REPORT NUMBER: SNCAP-MGA-2009-012

VALIDATION
MOVING DEFORMABLE BARRIER SIDE IMPACT TEST

FORD MOTOR COMPANY
2010 FORD MUSTANG CONVERTIBLE
NHTSA NUMBER: MA0210

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

Test Date: May 29, 2009

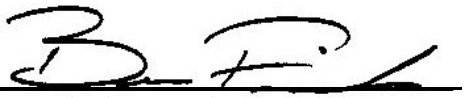
Report Date: August 28, 2009

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.

Prepared by: 
Donna Janovicz, Project Manager

Approved by: 
Ben Fischer, Project Engineer

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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9. Performing Organization Name and Address MGA Research Corporation 5000 Warren Road Burlington, WI 53105		*10. Work Unit No.* *11. Contract or Grant No.* DTNH22-03-D-12005
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Crashworthiness Standards 1200 New Jersey Ave, SE, Room W43-410 Washington, D.C. 20590		*13. Type of Report and Period Covered:* Final Test Report 5/29/2009 to 8/28/2009 *14. Sponsoring Agency Code* NVS-111

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 Ford Mustang Convertible 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 May 29, 2009.

The impact velocity of the Moving Deformable Barrier (MDB) was 62.4 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 196 mm at level 3. The test vehicle's occupant performance was as follows:

	Driver ATD (ES-2re)		
Measurement Description	**Units**	**Threshold**	**Result**
Head Injury Criteria (HIC_{36})	N/A	1000	134
Maximum Thorax Rib Deflection	mm	44	33
Combined Abdominal Force	N	2500	1169
Pubic Symphysis Force	N	6000	2118

	Passenger ATD (SID-IIs)		
Measurement Description	**Units**	**Threshold**	**Result**
Head Injury Criteria (HIC_{36})	N/A	1000	487
Lower Spine (T12) Resultant Acceleration	G	82	68
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2898

The door on the struck side of the vehicle did not separate from the body at the hinge or latch and the opposite door did not open during the side impact.

17. Key Words Validation Testing Side Impact MDB ES-2re SID-IIs		*18. Distribution Statement* Copies of this report are available from: National Highway Traffic Safety Adm. Technical Reference Division 1200 New Jersey Ave, SE Washington, D.C. 20590	
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Form DOT F1700.7 (8-72)

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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 Ford Mustang Convertible. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Laboratory Test Procedure dated April 2009.

SUMMARY

A 2010 Ford Mustang Convertible 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 62.4 km/h (38.8 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 May 29, 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

	Driver ATD (ES-2re)		
Measurement Description	**Units**	**Threshold**	**Result**
Head Injury Criteria (HIC_{36})	N/A	1000	134
Maximum Thorax Rib Deflection	mm	44	33
Combined Abdominal Force	N	2500	1169
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	Passenger ATD (SID-IIs)		
Measurement Description	**Units**	**Threshold**	**Result**
Head Injury Criteria (HIC_{36})	N/A	1000	487
Lower Spine (T12) Resultant Acceleration	G	82	68
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2898

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

Left Mid A-Post Y
Right Front Sill Z

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

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 Ford Mustang Convertible NHTSA No. MA0210
Test Program: Side Validation Testing Test Date: 5/29/2009

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	MA0210
Model Year	2010
Make	Ford
Model	Mustang
Body Style	Convertible
VIN	1ZVBP8EN6A5112357
Body Color	Black Clearcoat
Delivery Date	5/20/2009
Odometer (km/mi)	138 km / 86 mi
Dealer	Boucher Fleet Group
Transmission	Automatic
Final Drive	Rear
Type/No. Cylinders	V6
Engine Displacement (L)	4.0
Engine Placement	Longitudinal
Roof Rack	No
Sunroof/T-Top	No
Tinted Glass	No
Traction Control	Advancetrac w/ESC
Power Brakes	Yes
Front Disc	Yes
Rear Disc	Yes
Does owner's manual provide instructions to turn off automatic door locks?	Yes

Anti-Lock Brakes	Yes
All Wheel Drive	No
Power Steering	Yes
Driver Front Airbag	Yes
Driver Side Torso Airbag	No
Driver Side Head Airbag	No
Driver Curtain Airbag	No
Driver Knee Airbag	No
Driver Head/Torso Combo Airbag	Yes
Rear Pass. Front Airbag	No
Rear Pass. Side Torso Airbag	No
Rear Pass. Side Head Airbag	No
Rear Pass. Curtain Airbag	No
Rear Pass. Combo Airbag	No
Pretensioners	Yes
Load Limiters	Yes
Air Conditioning	Yes
AM/FM CD	Yes
Tilt Steering	Yes
Automatic Door Locks	Yes
Power Windows	Yes
Power Seats	No

DATA FROM CERTIFICATION LABEL

Manufactured By	Ford Motor Company
Date of Manufacture	04/09

GVWR (kg)	2091
GAWR Front (kg)	1007
GAWR Rear (kg)	1089

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity (DSC)	2	2		4	
Capacity Wt. (VCW) (kg)				301	(A)
DSC x 68.04 (kg)				272	(B)
Cargo Wt. (RCLW) (kg)				29	(A-B)

VEHICLE SEAT TYPE

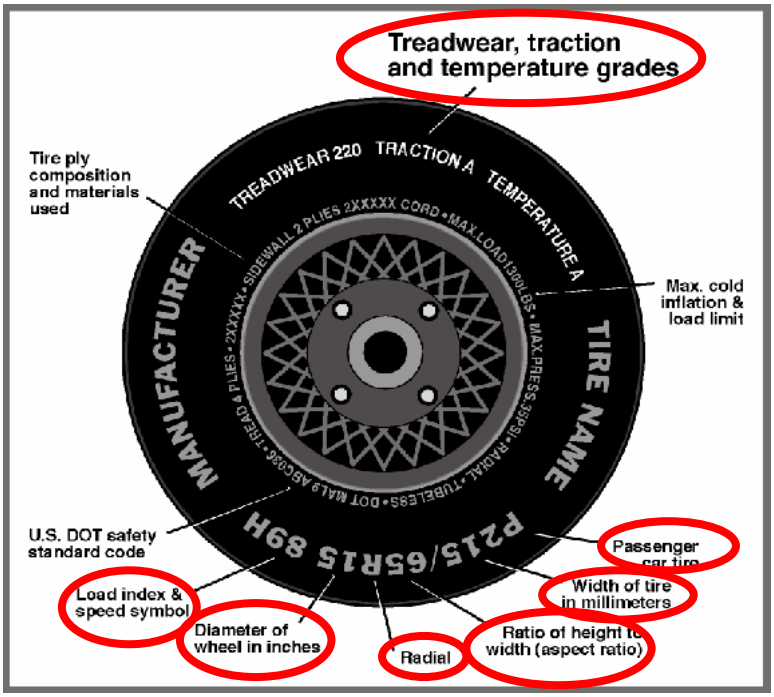
	Type of Seat Pan				Type of Seat Back		
Seating Location	Bucket	Bench	Split Bench	Contoured	Fixed	Adjustable w/ Lever	Adjustable w/ Knob
Front Seat	X					X	
Rear or Second	X				X		
Third Row Seat							

DATA SHEET NO. 1 (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2010 Ford Mustang Convertible NHTSA No. MA0210
Test Program: Side Validation Testing Test Date: 5/29/2009

VEHICLE TIRE INFORMATION



DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	220	220
Recommended Tire Size	P215/60R17	P215/60R17
Tire Size on Vehicle	P215/60R17	P215/60R17
Tire Manufacturer	BF Goodrich	BF Goodrich
Tire Model	Traction T/A	Traction T/A
Treadwear	620	620
Traction	A	A
Temperature Grades	B	B
Tire Plies Sidewall	1	1
Tire Plies Body	3	3
Load Index & Speed Symbol	95T	95T
Tire Material	Rubber	Rubber
DOT Safety Code Left	1209	1209
DOT Safety Code Right	APNV H111	APNV H111

DATA SHEET NO. 1 (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2010 Ford Mustang Convertible NHTSA No. MA0210
Test Program: Side Validation Testing Test Date: 5/29/2009

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW) (Axle)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	427.3	377.8		452.7	428.7		470.8	440.0	
Right	kg	429.6	386.5		452.7	440.4		431.8	436.8	
Ratio	%	52.9	47.1		51.0	49.0		50.7	49.3	
Totals	kg	856.9	764.3	1621.2	905.4	869.1	1774.5	902.6	876.8	1779.4

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1621.2	(A)
Sum of Actual Weight of 2 P572 ATDs Used	kg	129.3	(B)
Rated Cargo/Luggage Weight (RCLW)	kg	29	(C)
Calculated Target Vehicle Test Weight (TVTW)	kg	1779.5	(A+B+C)

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
Fully Loaded	mm	715	715	723	723	
As Tested (Fully Loaded ± 10mm at each wheel well)	mm	720	719	725	722	1332

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2720
Total Vehicle Length at Left Side	mm	4123
Total Vehicle Length at Centerline	mm	4768
Total Vehicle Length at Right Side	mm	4123
Weight of Ballast in Cargo Area	kg	0
Weight of Vehicle Components Removed	kg	26.7
Amount of Stoddard Solvent in Fuel Tank	L	56.2

Vehicle components removed to meet Test Weight: Spare tire, jack, trunk carpet, taillights, right rear window, trunk side trim.

TEST VEHICLE VERTICAL IMPACT LINE DATA

Measurement Description	Units	Value
Target Impact Point Aft of Front Axle	mm	420
Actual Impact Point Aft of Front Axle	mm	398

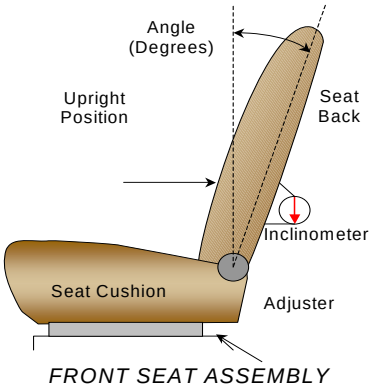
DATA SHEET NO. 2

SEAT ADJUSTMENT, FUEL SYSTEMS, AND STEERING WHEEL DATA

Test Vehicle: 2010 Ford Mustang Convertible NHTSA No. MA0210
Test Program: Side Validation Testing Test Date: 5/29/2009

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, set at 13 degrees using the headrest post.
The left rear passenger seat is fixed.



SEAT BACK ANGLES

	Degrees
Driver with Seated Dummy	13.5 at headrest post
Passenger with Seated Dummy	Fixed

SEAT FORE/AFT POSITIONS

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	25 detents	12th detent (1st as 0)
Rear Seat	Fixed	Fixed

Describe method: Using only the controls that primarily move the seat in the fore-aft direction, the seat was placed in the full rear position. The seat was moved forward marking each detent position until the forwardmost position was reached. The seat was placed in the mid point of travel or next rearward locking detent.

SEAT BELT UPPER ANCHORAGES

	Total # of Positions	Placed in Position #
Driver Seat	Fixed	
Rear Seat	Fixed	

Describe method: The anchorages were non-adjustable.

DATA SHEET NO. 2 (CONTINUED)

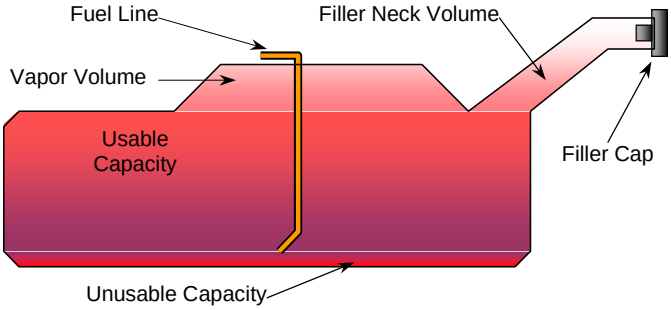
SEAT ADJUSTMENT, FUEL SYSTEMS, AND STEERING WHEEL DATA

Test Vehicle: 2010 Ford Mustang Convertible NHTSA No. MA0210
Test Program: Side Validation Testing Test Date: 5/29/2009

FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank"	60.6
Usable Capacity of "Optional" Tank	
Usable Capacity Used for FMVSS 301	55.7 to 56.9
Actual Amount of Solvent used	56.2

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

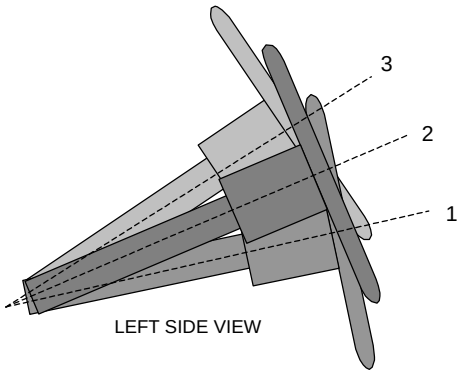


VEHICLE FUEL TANK ASSEMBLY

The test vehicle is equipped with an electric fuel pump. The electric fuel pump operates for 2 seconds to pressurize the fuel system following the actuation of the ignition. If no attempt has been made to start the engine within 2 seconds following ignition actuation, the fuel pump will shut off. The fuel pump operates continuously while the engine is running. If the engine stalls, the fuel pump is deactivated. Also, a fuel pump shut-off switch is provided, designed to stop fuel flow to the engine if the vehicle sustains an impact above a certain magnitude. The fuel pipe is on the left side.

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

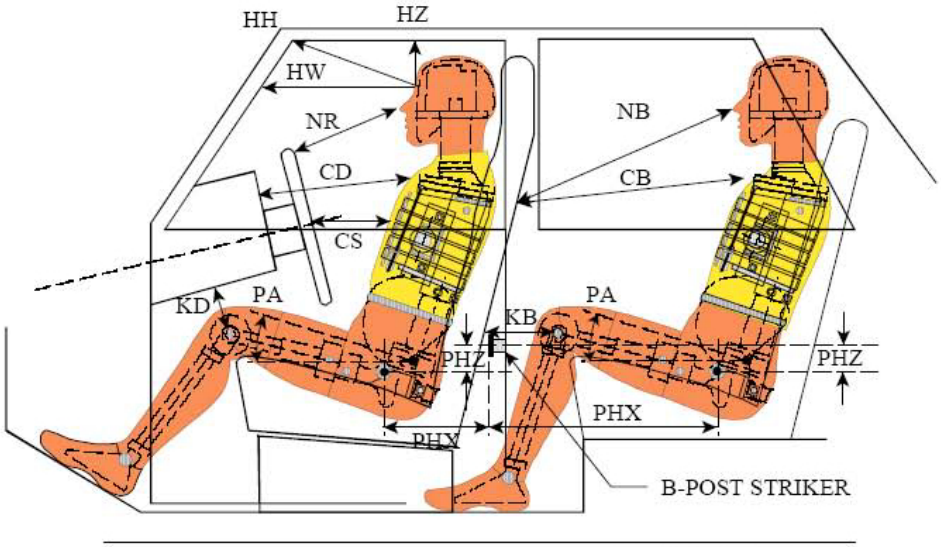
STEERING COLUMN POSITION

	Fore/Aft (mm)	Degrees
Lowermost - Position 1		66.3
Geometric Center – Position 2		68.5
Uppermost – Position 3		70.7
Telescoping Steering Wheel Travel		
Test Position		68.6

DATA SHEET NO. 3

DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2010 Ford Mustang Convertible NHTSA No. MA0210
Test Program: Side Validation Testing Test Date: 5/29/2009



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

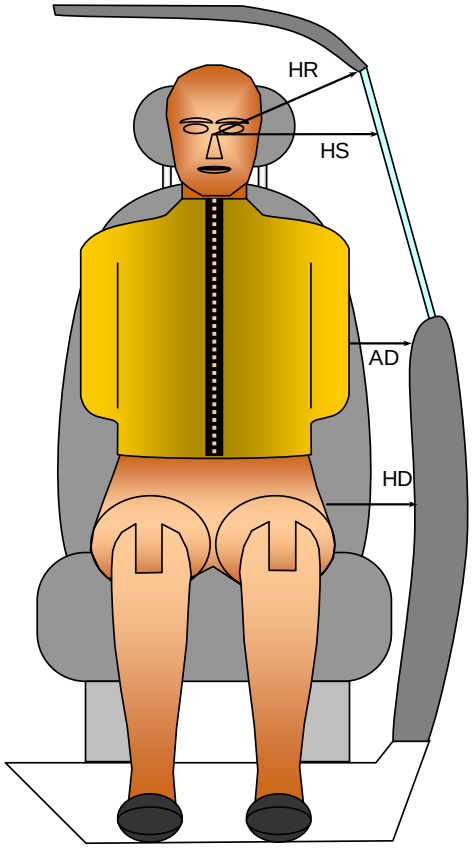
LEFT SIDE VIEW

Driver Code	Pass. Code	Measurement Description	Driver S/N 032		Passenger S/N 296	
			Length (mm)	Angle(°)	Length (mm)	Angle(°)
HH		Head to Header	340	10.8		
HW		Head to Windshield	524	0		
HZ	HZ	Head to Roof	168	90	231	90
NR	NB	Nose to Rim/Seat Back	421	12.3	402	14.0
CD	CB	Chest to Dash/Seat Back	541	8.4	409	13.2
CS		Chest to Steering Wheel	334	10.6		
KDL	KBL	Left Knee to Dash/Seat Back	122	49.2	179	25.3
KDR	KBR	Right Knee to Dash/Seat Back	136	39.2	175	30.3
PA	PA	Pelvic Angle		22.0		21.6
PHX	PHX	H-Point to Striker (X-Axis)	487	0	385	0
PHZ	PHZ	H-Point to Striker (Z-Axis)	212	90	156	90
SA	SA	Seat Back Angle (headrest post)		13.5		Fixed

DATA SHEET NO. 4

DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2010 Ford Mustang Convertible NHTSA No. MA0210
Test Program: Side Validation Testing Test Date: 5/29/2009



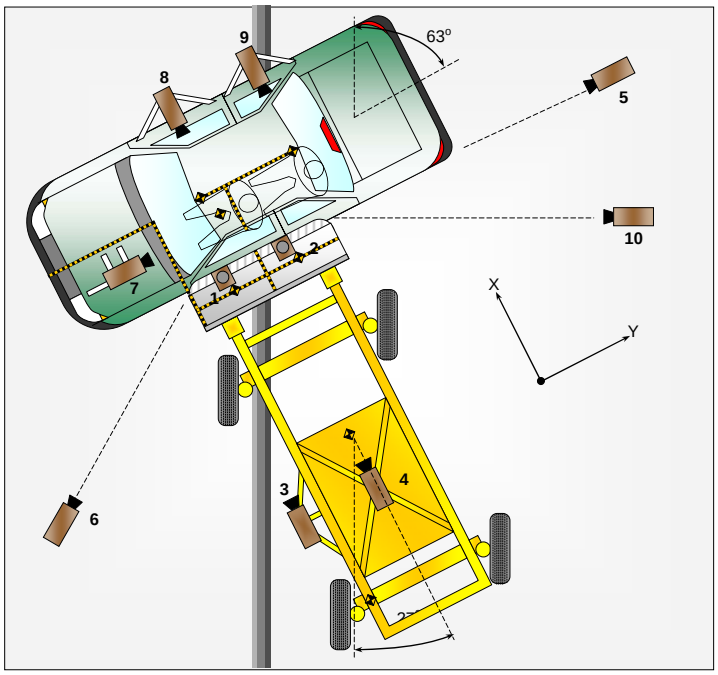
FRONT VIEW OF DUMMY

Code	Measurement Description	Units	Driver S/N 032	Passenger S/N 296
HR	Head to Side Header	mm	218	284
HS	Head to Side Window	mm	285	309
AD	Arm to Door	mm	91	74
HD	H-Point to Door	mm	141	134

DATA SHEET NO. 5

CAMERA LOCATIONS AND DATA

Test Vehicle: 2010 Ford Mustang Convertible NHTSA No. MA0210
Test Program: Side Validation Testing Test Date: 5/29/2009



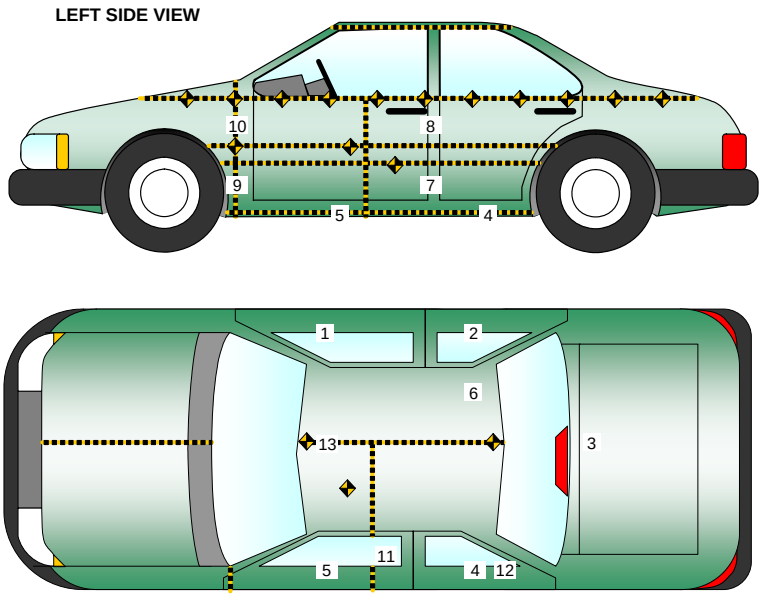
No.	Camera View	Location (mm)			Angle	Lens (mm)	Film Speed (fps)
		X	Y	Z			
1	Overhead Overall	140	1245	-5050		14	1000
2	Overhead Close-up	-565	-215	-5050		50	1000
3	Left Impact Point (MDB)					50	1000
4	Side Overall (MDB)					16	1000
5	Rear	75	6620	-1075		24	1000
6	Left Front	-3250	-4815	-1080		24	1000
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 Ford Mustang Convertible NHTSA No. MA0210
Test Program: Side Validation Testing Test Date: 5/29/2009



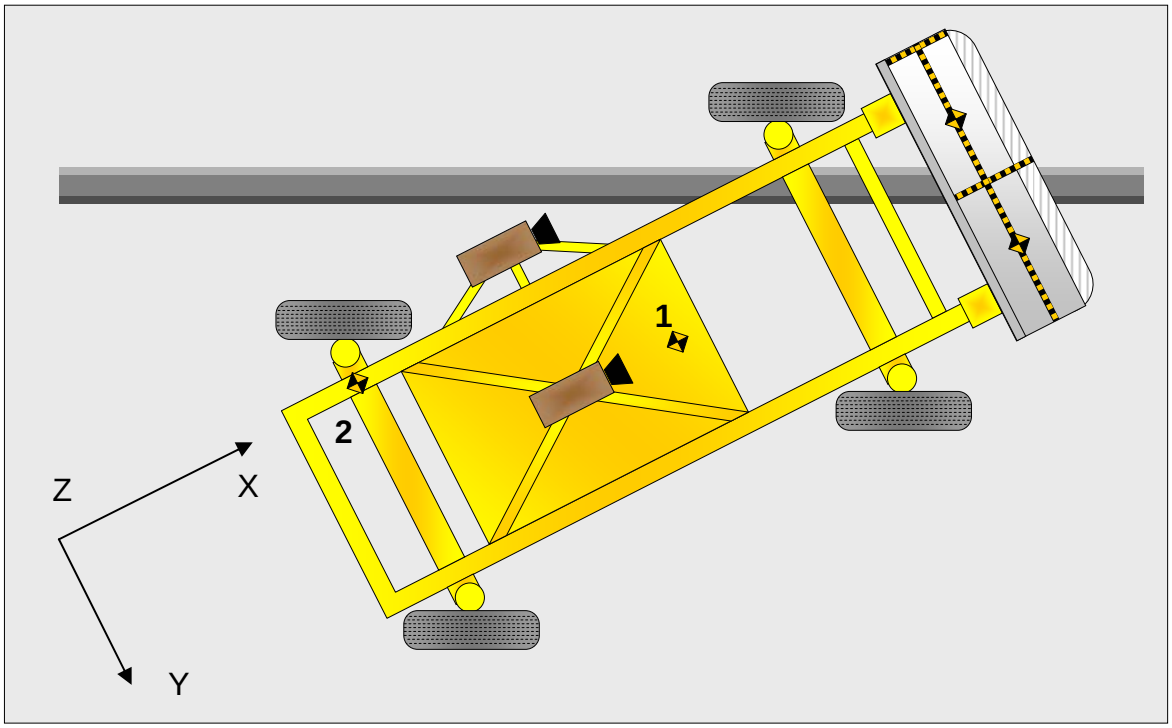
Loc. No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Right Sill at Front Seat	2500	732	-154
2	Right Sill at Rear Seat	1601	728	-181
3	Rear Floorpan Above Axle	953	0	-542
4	Left Sill at Rear Door	1653	-728	-203
5	Left Sill at Front Door	2459	-732	-169
6	Rt. Rear Occ. Compartment	1844	379	-437
7	Left Lower B-Post	1904	-662	-436
8	Left Middle B-Post	1802	-749	-747
9	Left Lower A-Post	2982	-714	-467
10	Left Middle A-Post	3003	-813	-697
11	Front Seat Track	2198	-544	-273
12	Rear Seat Track or Structure			
13	Vehicle CG	2533	0	-501

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 Ford Mustang Convertible NHTSA No. MA0210
Test Program: Side Validation Testing Test Date: 5/29/2009



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 Ford Mustang Convertible NHTSA No. MA0210
Test Program: Side Validation Testing Test Date: 5/29/2009

MAXIMUM EXTERIOR STATIC CRUSH

Level	Measurement Description	Units	Maximum Crush	Above Ground
1	Sill Top Height	mm	77	270
2	Occupant H-Point	mm	190	420
3	Mid Door	mm	196	630
4	Window Sill	mm	111	940
5	Window Top	mm	15	1300
	Maximum Penetration	mm	196	630

INSTRUMENTATION

Driver Dummy Channels	16
Passenger Dummy Channels	23
Vehicle Structure Accelerometers	20
Manufacturer's Additional Vehicle Channels	5
MDB Accelerometers	5
Total No. of Contact Switches	8
Monitoring Channels	1
Total	78

CAMERA COVERAGE

High-Speed Vehicle Onboard	3
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 Ford Mustang Convertible NHTSA No. MA0210
Test Program: Side Validation Testing Test Date: 5/29/2009

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	62.4
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	62.4
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	700	Right	255
B	Top of Bumper	533	700	Right	193
C	Mid-Level	686	800	Left	145
D	Top of Stack	813	800	Left	178

MDB INSTRUMENTATION AND CAMERAS

Accelerometers	5
Contact Switches	2
High-Speed Cameras	2

DATA SHEET NO. 10

POST-TEST OBSERVATIONS

Test Vehicle: 2010 Ford Mustang Convertible NHTSA No. MA0210
Test Program: Side Validation Testing Test Date: 5/29/2009

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	Combo Head/Torso Airbag, Headrest	Headliner
Upper Torso Contact	Combo Head/Torso Airbag	Interior Panel
Lower Torso Contact	Combo Head/Torso Airbag	Interior Panel
Left Knee Contact	Door Panel	Interior 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	
Right Side Doors	Remained closed and operational	
Hatch and Other Doors	Remained closed and operational	
Seat Movement	0	
Seat Back Failure	None	

POST TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	No Separation
Sill Separation	None
Windshield Damage	Cracked
Window Damage	Left Front and Left Rear Window 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	No		No	
Combination Head/Torso Side Airbag	Yes	Yes	No	
Side Head Curtain/Tube Airbag	No		No	
Pretensioner	Yes	Yes	No	
Load Limiter	Yes	No	No	

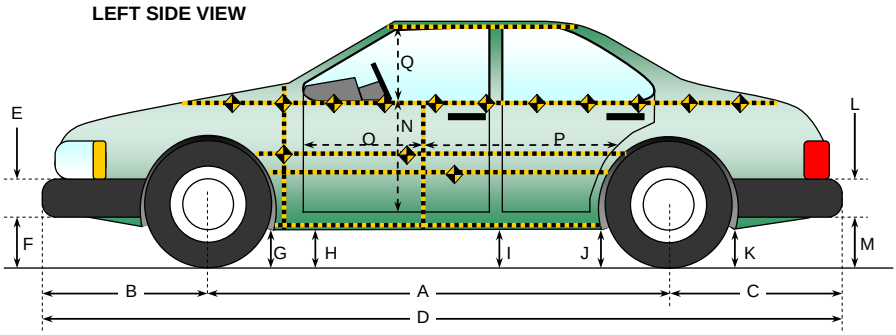
MDB LEFT EDGE IMPACT POINT DATA

Measured Parameter	Units	Requirement	Value
Horizontal Offset	mm	+/- 50	22 forward
Vertical Offset	mm	+/-20	6 down

DATA SHEET NO. 11

VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2010 Ford Mustang Convertible NHTSA No. MA0210
Test Program: Side Validation Testing Test Date: 5/29/2009



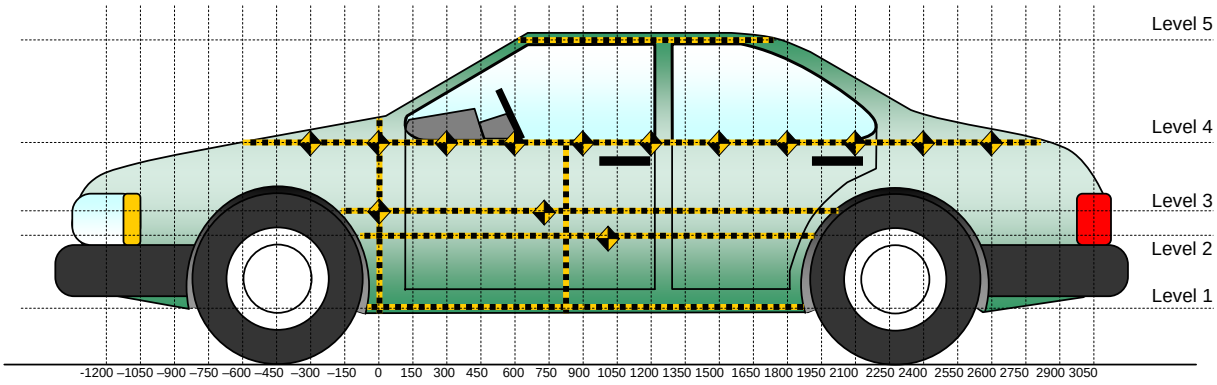
All Measurements in mm

Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2720	2722	-2
B	Front Axle to FSOV	928	936	-8
C	Rear Axle to RSOV	1120	1125	-5
D	Total Length at Centerline	4768	4783	-15
E	Front Bumper Thickness	130	130	0
F	Front Bumper Bottom to Ground	193	205	-12
G	Sill Height at Front Wheel Well	139	146	-7
H	Sill Height at Front Door Leading Edge	145	145	0
I	Sill Height at B Pillar	150	174	-24
J1	Sill Height at Rear Wheel Well	146	168	-22
J2	Pinch Weld Height at Rear Wheel Well	145	164	-19
K	Sill Height Aft of Rear Wheel Well	209	217	-8
L	Rear Bumper Thickness	342	342	0
M	Rear Bumper Bottom to Ground	275	288	-13
N	Sill Height to Window Bottom Sill	731	624	107
O	Front Door Leading Edge to Impact CL	522	529	-7
P	Rear Door Trailing Edge to Impact CL	782	770	12
Q	Front Window Opening	280	275	5
R	Right Side Length	4123	4125	-2
S	Left Side Length	4123	4093	30
T	Vehicle Width at B Post	1849	1683	166

DATA SHEET NO. 12

VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2010 Ford Mustang Convertible NHTSA No. MA0210
Test Program: Side Validation Testing Test Date: 5/29/2009



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	270
2	Occupant H-Point	420
3	Mid-Door	630
4	Window Sill	940
5	Window Top	1300

DATA SHEET NO. 12 (CONTINUED)

VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2010 Ford Mustang Convertible NHTSA No. MA0210
Test Program: Side Validation Testing Test Date: 5/29/2009

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-750				325					326					1	
-600				304					306					2	
-450				295					300					5	
-300				286					295					9	
-150				283					296					13	
0		193	182	278			299	308	295			106	126	17	
150	238	190	185	278		288	370	345	296		50	180	160	18	
300	235	189	183	274		300	379	366	303		65	190	183	29	
450	234	186	183	274		311	367	360	312		77	181	177	38	
600	233	184	182	270		302	365	357	318		69	181	175	48	
750	233	182	181	268		295	365	356	332		62	183	175	64	
900	230	182	181	267	468	294	362	355	337	480	64	180	174	70	12
1050	233	181	180	267	464	298	362	356	346	478	65	181	176	79	14
1200	233	181	180	268	464	303	360	352	355	476	70	179	172	87	12
1350	237	182	180	269	468	300	355	353	364	476	63	173	173	95	8
1500	241	184	181	270	465	288	352	355	376	475	47	168	174	106	10
1650	246	187	183	266	465	267	345	379	377	478	21	158	196	111	5
1800	245	188	175	255	475	253	285	351	326	478	8	97	176	71	3
1950			166	254	482			259	298	495			93	44	13
2100				254	494				279	509				25	15
2250				259	515				278	524				19	9
2400				266					281					15	
2550				276					290					14	
2700				286					299					13	
2850				299					310					11	

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

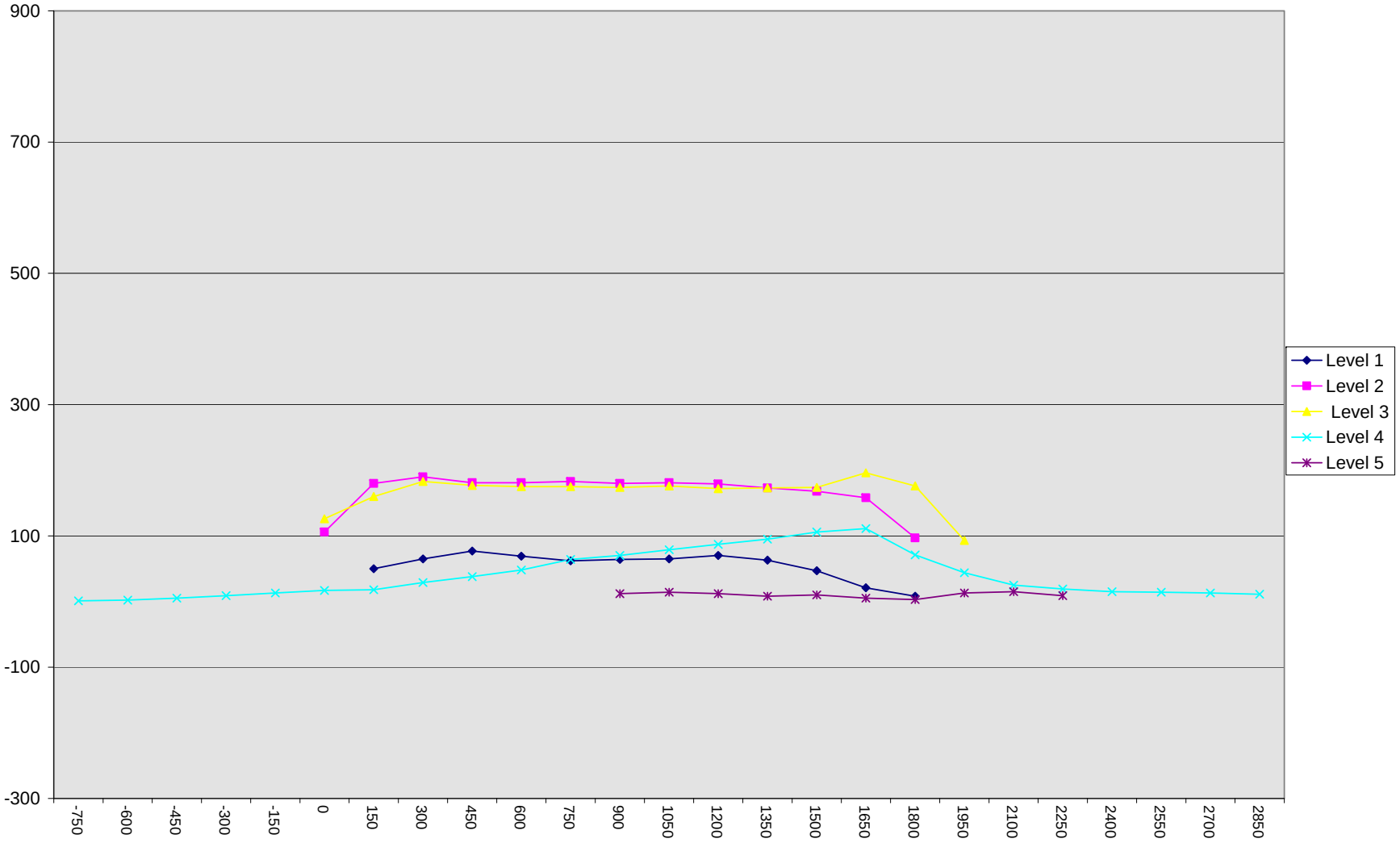
MAXIMUM CRUSH DATA

	Level 1	Level 2	Level 3	Level 4	Level 5
Maximum Crush (mm)	77	190	196	111	15
Distance From Impact (mm)	450	300	1650	1650	2100

DATA SHEET NO. 12 (continued)

VEHICLE EXTERIOR CRUSH MEASUREMENTS

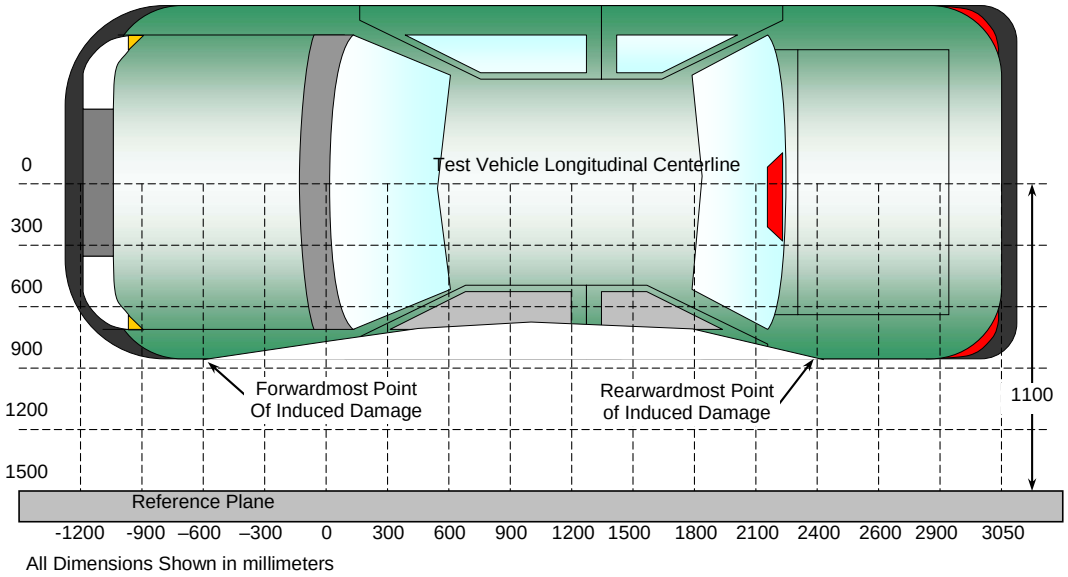
Test Vehicle: 2010 Ford Mustang Convertible NHTSA No. MA0210
Test Program: Side Validation Testing Test Date: 5/29/2009



DATA SHEET NO. 13

VEHICLE DAMAGE PROFILE DISTANCES

Test Vehicle: 2010 Ford Mustang Convertible NHTSA No. MA0210
Test Program: Side Validation Testing Test Date: 5/29/2009



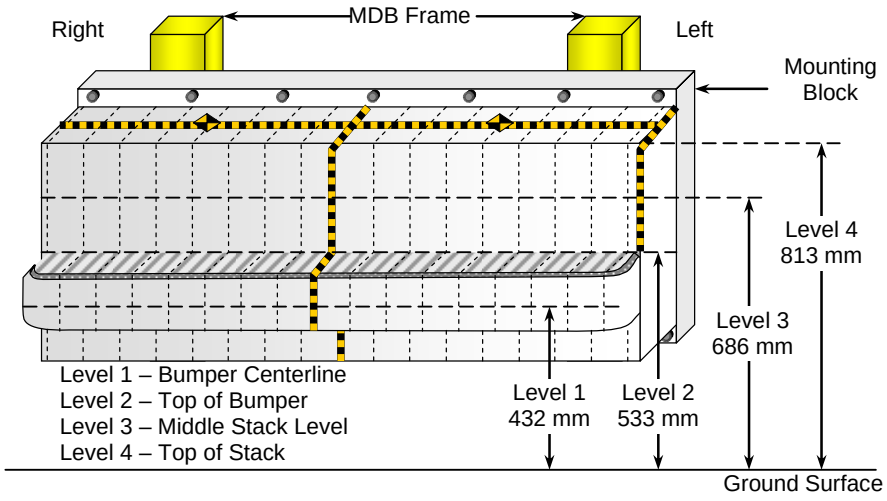
TOP VIEW

DPD	Distance from Impact Point (mm)	Level	Pre-Test (mm)	Post-Test (mm)	Max. Static Crush (mm)
1	2850	4	299	310	11
2	2136	4	255	274	19
3	1394	4	270	365	95
4	680	2	183	365	182
5	-35	4	193	293	100
6	-750	4	325	326	1

DATA SHEET NO. 14

EXTERIOR STATIC CRUSH FOR IMPACTOR FACE

Test Vehicle: 2010 Ford Mustang Convertible NHTSA No. MA0210
Test Program: Side Validation Testing Test Date: 5/29/2009



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	0	100	200	300	400	500	600	700	800
4	129	110	87	64	40	20	25	35	47	61	73	95	117	147	173	169	178
3	102	112	118	65	45	34	32	32	34	34	39	49	75	115	131	129	145
2	187	193	165	147	130	115	105	103	105	105	107	107	111	115	120	122	121
1	246	255	252	233	212	184	167	163	165	163	163	165	176	196	190	182	179

DATA SHEET NO. 15

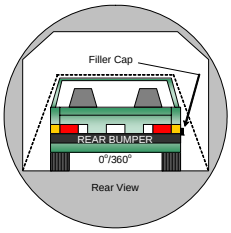
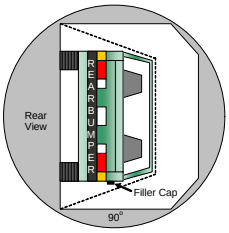
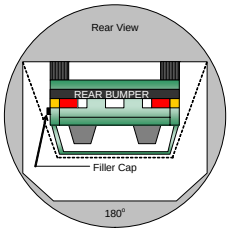
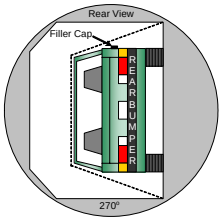
FMVSS 301 FUEL INTEGRITY POST-IMPACT DATA

Test Vehicle: 2010 Ford Mustang Convertible NHTSA No. MA0210
Test Program: Side Validation Testing Test Date: 5/29/2009

Test Time: 1:06 pm 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

			
0°/360°	90°	180°	270°

ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	125	300	425
90° to 180°	119	300	419
180° to 270°	112	300	412
270° to 360°	118	300	418

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

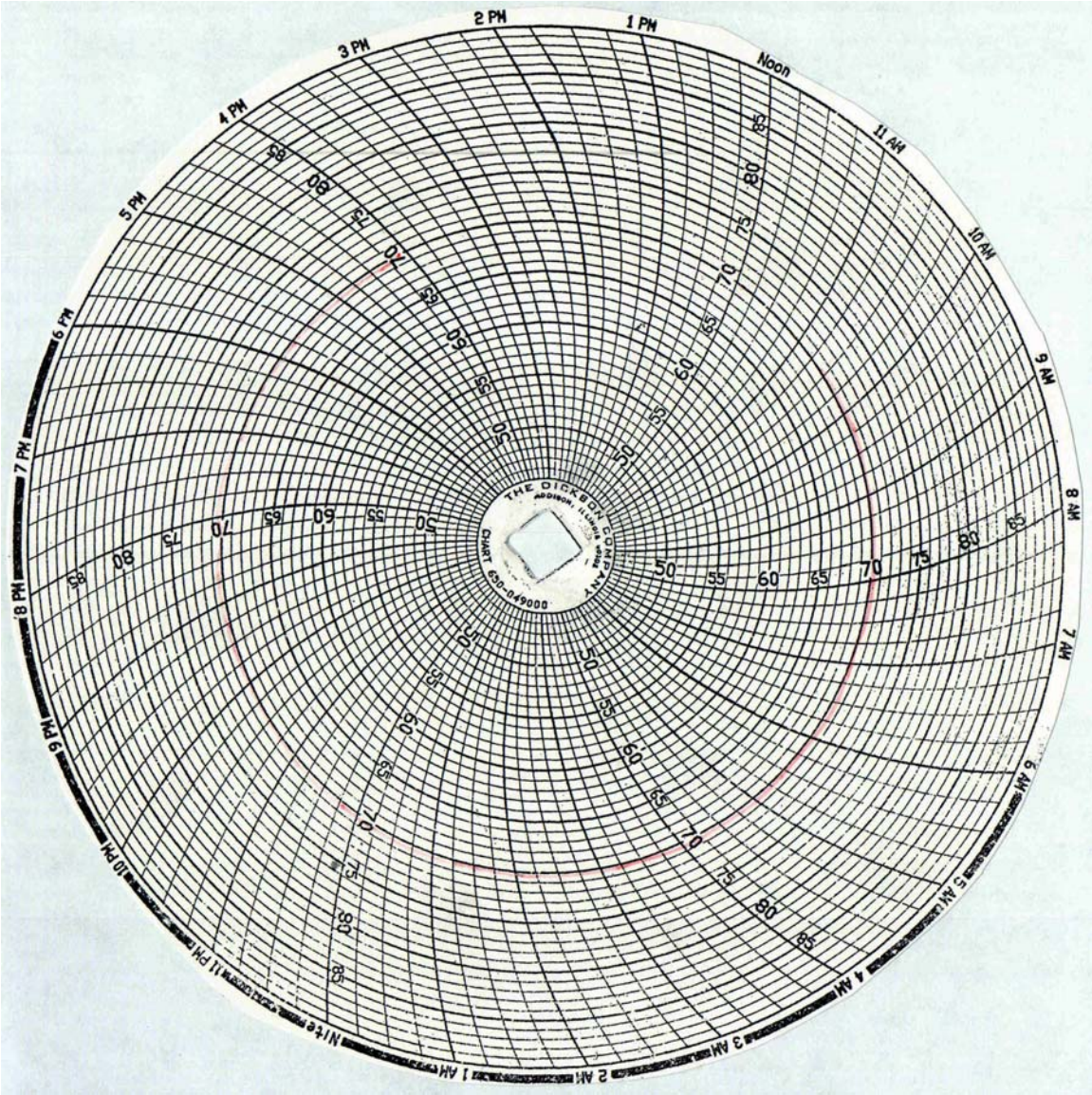
ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

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 Ford Mustang Convertible	NHTSA No.	MA0210
Test Program:	Side Validation Testing	Test Date:	5/29/2009



APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

As Delivered Right Front ¾ View of Test Vehicle

As Delivered Left Rear ¾ View of Test Vehicle

Pre-Test Frontal View of Test Vehicle

Post-Test Frontal View of Test Vehicle

Pre-Test Left ¾ Front View of Test Vehicle

Post-Test Left ¾ Front View of Test Vehicle

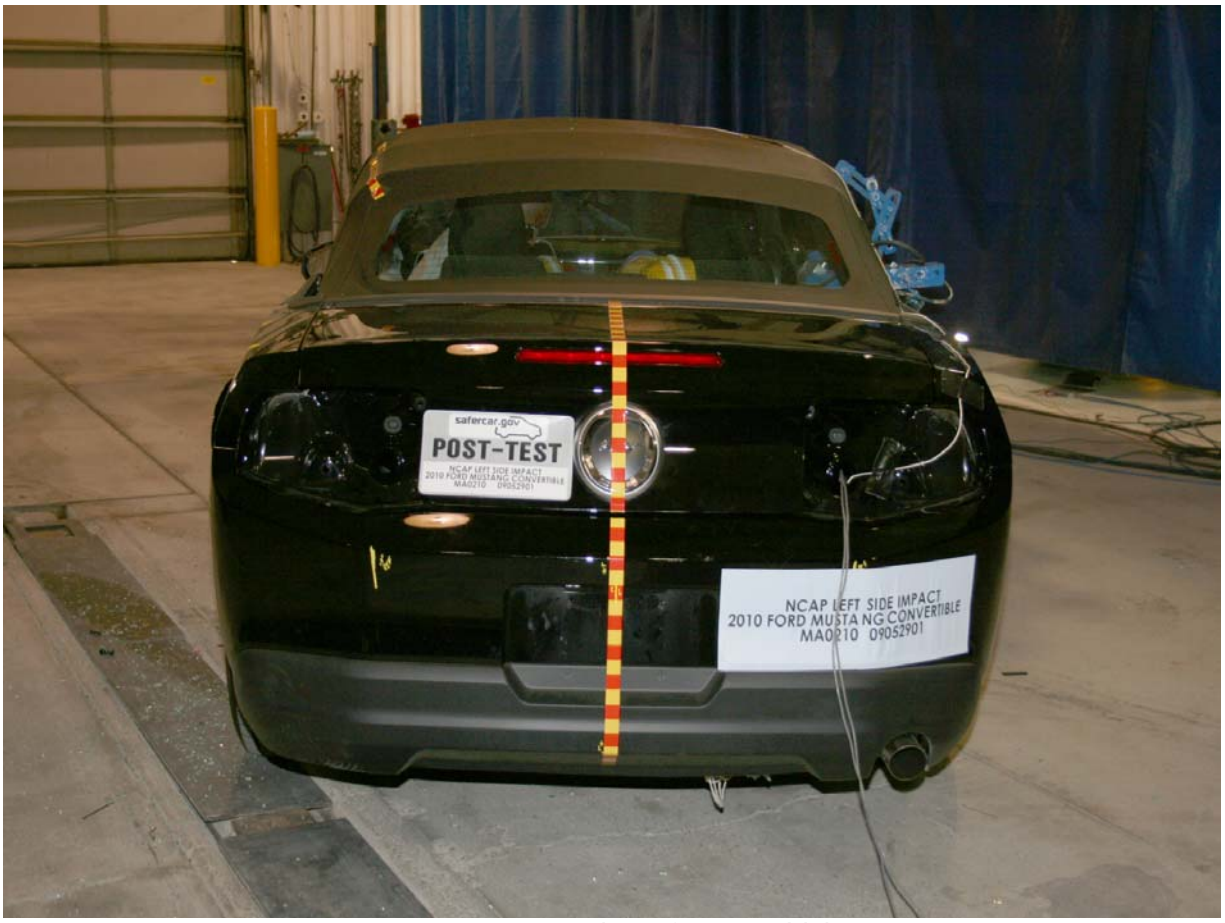
Pre-Test Left Side View of Test Vehicle

Post-Test Left Side View of Test Vehicle

Pre-Test Left ¾ Rear View of Test Vehicle

Post-Test Left ¾ 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

NO REAR DOOR

Pre-Test Left Rear Door Latch Close-Up

NO REAR DOOR

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 (through window with dummy)

Post-Test Right Side View of Front Seat of Occupant Compartment (through window with dummy)

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

SEAT NON-ADJUSTABLE

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

SEAT NON-ADJUSTABLE

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 (through window with dummy)

Post-Test Right Side View of Rear Seat of Occupant Compartment (through window with dummy)

NO REAR DOOR

Pre-Test Passenger Inner Door Panel View

NO REAR DOOR

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

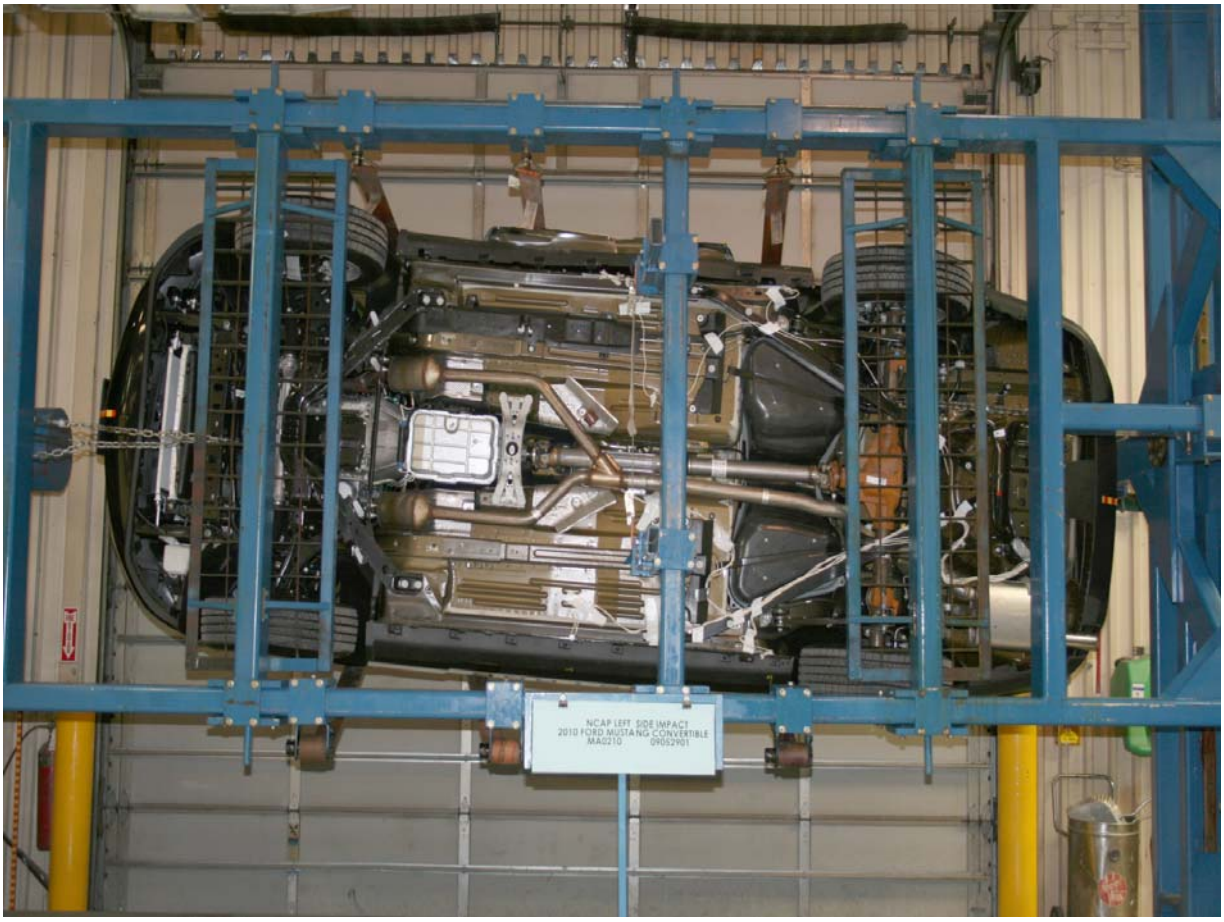
Post-Test Right Side View of MDB Impactor Face

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)

APPENDIX B

DUMMY RESPONSE DATA

TABLE OF DATA PLOTS
Driver & Passenger Dummy Instrumentation Plots
FILTERED DATA

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

Manufacturer’s Data

ACU (X)

ACU (Y)

ACU (Z)

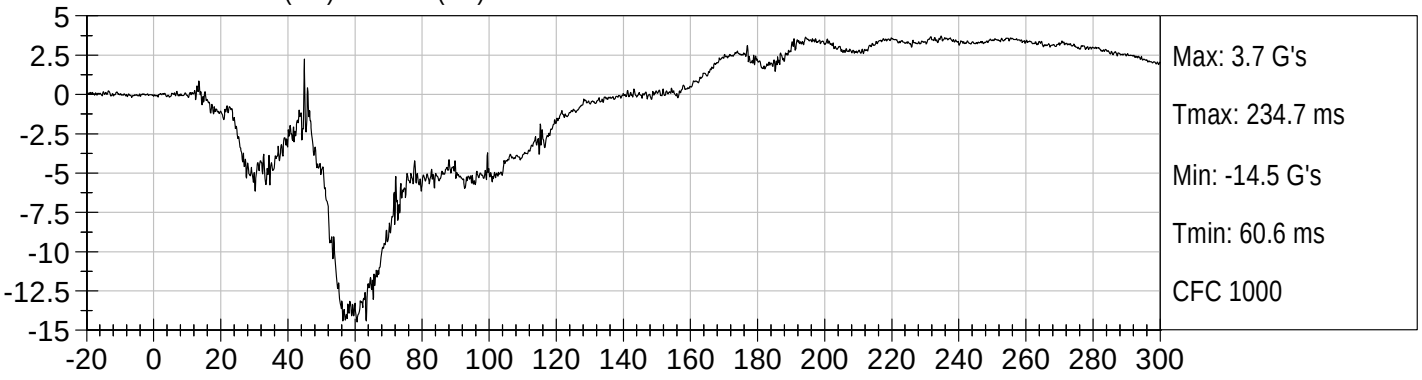
SIS LH (Y)

SIS RH (Y)

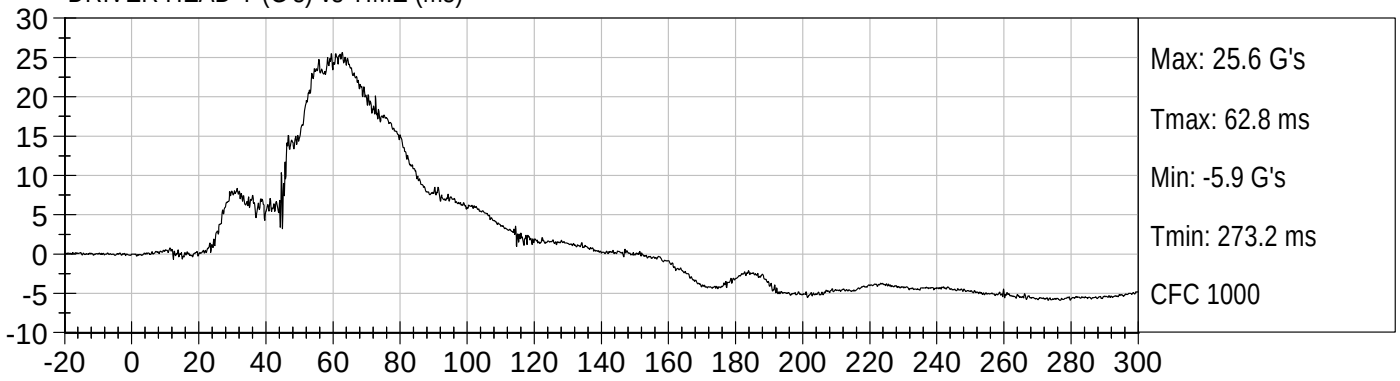
55/28 km/h 90° NCAP Side Impact
2010 Ford Mustang Convertible - MA0210

Test Date: 05/29/2009
Speed: 38.8 mph (62.4 km/h)

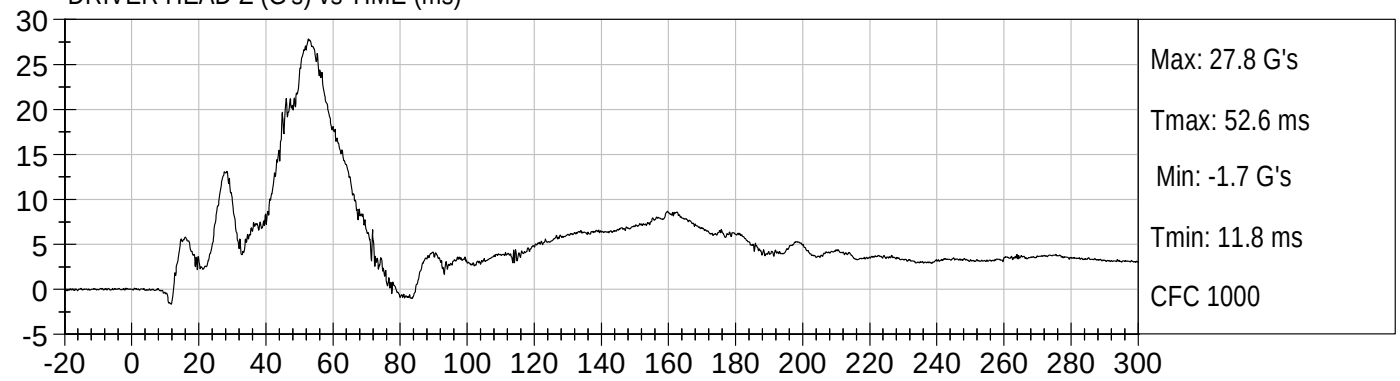
DRIVER HEAD X (G's) vs TIME (ms)



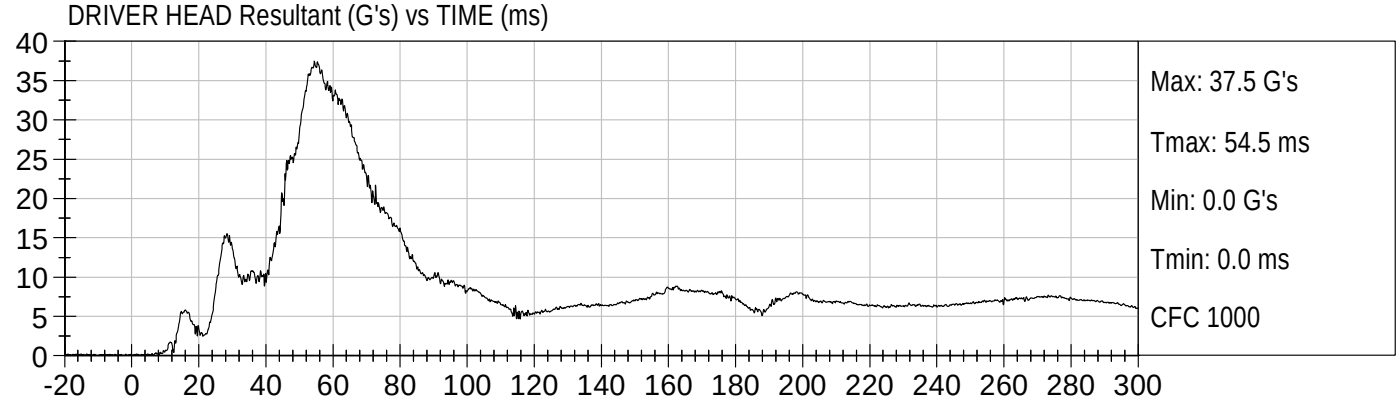
DRIVER HEAD Y (G's) vs TIME (ms)



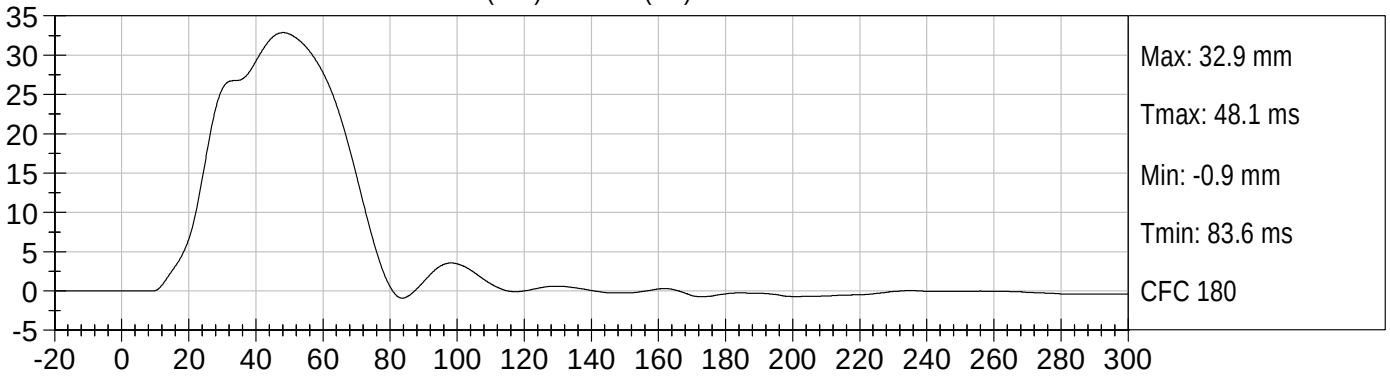
DRIVER HEAD Z (G's) vs TIME (ms)



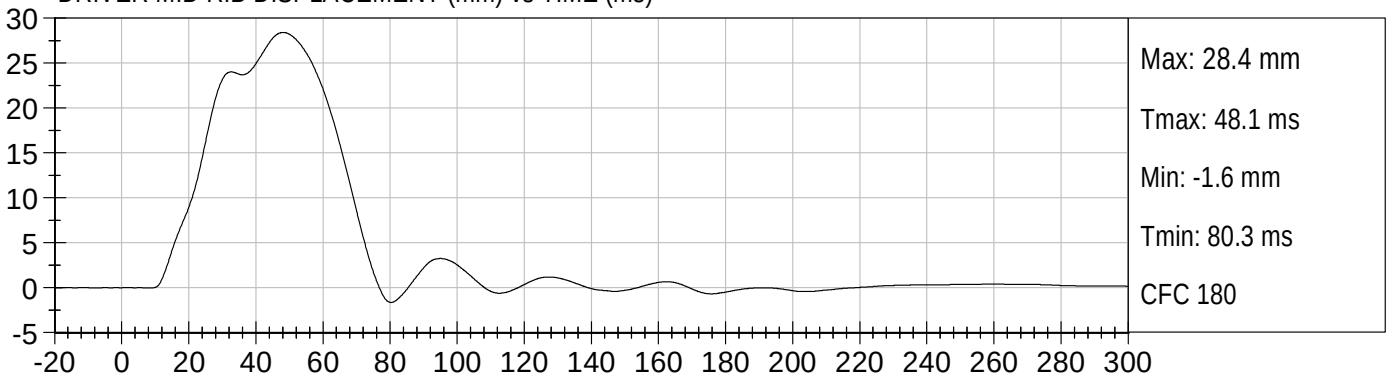
DRIVER HEAD Resultant (G's) vs TIME (ms)



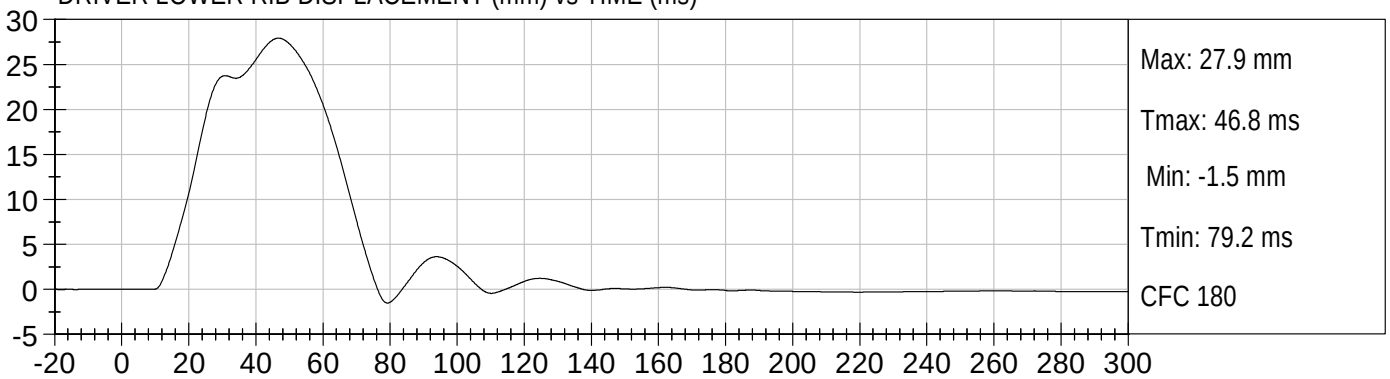
DRIVER UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



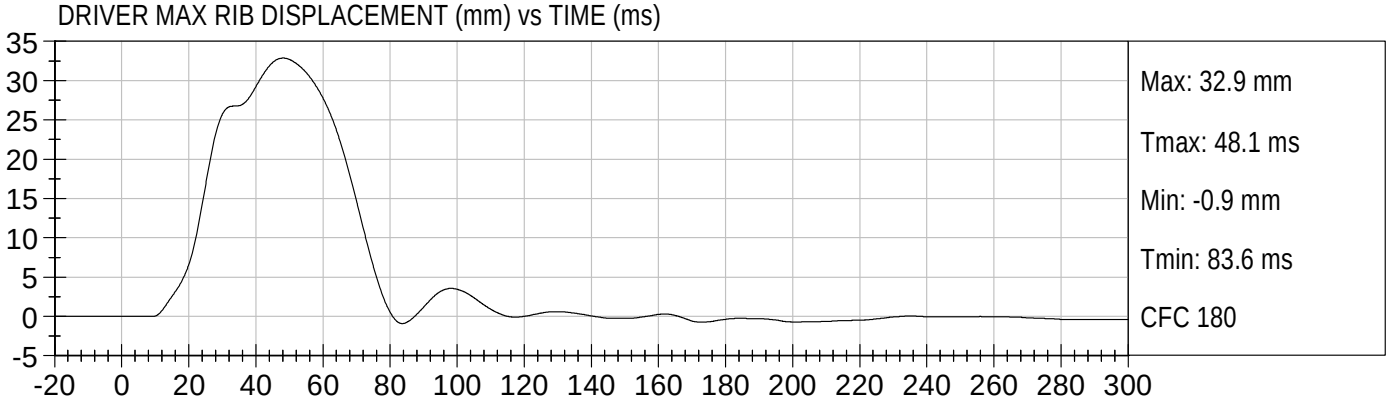
DRIVER MID RIB DISPLACEMENT (mm) vs TIME (ms)



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



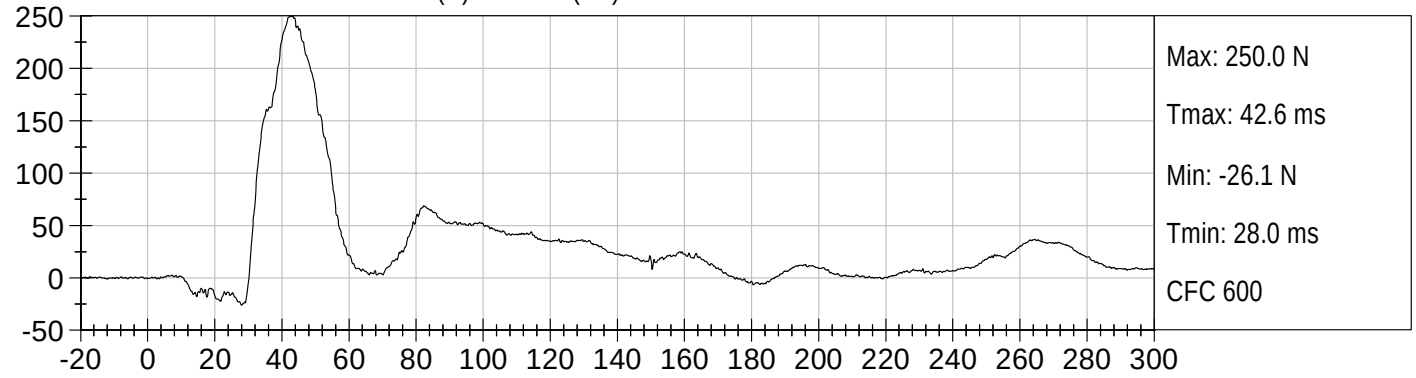
DRIVER MAX RIB DISPLACEMENT (mm) vs TIME (ms)



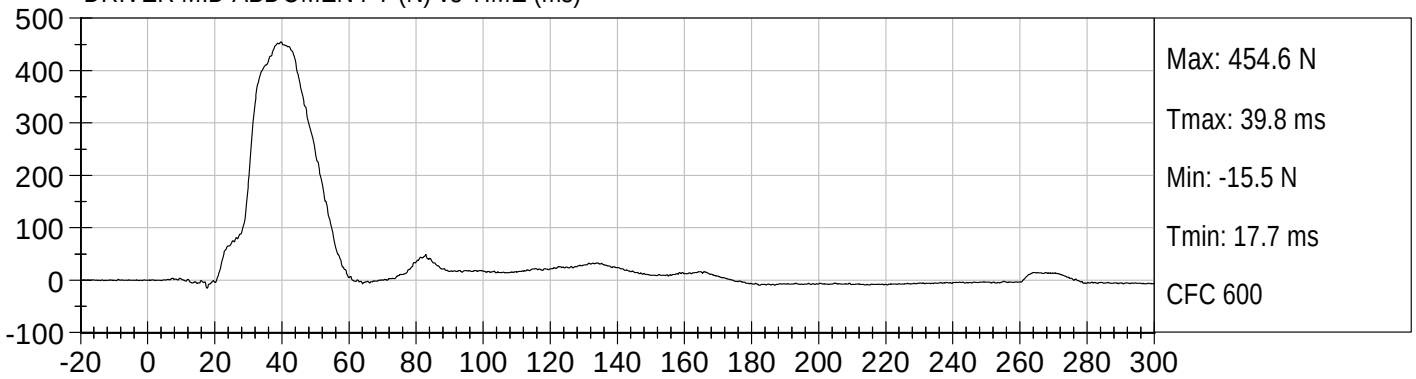
55/28 km/h 90° NCAP Side Impact
2010 Ford Mustang Convertible - MA0210

Test Date: 05/29/2009
Speed: 38.8 mph (62.4 km/h)

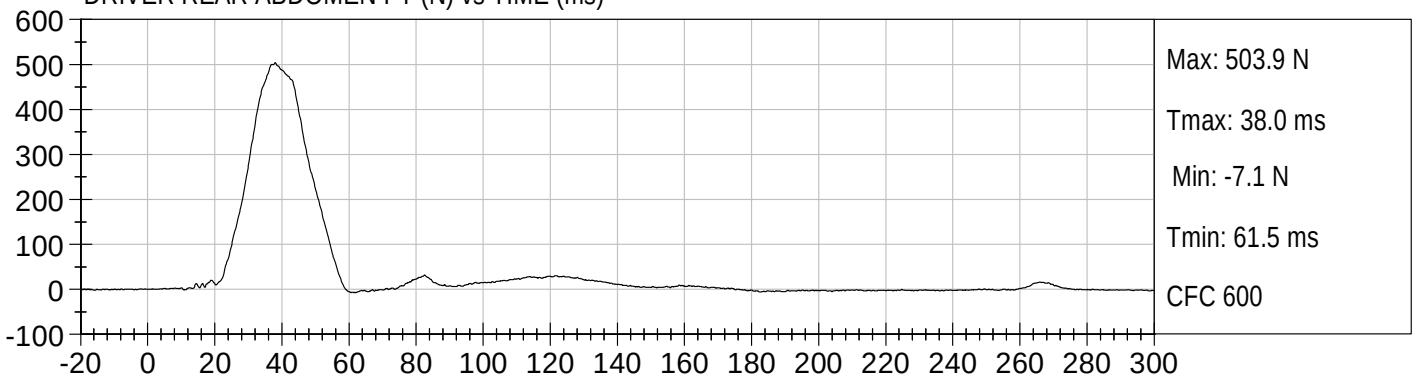
DRIVER FRONT ABDOMEN FY (N) vs TIME (ms)



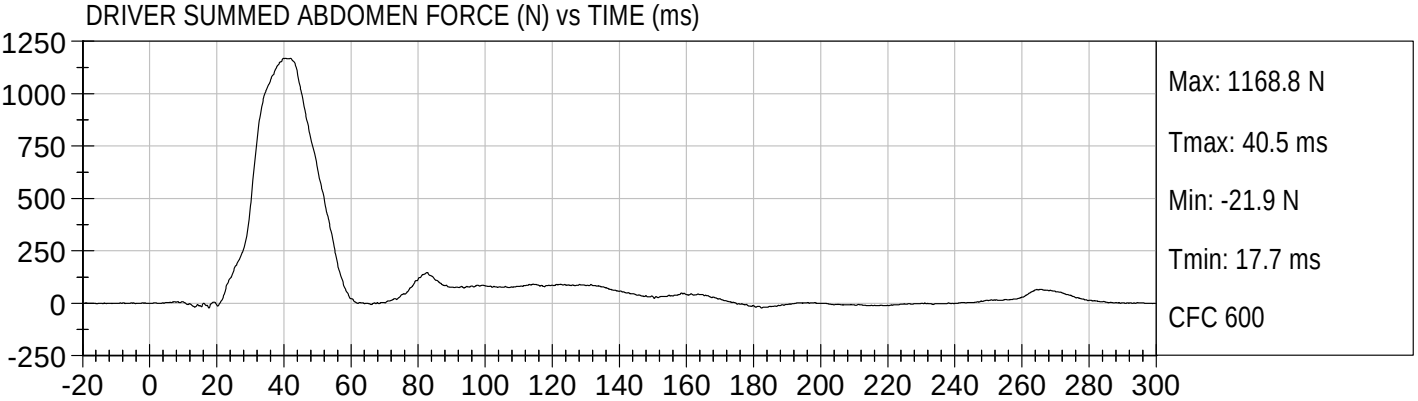
DRIVER MID ABDOMEN FY (N) vs TIME (ms)



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

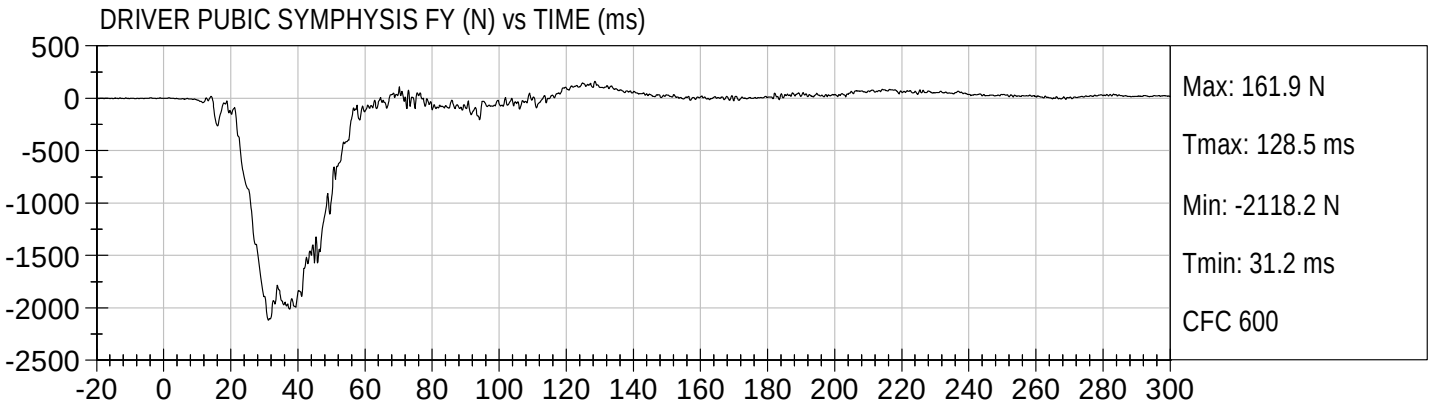


DRIVER SUMMED ABDOMEN FORCE (N) vs TIME (ms)



55/28 km/h 90° NCAP Side Impact
2010 Ford Mustang Convertible - MA0210

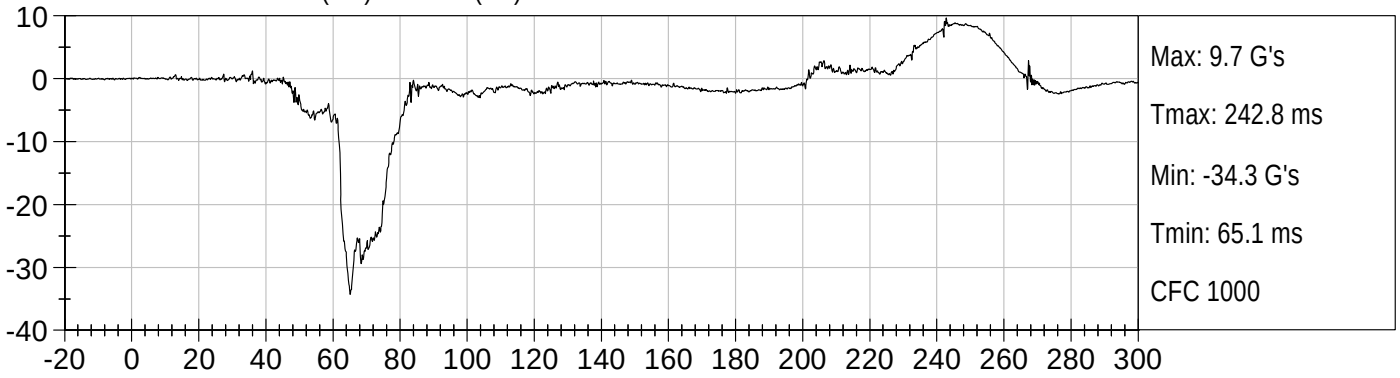
Test Date: 05/29/2009
Speed: 38.8 mph (62.4 km/h)



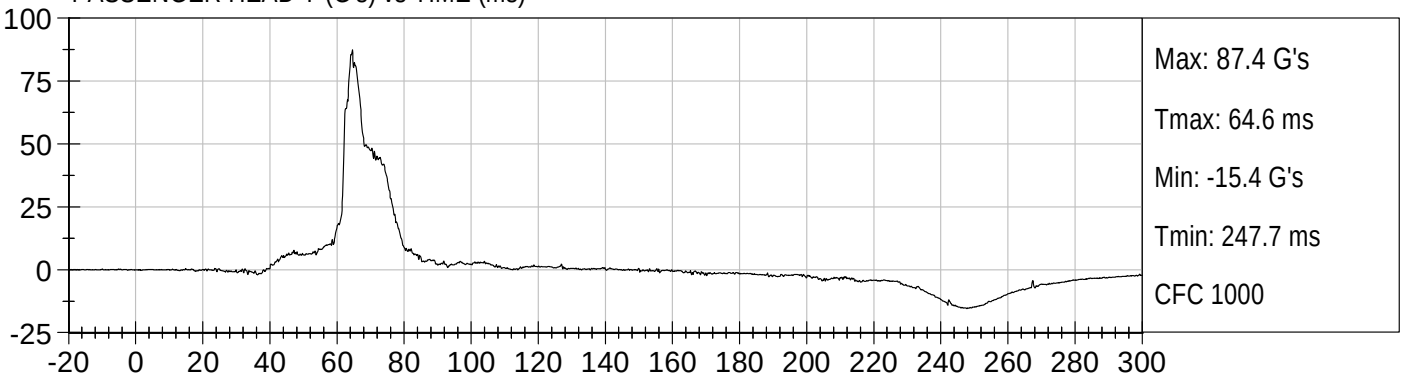
55/28 km/h 90° NCAP Side Impact
2010 Ford Mustang Convertible - MA0210

Test Date: 05/29/2009
Speed: 38.8 mph (62.4 km/h)

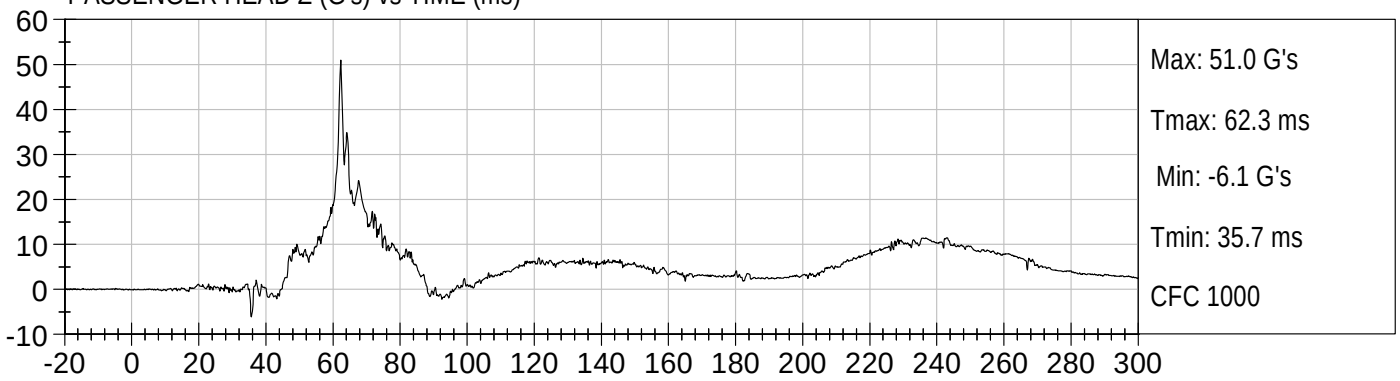
PASSENGER HEAD X (G's) vs TIME (ms)



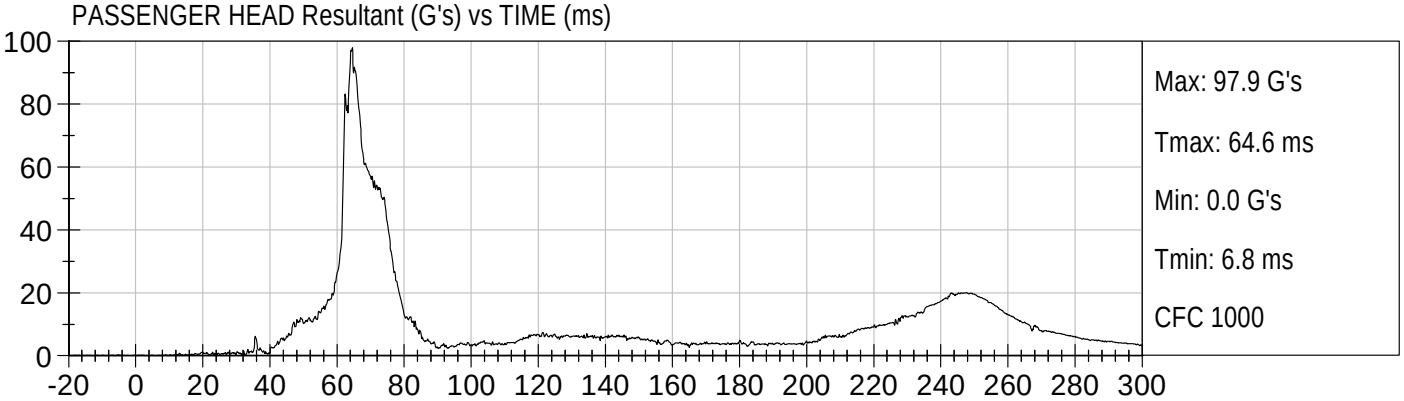
PASSENGER HEAD Y (G's) vs TIME (ms)



PASSENGER HEAD Z (G's) vs TIME (ms)



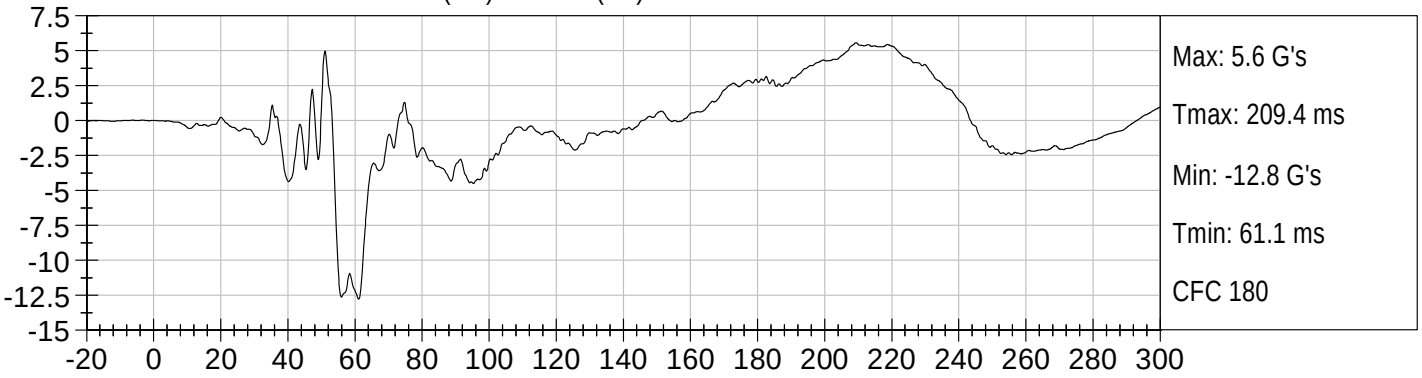
PASSENGER HEAD Resultant (G's) vs TIME (ms)



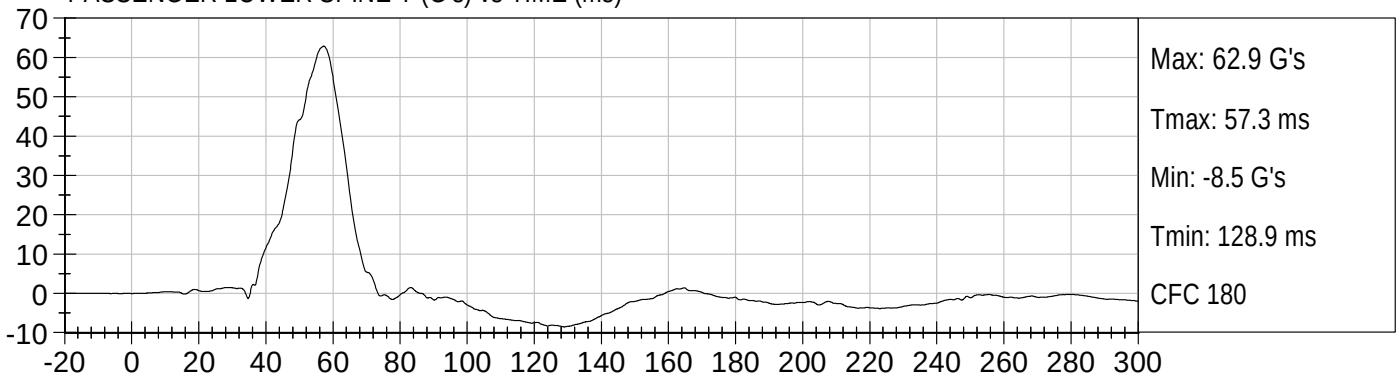
55/28 km/h 90° NCAP Side Impact
2010 Ford Mustang Convertible - MA0210

Test Date: 05/29/2009
Speed: 38.8 mph (62.4 km/h)

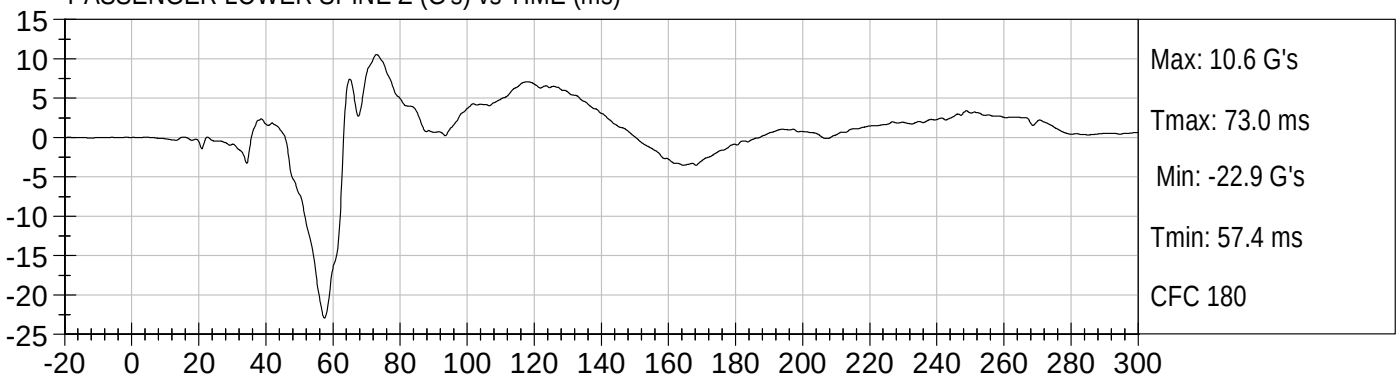
PASSENGER LOWER SPINE X (G's) vs TIME (ms)



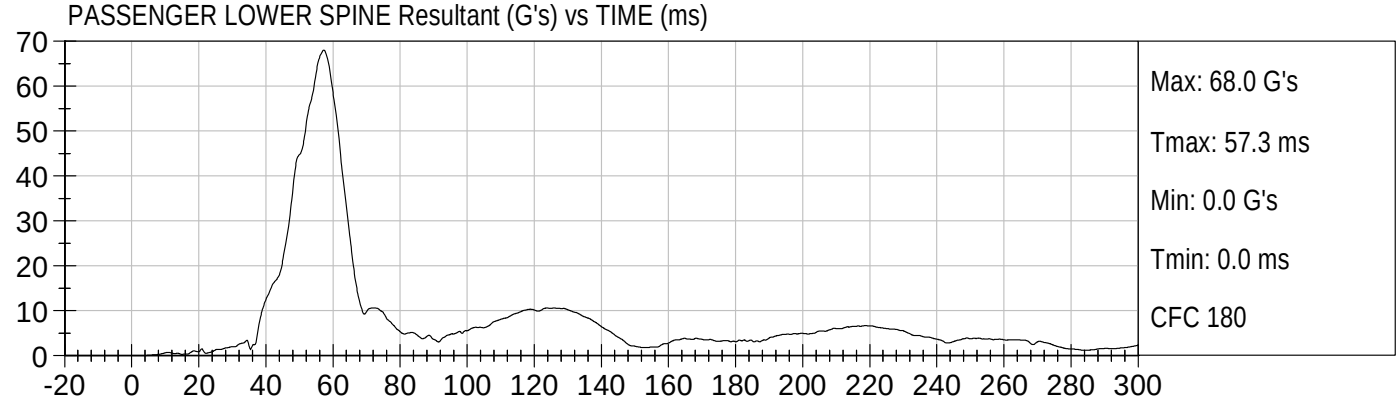
PASSENGER LOWER SPINE Y (G's) vs TIME (ms)



PASSENGER LOWER SPINE Z (G's) vs TIME (ms)



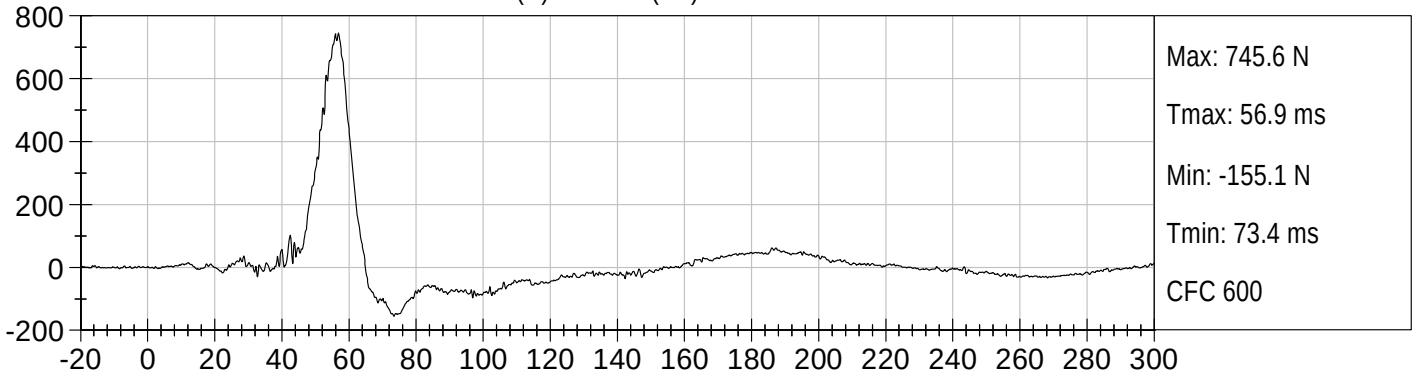
PASSENGER LOWER SPINE Resultant (G's) vs TIME (ms)



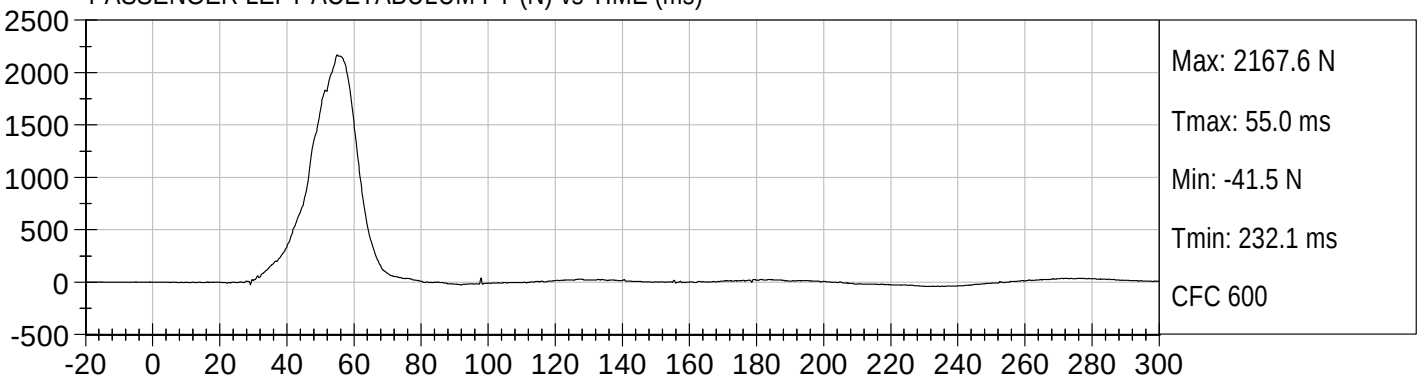
55/28 km/h 90° NCAP Side Impact
2010 Ford Mustang Convertible - MA0210

Test Date: 05/29/2009
Speed: 38.8 mph (62.4 km/h)

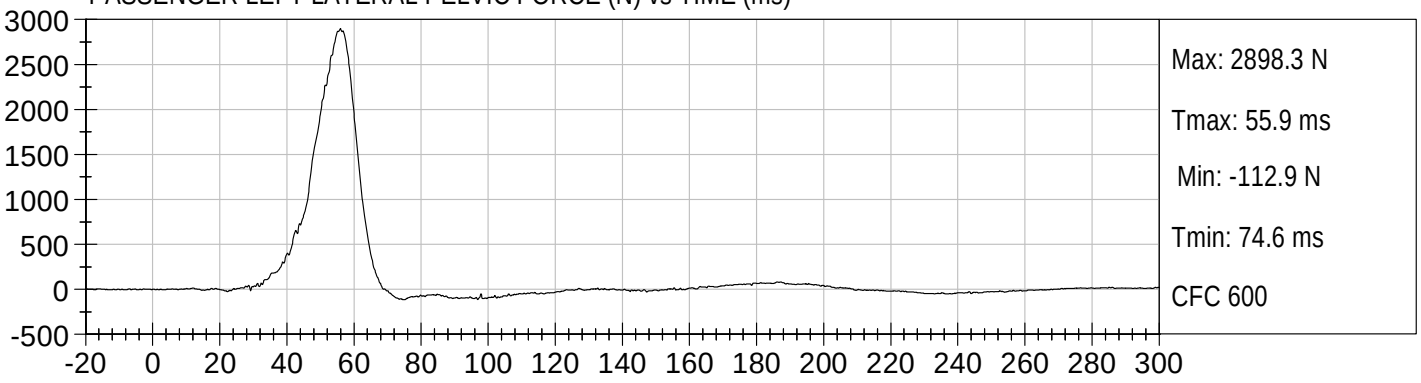
PASSENGER LEFT ILLIUM CREST FY (N) vs TIME (ms)



PASSENGER LEFT ACETABULUM 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:** D09991

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	50	Pass
Peak Resultant Acceleration	G's	125 to 155	141	Pass
Peak Lateral Acceleration	G's	+/- 15	-6.6	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

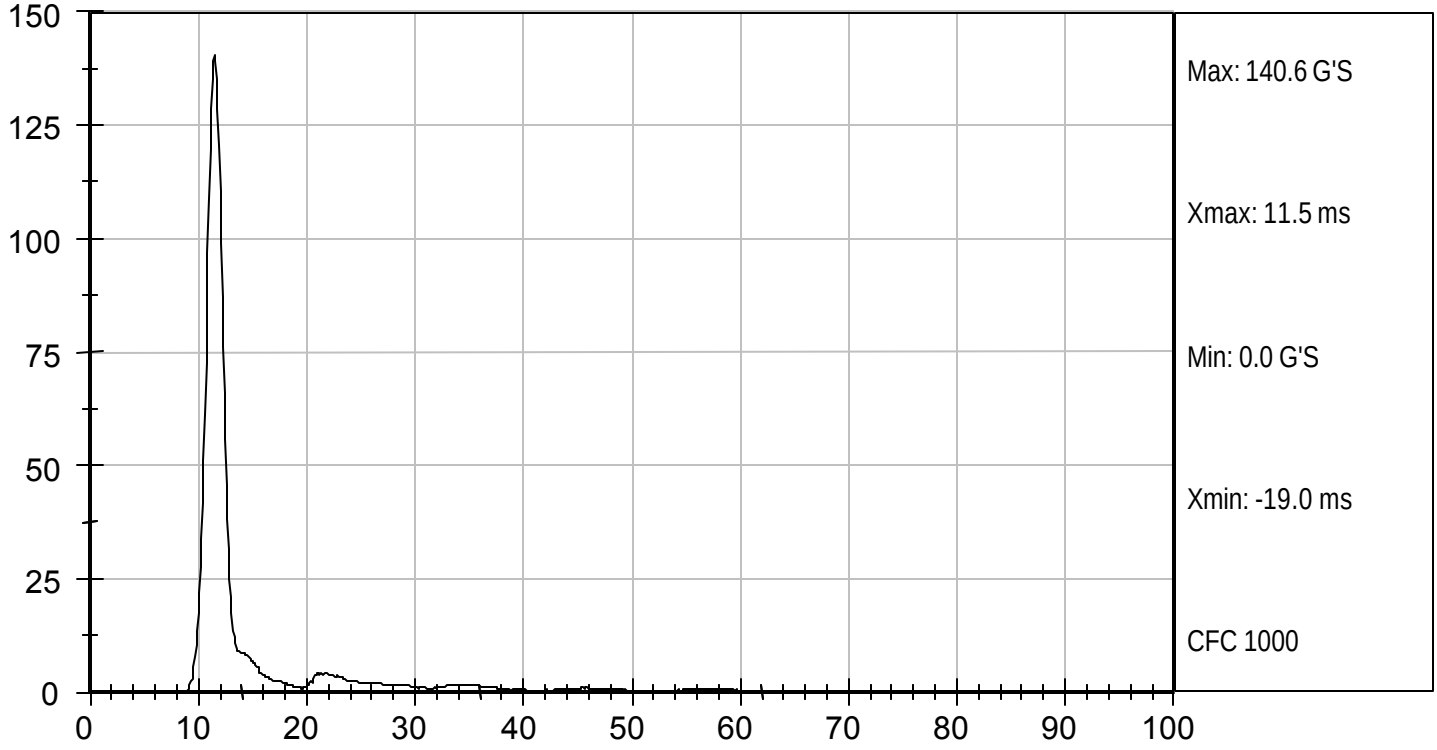
4/30/09
Test Date

David Winkelbauer
Approved By

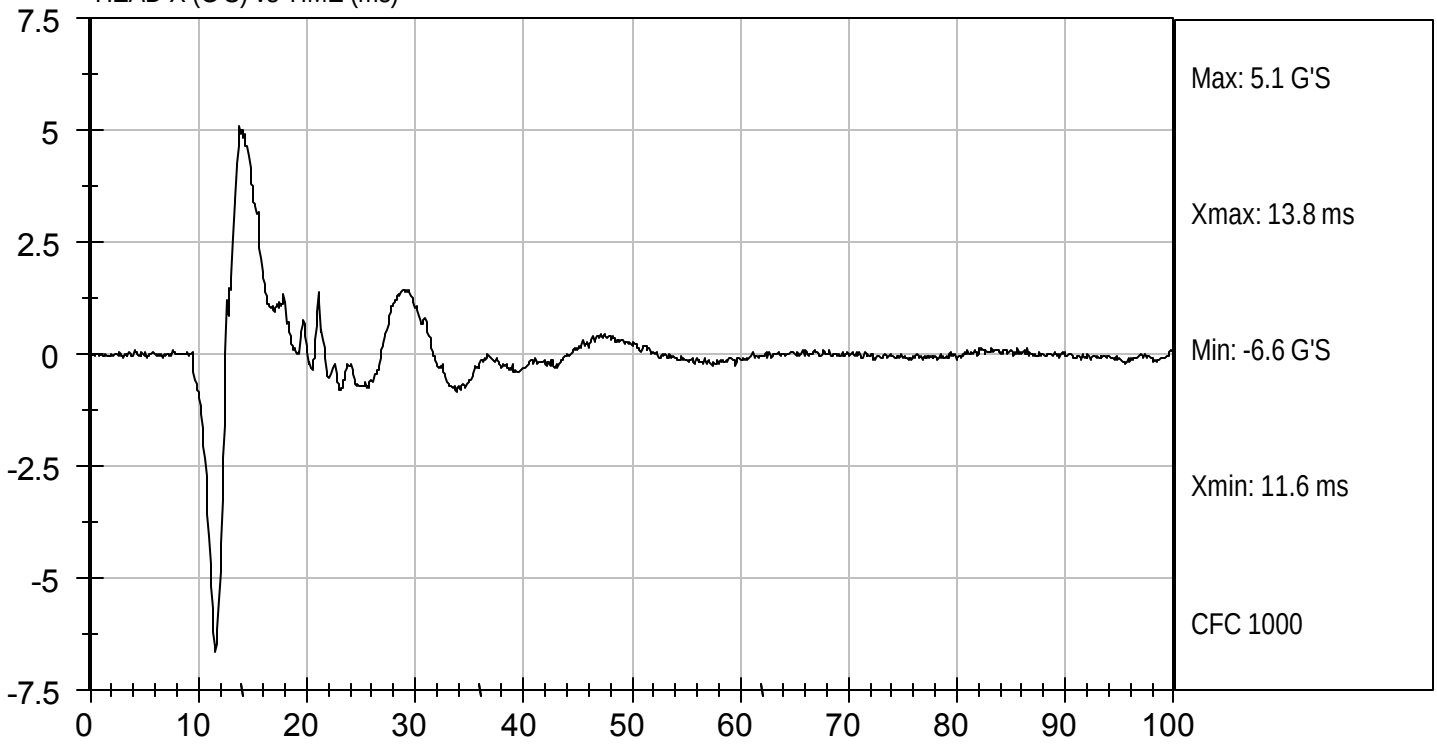
Test Desc: Head Drop
Component ID: D09991

Test Date: 4/30/09
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:** D09992

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	18.0 to 22.0	21.3	Pass
Laboratory Relative Humidity		%	10 to 70	48	Pass
Pendulum Speed		m/s	3.3 to 3.5	3.5	Pass
Pendulum Deceleration	1 msec	G's	0.00 to -0.05	-0.14	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	53.8	Pass
Time of Maximum Flexion Angle		msec	54.0 to 66.0	60.5	Pass
Head Rotation Decay Time to 0 degree		msec	53 to 88	62	Pass
			Overall Test Results		Pass

Jessica Hall
Laboratory Technician

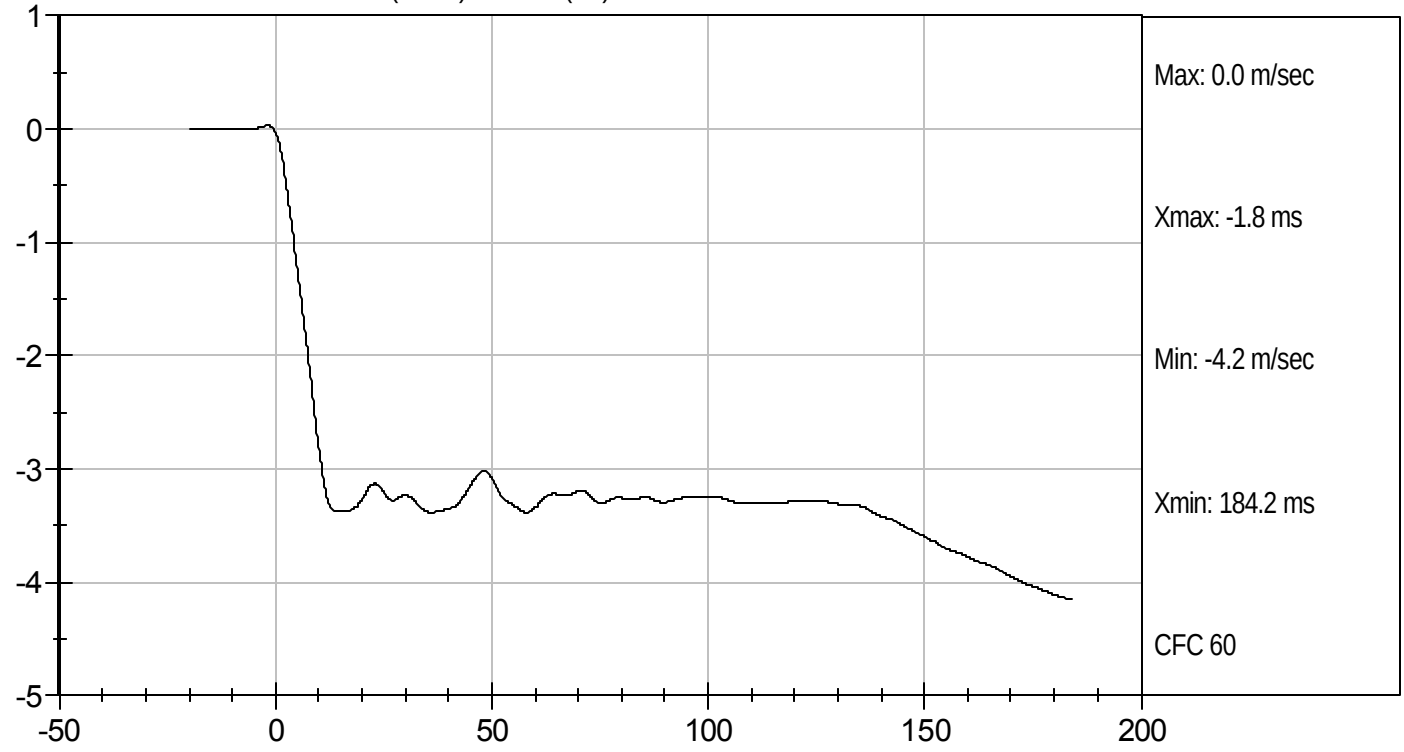
4/30/09
Test Date

David Winkelbauer
Approved By

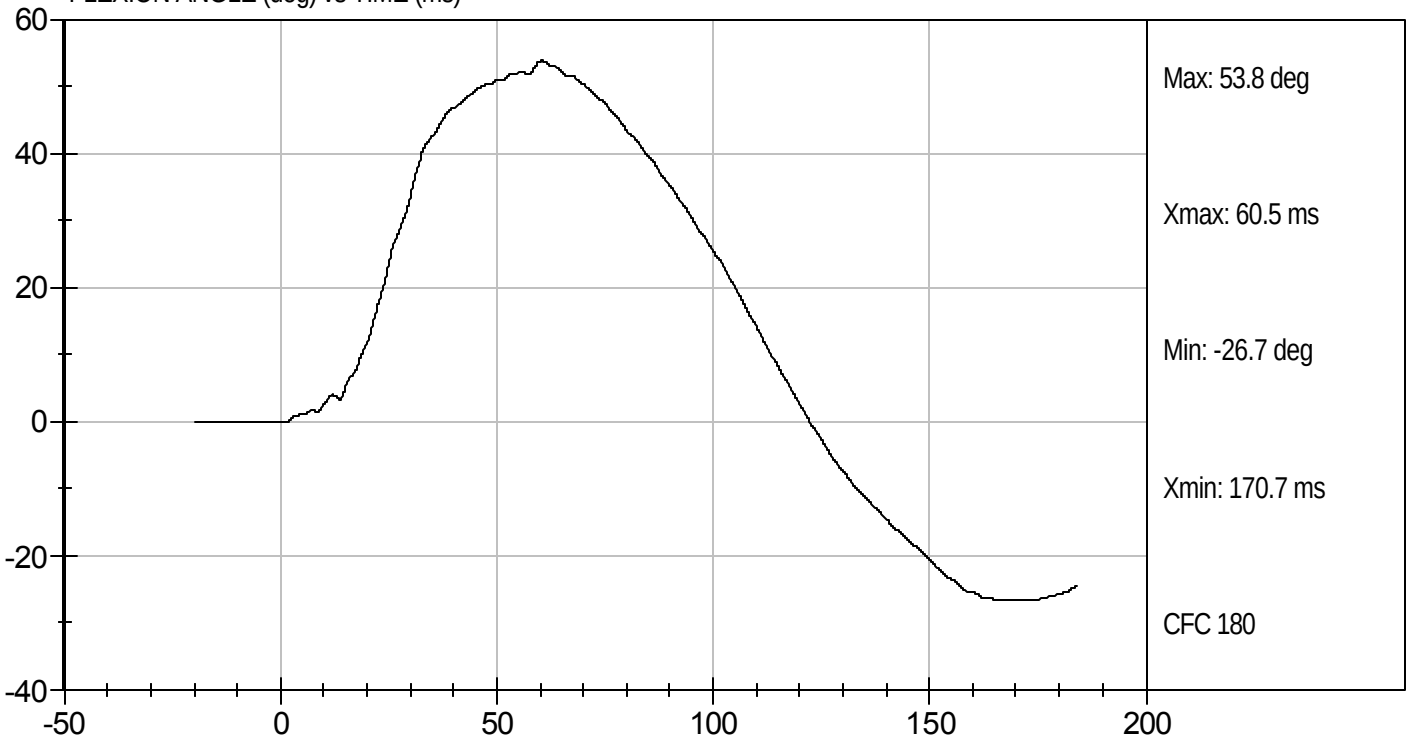
Test Desc: Neck Bending
Component ID: D09992

Test Date: 4/30/09
Velocity: 11.41 ft/s, 3.5 m/s

PENDULUM DECELERATION (m/sec) vs TIME (ms)

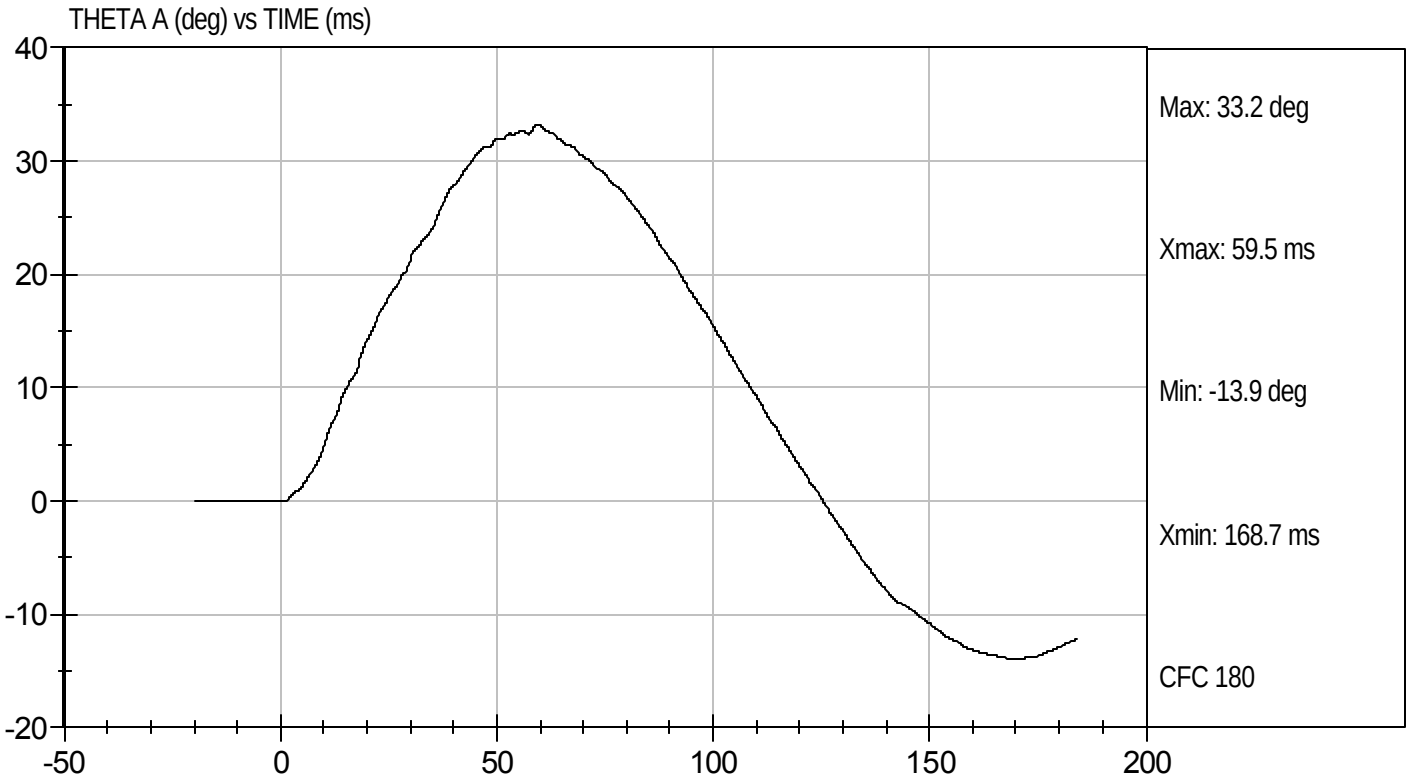


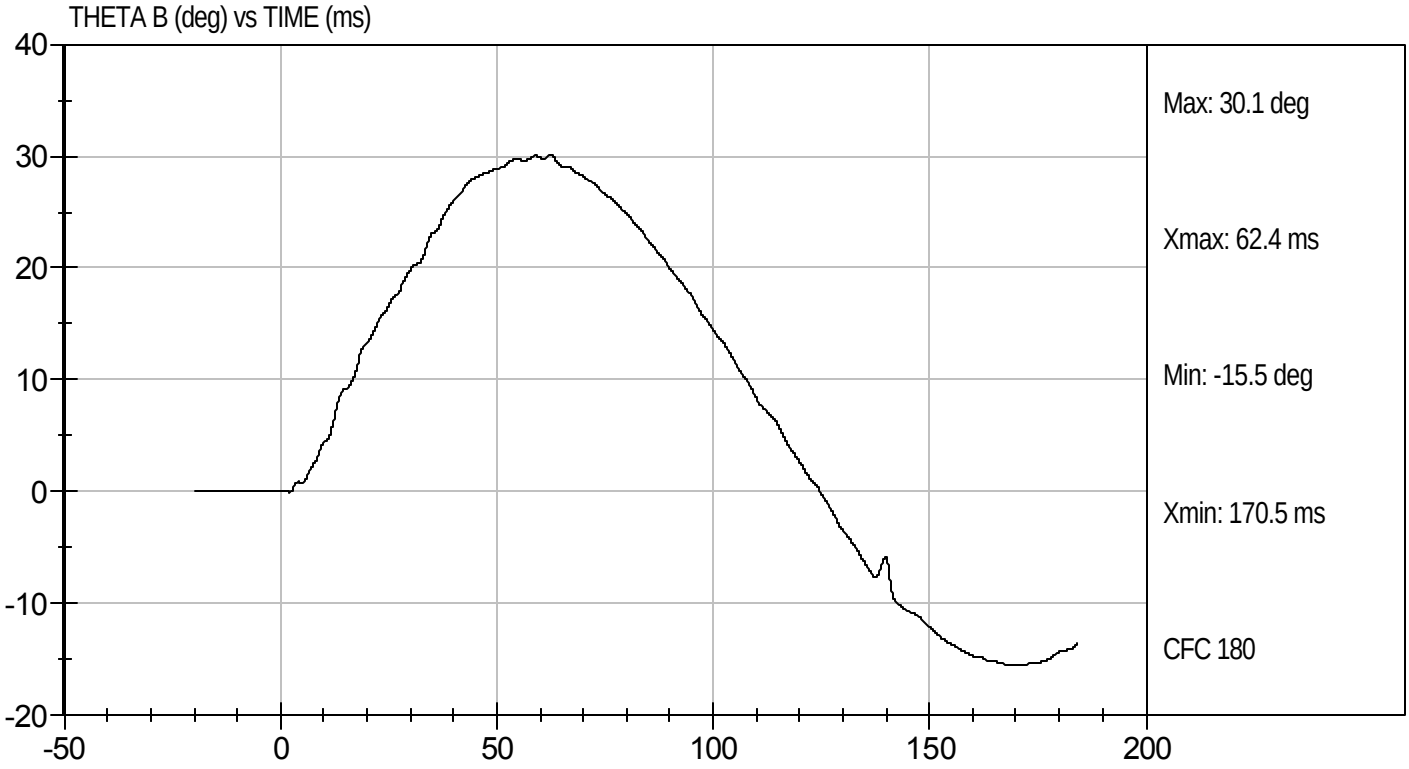
FLEXION ANGLE (deg) vs TIME (ms)



Test Desc: Neck Bending
Component ID: D09992

Test Date: 4/30/09
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:** D09993

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	48	Pass
Pendulum Speed	m/s	4.2 to 4.4	4.3	Pass
Peak Shoulder Acceleration	G's	7.5 to 10.5	9.6	Pass
Time of Peak Shoulder Acceleration	msec	NA	17.2	Pass
		Overall Test Results		Pass

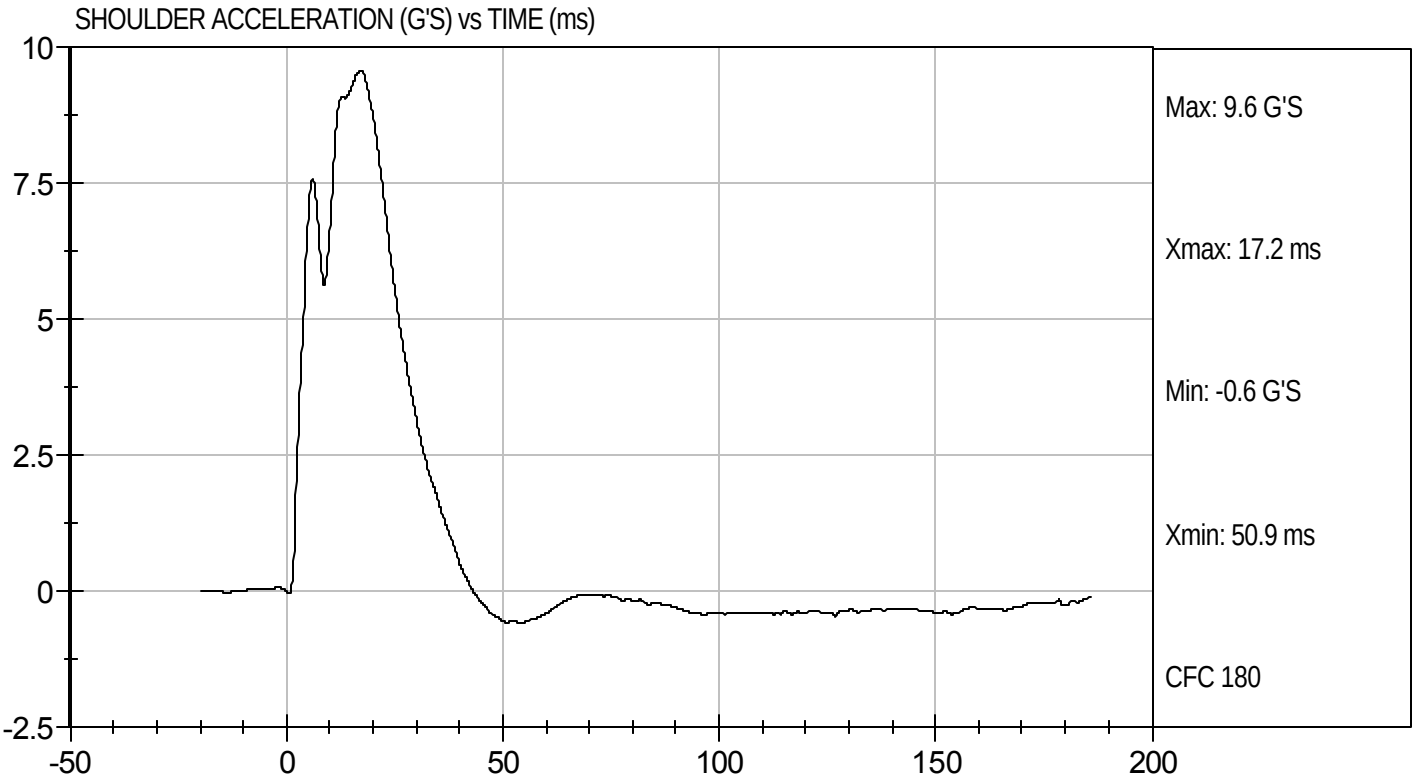
Jessica Hall
Laboratory Technician

4/30/09
Test Date

David Winkelbauer
Approved By

Test Desc: Shoulder Impact
Component ID: D09993

Test Date: 4/30/09
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:** D09994

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	50	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	47.5	Pass
		Overall Test Results		Pass

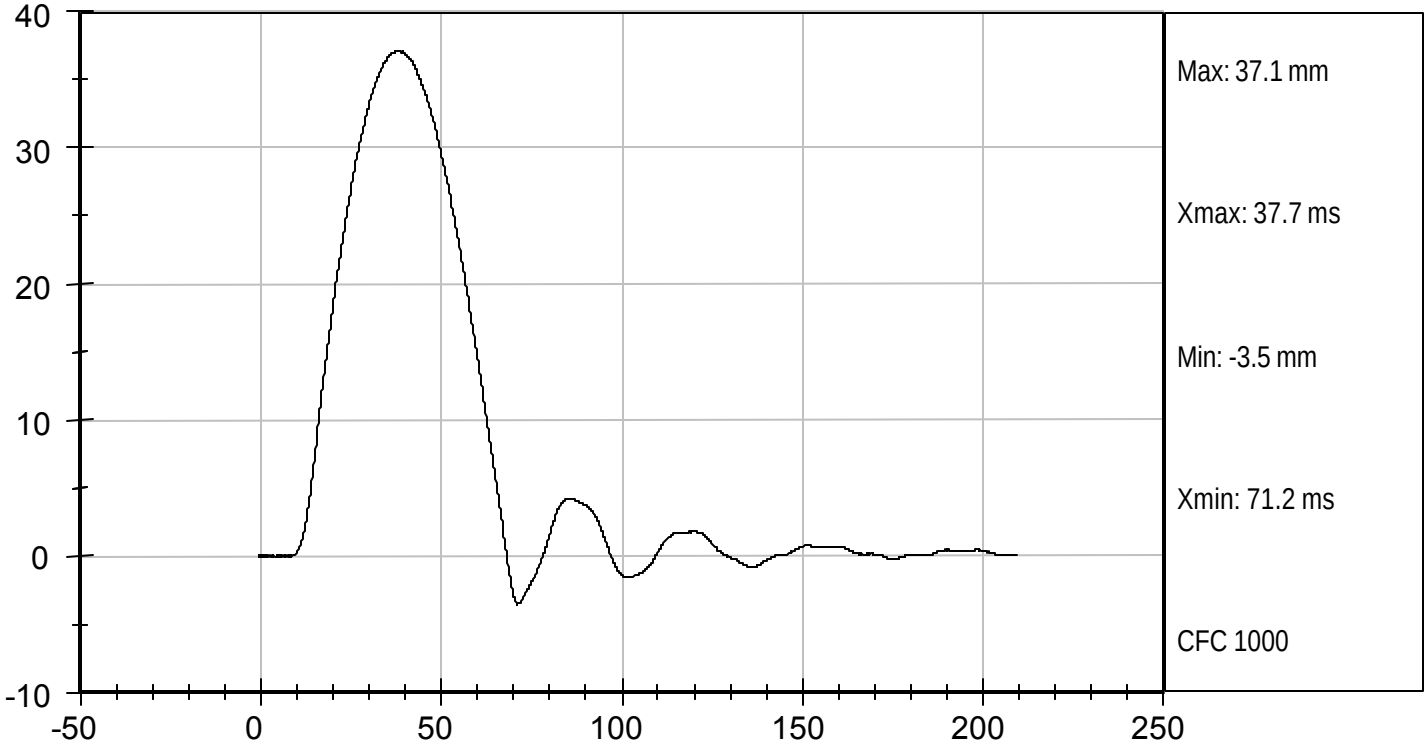
Jessica Hall
Laboratory Technician

4/30/09
Test Date

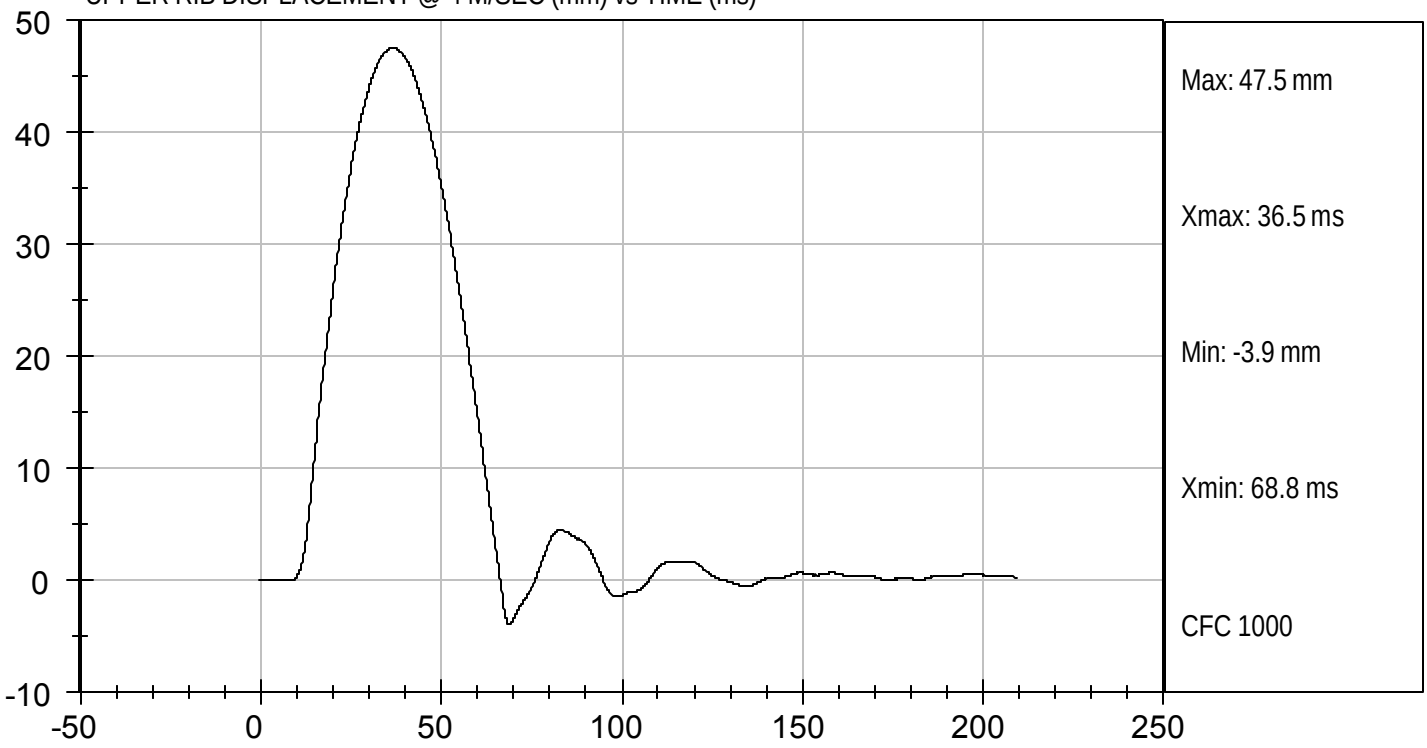
David Winkelbauer
Approved By

Test Desc: Rib Impact - Upper
Component ID: D09994
Test Date: 4/30/09

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:** D09995

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	50	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	37.5	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	48.2	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

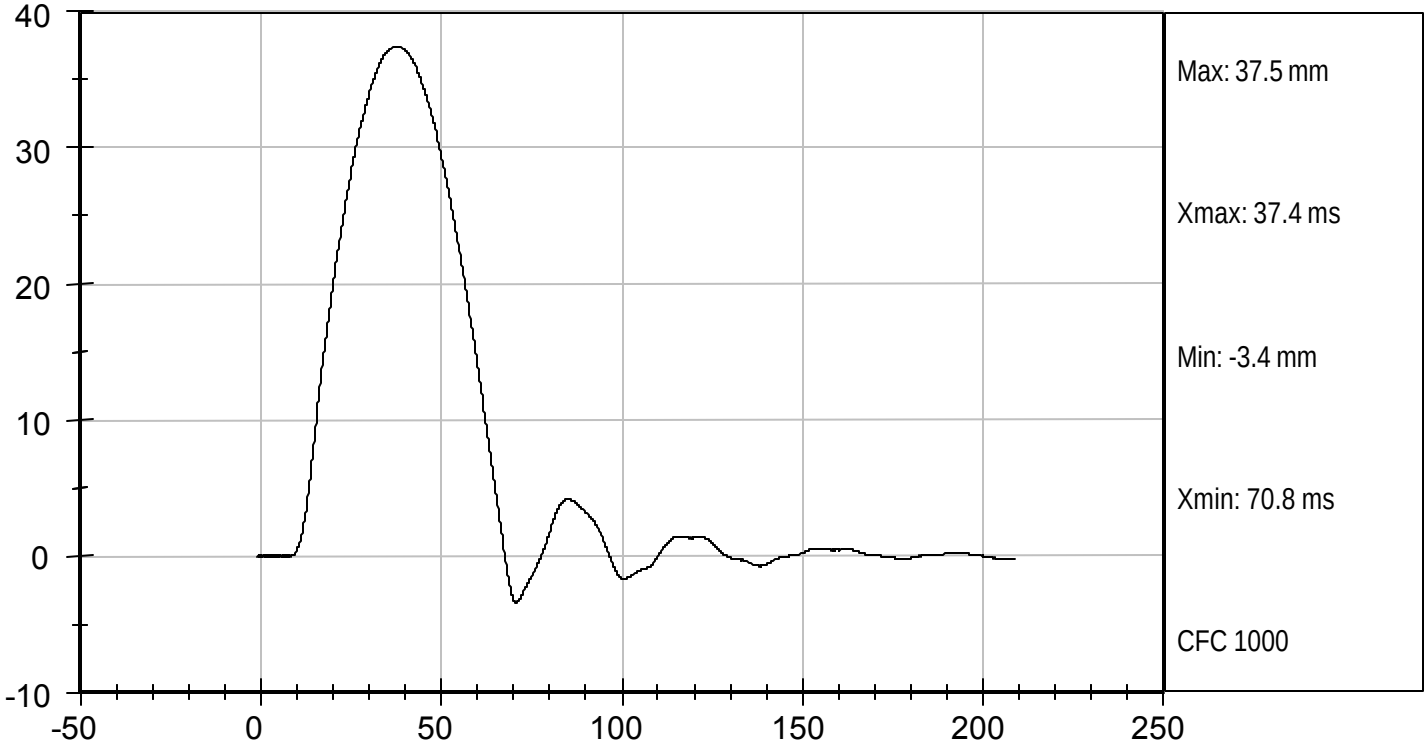
4/30/09
Test Date

David Winkelbauer
Approved By

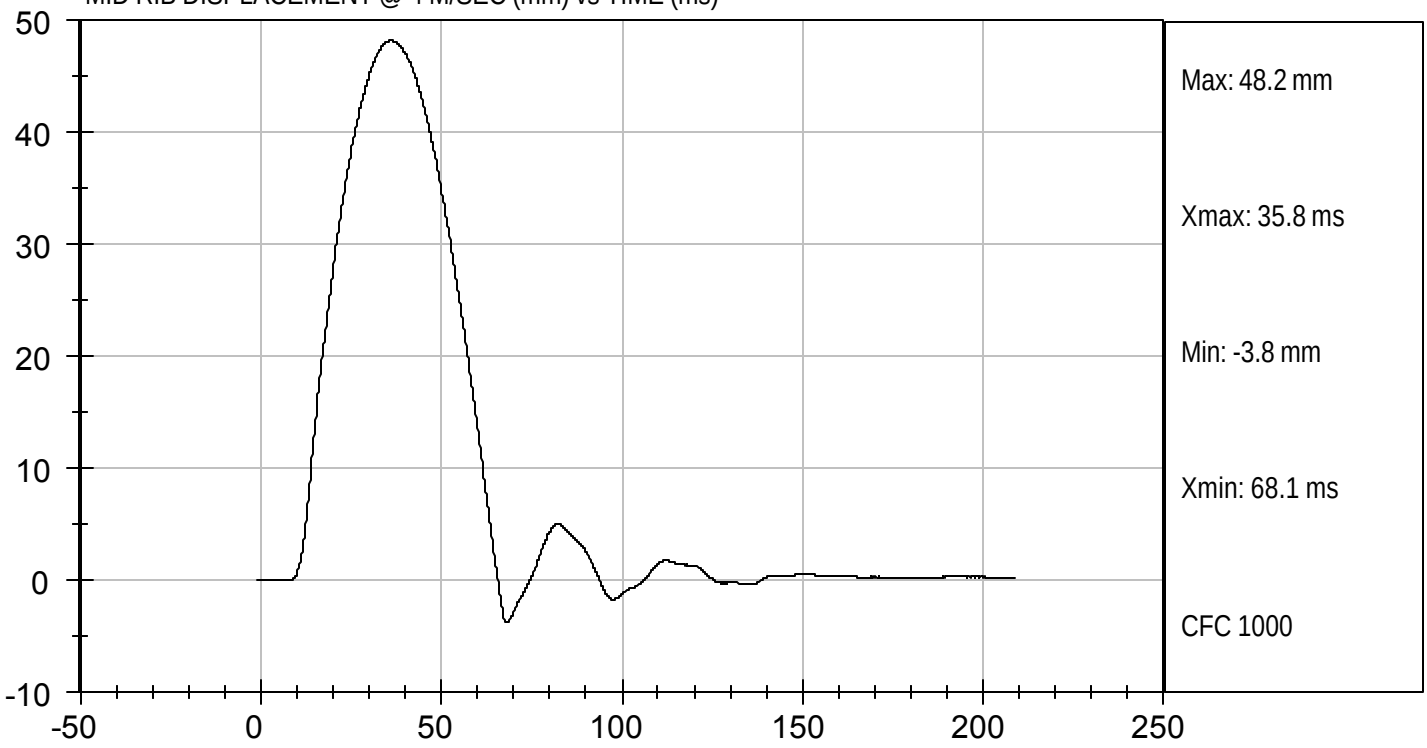
Test Desc: Rib Impact - Mid
Component ID: D09995

Test Date: 4/30/09

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



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



MGA RESEARCH CORPORATION

LOWER RIB TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D09996

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	50	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	36.7	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	47.9	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

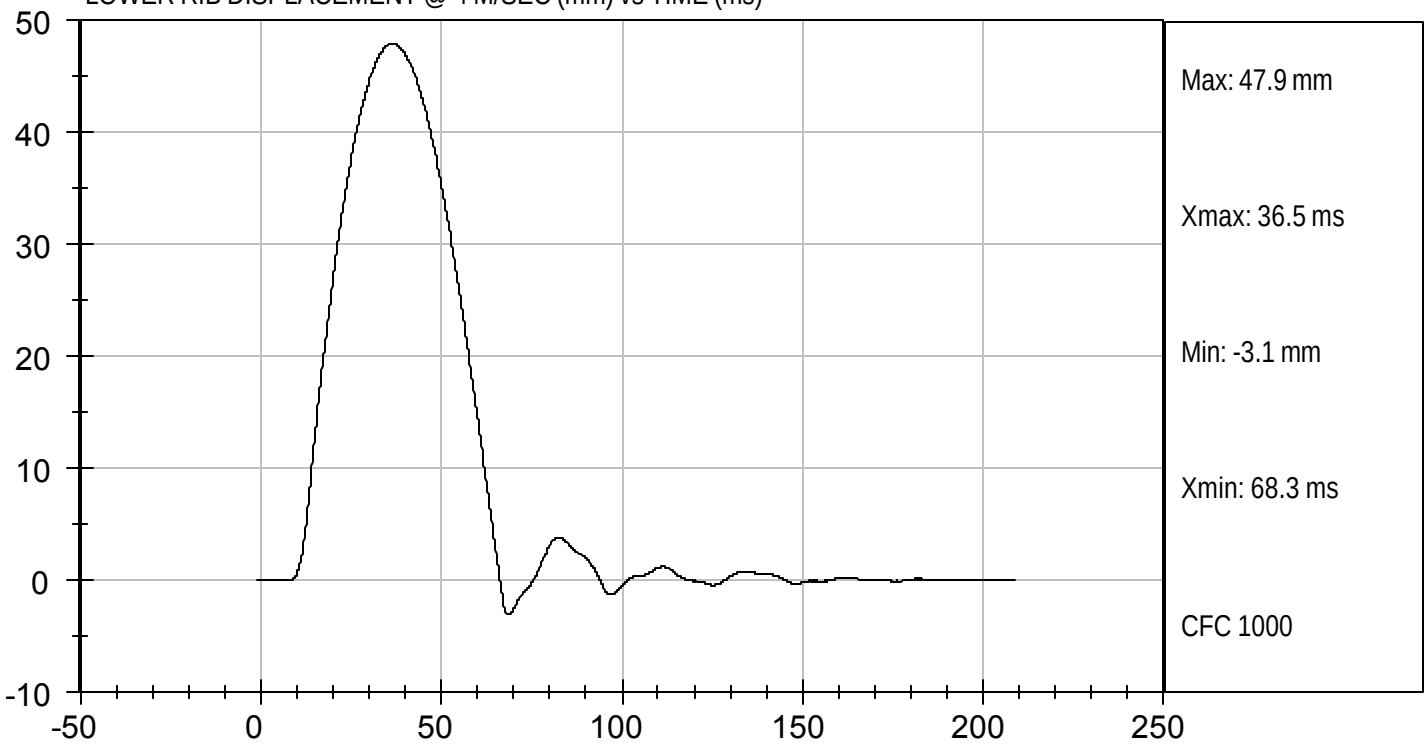
4/30/09
Test Date

David Winkelbauer
Approved By

Test Desc: Rib Impact - Lower
Component ID: D09996
Test Date: 4/30/09

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:** D09997

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	48	Pass
Probe Speed	m/s	3.90 to 4.10	3.99	Pass
Maximum Impact Force	kN	4.00 to 4.80	4.07	Pass
Time of Maximum Impactor Force	msec	10.60 to 13.00	11.50	Pass
Maximum Total Abdomen Force	kN	2.20 to 2.70	2.44	Pass
Time of Maximum Abdomen Force	msec	10.00 to 12.30	11.10	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

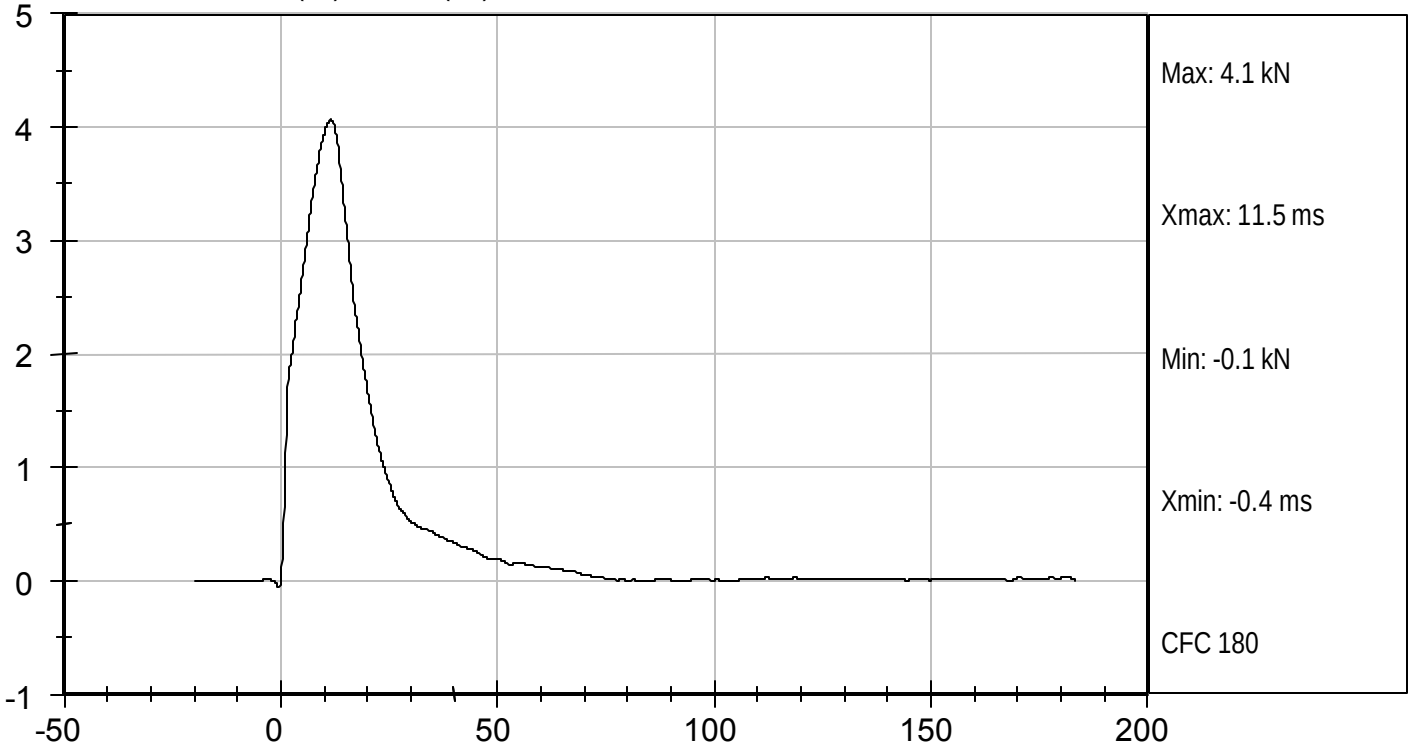
4/30/09
Test Date

David Winkelbauer
Approved By

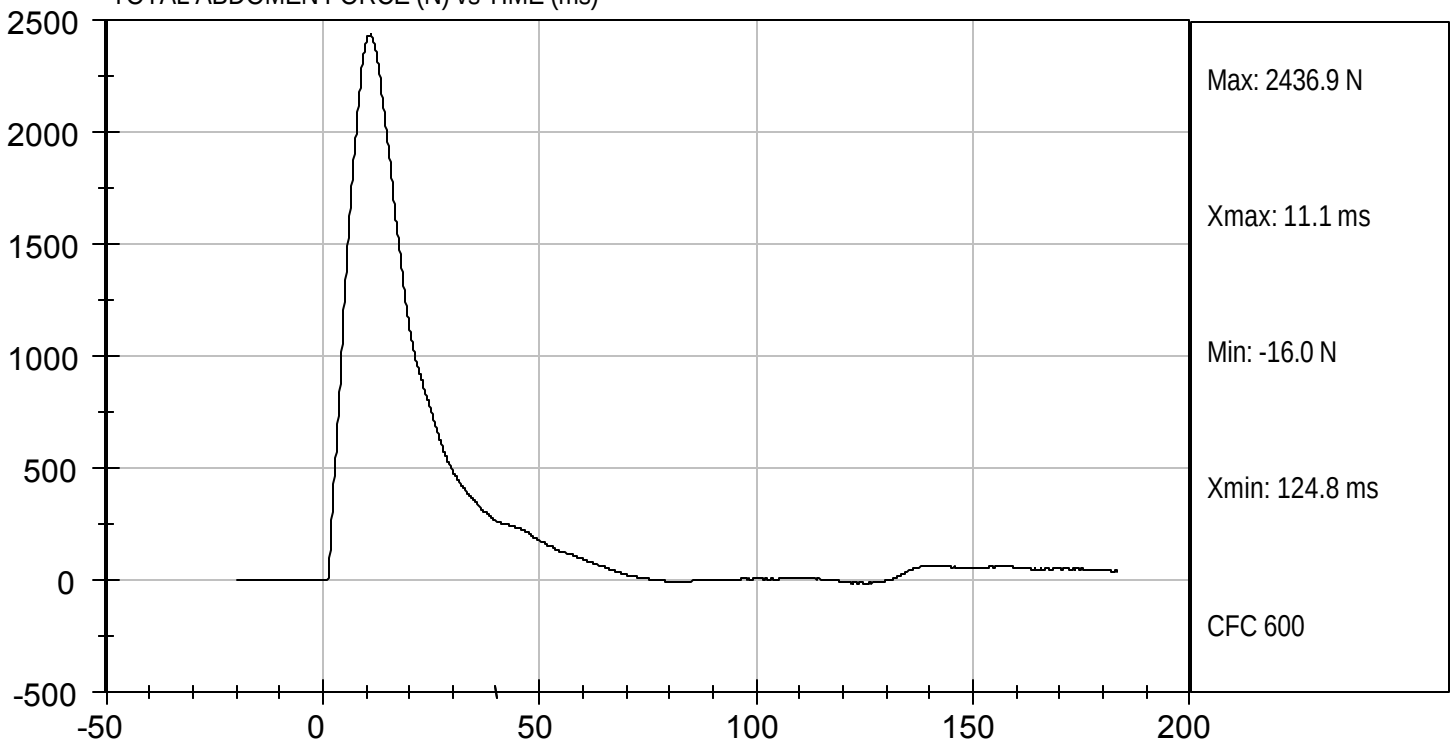
Test Desc: Abdomen Impact
Component ID: D09997

Test Date: 4/30/09
Velocity: 13.12 ft/s, 3.99 m/s

IMPACTOR FORCE (kN) vs TIME (ms)



TOTAL ABDOMEN FORCE (N) vs TIME (ms)



MGA RESEARCH CORPORATION

LUMBAR SPINE TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D09998

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	50	Pass
Pendulum Speed		m/sec	5.95 to 6.15	6.12	Pass
Pendulum Deceleration	1 msec	m/sec	-0.05 to 0.00	-0.01	Pass
	3.7 msec	m/sec	-0.425 to -0.24	-0.42	Pass
	27 msec	m/sec	-6.50 to -5.80	-6.05	Pass
	30 msec	m/sec	>= -6.5	-5.97	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	51.0	Pass
Time of Maximum Flexion Angle		msec	39.0 to 53.0	45.6	Pass
Headform Rotation Decay to Initial Position		msec	37 to 57	46	Pass
			Overall Results		Pass

Jessica Gall
Laboratory Technician

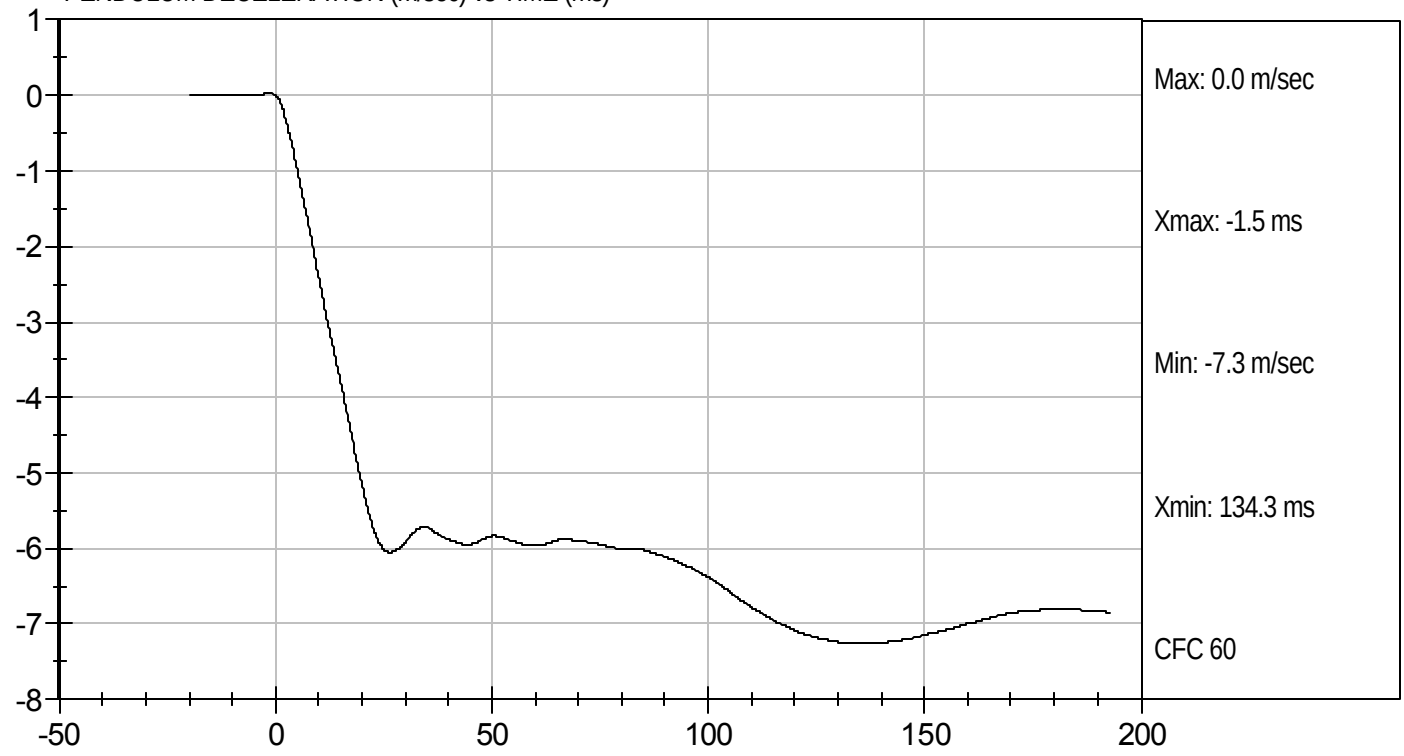
4/30/09
Test Date

David Winkelbauer
Approved By

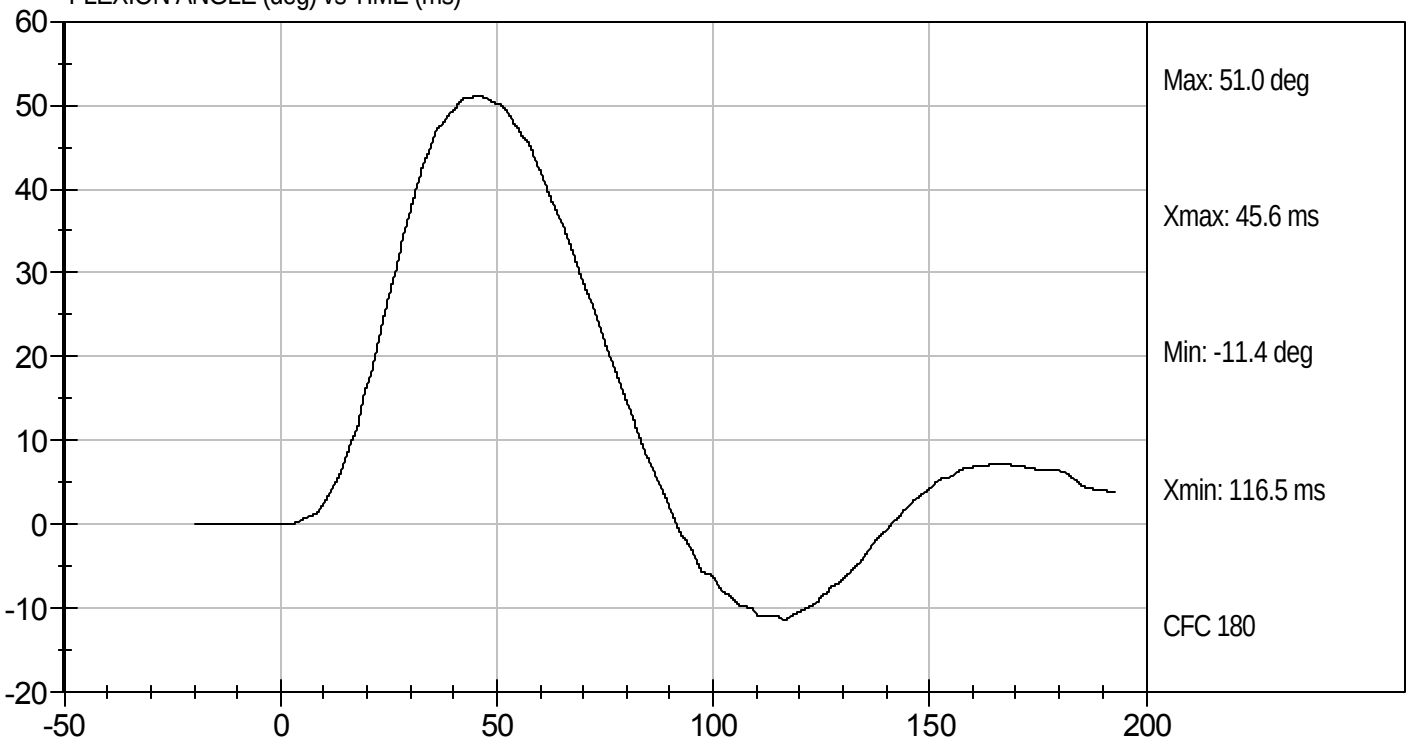
Test Desc: Lumbar Bending
Component ID: D09998

Test Date: 4/30/09
Velocity: 20.08 ft/s, 6.12 m/s

PENDULUM DECELERATION (m/sec) vs TIME (ms)

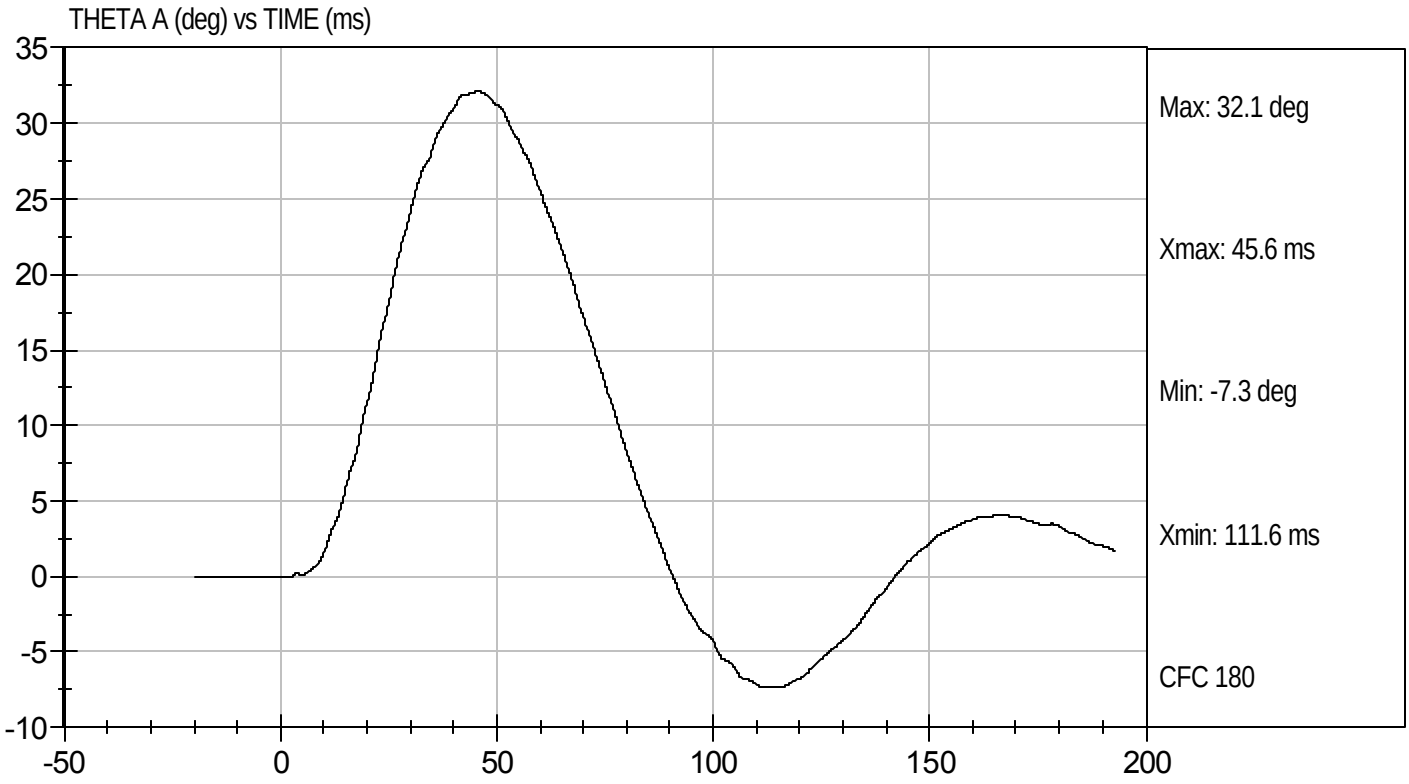


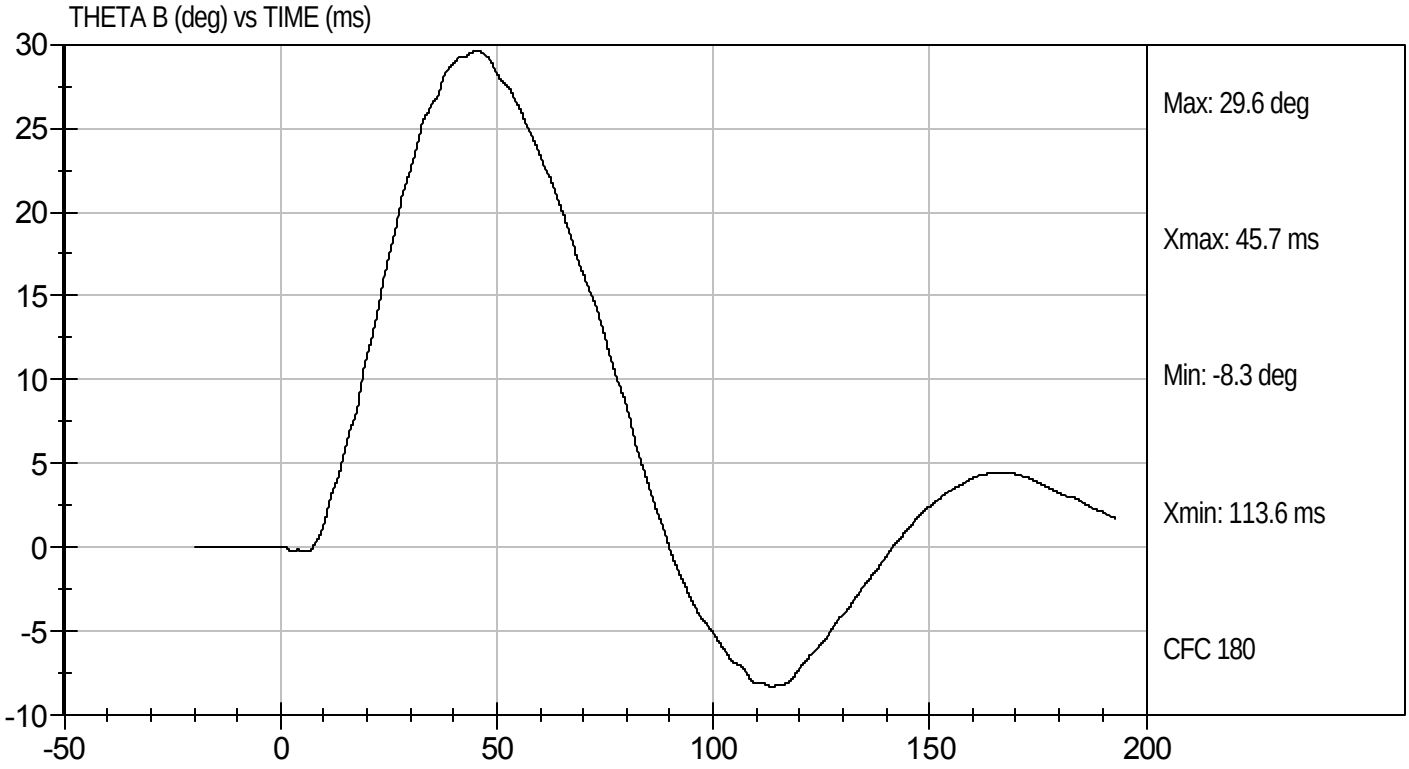
FLEXION ANGLE (deg) vs TIME (ms)



Test Desc: Lumbar Bending
Component ID: D09998

Test Date: 4/30/09
Velocity: 20.08 ft/s, 6.12 m/s





MGA RESEARCH CORPORATION

PELVIS TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D09999

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	47	Pass
Probe Speed	m/s	4.20 to 4.40	4.30	Pass
Maximum Impactor Force	kN	4.70 to 5.40	4.76	Pass
Time of Maximum Impactor Force	msec	11.80 to 16.10	13.70	Pass
Maximum Pubic Force	kN	1.23 to 1.59	1.40	Pass
Time of Maximum Pubic Force	msec	12.20 to 17.00	14.30	Pass
		Overall Test Results		Pass

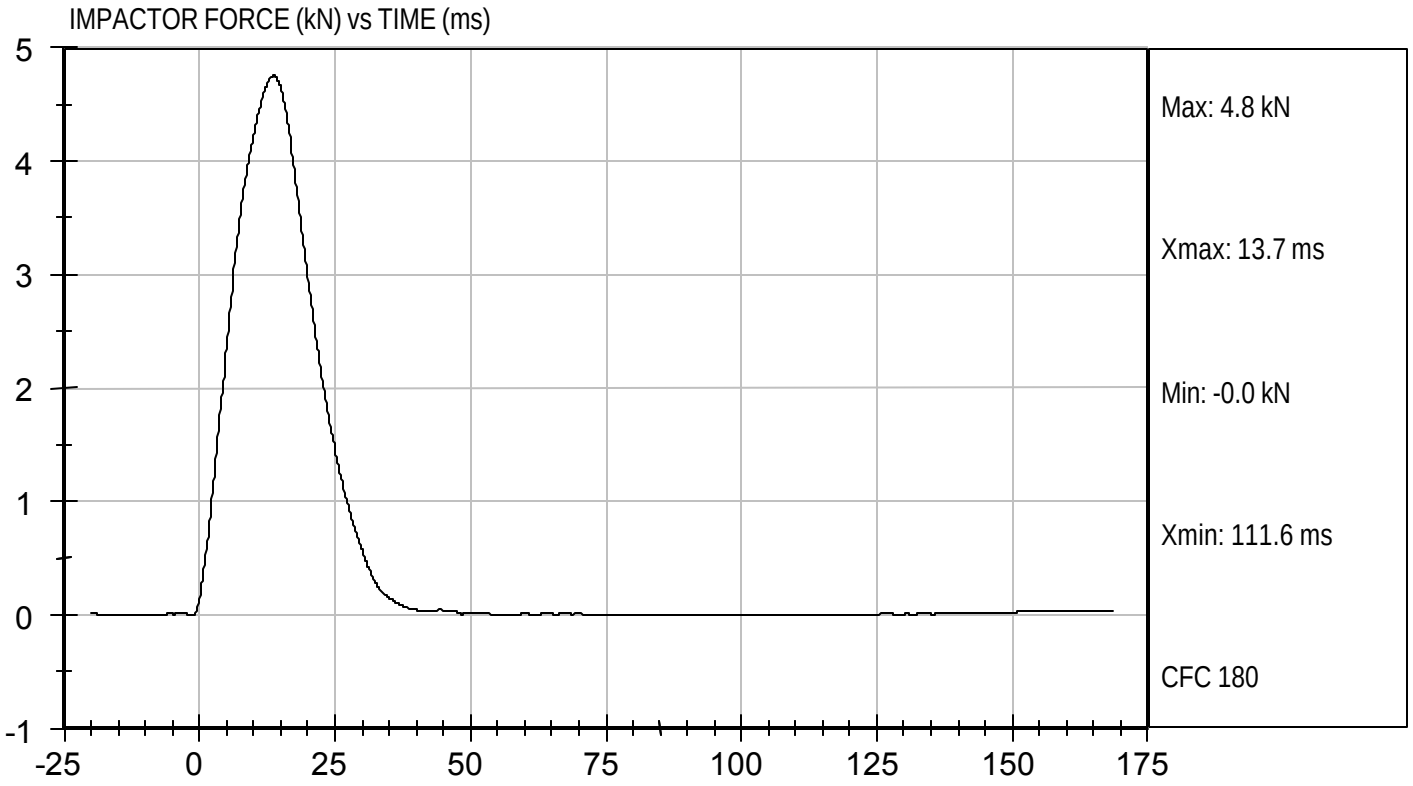
Jessica Hall
Laboratory Technician

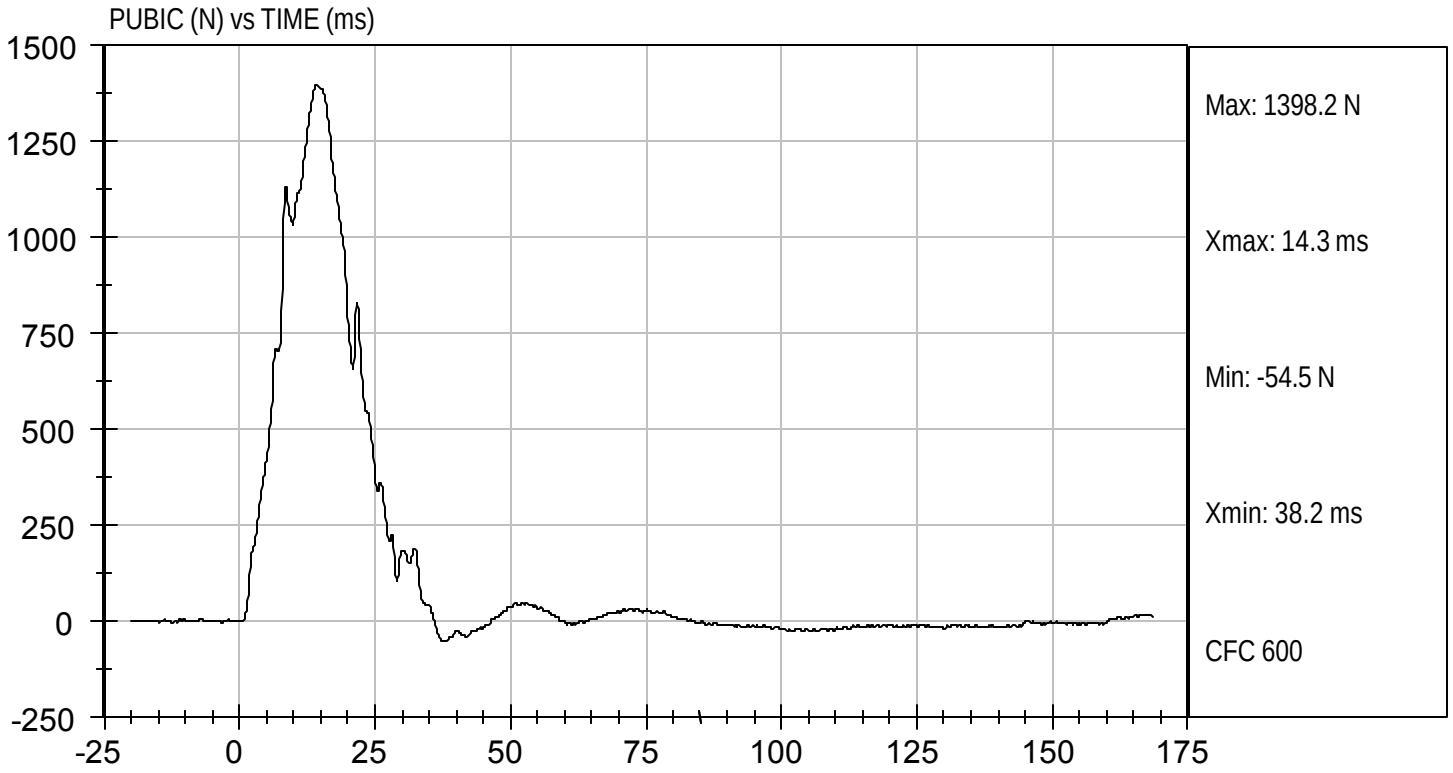
4/30/09
Test Date

David Winkelbauer
Approved By

Test Desc: Pelvis Impact
Component ID: D09999

Test Date: 4/30/09
Velocity: 14.1 ft/s, 4.30 m/s





MGA RESEARCH CORPORATION

FULL BODY THORAX IMPACT TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D09990

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Humidity	%	10 to 70	48	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	5.37	Pass
Upper Rib Displacement	mm	33.2 to 41.3	37.0	Pass
Middle Rib Displacement	mm	37.1 to 45.4	40.3	Pass
Lower Rib Displacement	mm	35.6 to 43.0	40.0	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

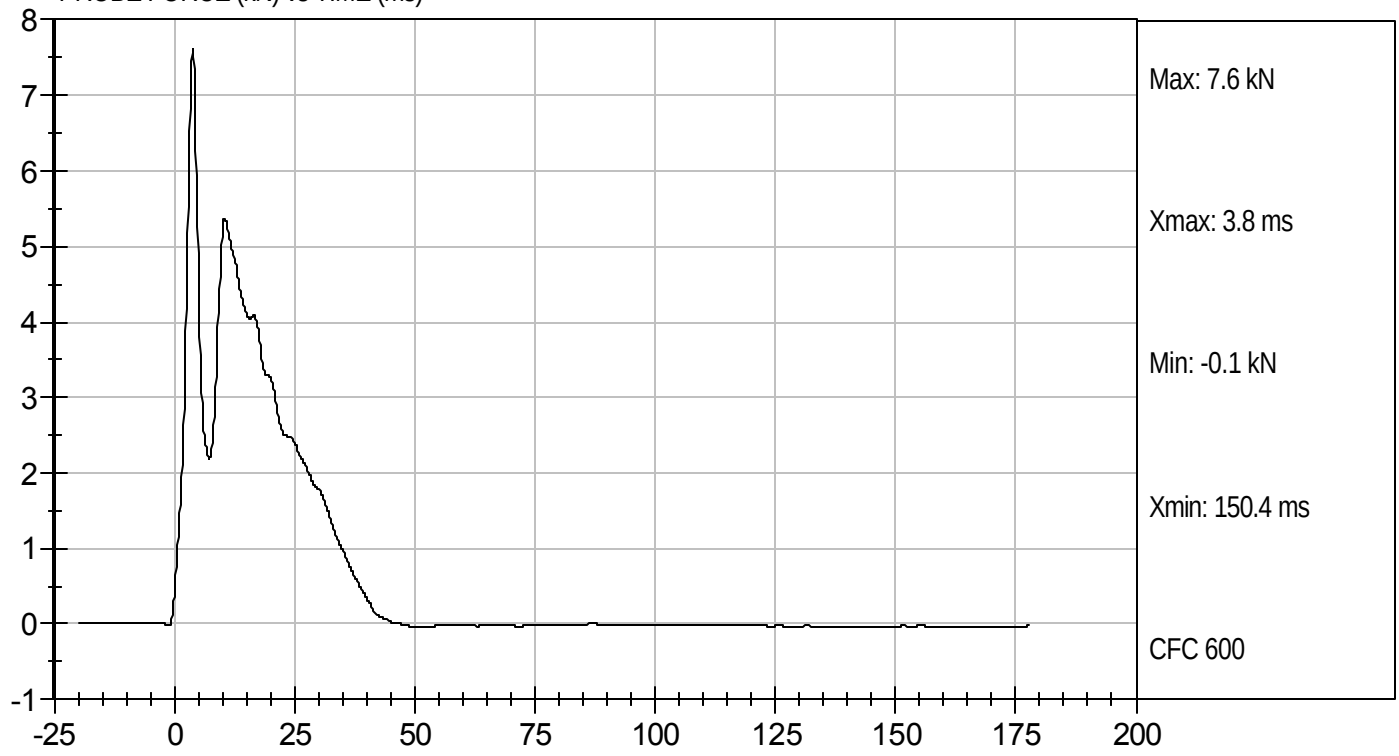
4/30/09
Test Date

David Winkelbauer
Approved By

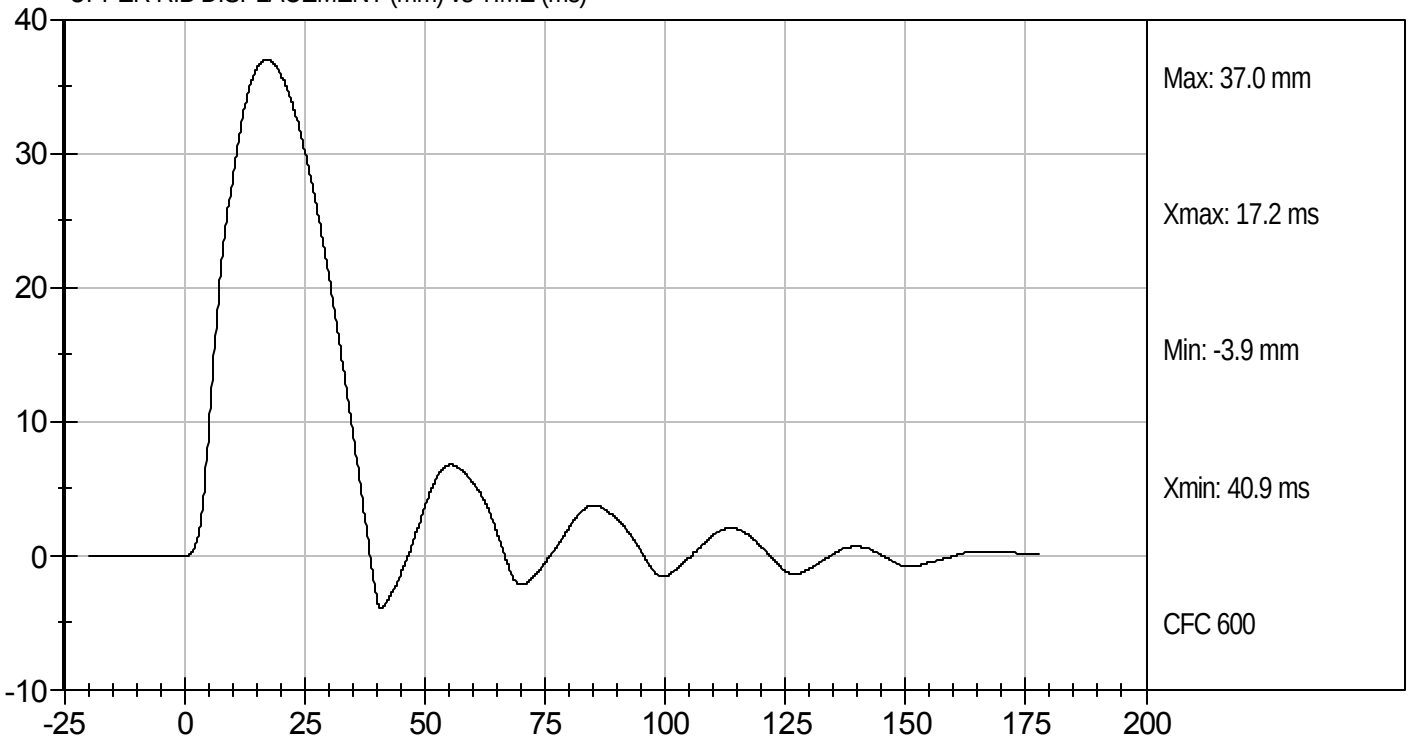
Test Desc: Thorax Impact
Component ID: D09990

Test Date: 4/30/09
Velocity: 18.31 ft/s, 5.58 m/s

PROBE FORCE (kN) vs TIME (ms)



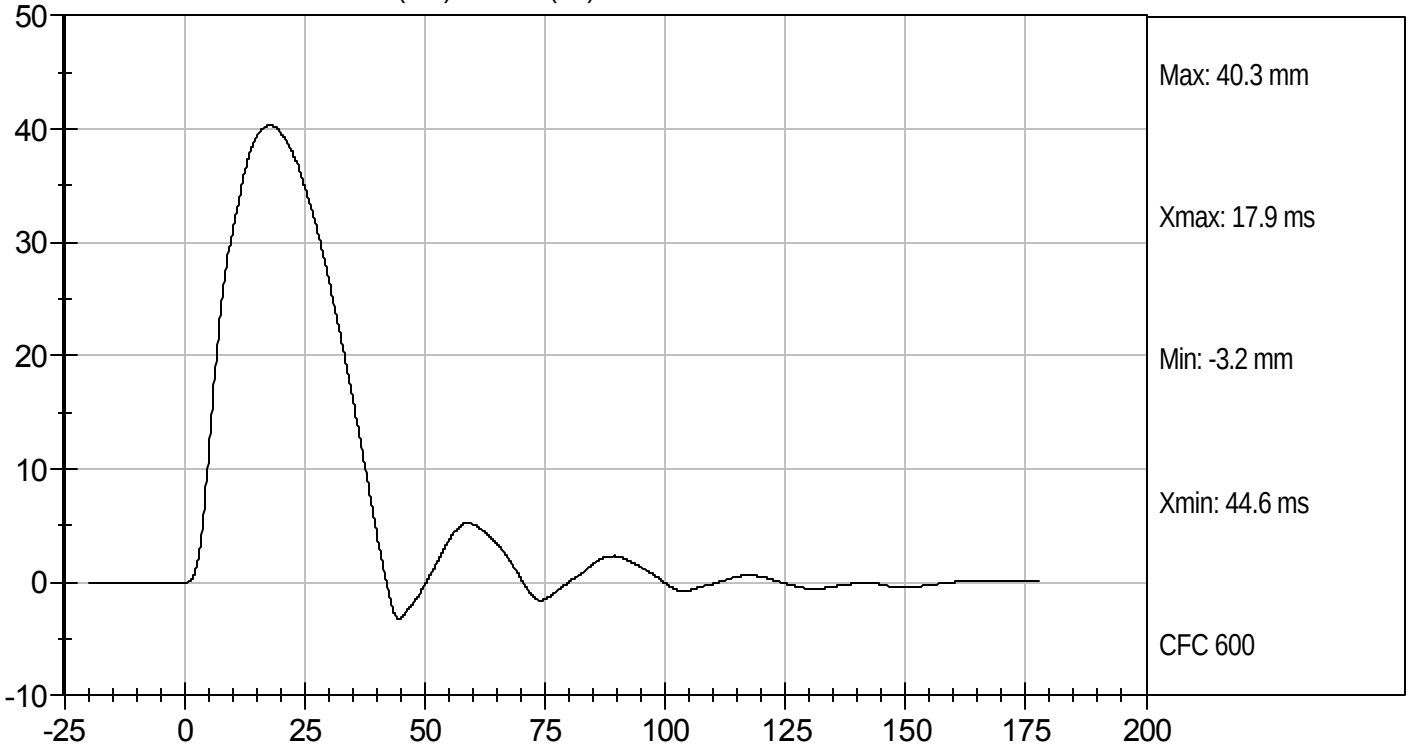
UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



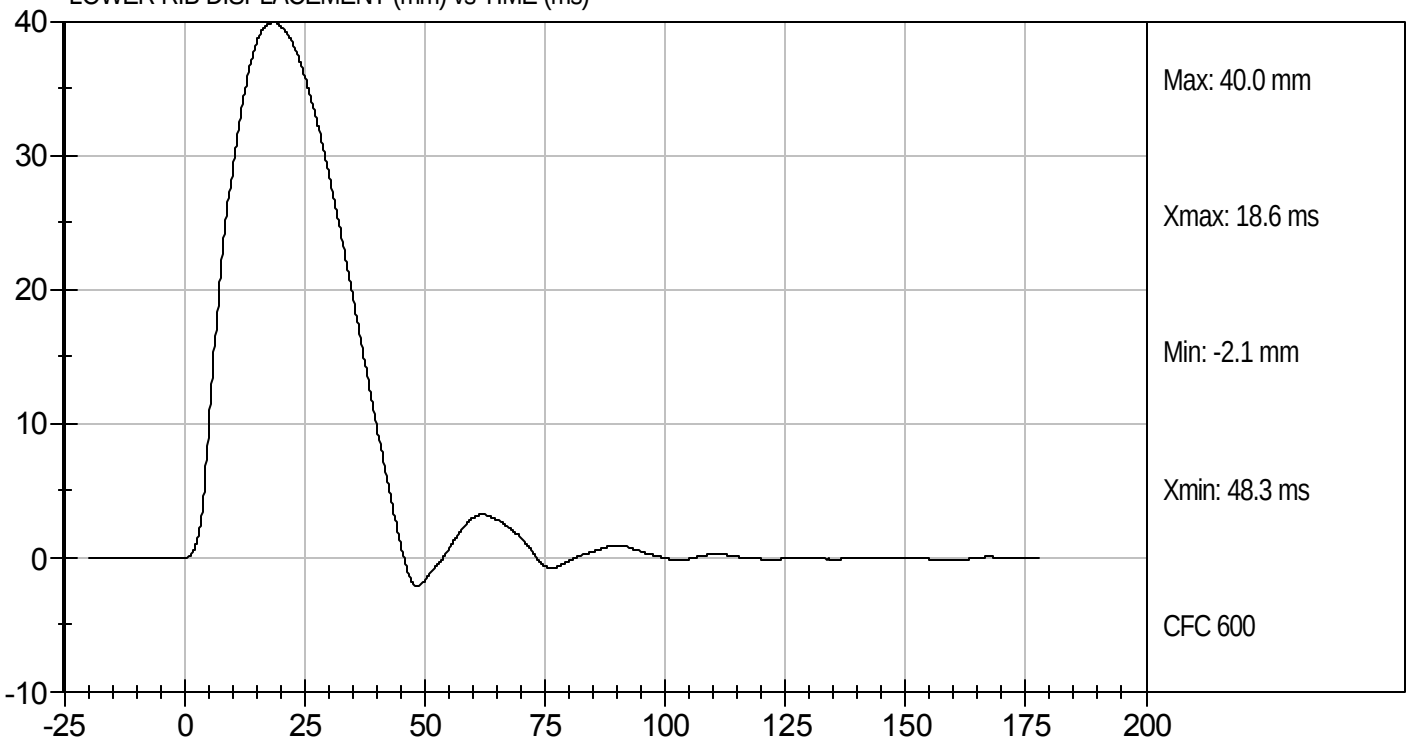
Test Desc: Thorax Impact
Component ID: D09990

Test Date: 4/30/09
Velocity: 18.31 ft/s, 5.58 m/s

MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

HEAD DROP TEST

ES-2re DUMMY

ATD Serial No: 032 **Test ID:** D091371

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	37	Pass
Peak Resultant Acceleration	G's	125 to 155	147	Pass
Peak Lateral Acceleration	G's	+/- 15	-10.3	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

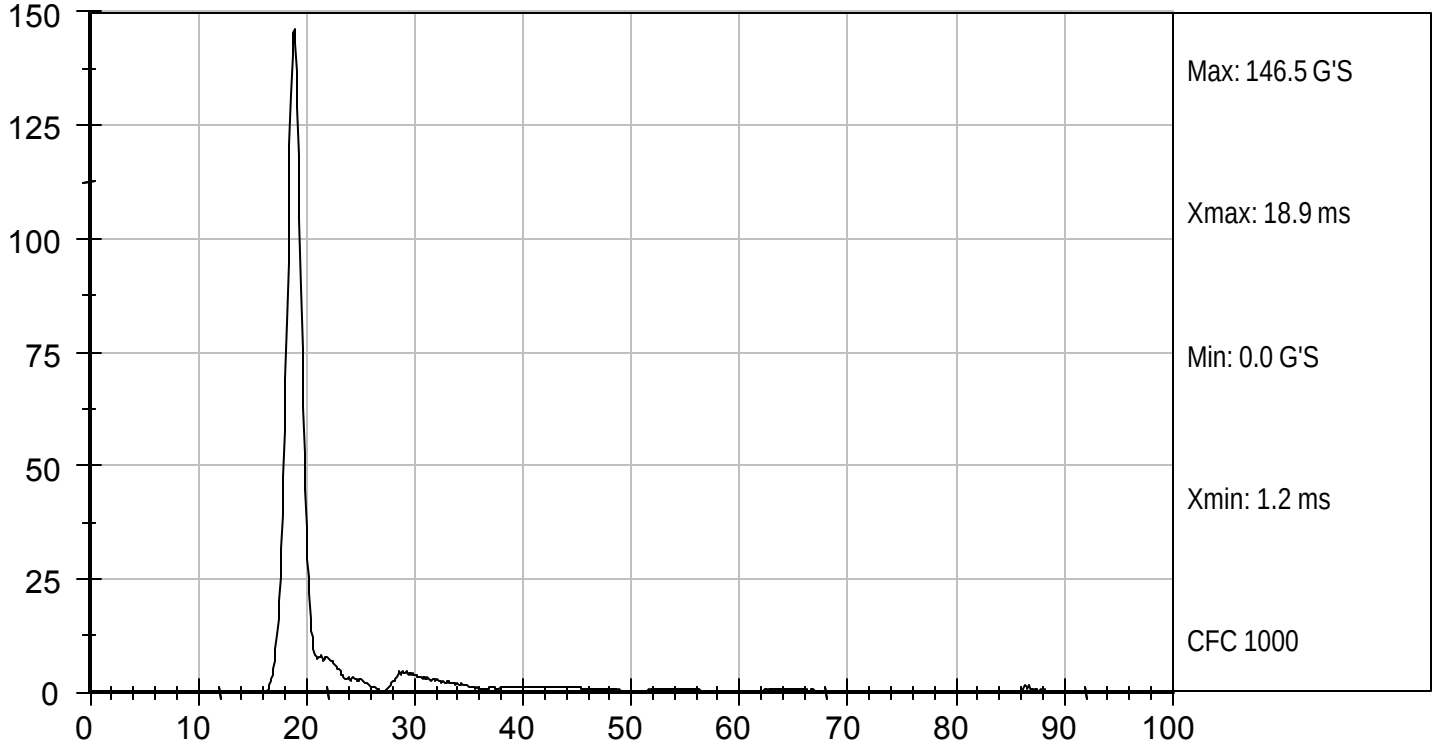
6/2/09
Test Date

David Winkelbauer
Approved By

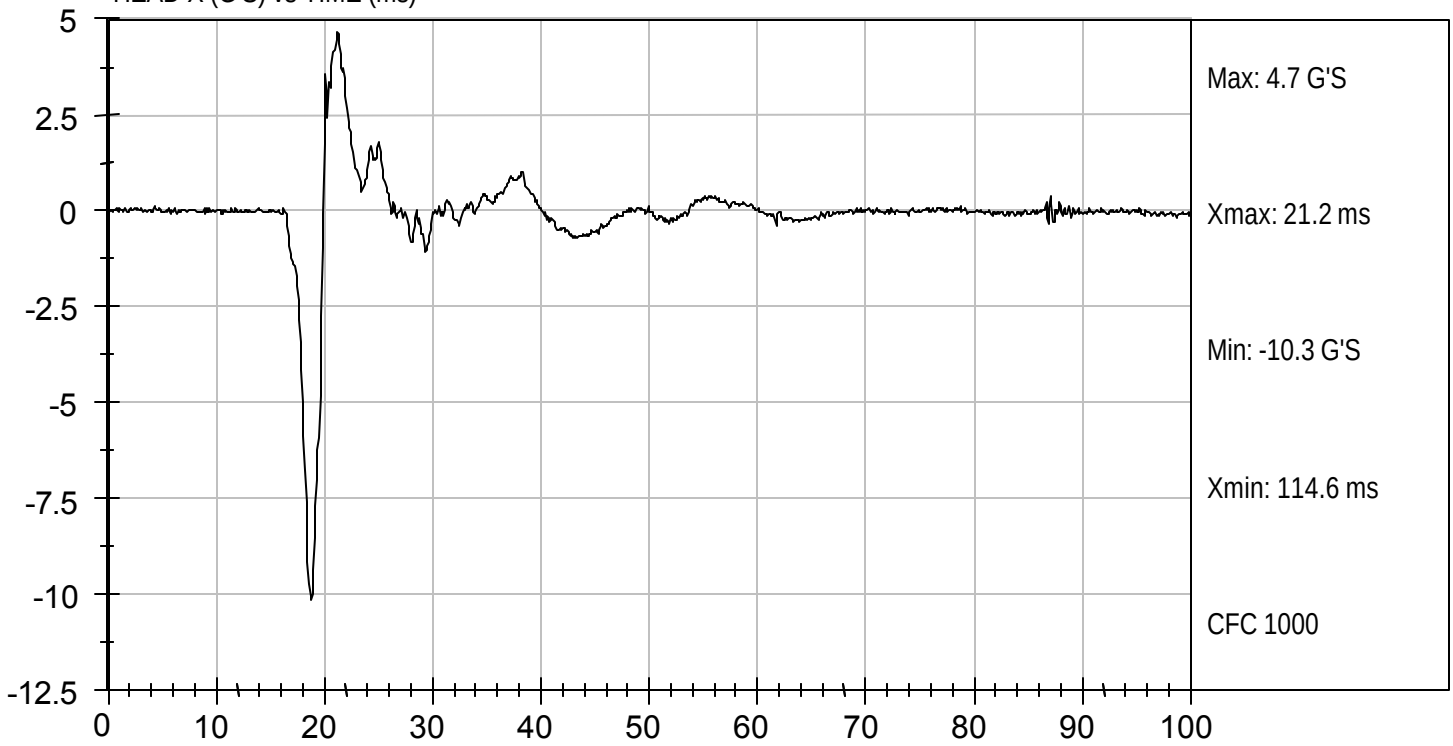
Test Desc: Head Drop
Component ID: D091371

Test Date: 6/2/09
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:** D091372

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	18.0 to 22.0	20.6	Pass
Laboratory Relative Humidity		%	10 to 70	46	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	-3.21	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	51.2	Pass
Time of Maximum Flexion Angle		msec	54.0 to 66.0	61.2	Pass
Head Rotation Decay Time to 0 degree		msec	53.0 to 88.0	54.9	Pass
			Overall Test Results		Pass

Jessica Hall
Laboratory Technician

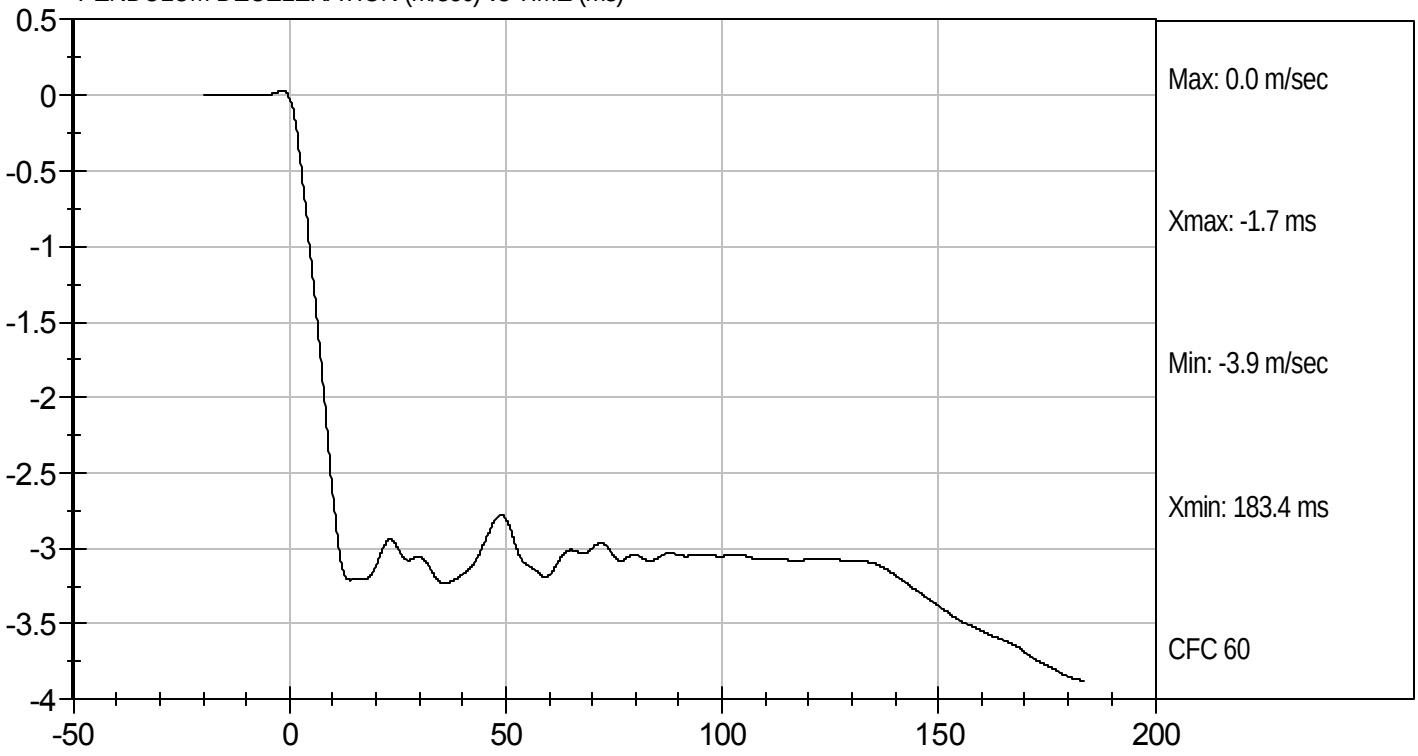
6/1/09
Test Date

David Winkelbauer
Approved By

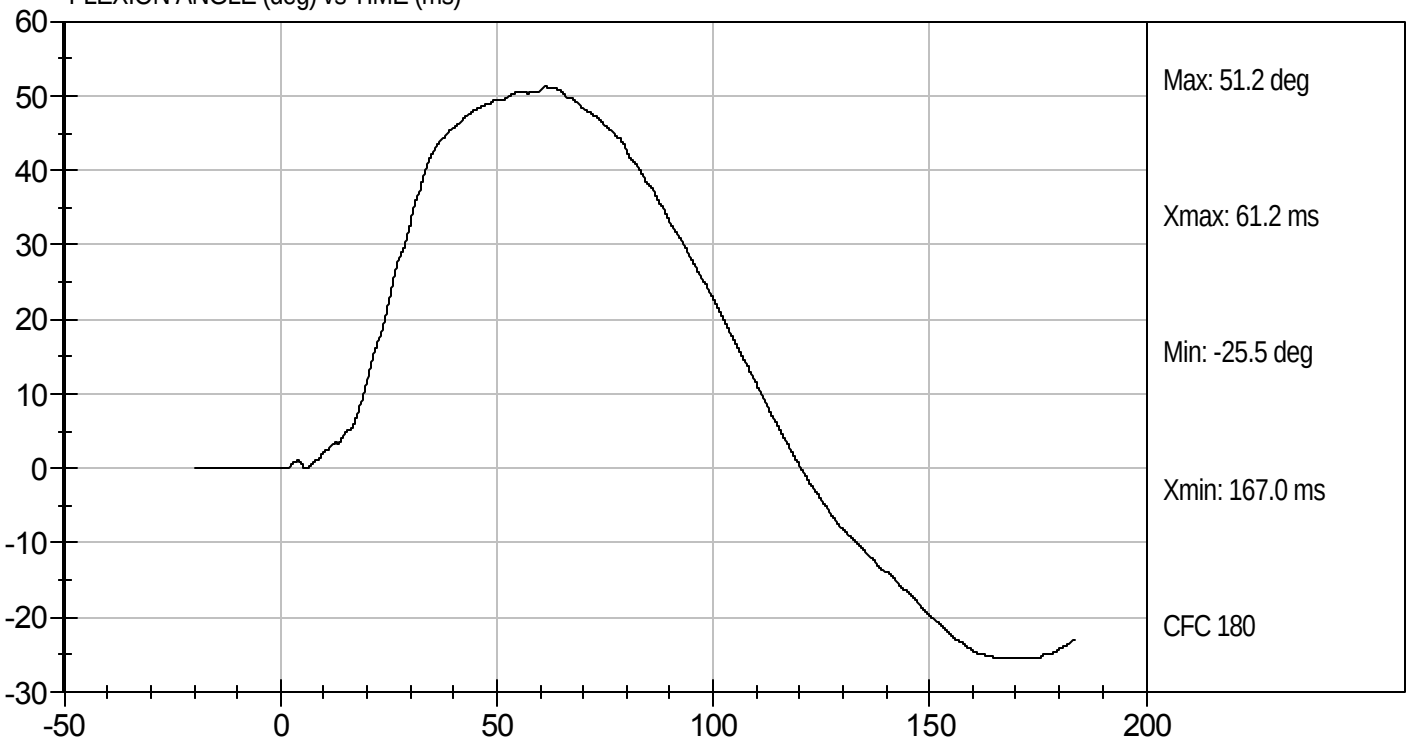
Test Desc: Neck Bending
Component ID: D091372

Test Date: 6/1/09
Velocity: 11.11 ft/s, 3.4 m/s

PENDULUM DECELERATION (m/sec) vs TIME (ms)

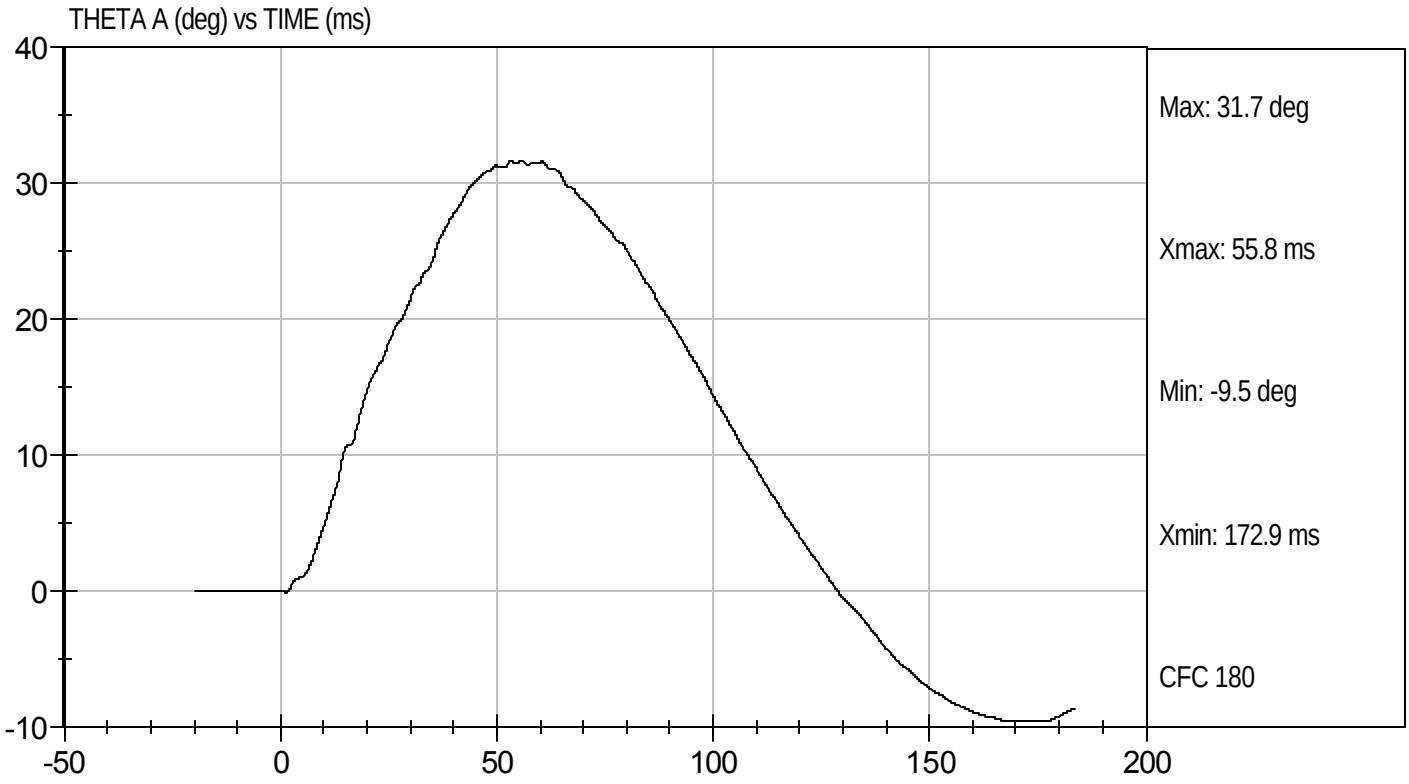


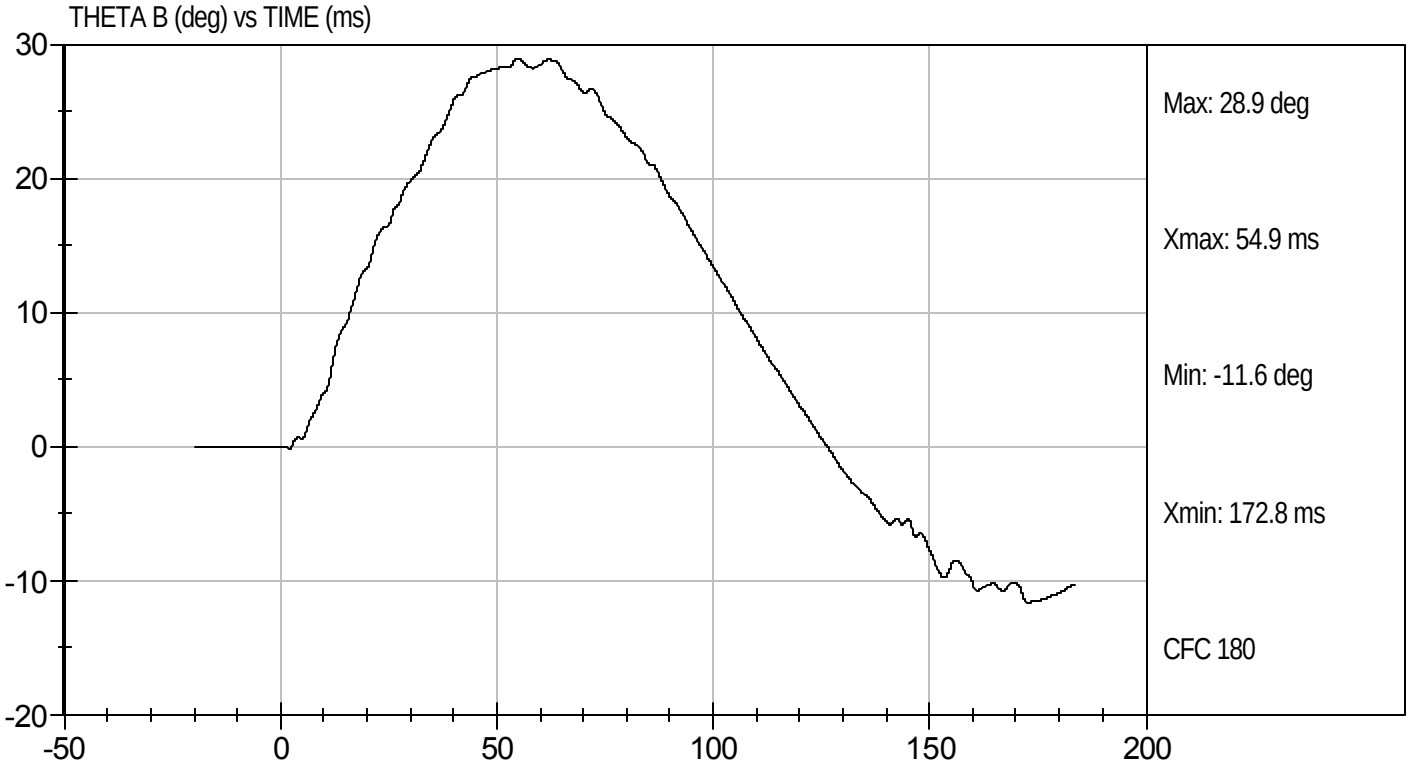
FLEXION ANGLE (deg) vs TIME (ms)



Test Desc: Neck Bending
Component ID: D091372

Test Date: 6/1/09
Velocity: 11.11 ft/s, 3.4 m/s





MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D091373

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Pendulum Speed	m/s	4.2 to 4.4	4.2	Pass
Peak Shoulder Acceleration	G's	7.5 to 10.5	10.3	Pass
Time of Peak Shoulder Acceleration	msec	NA	17.4	Pass
		Overall Test Results		Pass

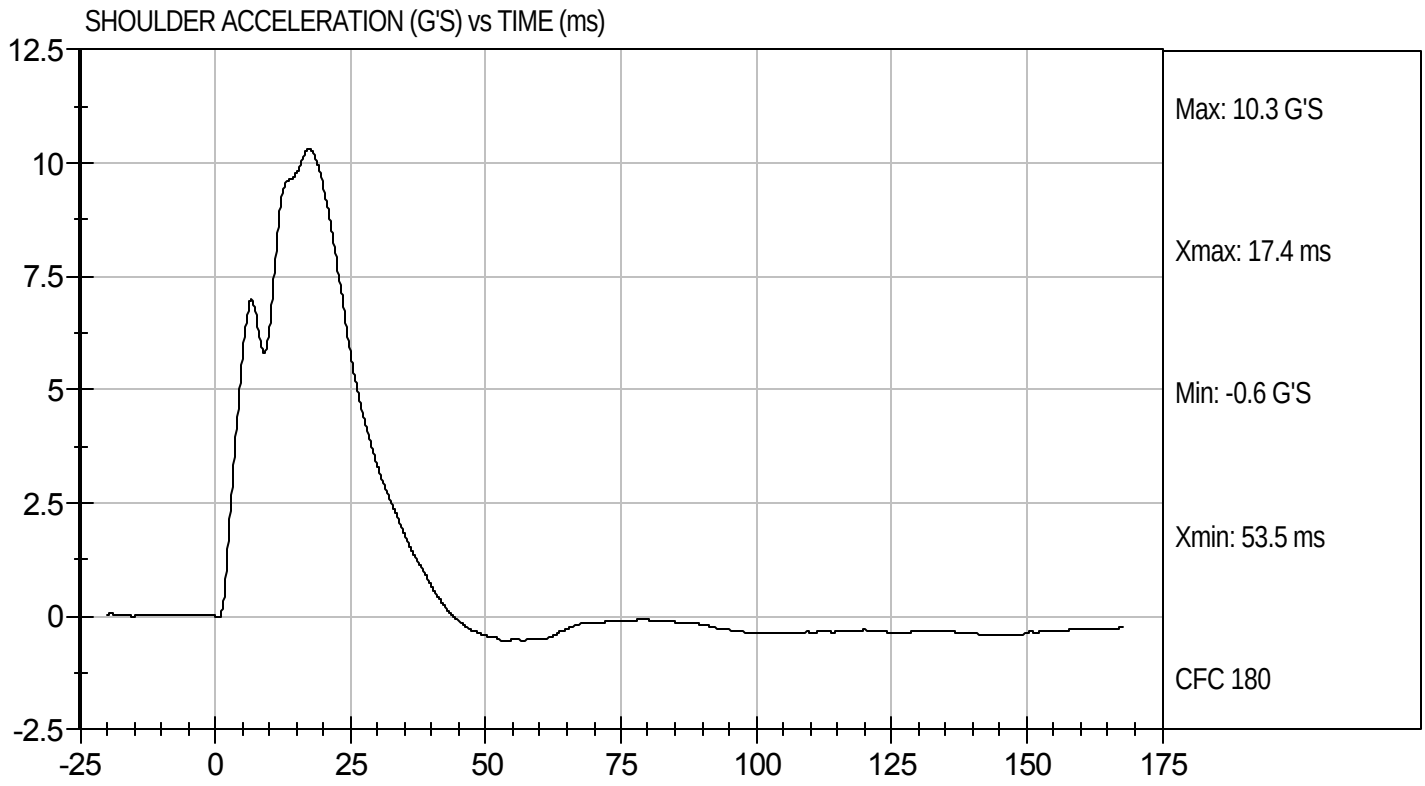
Jessica Hall
Laboratory Technician

6/1/09
Test Date

David Winkelbauer
Approved By

Test Desc: Shoulder Impact
Component ID: D091373

Test Date: 6/1/09
Velocity: 13.8 ft/s, 4.2 m/s



MGA RESEARCH CORPORATION

UPPER RIB TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D091374

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	46	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	48.0	Pass
		Overall Test Results		Pass

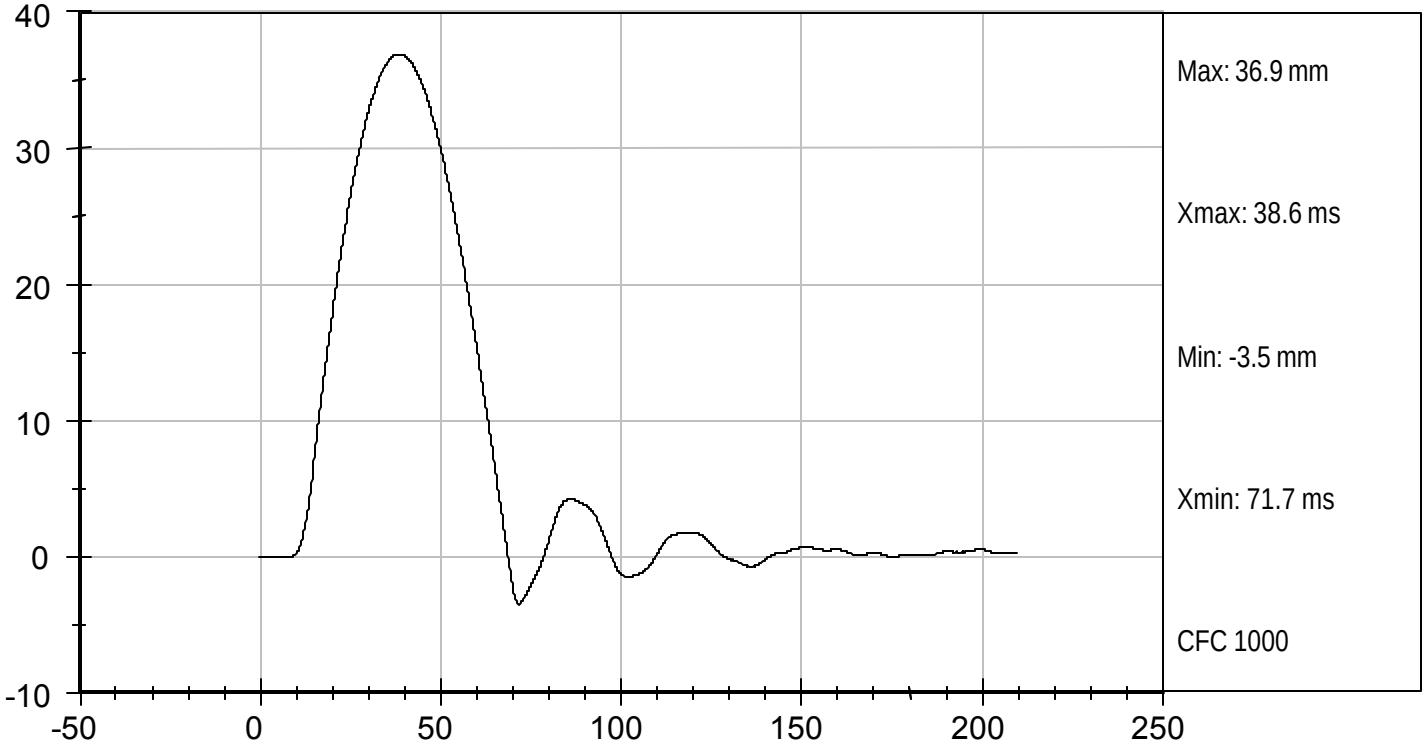
Jessica Gall
Laboratory Technician

6/1/09
Test Date

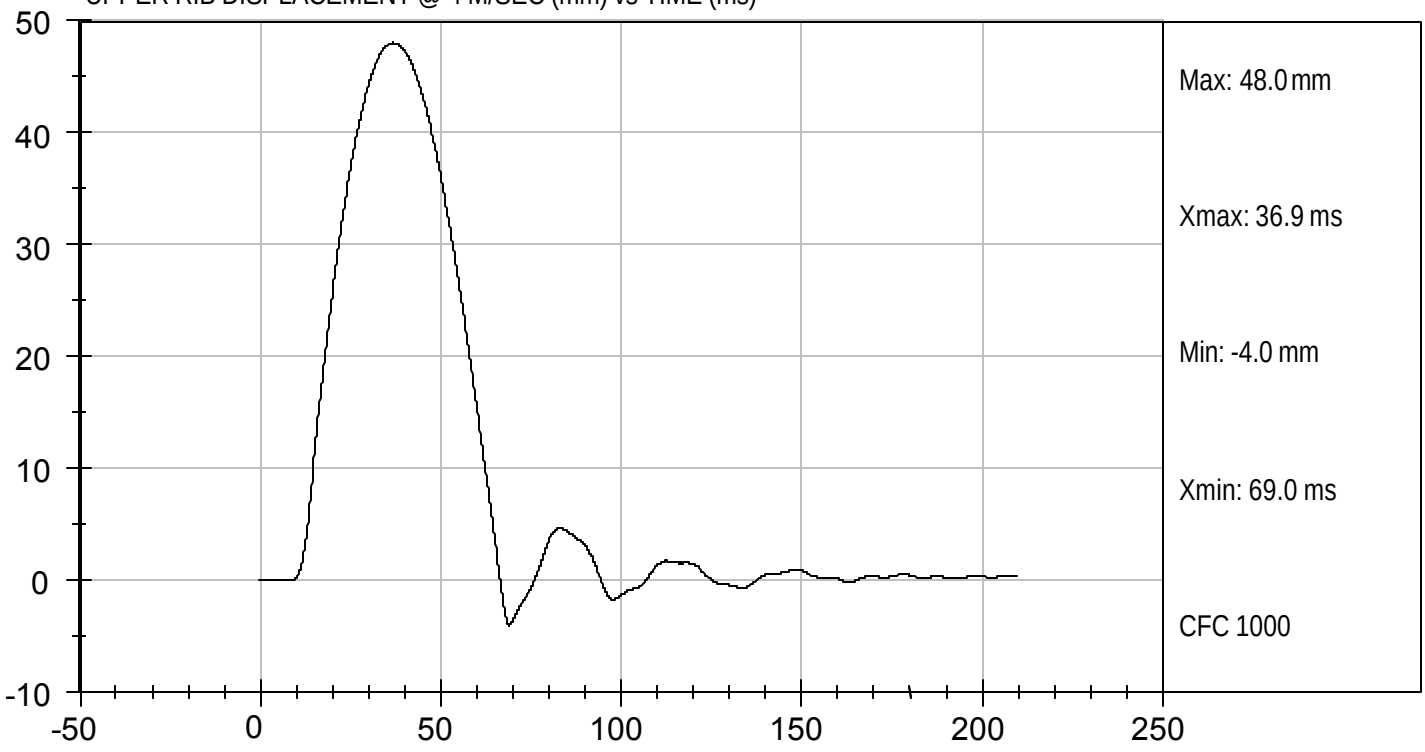
David Winkelbauer
Approved By

Test Desc: Rib Impact - Upper
Component ID: D091374
Test Date: 6/1/09

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:** D091375

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	37.0	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	48.1	Pass
		Overall Test Results		Pass

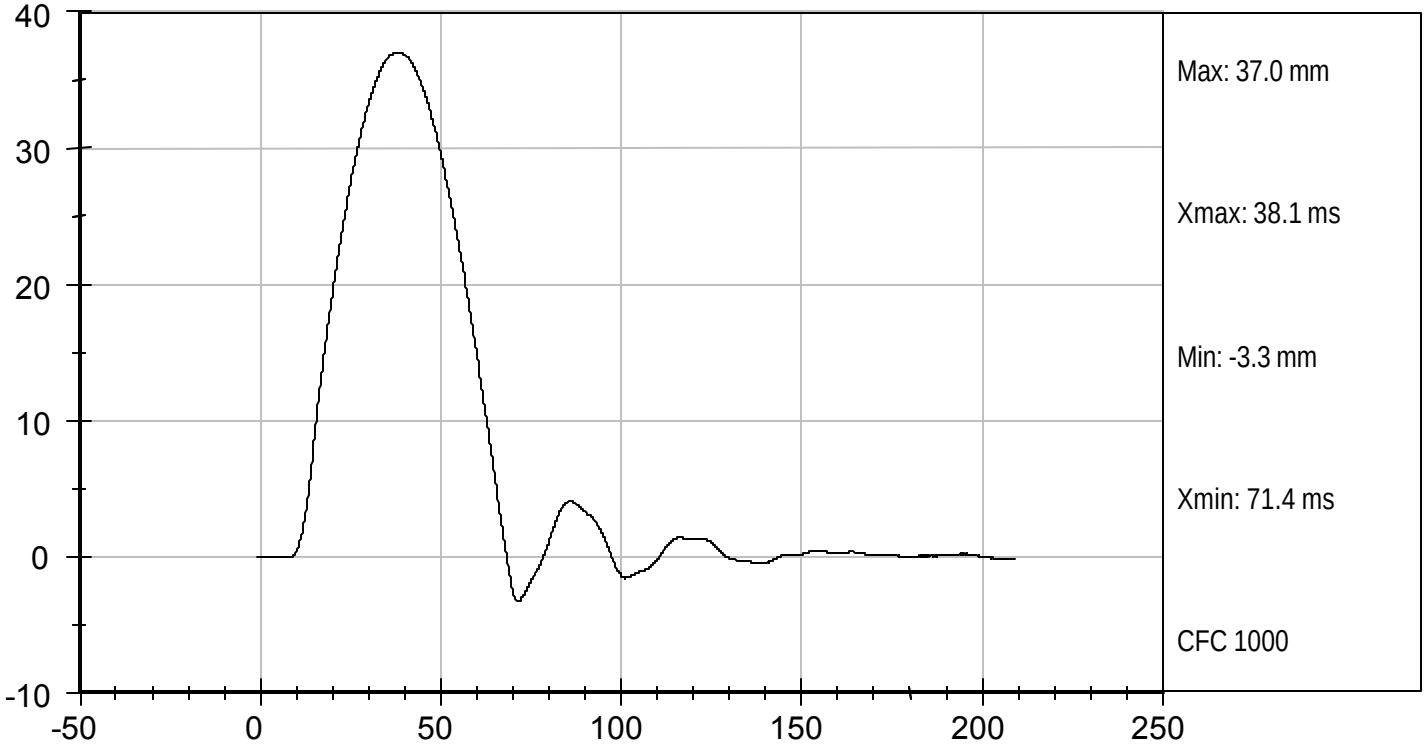
Jessica Hall
Laboratory Technician

6/1/09
Test Date

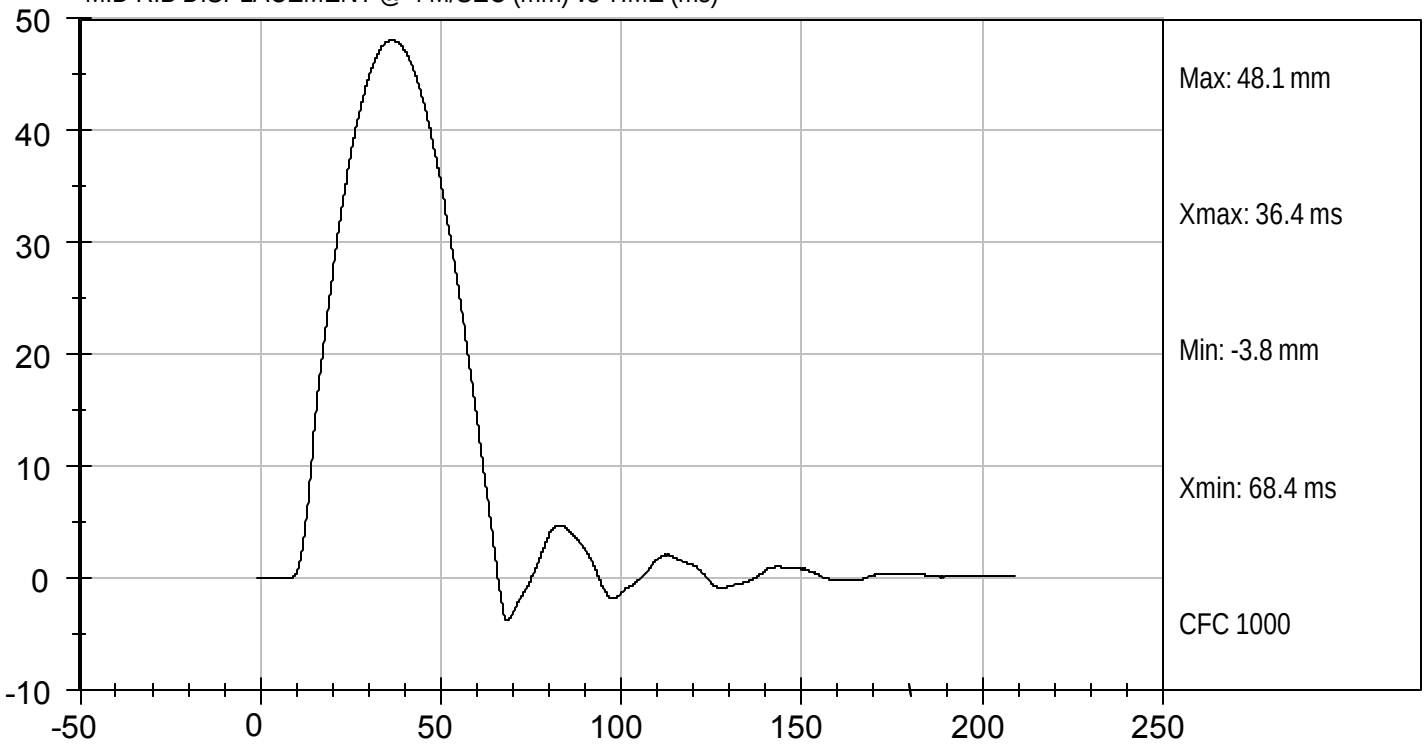
David Winkelbauer
Approved By

Test Desc: Rib Impact - Mid
Component ID: D091375
Test Date: 6/1/09

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



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



MGA RESEARCH CORPORATION

LOWER RIB TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D091376

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	47	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	47.7	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

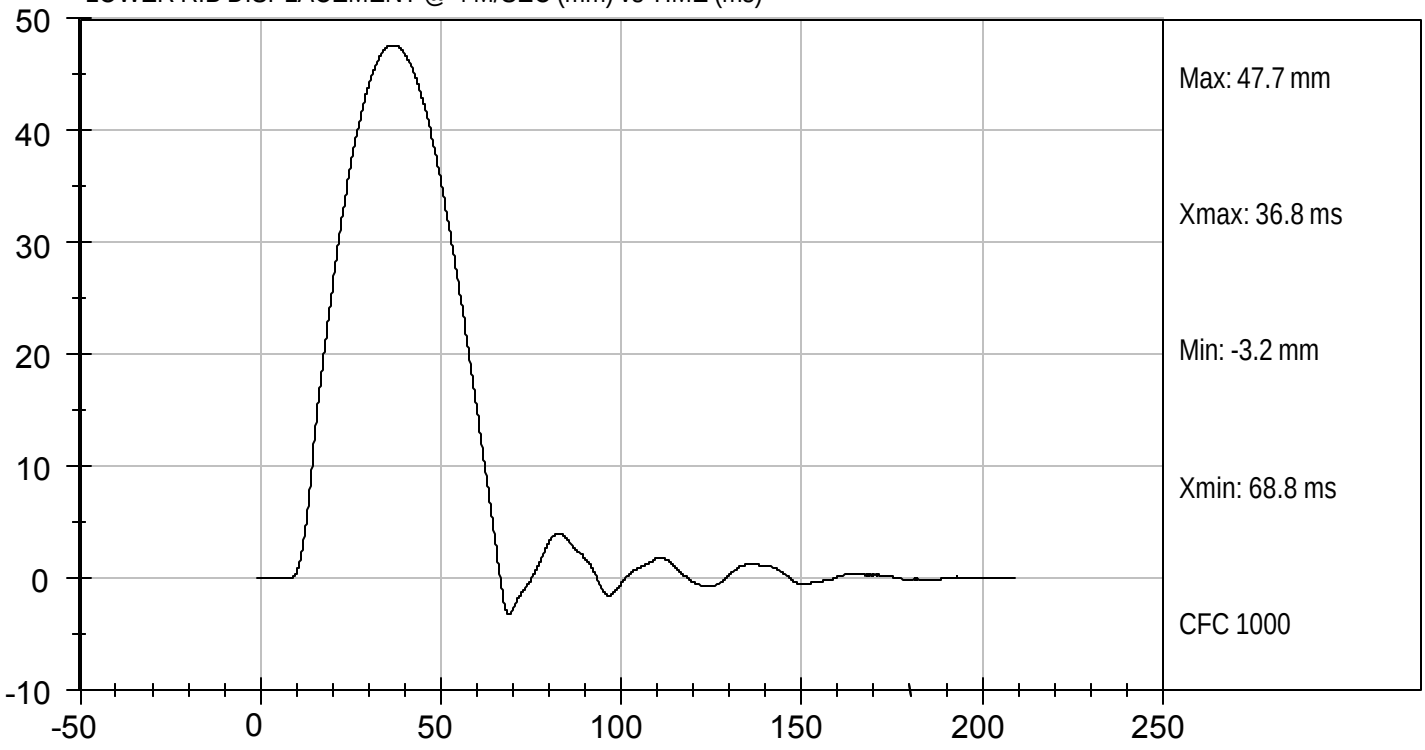
6/1/09
Test Date

David Winkelbauer
Approved By

Test Desc: Rib Impact - Lower
Component ID: D091376
Test Date: 6/1/09

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:** D091377

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Probe Speed	m/s	3.90 to 4.10	4.05	Pass
Maximum Impact Force	kN	4.00 to 4.80	4.04	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	11.50	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

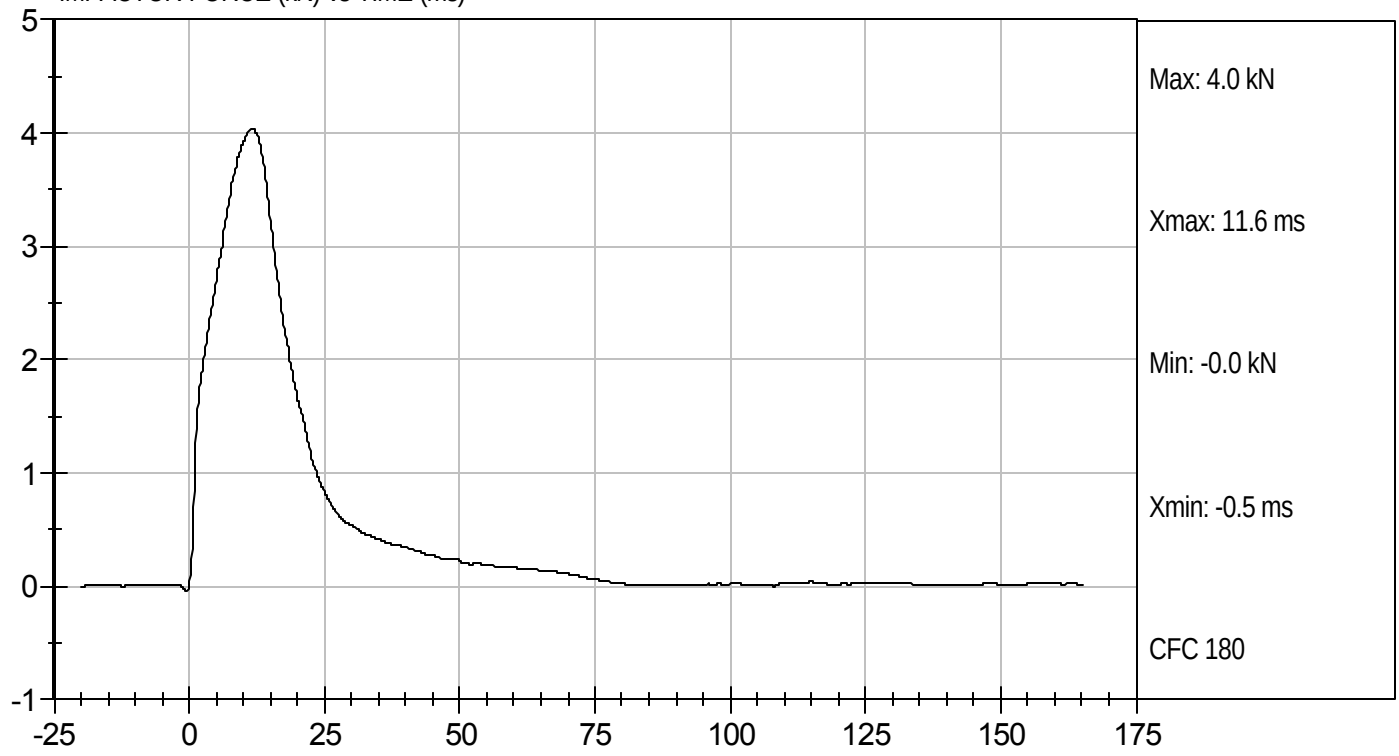
6/1/09
Test Date

David Winkelbauer
Approved By

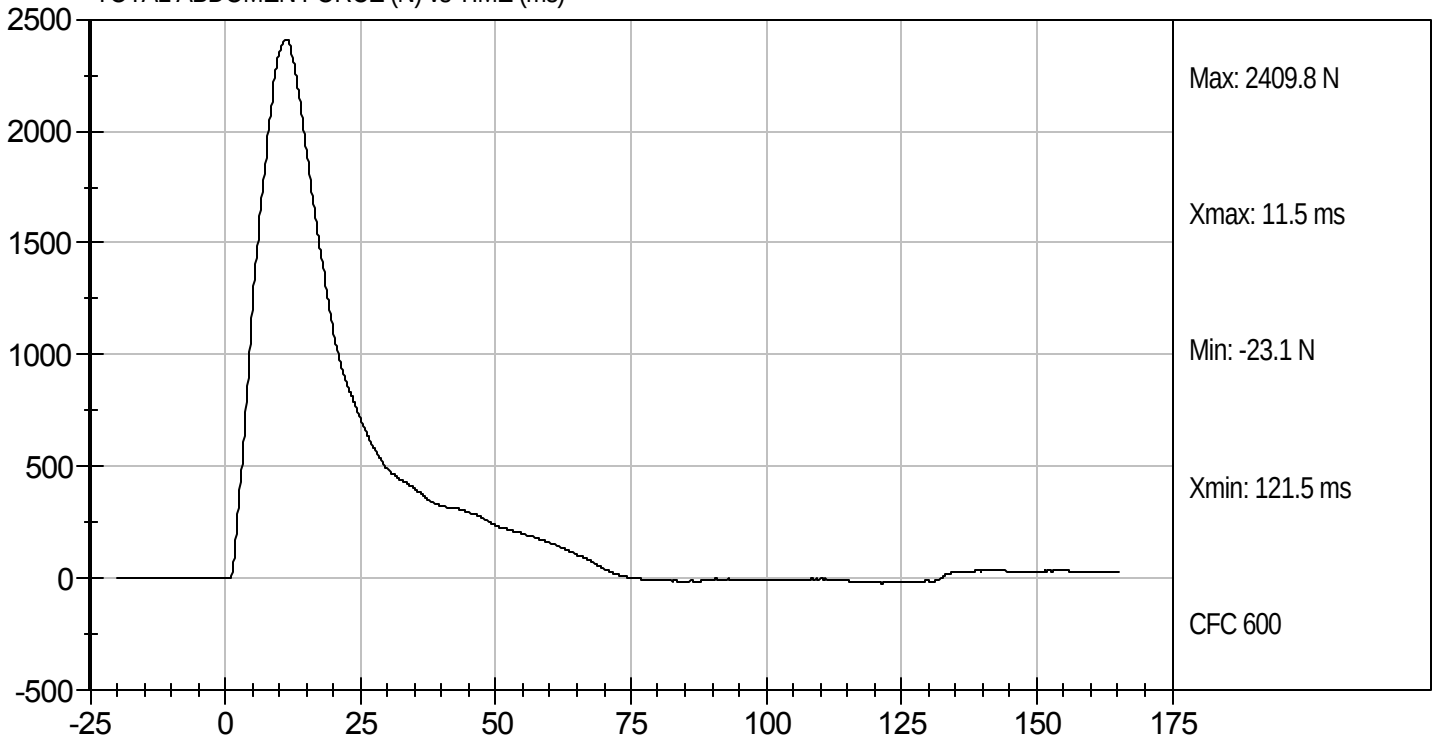
Test Desc: Abdomen Impact
Component ID: D091377

Test Date: 6/1/09
Velocity: 13.3 ft/s, 4.05 m/s

IMPACTOR FORCE (kN) vs TIME (ms)



TOTAL ABDOMEN FORCE (N) vs TIME (ms)



MGA RESEARCH CORPORATION

LUMBAR SPINE TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D091378

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	47	Pass
Pendulum Speed		m/sec	5.95 to 6.15	6.13	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	-5.93	Pass
	30 msec	m/sec	>= -6.5	-6.13	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	48.4	Pass
Time of Maximum Flexion Angle		msec	39.0 to 53.0	44.3	Pass
Headform Rotation Decay to Initial Position		msec	37 to 57	44.8	Pass
			Overall Results		Pass

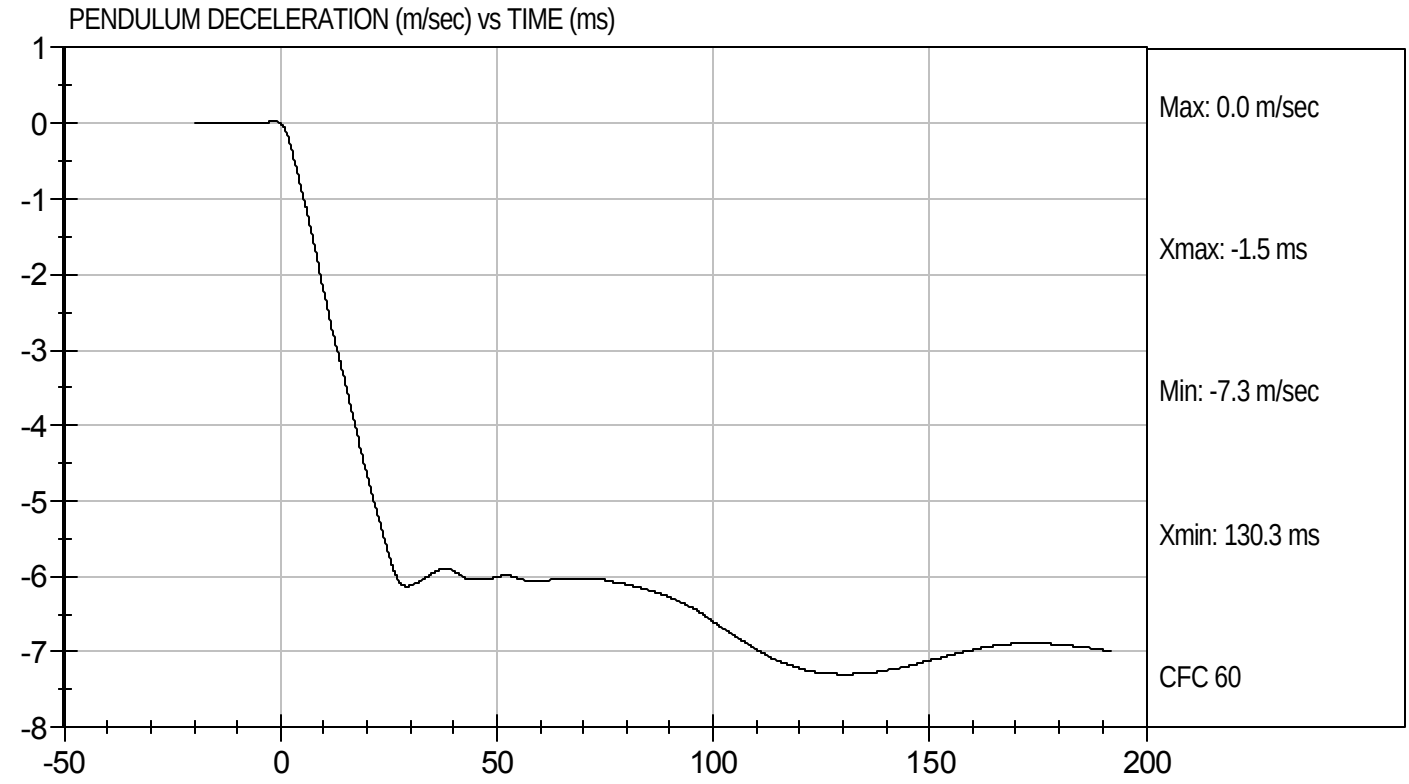
Jessica Hall
Laboratory Technician

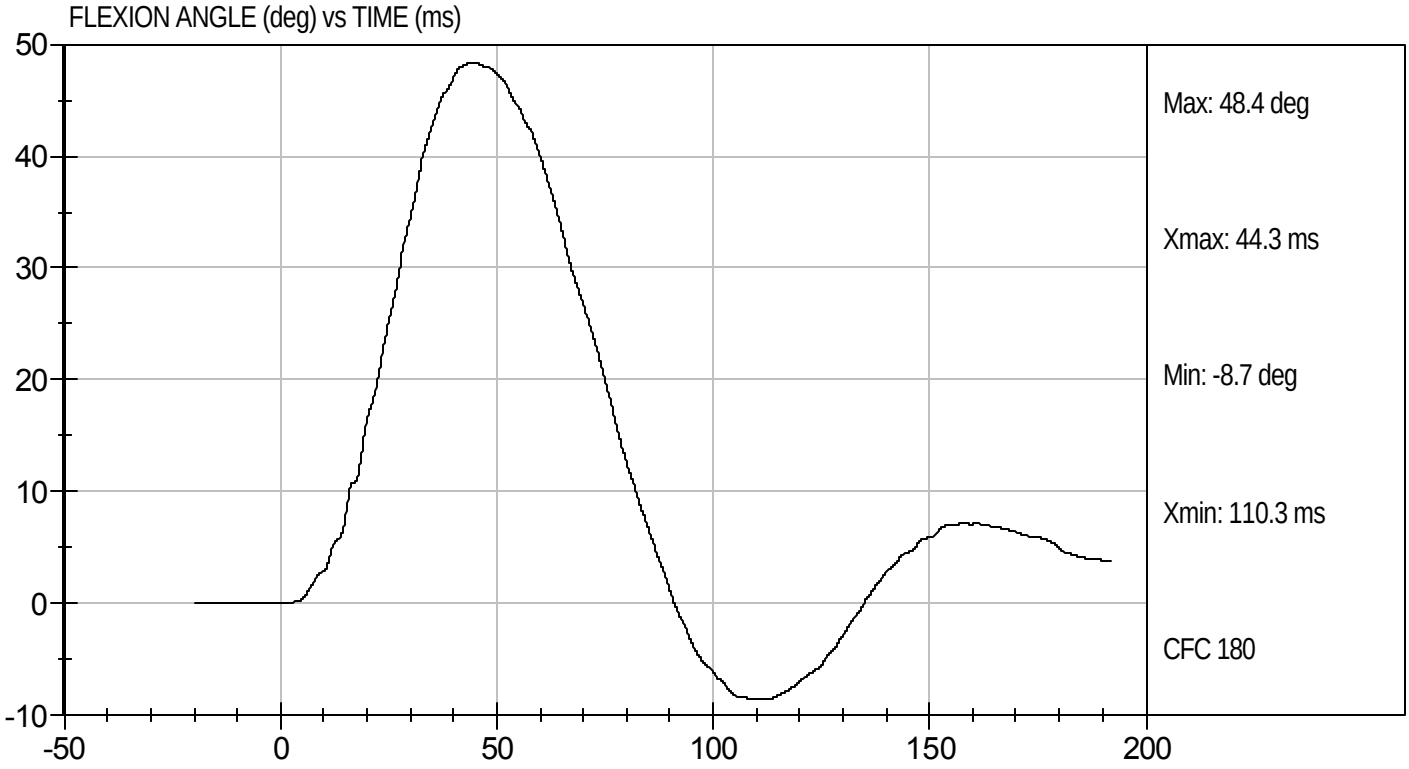
6/2/09
Test Date

David Winkelbauer
Approved By

Test Desc: Lumbar Bending
Component ID: D091378

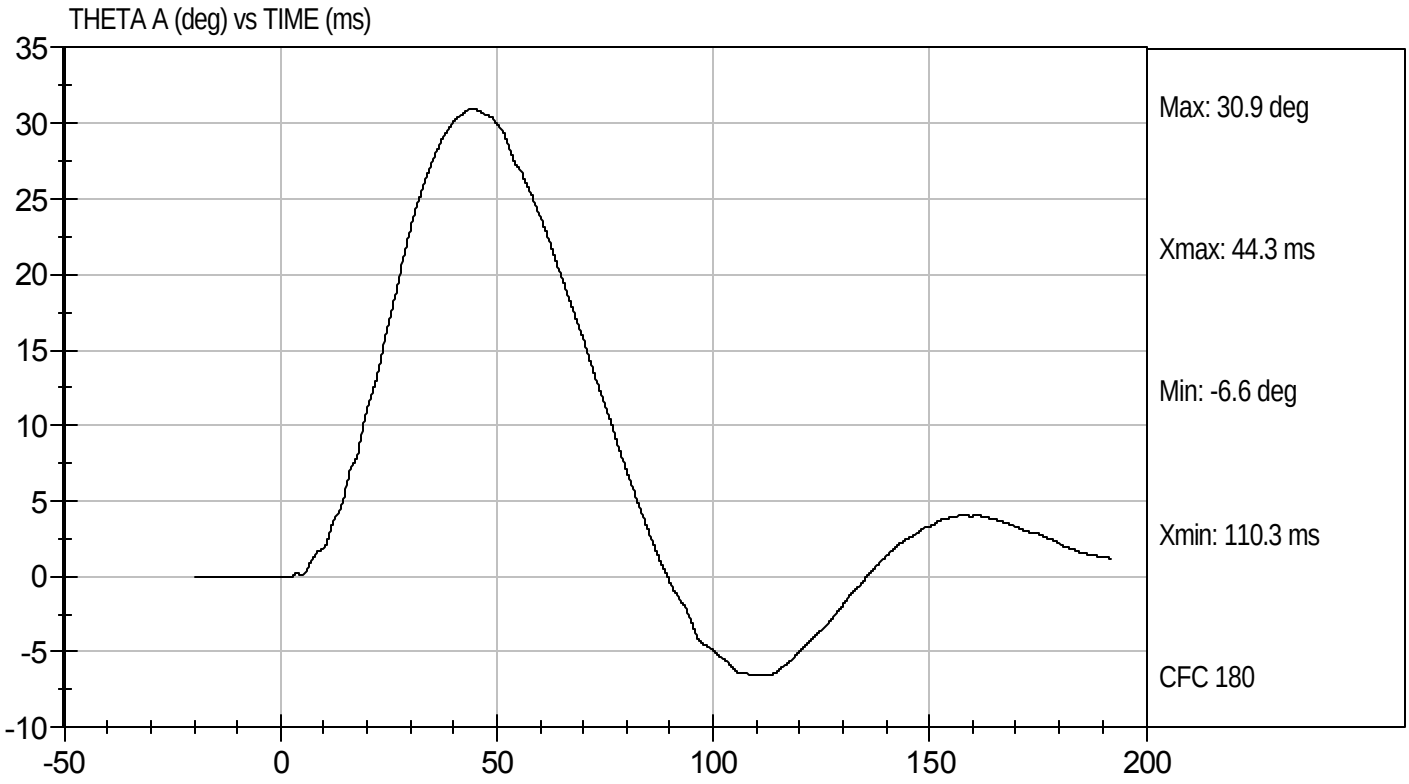
Test Date: 6/2/09
Velocity: 20.1 ft/s, 6.13 m/s

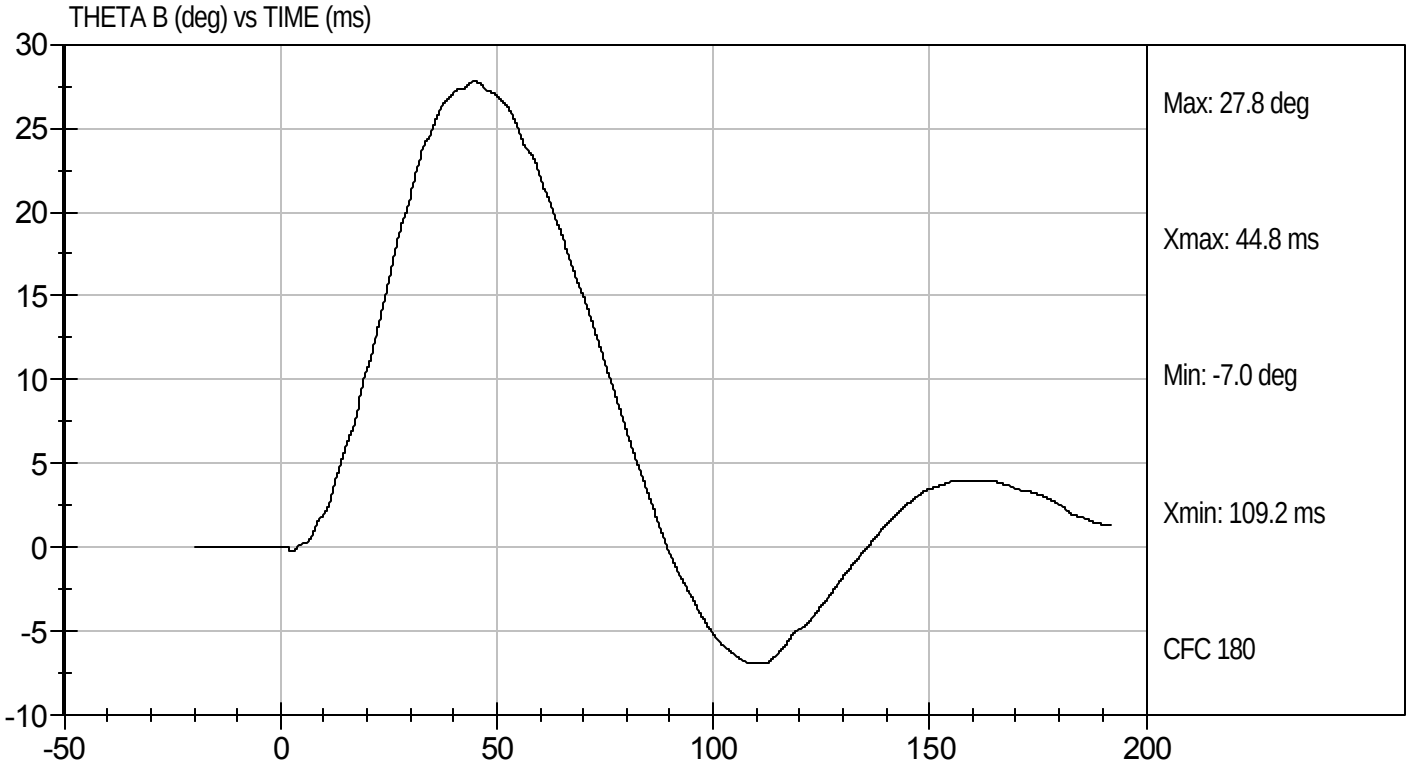




Test Desc: Lumbar Bending
Component ID: D091378

Test Date: 6/2/09
Velocity: 20.1 ft/s, 6.13 m/s





MGA RESEARCH CORPORATION

PELVIS TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D091379

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Probe Speed	m/s	4.20 to 4.40	4.30	Pass
Maximum Impactor Force	kN	4.70 to 5.40	4.74	Pass
Time of Maximum Impactor Force	msec	11.80 to 16.10	13.20	Pass
Maximum Pubic Force	kN	1.23 to 1.59	1.40	Pass
Time of Maximum Pubic Force	msec	12.20 to 17.00	14.00	Pass
		Overall Test Results		Pass

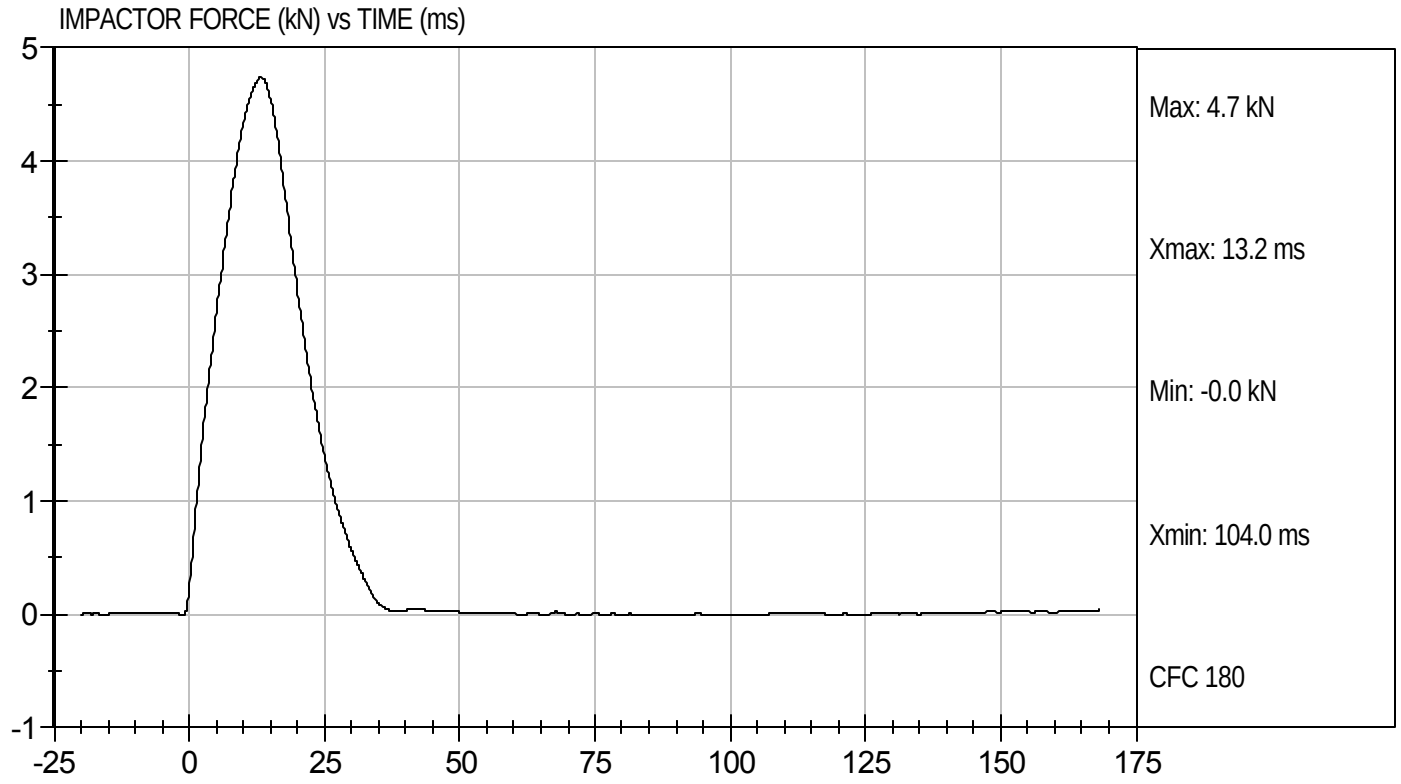
Jessica Hall
Laboratory Technician

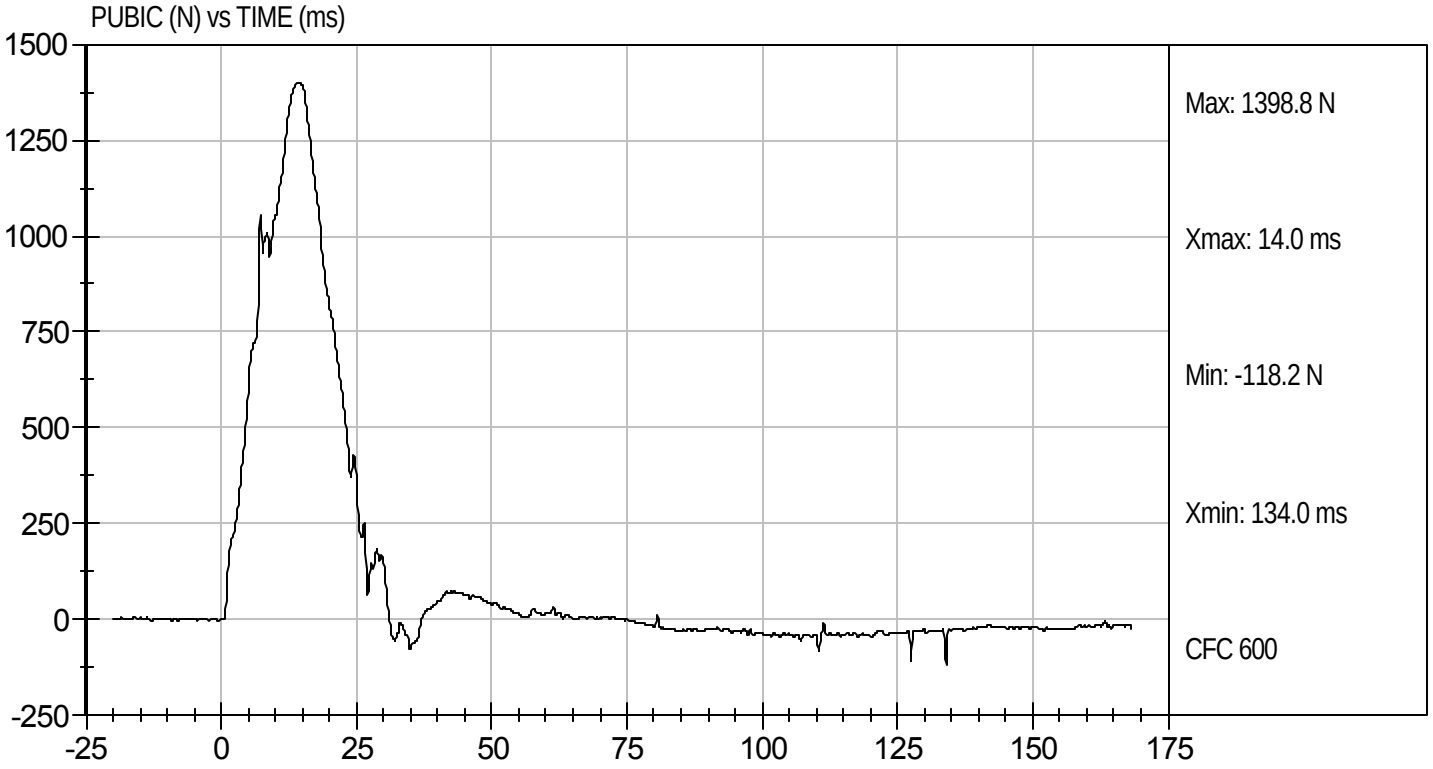
6/1/09
Test Date

David Winkelbauer
Approved By

Test Desc: Pelvis Impact
Component ID: D091379

Test Date: 6/1/09
Velocity: 14.1 ft/s, 5.52 m/s





MGA RESEARCH CORPORATION

FULL BODY THORAX IMPACT TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D091370

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.9	Pass
Humidity	%	10 to 70	48	Pass
Probe Speed	m/s	5.40 to 5.60	5.52	Pass
Maximum Impactor Force (after 6 ms)	kN	5.17 to 6.12	5.24	Pass
Upper Rib Displacement	mm	33.2 to 41.3	36.7	Pass
Middle Rib Displacement	mm	37.1 to 45.4	39.8	Pass
Lower Rib Displacement	mm	35.6 to 43.0	38.9	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

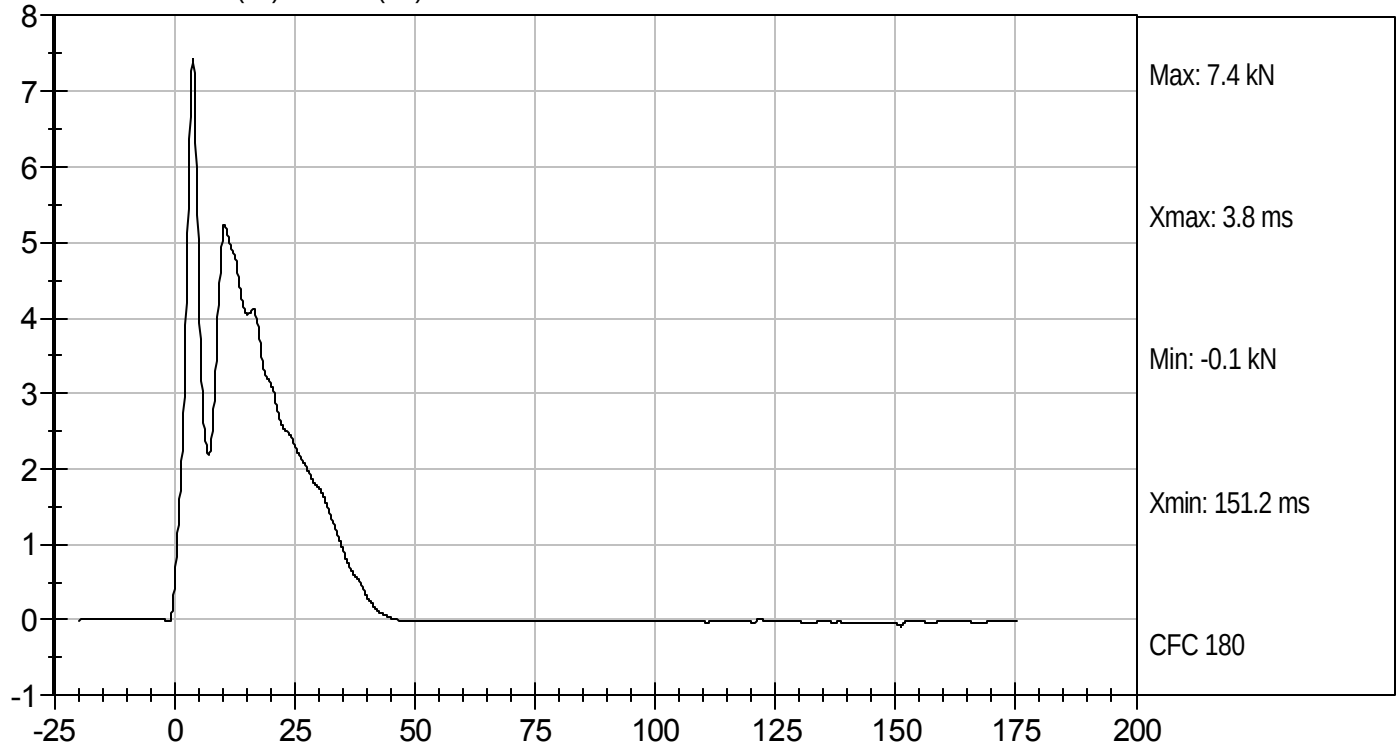
6/1/09
Test Date

David Winkelbauer
Approved By

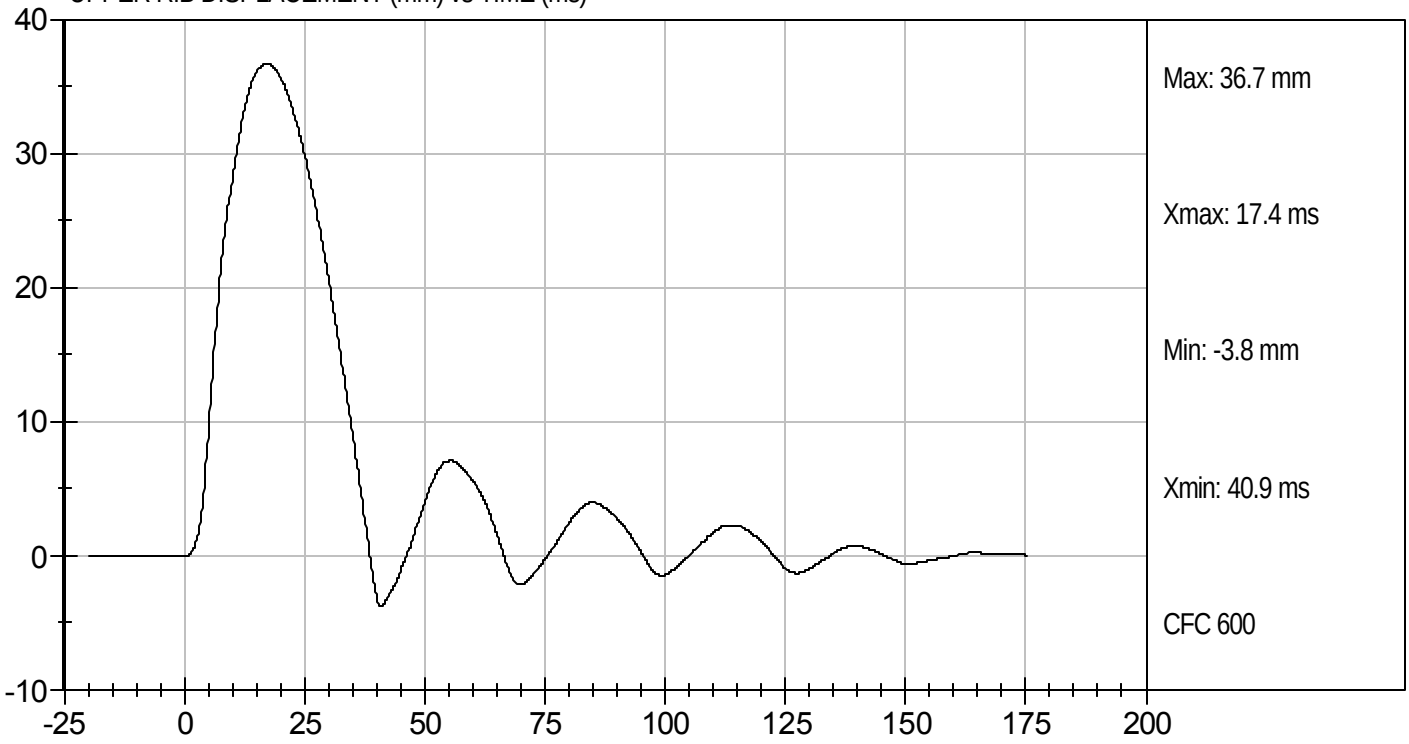
Test Desc: Thorax Impact
Component ID: D091370

Test Date: 6/1/09
Velocity: 18.1 ft/s, 5.52 m/s

PROBE FORCE (kN) vs TIME (ms)



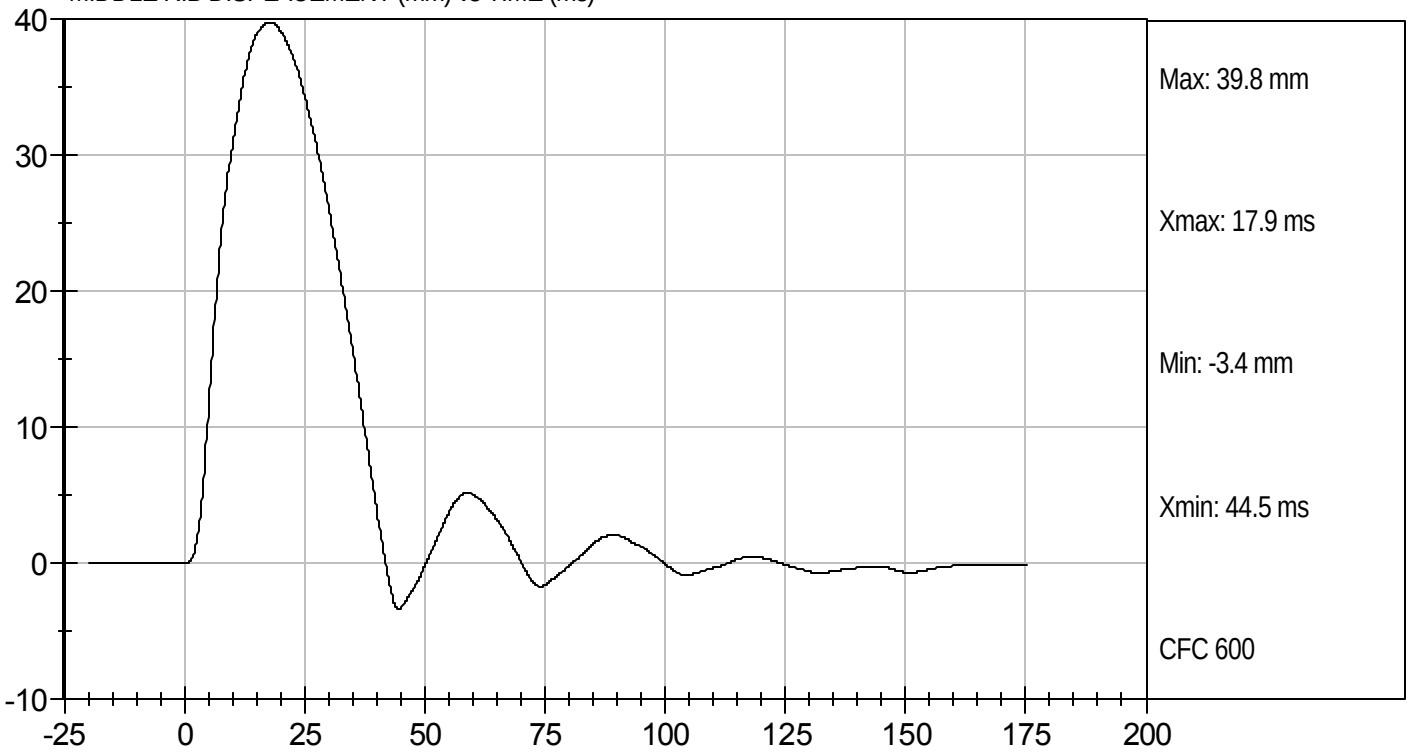
UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



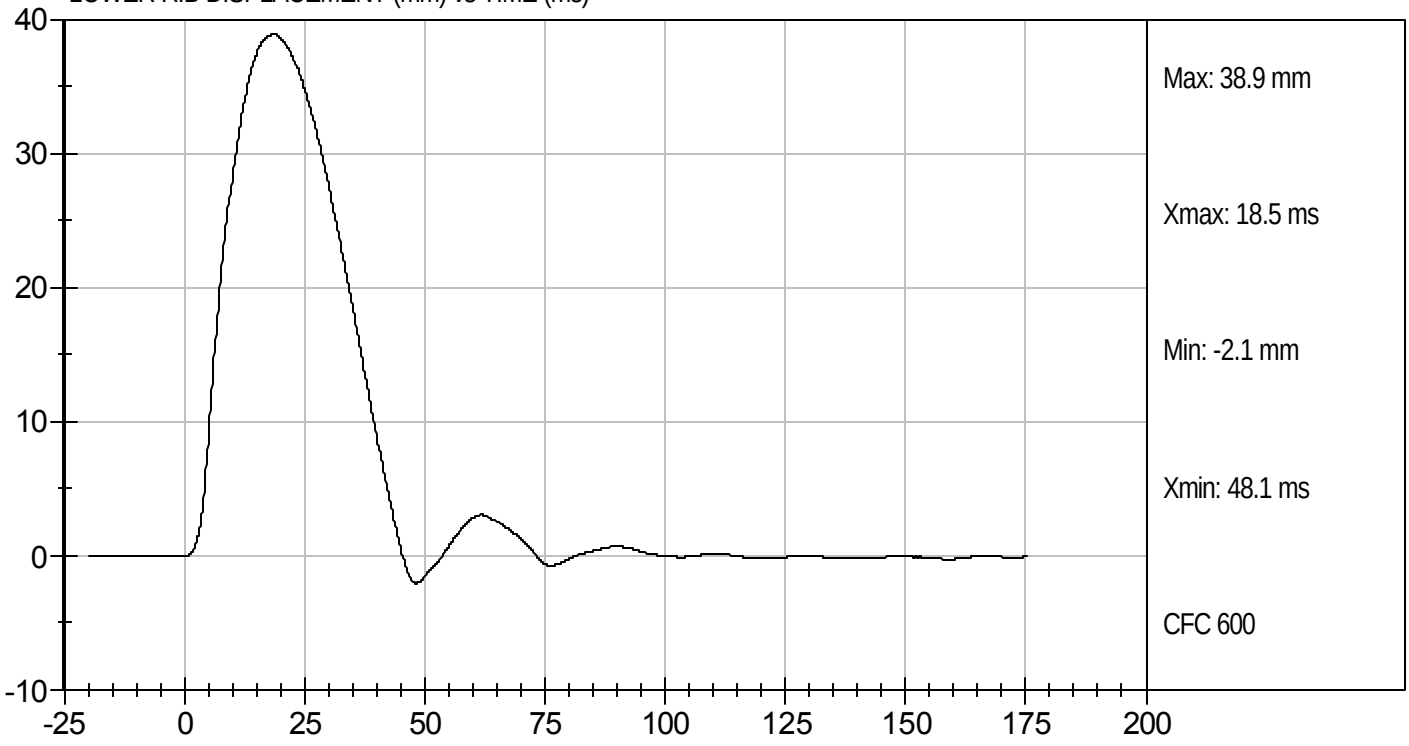
Test Desc: Thorax Impact
Component ID: D091370

Test Date: 6/1/09
Velocity: 18.1 ft/s, 5.52 m/s

MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

HEAD DROP TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test ID:** D091251

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Peak Resultant Acceleration	G's	115 to 137	121	Pass
Peak Lateral Acceleration	G's	+/- 15	-4.6	Pass
Unimodal	N/A	<15%	Yes	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

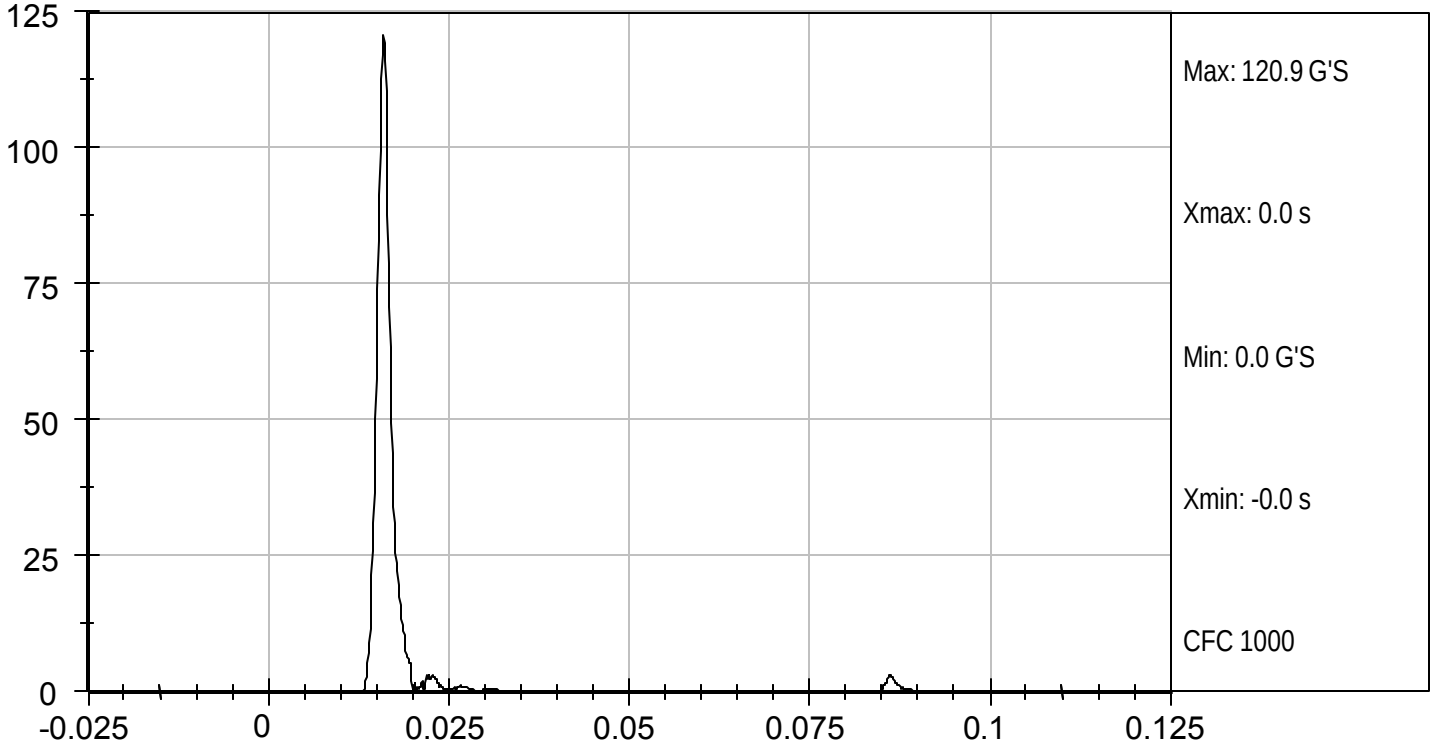
5/22/09
Test Date

David Winkelbauer
Approved By

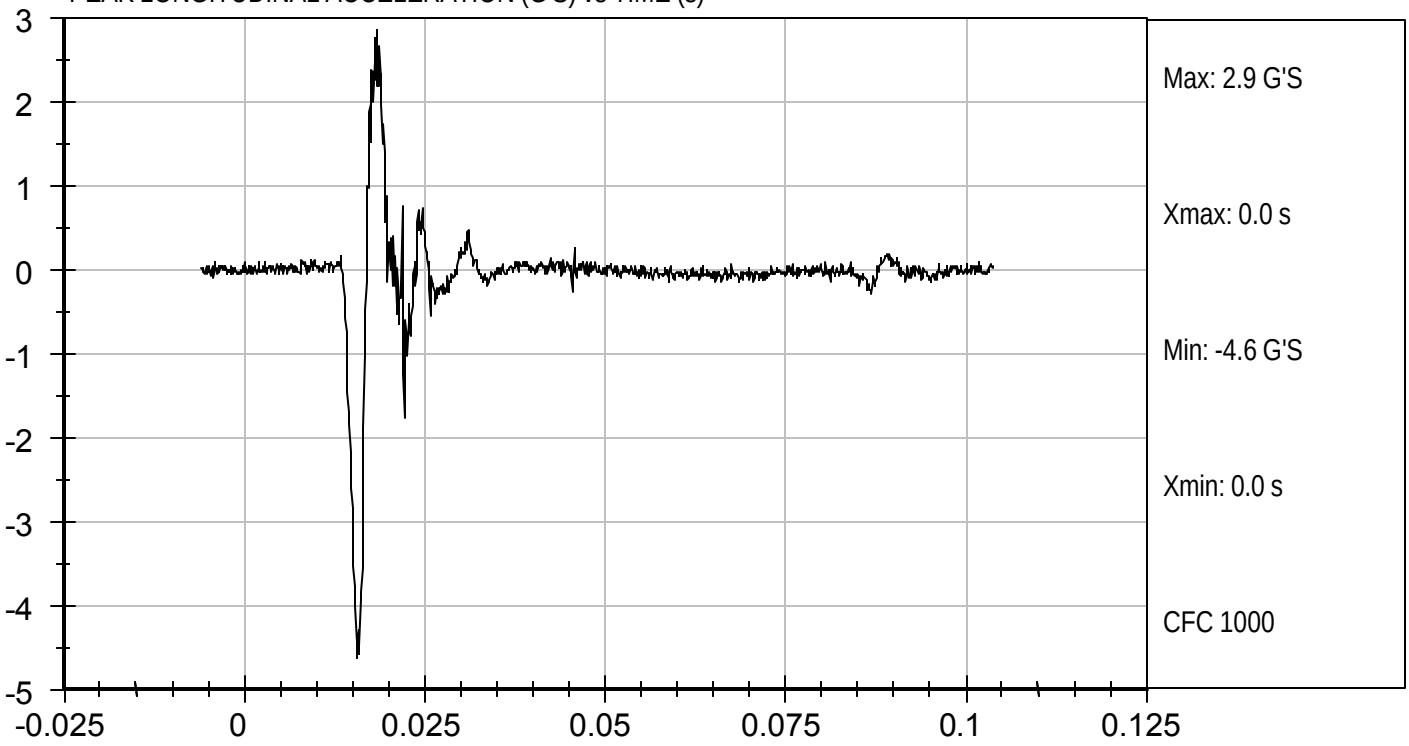
Test Desc: Head Drop
Component ID: D091251

Test Date: 5/22/09
Velocity: 0 ft/s, 0 m/s

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



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



MGA RESEARCH CORPORATION

LATERAL NECK PENDULUM TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test I.D:** D091252

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.2	Pass
Humidity		%	10 to 70	39	Pass
Impact Velocity		m/s	5.51 to 5.63	5.60	Pass
Delta Velocity	10 msec	m/s	2.20 to 2.80	2.56	Pass
	15 msec	m/s	3.30 to 4.10	3.66	Pass
	20 msec	m/s	4.40 to 5.40	4.82	Pass
	25 msec	m/s	5.40 to 6.10	5.66	Pass
	25-100 msec	m/s	5.50 to 6.20	5.68	Pass
Maximum D-Plane Rotation		deg	71 to 81	71	Pass
Time of Maximum D-Plane Rotation		msec	50 to 70	60	Pass
Maximum Occipital Condyle Moment during Rotation Interval		Nm	-44 to -36	-39	Pass
Time of Moment Decay to 0 Nm		msec	102 to 126	114	Pass
			Overall Test Results		Pass

Jessica Hall
Laboratory Technician

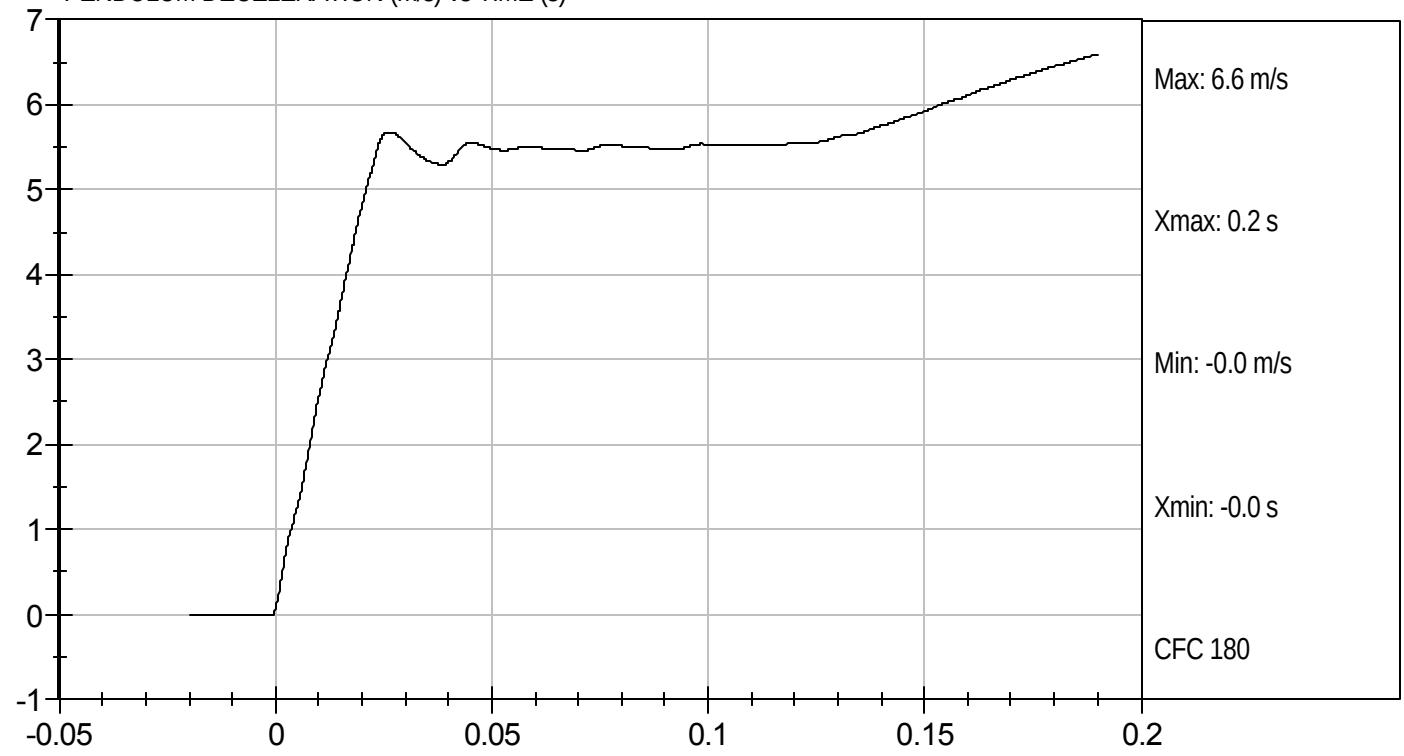
5/22/09
Test Date

David Winkelbauer
Approved By

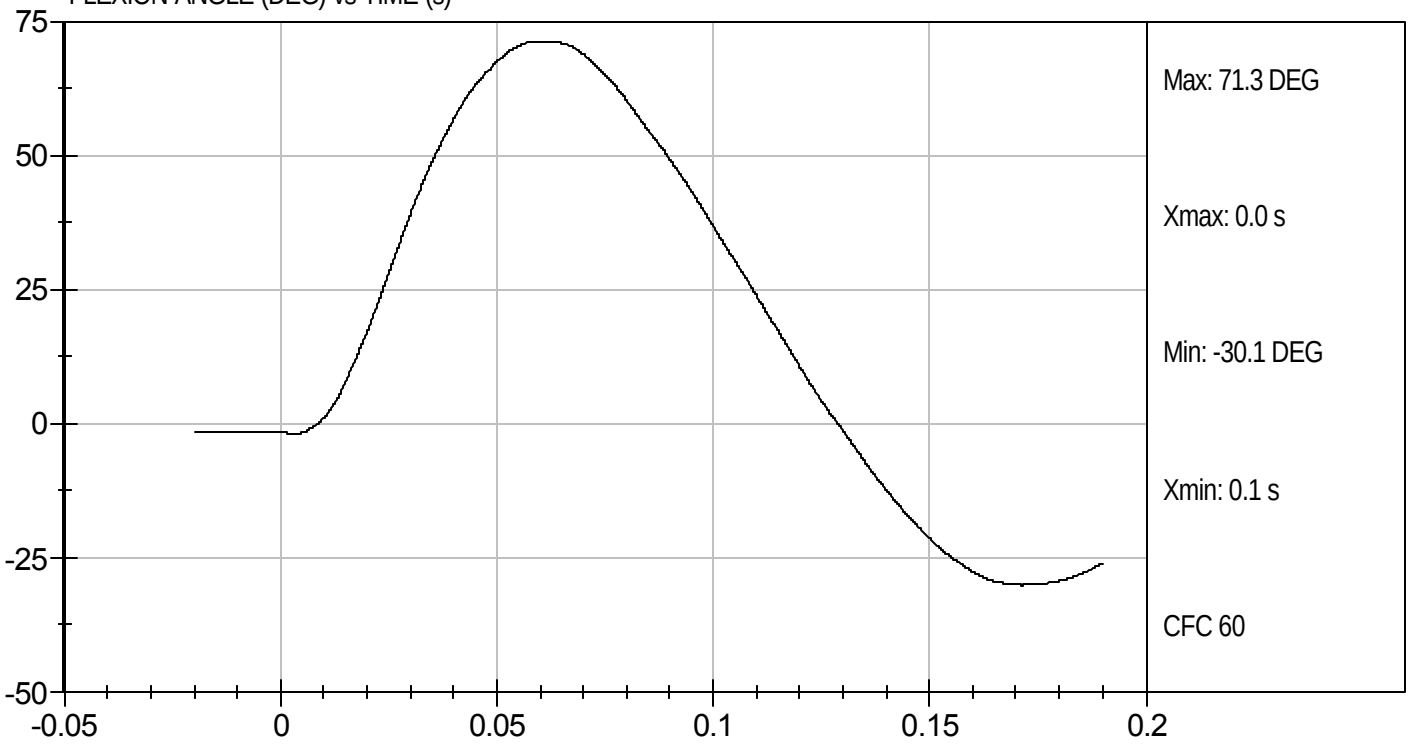
Test Desc: Neck Bending
Component ID: D091252

Test Date: 5/22/09
Velocity: 18.37 ft/s, 5.60 m/s

PENDULUM DECELERATION (m/s) vs TIME (s)

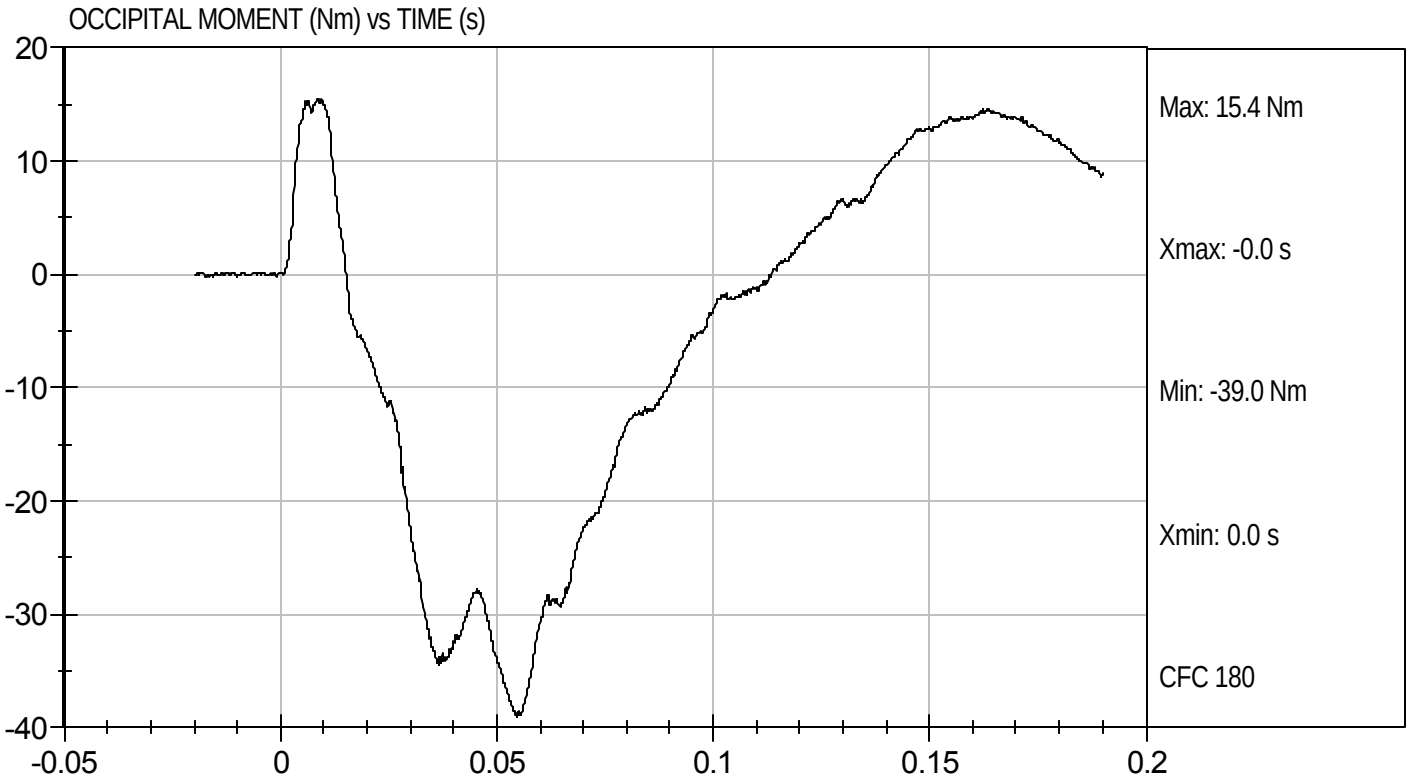


FLEXION ANGLE (DEG) vs TIME (s)



Test Desc: Neck Bending
Component ID: D091252

Test Date: 5/22/09
Velocity: 18.37 ft/s, 5.60 m/s



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test ID:** D091253

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	41	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	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

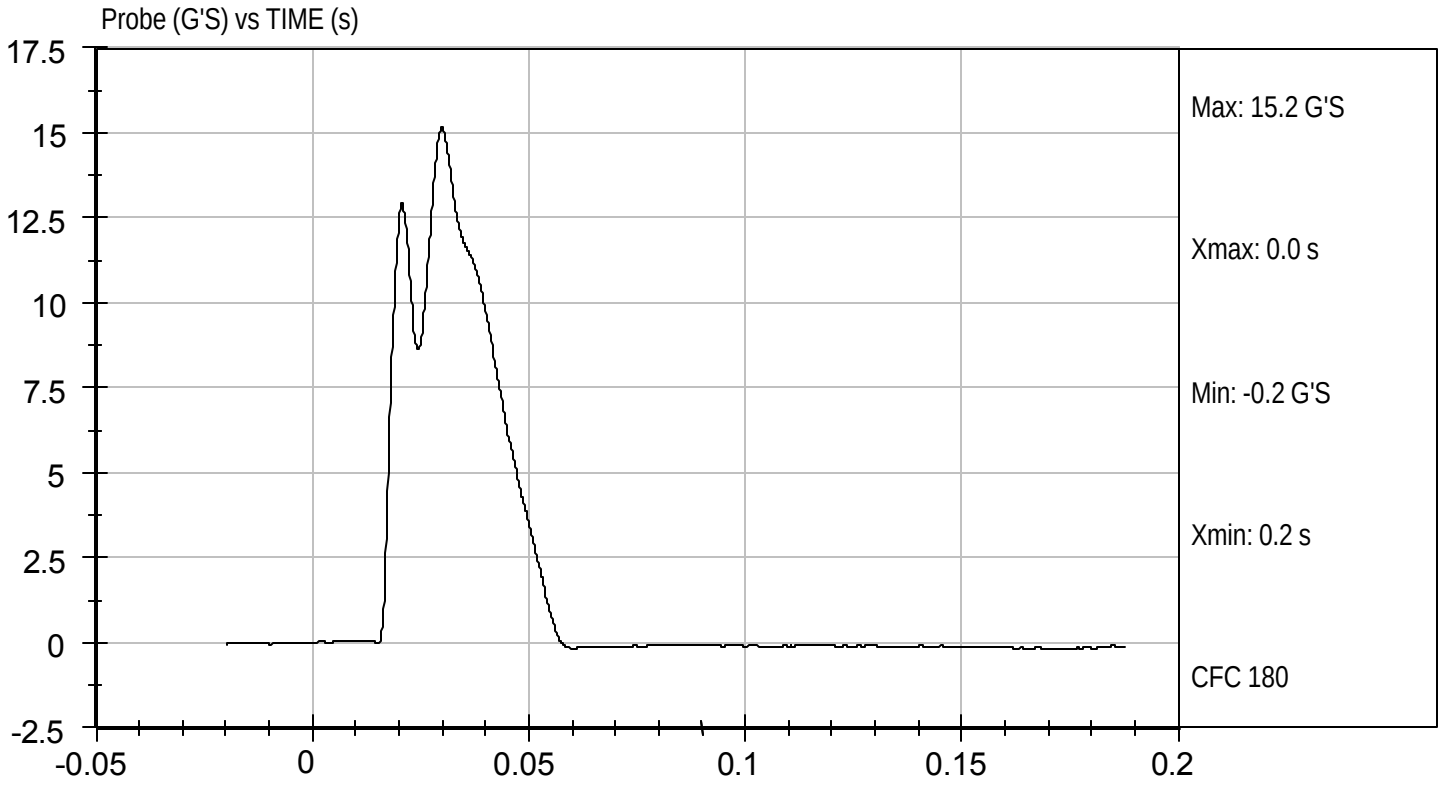
Jessica Gall
Laboratory Technician

5/22/09
Test Date

David Winkelbauer
Approved By

Test Desc: Shoulder Impact
Component ID: D091253

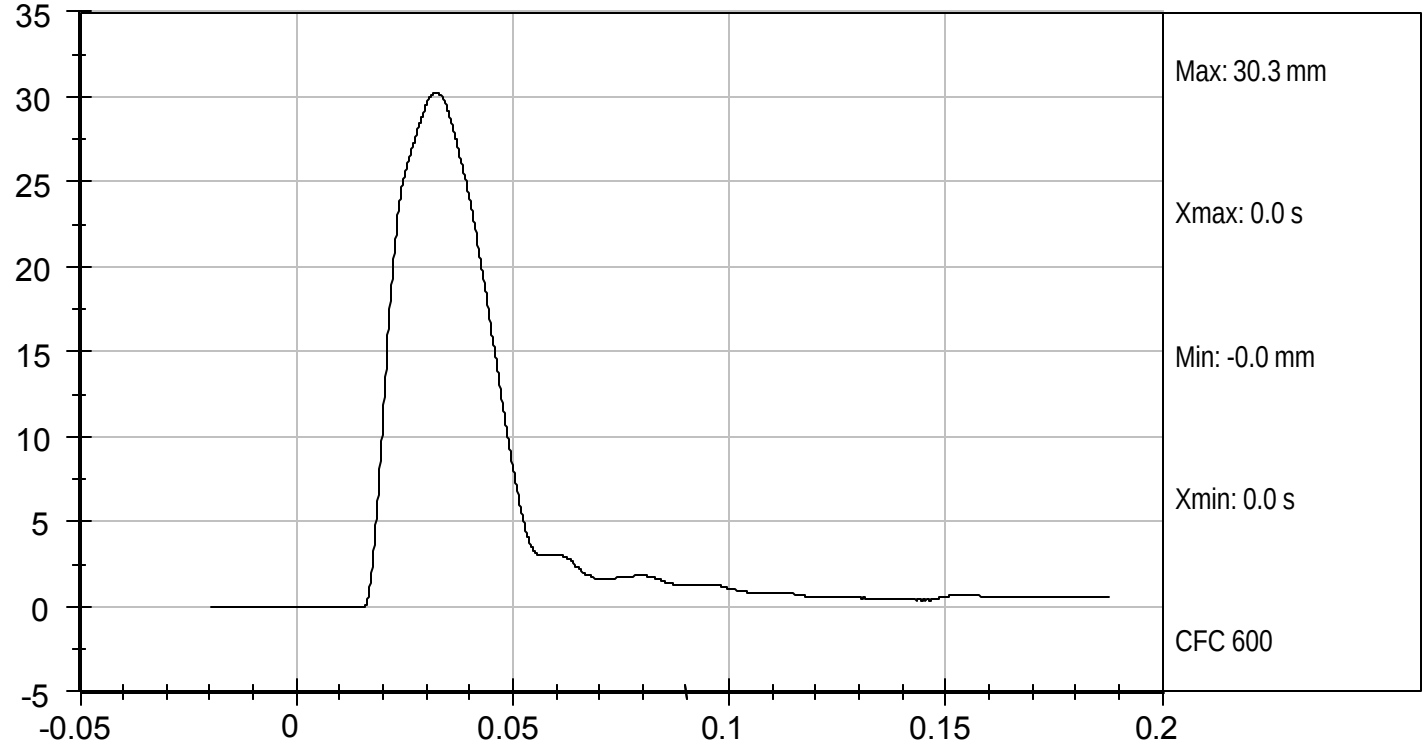
Test Date: 5/22/09
Velocity: 14.12 ft/s, 4.30 m/s



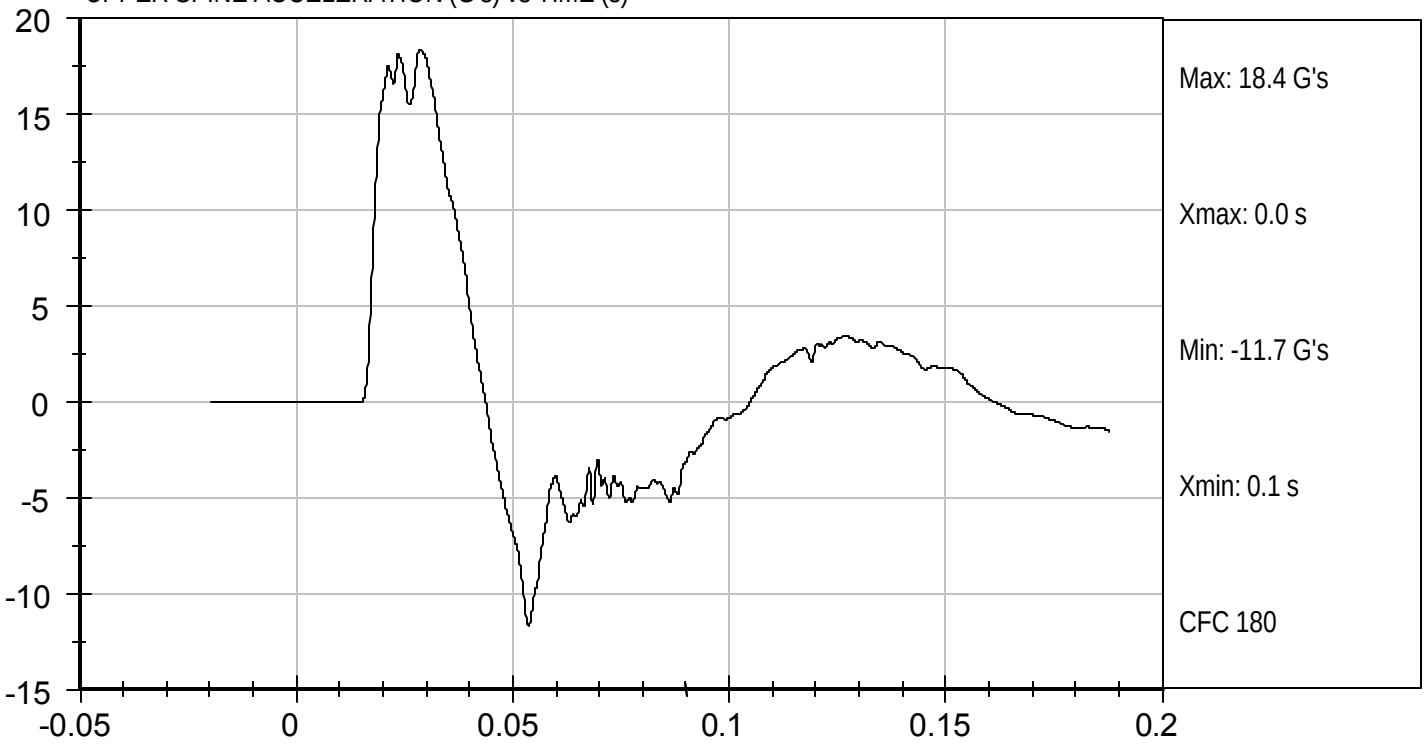
Test Desc: Shoulder Impact
Component ID: D091253

Test Date: 5/22/09
Velocity: 14.12 ft/s, 4.30 m/s

SHOULDER DISPLACEMENT (mm) vs TIME (s)



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



MGA RESEARCH CORPORATION

THORAX (WITH ARM) IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test I.D:** D091254

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Humidity	%	10 to 70	41	Pass
Impact Velocity	m/s	6.60 to 6.80	6.69	Pass
Peak Impactor Acceleration	G's	30 to 36	33	Pass
Shoulder Displacement	mm	31 to 40	36	Pass
Upper Rib Displacement	mm	25 to 32	27	Pass
Middle Rib Displacement	mm	30 to 36	31	Pass
Lower Rib Displacement	mm	32 to 38	32	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	38	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	35	Pass
		Overall Test Results		Pass

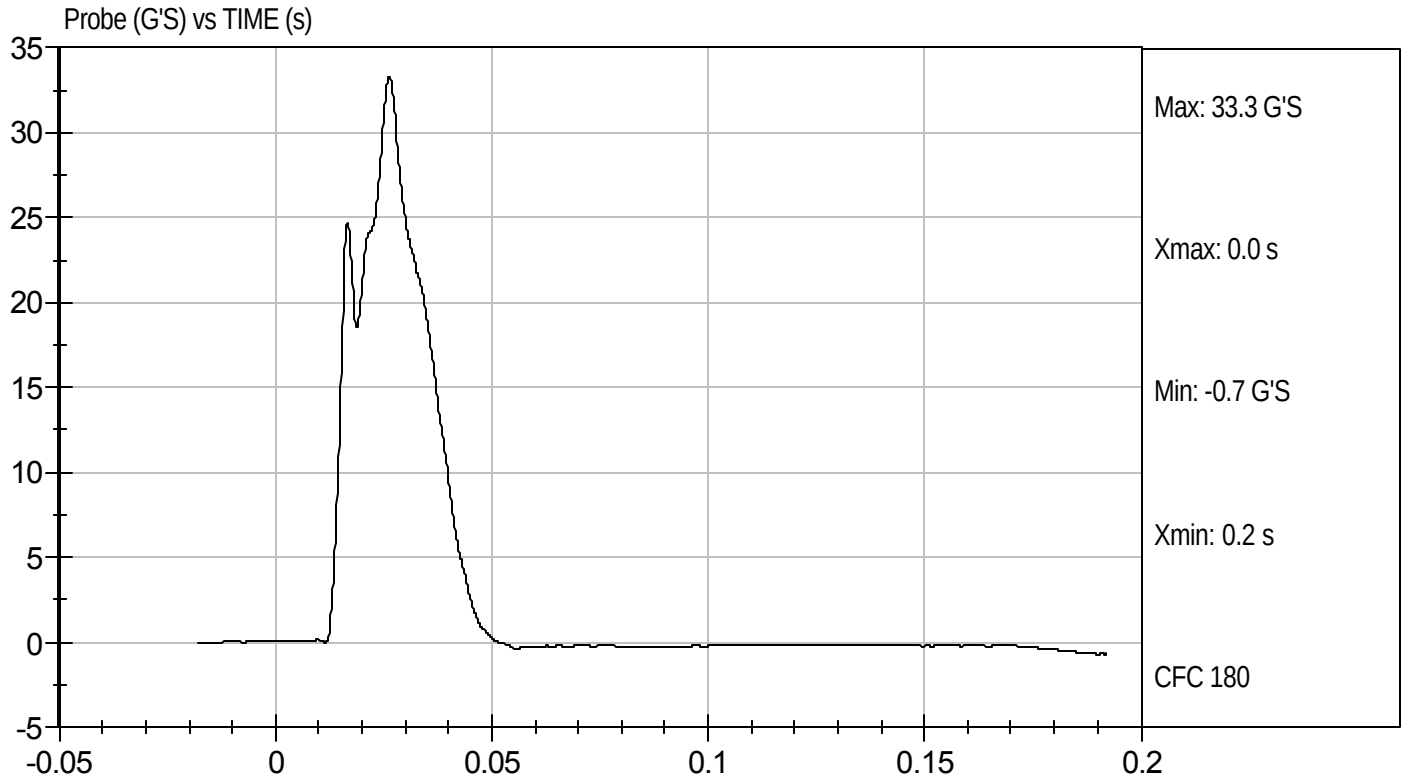
Jessica Gall
Laboratory Technician

5/22/09
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax With Arm
Component ID: D091254

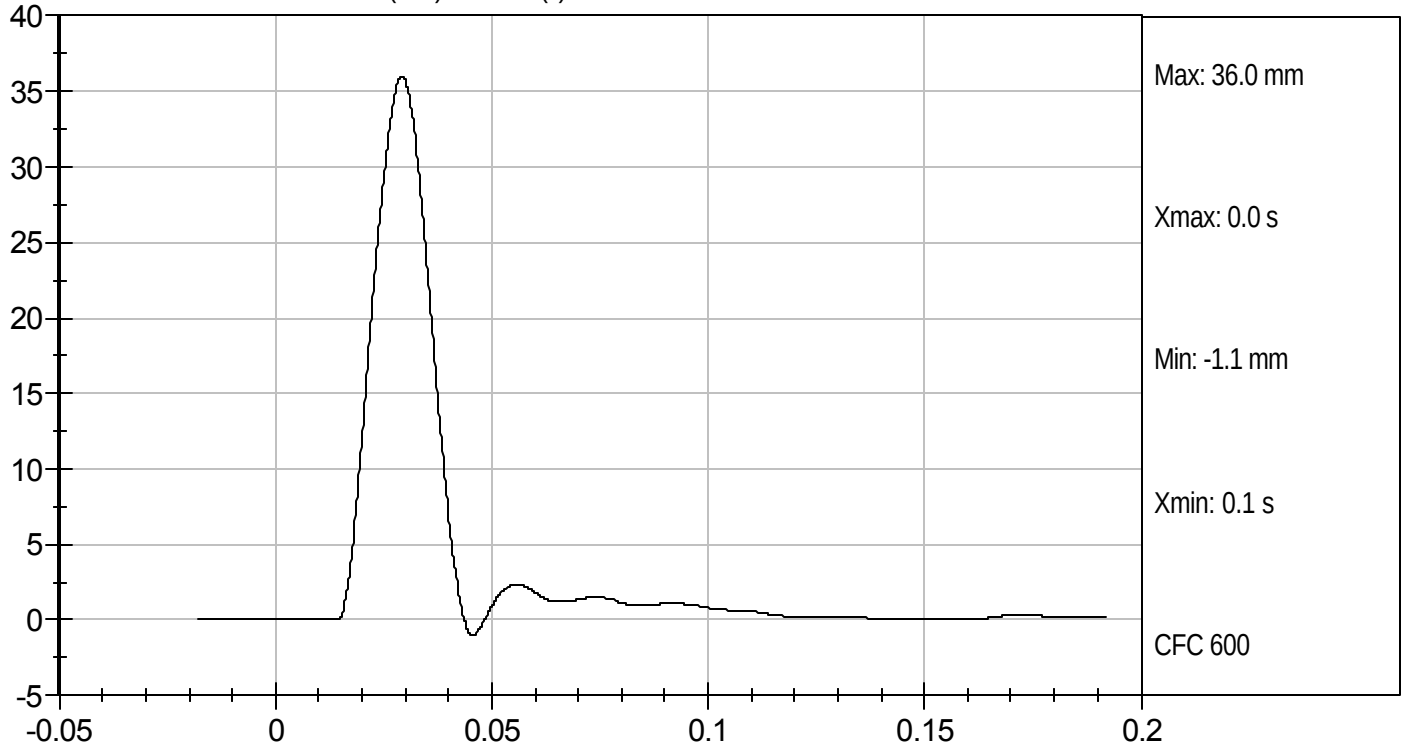
Test Date: 5/22/09
Velocity: 21.96 ft/s, 6.69 m/s



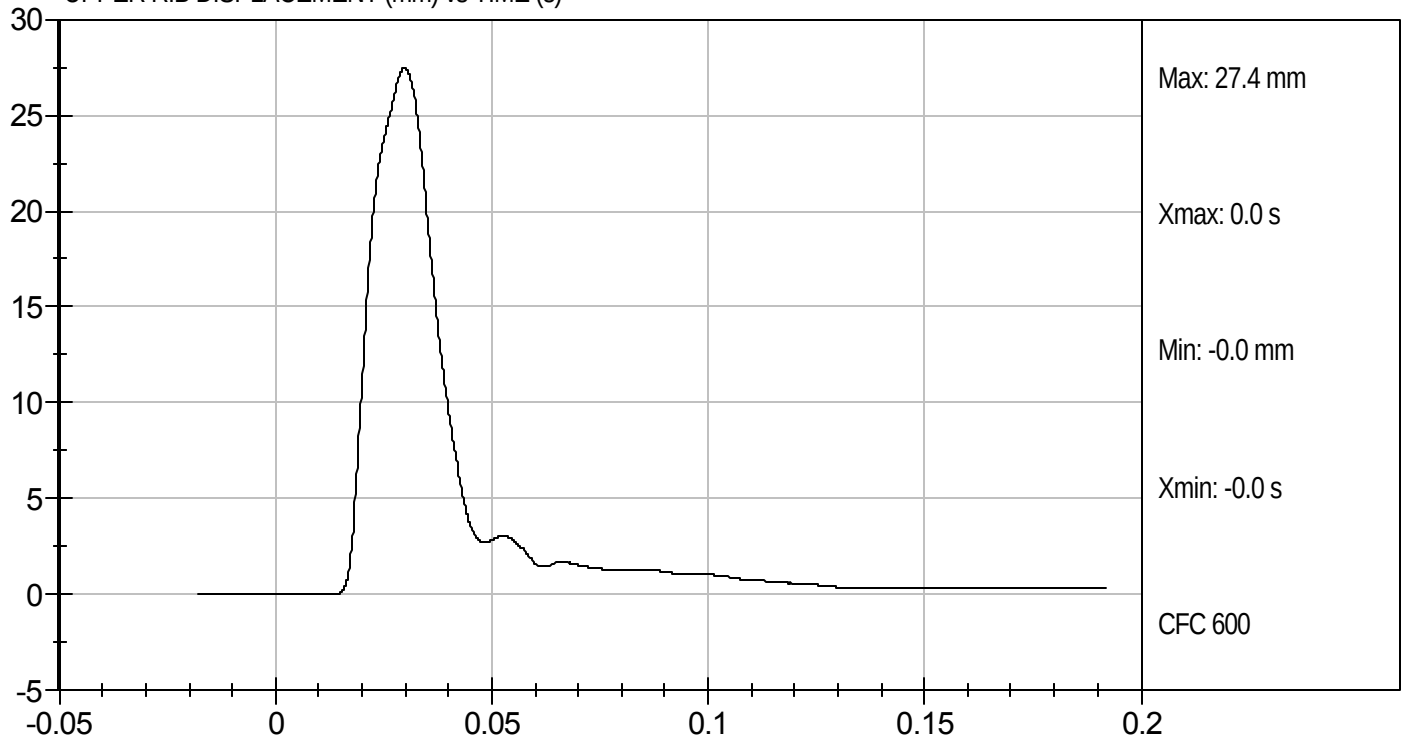
Test Desc: Thorax With Arm
Component ID: D091254

Test Date: 5/22/09
Velocity: 21.96 ft/s, 6.69 m/s

SHOULDER DISPLACEMENT (mm) vs TIME (s)



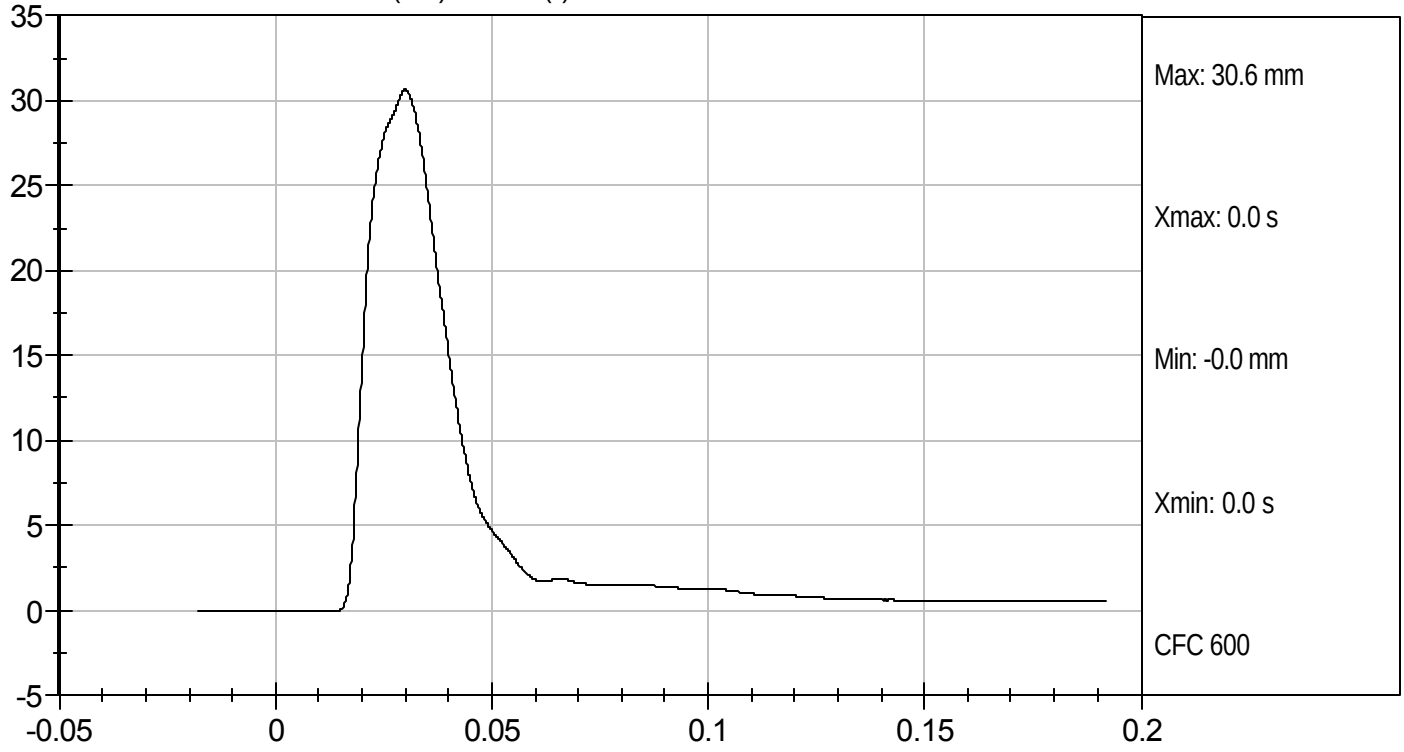
UPPER RIB DISPLACEMENT (mm) vs TIME (s)



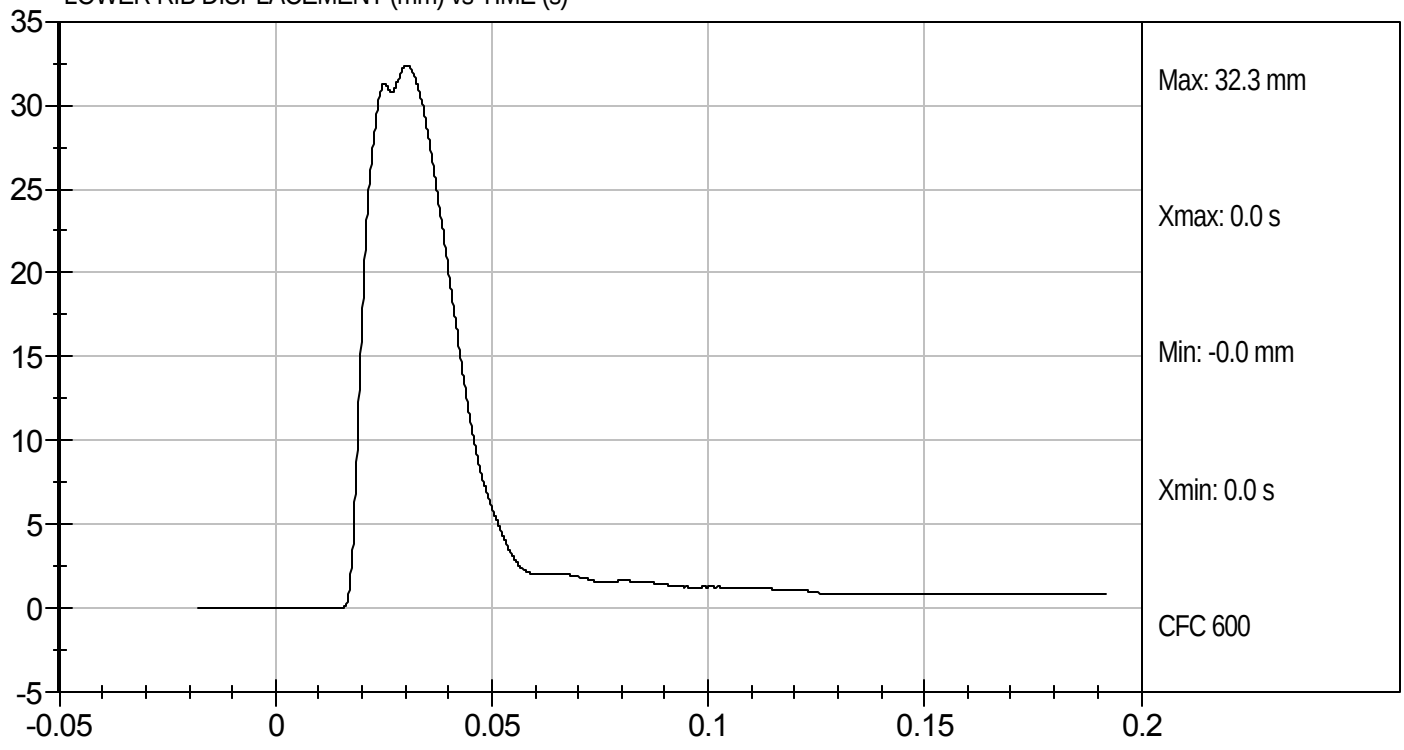
Test Desc: Thorax With Arm
Component ID: D091254

Test Date: 5/22/09
Velocity: 21.96 ft/s, 6.69 m/s

MIDDLE RIB DISPLACEMENT (mm) vs TIME (s)



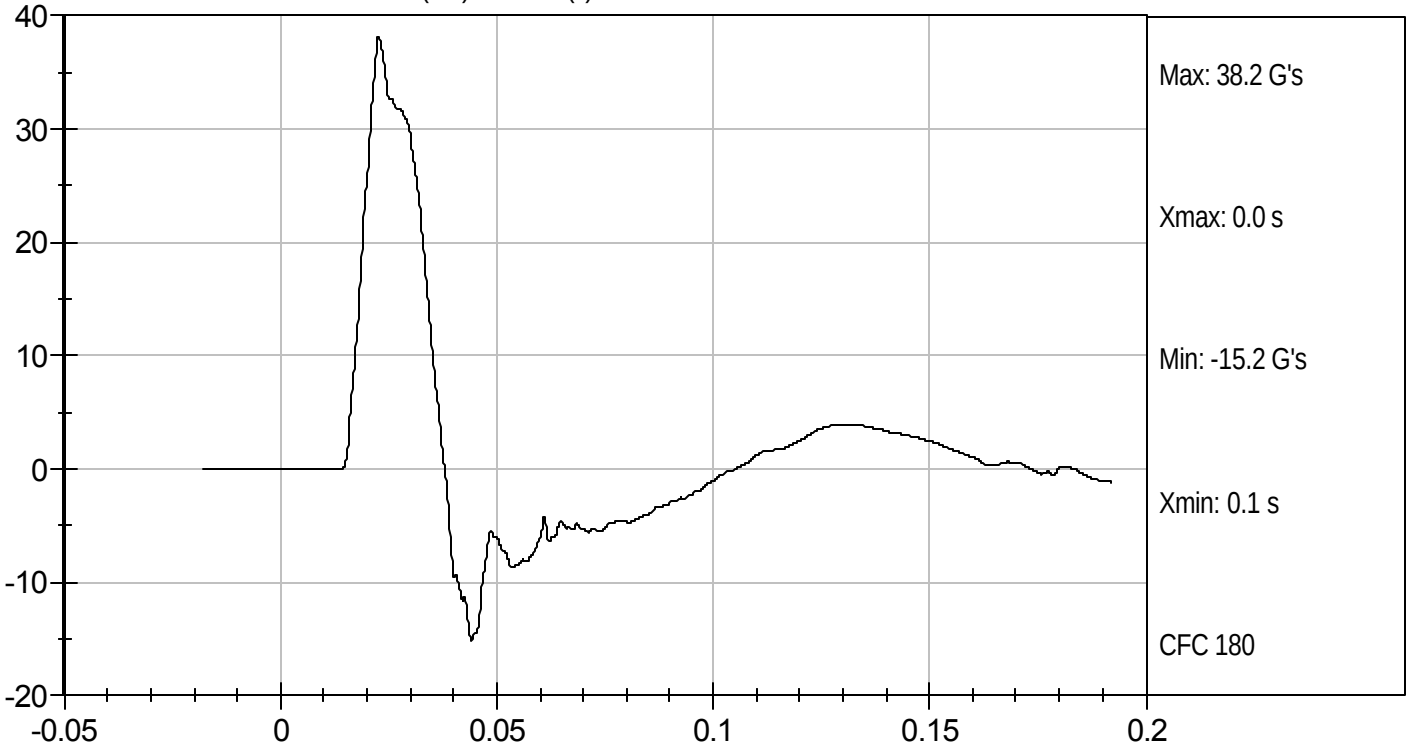
LOWER RIB DISPLACEMENT (mm) vs TIME (s)



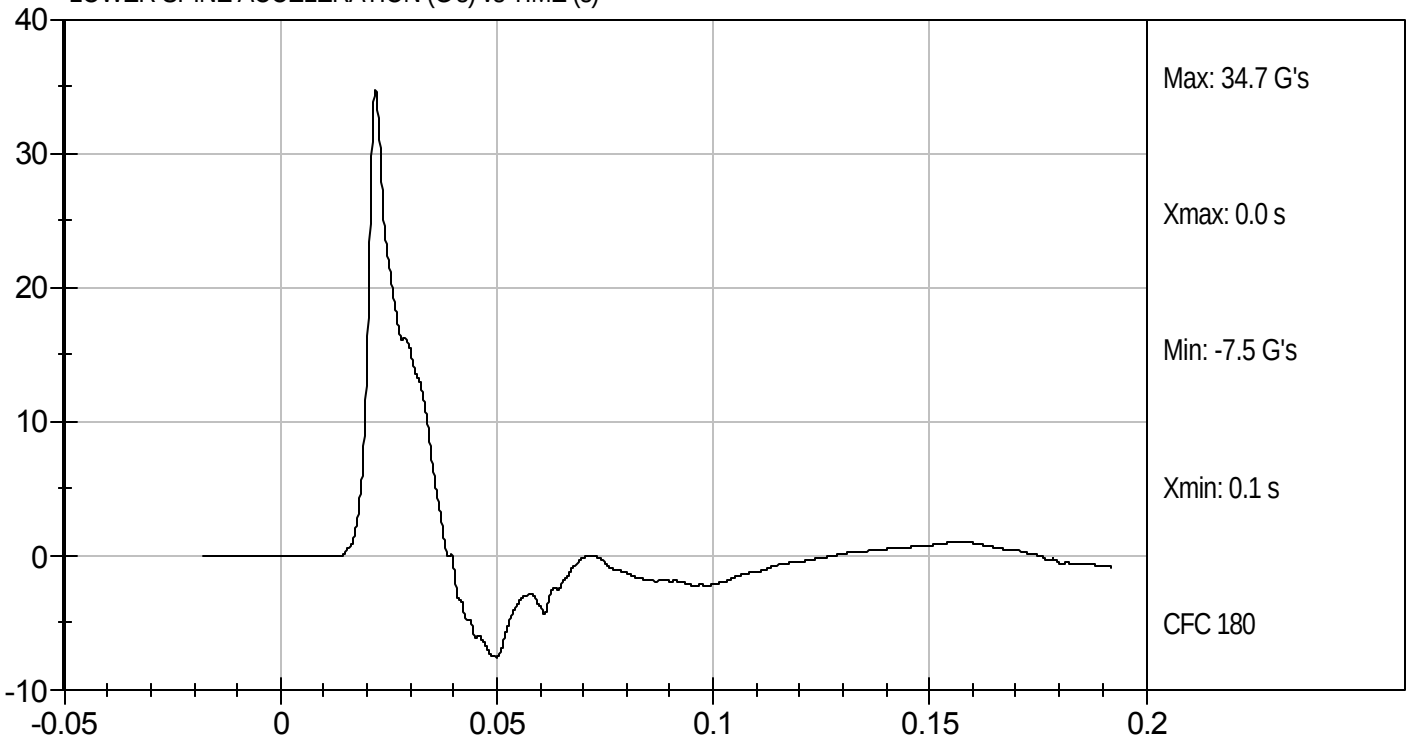
Test Desc: Thorax With Arm
Component ID: D091254

Test Date: 5/22/09
Velocity: 21.96 ft/s, 6.69 m/s

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



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



MGA RESEARCH CORPORATION

THORAX (WITHOUT ARM) IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test I.D:** D091255

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Humidity	%	10 to 70	41	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Peak Impactor Force	G's	14 to 18	15	Pass
Upper Rib Displacement	mm	32 to 40	39	Pass
Middle Rib Displacement	mm	39 to 45	42	Pass
Lower Rib Displacement	mm	35 to 43	39	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 17	15	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	9	Pass
		Overall Test Results		Pass

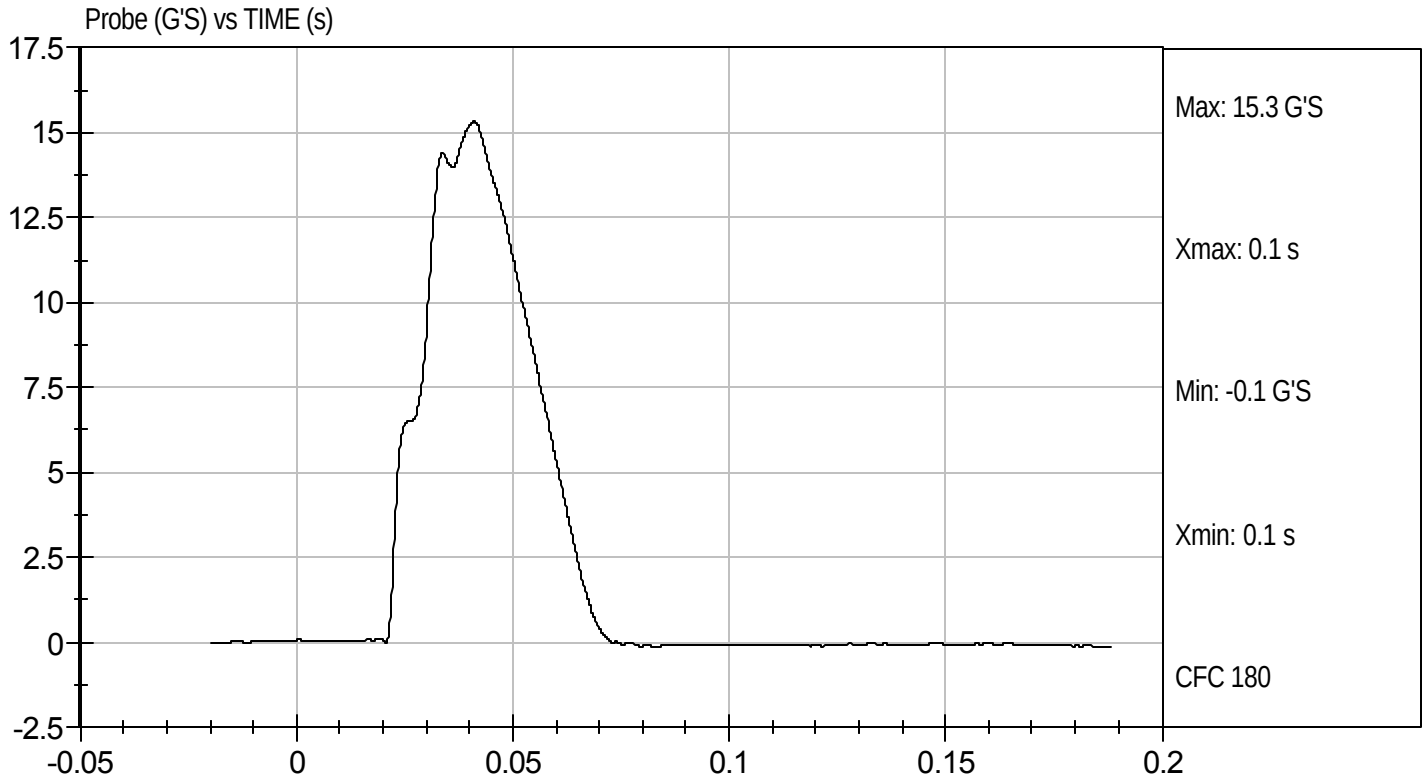
Jessica Hall
Laboratory Technician

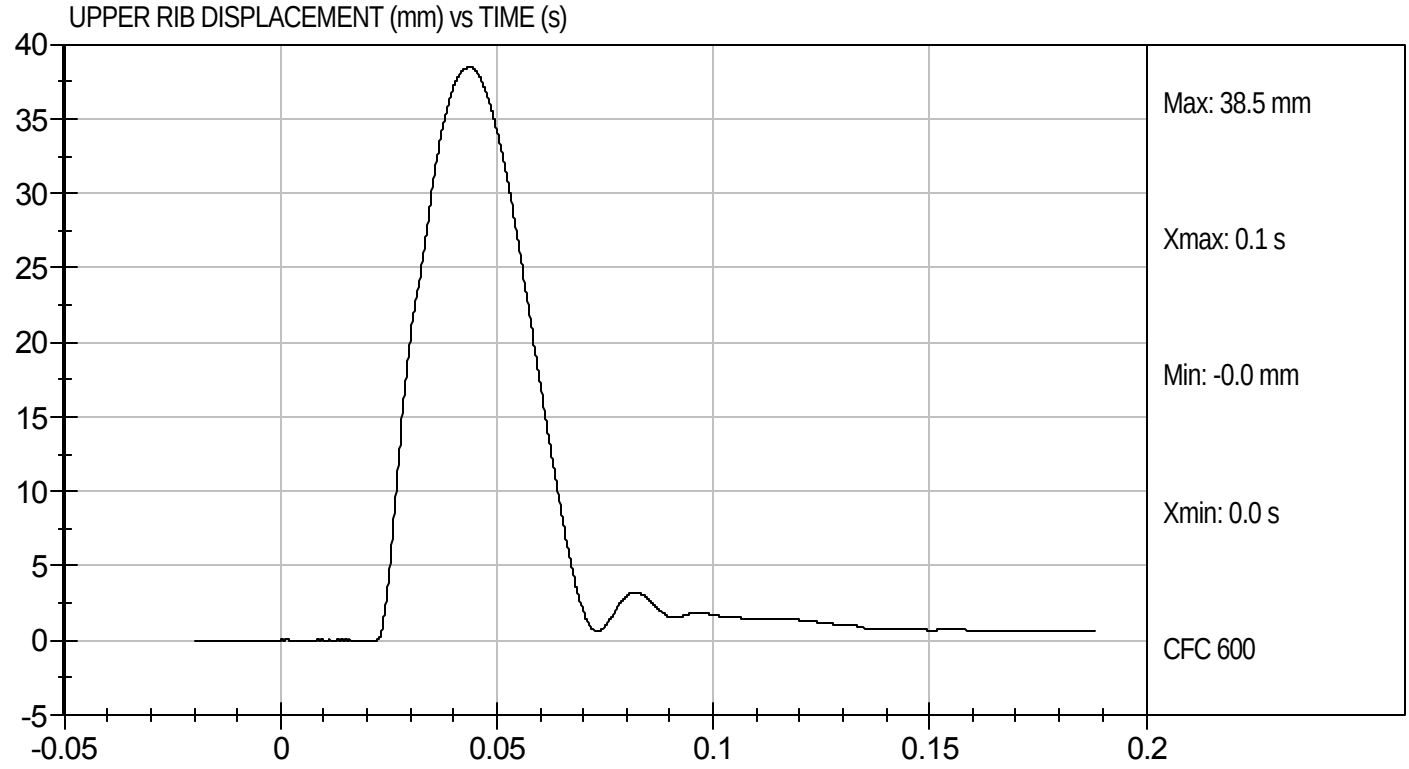
5/22/09
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Without Arm
Component ID: D091255

Test Date: 5/22/09
Velocity: 14.12 ft/s, 4.30 m/s

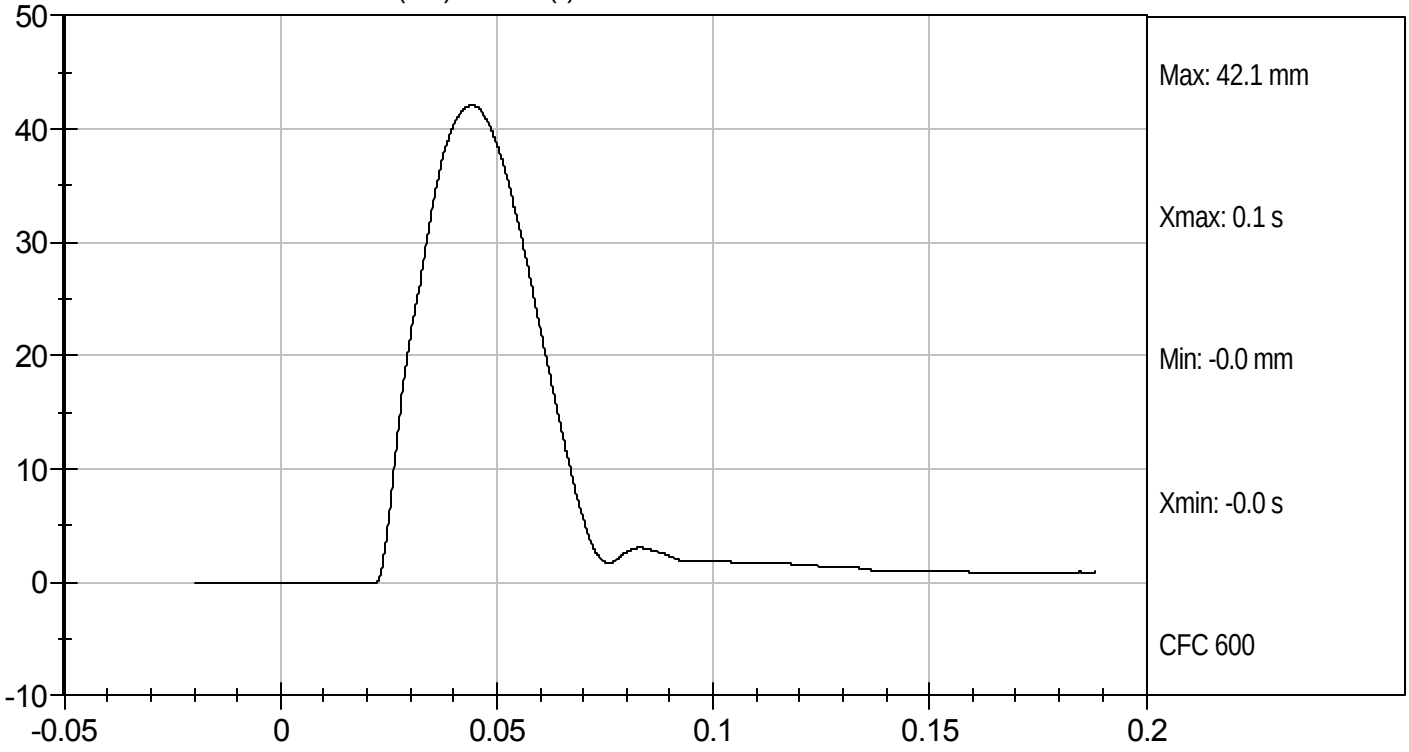




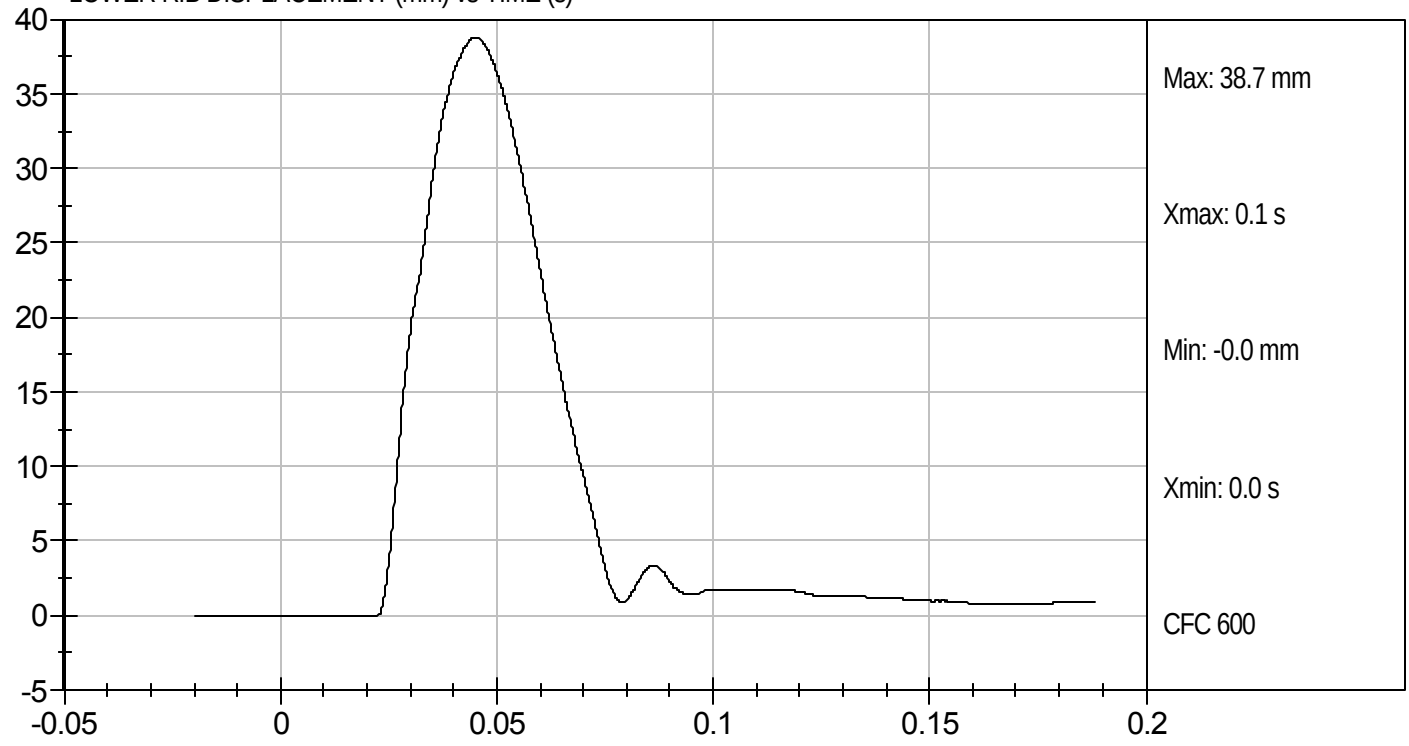
Test Desc: Thorax Without Arm
Component ID: D091255

Test Date: 5/22/09
Velocity: 14.12 ft/s, 4.30 m/s

MIDDLE RIB DISPLACEMENT (mm) vs TIME (s)



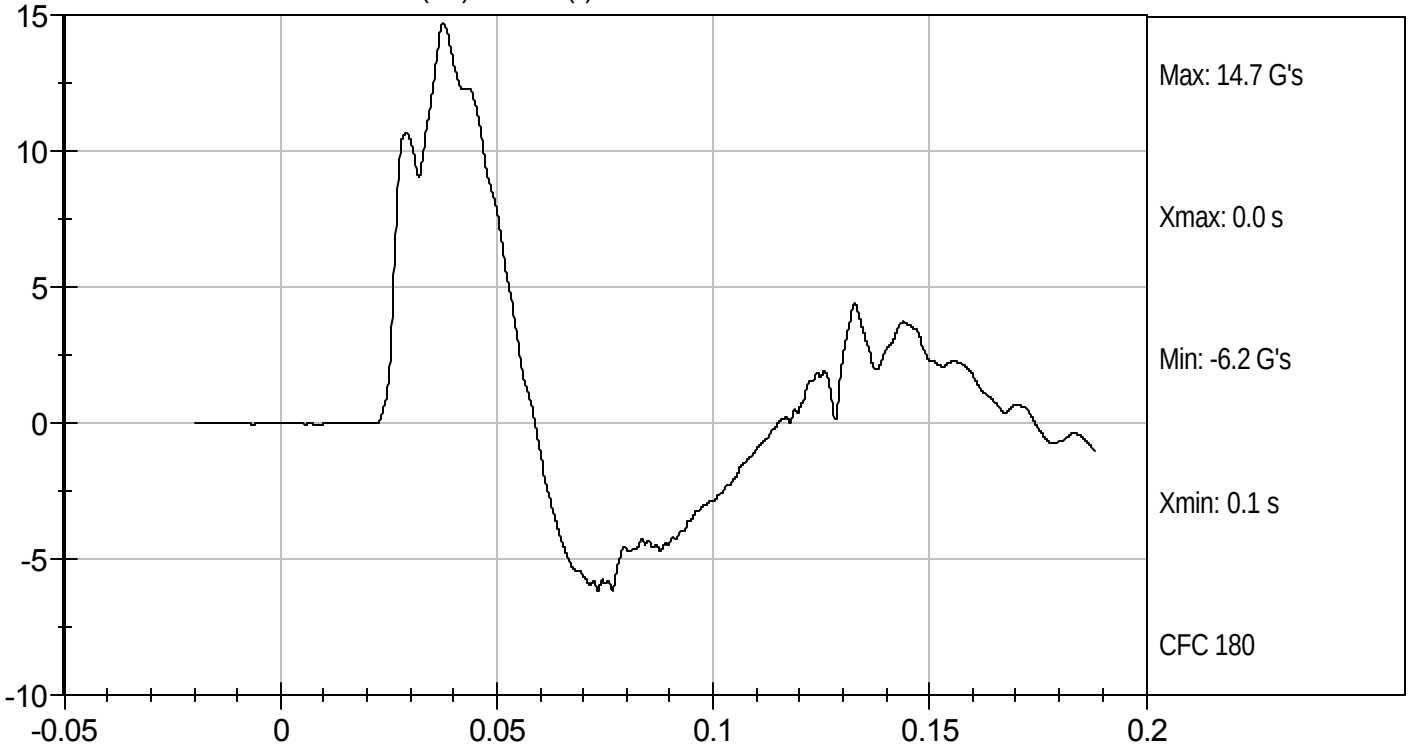
LOWER RIB DISPLACEMENT (mm) vs TIME (s)



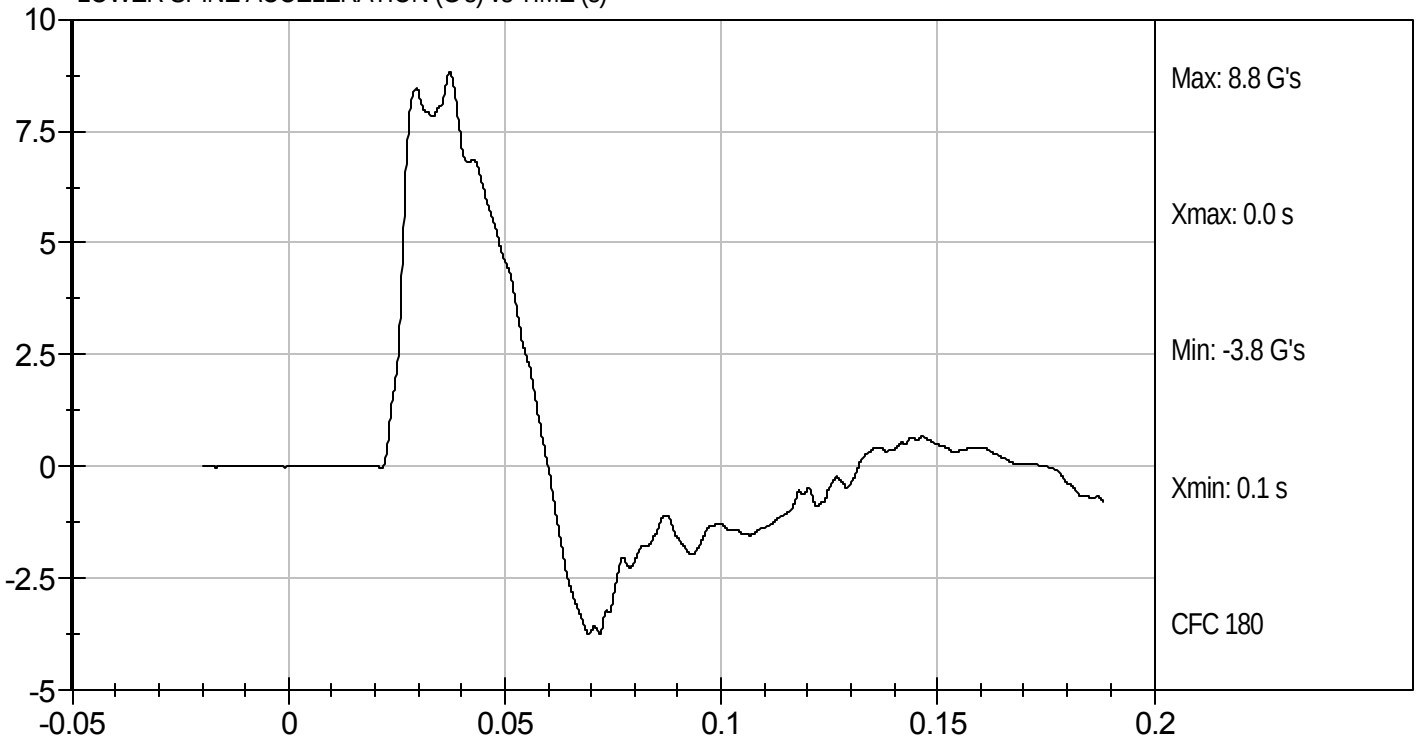
Test Desc: Thorax Without Arm
Component ID: D091255

Test Date: 5/22/09
Velocity: 14.12 ft/s, 4.30 m/s

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



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



MGA RESEARCH CORPORATION

ABDOMINAL IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test I.D:** D091256

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	12 to 16	14	Pass
Upper Rib Displacement	mm	36 to 47	41	Pass
Lower Rib Displacement	mm	33 to 44	37	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	11	Pass
		Overall Test Results		Pass

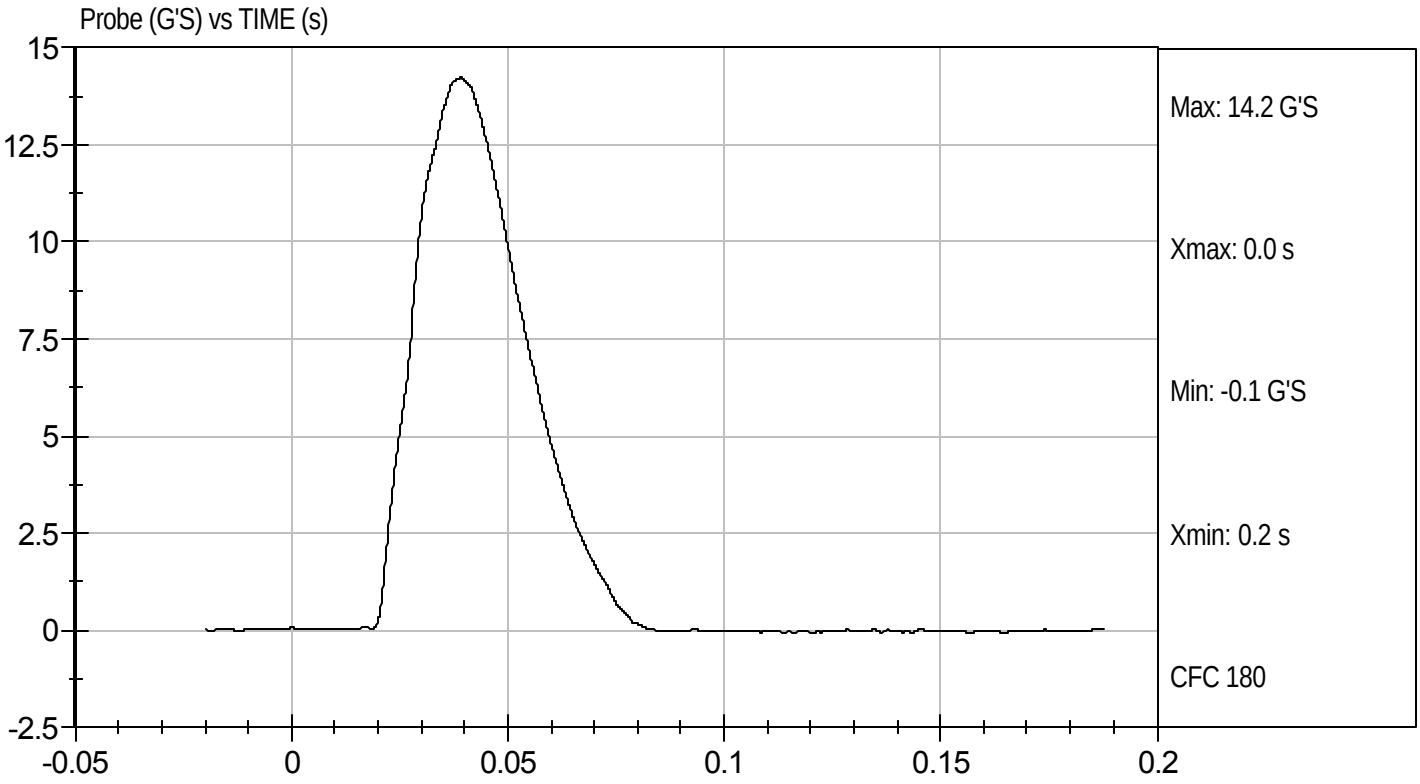
Jessica Hall
Laboratory Technician

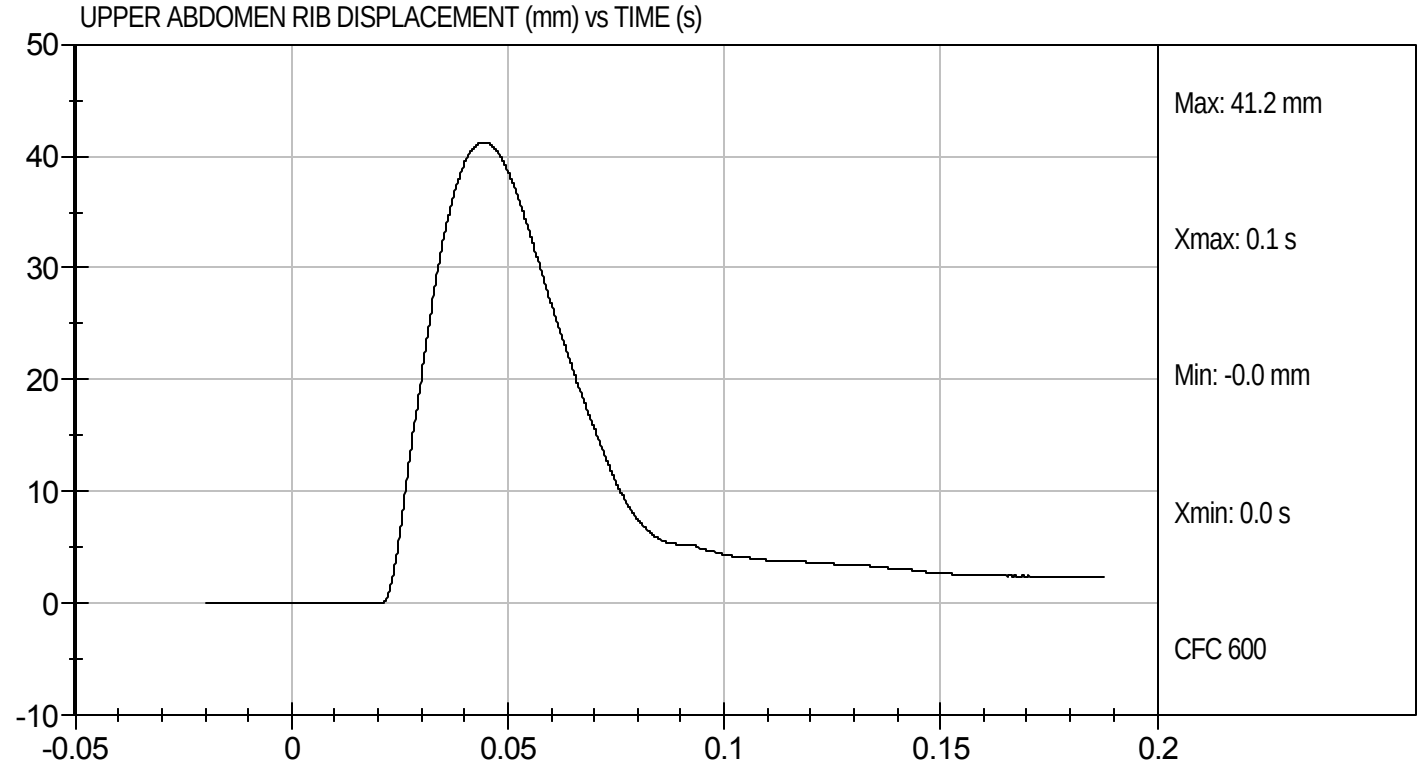
5/22/09
Test Date

David Winkelbauer
Approved By

Test Desc: Abdomen Impact
Component ID: D091256

Test Date: 5/22/09
Velocity: 14.12 ft/s, 4.30 m/s

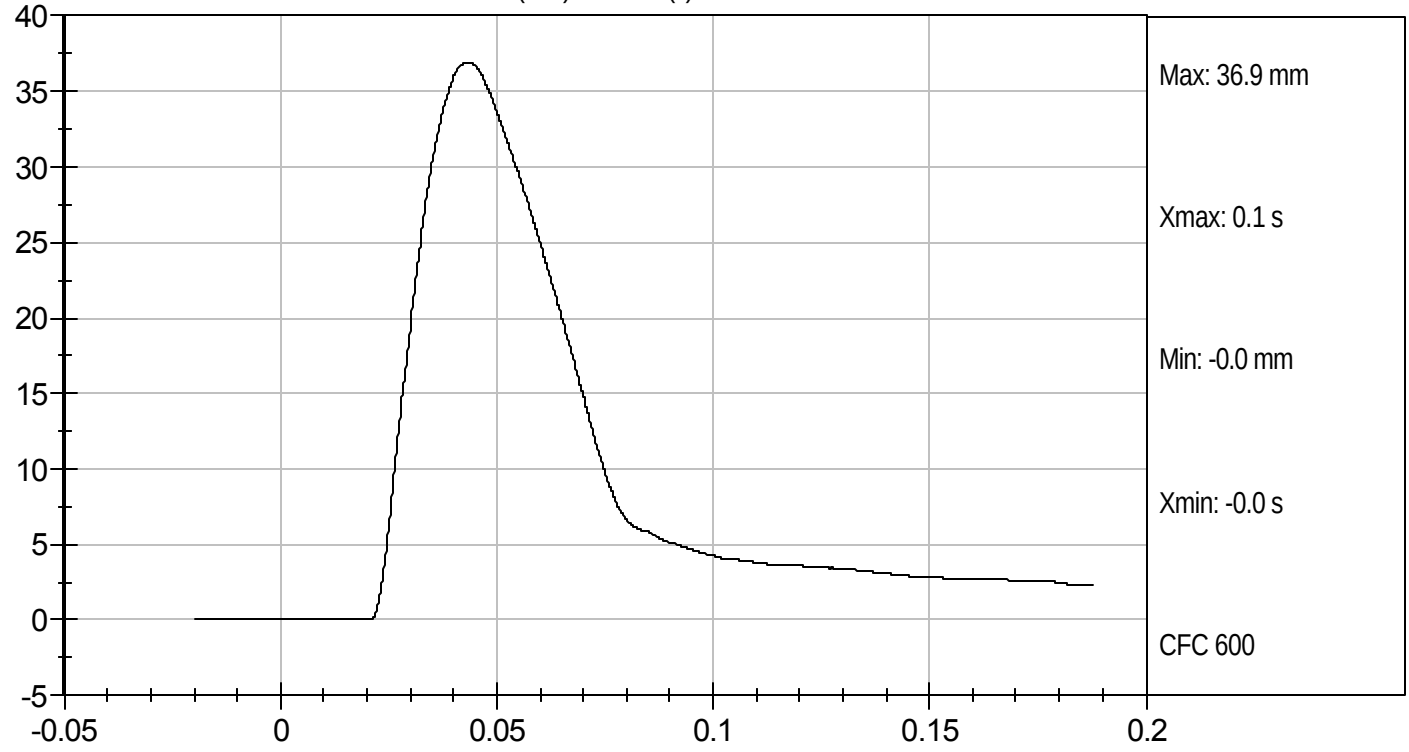




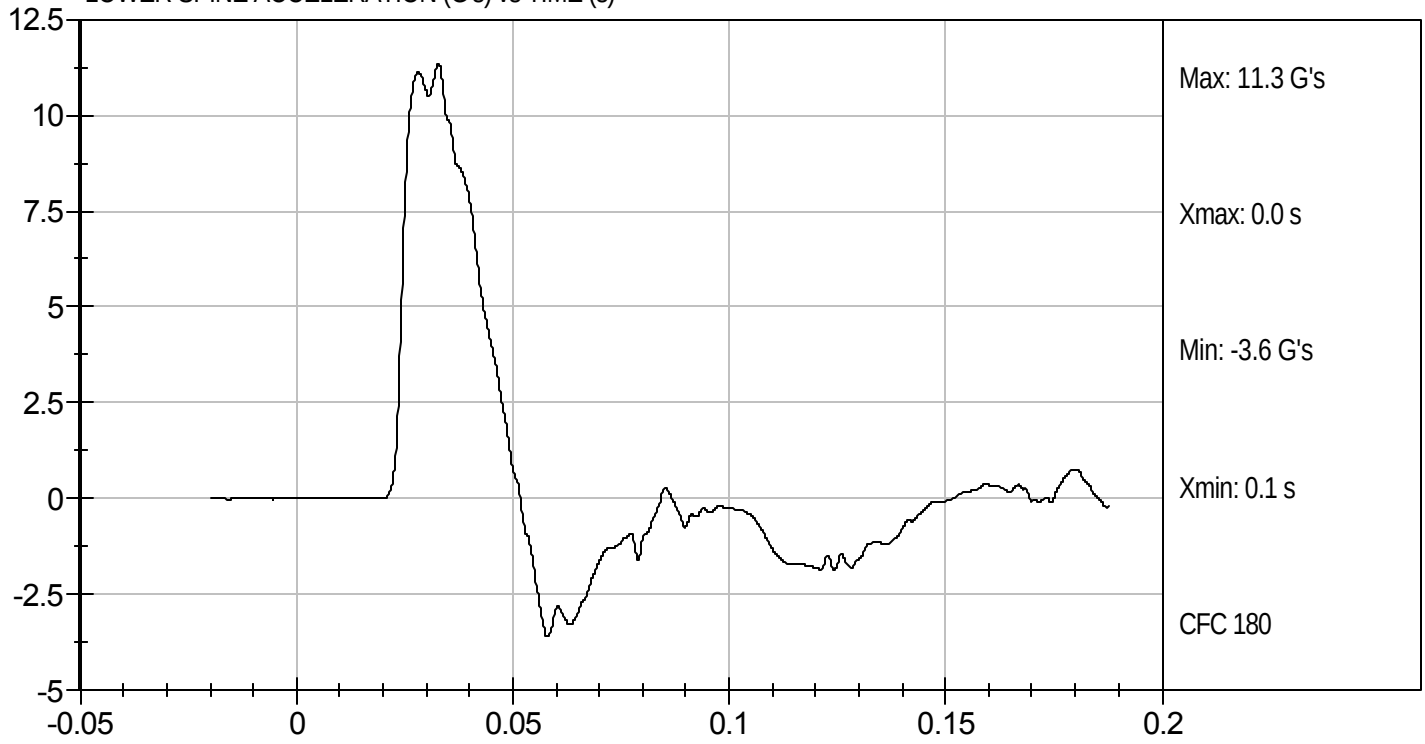
Test Desc: Abdomen Impact
Component ID: D091256

Test Date: 5/22/09
Velocity: 14.12 ft/s, 4.30 m/s

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



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



MGA RESEARCH CORPORATION

PELVIS IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test I.D:** D091257

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	6.60 to 6.80	6.69	Pass
Peak Impactor Acceleration	G's	38 to 47	44	Pass
Pelvis Y Acceleration after 6 ms	G's	34 to 42	37	Pass
Peak Acetabulum Force	N	3600 to 4300	4135	Pass
		Overall Test Results		Pass

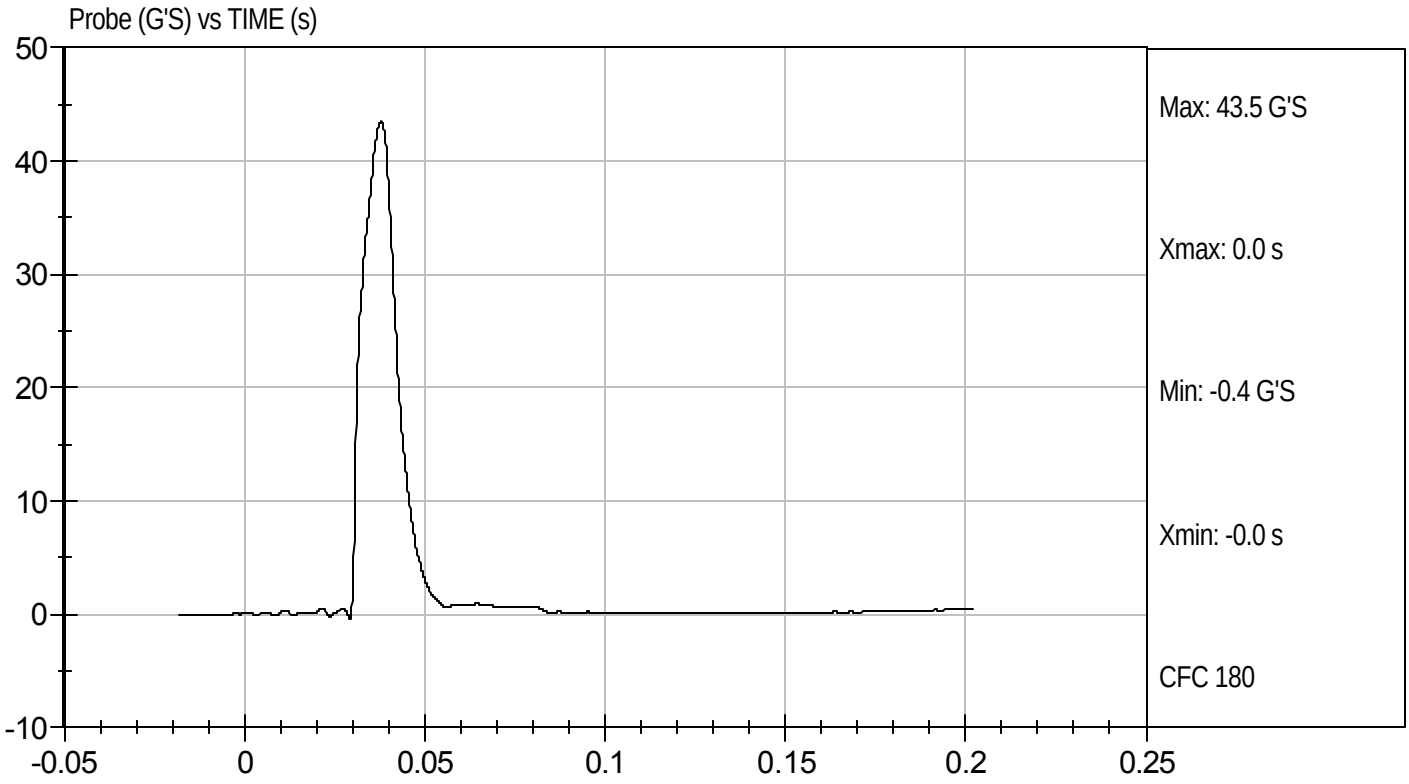
Jessica Hall
Laboratory Technician

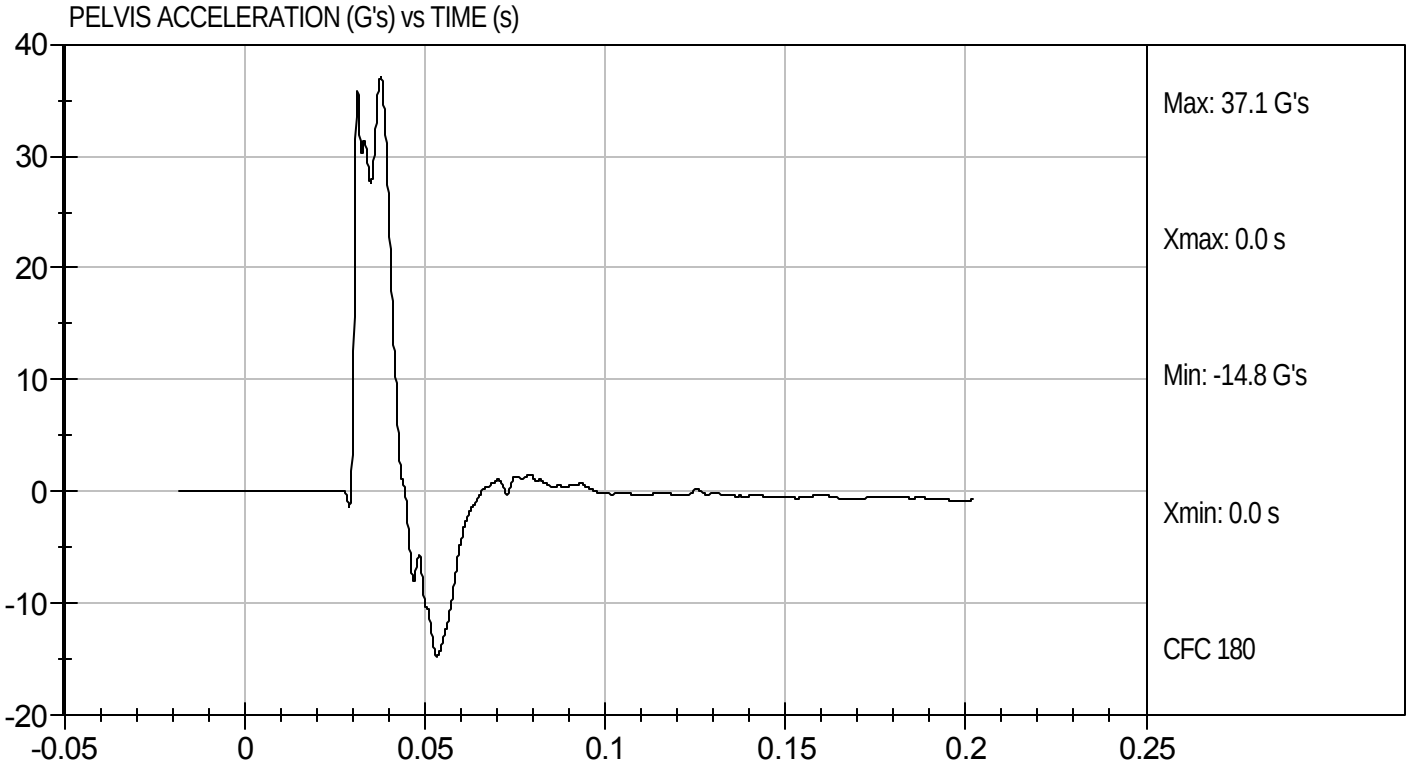
5/22/09
Test Date

David Winkelbauer
Approved By

Test Desc: Pelvis Impact
Component ID: D091257

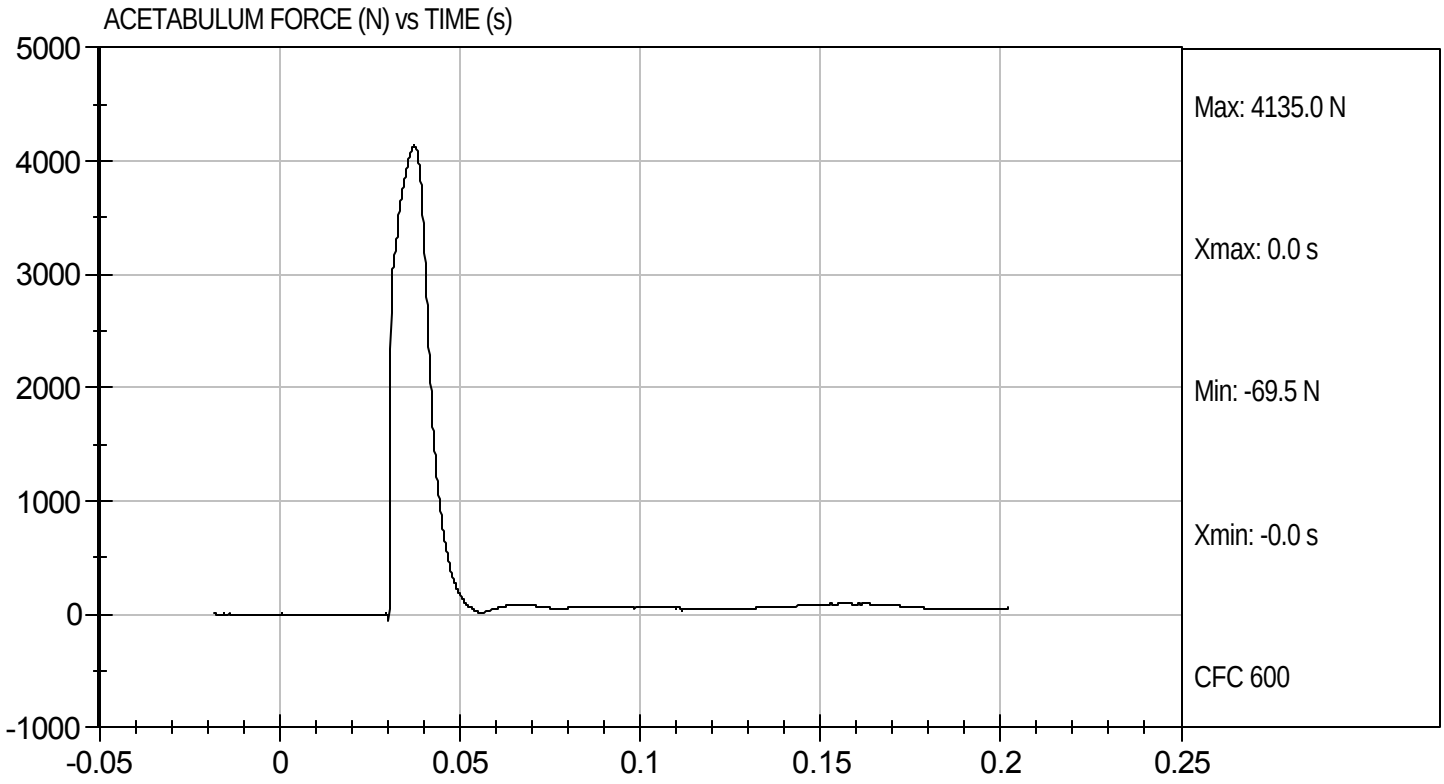
Test Date: 5/22/09
Velocity: 21.96 ft/s, 6.69 m/s





Test Desc: Pelvis Impact
Component ID: D091257

Test Date: 5/22/09
Velocity: 21.96 ft/s, 6.69 m/s



MGA RESEARCH CORPORATION

ILIAC IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test I.D:** D091258

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	4.34	Pass
Peak Impactor Acceleration	G's	36 to 45	40	Pass
Pelvis Y Acceleration	G's	28 to 39	37	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4844	Pass
		Overall Test Results		Pass

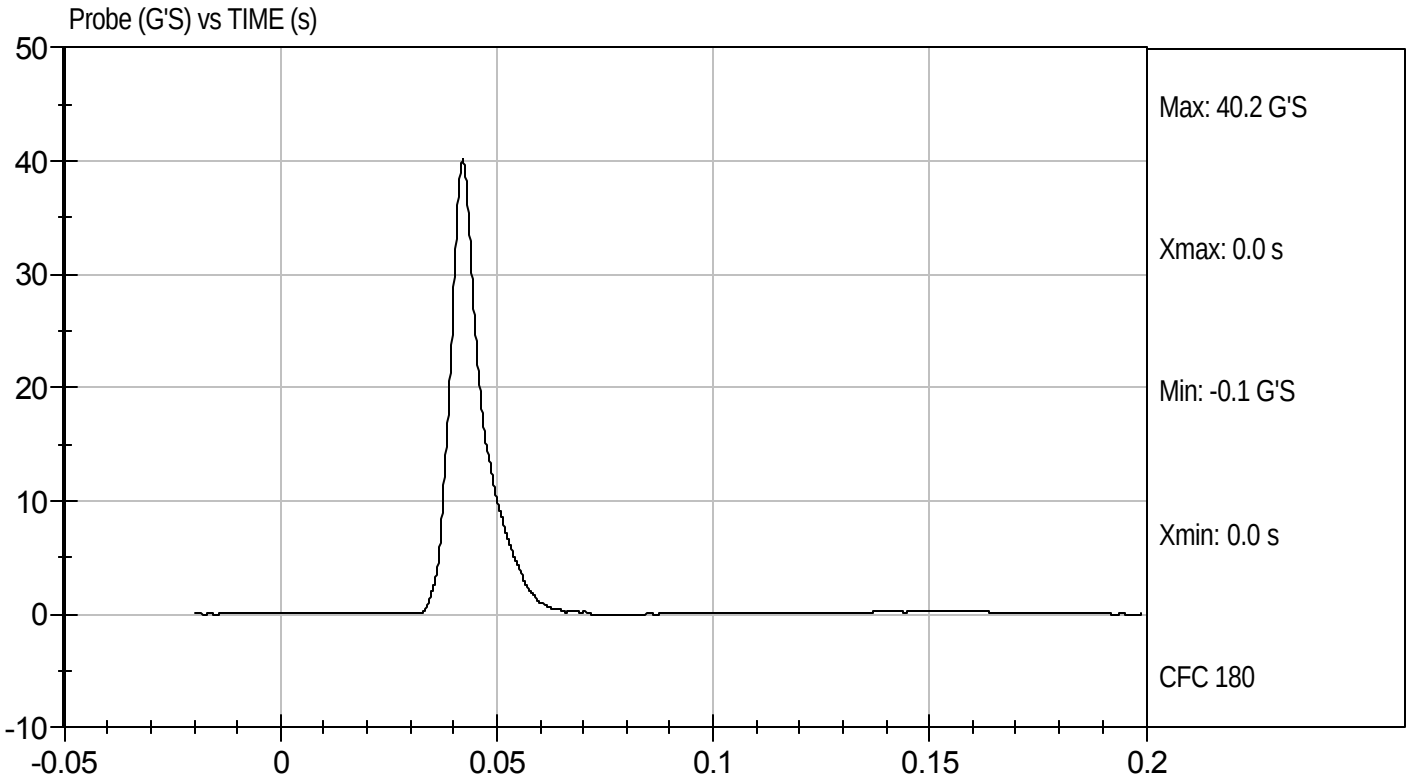
Jessica Hall
Laboratory Technician

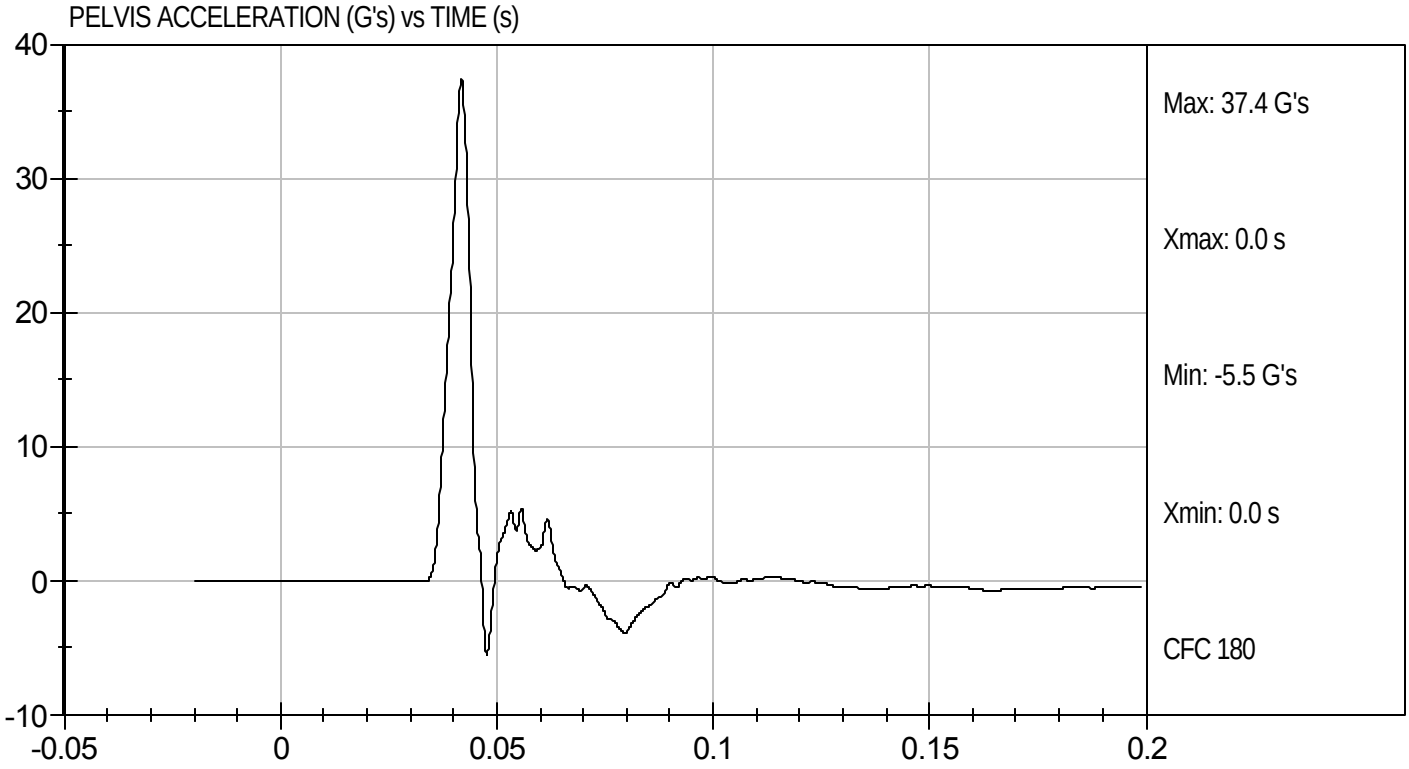
5/22/09
Test Date

David Winkelbauer
Approved By

Test Desc: Iliac Impact
Component ID: D091258

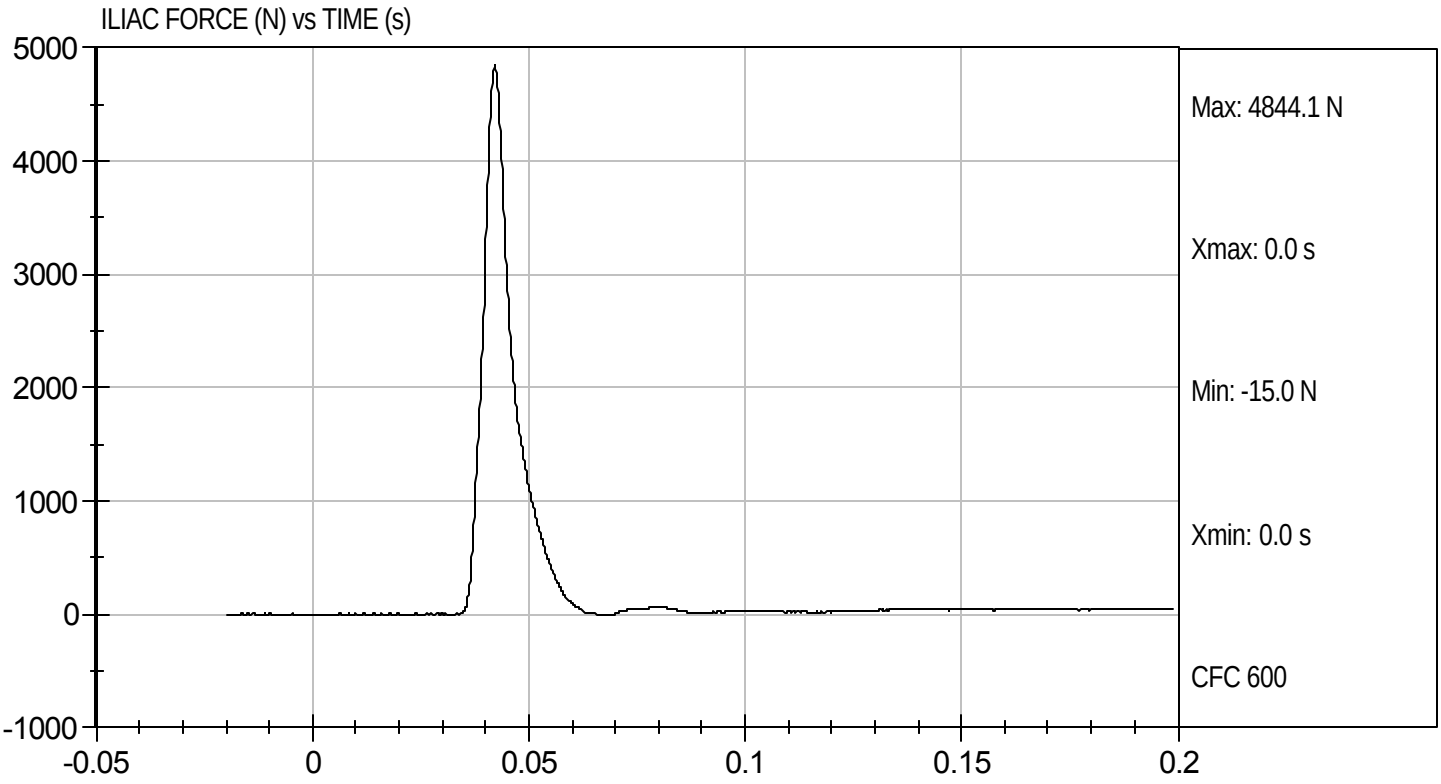
Test Date: 5/22/09
Velocity: 14.25 ft/s, 4.34 m/s





Test Desc: Iliac Impact
Component ID: D091258

Test Date: 5/22/09
Velocity: 14.25 ft/s, 4.34 m/s



MGA RESEARCH CORPORATION

HEAD DROP TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test ID:** D091361

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Peak Resultant Acceleration	G's	115 to 137	121	Pass
Peak Lateral Acceleration	G's	+/- 15	-4.8	Pass
Unimodal	N/A	<15%	Yes	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

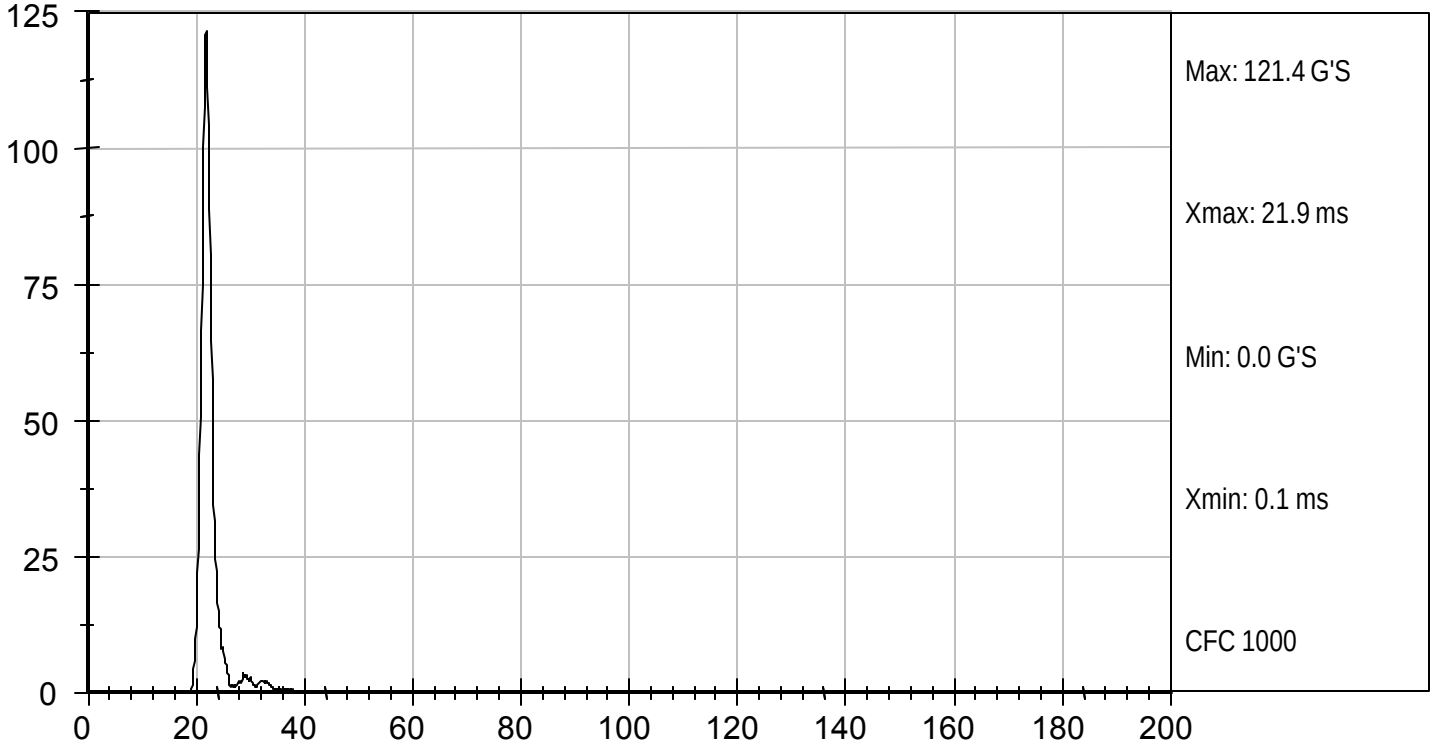
6/1/09
Test Date

David Winkelbauer
Approved By

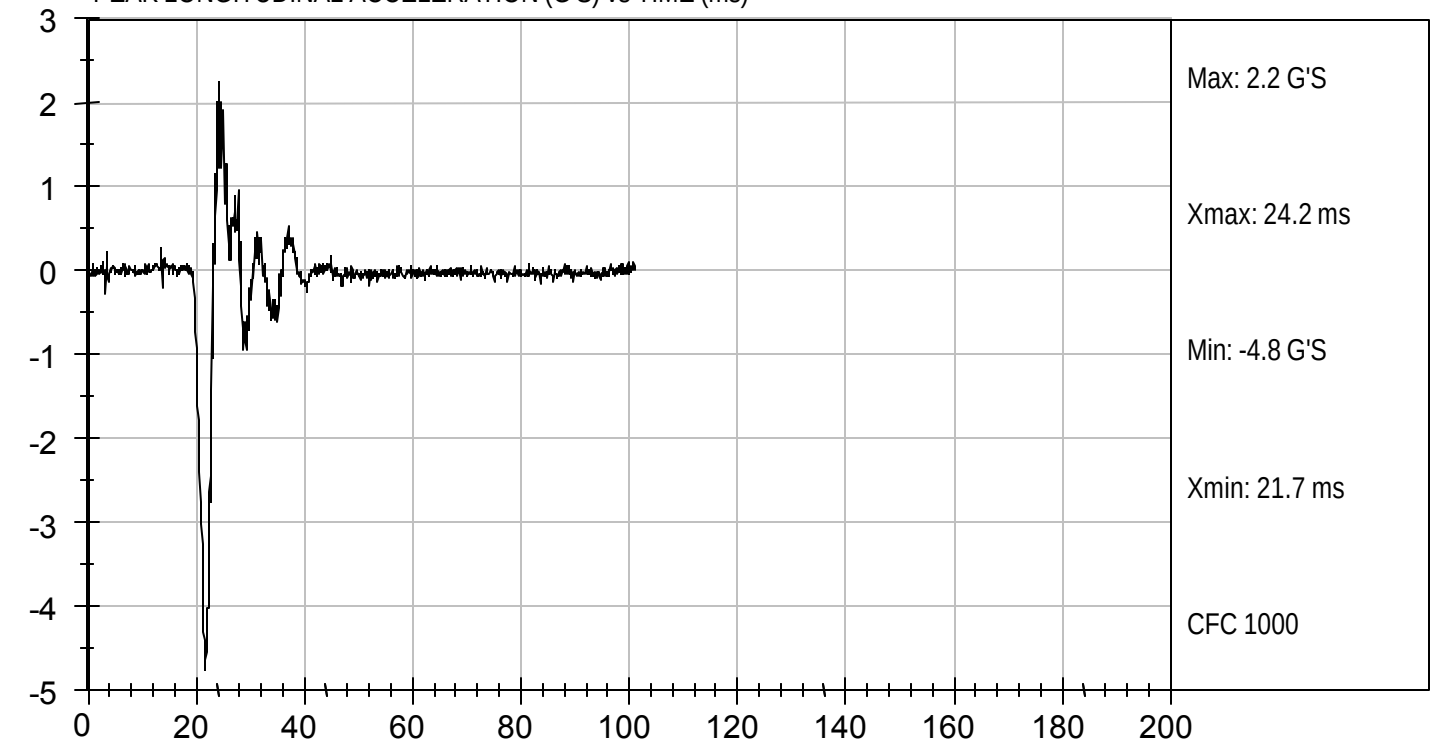
Test Desc: Head Drop
Component ID: D091361

Test Date: 6/1/09
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:** D091362

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	20.7	Pass
Humidity		%	10 to 70	49	Pass
Impact Velocity		m/s	5.51 to 5.63	5.52	Pass
Delta Velocity	10 msec	m/s	2.20 to 2.80	2.54	Pass
	15 msec	m/s	3.30 to 4.10	3.59	Pass
	20 msec	m/s	4.40 to 5.40	4.74	Pass
	25 msec	m/s	5.40 to 6.10	5.60	Pass
	25-100 msec	m/s	5.50 to 6.20	5.65	Pass
Maximum D-Plane Rotation		deg	71 to 81	71	Pass
Time of Maximum D-Plane Rotation		msec	50 to 70	62	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

Jessica Gall
Laboratory Technician

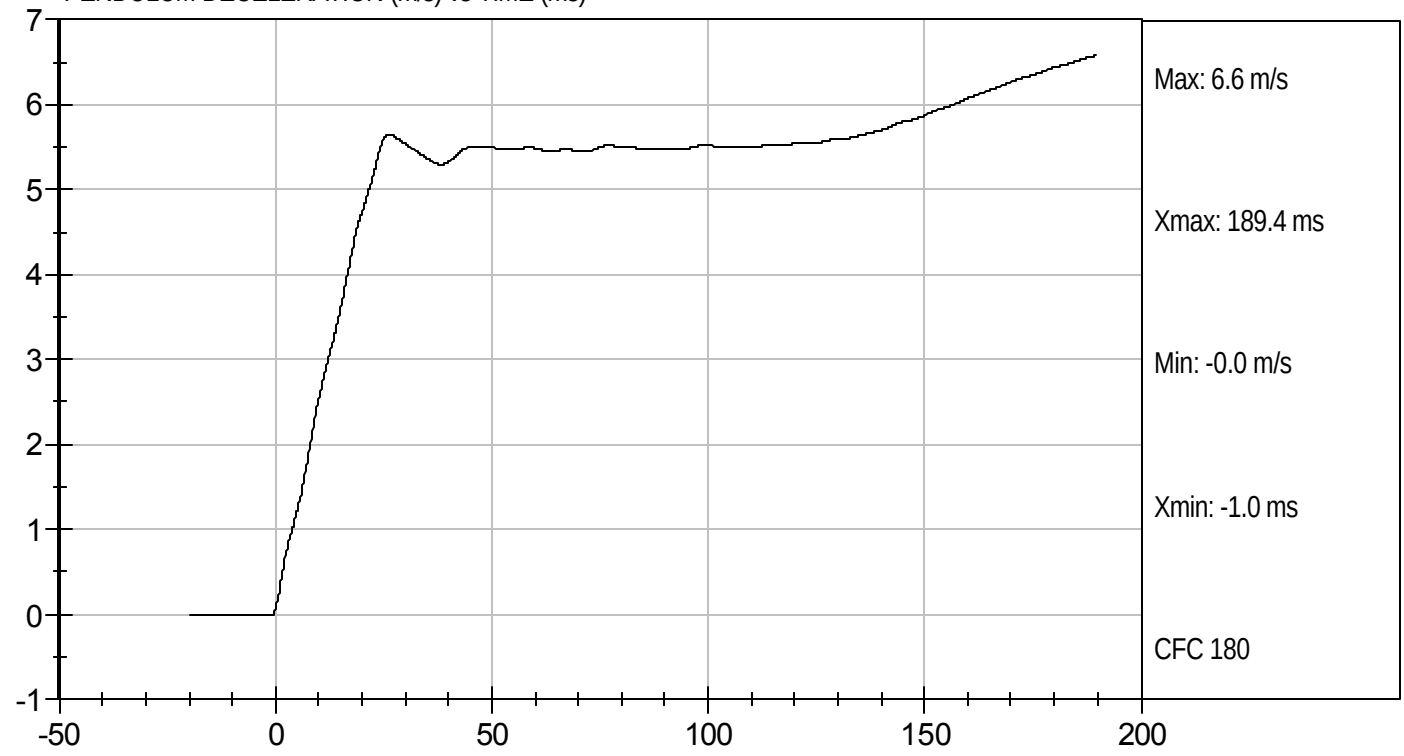
6/1/09
Test Date

David Winkelbauer
Approved By

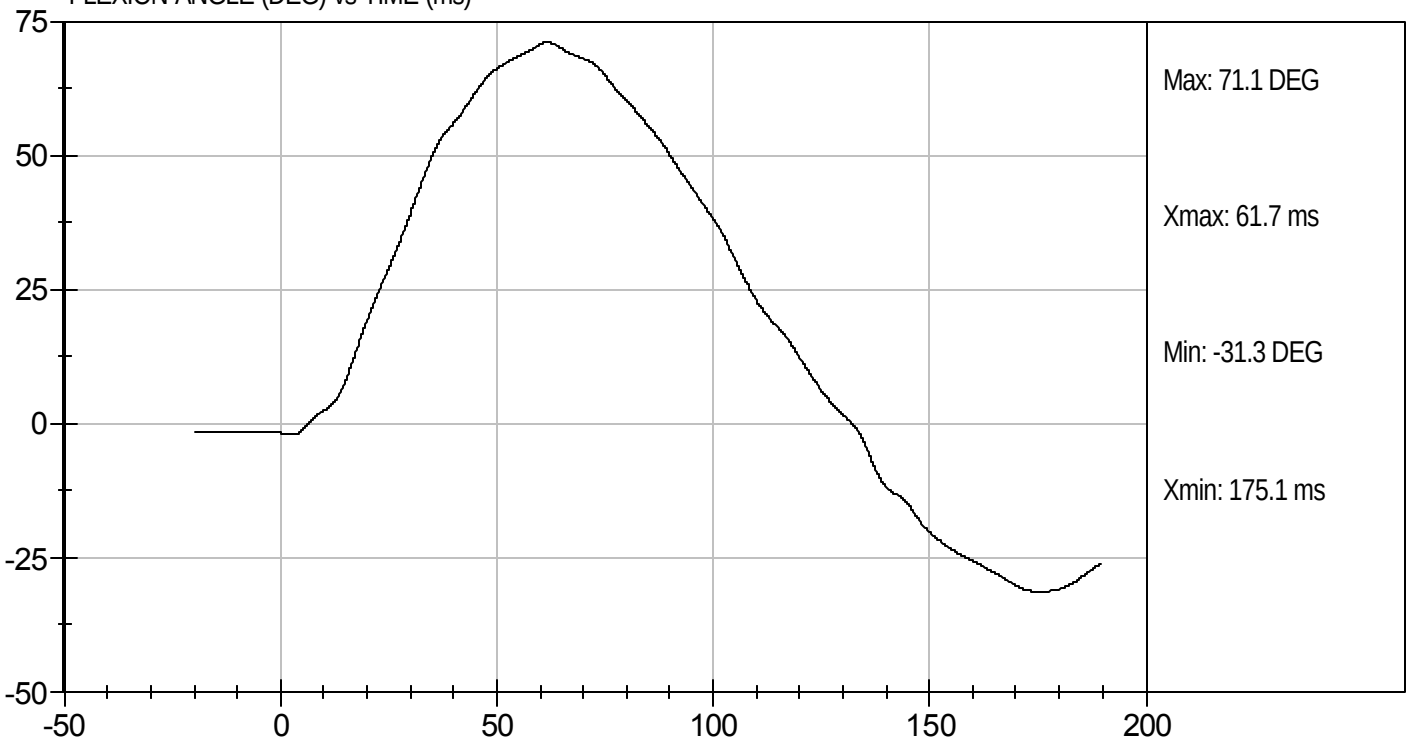
Test Desc: Neck Bending
Component ID: D091362

Test Date: 6/1/09
Velocity: 18.12 ft/s, 5.52 m/s

PENDULUM DECELERATION (m/s) vs TIME (ms)

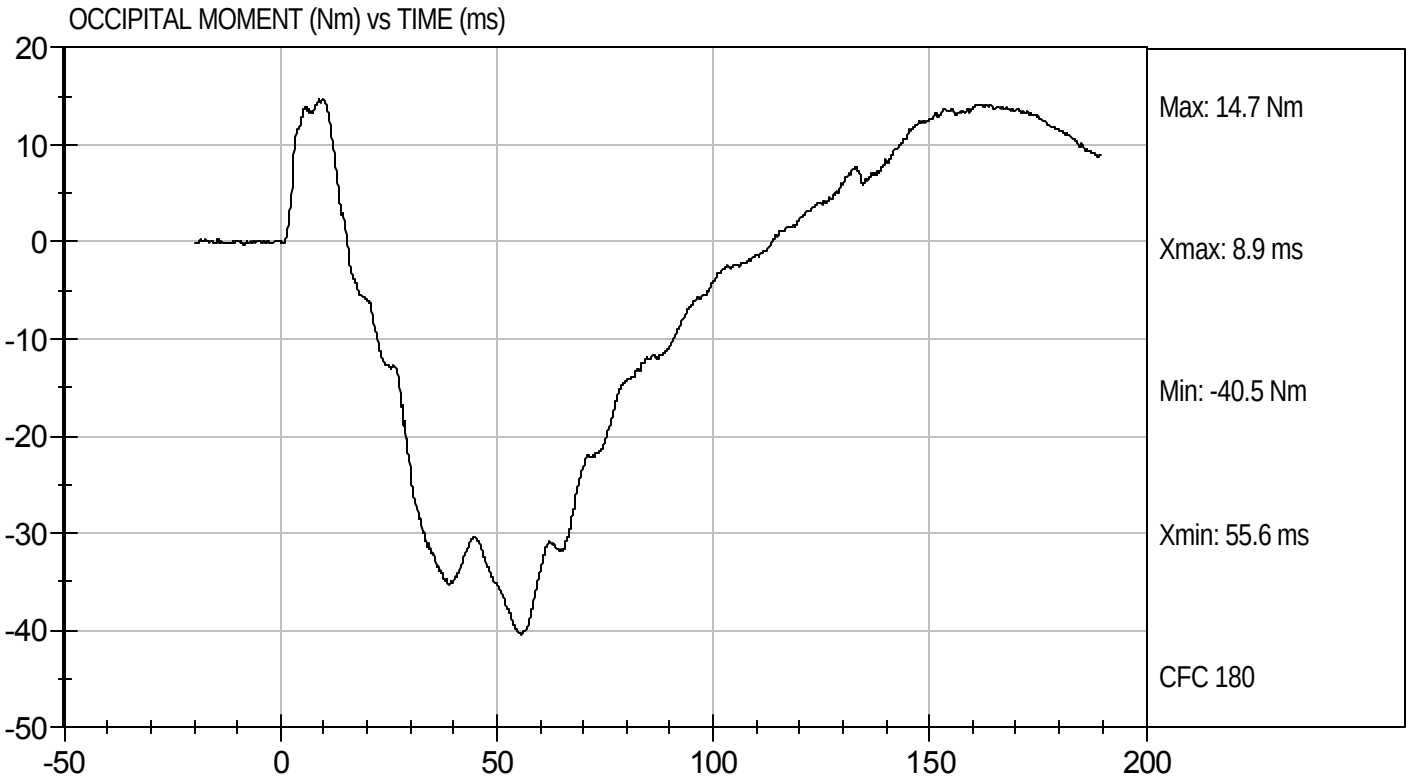


FLEXION ANGLE (DEG) vs TIME (ms)



Test Desc: Neck Bending
Component ID: D091362

Test Date: 6/1/09
Velocity: 18.12 ft/s, 5.52 m/s



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test ID:** D091363

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	45	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	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	19	Pass
		Overall Test Results		Pass

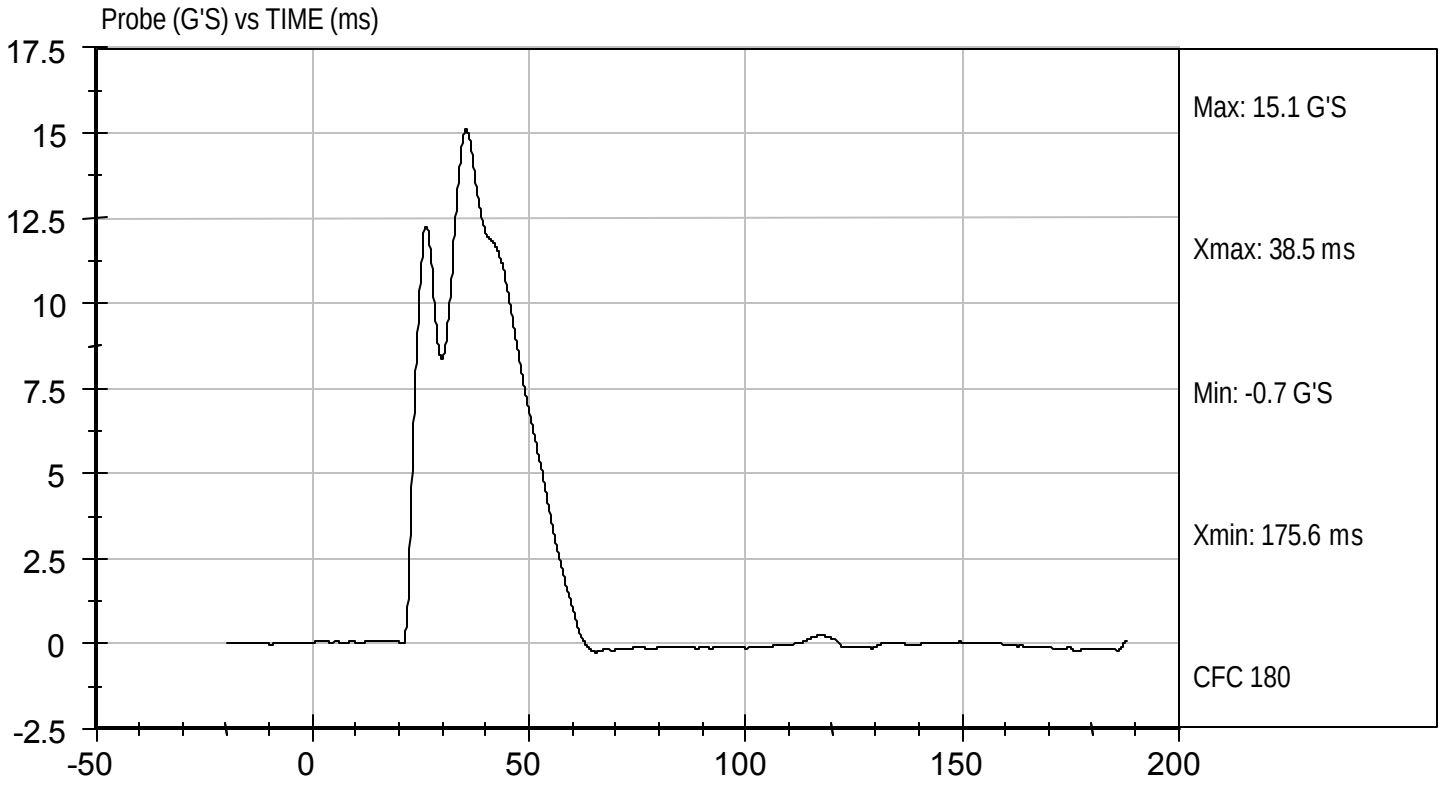
Jessica Hall
Laboratory Technician

5/29/09
Test Date

David Winkelbauer
Approved By

Test Desc: Shoulder Impact
Component ID: D091363

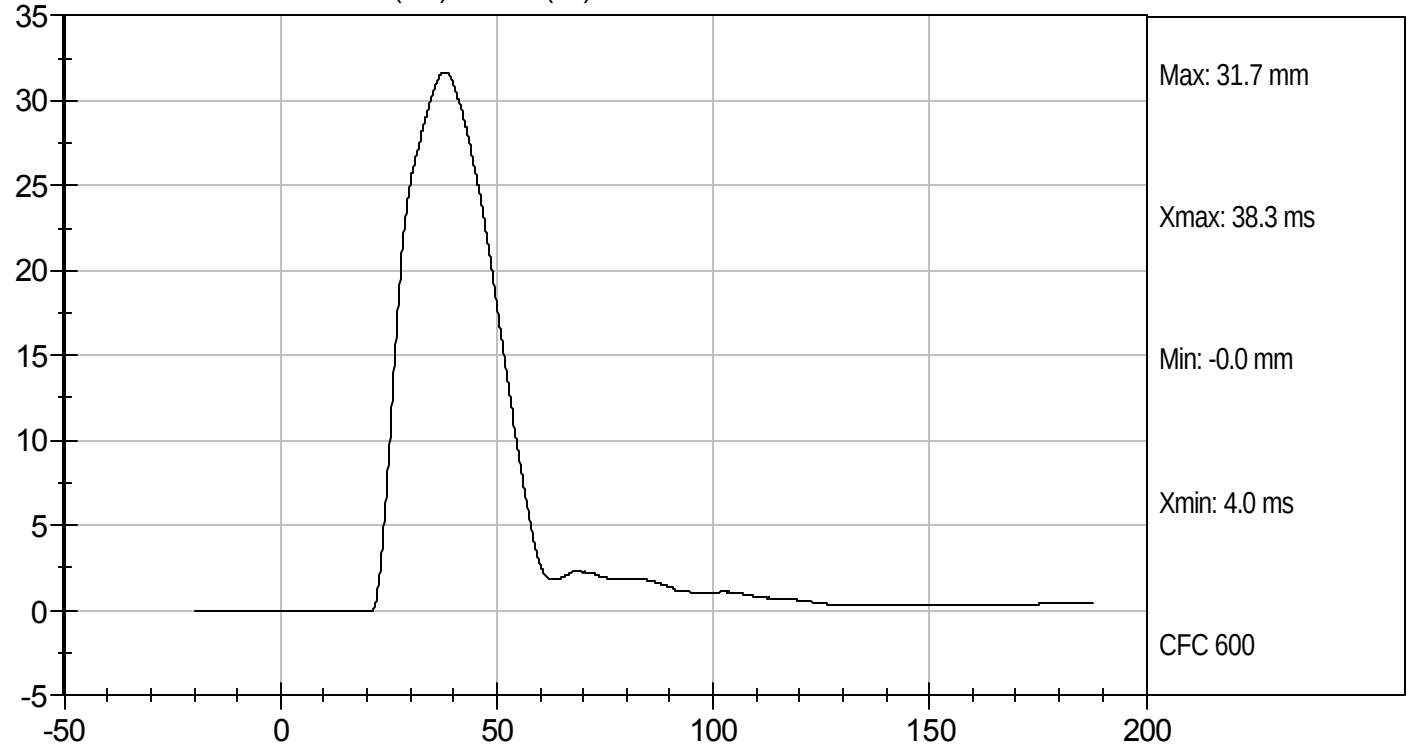
Test Date: 5/29/09
Velocity: 14.12 ft/s, m/s



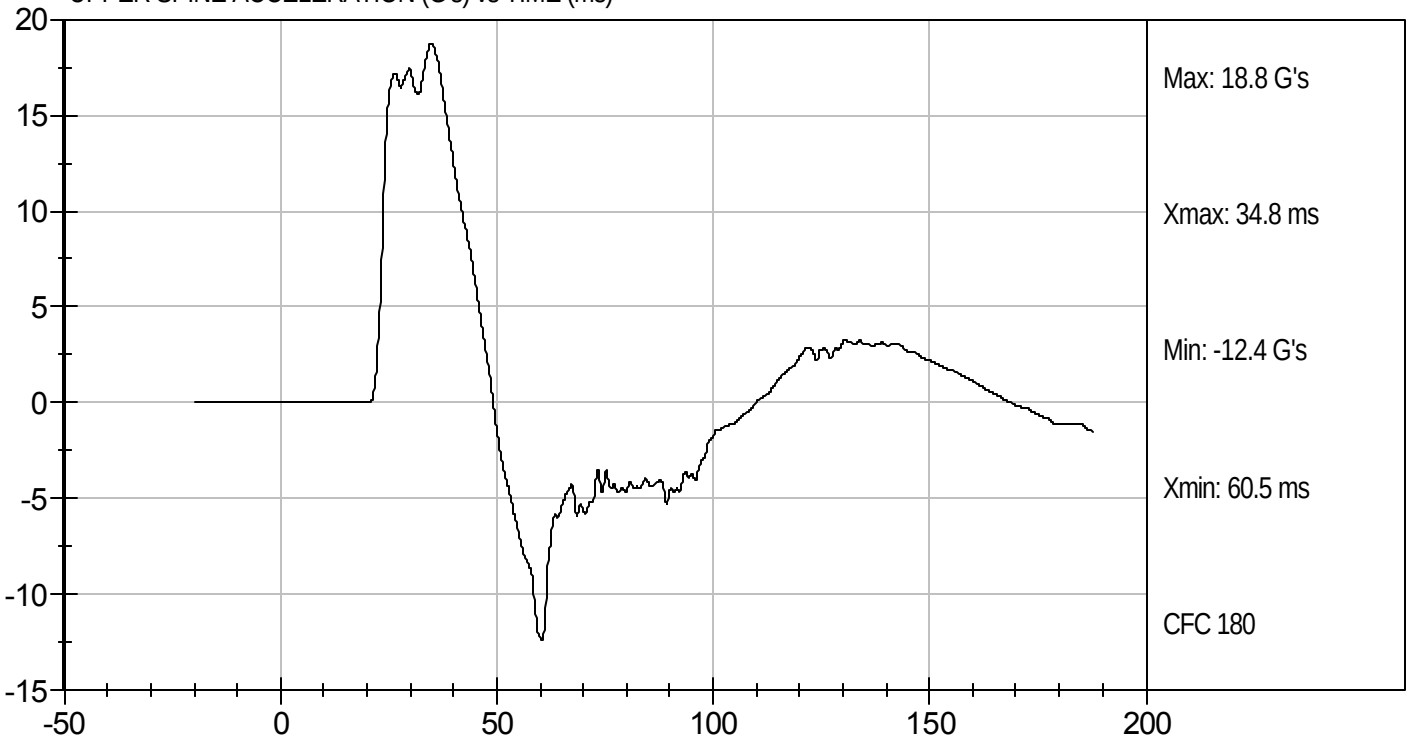
Test Desc: Shoulder Impact
Component ID: D091363

Test Date: 5/29/09
Velocity: 14.12 ft/s, 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:** D091364

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Humidity	%	10 to 70	45	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	36	Pass
Upper Rib Displacement	mm	25 to 32	28	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	34	Pass
		Overall Test Results		Pass

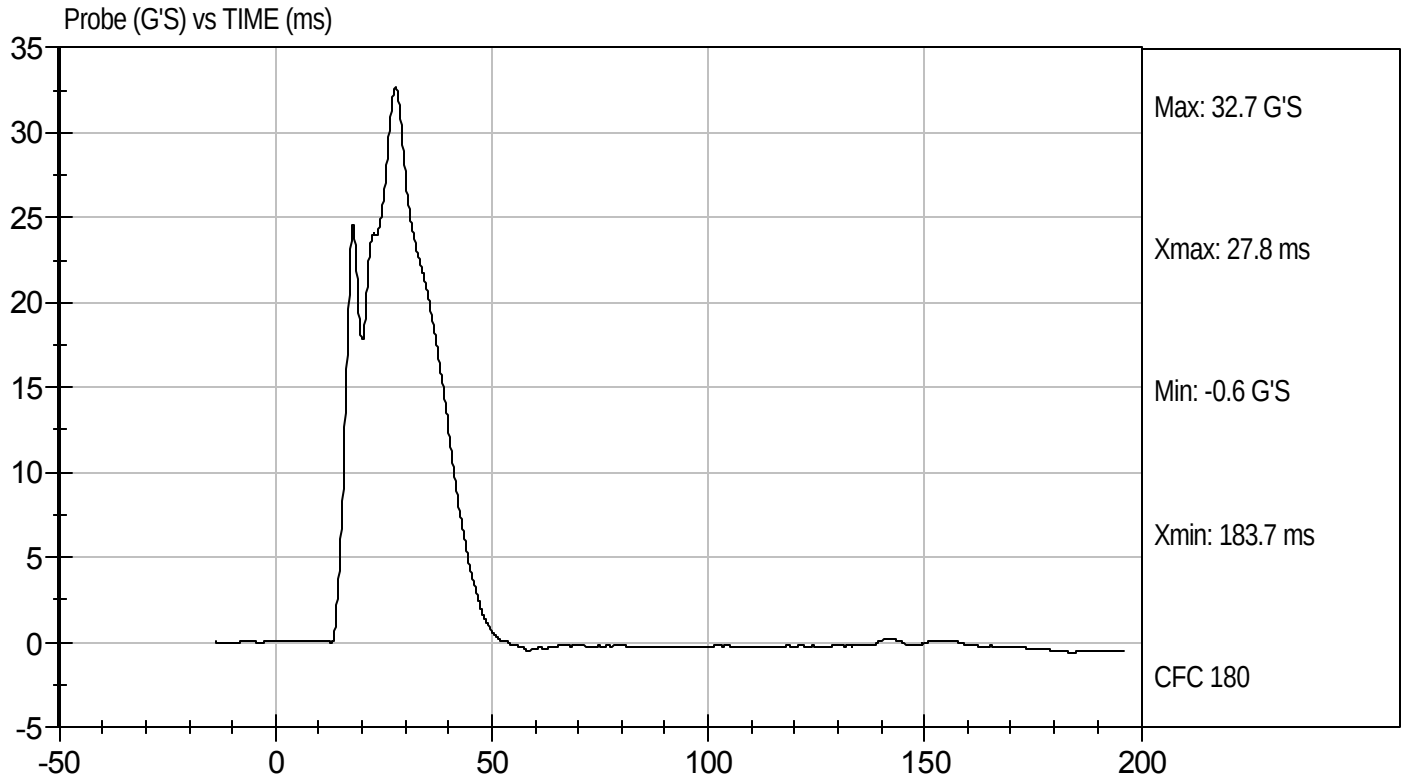
Jessica Gall
Laboratory Technician

5/29/09
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax With Arm
Component ID: D091364

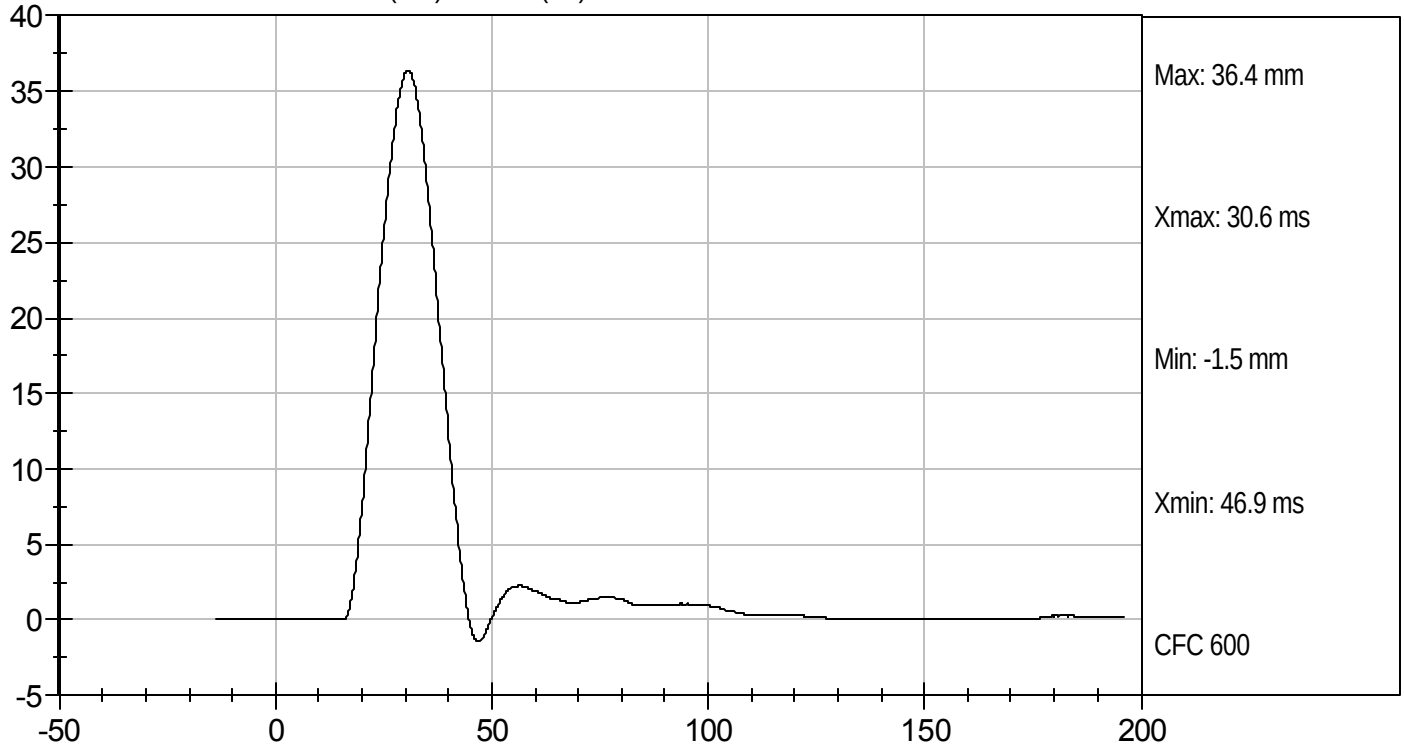
Test Date: 5/29/09
Velocity: 22.22 ft/s, 6.77 m/s



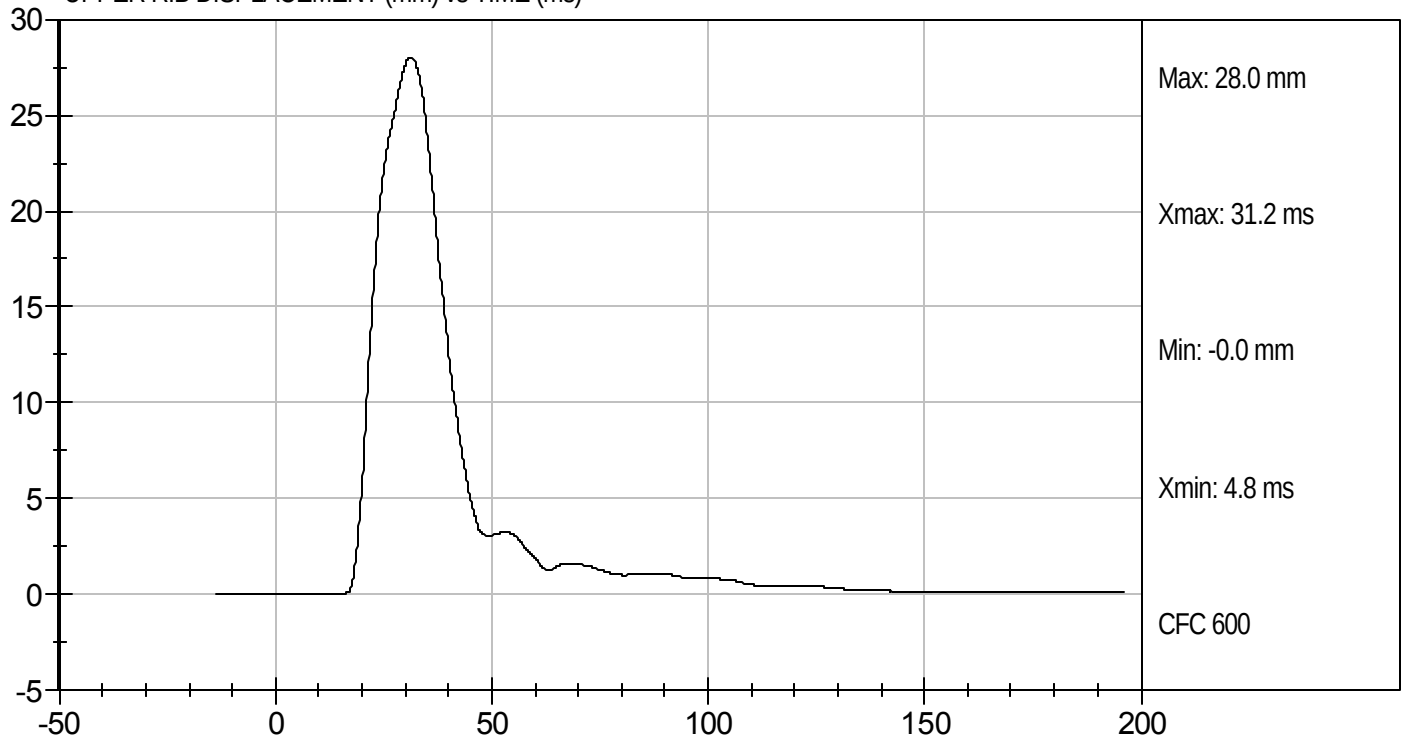
Test Desc: Thorax With Arm
Component ID: D091364

Test Date: 5/29/09
Velocity: 22.22 ft/s, 6.77 m/s

SHOULDER DISPLACEMENT (mm) vs TIME (ms)



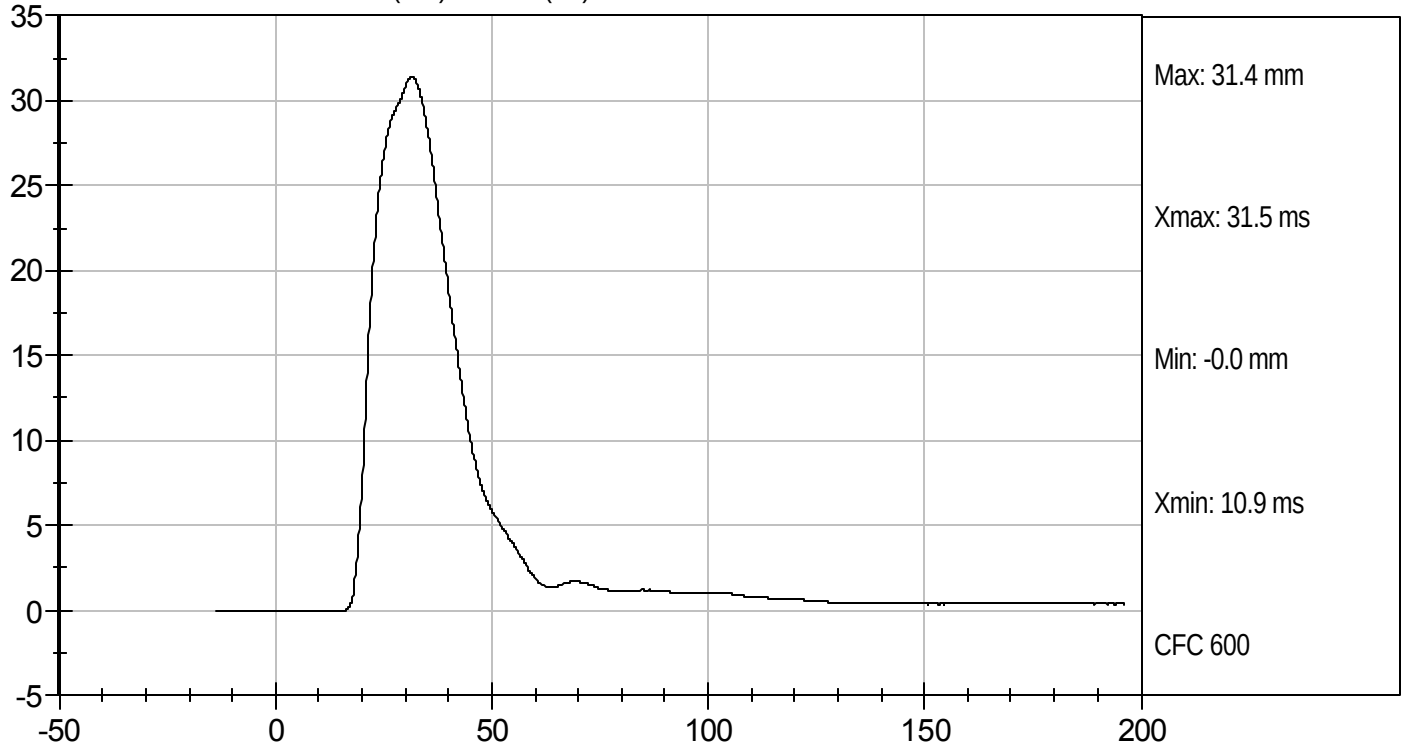
UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



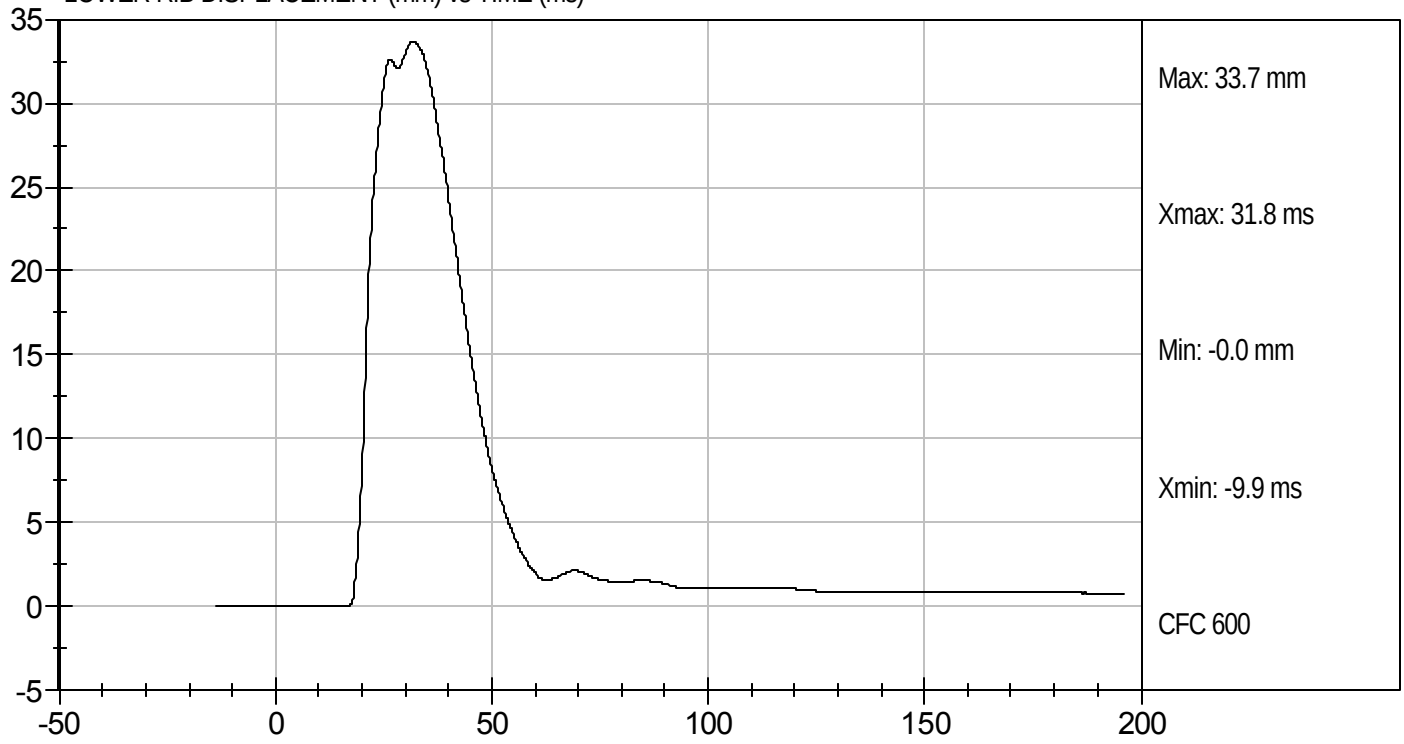
Test Desc: Thorax With Arm
Component ID: D091364

Test Date: 5/29/09
Velocity: 22.22 ft/s, 6.77 m/s

MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



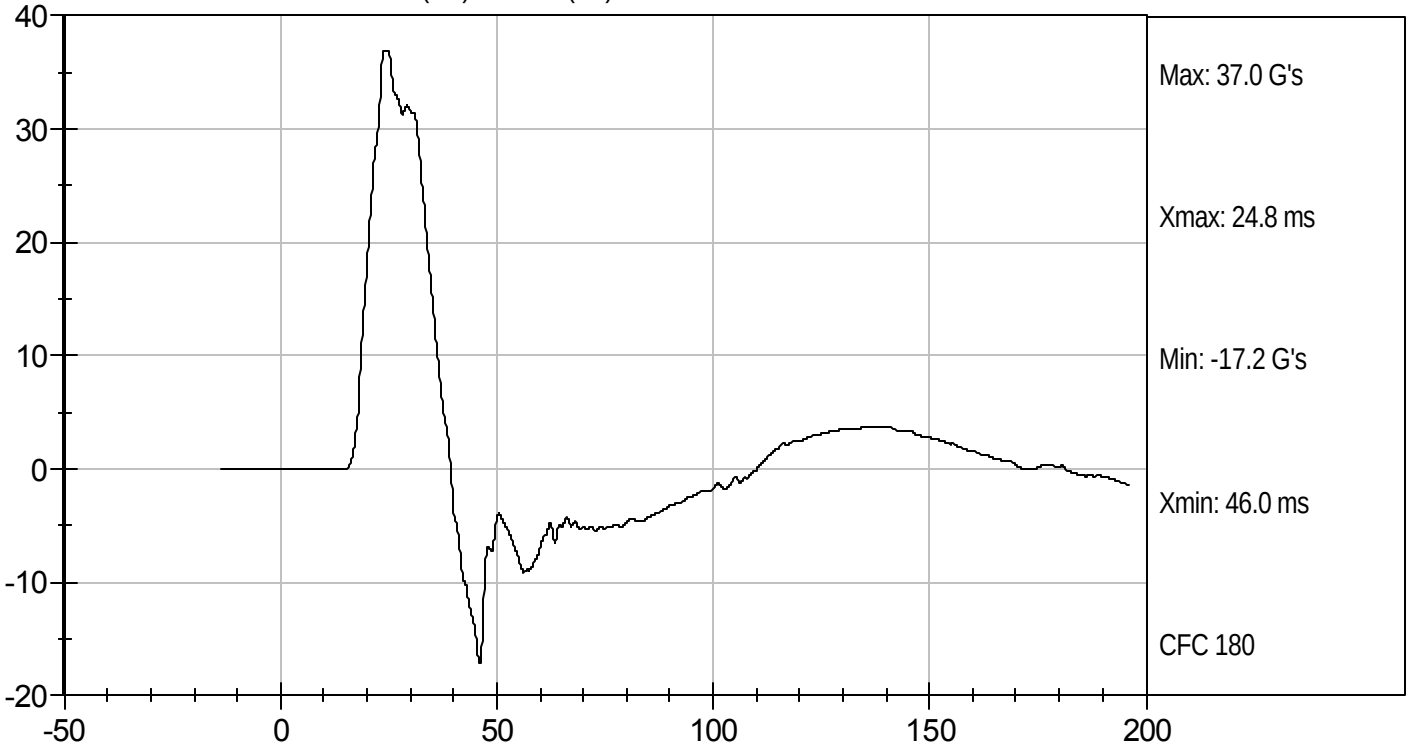
LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



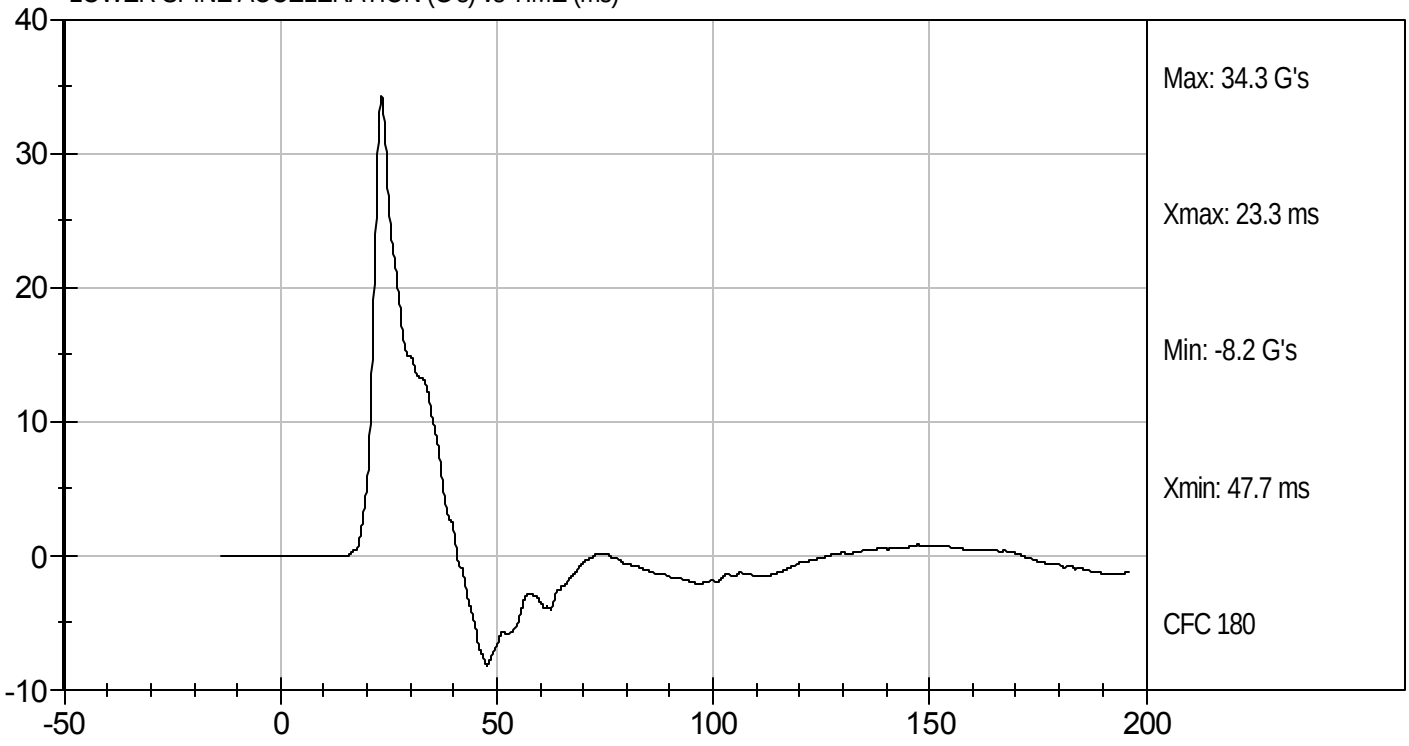
Test Desc: Thorax With Arm
Component ID: D091364

Test Date: 5/29/09
Velocity: 22.22 ft/s, 6.77 m/s

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



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



MGA RESEARCH CORPORATION

THORAX (WITHOUT ARM) IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test I.D:** D091365

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Humidity	%	10 to 70	45	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	40	Pass
Middle Rib Displacement	mm	39 to 45	43	Pass
Lower Rib Displacement	mm	35 to 43	38	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 17	15	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	8	Pass
		Overall Test Results		Pass

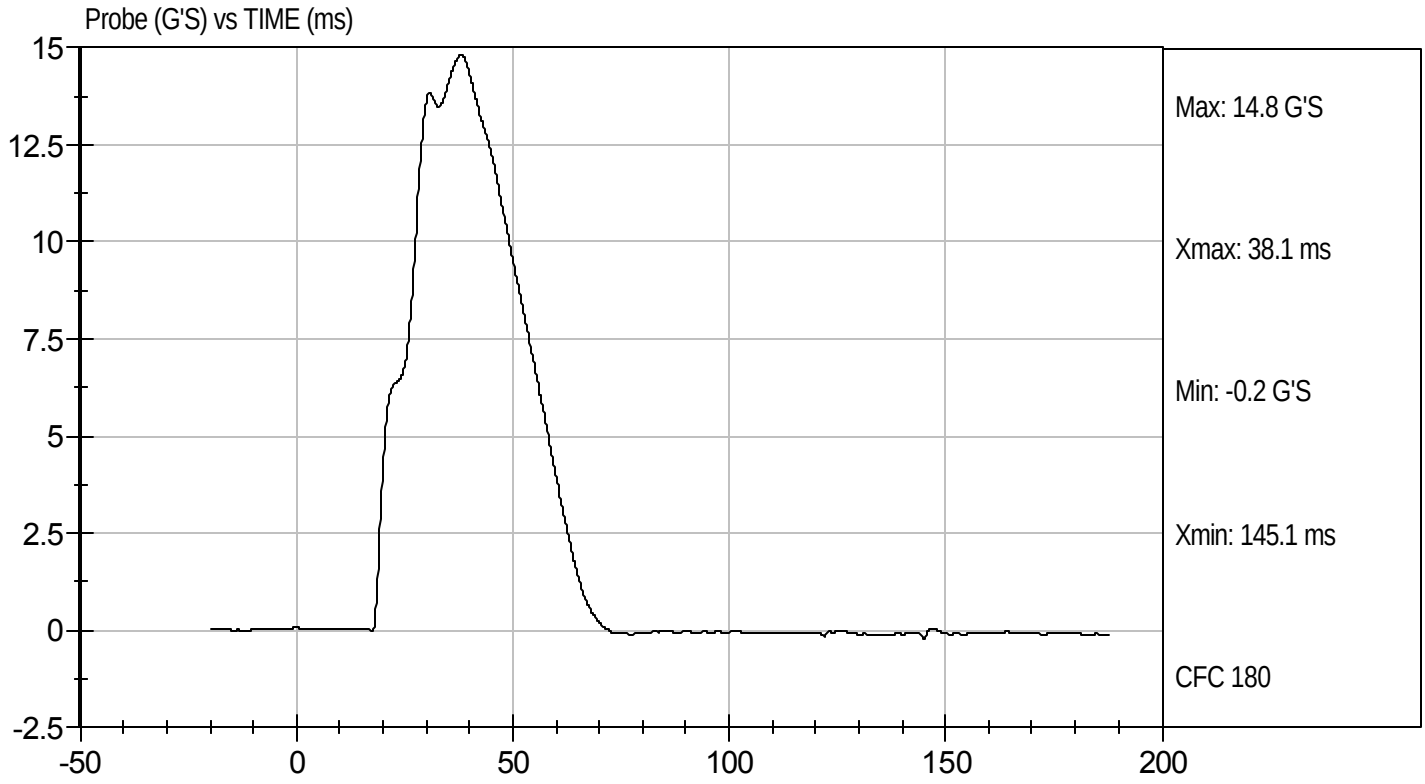
Jessica Hall
Laboratory Technician

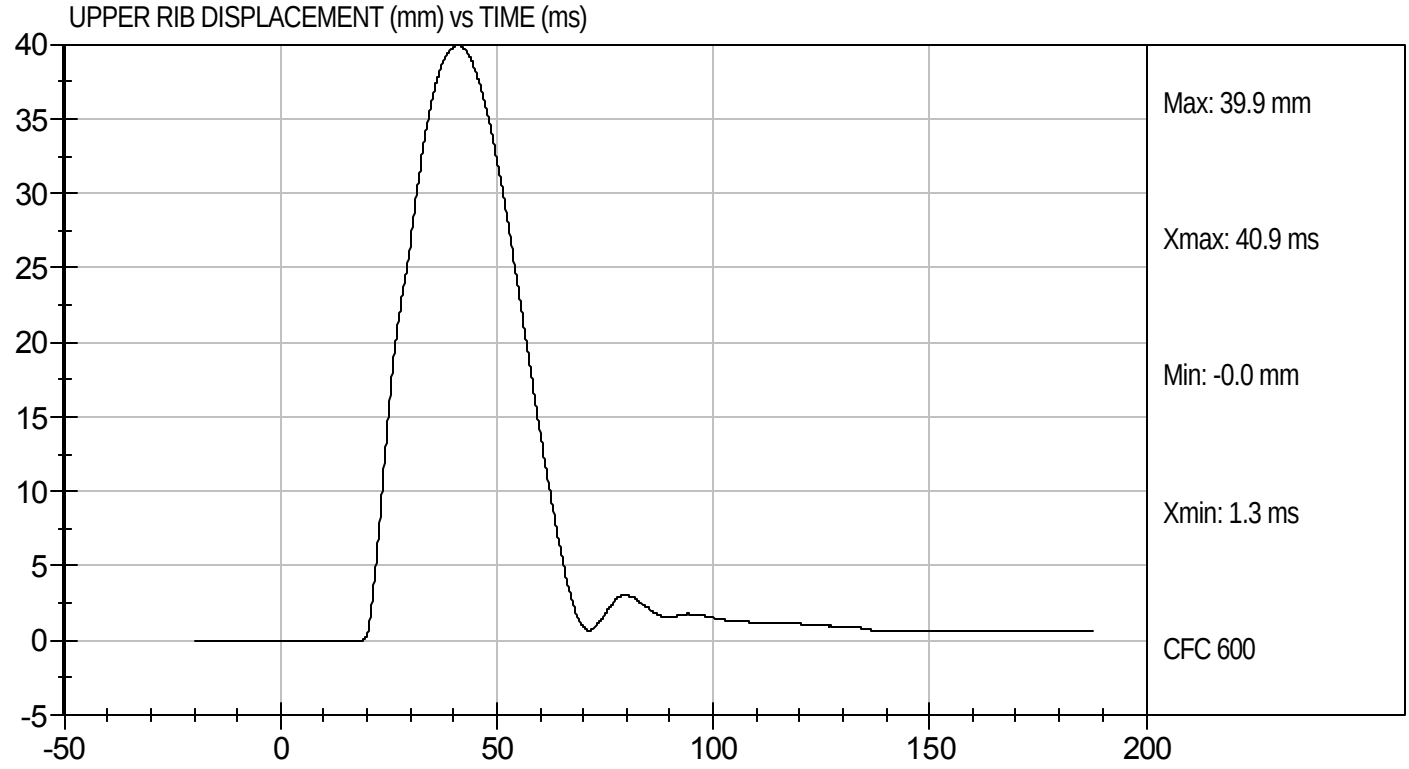
5/29/09
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Without Arm
Component ID: D091365

Test Date: 5/29/09
Velocity: 14.01 ft/s, 4.27 m/s

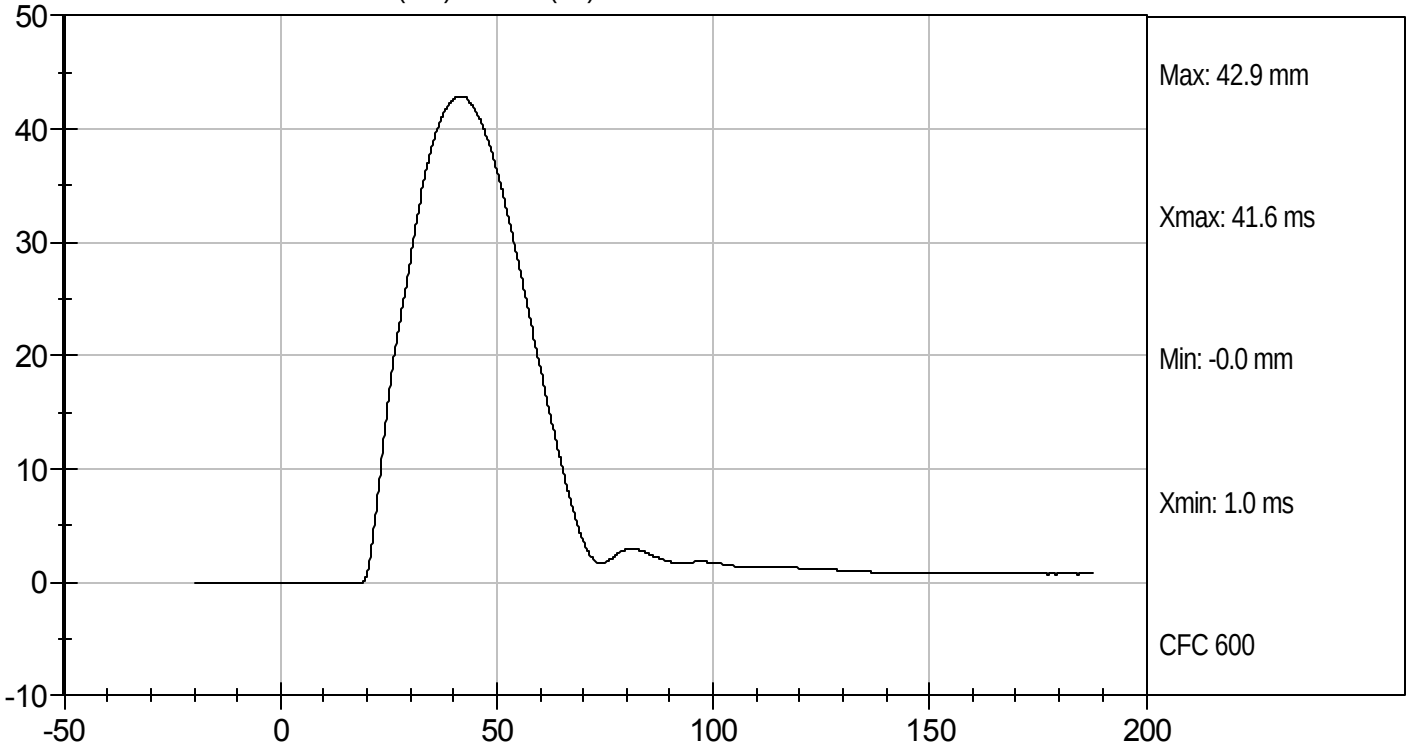




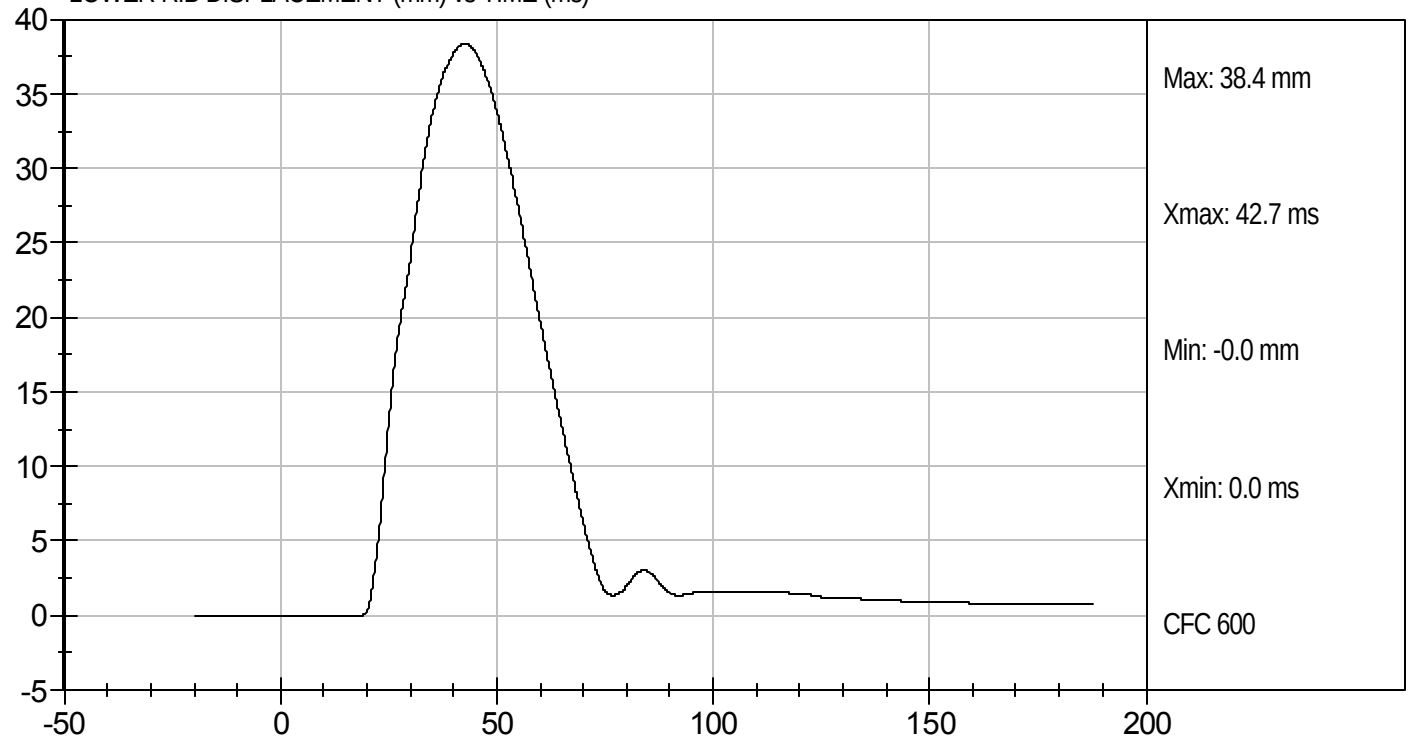
Test Desc: Thorax Without Arm
Component ID: D091365

Test Date: 5/29/09
Velocity: 14.01 ft/s, 4.27 m/s

MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



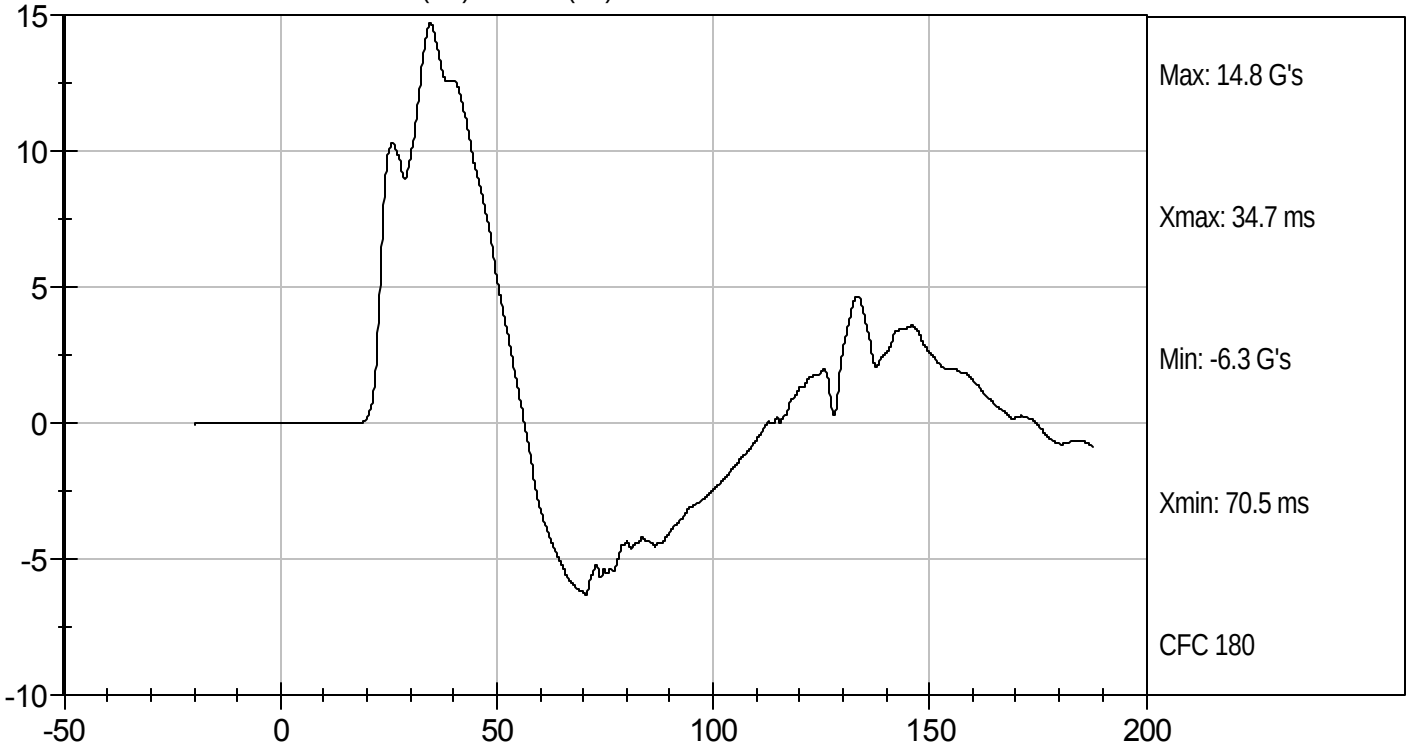
LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



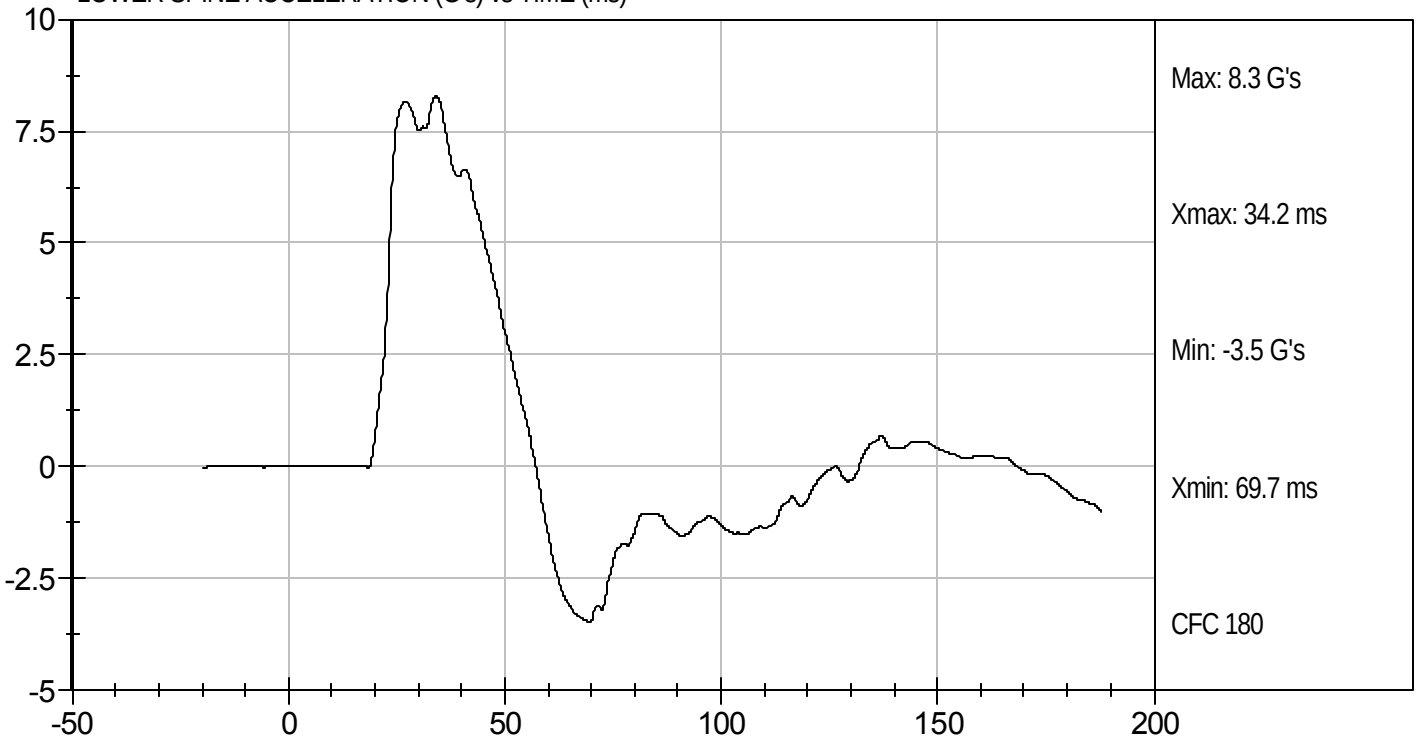
Test Desc: Thorax Without Arm
Component ID: D091365

Test Date: 5/29/09
Velocity: 14.01 ft/s, 4.27 m/s

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



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



MGA RESEARCH CORPORATION

ABDOMINAL IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test I.D:** D091366

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Humidity	%	10 to 70	45	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	40	Pass
Lower Rib Displacement	mm	33 to 44	38	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	11	Pass
		Overall Test Results		Pass

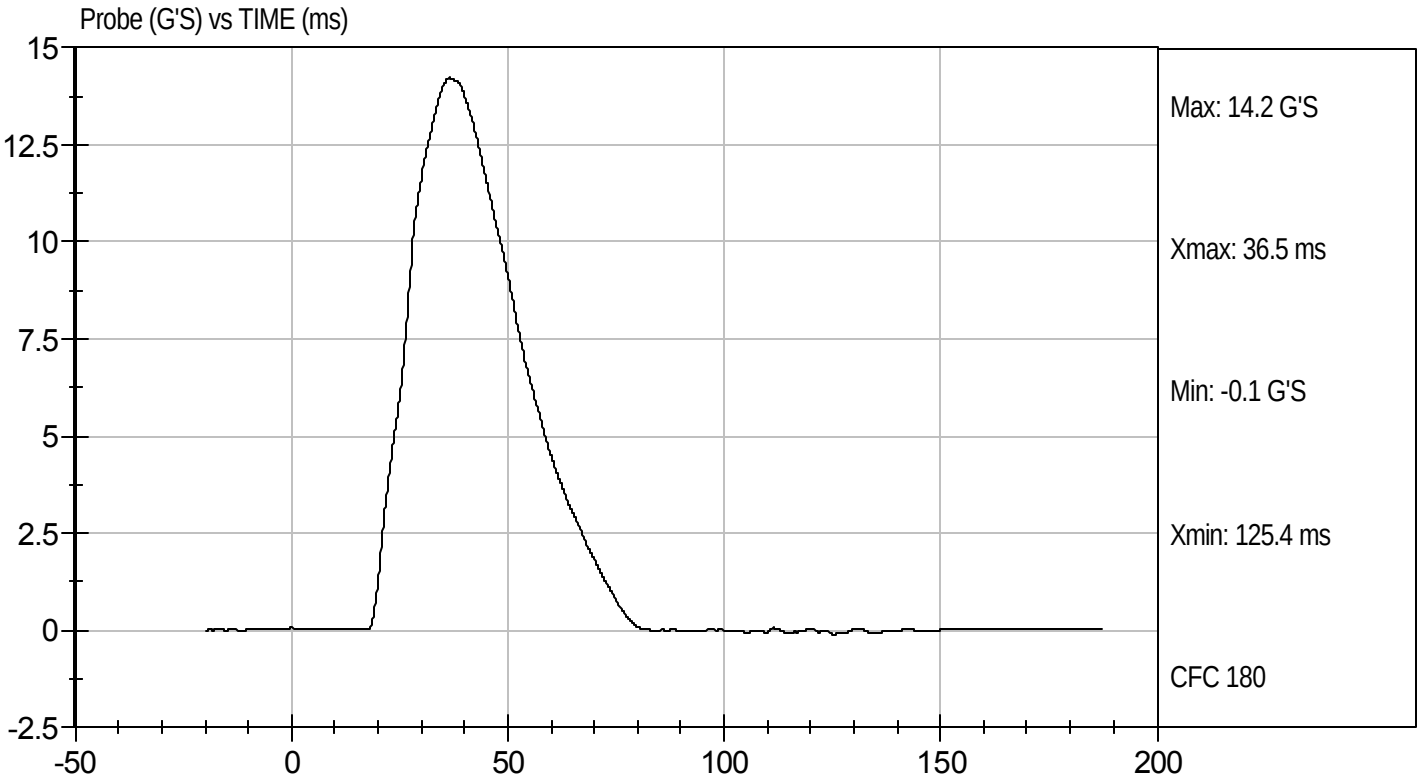
Jessica Hall
Laboratory Technician

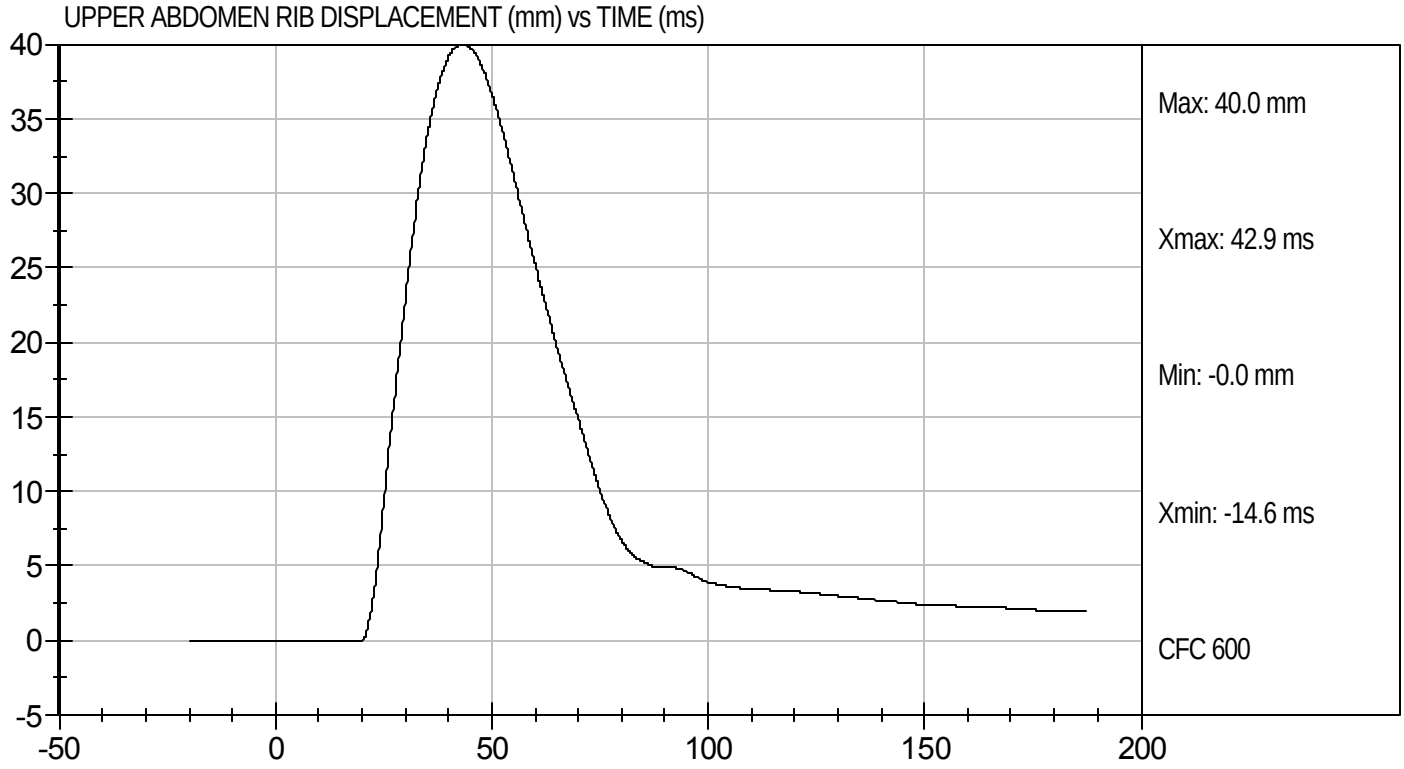
5/29/09
Test Date

David Winkelbauer
Approved By

Test Desc: Abdomen Impact
Component ID: D091366

Test Date: 5/29/09
Velocity: 14.01 ft/s, 4.27 m/s

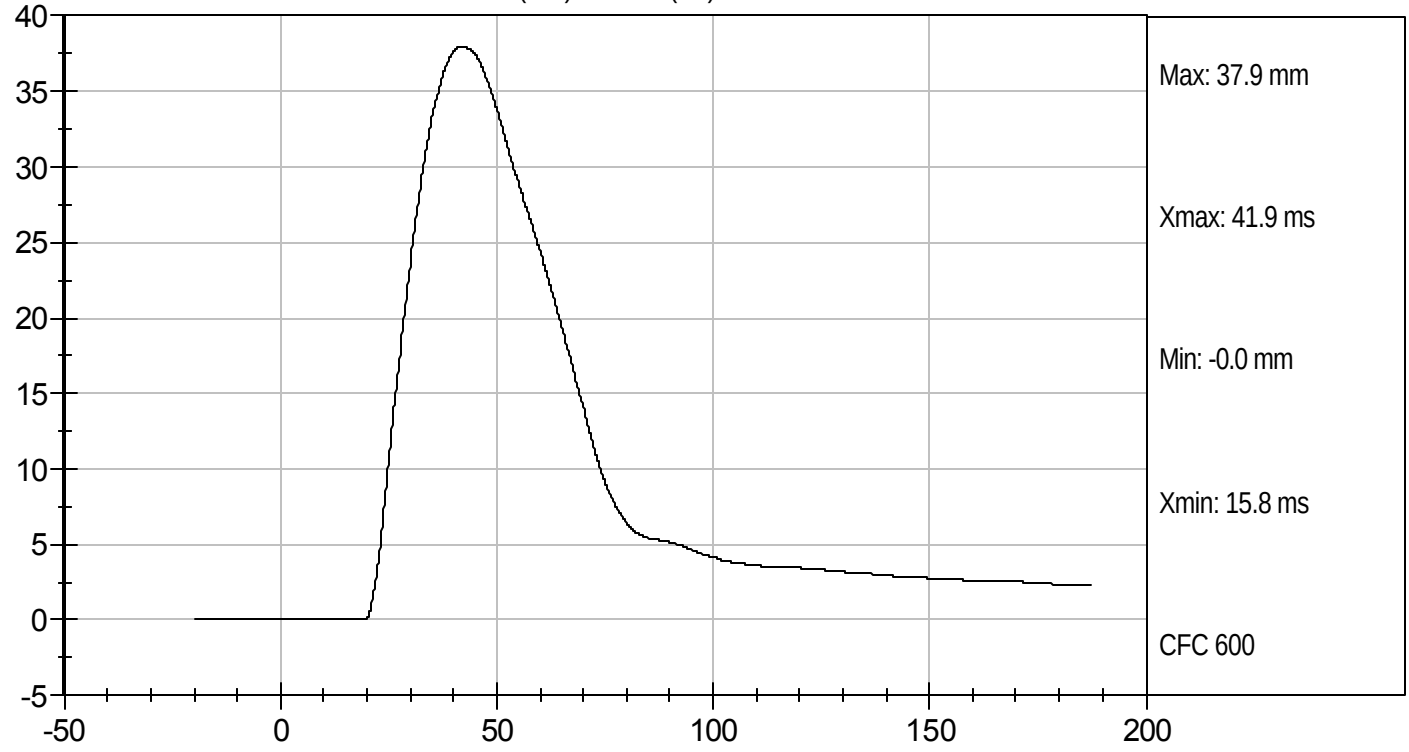




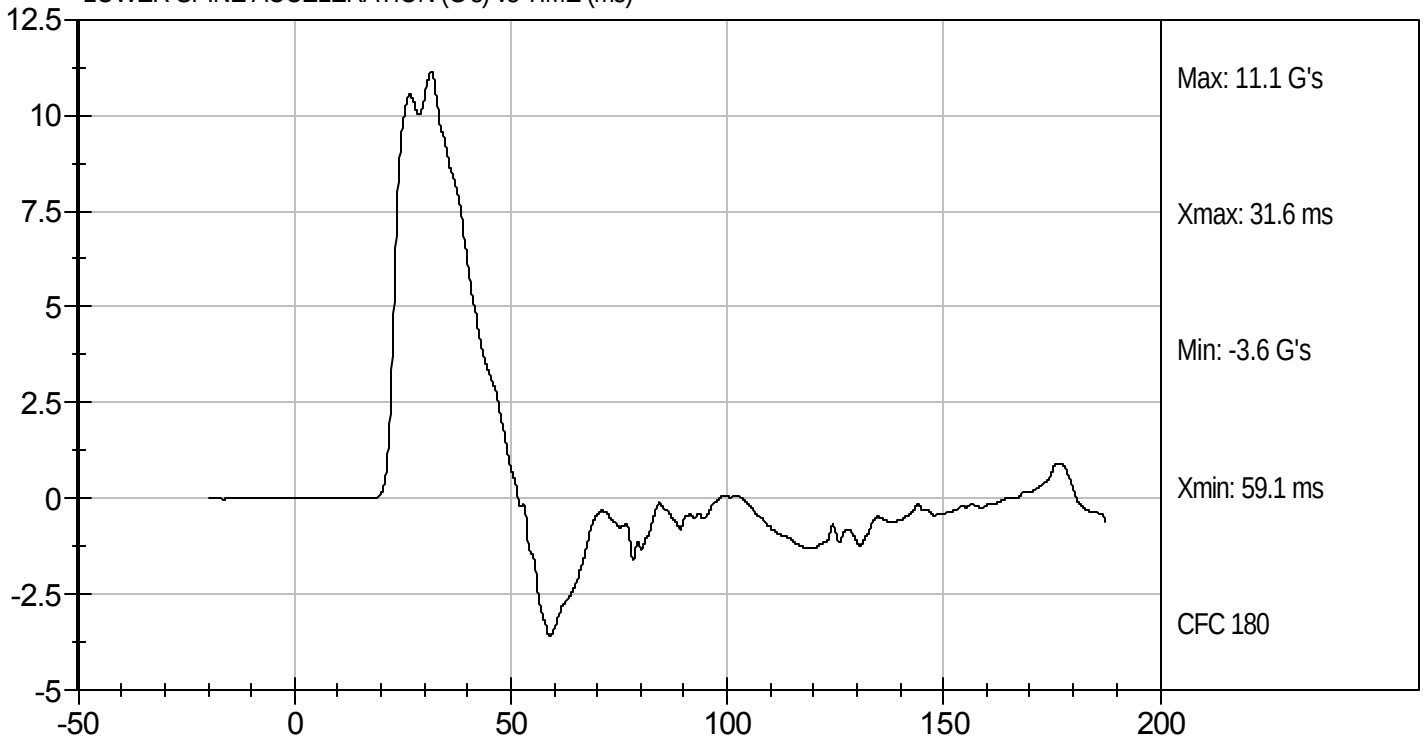
Test Desc: Abdomen Impact
Component ID: D091366

Test Date: 5/29/09
Velocity: 14.01 ft/s, 4.27 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:** D091367

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	45	Pass
Impact Velocity	m/s	6.60 to 6.80	6.71	Pass
Peak Impactor Acceleration	G's	38 to 47	44	Pass
Pelvis Y Acceleration after 6 ms	G's	34 to 42	38	Pass
Peak Acetabulum Force	N	3600 to 4300	3873	Pass
		Overall Test Results		Pass

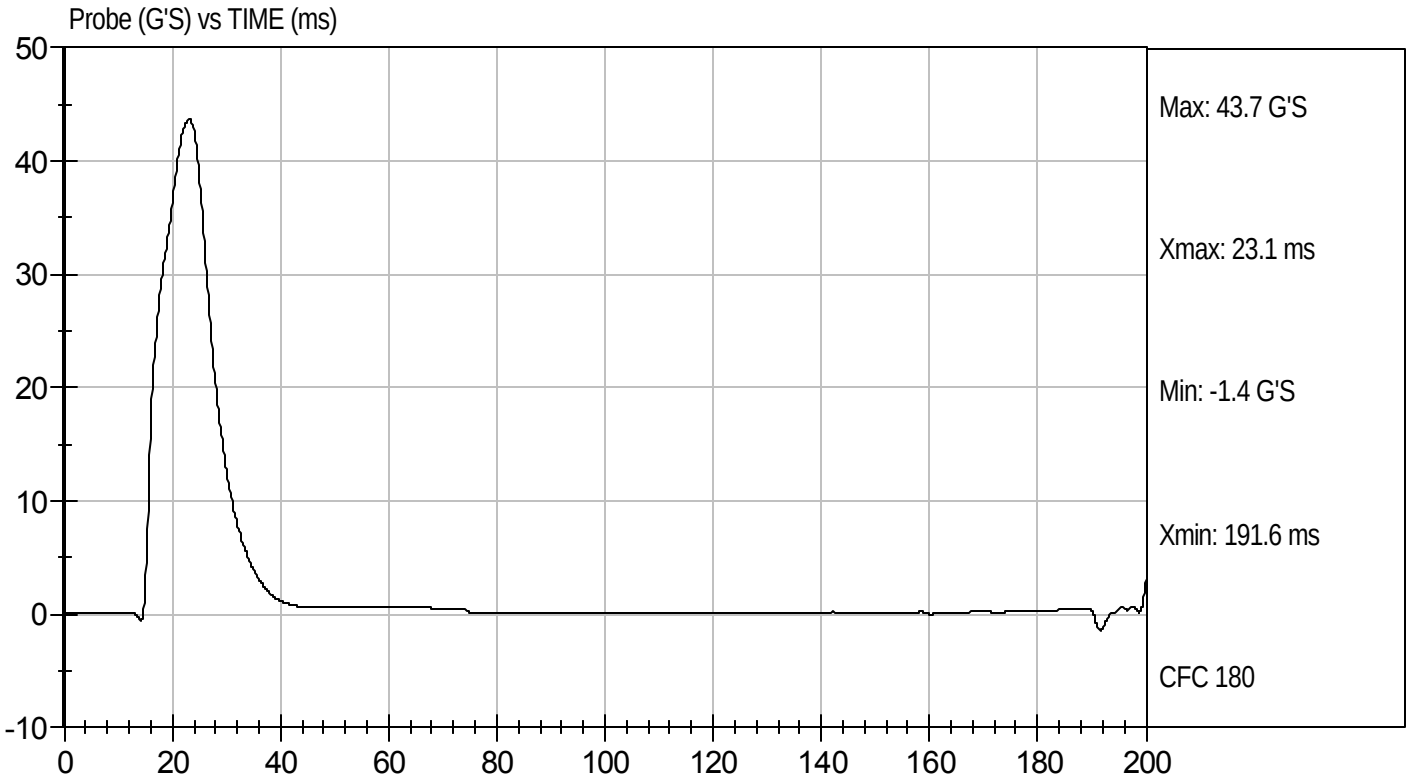
Jessica Hall
Laboratory Technician

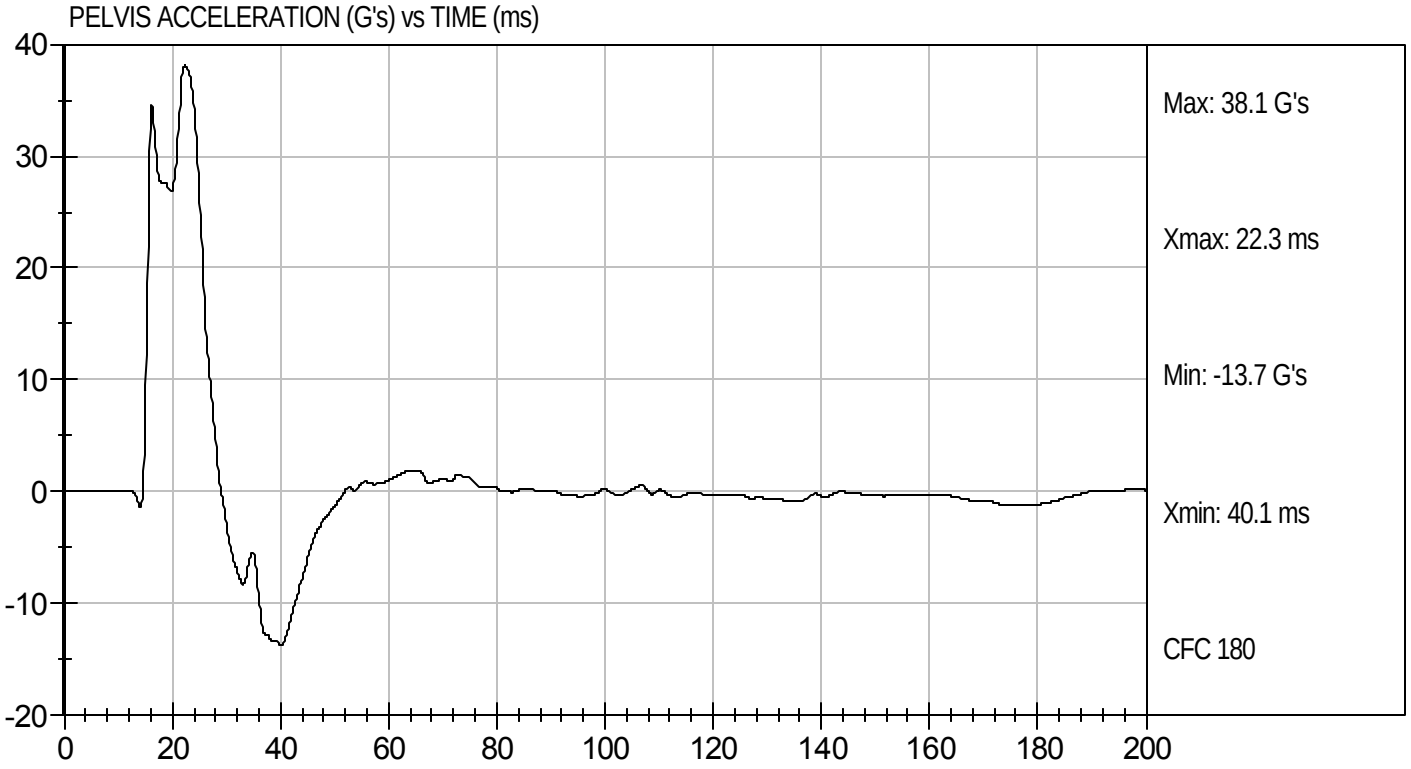
6/1/09
Test Date

David Winkelbauer
Approved By

Test Desc: Pelvis Impact
Component ID: D091367

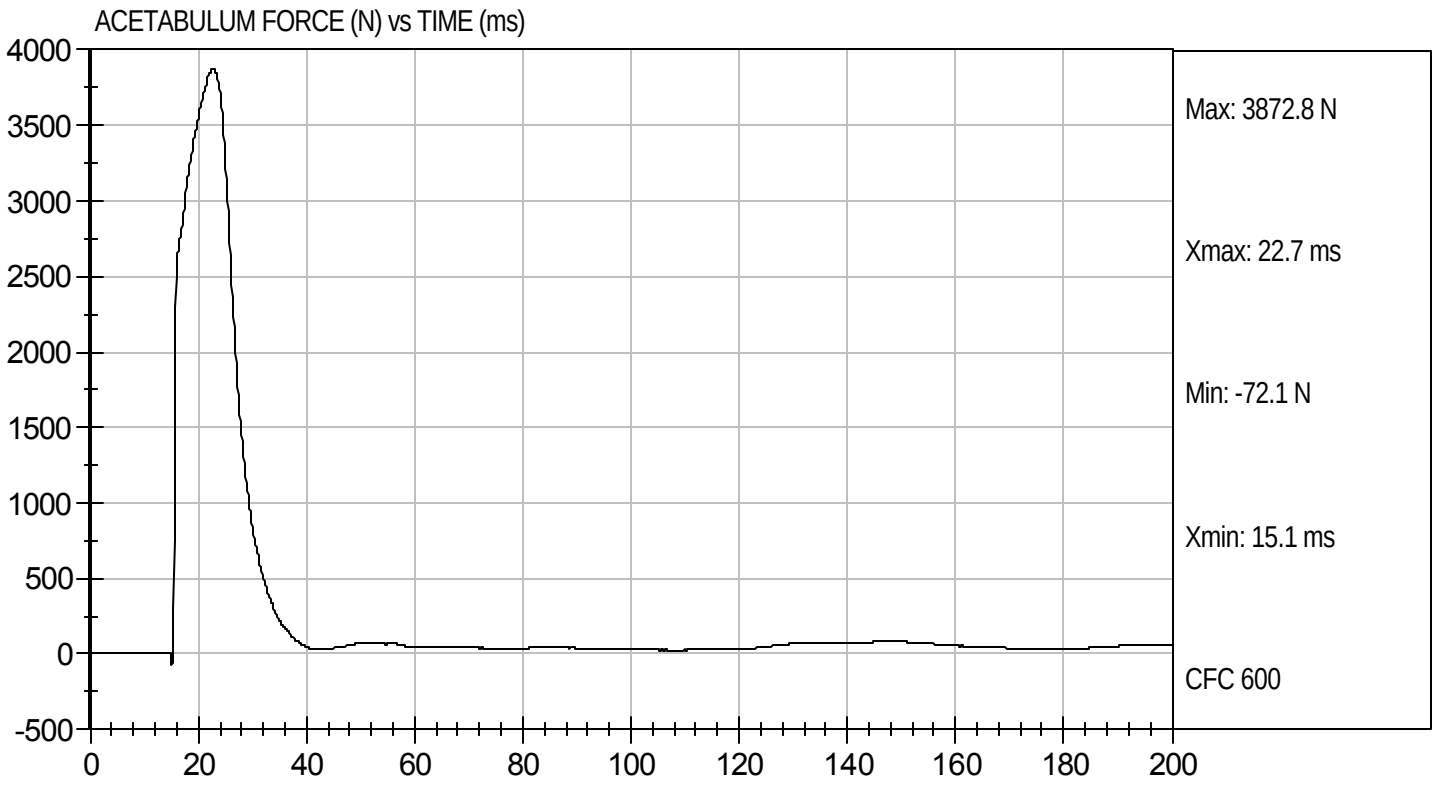
Test Date: 6/1/09
Velocity: 22.0 ft/s, 6.71 m/s





Test Desc: Pelvis Impact
Component ID: D091367

Test Date: 6/1/09
Velocity: 22.0 ft/s, 6.71 m/s



MGA RESEARCH CORPORATION

ILIAC IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test I.D:** D091368

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	45	Pass
Impact Velocity	m/s	4.20 to 4.40	4.33	Pass
Peak Impactor Acceleration	G's	36 to 45	40	Pass
Pelvis Y Acceleration	G's	28 to 39	37	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4857	Pass
		Overall Test Results		Pass

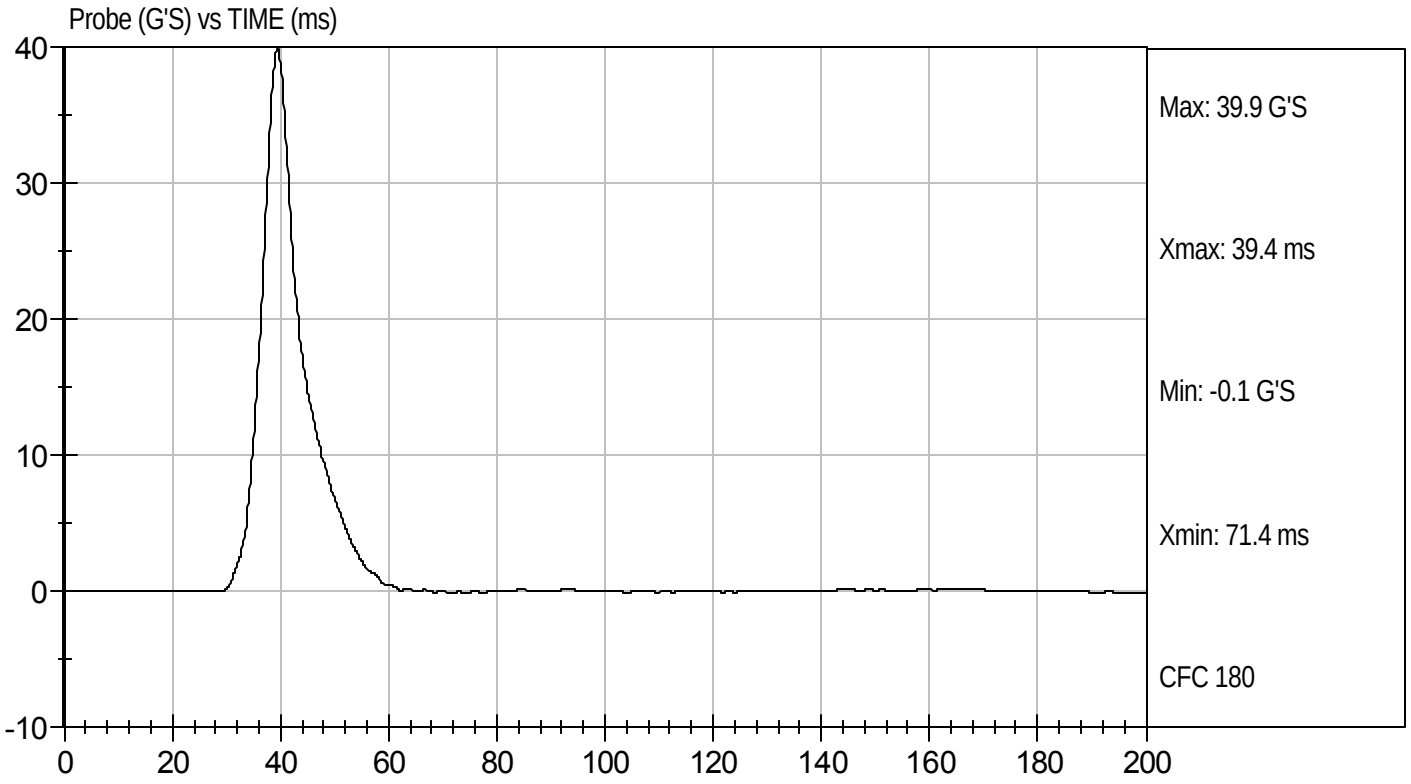
Jessica Gall
Laboratory Technician

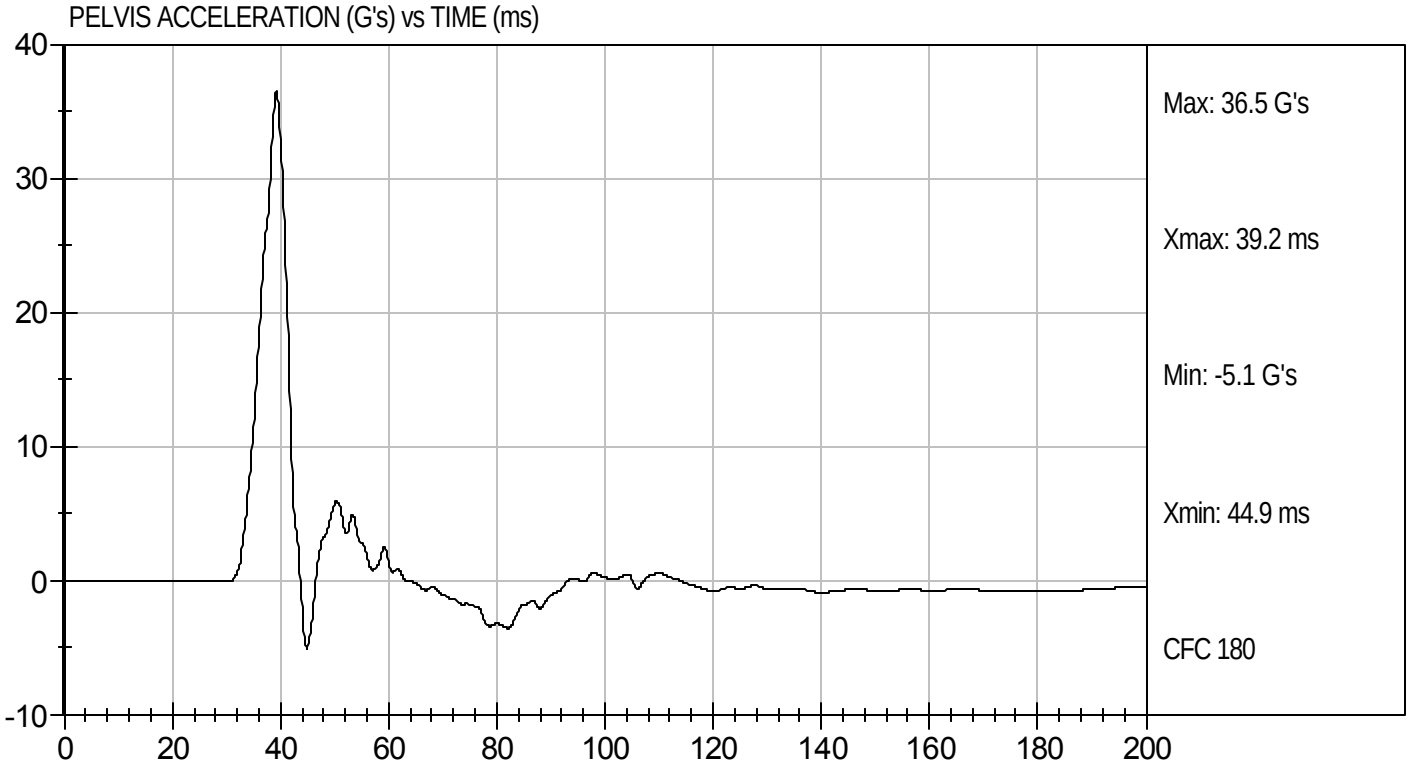
6/1/09
Test Date

David Winkelbauer
Approved By

Test Desc: Iliac Impact
Component ID: D091368

Test Date: 6/1/09
Velocity: 14.2 ft/s, 4.33 m/s





Test Desc: Iliac Impact
Component ID: D091368

Test Date: 6/1/09
Velocity: 14.2 ft/s, 4.33 m/s