REPORT NUMBER: SINCAP-MGA-2013-046

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

TOYOTA MOTOR MANUFACTURING, KENTUCKY, INC.
2013 Toyota Avalon XLE 4-Dr Sedan
NHTSA No.: YD5105

MGA RESEARCH CORPORATION
5000 Warren Road
Burlington, WI 53105

Test Date: January 10, 2013

Final Report Date: March 4, 2013

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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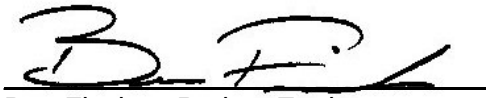
Prepared by: 
Donna Janovicz, Project Manager

Approved by: 
Ben Fischer, Project Engineer

Approval Date: March 4, 2013

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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7. Author(s) Donna Janovicz, Project Manager Ben Fischer, Project Engineer		*8. Performing Organization Report No.* SINCAP-MGA-2013-046
9. Performing Organization Name and Address MGA Research Corporation 5000 Warren Road Burlington, WI 53105		*10. Work Unit No.* *11. Contract or Grant No.* DTNH22-09-D-00124
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Crashworthiness Standards (NVS-111) 1200 New Jersey Ave, SE, Room W43-410 Washington, D.C. 20590		*13. Type of Report and Period Covered:* Final Test Report January 10, 2013 to March 4, 2013 *14. Sponsoring Agency Code* NVS-111
15. Supplementary Notes		

16. Abstract

A 55/28 km/h 90° Moving Deformable Barrier NCAP Side Impact Test was conducted on the 2013 Toyota Avalon XLE 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 January 10, 2013.

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 21.4° C. The target vehicle post-test maximum crush was 267 mm at level 2. The test vehicle's performance was as follows:

	Driver ATD (ES-2re)		
Measurement Description	**Units**	**Threshold**	**Result**
Head Injury Criteria (HIC_{36})	N/A	1000	124
Maximum Thorax Rib Deflection	mm	44	24
Total Abdominal Force	N	2500	1007
Pubic Symphysis Force	N	6000	1708

	Passenger ATD (SID-IIs)		
Measurement Description	**Units**	**Threshold**	**Result**
Head Injury Criteria (HIC_{36})	N/A	1000	146
Resultant Lower Spine Acceleration	Gs	82	47
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2721
Maximum Thoracic Rib Deflection	mm	38*	28
Maximum Abdomen Rib Deflection	mm	45*	33**

*Proposed IARV **Passenger Upper Abdominal Rib DY is questionable

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.

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 Washington, DC 20590 e-mail: 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 2013 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 2013 Toyota Avalon XLE 4-Dr Sedan. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Side NCAP Laboratory Test Procedure dated September 2012.

SECTION 2
SUMMARY OF TEST RESULTS

A 2013 Toyota Avalon XLE 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. 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 January 10, 2013. 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 September 2012. 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

	Driver ATD (ES-2re)		
Measurement Description	**Units**	**Threshold**	**Result**
Head Injury Criteria (HIC_{36})	N/A	1000	124
Maximum Thorax Rib Deflection	mm	44	24
Total Abdominal Force	N	2500	1007
Pubic Symphysis Force	N	6000	1708

	Passenger ATD (SID-IIs)		
Measurement Description	**Units**	**Threshold**	**Result**
Head Injury Criteria (HIC_{36})	N/A	1000	146
Resultant Lower Spine Acceleration	Gs	82	47
Total Pelvic Force	N	5525	2721
Maximum Thoracic Rib Deflection	mm	38*	28
Maximum Abdomen Rib Deflection	mm	45*	33**

*Proposed IARV **Passenger Upper Abdominal Rib DY is questionable

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	Yes	No		
Side Curtain Airbag	Yes	Yes	Yes	Yes
Side Torso/Abdomen/Pelvis Airbag	Yes	Yes	Yes	Yes
Seat Belt Pretensioner	Yes	Yes	No	
Seat Belt Load Limiter	Yes	Yes	No	
Other				

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

GENERAL COMMENTS

Passenger Upper Abdominal Rib DY is questionable
Right Rear Sill Z is questionable from 51-56ms
Left Mid B-Post Y is questionable from 4-14ms
Driver Seat Track Y is questionable from 12-21ms
Left Rear Seat Y is questionable from 5-13ms

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: 2013 Toyota Avalon XLE 4-Dr Sedan NHTSA No. YD5105
Test Program: NCAP Side MDB Impact Test Test Date: 1/10/2013

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	YD5105
Model Year	2013
Make	Toyota
Model	Avalon
Body Style	Sedan
VIN	4T1BK1EB6DU007323
Body Color	Magnetic Gray Metallic
Odometer Reading (km/mi)	124 / 77
Engine Displacement (L)	3.5
Type/No. Cylinders	6
Engine Placement	Lateral
Transmission Type	Automatic
Transmission Speeds	6
Overdrive	Yes
Final Drive	Front
Roof Rack	No
Sunroof/T-Top	Yes
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	Yes
Anti-Lock Brakes (ABS)	Yes

Traction Control System (TCS)	Yes
Auto-Leveling System	No
Automatic Door Locks (ADL)	Yes
Power Window Auto-Reverse	Yes
Other Optional Feature	N/A
Driver Front Airbag	Yes
Driver Curtain Airbag	Yes
Driver Head/Torso Airbag	No
Driver Torso Airbag	No
Driver Torso/Pelvis Airbag	Yes
Driver Pelvis Airbag	No
Driver Knee Airbag	Yes
Rear Pass. Curtain Airbag	Yes
Rear Pass. Head/Torso Airbag	No
Rear Pass. Torso Airbag	No
Rear Pass. Torso/Pelvis Airbag	Yes
Rear Pass. Pelvis Airbag	No
Driver Seat Belt Pretensioner	Yes
Rear Pass. Seat Belt Pretensioner	No
Driver Load Limiter	Yes
Rear Pass. Load Limiter	No
Other Safety Restraint	N/A

Does owner's manual provide instruction to turn off automatic door locks?	Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Toyota Motor Manufacturing, Kentucky, Inc.
Date of Manufacture	11/12
Vehicle Type	Passenger Car

GVWR (kg)	2082
GAWR Front (kg)	1191
GAWR Rear (kg)	1134

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity (DSC)	2	3		5	
Capacity Weight (VCW) (kg)				415	(A)
DSC x 68.04 kg				340	(B)
Rated Cargo and Luggage Weight (RCLW)				75	(A-B)

VEHICLE SEAT TYPE

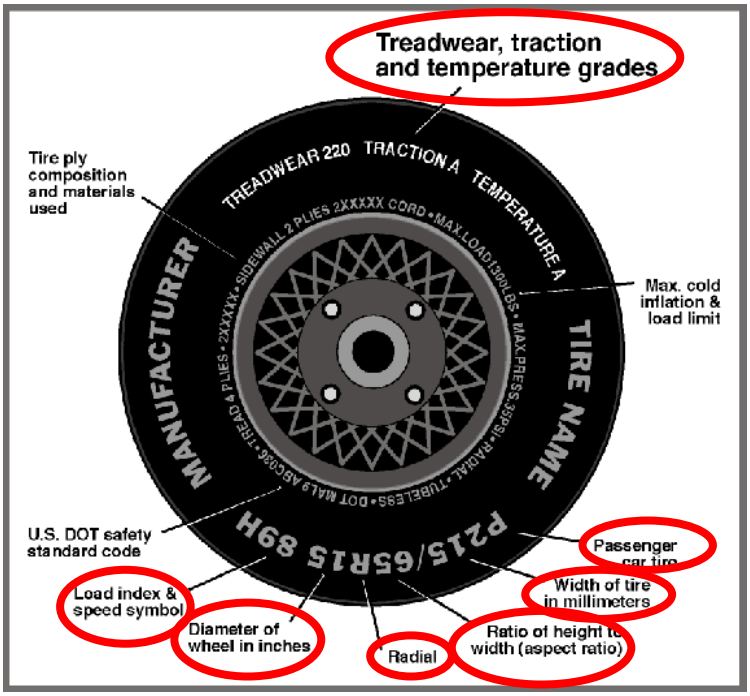
Seating Location	Type of Seat Pan				Type of Seat Back		
	Bucket	Bench	Split Bench	Contoured	Fixed	Adjustable	
						Manual	Power
Front Seat	X						X
Rear or Second Row		X			X		
Third Row Seat							

DATA SHEET NO. 1 (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2013 Toyota Avalon XLE 4-Dr Sedan NHTSA No. YD5105
Test Program: NCAP Side MDB Impact Test Test Date: 1/10/2013

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	240	240
Recommended Tire Size	P215/55R17	P215/55R17
Tire Size on Vehicle	P215/55R17	P215/55R17
Tire Manufacturer	Michelin	Michelin
Tire Model	Primacy MXV4	Primacy MXV4
Treadwear	500	500
Traction	A	A
Temperature Grade	A	A
Tire Plies Sidewall	1	1
Tire Plies Body	4	4
Load Index/Speed Symbol	93V	93V
Tire Material	Rubber	Rubber
DOT Safety Code Left	M33F 009X	M33F 009X
DOT Safety Code Right	M33F 009X	M33F 009X

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

Test Vehicle: 2013 Toyota Avalon XLE 4-Dr Sedan NHTSA No. YD5105
Test Program: NCAP Side MDB Impact Test Test Date: 1/10/2013

TEST PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kpa	240	240	240	240
Tire Placard	kpa	240	240	240	240
Owner's Manual	kpa				
As Tested	kpa	240	240	240	240

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	502.6	293.5		541.6	381.5		542.5	385.6	
Right	kg	467.2	312.1		473.1	377.4		468.6	382.8	
Ratio	%	61.6	38.4		57.2	42.8		56.8	43.2	
Totals	kg	969.8	605.6	1575.4	1014.7	758.9	1773.6	1011.1	768.4	1779.5

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1575.4	(A)
Sum of Actual Weight of 2 P572 ATDs Used	kg	129.3	(B)
Rated Cargo/Luggage Weight (RCLW)	kg	75	(C)
Calculated Vehicle Target Weight (TVTW)	kg	1779.7	(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**

TEST VEHICLE ATTITUDES AND CG

	Units	Fully Loaded	As Tested	Meets Requirement***
Left Front	mm	701	704	Yes
Right Front	mm	713	710	Yes
Right Rear	mm	699	701	Yes
Left Rear	mm	690	697	Yes
Vehicle CG (Aft of Front Axle)	Mm	1213	1202	
Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline)	mm	33	32	

*** 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. 1 (CONTINUED)
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2013 Toyota Avalon XLE 4-Dr Sedan NHTSA No. YD5105
Test Program: NCAP Side MDB Impact Test Test Date: 1/10/2013

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Weight of Ballast, if any	54.4
Spare tire, jack & tools, trunk sub floor/floor mat, rear sill plastic trim, trunk carpet, right side mirror.	25.9

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

Test Vehicle: 2013 Toyota Avalon XLE 4-Dr Sedan NHTSA No. YD5105
Test Program: NCAP Side MDB Impact Test Test Date: 1/10/2013

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	19.1	10.5	14.8
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 SCRP Height (mm)	SCRP Height Position	SCRP Height (mm)		
				Rear-most	Mid-Fore/Aft	Forward-Most
Driver Seat	14.8	0	Max	54	54	54
	14.8	0	Mid	27	27	27
	14.8	0	Min	0	0	0
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

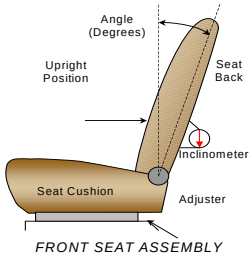
Test Vehicle: 2013 Toyota Avalon XLE 4-Dr Sedan NHTSA No. YD5105
Test Program: NCAP Side MDB Impact Test Test Date: 1/10/2013

SEAT FORE/AFT POSITIONS

Seat	Total Fore/Aft Travel		Test Position from Forward-most Position	
	mm	Detents	mm	Detent
Driver Seat	240		120	
Front Passenger Seat	240		120	
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 adjusted following Appendix C, "Positioning Dummies in the Test Vehicle" in the NCAP Laboratory Test Procedure dated September 2012. The rear center and non-struck side rear outboard seat backs are positioned to match the struck side rear seat back.



Seat	Total Seat Back Angle Range		Test Position from Vertical	
	Degrees	Detents	Degrees	Detent
Driver Seat w/Seated Dummy	56.4		3.1	
Front Passenger Seat	56.3		3.1	
Front Center Seat				
Struck Side Rear Seat	Fixed	Fixed	7.4*	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	7.4*	Fixed
Rear Center Seat	Fixed	Fixed	7.4*	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: 2013 Toyota Avalon XLE 4-Dr Sedan NHTSA No. YD5105
Test Program: NCAP Side MDB Impact Test Test Date: 1/10/2013

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 (1st as 1)	0 (uppermost as 0)
Rear Seat	Fixed	Not Applicable

HEAD RESTRAINT ADJUSTMENT

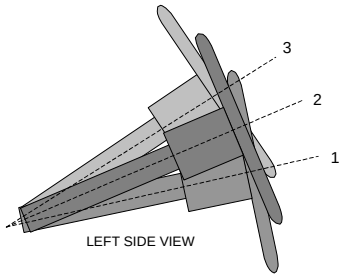
The driver's head restraint is adjusted to the highest and most full forward in-use position. The struck-side rear passenger's head restraint is adjusted to the lowest and most full forward in-use position.

	Total # of Positions	Placed in Position #
Driver Seat	2	Highest
Rear Seat	3	Lowest

STEERING COLUMN ADJUSTMENT

Steering wheel and column adjustments are made so that the steering wheel 0geometric locus is described when it moves through its full range of motion.

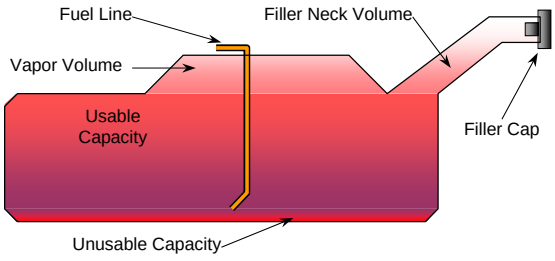
	Degrees	Fore/Aft Position (mm)
Lowermost, Position 1	68.0	209
Geometric Center, Position 2	65.9	191
Uppermost, Position 3	63.8	173
Telescoping Steering Wheel Travel		36
Test Position	65.9	191



STEERING COLUMN ASSEMBLY

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. The fuel pump is activated when the ignition is turned on. The fuel pipe is on the left side.



VEHICLE FUEL TANK ASSEMBLY

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

Test Vehicle: 2013 Toyota Avalon XLE 4-Dr Sedan NHTSA No. YD5105
Test Program: NCAP Side MDB Impact Test Test Date: 1/10/2013

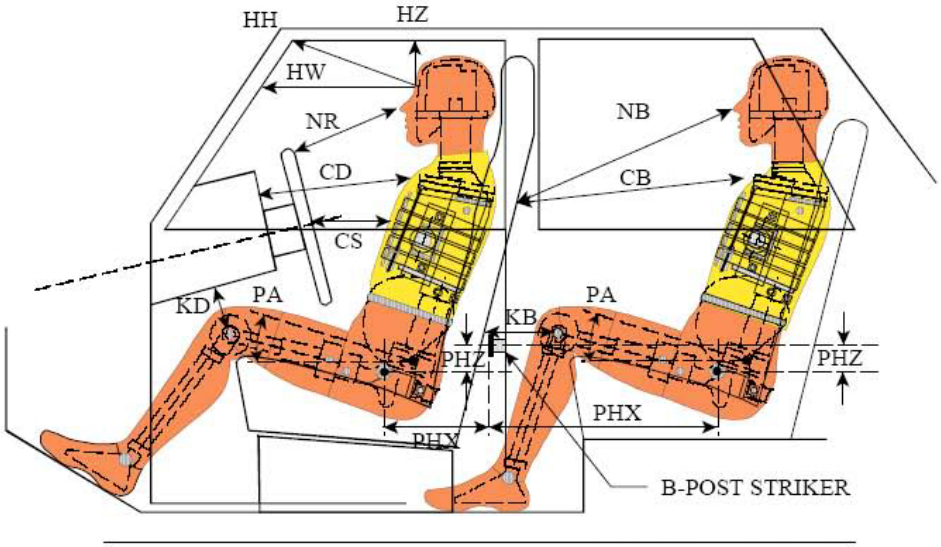
FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of "Standard" Tank (see Form No. 1)	62.8
Usable Capacity of "Optional" Tank (see Form No. 1)	
Usable Capacity of Standard Tank as Specified in Owner's Manual	64.35
Usable Capacity of Optional Tank as Specified in Owner's Manual	
93% of Usable Capacity	58.4
Actual Amount of Solvent Used	58.4
1/3 of Usable Capacity	20.9

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

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2013 Toyota Avalon XLE 4-Dr Sedan NHTSA No. YD5105
Test Program: NCAP Side MDB Impact Test Test Date: 1/10/2013



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

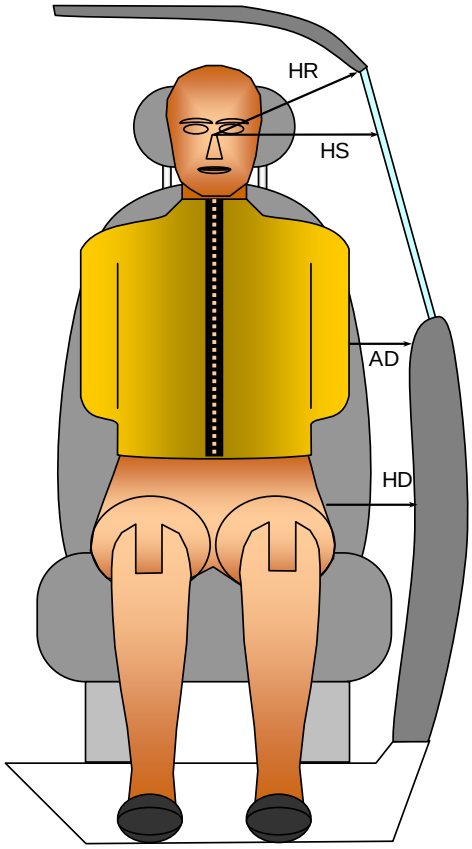
LEFT SIDE VIEW

DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Pass. Code	Measurement Description	Driver S/N 032		Passenger S/N 306	
			Length (mm)	Angle(°)	Length (mm)	Angle(°)
HH		Head to Header	379	12.5		
HW		Head to Windshield	625			
HZ	HZ	Head to Roof Liner	139		250	
NR	NB	Nose to Rim/Seat Back	483	10.1	633	12.0
CD	CB	Chest to Dashboard/Seat Back	576	10.4	606	11.3
CS		Chest to Steering Wheel	392	7.6		
KDL	KBL	Left Knee to Dash/Seat Back	175	37.4	314	25.1
KDR	KBR	Right Knee to Dash/Seat Back	170	33.8	319	24.5
PAX	PAX	Pelvic Tilt Angle X		24.0		26.3
	PAY	Pelvic Tilt Angle Y		-0.3		0.8
PHX	PHX	Hip Point to Striker (X-Axis)	202		338	
PHZ	PHZ	Hip Point to Striker (Z-Axis)	208		305	

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2013 Toyota Avalon XLE 4-Dr Sedan NHTSA No. YD5105
Test Program: NCAP Side MDB Impact Test Test Date: 1/10/2013



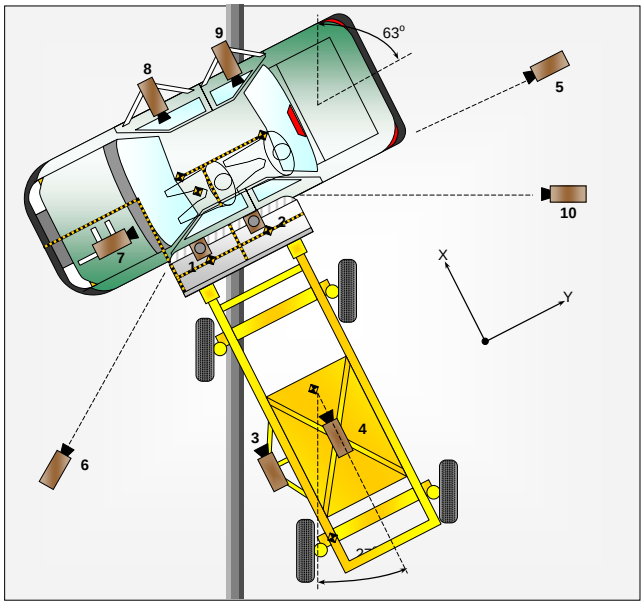
FRONT VIEW OF DUMMY

DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver S/N 032	Passenger S/N 306
HR	Head to Side Header	mm	188	232
HS	Head to Side Window	mm	329	370
AD	Arm to Door	mm	93	167
HD	Hip Point to Door	mm	155	169

DATA SHEET NO. 5
CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2013 Toyota Avalon XLE 4-Dr Sedan NHTSA No. YD5105
Test Program: NCAP Side MDB Impact Test Test Date: 1/10/2013



CAMERA LOCATIONS AND DATA

No.	Camera View	Coordinates (mm)			Lens Length (mm)	Operating Frame Rate (fps)
		X*	Y*	Z*		
1	Overhead Overall	120	170	-5050	14	1000
2	Overhead Close-Up	70	40	-5050	20	1000
3	Left Impact Point (MDB)				50	1000
4	Side Overall (MDB)				16	1000
5	Rear	80	4850	-1140	24	1000
6	Left Front	4120	-4240	-1130	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

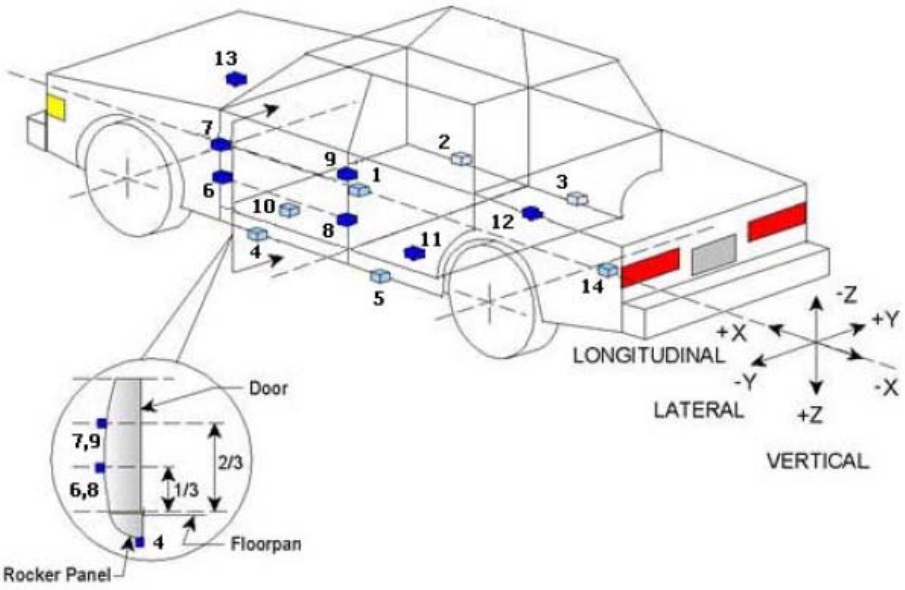
Explain why camera(s) did not operate as intended: None

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: 2013 Toyota Avalon XLE 4-Dr Sedan NHTSA No. YD5105
Test Program: NCAP Side MDB Impact Test Test Date: 1/10/2013



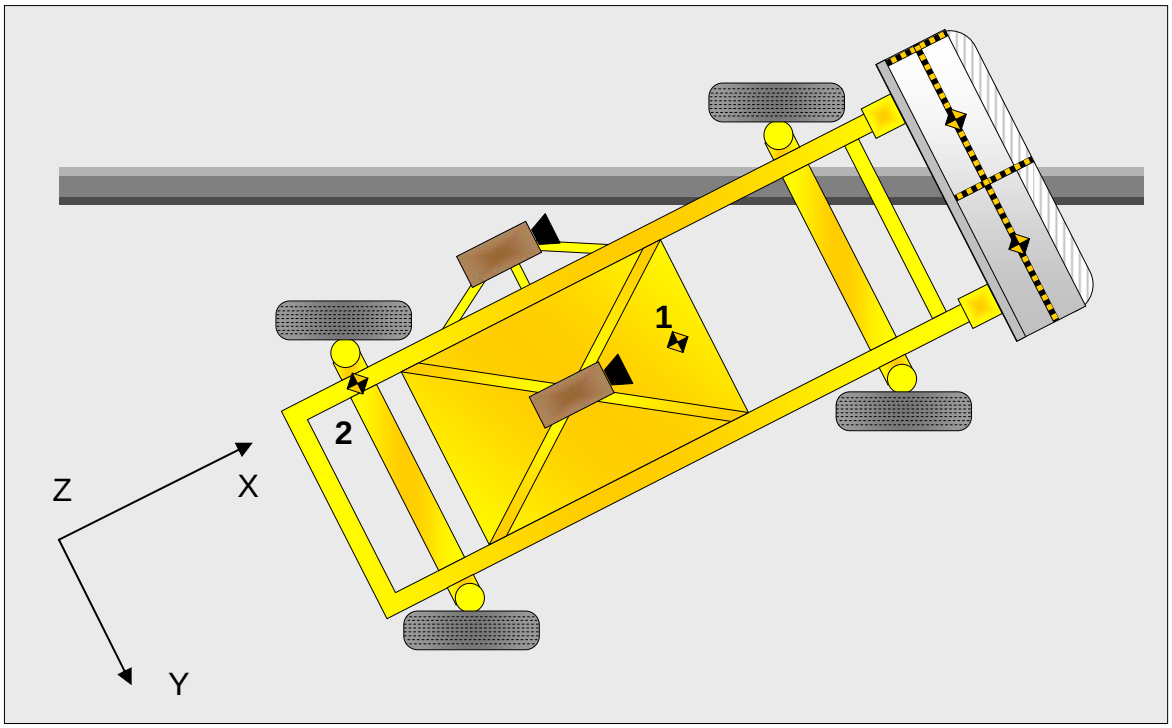
TEST VEHICLE ACCELEROMETER LOCATIONS

Accelerometer Location				
No.	ID	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2661	473	-146
2	Right Sill at Front Seat	2882	732	-205
3	Right Sill at Rear Seat	1856	732	-207
4	Left Sill at Front Door	2919	-732	-204
5	Left Sill at Rear Door	1856	-732	-206
6	Left Lower A-Post	3461	-821	-498
7	Left Middle A-Post	3483	-804	-735
8	Left Lower B-Post	2309	-740	-591
9	Left Middle B-Post	2282	-722	-810
10	Front Seat Track	2549	-560	-323
11	Rear Seat Structure	1961	-364	-267
12	Rt. Rear Occ. Compartment	1931	407	-221
13	Engine Block	4252	0	-801
14	Rear Above Axle	1025	0	-488

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: 2013 Toyota Avalon XLE 4-Dr Sedan NHTSA No. YD5105
Test Program: NCAP Side MDB Impact Test Test Date: 1/10/2013



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: 2013 Toyota Avalon XLE 4-Dr Sedan NHTSA No. YD5105
Test Program: NCAP Side MDB Impact Test Test Date: 1/10/2013

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, Headliner	Curtain Airbag
Left Side of Head	Curtain Airbag	Curtain Airbag
Back of Head	Curtain Airbag, Headliner, Headrest	Curtain Airbag, Headrest, Seatback
Left Shoulder	None	Side Airbag, Seatback
Upper Torso	Side Airbag, Seatback	Side Airbag, Seatback
Lower Torso	Side Airbag, Seatback	Side Airbag, Seatback
Left Hip	Side Airbag, Seatback	Side Airbag, Seatback
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

	Struck Side		Non-Struck Side	
Description	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 and Left Rear Windows Broken
Other Notable Effects	None

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

Test Vehicle: 2013 Toyota Avalon XLE 4-Dr Sedan NHTSA No. YD5105
Test Program: NCAP Side MDB Impact Test Test Date: 1/10/2013

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vehicle Wheel Base	mm		2810
Vertical Impact Reference Line (Aft of Front Axle) (Intended Impact Point)	mm		465
Actual Impact Point (Aft of Front Axle)	mm		477
Horizontal Offset (+forward / -rearward)	mm	+/- 50 of intended impact point	-12
Vertical Offset (+down / -up)	mm	+/- 20 of intended impact point	+5

DATA SHEET NO. 9

MDB SUMMARY OF RESULTS

Test Vehicle: 2013 Toyota Avalon XLE 4-Dr Sedan NHTSA No. YD5105
Test Program: NCAP Side MDB Impact Test Test Date: 1/10/2013

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

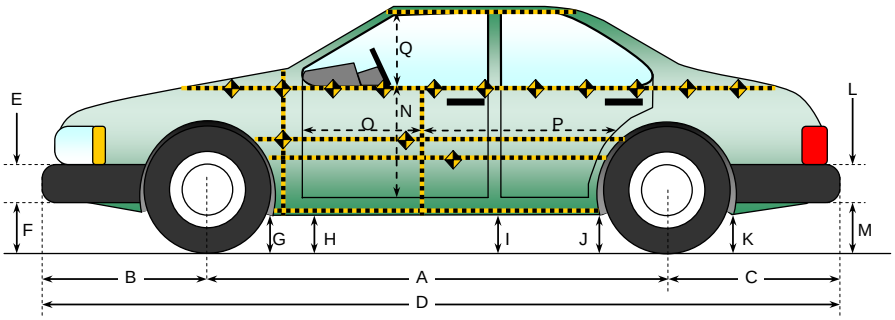
Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	62.3
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	62.1
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	90.0
MDB Forward Line of Motion to Target Vehicle CL	degrees	62.5 to 63.5	63.3
MDB Crabbed Angle to MDB Forward Line of Motion	degrees	26 to 28	26.7

MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE

Vertical Location			From Centerline		Maximum Crush
Row	Description	Height	Distance	Direction	
A	Center of Bumper	432	800	Right	188
B	Top of Bumper	533	800	Right	121
C	Mid-Level	686	0		59
D	Top of Stack	813	100	Right	89

DATA SHEET NO. 10
TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2013 Toyota Avalon XLE 4-Dr Sedan NHTSA No. YD5105
Test Program: NCAP Side MDB Impact Test Test Date: 1/10/2013



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

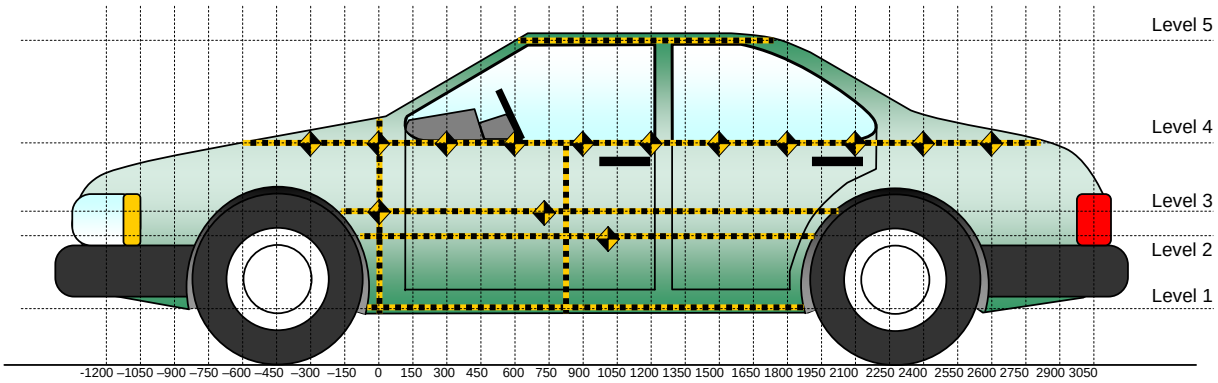
LEFT SIDE VIEW

VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2810	2803	7
B	Front Axle to FSOV	987	996	-9
C	Rear Axle to RSOV	1161	1154	7
D	Total Length at Centerline	4958	4953	5
E	Front Bumper Thickness	114	114	0
F	Front Bumper Bottom to Ground	211	214	-3
G	Sill Height at Front Wheel Well	192	210	-18
H	Sill Height at Front Door Leading Edge	204	220	-16
I	Sill Height at B Pillar	196	219	-23
J1	Sill Height at Rear Wheel Well	190	190	0
J2	Pinch Weld Height at Rear Wheel Well	198	200	-2
K	Sill Height Aft of Rear Wheel Well	219	212	7
L	Rear Bumper Thickness	130	130	0
M	Rear Bumper Bottom to Ground	263	260	3
N	Sill Height to Window Bottom Sill	740	654	86
O	Front Door Leading Edge to Impact CL	882	833	49
P	Rear Door Trailing Edge to Impact CL	1183	1094	89
Q	Front Window Opening	435	501	-66
R	Right Side Length	3631	3634	-3
S	Left Side Length	3631	3606	25
T	Vehicle Width at B Post	1833	1656	177

DATA SHEET NO. 11
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2013 Toyota Avalon XLE 4-Dr Sedan NHTSA No. YD5105
Test Program: NCAP Side MDB Impact Test Test Date: 1/10/2013



All Measurements Shown in mm

LEFT SIDE VIEW

MAXIMUM EXTERIOR CRUSH MEAUREMENTS

Level	Measurement Description	Height Above Ground (mm)	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	201	54	0
2	Occupant Hip Point	528	267	600
3	Mid Door	604	242	450
4	Window Sill	902	201	1650
5	Window Top	1386	28	1500

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: 2013 Toyota Avalon XLE 4-Dr Sedan NHTSA No. YD5105
Test Program: NCAP Side MDB Impact Test Test Date: 1/10/2013

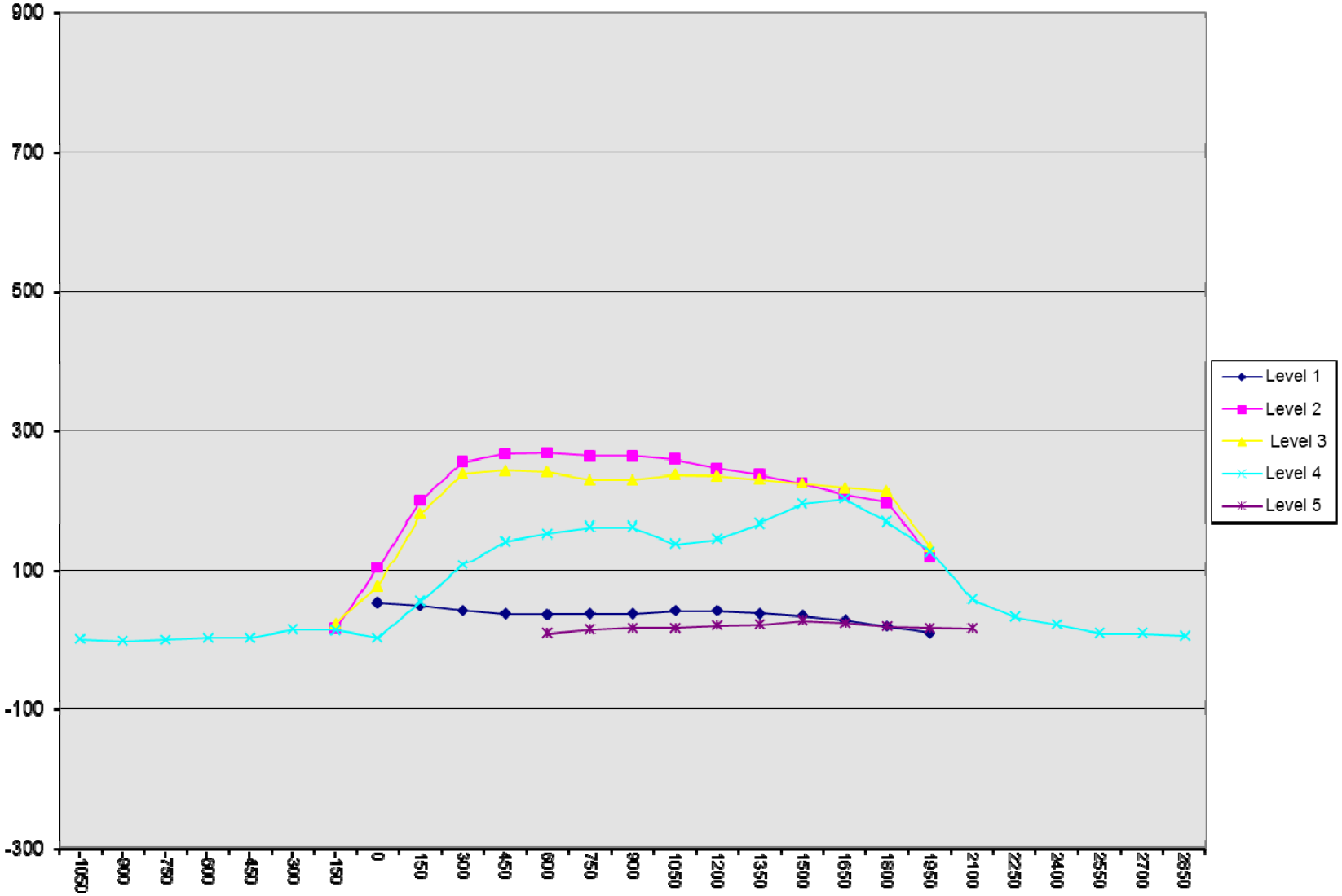
	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-1050				403					405					2	
-900				373					372					-1	
-750				344					345					1	
-600				320					324					4	
-450				302					306					4	
-300				289					305					16	
-150		187	186	280			204	211	295			17	25	15	
0	227	196	196	273		281	300	274	277		54	104	78	4	
150	231	196	194	265		281	395	374	321		50	199	180	56	
300	232	195	191	257		275	449	428	365		43	254	237	108	
450	234	194	190	249		272	460	432	391		38	266	242	142	
600	235	194	189	241	500	272	461	429	394	510	37	267	240	153	10
750	236	193	188	233	486	274	456	416	395	502	38	263	228	162	16
900	238	192	187	227	483	276	455	415	389	501	38	263	228	162	18
1050	238	191	186	224	483	280	449	422	362	501	42	258	236	138	18
1200	238	191	187	224	482	280	436	421	369	503	42	245	234	145	21
1350	241	193	189	225	483	280	429	418	392	506	39	236	229	167	23
1500	243	195	191	225	484	278	418	414	419	512	35	223	223	194	28
1650	243	197	194	227	486	272	404	411	428	511	29	207	217	201	25
1800	240	198	195	230	490	260	394	407	399	510	20	196	212	169	20
1950	235	192	191	237	501	246	312	325	365	519	11	120	134	128	18
2100				227	518				286	535				59	17
2250				238					272					34	
2400				245					268					23	
2550				256					266					10	
2700				268					278					10	
2850				283					290					7	

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

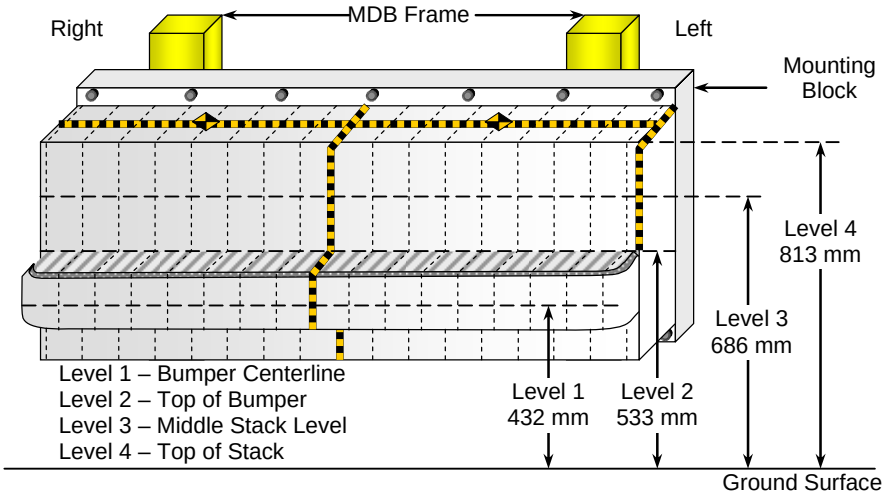
Test Vehicle: 2013 Toyota Avalon XLE 4-Dr Sedan
Test Program: NCAP Side MDB Impact Test

NHTSA No. YD5105
Test Date: 1/10/2013



DATA SHEET NO. 12
MDB EXTERIOR STATIC CRUSH MEASUREMENTS

Test Vehicle: 2013 Toyota Avalon XLE 4-Dr Sedan NHTSA No. YD5105
Test Program: NCAP Side MDB Impact Test Test Date: 1/10/2013



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	800
4	16	6	4	6	9	31	65	89	86	51	10	3	3	6	14	37	79
3	40	30	15	16	16	19	26	58	59	11	-1	-4	-5	-2	4	13	41
2	121	93	70	60	49	49	58	55	48	36	28	26	36	29	30	34	34
1	188	184	171	162	157	148	142	138	131	122	107	105	101	92	87	88	89

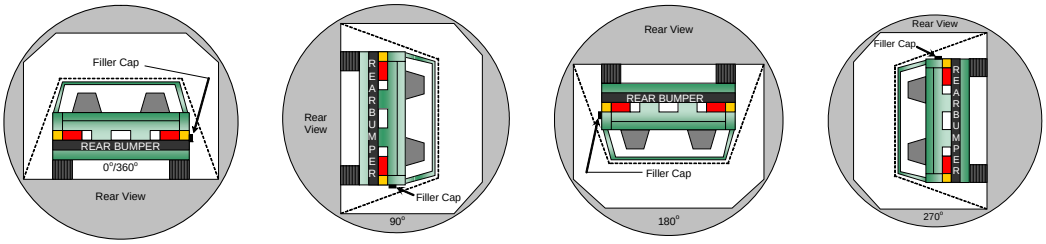
DATA SHEET NO. 13
FMVSS NO. 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2013 Toyota Avalon XLE 4-Dr Sedan NHTSA No. YD5105
Test Program: NCAP Side MDB Impact Test Test Date: 1/10/2013

Test Time: 10:46 am Temperature: 21.4° C

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

FMVSS 301 STATIC ROLLOVER DATA



0°/360° 90° 180° 270°

ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	115	300	415
90° to 180°	113	300	413
180° to 270°	106	300	406
270° to 360°	113	300	413

FMVSS 301 ROLLOVER SPILLAGE TABLE (units in ounces)

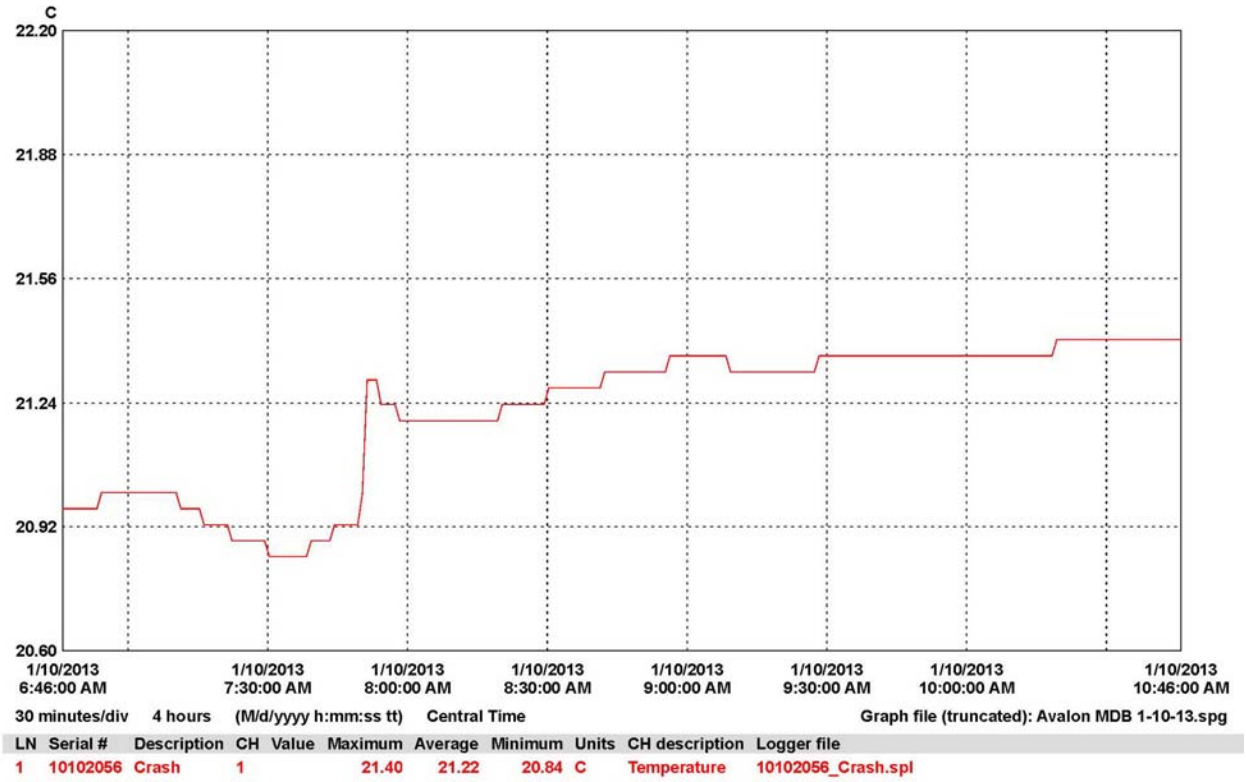
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eight Minute
0° to 90°	0	0	0	0
90° to 180°	0	0	0	0
180° to 270°	0	0	0	0
270° to 360°	0	0	0	0

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 STABILIZATION DATA

Test Vehicle:	2013 Toyota Avalon XLE 4-Dr Sedan	NHTSA No.	YD5105
Test Program:	NCAP Side MDB Impact Test	Test Date:	1/10/2013



LN	Serial #	Description	CH	Value	Maximum	Average	Minimum	Units	CH description	Logger file
1	10102056	Crash	1		21.40	21.22	20.84	C	Temperature	10102056_Crash.spl

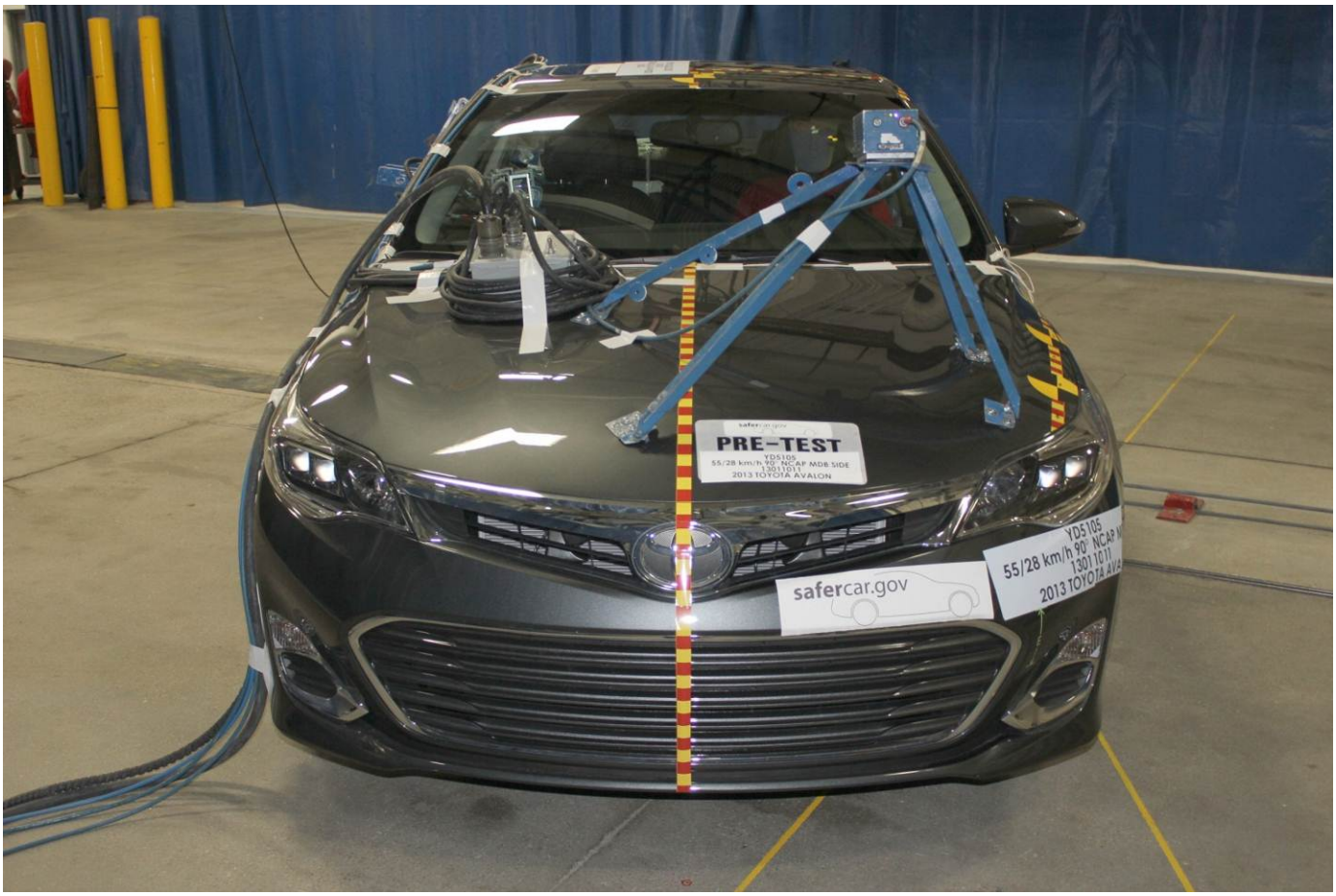
APPENDIX A

PHOTOGRAPHS

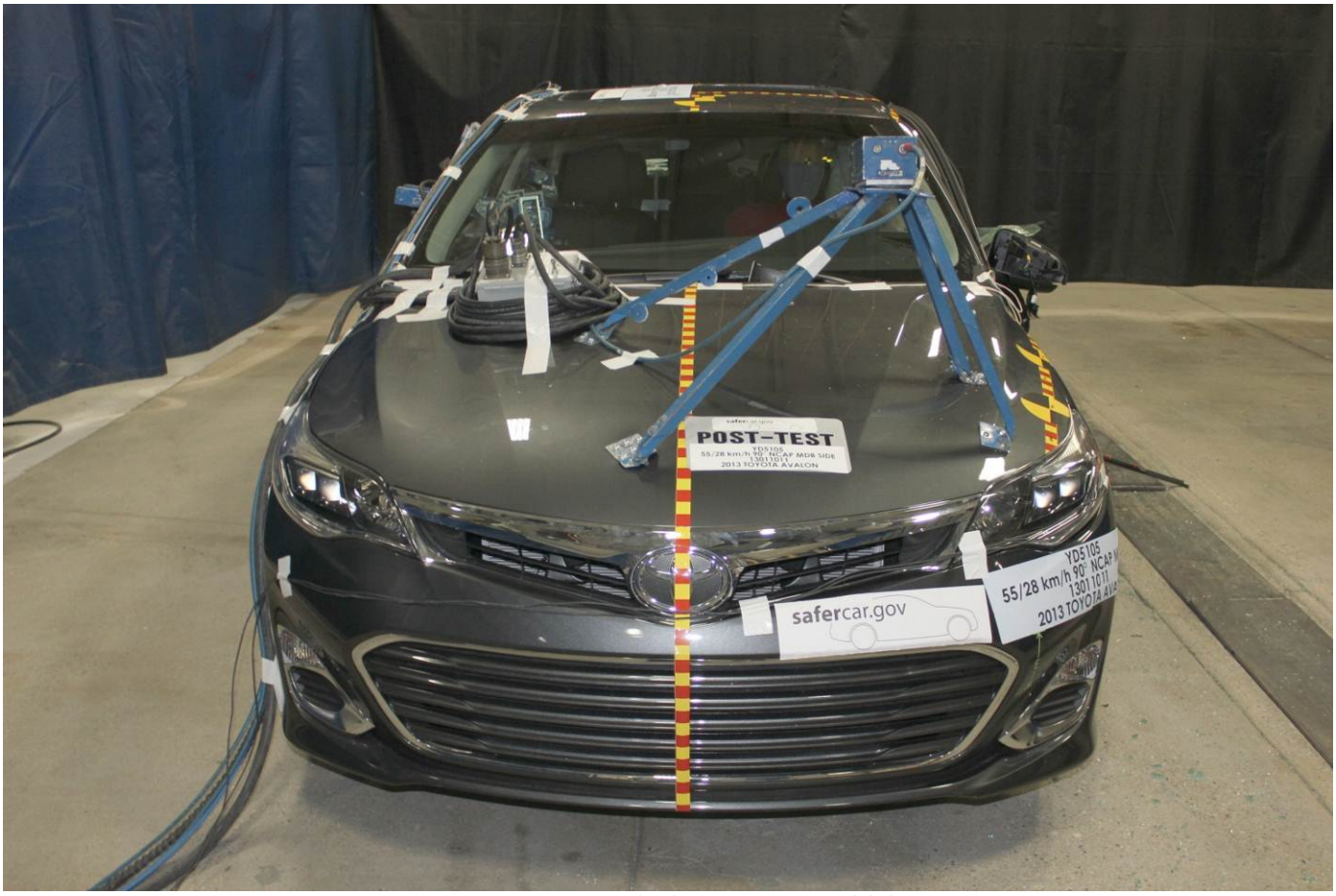
TABLE OF PHOTOGRAPHS

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

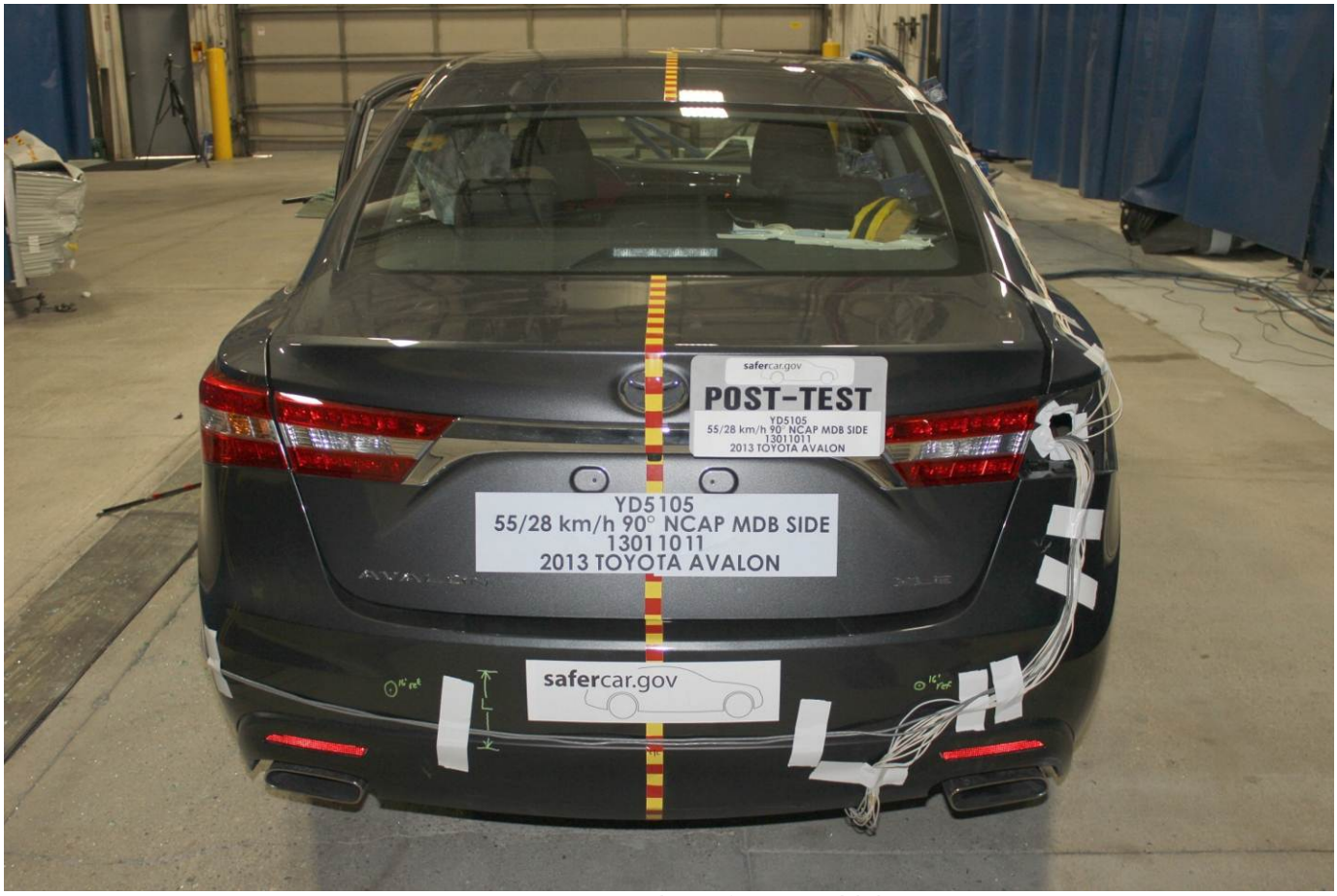
Pre-Test Left Side View of Test Vehicle

Post-Test Left Side View of Test Vehicle

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

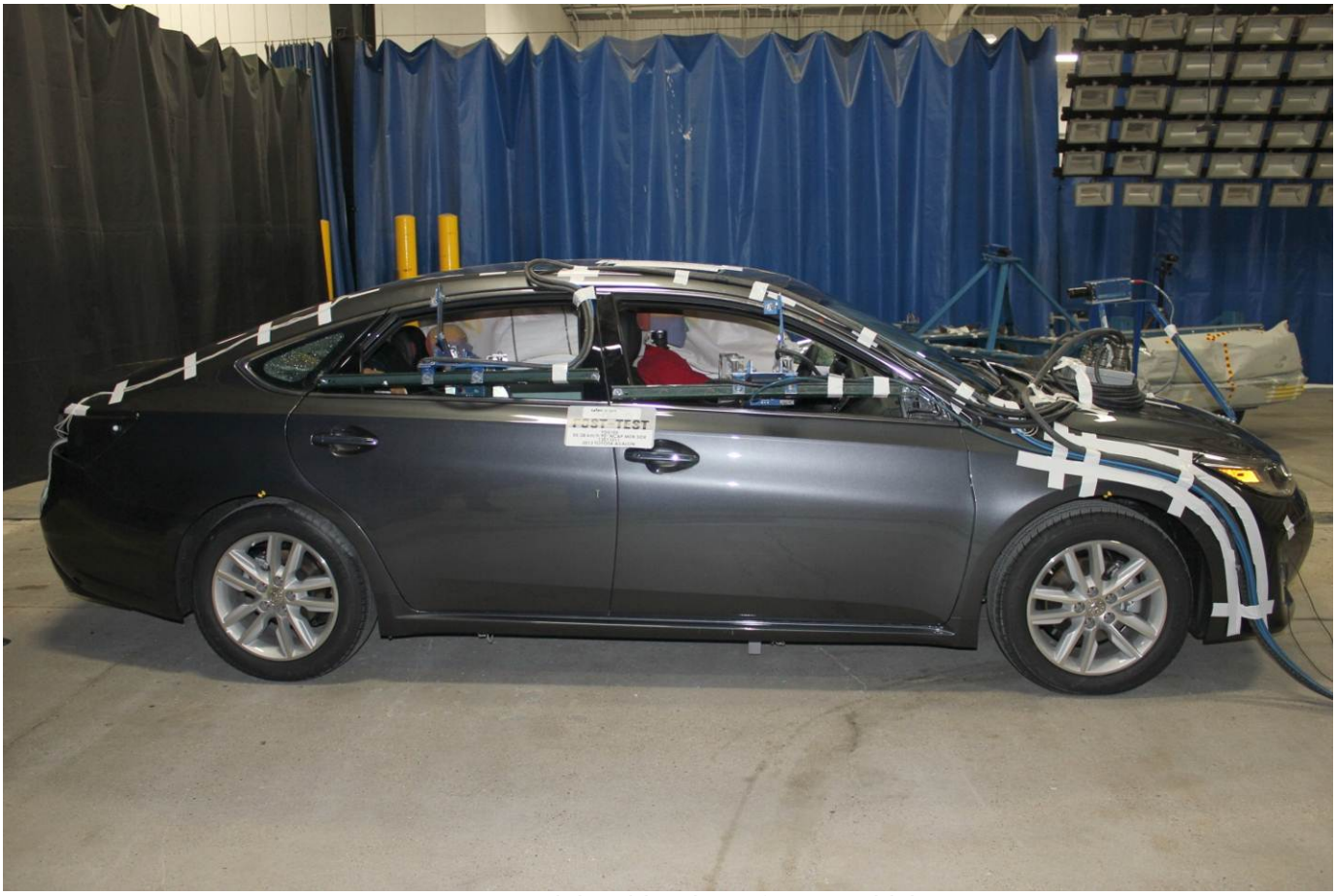
Post-Test Left Three-Quarter Rear View of Test Vehicle

Pre-Test Rear View of Test Vehicle

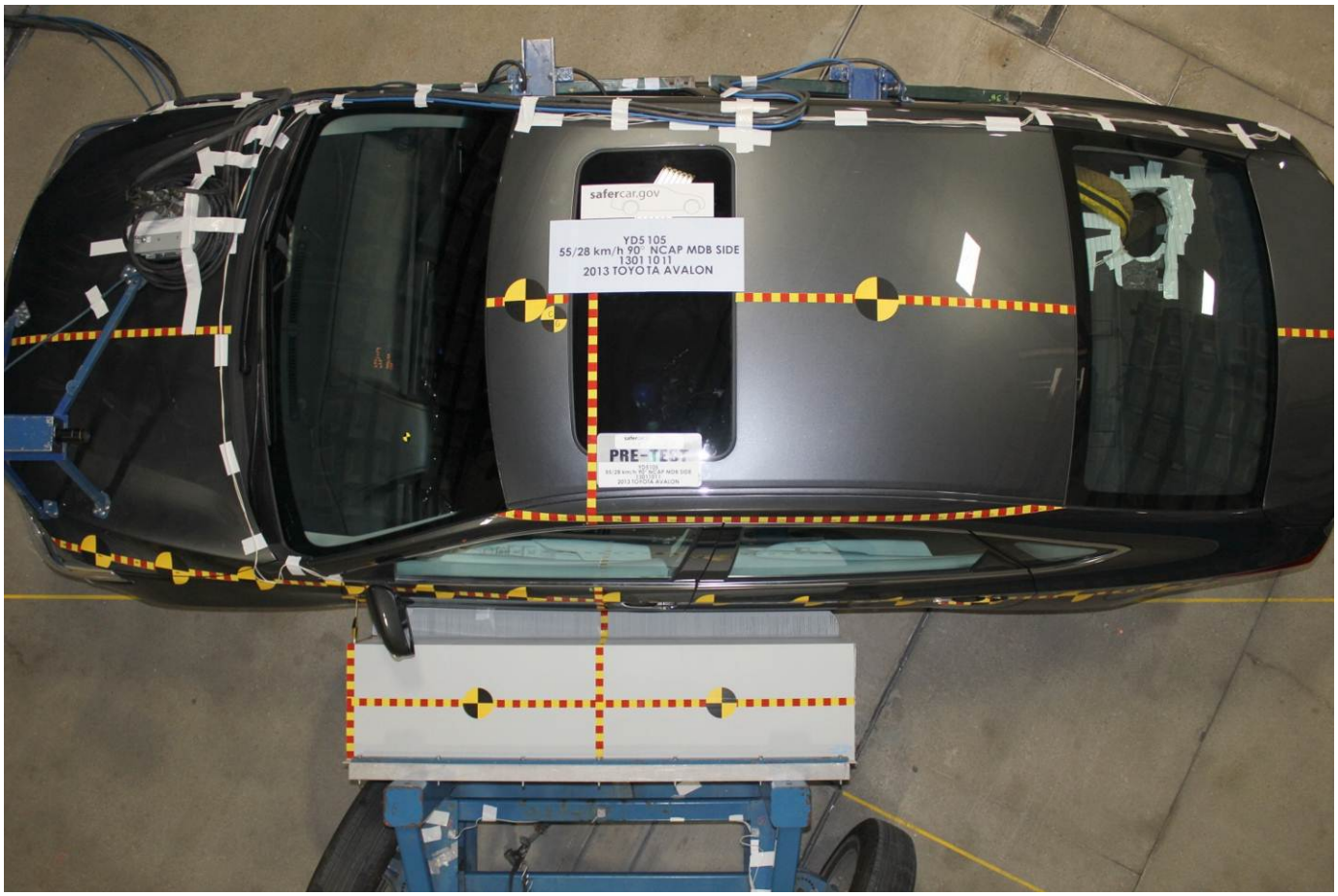


Post-Test Rear View of Test Vehicle

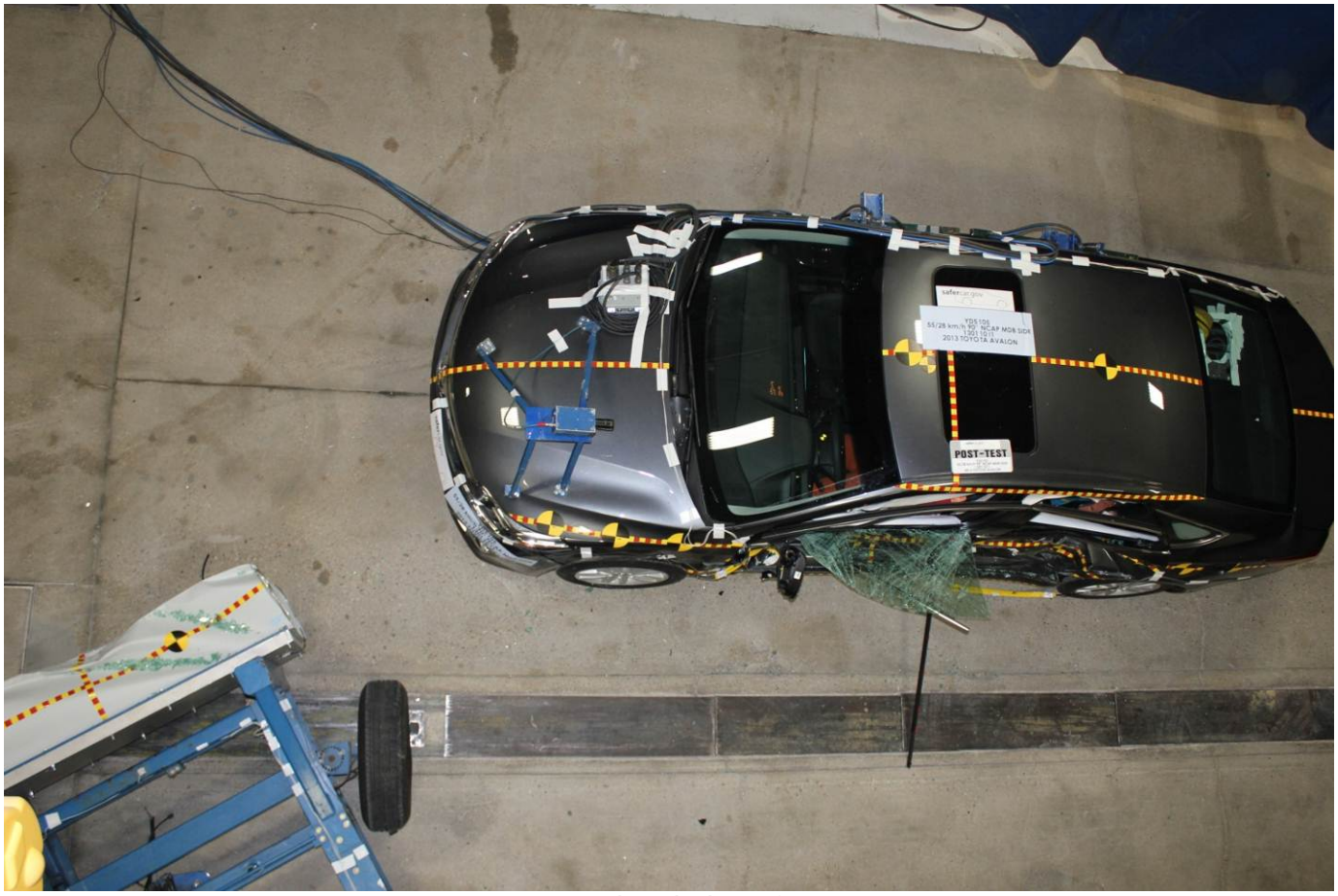
Pre-Test Right Side View of Test Vehicle



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

PHOTOGRAPH NOT AVAILABLE

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 Vehicle Interior View

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

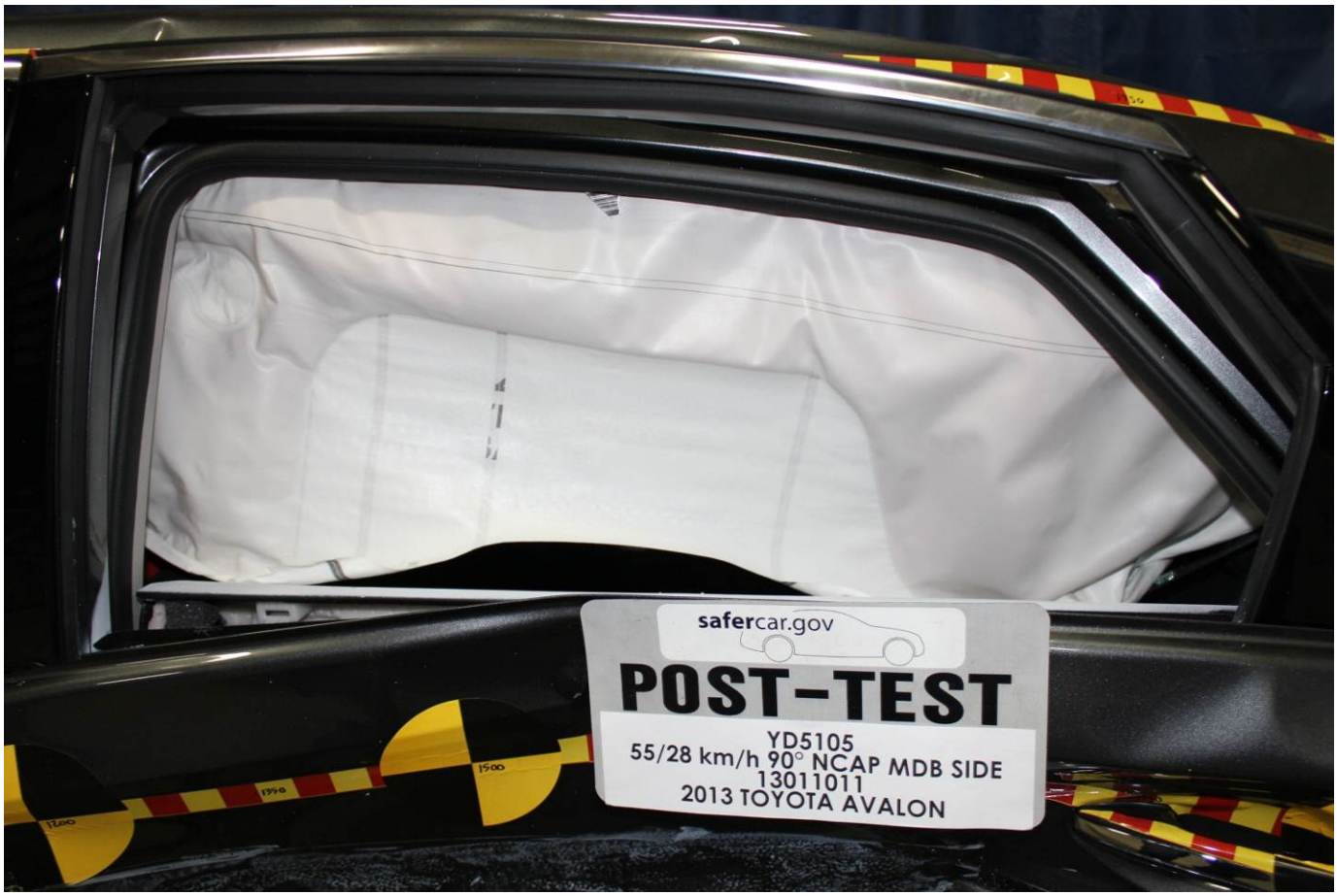
Post-Test Driver Dummy Close-up Pelvis Contact with Vehicle Interior View

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

Post-Test Driver Dummy Close-up Knee Contact 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



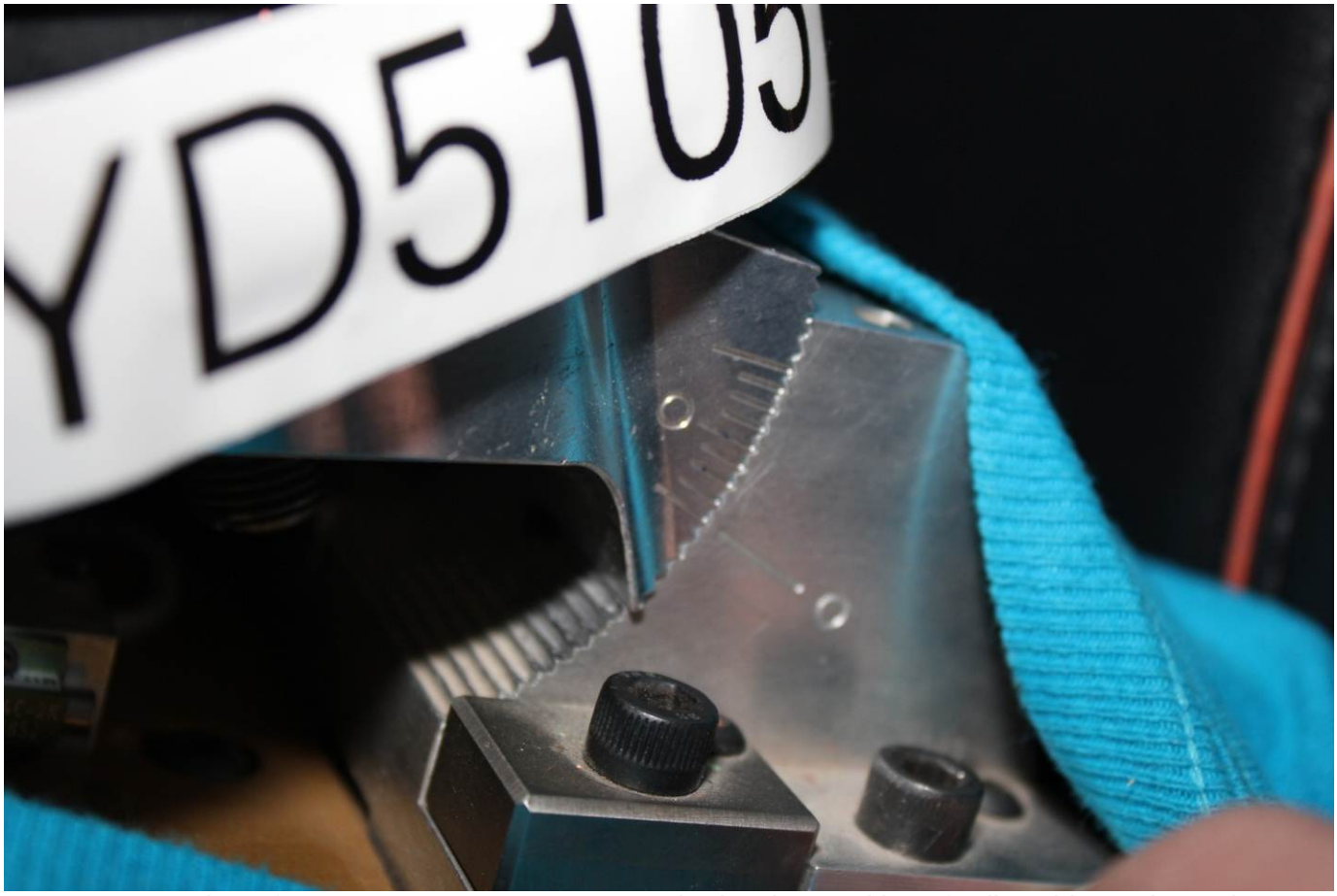
Post-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View

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 Side Airbag View

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

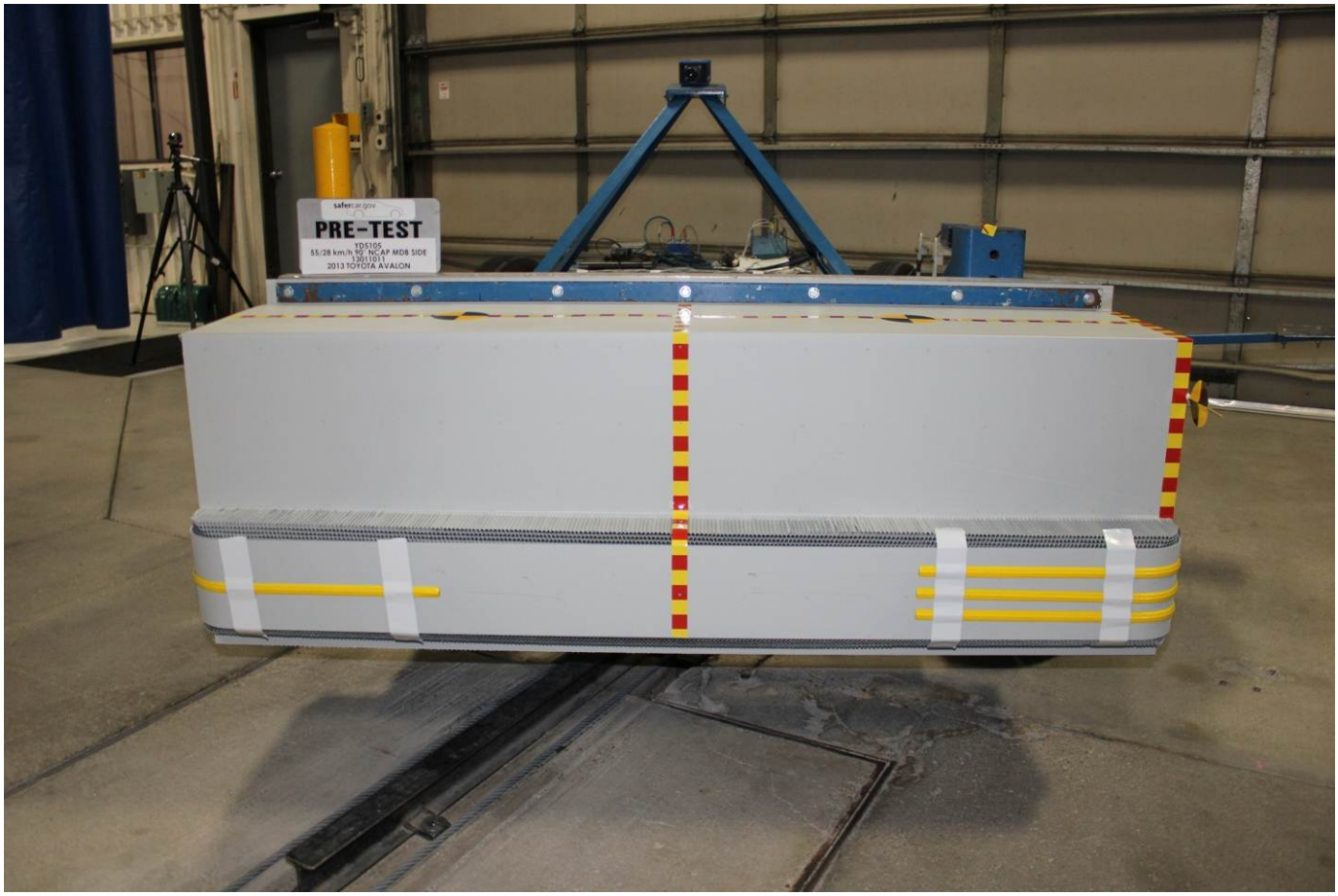
Post-Test Rear Passenger Dummy Close-up Pelvis Contact with Side Airbag View

Post-Test Rear Passenger Dummy Close-up Knee Contact View

PHOTOGRAPH NOT AVAILABLE

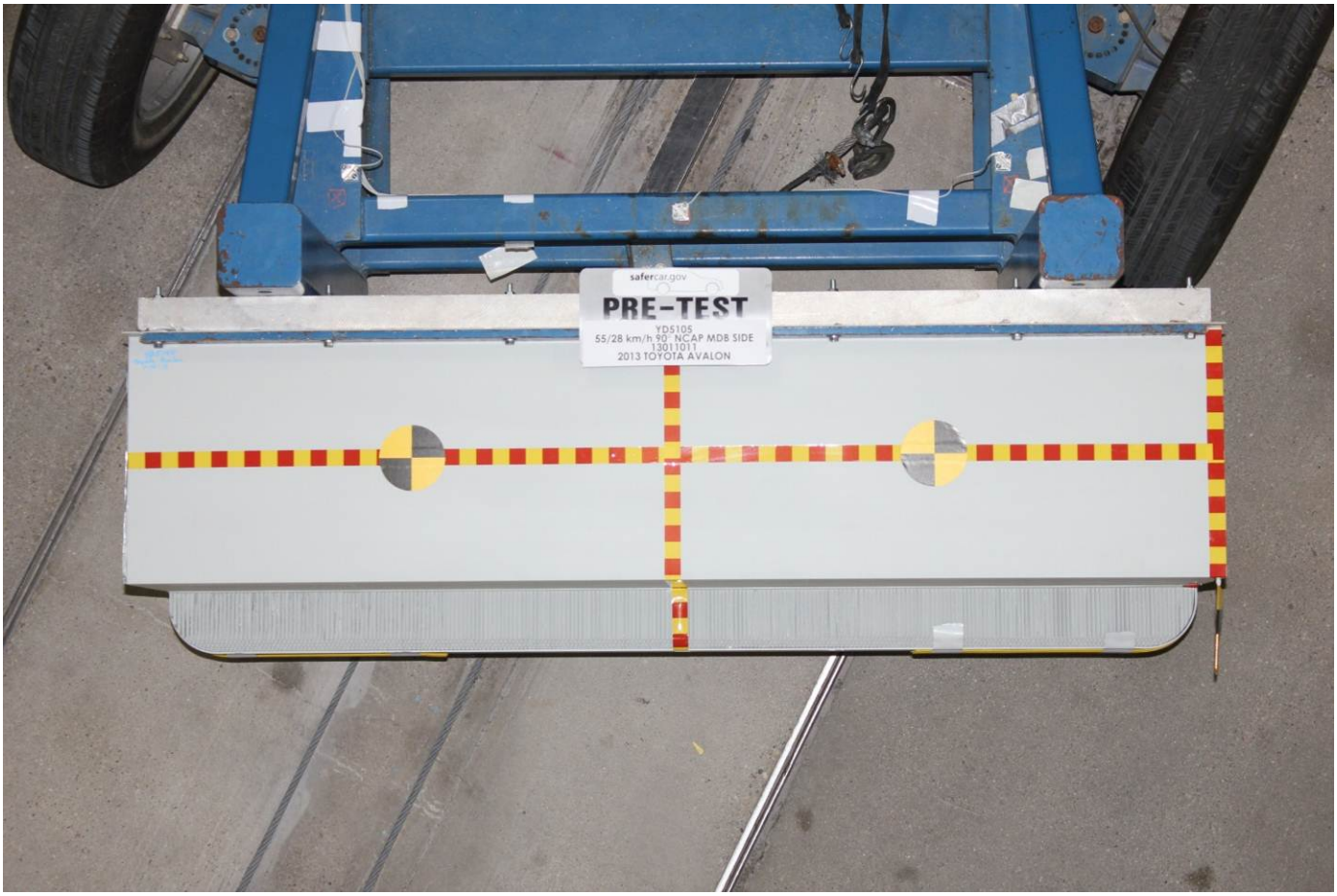
Pre-Test View of Fuel Filler Cap or Fuel Filler Neck

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

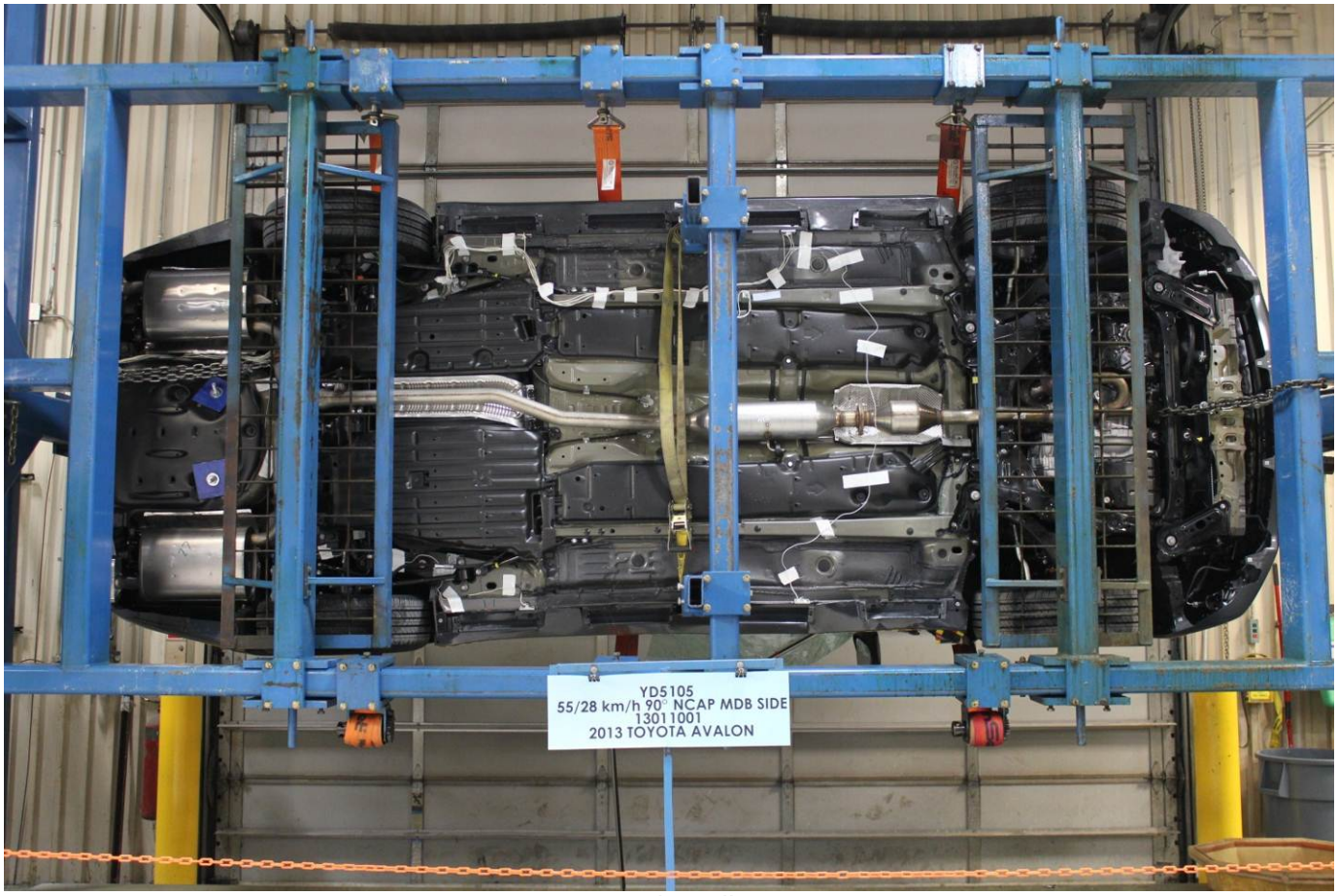
Close-Up View of Load Carrying Capacity Reduced Label

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

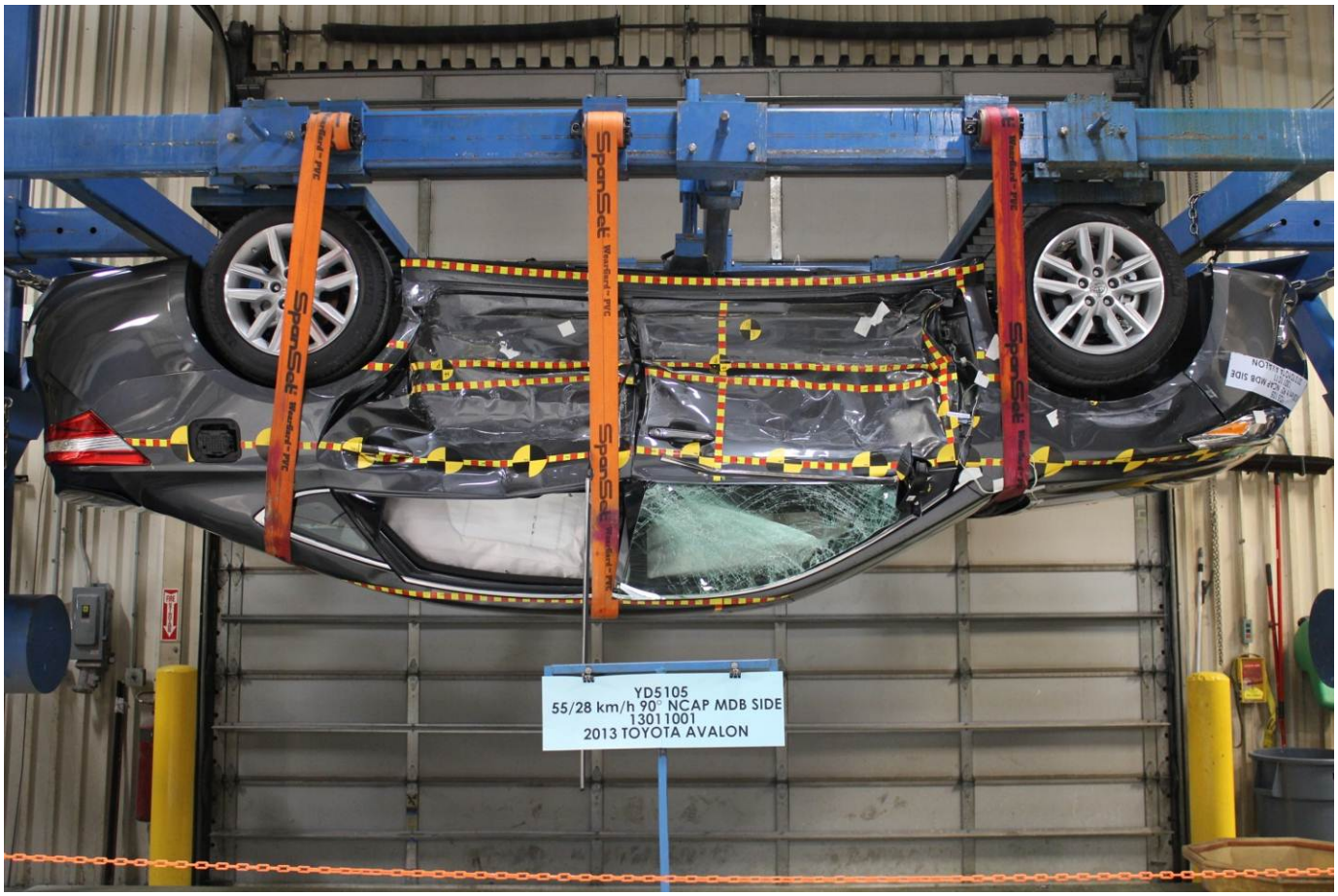
Pre-Test Ballast View

Post-Test Primary and Redundant Speed Trap Read-Out

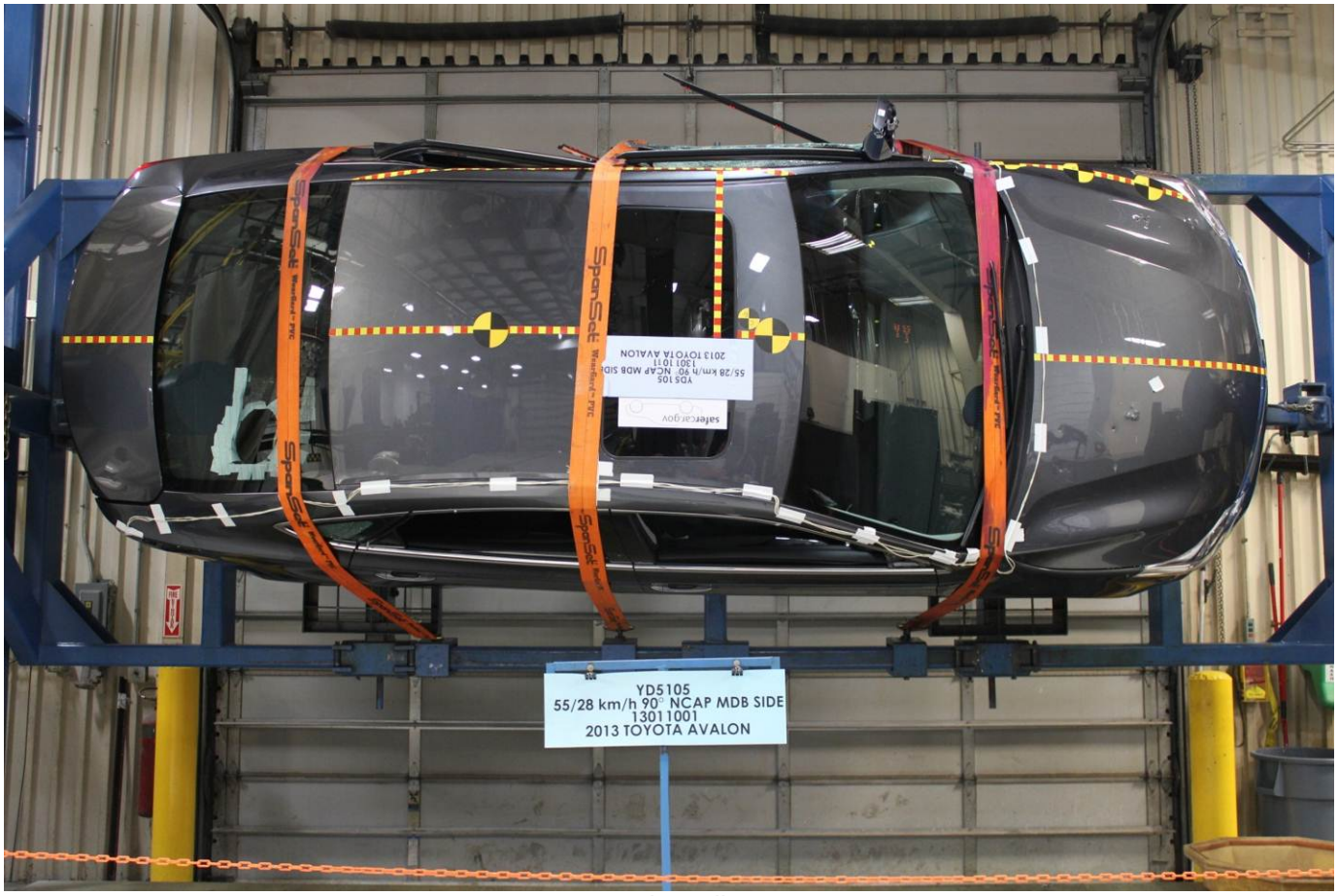
FMVSS No. 301 Static Rollover 0 Degrees



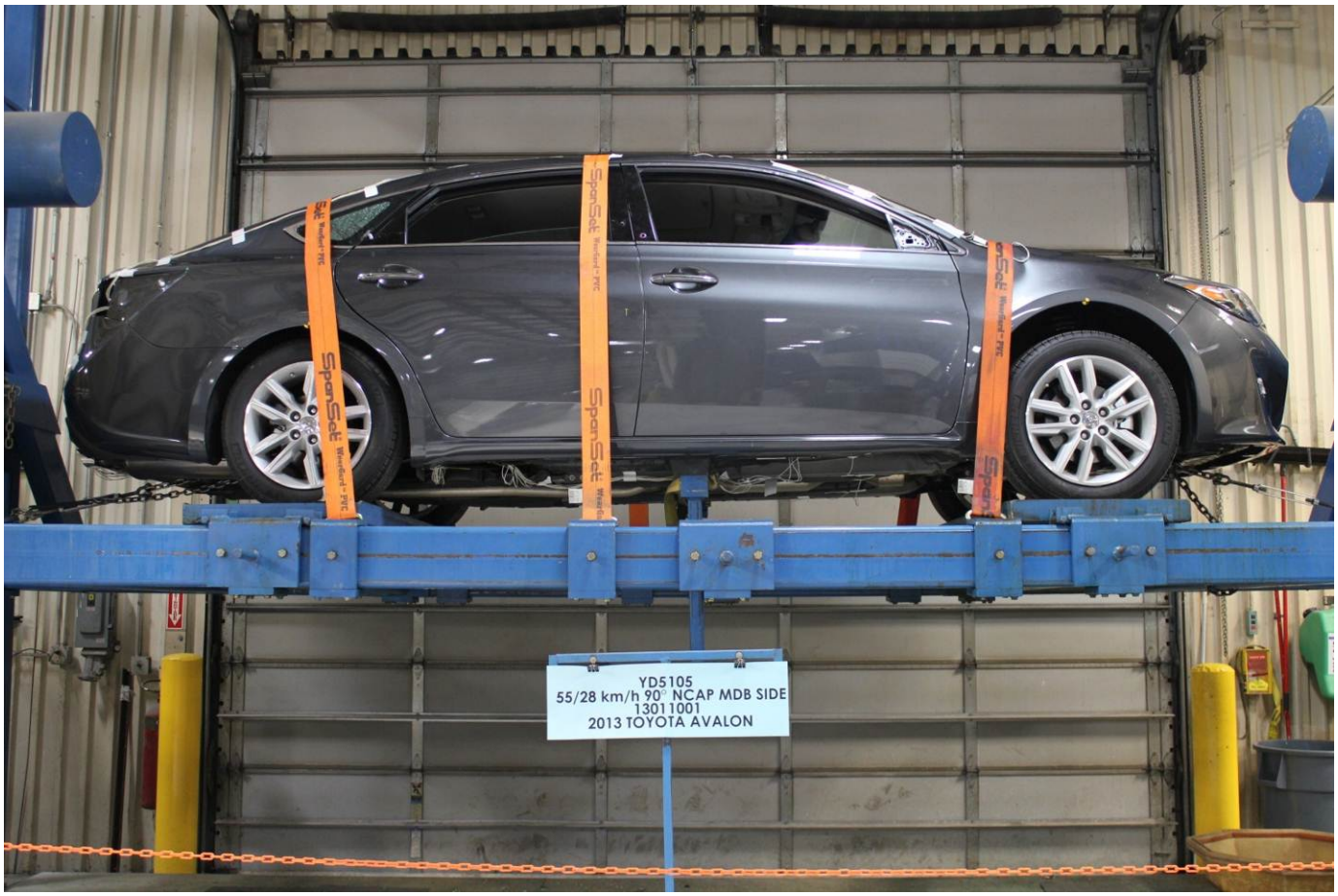
FMVSS No. 301 Static Rollover 90 Degrees



FMVSS No. 301 Static Rollover 180 Degrees



FMVSS No. 301 Static Rollover 270 Degrees



FMVSS No. 301 Static Rollover 360 Degrees

Impact Event

TOYOTA
Let's Go Places

DESC.: AVALON 4-DR XLE PREMIUM
VIN: 4T1BK1EB6DU007323
YR/MDL: 2013/3548A
CLR: MAGNETIC GRAY MET./BLACK LEAT (01G3/20)
PORT/PLANT: Georgetown, KY/TMMK RAILHEAD:

GOVERNMENT 5-STAR SAFETY RATINGS

This vehicle has not been rated by the government for overall vehicle score, frontal crash, side crash or rollover risk.

Star ratings range from 1 to 5 stars (★★★★★) with 5 being the highest.
Source: National Highway Traffic Safety Administration (NHTSA)
www.safercar.gov or 1-888-327-4236

STANDARD EQUIPMENT

MECHANICAL & PERFORMANCE
- 3.5L 268HP DOHC 24V w/Dual VVT-i
- 6-Speed ECT-i A/T w/Sequential Shift
- 17" Alloy Wheels w/P215/55R17 Tires
- Electric Power Steering (EPS)
- Pwr-Assisted Frt/Solid Rr Disc Brakes

SAFETY AND CONVENIENCE
- Star Safety System Includes: VSC, TRAC, Anti-lock Brake System, EBD, Brake Assist & Smart Stop Tech (SST)
- 10 Airbags: Dr & Fr Pass Adv Airbag Sys, Dr & Fr Pass Knee & Seat-Mounted Side, Front & Rear Side Curtain, and Rear Seat-Mounted Side Airbags
- LATCH(Lwr Anchor & Tethers for CHildren) for Outboard Rear Seating Positions Only
- Direct Tire Pressure Monitor System
- Anti-Theft System w/Engine Immobilizer

EXTERIOR
- Quadrabeam Headlights w/Auto On/Off
- Daytime Running Lights w/On/Off Switch
- Heated Outside Mirrors w/Turn Signals and Folding Feature
- Power Tilt/Slide Moonroof
- Dual Chrome-Tipped Exhaust

INTERIOR
- Dual Zone Auto Climate Control w/Air Filtration and Rear Seat Vents
- Display Audio: 6.1" Touch Screen, AM/FM/CD, MP3/WMA, 8 Spkrs, Aux Jack, USB w/iPod Conn & Bluetooth
- Audio/Climate Intellitouch(TM) Controls
- Backup Camera
- 3.5-in TFT Multi-Information Display
- Multi-Stage Heated Leather-Trimmed 8-Way Pwr Driver's Seat w/Lumbar Support & 4-Way Pwr Pass Seat
- Leather Steering Wheel w/Audio and Bluetooth Hands-Free Controls
- Smart Key System with Push Button Start
- Power Windows w/4 Door Auto Up/Down
- Auto-Dimming Rearview Mirror w/Compass and Homelink
- ***Full Tank of Gas***

MANUFACTURER'S SUGGESTED RETAIL PRICE $33,195.00

OPTIONAL EQUIPMENT

FE	50 State Emissions	
CF.	Carpet Floor Mats/Trunk Mat	225.00

DELIVERY PROCESSING AND HANDLING FEE 795.00

TOTAL $34,215.00

The New Vehicle Limited Warranty provides 3-year/36,000 mile basic coverage, 3-year/60,000 mile powertrain coverage, plus 3-year/unlimited mile corrosion perforation coverage. See Warranty and Maintenance Guide for details. An extended service contract may be available for the vehicle. Ask dealer for details.
Manufacturer's suggested retail price includes manufacturer's recommended pre-delivery service. Gasoline, license and title fees, applicable federal, state and local taxes and dealer and distributor installed options and accessories are not included in the manufacturer's suggested retail price.
Toyota Care, which covers normal factory scheduled maintenance for two years or 25,000 miles, whichever occurs first, is included as part of the sales price of the vehicle for qualifying buyers. See participating dealer for eligibility and coverage details.

Get more info on this Toyota. Just snap and text this tag.
snap me Text 27205
*Message and data rates may apply.

Dealer Name / Address: 12102 Ship to:
ARLINGTON TOYOTA
2086 N. RAND ROAD
PALATINE IL 60074

EPA DOT Fuel Economy and Environment — Gasoline Vehicle

Fuel Economy
25 MPG (Midsize Cars range from 13 to 58 MPG. The best vehicle rates 112 MPGe.)
21 city / 31 highway
combined city/hwy
4.0 gallons per 100 miles

You save **$ 850** in fuel costs over 5 years compared to the average new vehicle.

Annual fuel cost **$ 2,150**

Fuel Economy & Greenhouse Gas Rating (tailpipe only): 6 (1 – 10, Best)
This vehicle emits 368 grams CO2 per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel also create emissions; learn more at fueleconomy.gov

Smog Rating (tailpipe only): 5 (1 – 10, Best)

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 23 MPG and costs $11,600 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at $3.55 per gallon. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

fueleconomy.gov
Calculate personalized estimates and compare vehicles

Smartphone QR Code™

Monroney Label

Head restraints

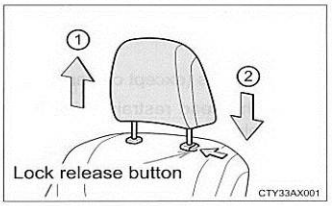
Head restraints are provided for all seats.

Front seats

Vertical adjustment

① Up
Pull the head restraints up.

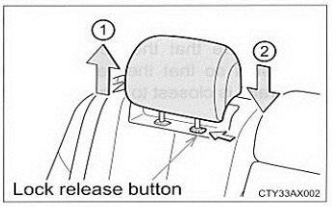
② Down
Push the head restraint down while pressing the lock release button.



Rear seats (except center seat)

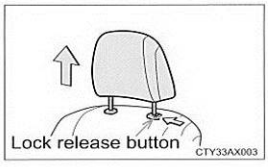
① Up
Pull the head restraints up.

② Down
Push the head restraint down while pressing the lock release button.



Removing the head restraints (except rear center seat)

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

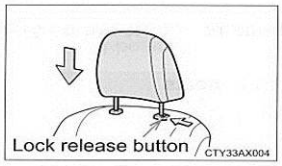


Driver Head Restraint Use and Adjustment Information from Vehicle Owner's Manual

Installing the head restraints

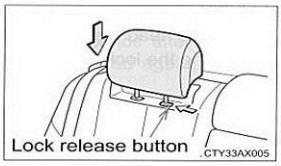
▶ Front seats

Align the head restraint with the installation holes and push it down to the lock position.
Press and hold the lock release button when lowering the head restraint.



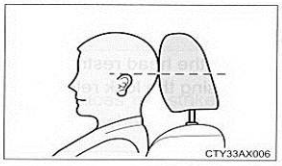
▶ Rear seats (except center seat)

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



Adjusting the height of the head restraints (except rear center seat)

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



Adjusting the rear seat head restraint (except center seat)

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

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

CAUTION

Head restraint precautions

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

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

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

APPENDIX B

DUMMY RESPONSE DATA PLOTS

TABLE OF DATA PLOTS
Driver Dummy Instrumentation Plots

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)

MDB Instrumentation Data

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)

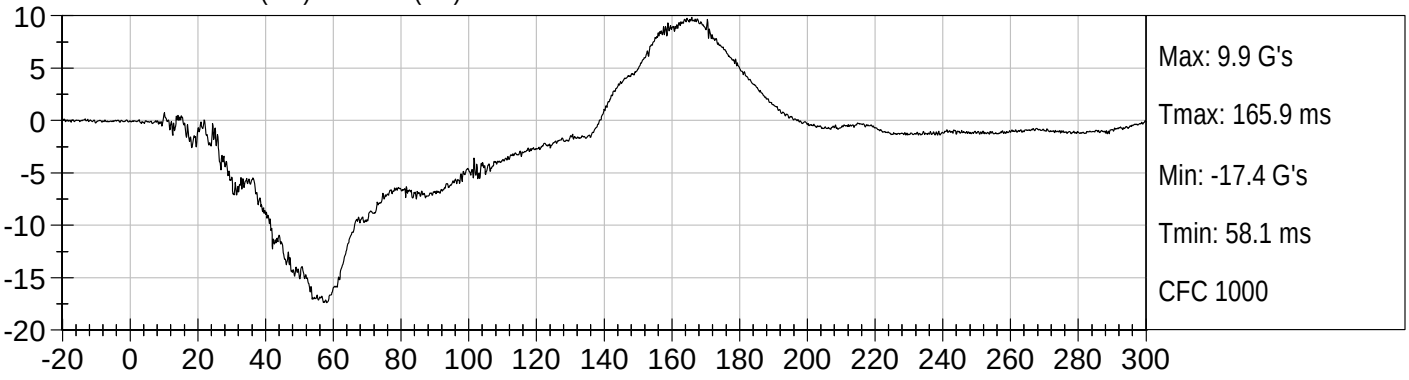
Left MDB Contact Switch

Right MDB Contact Switch

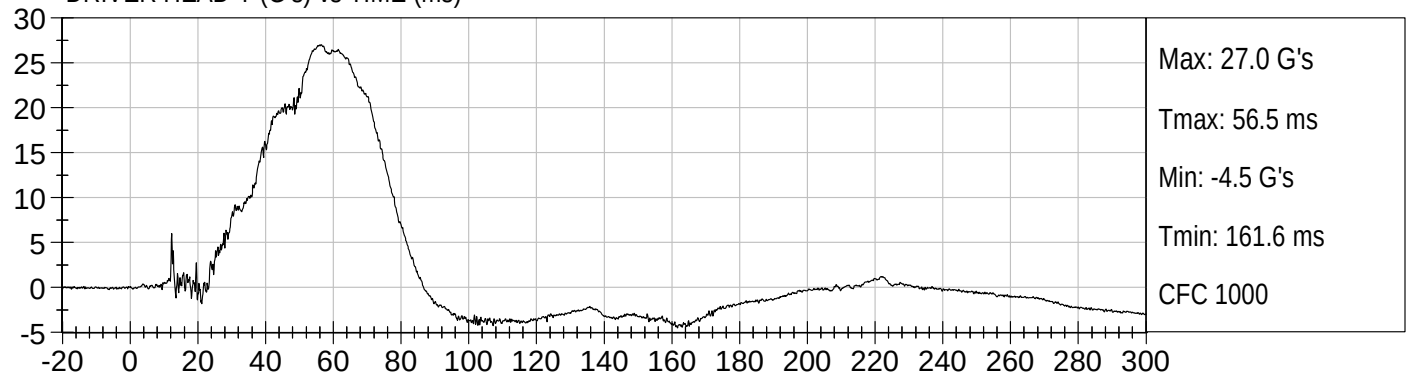
55/28 km/h 90° NCAP MDB Side Impact
2013 Toyota Avalon - YD5105

Test Date: 01/10/2013
Speed: 38.7 mph (62.3 km/h)

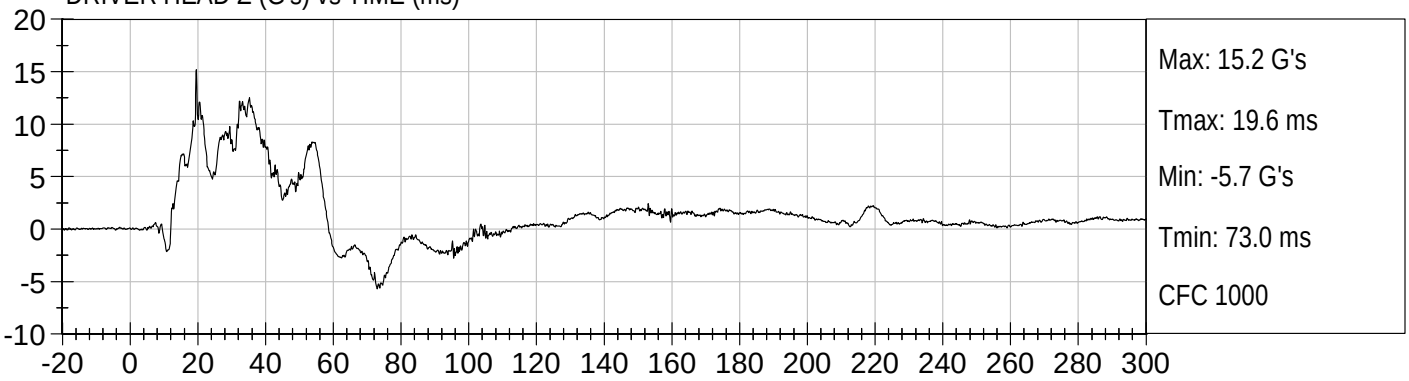
DRIVER HEAD X (G's) vs TIME (ms)



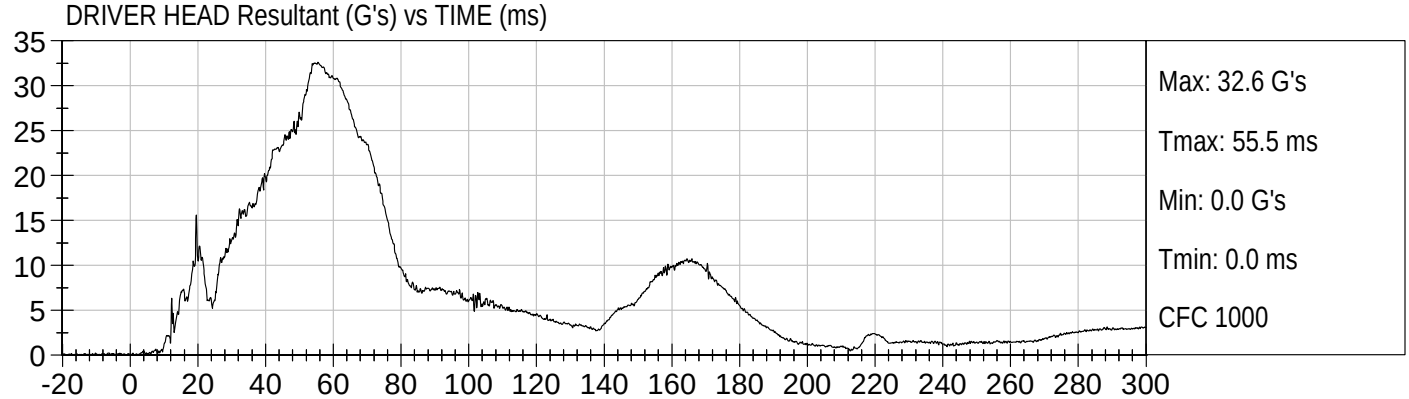
DRIVER HEAD Y (G's) vs TIME (ms)



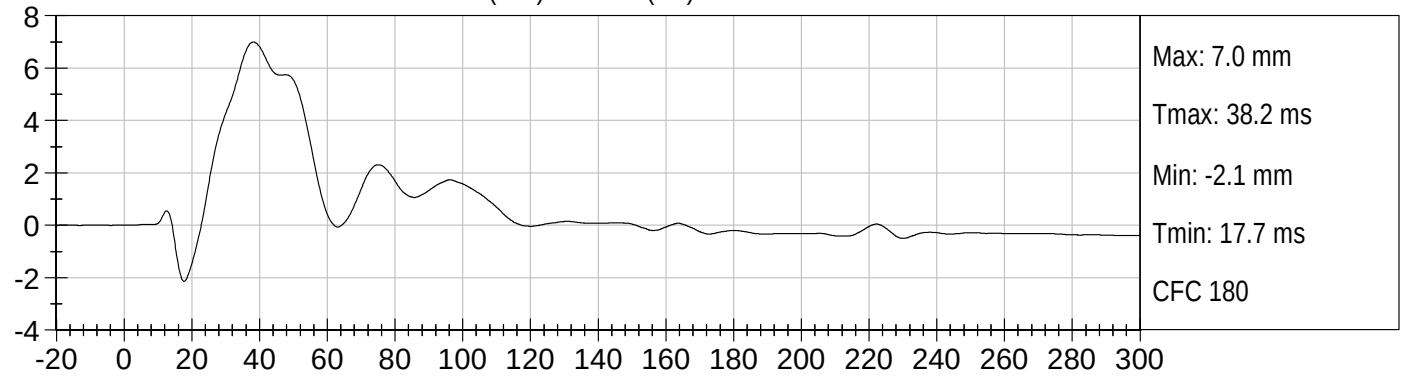
DRIVER HEAD Z (G's) vs TIME (ms)



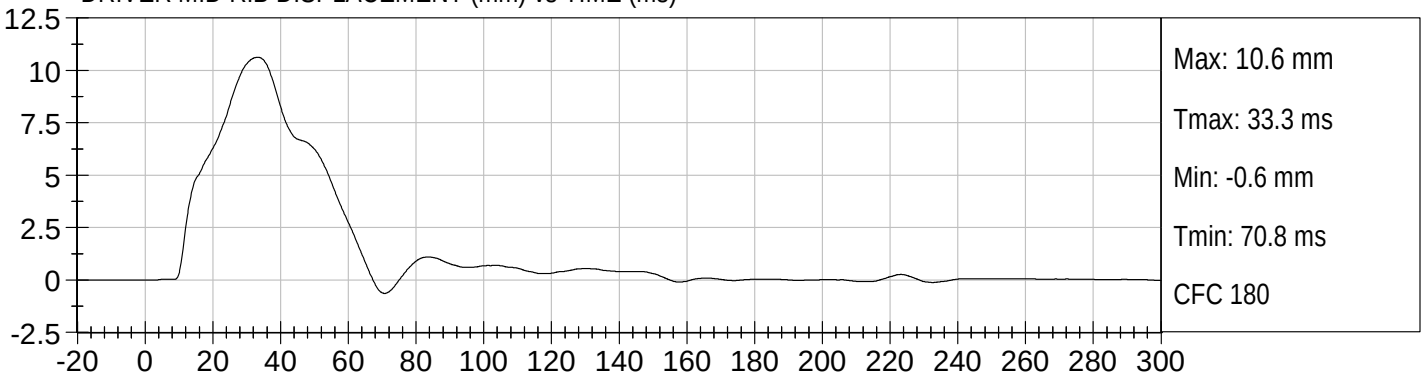
DRIVER HEAD Resultant (G's) vs TIME (ms)



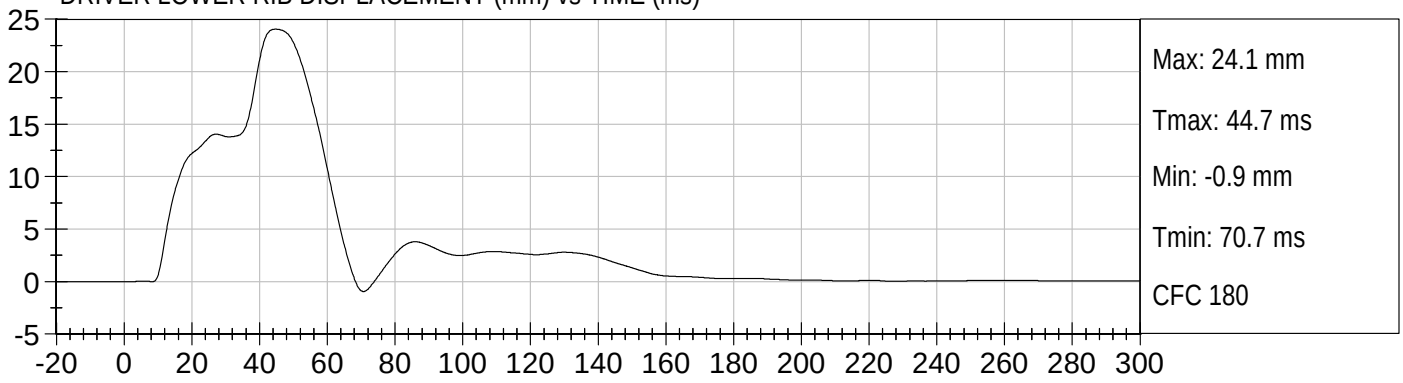
DRIVER UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



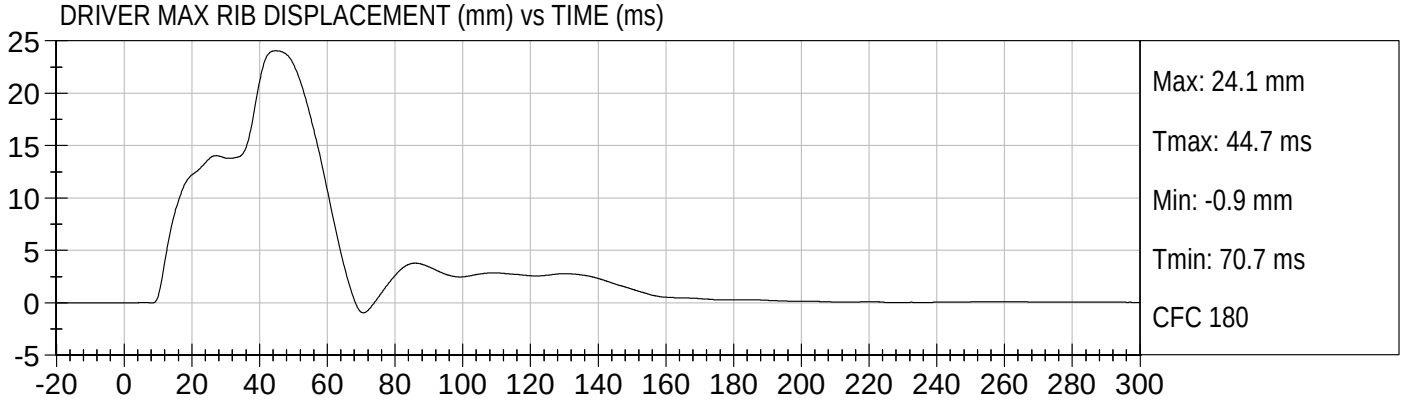
DRIVER MID RIB DISPLACEMENT (mm) vs TIME (ms)



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



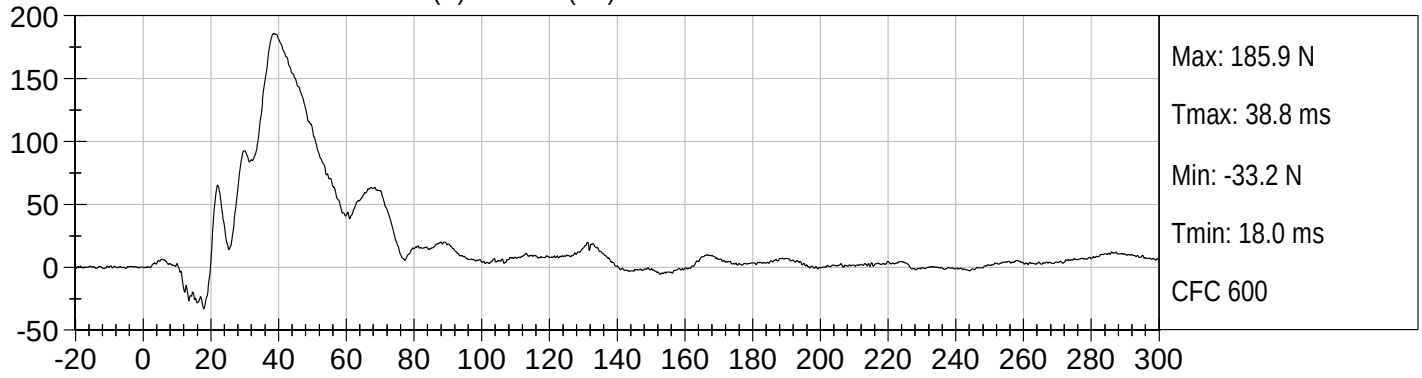
DRIVER MAX RIB DISPLACEMENT (mm) vs TIME (ms)



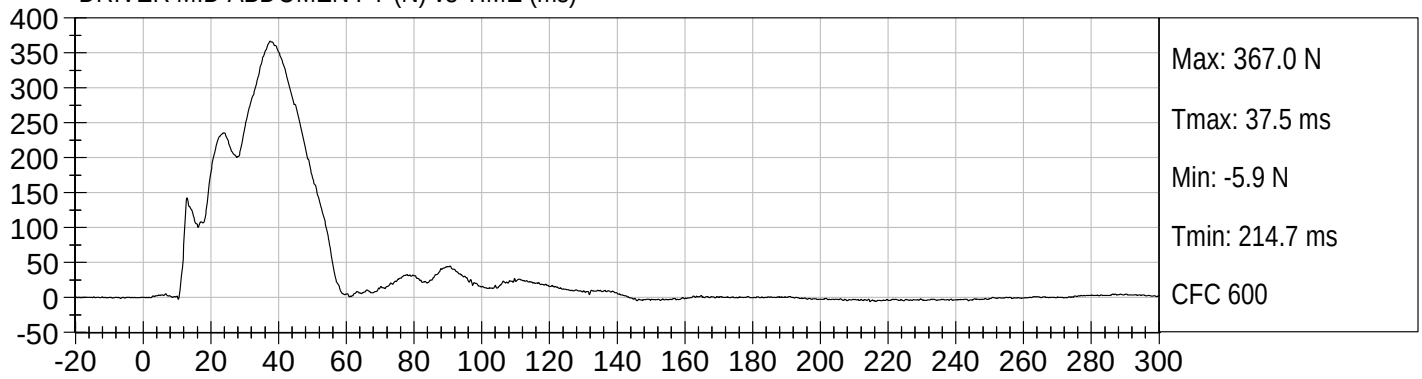
55/28 km/h 90° NCAP MDB Side Impact
2013 Toyota Avalon - YD5105

Test Date: 01/10/2013
Speed: 38.7 mph (62.3 km/h)

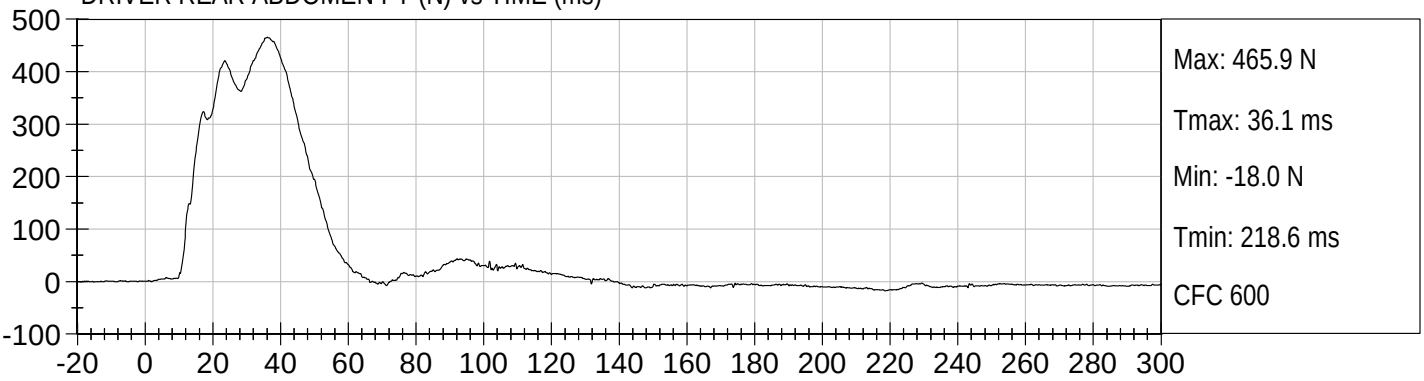
DRIVER FRONT ABDOMEN FY (N) vs TIME (ms)



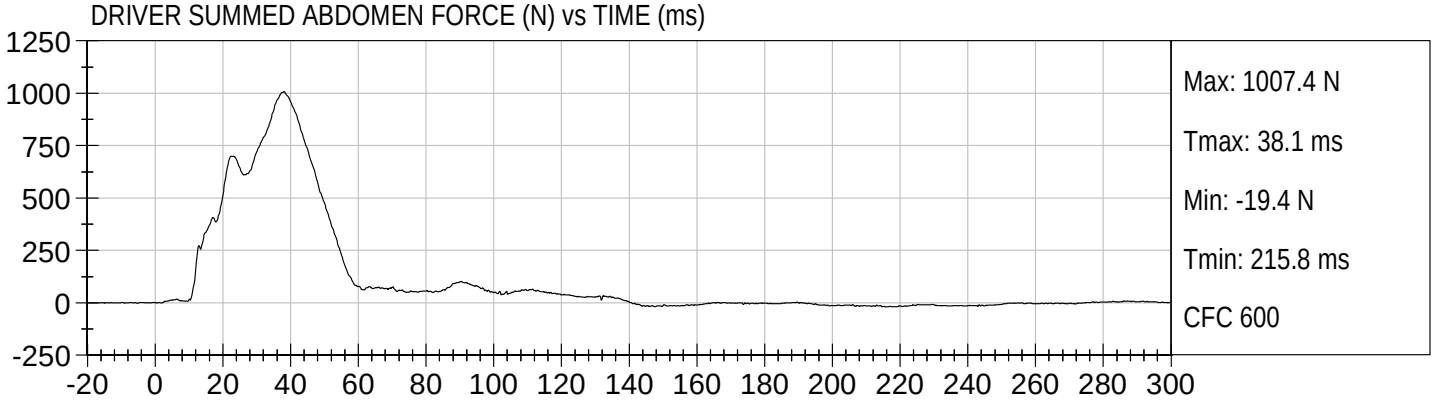
DRIVER MID ABDOMEN FY (N) vs TIME (ms)



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

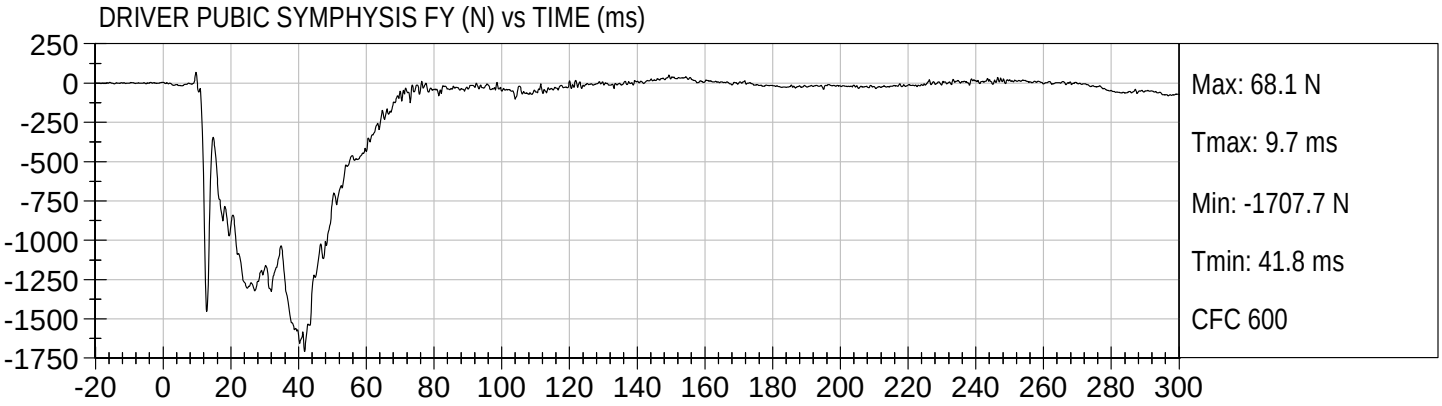


DRIVER SUMMED ABDOMEN FORCE (N) vs TIME (ms)



55/28 km/h 90° NCAP MDB Side Impact
2013 Toyota Avalon - YD5105

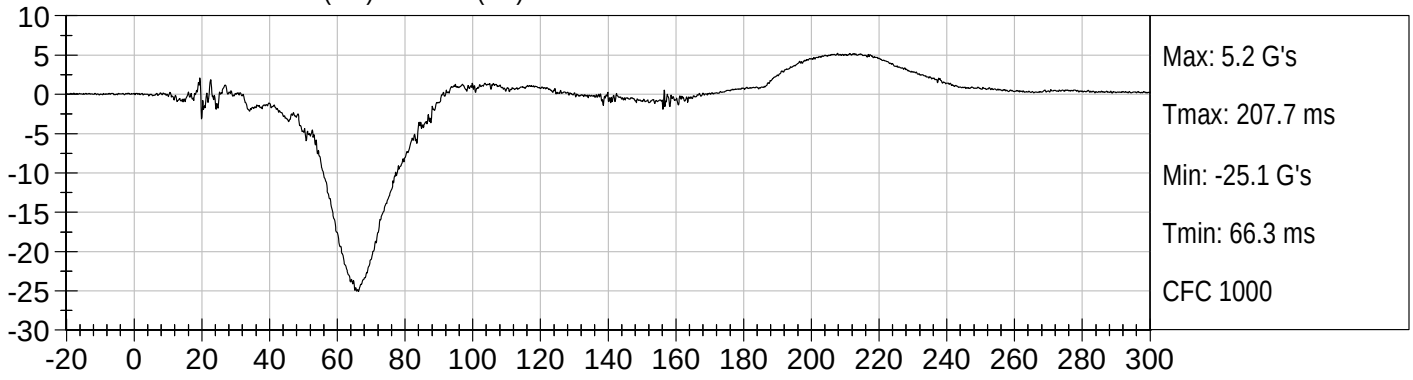
Test Date: 01/10/2013
Speed: 38.7 mph (62.3 km/h)



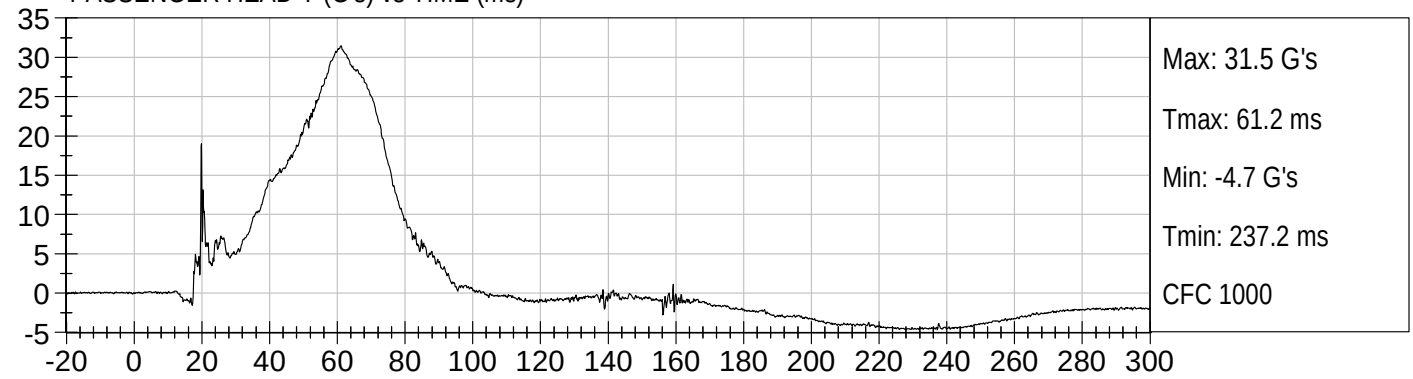
55/28 km/h 90° NCAP MDB Side Impact
2013 Toyota Avalon - YD5105

Test Date: 01/10/2013
Speed: 38.7 mph (62.3 km/h)

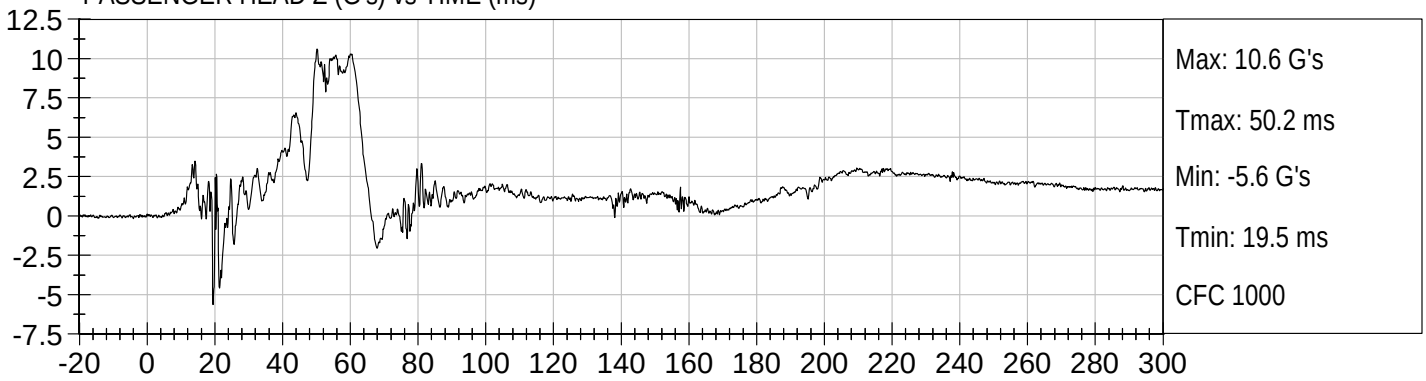
PASSENGER HEAD X (G's) vs TIME (ms)



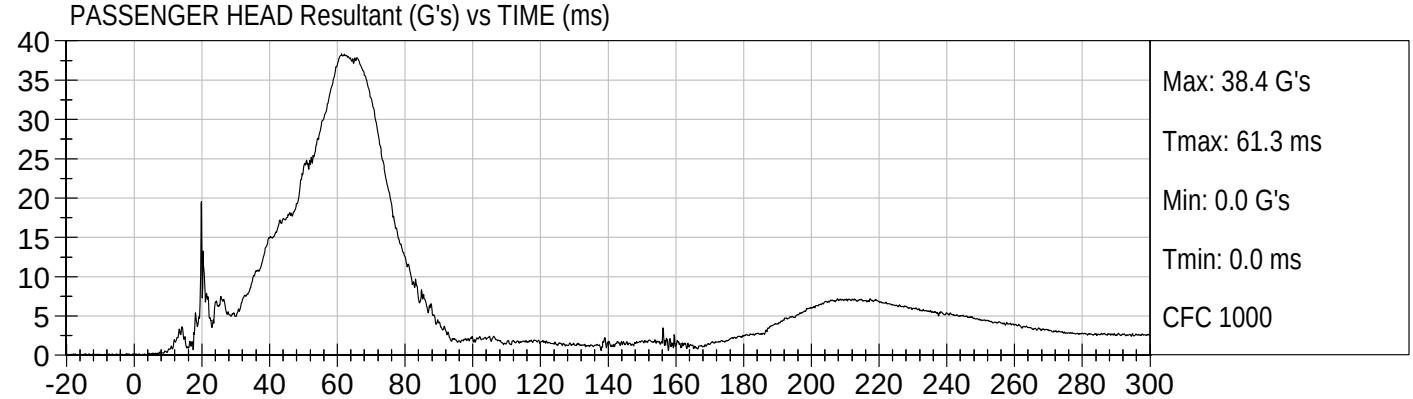
PASSENGER HEAD Y (G's) vs TIME (ms)



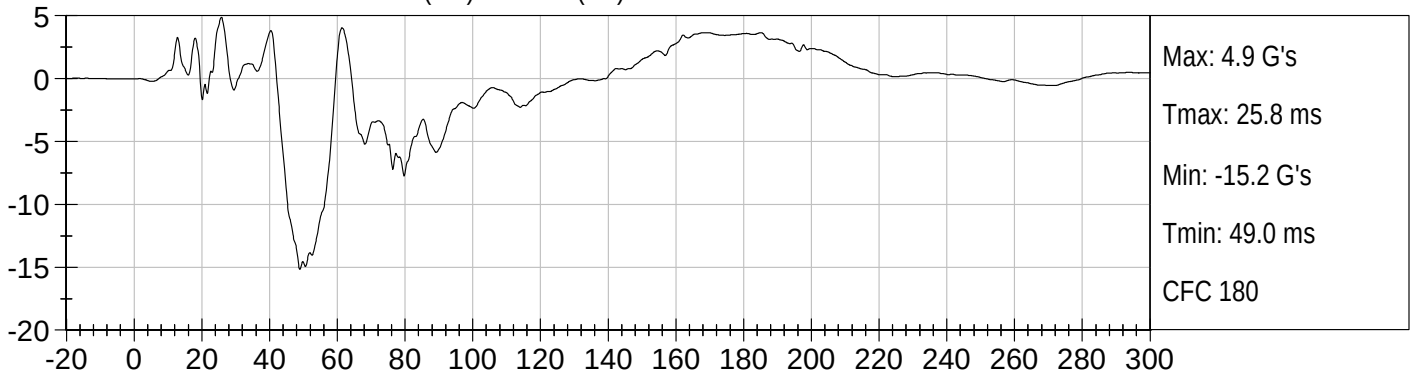
PASSENGER HEAD Z (G's) vs TIME (ms)



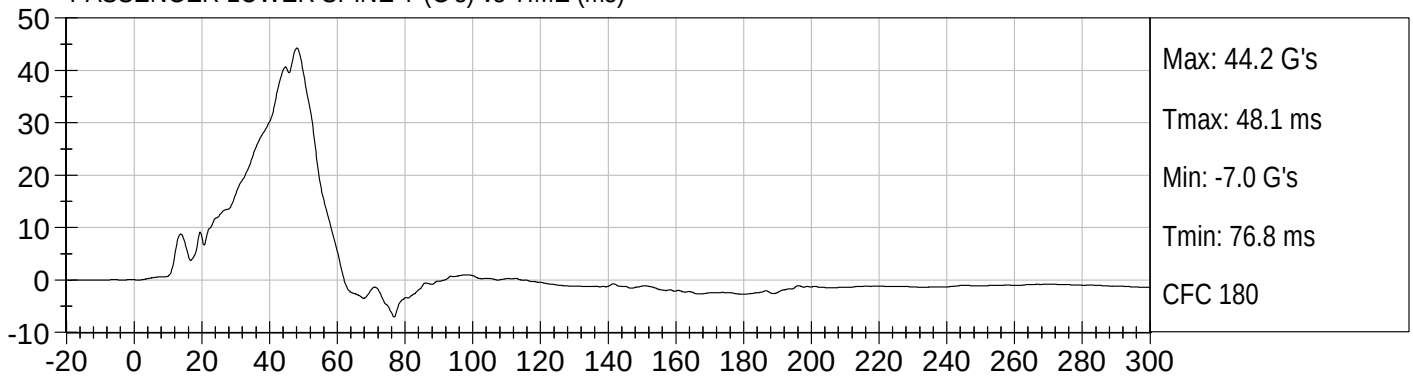
PASSENGER HEAD Resultant (G's) vs TIME (ms)



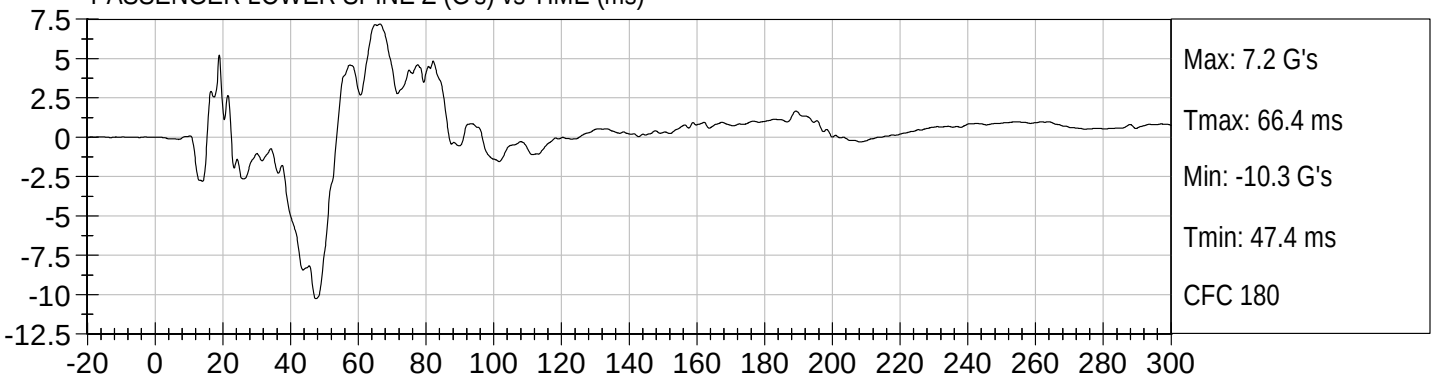
PASSENGER LOWER SPINE X (G's) vs TIME (ms)



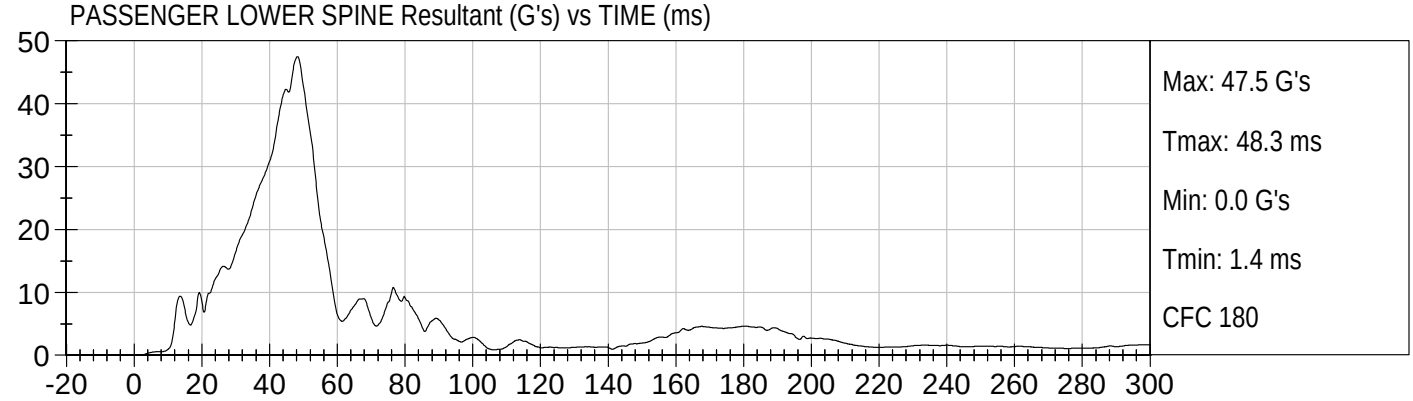
PASSENGER LOWER SPINE Y (G's) vs TIME (ms)



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



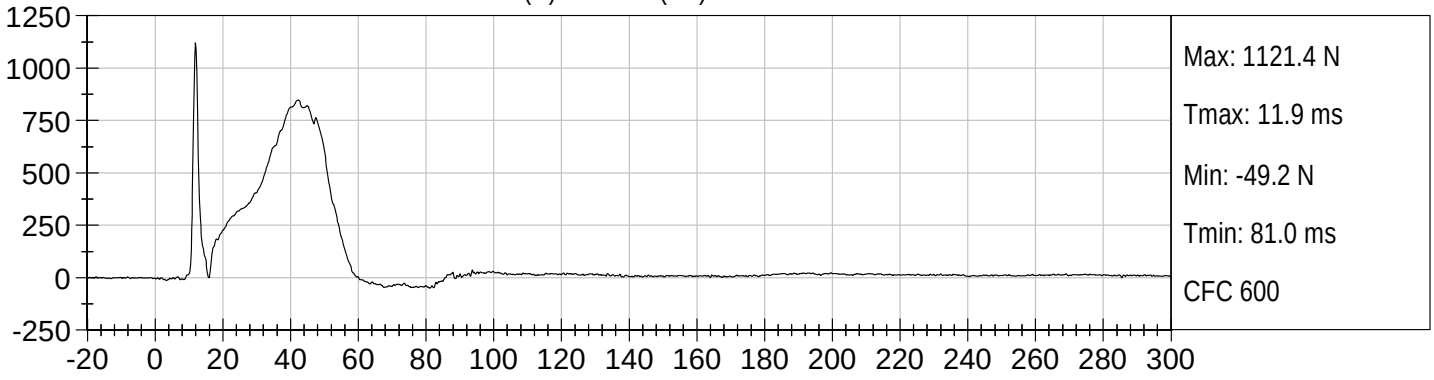
PASSENGER LOWER SPINE Resultant (G's) vs TIME (ms)



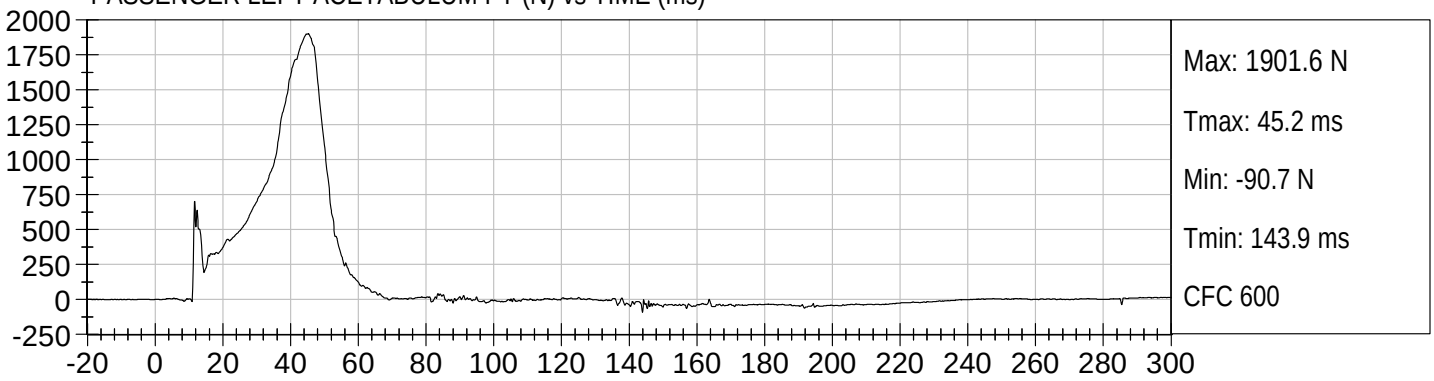
55/28 km/h 90° NCAP MDB Side Impact
2013 Toyota Avalon - YD5105

Test Date: 01/10/2013
Speed: 38.7 mph (62.3 km/h)

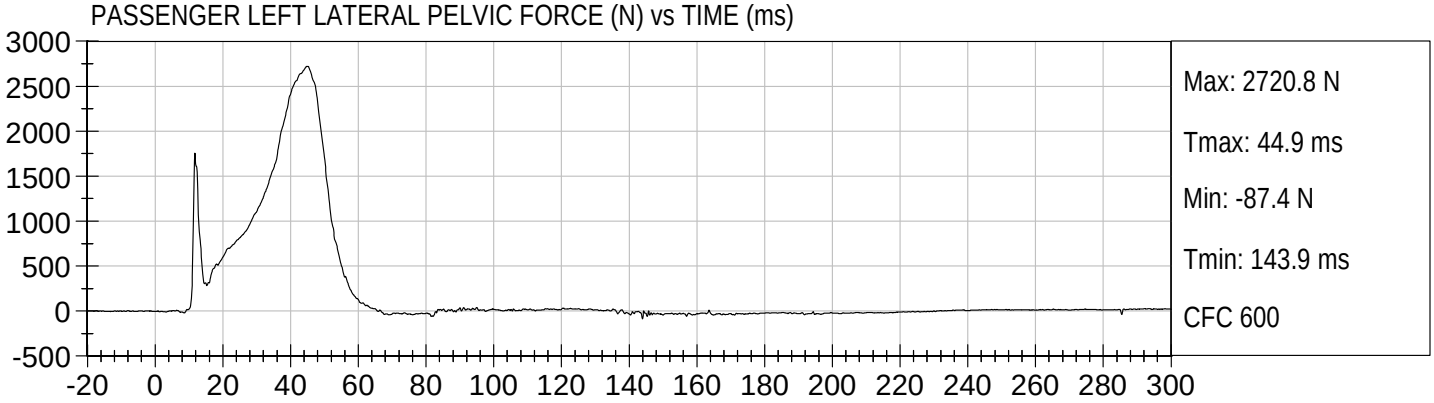
PASSENGER LEFT ILLIUM CREST FY (N) vs TIME (ms)



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



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



APPENDIX C

DUMMY 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:** D124801

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	37	Pass
Peak Resultant Acceleration	G's	125 to 155	150	Pass
Peak Longitudinal Acceleration	G's	<= +/- 15.0	-5.6	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

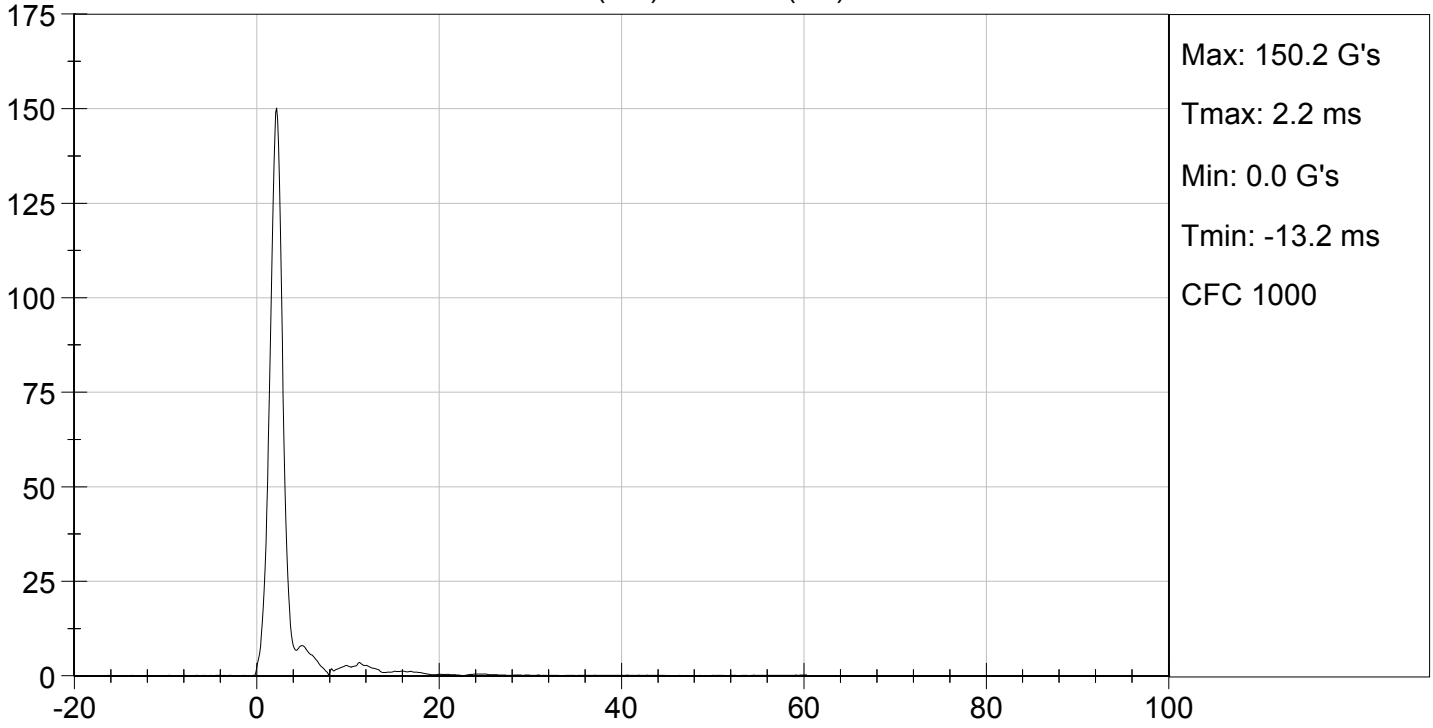
12/20/2012
Test Date

David Winkelbauer
Approved By

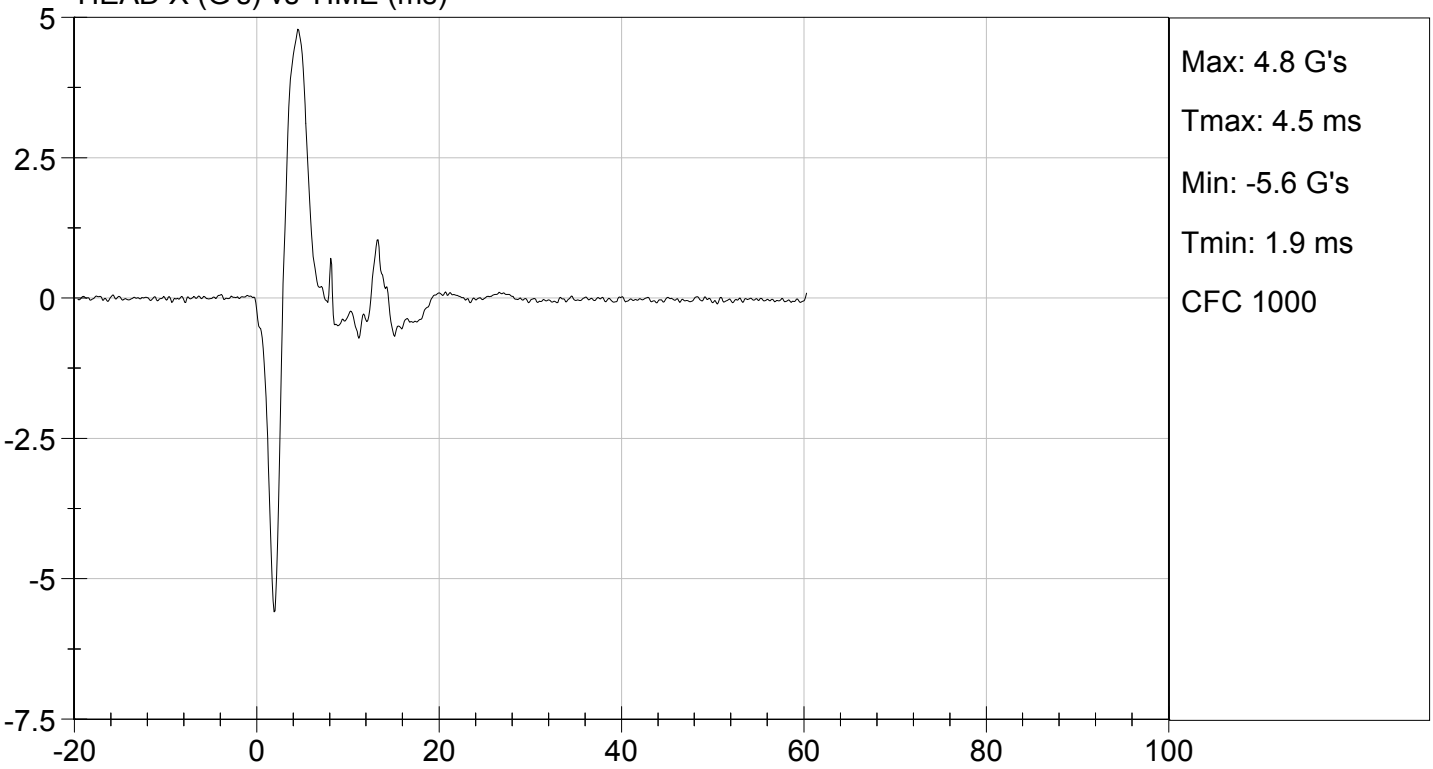
TEST DESC: HEAD DROP

TEST DATE: 12/20/2012
TEST #: D124801

HEAD RESULTANT ACCELERATION (G's) vs TIME (ms)



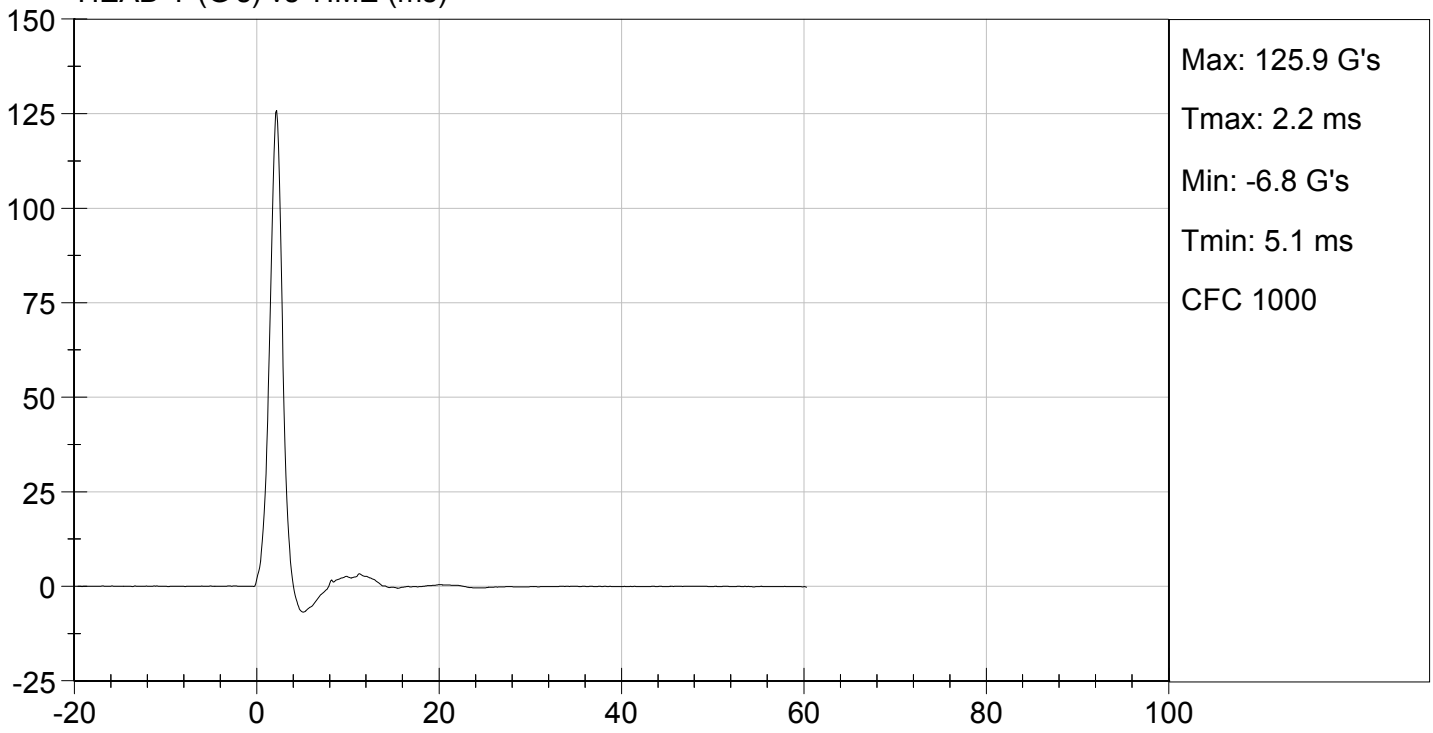
HEAD X (G's) vs TIME (ms)



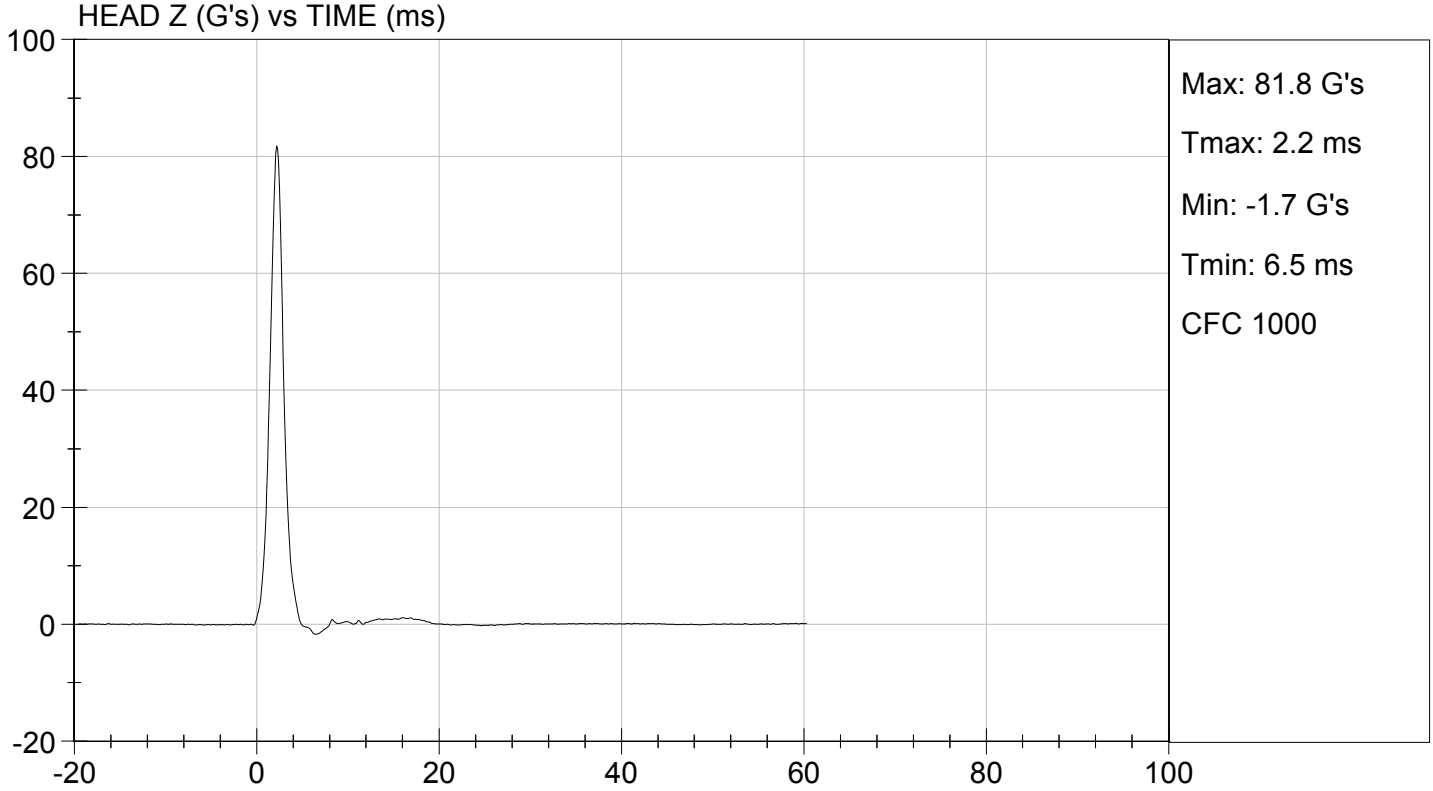
TEST DESC: HEAD DROP

TEST DATE: 12/20/2012
TEST #: D124801

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



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



MGA RESEARCH CORPORATION

NECK PENDULUM TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D124802

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
Pendulum Speed		m/s	3.30 to 3.50	3.43	Pass
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	-0.02	Pass
	3 ms	m/s	-0.25 to -0.375	-0.33	Pass
	14 ms	m/s	-3.20 to -3.70	-3.26	Pass
	17 ms	m/s	>= -3.70	-3.25	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	52.0	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	64.1	Pass
Head Rotation Decay Time to 0 Degree		ms	53.0 to 88.0	58.5	Pass
			Overall Results		Pass

Jessica Hall
Laboratory Technician

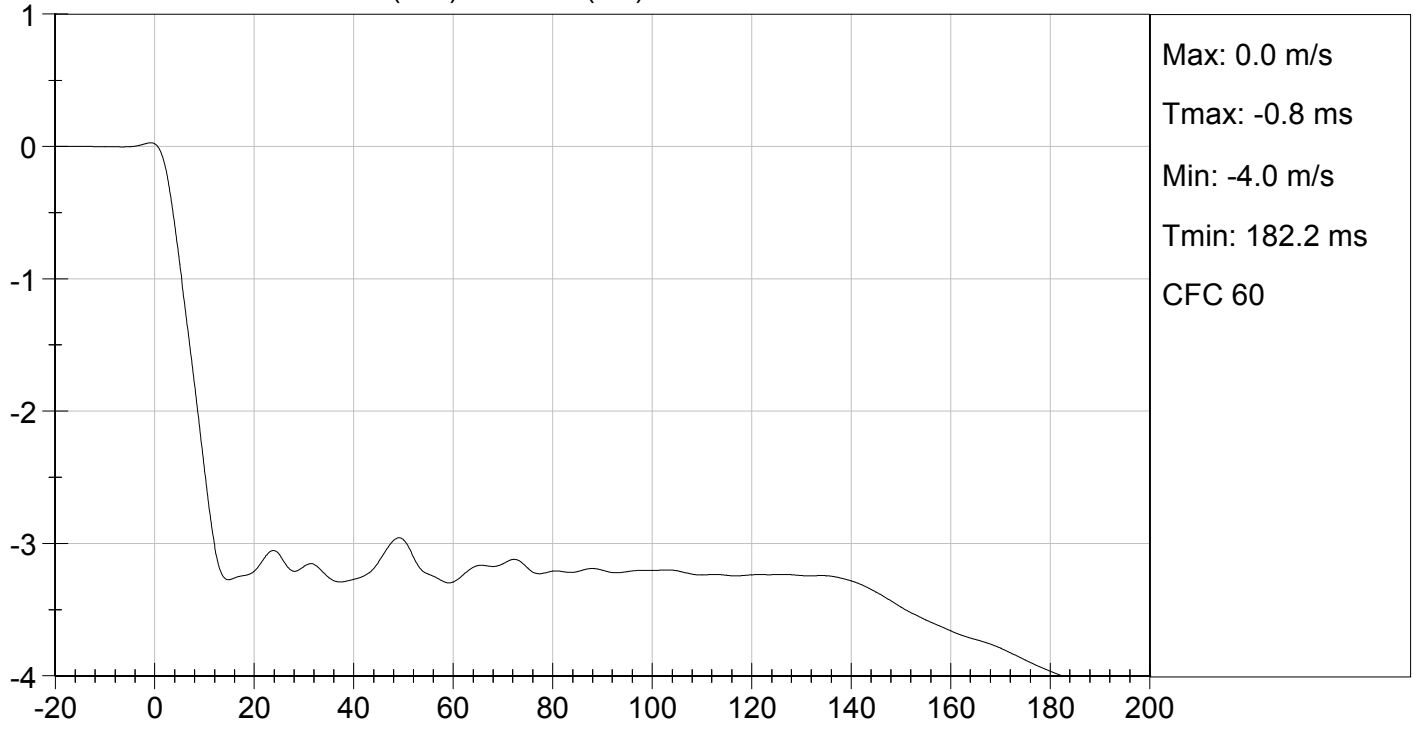
12/20/2012
Test Date

David Winkelbauer
Approved By

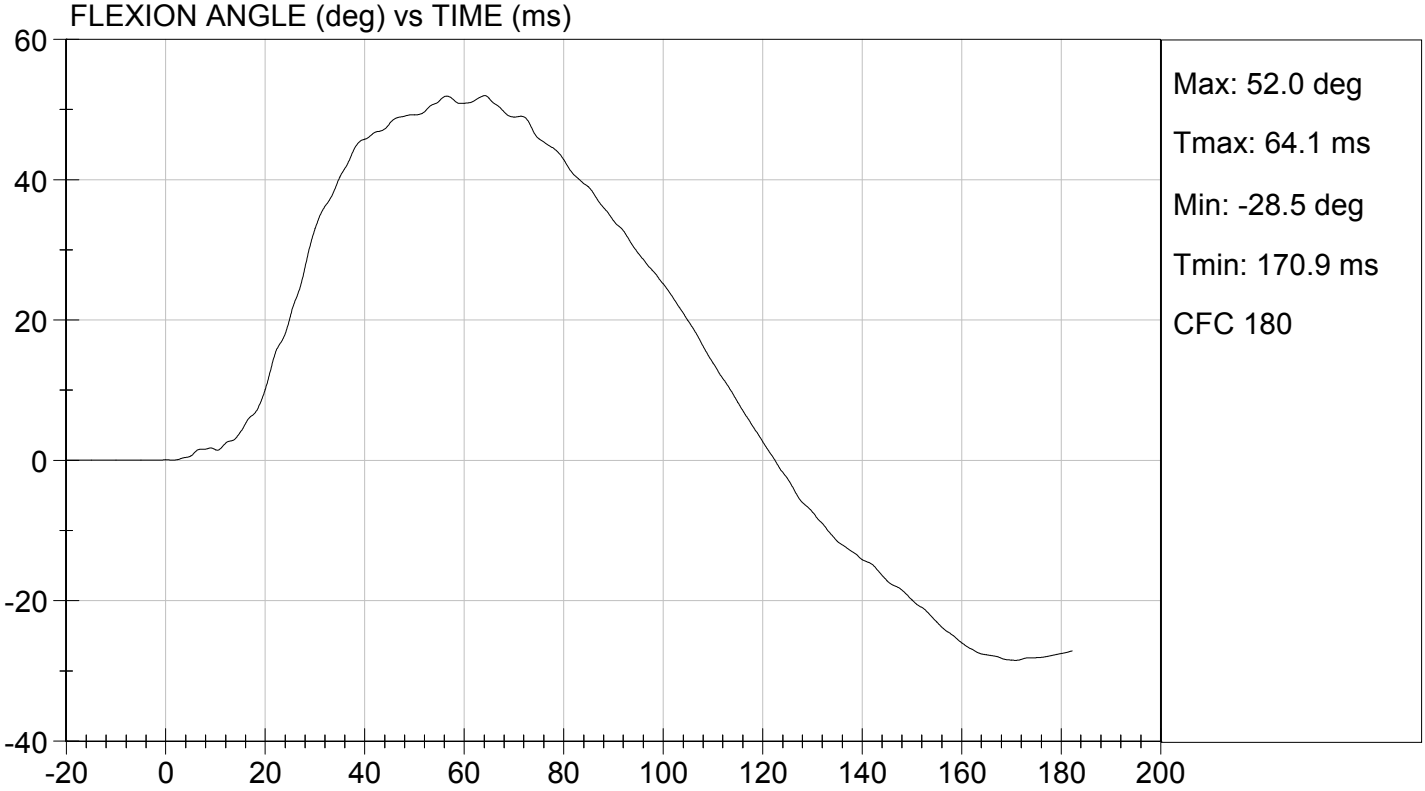
TEST DESC: NECK BENDING
VELOCITY: 11.26 ft/s, 3.43 m/s

TEST DATE: 12/20/2012
TEST #: D124802

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



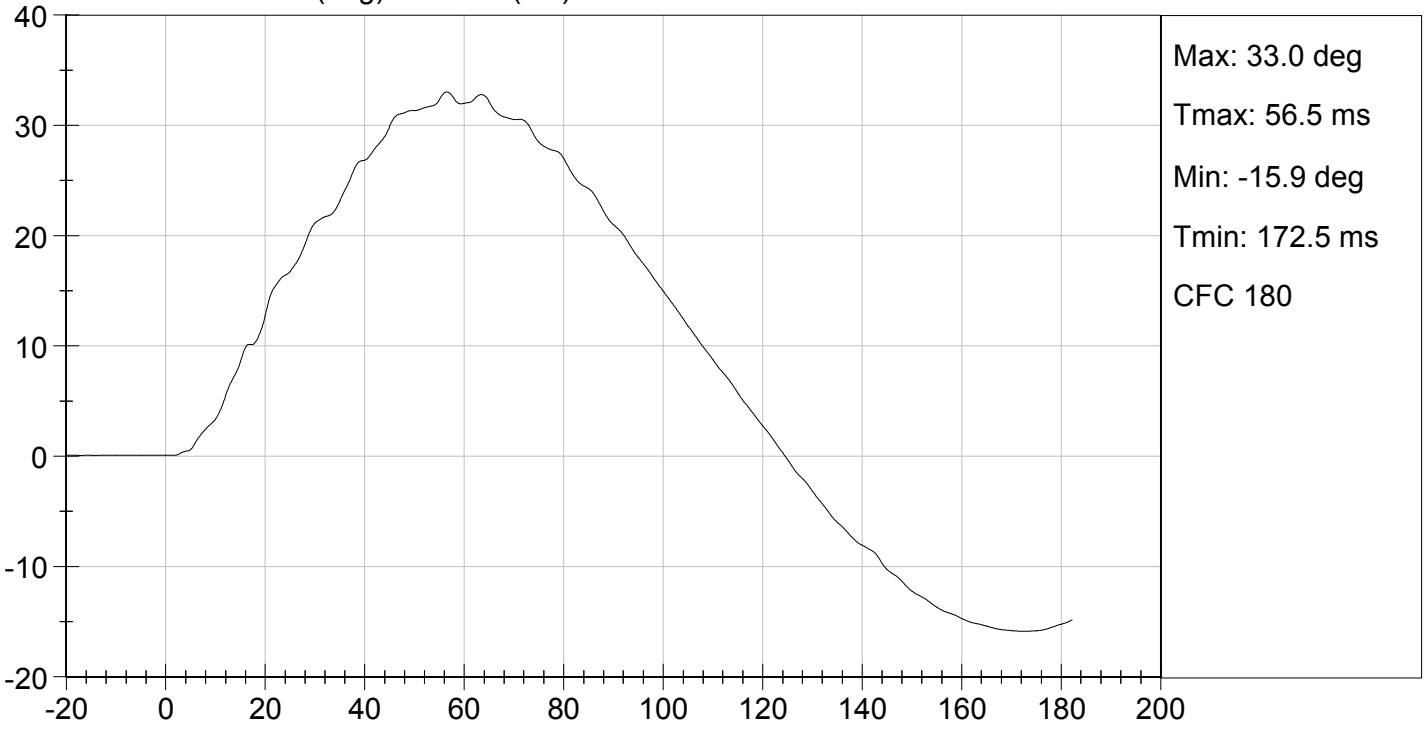
FLEXION ANGLE (deg) vs TIME (ms)



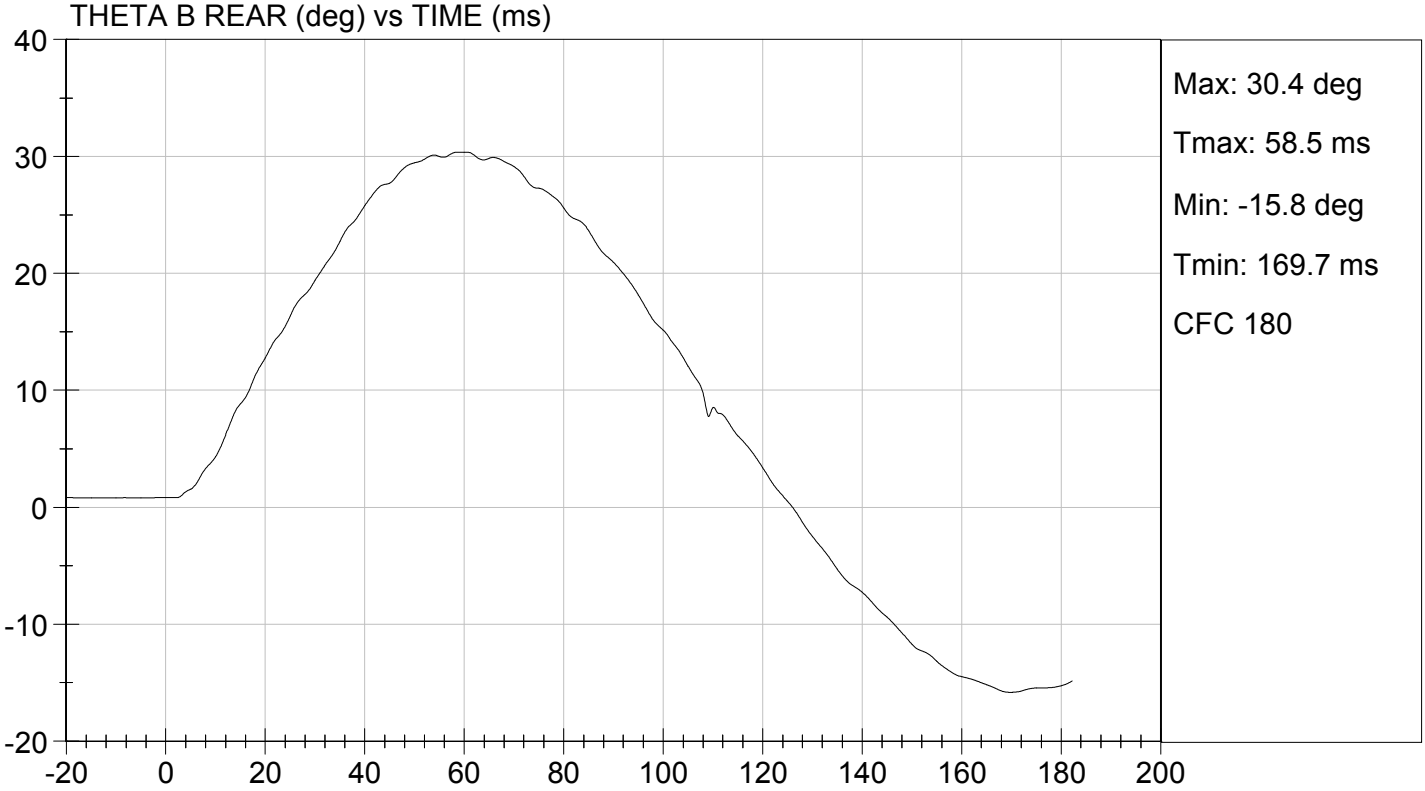
TEST DESC: NECK BENDING
VELOCITY: 11.26 ft/s, 3.43 m/s

TEST DATE: 12/20/2012
TEST #: D124802

THETA A FRONT (deg) vs TIME (ms)

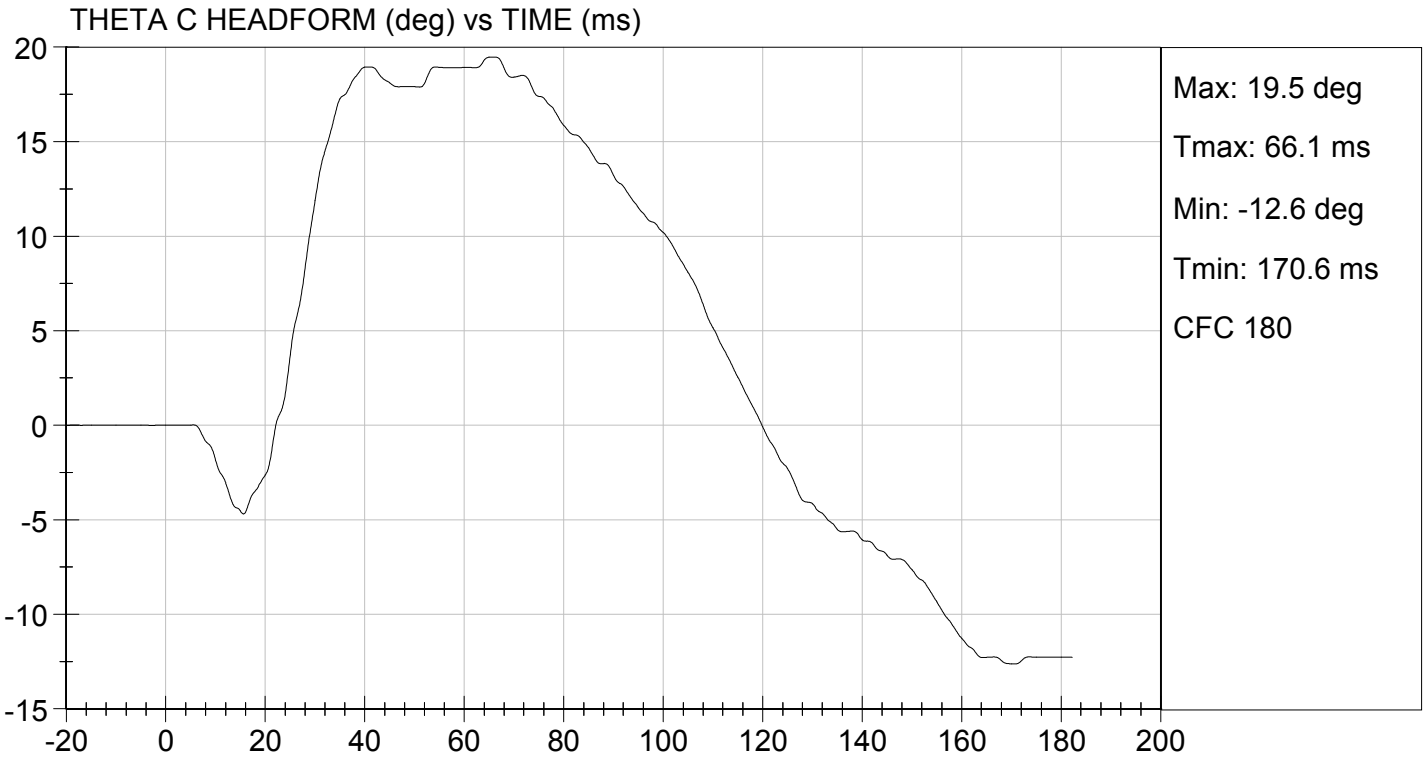


THETA B REAR (deg) vs TIME (ms)



TEST DESC: NECK BENDING
VELOCITY: 11.26 ft/s, 3.43 m/s

TEST DATE: 12/20/2012
TEST #: D124802



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D124803

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Pendulum Speed	m/s	4.20 to 4.40	4.23	Pass
Peak Impactor Acceleration	G's	7.5 to 10.5	9.9	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

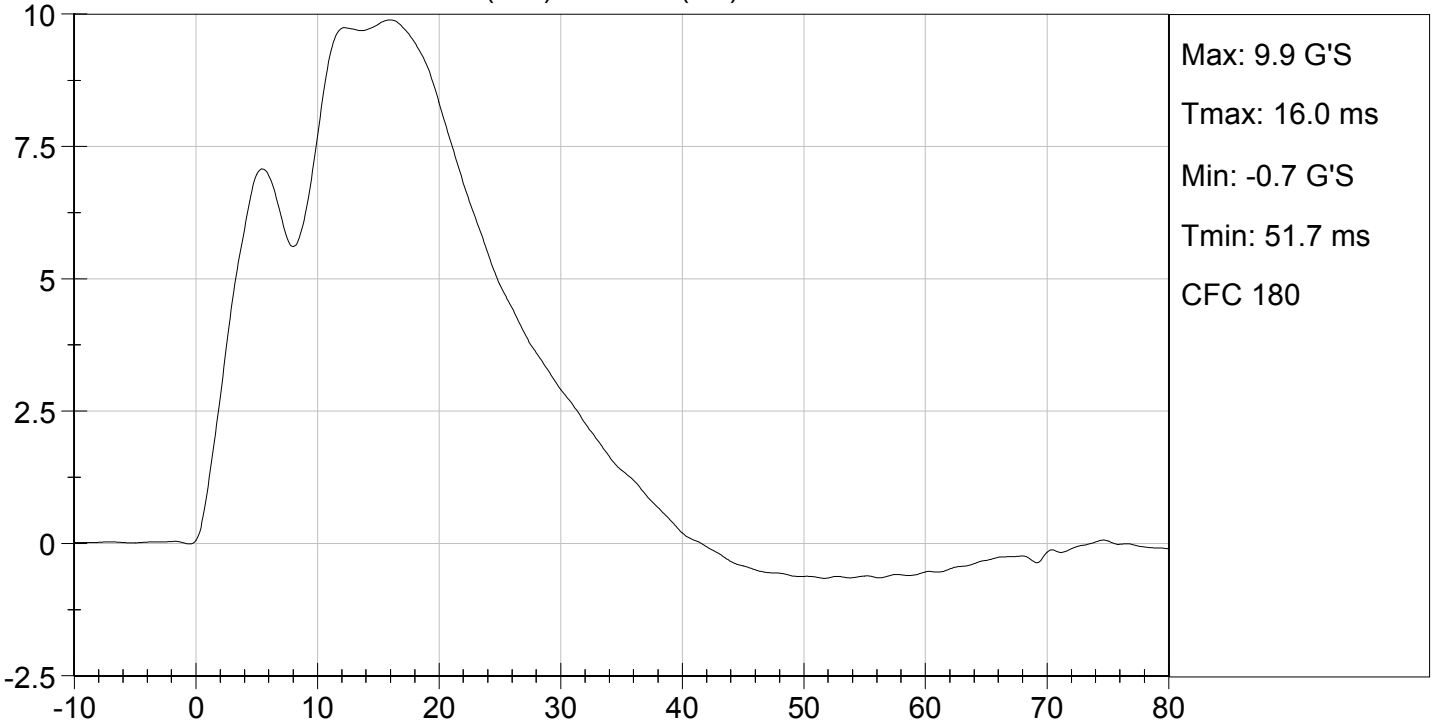
12/21/2012
Test Date

David Winkelbauer
Approved By

TEST DESC: SHOULDER IMPACT
VELOCITY: 13.89 ft/s, 4.23 m/s

TEST DATE: 12/21/2012
TEST #: D124803

IMPACTOR ACCELERATION (G'S) vs TIME (ms)



MGA RESEARCH CORPORATION

UPPER RIB TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D124804

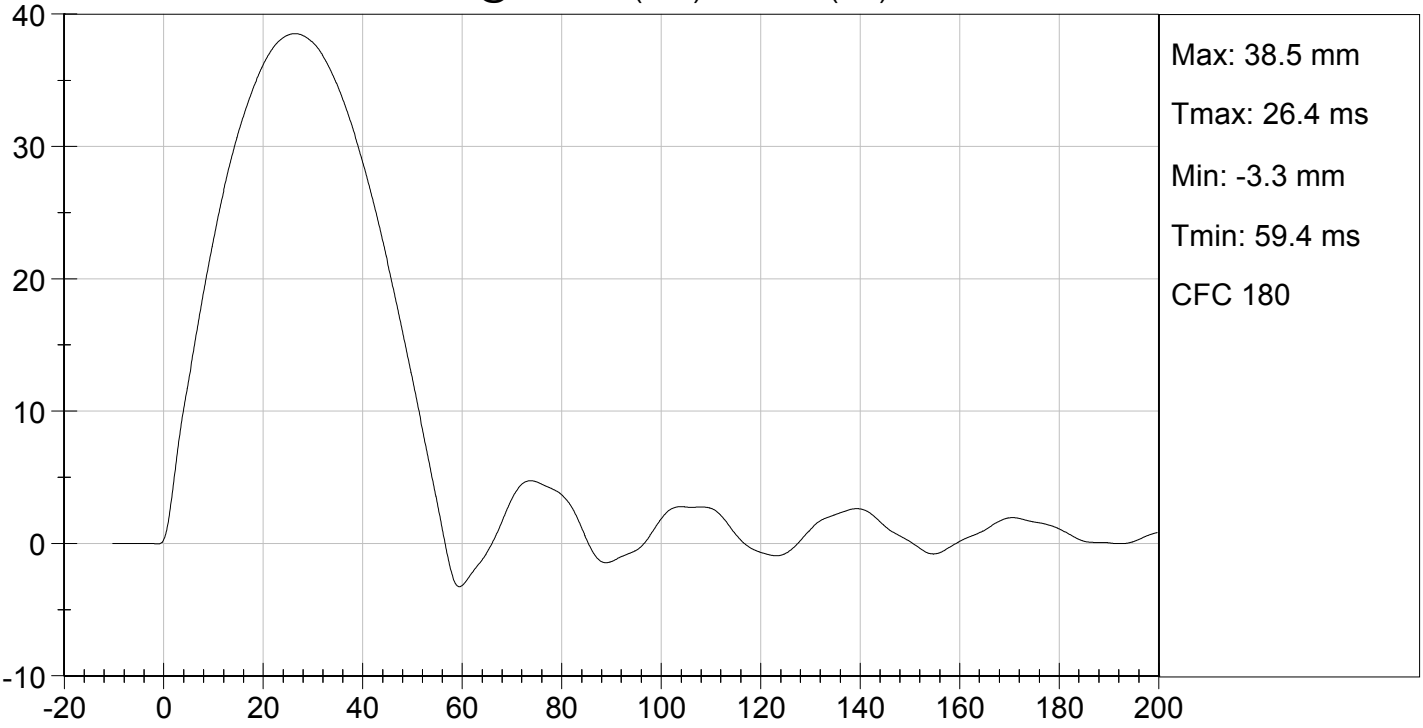
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Displacement at 459 mm	mm	36.0 to 40.0	38.5	Pass
Displacement at 815 mm	mm	46.0 to 51.0	48.0	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

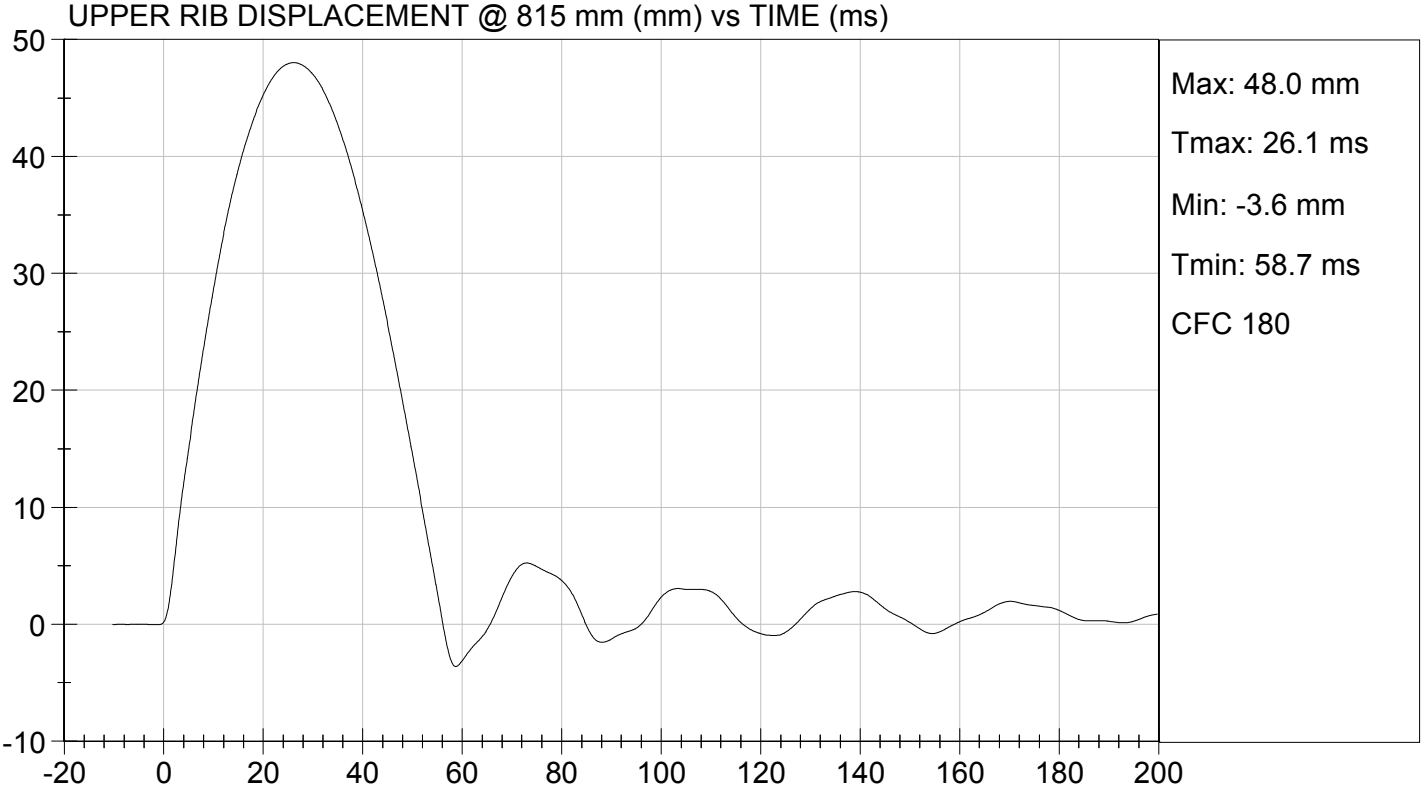
12/21/2012
Test Date

David Winkelbauer
Approved By

UPPER RIB DISPLACEMENT @ 459 mm (mm) vs TIME (ms)



UPPER RIB DISPLACEMENT @ 815 mm (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

MID RIB TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D124805

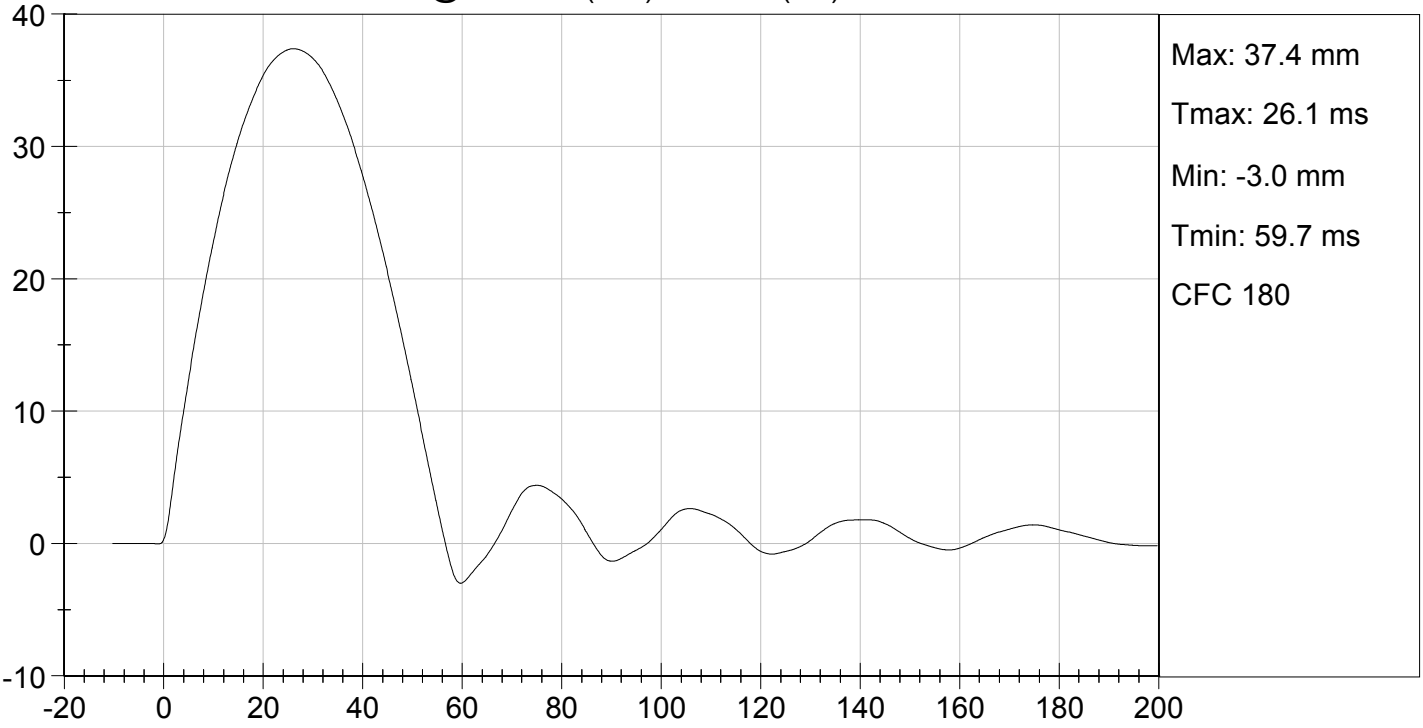
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Displacement at 459 mm	mm	36.0 to 40.0	37.4	Pass
Displacement at 815 mm	mm	46.0 to 51.0	46.9	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

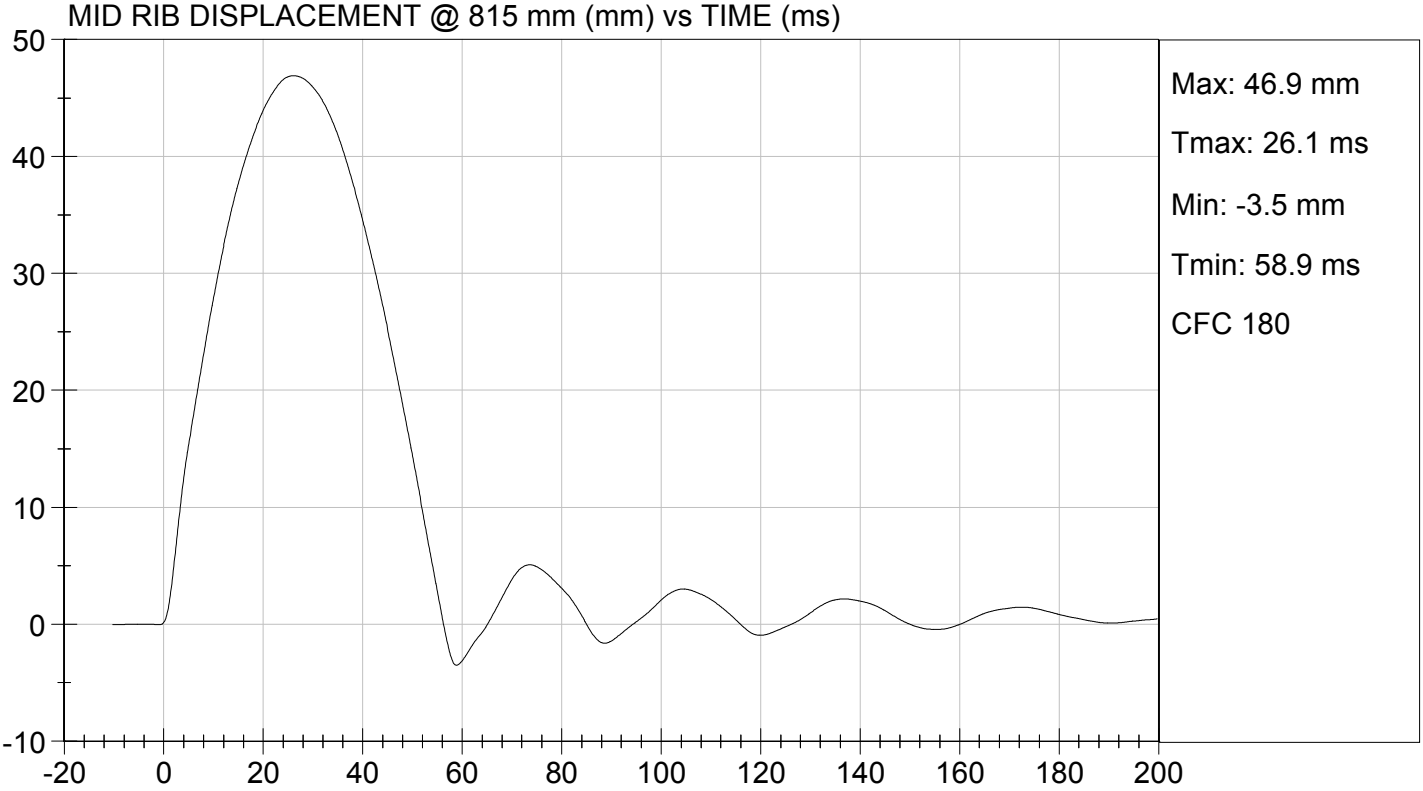
12/21/2012
Test Date

David Winkelbauer
Approved By

MID RIB DISPLACEMENT @ 459 mm (mm) vs TIME (ms)



MID RIB DISPLACEMENT @ 815 mm (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

LOWER RIB TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D124806

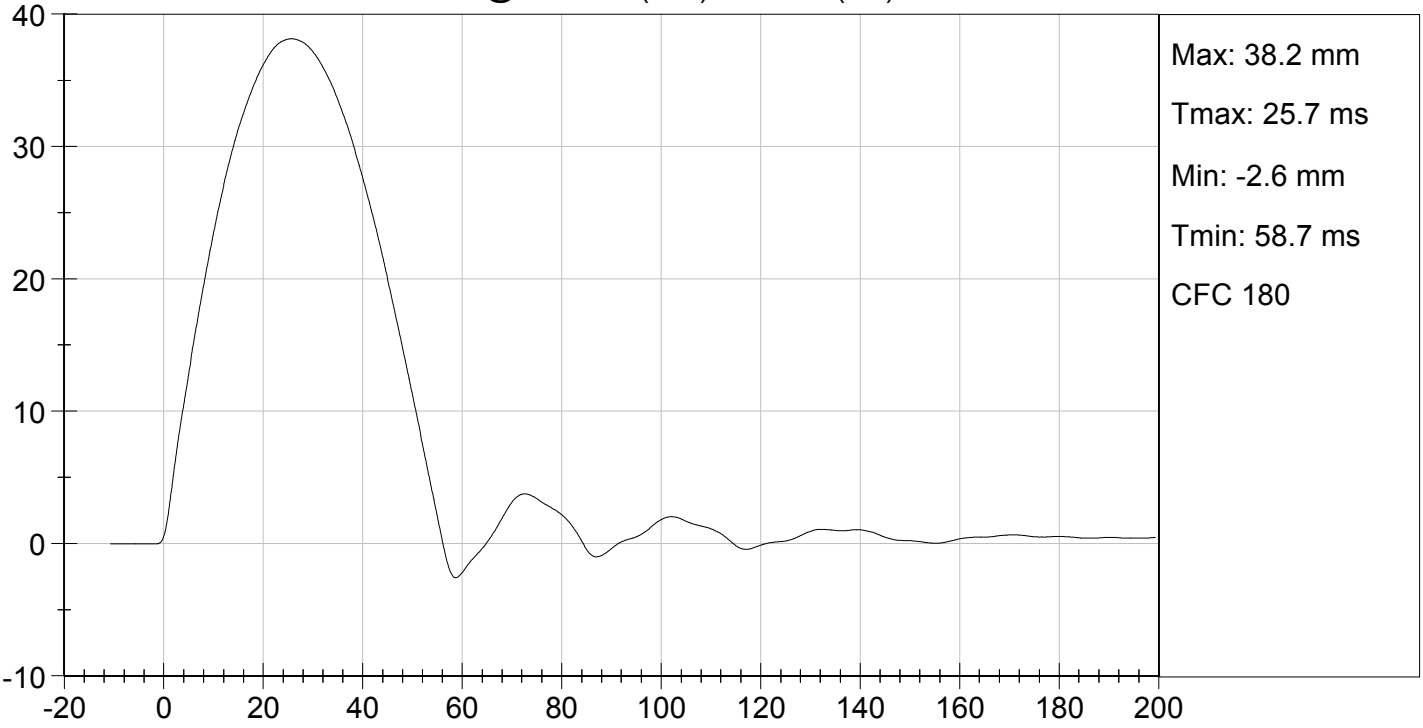
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Displacement at 459 mm	mm	36.0 to 40.0	38.2	Pass
Displacement at 815 mm	mm	46.0 to 51.0	46.9	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

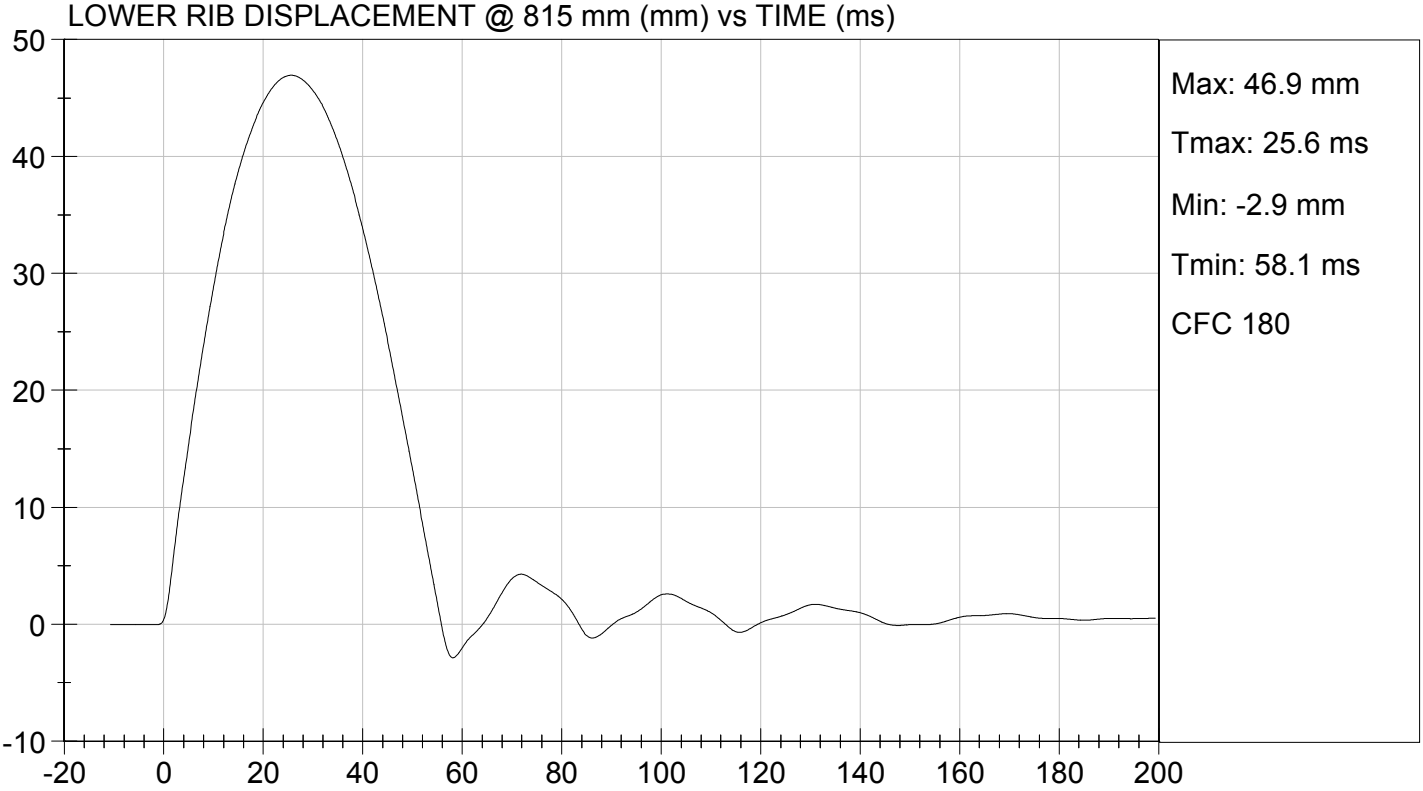
12/21/2012
Test Date

David Winkelbauer
Approved By

LOWER RIB DISPLACEMENT @ 459 mm (mm) vs TIME (ms)



LOWER RIB DISPLACEMENT @ 815 mm (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

THORAX IMPACT TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D124800

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Humidity	%	10 to 70	37	Pass
Probe Speed	m/s	5.40 to 5.60	5.59	Pass
Maximum Impactor Force (after 6 ms)	N	5100 to 6200	5138	Pass
Upper Rib Displacement	mm	34.0 to 41.0	38.1	Pass
Middle Rib Displacement	mm	37.0 to 45.0	40.2	Pass
Lower Rib Displacement	mm	37.0 to 44.0	38.8	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

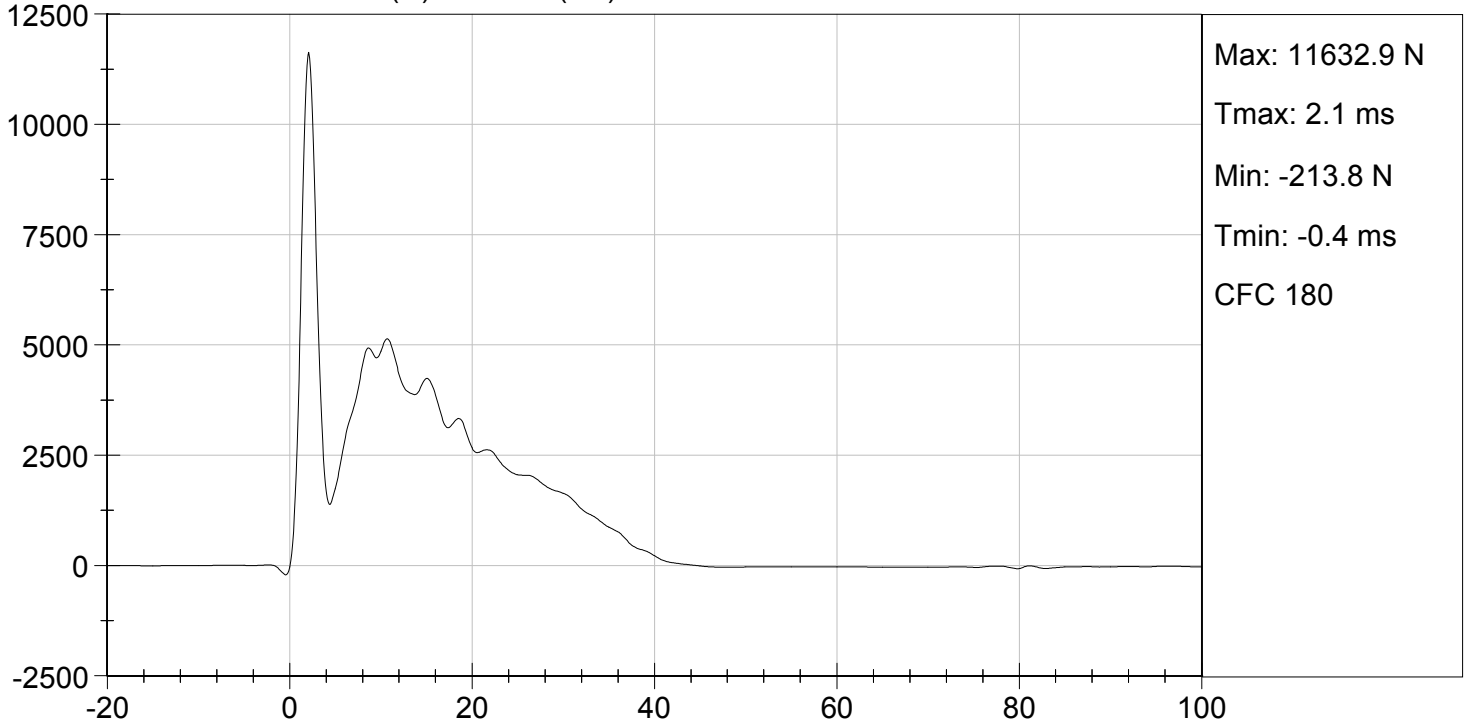
12/20/2012
Test Date

David Winkelbauer
Approved By

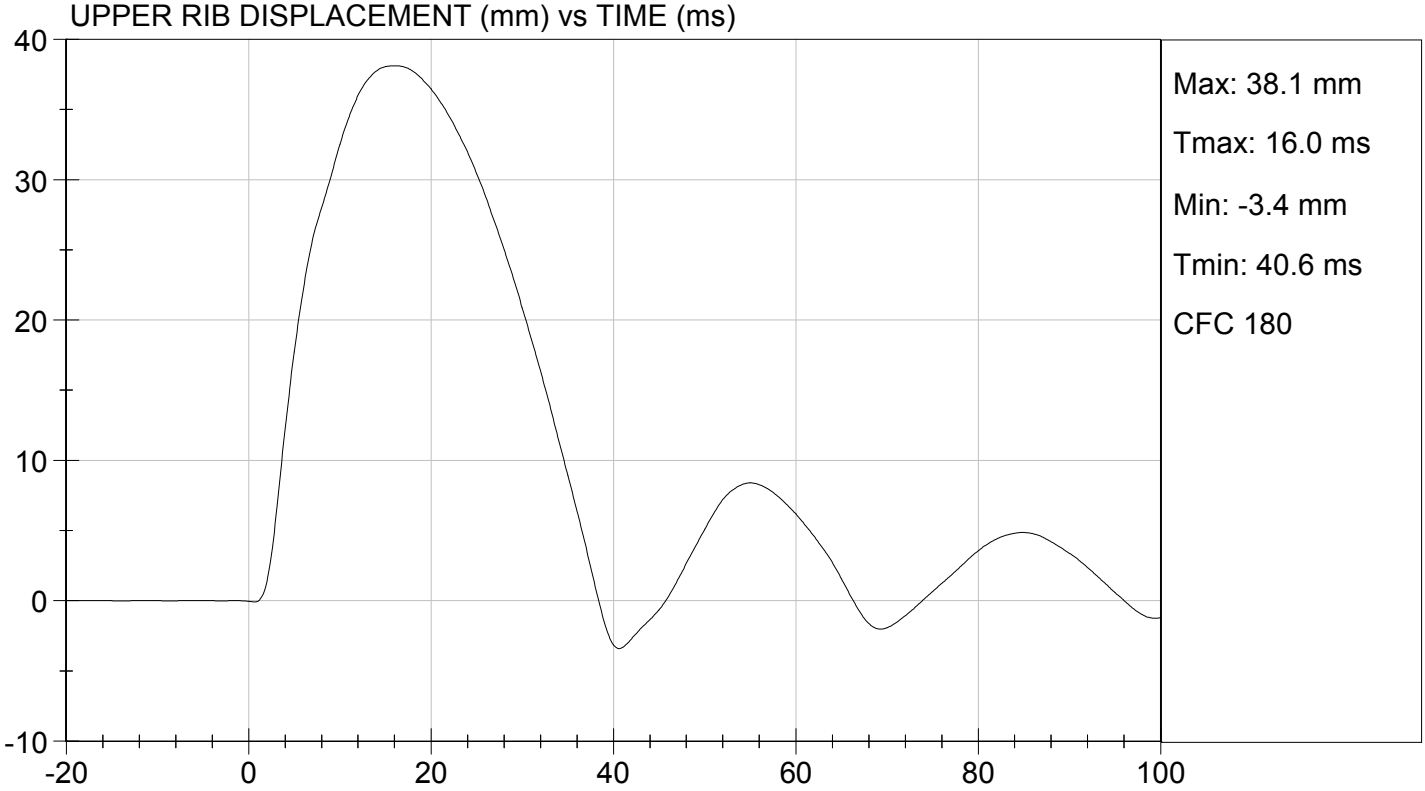
TEST DESC: THORAX IMPACT
VELOCITY: 18.35 ft/s, 5.59 m/s

TEST DATE: 12/20/2012
TEST #: D124800

IMPACTOR FORCE (N) vs TIME (ms)



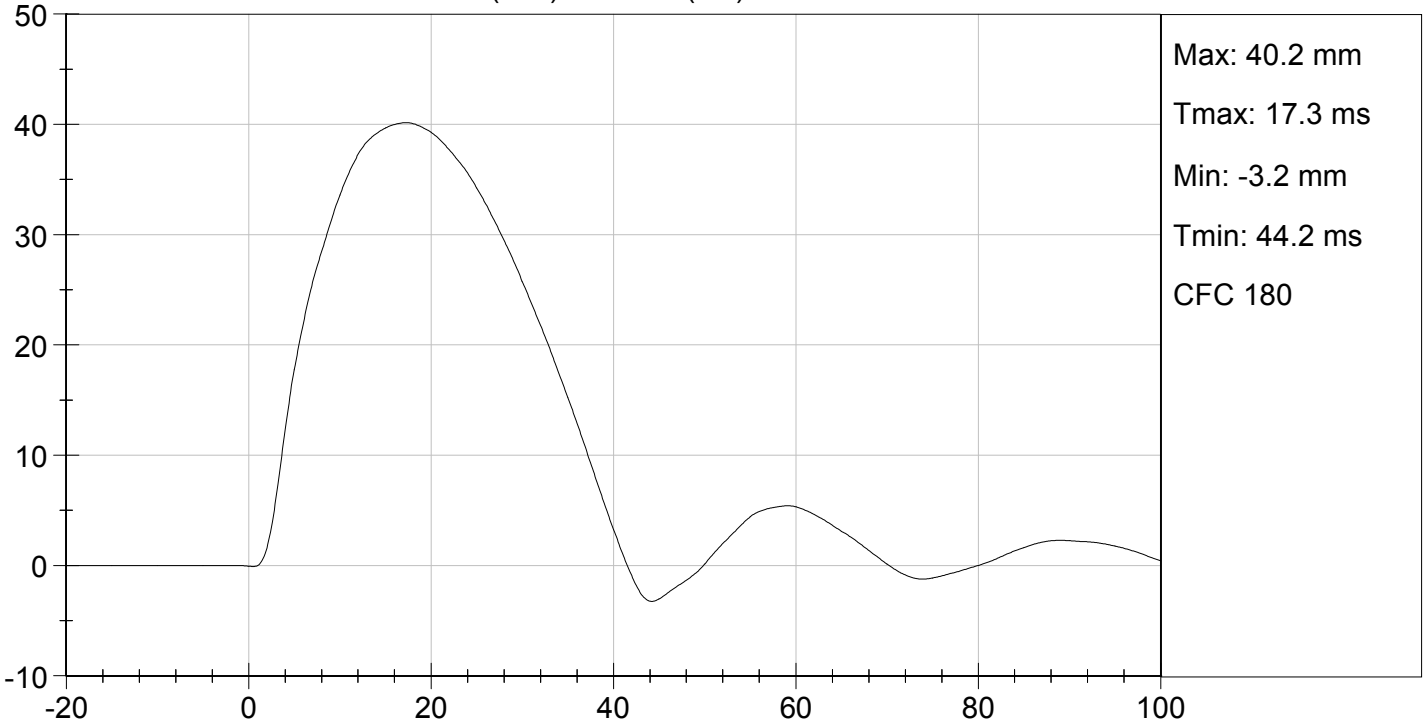
UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



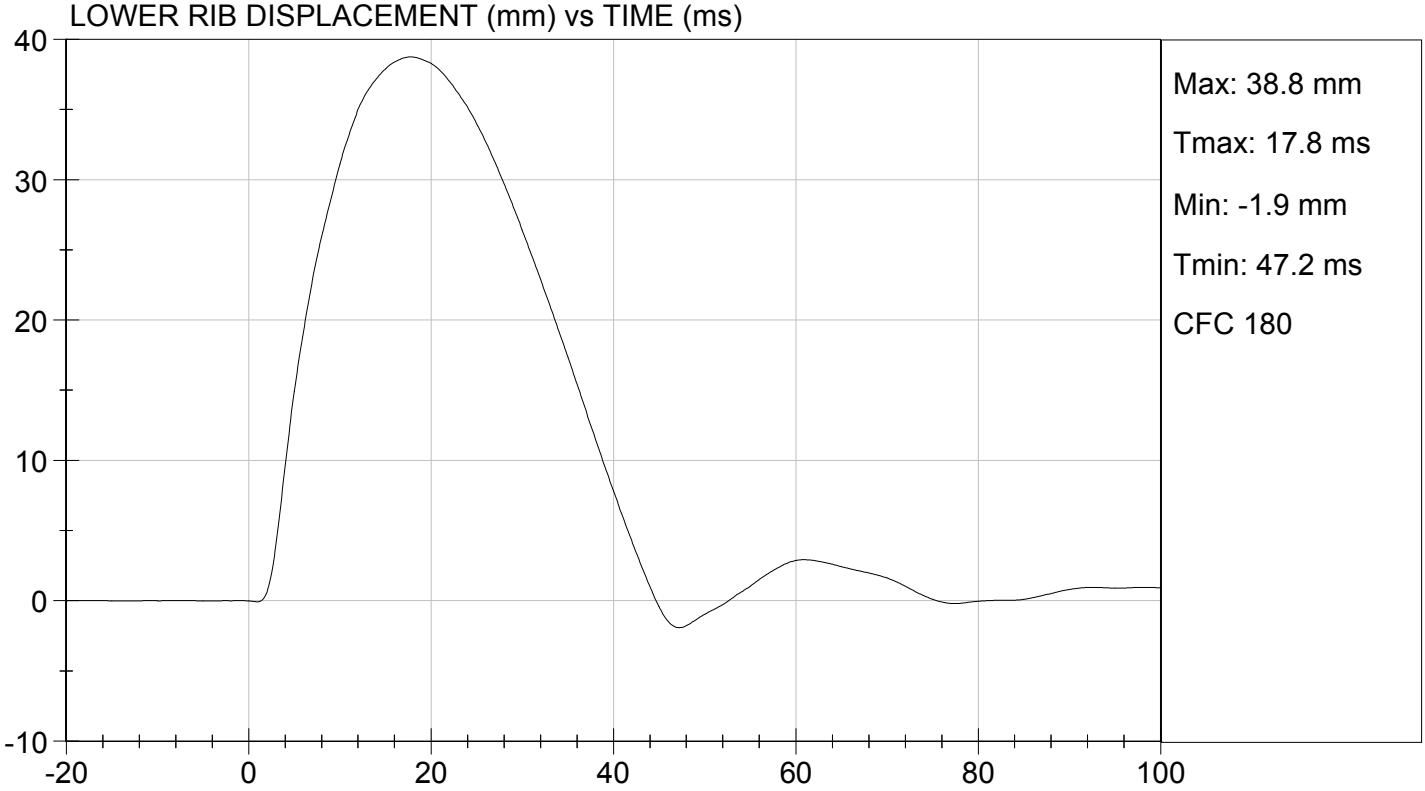
TEST DESC: THORAX IMPACT
VELOCITY: 18.35 ft/s, 5.59 m/s

TEST DATE: 12/20/2012
TEST #: D124800

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:** D124807

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	37	Pass
Probe Speed	m/s	3.90 to 4.10	4.04	Pass
Maximum Impactor Force	N	4000 to 4800	4489	Pass
Time of Maximum Impactor Force	ms	10.6 to 13.0	11.2	Pass
Maximum Total Abdomen Force	N	2200 to 2700	2542	Pass
Time of Maximum Abdomen Force	ms	10.0 to 12.3	10.9	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

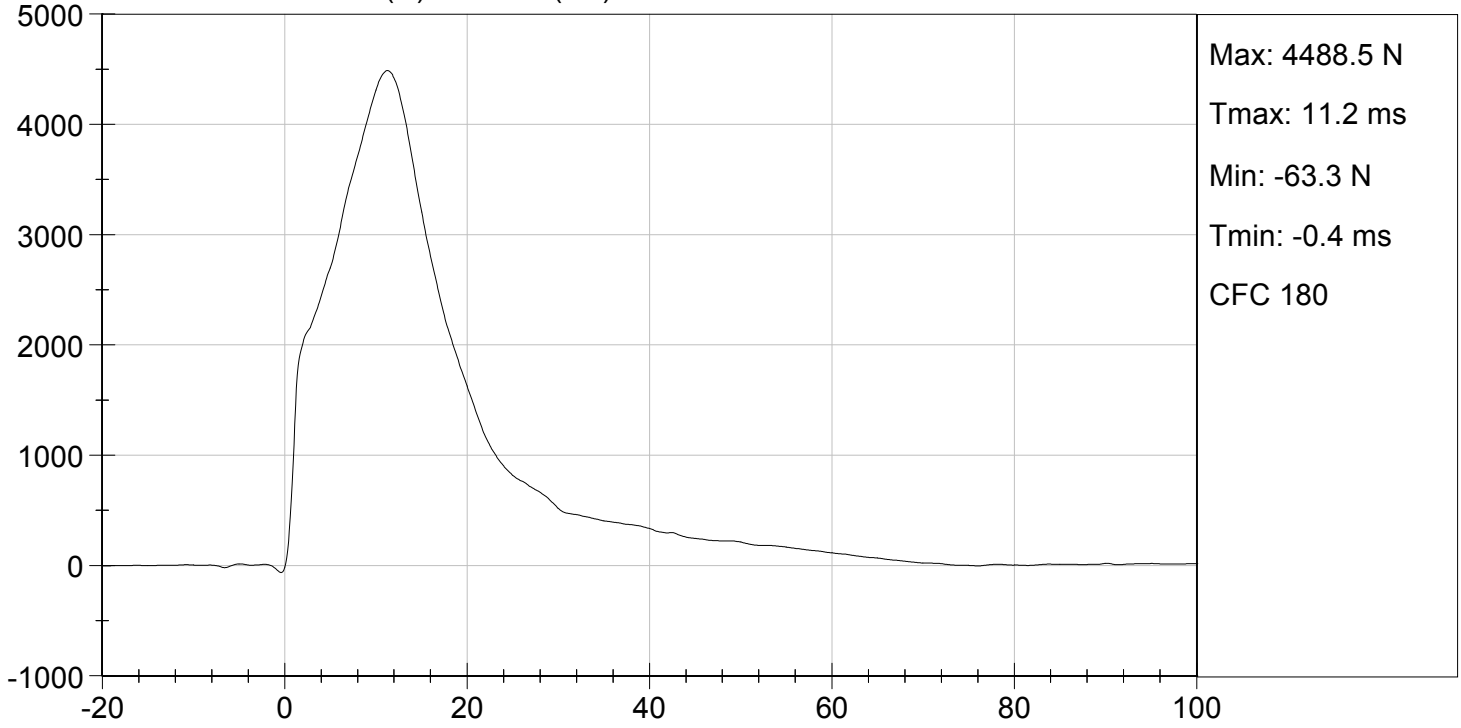
12/20/2012
Test Date

David Winkelbauer
Approved By

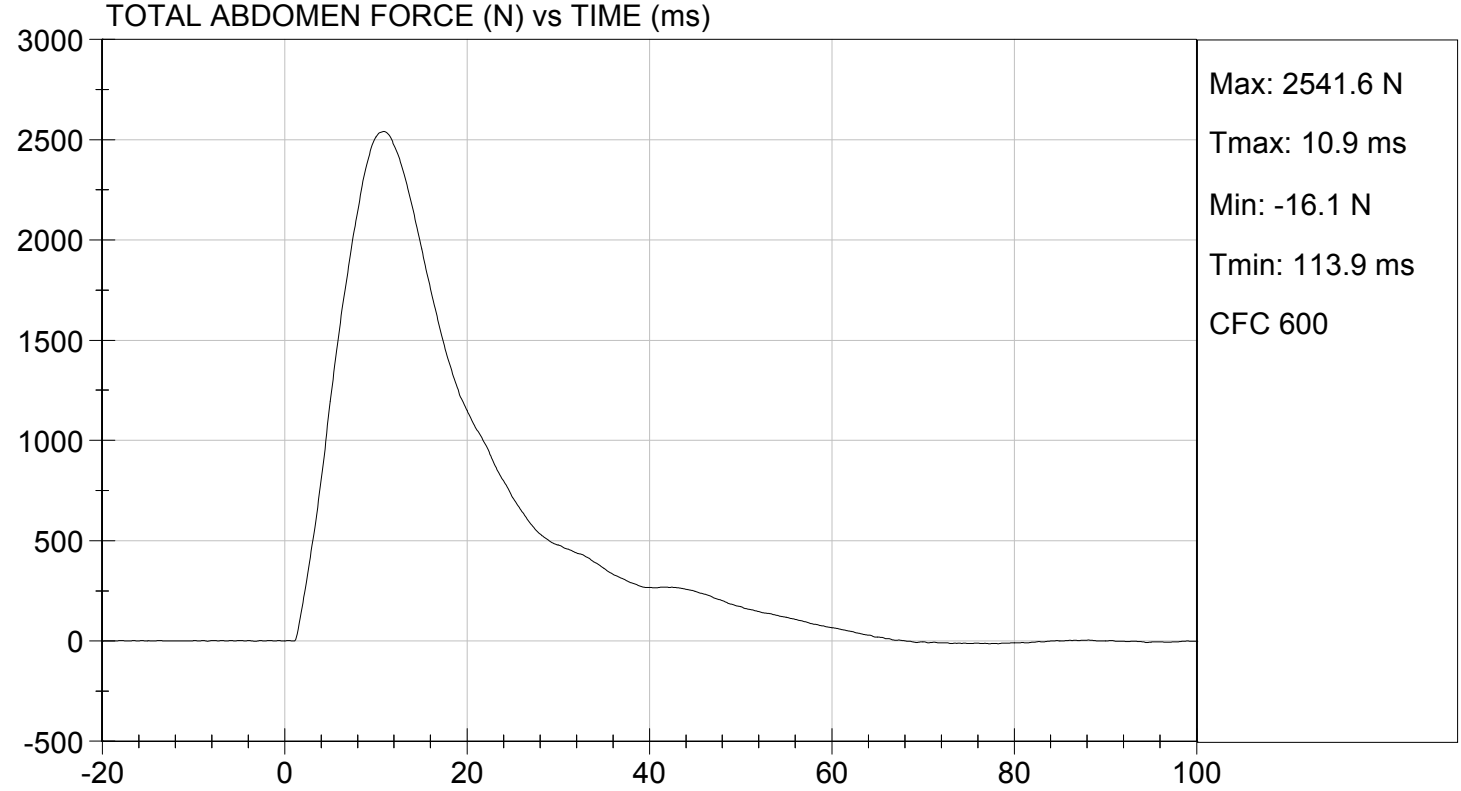
TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.25 ft/s, 4.04 m/s

TEST DATE: 12/20/2012
TEST #: D124807

IMPACTOR FORCE (N) vs TIME (ms)



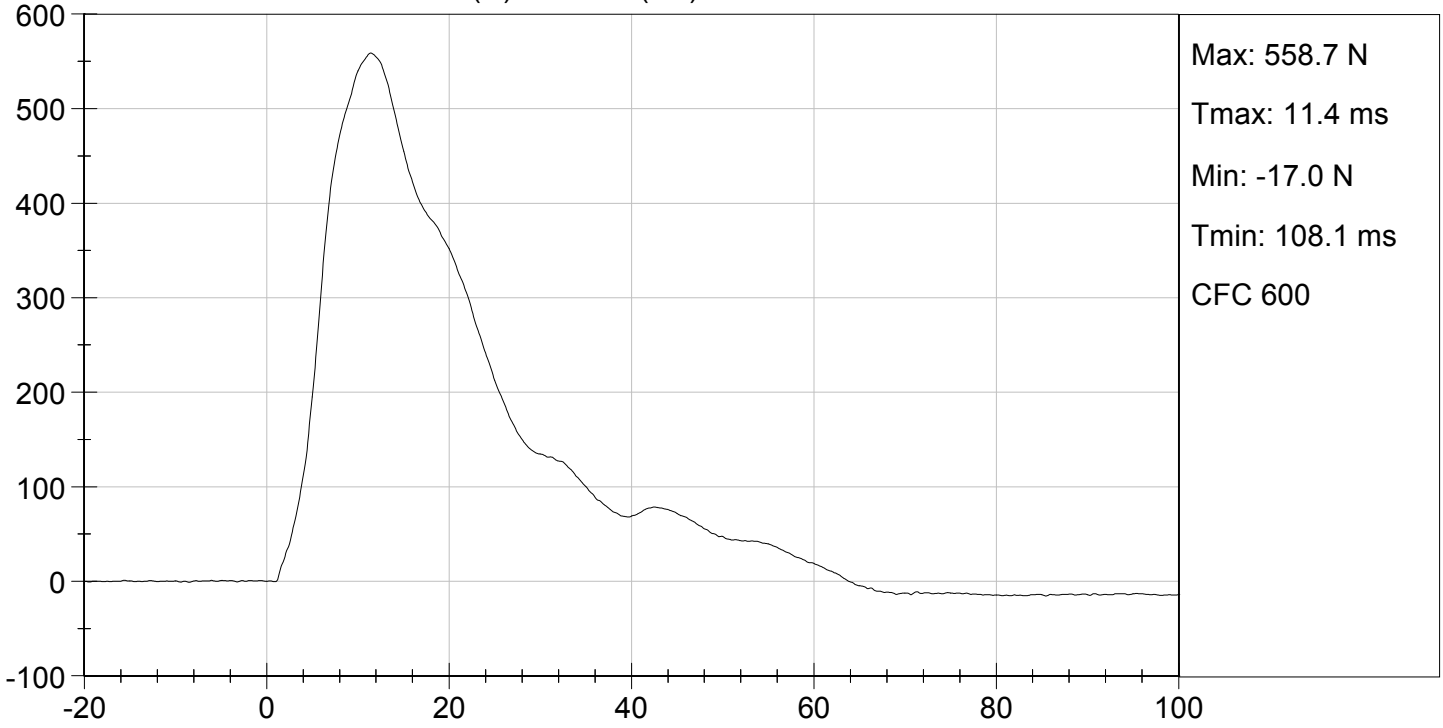
TOTAL ABDOMEN FORCE (N) vs TIME (ms)



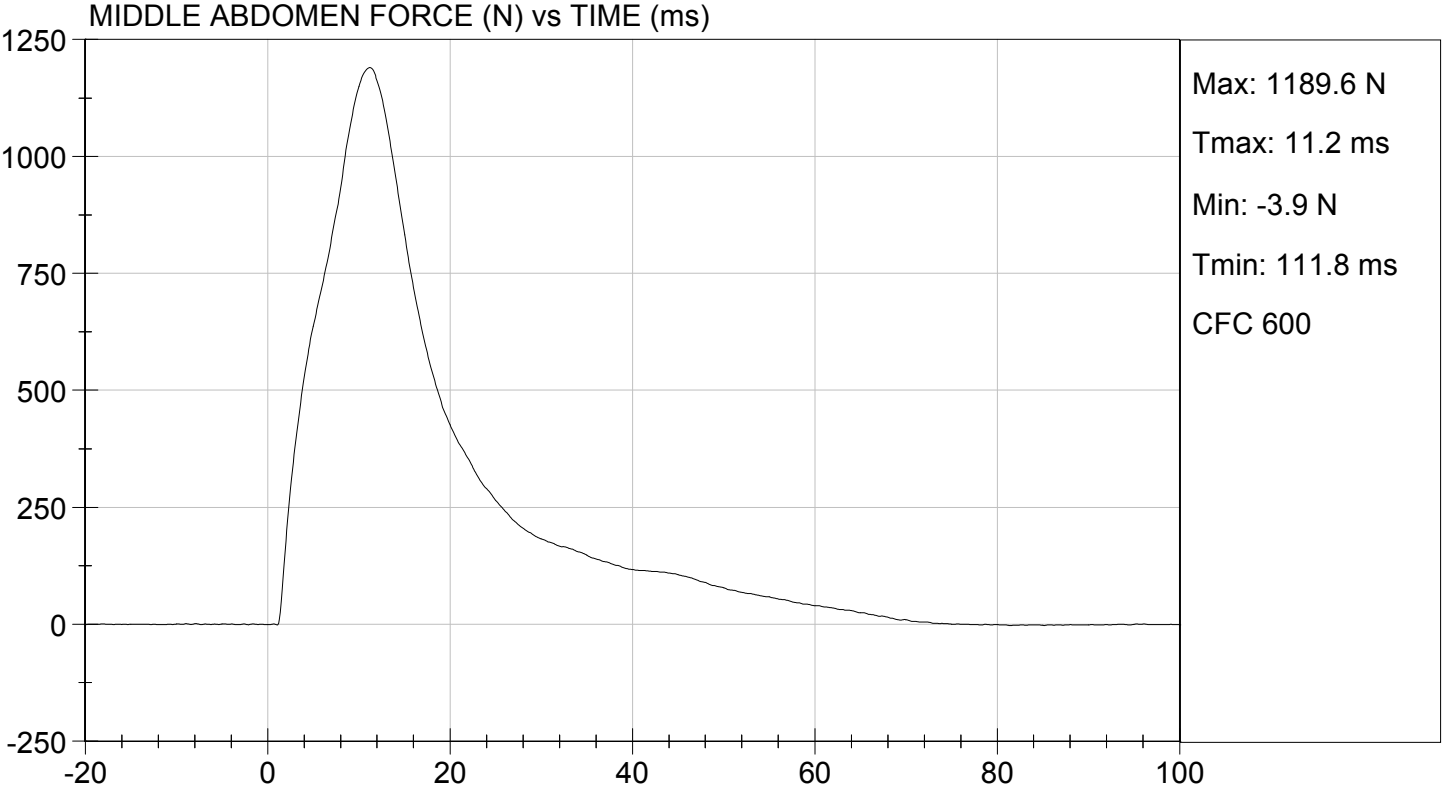
TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.25 ft/s, 4.04 m/s

TEST DATE: 12/20/2012
TEST #: D124807

FRONT ABDOMEN FORCE (N) vs TIME (ms)



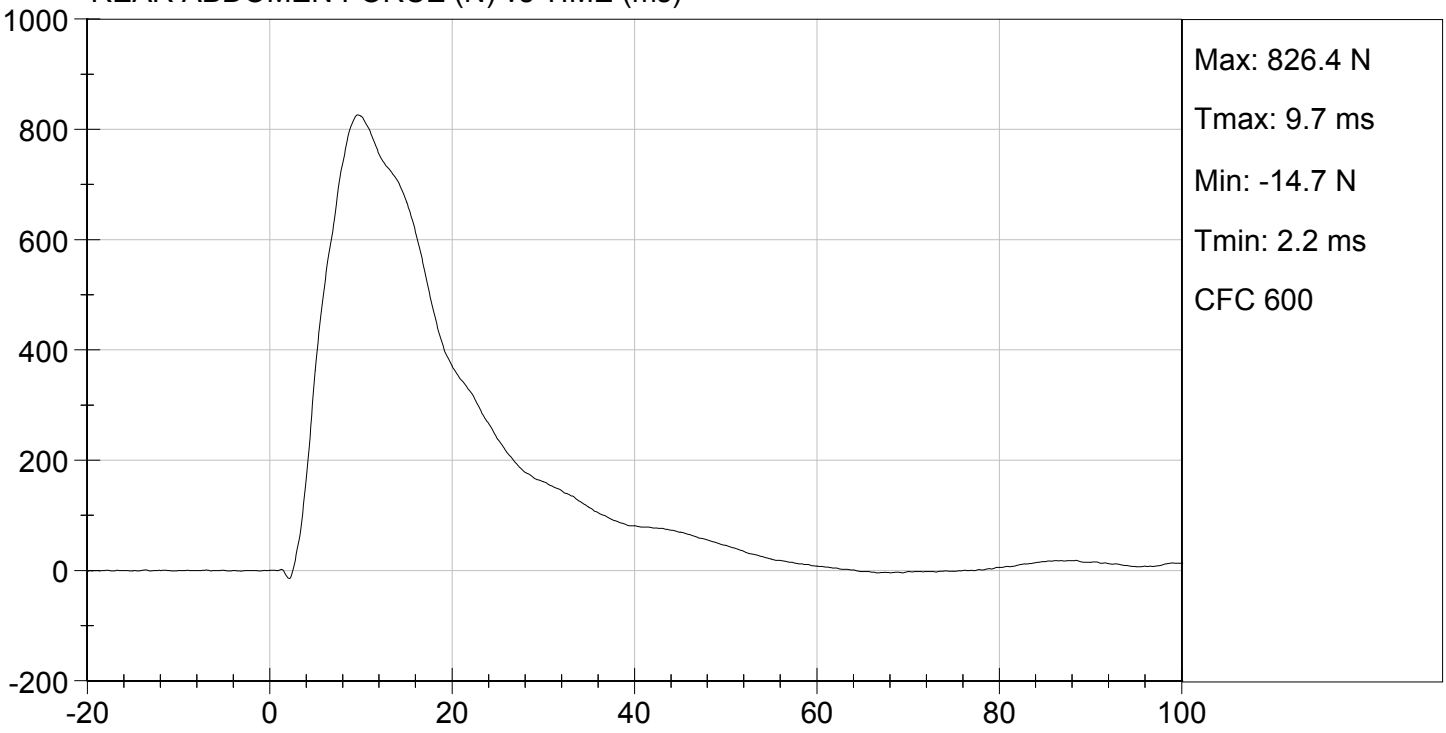
MIDDLE ABDOMEN FORCE (N) vs TIME (ms)



TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.25 ft/s, 4.04 m/s

TEST DATE: 12/20/2012
TEST #: D124807

REAR ABDOMEN FORCE (N) vs TIME (ms)



MGA RESEARCH CORPORATION

LUMBAR SPINE TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D124808

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	37	Pass
Pendulum Speed		m/s	5.95 to 6.15	6.12	Pass
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	-0.00	Pass
	3.7 ms	m/s	-0.425 to -0.24	-0.404	Pass
	27 ms	m/s	-6.50 to -5.80	-5.95	Pass
	30 ms	m/s	>= -6.50	-5.94	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	47.6	Pass
Time of Maximum Flexion Angle		ms	39.0 to 53.0	42.7	Pass
Headform Rotation Decay to Initial Position		ms	37 to 57	42	Pass
			Overall Results		Pass

Jessica Hall
Laboratory Technician

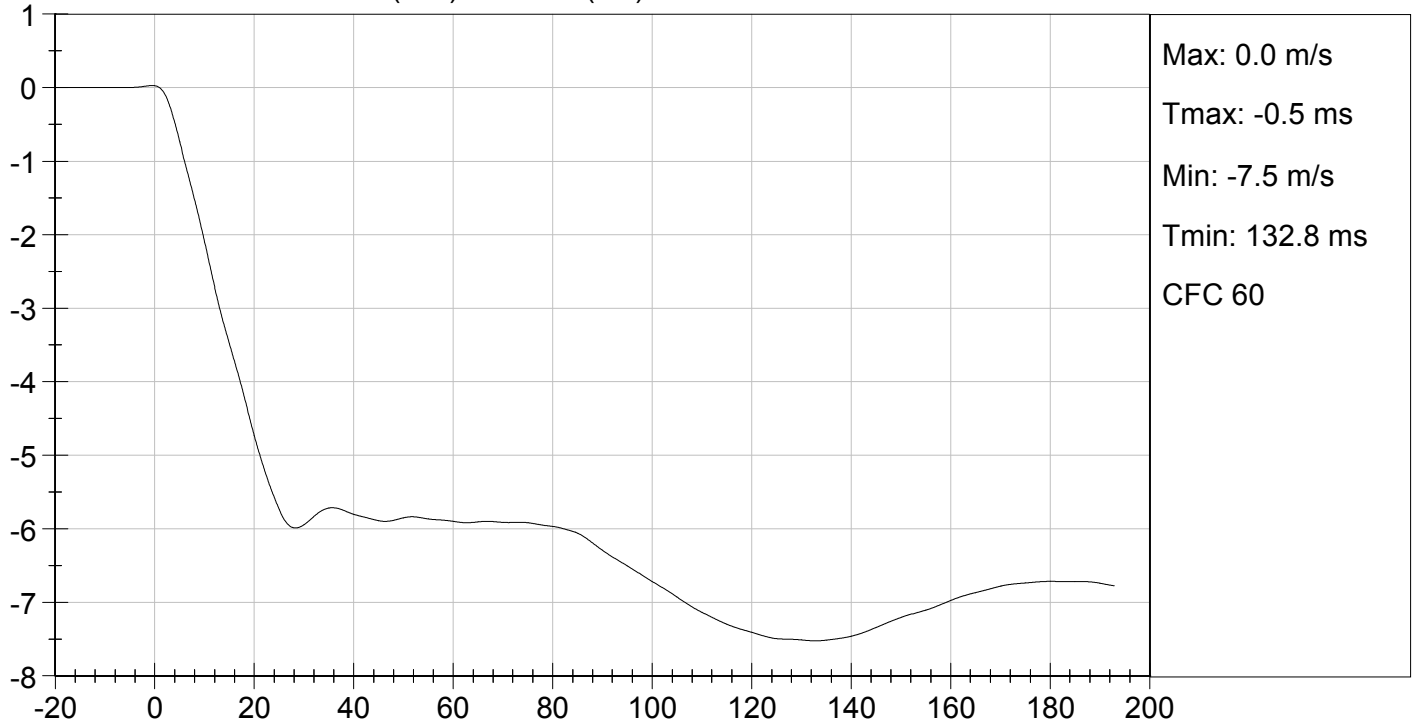
12/20/2012
Test Date

David Winkelbauer
Approved By

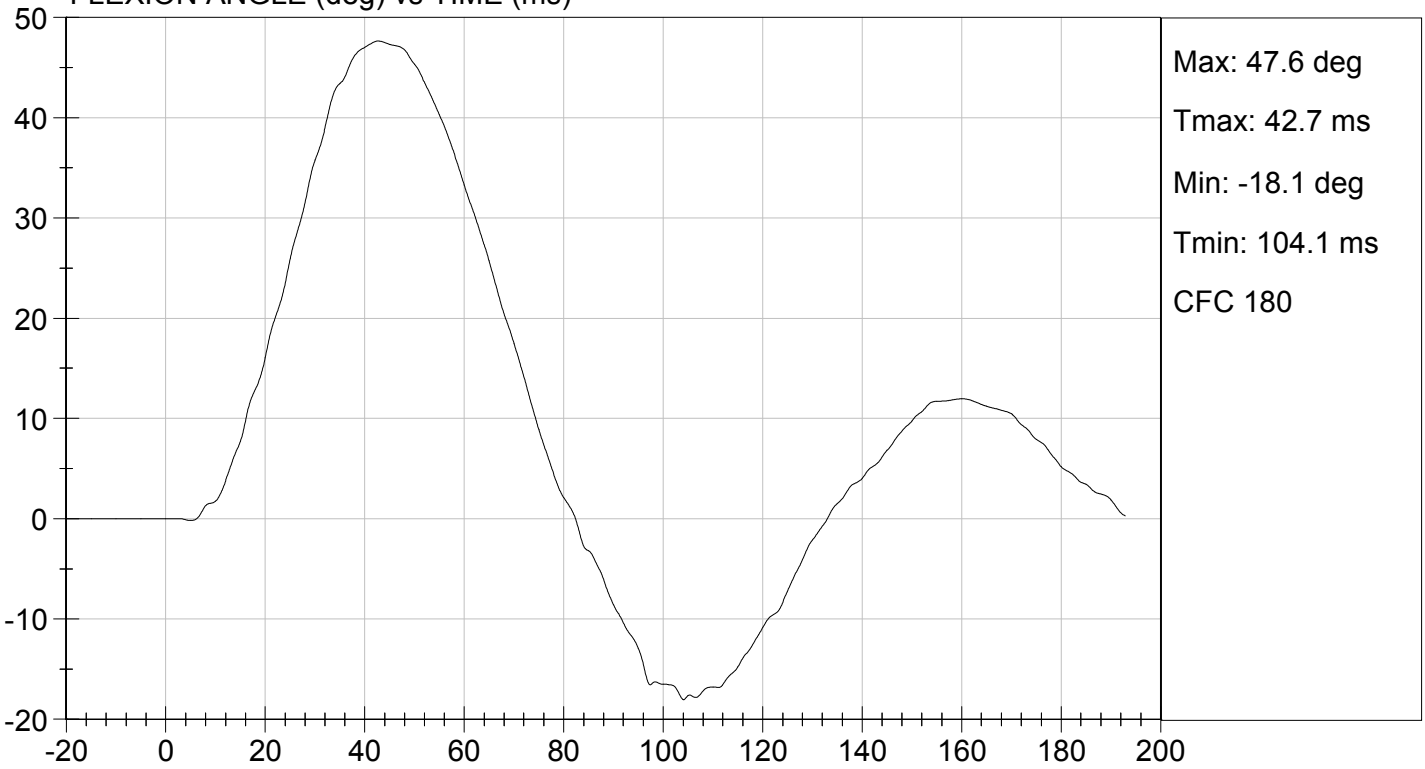
TEST DESC: LUMBAR BENDING
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 12/20/2012
TEST #: D124808

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



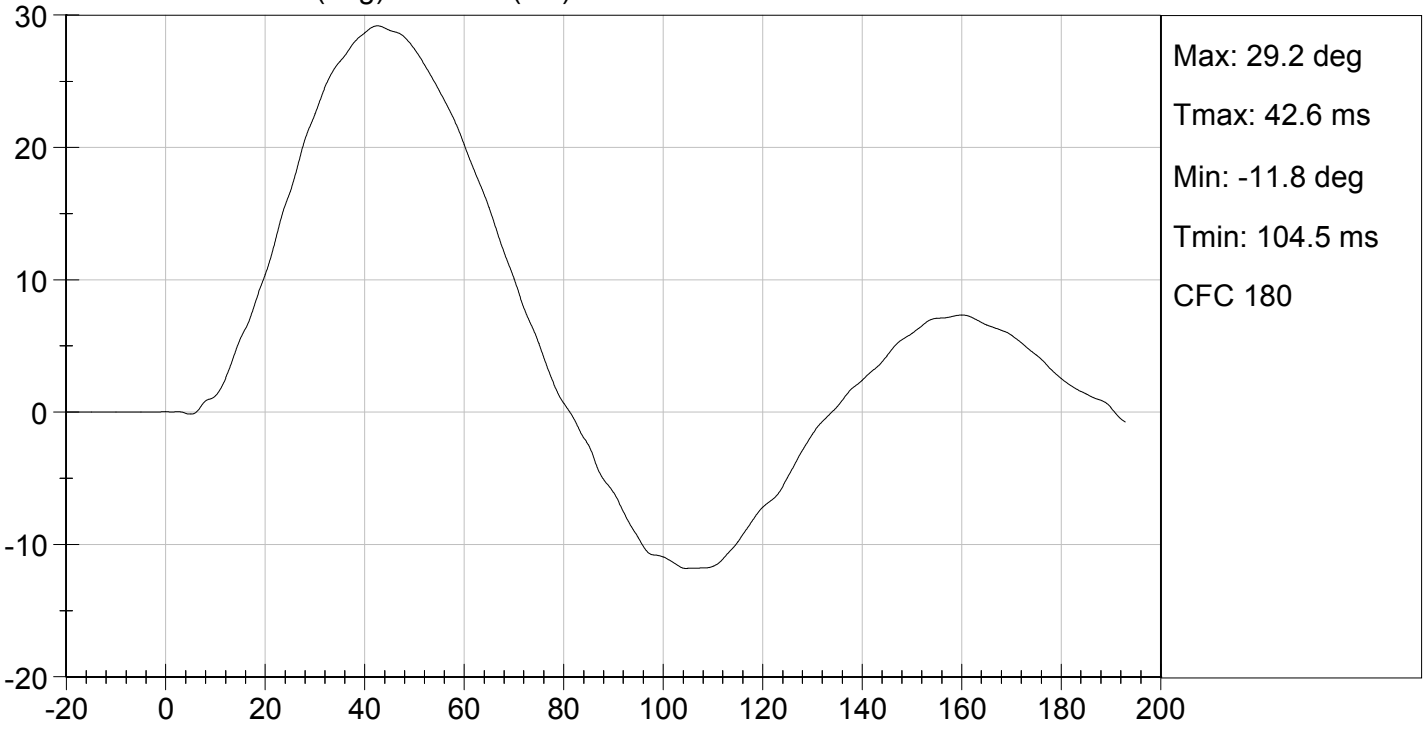
FLEXION ANGLE (deg) vs TIME (ms)



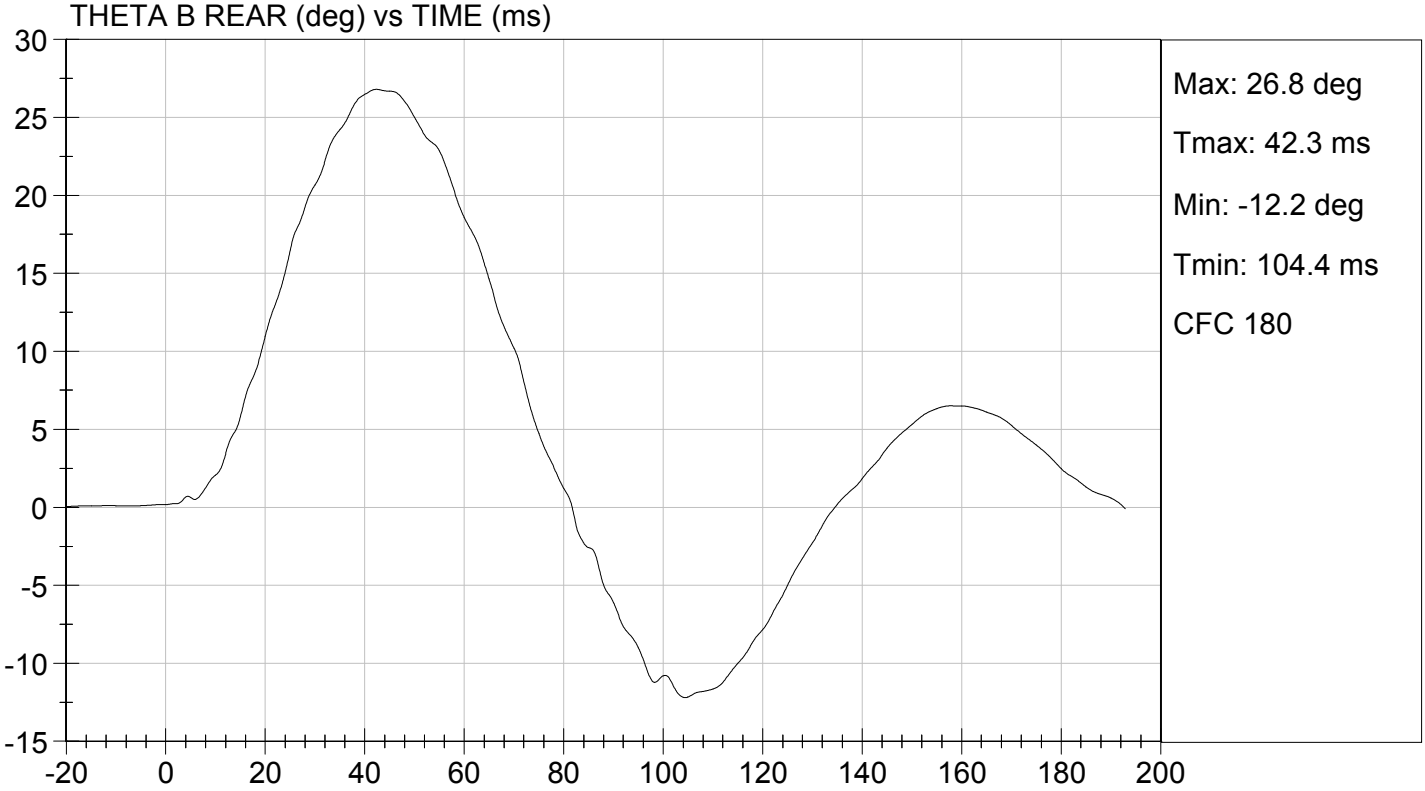
TEST DESC: LUMBAR BENDING
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 12/20/2012
TEST #: D124808

THETA A FRONT (deg) vs TIME (ms)

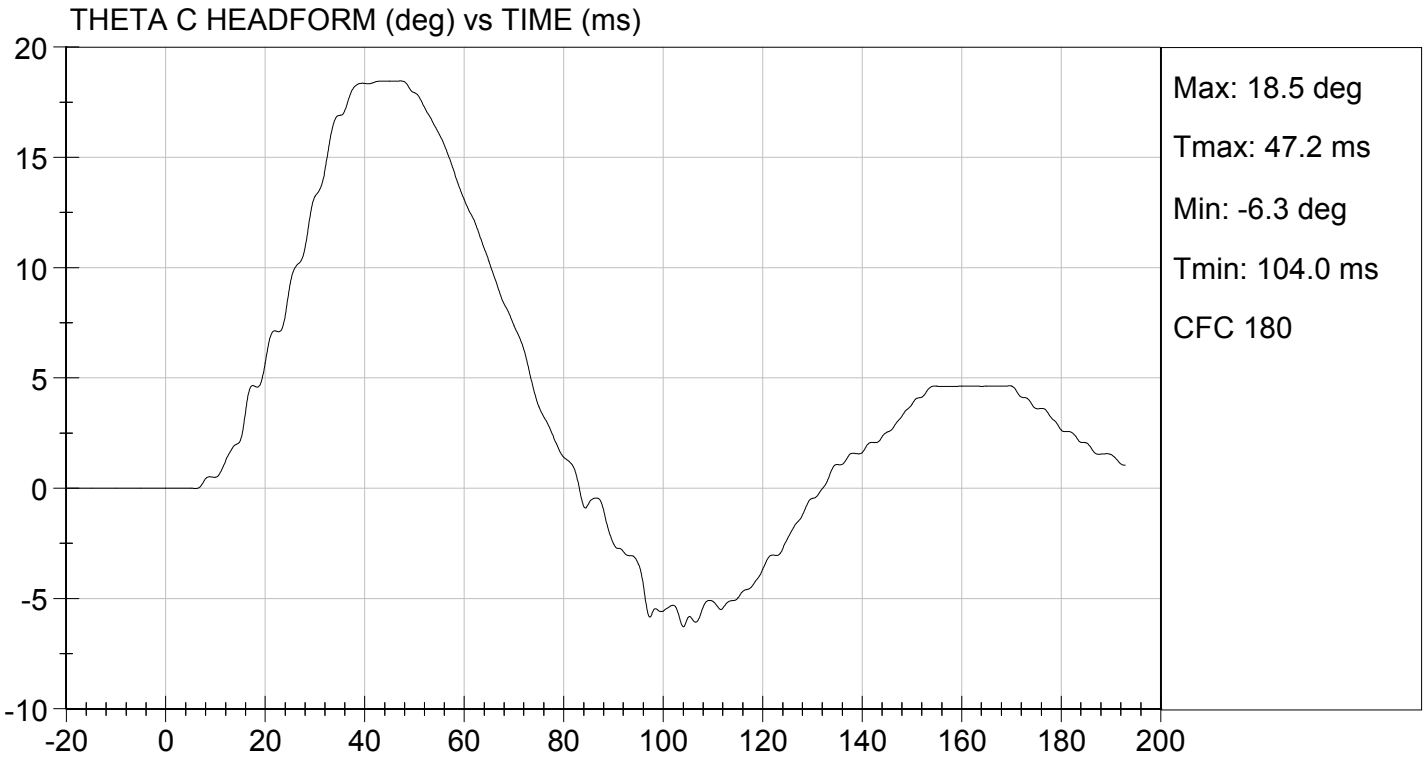


THETA B REAR (deg) vs TIME (ms)



TEST DESC: LUMBAR BENDING
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 12/20/2012
TEST #: D124808



MGA RESEARCH CORPORATION

PELVIS TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D124809

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	37	Pass
Probe Speed	m/s	4.20 to 4.40	4.30	Pass
Maximum Impactor Force	N	4700 to 5400	4824	Pass
Time of Maximum Impactor Force	ms	11.8 to 16.1	13.5	Pass
Maximum Pubic Force	N	1230 to 1590	1448	Pass
Time of Maximum Pubic Force	ms	12.2 to 17.0	15.0	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

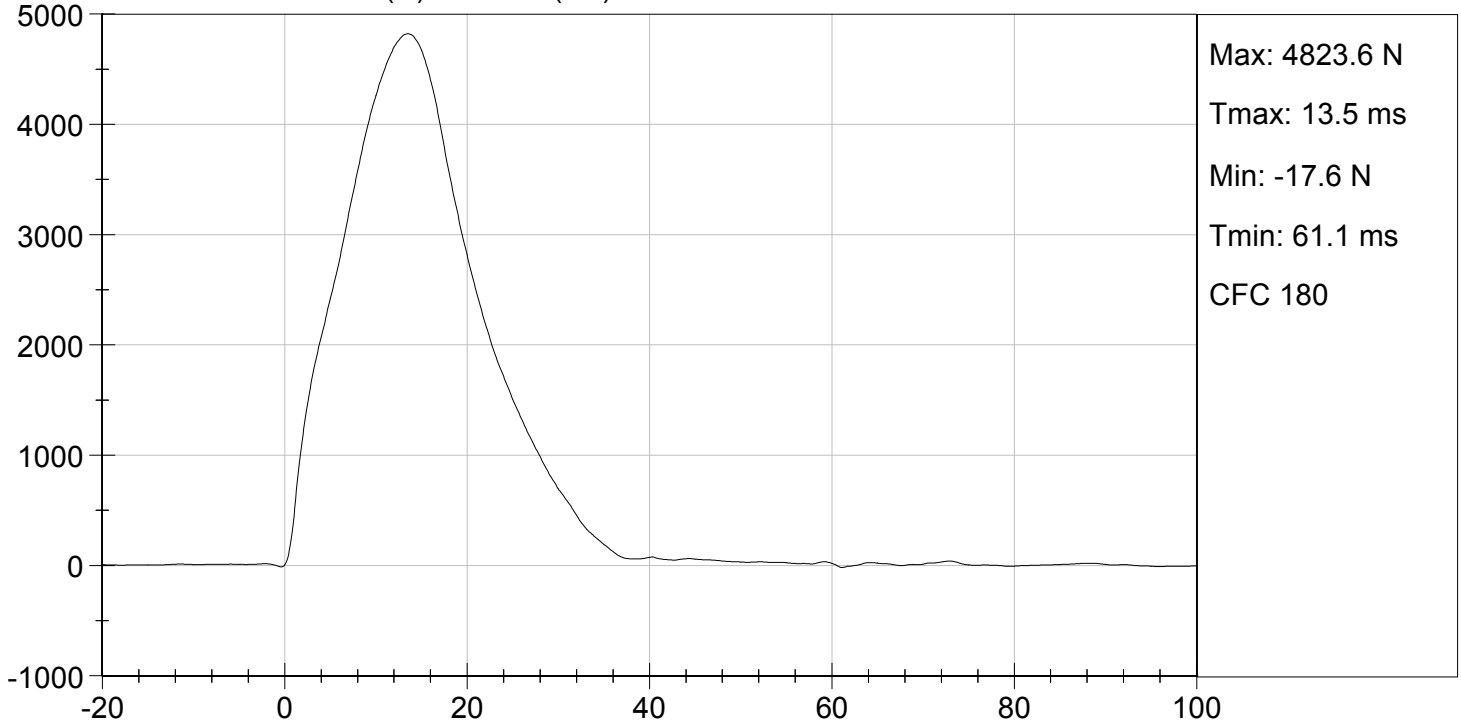
12/20/2012
Test Date

David Winkelbauer
Approved By

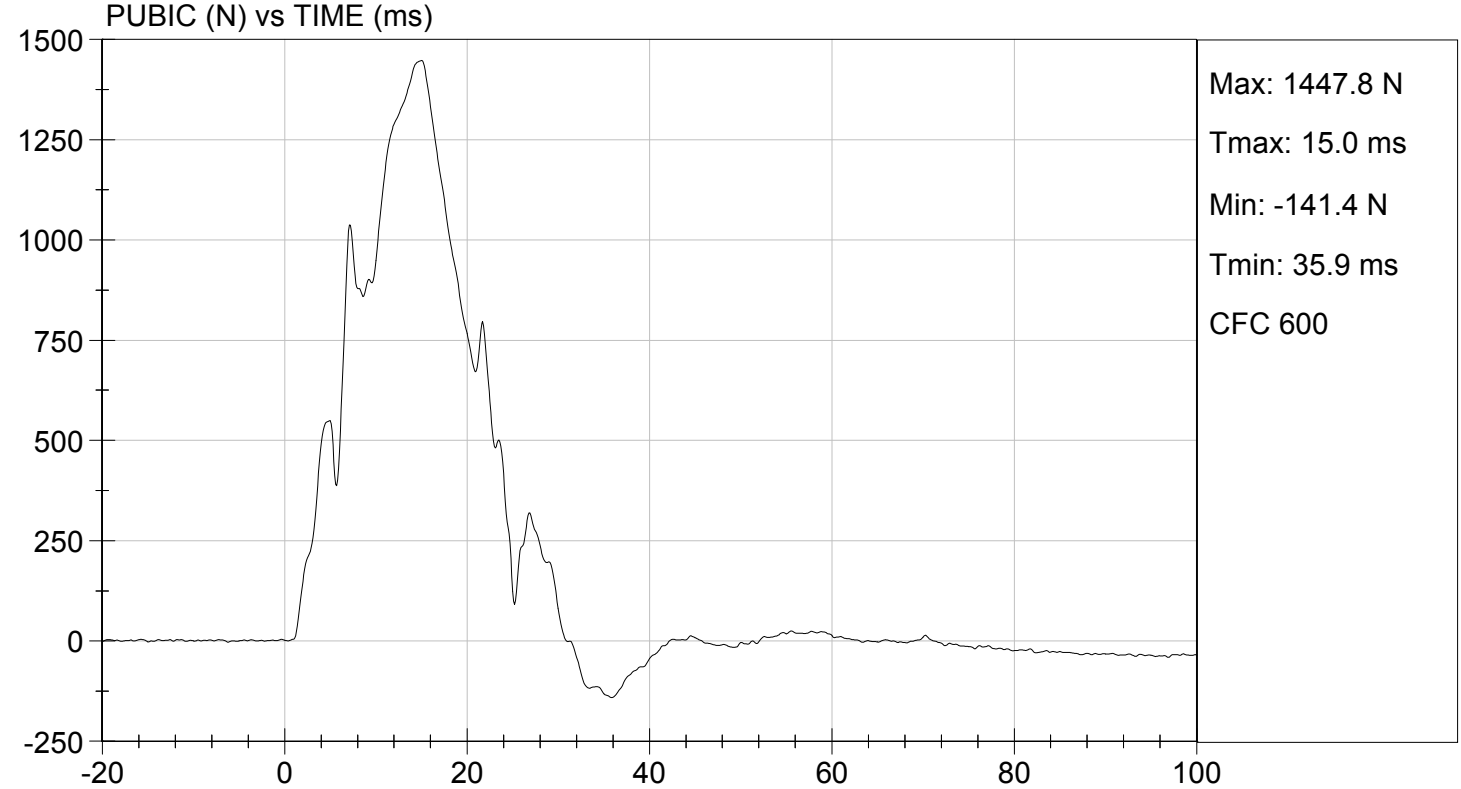
TEST DESC: PELVIS IMPACT
VELOCITY: 14.12 ft/s, 4.3 m/s

TEST DATE: 12/20/2012
TEST #: D124809C

IMPACTOR FORCE (N) vs TIME (ms)



PUBIC (N) vs TIME (ms)



MGA RESEARCH CORPORATION

HEAD DROP TEST

ES-2re DUMMY

ATD Serial No: 032 **Test ID:** D13061

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	24	Pass
Peak Resultant Acceleration	G's	125 to 155	141	Pass
Peak Longitudinal Acceleration	G's	<= +/- 15.0	-8.1	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

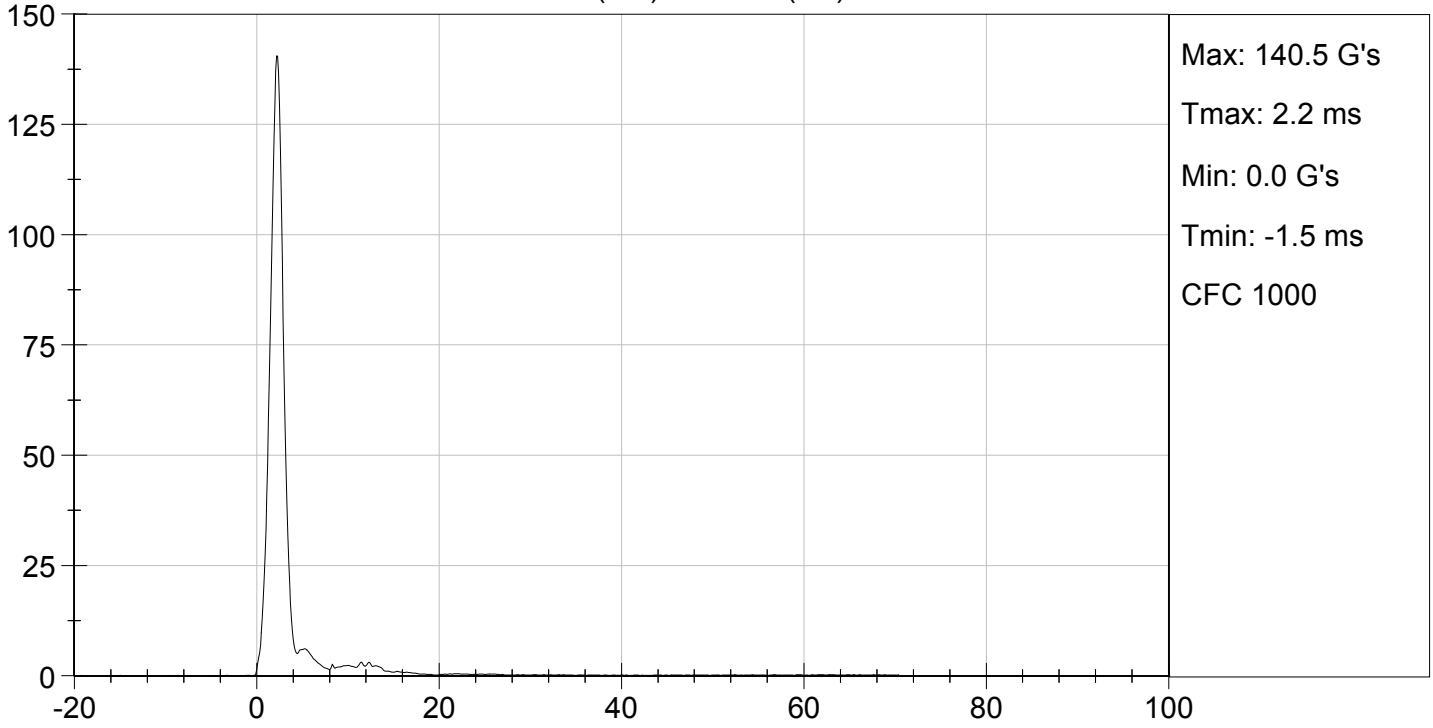
01/10/2013
Test Date

David Winkelbauer
Approved By

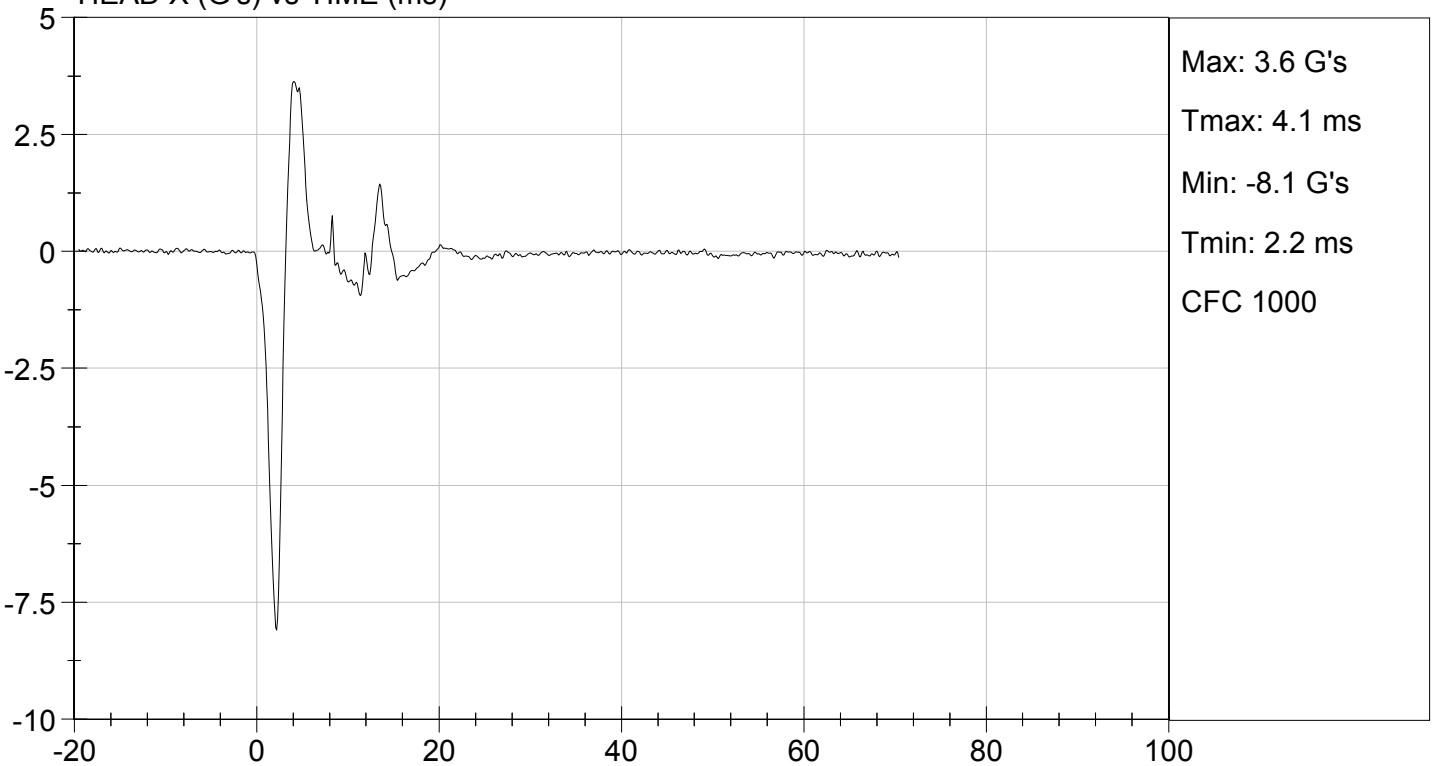
TEST DESC: HEAD DROP

TEST DATE: 01/10/2013
TEST #: D13061

HEAD RESULTANT ACCELERATION (G's) vs TIME (ms)

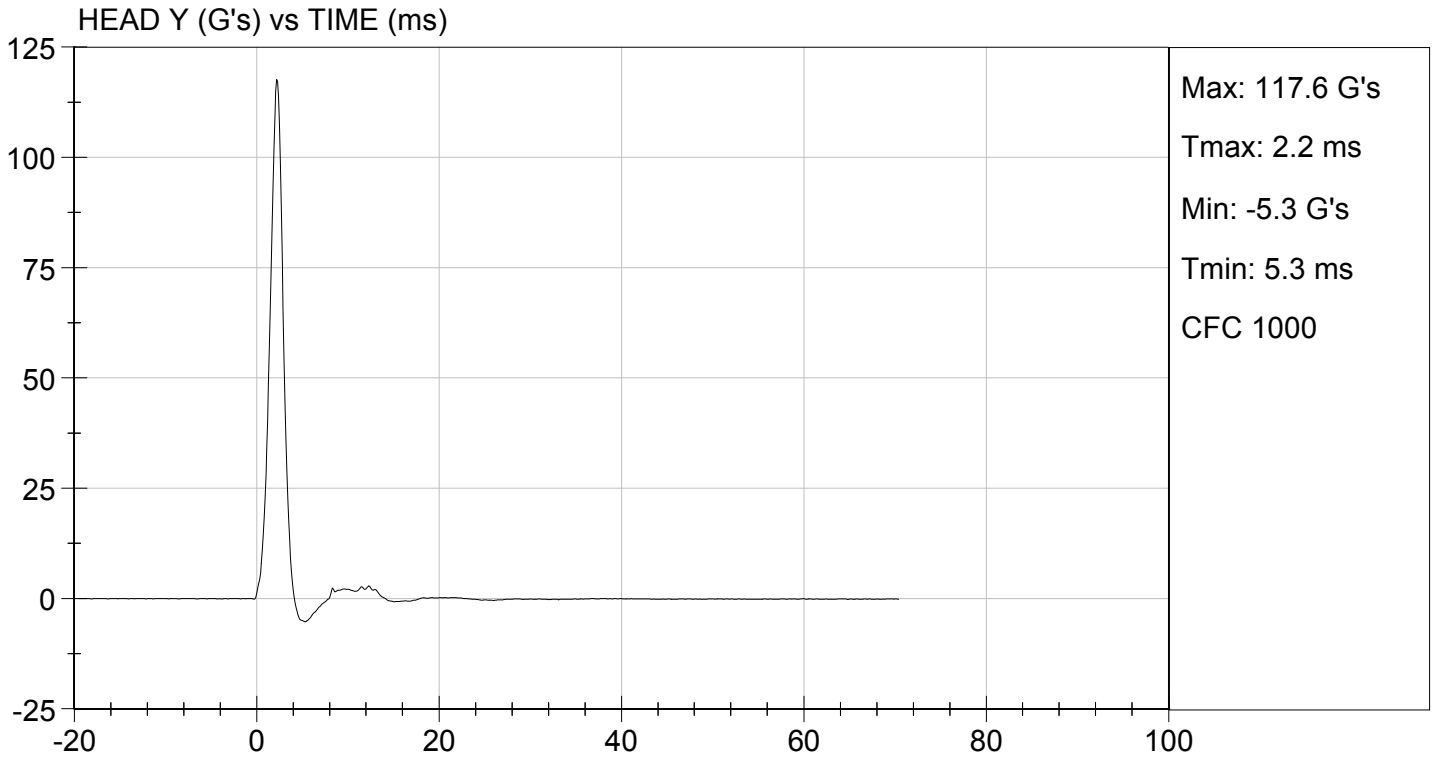


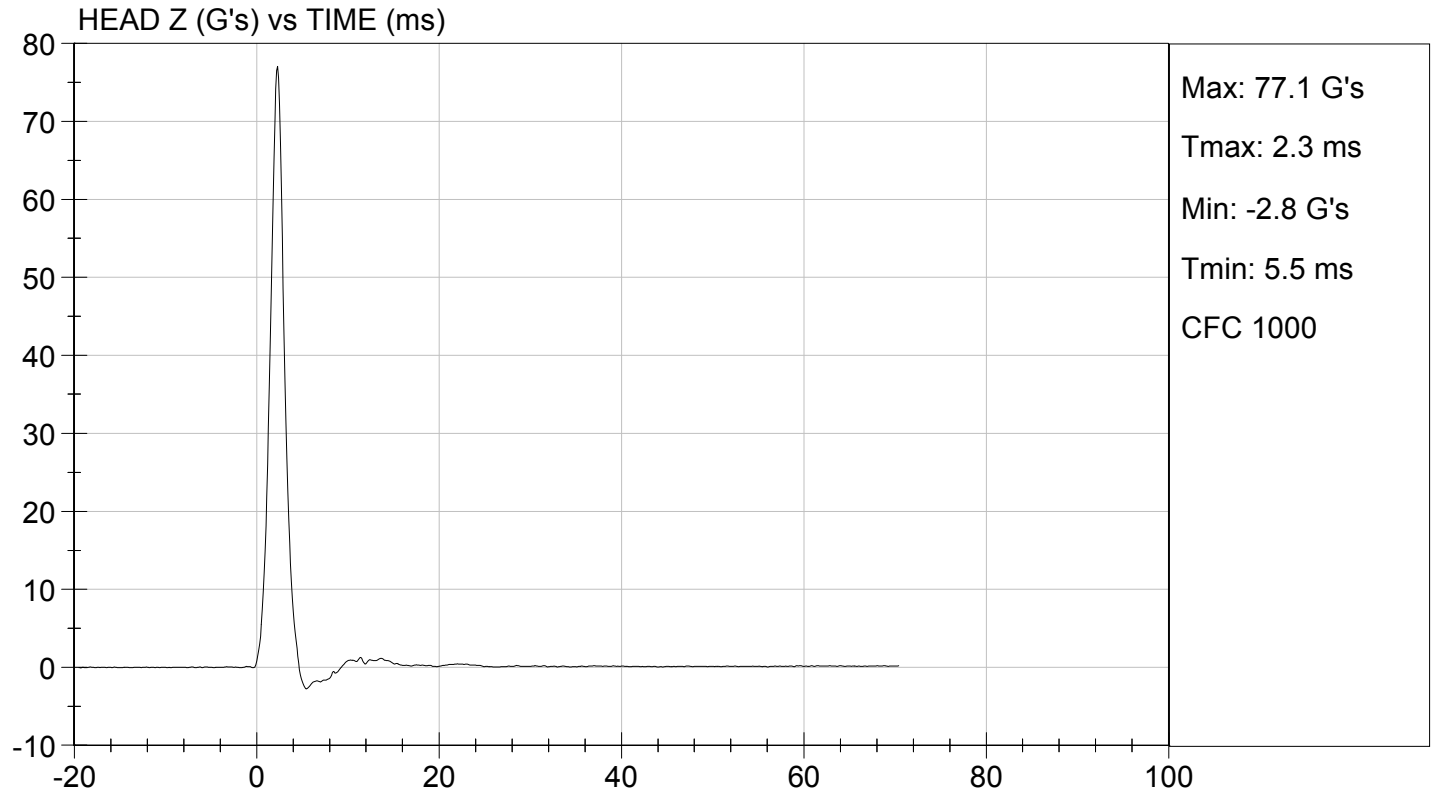
HEAD X (G's) vs TIME (ms)



TEST DESC: HEAD DROP

TEST DATE: 01/10/2013
TEST #: D13061





MGA RESEARCH CORPORATION

NECK PENDULUM TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D13062

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.0	Pass
Laboratory Relative Humidity		%	10 to 70	25	Pass
Pendulum Speed		m/s	3.30 to 3.50	3.46	Pass
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	-0.03	Pass
	3 ms	m/s	-0.25 to -0.375	-0.33	Pass
	14 ms	m/s	-3.20 to -3.70	-3.28	Pass
	17 ms	m/s	>= -3.70	-3.27	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	51.8	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	62.9	Pass
Head Rotation Decay Time to 0 Degree		ms	53.0 to 88.0	56.5	Pass
			Overall Results		Pass

Jessica Hall
Laboratory Technician

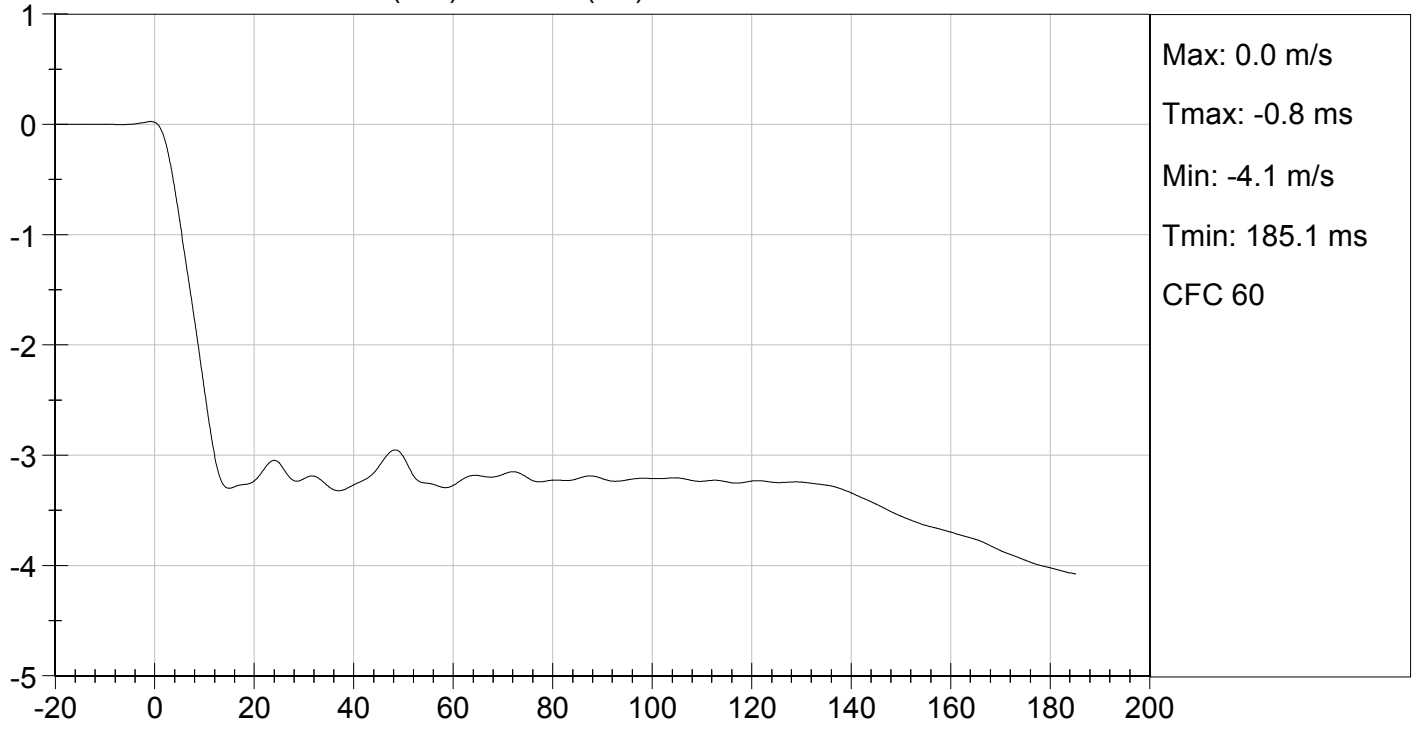
01/10/2013
Test Date

David Winkelbauer
Approved By

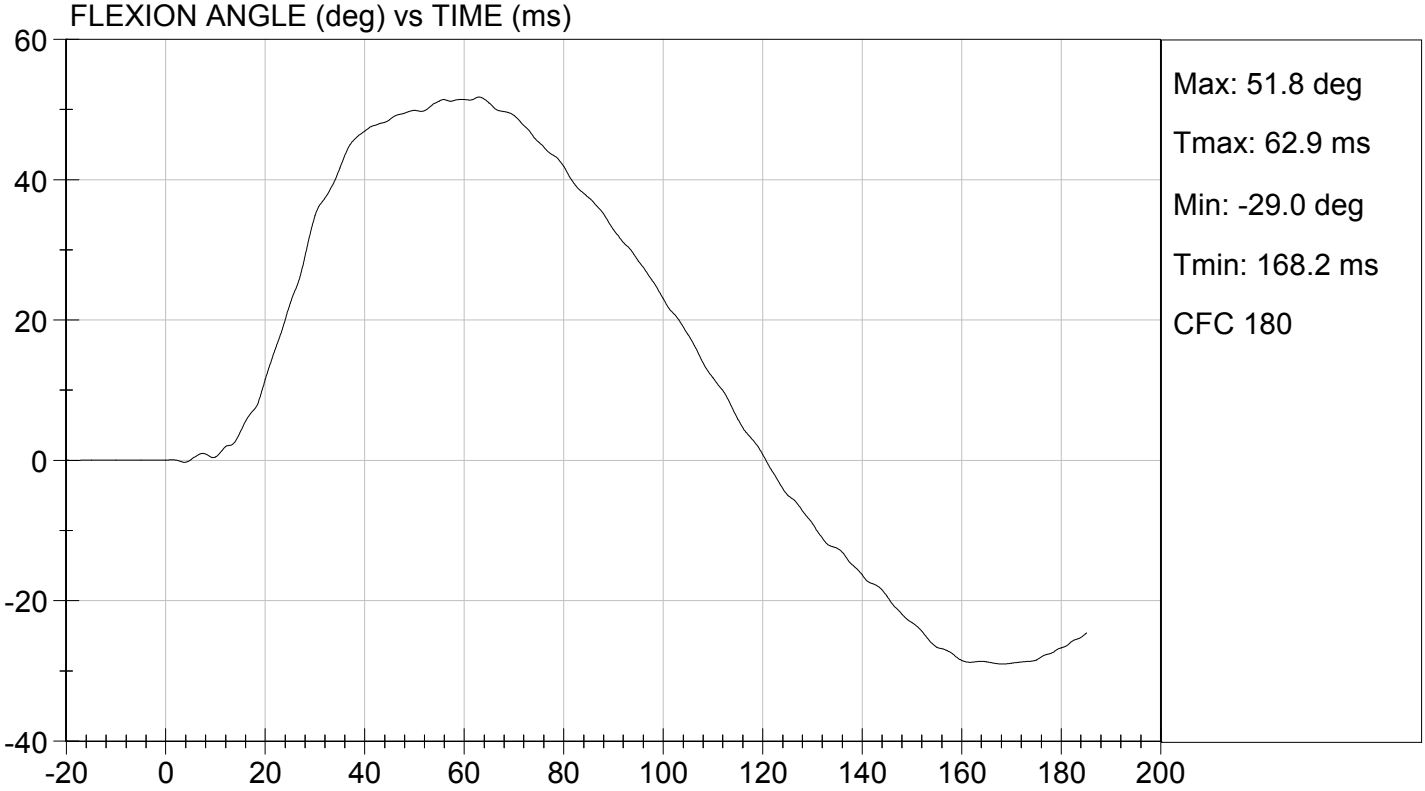
TEST DESC: NECK BENDING
VELOCITY: 11.34 ft/s, 3.46 m/s

TEST DATE: 01/10/2013
TEST #: D13062

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



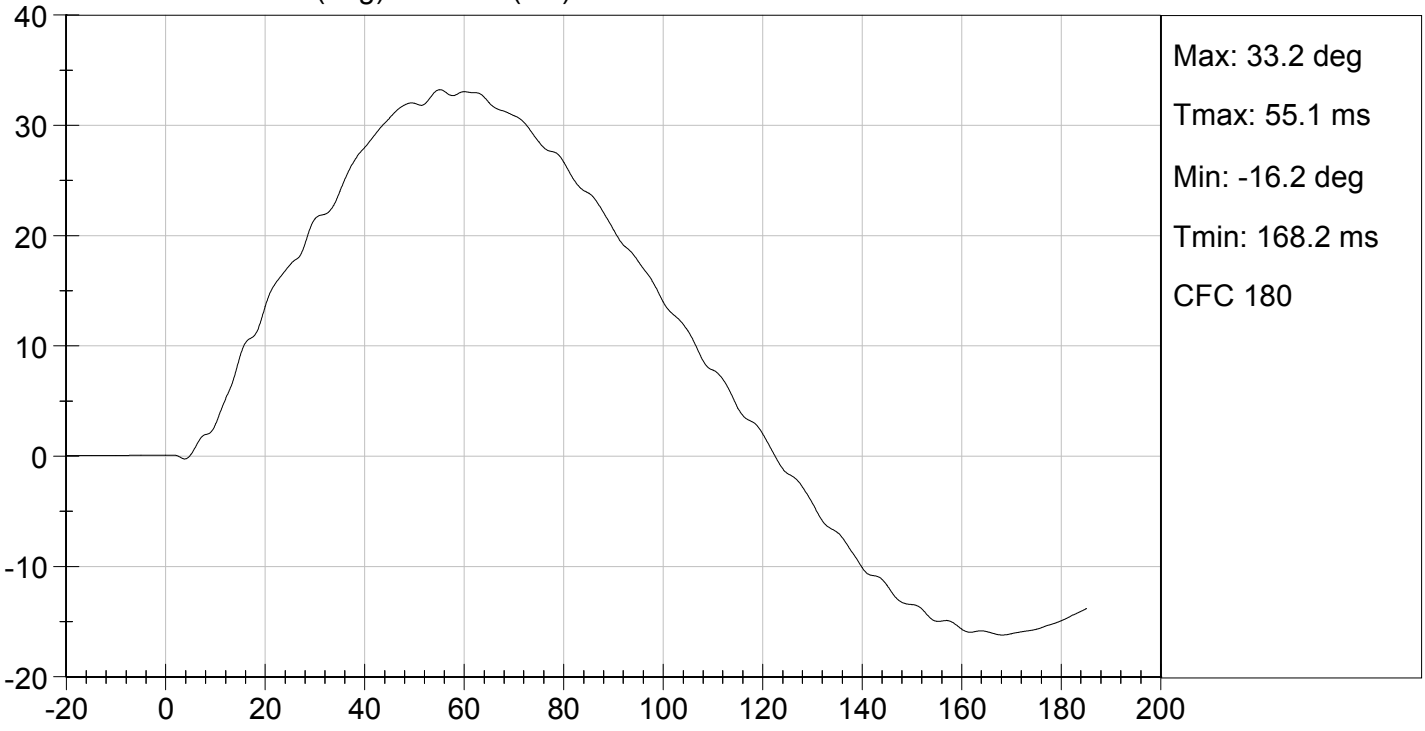
FLEXION ANGLE (deg) vs TIME (ms)



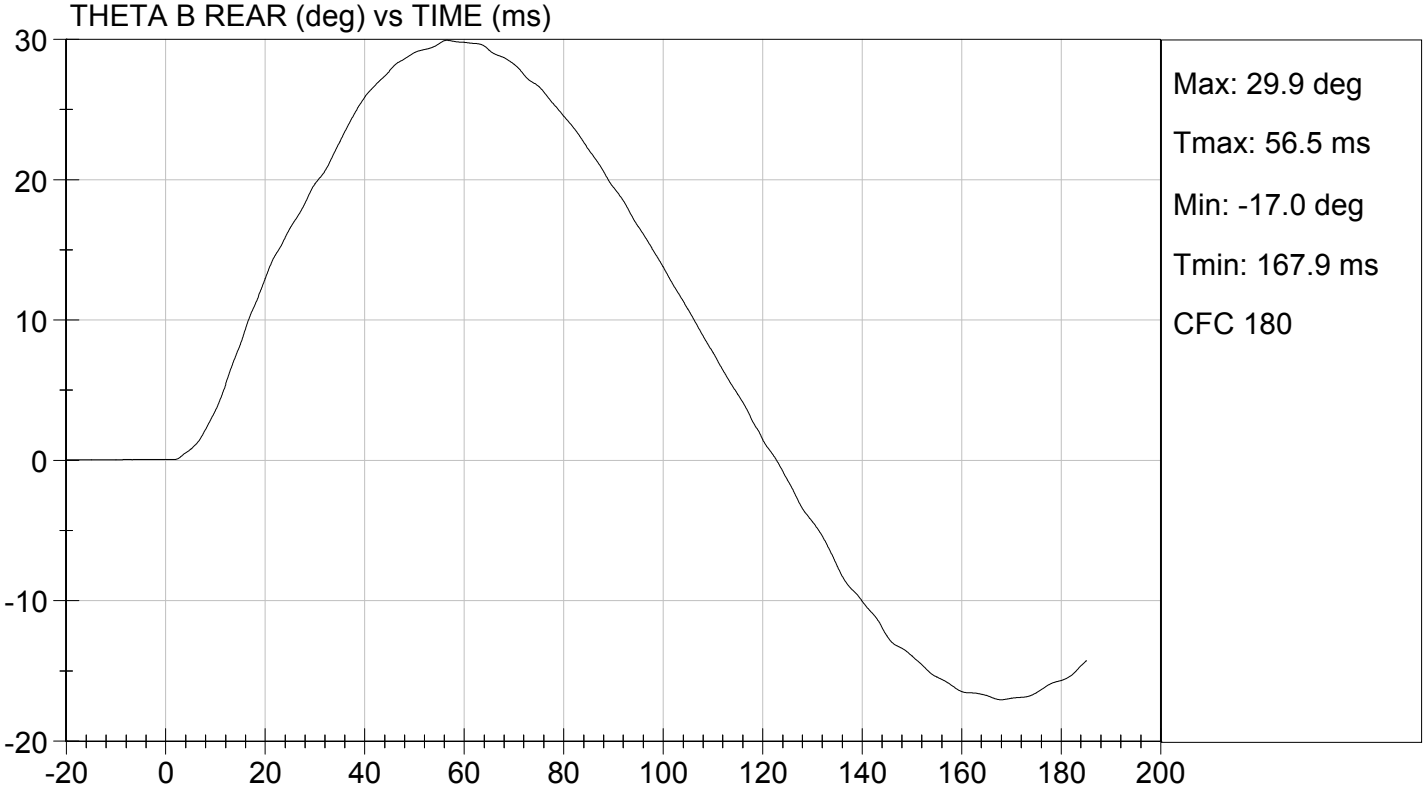
TEST DESC: NECK BENDING
VELOCITY: 11.34 ft/s, 3.46 m/s

TEST DATE: 01/10/2013
TEST #: D13062

THETA A FRONT (deg) vs TIME (ms)

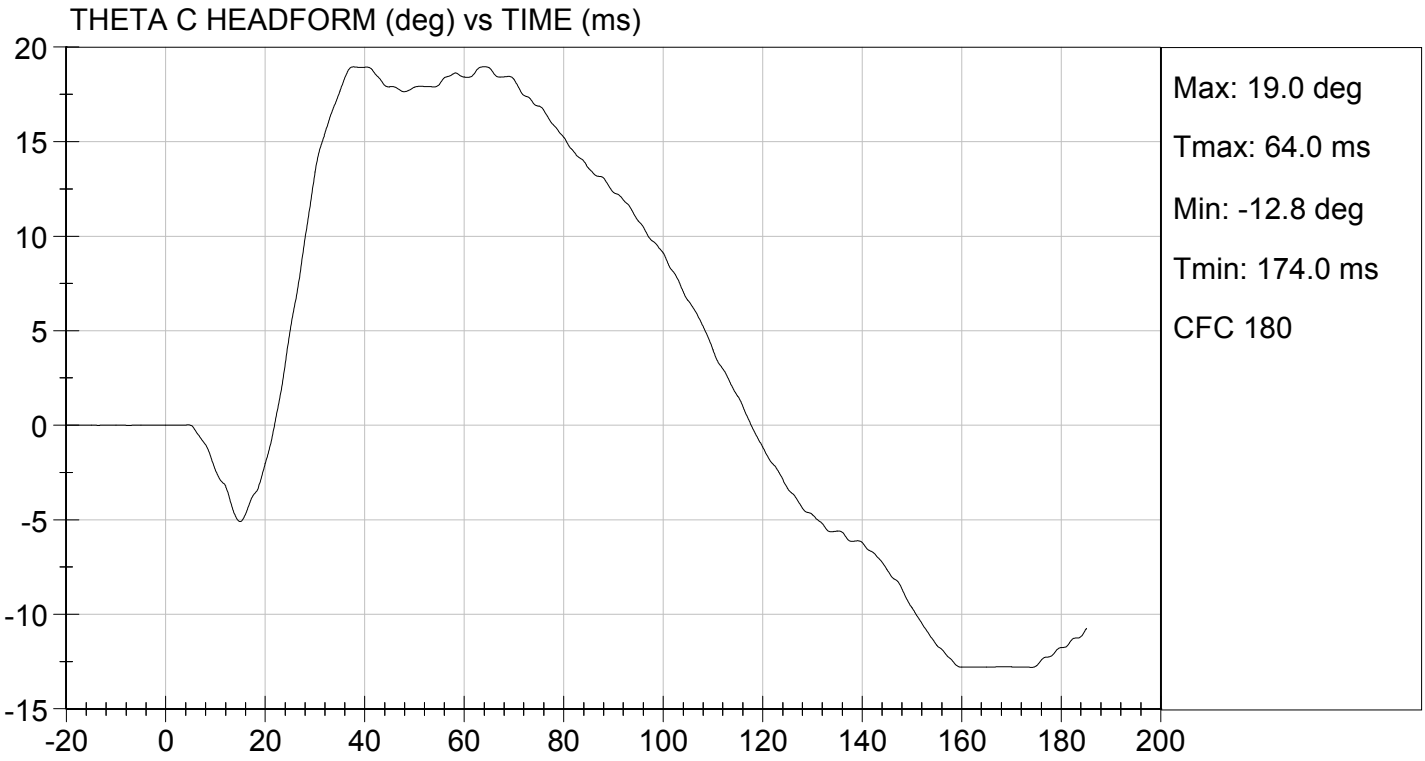


THETA B REAR (deg) vs TIME (ms)



TEST DESC: NECK BENDING
VELOCITY: 11.34 ft/s, 3.46 m/s

TEST DATE: 01/10/2013
TEST #: D13062



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D13063

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	33	Pass
Pendulum Speed	m/s	4.20 to 4.40	4.3	Pass
Peak Impactor Acceleration	G's	7.5 to 10.5	9.7	Pass
		Overall Test Results		Pass

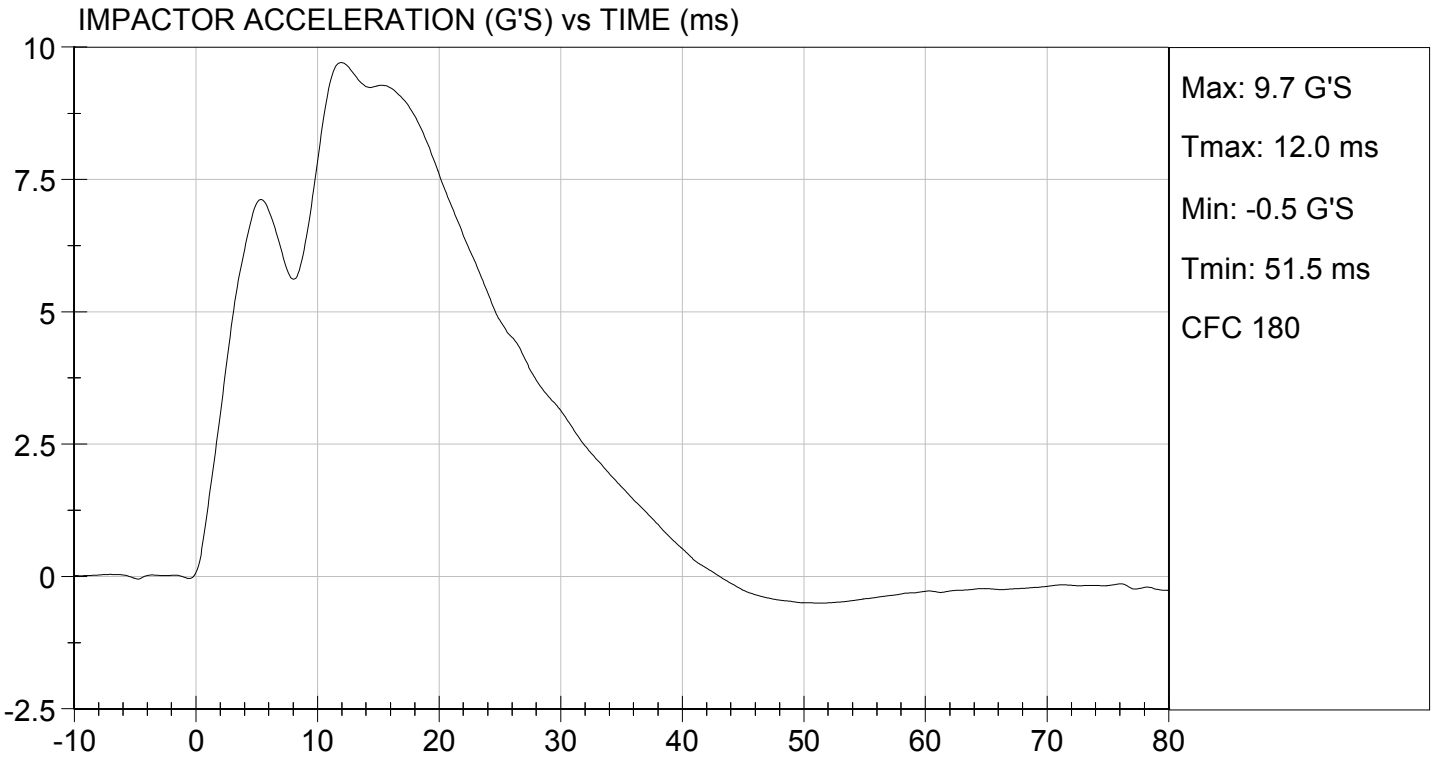
Jessica Gall
Laboratory Technician

01/11/2013
Test Date

David Winkelbauer
Approved By

TEST DESC: SHOULDER IMPACT
VELOCITY: 14.12 ft/s, 4.3 m/s

TEST DATE: 01/11/2013
TEST #: D13063



MGA RESEARCH CORPORATION

UPPER RIB TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D13064

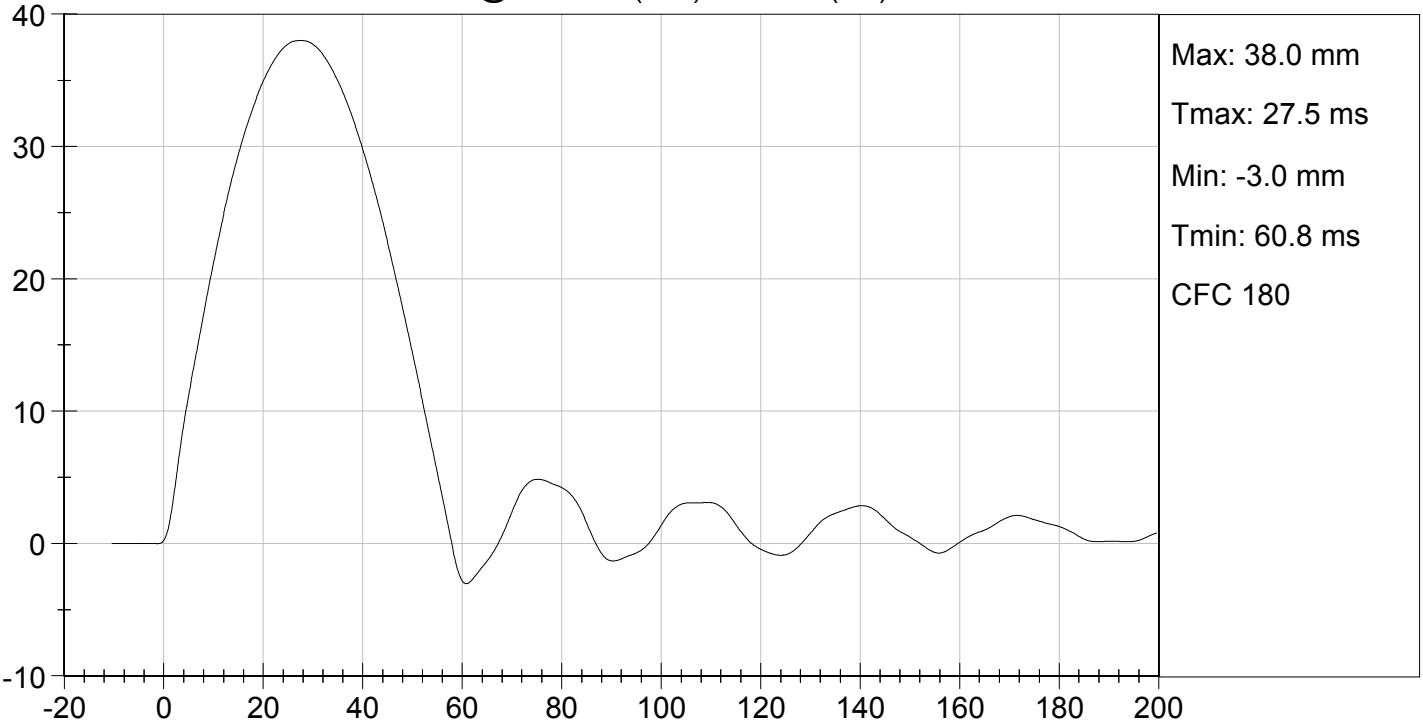
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	24	Pass
Displacement at 459 mm	mm	36.0 to 40.0	38.0	Pass
Displacement at 815 mm	mm	46.0 to 51.0	48.6	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

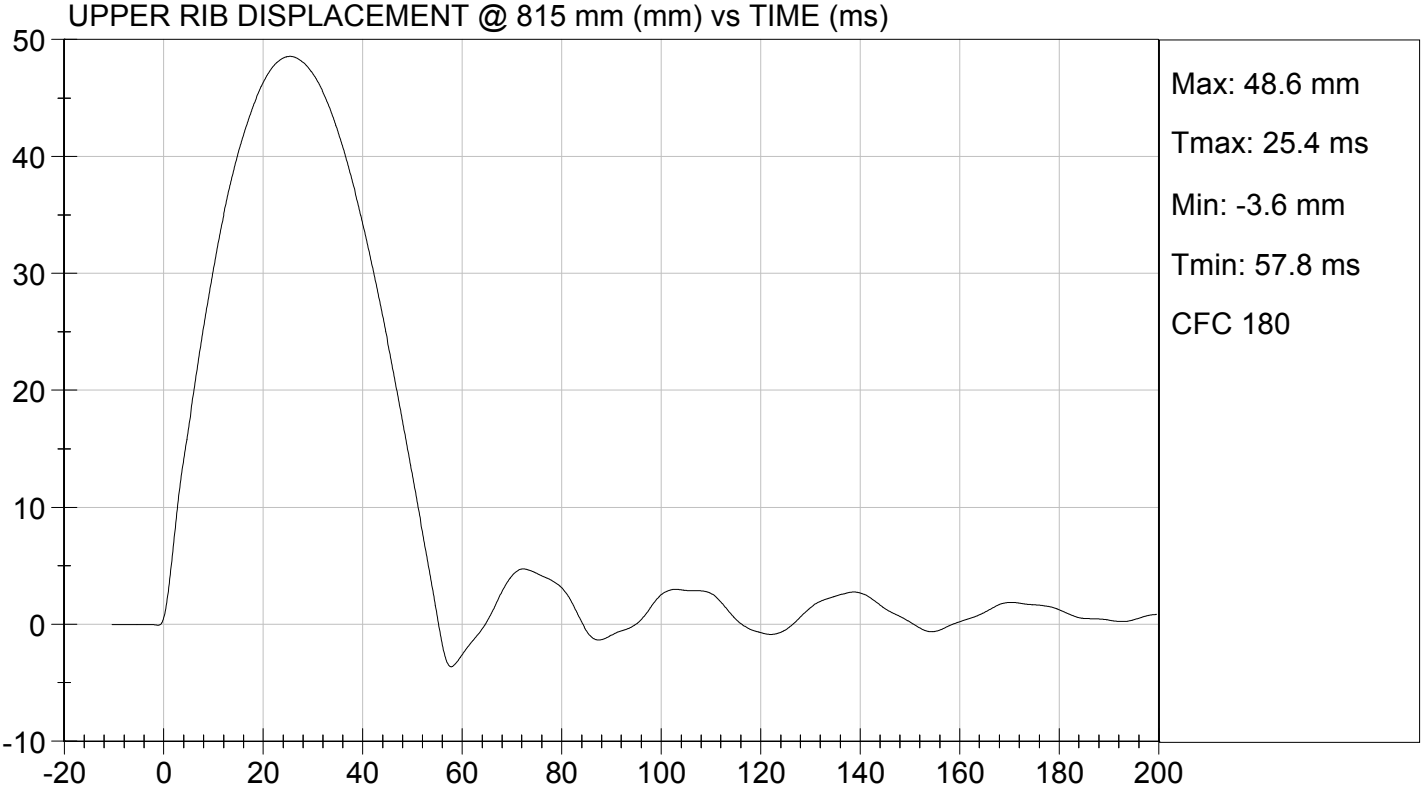
01/10/2013
Test Date

David Winkelbauer
Approved By

UPPER RIB DISPLACEMENT @ 459 mm (mm) vs TIME (ms)



UPPER RIB DISPLACEMENT @ 815 mm (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

MID RIB TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D13065

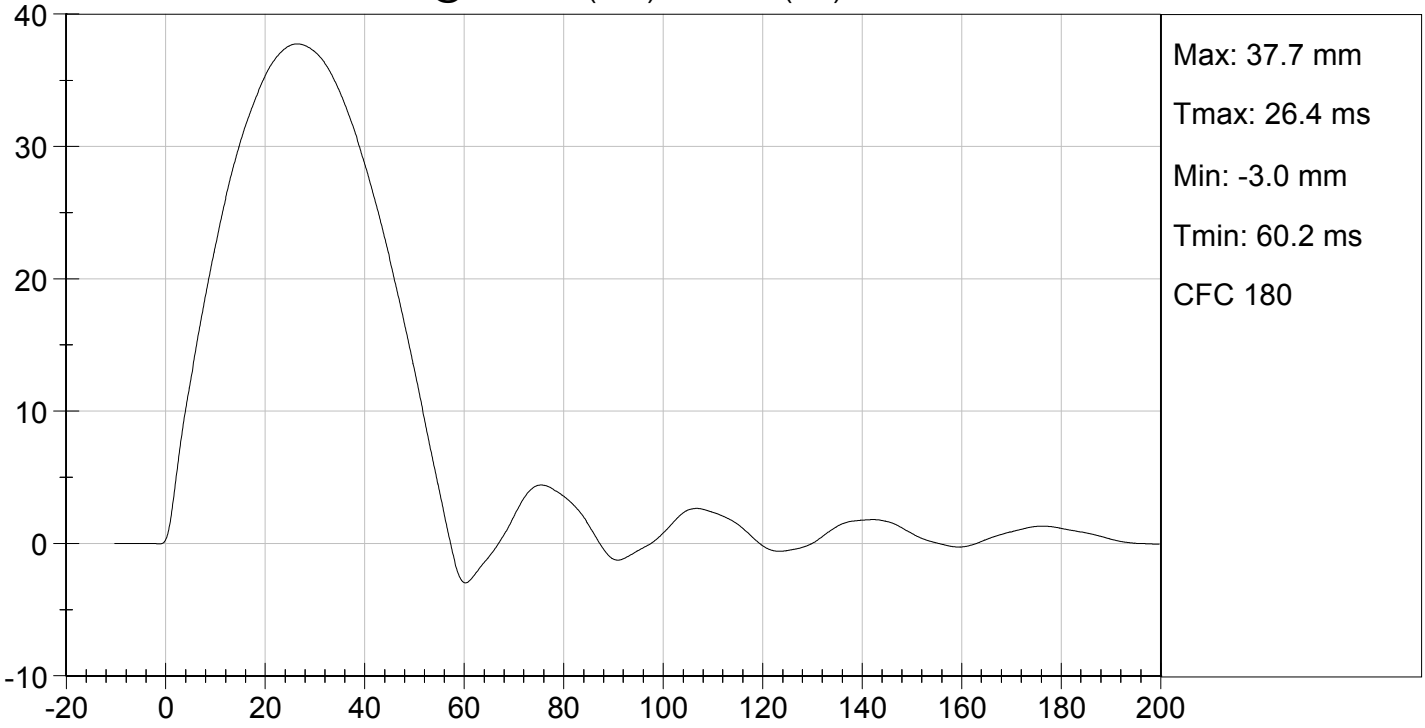
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	24	Pass
Displacement at 459 mm	mm	36.0 to 40.0	37.7	Pass
Displacement at 815 mm	mm	46.0 to 51.0	47.8	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

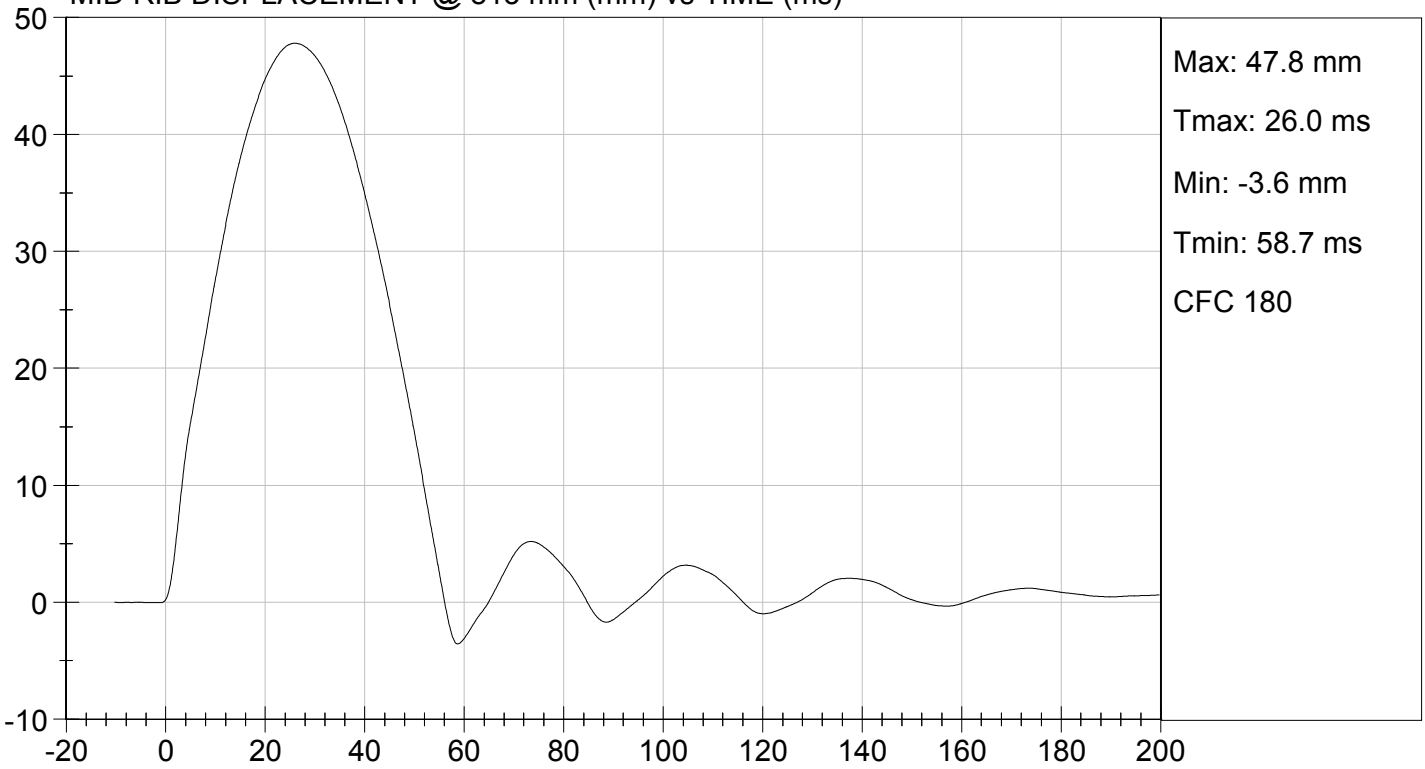
01/10/2013
Test Date

David Winkelbauer
Approved By

MID RIB DISPLACEMENT @ 459 mm (mm) vs TIME (ms)



MID RIB DISPLACEMENT @ 815 mm (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

LOWER RIB TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D13066

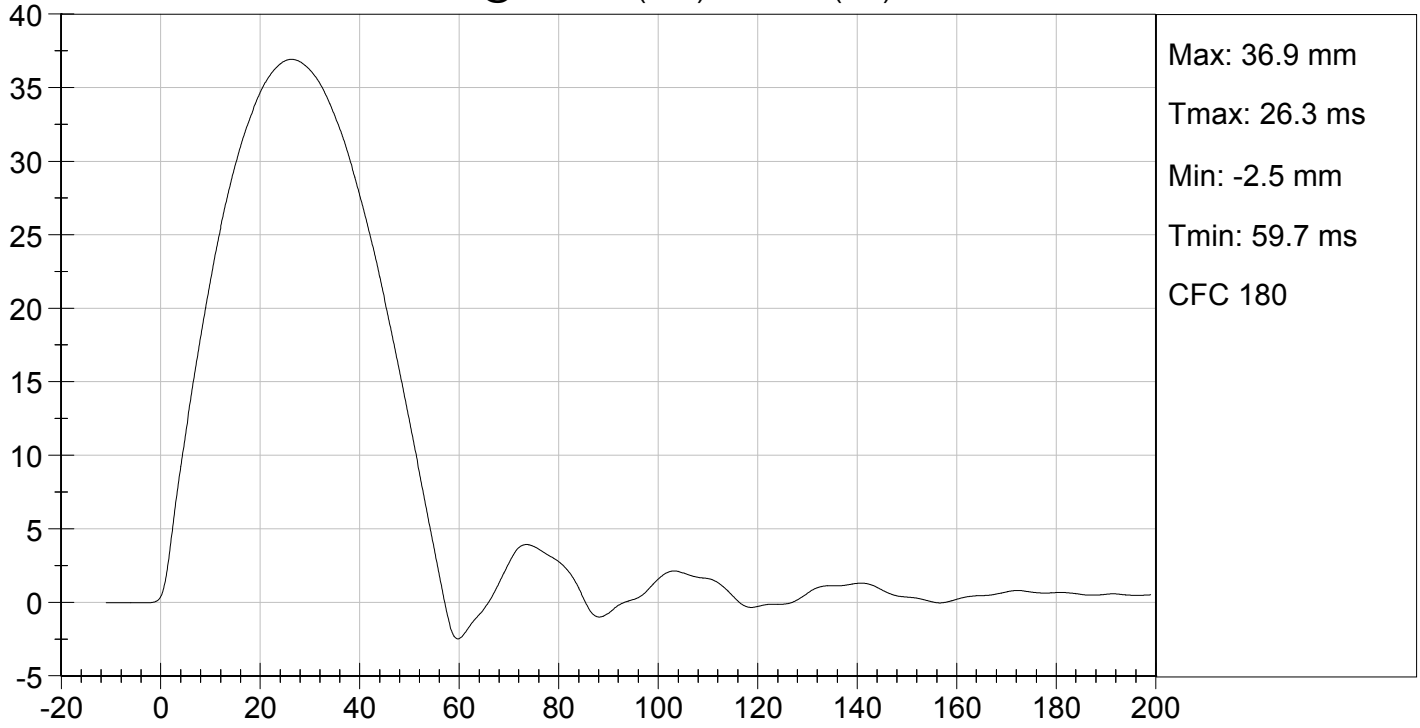
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	24	Pass
Displacement at 459 mm	mm	36.0 to 40.0	36.9	Pass
Displacement at 815 mm	mm	46.0 to 51.0	48.4	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

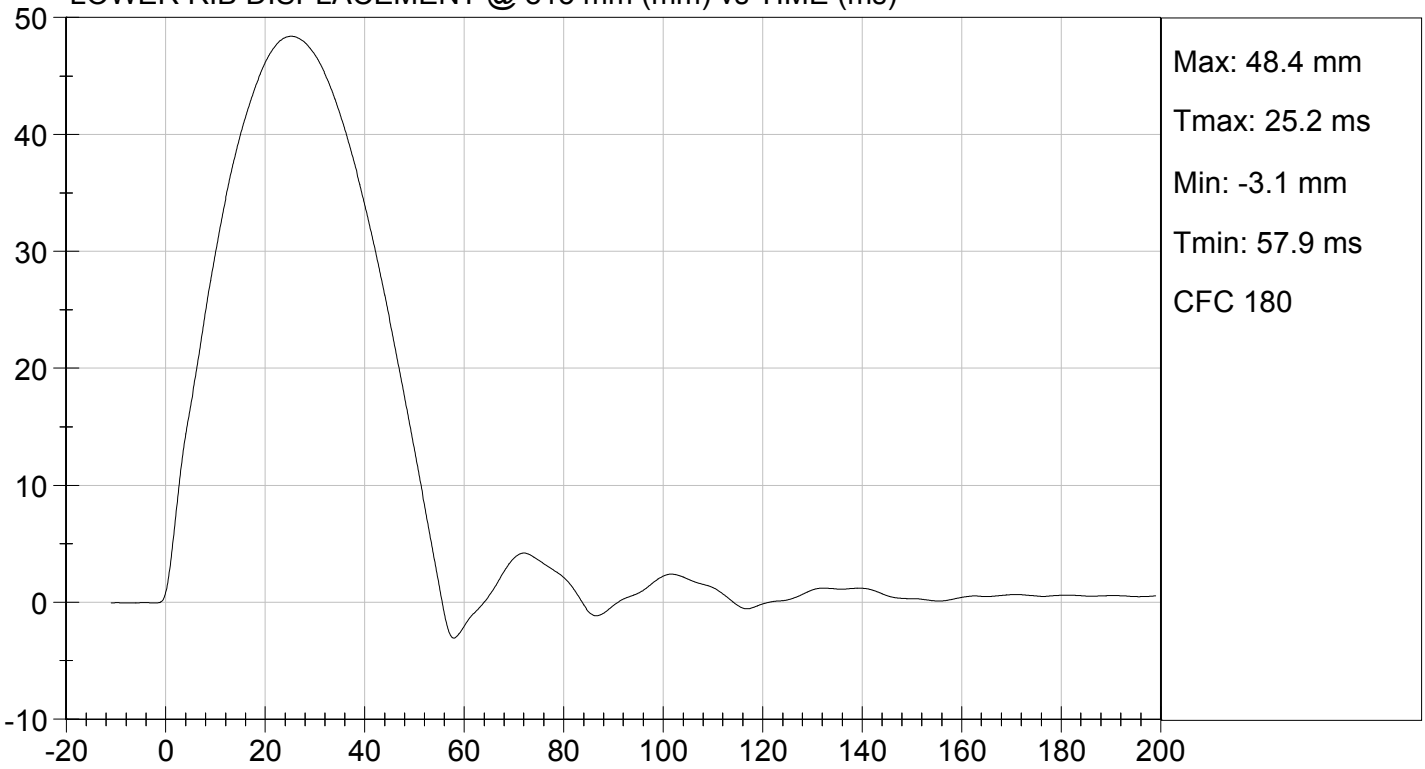
01/10/2013
Test Date

David Winkelbauer
Approved By

LOWER RIB DISPLACEMENT @ 459 mm (mm) vs TIME (ms)



LOWER RIB DISPLACEMENT @ 815 mm (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

THORAX IMPACT TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D13060

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.7	Pass
Humidity	%	10 to 70	33	Pass
Probe Speed	m/s	5.40 to 5.60	5.58	Pass
Maximum Impactor Force (after 6 ms)	N	5100 to 6200	5405	Pass
Upper Rib Displacement	mm	34.0 to 41.0	36.1	Pass
Middle Rib Displacement	mm	37.0 to 45.0	39.2	Pass
Lower Rib Displacement	mm	37.0 to 44.0	38.4	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

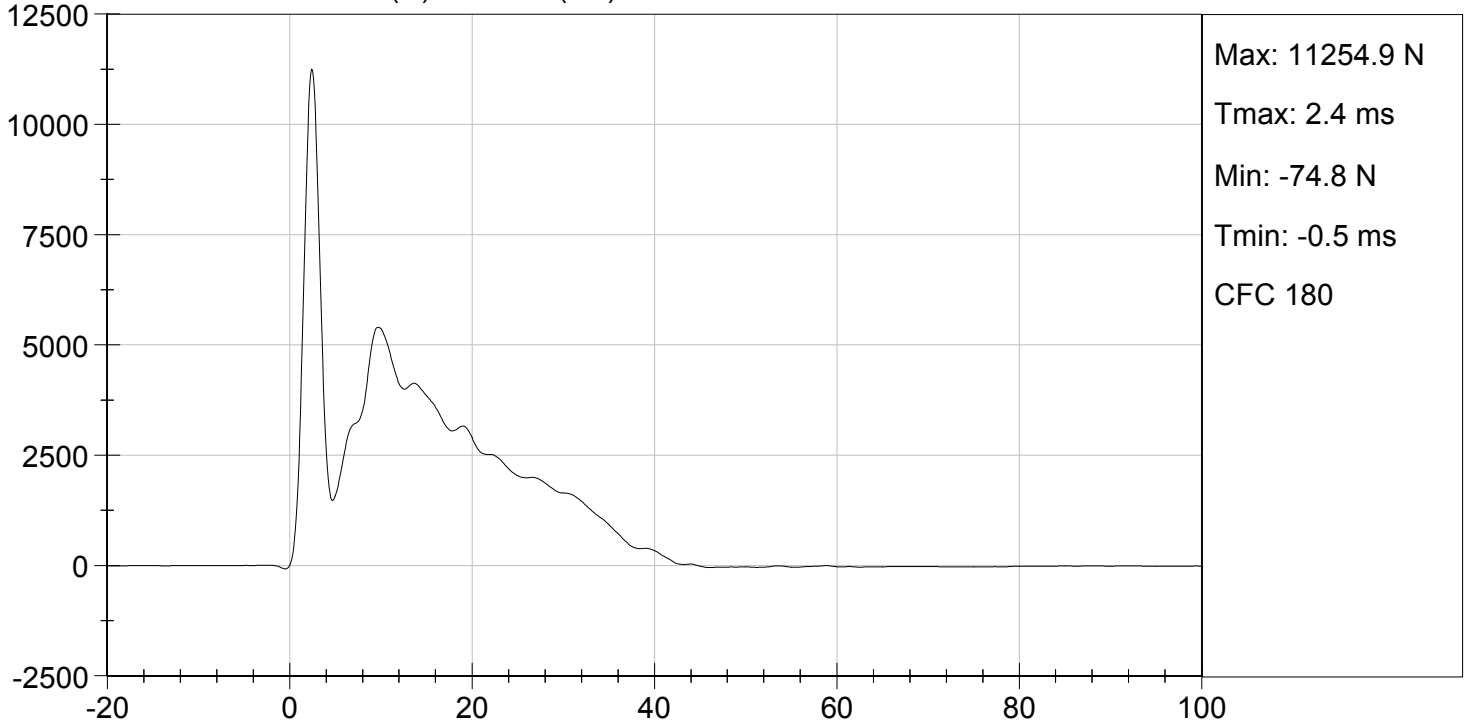
01/11/2013
Test Date

David Winkelbauer
Approved By

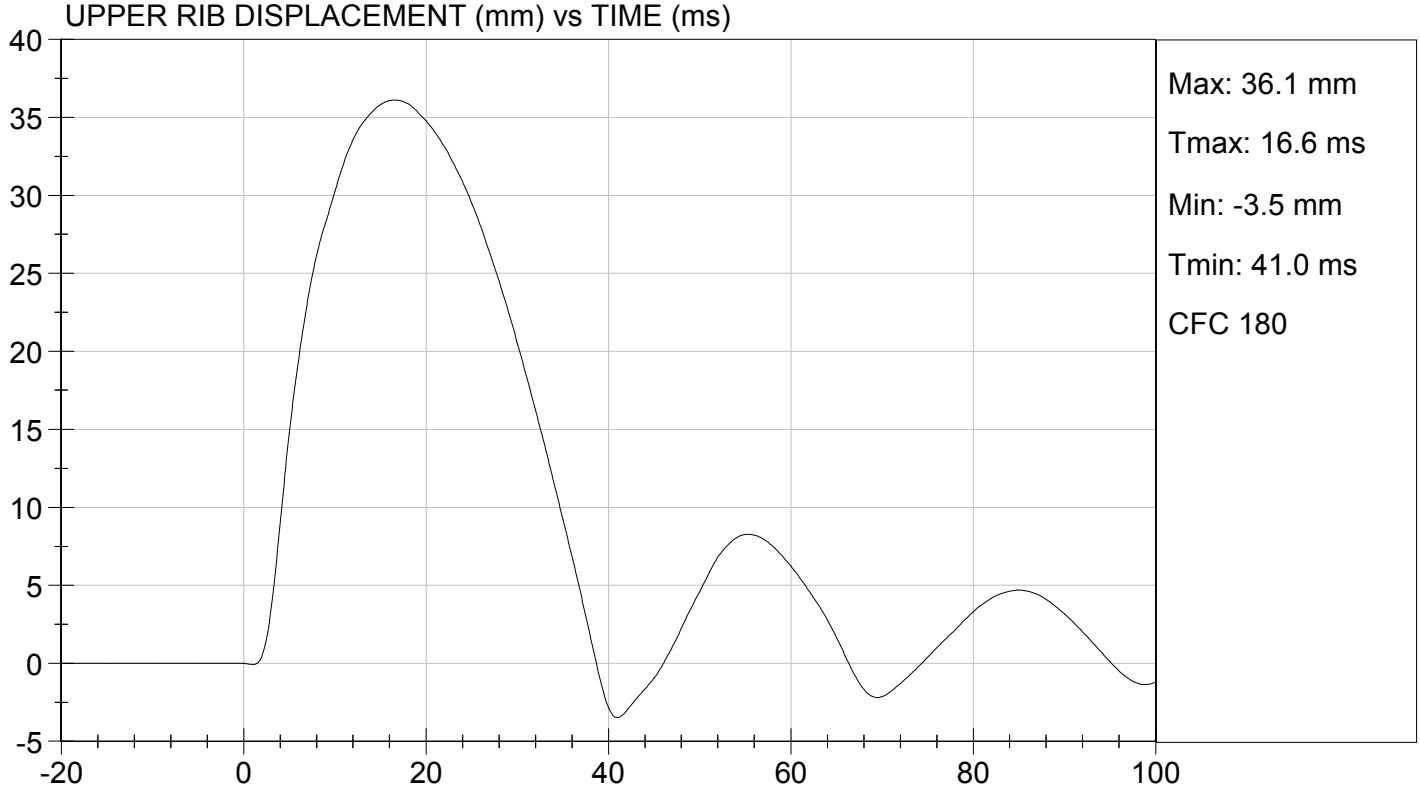
TEST DESC: THORAX IMPACT
VELOCITY: 18.31 ft/s, 5.58 m/s

TEST DATE: 01/11/2013
TEST #: D13060

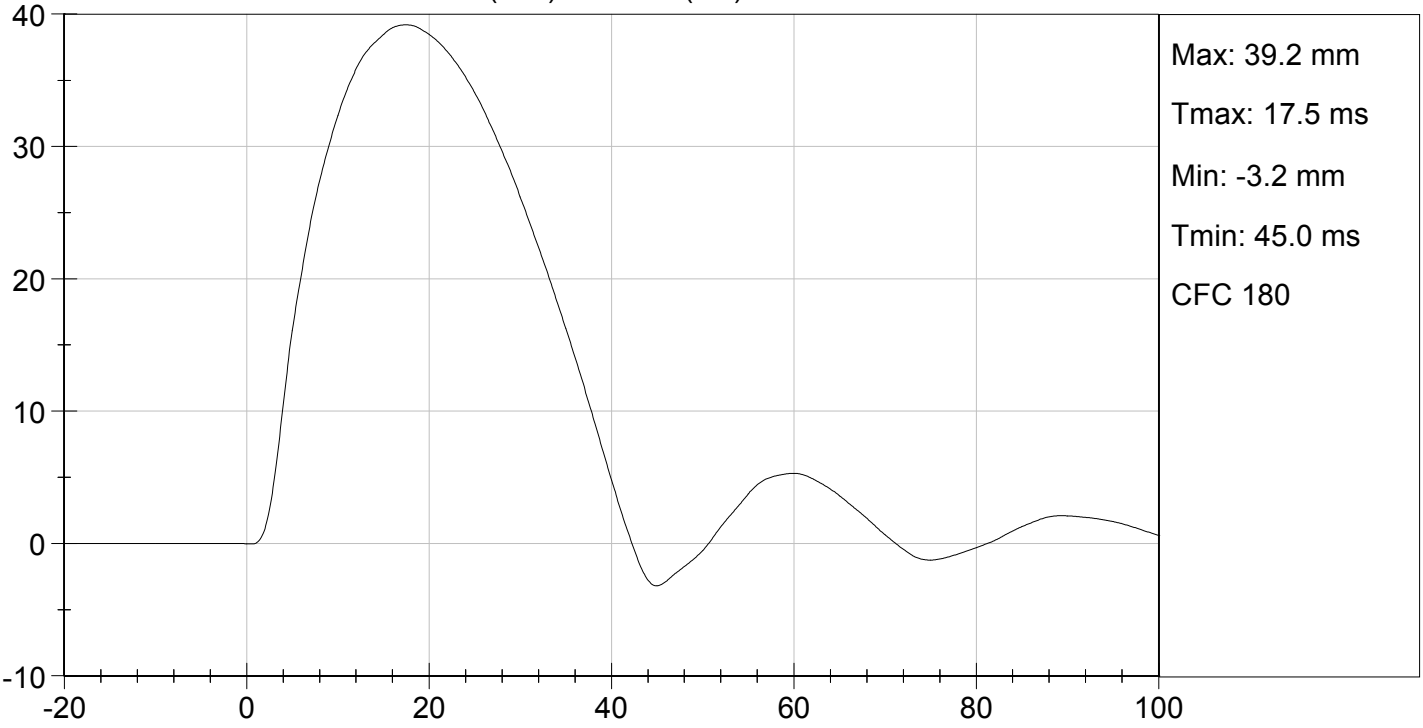
IMPACTOR FORCE (N) vs TIME (ms)



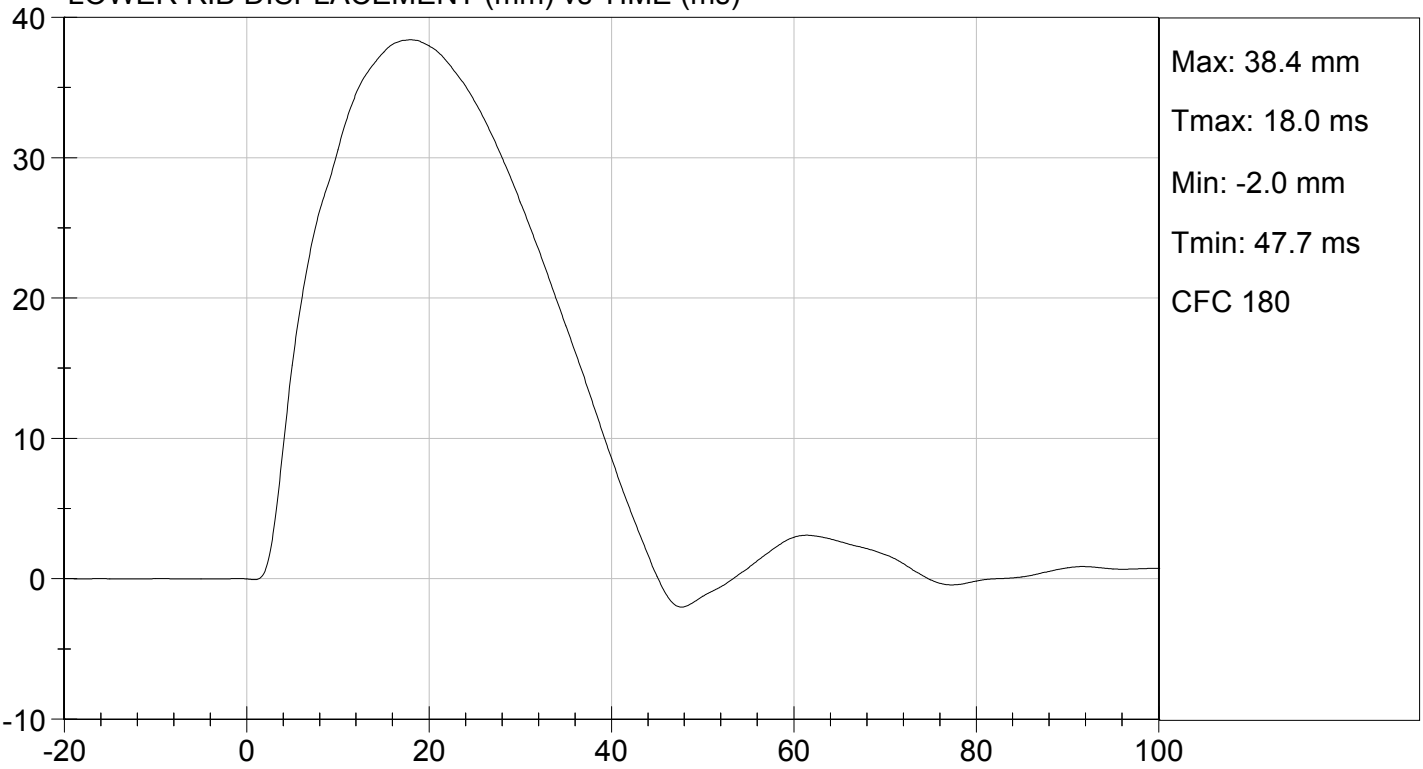
UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



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:** D13067

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	33	Pass
Probe Speed	m/s	3.90 to 4.10	4.10	Pass
Maximum Impactor Force	N	4000 to 4800	4328	Pass
Time of Maximum Impactor Force	ms	10.6 to 13.0	10.7	Pass
Maximum Total Abdomen Force	N	2200 to 2700	2468	Pass
Time of Maximum Abdomen Force	ms	10.0 to 12.3	10.4	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

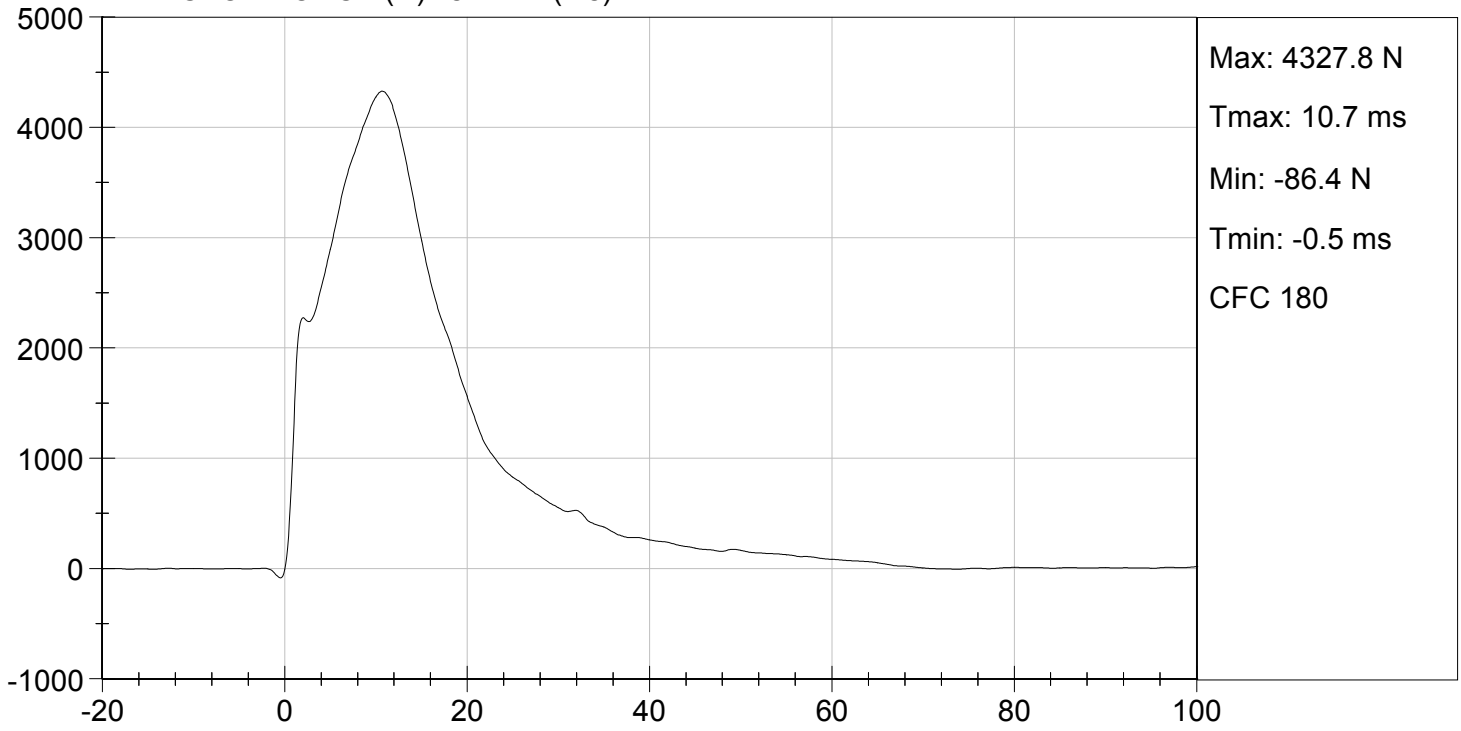
01/11/2013
Test Date

David Winkelbauer
Approved By

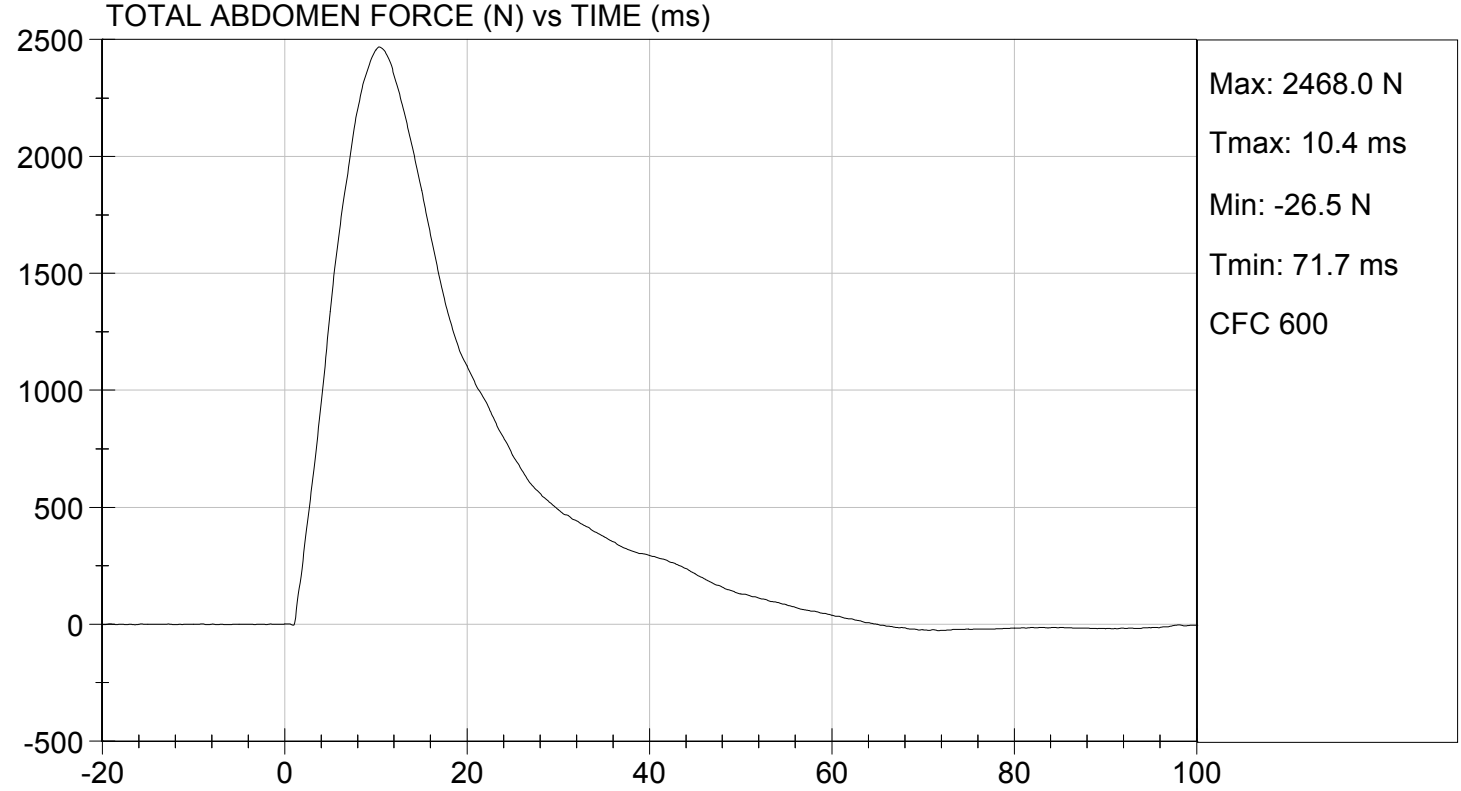
TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.44 ft/s, 4.10 m/s

TEST DATE: 01/11/2013
TEST #: D13067

IMPACTOR FORCE (N) vs TIME (ms)



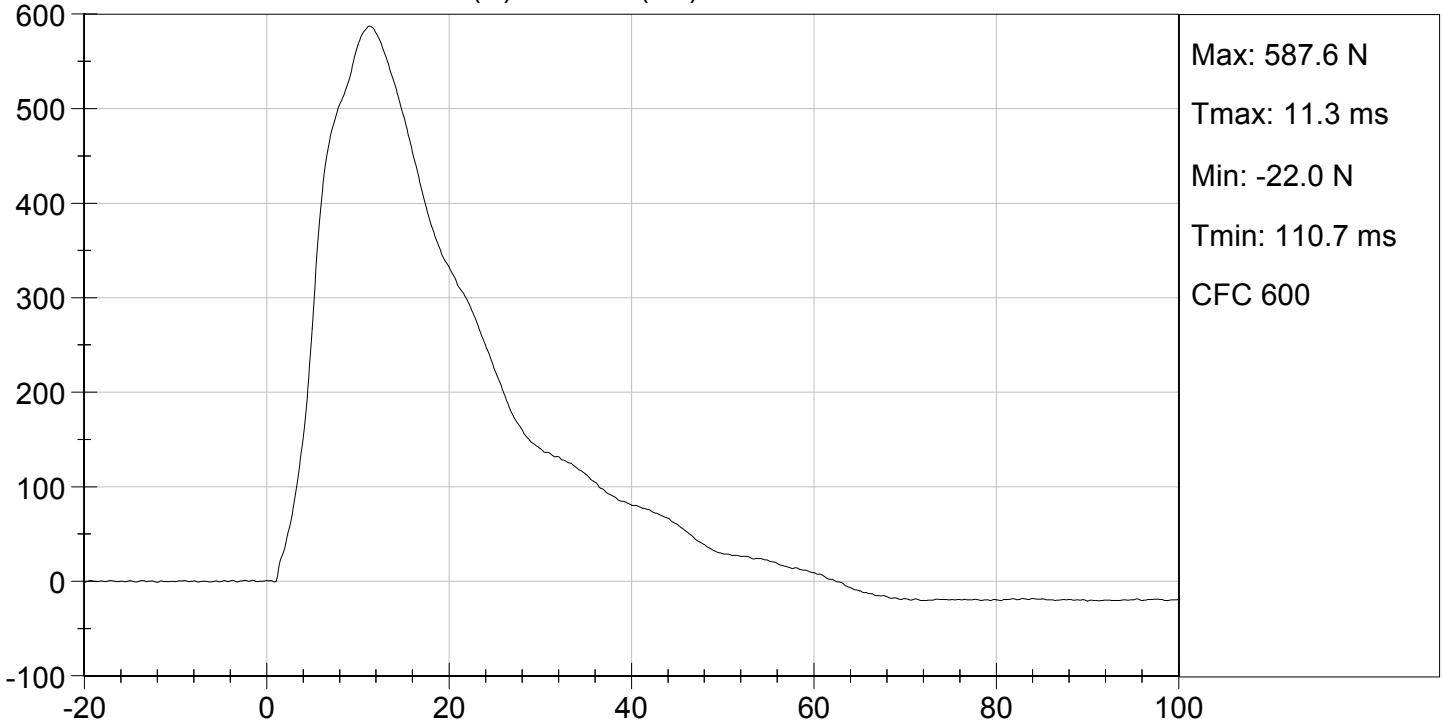
TOTAL ABDOMEN FORCE (N) vs TIME (ms)



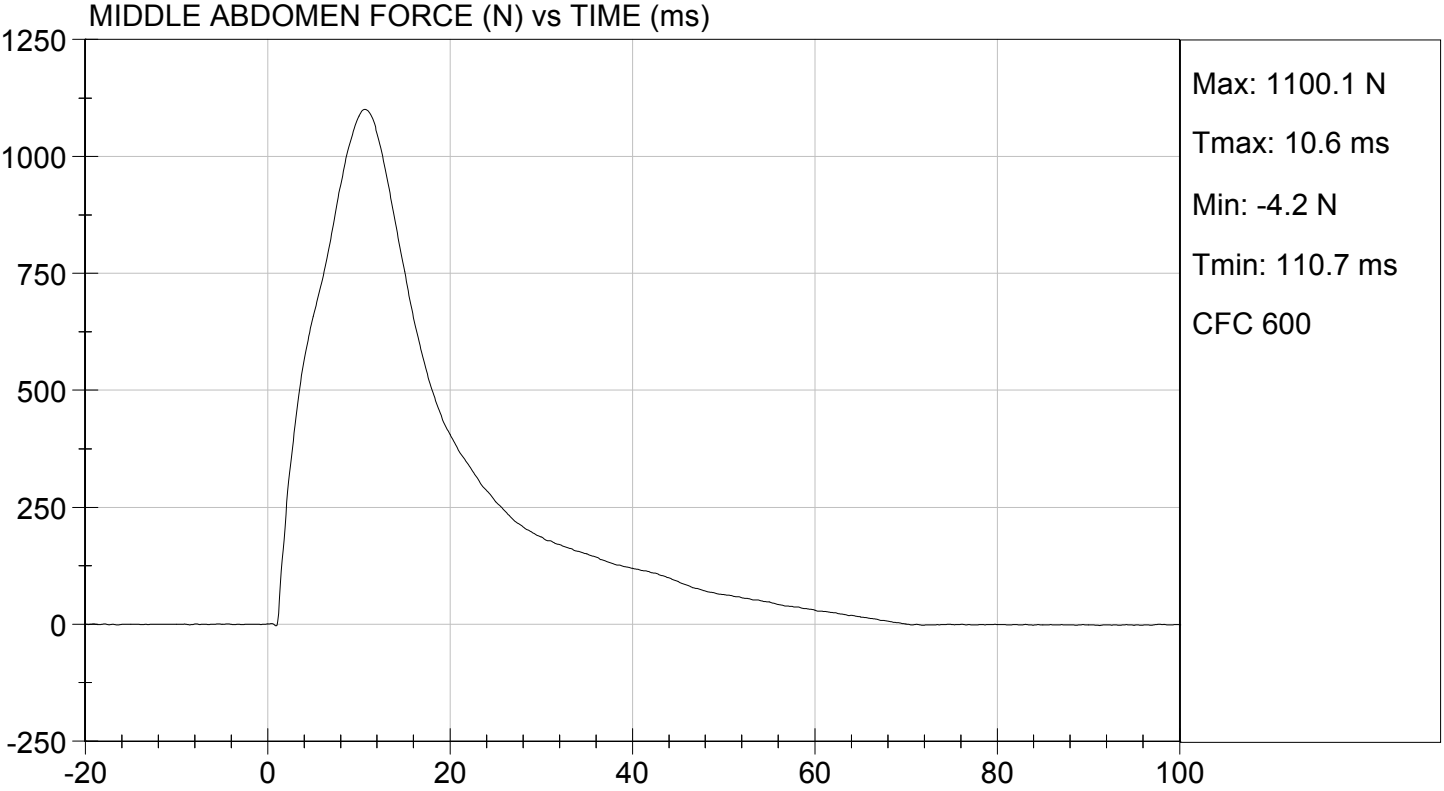
TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.44 ft/s, 4.10 m/s

TEST DATE: 01/11/2013
TEST #: D13067

FRONT ABDOMEN FORCE (N) vs TIME (ms)



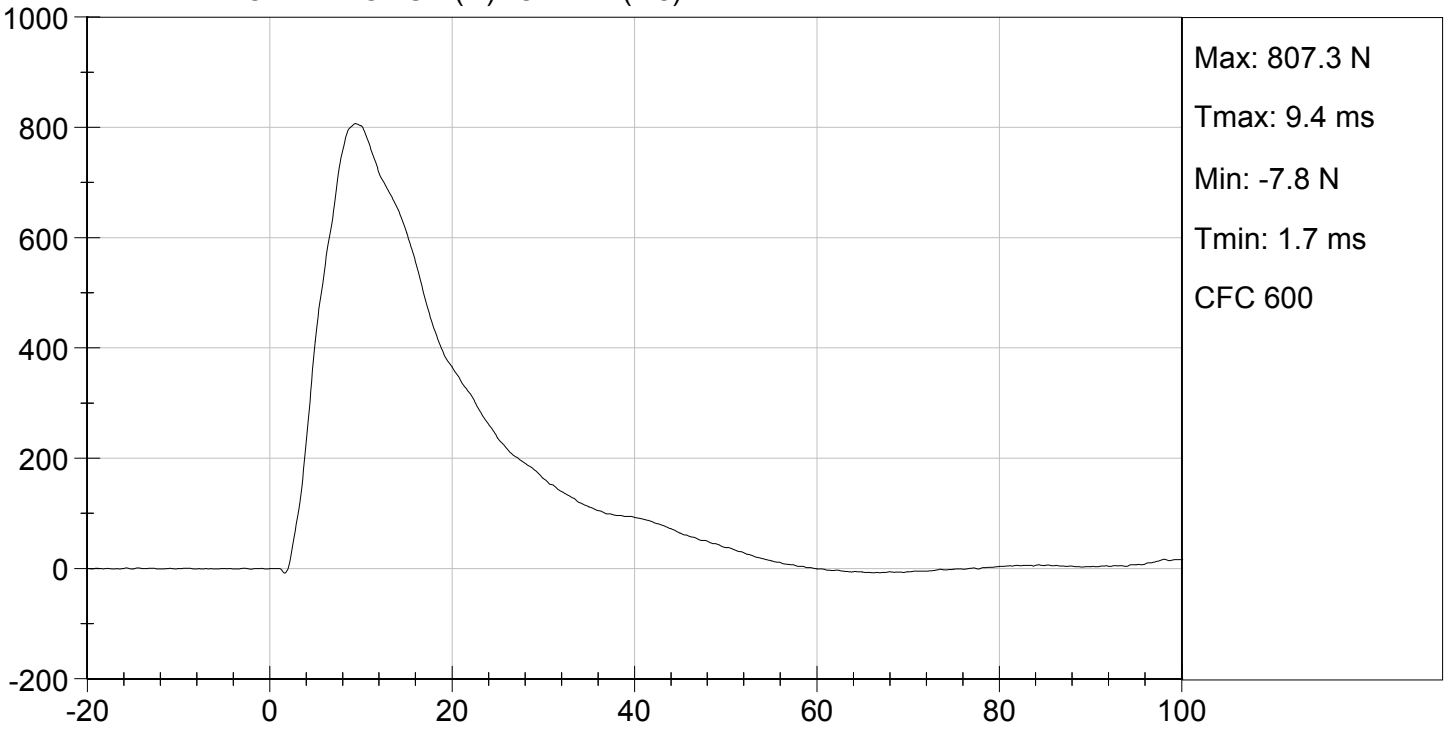
MIDDLE ABDOMEN FORCE (N) vs TIME (ms)



TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.44 ft/s, 4.10 m/s

TEST DATE: 01/11/2013
TEST #: D13067

REAR ABDOMEN FORCE (N) vs TIME (ms)



MGA RESEARCH CORPORATION

LUMBAR SPINE TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D13068

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.0	Pass
Laboratory Relative Humidity		%	10 to 70	47	Pass
Pendulum Speed		m/s	5.95 to 6.15	6.13	Pass
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	-0.00	Pass
	3.7 ms	m/s	-0.425 to -0.24	-0.407	Pass
	27 ms	m/s	-6.50 to -5.80	-5.98	Pass
	30 ms	m/s	>= -6.50	-5.91	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	48.3	Pass
Time of Maximum Flexion Angle		ms	39.0 to 53.0	42.5	Pass
Headform Rotation Decay to Initial Position		ms	37 to 57	45	Pass
			Overall Results		Pass

Jessica Gall
Laboratory Technician

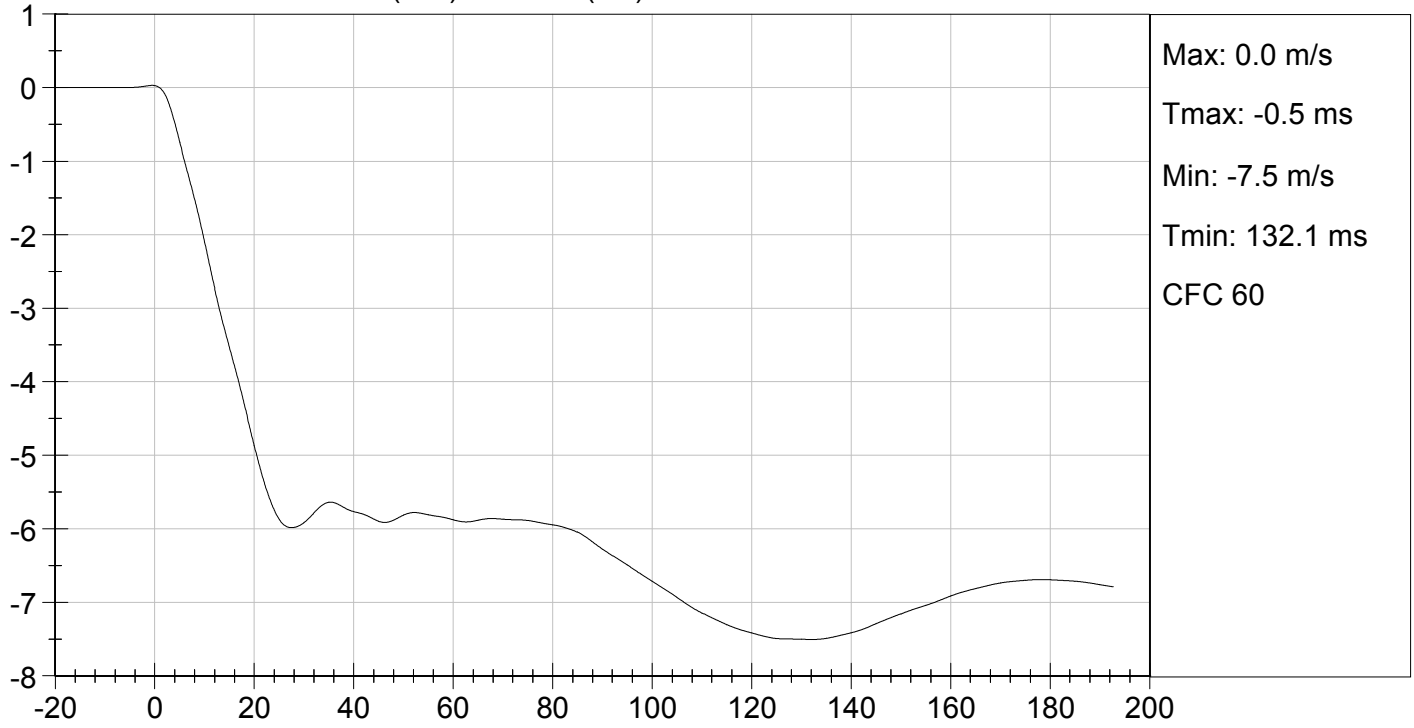
01/10/2013
Test Date

David Winkelbauer
Approved By

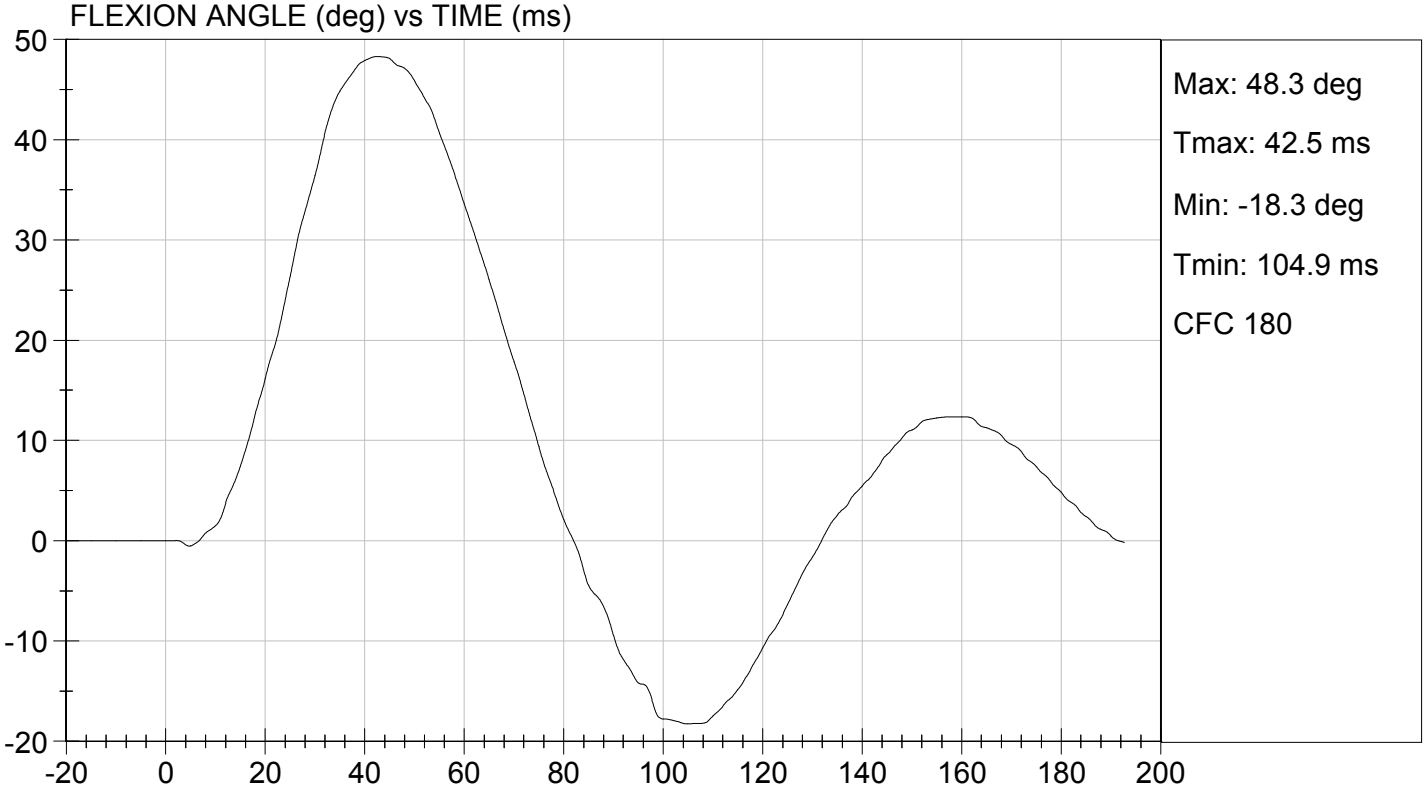
TEST DESC: LUMBAR BENDING
VELOCITY: 20.10 ft/s, 6.13 m/s

TEST DATE: 01/10/2013
TEST #: D13068

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



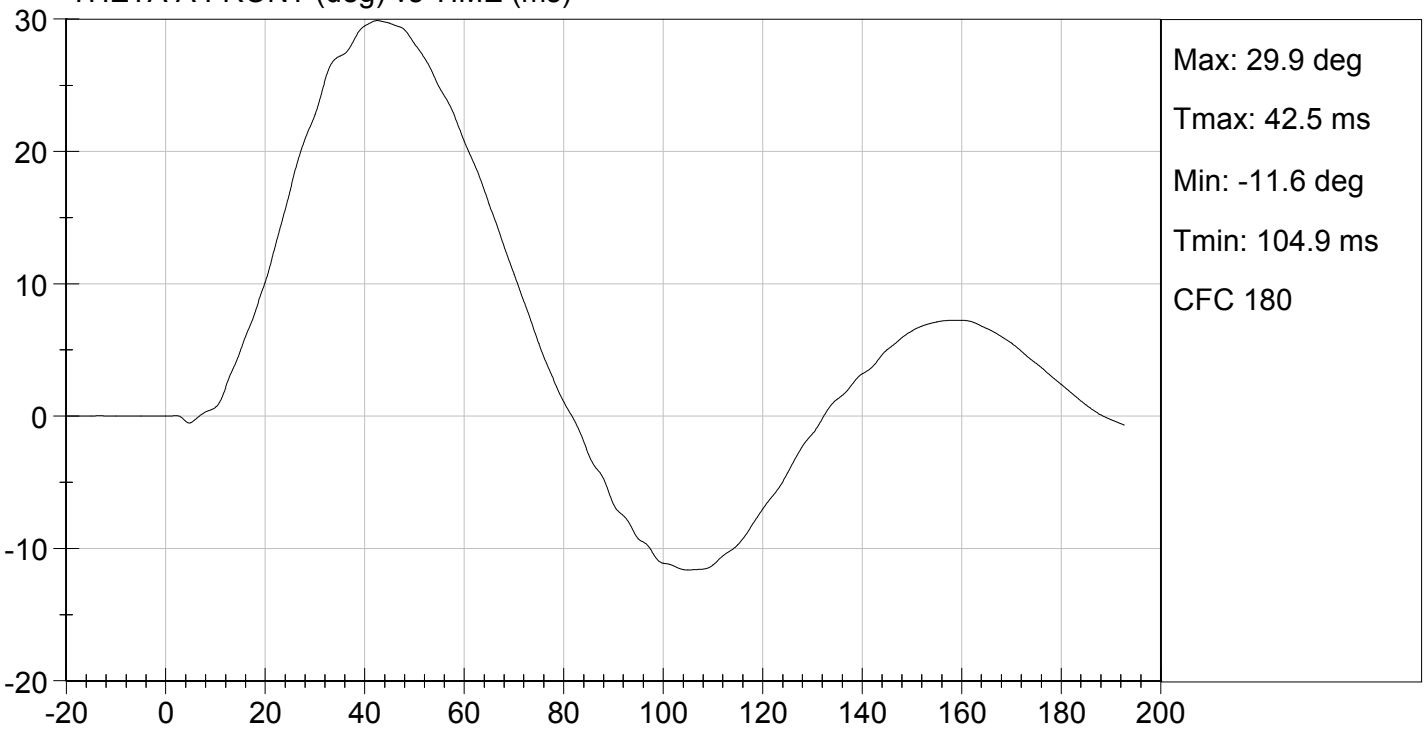
FLEXION ANGLE (deg) vs TIME (ms)



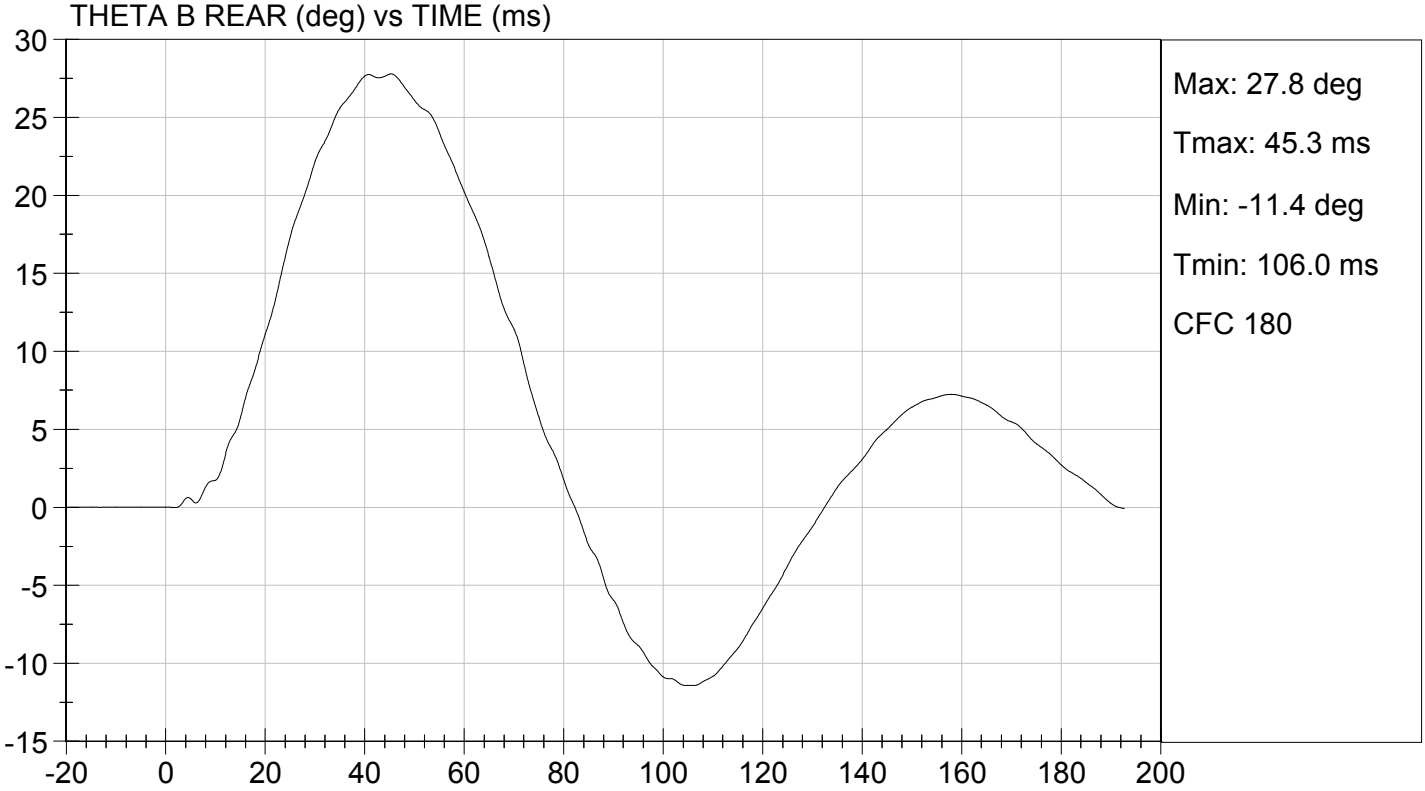
TEST DESC: LUMBAR BENDING
VELOCITY: 20.10 ft/s, 6.13 m/s

TEST DATE: 01/10/2013
TEST #: D13068

THETA A FRONT (deg) vs TIME (ms)

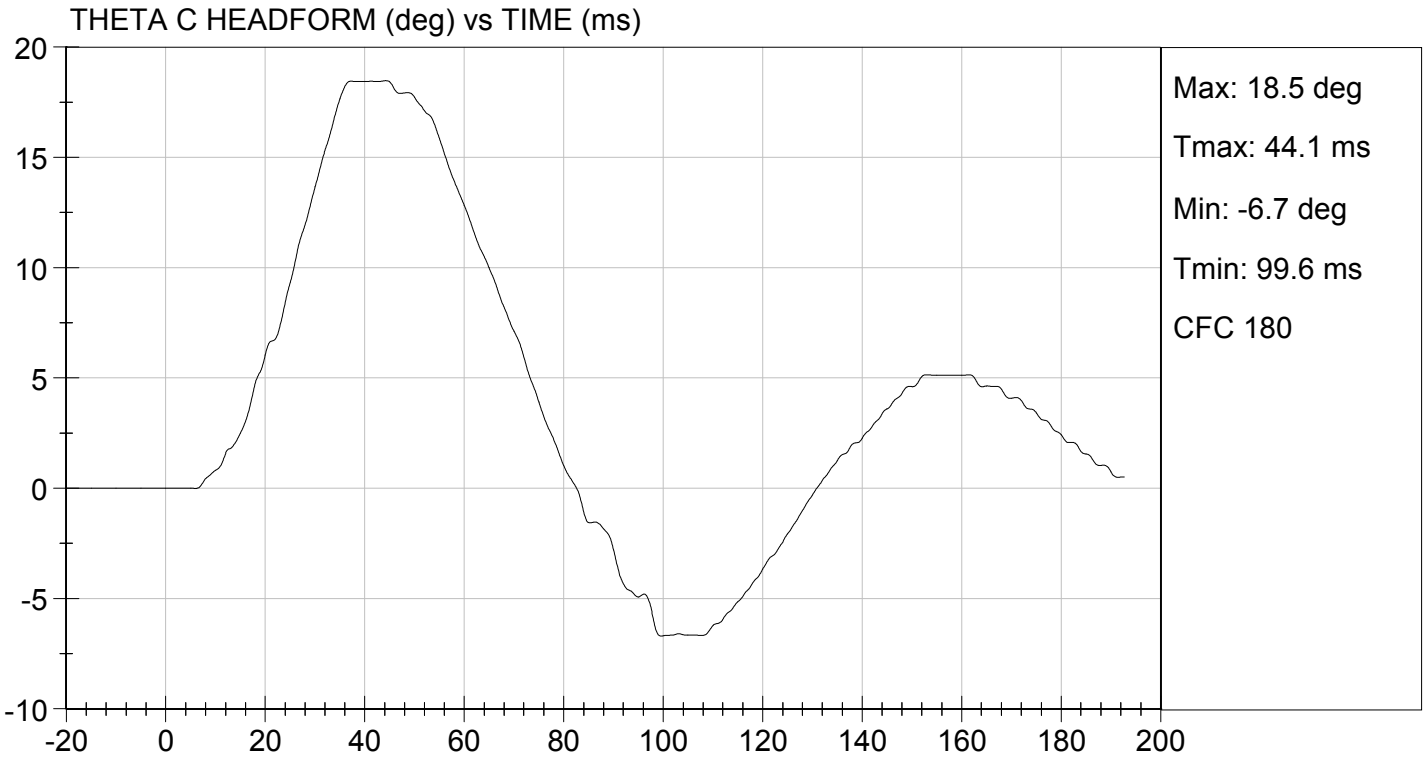


THETA B REAR (deg) vs TIME (ms)



TEST DESC: LUMBAR BENDING
VELOCITY: 20.10 ft/s, 6.13 m/s

TEST DATE: 01/10/2013
TEST #: D13068



MGA RESEARCH CORPORATION

PELVIS TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D13069

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	33	Pass
Probe Speed	m/s	4.20 to 4.40	4.34	Pass
Maximum Impactor Force	N	4700 to 5400	4759	Pass
Time of Maximum Impactor Force	ms	11.8 to 16.1	13.1	Pass
Maximum Pubic Force	N	1230 to 1590	1310	Pass
Time of Maximum Pubic Force	ms	12.2 to 17.0	13.9	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

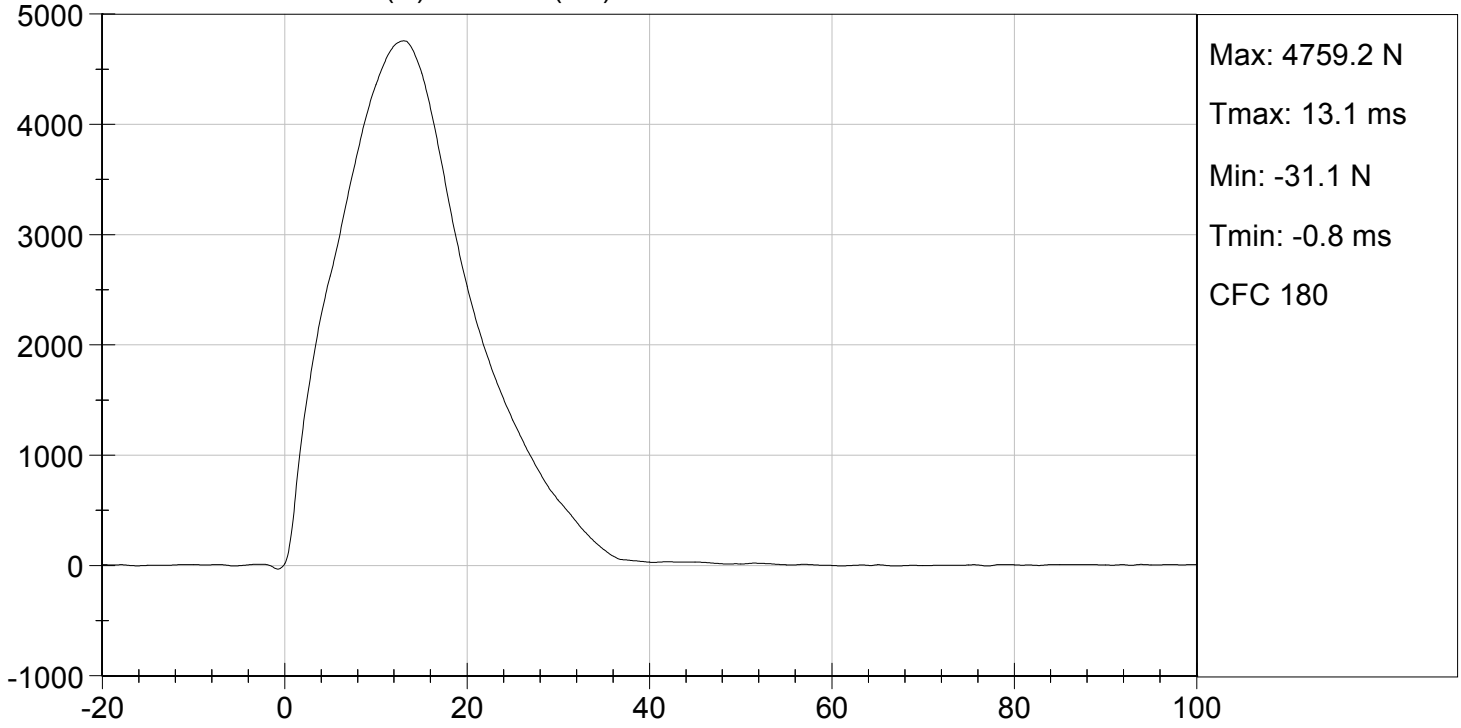
01/11/2013
Test Date

David Winkelbauer
Approved By

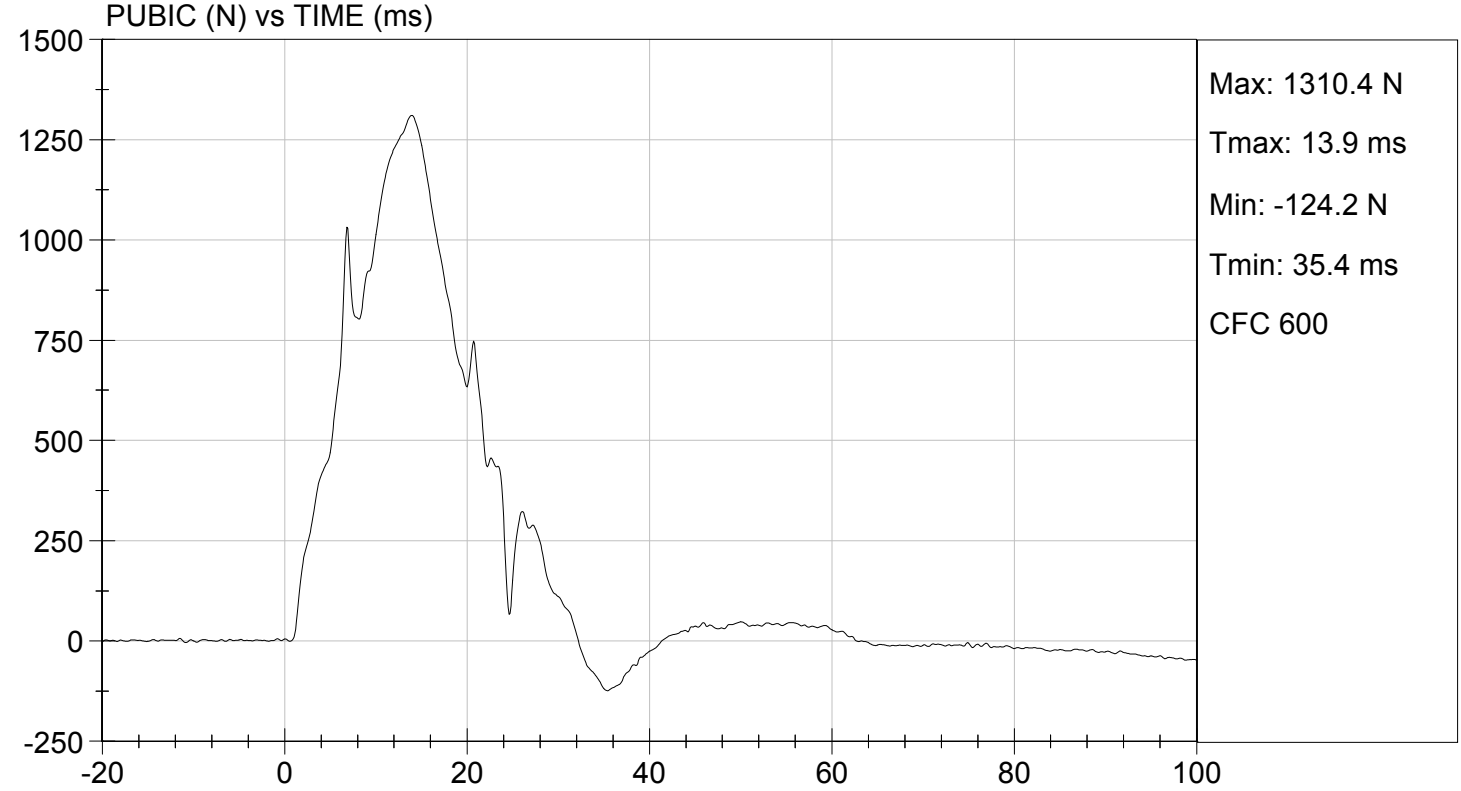
TEST DESC: PELVIS IMPACT
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 01/11/2013
TEST #: D13069

IMPACTOR FORCE (N) vs TIME (ms)



PUBIC (N) vs TIME (ms)



SID-IIsD External Measurements
SN: 306

No.	Name	Spec. (mm)	Result	Pass/Fail
A	Sitting Height	772 - 788	785	Pass
B	Shoulder Pivot Height	437 - 453	449	Pass
C	H-point Height	79 - 89	86	Pass
D	H-point from Seatback	141 - 151	147	Pass
E	Shoulder Pivot from Backline	97 - 107	99	Pass
F	Thigh Clearance	119 -135	120	Pass
G	Head Breadth	140 - 148	141	Pass
H	Head Back from Backline	40 - 46	45	Pass
I	Head Depth	178 - 188	182	Pass
J	Head Circumference	541 - 551	550	Pass
K	Buttock to Knee Length	514 - 540	538	Pass
L	Popliteal Height	343 - 369	349	Pass
M	Knee Pivot to Floor Height	392 - 409	394	Pass
N	Buttock Popliteal Length	416 - 442	435	Pass
O	Chest Depth w/o Jacket	195 - 211	198	Pass
P	Foot Length	216 - 232	222	Pass
Q	Hip Breadth (w/ pelvic plugs)	313 - 323	317	Pass
R	Arm Length	249 - 259	250	Pass
S	Knee Joint to Seatback	477 - 493	483	Pass
V	Shoulder Width	341 - 357	351	Pass
W	Foot Width	78 - 94	82	Pass
Y	Chest Circumference w/ jacket	851 - 881	863	Pass
Z	Waist Circumference	761 - 791	782	Pass

MGA RESEARCH CORPORATION

HEAD DROP TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test ID:** D124811

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	37	Pass
Peak Resultant Acceleration	G's	115 to 137	122	Pass
Peak Longitudinal Acceleration	G's	+/- 15	-3.9	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	<15%	Yes	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

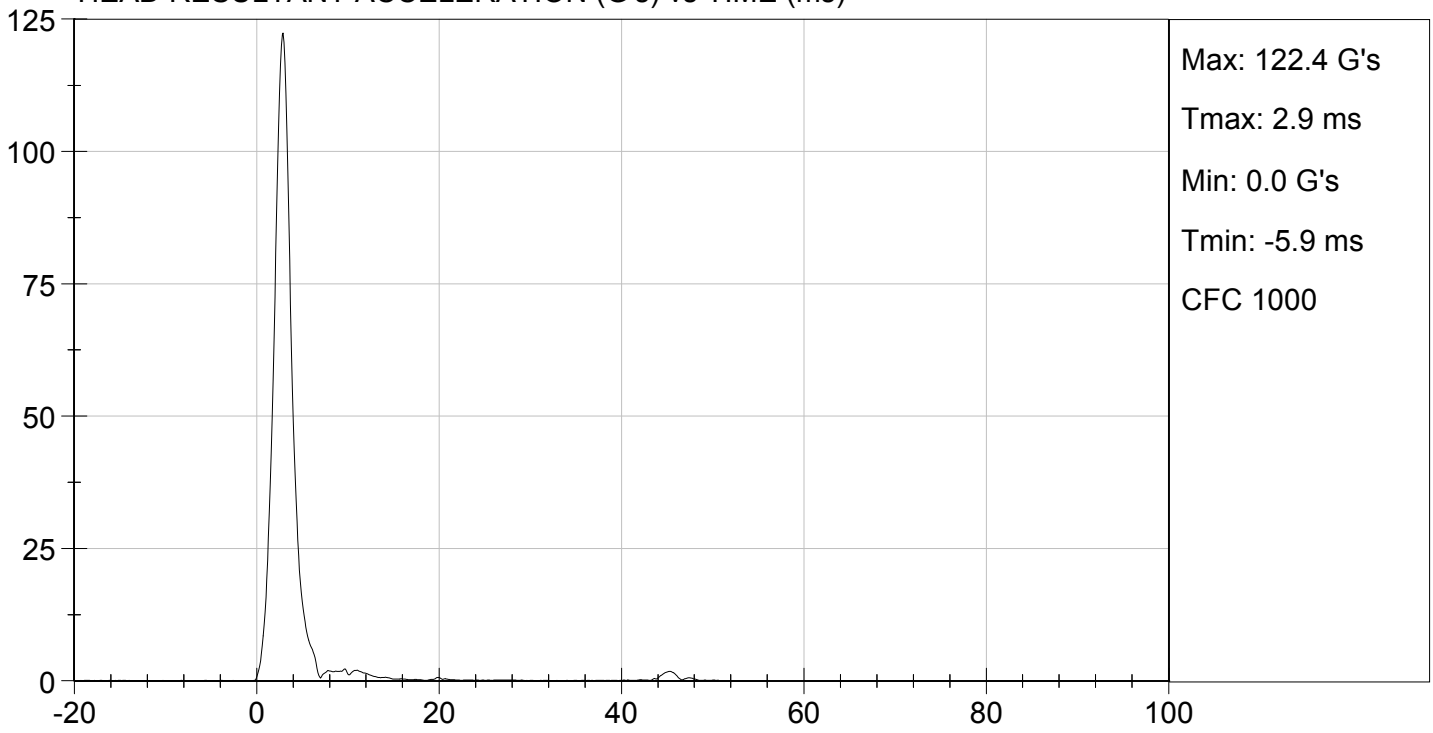
12/20/2012
Test Date

David Winkelbauer
Approved By

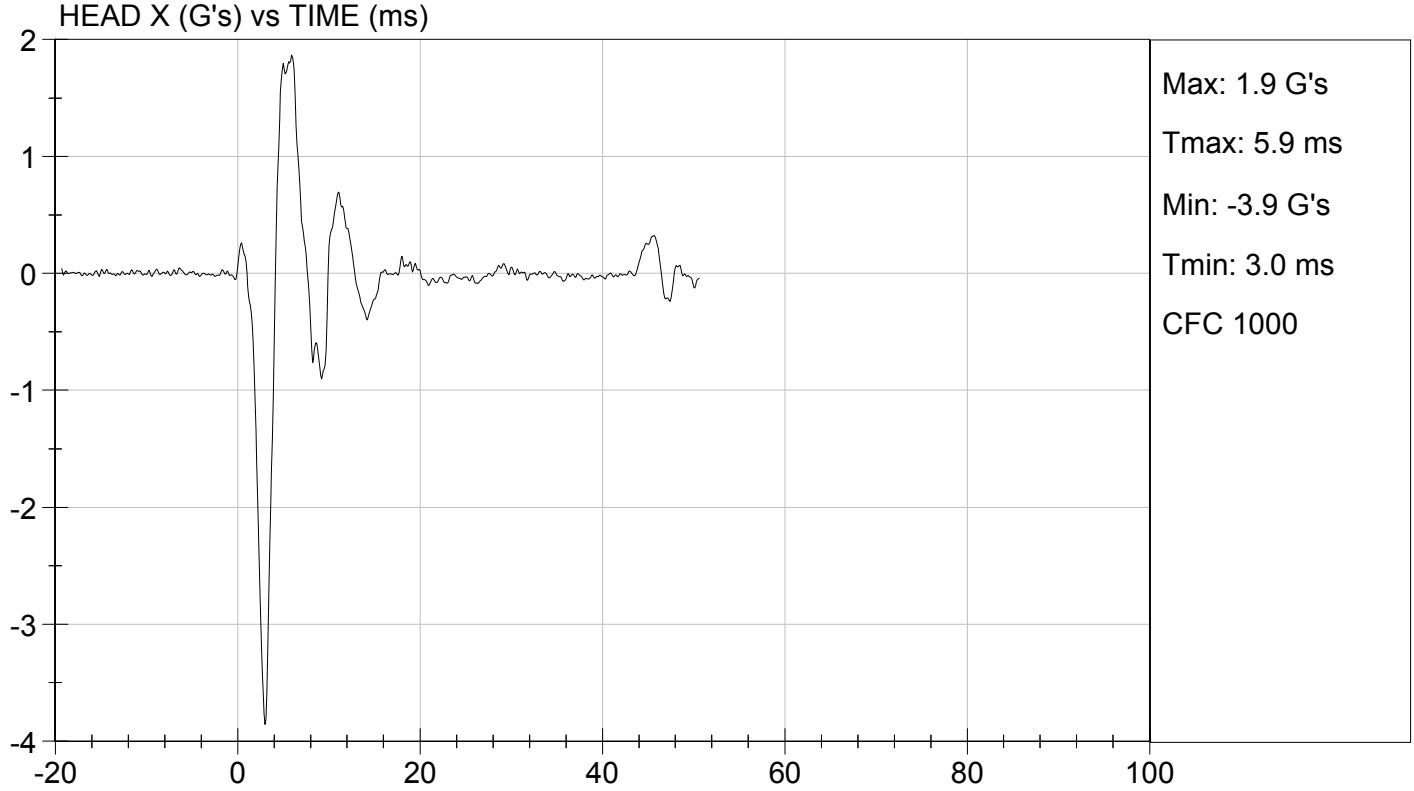
TEST DESC: HEAD DROP

TEST DATE: 12/20/2012
TEST #: D124811

HEAD RESULTANT ACCELERATION (G's) vs TIME (ms)



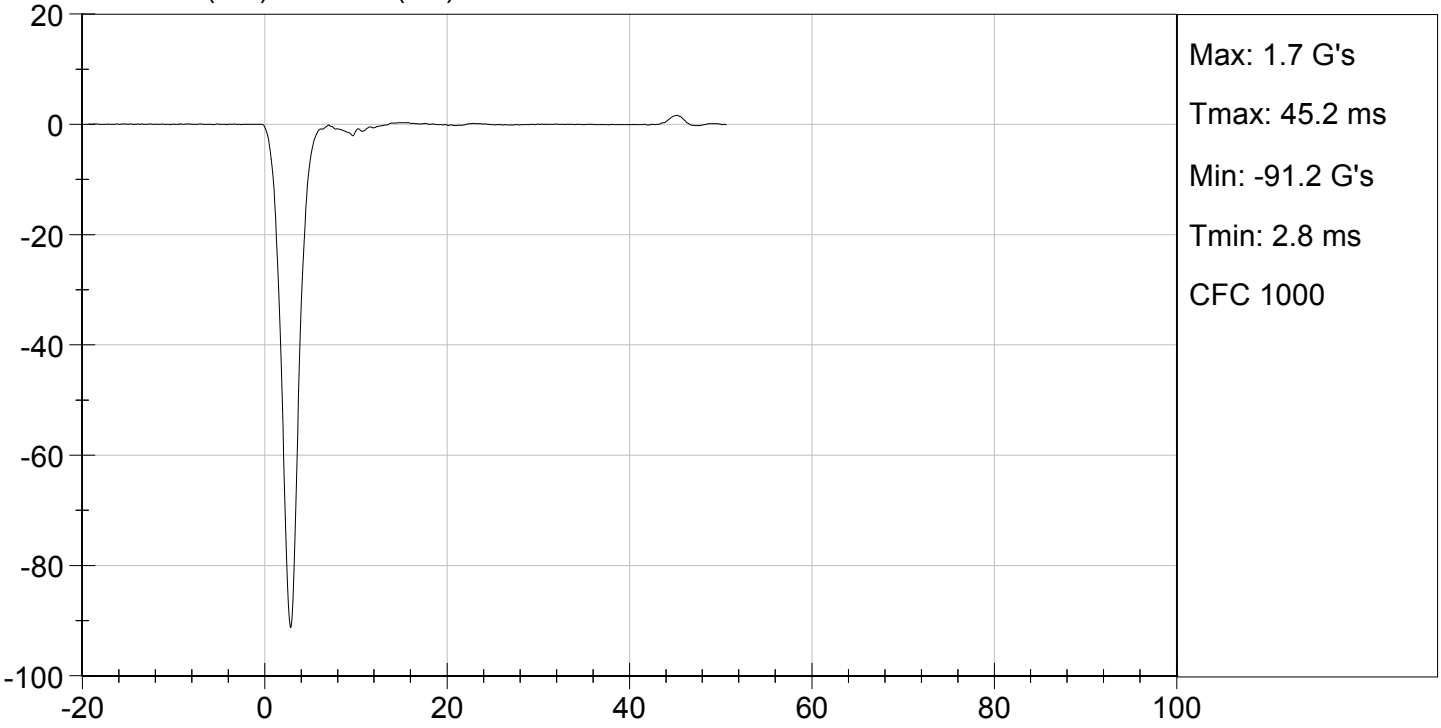
HEAD X (G's) vs TIME (ms)



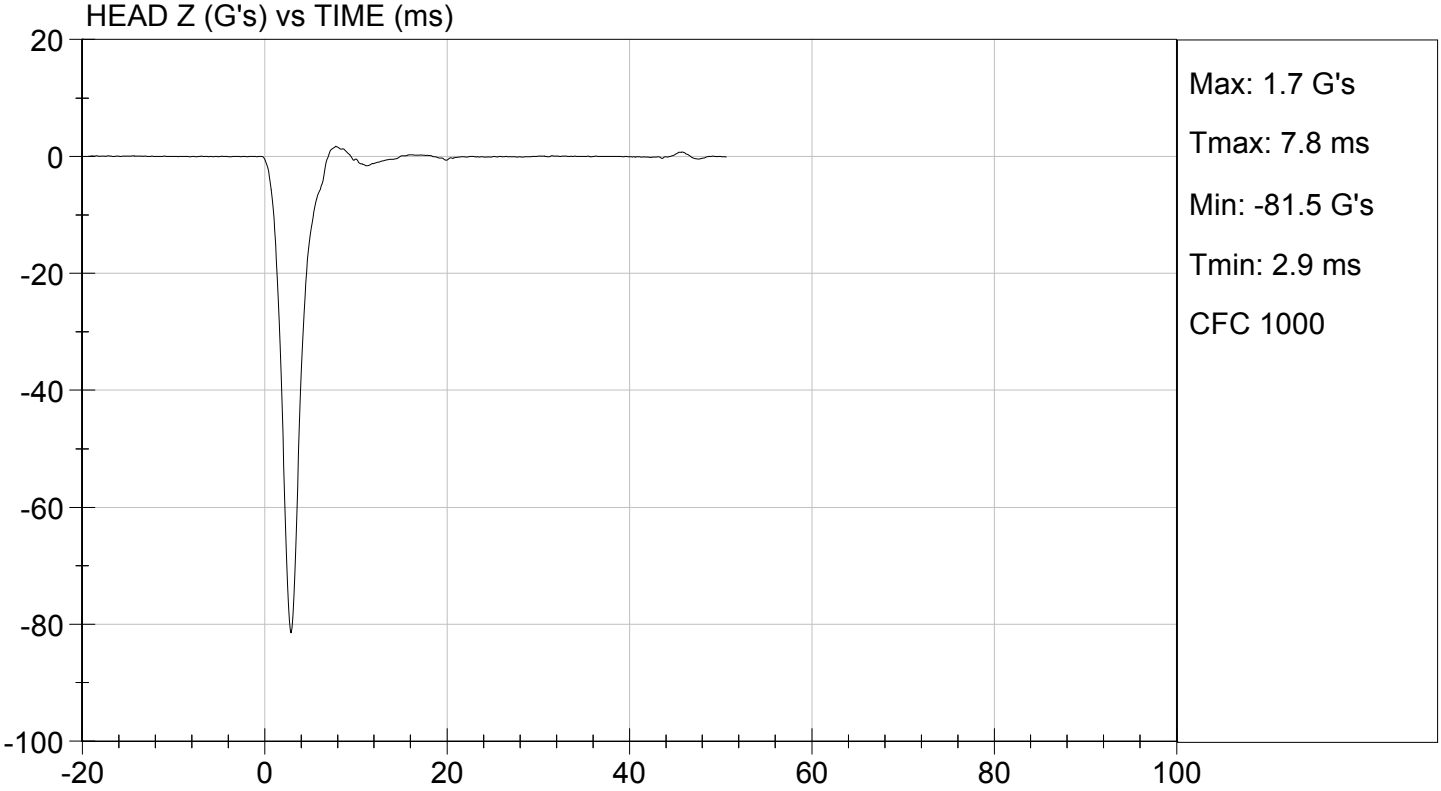
TEST DESC: HEAD DROP

TEST DATE: 12/20/2012
TEST #: D124811

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



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



MGA RESEARCH CORPORATION

LATERAL NECK PENDULUM TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D124812

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.3	Pass
Humidity		%	10 to 70	37	Pass
Impact Velocity		m/s	5.51 to 5.63	5.52	Pass
Pendulum Velocity	10 ms	m/s	2.20 to 2.80	2.51	Pass
	15 ms	m/s	3.30 to 4.10	3.59	Pass
	20 ms	m/s	4.40 to 5.40	4.81	Pass
	25 ms	m/s	5.40 to 6.10	5.50	Pass
	25-100 ms	m/s	5.50 to 6.20	5.57	Pass
Maximum D-Plane Rotation		deg	71 to 81	71	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	59	Pass
Maximum Occipital Condyle Moment		Nm	-44 to -36	-40	Pass
Time of Moment Decay to 0 Nm		ms	102 to 126	114	Pass
			Overall Test Results		Pass

Jessica Hall
Laboratory Technician

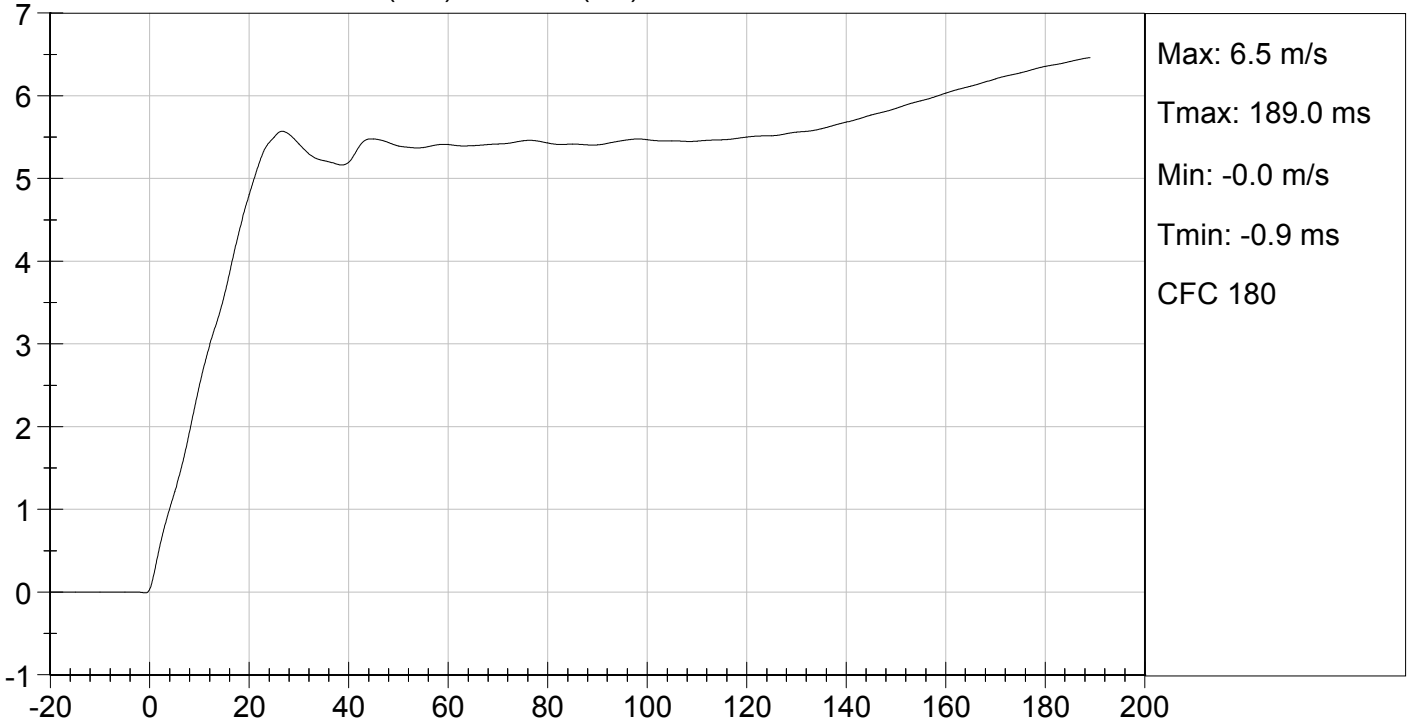
12/20/2012
Test Date

David Winkelbauer
Approved By

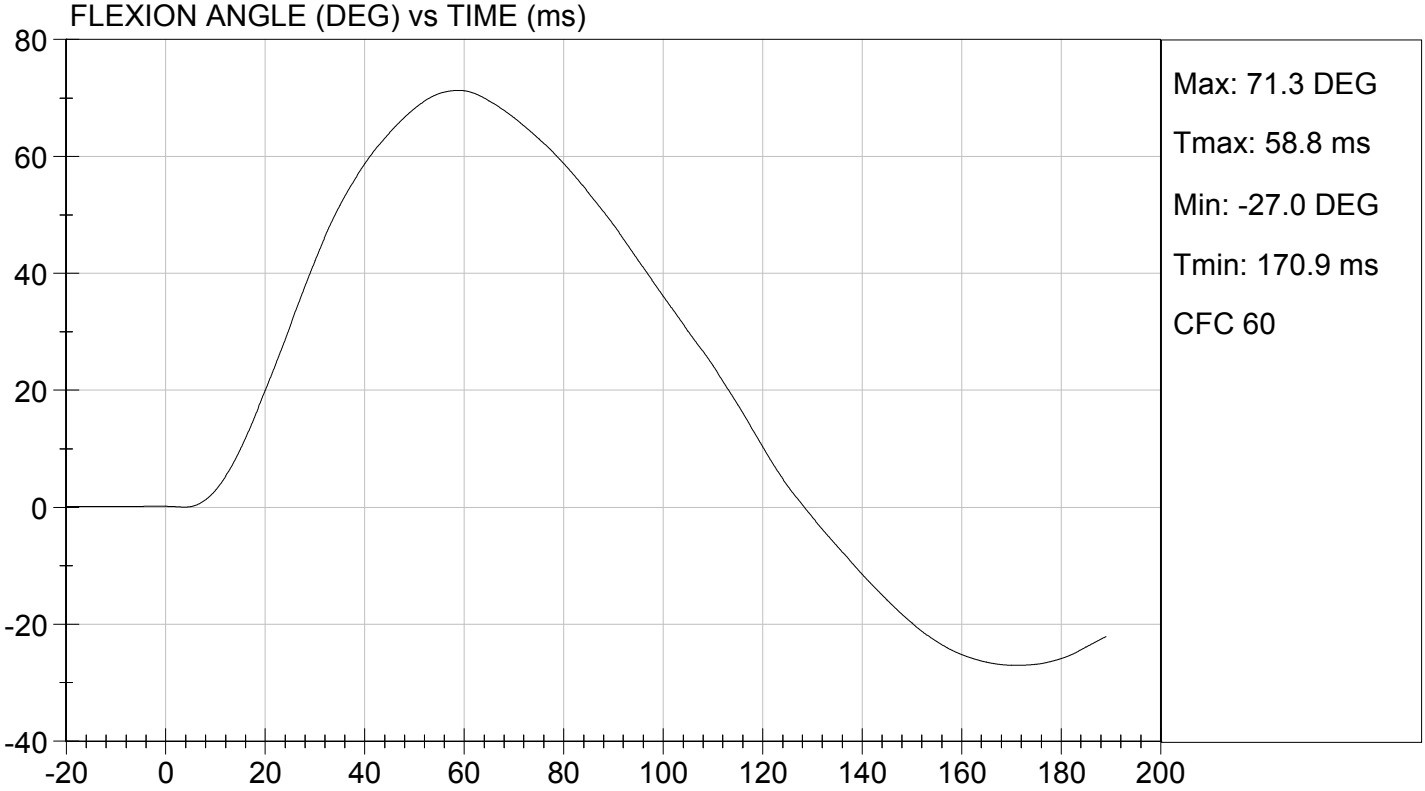
TEST DESC: NECK BENDING
VELOCITY: 18.12 ft/s, 5.52 m/s

TEST DATE: 12/20/2012
TEST #: D124812

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

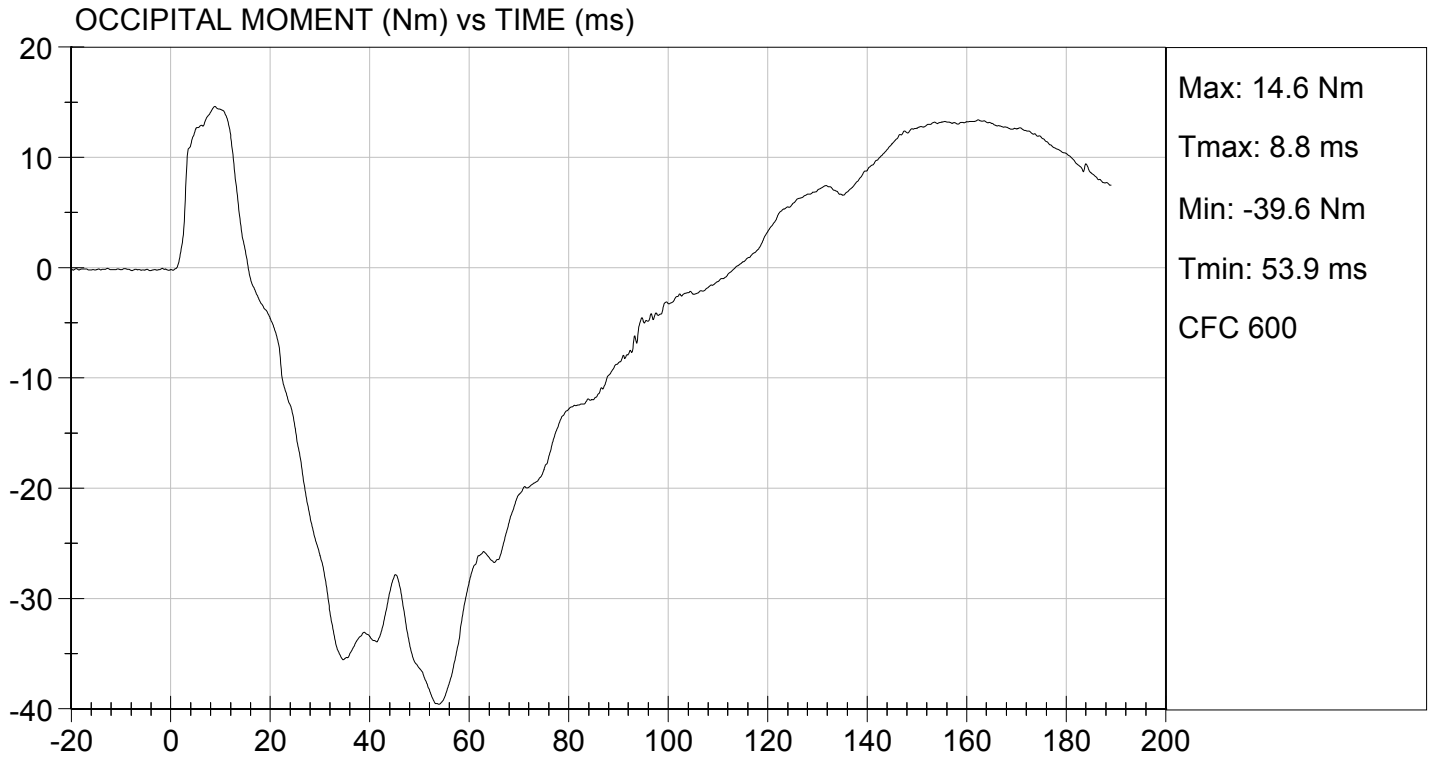


FLEXION ANGLE (DEG) vs TIME (ms)



TEST DESC: NECK BENDING
VELOCITY: 18.12 ft/s, 5.52 m/s

TEST DATE: 12/20/2012
TEST #: D124812



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test ID:** D124813

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	37	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Maximum Probe Acceleration	G's	13 to 18	15	Pass
Shoulder Displacement	mm	28 to 37	28	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	19	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

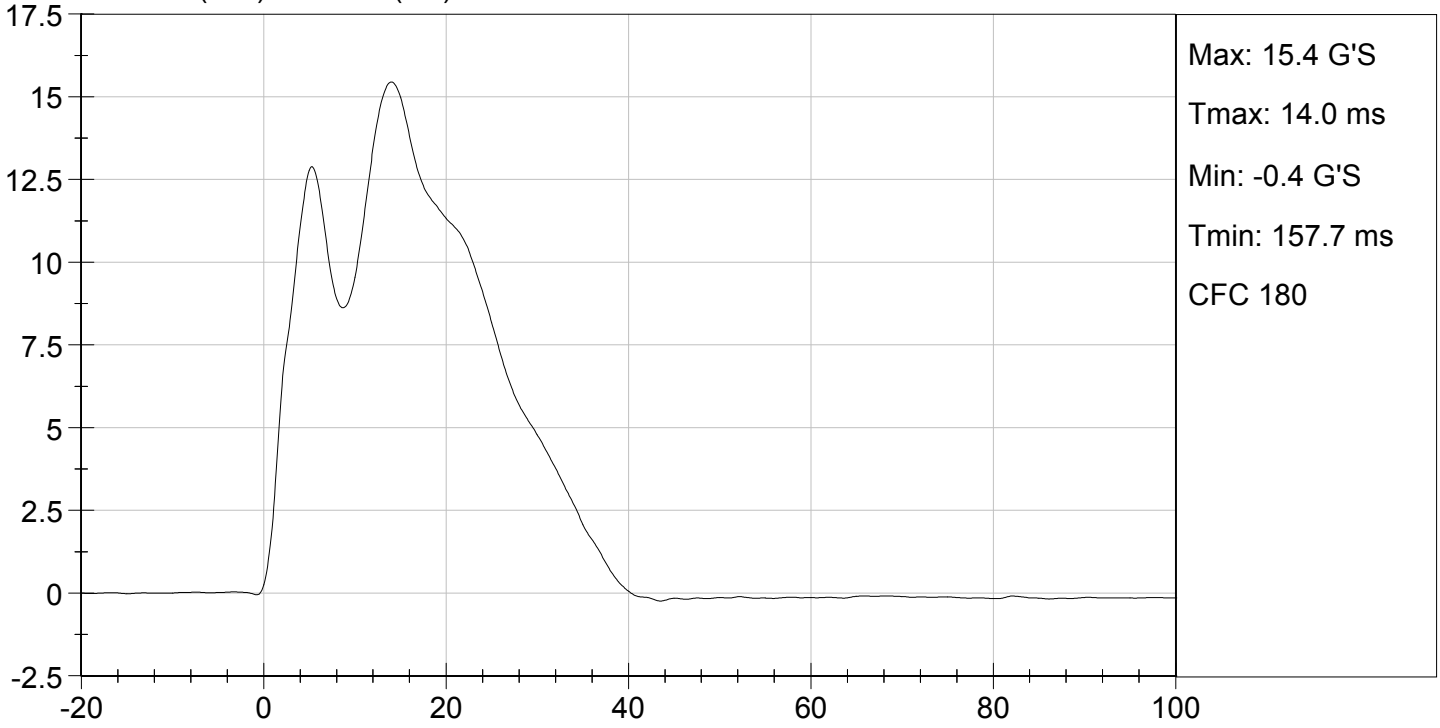
12/20/2012
Test Date

David Winkelbauer
Approved By

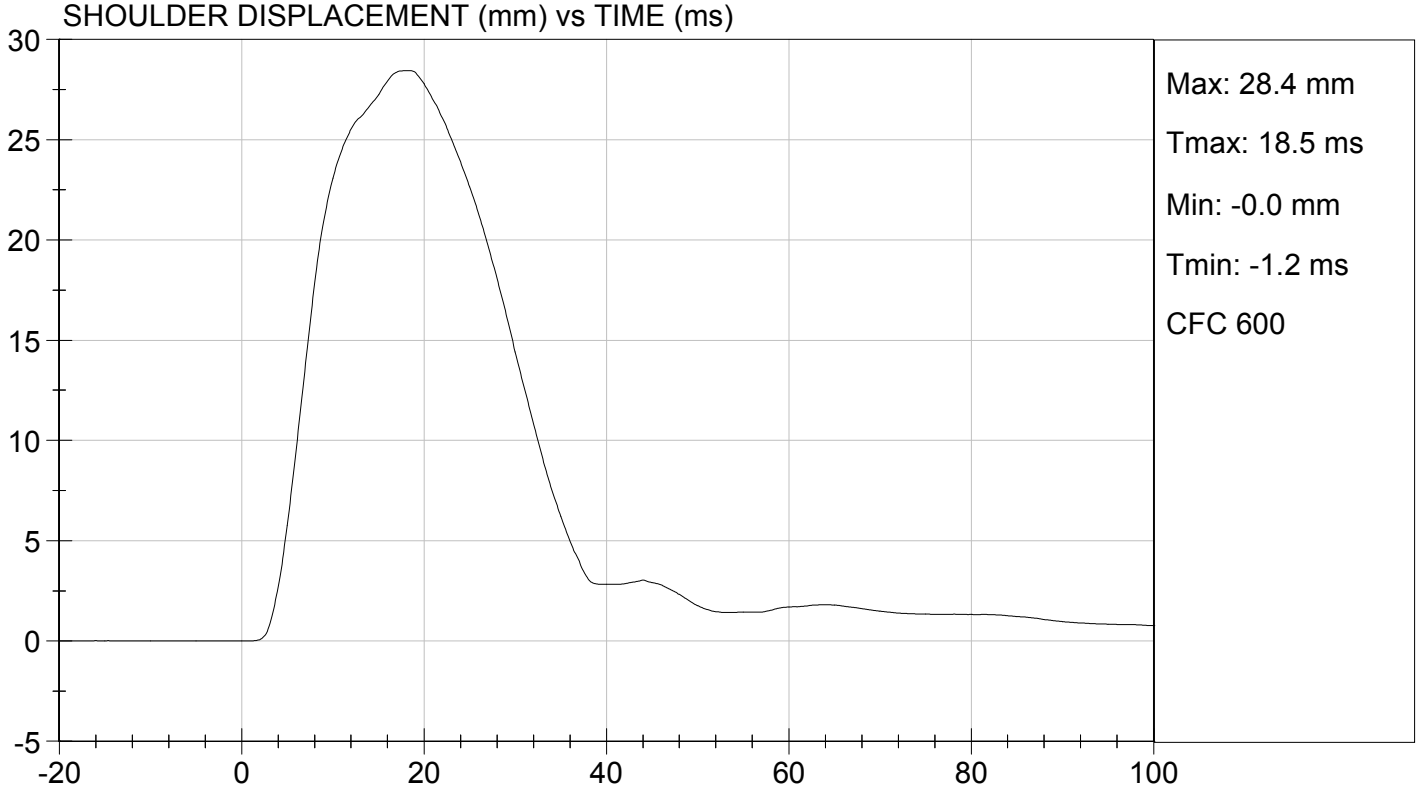
TEST DESC: SHOULDER IMPACT
VELOCITY: 14.12 ft/s, 4.30 m/s

TEST DATE: 12/20/2012
TEST #: D124813

PROBE (G'S) vs TIME (ms)

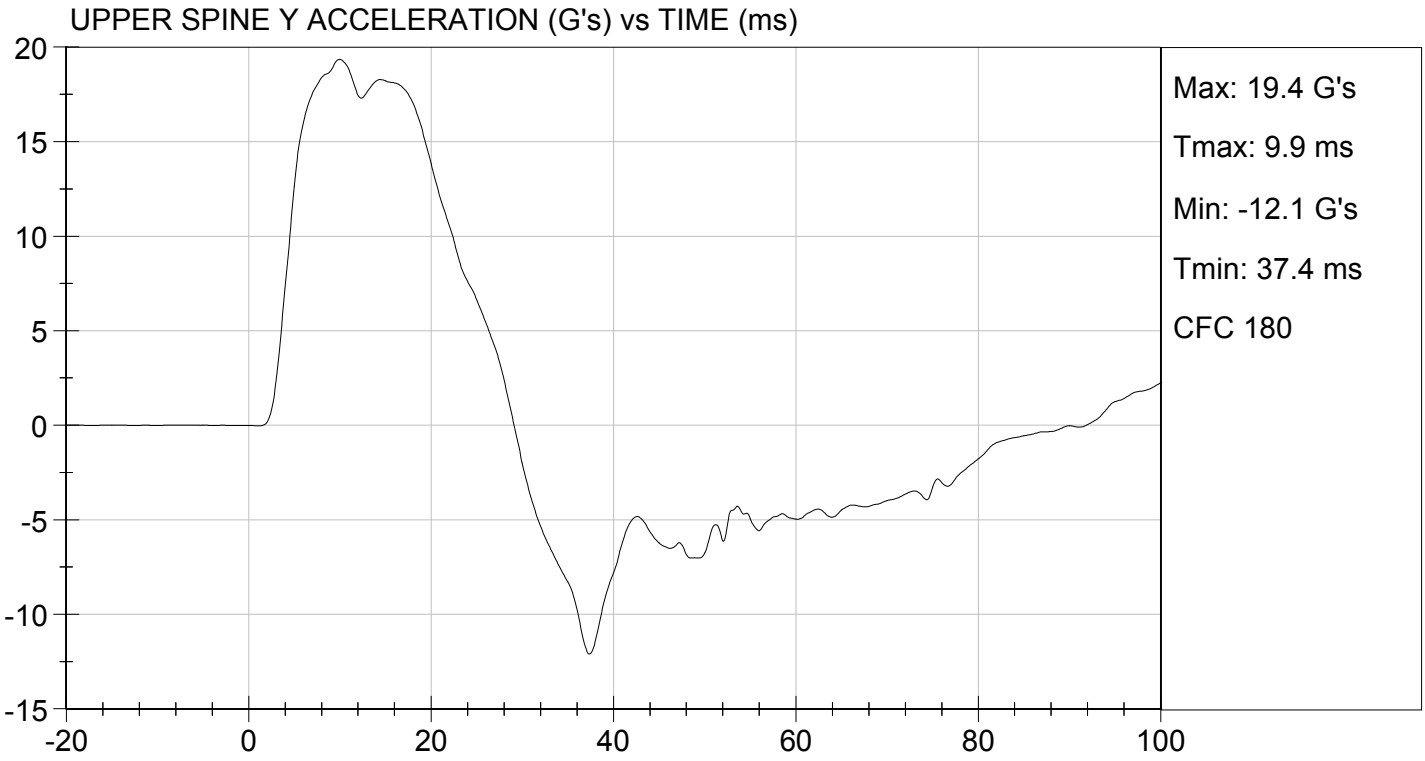


SHOULDER DISPLACEMENT (mm) vs TIME (ms)



TEST DESC: SHOULDER IMPACT
VELOCITY: 14.12 ft/s, 4.30 m/s

TEST DATE: 12/20/2012
TEST #: D124813



MGA RESEARCH CORPORATION

THORAX (WITH ARM) IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D124814

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Humidity	%	10 to 70	37	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Maximum Probe Acceleration	G's	30 to 36	32	Pass
Shoulder Displacement	mm	31 to 40	32	Pass
Upper Rib Displacement	mm	25 to 32	27	Pass
Middle Rib Displacement	mm	30 to 36	31	Pass
Lower Rib Displacement	mm	32 to 38	33	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	39	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	31	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

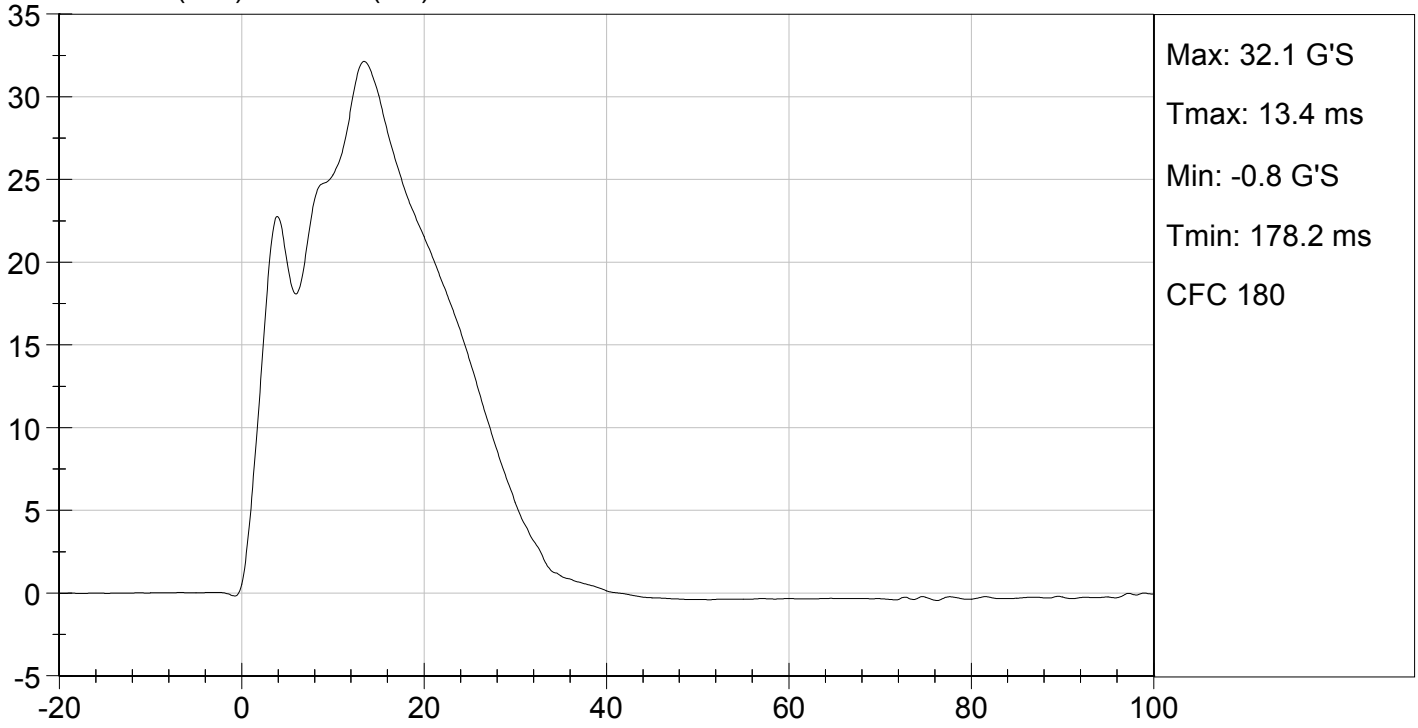
12/20/2012
Test Date

David Winkelbauer
Approved By

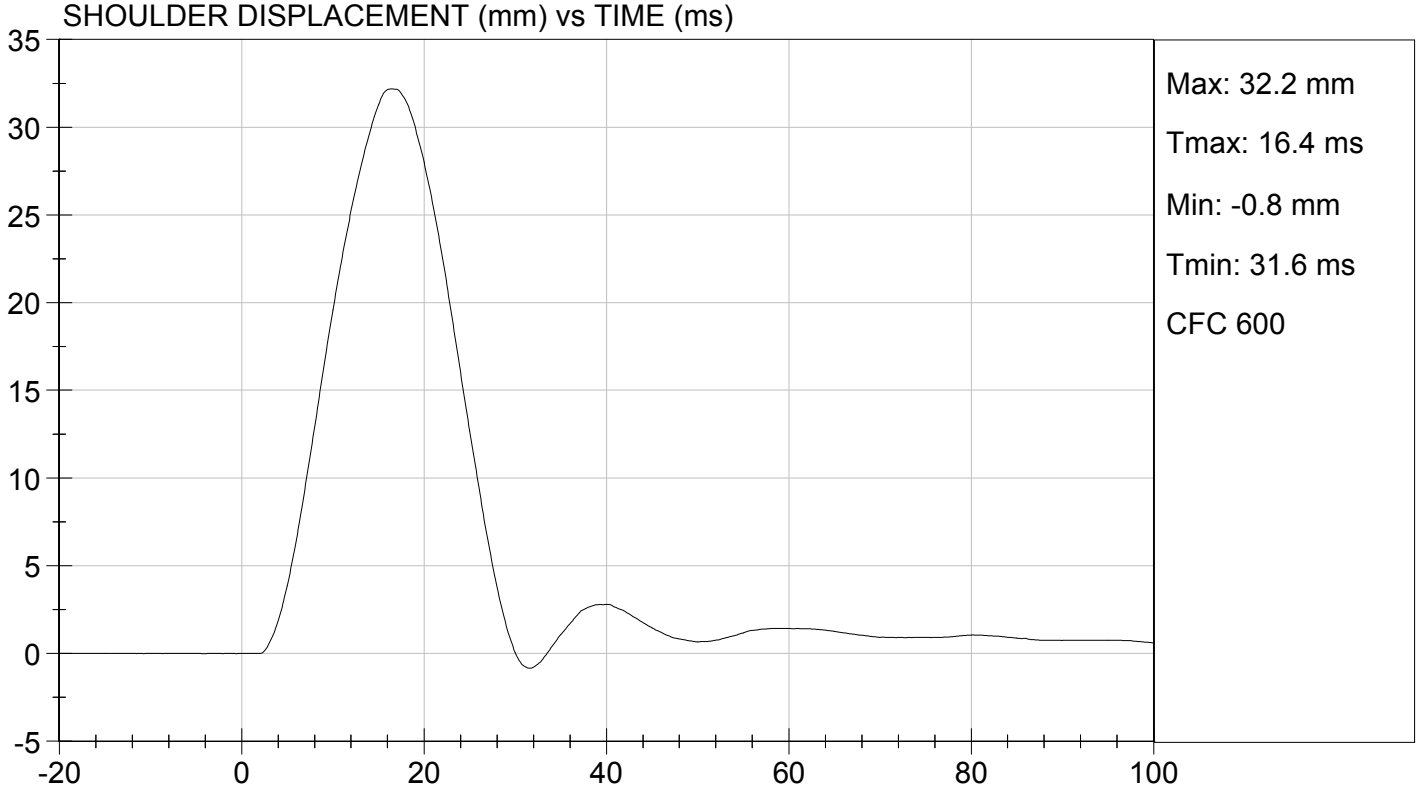
TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 12/20/2012
TEST #: D124814

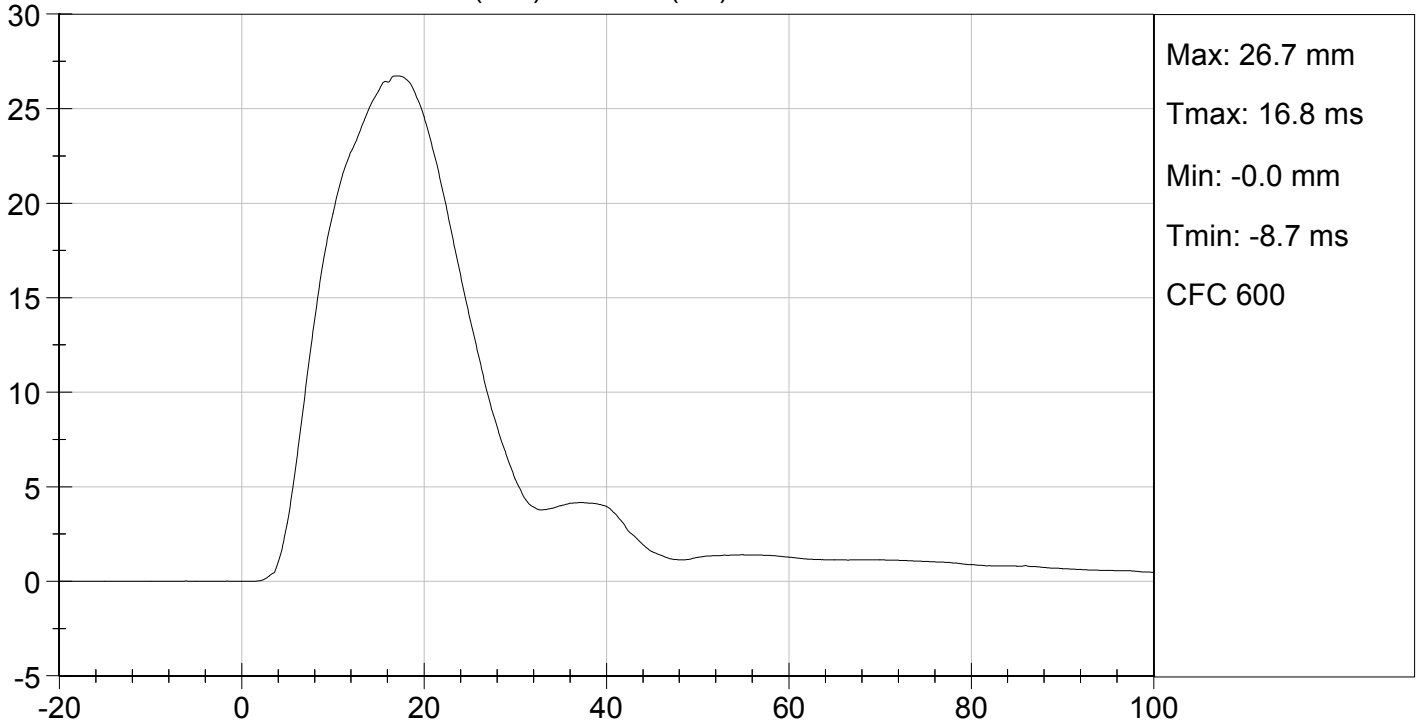
PROBE (G'S) vs TIME (ms)



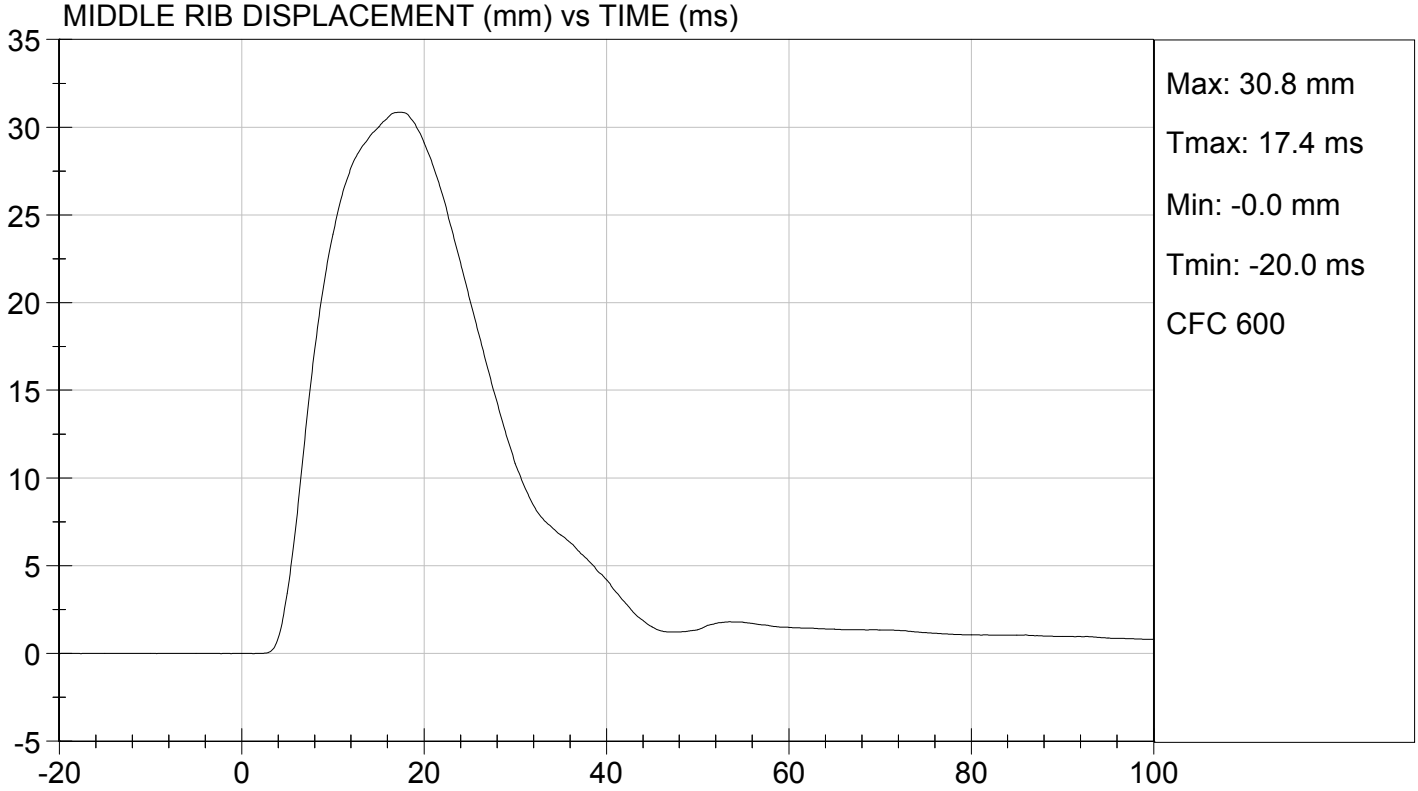
SHOULDER DISPLACEMENT (mm) vs TIME (ms)



UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



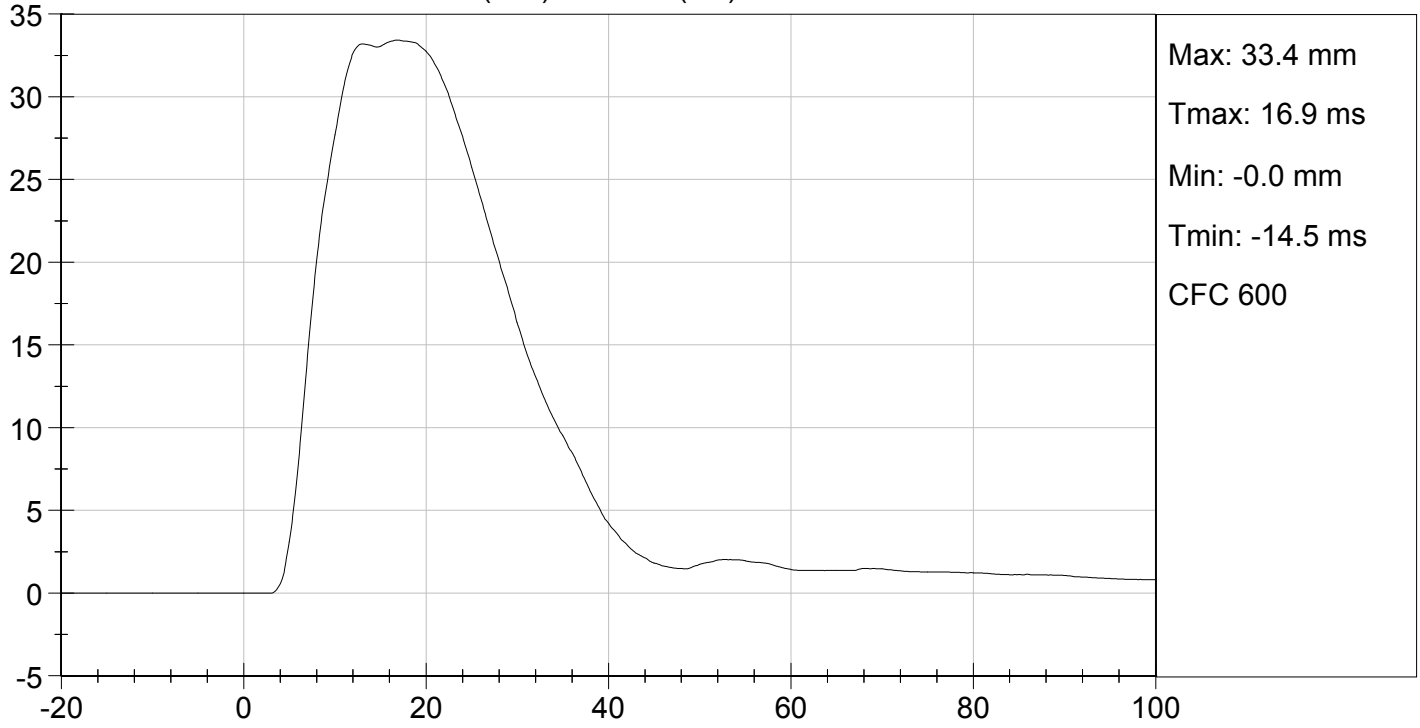
MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



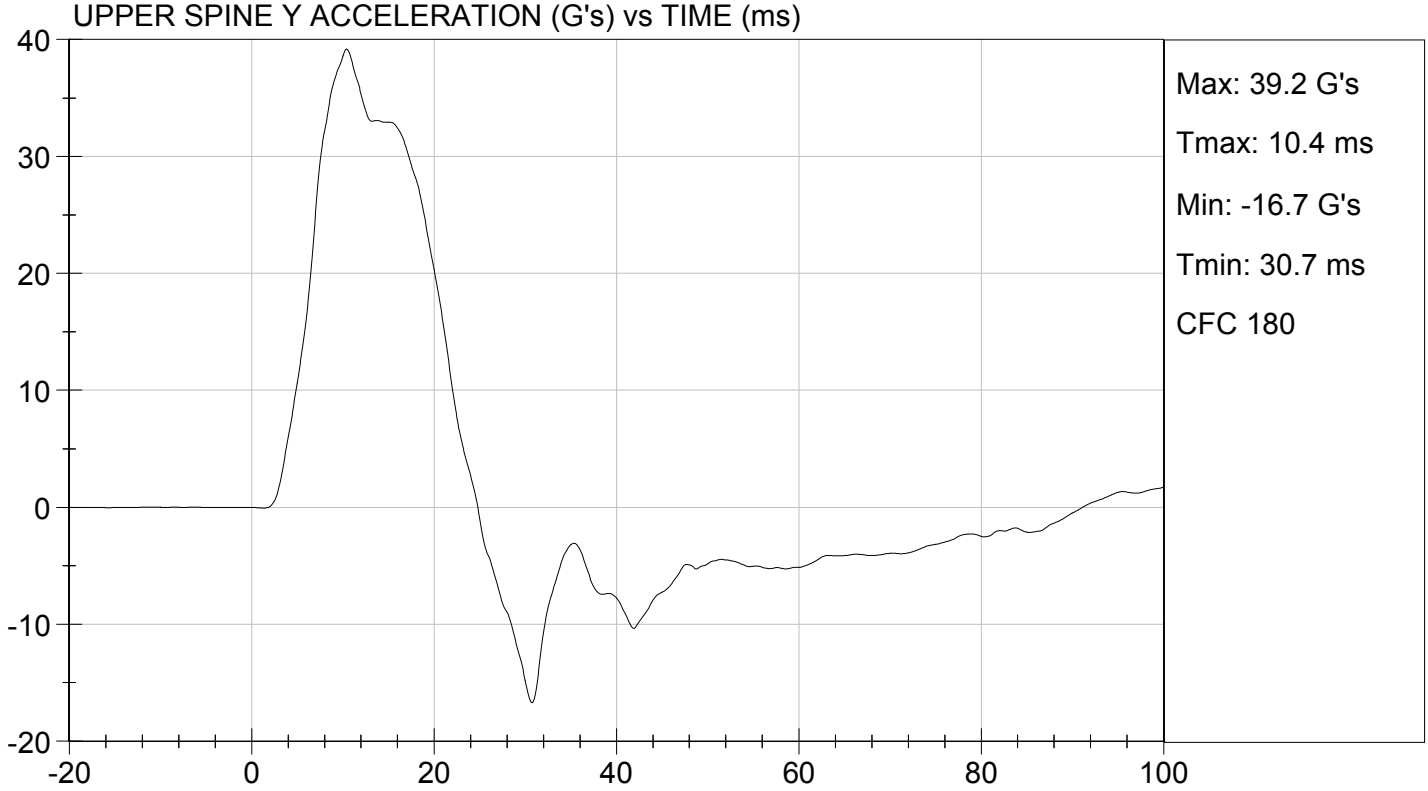
TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 12/20/2012
TEST #: D124814

LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



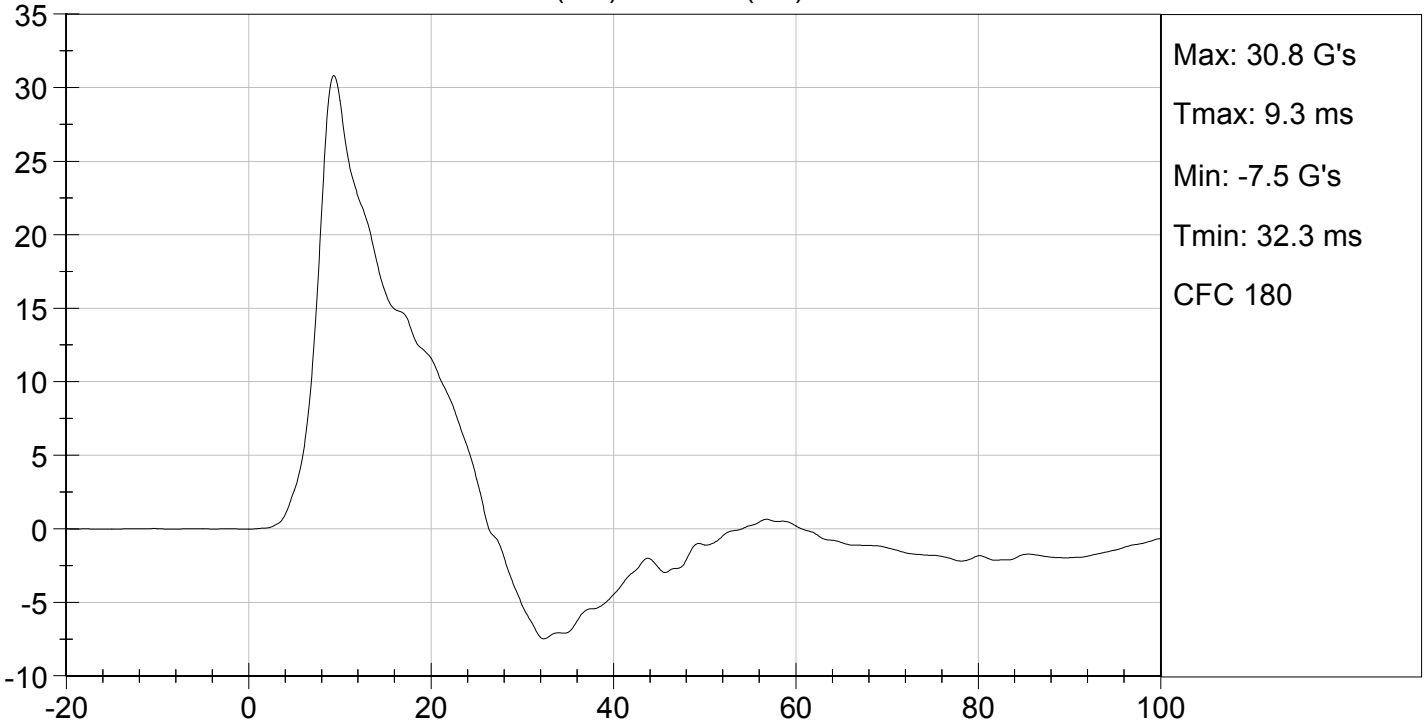
UPPER SPINE Y ACCELERATION (G's) vs TIME (ms)



TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 12/20/2012
TEST #: D124814

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



MGA RESEARCH CORPORATION

THORAX (WITHOUT ARM) IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D124815

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Humidity	%	10 to 70	37	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Maximum Probe Acceleration	G's	14 to 18	15	Pass
Upper Rib Displacement	mm	32 to 40	38	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	15	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	9	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

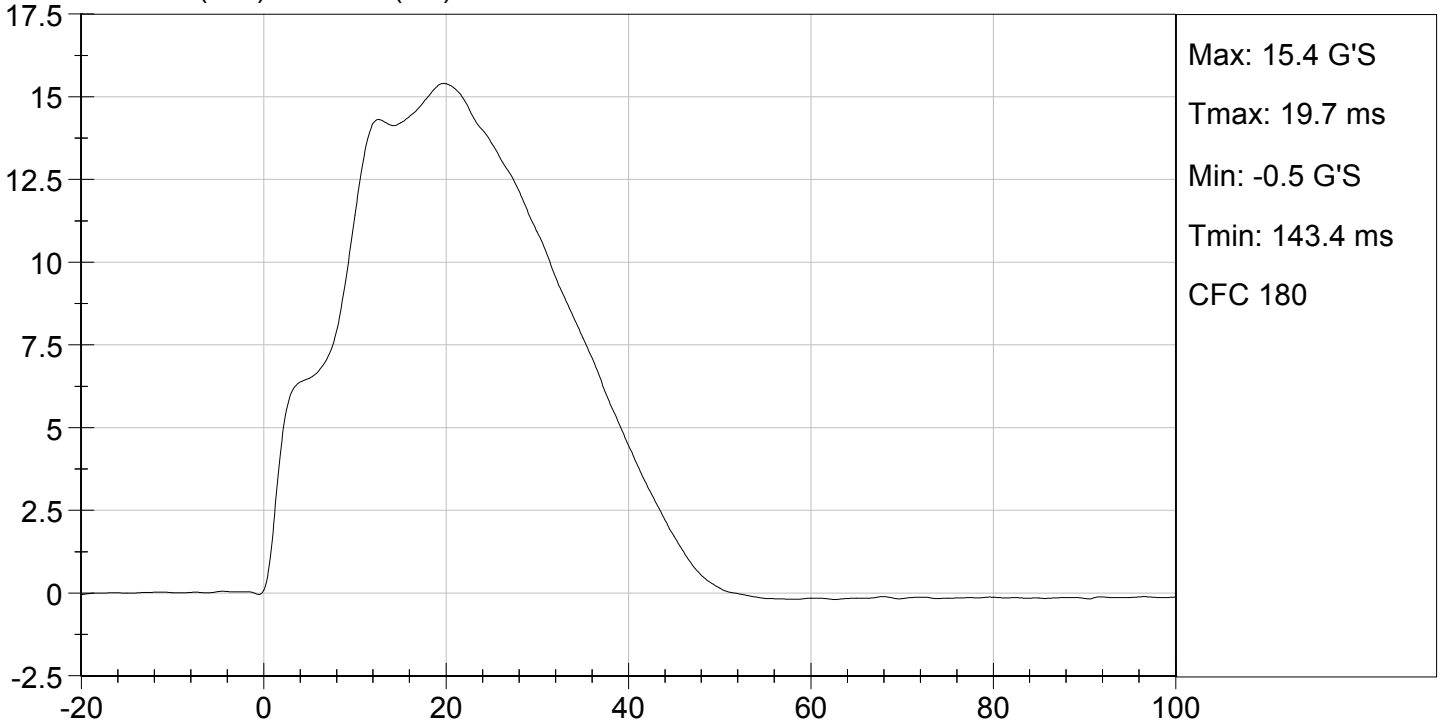
12/20/2012
Test Date

David Winkelbauer
Approved By

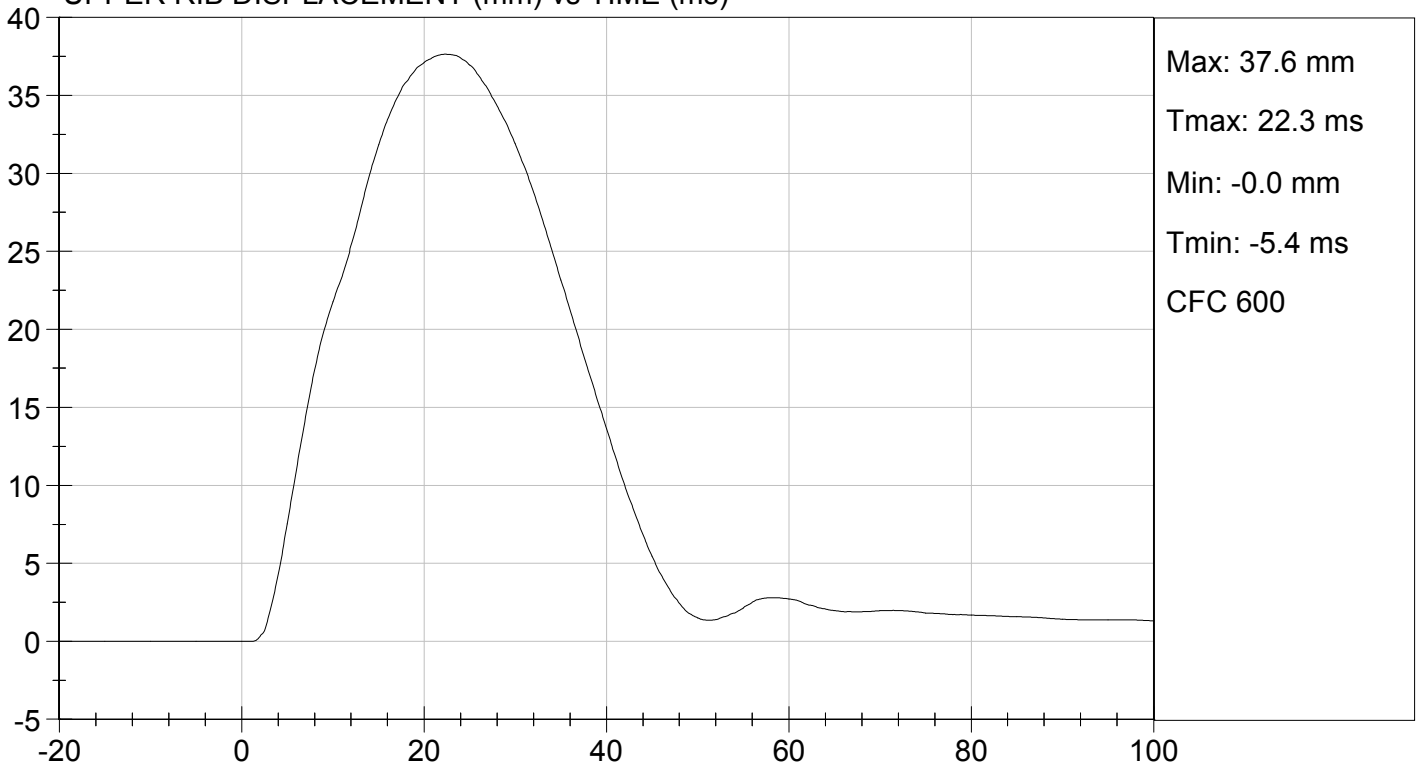
TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.37 ft/s, 4.38 m/s

TEST DATE: 12/20/2012
TEST #: D124815

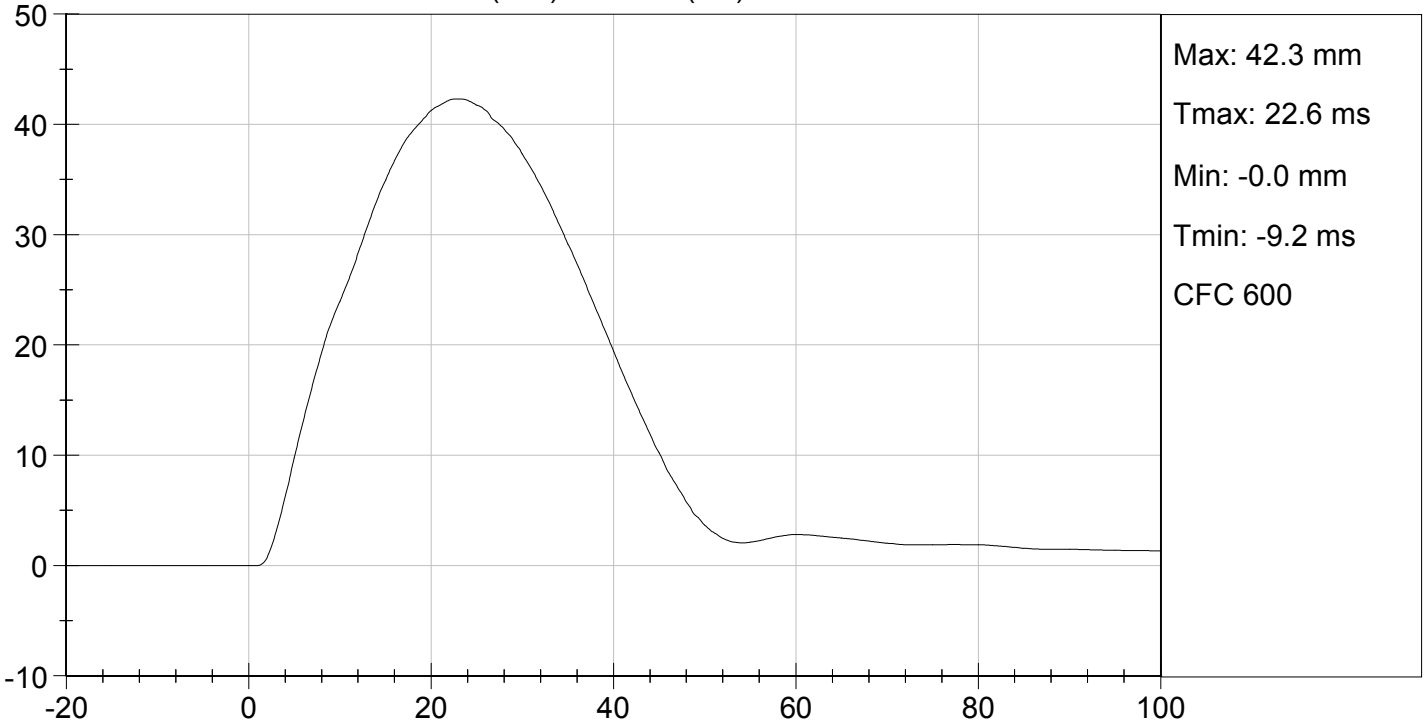
PROBE (G'S) vs TIME (ms)



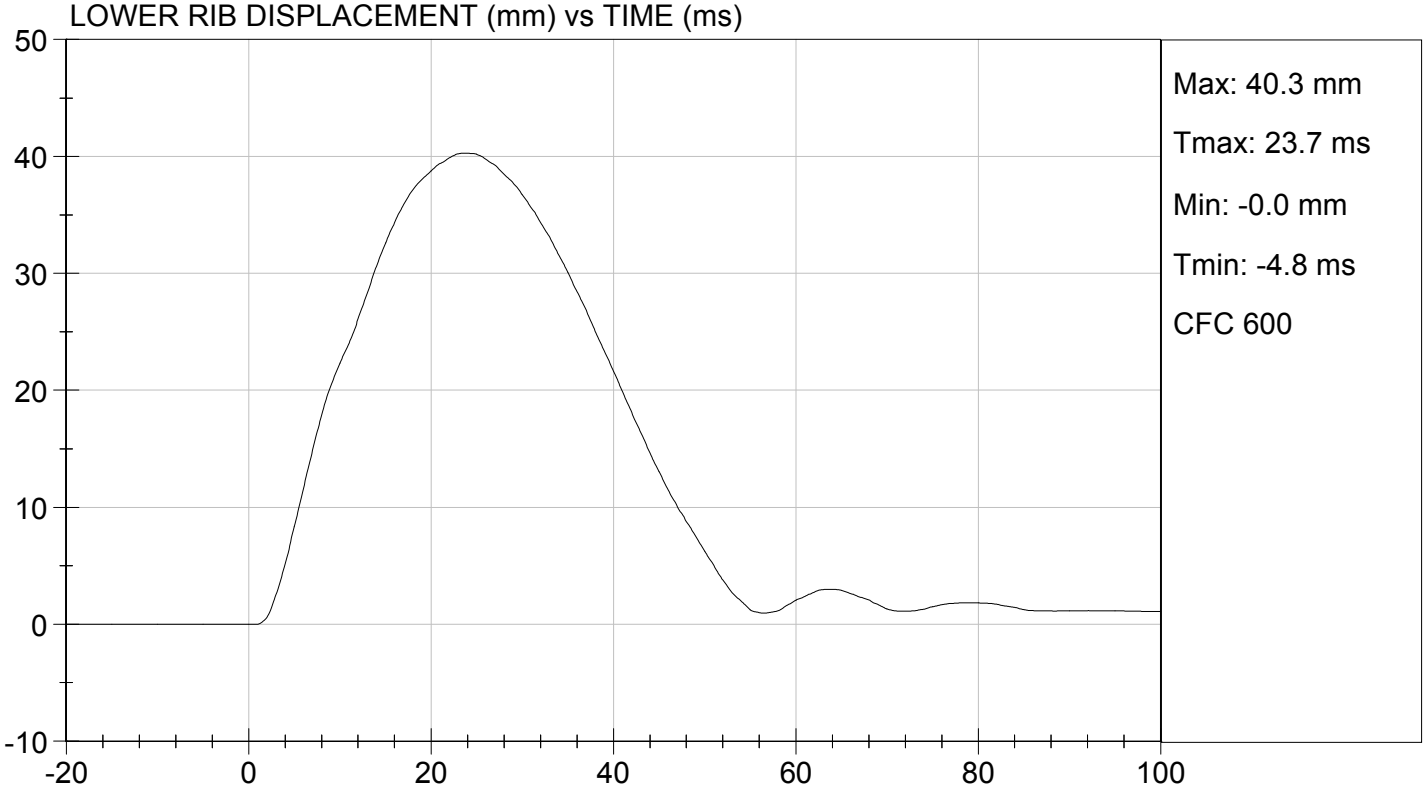
UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



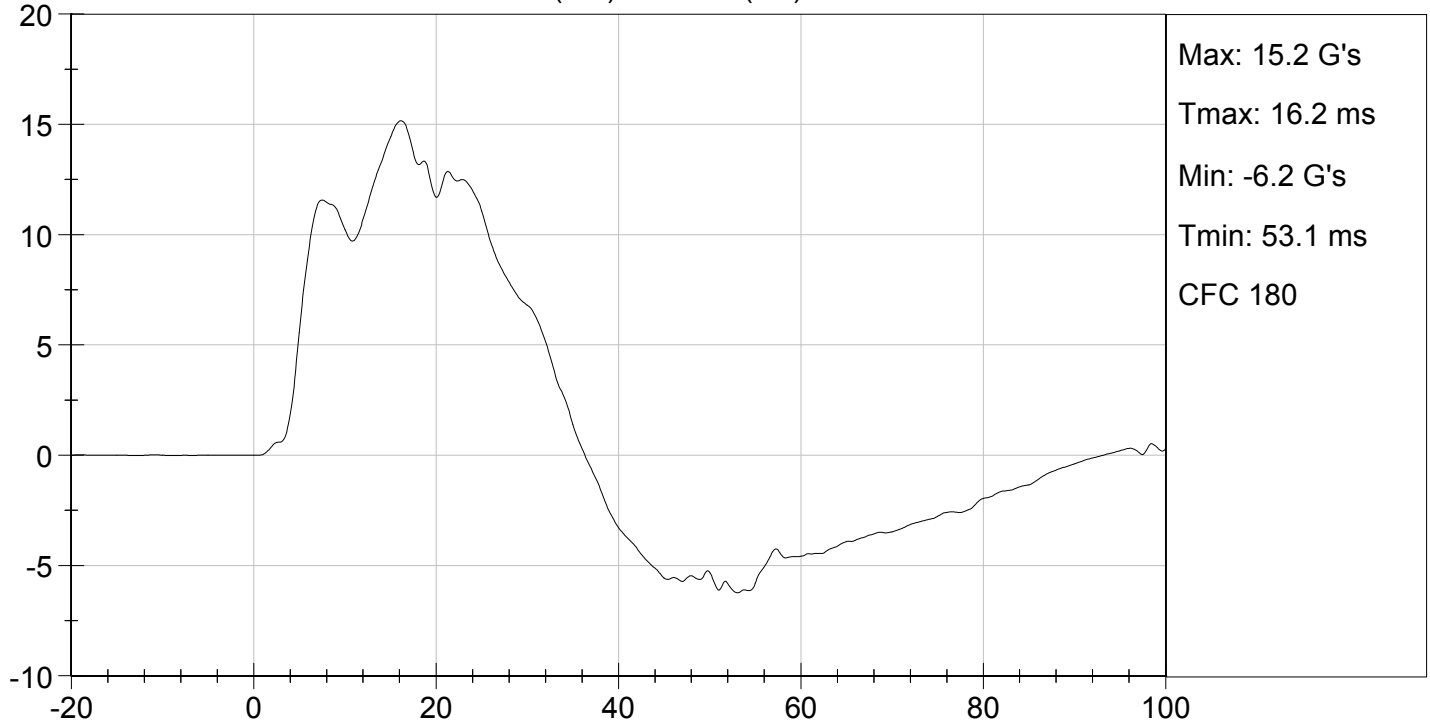
LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



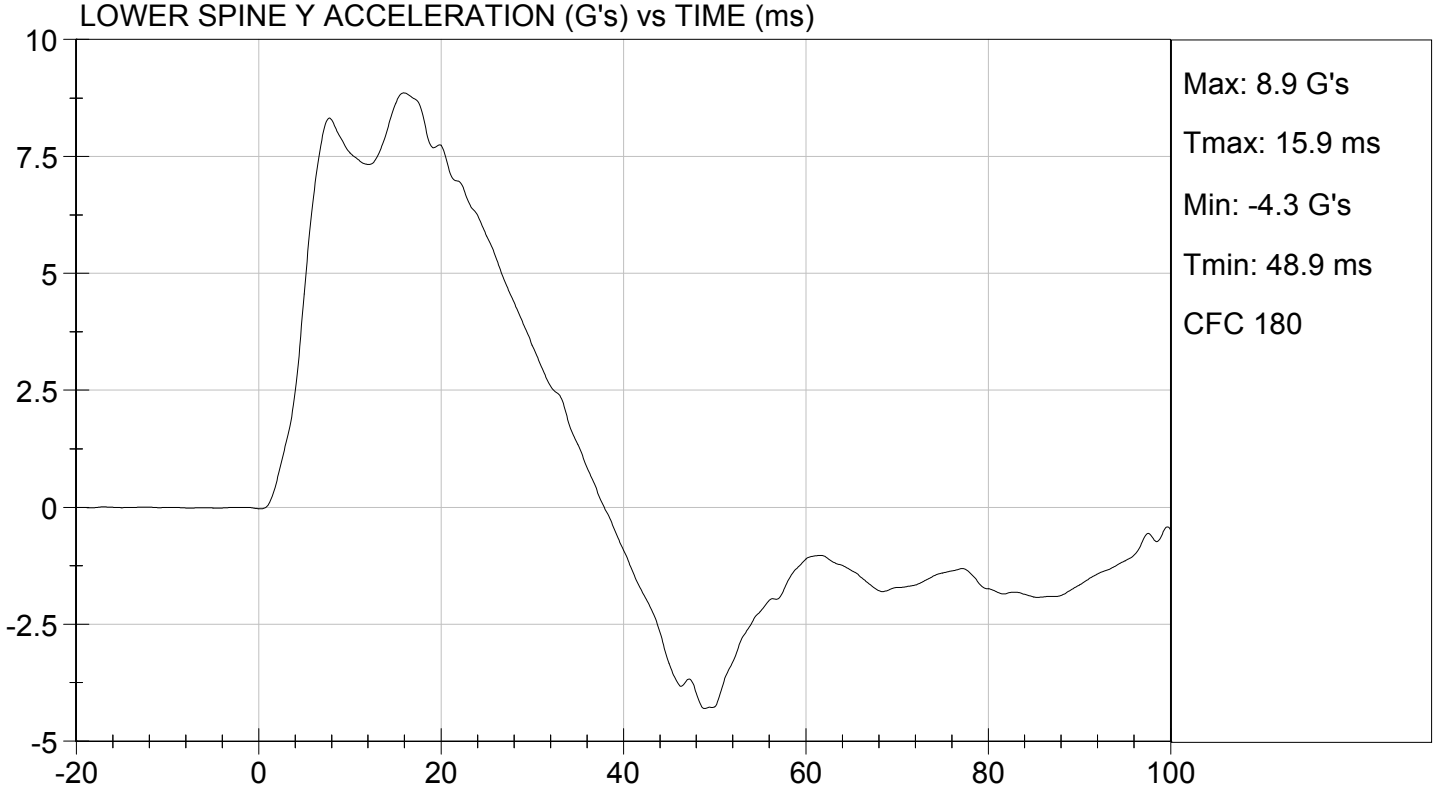
TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.37 ft/s, 4.38 m/s

TEST DATE: 12/20/2012
TEST #: D124815

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



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



MGA RESEARCH CORPORATION

ABDOMINAL IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D124816

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Humidity	%	10 to 70	36	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Maximum Probe Acceleration	G's	12 to 16	14	Pass
Upper Abdomen Rib Displacement	mm	36 to 47	39	Pass
Lower Abdomen Rib Displacement	mm	33 to 44	39	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	10	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

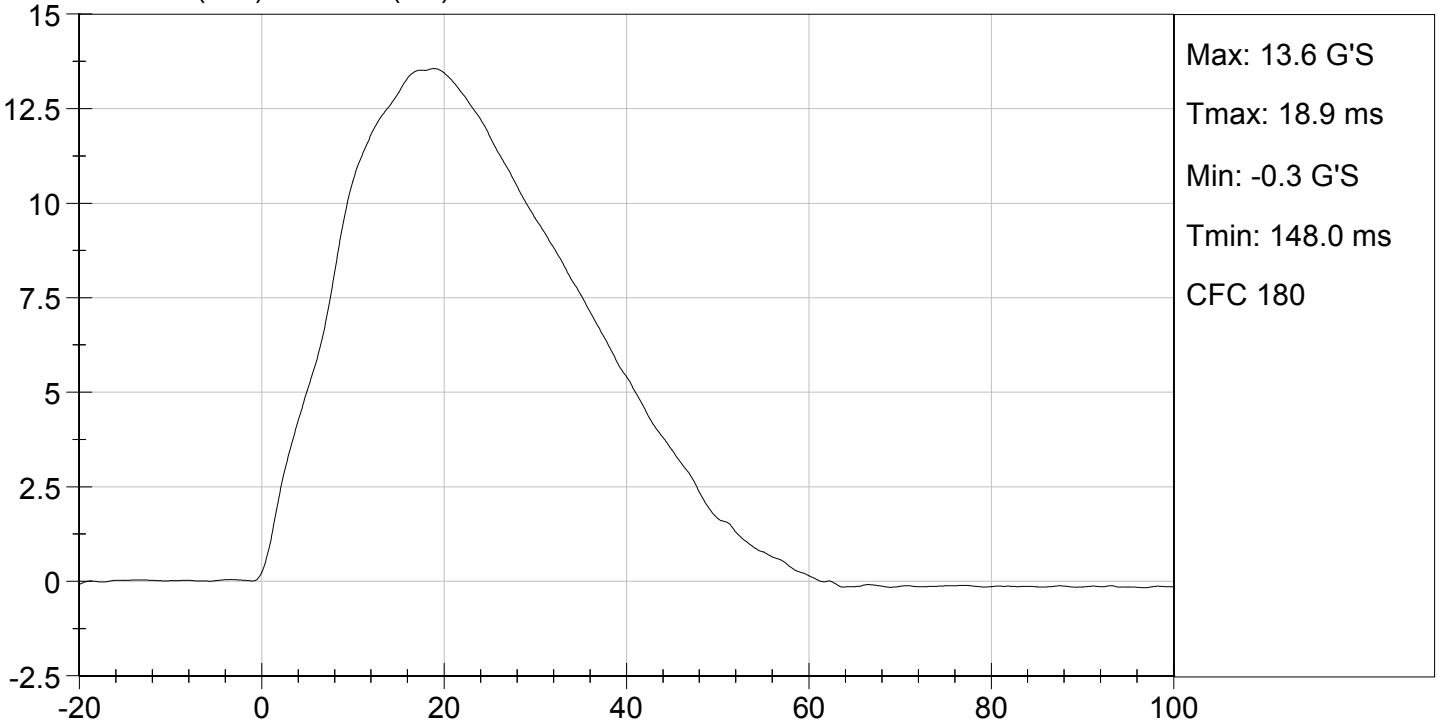
12/20/2012
Test Date

David Winkelbauer
Approved By

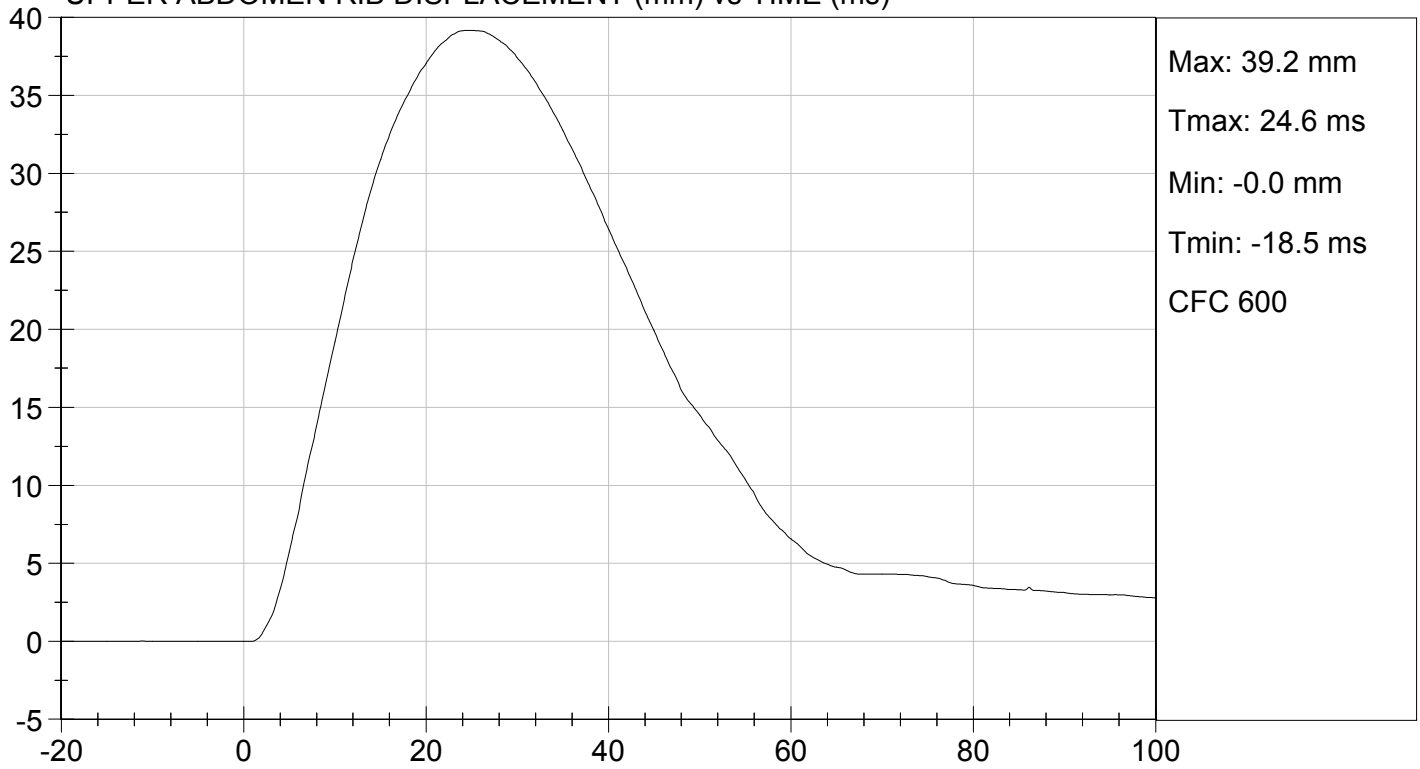
TEST DESC: ABDOMEN IMPACT
VELOCITY: 14.37 ft/s, 4.38 m/s

TEST DATE: 12/20/2012
TEST #: D124816

PROBE (G'S) vs TIME (ms)



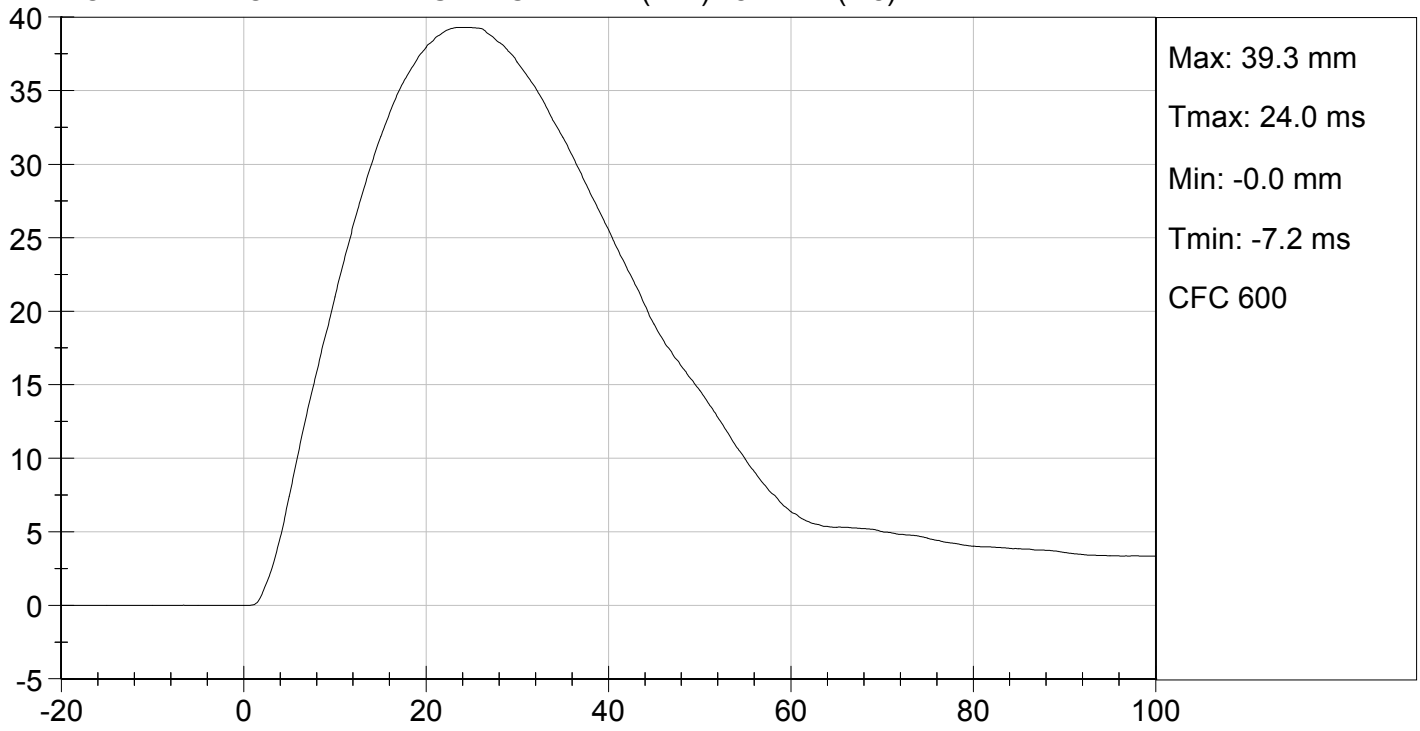
UPPER ABDOMEN RIB DISPLACEMENT (mm) vs TIME (ms)



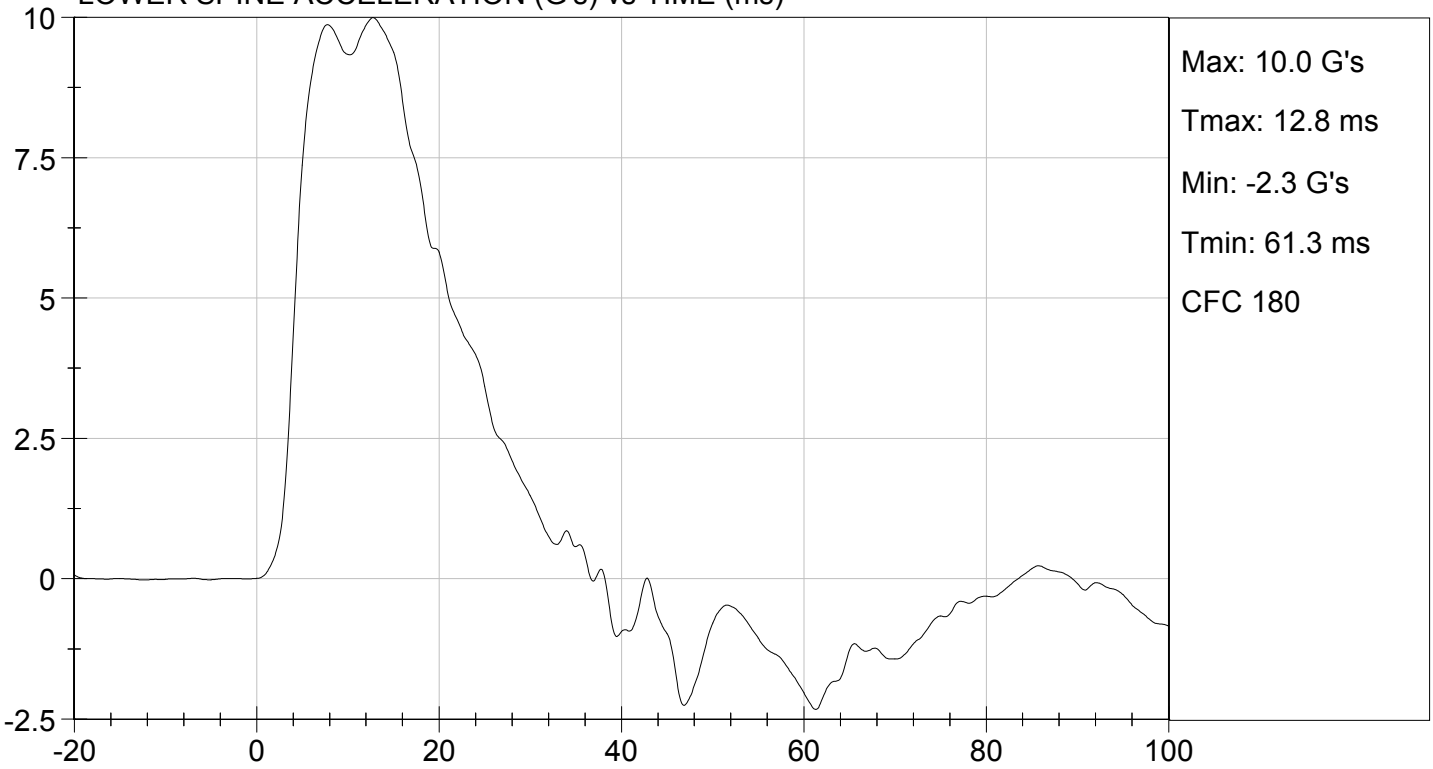
TEST DESC: ABDOMEN IMPACT
VELOCITY: 14.37 ft/s, 4.38 m/s

TEST DATE: 12/20/2012
TEST #: D124816

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: 306 **Test I.D:** D124817

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.8	Pass
Humidity	%	10 to 70	26	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Maximum Probe Acceleration	G's	38 to 47	39	Pass
Pelvis Y Acceleration After 6 ms	G's	34 to 42	42	Pass
Peak Acetabulum Force	N	3600 to 4300	3,901	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

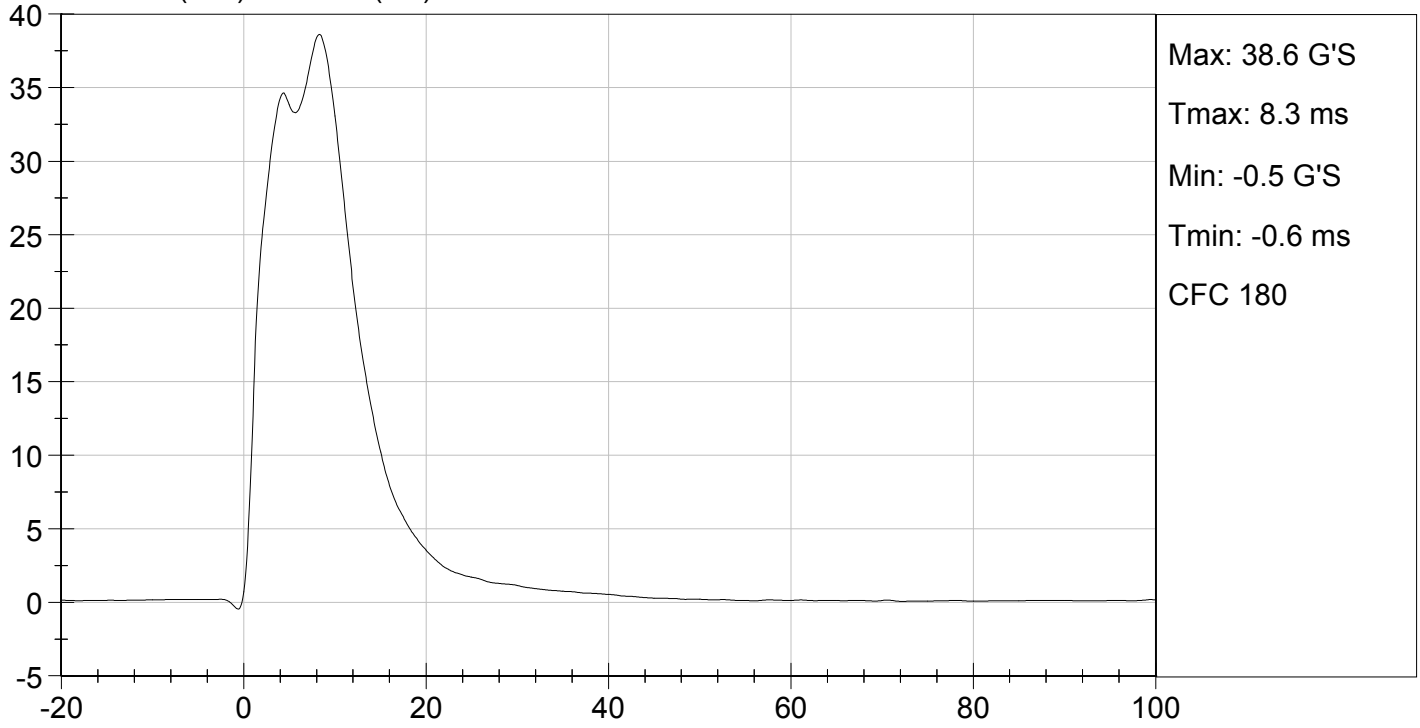
12/21/2012
Test Date

David Winkelbauer
Approved By

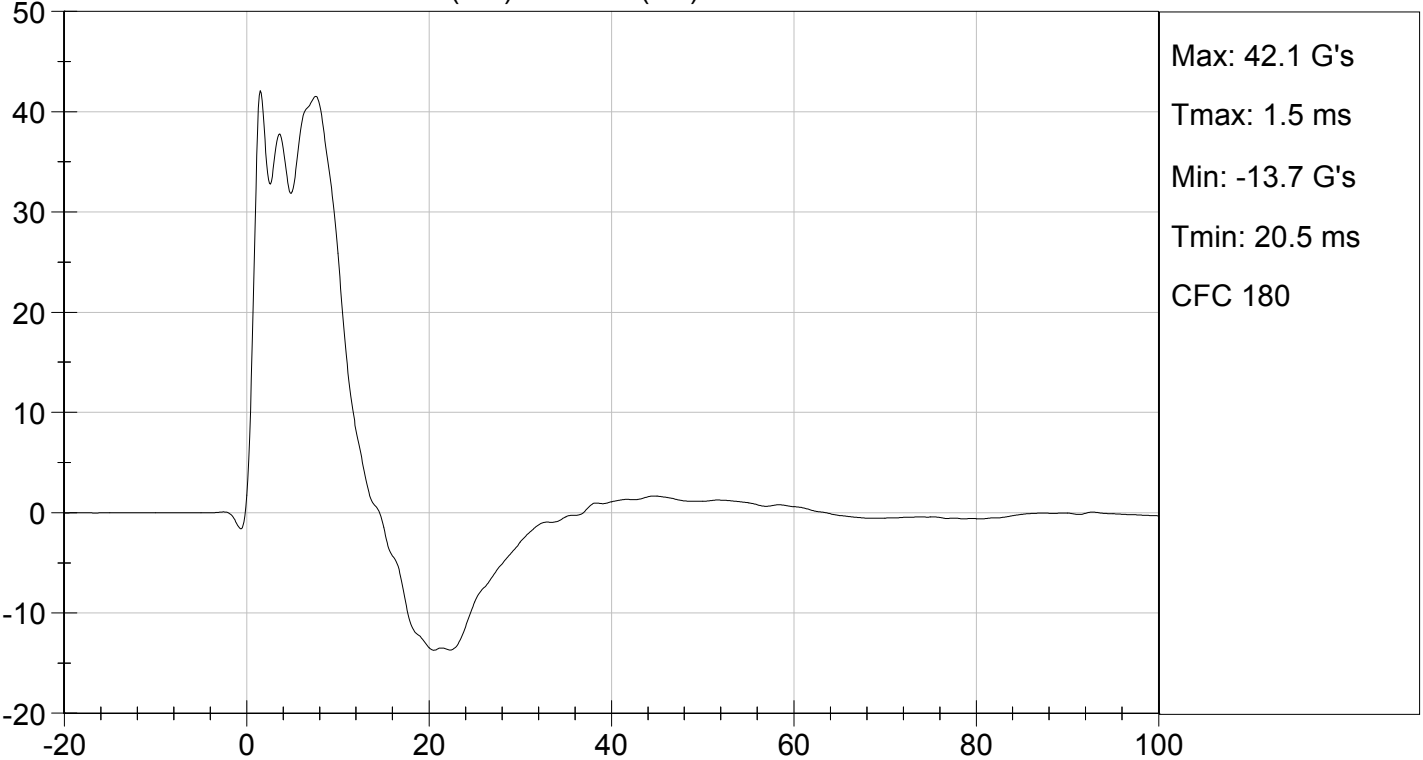
TEST DESC: PELVIS IMPACT
VELOCITY: 22.22 ft/s, 6.77 m/s

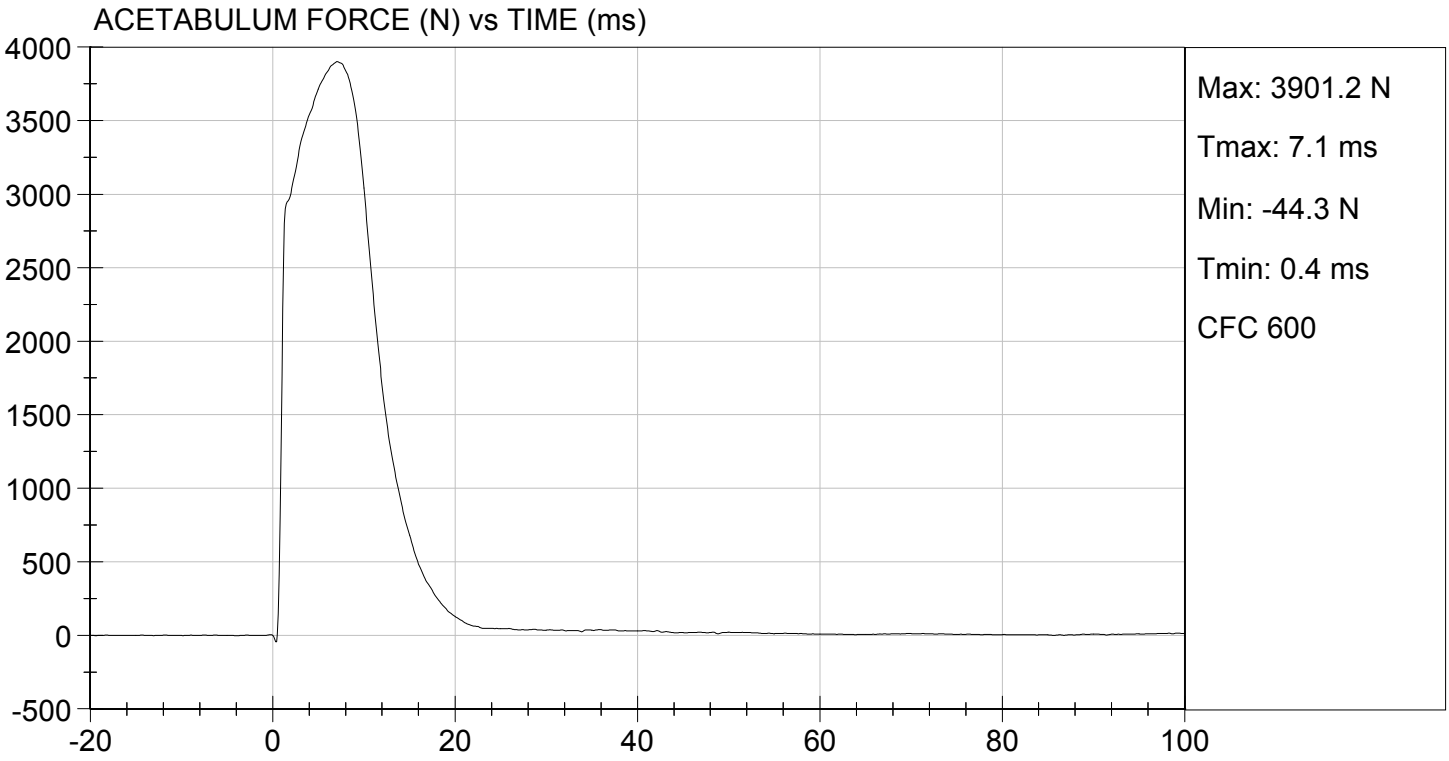
TEST DATE: 12/21/2012
TEST #: D124817

PROBE (G'S) vs TIME (ms)



PELVIS Y ACCELERATION (G's) vs TIME (ms)




ACETABULUM FORCE (N) vs TIME (ms)
4000
3500
3000
2500
2000
1500
1000
500
0
-500
-20
0
20
40
60
80
100
Max: 3901.2 N
Tmax: 7.1 ms
Min: -44.3 N
Tmin: 0.4 ms
CFC 600

MGA RESEARCH CORPORATION

ILIAC IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D124818

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.8	Pass
Humidity	%	10 to 70	26	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Maximum Probe Acceleration	G's	36 to 45	38	Pass
Pelvis Y Acceleration	G's	28 to 39	32	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4,604	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

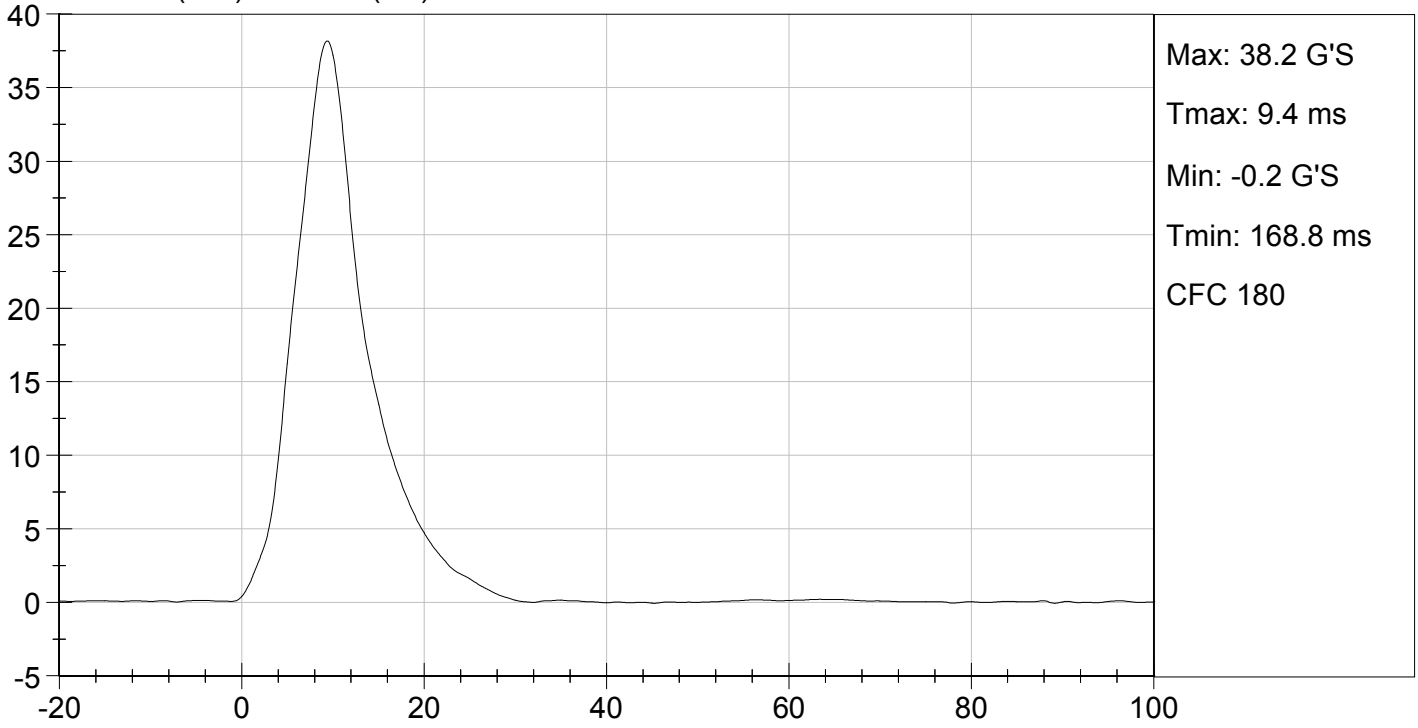
12/21/2012
Test Date

David Winkelbauer
Approved By

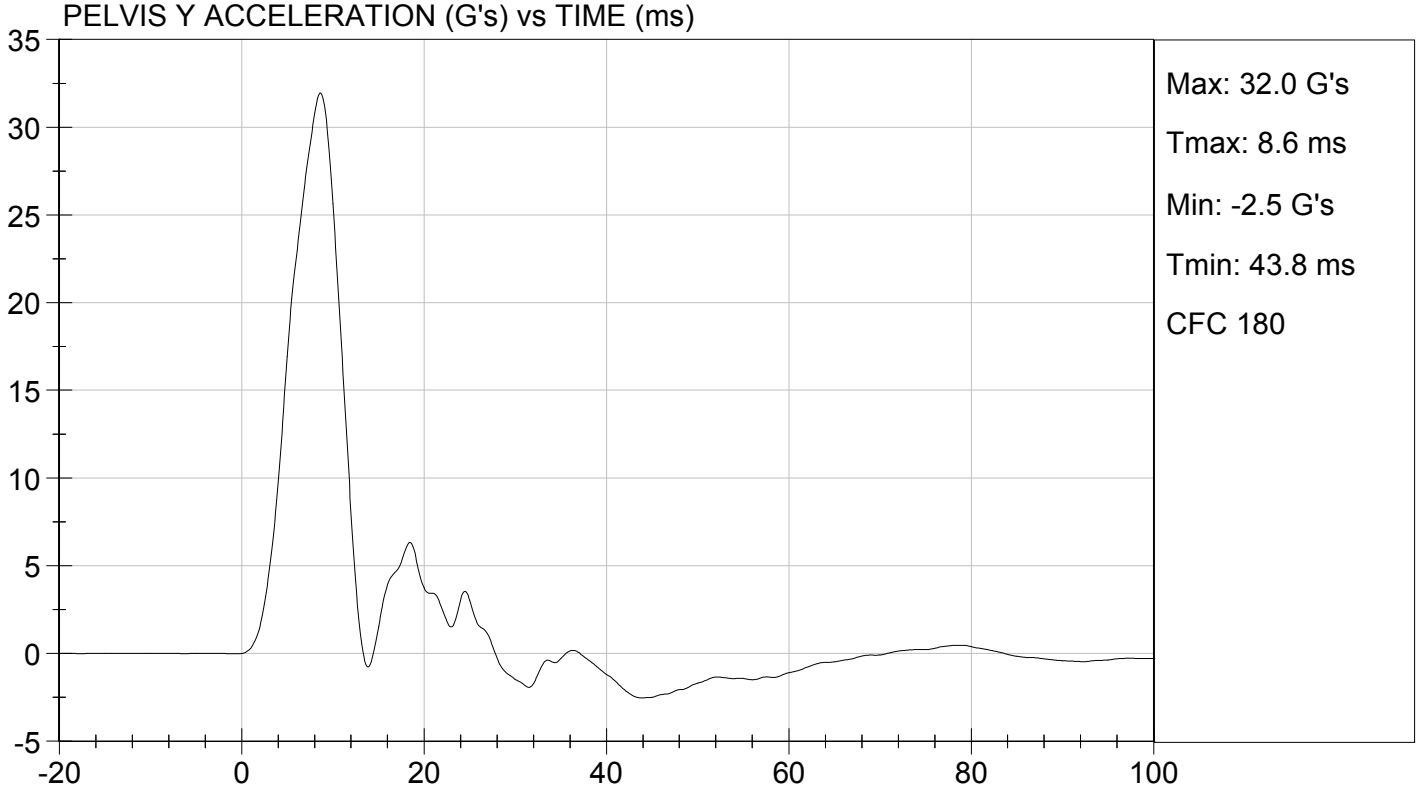
TEST DESC: ILLIAC
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 12/21/2012
TEST #: D124818

PROBE (G'S) vs TIME (ms)

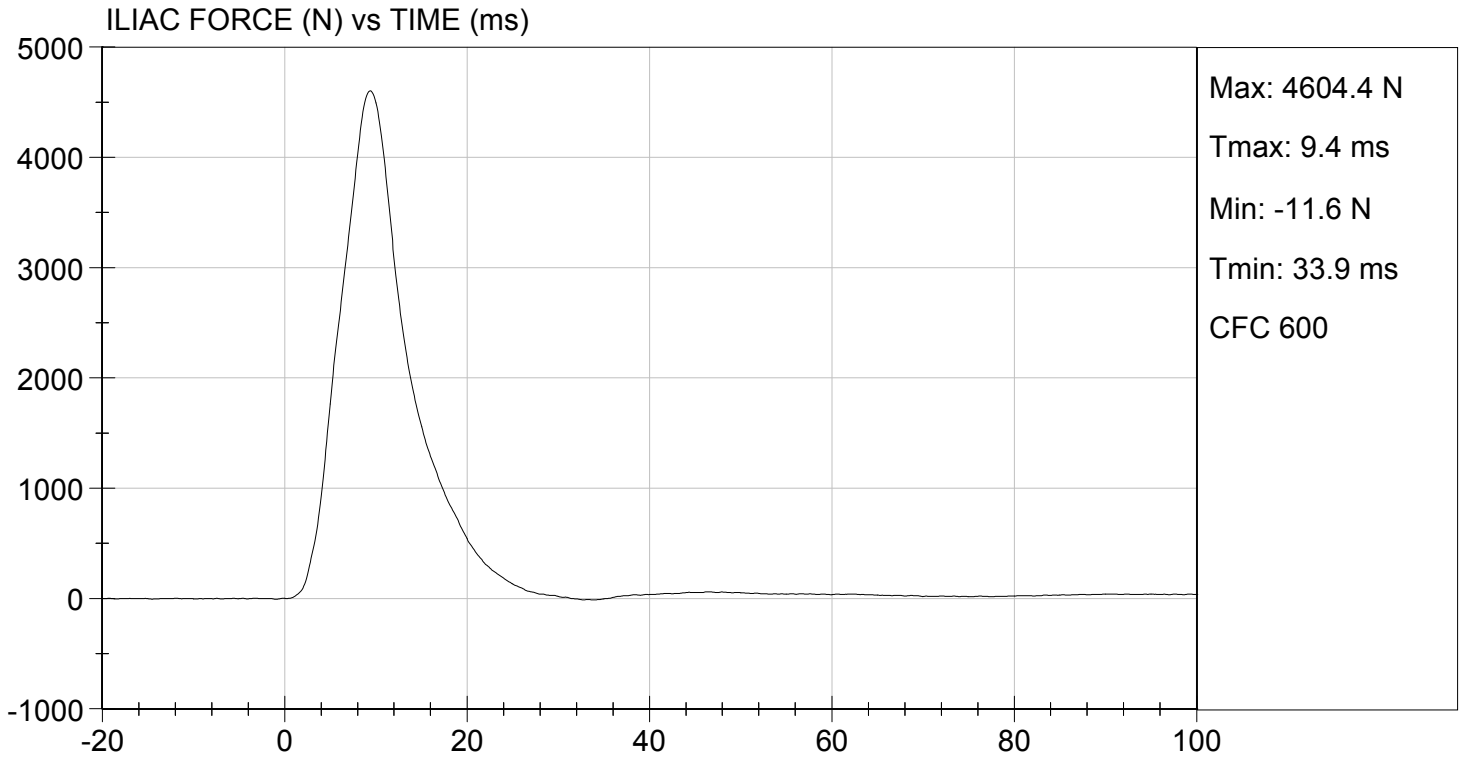


PELVIS Y ACCELERATION (G's) vs TIME (ms)



TEST DESC: ILLIAC
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 12/21/2012
TEST #: D124818



MGA RESEARCH CORPORATION

HEAD DROP TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test ID:** D13051

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	24	Pass
Peak Resultant Acceleration	G's	115 to 137	118	Pass
Peak Longitudinal Acceleration	G's	+/- 15	-3.6	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	<15%	Yes	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

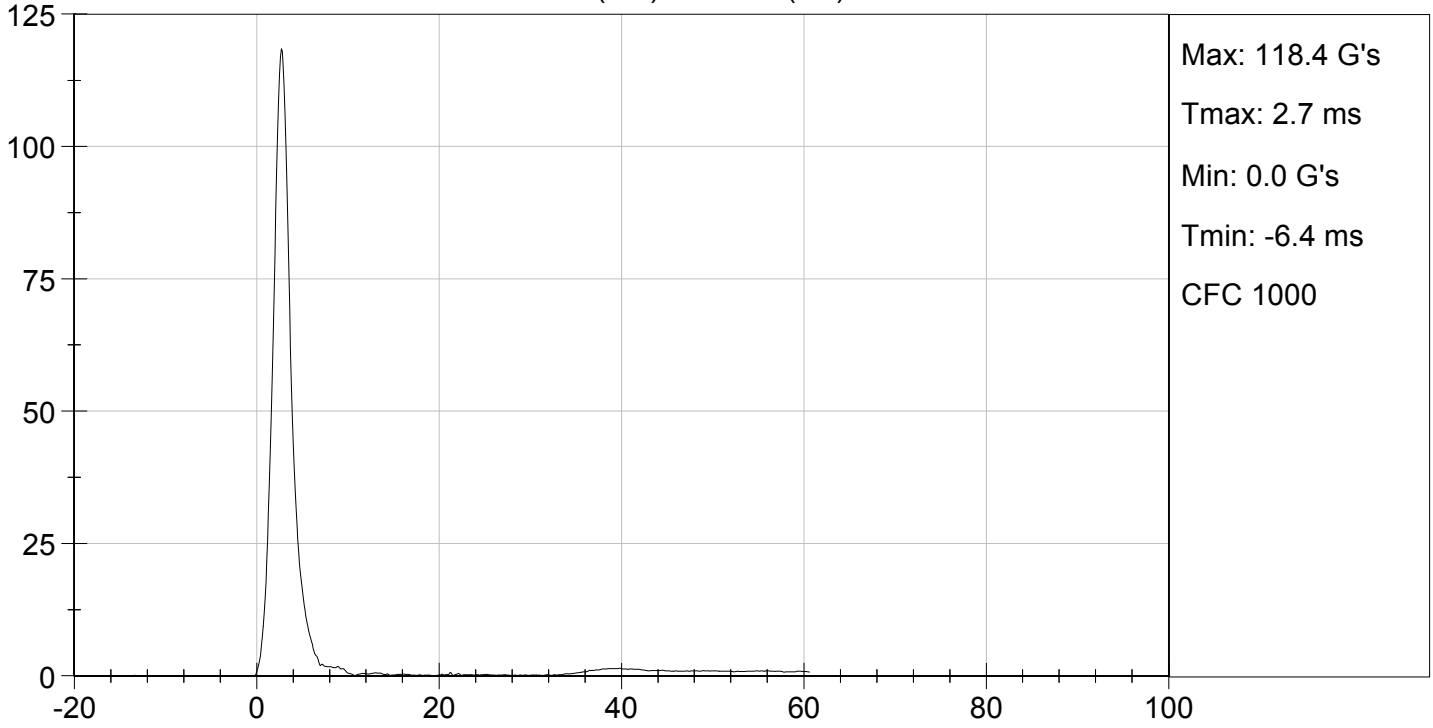
01/10/2013
Test Date

David Winkelbauer
Approved By

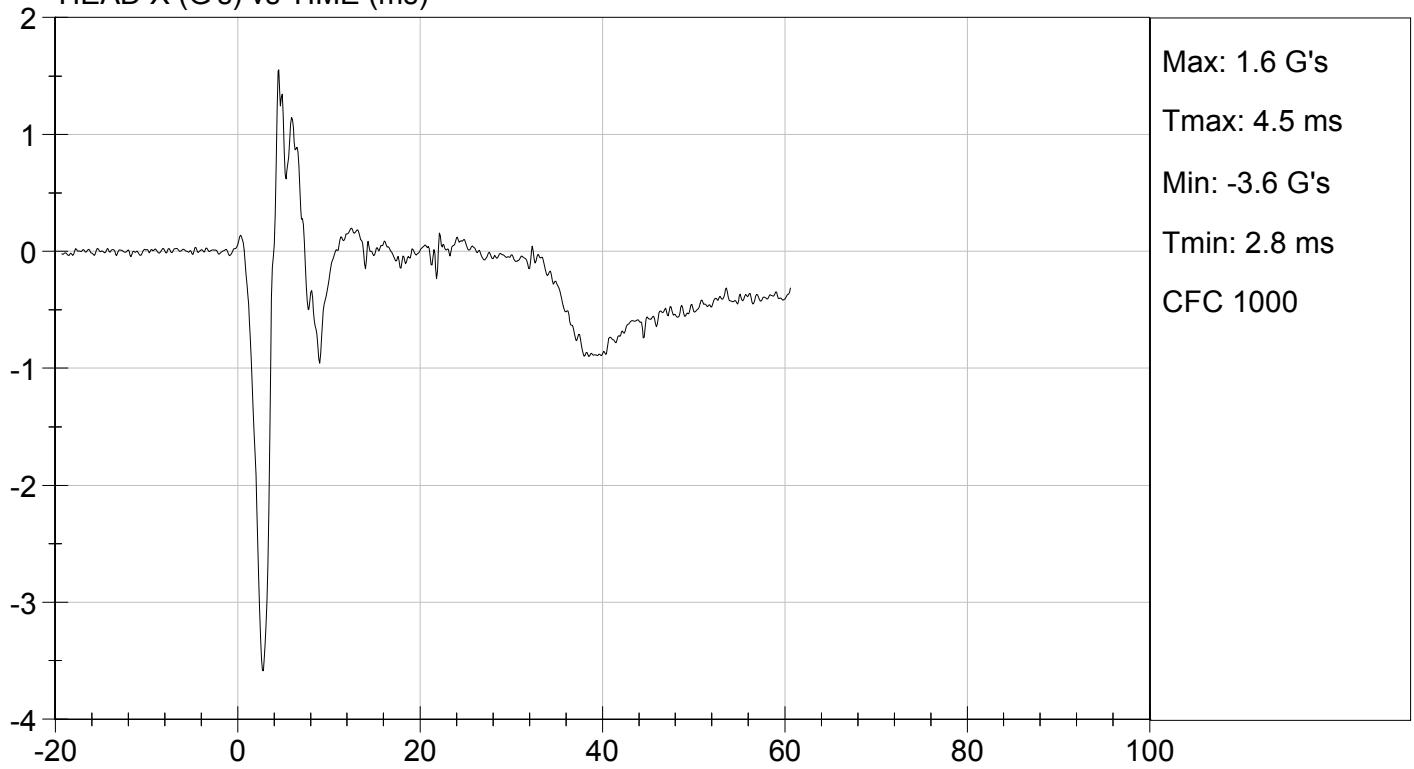
TEST DESC: HEAD DROP

TEST DATE: 01/10/2013
TEST #: D13051

HEAD RESULTANT ACCELERATION (G's) vs TIME (ms)



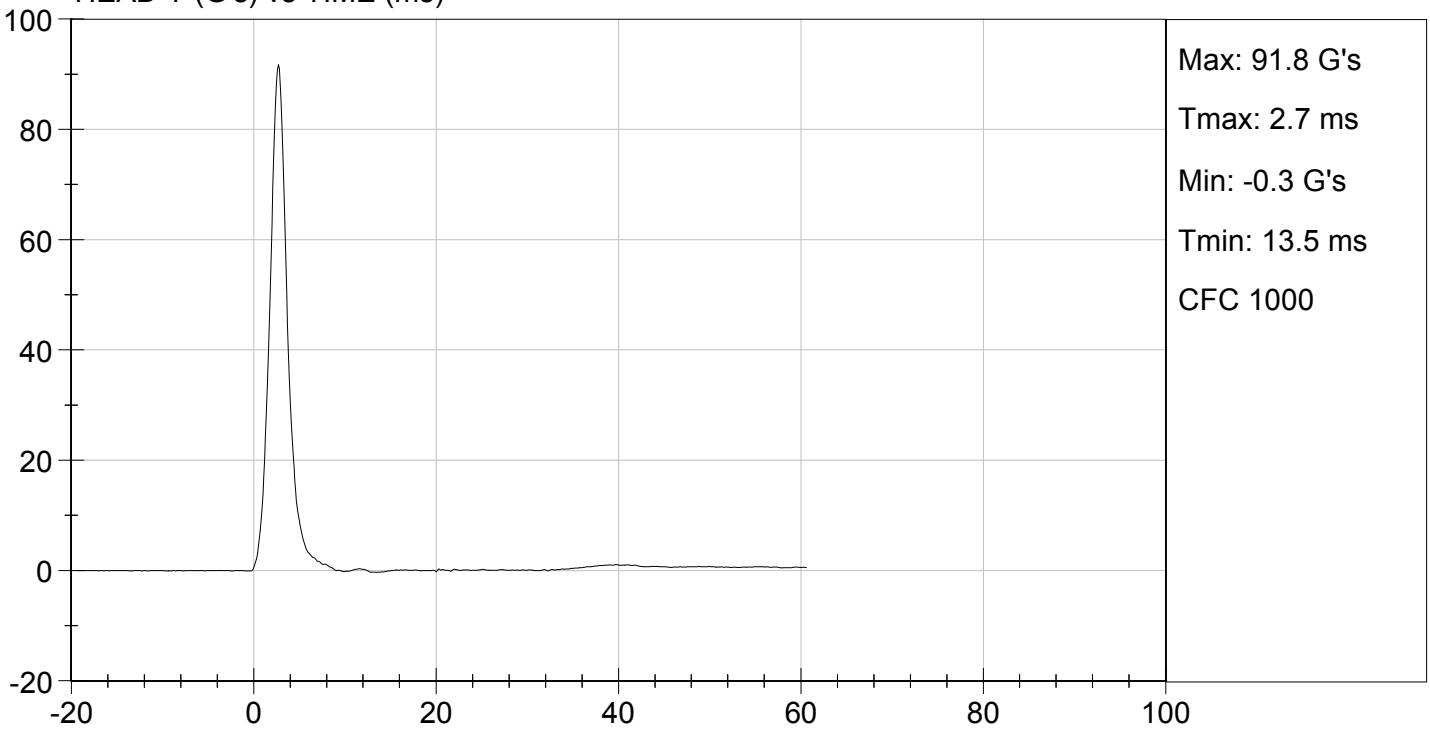
HEAD X (G's) vs TIME (ms)



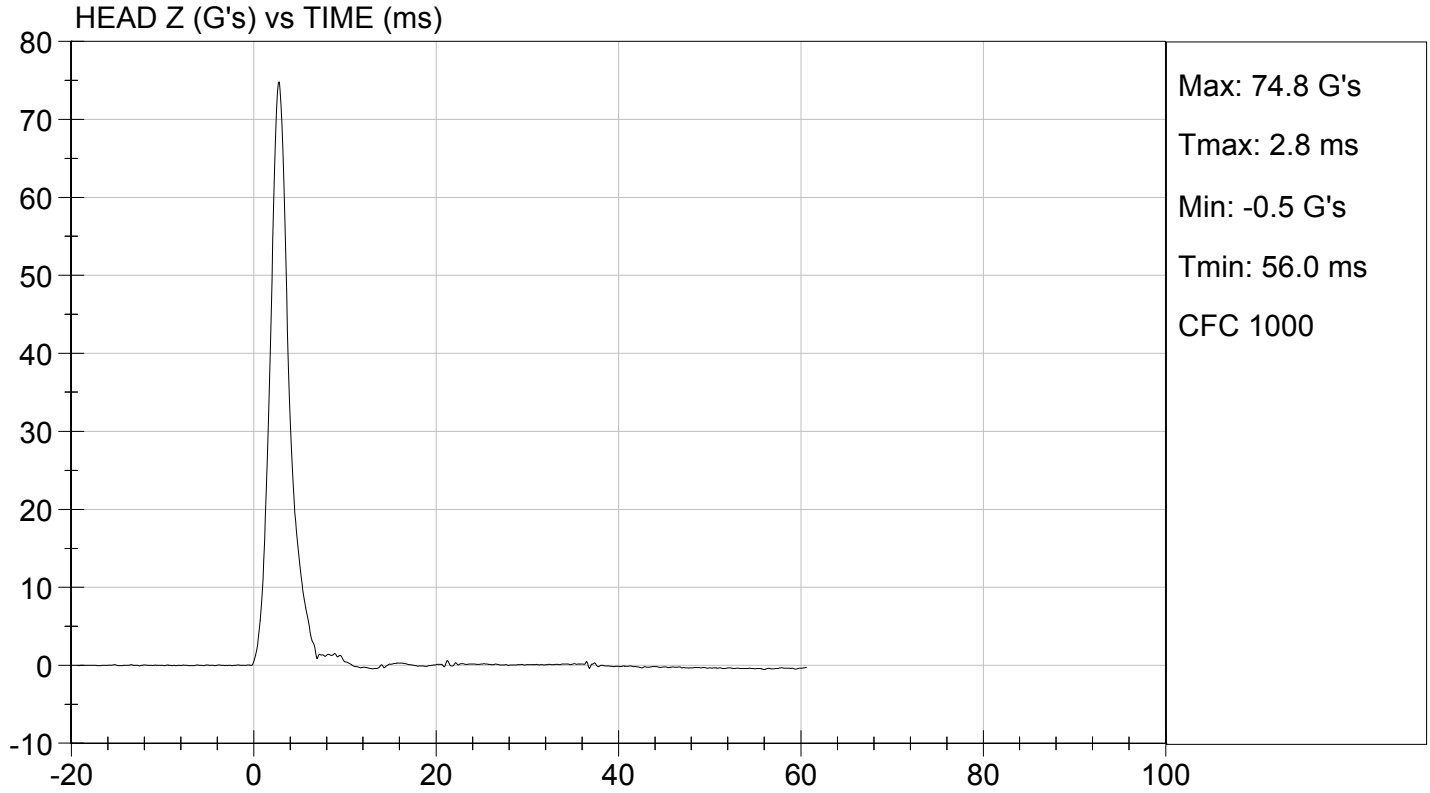
TEST DESC: HEAD DROP

TEST DATE: 01/10/2013
TEST #: D13051

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



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



MGA RESEARCH CORPORATION

LATERAL NECK PENDULUM TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D13052

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	20.9	Pass
Humidity		%	10 to 70	25	Pass
Impact Velocity		m/s	5.51 to 5.63	5.52	Pass
Pendulum Velocity	10 ms	m/s	2.20 to 2.80	2.57	Pass
	15 ms	m/s	3.30 to 4.10	3.67	Pass
	20 ms	m/s	4.40 to 5.40	4.84	Pass
	25 ms	m/s	5.40 to 6.10	5.42	Pass
	25-100 ms	m/s	5.50 to 6.20	5.55	Pass
Maximum D-Plane Rotation		deg	71 to 81	73	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	62	Pass
Maximum Occipital Condyle Moment		Nm	-44 to -36	-39	Pass
Time of Moment Decay to 0 Nm		ms	102 to 126	116	Pass
			Overall Test Results		Pass

Jessica Gall
Laboratory Technician

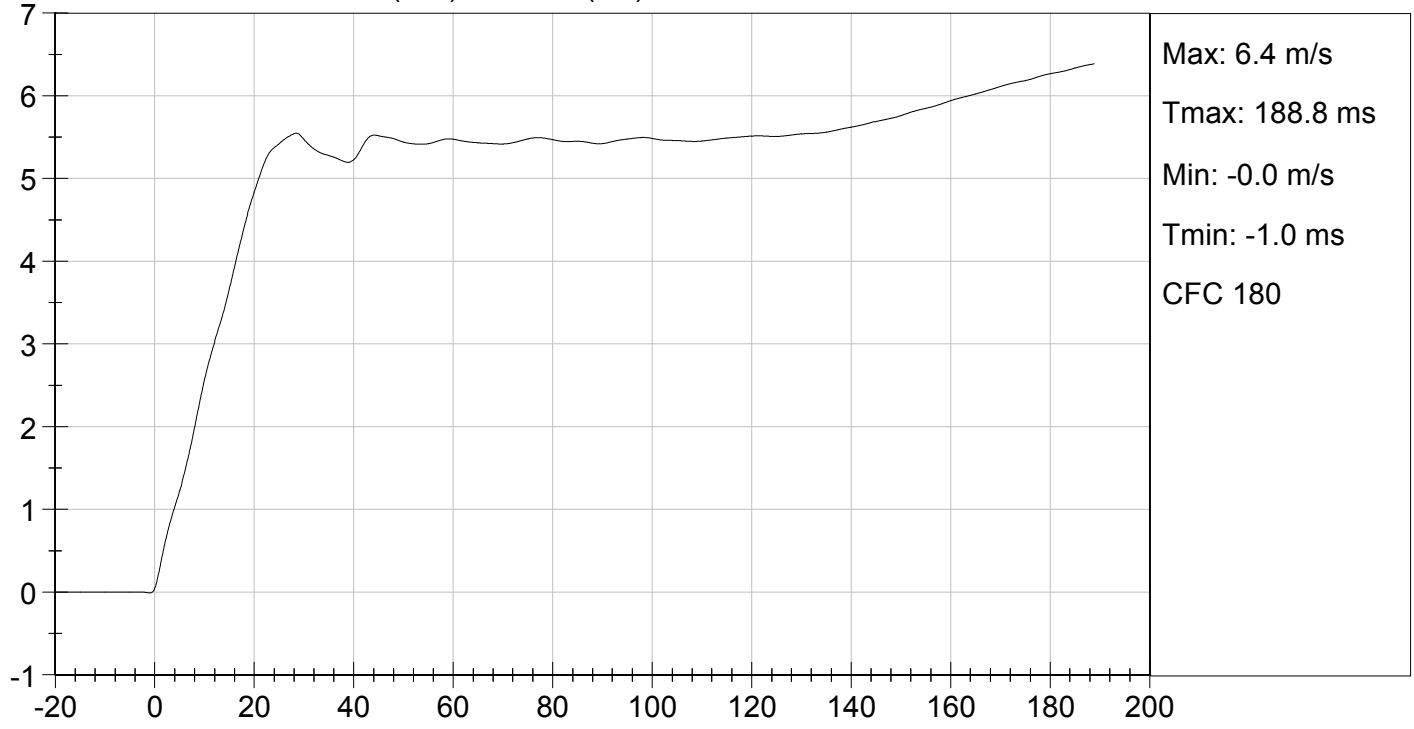
01/10/2013
Test Date

David Winkelbauer
Approved By

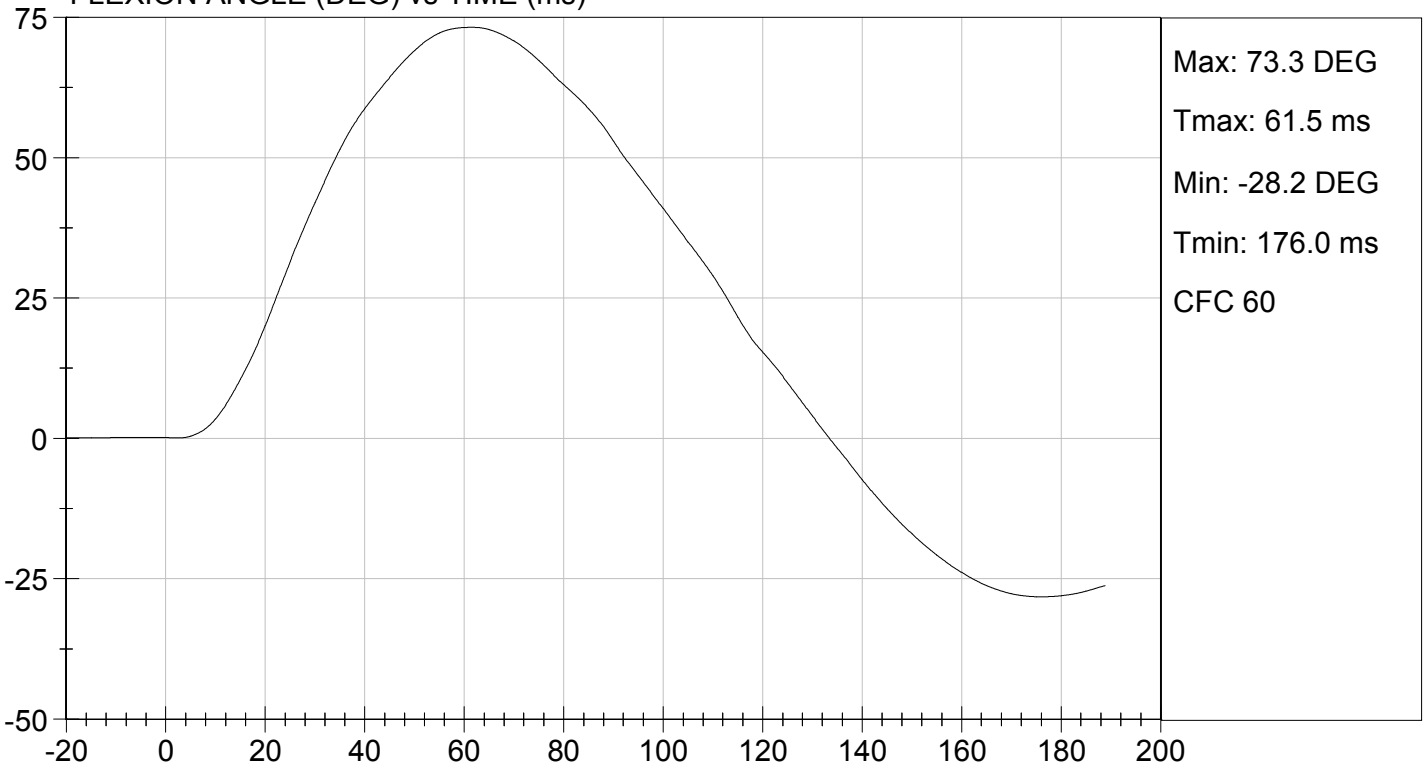
TEST DESC: NECK BENDING
VELOCITY: 18.12 ft/s, 5.52 m/s

TEST DATE: 01/10/2013
TEST #: D13052

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

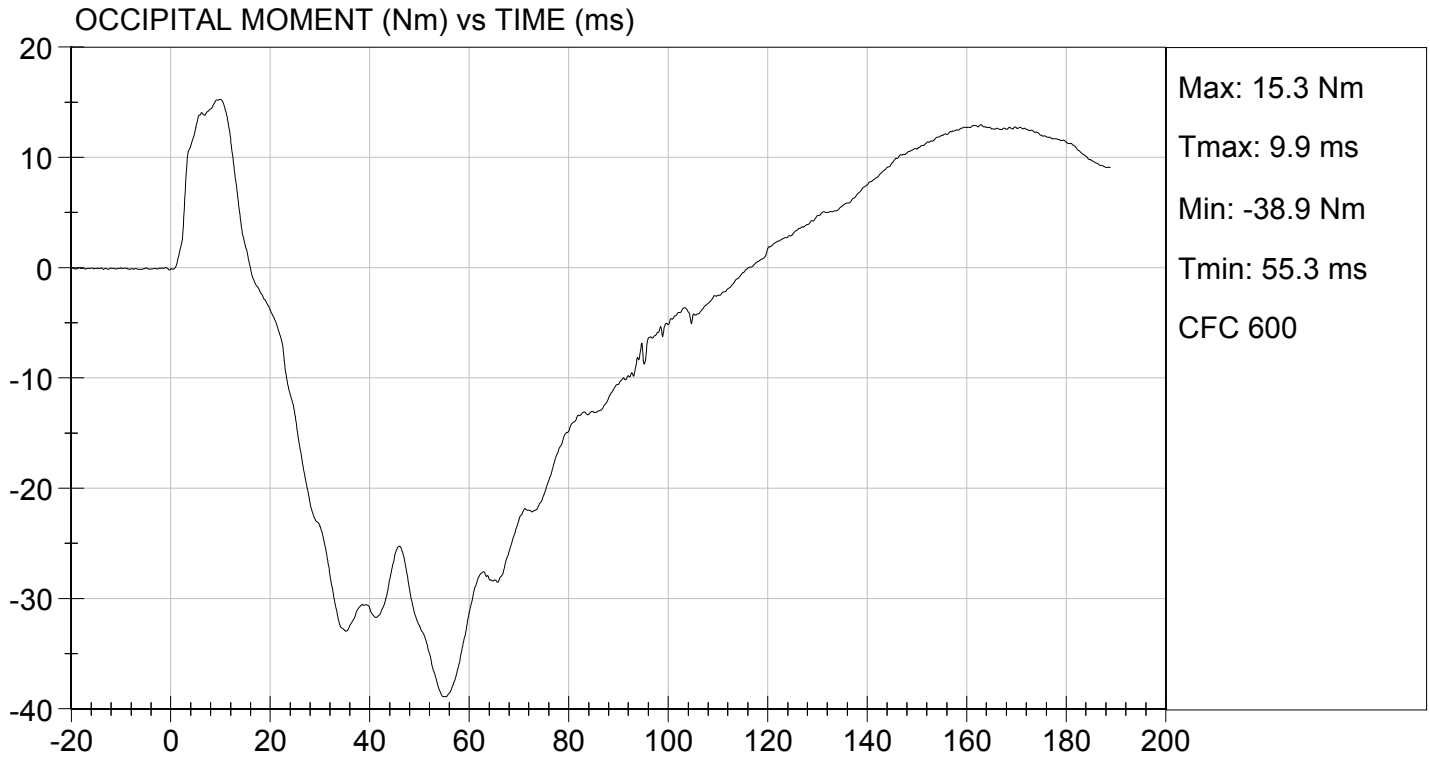


FLEXION ANGLE (DEG) vs TIME (ms)



TEST DESC: NECK BENDING
VELOCITY: 18.12 ft/s, 5.52 m/s

TEST DATE: 01/10/2013
TEST #: D13052



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test ID:** D13053

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	24	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	29	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	19	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

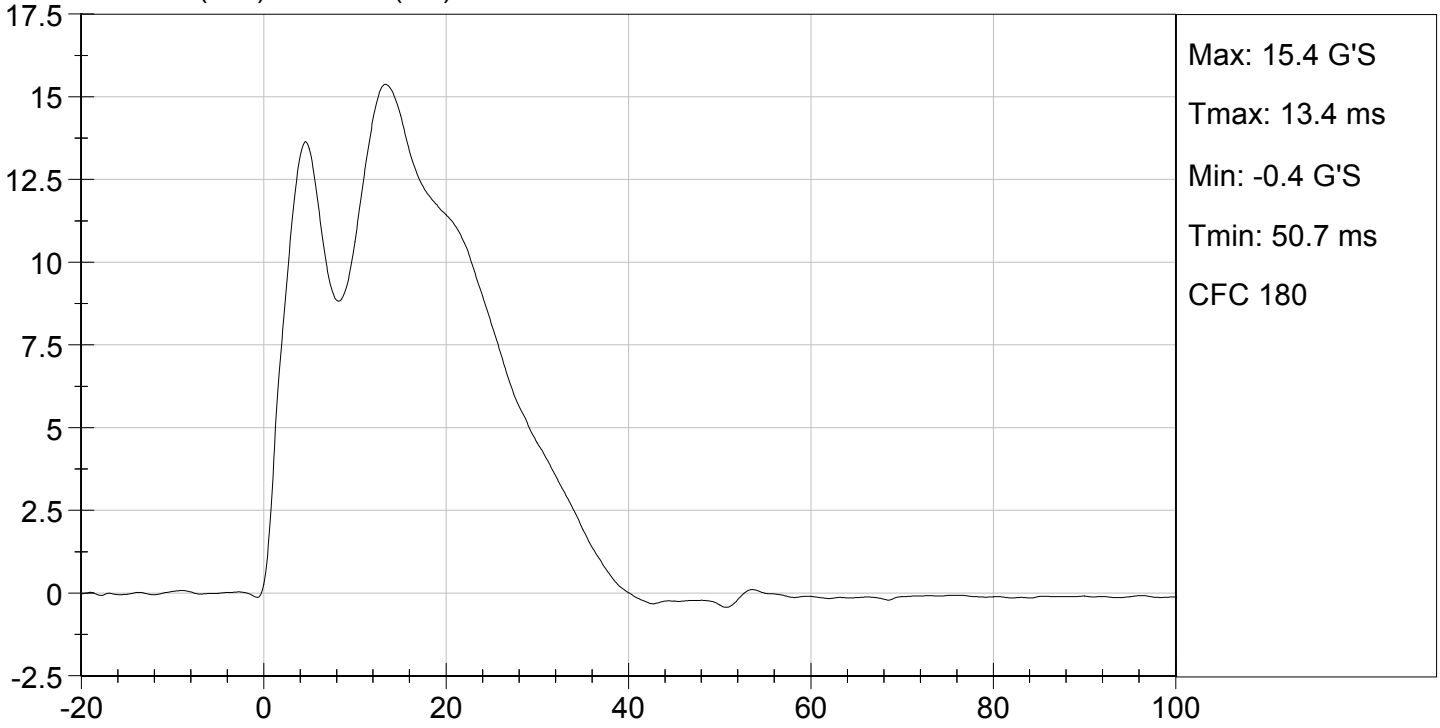
01/10/2013
Test Date

David Winkelbauer
Approved By

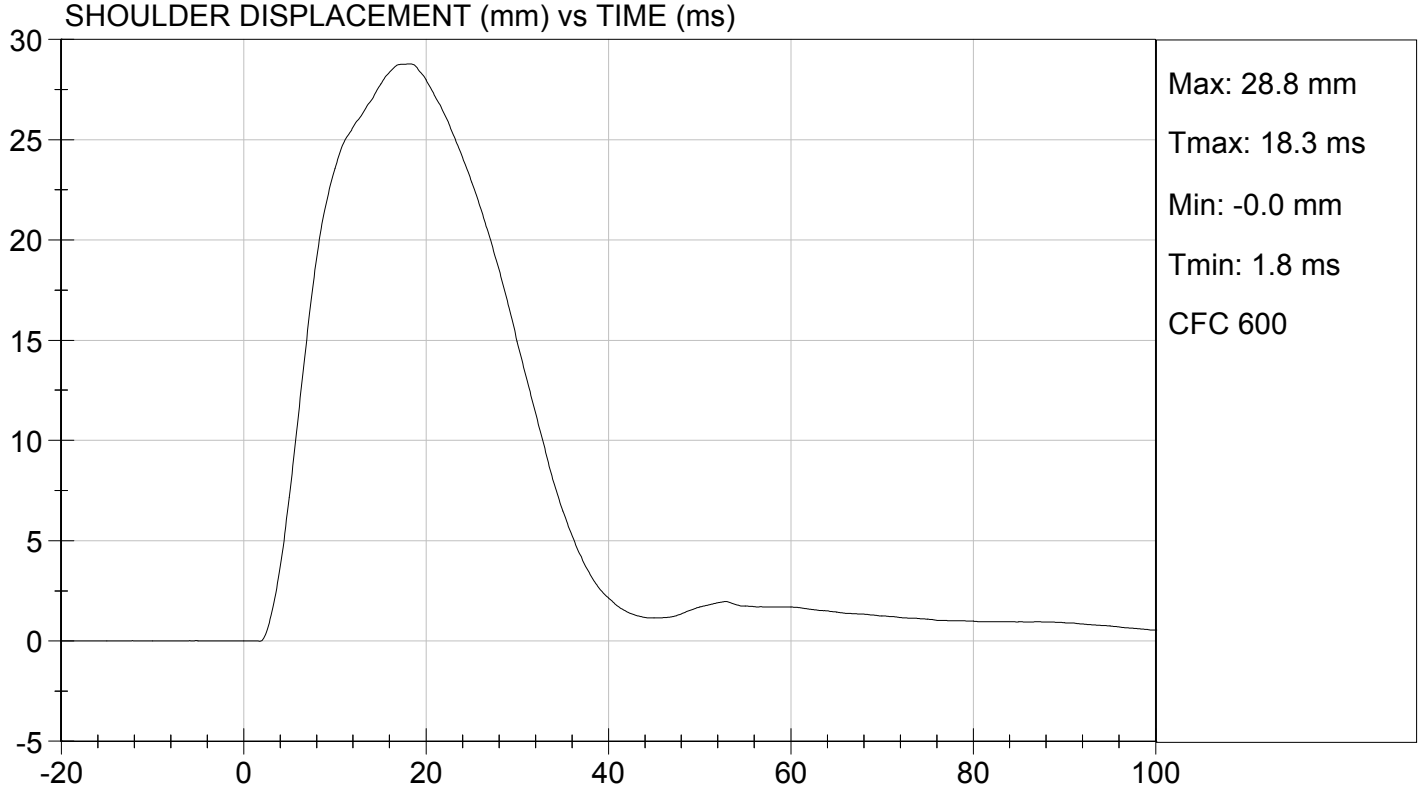
TEST DESC: SHOULDER IMPACT
VELOCITY: 14.37 ft/s, 4.38 m/s

TEST DATE: 01/10/2013
TEST #: D13053

PROBE (G'S) vs TIME (ms)



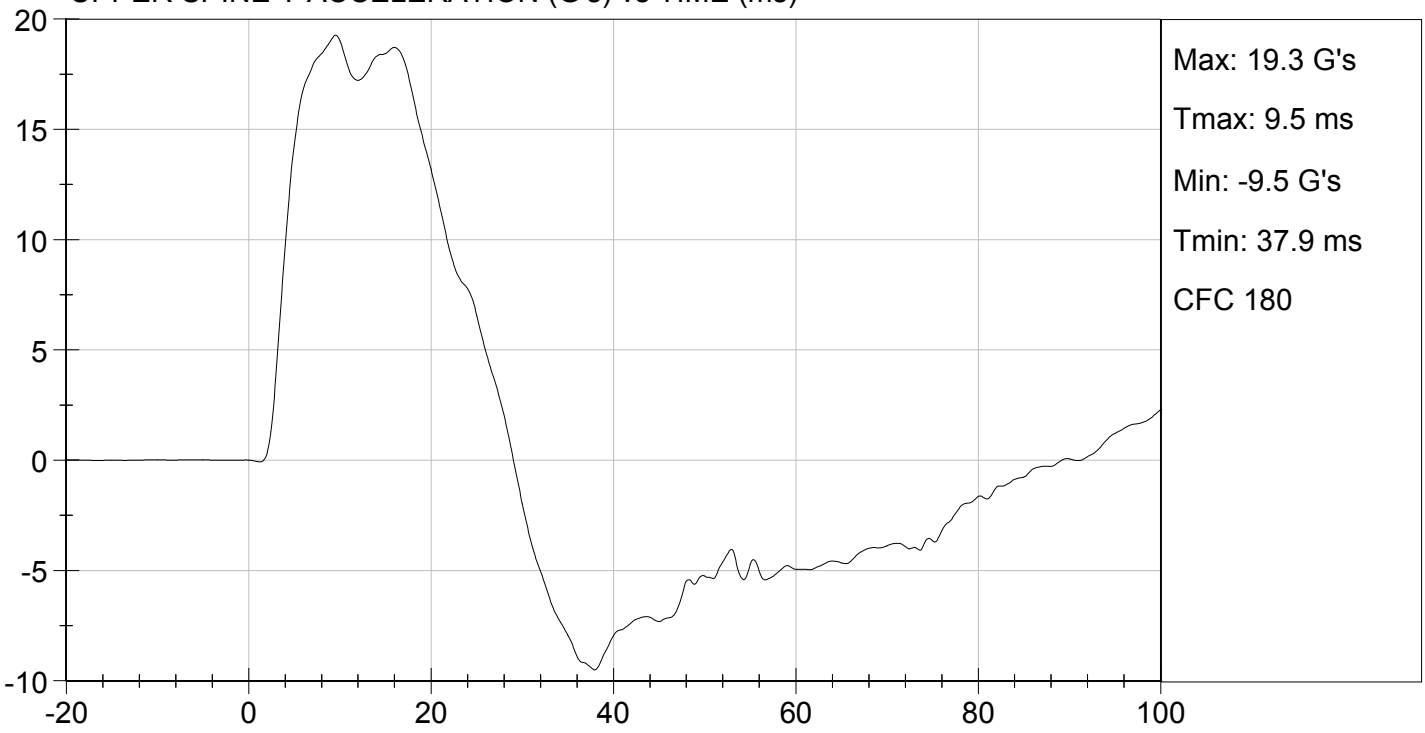
SHOULDER DISPLACEMENT (mm) vs TIME (ms)



TEST DESC: SHOULDER IMPACT
VELOCITY: 14.37 ft/s, 4.38 m/s

TEST DATE: 01/10/2013
TEST #: D13053

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



MGA RESEARCH CORPORATION

THORAX (WITH ARM) IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D13054

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.8	Pass
Humidity	%	10 to 70	24	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Maximum Probe Acceleration	G's	30 to 36	33	Pass
Shoulder Displacement	mm	31 to 40	31	Pass
Upper Rib Displacement	mm	25 to 32	26	Pass
Middle Rib Displacement	mm	30 to 36	31	Pass
Lower Rib Displacement	mm	32 to 38	34	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	38	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	31	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

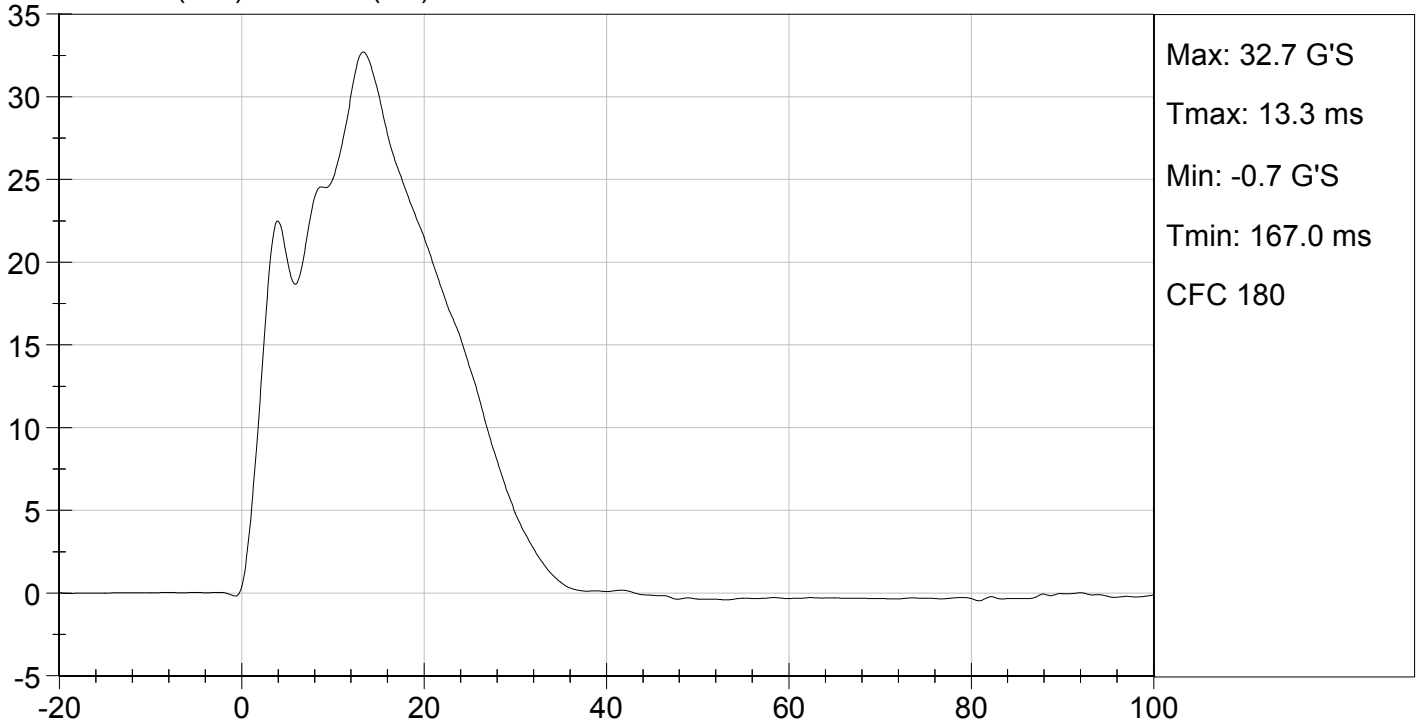
01/10/2013
Test Date

David Winkelbauer
Approved By

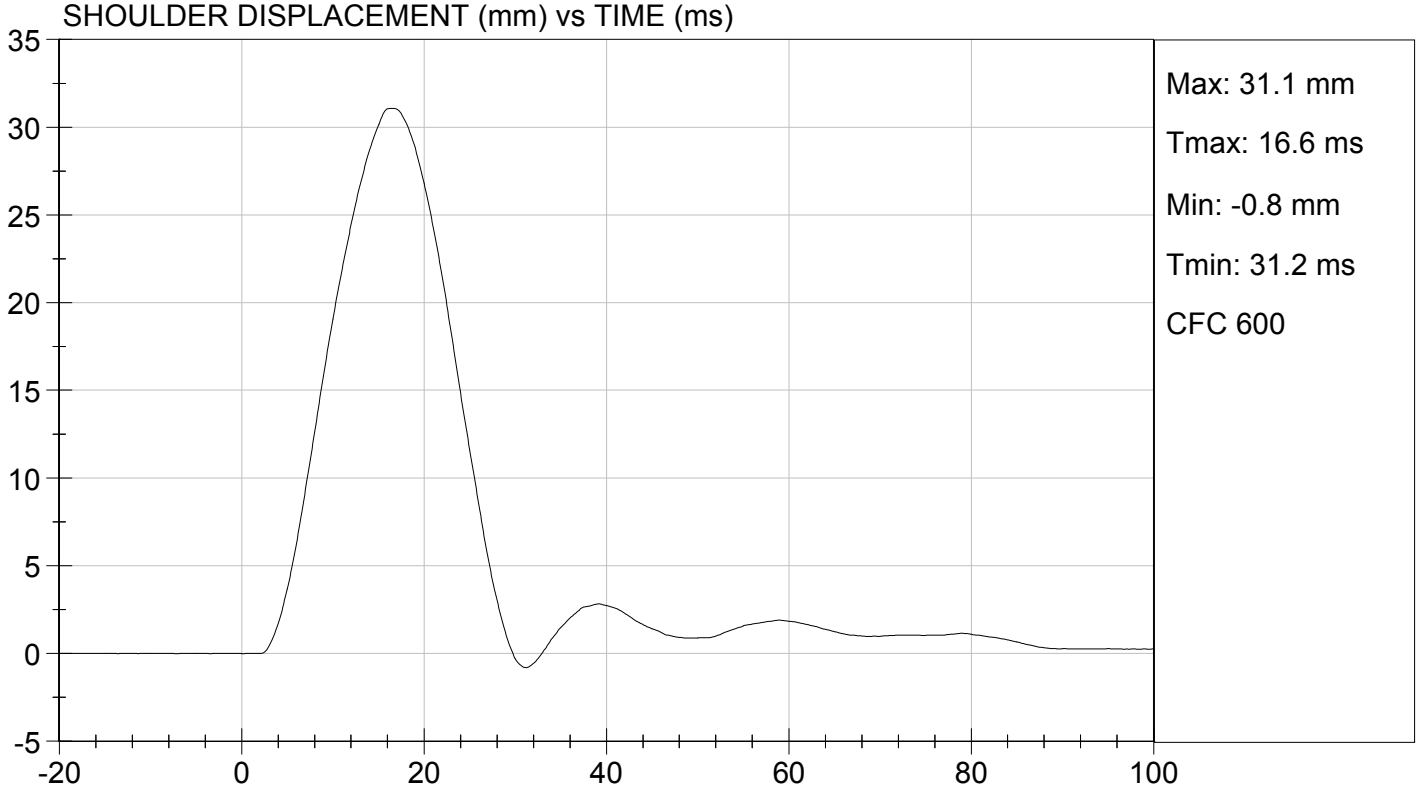
TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 01/10/2013
TEST #: D13054

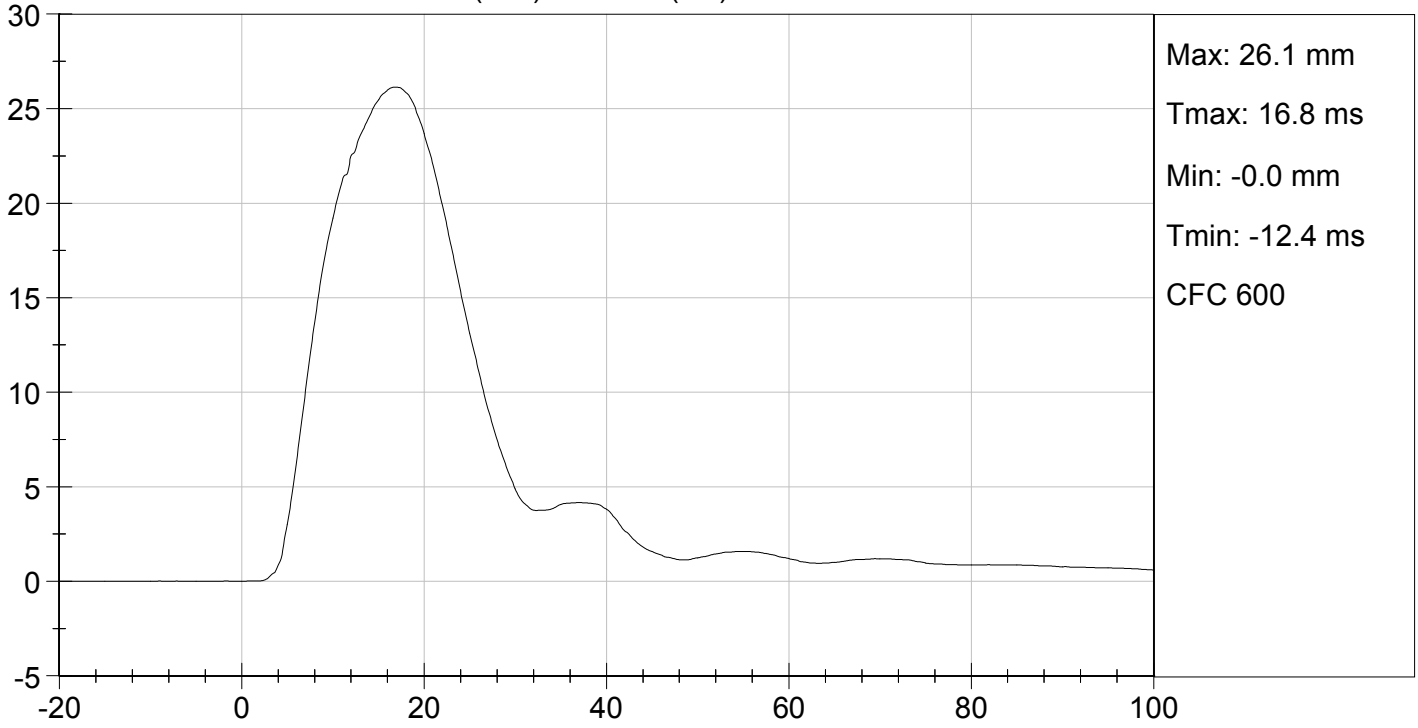
PROBE (G'S) vs TIME (ms)



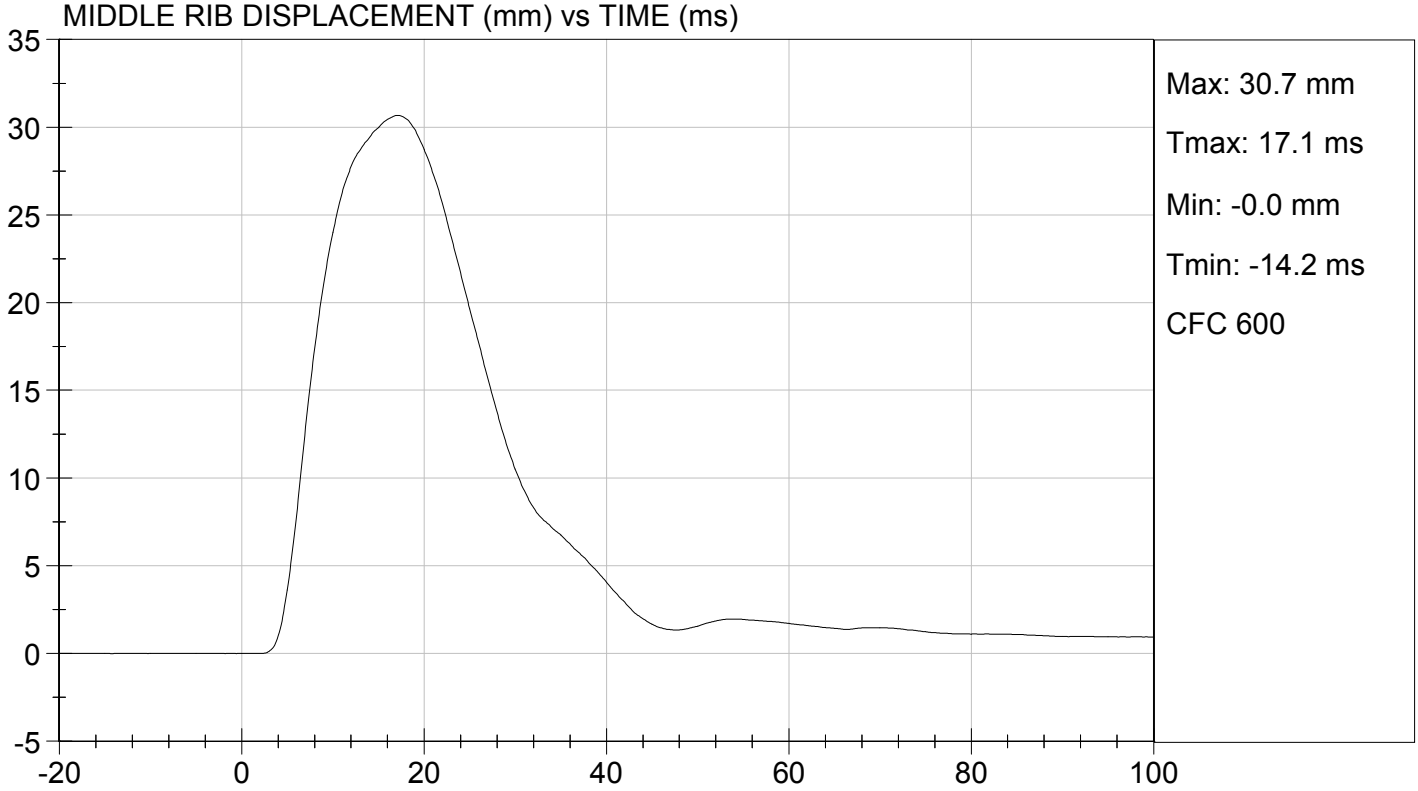
SHOULDER DISPLACEMENT (mm) vs TIME (ms)



UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



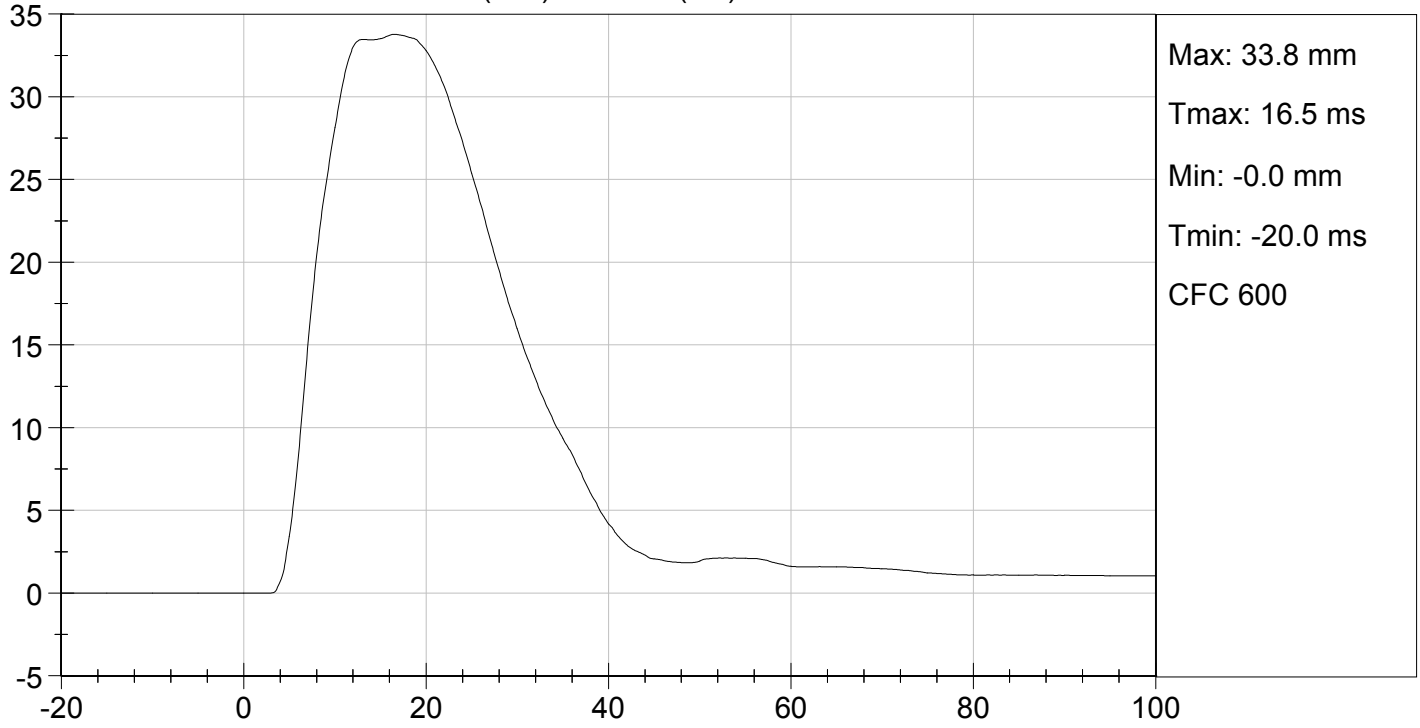
MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



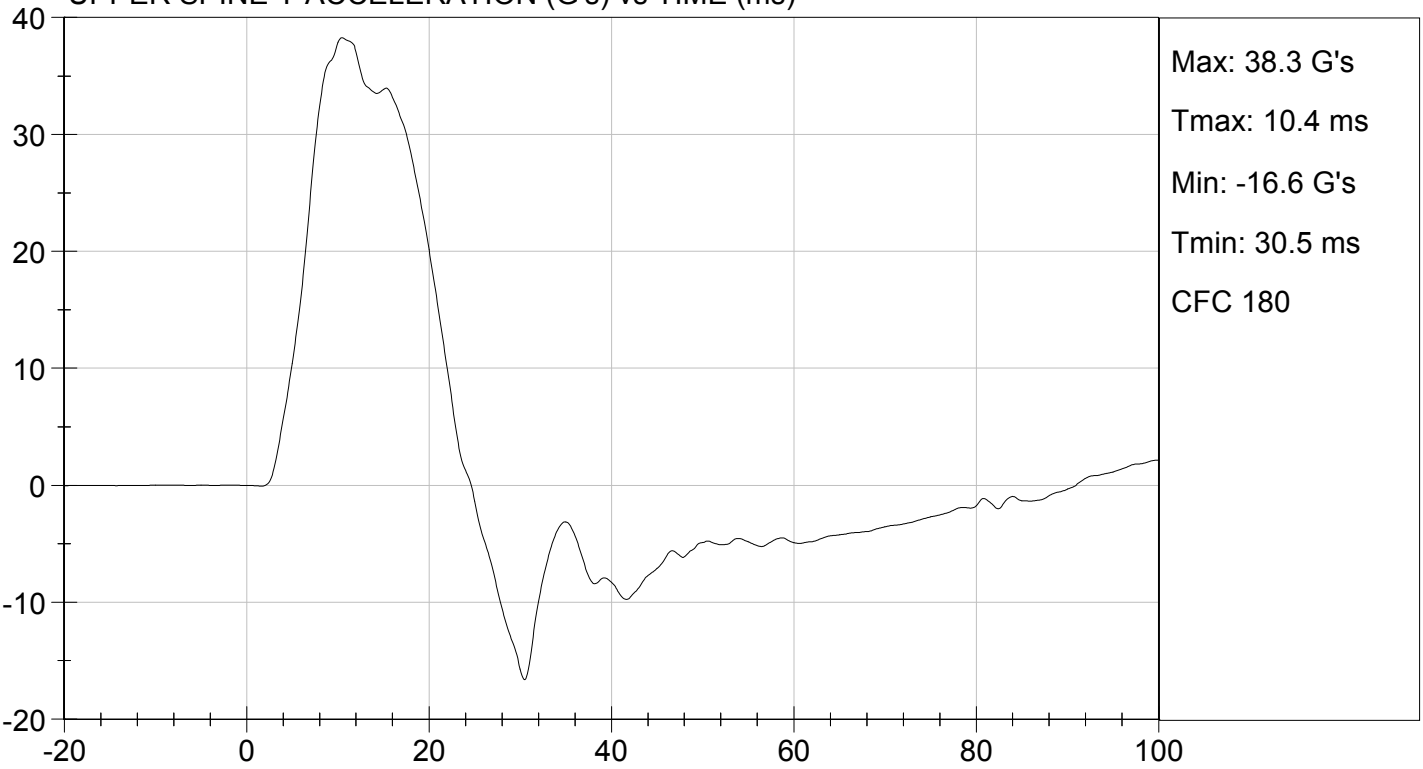
TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 01/10/2013
TEST #: D13054

LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



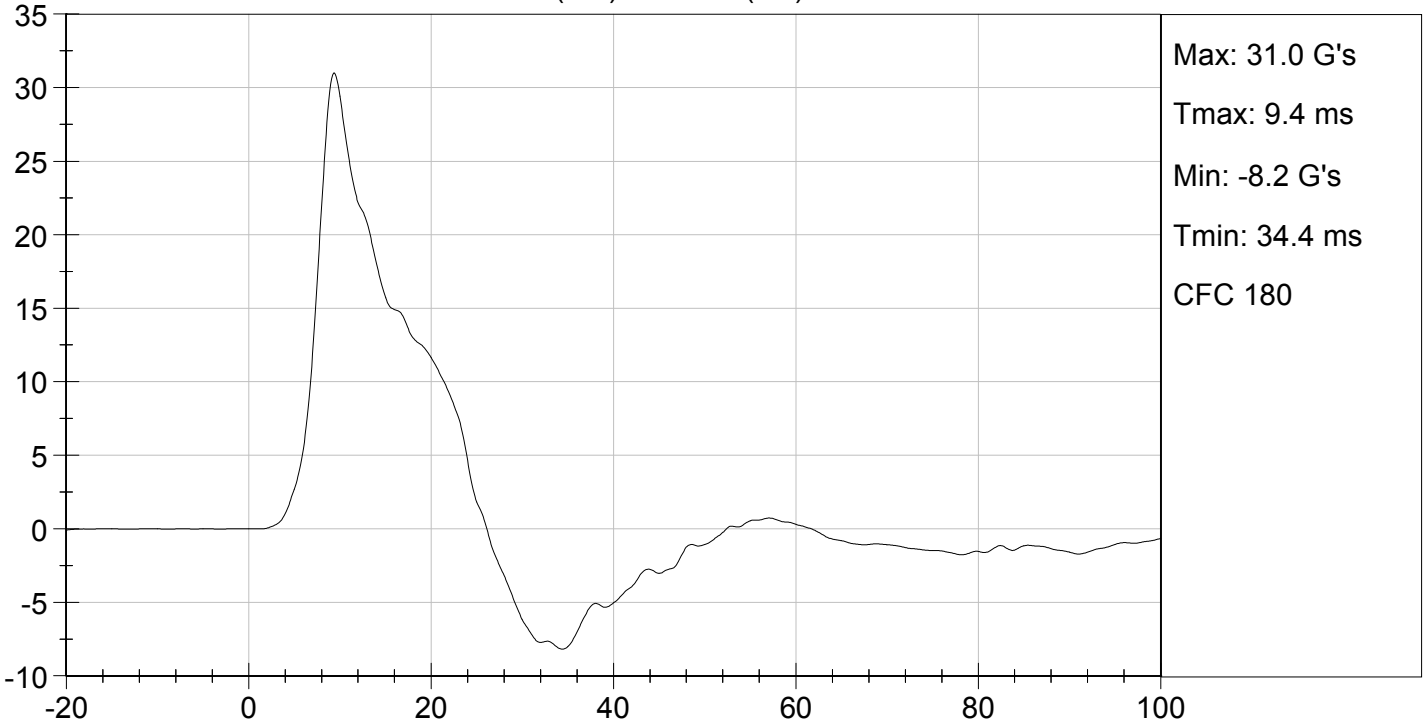
UPPER SPINE Y ACCELERATION (G's) vs TIME (ms)



TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 01/10/2013
TEST #: D13054

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



MGA RESEARCH CORPORATION

THORAX (WITHOUT ARM) IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D13055

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.8	Pass
Humidity	%	10 to 70	24	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Maximum Probe Acceleration	G's	14 to 18	15	Pass
Upper Rib Displacement	mm	32 to 40	38	Pass
Middle Rib Displacement	mm	39 to 45	41	Pass
Lower Rib Displacement	mm	35 to 43	38	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 17	16	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	8	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

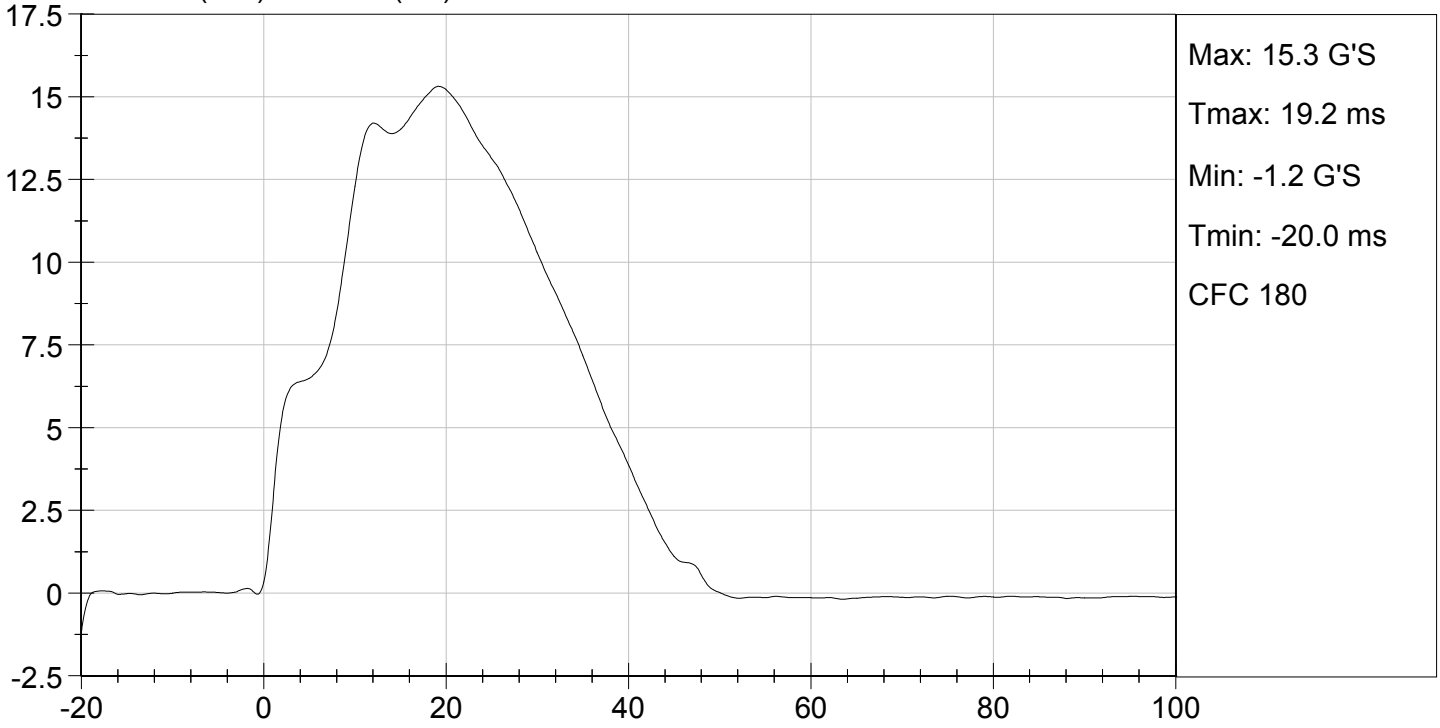
01/10/2013
Test Date

David Winkelbauer
Approved By

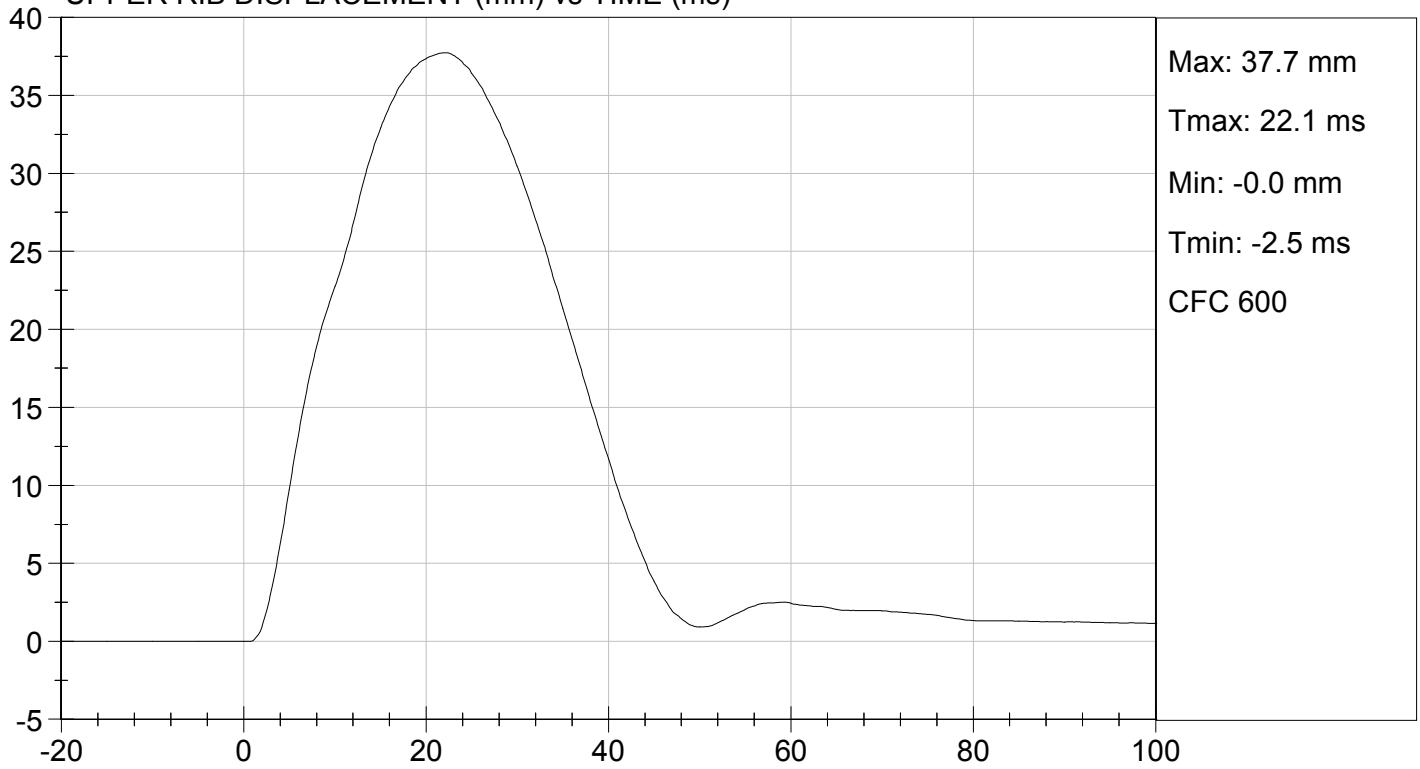
TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 01/10/2013
TEST #: D13055

PROBE (G'S) vs TIME (ms)



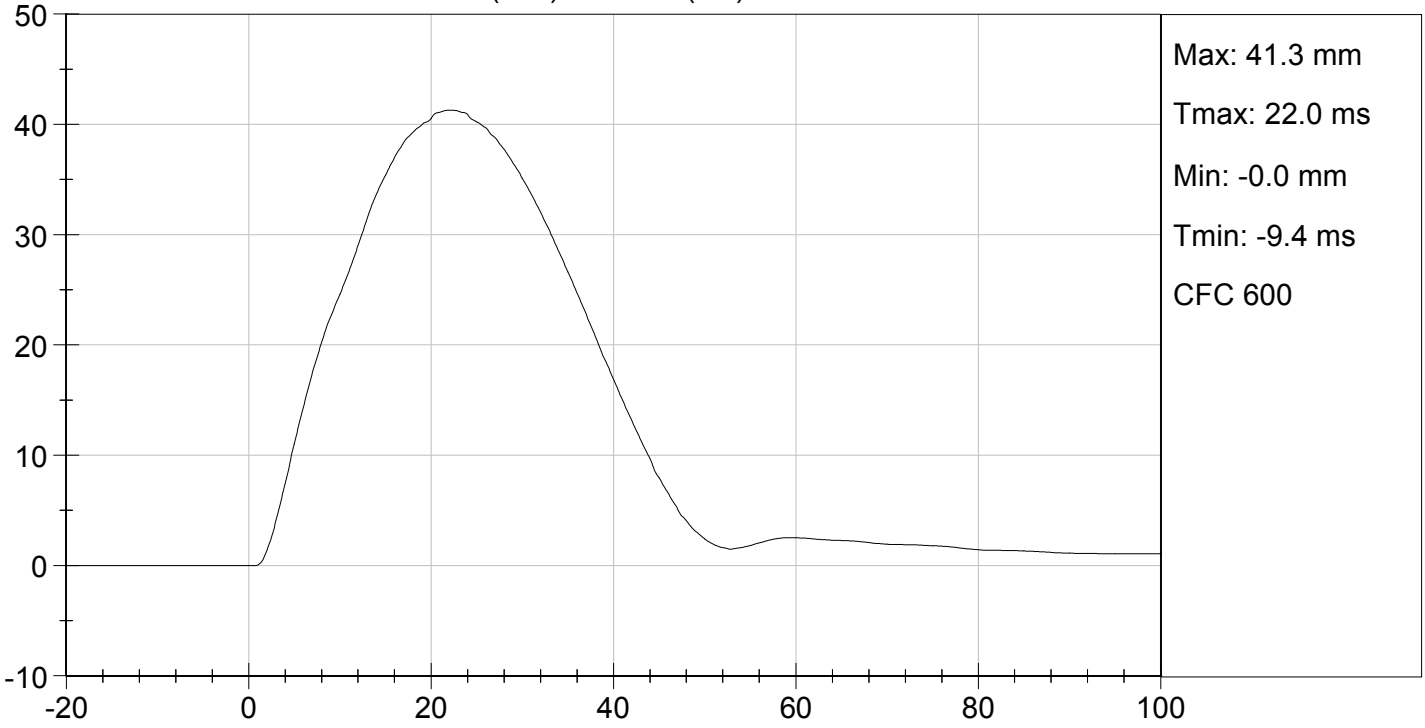
UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



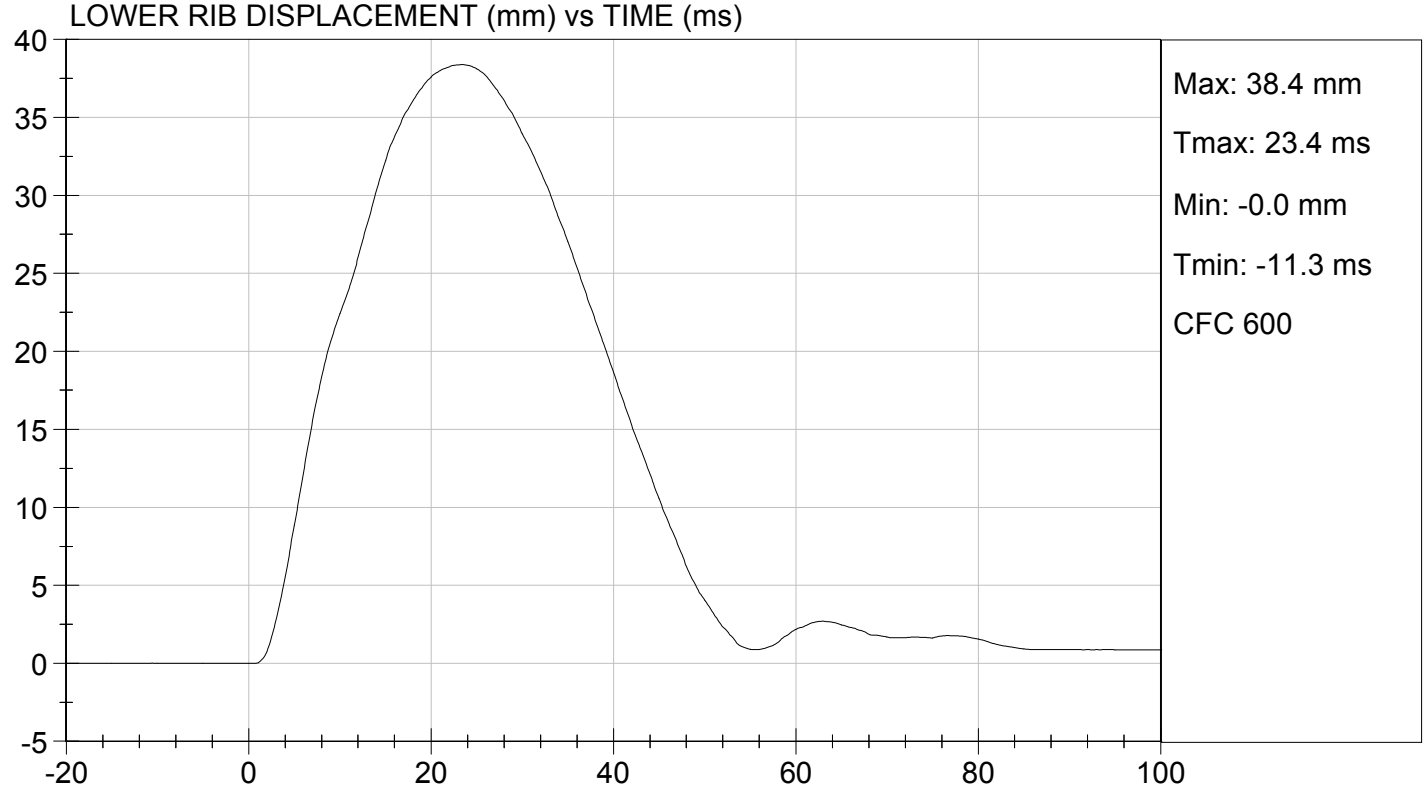
TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 01/10/2013
TEST #: D13055

MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



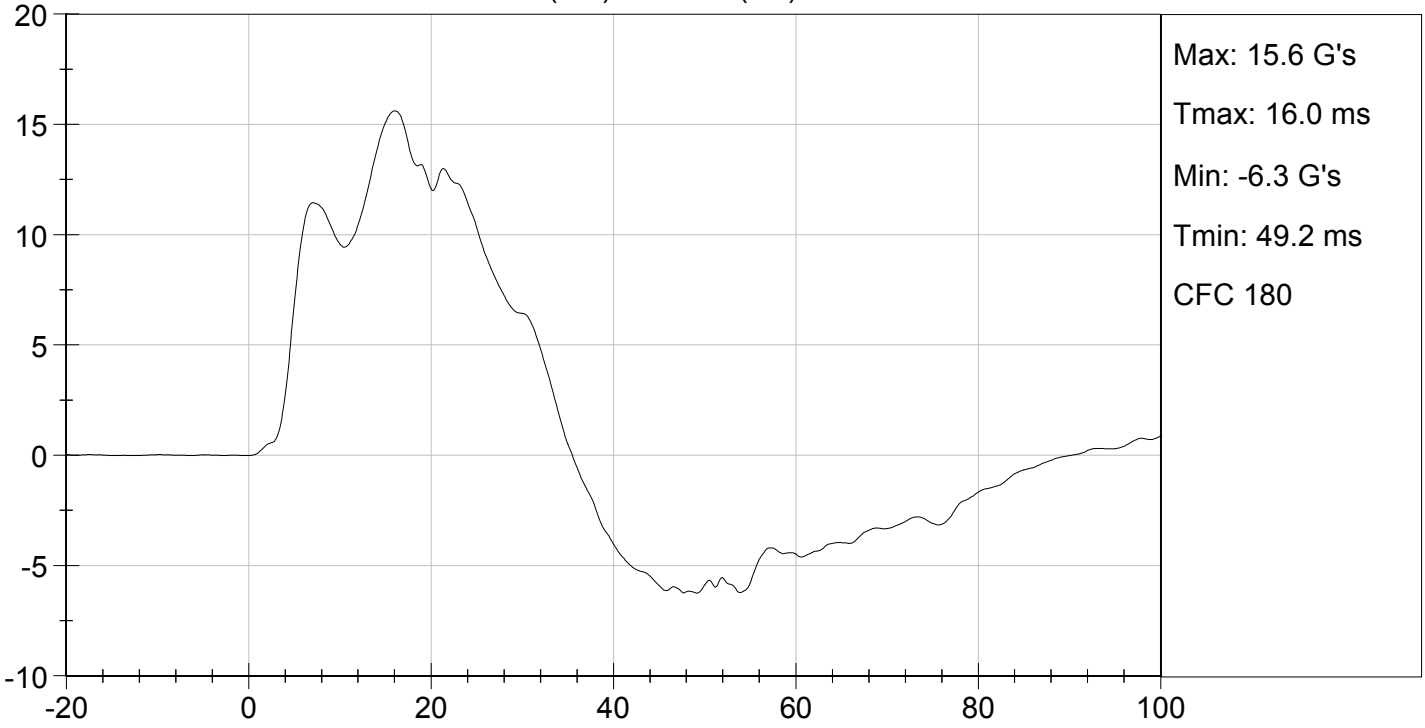
LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



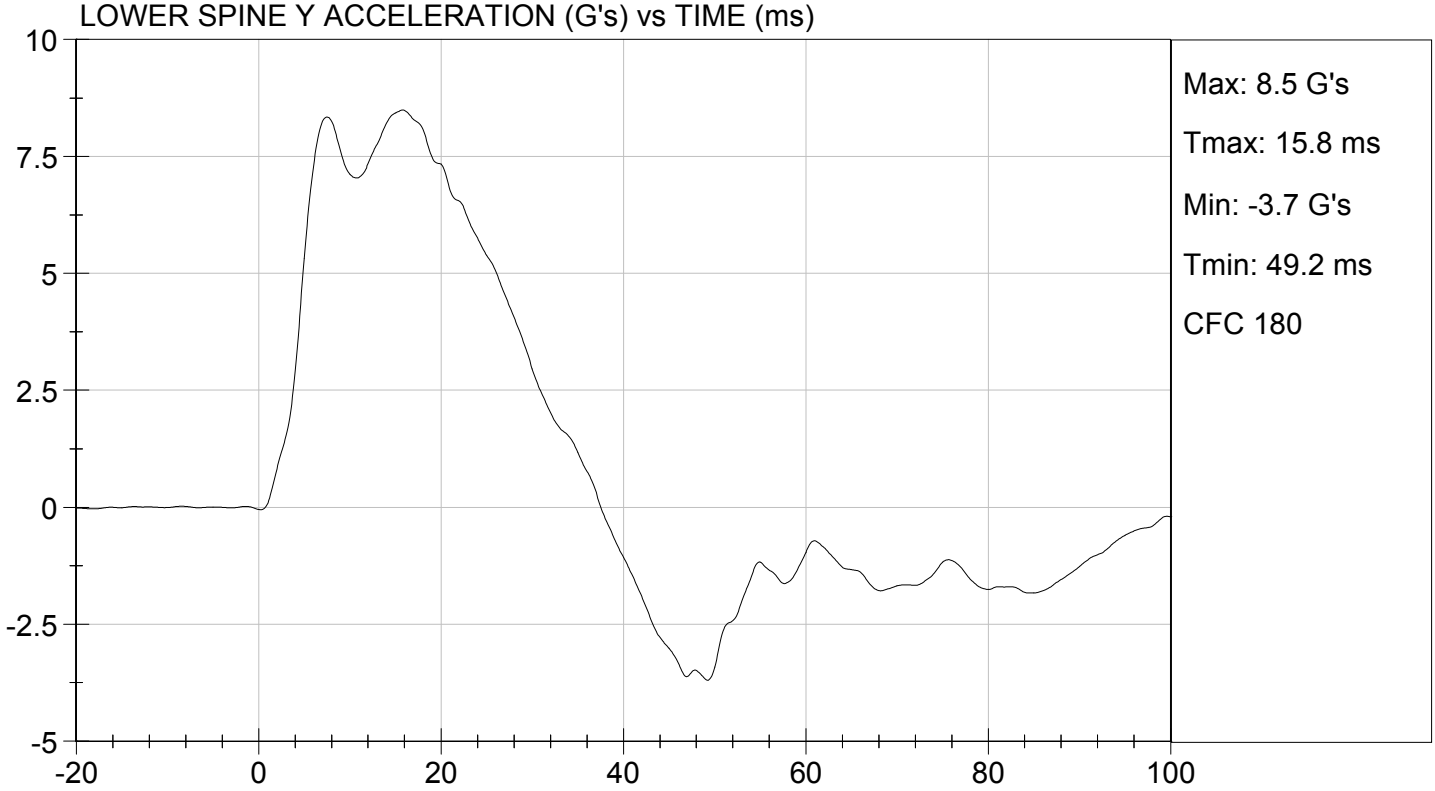
TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 01/10/2013
TEST #: D13055

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



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



MGA RESEARCH CORPORATION

ABDOMINAL IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D13056

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.8	Pass
Humidity	%	10 to 70	24	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Maximum Probe Acceleration	G's	12 to 16	13	Pass
Upper Abdomen Rib Displacement	mm	36 to 47	42	Pass
Lower Abdomen Rib Displacement	mm	33 to 44	33	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	11	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

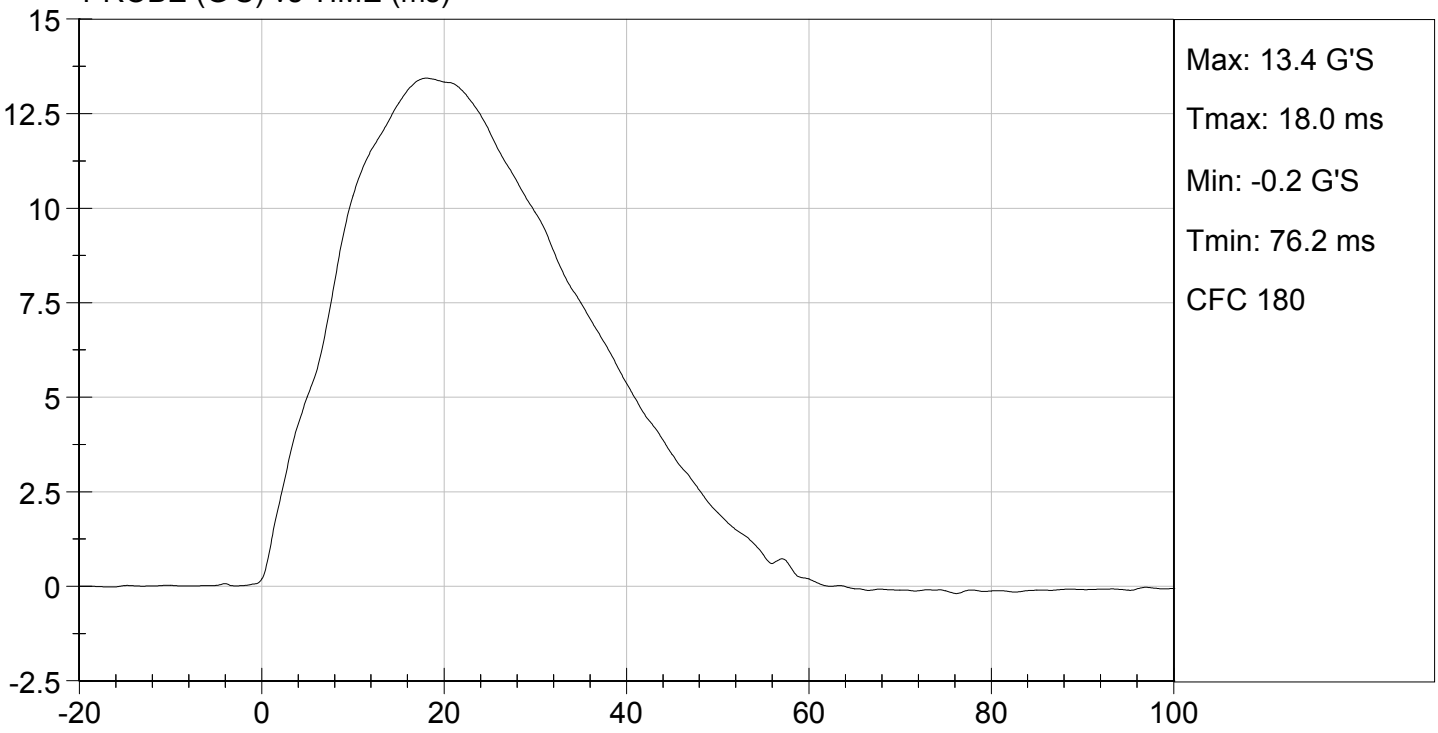
01/10/2013
Test Date

David Winkelbauer
Approved By

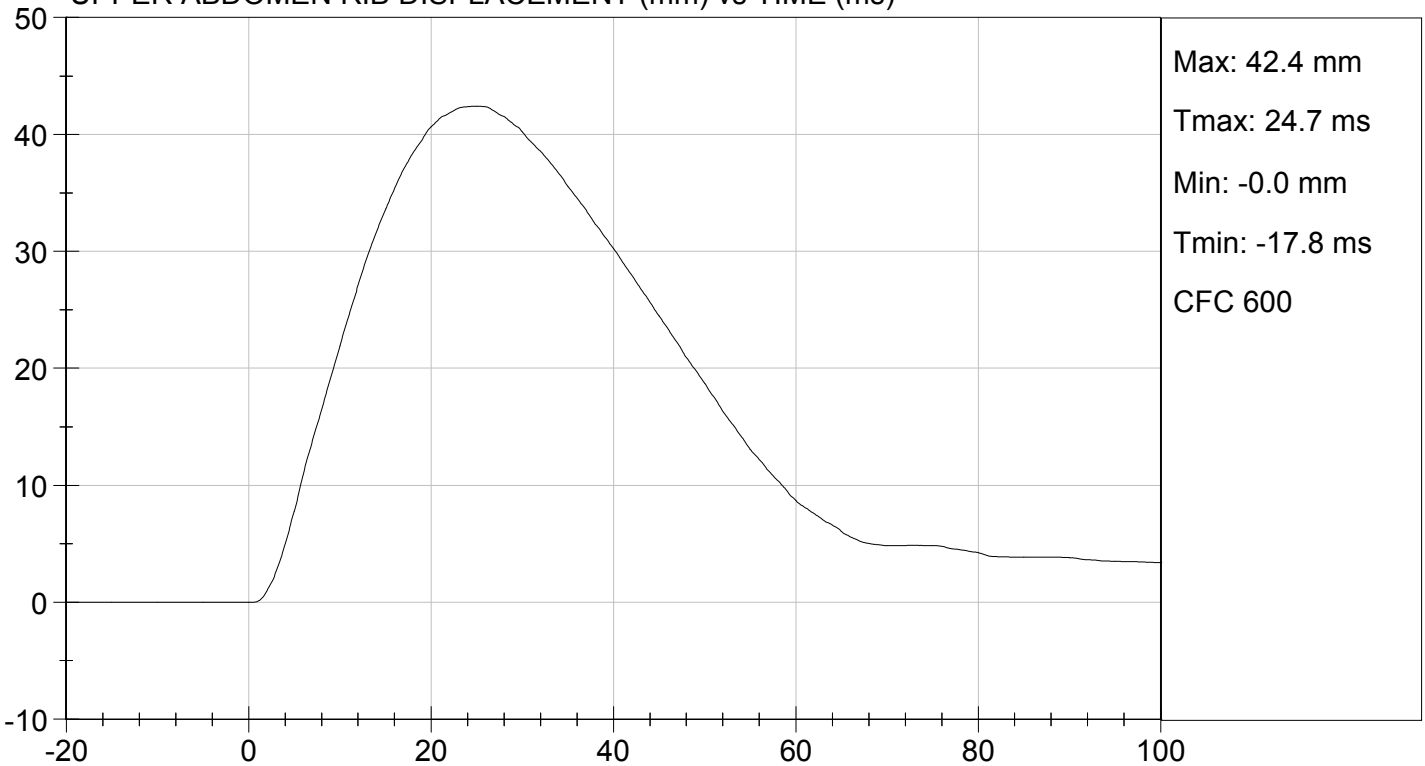
TEST DESC: ABDOMEN IMPACT
VELOCITY: 14.37 ft/s, 4.38 m/s

TEST DATE: 01/10/2013
TEST #: D13056

PROBE (G'S) vs TIME (ms)



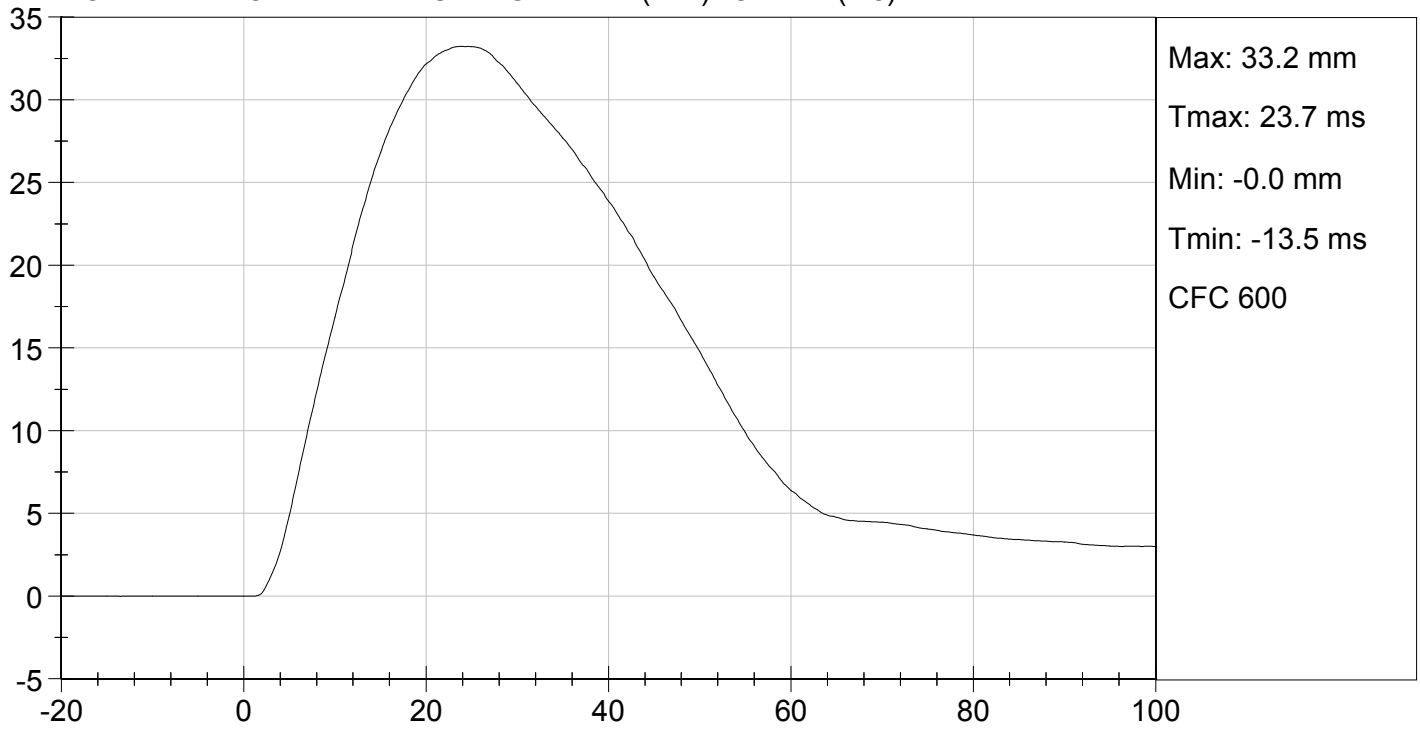
UPPER ABDOMEN RIB DISPLACEMENT (mm) vs TIME (ms)



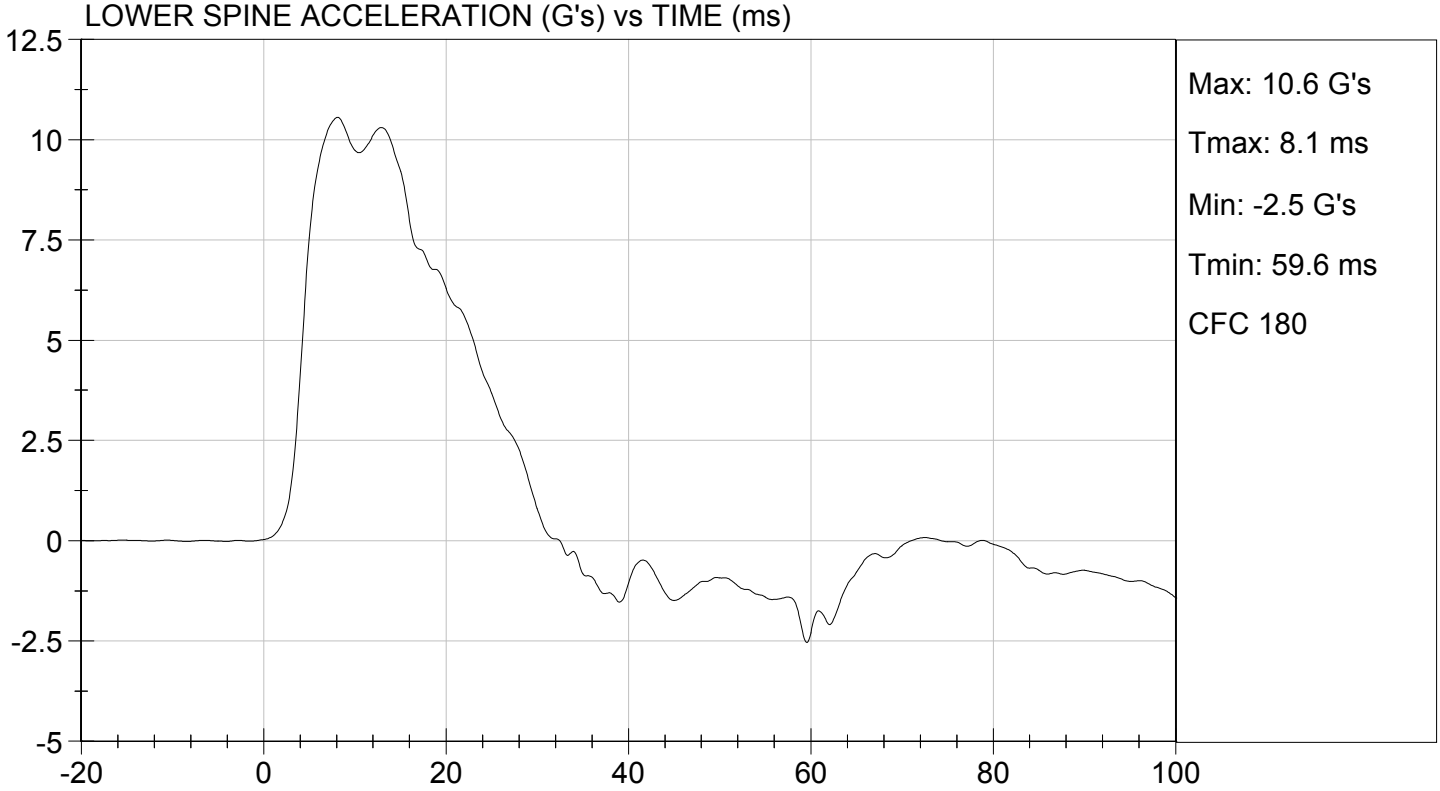
TEST DESC: ABDOMEN IMPACT
VELOCITY: 14.37 ft/s, 4.38 m/s

TEST DATE: 01/10/2013
TEST #: D13056

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: 306 **Test I.D:** D13057

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.8	Pass
Humidity	%	10 to 70	24	Pass
Impact Velocity	m/s	6.60 to 6.80	6.68	Pass
Maximum Probe Acceleration	G's	38 to 47	44	Pass
Pelvis Y Acceleration After 6 ms	G's	34 to 42	37	Pass
Peak Acetabulum Force	N	3600 to 4300	3,829	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

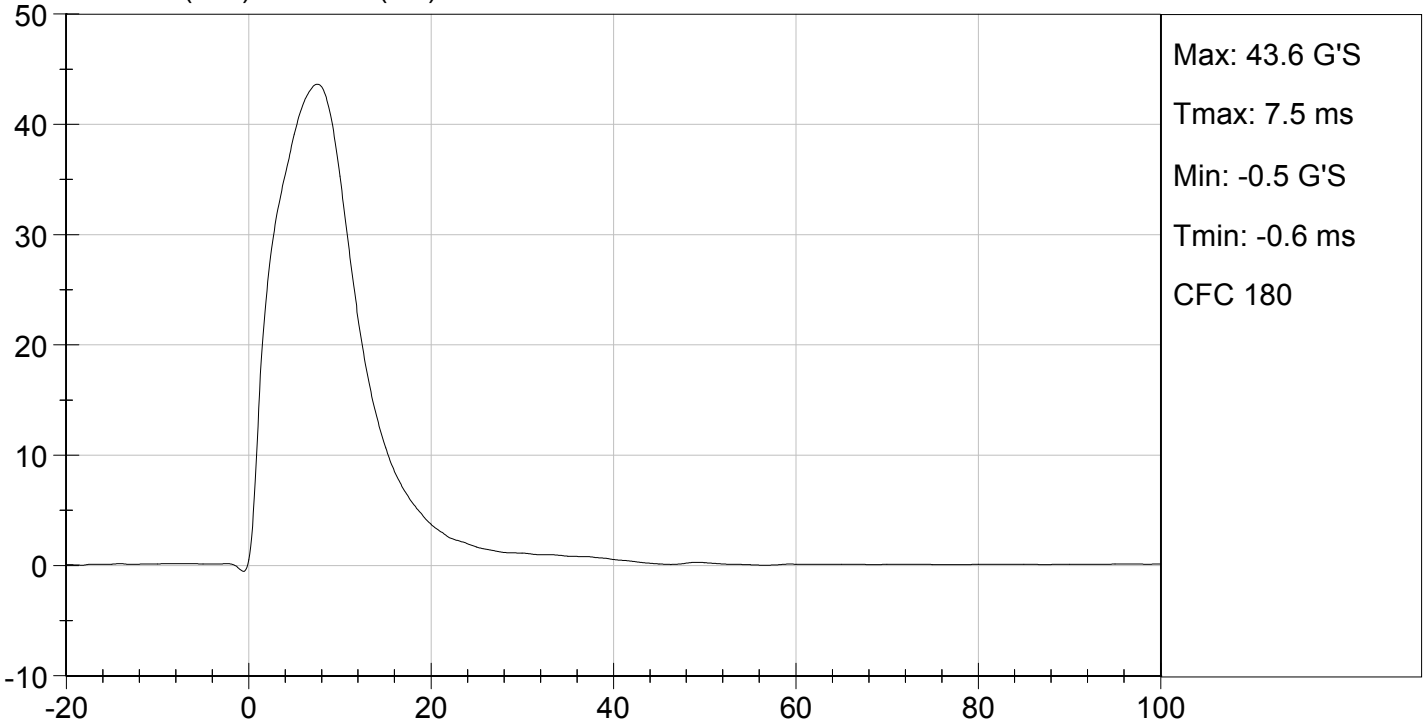
01/10/2013
Test Date

David Winkelbauer
Approved By

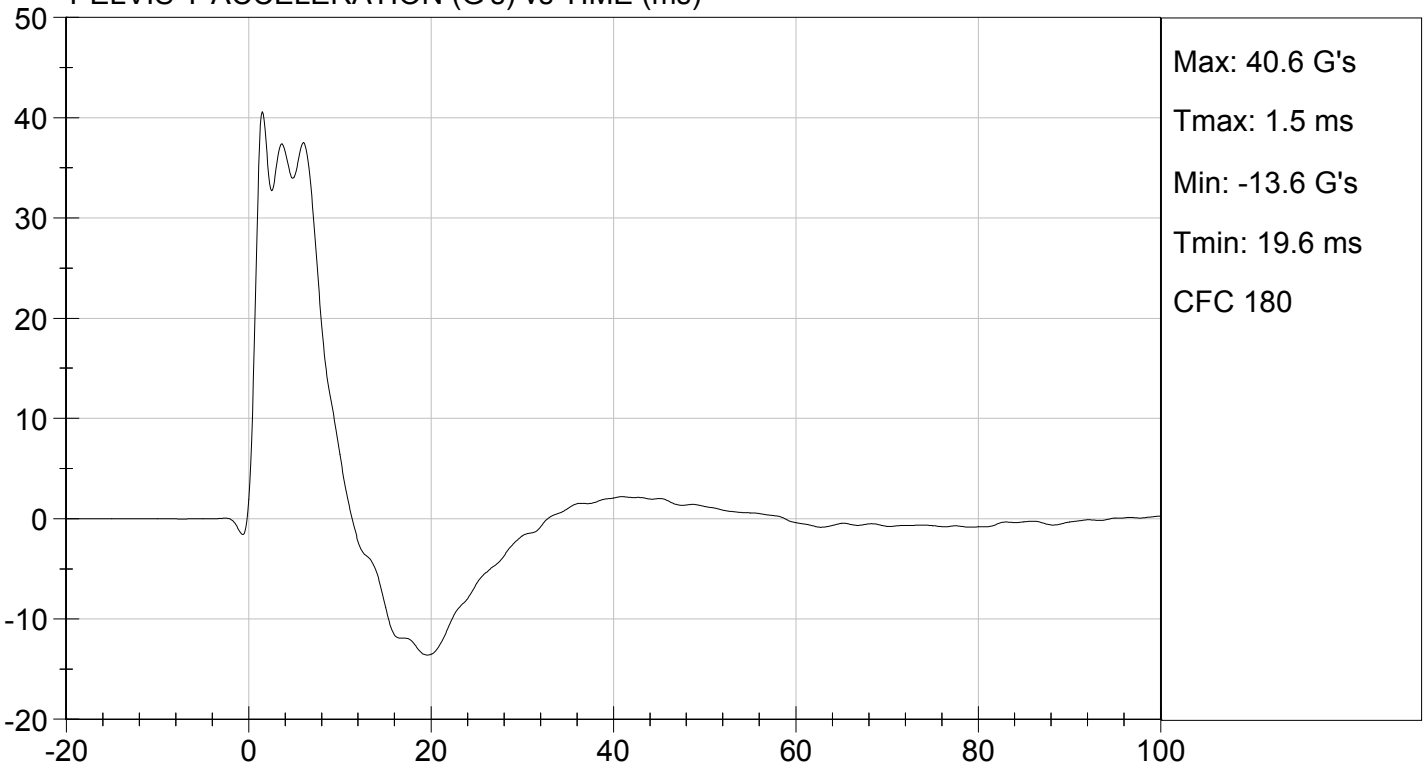
TEST DESC: PELVIS IMPACT
VELOCITY: 21.93 ft/s, 6.68 m/s

TEST DATE: 01/10/2013
TEST #: D13057

PROBE (G'S) vs TIME (ms)

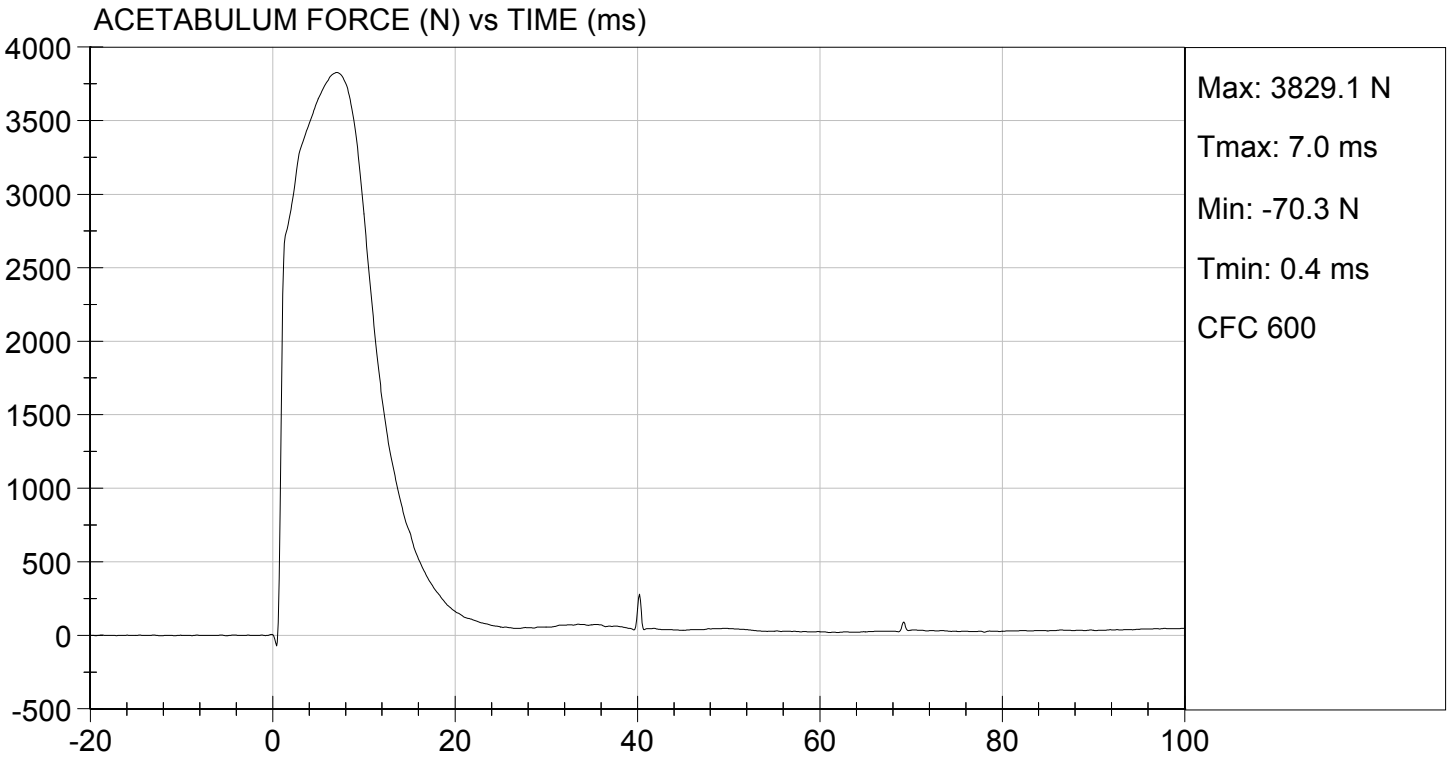


PELVIS Y ACCELERATION (G's) vs TIME (ms)



TEST DESC: PELVIS IMPACT
VELOCITY: 21.93 ft/s, 6.68 m/s

TEST DATE: 01/10/2013
TEST #: D13057



MGA RESEARCH CORPORATION

ILIAC IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D13058

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.8	Pass
Humidity	%	10 to 70	24	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Maximum Probe Acceleration	G's	36 to 45	38	Pass
Pelvis Y Acceleration	G's	28 to 39	31	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4,568	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

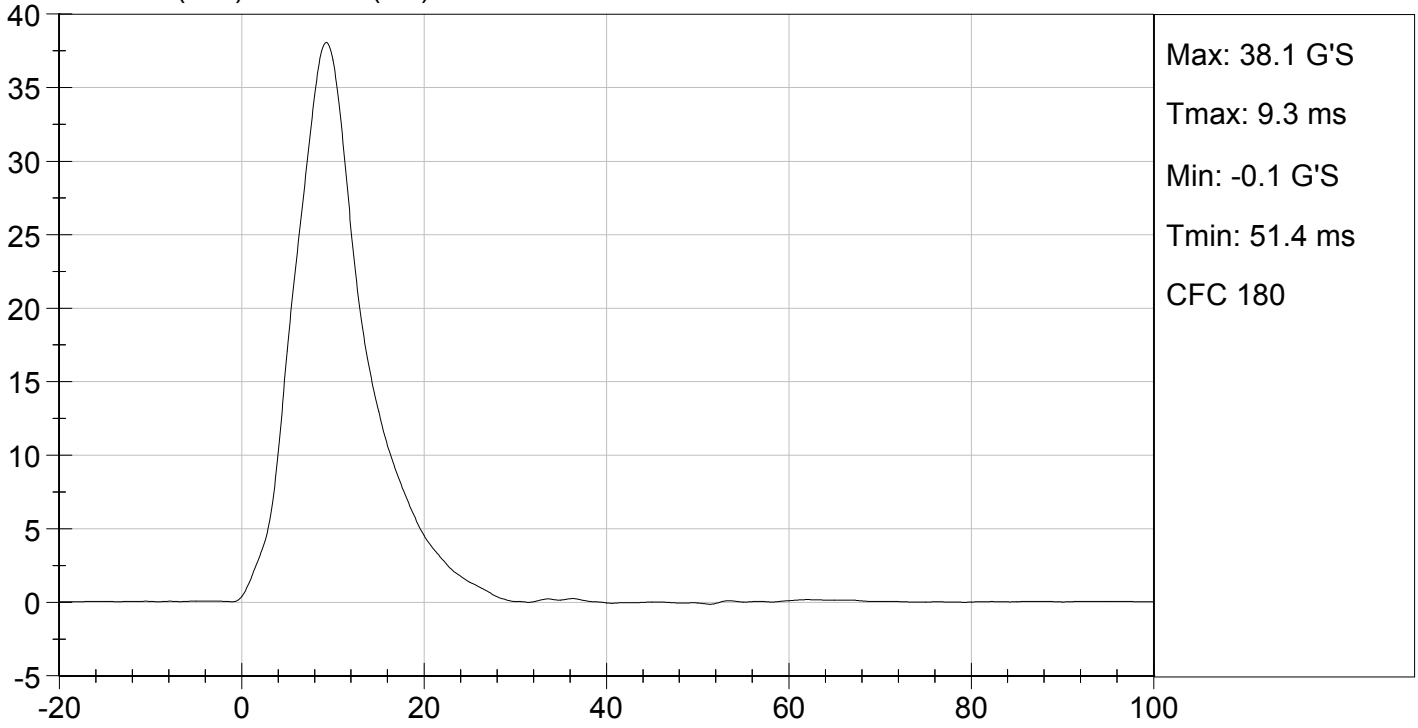
01/10/2013
Test Date

David Winkelbauer
Approved By

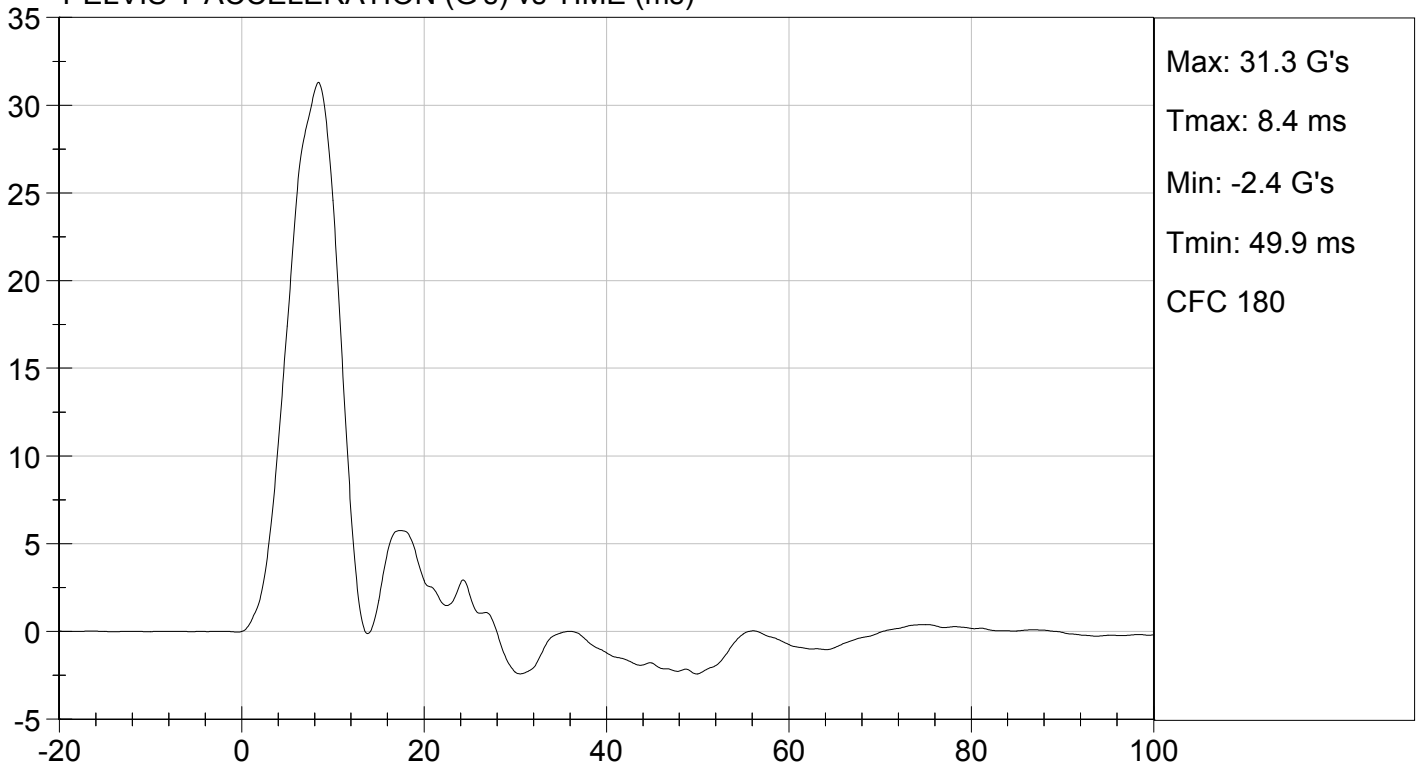
TEST DESC: ILLIAC
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 01/10/2013
TEST #: D13058

PROBE (G'S) vs TIME (ms)

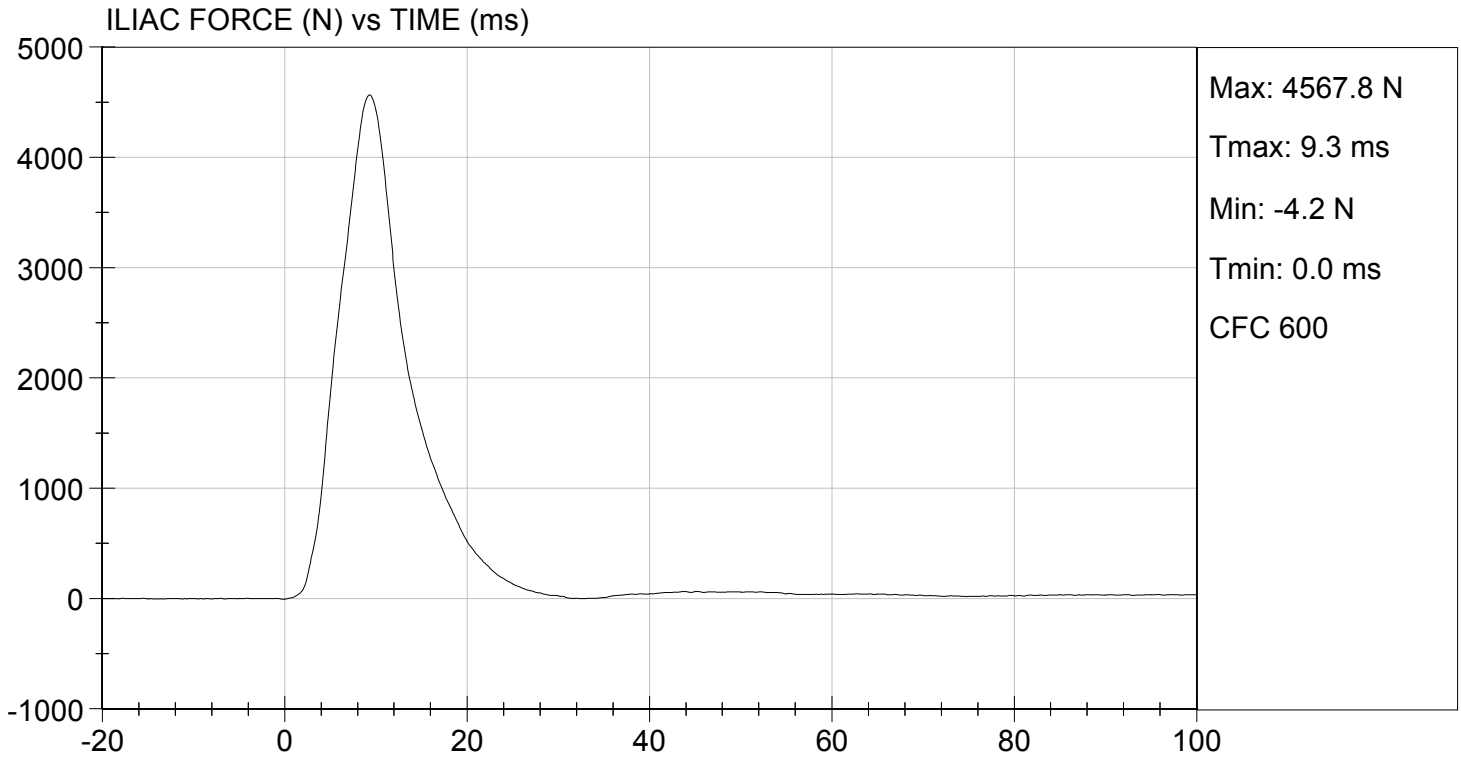


PELVIS Y ACCELERATION (G's) vs TIME (ms)

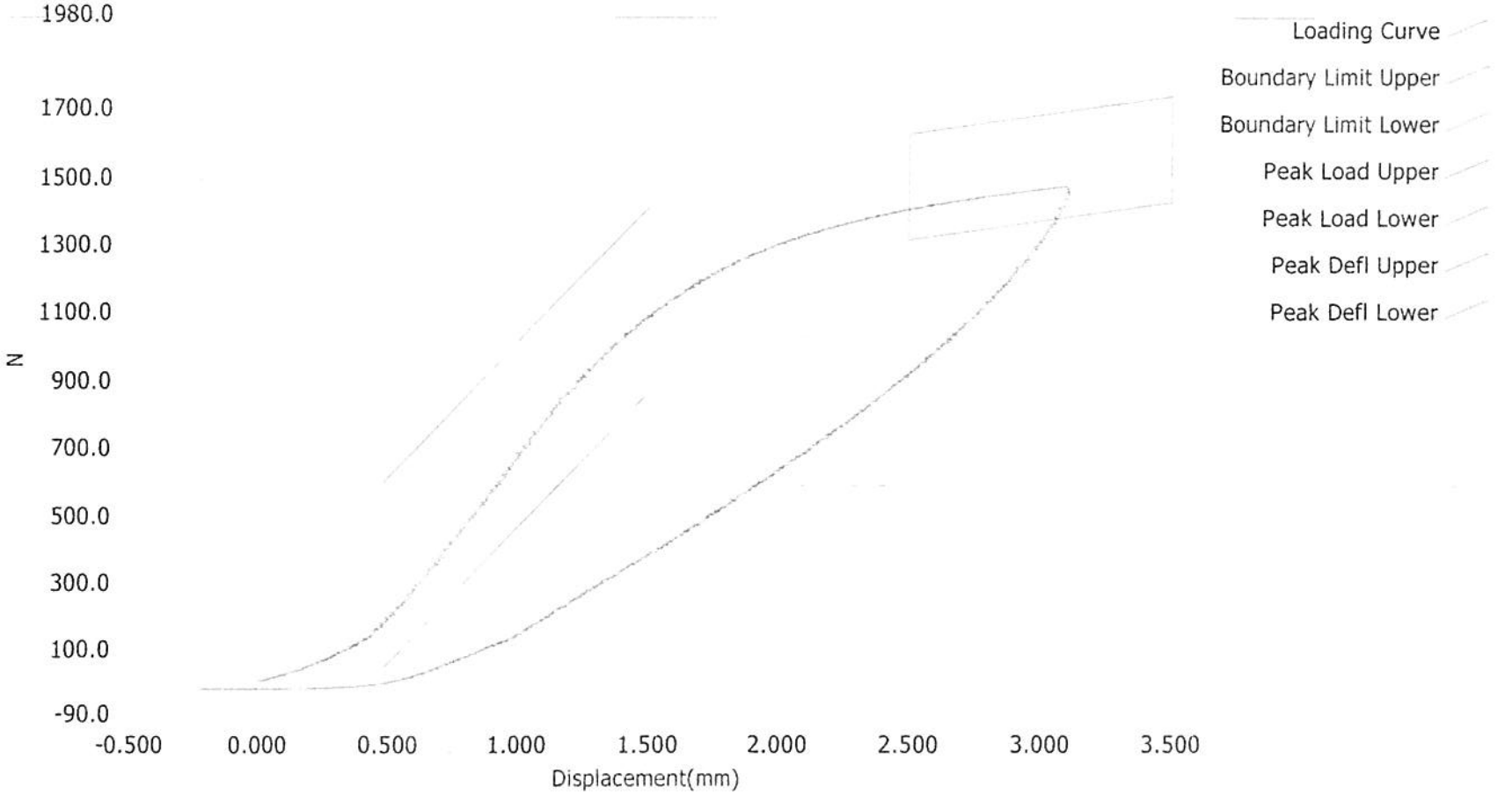


TEST DESC: ILLIAC
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 01/10/2013
TEST #: D13058



Resultant Data - SIDIIs Plug Compression

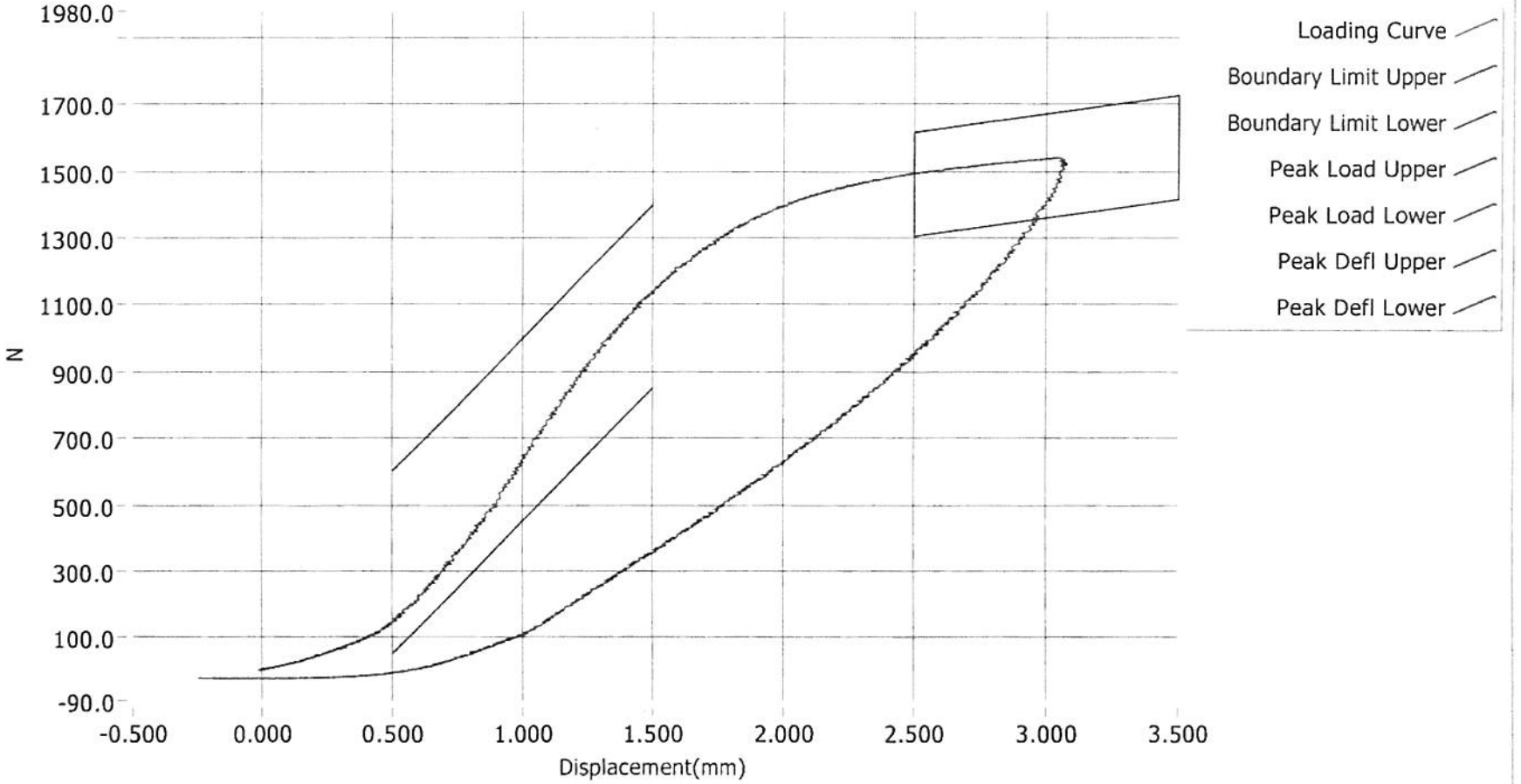


ATD Calibration Lab

Test ID	Part Serial Number	Test Date	Test Time
	47922	10/31/2011	8:46 PM
Cert ID	ATD Serial Number	ATD Type	
	N/A	SIDIIs	

Current Date : 10/31/2011 Current Time : 20:46:47

Resultant Data - SIDIIs Plug Compression



ATD Calibration Lab

Test ID	Part Serial Number	Test Date	Test Time
	48922	12/5/2011	9:05 PM
Cert ID	ATD Serial Number	ATD Type	
	N/A	SIDIIs	

Current Date : 12/5/2011 Current Time : 21:06:35

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 CG Accelerometers		X	P72799	Endevco	09/28/12
		Y	P72800	Endevco	09/28/12
		Z	P72801	Endevco	09/28/12
		Xr	P72802	Endevco	09/28/12
		Yr	P72803	Endevco	09/28/12
		Zr	P72804	Endevco	09/28/12
Thorax Rib Displacement Potentiometers	Upper	Y	G176	Honeywell	10/19/12
	Middle	Y	G169	Honeywell	10/19/12
	Lower	Y	G164	Honeywell	10/19/12
Abdomen Load Cells	Forward	Y	ABG1513	Denton	04/12/12
	Middle	Y	ABG1531	Denton	04/12/12
	Rear	Y	ABG1536	Denton	04/12/12
Lower Spine Accelerometers (T12)		X	P77693	Endevco	10/12/12
		Y	P77714	Endevco	10/12/12
		Z	P77736	Endevco	10/12/12
Public Symphysis Load Cell		Y	PG462	Denton	04/12/12

Table 2 – Dummy Instrumentation (SID-IIs)

				SID-IIs S/N 306		
				Serial Number	Manufacturer	Calibration Date
Head CG Accelerometers			X	P78770	Endevco	11/12/12
			Y	P67771	Endevco	11/12/12
			Z	P78772	Endevco	11/12/12
			Xr	P78787	Endevco	11/12/12
			Yr	P78794	Endevco	11/12/12
			Zr	P78797	Endevco	11/12/12
Displacement Potentiometers	Thoracic Rib	Upper	Y	G1187	Servo	11/19/12
		Middle	Y	G1261	FTSS	11/19/12
		Lower	Y	G1270	FTSS	11/19/12
	Abdominal Rib	Upper	Y	G1287	FTSS	11/19/12
		Lower	Y	G1304	FTSS	11/19/12
Lower Spine Accelerometers (T12)			X	P78801	Endevco	11/12/12
			Y	P78802	Endevco	11/12/12
			Z	P78803	Endevco	11/12/12
Acetabulum Load Cell			Y	ACG111	FTSS	05/09/12
Iliac Wing Load Cell			Y	IWG226	FTSS	05/14/12
Pelvis Plug (struck side)				47725	FTSS	10/28/11
Pelvis Plug (non-struck side)				47797	FTSS	10/28/11

Table 3 – Vehicle Instrumentation

			Serial Number	Manufacturer	Calibration Date
1	Vehicle Center of Gravity	X	P66678	Endevco	12/27/12
	Vehicle Center of Gravity	Y	P66679	Endevco	12/27/12
	Vehicle Center of Gravity	Z	P66680	Endevco	12/27/12
2	Right Sill at Front Seat	X	P66758	Endevco	12/27/12
	Right Sill at Front Seat	Y	P66757	Endevco	12/27/12
	Right Sill at Front Seat	Z	P66756	Endevco	12/27/12
3	Right Sill at Rear Seat	X	P59659	Endevco	12/27/12
	Right Sill at Rear Seat	Y	P59658	Endevco	12/27/12
	Right Sill at Rear Seat	Z	P59657	Endevco	12/27/12
4	Left Sill at Front Door	Y	P78974	Endevco	12/03/12
5	Left Sill at Rear Door	Y	P59290	Endevco	10/08/12
6	Left A-Post Lower	Y	P66522	Endevco	08/02/12
7	Left A-Post Middle	Y	P66521	Endevco	08/02/12
8	Left B-Post Lower	Y	P63255	Endevco	10/18/12
9	Left B-Post Middle	Y	P63254	Endevco	10/18/12
10	Front Seat Track	Y	P67441	Endevco	10/30/12
11	Rear Seat Track or Structure	Y	P63503	Endevco	11/02/12
12	Right Rear Occ. Compartment	Y	P66656	Endevco	12/26/12
13	Engine Block	X	P59298	Endevco	12/26/12
	Engine Block	Y	P59299	Endevco	12/26/12
14	Rear Floorpan Above Axle	X	P73975	Endevco	08/01/12
	Rear Floorpan Above Axle	Y	P73976	Endevco	08/01/12
	Rear Floorpan Above Axle	Z	P73977	Endevco	08/01/12

Table 4 – MDB Instrumentation

		Serial Number	Manufacturer	Calibration Date
MDB Center of Gravity	X	P77672	Endevco	07/30/12
MDB Center of Gravity	Y	P77673	Endevco	07/30/12
MDB Center of Gravity	Z	P77674	Endevco	07/30/12
Left Frame at Rear Axle Centerline	X	P78910	Endevco	11/02/12
Left Frame at Rear Axle Centerline	Y	P78911	Endevco	11/02/12