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## ON-SITE HYBRID VEHICLE INVESTIGATION

CASE NUMBER - IN09010

LOCATION - TEXAS

VEHICLE - 2008 FORD ESCAPE HYBRID

CRASH DATE - February 2009

Submitted:

September 17, 2009



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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. <i>Abstract</i> This report covers an on-site investigation of a crash that involved a 2008 Ford Escape Hybrid and a 2001 Ford Taurus SE. This investigation focused on the crash performance of the Escape's Nickel-Metal Hydride (NiMH) propulsion battery. The Escape's restrained 45-year-old female driver was traveling southeast on a 4-lane city street approaching a 4-leg intersection. The Taurus was traveling southwest also approaching the intersection. The Escape entered the intersection against a red traffic signal and the front plane impacted the right side plane of the Taurus (event 1). The Escape rotated clockwise and rolled over (event 2), right side leading, 6 quarter turns. The Taurus rotated clockwise and its left side plane impacted a traffic signal pole (event 3). The Escape's driver's frontal air bag and rollover inflatable curtain air bags deployed during the crash. The Escape's NiMH propulsion battery was not damaged or displaced during the crash. The driver refused medical attention and was not transported to a medical facility.					
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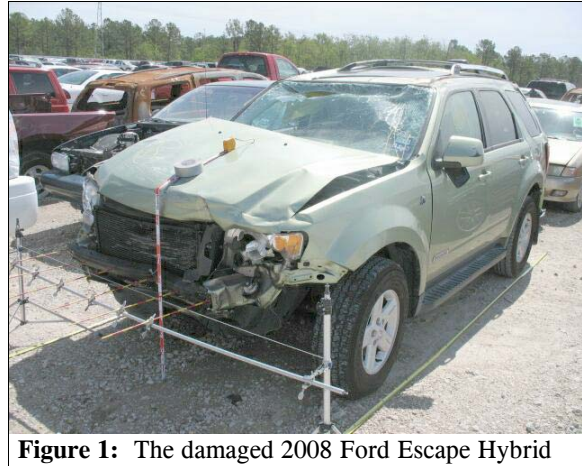
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This on-site investigation focused on the crash performance of a 2008 Ford Escape Hybrid's Nickel-Metal Hydride (NiMH) propulsion battery. This crash was brought to the attention of the National Highway Traffic Safety Administration (NHTSA) on March 18, 2009 during an on-line search of auction yard inventories. The investigation was assigned on March 26, 2009. The crash involved the Escape (**Figure 1**) and a 2001 Ford Taurus SE, which were involved in an intersection crash. The crash occurred in February, 2009 at 2324 hours in Texas and was investigated by the city police department. Both vehicles and the crash scene were inspected on April 1-2, 2009. A partial interview was conducted with the Escape's driver on April 8, 2009. This report is based on the police crash report, crash scene and vehicle inspections, exemplar vehicle inspections, the Ford Escape Hybrid/Mariner Hybrid Emergency Response Guide, occupant kinematic principles, a partial driver interview, and evaluation of the evidence.

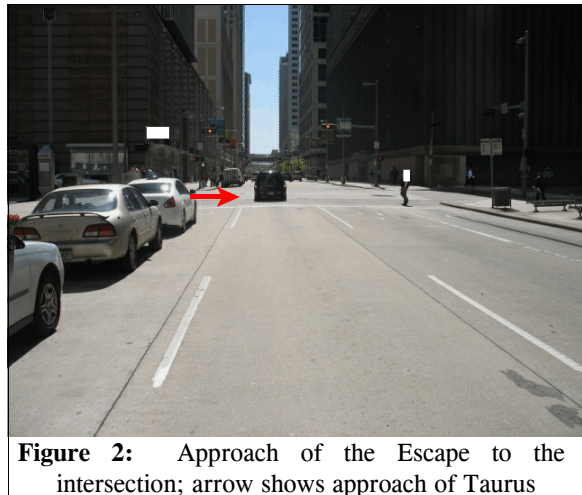


**Figure 1:** The damaged 2008 Ford Escape Hybrid

### CRASH CIRCUMSTANCES

**Crash Environment:** The trafficway on which each vehicle was traveling was a 4-lane, one way city street, and the vehicles were approaching a 4-leg intersection. Each travel lane was approximately 3.4 m (11.1 ft) in width and the roadways were bordered by 10 cm (4 in) high curbs. The roadway pavement markings consisted of broken white lane lines, solid white stop bars at the intersection, and solid white delineated pedestrian crossings. The intersection was controlled by three phase traffic signals, which were on the red phase for the Escape and the green phase for the Taurus. The speed limit for both vehicles was 48 km/h (30 mph). At the time of the crash, the light condition was dark with overhead lighting, the atmospheric condition was clear and the roadway pavement was dry, level concrete. The traffic density was unknown and the site of the crash was urban commercial. See the Crash Diagram on page 11 of this report.

**Pre-Crash:** The restrained 45-year-old female driver of the Escape was traveling southeast in the third through lane from the right (**Figure 2**) and intended to continue southeast through the intersection. The restrained 21-year-old male driver of the Taurus was traveling southwest in the second through lane from the right (**Figure 3**) and intended to continue southwest through the



**Figure 2:** Approach of the Escape to the intersection; arrow shows approach of Taurus

intersection. It is unknown if the driver of the Escape attempted any avoidance maneuvers. The impact occurred within the intersection.

**Crash:** The front of the Escape (**Figure 4**) impacted the right side of the Taurus (**Figure 5**, event 1). The Escape's direction of force was within the 11 o'clock sector and the impact force was sufficient to trigger deployment of the driver's frontal air bag. As a result of the impact, the Escape rotated clockwise. While the vehicle was equipped with Electronic Stability Control (ESC), the post-impact rotation was significant and the vehicle rolled over (event 2), right side leading. The Escape came to final rest on its top plane, headed southeast on the right outside lane southeast of the intersection. The rollover event triggered the deployment of the Escape's rollover inflatable curtain (IC) air bags. The impact caused the Taurus to rotate clockwise and the left side plane impacted a traffic signal pole (event 3) located on the southeast corner of the intersection, 17 m (56 ft) from the area of impact.

**Post-Crash:** The police were notified of the crash at 2327 hours and arrived on scene at 2337 hours. Emergency rescue and medical personnel also responded to the crash scene. The driver was not cooperative during the SCI interview and would only say that she walked away from the crash and refused transport to a medical facility. The driver of the Taurus was transported to a hospital by ambulance. Both vehicles were towed due to damage.

### ROLLOVER DISCUSSION

The NHTSA has given the Escape a three star rollover rating on a five star scale and a Static Stability Factor (SSF) of 1.14<sup>1</sup>. A three star rating indicates that the vehicle has a 20%-30% chance of a rollover when involved in a single vehicle crash. The specific chance of rollover for this vehicle model was given as 22%. The SSF



Figure 3: Approach of the Taurus (in second lane from right) to the intersection; arrow shows approach of Escape



Figure 4: Damage to the Escape's front plane from the impact with the Taurus



Figure 5: Damage to the Taurus' right side plane from the impact with the Escape

<sup>1</sup> [www.safercar.gov](http://www.safercar.gov), 9/15/09

is a calculation based on the vehicle's track width and height of its center of gravity. The result of the calculation is a measure of a vehicle's resistance to rollover. A higher SSF indicates a more stable vehicle. The majority of passenger vehicles have an SSF of 1.30 to 1.50<sup>2</sup>. The test vehicle also did not tip-up during the dynamic steering maneuver test in which the test vehicle was put through a fish-hook shaped steering maneuver (i.e., hard left and hard right steer) at between 56 km/h-80km/h (35-50 mph).

The Escape's initial front plane impact with the Taurus induced a clockwise rotation. The rotation was significant and the vehicle rotated clockwise in excess of 270 degrees prior to rolling over. Based on the damage on the vehicle's top plane and both side planes, and the police crash schematic showing the vehicle on its top plane at final rest, it was estimated that the vehicle rolled over 6 quarter turns. A rollover distance could not be reasonably approximated since there was insufficient evidence at the crash scene to determine the specific location on the roadway where rollover initiation occurred. The vehicle's specific location of final rest was also unknown.

#### **CASE VEHICLE**

**Case Vehicle:** The 2008 Ford Escape Hybrid was a front wheel drive, 4-door, sport utility vehicle (VIN: 1FMCU49H88K-----) equipped with an 2.3L, 4-cylinder gasoline engine with a permanent-magnet AC-synchronous electric motor, a 300 volt sealed NiMH propulsion battery, and a continuously variable automatic transmission. The vehicle was also equipped with 4-wheel anti-lock disc brakes with electronic brake force distribution, traction control, a rollover sensor, and ESC. The front row was equipped with bucket seats, adjustable head restraints, lap-and-shoulder belts, dual stage driver and front right passenger frontal air bags, seat-mounted side impact air bags, and rollover/side impact IC air bags, which provided protection for the front and second rows. The second row was equipped with a split bench seat with folding backs, adjustable head restraints, lap-and-shoulder belts, and Lower Anchors and Tethers for Children (LATCH). The vehicle's mileage at the time of the inspection could not be determined since the vehicle was equipped with an electronic odometer and was without power. The vehicle's specified wheelbase was 262 cm (103.1 in).

#### **CASE VEHICLE DAMAGE**

**Exterior Damage:** The impact with the Taurus involved the Escape's front plane. The bumper, bumper fascia, grille, hood, both fenders, and both headlamp/turn signal assemblies were directly damaged. The direct damage began at the front left bumper corner and extended across the full width of the front plane. The front bumper fascia was not present at the vehicle inspection and the direct damage width of 112 cm (44.1 in) was measured on the bumper bar. The crush measurements were taken on the bumper bar and the residual maximum crush was 24 cm (9.5 in) occurring at C<sub>3</sub> (**Figure 6**). The induced damage involved the hood and both fenders. The table below shows the vehicle's front crush profile.

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<sup>2</sup> "Trends in the Static Stability Factor of Passenger Cars, Light Trucks, and Vans", NHTSA Technical Report, DOT HS 809 868, June 2005

Units	Event	Direct Damage		Field L	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	C <sub>4</sub>	C <sub>5</sub>	C <sub>6</sub>	Direct	Field L
		Width CDC	Max Crush								±D	±D
cm	1	112	24	112	13	18	24	18	15	10	0	0
in		44.1	9.4	44.1	0.0	7.1	9.4	7.1	5.9	3.9	0.0	0.0

The damage from the rollover involved the Escape’s top, left, and right side planes. The direct damage on the left side plane began 92 cm (36.2 in) rear of the left front axle and extended 230 cm (90.5 in) rearward along the left side, mostly at the roof side rail and upper pillars. The maximum lateral crush was 6 cm (2.4 in) and occurred at the top of the left D-pillar (**Figure 7**).

The Escape’s direct damage on the right side plane also began 92 cm (36.2 in) rear of the right front axle and extended 285 cm (112 in) rearward along the right side. There was no lateral crush to the roof structure on the right side plane.

The Escape’s direct damage on the top plane began at the front of the hood and extended the entire length of the vehicle and the full width of the roof, 106 cm (41.7 in). The maximum vertical crush occurred on the roof (**Figure 8**) and was 6 cm (2.4 in). It was located 15 cm (5.9 in) inboard of the right A-pillar and 188 cm (46.5 in) rear of the right front axle. The induced damage from the rollover involved the roof and the rear hatch.

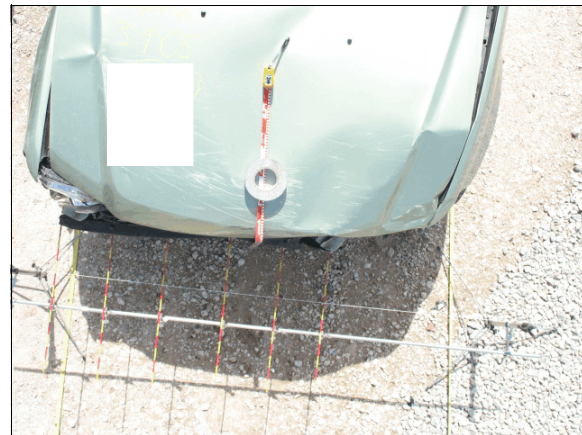


Figure 6: Top view of Escape’s front crush profile

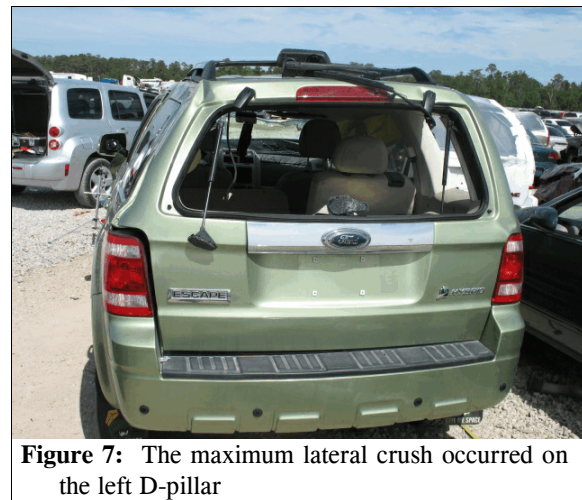


Figure 7: The maximum lateral crush occurred on the left D-pillar

**Damage Classification:** The Collision Deformation Classification (CDC) for the Escape’s front plane damage was: **71-FDEW-2 (320 degrees)**. The force direction was incremented by 60 to account for the rightward shift of the Escape’s basic end structure (**Figure 4**), which exceeded the 10 cm (4 in) threshold. The CDC for the rollover was **00-TDDO-2**. The Damage algorithm of the WinSMASH program calculated the Escape’s Delta V for the front impact as 23 km/h (14.3 mph). The longitudinal and lateral velocity changes were -17.6 km/h (-10.9.0 mph) and 14.8 km/h (9.2 mph), respectively. The results appeared reasonable based on the damage on both vehicles. The severity of the rollover damage was minor based on the extent of the roof crush.

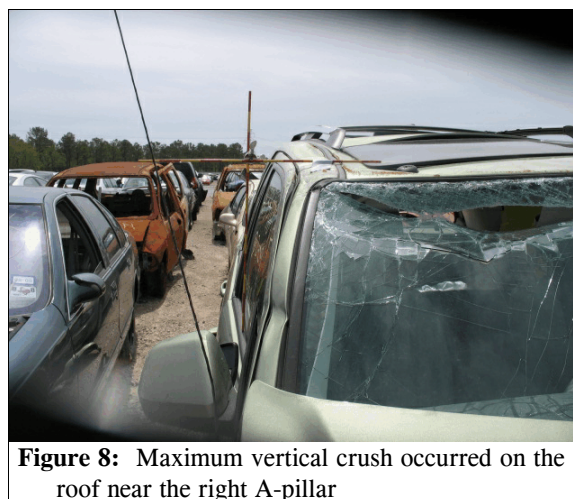


The vehicle manufacturer’s recommended tire size was P235/70R16 and the vehicle was equipped with tires of this size. The Escape’s tire data are shown in the table below.

Tire	Measured Pressure		Vehicle Manufacturer’s Recommended Cold Tire Pressure		Tread Depth		Damage	Restricted	Deflated
	kPa	psi	kPa	psi	milli-meters	32 <sup>nd</sup> of an inch			
LF	186	27	241	35	9	11	None	No	No
LR	269	39	241	35	8	10	None	No	No
RR	269	39	241	35	8	10	None	No	No
RF	262	38	241	35	8	10	None	No	No

**Vehicle Interior:** The inspection of the Escape’s interior revealed no discernable evidence of occupant contact. There was no steering rim deformation or compression of the energy absorbing steering column.

All the vehicle’s doors and the rear hatch remained closed and operational. The pre-crash status of all the glazings was either closed or fixed. The windshield was in place and cracked due to impact forces. At the time of the inspection, the windshield glazing was split open near the header (**Figure 8**), but this was probably due to weathering. The second right rear window glazing and the backlight glazing were disintegrated due to impact forces.



**Figure 8:** Maximum vertical crush occurred on the roof near the right A-pillar

The roof, windshield header, and right A-pillar intruded vertically 3 cm (1.2 in), 2 cm (1.2 in), and 1 cm (0.4 in), respectively into the front passenger occupant space. The roof intruded 1 cm into the driver’s occupant space.

**CONFORMANCE WITH FMVSS 305, SECTION 571, ELECTRIC POWERED VEHICLES**

The Escape’s propulsion battery was located in the back cargo area under the carpet. The battery pack consisted of 50 battery modules, each comprised of five, 1.3 volt NiMH batteries sealed in a water resistant stainless steel case. The battery cells contained a base electrolyte consisting of potassium hydroxide as the dominant active ingredient, which is absorbed in a special paper. The electrolyte will not leak from the battery under most conditions; however, if the

battery is crushed, it is possible for a small amount of electrolyte to leak<sup>3</sup>. Inspection of the propulsion battery revealed no evidence of movement and no damage. The battery was equipped with a high voltage service disconnect switch (Figure 9), which was located on the top right of the battery. At inspection, the switch was in the “Lock” position. It could be turned to the “Unlock” position but not to the “Service/Shipping” position. Since the switch could not be removed, no attempt to take a voltage measurement was made. The high voltage wiring connector was located on the front right of the battery (Figure 10). It was undamaged and exhibited no evidence of displacement within the socket. Examination of the DC/DC converter and the high voltage wiring and connectors that were in the engine compartment (Figure 11, exemplar) could not be made because the hood was jammed shut. The vehicle was equipped with an inertia activated high voltage shut off switch, which was located in the jack storage compartment within the passenger side cargo area (Figure 12). The switch button was pushed in an attempt to determine if the switch had opened during the crash, but it did not click or feel like it reset. While it is probable that the switch opened during the crash and disabled the high voltage system, this simple test was indeterminate. See the attachments<sup>3</sup> at the end of this report, which show the location and identification of the Escape’s hybrid components.

#### AUTOMATIC RESTRAINT SYSTEM

The Escape was equipped with a frontal air bag system that was certified by the manufacturer to be compliant to the Advanced Air Bag portion of the Federal Motor Vehicle Safety Standard (FMVSS) No. 208. The front impact sensor was located on the center radiator support. The driver’s frontal air bag deployed in this crash.



Figure 9: The high voltage service disconnect switch; switch in the locked position at inspection

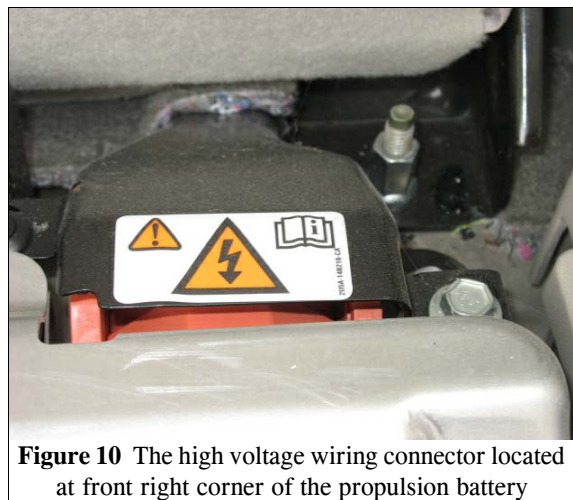


Figure 10 The high voltage wiring connector located at front right corner of the propulsion battery

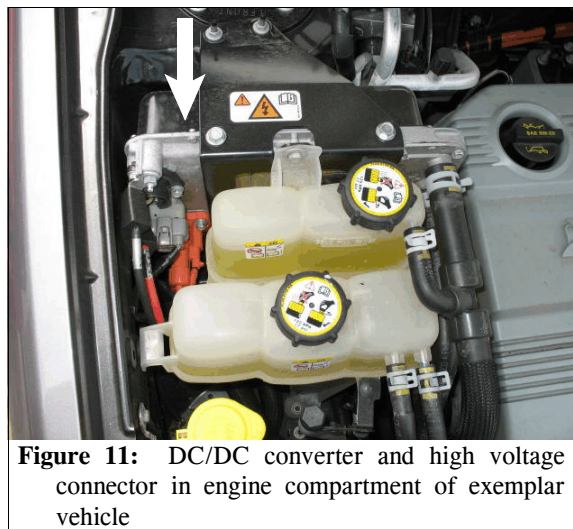


Figure 11: DC/DC converter and high voltage connector in engine compartment of exemplar vehicle

<sup>3</sup> Source: Escape Hybrid/Mariner Hybrid Emergency Response Guide

The Escape was also equipped with seat-mounted side impact air bags and rollover/side impact IC air bags. Based on the Holmatro Rescuer's Guide to Vehicle Safety Systems, the vehicle's side impact sensors were located in the left and right lower B-pillars and mid C-pillars. The vehicle's rollover IC air bags deployed in this crash. The remaining side air bags did not deploy.

The driver's frontal air bag was located within the steering wheel hub and the module cover was a two flap configuration constructed of pliable vinyl. Each cover flap was 12 cm (4.7 in) in height and 6.5 cm (2.6 in) in width. The cover flaps opened at the designated tear seams and were not damaged. The deployed air bag (**Figure 13**) was round with a diameter of 58 cm (22.8 in) and was designed with two tethers and two vent ports. There was no discernable evidence of occupant contact on the air bag and no damage.

The Escape's IC air bags were located along the roof side rails inside the headliner (**Figure 14**) and extended from the A-pillar to the C-pillar. They were designed with inflation chambers adjacent to each outboard seat position and did not have external vent ports. The IC air bags were 146 cm (57.4 in) in length and 44 cm (17.3 in) in height. Each IC was anchored to the A-pillar by a cloth cord 38 cm (15 in) in length and to the C-pillar by a cloth cord 5 cm (2 inches) in length. There was a 30 cm (11.8 inches) wide gap between the bottom leading edge of each IC air bag and the A-pillar. The distance from the beltline to the bottom of the IC air bags was 14 cm (5.5 in). The inspection of the IC air bags revealed no discernable evidence of occupant contact and there was no damage.



**Figure 12:** Inertia activated high voltage shut off switch in rear right side of Escape



**Figure 13:** The driver's frontal air bag



**Figure 14:** Forward portion of left side curtain air bag

## MANUAL RESTRAINT SYSTEM

The Escape was equipped with lap-and-shoulder seat belts in the front and second row seating positions. The driver's seat belt consisted of continuous loop belt webbing, an Emergency Locking Retractor (ELR), a sliding latch plate, and an adjustable upper anchor that was adjusted

to the full-down position. The front passenger seat belt was similarly equipped but had an ELR/Automatic Locking Retractor. Both seat belts were equipped with retractor-mounted and buckle-mounted pretensioners. The second row seat belts were similarly equipped as the front passenger, but had fixed upper anchors and the center seat belt was integrated within the seat.

Inspection of the driver's seat belt assembly revealed abrasions on the belt webbing associated with the D-ring and plastic transfer on the belt webbing. The transfer was located 113 cm (44.5 inches) above the stop button. There were heavy historical usage scratches on the latch plate. The driver's retractor was also jammed and would not retract indicating that the pretensioner actuated during the crash consistent with the deployment of the driver's frontal air bag. The buckle-mounted pretensioner also actuated and the buckle stalk's length was reduced 1 cm (0.4 in). This evidence indicated that the driver was restrained by the lap-and-shoulder belt. The remaining seat positions were unoccupied.

#### **CASE VEHICLE DRIVER KINEMATICS**

The Escape's driver (45-year-old, female; unknown height and weight) was seated in an unknown posture. At the time of the vehicle inspection, the driver's seat track was located between the middle and rear-most positions and the seat back was slightly reclined. The tilt steering column was located in the center position.

The Escape's frontal impact with the Taurus displaced the driver forward and to the left opposite the 11 o'clock direction of force and she loaded the seat belt. While there was no discernable occupant contact evidence on the deployed frontal air bag, the driver's face and chest probably loaded the air bag. As the vehicle rolled over the driver was redirected toward the roof within the seat belt. Although there was no discernable occupant contact evidence on the left IC, the driver's head and left shoulder probably loaded the IC during the roll over.

#### **CASE VEHICLE DRIVER INJURIES**

The Escape's driver sustained police reported C-injuries. She refused transport to a medical facility at the crash scene. It is not known if she was injured or sought medical treatment following the crash.

#### **OTHER VEHICLE**

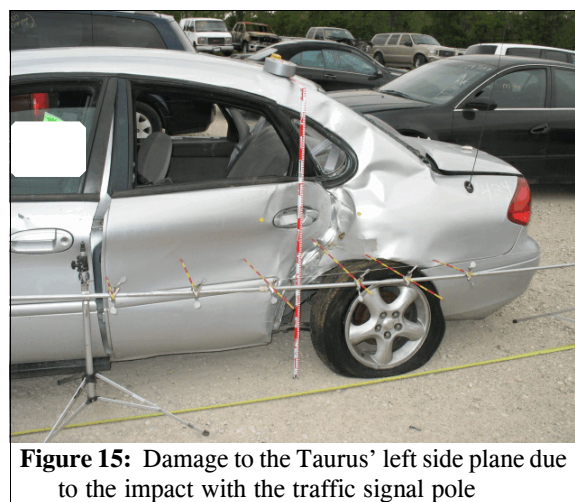
The 2001 Ford Taurus SE was a front wheel drive, 4-door sedan (VIN: 1FAFP53U81G----) equipped with a 6-cylinder, 3.0-liter engine and redesigned frontal air bags.

**Exterior Damage:** The impact with the Escape involved the Taurus' right side plane (**Figure 5**). The right front and rear doors, B-pillar, quarter panel, rear wheel, and C-pillar were all directly damaged. The direct damage began 137 cm (53.9 in) rear of the right front axle and extended 172 cm (67.7 in) rearward along the right side. The crush measurements were taken at the mid-door level and the residual maximum crush was 34 cm (13.4 in) occurring at C<sub>5</sub>. The induced damage

involved the left front door, quarter panel, and trunk lid. The right side wheelbase was extended 1 cm (0.4 in). The table below shows the vehicle’s right side crush profile.

Units	Event	Direct Damage		Field L	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	C <sub>4</sub>	C <sub>5</sub>	C <sub>6</sub>	Direct	Field L
		Width CDC	Max Crush								±D	±D
cm	1	172	34	243	0	9	18	33	34	0	-84	-104
in		67.7	13.4	95.7	0.0	3.5	7.1	13.0	13.4	0.0	-33.1	-40.9

The Taurus’ impact with the traffic signal pole (event 3) involved the left side of the vehicle. The left rear door, left C-pillar, roof side rail, and quarter panel were all directly damaged (**Figure 15**). The direct damage began 228 cm (90 in) rear of the left front axle and extended 48 cm (19 in) rearward along the left rear door and quarter panel. The crush measurements were taken at the mid-door level and the residual maximum crush was 28 cm (11 in) at C<sub>3</sub>. There was induced damage on both left side doors, the left quarter panel, roof side rail, and C-pillar. The vehicle’s left side wheel base was extended 10 cm (3.9 in). The table below shows the Taurus’ left side crush profile.



**Figure 15:** Damage to the Taurus’ left side plane due to the impact with the traffic signal pole

Units	Event	Direct Damage		Field L	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	C <sub>4</sub>	C <sub>5</sub>	C <sub>6</sub>	Direct	Field L
		Width CDC	Max Crush								±D	±D
cm	3	48	28	142	6	16	28	16	8	0	-113	-94
in		18.9	11.0	55.9	2.4	6.3	11.0	6.3	3.2	0.0	-44.5	-37.0

**Damage Classification:** The CDC for the Taurus’ right side plane impact with the Escape’s front plane was: **02-RZAW-3 (50 degrees)**. The CDC for left side plane impact with the traffic signal police was **09-LZAW-3 (280 degrees)**. The Damage algorithm of the WinSMASH program calculated the Taurus’ Delta V for the right side impact as 24 km/h (14.9 mph). The longitudinal and lateral velocity changes were -15.4 km/h (-9.6 mph) and -18.4 km/h (-11.4 mph), respectively. Based on the damage on both vehicles, the results appeared reasonable. The Barrier algorithm of the WinSMASH program calculated the Taurus’ Delta V for the left side impact as 15 km/h (9.3 mph). The longitudinal and lateral velocity changes were -2.6 km/h (-1.6 mph) and 14.8 km/h (9.2 mph), respectively. Based on the extent of the damage the results appeared reasonable.

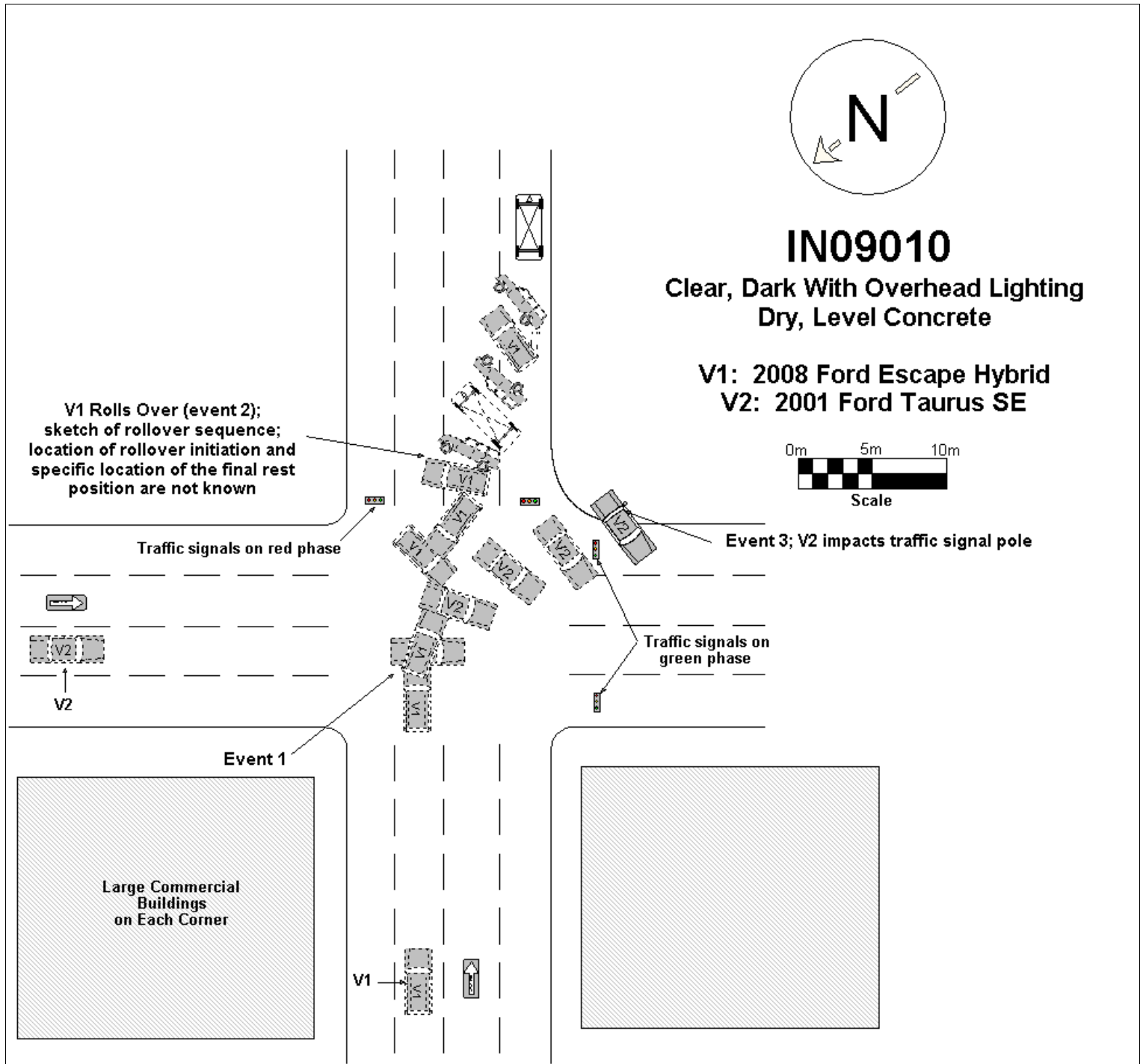
**Other Vehicle (Continued)**

IN09010

The vehicle manufacturer's recommended tire size was P215/60R16. The vehicle was equipped with the recommended size tires on the rear wheels and P225/60R16 size tires on the front wheels. The Taurus' 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	32 <sup>nd</sup> of an inch			
LF	262	38	228	33	2	3	None	No	No
LR	Flat	Flat	228	33	4	5	None	Yes	Yes
RR	Flat	Flat	228	33	5	6	None	Yes	Yes
RF	221	32	228	33	3	4	None	No	No

**Other Vehicle's Driver:** According to the police crash report, the Taurus's driver (21-year-old, male) was restrained by the lap-and-shoulder seat belt. He sustained police reported C-injuries and was transported by ambulance to a medical facility.



## **HYBRID COMPONENT LOCATION AND IDENTIFICATION**

This chart provides the location, description and basic function of the Hybrid system components. Refer to the Hybrid Component Location illustration on the following page.

	<b>COMPONENT</b>	<b>LOCATION / DESCRIPTION</b>	<b>FUNCTION</b>
1	High-Voltage Shut-Off Switch	<ul style="list-style-type: none"> <li>• Located in the jack stowage compartment, passenger side in the cargo area.</li> </ul>	Disconnects high-voltage battery in the event of a collision.
2	High-Voltage Service Disconnect Switch	<ul style="list-style-type: none"> <li>• Located on top of the high-voltage battery, passenger side in the cargo area under carpet.</li> <li>• Orange in color with molded plastic handle, about 100 mm (4 inch) in diameter.</li> </ul>	Provides means to disconnect high-voltage battery for safely servicing vehicle.
3	High-Voltage Battery — 300+ Volts	<ul style="list-style-type: none"> <li>• Located in the cargo area under carpet.</li> <li>• Sealed nickel-metal hydride.</li> </ul>	Provides high-voltage storage (300+ V) for vehicle propulsion requirements.
4	High-Voltage Wiring	<ul style="list-style-type: none"> <li>• Runs along underside of vehicles cab floor from high-voltage battery to electronically controlled continuously variable transaxle (eCVT) then to DC-to-DC converter.</li> <li>• All high-voltage wiring has orange-colored insulation.</li> </ul>	Provides physical path for high-voltage circuitry.
5	12-Volt Battery	<ul style="list-style-type: none"> <li>• Located under the hood on driver side of the vehicle.</li> <li>• Typical automotive 6-cell lead/acid design.</li> </ul>	Provides 12-volt power for vehicle accessories.
6	Electronically Controlled Continuously Variable Transaxle (eCVT)	<ul style="list-style-type: none"> <li>• Transverse-mounted design similar to the non-Hybrid Escape/Mariner vehicles.</li> <li>• Contains the traction motor, generator motor and Hybrid electronics.</li> </ul>	Provides delivery of power to wheels for vehicle propulsion, generates electricity to recharge the batteries during braking and coasting, and contains certain Hybrid electronics.
7	DC/DC Converter	<ul style="list-style-type: none"> <li>• Located under the hood on the passenger side forward of the strut tower.</li> </ul>	Provides 12 volts of power to charge the 12-volt battery and run vehicle accessories.
8	Fuel Shut-Off Inertia Switch	<ul style="list-style-type: none"> <li>• Located behind the flip-up panel in the passenger front foot well.</li> </ul>	Disables power supply to the gasoline fuel pump and the HV shut-off switch in the event of a collision.

**NOTE:** All high-voltage wires and harnesses are wrapped in orange-colored insulation.



## Hybrid Component Location

