Insurance Institute for Highway Safety
Crashworthiness Evaluation

Crash Test Report
2005 Ford Taurus (CF09009A)

Vehicle identification number: 1FAFP53U85A117186
Body style: Large 4-door sedan
Engine/transmission: Transverse 3.0-liter V6, 4-speed automatic, front-wheel drive

Standard crashworthiness features:

Frontal airbags, dual-stage depending on crash severity, belt use, and driver seat position
Frontal airbags also have separate deployment thresholds for belted and unbelted occupants
Dual-locking shoulder belts (front outboard and all rear seating positions)
Shoulder belt height adjusters (front outboard seating positions only)
Seat belt crash tensioners in buckle (front outboard seating positions only)
Seat belt force-limiting mechanisms (front outboard seating positions only)
Lap/shoulder belt, center rear seating position
Shoulder belt retractors (right front and all rear) are convertible from emergency to automatic locking
LATCH system for child restraints (outboard rear seating positions)

Optional safety features (test vehicle not equipped):

Seat-mounted combination head and thorax side airbags (front seating positions)
Adjustable brake and accelerator pedals
Antilock brakes, 4-wheel
Daytime running lights

Vehicle specifications (provided by manufacturer):

Wheelbase:	276 cm
Overall length:	502 cm
Overall width:	185 cm
Curb weight:	1,500 kg

Vehicle specifications (measured):

Curb weight:	1,452 kg
Test weight:	1,528 kg (62% front, 38% rear)
Overall width:	185 cm

Nominal test parameters:

56.3 km/h and 28% overlap into 2001 Ford Taurus

Dummy Seating Protocol:

IIHS Guidelines for Using the UMTRI ATD Positioning Procedure for ATD and Seat Positioning (Version V)

Crash test date: June 23, 2009

Figure 1
Precrash and Postcrash Side Views — 2005 Ford Taurus

Summary

A 2005 Ford Taurus was crashed into a 2001 Ford Taurus in a collinear frontal offset configuration on June 23, 2009. The 2005 Ford Taurus was traveling at 55.9 km/h and the 2001 Ford Taurus was traveling at 56.1 km/h with a 28 percent overlap on the driver side for both vehicles. A Hybrid III 50th percentile male dummy was positioned in the driver seat with the lap/shoulder belt fastened. Figure 2 shows the dummy's postcrash overall position in the vehicle.

The pretest setup followed the IIHS Crashworthiness Evaluation Offset Barrier Crash Test Protocol (version XIII); however, the collinear car-to-car crash configuration for this test required some deviations from the protocol, which include:

- Removal of the fuel tank (resulting in a somewhat reduced test weight);
- A targeted 28 percent overlap with its crash partner (Figure 3); and
- The test was conducted at a nominal speed of 56.3 km/h.

Measures of intrusion taken after the crash indicated the lower instrument panel in front of the dummy moved rearward 4-6 cm. Resultant intrusion in the driver footwell measured 11 cm at the footrest and 10-12 cm at other places on the toepan (Table 1). All doors remained closed during the crash. The driver door aperture shortened 4 cm, as measured at the lower edge of the window. After the crash, the driver door required tools to open; all other doors opened with ease.

The driver dummy was restrained by a three-point lap/shoulder belt and an airbag. During the crash, the dummy's head loaded the fully inflated airbag. During rebound, the rear of the head contacted the driver head restraint. After the crash, the upper end of the steering column had moved upward 7 cm and rearward 6 cm. Table 2 summarizes the timing of airbag deployment and dummy kinematic events.

Tables 3-6 contain summaries of the peak dummy injury measures.

None of the recorded injury measures exceeded threshold values.

Figure 2
Dummy and Vehicle Interior, Postcrash — 2005 Ford Taurus

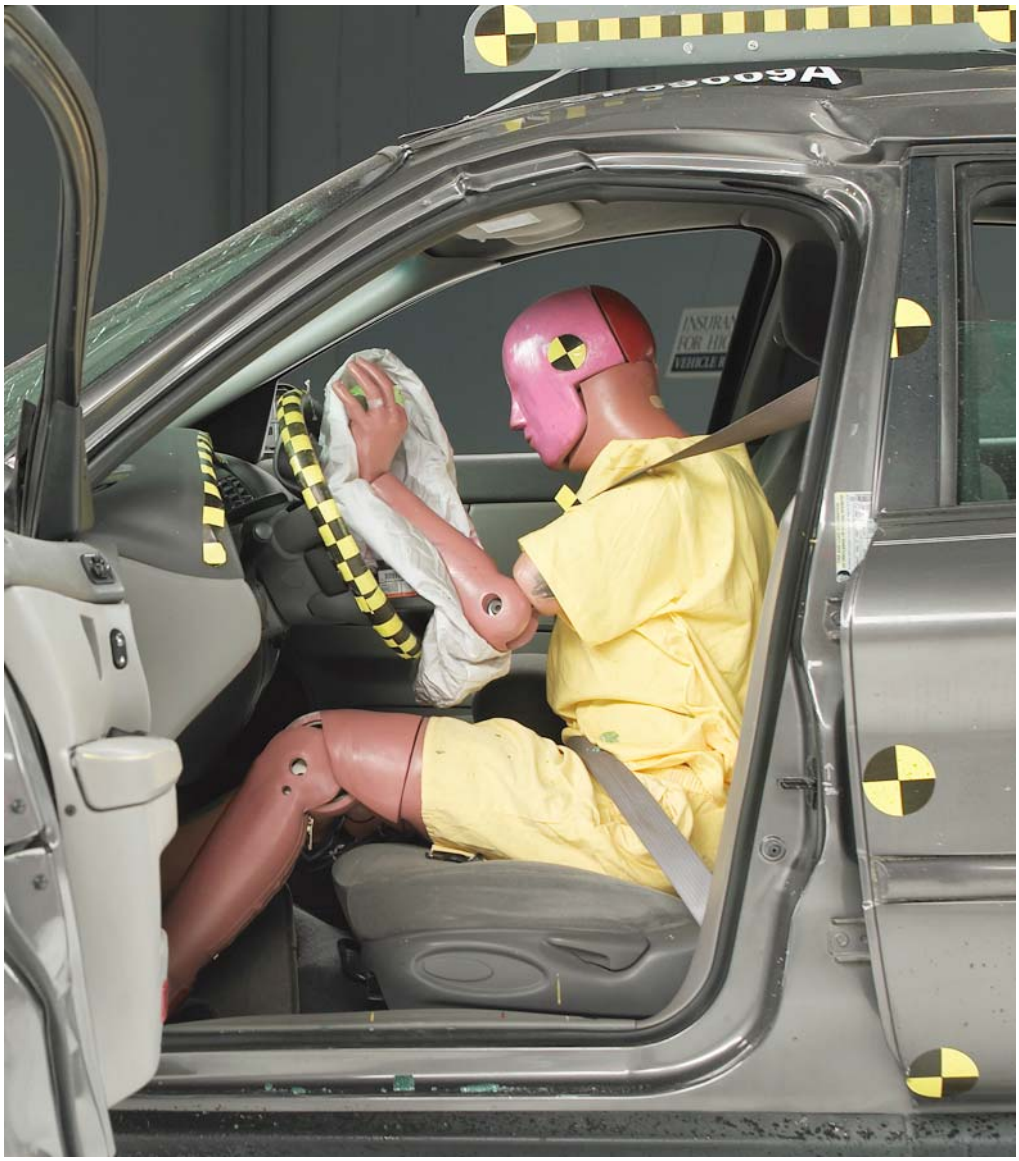

Figure 3
Video Frame Capture, Precrash —
2005 Ford Taurus (left) and 2001 Ford Taurus (right)

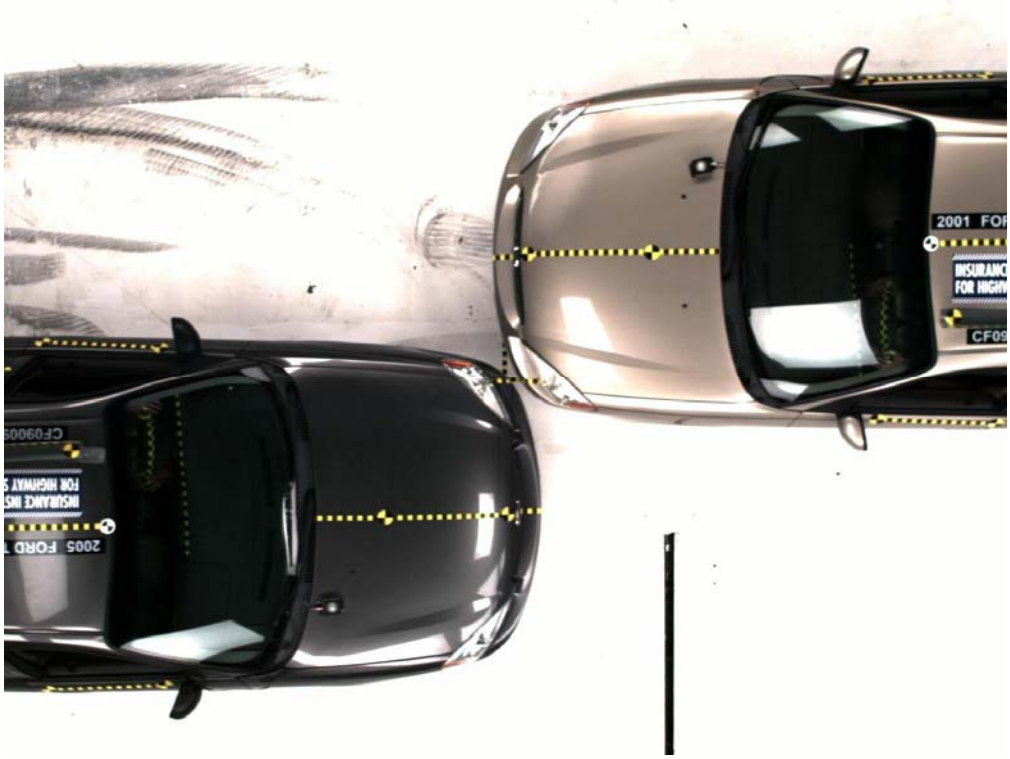

Table 1
Residual Measurements of Intrusion Relative to Driver Seat — 2005 Ford Taurus

Selected Locations*	Longitudinal	Lateral	Vertical	Resultant
Steering column (cm)	–6	–3	7	10
Left lower instrument panel (cm)	–6	–5	2	8
Right lower instrument panel (cm)	–4	–5	3	7
Brake pedal (cm)	–9	–4	5	11
Left toepan (cm)	–8	–7	4	12
Center toepan (cm)	–6	–5	6	10
Right toepan (cm)	–7	–6	5	11
Footrest (cm)	–8	–7	2	11
Average displacement of the four seat attachment bolts relative to reference system (cm)	1	0	1	n/a

* All measurements taken on driver side. From the driver's position, positive is forward, left, and up.

Table 2
Restraint System Performance and Dummy Kinematics — 2005 Ford Taurus

Event	Time (ms)
Activation of seat belt crash tensioner (at buckle)	32
Deployment of driver frontal airbag	40
Airbag fully inflated	66
Face begins to load airbag	72
Rear of head contacts driver head restraint	295

Table 3 Head Injury Measurements — 2005 Ford Taurus			
Measure	**Published Tolerance Threshold**	**Result**	**Time (ms)**
Vector resultant acceleration (g), during airbag loading	80	34	95
Vector resultant acceleration — 3 ms clip (g), during airbag loading	80	34	93-97*
Head Injury Criterion (HIC)	1000	142	78-114
Head Injury Criterion — 15 ms interval (HIC-15)	700	89	89-104

* The acceleration level that was continuously maintained for at least 3 ms is indicated. There was no level associated with an interval of exactly 3 ms in duration.

Table 4 Neck Injury Measurements — 2005 Ford Taurus			
Measure	**Published Tolerance Threshold**	**Result**	**Time (ms)**
A-P shear force (kN)	±3.1	–0.4	103
Axial compression force (kN)	4.0	0	0
Axial tension force (kN)	3.3	1.0	82
N_{ij} Tension-Extension	1.00	0.16	71
N_{ij} Tension-Flexion	1.00	0.18	83
N_{ij} Compression-Extension	1.00	0.08	72
N_{ij} Compression-Flexion	1.00	0.09	90
Flexion bending moment (Nm)		26	90
Extension bending moment (Nm)		11	72

Table 5 Chest Injury Measurements — 2005 Ford Taurus			
Measure	**Published Tolerance Threshold**	**Result**	**Time (ms)**
Vector resultant spine acceleration — 3 ms clip (g)	60	32	92-95
Rib compression (mm)	–50	–23	84
Viscous criteria (m/s)	1.0	0.1	65
Sternum deflection rate (m/s)	–8.2	–1.0	65

Table 6 Leg and Foot Injury Measurements — 2005 Ford Taurus					
Measure	**Published Tolerance Threshold**	**Left**	**Time (ms)**	**Right**	**Time (ms)**
Femur axial force (kN)	–9.1*	–1.0	79	–2.6	77
Tibia-femur displacement (mm)	–15	–1	81	0	0
Upper Tibia					
L-M moment (Nm)	±225	–86	63	–87	65
A-P moment (Nm)	±225	–52	50	–34	68
Vector resultant moment (Nm)	225	89	63	90	65
Index	1.00	0.41	63	0.49	65
Lower Tibia					
L-M moment (Nm)	±225**	–121	62	–128	65
A-P moment (Nm)	±225**	129	64	–43	65
Vector resultant moment (Nm)	225**	170	63	134	65
Axial force (kN)	–8.0**	–1.7	50	–3.6	64
Index	1.00	0.77	63	0.69	65
Foot					
A-P acceleration (g)	±150	–95	51	–80	63
I-S acceleration (g)	±150	–108	49	–76	65
Vector resultant acceleration (g)	150	141	49	98	64

* This critical value is for instantaneous loading. Femur loads are also compared with magnitude-duration injury criteria.

** These published thresholds are for fractures of the tibia. Ankle and foot injuries have been associated with bending moments as low as 50-100 Nm, and heel fractures have been associated with axial forces as low as –6.0 kN.

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Appendix

Dummy Clearance Measurements

Dummy Clearance Measurements

Test Number:	CF09009A
Vehicle:	2005 Ford Taurus
Seat Type:	Manually adjusted bucket seat (seat back angle and fore/aft)
Upper Belt Anchorage:	Set to 3rd of 5 positions
Steering Column Adjustment:	Set to 3rd of 5 tilt adjustment positions
Foot Pedal Adjustment	Fixed

Location	Code	Measure	Location	Code	Measure
Head to header	HH	378	Striker to CG, horizontal	CGH	–21
Nose to rim	NR	435	Striker to CG, lateral	CGL	362
Chest to dash	CD	650	Striker to CG, vertical	CGV	520
Rim to abdomen	RA	236	Striker to knee**	SK	539
Knee to dash, left	KDL	300	Striker to knee angle**	SKA	–2.7°
Knee to dash, right	KDR	240	Striker to H-point, horizontal	SHH	–153
Steering wheel to chest, horizontal	SCH	347	Striker to H-point, vertical	SHV	–118
Steering wheel to chest, reference	SCR	423	Ankle to ankle	AA	384
Hub to chest, minimum	HCM	288	Knee to knee	KK	360
Pelvic angle	PA	26.7°	Arm to door	AD	123
Seat back angle*	SA	22.8°	H-point to door	HD	184
Torso recline angle (H-point to Head CG)	TRA	11.7°	Head to A-pillar	HA	517
Neck bracket angle	NBA	0°	Head to roof	HR	169
Neck angle, seated	NAS	5.1°	Head to side window	HS	326

All distance measurements are in millimeters (mm).
* Indicated value is from vertical, as measured on the head restraint post.
** These measurements were made in a vertical plane containing the striker and parallel to the driver door sill.