

**VALIDATION
SIDE IMPACT POLE TEST**

**TOYOTA MOTOR CORPORATION
2010 TOYOTA COROLLA 4-DR SEDAN
NHTSA NUMBER: MA5117**

**PREPARED BY:
MGA RESEARCH CORPORATION
5000 WARREN ROAD
BURLINGTON, WI 53105**



Test Date: June 8, 2009

Report Date: September 18, 2009

FINAL REPORT

**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
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Approval Date: September 18, 2009

FINAL REPORT ACCEPTANCE BY OCWS:

Division Chief, New Car Assessment Program
NHTSA, Office of Crashworthiness Standards

Date: _____

COTR, New Car Assessment Program
NHTSA, Office of Crashworthiness Standards

Date: _____

Technical Report Documentation Page

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16. Abstract A 31.2 km/h (19.5 mph), 75° oblique impact Side Validation Test was conducted on the subject 2010 Toyota Corolla 4-Dr Sedan in accordance with the specifications of the Office of Crashworthiness Standards Side NCAP Pole Laboratory Test Procedure for the generation of consumer information on vehicle side pole crash protection. The test was conducted at MGA Research Corporation, in Burlington, Wisconsin, on June 8, 2009. The impact velocity was 31.2 km/h, and the ambient temperature at the struck (driver's) side of the target vehicle at the time of impact was 21°C. The test vehicle post-test maximum crush was 340 mm at level 3. The test vehicle's occupant performance was as follows: <table border="1" style="margin: 10px auto; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th colspan="3">Driver ATD (SID-IIs)</th> </tr> <tr> <th>Units</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td>N/A</td> <td>1000</td> <td>471</td> </tr> <tr> <td>Resultant Lower Spine Acceleration</td> <td>Gs</td> <td>82</td> <td>69</td> </tr> <tr> <td>Combined Acetabular and Iliac Pelvic Force</td> <td>N</td> <td>5525</td> <td>6016</td> </tr> </tbody> </table> The two doors on the struck side of the vehicle did not separate from the body at the hinges or latches and the opposite doors did not open during the side impact event.				Measurement Description	Driver ATD (SID-IIs)			Units	Threshold	Result	Head Injury Criteria (HIC ₃₆)	N/A	1000	471	Resultant Lower Spine Acceleration	Gs	82	69	Combined Acetabular and Iliac Pelvic Force	N	5525	6016
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17. Key Words Validation Side Impact Pole Part 572V SID-IIs		18. Distribution Statement Copies of this report are available from: National Highway Traffic Safety Administration Technical Reference Division 1200 New Jersey Ave, SE Washington, D.C. 20590																				
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SECTION 1
TEST PURPOSE AND PROCEDURE

This Side Impact Test is part of the FY 2009 Side Impact Validation Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. DTNH22-03-D-12005. The purpose of this test is to generate comparative side impact performance in a 2010 Toyota Corolla 4-Dr Sedan. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Laboratory Side NCAP Pole Laboratory Test Procedure, dated April 2009.

SECTION 2

SUMMARY OF TEST RESULTS

A rigid pole side impact test was conducted on a 2010 Toyota Corolla 4-Dr Sedan. The subject vehicle was towed into the rigid pole at an angle of 75° and a velocity of 31.2 km/h. The test was conducted by MGA Research Corporation in Burlington, Wisconsin, on June 8, 2009. Pre-test and post-test photographs of the test vehicle and Side Impact Dummy (SID-IIs) are included in Appendix A of this report.

One Part 572V (SID-IIs) dummy was placed in the driver designated seating position according to instructions specified in the OCWS Side NCAP Pole Laboratory Test Procedure, dated April, 2009. Camera locations and other pertinent camera information are included in this report.

The Part 572V (SID-IIs) dummy was instrumented accordingly:

- Head CG Triaxial Accelerometers
- Upper Neck Load Cells
- Shoulder Displacement Transducer
- Chest Upper, Middle, and Lower Rib Displacement Transducers
- Abdomen Upper and Lower Rib Displacement Transducers
- Iliac Load Cell
- Acetabulum Load Cell
- Lower Spine Triaxial Accelerometers

Appendix B contains the vehicle and dummy response data. Dummy configuration and performance verification data can be found in Appendix C of this report.

The following table summarizes the results of the test:

DUMMY INJURY VALUES

Dummy	HIC (36ms)	Resultant Lower Spine Acceleration	Pelvic Force (N)	
SID-IIs 5 th Percentile Female	471	69	Iliac Wing	2437
			Acetabular	3653
			Sum	6016

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Left Front Driver (P1)		Left Rear Passenger (P4)	
	Installed	Operated	Installed	Operated
Frontal Airbag	Yes	No		
Knee Airbag	No			
Side Torso Airbag	Yes	Yes	No	
Combination Head/Torso Side Airbag	No		No	
Curtain/Tube Side Airbag	Yes	Yes	Yes	Yes
Seat Belt Pretensioner	Yes	Yes	No	
Seat Belt Load Limiter	Yes	No	No	

The test data can be found on the NHTSA website at www.nhtsa.dot.gov

GENERAL COMMENTS

There was no valid data collected for:

Vehicle CG X after 140 msec.

Driver Seat Track Y after 20 msec.

Right Sill at Impact Line Y after 50 msec.

The driver side curtain airbag was not monitored.

MGA does not endorse or certify products. The manufacturer's name appears solely for identification purposes.

SECTION 3
OCCUPANT AND VEHICLE INFORMATION

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2010 Toyota Corolla 4-Dr Sedan
 Test Program: Validation Side Impact Pole

NHTSA No. MA5117
 Test Date: 6/08/2009

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	MA5117	Anti-Lock Brakes	Yes
Model Year	2010	All Wheel Drive	No
Make	Toyota	Power Steering	Yes
Model	Corolla	Driver Front Airbag	Yes
Body Style	Sedan	Driver Side Airbag	Yes
VIN	JTDBU4EE2A9097255	Driver Head/Torso Airbag	No
Body Color	Blue Streak Metallic	Driver Curtain Airbag	Yes
Delivery Date	6/03/2009	Driver Knee Bag	No
Odometer (km/mi)	132 / 82	LR Pass. Front Airbag	No
Dealer	Jack Safto Toyota	LR Pass. Side Airbag	No
Transmission	Automatic	LR Pass. Head Airbag	No
Final Drive	Front	LR Pass. Curtain Airbag	Yes
Type/No. Cylinders	4	LR Pass. Knee Bag	No
Engine Displacement (L)	1.8	Pretensioners	Yes
Engine Placement	Lateral	Load Limiters	Yes
Roof Rack	No	Air Conditioning	Yes
Sunroof/T-Top	No	AM/FM CD	Yes
Tinted Glass	No	Tilt Wheel	Yes
Traction Control	Yes	Automatic Door Locks	No
Power Brakes	Yes	Power Windows	No
Front Disc	Yes	Power Seats	No
Rear Disc	No	Other:	
Does owner's manual provide instructions to turn off automatic door locks?	N/A		

DATA FROM CERTIFICATION LABEL

Manufactured By	Toyota Motor Corporation	GVWR (kg)	1742
Date of Manufacture	01/09	GAWR Front (kg)	948
		GAWR Rear (kg)	839

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity (DSC)	2	3		5	(A)
Vehicle Capacity Weight (VCW) (kg)				370	(B)
DSC x 68.04 kg				340	(A-B)
Rated Cargo and Luggage Weight (RCLW) (kg)				30	

VEHICLE SEAT TYPE

Seating Location	Type of Seat Pan				Type of Seat Back		
	Bucket	Bench	Split Bench	Contoured	Fixed	Adjustable w/ Lever	w/ Knob
Front Seat	X					X	
Rear or Second Row Seat	X				X		
Third Row Seat							

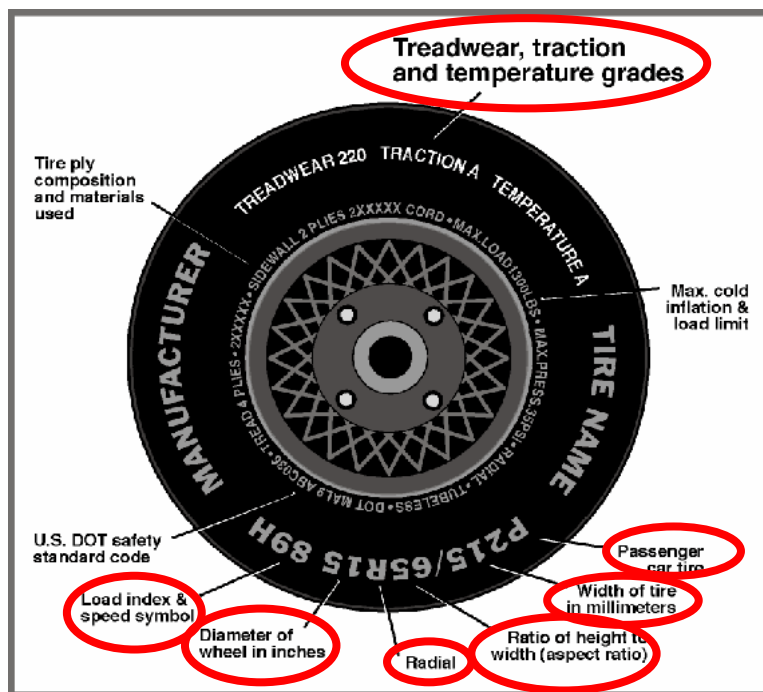
DATA SHEET NO. 1 (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2010 Toyota Corolla 4-Dr Sedan
 Test Program: Validation Side Impact Pole

NHTSA No. MA5117
 Test Date: 6/08/2009

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	275	275
Cold Pressure (kPa)	210	210
Recommended Tire Size	P195/65R15	P195/65R15
Tire Size on Vehicle	P195/65R15	P195/65R15
Tire Model	Firestone	Firestone
Tire Manufacturer	Affinity	Affinity
Treadwear	500	500
Traction	A	A
Temperature Grades	B	B
Tire Plies Sidewall	1 ply polyester	1 ply polyester
Tire Plies Body	1 ply polyester + 2 steel	1 ply polyester + 2 steel
Load Index & Speed Symbol	89S	89S
Tire Material	Rubber	Rubber
DOT Safety Code Right	W2C6 AA7 4008	W2C6 AA7 4008
DOT Safety Code Left	W2C6 AA7 4008	W2C6 AA7 4008

DATA SHEET NO. 1 (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2010 Toyota Corolla 4-Dr Sedan
 Test Program: Validation Side Impact Pole

NHTSA No. MA5117
 Test Date: 6/08/2009

TEST VEHICLE AXLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	375.6	257.2		404.6	275.8		398.7	288.5	
Right	kg	379.6	235.9		395.5	249.5		384.7	258.5	
Ratio	%	60.5	39.5		60.4	39.6		58.9	41.1	
Totals	kg	755.2	493.1	1248.3	800.1	525.3	1325.4	783.4	547.0	1330.4

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total As Delivered Weight (UVW)	kg	1248.3	(A)
Actual Weight of 1 P572V ATD (SID-IIs) Dummy Used	kg	52.2	(B)
Rated Cargo/Luggage Weight (RCLW)	kg	30	(C)
Calculated Vehicle Target Weight (TVTW)	kg	1330.5	(A+B+C)

TEST VEHICLE ATTITUDES AND CG

	Units	As Delivered	As Tested	Fully Loaded
Driver Door Sill Angle (front-to-rear)*	deg	0.0	0.2	0.3
Front Passenger Sill Angle (front-to-rear)*	deg	-0.3	-0.1	0.2
Front Bumper Angle (left-to-right)**	deg	0.0	0.0	-0.2
Rear Bumper Angle (left-to-right)**	deg	0.0	-0.2	-0.3
Vehicle CG (Aft of Front Axle)	mm	1029	1033	1071
Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline)	mm	11	20	25

*Front up is positive ** Left up is positive

GENERAL VEHICLE TEST DATA

Measurement Description	Units	Value
Weight of Ballast in Cargo Area	kg	0
Weight of Vehicle Components Removed	kg	25.9

Vehicle components removed to make target vehicle test weight: Tail lights, spare tire, jack, tools, spare tire cover, right front mirror, right rear speaker, rear seat head rests, hub caps, engine cover, trunk carpet.

TEST VEHICLE VERTICAL IMPACT LINE DATA

Measurement Parameter	Units	Value
Vertical Impact Reference Line (Aft of Front Axle)	mm	1036
Actual Impact Point (Aft of Front Axle)	mm	1049
Impact Point Difference	mm	13

DATA SHEET NO. 2

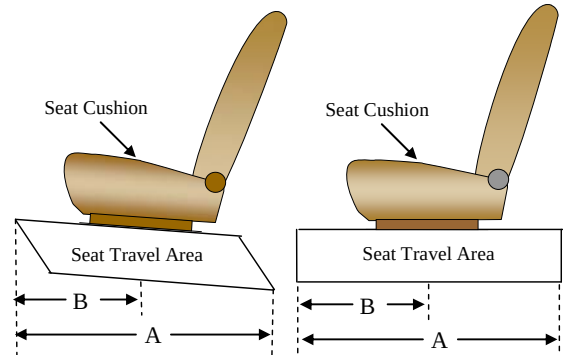
SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT, AND FUEL SYSTEMS DATA

Test Vehicle: 2010 Toyota Corolla 4-Dr Sedan
 Test Program: Validation Side Impact Pole

NHTSA No. MA5117
 Test Date: 6/08/2009

SEAT FORE/AFT POSITIONS

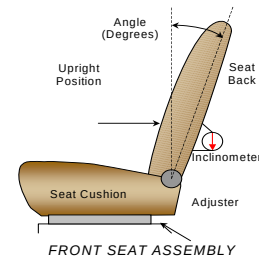
The driver seat was a manual fore/aft adjustable seat with a manual angle adjustment. The seat travel was set as specified in Appendix B of the TP dated April 2009. The right front passenger manual seat was set to match the driver seat. The rear passenger seats' were non-adjustable.



SEAT FORE/AFT POSITIONING	Total Fore/Aft Travel (mm)	Placed in Detent # or Position (mm)
Driver Seat	17 detents	0 detent (full forward)
Front Passenger Seat	17 detents	0 detent (full forward)
Rear Seat – Struck Side	Fixed	
Rear Seat – Non-Struck Side	Fixed	

SEAT BACK ANGLE POSITION

The seat back was set as specified in Appendix B of the TP dated April 2009. The seat back angle measurement was made relative to the rocker sill at the headrest post.



SEAT BACK ANGLE	Degrees	Detents
Driver Seat Back Angle with Seated Dummy	-5.4	
Front Passenger Seat Back Angle	-5.7	
Struck Side Rear Seat Back Angle	Fixed	
Non-Struck Side Rear Passenger Seat Back Angle	Fixed	

SEAT BELT UPPER ANCHORAGE

The driver and passenger seat belt upper anchorages were set in the lowermost position.

SEAT BELT UPPER ANCHORAGE POSITIONING	Total # of Positions	Placed in Position #
Driver Seat	4 detents	3 (uppermost as 0)
Front Passenger Seat	4 detents	3 (uppermost as 0)

DATA SHEET NO. 2 (CONTINUED)

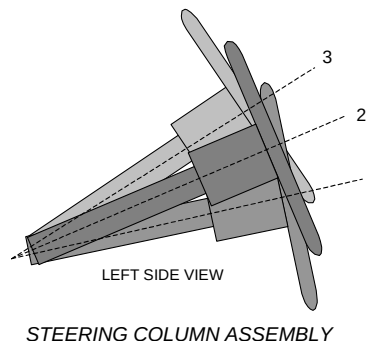
SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT, AND FUEL SYSTEMS DATA

Test Vehicle: 2010 Toyota Corolla 4-Dr Sedan
 Test Program: Validation Side Impact Pole

NHTSA No. MA5117
 Test Date: 6/08/2009

STEERING COLUMN ADJUSTMENT

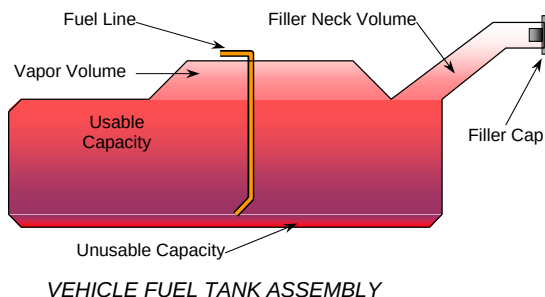
Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes when moved through its full range of motion. An aluminum plate is placed across the rim of the steering wheel, an inclinometer is placed on the plate and the angle is measured.



STEERING COLUMN POSITIONING

	Degrees	Fore/Aft Position (mm)
Lowermost - Position 1	63.3	143 mm
Geometric Center – Position 2	64.7	163 mm
Uppermost – Position 3	66.1	183 mm
Telescoping Steering Wheel Travel	2.8	40 mm
Test Position	64.7	163 mm

Describe the fuel pump type, its behavior, and the location of the fuel filler pipe. The test vehicle is equipped with an electric fuel pump. The fuel pump is activated when the ignition is turned on. The fuel pipe is on the left side.



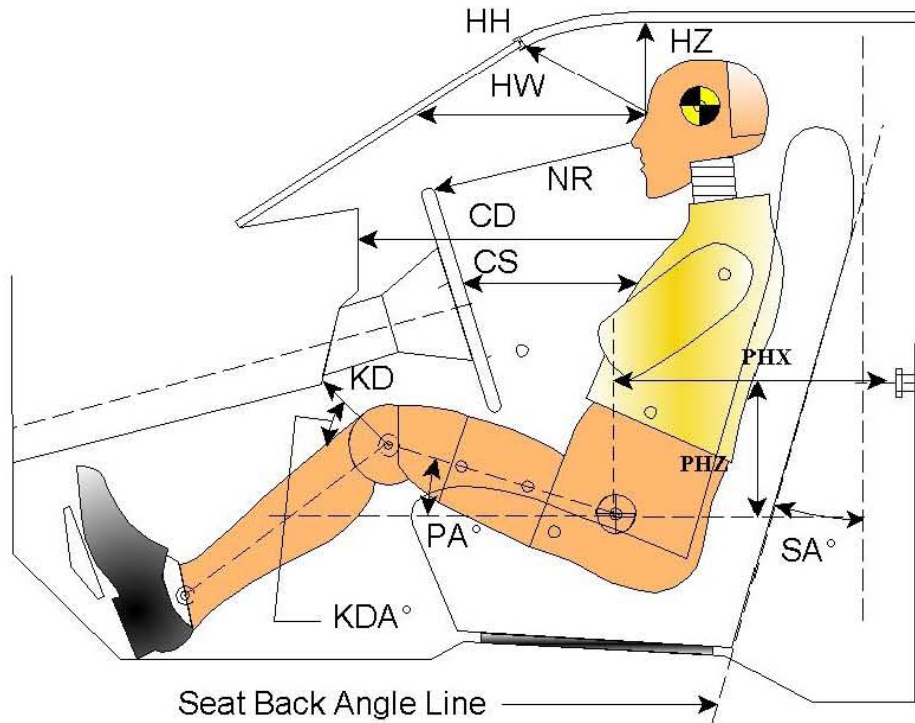
FUEL CAPACITY DATA

	Liters
Usable Capacity of "Standard" Tank	50.0
Usable Capacity of "Optional" Tank	
Usable Capacity of Standard Tank as Specified in Owner's Manual	50.0
Usable Capacity of Optional Tank as Specified in Owner's Manual	
92-94% of Usable Capacity	46.0 to 47.0
Actual Amount of Solvent Used	46.2
1/3 of Usable Capacity	16.7

.DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2010 Toyota Corolla 4-Dr Sedan
 Test Program: Validation Side Impact Pole

NHTSA No. MA5117
 Test Date: 6/08/2009

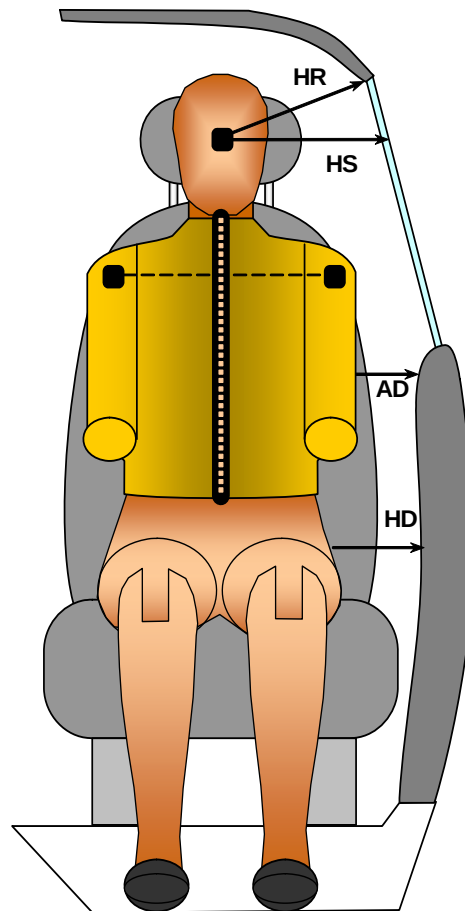


Code	Measurement Description	Driver S/N 296	
		Length (mm)	Angle (°)
HH	Head to Header	258	
HW	Head to Windshield	567	
HZ	Head to Roof	172	
NR	Nose to Rim	222	
CD	Chest to Dash	367	
CS	Chest to Steering Wheel	152	
KDL/KDAL°	Left Knee to Dash	82	30.8
KDR/KDAR°	Right Knee to Dash	67	32.1
PA°	Pelvic Angle		21.3
PHX	H-Point to Striker (X-Axis)	360	
PHZ	H-Point to Striker (Z-Axis)	202	
SA°	Seat Back Angle		-5.4

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2010 Toyota Corolla 4-Dr Sedan
Test Program: Validation Side Impact Pole

NHTSA No. MA5117
Test Date: 6/08/2009



FRONT VIEW OF DUMMY

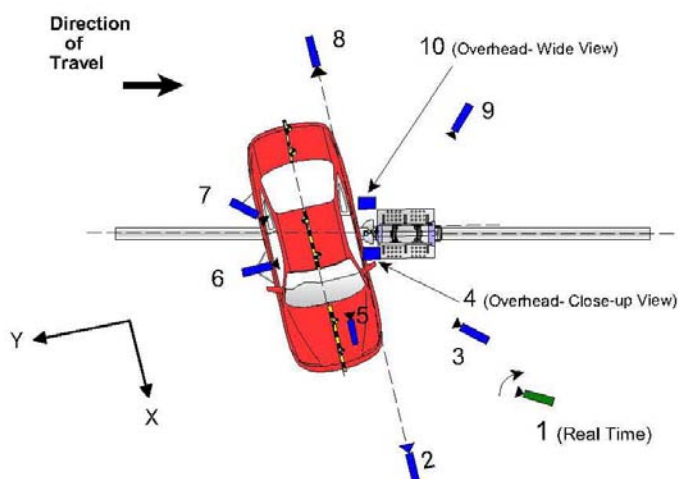
Code	Measurement Description	Length (mm)
HR	Head to Side Header	228
HS	Head to Side Window	351
AD	Arm to Door	190
HD	H-Point to Door	181

DATA SHEET NO. 5

CAMERA LOCATIONS AND DATA

Test Vehicle: 2010 Toyota Corolla 4-Dr Sedan
 Test Program: Validation Side Impact Pole

NHTSA No. MA5117
 Test Date: 6/08/2009



Reference: From Point of Impact for X and Y; from Ground for Z):
 +X = Forward of Impact, + Y = Right of Impact, +Z = Down

Camera No.	View	Coordinates (mm)			Lens (mm)	Film Speed (fps)
		X*	Y*	Z*		
1	Real-Time				13	24
2	Front Ground Level	5540	-1560	-1715	24	1000
3	Impact Side 45° Forward	3245	-2570	-1810	20	1000
4	Overhead Closeup	0	-70	-4520	50	1000
5	Onboard – Driver Front				12.5	1000
6	Onboard – Driver Side				8	1000
7	Onboard – Driver Rear				8	1000
8	Rear Ground Level	-5950	1510	-1810	24	1000
9	Impact Side 45° Rearward	-3565	-2755	-1785	20	1000
10	Overhead Side	0	-580	-4890	14	1000

* All measurements accurate to ± 6 mm

Note: Vehicle was at a 15° angle to the rigid pole.

INSTRUMENTATION

	Number of Channels
Driver Dummy	23
Vehicle Structure	21
Pole Load Cells	0
Contact Switches	3
Airbag Timing	1
Total No. of Data Channels	48

DATA SHEET NO. 6

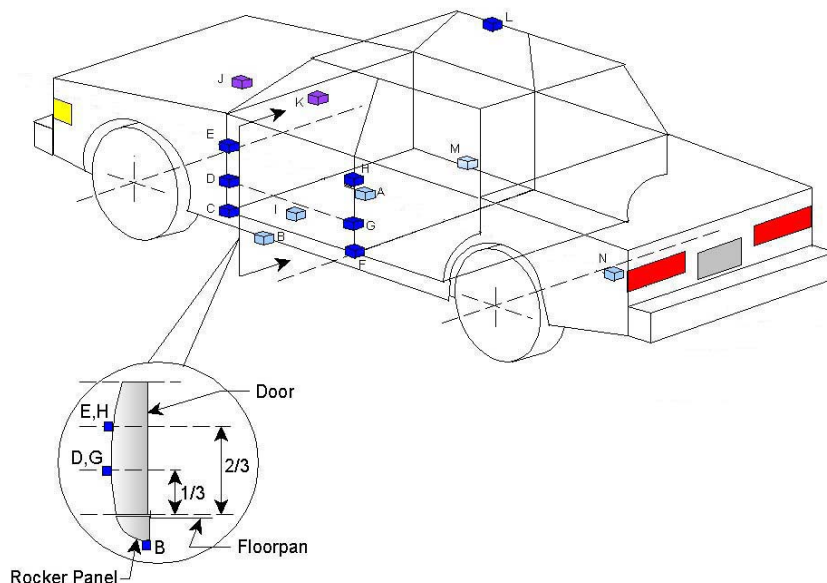
VEHICLE ACCELEROMETER DATA

Test Vehicle: 2010 Toyota Corolla 4-Dr Sedan

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Test Program: Validation Side Impact Pole

Test Date: 6/08/2009



	Accelerometer Location			
	ID	Coordinates (mm)		
		X	Y	Z
A	Vehicle CG	1998	-15	-301
	Vehicle CG Sensor	1998	0	-301
B	Left Floor Sill	2839	-690	-220
C	A Pillar Sill	3106	-698	-216
D	A Pillar Low	3127	-671	-496
E	A Pillar Mid	3138	-782	-772
F	B Pillar Sill	2056	-690	-229
G	B Pillar Low	2069	-707	-537
H	B Pillar Mid	2054	-702	-808
I	Driver Seat	2269	-536	-325
L	Engine Top	3727	0	-850
J	Firewall	3365	-22	-826
K	Right Roof	2166	529	-1446
M	Right Floor Sill	2264	690	-221
N	Rear Floorpan	971	0	-506

Reference: From Point of Impact for X and Y; from Ground for Z):

+X = Forward of Vehicle, + Y = Right of Vehicle, +Z = Down

DATA SHEET NO. 7
RIGID POLE LOAD CELL DATA

Test Vehicle: 2010 Toyota Corolla 4-Dr Sedan
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NHTSA No. MA5117
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254 mm Diameter Rigid Pole

The pole was not instrumented.

Load Cell Locations	
ID	Height From Ground (m)
1	
2	
3	
4	
5	
6	
7	
8	

DATA SHEET NO. 8

POST-TEST OBSERVATIONS

Test Vehicle: 2010 Toyota Corolla 4-Dr Sedan

NHTSA No. MA5117

Test Program: Validation Side Impact Pole

Test Date: 6/08/2009

TEST DUMMY INFORMATION AND CONTACT

Description	Driver Dummy
Dummy Type / Serial No.	SID-IIs / 296
Head Contact	Curtain Airbag, Headrest
Upper Torso Contact	Side Airbag
Lower Torso Contact	Door Panel
Left Knee Contact	Door Panel
Right Knee Contact	Left Knee

POST TEST DOOR OPENING AND SEAT TRACK INFORMATION

Description	Front	Rear
Left Side Doors	Remained closed and jammed shut	Remained closed and jammed shut
Right Side Doors	Remained closed and operational	Remained closed and operational
Hatch and Other Doors	Remained closed and operational	Remained closed and operational
Seat Movement	0	0
Seat Back Failure	None	None

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	No Separation
Sill Separation	None
Windshield Damage	Cracked
Window Damage	Left Front Window Broke
Other Notable Effects	None

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Left Front Driver (P1)		Left Rear Passenger (P4)	
	Installed	Operated	Installed	Operated
Frontal Airbag	Yes	No		
Knee Airbag	No			
Side Torso Airbag	Yes	Yes	No	
Combination Head/Torso Side Airbag	No		No	
Curtain/Tube Side Airbag	Yes	Yes	Yes	Yes
Seat Belt Pretensioner	Yes	Yes	No	
Seat Belt Load Limiter	Yes	No	No	

VEHICLE SPEED AND IMPACT DATA

Measured Parameter	Units	Requirement	Value
Horizontal Offset from Vertical Impact Reference Line	mm	+/- 38	+13
Trap No. 1 Velocity (Primary) – Radar Speed	km/h	30.4 to 32.0	31.2
Trap No. 2 Velocity (Redundant)	km/h	30.4 to 32.0	31.2

DATA SHEET NO. 9

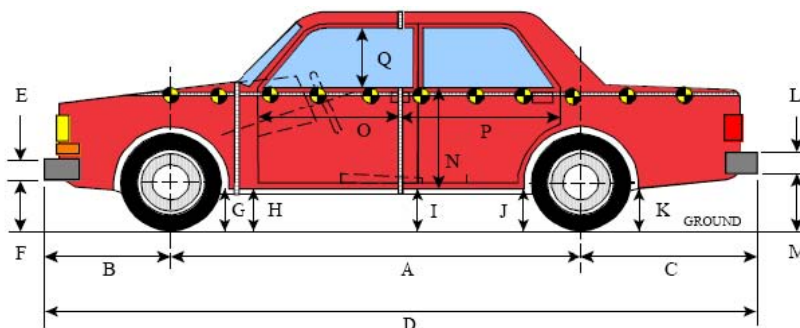
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2010 Toyota Corolla 4-Dr Sedan

NHTSA No. MA5117

Test Program: Validation Side Impact Pole

Test Date: 6/08/2009



LEFT SIDE VIEW

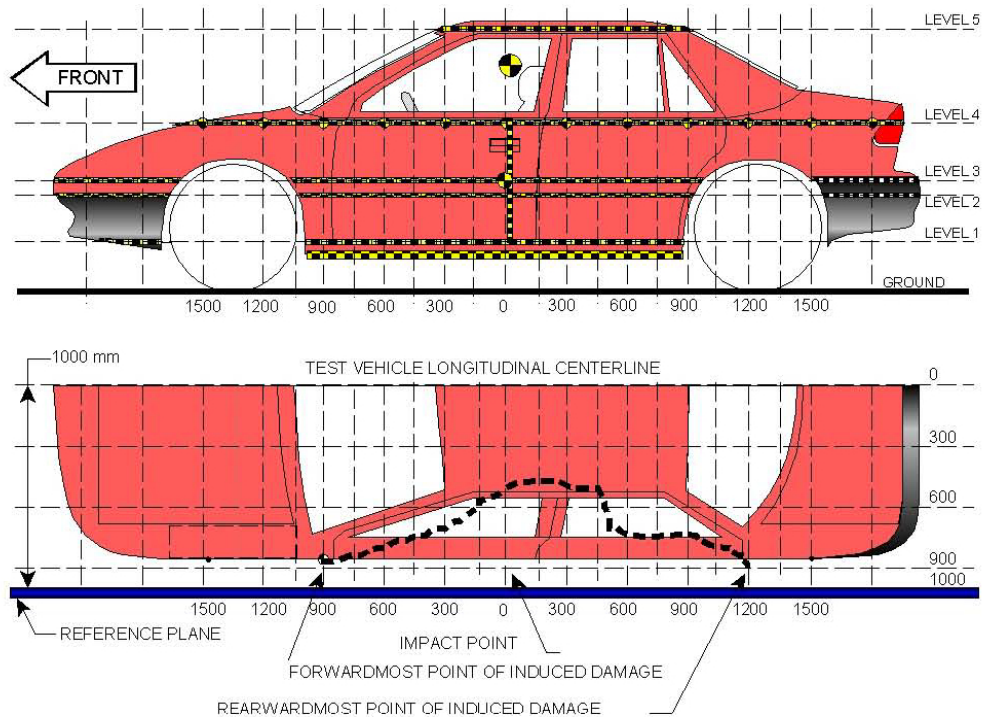
All MEASUREMENTS IN (mm) WITH TOLERANCE OF ± 3 mm

Code	Measurement Description	Pre-Test (mm)	Post-Test (mm)	Difference (mm)
A	Wheelbase	2606	2554	52
B	Front Axle to FSOV	930	937	-7
C	Rear Axle to RSOV	1003	1020	-17
D1	Total Vehicle Length at Left Side	3482	3398	84
D2	Total Vehicle Length at Centerline	4539	4511	28
D3	Total Vehicle Length at Right Side	3482	3500	-18
E	Front Bumper Thickness	137	137	0
F	Front Bumper Bottom to Ground	215	248	-33
G	Sill Height at Front Wheel Well	167	167	0
H	Sill Height at Front Door Leading Edge	181	184	-3
I	Sill Height at B Pillar	195	218	-23
J1	Sill Height at Rear Wheel Well	211	232	-21
J2	Pinch Weld Height at Rear Wheel Well	203	211	-8
K	Sill Height Aft of Rear Wheel Well	256	268	-12
L	Rear Bumper Thickness	136	136	0
M	Rear Bumper Bottom to Ground	427	418	9
N	Sill Height to Window Bottom Sill	713	712	1
O	Front Door Leading Edge to Impact CL	592	587	5
P	Rear Door Trailing Edge to Impact CL	1311	1305	6
Q	Front Window Opening	382	353	29
R	Right Side Length	3482	3500	-18
S	Left Side Length	3482	3398	84
T	Vehicle Width at B Post	1759	1672	87

DATA SHEET NO. 10
VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2010 Toyota Corolla 4-Dr Sedan
 Test Program: Validation Side Impact Pole

NHTSA No. MA5117
 Test Date: 6/08/2009



Level	Measurement Description	Height Above Ground (mm)
1	Sill Top	297
2	Occupant H-Point	568
3	Mid-Door	635
4	Window Sill	974
5	Window Top	1385

NOTE: The above measurements are taken along the vertical impact reference line.
 Vehicle measurements forward of the vertical impact reference line are negative.

DATA SHEET NO. 10 (CONTINUED)

VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2010 Toyota Corolla 4-Dr Sedan
Test Program: Validation Side Impact Pole

NHTSA No. MA5117
Test Date: 6/08/2009

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-1350				295					307					12	
-1200				284					300					16	
-1050				279					301					22	
-900				280					305					25	
-825				280					308					28	
-750			220	282				260	313				40	31	
-675		220	223	284			264	265	318			44	42	34	
-600	252	226	229	287		299	270	270	325		47	44	41	38	
-525	261	232	233	289		320	280	284	342		59	48	51	53	
-450	269	235	234	292		351	329	321	364		82	94	78	72	
-375	272	235	234	293		380	365	363	392		108	130	129	99	
-300	274	235	233	294		405	392	392	420		131	157	159	126	
-225	274	234	232	295		437	424	423	457		163	190	191	162	
-150	273	232	230	296	521	465	460	461	493	610	192	228	231	197	89
-75	273	231	228	298	518	504	496	501	520	601	231	265	273	222	83
0	272	229	227	298	512	551	550	550	569	628	279	321	323	271	116
75	271	228	225	299	509	550	564	565	569	616	279	336	340	270	107
150	269	227	224	299	509	503	527	533	539	588	234	300	309	240	79
225	269	227	224	298	510	452	483	495	495	584	183	256	271	198	74
300	268	226	223	300	511	428	443	449	454	575	160	217	226	154	64
375	267	225	223	300	512	394	390	391	409	562	127	165	168	109	50
450	266	225	222	303	513	355	327	323	380	549	89	102	101	77	36
525	267	225	223	305	513	348	302	299	369	539	81	77	76	64	23
600	267	225	223	306	513	337	295	293	365	533	70	70	70	59	20
675	266	225	223	309	514	321	284	282	359	527	55	59	59	50	13
750	265	225	223	310	515	306	275	275	355	526	41	50	52	45	11
825	265	226	224	312	516	291	265	261	356	525	26	39	37	44	9
900	263	226	224	315	517	279	255	255	342	522	16	29	31	27	5
1050	259	226	224	319	522	233	237	237	333	525	-26	11	13	14	3
1200	246	221	223	326	530	222	213	217	324	531	-24	-8	-6	-2	1
1350			217	333				218	318				1	-15	
1500				341					350					9	
1650				352					364					12	
1800				365					376					11	
1950				379					389					10	
2100				396					403					7	
2250				415					420					5	

DATA SHEET NO. 10 (CONTINUED)

VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2010 Toyota Corolla 4-Dr Sedan
Test Program: Validation Side Impact Pole

NHTSA No. MA5117
Test Date: 6/08/2009

MAXIMUM CRUSH DATA

	Level 1	Level 2	Level 3	Level 4	Level 5
Maximum Crush (mm)	279	336	340	271	116
Distance From Impact (mm)	75	75	75	0	0

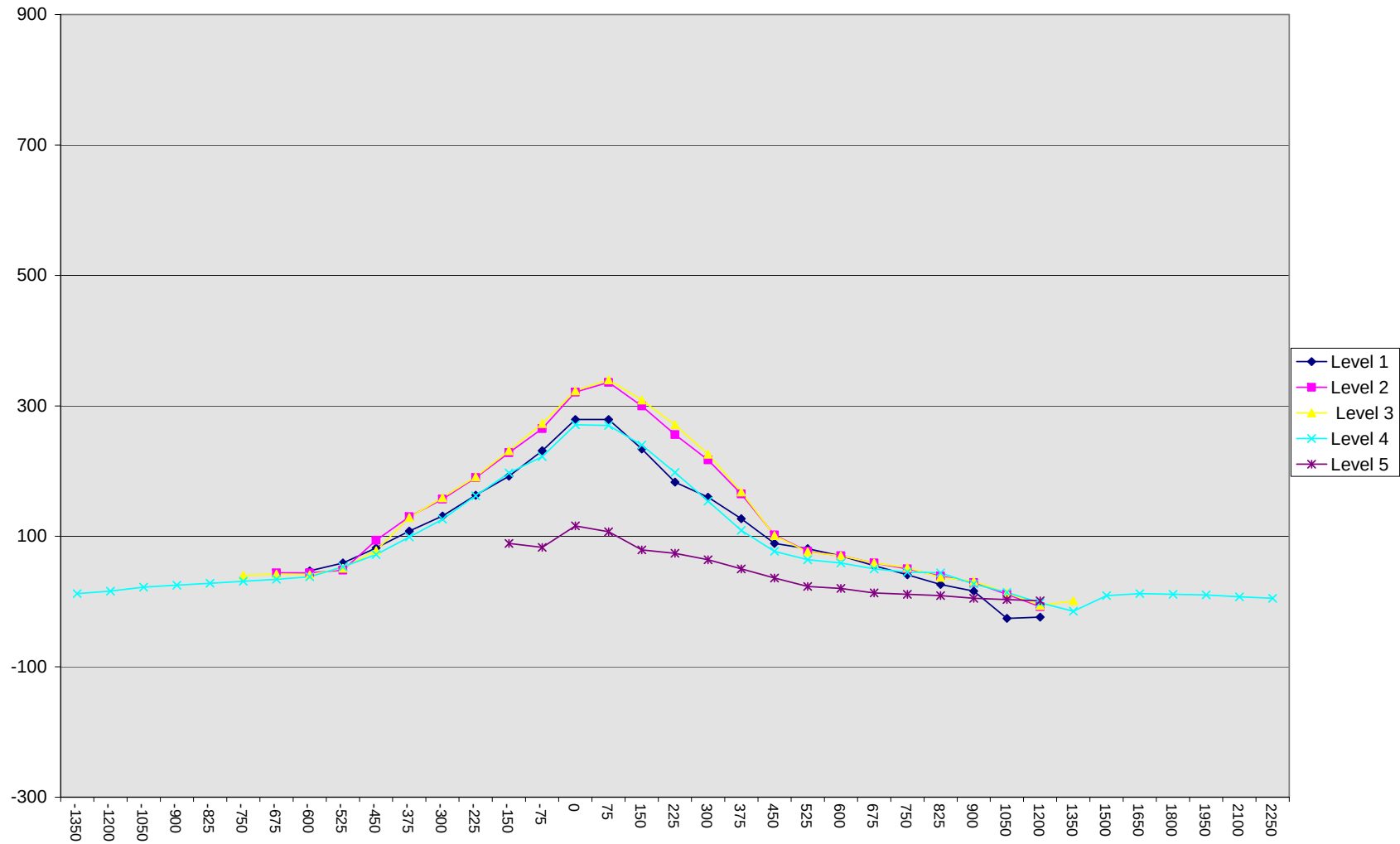
Note: Pre-test measurements are taken when the vehicle is in the "As Tested" weight condition. Vehicle measurements forward of the vertical impact reference line are negative. The crush profile grid is established prior to test based on an estimated impact point. The final distance to impact is determined after the final dummy positioning and the pole is aligned with the center of gravity of the dummy's head.

DATA SHEET NO. 10 (CONTINUED)
VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2010 Toyota Corolla 4-Dr Sedan
Test Program: Validation Side Impact Pole

NHTSA No. MA5117
Test Date: 6/08/2009

20

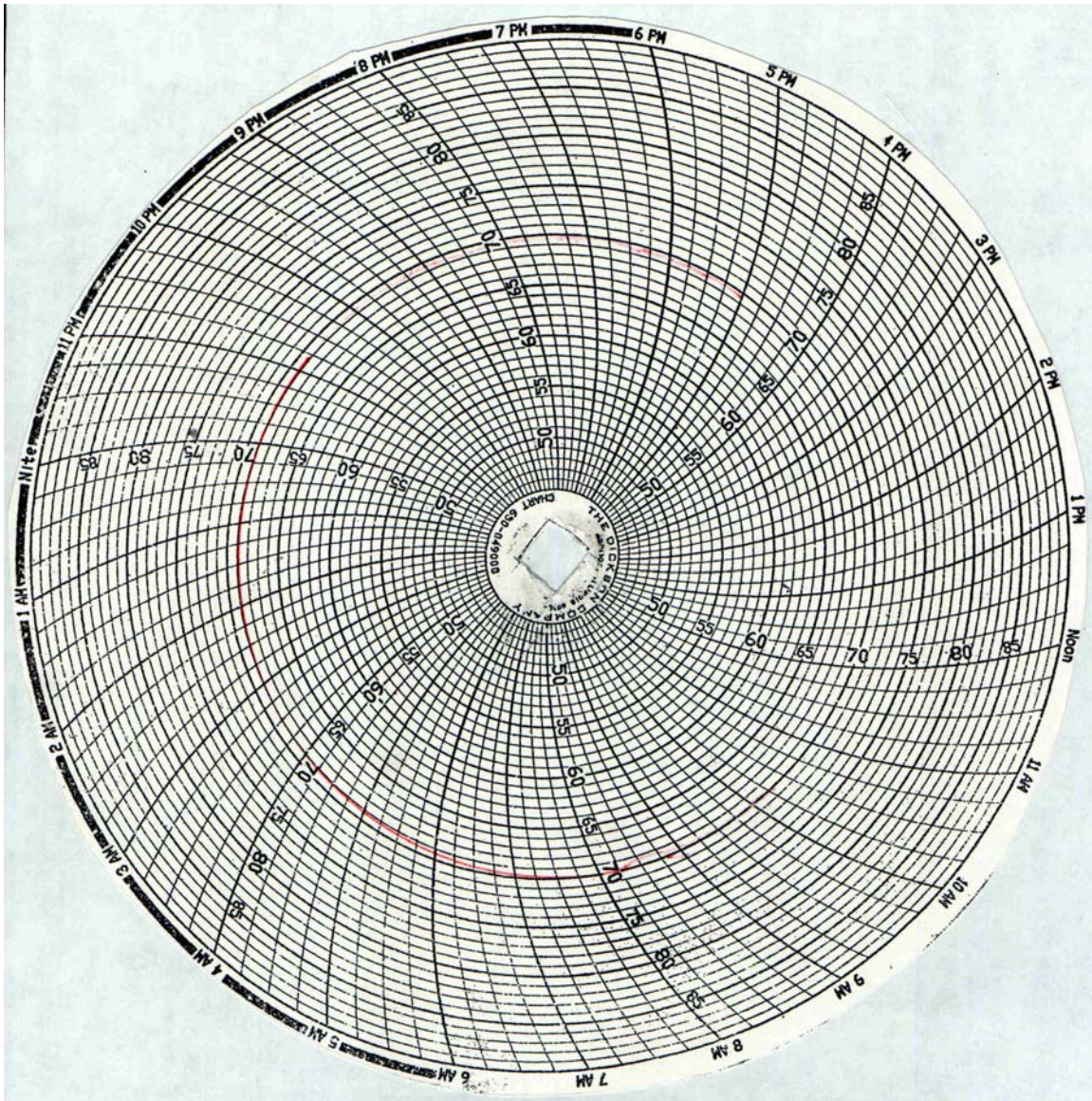


DATA SHEET NO. 11

DUMMY/VEHICLE TEMPERATURE STABILIZATION DATA

Test Vehicle: 2010 Toyota Corolla 4-Dr Sedan
Test Program: Validation Side Impact Pole

NHTSA No. MA5117
Test Date: 6/08/2009



APPENDIX A
PHOTOGRAPHS

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As Delivered Left Front $\frac{3}{4}$ View of Test Vehicle



As Delivered Left Rear $\frac{3}{4}$ View of Test Vehicle



Pre-Test Frontal View of Test Vehicle



Post-Test Frontal View of Test Vehicle



Pre-Test Left Front $\frac{3}{4}$ View of Test Vehicle



Post-Test Left Front $\frac{3}{4}$ View of Test Vehicle



Pre-Test Left Side View of Test Vehicle



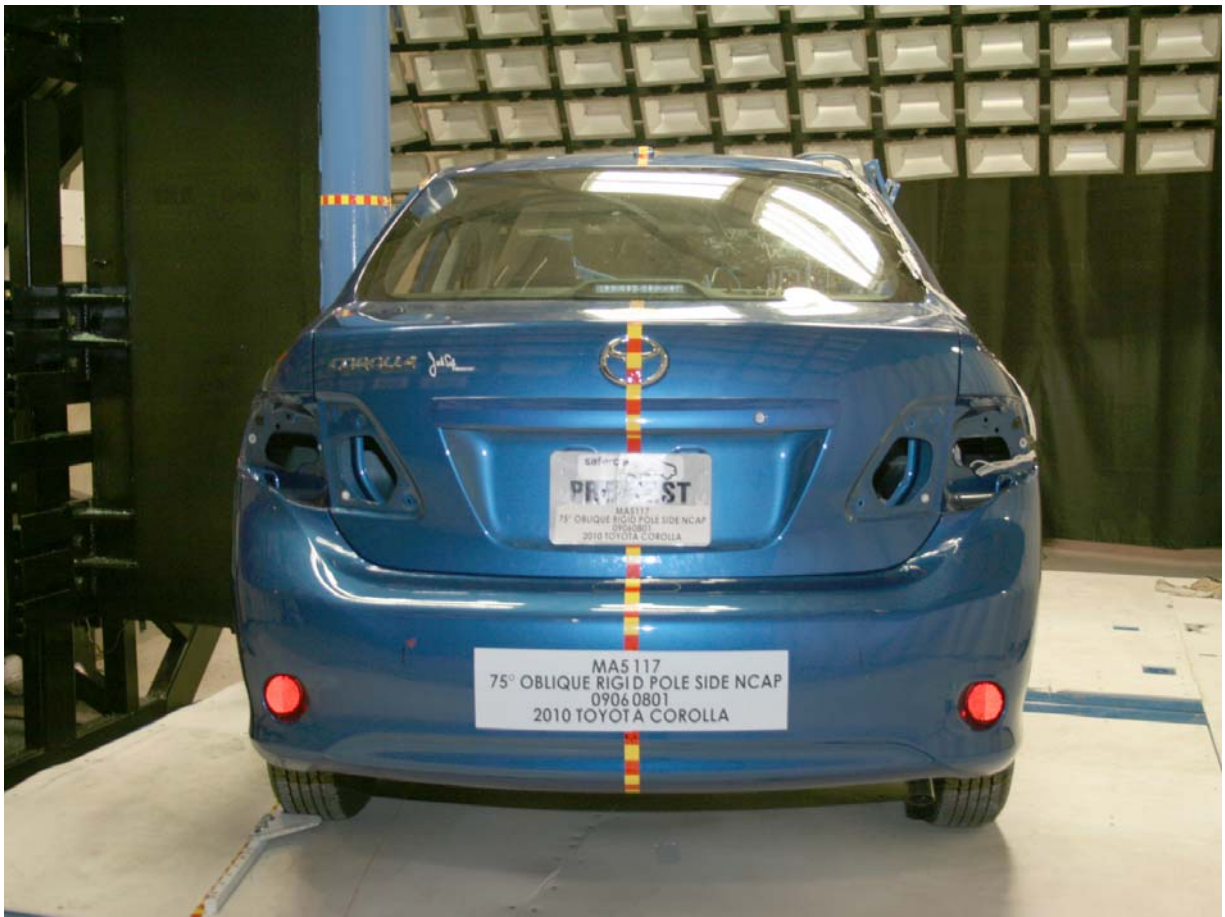
Post-Test Left Side View of Test Vehicle



Pre-Test Left Rear $\frac{3}{4}$ View of Test Vehicle



Post-Test Left Rear $\frac{3}{4}$ View of Test Vehicle



Pre-Test Rear View of Test Vehicle



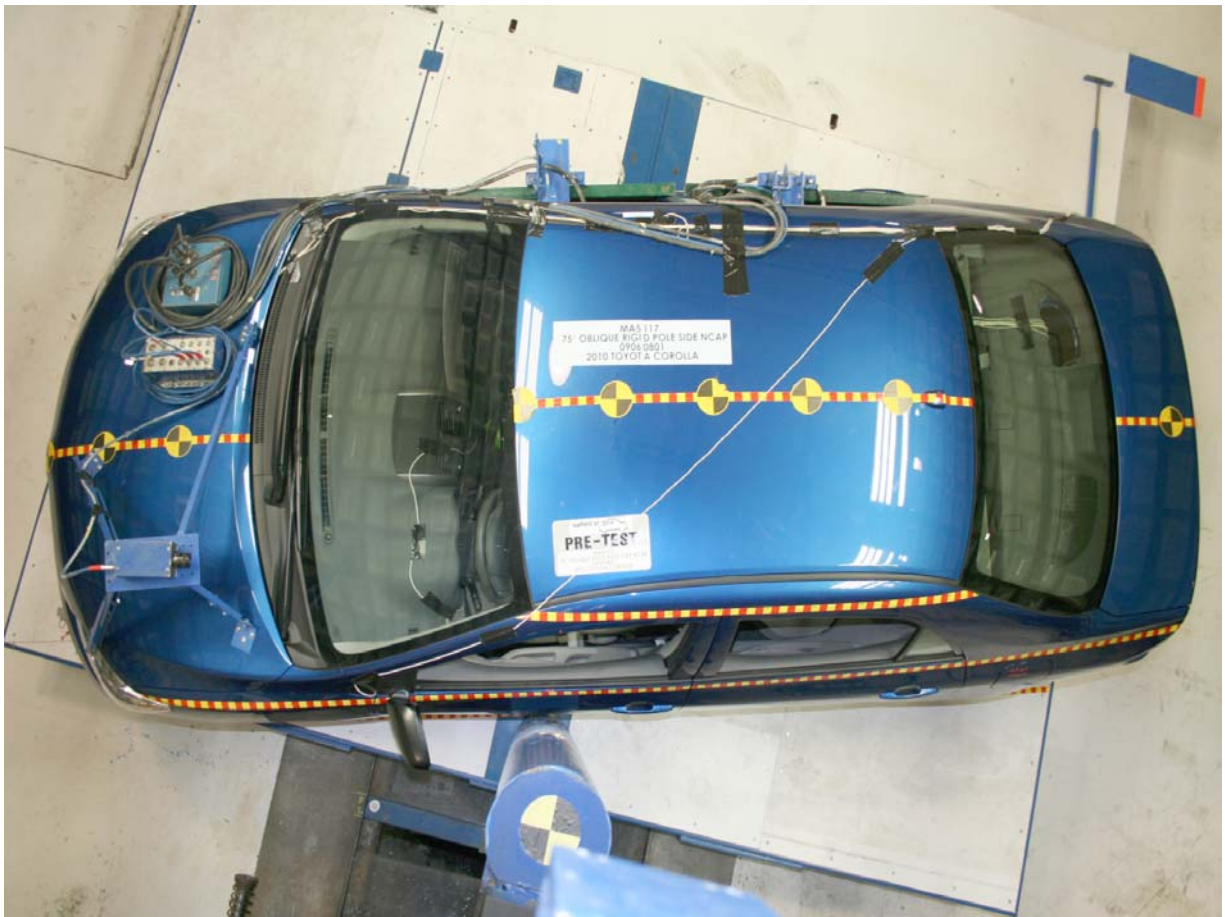
Post-Test Rear View of Test Vehicle



Pre-Test Right Side View of Test Vehicle



Post-Test Right Side View of Test Vehicle



Pre-Test Overhead View of Test Vehicle and Pole



Post-Test Overhead View of Test Vehicle and Pole



Pre-Test Left Side View of Pole Positioned Against Side of Vehicle at Ideal Impact Point



Pre-Test Right Side View of Pole Positioned Against Side of Vehicle at Ideal Impact Point



Pre-Test Close-Up View of Impact Point Target



Post-Test Close-Up View of Impact Point Target Showing Impact Location



Pre-Test Front Close-Up View of Dummy (through front window)



Post-Test Front Close-Up View of Dummy (through front window)



Pre-Test Left Side View of Dummy Showing Belts, Chalking, and Contact Switches (Door Open)



Pre-Test Left Side View of Dummy Shoulder and Door Top View



Post-Test Left Side View of Dummy Shoulder and Door Top View

NO PHOTOGRAPH AVAILABLE

Pre-Test Frontal View of Seat Back Prior to Dummy Positioning



Pre-Test Frontal View of Dummy Head and Shoulders in Relation to Head Restraint

NO PHOTOGRAPH AVAILABLE

Pre-Test Frontal View of Seat Pan Prior to Dummy Positioning (showing centerline)



Pre-Test Overhead View of Dummy Thighs on Seat Pan

NO PHOTOGRAPH AVAILABLE

Pre-Test View of Dummy's Neck Showing Position of Adjustable Neck Bracket

NO PHOTOGRAPH AVAILABLE

Pre-Test View of Dummy's Head Showing Dummy's Head is Level (level should be shown in photo)



Pre-Test Placement of Dummy's Feet



Pre-Test View of Belt Anchorage for Dummy to Show Position



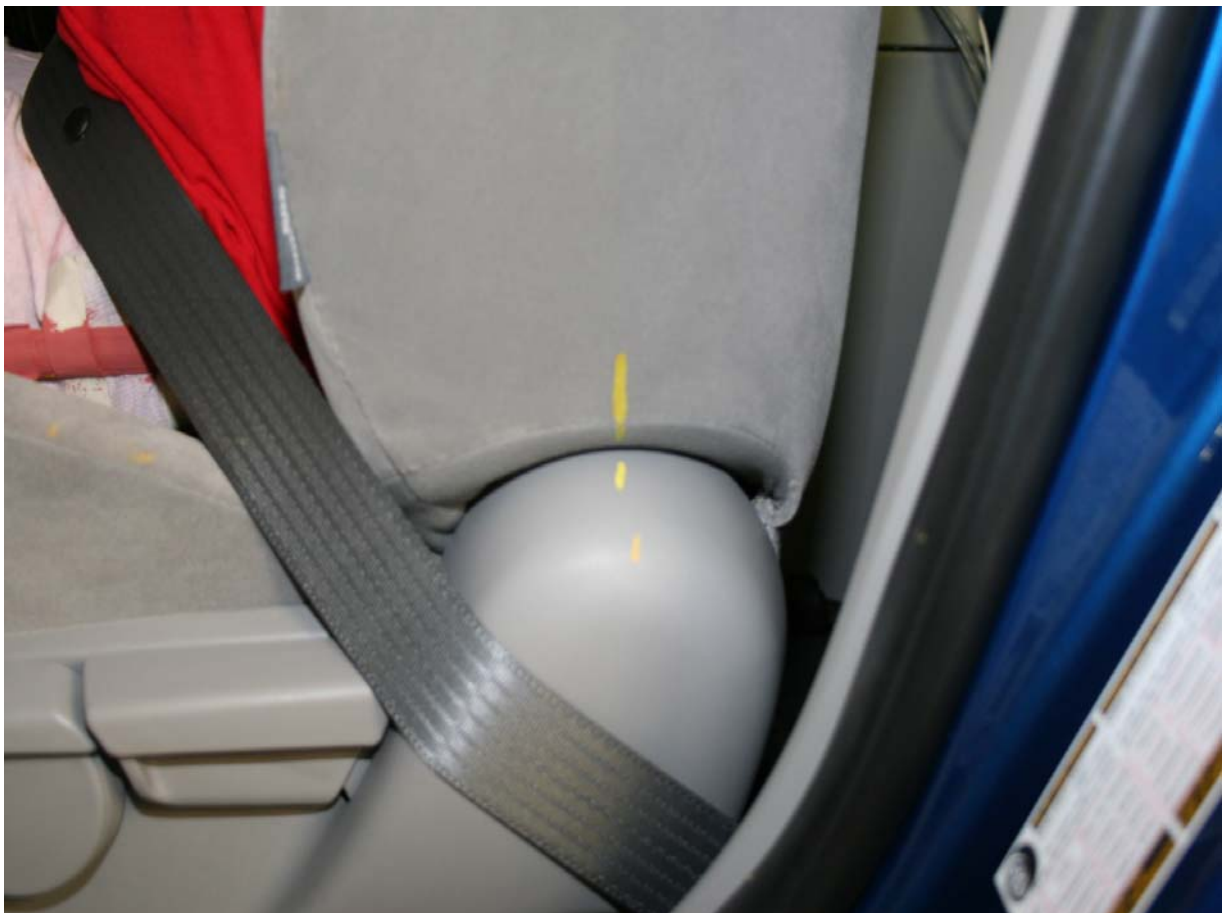
Pre-Test Left Side View of Steering Wheel to Show Position



Pre-Test View of Parking Brake



Pre-Test Close-Up Left Side View of Driver Seat Track Showing Test Position



Pre-Test Close-Up Left Side View of Driver Seat Back Showing Test Position

NO PHOTOGRAPH AVAILABLE

Pre-Test Close-Up View of Driver Seat Back or Head Restraint Showing Seat Back Test Position



Pre-Test Dummy and Door Clearance View



Post-Test Dummy and Door Clearance View



Pre-Test Right Side View of Dummy and Front Seat Occupant Compartment



Post-Test Right Side View of Dummy and Front Seat Occupant Compartment



Pre-Test Inner Door Panel View



Post-Test Inner Door Panel View Showing Dummy Contact Location



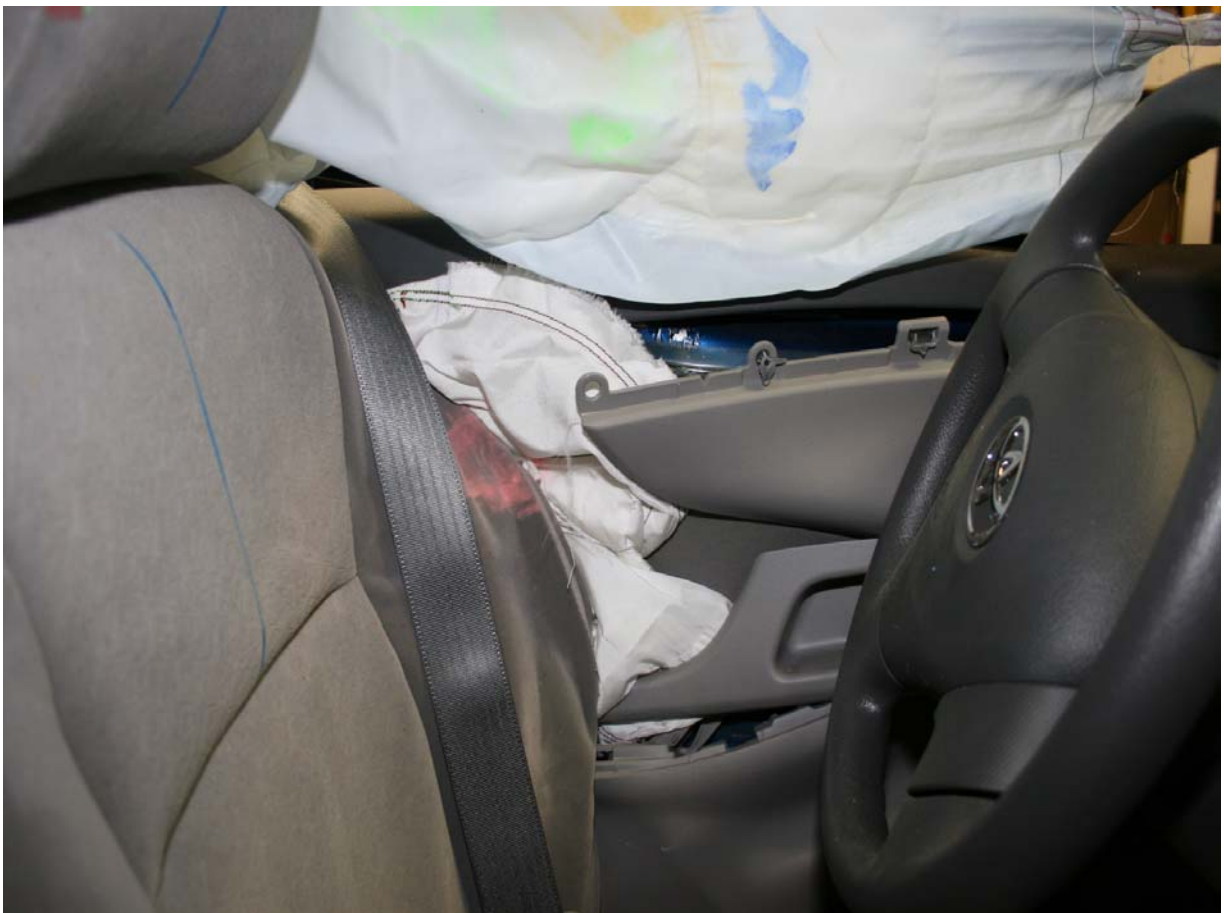
Post-Test Dummy Close-Up Head Contact with Vehicle View, if applicable



Post-Test Dummy Close-Up Head Contact with Side Airbag View, if applicable



Post-Test Dummy Close-Up Torso Contact with Vehicle Interior View, if applicable



Post-Test Dummy Close-Up Torso Contact with Side Airbag View, if applicable



Post-Test Dummy Close-Up Pelvis Contact View, if applicable

NO PHOTOGRAPH AVAILABLE

Post-Test Dummy Close-Up Pelvis Contact with Side Airbag View, if applicable



Pre-Test View of Fuel Filler Cap or Fuel Filler Neck



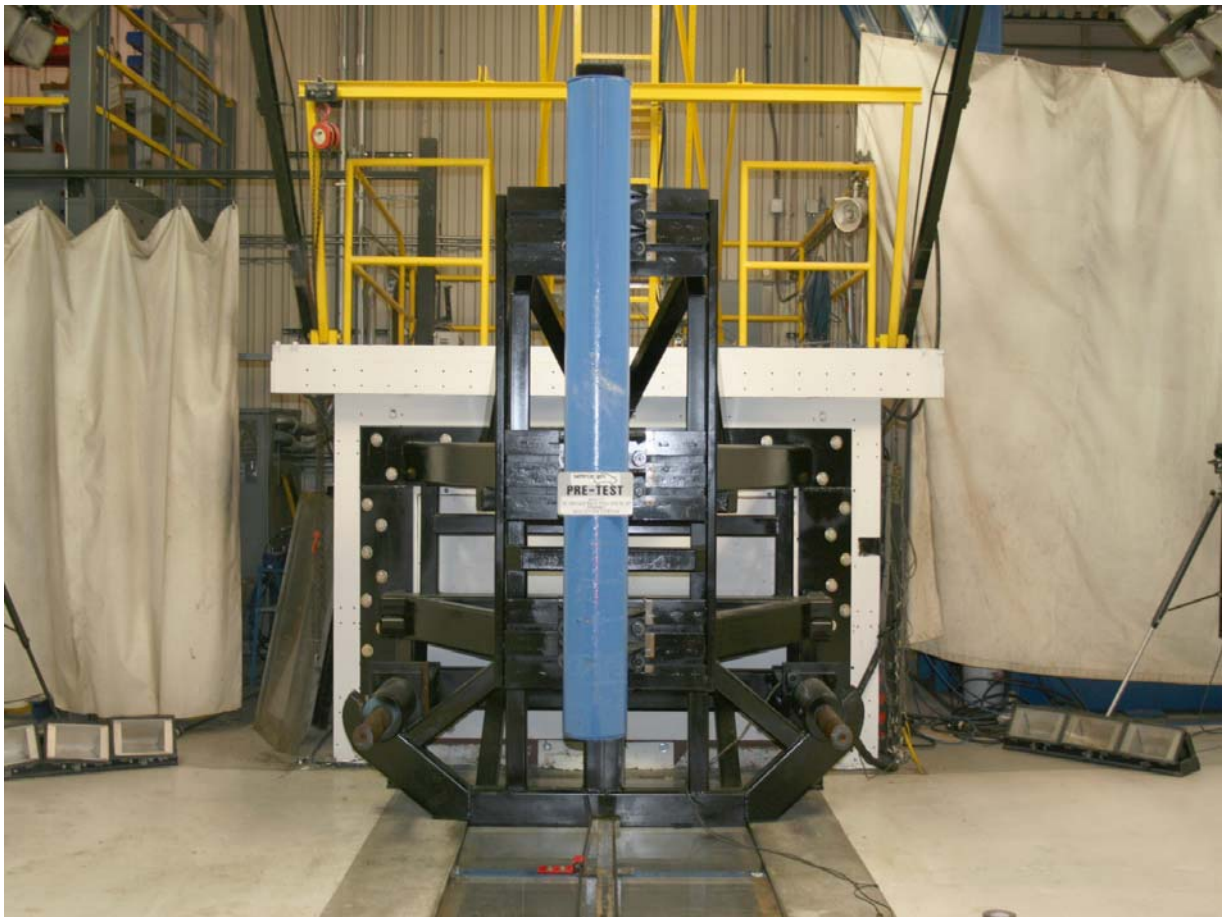
Post-Test View of Fuel Filler Cap or Fuel Filler Neck



Close-Up View of Vehicle's Certification Label



Close-Up View of Vehicle's Tire Information Placard of Label



Pre-Test Pole Barrier Front View



Post-Test Pole Barrier Front View



Pre-Test Pole Barrier Side View



Post-Test Pole Barrier Side View



Pre-Test Ballast View



Post-Test Primary and Redundant Speed Trap Read-Out

NO STATIC ROLLOVER PERFORMED

FMVSS No. 301/305 Rollover 0 Degrees

NO STATIC ROLLOVER PERFORMED

FMVSS No. 301/305 Rollover 90 Degrees

NO STATIC ROLLOVER PERFORMED

FMVSS No. 301/305 Rollover 180 Degrees

NO STATIC ROLLOVER PERFORMED

FMVSS No. 301/305 Rollover 270 Degrees

NO STATIC ROLLOVER PERFORMED

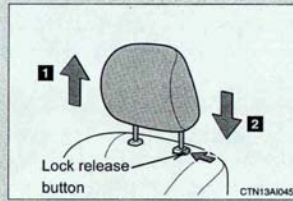
FMVSS No. 301/305 Rollover 360 Degrees



Impact Event (Impact Side)

Head restraints

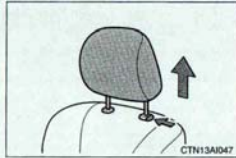
Head restraints are provided for all seats.

**1 Up**

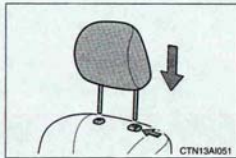
Pull the head restraints up.

2 Down

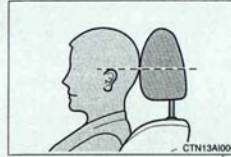
Push the head restraint down while pushing the lock release button.

■ Removing the head restraints

Pull the head restraint up while pushing the lock release button.

■ Installing the head restraints

Align the head restraint with the installation holes and push it down while pressing the lock release button.

■ Adjusting the height of the head restraints

Make sure that the head restraints are adjusted so that the center of the head restraint is closest to the top of your ears.

■ Adjusting the rear center seat head restraint

Always raise the head restraint one level from the stowed position when using.

⚠ CAUTION**■ Head restraint precautions**

Observe the following precautions regarding the head restraints. Failure to do so may result in death or serious injury.

- Use the head restraints designed for each respective seat.
- Adjust the head restraints to the correct position at all times.
- After adjusting the head restraints, push down on them and make sure they are locked in position.
- Do not drive with the head restraints removed.

Head Restraint Use and Adjustment Information from Vehicle Owner's Manual

APPENDIX B

VEHICLE AND DUMMY RESPONSE DATA PLOTS

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Figure No. 3.	Driver Head Acceleration (Z) Primary vs. Time	B-1
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The following dummy and vehicle response data can be found in the R&D section of the NHTSA website at www.nhtsa.dot.gov

Driver Head Acceleration (X) Redundant

Driver Head Acceleration (Y) Redundant

Driver Head Acceleration (Z) Redundant

Driver Upper Neck Force (X)

Driver Upper Neck Force (Y)

Driver Upper Neck Force (Z)

Driver Upper Neck Moment About X

Driver Upper Neck Moment About Y

Driver Upper Neck Moment About Z

Driver Shoulder Deflection (Y)

Driver Upper Thorax Rib Deflection (Y)

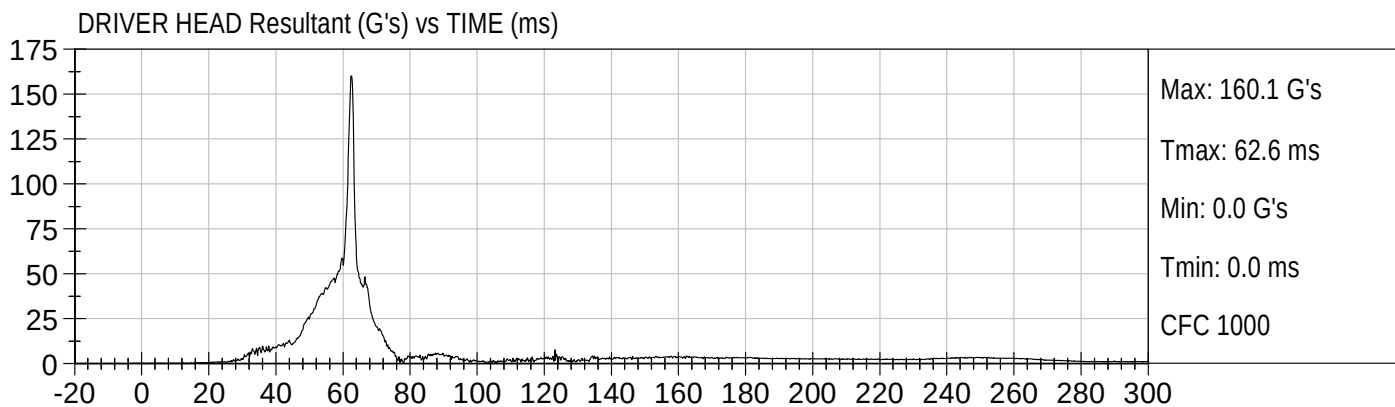
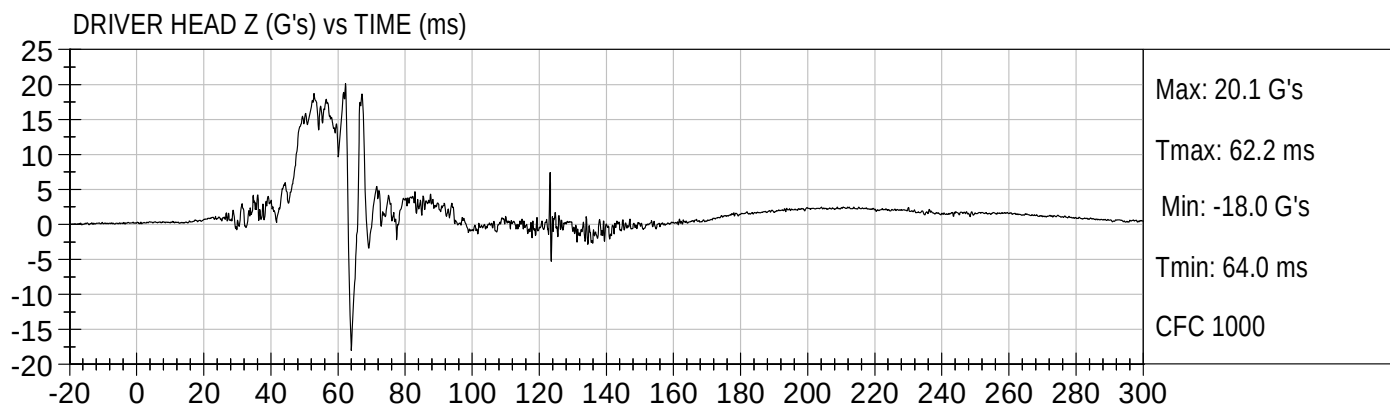
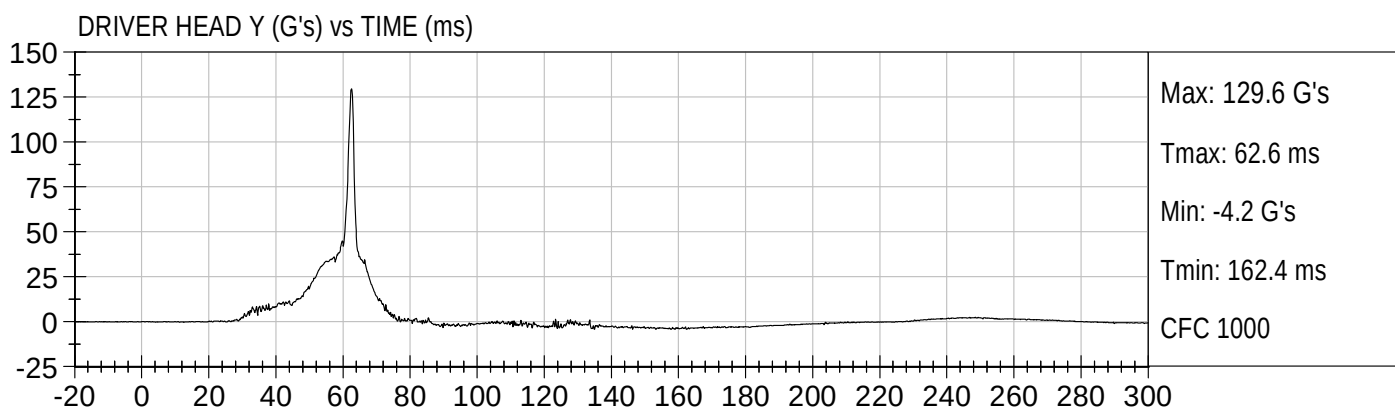
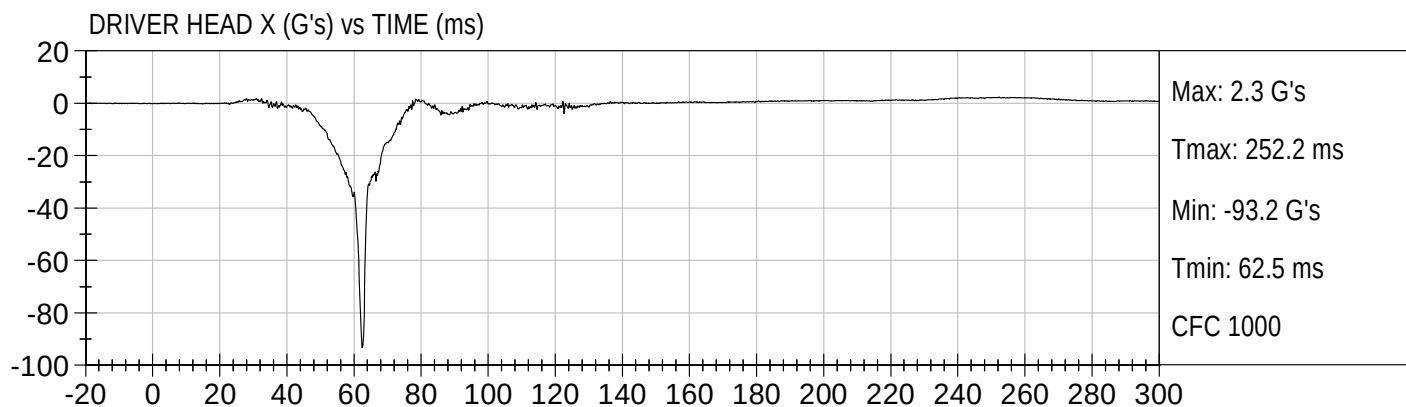
Driver Middle Thorax Rib Deflection (Y)

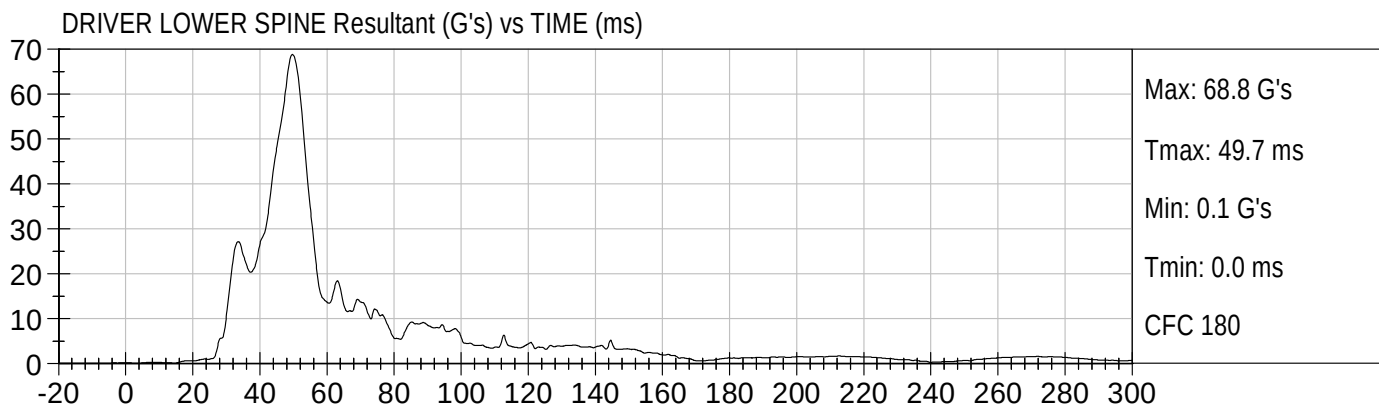
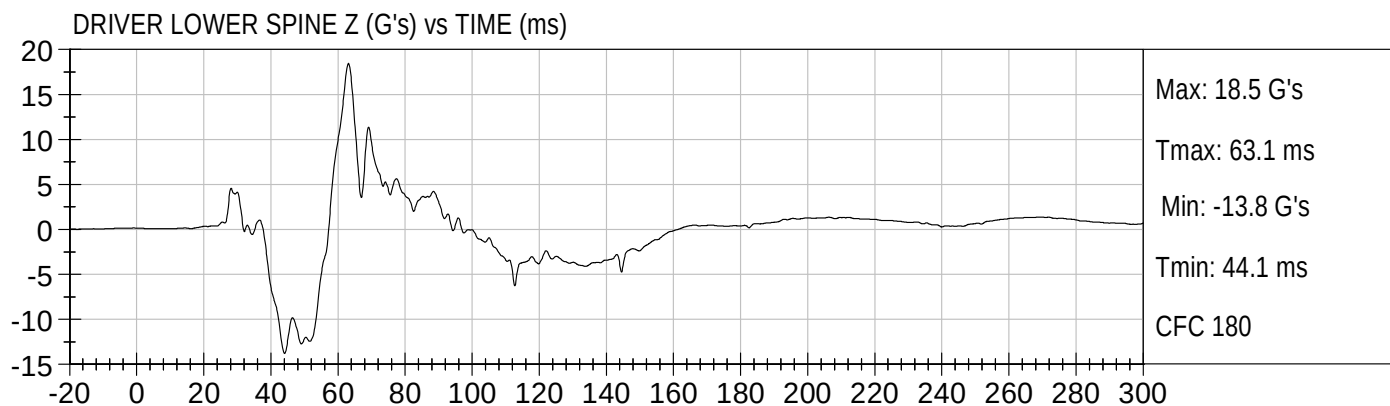
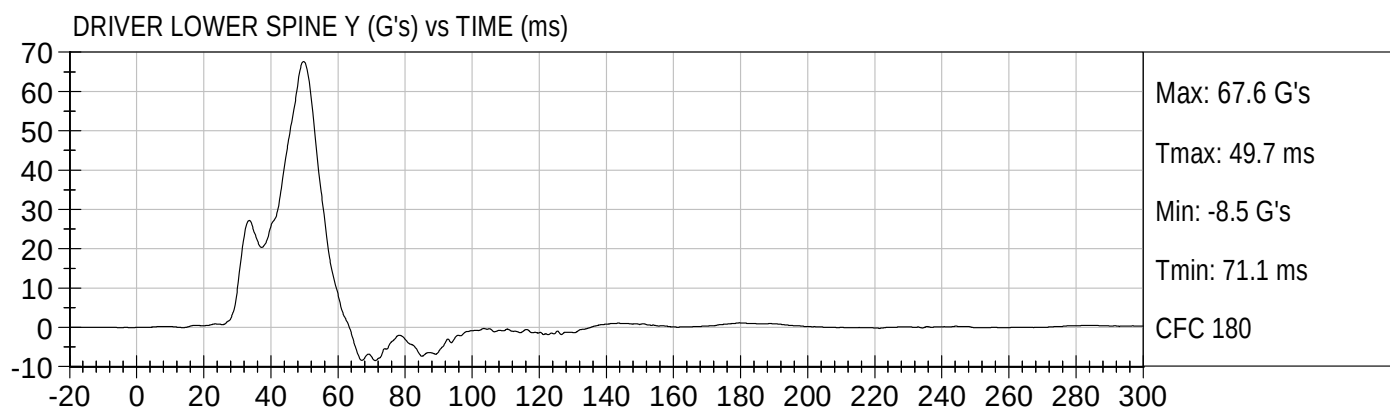
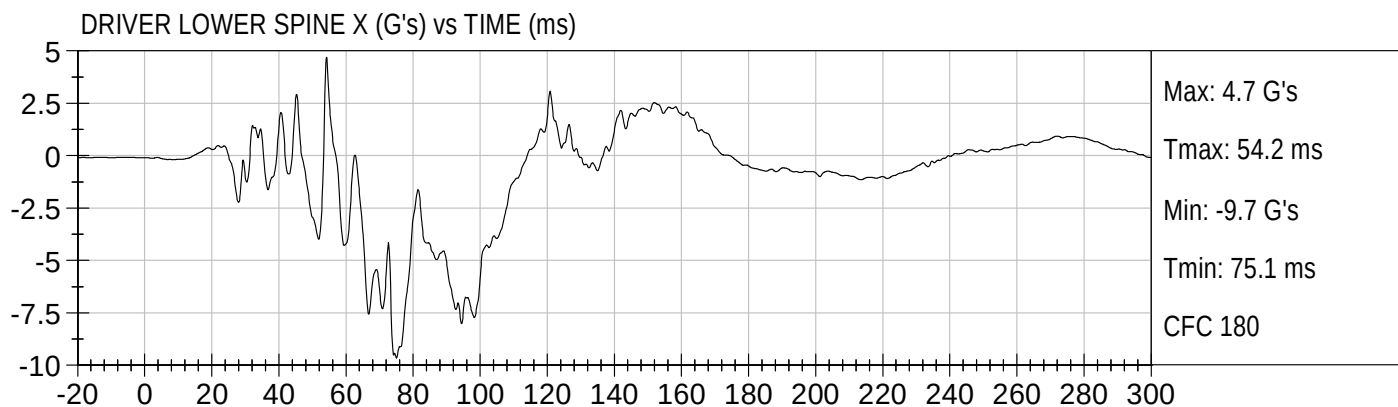
Driver Lower Thorax Rib Deflection (Y)

Driver Upper Abdomen Rib Deflection (Y)

Driver Lower Abdomen Rib Deflection (Y)

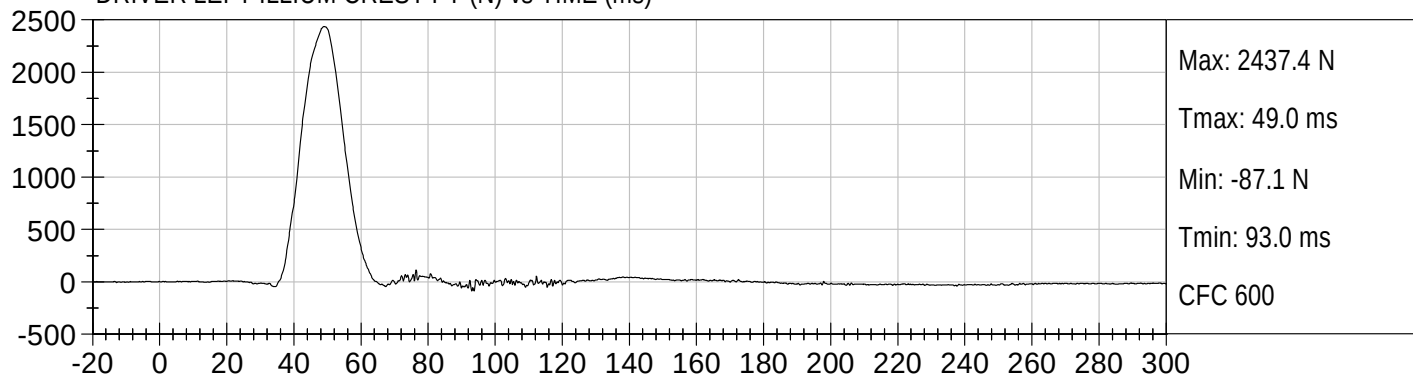
Driver Shoulder Contact Switch
Driver Torso Contact Switch
Driver Pelvis Contact Switch
Vehicle CG Acceleration (X)
Vehicle CG Acceleration (Y)
Vehicle CG Acceleration (Z)
Vehicle CG Angular Rate About X (Roll)
Vehicle CG Angular Rate About Y (Pitch)
Vehicle CG Angular Rate About Z (Yaw)
Left Floor Sill Acceleration (Y)
Left A-Pillar Sill Acceleration (Y)
Left Lower A-Pillar Acceleration (Y)
Left Mid A-Pillar Acceleration (Y)
Left B-Pillar Sill Acceleration (Y)
Left Lower B-Pillar Acceleration (Y)
Left Mid B-Pillar Acceleration (Y)
Driver Seat Track at Dummy H-Point Acceleration (Y)
Engine Top Acceleration (X)
Engine Top Acceleration (Y)
Firewall Center Acceleration (Y)
Right Roof at Vertical Impact Reference Line Acceleration (Y)
Right Sill at Vertical Impact Reference Line Acceleration (Y)
Rear Floorpan Behind Rear Axle at Centerline Acceleration (X)
Rear Floorpan Behind Rear Axle at Centerline Acceleration (Y)
Driver Side Airbag Timing
Driver Side Curtain Airbag Timing



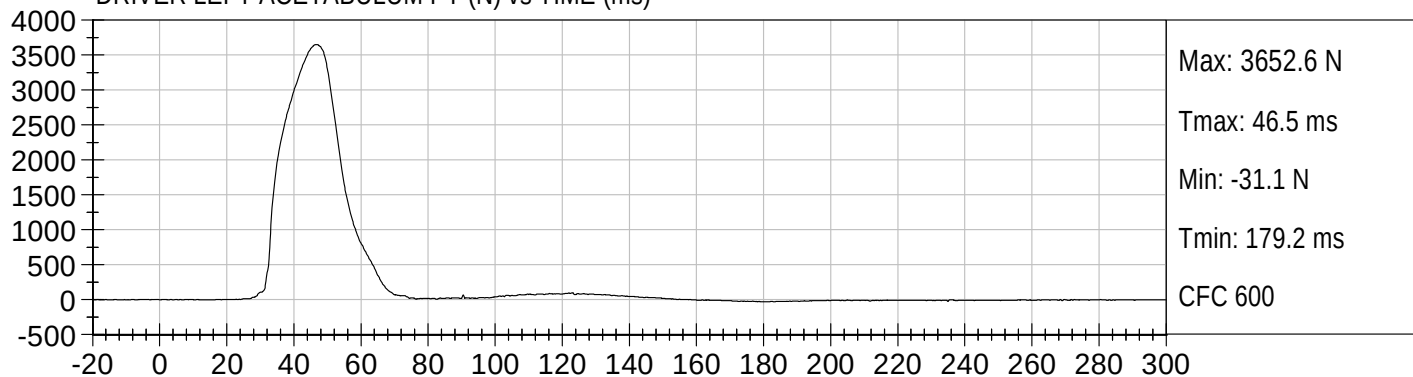




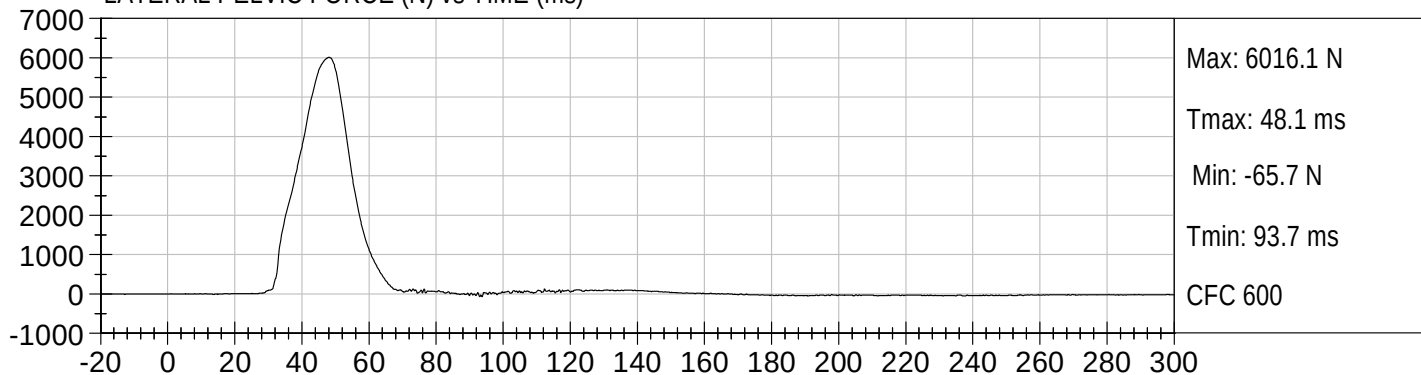
DRIVER LEFT ILLIUM CREST FY (N) vs TIME (ms)



DRIVER LEFT ACETABULUM FY (N) vs TIME (ms)



LATERAL PELVIC FORCE (N) vs TIME (ms)



APPENDIX C

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

MGA RESEARCH CORPORATION
HEAD DROP TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test ID: D091421

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	37	Pass
Peak Resultant Acceleration	G's	115 to 137	118	Pass
Peak Lateral Acceleration	G's	+/- 15	-9.8	Pass
Unimodal	N/A	<15%	Yes	Pass
Overall Test Results				Pass



Laboratory Technician

6/5/09

Test Date



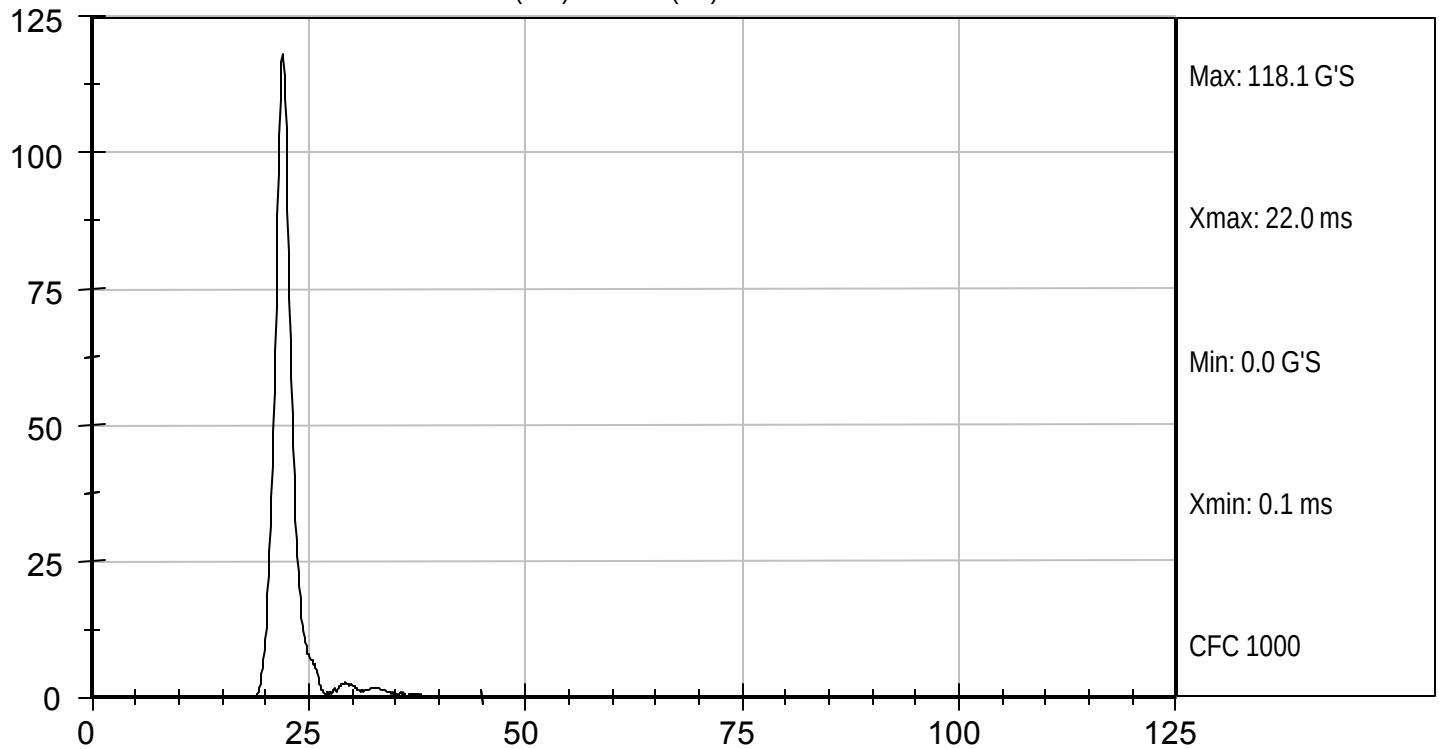
Approved By



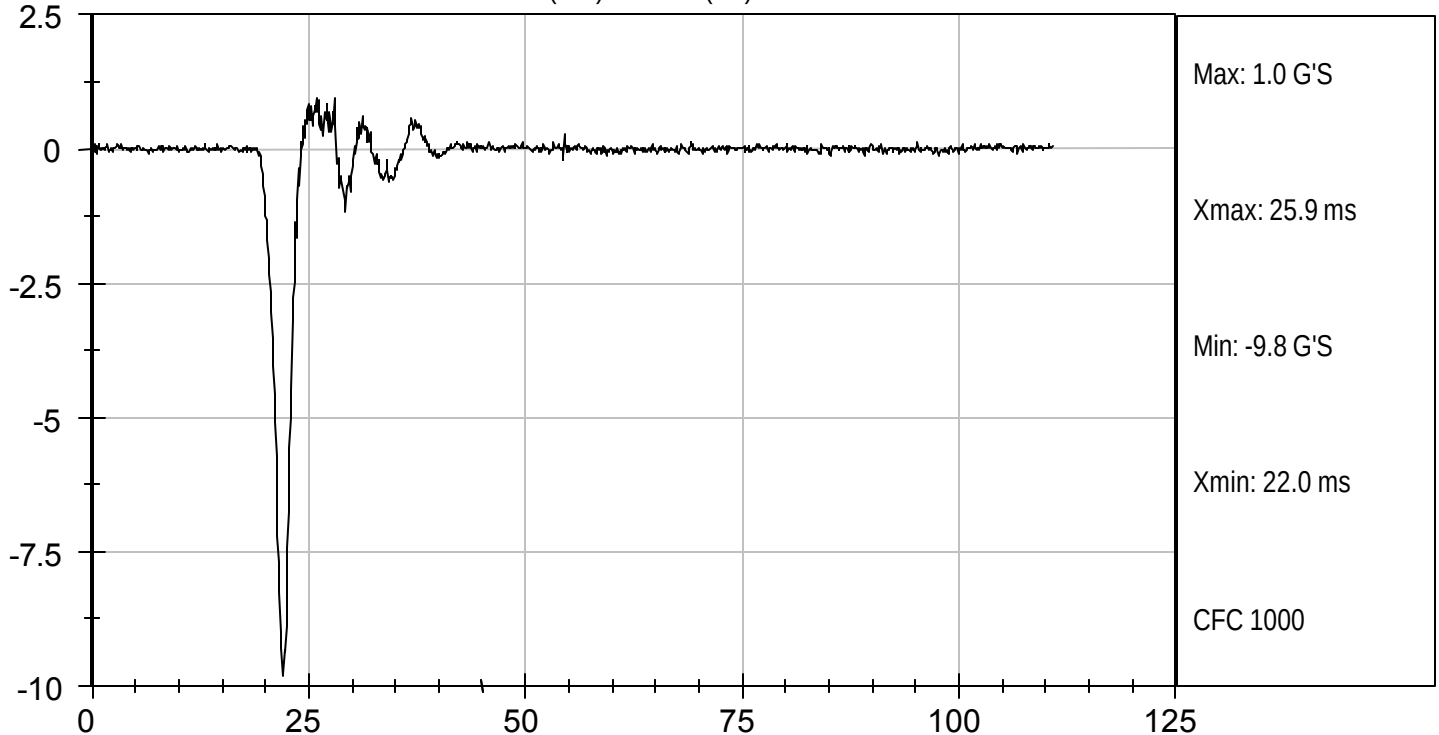
Test Desc: Head Drop
Component ID: D091421

Test Date: 6/5/09
Velocity: 0 ft/s, 0 m/s

PEAK RESULTANT ACCELERATION (G'S) vs TIME (ms)



PEAK LONGITUDINAL ACCELERATION (G'S) vs TIME (ms)

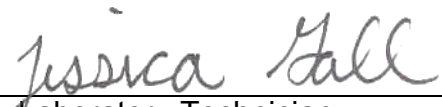


MGA RESEARCH CORPORATION
LATERAL NECK PENDULUM TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D091422

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.0	Pass
Humidity		%	10 to 70	36	Pass
Impact Velocity		m/s	5.51 to 5.63	5.58	Pass
Delta Velocity	10 msec	m/s	2.20 to 2.80	2.57	Pass
	15 msec	m/s	3.30 to 4.10	3.74	Pass
	20 msec	m/s	4.40 to 5.40	5.06	Pass
	25 msec	m/s	5.40 to 6.10	5.66	Pass
	25-100 msec	m/s	5.50 to 6.20	5.66	Pass
Maximum D-Plane Rotation		deg	71 to 81	72	Pass
Time of Maximum D-Plane Rotation		msec	50 to 70	66	Pass
Maximum Occipital Condyle Moment during Rotation Interval		Nm	-44 to -36	-43	Pass
Time of Moment Decay to 0 Nm		msec	102 to 126	113	Pass
Overall Test Results					Pass


 Laboratory Technician

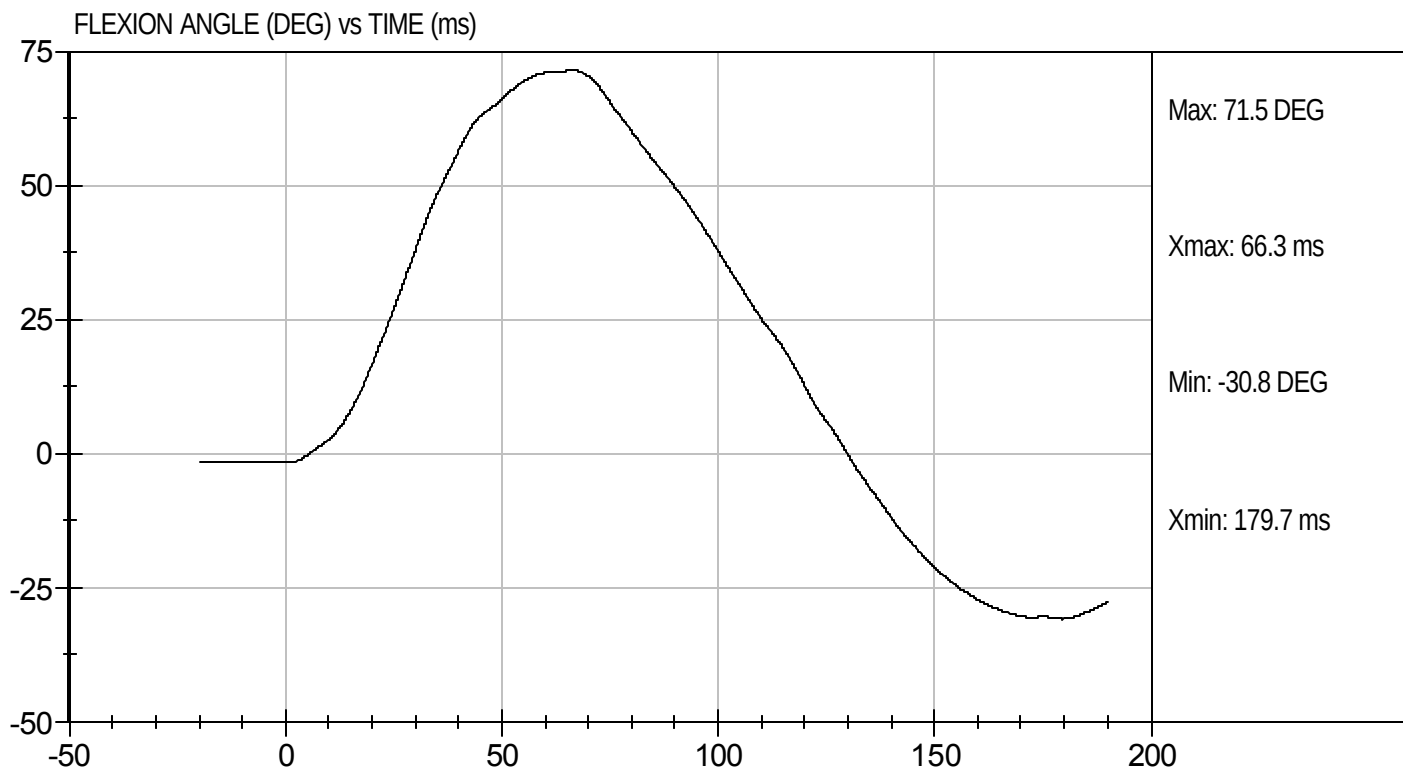
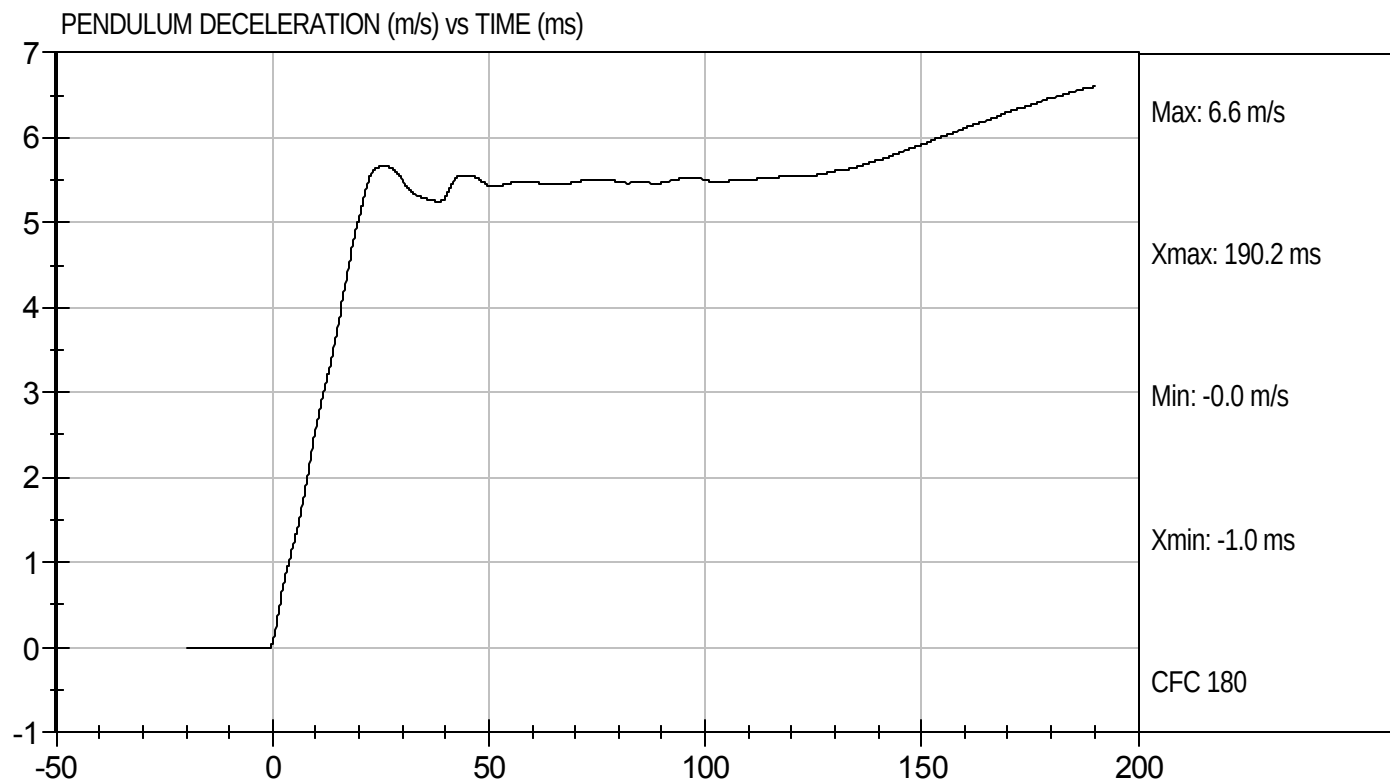
6/5/09
 Test Date


 Approved By



Test Desc: Neck Bending
Component ID: D091422

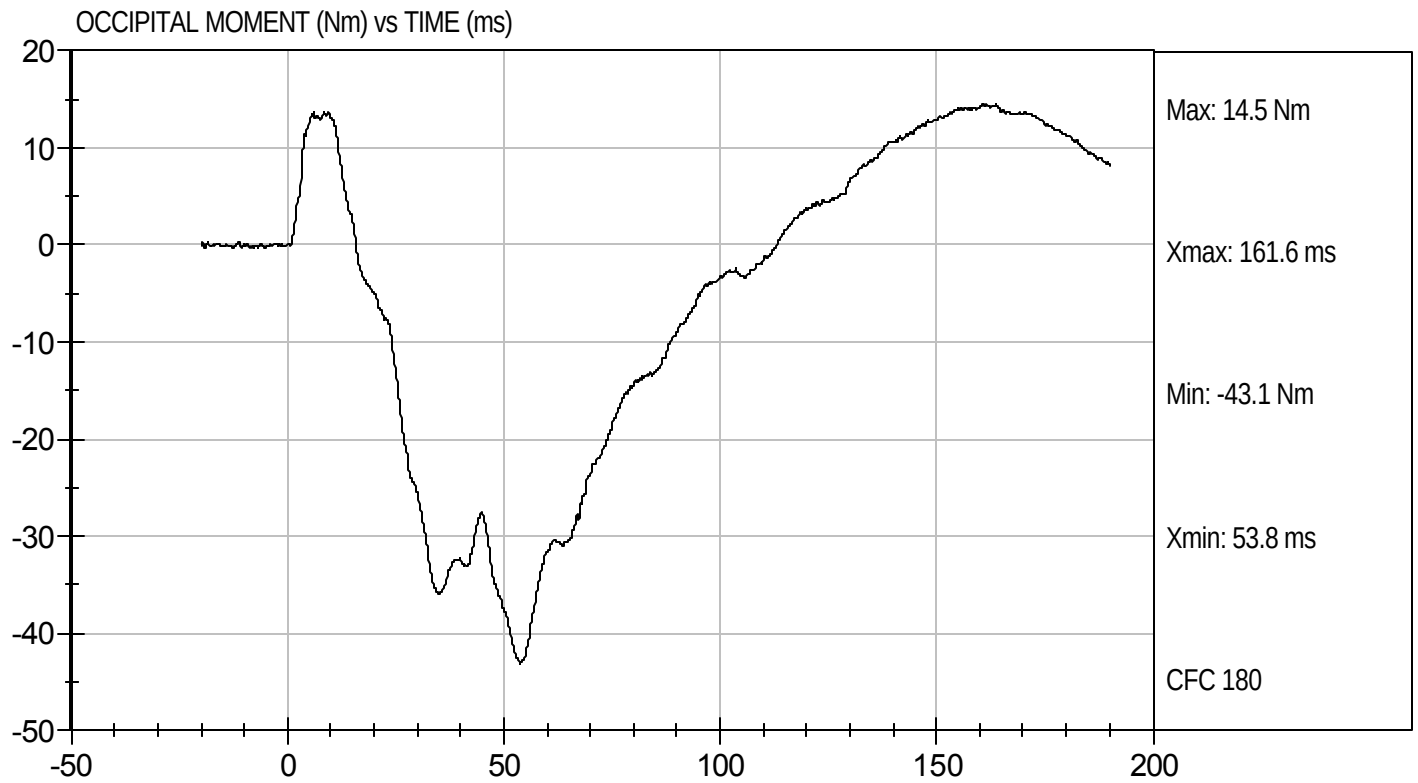
Test Date: 6/5/09
Velocity: 18.32 ft/s, 5.58 m/s





Test Desc: Neck Bending
Component ID: D091422

Test Date: 6/5/09
Velocity: 18.32 ft/s, 5.58 m/s

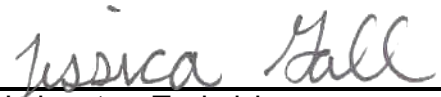


MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test ID: D091423

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	36	Pass
Impact Velocity	m/s	4.20 to 4.40	4.21	Pass
Maximum Probe Acceleration	G's	13 to 18	15	Pass
Shoulder Displacement	mm	28 to 37	32	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	18	Pass
Overall Test Results				Pass


Laboratory Technician

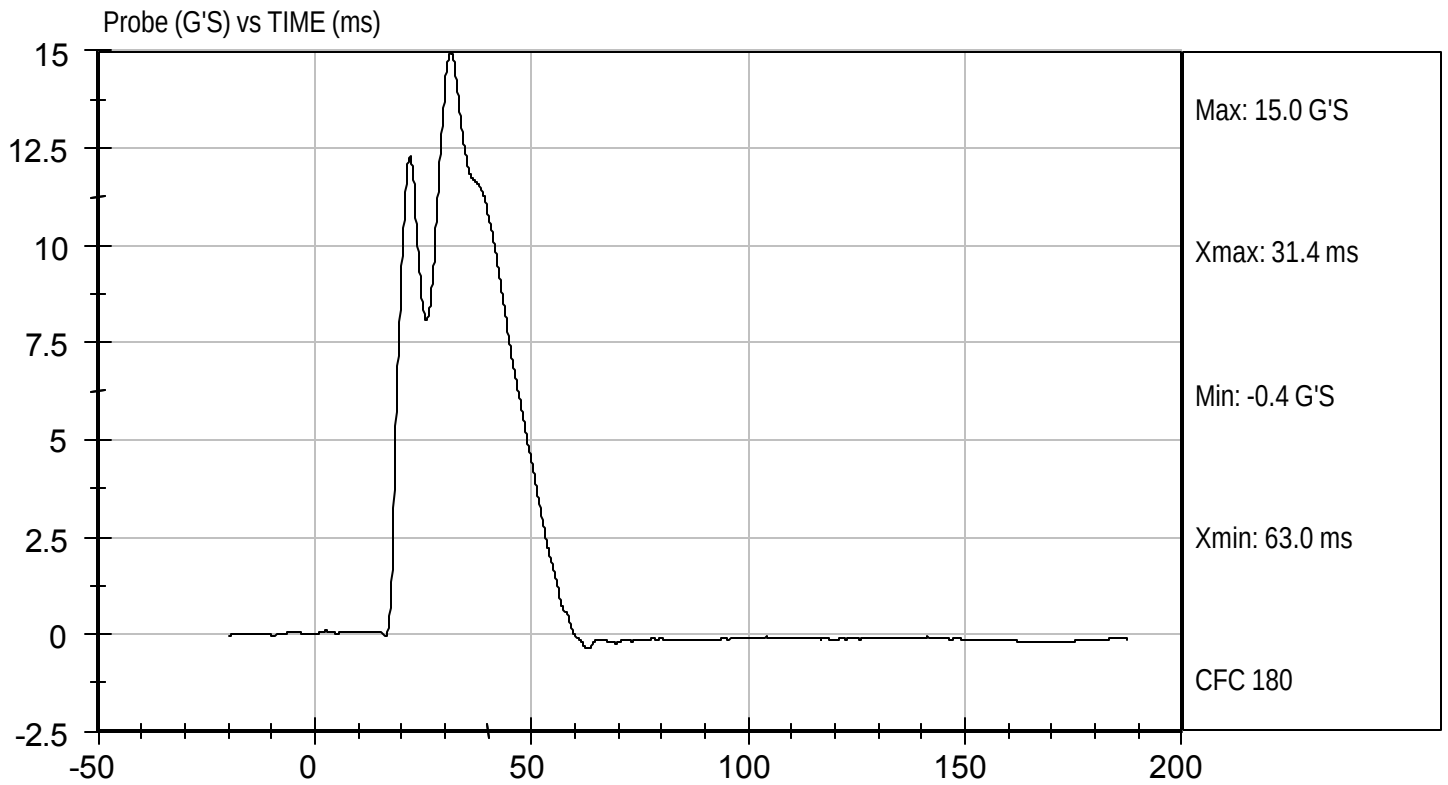
6/5/09
Test Date


Approved By



Test Desc: Shoulder Impact
Component ID: D091423

Test Date: 6/5/09
Velocity: 13.8 ft/s, 4.21 m/s

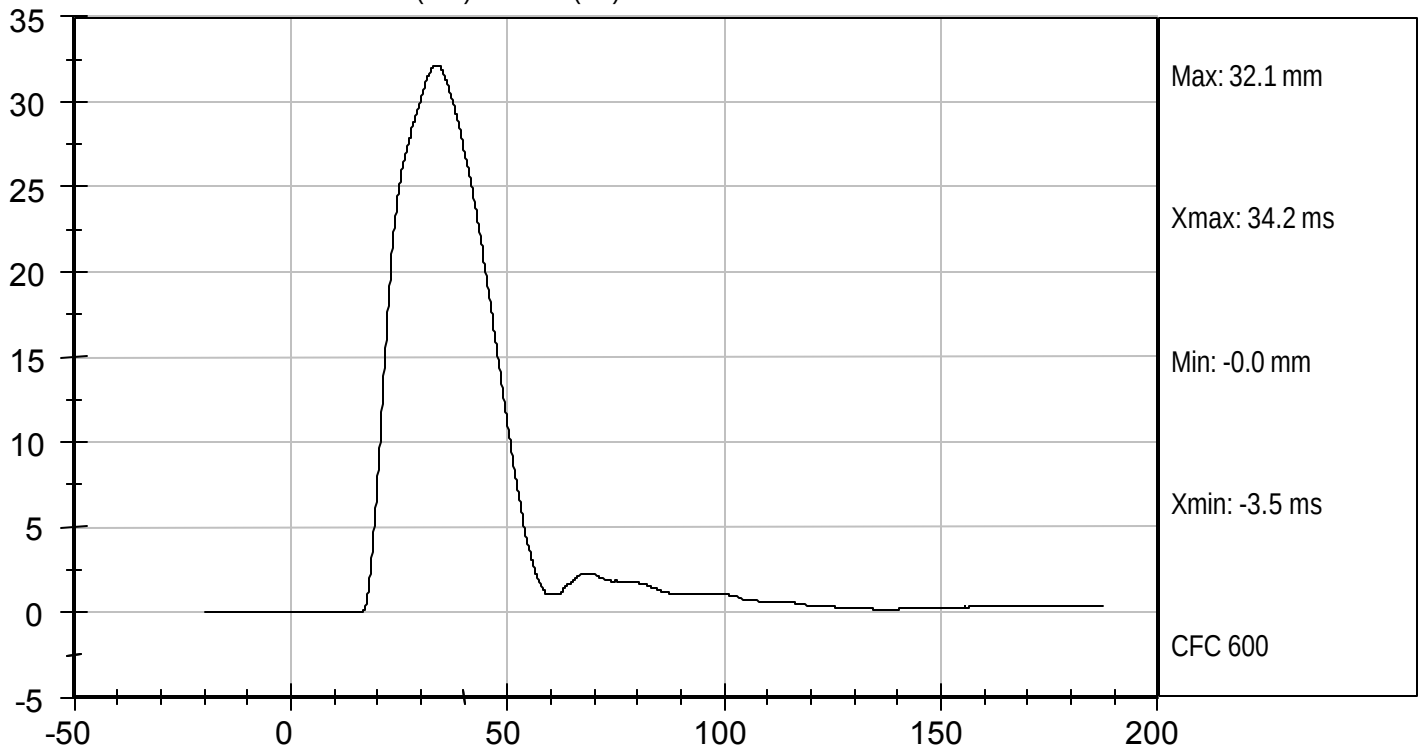




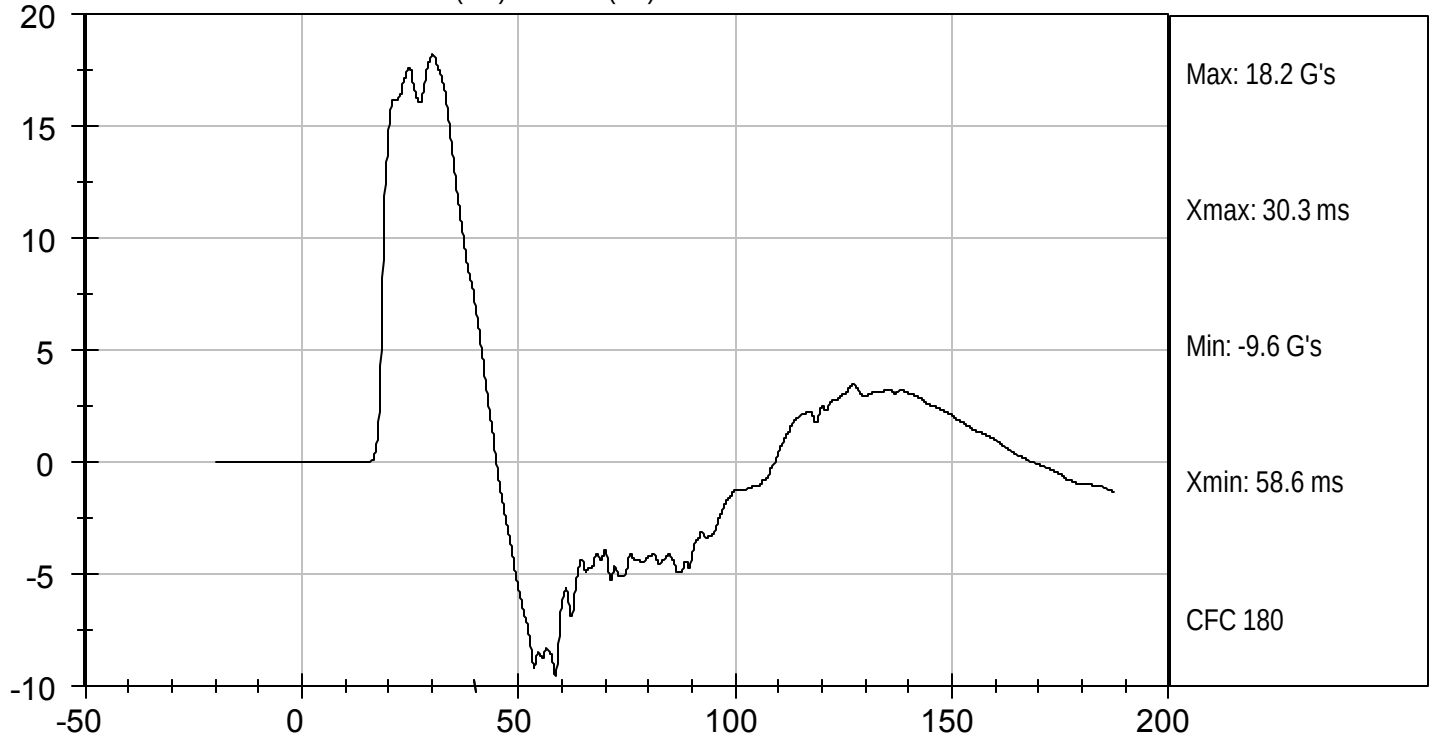
Test Desc: Shoulder Impact
Component ID: D091423

Test Date: 6/5/09
Velocity: 13.8 ft/s, 4.21 m/s

SHOULDER DISPLACEMENT (mm) vs TIME (ms)



UPPER SPINE ACCELERATION (G's) vs TIME (ms)



MGA RESEARCH CORPORATION
THORAX (WITH ARM) IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D091424

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Humidity	%	10 to 70	36	Pass
Impact Velocity	m/s	6.60 to 6.80	6.68	Pass
Peak Impactor Acceleration	G's	30 to 36	32	Pass
Shoulder Displacement	mm	31 to 40	35	Pass
Upper Rib Displacement	mm	25 to 32	27	Pass
Middle Rib Displacement	mm	30 to 36	32	Pass
Lower Rib Displacement	mm	32 to 38	34	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	37	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	32	Pass
Overall Test Results			Pass	


 Laboratory Technician

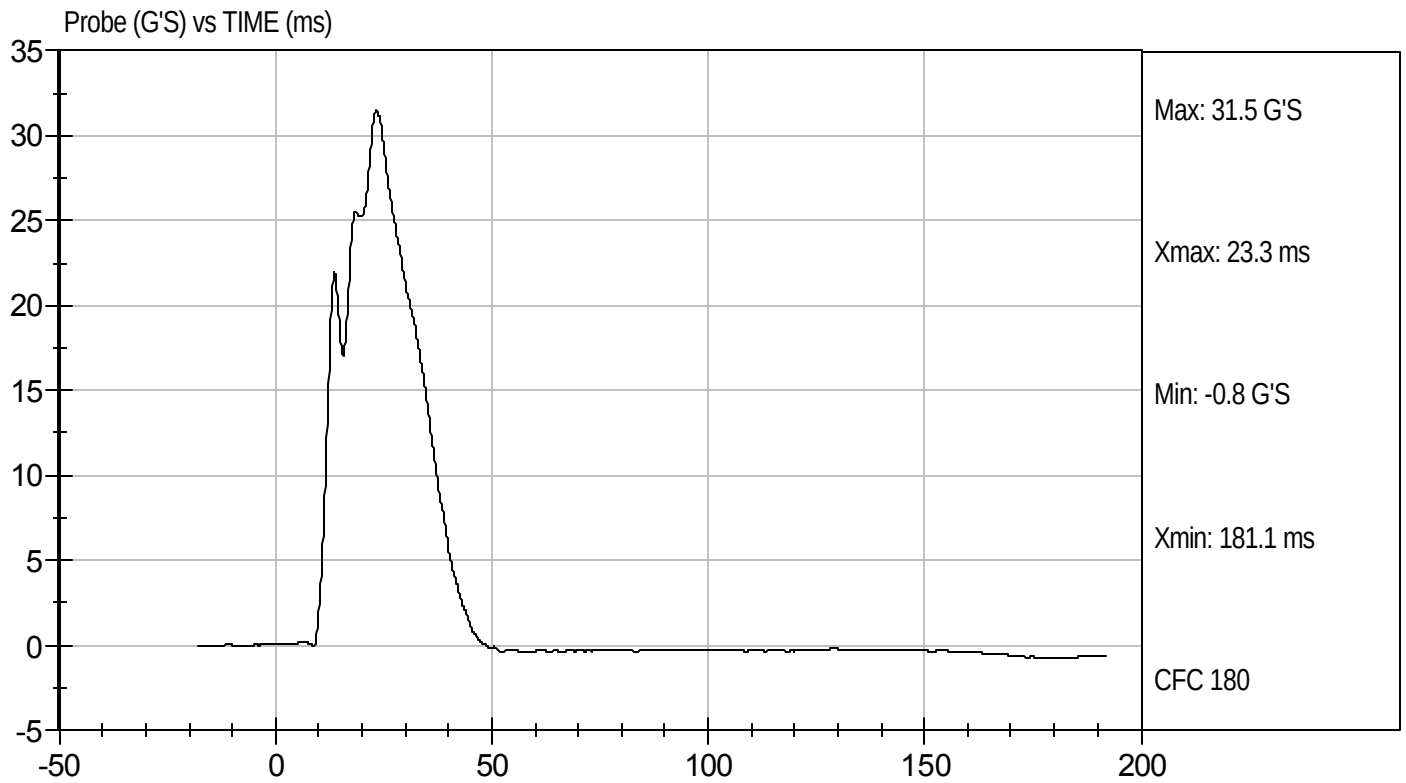
6/5/09
 Test Date


 Approved By



Test Desc: Thorax Impact
Component ID: D091424

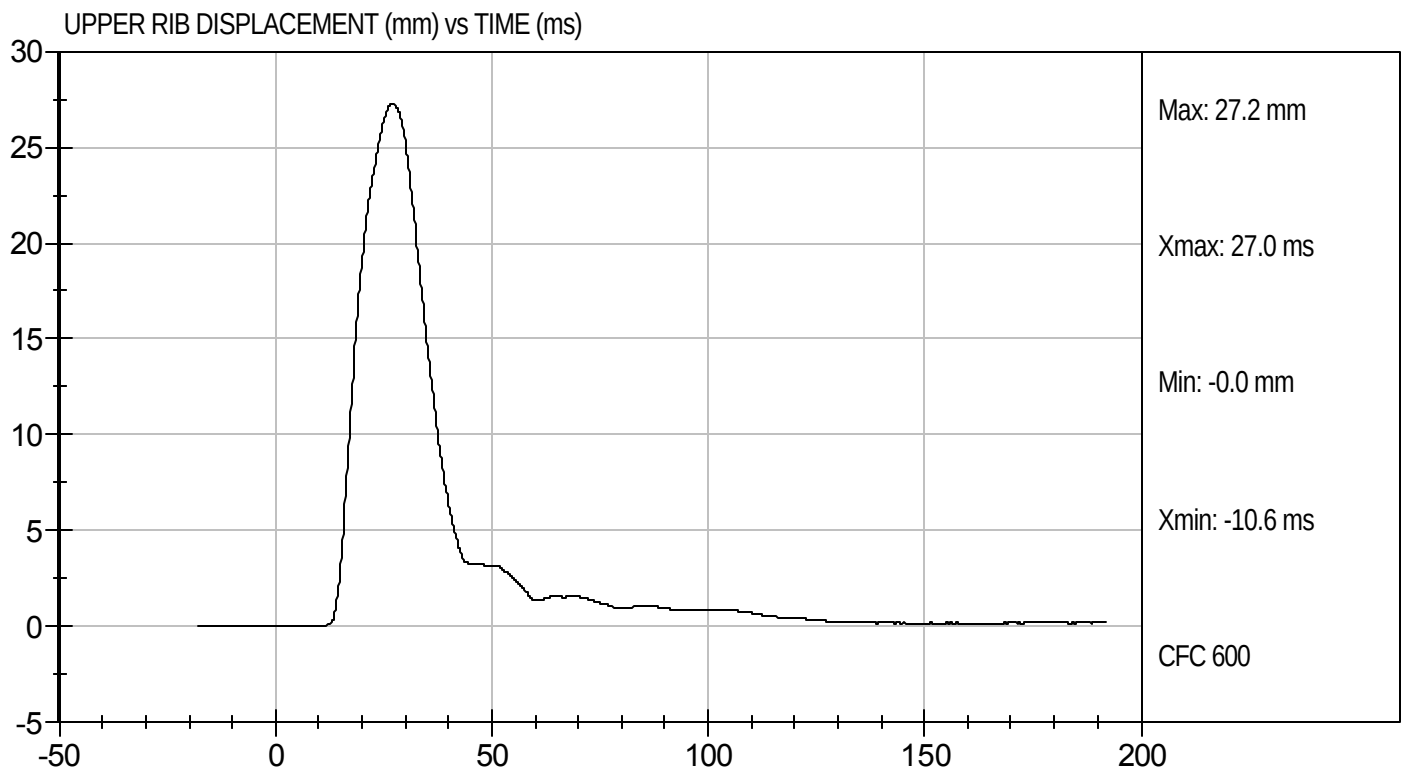
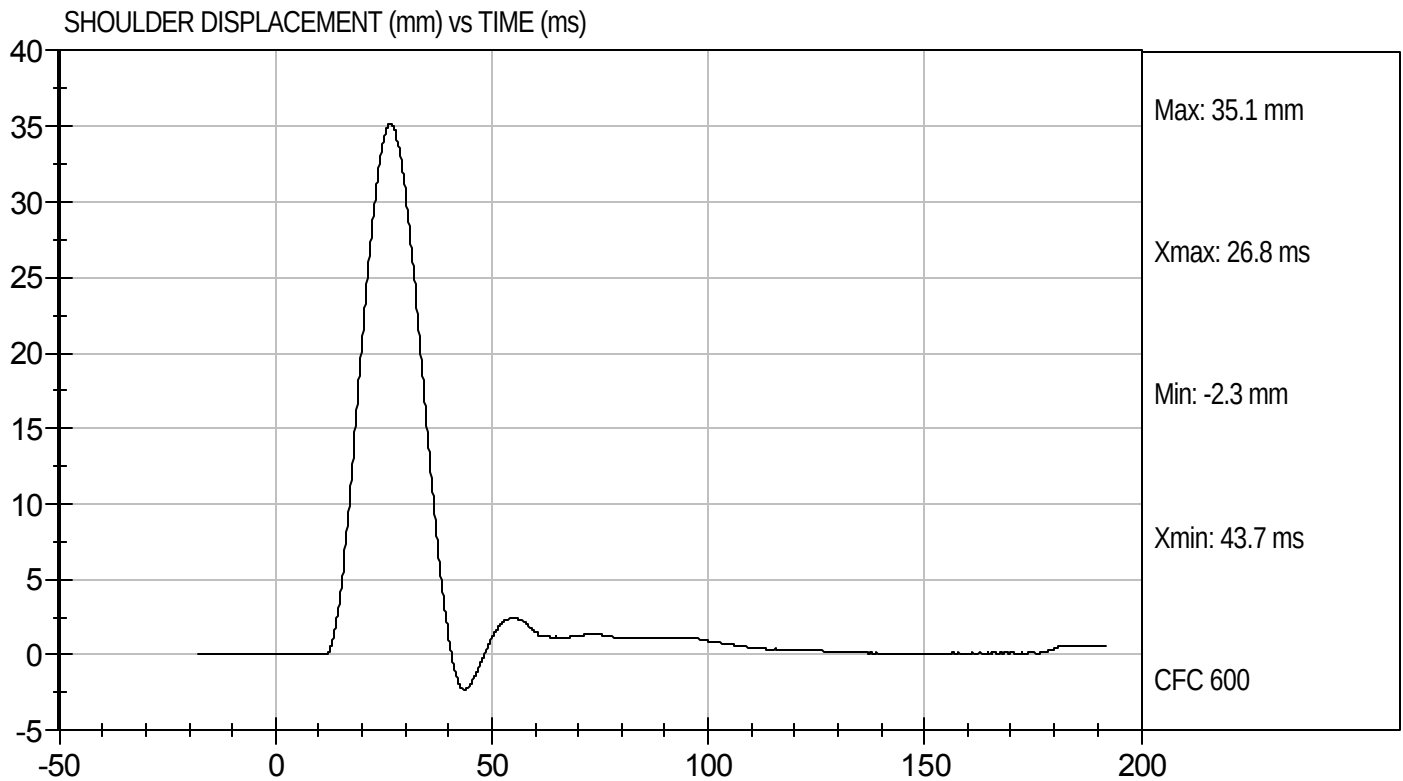
Test Date: 6/5/09
Velocity: 21.9 ft/s, 6.68 m/s





Test Desc: Thorax Impact
Component ID: D091424

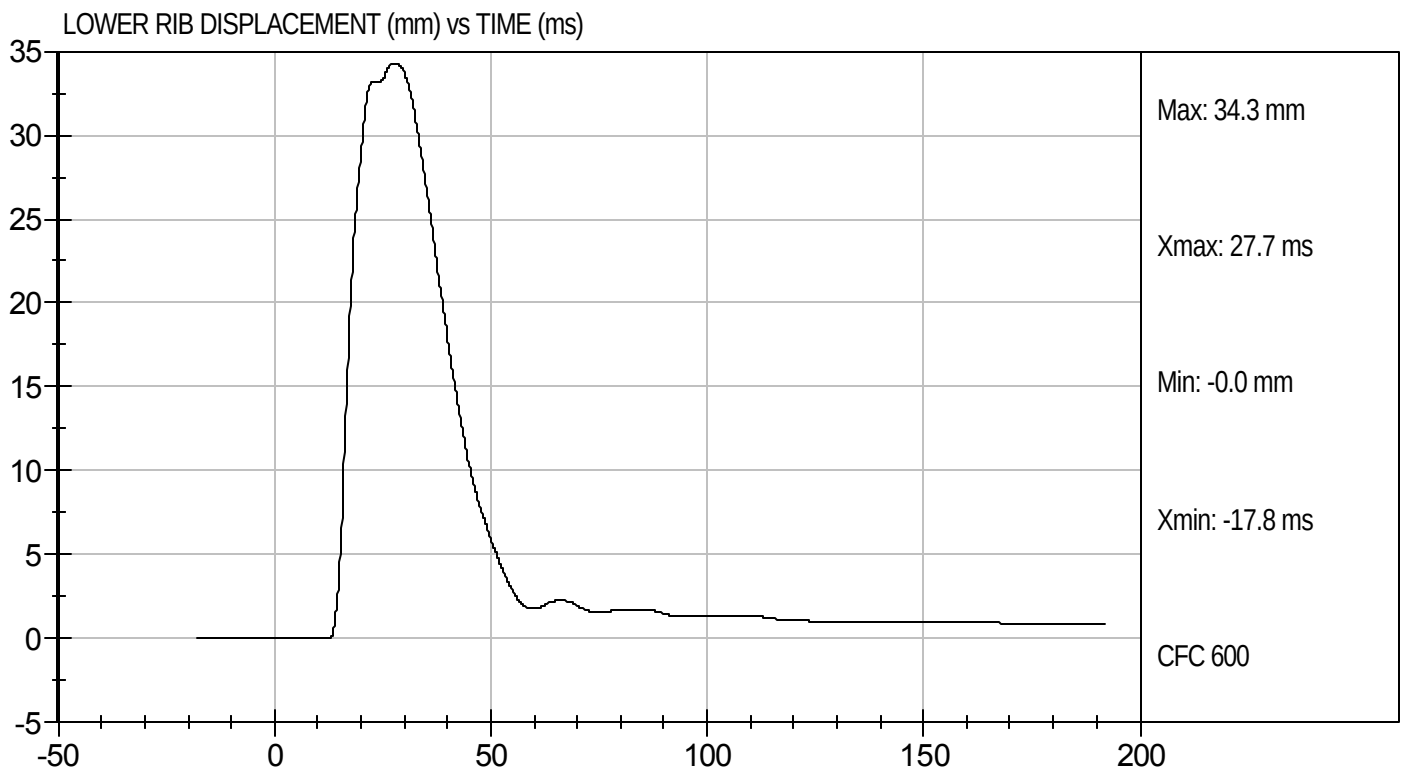
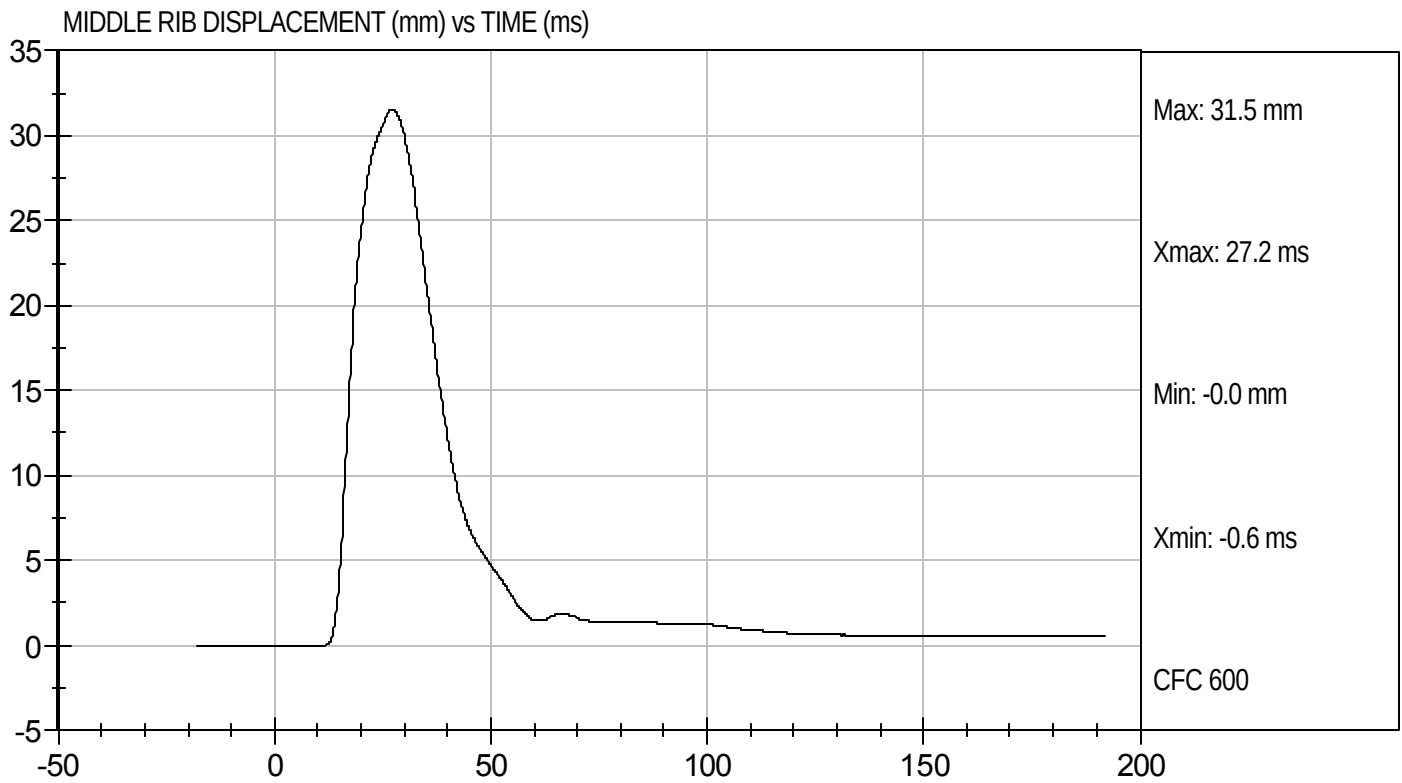
Test Date: 6/5/09
Velocity: 21.9 ft/s, 6.68 m/s





Test Desc: Thorax Impact
Component ID: D091424

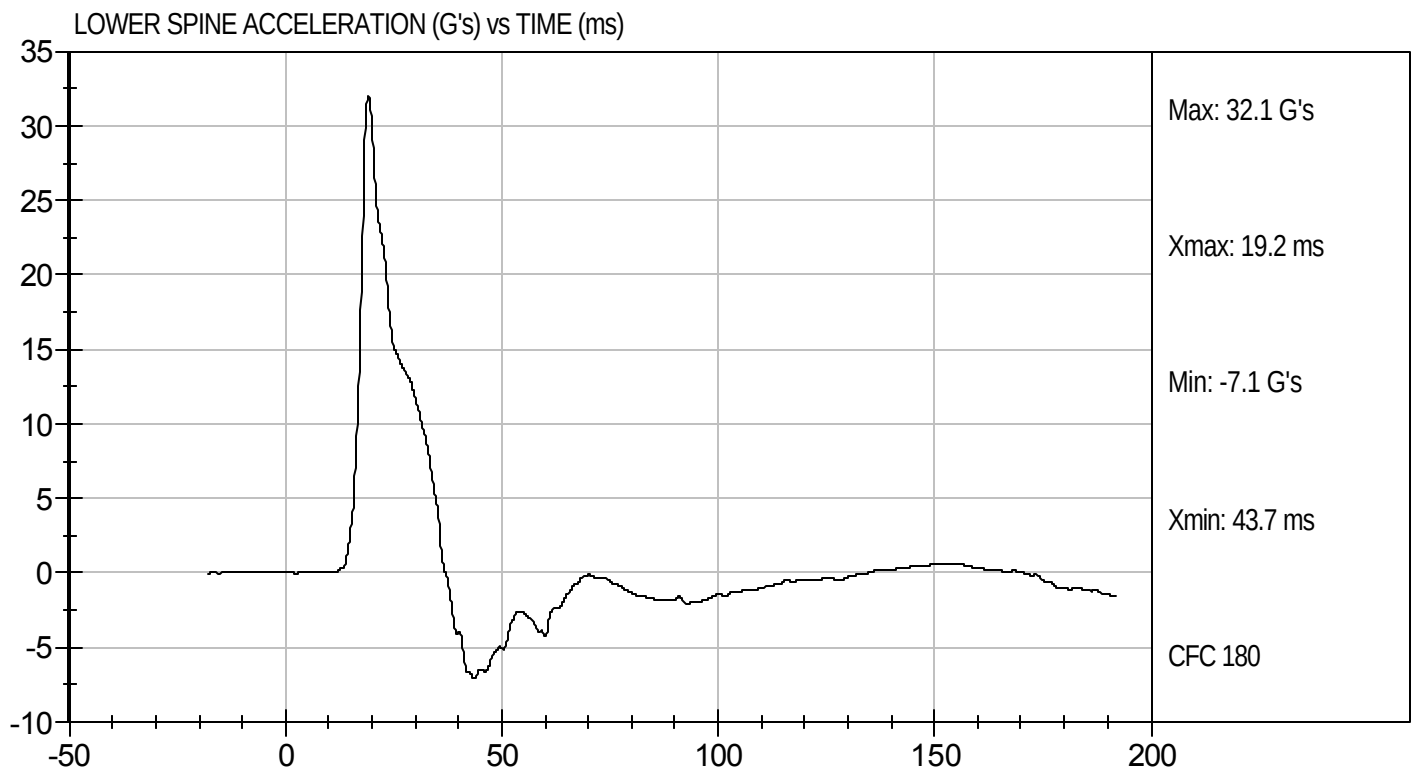
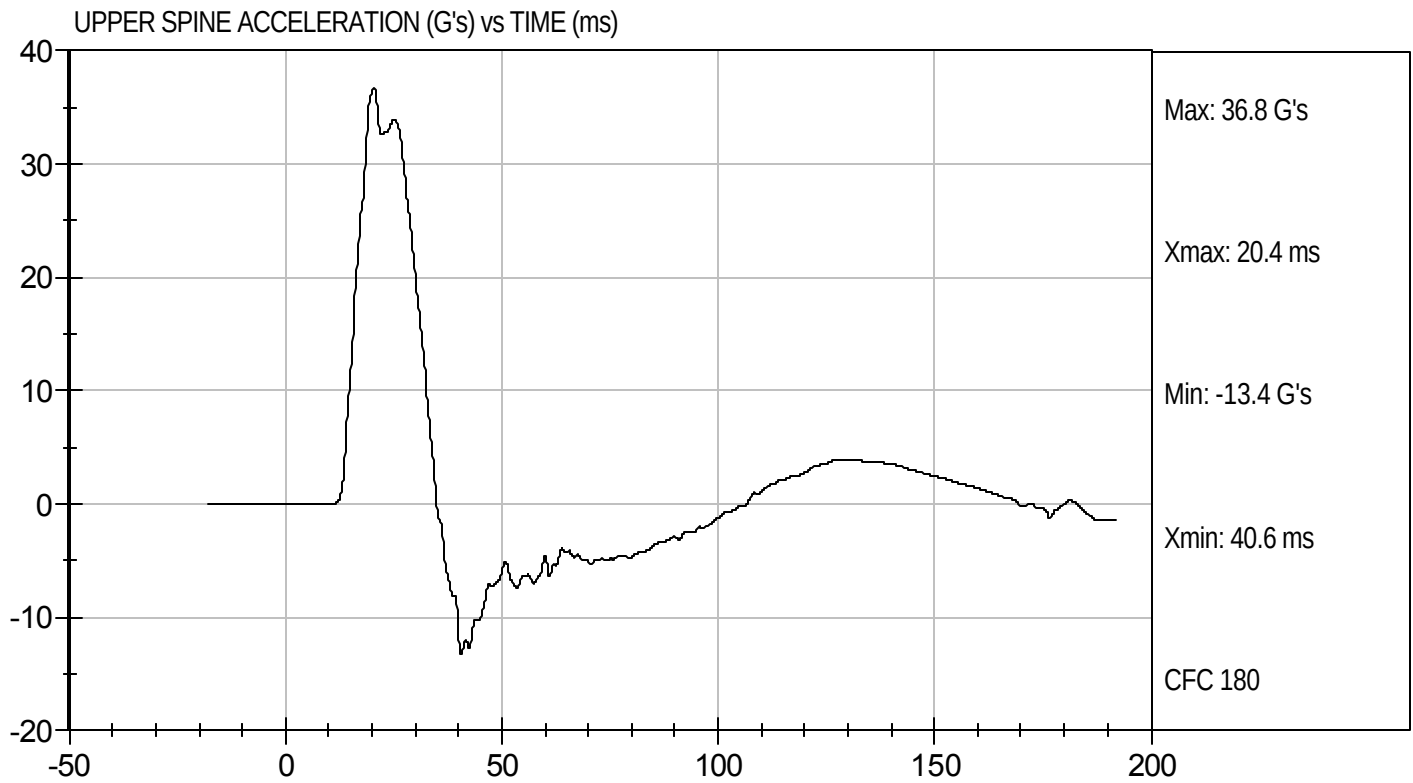
Test Date: 6/5/09
Velocity: 21.9 ft/s, 6.68 m/s





Test Desc: Thorax Impact
Component ID: D091424

Test Date: 6/5/09
Velocity: 21.9 ft/s, 6.68 m/s

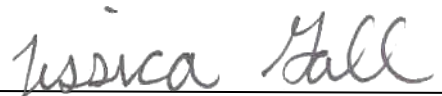


MGA RESEARCH CORPORATION
THORAX (WITHOUT ARM) IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D091425

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Humidity	%	10 to 70	35	Pass
Impact Velocity	m/s	4.20 to 4.40	4.21	Pass
Peak Impactor Force	G's	14 to 18	16	Pass
Upper Rib Displacement	mm	32 to 40	34	Pass
Middle Rib Displacement	mm	39 to 45	41	Pass
Lower Rib Displacement	mm	35 to 43	41	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 17	14	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	11	Pass
Overall Test Results			Pass	


Laboratory Technician

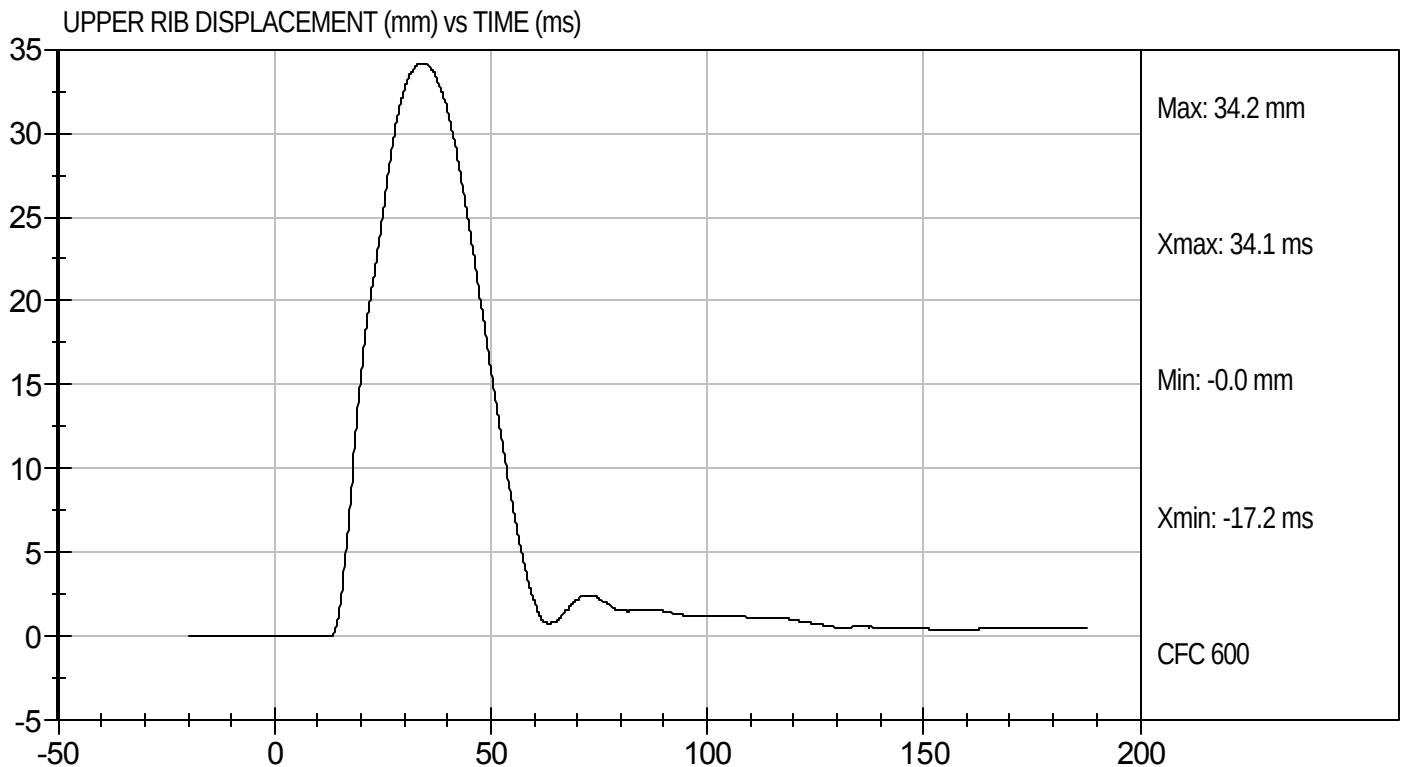
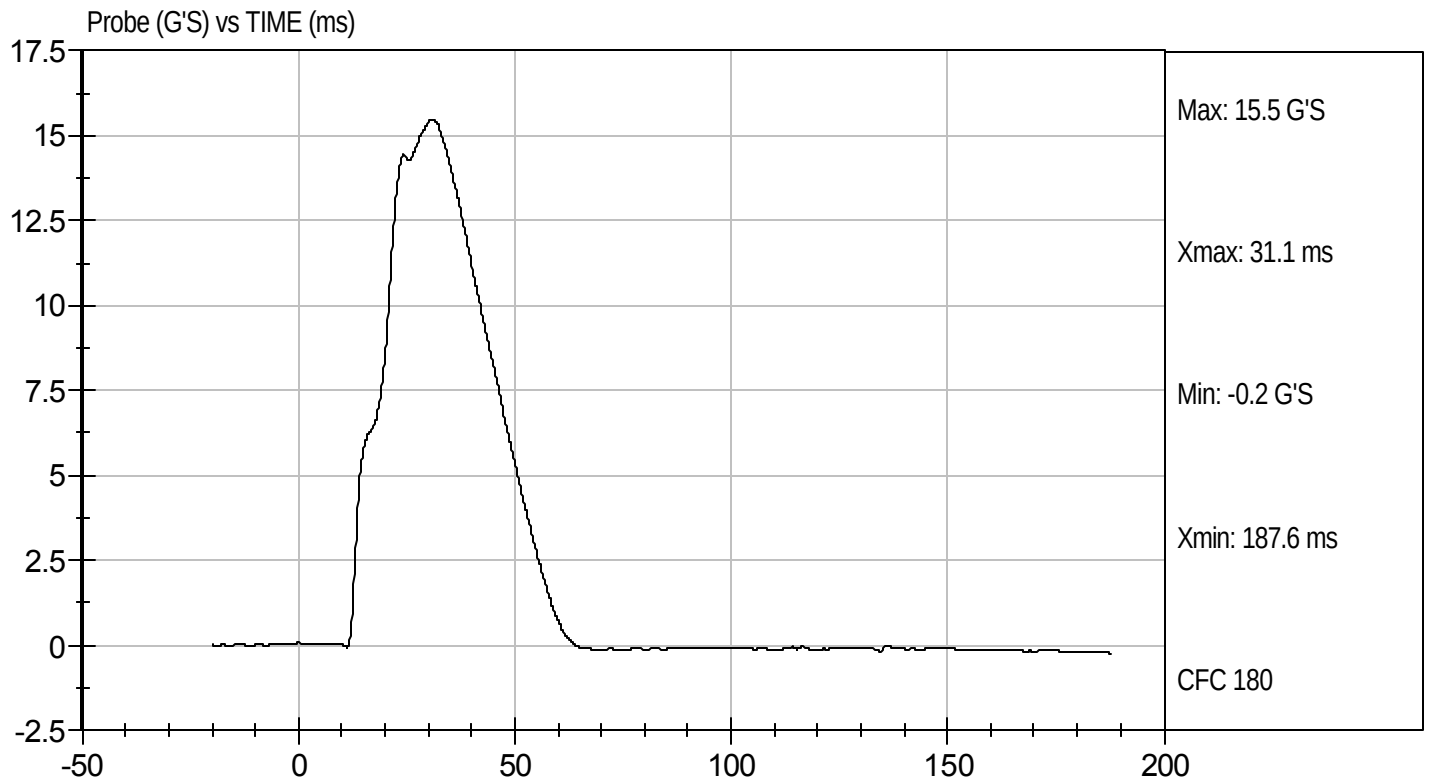
6/5/09
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D091425

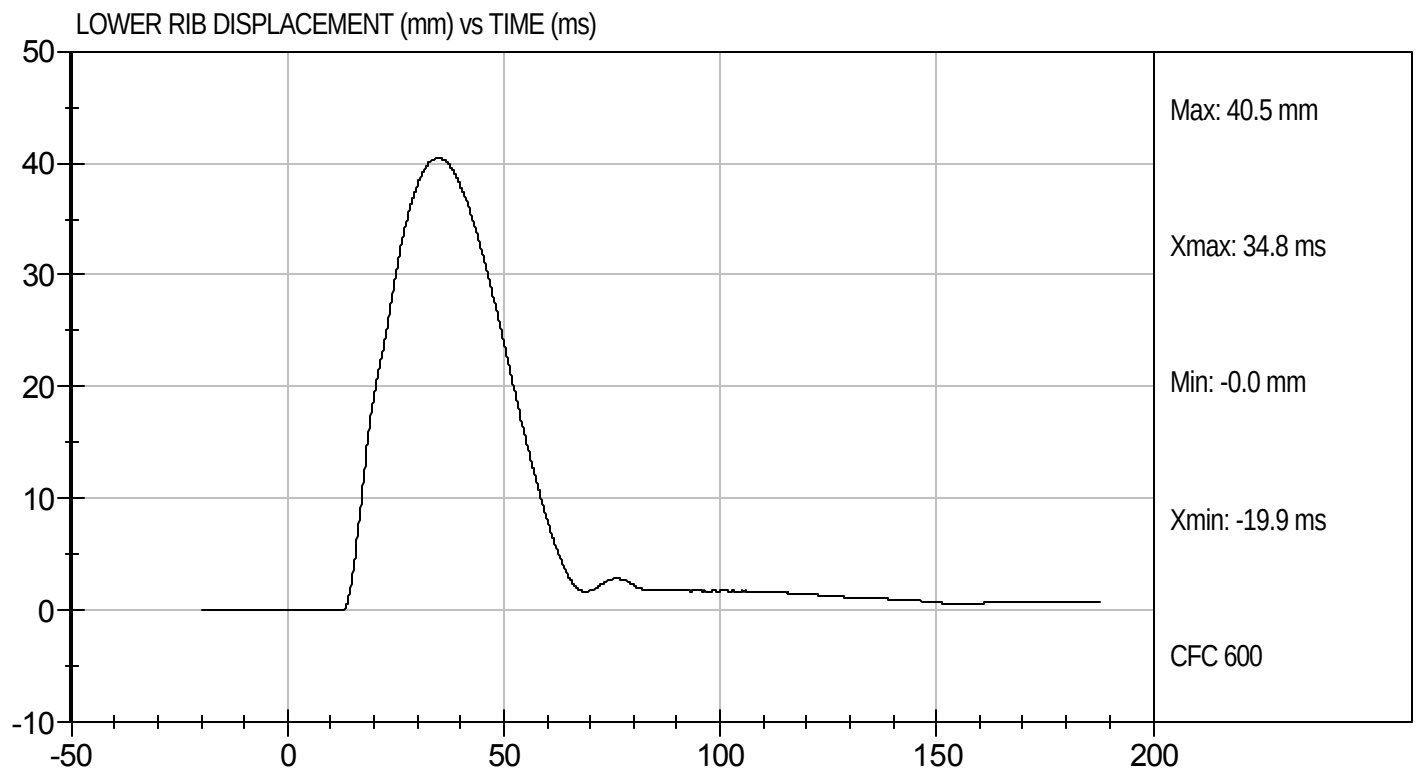
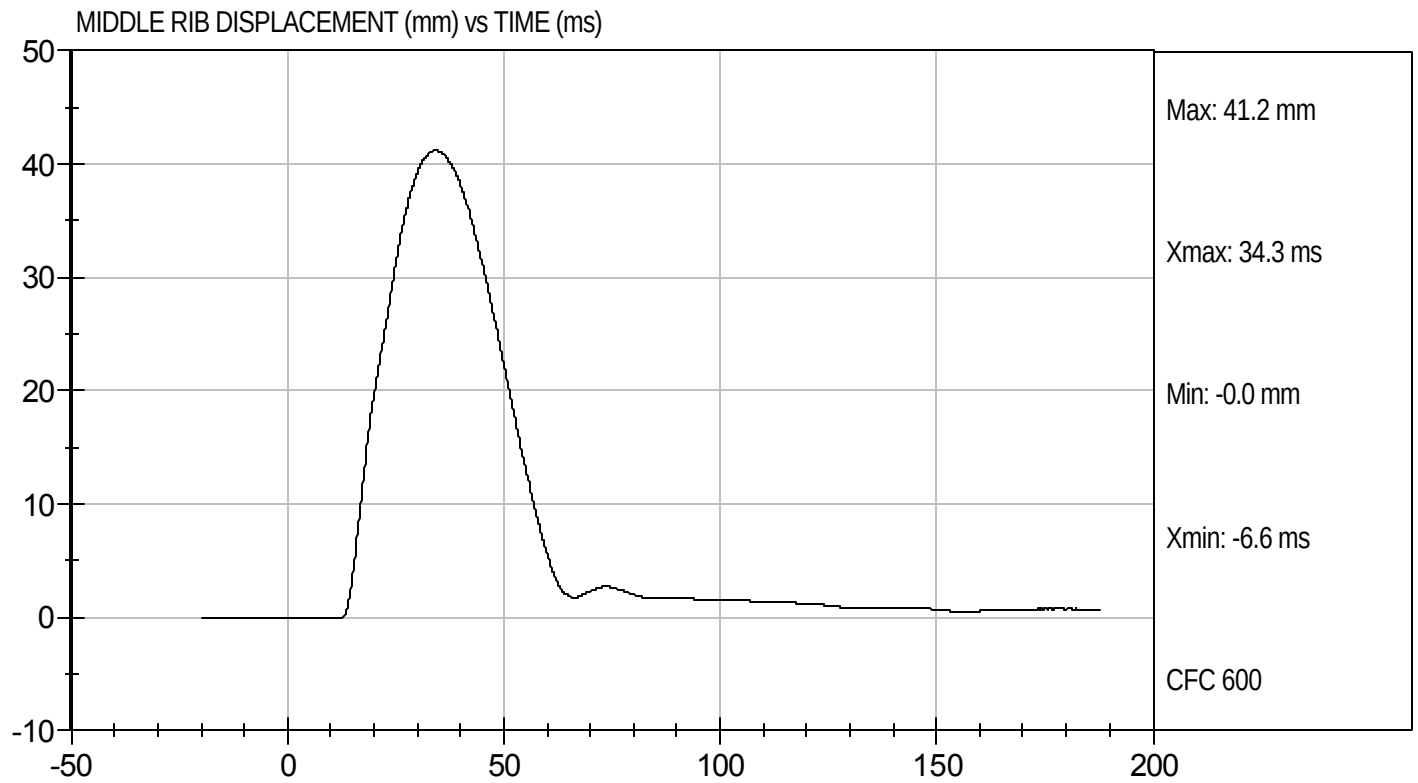
Test Date: 6/5/09
Velocity: 13.8 ft/s, 4.21 m/s





Test Desc: Thorax Impact
Component ID: D091425

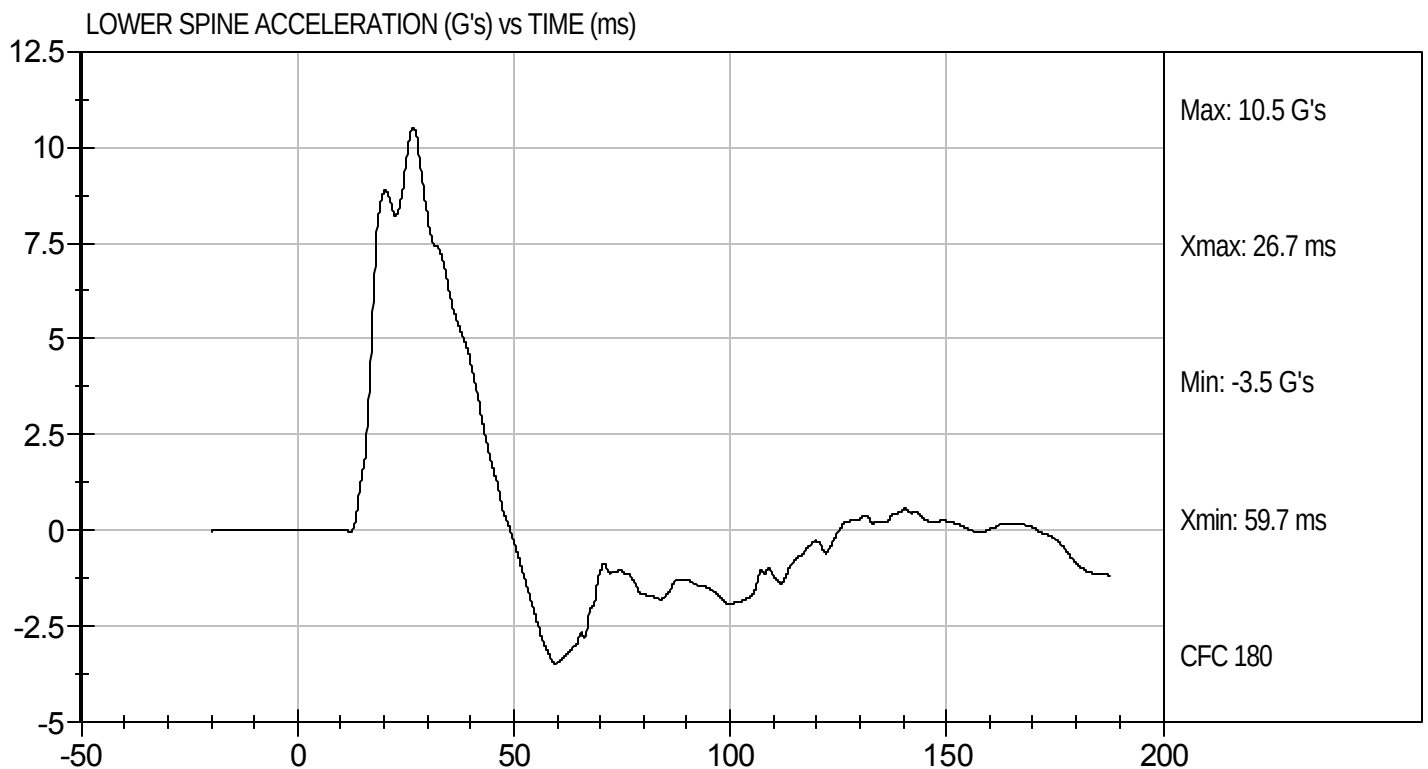
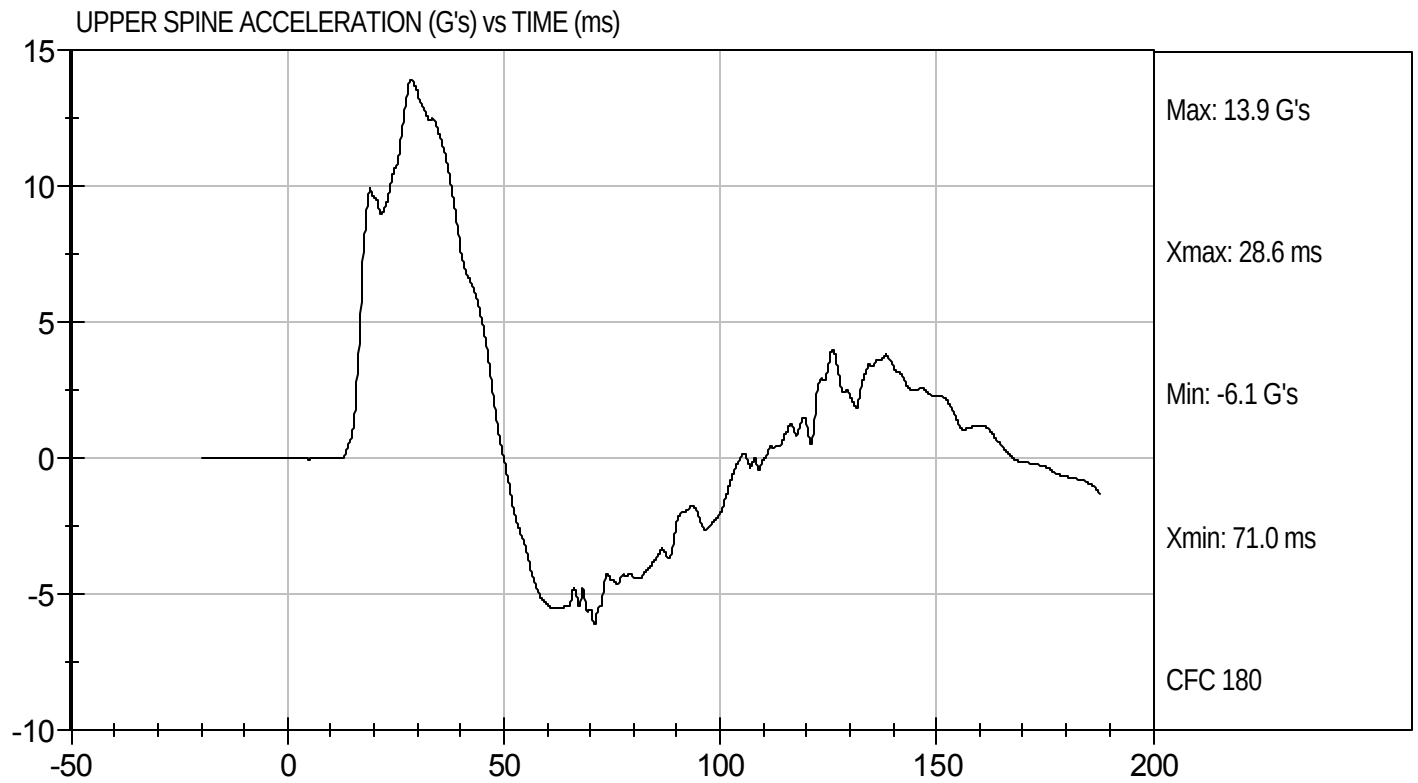
Test Date: 6/5/09
Velocity: 13.8 ft/s, 4.21 m/s





Test Desc: Thorax Impact
Component ID: D091425

Test Date: 6/5/09
Velocity: 13.8 ft/s, 4.21 m/s

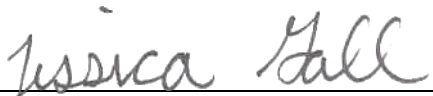


MGA RESEARCH CORPORATION
ABDOMINAL IMPACT TEST
SID-II's BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D091426

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Humidity	%	10 to 70	35	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Peak Impactor Acceleration	G's	12 to 16	14	Pass
Upper Rib Displacement	mm	36 to 47	42	Pass
Lower Rib Displacement	mm	33 to 44	38	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	11	Pass
Overall Test Results				Pass


Laboratory Technician

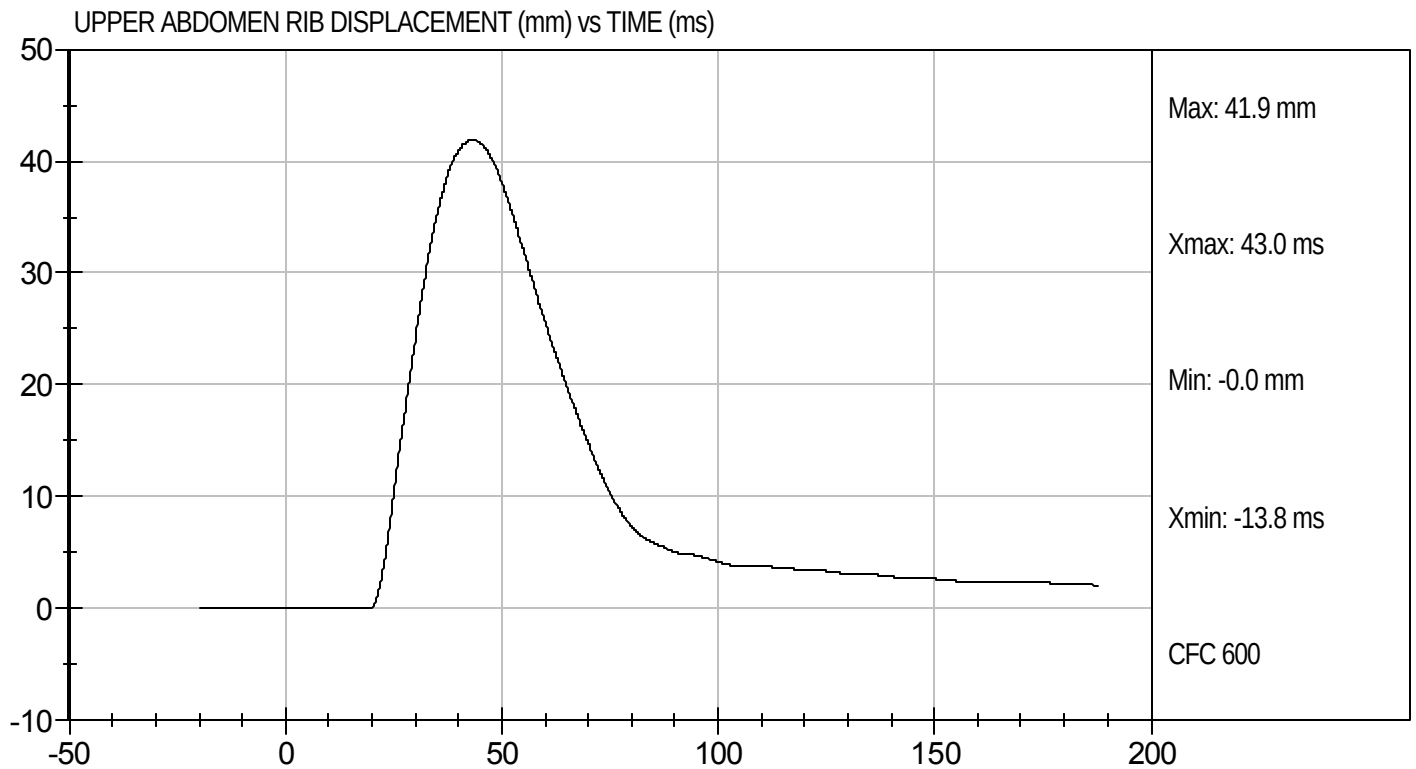
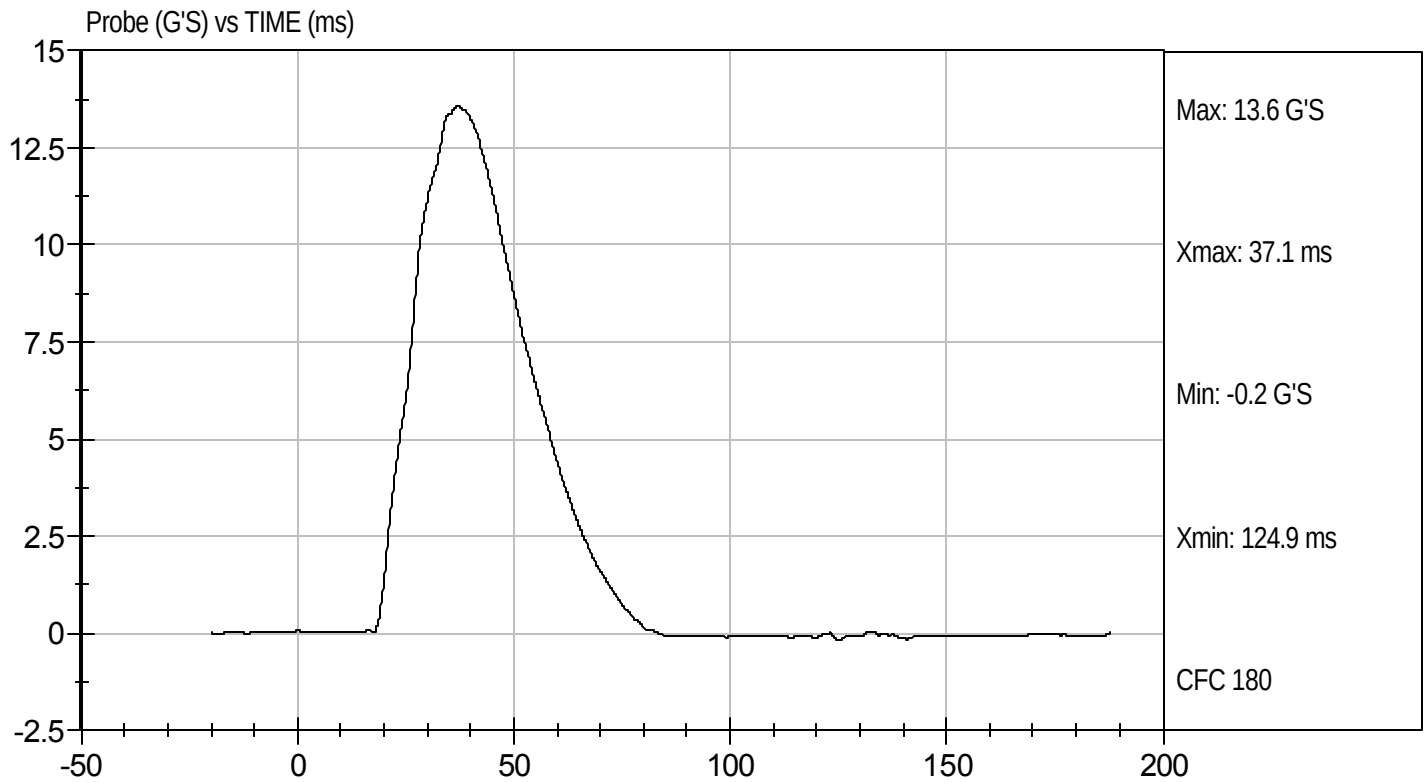
6/5/09
Test Date


Approved By



Test Desc: Abdomen Impact
Component ID: D091426

Test Date: 6/5/09
Velocity: 14.1 ft/s, 4.30 m/s

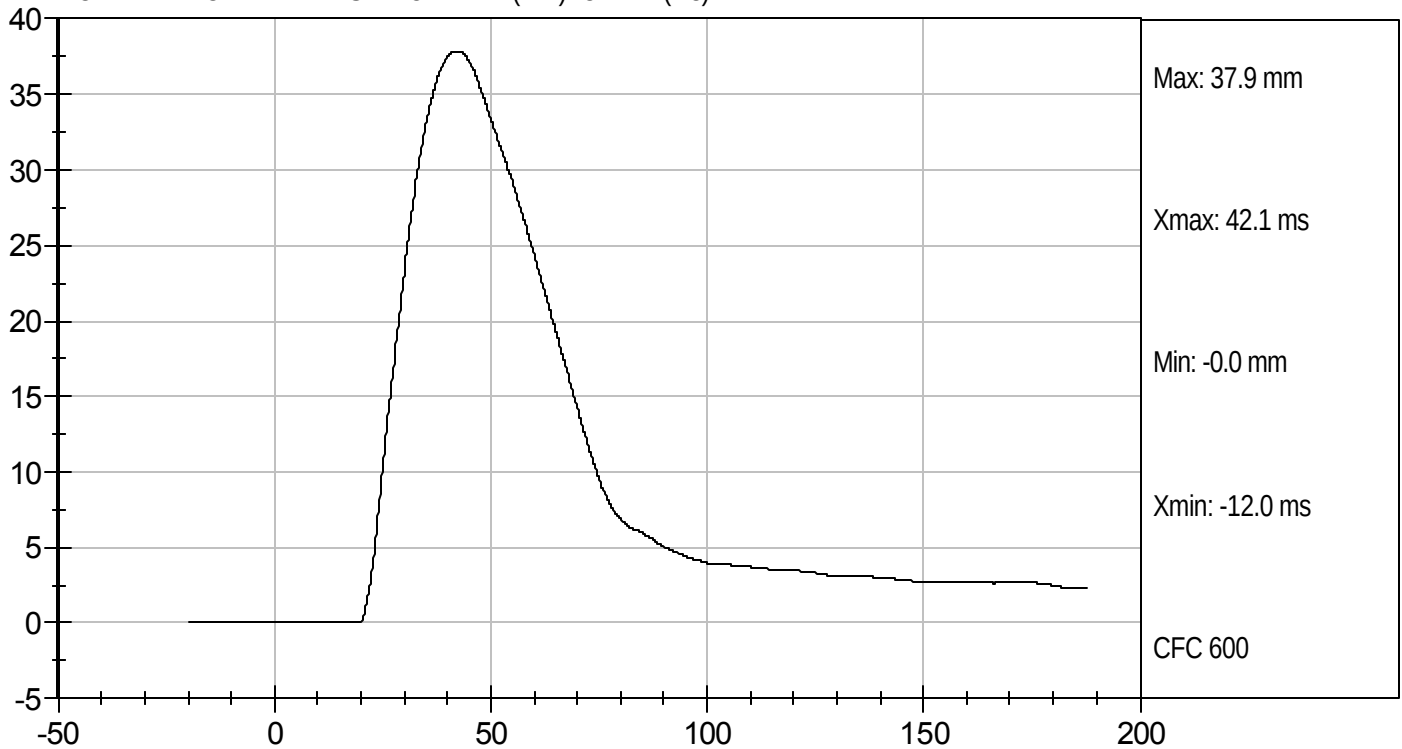




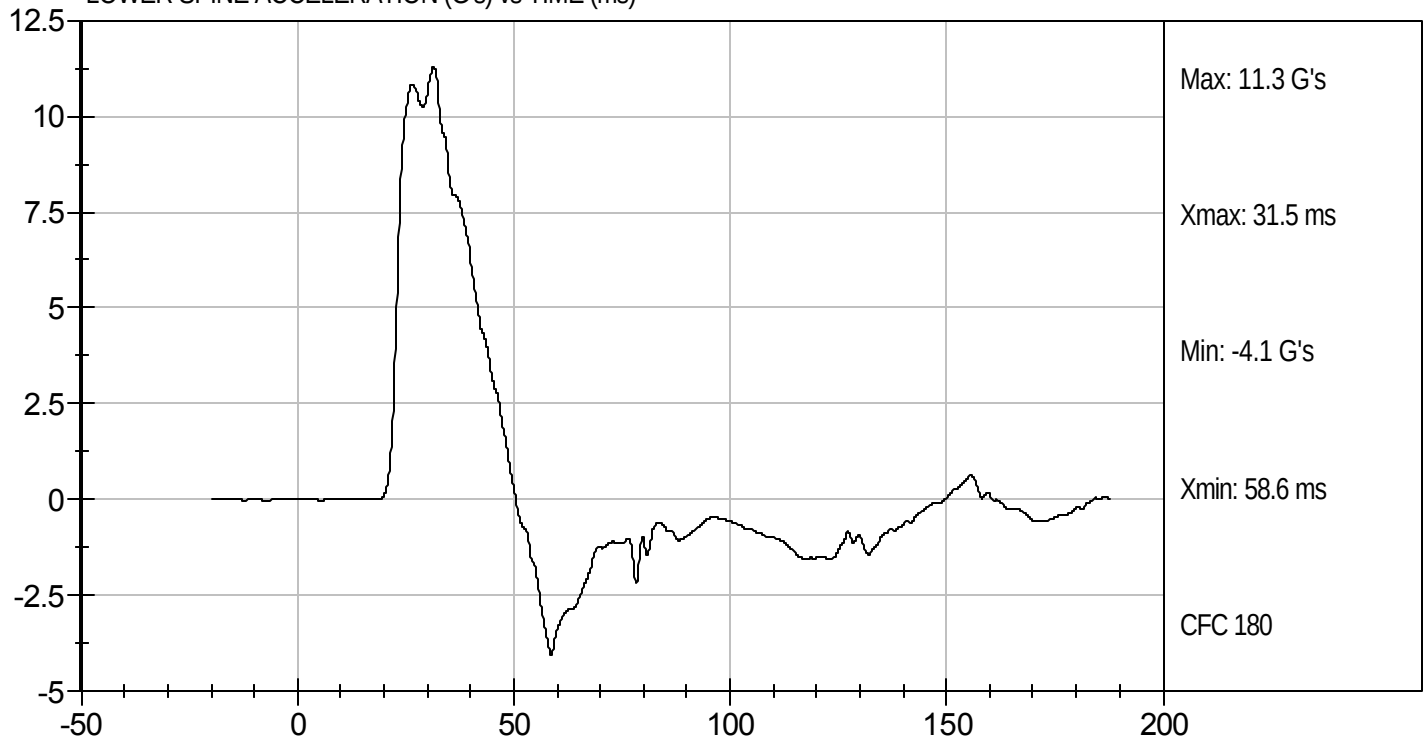
Test Desc: Abdomen Impact
Component ID: D091426

Test Date: 6/5/09
Velocity: 14.1 ft/s, 4.30 m/s

LOWER ABDOMEN RIB DISPLACEMENT (mm) vs TIME (ms)



LOWER SPINE ACCELERATION (G's) vs TIME (ms)

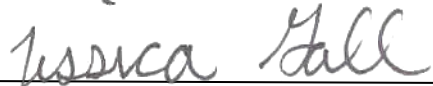


MGA RESEARCH CORPORATION
PELVIS IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D091427

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Humidity	%	10 to 70	36	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Peak Impactor Acceleration	G's	38 to 47	43	Pass
Pelvis Y Acceleration after 6 ms	G's	34 to 42	38	Pass
Peak Acetabulum Force	N	3600 to 4300	4157	Pass
Overall Test Results			Pass	


Laboratory Technician

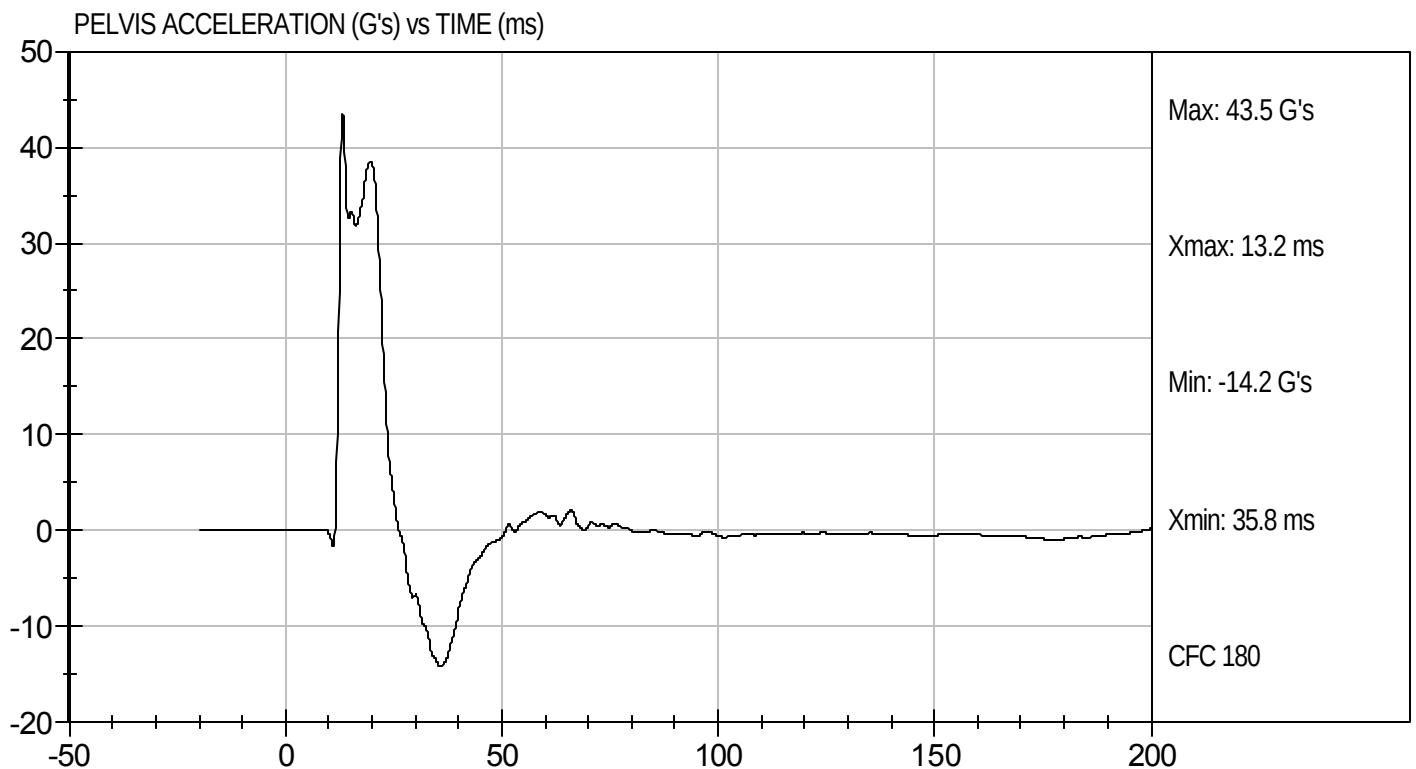
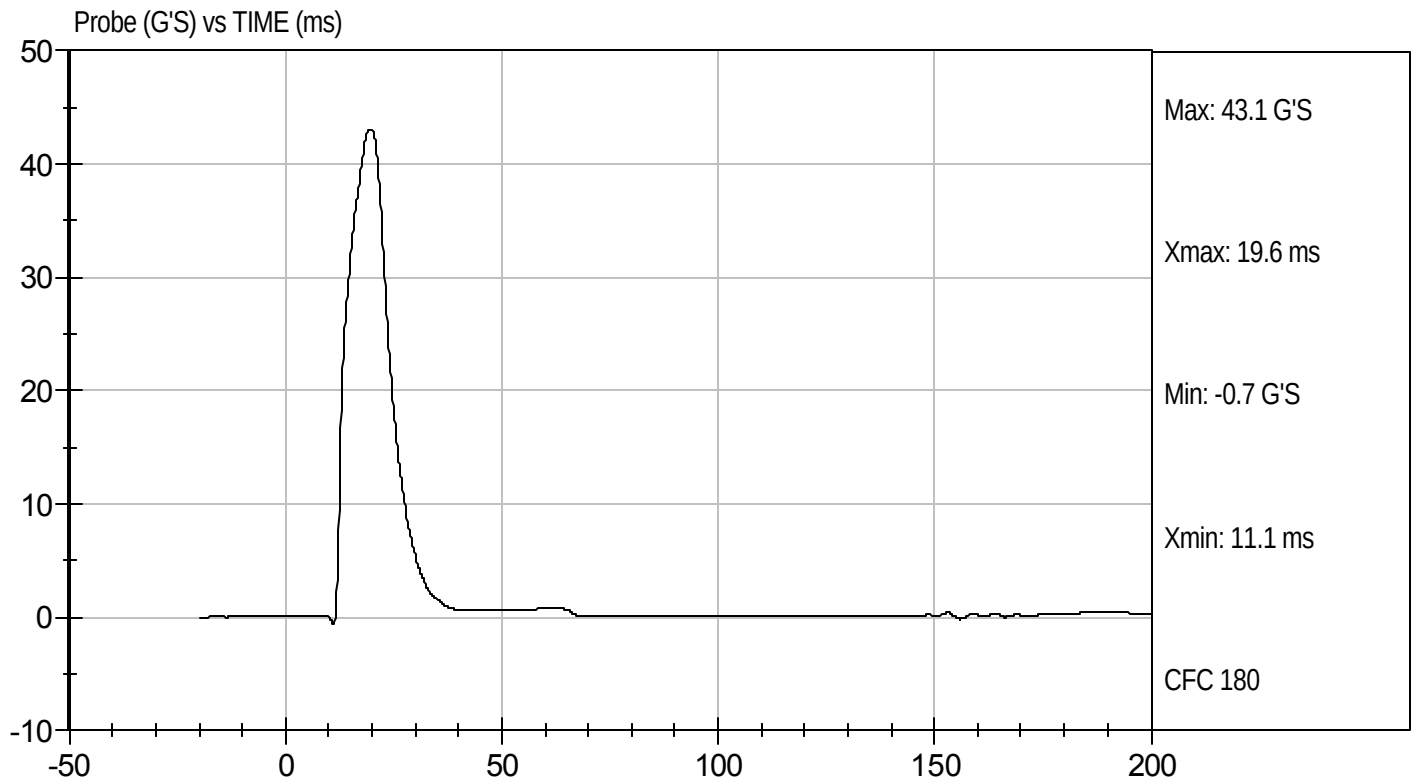
6/5/09
Test Date


Approved By



Test Desc: Pelvis Impact
Component ID: D091427

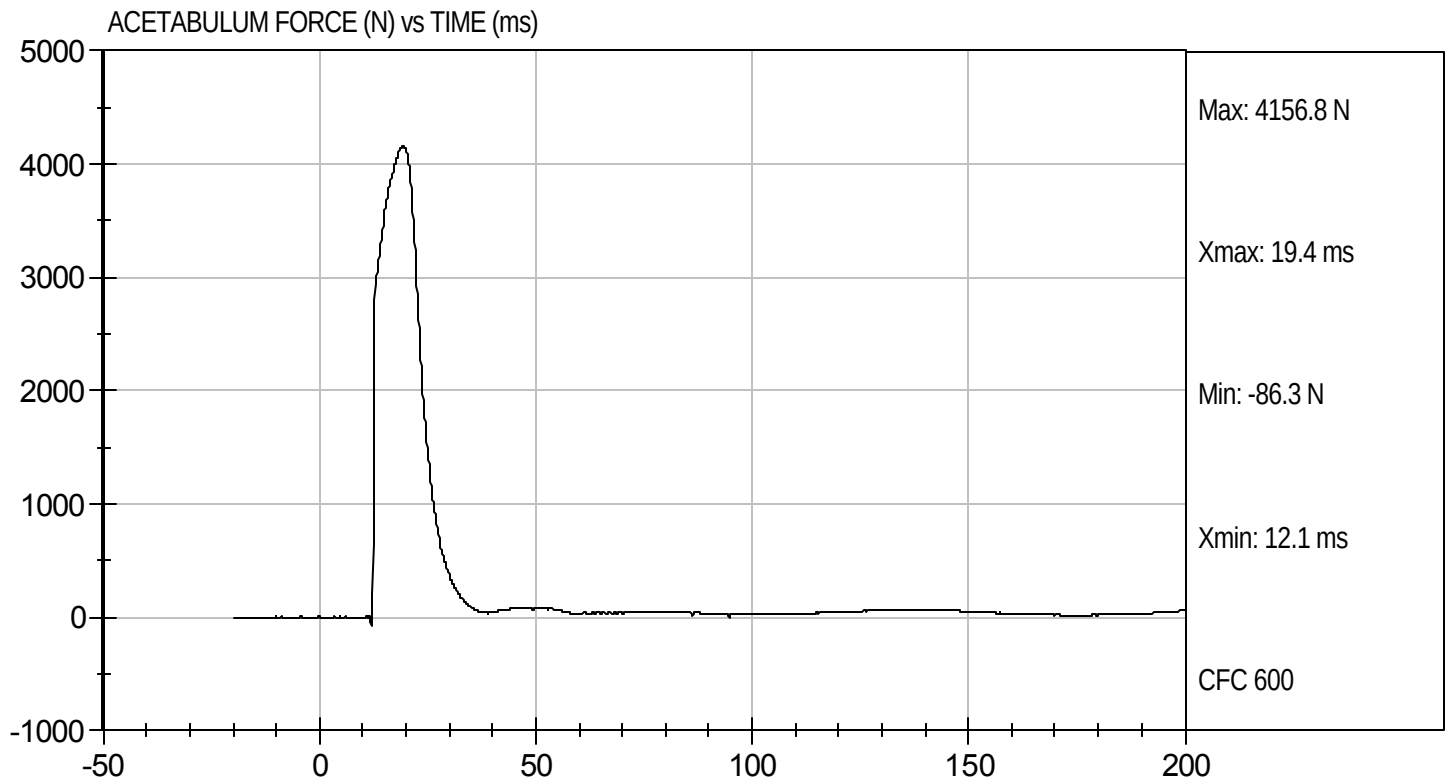
Test Date: 6/5/09
Velocity: 22.2 ft/s, 6.77 m/s





Test Desc: Pelvis Impact
Component ID: D091427

Test Date: 6/5/09
Velocity: 22.2 ft/s, 6.77 m/s



MGA RESEARCH CORPORATION
ILIAC IMPACT TEST
SID-IIIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D091428

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Humidity	%	10 to 70	36	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Peak Impactor Acceleration	G's	36 to 45	39	Pass
Pelvis Y Acceleration	G's	28 to 39	34	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4656	Pass
Overall Test Results			Pass	


Laboratory Technician

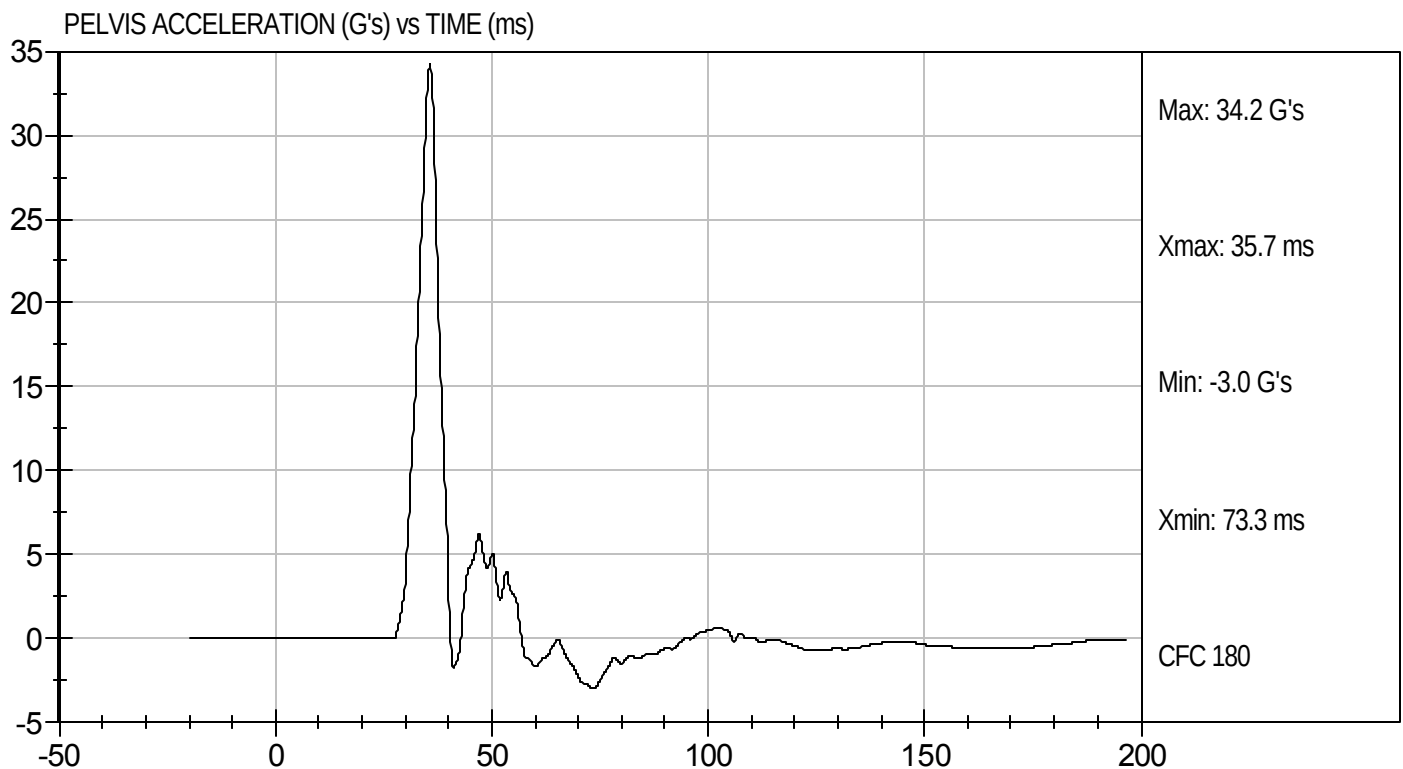
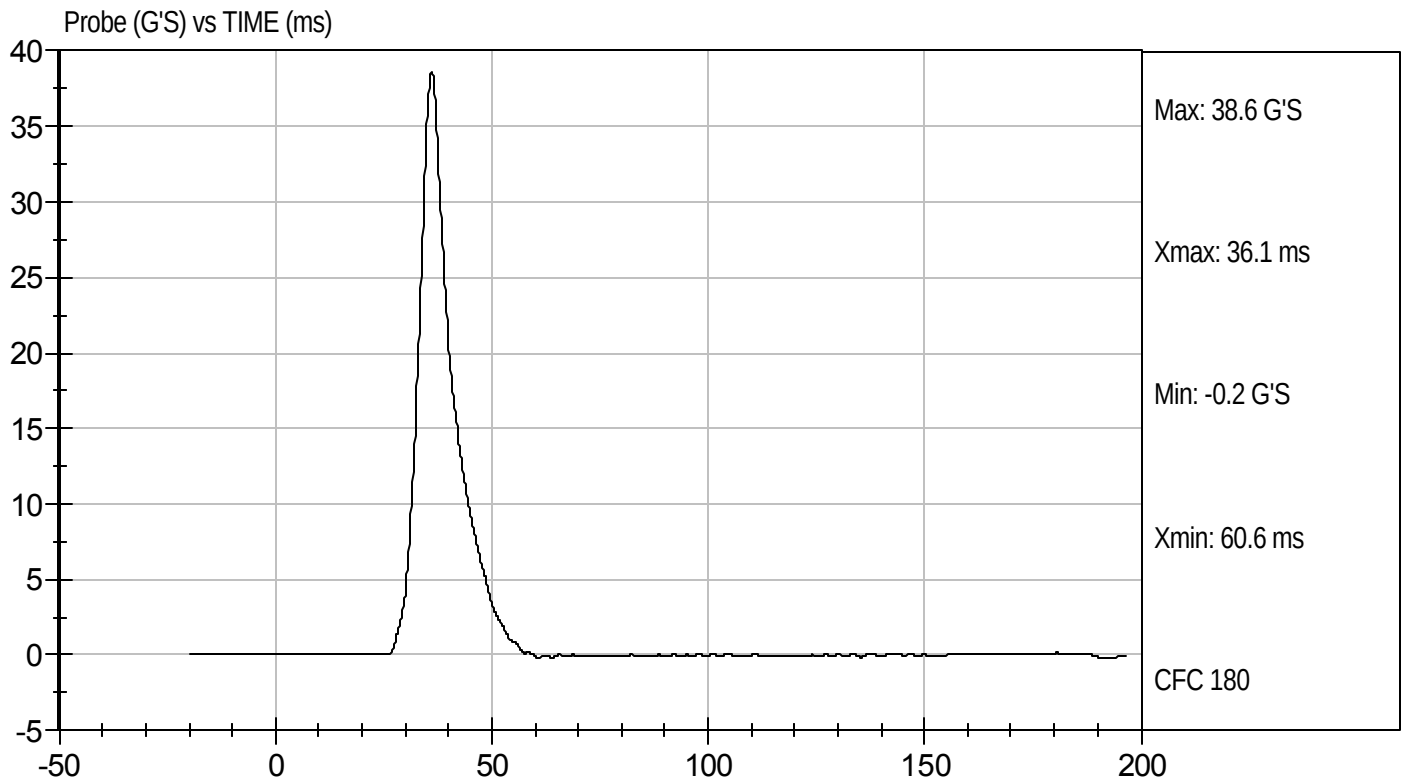
6/5/09
Test Date


Approved By



Test Desc: Iliac Impact
Component ID: D091428

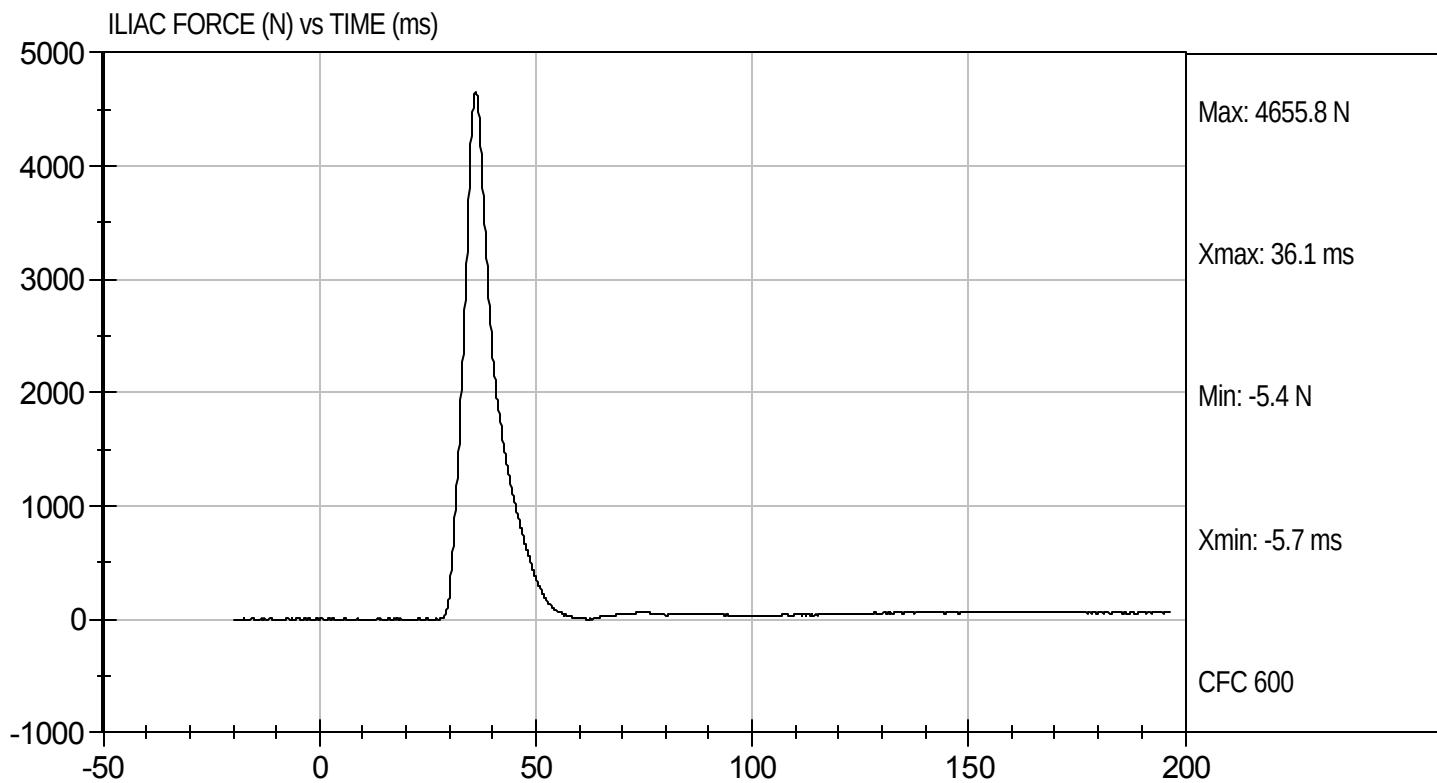
Test Date: 6/5/09
Velocity: 14.12 ft/s, 4.30 m/s





Test Desc: Iliac Impact
Component ID: D091428

Test Date: 6/5/09
Velocity: 14.12 ft/s, 4.30 m/s



MGA RESEARCH CORPORATION
HEAD DROP TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test ID: D091431

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Peak Resultant Acceleration	G's	115 to 137	116	Pass
Peak Lateral Acceleration	G's	+/- 15	-4.2	Pass
Unimodal	N/A	<15%	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

6/8/09
Test Date

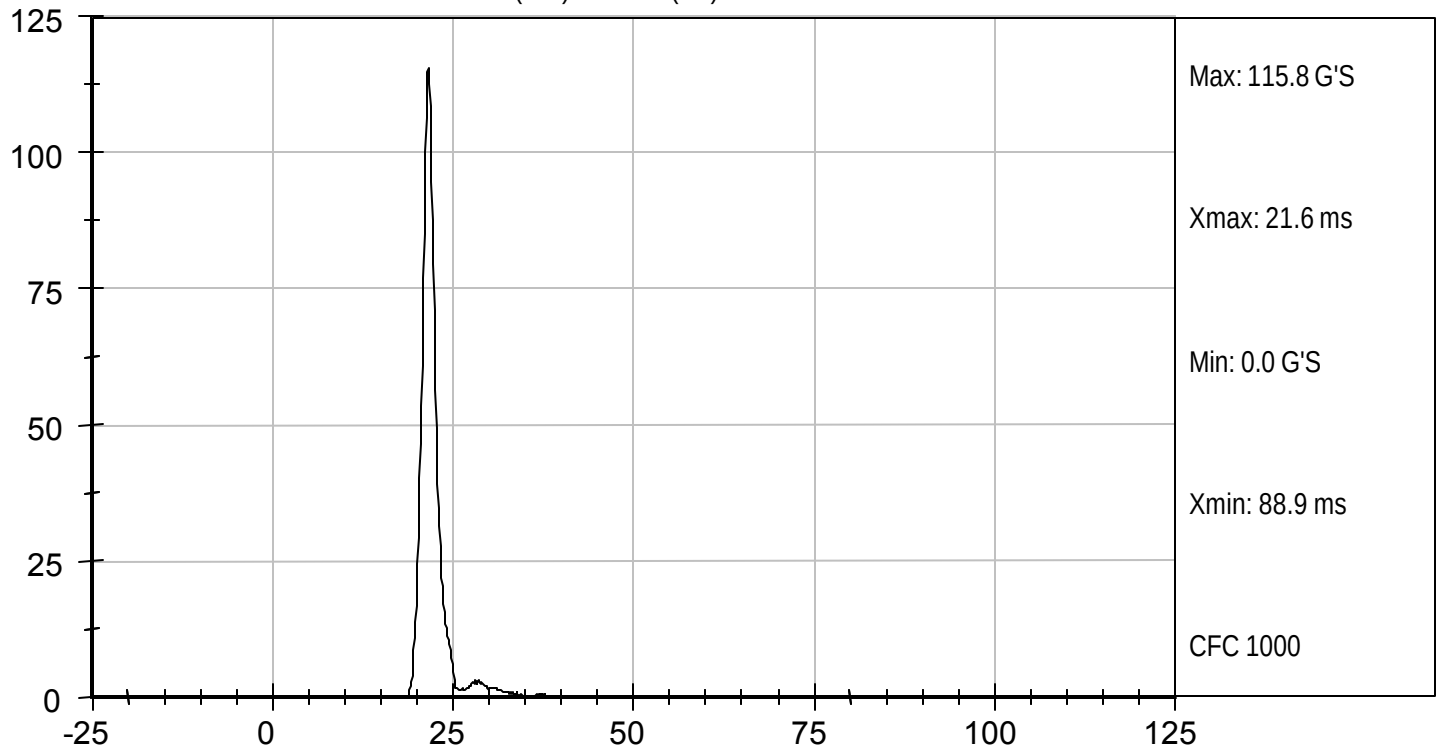

Approved By



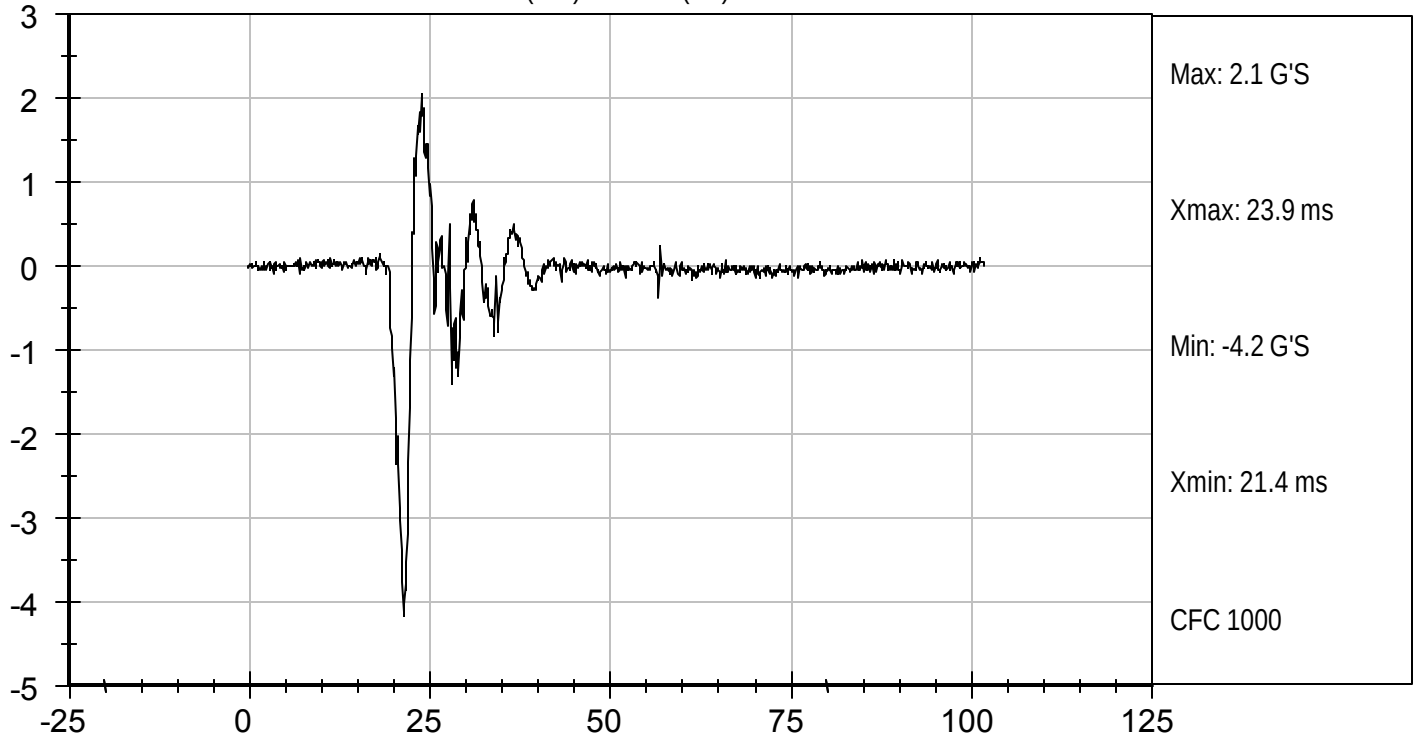
Test Desc: Head Drop
Component ID: D091431

Test Date: 6/8/09
Velocity: 0 ft/s, 0 m/s

PEAK RESULTANT ACCELERATION (G'S) vs TIME (ms)



PEAK LONGITUDINAL ACCELERATION (G'S) vs TIME (ms)

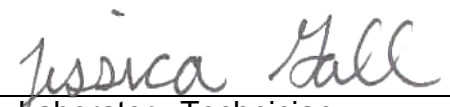


MGA RESEARCH CORPORATION
LATERAL NECK PENDULUM TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D091432

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.9	Pass
Humidity		%	10 to 70	45	Pass
Impact Velocity		m/s	5.51 to 5.63	5.58	Pass
Delta Velocity	10 msec	m/s	2.20 to 2.80	2.74	Pass
	15 msec	m/s	3.30 to 4.10	3.97	Pass
	20 msec	m/s	4.40 to 5.40	5.38	Pass
	25 msec	m/s	5.40 to 6.10	5.68	Pass
	25-100 msec	m/s	5.50 to 6.20	5.70	Pass
Maximum D-Plane Rotation		deg	71 to 81	72	Pass
Time of Maximum D-Plane Rotation		msec	50 to 70	58	Pass
Maximum Occipital Condyle Moment during Rotation Interval		Nm	-44 to -36	-44	Pass
Time of Moment Decay to 0 Nm		msec	102 to 126	110	Pass
Overall Test Results					Pass


 Laboratory Technician

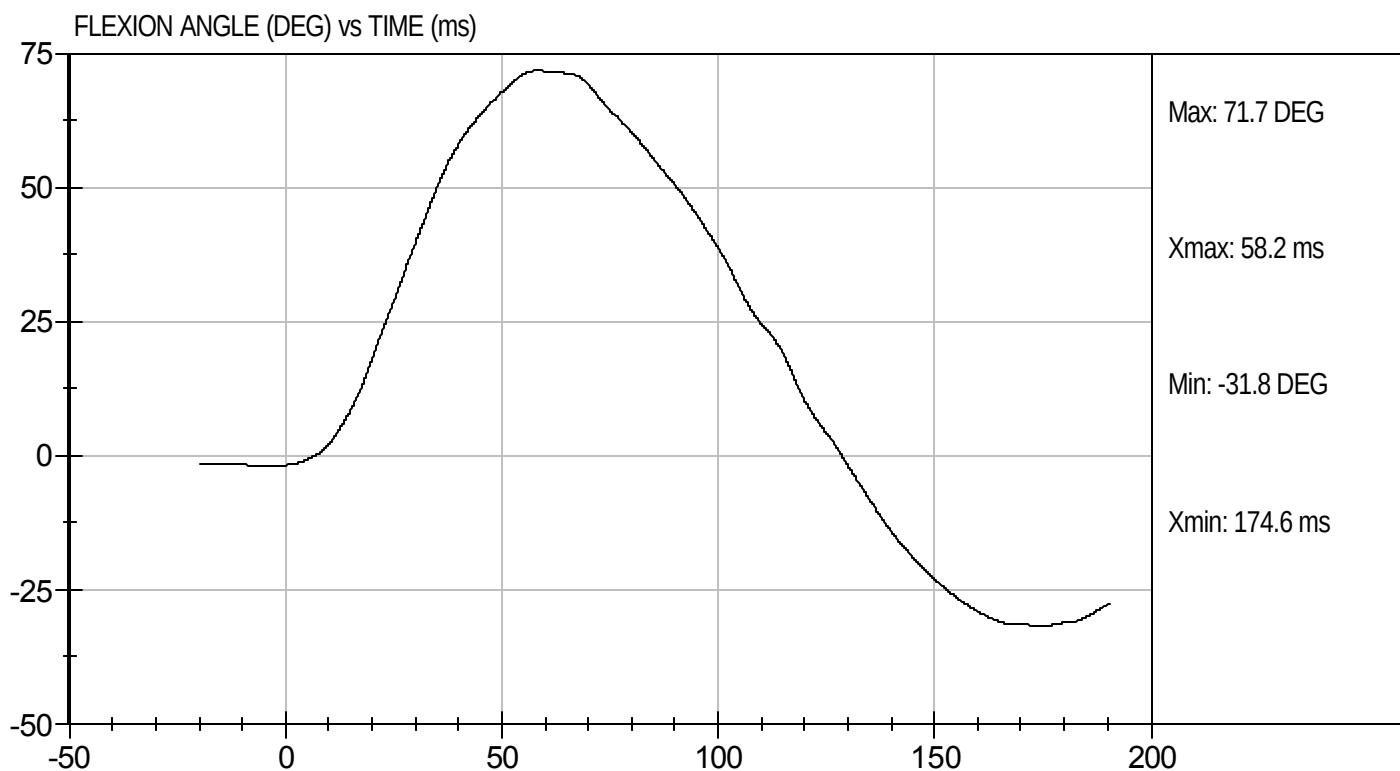
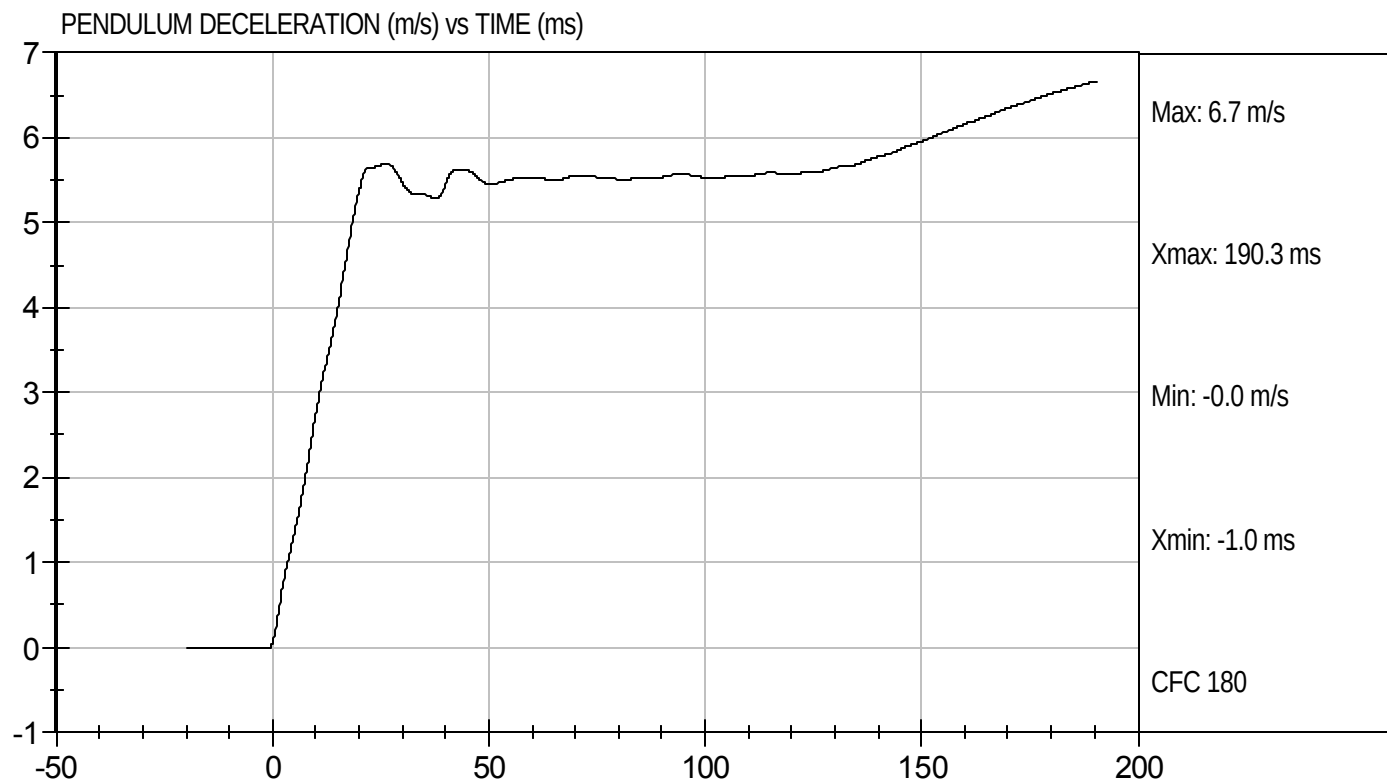
6/8/09
 Test Date


 Approved By



Test Desc: Neck Bending
Component ID: D091432

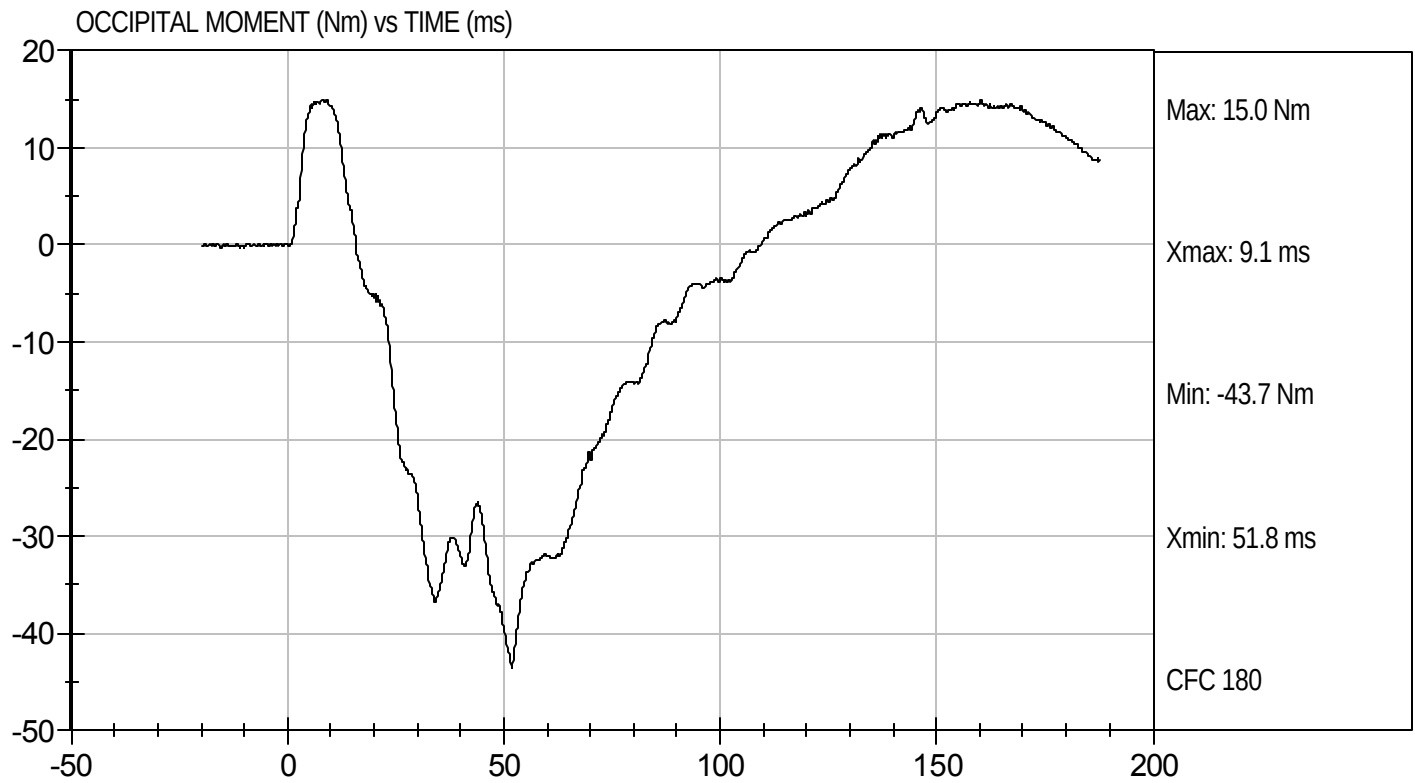
Test Date: 6/8/09
Velocity: 18.32 ft/s, 5.58 m/s





Test Desc: Neck Bending
Component ID: D091432

Test Date: 6/8/09
Velocity: 18.32 ft/s, 5.58 m/s

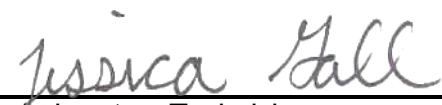


MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test ID: D091433

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Impact Velocity	m/s	4.20 to 4.40	4.27	Pass
Maximum Probe Acceleration	G's	13 to 18	15	Pass
Shoulder Displacement	mm	28 to 37	31	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	18	Pass
Overall Test Results				Pass


Laboratory Technician

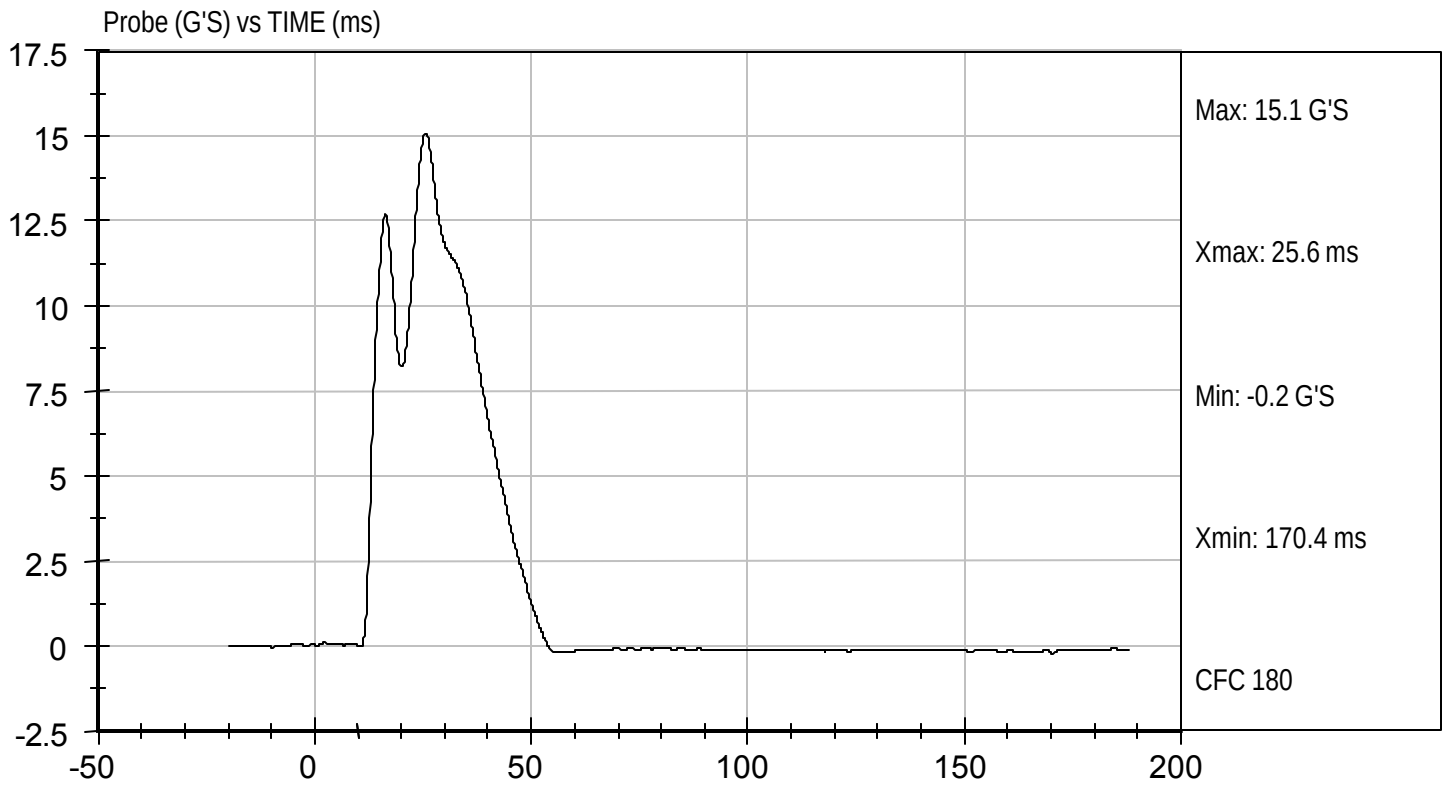
6/8/09
Test Date


Approved By



Test Desc: Shoulder Impact
Component ID: D091433

Test Date: 6/8/09
Velocity: 14.0 ft/s, 4.27 m/s

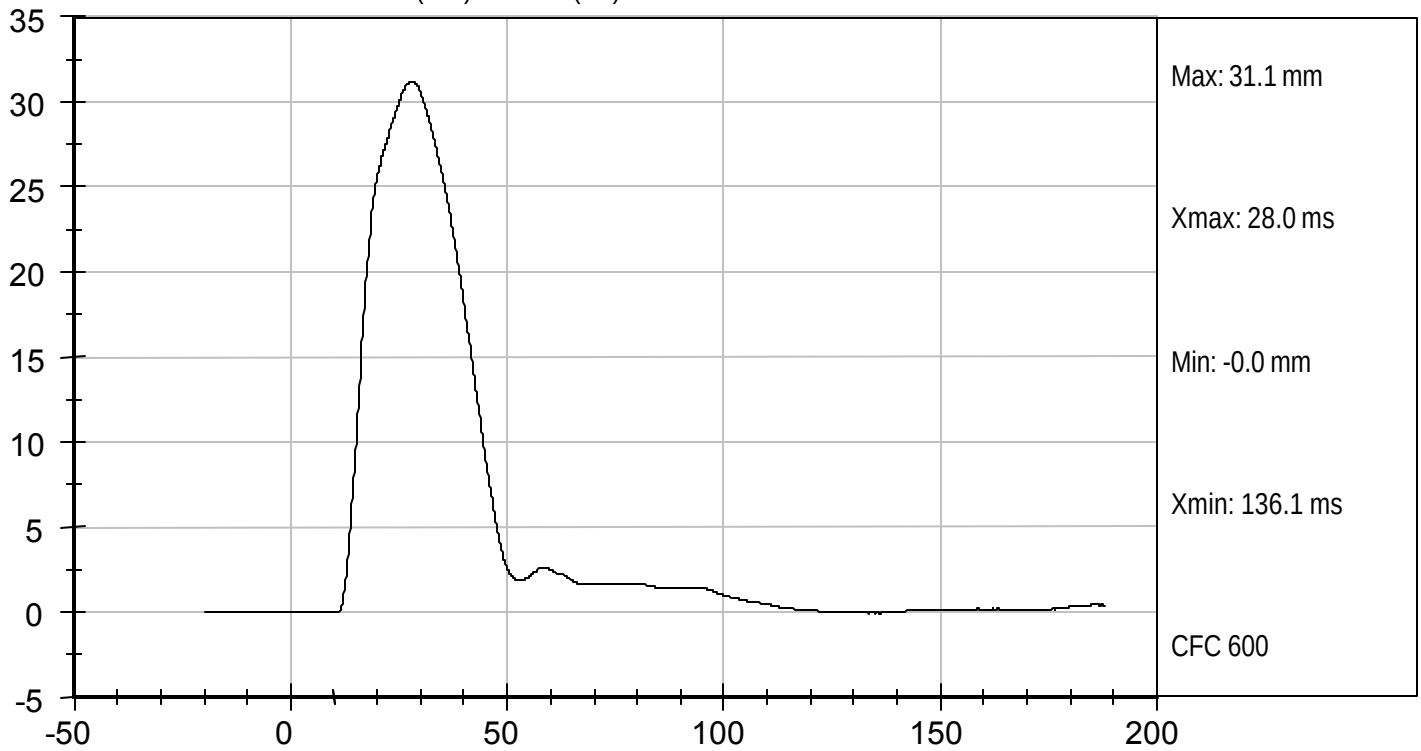




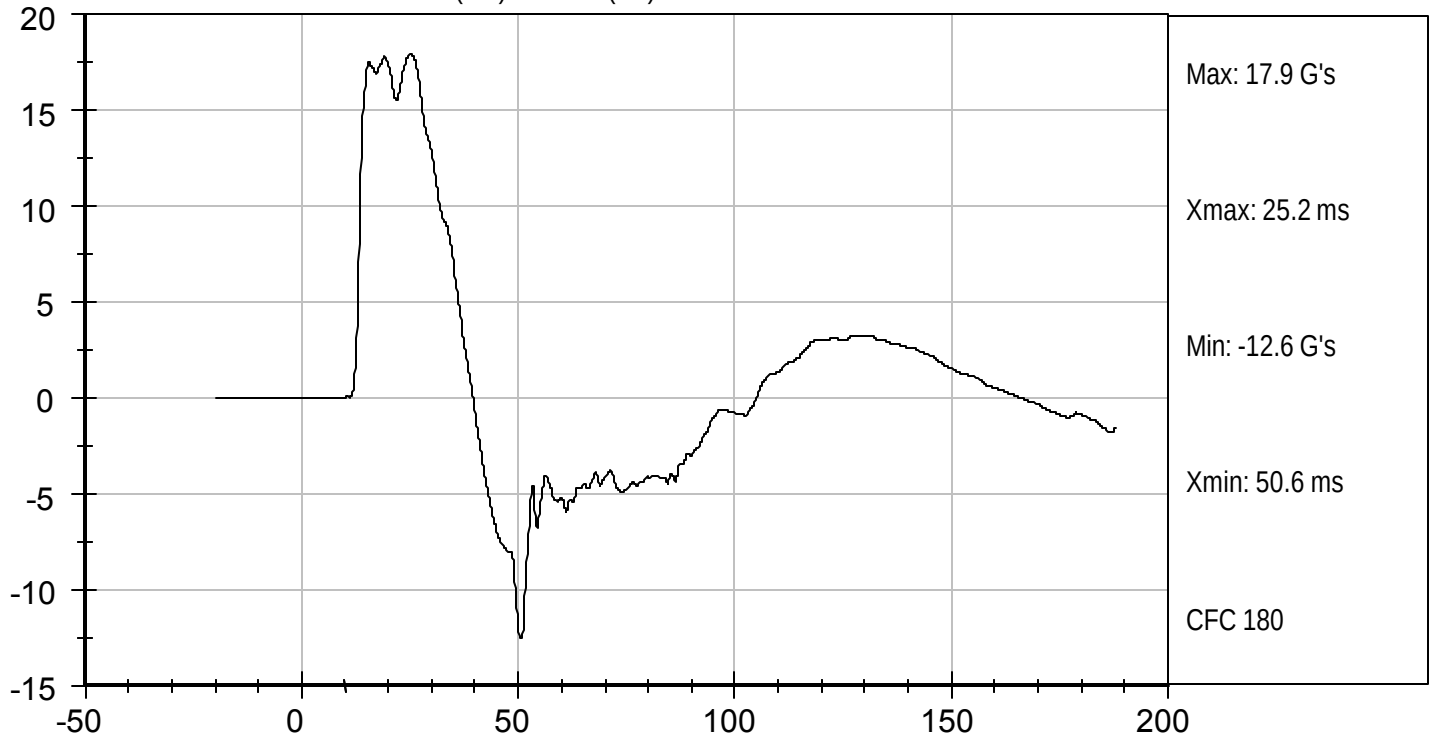
Test Desc: Shoulder Impact
Component ID: D091433

Test Date: 6/8/09
Velocity: 14.0 ft/s, 4.27 m/s

SHOULDER DISPLACEMENT (mm) vs TIME (ms)



UPPER SPINE ACCELERATION (G's) vs TIME (ms)

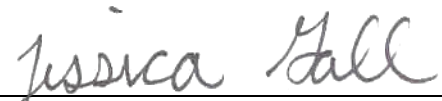


MGA RESEARCH CORPORATION
THORAX (WITH ARM) IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D091434

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Humidity	%	10 to 70	47	Pass
Impact Velocity	m/s	6.60 to 6.80	6.68	Pass
Peak Impactor Acceleration	G's	30 to 36	32	Pass
Shoulder Displacement	mm	31 to 40	36	Pass
Upper Rib Displacement	mm	25 to 32	27	Pass
Middle Rib Displacement	mm	30 to 36	31	Pass
Lower Rib Displacement	mm	32 to 38	33	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	36	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	34	Pass
Overall Test Results			Pass	


 Laboratory Technician

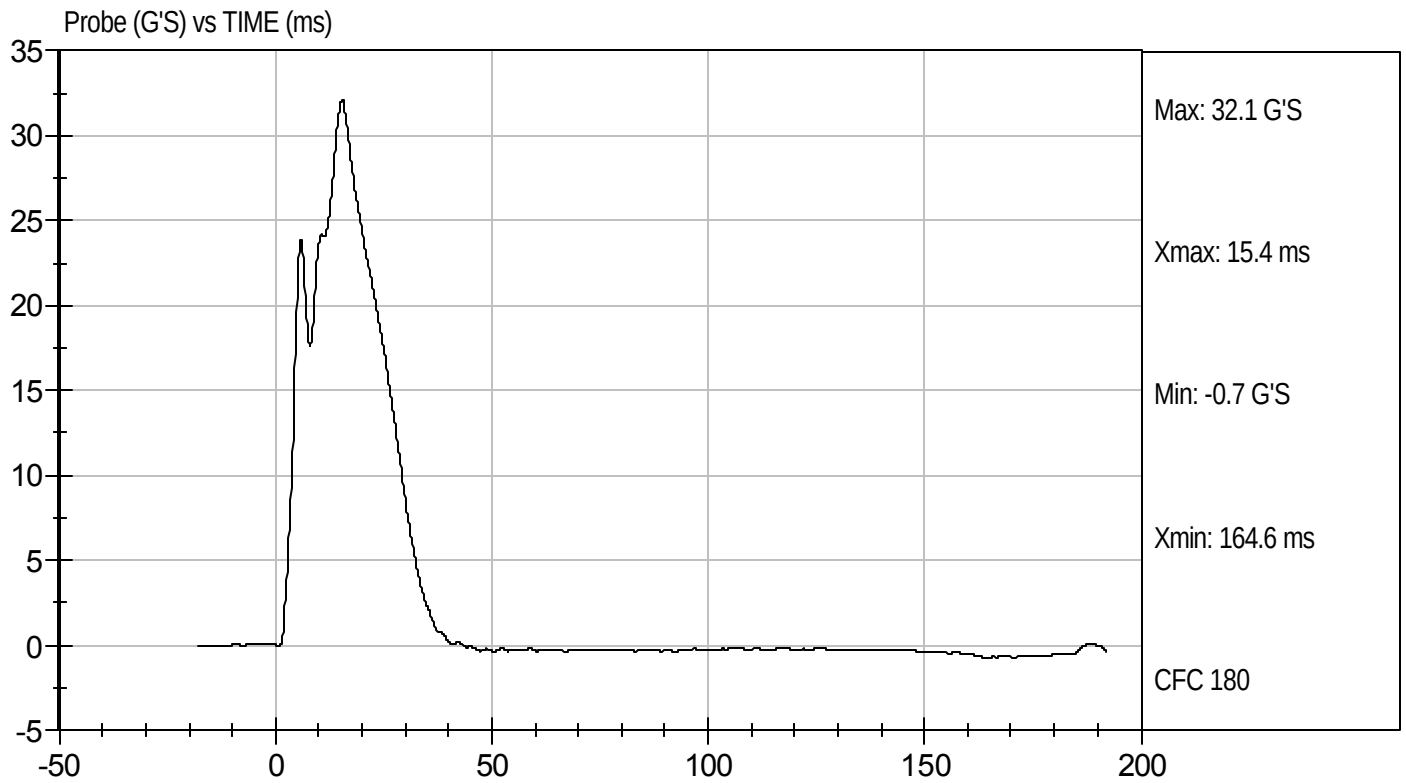
6/8/09
 Test Date


 Approved By



Test Desc: Thorax Impact
Component ID: D091434

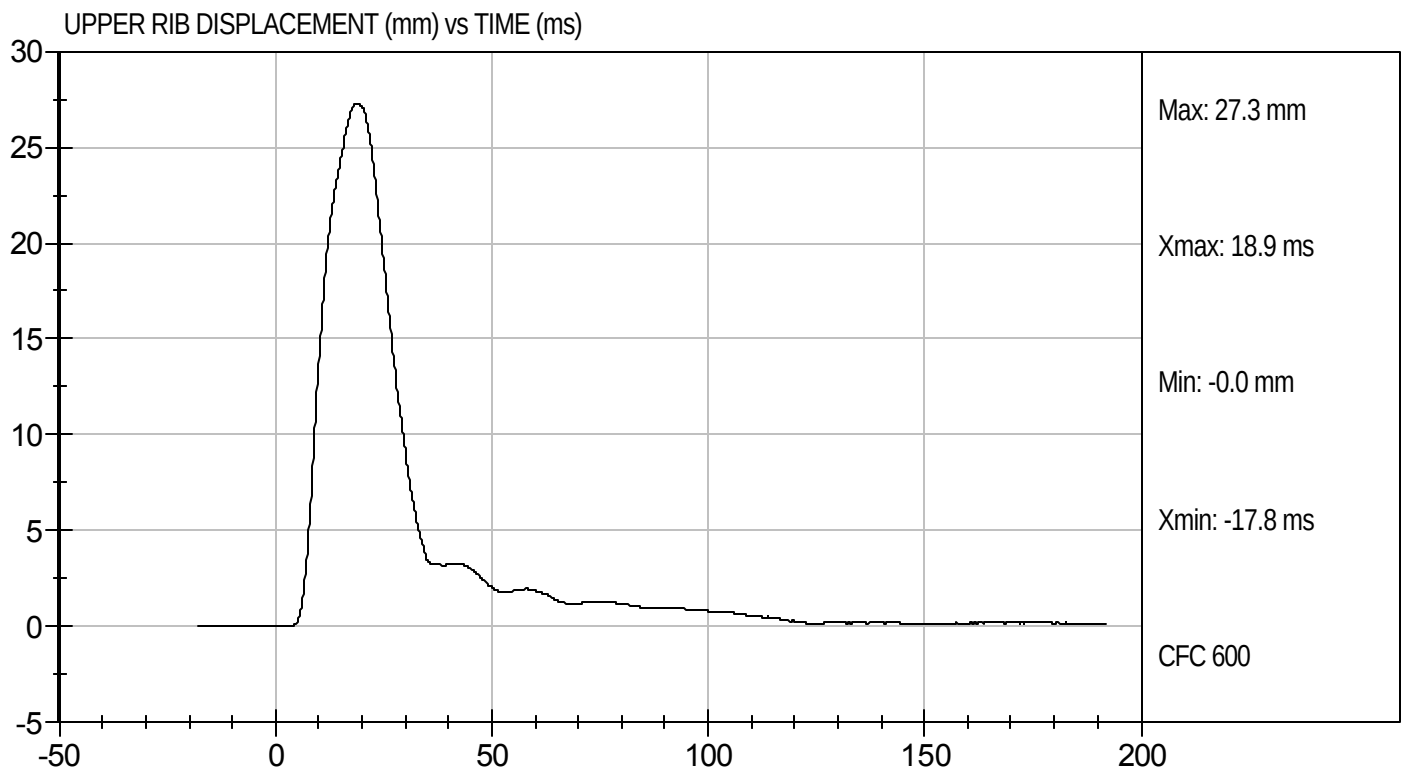
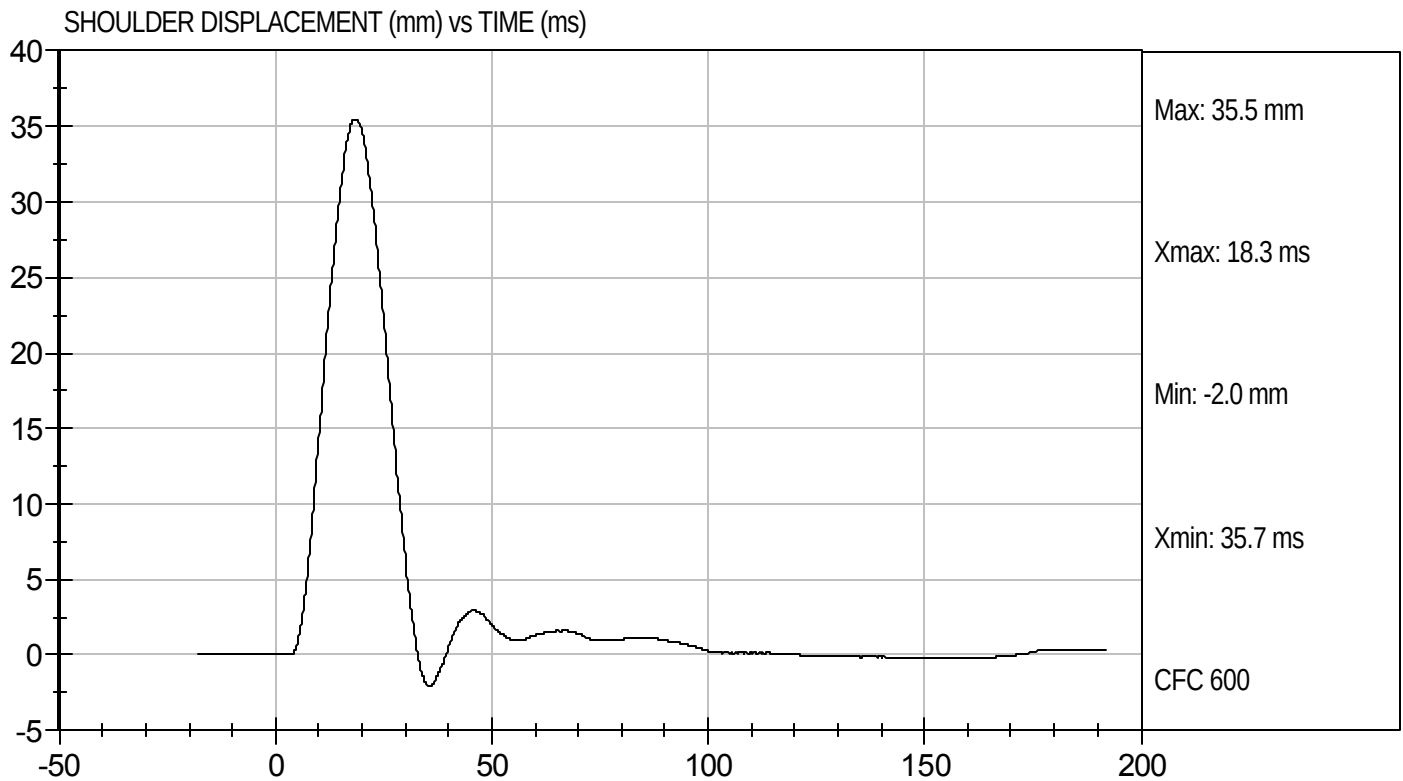
Test Date: 6/8/09
Velocity: 21.9 ft/s, 6.68 m/s





Test Desc: Thorax Impact
Component ID: D091434

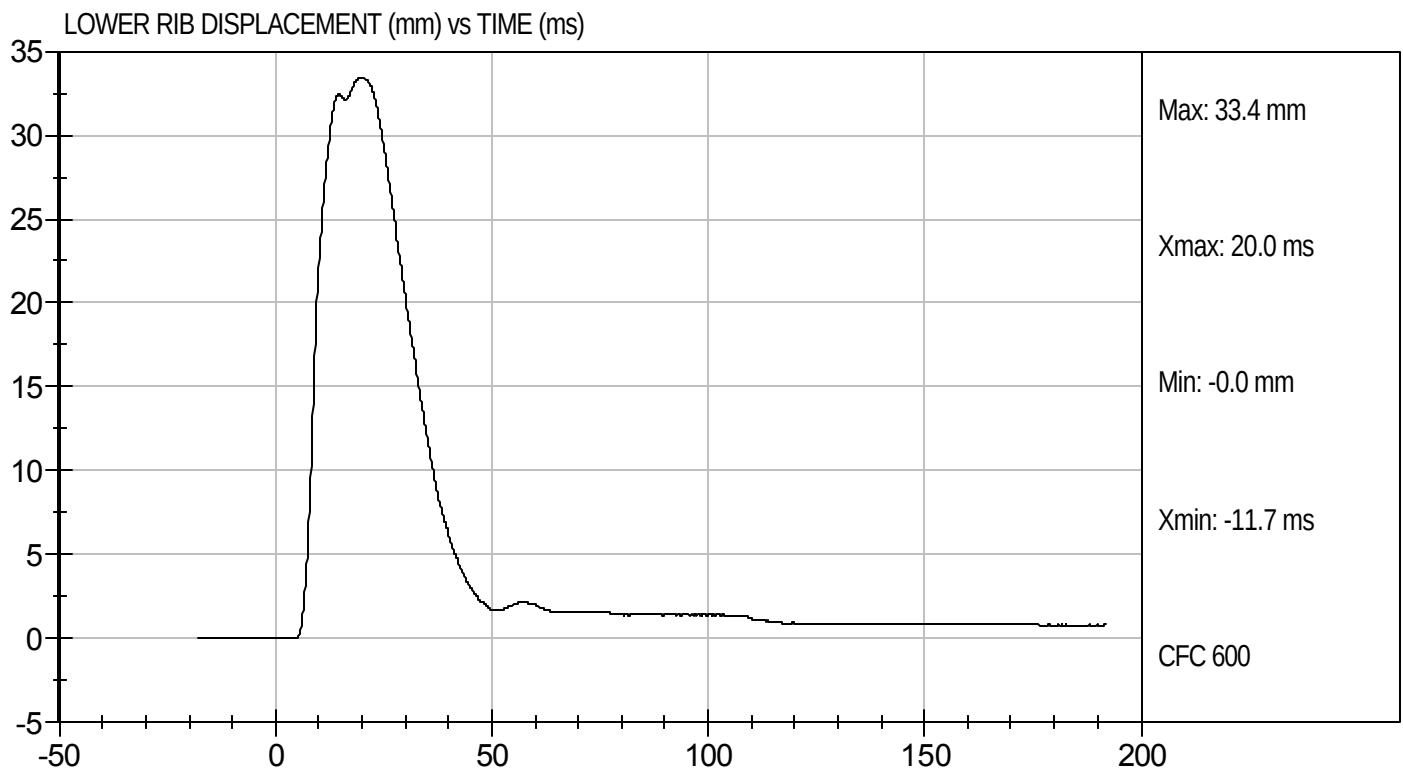
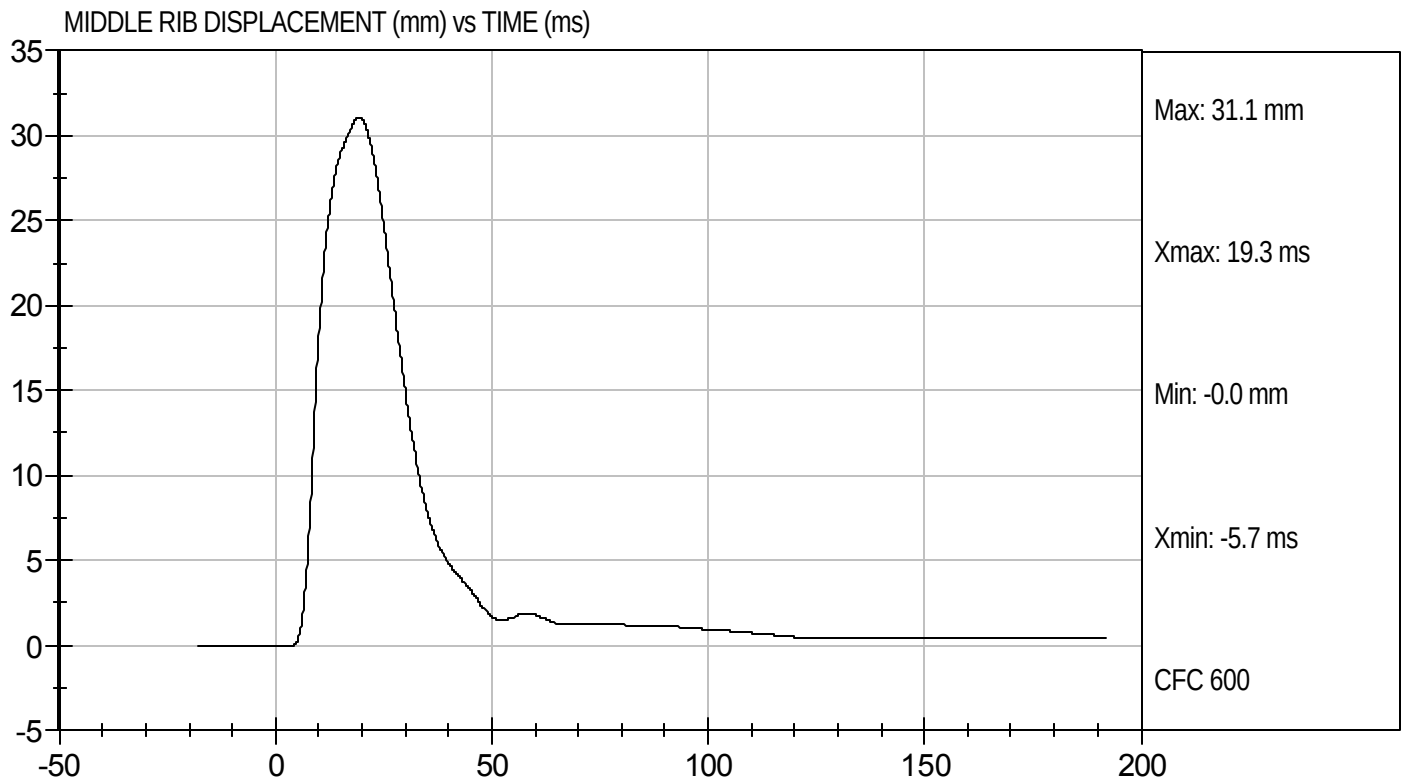
Test Date: 6/8/09
Velocity: 21.9 ft/s, 6.68 m/s





Test Desc: Thorax Impact
Component ID: D091434

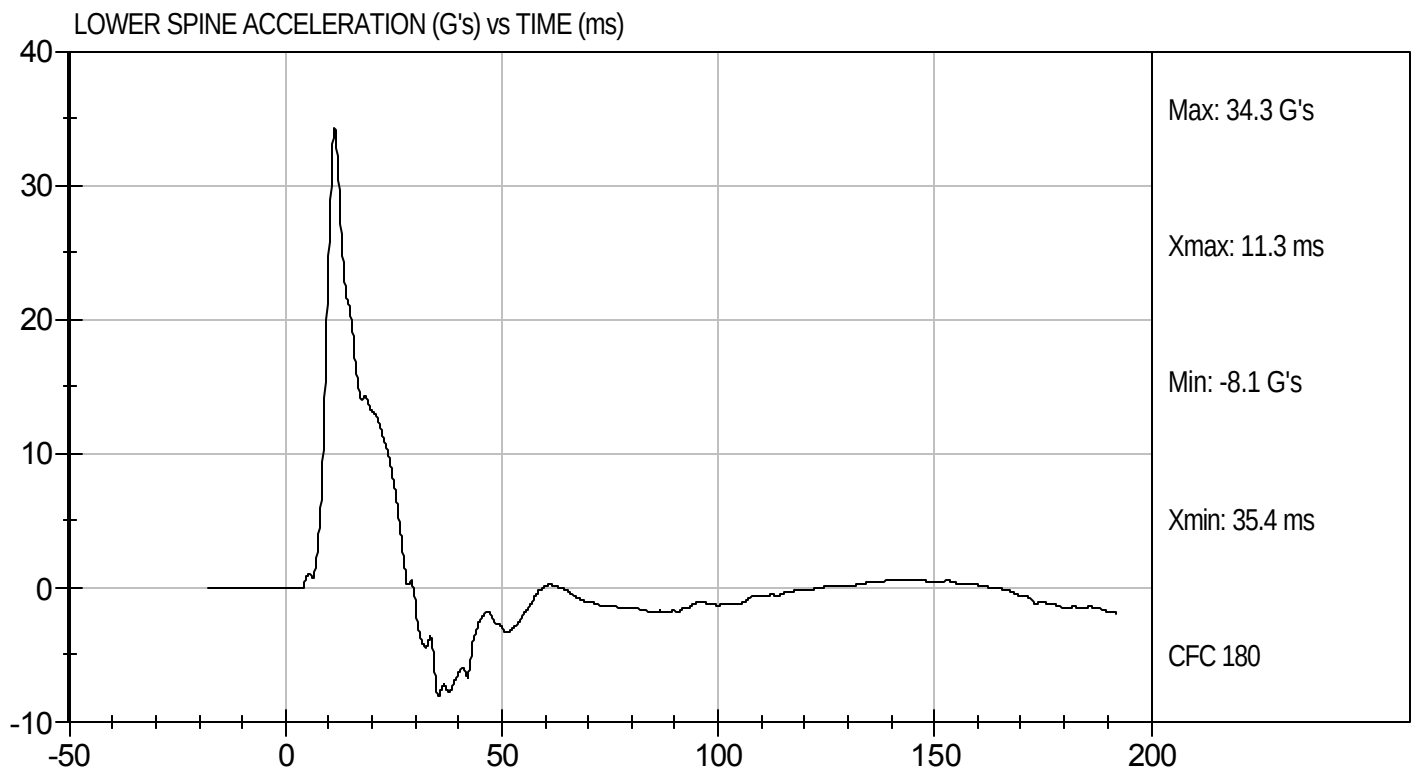
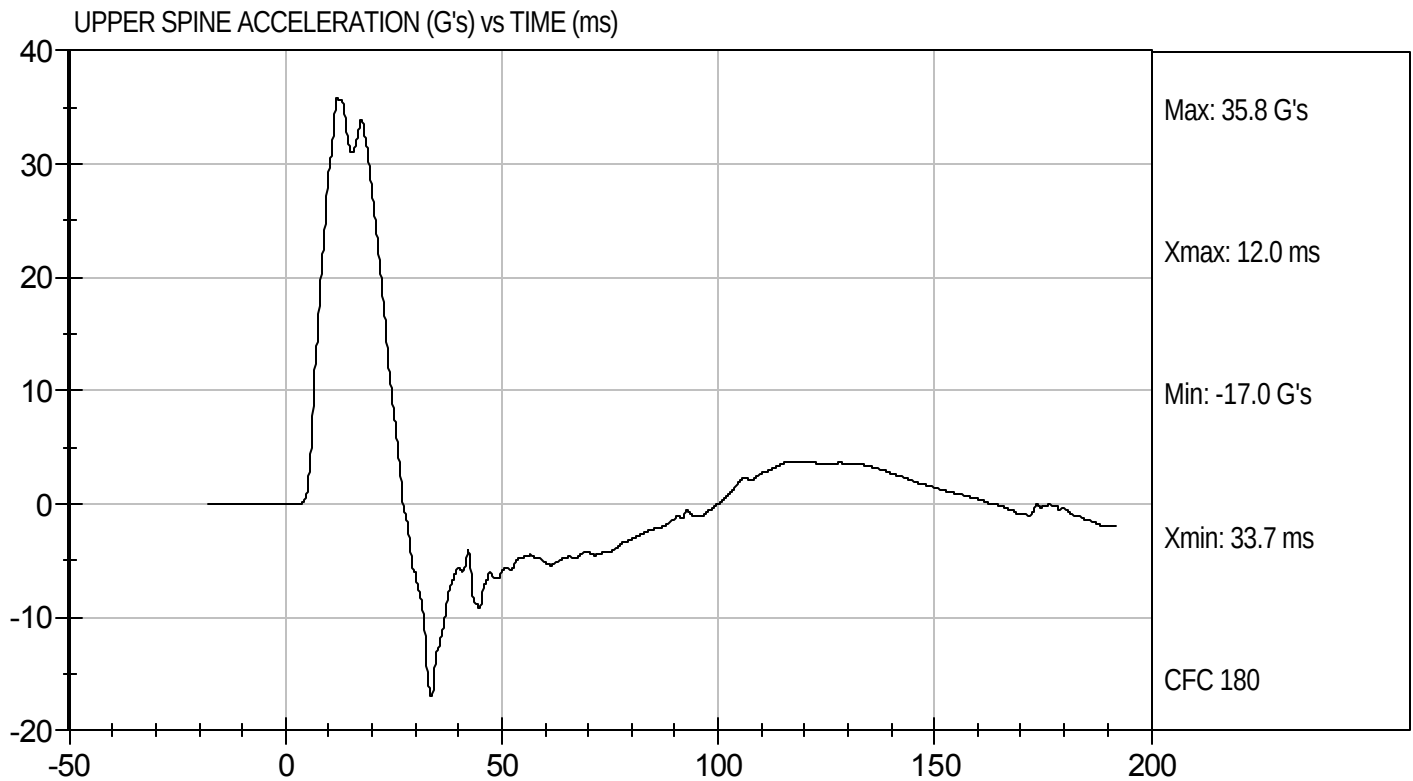
Test Date: 6/8/09
Velocity: 21.9 ft/s, 6.68 m/s





Test Desc: Thorax Impact
Component ID: D091434

Test Date: 6/8/09
Velocity: 21.9 ft/s, 6.68 m/s



MGA RESEARCH CORPORATION
THORAX (WITHOUT ARM) IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D091435

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Humidity	%	10 to 70	47	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Peak Impactor Force	G's	14 to 18	15	Pass
Upper Rib Displacement	mm	32 to 40	40	Pass
Middle Rib Displacement	mm	39 to 45	42	Pass
Lower Rib Displacement	mm	35 to 43	37	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 17	14	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	9	Pass
Overall Test Results				Pass


 Laboratory Technician

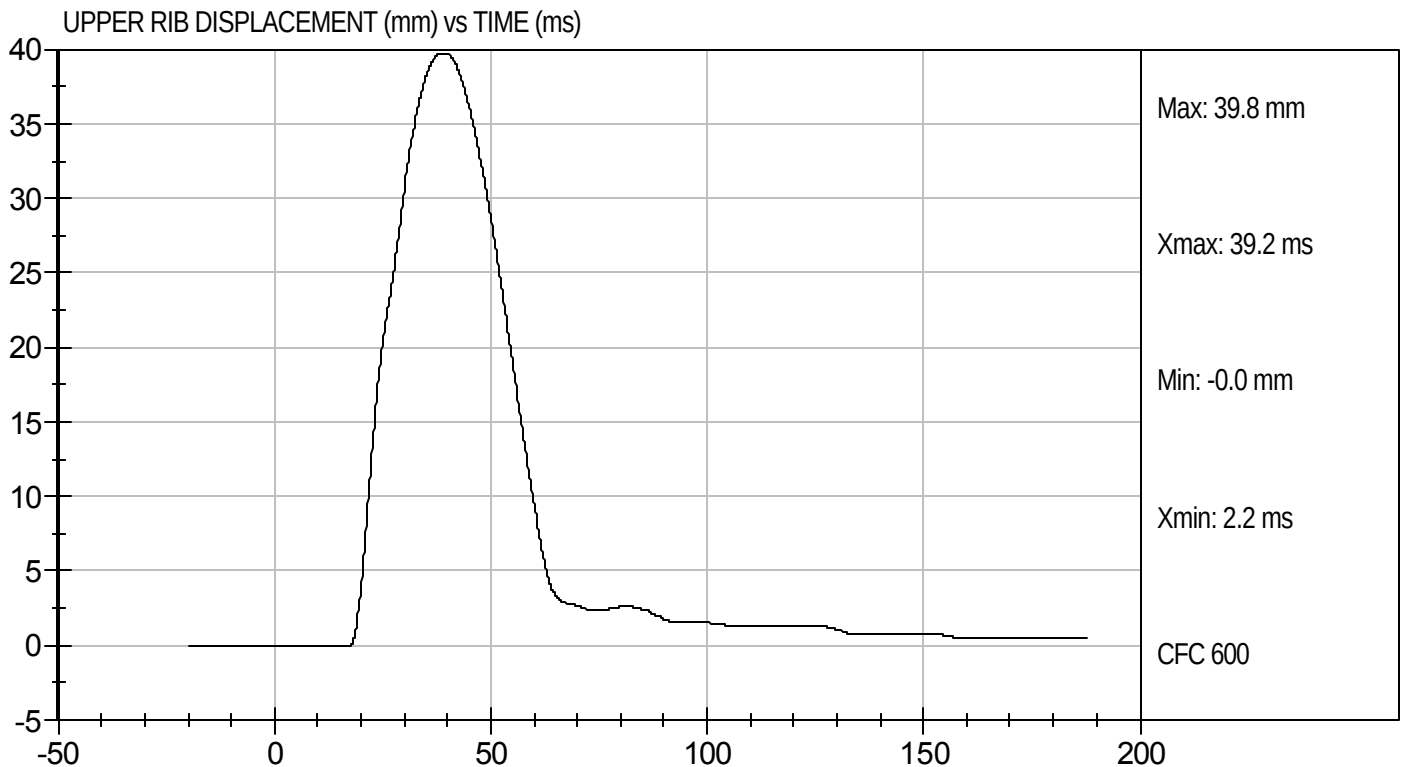
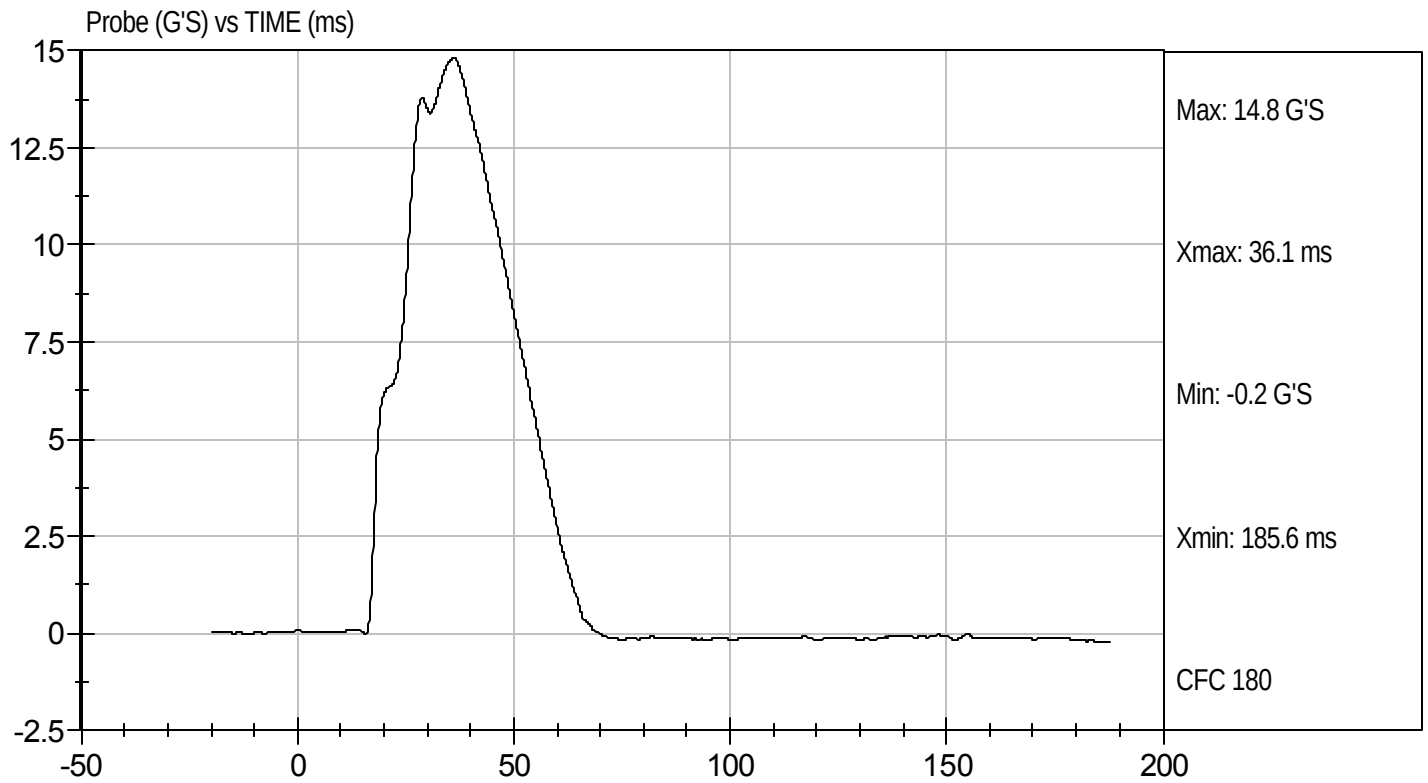
6/8/09
 Test Date


 Approved By



Test Desc: Thorax Impact
Component ID: D091435

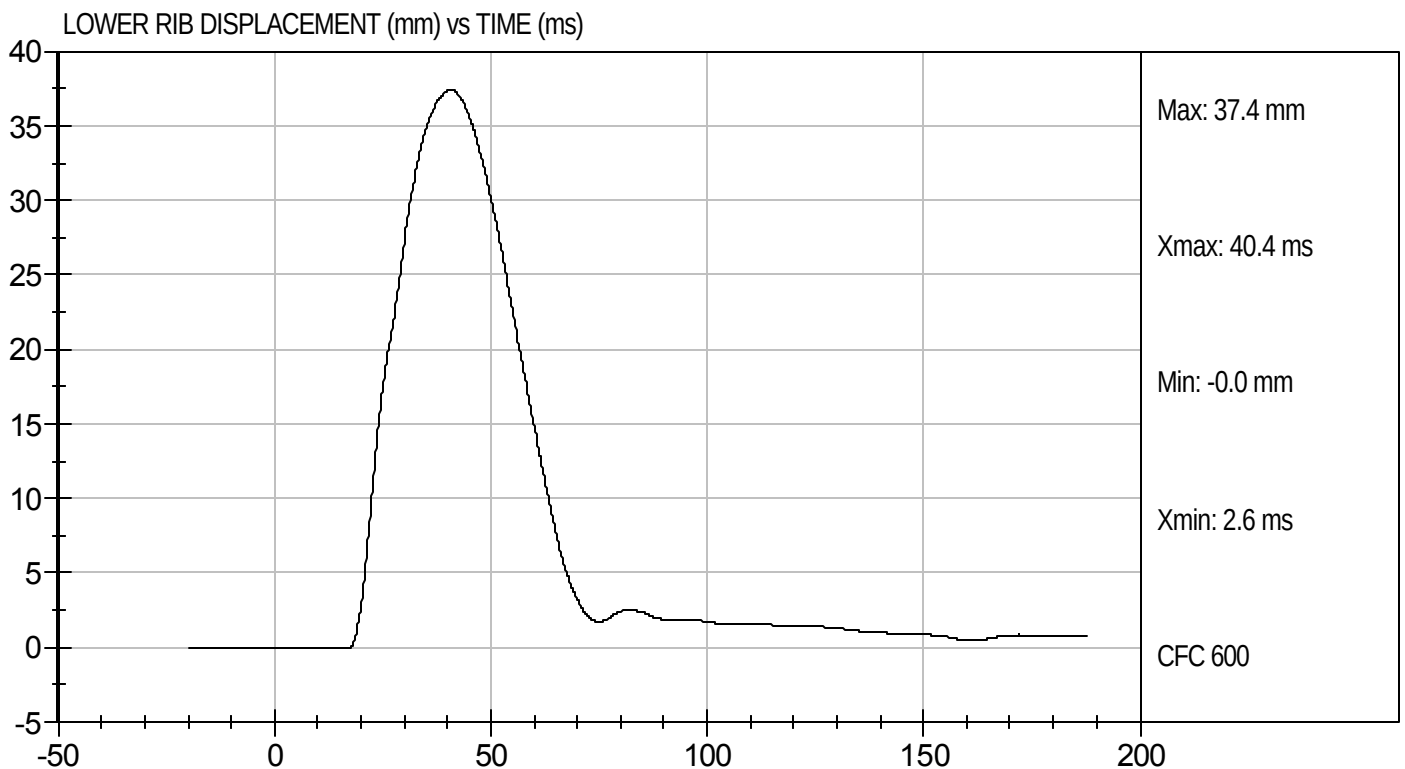
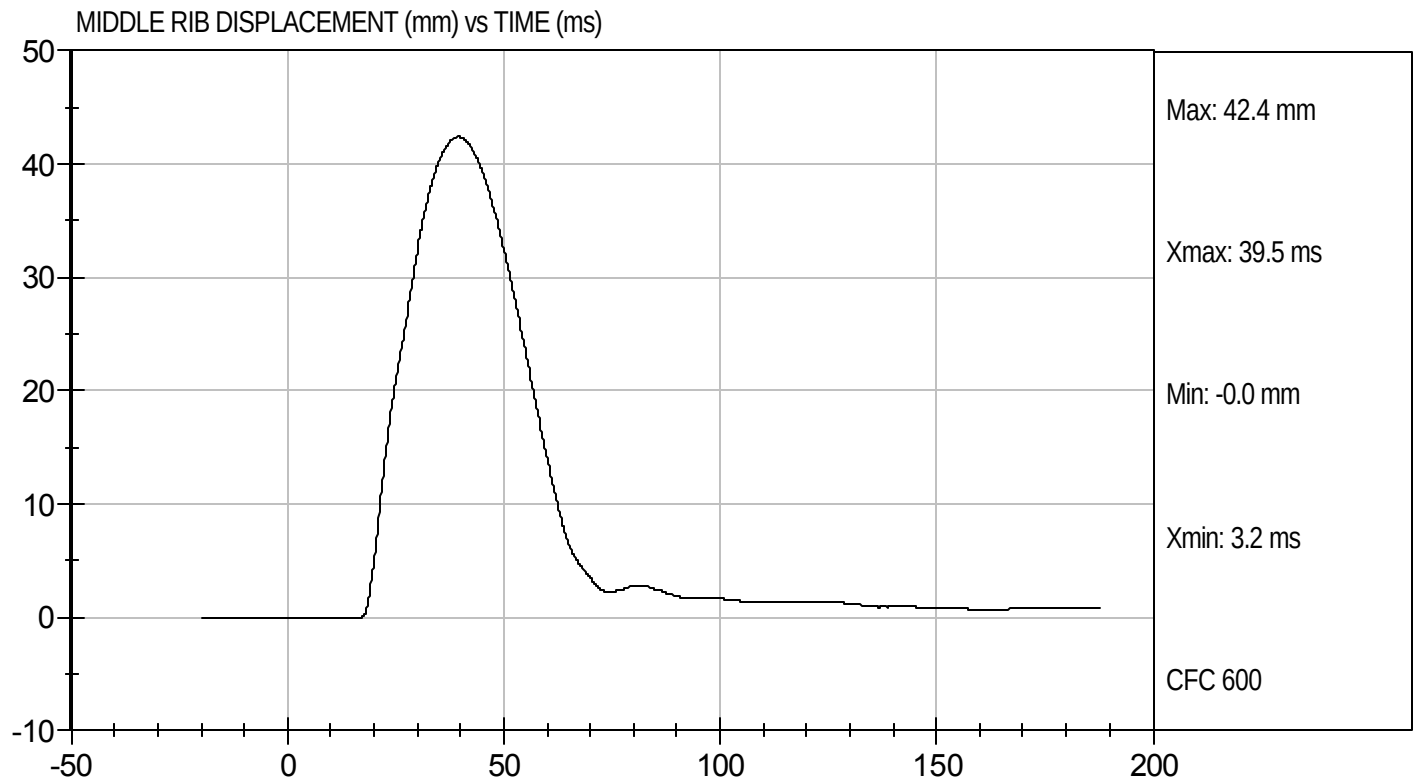
Test Date: 6/8/09
Velocity: 14.1 ft/s, 4.30 m/s





Test Desc: Thorax Impact
Component ID: D091435

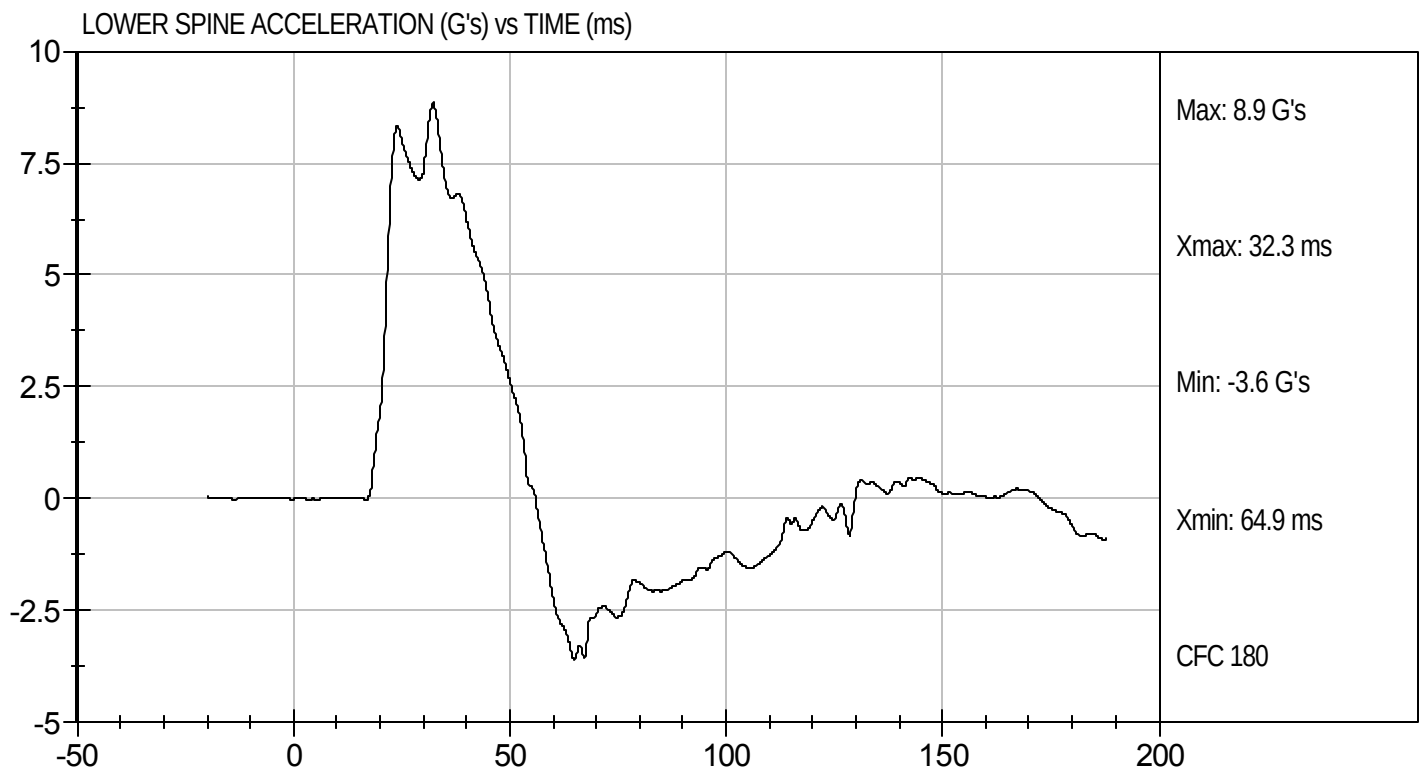
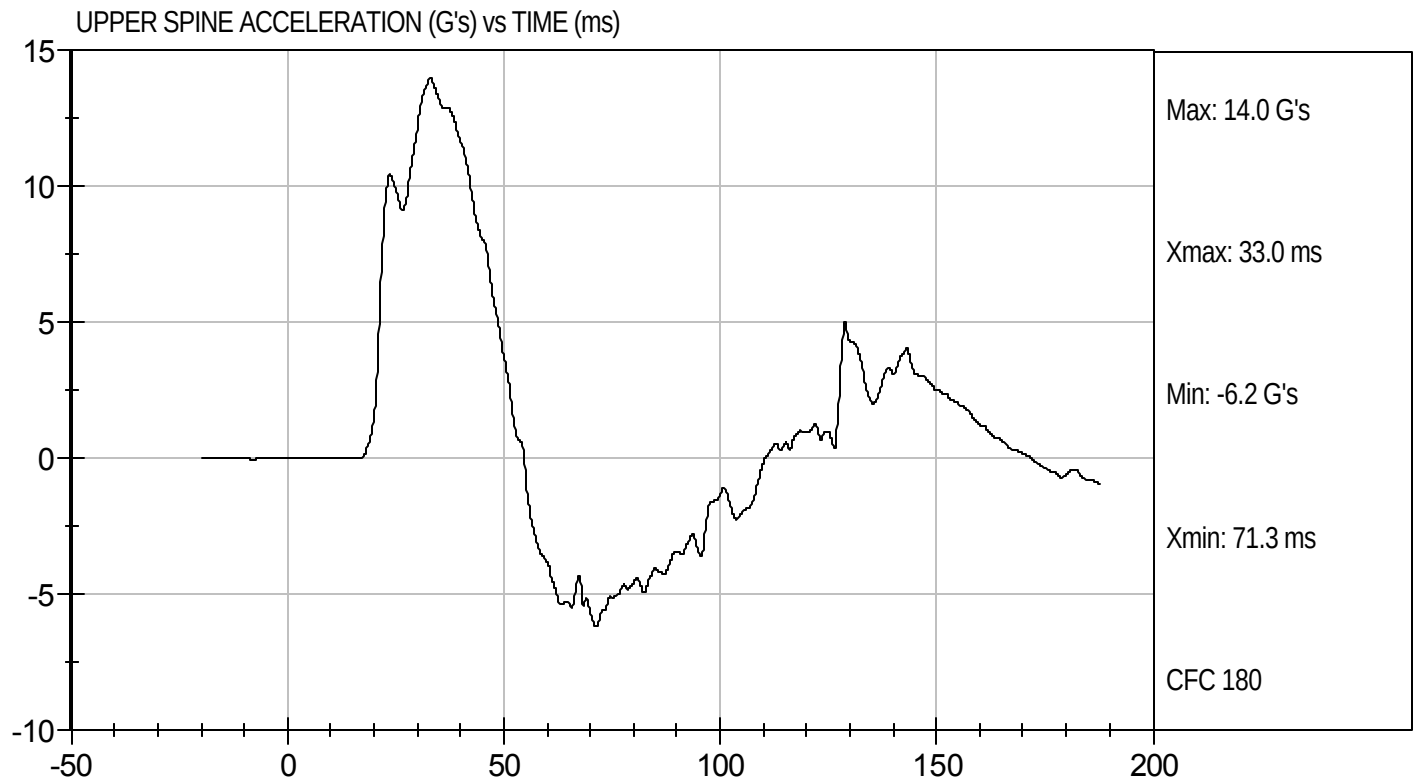
Test Date: 6/8/09
Velocity: 14.1 ft/s, 4.30 m/s





Test Desc: Thorax Impact
Component ID: D091435

Test Date: 6/8/09
Velocity: 14.1 ft/s, 4.30 m/s



MGA RESEARCH CORPORATION
ABDOMINAL IMPACT TEST
SID-II's BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D091436

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	22.1	Pass
Humidity	%	10 to 70	47	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Peak Impactor Acceleration	G's	12 to 16	14	Pass
Upper Rib Displacement	mm	36 to 47	40	Pass
Lower Rib Displacement	mm	33 to 44	39	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	11	Pass
			Overall Test Results	Pass


Laboratory Technician

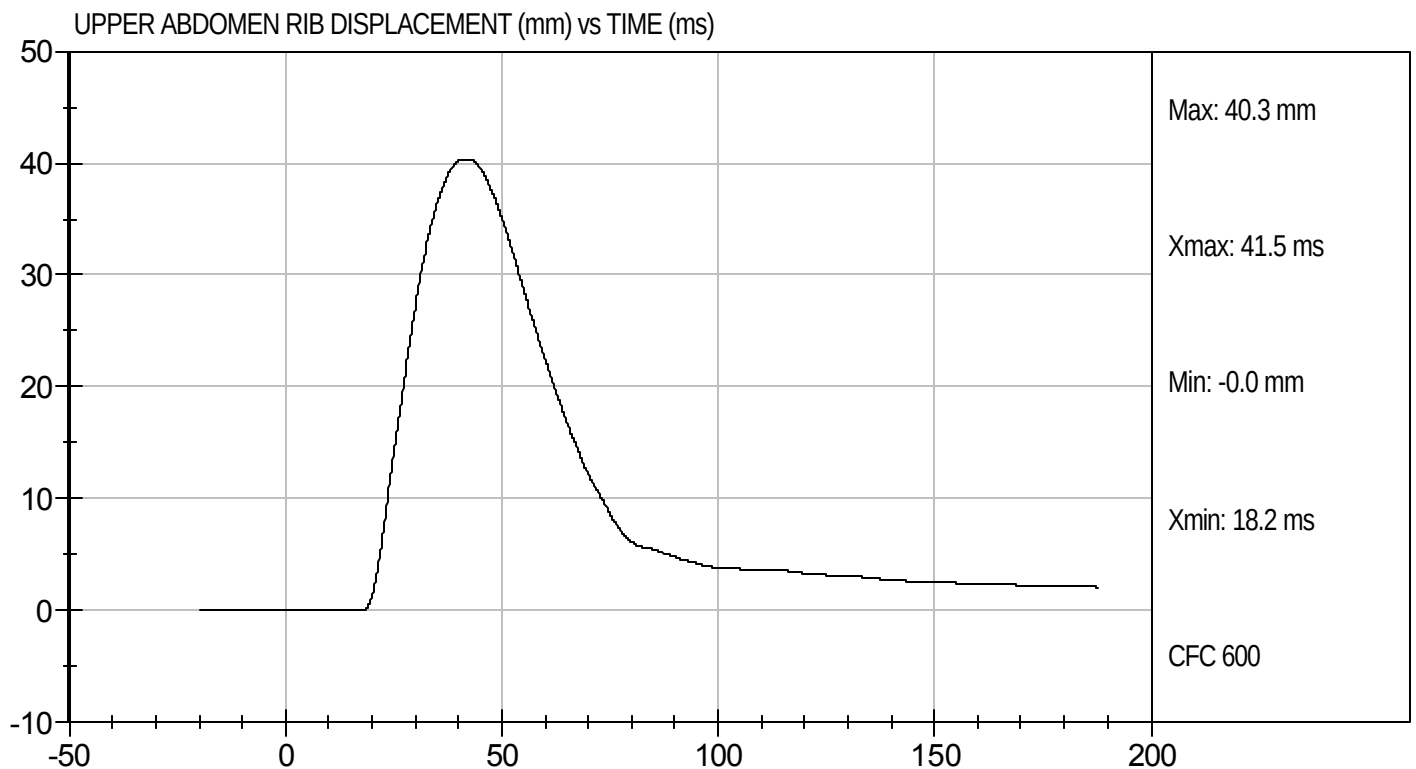
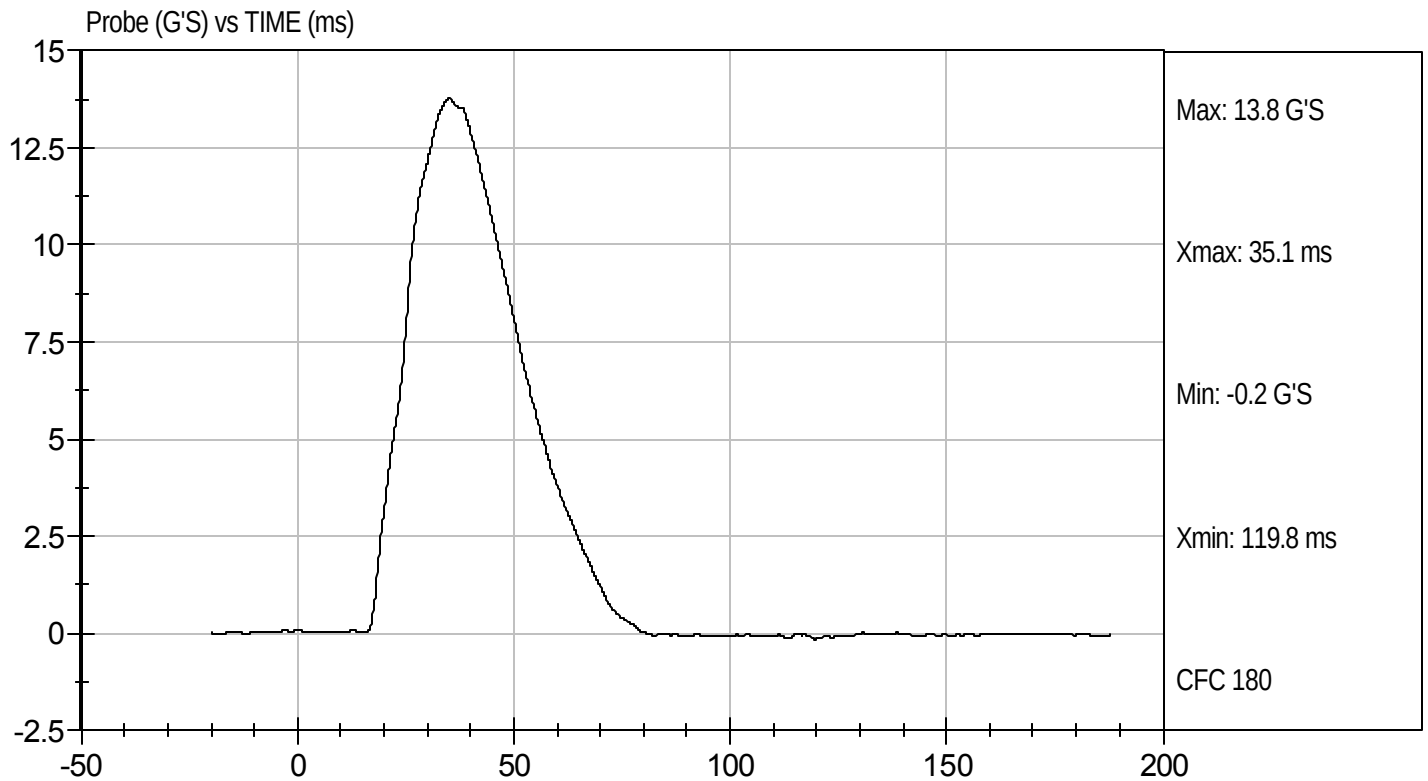
6/8/09
Test Date


Approved By



Test Desc: Abdomen Impact
Component ID: D091436

Test Date: 6/8/09
Velocity: 14.1 ft/s, 4.30 m/s

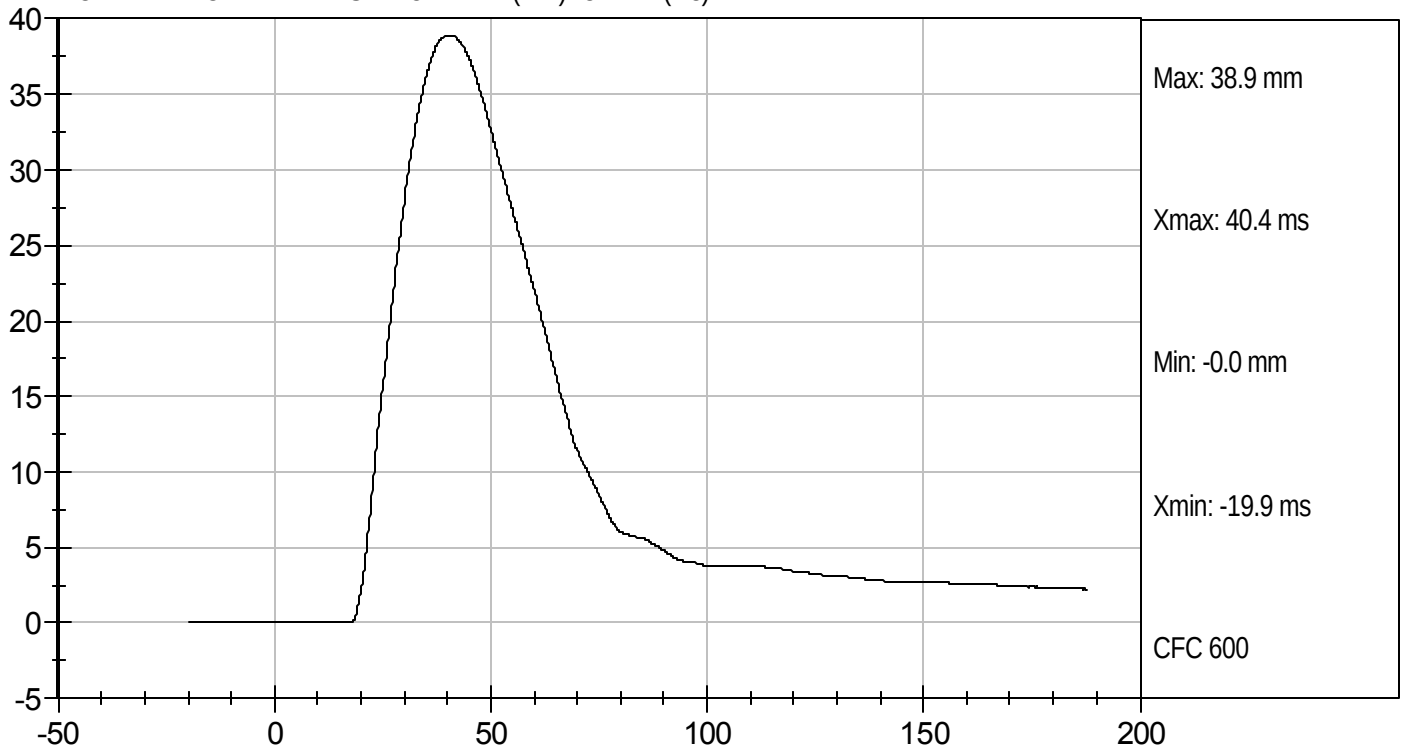




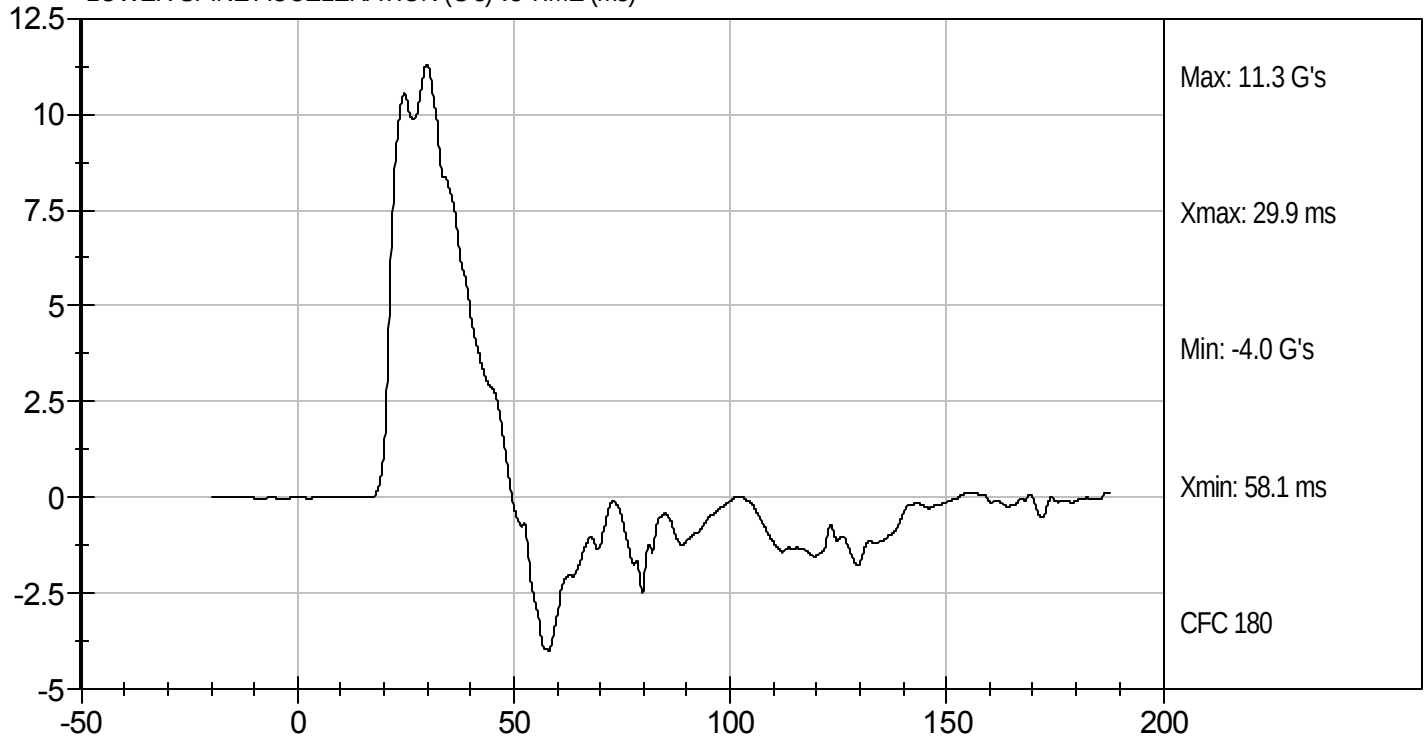
Test Desc: Abdomen Impact
Component ID: D091436

Test Date: 6/8/09
Velocity: 14.1 ft/s, 4.30 m/s

LOWER ABDOMEN RIB DISPLACEMENT (mm) vs TIME (ms)



LOWER SPINE ACCELERATION (G's) vs TIME (ms)



MGA RESEARCH CORPORATION
PELVIS IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D091437

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	22.2	Pass
Humidity	%	10 to 70	47	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Peak Impactor Acceleration	G's	38 to 47	43	Pass
Pelvis Y Acceleration after 6 ms	G's	34 to 42	38	Pass
Peak Acetabulum Force	N	3600 to 4300	4114	Pass
Overall Test Results			Pass	


Laboratory Technician

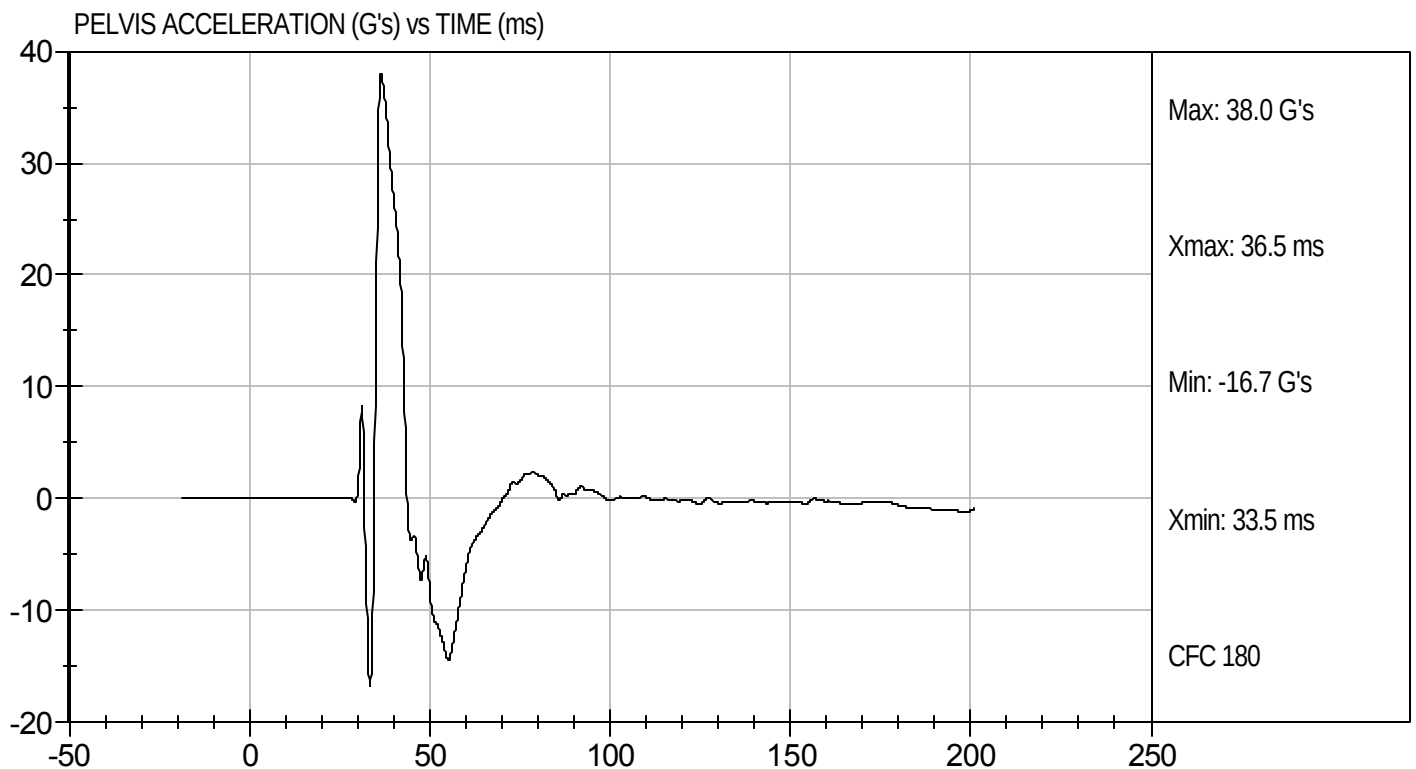
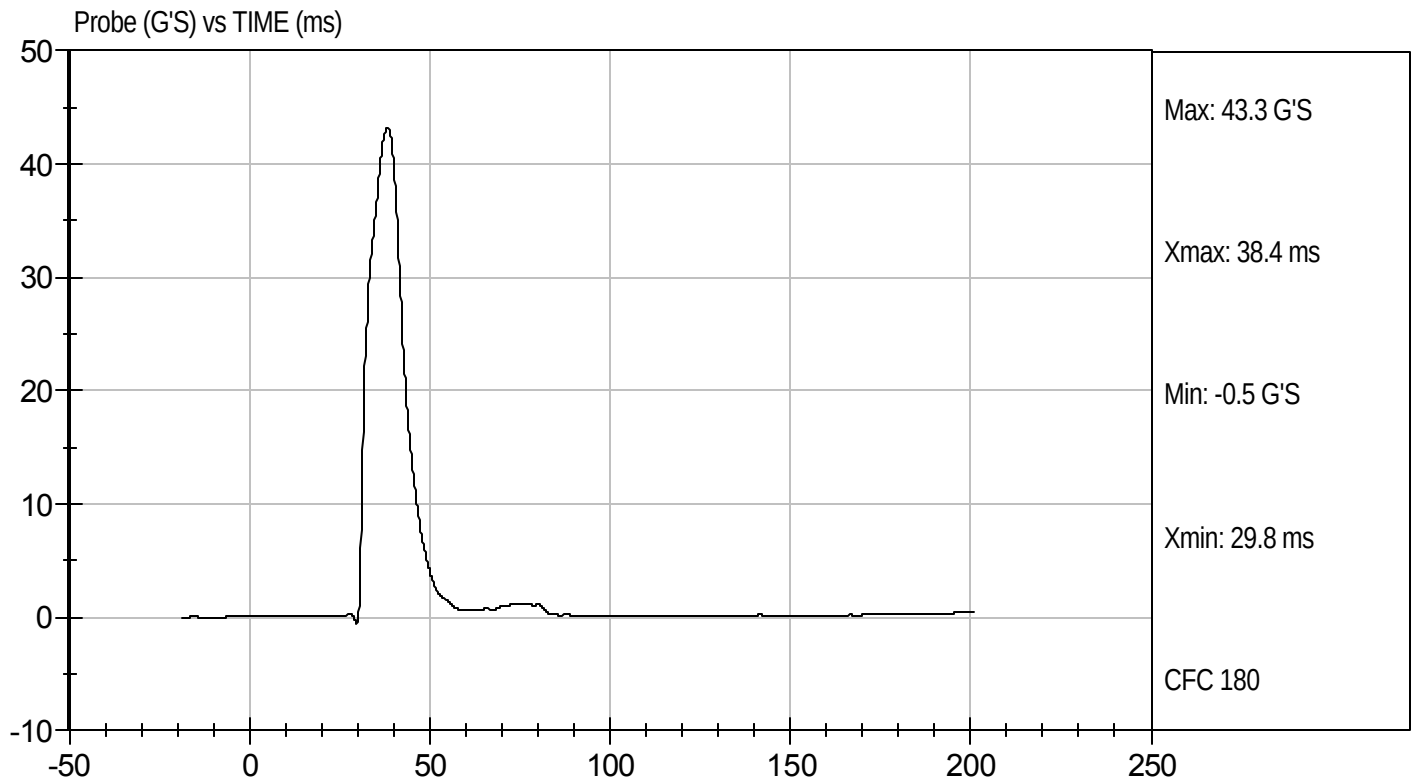
6/8/09
Test Date


Approved By



Test Desc: Pelvis Impact
Component ID: D091437

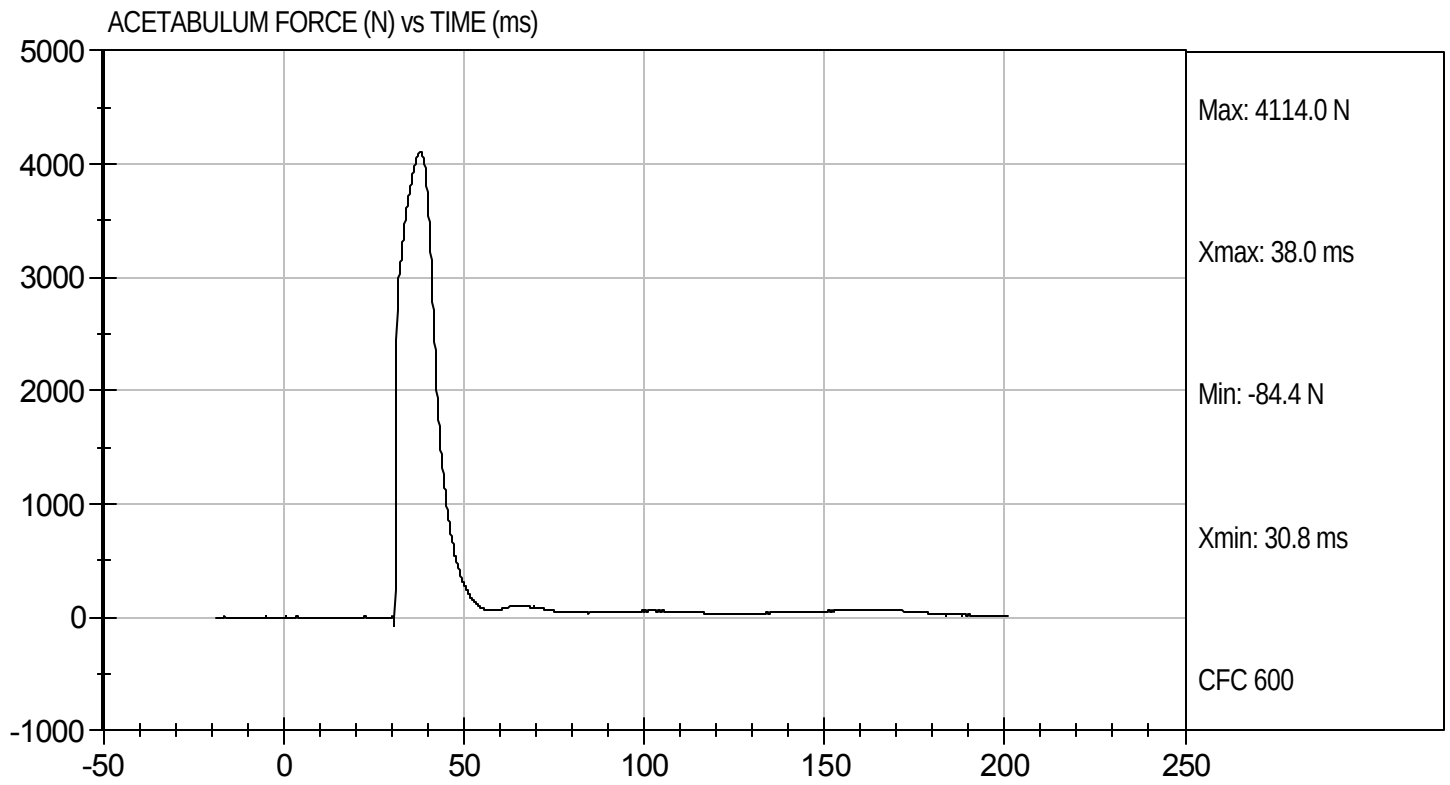
Test Date: 6/8/09
Velocity: 22.2 ft/s, 6.77 m/s





Test Desc: Pelvis Impact
Component ID: D091437

Test Date: 6/8/09
Velocity: 22.2 ft/s, 6.77 m/s



MGA RESEARCH CORPORATION
ILIAC IMPACT TEST
SID-IIIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D091438

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	22.2	Pass
Humidity	%	10 to 70	47	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Peak Impactor Acceleration	G's	36 to 45	38	Pass
Pelvis Y Acceleration	G's	28 to 39	31	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4430	Pass
Overall Test Results			Pass	


Laboratory Technician

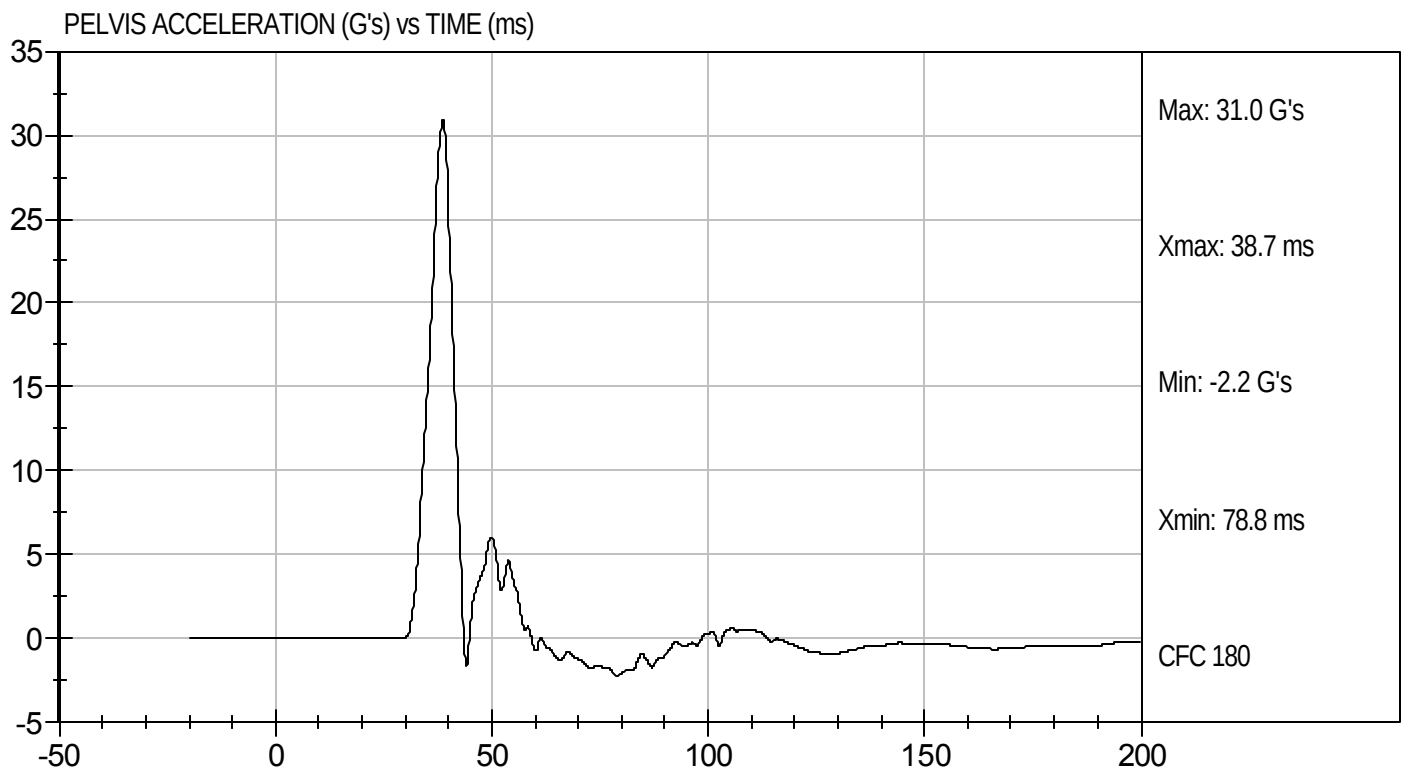
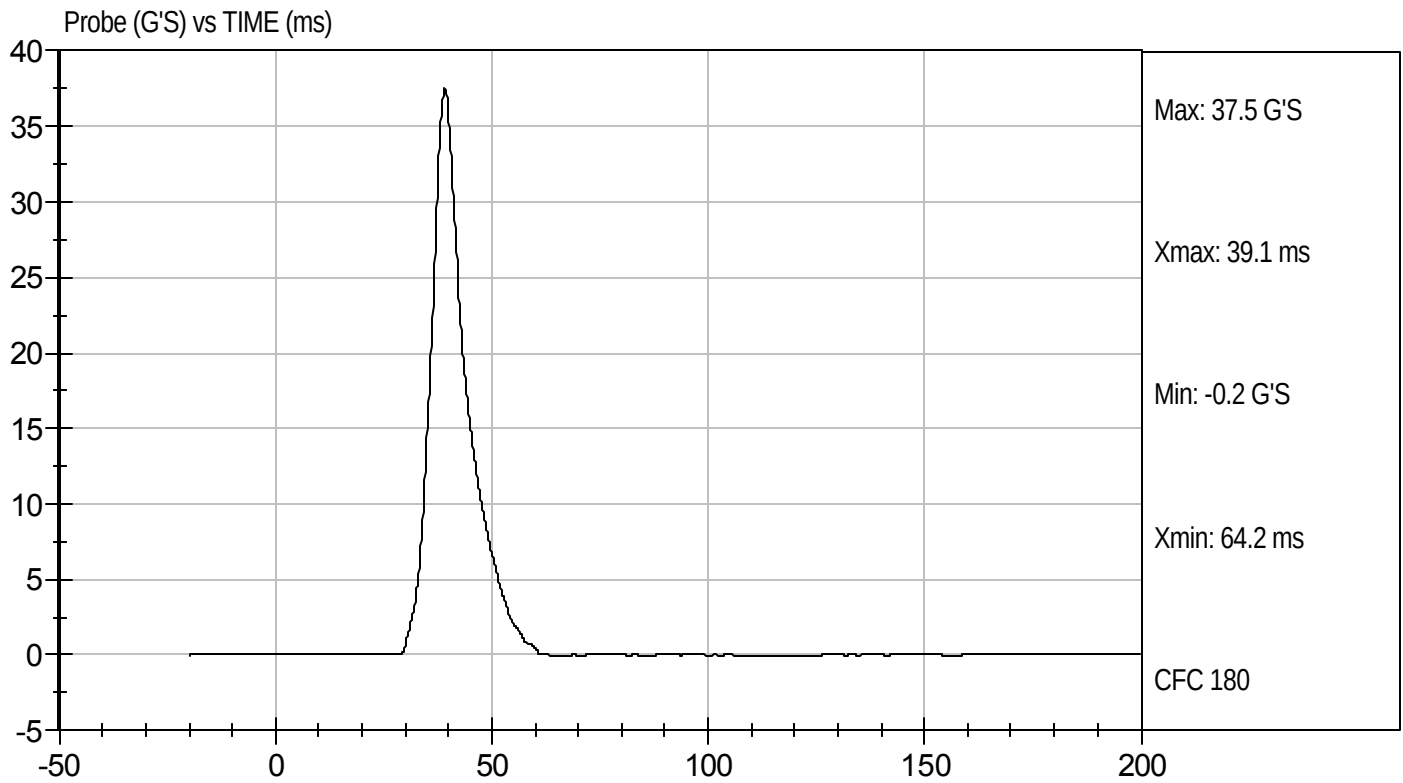
6/8/09
Test Date


Approved By



Test Desc: Iliac Impact
Component ID: D091438

Test Date: 6/8/09
Velocity: 14.1 ft/s, 4.30 m/s





Test Desc: Iliac Impact
Component ID: D091438

Test Date: 6/8/09
Velocity: 14.1 ft/s, 4.30 m/s

