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REMOTE CHILD SAFETY SEAT REPORT

CASE NUMBER - IN99-072
LOCATION - Illinois
VEHICLE - 1995 CHEVROLET LUMINA
CRASH DATE - May 1999

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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.

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15. Supplementary Notes Remote child fatality investigation involving a 1995 Chevrolet Lumina with three-point safety belts and dual front air bags, and a 1996 Ford Explorer XLT sport utility vehicle.					
16. Abstract This report covers a remote investigation of a crash that involved a 1995 Chevrolet Lumina (case vehicle) and a 1996 Ford Explorer (other vehicle). This crash is of special interest because the case vehicle's rear left passenger (3-year-old male), who was restrained in a forward facing child safety seat, sustained fatal head injuries as a result of being hit by the intruding left front fender of the other vehicle. The case vehicle was traveling north in the northbound lane on a two-lane, undivided state highway. The other vehicle was traveling south in the southbound lane on the same roadway. The other vehicle drifted over the centerline. The case vehicle's driver steered to the right attempting to avoid the crash, but the other vehicle's front left bumper corner impacted the left side of the case vehicle, near the left A-pillar, causing the case vehicle's driver and front right passenger air bags to deploy. The other vehicle scraped along the case vehicle's left side and the other vehicle's left front fender penetrated the case vehicle's left rear window, striking the rear left passenger's face and head. He sustained fatal injuries consisting of a crushed skull with avulsion of the brain. The case vehicle's driver (37-year-old male) was restrained by his available, active, three-point, lap-and-shoulder belt and sustained minor injuries. The case vehicle's front center passenger (7-year-old male) was restrained by his available, active, two-point, lap belt and sustained minor injuries. The front right passenger in the case vehicle (34-year-old female) was restrained by her available, active, three-point, lap-and-shoulder belt and sustained minor injuries. The case vehicle's rear center passenger (9-year-old male) was restrained by his available, active, two-point, lap belt and sustained minor injuries. The rear right passenger in the case vehicle (11-year-old male) was restrained by his available, active, three-point, lap-and-shoulder belt and sustained minor injuries. Both vehicles were towed from the scene due to damage.					
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TABLE OF CONTENTS

IN99-072

	<u>Page No.</u>
BACKGROUND	1
CRASH CIRCUMSTANCES	1
CASE VEHICLE	2
CASE VEHICLE REAR LEFT PASSENGER	3
REAR LEFT PASSENGER'S INJURIES	3
CASE VEHICLE DRIVER	3
DRIVER'S INJURIES	4
CASE VEHICLE FRONT CENTER PASSENGER	4
FRONT CENTER PASSENGER'S INJURIES	5
CASE VEHICLE FRONT RIGHT PASSENGER	5
FRONT RIGHT PASSENGER'S INJURIES	5
CASE VEHICLE REAR CENTER PASSENGER	6
REAR CENTER PASSENGER'S INJURIES	6
CASE VEHICLE REAR RIGHT PASSENGER	6
REAR RIGHT PASSENGER'S INJURIES	7
OTHER VEHICLE	7
 SELECTED PHOTOGRAPHS	
Figure 1: Case vehicle's northbound approach and final rest	1
Figure 2: Look back along case vehicle's approach and other vehicle's final rest	1
Figure 3: Left side of case vehicle	2
Figure 4: Direct contact on case vehicle's left upper B- and C-pillars	2
Figure 5: Other vehicle's front damage	7
Figure 6: Other vehicle's left fender damage	8
Figure 7: Closeup, other vehicle's left front corner	8
Figure 8: Closeup, other vehicle's fender that penetrated case vehicle	8
Figure 9: Closeup, fatal victim's hair on other vehicle's fender	8

This remote report was brought to the NHTSA's attention on May 17, 1999 by an officer with the investigating police agency. This crash involved a 1995 Chevrolet Lumina (case vehicle) and a 1996 Ford Explorer XLT (other vehicle). The crash occurred in May 1999, at 5:39 p.m., in Illinois and was investigated by the applicable state police. This crash is of special interest because the case vehicle's rear left passenger (3-year-old male), who was restrained in a forward facing child safety seat, sustained a crushed skull with brain avulsion from the other vehicle's intruding components in a sideswipe-type crash. This contractor interviewed the case vehicle driver on July 29, 1999. This summary is based on the Police Crash Report, interviews with the case vehicle's driver and the investigating police officer, police scene and vehicle photographs, occupant kinematic principles, and this contractor's evaluation of the evidence.

CRASH CIRCUMSTANCES

The case vehicle was traveling north in the northbound lane of a two-lane, undivided state highway and was intending to continue north. The other vehicle was traveling south in the southbound lane of the same roadway and intended to continue south. The bituminous roadway was dry and level. The case vehicle had just exited a left-hand curve and was in a short, straight road segment before entering another left-hand curve. The driver of the other vehicle became distracted while looking for a compact disc and drifted over the centerline into the northbound lane. The case vehicle's driver steered to the right, attempting to avoid the crash. The crash occurred in the northbound lane.

The other vehicle's front left bumper corner impacted the left side of the case vehicle near the left A-pillar. The other vehicle's left front wheel snagged on the case vehicle's front left door, tearing off the wheel assembly and the case vehicle's left front and rear door panels, and causing the case vehicle's driver and front right passenger air bags to deploy. The snagging action resulted in the other vehicle's front left bumper corner and left fender buckling upward. The other vehicle's deformed left fender partially overrode and intruded into the case vehicle's rear left seating area, striking the case vehicle's restrained rear left child passenger. The case vehicle departed the east side of the roadway,



Figure 1: On-scene, case vehicle's northbound approach, point of impact, east road edge departure and final rest (case photo #01)



Figure 2: On-scene, look back along case vehicle's northbound approach (looking south) showing the other vehicle's track of gouges and final rest (case photo #07)

rotated approximately 170 degrees clockwise while traversing a grassy slope along the roadside and came to rest heading southeast, approximately 49.1 meters [161 feet] northeast from the point of impact (**Figure 1**). The other vehicle continued southward in the northbound lane and came to rest heading south on the east shoulder approximately 133.5 meters [438 feet] south of the point of impact (**Figure 2**).

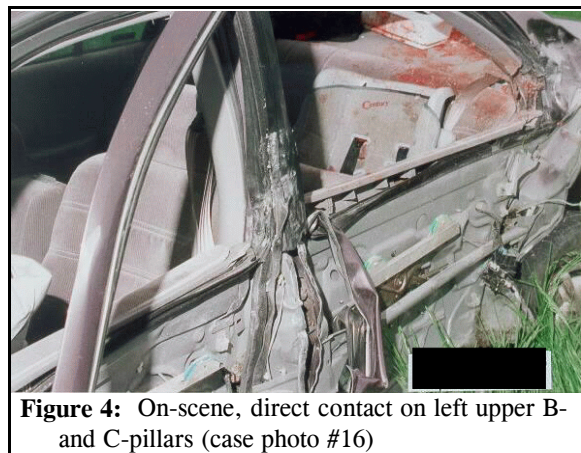
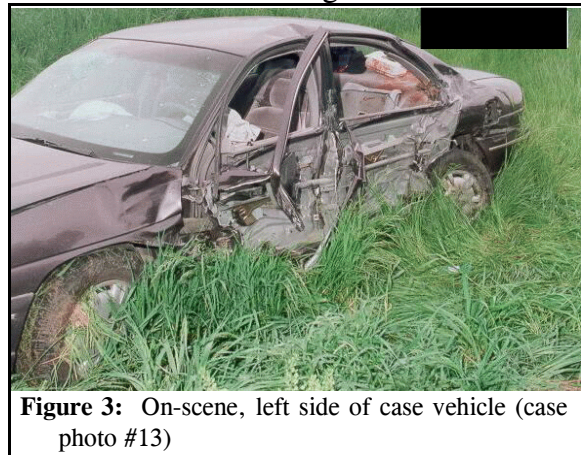
CASE VEHICLE

The case vehicle was a front wheel drive 1995 Chevrolet Lumina, four-door, six-passenger sedan (VIN: 2G1WL52M8S1-----), equipped with a 3.1 liter V6 engine and an automatic transmission with a column-mounted selector lever, and was not equipped with anti-lock brakes. The wheelbase was 273 centimeters [107.5 inches] and the odometer reading is unknown.

The case vehicle's contact with the other vehicle involved the left side, extending from just forward of the left A-pillar rearward to the left rear bumper corner and vertically from the sill to just above the base of the side windows (**Figure 3**). The driver's door exterior window frame was snagged and pulled outward. The left front and rear door exterior body panels were peeled away and there was direct contact on the upper B- and C-pillars, with some remote bucking on the roof near the B-pillar. The left side window glazing was disintegrated (**Figure 4**) and the windshield had stress cracks on the left, but the back window glazing was not damaged. The case vehicle's left rear tire was deflated and restricted. The available photographs do not show the left side interior surface, but the police inspection report indicates intrusions on the left side of 6 centimeters [2.5 inches] for the driver's door, 10 centimeters [4.0 inches] for the left B-pillar and 8 centimeters [3.0 inches] for the left rear door. The case vehicle was towed due to damage.

Based on the available photographs, the CDC for the case vehicle's single impact was estimated as: **12-LDAW-2 (350)**. No reconstruction program was used on this crash because of the swiping-type nature of the impact. This contractor's visual estimate of the delta V is 14-23 km.p.h. [9-14 m.p.h.], indicating a crash of low severity for the case vehicle.

The case vehicle's driver air bag was located in the steering wheel hub, and the front right passenger air bag was located in the top of the right instrument panel. On-scene photographs of both air bags revealed that their cover flaps opened at the designated tear points, and there was



no visible evidence, nor mention by the investigating officer, of damage during the deployment to the air bags or the cover flaps.

The rear left passenger was seated in a forward facing child safety seat (CSS) that was identified as a “Century 3000 STE” convertible seat. The police inspection of the CSS indicates that the CSS was secured with the vehicle’s safety belt system routed through the frame on the back of the CSS. The CSS was equipped with a tray shield that was in the down position, with the harness shoulder straps routed in the topmost slots on the CSS. It is not known if the tray shield’s latch was engaged. The police inspection of the CSS does not mention a tether and there is no tether visible in the photographs.

CASE VEHICLE REAR LEFT PASSENGER

The case vehicle's rear left passenger (3-year-old male, white, non-Hispanic, 84 centimeters, 13.6 kilograms [33 inches, 30 pounds]) was restrained by the tray shield and harness in a forward facing child safety seat (CSS) that was secured by the available, active, three-point, lap-and-shoulder safety belt system. He was declared dead at the scene and transported directly to the county morgue. There was no autopsy.

Immediately prior to the crash the case vehicle's rear left passenger was seated in his forward facing CSS in an upright posture with his back against the seat back of the CSS, his feet hanging down over the front edge of the seat’s cushion, and both arms leaning against the CSS shield. The rear left seat’s track and seat back were not adjustable and the seat back of his CSS was upright. The case vehicle's driver steered to the right, attempting to avoid the crash. As a result of this attempted avoidance maneuver and independent of the use of his available child safety seat harness, the rear left passenger most likely moved slightly to his left just prior to impact. The case vehicle's impact with the other vehicle caused the child to move forward and further leftward, toward the 350 degree direction of force. The other vehicle’s intruding left fender contacted the rear left passenger’s forehead, breaking open his skull and avulsing his entire brain, killing him instantly. His torso was knocked back into the seat back of his CSS. At final rest the child remained restrained in his CSS.

REAR LEFT PASSENGER’S INJURIES

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1.	Skull (calvarium) broken open, entire brain avulsed	113000.6 untreatable	Other vehicle	Certain	Interviewee

CASE VEHICLE DRIVER

The case vehicle's driver (37-year-old male, white, non-Hispanic, 191 centimeters, 107 kilograms [75 inches, 235 pounds]) was restrained by his available, active, three-point, lap and

shoulder belt. He was transported to a hospital, where he was treated for minor injuries and released.

The driver was seated in an upright posture with his back against the seat back, his left foot on the floor, his right foot reaching for the brake, and both hands on the steering wheel. His seat track was located between its middle and rearmost positions, and the tilt steering wheel was located in its middle position. He steered to the right, attempting to avoid the crash. As a result of this attempted avoidance maneuver and independent of the use of his available seat belts, he most likely moved slightly to his left just prior to impact. The case vehicle's impact with the other vehicle caused the driver to move forward and further leftward, toward the 350 degree direction of force. His left shoulder and lower left leg contacted the left interior surface causing contusions, and he was showered with flying glass when the left front window glazing shattered, causing numerous small lacerations on his scalp and face. His torso subsequently rebounded off the door panel to the right. As the case vehicle rotated clockwise his restraint kept him in his seat position. As the case vehicle rotated to final rest he moved back to the left.

DRIVER'S INJURIES

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1.	Contusions, left shoulder	790402.1 minor	Driver's door interior surface	Probable	Interviewee
2.	Contusions, left lower leg	890402.1 minor	Driver's door interior surface	Probable	Interviewee
3.	Lacerations, scalp, NFS	190600.1 minor	Non-contact: flying glass	Probable	Interviewee
4.	Lacerations, face, NFS	290600.1 minor	Non-contact: flying glass	Probable	Interviewee

CASE VEHICLE FRONT CENTER PASSENGER

The case vehicle's front center passenger (7-year-old male, white, non-Hispanic, 135 centimeters, 32 kilograms [53 inches, 70 pounds]) was restrained by his available, active, two-point, lap belt. He was transported to a hospital, where he was treated for minor injuries and released.

The front center passenger was seated in an upright posture with his back against the left portion of the 60/40 split bench seat back and his feet hanging down over the front edge of the seat's cushion, angled downward; the exact position of his hands is unknown. His seat track was located in its between its middle and rearmost positions, and the seat back was upright. The case vehicle's driver steered to the right, attempting to avoid the crash. As a result of this attempted avoidance maneuver and independent of the use of his available seat belts, the center front

passenger most likely moved slightly to his left just prior to impact. The case vehicle's impact with the other vehicle caused him to move forward and slightly leftward, toward the 350 degree direction of force. The left front window glazing shattered and he sustained numerous small lacerations on his scalp and face from flying glass. As the case vehicle rotated clockwise his lap belt kept him in his seat position.

FRONT CENTER PASSENGER'S INJURIES

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1.	Lacerations, scalp, NFS	190600.1 minor	Non-contact: flying glass	Probable	Interviewee
2.	Lacerations, face, NFS	290600.1 minor	Non-contact: flying glass	Probable	Interviewee

CASE VEHICLE FRONT RIGHT PASSENGER

The case vehicle's front right passenger (34-year-old female, white, non-Hispanic, 163 centimeters, 59 kilograms [64 inches, 130 pounds]) was restrained by her available, active, three-point, lap and shoulder belt. She was transported to a hospital, where she was treated for minor injuries and released.

The front right passenger was seated in an upright posture with her back against the right portion of the 60/40 split bench seat back and her feet on the floor; the exact position of her hands is unknown. Her seat track was located between its middle and rearmost positions, and the seat back was upright. The case vehicle's driver steered to the right, attempting to avoid the crash. As a result of this attempted avoidance maneuver and independent of the use of her available seat belts, she most likely moved slightly to her left just prior to impact. The case vehicle's impact with the other vehicle caused her to move forward and slightly leftward, toward the 350 degree direction of force. She was sprayed with flying glass when the left front window glazing shattered, causing lacerations on her scalp and face. As the case vehicle rotated to final rest three-point restraint kept her in her seat position.

FRONT RIGHT PASSENGER'S INJURIES

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1.	Lacerations, scalp, NFS	190600.1 minor	Non-contact: flying glass	Probable	Interviewee
2.	Lacerations, face, NFS	290600.1 minor	Non-contact: flying glass	Probable	Interviewee

The case vehicle's rear center passenger (9-year-old, White (non-Hispanic), 142 centimeters, 32 kilograms [56 inches, 70 pounds]) was restrained by his available, active, two-point, lap belt. He was transported to a hospital, where he was treated for minor injuries and released.

The rear center passenger was seated in an upright posture with his back against the seat back and his feet on the floor hanging down over the front edge of the seat's cushion; the exact position of his hands is unknown. His seat track and seat back were not adjustable. The case vehicle's driver steered to the right, attempting to avoid the crash. As a result of this attempted avoidance maneuver and independent of the use of his available seat belt, he most likely moved slightly to his left just prior to impact. The case vehicle's impact with the other vehicle caused him to move forward and leftward, toward the 350 degree direction of force. He contacted the side of the child safety seat in the rear left seat position with the left side of his face, causing a laceration to his lip and a contusion on his left cheek. The left rear window glazing shattered, spraying him with flying glass and causing lacerations on his scalp and face. As the case vehicle rotated to final rest, his lap belt kept him in his seat position.

REAR CENTER PASSENGER'S INJURIES

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1.	Lacerations, scalp, NFS	190600.1 minor	Non-contact: flying glass	Probable	Interviewee
2.	Lacerations, face, NFS	290600.1 minor	Non-contact: flying glass	Probable	Interviewee
3.	Laceration, lip, NFS	290600.1 minor	Child safety seat	Probable	Interviewee
4.	Contusion, left cheek	290402.1 minor	Child safety seat	Probable	Interviewee

CASE VEHICLE REAR RIGHT PASSENGER

The case vehicle's rear right passenger (11-year-old male, white, non-Hispanic, 145 centimeters, 32 kilograms [57 inches, 70 pounds]) was restrained by his available, active, three-point, lap-and-shoulder safety belt system. He was transported to a hospital, where he was treated for minor injuries and released.

The rear right passenger was seated in an upright posture with his back against the seat back and his feet on the floor; the exact position of his hands is unknown. His seat track and seat back were not adjustable. The case vehicle's driver steered to the right, attempting to avoid the crash. As a result of this attempted avoidance maneuver and independent of the use of his available seat belts, the rear right passenger most likely moved slightly to his left just prior to impact. The case

vehicle's impact with the other vehicle caused him to move forward and slightly leftward, toward the 350 degree direction of force. The rear left window glazing shattered, spraying him with flying glass and causing lacerations on his scalp and face. As the case vehicle went into its clockwise rotation, he moved back to the right, striking the right side interior surface which caused a contusion on his right hip. As the case vehicle rotated to final rest, his three-point restraint kept him in his seat position.

REAR RIGHT PASSENGER’S INJURIES

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1.	Lacerations, scalp, NFS	190600.1 minor	Non-contact: flying glass	Probable	Interviewee
2.	Lacerations, face, NFS	290600.1 minor	Non-contact: flying glass	Probable	Interviewee
3.	Contusion, right hip	890402.1 minor	Right side interior surface	Probable	Interviewee

OTHER VEHICLE

The other vehicle was a four wheel drive 1996 Ford Explorer XLT four-door, five-passenger sports utility vehicle (VIN: 1FMDU34X4TZ-----), equipped with a 4.0 liter V6 engine and an automatic transmission. Anti-lock rear brakes were standard for this model vehicle; four-wheel anti-lock brakes were an option, but it is not known if this vehicle was so equipped. The wheelbase was 283 centimeters [111.5 inches]. The odometer reading is not known.

The Ford’s initial contact with the case vehicle involved the front left bumper corner, the left headlight assembly, the leading edge of the left fender and the left corner of the engine hood, with direct contact extending down the left side to the A-pillar (**Figure 5**), with some direct damage on the lower edge of the driver’s door (**Figure 6**). The front left wheel snagged against the case vehicle’s front left door, tearing off the wheel assembly. The leading edge of left front fender was crushed inward and rotated upward and penetrated the case vehicle’s left rear window. The police photographs show hair and other tissue on the crushed fender (**Figures 7 - 9**). The Ford was equipped with dual front air bags that did not deploy.



Figure 5: Other vehicle's front left damage; Note: left front wheel torn off during impact with case vehicle (case photo #30)

Based on the available photographs, the CDC for the Ford was estimated as **12-FLEE-6 (0)**. No reconstruction program was used on this crash because of the sideswiping nature of the impact. This contractor's visual estimate the delta V is 14-23 km.p.h. [9-14 m.p.h.], indicating a crash of low severity.



Figure 6: Other vehicle's damaged left fender (case photo #34)

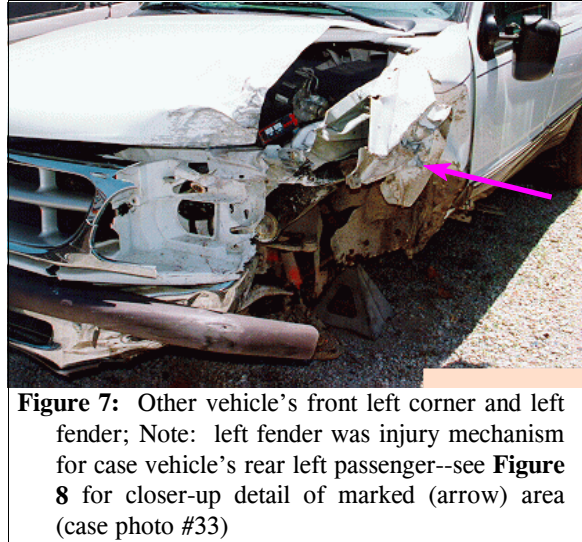


Figure 7: Other vehicle's front left corner and left fender; Note: left fender was injury mechanism for case vehicle's rear left passenger--see **Figure 8** for closer-up detail of marked (arrow) area (case photo #33)

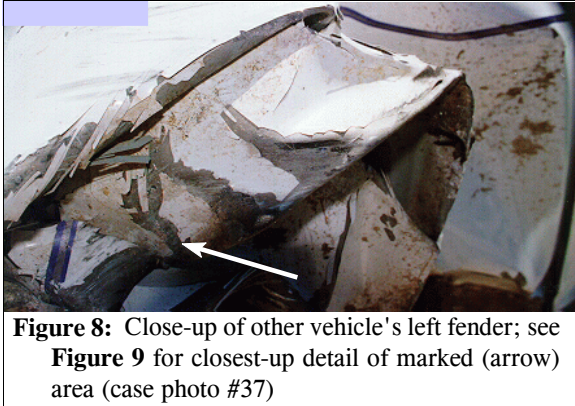


Figure 8: Close-up of other vehicle's left fender; see **Figure 9** for closest-up detail of marked (arrow) area (case photo #37)

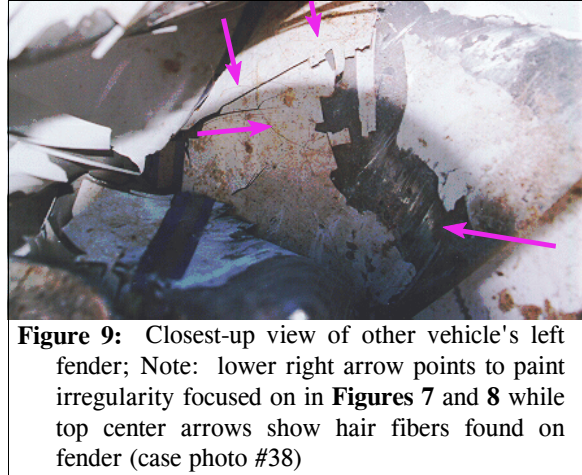


Figure 9: Closest-up view of other vehicle's left fender; Note: lower right arrow points to paint irregularity focused on in **Figures 7** and **8** while top center arrows show hair fibers found on fender (case photo #38)