



TEST REPORT FOR:

The Center for Auto Safety

40 mph Vehicle to Vehicle 30% Offset Rear Impact



40 mph Vehicle to Vehicle 30% Offset Rear Impact

1996 Jeep Grand Cherokee Limited

1988 Ford Taurus

PREPARED FOR:

The Center for Auto Safety

1825 Connecticut Ave, NW

Washington, DC 20009

TEST REPORT NUMBER:

TR-P31070-01-NC

TEST DATE:

May 16, 2011

REPORT DATE:

June 7, 2011

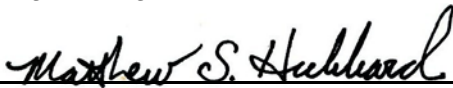


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SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

This 40 mph (64.4 km/h) 30% offset rear impact test was conducted to examine the fuel system integrity of the subject target vehicle, a 1996 Jeep Grand Cherokee Limited 5-door MPV, when impacted by a target vehicle, a 1988 Ford Taurus 4-door sedan, under conditions similar to those of FMVSS 301.

The impact test was conducted in accordance with instructions received by KARCO Engineering, LLC from The Center for Auto Safety. This test was funded by the Santos Family Foundation.

SUMMARY

A 1996 Jeep Grand Cherokee Limited 5-door MPV (target vehicle) was impacted by a 1988 Ford Taurus 4-door sedan (bullet vehicle) at a velocity of 65.53 km/h. The target vehicle was sitting stationary with the transmission in neutral and the parking brake disengaged. It was oriented parallel to the bullet vehicle facing the same direction, with a target offset of 574 mm.

The test was performed at KARCO Engineering, LLC. on May 16, 2011. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A of this report. Two (2) real-time camera and three (3) high-speed cameras were used to document the vehicle to vehicle impact event.

One Part 572E 50th percentile male anthropomorphic test device (ATD) was placed in both the driver and left front seating positions of the target vehicle. Both ATD's were uninstrumented. One surrogate occupant was placed in both the driver and left front seating positions of the bullet vehicle.

The 6 channels of data were recorded on an on-board data acquisition system. Appendix B contains the dummy response data traces.

The maximum static crush of the target vehicle was 580 mm located at DPD 3 to the left of the vehicle centerline. Both the driver and passenger side doors remained closed during the impact event and were jammed shut after the impact.

The maximum static crush of the bullet vehicle was 370 mm located at DPD 4 to the right of the vehicle centerline¹. Both the driver and passenger side doors remained closed during the impact event and were operable after the impact.

The target vehicle had immediate Stoddard solvent leakage as a result of the impact with the bullet vehicle. Solvent leaked out from two (2) locations on the fuel tank, both of them were cracks formed on what was the bottom of the fuel tank. All of the Stoddard solvent leaked from the fuel tank from these two (2) locations after the impact, with only trace amounts remaining in the tank.

The hoses routed to the fuel filler remained attached to the fuel tank and the filler neck, and were not severed. The fuel tank did end up with cracks in the plastic around the hose connections, but no Stoddard solvent leaked from that area.

An FMVSS 301 rollover was not performed on the target vehicle as all of the Stoddard solvent had already leaked from the fuel tank.

¹ -Post-Test measurements were taken without the bumper fascia due to damage to the fascia as a result of the impact.

SECTION 2
DATA SHEETS

Bullet Vehicle: 1988 Ford Taurus 4-Door Sedan

Project No.: P31070-01

Target Vehicle: 1996 Jeep Grand Cherokee Limited 5-Door MPV

Test Date: 05/16/11

CONVERSION FACTORS

Quantity	Typical Application	Std Units	Metric Unit	Multiply By
Mass	Vehicle Weight	lb	kg	0.4536
Linear Velocity	Impact Velocity	miles/hr	km/hr	1.609344
Length or Distance	Measurements	in	mm	25.4
Volume	Fuel Systems	gal	liter	3.785
Volume	Small Fluids	oz	mL	29.573
Pressure	Tire Pressures	lbf/in ²	kPa	7.0
Volume	Liquid	gal	liter	3.785
Temperature	General Use	°F	°C	$=(tf - 32)/1.8$
Force	Dynamic Forces	lbf	N	4.448
Moment	Torque	lbf•ft	N•m	1.355

DATA SHEET NO. 1
CRASH TEST SUMMARY

Bullet Vehicle: 1988 Ford Taurus 4-Door Sedan

Project No.: P31070-01

Target Vehicle: 1996 Jeep Grand Cherokee Limited 5-Door MPV

Test Date: 05/16/11

PRIMARY IMPACT DATA

Parameter	Units	Value
Bullet Vehicle Velocity at Impact	km/h	65.53
Bullet Vehicle Test Weight	kg	1529.0
Bullet Vehicle Maximum Static Crush	mm	370
Target Vehicle Test Weight	kg	1899.0
Target Vehicle Maximum Static Crush	mm	580
Impact Point (From Centerline)	mm	560

BULLET VEHICLE DOOR OPENING AND SEAT TRACK DATA

Description	Driver	Passenger
Front Door Opening	Remained closed and operational	Remained closed and operational
Rear Door Opening	Remained closed and operational	Remained closed and operational
Seat Track Shift	Unknown	Unknown
Seat Back Failure	No	No

TARGET VEHICLE DOOR OPENING AND SEAT TRACK DATA

Description	Driver	Passenger
Front Door Opening	Jammed shut	Jammed shut
Rear Door Opening	Jammed shut	Jammed shut
Seat Track Shift	Unknown	Unknown
Seat Back Failure	Yes	Yes

VIDEO COVERAGE

Description	Number
High Speed Video Cameras	3
Real Time Video Cameras	2
Total	5

INSTRUMENTATION SUMMARY

Description	Number
Driver ATD Sensors	
Passenger ATD Sensors	
Bullet Vehicle Structure Accelerometers	3
Target Vehicle Structure Accelerometers	3
Total	6

DATA SHEET NO. 2

BULLET VEHICLE PARAMETER DATA

Bullet Vehicle: 1988 Ford Taurus 4-Door Sedan Project No.: P31070-01
 Target Vehicle: 1996 Jeep Grand Cherokee Limited 5-Door MPV Test Date: 05/16/11

BULLET VEHICLE INFORMATION AND OPTIONS

Make	Ford
Year	1988
Model	Taurus
Body Style	4-Door Sedan
VIN	1FABP52U8JG196592
Body Color	Tan
Delivery Date	5/6/2011
Odometer Reading (mi)	48,952
Odometer Reading (km)	78,781
Dealer	
Transmission	3-Speed Automatic
Final Drive	Front
Type / No. of Cylinders	V6
Engine Displacement (L)	3.0

Engine Placement	Transverse
Power Brakes	Yes
Front Disc Brakes	Yes
Rear Disc Brakes	No
Anti-Lock Brakes	No
Driver Front Airbag	No
Pass. Front Airbag	No
Power Windows	No
Power Steering	Yes
Tilt Wheel	Yes
Power Door Locks	Yes
Air Conditioning	Yes
Power Seat	Yes
AM/FM/Cassette	Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Ford Motor Co.
Date of Manufacture	Feb-88

GVWR (kg)	2093.0
GAWR Front (kg)	1176.0
GAWR Rear (kg)	968.0

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench		
Number of Occupants	2	3		5
Capacity Weight (VCW) (kg)				408.0
Cargo Weight (RCLW) (kg)				67.8

DATA SHEET NO. 2 ... (CONTINUED)

BULLET VEHICLE PARAMETER DATA

Bullet Vehicle: 1988 Ford Taurus 4-Door Sedan Project No.: P31070-01
 Target Vehicle: 1996 Jeep Grand Cherokee Limited 5-Door MPV Test Date: 05/16/11

BULLET VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	503.5	203.5		514.5	273.0	
Right	kg	401.5	268.0		461.0	280.5	
Ratio	%	65.7%	34.3%	100.0%	63.8%	36.2%	100.0%
Total	kg	905.0	471.5	1376.5	975.5	553.5	1529.0

BULLET VEHICLE TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1376.5	A
Weight of Surrogate Occupants	kg	170.0	B
Rated Cargo/Luggage Weight (RCLW)	kg	67.8	C
Calculated Vehicle Target Weight (TVT _W)	kg	1614.3	A+B+C

BULLET VEHICLE ATTITUDES

Condition	Units	LF	RF	LR	RR
As Delivered	mm	696	693	654	647
As Tested	mm	667	665	615	608
Post-Test	mm	649	695	628	609

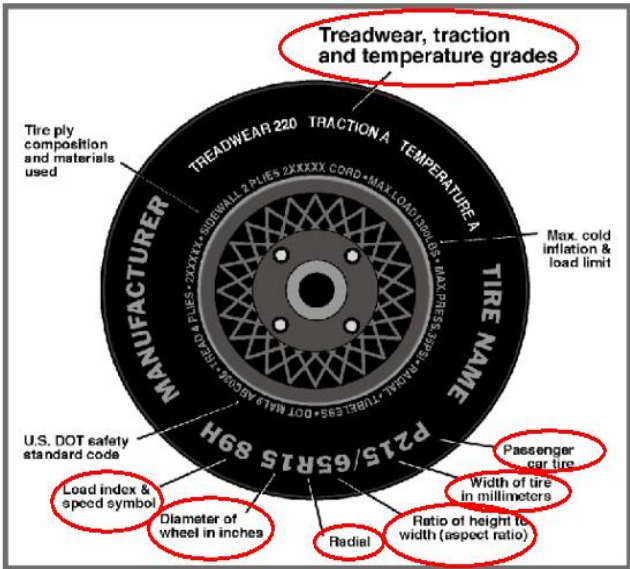
Description	Units	Value
Vehicle Components Removed	kg	0.0
Ballast Added	kg	36.0

BULLET VEHICLE COMPONENTS REMOVED:

None _____

DATA SHEET NO. 2 ... (CONTINUED)
BULLET VEHICLE PARAMETER DATA

Bullet Vehicle: 1988 Ford Taurus 4-Door Sedan Project No.: P31070-01
 Target Vehicle: 1996 Jeep Grand Cherokee Limited 5-Door MPV Test Date: 05/16/11



BULLET VEHICLE TIRE INFORMATION

Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	245	245
Cold Pressure (kPa)	240	240
Recommended Tire Size	P205/70R14	P205/70R14
Tire Size on Vehicle	P195/70R14	P195/70R14
Tire Manufacturer	Futura	Futura
Tire Model	775	775
Treadwear	380	380
Traction	A	A
Temperature Grades	B	B
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Steel, 1 Polyester	2 Steel, 1 Polyester
Load Index / Speed Symbol	90S	90S
Tire Material	Polyester, Steel	Polyester, Steel
DOT Safety Code Left	U9RW XC8 0304 B12L	U9RW XC8 3003 B12L
DOT Safety Code Right	U9RW XC8 0404 A12L	U9RW XC8 0304 B12R

DATA SHEET NO. 3

BULLET VEHICLE ACCELEROMETER DATA

Bullet Vehicle: 1988 Ford Taurus 4-Door Sedan Project No.: P31070-01

Target Vehicle: 1996 Jeep Grand Cherokee Limited 5-Door MPV Test Date: 05/16/11

BULLET VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Description	Location		
		X	Y	Z
1	Vehicle Center of Gravity	2187	0	277

Reference Points: X – Rear Surface of Vehicle (+ forward)
Y – Vehicle Centerline (+ to left)
Z – Ground Plane (+ up)

DATA SHEET NO. 4

BULLET VEHICLE ACCIDENT INVESTIGATION DATA

Bullet Vehicle: 1988 Ford Taurus 4-Door Sedan Project No.: P31070-01
 Target Vehicle: 1996 Jeep Grand Cherokee Limited 5-Door MPV Test Date: 05/16/11

VEHICLE INFORMATION

VIN: 1FABP52U8JG196592 Wheelbase (mm): Unknown
 Vehicle Size Category: 4-Door Sedan Test Weight (kg): 1529.0

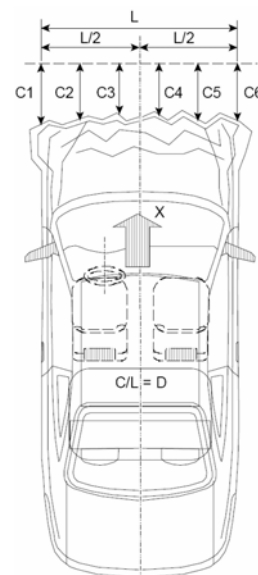
ACCELEROMETER DATA

Accelerometer Locations: Vehicle Center Tunnel
 Cal. Procedure/Interval: Drop Test / 6 months
 Integration Algorithm: NHTSA Standard
 Impact Velocity (km/h): 65.53
 Velocity Change (km/h): 43.1
 Time of Separation (msec): n/a

Linearity: Good

CRUSH PROFILE

Collision Deformation Classification: 01FZEW2
 Midpoint of Damage: Vehicle Centerline
 Damage Region Length (mm): 1507
 Impact Mode: Offset Frontal



No.	Measurement Description	Units	Pre-Test	Post-Test ²	Difference
C1	Crush Zone 1 at Left Side	mm	160	180	-20
C2	Crush Zone 2 at Left Side	mm	60	110	-50
C3	Crush Zone 3 at Left Side	mm	20	383	-363
C4	Crush Zone 4 at Right Side	mm	20	390	-370
C5	Crush Zone 5 at Right Side	mm	60	283	-223
C6	Crush Zone 6 at Right Side	mm	160	271	-111
L	C1 to C6	mm	1507		

² – Post-Test measurements were taken without the bumper fascia due to damage to the fascia as a result of the impact.

DATA SHEET NO. 5

TARGET VEHICLE PARAMETER DATA

Bullet Vehicle: 1988 Ford Taurus 4-Door Sedan Project No.: P31070-01
 Target Vehicle: 1996 Jeep Grand Cherokee Limited 5-Door MPV Test Date: 05/16/11

TARGET VEHICLE INFORMATION AND OPTIONS

Make	Jeep
Year	1996
Model	Grand Cherokee Limited
Body Style	5-Door MPV
VIN	1J4GZ78S7TC184529
Body Color	White
Delivery Date	5/6/2011
Odometer Reading (mi)	172,686
Odometer Reading (km)	277,911
Dealer	
Transmission	4-Speed Automatic
Final Drive	4x4
Type / No. of Cylinders	Inline-6
Engine Displacement (L)	4.0

Engine Placement	Longitudinal
Power Brakes	Yes
Front Disc Brakes	Yes
Rear Disc Brakes	Yes
Anti-Lock Brakes	Yes
Driver Front Airbag	Yes
Pass. Front Airbag	Yes
Power Windows	Yes
Power Steering	Yes
Tilt Wheel	Yes
Power Door Locks	Yes
Air Conditioning	Yes
Power Seat	Yes
AM/FM/Cassette	Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Chrysler Corporation
Date of Manufacture	Oct-95

GVWR (kg)	2405.0
GAWR Front (kg)	1248.0
GAWR Rear (kg)	1339.0

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench		
Number of Occupants	2	3		5
Capacity Weight (VCW) (kg)				Unavailable
Cargo Weight (RCLW) (kg)				Unavailable

DATA SHEET NO. 5 ... (CONTINUED)

TARGET VEHICLE PARAMETER DATA

Bullet Vehicle: 1988 Ford Taurus 4-Door Sedan Project No.: P31070-01
 Target Vehicle: 1996 Jeep Grand Cherokee Limited 5-Door MPV Test Date: 05/16/11

TARGET VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	505.5	378.5		544.0	420.0	
Right	kg	502.0	359.5		533.0	402.0	
Ratio	%	57.7%	42.3%	100.0%	56.7%	43.3%	100.0%
Total	kg	1007.5	738.0	1745.5	1077.0	822.0	1899.0

TARGET VEHICLE TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1745.5	A
Weight of 2 P572E ATD's	kg	152.0	B
Rated Cargo/Luggage Weight (RCLW)	kg	136.0	C
Calculated Vehicle Target Weight (TVTW)	kg	2033.5	A+B+C

TARGET VEHICLE ATTITUDES

Condition	Units	LF	RF	LR	RR
As Delivered	mm	810	810	825	824
As Tested	mm	792	799	814	802
Post-Test	mm	806	781	690	728

Description	Units	Value
Vehicle Components Removed	kg	52.5
Ballast Added	kg	38.0

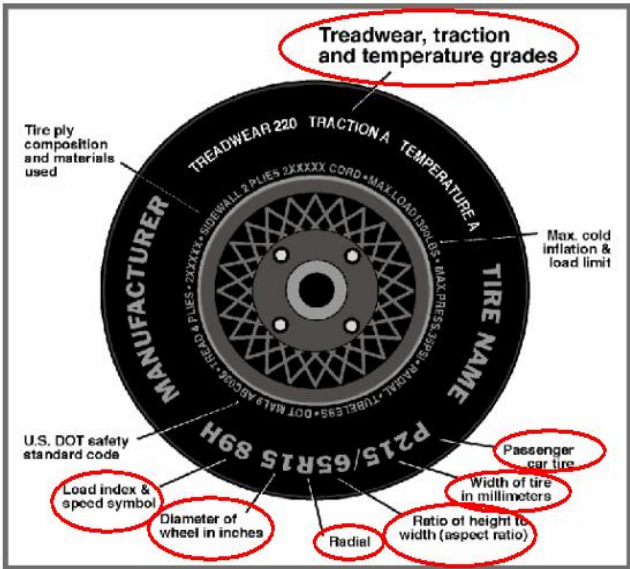
TARGET VEHICLE COMPONENTS REMOVED:

Rear Door Panels (5.0 kg), Front Door Panels (7.0 kg), Rear Door Side Windows (12.0 kg)
Outboard Mirrors (3.0 kg), Rear Door Speakers (2.0 kg), Spare Tire (21.5 kg), Front Door
Speakers (2.0 kg)

DATA SHEET NO. 5 ... (CONTINUED)

TARGET VEHICLE PARAMETER DATA

Bullet Vehicle: 1988 Ford Taurus 4-Door Sedan Project No.: P31070-01
 Target Vehicle: 1996 Jeep Grand Cherokee Limited 5-Door MPV Test Date: 05/16/11



TARGET VEHICLE TIRE INFORMATION

Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	248	248
Recommended Tire Size	P225/75R16	P225/75R16
Tire Size on Vehicle	P245/70R16	P245/70R16
Tire Manufacturer	Kumho	Kumho
Tire Model	Solus KR21	Solus KR21
Treadwear	680	680
Traction	A	A
Temperature Grades	B	B
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 2 Steel, 1Nylon	2 Polyester, 2 Steel, 1Nylon
Load Index / Speed Symbol	101T	101T
Tire Material	Polyester, Steel, Nylon	Polyester, Steel, Nylon
DOT Safety Code Left	C0VH YP6V 2507	C0VH YP6V 2507
DOT Safety Code Right	C0VH YP6V 2507	C0VH YP6V 2507

DATA SHEET NO. 6

TARGET VEHICLE ACCELEROMETER DATA

Bullet Vehicle: 1988 Ford Taurus 4-Door Sedan Project No.: P31070-01

Target Vehicle: 1996 Jeep Grand Cherokee Limited 5-Door MPV Test Date: 05/16/11

TARGET VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Description	Location		
		X	Y	Z
1	Vehicle Center of Gravity	1745	0	498

Reference Points: X – Rear Surface of Vehicle (+ forward)
Y – Vehicle Centerline (+ to left)
Z – Ground Plane (+ up)

DATA SHEET NO. 7

TARGET VEHICLE ACCIDENT INVESTIGATION DATA

Bullet Vehicle: 1988 Ford Taurus 4-Door Sedan Project No.: P31070-01
 Target Vehicle: 1996 Jeep Grand Cherokee Limited 5-Door MPV Test Date: 05/16/11

VEHICLE INFORMATION

VIN: 1J4GZ78S7TC184529 Wheelbase (mm): 2690
 Vehicle Size Category: 5-Door MPV Test Weight (kg): 1899.0

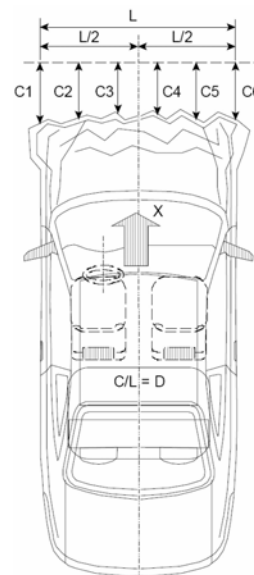
ACCELEROMETER DATA

Accelerometer Locations: Vehicle Center Tunnel
 Cal. Procedure/Interval: Drop Test / 6 months
 Integration Algorithm: NHTSA Standard
 Impact Velocity (km/h): 65.53
 Velocity Change (km/h): 34.9
 Time of Separation (msec): n/a

Linearity: Good

CRUSH PROFILE

Collision Deformation Classification: 07BYEW4
 Midpoint of Damage: Vehicle Centerline
 Damage Region Length (mm): 1465
 Impact Mode: Offset Frontal



No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush Zone 1 at Left Side	mm	65	85	-20
C2	Crush Zone 2 at Left Side	mm	0	303	-303
C3	Crush Zone 3 at Left Side	mm	20	600	-580
C4	Crush Zone 4 at Right Side	mm	20	543	-523
C5	Crush Zone 5 at Right Side	mm	0	507	-507
C6	Crush Zone 6 at Right Side	mm	65	520	-455
L	C1 to C6	mm	1465		

DATA SHEET NO. 8

TARGET VEHICLE PROFILE MEASUREMENTS

Bullet Vehicle: 1988 Ford Taurus 4-Door Sedan Project No.: P31070-01
 Target Vehicle: 1996 Jeep Grand Cherokee Limited 5-Door MPV Test Date: 05/16/11

TARGET VEHICLE PROFILE MEASUREMENTS

No.	Measurement Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	4500	3970	-530
2	Rear Surface of Vehicle to Front of Engine			
3	RSOV to Firewall			
4	FSOV to Upper Leading Edge of Right Door	1383	1405	22
5	FSOV to Upper Leading Edge of Left Door	1385	1391	6
6	FSOV to Lower Leading Edge of Right Door	1430	1428	-2
7	FSOV to Lower Leading Edge of Left Door	1435	1422	-13
8	FSOV to Upper Trailing Edge of Right Door	2446	2469	23
9	FSOV to Upper Trailing Edge of Left Door	2448	2456	8
	FSOV to Leading Edge of Left Door	1385	1391	6
	FSOV to Leading Edge of Right Door	1383	1405	22
	FSOV to Trailing Edge of Left Door	2448	2456	8
	FSOV to Trailing Edge of Right Door	2446	2469	23
10	FSOV to Lower Trailing Edge of Right Door	2471	2479	8
11	FSOV to Lower Trailing Edge of Left Door	2469	2470	1
	FSOV to Upper Trailing Edge of Right Rear Door	3351	3359	8
	FSOV to Upper Trailing Edge of Left Rear Door	3351	3340	-11
	FSOV to Trailing Edge of Right Rear Door	3351	3359	8
	FSOV to Trailing Edge of Left Rear Door	3351	3355	4
	FSOV to Lower Trailing Edge of Right Rear Door	3062	3067	5
	FSOV to Lower Trailing Edge of Left Rear Door	3064	3053	-11
12	FSOV to Bottom of A-Pillar of Right Side	1431	1432	1
13	FSOV to Bottom of A-Pillar of Left Side	1433	1424	-9
	FSOV to Bottom of B-Pillar on Right Side	2480	2477	-3
	FSOV to Bottom of B-Pillar on Left Side	2480	2475	-5
	FSOV to Bottom of C-Pillar on Right Side	3350	3358	8
	FSOV to Bottom of C-Pillar on Left Side	3355	3313	-42
14	RSOV to Firewall, Right Side			
15	RSOV to Firewall, Left Side			
16	FSOV to Steering Column	1877	1935	58
17	Center of Steering Column to A-Pillar	402	400	-2
18	Center of Steering Column to Headliner	420	435	15
19	FSOV to Right Side of Rear Bumper	3813	4237	424
20	FSOV to Left Side of Rear Bumper	3814	3627	-187

All measurements in millimeters.

DATA SHEET NO. 9**TARGET VEHICLE STRUCTURAL MEASUREMENTS**

Bullet Vehicle: 1988 Ford Taurus 4-Door Sedan Project No.: P31070-01
 Target Vehicle: 1996 Jeep Grand Cherokee Limited 5-Door MPV Test Date: 05/16/11

TARGET VEHICLE STRUCTURAL MEASUREMENTS

No.	Description	Pre-Test	Post-Test	Difference
1	Total Length	4500	4450	-50
2	Total Width	1765	2060	295
3	Bumper Top Height	705	735	30
4	Bumper Bottom Height	350	390	40
5	Longitudinal Member Top Height			
6	Distance Between Longitudinal Members			
7	Longitudinal Member Width			
8	Engine Top Height			
9	Engine Bottom Height			
10	Engine and Gearbox Width			
11	Front Bumper to Engine Distance			
12	Front Shock Absorber Fixing Height			
13	Bonnet Leading Edge Height			
14	Front Shock Absorber Fixing Width			
15	Front Bumper to Front Axle Distance			
16	Front Axle to A-Pillar Distance	610	610	0
17	A-Pillar to B-Pillar Distance	978	975	-3
	C-Pillar to Rear Axle Distance	433	355	-78
18	B-Pillar to Rear Axle Distance	1035	935	-100
19	B-Pillar to C-Pillar Distance	840	813	-27
20	Roof Sill Bottom Height	1522	1524	2
21	Roof Sill Top Height	1601	1600	-1
22	Floor Sill Bottom Height	361	365	4
23	Floor Sill Top Height	498	503	5

All measurements in millimeters.

DATA SHEET NO. 10

TARGET VEHICLE INTRUSION MEASUREMENTS

Bullet Vehicle: 1988 Ford Taurus 4-Door Sedan

Project No.: P31070-01

Target Vehicle: 1996 Jeep Grand Cherokee Limited 5-Door MPV

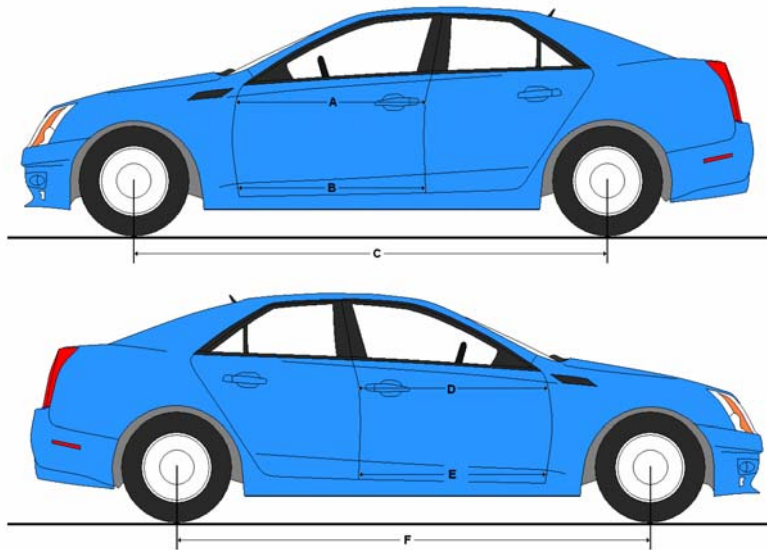
Test Date: 05/16/11

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Front Upper	mm	980	975	-5
B	Left Side Front Lower	mm	921	926	5
	Left Side Rear Upper	mm	840	796	-44
	Left Side Rear Lower	mm	544	528	-16
D	Right Side Front Upper	mm	976	975	-1
E	Right Side Front Lower	mm	920	918	-2
	Right Side Rear Upper	mm	840	823	-17
	Right Side Rear Lower	mm	541	526	-15

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2690	2610	-80
F	Right Side Wheelbase	mm	2690	2690	0



DATA SHEET NO. 10 ... (CONTINUED)

TARGET VEHICLE INTRUSION MEASUREMENTS

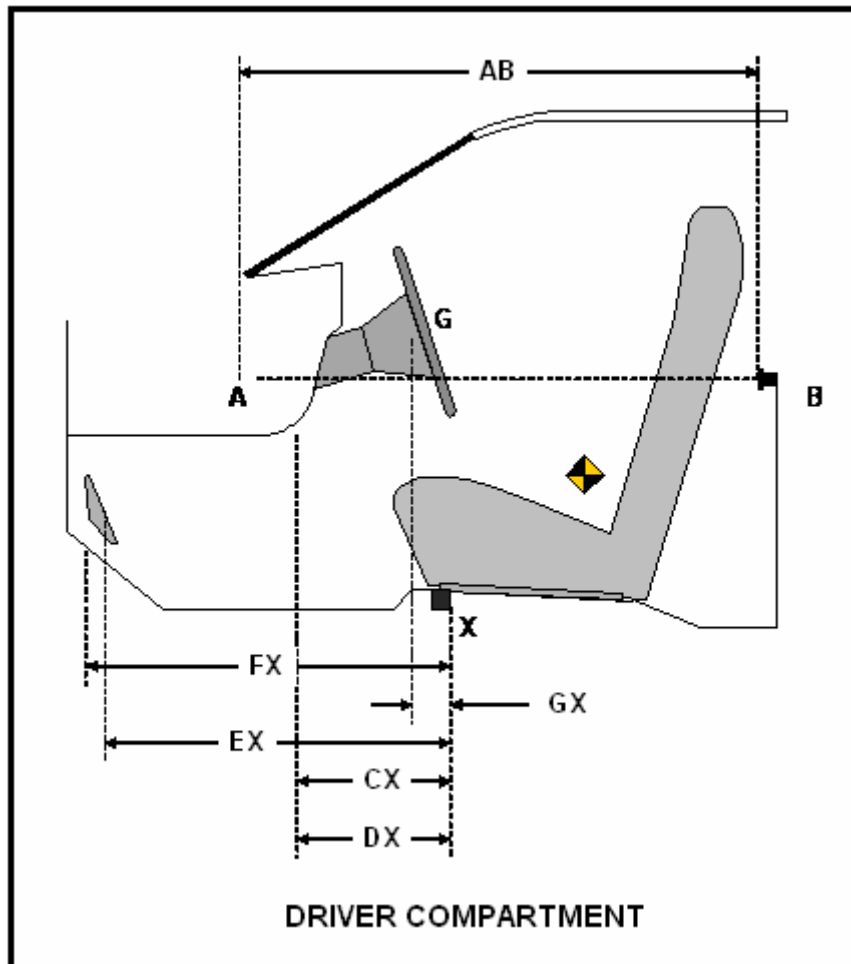
Bullet Vehicle: 1988 Ford Taurus 4-Door Sedan Project No.: P31070-01

Target Vehicle: 1996 Jeep Grand Cherokee Limited 5-Door MPV Test Date: 05/16/11

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	980	903	-77
CX	Left Knee Bolster to X	mm	302	320	18
DX	Right Knee Bolster to X	mm	325	285	-40
EX	Brake Pedal to X	mm	464	540	76
FX	Foot Rest to X	mm	690	600	-90
GX	Center of Steering Wheel Hub to X	mm	115	20	-95

X = Front of Seat Track (Stationary)



**APPENDIX A
PHOTOGRAPHS**

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FIGURE 1. Bullet Vehicle, As Received



FIGURE 2. Bullet Vehicle, As Received

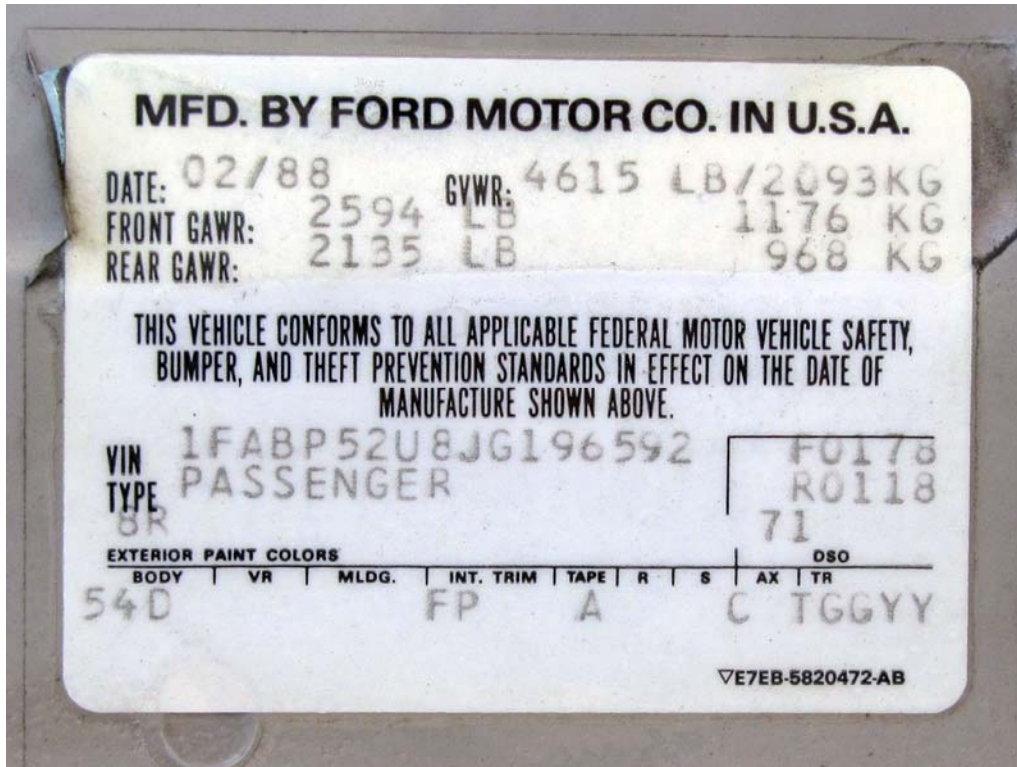


FIGURE 3. Bullet Vehicle Manufacturer's Label

MODEL MODELO		LOAD RANGE MARGEN DE CARGA	TIRE SIZE (LOAD RANGE C&D NOT PERMISSIBLE) TAMAÑO DE NEUMÁTICO (MARGEN DE CARGA C Y D NO PERMISIBLE)	PRESSURE PRESION		
				FRONT DELANTERO	REAR TRASERO	
ALL TODOS		STD	P205/70R14 P205/65R15	35 PSI lb/pu ² 240 kPa	35 PSI lb/pu ² 240 kPa	
ALL TODOS		T	T135/80R14 T135/80D14 TEMPORAL SPARE REPUESTO TEMPORAL	60 PSI lb/pu ² 415 kPa	60 PSI lb/pu ² 415 kPa	
TOTAL LOAD = OCCUPANTS PLUS LUGGAGE CARGA TOTAL = OCUPANTES MAS EQUIPAJE						
MODEL MODELO	MAXIMUM LOAD CARGA MAXIMA	OCCUPANTS OCUPANTES	DISTRIBUTION DISTRIBUCION			LUGGAGE EQUIPAJE
			FRONT DELANTERO	REAR TRASERO	THIRD SEAT TERCER ASIENTO	
SEDANS BERLINAS	900 lb/408 kg	5	2	3	0	200 lb/91 kg
	1100 lb/499 kg	5	3	3	0	
STATION WAGONS CAMIONETAS	1000 lb/453 kg	5	2	3	0	300 lb/136 kg
	1200 lb/544 kg	6	3	3	0	
	1050 lb/476 kg	7	2	3	2	
	1200 lb/544 kg	8	3	3	2	NONE NINGUNO

FOR SUSTAINED HIGH SPEED TRAILER TOWING, RECREATIONAL ACCESSORIES AND TEMPORAL SPARE USAGE—SEE OWNER'S GUIDE. PARA ALTA VELOCIDAD SOSTENIDA: TIPO DE REMOLQUES, ACCESORIOS RECREACIONALES Y USO TEMPORAL DE LA RUEDA DE REPUESTO, CONSULTE LA GUIA DEL PROPIETARIO. E8DC-1532-CA

FIGURE 4. Bullet Vehicle Tire Placard



FIGURE 5. Target Vehicle, As-Received



FIGURE 6. Target Vehicle, As-Received



FIGURE 7. Target Vehicle Manufacturer's Label

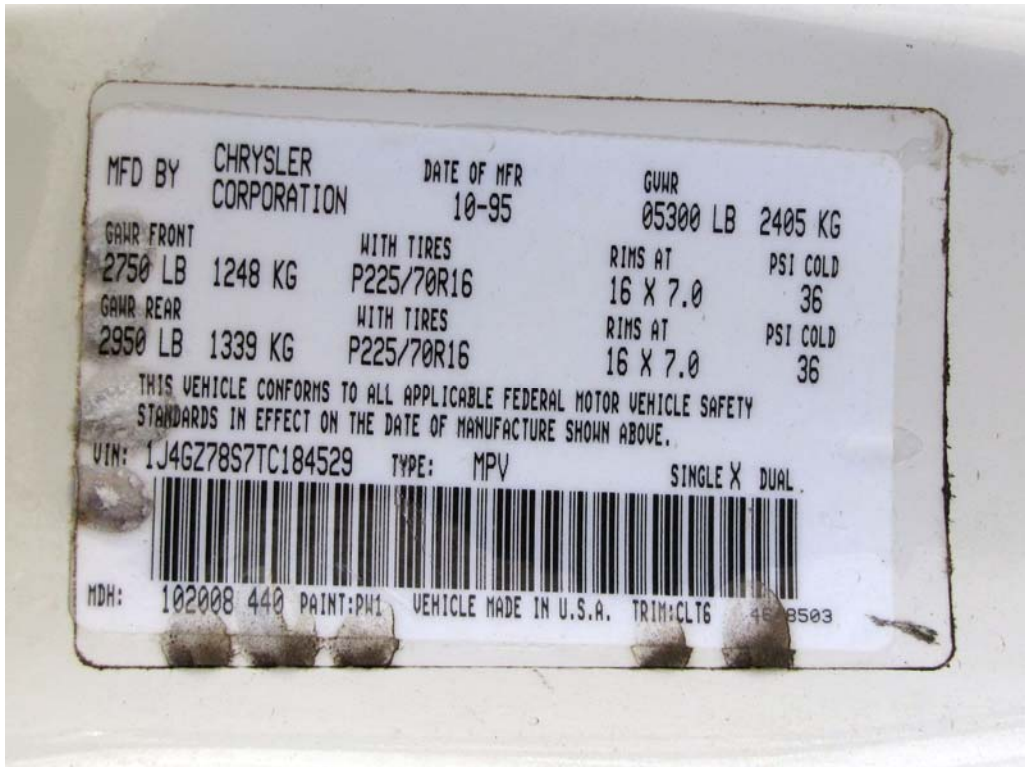


FIGURE 8. Target Vehicle Tire Placard



FIGURE 9. Test Setup, Left Side



FIGURE 10. Test Setup, Left Front ¾



FIGURE 11. Test Setup, Front



FIGURE 12. Test Setup, Right Front $\frac{3}{4}$



FIGURE 13. Test Setup, Right Side



FIGURE 14. Test Setup, Right Rear $\frac{3}{4}$



FIGURE 17. Test Setup



FIGURE 18. Post Test



FIGURE 19. Pre-Test Bullet Vehicle, Left Side



FIGURE 20. Post-Test Bullet Vehicle, Left Side



FIGURE 21. Pre-Test Bullet Vehicle, Left Front $\frac{3}{4}$

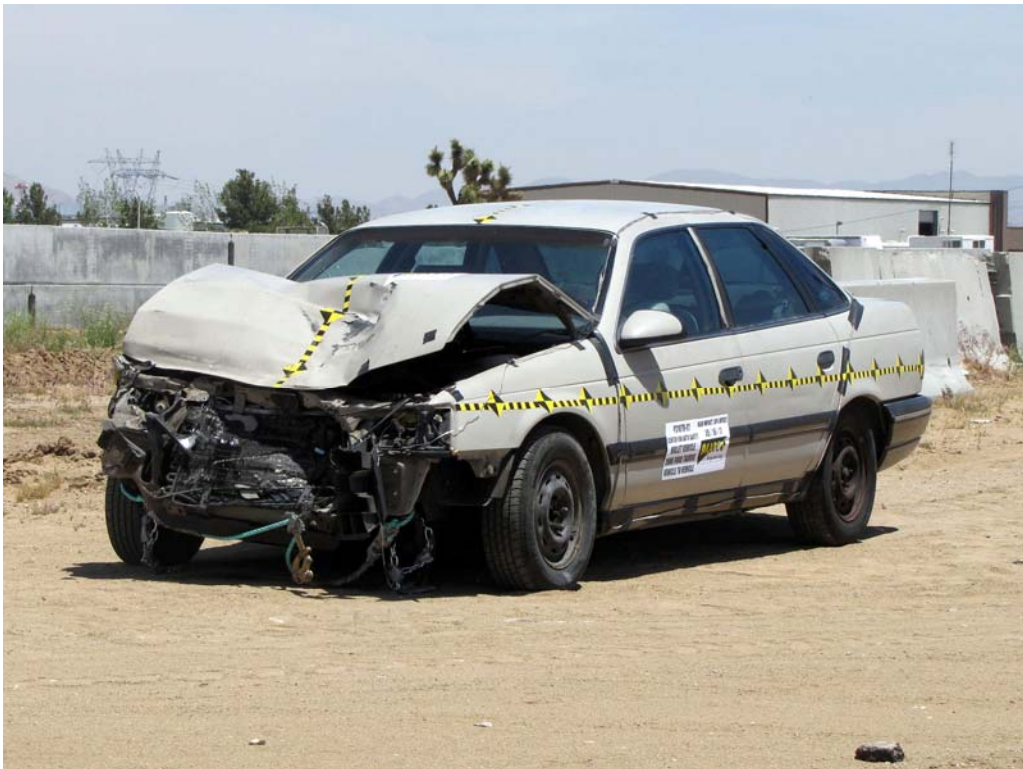


FIGURE 22. Post-Test Bullet Vehicle, Left Front $\frac{3}{4}$



FIGURE 23. Pre-Test Bullet Vehicle, Front

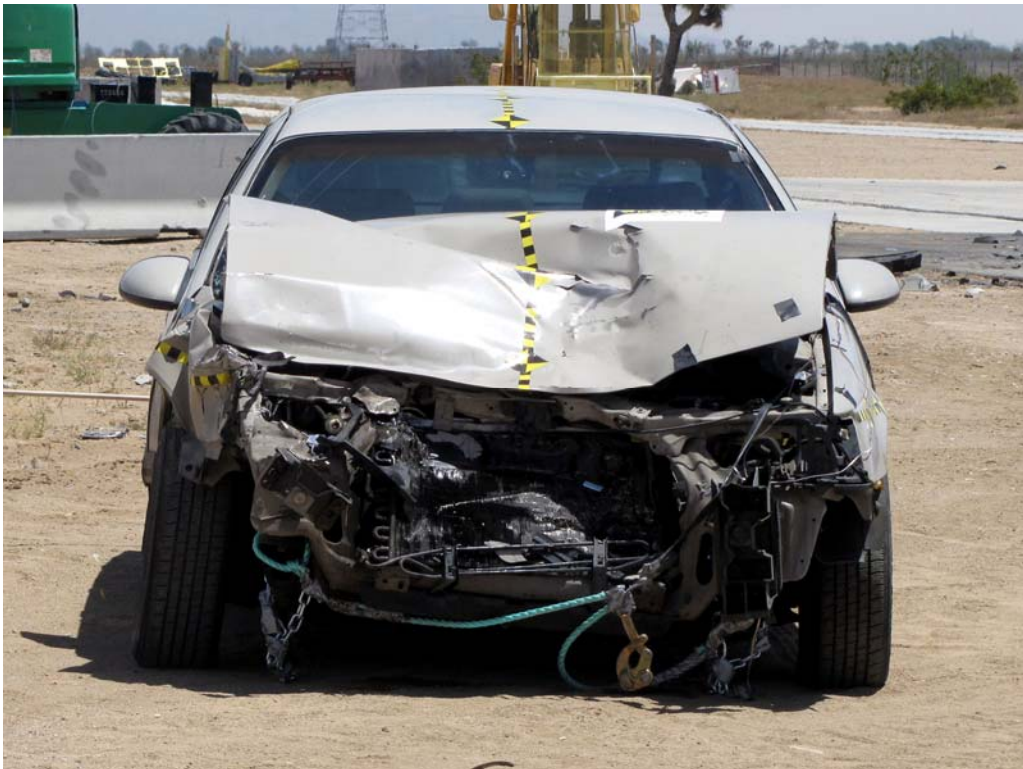


FIGURE 24. Post-Test Bullet Vehicle, Front



FIGURE 25. Pre-Test Bullet Vehicle, Right Front $\frac{3}{4}$

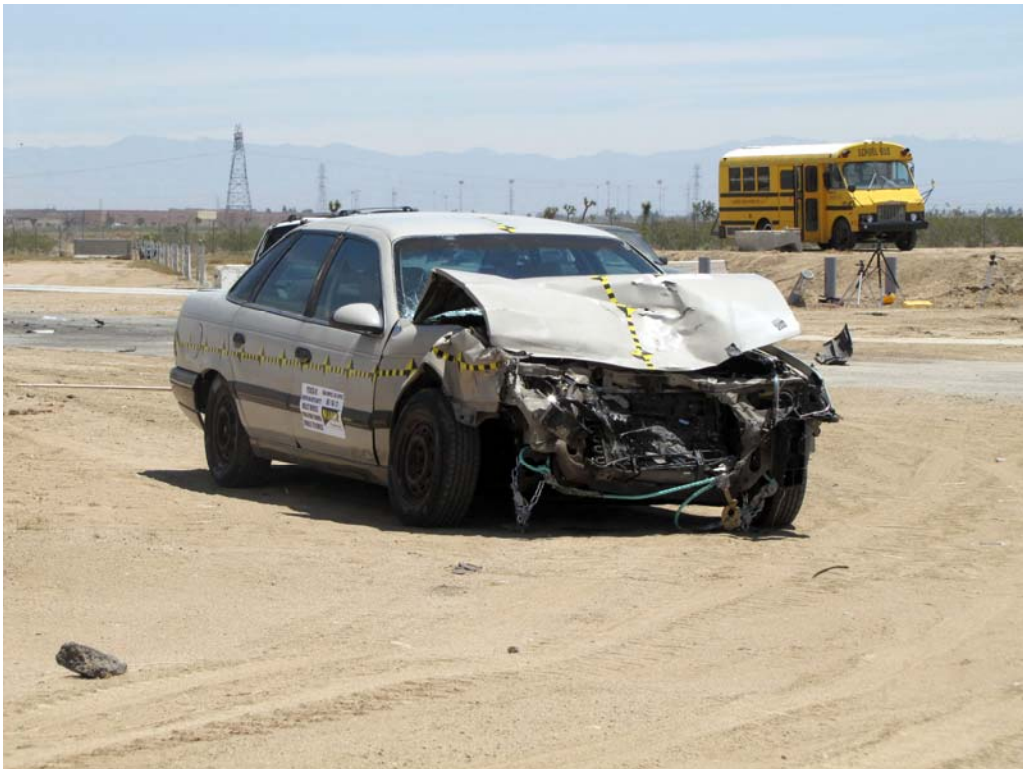


FIGURE 26. Post-Test Bullet Vehicle, Right Front $\frac{3}{4}$



FIGURE 27. Pre-Test Bullet Vehicle, Right Side



FIGURE 28. Post-Test Bullet Vehicle, Right Side



FIGURE 29. Pre-Test Target Vehicle, Left Side



FIGURE 30. Post-Test Target Vehicle, Left Side



FIGURE 31. Pre-Test Target Vehicle, Left Rear $\frac{3}{4}$



FIGURE 32. Post-Test Target Vehicle, Left Rear $\frac{3}{4}$



FIGURE 33. Pre-Test Target Vehicle, Rear



FIGURE 34. Post-Test Target Vehicle, Rear



FIGURE 35. Pre-Test Target Vehicle, Right Rear $\frac{3}{4}$



FIGURE 36. Post-Test Target Vehicle, Right Rear $\frac{3}{4}$



FIGURE 37. Pre-Test Target Vehicle, Right Side



FIGURE 38. Post-Test Target Vehicle, Right Side



FIGURE 39. Pre-Test Target Vehicle



FIGURE 40. Post-Test Target Vehicle



FIGURE 41. Pre-Test Target Vehicle



FIGURE 42. Post-Test Target Vehicle



FIGURE 43. Pre-Test Target Vehicle



FIGURE 44. Post-Test Target Vehicle



FIGURE 45. Pre-Test Target Vehicle



FIGURE 46. Post-Test Target Vehicle



FIGURE 47. Pre-Test Target Vehicle



FIGURE 48. Post-Test Target Vehicle



FIGURE 49. Post-Test Target Vehicle



FIGURE 50. Post-Test Target Vehicle



FIGURE 51. Post-Test Target Vehicle



FIGURE 52. Post-Test Target Vehicle



FIGURE 53. Post -Test Target Vehicle

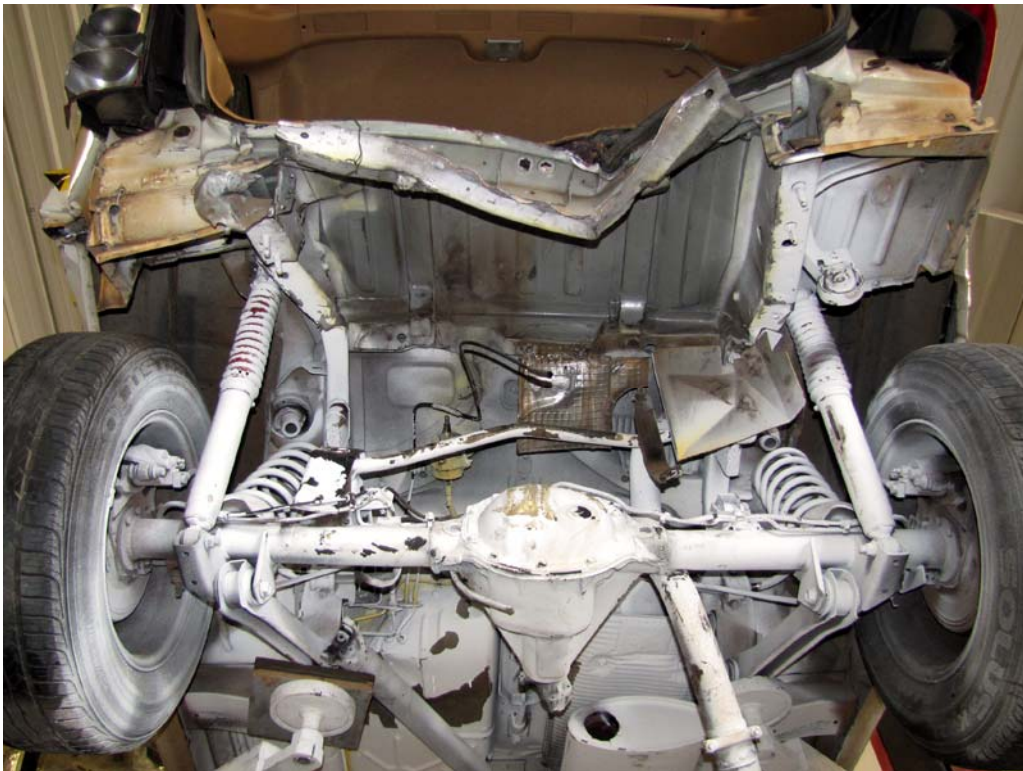


FIGURE 54. Post-Test Target Vehicle



FIGURE 55. Post -Test Target Vehicle, Fuel Tank



FIGURE 56. Post-Test Target Vehicle, Fuel Tank



FIGURE 57. Post -Test Target Vehicle, Fuel Tank



FIGURE 58. Post-Test Target Vehicle, Fuel Tank



FIGURE 59. Post -Test Target Vehicle, Fuel Tank



FIGURE 60. Post-Test Target Vehicle, Fuel Tank

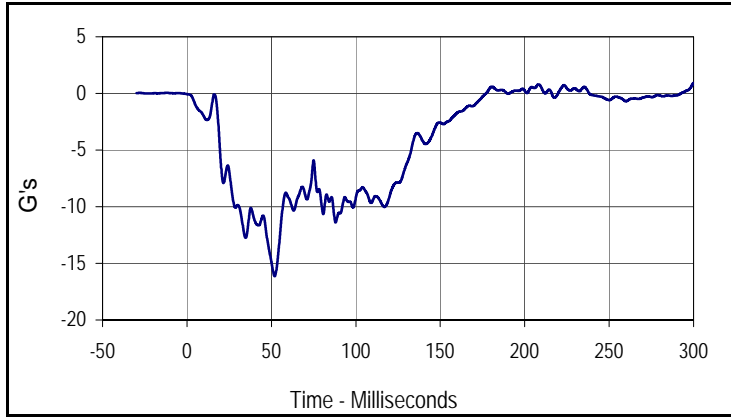
APPENDIX B
INSTRUMENTATION DATA TRACES

TABLE OF DATA PLOTS

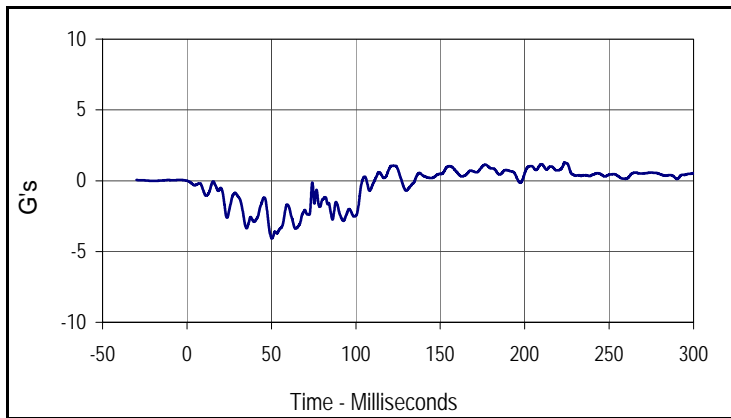
<u>Plot</u>		<u>Page</u>
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2	Bullet Vehicle Center Tunnel Y	B-1
3	Bullet Vehicle Center Tunnel Z	B-1
4	Bullet Vehicle Center Tunnel Resultant	B-1
5	Bullet Vehicle Center Tunnel X Velocity	B-2
6	Target Vehicle Center Tunnel X	B-3
7	Target Vehicle Center Tunnel Y	B-3
8	Target Vehicle Center Tunnel Z	B-3
9	Target Vehicle Center Tunnel Resultant	B-3
10	Target Vehicle Center Tunnel X Velocity	B-4

Test Vehicle: 1988 Ford Taurus 4-Dr Sedan
 Test Program: 40 MPH Rear Impact 30% Offset

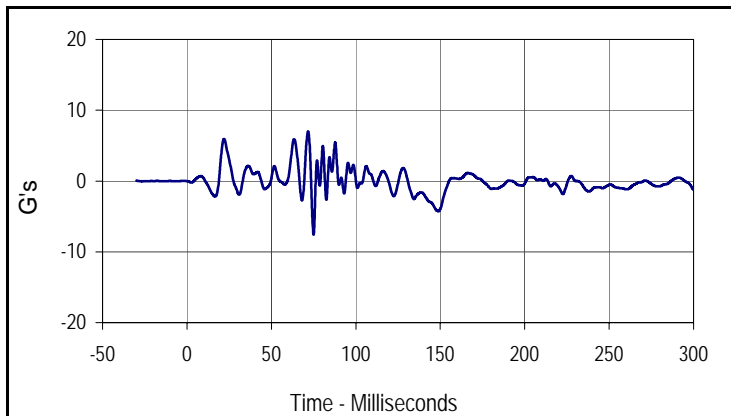
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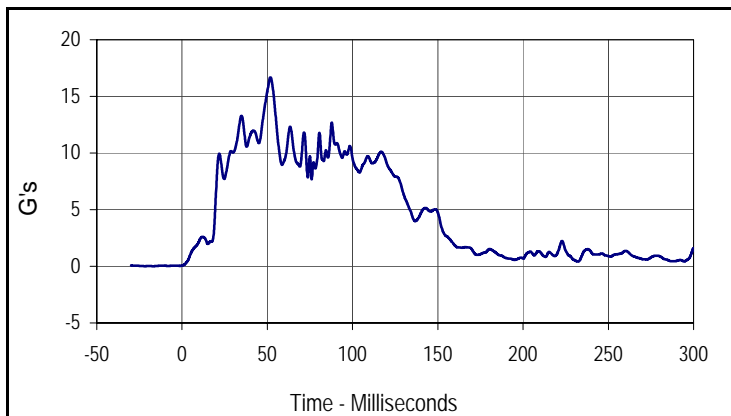
Curve Description			
Bullet Vehicle Center Tunnel X			
Plot	Type	SAE Class	Units
001	FIL	60	G's
Max	Time	Min	Time
0.9	299.9	-16.1	51.9



Curve Description			
Bullet Vehicle Center Tunnel Y			
Plot	Type	SAE Class	Units
002	FIL	60	G's
Max	Time	Min	Time
1.3	223.7	-4.1	50.3



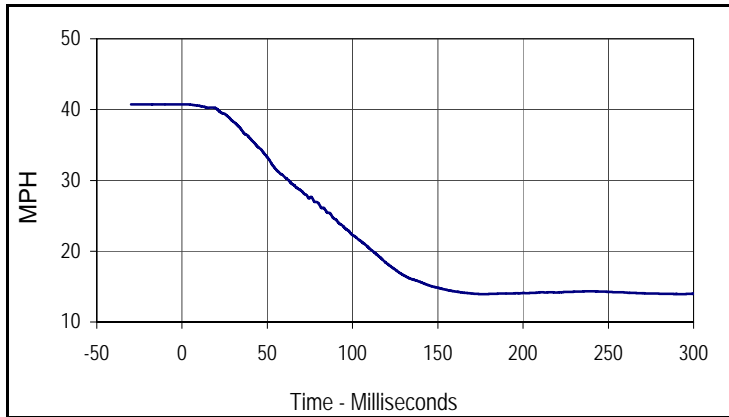
Curve Description			
Bullet Vehicle Center Tunnel Z			
Plot	Type	SAE Class	Units
003	FIL	60	G's
Max	Time	Min	Time
7.0	71.7	-7.6	75.0



Curve Description			
Bullet Vehicle Center Tunnel Resultant			
Plot	Type	SAE Class	Units
004	RES	60	G's
Max	Time	Min	Time
16.7	51.9	0.1	0.0

Test Vehicle: 1988 Ford Taurus 4-Dr Sedan
 Test Program: 40 MPH Rear Impact 30% Offset

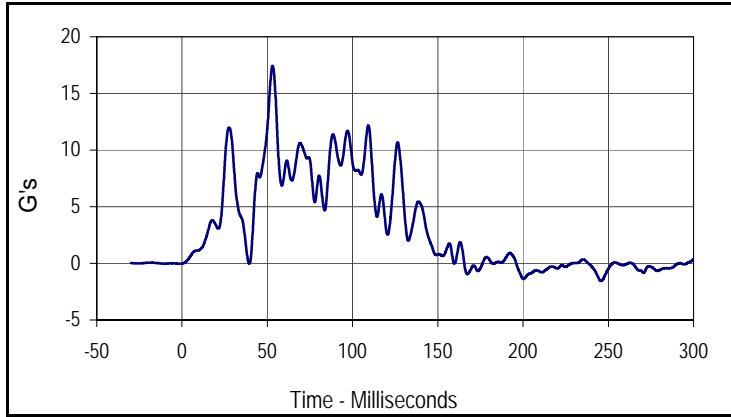
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 Test Date: 5/16/11



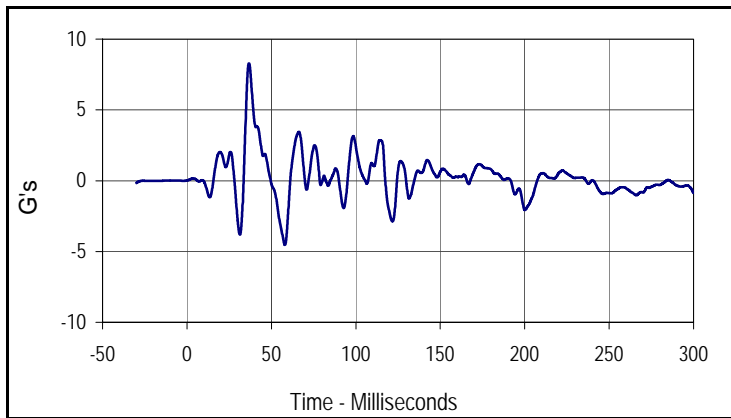
Curve Description			
Bullet Vehicle Center Tunnel X Velocity			
Plot	Type	SAE Class	Units
005	IN1	180	MPH
Max	Time	Min	Time
40.7	0.0	13.9	178.9

Test Vehicle: 1996 Jeep Grand Cherokee 5-Dr MPV
 Test Program: 40 MPH Rear Impact 30% Offset

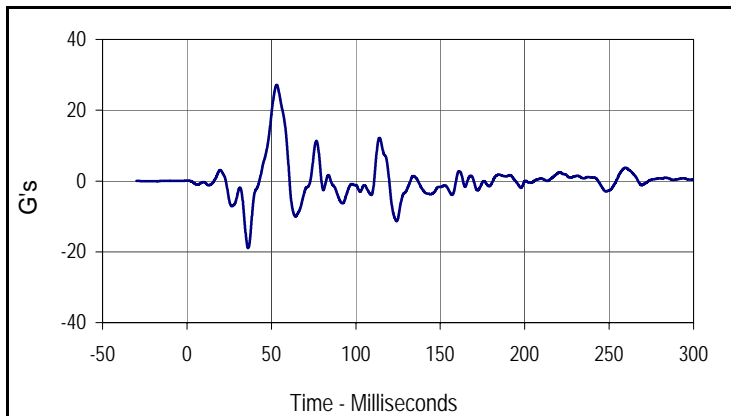
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 Test Date: 5/16/11



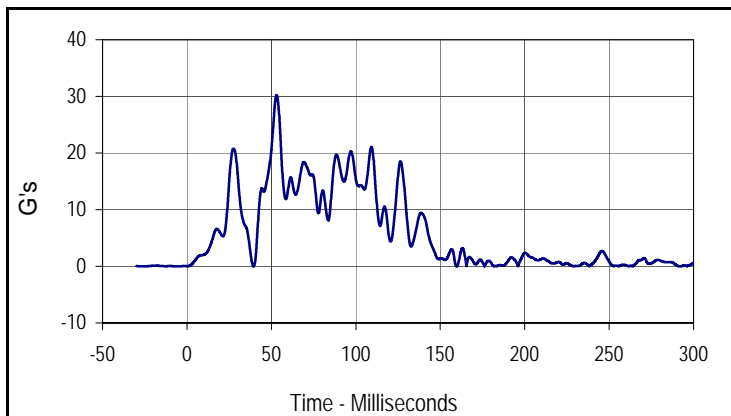
Curve Description			
Target Vehicle Center Tunnel X			
Plot	Type	SAE Class	Units
006	FIL	60	G's
Max	Time	Min	Time
17.4	53.1	-1.6	245.8



Curve Description			
Target Vehicle Center Tunnel Y			
Plot	Type	SAE Class	Units
007	FIL	60	G's
Max	Time	Min	Time
8.3	36.7	-4.5	58.0



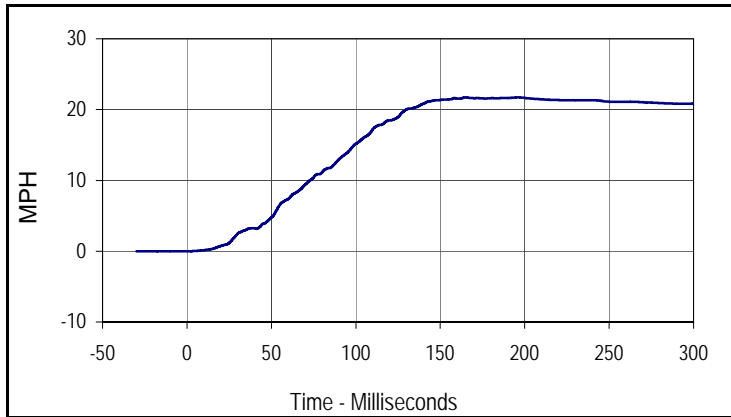
Curve Description			
Target Vehicle Center Tunnel Z			
Plot	Type	SAE Class	Units
008	FIL	60	G's
Max	Time	Min	Time
27.1	53.1	-18.9	36.3



Curve Description			
Target Vehicle Center Tunnel Resultant			
Plot	Type	SAE Class	Units
009	RES	60	G's
Max	Time	Min	Time
30.2	53.1	0.0	291.3

Test Vehicle: 1996 Jeep Grand Cherokee 5-Dr MPV
 Test Program: 40 MPH Rear Impact 30% Offset

Project No.: P31070-01
 Test Date: 5/16/11



Curve Description			
Target Vehicle Center Tunnel X Velocity			
Plot	Type	SAE Class	Units
010	IN1	180	MPH
Max	Time	Min	Time
21.7	196.0	0.0	1.0

APPENDIX C
INSTRUMENTATION DATA CHANNEL ASSIGNMENTS

**40 MPH Rear Impact 30% Offset
Instrumentation Data Channel Assignments
Vehicle Accelerometers
5/16/11
1988 Ford Taurus 4-Dr Sedan**

CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
1	Vehicle Center Tunnel	X	J36724	Accel., Single Axis	Endevco	7264-2000	G
2	Vehicle Center Tunnel	Y	AR17	Accel., Single Axis	Endevco	7264-2000	G
3	Vehicle Center Tunnel	Z	AD99	Accel., Single Axis	Endevco	7264-2000	G

1996 Jeep Grand Cherokee 5-Dr MPV

6	Vehicle Center Tunnel	X	J24512	Accel., Single Axis	Endevco	7264-2000	G
7	Vehicle Center Tunnel	Y	BI14H	Accel., Single Axis	Endevco	7264-2000	G
8	Vehicle Center Tunnel	Z	J24533	Accel., Single Axis	Endevco	7264-2000	G