

REPORT NUMBER: SINCAP-MGA-2012-075

**NEW CAR ASSESSMENT PROGRAM (NCAP)
Moving Deformable Barrier Side Impact Test**

**KIA MOTORS CORPORATION
2012 KIA Rio LX 4-Dr Sedan
NHTSA No.: MC0522**

**MGA RESEARCH CORPORATION
5000 Warren Road
Burlington, WI 53105**



Test Date: March 13, 2012

Final Report Date: April 27, 2012

FINAL REPORT

**U.S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Office of Crashworthiness Standards
Mail Code: NVS-111
1200 New Jersey Ave, SE
Room W43-410
Washington, DC 20590**

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Approved by: 
Ben Fischer, Project Engineer

Approval Date: April 27, 2012

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

Technical Report Documentation Page

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15. Supplementary Notes																														
16. Abstract <p>A 55/28 km/h 90° Moving Deformable Barrier NCAP Side Impact Test was conducted on the subject 2012 KIA Rio LX 4-Dr Sedan in accordance with the specifications of the Office of Crashworthiness Standards NCAP Side Laboratory 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 March 13, 2012.</p> <p>The impact velocity of the Moving Deformable Barrier (MDB) was 62.3 km/h, and the ambient temperature at the struck (driver's) side of the target vehicle at the time of impact was 21.1°C. The target vehicle post-test maximum crush was 236 mm at level 3. The test vehicle's performance was as follows:</p>																														
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<p>The two doors on the struck side of the vehicle did not separate from the body at the hinges or latches and the opposite doors did not open during the side impact event.</p>																														
17. Key Words New Car Assessment Program (NCAP) Side Impact MDB ES-2re SID-IIs		18. Distribution Statement Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services Division, NPO-411 1200 New Jersey Ave, SE, Room E12-100 Washington, DC 20590 Email: tis@nhtsa.dot.gov FAX: 202-493-2833																												
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SECTION 1
TEST PURPOSE AND PROCEDURE

This moving deformable barrier side impact test is part of the MY 2012 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. DTNH22-09-D-00124. The purpose of this test is to generate comparative side impact performance in a 2012 KIA Rio LX 4-Dr Sedan. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Side NCAP Laboratory Test Procedure dated August 2011.

SECTION 2 SUMMARY OF TEST RESULTS

A 2012 KIA Rio LX 4-Dr Sedan was impacted on the left (driver's) side by a Moving Deformable Barrier (MDB) which was moving forward in a 27° crabbed position to the tow road guidance system at a velocity of 62.3 km/h (38.7 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 March 13, 2012. 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 NCAP Side Laboratory Test Procedure dated August 2011. 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)

Primary and Redundant Head CG Triaxial Accelerometers
 Chest Upper Rib, Middle Rib, and Lower Rib Y-Axis Displacement Potentiometers
 Abdomen Forward, Middle, and Rear Y-Axis Load Cells
 Lower Spine (T12) Triaxial Accelerometers
 Pubic Symphysis Y-Axis Load Cell

PASSENGER ATD (SID-IIs)

Primary and Redundant Head CG Triaxial Accelerometers
 Chest Upper Rib, Middle Rib, and Lower Rib Y-Axis Displacement Potentiometers
 Abdomen Upper Rib and Lower Rib Y-Axis Displacement Potentiometers
 Lower Spine (T12) Triaxial Accelerometers
 Acetabulum and Iliac Wing Y-Axis Load Cells

Appendix B contains the dummy response data. Dummy configuration and performance verification data can be found in Appendix C of this report. Appendix D contains the test equipment and instrumentation calibration data.

Dummy Injury readings were recorded as follows:

DUMMY INJURY VALUES

Measurement Description	Driver ATD (ES-2re)		
	Units	Threshold	Result
Head Injury Criteria (HIC ₃₆)	N/A	1000	307
Maximum Thorax Rib Deflection	mm	44	32
Total Abdominal Force	N	2500	1453
Pubic Symphysis Force	N	6000	1909

Measurement Description	Passenger ATD (SID-IIs)		
	Units	Threshold	Result
Head Injury Criteria (HIC ₃₆)	N/A	1000	324
Resultant Lower Spine Acceleration	Gs	82	85
Total Pelvic Force	N	5525	3766
Maximum Thoracic Rib Deflection	mm	38*	38
Maximum Abdomen Rib Deflection	mm	45*	29

*Proposed IARV

Supplemental restraint information is given below:

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Struck Side Driver		Struck Side Rear Passenger	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	No		
Knee Airbag	No			
Side Curtain Airbag	Yes	Yes	Yes	Yes
Side Torso/Abdomen/Pelvis Airbag	Yes	Yes	No	
Seat Belt Pretensioner	Yes	Yes	No	
Seat Belt Load Limiter	Yes		No	
Other				

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 Lower A-Post Y
- Left Mid A-Post Y
- Left Lower B-Post Y after 4ms
- Left Mid B-Post Y after 4ms
- Driver Seat Track Y after 5ms

- Left Front Sill Y is questionable from 6-9ms
- Left Rear Sill Y is questionable from 5-9ms
- Left Rear Seat Y is questionable from 7-12ms

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

SECTION 3
OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

**DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2012 KIA Rio LX 4-Dr Sedan
Test Program: NCAP Side MDB Impact Test

NHTSA No. MC0522
Test Date: 3/13/2012

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	MC0522	Traction Control System (TCS)	Yes
Model Year	2012	Auto-Leveling System	No
Make	KIA	Automatic Door Locks (ADL)	No
Model	Rio	Power Window Auto-Reverse	No
Body Style	Sedan	Other Optional Feature	N/A
VIN	KNADM4A34C6055684	Driver Front Airbag	Yes
Body Color	Signal Red	Driver Curtain Airbag	Yes
Odometer Reading (km/mi)	130 / 81	Driver Head/Torso Airbag	No
Engine Displacement (L)	1.6	Driver Torso Airbag	No
Type/No. Cylinders	4	Driver Torso/Pelvis Airbag	Yes
Engine Placement	Lateral	Driver Pelvis Airbag	No
Transmission Type	Automatic	Driver Knee Airbag	No
Transmission Speeds	6	Rear Pass. Curtain Airbag	Yes
Overdrive	Yes	Rear Pass. Head/Torso Airbag	No
Final Drive	Front	Rear Pass. Torso Airbag	No
Roof Rack	No	Rear Pass. Torso/Pelvis Airbag	No
Sunroof/T-Top	No	Rear Pass. Pelvis Airbag	No
Running Boards	No	Driver Seat Belt Pretensioner	Yes
Tilt Steering Wheel	Yes	Rear Pass. Seat Belt Pretensioner	No
Power Seats	No	Driver Load Limiter	Yes
Anti-Lock Brakes (ABS)	Yes	Rear Pass. Load Limiter	No
All Wheel Drive (AWD)	No	Other Safety Restraint	N/A
Does owner's manual provide instruction to turn off automatic door locks?			N/A

DATA FROM CERTIFICATION LABEL

Manufactured By	KIA Motors Corporation	GVWR (kg)	1660
Date of Manufacture	12/11	GAWR Front (kg)	920
Vehicle Type	Passenger Car	GAWR Rear (kg)	840

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity (DSC)	2	3		5	
Capacity Weight (VCW) (kg)				420	(A)
DSC x 68.04 kg				340	(B)
Rated Cargo and Luggage Weight (RCLW)				80	(A-B)

VEHICLE SEAT TYPE

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

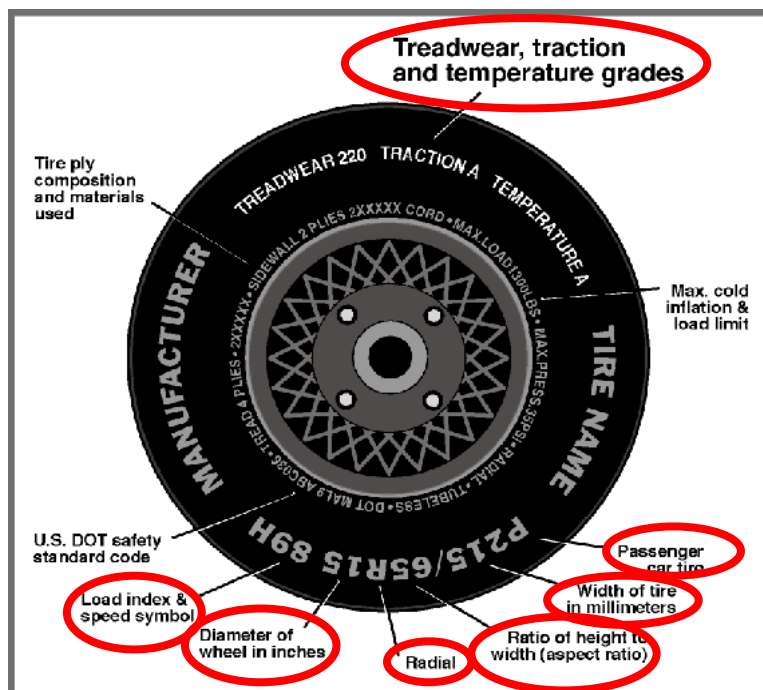
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GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2012 KIA Rio LX 4-Dr Sedan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MC0522
 Test Date: 3/13/2012

VEHICLE TIRE INFORMATION



TIRE PLACARD INFORMATION

Measured Parameter	Front	Rear
Recommended Cold Tire Pressure (kPa)	220	220
Recommended Tire Size	P185/65R15	P185/65R15

TIRE SIDEWALL INFORMATION

Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	300	300
Tire Size on Vehicle	P185/65R15	P185/65R15
Tire Manufacturer	Kumho	Kumho
Tire Name	SOLUS KH25	SOLUS KH25
Tire Type	Passenger	Passenger
Tire Width	185	185
Aspect Ratio	65	65
Radial	Yes	Yes
Wheel Diameter	15	15
Load Index/Speed Symbol	86T	86T
Treadwear	480	480
Traction Grade	A	A
Temperature Grade	A	A
Tire Material	Rubber	Rubber

DATA SHEET NO. 1 (CONTINUED)
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2012 KIA Rio LX 4-Dr Sedan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MC0522
 Test Date: 3/13/2012

TEST PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kpa	220	220	220	220
Tire Placard	kpa	220	220	220	220
Owner's Manual	kpa				
As Tested	kpa	220	220	220	220

MDB TIRE SPECIFICATIONS

	Requirement	Units	LF	RF	LR	RR
Tire Size	P205/75R15	N/A	P205/75R15	P205/75R15	P205/75R15	P205/75R15
Tire	200 ± 21	kpa	220	220	220	220

TEST VEHICLE AXLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	363.8	214.5		407.8	324.8		396.0	329.3	
Right	kg	355.2	230.4		365.1	268.5		356.5	291.2	
Ratio	%	61.8	38.2		56.6	43.4		54.8	45.2	
Totals	kg	719.0	444.9	1163.9	772.9	593.3	1366.2	752.5	620.5	1373.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1163.9	(A)
Sum of Actual Weight of 2 P572 ATDs Used	kg	129.3	(B)
Rated Cargo/Luggage Weight (RCLW)	kg	80	(C)
Calculated Vehicle Target Weight (TVTW)	kg	1373.2	(A+B+C)

Does the measured As Tested Vehicle Weight lie within the required weight range (i.e. Calculated Test Vehicle Target Weight – 4.5 kg to 9 kg)? **YES**

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Weight of Ballast, if any	29.5
Right taillight, right side mirror, tire inflator, trunk carpet.	5.4

DATA SHEET NO. 1 (CONTINUED)
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2012 KIA Rio LX 4-Dr Sedan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MC0522
 Test Date: 3/13/2012

TEST VEHICLE ATTITUDES AND CG

	Units	Fully Loaded	As Tested	Meets Requirement***
Left Front	mm	643	641	Yes
Right Front	mm	652	653	Yes
Right Rear	mm	638	642	Yes
Left Rear	mm	623	633	Yes
Vehicle CG (Aft of Front Axle)	mm	1161	1116	
Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline)	mm	43	55	

*** The "As Tested" vehicle attitude measurements must be equal to or within ± 10 mm of the "Fully Loaded" vehicle attitude measurements at each wheel well.

DATA SHEET NO. 2
SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEM DATA

Test Vehicle: 2012 KIA Rio LX 4-Dr Sedan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MC0522
 Test Date: 3/13/2012

SEAT POSITIONING

The driver's seat, front center seat (if applicable), and right front passenger's seat should be set to the mid-track, lowest, mid-angle position. The struck-side rear passenger's seat, rear center seat, and non-struck side rear passenger's seats should be set to the rear-most, lowest, mid-angle position.

SCRL ANGLE RANGE

Seat	SCRL (°)		
	Max	Min	Mid
Driver Seat	17.8	15.1	16.5
Front Passenger Seat	Fixed	Fixed	Fixed
Front Center Seat			
Struck Side Rear Seat	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed
Rear Center Seat	Fixed	Fixed	Fixed

SEAT HEIGHT AND ANGLE

Seat	As Tested SCRL Angle (Mid) (°)	As Tested SCRIP Height (mm)	SCRIP Height Position	SCRIP Height (mm)		
				Rear-most	Mid-Fore/Aft	Forward-Most
Driver Seat	16.5	Fixed	Max	Fixed	Fixed	Fixed
	16.5	Fixed	Mid	Fixed	Fixed	Fixed
	16.5	Fixed	Min	Fixed	Fixed	Fixed
Front Passenger Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
	Fixed	Fixed	Mid	Fixed	Fixed	Fixed
	Fixed	Fixed	Min	Fixed	Fixed	Fixed
Front Center Seat			Max			
			Mid			
			Min			
Struck Side Rear Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
	Fixed	Fixed	Mid	Fixed	Fixed	Fixed
	Fixed	Fixed	Min	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
	Fixed	Fixed	Mid	Fixed	Fixed	Fixed
	Fixed	Fixed	Min	Fixed	Fixed	Fixed
Rear Center Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
	Fixed	Fixed	Mid	Fixed	Fixed	Fixed
	Fixed	Fixed	Min	Fixed	Fixed	Fixed

DATA SHEET NO. 2 (CONTINUED)
SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEM DATA

Test Vehicle: 2012 KIA Rio LX 4-Dr Sedan
 Test Program: NCAP Side MDB Impact Test

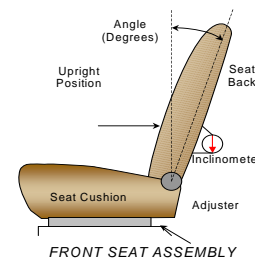
NHTSA No. MC0522
 Test Date: 3/13/2012

SEAT FORE/AFT POSITIONS

Seat	Total Fore/Aft Travel		Test Position from Forward-most Position	
	mm	Detents	mm	Detent
Driver Seat	240	24 (1 st as 0)	120 mm	12 th (1 st as 0)
Front Passenger Seat	240	24 (1 st as 0)	120 mm	12 th (1 st as 0)
Front Center Seat				
Struck Side Rear Seat	Fixed	Fixed	Fixed	Fixed
Non-Struck Side	Fixed	Fixed	Fixed	Fixed
Rear Center Seat	Fixed	Fixed	Fixed	Fixed

SEAT BACK ANGLE ADJUSTMENT

The driver's seat back is positioned to the manufacturer's designated design angle. The front passenger's seat back is positioned in a similar manner as the driver's seat back. The struck side rear seat back is fixed. The rear center and non-struck side rear outboard seat backs are also fixed.



Seat	Total Seat Back Angle Range		Test Position from Vertical	
	Degrees	Detents	Degrees	Detent
Driver Seat w/Seated Dummy	67.0		6.2	7 th (1 st as 0)
Front Passenger Seat	60.4		6.2	6 th (1 st as 0)
Front Center Seat				
Struck Side Rear Seat	Fixed	Fixed	16.2*	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	16.2*	Fixed
Rear Center Seat	Fixed	Fixed	16.2*	Fixed

*Seat back was fixed, angle measured on headrest post.

DATA SHEET NO. 2 (CONTINUED)
SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEM DATA

Test Vehicle: 2012 KIA Rio LX 4-Dr Sedan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MC0522
 Test Date: 3/13/2012

SEAT BELT ANCHORAGE ADJUSTMENT

Seat belt anchorages are adjusted in accordance with the information provided by the manufacturer on Form No. 1.

	Total # of Positions	Placed in Position #
Driver Seat	4 detents (1 st as 1)	0 (uppermost as 0)
Rear Seat	Fixed	Not Applicable

HEAD RESTRAINT ADJUSTMENT

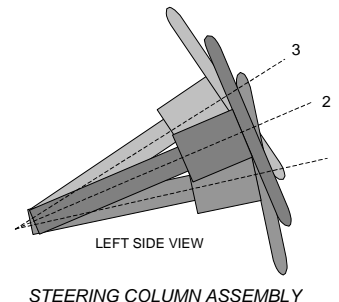
The driver's head restraint is adjusted to the highest and most full forward in-use position. The struck-side rear passenger's head restraint is adjusted to the lowest and most full forward in-use position.

	Total # of Positions	Placed in Position #
Driver Seat	6	Highest and Full-Forward
Rear Seat	3	Lowest

STEERING COLUMN ADJUSTMENT

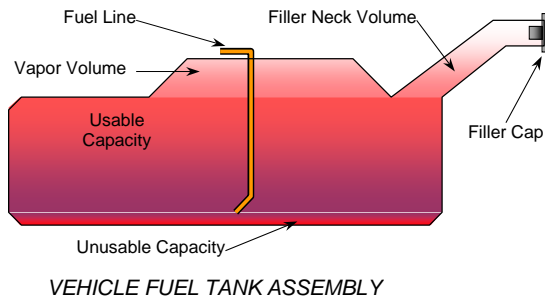
Steering wheel and column adjustments are made so that the steering wheel geometric locus is described when it moves through its full range of motion.

	Degrees	Fore/Aft Position (mm)
Lowermost, Position 1	67.2	
Geometric Center, Position 2	65.1	
Uppermost, Position 3	62.9	
Telescoping Steering Wheel Travel		
Test Position	65.1	



FUEL PUMP

Describe the fuel pump type, details about how it operates and the location of the fuel filler pipe. The vehicle is equipped with an electric fuel pump. Fuel pump will operate when engine system is normally operating. The fuel pipe is on the left side.



DATA SHEET NO. 2 (CONTINUED)
SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEM DATA

Test Vehicle: 2012 KIA Rio LX 4-Dr Sedan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MC0522
 Test Date: 3/13/2012

FUEL TANK CAPACITY DATA

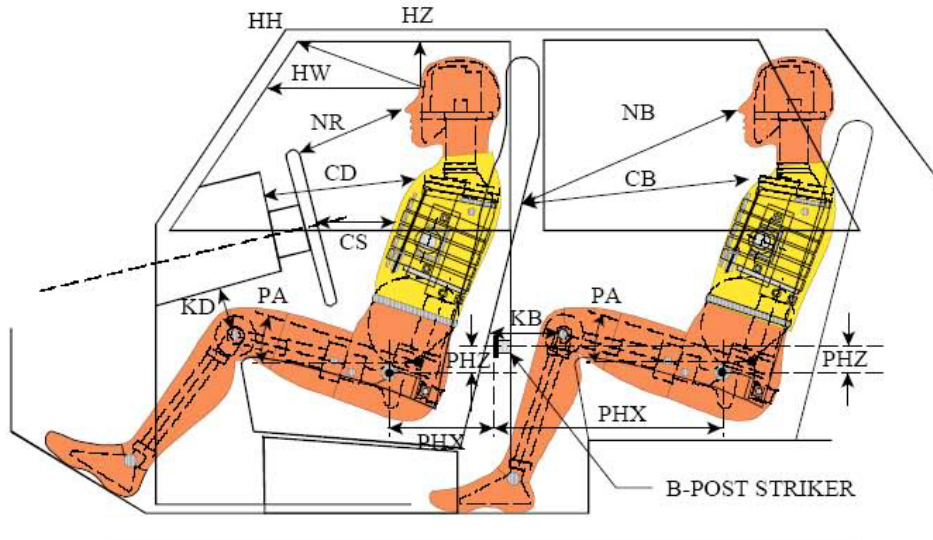
	Liters
Usable Capacity of "Standard" Tank (see Form No. 1)	42.8
Usable Capacity of "Optional" Tank (see Form No. 1)	
Usable Capacity of Standard Tank as Specified in Owner's Manual	43.0
Usable Capacity of Optional Tank as Specified in Owner's Manual	
93% of Usable Capacity	39.8
Actual Amount of Solvent Used	39.7
1/3 of Usable Capacity	14.3

Is the actual amount of solvent used in the test equal to 93% \pm 1%
 of the Usable Capacity stated in Form No. 1? **YES**

**DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS**

Test Vehicle: 2012 KIA Rio LX 4-Dr Sedan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MC0522
 Test Date: 3/13/2012



LEFT SIDE VIEW

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

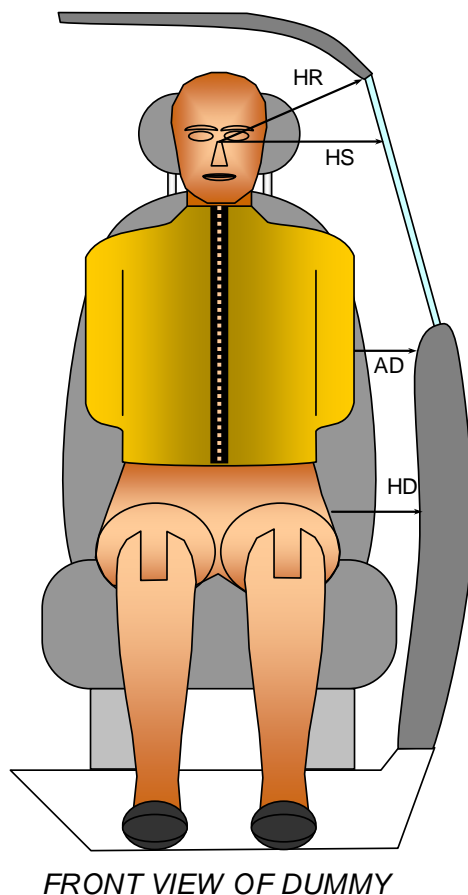
DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Pass. Code	Measurement Description	Driver S/N 032		Passenger S/N 296	
			Length (mm)	Angle(°)	Length (mm)	Angle(°)
HH		Head to Header	428	9.5		
HW		Head to Windshield	654			
HZ	HZ	Head to Roof Liner	158		274	
NR	NB	Nose to Rim/Seat Back	477	10.0	498	3.4
CD	CB	Chest to Dashboard/Seat Back	570	7.4	520	17.3
CS		Chest to Steering Wheel	377	9.2		
KDL	KBL	Left Knee to Dash/Seat Back	177	26.8	233	27.6
KDR	KBR	Right Knee to Dash/Seat Back	158	30.1	231	25.7
PAX	PAX	Pelvic Tilt Angle X		25.9		26.0
	PAY	Pelvic Tilt Angle Y		-1.2		-0.6
PHX	PHX	Hip Point to Striker (X-Axis)	183		245	
PHZ	PHZ	Hip Point to Striker (Z-Axis)	225		294	

**DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS**

Test Vehicle: 2012 KIA Rio LX 4-Dr Sedan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MC0522
 Test Date: 3/13/2012



FRONT VIEW OF DUMMY

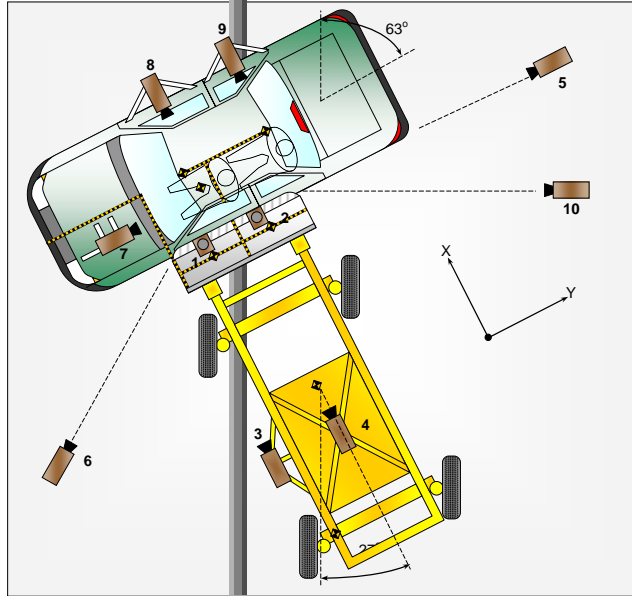
DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver S/N 032	Passenger S/N 296
HR	Head to Side Header	mm	173	241
HS	Head to Side Window	mm	318	360
AD	Arm to Door	mm	72	97
HD	Hip Point to Door	mm	141	173

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

Test Vehicle: 2012 KIA Rio LX 4-Dr Sedan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MC0522
 Test Date: 3/13/2012



CAMERA LOCATIONS AND DATA

No.	Camera View	Coordinates (mm)			Lens Length (mm)	Operating Frame Rate (fps)
		X*	Y*	Z*		
1	Overhead Overall	100	590	-4860	14	1000
2	Overhead Close-Up	100	470	-4860	20	1000
3	Left Impact Point (MDB)				50	1000
4	Side Overall (MDB)				16	1000
5	Rear	110	4630	-1090	24	1000
6	Left Front	2190	-4450	-1100	24	1000
7	Driver Front (OB)				16	1000
8	Driver Side (OB)				8	1000
9	Passenger Side (OB)				8	1000
10	Real Time Left Rear					30
11	Real Time Inrun					30

Reference: Impact Point projected to Ground; +X = To Front of MDB, +Y = To Right of MDB, +Z = Down

* All measurements accurate to ± 6 mm

Explain why camera(s) did not operate as intended: Not Applicable

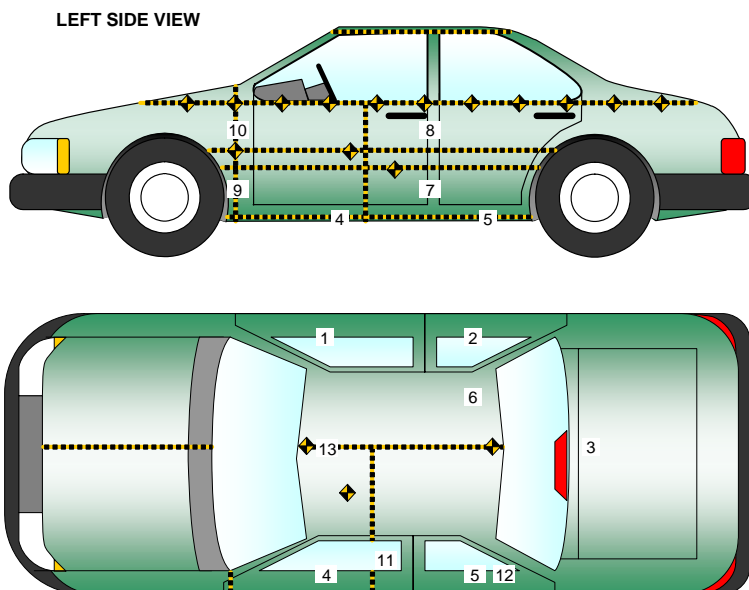
INSTRUMENTATION

Driver Dummy Channels	16
Passenger Dummy Channels	16
Vehicle Structure Accelerometers	23
MDB Accelerometers	5
MDB Contacts	2
Total	62

**DATA SHEET NO. 6
TEST VEHICLE ACCELEROMETER LOCATIONS**

Test Vehicle: 2012 KIA Rio LX 4-Dr Sedan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MC0522
 Test Date: 3/13/2012



TEST VEHICLE ACCELEROMETER LOCATIONS

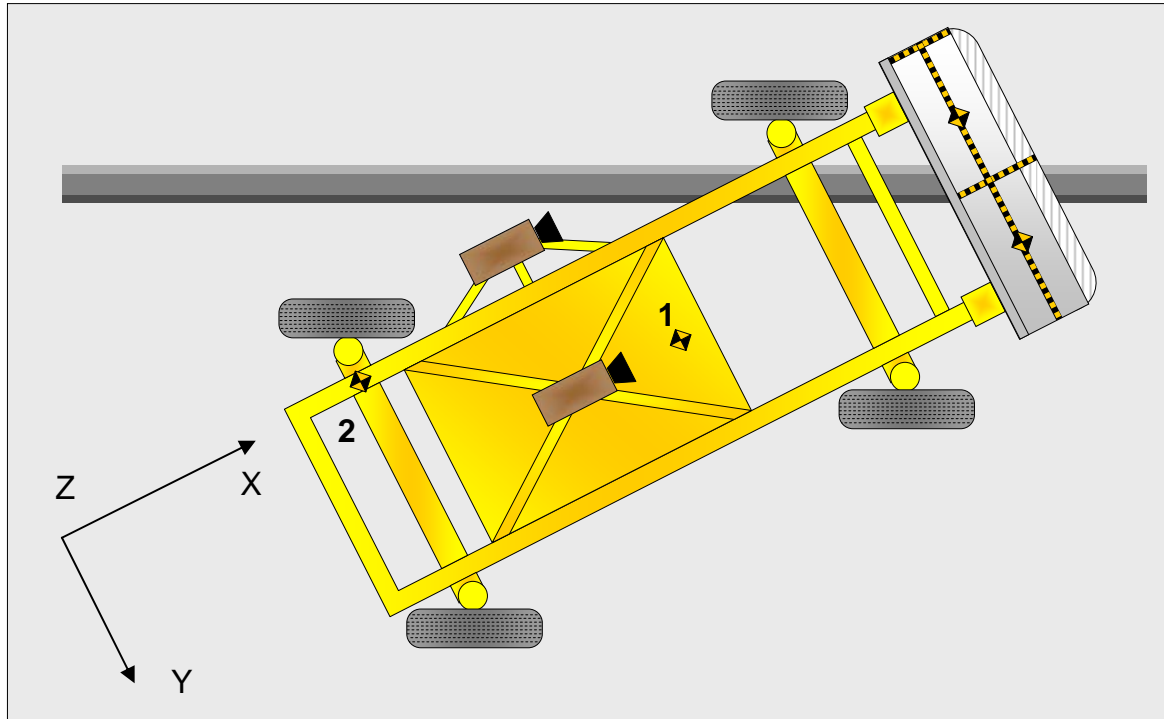
Accelerometer Location				
No.	ID	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2552	180	-162
2	Right Sill at Front Seat	2573	673	-185
3	Right Sill at Rear Seat	1618	673	-193
4	Left Sill at Front Door	2622	-673	-172
5	Left Sill at Rear Door	1629	-673	-176
6	Left Lower A-Post	3037	-689	-479
7	Left Middle A-Post	3089	-750	-724
8	Left Lower B-Post	1982	-673	-569
9	Left Middle B-Post	1931	-679	-761
10	Front Seat Track	2363	-545	-336
11	Rear Seat Structure	1744	-264	-373
12	Rt. Rear Occ. Compartment	1771	357	-190
13	Engine Block	3873	0	-767
14	Rear Above Axle	936	0	-510

Reference: X – Rear Surface of Vehicle (+ forward)
 Y - Vehicle Centerline (+ to right)
 Z - Ground Plane (+ down)

**DATA SHEET NO. 7
MDB ACCELEROMETER LOCATIONS**

Test Vehicle: 2012 KIA Rio LX 4-Dr Sedan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MC0522
 Test Date: 3/13/2012



MDB ACCELEROMETER LOCATIONS

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
POST-TEST OBSERVATIONS**

Test Vehicle: 2012 KIA Rio LX 4-Dr Sedan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MC0522
 Test Date: 3/13/2012

TEST DUMMY INFORMATION AND CONTACT POINTS

Description	Front Seat Dummy (ES-2re)	Rear Seat Dummy (SID-IIs)
Face	Curtain Airbag	Curtain Airbag
Top of Head	Curtain Airbag, Side Header	Curtain Airbag, Headliner
Left Side of Head	Curtain Airbag, Side Header	Curtain Airbag
Back of Head	Curtain Airbag, Side Header, Headrest	Curtain Airbag, Headliner, Mid Seatback
Left Shoulder	Side Airbag, Door Panel	Door Panel
Upper Torso	Side Airbag, Seatback	Door Panel, Door Trim
Lower Torso	Side Airbag, Seatback	Door Panel, Door Trim
Left Hip	Side Airbag	Door Panel, Seat Cushion
Left Knee	Door Panel	Door Panel

POST-TEST DOOR PERFORMANCE

Description	Struck Side		Non-Struck Side		Rear Hatch/ Other Door
	Front	Rear	Front	Rear	
Remained Closed and Operational	No	No	Yes	Yes	Yes
Total Separation from Vehicle at Hinges or Latches	No	No	No	No	No
Latch or Hinge Systems Pulled Out of Their Anchorages	No	No	No	No	No
Disengaged from Latched Position	No	No	No	No	No
Latch Separated from Striker	No	No	No	No	No
Jammed Shut	Yes	Yes	No	No	No
If Door Opened at Striker, Record Width of Opening at Striker (mm)	N/A	N/A	N/A	N/A	N/A

POST-TEST SEAT PERFORMANCE

Description	Struck Side		Non-Struck Side	
	Front	Rear	Front	Rear
Seat Movement Along Seat Track	No	No	No	No
Seat Disengagement from Floor Pan	No	No	No	No
Seat Back Movement from Initial Position	No	No	No	No
Seat Back Collapse	No	No	No	No

POST-TEST STRUCTURAL OBSERVATIONS

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

**DATA SHEET NO. 8 (CONTINUED)
POST-TEST OBSERVATIONS**

Test Vehicle: 2012 KIA Rio LX 4-Dr Sedan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MC0522
 Test Date: 3/13/2012

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Struck Side Driver		Struck Side Rear Passenger	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	No		
Knee Airbag	No			
Side Curtain Airbag	Yes	Yes	Yes	Yes
Side Torso/Abdomen/Pelvis Airbag	Yes	Yes	No	
Seat Belt Pretensioner	Yes	Yes	No	
Seat Belt Load Limiter	Yes		No	
Other				

IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vehicle Wheel Base	mm		2570
Vertical Impact Reference Line (Aft of Front Axle) (Intended Impact Point)	mm		345
Actual Impact Point (Aft of Front Axle)	mm		336
Horizontal Offset (+forward / -rearward)	mm	+/- 50 of intended impact point	+9
Vertical Offset (+down / -up)	mm	+/- 20 of intended impact point	+9

DATA SHEET NO. 9
MDB SUMMARY OF RESULTS

Test Vehicle: 2012 KIA Rio LX 4-Dr Sedan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MC0522
 Test Date: 3/13/2012

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 ANGLE AT IMPACT DATA

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	62.3
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	62.3
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	90.0
MDB Forward Line of Motion to Target Vehicle CL	degrees	62.5 to 63.5	63.3
MDB Crabbed Angle to MDB Forward Line of Motion	degrees	26 to 28	26.7

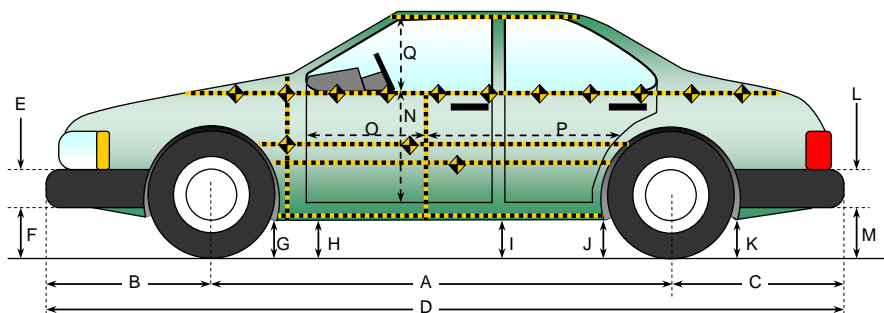
MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE

Row	Vertical Location		From Centerline		Maximum Crush
	Description	Height	Distance	Direction	
A	Center of Bumper	432	800	Left	165
B	Top of Bumper	533	800	Left	100
C	Mid-Level	686	800	Left	113
D	Top of Stack	813	800	Left	168

DATA SHEET NO. 10
TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2012 KIA Rio LX 4-Dr Sedan
Test Program: NCAP Side MDB Impact Test

NHTSA No. MC0522
Test Date: 3/13/2012



All measurements in (mm) with tolerance of ± 3 mm

LEFT SIDE VIEW

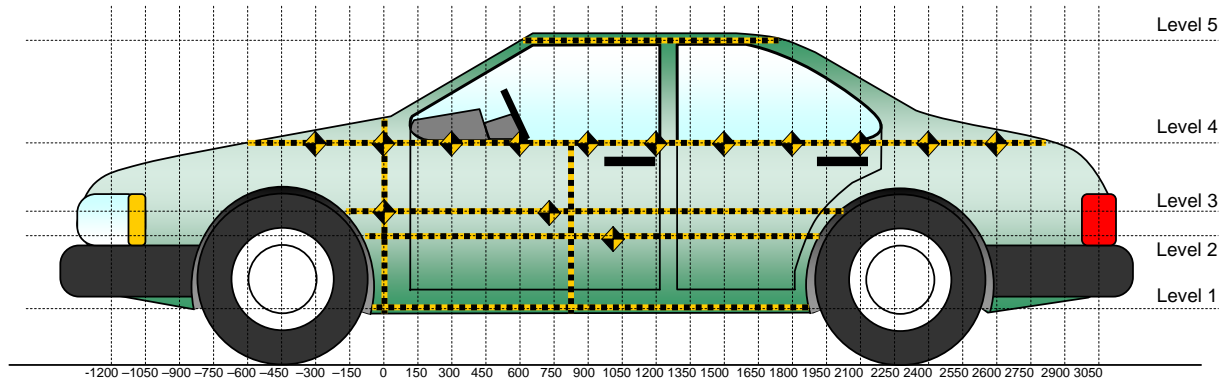
VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2570	2571	-1
B	Front Axle to FSOV	811	811	0
C	Rear Axle to RSOV	983	983	0
D	Total Length at Centerline	4364	4365	-1
E	Front Bumper Thickness	117	117	0
F	Front Bumper Bottom to Ground	158	158	0
G	Sill Height at Front Wheel Well	148	152	-4
H	Sill Height at Front Door Leading Edge	150	152	-2
I	Sill Height at B Pillar	157	168	-11
J1	Sill Height at Rear Wheel Well	153	159	-6
J2	Pinch Weld Height at Rear Wheel Well	152	158	-6
K	Sill Height Aft of Rear Wheel Well	208	195	13
L	Rear Bumper Thickness	166	166	0
M	Rear Bumper Bottom to Ground	300	322	-22
N	Sill Height to Window Bottom Sill	728	657	71
O	Front Door Leading Edge to Impact CL	766	750	16
P	Rear Door Trailing Edge to Impact CL	1124	1110	14
Q	Front Window Opening	407	375	32
R	Right Side Length	3244	3247	-3
S	Left Side Length	3244	3220	24
T	Vehicle Width at B Post	1709	1539	170

**DATA SHEET NO. 11
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS**

Test Vehicle: 2012 KIA Rio LX 4-Dr Sedan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MC0522
 Test Date: 3/13/2012



All Measurements Shown in mm

LEFT SIDE VIEW

MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Measurement Description	Height Above Ground (mm)	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	211	35	1650
2	Occupant Hip Point	513	218	600
3	Mid Door	592	236	600
4	Window Sill	841	235	1200
5	Window Top	1362	29	1650

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

DATA SHEET NO. 11 (CONTINUED)
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2012 KIA Rio LX 4-Dr Sedan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MC0522
 Test Date: 3/13/2012

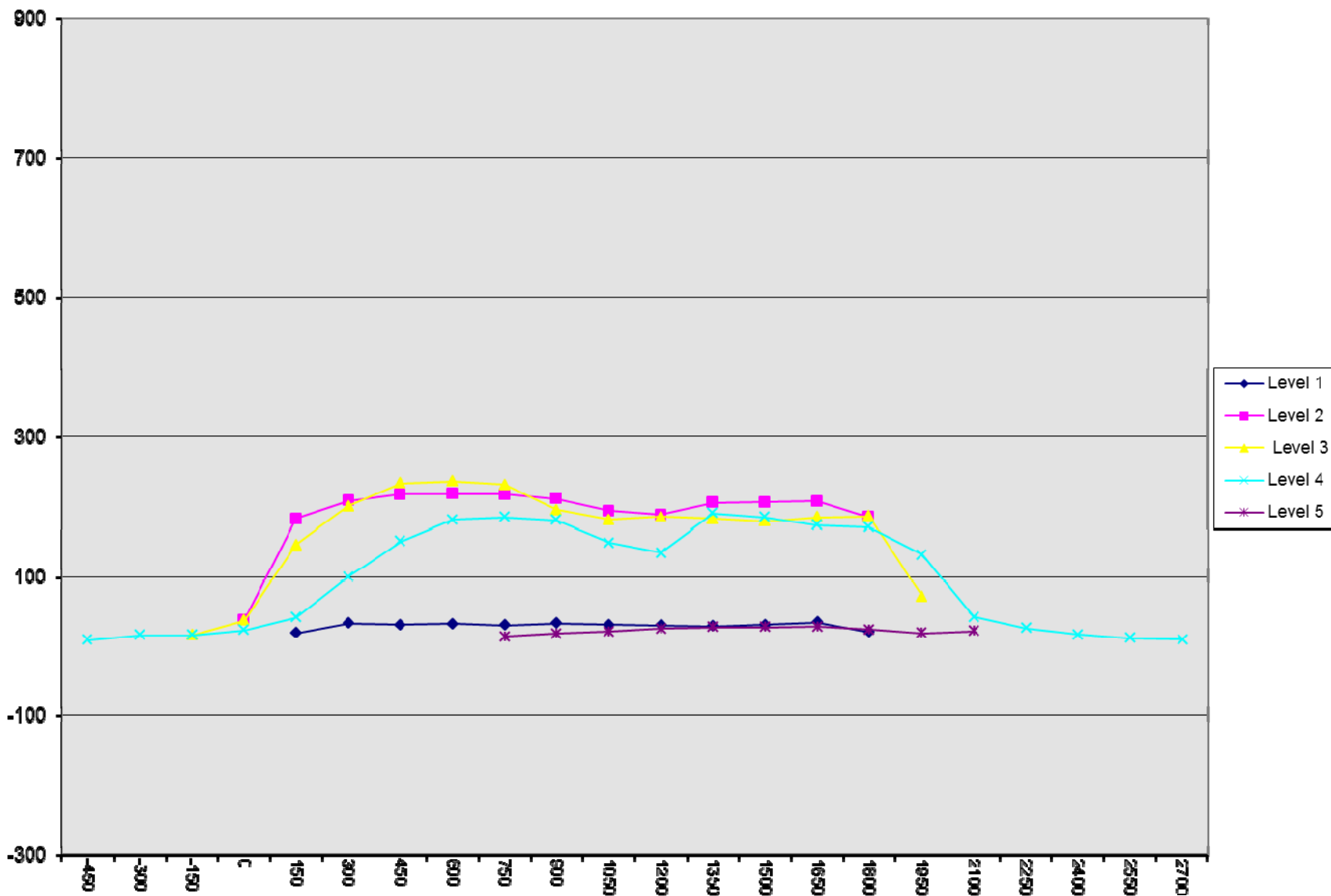
	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-450				358					368					10	
-300				338					355					17	
-150			241	324				258	341				17	17	
0		245	252	314			284	290	338			39	38	24	
150	301	258	257	302		321	440	403	344		20	182	146	42	
300	308	257	254	292		342	465	454	392		34	208	200	100	
450	308	259	250	284		340	476	483	435		32	217	233	151	
600	307	260	254	276		340	478	490	457		33	218	236	181	
750	307	261	254	270	513	338	478	485	454	528	31	217	231	184	15
900	304	263	255	265	505	338	474	450	445	524	34	211	195	180	19
1050	304	265	257	271	504	336	458	438	420	526	32	193	181	149	22
1200	304	265	260	260	504	335	453	445	395	530	31	188	185	135	26
1350	305	265	262	260	505	335	470	444	450	533	30	205	182	190	28
1500	305	265	264	263	510	337	471	443	447	538	32	206	179	184	28
1650	306	264	266	267	515	341	471	450	440	544	35	207	184	173	29
1800	296	255	263	274	522	317	439	449	444	547	21	184	186	170	25
1950			245	279	539			317	411	559			72	132	20
2100				286	565				329	588				43	23
2250				297					324					27	
2400				305					323					18	
2550				318					331					13	
2700				336					347					11	

NOTE: Pre-test measurements are taken when the vehicle is in the "As Tested" weight condition. Vehicle measurements forward of the vertical impact reference line are negative. The crush profile grid is established prior to the test based on an estimated impact point.

DATA SHEET NO. 11 (CONTINUED)
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2012 KIA Rio LX 4-Dr Sedan
 Test Program: NCAP Side MDB Impact Test

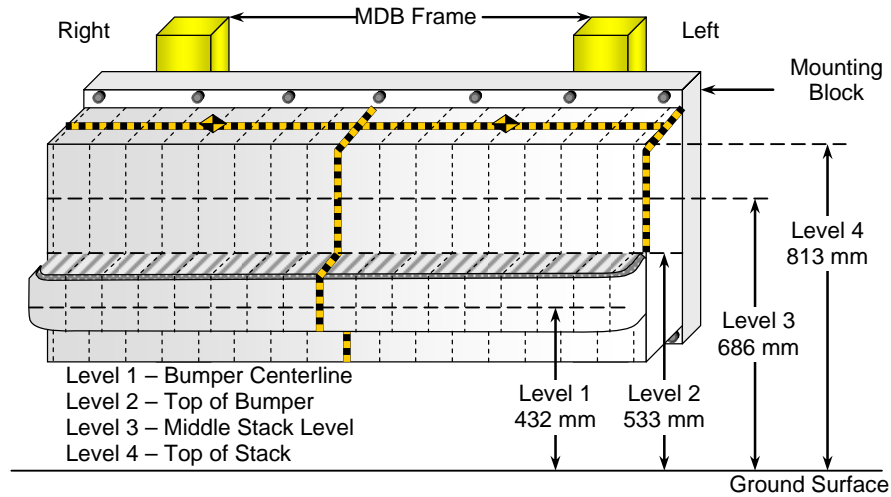
NHTSA No. MC0522
 Test Date: 3/13/2012



DATA SHEET NO. 12
MDB EXTERIOR STATIC CRUSH MEASUREMENTS

Test Vehicle: 2012 KIA Rio LX 4-Dr Sedan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MC0522
 Test Date: 3/13/2012



FRONT VIEW

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
4	26	25	23	19	29	66	85	79	58	21	17	19	23	24	65	122	168
3	40	25	15	13	15	19	37	37	24	13	11	13	15	19	25	56	113
2	93	87	74	75	70	67	60	60	50	47	53	59	60	64	75	86	100
1	160	155	148	145	145	145	138	131	121	113	108	104	104	106	118	142	165

DATA SHEET NO. 13
FMVSS 301 FUEL SYSTEM INTEGRITY POST-IMPACT DATA

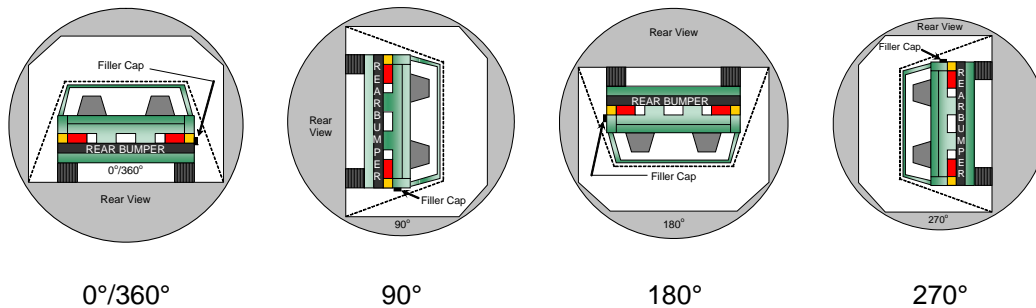
Test Vehicle: 2012 KIA Rio LX 4-Dr Sedan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MC0522
 Test Date: 3/13/2012

Test Time: 10:16 am Temperature: 21.1° C

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

FMVSS 301 STATIC ROLLOVER DATA



ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	118	300	418
90° to 180°	115	300	415
180° to 270°	106	300	406
270° to 360°	116	300	416

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

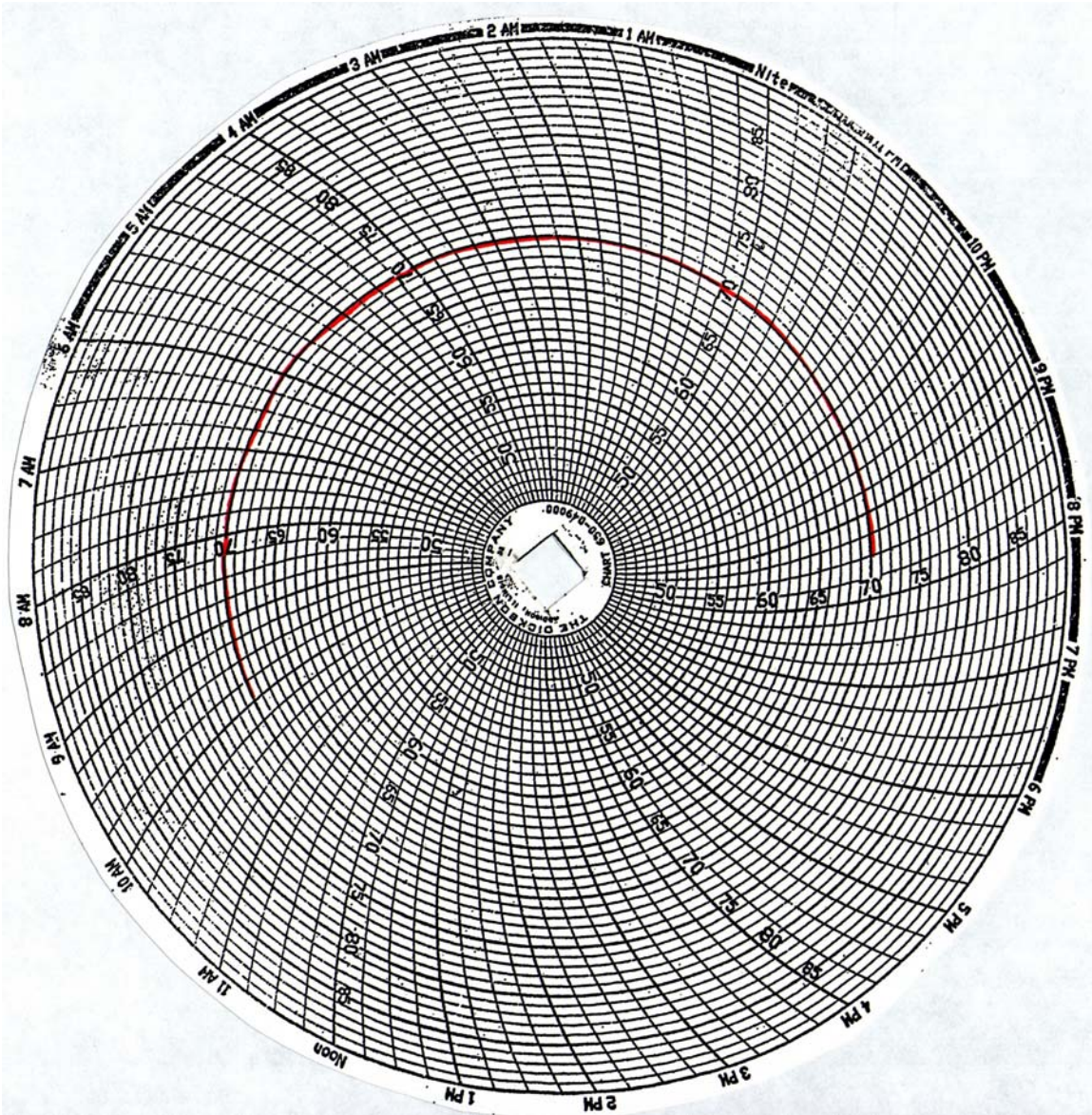
ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

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

DATA SHEET NO. 14
DUMMY/VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION DATA

Test Vehicle: 2012 KIA Rio LX 4-Dr Sedan
Test Program: NCAP Side MDB Impact Test

NHTSA No. MC0522
Test Date: 3/13/2012



APPENDIX A
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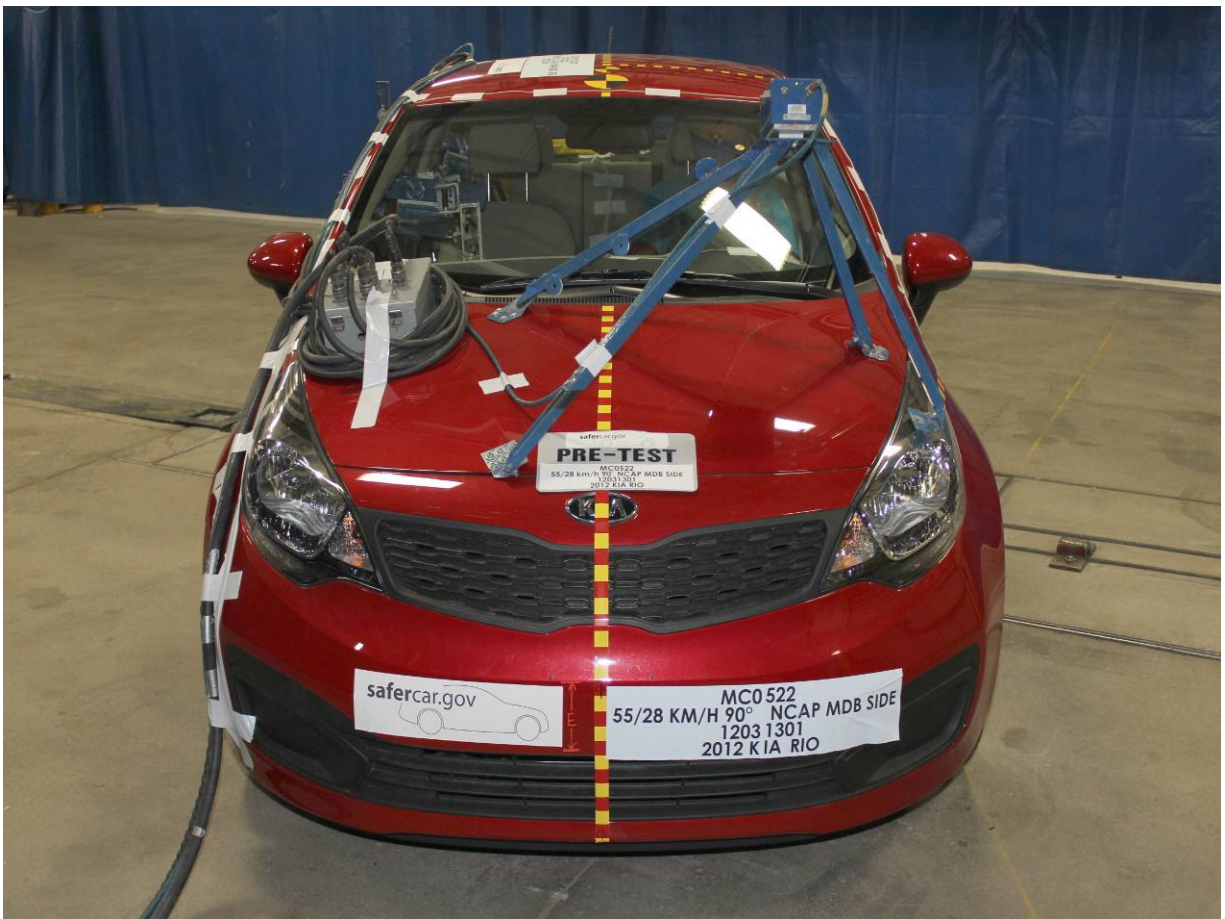
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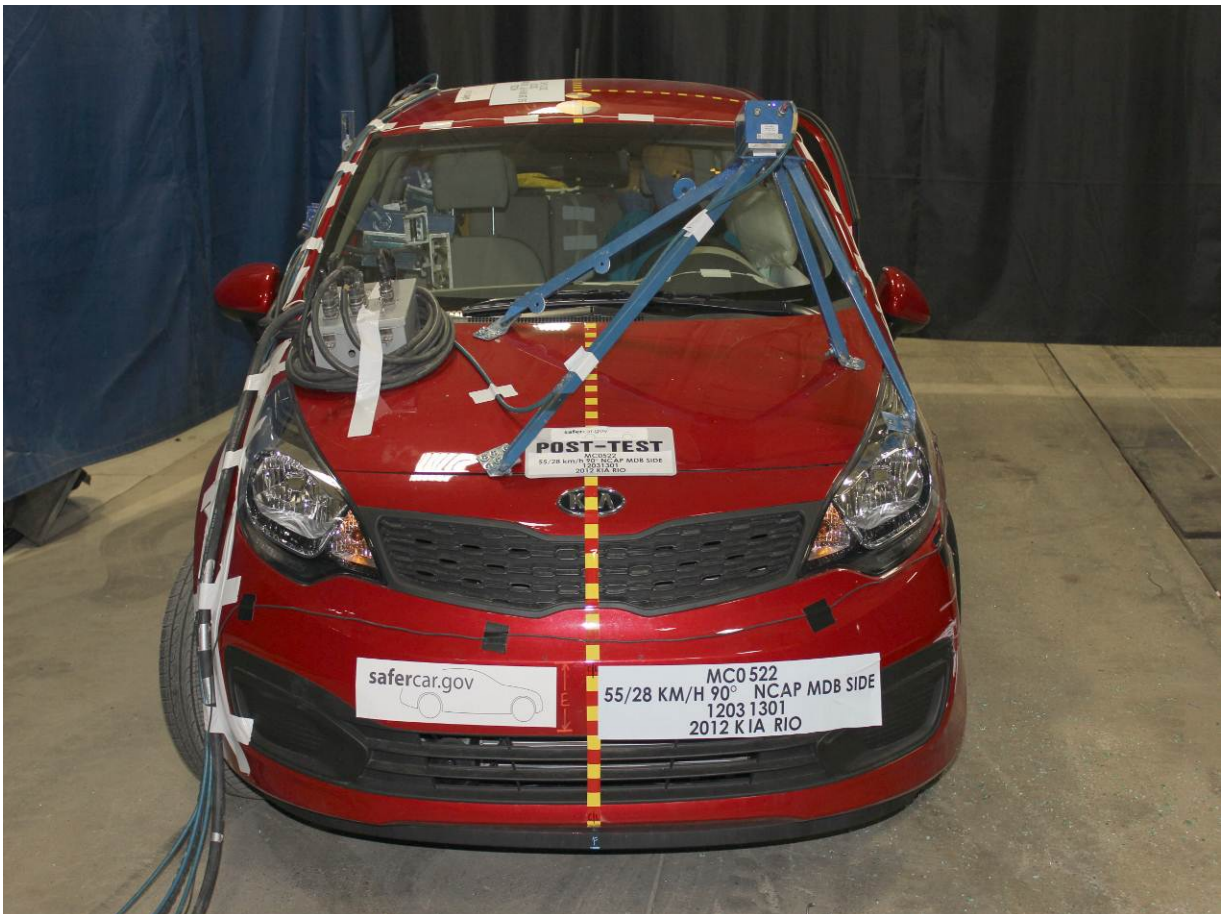
As Delivered Right Front Three-Quarter View of Test Vehicle



As Delivered Left Rear Three-Quarter View of Test Vehicle



Pre-Test Frontal View of Test Vehicle



Post-Test Frontal View of Test Vehicle



Pre-Test Left Front Three-Quarter View of Test Vehicle



Post-Test Left Front Three-Quarter View of Test Vehicle



Pre-Test Left Side View of Test Vehicle



Post-Test Left Side View of Test Vehicle



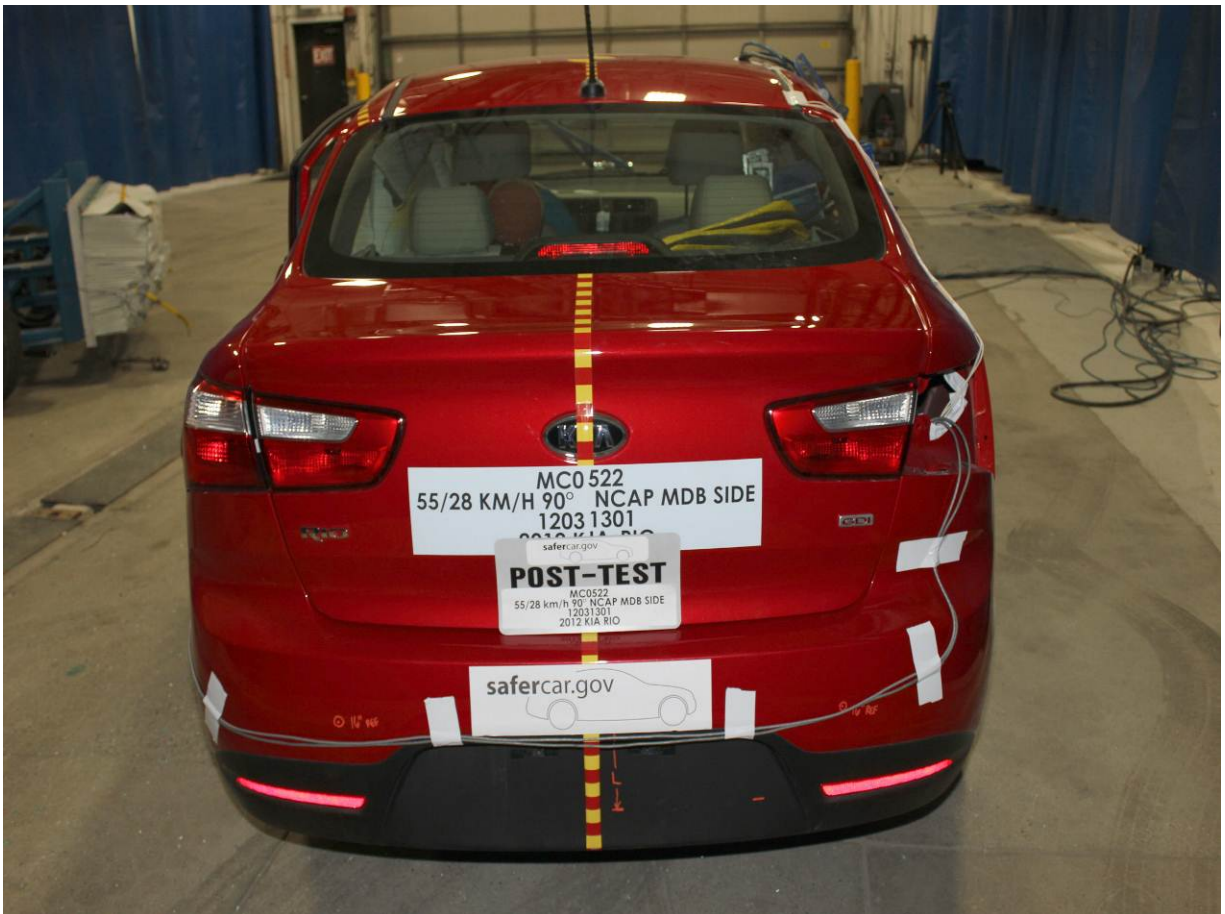
Pre-Test Left Three-Quarter Rear View of Test Vehicle



Post-Test Left Three-Quarter Rear View of Test Vehicle



Pre-Test Rear View of Test Vehicle



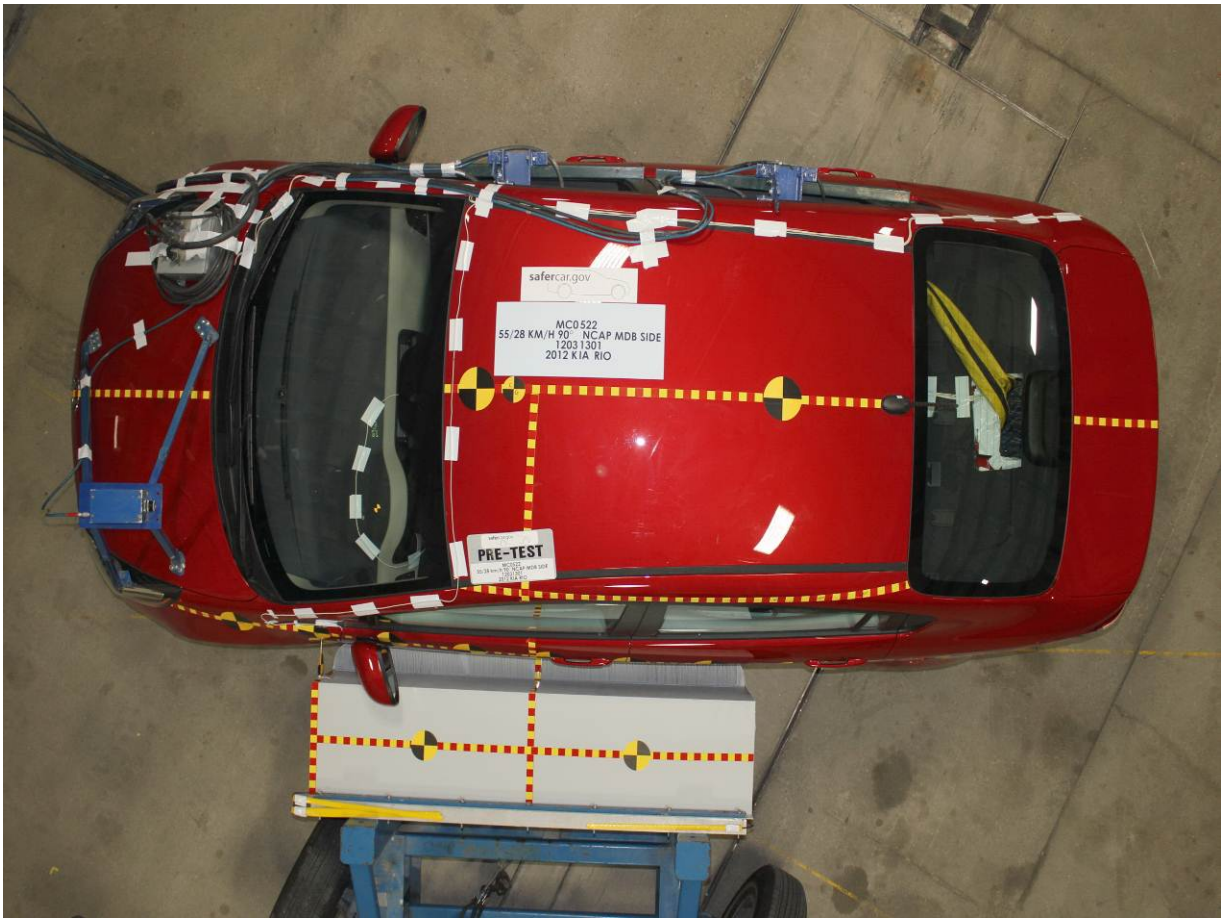
Post-Test Rear View of Test Vehicle



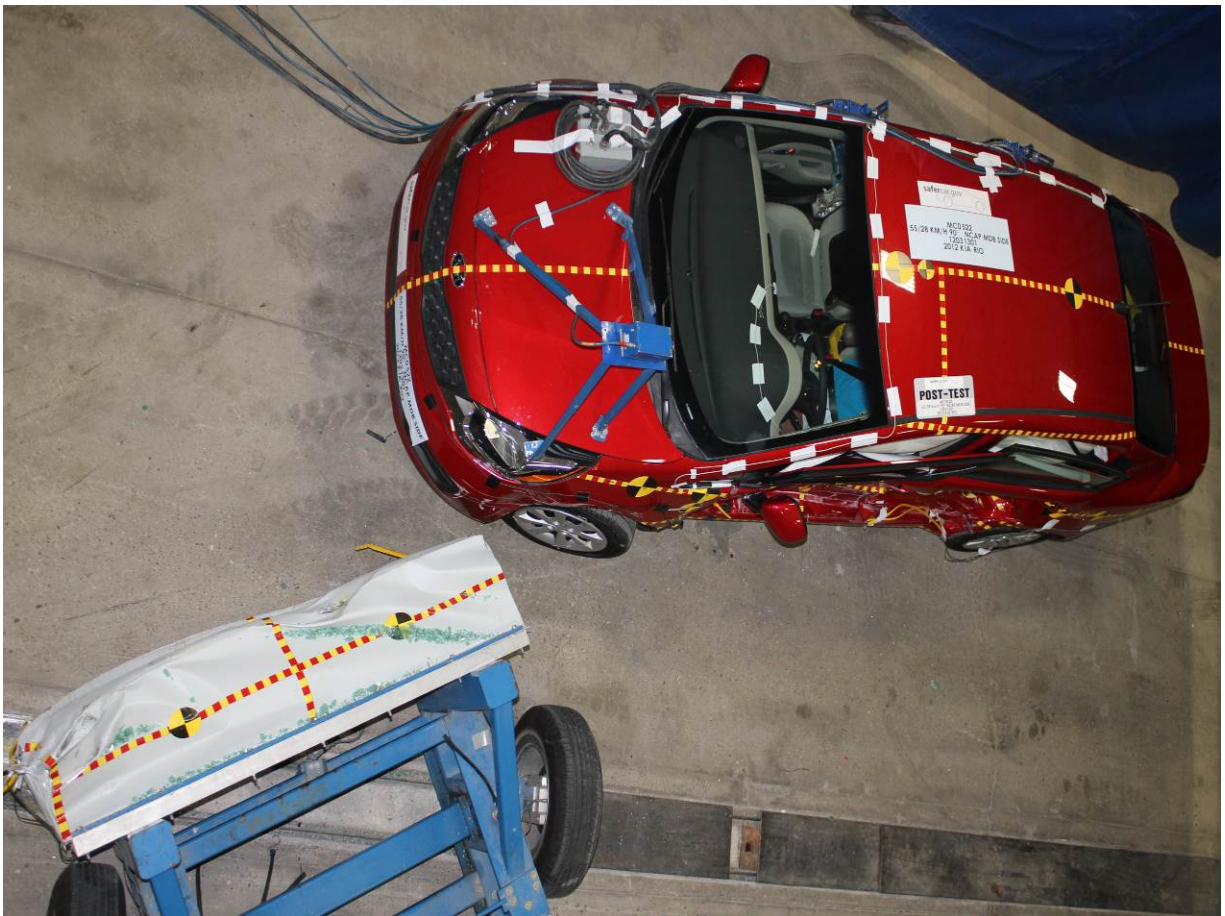
Pre-Test Right Side View of Test Vehicle



Post-Test Right Side View of Test Vehicle



Pre-Test Overhead View of Test Area



Post-Test Overhead View of Test Area



Pre-Test Left Side View of MDB Positioned Against Side of Test Vehicle



Pre-Test Right Side View of MDB Positioned Against Side of Test Vehicle



Pre-Test Close-Up View of Impact Point Target



Post-Test Close-Up View of Impact Point Target



Pre-Test Left Front Door Latch Close-Up



Post-Test Left Front Door Latch Close-Up



Pre-Test Left Rear Door Latch Close-Up



Post-Test Left Rear Door Latch Close-Up



Pre-Test Front Close-Up View of Driver Dummy



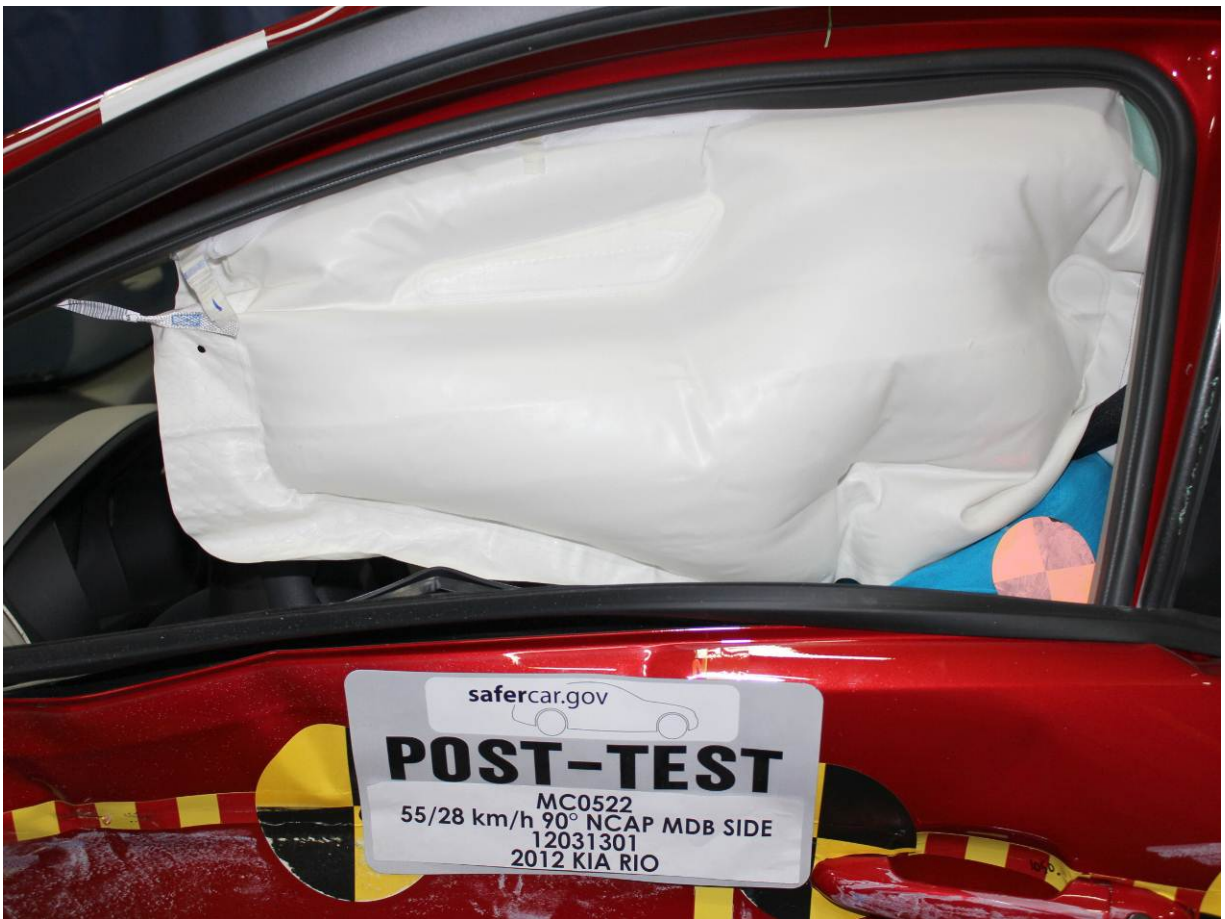
Post-Test Front Close-Up View of Driver Dummy



Pre-Test Left Side View of Driver Dummy Showing Belt and Chalking



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 Frontal View of Driver Seat Back Prior to Dummy Positioning



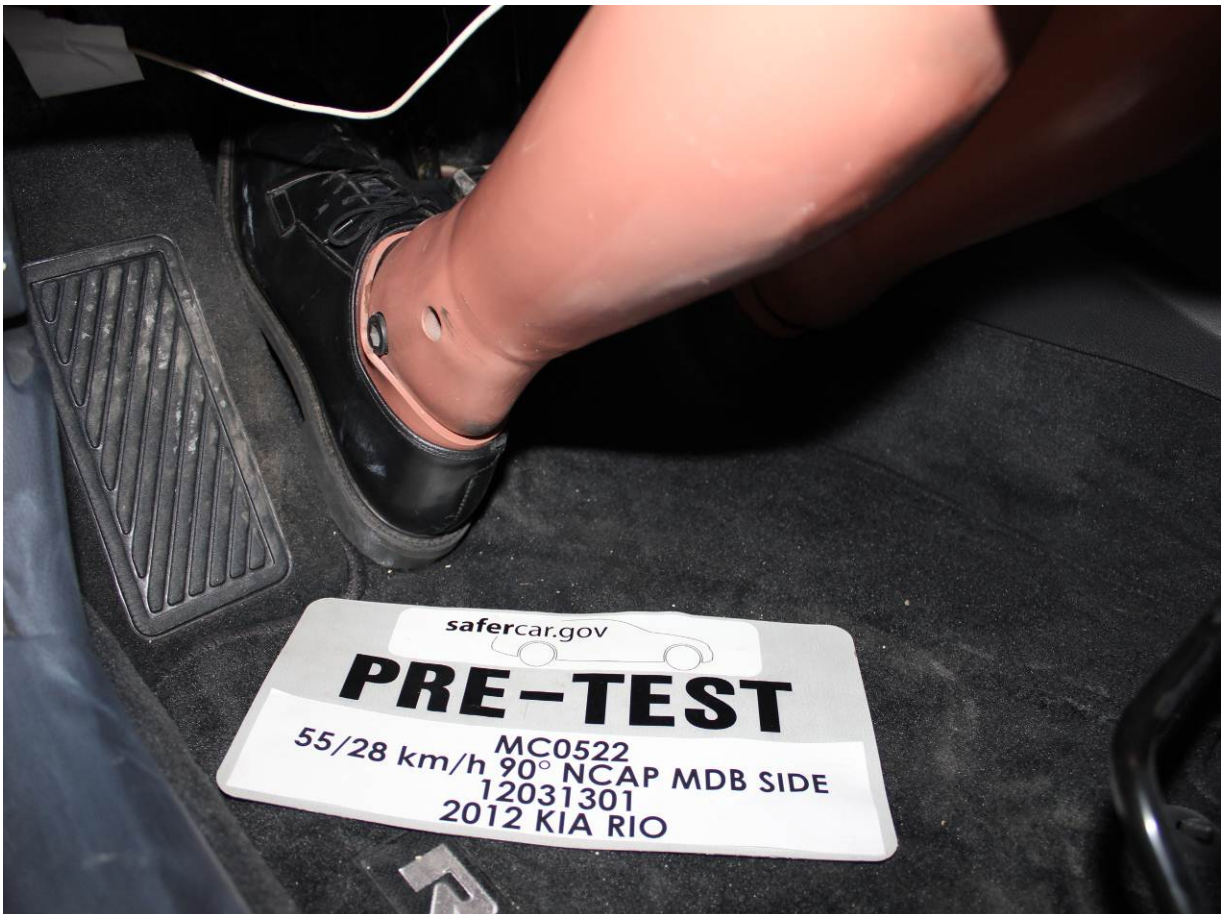
Pre-Test Frontal View of Driver Dummy Head and Shoulders in Relation to Head Restraint



Pre-Test Frontal View of Driver Seat Pan Prior to Dummy Positioning



Pre-Test Overhead View of Driver Dummy Thighs on Seat Pan



Pre-Test Placement of Driver Dummy's Feet



Pre-Test View of Belt Anchorage for Driver Dummy



Pre-Test Left Side View of Steering Wheel



Pre-Test View of Disengaged Parking Brake



Pre-Test View of Parking Brake



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



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



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



Pre-Test Driver Dummy and Door Clearance View



Post-Test Driver Dummy and Door Clearance View



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



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



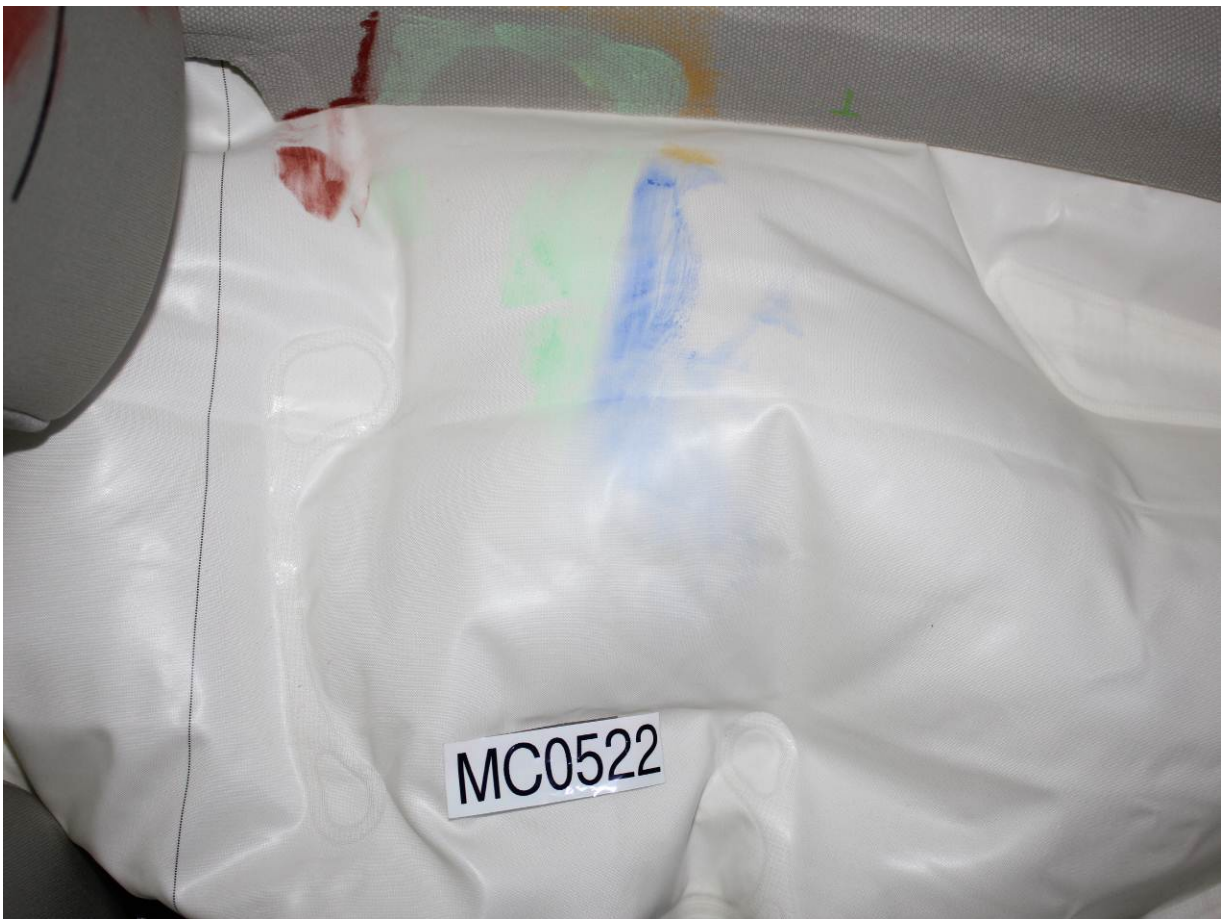
Pre-Test Driver Inner Door Panel View



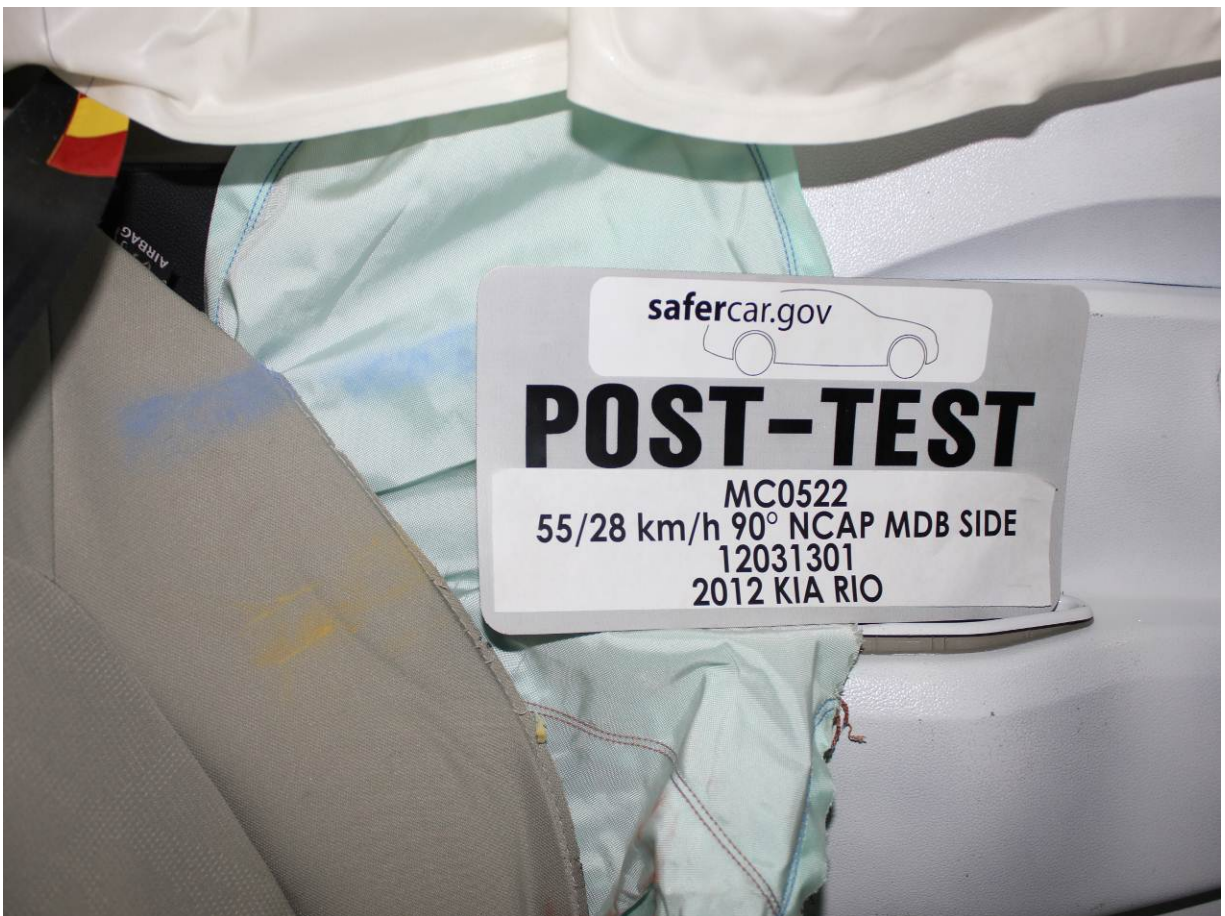
Post-Test Driver Inner Door Panel View



Post-Test Driver Dummy Close-up Head Contact with Vehicle Interior View



Post-Test Driver Dummy Close-up Head Contact with Side Airbag View



Post-Test Driver Dummy Close-up Torso Contact with Vehicle Interior View



Post-Test Driver Dummy Close-up Torso Contact with Side Airbag View



Post-Test Driver Dummy Close-up Pelvis Contact with Vehicle Interior View



Post-Test Driver Dummy Close-up Pelvis Contact with Side Airbag View



Pre-Test Left Side View of Rear Passenger Dummy Showing Belt and Chalking



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



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



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



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



Pre-Test Overhead View of Rear Passenger Seat Pan Prior to Dummy Positioning



Pre-Test Overhead View of Rear Passenger Dummy Thighs on Seat Pan



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



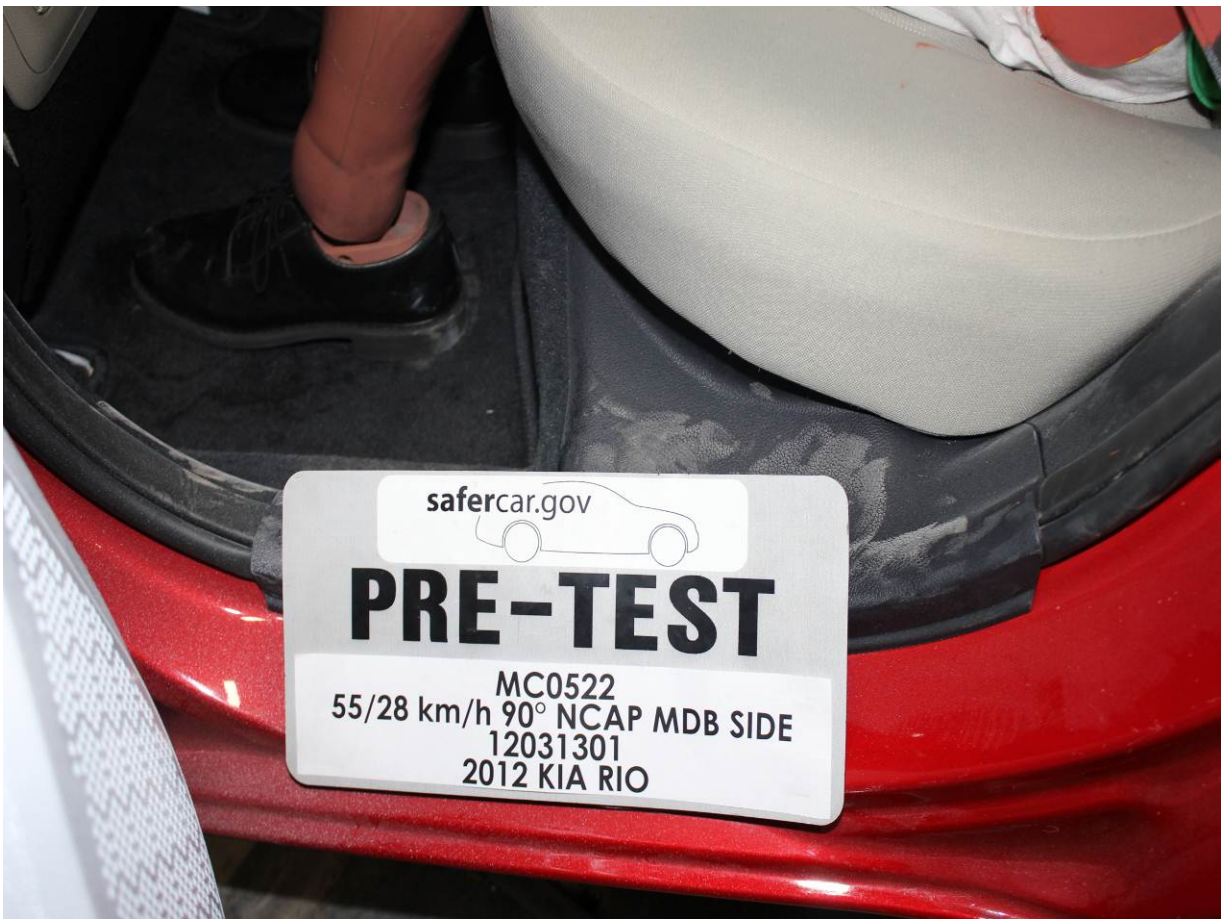
Pre-Test View of Rear Passenger Dummy's Head Showing Dummy's Head is Level



Pre-Test Placement of Rear Passenger Dummy's Feet



Pre-Test View of Belt Anchorage for Rear Passenger Dummy



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



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



Pre-Test Close-up View of Rear Passenger Seat Back or Head Restraint



Pre-Test Rear Passenger Dummy and Door Clearance View



Post-Test Rear Passenger Dummy and Door Clearance View



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



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



Pre-Test Rear Passenger Inner Door Panel View



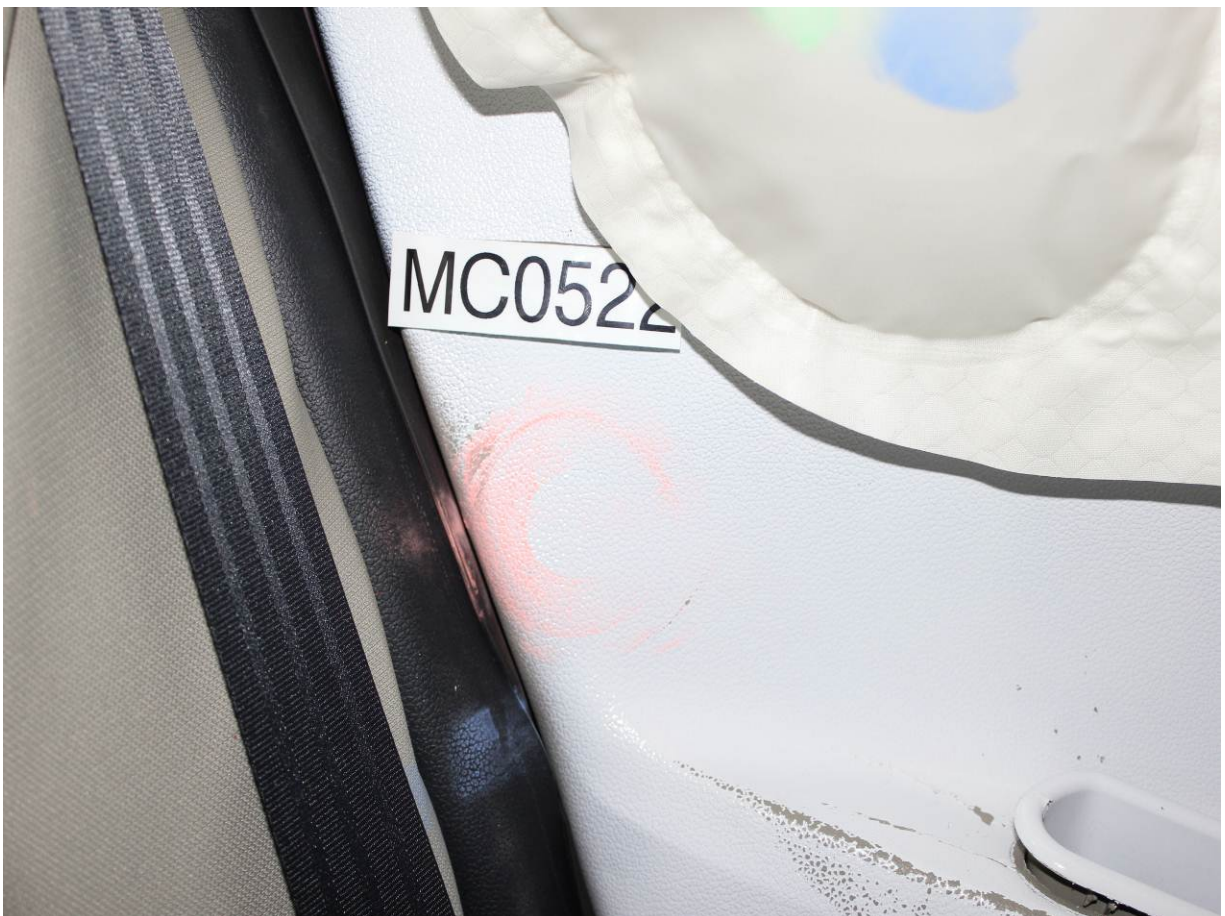
Post-Test Rear Passenger Inner Door Panel View



Post-Test Rear Passenger Dummy Close-up Head Contact with Vehicle Interior View



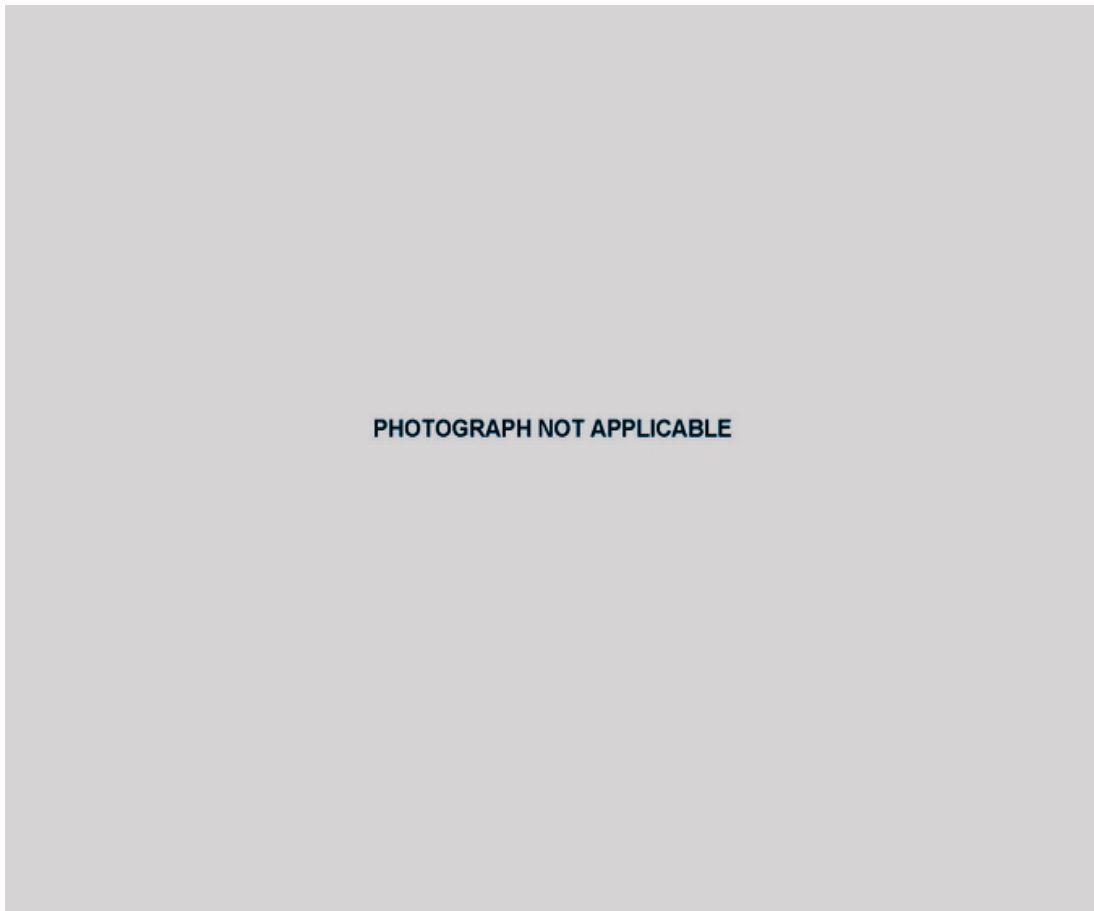
Post-Test Rear Passenger Dummy Close-up Head Contact with Side Airbag View



Post-Test Rear Passenger Dummy Close-up Torso Contact with Vehicle Interior View



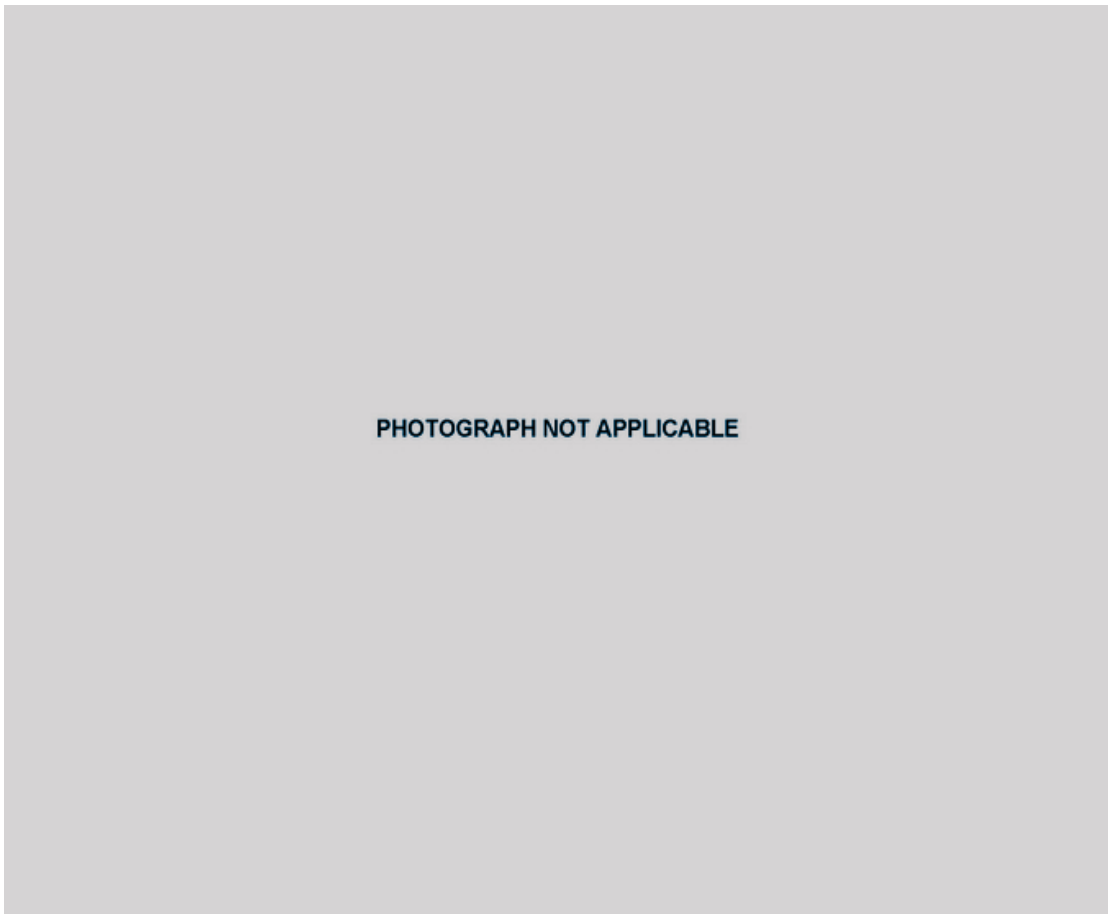
Post-Test Rear Passenger Dummy Close-up Torso Contact with Vehicle Interior View



Post-Test Rear Passenger Dummy Close-up Torso Contact with Side Airbag View



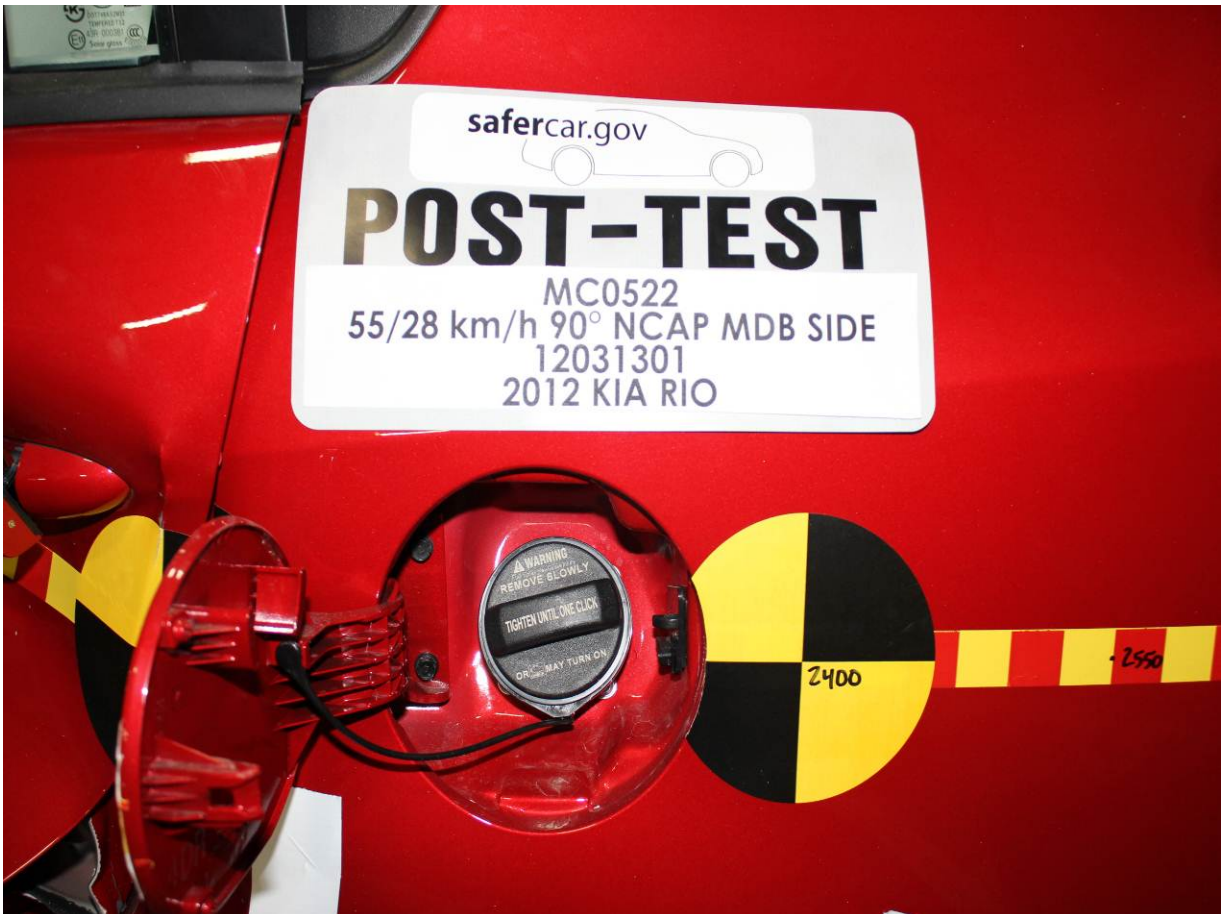
Post-Test Rear Passenger Dummy Close-up Pelvis Contact with Vehicle Interior View



Post-Test Rear Passenger Dummy Close-up Pelvis Contact with Side Airbag View



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



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



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



Close-Up View of Vehicle's Certification Label



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



Pre-Test Ballast View



Post-Test Primary and Redundant Speed Trap Read-Out



MC0522
55/28 km/h 90° NCAP MDB SIDE
12031301
2012 KIA RIO

FMVSS No. 301 Static Rollover 0 Degrees



MC0522
55/28 km/h 90° NCAP MDB SIDE
12031301
2012 KIA RIO

FMVSS No. 301 Static Rollover 90 Degrees



MC0522
55/28 km/h 90° NCAP MDB SIDE
12031301
2012 KIA RIO

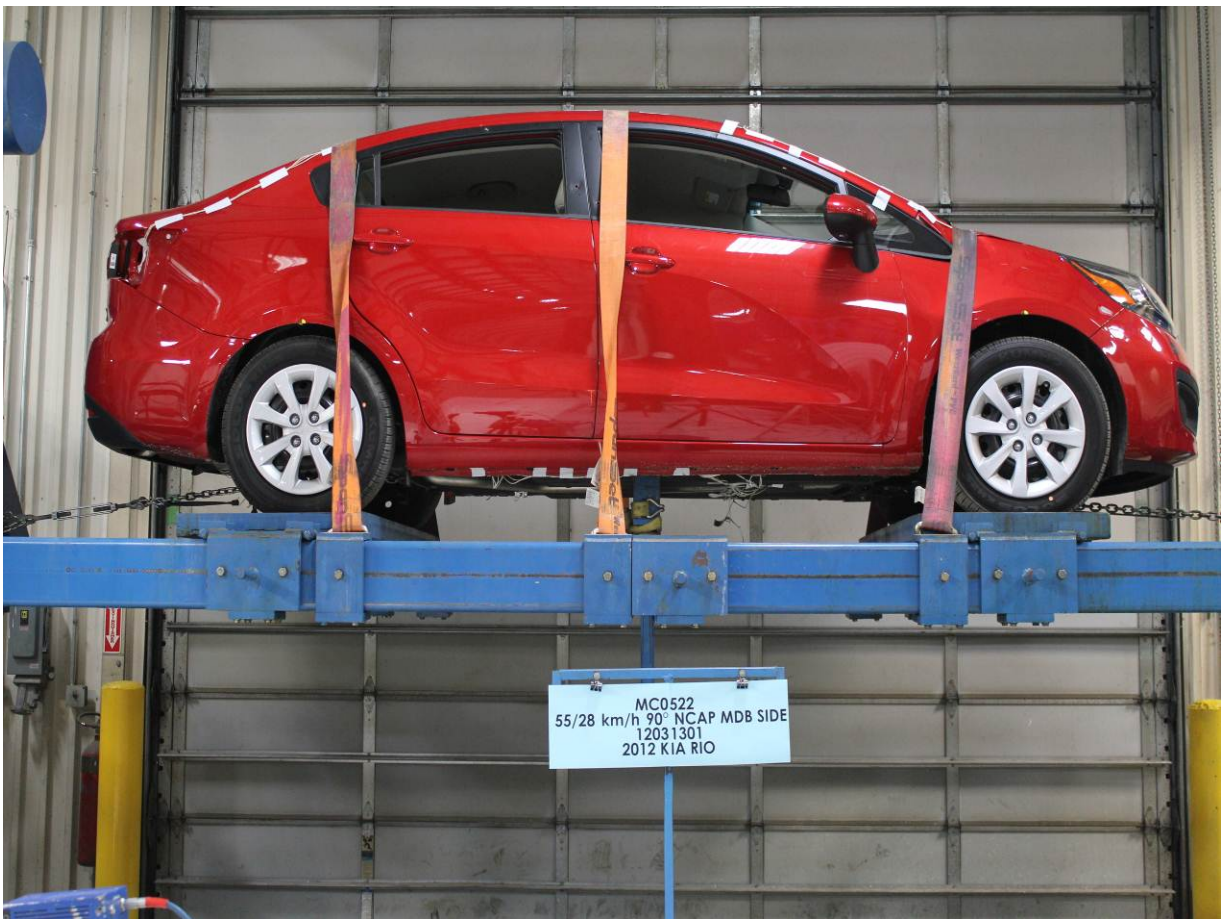
FMVSS No. 301 Static Rollover 180 Degrees



MC0522
55/28 KM/H 90° NCAP MDB SIDE
12031301
2012 KIA R

MC0522
55/28 km/h 90° NCAP MDB SIDE
12031301
2012 KIA RIO





FMVSS No. 301 Static Rollover 270 Degrees



FMVSS No. 301 Static Rollover 360 Degrees

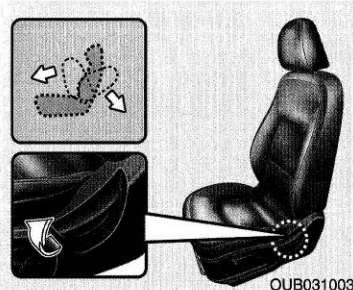


Impact Event

		2012 31422 KIA RIO LX MODEL YEAR MODEL MODEL DESCRIPTION SIGNAL RED/BEIGE EXTERIOR / INTERIOR COLOR KNADM4A3AC055684 G4FDBS21 VEHICLE NUMBER ENGINE NUMBER TACOMA TRUCK PORT OF ENTRY MODE OF TRANSPORTATION	SOLD TO: W1027 BOUCHER KIA 8730 N. 91ST STREET MILWAUKEE WI 53224	SHIP TO: W1027
STANDARD FEATURES MECHANICAL 1.6L Gas Direct Injection 4-cyl Engine 6-Speed Automatic Transmission Electric Power Steering 15" Steel Wheels with Wheel Covers SAFETY Dual Front Advanced Airbags Front Seat-Mounted Side Airbags Full-Length Side Curtain Airbags 3-Point Seatbelts for All Seating Positions Lower Anchors and Tethers for Children (LATCH) Anti-Lock Brake System (ABS) Traction Control System (TCS) Electronic Stability Control (ESC) Vehicle Stability Management (VSM) Hill Assist Control (HAC) INTERIOR Air Conditioning AM/FM/CD/MP3 Audio System SIRIUS Satellite Radio w/ free 3-mo. subscription** USB & Auxiliary Input Jacks Multi-Adjustable Driver's Seat 60/40 Split Folding Rear Seats Tilt Steering Column Steering Wheel Mounted Audio Controls Trip Computer EXTERIOR Body Color Power Heated Outside Mirrors Body Color Door Handles Variable Intermittent Front Wipers 10 YEAR/100,000 MILE LIMITED POWERTRAIN WARRANTY 5 YEAR/60,000 MILE 5 Year/60,000 Mile Roadside Assistance ** Ask dealer for details		MANUFACTURER'S SUGGESTED RETAIL PRICE → \$14,500.00 ADDITIONAL INSTALLED EQUIPMENT: (In addition to or in place of standard features) Carpeted Floor Mats \$95.00 Cargo Net \$50.00 MSRP INCLUDING OPTIONS \$14,645.00 INLAND FREIGHT AND HANDLING \$750.00 TOTAL MANUFACTURER'S SUGGESTED RETAIL PRICE → \$15,395.00 <small>Manufacturer's suggested retail price includes manufacturer's recommended pre-delivery service. License and title fees, state and local taxes and other dealer installed options and accessories are not included in the manufacturer's suggested retail price.</small>		
GOVERNMENT SAFETY RATINGS This vehicle has not been rated by the government for frontal crash, side crash or rollover risk. Source: National Highway Traffic Safety Administration (NHTSA). www.safercar.gov or 1-888-327-4236		PARTS CONTENT INFORMATION FOR VEHICLES IN THIS CAR LINE U.S./CANADIAN PARTS CONTENT: 1% MAJOR SOURCES OF FOREIGN PARTS: KOREA: 95% NOTE: PARTS CONTENT DOES NOT INCLUDE FINAL ASSEMBLY, DISTRIBUTION, OR OTHER NON-PARTS COSTS. FOR THIS VEHICLE FINAL ASSEMBLY POINT: KOREA COUNTRY OF ORIGIN ENGINE: KOREA TRANSMISSION: KOREA		
Environmental Performance Protect the environment, choose vehicles with higher scores: Global Warming Score 9 Smog Score 5   <small>Using alternative fuels may improve scores. See www.DriveClean.ca. Vehicle emissions are a primary contributor to global warming and smog. Scores are determined by the California Air Resources Board based on this vehicle's measured emissions. Please visit www.DriveClean.ca for more information.</small>		EPA Fuel Economy Estimates <small>These estimates reflect new EPA methods beginning with 2008 models.</small> CITY MPG 30 Expected range for most drivers 24 to 36 MPG Estimated Annual Fuel Cost \$1682.00 <small>based on 15,000 miles at \$3.70 per gallon</small> Highway MPG 40 Expected range for most drivers 33 to 47 MPG Combined Fuel Economy This Vehicle 33 ALL COMPACT CARS Your actual mileage will vary depending on how you drive and maintain your vehicle.		
TOTAL ADDITIONAL WEIGHT: 6.4 				

Monroney Label

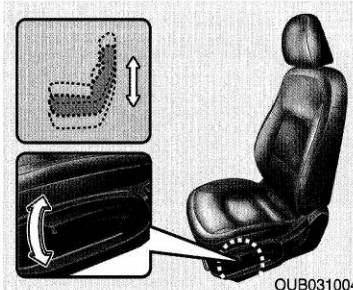
Safety features of your vehicle



Seatback angle

To recline the seatback:

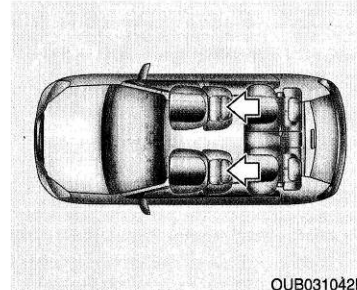
1. Lean forward slightly and lift up the seatback recline lever.
2. Carefully lean back on the seat and adjust the seatback of the seat to the position you desire.
3. Release the lever and make sure the seatback is locked in place. (The lever MUST return to its original position for the seatback to lock.)



Seat height (if equipped) (for driver's seat)

To change the height of the seat, move the lever upwards or downwards.

- To lower the seat cushion, push down the lever several times.
- To raise the seat cushion, pull up the lever several times.



Headrest

The driver's and front passenger's seats are equipped with a headrest for the occupant's safety and comfort.

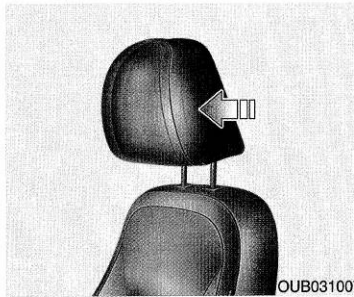
The headrest not only provides comfort for the driver and front passenger, but also helps protect the head and neck in the event of a collision.

For maximum effectiveness in case of an accident, the headrest should be adjusted so the middle of the headrest is at the same height of the center of gravity of an occupant's head. Generally, the center of gravity of most people's head is similar with the height of the top of their eyes. Also, adjust the headrest as close to your head as possible.

For this reason, the use of a cushion that holds the body away from the seatback is not recommended.

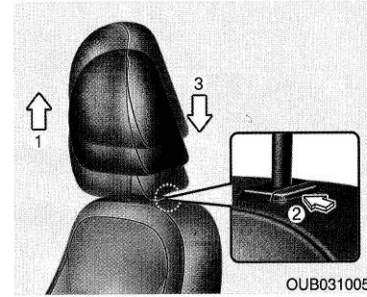
⚠ WARNING - Headrest removal/adjustment

- Do not operate the vehicle with the headrests removed. Headrests can provide critical neck and head support in a crash.
- Do not adjust the headrest height while the vehicle is in motion. Driver may lose control of the vehicle.



Forward and backward adjustment

The headrest may be adjusted forward to 4 different positions by pulling the headrest forward to the desired detent. To adjust the headrest to its furthest backwards position, pull it fully forward to the farthest position and release it. Adjust the headrest so that it properly supports the head and neck.

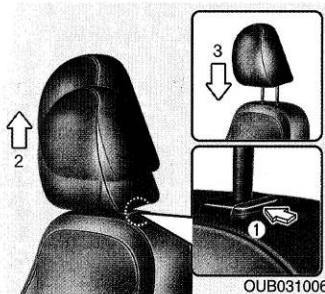


Adjusting the height up and down

To raise the headrest, pull it up to the desired position (1). To lower the headrest, push and hold the release button (2) on the headrest support and lower the headrest to the desired position (3).

3 | 6

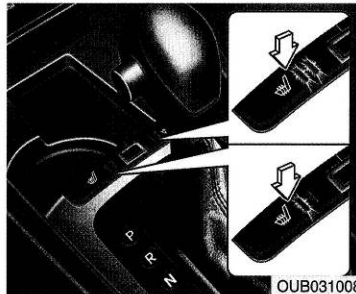
Driver Head Restraint Use and Adjustment Information from Vehicle Owner's Manual



Removal and installation

To remove the headrest, raise it as far as it can go then press the release button (1) while pulling the headrest up (2).

To reinstall the headrest, put the headrest poles (3) into the holes while pressing the release button (1). Then adjust it to the appropriate height.



Seat warmer (if equipped)

The seat warmers are provided to warm the front seats during cold weather. With the ignition switch in the ON position, push either of the switches to warm the driver's seat or the front passenger's seat.

During mild weather or under conditions where the operation of the seat warmer is not needed, keep the switches in the OFF position.

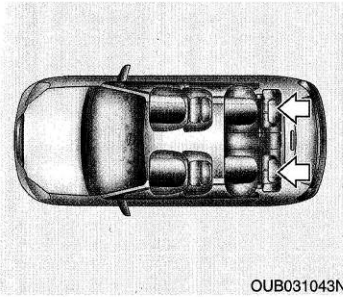
With the seat warmer switch in the ON position, the heating system in the seat turns off or on automatically depending on the seat temperature.

⚠ CAUTION - Seat damage

- When cleaning the seats, do not use an organic solvent such as paint thinner, benzene, alcohol and gasoline. Doing so may damage the surface of the heater or seats.
- To prevent overheating the seat warmer, do not place anything on the seats that insulates against heat, such as blankets, cushions or seat covers while the seat warmer is in operation.
- Do not place heavy or sharp objects on seats equipped with seat warmers. Damage to the seat warming components could occur.

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



Rear seat adjustment

Headrest

The rear seat is equipped with headrests in all the seating positions for the occupant's safety and comfort.

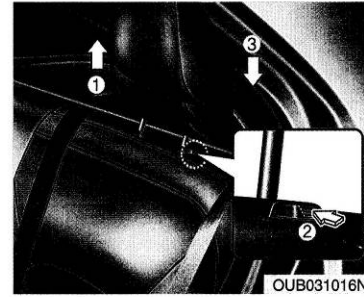
The headrest not only provides comfort for passengers, but also helps protect the head and neck in the event of a collision.

For maximum effectiveness in case of an accident, the headrest should be adjusted so the middle of the headrest is at the same height of the center of gravity of an occupant's head. Generally, the center of gravity of most people's head is similar with the height as the top of their eyes.

Also adjust the headrest as close to your head as possible. For this reason, the use of a cushion that holds the body away from the seatback is not recommended.

⚠ WARNING - Headrest removal

Do not operate the vehicle with the headrests removed. Headrests can provide critical neck and head support in a crash.

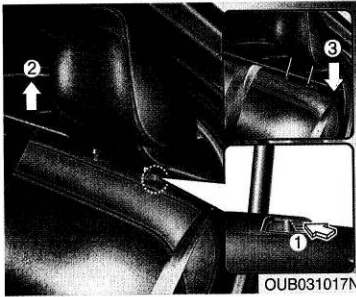


Adjusting the height up and down (if equipped)

To raise the headrest, pull it up to the desired position (1). To lower the headrest, push and hold the release button (2) on the headrest support and lower the headrest to the desired position (3).

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



Removal and installation

To remove the headrest, raise it as far as it can go then press the release button (1) while pulling the headrest upward (2).

To reinstall the headrest, put the headrest poles (3) into the holes while pressing the release button (1). Then adjust it to the appropriate height and ensure that it locks in position.

Make sure the headrest locks in position after adjusting.

Folding the rear seat

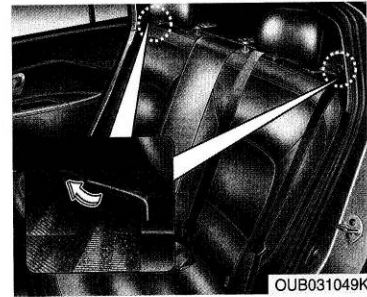
The rear seatbacks may be folded to facilitate carrying long items or to increase the luggage capacity of the vehicle.

⚠ WARNING

Never allow passengers sit on top of the folded down seatback while the vehicle is moving. This is not a proper seating position and no seat belts are available for use. This could result in serious injury or death in case of an accident or sudden stop.

⚠ WARNING - Objects

Objects carried on the folded down seatback should not extend higher than the top of the front seatbacks. This could allow cargo to slide forward and cause injury or damage during sudden stops.



To fold down the rear seatback:

• 4 door

1. Make sure the rear seat belt webbing is in the guide to prevent the seat belt from being damaged.
2. Set the front seatback to the upright position and if necessary, slide the front seat forward.
3. Lower the rear headrests to the lowest position.

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



Post-Test Driver Dummy Knee Contact with Vehicle Interior View



Post-Test Rear Passenger Dummy Knee Contact with Vehicle Interior View

APPENDIX B
DUMMY RESPONSE DATA PLOTS

TABLE OF DATA PLOTS
Driver Dummy Instrumentation Plots

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Figure No. 23.	Passenger Acetabulum Force on Impact Side (Y) vs. Time	B-7
Figure No. 24.	Passenger Total Pelvic Force on Impact Side (Y) vs. Time	B-7

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

Additional 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 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)
Passenger Head Acceleration Redundant (X)
Passenger Head Acceleration Redundant (Y)
Passenger Head Acceleration Redundant (Z)

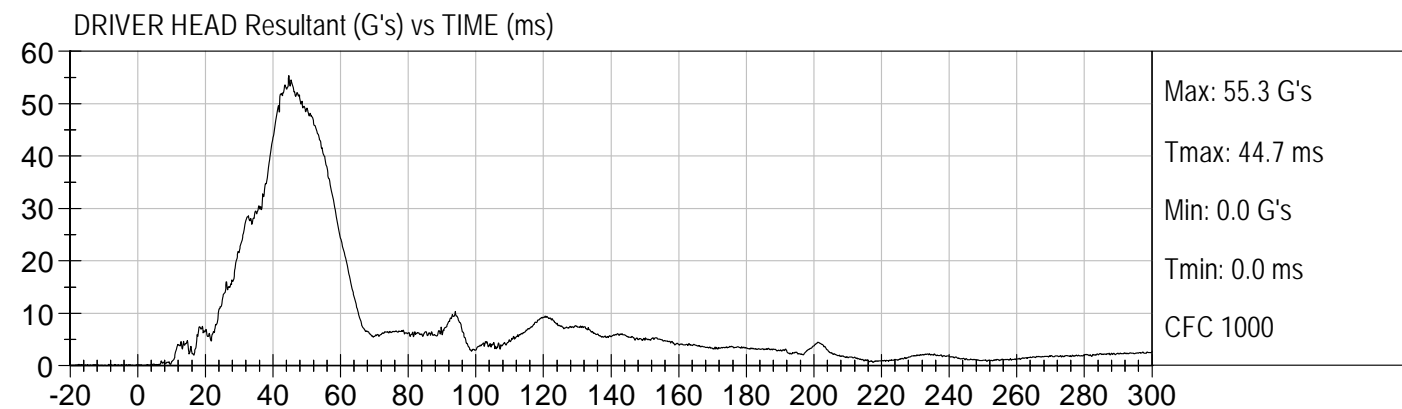
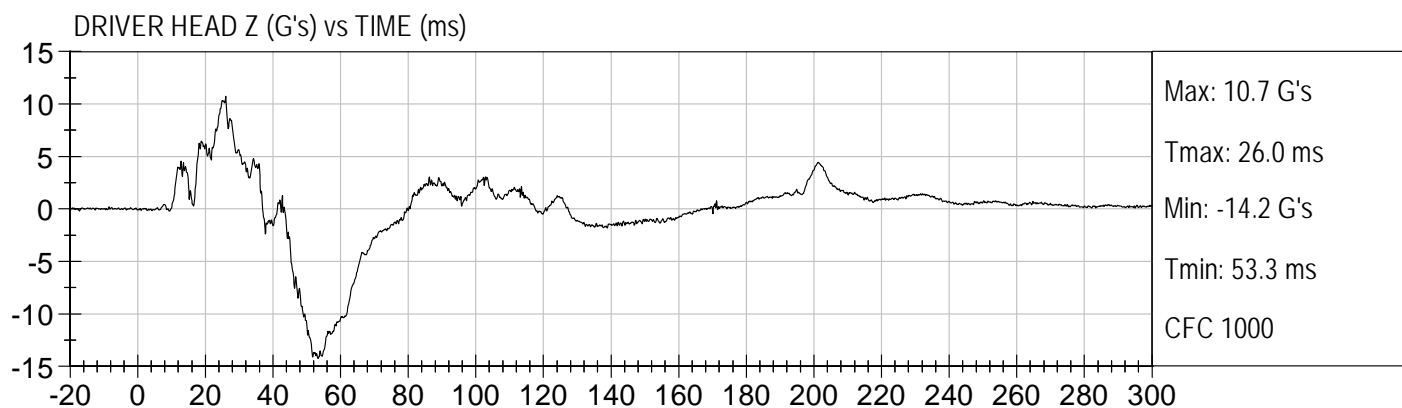
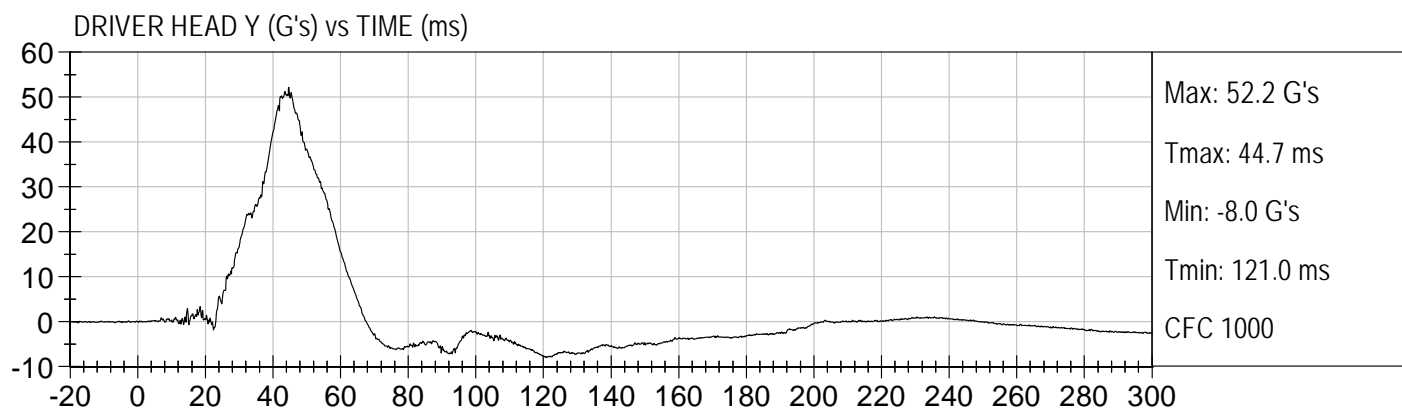
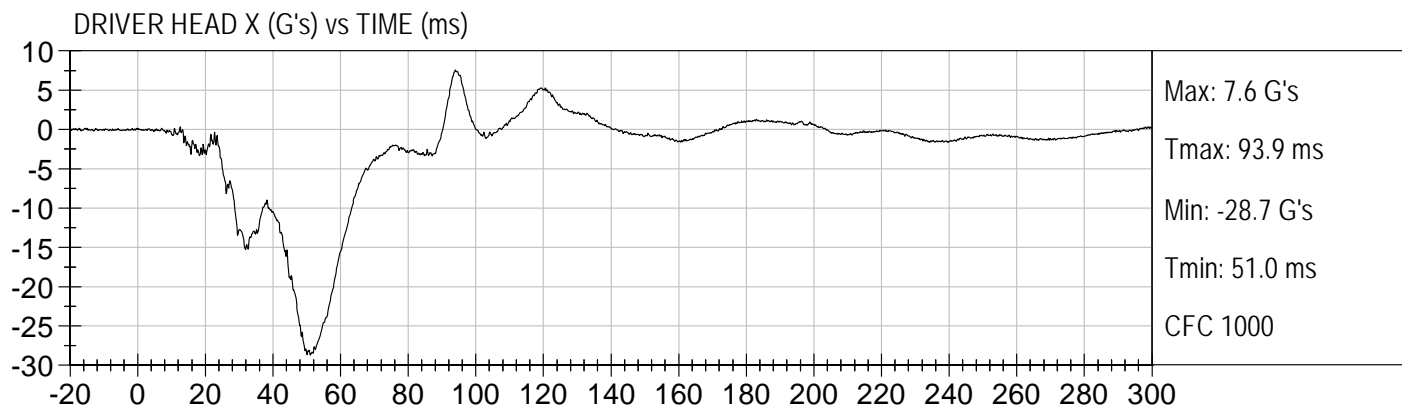
Vehicle Instrumentation Data

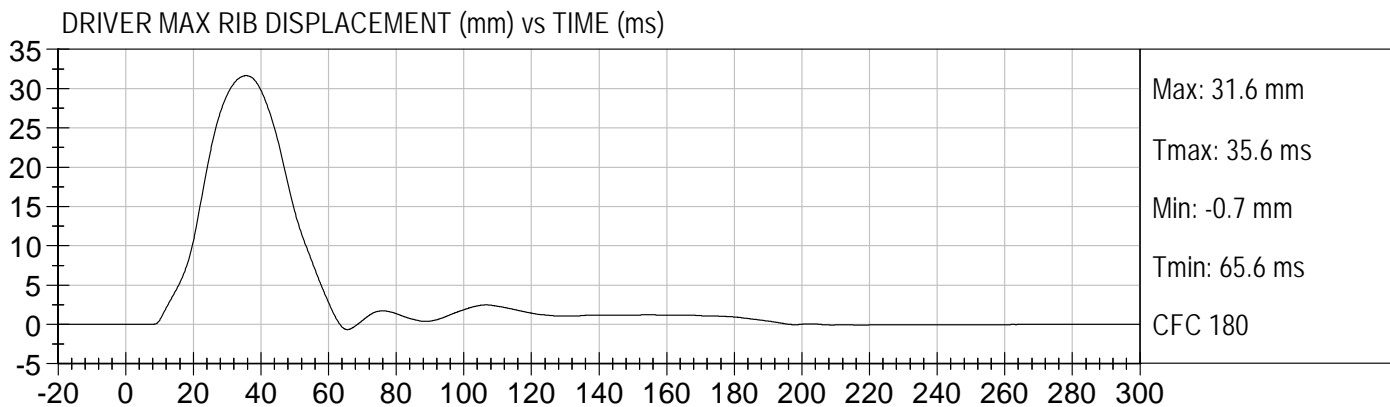
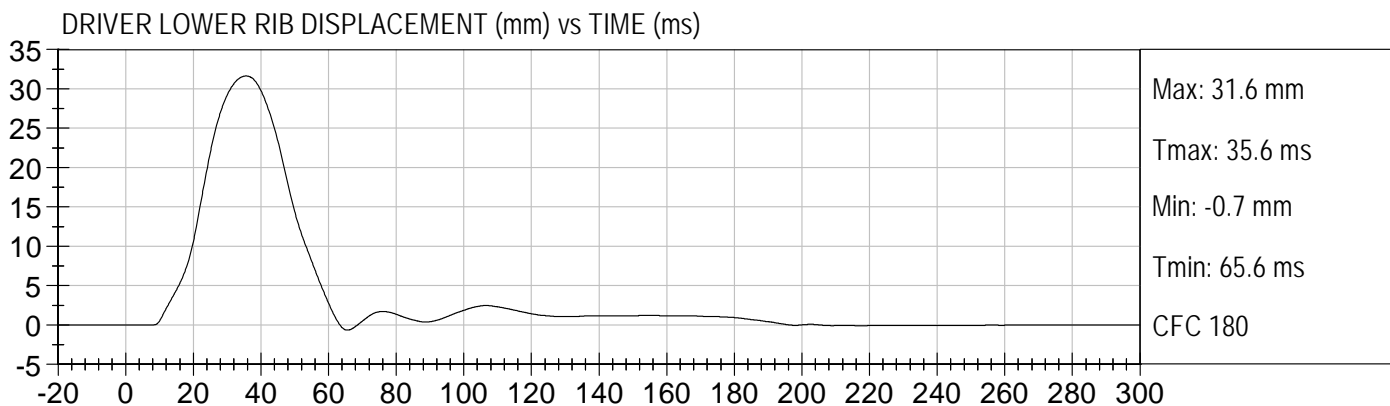
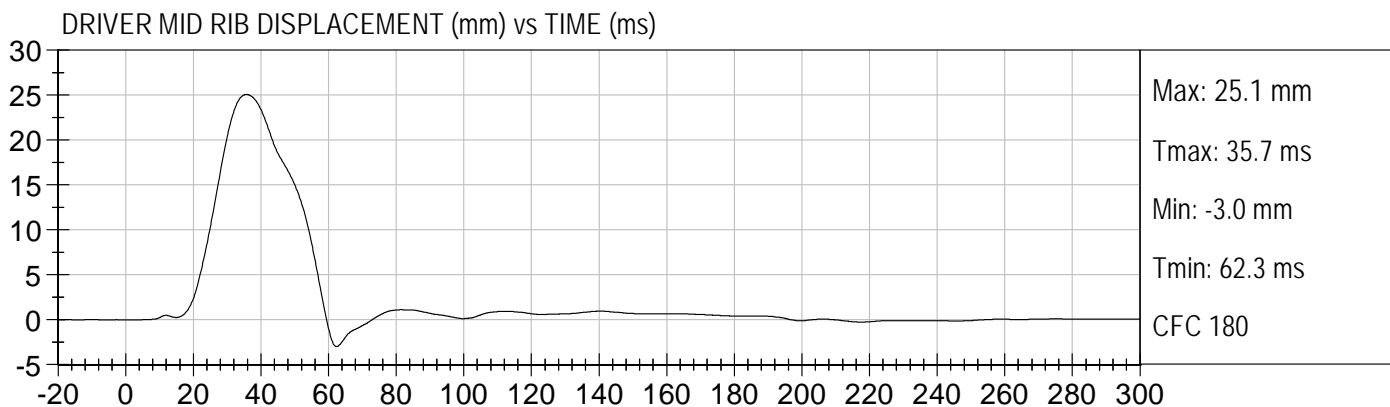
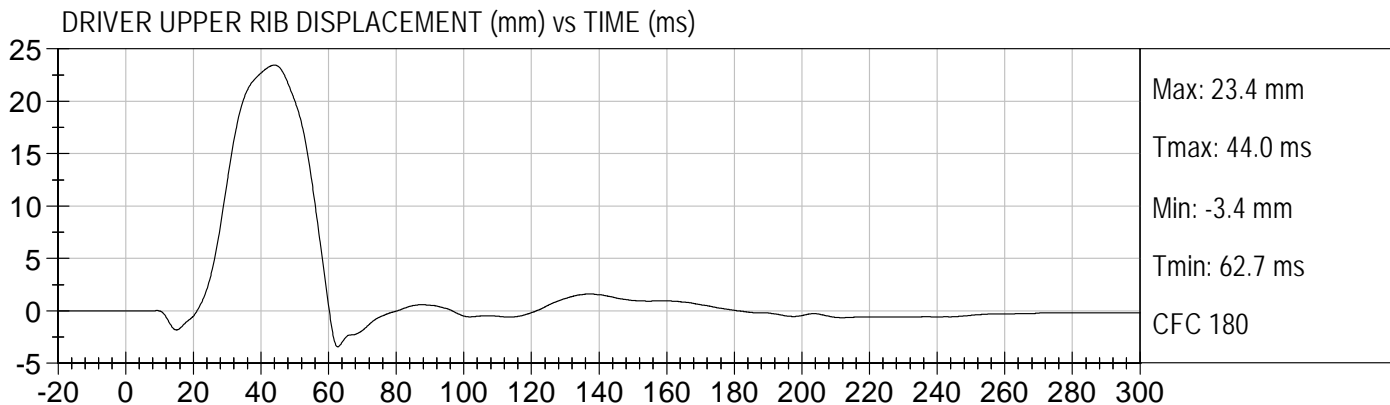
Vehicle Center of Gravity Acceleration (X)
Vehicle Center of Gravity Acceleration (Y)
Vehicle Center of Gravity Acceleration (Z)
Right Side Sill at Front Seat Acceleration (X)
Right Side Sill at Front Seat Acceleration (Y)
Right Side Sill at Front Seat Acceleration (Z)
Right Side Sill at Rear Seat Acceleration (X)
Right Side Sill at Rear Seat Acceleration (Y)
Right Side Sill at Rear Seat Acceleration (Z)

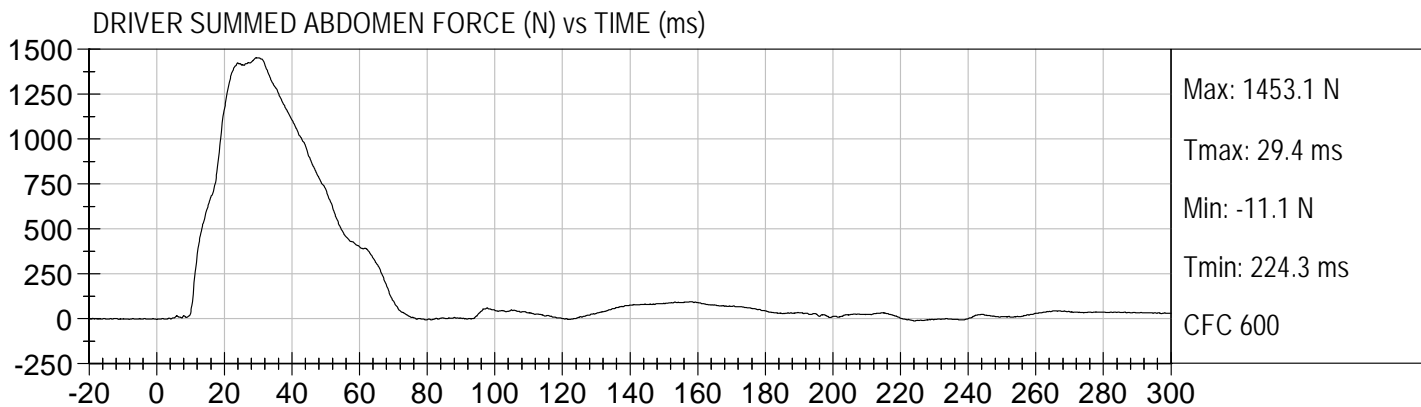
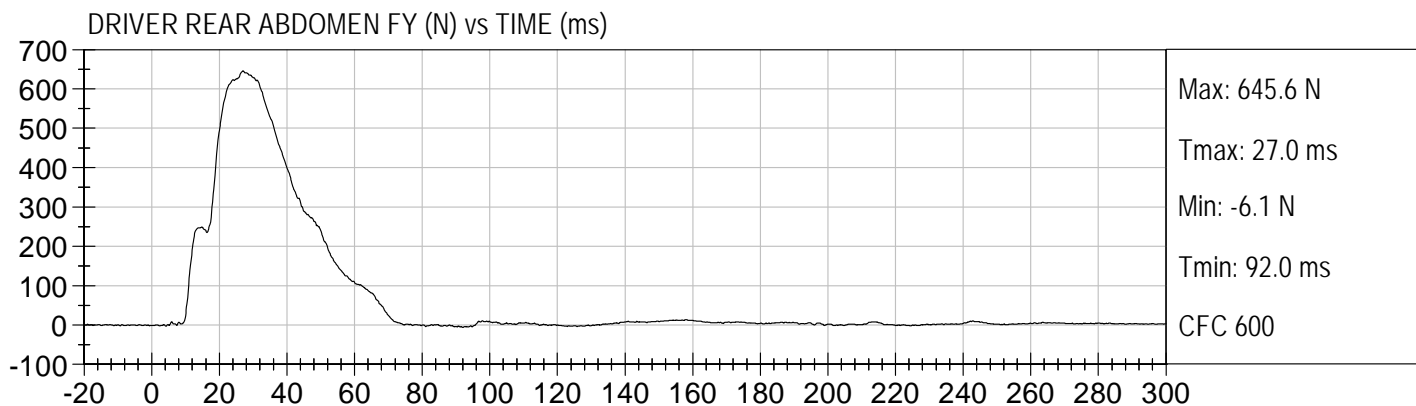
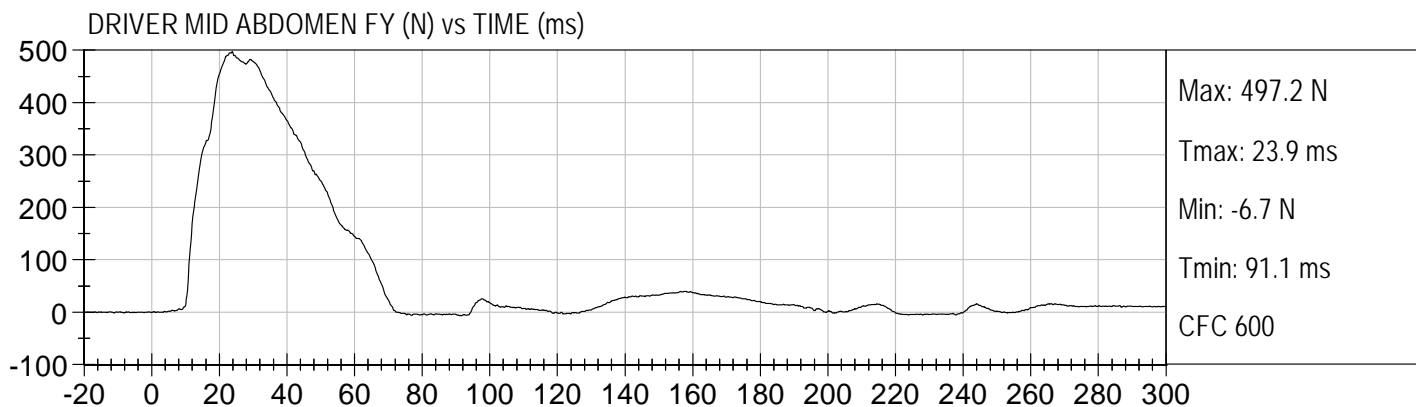
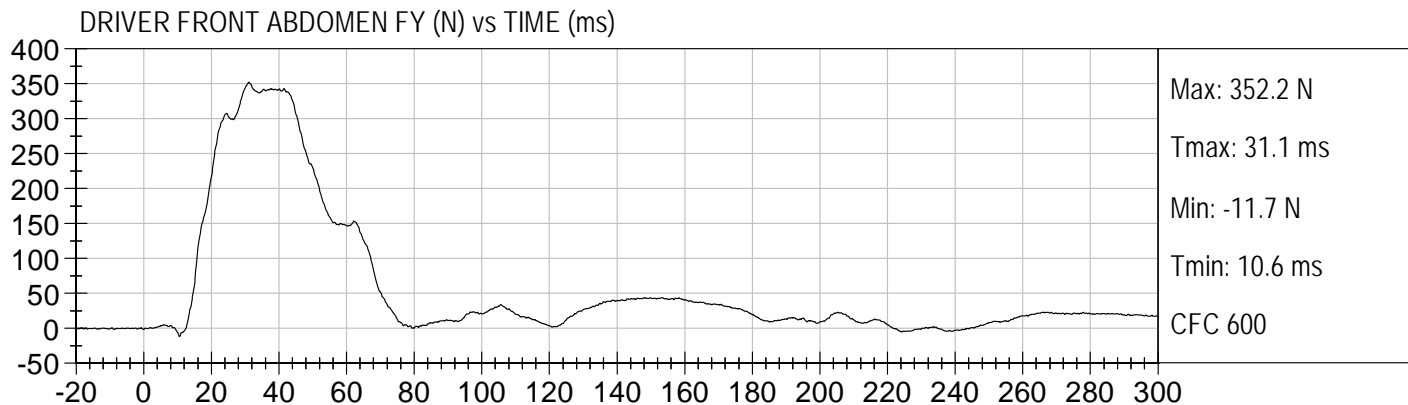
Left Side Sill at Front Seat Acceleration (Y)
Left Side Sill at Rear Seat Acceleration (Y)
Lower A-Post Acceleration (Y)
Middle A-Post Acceleration (Y)
Lower B-Post Acceleration (Y)
Middle B-Post Acceleration (Y)
Front Seat Track Acceleration (Y)
Rear Seat Track Acceleration (Y)
Right Rear Occupant Compartment Acceleration (Y)
Engine Block (X)
Engine Block (Y)
Rear Floorpan Above Axle Acceleration (X)
Rear Floorpan Above Axle Acceleration (Y)
Rear Floorpan Above Axle Acceleration (Z)

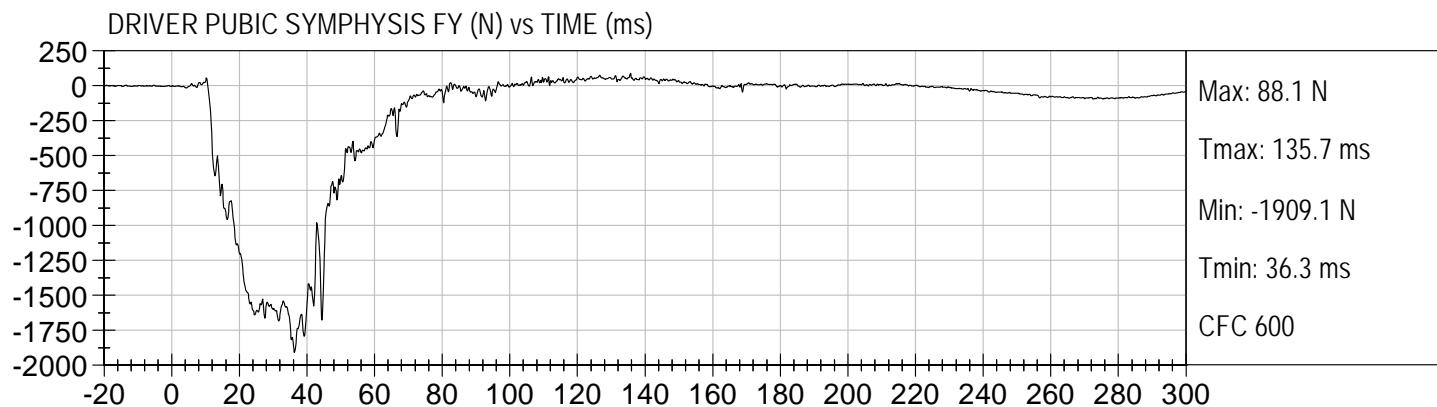
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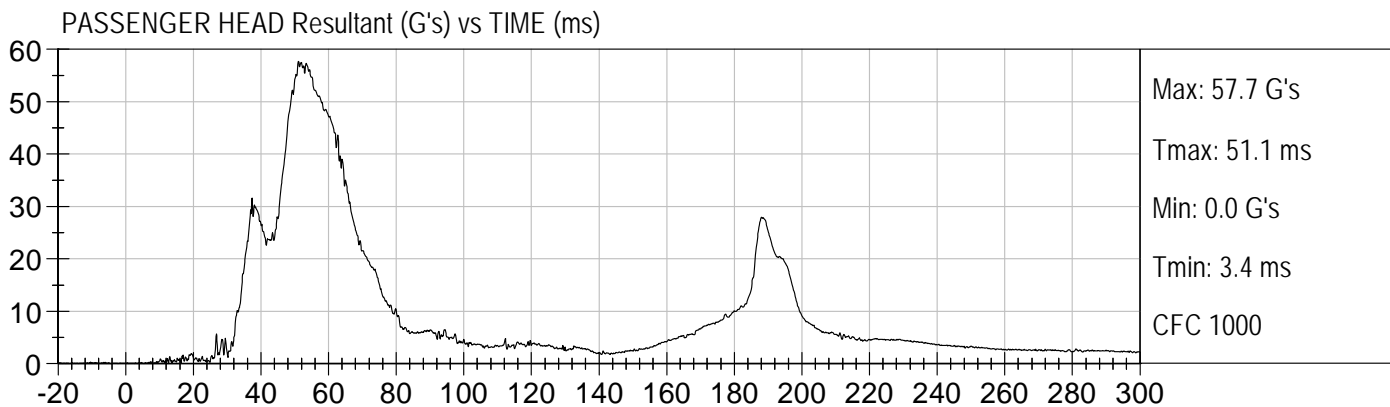
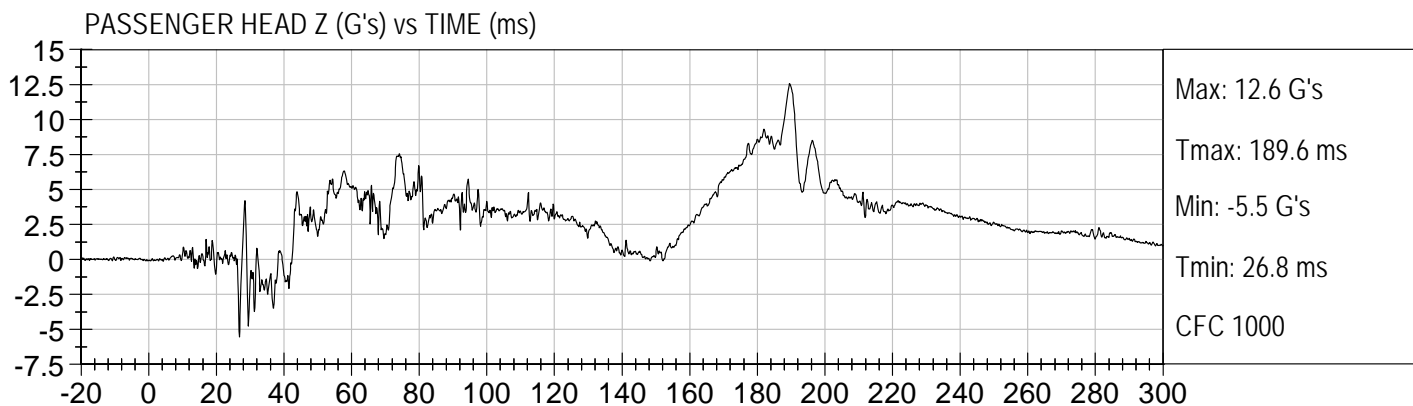
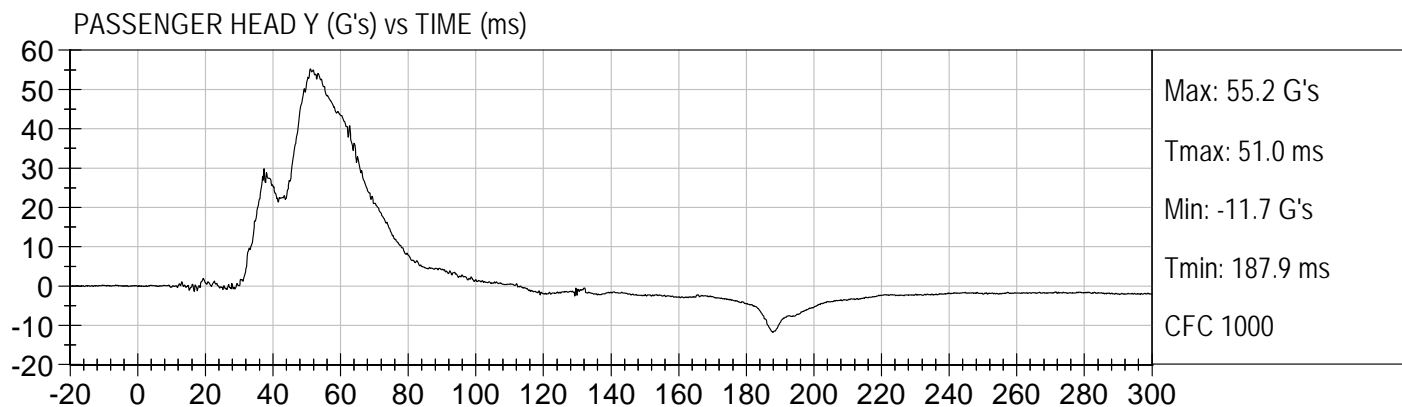
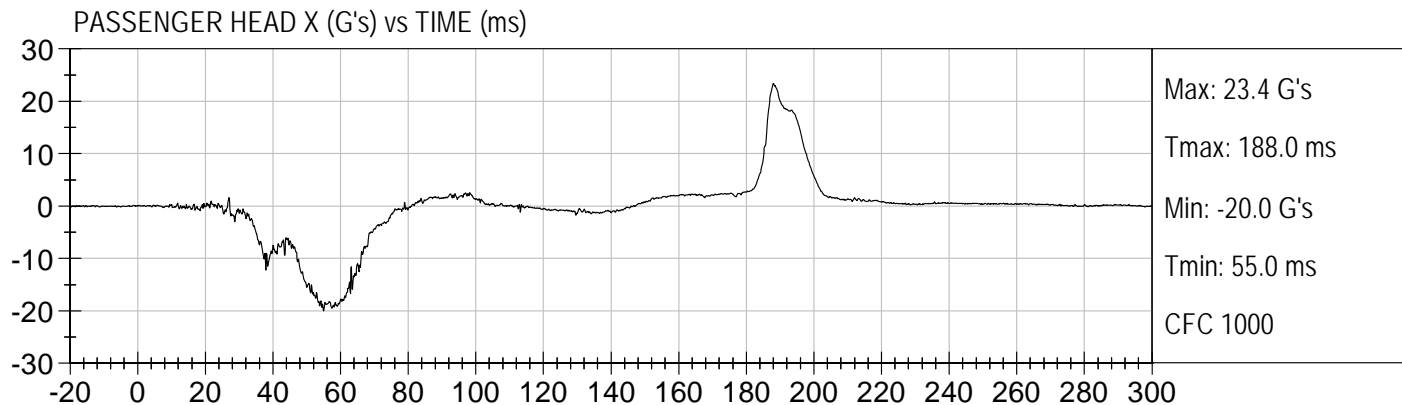
MDB Center of Gravity Acceleration (X)
MDB Center of Gravity Acceleration (Y)
MDB Center of Gravity Acceleration (Z)
MDB Rear Acceleration (X)
MDB Rear Acceleration (Y)
Left MDB Contact Switch
Right MDB Contact Switch

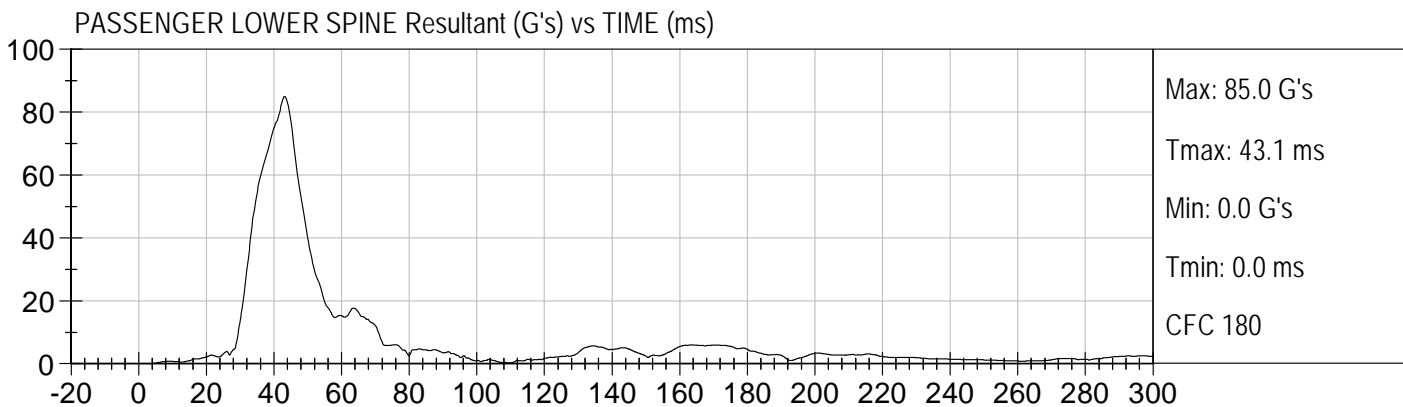
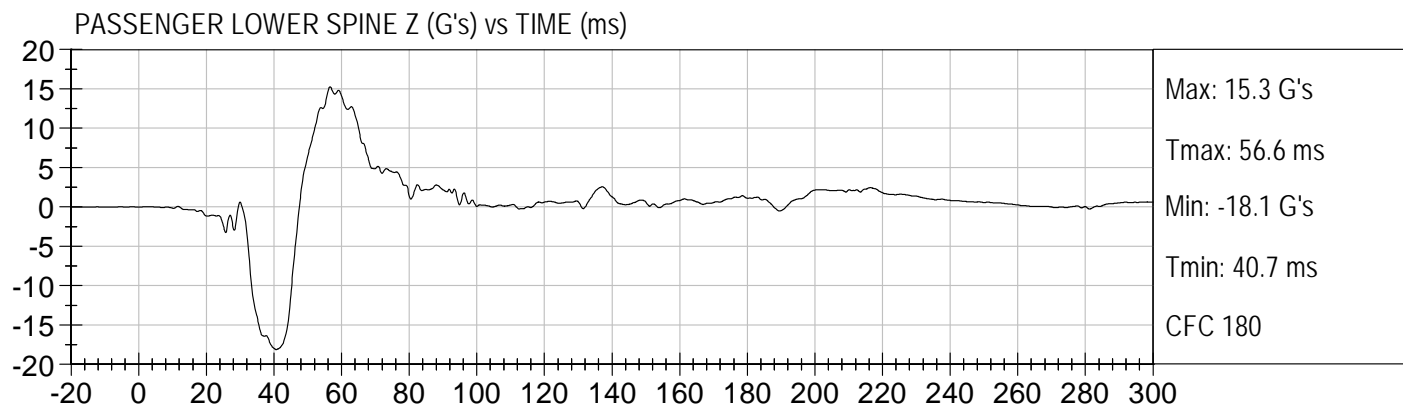
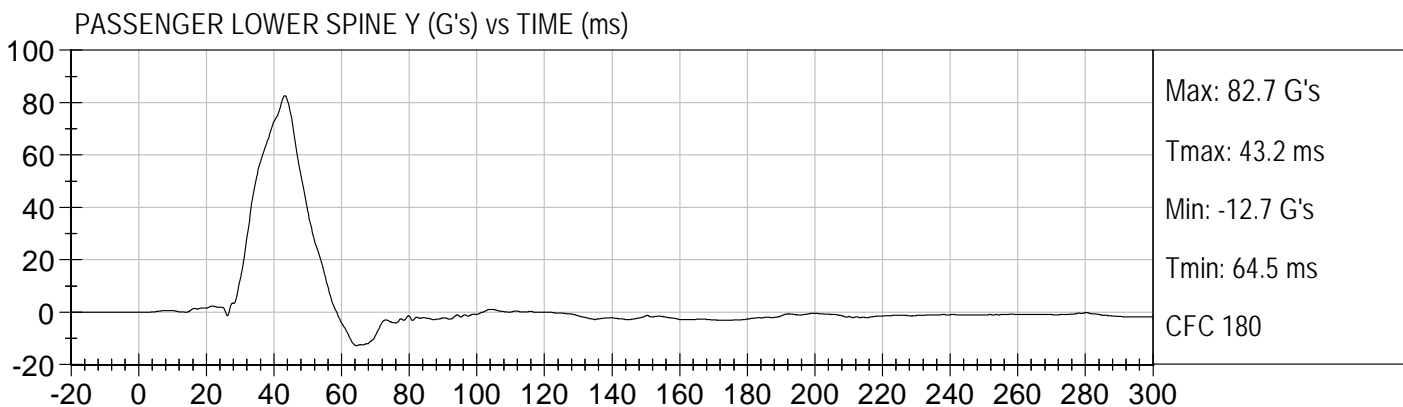
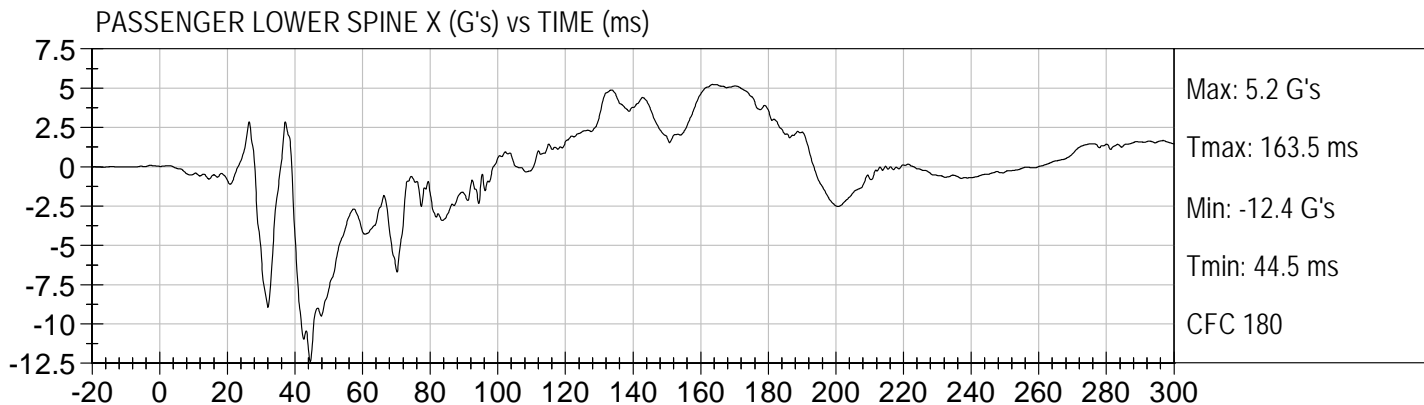


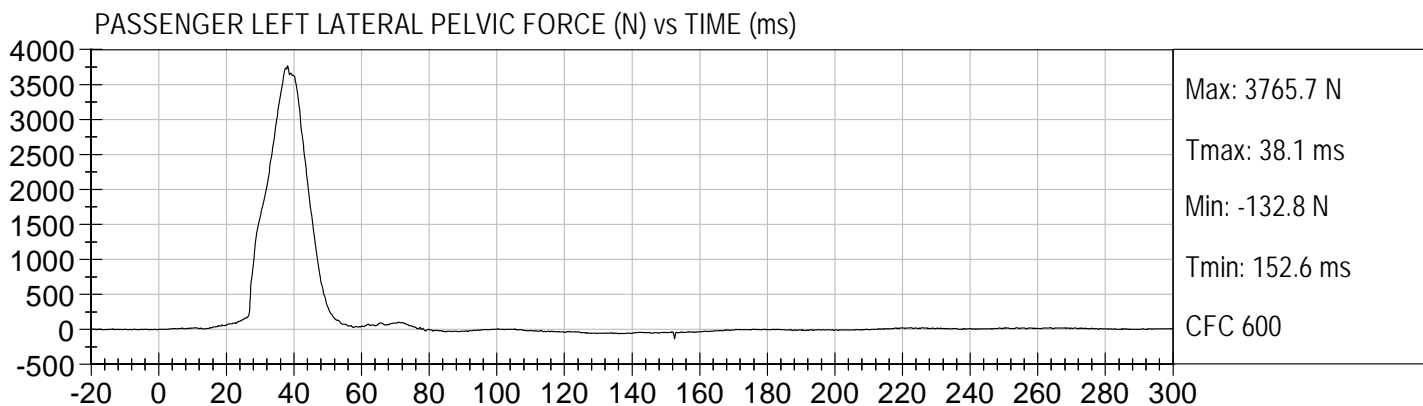
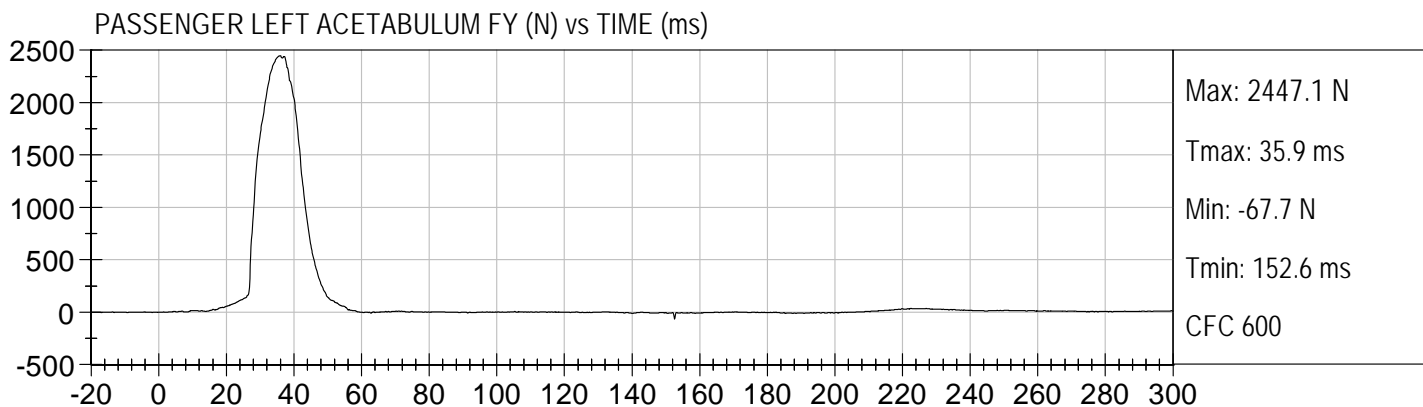
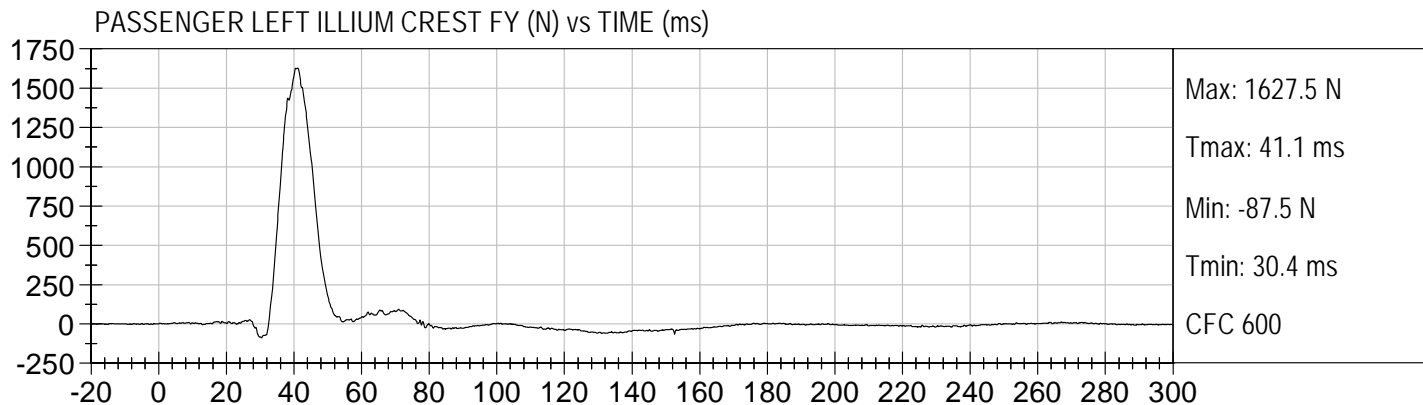












APPENDIX C

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

ES-2re External Measurements
SN: 032

No.	Name	Spec. (mm)	Result	Pass/Fail
1	Sitting Height	900 - 918	915	Pass
2	Seat to Shoulder Joint	558 - 572	568	Pass
3	Seat to Lower Face of Thoracic Spine Box	346 - 356	355	Pass
4	Seat to Hip Joint (center of bolt)	97 - 103	98	Pass
5	Sole to Seat, Sitting	333 - 451	440	Pass
6	Head Width	152 - 158	157	Pass
7	Shoulder/Arm Width	461 - 479	464	Pass
8	Thorax Width	322 - 332	323	Pass
9	Abdomen Width	273 - 287	281	Pass
10	Pelvis Lap Width	359 - 373	370	Pass
11	Head Depth	196 - 206	203	Pass
12	Thorax Depth	262 - 272	264	Pass
13	Abdomen Depth	194 - 204	196	Pass
14	Pelvis Depth	235 - 245	236	Pass
15	Back of Buttocks to Hip Joint (center of bolt)	150 - 160	151	Pass
16	Back of Buttocks to Front Knee	597 - 615	607	Pass

MGA RESEARCH CORPORATION
HEAD DROP TEST
ES-2re DUMMY

ATD Serial No: 032

Test ID: D12851

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	18	Pass
Peak Resultant Acceleration	G's	125 to 155	141	Pass
Peak Longitudinal Acceleration	G's	+/- 15	-13.9	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
Overall Test Results				Pass

Jessica Hall
 Laboratory Technician

3/6/12
 Test Date

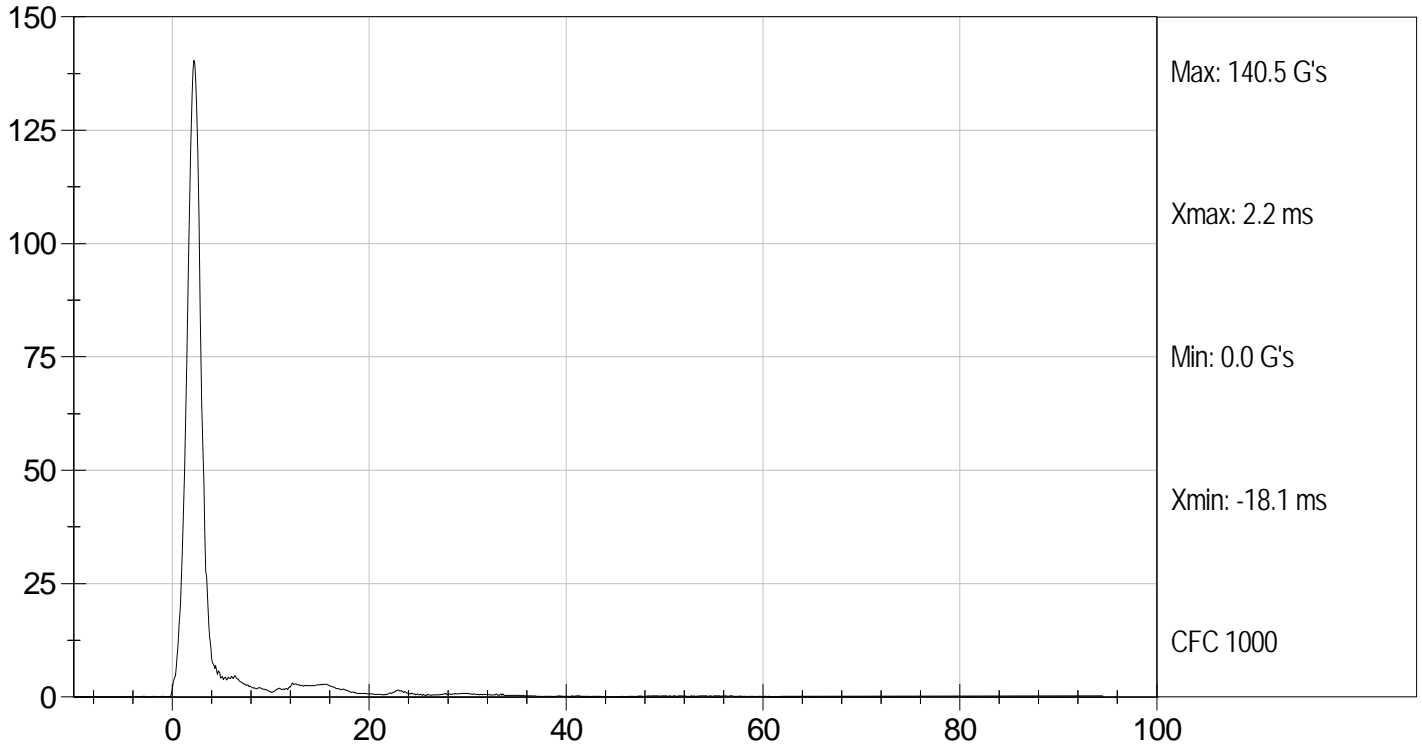
David Winkelbauer
 Approved By



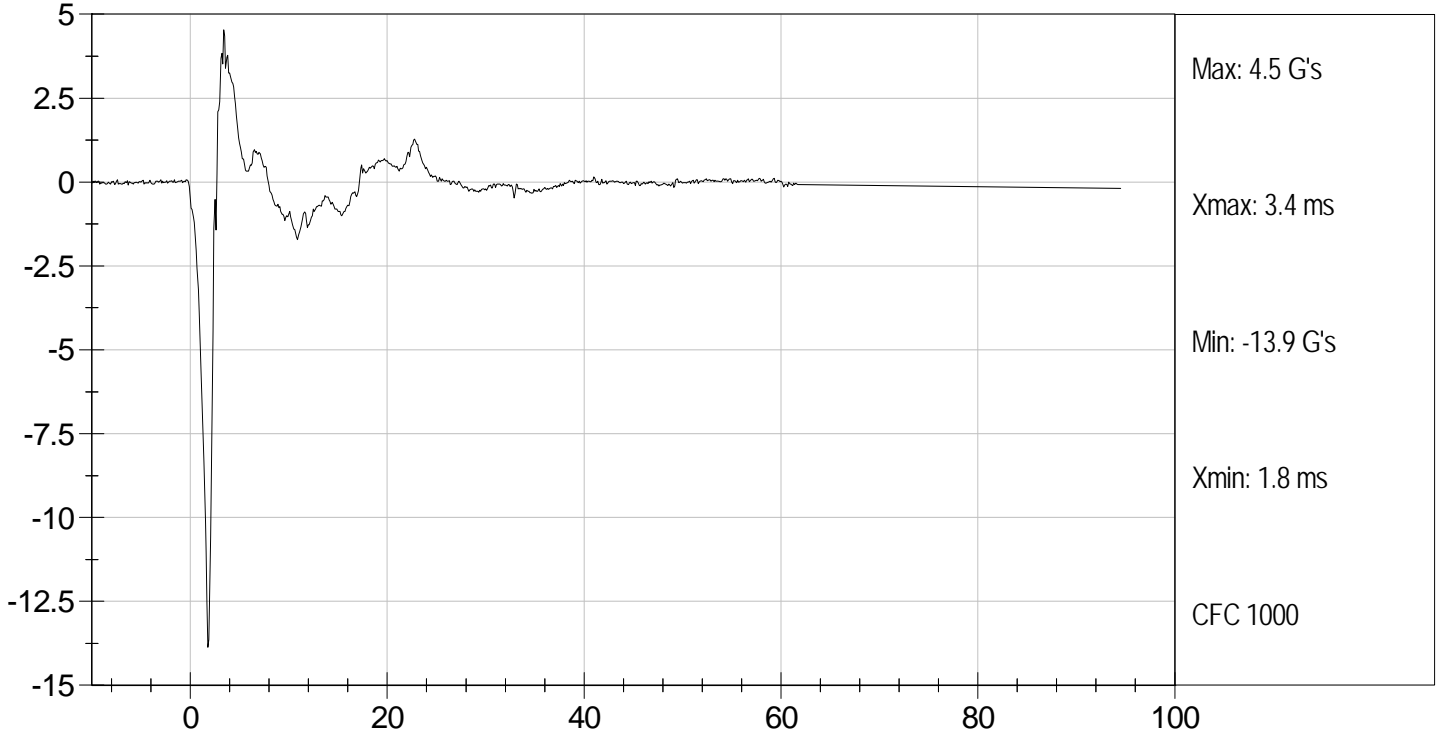
Test Desc: Head Drop
Component ID: D12851

Test Date: 3/6/12
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.: D12852

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	18.0 to 22.0	22.0	Pass
Laboratory Relative Humidity		%	10 to 70	25	Pass
Pendulum Speed		m/s	3.3 to 3.5	3.3	Pass
Pendulum Deceleration	1 ms	m/s	0.00 to -0.05	-0.02	Pass
	3 ms	m/s	-0.25 to -0.375	-0.32	Pass
	14 ms	m/s	-3.20 to -3.70	-3.33	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	52.4	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	57.2	Pass
Head Rotation Decay Time to 0 degree		ms	53.0 to 88.0	56.2	Pass
Overall Test Results					Pass

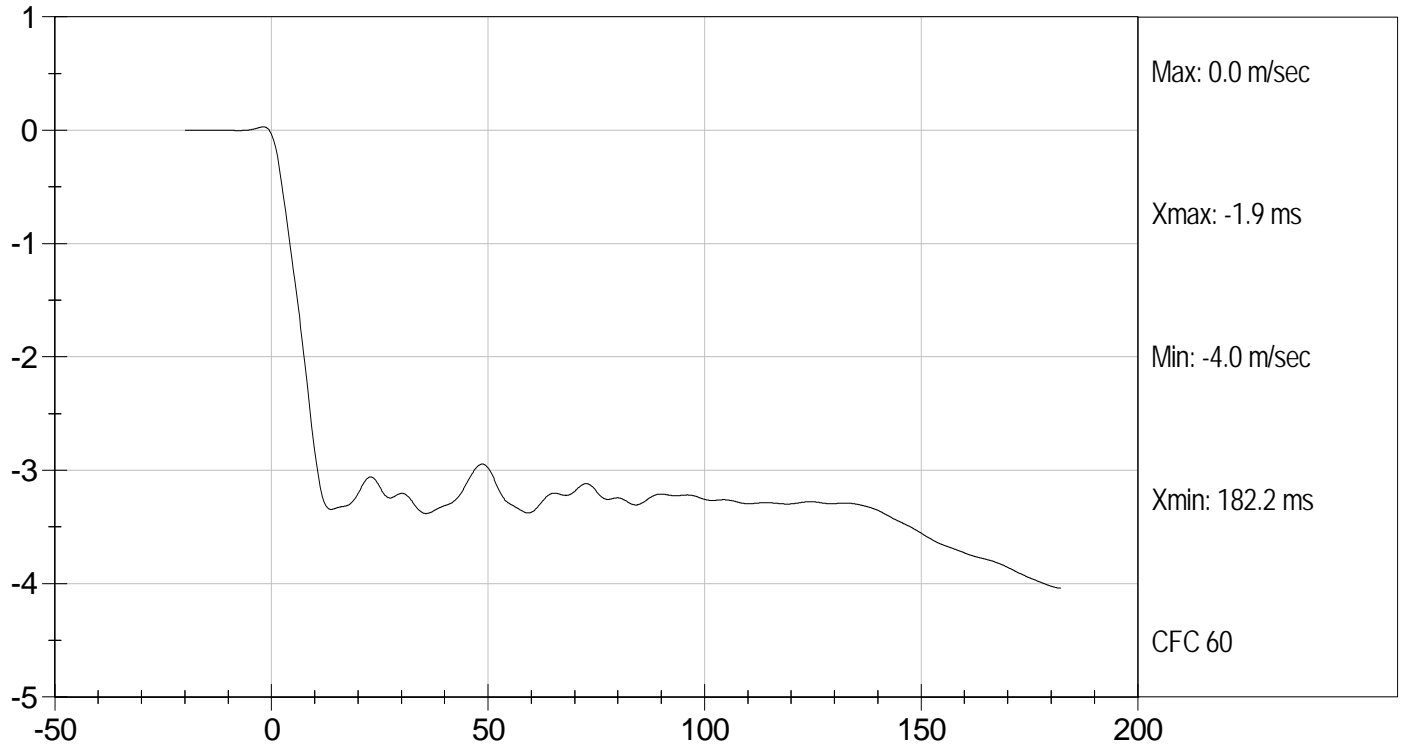
Jessica Hall
 Laboratory Technician

3/6/12
 Test Date

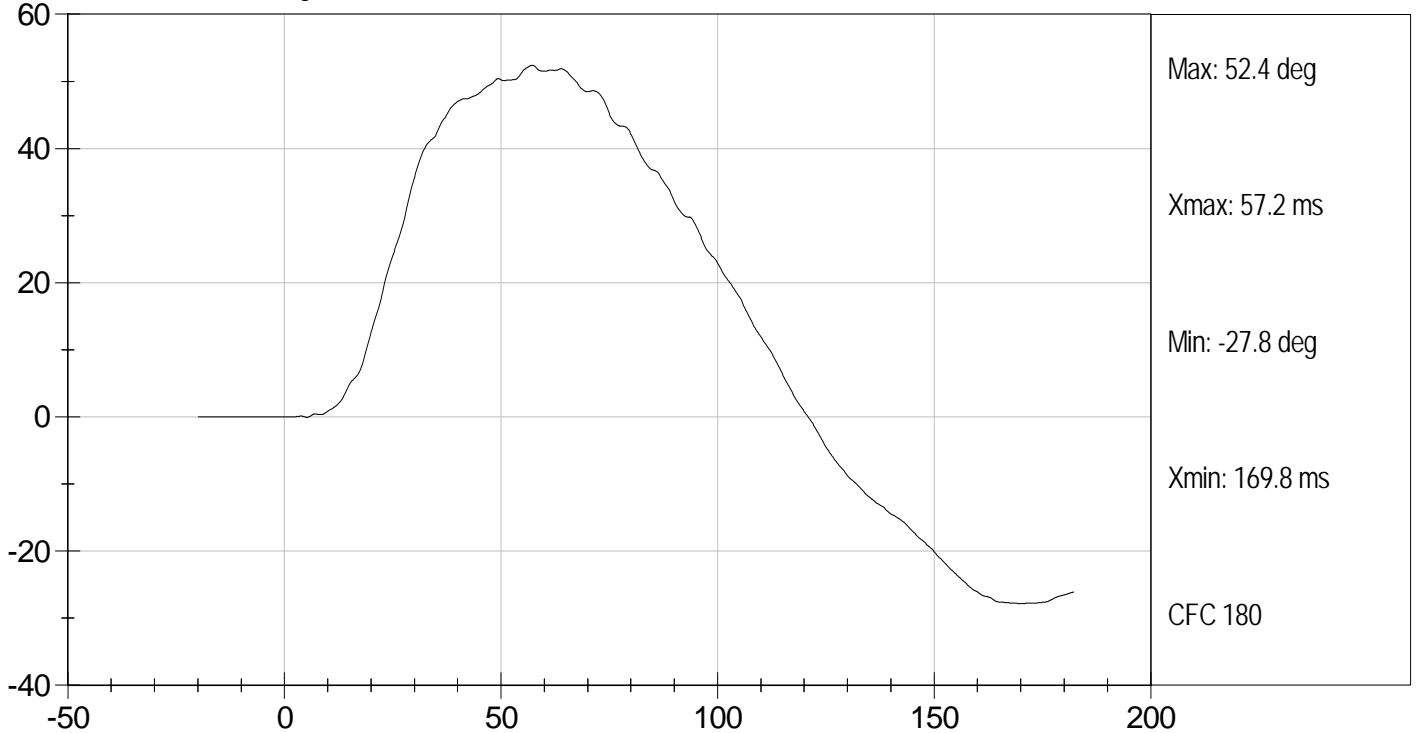
David Winkelbauer
 Approved By



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



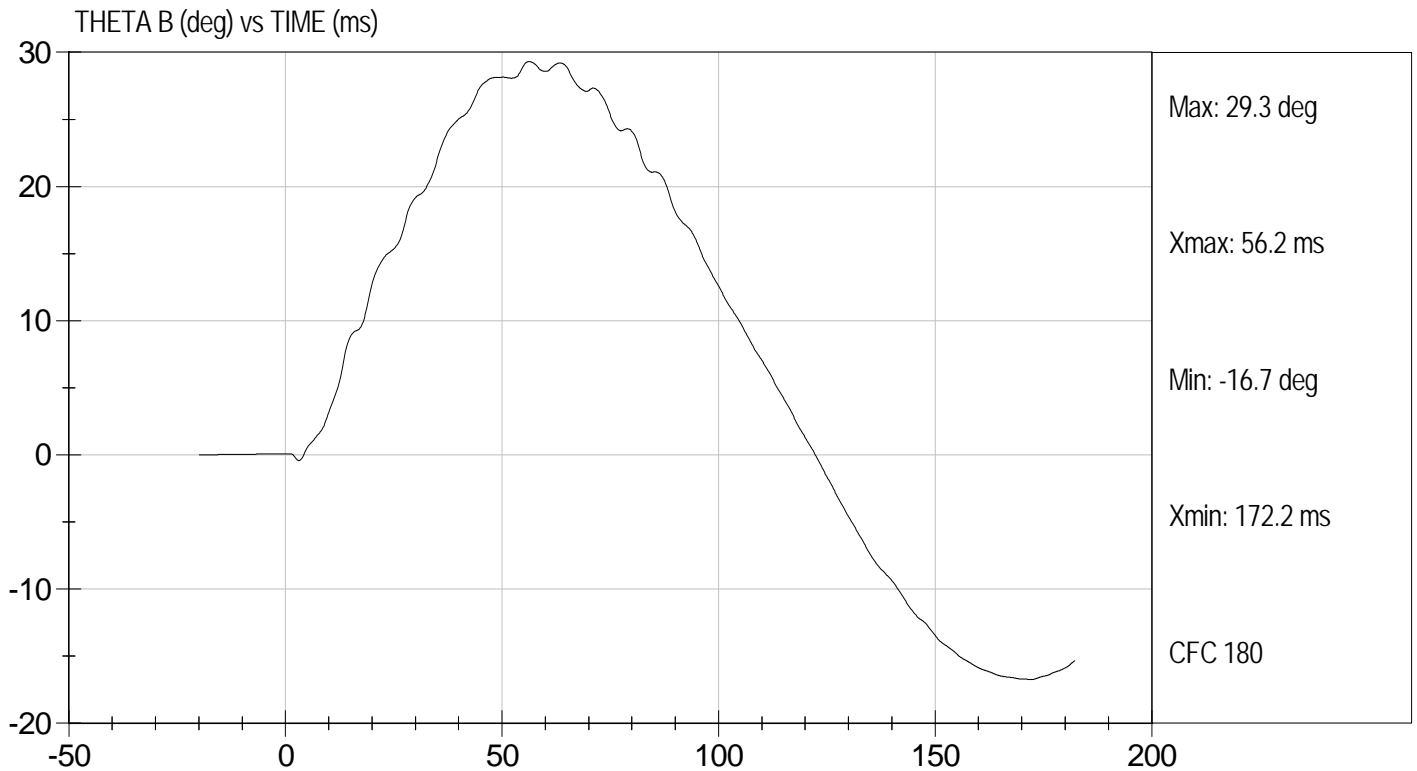
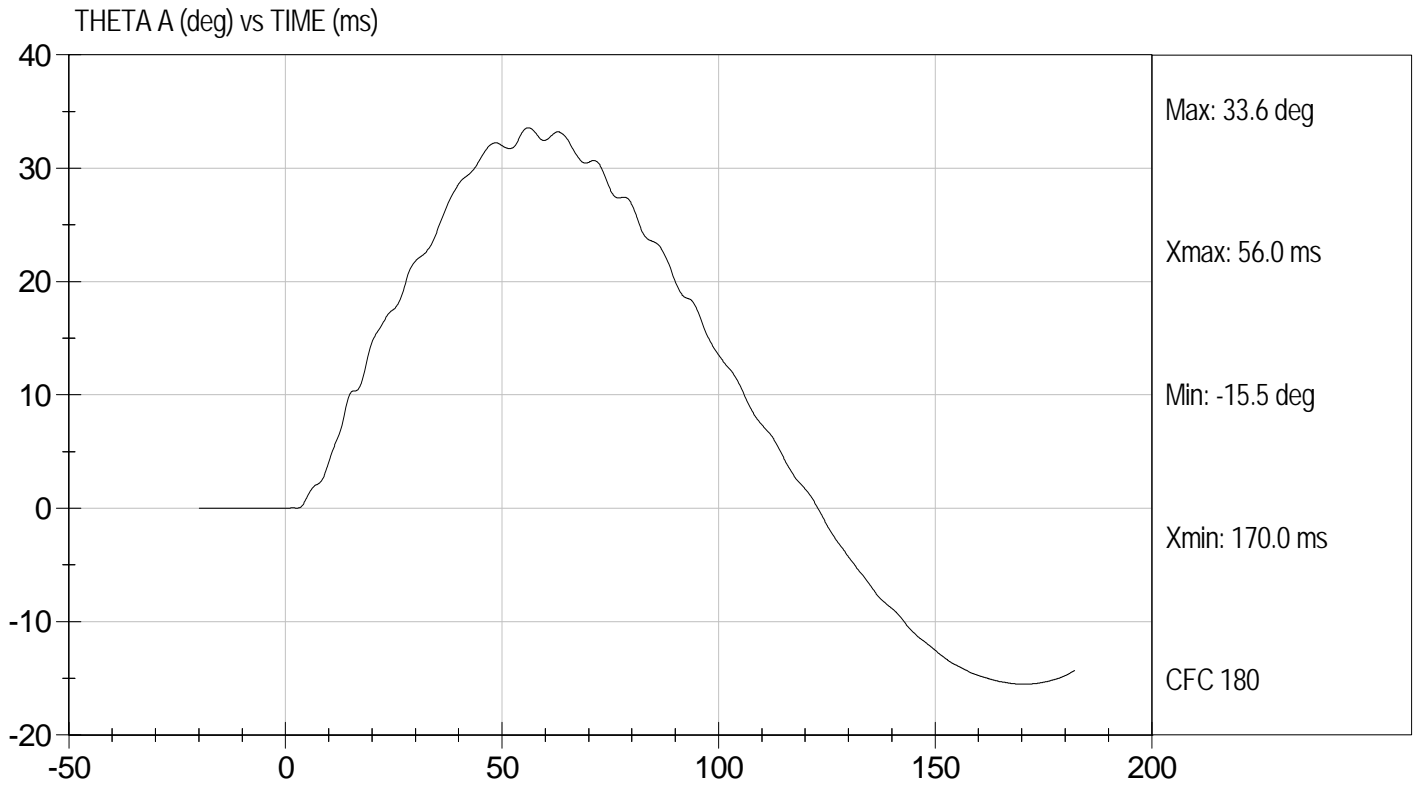
FLEXION ANGLE (deg) vs TIME (ms)





Test Desc: Neck Bending
Component ID: D12852

Test Date: 3/6/12
Velocity: 10.89 ft/s, 3.3 m/s



MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D.: D12853

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Pendulum Speed	m/s	4.2 to 4.4	4.3	Pass
Peak Shoulder Acceleration	G's	7.5 to 10.5	10.0	Pass
Time of Peak Shoulder Acceleration	ms	NA	17.0	Pass
Overall Test Results				Pass

Jessica Hall
 Laboratory Technician

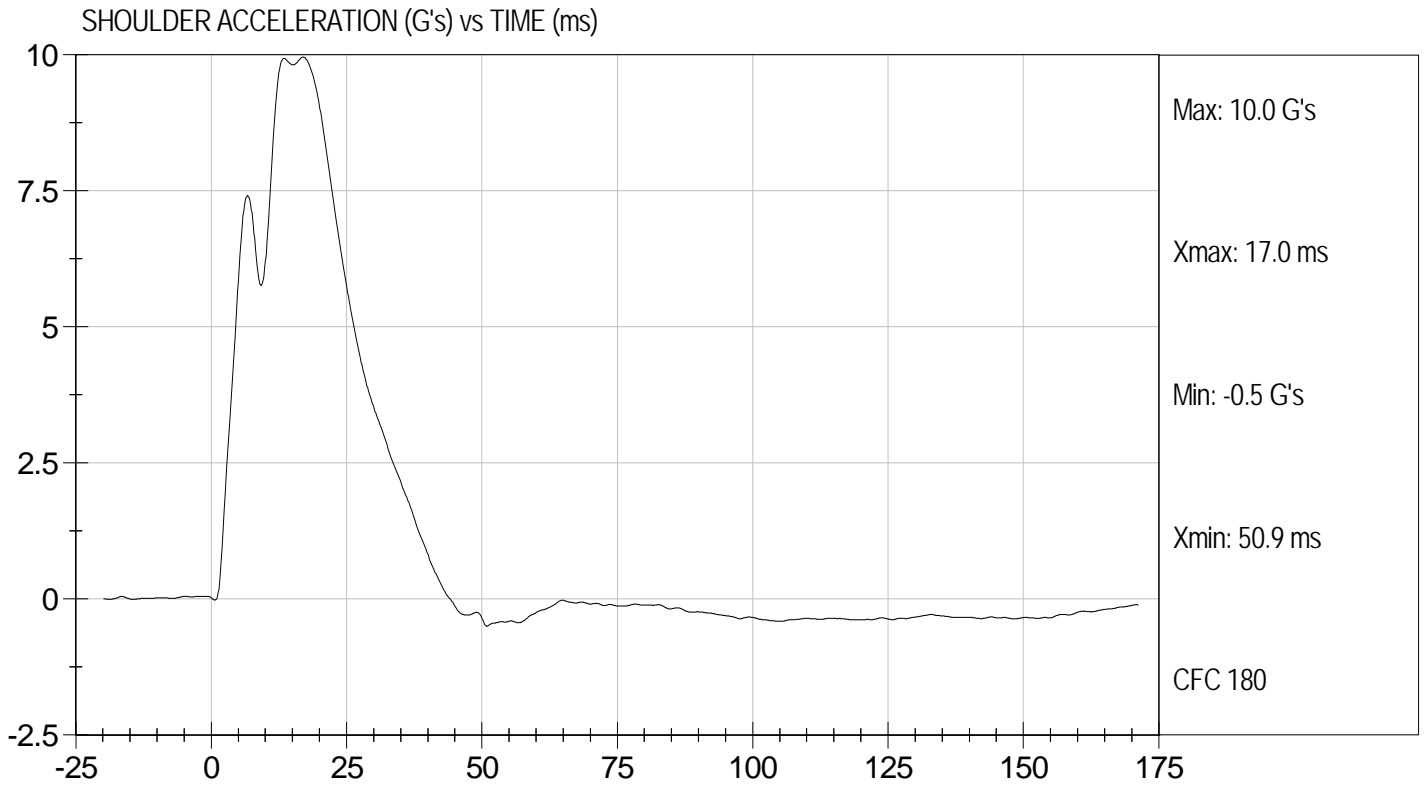
3/6/12
 Test Date

David Winkelbauer
 Approved By



Test Desc: Shoulder Impact
Component ID: D12853

Test Date: 3/6/12
Velocity: 14.25 ft/s, 4.3 m/s



MGA RESEARCH CORPORATION
UPPER RIB TEST
EUROSID 2 DUMMY

ATD Serial No: 032

Test I.D.: D12854

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	31	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	37.6	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	48.4	Pass
Overall Test Results				Pass

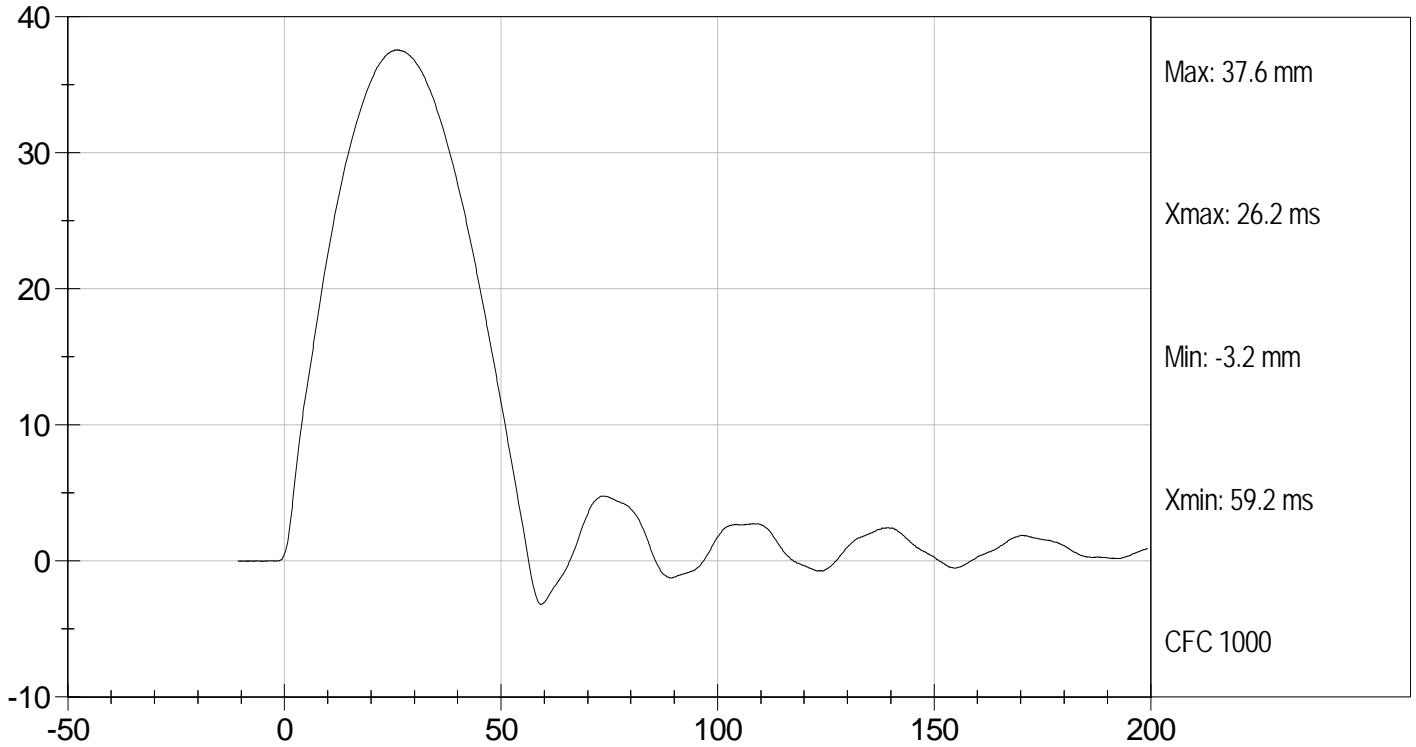
Jessica Gall
 Laboratory Technician

3/6/12
 Test Date

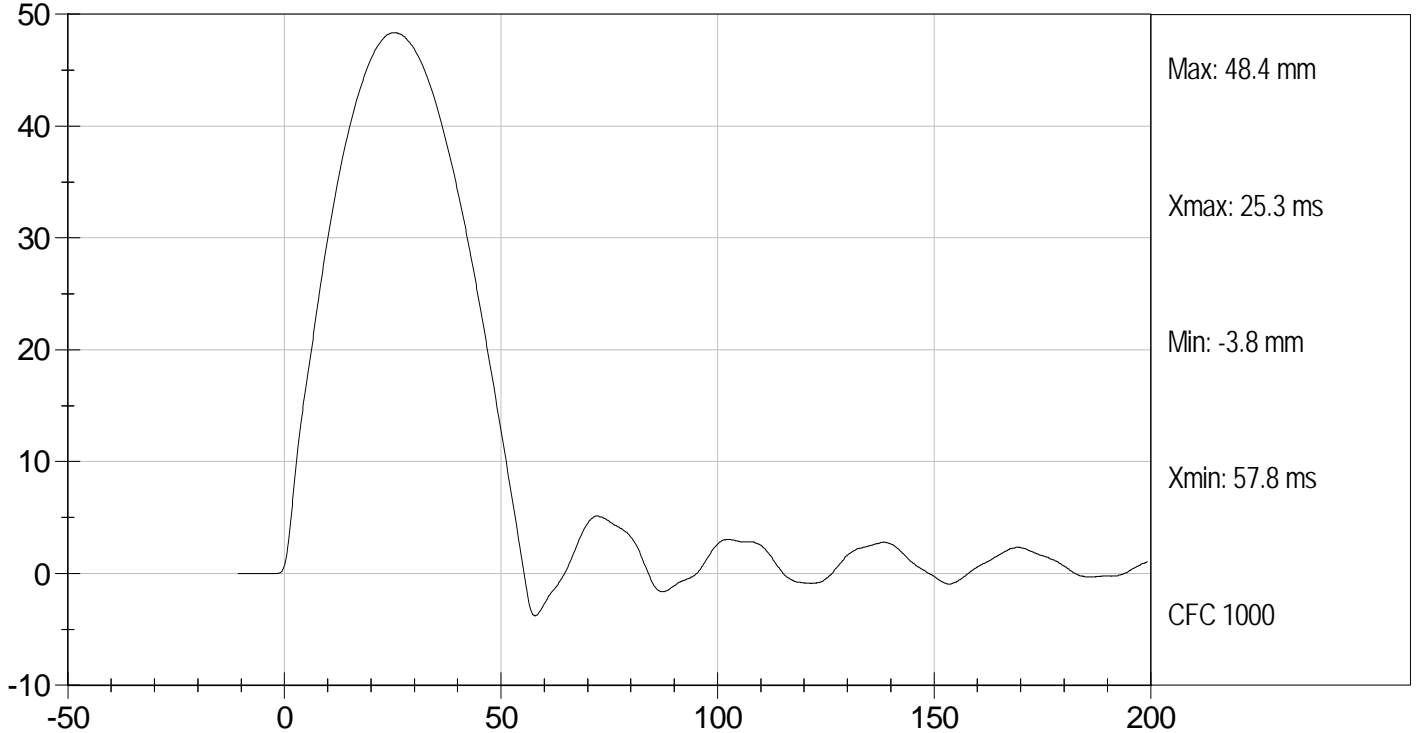
David Winkelbauer
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UPPER RIB DISPLACEMENT @ 3 M/SEC (mm) vs TIME (ms)



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



MGA RESEARCH CORPORATION
MID RIB TEST
EUROSID 2 DUMMY

ATD Serial No: 032

Test I.D.: D12855

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	31	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	36.8	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	48.1	Pass
Overall Test Results				Pass

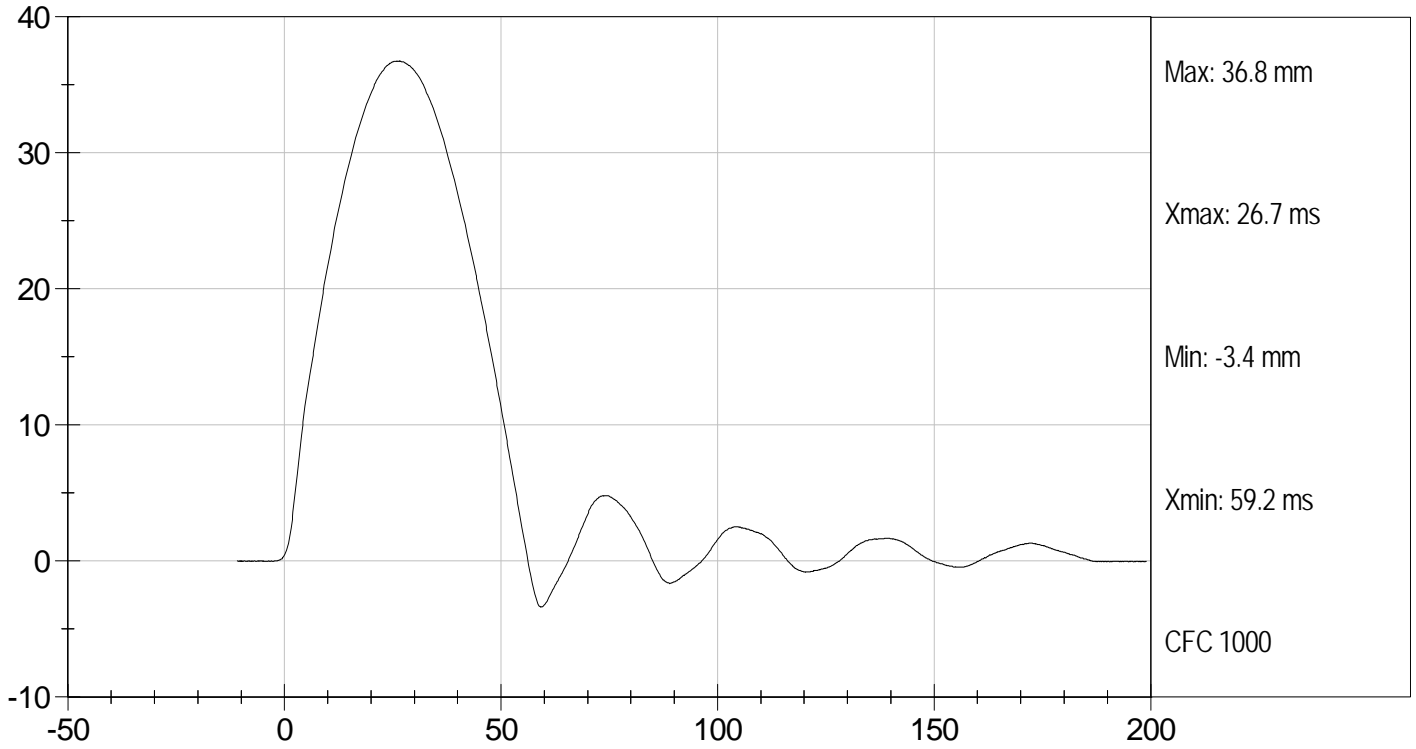
Jessica Gall
 Laboratory Technician

3/6/12
 Test Date

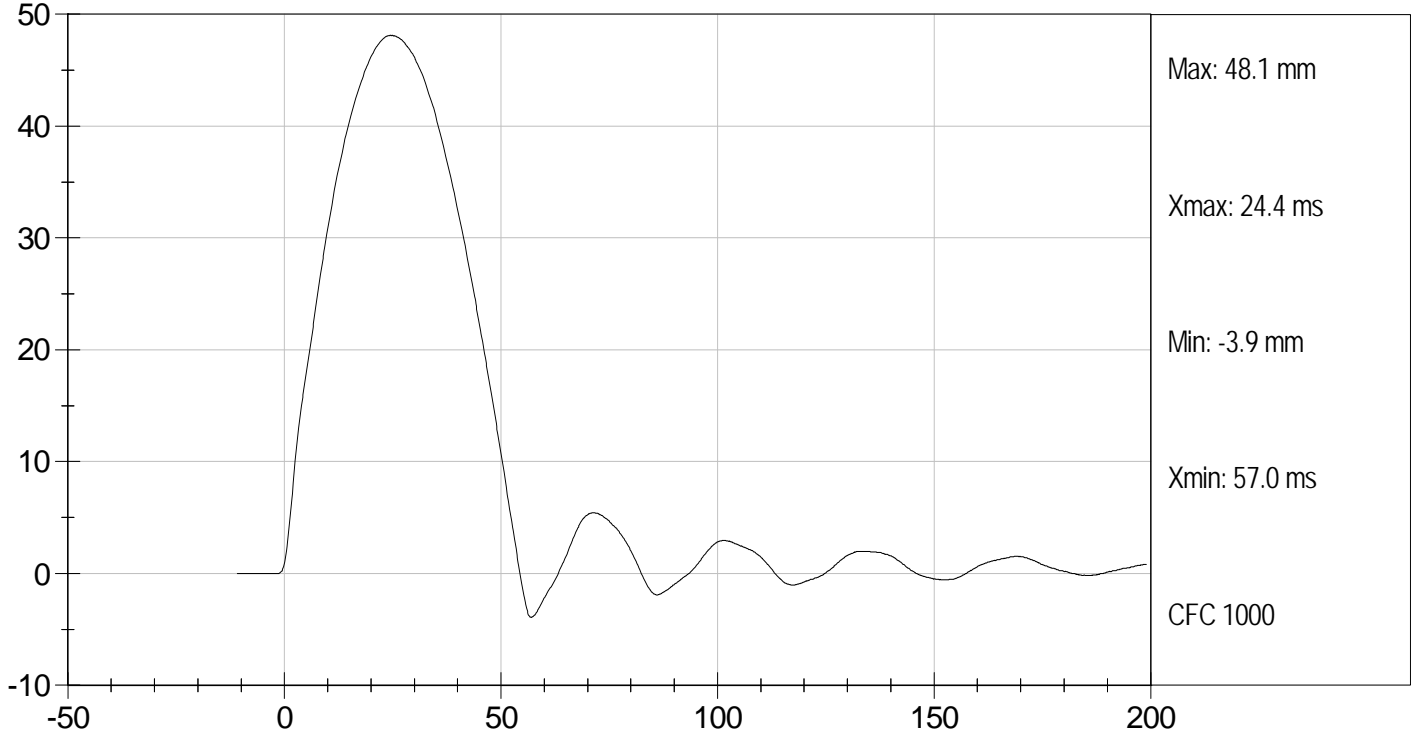
David Winkelbauer
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MID RIB DISPLACEMENT @ 3 M/SEC (mm) vs TIME (ms)



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



MGA RESEARCH CORPORATION
LOWER RIB TEST
EUROSID 2 DUMMY

ATD Serial No: 032

Test I.D.: D12856

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	31	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	38.1	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	48.8	Pass
Overall Test Results				Pass

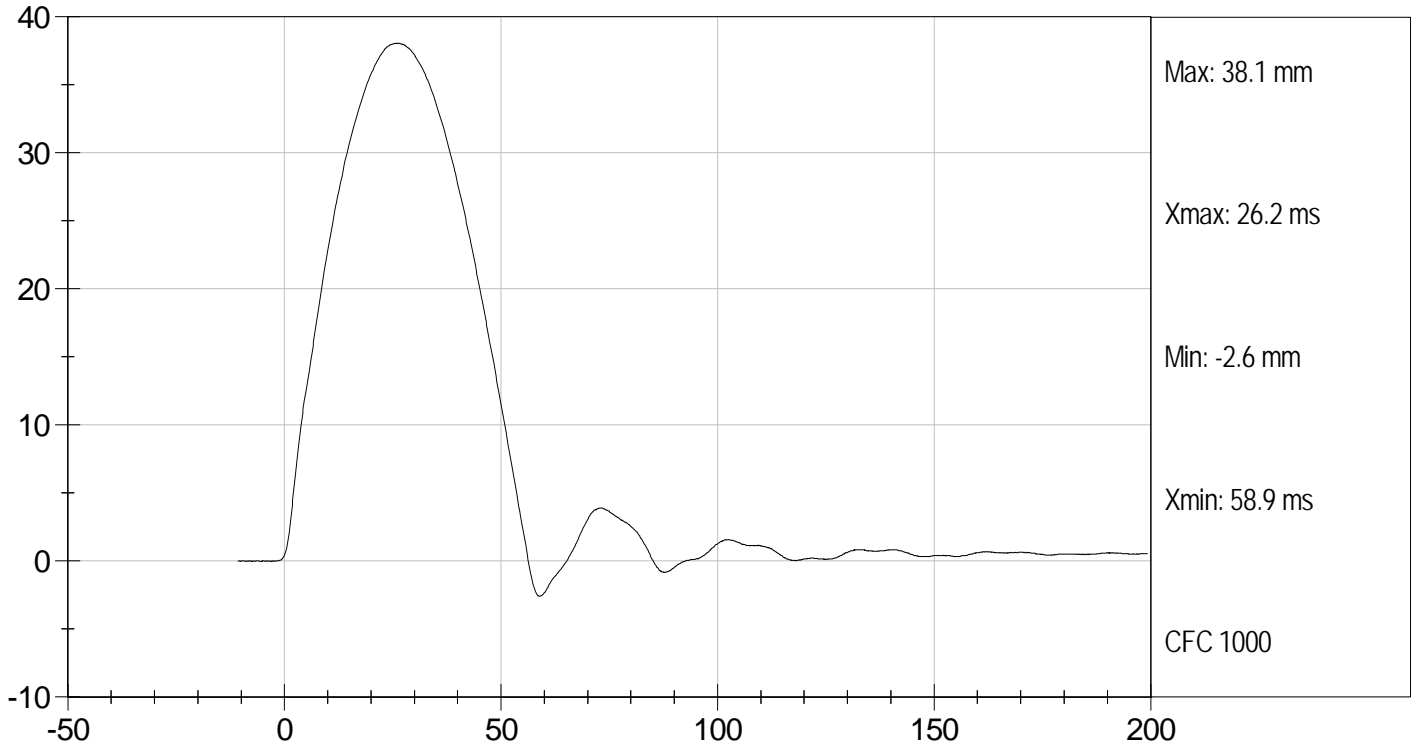
Jessica Gall
 Laboratory Technician

3/6/12
 Test Date

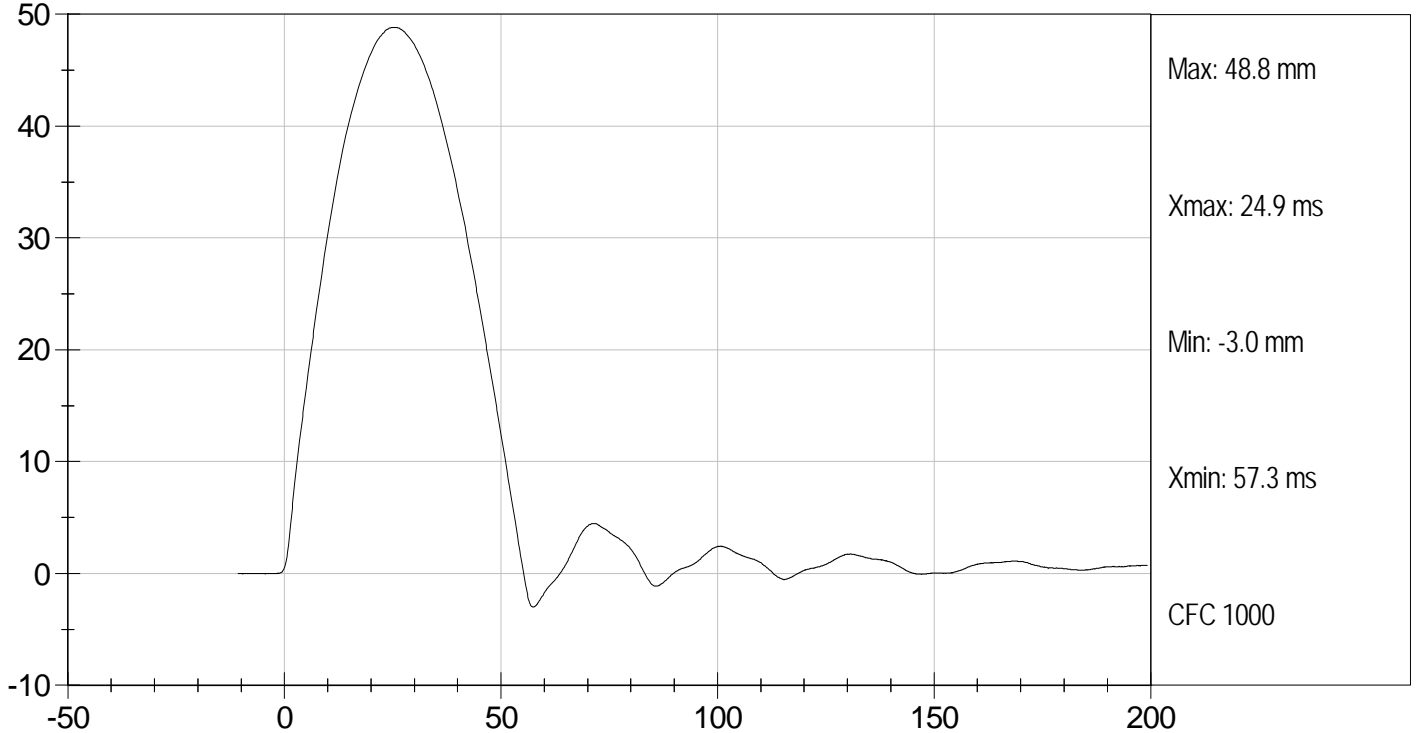
David Winkelbauer
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LOWER RIB DISPLACEMENT @ 3 M/SEC (mm) vs TIME (ms)



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



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

ATD Serial No: 032

Test I.D.: D12850

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Humidity	%	10 to 70	20	Pass
Probe Speed	m/s	5.40 to 5.60	5.58	Pass
Maximum Impactor Force (after 6 ms)	kN	5.10 to 6.20	5.24	Pass
Upper Rib Displacement	mm	34.0 to 41.0	36.4	Pass
Middle Rib Displacement	mm	37.0 to 45.0	39.2	Pass
Lower Rib Displacement	mm	37.0 to 44.0	38.7	Pass
Overall Test Results				Pass

Jessica Gall
 Laboratory Technician

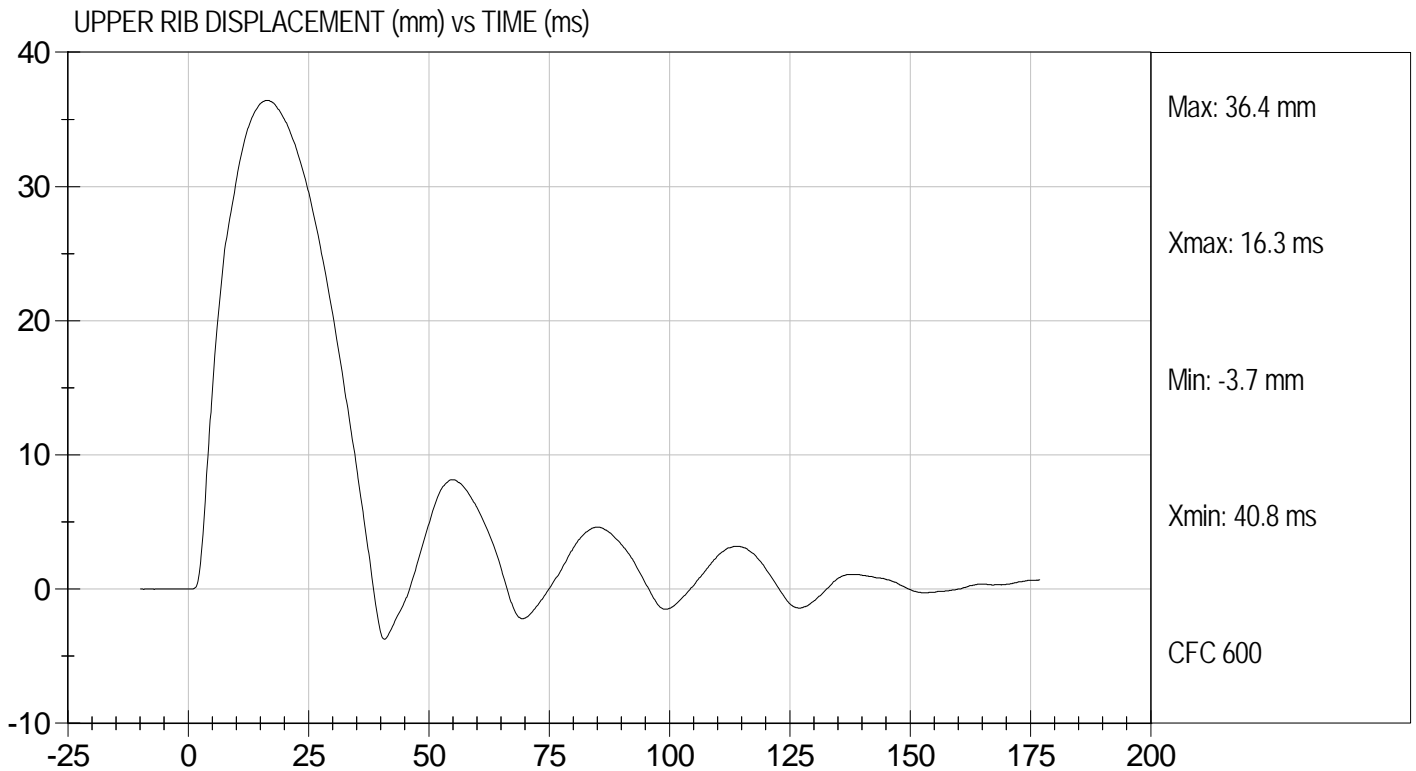
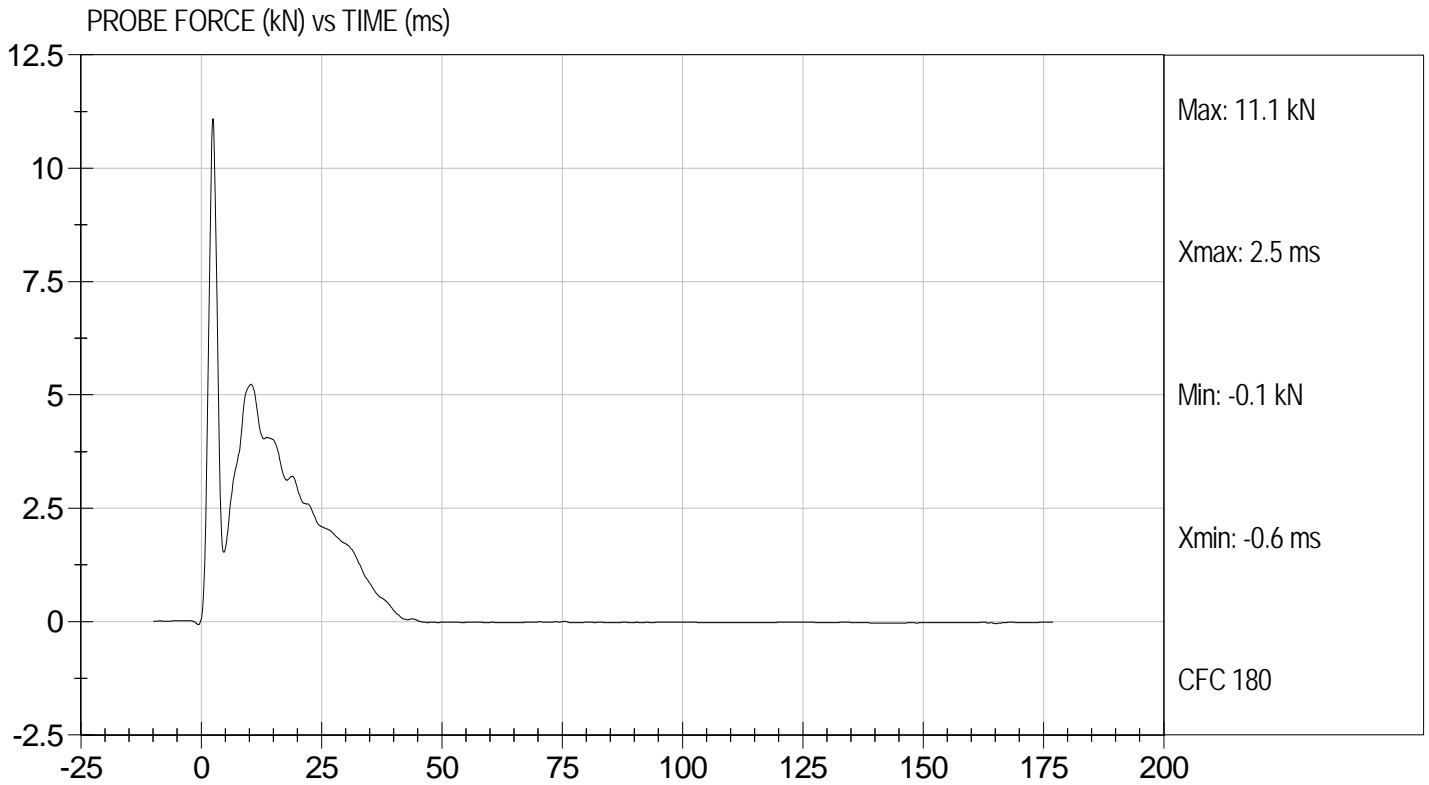
3/6/12
 Test Date

David Winkelbauer
 Approved By



Test Desc: Thorax Impact
Component ID: D12850

Test Date: 3/6/12
Velocity: 18.32 ft/s, 5.58 m/s

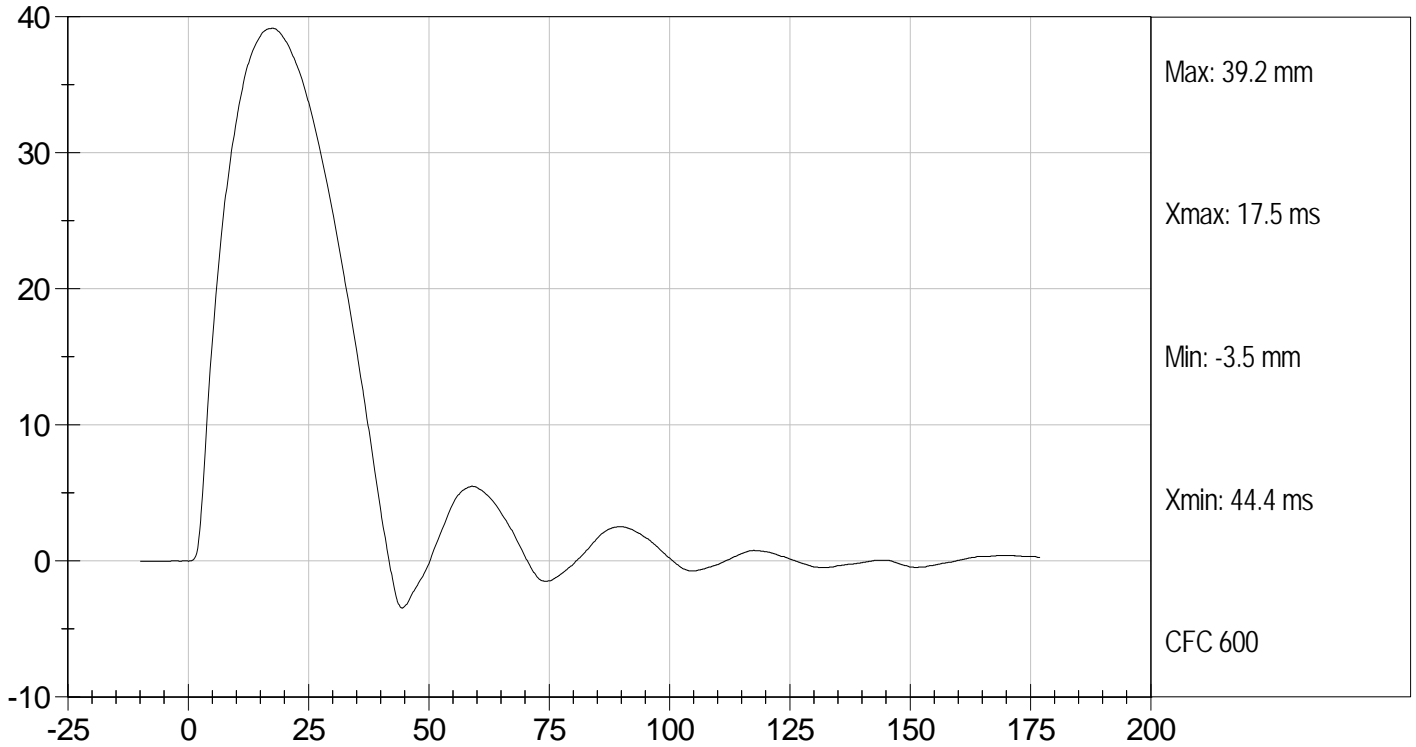




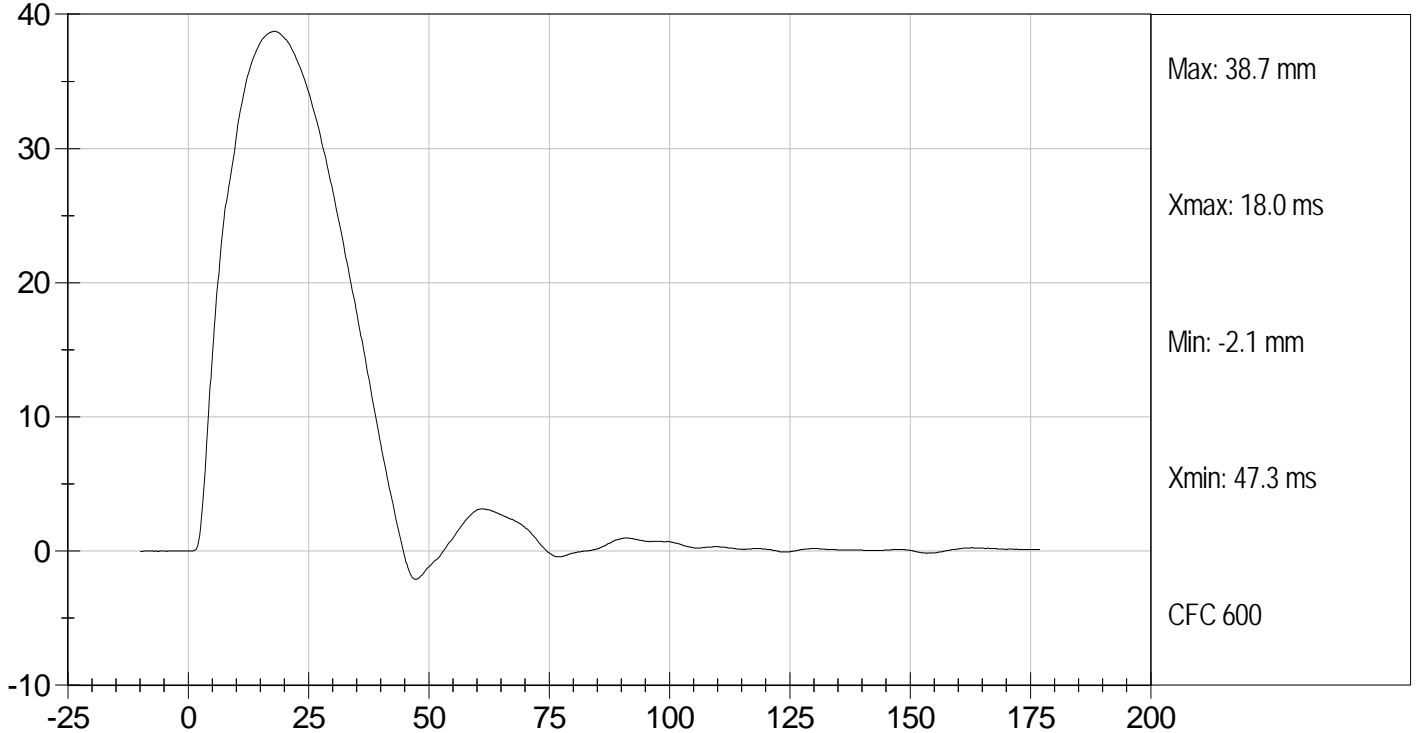
Test Desc: Thorax Impact
Component ID: D12850

Test Date: 3/6/12
Velocity: 18.32 ft/s, 5.58 m/s

MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

ABDOMEN TEST

ES-2re DUMMY


ATD Serial No: 032

Test I.D: D12857

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Probe Speed	m/s	3.90 to 4.10	3.97	Pass
Maximum Impact Force	kN	4.00 to 4.80	4.12	Pass
Time of Maximum Impactor Force	ms	10.60 to 13.00	10.90	Pass
Maximum Total Abdomen Force	kN	2.20 to 2.70	2.44	Pass
Time of Maximum Abdomen Force	ms	10.00 to 12.30	10.40	Pass
Overall Test Results				Pass

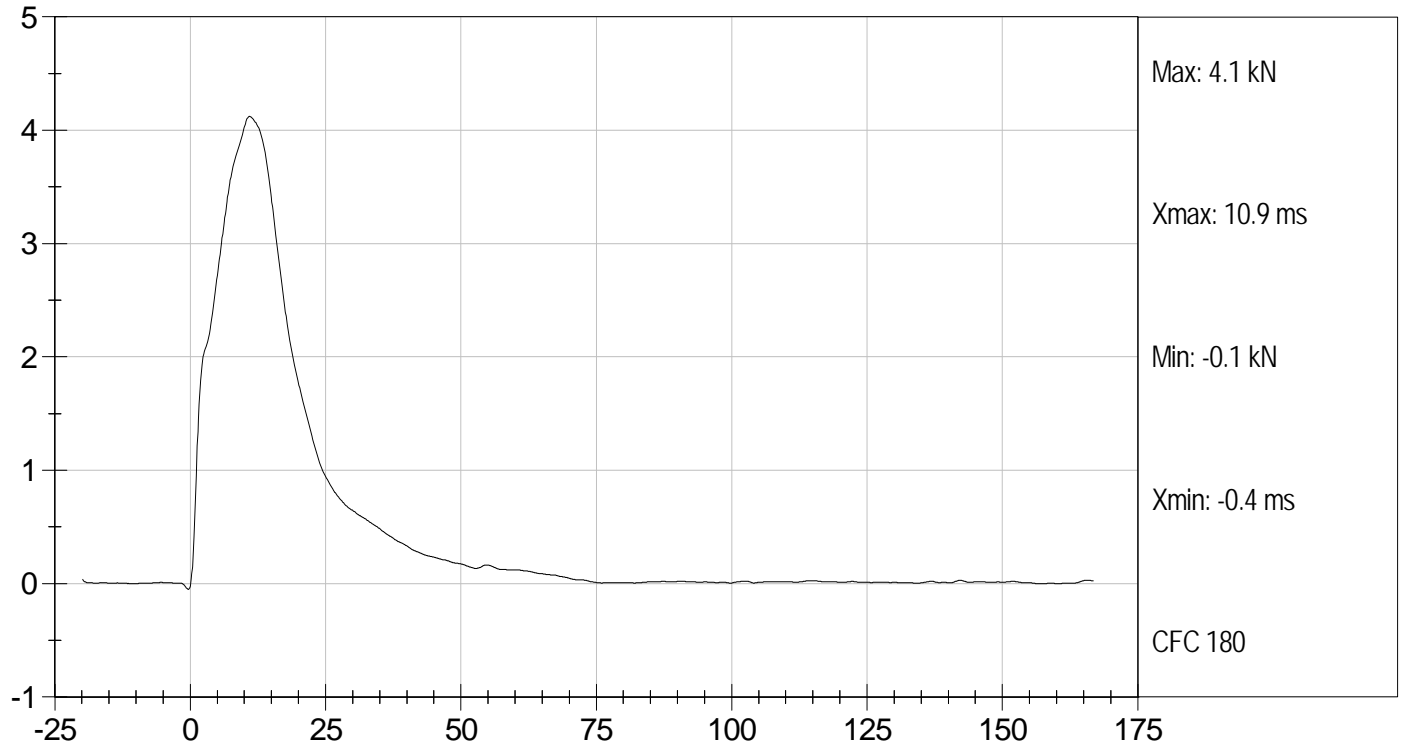

Laboratory Technician

3/6/12
Test Date

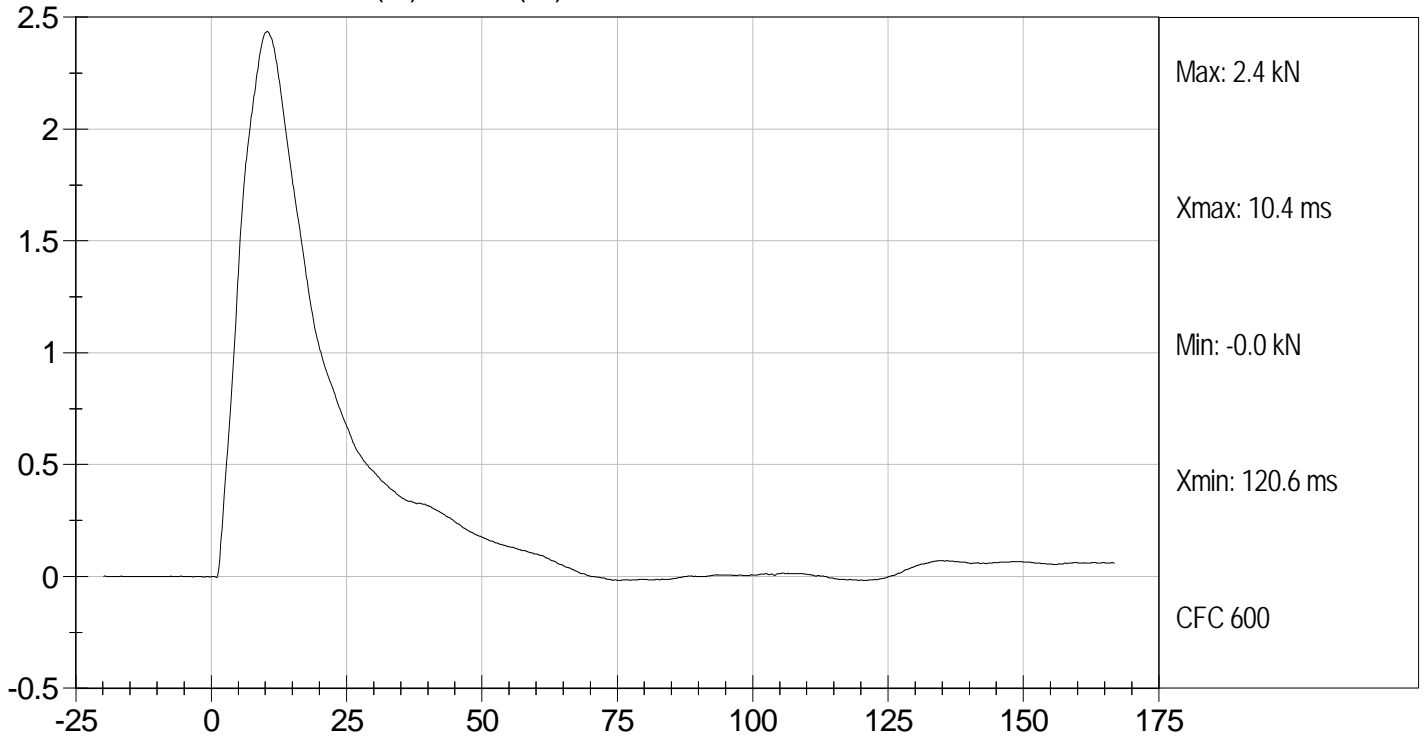

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IMPACTOR FORCE (kN) vs TIME (ms)



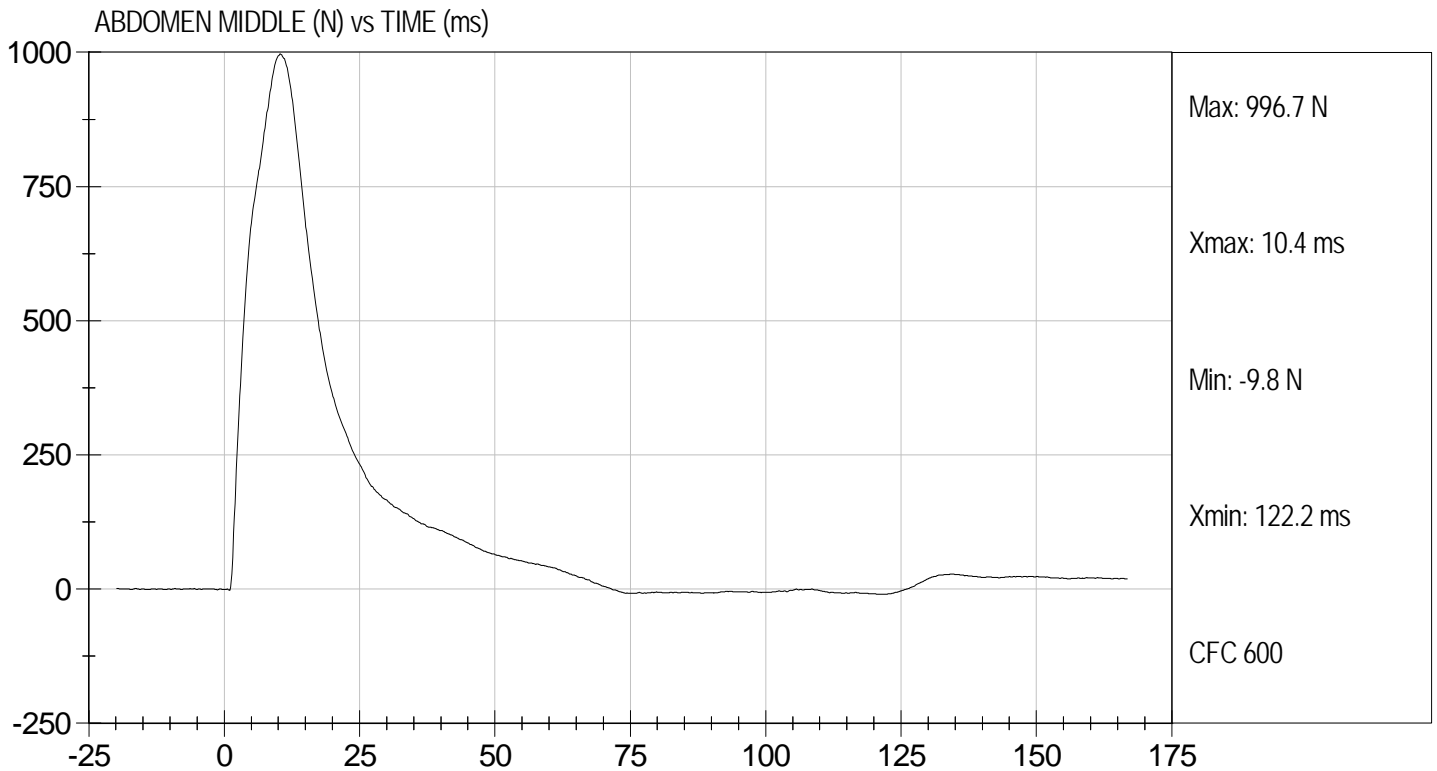
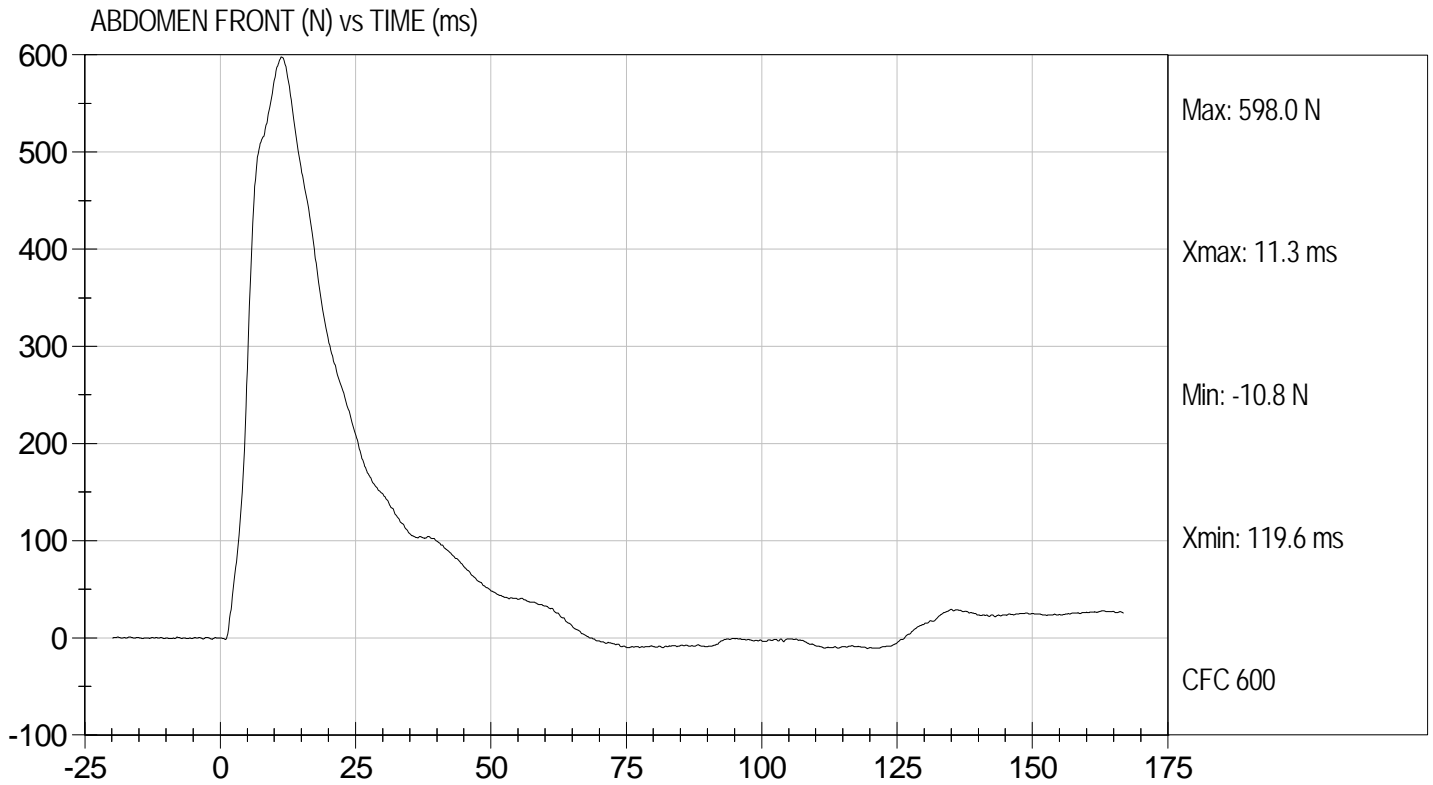
TOTAL ABDOMEN FORCE (kN) vs TIME (ms)





Test Desc: Abdomen Impact
Component ID: D12857

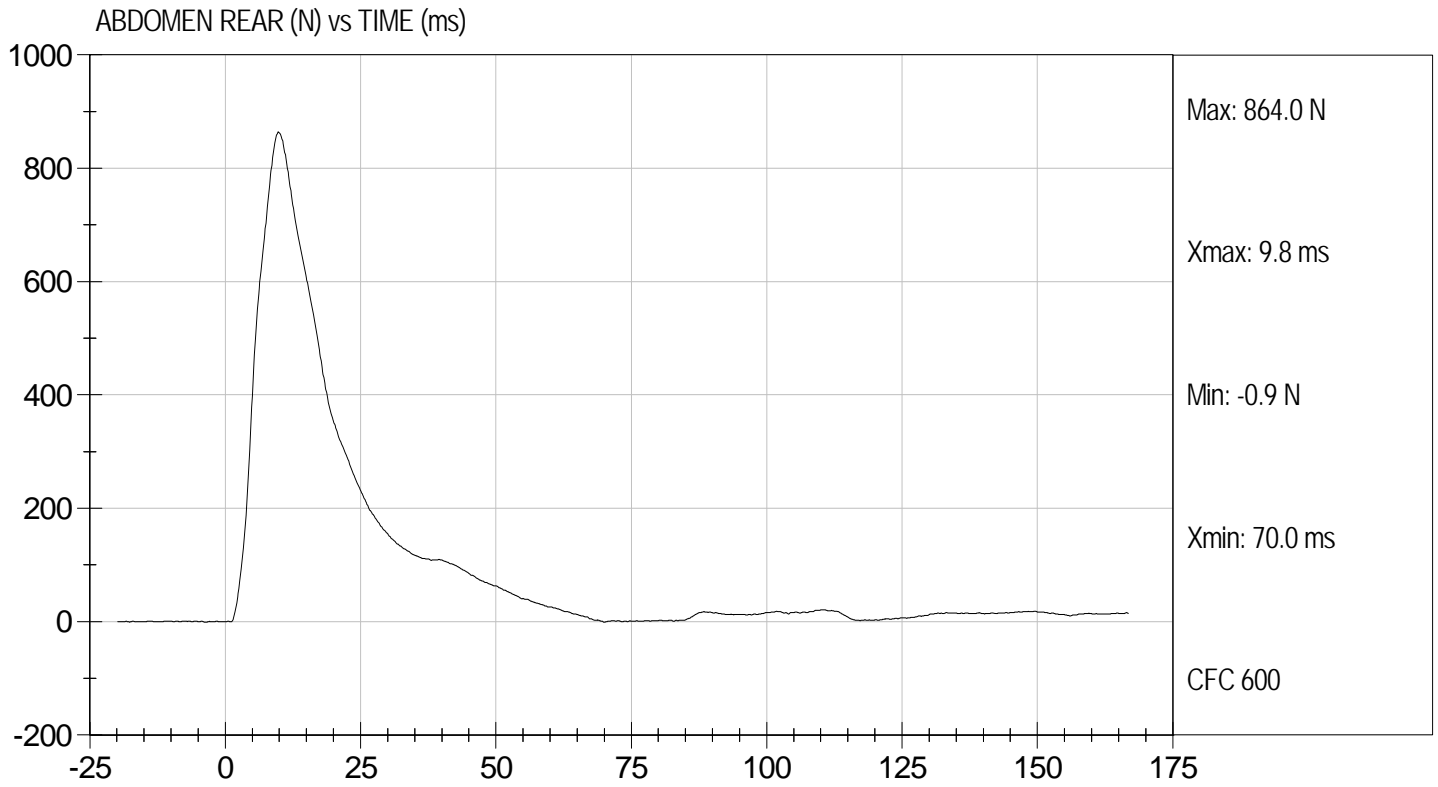
Test Date: 3/6/12
Velocity: 13.02 ft/s, 3.97 m/s





Test Desc: Abdomen Impact
Component ID: D12857

Test Date: 3/6/12
Velocity: 13.02 ft/s, 3.97 m/s



MGA RESEARCH CORPORATION
LUMBAR SPINE TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D.: D12858

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity		%	10 to 70	25	Pass
Pendulum Speed		m/s	5.95 to 6.15	6.12	Pass
Pendulum Deceleration	1 ms	m/s	-0.05 to 0.00	-0.01	Pass
	3.7 ms	m/s	-0.425 to -0.24	-0.41	Pass
	27 ms	m/s	-6.50 to -5.80	-5.86	Pass
	30 ms	m/s	>= -6.5	-5.76	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	47.9	Pass
Time of Maximum Flexion Angle		ms	39.0 to 53.0	41.8	Pass
Headform Rotation Decay to Initial Position		ms	37 to 57	45	Pass
Overall Results					Pass

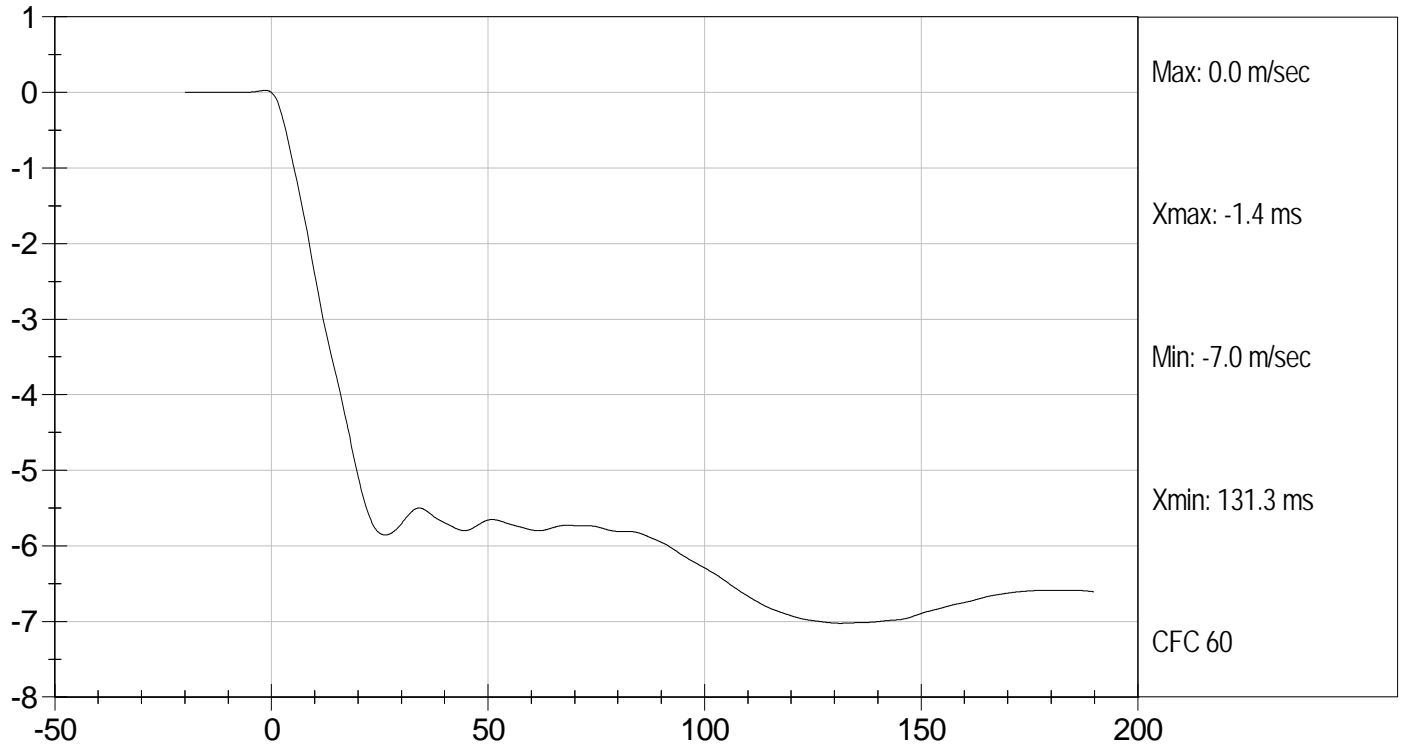
Jessica Hall
 Laboratory Technician

3/6/12
 Test Date

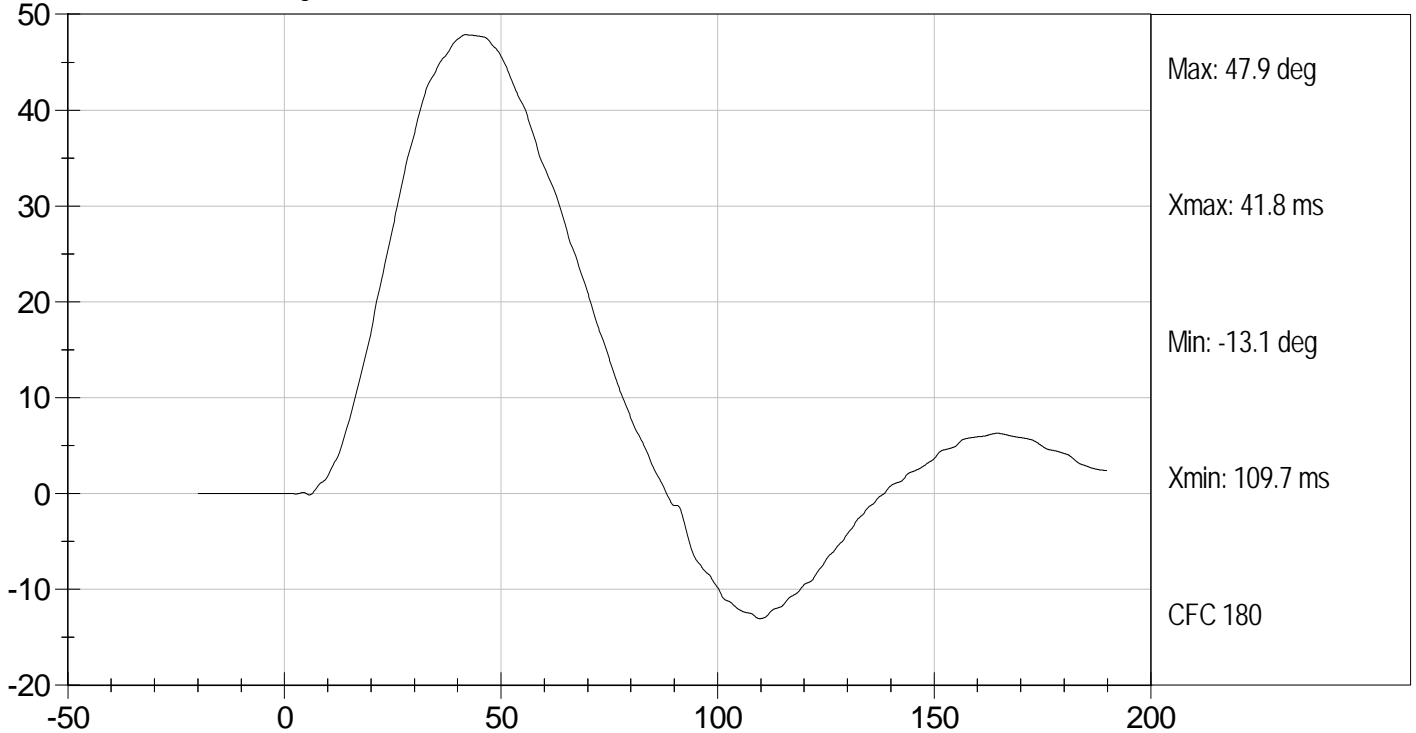
David Winkelbauer
 Approved By



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



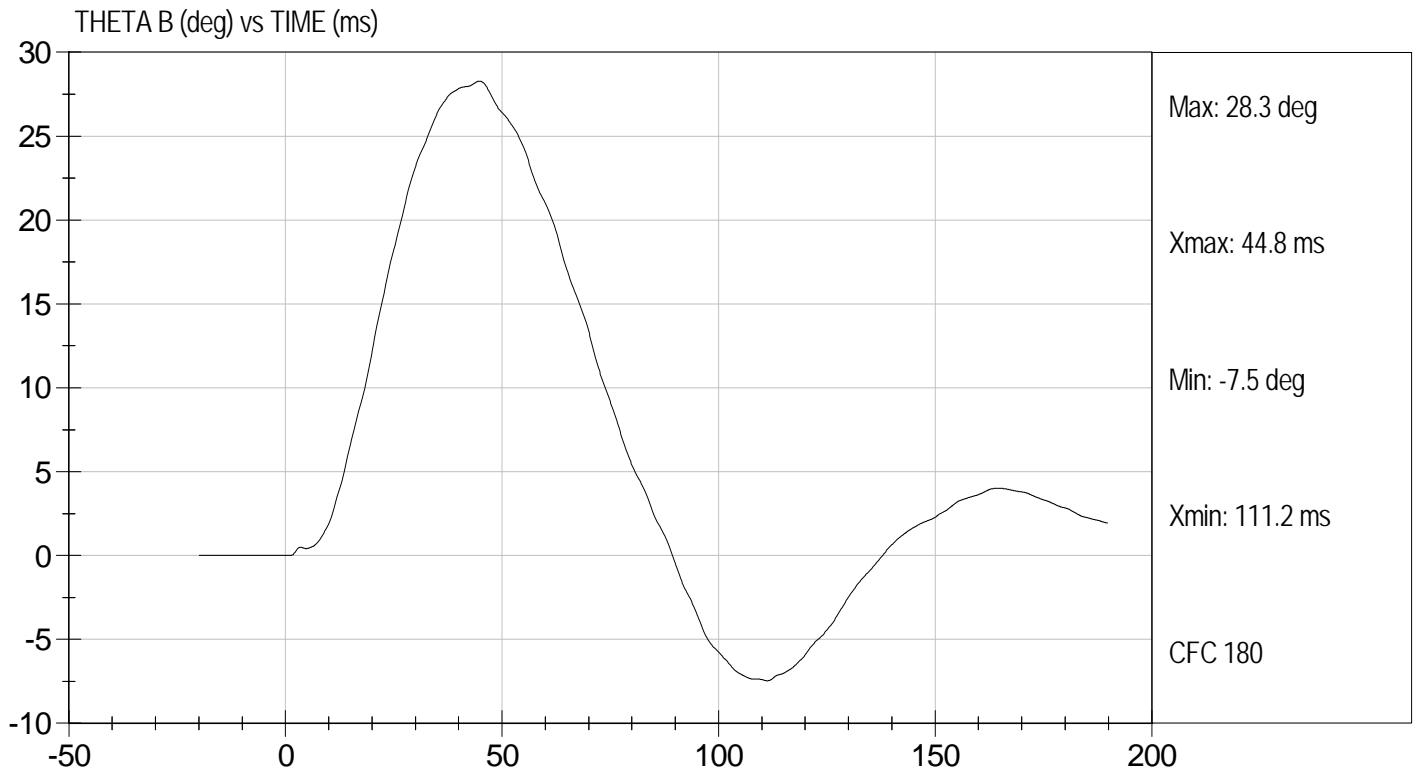
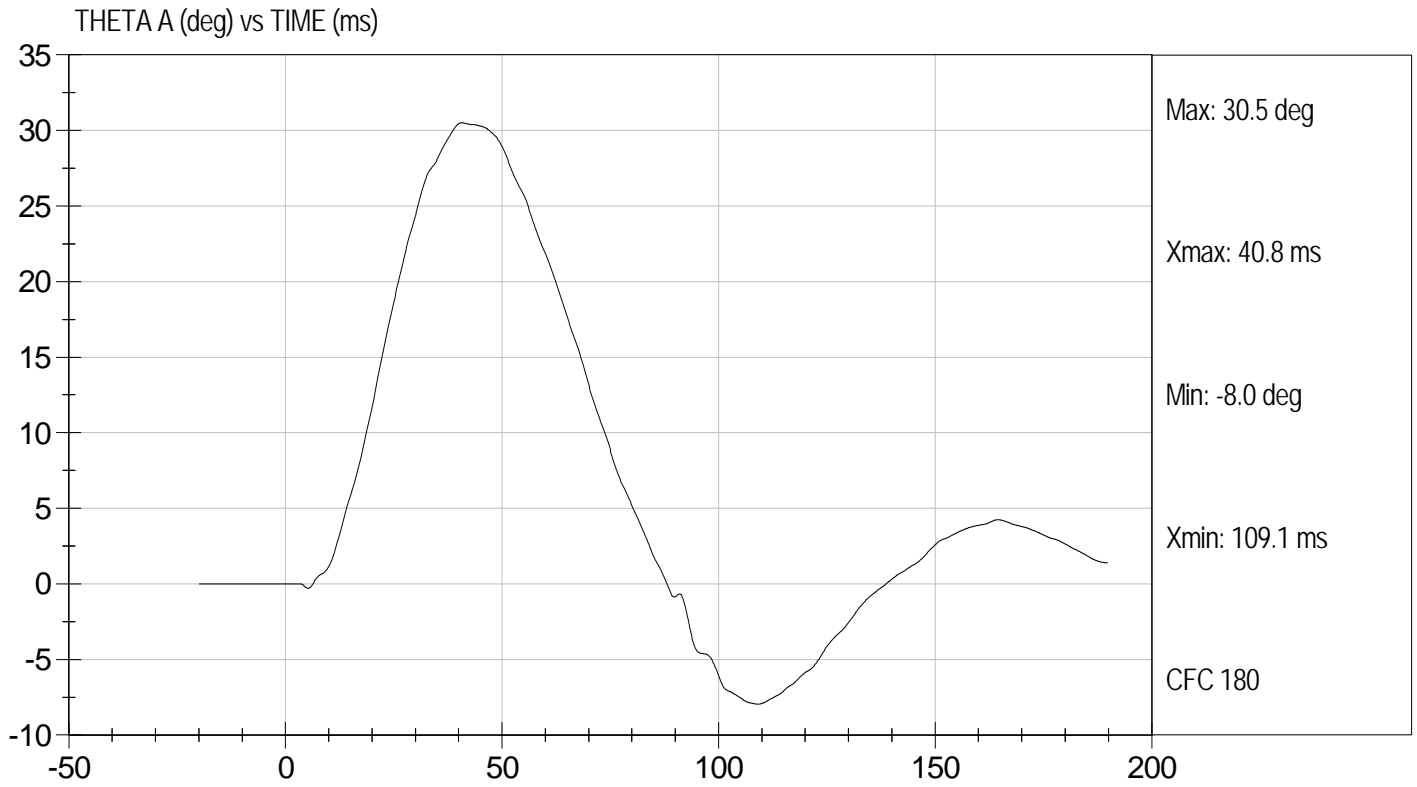
FLEXION ANGLE (deg) vs TIME (ms)





Test Desc: Lumbar Bending
Component ID: D12858

Test Date: 3/6/12
Velocity: 20.08 ft/s, 6.12 m/s



MGA RESEARCH CORPORATION

PELVIS TEST
ES-2re DUMMY


ATD Serial No: 032

Test I.D: D12859

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Probe Speed	m/s	4.20 to 4.40	4.34	Pass
Maximum Impactor Force	kN	4.70 to 5.40	5.11	Pass
Time of Maximum Impactor Force	ms	11.80 to 16.10	13.10	Pass
Maximum Pubic Force	kN	1.23 to 1.59	1.43	Pass
Time of Maximum Pubic Force	ms	12.20 to 17.00	14.10	Pass
Overall Test Results				Pass


Laboratory Technician

3/6/12
Test Date

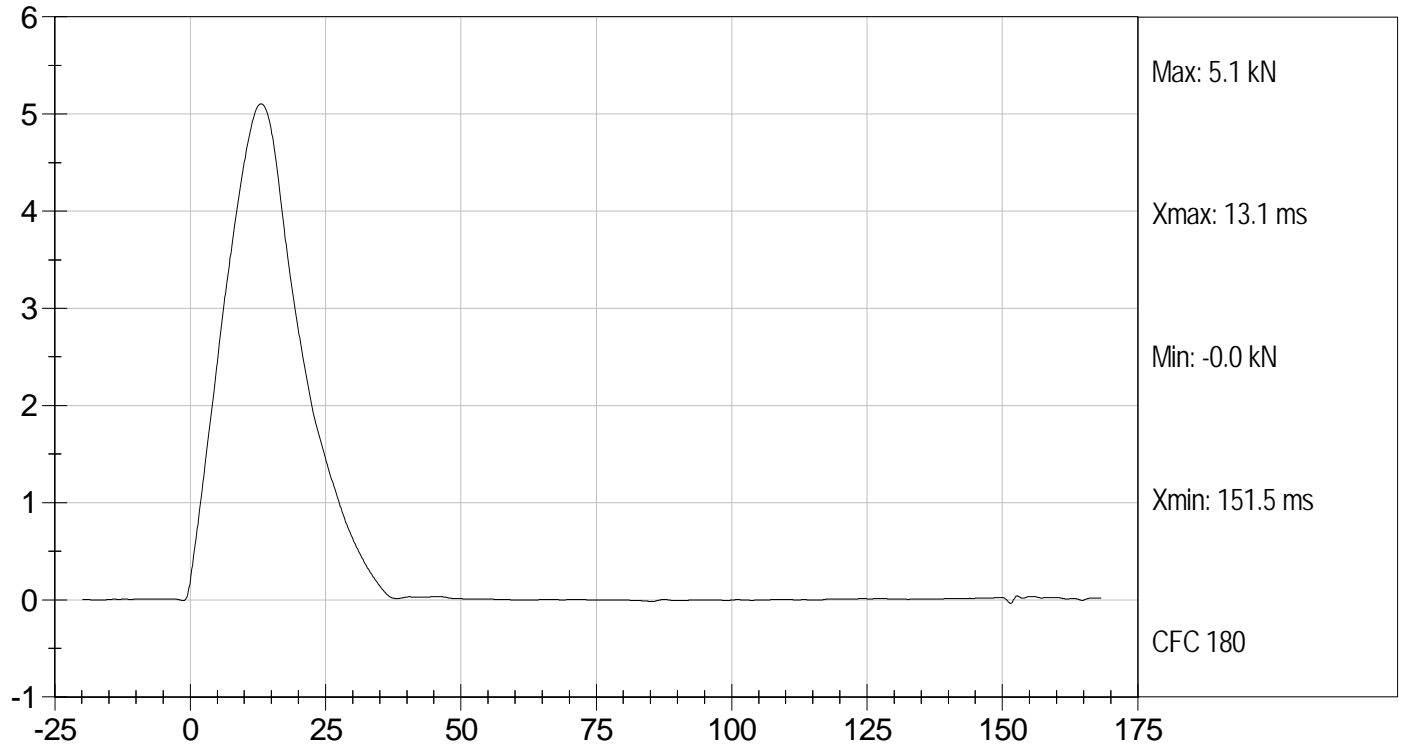

Approved By



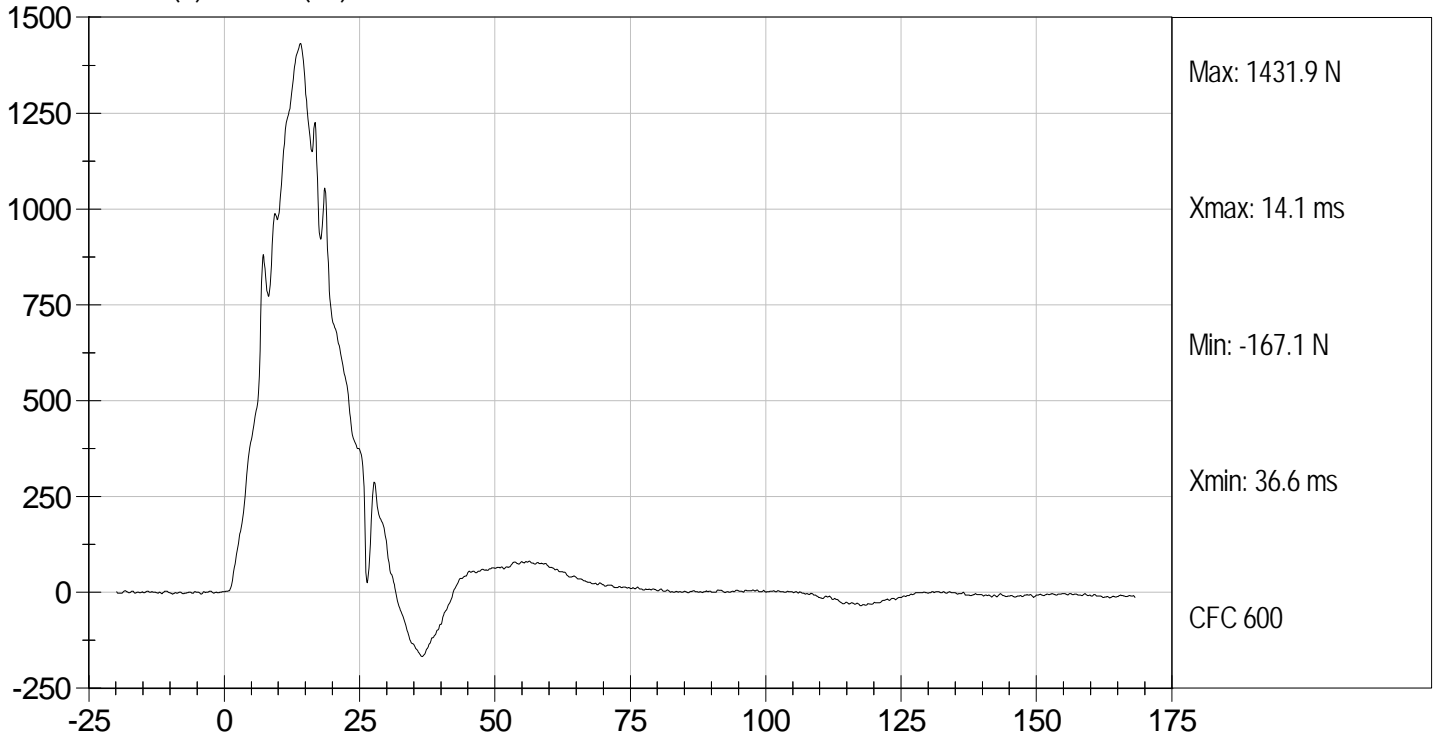
Test Desc: Pelvis Impact
Component ID: D12859

Test Date: 3/6/12
Velocity: 14.25 ft/s, 4.38 m/s

IMPACTOR FORCE (kN) vs TIME (ms)



PUBIC (N) vs TIME (ms)



MGA RESEARCH CORPORATION
HEAD DROP TEST
ES-2re DUMMY

ATD Serial No: 032

Test ID: D12981

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	31	Pass
Peak Resultant Acceleration	G's	125 to 155	146	Pass
Peak Longitudinal Acceleration	G's	+/- 15	6.4	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
Overall Test Results				Pass

Jessica Gall
 Laboratory Technician

3/13/12
 Test Date

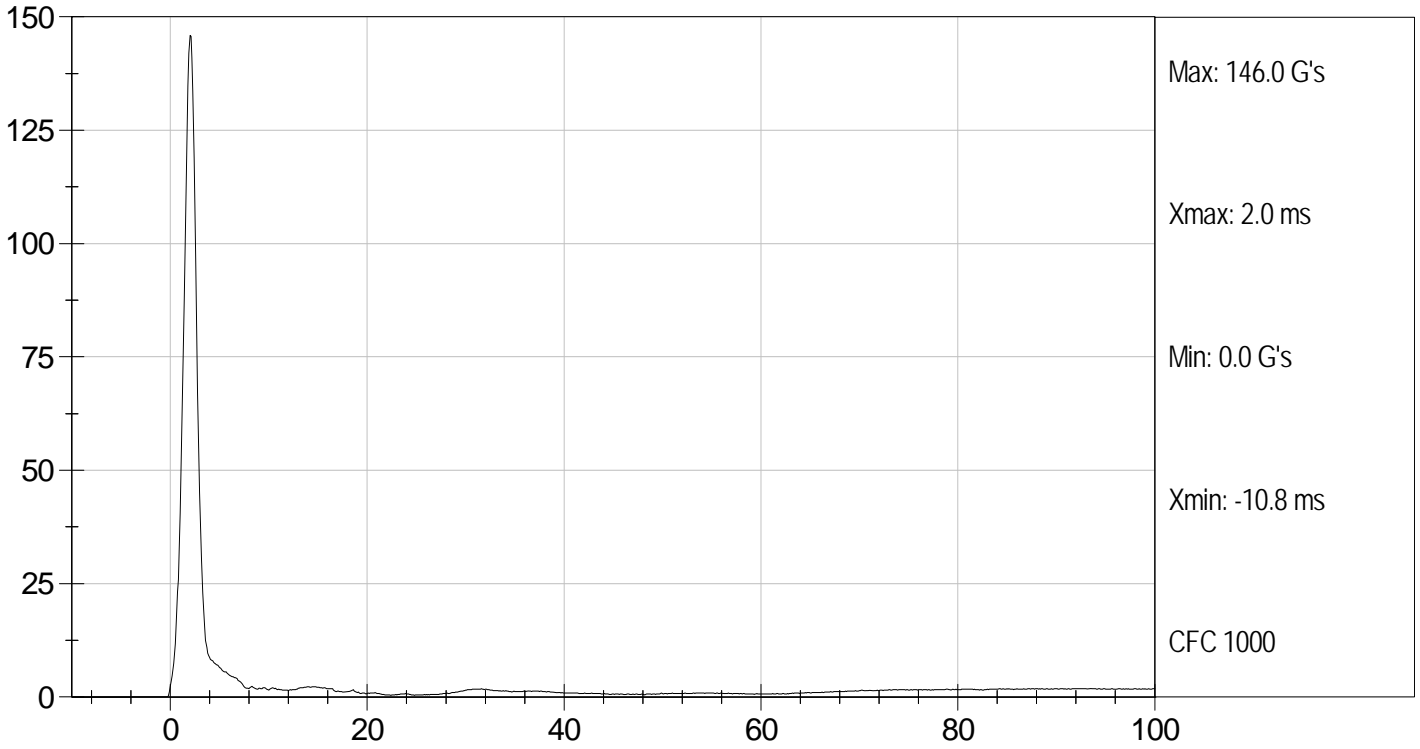
David Winkelbauer
 Approved By



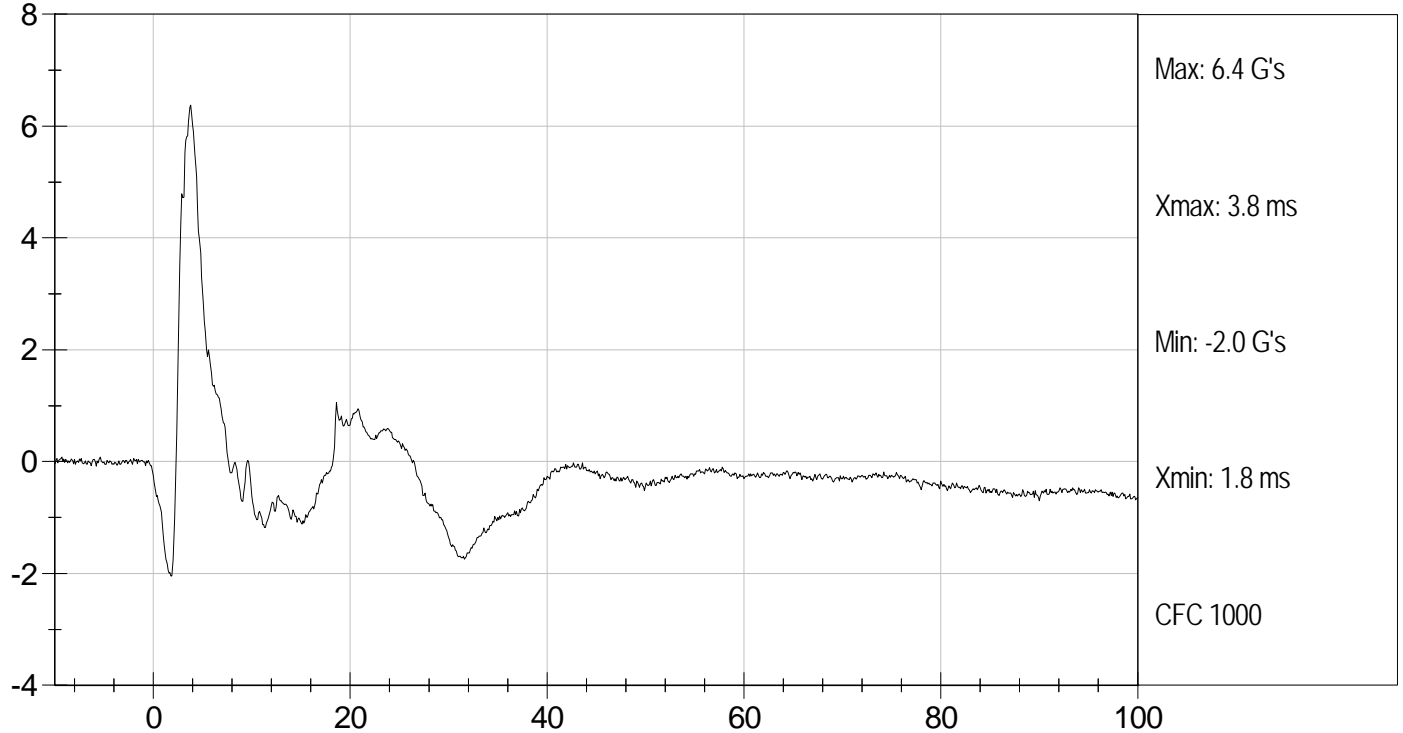
Test Desc: Head Drop
Component ID: D12981

Test Date: 3/13/12
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.: D12982

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	18.0 to 22.0	21.9	Pass
Laboratory Relative Humidity		%	10 to 70	35	Pass
Pendulum Speed		m/s	3.3 to 3.5	3.4	Pass
Pendulum Deceleration	1 ms	m/s	0.00 to -0.05	-0.01	Pass
	3 ms	m/s	-0.25 to -0.375	-0.33	Pass
	14 ms	m/s	-3.20 to -3.70	-3.36	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	52.3	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	58.0	Pass
Head Rotation Decay Time to 0 degree		ms	53.0 to 88.0	59.0	Pass
Overall Test Results					Pass

Jessica Gall
Laboratory Technician

3/13/12
Test Date

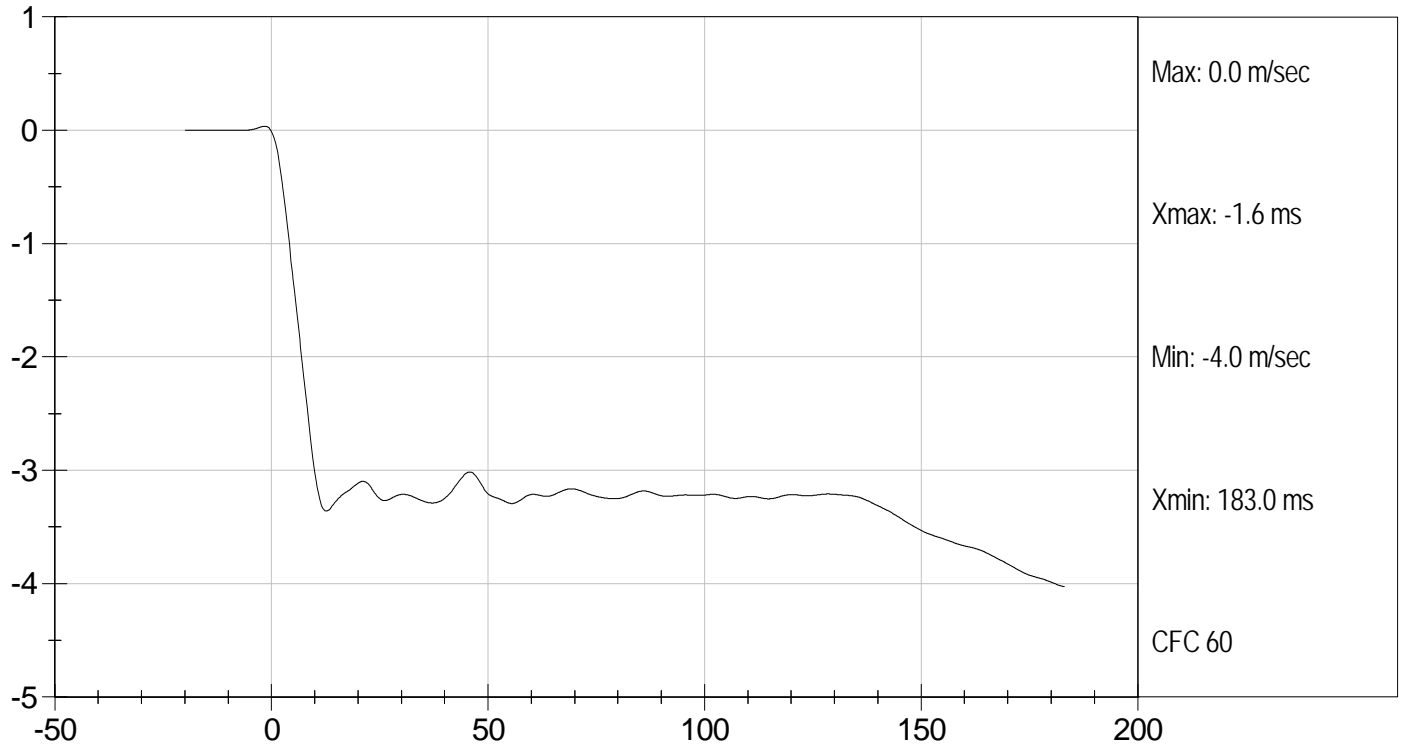
David Winkelbauer
Approved By



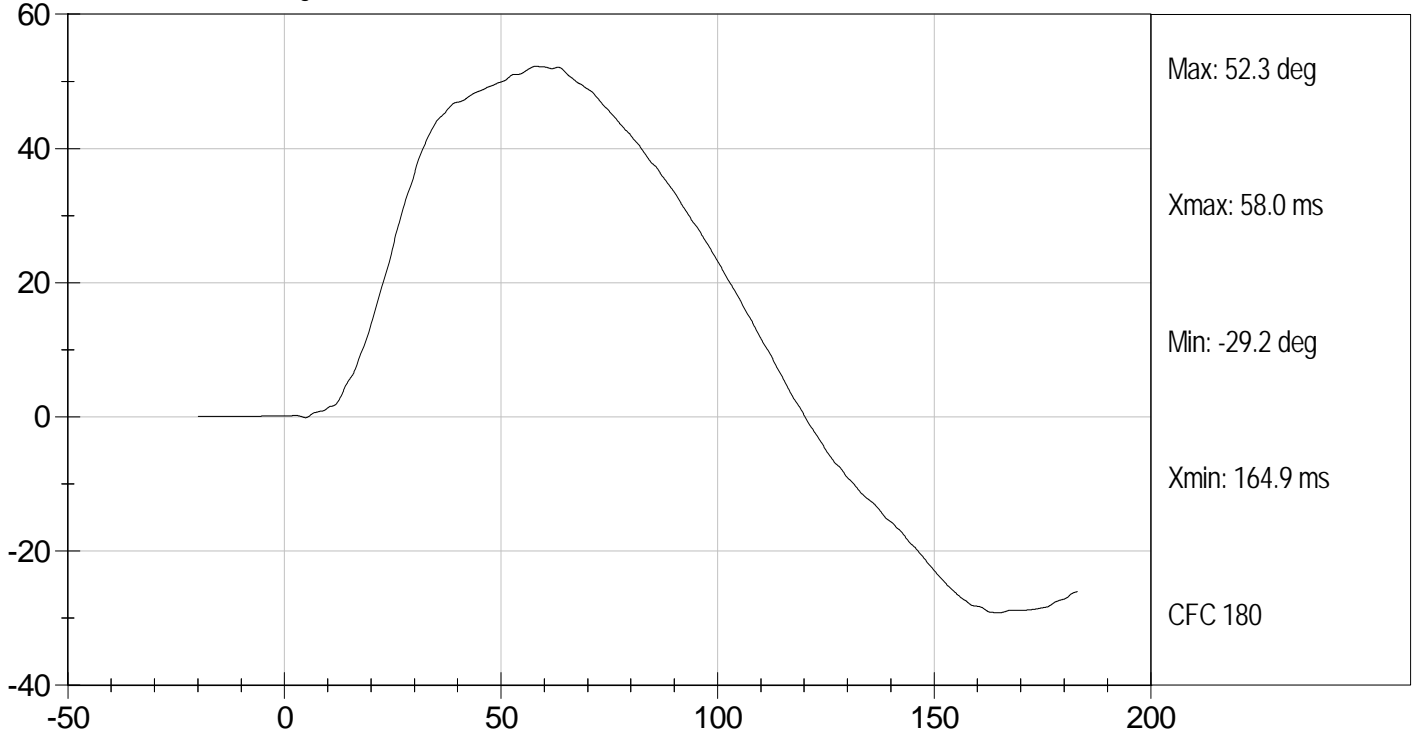
Test Desc: Neck Bending
Component ID: D12982

Test Date: 3/13/12
Velocity: 11.11 ft/s, 3.4 m/s

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



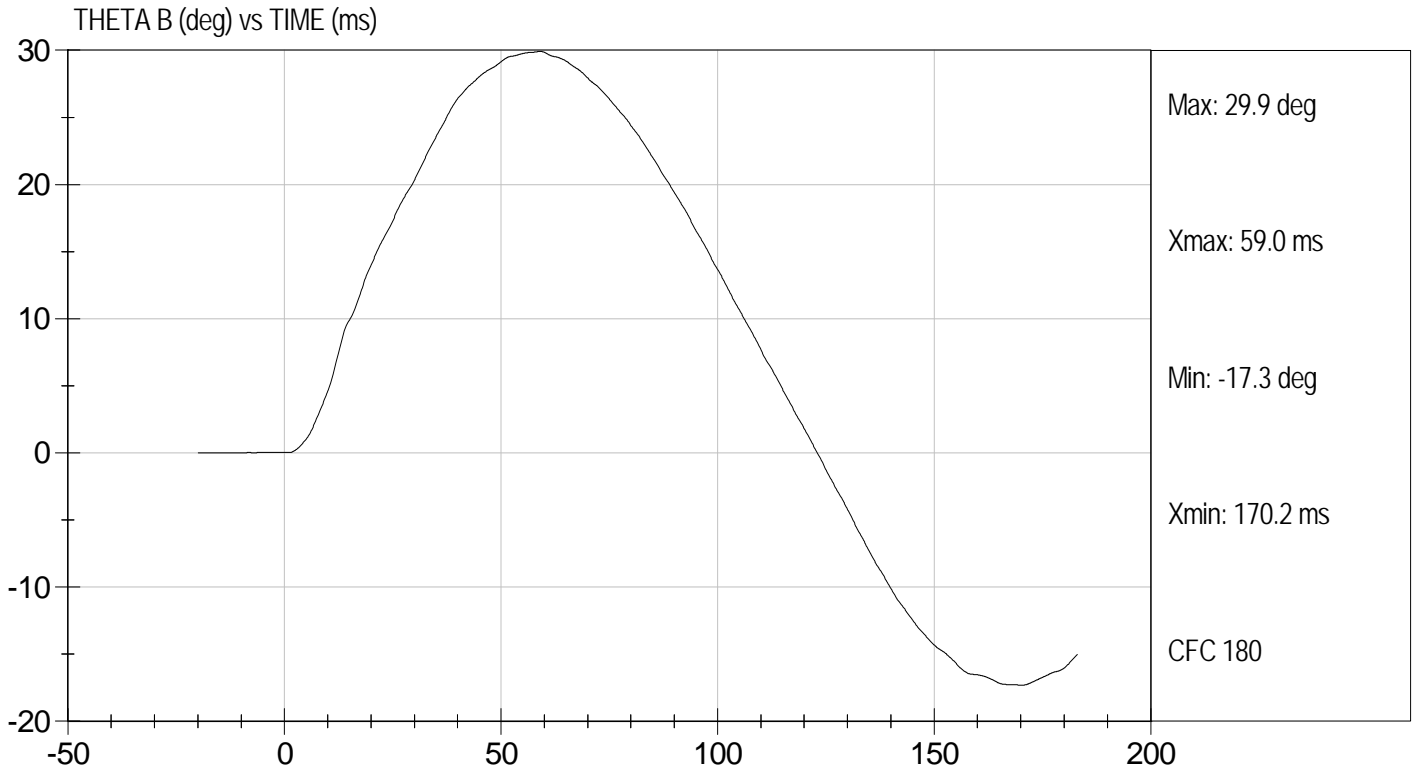
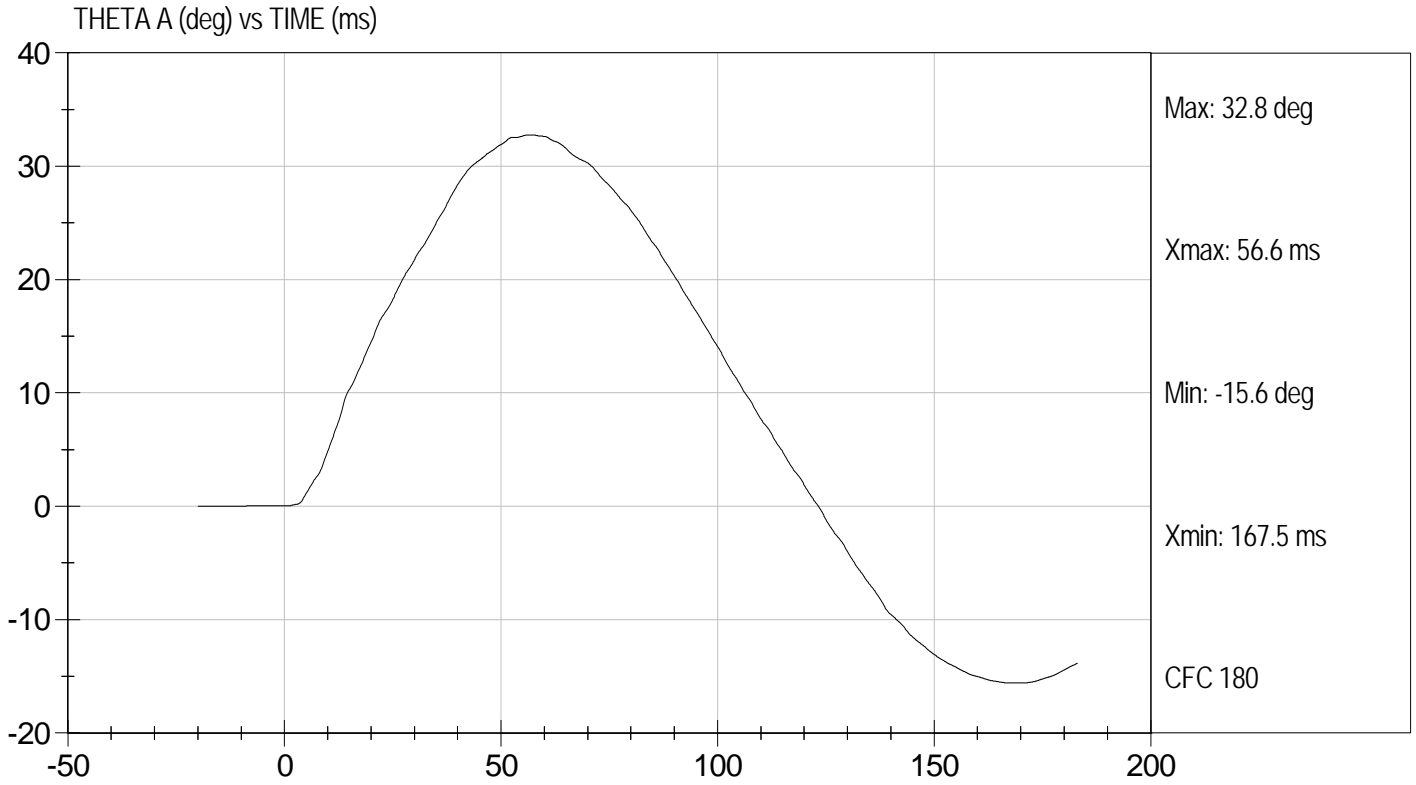
FLEXION ANGLE (deg) vs TIME (ms)





Test Desc: Neck Bending
Component ID: D12982

Test Date: 3/13/12
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.: D12983

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	34	Pass
Pendulum Speed	m/s	4.2 to 4.4	4.3	Pass
Peak Shoulder Acceleration	G's	7.5 to 10.5	9.2	Pass
Time of Peak Shoulder Acceleration	ms	NA	13.6	Pass
Overall Test Results				Pass

Jessica Hall
 Laboratory Technician

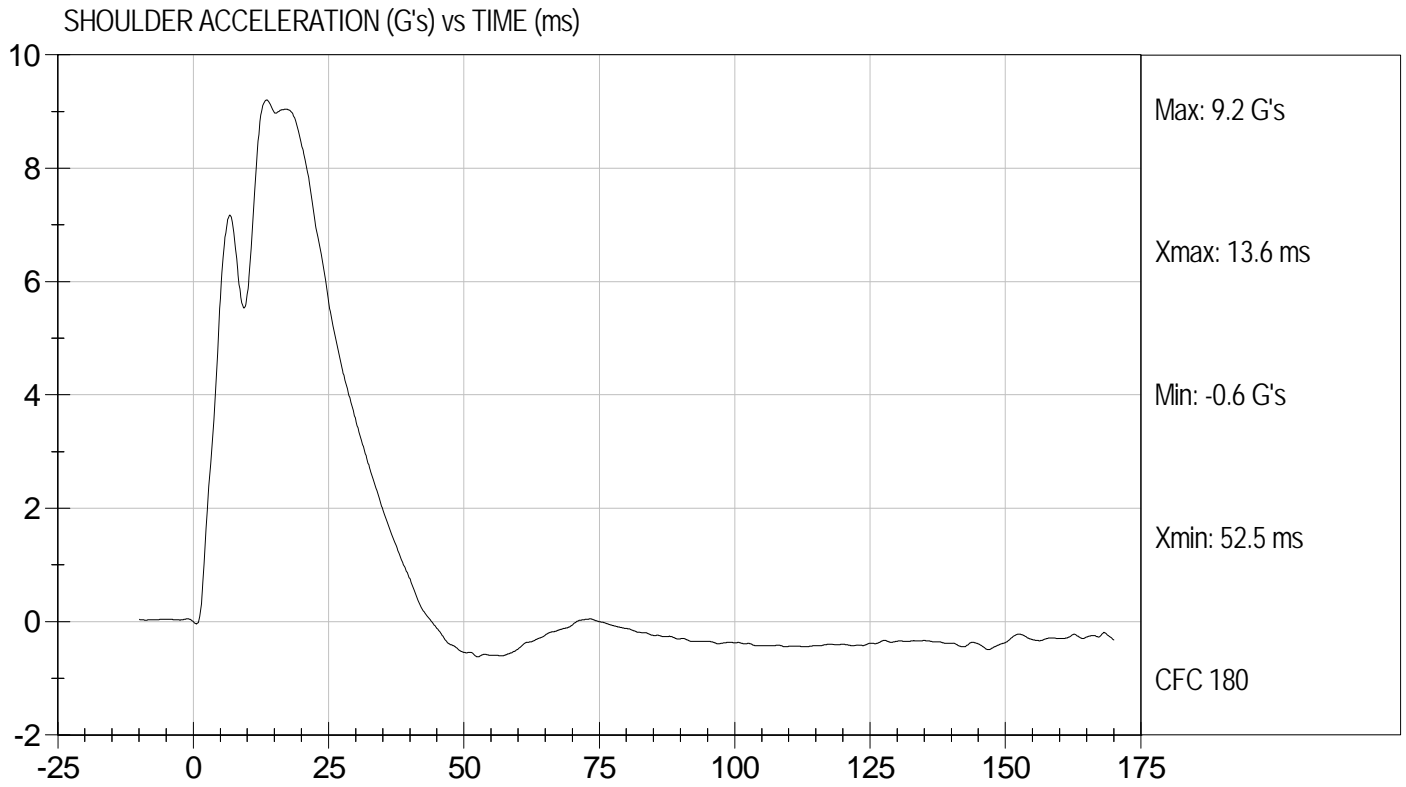
3/13/12
 Test Date

David Winkelbauer
 Approved By



Test Desc: Shoulder Impact
Component ID: D12983

Test Date: 3/13/12
Velocity: 14.25 ft/s, 4.3 m/s



MGA RESEARCH CORPORATION
UPPER RIB TEST
EUROSID 2 DUMMY

ATD Serial No: 032

Test I.D.: D12984

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	31	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	38.0	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	47.9	Pass
Overall Test Results				Pass

Jessica Gall

 Laboratory Technician

3/13/12

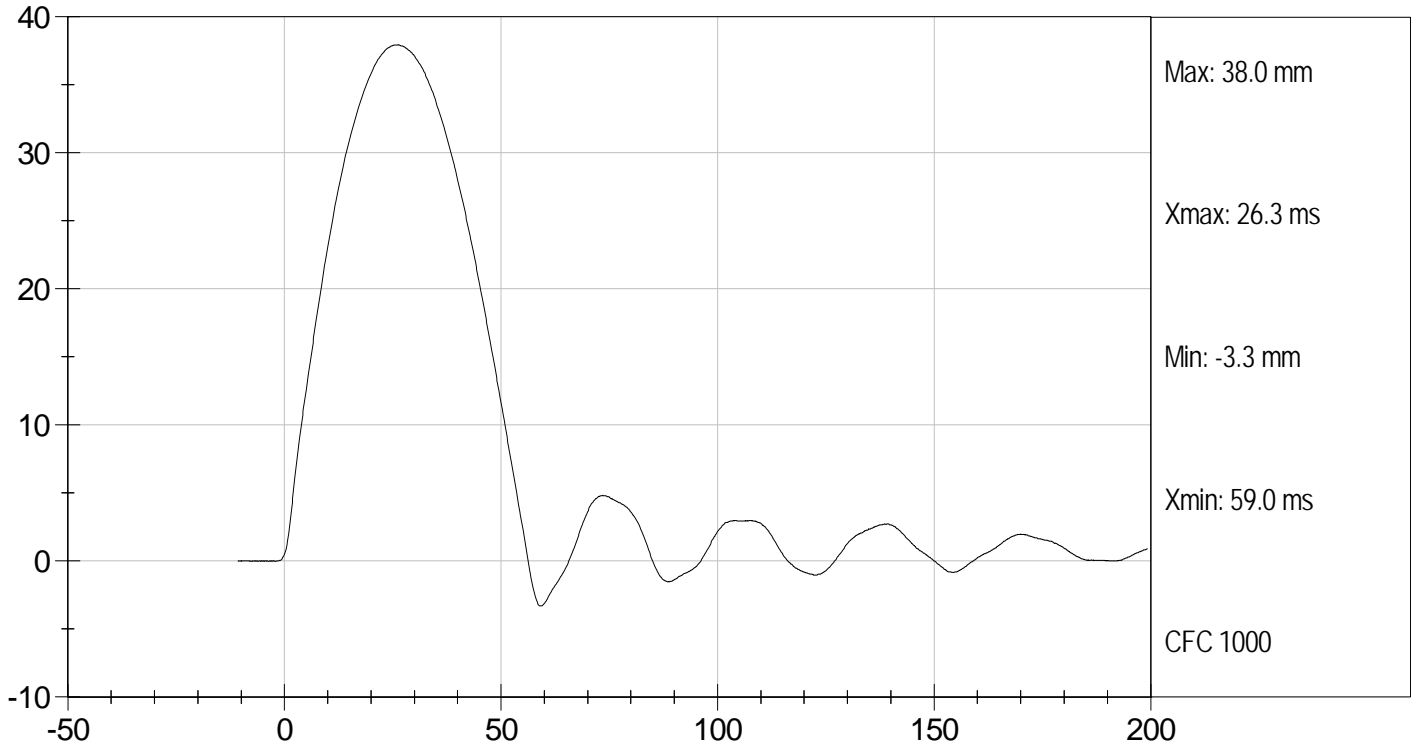
 Test Date

David Winkelbauer

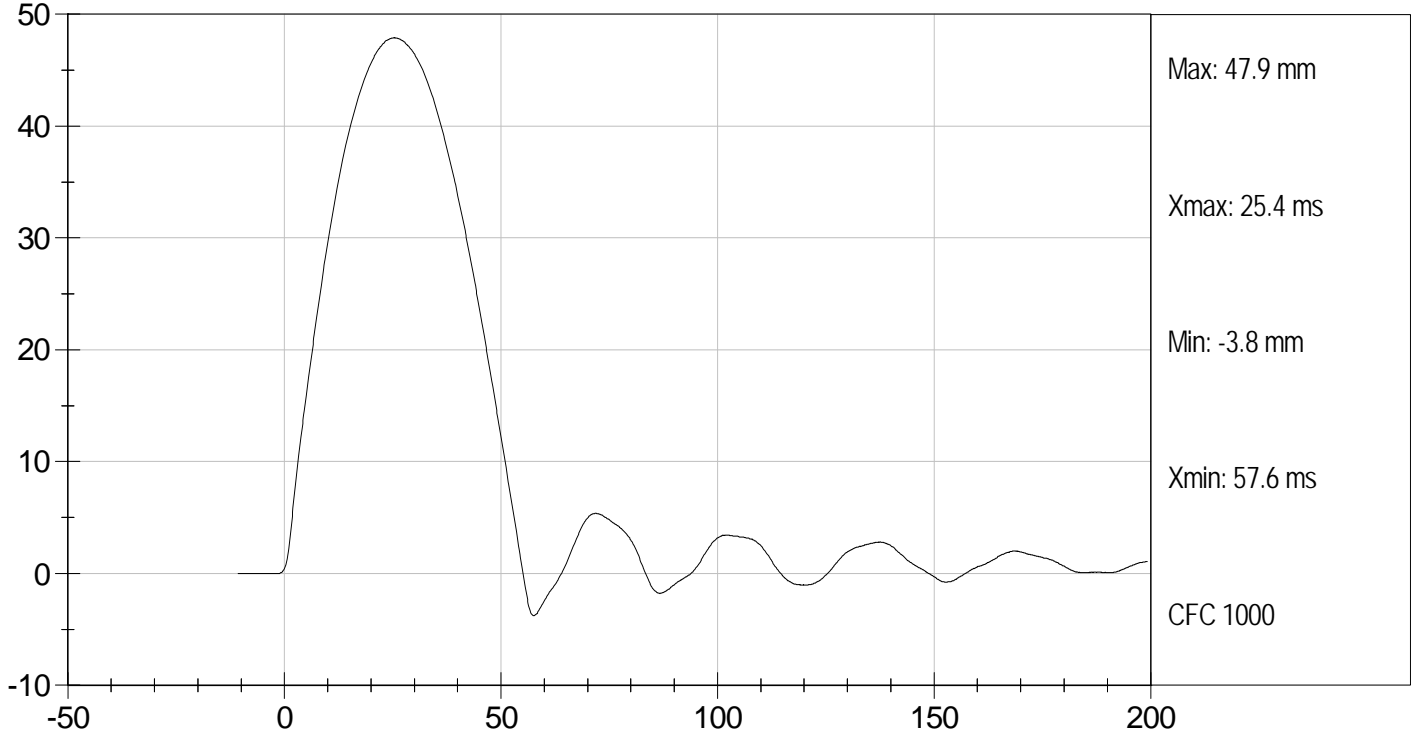
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UPPER RIB DISPLACEMENT @ 3 M/SEC (mm) vs TIME (ms)



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



MGA RESEARCH CORPORATION
MID RIB TEST
EUROSID 2 DUMMY


ATD Serial No: 032

Test I.D.: D12985

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	31	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	37.6	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	47.4	Pass
Overall Test Results				Pass

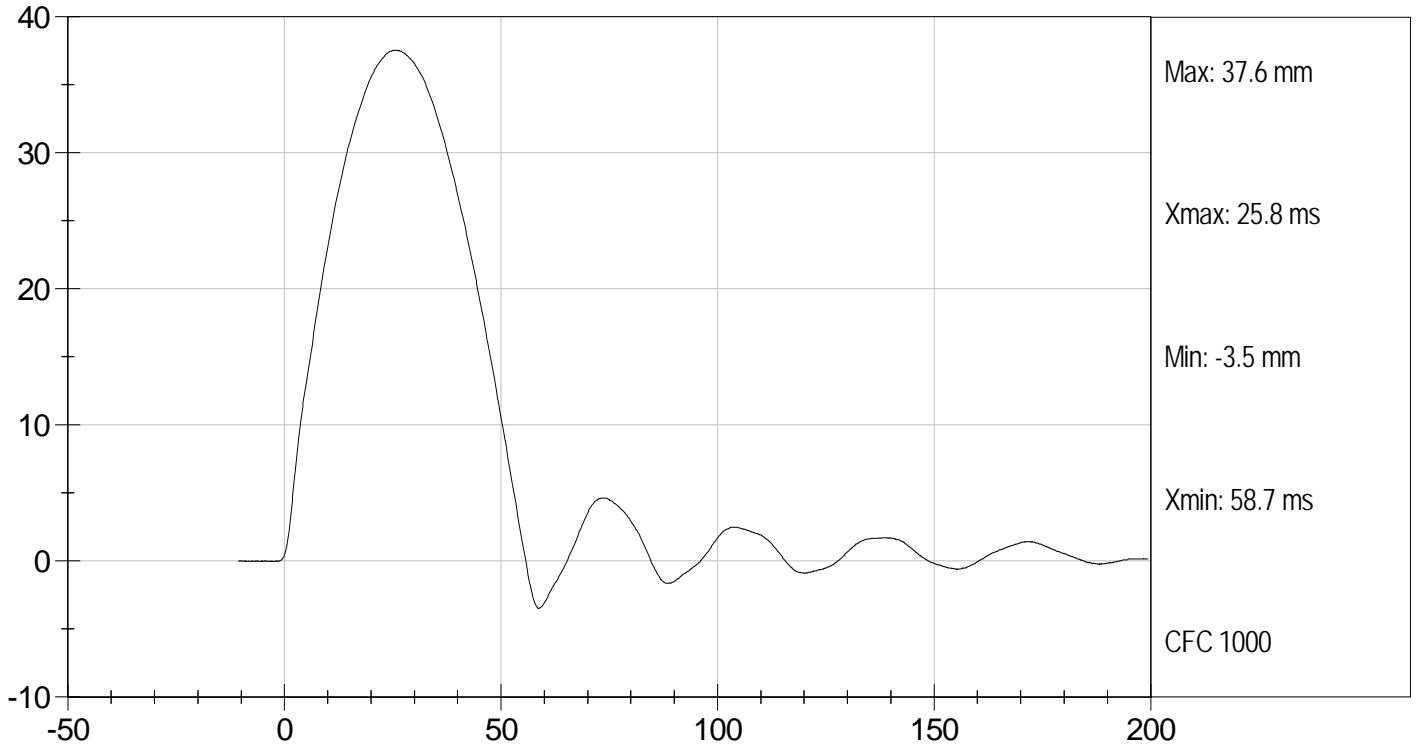

 Laboratory Technician

3/13/12
 Test Date

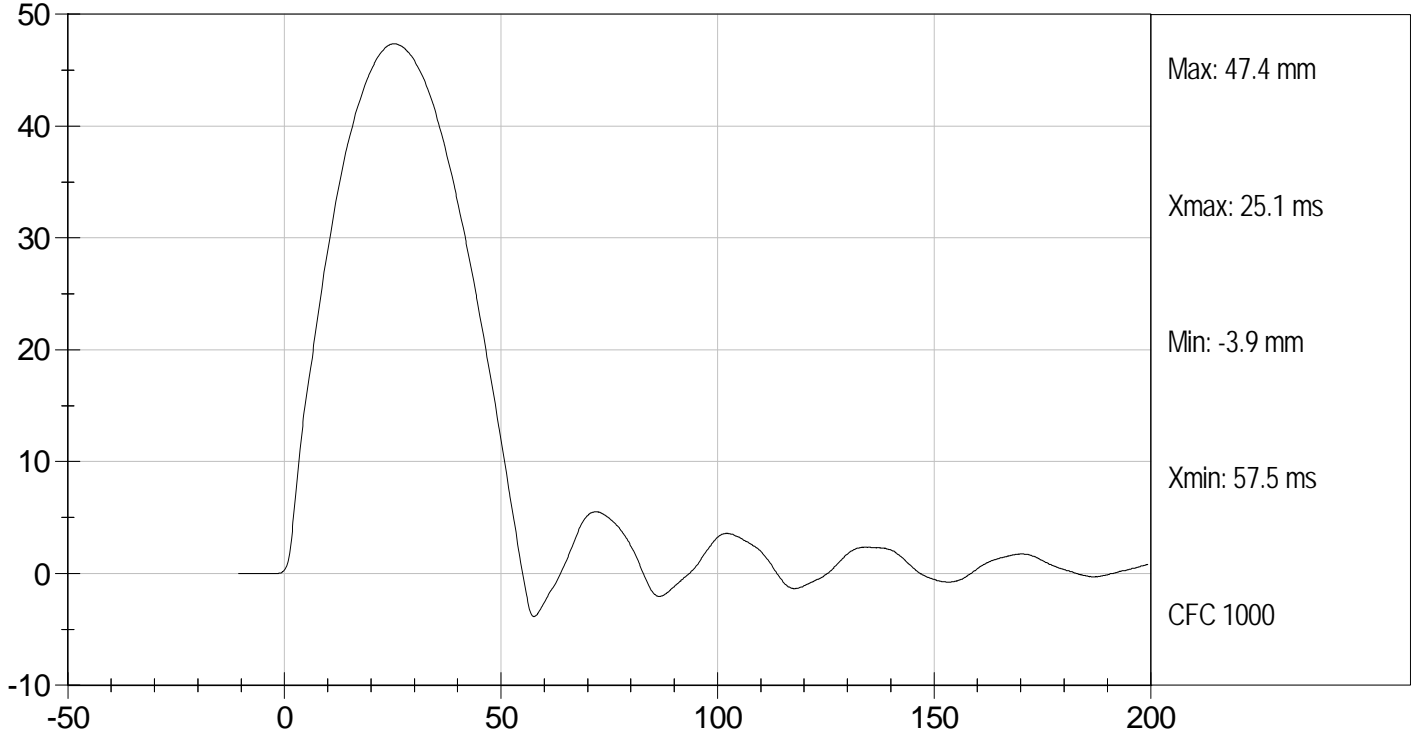

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MID RIB DISPLACEMENT @ 3 M/SEC (mm) vs TIME (ms)



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



MGA RESEARCH CORPORATION
LOWER RIB TEST
EUROSID 2 DUMMY

ATD Serial No: 032

Test I.D.: D12986

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	31	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	38.2	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	49.2	Pass
Overall Test Results				Pass

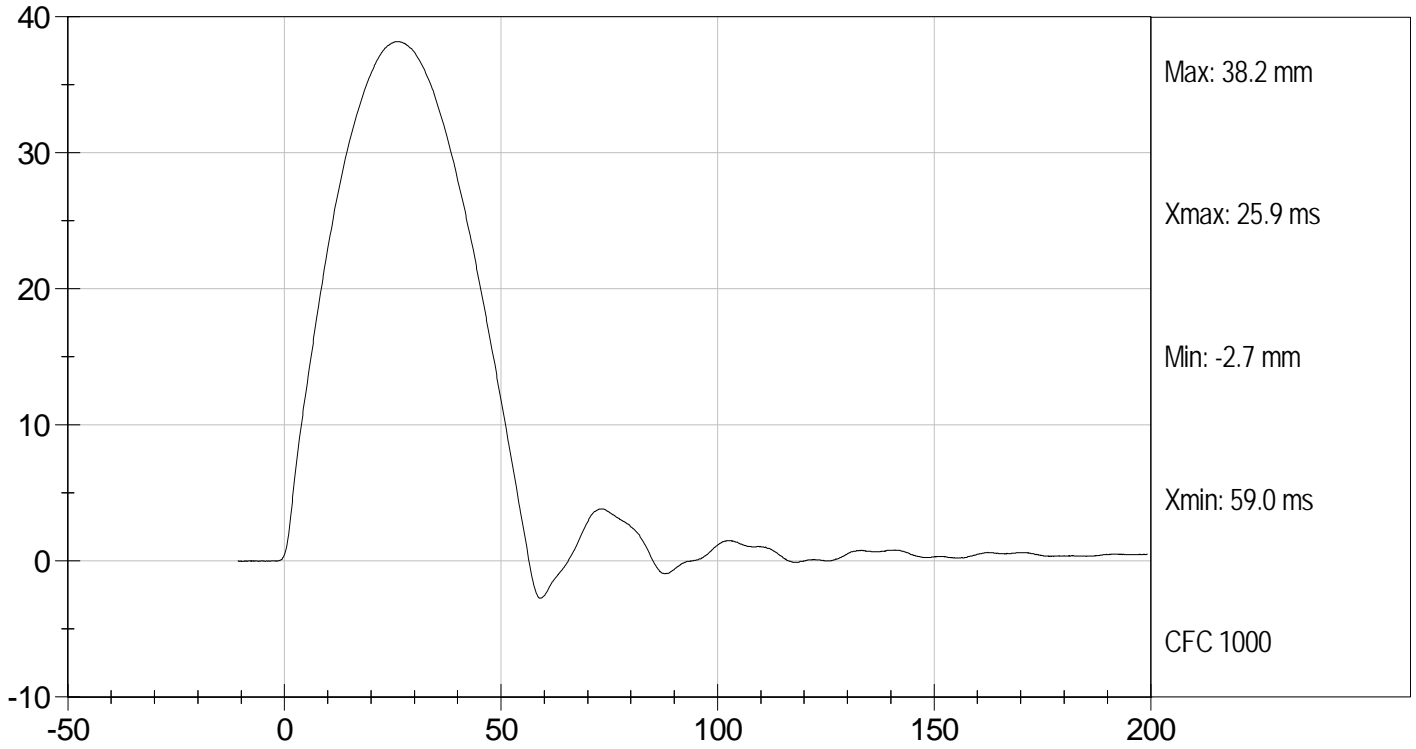
Jessica Hall
 Laboratory Technician

3/13/12
 Test Date

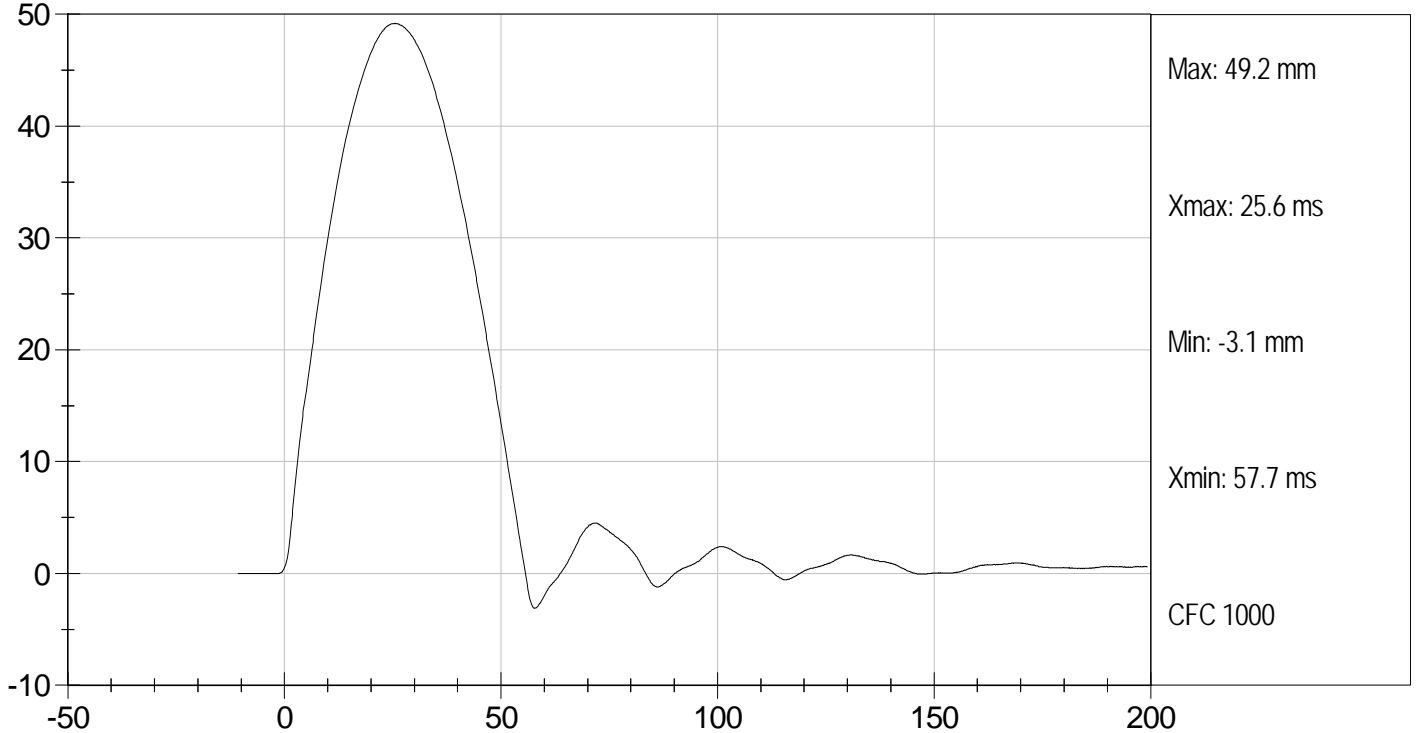
David Winkelbauer
 Approved By



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



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



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

ATD Serial No: 032

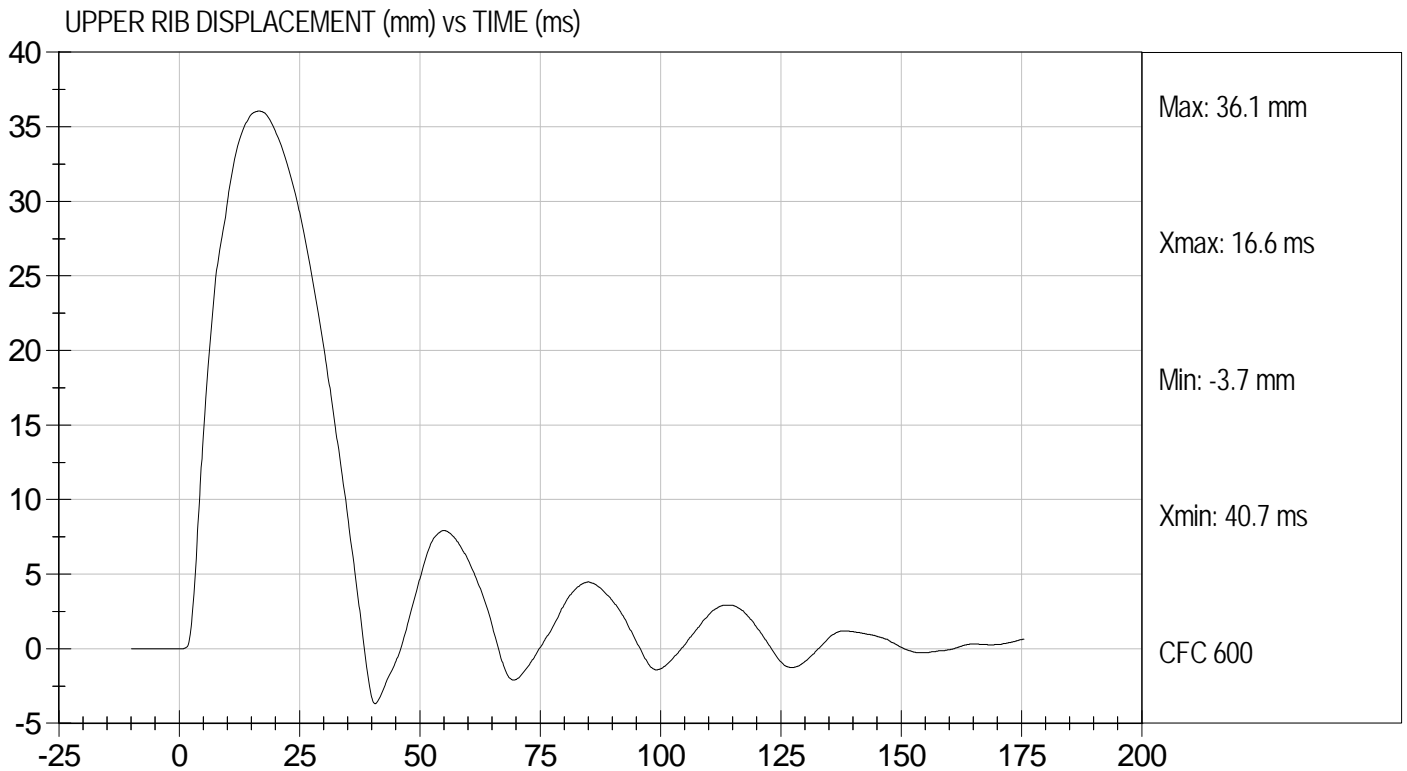
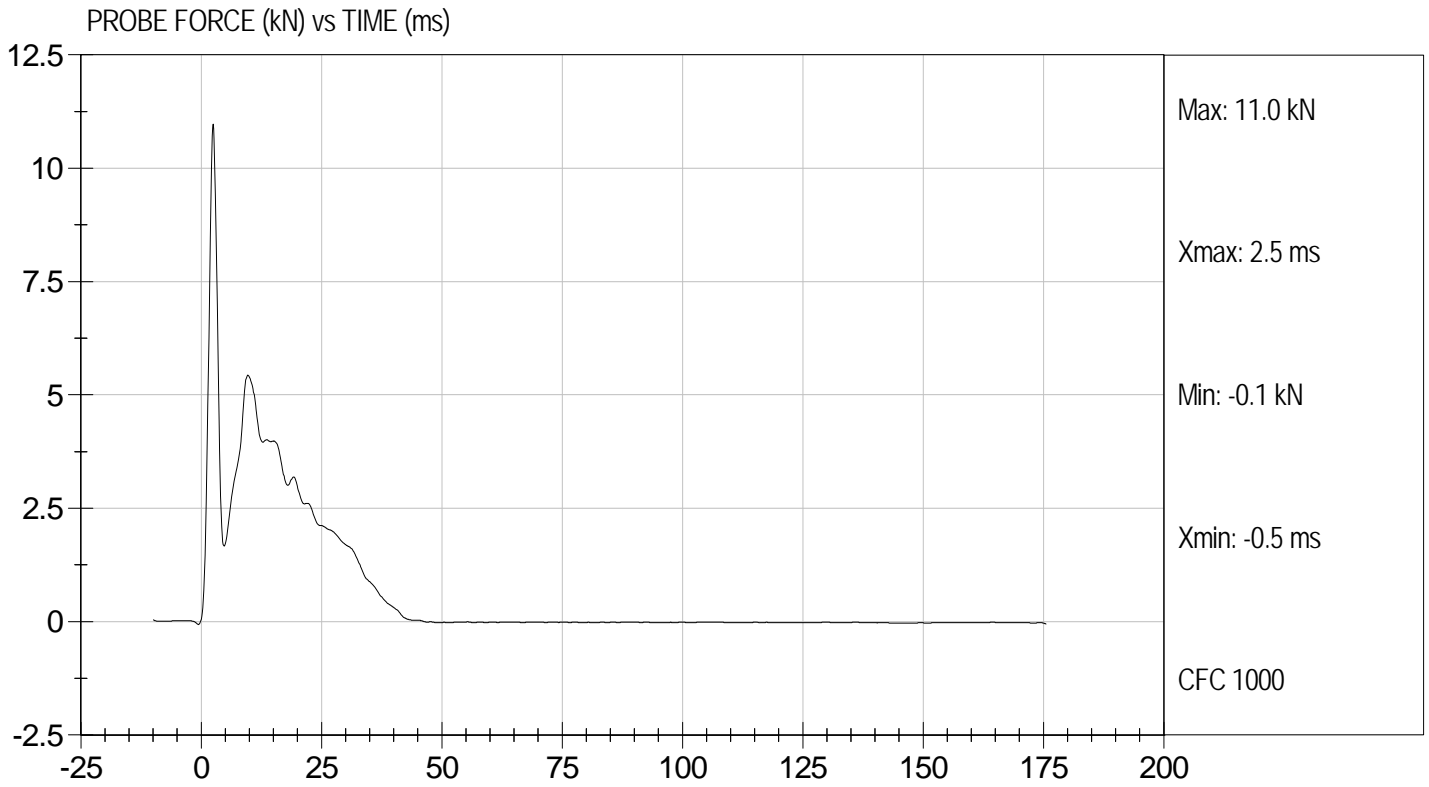
Test I.D.: D12980

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	35	Pass
Probe Speed	m/s	5.40 to 5.60	5.58	Pass
Maximum Impactor Force (after 6 ms)	kN	5.10 to 6.20	5.44	Pass
Upper Rib Displacement	mm	34.0 to 41.0	36.1	Pass
Middle Rib Displacement	mm	37.0 to 45.0	39.1	Pass
Lower Rib Displacement	mm	37.0 to 44.0	38.9	Pass
Overall Test Results				Pass

Jessica Gall
 Laboratory Technician

3/13/12
 Test Date

David Winkelbauer
 Approved By

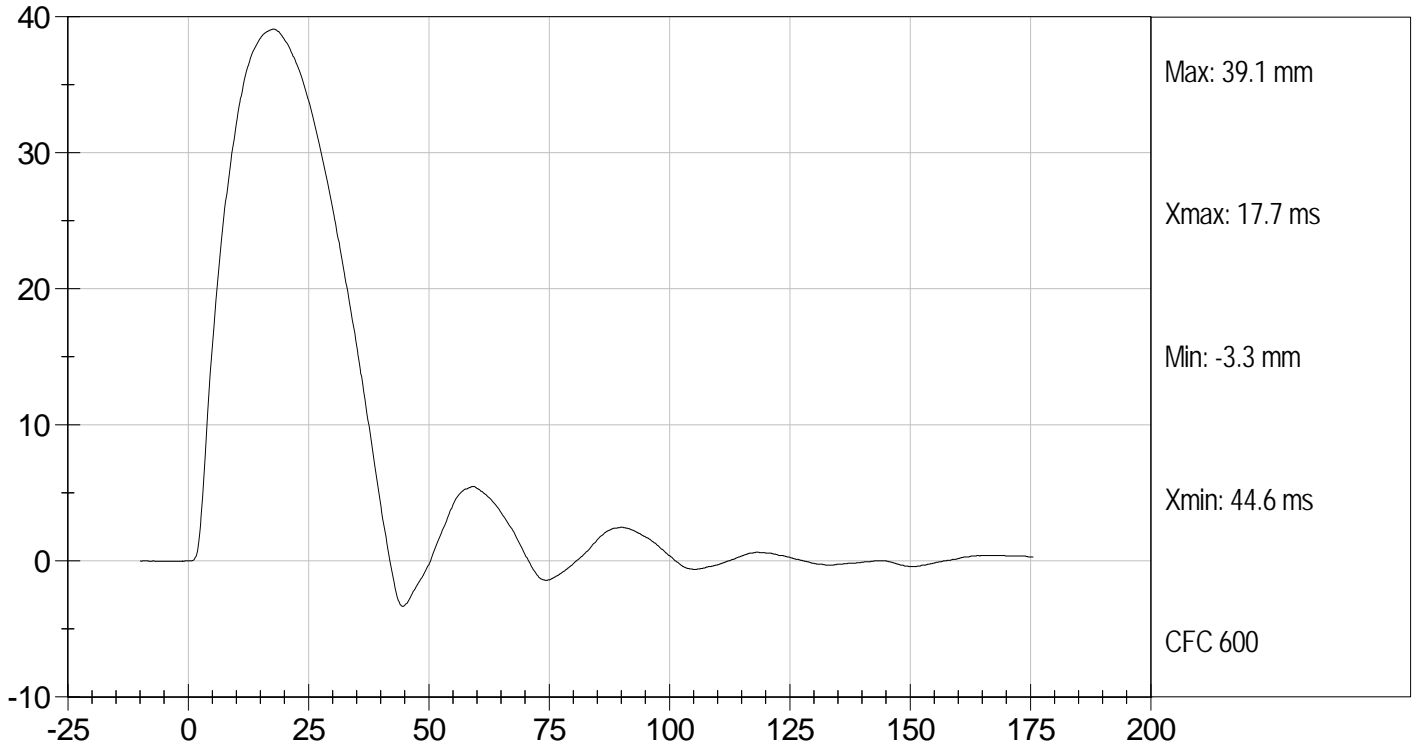




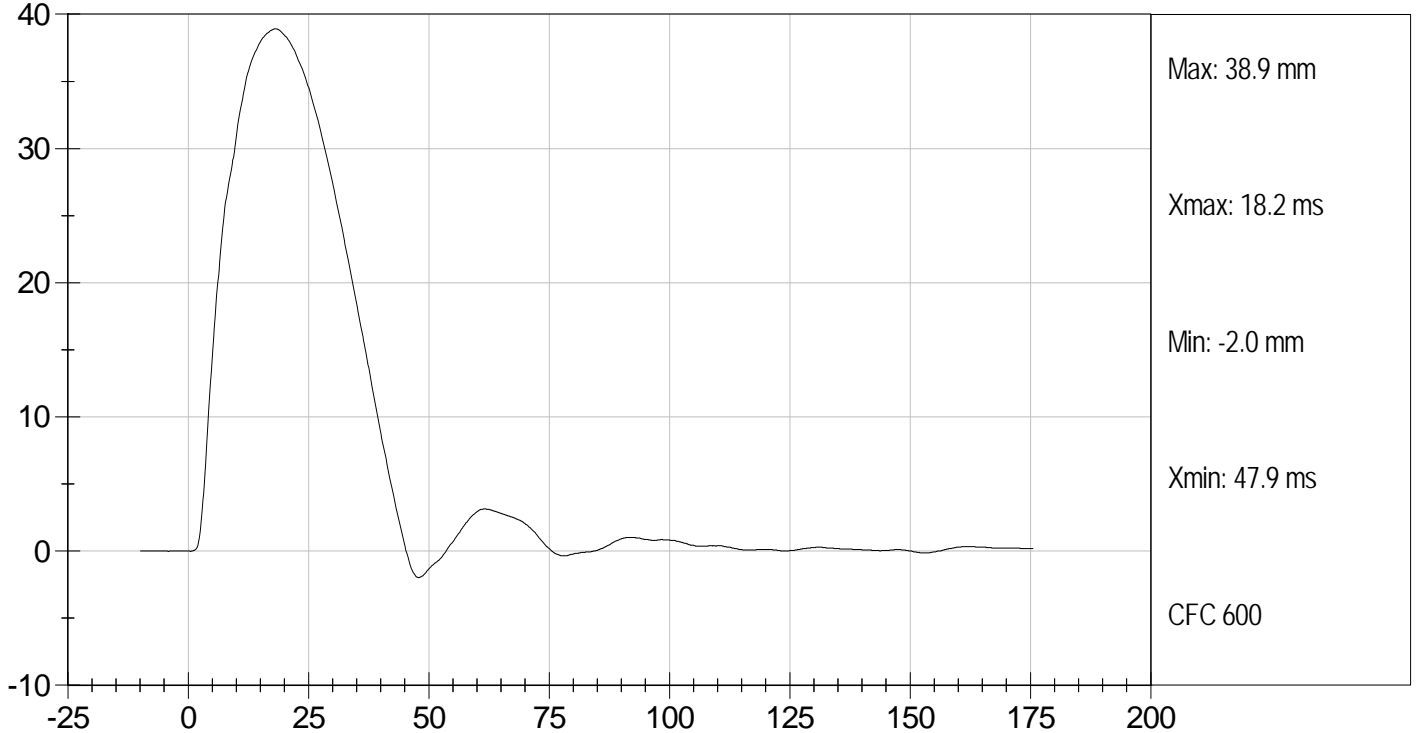
Test Desc: Thorax Impact
Component ID: D12980

Test Date: 3/13/12
Velocity: 18.32 ft/s, 5.58 m/s

MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

ABDOMEN TEST

ES-2re DUMMY

ATD Serial No: 032

Test I.D: D12987

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	33	Pass
Probe Speed	m/s	3.90 to 4.10	4.00	Pass
Maximum Impact Force	kN	4.00 to 4.80	4.05	Pass
Time of Maximum Impactor Force	ms	10.60 to 13.00	10.90	Pass
Maximum Total Abdomen Force	kN	2.20 to 2.70	2.42	Pass
Time of Maximum Abdomen Force	ms	10.00 to 12.30	10.50	Pass
Overall Test Results				Pass

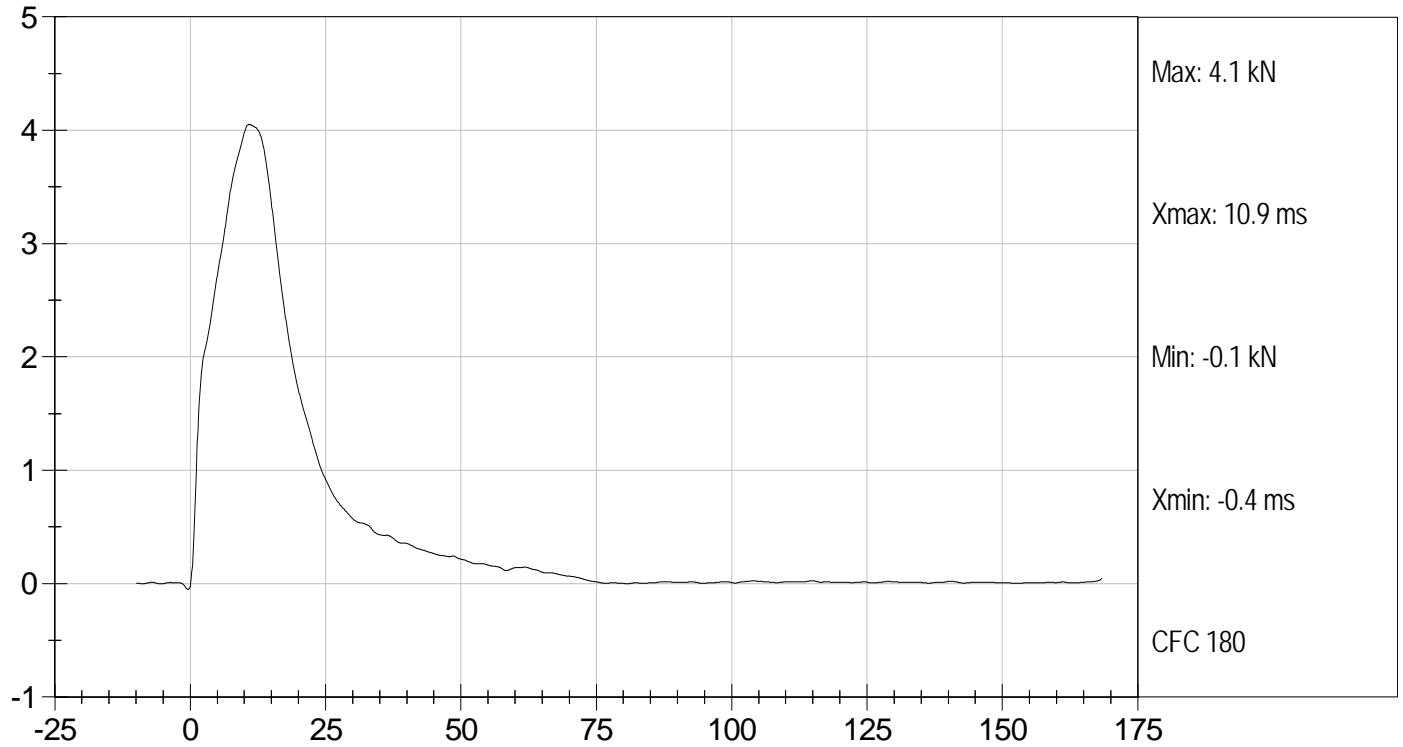
Jessica Hall
Laboratory Technician

3/13/12
Test Date

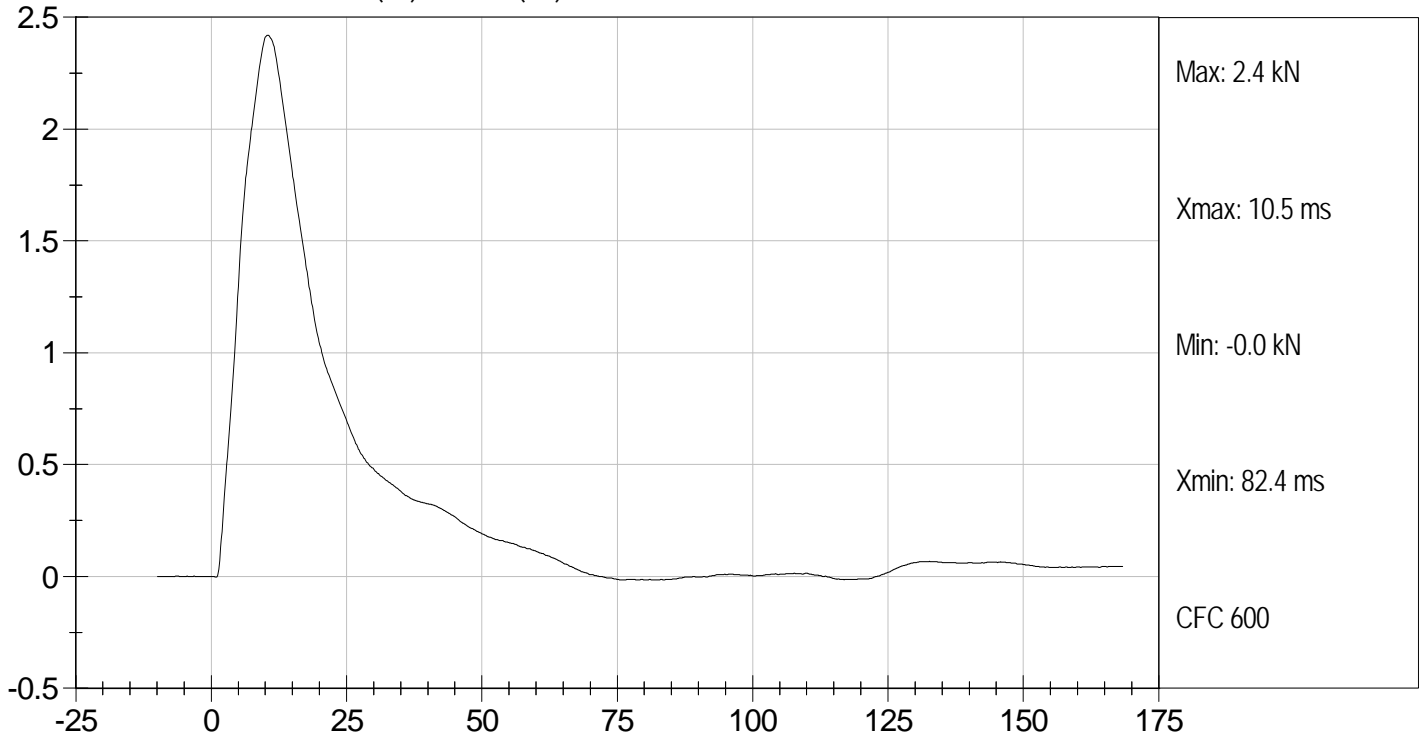
David Winkelbauer
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IMPACTOR FORCE (kN) vs TIME (ms)



TOTAL ABDOMEN FORCE (kN) vs TIME (ms)

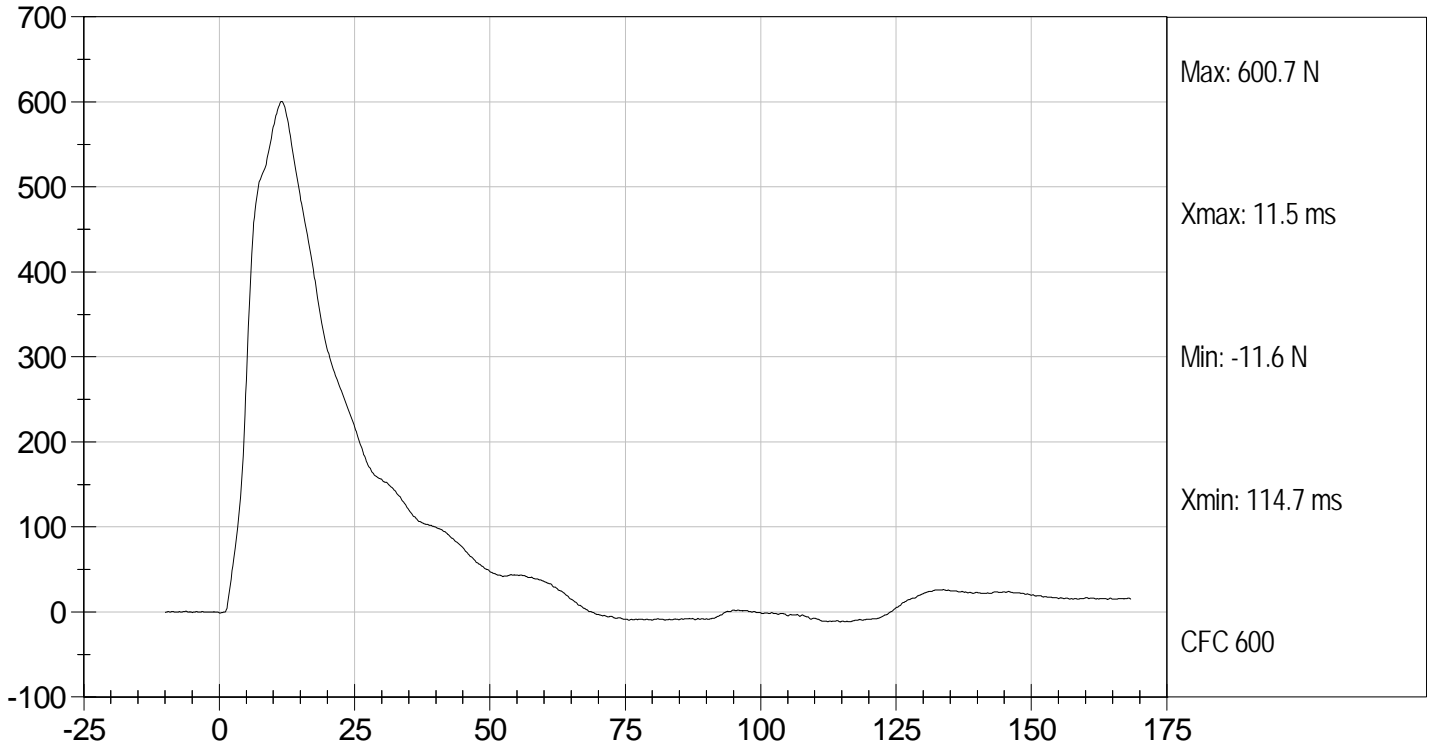




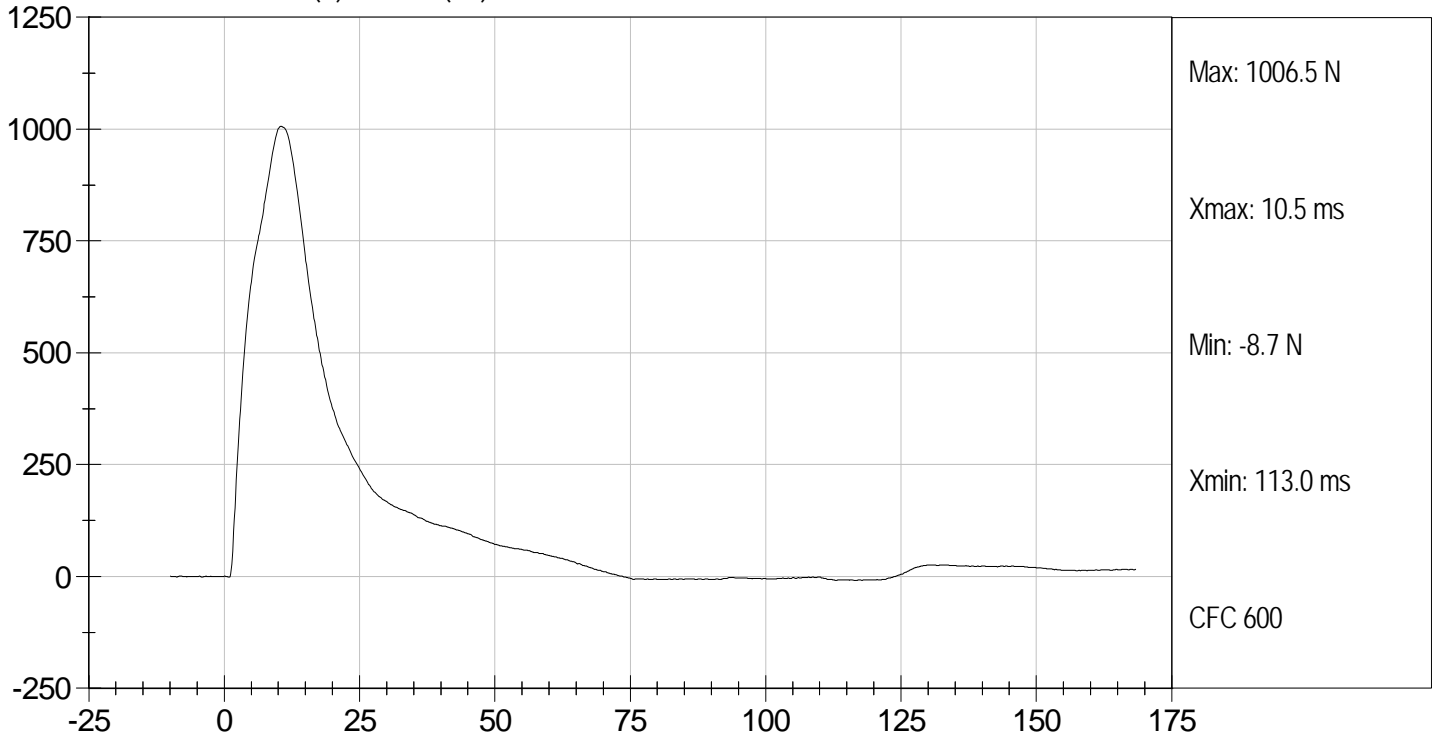
Test Desc: Abdomen Impact
Component ID: D12987

Test Date: 3/13/12
Velocity: 13.12 ft/s, 4.00 m/s

ABDOMEN FRONT (N) vs TIME (ms)



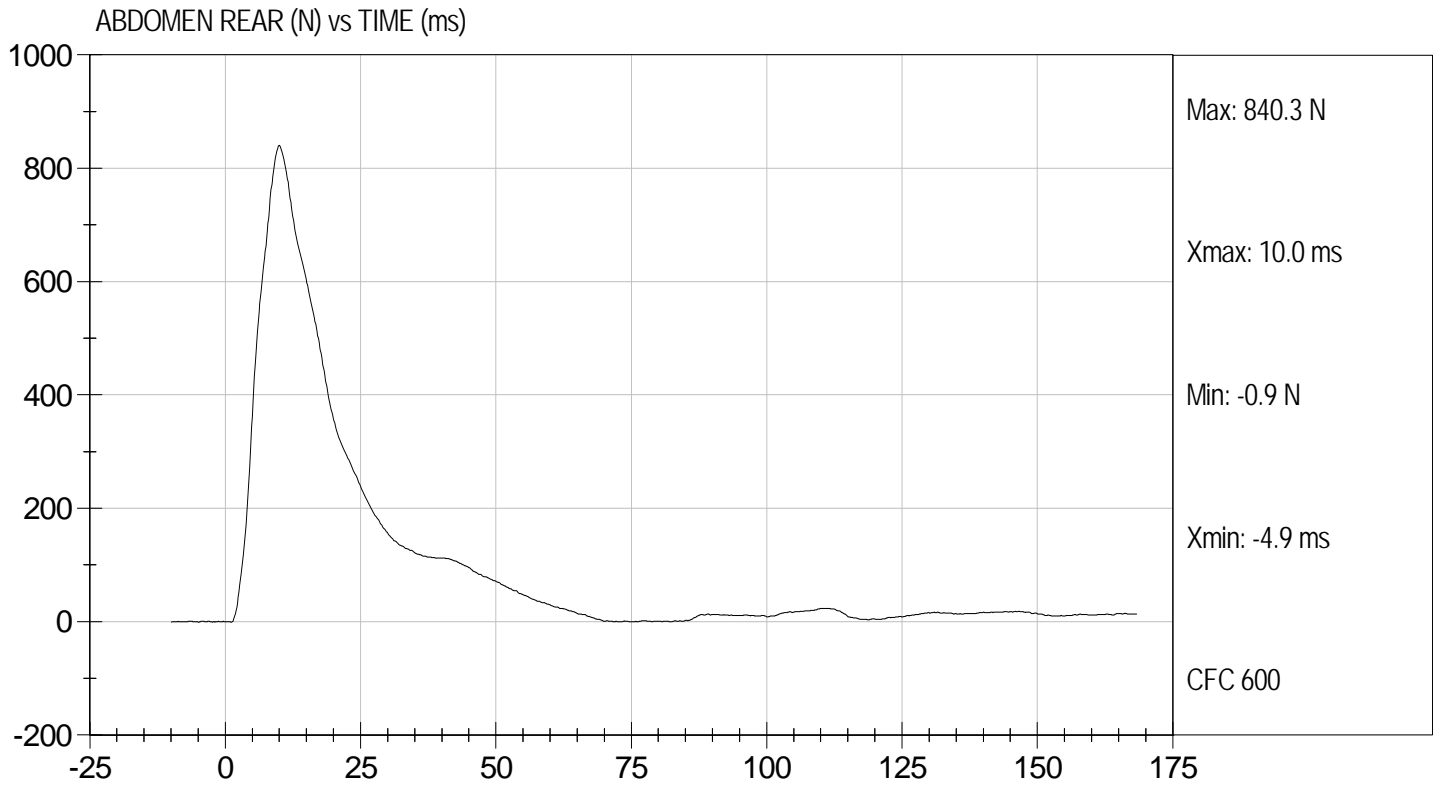
ABDOMEN MIDDLE (N) vs TIME (ms)





Test Desc: Abdomen Impact
Component ID: D12987

Test Date: 3/13/12
Velocity: 13.12 ft/s, 4.00 m/s



MGA RESEARCH CORPORATION
LUMBAR SPINE TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D.: D12988

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity		%	10 to 70	34	Pass
Pendulum Speed		m/s	5.95 to 6.15	6.13	Pass
Pendulum Deceleration	1 ms	m/s	-0.05 to 0.00	-0.00	Pass
	3.7 ms	m/s	-0.425 to -0.24	-0.42	Pass
	27 ms	m/s	-6.50 to -5.80	-6.00	Pass
	30 ms	m/s	>= -6.5	-5.86	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	45.7	Pass
Time of Maximum Flexion Angle		ms	39.0 to 53.0	42.2	Pass
Headform Rotation Decay to Initial Position		ms	37 to 57	43	Pass
Overall Results					Pass

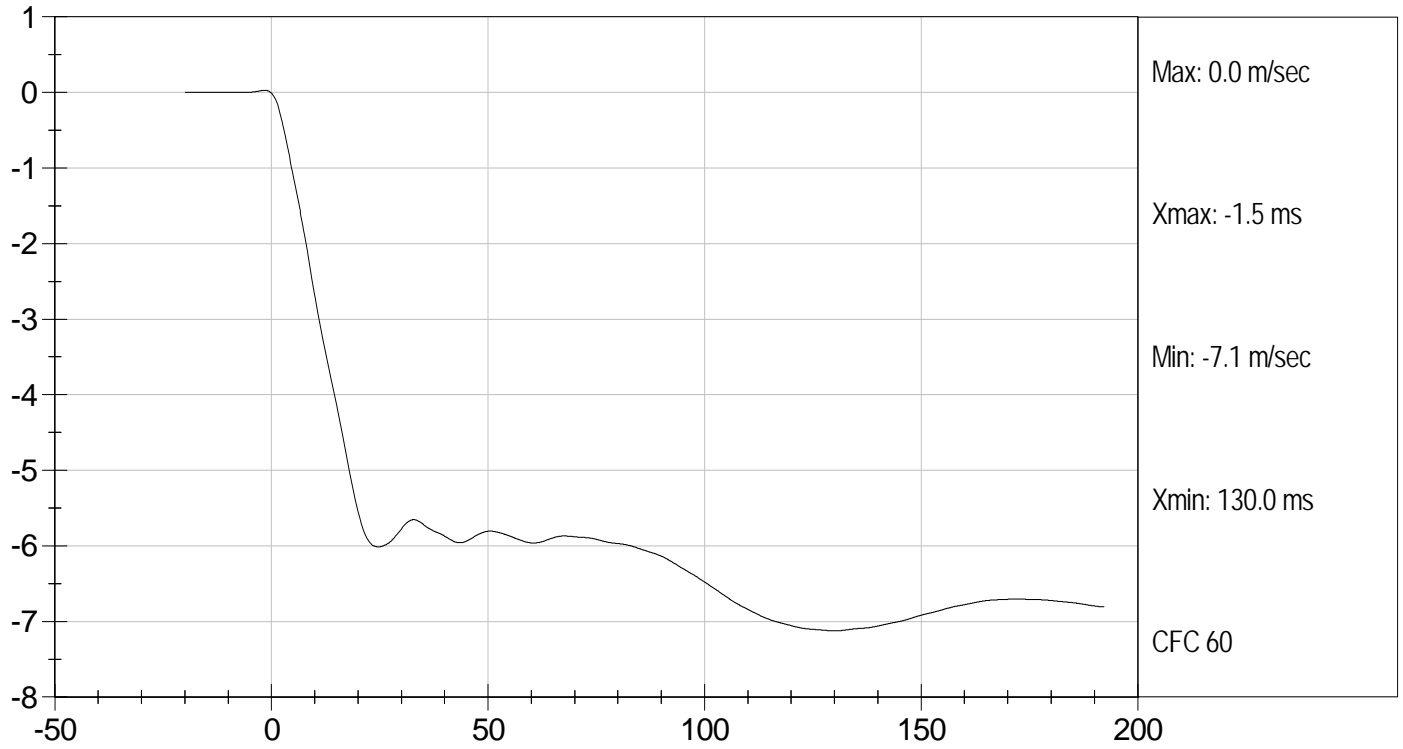
Jessica Hall
 Laboratory Technician

3/13/12
 Test Date

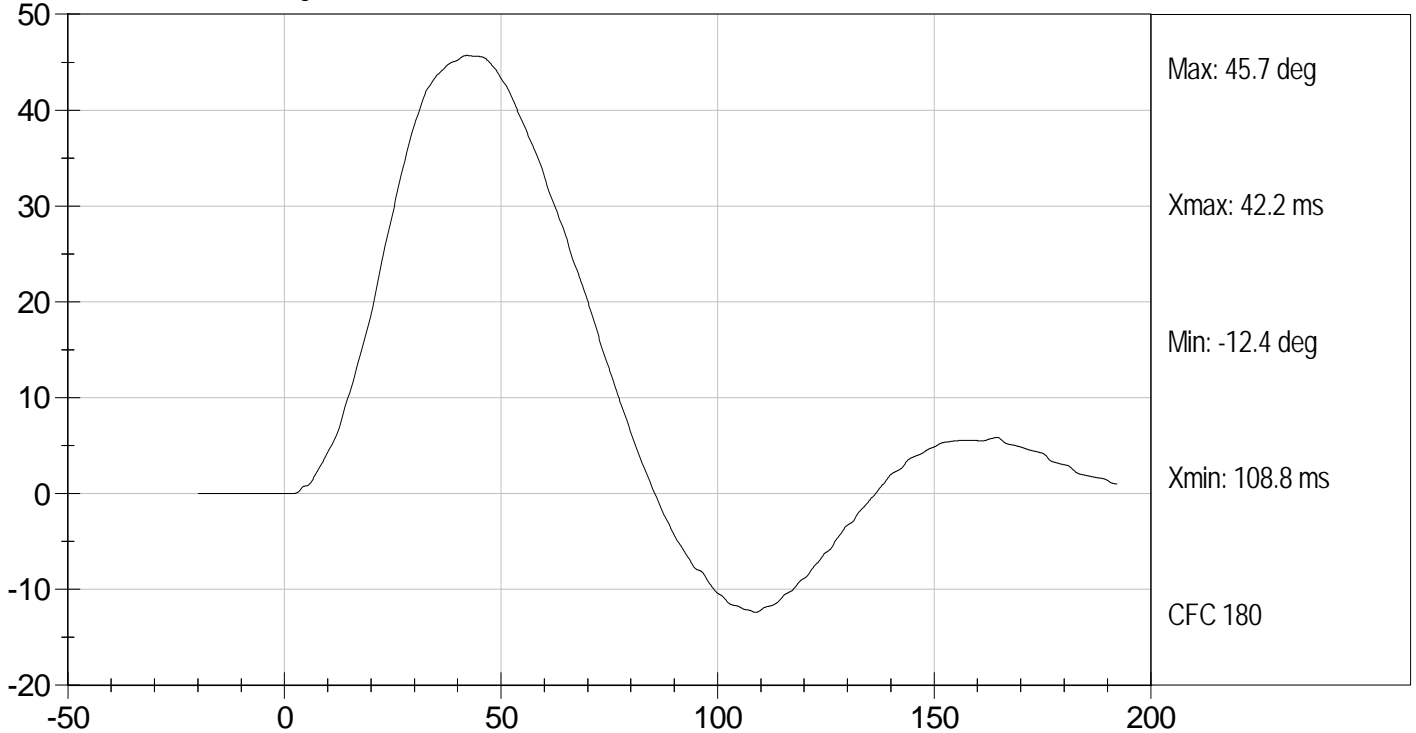
David Winkelbauer
 Approved By



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



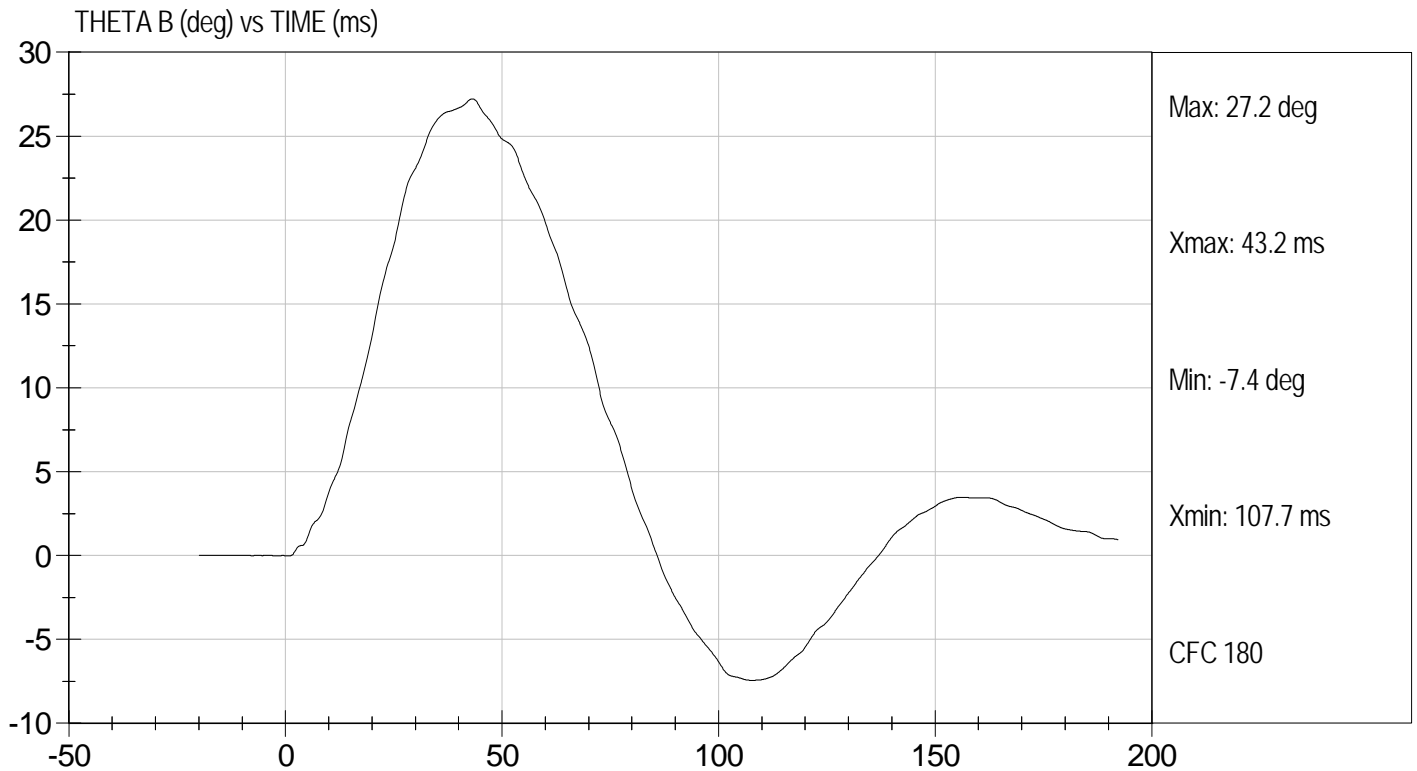
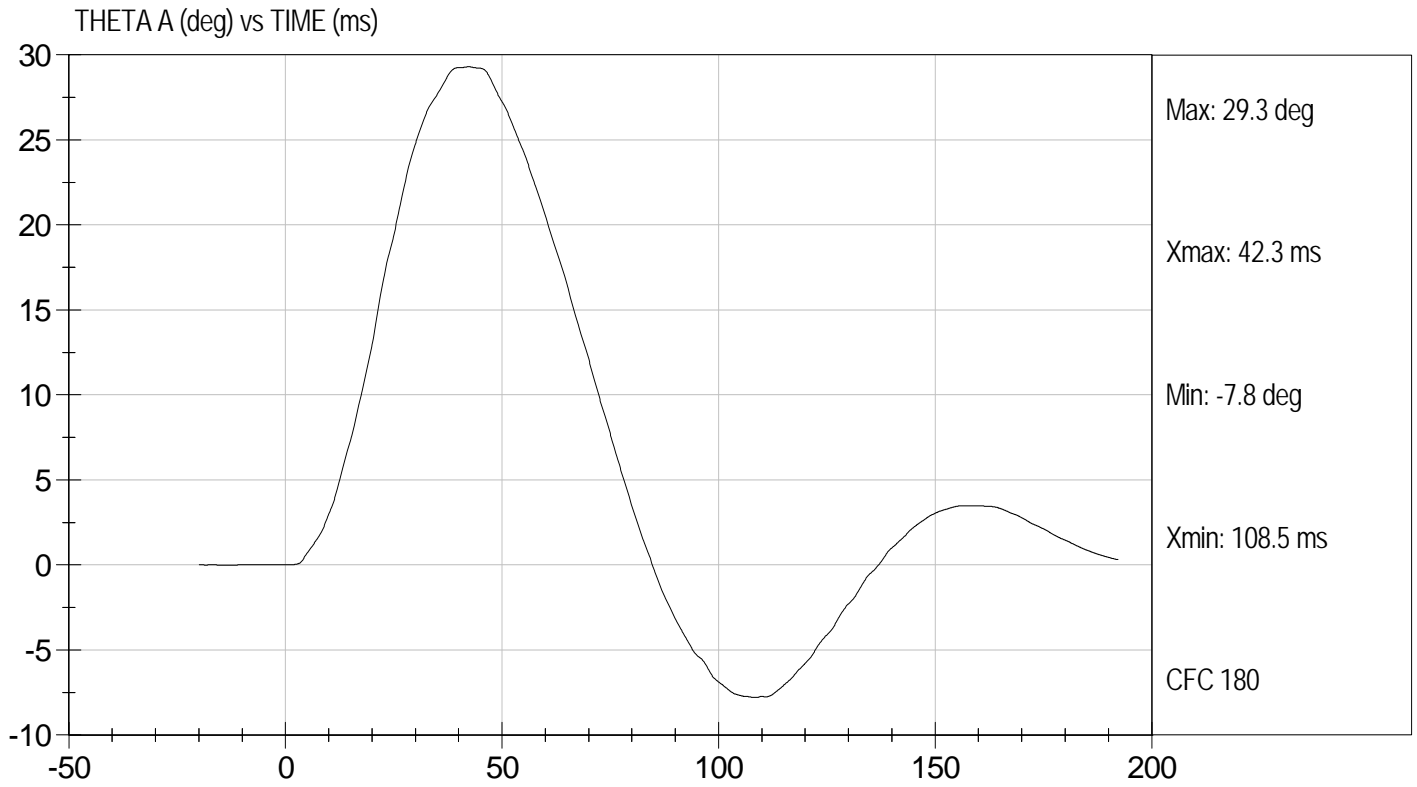
FLEXION ANGLE (deg) vs TIME (ms)





Test Desc: Lumbar Bending
Component ID: D12988

Test Date: 3/13/12
Velocity: 20.10 ft/s, 6.13 m/s



MGA RESEARCH CORPORATION

**PELVIS TEST
ES-2re DUMMY**

ATD Serial No: 032

Test I.D: D12989

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	33	Pass
Probe Speed	m/s	4.20 to 4.40	4.38	Pass
Maximum Impactor Force	kN	4.70 to 5.40	5.19	Pass
Time of Maximum Impactor Force	ms	11.80 to 16.10	13.70	Pass
Maximum Pubic Force	kN	1.23 to 1.59	1.46	Pass
Time of Maximum Pubic Force	ms	12.20 to 17.00	14.80	Pass
Overall Test Results				Pass

Jessica Gall
Laboratory Technician

3/13/12
Test Date

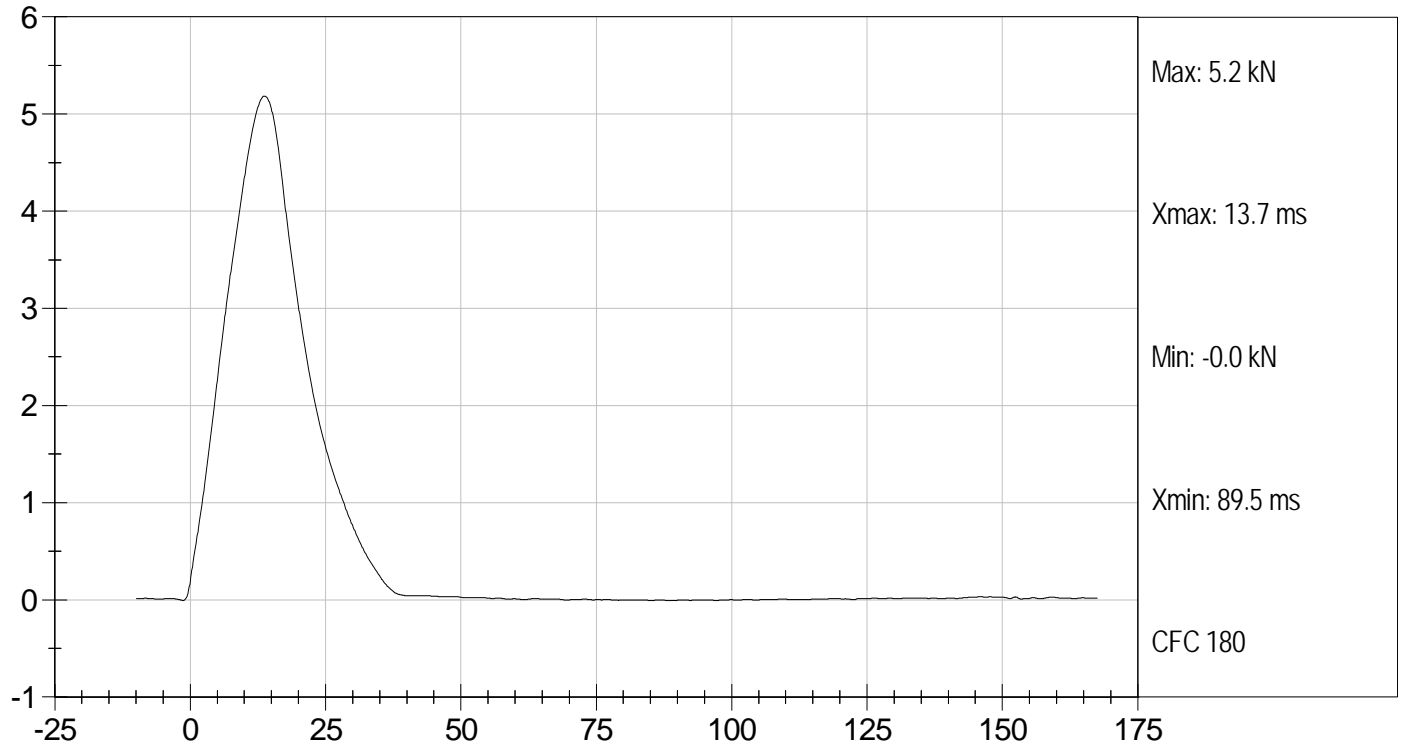
David Winkelbauer
Approved By



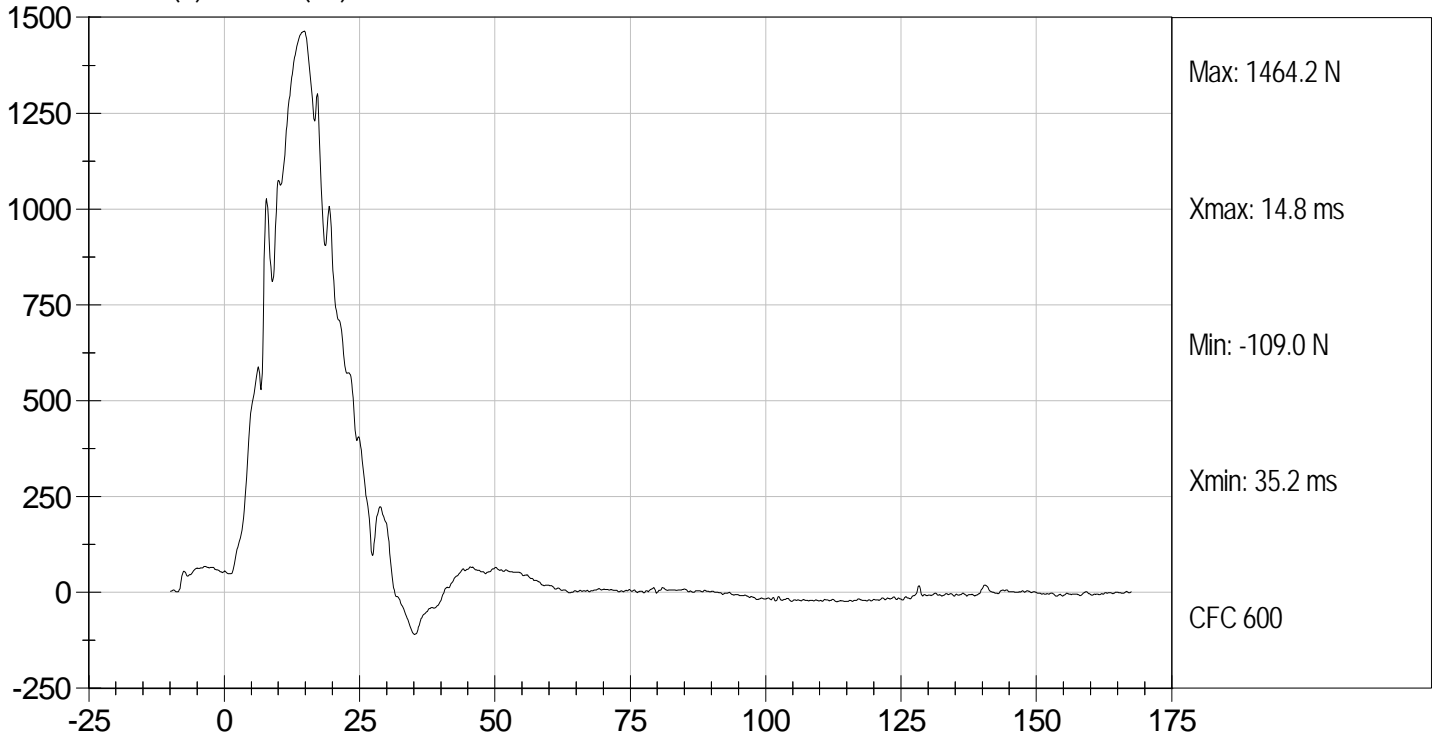
Test Desc: Pelvis Impact
Component ID: D12989

Test Date: 3/13/12
Velocity: 14.37 ft/s, 4.38 m/s

IMPACTOR FORCE (kN) vs TIME (ms)



PUBIC (N) vs TIME (ms)



SID-IIsD External Measurements
SN: 296

No.	Name	Spec. (mm)	Result	Pass/Fail
A	Sitting Height	772 - 788	784	Pass
B	Shoulder Pivot Height	437 - 453	442	Pass
C	H-point Height	79 - 89	83	Pass
D	H-point from Seatback	141 - 151	145	Pass
E	Shoulder Pivot from Backline	97 - 107	99	Pass
F	Thigh Clearance	119 - 135	121	Pass
G	Head Breadth	140 - 148	142	Pass
H	Head Back from Backline	40 - 46	45	Pass
I	Head Depth	178 - 188	180	Pass
J	Head Circumference	541 - 551	548	Pass
K	Buttock to Knee Length	514 - 540	535	Pass
L	Popliteal Height	343 - 369	358	Pass
M	Knee Pivot to Floor Height	392 - 409	404	Pass
N	Buttock Popliteal Length	416 - 442	435	Pass
O	Chest Depth w/o Jacket	195 - 211	206	Pass
P	Foot Length	216 - 232	219	Pass
Q	Hip Breadth (w/ pelvic plugs)	313 - 323	316	Pass
R	Arm Length	249 - 259	250	Pass
S	Knee Joint to Seatback	477 - 493	481	Pass
V	Shoulder Width	341 - 357	346	Pass
W	Foot Width	78 - 94	85	Pass
Y	Chest Circumference w/ jacket	851 - 881	870	Pass
Z	Waist Circumference	761 - 791	772	Pass

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

ATD Serial No: 296

Test ID: D12861

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	18	Pass
Peak Resultant Acceleration	G's	115 to 137	123	Pass
Peak Longitudinal Acceleration	G's	+/- 15	-4.3	Pass
Unimodal	N/A	<15%	Yes	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

3/6/12
Test Date

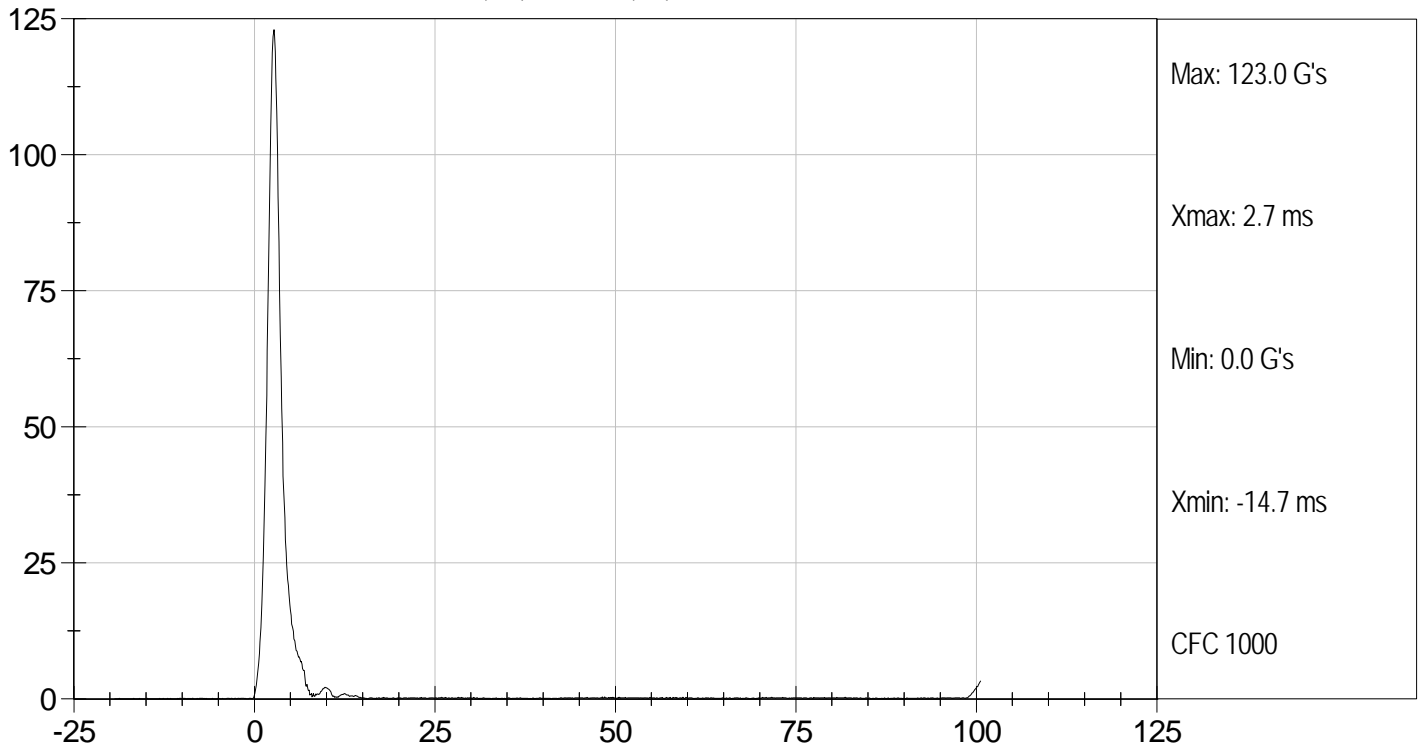
David Winkelbauer
Approved By



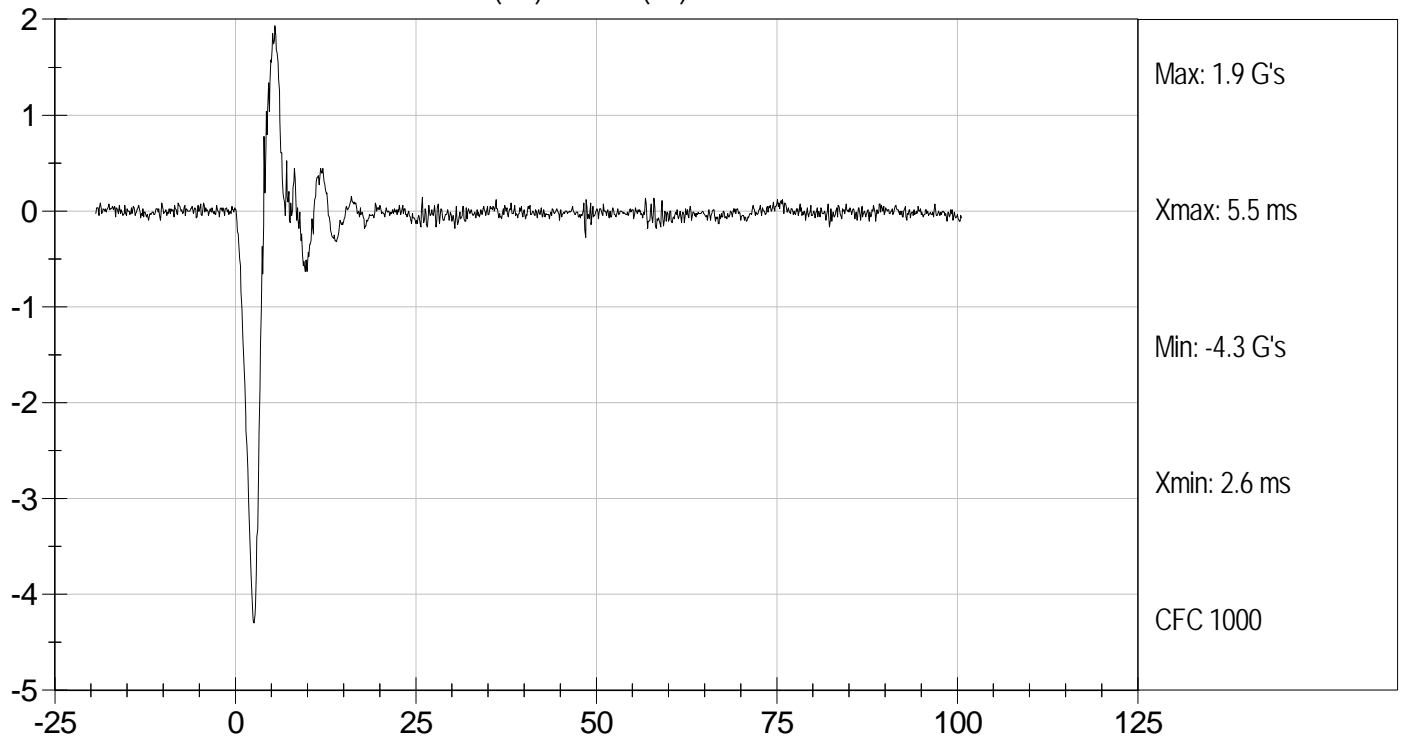
Test Desc: Head Drop
Component ID: D12861

Test Date: 3/6/12
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: D12862

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	22.0	Pass
Humidity		%	10 to 70	28	Pass
Impact Velocity		m/s	5.51 to 5.63	5.58	Pass
Delta Velocity	10 ms	m/s	2.20 to 2.80	2.51	Pass
	15 ms	m/s	3.30 to 4.10	3.56	Pass
	20 ms	m/s	4.40 to 5.40	4.77	Pass
	25 ms	m/s	5.40 to 6.10	5.49	Pass
	25-100 ms	m/s	5.50 to 6.20	5.50	Pass
Maximum D-Plane Rotation		deg	71 to 81	72	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	59	Pass
Maximum Occipital Condyle Moment during Rotation Interval Nm			-44 to -36	-42	Pass
Time of Moment Decay to 0 Nm		ms	102 to 126	116	Pass
Overall Test Results					Pass

Jessica Hall

Laboratory Technician

3/6/12

Test Date

David Winkelbauer

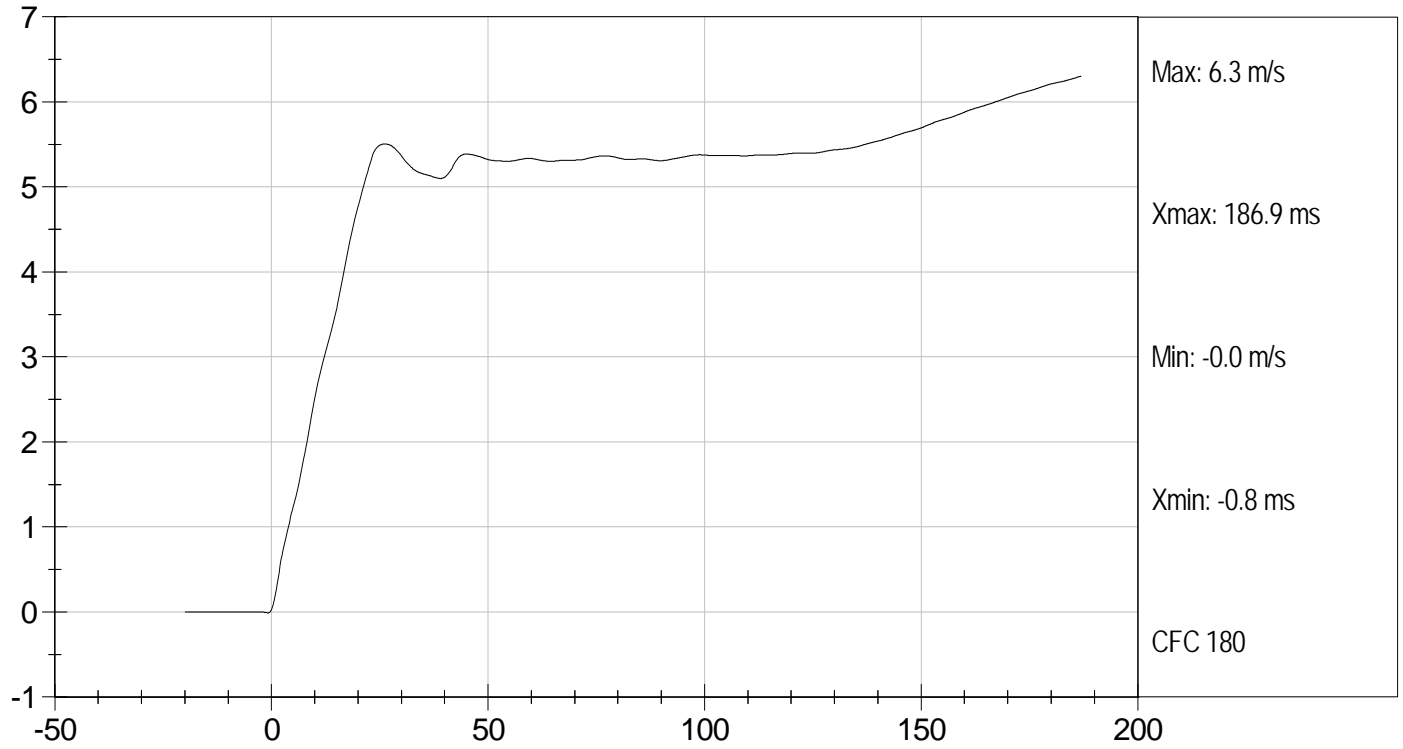
Approved By



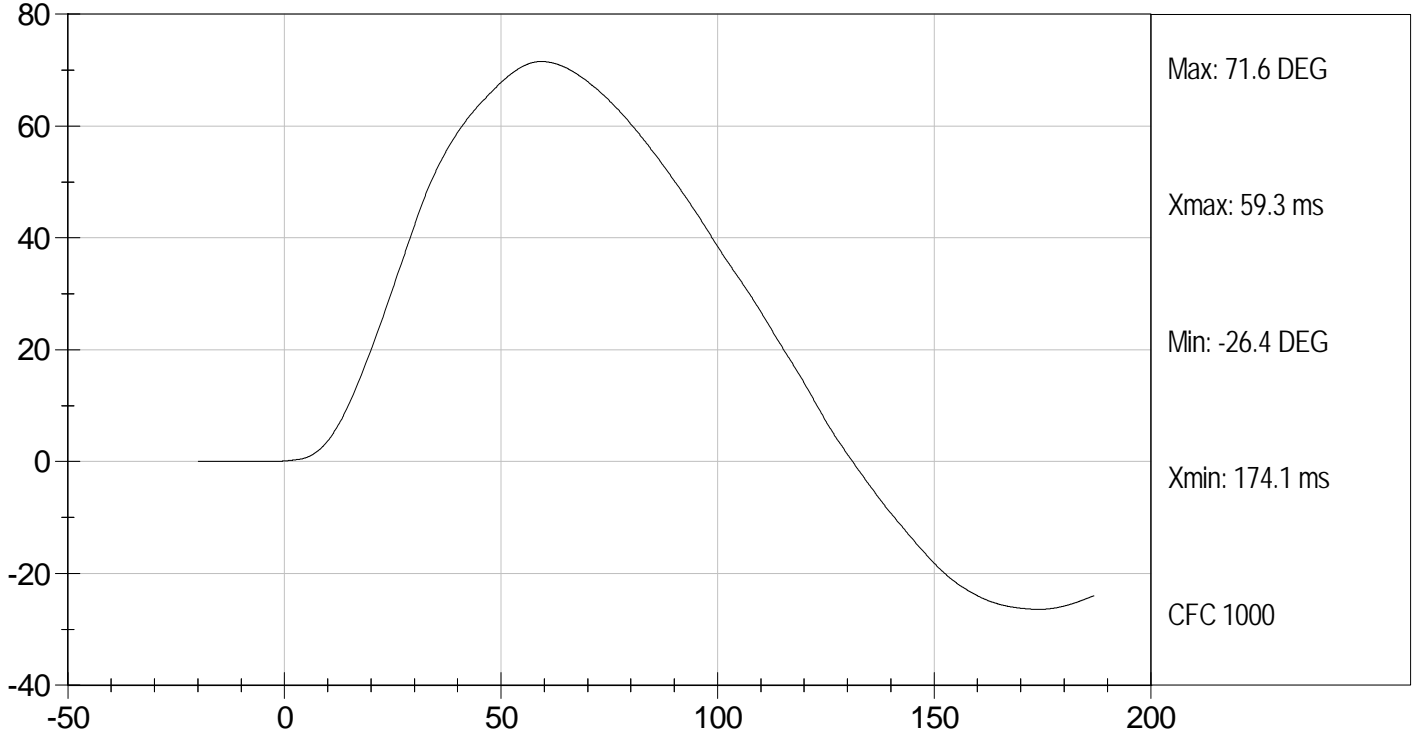
Test Desc: Neck Bending
Component ID: D12862

Test Date: 3/6/12
Velocity: 18.32 ft/s, 5.58 m/s

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



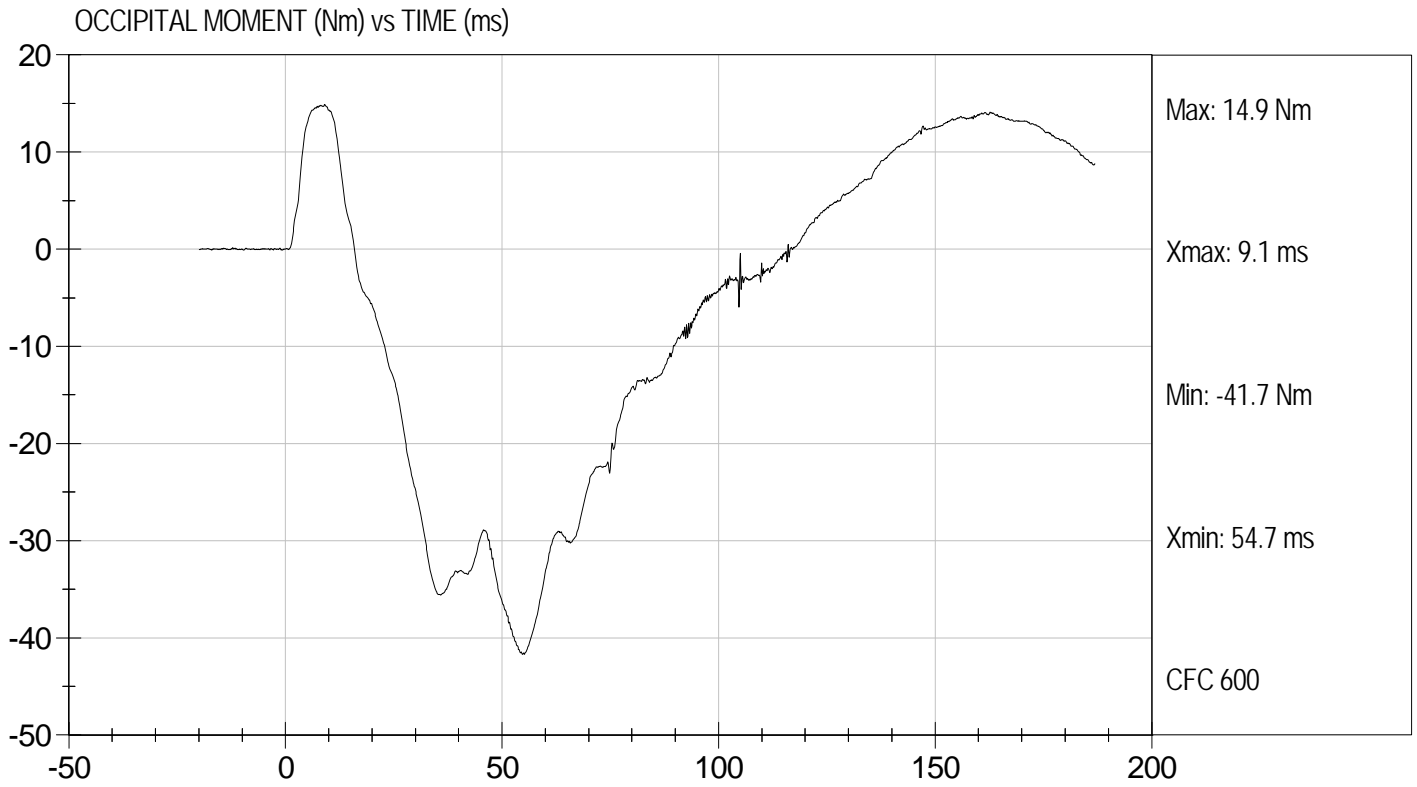
FLEXION ANGLE (DEG) vs TIME (ms)





Test Desc: Neck Bending
Component ID: D12862

Test Date: 3/6/12
Velocity: 18.32 ft/s, 5.58 m/s



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

ATD Serial No: 296

Test ID: D12863

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	19	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Maximum Probe Acceleration	G's	13 to 18	15	Pass
Shoulder Displacement	mm	28 to 37	31	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	18	Pass
Overall Test Results				Pass

Jessica Gall
Laboratory Technician

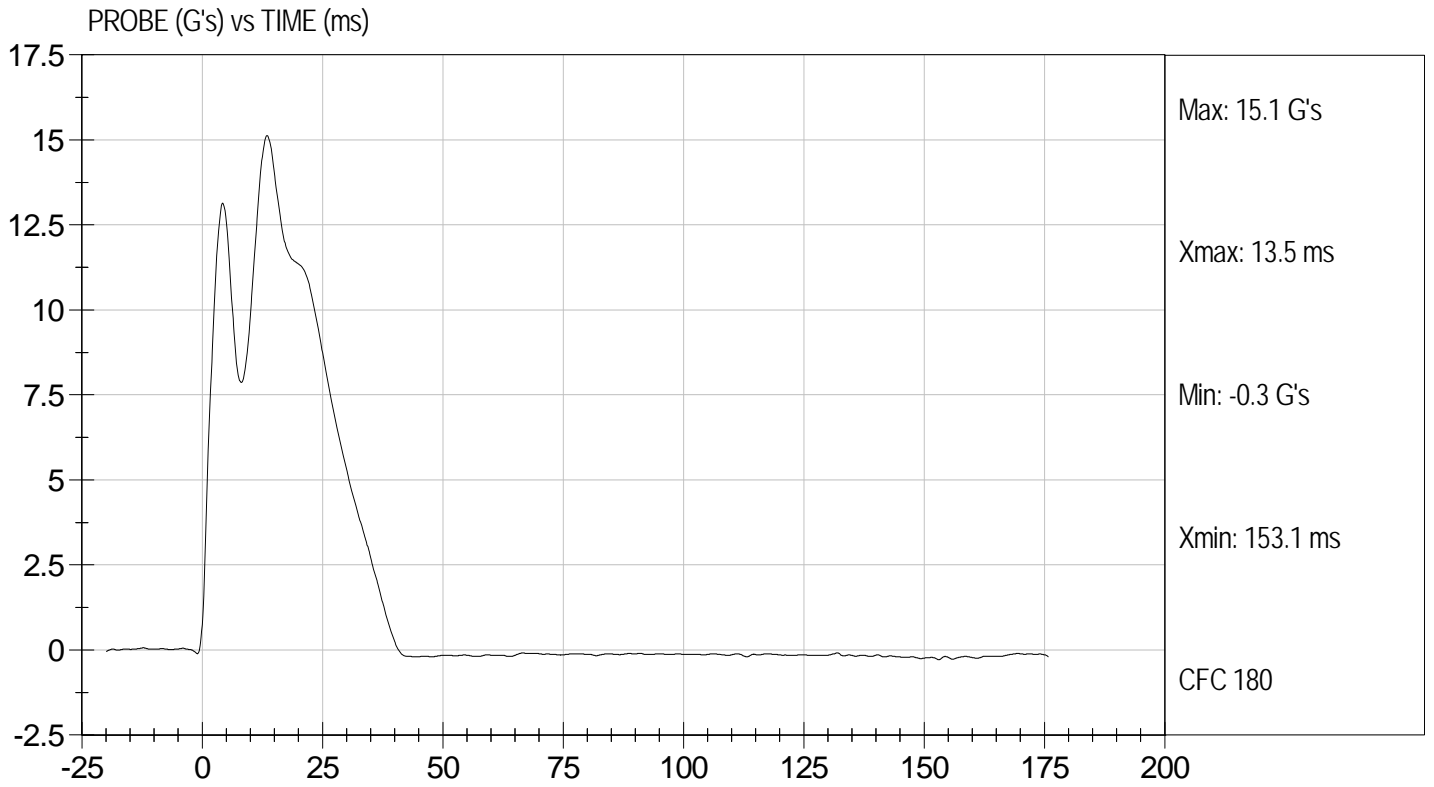
3/6/12
Test Date

David Winkelbauer
Approved By



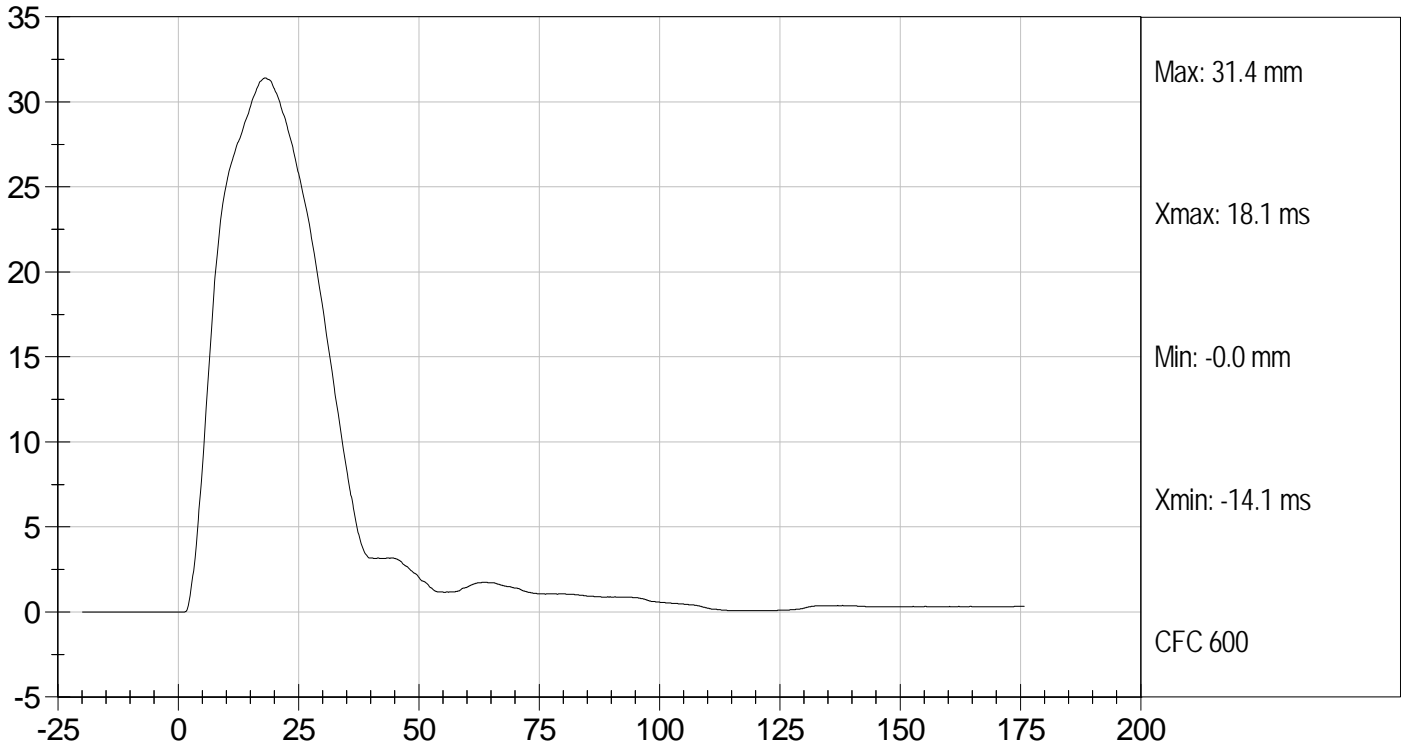
Test Desc: Shoulder Impact
Component ID: D12863

Test Date: 3/6/12
Velocity: 14.37 ft/s, 4.38 m/s

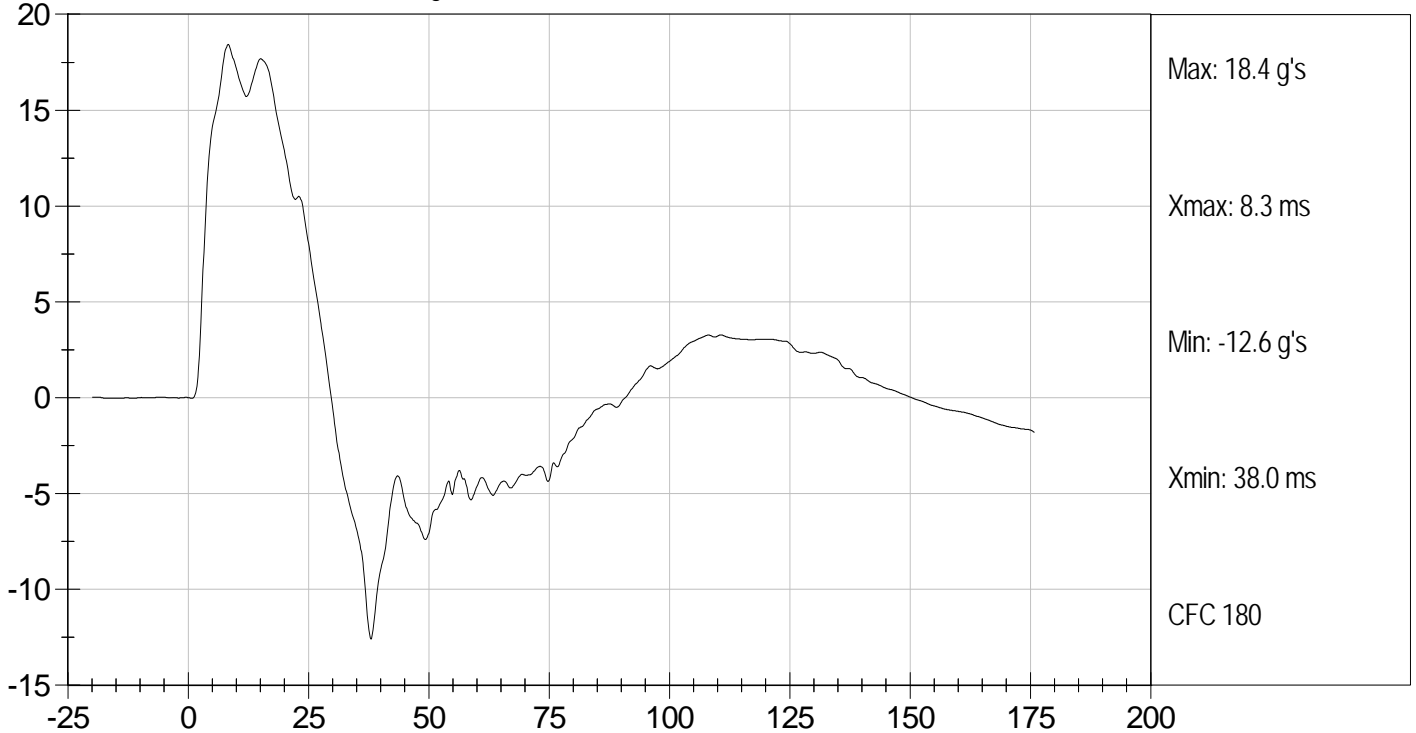




SHOULDER DISPLACEMENT (mm) vs TIME (ms)



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: D12864

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	22.0	Pass
Humidity	%	10 to 70	19	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Peak Impactor Acceleration	G's	30 to 36	32	Pass
Shoulder Displacement	mm	31 to 40	35	Pass
Upper Rib Displacement	mm	25 to 32	28	Pass
Middle Rib Displacement	mm	30 to 36	32	Pass
Lower Rib Displacement	mm	32 to 38	35	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	37	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	31	Pass
Overall Test Results				Pass


Laboratory Technician

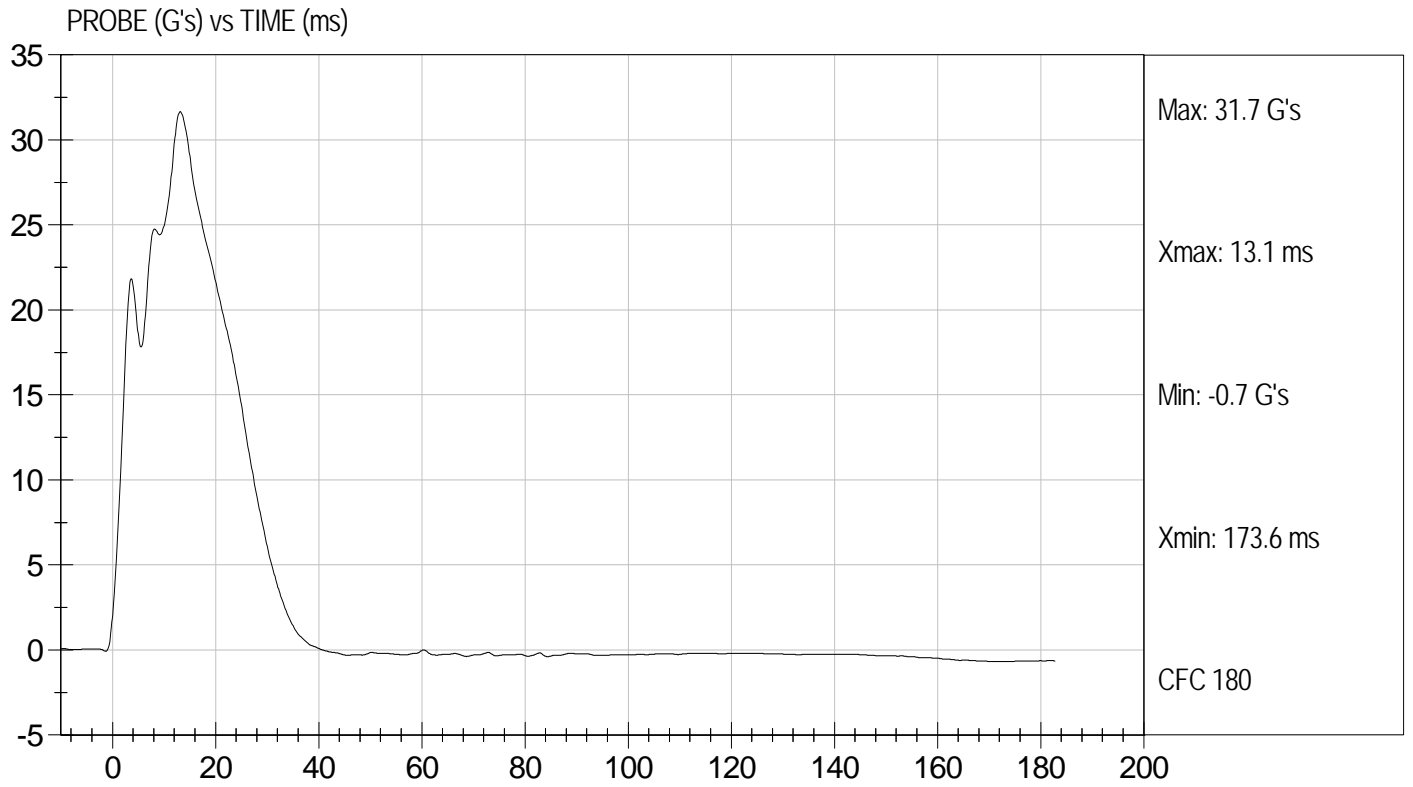
3/6/12
Test Date


Approved By



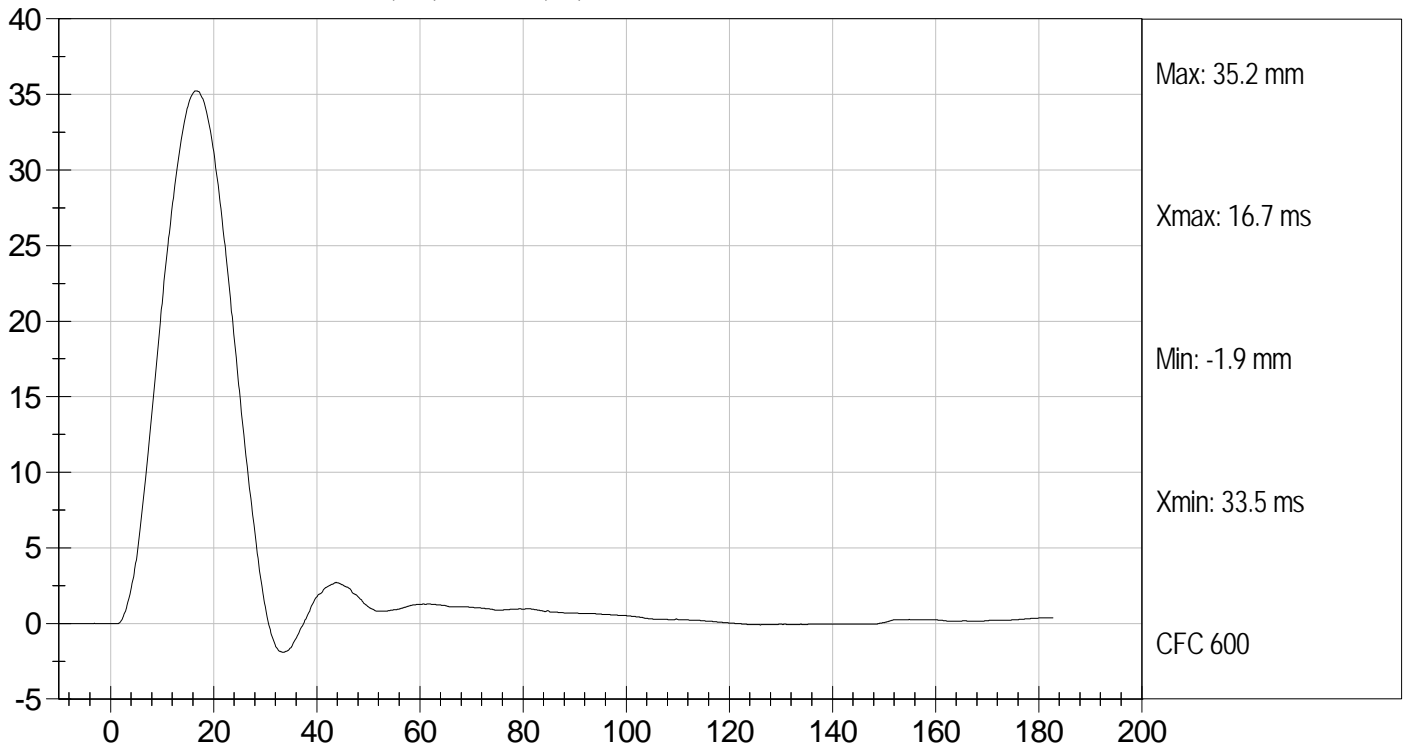
Test Desc: Thorax With Arm
Component ID: D12864

Test Date: 3/6/12
Velocity: 22.22 ft/s, 6.77 m/s

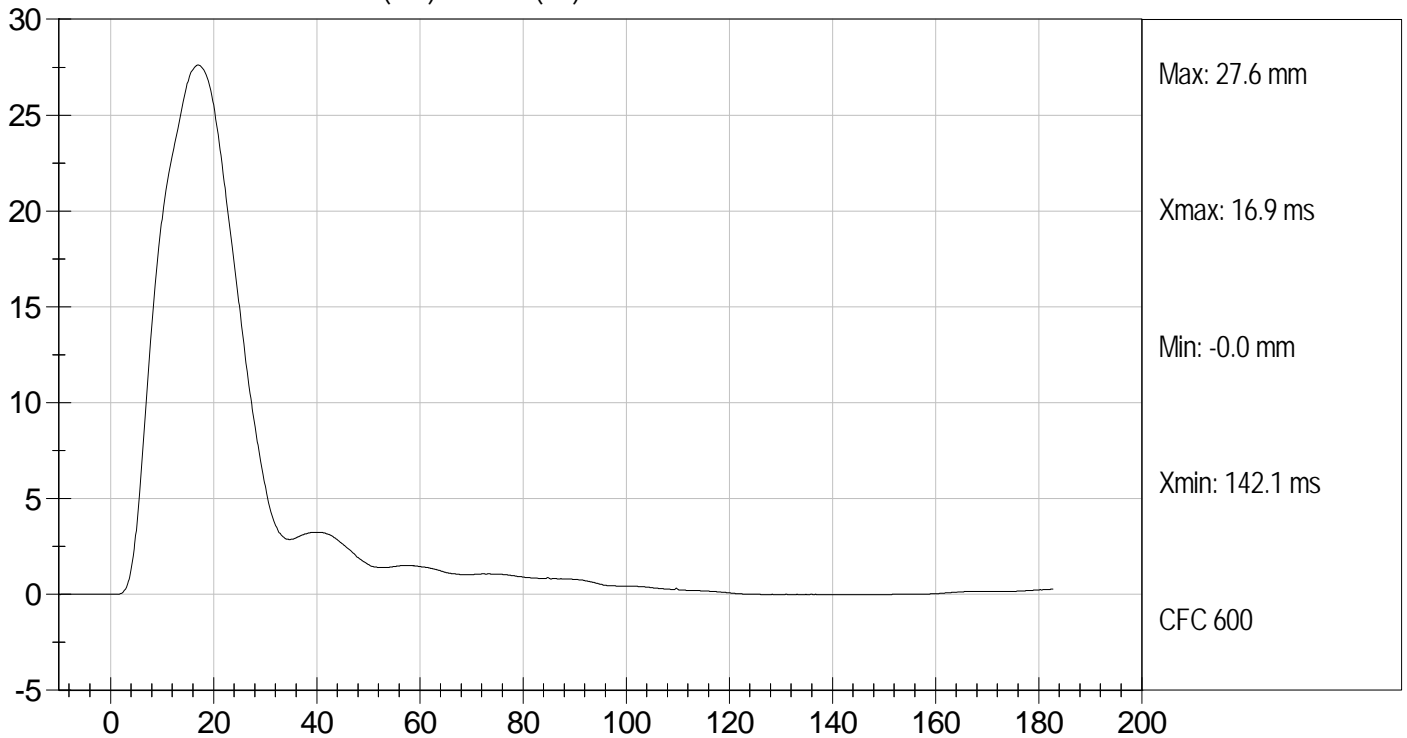




SHOULDER DISPLACEMENT (mm) vs TIME (ms)



UPPER RIB DISPLACEMENT (mm) vs TIME (ms)

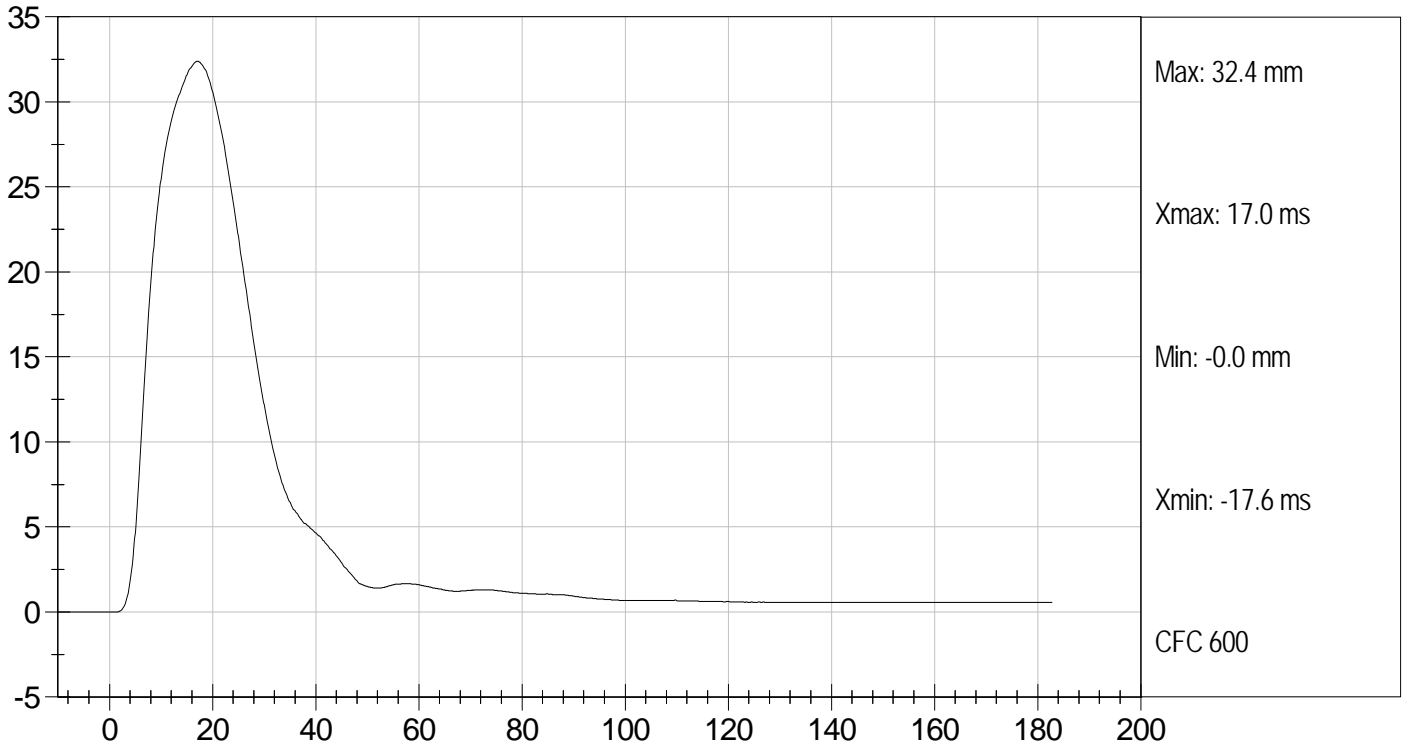




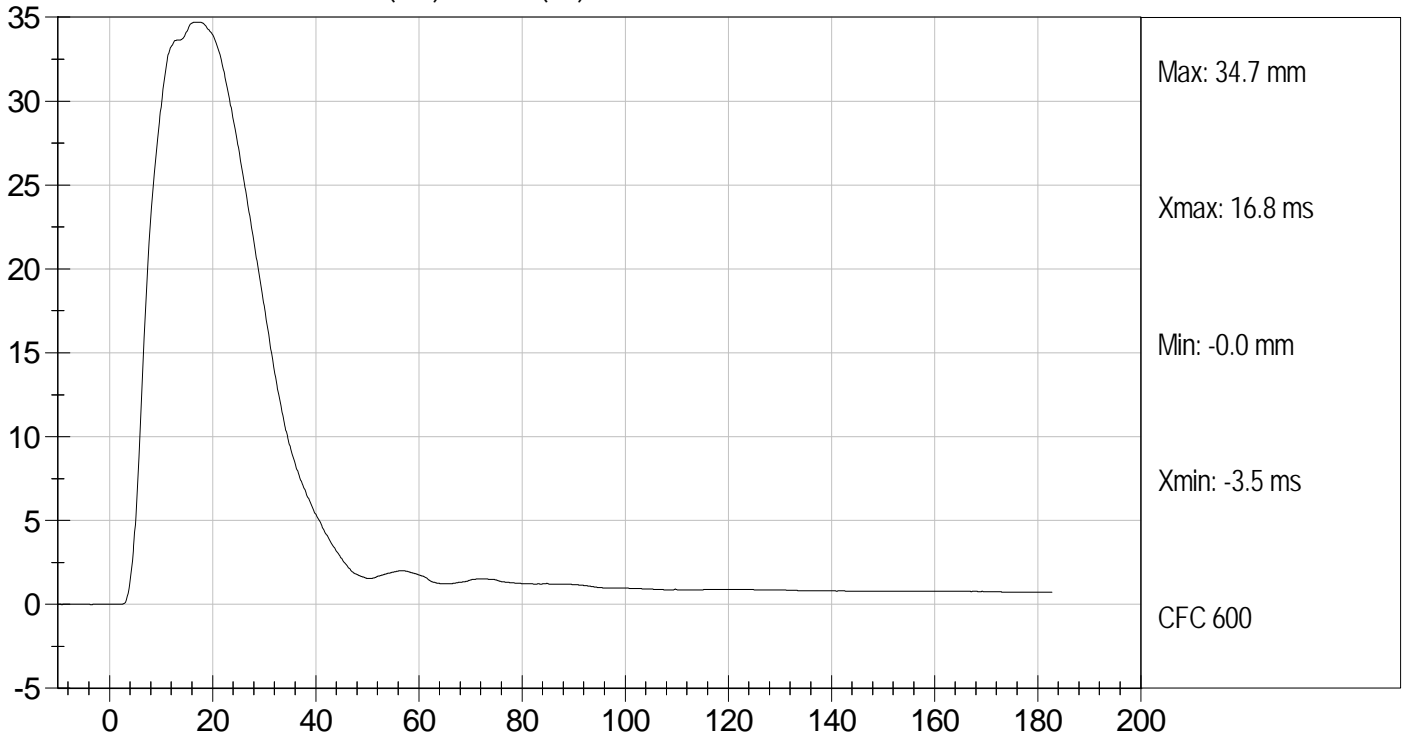
Test Desc: Thorax With Arm
Component ID: D12864

Test Date: 3/6/12
Velocity: 22.22 ft/s, 6.77 m/s

MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



LOWER RIB DISPLACEMENT (mm) vs TIME (ms)

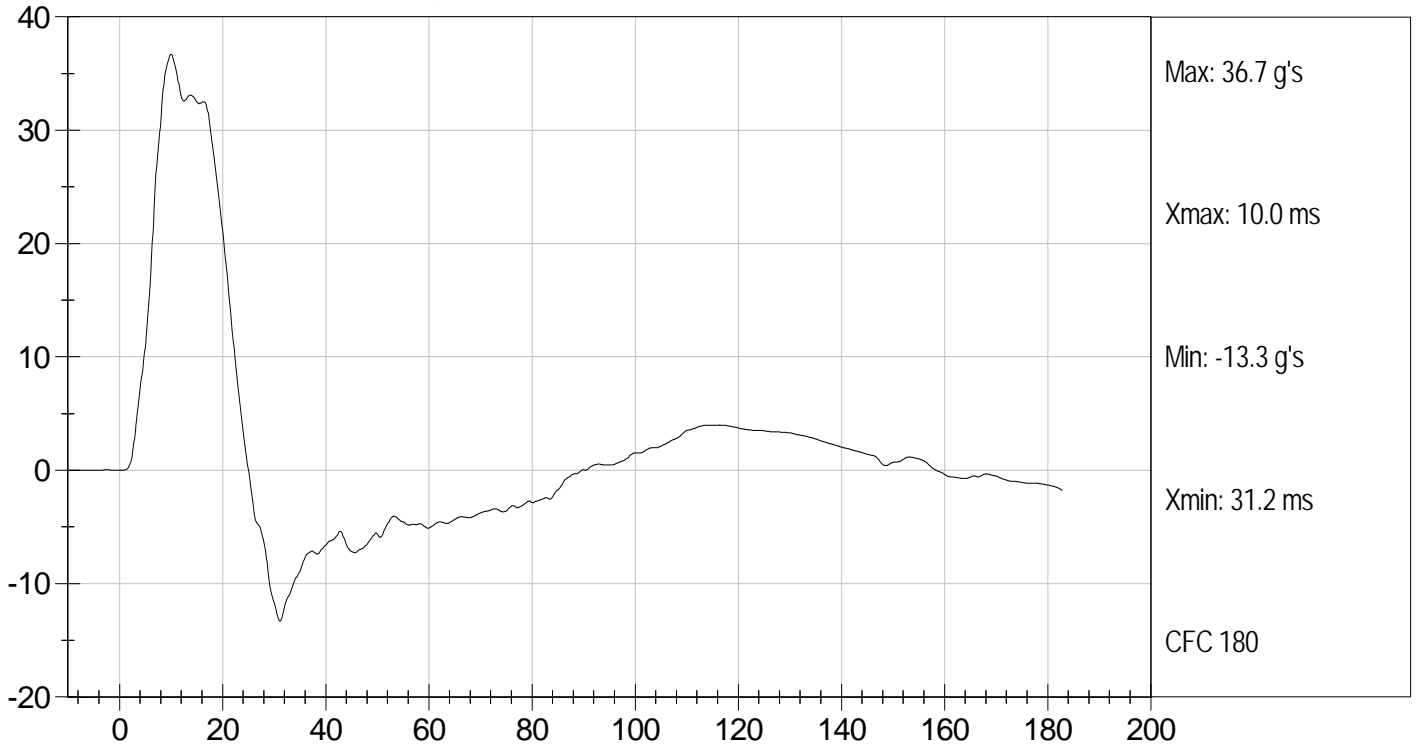




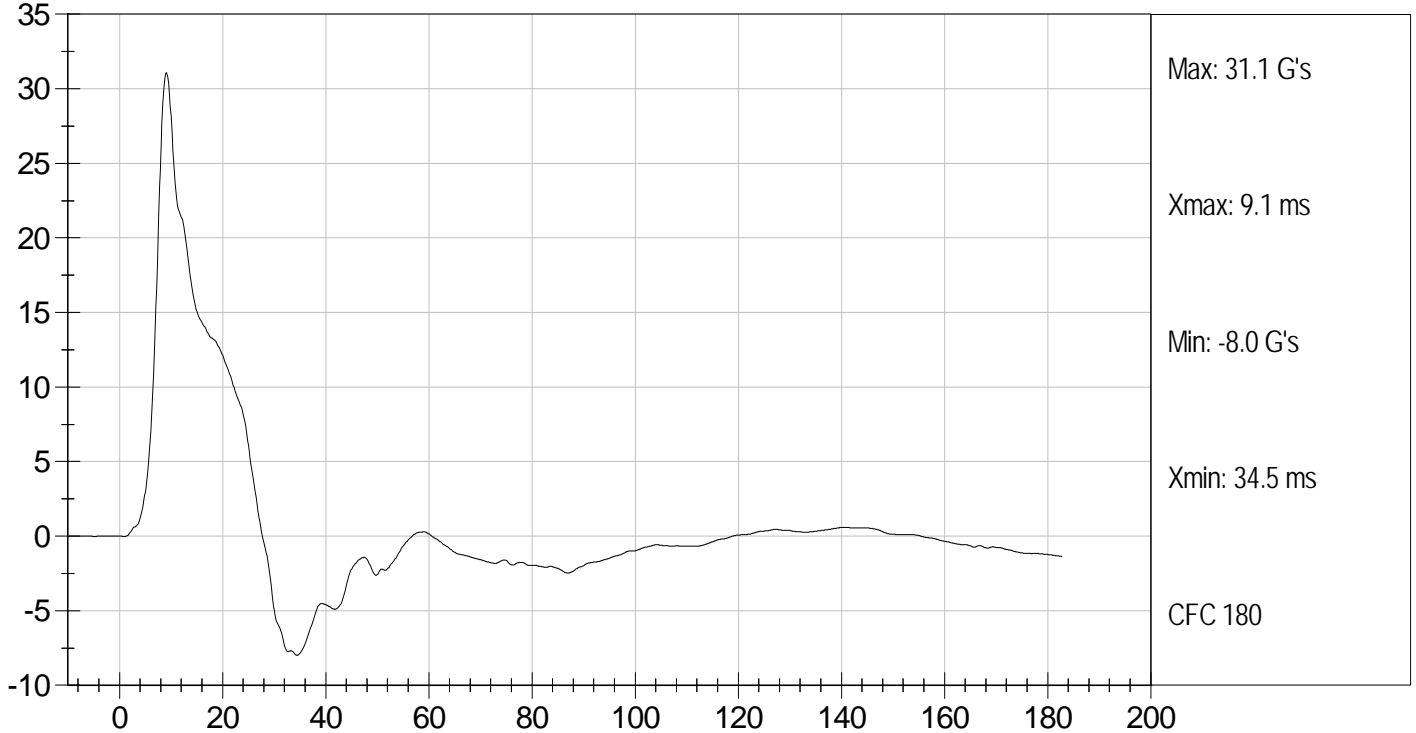
Test Desc: Thorax With Arm
Component ID: D12864

Test Date: 3/6/12
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.: D12865

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.9	Pass
Humidity	%	10 to 70	19	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Peak Impactor Force	G's	14 to 18	15	Pass
Upper Rib Displacement	mm	32 to 40	35	Pass
Middle Rib Displacement	mm	39 to 45	42	Pass
Lower Rib Displacement	mm	35 to 43	40	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 17	13	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	9	Pass
Overall Test Results				Pass

Jessica Gall
 Laboratory Technician

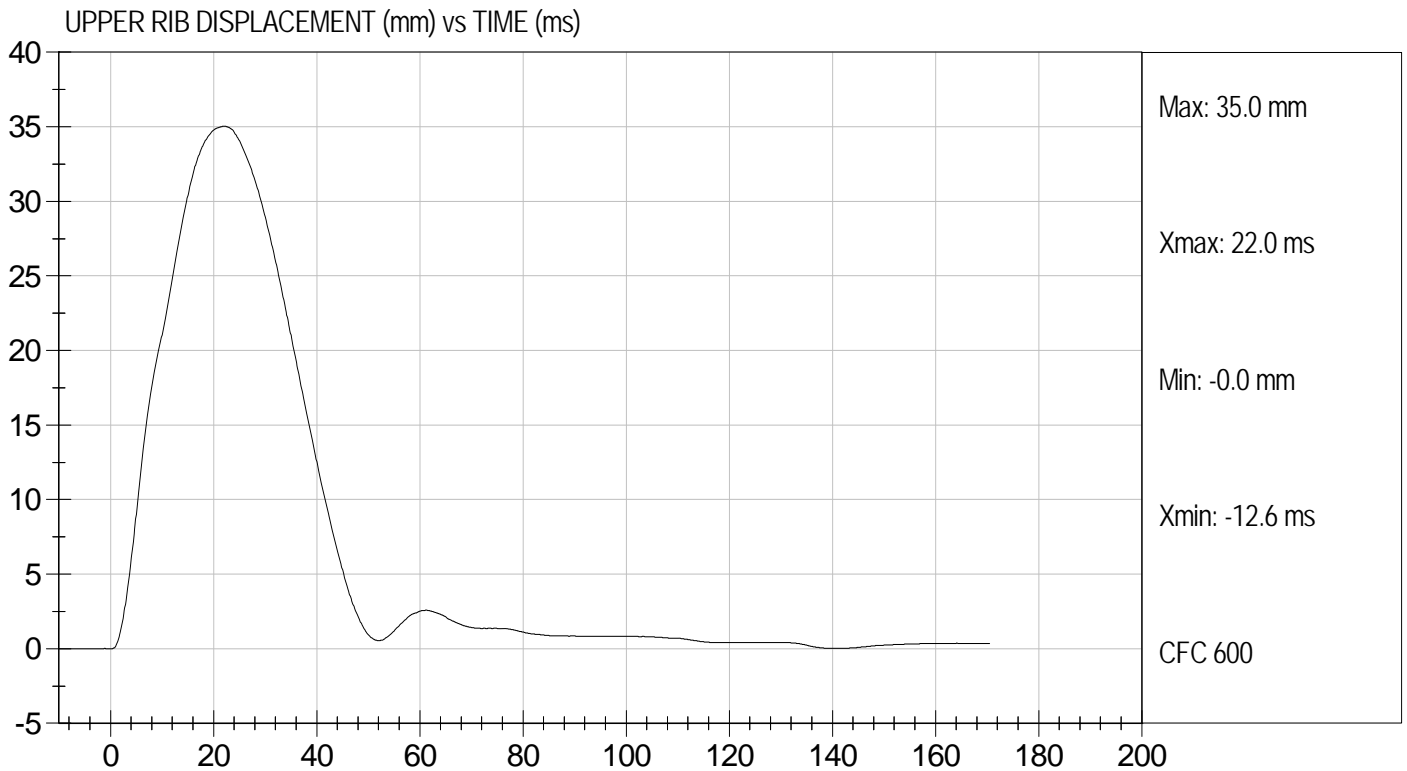
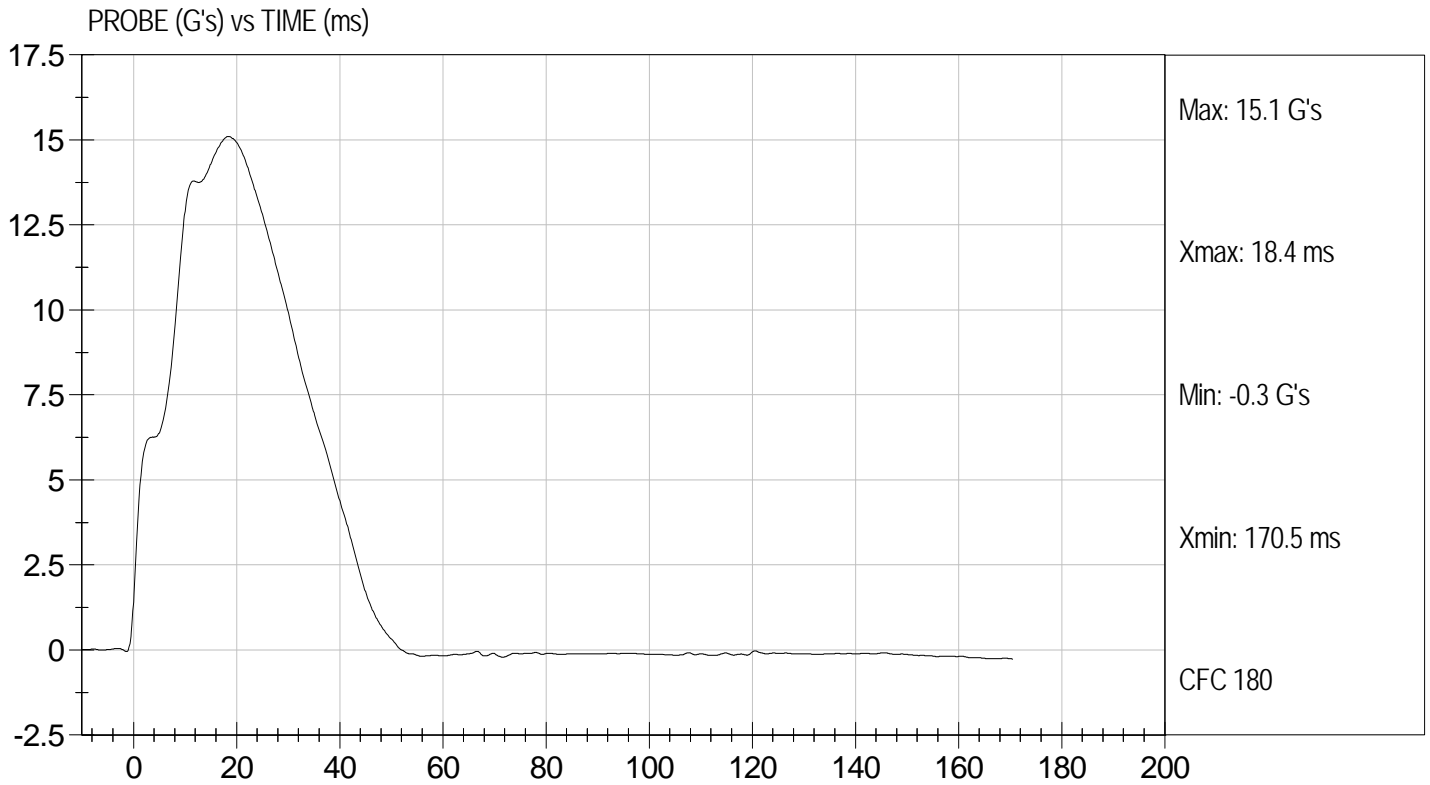
3/6/12
 Test Date

David Winkelbauer
 Approved By



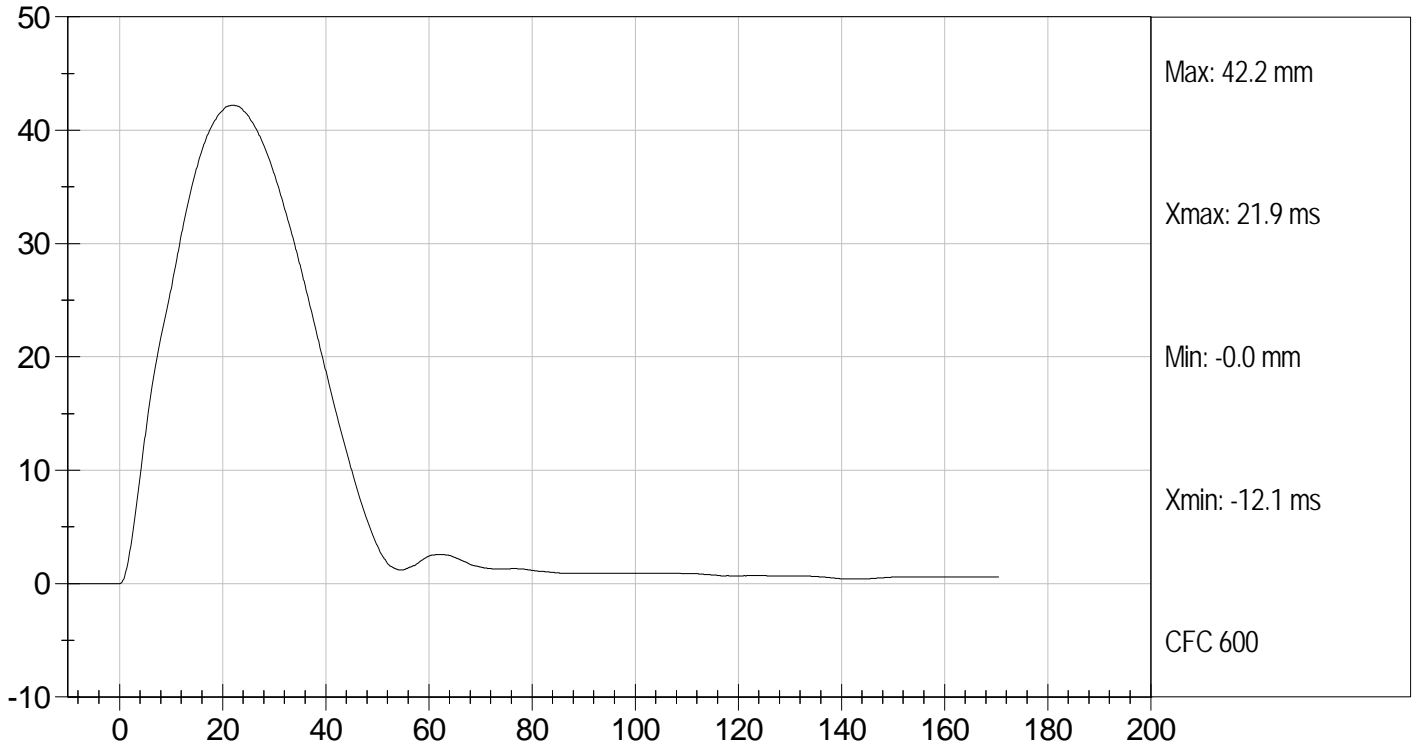
Test Desc: Thorax Without Arm
Component ID: D12865

Test Date: 3/6/12
Velocity: 14.25 ft/s, 4.34 m/s

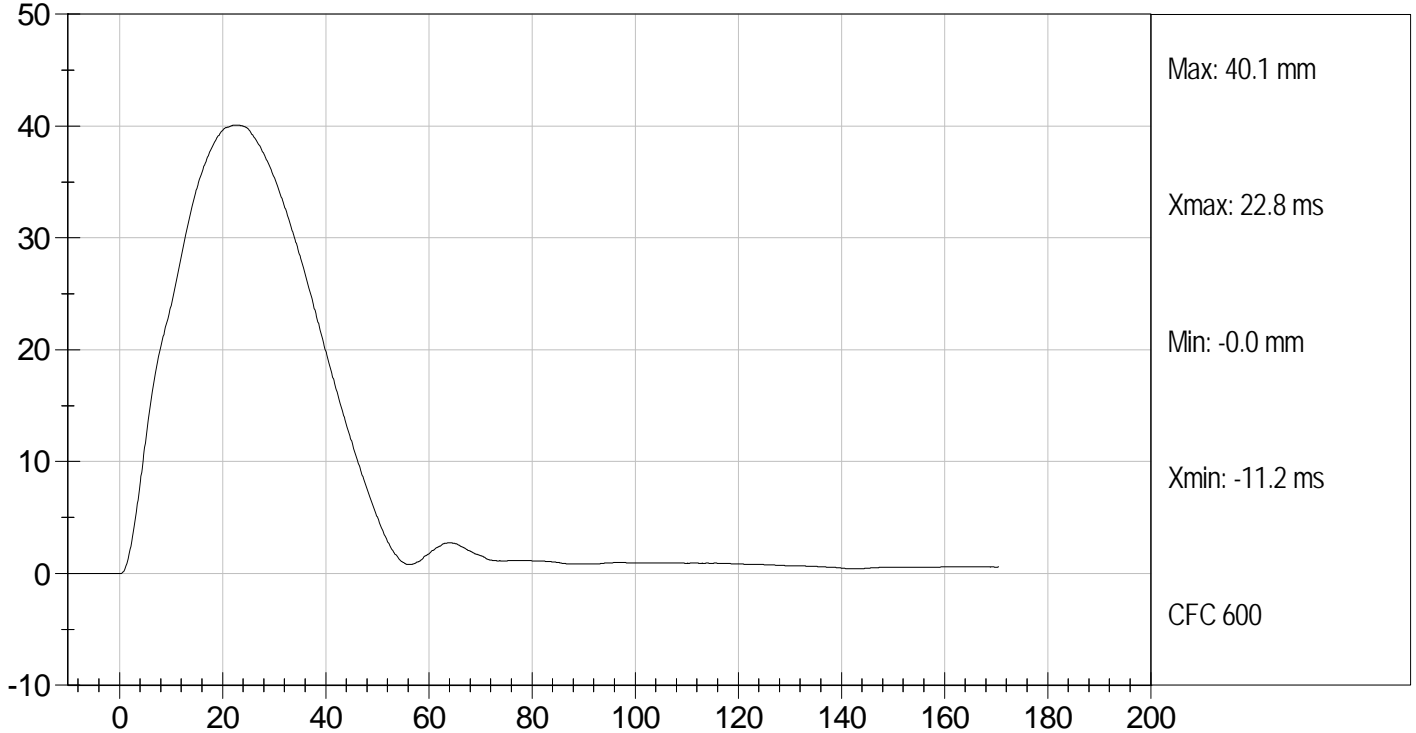




MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



LOWER RIB DISPLACEMENT (mm) vs TIME (ms)

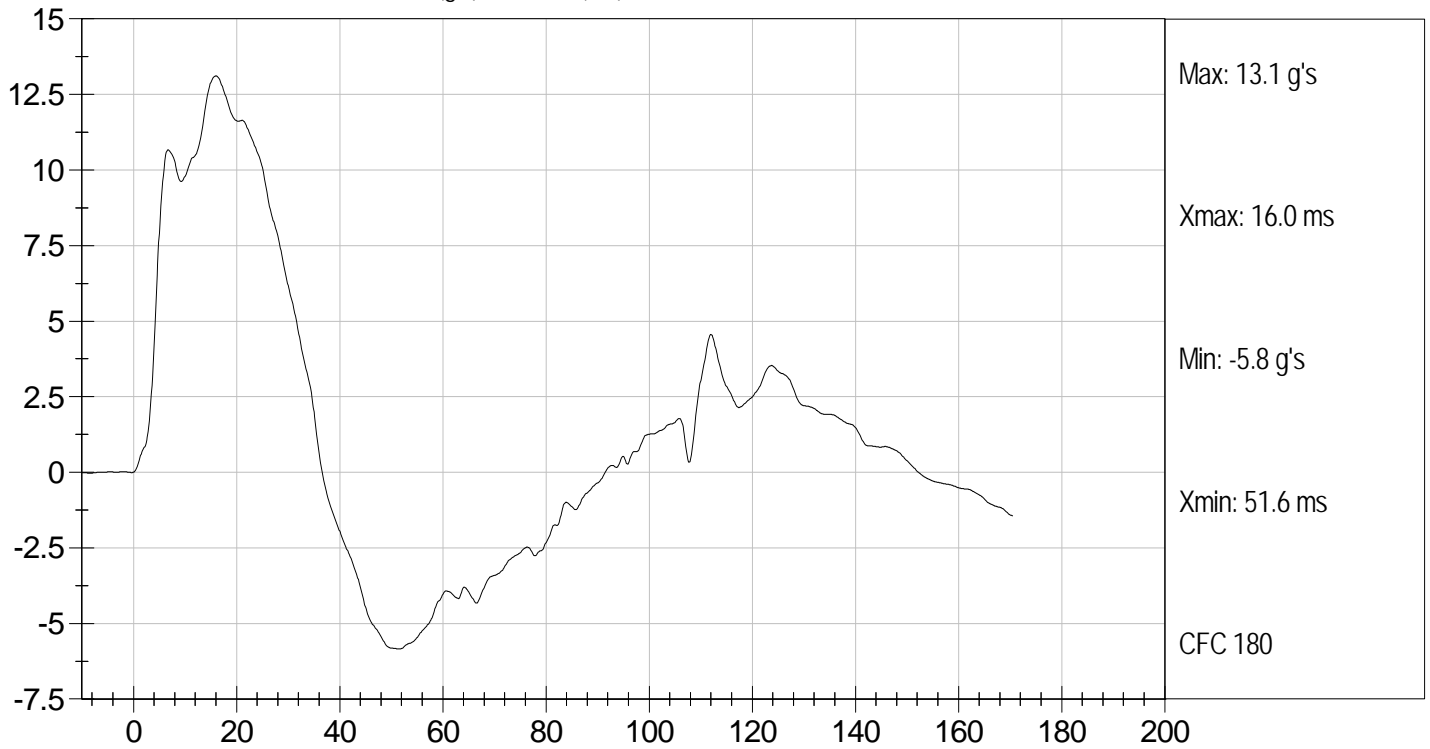




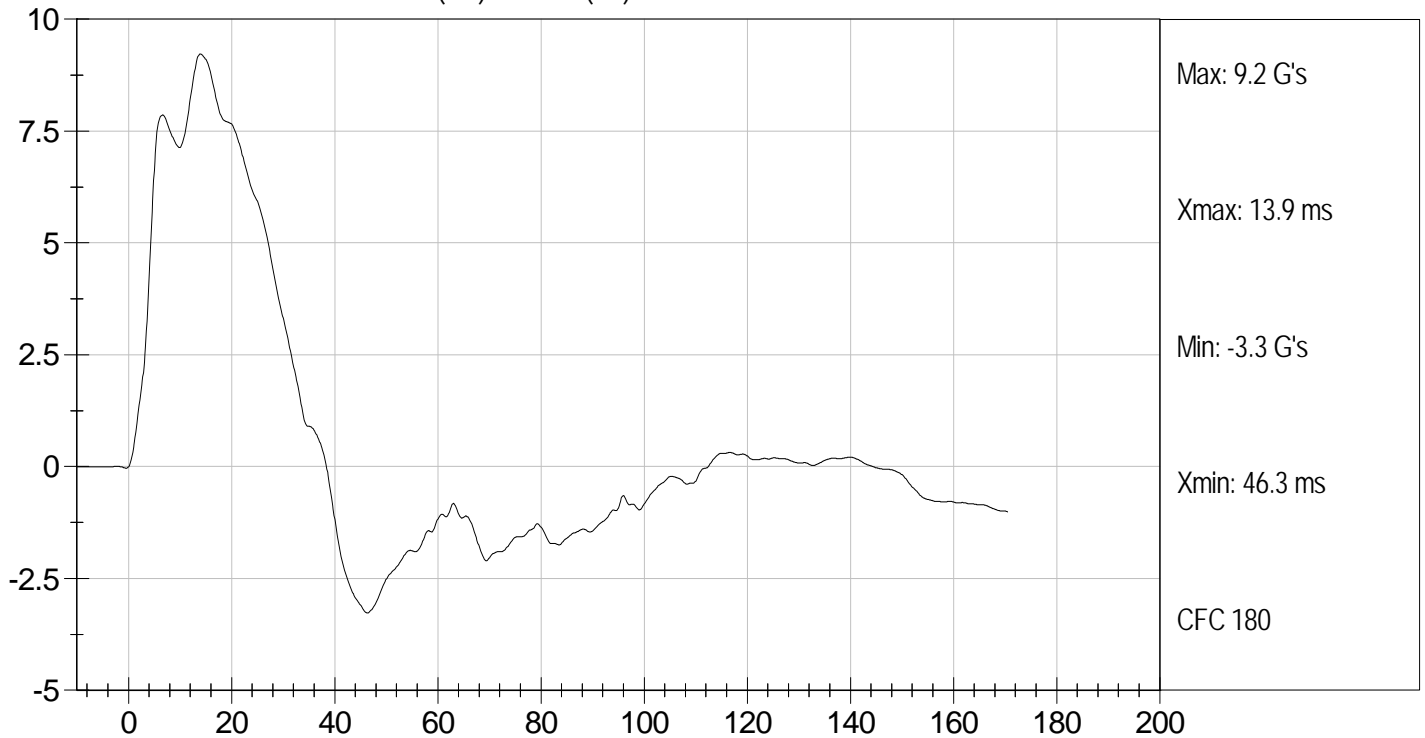
Test Desc: Thorax Without Arm
Component ID: D12865

Test Date: 3/6/12
Velocity: 14.25 ft/s, 4.34 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: D12866

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	22.0	Pass
Humidity	%	10 to 70	18	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Peak Impactor Acceleration	G's	12 to 16	13	Pass
Upper Rib Displacement	mm	36 to 47	41	Pass
Lower Rib Displacement	mm	33 to 44	40	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	11	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

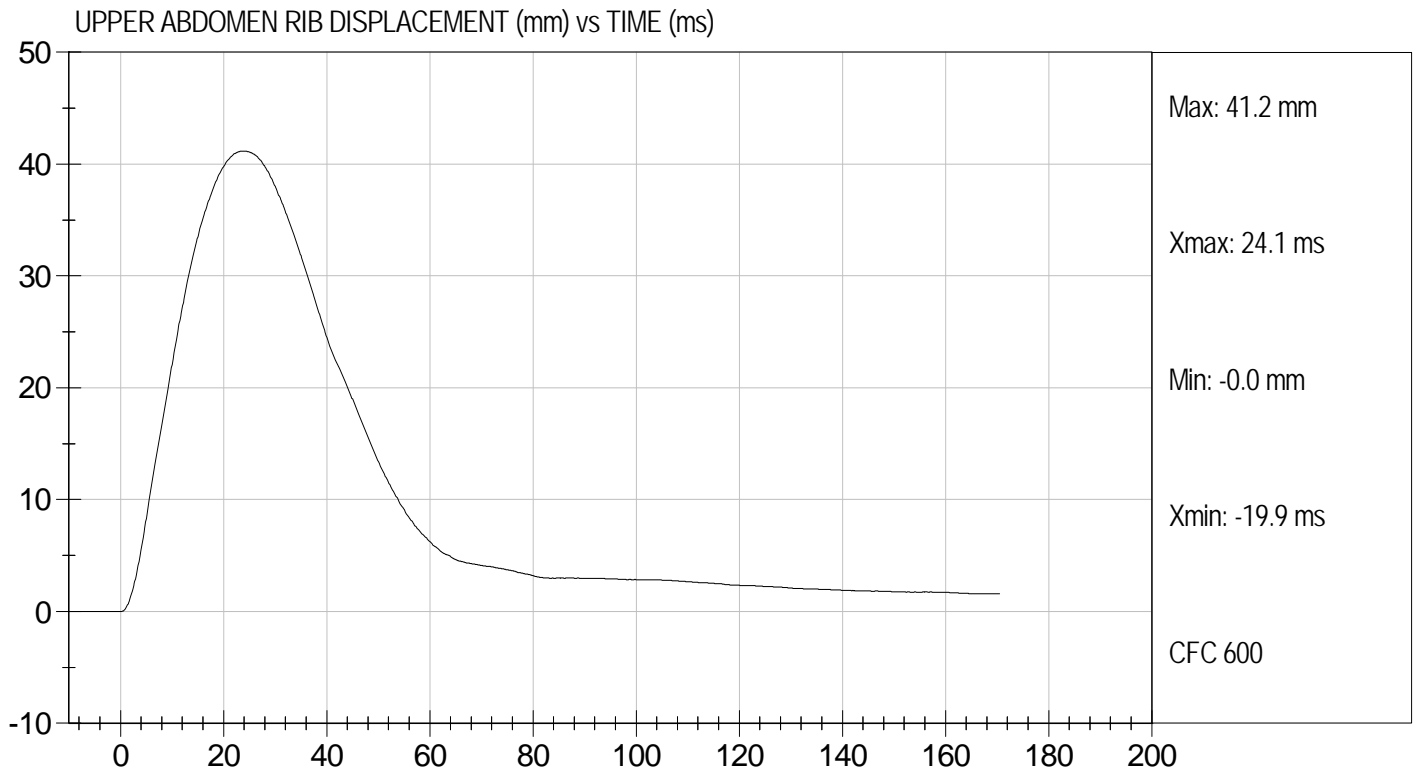
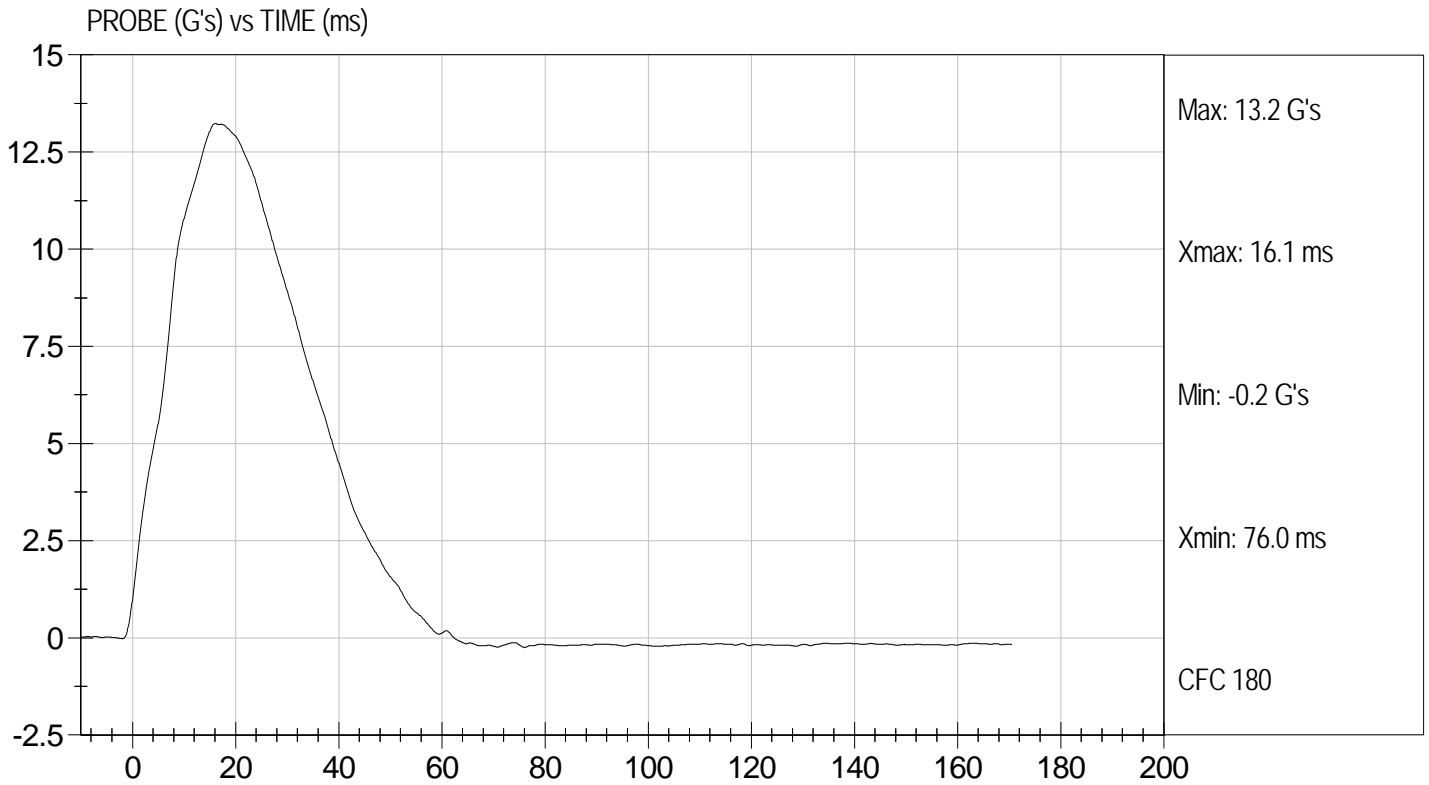
3/6/12
Test Date

David Winkelbauer
Approved By



Test Desc: Abdomen Impact
Component ID: D12866

Test Date: 3/6/12
Velocity: 14.37 ft/s, 4.38 m/s

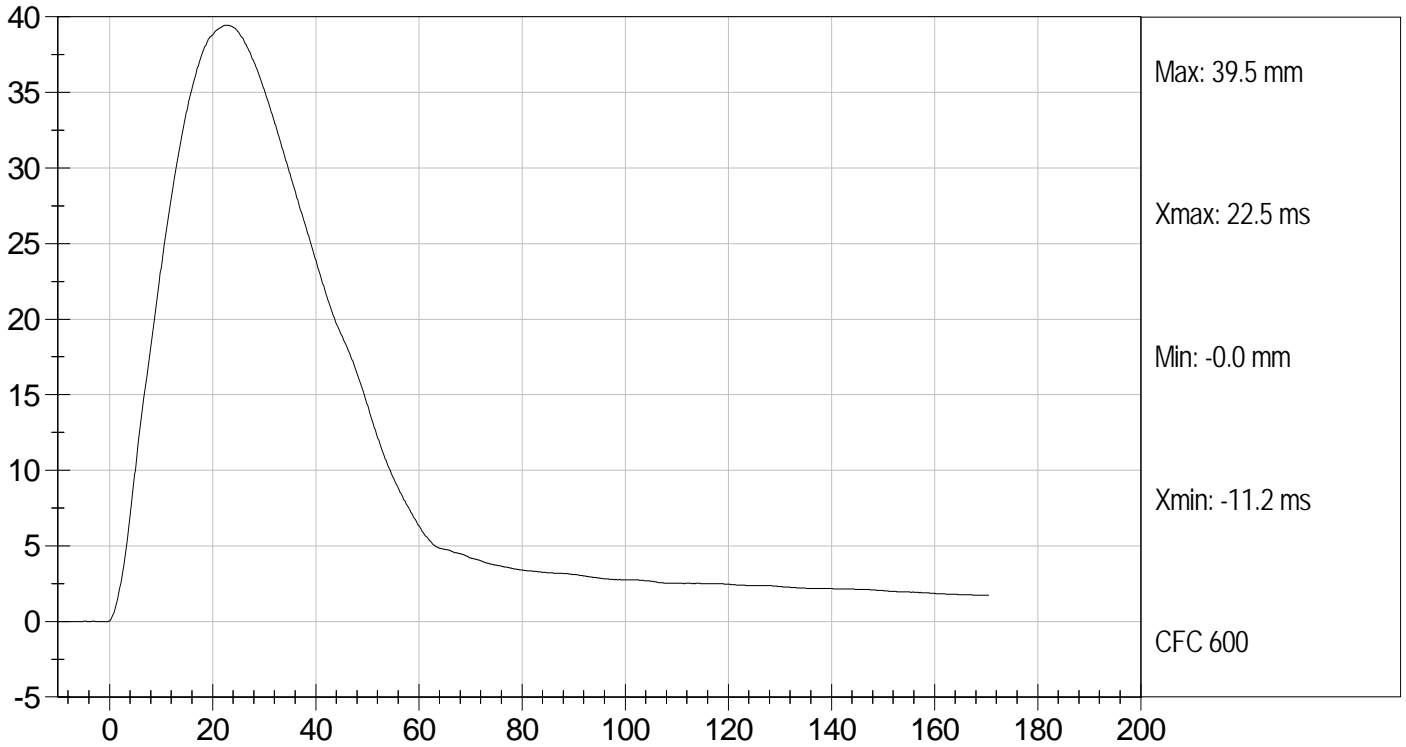




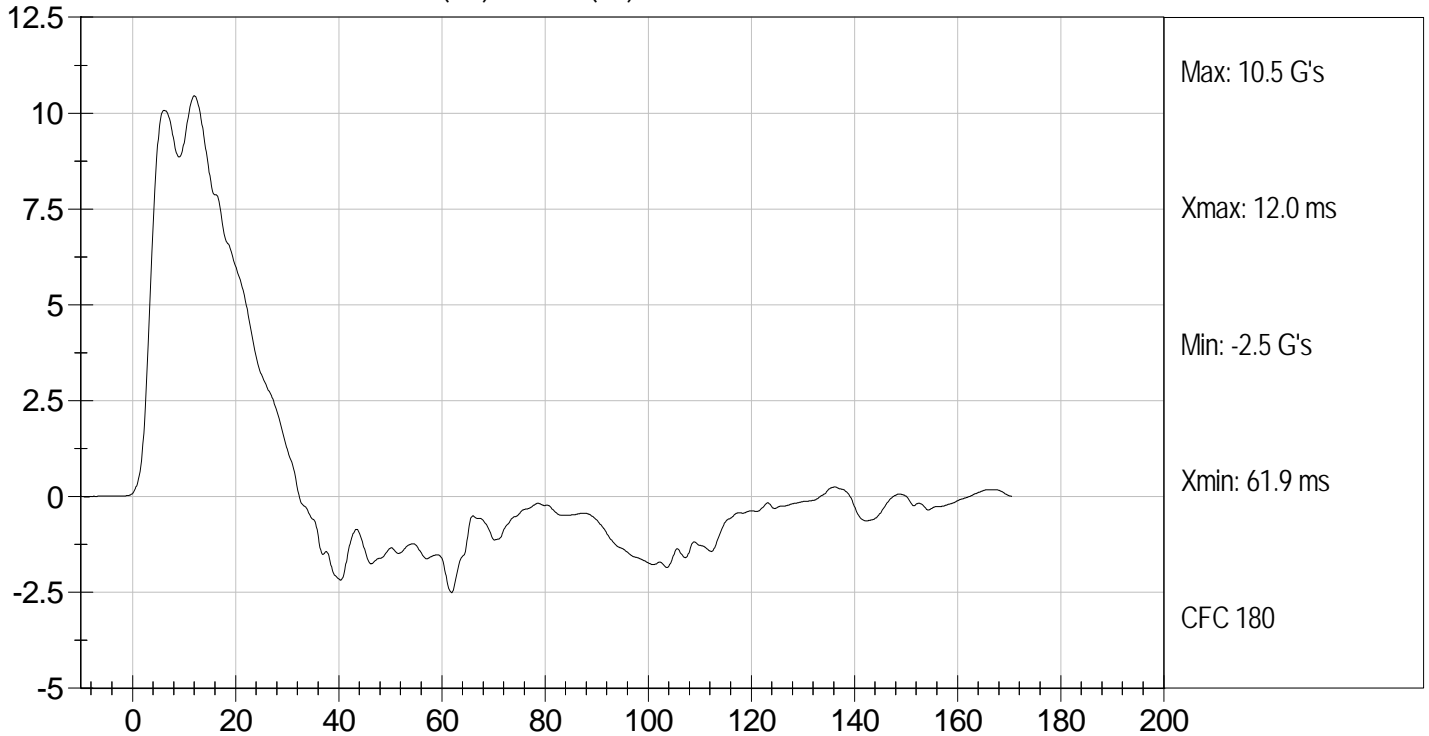
Test Desc: Abdomen Impact
Component ID: D12866

Test Date: 3/6/12
Velocity: 14.37 ft/s, 4.38 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: D12867

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	22.0	Pass
Humidity	%	10 to 70	18	Pass
Impact Velocity	m/s	6.60 to 6.80	6.74	Pass
Peak Impactor Acceleration	G's	38 to 47	44	Pass
Pelvis Y Acceleration after 6 ms	G's	34 to 42	41	Pass
Peak Acetabulum Force	N	3600 to 4300	4114	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

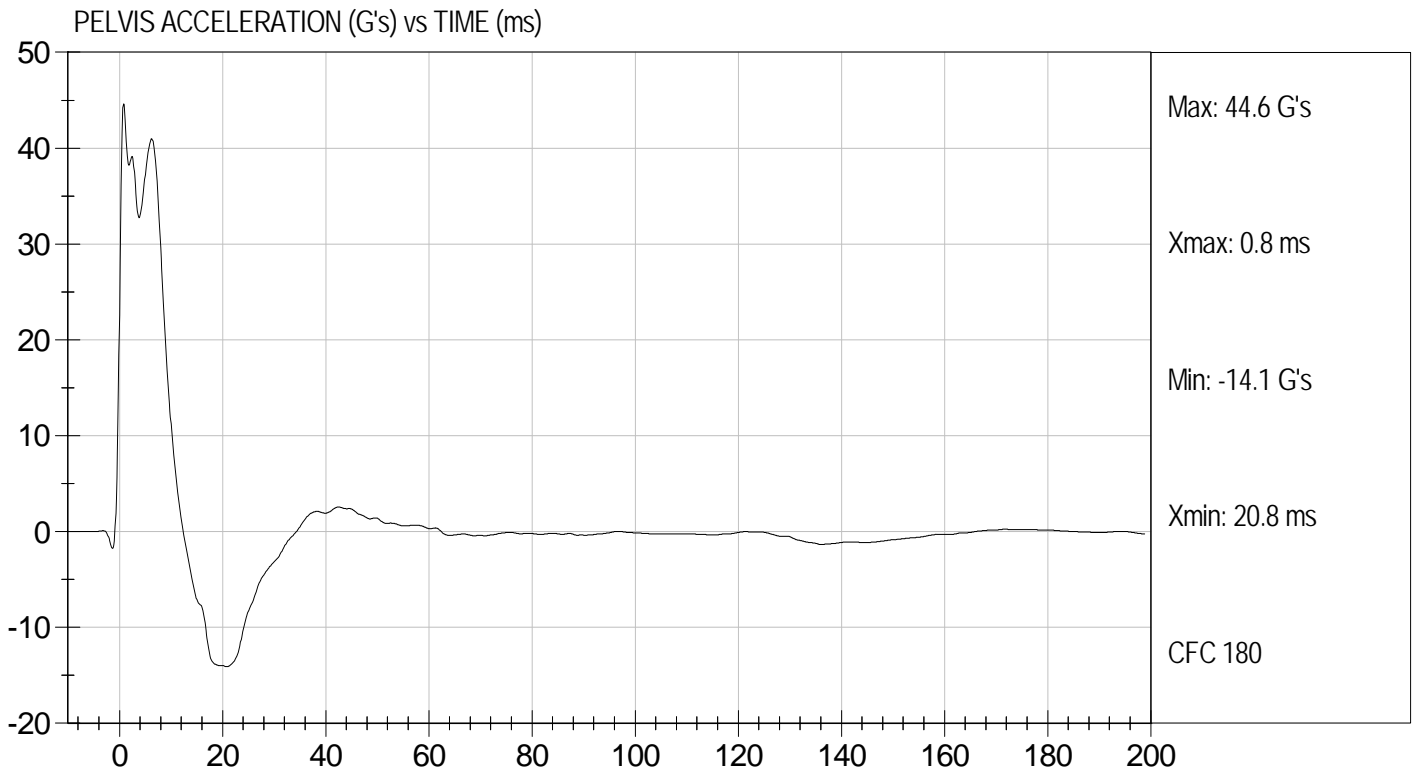
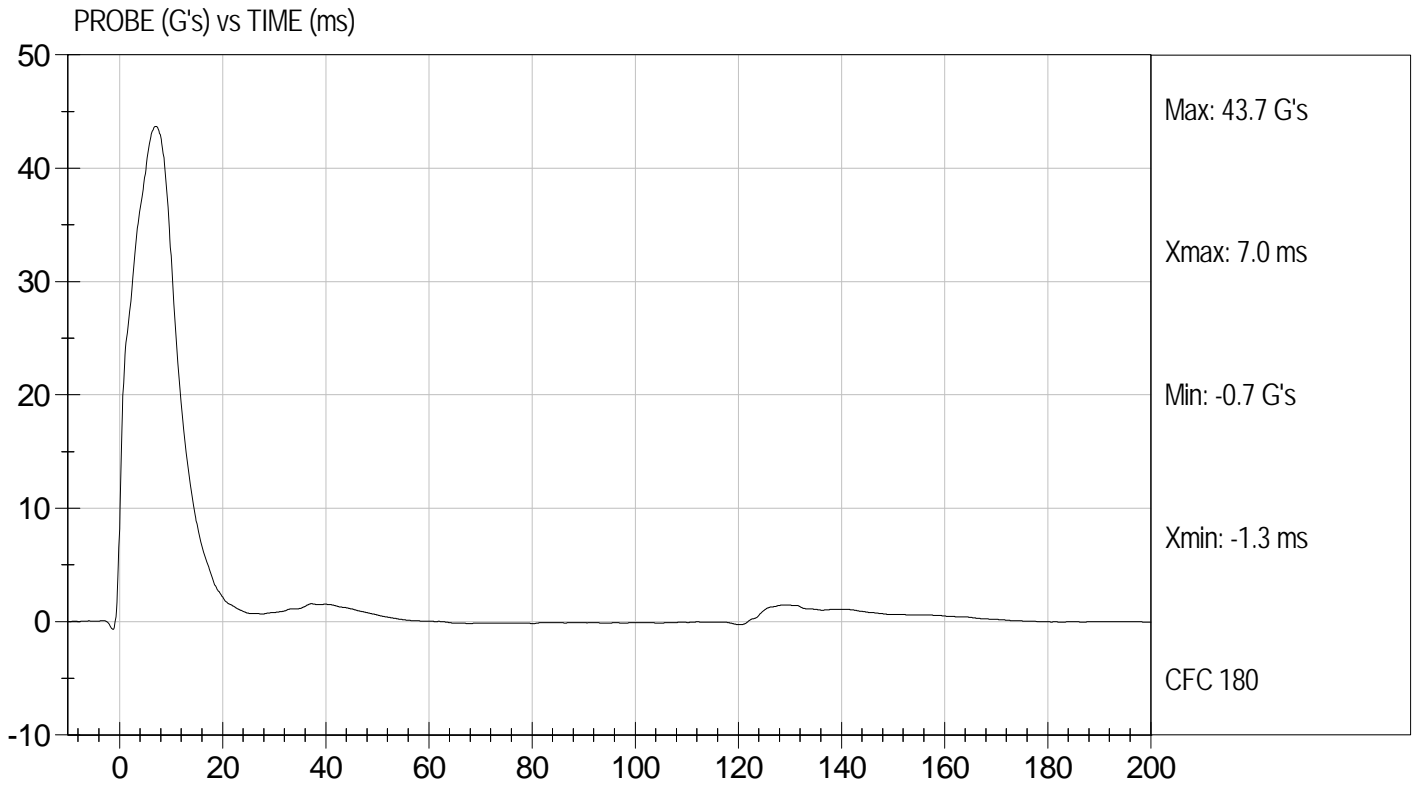
3/6/12
Test Date

David Winkelbauer
Approved By



Test Desc: Pelvis Impact
Component ID: D12867

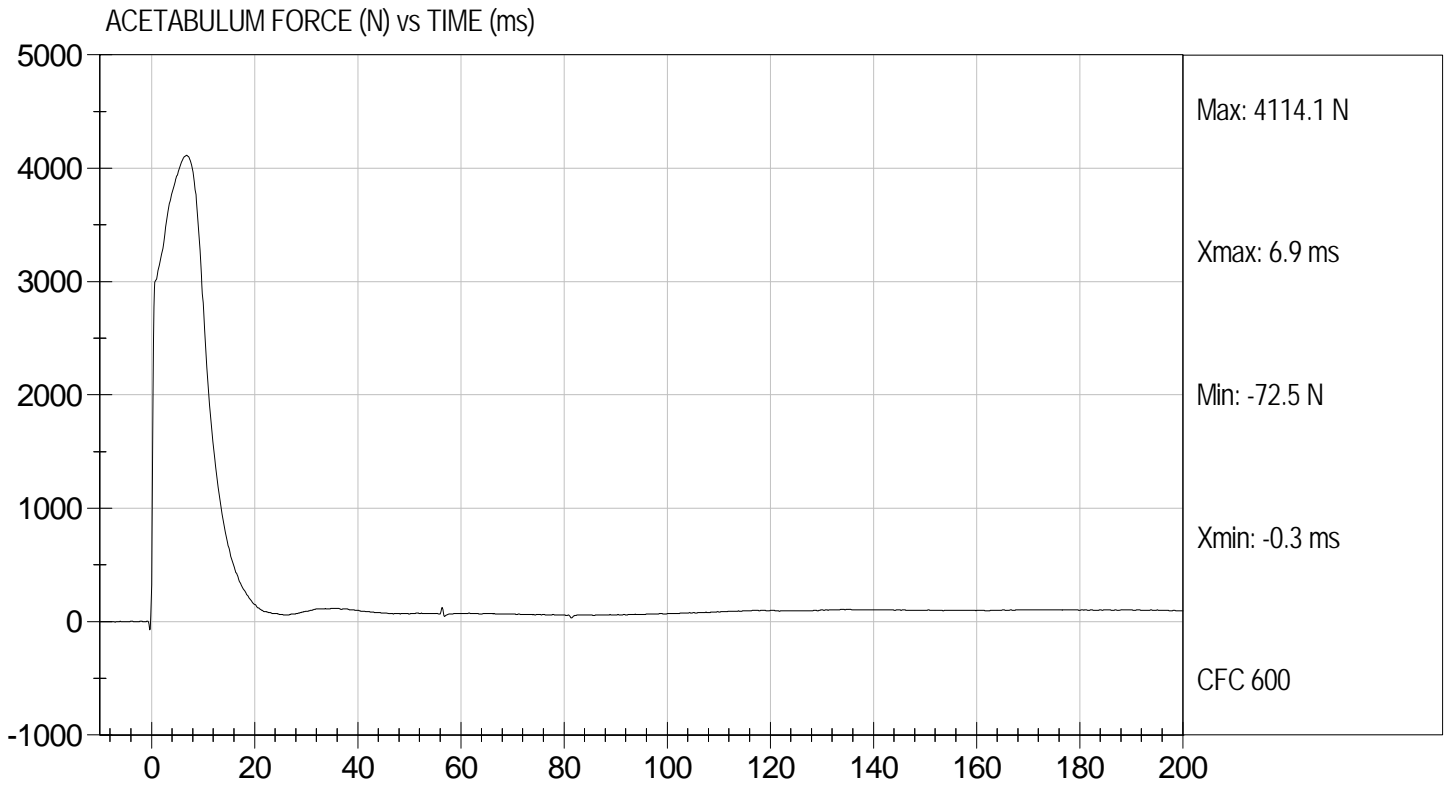
Test Date: 3/6/12
Velocity: 22.10 ft/s, 6.74 m/s





Test Desc: Pelvis Impact
Component ID: D12867

Test Date: 3/6/12
Velocity: 22.10 ft/s, 6.74 m/s



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

ATD Serial No: 296

Test I.D: D12868

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	22.0	Pass
Humidity	%	10 to 70	18	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Peak Impactor Acceleration	G's	36 to 45	37	Pass
Pelvis Y Acceleration	G's	28 to 39	29	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4505	Pass
Overall Test Results				Pass

Jessica Hall
 Laboratory Technician

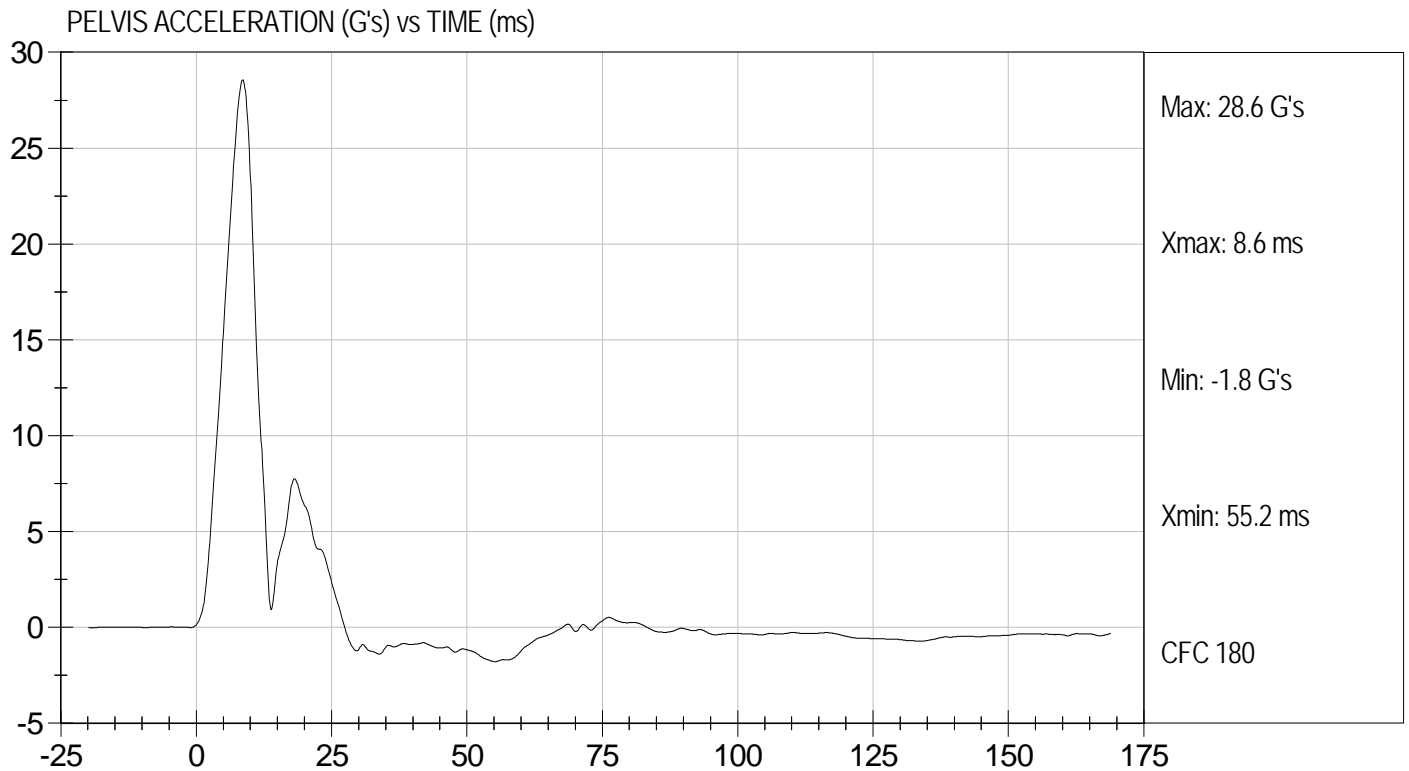
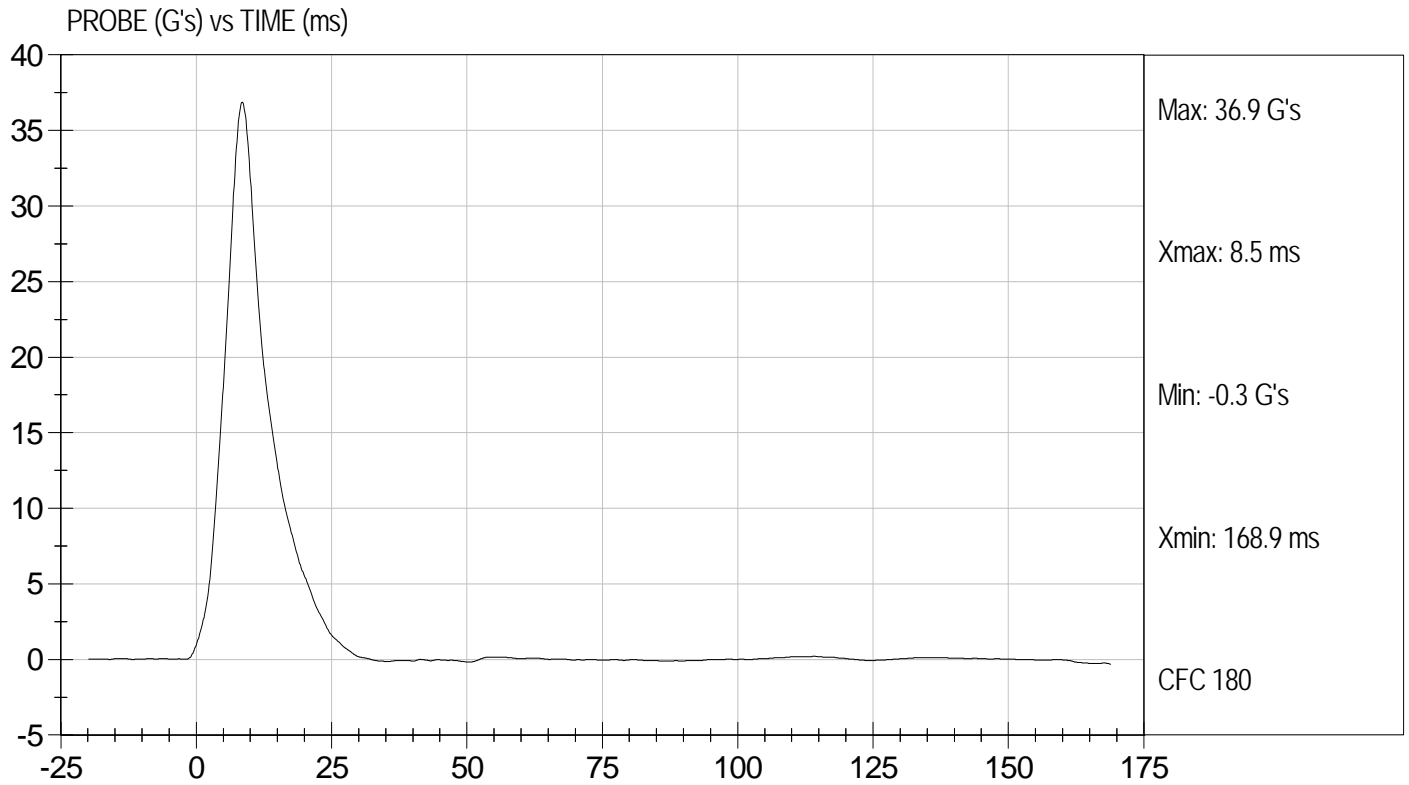
3/6/12
 Test Date

David Winkelbauer
 Approved By



Test Desc: Iliac Impact
Component ID: D12868

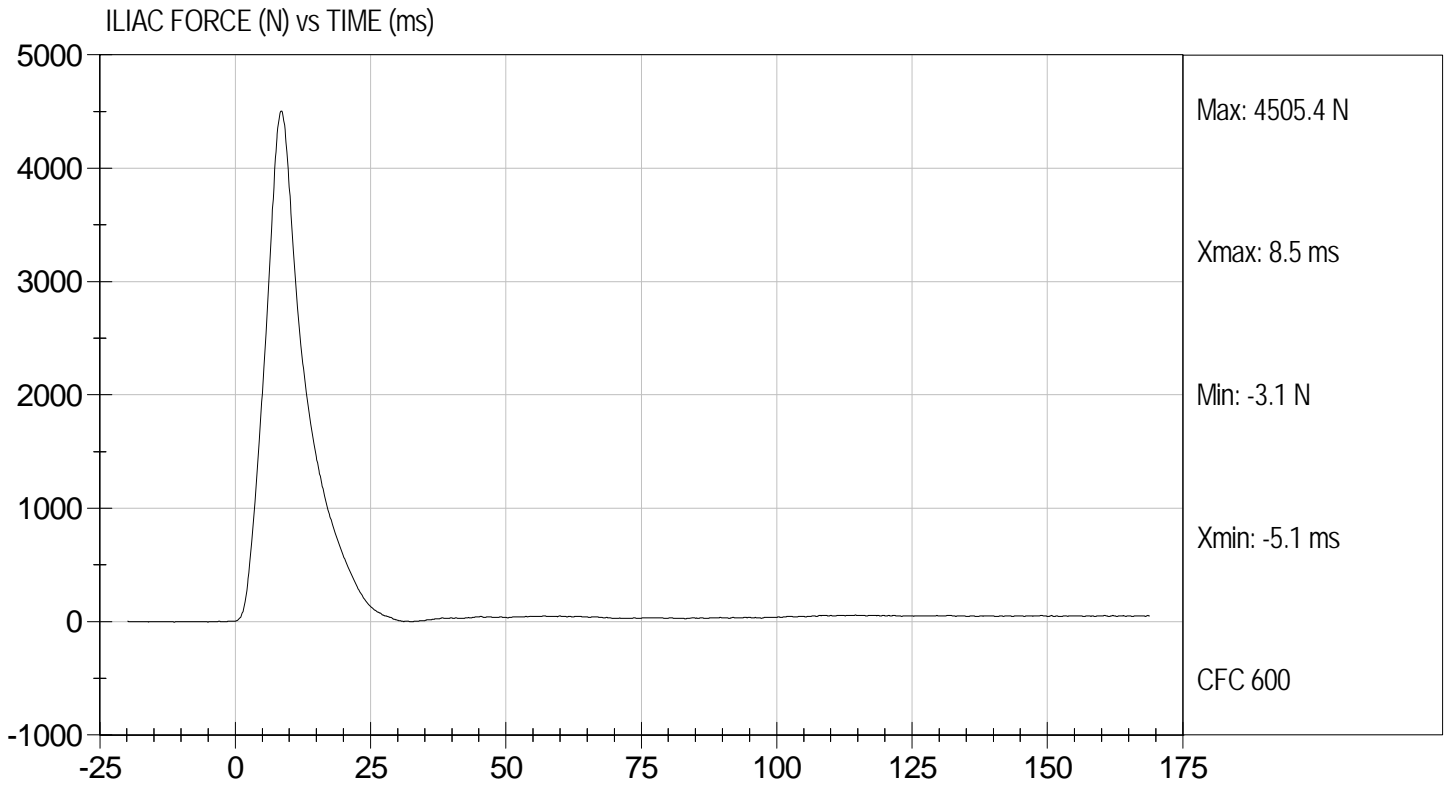
Test Date: 3/6/12
Velocity: 14.25 ft/s, 4.34 m/s





Test Desc: Iliac Impact
Component ID: D12868

Test Date: 3/6/12
Velocity: 14.25 ft/s, 4.34 m/s



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

ATD Serial No: 296

Test ID: D12991

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	35	Pass
Peak Resultant Acceleration	G's	115 to 137	119	Pass
Peak Longitudinal Acceleration	G's	+/- 15	3.2	Pass
Unimodal	N/A	<15%	Yes	Pass
Overall Test Results				Pass

Jessica Hall
 Laboratory Technician

3/13/12
 Test Date

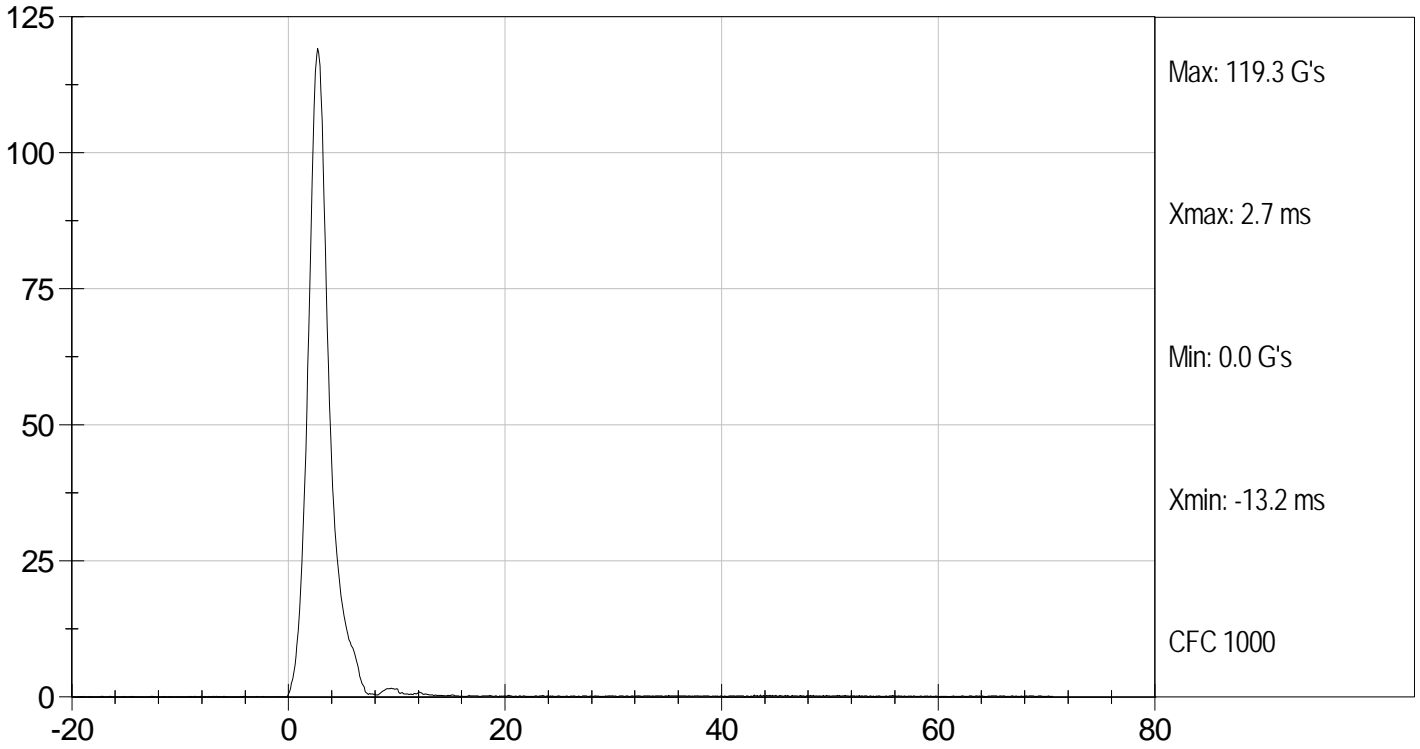
David Winkelbauer
 Approved By



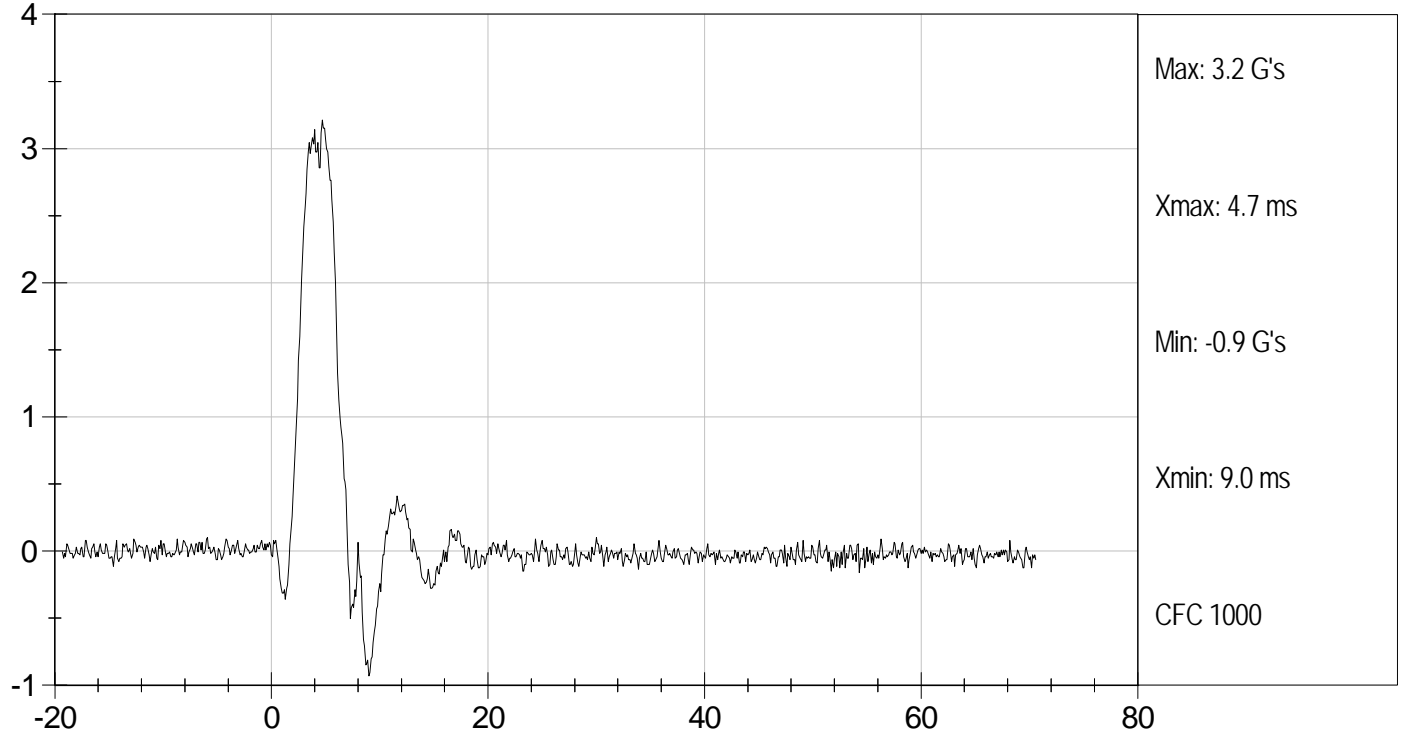
Test Desc: Head Drop
Component ID: D12991

Test Date: 3/13/12
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: D12992

Tested Parameter	Units	Specification	Result	Pass/Fail	
Temperature	deg C	20.6 to 22.2	22.0	Pass	
Humidity	%	10 to 70	35	Pass	
Impact Velocity	m/s	5.51 to 5.63	5.58	Pass	
Delta Velocity	10 ms	m/s	2.20 to 2.80	2.76	Pass
	15 ms	m/s	3.30 to 4.10	3.95	Pass
	20 ms	m/s	4.40 to 5.40	5.27	Pass
	25 ms	m/s	5.40 to 6.10	5.53	Pass
	25-100 ms	m/s	5.50 to 6.20	5.55	Pass
Maximum D-Plane Rotation	deg	71 to 81	72	Pass	
Time of Maximum D-Plane Rotation	ms	50 to 70	60	Pass	
Maximum Occipital Condyle Moment during Rotation Interval	Nm	-44 to -36	-41	Pass	
Time of Moment Decay to 0 Nm	ms	102 to 126	115	Pass	
Overall Test Results				Pass	


Laboratory Technician

3/13/12
Test Date

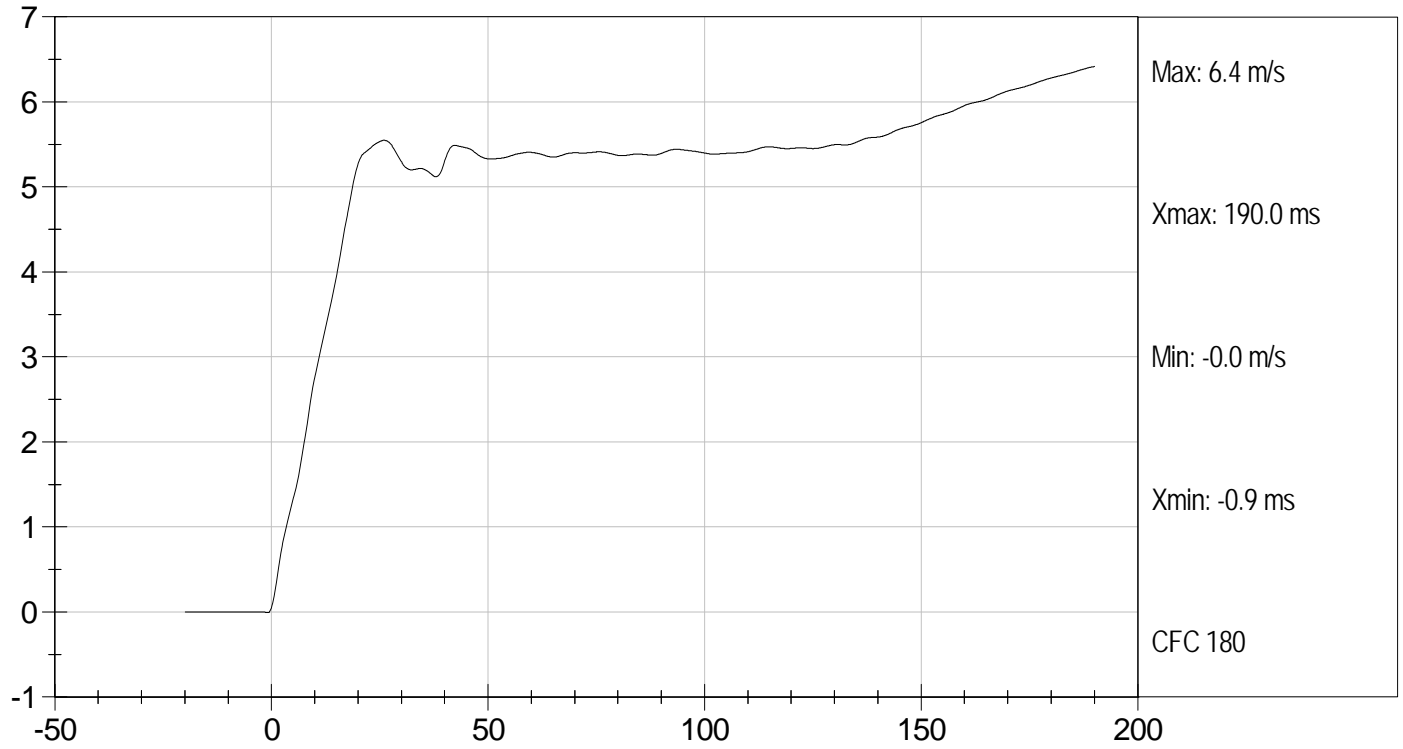

Approved By



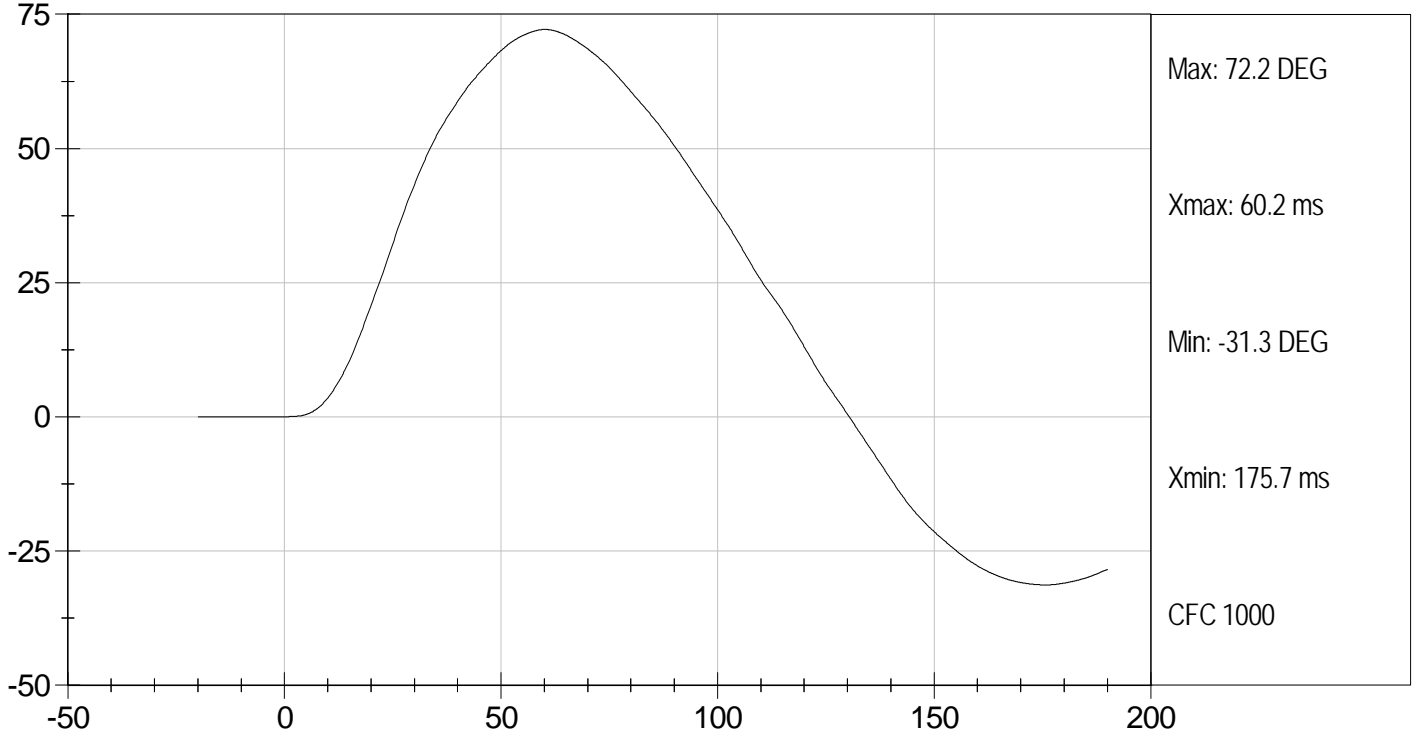
Test Desc: Neck Bending
Component ID: D12992

Test Date: 3/13/12
Velocity: 18.31 ft/s, 5.58 m/s

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



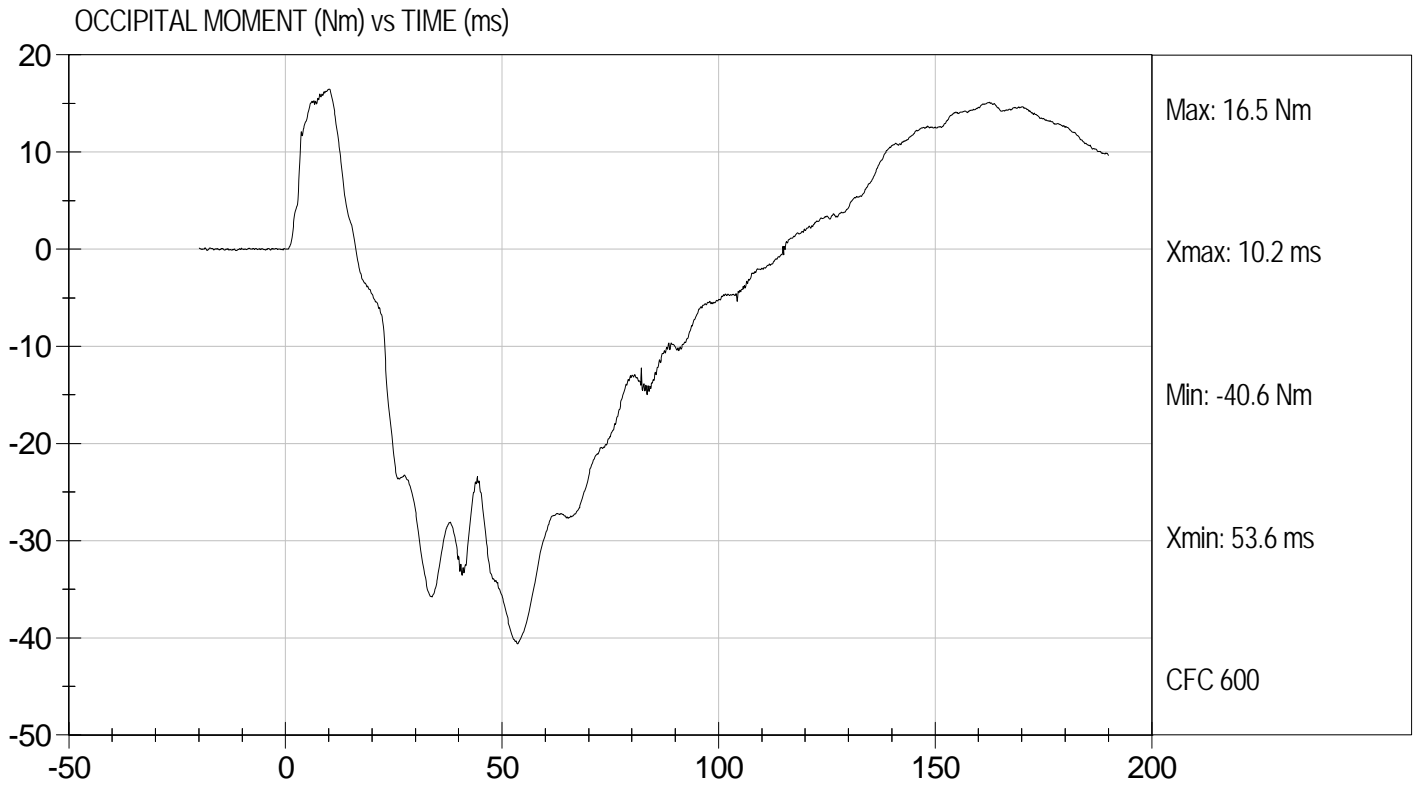
FLEXION ANGLE (DEG) vs TIME (ms)





Test Desc: Neck Bending
Component ID: D12992

Test Date: 3/13/12
Velocity: 18.31 ft/s, 5.58 m/s



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

ATD Serial No: 296

Test ID: D12993

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	35	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Maximum Probe Acceleration	G's	13 to 18	15	Pass
Shoulder Displacement	mm	28 to 37	31	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	19	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

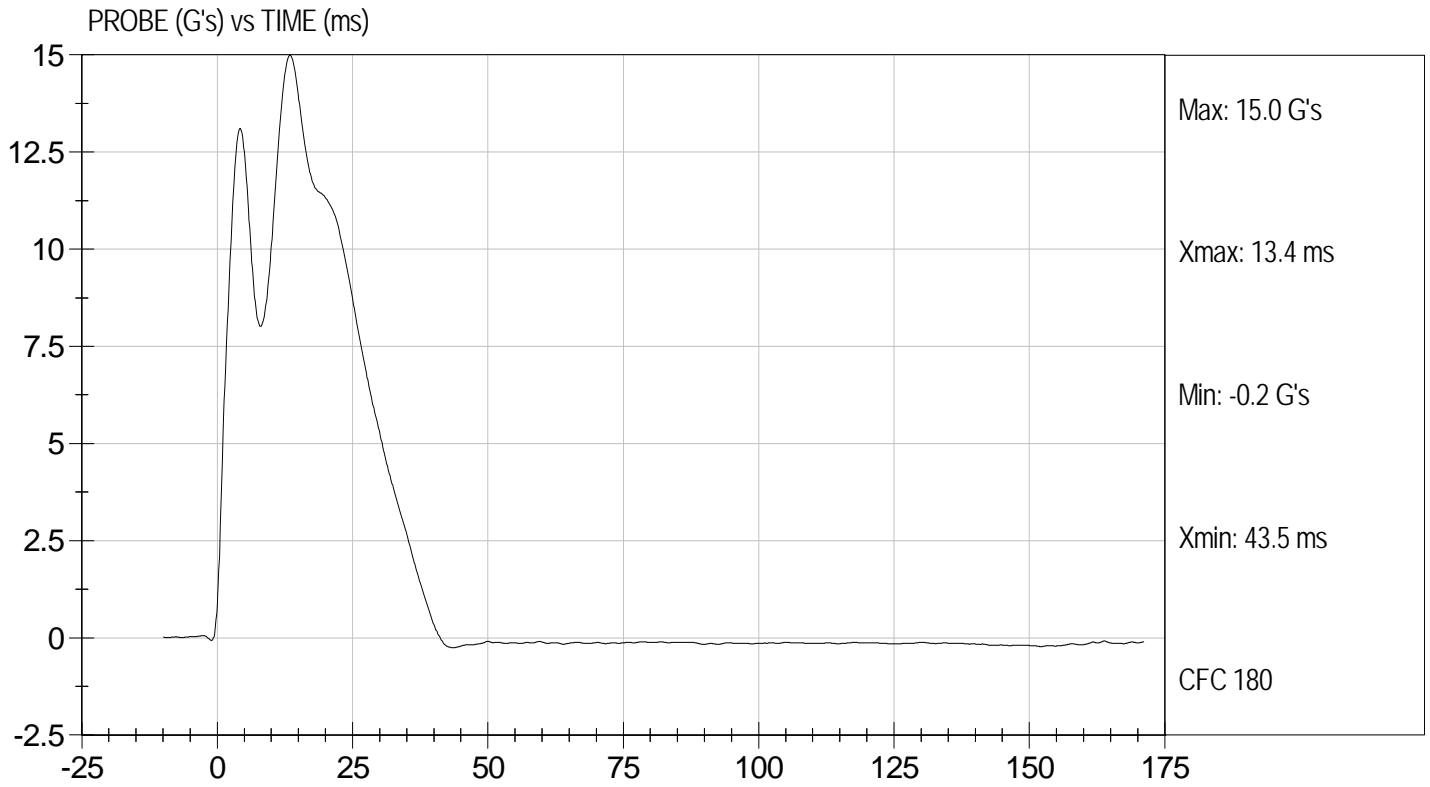
3/13/12
Test Date

David Winkelbauer
Approved By



Test Desc: Shoulder Impact
Component ID: D12993

Test Date: 3/13/12
Velocity: 14.24 ft/s, 4.34 m/s

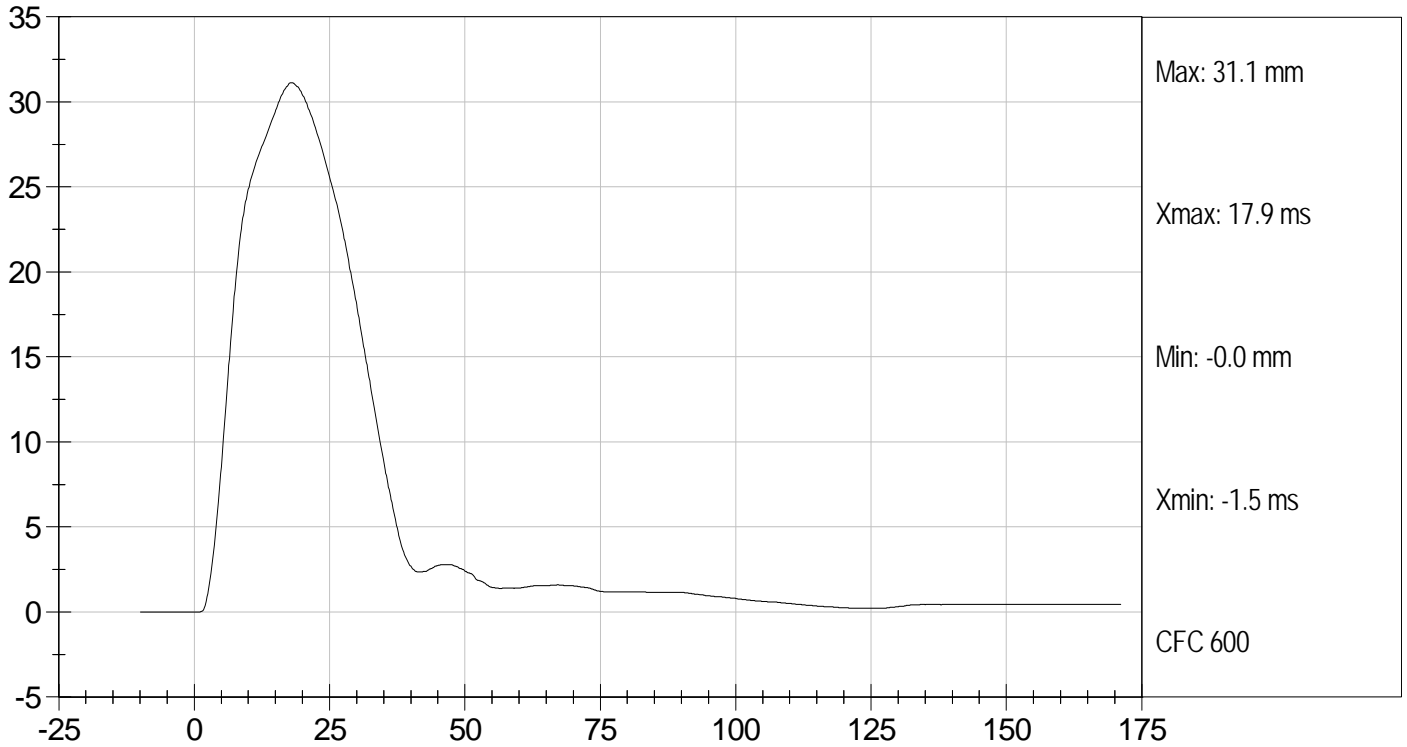




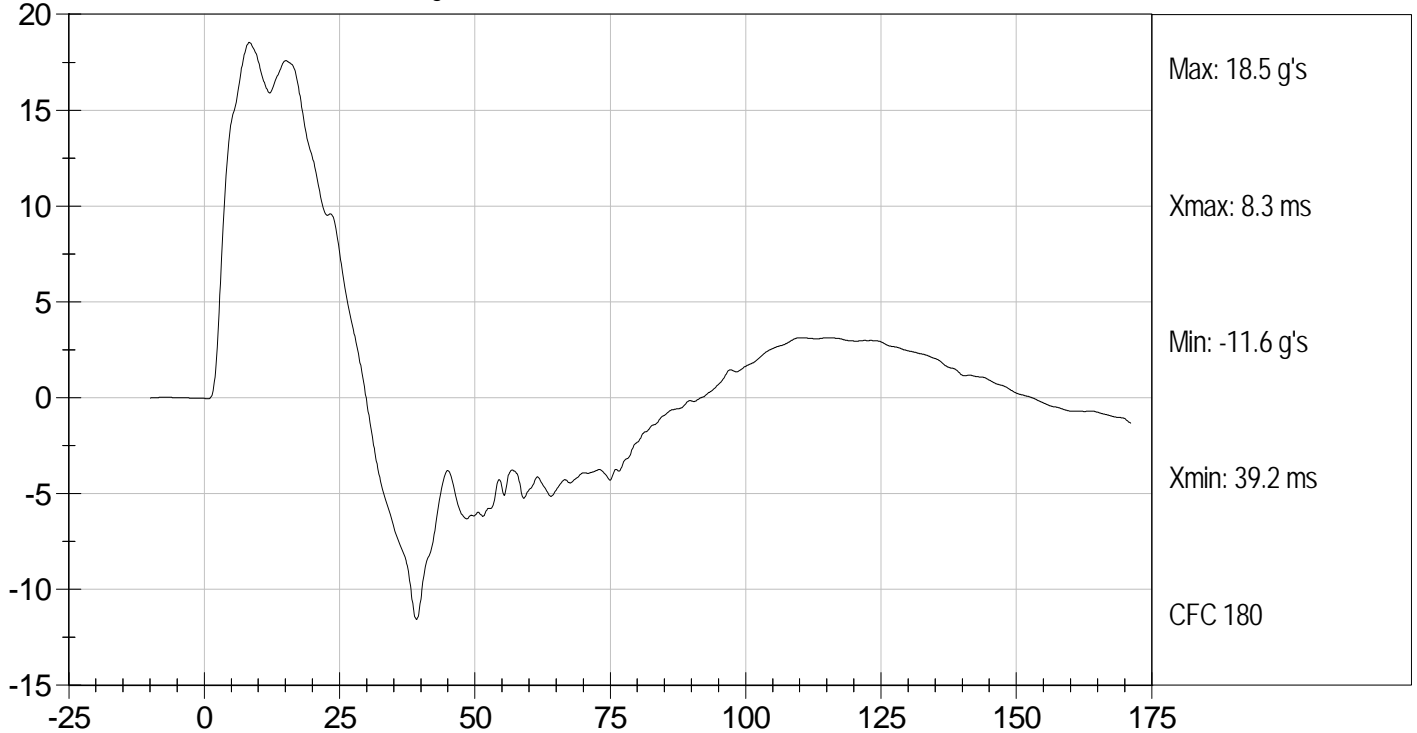
Test Desc: Shoulder Impact
Component ID: D12993

Test Date: 3/13/12
Velocity: 14.24 ft/s, 4.34 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: D12994

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	22.0	Pass
Humidity	%	10 to 70	35	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Peak Impactor Acceleration	G's	30 to 36	32	Pass
Shoulder Displacement	mm	31 to 40	36	Pass
Upper Rib Displacement	mm	25 to 32	28	Pass
Middle Rib Displacement	mm	30 to 36	32	Pass
Lower Rib Displacement	mm	32 to 38	34	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	38	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	31	Pass
Overall Test Results				Pass

Jessica Gall
Laboratory Technician

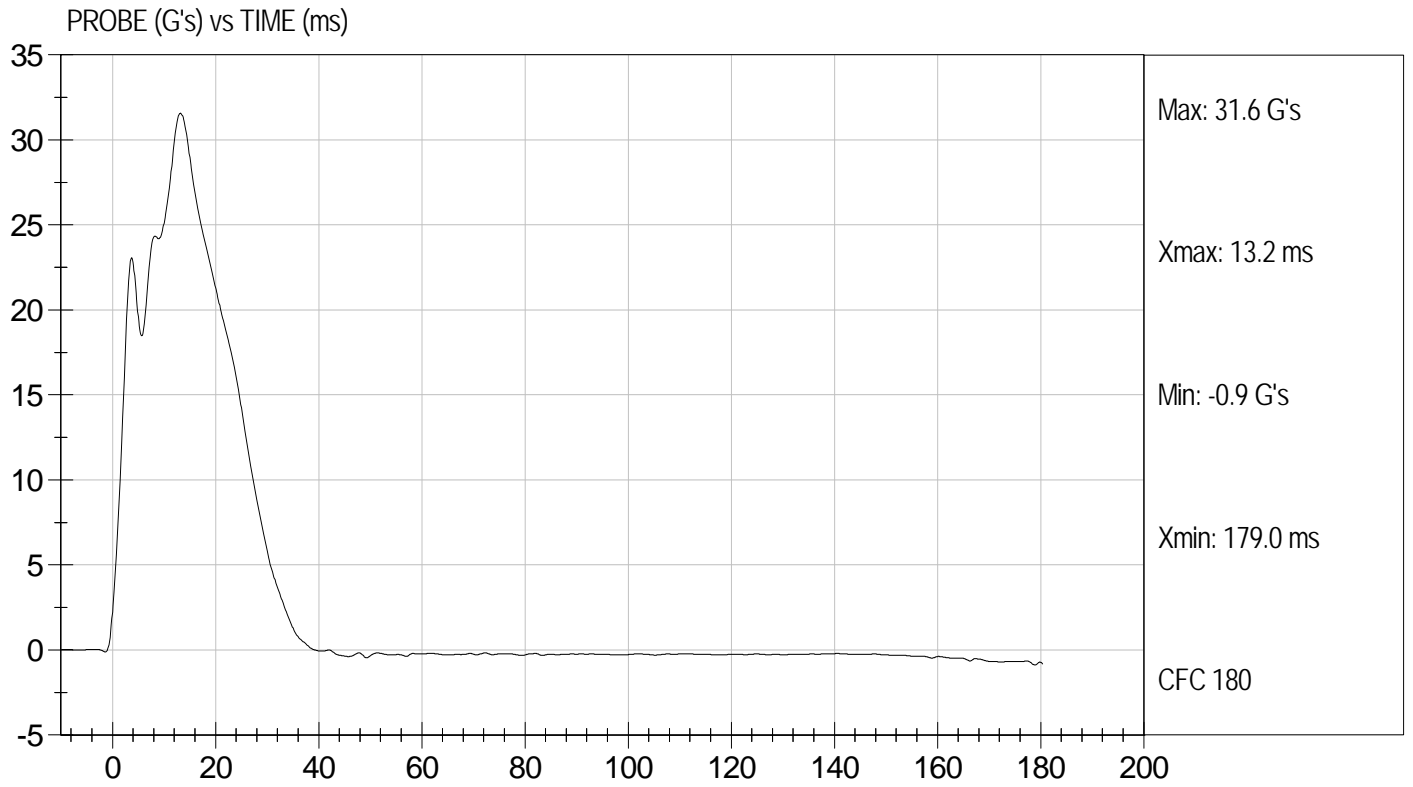
3/13/12
Test Date

David Winkelbauer
Approved By



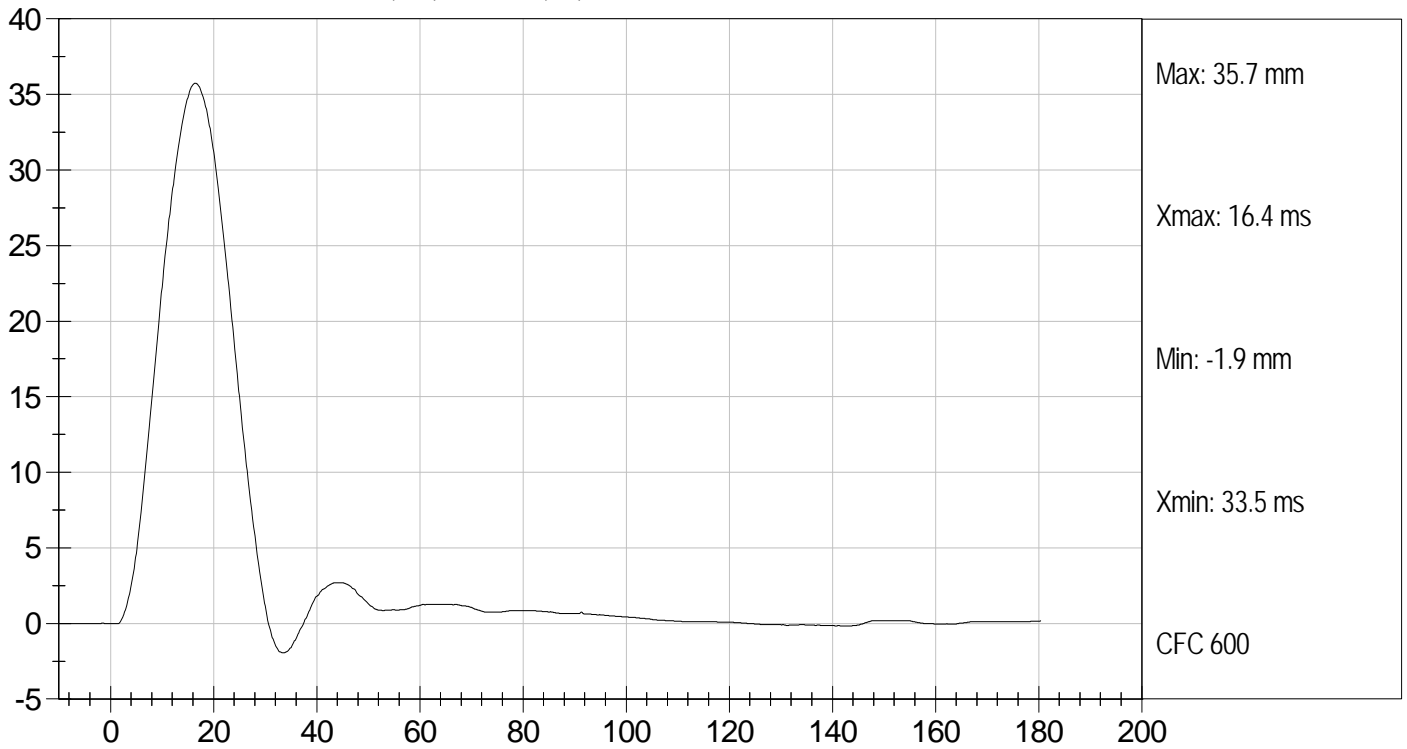
Test Desc: Thorax With Arm
Component ID: D12994

Test Date: 3/13/12
Velocity: 22.22 ft/s, 6.77 m/s

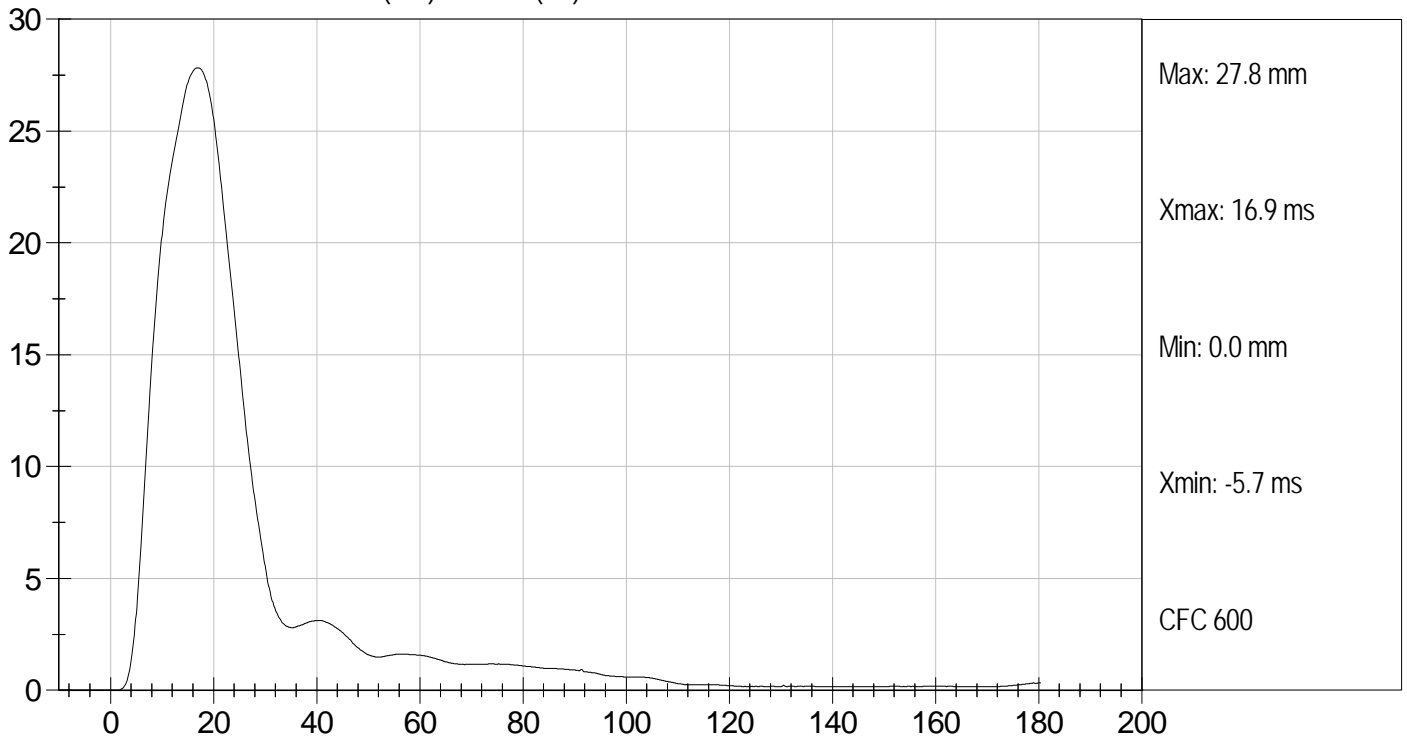




SHOULDER DISPLACEMENT (mm) vs TIME (ms)



UPPER RIB DISPLACEMENT (mm) vs TIME (ms)

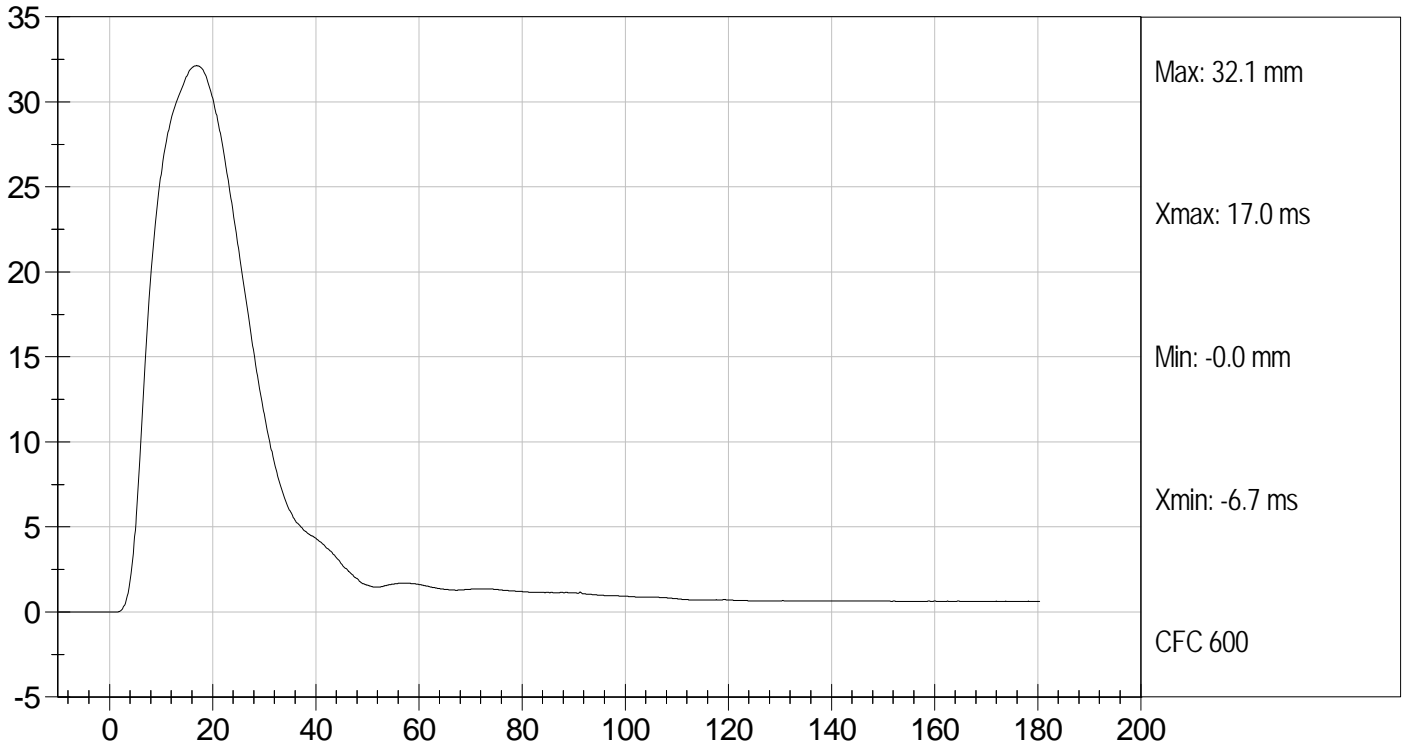




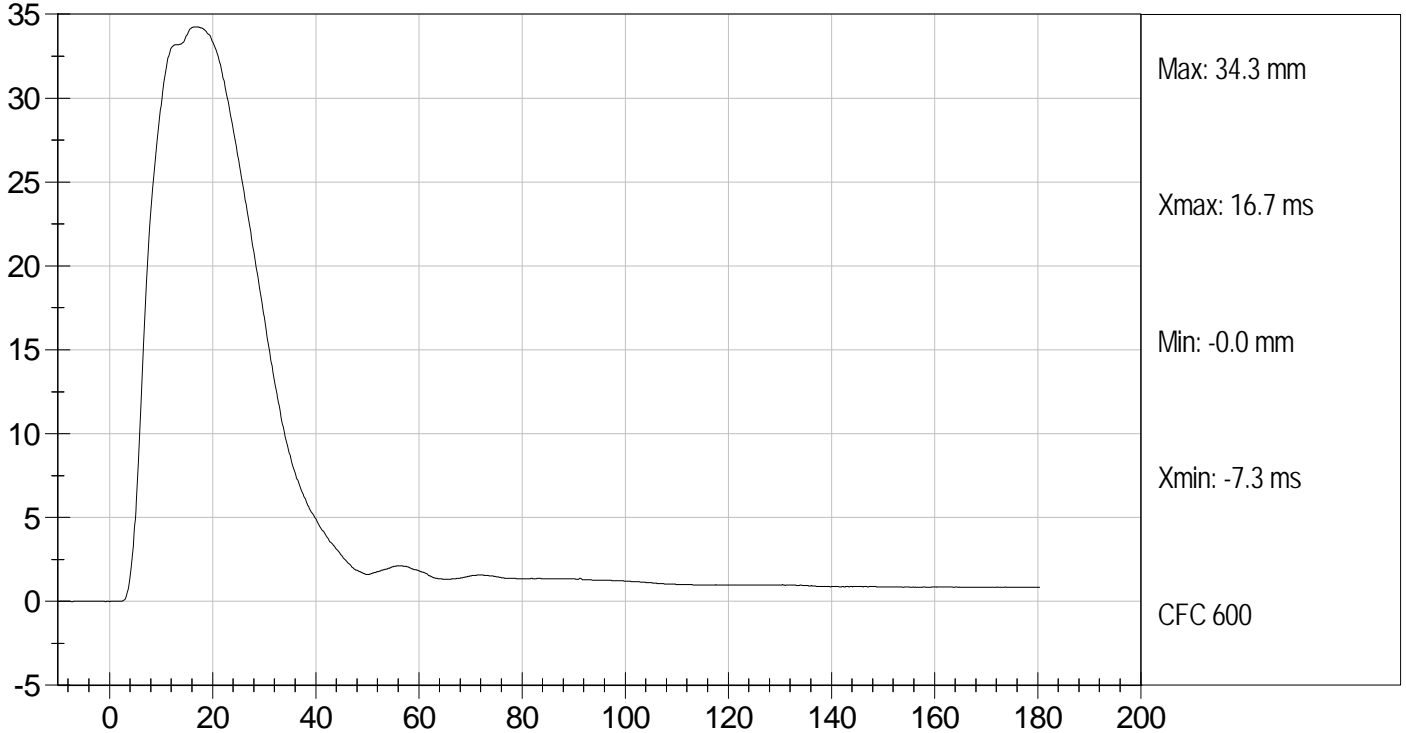
Test Desc: Thorax With Arm
Component ID: D12994

Test Date: 3/13/12
Velocity: 22.22 ft/s, 6.77 m/s

MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



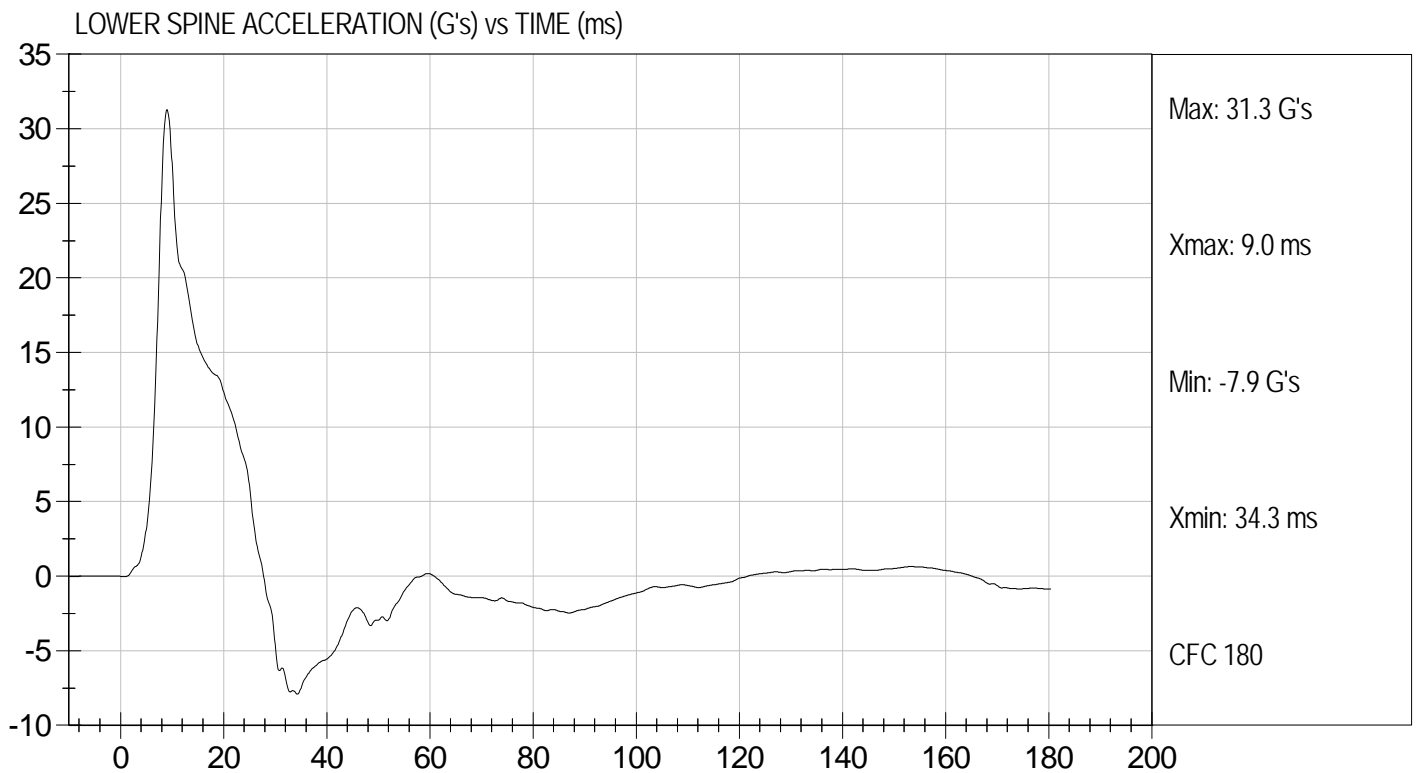
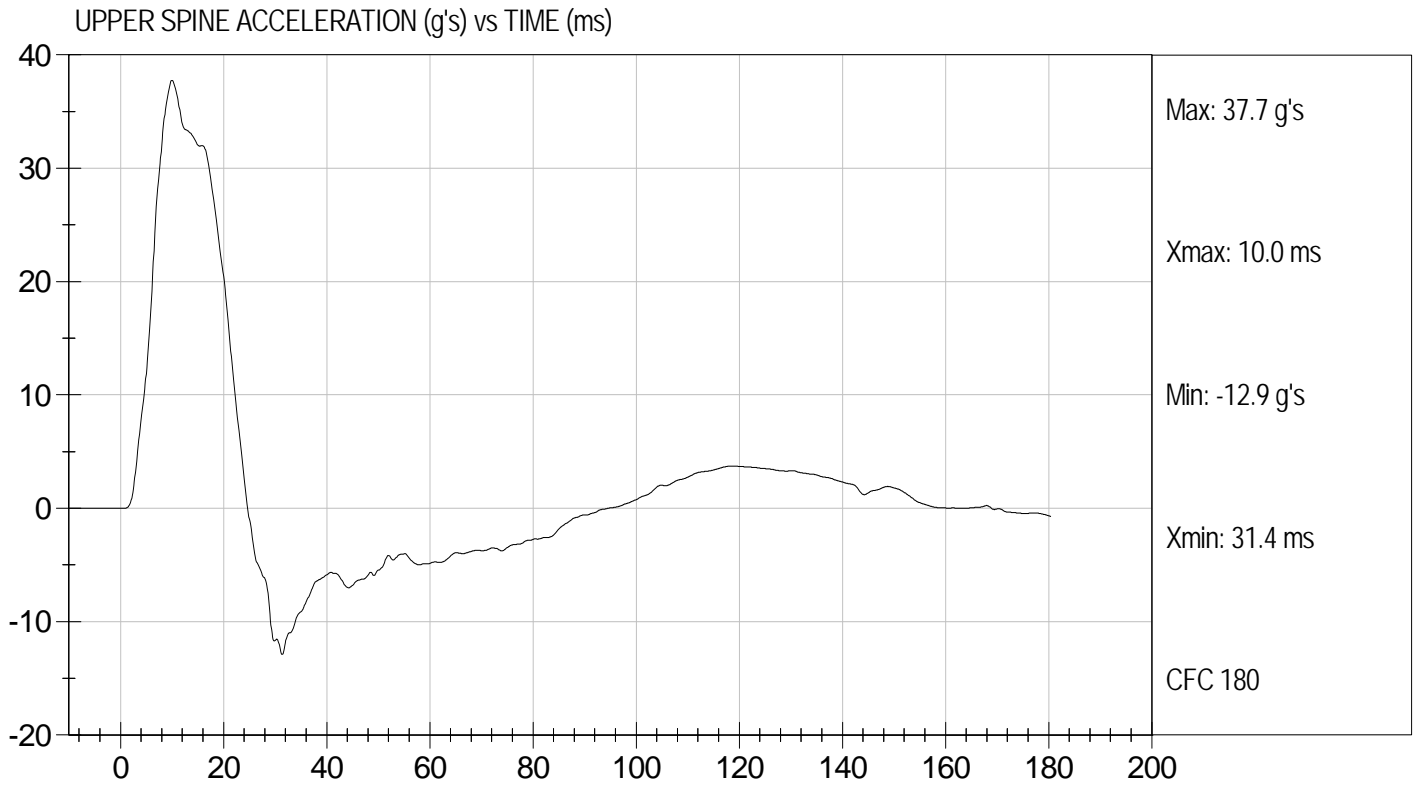
LOWER RIB DISPLACEMENT (mm) vs TIME (ms)





Test Desc: Thorax With Arm
Component ID: D12994

Test Date: 3/13/12
Velocity: 22.22 ft/s, 6.77 m/s



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

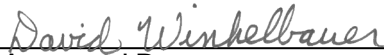
ATD Serial No: 296

Test I.D: D12995

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	22.0	Pass
Humidity	%	10 to 70	33	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Peak Impactor Force	G's	14 to 18	15	Pass
Upper Rib Displacement	mm	32 to 40	37	Pass
Middle Rib Displacement	mm	39 to 45	42	Pass
Lower Rib Displacement	mm	35 to 43	38	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 17	13	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	8	Pass
Overall Test Results				Pass


 Laboratory Technician

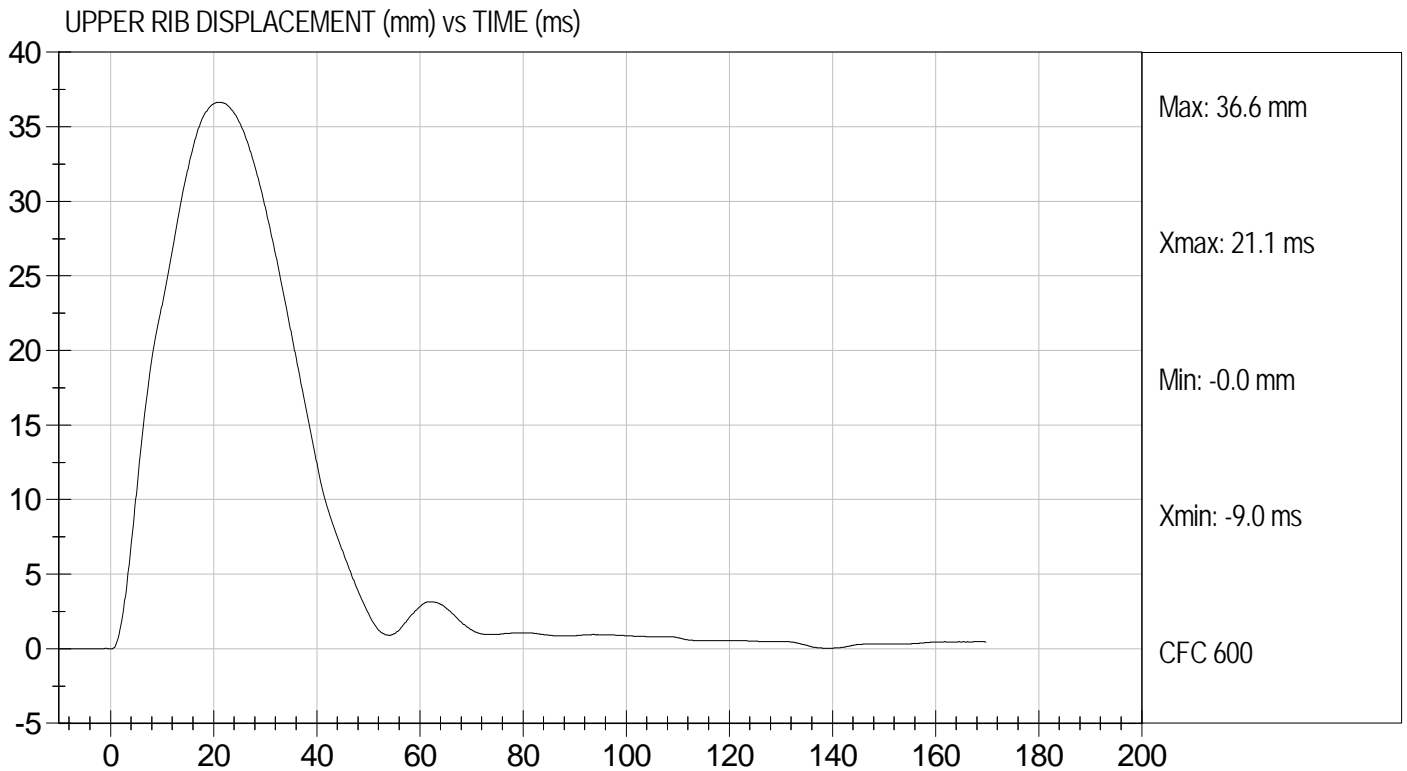
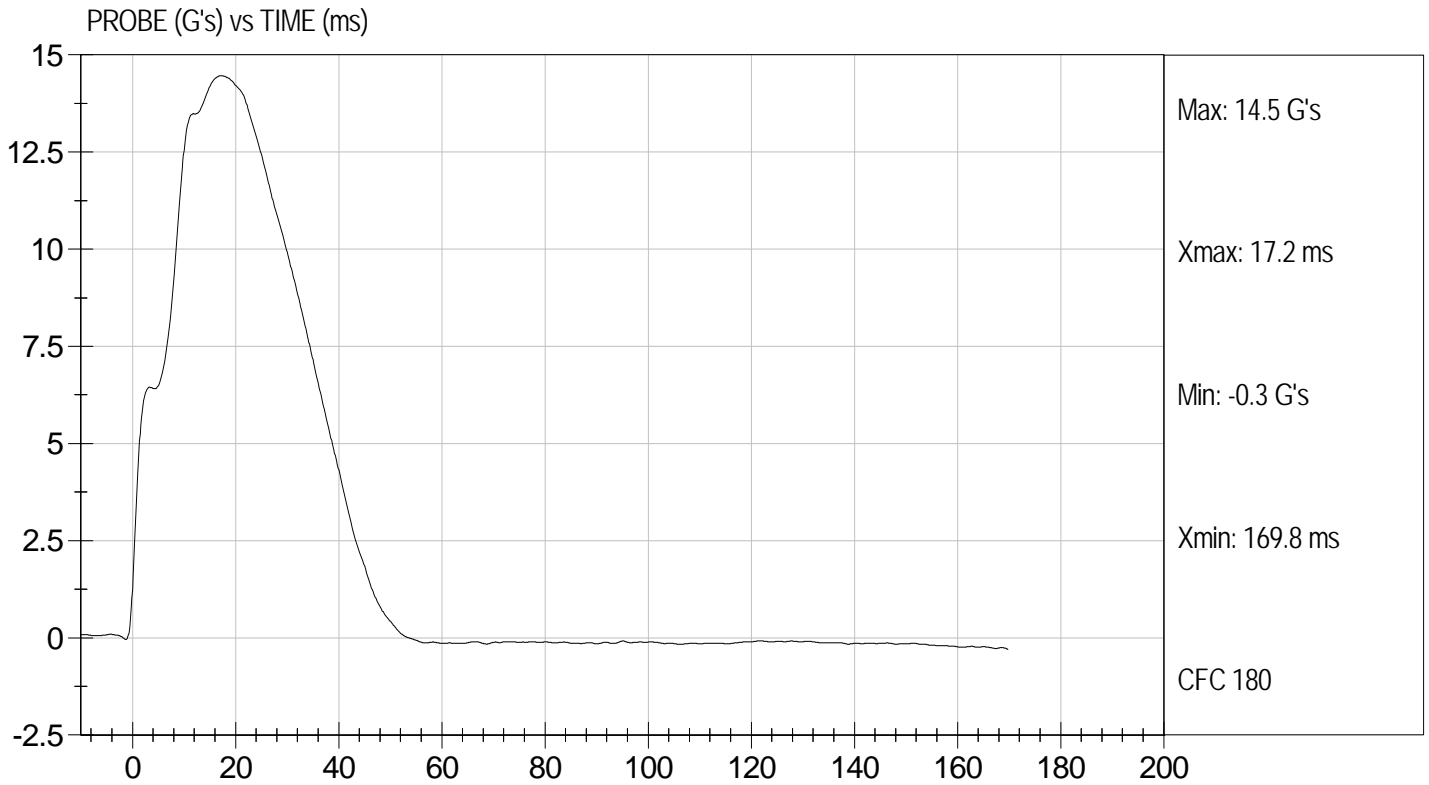
3/13/12
 Test Date


 Approved By



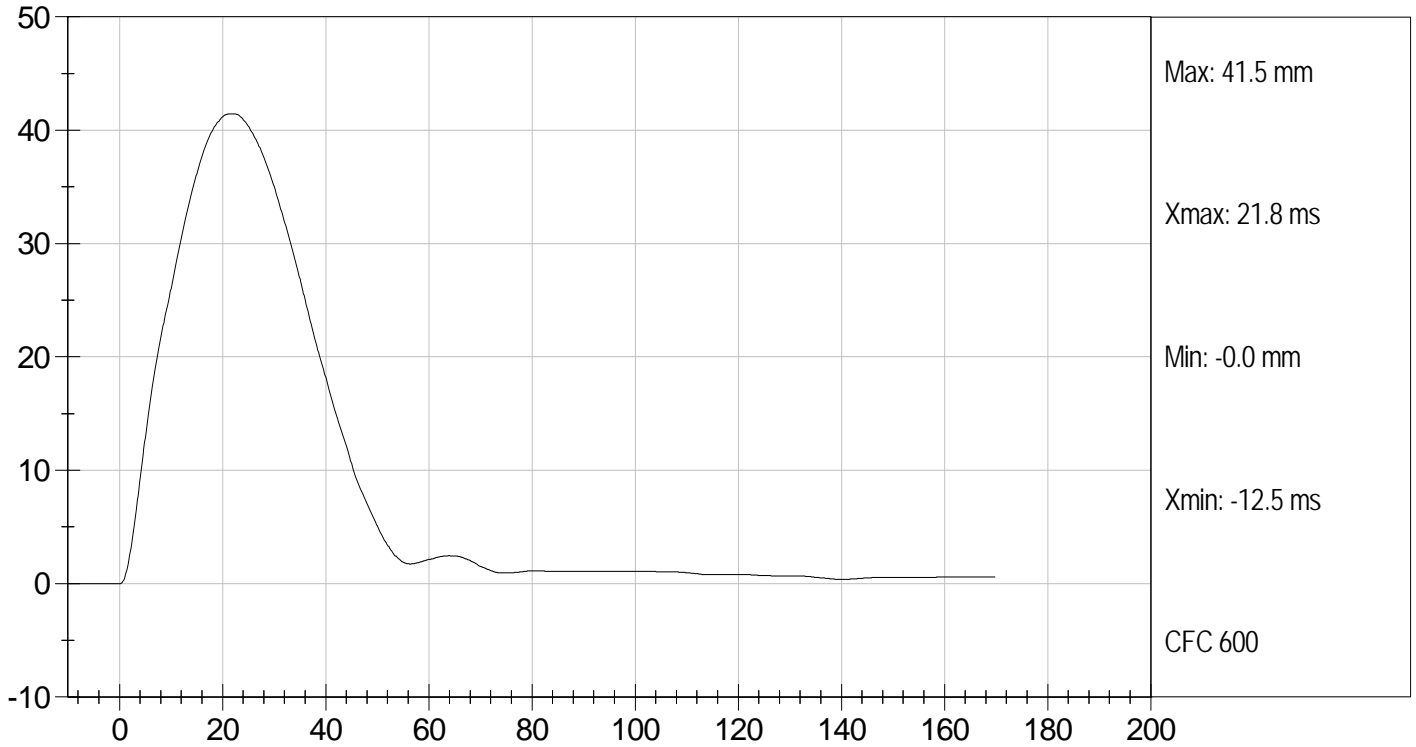
Test Desc: Thorax Without Arm
Component ID: D12995

Test Date: 3/13/12
Velocity: 14.24 ft/s, 4.34 m/s

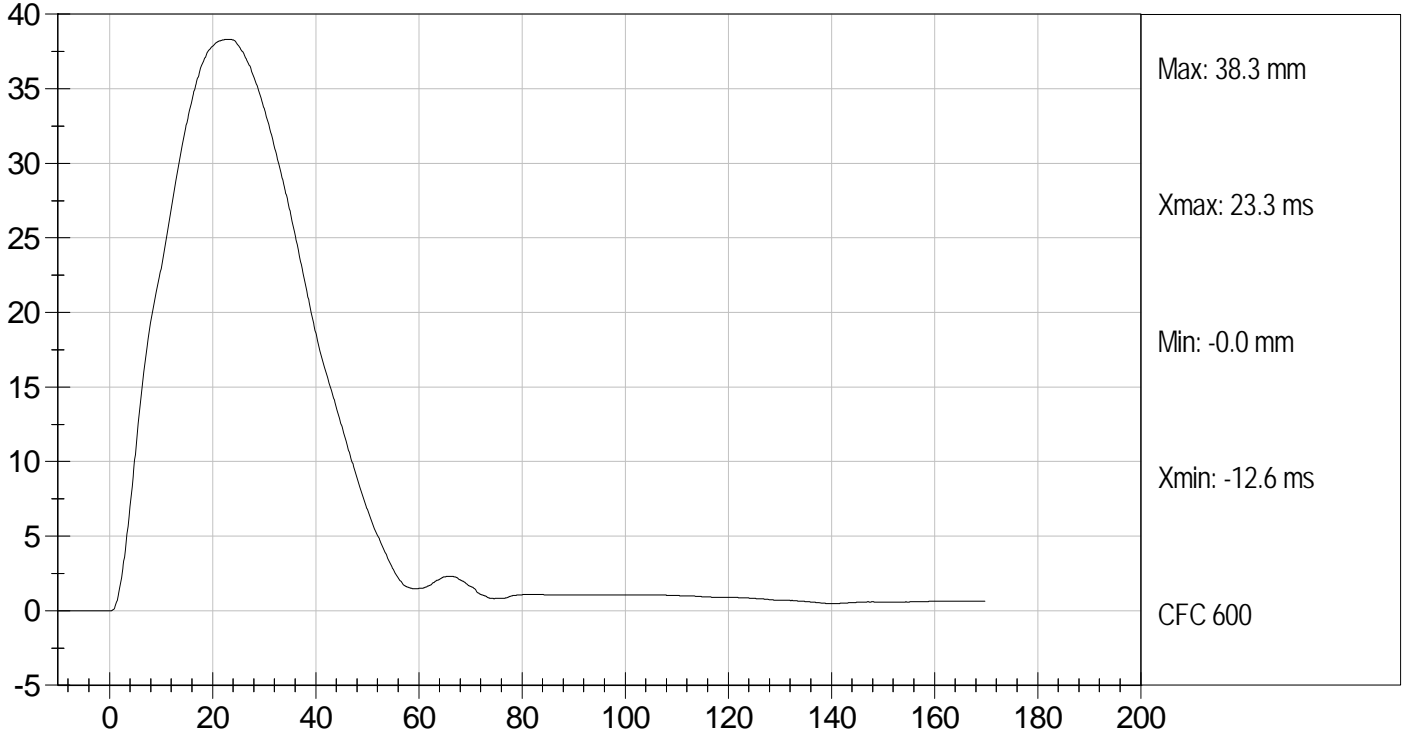




MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



LOWER RIB DISPLACEMENT (mm) vs TIME (ms)

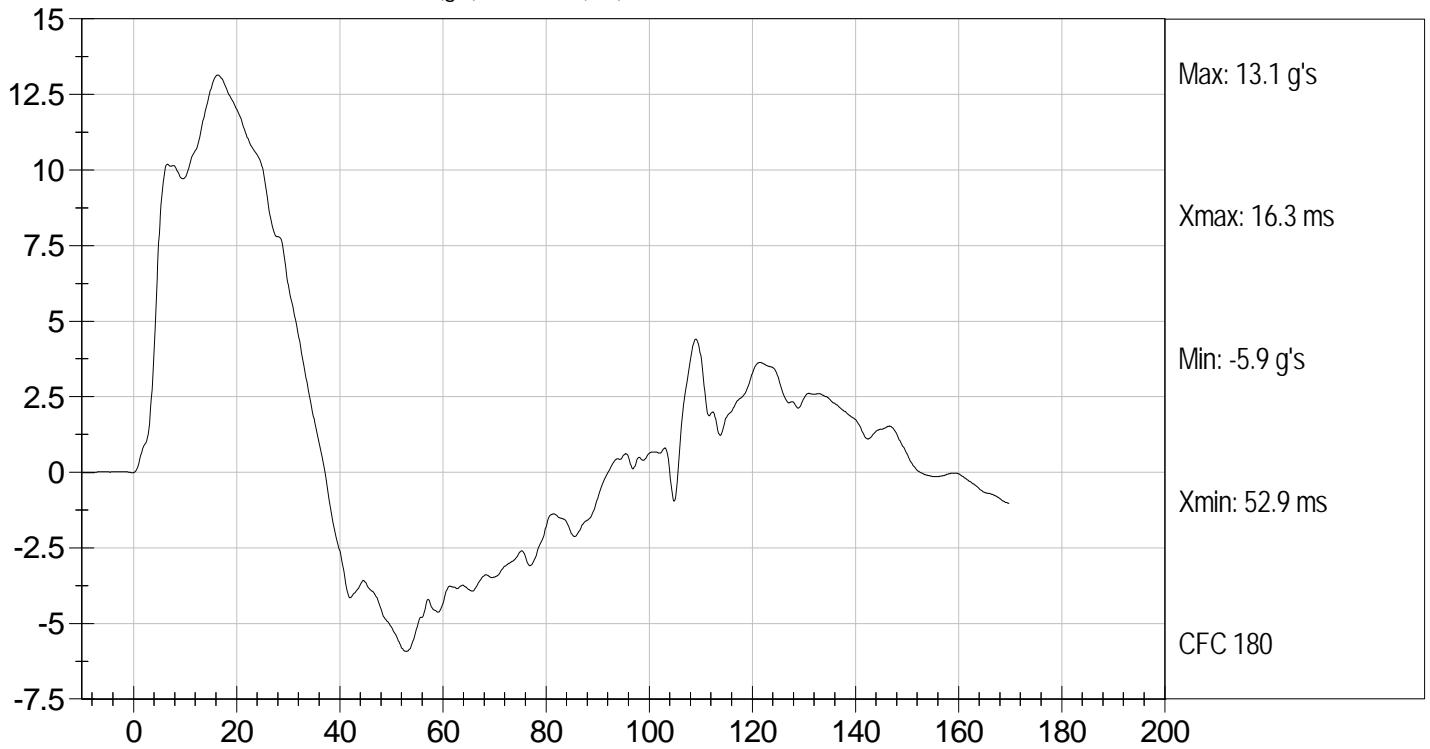




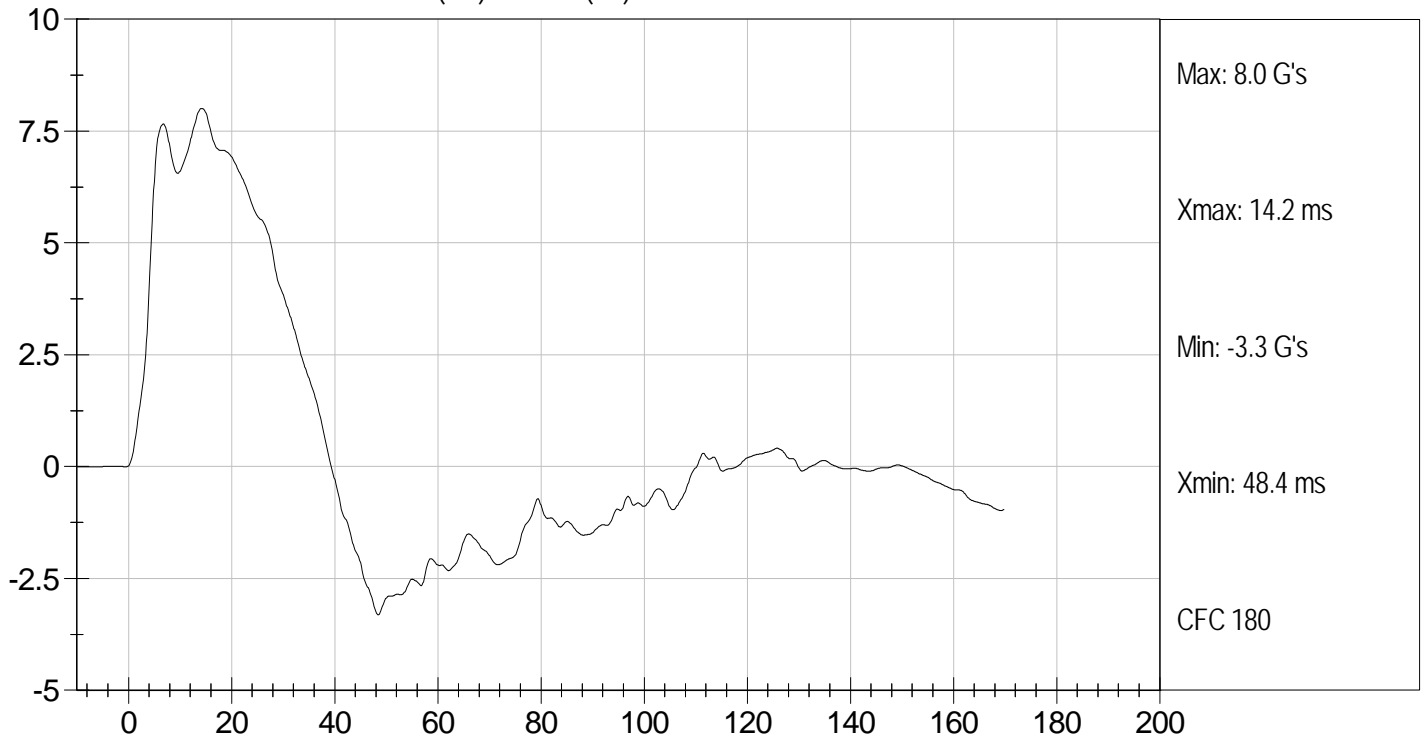
Test Desc: Thorax Without Arm
Component ID: D12995

Test Date: 3/13/12
Velocity: 14.24 ft/s, 4.34 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: D12996

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	22.0	Pass
Humidity	%	10 to 70	33	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Peak Impactor Acceleration	G's	12 to 16	13	Pass
Upper Rib Displacement	mm	36 to 47	38	Pass
Lower Rib Displacement	mm	33 to 44	38	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	10	Pass
Overall Test Results				Pass

Jessica Gall
 Laboratory Technician

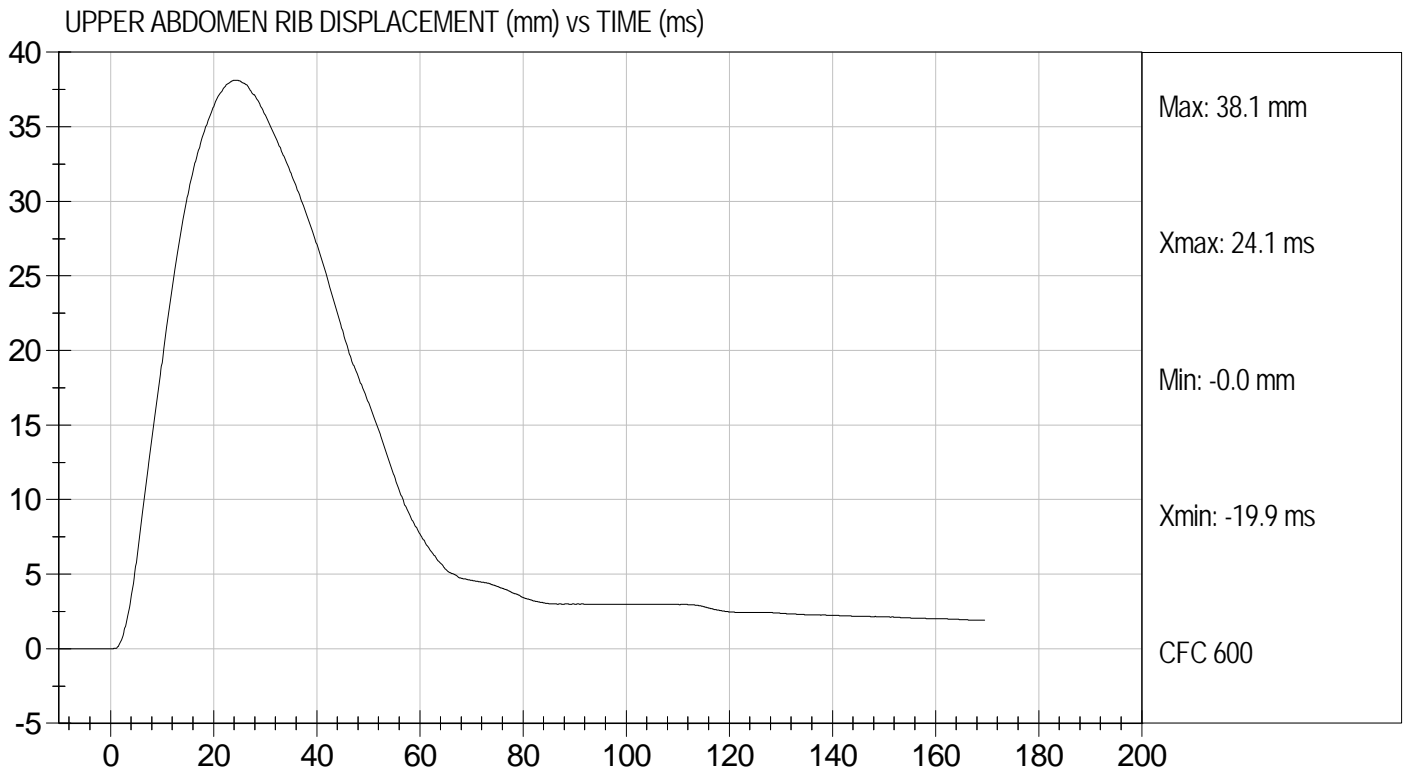
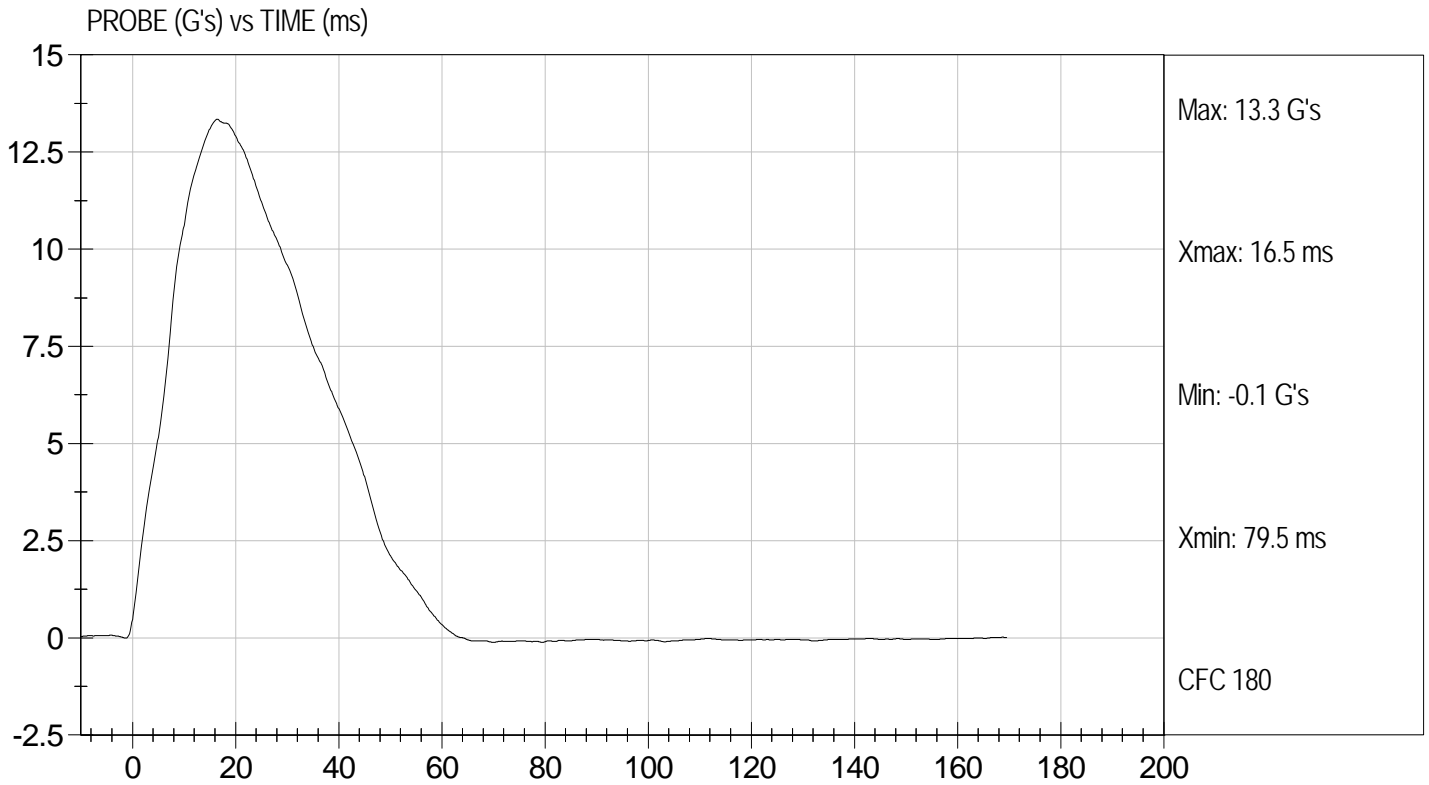
3/13/12
 Test Date

David Winkelbauer
 Approved By



Test Desc: Abdomen Impact
Component ID: D12996

Test Date: 3/13/12
Velocity: 14.24 ft/s, 4.34 m/s

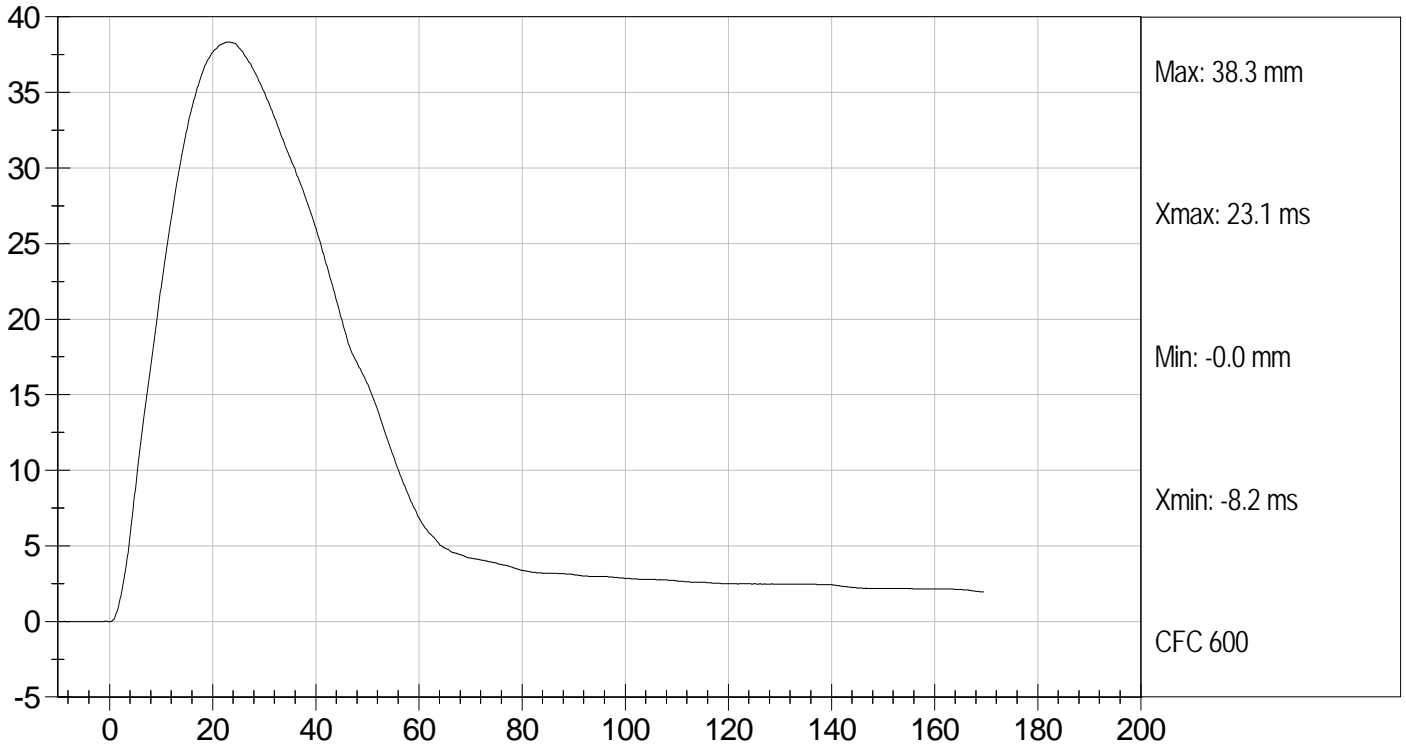




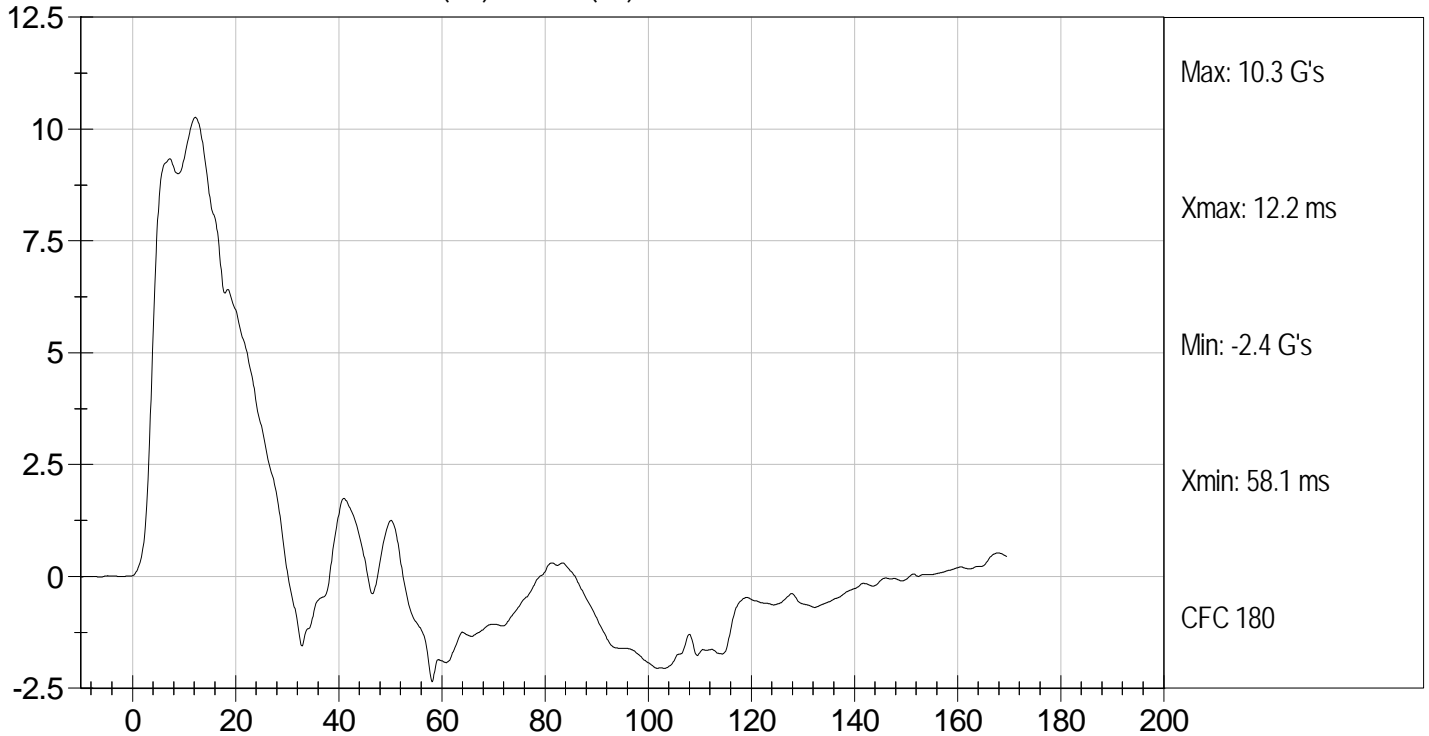
Test Desc: Abdomen Impact
Component ID: D12996

Test Date: 3/13/12
Velocity: 14.24 ft/s, 4.34 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: D12997

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	22.0	Pass
Humidity	%	10 to 70	33	Pass
Impact Velocity	m/s	6.60 to 6.80	6.68	Pass
Peak Impactor Acceleration	G's	38 to 47	44	Pass
Pelvis Y Acceleration after 6 ms	G's	34 to 42	42	Pass
Peak Acetabulum Force	N	3600 to 4300	4161	Pass
Overall Test Results				Pass


 Laboratory Technician

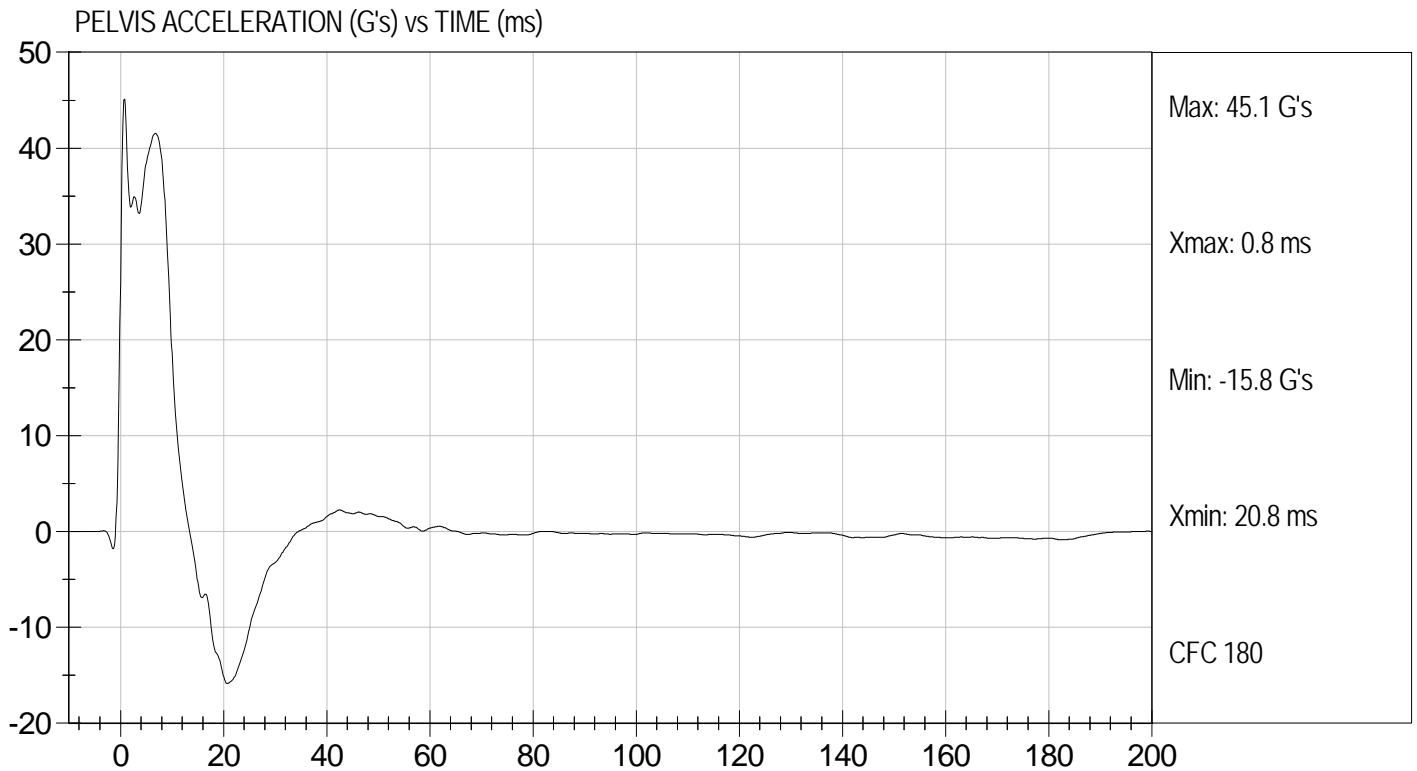
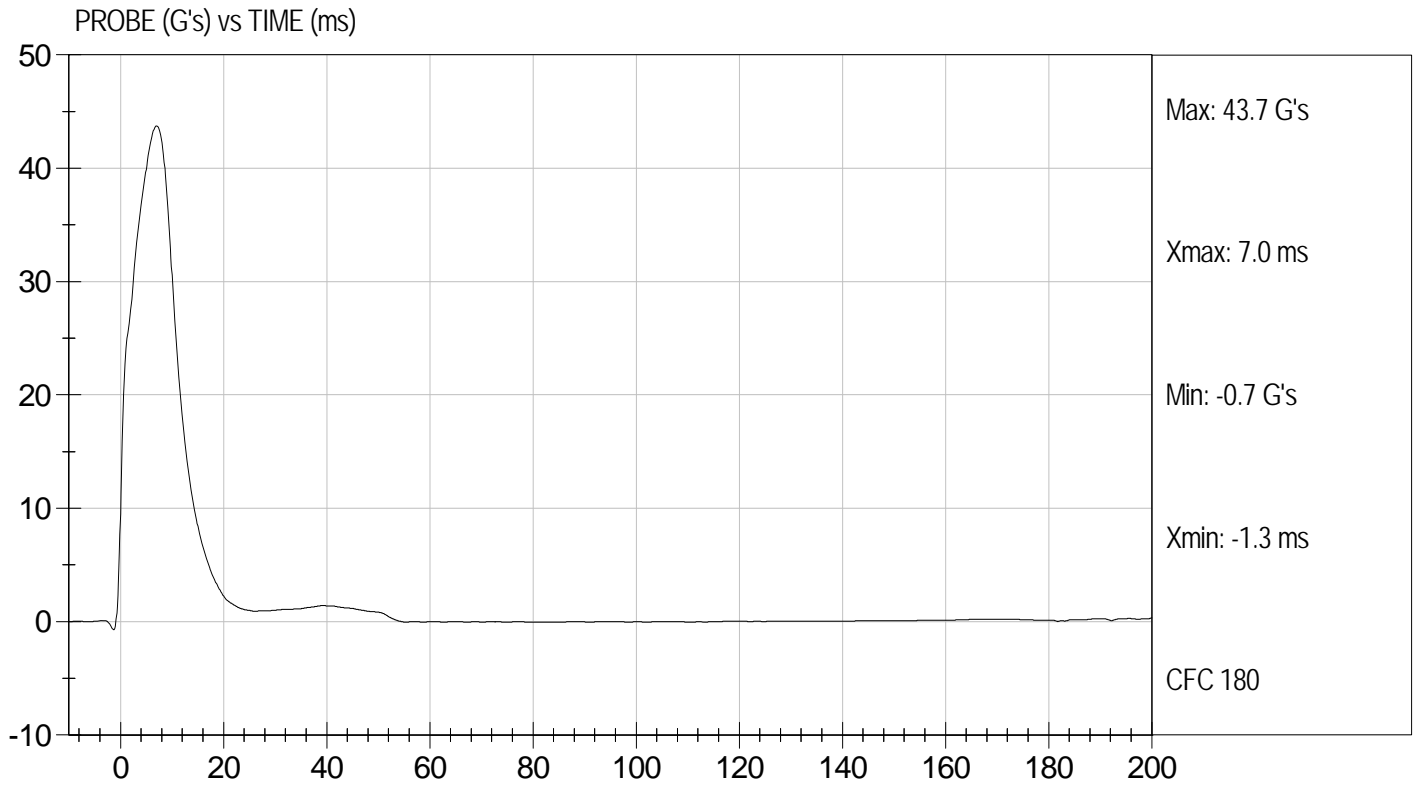
3/13/12
 Test Date


 Approved By



Test Desc: Pelvis Impact
Component ID: D12997

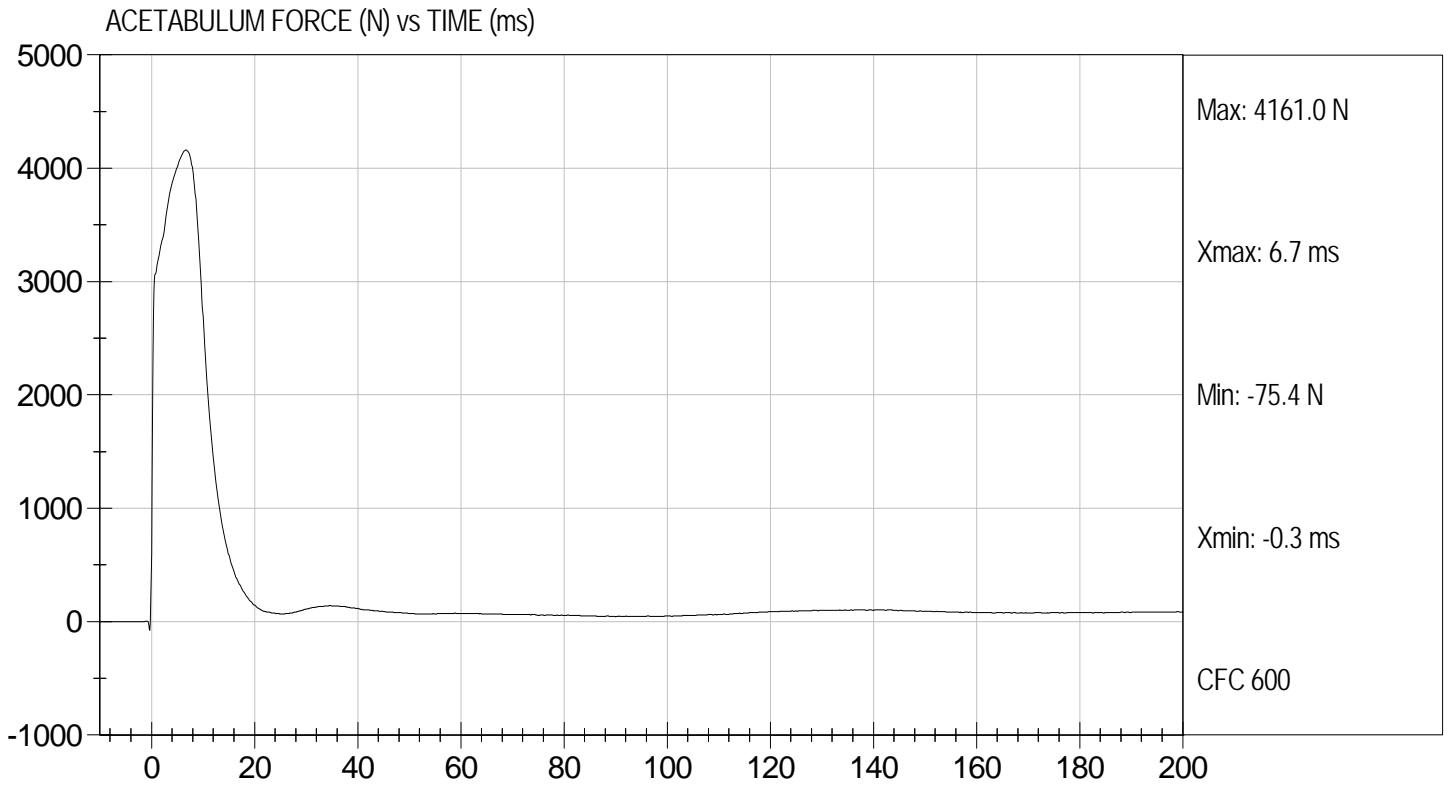
Test Date: 3/13/12
Velocity: 21.9 ft/s, 6.68 m/s





Test Desc: Pelvis Impact
Component ID: D12997

Test Date: 3/13/12
Velocity: 21.9 ft/s, 6.68 m/s



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

ATD Serial No: 296

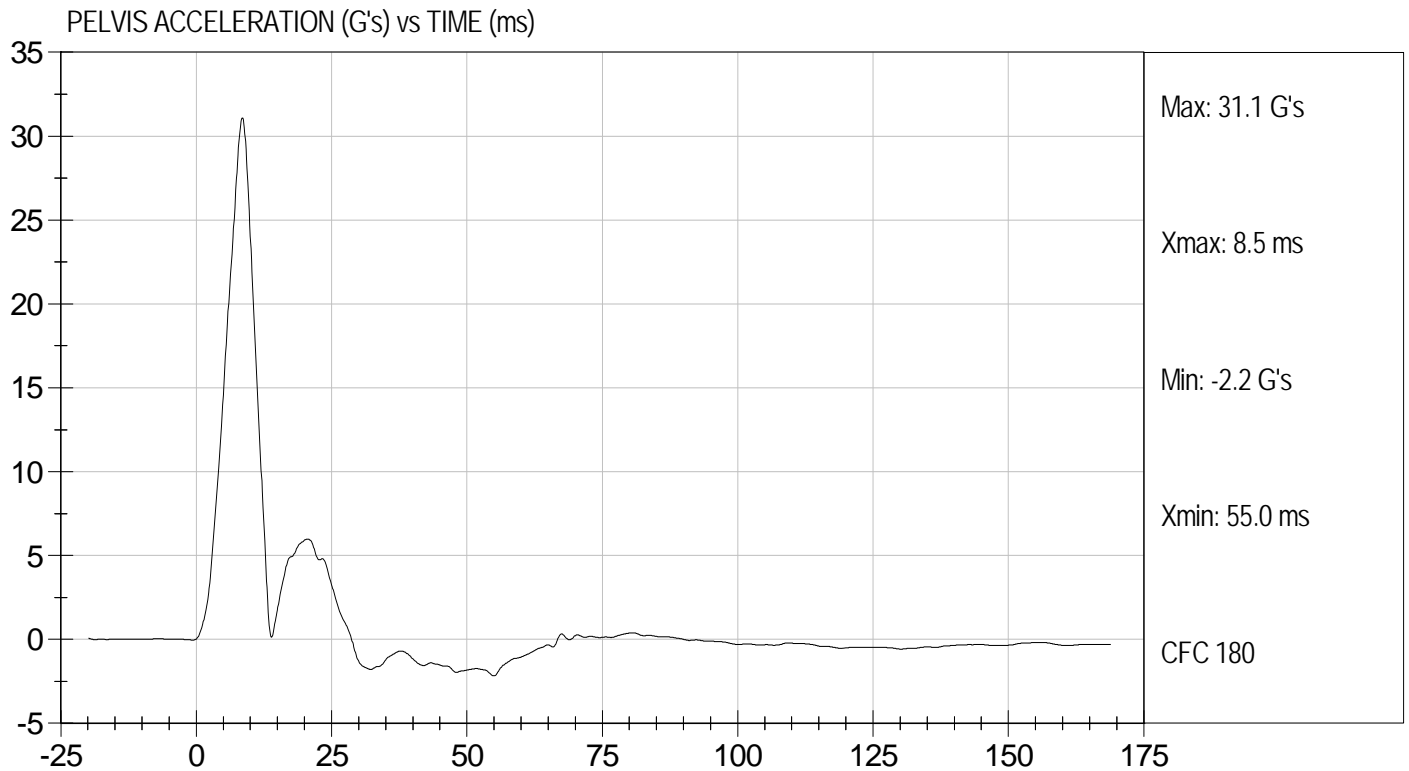
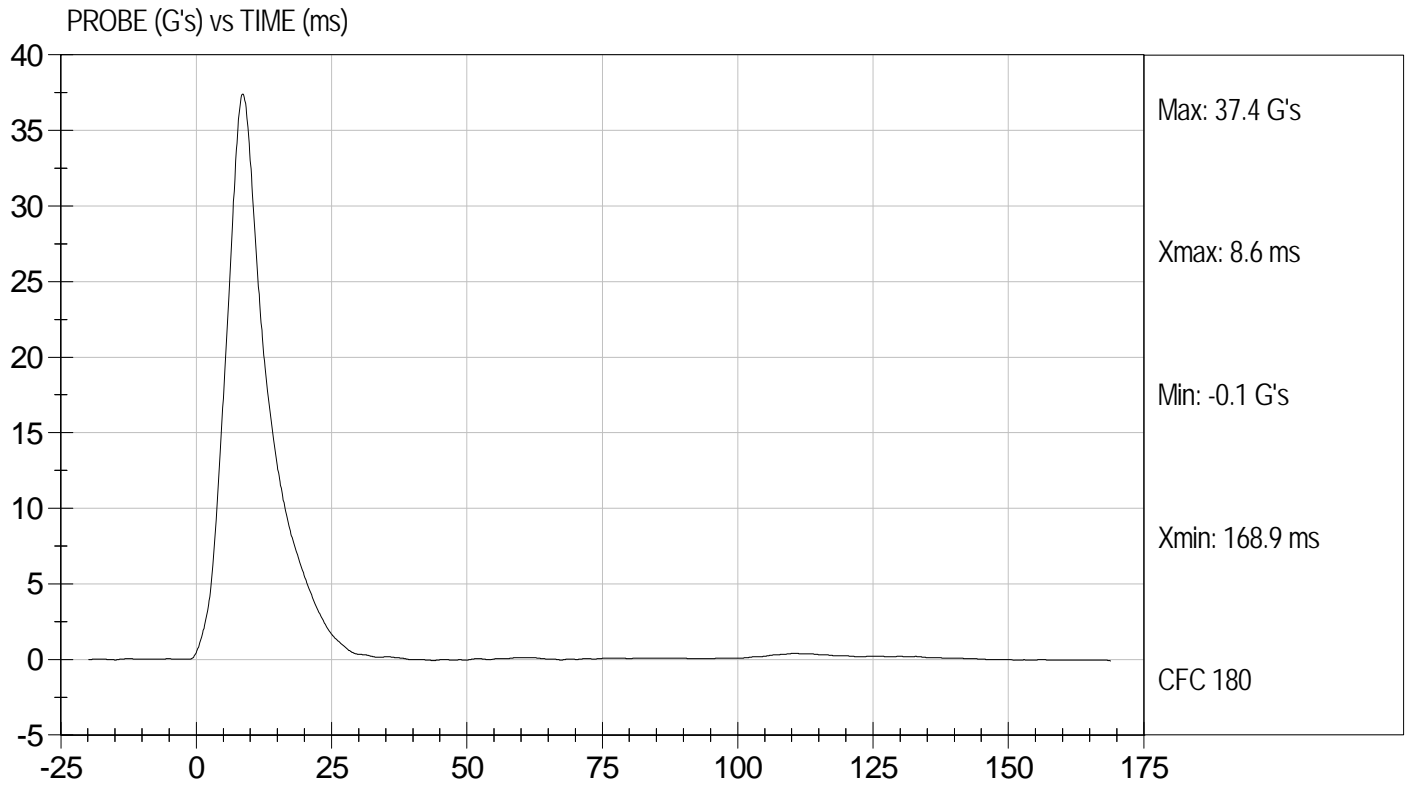
Test I.D: D12998

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	22.0	Pass
Humidity	%	10 to 70	33	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Peak Impactor Acceleration	G's	36 to 45	37	Pass
Pelvis Y Acceleration	G's	28 to 39	31	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4568	Pass
Overall Test Results				Pass

Jessica Gall
 Laboratory Technician

3/13/12
 Test Date

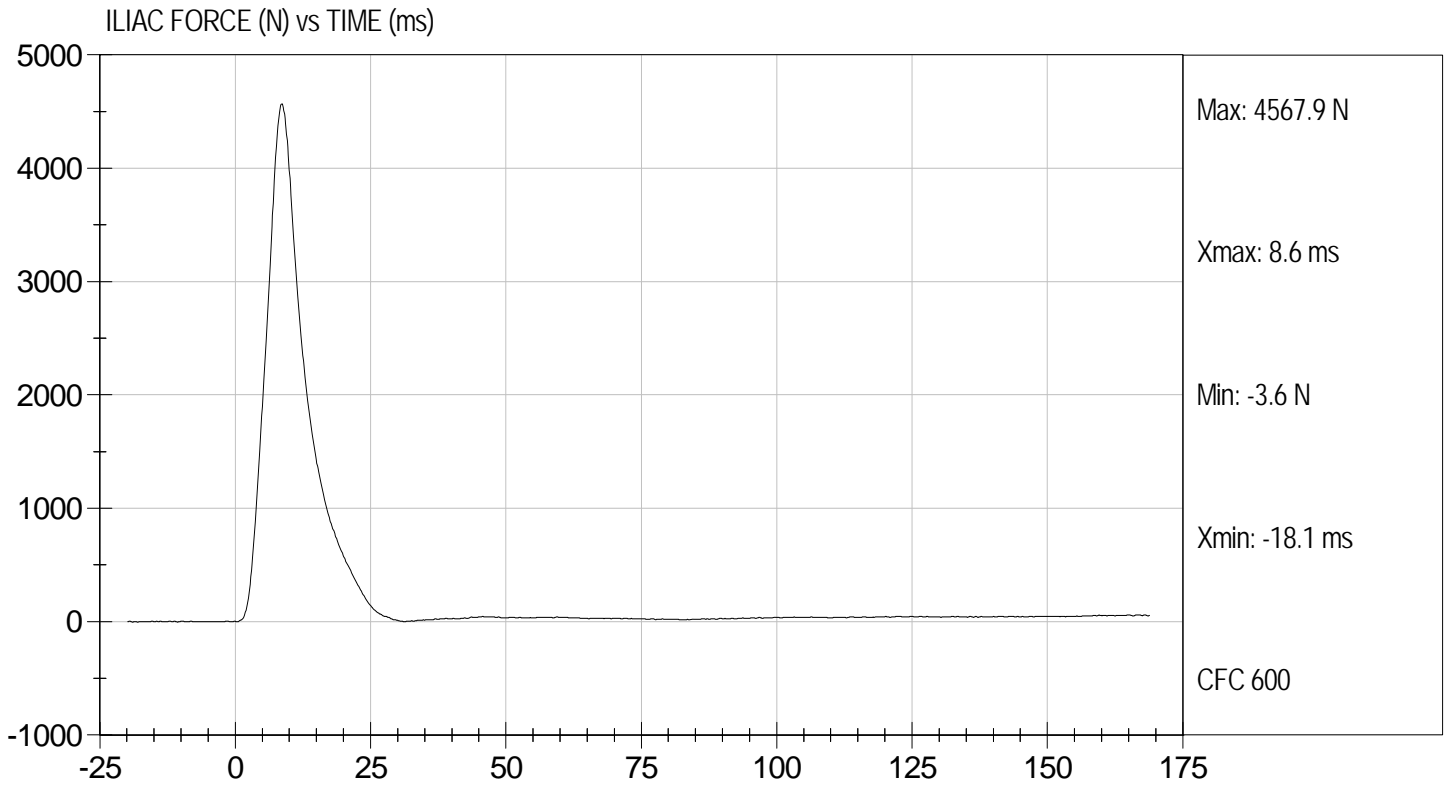
David Winkelbauer
 Approved By





Test Desc: Iliac Impact
Component ID: D12998

Test Date: 3/13/12
Velocity: 14.36 ft/s, 4.38 m/s



APPENDIX D

TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

Table 1 – Dummy Instrumentation (ES-2re)

			ES-2re S/N 032		
			Serial Number	Manufacturer	Calibration Date
Head Accelerometers		X	P73737	Endevco	10/04/11
		Y	P73738	Endevco	10/04/11
		Z	P73740	Endevco	10/04/11
Head Accelerometers		Xr	P66627	Endevco	10/10/11
		Yr	P73753	Endevco	10/04/11
		Zr	P73754	Endevco	10/04/11
Thorax Rib Displacement Potentiometers	Upper	Y	G176	Honeywell	10/12/11
	Middle	Y	G169	Honeywell	10/12/11
	Lower	Y	G164	Honeywell	10/12/11
Abdomen Load Cells	Forward	Y	ABG1513	Denton	05/20/11
	Middle	Y	ABG1531	Denton	05/20/11
	Rear	Y	ABG1536	Denton	05/20/11
Lower Spine Accelerometers (T12)		X	P73742	Endevco	10/04/11
		Y	P73743	Endevco	10/04/11
		Z	P73749	Endevco	10/04/11
Pubic Symphysis Load Cell		Y	PG462	Denton	05/20/11

Table 2 – Dummy Instrumentation (SID-IIs)

				SID-IIs S/N 296		
				Serial Number	Manufacturer	Calibration Date
Head Accelerometers			X	P67363	Endevco	10/13/11
			Y	P67364	Endevco	10/13/11
			Z	P67365	Endevco	10/13/11
Head Accelerometers			X	P64023	Endevco	10/13/11
			Y	P66672	Endevco	10/13/11
			Z	P66762	Endevco	10/13/11
Displacement Potentiometers	Thoracic Rib	Upper	Y	G012	Servo	02/15/12
		Middle	Y	G1163	FTSS	10/18/11
		Lower	Y	G1158	FTSS	10/18/11
	Abdominal Rib	Upper	Y	G1146	FTSS	10/18/11
		Lower	Y	G1126	FTSS	10/18/11
Lower Spine Accelerometers (T12)			X	P67286	Endevco	09/22/11
			Y	P67289	Endevco	09/22/11
			Z	P67291	Endevco	09/22/11
Acetabulum Load Cell			Y	ACG268	Denton	01/11/12
Iliac Wing Load Cell			Y	IWG282	Denton	12/23/11
Pelvis Plug (struck side)				42608	FTSS	06/22/11
Pelvis Plug (non-struck side)				49130	FTSS	12/07/11

Table 3 – Vehicle Instrumentation

		Serial Number	Manufacturer	Calibration Date
Vehicle Center of Gravity	X	P52259	Endevco	02/10/12
Vehicle Center of Gravity	Y	P52258	Endevco	02/10/12
Vehicle Center of Gravity	Z	P52257	Endevco	02/10/12
Right Sill at Front Seat	X	P63504	Endevco	10/25/11
Right Sill at Front Seat	Y	P63505	Endevco	10/25/11
Right Sill at Front Seat	Z	P63503	Endevco	10/25/11
Right Sill at Rear Seat	X	P63506	Endevco	10/25/11
Right Sill at Rear Seat	Y	P63508	Endevco	10/25/11
Right Sill at Rear Seat	Z	P63507	Endevco	10/25/11
Left Sill at Front Door	Y	P63226	Endevco	10/20/11
Left Sill at Rear Door	Y	P63210	Endevco	01/12/12
Left A-Post Lower	Y	P63206	Endevco	10/20/11
Left A-Post Middle	Y	P63280	Endevco	11/04/11
Left B-Post Lower	Y	P59283	Endevco	01/12/12
Left B-Post Middle	Y	P66755	Endevco	12/28/11
Front Seat Track	Y	P63530	Endevco	02/10/12
Rear Seat Track or Structure	Y	P59311	Endevco	12/13/11
Right Rear Occ. Compartment	Y	P47852	Endevco	12/13/11
Engine Block	X	P63342	Endevco	11/04/11
Engine Block	Y	P63343	Endevco	11/04/11
Rear Floorpan Above Axle	X	P63498	Endevco	01/13/12
Rear Floorpan Above Axle	Y	P63497	Endevco	01/13/12
Rear Floorpan Above Axle	Z	P63499	Endevco	01/13/12

Table 4 – MDB Instrumentation

		Serial Number	Manufacturer	Calibration Date
MDB Center of Gravity	X	P59379	Endevco	12/14/11
MDB Center of Gravity	Y	P59380	Endevco	12/14/11
MDB Center of Gravity	Z	P59381	Endevco	12/14/11
Left Frame at Rear Axle Centerline	X	P59279	Endevco	12/13/11
Left Frame at Rear Axle Centerline	Y	P59280	Endevco	12/13/11