

CRASH DATA RESEARCH CENTER
Calspan Corporation
Buffalo, NY 14225

**CALSPAN ON-SITE POTENTIAL SAFETY-RELATED
DEFECT CRASH INVESTIGATION**

SCI CASE: CA06-019

**VEHICLE: 1997 FORD EXPLORER
LOCATION: GEORGIA
CRASH DATE: MAY 2005**

Contract No. DTNH22-01-C-17002

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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 are 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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<p>16. <i>Abstract</i> This on-site investigation focused on an alleged safety-related defect that involved the tread separation of the left rear tire on a 1997 Ford Explorer sport utility vehicle. The Ford Explorer was eastbound on the inboard lane of a two-lane divided interstate highway at highway speed. The Ford was driven by a 19 year old unrestrained male and was occupied by a 19 year unrestrained female in the front right position, and two unrestrained males in the rear seat. As the driver was proceeding on the roadway, the left rear passenger reported that he heard a loud explosion from the left rear area of the vehicle. The driver steered the Ford Explorer toward the right shoulder and as he crossed the rumble strips, he over-steered the vehicle to the left to regain the travel lane. The Explorer subsequently tripped and initiated a right side leading rollover event. The driver and the three unrestrained passengers were ejected during the 12 quarter turn rollover sequence. The driver expired two days following the crash and the female front right passenger was pronounced deceased at the scene. The two males occupants seated in the rear of the vehicle survived the crash. The crash occurred during the daylight hours of May, 2005 in the state of Georgia. The weather was clear and not a crash factor.</p>			
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BACKGROUND

This on-site investigation focused on an alleged safety-related defect that involved the tread separation of the left rear tire on a 1997 Ford Explorer sport utility vehicle, **Figure 1**. The Ford Explorer was eastbound on the inboard lane of a two-lane divided interstate highway at highway speed. The Ford was driven by a 19 year old unrestrained male and was occupied by a 19 year unrestrained female in the front right position, and two unrestrained males in the rear seat. As the driver was proceeding on the roadway, the left rear passenger reported that he heard a loud explosion from the left rear area of the vehicle. The driver steered the Ford Explorer toward the right shoulder and as he crossed the rumble strips, he over-steered the vehicle to the left to regain the travel lane. The Explorer subsequently tripped and initiated a right side leading rollover event. The driver and the three unrestrained passengers were ejected during the 12 quarter turn rollover sequence. The driver expired two days following the crash and the female front right passenger was pronounced deceased at the scene. The two males occupants seated in the rear of the vehicle survived the crash. The crash occurred during the daylight hours of May, 2005 in the state of Georgia. The weather was clear and not a crash factor.



Figure 1: 1997 Ford Explorer

The mother of the deceased female passenger reported the crash to National Highway Traffic Safety Administration's Office of Defects Investigation (ODI) via the Auto Safety Hotline on August 2, 2006. NHTSA's ODI asked the Crash Investigation Division to assign an investigation of the crash to the Special Crash Investigations team at Calspan due to the agency's interest in potential safety related defects. The Vehicle's Owner's Questionnaire was forwarded to the Calspan SCI team on August 4, 2006. Telephone contact was initiated and cooperation was established with the mother of the deceased passenger. The mother hired an attorney who purchased the Ford Explorer from the insurance company and transported the Ford Explorer to Houston, TX, the location of his firm. The SCI investigation involved the inspection and documentation of the damage and undercarriage components of the Ford Explorer and a detailed examination/documentation of the tire and separated tread. Due to the location of the vehicle and the passage of time between the crash and case assignment, the crash site was not inspected. The vehicle and tire were inspected on August 28, 2006.

VEHICLE DATA

1997 Ford Explorer XLT 4 x 2

VIN: 1FMDU32E7VU (production sequence deleted)

- Mileage: 260,470 km (161,853 miles)
- Left Rear Tire Failure
- Tripped Right Side Leading Roll: 12 Quarter-turns
- Maximum lateral and vertical crush located on the left roof rail within the D-pillar area
 - Max Lateral Displacement: 11 cm (4.3 in)
 - Max Vertical Crush: 11cm (4.2 in)
- Damage to left rear wheelhouse from detread tire slap
- Undercarriage: Good condition, all bushings and links tight, no leaking seals, no broken springs, brake lines intact, all parts appeared to be OEM.



Figure 2: Left front oblique.



Figure 3: Left rear oblique.



Figure 4: Right rear oblique



Figure 5: Right front oblique.

OCCUPANT DATA

Driver: 19 year old unrestrained male Ejection path: LF window Fatal injuries	Front Right: 19 year old unrestrained female Ejection path: RF window Fatal injuries
Left Rear: 19 year old unrestrained male Ejection path: L2 window Non-life threatening injuries	Right Rear: 19 year old unrestrained male Ejection path: R2 window Disabling injuries requiring rehabilitation

TIRE DATA

Position:	Left Front Tire	Right Front Tire
Manufacturer / Model:	Winston Winner GT	Winston Winner GT
Tire Size:	P255/70R15 108S M+S	P255/70R15 108S M+S
DOT Number:	PJM2 T2LR 3404	PJM2 T2LR 3404
Tread Depth (mm/in): (Outboard to Inboard)	6 mm 5 mm 5 mm 2 mm (8/32" 7/32" 7/32" 3/32")	7 mm 6 mm 6 mm 5 mm (9/32" 8/32" 8/32" 7/32")
Construction: Tread: Sidewall:	2 ply steel and 2 ply polyester 2 ply polyester	2 ply steel and 2 ply polyester 2 ply polyester
Notes:	Two rips in outer sidewall of tire, 80% of rim circumference abraded by road contact, concrete embedded in rim	Wheel fractured at hub, 100% of rim abraded – very heavy more 30% with asphalt build-up

Position:	Left Rear Tire	Right Rear Tire
Manufacturer / Model:	Futura Super Sport GLS	Firestone Wilderness AT
Tire Size:	P255/70R15 M+S	P235/70R15 105S M+S
DOT Number:	3DM2 XBH 4901	W2HL IVY? 406
Tread Depth (mm/in):: (Outboard to Inboard)	2 mm 1 mm 1mm 2 mm (3/32" 1/32" 1/32" 3/32")	10 mm 10 mm 11 mm 10 mm (12/32" 12/32" 13/32" 12/32")
Construction: Tread: Sidewall:	2 ply steel and 2 ply polyester 2 ply polyester	2 ply steel and 2 ply polyester 2 ply polyester
Notes:	See below for detailed tire information, Rim abraded over 25% of circumference with asphalt deposits	Tire debeaded, Outer edge of rim deformed 10 to 2 o'clock sector

Left Rear Tire

The general condition of the tire, **Figures 6 and 7**, was considered to be worn. The sidewalls of the tire were dry rotted at the shoulder around the entire circumference. The tread was thoroughly worn as noted above (center tread 1/32 in). The tread and casing had been punctured twice and repaired by fiber plugs. The two plugs (identified by P1 and P2) were located 46 cm

(18.25 in) apart. Plug P1 was located between the 5 and 6 o'clock sectors, **Figure 8**. Plug P2 was located at 8 o'clock. The remains of a screw [approximately 16 mm (5/8 in) in length] were present in the tread. The screw (located at 5 o'clock) became embedded at an angle and the head of the screw was worn away. Refer to **Figure 9**. Inspection of the tread in this area indicated the screw penetrated the first steel ply and abraded the second steel ply but did not puncture through. A failure line was noted emanating from the screw's location along the ply diagonally to the shoulder, **Figures 9 and 10**. The tire sustained a 100 percent circumferential separation of the tread from the tire casing, **Figures 11-13**. The separation occurred between the 2 steel plies and along both shoulders. The separated tread measured 226 cm (89 in) in total length. The age and multiple punctures and repairs to the tire were probable contributing factors in the tread separation.

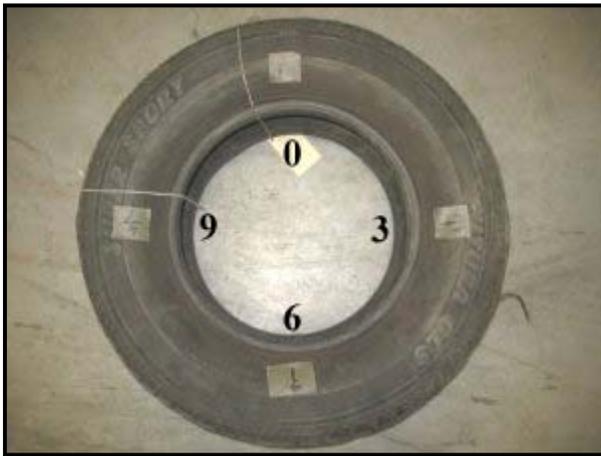


Figure 6: DOT side of tire (inboard).



Figure 7: Non-DOT side (outboard).



Figure 8: Plug P1 and screw S at 5 to 6 o'clock Non DOT side shown.



Figure 9: Plug P1 and screws. Note, the diagonal line emanating from S.



Figure 10: Close-up view of the detread at S.



Figure 11: Tire tread exterior surface.



Figure 12: Tread interior surface.



Figure 13: Close-up of interior surface at S.