

REPORT NUMBER: SNCAP-MGA-2009-018

**VALIDATION
MOVING DEFORMABLE BARRIER SIDE IMPACT TEST**

**TOYOTA MOTOR MANUFACTURING NORTHERN KENTUCKY, INC.
2010 TOYOTA CAMRY LE 4-DR SEDAN
NHTSA NUMBER: MA5113**

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



Test Date: June 12, 2009

Report Date: August 28, 2009

FINAL REPORT

**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
1200 NEW JERSEY AVENUE, SE
ROOM W43-410
WASHINGTON, D.C. 20590**

This final test report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, in response to Contract Number DTNH22-03-D-12005.

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Approval Date: August 28, 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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15. Supplementary Notes Validation Testing																																															
16. Abstract A 55/28 km/h 90° Moving Deformable Barrier NCAP Side Validation Test was conducted on the subject 2010 Toyota Camry LE 4-Dr Sedan in accordance with the specifications of the Office of Crashworthiness Standards Test Procedure for the generation of consumer information on vehicle side crash protection. The test was conducted at MGA Research Corporation, in Burlington, Wisconsin, on June 12, 2009. The impact velocity of the Moving Deformable Barrier (MDB) was 62.1 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 target vehicle post test maximum crush was 285 mm at level 2. The test vehicle's occupant performance was as follows: <table border="1" style="margin: 10px auto; border-collapse: collapse;"> <thead> <tr> <th colspan="4" style="text-align: center;">Driver ATD (ES-2re)</th> </tr> <tr> <th style="text-align: left;">Measurement Description</th> <th style="text-align: center;">Units</th> <th style="text-align: center;">Threshold</th> <th style="text-align: center;">Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td style="text-align: center;">N/A</td> <td style="text-align: center;">1000</td> <td style="text-align: center;">150</td> </tr> <tr> <td>Maximum Thorax Rib Deflection</td> <td style="text-align: center;">mm</td> <td style="text-align: center;">44</td> <td style="text-align: center;">25</td> </tr> <tr> <td>Combined Abdominal Force</td> <td style="text-align: center;">N</td> <td style="text-align: center;">2500</td> <td style="text-align: center;">1270</td> </tr> <tr> <td>Pubic Symphysis Force</td> <td style="text-align: center;">N</td> <td style="text-align: center;">6000</td> <td style="text-align: center;">3185</td> </tr> </tbody> </table> <table border="1" style="margin: 10px auto; border-collapse: collapse;"> <thead> <tr> <th colspan="4" style="text-align: center;">Passenger ATD (SID-IIs)</th> </tr> <tr> <th style="text-align: left;">Measurement Description</th> <th style="text-align: center;">Units</th> <th style="text-align: center;">Threshold</th> <th style="text-align: center;">Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td style="text-align: center;">N/A</td> <td style="text-align: center;">1000</td> <td style="text-align: center;">94</td> </tr> <tr> <td>Lower Spine (T12) Resultant Acceleration</td> <td style="text-align: center;">G</td> <td style="text-align: center;">82</td> <td style="text-align: center;">71</td> </tr> <tr> <td>Total Pelvic Force (sum of acetabular and iliac forces)</td> <td style="text-align: center;">N</td> <td style="text-align: center;">5525</td> <td style="text-align: center;">5693</td> </tr> </tbody> </table>				Driver ATD (ES-2re)				Measurement Description	Units	Threshold	Result	Head Injury Criteria (HIC ₃₆)	N/A	1000	150	Maximum Thorax Rib Deflection	mm	44	25	Combined Abdominal Force	N	2500	1270	Pubic Symphysis Force	N	6000	3185	Passenger ATD (SID-IIs)				Measurement Description	Units	Threshold	Result	Head Injury Criteria (HIC ₃₆)	N/A	1000	94	Lower Spine (T12) Resultant Acceleration	G	82	71	Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	5693
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SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

This moving deformable barrier side impact test is part of the NCAP Side 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 Camry LE 4-Dr Sedan. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Laboratory Test Procedure dated April 2009.

SUMMARY

A 2010 Toyota Camry LE 4-Dr Sedan was impacted on the left (driver's) side by a Moving Deformable Barrier (MDB) which was moving forward in a 27° crabbed position to the tow road guidance system at a velocity of 62.1 km/h (38.6 mph). The target vehicle was stationary and was positioned at an angle of 63° to the line of forward motion. The side impact test was conducted by MGA Research Corporation in Burlington, Wisconsin, on June 12, 2009. Pretest and post test photographs of the test vehicle, the MDB, and the dummies (ES-2re and SID-IIs) are included in this report.

Dummies were placed in the driver and left rear designated seating positions according to instructions specified in the OCWS Side Impact Laboratory Test Procedure, dated April 2009. The side impact event was documented by eleven (11) cameras. Camera locations are included in this report.

The dummies were instrumented in the following manner:

DRIVER ATD (ES-2re)

- Head Accelerometers
- Thorax Rib 1 to Rib 3 Potentiometers
- Abdomen Forward, Middle, and Rear Load Cells
- Lower Spine Accelerometers
- Pubic Load Cell

PASSENGER ATD (SID-IIs)

- Head Accelerometers
- Upper Neck Load Cells
- Shoulder Displacement Potentiometer
- Thorax Upper, Middle, and Lower Rib Potentiometers
- Abdomen Upper and Lower Rib Potentiometers
- Lower Spine Accelerometers
- Iliac Load Cell
- Acetabulum Load Cell

DUMMY INJURY VALUES

Measurement Description	Driver ATD (ES-2re)		
	Units	Threshold	Result
Head Injury Criteria (HIC ₃₆)	N/A	1000	150
Maximum Thorax Rib Deflection	mm	44	25
Combined Abdominal Force	N	2500	1270
Pubic Symphysis Force	N	6000	3185

Measurement Description	Passenger ATD (SID-IIs)		
	Units	Threshold	Result
Head Injury Criteria (HIC ₃₆)	N/A	1000	94
Lower Spine (T12) Resultant Acceleration	G	82	71
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	5693

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Left Front Driver		Left Rear Passenger	
	Installed	Deployed	Installed	Deployed
Front Airbag	Yes	No		
Knee Airbag	Yes	No		
Side Torso Airbag	Yes	Yes	No	
Head/Torso Airbag	No		No	
Side Head Curtain/Tube Airbag	Yes	Yes	Yes	Yes
Pretensioner	Yes	Yes	No	
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:

- Right Rear Sill X after 40 msec.
- Left Rear Sill Y
- Left Front Sill Y
- Left Lower B-Post Y after 10 msec.

The following accelerometers were not used:

- Front Door Centerline
- Front Door Mid-Rear
- Front Door Upper Centerline
- Rear Door Mid-Rear
- Rear Door Upper Centerline

Three on-board high speed camera views were lost due to the excessive post-test travel of the vehicle.

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

SECTION 2
OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2010 Toyota Camry LE 4-Dr Sedan
 Test Program: Side Validation Testing

NHTSA No. MA5113
 Test Date: 6/12/2009

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	MA5113	Anti-Lock Brakes	Yes
Model Year	2010	All Wheel Drive	No
Make	Toyota	Power Steering	Yes
Model	Camry	Driver Front Airbag	Yes
Body Style	Sedan	Driver Side Torso Airbag	Yes
VIN	4T4BF3EK5AR002440	Driver Side Head Airbag	No
Body Color	Magnetic Gray Met.	Driver Curtain Airbag	Yes
Delivery Date	6/03/2009	Driver Knee Airbag	Yes
Odometer (km/mi)	167 / 104	Driver Head/Torso Combo Airbag	No
Dealer	Jack Safto Toyota	Rear Pass. Front Airbag	No
Transmission	Automatic	Rear Pass. Side Torso Airbag	No
Final Drive	Front	Rear Pass. Side Head Airbag	No
Type/No. Cylinders	4	Rear Pass. Curtain Airbag	Yes
Engine Displacement (L)	2.5	Rear Pass. Combo Airbag	No
Engine Placement	Lateral	Pretensioners	Yes
Roof Rack	No	Load Limiters	Yes
Sunroof/T-Top	No	Air Conditioning	Yes
Tinted Glass	No	AM/FM CD	Yes
Traction Control	Yes	Tilt Steering	Yes
Power Brakes	Yes	Automatic Door Locks	Yes
Front Disc	Yes	Power Windows	Yes
Rear Disc	Yes	Power Seats	Yes
Does owner's manual provide instructions to turn off automatic door locks?	Yes		

DATA FROM CERTIFICATION LABEL

Manufactured By	Toyota Motor Manufacturing Northern Kentucky, Inc.	GVWR (kg)	1970
Date of Manufacture	02/09	GAWR Front (kg)	1210
		GAWR Rear (kg)	1070

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity (DSC)	2	3		5	(A)
Capacity Wt. (VCW) (kg)				410	(B)
DSC x 68.04 (kg)				340	(A-B)
Cargo Wt. (RCLW) (kg)				70	

VEHICLE SEAT TYPE

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

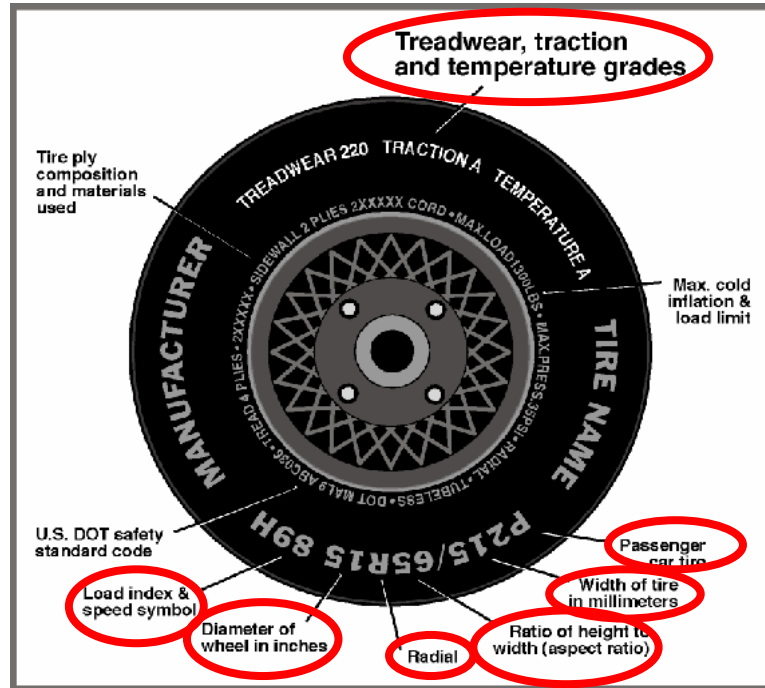
DATA SHEET NO. 1 (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2010 Toyota Camry LE 4-Dr Sedan
 Test Program: Side Validation Testing

NHTSA No. MA5113
 Test Date: 6/12/2009

VEHICLE TIRE INFORMATION



DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	230	230
Recommended Tire Size	P215/60R16	P215/60R16
Tire Size on Vehicle	P215/60R16	P215/60R16
Tire Manufacturer	Bridgestone	Bridgestone
Tire Model	Turanza	Turanza
Treadwear	260	260
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	1 ply poly	1 ply poly
Tire Plies Body	1 ply poly/2 steel/1 nylon	1 ply poly/2 steel/1 nylon
Load Index & Speed Symbol	94V	94V
Tire Material	Rubber	Rubber
DOT Safety Code Left	OBX8 PM2 0309	OBX8 PM2 0309
DOT Safety Code Right	OBX8 PM2 0309	OBX8 PM2 0309

DATA SHEET NO. 1 (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2010 Toyota Camry LE 4-Dr Sedan
 Test Program: Side Validation Testing

NHTSA No. MA5113
 Test Date: 6/12/2009

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW) (Axle)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	457.2	303.4		504.8	389.2		494.9	398.7	
Right	kg	450.9	295.3		452.3	351.1		449.1	361.5	
Ratio	%	60.3	39.7		56.4	43.6		55.4	44.6	
Totals	kg	908.1	598.7	1506.8	957.1	740.3	1697.4	944.0	760.2	1704.2

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1506.8	(A)
Sum of Actual Weight of 2 P572 ATDs Used	kg	129.3	(B)
Rated Cargo/Luggage Weight (RCLW)	kg	70	(C)
Calculated Target Vehicle Test Weight (TVTW)	kg	1706.1	(A+B+C)

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
Fully Loaded	mm	698	707	678	691	
As Tested (Fully Loaded $\pm$ 10mm at each wheel well)	mm	697	705	687	687	1208

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2770
Total Vehicle Length at Left Side	mm	3674
Total Vehicle Length at Centerline	mm	4804
Total Vehicle Length at Right Side	mm	3674
Weight of Ballast in Cargo Area	kg	22.7
Weight of Vehicle Components Removed	kg	26.8
Amount of Stoddard Solvent in Fuel Tank	L	65.7

Vehicle components removed to meet Test Weight: Trunk lining and carpet, tools, spare tire, jack, right front mirror, hub caps, engine cover, and right rear speaker.

TEST VEHICLE VERTICAL IMPACT LINE DATA

Measurement Description	Units	Value
Target Impact Point Aft of Front Axle	mm	445
Actual Impact Point Aft of Front Axle	mm	426

DATA SHEET NO. 2

SEAT ADJUSTMENT, FUEL SYSTEMS, AND STEERING WHEEL DATA

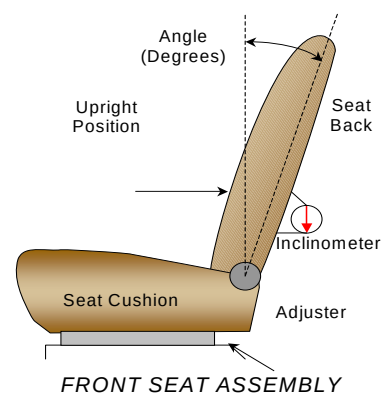
Test Vehicle: 2010 Toyota Camry LE 4-Dr Sedan
Test Program: Side Validation Testing

NHTSA No. MA5113
Test Date: 6/12/2009

NORMAL DESIGN RIDING POSITION

The driver and passenger seat backs are positioned to the manufacturer's designated angle. The procedure is as follows:

For the driver seat, the seat back is measure on the head rest stay (Door sill angle is 0 degrees).



SEAT BACK ANGLES

	Degrees
Driver with Seated Dummy	5.7° at headrest post
Passenger with Seated Dummy	Fixed

SEAT FORE/AFT POSITIONS

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	260 mm	130 mm
Rear Seat	Fixed	Fixed

Describe method: Using only the controls that primarily move the seat in the fore-aft direction, the seat was moved to the full rear position and marked. The seat was then moved to the foremost position and marked. The seat was then placed in the mid point of travel and marked.

SEAT BELT UPPER ANCHORAGES

	Total # of Positions	Placed in Position #
Driver Seat	4 detents	2 (uppermost as 0)
Rear Seat	Fixed	

Describe method: The driver seat anchorages were set 50 mm from uppermost position. The rear seat anchorages are non-adjustable.

DATA SHEET NO. 2 (CONTINUED)

SEAT ADJUSTMENT, FUEL SYSTEMS, AND STEERING WHEEL DATA

Test Vehicle: 2010 Toyota Camry LE 4-Dr Sedan
 Test Program: Side Validation Testing

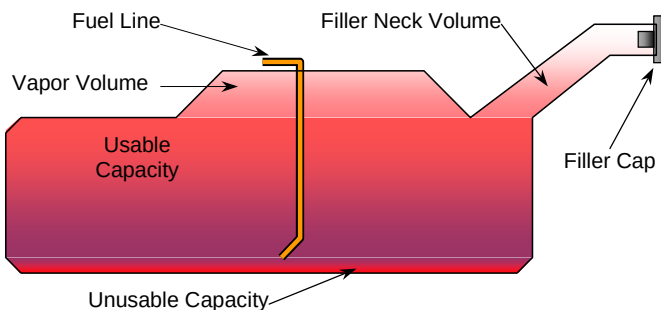
NHTSA No. MA5113
 Test Date: 6/12/2009

FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank"	70.0
Usable Capacity of "Optional" Tank	
Usable Capacity Used for FMVSS 301	64.4 to 65.8
Actual Amount of Solvent used	65.7

Describe the fuel pump type, its behavior, and the location of the fuel filler pipe.

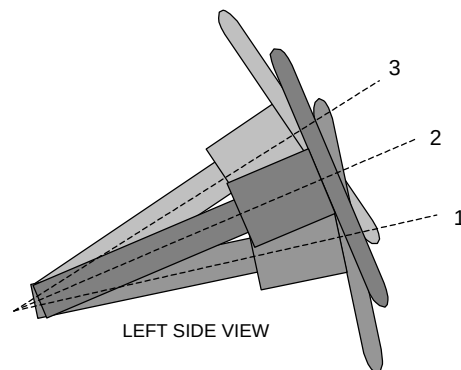
The test vehicle is equipped with an electric fuel pump. The fuel pump is activated when the ignition is turned on. The fuel pipe is on the left side.



VEHICLE FUEL TANK ASSEMBLY

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 ASSEMBLY

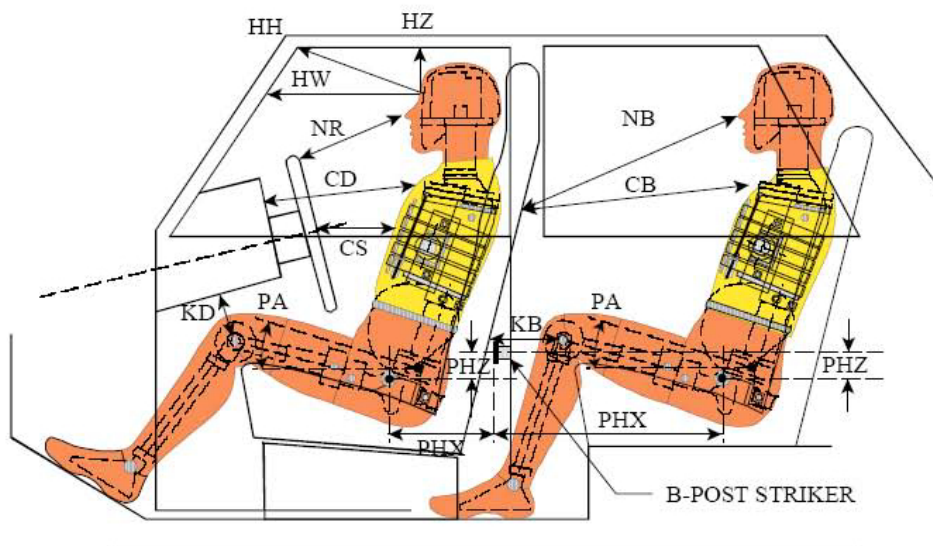
STEERING COLUMN POSITION

	Fore/Aft (mm)	Degrees
Lowermost - Position 1	133	63.1
Geometric Center – Position 2	154	64.9
Uppermost – Position 3	174	66.7
Telescoping Steering Wheel Travel	41	
Test Position	154	64.7

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2010 Toyota Camry LE 4-Dr Sedan
 Test Program: Side Validation Testing

NHTSA No. MA5113
 Test Date: 6/12/2009



LEFT SIDE VIEW

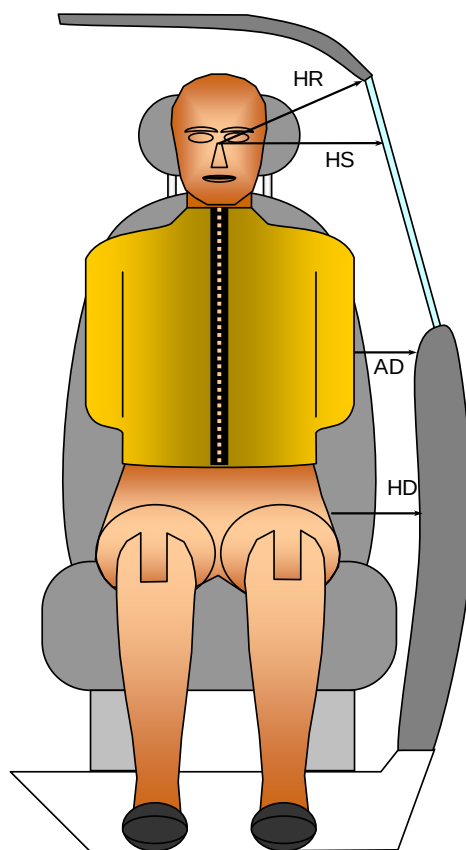
NOTE: 2-DOOR VEHICLE SHOWN.
 REAR DUMMY PHX & PHZ
 MEASUREMENTS FOR A 4-DOOR
 VEHICLE WOULD USE THE C-POST
 STRIKER AS A REFERENCE POINT

Driver Code	Pass. Code	Measurement Description	Driver S/N 032		Passenger S/N 296	
			Length (mm)	Angle(°)	Length (mm)	Angle(°)
HH		Head to Header	409	9.7		
HW		Head to Windshield	640	0		
HZ	HZ	Head to Roof	153	90	248	90
NR	NB	Nose to Rim/Seat Back	503	13.2	518	15.7
CD	CB	Chest to Dash/Seat Back	581	8.8	512	10.0
CS		Chest to Steering Wheel	376	7.4		
KDL	KBL	Left Knee to Dash/Seat Back	179	20.6	273	42.3
KDR	KBR	Right Knee to Dash/Seat Back	166	27.1	275	43.1
PA	PA	Pelvic Angle		21.1		19.8
PHX	PHX	H-Point to Striker (X-Axis)	219	0	368	0
PHZ	PHZ	H-Point to Striker (Z-Axis)	254	90	356	90
SA	SA	Seat Back Angle (headrest post)		5.7		Fixed

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2010 Toyota Camry LE 4-Dr Sedan
 Test Program: Side Validation Testing

NHTSA No. MA5113
 Test Date: 6/12/2009



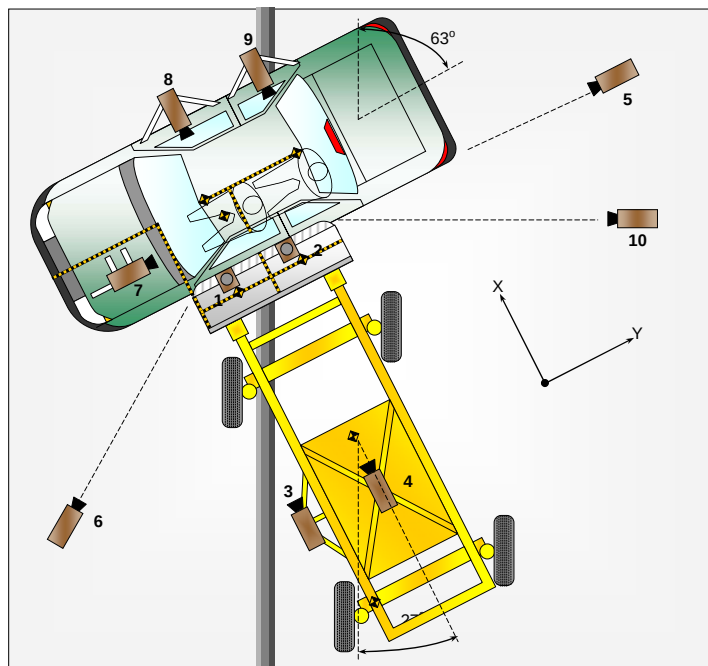
FRONT VIEW OF DUMMY

Code	Measurement Description	Units	Driver S/N 032	Passenger S/N 296
HR	Head to Side Header	mm	174	230
HS	Head to Side Window	mm	288	257
AD	Arm to Door	mm	104	164
HD	H-Point to Door	mm	147	178

DATA SHEET NO. 5 **CAMERA LOCATIONS AND DATA**

Test Vehicle: 2010 Toyota Camry LE 4-Dr Sedan
 Test Program: Side Validation Testing

NHTSA No. MA5113
 Test Date: 6/12/2009



No.	Camera View	Location (mm)			Angle	Lens (mm)	Film Speed (fps)
		X	Y	Z			
1	Overhead Overall	650	1300	-5050	88.4	14	1000
2	Overhead Close-up	-530	-240	-5055	81.8	50	1000
3	Left Impact Point (MDB)					50	1000
4	Side Overall (MDB)					16	1000
5	Rear	30	7250	-1100	5.3	24	1000
6	Left Front	-3170	-4840	-1250	5.0	24	1000
7	Driver Front (OB)					12.5	1000
8	Driver Side (OB)					8	1000
9	Passenger Side (OB)					8	1000
10	Real Time Left Front					13	24
11	Real Time Inrun					13	24

Reference: Impact Point projected to Ground
 +X = To Front of MDB, +Y = To Right of MDB, +Z = Down
 * All measurements accurate to ± 6 mm

DATA SHEET NO. 6

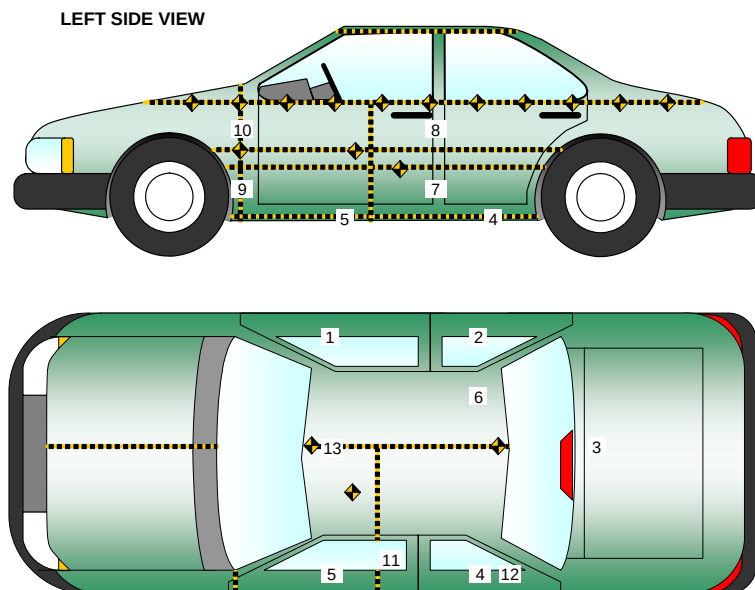
VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2010 Toyota Camry LE 4-Dr Sedan

NHTSA No. MA5113

Test Program: Side Validation Testing

Test Date: 6/12/2009



Loc. No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Right Sill at Front Seat	2772	704	-214
2	Right Sill at Rear Seat	1828	703	-216
3	Rear Floorpan Above Axle	1045	0	-535
4	Left Sill at Rear Door	1848	-732	-226
5	Left Sill at Front Door	2828	-730	-219
6	Rt. Rear Occ. Compartment	1868	397	-302
7	Left Lower B-Post	2252	-741	-564
8	Left Middle B-Post	2230	-739	-806
9	Left Lower A-Post	3275	-719	-553
10	Left Middle A-Post	3344	-817	-790
11	Front Seat Track	2440	-542	-327
12	Rear Seat Track or Structure			
13	Vehicle CG	2213	0	-285

Reference: X - Test Vehicle Rear Bumper (+ forward)

Y - Test Vehicle Centerline (+ to right)

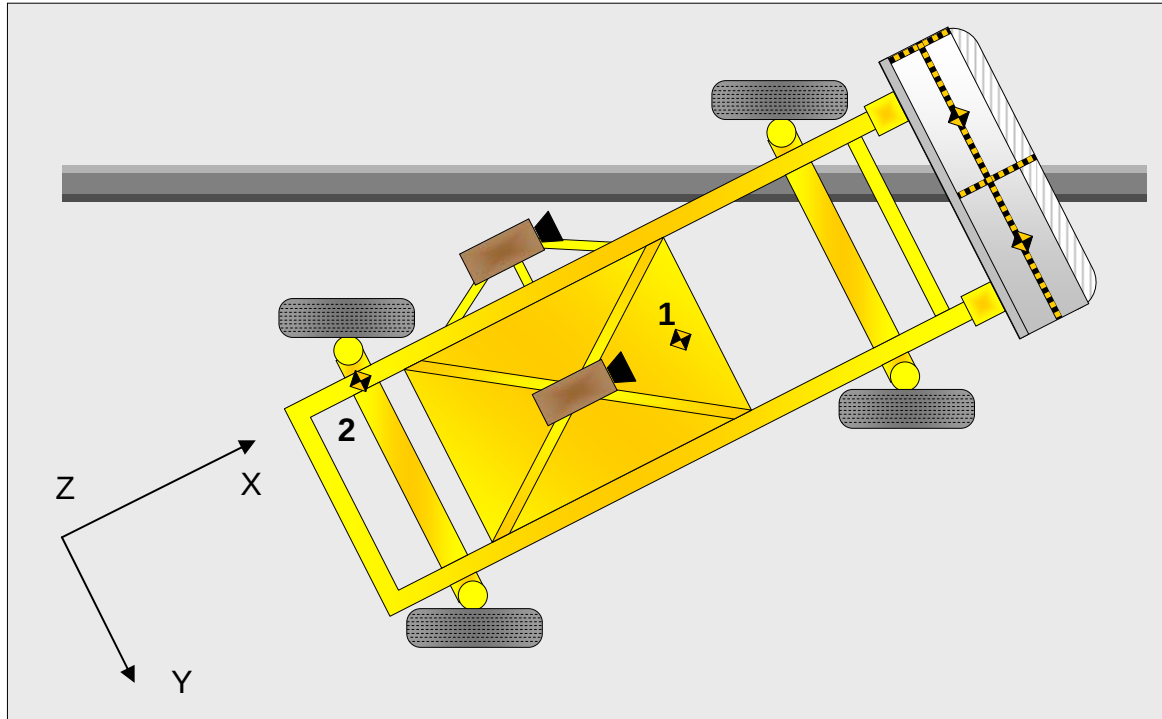
Z - Ground Plane (+ down)

DATA SHEET NO. 7

MOVING DEFORMABLE BARRIER ACCELEROMETER LOCATIONS

Test Vehicle: 2010 Toyota Camry LE 4-Dr Sedan
Test Program: Side Validation Testing

NHTSA No. MA5113
Test Date: 6/12/2009



Loc. No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	MDB CG	-1105	0	-330
2	MDB Rear	-2580	-650	-625

Reference: X - MDB Face (+ forward)
Y - MDB Centerline (+ to right)
Z - Ground Plane (+ down)

DATA SHEET NO. 8
TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2010 Toyota Camry LE 4-Dr Sedan
 Test Program: Side Validation Testing

NHTSA No. MA5113
 Test Date: 6/12/2009

MAXIMUM EXTERIOR STATIC CRUSH

Level	Measurement Description	Units	Maximum Crush	Above Ground
1	Sill Top Height	mm	149	275
2	Occupant H-Point	mm	285	490
3	Mid Door	mm	270	625
4	Window Sill	mm	145	955
5	Window Top	mm	50	1370
	Maximum Penetration	mm	285	490

INSTRUMENTATION

Driver Dummy Channels	16
Passenger Dummy Channels	23
Vehicle Structure Accelerometers	20
MDB Accelerometers	5
Total No. of Contact Switches	8
Monitoring Channels	1
Total	73

CAMERA COVERAGE

High-Speed Vehicle Onboard	3 (see test notes)
High-Speed Offboard	4
High-Speed MDB Onboard	2
Real-Time Stationary	1
Real-Time Panning	1
Total	11

DATA SHEET NO. 9**MOVING DEFORMABLE BARRIER SUMMARY OF RESULTS**Test Vehicle: 2010 Toyota Camry LE 4-Dr SedanNHTSA No. MA5113Test Program: Side Validation TestingTest Date: 6/12/2009**MDB SPECIFICATIONS**

Measurement Description	Length (mm)
Overall Width of Framework Carriage	1252
Overall Length Including Honeycomb Face	4115
Wheelbase of Framework Carriage	2592
CG Location aft of Front Axle	1129

MDB WEIGHTS

	Units	Front Axle	Rear Axle	Total
Left	kg	411.8	281.6	
Right	kg	356.8	311.3	
Ratio	%	56.5	43.5	
Totals	kg	768.6	592.9	1361.5

SPEED AND IMPACT DATA

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	62.1
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	62.6
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	89.9

MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE

Vertical Location			From Centerline		Maximum Crush
Row	Description	Height	Distance	Direction	
A	Center of Bumper	432	800	Right	178
B	Top of Bumper	533	800	Right	119
C	Mid-Level	686	800	Right	62
D	Top of Stack	813	800	Left	103

MDB INSTRUMENTATION AND CAMERAS

Accelerometers	5
Contact Switches	2
High-Speed Cameras	2

DATA SHEET NO. 10**POST-TEST OBSERVATIONS**Test Vehicle: 2010 Toyota Camry LE 4-Dr SedanNHTSA No. MA5113Test Program: Side Validation TestingTest Date: 6/12/2009**TEST DUMMY INFORMATION AND CONTACT**

Description	Front Seat Dummy (ES-2re)	Rear Seat Dummy (SID-IIs)
Dummy Type / Serial No.	ES-2re / 032	SID-IIs / 296
Head Contact	Curtain Airbag, Headliner, Headrest	Curtain Airbag, Rear Seat Back
Upper Torso Contact	Side Airbag	Door Panel
Lower Torso Contact	Door Panel	Door Panel
Left Knee Contact	Door Panel	Door Panel
Right Knee Contact	Left Knee	Left Knee

POST TEST DOOR OPENING AND SEAT TRACK INFORMATION

Description	Left Front	Left 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	None
Window Damage	Left Front and Left Rear Windows Broke
Other Notable Effects	None

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Left Front Driver		Left Rear Passenger	
	Installed	Deployed	Installed	Deployed
Front Airbag	Yes	No	No	
Knee Airbag	Yes	No	No	
Side Torso Airbag	Yes	Yes	No	
Head/Torso Airbag	No		No	
Side Head Curtain/Tube Airbag	Yes	Yes	Yes	Yes
Pretensioner	Yes	Yes	No	
Load Limiter	Yes	No	No	

MDB LEFT EDGE IMPACT POINT DATA

Measured Parameter	Units	Requirement	Value
Horizontal Offset	mm	+/- 50	19 forward
Vertical Offset	mm	+/-20	7 up

DATA SHEET NO. 11

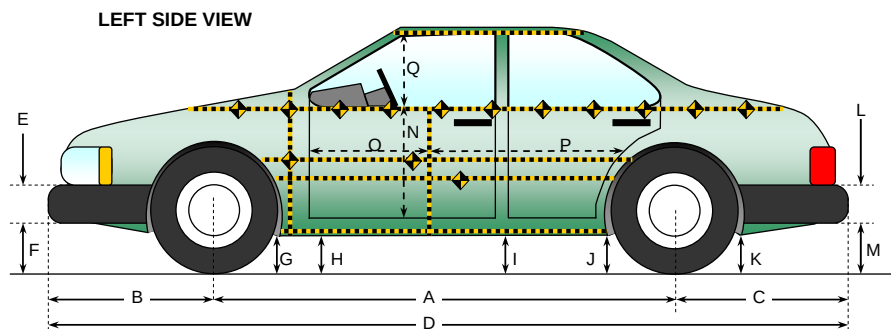
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2010 Toyota Camry LE 4-Dr Sedan

NHTSA No. MA5113

Test Program: Side Validation Testing

Test Date: 6/12/2009



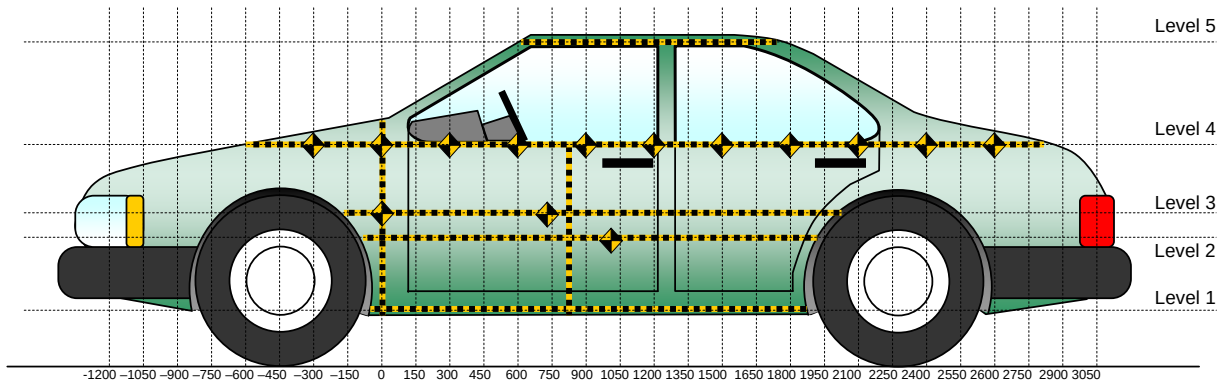
All Measurements in mm

Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2770	2776	-6
B	Front Axle to FSOV	944	953	-9
C	Rear Axle to RSOV	1090	1085	5
D	Total Length at Centerline	4804	4814	-10
E	Front Bumper Thickness	141	141	0
F	Front Bumper Bottom to Ground	214	222	-8
G	Sill Height at Front Wheel Well	170	171	-1
H	Sill Height at Front Door Leading Edge	191	206	-15
I	Sill Height at B Pillar	193	219	-26
J1	Sill Height at Rear Wheel Well	165	184	-19
J2	Pinch Weld Height at Rear Wheel Well	187	199	-12
K	Sill Height Aft of Rear Wheel Well	215	202	13
L	Rear Bumper Thickness	146	146	0
M	Rear Bumper Bottom to Ground	274	269	5
N	Sill Height to Window Bottom Sill	720	672	48
O	Front Door Leading Edge to Impact CL	850	840	10
P	Rear Door Trailing Edge to Impact CL	1262	1275	-13
Q	Front Window Opening	402	380	22
R	Right Side Length	3674	3685	-11
S	Left Side Length	3674	3642	32
T	Vehicle Width at B Post	1818	1640	178

DATA SHEET NO. 12
VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2010 Toyota Camry LE 4-Dr Sedan
Test Program: Side Validation Testing

NHTSA No. MA5113
Test Date: 6/12/2009



All Measurements Shown in mm

LEFT SIDE VIEW

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

Level	Measurement Description	Height Above Ground (mm)
1	Sill Top	275
2	Occupant H-Point	490
3	Mid-Door	625
4	Window Sill	955
5	Window Top	1370

DATA SHEET NO. 12 (CONTINUED)
VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2010 Toyota Camry LE 4-Dr Sedan
 Test Program: Side Validation Testing

NHTSA No. MA5113
 Test Date: 6/12/2009

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-900				441					443					2	
-750				403					413					10	
-600				372					382					10	
-450				347					357					10	
-300				321					338					17	
-150			191	305				238	328				47	23	
0	215	200	201	324		251	329	287	324		36	129	86	0	
150	221	204	200	287		336	423	400	325		115	219	200	38	
300	223	202	198	280		364	462	460	353		141	260	262	73	
450	223	202	195	276		366	478	465	381		143	276	270	105	
600	222	201	192	273		368	485	460	411		146	284	268	138	
750	220	200	191	271	502	369	484	445	416	530	149	284	254	145	28
900	222	200	191	272	494	363	485	440	409	524	141	285	249	137	30
1050	223	200	191	271	491	358	476	443	400	527	135	276	252	129	36
1200	225	202	192	272	490	350	460	438	407	534	125	258	246	135	44
1350	225	205	195	272	490	343	457	446	394	539	118	252	251	122	49
1500	230	208	196	277	492	336	442	466	392	542	106	234	270	115	50
1650	233	212	200	277	497	342	427	445	398	546	109	215	245	121	49
1800	230	216	204	280	502	326	414	413	368	536	96	198	209	88	34
1950	222	202	202	286	510	268	321	333	343	540	46	119	131	57	30
2100			190	292	528			252	327	550			62	35	-22
2250				302					320					18	
2400				314					354					40	
2550				329					365					36	
2700				347					377					30	
2850				372					391					19	
3000				397					394					-3	

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

MAXIMUM CRUSH DATA

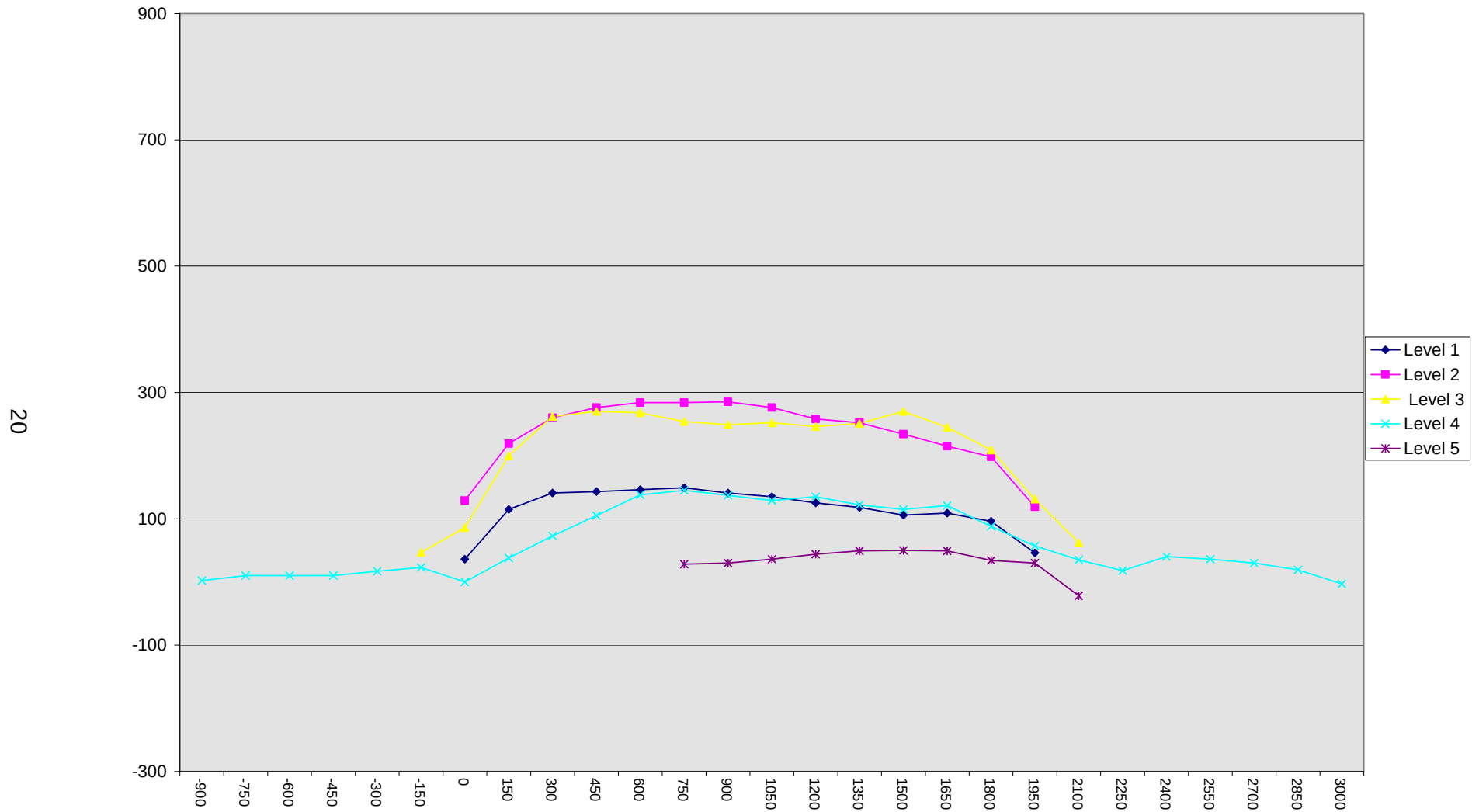
	Level 1	Level 2	Level 3	Level 4	Level 5
Maximum Crush (mm)	149	285	270	145	50
Distance From Impact (mm)	750	900	450	750	1500

DATA SHEET NO. 12 (continued)

VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2010 Toyota Camry LE 4-Dr Sedan
Test Program: Side Validation Testing

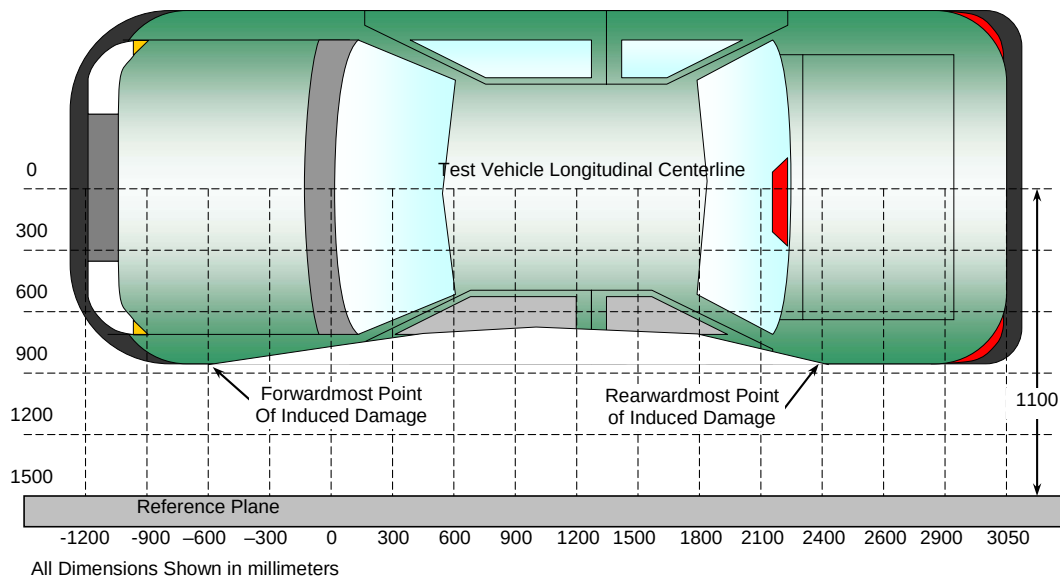
NHTSA No. MA5113
Test Date: 6/12/2009



DATA SHEET NO. 13
VEHICLE DAMAGE PROFILE DISTANCES

Test Vehicle: 2010 Toyota Camry LE 4-Dr Sedan
 Test Program: Side Validation Testing

NHTSA No. MA5113
 Test Date: 6/12/2009



TOP VIEW

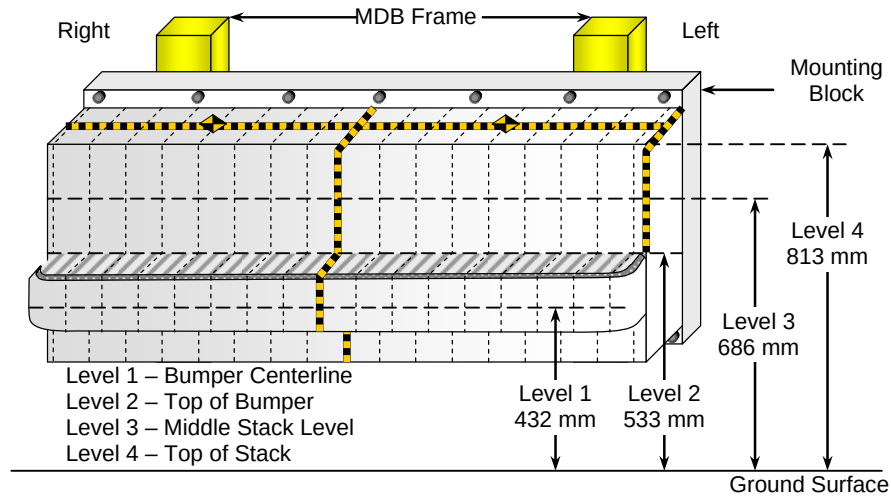
DPD	Distance from Impact Point (mm)	Level	Pre-Test (mm)	Post-Test (mm)	Max. Static Crush (mm)
1	3000	4	397	394	-3
2	2200	4	300	322	22
3	1420	3	196	480	284
4	620	2	201	492	291
5	-135	4	303	325	22
6	-900	4	441	443	2

DATA SHEET NO. 14

EXTERIOR STATIC CRUSH FOR IMPACTOR FACE

Test Vehicle: 2010 Toyota Camry LE 4-Dr Sedan
 Test Program: Side Validation Testing

NHTSA No. MA5113
 Test Date: 6/12/2009



DEFORMABLE BARRIER STATIC CRUSH

Stack Level	Distance Right of Center (mm)								C _L	Distance Left of Center (mm)							
	800	700	600	500	400	300	200	100		100	200	300	400	500	600	700	800
4	33	16	7	9	19	47	85	93	53	25	13	7	7	18	37	69	103
3	62	31	17	18	20	29	50	58	25	13	12	11	11	12	18	26	60
2	119	111	87	64	51	43	43	56	47	38	34	30	30	32	35	45	58
1	178	174	163	149	142	139	135	130	121	114	109	104	100	96	97	108	118

DATA SHEET NO. 15

FMVSS 301 FUEL INTEGRITY POST-IMPACT DATA

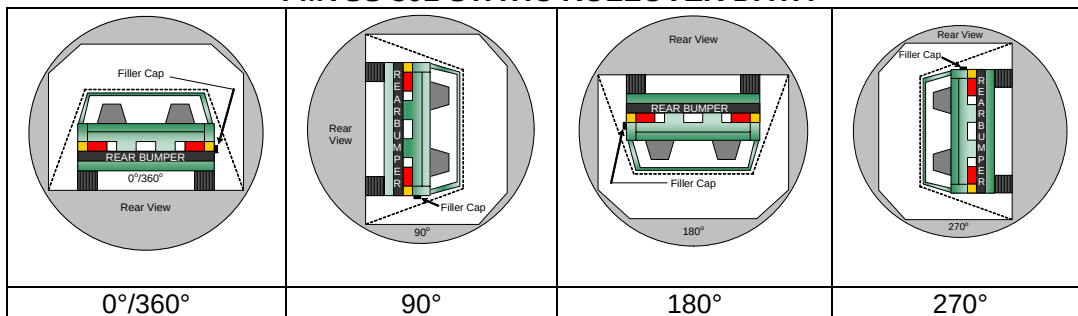
Test Vehicle: 2010 Toyota Camry LE 4-Dr Sedan
 Test Program: Side Validation Testing

NHTSA No. MA5113
 Test Date: 6/12/2009

Test Time: 11:00 am Temperature: 21° C

- A. From impact until vehicle motion ceases: 0 oz.
 (Maximum Allowable = 1 ounce)
 B. For the 5 minute period after motion ceases: None
 (Maximum allowable = 5 ounces)
 C. For the following 25 minutes: None
 (Maximum allowable = 1 oz./minute)
 D. Spillage Details: None

FMVSS 301 STATIC ROLLOVER DATA



ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	121	300	421
90° to 180°	116	300	416
180° to 270°	114	300	414
270° to 360°	125	300	425

FMVSS 301 ROLLOVER SPILLAGE TABLE (units in ounces)

Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eight Minute
0° to 90°	0	0	0	0
90° to 180°	0	0	0	0
180° to 270°	0	0	0	0
270° to 360°	0	0	0	0

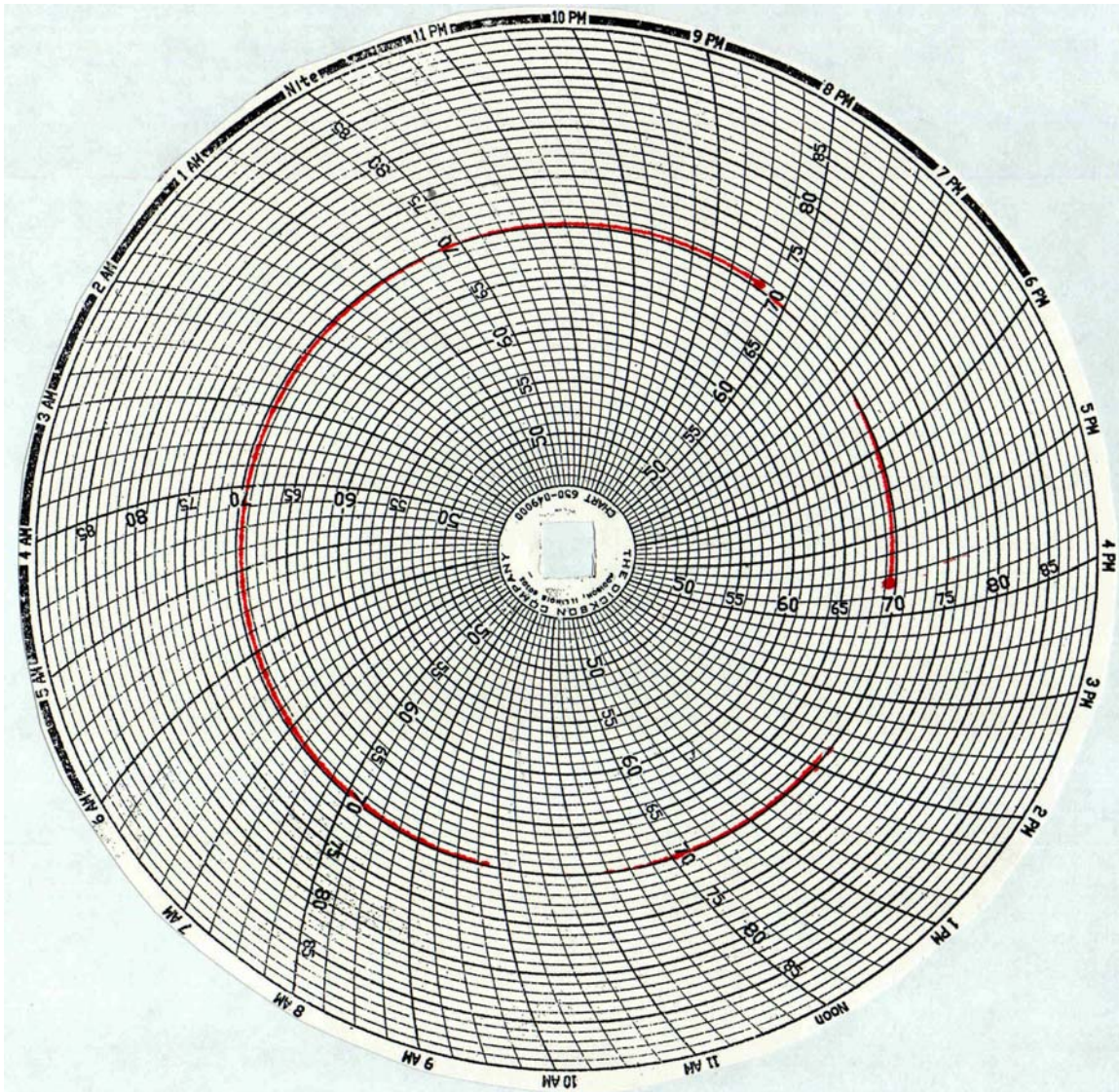
ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

Test Phase	Spillage Location
0° to 90°	
90° to 180°	
180° to 270°	
270° to 360°	

DATA SHEET NO. 16
DUMMY/VEHICLE TEMPERATURE STABILIZATION

Test Vehicle: 2010 Toyota Camry LE 4-Dr Sedan
Test Program: Side Validation Testing

NHTSA No. MA5113
Test Date: 6/12/2009



APPENDIX A
PHOTOGRAPHS

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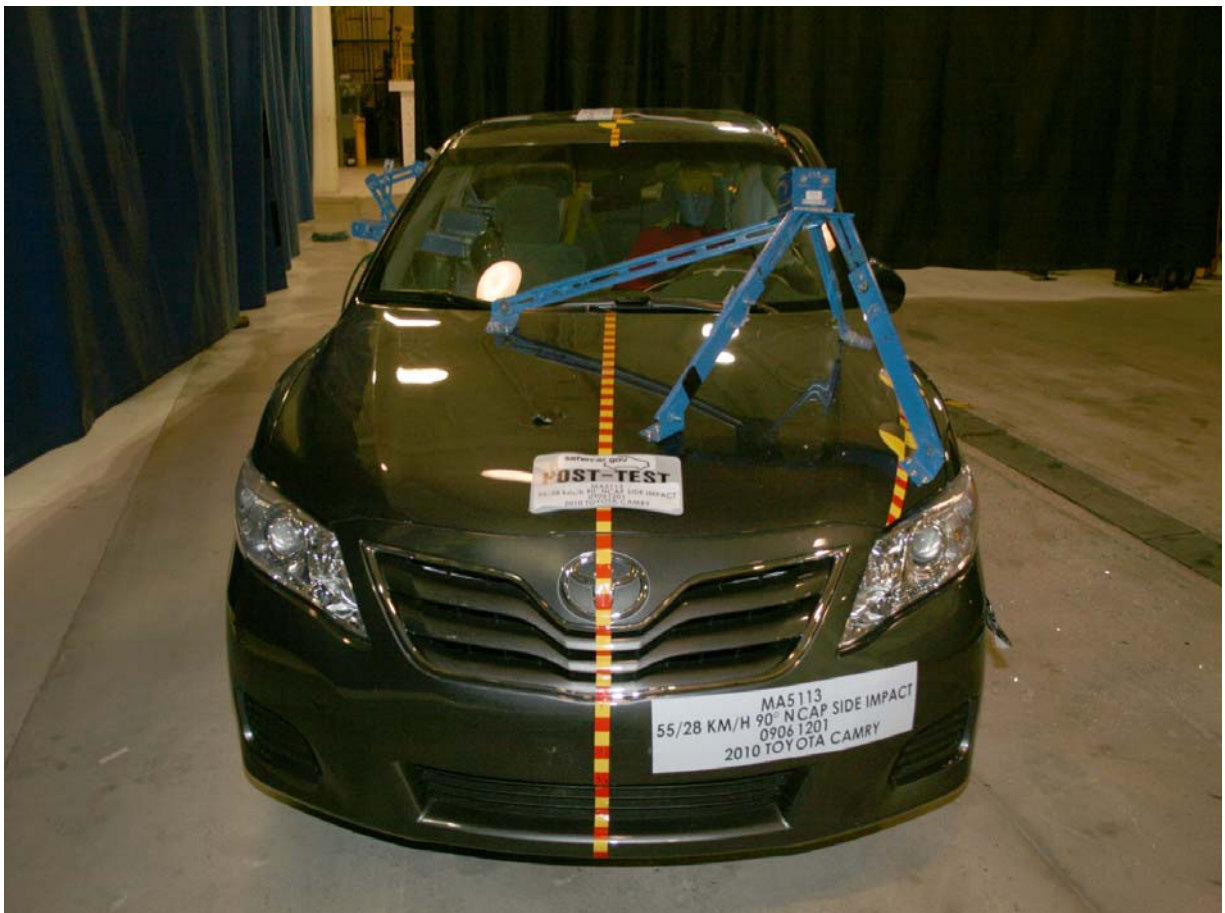
As Delivered Right Front $\frac{3}{4}$ View of Test Vehicle



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



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



Pre-Test Left Side View of Test Vehicle



Post-Test Left Side View of Test Vehicle



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



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



Pre-Test Rear View of Test Vehicle



Post-Test Rear View of Test Vehicle



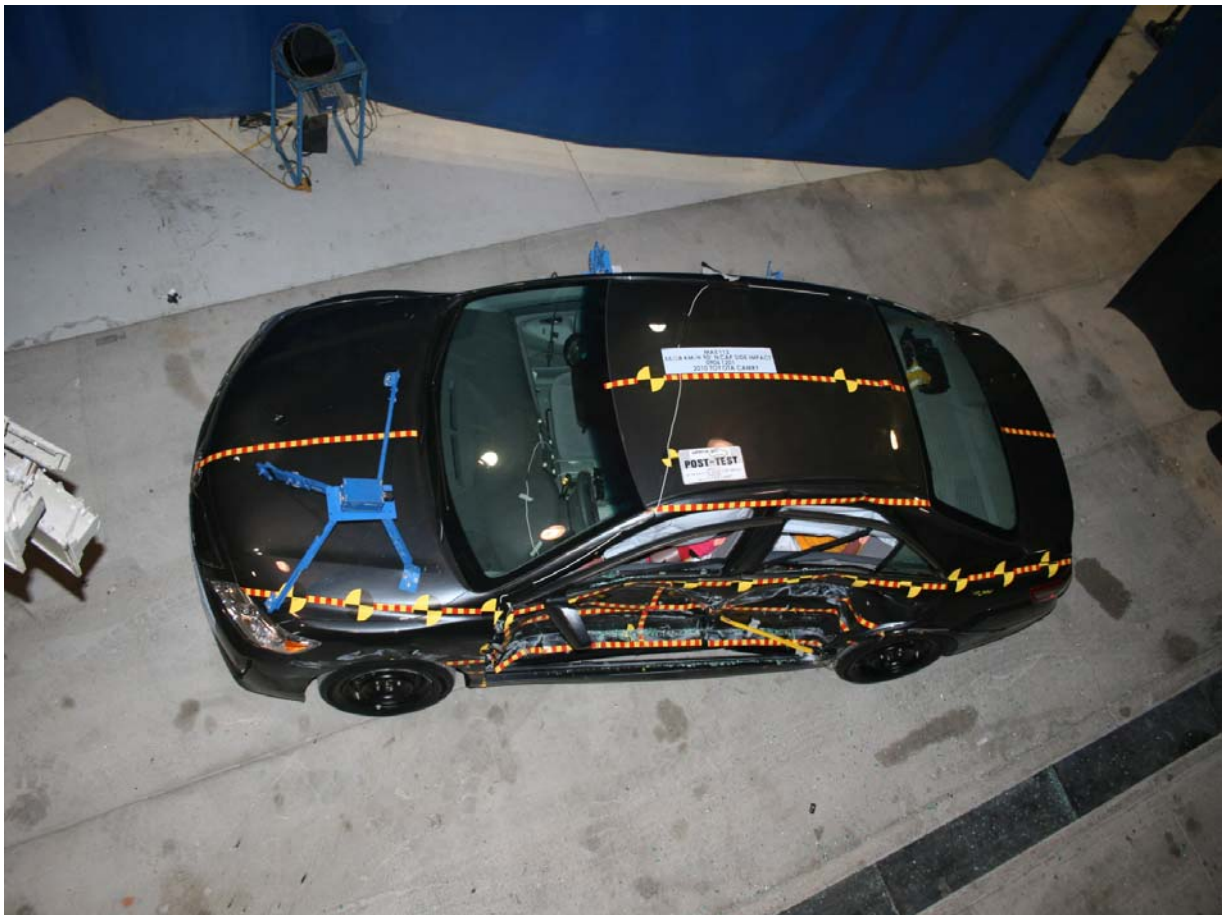
Pre-Test Right Side View of Test Vehicle



Post-Test Right Side View of Test Vehicle



Pre-Test Overhead View of the Test Vehicle with MDB Positioned Against the Side of the Test Vehicle at the Ideal Impact Point



Post-Test Overhead View of the Test Vehicle and MDB



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



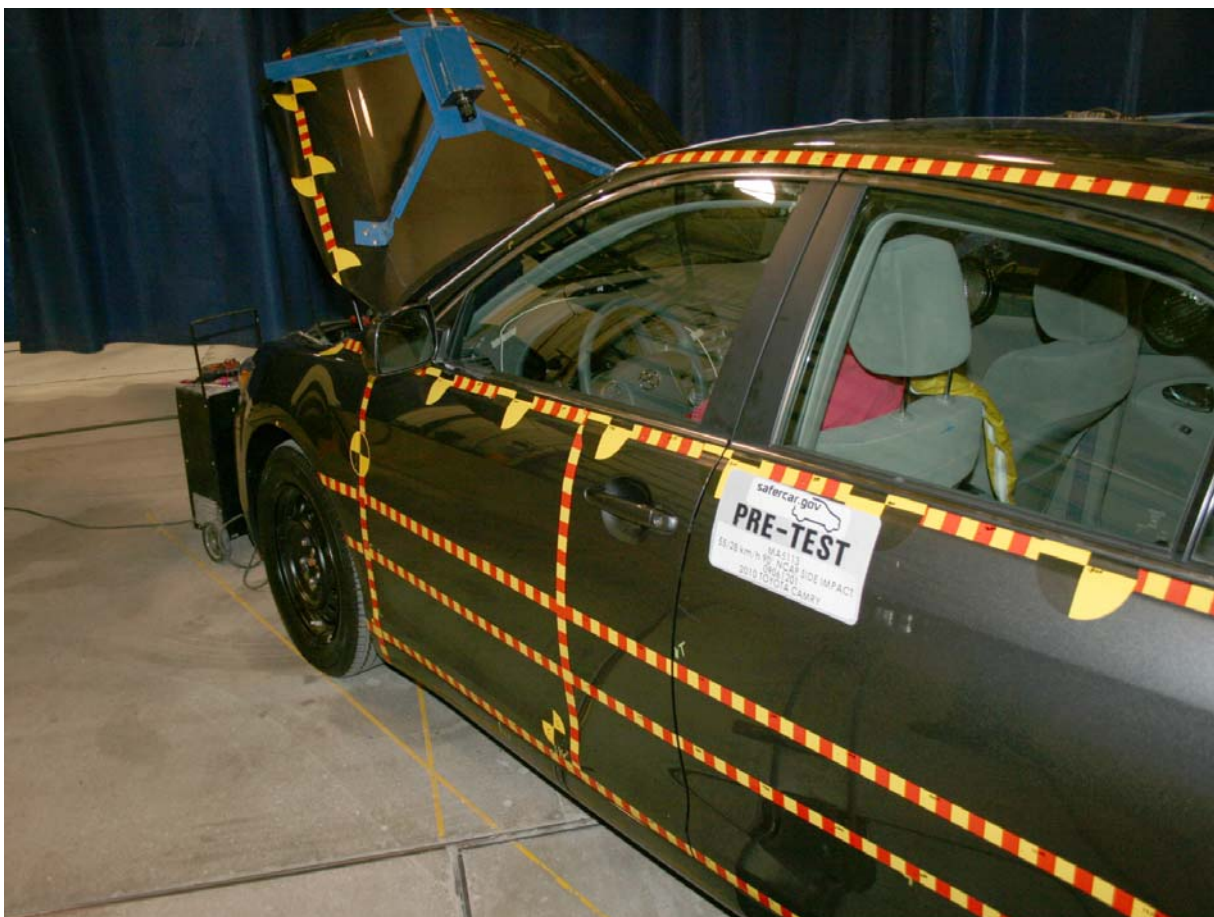
Pre-Test Right Side View of MDB Positioned Against the Side of the Test Vehicle at the Ideal Impact Point



Pre-Test Close-Up View of Impact Point Target



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



Pre-Test Left Front Door Latch Close-Up



Post-Test Left Front Door Latch Close-Up



Pre-Test Left Rear Door Latch Close-Up



Post-Test Left Rear Door Latch Close-Up



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



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



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



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



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



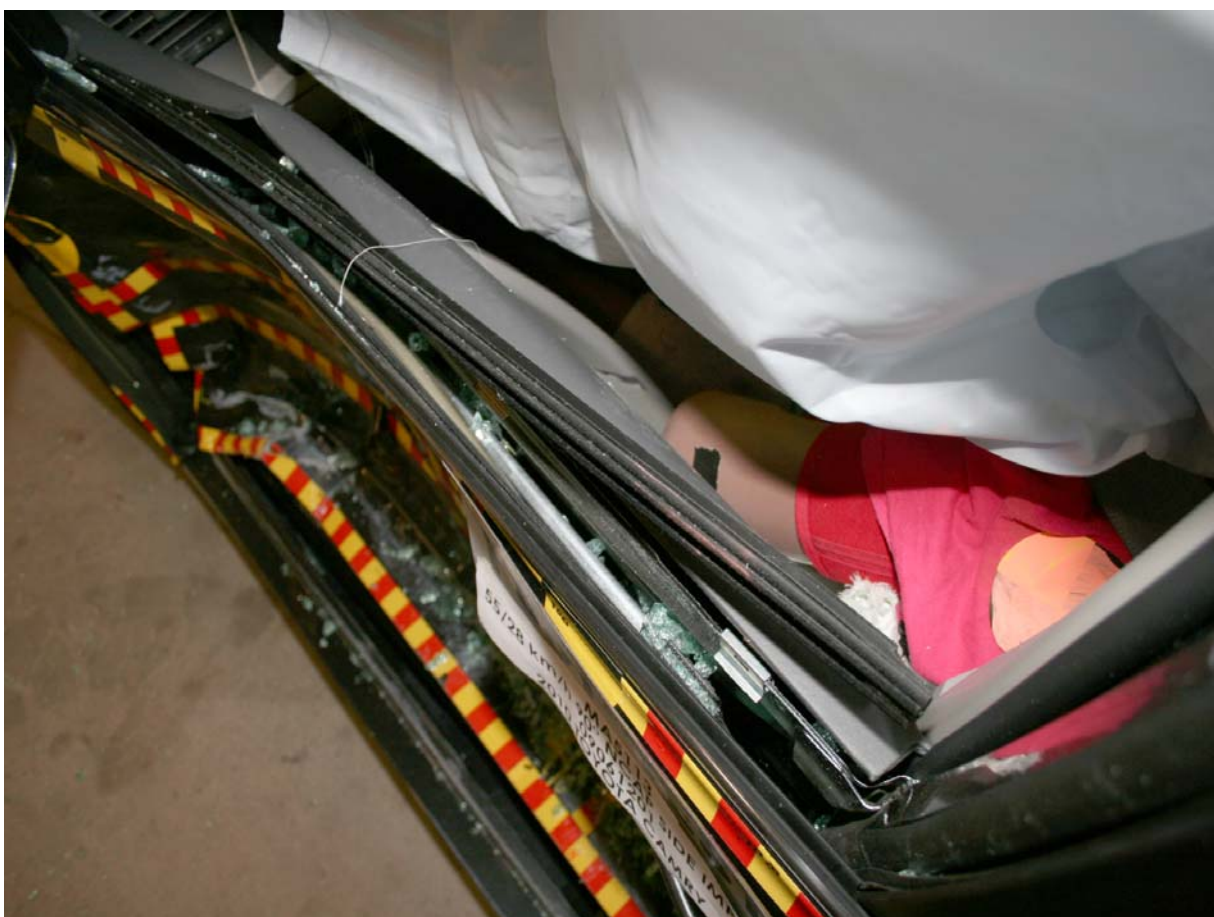
Pre-Test Close-Up Left Side View of Driver Seat Track Showing Seat Positioning



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



Pre-Test Driver Dummy and Door Clearance View



Post-Test Driver Dummy and Door Clearance View



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



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



Pre-Test Driver Inner Door Panel View



Post-Test Driver Inner Door Panel View (with dummy removed)



Post-Test Driver Dummy Head Contact View



Post-Test Driver Dummy Door Contact View



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



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



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



Pre-Test Close-Up Left Side View of Passenger Seat Track Showing Seat Positioning



Pre-Test Close-Up Left Side View of Passenger Seat Back Showing Seat Back Positioning



Pre-Test Passenger Dummy and Door Clearance View



Post-Test Passenger Dummy and Door Clearance View



Pre-Test Right Side View of Rear Seat of Occupant Compartment



Post-Test Right Side View of Rear Seat of Occupant Compartment



Pre-Test Passenger Inner Door Panel View



Post-Test Passenger Inner Door Panel View (with dummy removed)



Post-Test Passenger Dummy Head Contact View



Post-Test Passenger Dummy Door Contact View



Close-Up View of Vehicle's Certification Label



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



Pre-Test Front View of MDB Impactor Face



Post-Test Front View of MDB Impactor Face



Pre-Test Top View of MDB Impactor Face



Post-Test Top View of MDB Impactor Face



Pre-Test Left Side View of MDB Impactor Face



Post-Test Left Side View of MDB Impactor Face



Pre-Test Right Side View of MDB Impactor Face



Post-Test Right Side View of MDB Impactor Face



Post-Test Primary and Redundant Speed Trap Velocity Read-Out with Placard Showing NHTSA Number



FMVSS No. 301/305 Rollover 0 Degrees



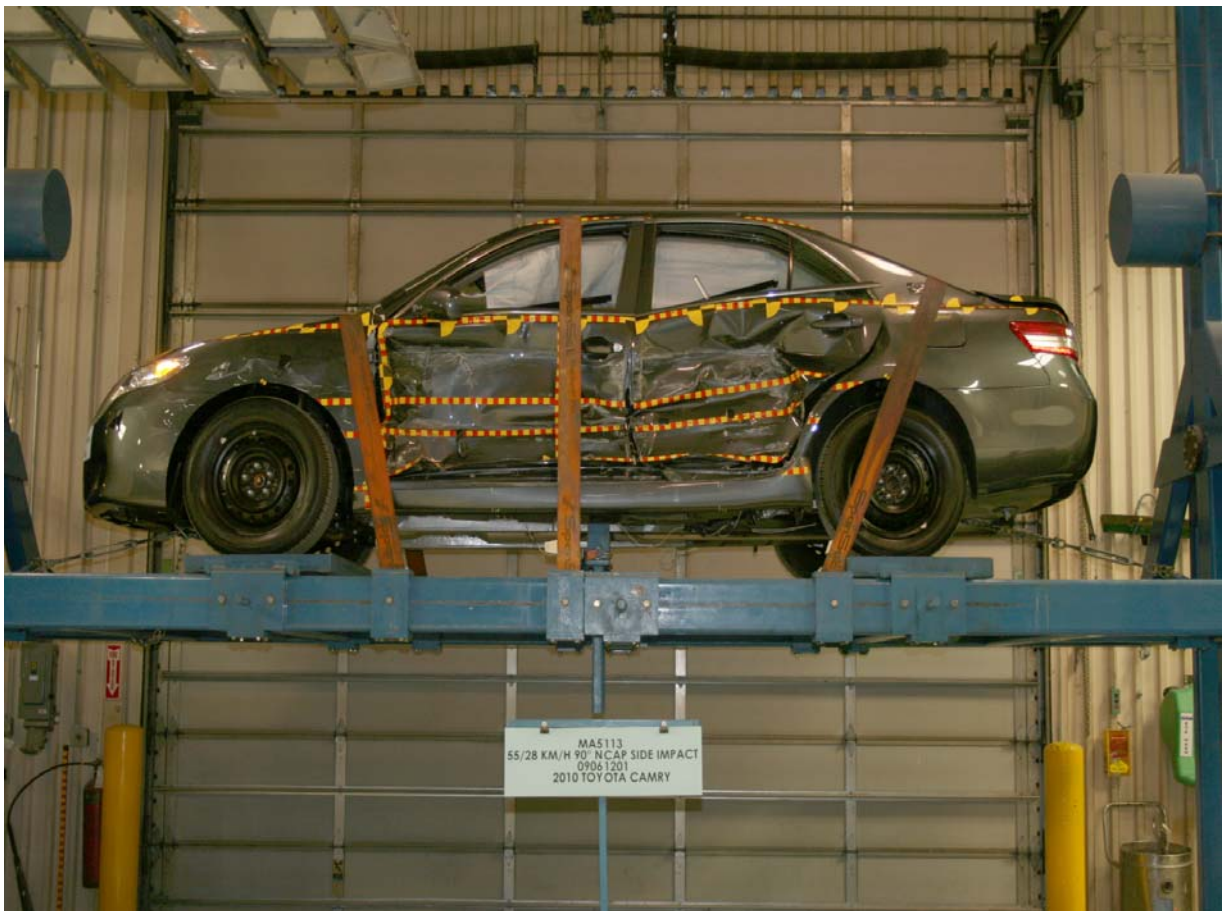
FMVSS No. 301/305 Rollover 90 Degrees



FMVSS No. 301/305 Rollover 180 Degrees



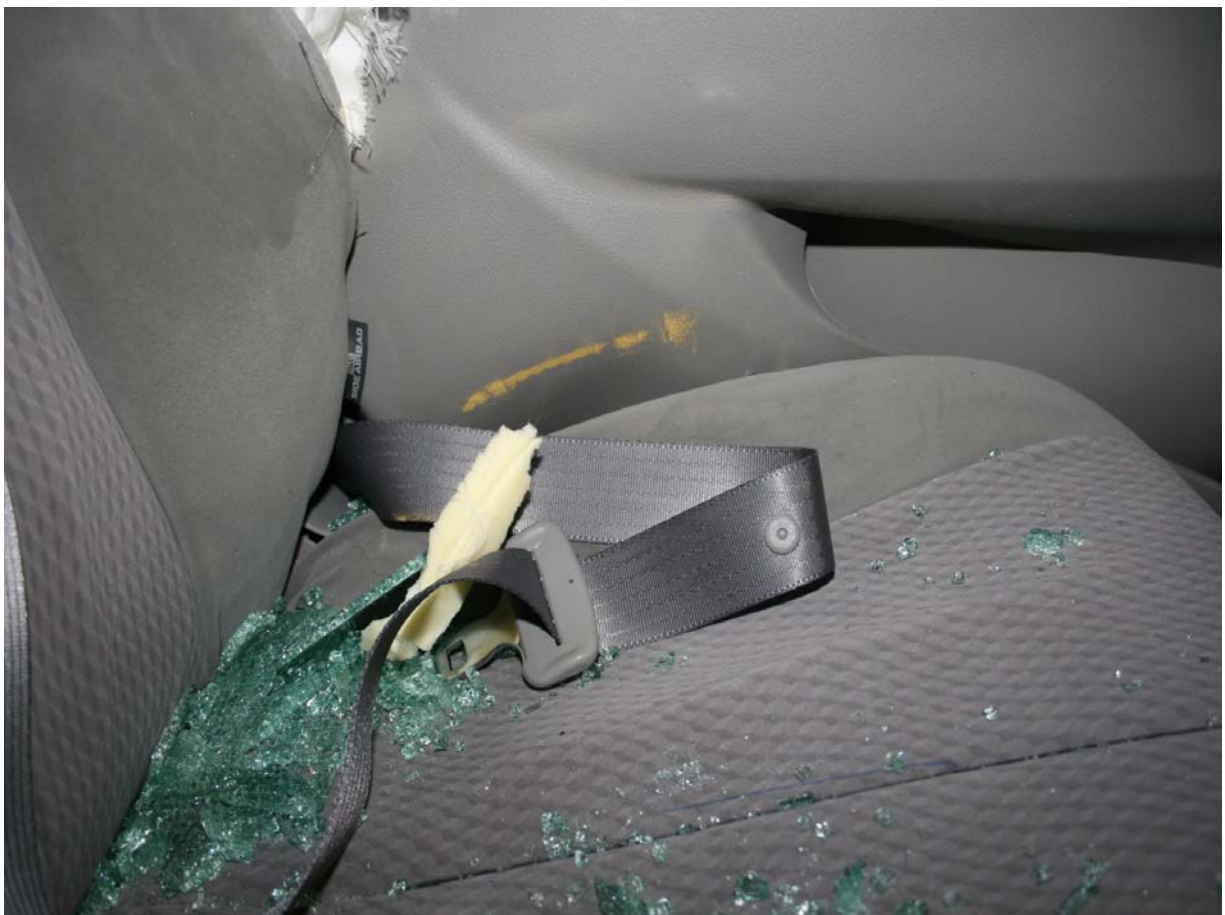
FMVSS No. 301/305 Rollover 270 Degrees



FMVSS No. 301/305 Rollover 360 Degrees



Impact Event (Impact Side)



Post-Test Driver Dummy Door Contact View 2



Post-Test Passenger Dummy Door Contact View 2



Post-Test Passenger Dummy Head Contact View 2

APPENDIX B
DUMMY RESPONSE DATA

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Driver & Passenger Dummy Instrumentation Plots
FILTERED DATA

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The following additional data for this test can be obtained from the Research and Development section of the NHTSA website. The website can be found at www.nhtsa.dot.gov

Driver & Passenger Dummy Instrumentation Data

Driver Lower Spine T12 Acceleration (X)

Driver Lower Spine T12 Acceleration (Y)

Driver Lower Spine T12 Acceleration (Z)

Passenger Upper Neck Force (X)

Passenger Upper Neck Force (Y)

Passenger Upper Neck Force (Z)

Passenger Upper Neck Moment About X

Passenger Upper Neck Moment About Y

Passenger Upper Neck Moment About Z

Passenger Shoulder Deflection (Y)

Passenger Upper Thorax Rib Deflection (Y)

Passenger Middle Thorax Rib Deflection (Y)

Passenger Lower Thorax Rib Deflection (Y)

Passenger Upper Abdomen Rib Deflection (Y)

Passenger Lower Abdomen Rib Deflection (Y)

Driver Head Acceleration Redundant (X)

Driver Head Acceleration Redundant (Y)

Driver Head Acceleration Redundant (Z)

Driver Shoulder Contact Switch

Driver Torso Contact Switch

Driver Pelvis Contact Switch

Passenger Head Acceleration Redundant (X)

Passenger Head Acceleration Redundant (Y)

Passenger Head Acceleration Redundant (Z)

Passenger Shoulder Contact Switch

Passenger Torso Contact Switch

Passenger Pelvis Contact Switch

Vehicle Instrumentation Data

Driver Side Airbag Timing

Driver Side Curtain Airbag Timing (not installed)

Passenger Side Airbag Timing (not installed)

Passenger Side Curtain Airbag Timing (not installed)

Right Side Sill at Front Seat Acceleration (X)

Right Side Sill at Front Seat Acceleration (Y)

Right Side Sill at Front Seat Acceleration (Z)

Right Side Sill at Rear Seat Acceleration (X)

Right Side Sill at Rear Seat Acceleration (Y)

Right Side Sill at Rear Seat Acceleration (Z)

Rear Floorpan Above Axle Acceleration (X)

Rear Floorpan Above Axle Acceleration (Y)

Rear Floorpan Above Axle Acceleration (Z)

Left Side Sill at Front Seat Acceleration (Y)

Left Side Sill at Rear Seat Acceleration (Y)

Right Rear Occupant Compartment Acceleration (Y)

Lower A-Post Acceleration (Y)

Upper A-Post Acceleration (Y)

Lower B-Post Acceleration (Y)

Upper B-Post Acceleration (Y)

Front Seat Track Acceleration (Y)

Rear Seat Track Acceleration (Y) (not installed)

Vehicle Center of Gravity Acceleration (X)

Vehicle Center of Gravity Acceleration (Y)

Vehicle Center of Gravity Acceleration (Z)

MDB Instrumentation Data

MDB Center of Gravity Acceleration (X)

MDB Center of Gravity Acceleration (Y)

MDB Center of Gravity Acceleration (Z)

MDB Center of Gravity Resultant Acceleration (not recorded)

MDB Rear Acceleration (X)

MDB Rear Acceleration (Y)

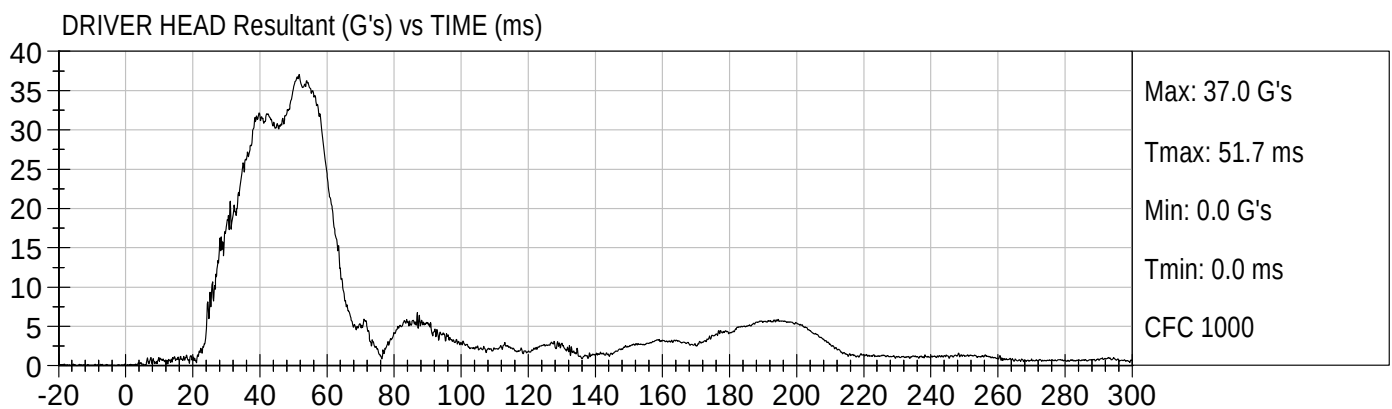
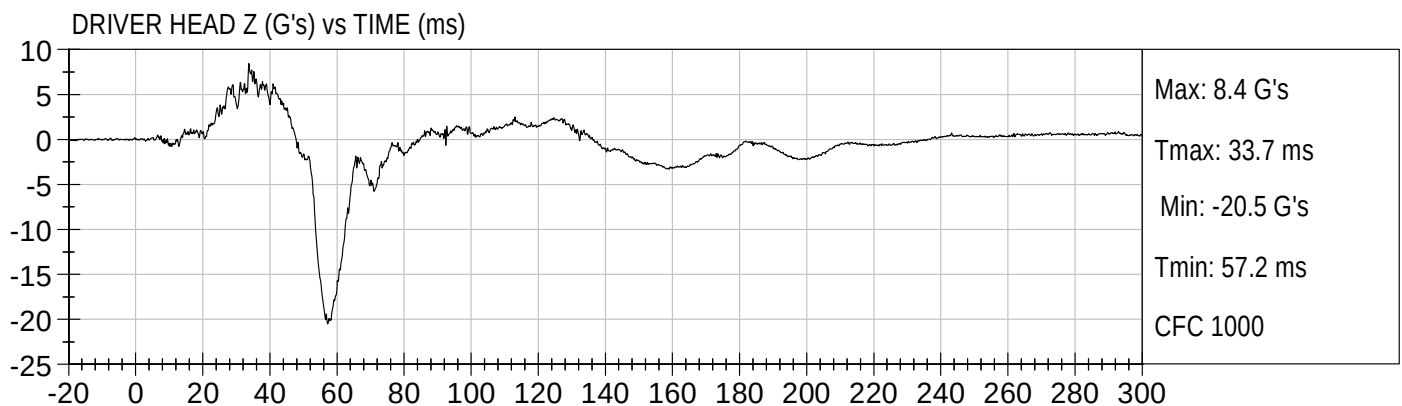
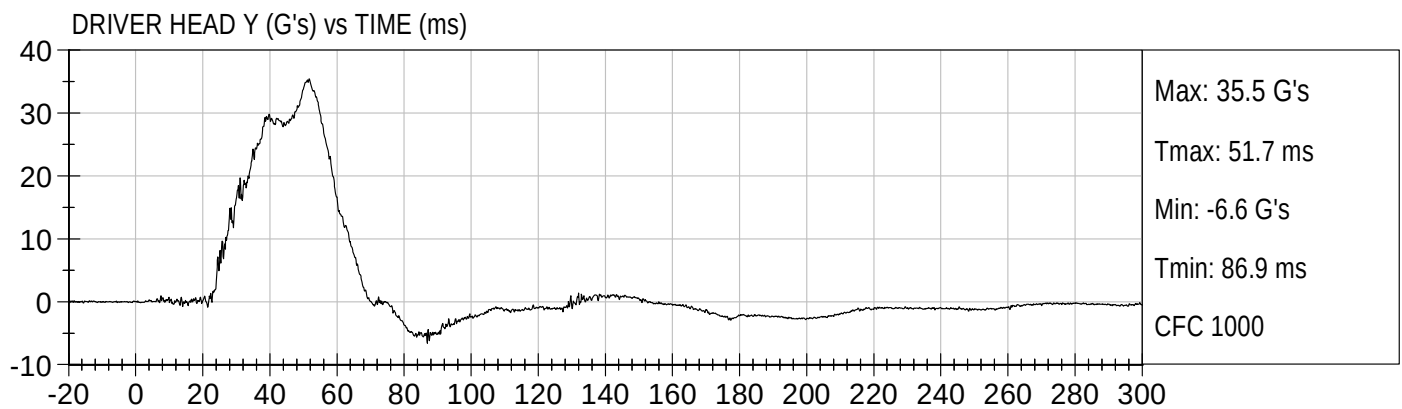
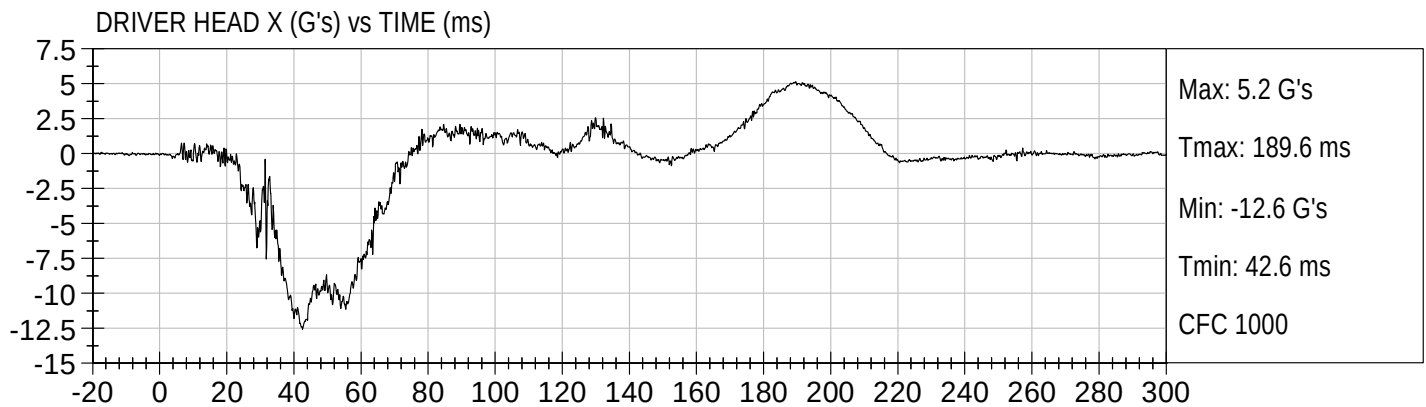
Left MDB Contact Switch

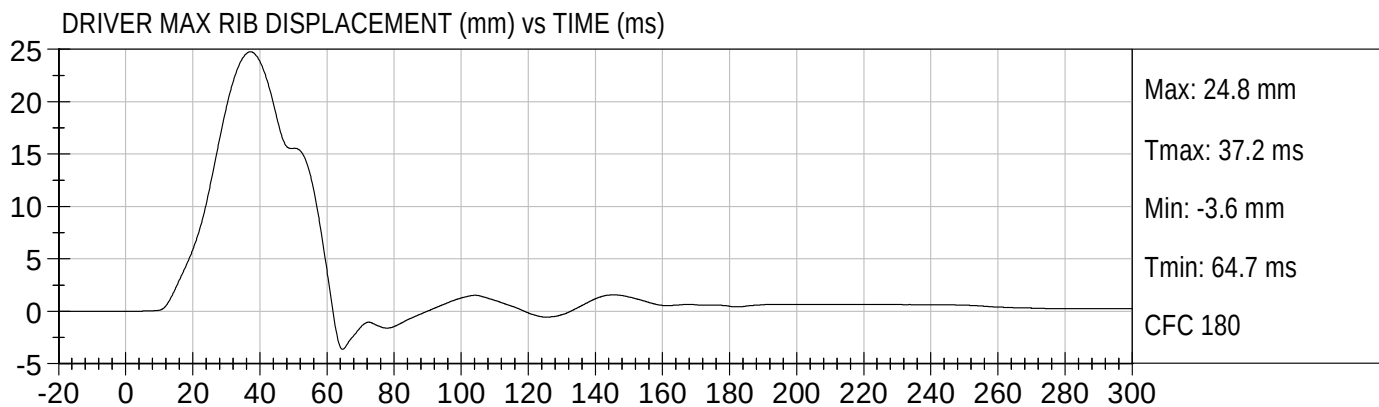
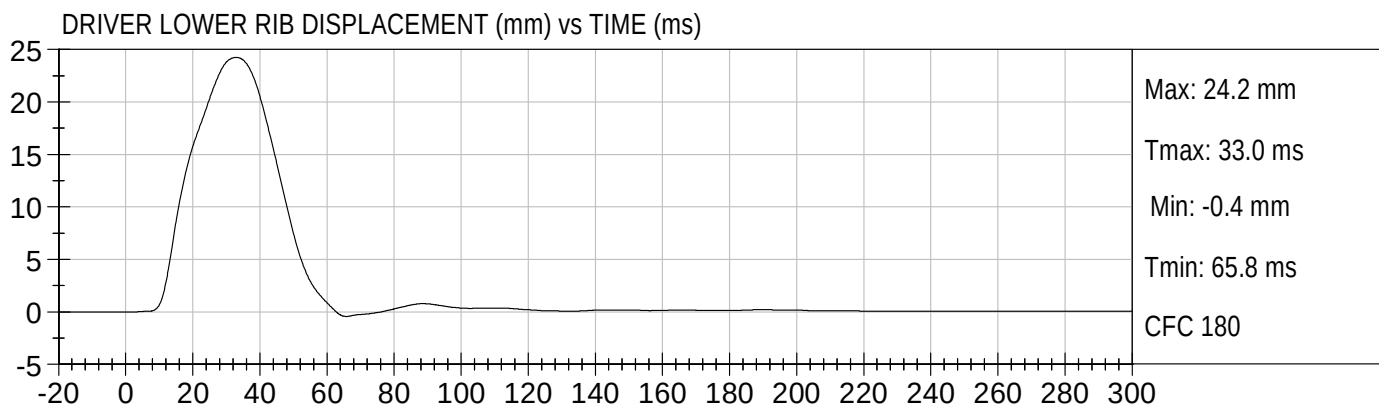
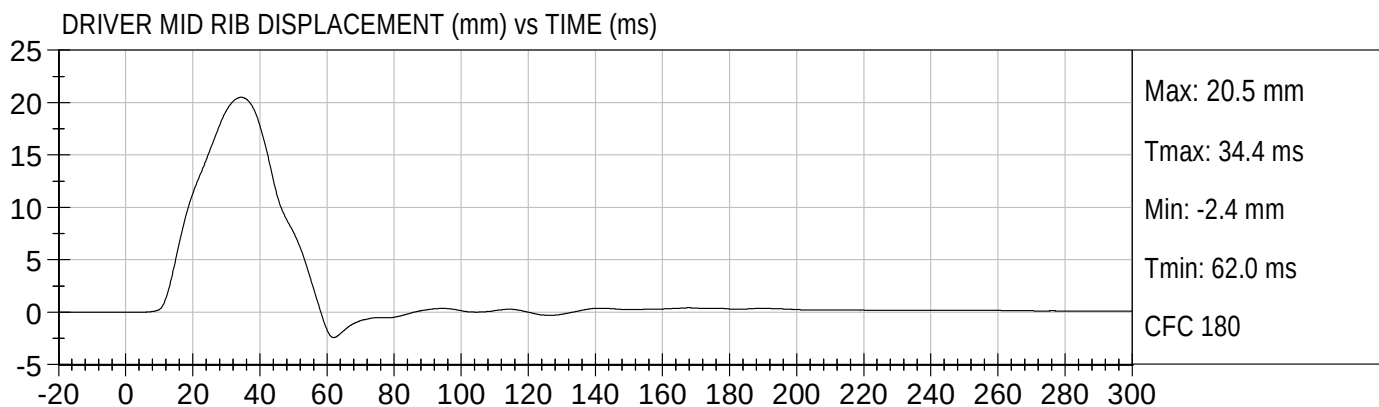
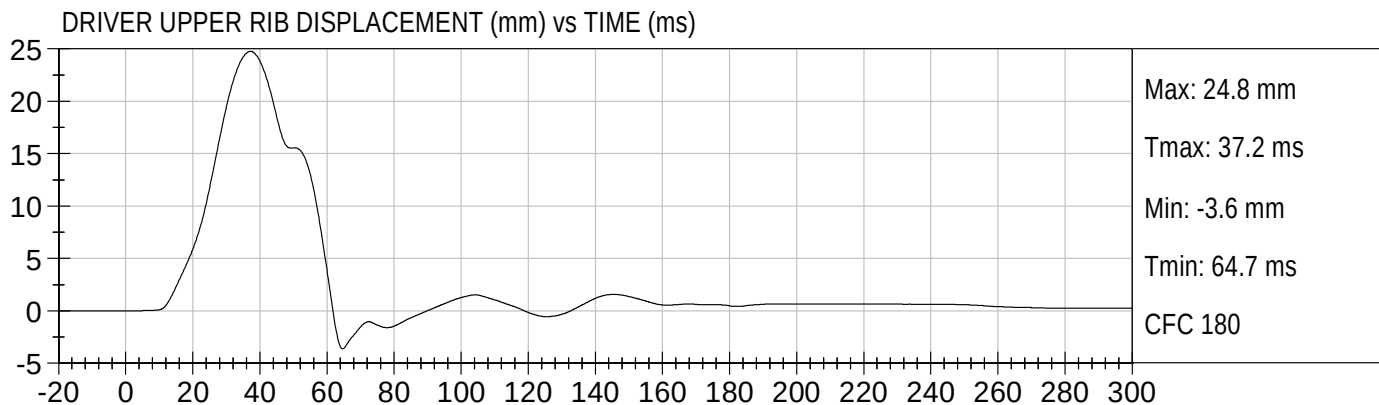
Right MDB Contact Switch



55/28 km/h 90° NCAP Side Impact
2010 Toyota Camry - MA5113

Test Date: 06/12/2009
Speed: 38.6 mph (62.1 km/h)



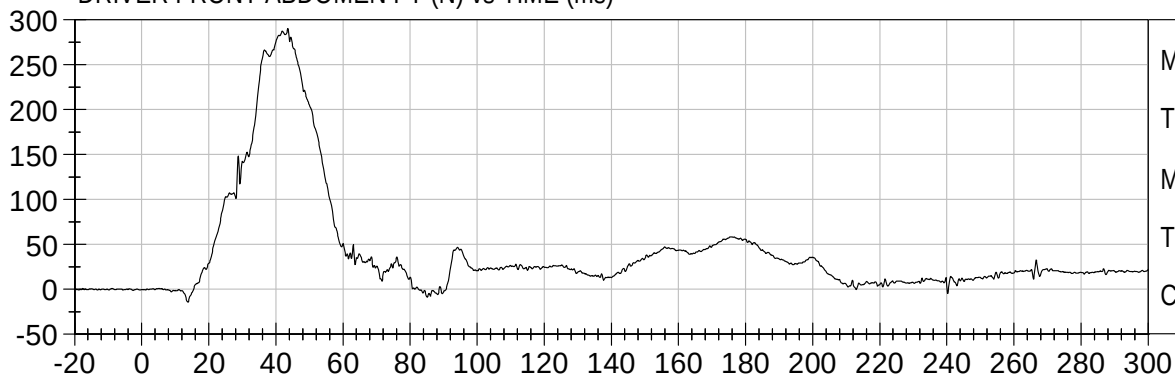




55/28 km/h 90° NCAP Side Impact
2010 Toyota Camry - MA5113

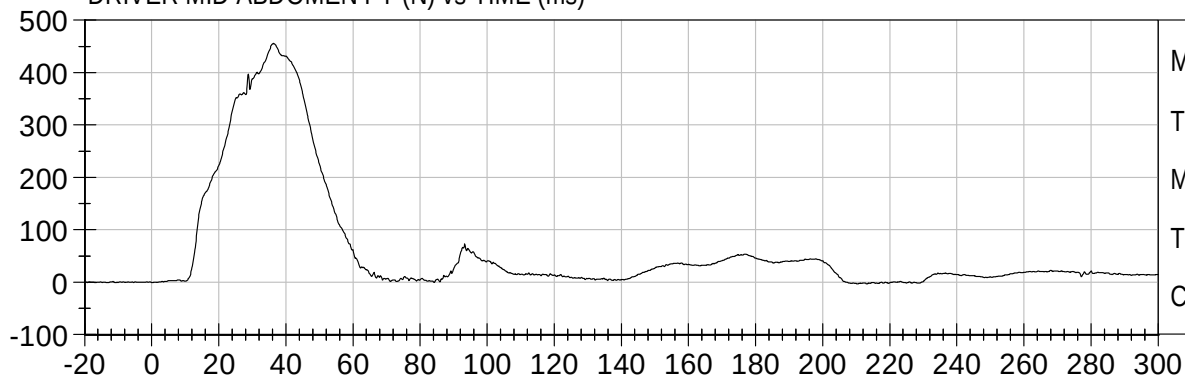
Test Date: 06/12/2009
Speed: 38.6 mph (62.1 km/h)

DRIVER FRONT ABDOMEN FY (N) vs TIME (ms)



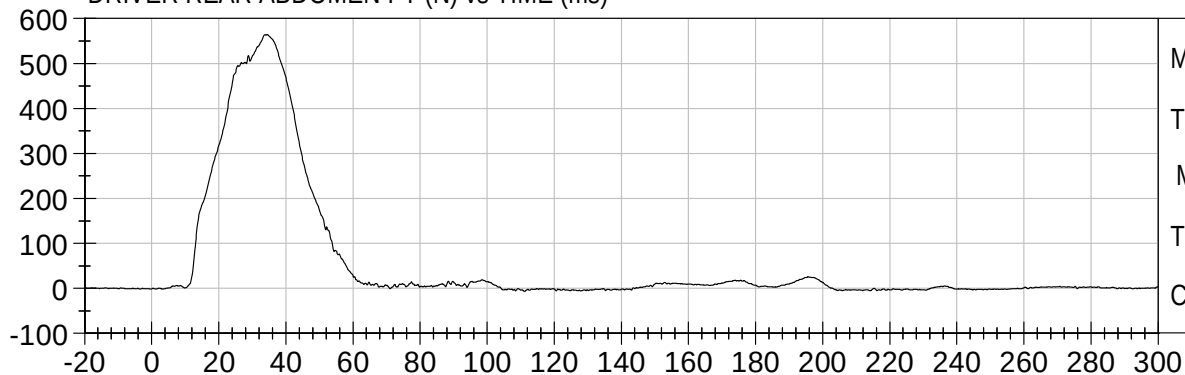
Max: 290.5 N
Tmax: 43.6 ms
Min: -14.3 N
Tmin: 13.8 ms
CFC 600

DRIVER MID ABDOMEN FY (N) vs TIME (ms)



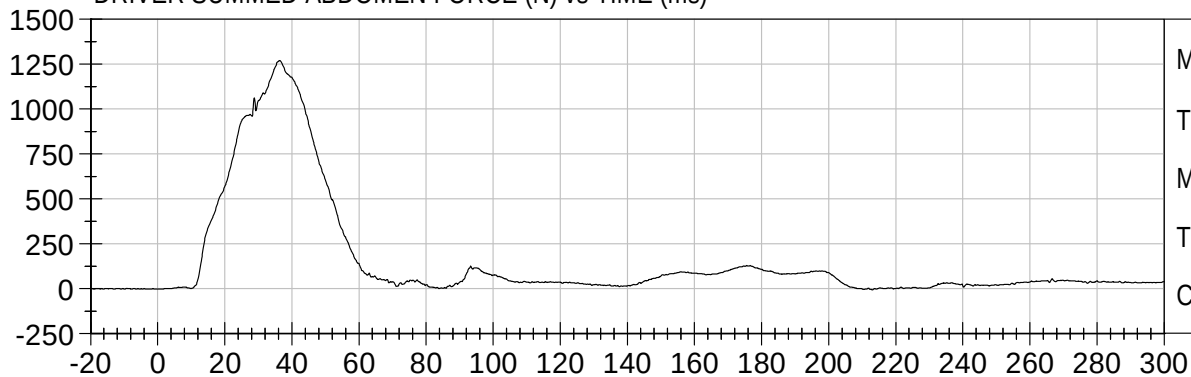
Max: 455.4 N
Tmax: 36.4 ms
Min: -3.1 N
Tmin: 213.2 ms
CFC 600

DRIVER REAR ABDOMEN FY (N) vs TIME (ms)



Max: 564.3 N
Tmax: 34.5 ms
Min: -6.4 N
Tmin: 111.2 ms
CFC 600

DRIVER SUMMED ABDOMEN FORCE (N) vs TIME (ms)

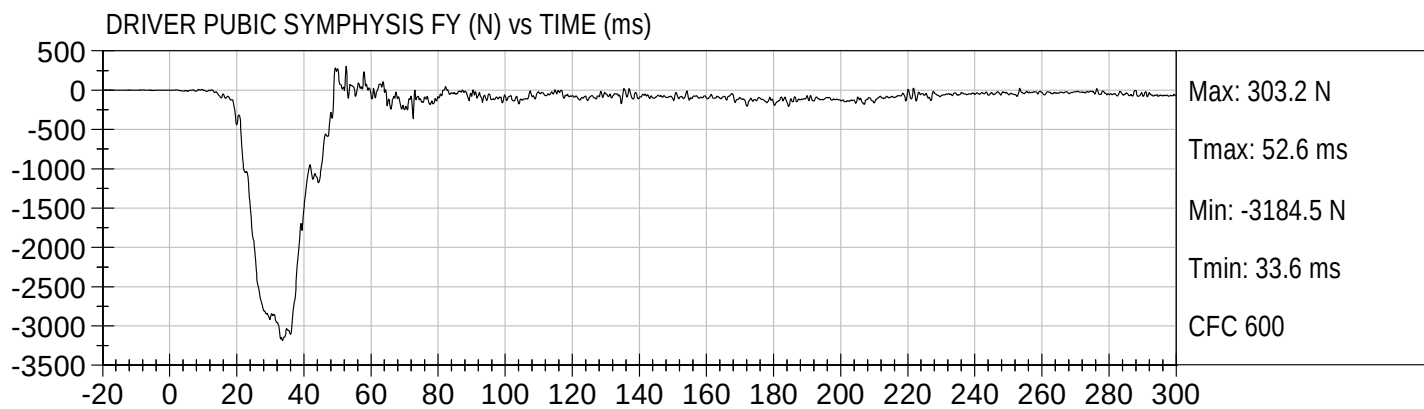


Max: 1270.1 N
Tmax: 36.4 ms
Min: -6.0 N
Tmin: 213.0 ms
CFC 600



55/28 km/h 90° NCAP Side Impact
2010 Toyota Camry - MA5113

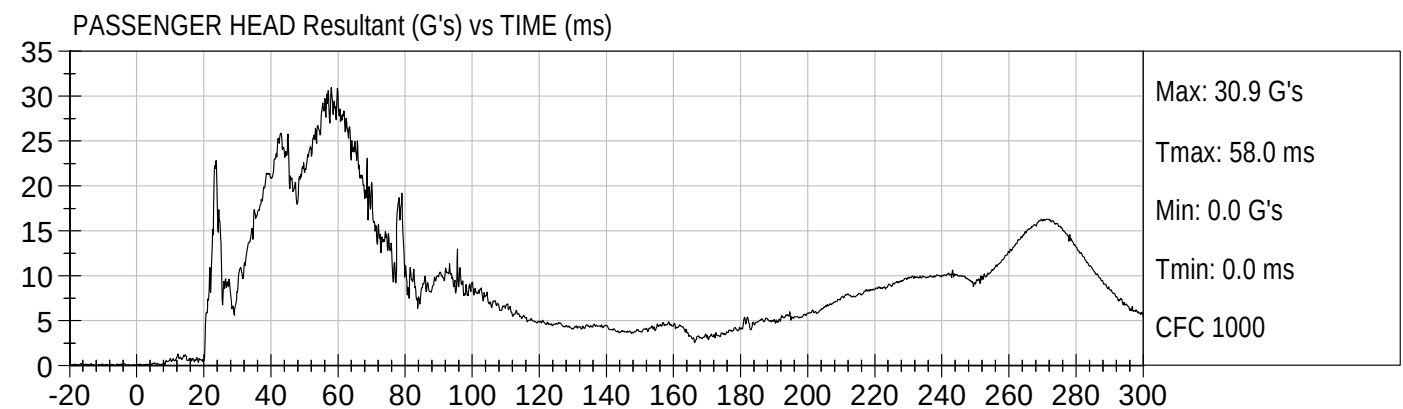
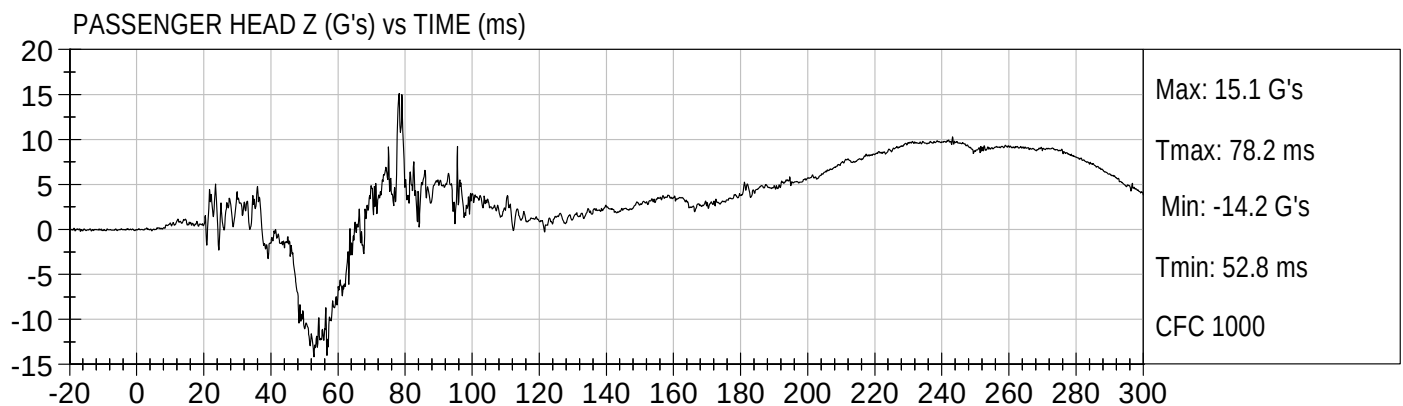
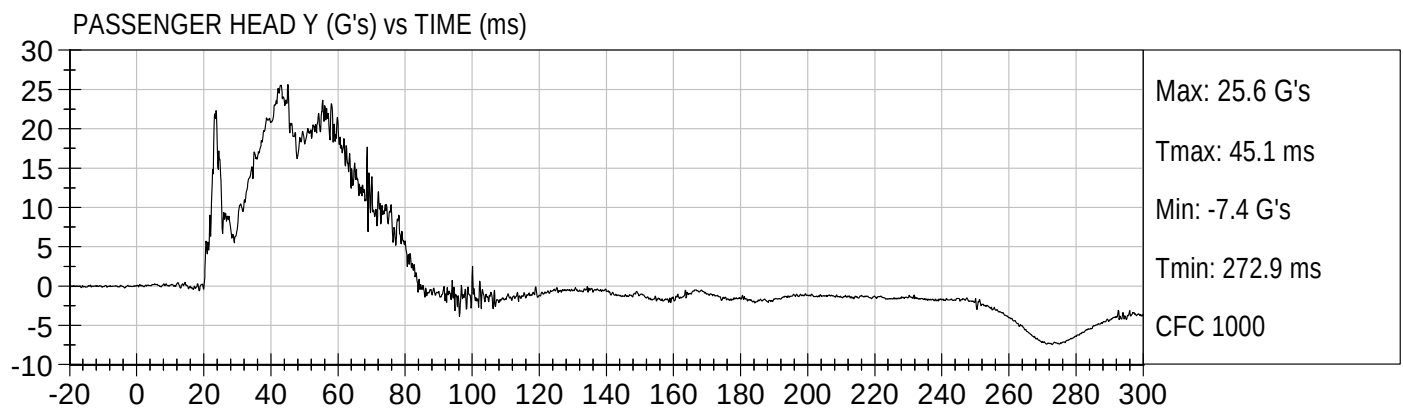
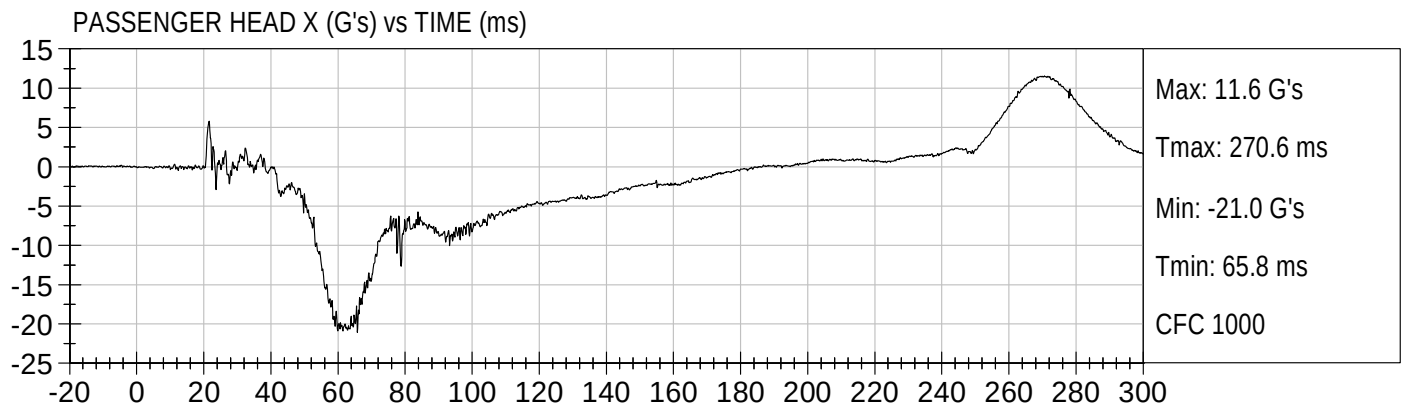
Test Date: 06/12/2009
Speed: 38.6 mph (62.1 km/h)





55/28 km/h 90° NCAP Side Impact
2010 Toyota Camry - MA5113

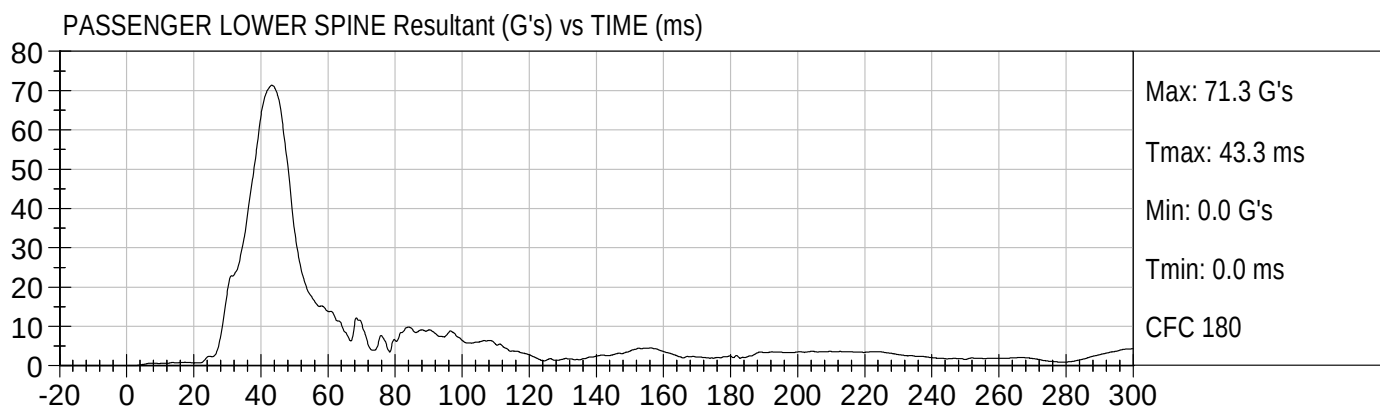
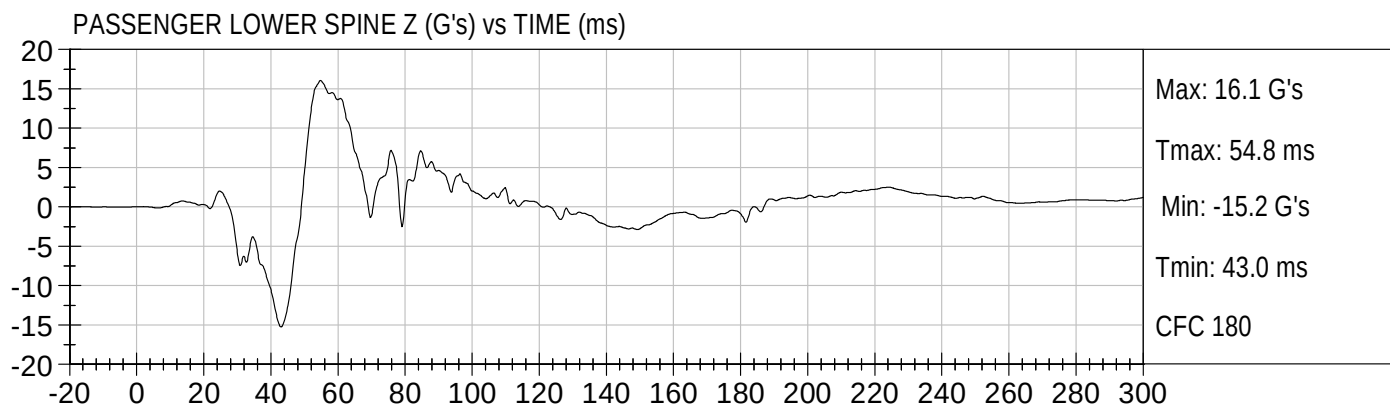
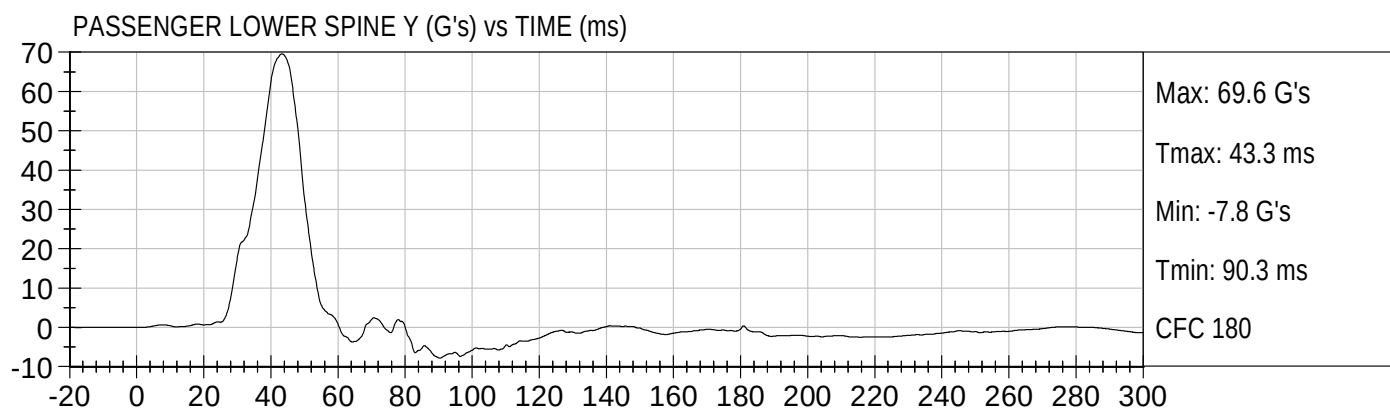
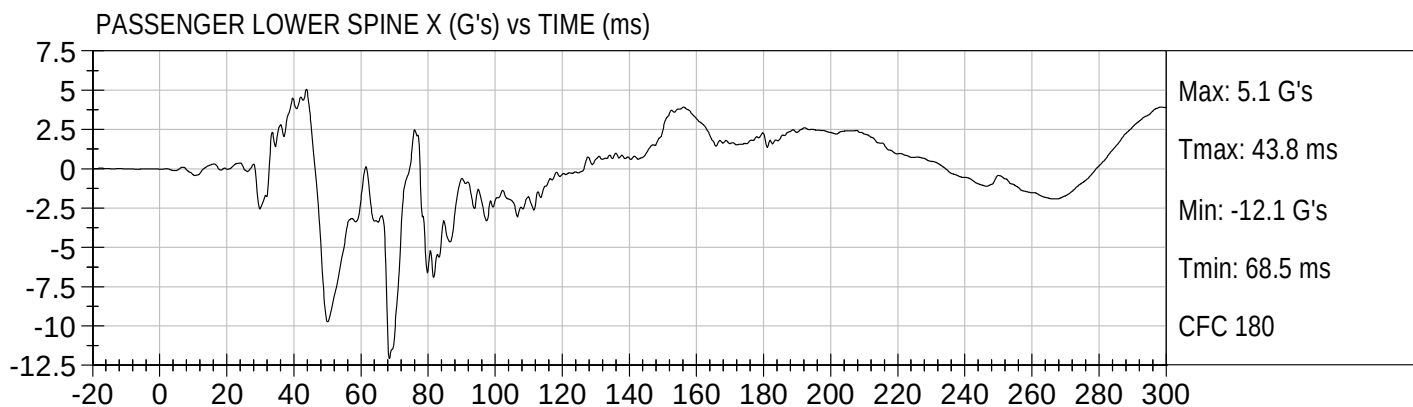
Test Date: 06/12/2009
Speed: 38.6 mph (62.1 km/h)





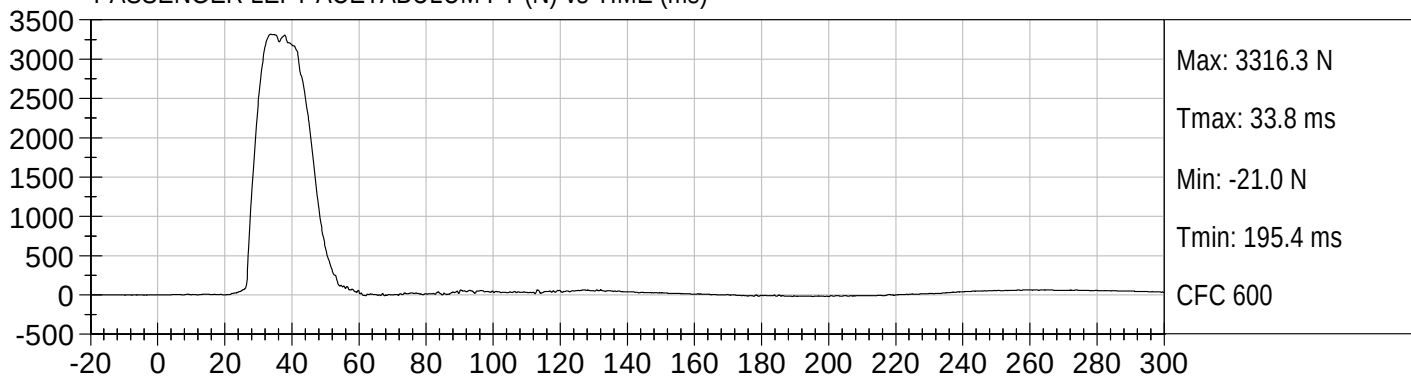
55/28 km/h 90° NCAP Side Impact
2010 Toyota Camry - MA5113

Test Date: 06/12/2009
Speed: 38.6 mph (62.1 km/h)

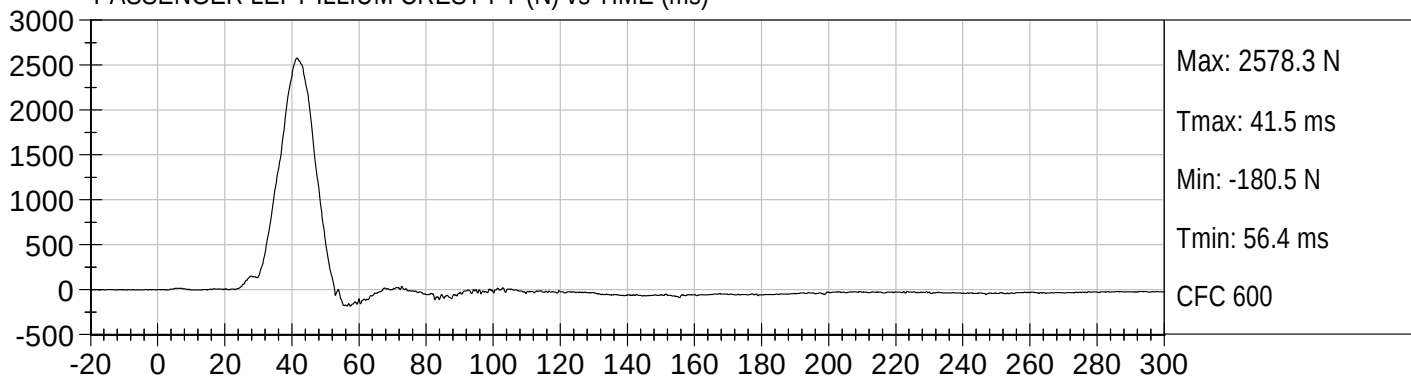




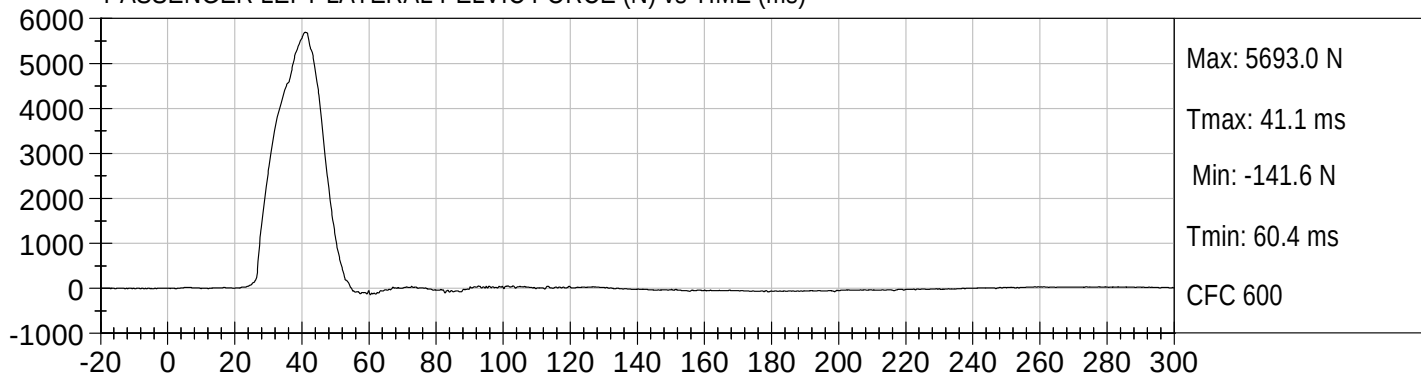
PASSENGER LEFT ACETABULUM FY (N) vs TIME (ms)



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



PASSENGER LEFT LATERAL PELVIC FORCE (N) vs TIME (ms)



APPENDIX C
DUMMY CALIBRATION DATA

MGA RESEARCH CORPORATION
HEAD DROP TEST
ES-2re DUMMY

ATD Serial No: 032

Test ID: D091451

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	41	Pass
Peak Resultant Acceleration	G's	125 to 155	146	Pass
Peak Lateral Acceleration	G's	+/- 15	-12.6	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

6/10/09
Test Date

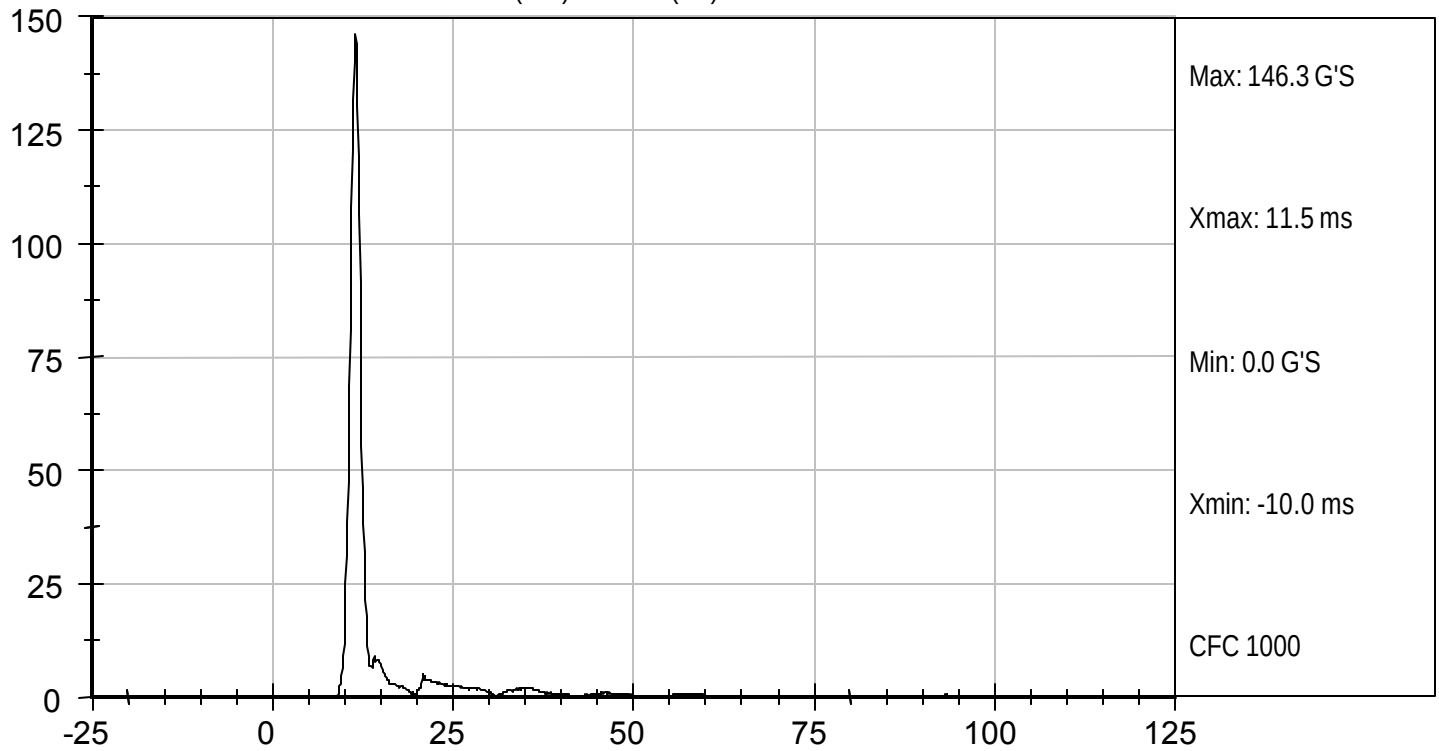

Approved By



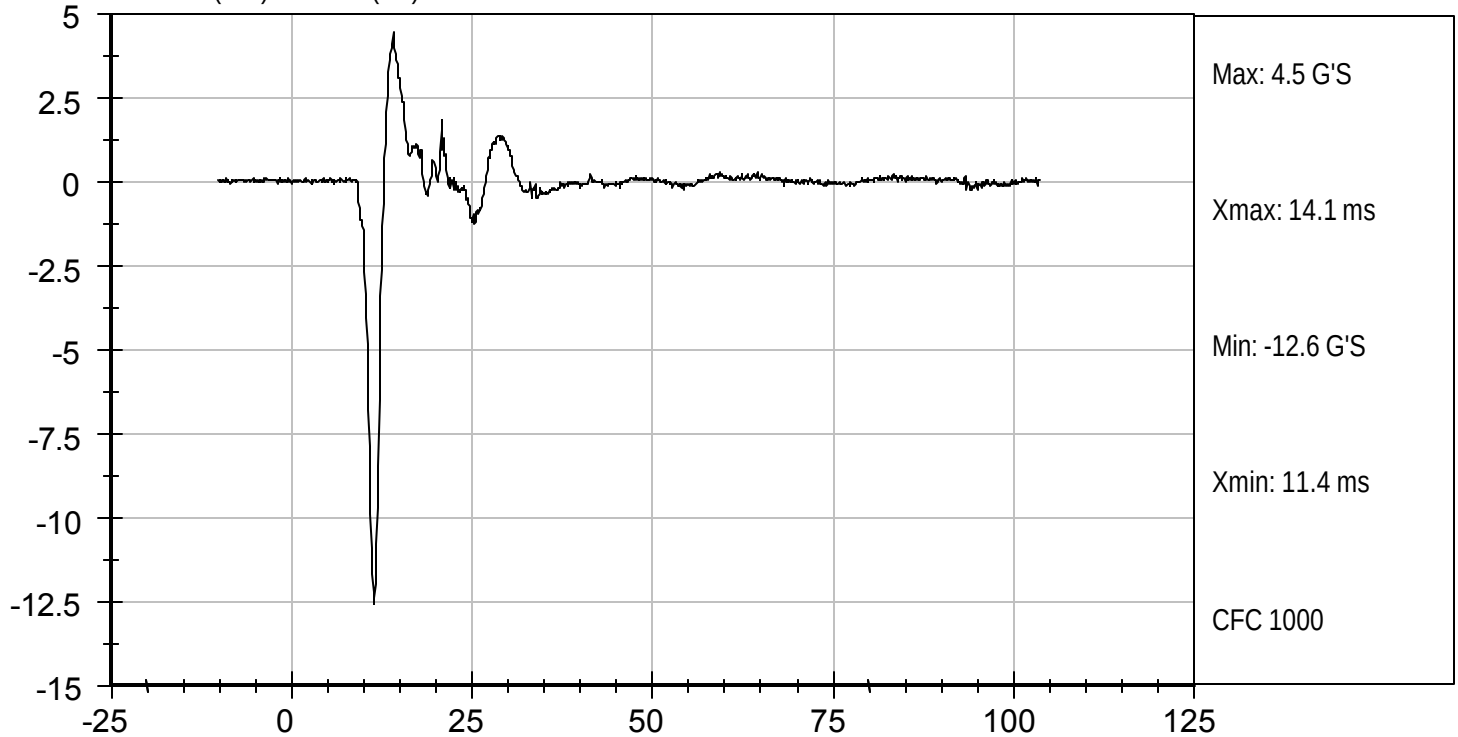
Test Desc: Head Drop
Component ID: D091451

Test Date: 6/10/09
Velocity: 0 ft/s, 0 m/s

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



HEAD X (G'S) vs TIME (ms)



MGA RESEARCH CORPORATION
NECK PENDULUM TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D091452

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	18.0 to 22.0	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	40	Pass
Pendulum Speed		m/s	3.3 to 3.5	3.5	Pass
Pendulum Deceleration	1 msec	G's	0.00 to -0.05	-0.02	Pass
	3 msec	G's	-0.25 to -0.375	-0.31	Pass
	14 msec	G's	-3.20 to -3.70	-3.34	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	52.3	Pass
Time of Maximum Flexion Angle		msec	54.0 to 66.0	58.0	Pass
Head Rotation Decay Time to 0 degree		msec	53.0 to 88.0	64.8	Pass
Overall Test Results				Pass	


 Laboratory Technician

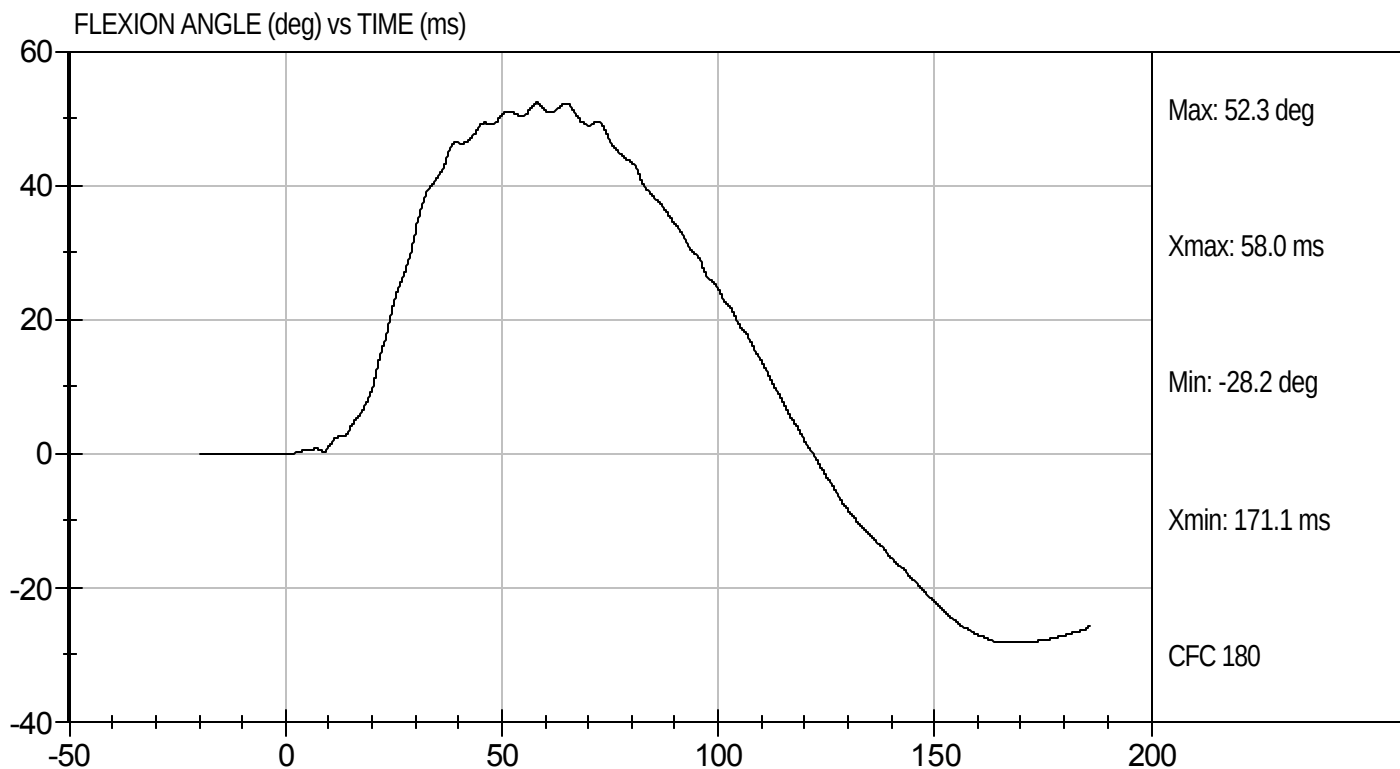
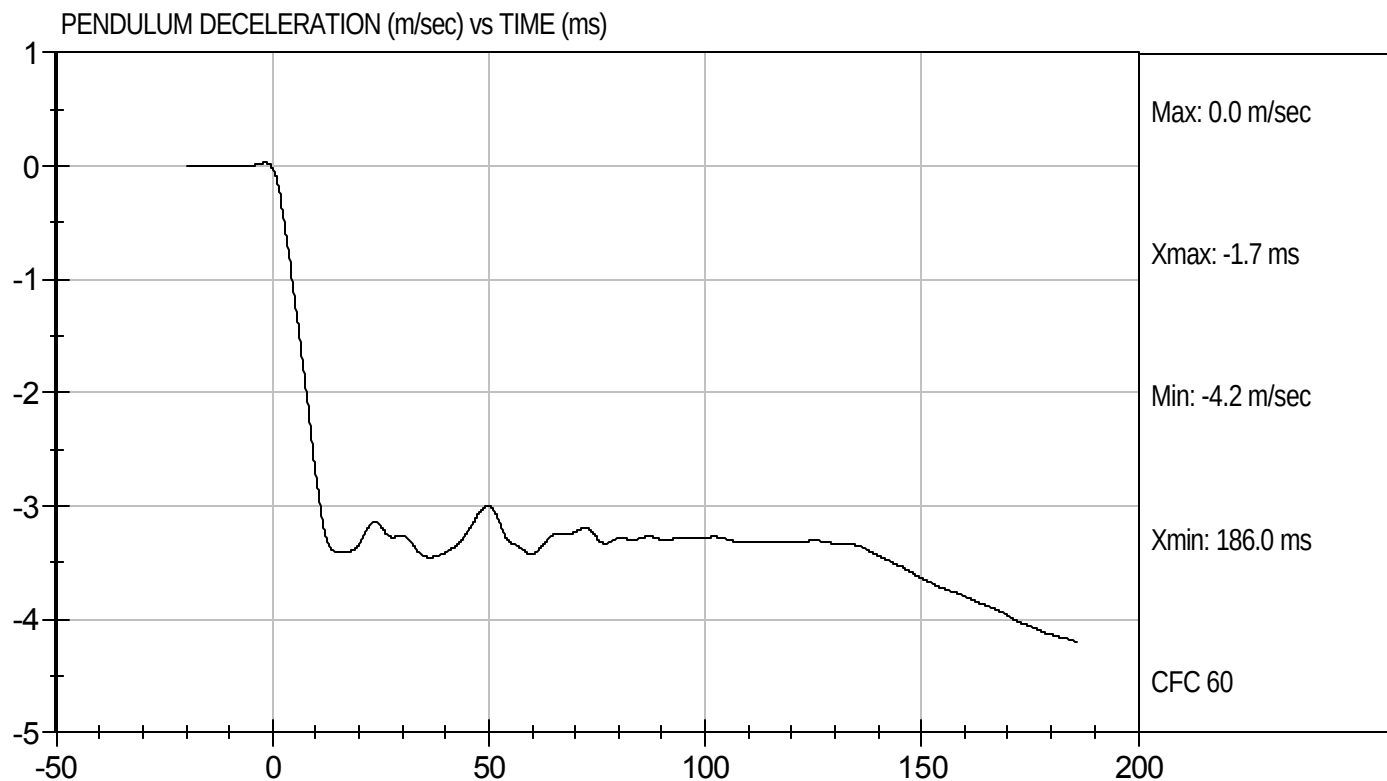
6/10/09
 Test Date


 Approved By



Test Desc: Neck Bending
Component ID: D091452

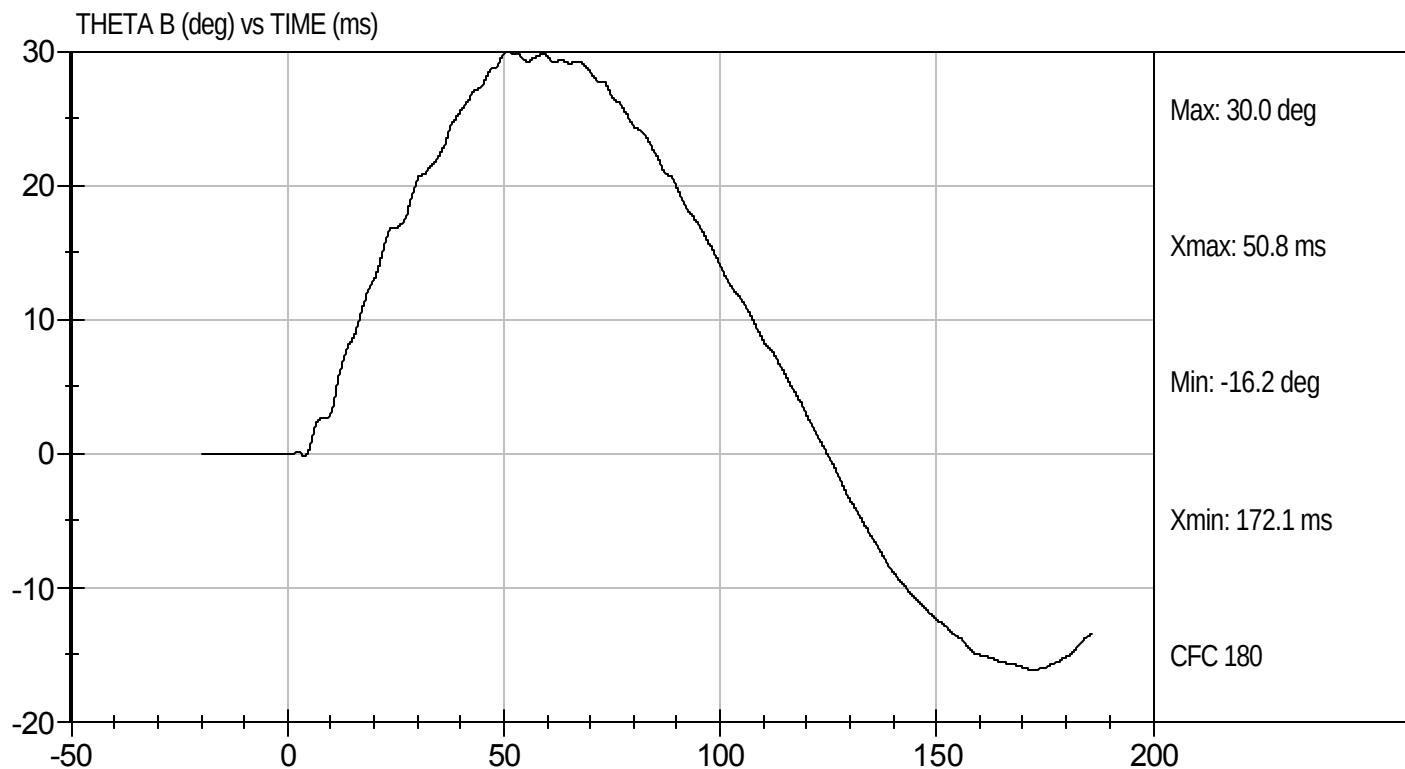
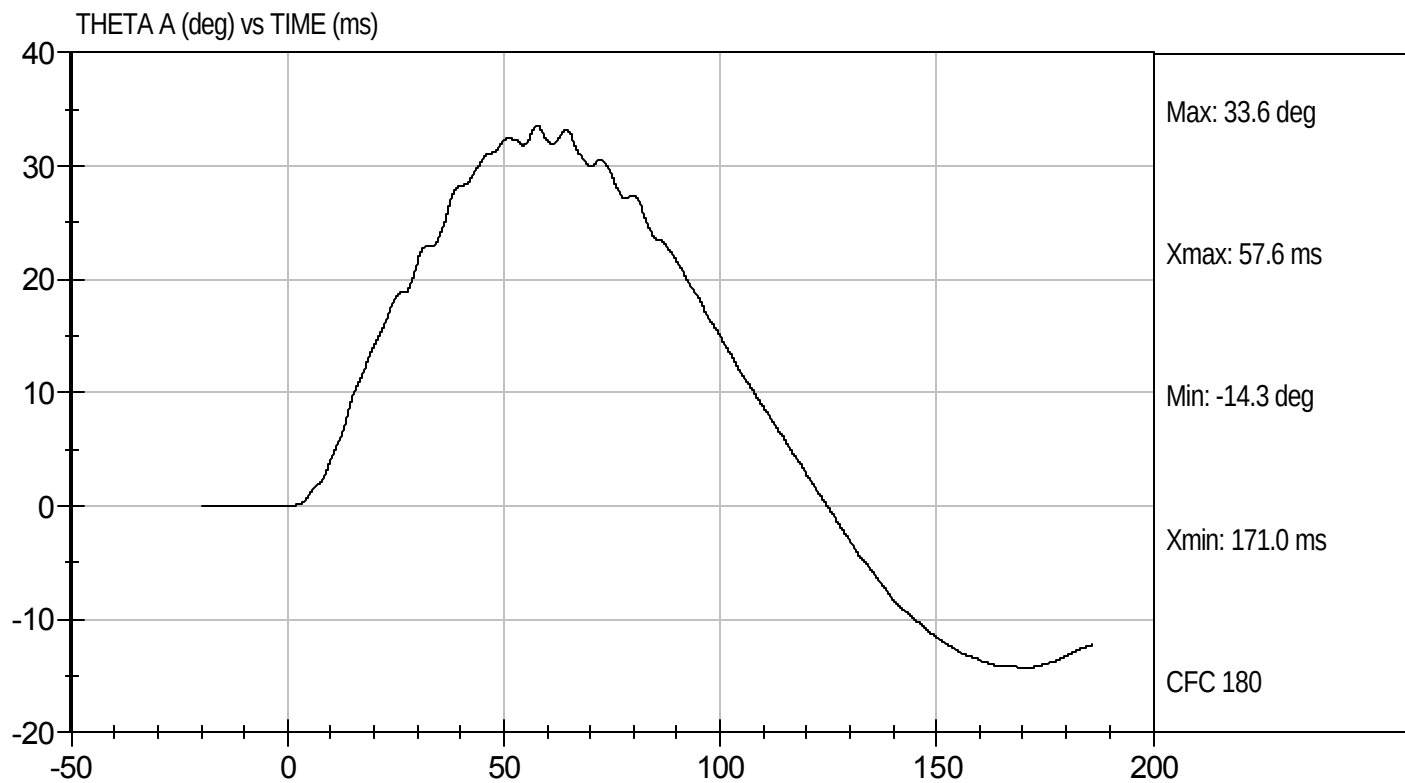
Test Date: 6/10/09
Velocity: 11.41 ft/s, 3.5 m/s





Test Desc: Neck Bending
Component ID: D091452

Test Date: 6/10/09
Velocity: 11.41 ft/s, 3.5 m/s



MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D091453

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Pendulum Speed	m/s	4.2 to 4.4	4.2	Pass
Peak Shoulder Acceleration	G's	7.5 to 10.5	10.1	Pass
Time of Peak Shoulder Acceleration	msec	NA	17.8	Pass
Overall Test Results			Pass	


Laboratory Technician

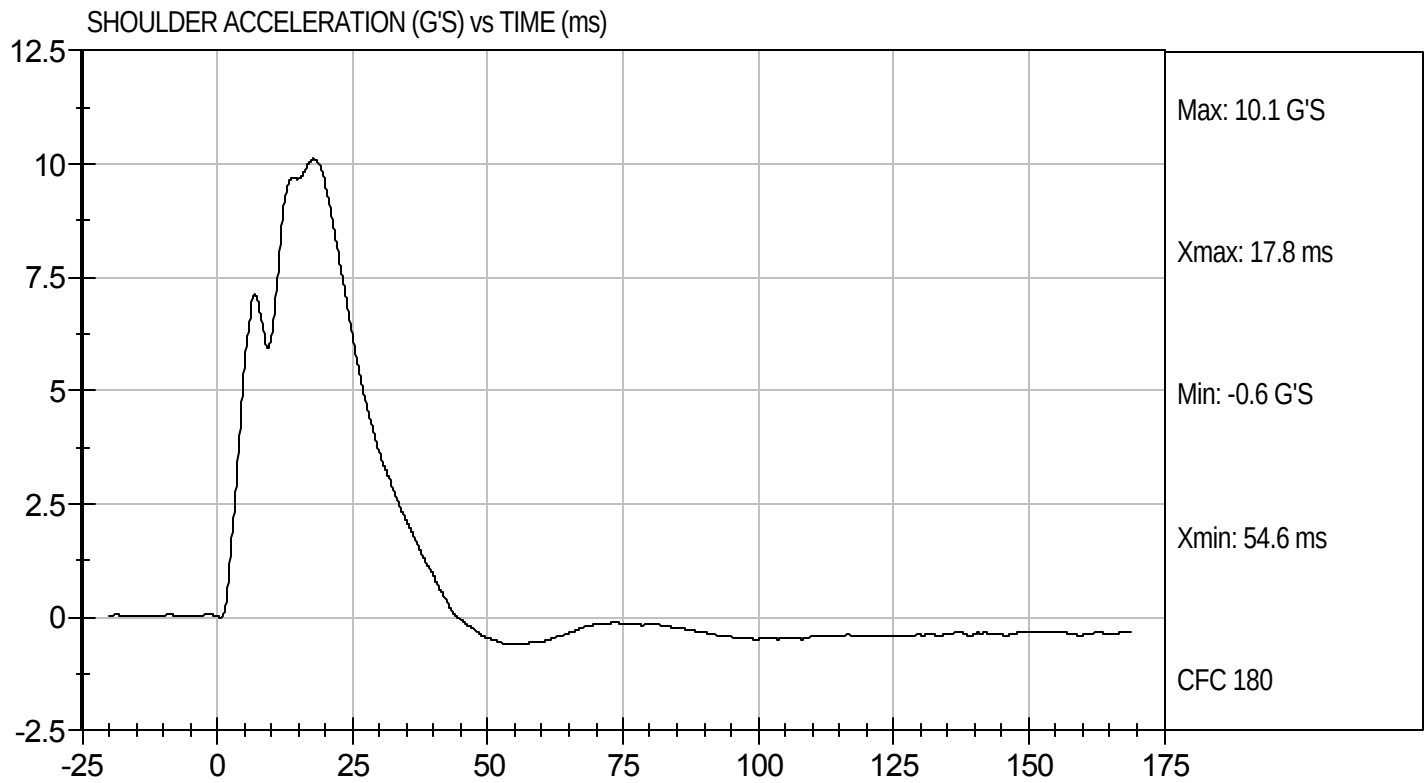
6/11/09
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D091453

Test Date: 6/11/09
Velocity: 13.88 ft/s, 4.2 m/s



MGA RESEARCH CORPORATION

UPPER RIB TEST

ES-2re DUMMY

ATD Serial No: 032

Test I.D: D091454

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	36.8	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	47.9	Pass
Overall Test Results			Pass	

Jessica Hall
Laboratory Technician

6/11/09
Test Date

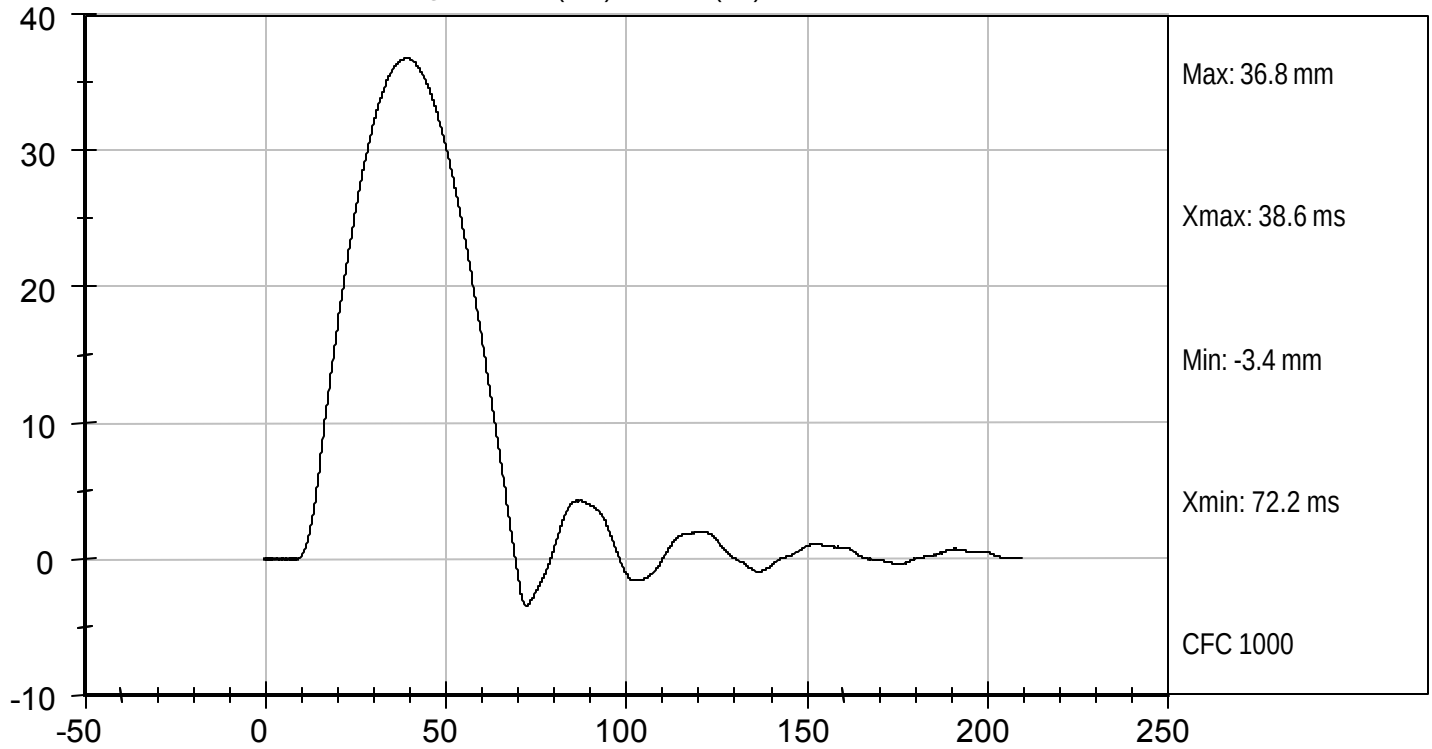
David Winkelbauer
Approved By



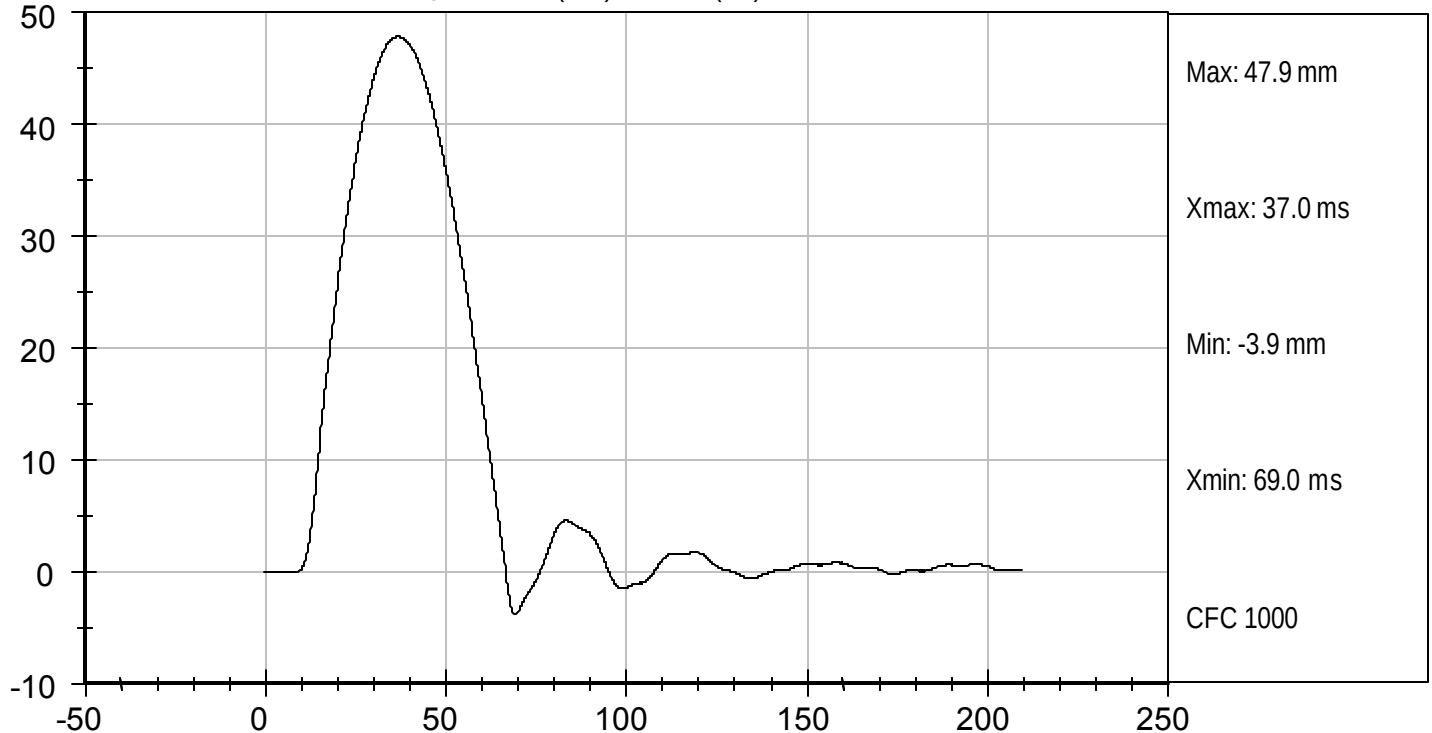
Test Desc: Rib Impact - Upper
Component ID: D091454

Test Date: 6/11/09

UPPER RIB DISPLACEMENT @ 3 M/SEC (mm) vs TIME (ms)



UPPER RIB DISPLACEMENT @ 4 M/SEC (mm) vs TIME (ms)



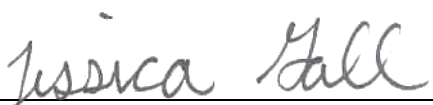
MGA RESEARCH CORPORATION

**MID RIB TEST
ES-2re DUMMY**

ATD Serial No: 032

Test I.D: D091455

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	37.7	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	48.5	Pass
Overall Test Results				Pass


Laboratory Technician

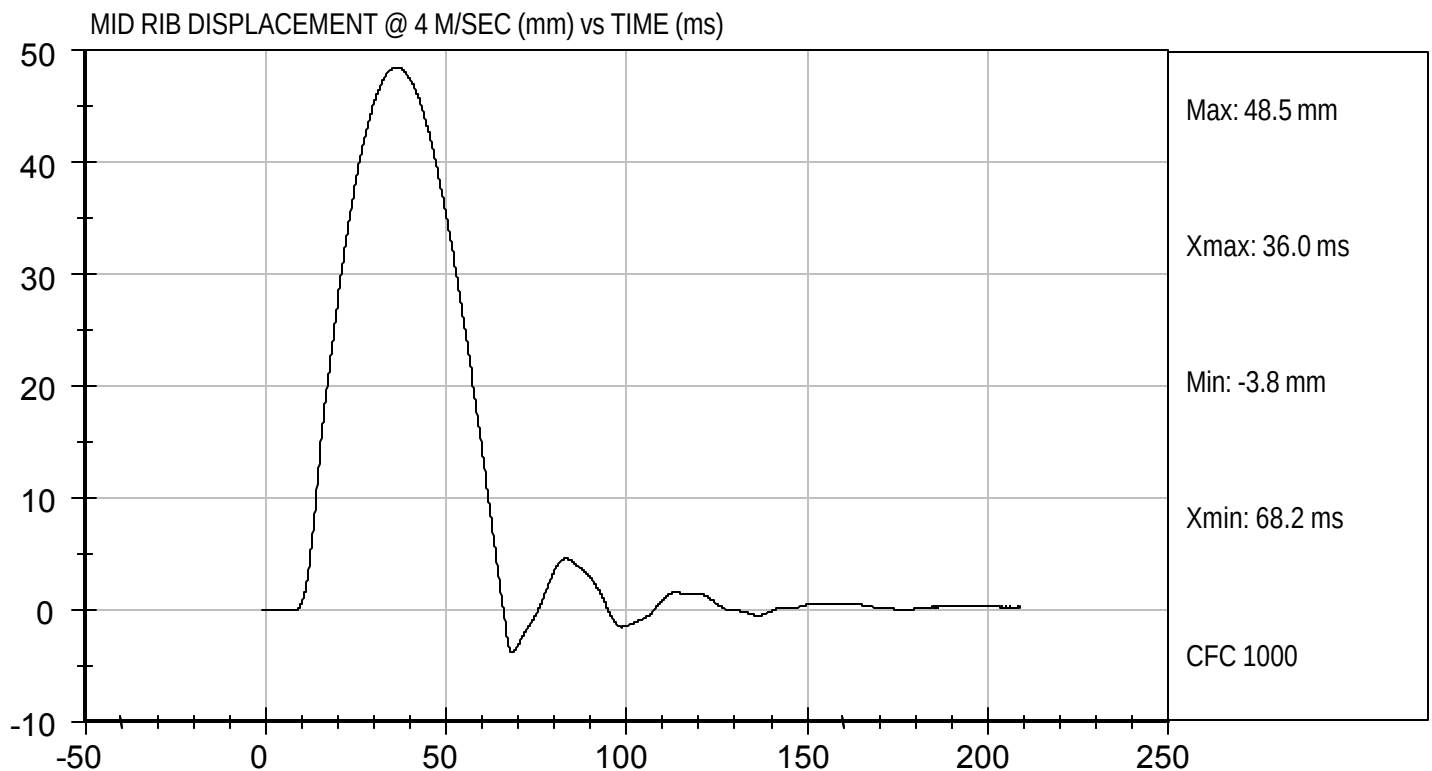
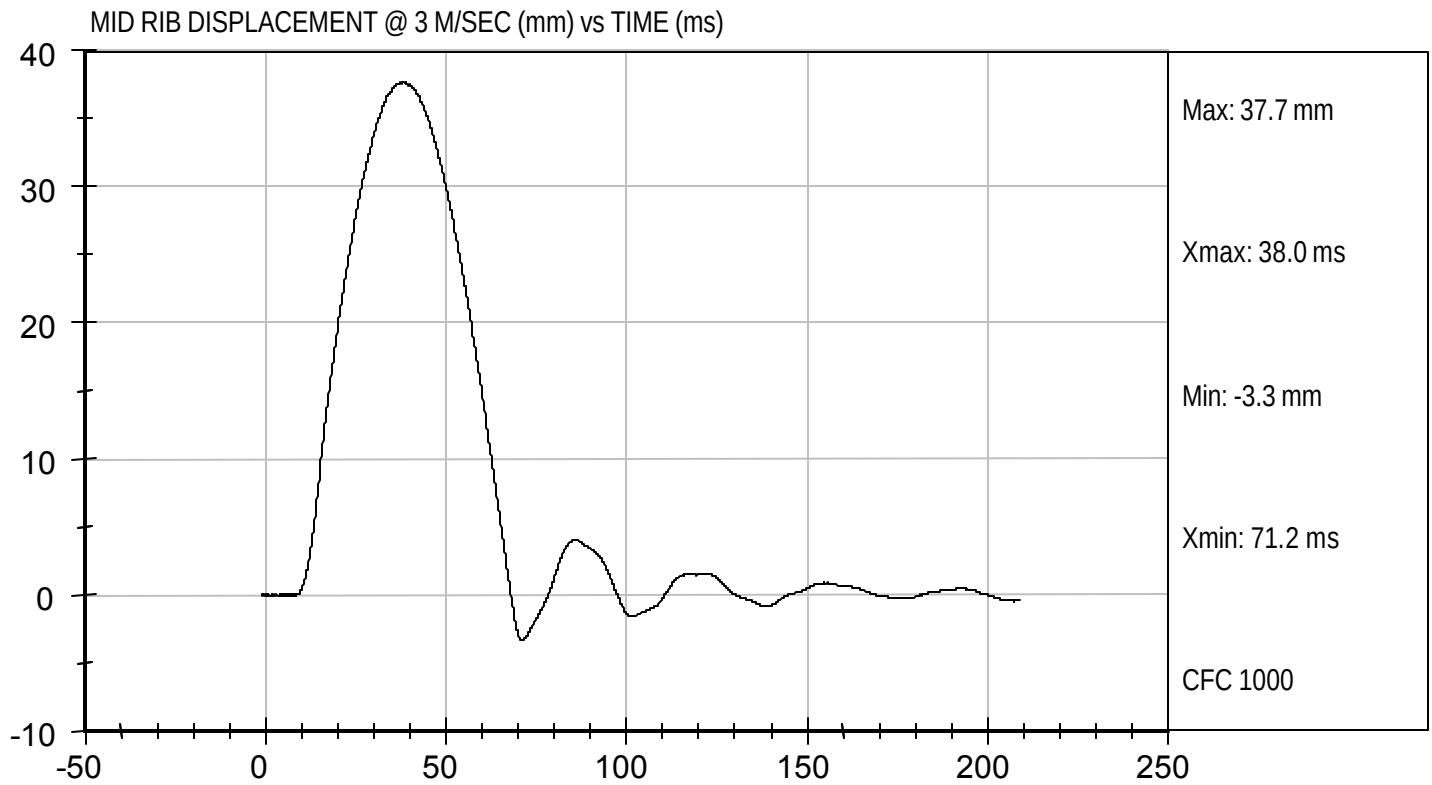
6/11/09
Test Date


Approved By



Test Desc: Rib Impact - Mid
Component ID: D091455

Test Date: 6/11/09



MGA RESEARCH CORPORATION

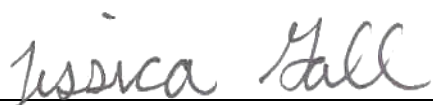
LOWER RIB TEST

ES-2re DUMMY

ATD Serial No: 032

Test I.D: D091456

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	36.9	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	48.1	Pass
Overall Test Results				Pass


Laboratory Technician

6/11/09
Test Date

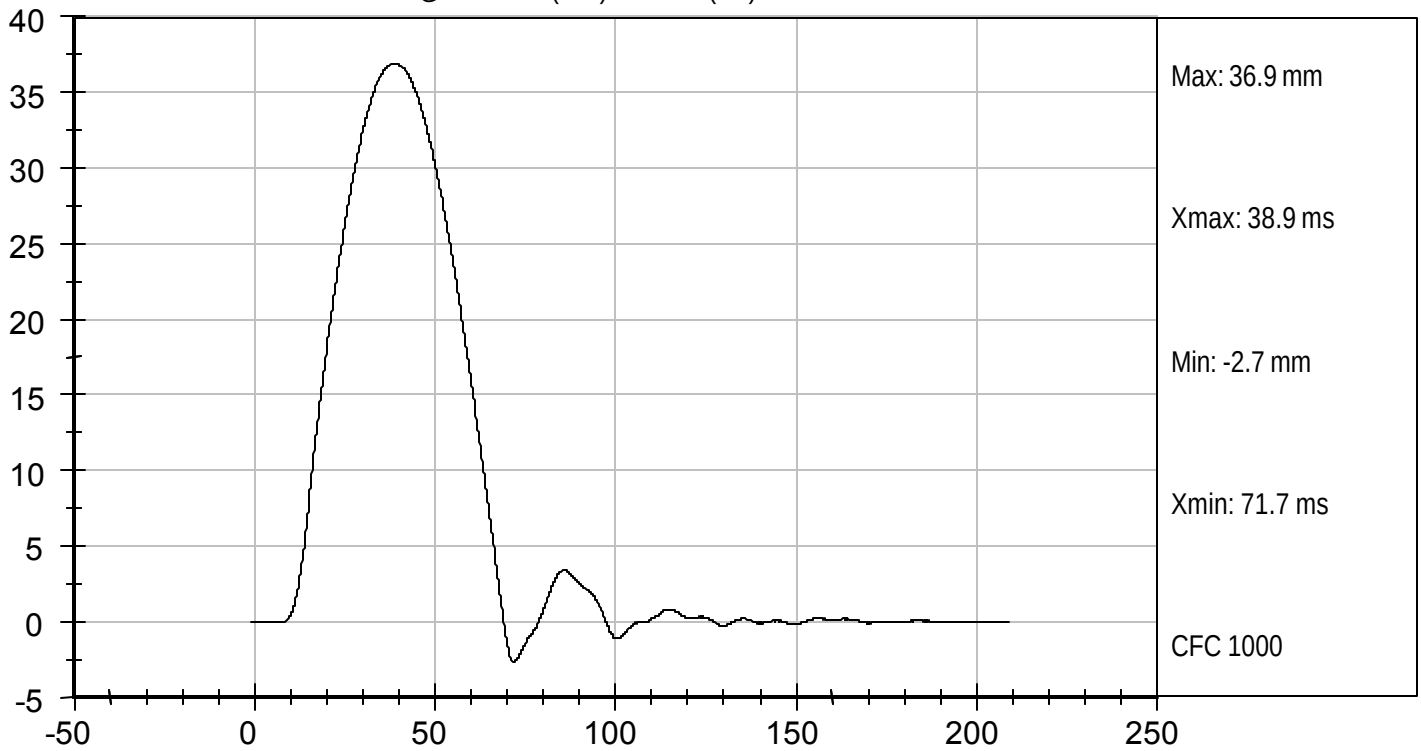

Approved By



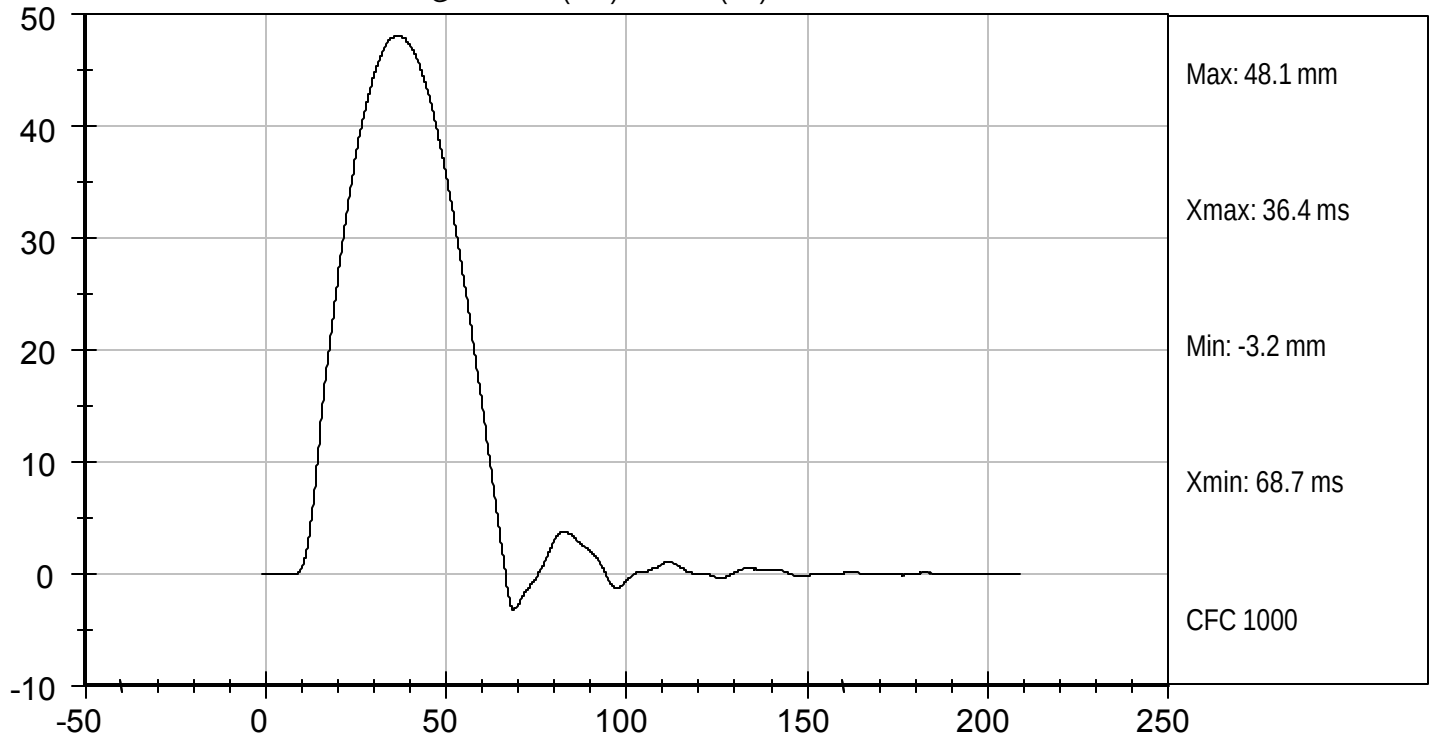
Test Desc: Rib Impact - Lower
Component ID: D091456

Test Date: 6/11/09

LOWER RIB DISPLACEMENT @ 3 M/SEC (mm) vs TIME (ms)



LOWER RIB DISPLACEMENT @ 4 M/SEC (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

ABDOMEN TEST

ES-2re DUMMY

ATD Serial No: 032

Test I.D: D091457

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	39	Pass
Probe Speed	m/s	3.90 to 4.10	4.02	Pass
Maximum Impact Force	kN	4.00 to 4.80	4.08	Pass
Time of Maximum Impact Force	msec	10.60 to 13.00	11.40	Pass
Maximum Total Abdomen Force	kN	2.20 to 2.70	2.41	Pass
Time of Maximum Abdomen Force	msec	10.00 to 12.30	11.00	Pass
Overall Test Results			Pass	


 Laboratory Technician

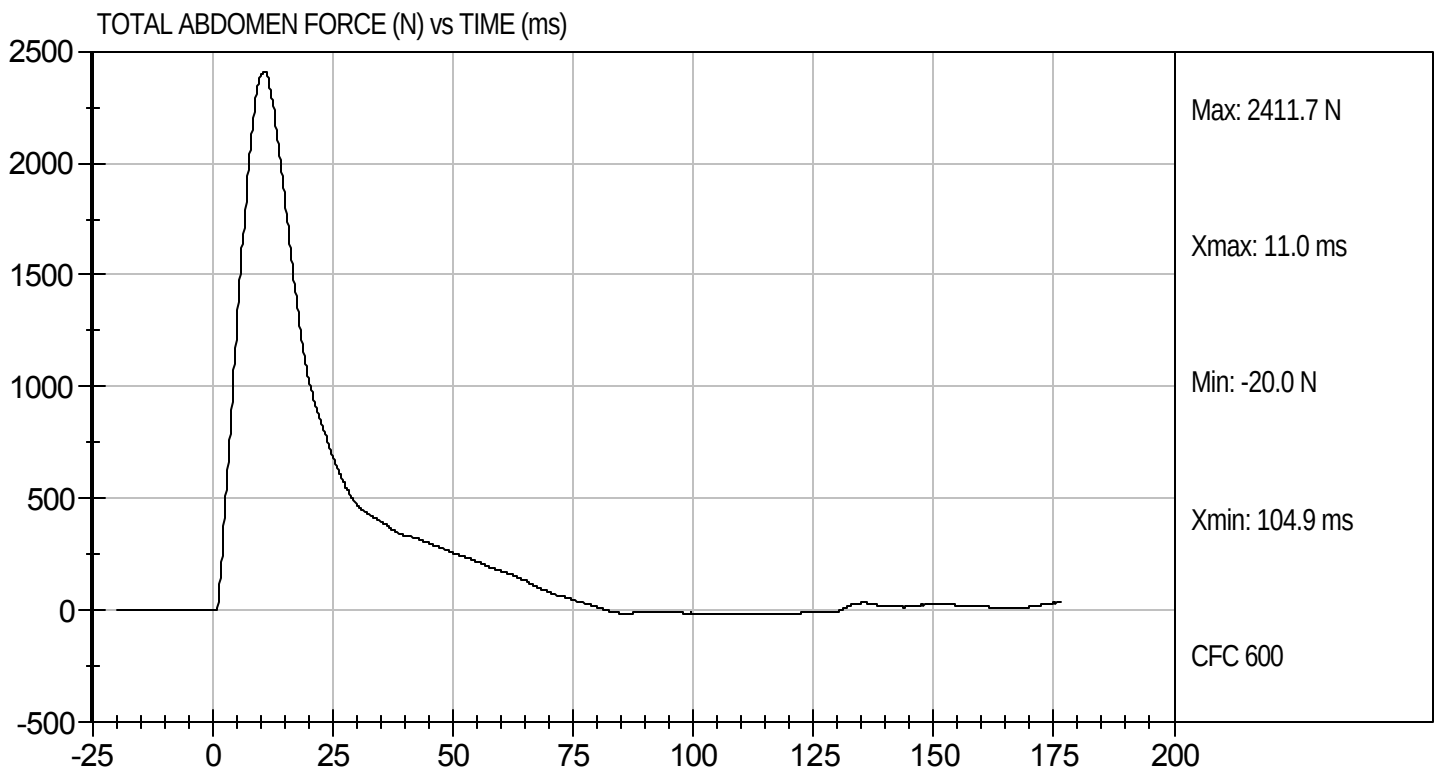
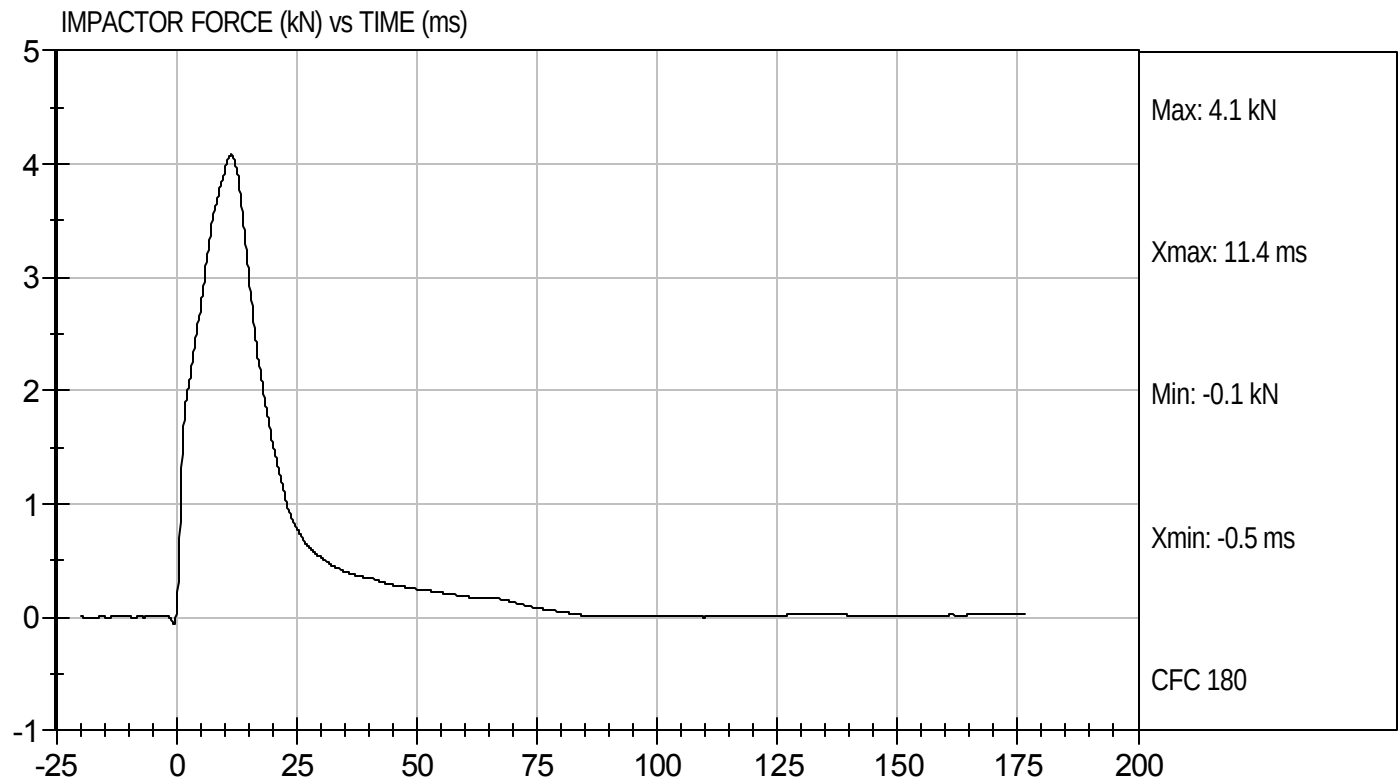
6/11/09
 Test Date


 Approved By



Test Desc: Abdomen Impact
Component ID: D091457

Test Date: 6/11/09
Velocity: 13.2 ft/s, 4.02 m/s

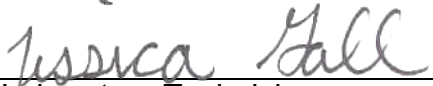


MGA RESEARCH CORPORATION
LUMBAR SPINE TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D091458

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	40	Pass
Pendulum Speed		m/sec	5.95 to 6.15	6.12	Pass
Pendulum Deceleration	1 msec	m/sec	-0.05 to 0.00	-0.02	Pass
	3.7 msec	m/sec	-0.425 to -0.24	-0.42	Pass
	27 msec	m/sec	-6.50 to -5.80	-5.97	Pass
	30 msec	m/sec	>= -6.5	-5.94	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	49.9	Pass
Time of Maximum Flexion Angle		msec	39.0 to 53.0	45.5	Pass
Headform Rotation Decay to Initial Position		msec	37 to 57	45	Pass
Overall Results				Pass	


 Laboratory Technician

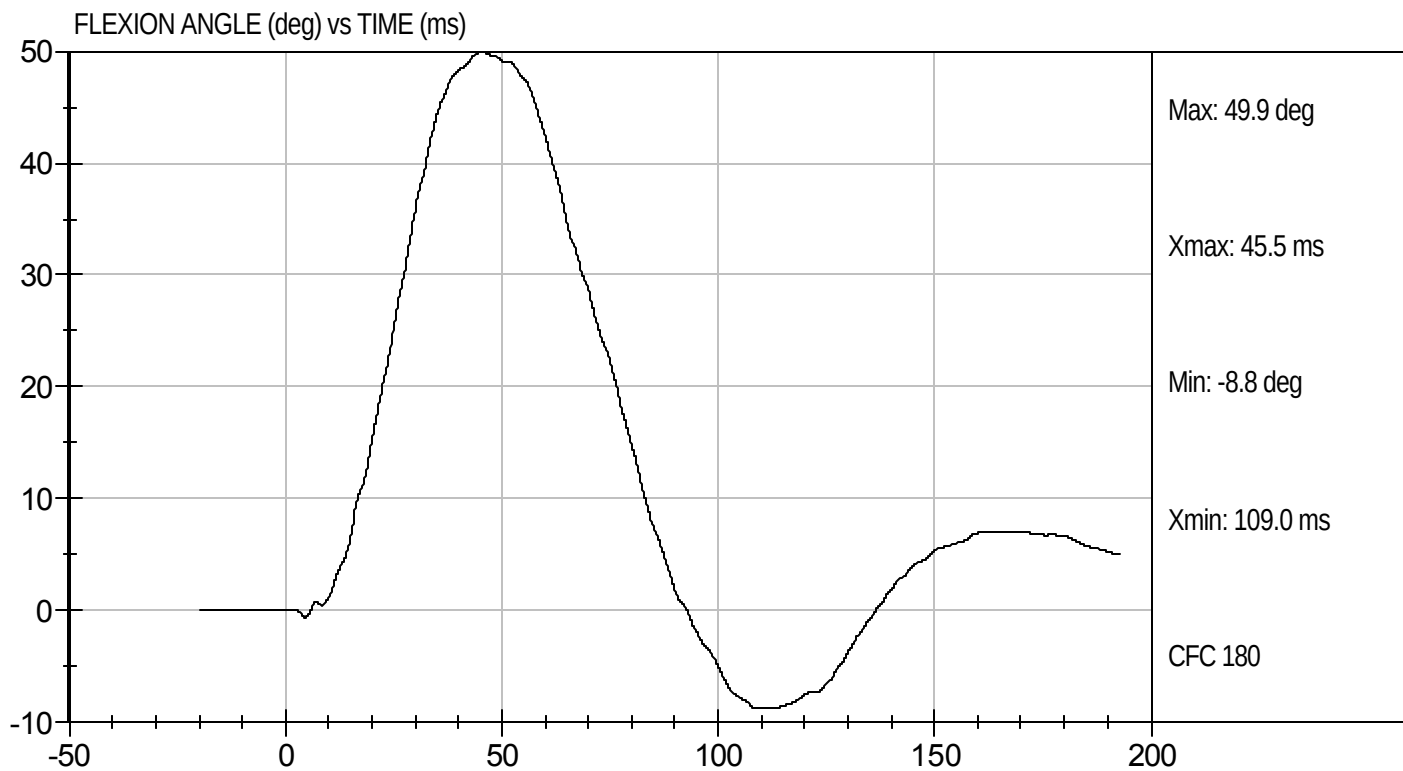
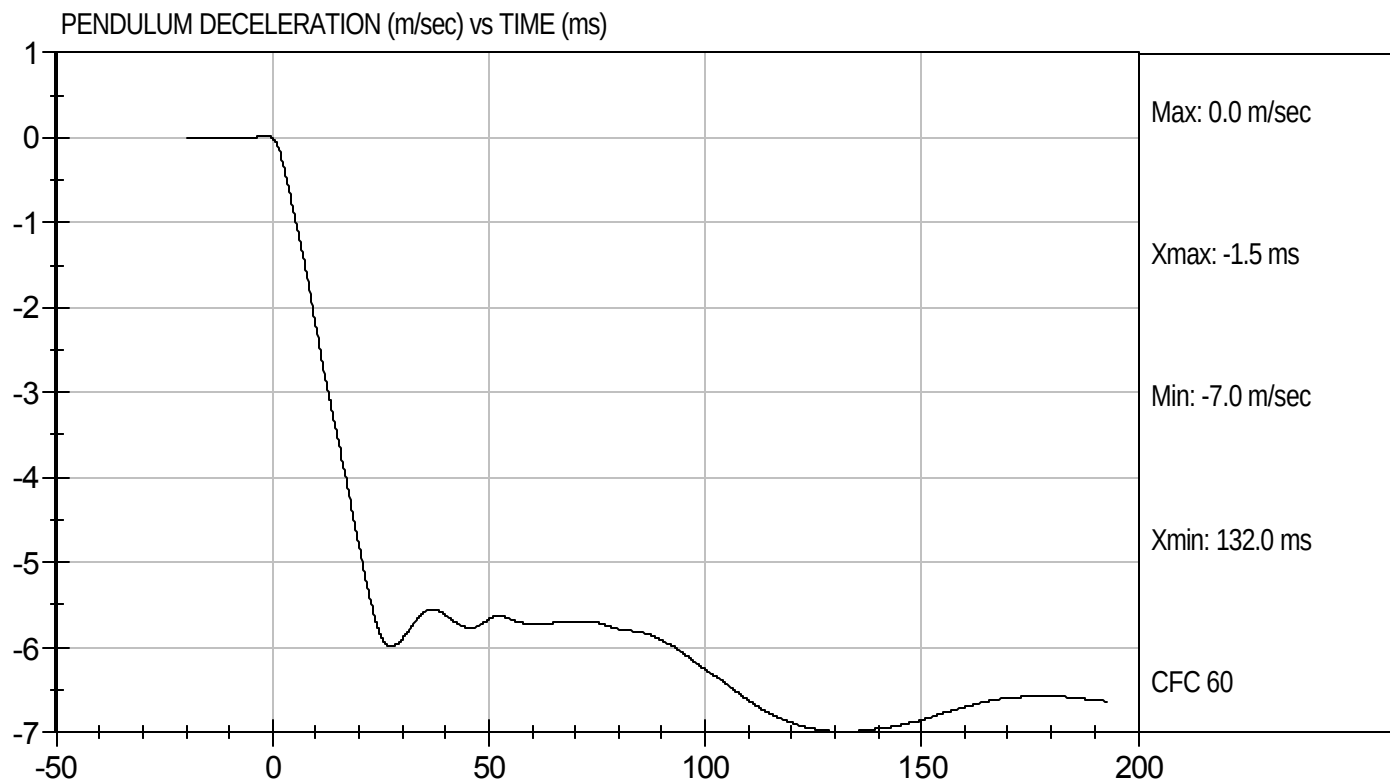
6/10/09
 Test Date


 Approved By



Test Desc: Lumbar Bending
Component ID: D091458

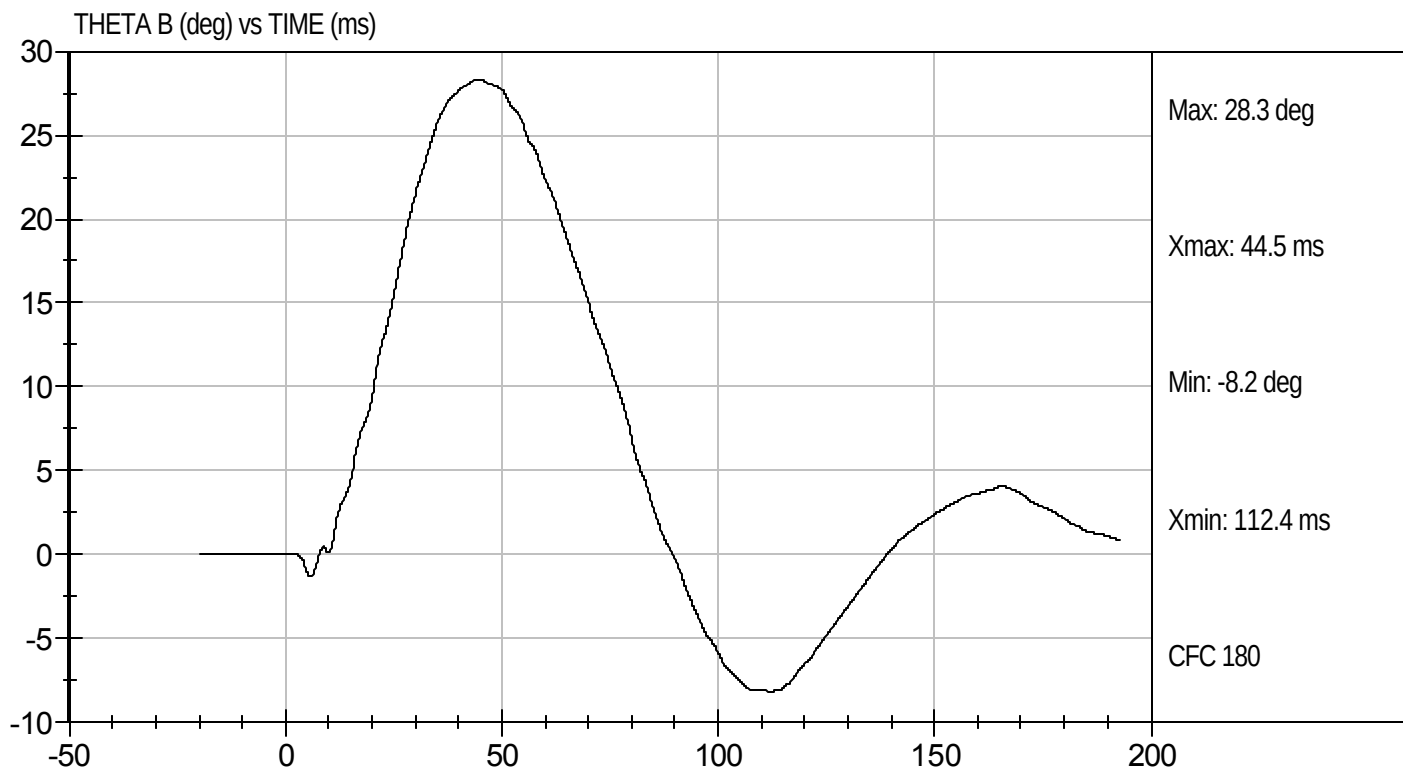
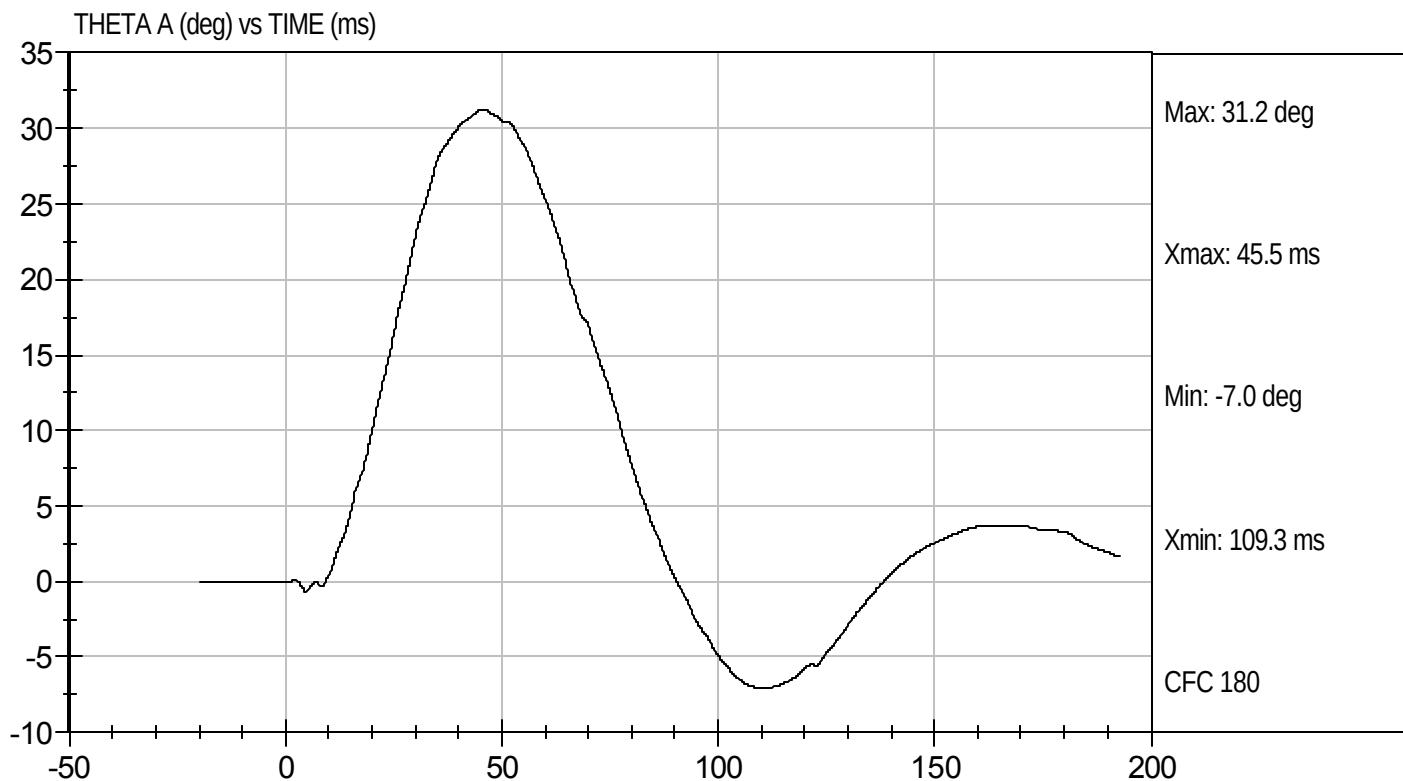
Test Date: 6/10/09
Velocity: 20.08 ft/s, 6.12 m/s





Test Desc: Lumbar Bending
Component ID: D091458

Test Date: 6/10/09
Velocity: 20.08 ft/s, 6.12 m/s



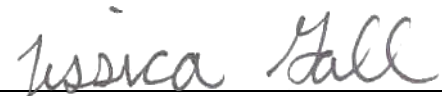
MGA RESEARCH CORPORATION

**PELVIS TEST
ES-2re DUMMY**

ATD Serial No: 032

Test I.D: D091459

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	39	Pass
Probe Speed	m/s	4.20 to 4.40	4.27	Pass
Maximum Impactor Force	kN	4.70 to 5.40	4.76	Pass
Time of Maximum Impactor Force	msec	11.80 to 16.10	13.20	Pass
Maximum Pubic Force	kN	1.23 to 1.59	1.46	Pass
Time of Maximum Pubic Force	msec	12.20 to 17.00	14.60	Pass
Overall Test Results				Pass


Laboratory Technician

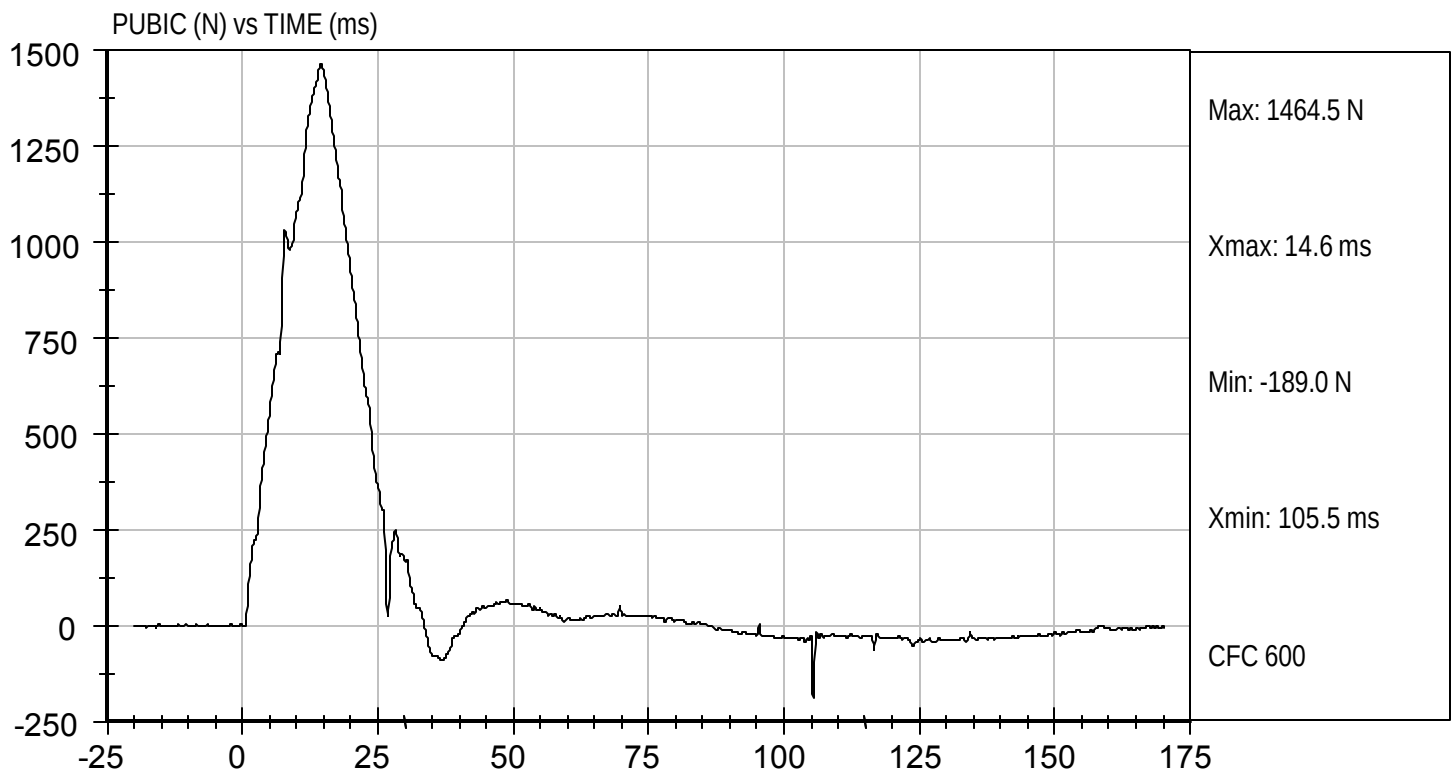
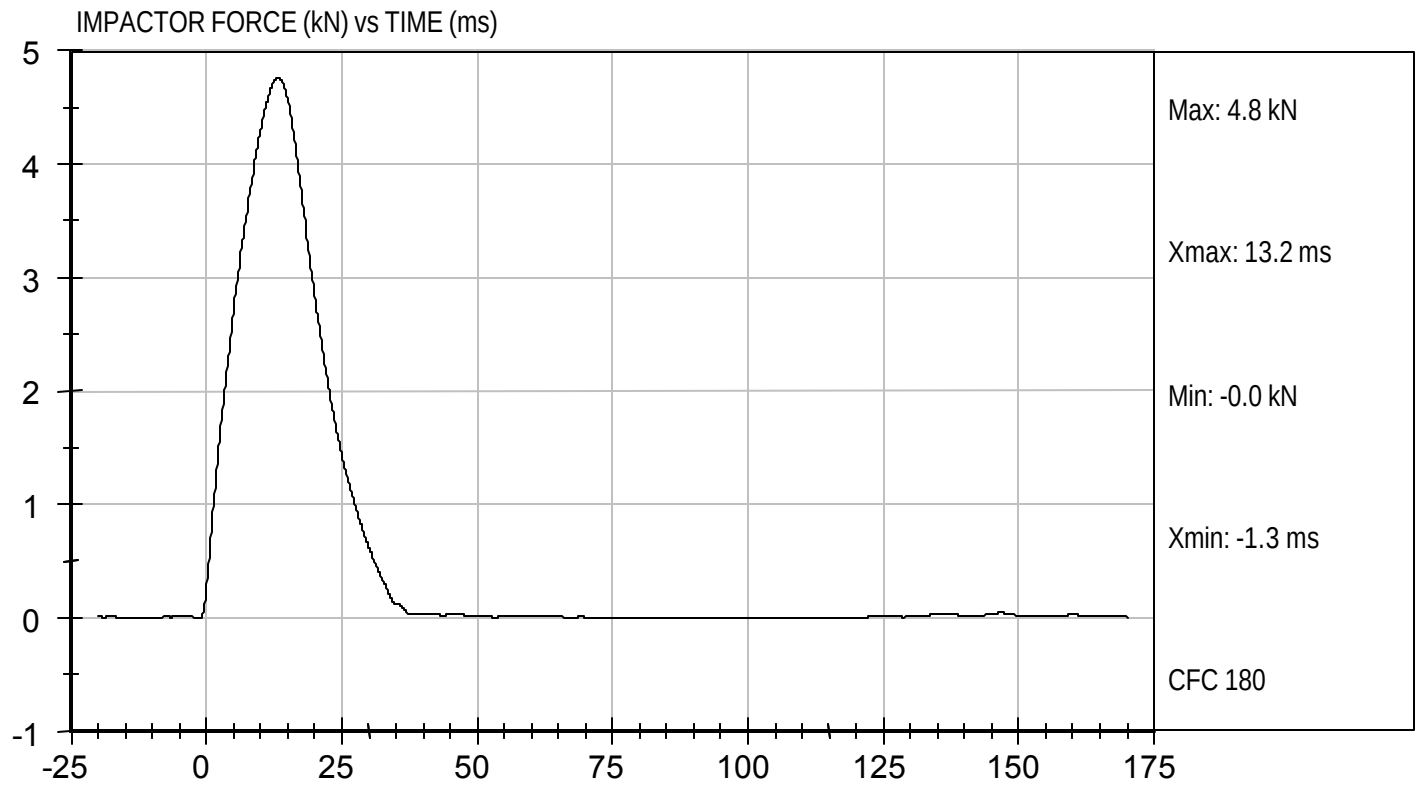
6/11/09
Test Date


Approved By



Test Desc: Pelvis Impact
Component ID: D091459

Test Date: 6/11/09
Velocity: 14.01 ft/s, 4.27 m/s

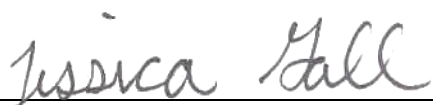


MGA RESEARCH CORPORATION
FULL BODY THORAX IMPACT TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D091450

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.9	Pass
Humidity	%	10 to 70	46	Pass
Probe Speed	m/s	5.40 to 5.60	5.58	Pass
Maximum Impactor Force (after 6 ms)	kN	5.17 to 6.12	5.18	Pass
Upper Rib Displacement	mm	33.2 to 41.3	37.9	Pass
Middle Rib Displacement	mm	37.1 to 45.4	41.0	Pass
Lower Rib Displacement	mm	35.6 to 43.0	40.0	Pass
			Overall Test Results	Pass


Laboratory Technician

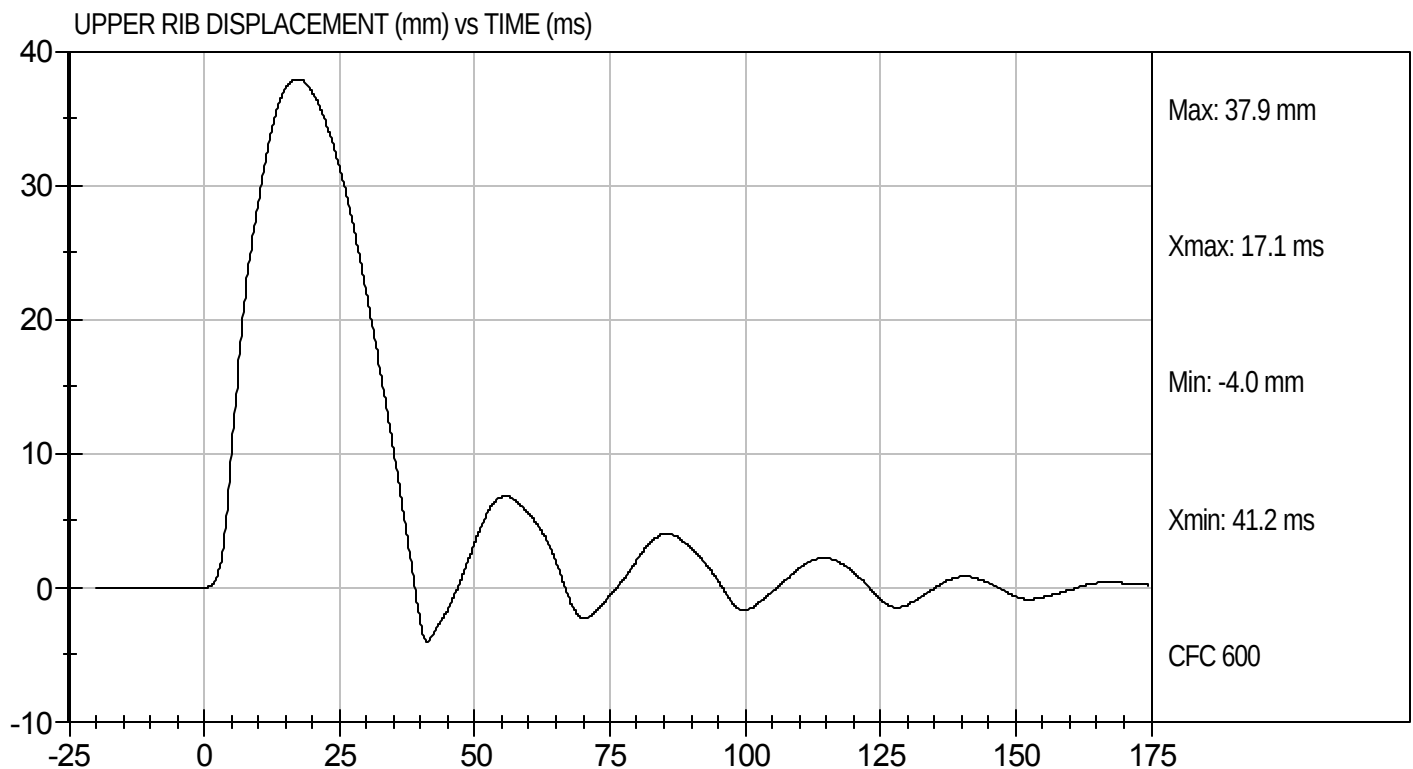
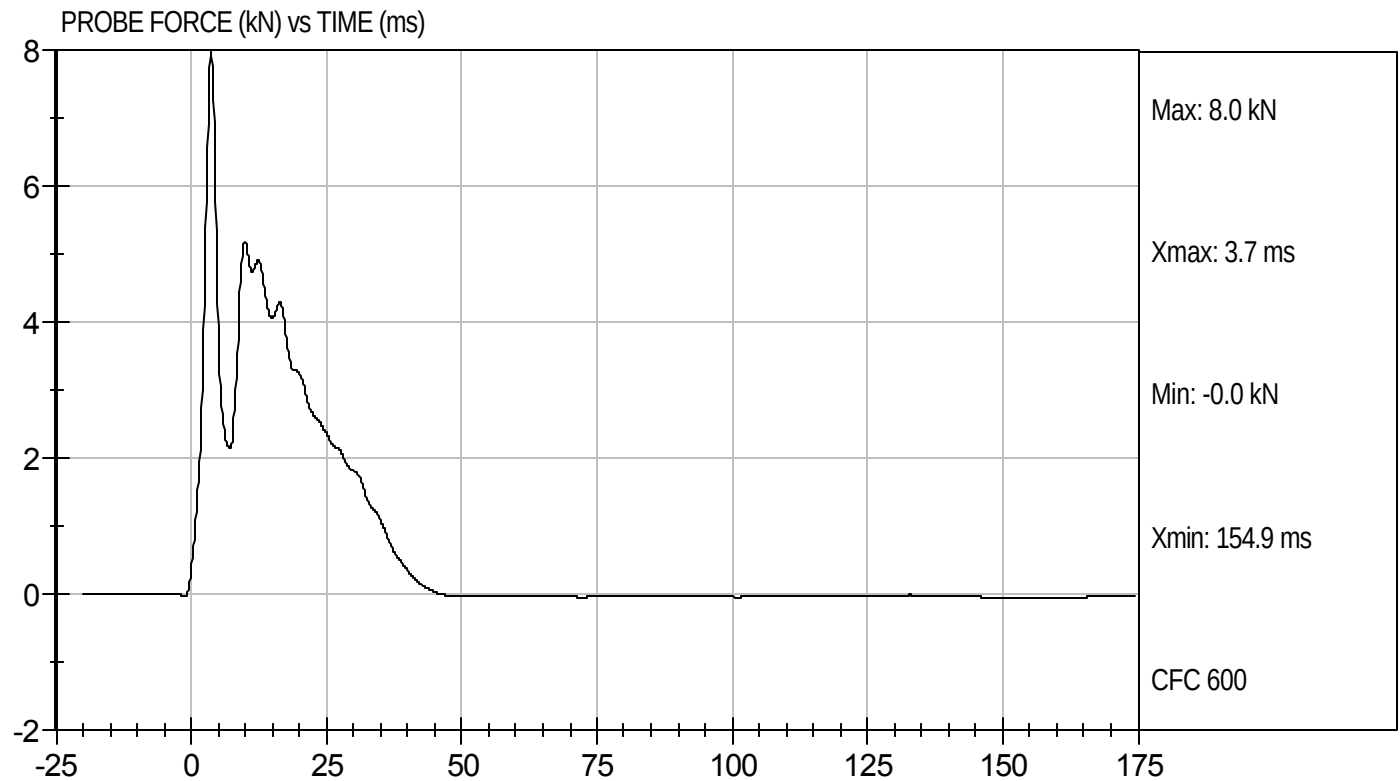
6/11/09
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D091450

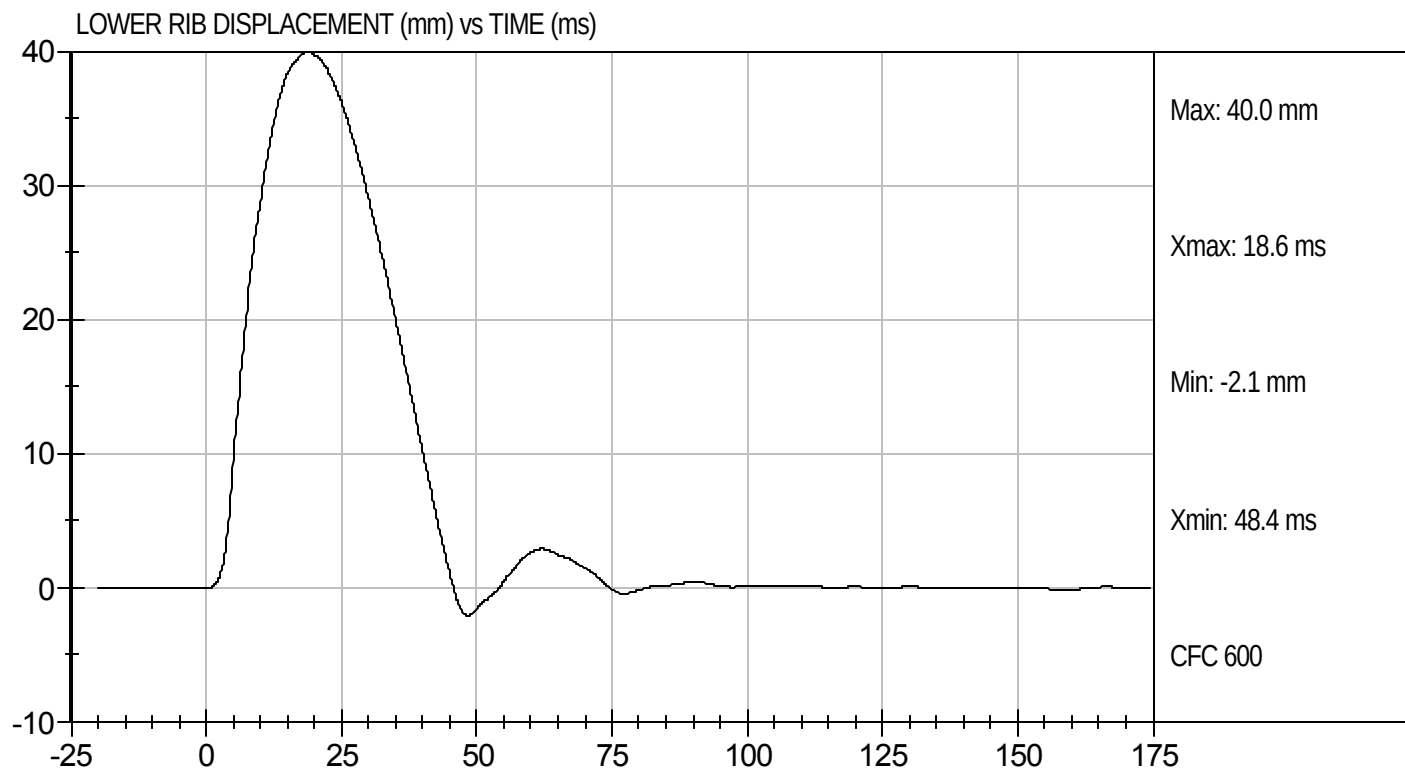
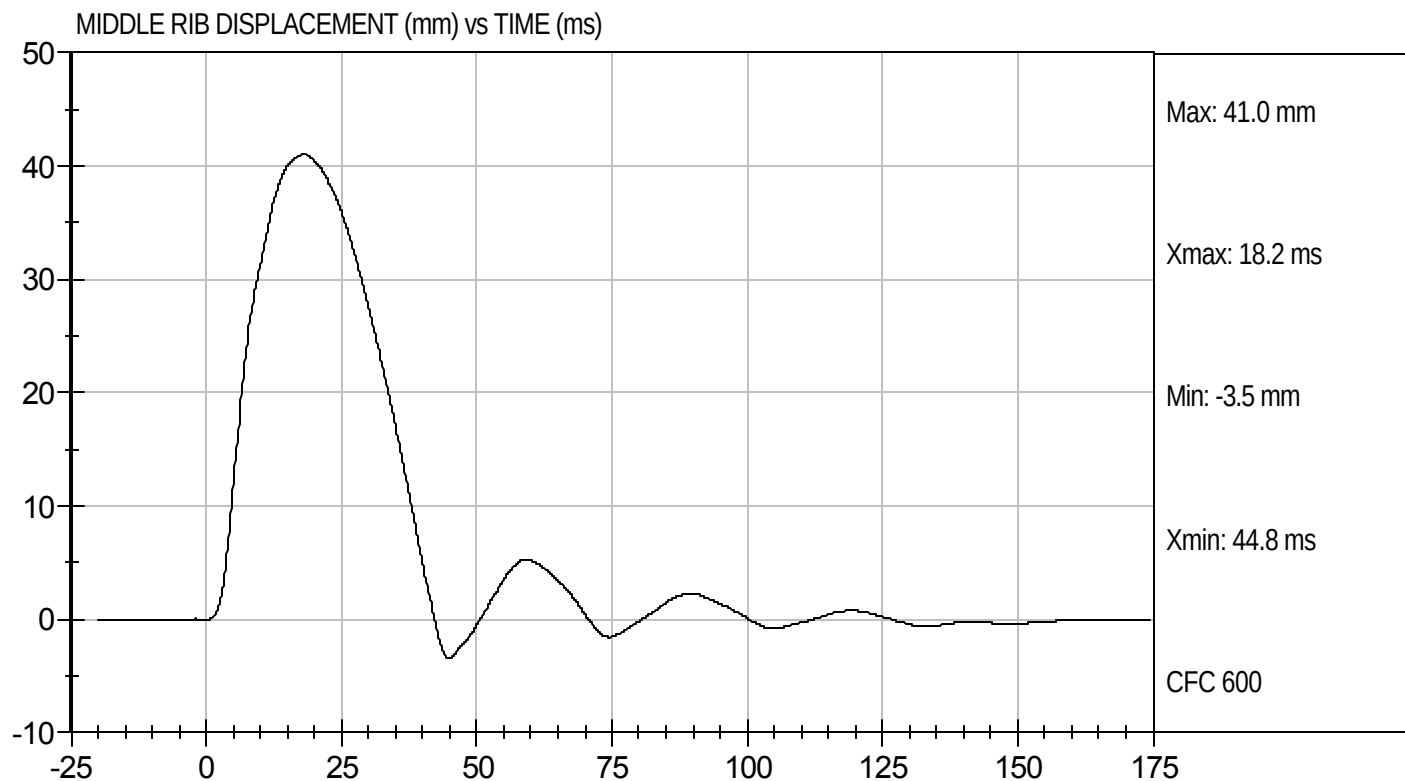
Test Date: 6/11/09
Velocity: 18.3 ft/s, 5.58 m/s





Test Desc: Thorax Impact
Component ID: D091450

Test Date: 6/11/09
Velocity: 18.3 ft/s, 5.58 m/s

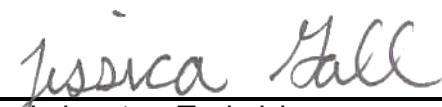


MGA RESEARCH CORPORATION
HEAD DROP TEST
ES-2re DUMMY

ATD Serial No: 032

Test ID: D091501

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Peak Resultant Acceleration	G's	125 to 155	146	Pass
Peak Lateral Acceleration	G's	+/- 15	5.1	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

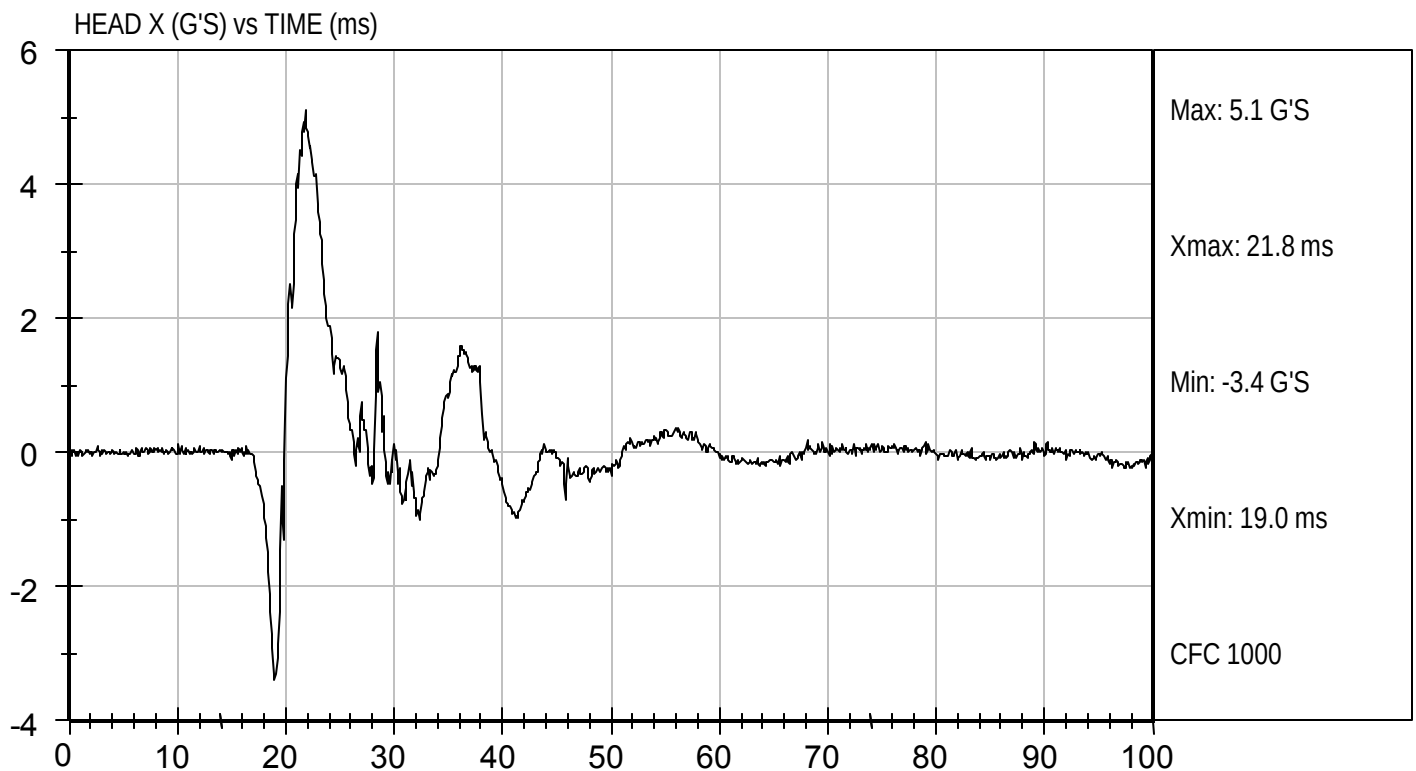
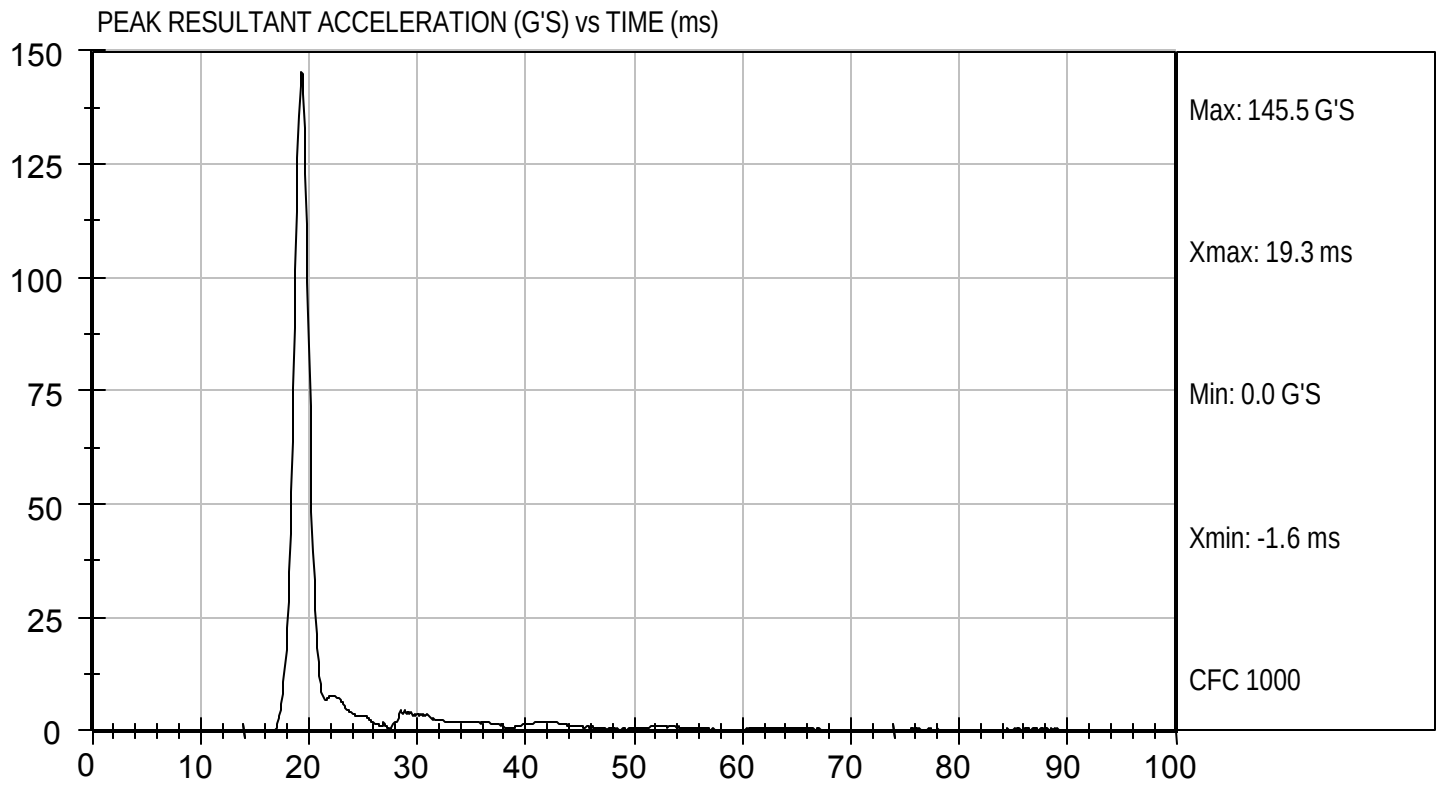
6/16/09
Test Date


Approved By



Test Desc: Head Drop
Component ID: D091501

Test Date: 6/16/09
Velocity: 0 ft/s, 0 m/s



MGA RESEARCH CORPORATION
NECK PENDULUM TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D091502

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	18.0 to 22.0	21.9	Pass
Laboratory Relative Humidity		%	10 to 70	47	Pass
Pendulum Speed		m/s	3.3 to 3.5	3.4	Pass
Pendulum Deceleration	1 msec	G's	0.00 to -0.05	-0.02	Pass
	3 msec	G's	-0.25 to -0.375	-0.33	Pass
	14 msec	G's	-3.20 to -3.70	-3.35	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	53.2	Pass
Time of Maximum Flexion Angle		msec	54.0 to 66.0	58.2	Pass
Head Rotation Decay Time to 0 degree		msec	53.0 to 88.0	53.7	Pass
Overall Test Results					Pass


 Laboratory Technician

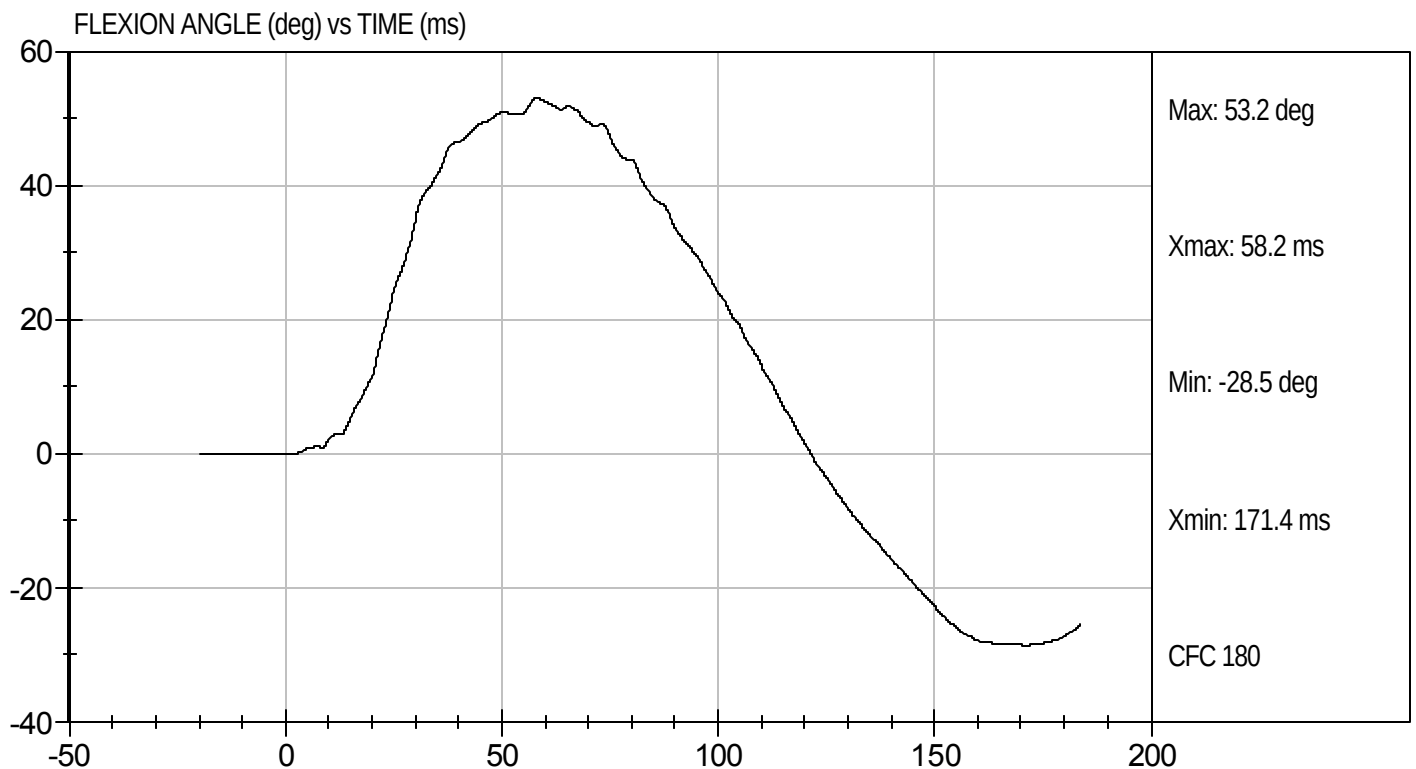
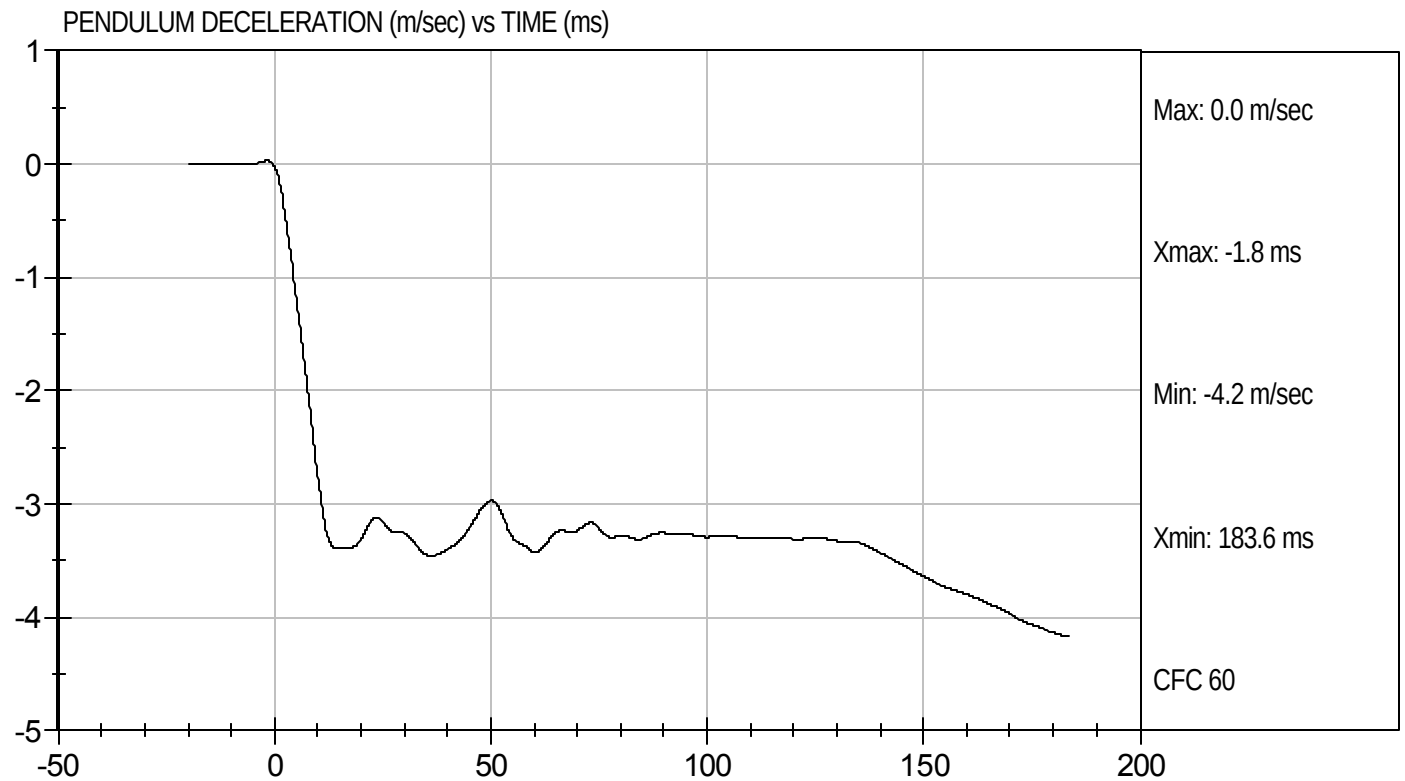
6/15/09
 Test Date


 Approved By



Test Desc: Neck Bending
Component ID: D091502

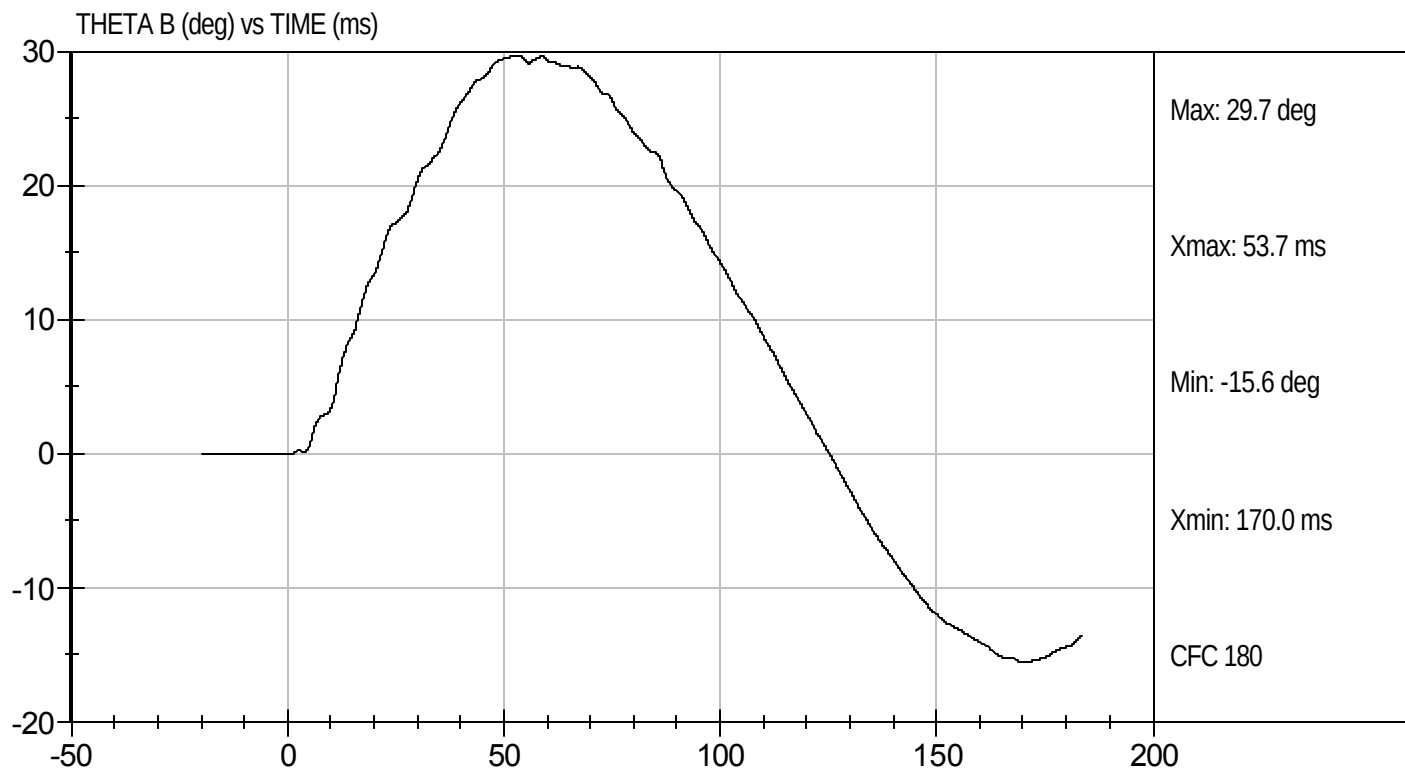
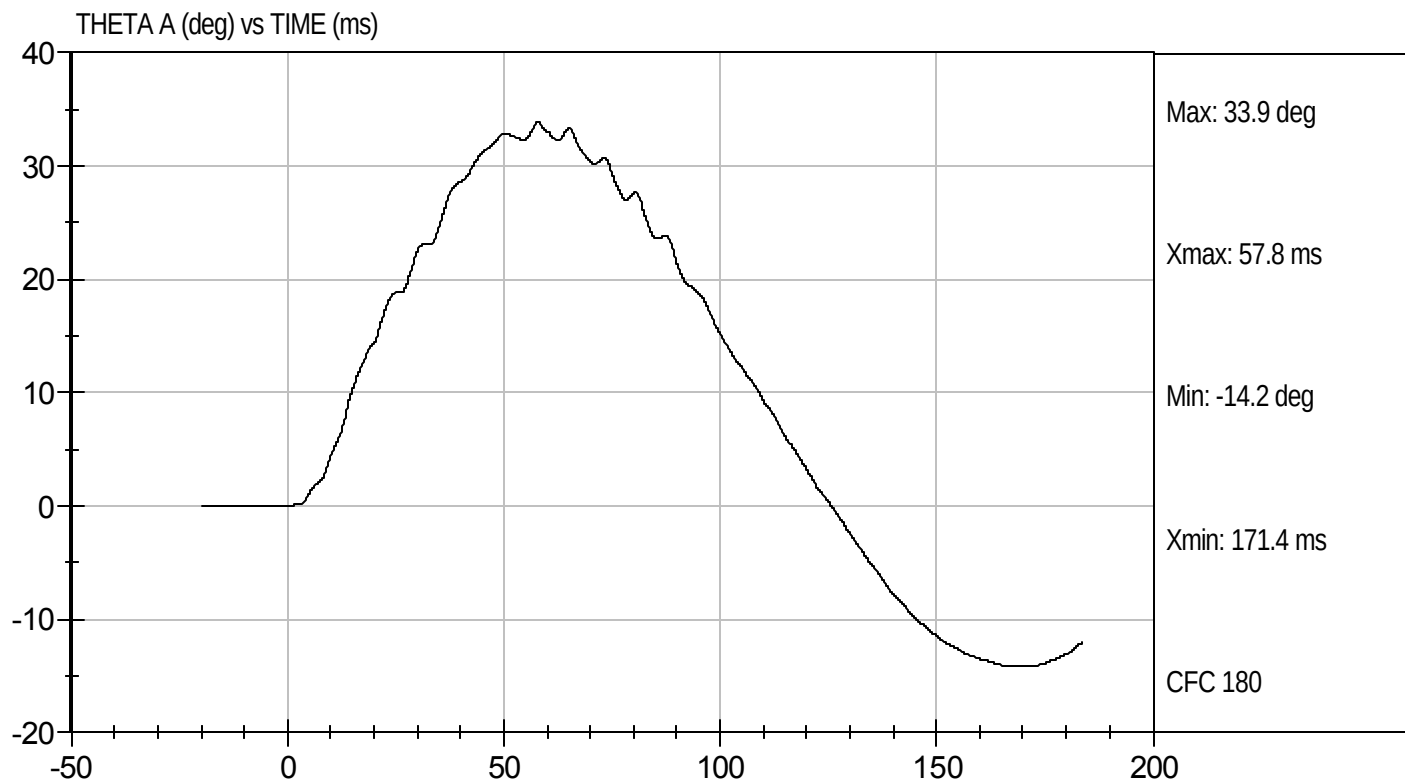
Test Date: 6/15/09
Velocity: 11.19 ft/s, 3.4 m/s





Test Desc: Neck Bending
Component ID: D091502

Test Date: 6/15/09
Velocity: 11.19 ft/s, 3.4 m/s

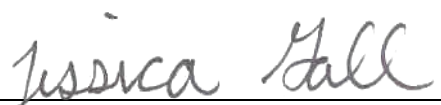


MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D091503

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	44	Pass
Pendulum Speed	m/s	4.2 to 4.4	4.3	Pass
Peak Shoulder Acceleration	G's	7.5 to 10.5	9.5	Pass
Time of Peak Shoulder Acceleration	msec	NA	17.2	Pass
Overall Test Results			Pass	


Laboratory Technician

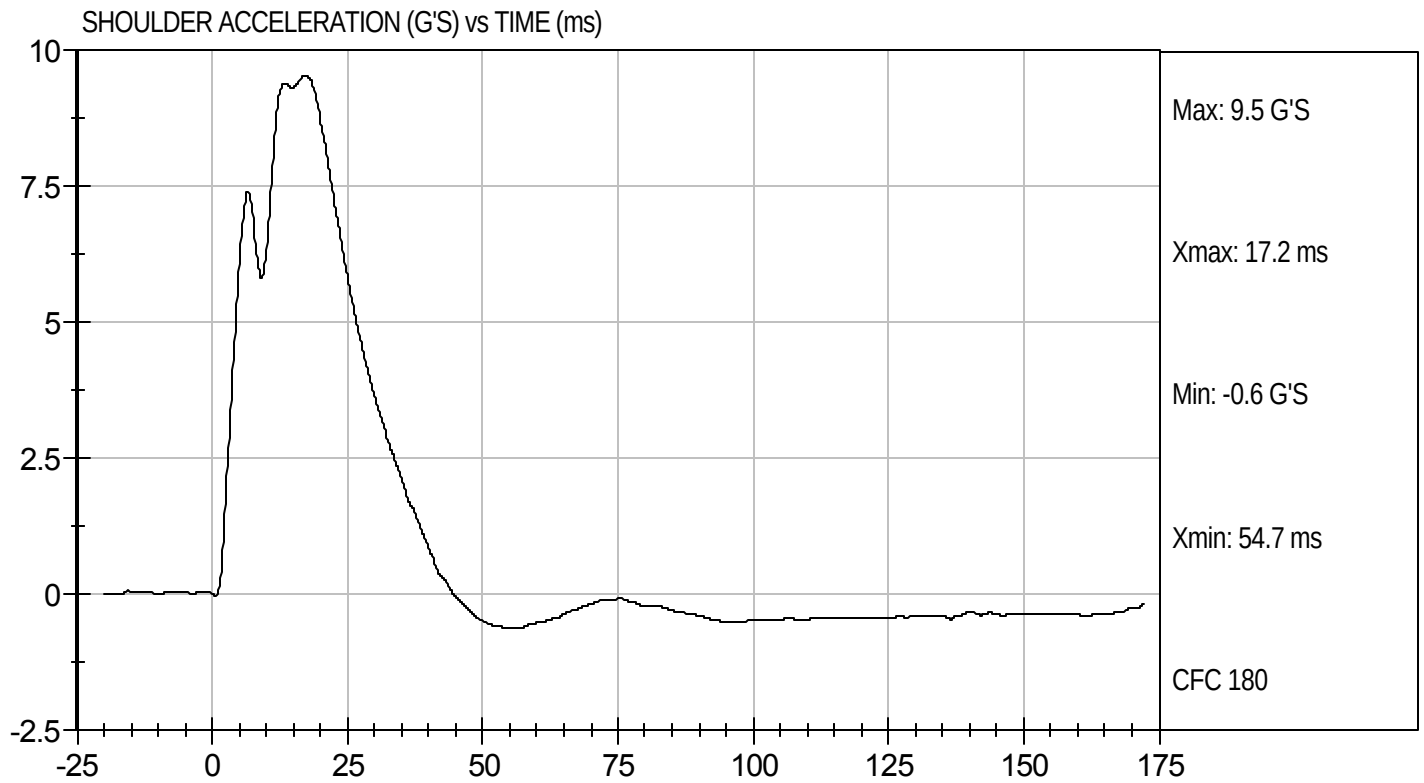
6/12/09
Test Date


Approved By



Test Desc: Shoulder Impact
Component ID: D091503

Test Date: 6/12/09
Velocity: 14.12 ft/s, 4.3 m/s



MGA RESEARCH CORPORATION

UPPER RIB TEST

ES-2re DUMMY

ATD Serial No: 032

Test I.D: D091504

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	37.1	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	47.1	Pass
Overall Test Results				Pass


Laboratory Technician

6/15/09
Test Date

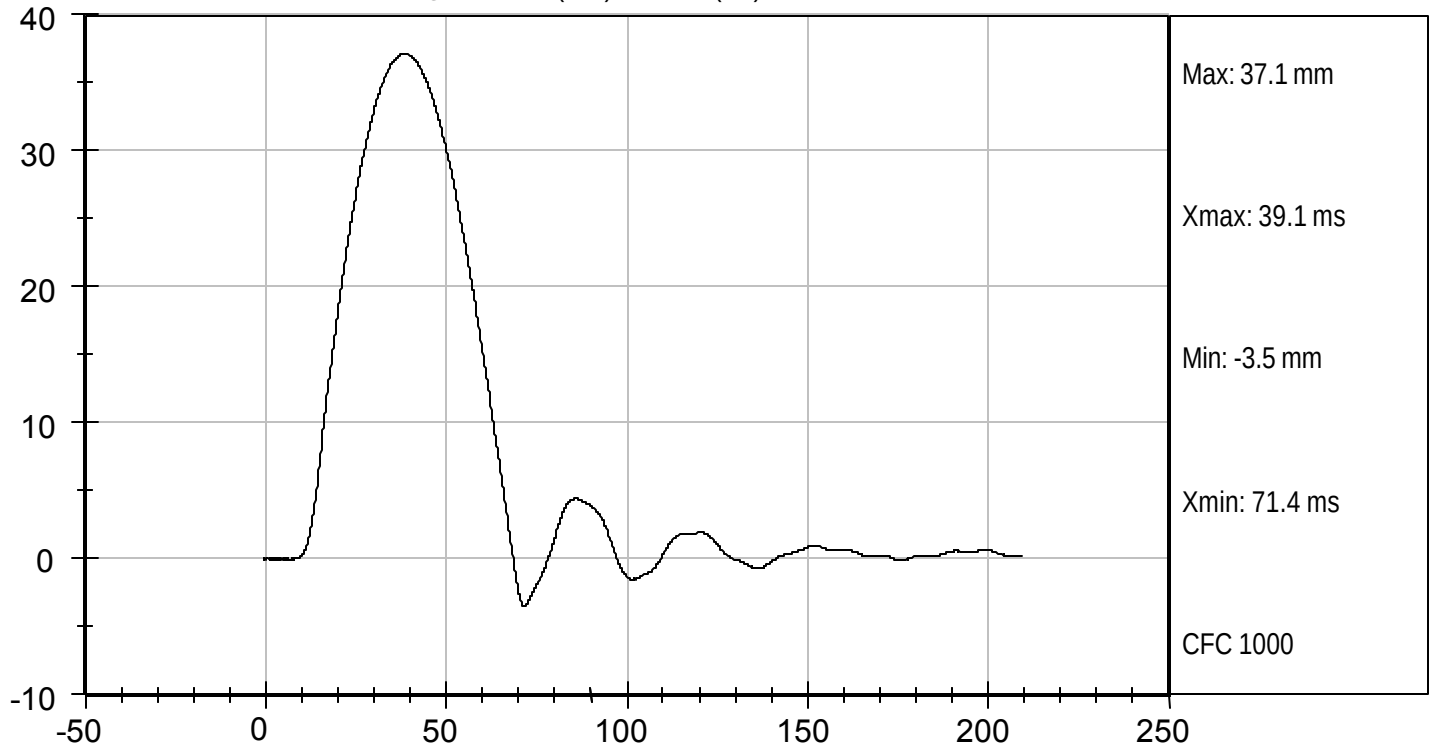

Approved By



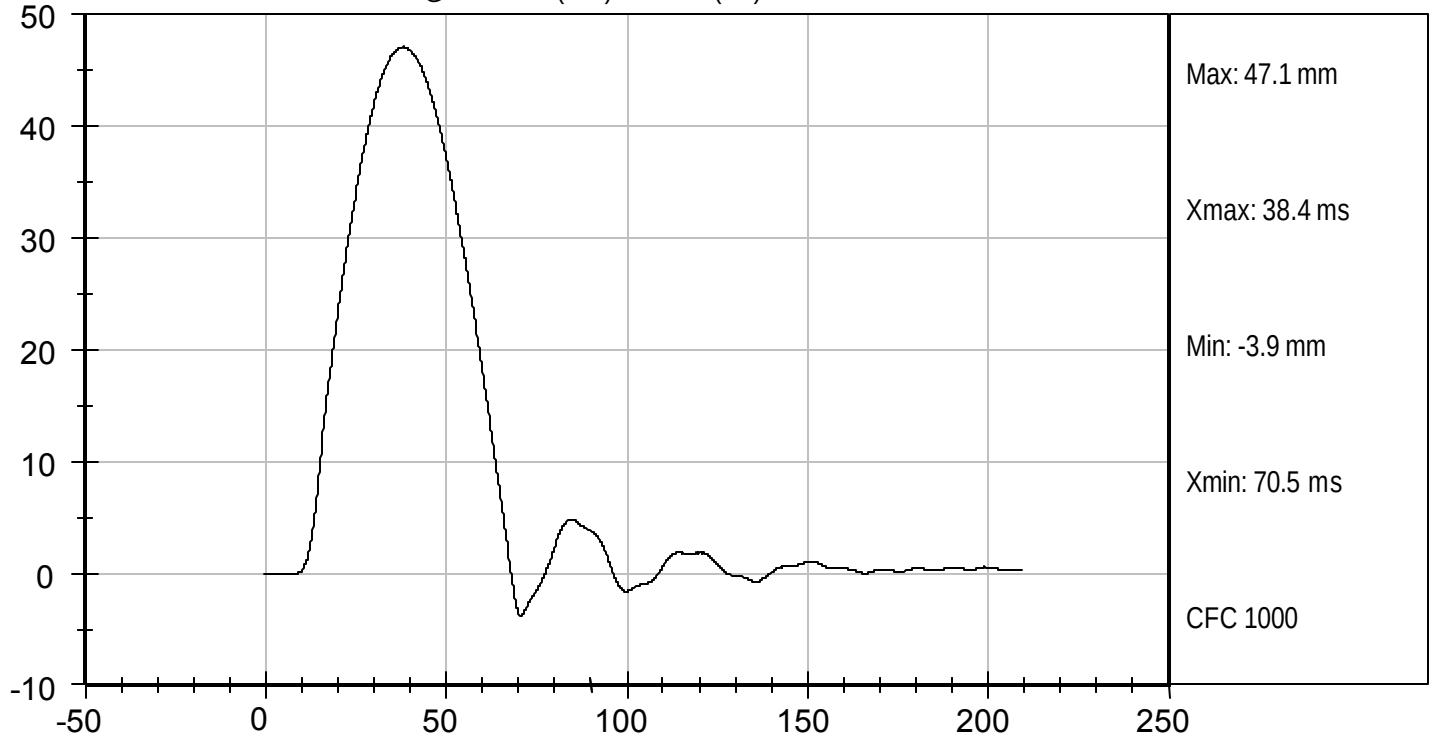
Test Desc: Rib Impact - Upper
Component ID: D091504

Test Date: 6/15/09

UPPER RIB DISPLACEMENT @ 3 M/SEC (mm) vs TIME (ms)



UPPER RIB DISPLACEMENT @ 4 M/SEC (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

MID RIB TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D091505

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	37.7	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	48.2	Pass
Overall Test Results				Pass


Laboratory Technician

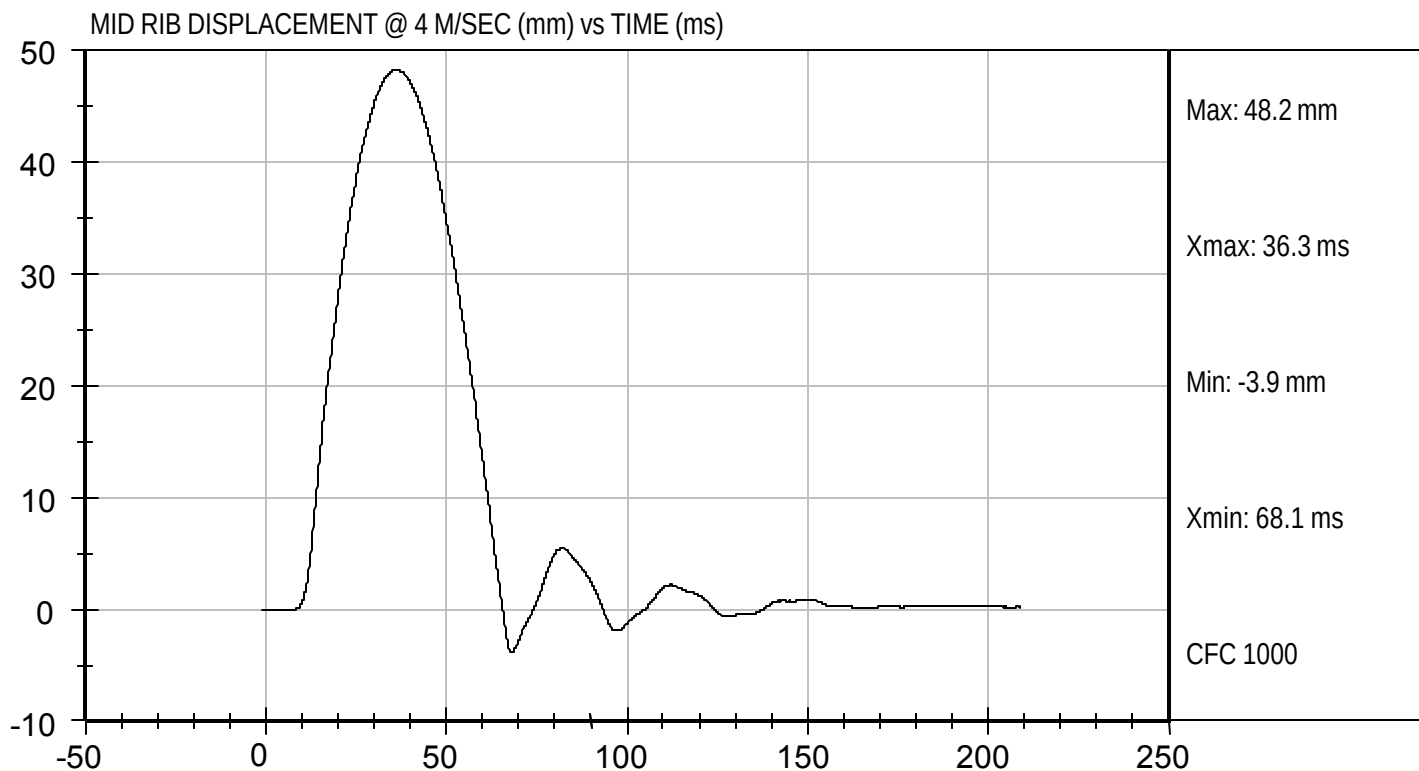
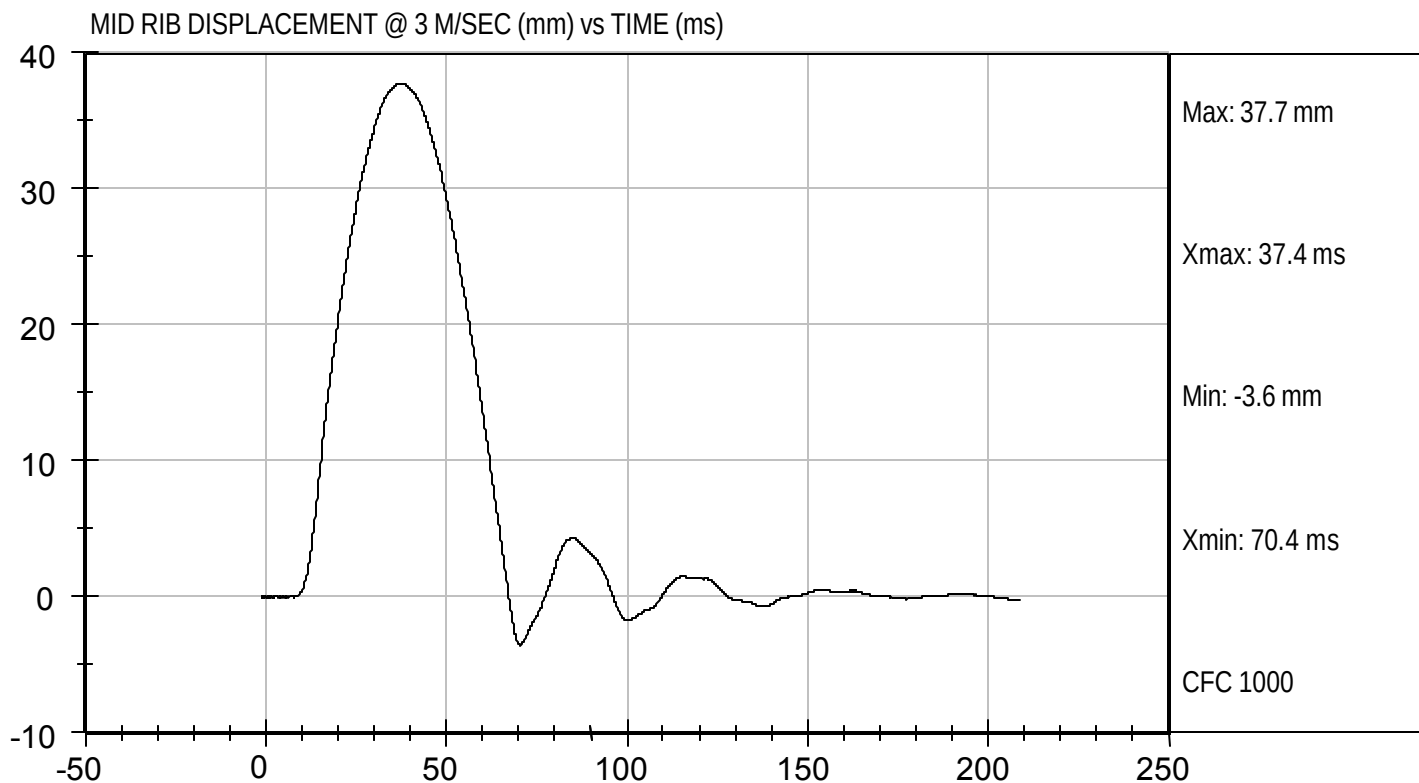
6/15/09
Test Date


Approved By



Test Desc: Rib Impact - Mid
Component ID: D091505

Test Date: 6/15/09



MGA RESEARCH CORPORATION

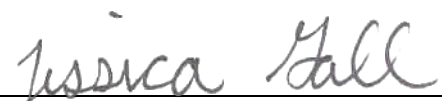
LOWER RIB TEST

ES-2re DUMMY

ATD Serial No: 032

Test I.D: D091506

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.2	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	37.1	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	47.8	Pass
Overall Test Results				Pass


Laboratory Technician

6/15/09
Test Date

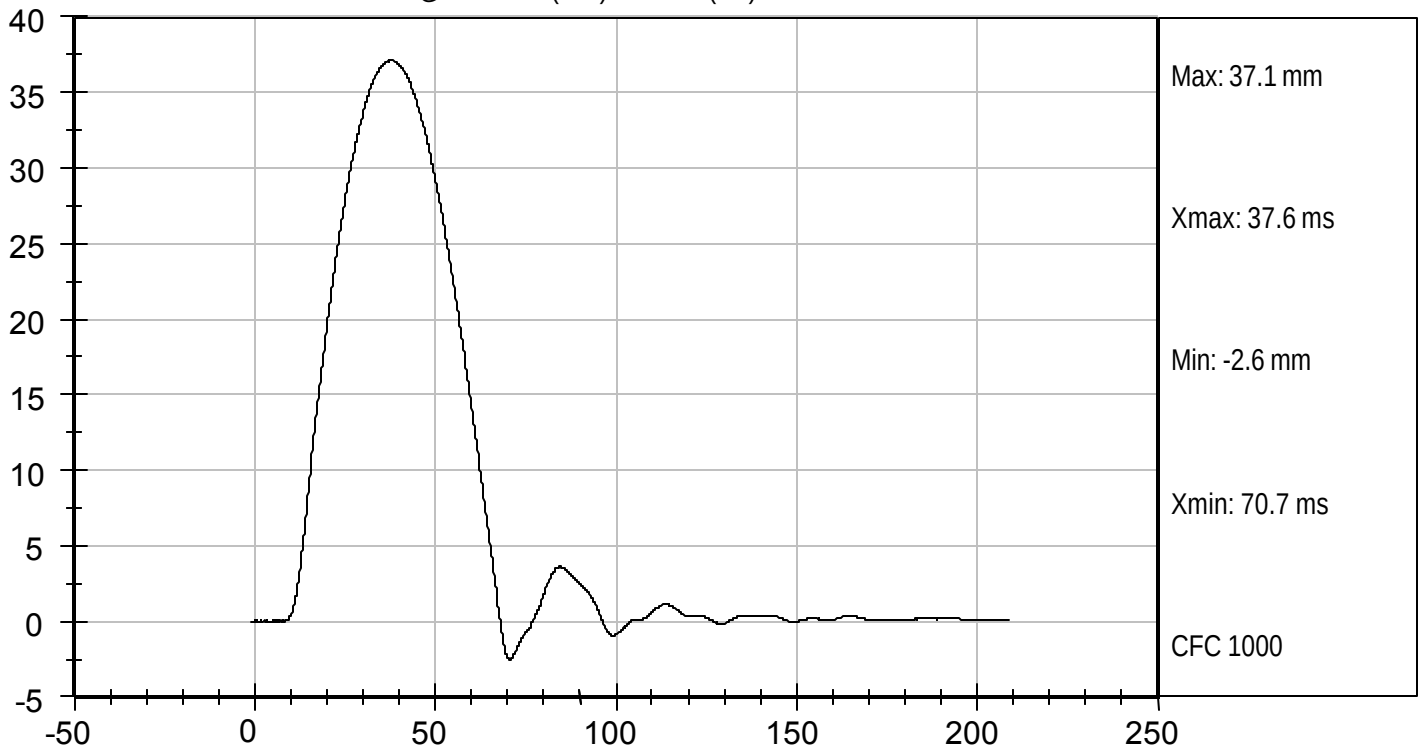

Approved By



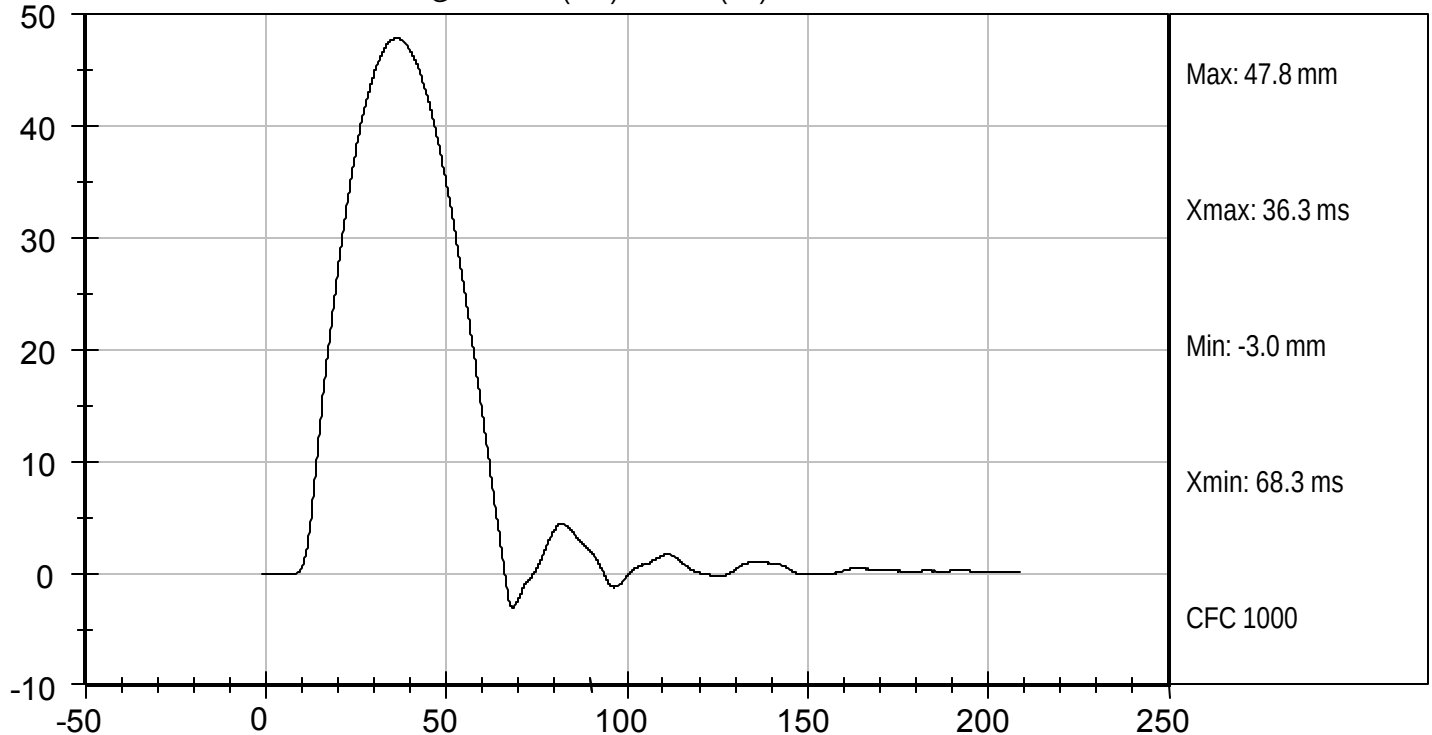
Test Desc: Rib Impact - Lower
Component ID: D091506

Test Date: 6/15/09

LOWER RIB DISPLACEMENT @ 3 M/SEC (mm) vs TIME (ms)



LOWER RIB DISPLACEMENT @ 4 M/SEC (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

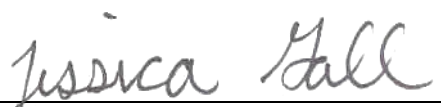
ABDOMEN TEST

ES-2re DUMMY

ATD Serial No: 032

Test I.D: D091507

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	47	Pass
Probe Speed	m/s	3.90 to 4.10	3.99	Pass
Maximum Impact Force	kN	4.00 to 4.80	4.13	Pass
Time of Maximum Impactor Force	msec	10.60 to 13.00	11.60	Pass
Maximum Total Abdomen Force	kN	2.20 to 2.70	2.41	Pass
Time of Maximum Abdomen Force	msec	10.00 to 12.30	10.60	Pass
Overall Test Results				Pass


Laboratory Technician

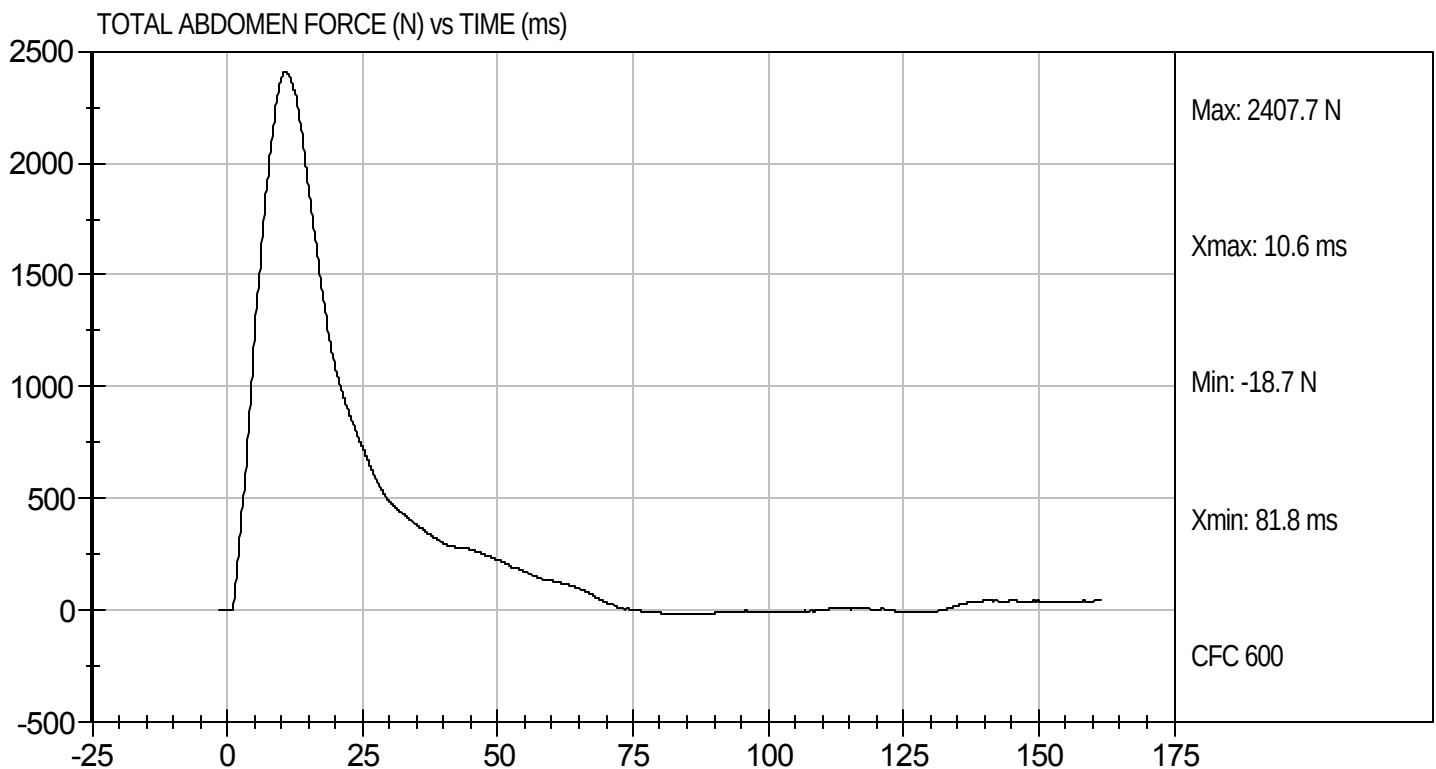
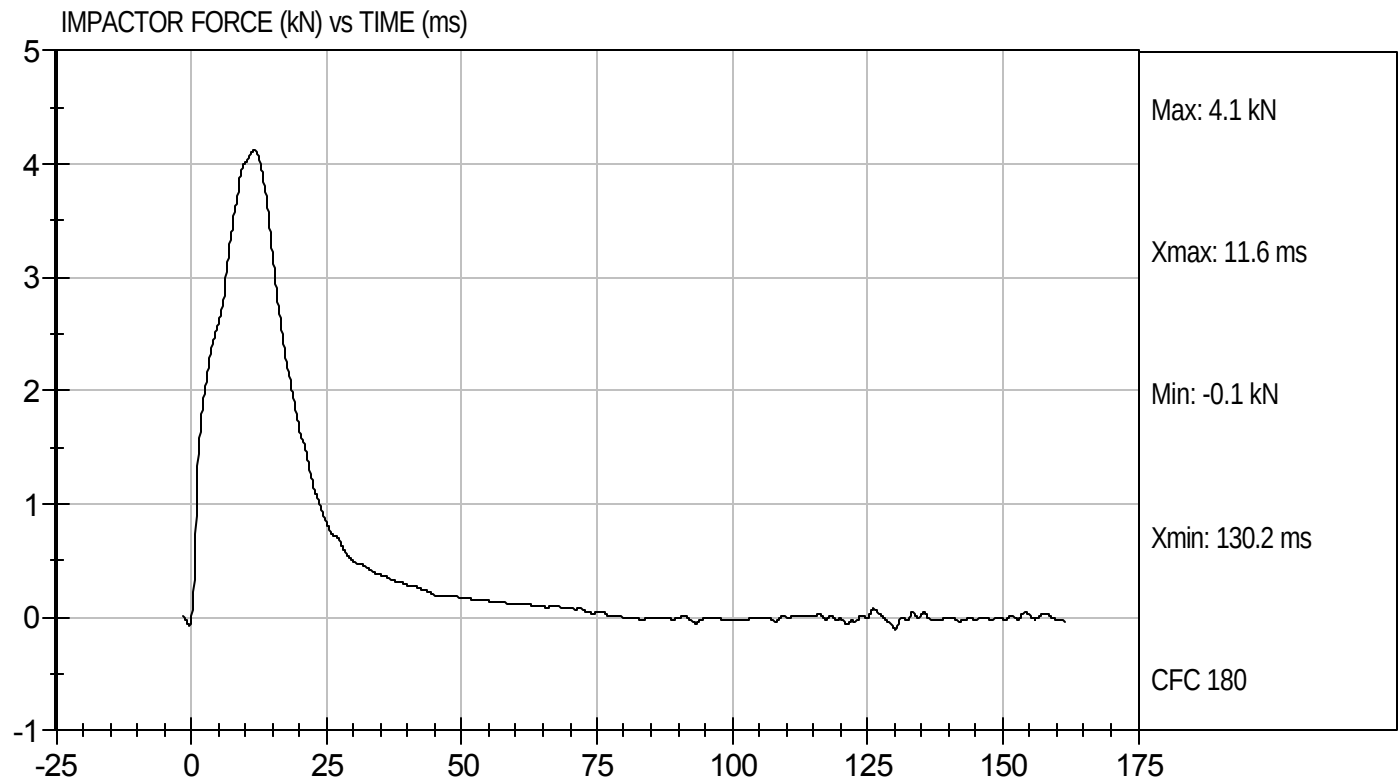
6/16/09
Test Date


Approved By



Test Desc: Abdomen Impact
Component ID: D091507

Test Date: 6/16/09
Velocity: 13.1 ft/s, 3.99 m/s

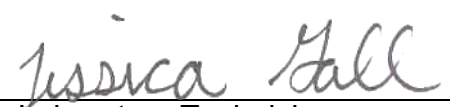


MGA RESEARCH CORPORATION
LUMBAR SPINE TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D091508

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22.1	Pass
Laboratory Relative Humidity		%	10 to 70	47	Pass
Pendulum Speed		m/sec	5.95 to 6.15	6.12	Pass
Pendulum Deceleration	1 msec	m/sec	-0.05 to 0.00	-0.03	Pass
	3.7 msec	m/sec	-0.425 to -0.24	-0.42	Pass
	27 msec	m/sec	-6.50 to -5.80	-5.97	Pass
	30 msec	m/sec	>= -6.5	-5.98	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	47.4	Pass
Time of Maximum Flexion Angle		msec	39.0 to 53.0	44.8	Pass
Headform Rotation Decay to Initial Position		msec	37 to 57	45	Pass
Overall Results				Pass	


 Laboratory Technician

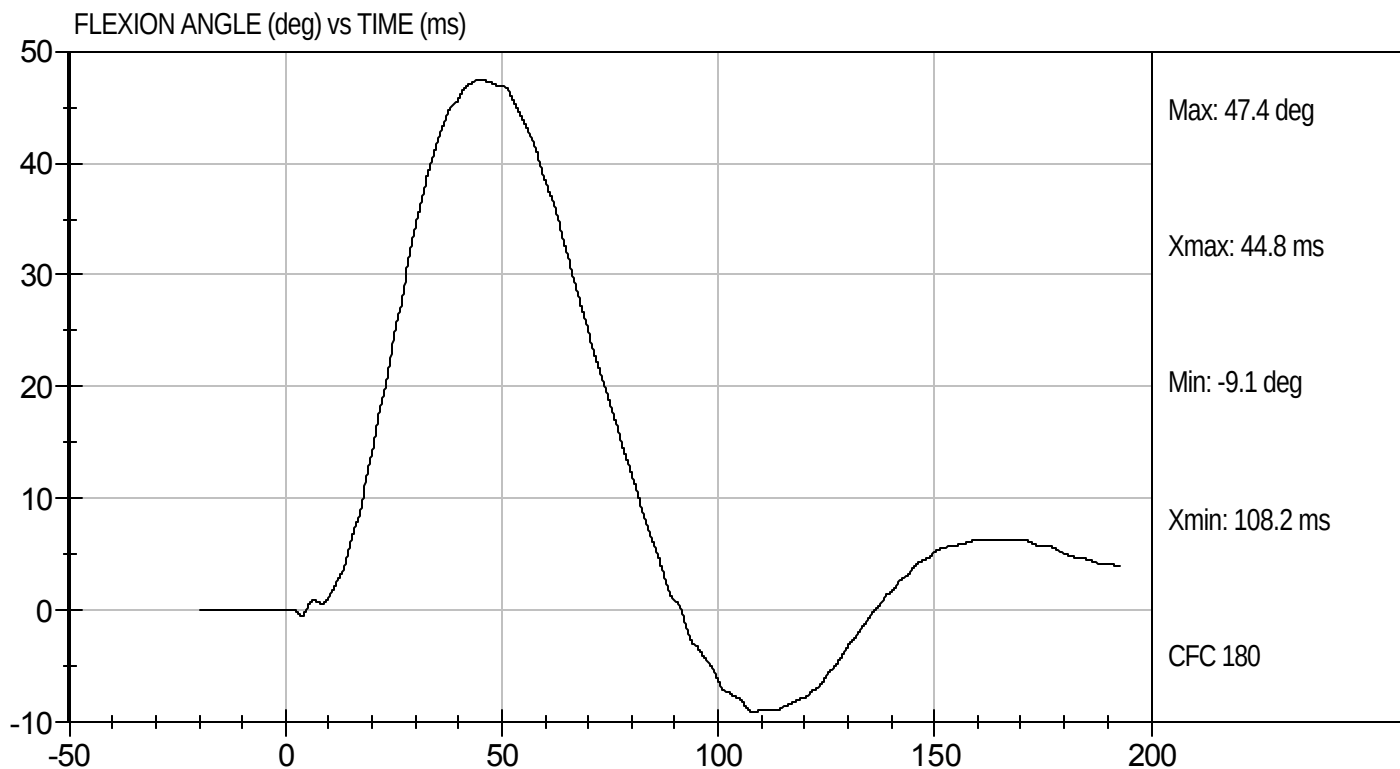
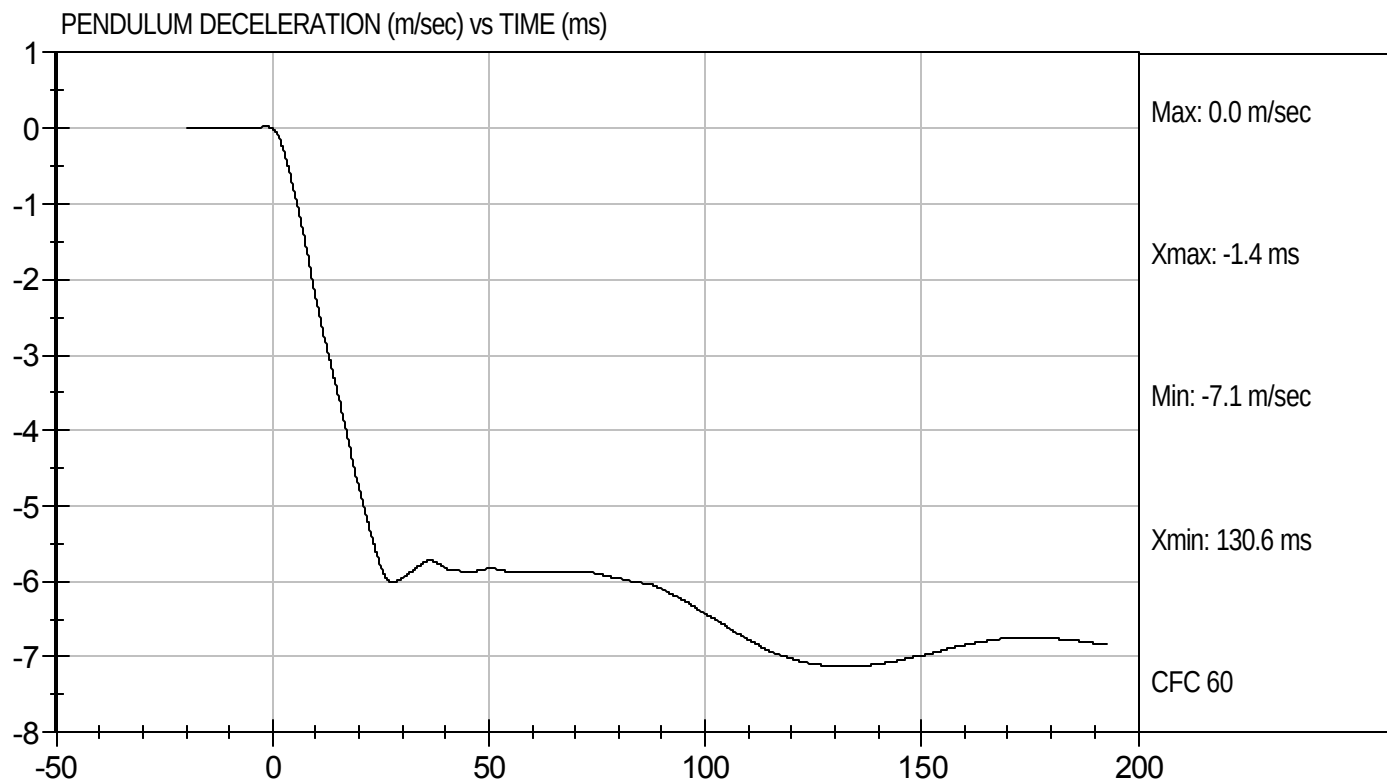
6/15/09
 Test Date


 Approved By



Test Desc: Lumbar Bending
Component ID: D091508

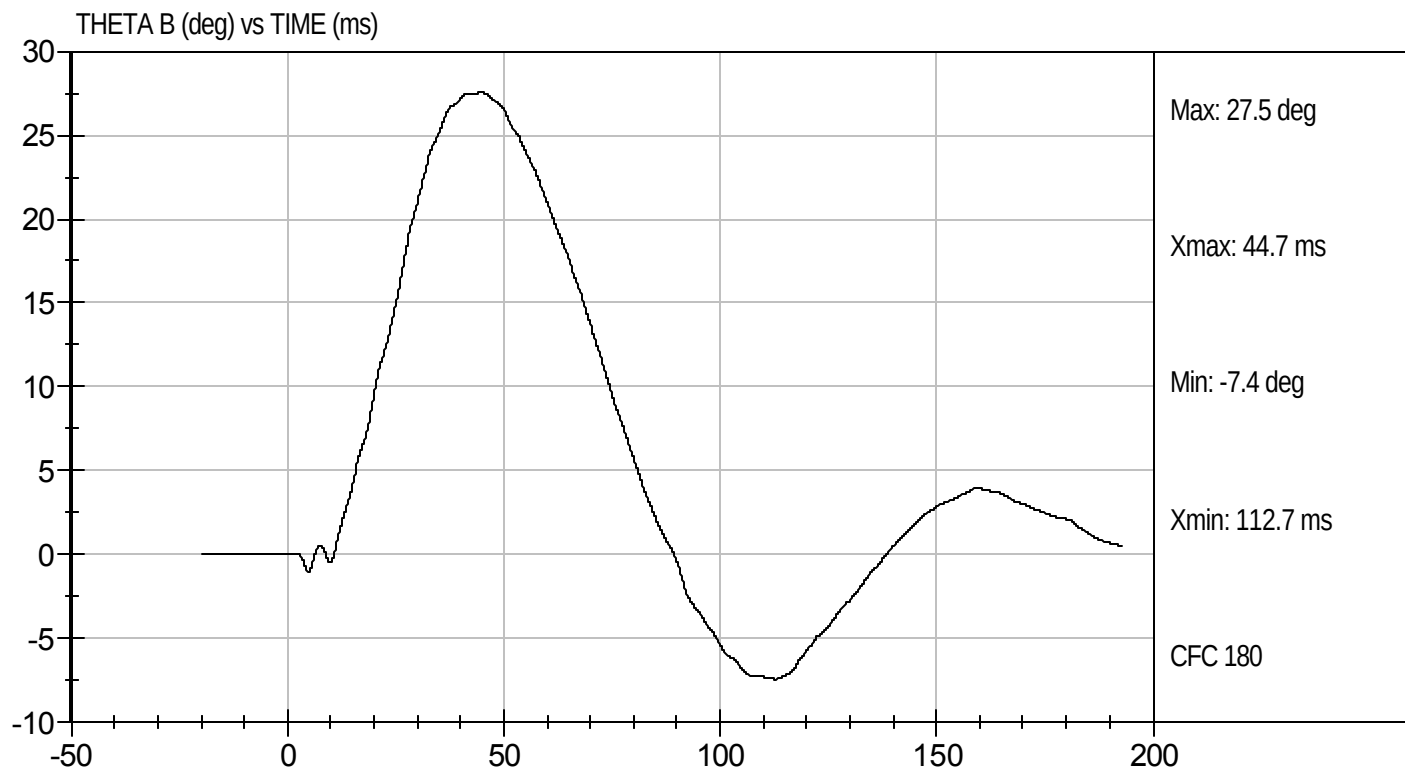
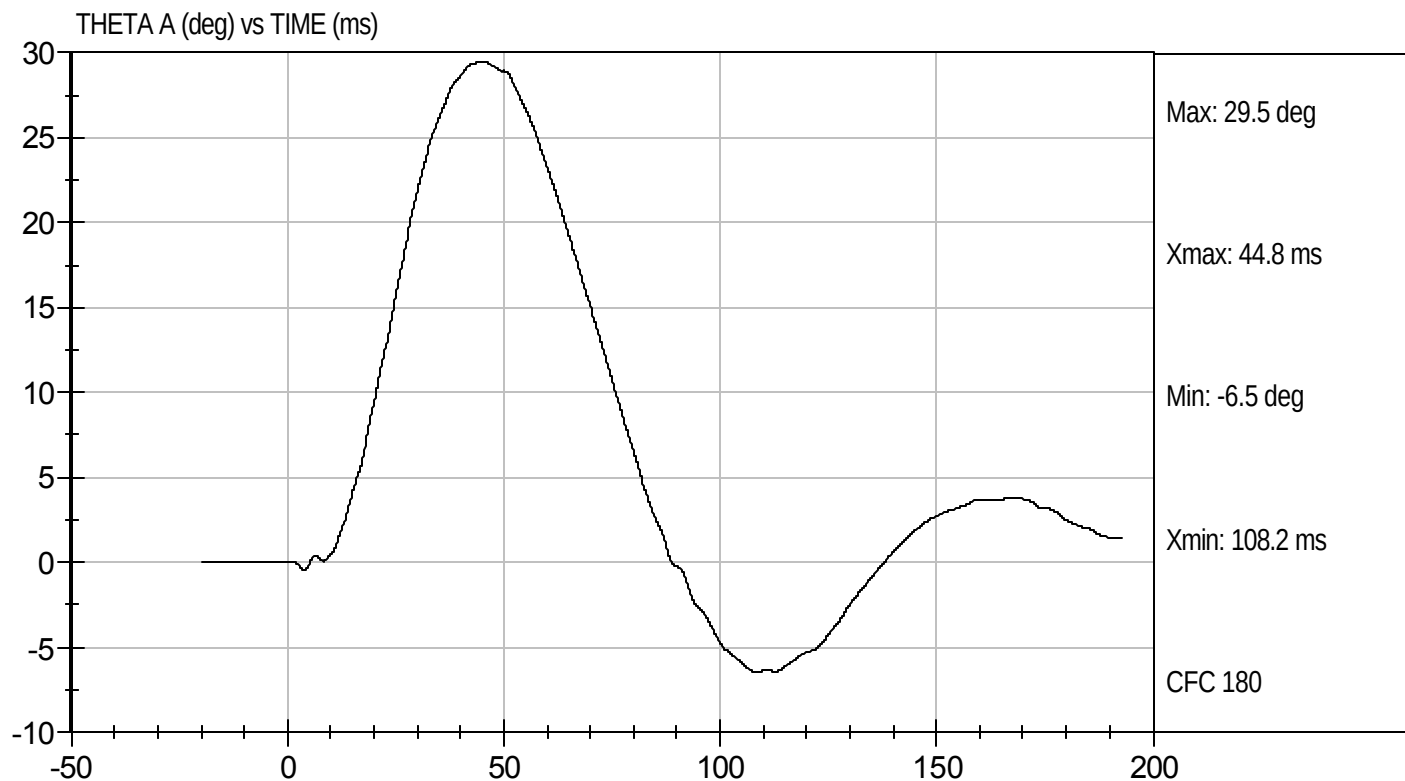
Test Date: 6/15/09
Velocity: 20.08 ft/s, 6.12 m/s





Test Desc: Lumbar Bending
Component ID: D091508

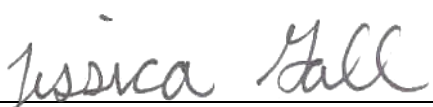
Test Date: 6/15/09
Velocity: 20.08 ft/s, 6.12 m/s



MGA RESEARCH CORPORATION

PELVIS TEST
ES-2re DUMMYATD Serial No: 032Test I.D: D091509

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	44	Pass
Probe Speed	m/s	4.20 to 4.40	4.30	Pass
Maximum Impactor Force	kN	4.70 to 5.40	4.81	Pass
Time of Maximum Impactor Force	msec	11.80 to 16.10	13.40	Pass
Maximum Pubic Force	kN	1.23 to 1.59	1.45	Pass
Time of Maximum Pubic Force	msec	12.20 to 17.00	14.30	Pass
Overall Test Results				Pass


Laboratory Technician

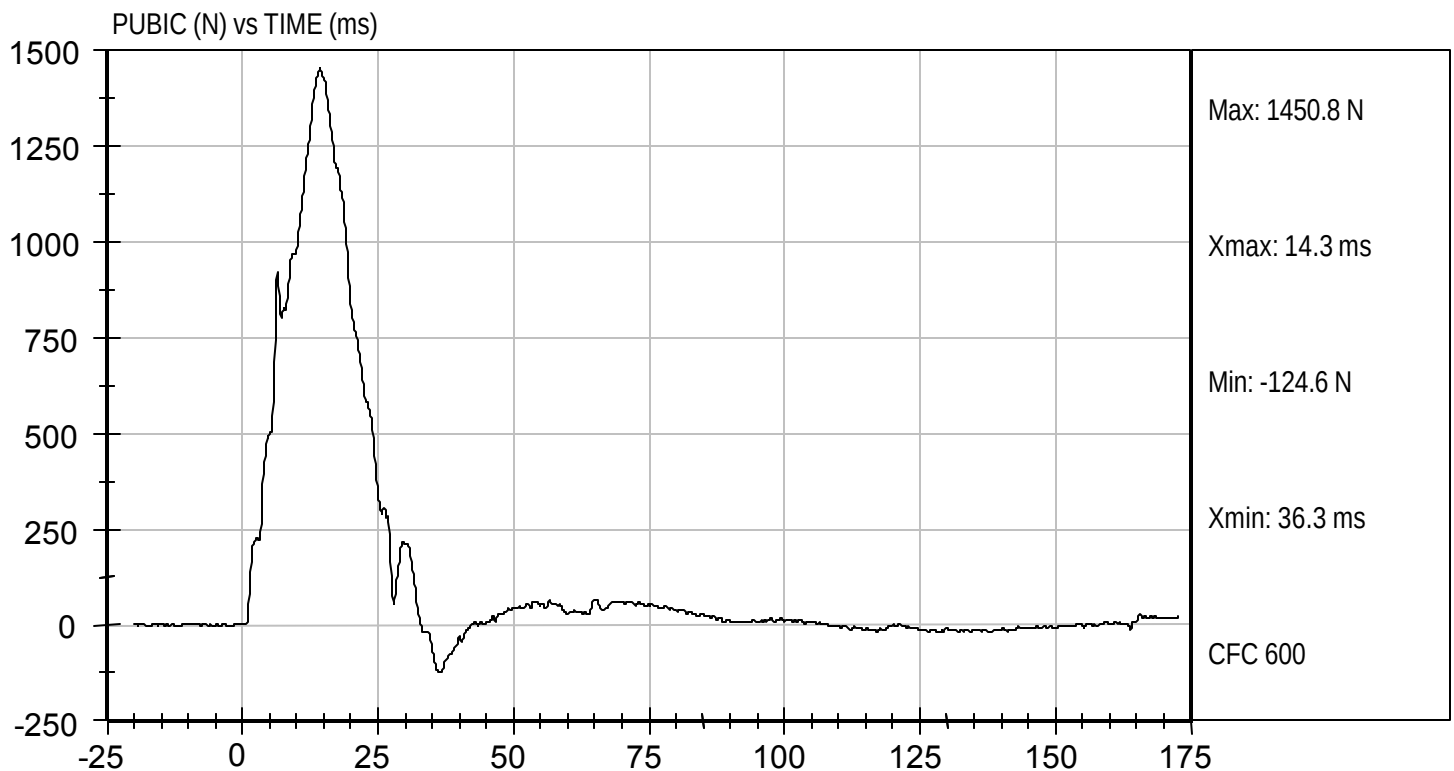
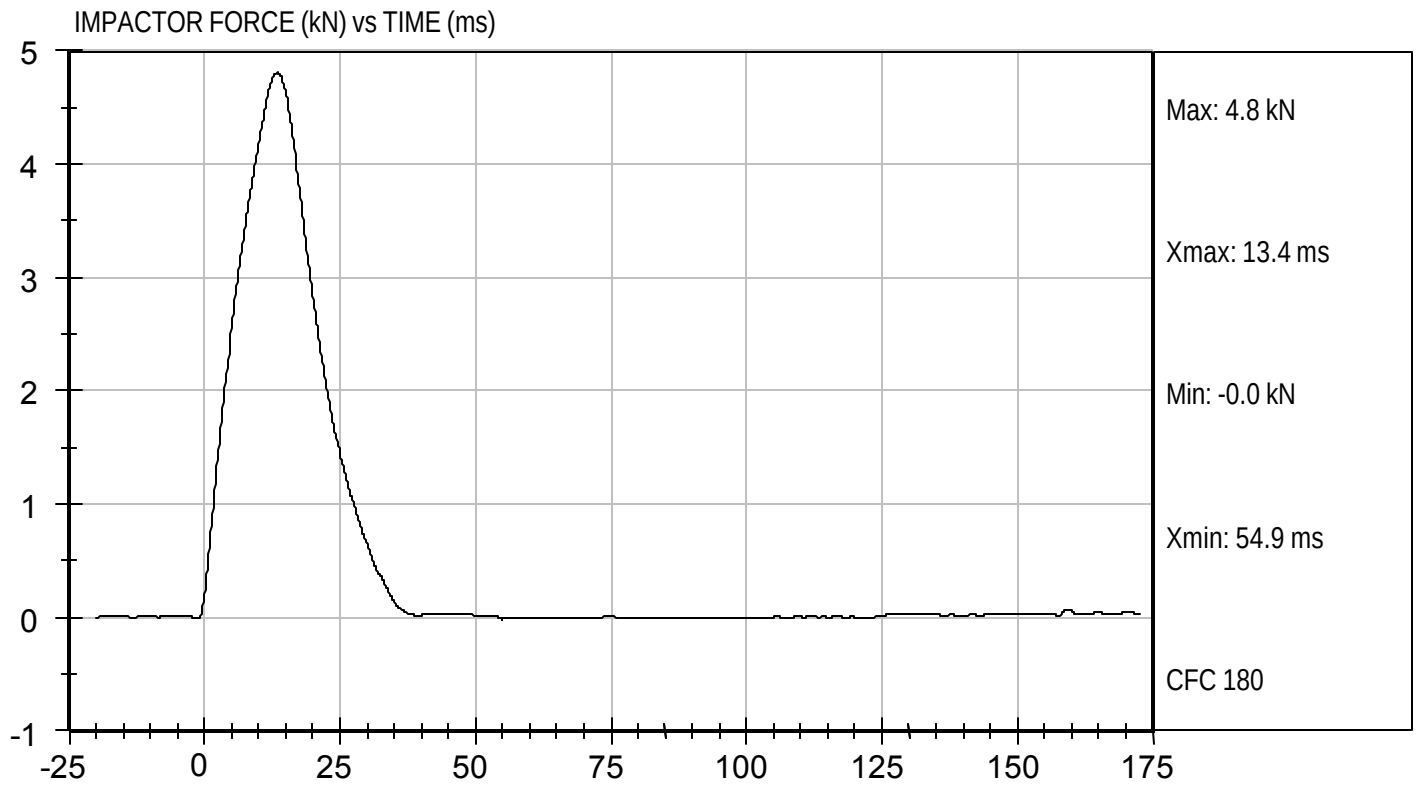
6/12/09
Test Date


Approved By



Test Desc: Pelvis Impact
Component ID: D091509

Test Date: 6/12/09
Velocity: 14.12 ft/s, 4.30 m/s

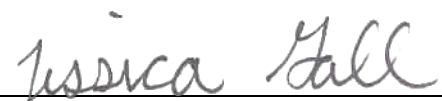


MGA RESEARCH CORPORATION
FULL BODY THORAX IMPACT TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D091500

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	44	Pass
Probe Speed	m/s	5.40 to 5.60	5.58	Pass
Maximum Impactor Force (after 6 ms)	kN	5.17 to 6.12	5.30	Pass
Upper Rib Displacement	mm	33.2 to 41.3	38.0	Pass
Middle Rib Displacement	mm	37.1 to 45.4	40.7	Pass
Lower Rib Displacement	mm	35.6 to 43.0	39.7	Pass
			Overall Test Results	Pass


Laboratory Technician

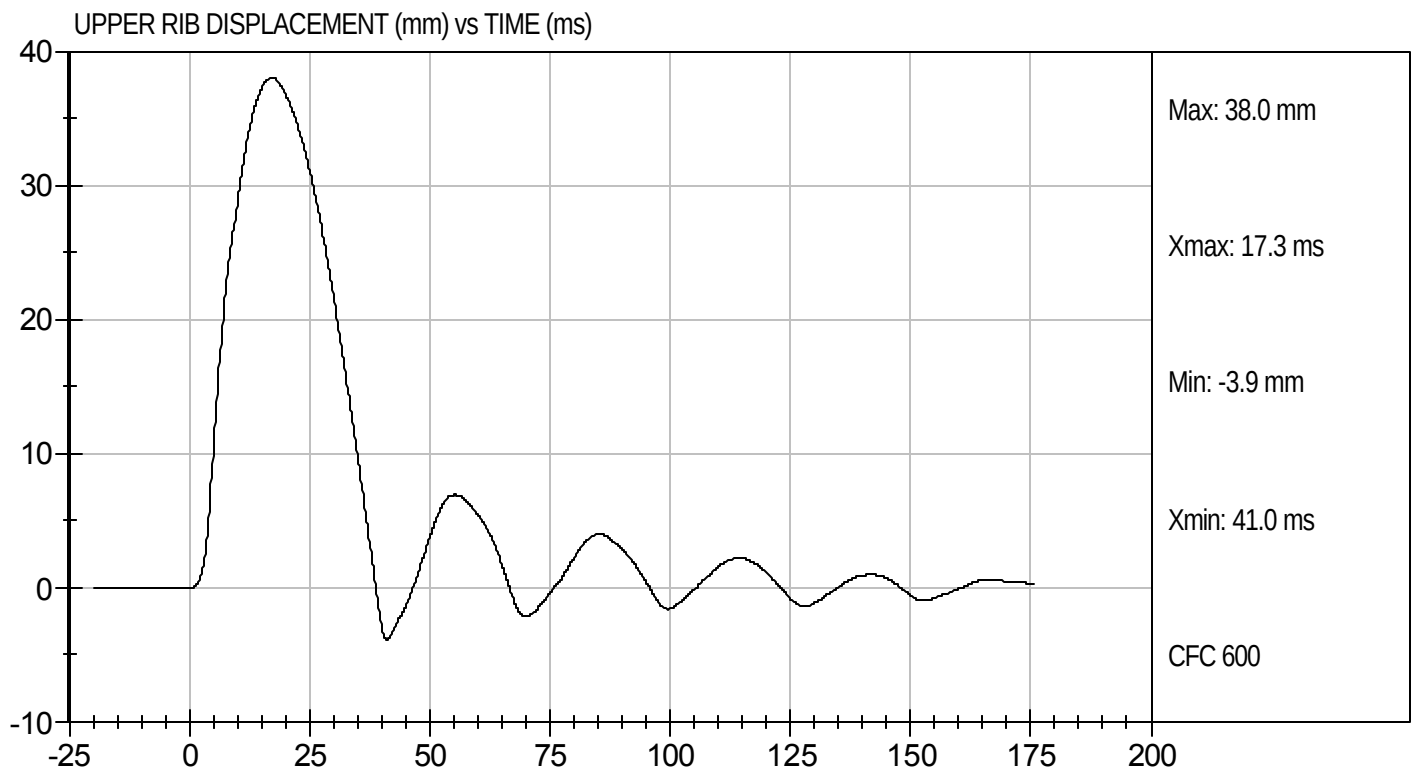
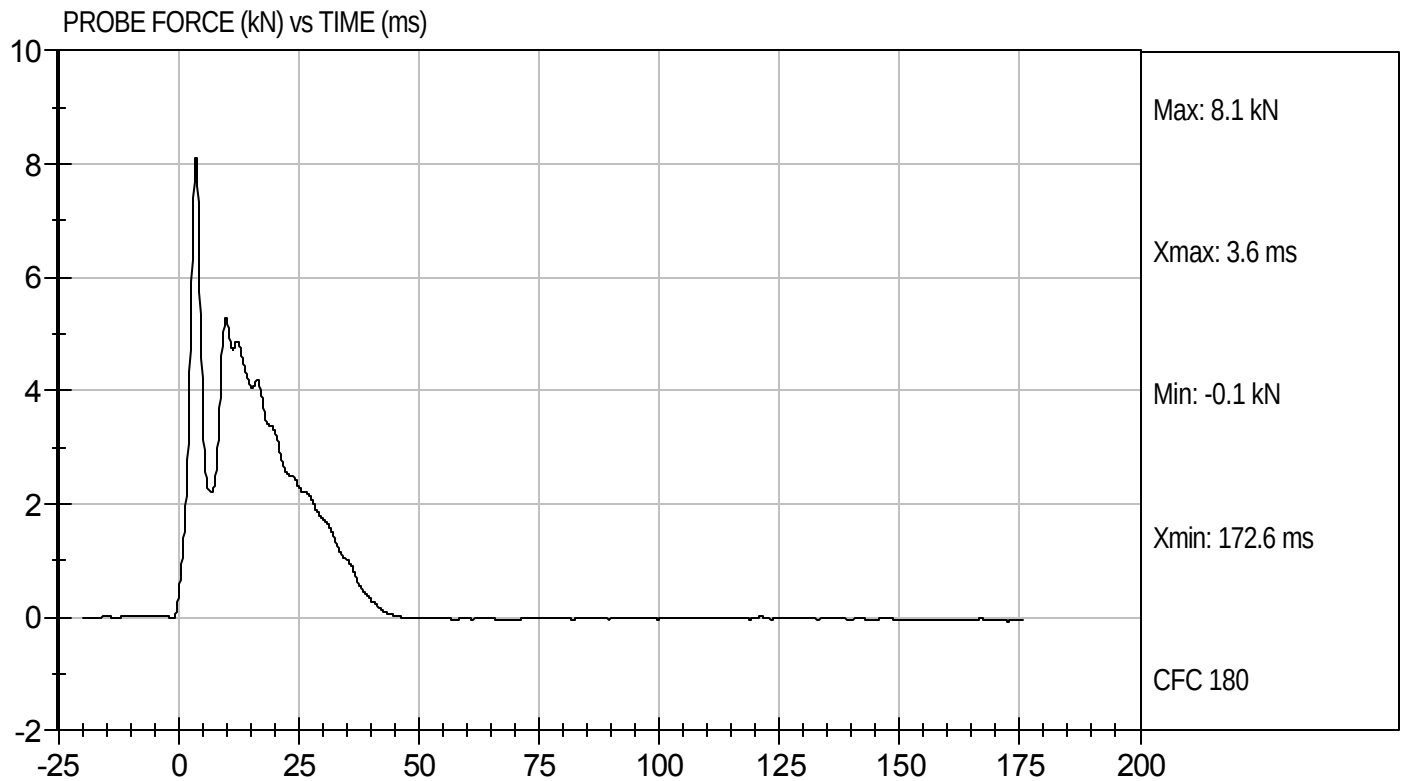
6/12/09
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D091500

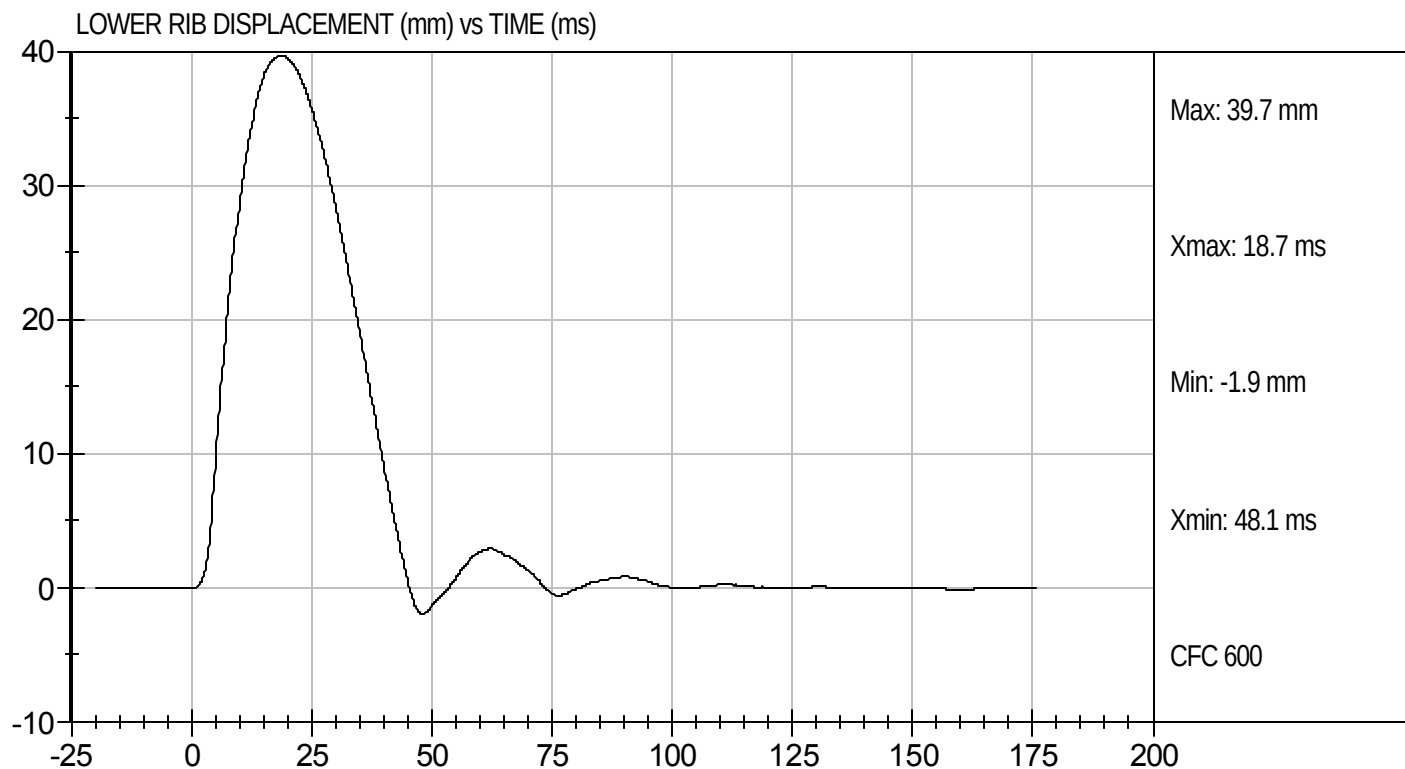
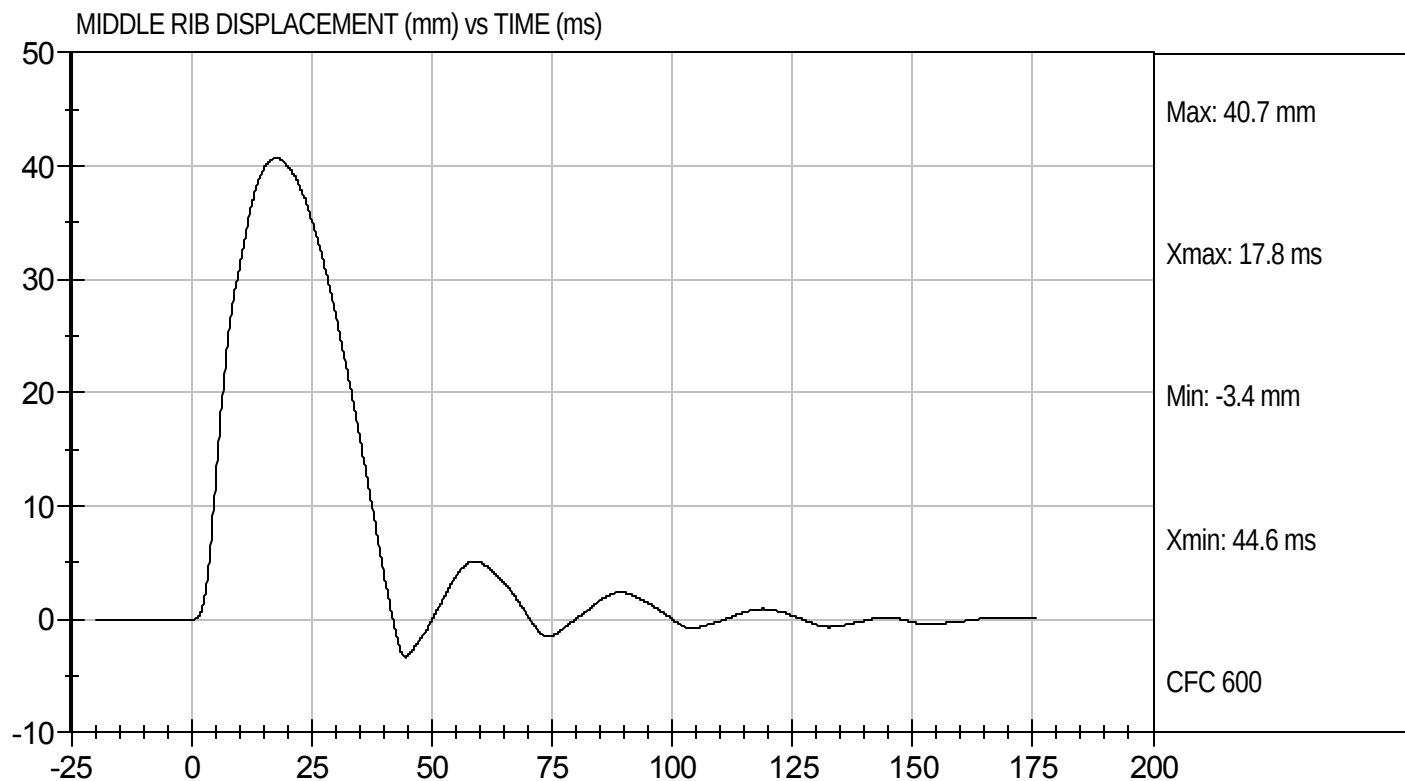
Test Date: 6/12/09
Velocity: 18.32 ft/s, 5.58 m/s





Test Desc: Thorax Impact
Component ID: D091500

Test Date: 6/12/09
Velocity: 18.32 ft/s, 5.58 m/s



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

ATD Serial No: 296

Test ID: D091441

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	40	Pass
Peak Resultant Acceleration	G's	115 to 137	119	Pass
Peak Lateral Acceleration	G's	+/- 15	4.5	Pass
Unimodal	N/A	<15%	Yes	Pass
Overall Test Results				Pass



Laboratory Technician

6/10/09
Test Date



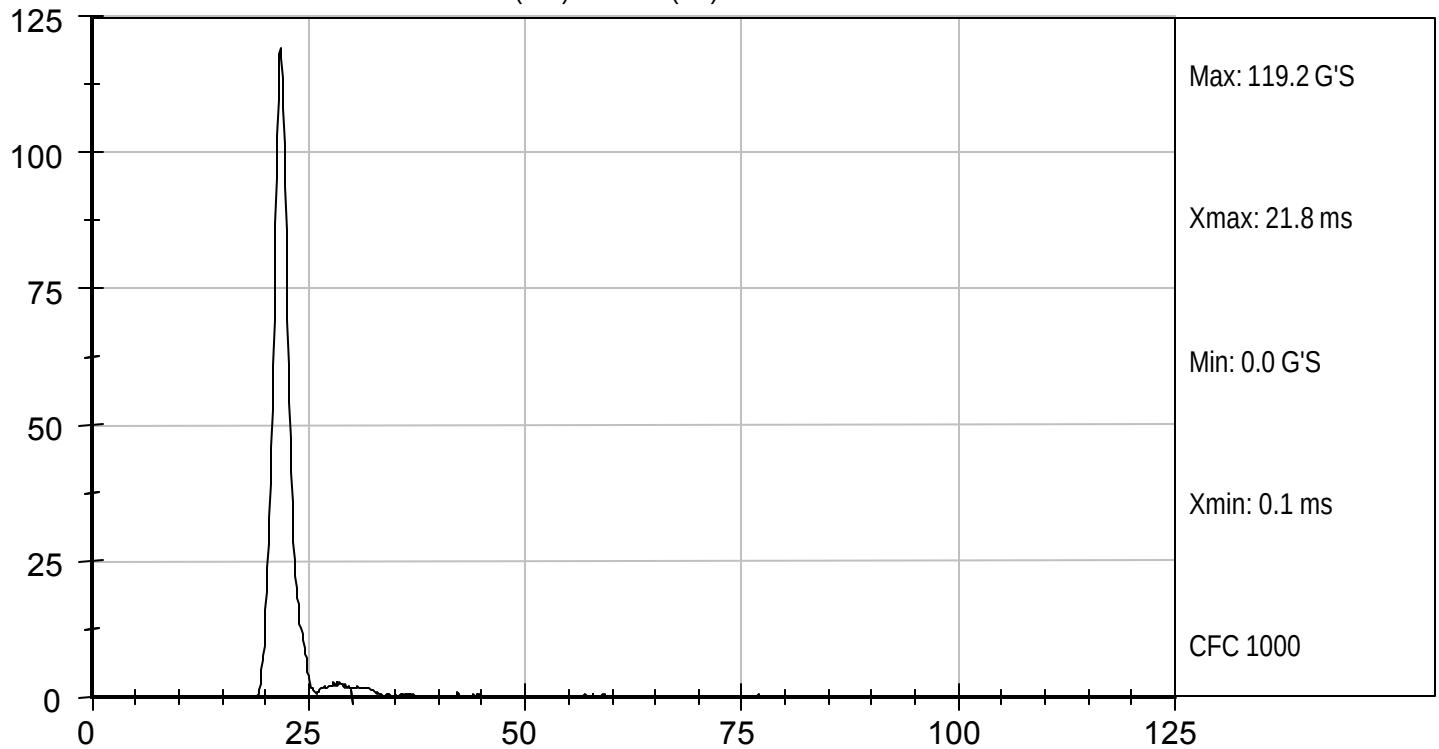
Approved By



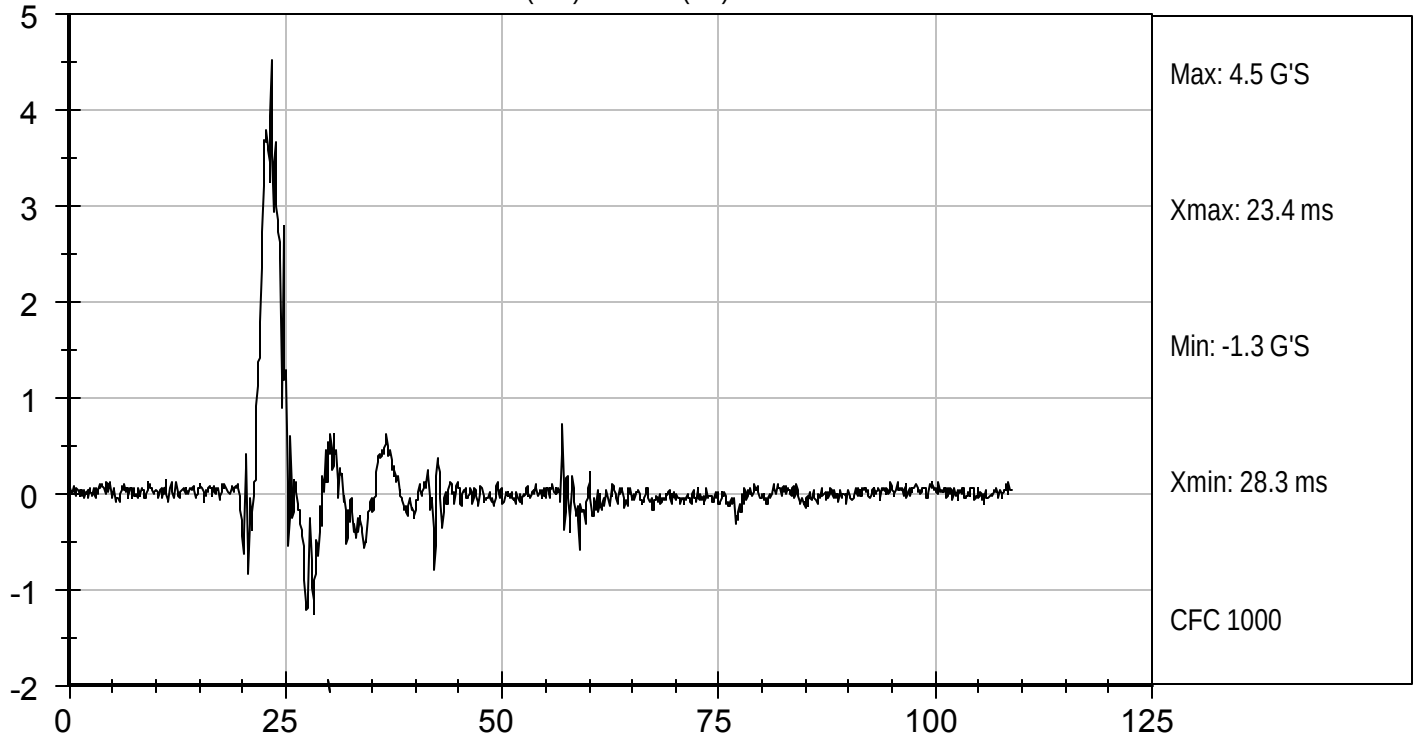
Test Desc: Head Drop
Component ID: D091441

Test Date: 6/10/09
Velocity: 0 ft/s, 0 m/s

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



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

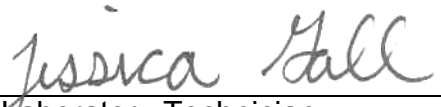


MGA RESEARCH CORPORATION
LATERAL NECK PENDULUM TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D091442

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	22.2	Pass
Humidity		%	10 to 70	41	Pass
Impact Velocity		m/s	5.51 to 5.63	5.52	Pass
Delta Velocity	10 msec	m/s	2.20 to 2.80	2.52	Pass
	15 msec	m/s	3.30 to 4.10	3.51	Pass
	20 msec	m/s	4.40 to 5.40	4.63	Pass
	25 msec	m/s	5.40 to 6.10	5.55	Pass
	25-100 msec	m/s	5.50 to 6.20	5.60	Pass
Maximum D-Plane Rotation		deg	71 to 81	72	Pass
Time of Maximum D-Plane Rotation		msec	50 to 70	63	Pass
Maximum Occipital Condyle Moment during Rotation Interval		Nm	-44 to -36	-40	Pass
Time of Moment Decay to 0 Nm		msec	102 to 126	115	Pass
Overall Test Results					Pass


 Laboratory Technician

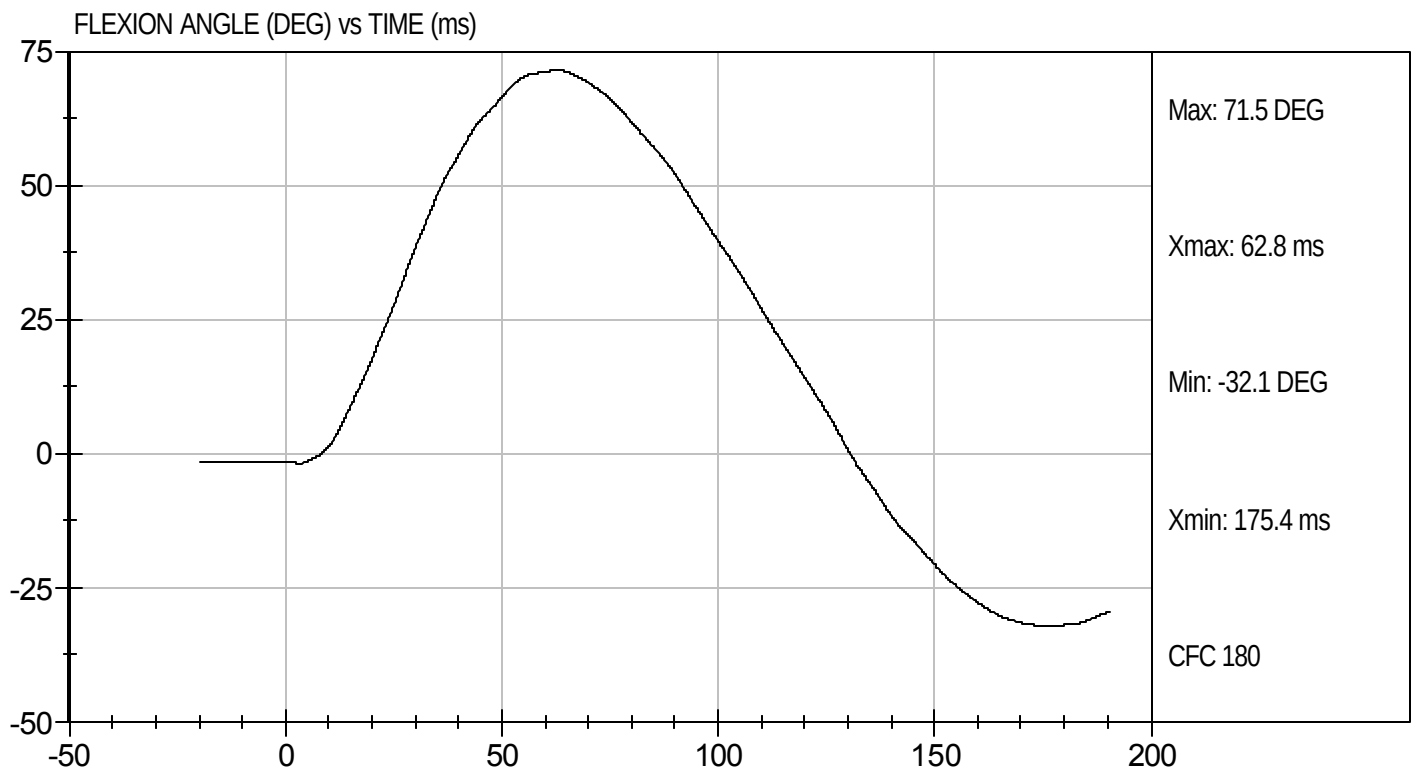
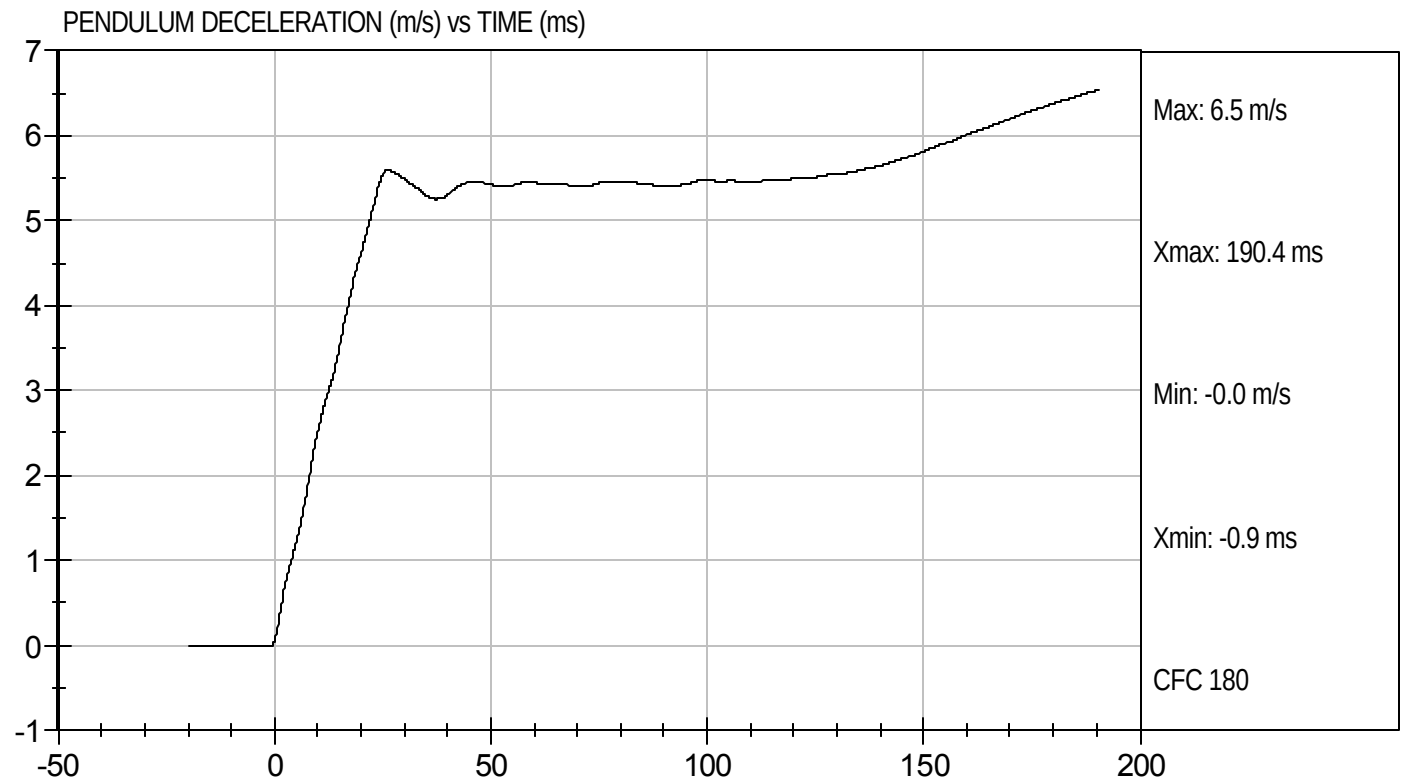
6/11/09
 Test Date


 Approved By



Test Desc: Neck Bending
Component ID: D091442

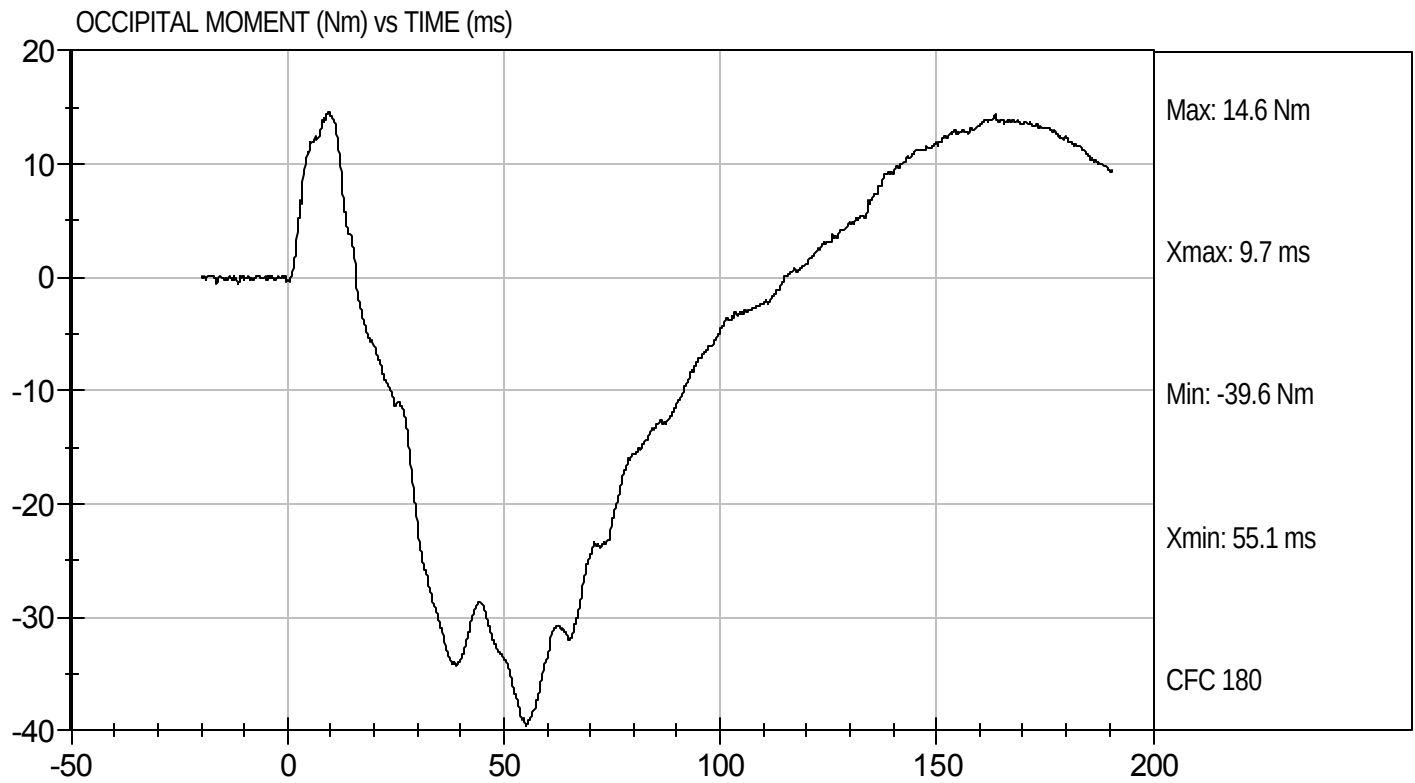
Test Date: 6/11/09
Velocity: 18.1 ft/s, 5.52 m/s





Test Desc: Neck Bending
Component ID: D091442

Test Date: 6/11/09
Velocity: 18.1 ft/s, 5.52 m/s



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

ATD Serial No: 296

Test ID: D091443

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	44	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	30	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	18	Pass
Overall Test Results				Pass


Laboratory Technician

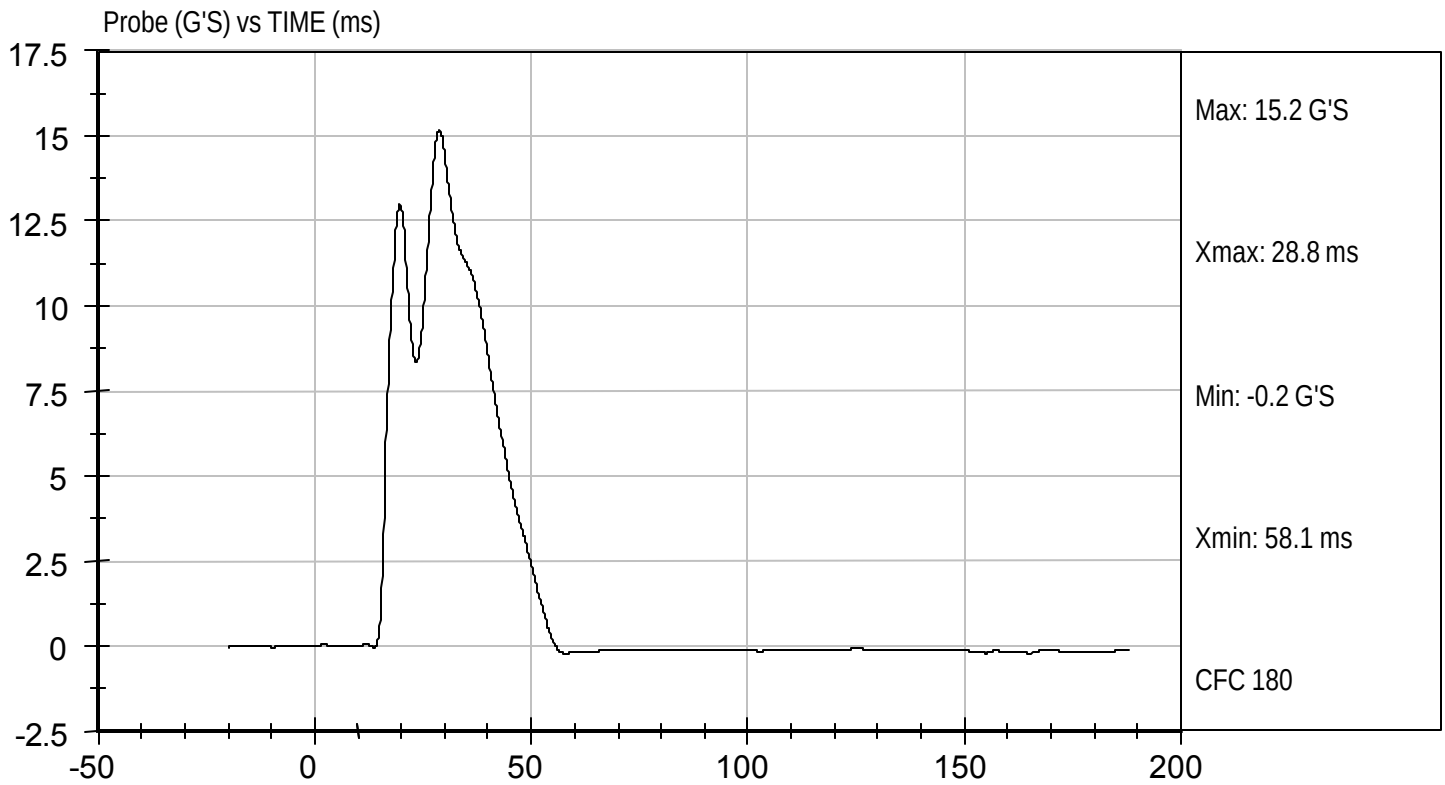
6/10/09
Test Date


Approved By



Test Desc: Shoulder Impact
Component ID: D091443

Test Date: 6/10/09
Velocity: 14.0 ft/s, 4.27 m/s

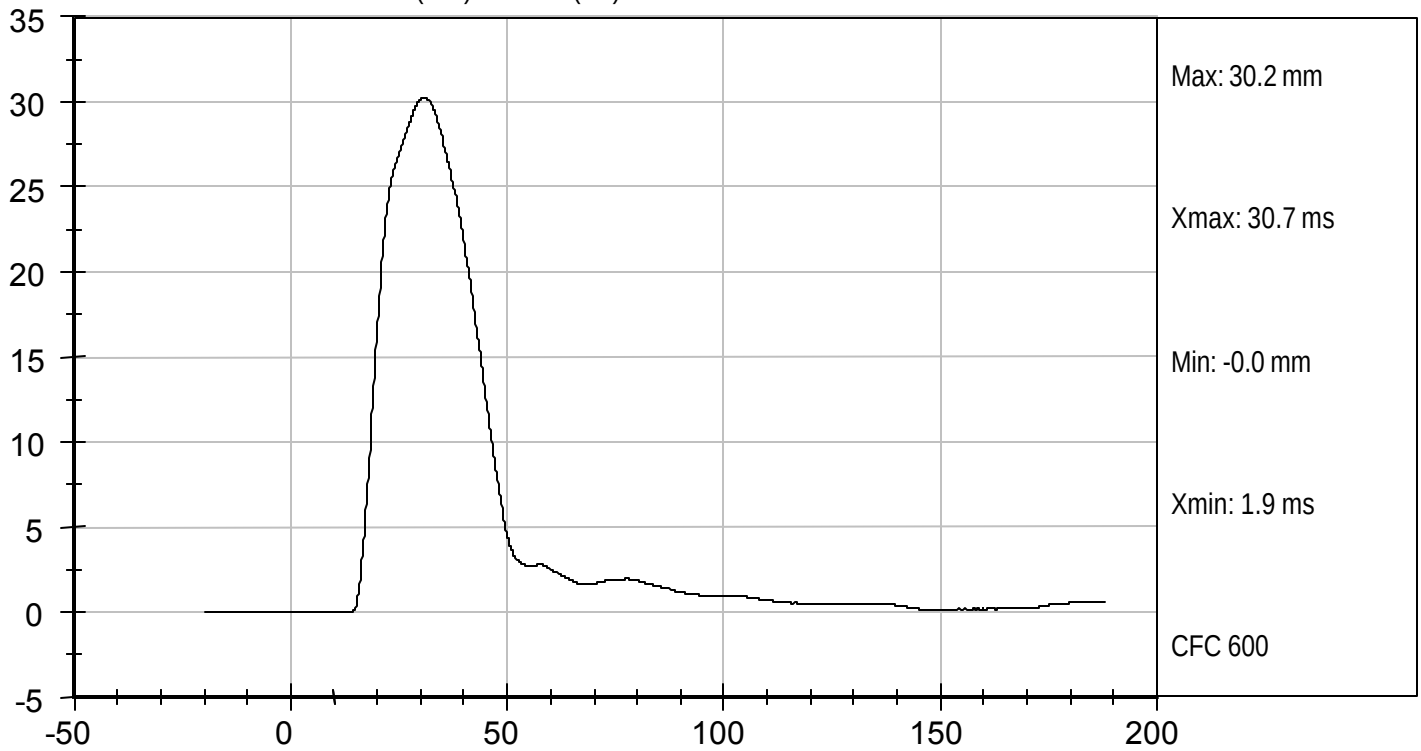




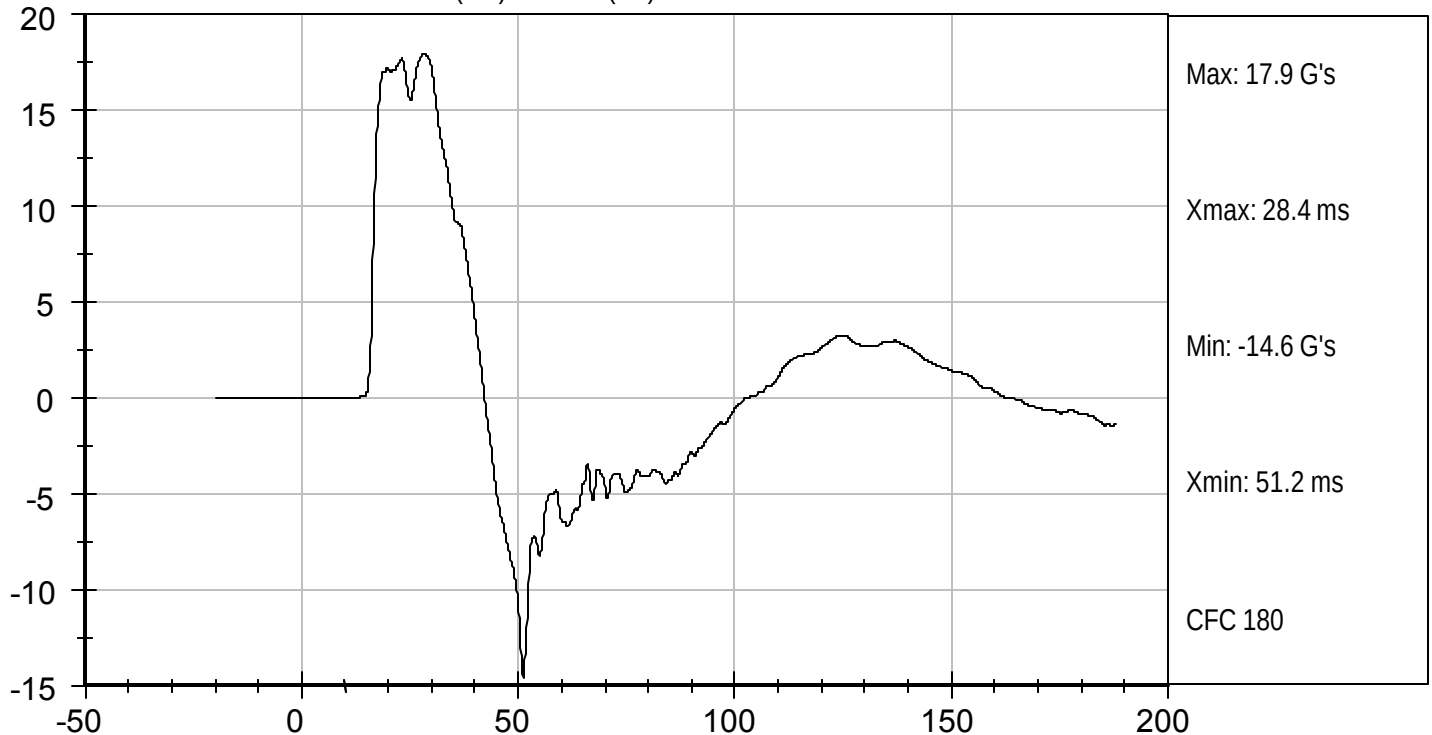
Test Desc: Shoulder Impact
Component ID: D091443

Test Date: 6/10/09
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: D091444

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Humidity	%	10 to 70	44	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	31	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	33	Pass
Overall Test Results			Pass	


 Laboratory Technician

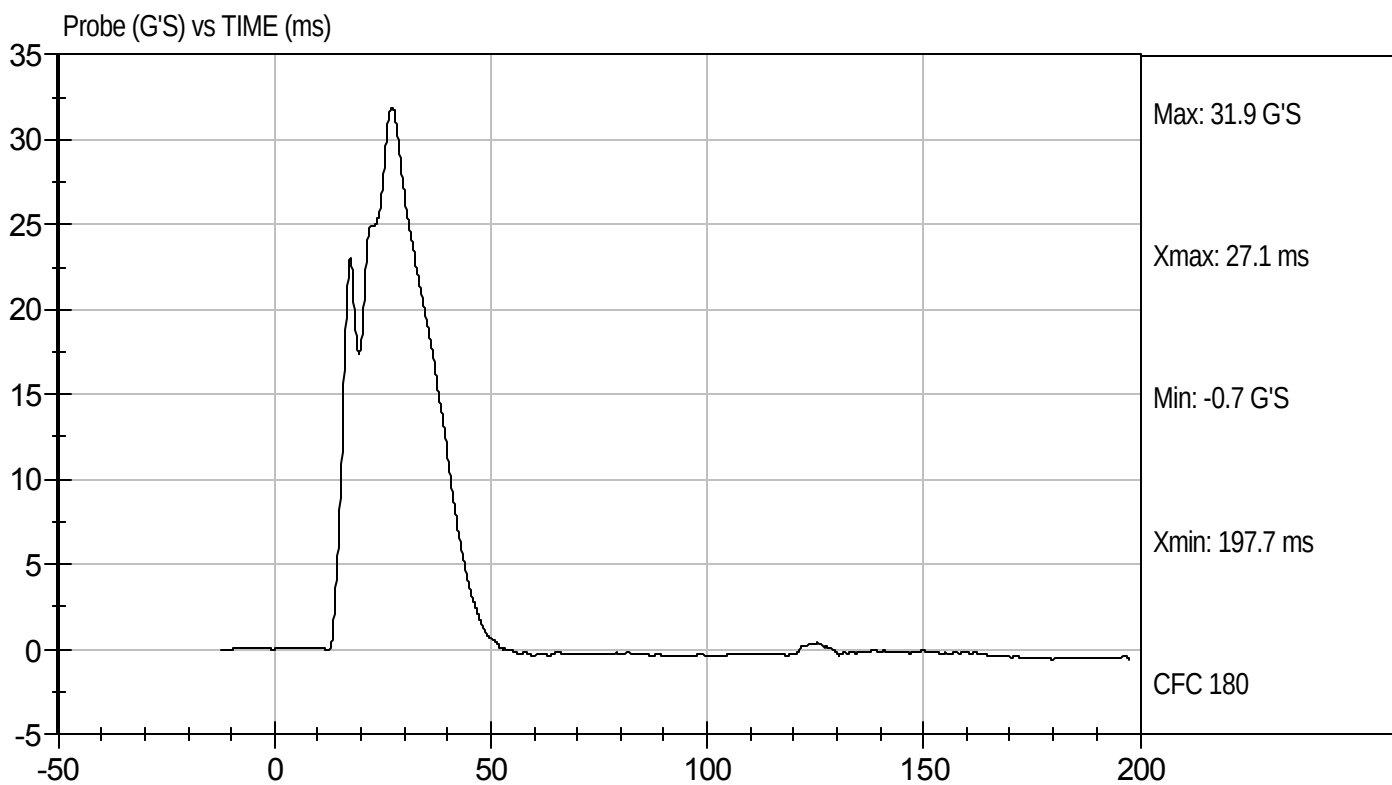
6/10/09
 Test Date


 Approved By



Test Desc: Thorax With Arm
Component ID: D091444

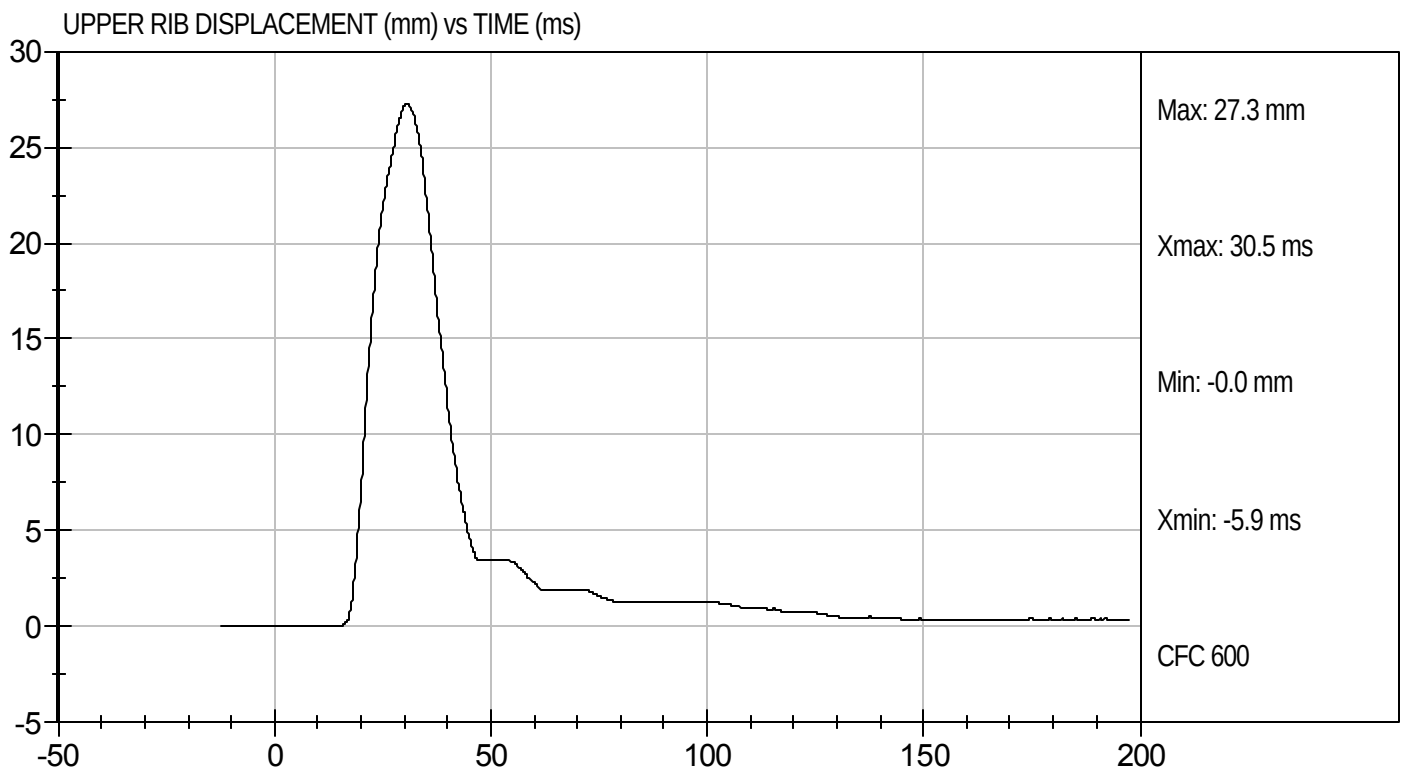
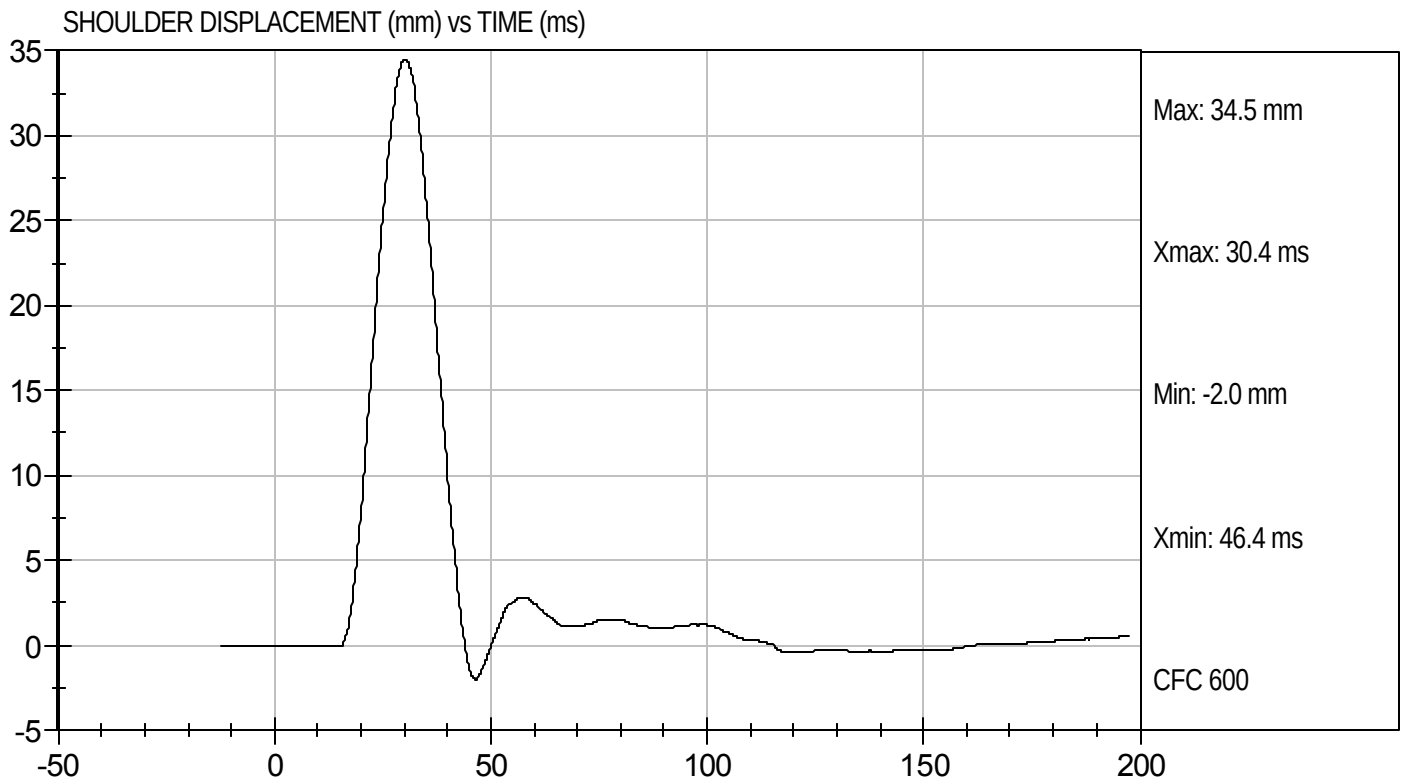
Test Date: 6/10/09
Velocity: 21.9 ft/s, 6.68 m/s





Test Desc: Thorax With Arm
Component ID: D091444

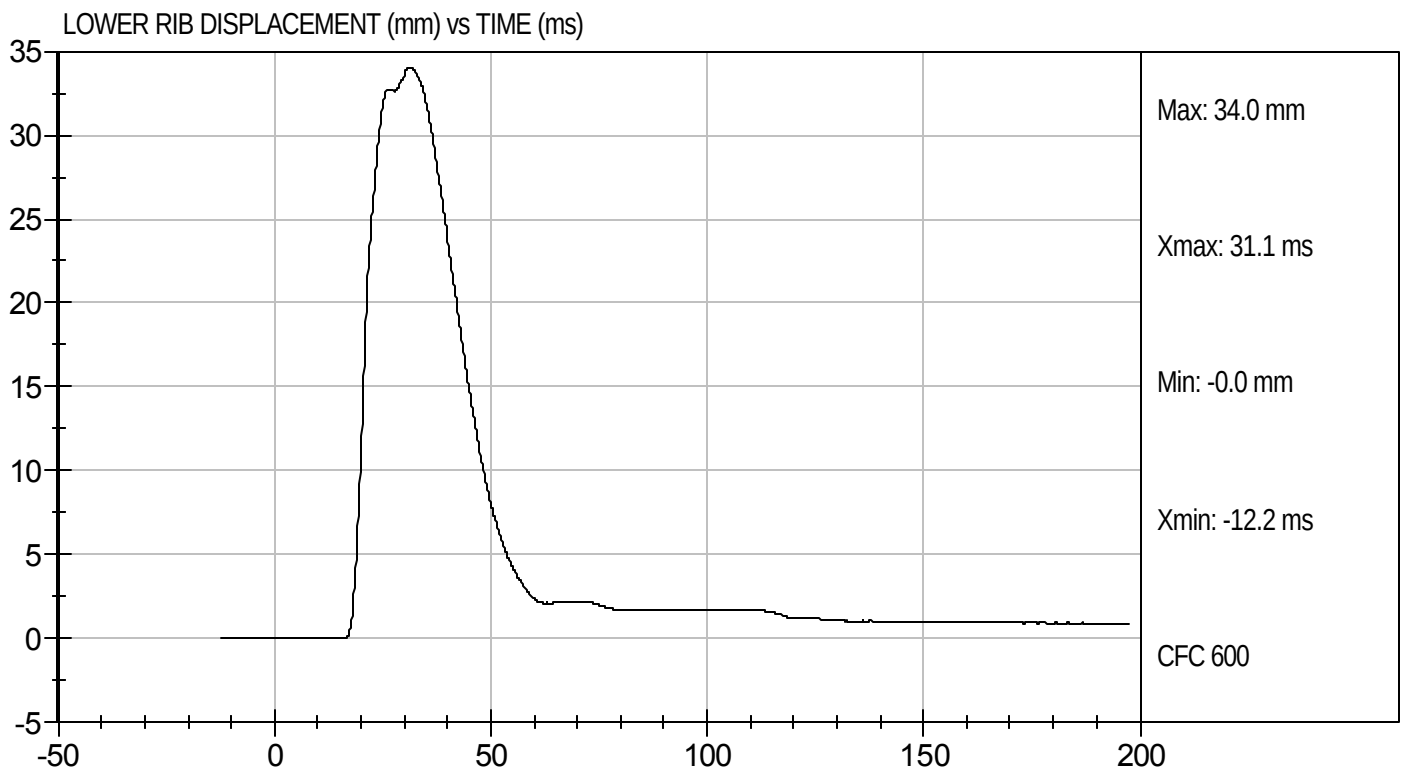
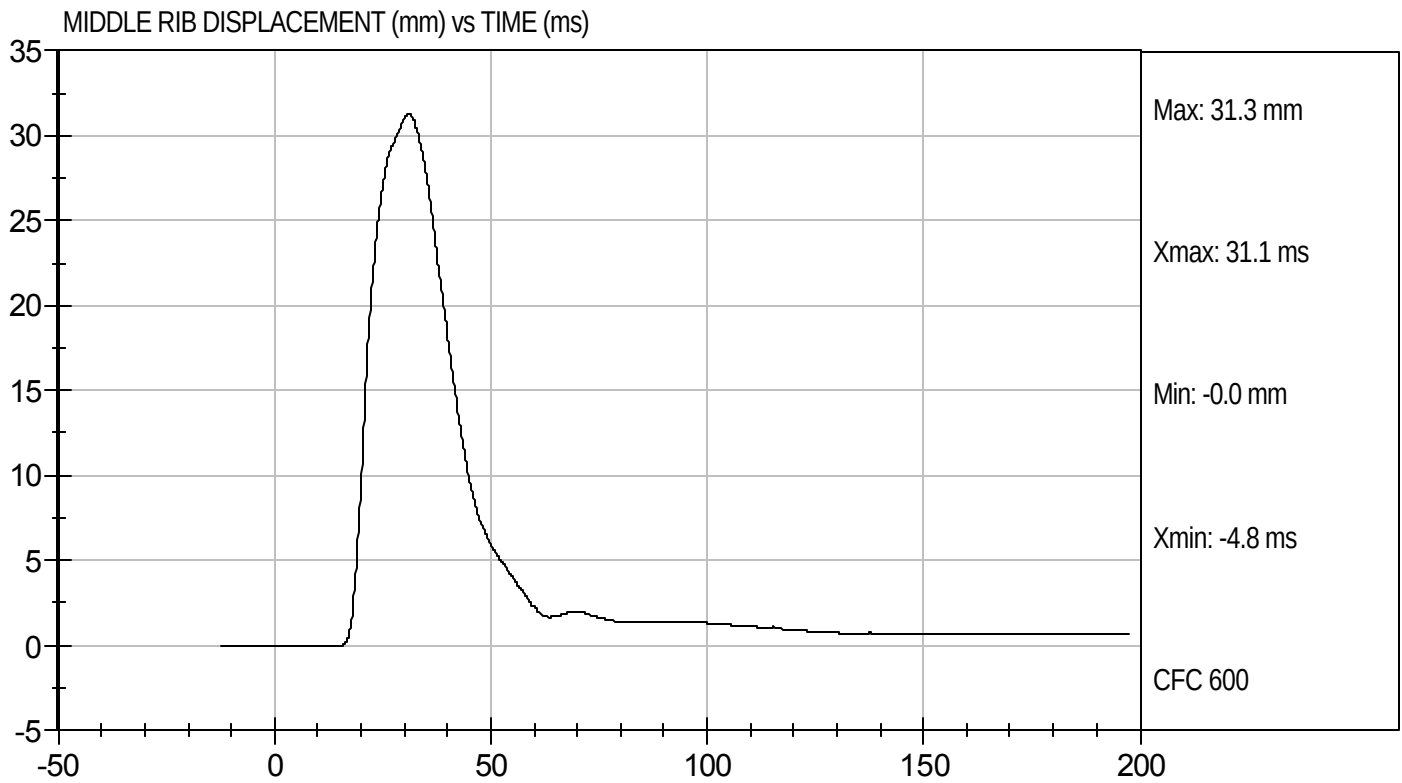
Test Date: 6/10/09
Velocity: 21.9 ft/s, 6.68 m/s





Test Desc: Thorax With Arm
Component ID: D091444

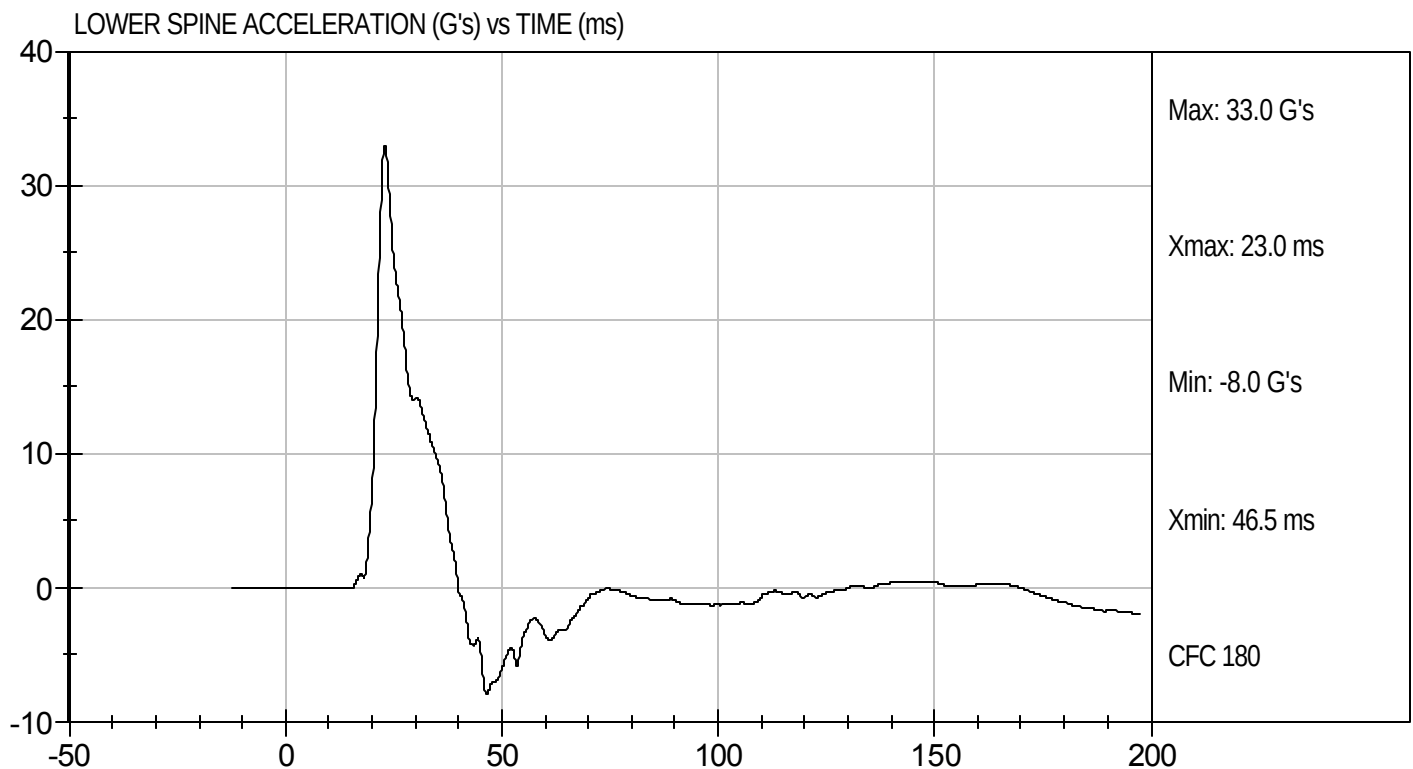
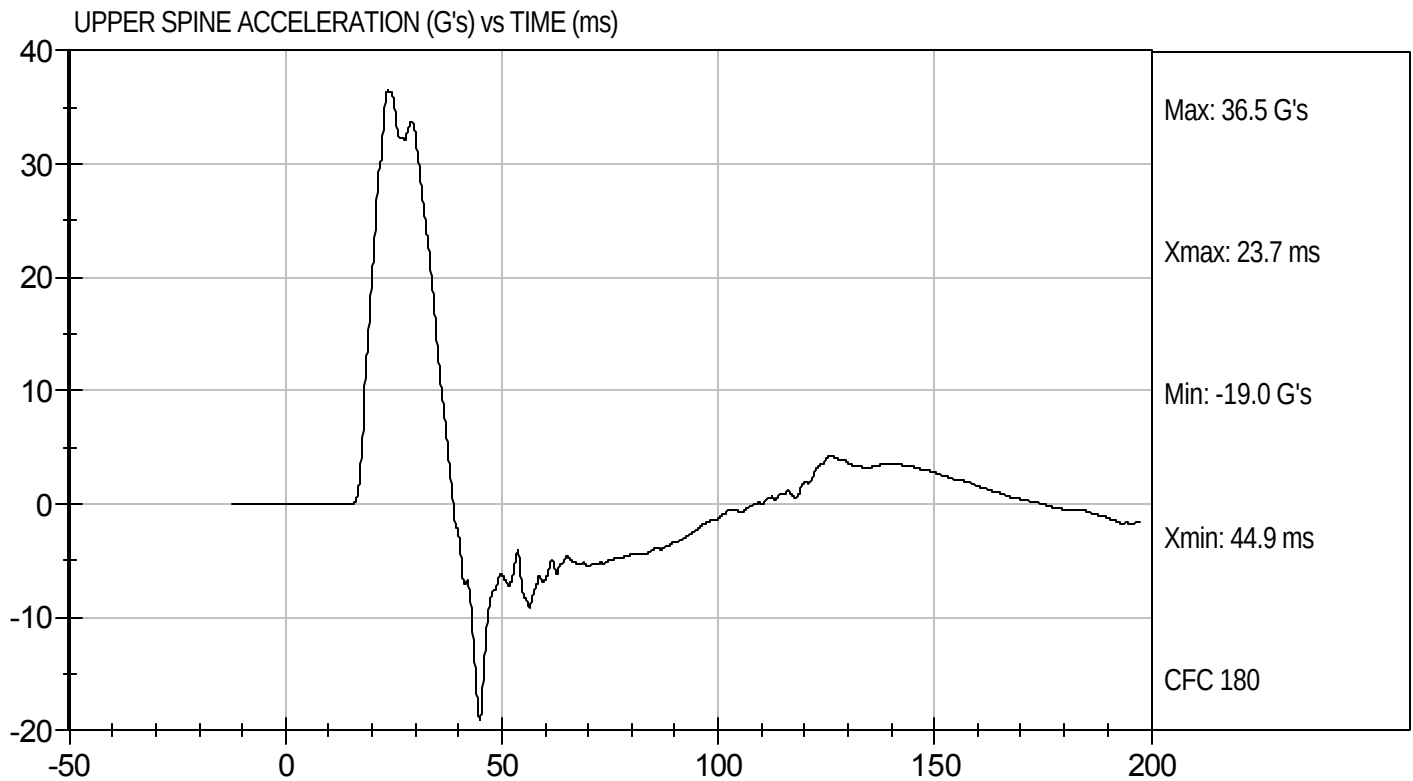
Test Date: 6/10/09
Velocity: 21.9 ft/s, 6.68 m/s





Test Desc: Thorax With Arm
Component ID: D091444

Test Date: 6/10/09
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: D091445

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	43	Pass
Impact Velocity	m/s	4.20 to 4.40	4.27	Pass
Peak Impactor Force	G's	14 to 18	15	Pass
Upper Rib Displacement	mm	32 to 40	36	Pass
Middle Rib Displacement	mm	39 to 45	42	Pass
Lower Rib Displacement	mm	35 to 43	40	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

Jessica Hall
Laboratory Technician

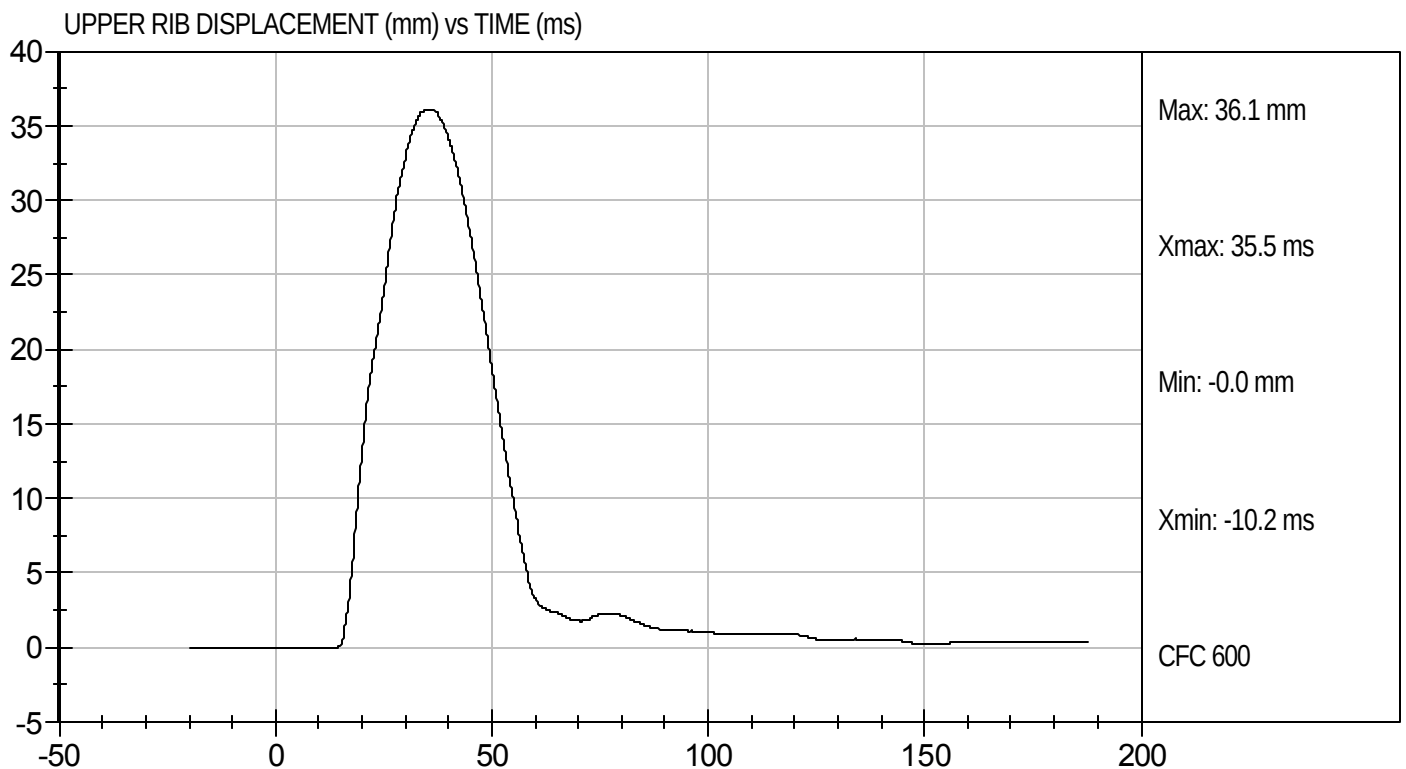
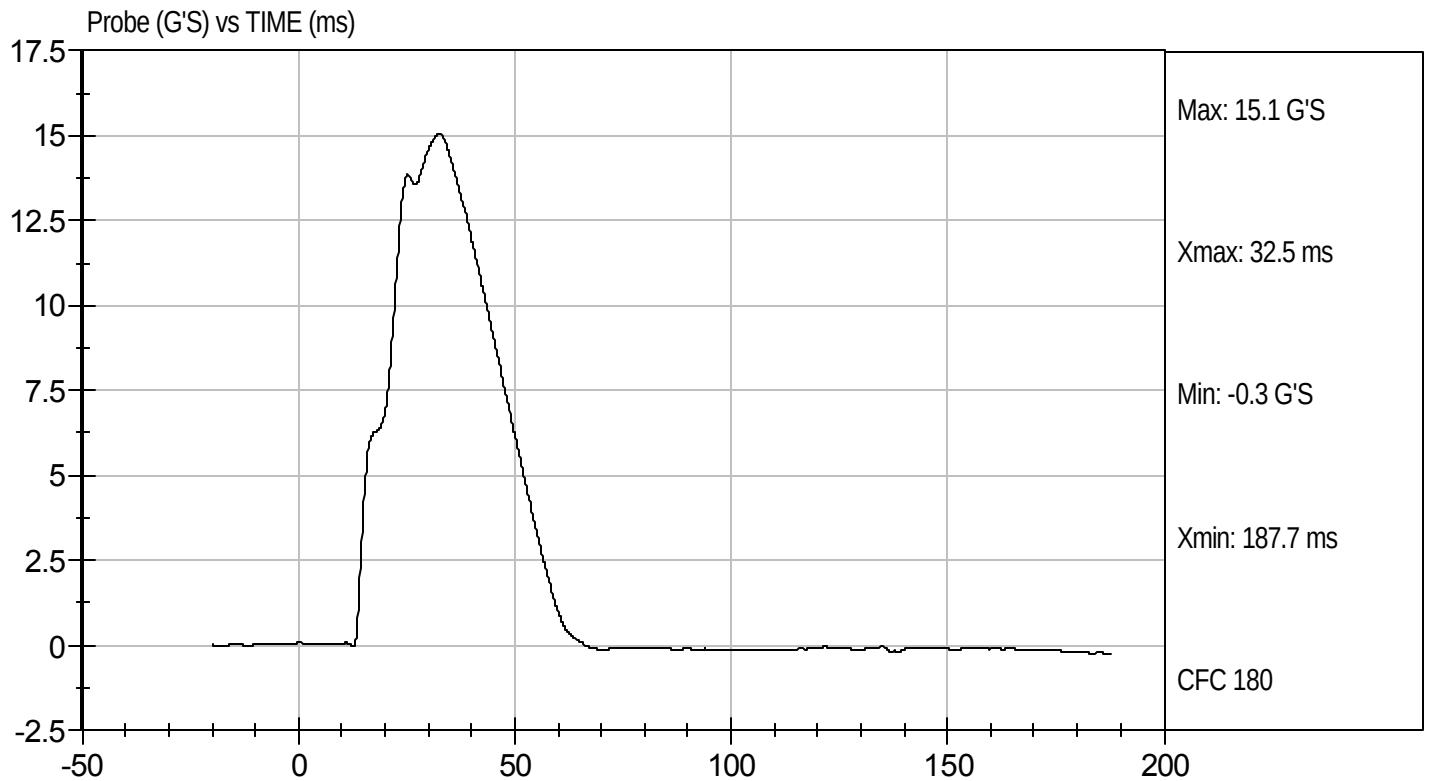
6/10/09
Test Date

David Winkelbauer
Approved By



Test Desc: Thorax Without Arm
Component ID: D091445

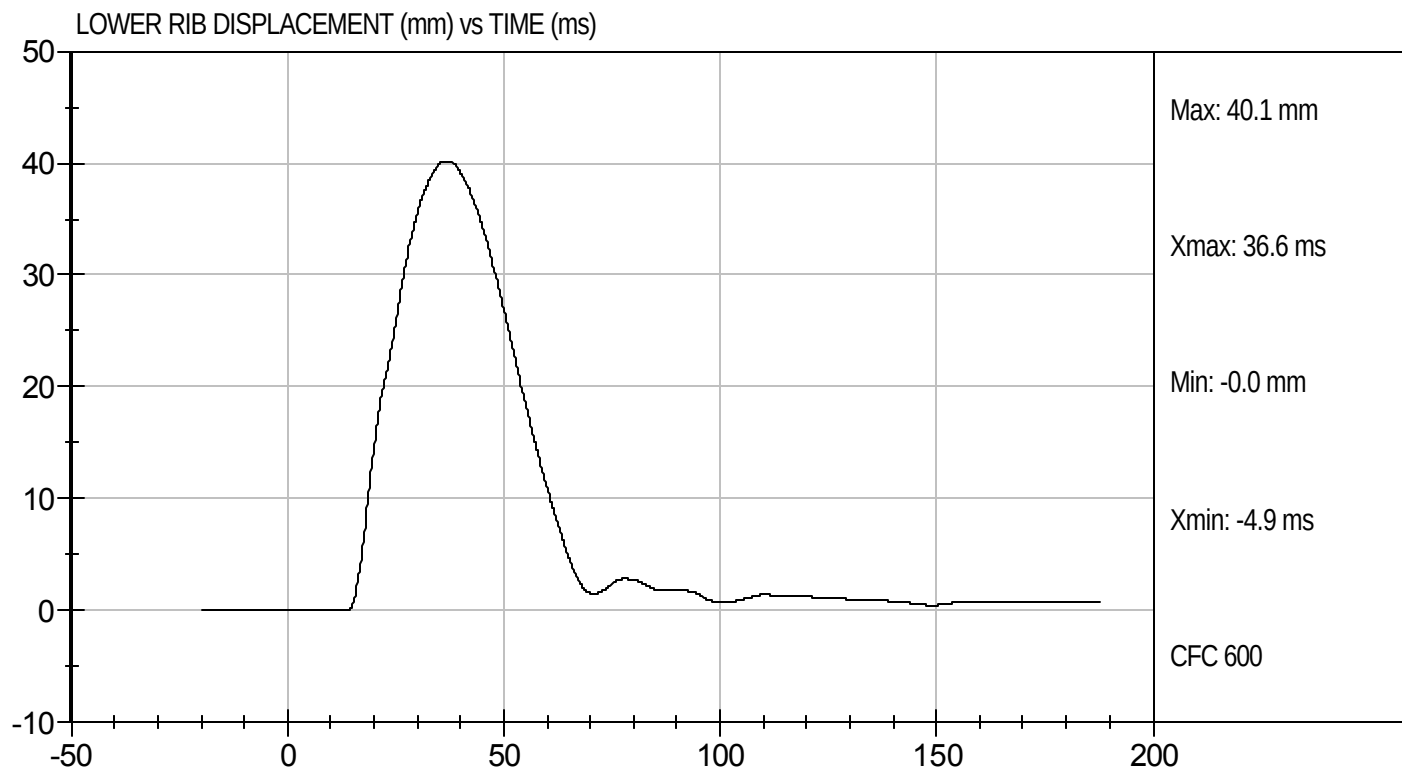
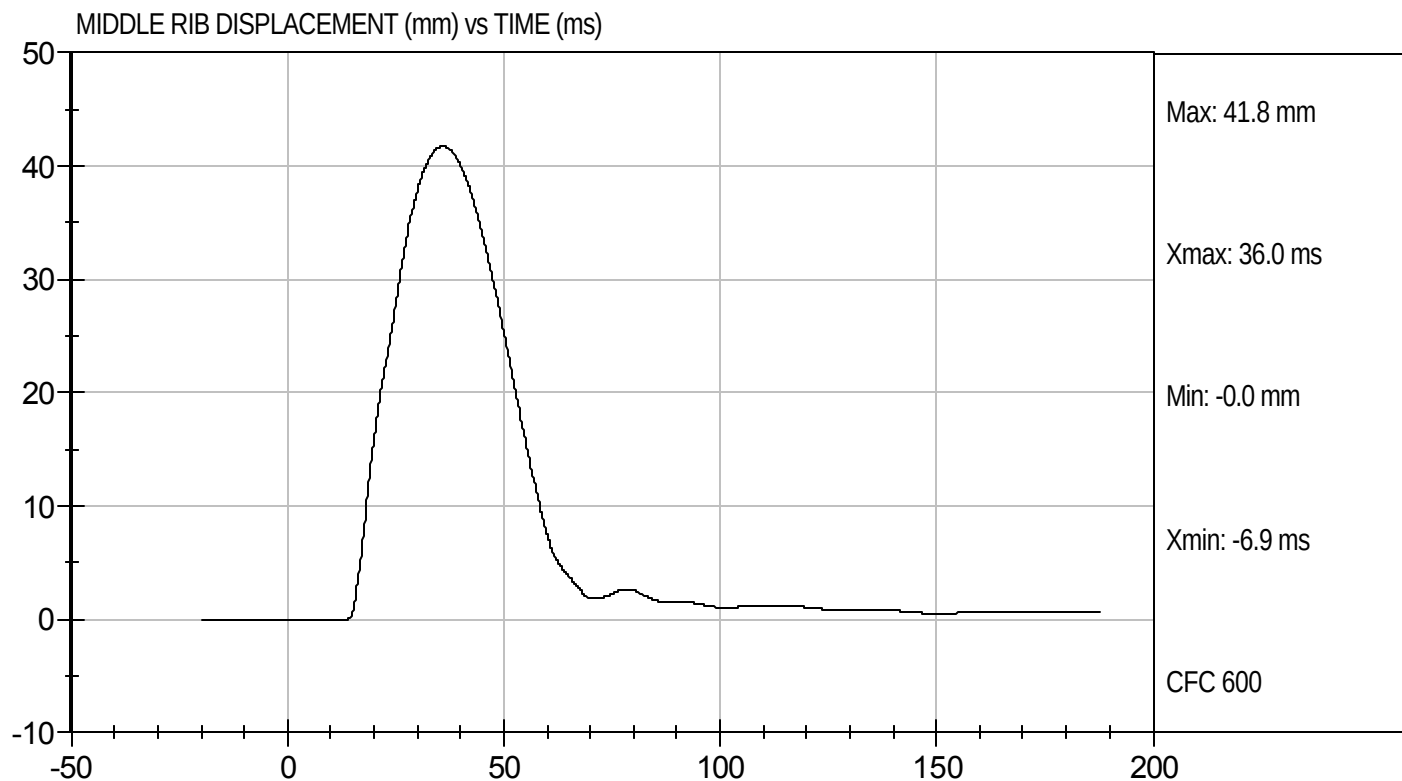
Test Date: 6/10/09
Velocity: 14.0 ft/s, 4.27 m/s





Test Desc: Thorax Without Arm
Component ID: D091445

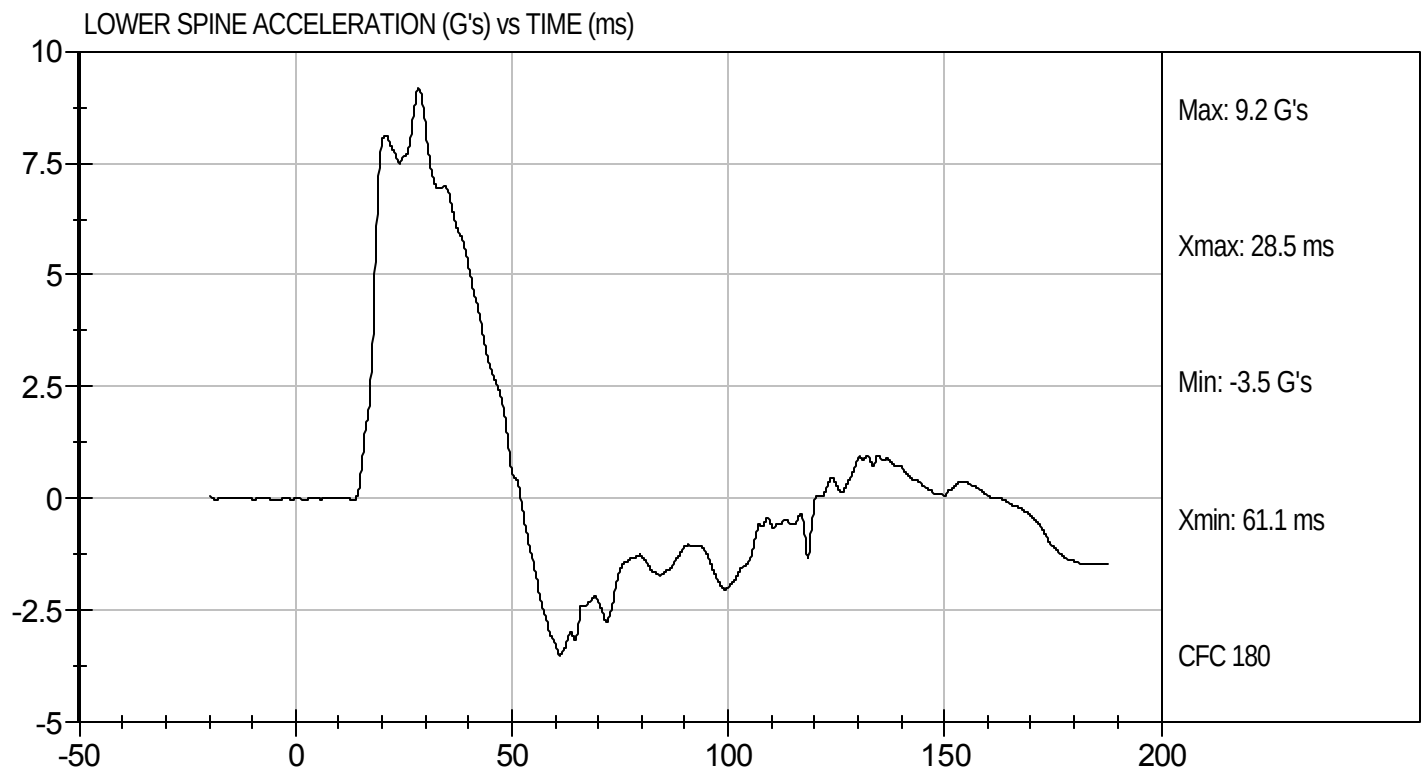
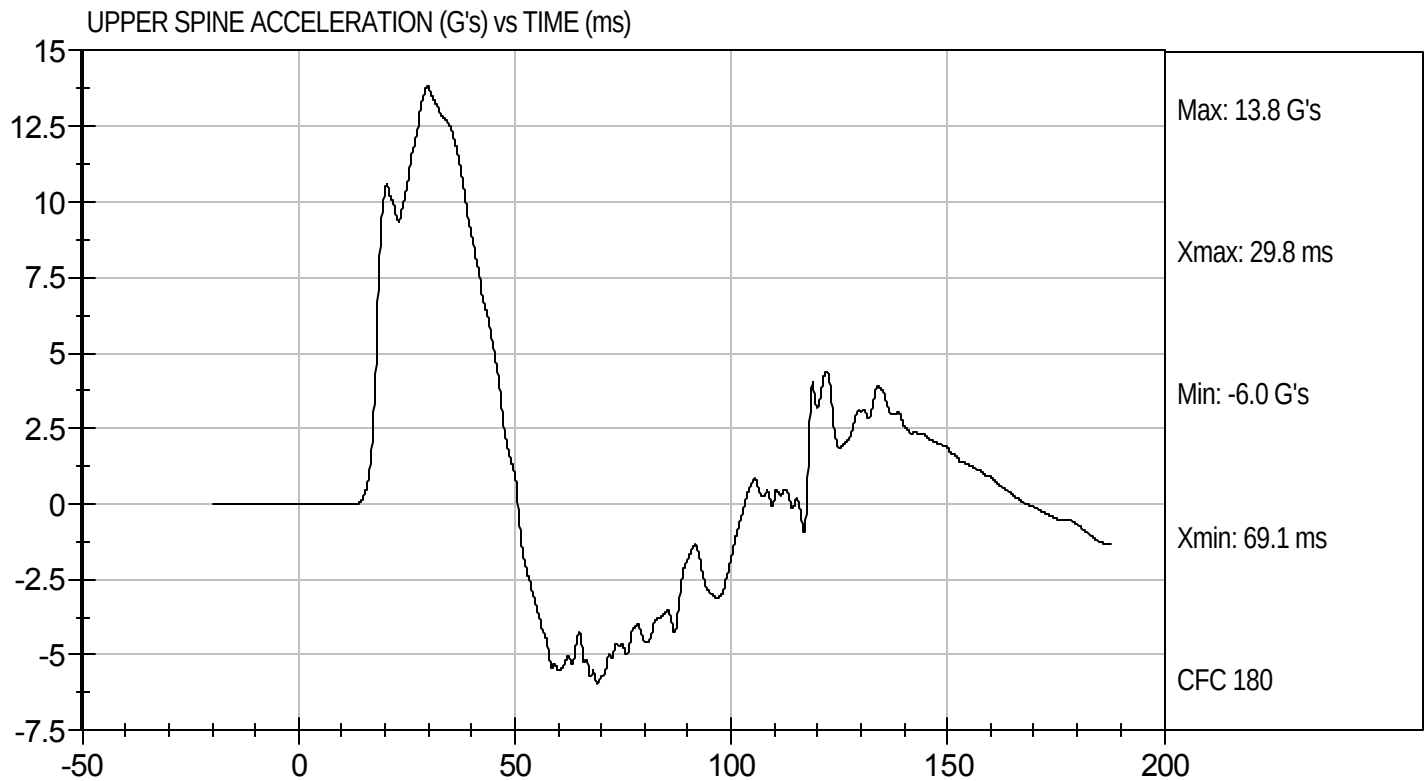
Test Date: 6/10/09
Velocity: 14.0 ft/s, 4.27 m/s





Test Desc: Thorax Without Arm
Component ID: D091445

Test Date: 6/10/09
Velocity: 14.0 ft/s, 4.27 m/s

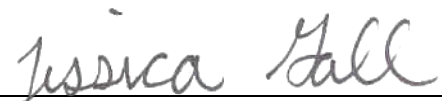


MGA RESEARCH CORPORATION
ABDOMINAL IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D091446

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	43	Pass
Impact Velocity	m/s	4.20 to 4.40	4.27	Pass
Peak Impactor Acceleration	G's	12 to 16	14	Pass
Upper Rib Displacement	mm	36 to 47	36	Pass
Lower Rib Displacement	mm	33 to 44	42	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	11	Pass
Overall Test Results				Pass


Laboratory Technician

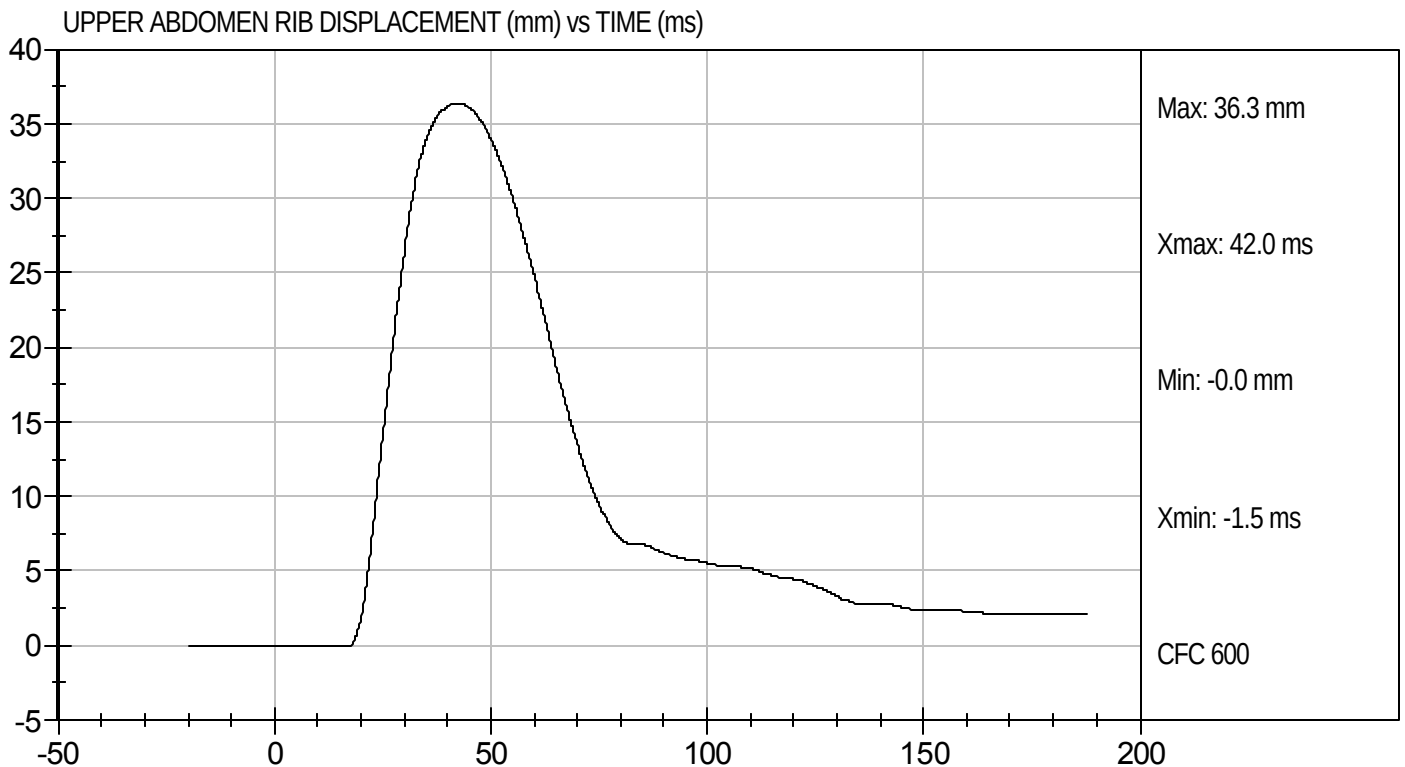
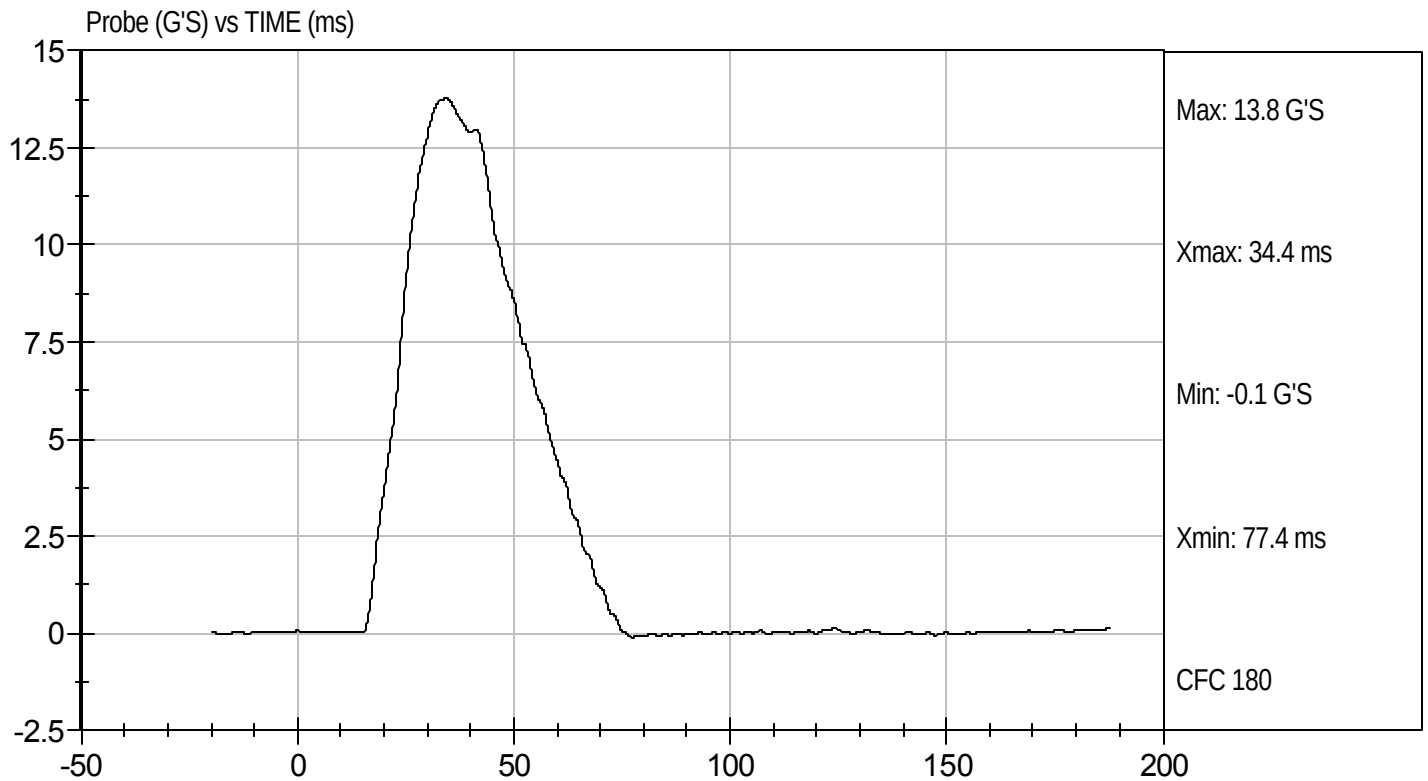
6/10/09
Test Date


Approved By



Test Desc: Abdomen Impact
Component ID: D091446

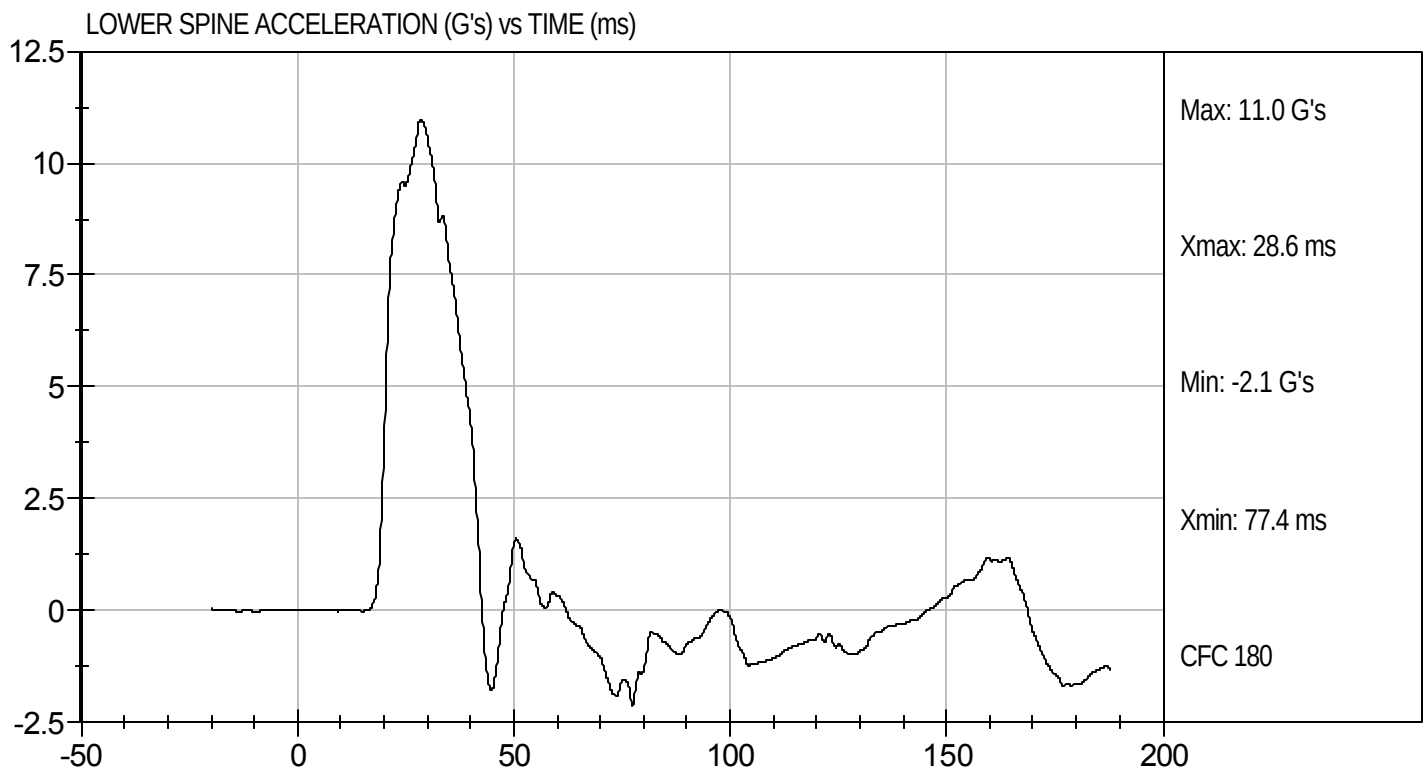
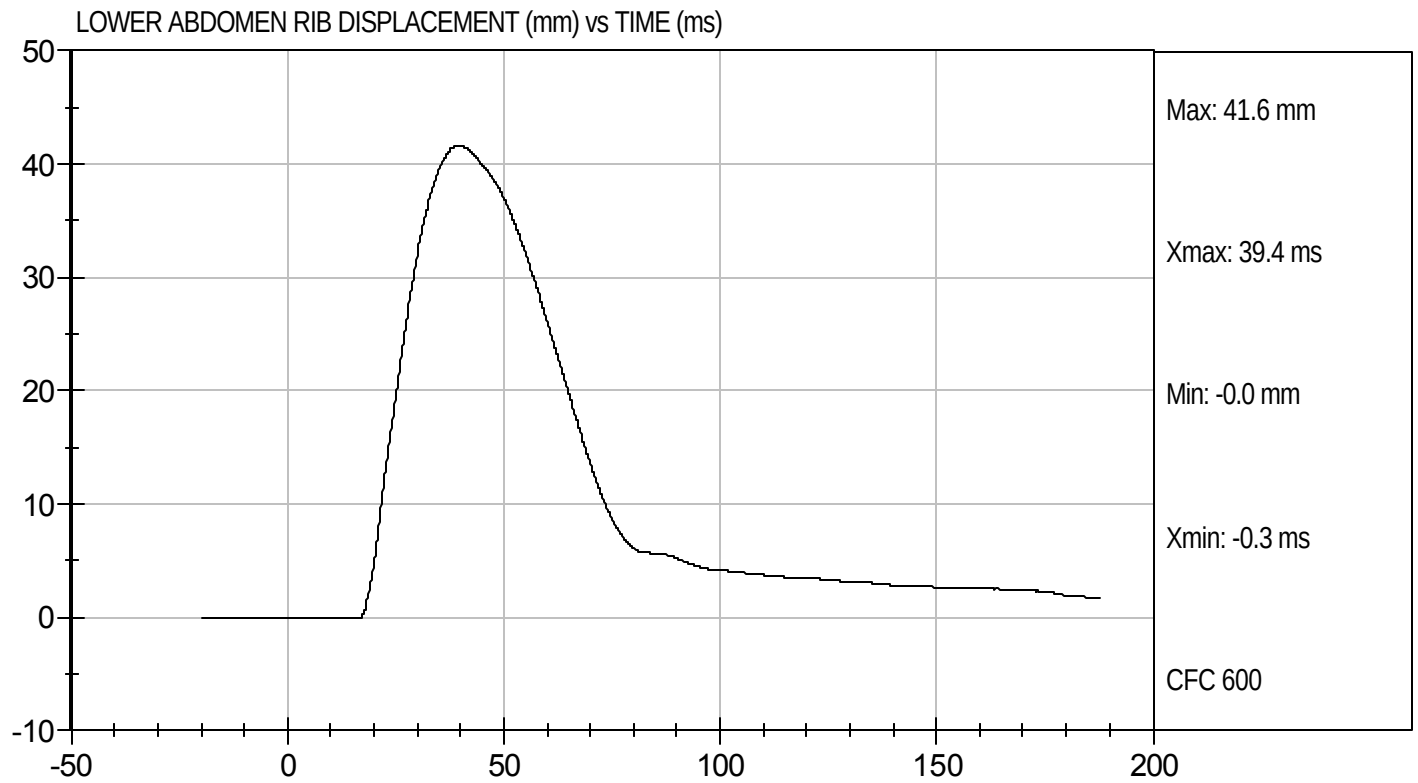
Test Date: 6/10/09
Velocity: 14.0 ft/s, 4.27 m/s





Test Desc: Abdomen Impact
Component ID: D091446

Test Date: 6/10/09
Velocity: 14.0 ft/s, 4.27 m/s



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

ATD Serial No: 296

Test I.D: D091447

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.6	Pass
Humidity	%	10 to 70	40	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Peak Impactor Acceleration	G's	38 to 47	42	Pass
Pelvis Y Acceleration after 6 ms	G's	34 to 42	39	Pass
Peak Acetabulum Force	N	3600 to 4300	4136	Pass
Overall Test Results				Pass


Laboratory Technician

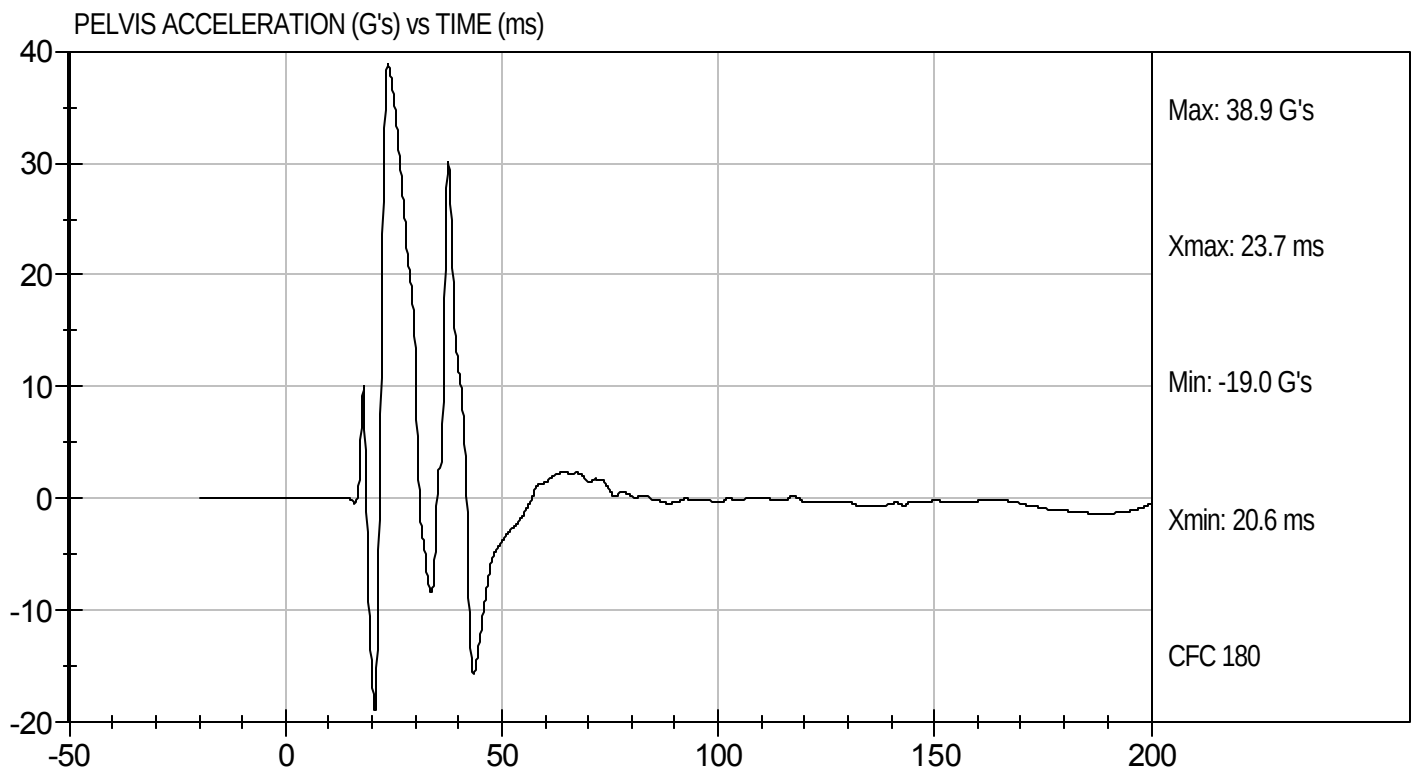
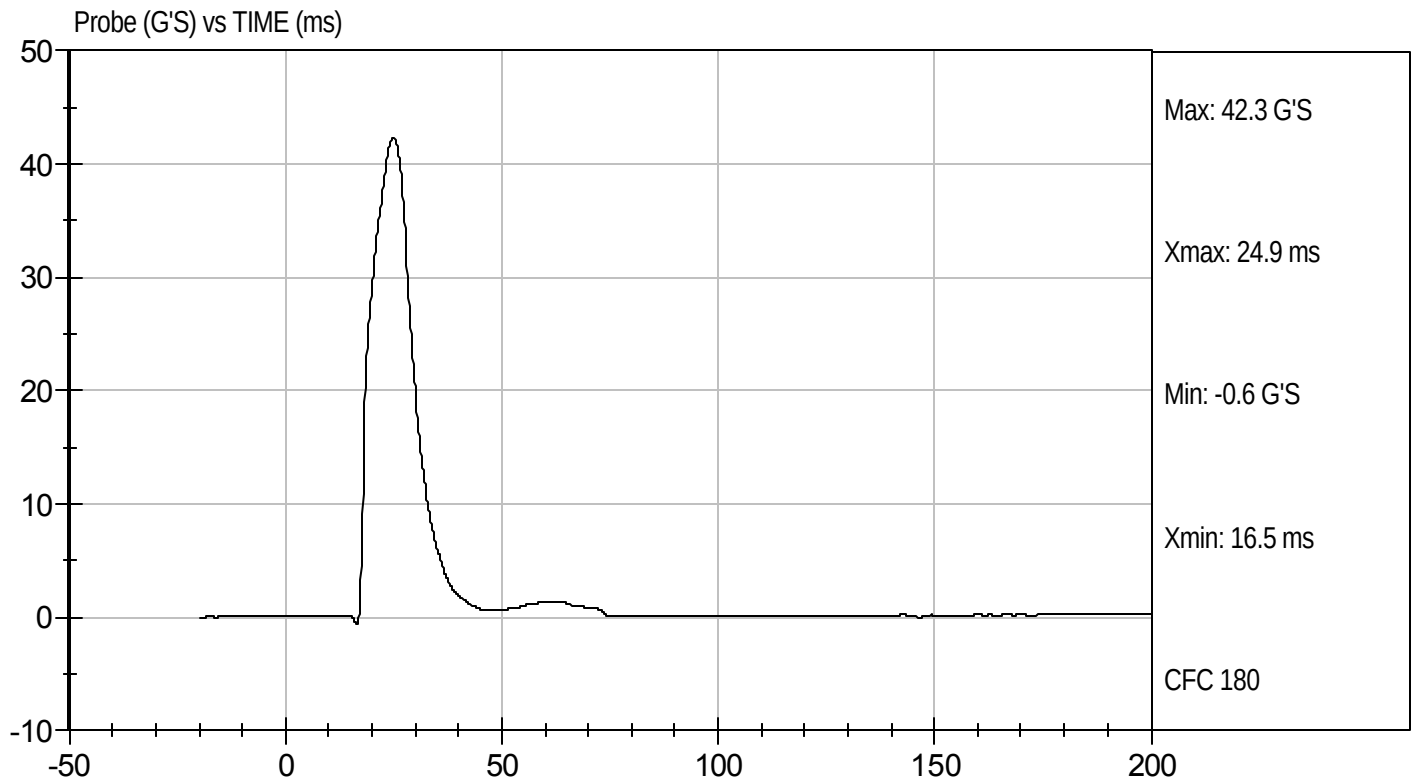
6/10/09
Test Date


Approved By



Test Desc: Pelvis Impact
Component ID: D091447

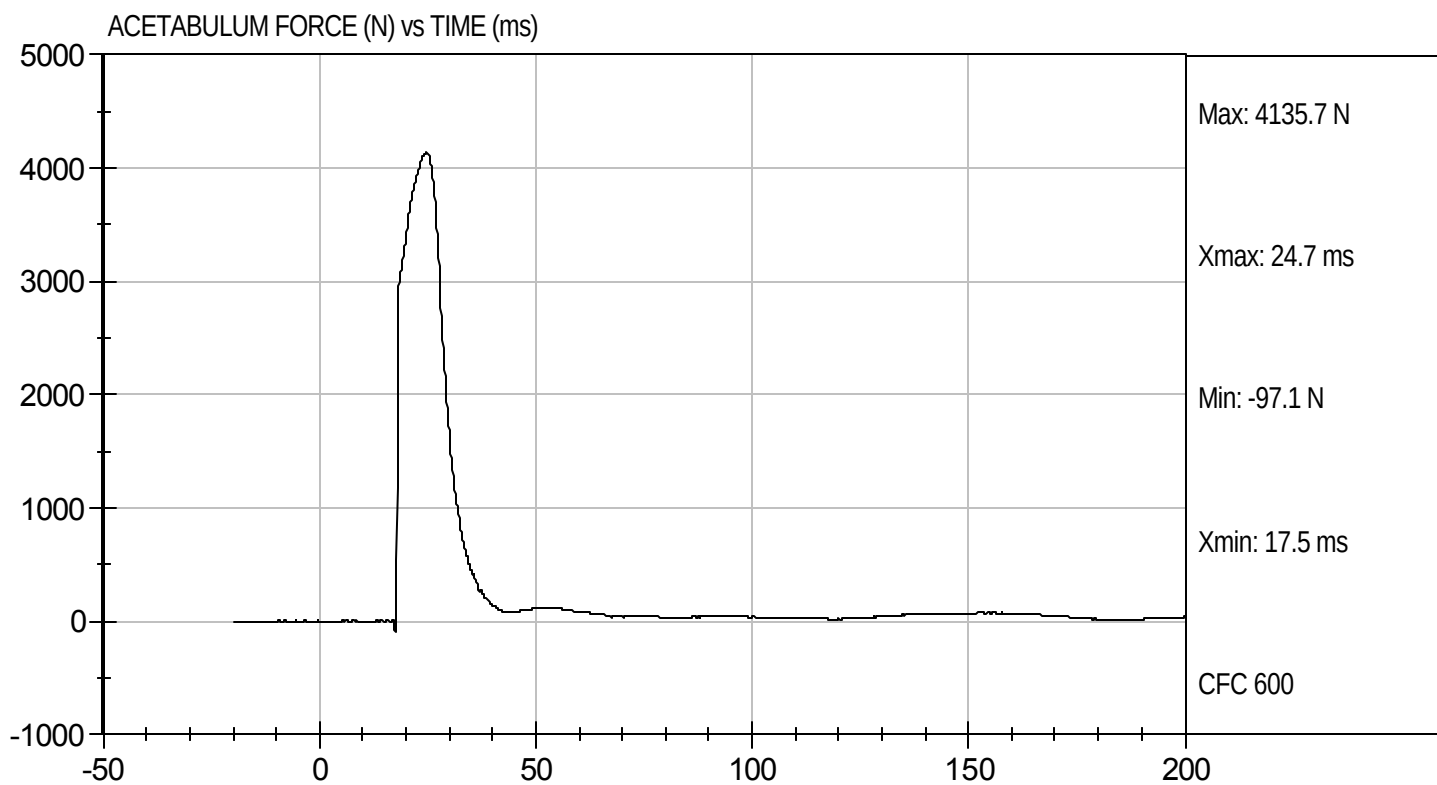
Test Date: 6/10/09
Velocity: 22.2 ft/s, 6.77 m/s





Test Desc: Pelvis Impact
Component ID: D091447

Test Date: 6/10/09
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: D091448

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Humidity	%	10 to 70	40	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	34	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4561	Pass
Overall Test Results				Pass


Laboratory Technician

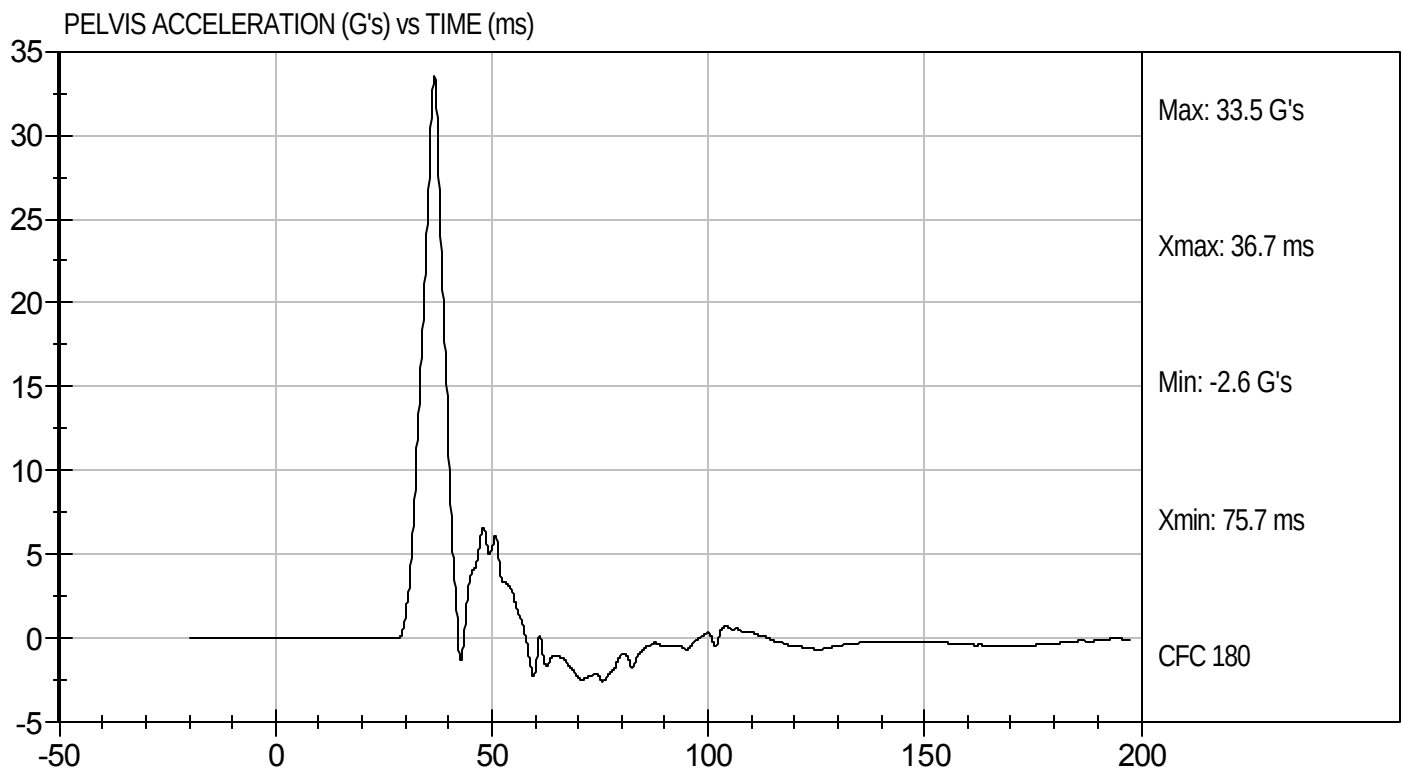
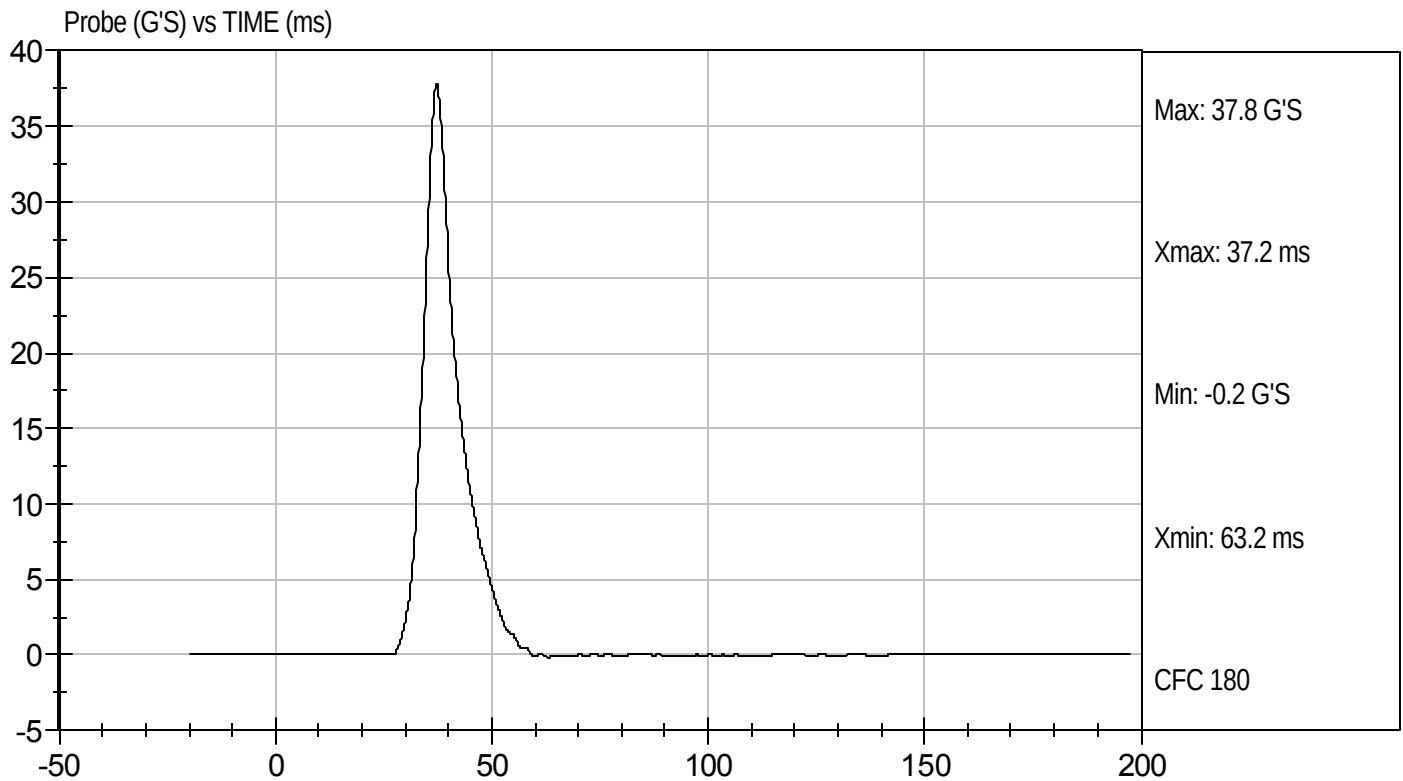
6/10/09
Test Date


Approved By



Test Desc: Iliac Impact
Component ID: D091448

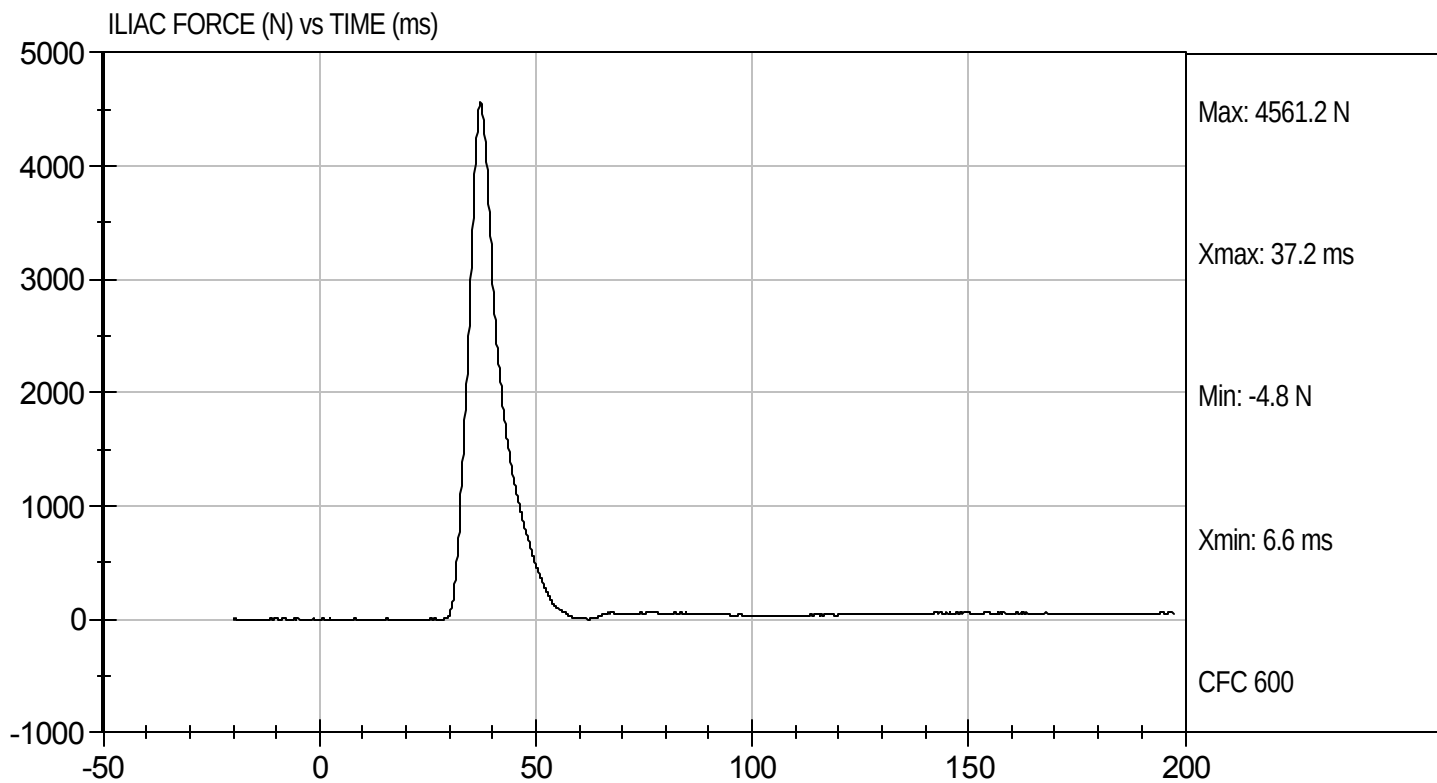
Test Date: 6/10/09
Velocity: 14.1 ft/s, 4.30 m/s





Test Desc: Iliac Impact
Component ID: D091448

Test Date: 6/10/09
Velocity: 14.1 ft/s, 4.30 m/s



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

ATD Serial No: 296

Test ID: D091491

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Peak Resultant Acceleration	G's	115 to 137	117	Pass
Peak Lateral Acceleration	G's	+/- 15	-5.6	Pass
Unimodal	N/A	<15%	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

6/15/09
Test Date

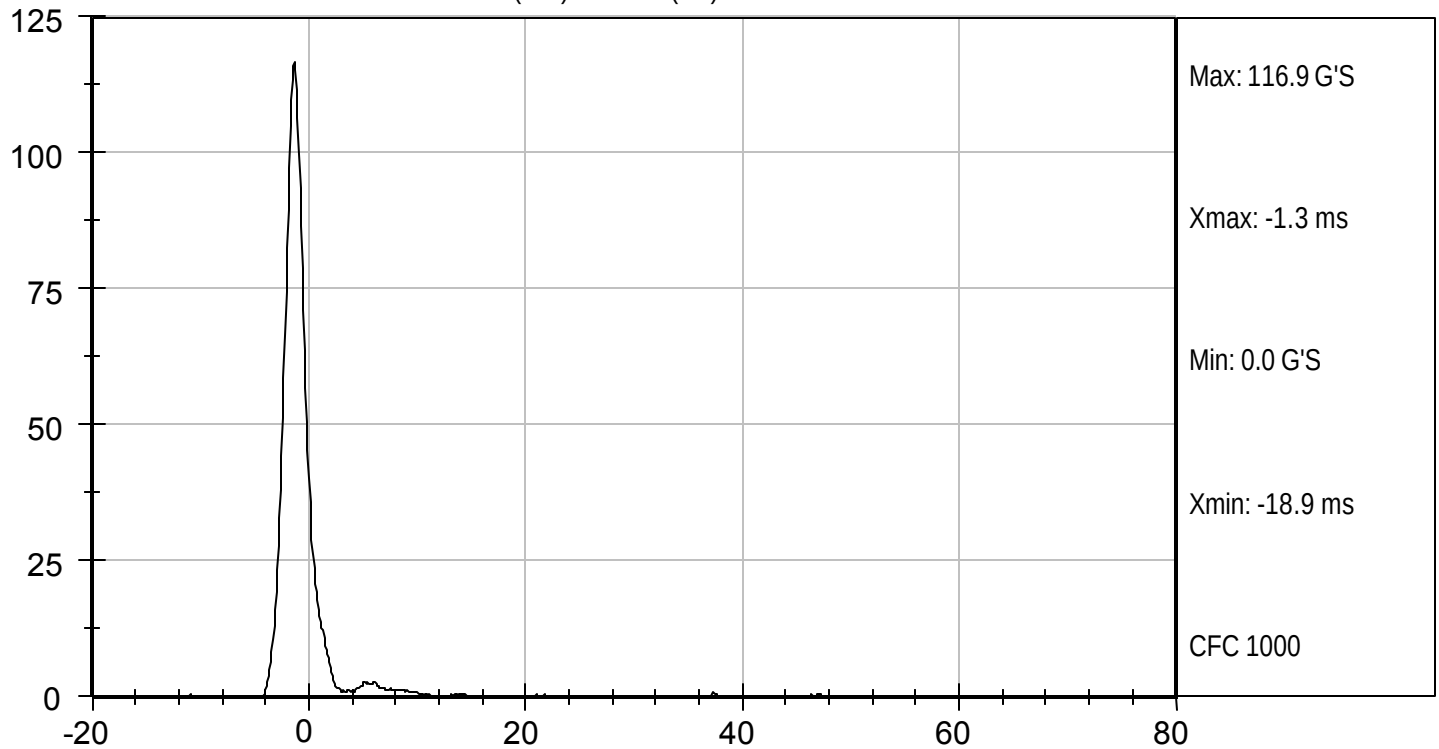

Approved By



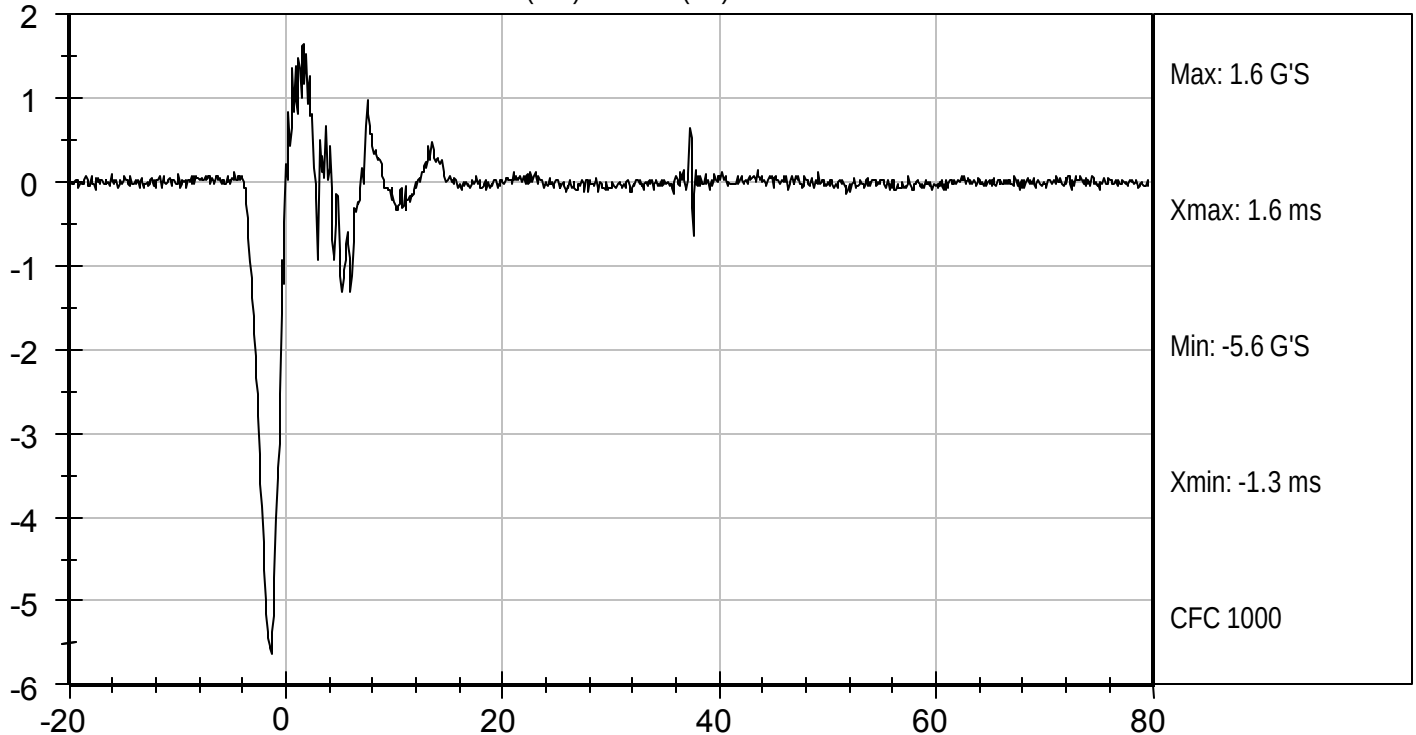
Test Desc: Head Drop
Component ID: D091491

Test Date: 6/15/09
Velocity: 0 ft/s, 0 m/s

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



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

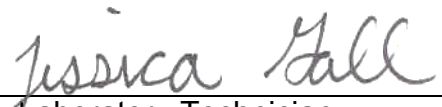


MGA RESEARCH CORPORATION
LATERAL NECK PENDULUM TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D091492

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.9	Pass
Humidity		%	10 to 70	47	Pass
Impact Velocity		m/s	5.51 to 5.63	5.58	Pass
Delta Velocity	10 msec	m/s	2.20 to 2.80	2.58	Pass
	15 msec	m/s	3.30 to 4.10	3.62	Pass
	20 msec	m/s	4.40 to 5.40	4.90	Pass
	25 msec	m/s	5.40 to 6.10	5.62	Pass
	25-100 msec	m/s	5.50 to 6.20	5.63	Pass
Maximum D-Plane Rotation		deg	71 to 81	71	Pass
Time of Maximum D-Plane Rotation		msec	50 to 70	59	Pass
Maximum Occipital Condyle Moment during Rotation Interval		Nm	-44 to -36	-41	Pass
Time of Moment Decay to 0 Nm		msec	102 to 126	114	Pass
Overall Test Results					Pass


 Laboratory Technician

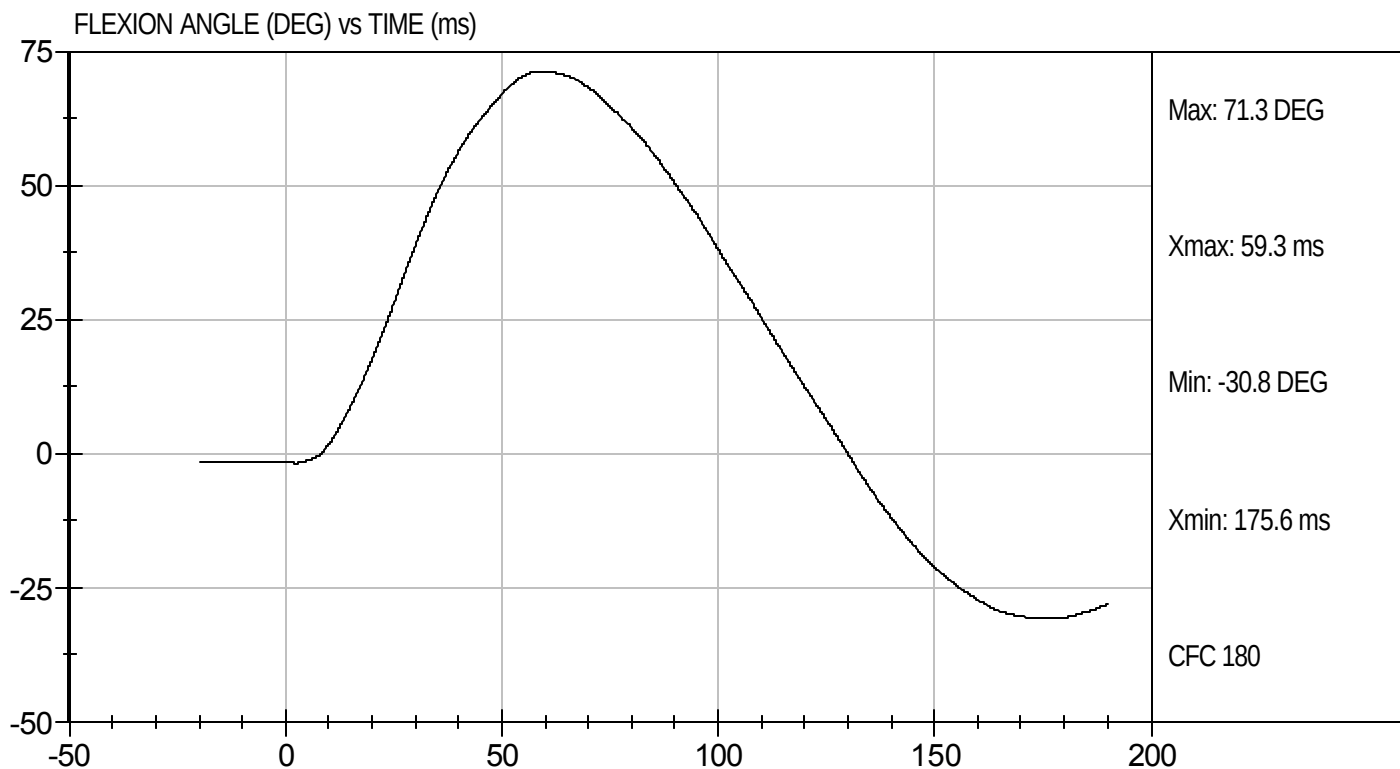
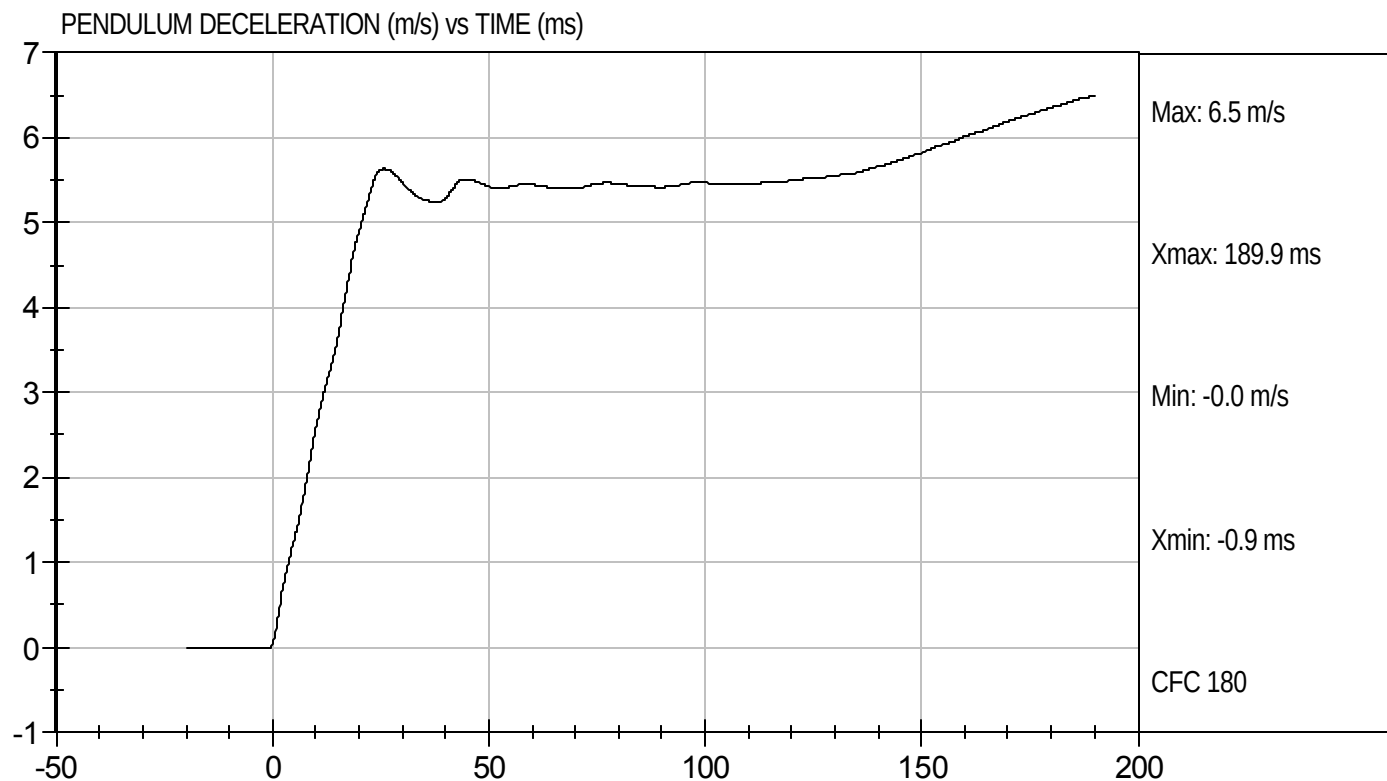
6/15/09
 Test Date


 Approved By



Test Desc: Neck Bending
Component ID: D091492

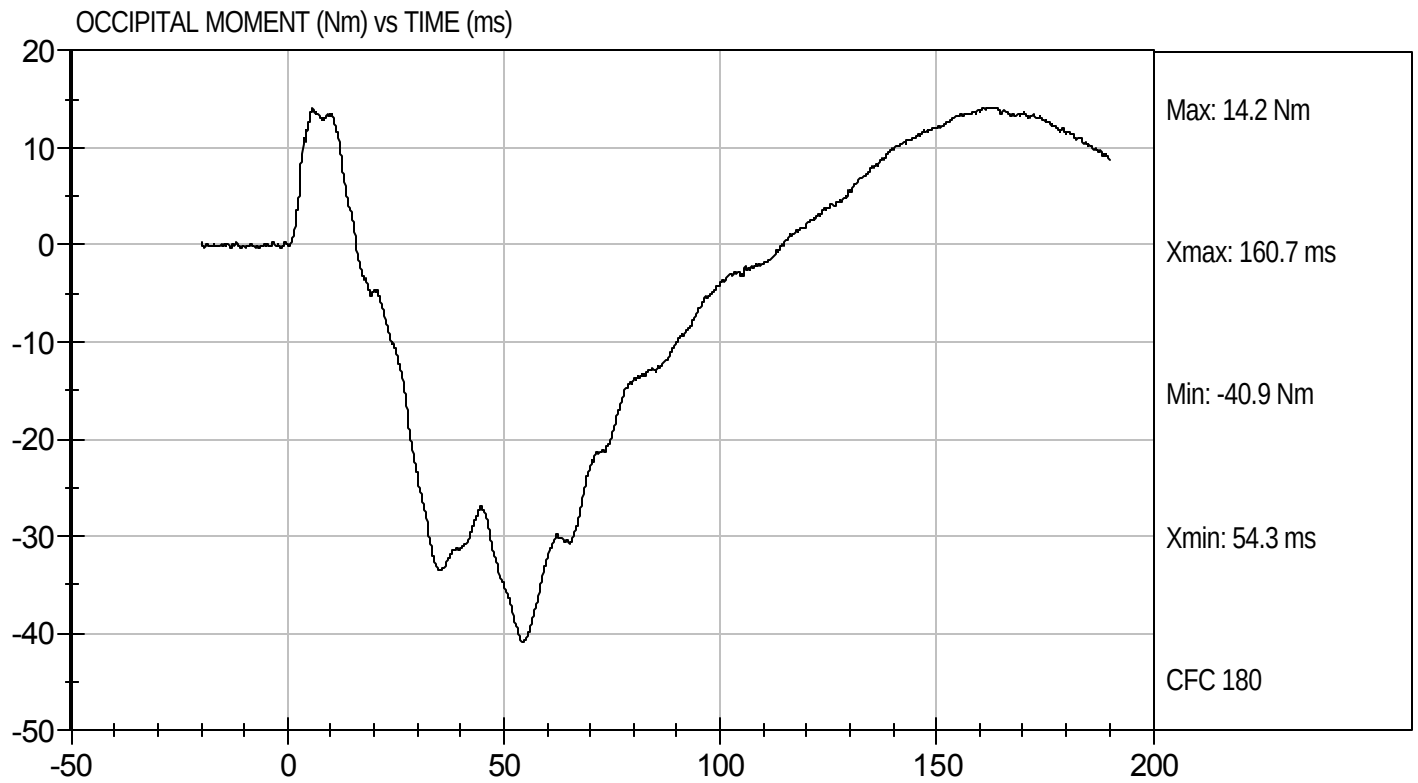
Test Date: 6/15/09
Velocity: 18.3 ft/s, 5.58 m/s





Test Desc: Neck Bending
Component ID: D091492

Test Date: 6/15/09
Velocity: 18.3 ft/s, 5.58 m/s



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

ATD Serial No: 296

Test ID: D091493

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	46	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	32	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	18	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

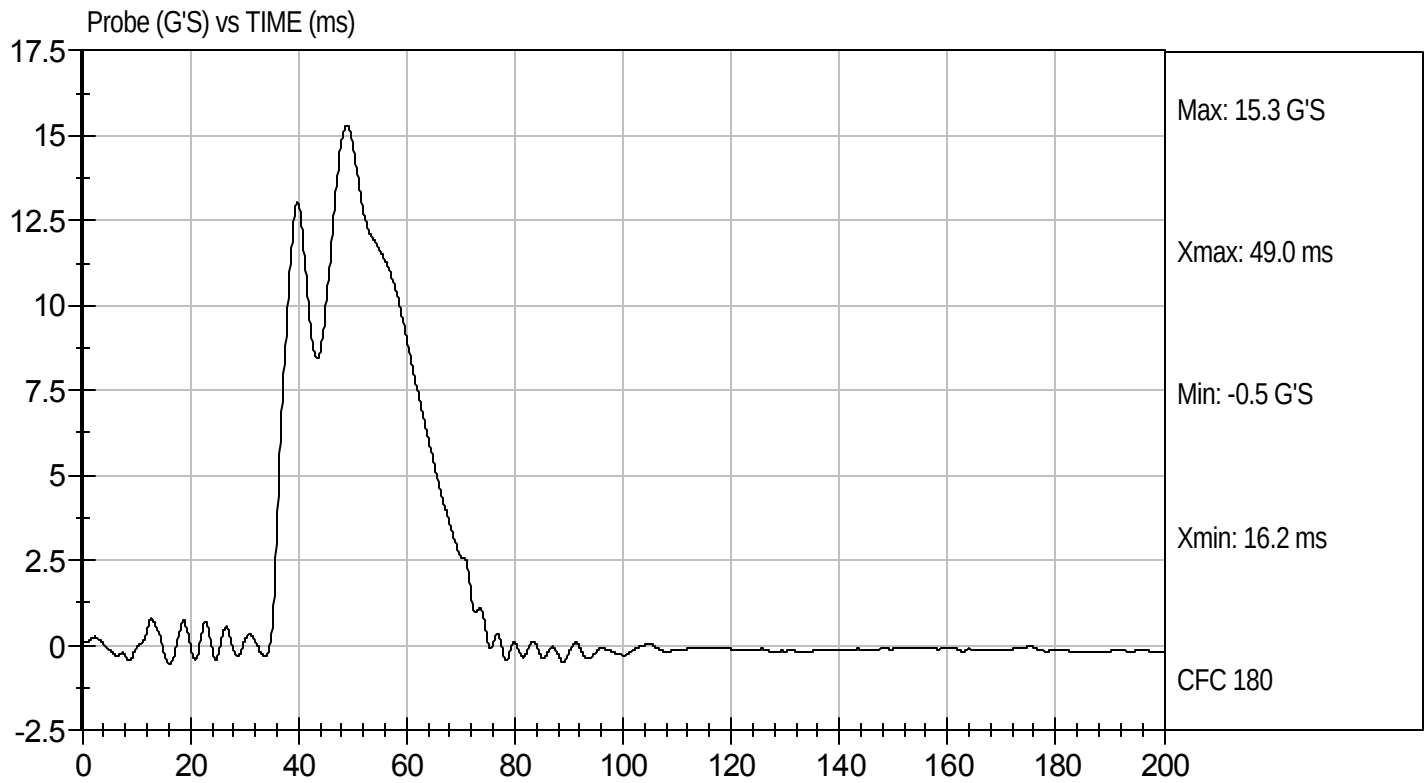
6/15/09
Test Date

David Winkelbauer
Approved By



Test Desc: Shoulder Impact
Component ID: D091493

Test Date: 6/15/09
Velocity: 14.01 ft/s, 4.23 m/s

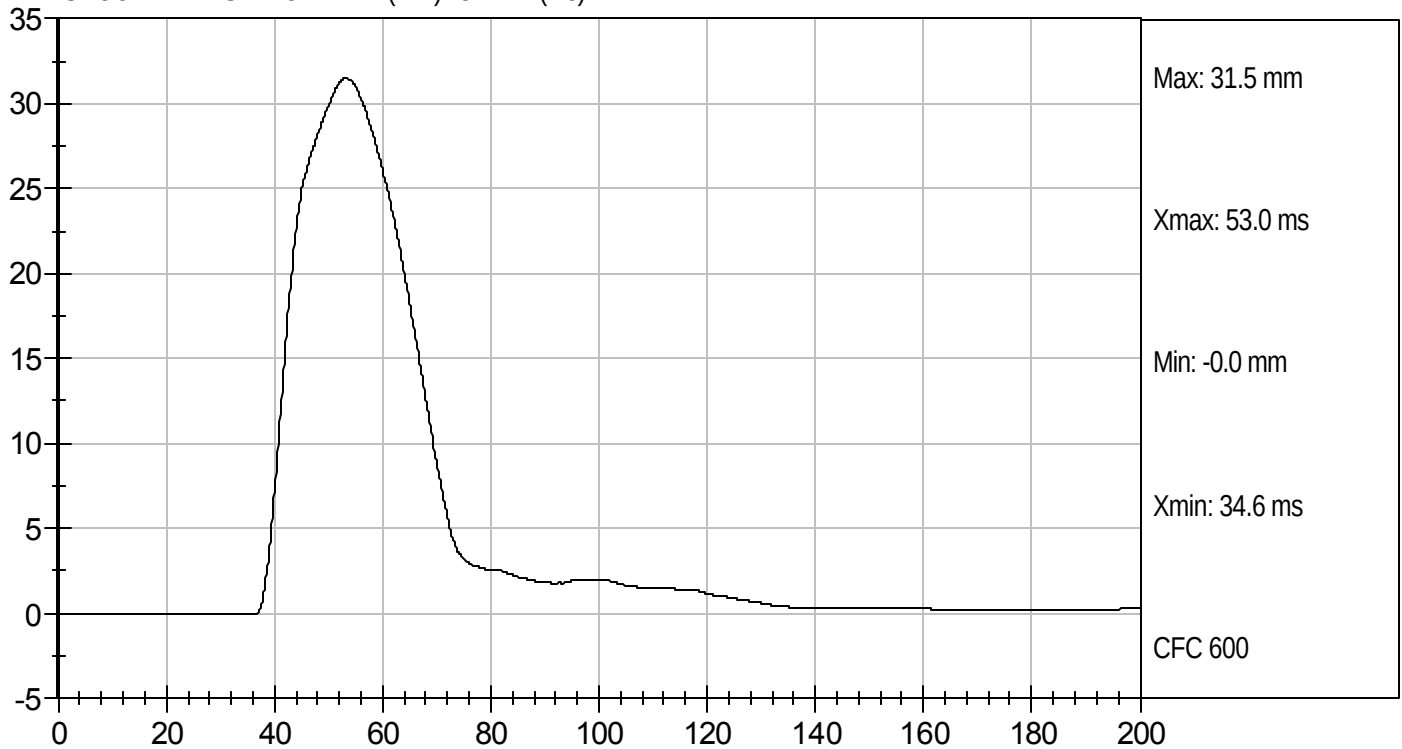




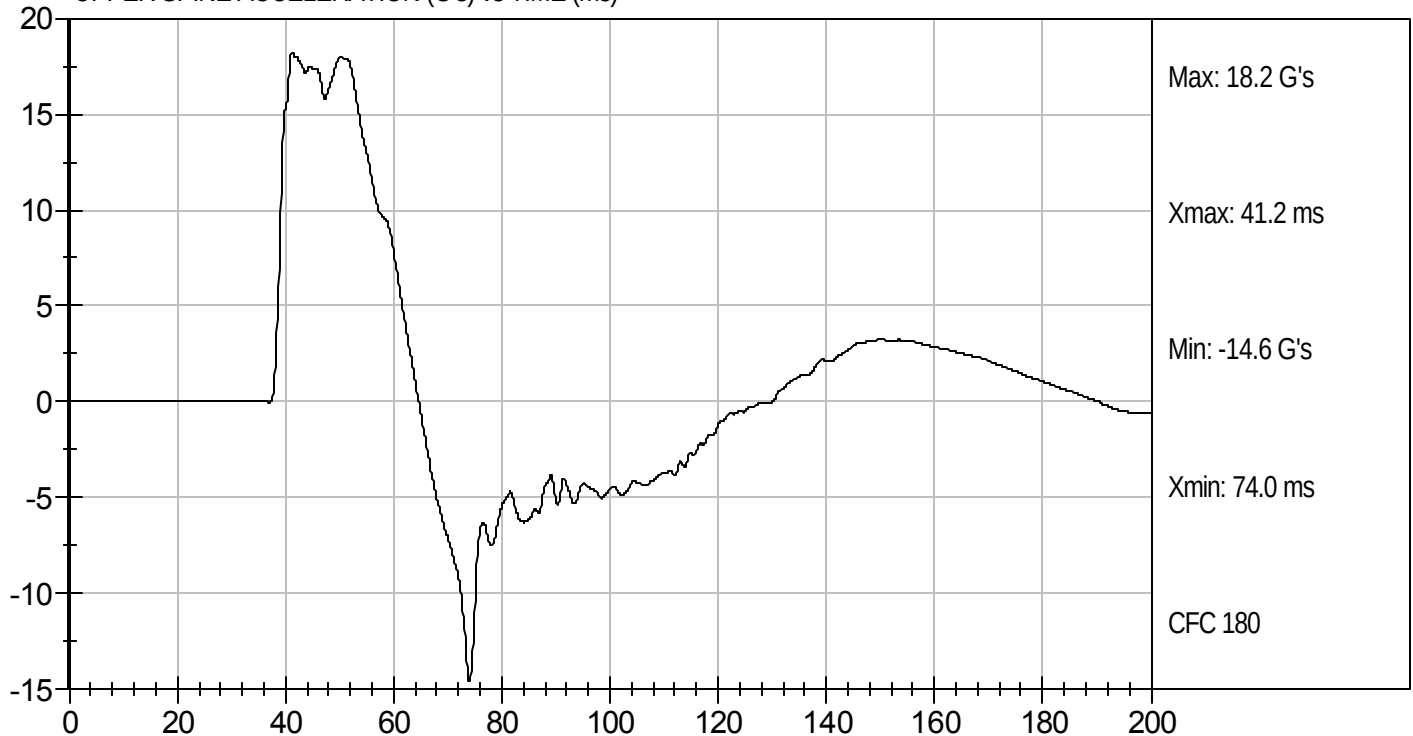
Test Desc: Shoulder Impact
Component ID: D091493

Test Date: 6/15/09
Velocity: 14.01 ft/s, 4.23 m/s

SHOULDER DISPLACEMENT (mm) vs TIME (ms)



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

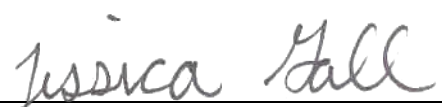


MGA RESEARCH CORPORATION
THORAX (WITH ARM) IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D091494

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.8	Pass
Humidity	%	10 to 70	47	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Peak Impactor Acceleration	G's	30 to 36	33	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	31	Pass
Lower Rib Displacement	mm	32 to 38	33	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	37	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	33	Pass
Overall Test Results			Pass	


 Laboratory Technician

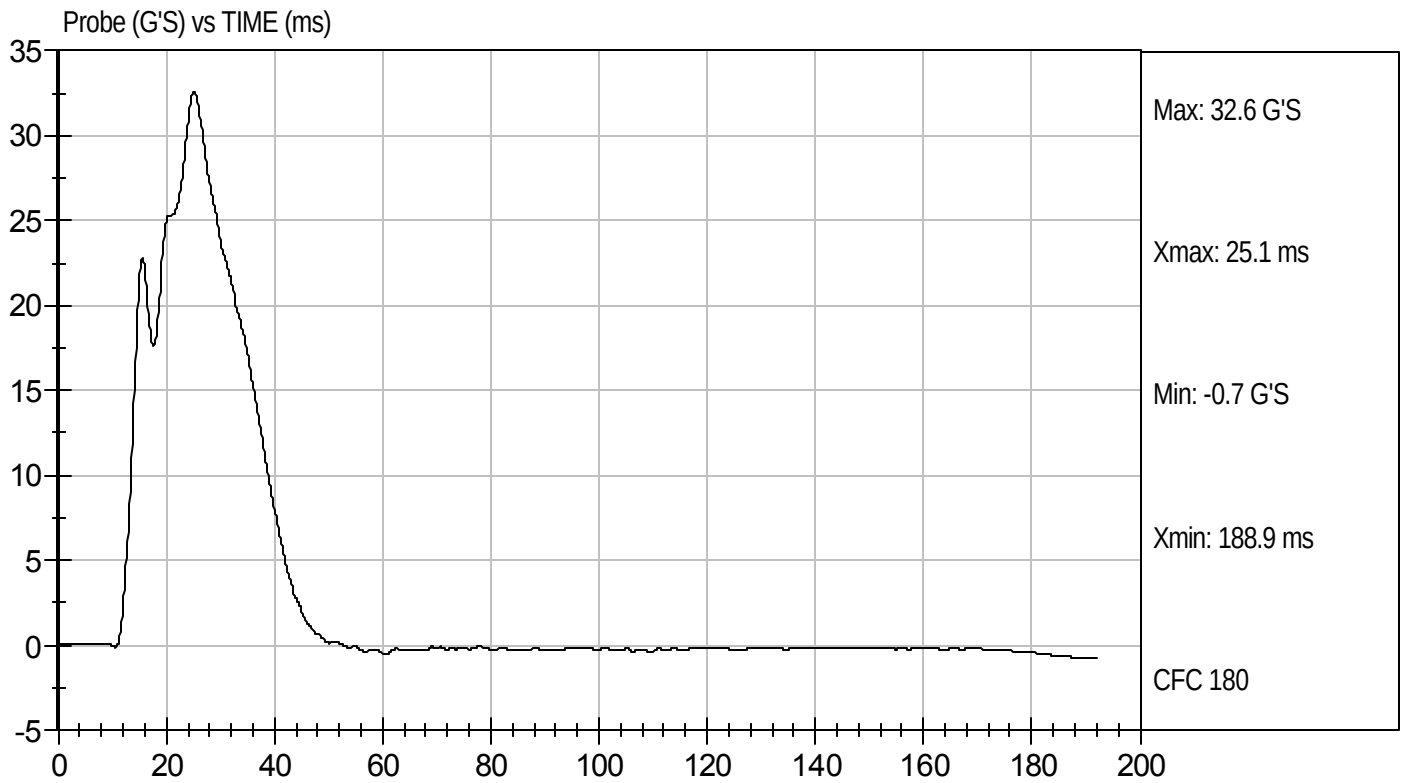
6/15/09
 Test Date


 Approved By



Test Desc: Thorax With Arm
Component ID: D091494

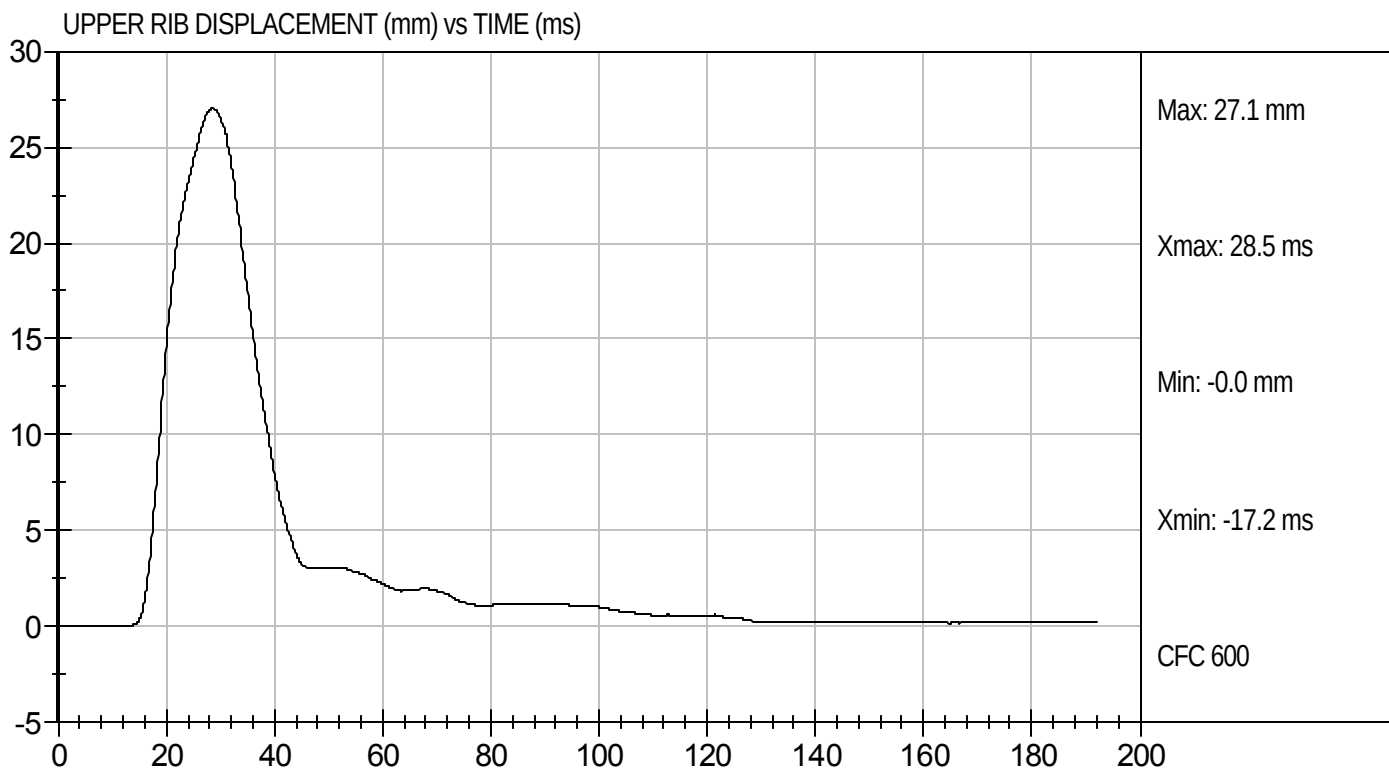
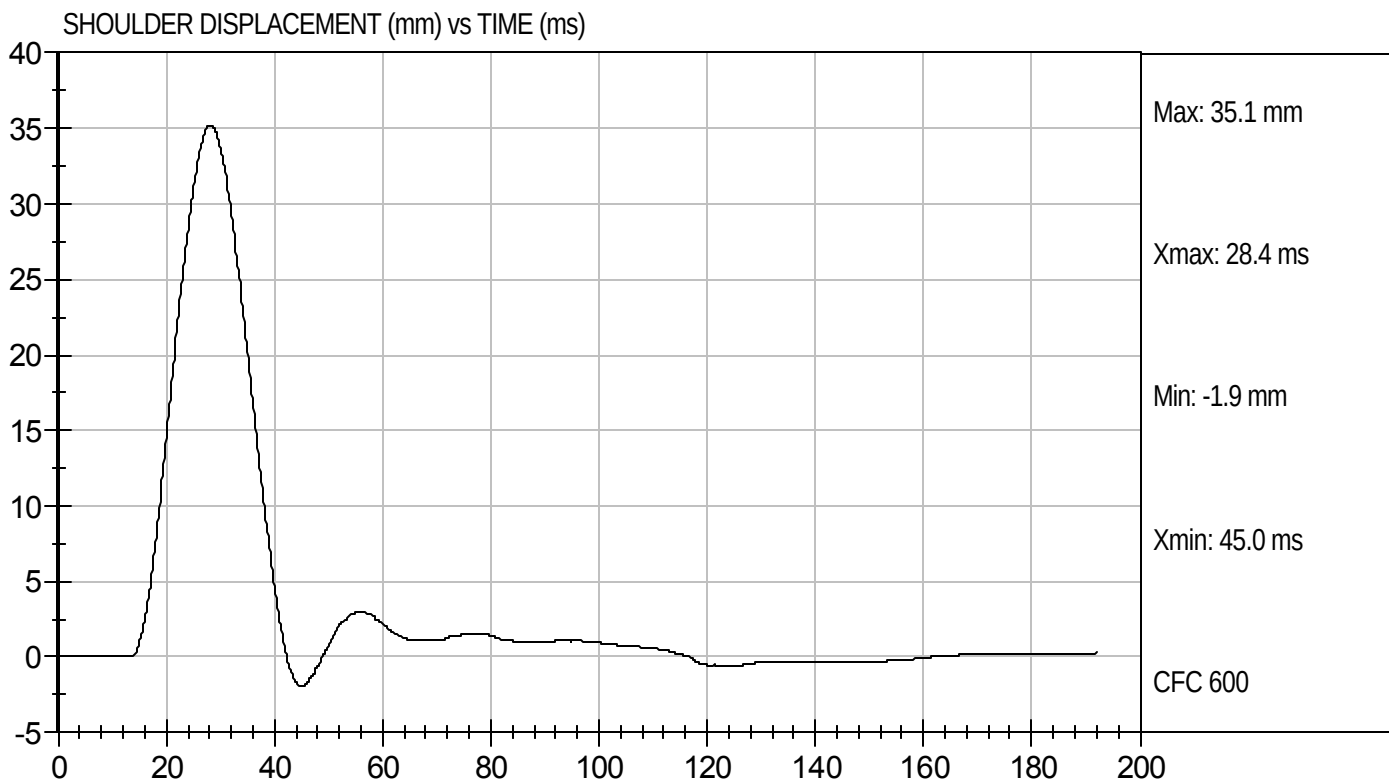
Test Date: 6/15/09
Velocity: 22.22 ft/s, 6.77 m/s





Test Desc: Thorax With Arm
Component ID: D091494

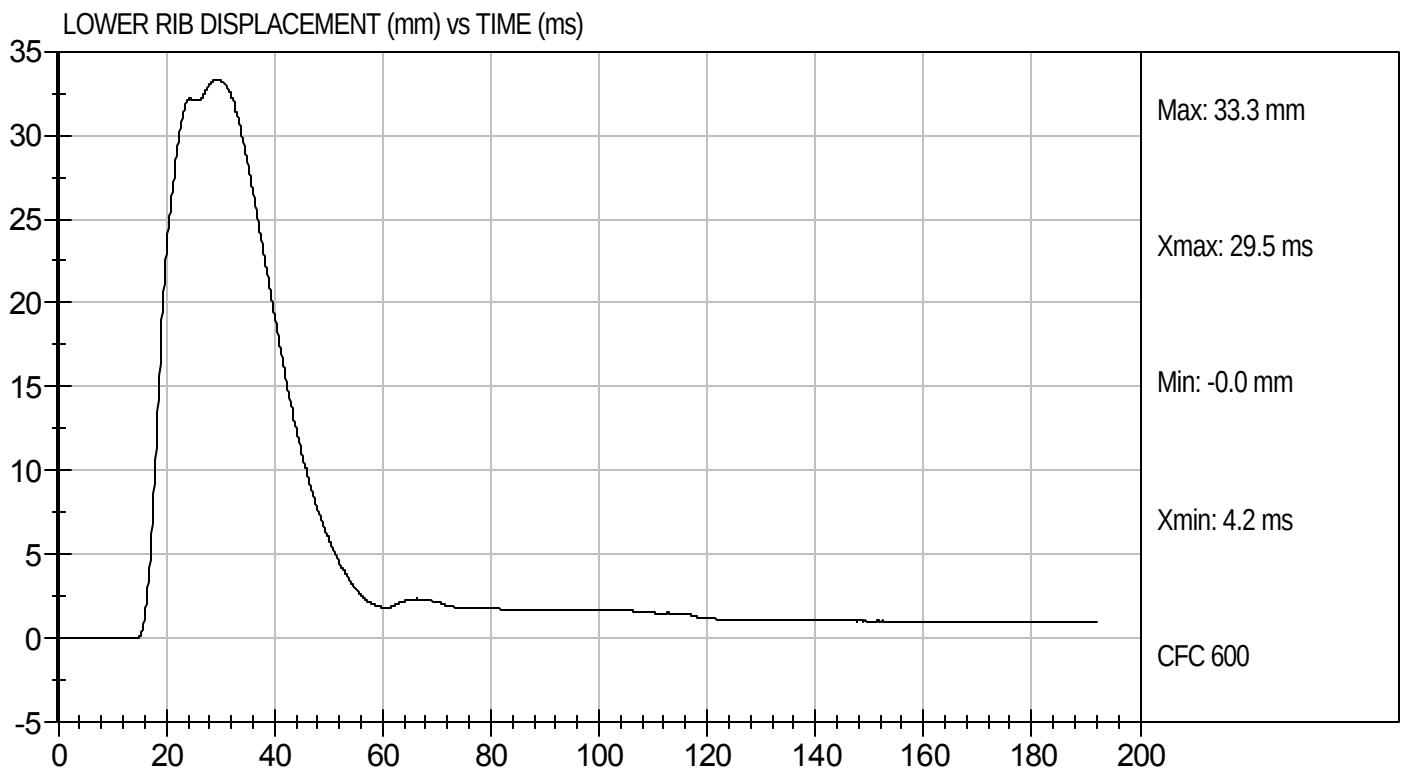
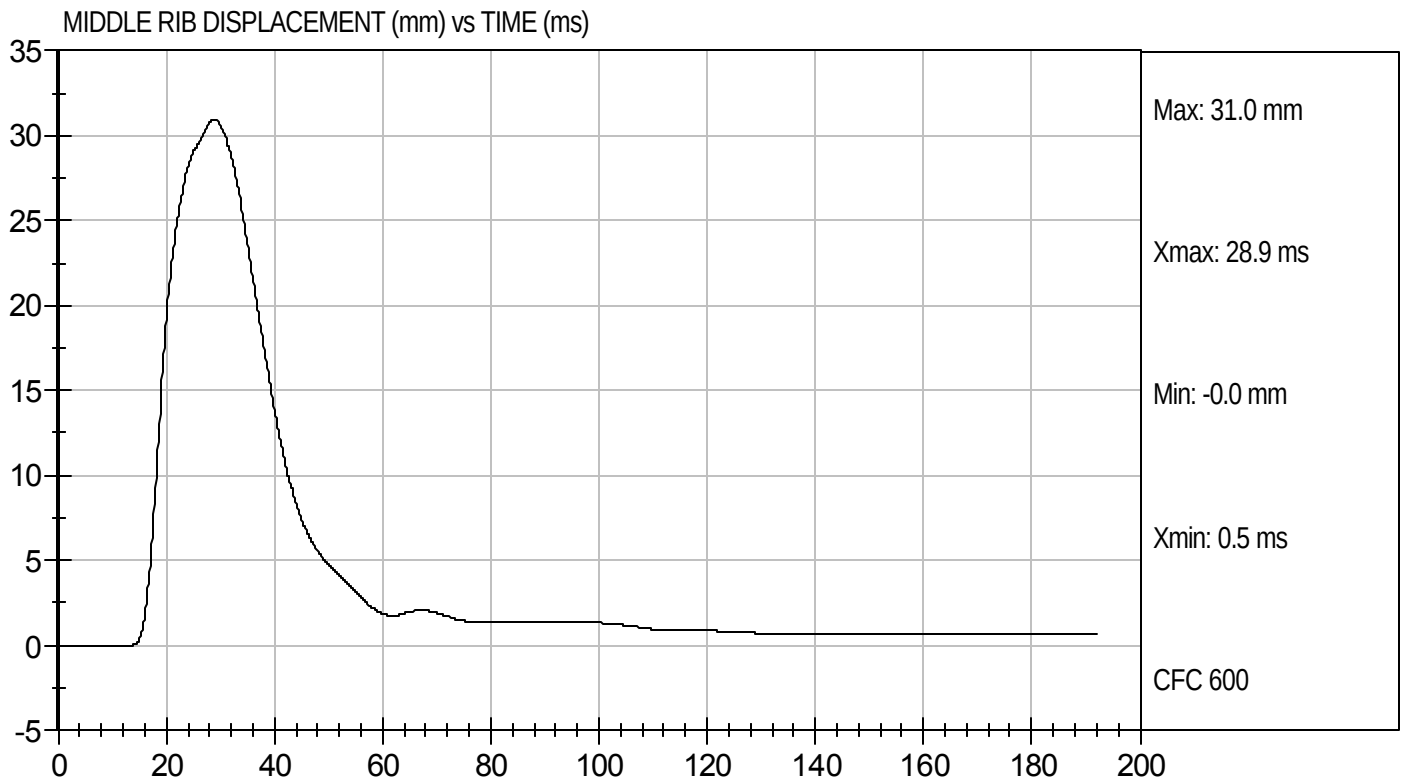
Test Date: 6/15/09
Velocity: 22.22 ft/s, 6.77 m/s





Test Desc: Thorax With Arm
Component ID: D091494

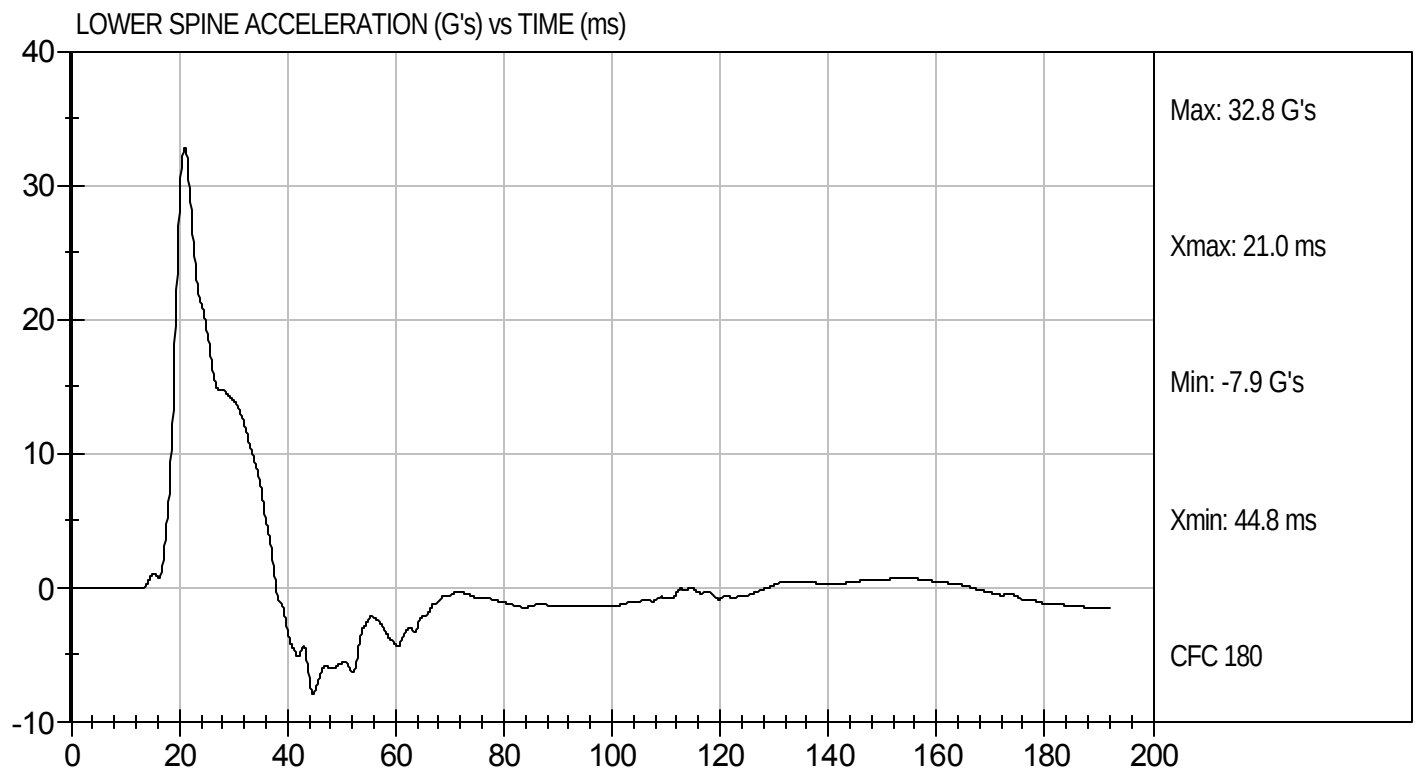
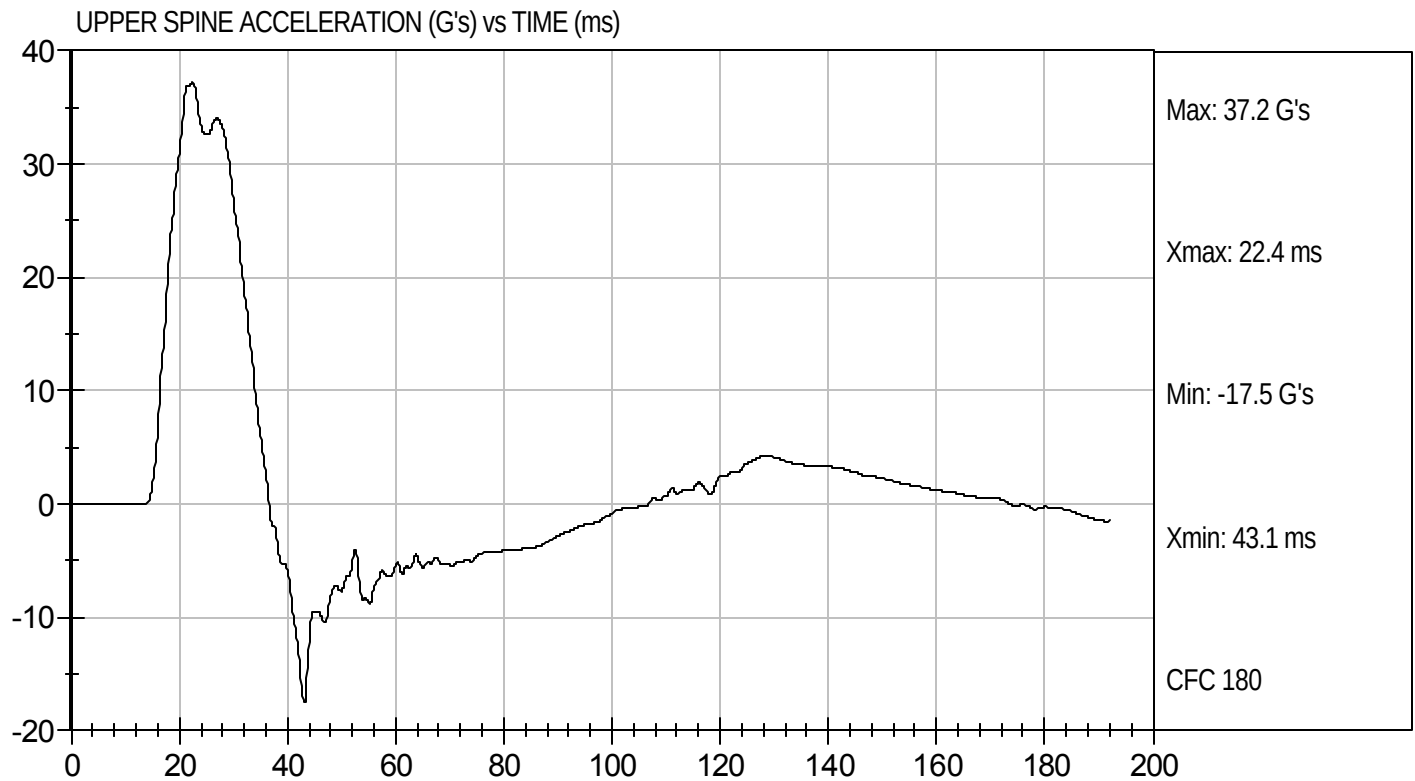
Test Date: 6/15/09
Velocity: 22.22 ft/s, 6.77 m/s





Test Desc: Thorax With Arm
Component ID: D091494

Test Date: 6/15/09
Velocity: 22.22 ft/s, 6.77 m/s



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

ATD Serial No: 296

Test I.D: D091495

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Humidity	%	10 to 70	46	Pass
Impact Velocity	m/s	4.20 to 4.40	4.23	Pass
Peak Impactor Force	G's	14 to 18	15	Pass
Upper Rib Displacement	mm	32 to 40	34	Pass
Middle Rib Displacement	mm	39 to 45	40	Pass
Lower Rib Displacement	mm	35 to 43	39	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 17	13	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	9	Pass
Overall Test Results				Pass


 Laboratory Technician

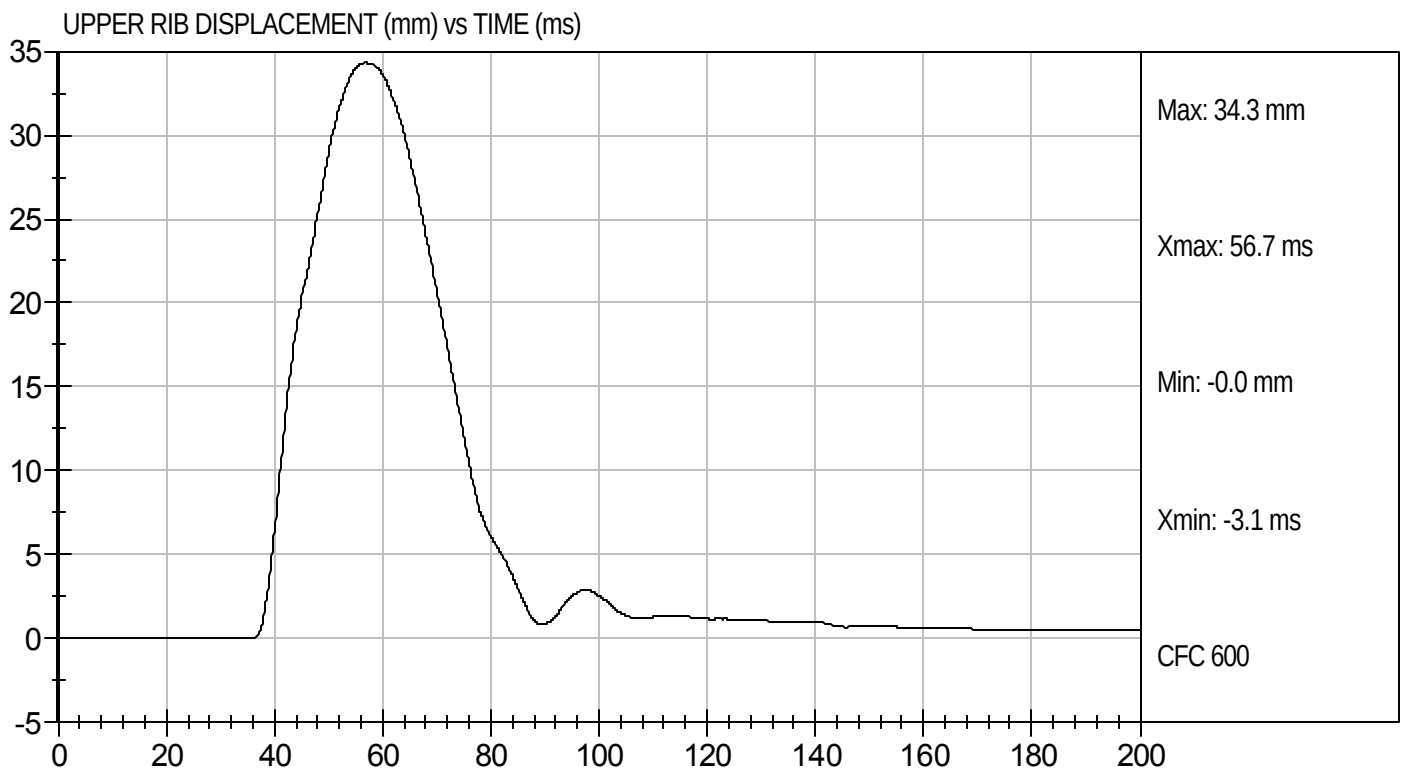
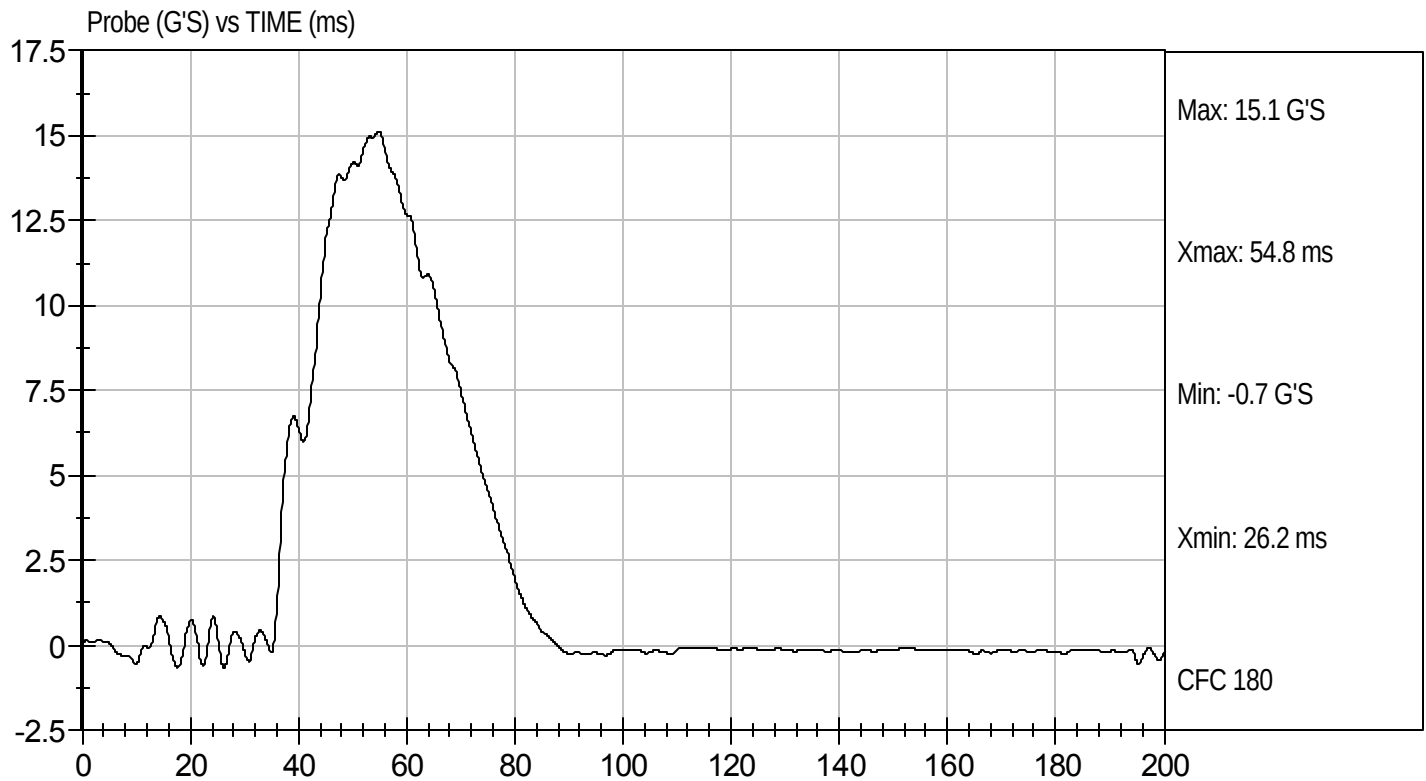
6/15/09
 Test Date


 Approved By



Test Desc: Thorax Without Arm
Component ID: D091495

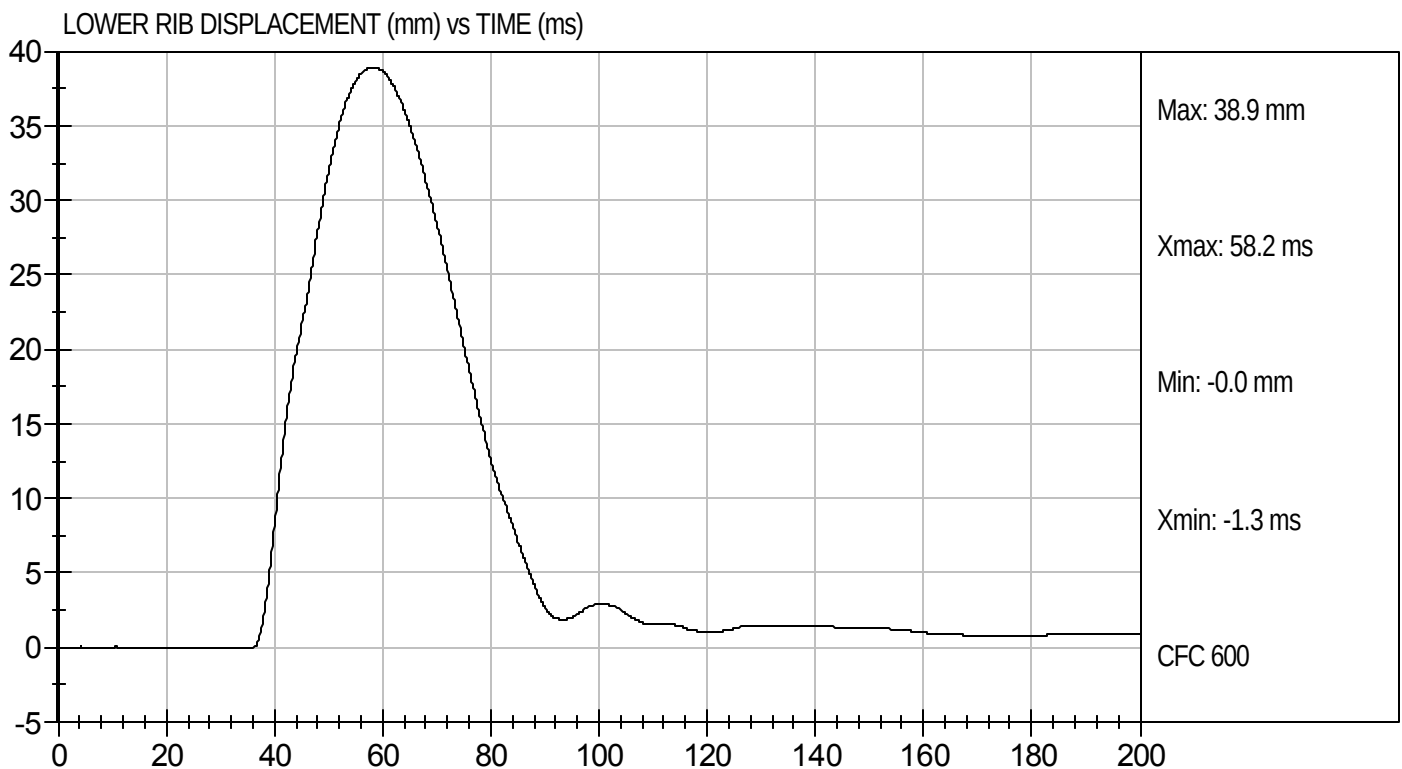
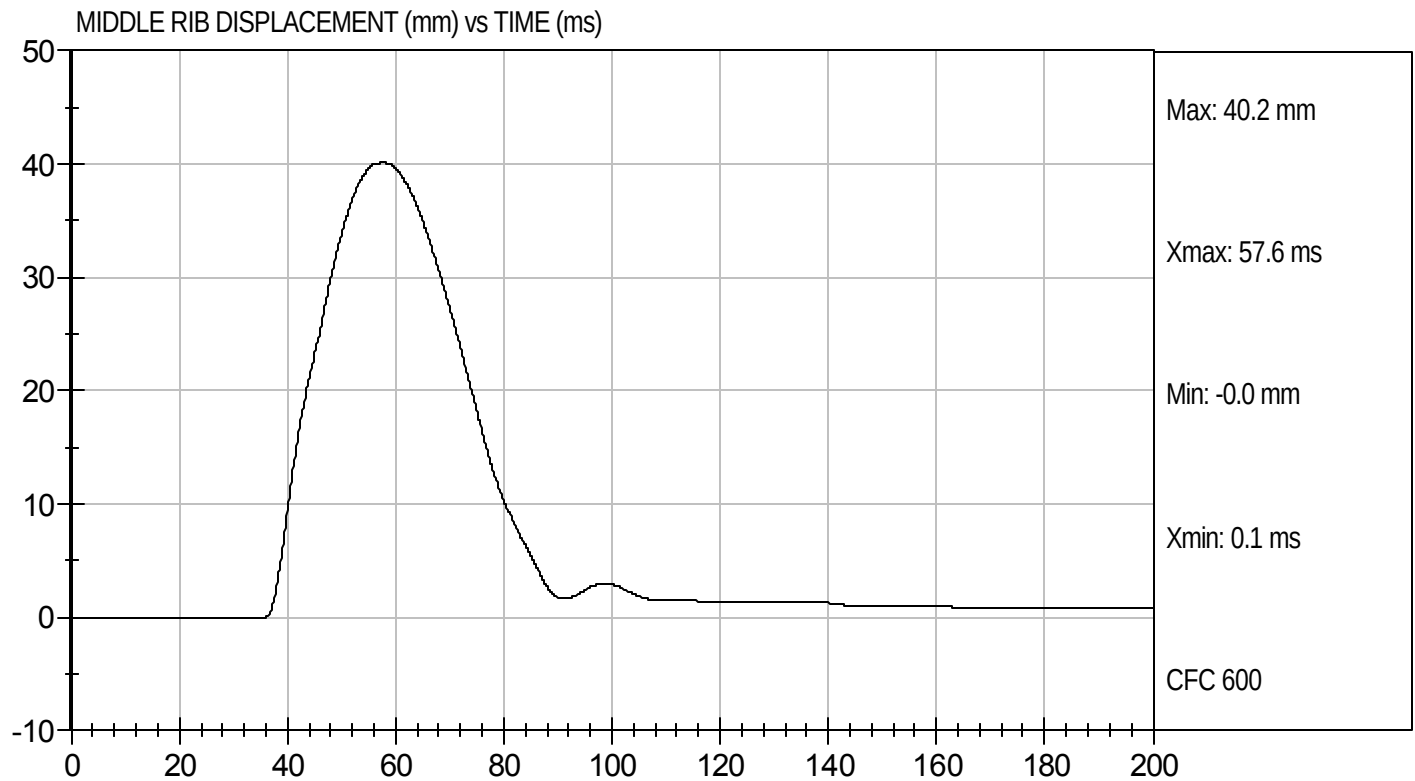
Test Date: 6/15/09
Velocity: 13.88 ft/s, 4.23 m/s





Test Desc: Thorax Without Arm
Component ID: D091495

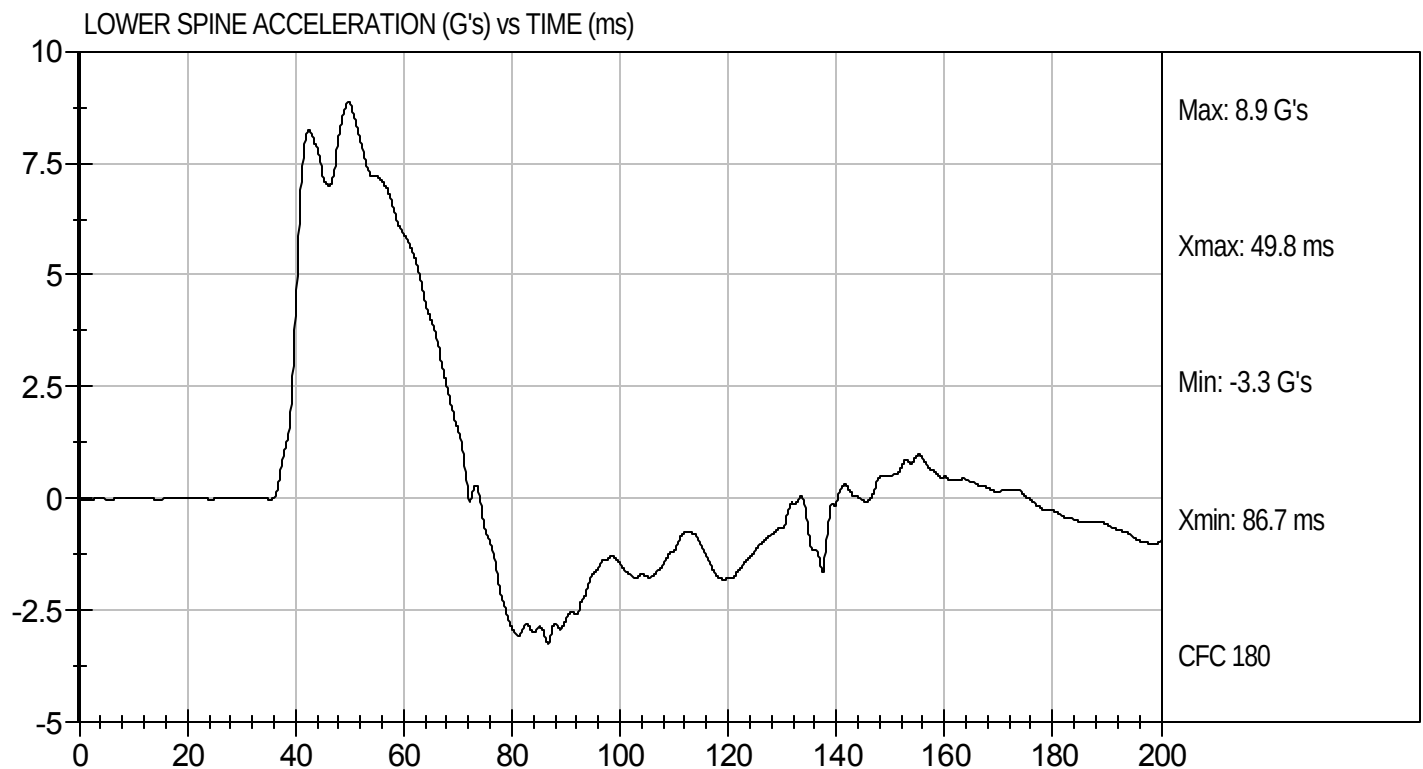
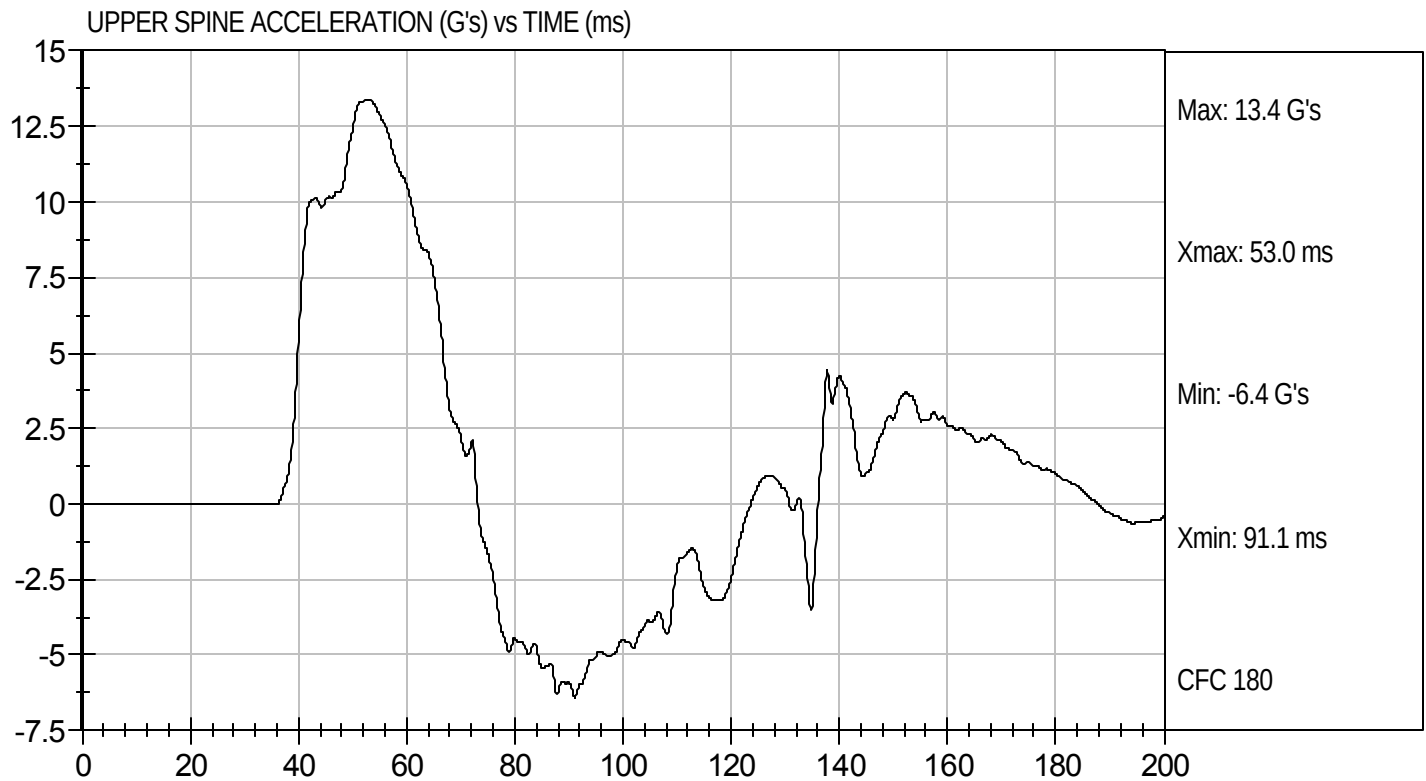
Test Date: 6/15/09
Velocity: 13.88 ft/s, 4.23 m/s





Test Desc: Thorax Without Arm
Component ID: D091495

Test Date: 6/15/09
Velocity: 13.88 ft/s, 4.23 m/s

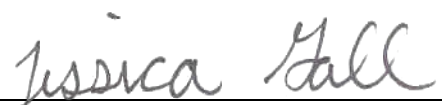


MGA RESEARCH CORPORATION
ABDOMINAL IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D091496

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	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	39	Pass
Lower Rib Displacement	mm	33 to 44	38	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	12	Pass
Overall Test Results				Pass


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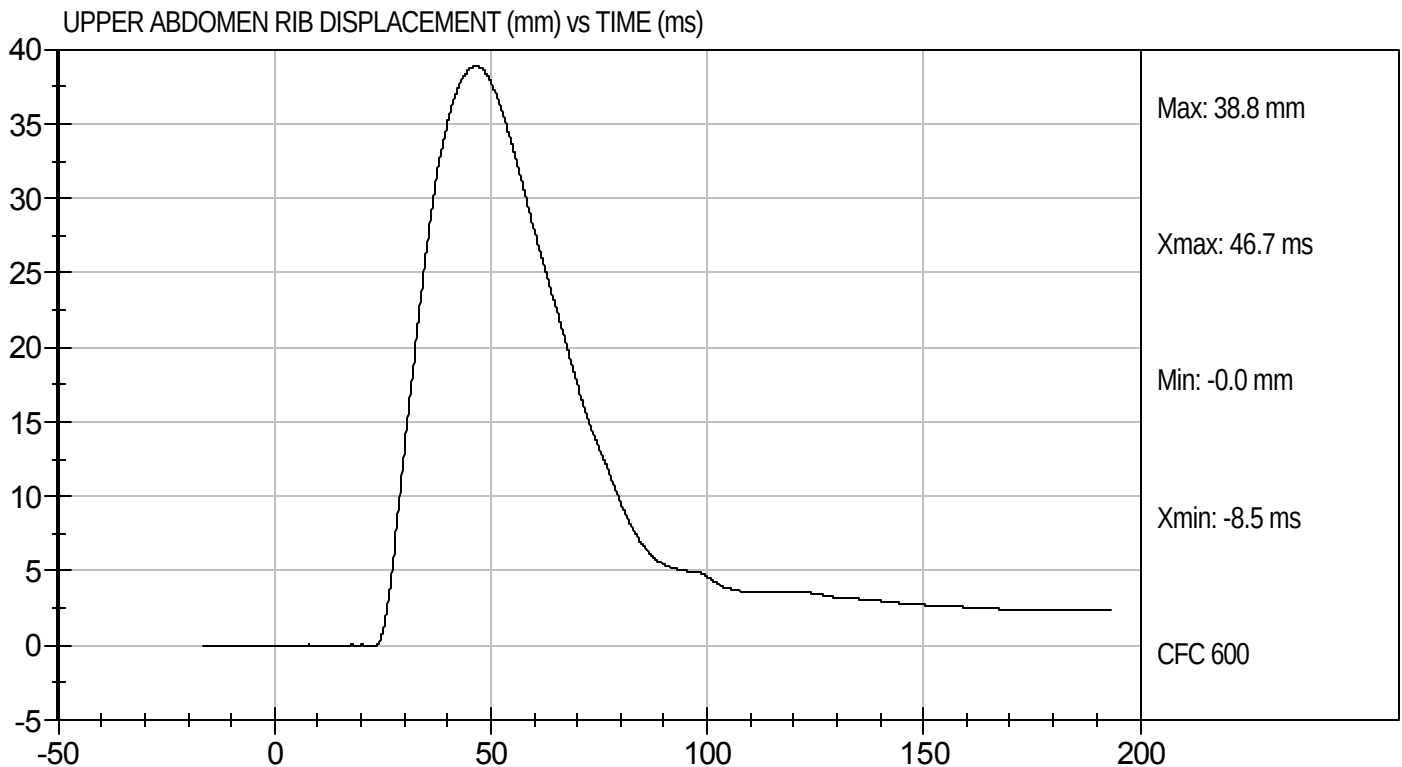
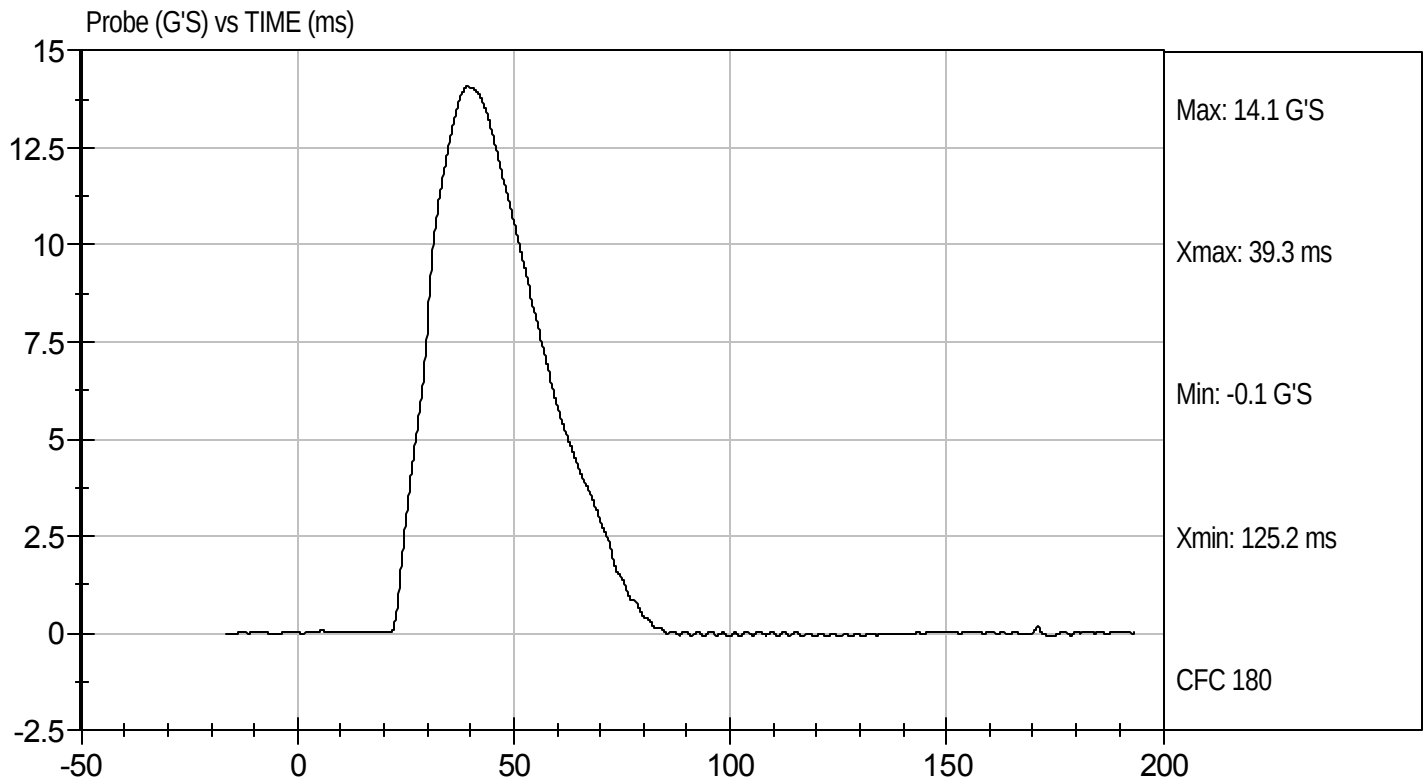
6/12/09
Test Date


Approved By



Test Desc: Abdomen Impact
Component ID: D091496

Test Date: 6/12/09
Velocity: 14.12 ft/s, 4.30 m/s

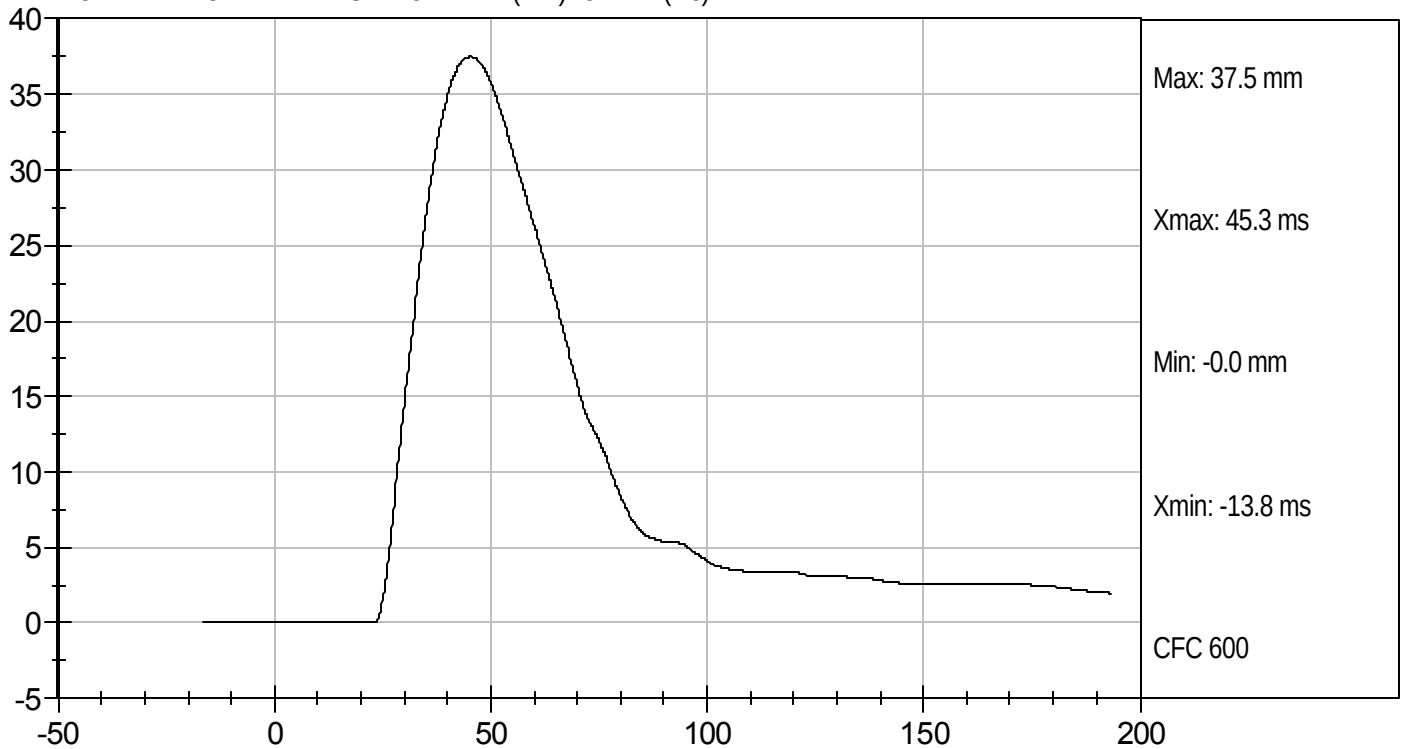




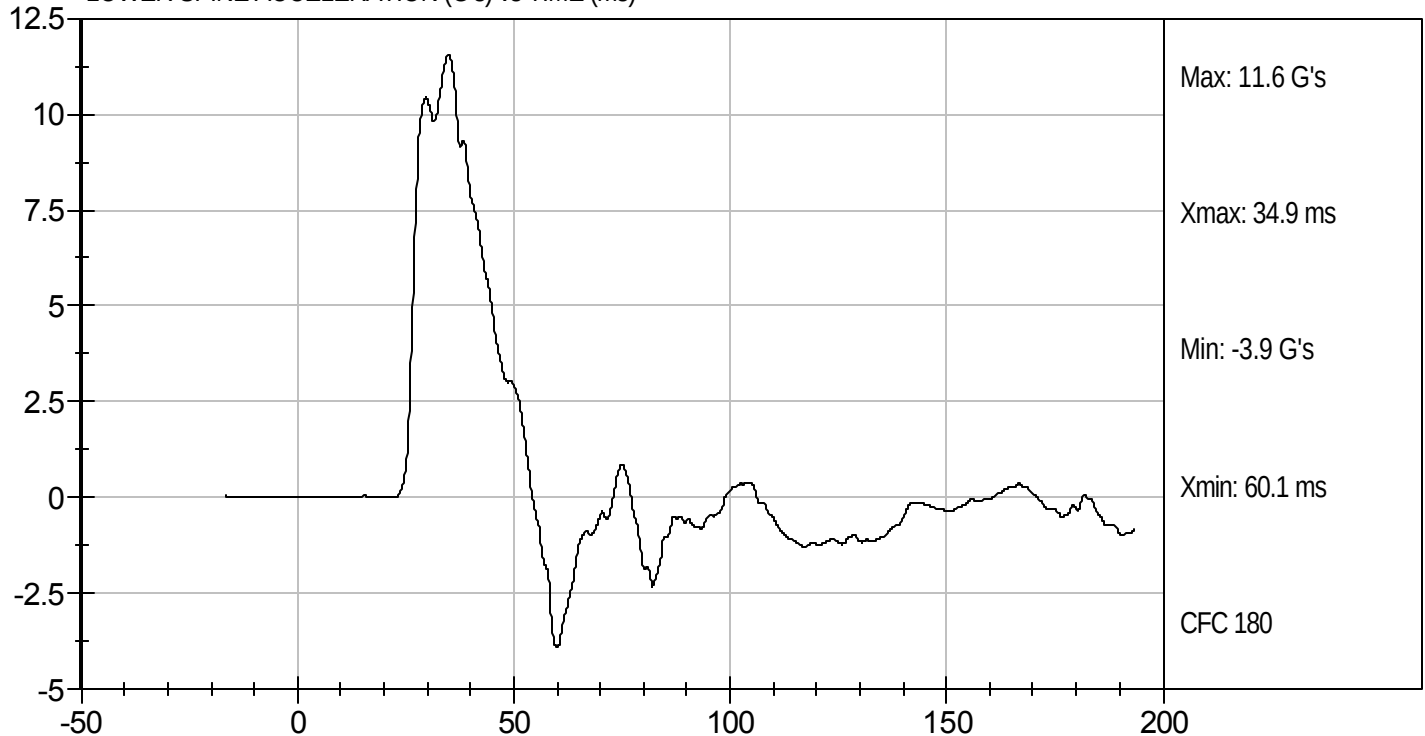
Test Desc: Abdomen Impact
Component ID: D091496

Test Date: 6/12/09
Velocity: 14.12 ft/s, 4.30 m/s

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



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

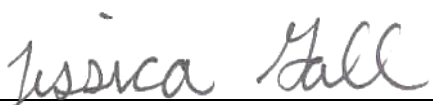


MGA RESEARCH CORPORATION
PELVIS IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D091497

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	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	4221	Pass
Overall Test Results				Pass


Laboratory Technician

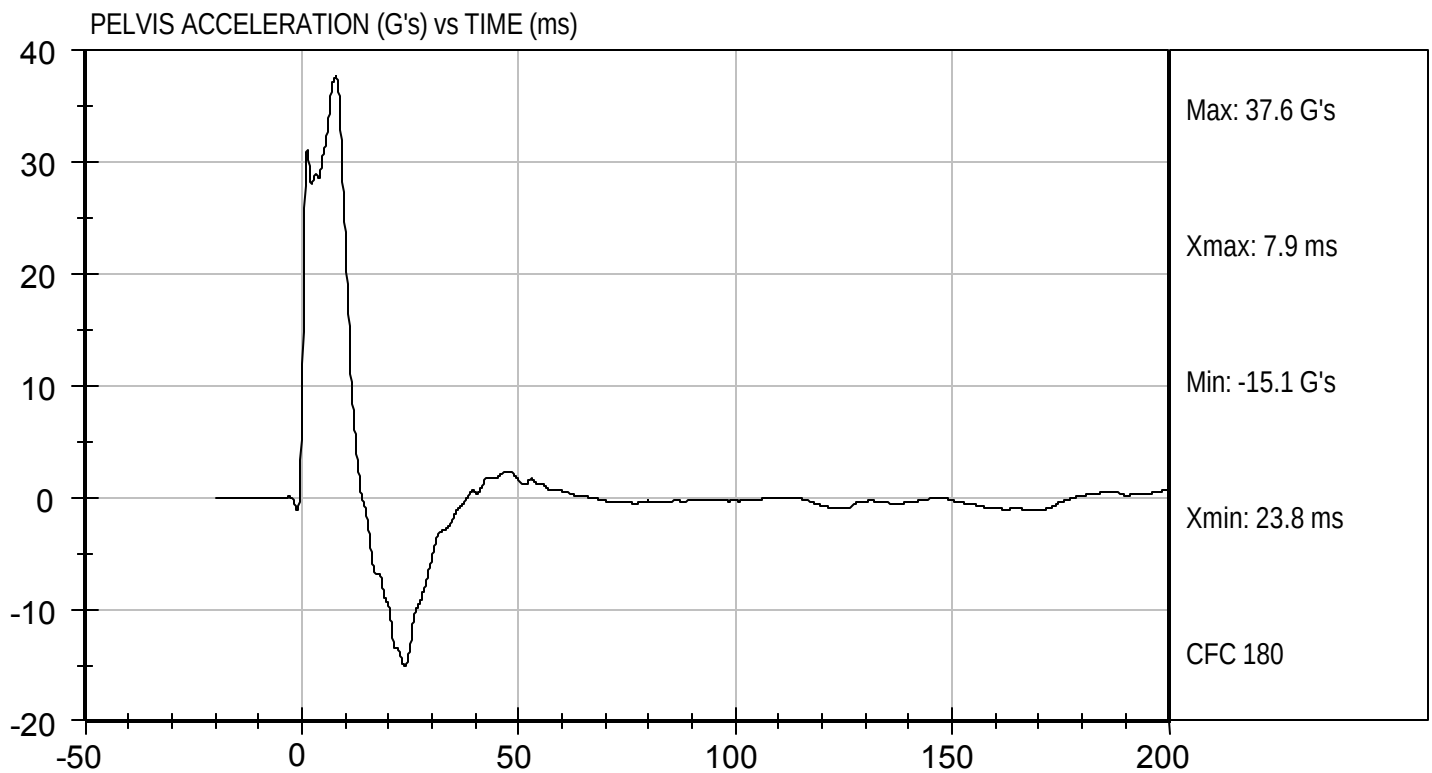
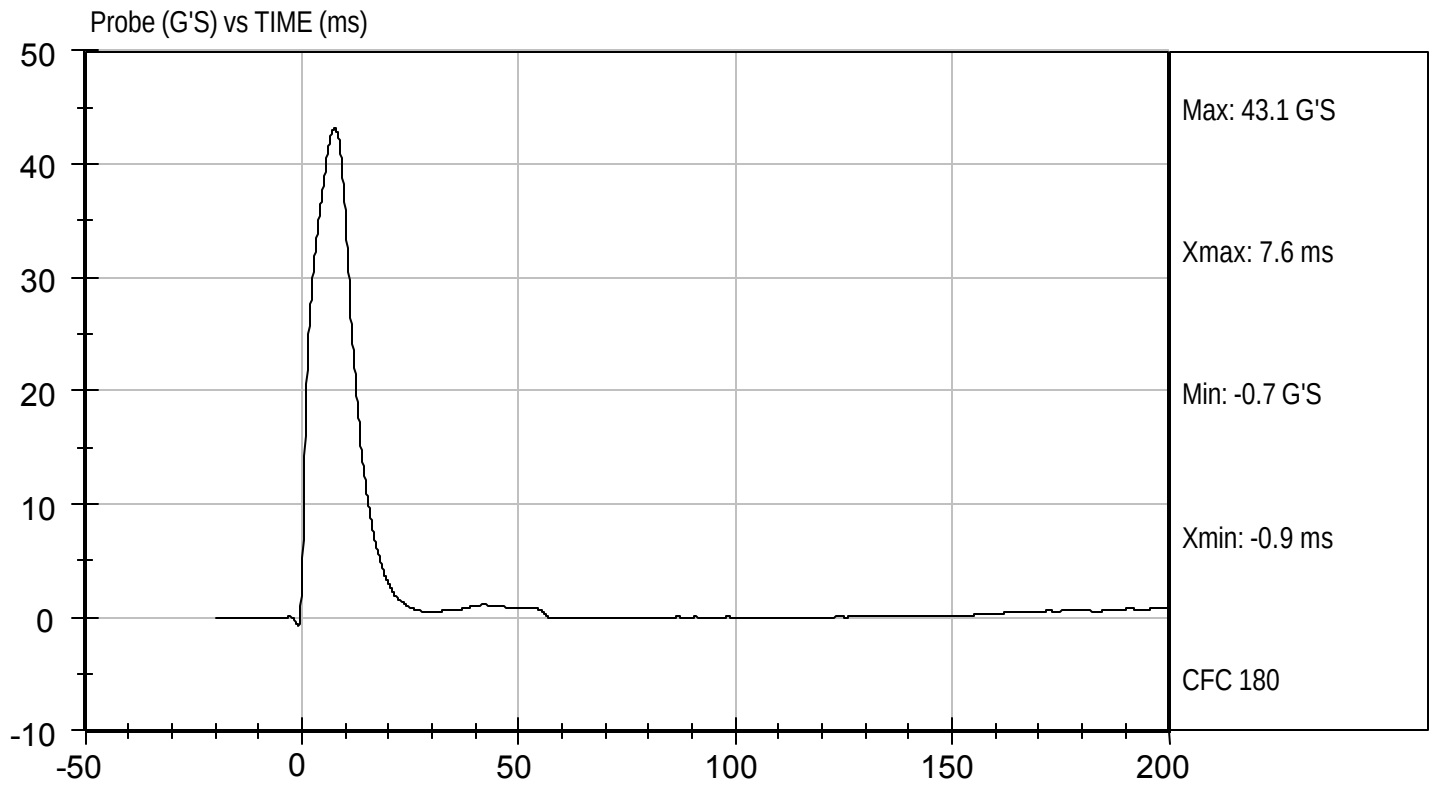
6/12/09
Test Date


Approved By



Test Desc: Pelvis Impact
Component ID: D091497

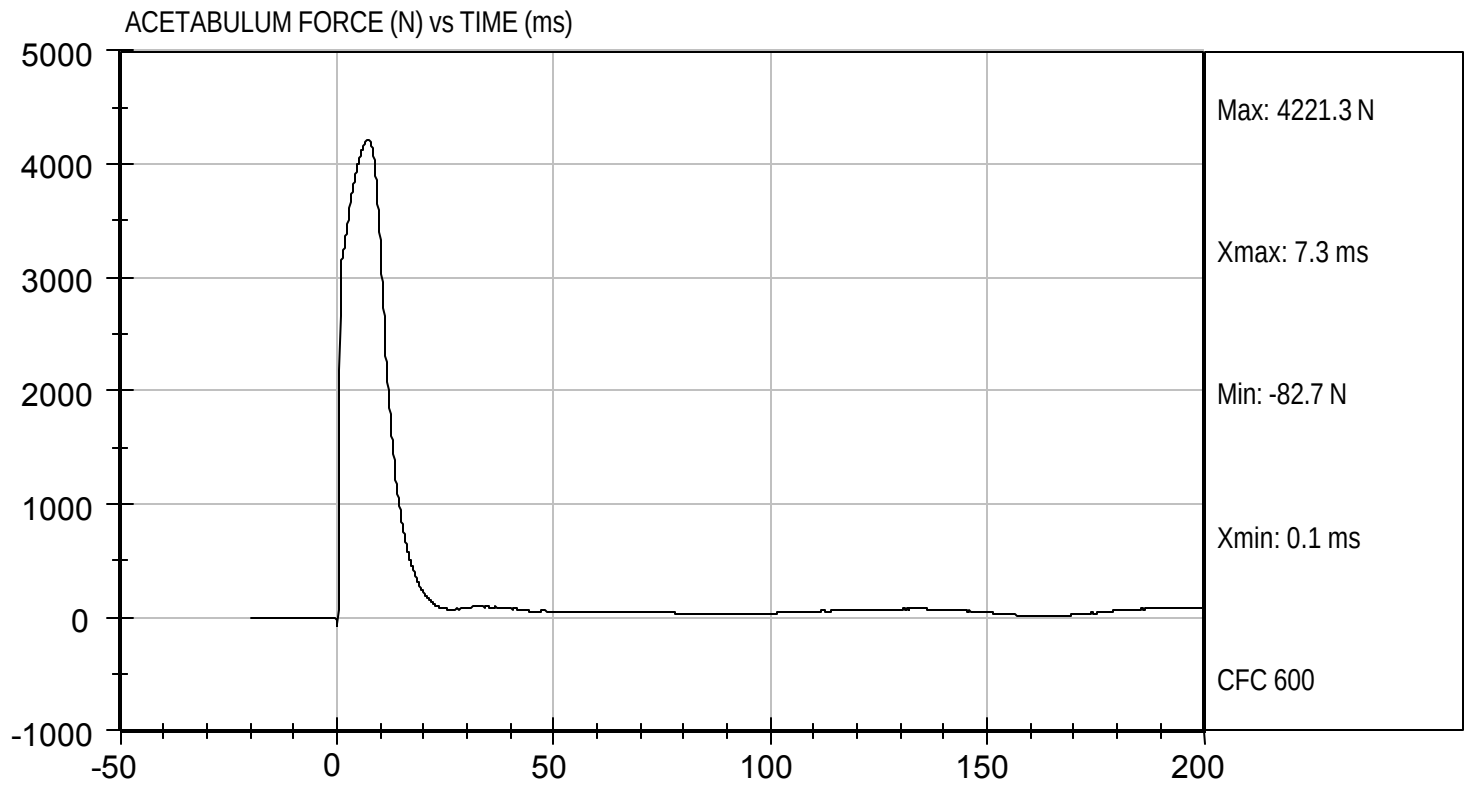
Test Date: 6/12/09
Velocity: 22.22 ft/s, 6.77 m/s





Test Desc: Pelvis Impact
Component ID: D091497

Test Date: 6/12/09
Velocity: 22.22 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: D091498

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	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	37	Pass
Pelvis Y Acceleration	G's	28 to 39	31	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4367	Pass
Overall Test Results				Pass


Laboratory Technician

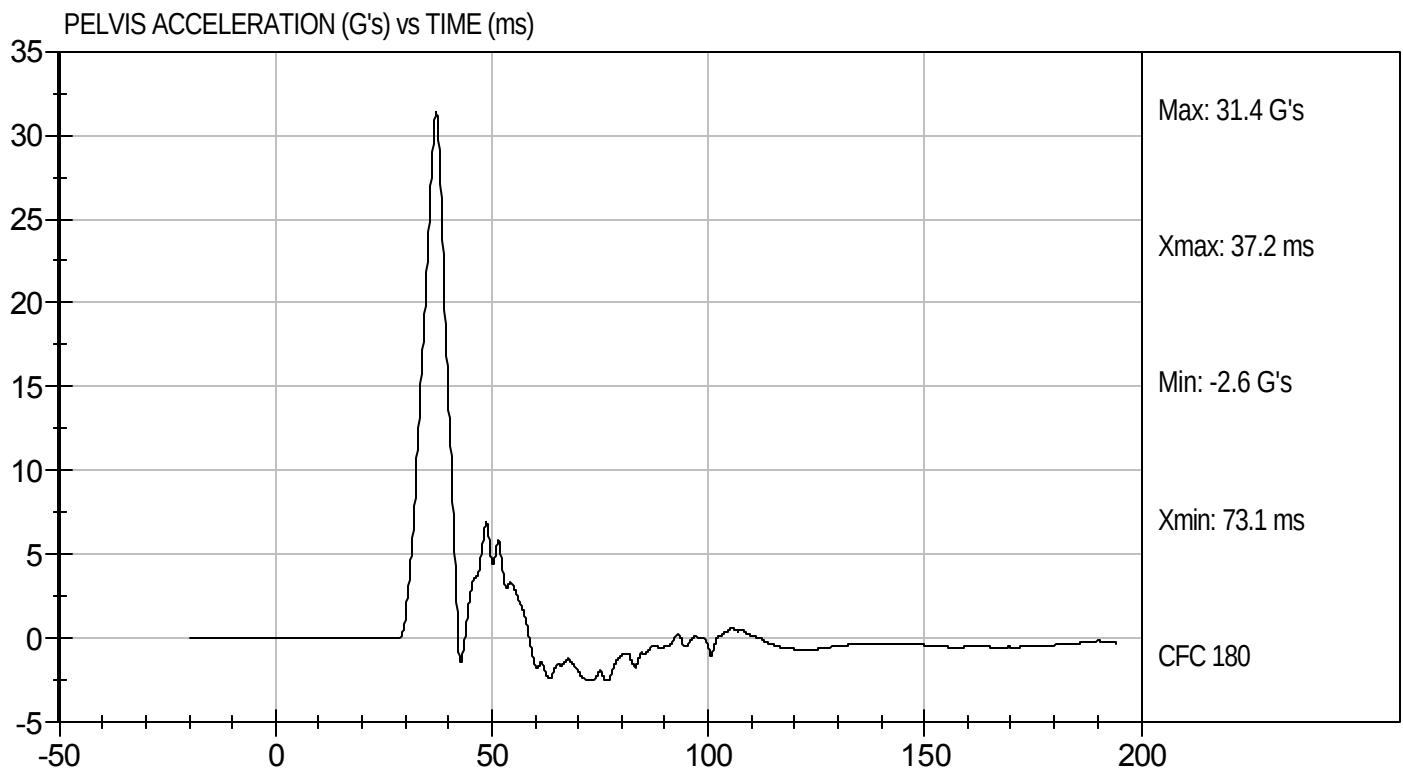
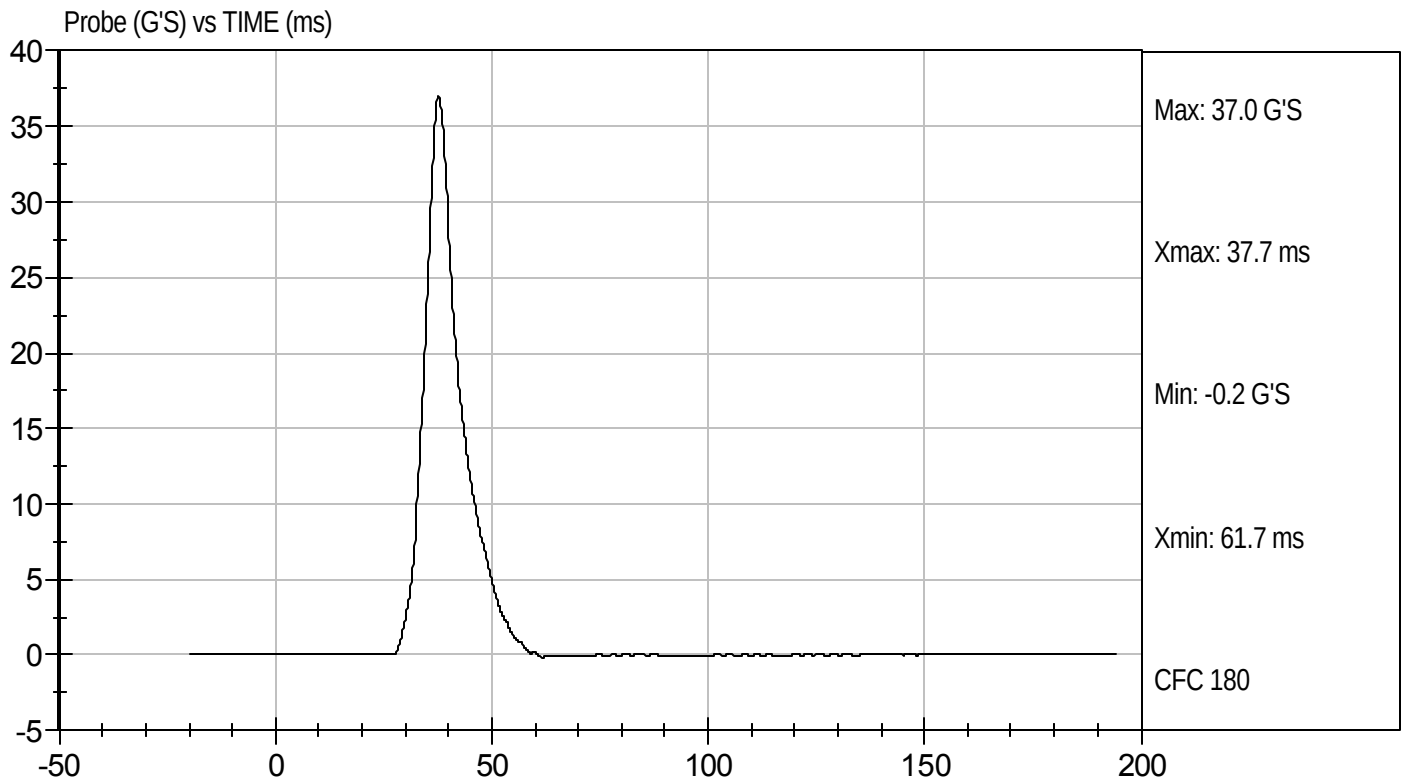
6/12/09
Test Date


Approved By



Test Desc: Iliac Impact
Component ID: D091498

Test Date: 6/12/09
Velocity: 14.12 ft/s, 4.30 m/s





Test Desc: Iliac Impact
Component ID: D091498

Test Date: 6/12/09
Velocity: 14.12 ft/s, 4.30 m/s

