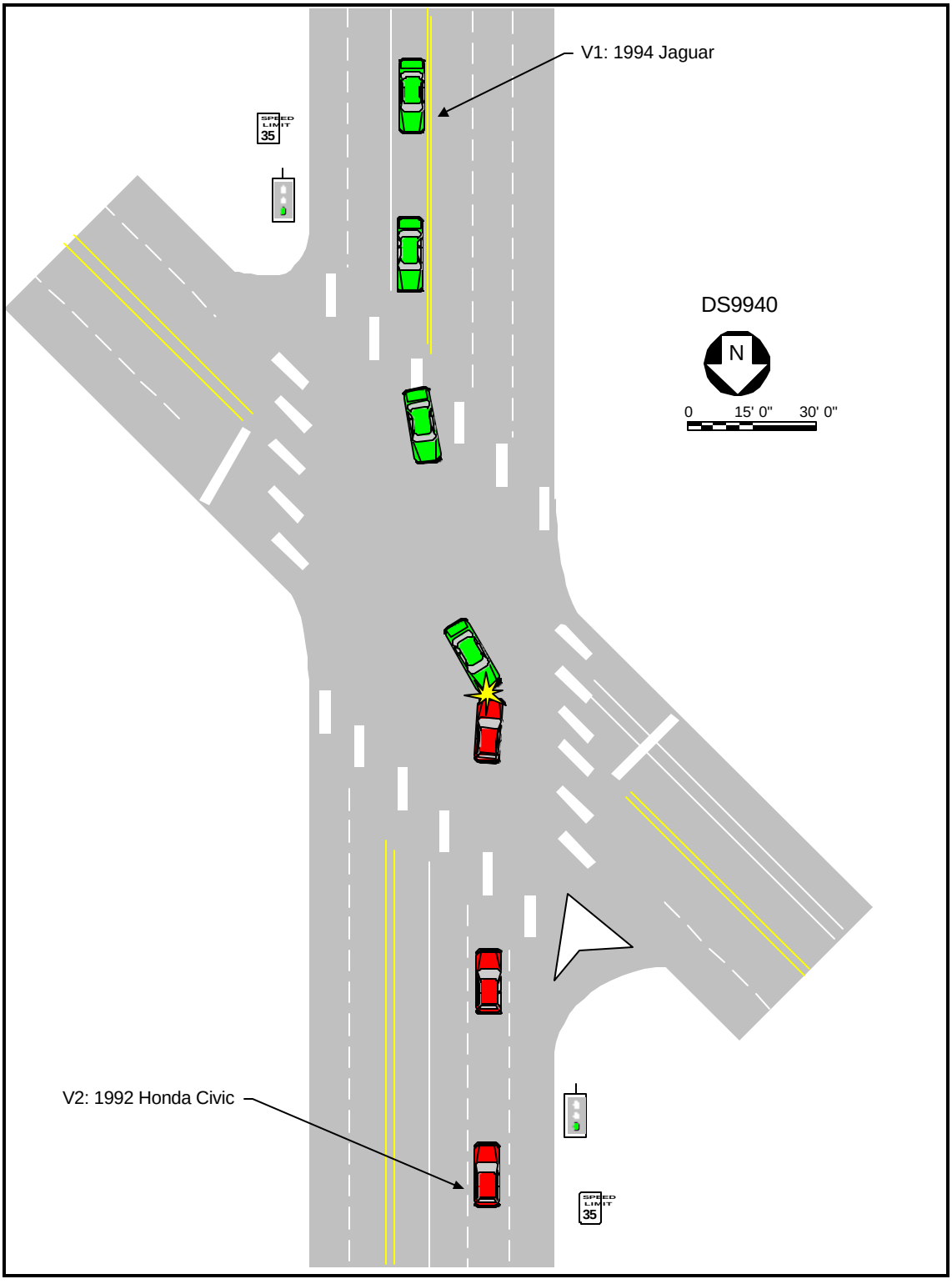
The case vehicle is a 1994 Jaguar XJS 2-door coupe equipped with driver side and passenger side front air bags. The Breed manufactured air bags are self contained units incorporating both the crash sensor and the inflator assembly. The passenger side air bag was a single tether design with no visible vent ports. In the fully deployed mode, the excursion of the air bag measured an estimated distance of 55.2 cm (21.7 in)[1] from the instrument panel. The case vehicle was traveling north at an unknown speed in the left turn lane approaching the intersection. The driver was a 73-year-old female. The front right seat was occupied by two male children, ages 4 and 5. The 5-year-old was nearest to the passenger side door and the 4-year-old was nearest to the driver. According to the attorney, they were both using the same lap and shoulder belt. The 5-year-old (107 cm/42 in, 20 kg./44 lbs) child is the case occupant.

The other vehicle, a 1992 Honda Civic 3-door driven by a 24-year-old male, was traveling southbound in the middle travel lane at an unknown speed approaching the intersection.

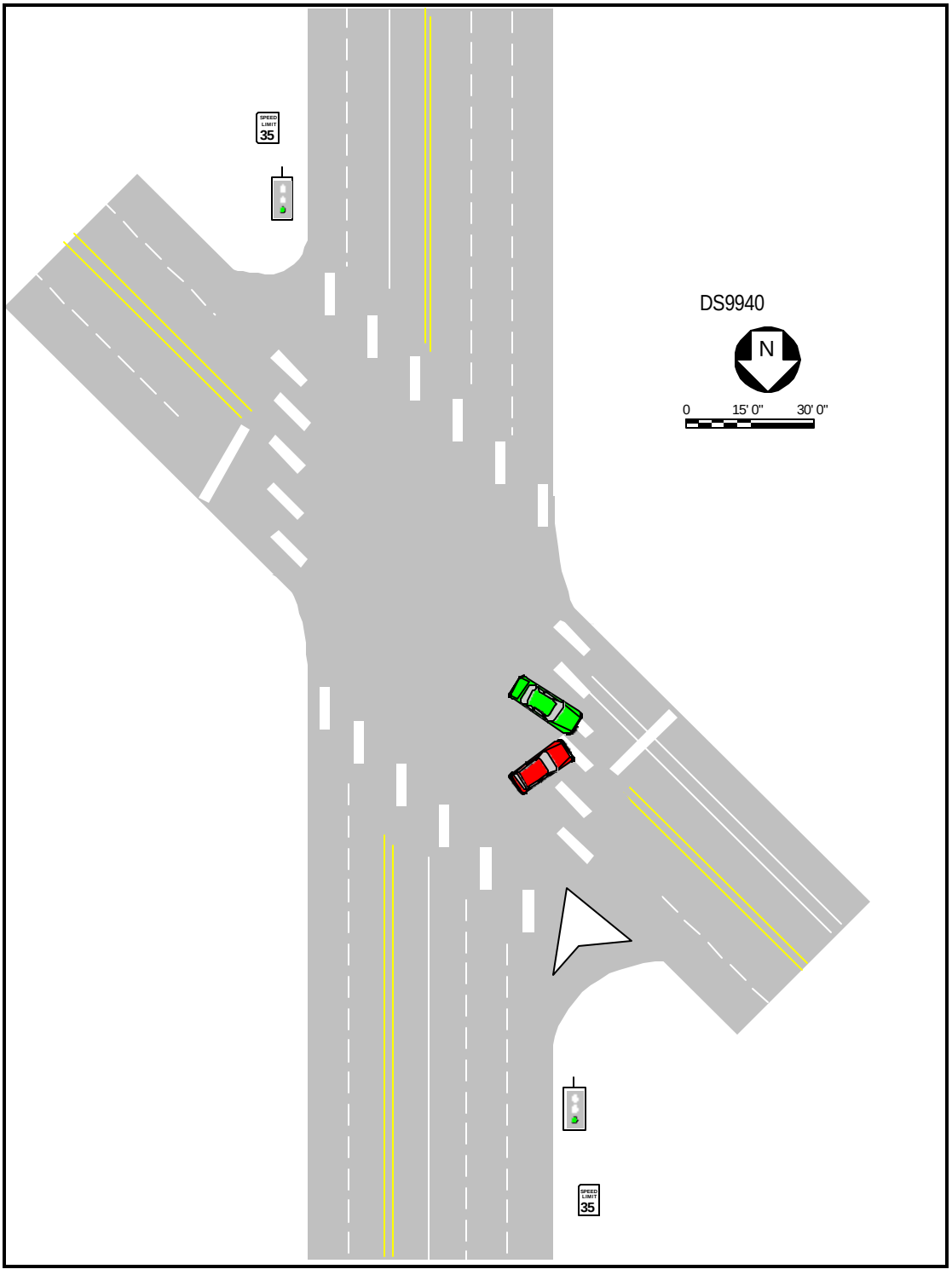
As The case vehicle entered the intersection, the driver began a left hand turn. The driver of The other vehicle saw The case vehicle and began braking. The front of The other vehicle (11FDEW1) struck the front of The case vehicle (01FZEW1). The case vehicle sustained a total delta v of 17.4 km/h (11.2 mph), a longitudinal delta v of -15.0 km/h (-9.7 mph), and a lateral delta v of -8.7 km/h (-5.6 mph). The other vehicle sustained a total delta v of 26.8 km/h (17.3 mph), a longitudinal delta v of -23.2 km/h (-14.9 mph), and a lateral delta v of 13.4 km/h (8.6 mph). The impact was of sufficient magnitude and both frontal air bags in The case vehicle deployed and the driver's side front air bag in The other vehicle also deployed. The other vehicle was pushed into a clockwise direction and came to rest facing east. The case vehicle was pushed into a counterclockwise direction and came to rest facing southeast. Both vehicles were towed from the scene due to damage.

The driver of The case vehicle sustained skeletal injuries of an unknown nature. The 4-year-old child sustained minor abrasions and contusions. The 5-year-old child sustained a large 2 x 5 cm (0.8 x 1.9 in.) laceration/avulsion that begins over the right eye and extends along the right side of his face. CT scan revealed diffuse brain swelling and a small right temporal lobe contusion. He was found at the scene to be unconscious and unresponsive. He had a Glasgow Coma Scale of 3. All three occupants were transported by ground ambulance for treatment. The 5-year-old child was subsequently admitted and hospitalized for 15 days. At this point, he was discharged and transferred to neurosurgery service. He was in a coma for several months. At this time he is apparently unable to walk, talk, or eat without assistance.

[1]Measurements are from an earlier air bag case involving the same air bag system.



Scene Diagram


SPEED LIMIT 35
DS9940
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0
15' 0"
30' 0"
SPEED LIMIT 35

DETAILED INFORMATION

Vehicles

Case vehicle

Description:	1994 Jaguar XJS 2-door coupe	
VIN:	SAJNX5743RCxxxxxx	
Odometer:	24,897 km (15,471 miles)	
Engine:	4.0 L, Automatic transmission	
Reported Defects:	None	
Cargo:	Unknown	
Damage Description:	Moderate frontal damage to bumper, grille, and hood. Both door windows broken.	
CDC:	01FZEW1	
Delta V^2:	Total	17.4 km/h (11.2 mph)
	Longitudinal	-15.0 km/h (-9.7 mph)
	Latitudinal	-8.7 km/h (-5.6 mph)
	Energy	31,686 joules (23,385 ft-lbs)

[2]Calculated using WinSmash. Crush profiles obtained from field measurements taken by an engineer involved in this case. Crush profiles adjusted for free space.

Figure 4. Exterior, Case vehicle.

DETAILED INFORMATION

Vehicles

Other vehicle

Description:	1992 Honda Civic VX 3-door	
VIN:	2HGEH2367NHxxxxxx	
Odometer:	87,010 km (54,067 miles)	
Engine:	Unknown, Manual transmission	
Reported Defects:	None	
Cargo:	Unknown	
Damage Description:	Moderate frontal damage to bumper, grille, and hood. Movement of metal from left to right.	
CDC:	11FYEW1	
Delta V:	Total	26.8 km/h (17.3 mph)
	Longitudinal	-23.2 km/h (-14.9 mph)
	Latitudinal	13.4 km/h (8.6 mph)
	Energy	46,158 joules (34,048 ft-lbs.)

Figure 5. Exterior, Other vehicle.

Occupants

Case vehicle	Occupant 1	Occupant 2	Occupant 3
Age/Sex:	73/Female	4/Male	5/Male
Seated Position:	Front left	Front right (nearest to the driver)	Front right (nearest to the passenger side door)
Seat Type:	Bucket with folding back	Bucket with folding back	Bucket with folding back
Height:	Unknown	Unknown	107 cm (42 in.)
Weight:	Unknown	Unknown	20 kg (44 lbs.)
Occupation:	Unknown	NA	NA
Pre-existing Medical Condition:	Unknown	Unknown	None indicated
Alcohol/Drug Involvement:	None	NA	NA
Driving Experience:	Presumed to be > 20 years	NA	NA
Body Posture:	Unknown	Unknown	Unknown
Hand Position:	Unknown	Unknown	Unknown
Foot Position:	Unknown	Unknown	Unknown
Restraint Usage:		Used with Occupant #3	Used with Occupant #2
Air bag:	Deployed	Deployed	Deployed

Occupants

Other vehicle

Age/Sex:	24/Male
Seated Position:	Front left
Seat Type:	Bucket with folding back
Height:	Unknown
Weight:	Unknown
Occupation:	Unknown
Pre-existing Medical Condition:	Unknown
Alcohol/Drug Involvement:	None
Driving Experience:	Unknown
Body Posture:	Unknown
Hand Position:	Unknown
Foot Position:	Right presumed to be on brake
Restraint Usage:	No, per police report

Injuries and Injury Mechanisms

Case vehicle

	INJURY	OIC CODE	ICD-9	SOURCE
Driver:	Skeletal injuries of unknown nature	Note codeable	--	Unknown
RF Occupant 1:	Multiple contusions	990400.1,9	924.8	Unknown
	Multiple abrasions	990200.1,9	919.0	Unknown
	Facial lacerations	290600.1,0	873.40	Air bag
RF Occupant 2:	2 x 5 cm complex laceration that extends from lateral canthus to above the right ear	290602.1,1	873.59	Door
	Mild to moderate diffuse brain swelling with obliteration of suprasellar cistern and third ventricle (from CT scan)	140664.4,1	853.05	Door
	Small, right temporal lobe contusion	140604.3,1	851.45	Door

Other vehicle

	INJURY	OIC CODE	ICD-9	SOURCE
Driver:	Skeletal injuries	Not codeable	–	Unknown

Occupant Kinematics

The two front right occupants were seated next to one another in the same bucket seat. The bucket seat was situated with seat back approximately 81 cm (32 in) rearward of the face of the instrument panel. They were both using the same seat belt. The position of the torso portion of the belt is not entirely clear, but in any event would not have been in the proper position for either child. The D-ring adjuster for the shoulder belt was in the full down position. The lap portion of the belt also was likely out of position (unable to be secured across the iliac crests of both children at any time). At impact, these occupants responded to the 30 degree principal force by moving forward and to the right. As the air bag deployed, the 5-year-old child occupant engaged and started loading the air bag. As the pressure increased, the membrane effect snapped his head rearward and to the right where he struck the wood paneling on the passenger side door with the right portion of his face. This contact likely caused the large laceration and avulsion, as well as the resultant brain injuries. The 5-year-old child came to rest against the door.

Figure 6. Interior, Case vehicle.

Figure 7. Passenger air bag. Arrow depicts likely contact between case occupant and air bag.

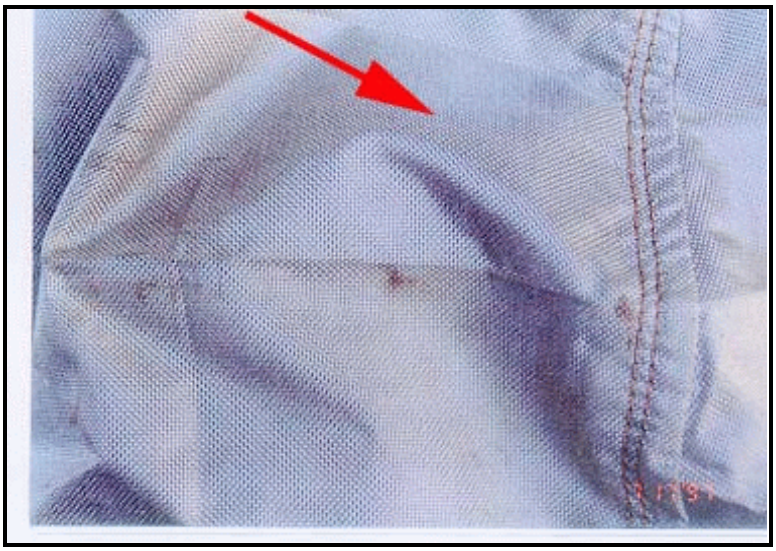

Figure 8. Close up of contact to air bag.

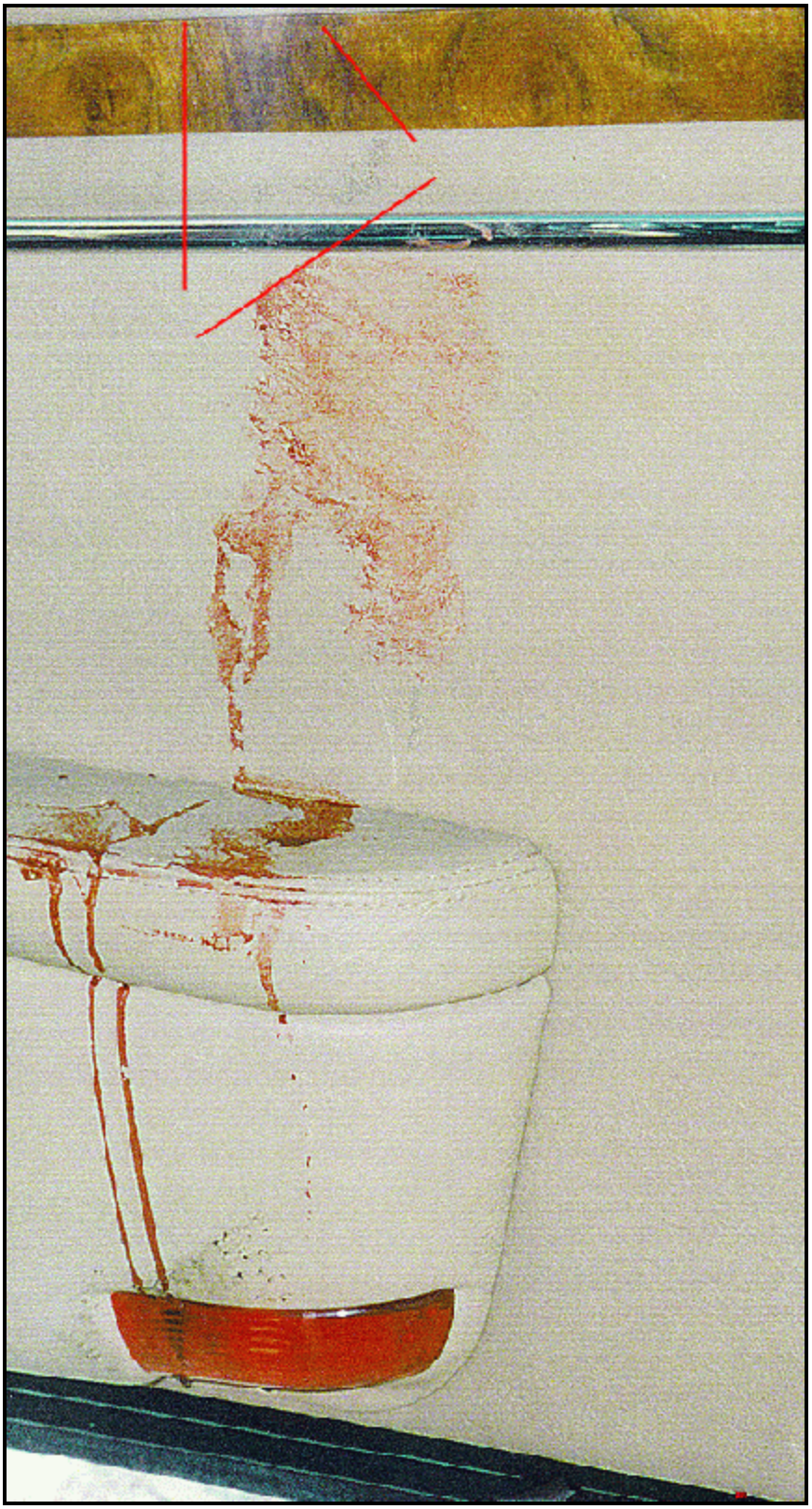

Figure 9. Right front door. Facial contact to wood panel.