

REPORT NUMBER: SINCAP-MGA-2015-033

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

**TOYOTA MOTOR MANUFACTURING, INDIANA, INC.
2015 Toyota Sienna L Minivan
NHTSA No.: O20155105**

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



Test Date: November 19, 2014

Final Report Date: January 9, 2015

FINAL REPORT

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

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Approved by: 
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Approval Date: January 9, 2015

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-2015-033																																																					
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15. Supplementary Notes																																																							
16. Abstract A 55/28 km/h 90° Moving Deformable Barrier NCAP Side Impact Test was conducted on the 2015 Toyota Sienna L Minivan 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 November 19, 2014. The impact velocity of the Moving Deformable Barrier (MDB) was 62.0 km/h, and the ambient temperature at the struck (driver's) side of the target vehicle at the time of impact was 21.7° C. The target vehicle post-test maximum crush was 231 mm at level 3. The test vehicle's performance was as follows: <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th></th> <th colspan="3">Driver ATD (ES-2re)</th> </tr> <tr> <th>Measurement Description</th> <th>Units</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td>N/A</td> <td>1000</td> <td>49</td> </tr> <tr> <td>Maximum Thorax Rib Deflection</td> <td>mm</td> <td>44</td> <td>14</td> </tr> <tr> <td>Total Abdominal Force</td> <td>N</td> <td>2500</td> <td>641</td> </tr> <tr> <td>Pubic Symphysis Force</td> <td>N</td> <td>6000</td> <td>1738</td> </tr> </tbody> </table> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th></th> <th colspan="3">Passenger ATD (SID-IIs)</th> </tr> <tr> <th>Measurement Description</th> <th>Units</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td>N/A</td> <td>1000</td> <td>143</td> </tr> <tr> <td>Resultant Lower Spine Acceleration</td> <td>Gs</td> <td>82</td> <td>52</td> </tr> <tr> <td>Total Pelvic Force (sum of acetabular and iliac forces)</td> <td>N</td> <td>5525</td> <td>3320</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td>mm</td> <td>38*</td> <td>13</td> </tr> <tr> <td>Maximum Abdomen Rib Deflection</td> <td>mm</td> <td>45*</td> <td>3</td> </tr> </tbody> </table> *Proposed IARV 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.					Driver ATD (ES-2re)			Measurement Description	Units	Threshold	Result	Head Injury Criteria (HIC ₃₆)	N/A	1000	49	Maximum Thorax Rib Deflection	mm	44	14	Total Abdominal Force	N	2500	641	Pubic Symphysis Force	N	6000	1738		Passenger ATD (SID-IIs)			Measurement Description	Units	Threshold	Result	Head Injury Criteria (HIC ₃₆)	N/A	1000	143	Resultant Lower Spine Acceleration	Gs	82	52	Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	3320	Maximum Thoracic Rib Deflection	mm	38*	13	Maximum Abdomen Rib Deflection	mm	45*	3
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SECTION 1

TEST PURPOSE AND PROCEDURE

This moving deformable barrier side impact test is part of the MY 2015 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 2015 Toyota Sienna L Minivan. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Side NCAP Laboratory Test Procedure dated September 2013.

SECTION 2 SUMMARY OF TEST RESULTS

A 2015 Toyota Sienna L Minivan 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 62.0 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 November 19, 2014. Pre-test 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 2013. 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	49
Maximum Thorax Rib Deflection	mm	44	14
Total Abdominal Force	N	2500	641
Pubic Symphysis Force	N	6000	1738

	Passenger ATD (SID-IIs)		
Measurement Description	Units	Threshold	Result
Head Injury Criteria (HIC ₃₆)	N/A	1000	143
Resultant Lower Spine Acceleration	Gs	82	52
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	3320
Maximum Thoracic Rib Deflection	mm	38*	13
Maximum Abdomen Rib Deflection	mm	45*	3

*Proposed IARV

Supplemental restraint information is given below:

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

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

GENERAL COMMENTS

None

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: 2015 Toyota Sienna L Minivan
Test Program: NCAP Side MDB Impact Test

NHTSA No. O20155105
Test Date: 11/19/2014

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	O20155105	Traction Control System (TCS)	Yes
Model Year	2015	Auto-Leveling System	No
Make	Toyota	Automatic Door Locks (ADL)	Yes
Model	Sienna	Power Window Auto-Reverse	Yes
Body Style	Minivan	Other Optional Feature	N/A
VIN	5TDZK3DC5FS533796	Driver Front Airbag	Yes
Body Color	Sky Blue Pearl	Driver Curtain Airbag	Yes
Odometer Reading (km/mi)	156 / 97	Driver Head/Torso Airbag	No
Engine Displacement (L)	3.5	Driver Torso Airbag	No
Type/No. Cylinders	6	Driver Torso/Pelvis Airbag	Yes
Engine Placement	Lateral	Driver Pelvis Airbag	No
Transmission Type	Automatic	Driver Knee Airbag	Yes
Transmission Speeds	6	Rear Pass. Curtain Airbag	Yes
Overdrive	Yes	Rear Pass. Head/Torso Airbag	No
Final Drive	Front	Rear Pass. Torso Airbag	No
Roof Rack	No	Rear Pass. Torso/Pelvis Airbag	No
Sunroof/T-Top	No	Rear Pass. Pelvis Airbag	No
Running Boards	No	Driver Seat Belt Pretensioner	Yes
Tilt Steering Wheel	Yes	Rear Pass. Seat Belt Pretensioner	No
Power Seats	No	Driver Load Limiter	Yes
Anti-Lock Brakes (ABS)	Yes	Rear Pass. Load Limiter	No
		Other Restraint Feature	N/A

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

DATA FROM CERTIFICATION LABEL

Manufactured By	Toyota Motor Manufacturing, Indiana, Inc.	GVWR (kg)	2715
Date of Manufacture	09/14	GAWR Front (kg)	1405
Vehicle Type	MPV	GAWR Rear (kg)	1405

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity (DSC)	2	2	3	7	
Capacity Weight (VCW) (kg)				619	(A)
DSC x 68.04 kg				476	(B)
Rated Cargo and Luggage Weight (RCLW)				143	(A-B)

VEHICLE SEAT TYPE

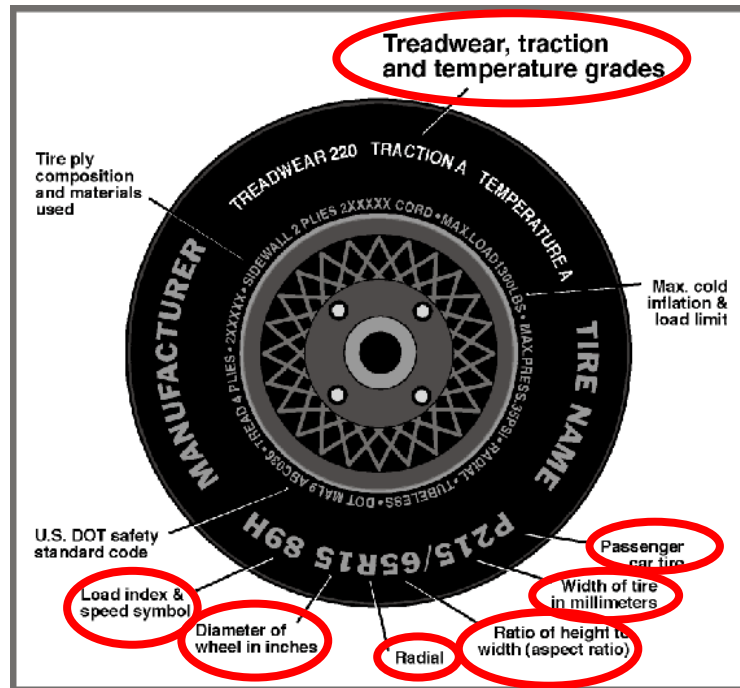
Seating Location	Type of Seat Pan				Type of Seat Back		
	Bucket	Bench	Split Bench	Contoured	Fixed	Adjustable	
						Manual	Power
Front Seat	X					w/lever	
Rear or Second Row	X					w/lever	
Third Row Seat			X			w/strap	

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

Test Vehicle: 2015 Toyota Sienna L Minivan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. O20155105
 Test Date: 11/19/2014

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	240	240
Recommended Tire Size	P235/60R17	P235/60R17
Tire Size on Vehicle	P235/60R17	P235/60R17
Tire Manufacturer	Michelin	Michelin
Tire Model	Primacy MXV4	Primacy MXV4
Treadwear	500	500
Traction	A	A
Temperature Grade	A	A
Tire Plies Sidewall	1 Polyester	1 Polyester
Tire Plies Body	1 Polyester, 1 Polyamide, 2 Steel	1 Polyester, 1 Polyamide, 2 Steel
Load Index/Speed Symbol	100T	100T
Tire Material	Rubber	Rubber
DOT Safety Code Left	B91H 7R6X 3214	B91H 7R6X 3214
DOT Safety Code Right	B91H 7R6X 3214	B91H 7R6X 3214

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

Test Vehicle: 2015 Toyota Sienna L Minivan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. O20155105
 Test Date: 11/19/2014

TEST PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	248	248	255	252
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 Pressure	200 ± 21	kPa	200	200	200	200

TEST VEHICLE AXLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	584.0	429.5		630.0	563.5		620.0	560.5	
Right	kg	558.5	410.0		550.0	496.5		551.5	515.0	
Ratio	%	57.6	42.4		52.7	47.3		52.1	47.9	
Totals	kg	1142.5	839.5	1982.0	1180.0	1060.0	2240.0	1171.5	1075.5	2247.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1982.0	(A)
Sum of Actual Weight of 2 P572 ATDs Used	kg	129.3	(B)
Rated Cargo/Luggage Weight (RCLW)	kg	136	(C)
Calculated Test Vehicle Target Weight (TVTW)	kg	2247.3	(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	751	748	Yes
Right Front	mm	760	765	Yes
Right Rear	mm	755	760	Yes
Left Rear	mm	739	746	Yes
Vehicle CG (Aft of Front Axle)	mm	1451	1435	
Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline)	mm	43	55	

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

Test height adjustable suspension setting, if applicable:	Not Applicable
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DATA SHEET NO. 1 (CONTINUED)
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2015 Toyota Sienna L Minivan
Test Program: NCAP Side MDB Impact Test

NHTSA No. O20155105
Test Date: 11/19/2014

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Weight of Ballast, if any	92.1
Cargo area carpet, rear floormats, jack & tools, right side mirror, right taillight, engine cover.	14.5

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

Test Vehicle: 2015 Toyota Sienna L Minivan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. O20155105
 Test Date: 11/19/2014

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	16.2	8.8	12.5
Front Passenger Seat	Fixed	Fixed	Fixed
Front Center Seat			
Struck Side Rear Seat	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed
Rear Center Seat			

SEAT HEIGHT AND ANGLE

Seat	As Tested SCRL Angle (Mid) (°)	As Tested SCR Height (mm)	SCR Height Position	SCR Height (mm)		
				Rear- most	Mid- Fore/Aft	Forward- Most
Driver Seat	12.5	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
Front Passenger Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
Front Center Seat			Max			
			Mid			
			Min			
Struck Side Rear Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
Rear Center Seat			Max			
			Mid			
			Min			

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

Test Vehicle: 2015 Toyota Sienna L Minivan
 Test Program: NCAP Side MDB Impact Test

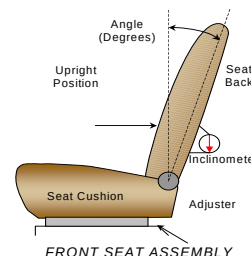
NHTSA No. O20155105
 Test Date: 11/19/2014

SEAT FORE/AFT POSITIONS

Seat	Total Fore/Aft Travel		Test Position from Forward-most Position	
	mm	Detents	mm	Detent
Driver Seat	240	25 (1 st as 1)	120	12 th (1 st as 0)
Front Passenger Seat	240	25 (1 st as 1)	120	12 th (1 st as 0)
Front Center Seat				
Struck Side Rear Seat	368	24 (1 st as 1)	368	23 (1 st as 0)
Non-Struck Side	368	24 (1 st as 1)	368	23 (1 st as 0)
Rear Center Seat				

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 2013. 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	50.1	26 (1 st as 1)	2.2	4 th (1 st as 0)
Front Passenger Seat	50.3	26 (1 st as 1)	2.7	5 th (1 st as 0)
Front Center Seat				
Struck Side Rear Seat	26.1	15 (1 st as 1)	-7.2	0 th (1 st as 0)
Non-Struck Side Rear Seat	25.7	15 (1 st as 1)	-6.9	0 th (1 st as 0)
Rear Center Seat				

Seat back angles measured on headrest post.

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

Test Vehicle: 2015 Toyota Sienna L Minivan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. O20155105
 Test Date: 11/19/2014

SEAT BELT ANCHORAGE ADJUSTMENT

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

	Total # of Positions	Placed in Position #
Driver Seat	4 detents (1 st as 1)	0 th (uppermost as 0)
Rear Seat	4 detents (1 st as 1)	3 rd (uppermost as 0)

HEAD RESTRAINT ADJUSTMENT

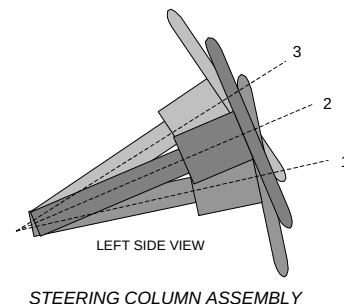
The driver's head restraint is adjusted to the highest and most full forward in-use position. The struck-side rear passenger's head restraint is adjusted to the lowest and most full forward in-use position.

	Total # of Positions	Placed in Position #
Driver Seat	4	Highest
Rear Seat	3	Lowest

STEERING COLUMN ADJUSTMENT

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

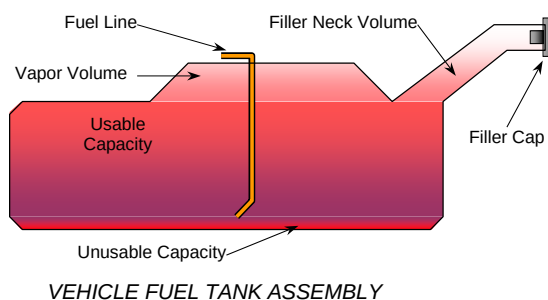
	Degrees	Fore/Aft Position (mm)
Lowermost, Position 1	67.2	216
Geometric Center, Position 2	65.0	196
Uppermost, Position 3	62.8	176
Telescoping Steering Wheel Travel		40
Test Position	65.0	196



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. Any time the key is turned to the "ON" position the pump will run for a couple seconds. The fuel pipe is on the left side.



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

Test Vehicle: 2015 Toyota Sienna L Minivan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. O20155105
 Test Date: 11/19/2014

FUEL TANK CAPACITY DATA

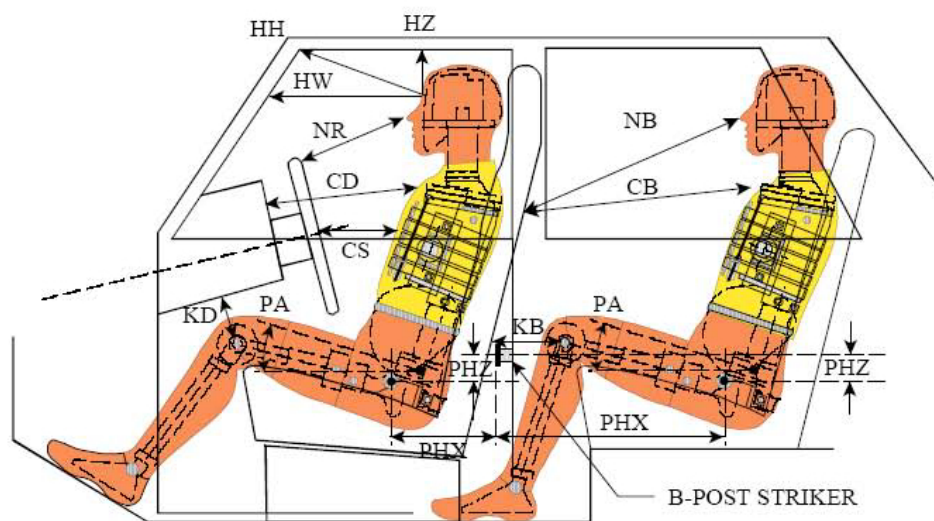
	Liters
Usable Capacity of "Standard" Tank (see Form No. 1)	79.1
Usable Capacity of "Optional" Tank (see Form No. 1)	
Usable Capacity of Standard Tank as Specified in Owner's Manual	79.0
Usable Capacity of Optional Tank as Specified in Owner's Manual	
93% of Usable Capacity	73.6
Actual Amount of Solvent Used	73.4
1/3 of Usable Capacity	26.4

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

DATA SHEET NO. 3 DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2015 Toyota Sienna L Minivan
Test Program: NCAP Side MDB Impact Test

NHTSA No. O20155105
Test Date: 11/19/2014



LEFT SIDE VIEW

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

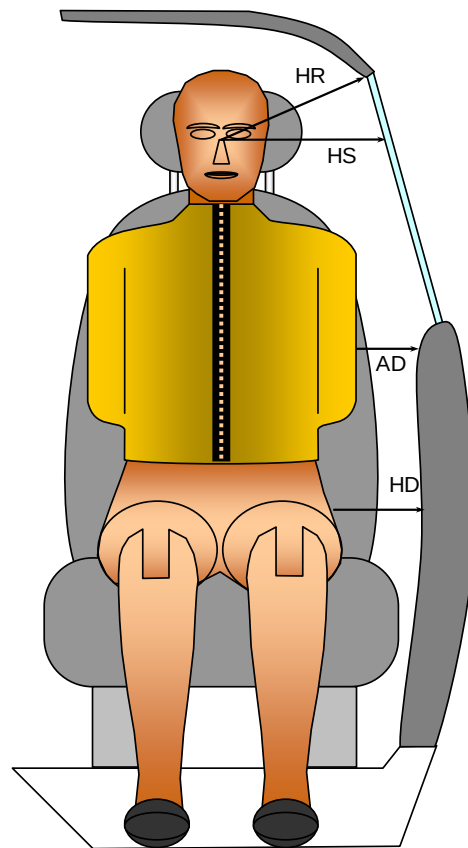
DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Pass. Code	Measurement Description	Driver		Passenger	
			Length (mm)	Angle(°)	Length (mm)	Angle(°)
HH		Head to Header	434	13.1		
HW		Head to Windshield	651			
HZ	HZ	Head to Roof Liner	187		290	
NR	NB	Nose to Rim/Seat Back	470	15.6	714	13.1
CD	CB	Chest to Dashboard/Seat Back	573	5.8	723	0.8
CS		Chest to Steering Wheel	389	10.3		
KDL	KBL	Left Knee to Dash/Seat Back	182	15.0	493	20.8
KDR	KBR	Right Knee to Dash/Seat Back	199	24.1	502	20.4
PAX	PAX	Pelvic Tilt Angle X		16.9		21.2
	PAY	Pelvic Tilt Angle Y		0.0		0.5
PHX	PHX	Hip Point to Striker (X-Axis)	230		280	
PHZ	PHZ	Hip Point to Striker (Z-Axis)	136		198	

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2015 Toyota Sienna L Minivan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. O20155105
 Test Date: 11/19/2014



FRONT VIEW OF DUMMY

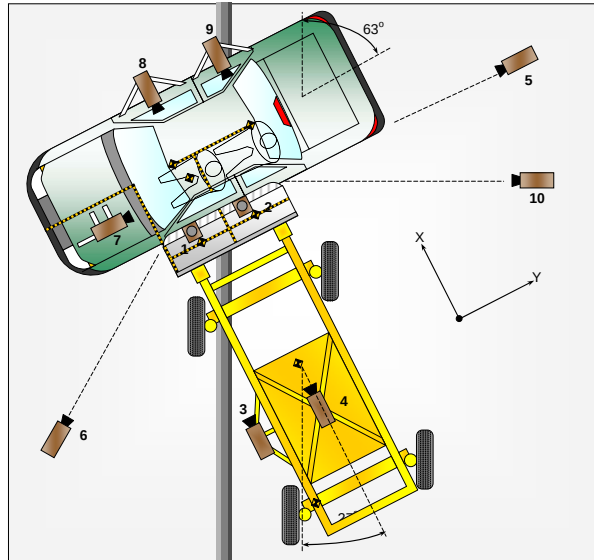
DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver	Passenger
HR	Head to Side Header	mm	215	263
HS	Head to Side Window	mm	327	376
AD	Arm to Door	mm	115	175
HD	Hip Point to Door	mm	136	235

DATA SHEET NO. 5
CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2015 Toyota Sienna L Minivan
Test Program: NCAP Side MDB Impact Test

NHTSA No. O20155105
Test Date: 11/19/2014



CAMERA LOCATIONS AND DATA

No.	Camera View	Coordinates (mm)			Lens Length (mm)	Operating Frame Rate (fps)
		X*	Y*	Z*		
1	Overhead Overall	-110	180	-5050	14	1000
2	Overhead Close-Up	40	20	-5050	20	1000
3	Left Impact Point (MDB)				50	1000
4	Side Overall (MDB)				16	1000
5	Rear	30	5060	-1090	24	1000
6	Left Front	4200	-4320	-1070	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

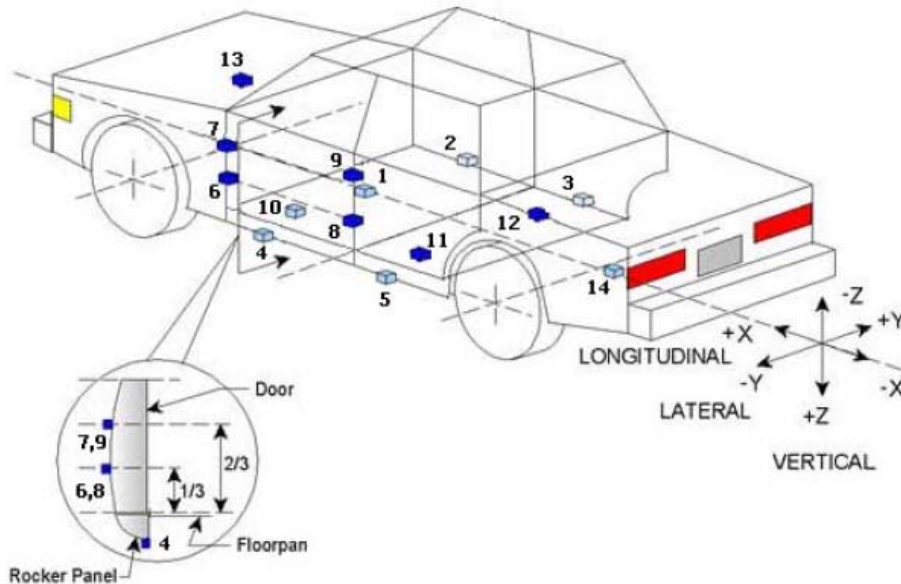
INSTRUMENTATION

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

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

Test Vehicle: 2015 Toyota Sienna L Minivan
Test Program: NCAP Side MDB Impact Test

NHTSA No. O20155105
Test Date: 11/19/2014



TEST VEHICLE ACCELEROMETER LOCATIONS

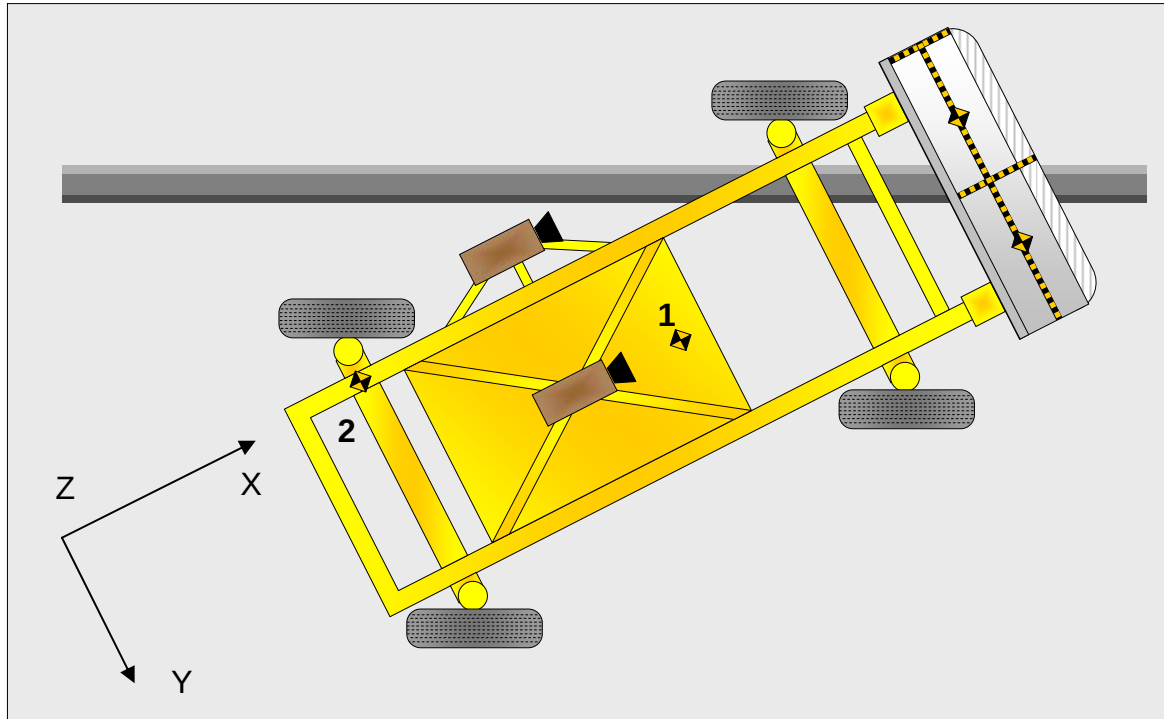
Accelerometer Location				
No.	ID	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2890	240	-387
2	Right Sill at Front Seat	2658	842	-240
3	Right Sill at Rear Seat	1664	842	-235
4	Left Sill at Front Door	3153	-842	-236
5	Left Sill at Rear Door	2113	-842	-240
6	Left Lower A-Post	3685	-907	-665
7	Left Middle A-Post	3710	-900	-863
8	Left Lower B-Post	2564	-809	-631
9	Left Middle B-Post	2579	-810	-833
10	Front Seat Track	2695	-410	-458
11	Rear Seat Structure	2185	-450	-457
12	Rt. Rear Occ. Compartment	2174	435	-456
13	Engine Block	4463	0	-826
14	Rear Above Axle	846	0	-289

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

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

Test Vehicle: 2015 Toyota Sienna L Minivan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. O20155105
 Test Date: 11/19/2014



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: 2015 Toyota Sienna L Minivan
Test Program: NCAP Side MDB Impact Test

NHTSA No. O20155105
Test Date: 11/19/2014

TEST DUMMY INFORMATION AND CONTACT POINTS

Description	Front Seat Dummy (ES-2re)	Rear Seat Dummy (SID-IIs)
Face	Curtain Airbag	Curtain Airbag, Headrest
Top of Head	Curtain Airbag	Curtain Airbag, Headrest
Left Side of Head	Curtain Airbag	Curtain Airbag
Back of Head	Curtain Airbag, Headrest	Headrest
Left Shoulder	Curtain Airbag	Curtain Airbag, Door Panel
Upper Torso	Side Airbag	None
Lower Torso	Side Airbag, Seatback	Seatback, Door Panel
Left Hip	Side Airbag, Seatpan	Door Panel, Seatpan
Left Knee	Door Panel	Door Panel

POST-TEST DOOR PERFORMANCE

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

POST-TEST SEAT PERFORMANCE

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

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	No Separation
Sill Separation	None
Windshield Damage	None
Side Window Damage	Third Row Window Broken
Other Notable Effects	None

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

Test Vehicle: 2015 Toyota Sienna L Minivan
Test Program: NCAP Side MDB Impact Test

NHTSA No. O20155105
Test Date: 11/19/2014

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/Pelvis Airbag	Yes	Yes	No	
Seat Belt Pretensioner	Yes	Yes	No	
Seat Belt Load Limiter	Yes		No	
Other				

IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vehicle Wheel Base	mm		3032
Vertical Impact Reference Line (Aft of Front Axle) (Intended Impact Point)	mm		508
Actual Impact Point (Aft of Front Axle)	mm		534
Horizontal Offset (+forward / -rearward)	mm	+/- 50 of intended impact point	-26
Vertical Offset (+down / -up)	mm	+/- 20 of intended impact point	-4

DATA SHEET NO. 9
MDB SUMMARY OF RESULTS

Test Vehicle: 2015 Toyota Sienna L Minivan
Test Program: NCAP Side MDB Impact Test

NHTSA No. O20155105
Test Date: 11/19/2014

MDB SPECIFICATIONS

Measurement Description	Length (mm)
Overall Width of Framework Carriage	1251
Overall Length Including Honeycomb Face	4115
Wheelbase of Framework Carriage	2595
CG Location aft of Front Axle	1134

MDB WEIGHTS

	Units	Front Axle	Rear Axle	Total
Left	kg	390.0	300.1	
Right	kg	376.8	294.7	
Ratio	%	56.3	43.7	
Totals	kg	766.8	594.8	1361.6

SPEED AND ANGLE AT IMPACT DATA

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	62.0
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	62.0
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	89.9
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	26.8

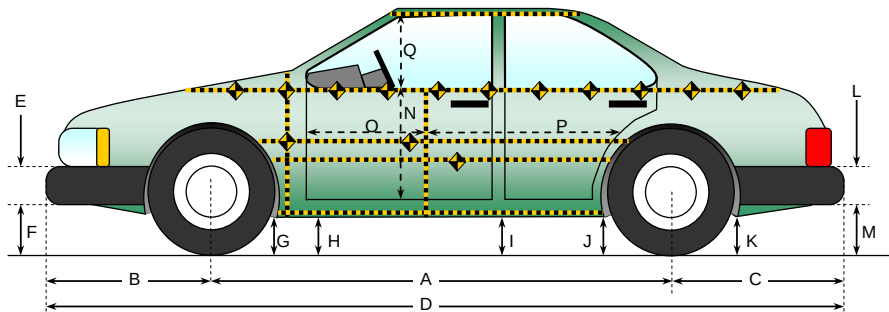
MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE

Vertical Location			From Centerline		Maximum Crush
Row	Description	Height	Distance	Direction	
A	Center of Bumper	432	100	Right	253
B	Top of Bumper	533	800	Left	142
C	Mid-Level	686	800	Left	125
D	Top of Stack	813	800	Left	149

DATA SHEET NO. 10
TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2015 Toyota Sienna L Minivan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. O20155105
 Test Date: 11/19/2014



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

LEFT SIDE VIEW

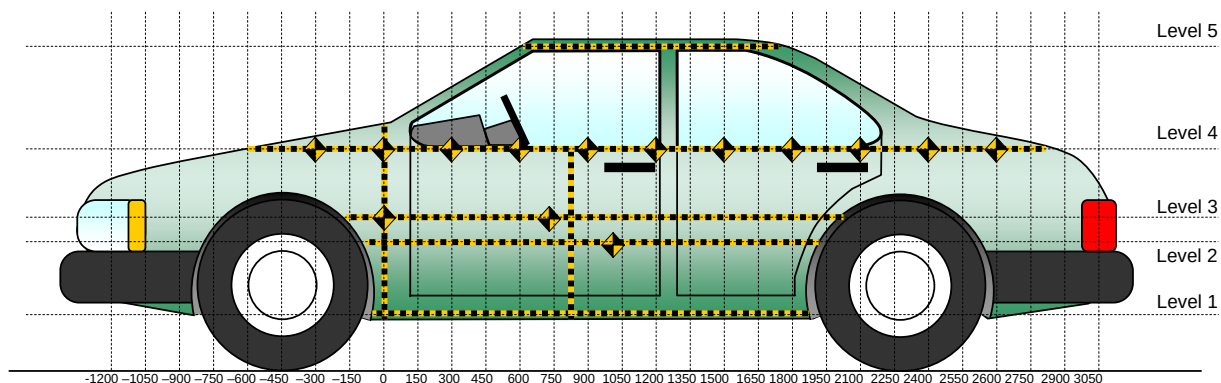
VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	3032	3025	7
B	Front Axle to FSOV	940	957	-17
C	Rear Axle to RSOV	1118	1108	10
D	Total Length at Centerline	5090	5090	0
E	Front Bumper Thickness	114	114	0
F	Front Bumper Bottom to Ground	227	218	9
G	Sill Height at Front Wheel Well	213	213	0
H	Sill Height at Front Door Leading Edge	215	212	3
I	Sill Height at B Pillar	221	223	-2
J1	Sill Height at Rear Wheel Well	208	214	-6
J2	Pinch Weld Height at Rear Wheel Well	212	212	0
K	Sill Height Aft of Rear Wheel Well	225	218	7
L	Rear Bumper Thickness	114	114	0
M	Rear Bumper Bottom to Ground	307	317	-10
N	Sill Height to Window Bottom Sill	850	739	111
O	Front Door Leading Edge to Impact CL	920	872	48
P	Rear Door Trailing Edge to Impact CL	1306	1226	80
Q	Front Window Opening	542	522	20
R	Right Side Length	4055	4055	0
S	Left Side Length	4055	4052	3
T	Vehicle Width at B Post	1985	1928	57

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

Test Vehicle: 2015 Toyota Sienna L Minivan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. O20155105
 Test Date: 11/19/2014



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	278	29	1050
2	Mid Door	669	212	750
3	Occupant Hip Point	747	231	1350
4	Window Sill	1056	122	1350
5	Window Top	1630	-4	750

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: 2015 Toyota Sienna L Minivan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. O20155105
 Test Date: 11/19/2014

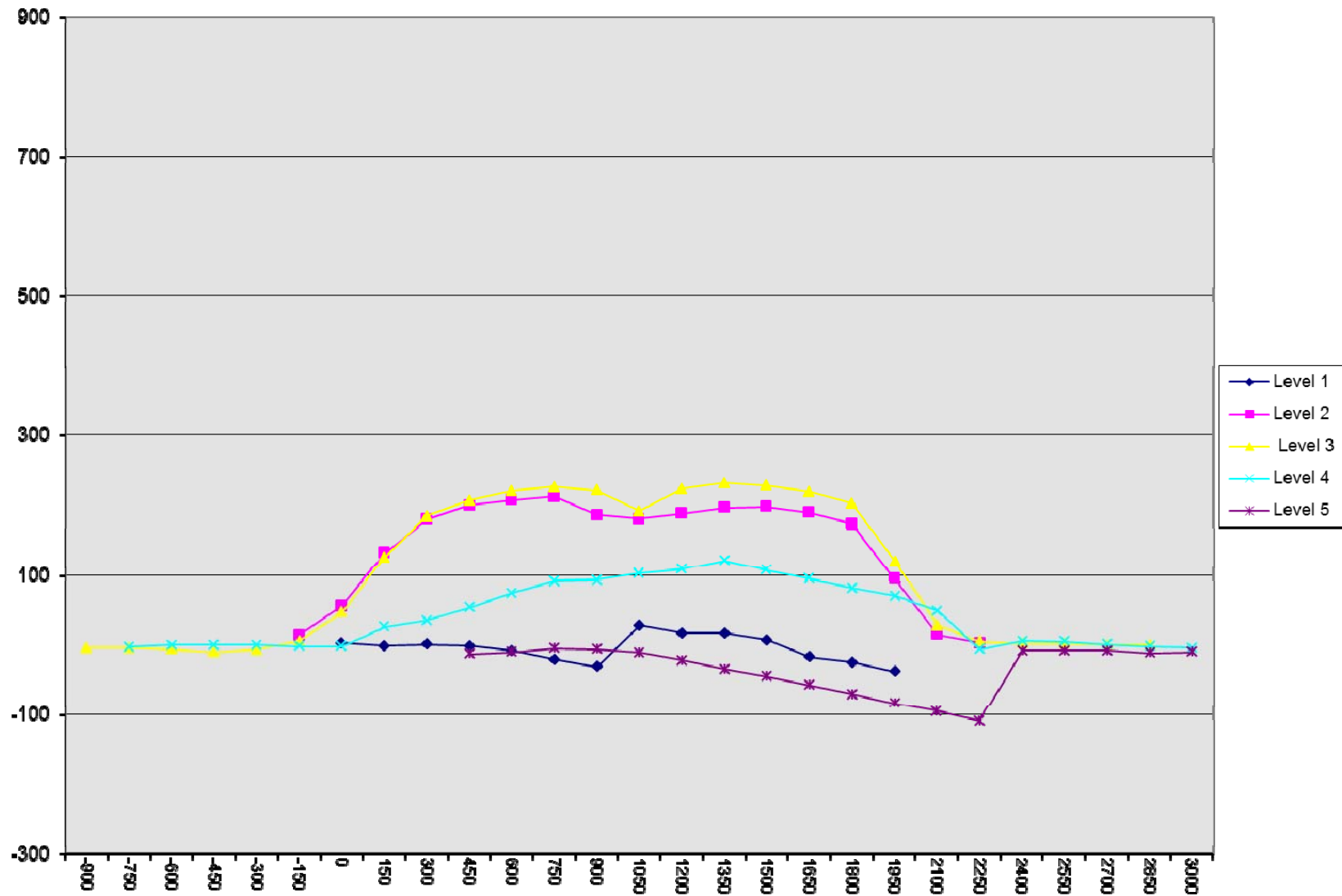
	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-900			143					140					-3		
-750			116	256				113	254				-3	-2	
-600			109	220				104	221				-5	1	
-450			109	195				100	196				-9	1	
-300			109	187				103	188				-6	1	
-150		110	118	185			125	125	184			15	7	-1	
0	143	120	119	184		147	177	167	183		4	57	48	-1	
150	155	118	118	179		155	251	245	206		0	133	127	27	
300	156	117	115	177		158	296	299	213		2	179	184	36	
450	155	115	114	172	454	155	314	320	227	442	0	199	206	55	-12
600	155	114	112	166	417	148	321	332	241	408	-7	207	220	75	-9
750	154	113	111	161	396	134	325	337	253	392	-20	212	226	92	-4
900	154	113	110	157	395	124	298	331	250	390	-30	185	221	93	-5
1050	154	113	110	154	390	183	293	301	257	380	29	180	191	103	-10
1200	153	113	110	151	387	171	300	333	260	366	18	187	223	109	-21
1350	153	114	110	146	387	171	310	341	268	353	18	196	231	122	-34
1500	153	115	111	144	386	161	312	339	252	342	8	197	228	108	-44
1650	154	116	112	142	389	138	305	331	237	332	-16	189	219	95	-57
1800	152	117	113	140	390	128	290	315	222	320	-24	173	202	82	-70
1950	140	118	115	139	374	103	213	236	210	311	-37	95	121	71	-83
2100		112	115	139	398		128	144	189	303		16	29	50	-95
2250		106	107	142	404		110	113	137	295		4	6	-5	-109
2400			106	145	408			109	152	401			3	7	-7
2550			106	149	414			109	155	407			3	6	-7
2700			111	152	423			112	154	416			1	2	-7
2850			124	158	435			125	157	424			1	-1	-11
3000				165	447				162	438				-3	-9

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: 2015 Toyota Sienna L Minivan
Test Program: NCAP Side MDB Impact Test

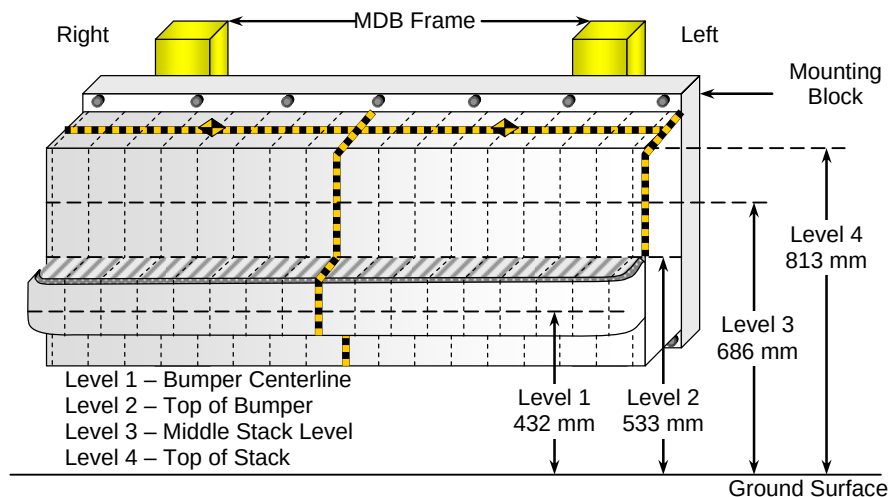
NHTSA No. O20155105
Test Date: 11/19/2014



DATA SHEET NO. 12
MDB EXTERIOR STATIC CRUSH MEASUREMENTS

Test Vehicle: 2015 Toyota Sienna L Minivan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. O20155105
 Test Date: 11/19/2014



FRONT VIEW

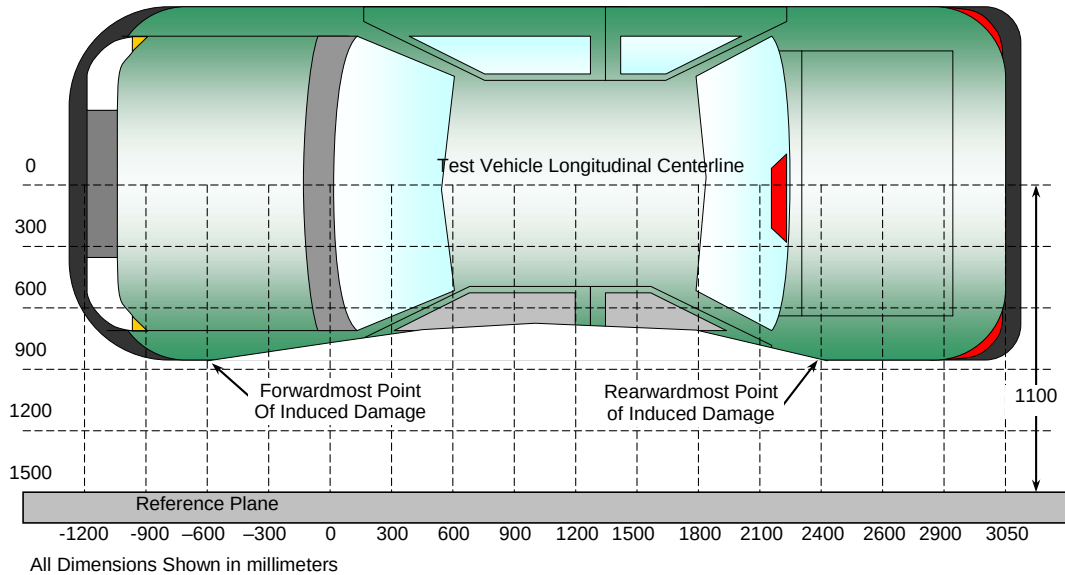
DEFORMABLE BARRIER STATIC CRUSH

Stack Level	Distance Right of Center (mm)								C _L	Distance Left of Center (mm)							
	800	700	600	500	400	300	200	100		100	200	300	400	500	600	700	800
4	105	99	55	37	43	58	67	85	113	99	88	78	85	96	103	118	149
3	109	87	50	47	55	61	81	101	99	78	62	55	57	63	75	90	125
2	122	101	106	109	110	113	115	118	129	131	130	134	134	136	139	140	142
1	236	237	239	241	240	244	248	253	251	245	241	247	241	245	245	251	248

DATA SHEET NO. 13
VEHICLE AND MDB DAMAGE PROFILE DISTANCES

Test Vehicle: 2015 Toyota Sienna L Minivan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. O20155105
 Test Date: 11/19/2014



TOP VIEW

VEHICLE DAMAGE PROFILE DISTANCES

DPD	Distance from Impact Point (mm)	Level	Pre-Test (mm)	Post-Test (mm)	Max. Static Crush (mm)
1	2200	3	107	115	8
2	1740	3	112	323	211
3	1280	3	110	339	229
4	820	3	110	337	227
5	360	3	115	311	196
6	-100	3	119	136	17

MDB DAMAGE PROFILE DISTANCES

DPD	Distance from Center of MDB	Level	Post-Test (mm)
1	800 mm right of center	1	236
2	480 mm right of center	1	241
3	160 mm right of center	1	250
4	160 mm left of center	1	243
5	480 mm left of center	1	244
6	800 mm left of center	1	248

DATA SHEET NO. 14
FMVSS NO. 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2015 Toyota Sienna L Minivan
 Test Program: NCAP Side MDB Impact Test

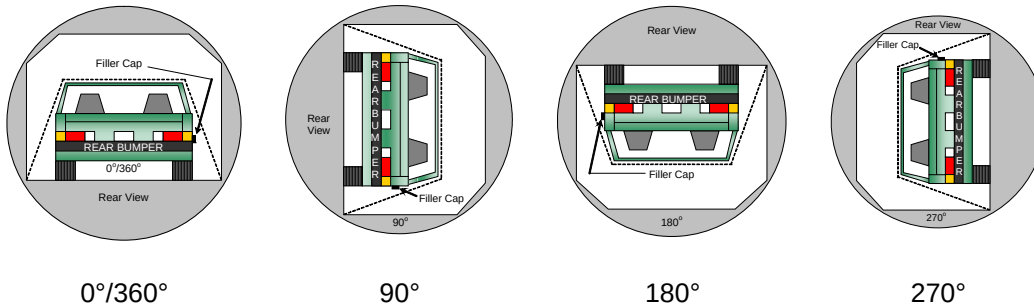
NHTSA No. O20155105
 Test Date: 11/19/2014

Test Time: 1:46 pm

Temperature: 21.7° C

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

FMVSS 301 STATIC ROLLOVER DATA



ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	109	300	409
90° to 180°	111	300	411
180° to 270°	107	300	407
270° to 360°	112	300	412

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

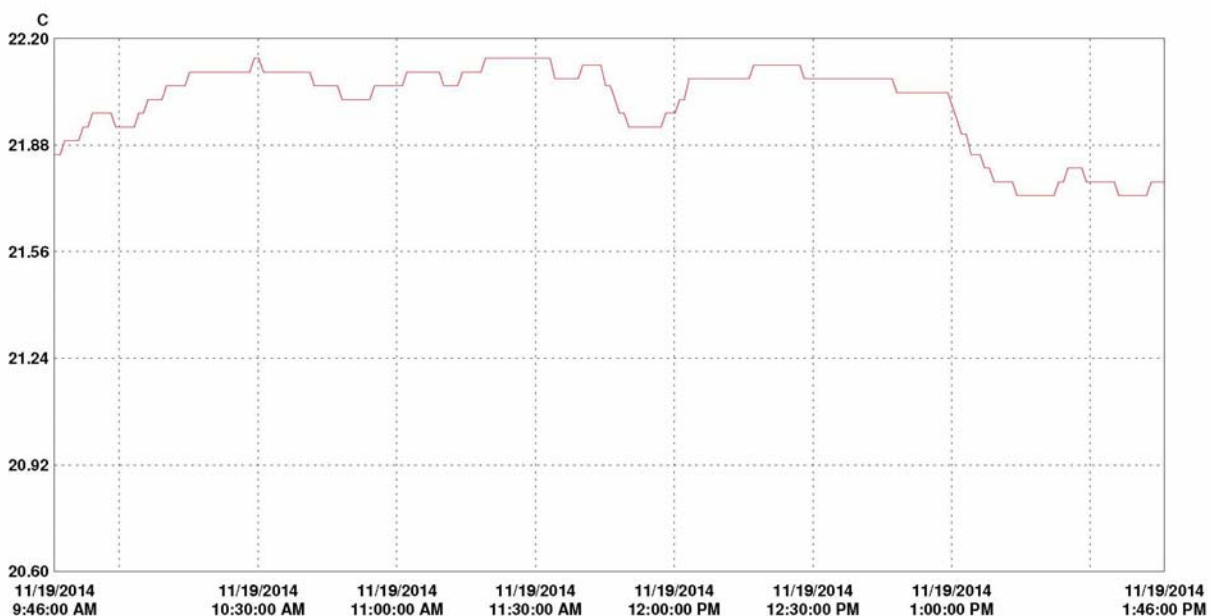
ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

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

DATA SHEET NO. 15 **DUMMY/VEHICLE TEMPERATURE STABILIZATION DATA**

Test Vehicle: 2015 Toyota Sienna L Minivan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. O20155105
 Test Date: 11/19/2014



LN	Serial #	Description	CH	Value	Maximum	Average	Minimum	Units	CH description	Logger file
1	04042132	MGA logger	1		22.14	22.01	21.73	C	Temperature	04042132_MGA_logger.spl
LN Logger file										
1	\\REPORTS\Office\Reports\Reports In Progress\NCAP\33 Optional SINCAP 2015 Toyota Sienna 11-19-14\04042132_MGA_logger.spl									

ID #	Security	Created
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ID # Security Created

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As Delivered Right Front Three-Quarter View of Test Vehicle



As Delivered Left Rear Three-Quarter View of Test Vehicle



Pre-Test Frontal View of Test Vehicle



Post-Test Frontal View of Test Vehicle



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



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



Pre-Test Left Side View of Test Vehicle



Post-Test Left Side View of Test Vehicle



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



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



Pre-Test Rear View of Test Vehicle



Post-Test Rear View of Test Vehicle



Pre-Test Right Side View of Test Vehicle



Post-Test Right Side View of Test Vehicle



Pre-Test Overhead View of Test Area



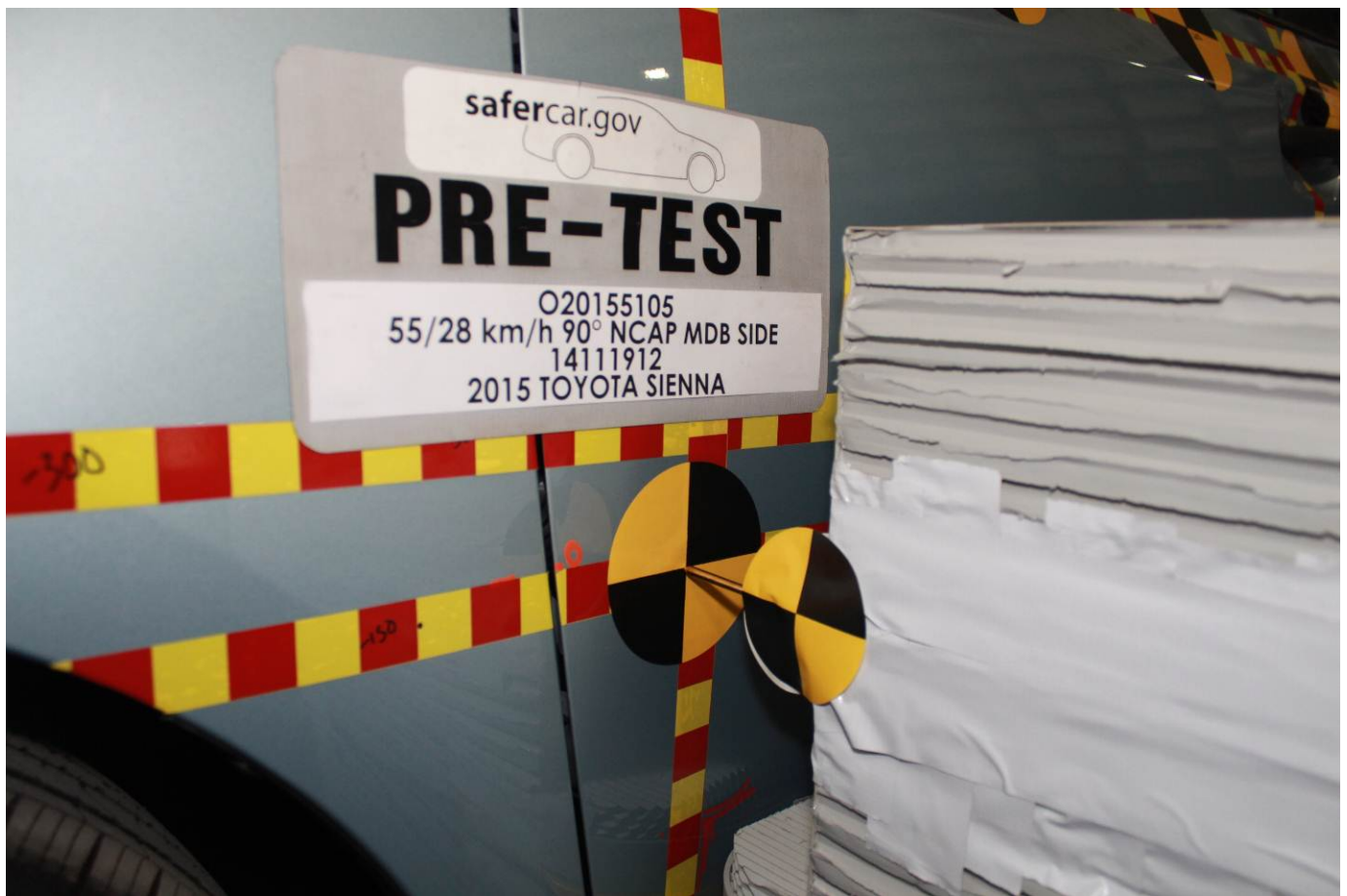
Post-Test Overhead View of Test Area



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



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



Pre-Test Close-Up View of Impact Point Target



Post-Test Close-Up View of Impact Point Target



Pre-Test Left Front Door Latch Close-Up



Post-Test Left Front Door Latch Close-Up



Pre-Test Left Rear Door Latch Close-Up



Post-Test Left Rear Door Latch Close-Up



Pre-Test Front Close-Up View of Driver Dummy



Post-Test Front Close-Up View of Driver Dummy



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



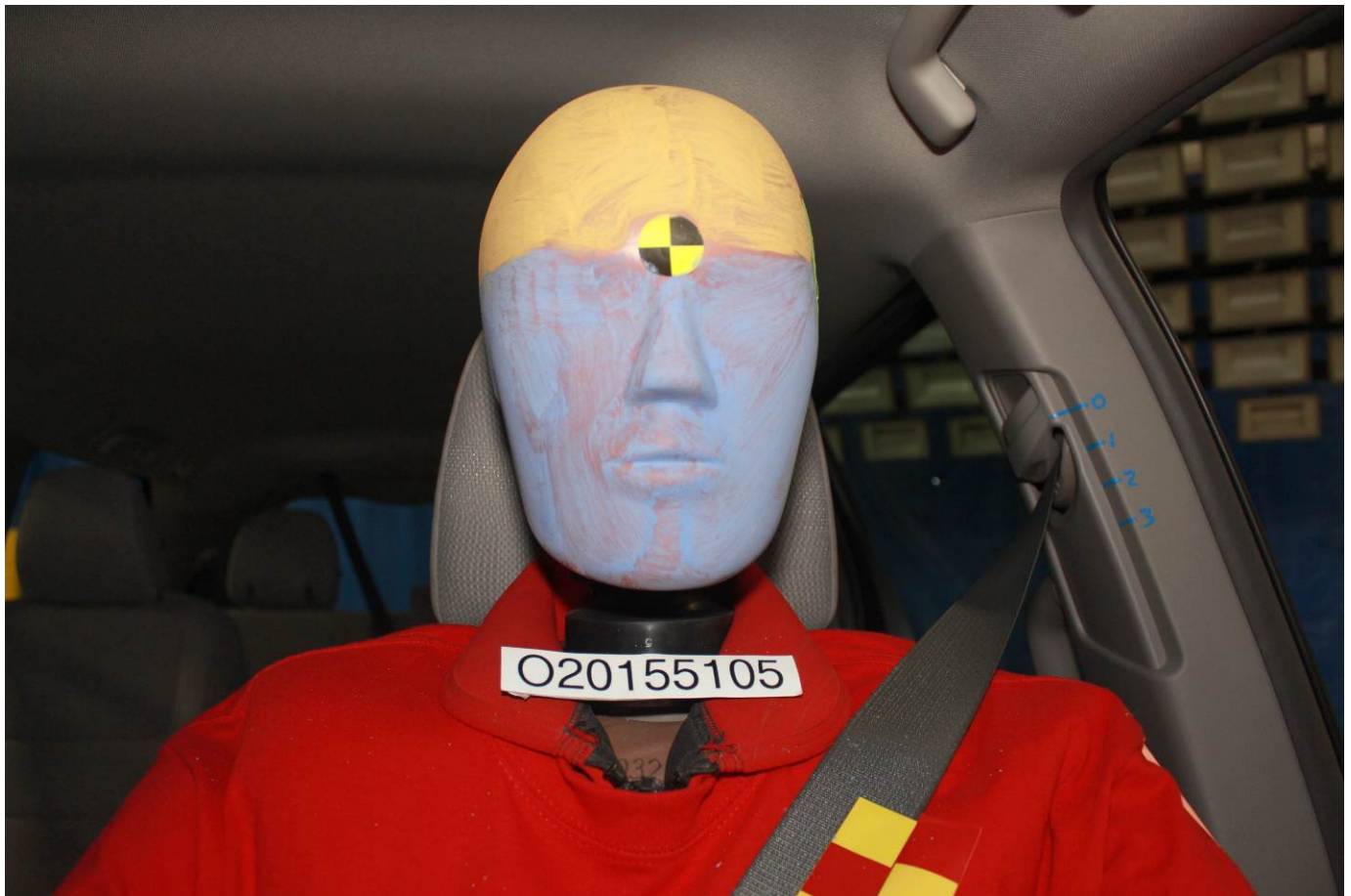
Pre-Test Left Side View of Driver Dummy Shoulder and Door Top View



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



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



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



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



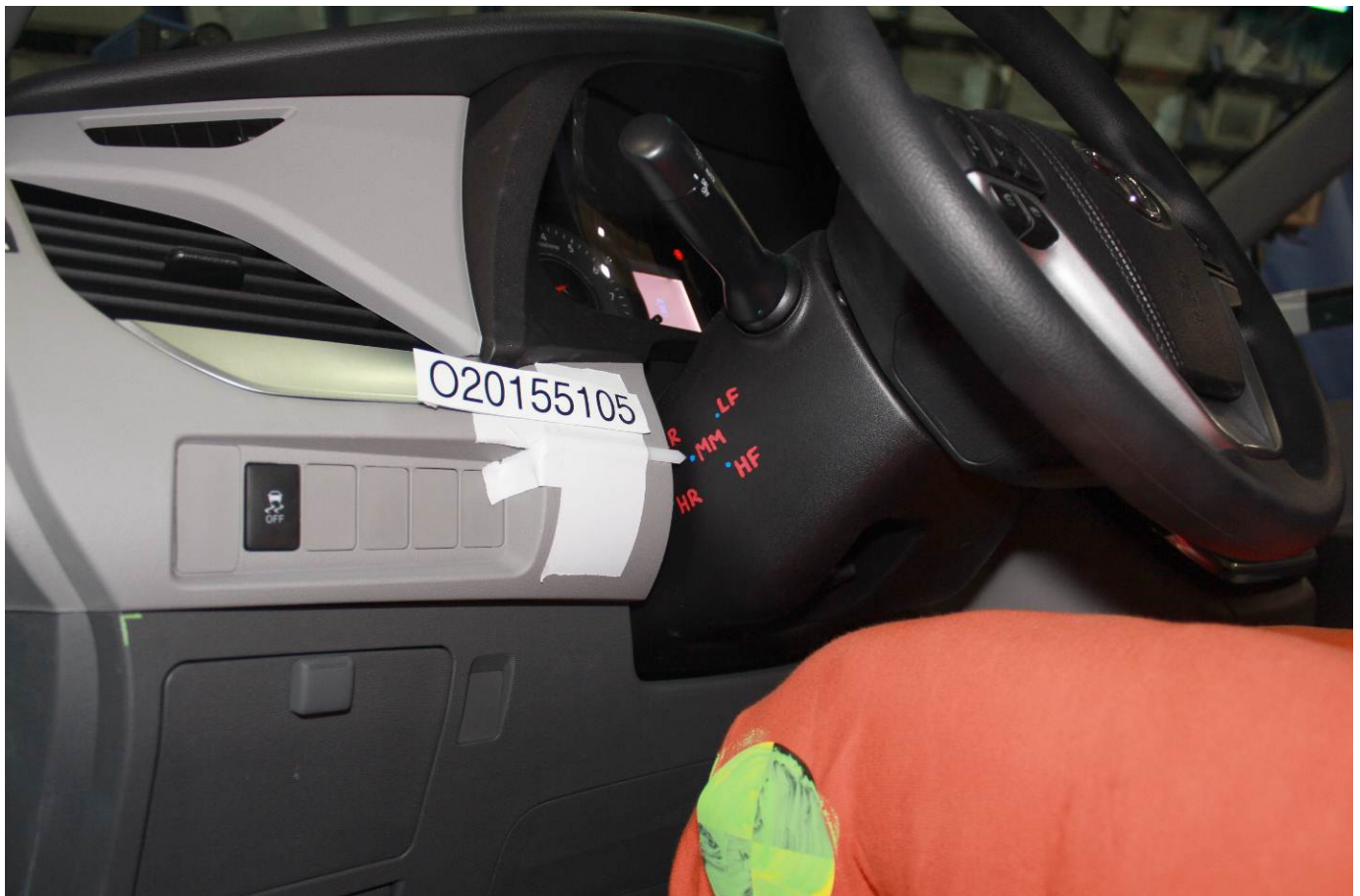
Pre-Test Overhead View of Driver Dummy Thighs on Seat Pan



Pre-Test Placement of Driver Dummy's Feet



Pre-Test View of Belt Anchorage for Driver Dummy



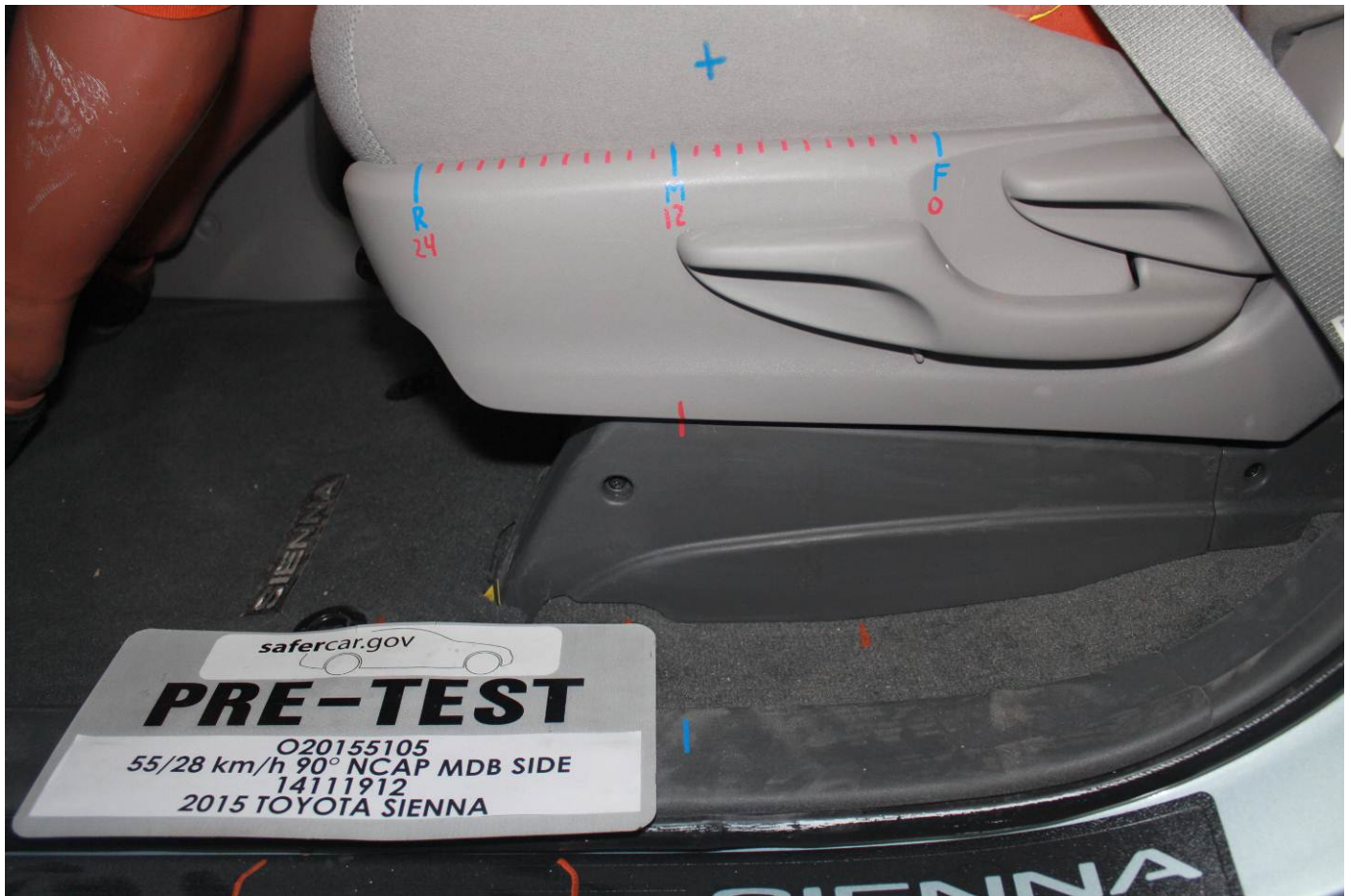
Pre-Test Left Side View of Steering Wheel



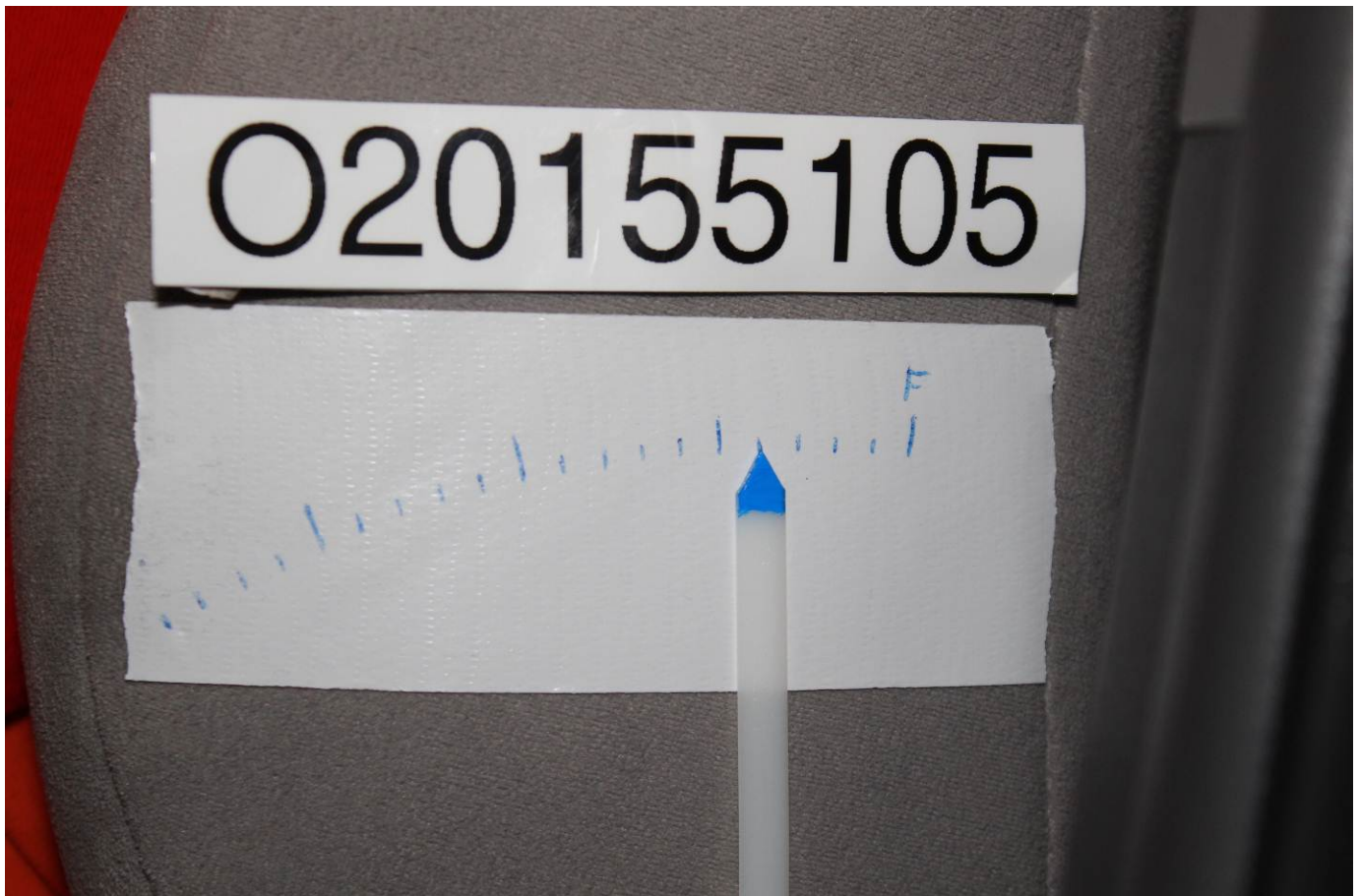
Pre-Test View of Disengaged Parking Brake



Pre-Test View of Parking Brake



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



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



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



Pre-Test Driver Dummy and Door Clearance View



Post-Test Driver Dummy and Door Clearance View



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



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



Pre-Test Driver Inner Door Panel View



Post-Test Driver Inner Door Panel View



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



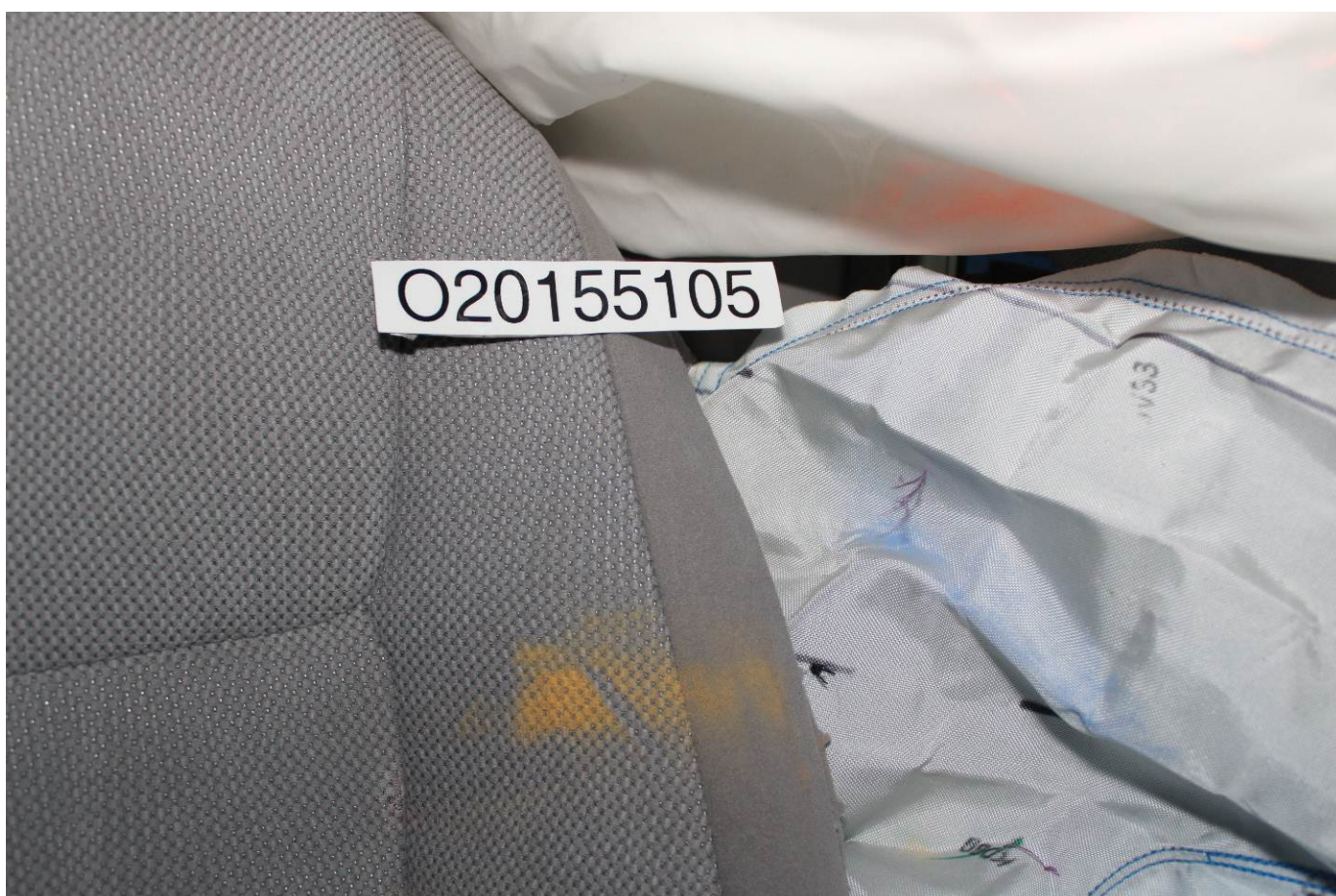
Post-Test Driver Dummy Close-up Head Contact with Side Airbag View



Post-Test Driver Dummy Close-up 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



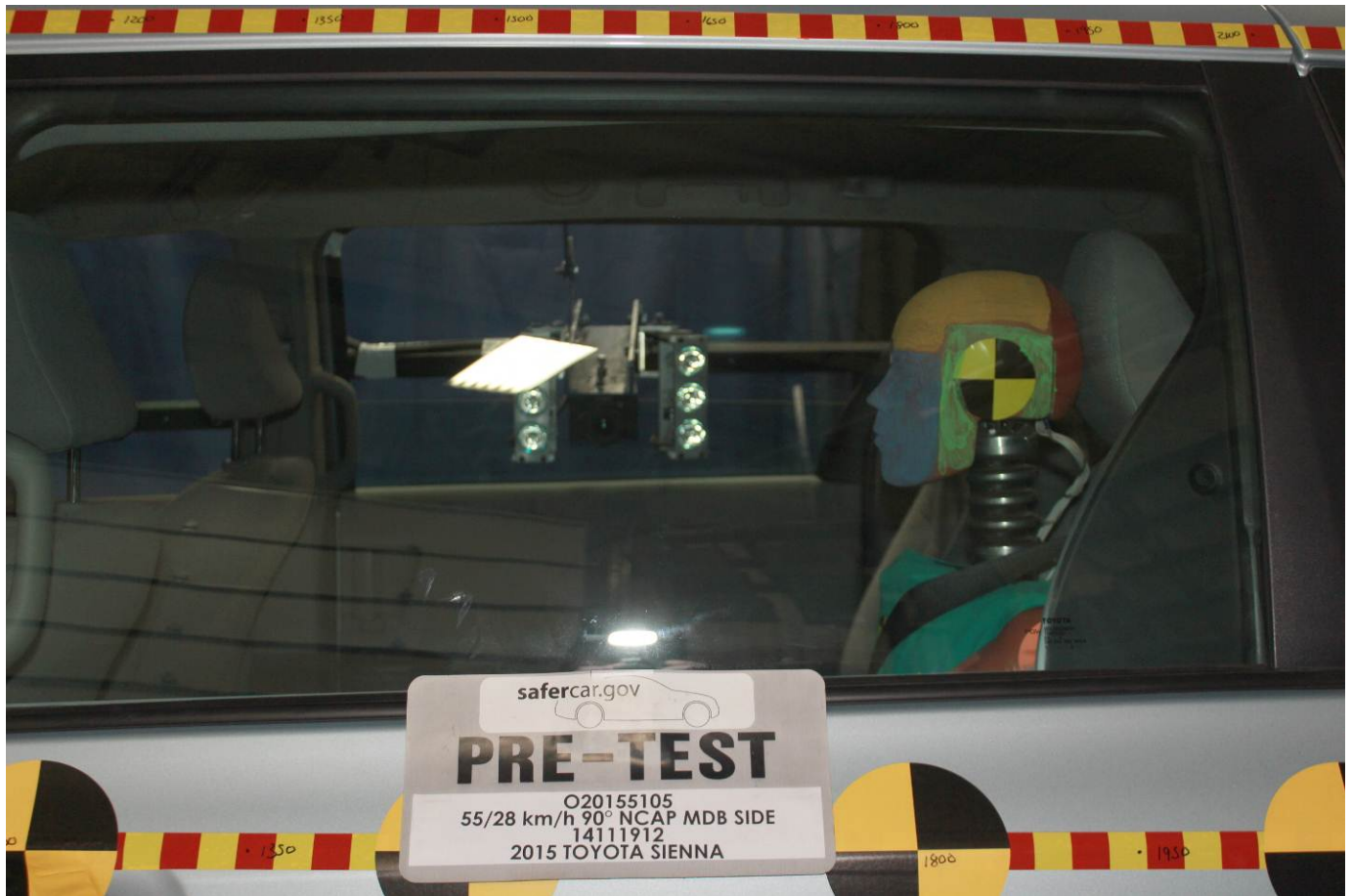
Post-Test Driver Dummy Close-up Pelvis Contact with Side Airbag View



Post-Test Driver Dummy Close-up Knee Contact View



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



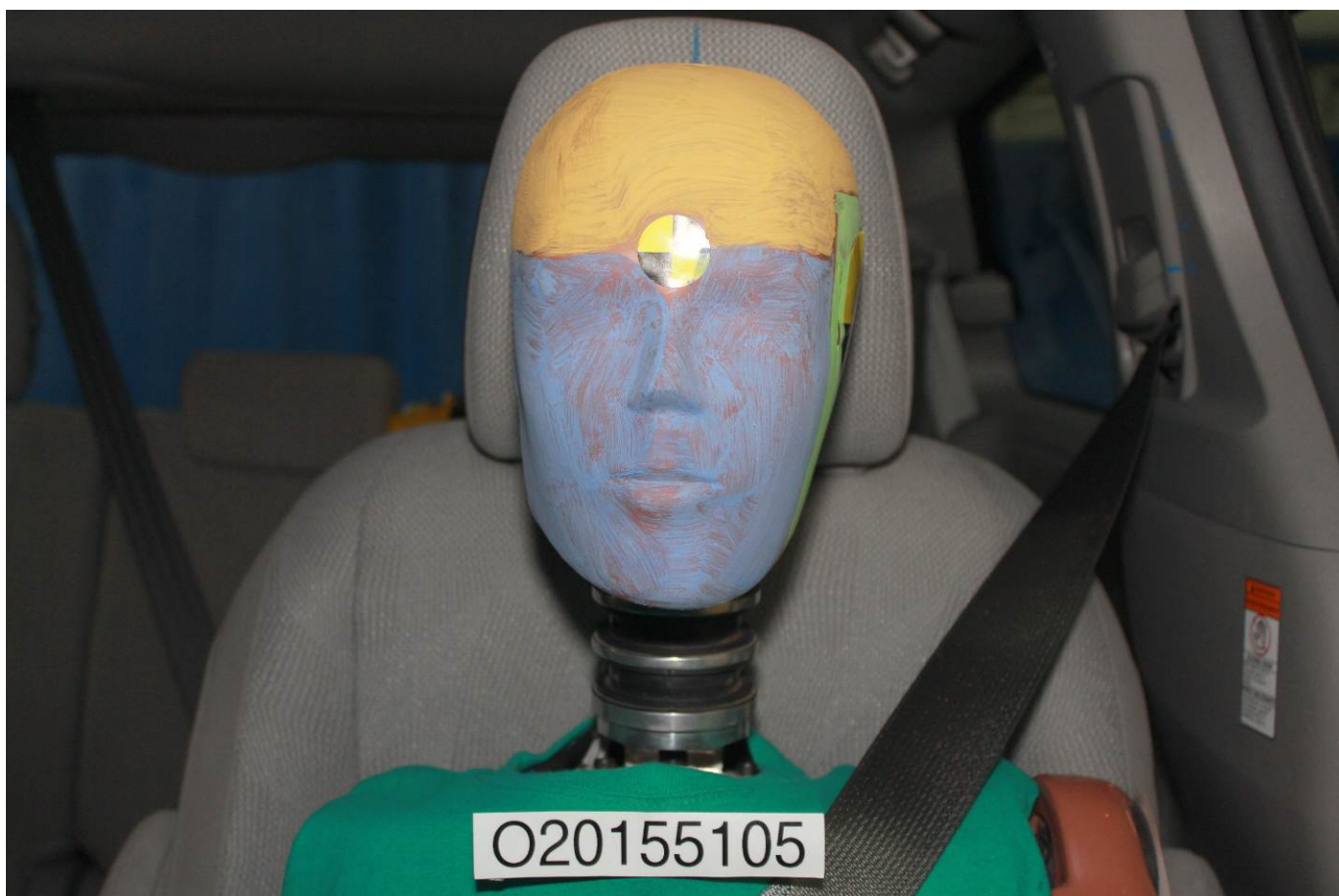
Pre-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View



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



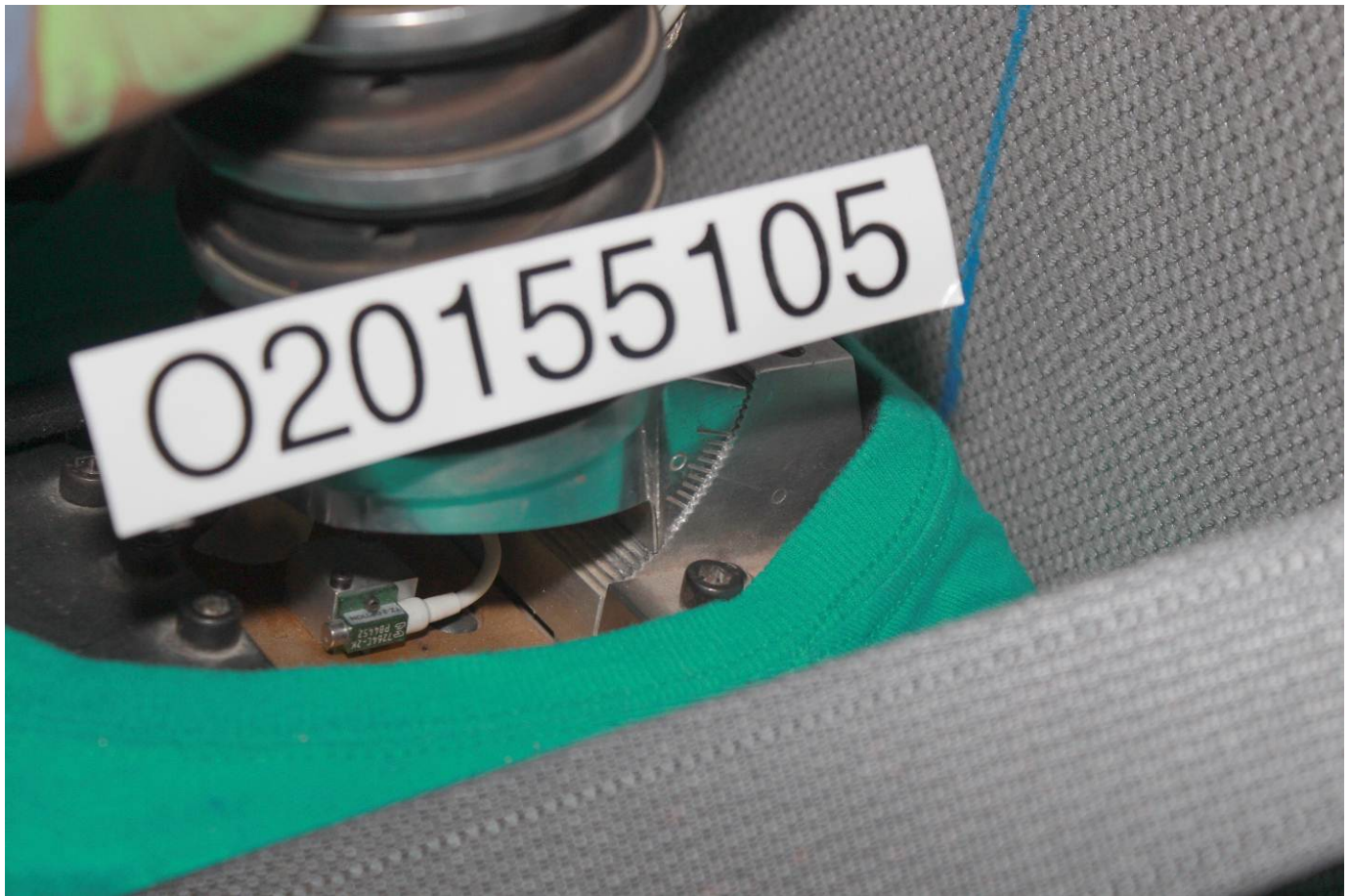
Pre-Test Frontal View of Rear Passenger Dummy Head and Shoulders in Relation to Head Restraint



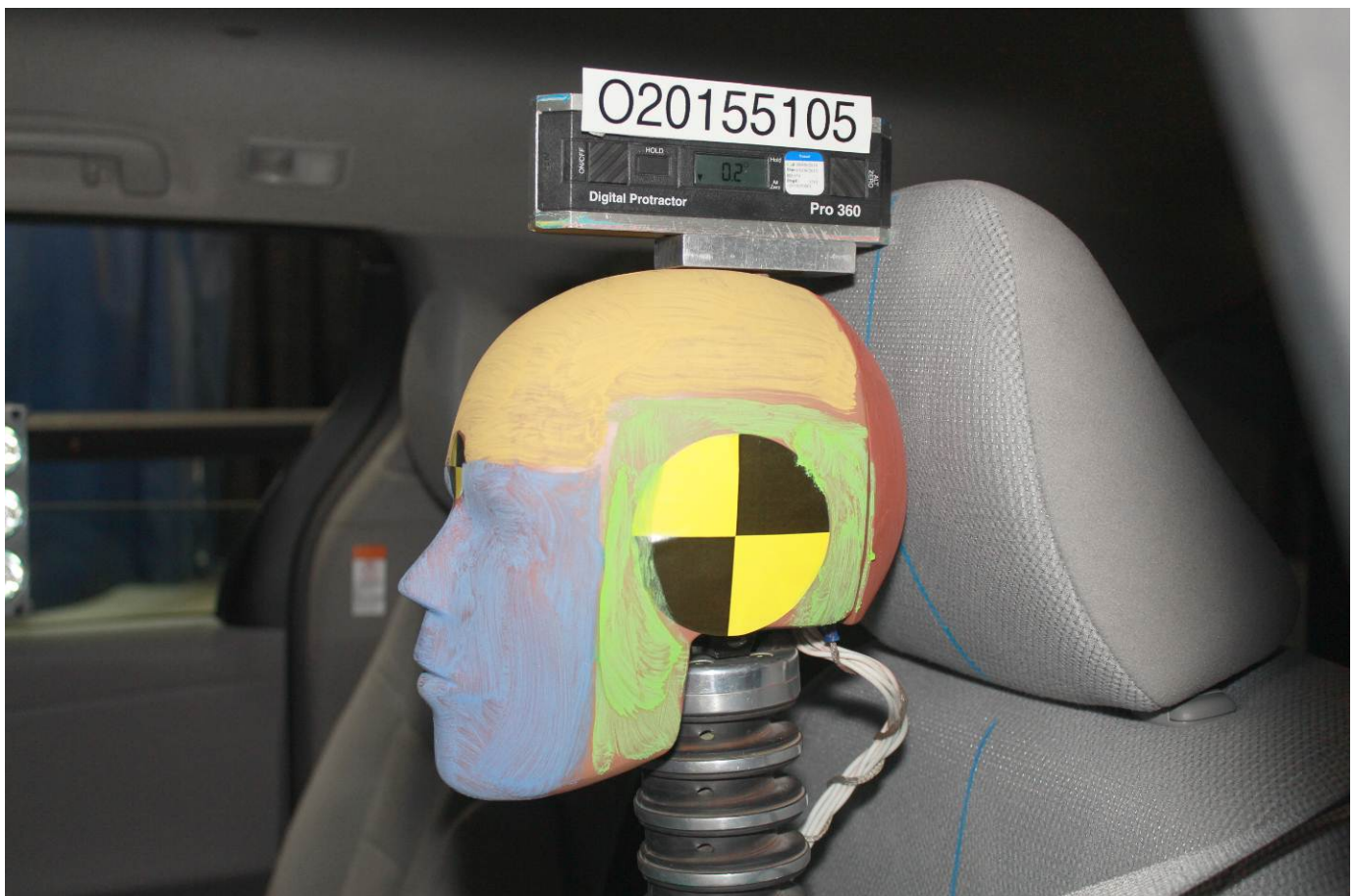
Pre-Test Overhead View of Rear Passenger Seat Pan Prior to Dummy Positioning



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



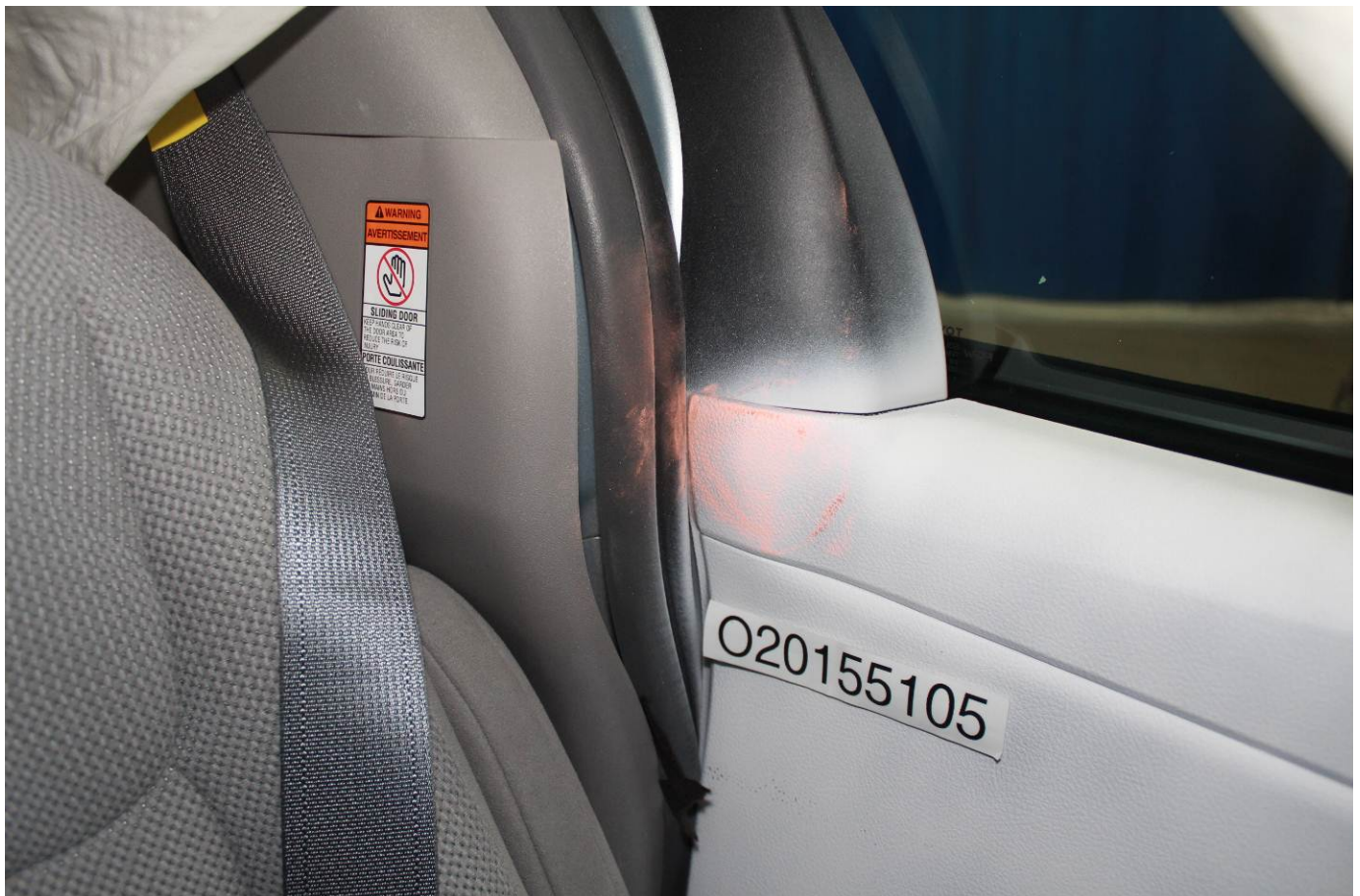
Post-Test Rear Passenger Inner Door Panel View



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



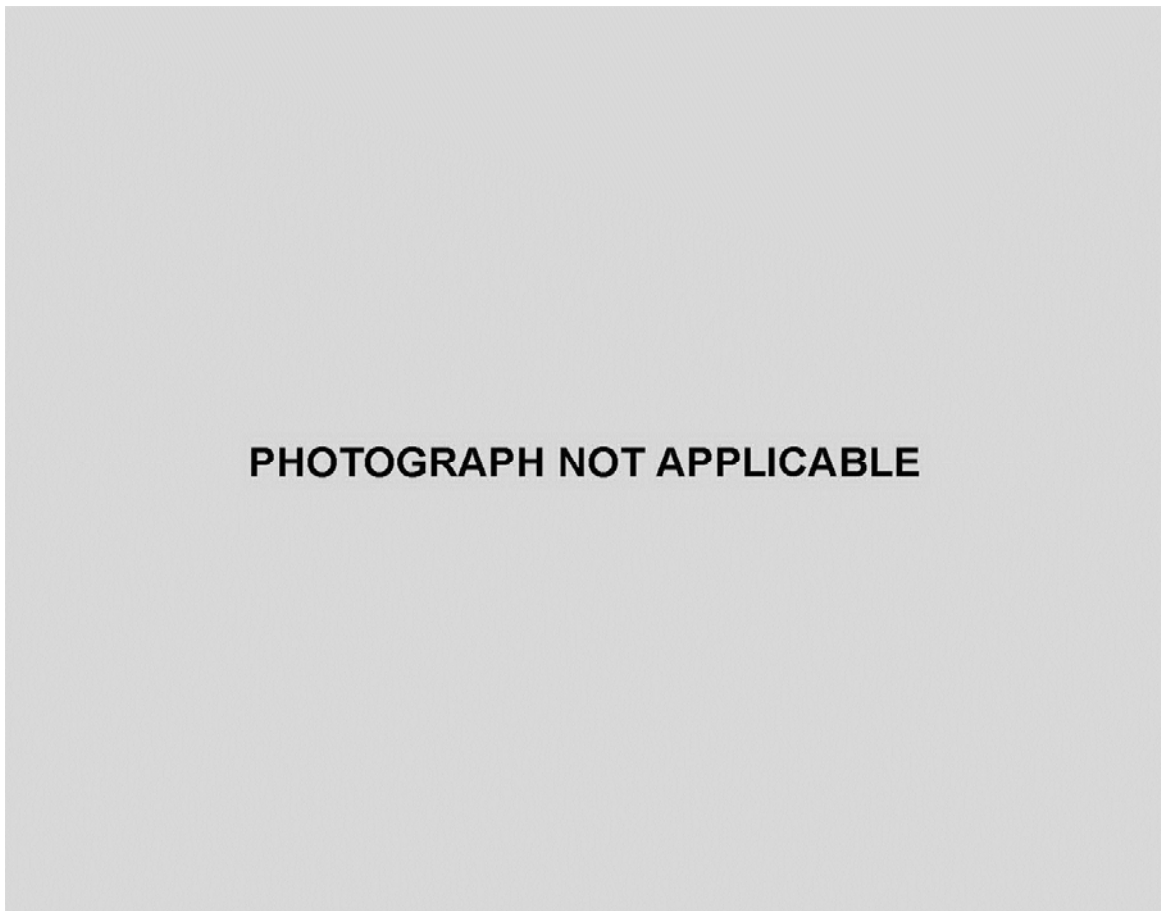
Post-Test Rear Passenger Dummy Close-up Torso Contact with Vehicle Interior View



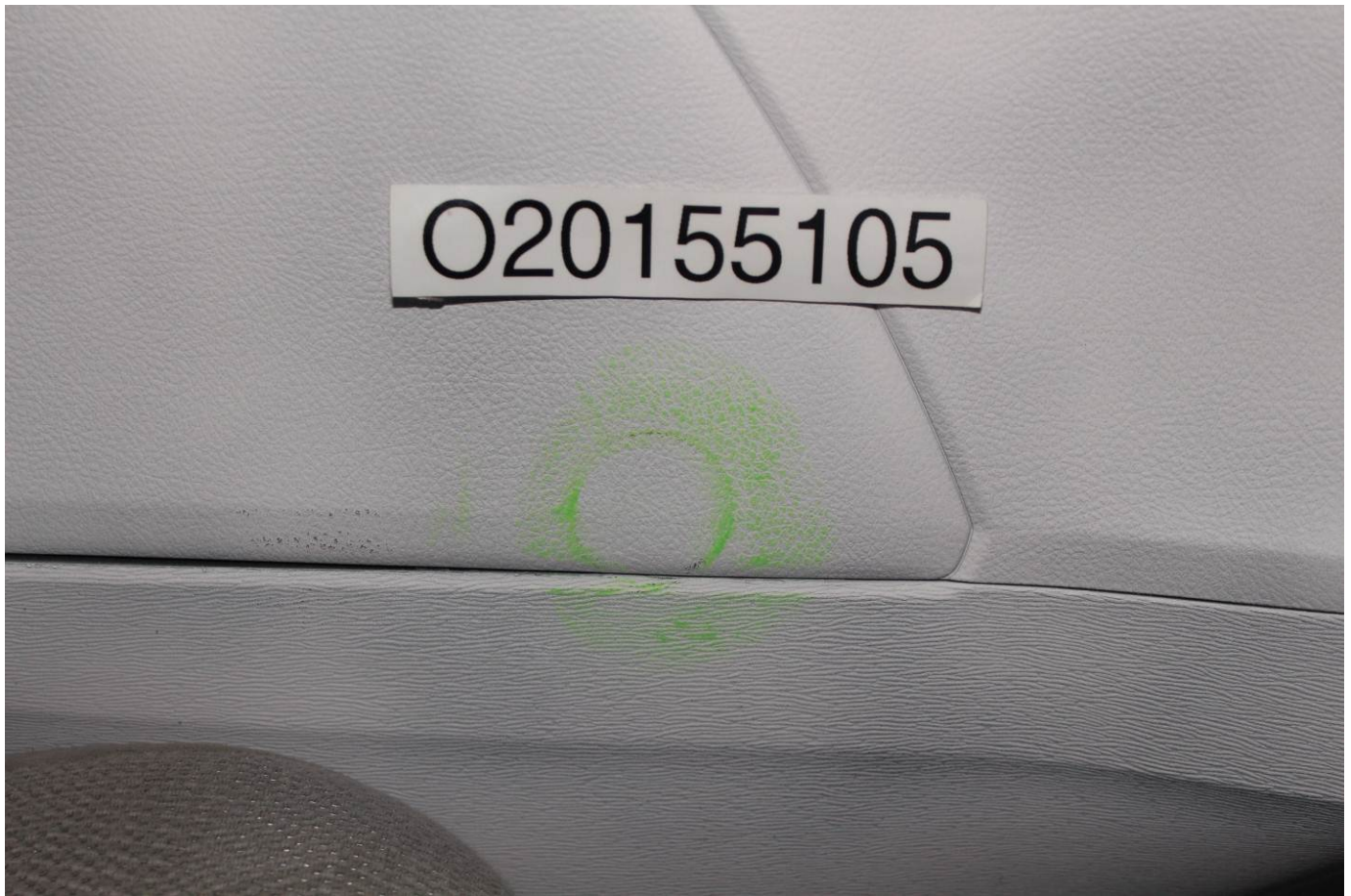
Post-Test Rear Passenger Dummy Close-up Torso Contact with Side Airbag View



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



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



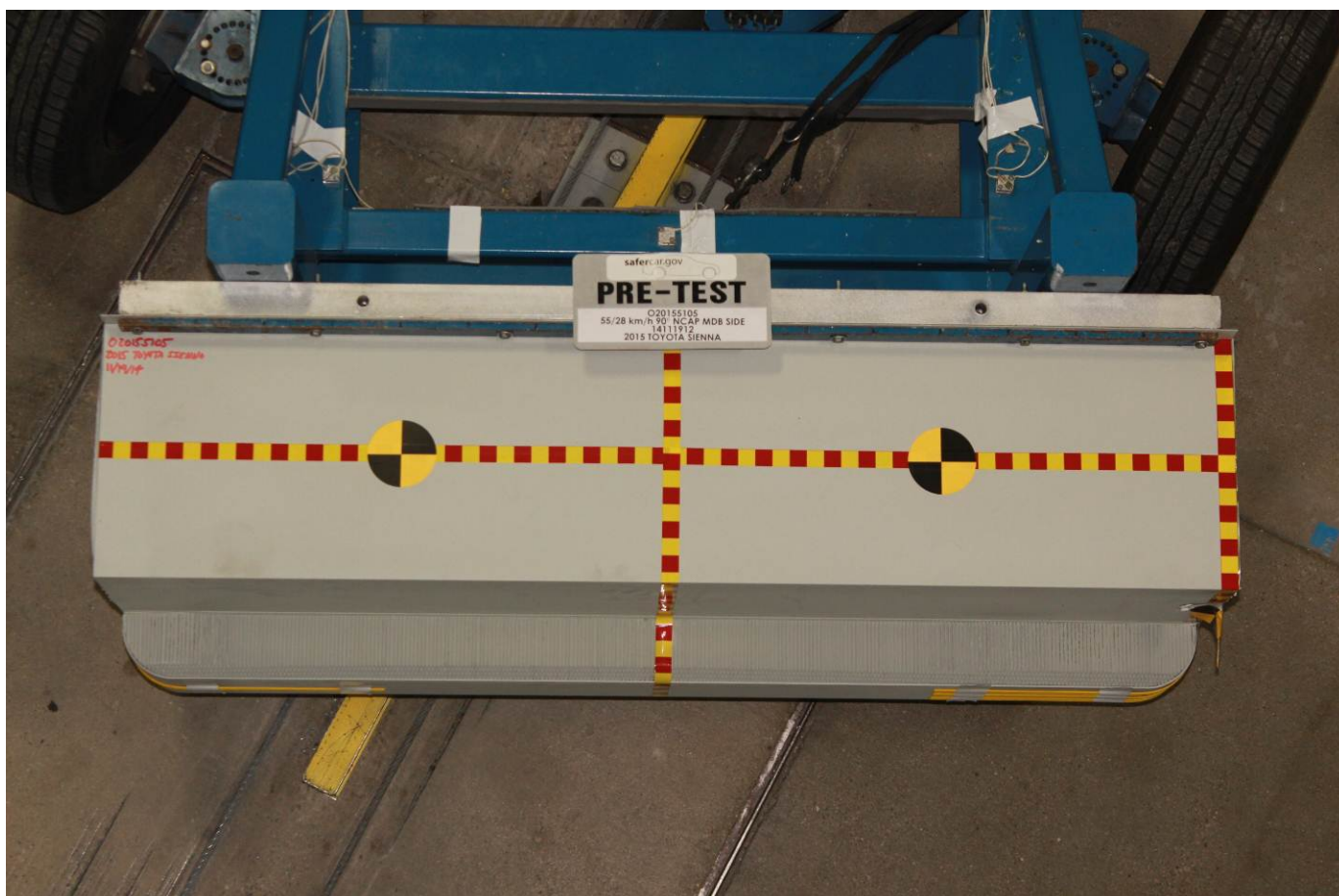
Post-Test View of Fuel Filler Cap or Fuel Filler Neck



Pre-Test Front View of MDB Impactor Face



Post-Test Front View of MDB Impactor Face



Pre-Test Top View of MDB Impactor Face



Post-Test Top View of MDB Impactor Face



Pre-Test Left Side View of MDB Impactor Face



Post-Test Left Side View of MDB Impactor Face



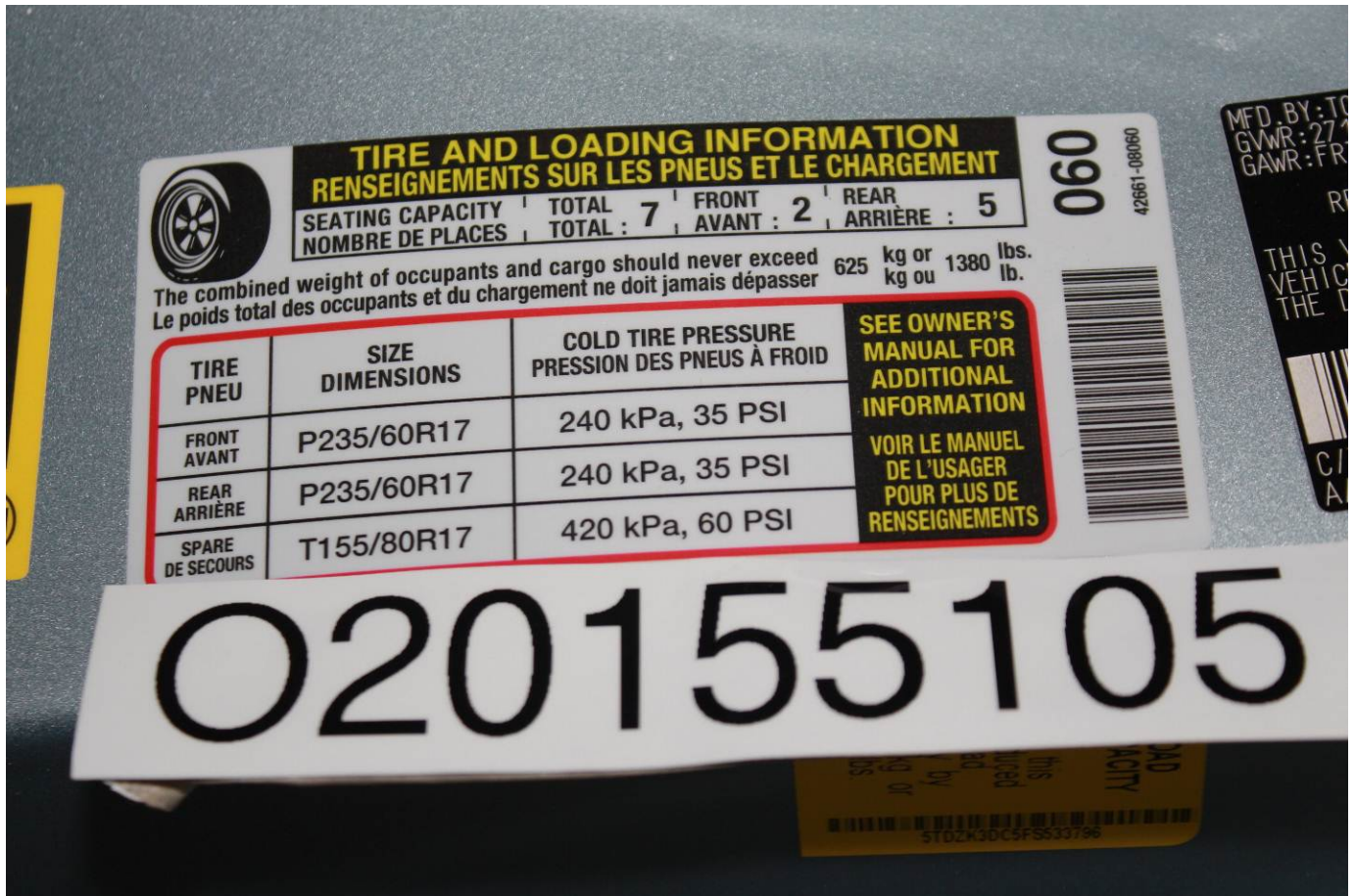
Pre-Test Right Side View of MDB Impactor Face



Post-Test Right Side View of MDB Impactor Face



Close-Up View of Vehicle's Certification Label



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



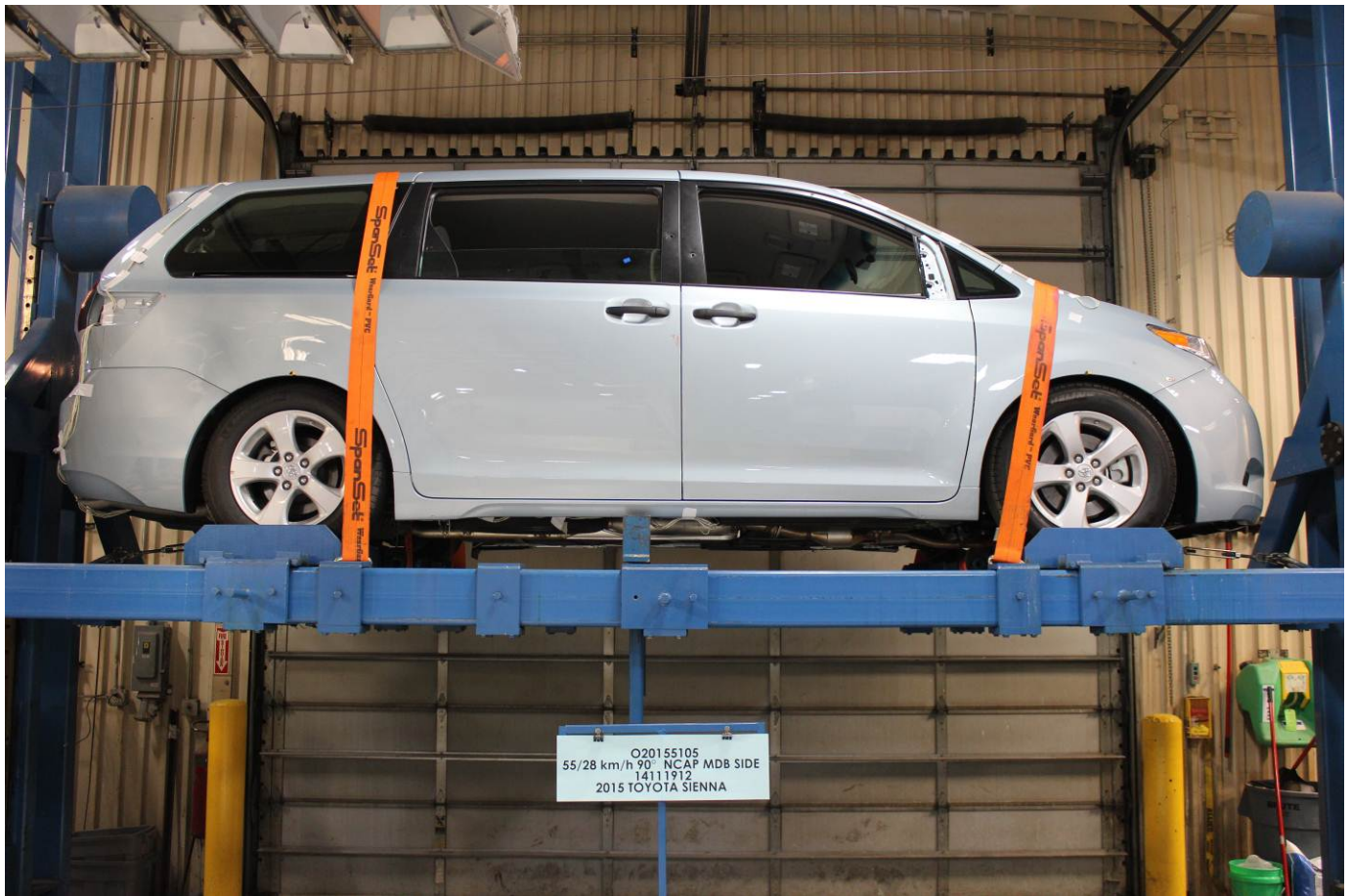
Close-Up View of Vehicle's Load Carrying Capacity Reduced Label



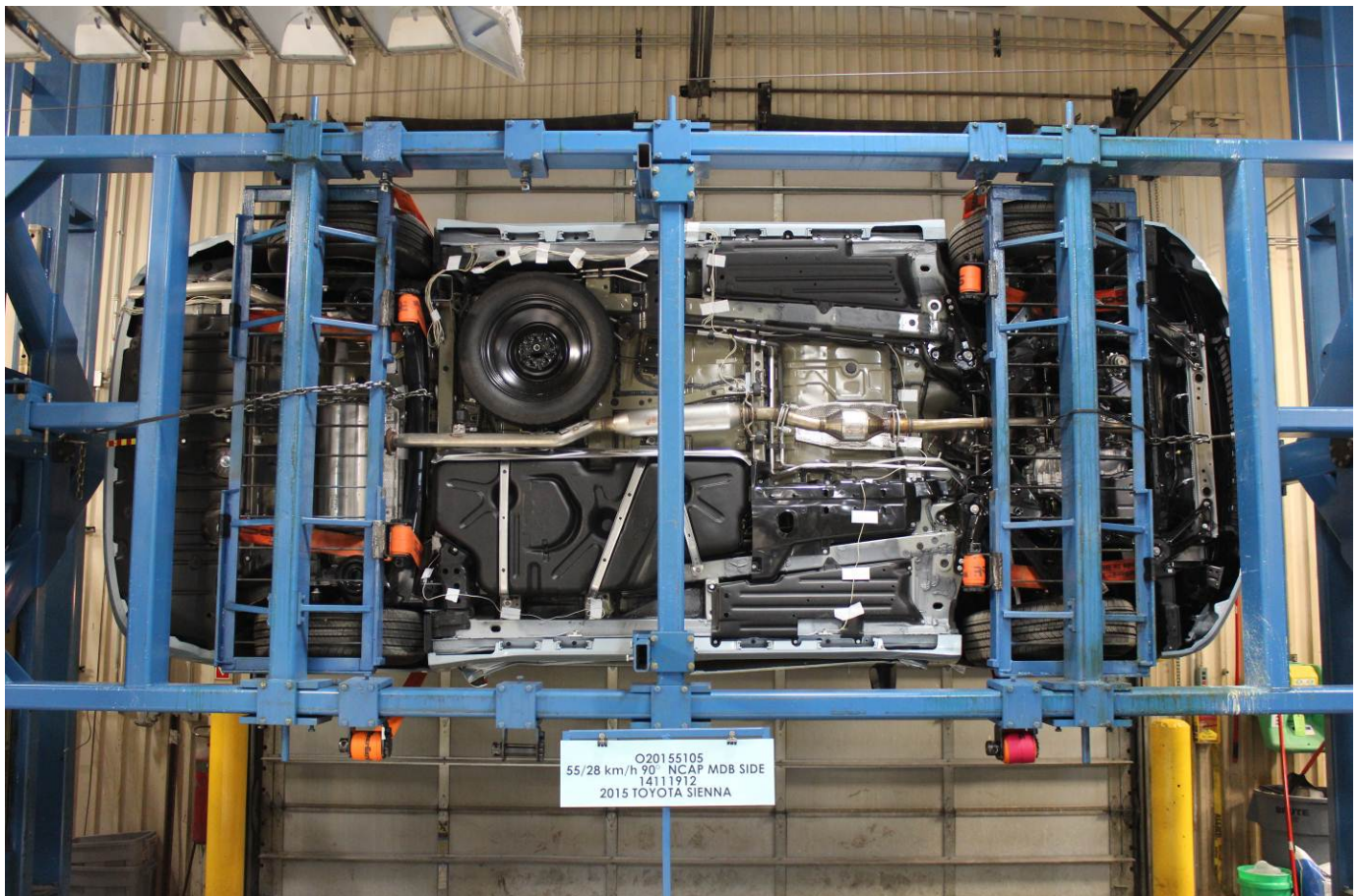
Pre-Test Ballast View



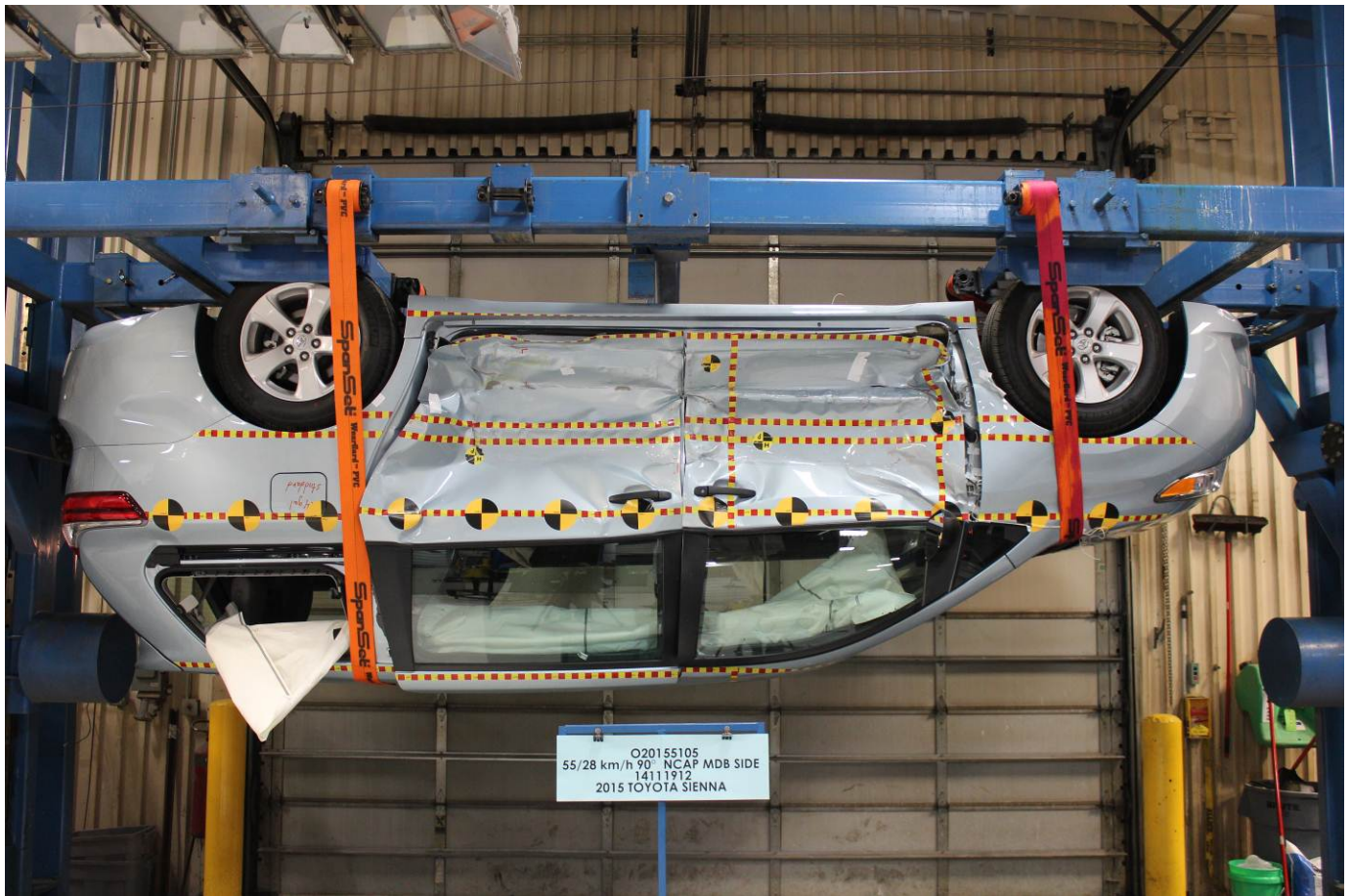
Post-Test Primary and Redundant Speed Trap Read-Out



FMVSS No. 301 Static Rollover 0 Degrees



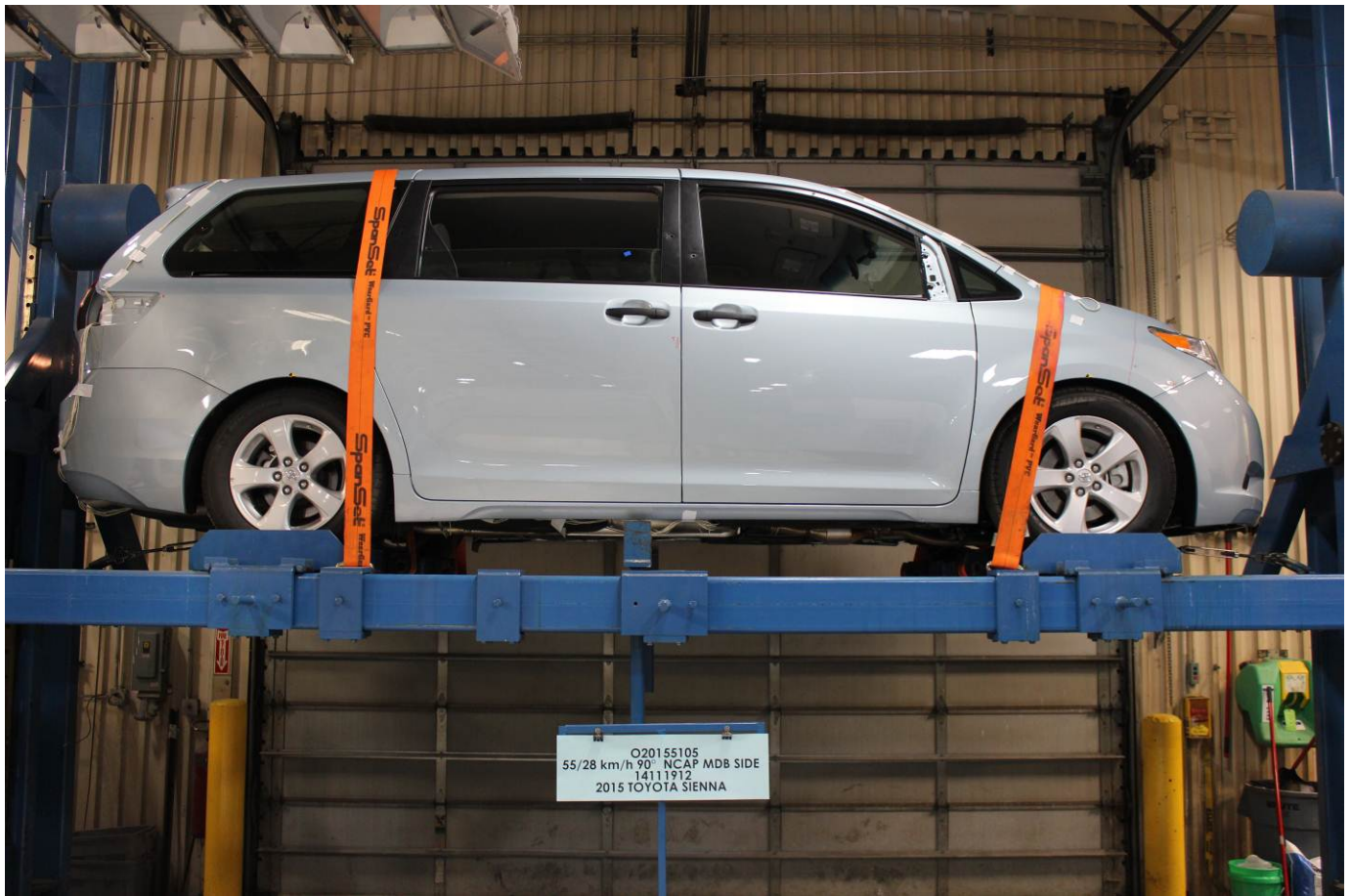
FMVSS No. 301 Static Rollover 90 Degrees



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: **SIENNA L 3.5L** FWD 7 PSGR
VIN: **5TDZK3DC5FSS33796**
YR/MDL: 2015/5328A
CLR: SKY BLUE PEARL/FA14 (08S4/14)
PORT/PLANT: Princeton, IN/TMMI RAILHEAD:

STANDARD EQUIPMENT

MECHANICAL & PERFORMANCE

- 3.5L D4CH 24-valve Dual VVT-i V6
- 6-Speed Electronically Controlled Auto Overdrive Trans. w/ Intelligence (ECT-I)
- 17" 5-spoke Alloy W/MS WP235/60R17 Tires

SAFETY & CONVENIENCE

- Star Safety System: Enhanced Vehicle Stability Control, Traction Control, Anti-Lock Brake System, Electronic Brake-Power Distribution, Brake Assist & Smart Stop Technology
- 8 Airbags: Dr & Fr Passenger Active Headrests Advanced Airbag System, Dr & Fr Passenger Side-Mounted Side, Dr Knee, Fr Passenger Seat Cushion & 3-Row Side Curtain Airbags
- 4 LATCH (Lower Anchor & Tethers for Children) Locations

EXTERIOR

- Projector-Beam Headlights w/Auto On/Off
- Dual Sliding Side Doors
- Daytime Running Lights
- Power Outside Mirrors with Integrated Blind Spot Mirrors

INTERIOR

- 6-Way Manual Adjustable Driver Seat, 6-Way Manual Adjustable Fr Passenger Seat, Removable 2nd-Row Captain's Chairs with Tie Up & Long Slide feature, 60/40 Split & Slide 3rd Row seat w/One-Action Stow
- 9-Zone Auto A/C - Driver, Passenger, Rear
- 6.1" Touch-Screen AM/FM/CD/USB/Bluetooth & Integrated Backup Camera Display
- 3.5" LCD Multi-Info Display Screen
- Remote Keyless Entry
- ***Full Tank of Gas***

MANUFACTURER'S SUGGESTED RETAIL PRICE \$28,689.00

OPTIONAL EQUIPMENT

PE 50 State Emissions
DK Preferred Owner's Portfolio
CF Carpet Floor Mats/Door Sill Protector 330.00

GOVERNMENT 5 STAR SAFETY RATINGS

Overall Vehicle Score Not Rated
Based on the combined ratings of frontal, side and rollover. Should ONLY be compared to other vehicles of similar size and weight.

Crash	Driver Passenger	Not Rated
Frontal	Not Rated	Not Rated
Side	Front seat Not Rated	Not Rated
Side	Rear seat Not Rated	Not Rated

Rollover
Based on the risk of rollover in a single-vehicle crash. ★★★★★

Star ratings range from 1 to 5 stars (★★★★★) with 5 being the highest. Sources: National Highway Traffic Safety Administration (NHTSA) www.safercar.gov or 1.888.327.4236

EPA DOT Fuel Economy and Environment

Fuel Economy

21 MPG
combined city/hwy
18 city
25 highway

Mileage range from 18 to 24 MPG. The best vehicle order: 119 MPG.

You spend \$1,500 more in fuel costs over 5 years compared to the average new vehicle.

Annual fuel cost \$2,500

Fuel Economy & Greenhouse Gas Rating (tailpipe only) Smog Rating (tailpipe only)

1 5 10 Best 1 5 10 Best

The vehicle emits 430 grams CO2 per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel also creates emissions: learn more at www.epa.gov

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 24 MPG and costs \$11,000 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$3.50 per gallon. 16¢ per mile is the average cost per gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

fuel economy.gov
Calculate personalized estimates and compare vehicles

DELIVERY PROCESSING AND HANDLING FEE 885.00

TOTAL \$29,615.00

The New Vehicle Limited Warranty provides 3-year/50,000-mile basic coverage, 5-year/100,000-mile powertrain coverage, plus 24-hour roadside assistance 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 destination installed options and accessories are not included in the manufacturer's suggested retail price.

ToyotaCare, 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.

Dealer Name / Address: 31190 WEST HERR TOYORCHARD PK 4141 SOUTHWESTERN BLVD. ORCHARD PARK NY14127 Ship to:

Monroney Label

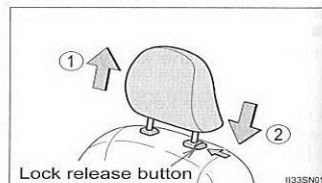
172 3-3. Adjusting the seats

Head restraints

Head restraints are provided for all seats.

Front and second outside seats

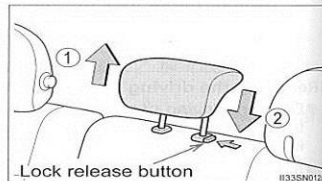
- Up
Pull the head restraints up.
- Down
Push the head restraint down while pressing the lock release button.



Second center* and third center seats

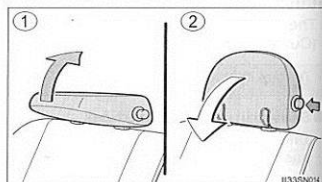
- Up
Pull the head restraints up.
- Down
Push the head restraint down while pressing the lock release button.

*: 8-passenger models only



Third outside seats

- To use
Pull the head restraints up.
- To fold
Press the button.



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

■ Removing the head restraints

► Front and second outside seats

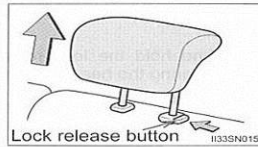
Pull the head restraint up while pressing the lock release button.



► Second center* and third center seats

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

*: 8-passenger models only



► Third outside seats

The head restraint cannot be removed.

3 Operation of each component

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

■ Installing the head restraints

► Front and second outside 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.

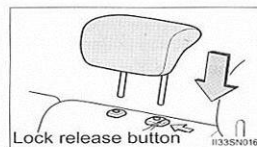


► Second center* and third center seats

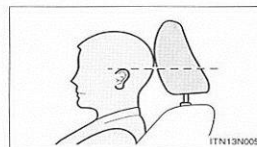
Align the head restraint with the installation holes and push it down to the lock position.

Press and hold the lock release button when lowering the head restraint.

*: 8-passenger models only

**■ Adjusting the height of the head restraints**

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

**■ Adjusting the center seat head restraints**

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

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

 WARNING**■ 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.


Operation of each component

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

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Figure No. 2.	Driver Head Acceleration (Y) Primary vs. Time	B-1
Figure No. 3.	Driver Head Acceleration (Z) Primary vs. Time	B-1
Figure No. 4.	Driver Head Resultant Acceleration Primary vs. Time	B-1
Figure No. 5.	Driver Upper Thorax Rib Deflection (Y) vs. Time	B-2
Figure No. 6.	Driver Middle Thorax Rib Deflection (Y) vs. Time	B-2
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Figure No. 19.	Passenger Lower Spine T12 Acceleration (Y) vs. Time	B-6
Figure No. 20.	Passenger Lower Spine T12 Acceleration (Z) vs. Time	B-6
Figure No. 21.	Passenger Lower Spine T12 Resultant Acceleration vs. Time	B-6
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Figure No. 23.	Passenger Acetabulum Force on Impact Side (Y) vs. Time	B-7
Figure No. 24.	Passenger Total Pelvic Force on Impact Side (Y) vs. Time	B-7

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

Additional Driver & Passenger Dummy Instrumentation Data

Driver Lower Spine T12 Acceleration (X)
Driver Lower Spine T12 Acceleration (Y)
Driver Lower Spine T12 Acceleration (Z)
Passenger Upper Thorax Rib Deflection (Y)
Passenger Middle Thorax Rib Deflection (Y)
Passenger Lower Thorax Rib Deflection (Y)
Passenger Upper Abdomen Rib Deflection (Y)
Passenger Lower Abdomen Rib Deflection (Y)
Driver Head Acceleration Redundant (X)
Driver Head Acceleration Redundant (Y)
Driver Head Acceleration Redundant (Z)
Passenger Head Acceleration Redundant (X)
Passenger Head Acceleration Redundant (Y)
Passenger Head Acceleration Redundant (Z)

Vehicle Instrumentation Data

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

MDB Instrumentation Data

MDB Center of Gravity Acceleration (X)

MDB Center of Gravity Acceleration (Y)

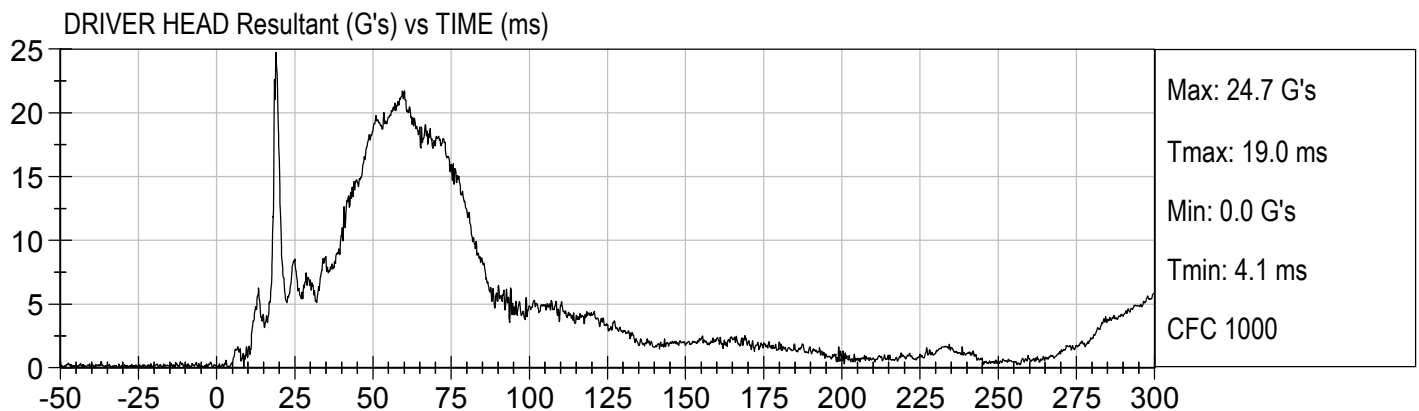
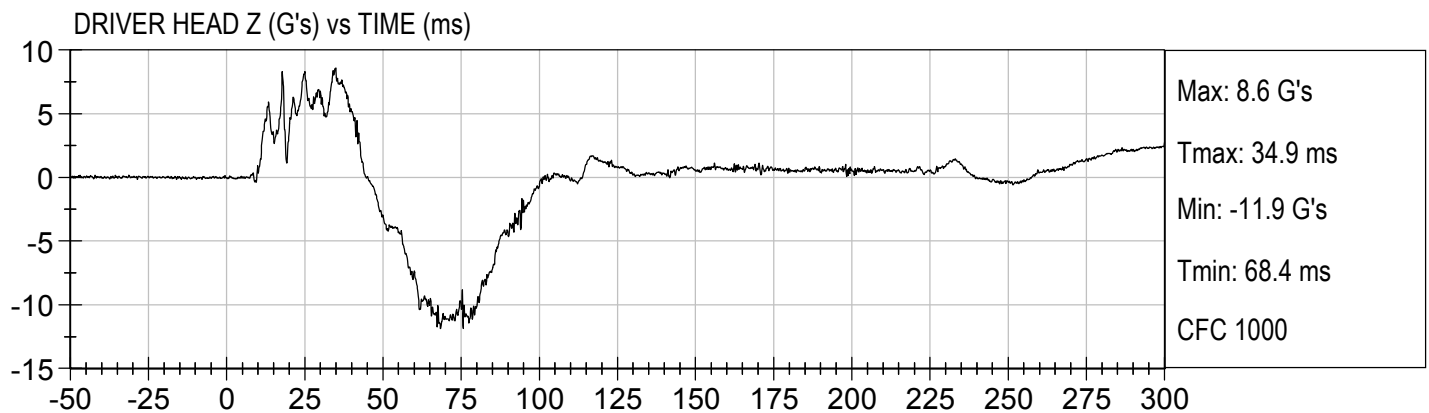
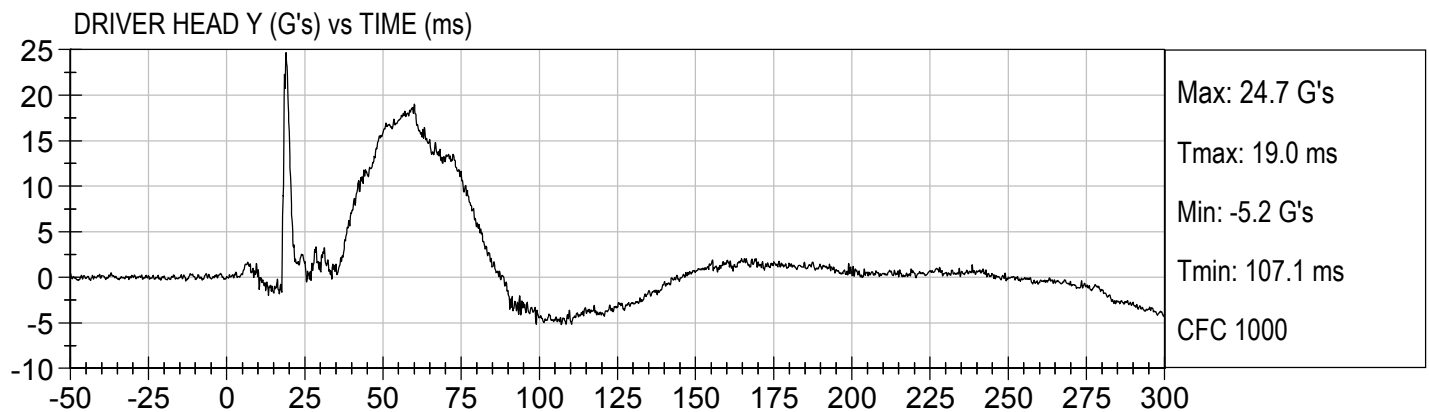
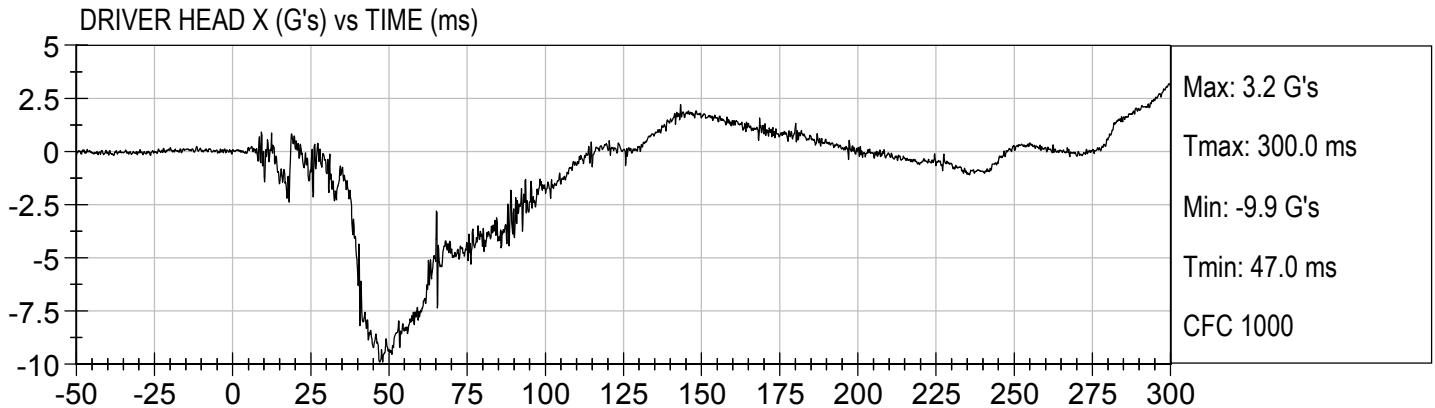
MDB Center of Gravity Acceleration (Z)

MDB Rear Acceleration (X)

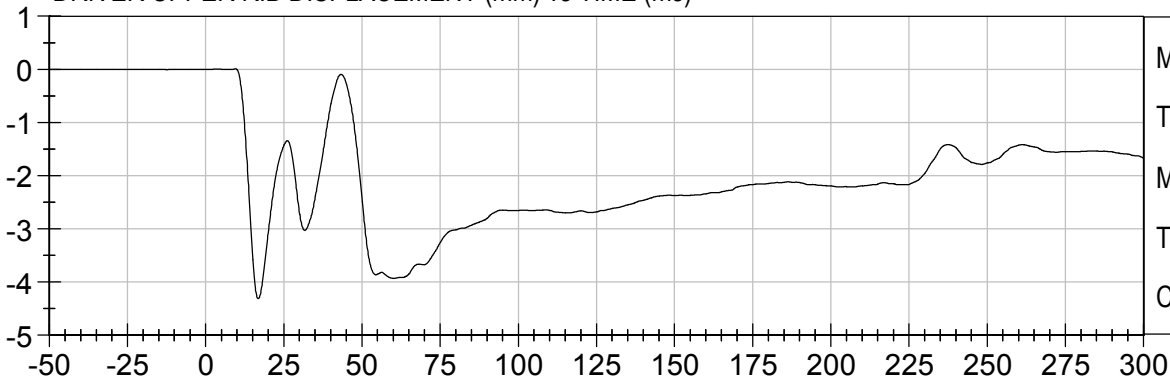
MDB Rear Acceleration (Y)

Left MDB Contact Switch

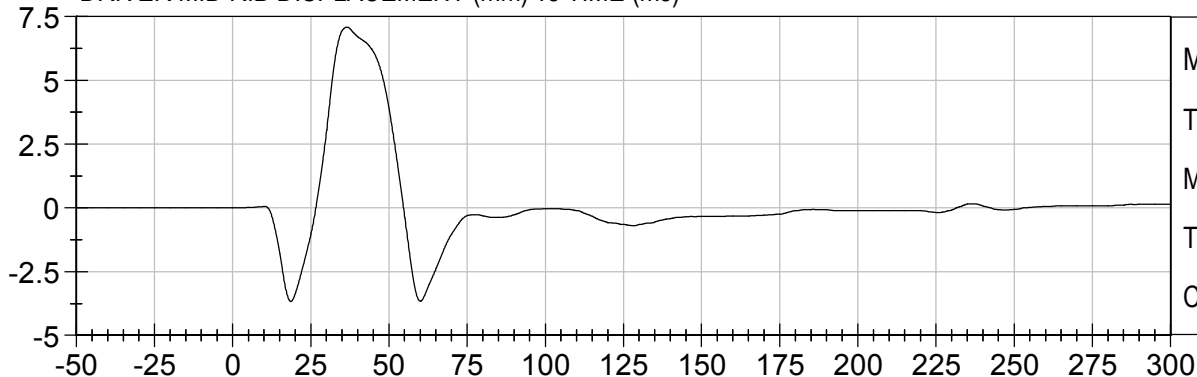
Right MDB Contact Switch



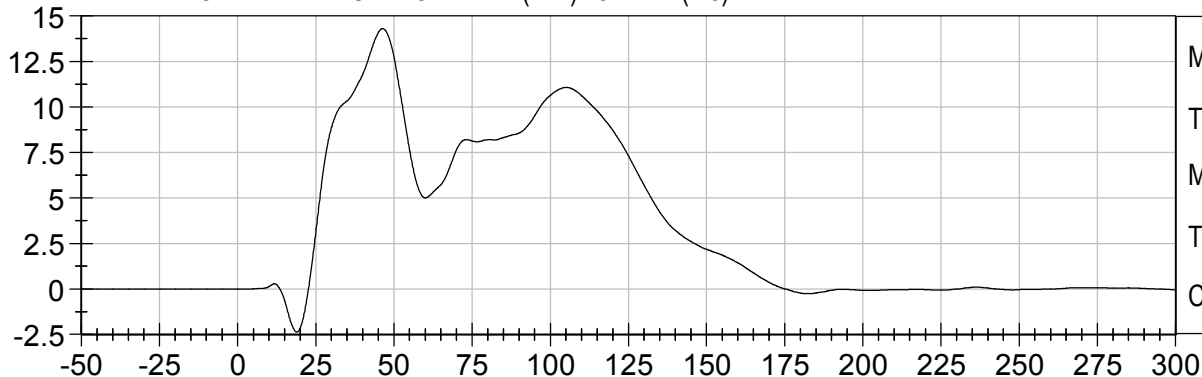
DRIVER UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



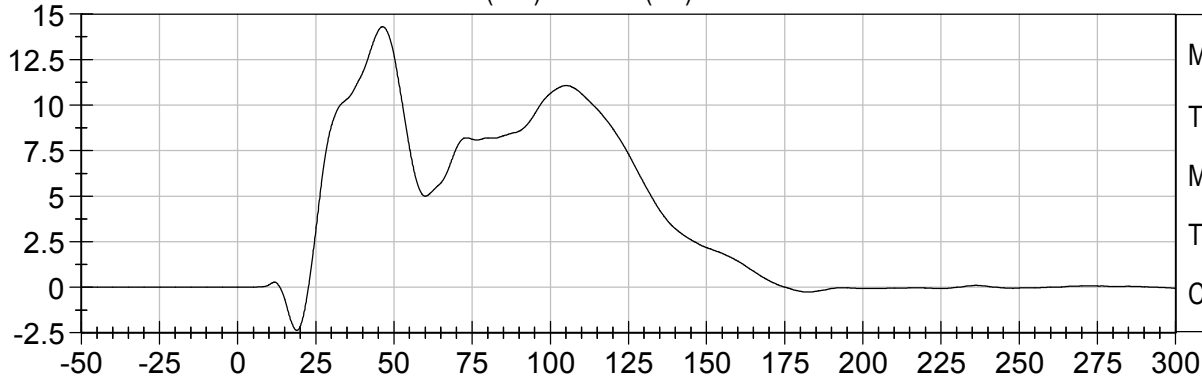
DRIVER MID RIB DISPLACEMENT (mm) vs TIME (ms)

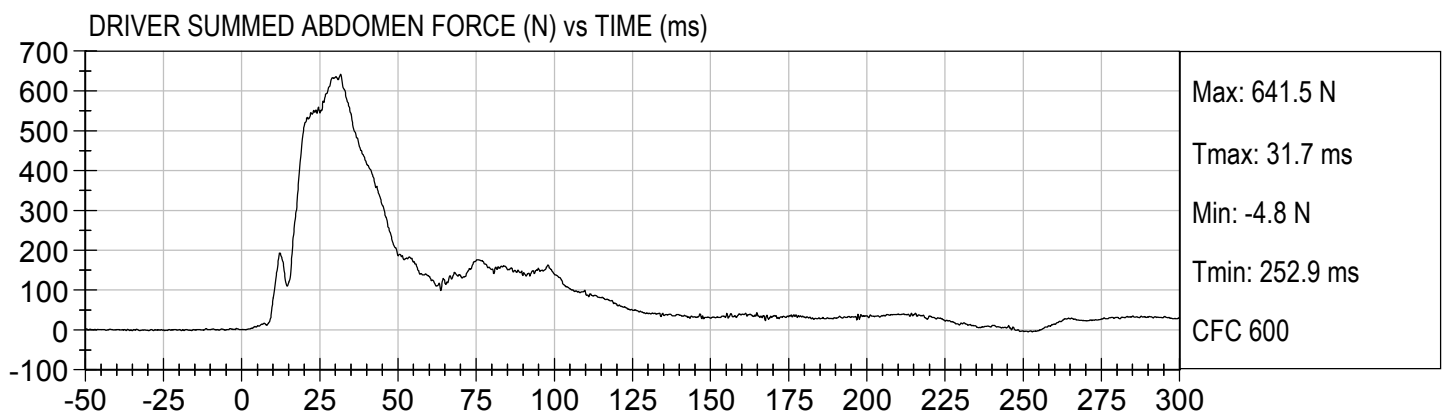
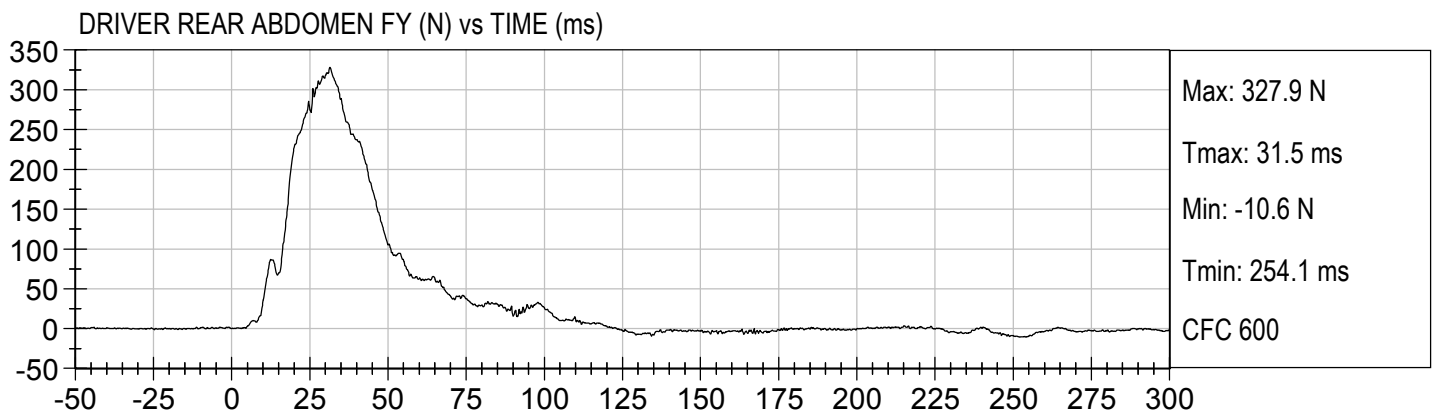
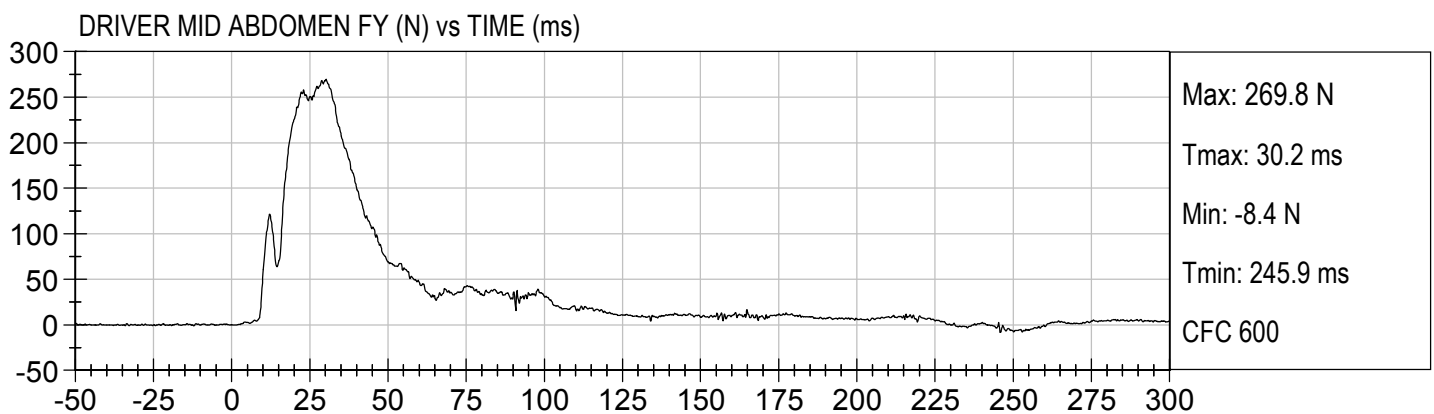
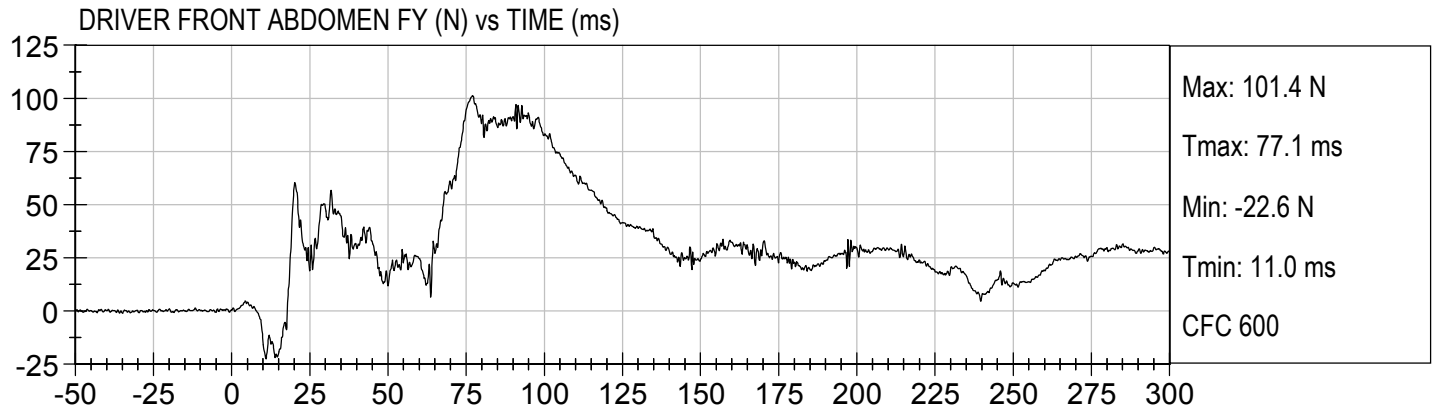


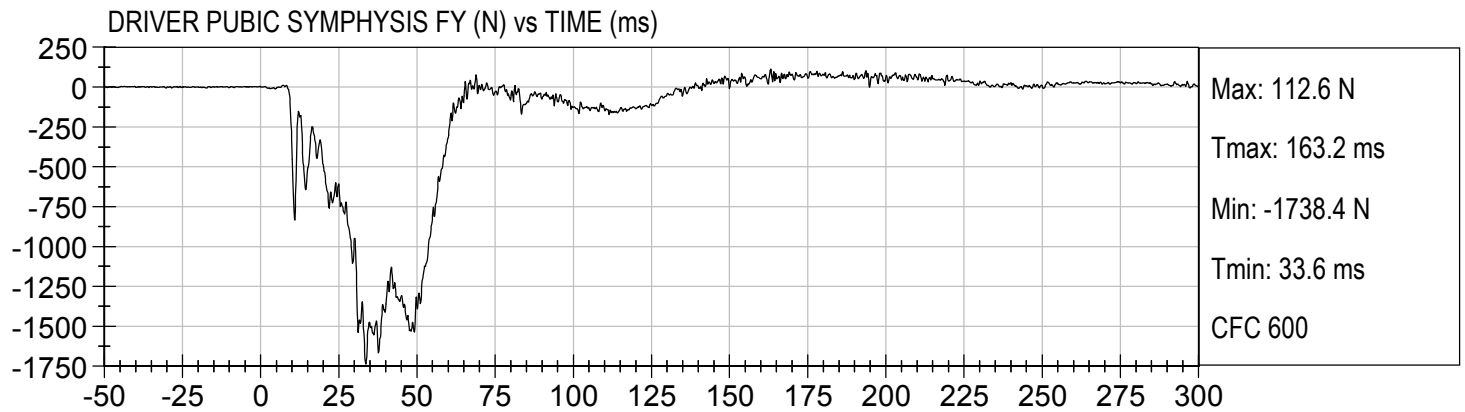
DRIVER LOWER RIB DISPLACEMENT (mm) vs TIME (ms)

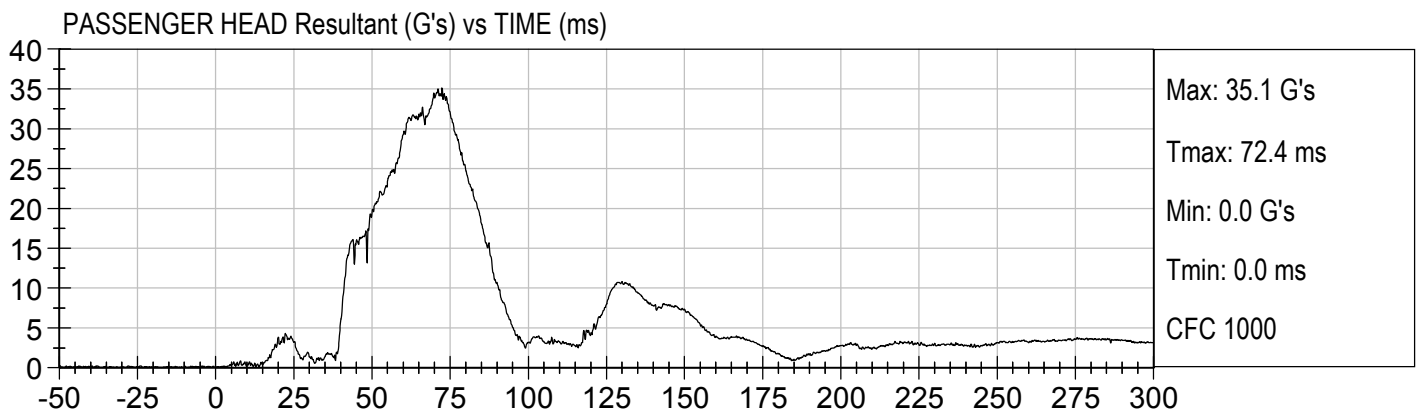
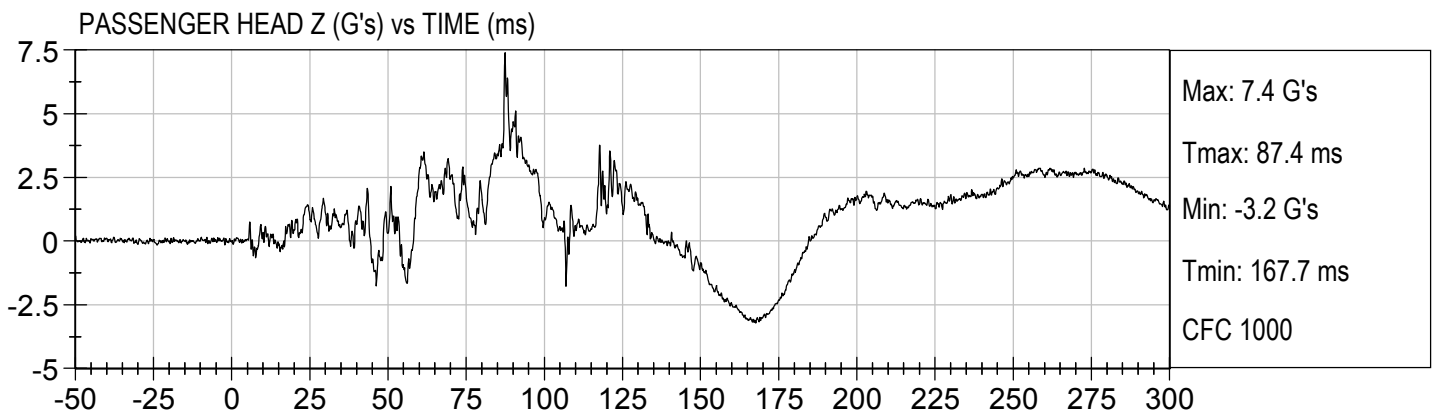
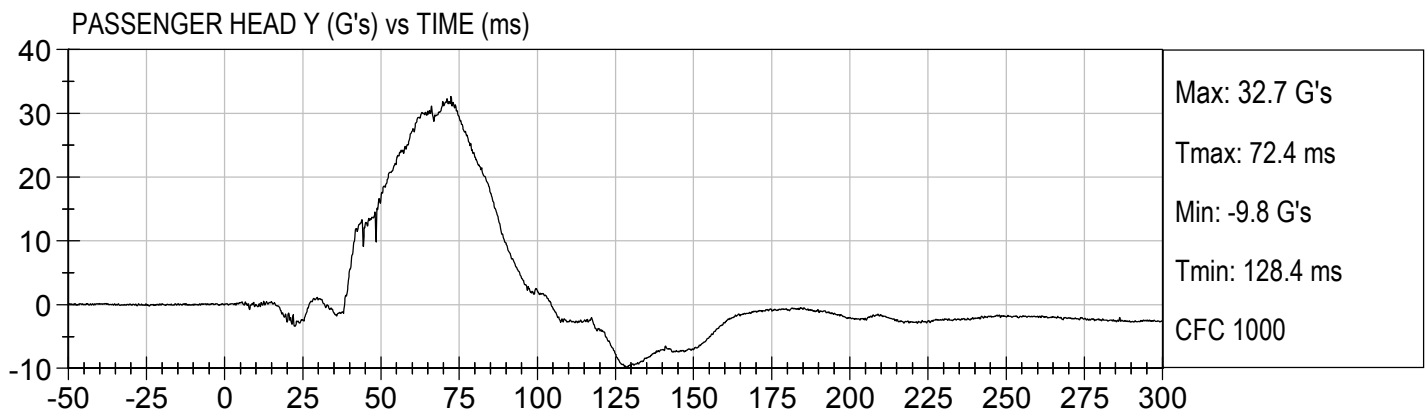
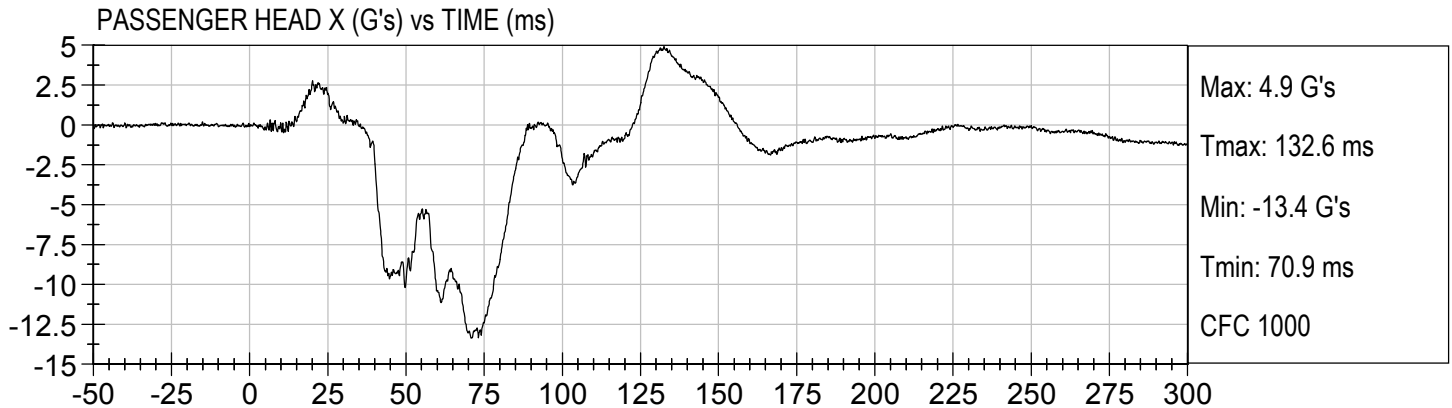


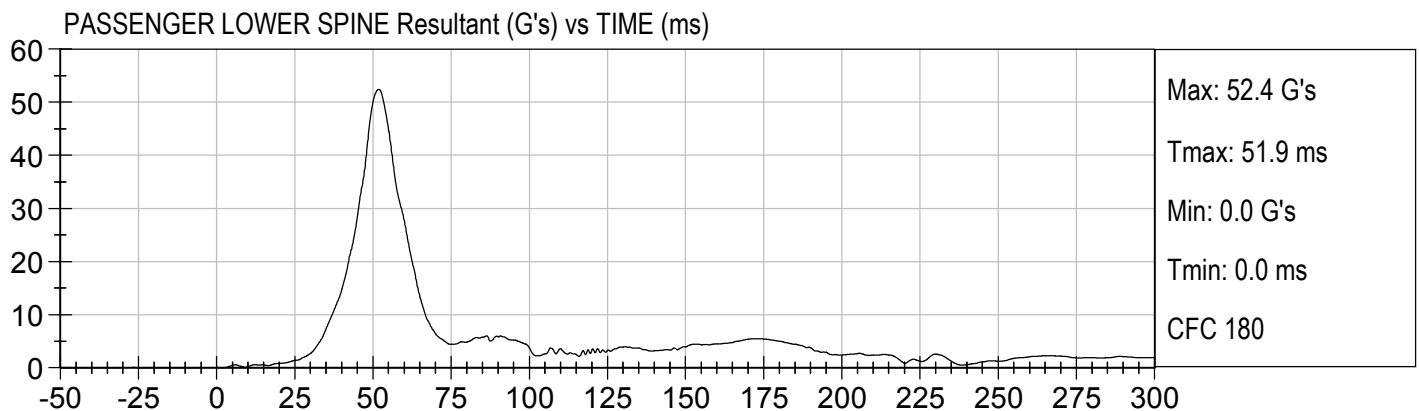
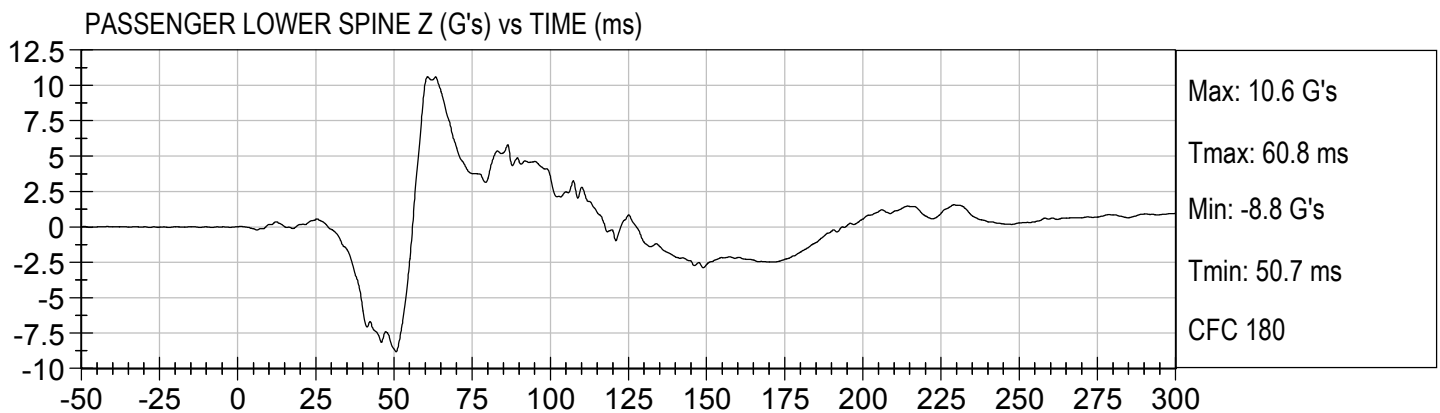
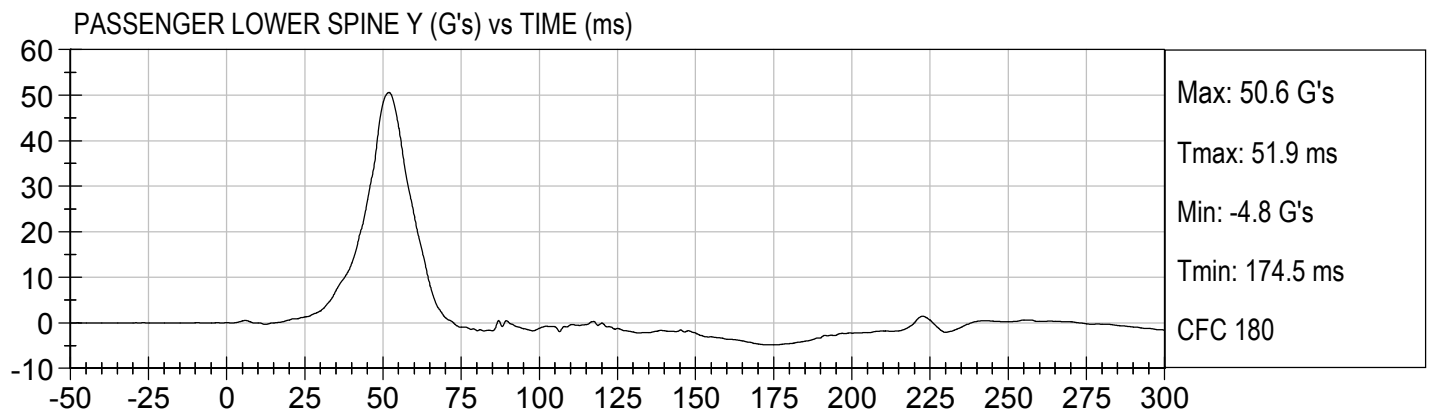
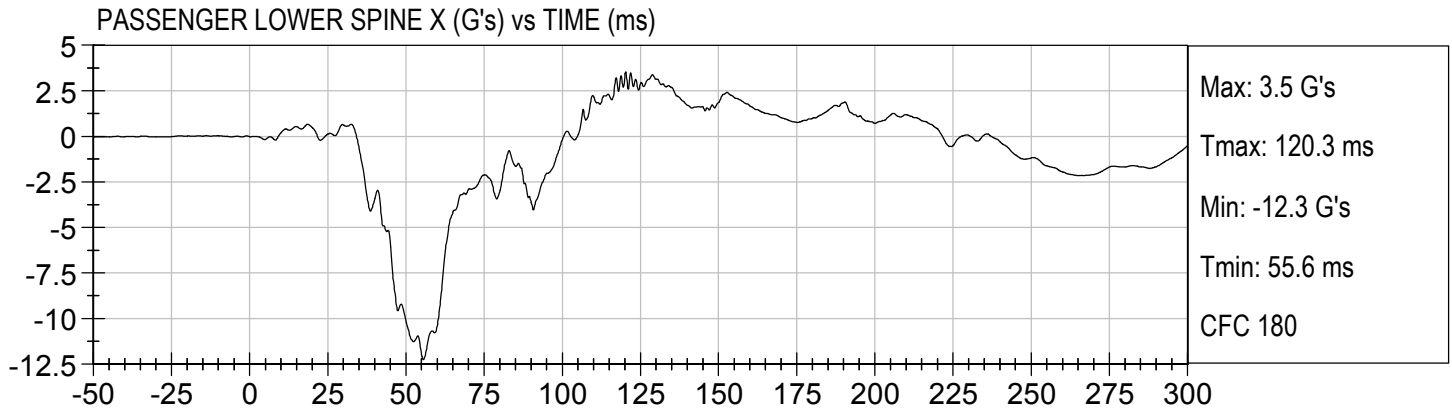
DRIVER MAX RIB DISPLACEMENT (mm) vs TIME (ms)

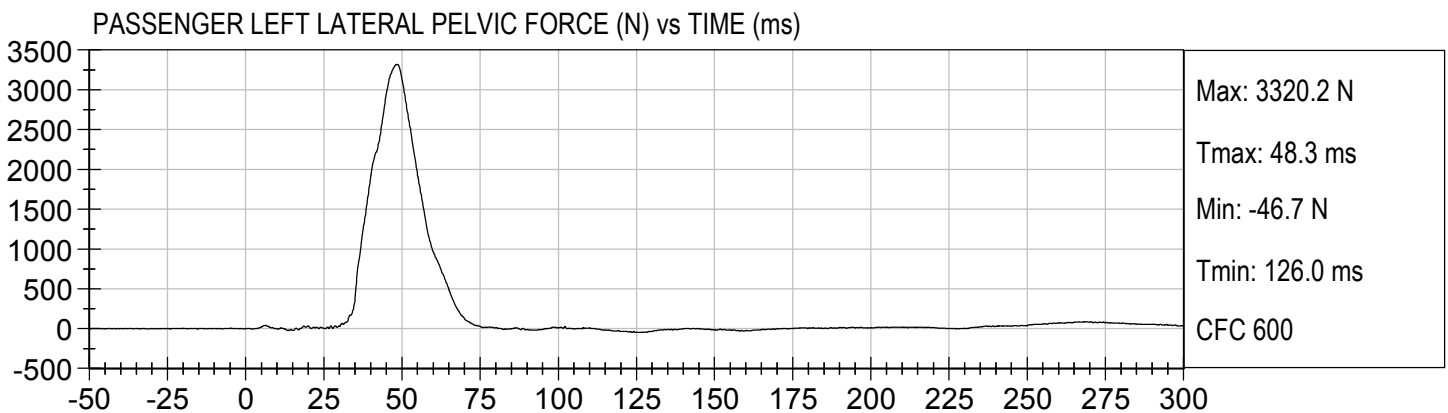
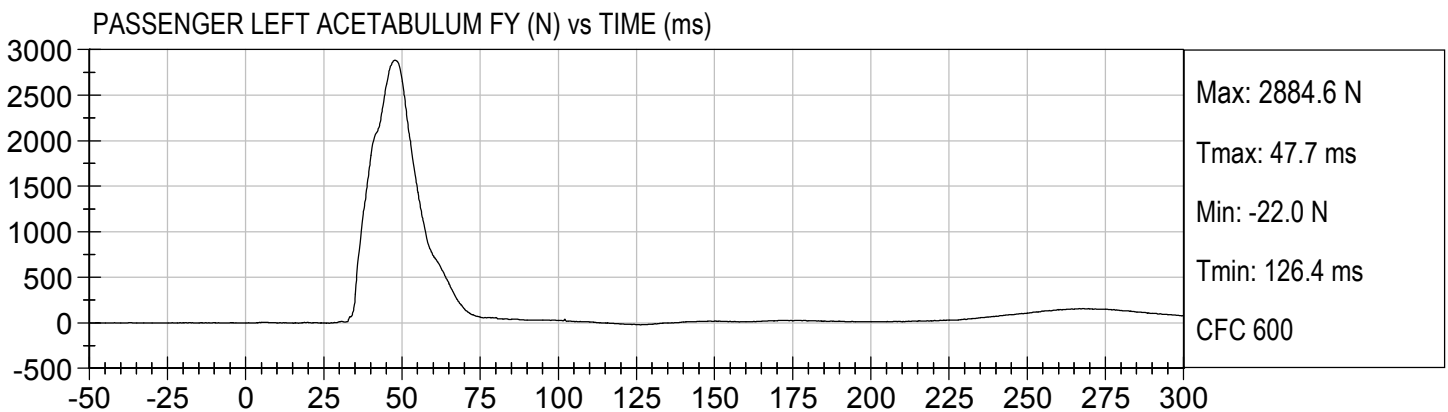
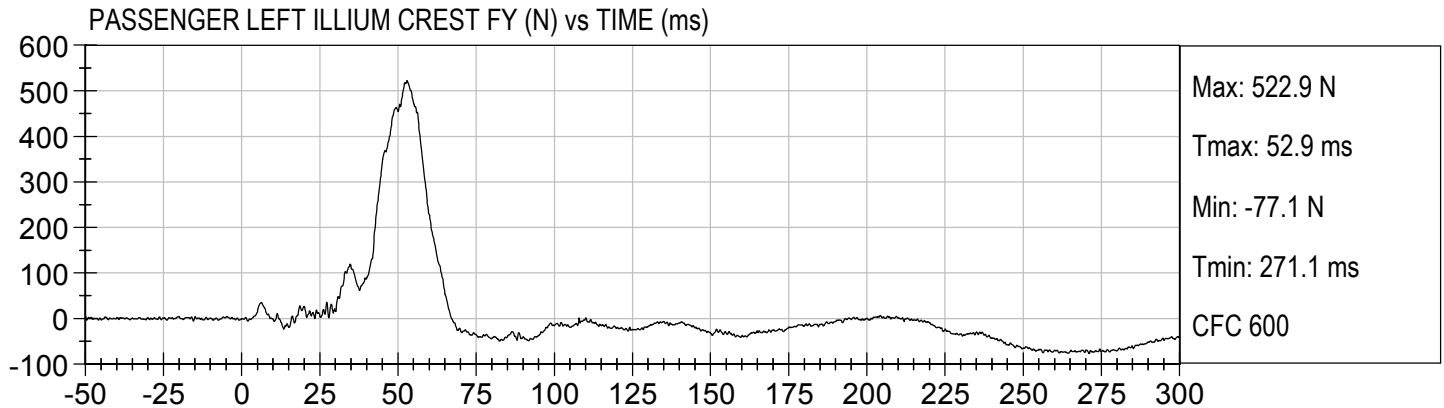












APPENDIX C
DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

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

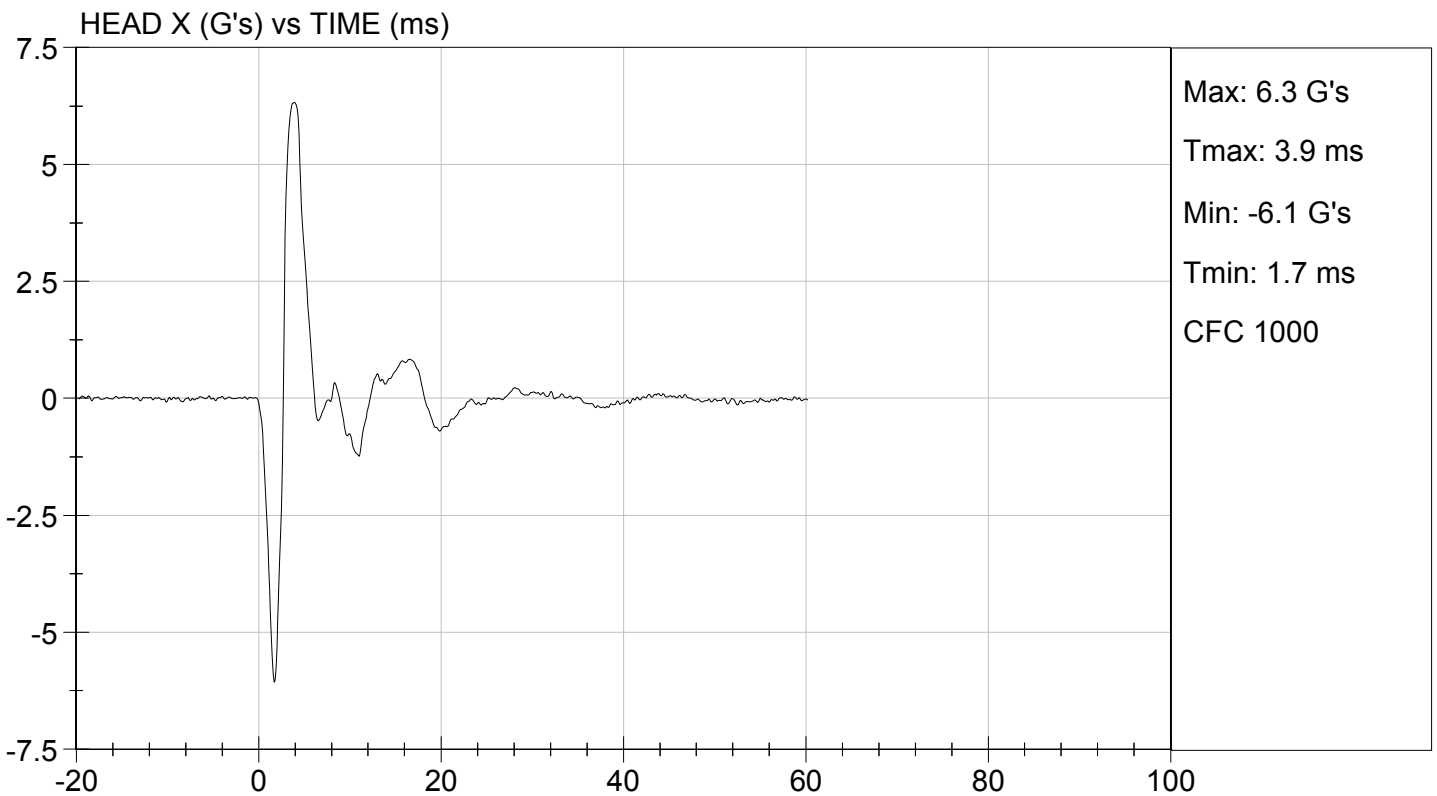
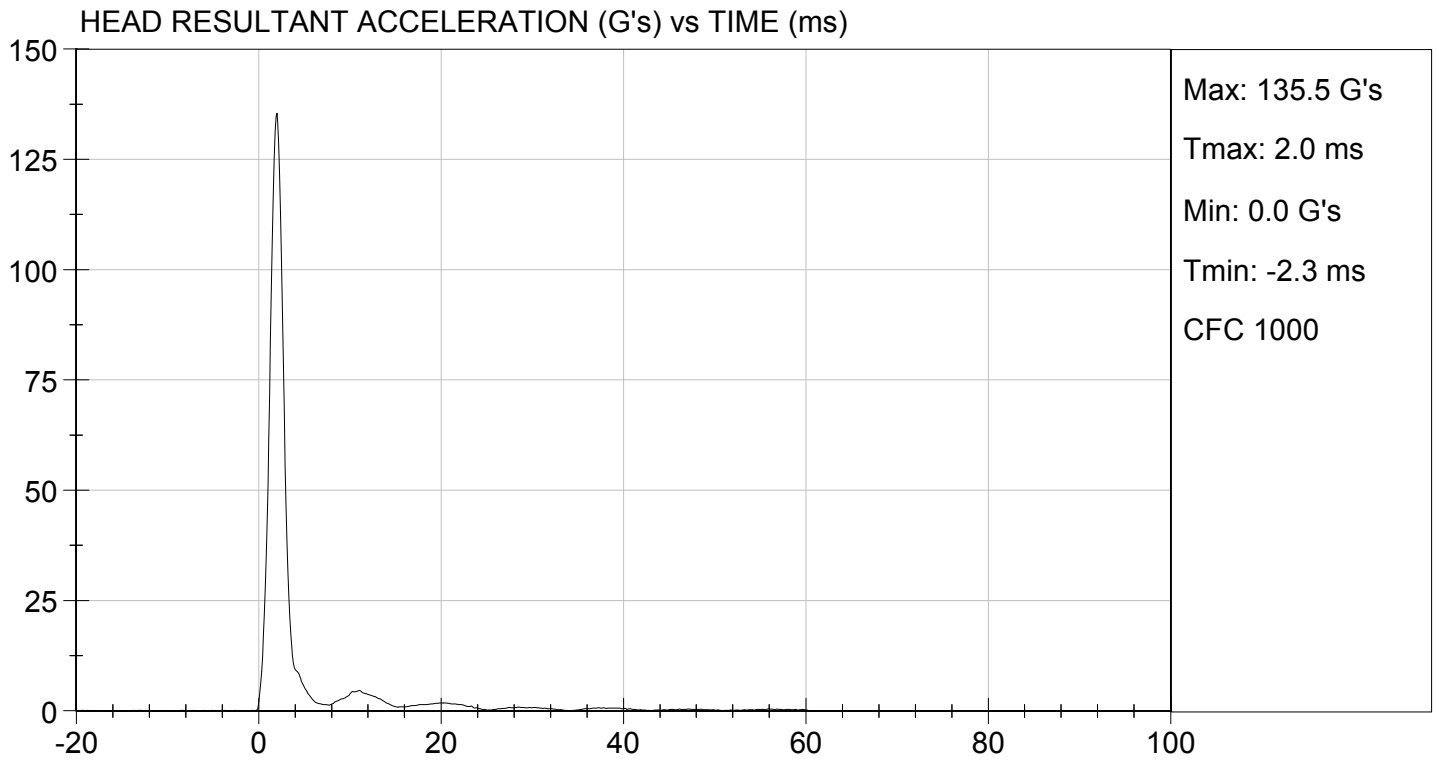
Test ID: D143991

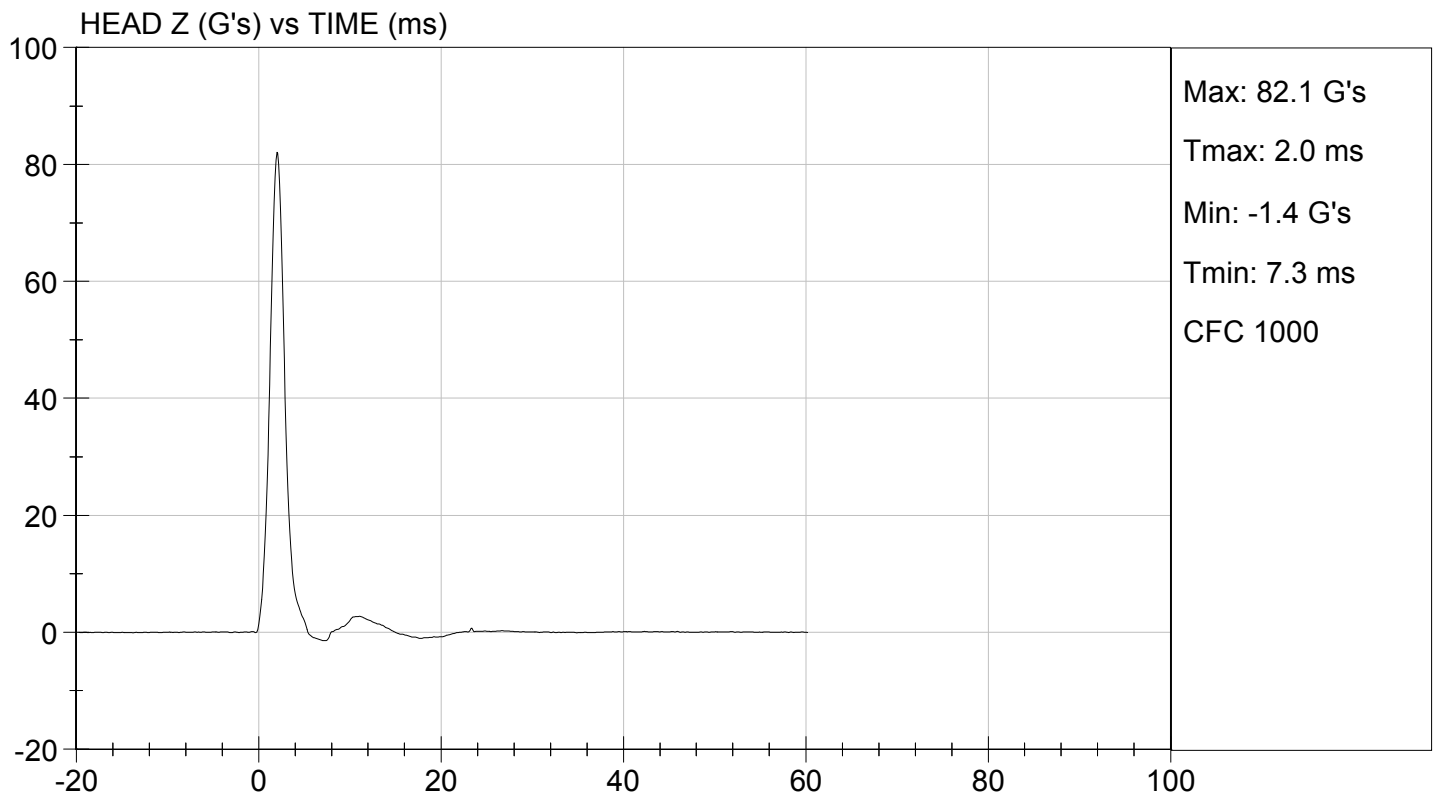
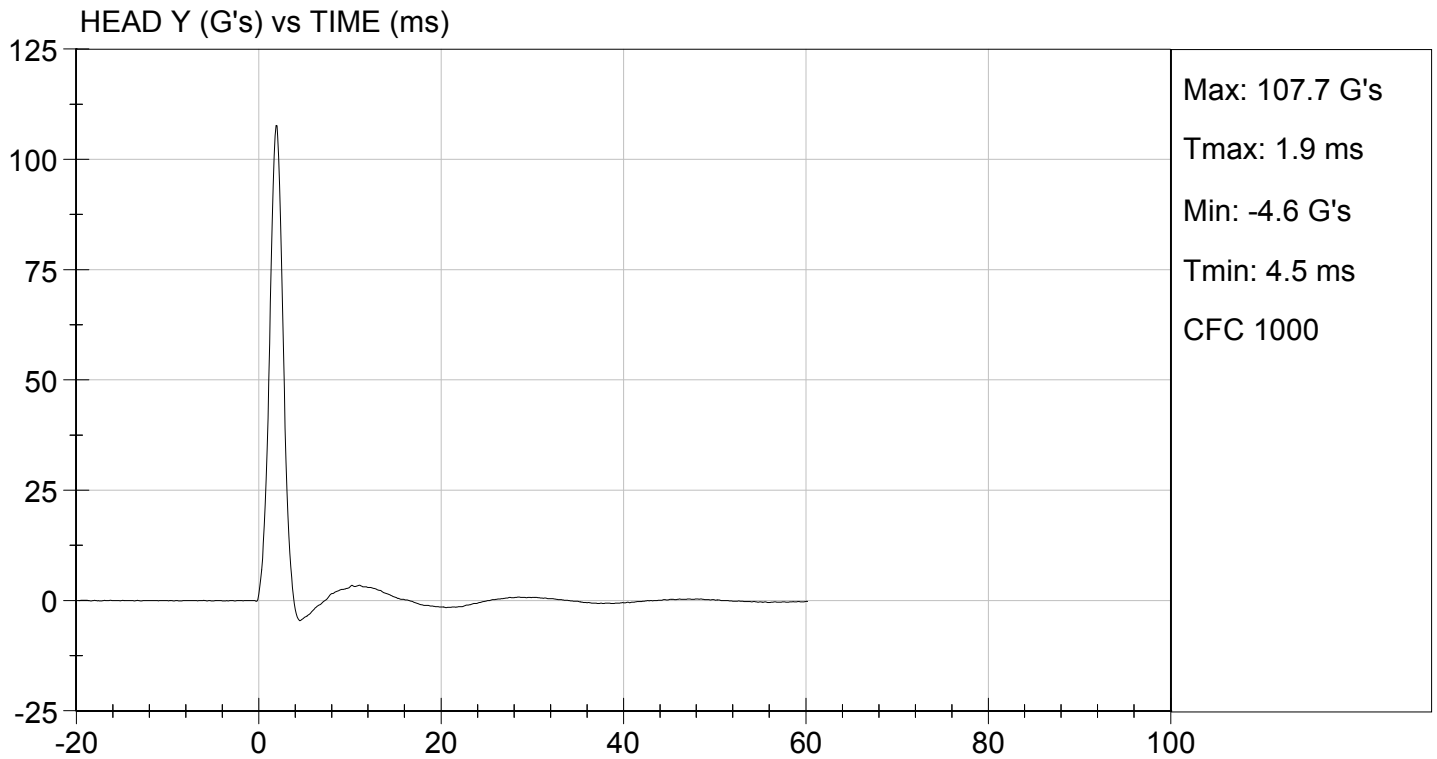
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Peak Resultant Acceleration	G's	125 to 155	135	Pass
Peak Longitudinal Acceleration	G's	<= +/- 15.0	6.3	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
Overall Test Results				Pass

Maxime Chamberland
Laboratory Technician

11/13/2014
Test Date

Jessica Hall
Approved By





MGA RESEARCH CORPORATION
NECK PENDULUM TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D143992

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22.1	Pass
Laboratory Relative Humidity		%	10 to 70	23	Pass
Pendulum Speed		m/s	3.30 to 3.50	3.46	Pass
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	-0.02	Pass
	3 ms	m/s	-0.25 to -0.375	-0.34	Pass
	14 ms	m/s	-3.20 to -3.70	-3.27	Pass
	17 ms	m/s	>= -3.70	-3.32	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	50.1	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	57.7	Pass
Head Rotation Decay Time to 0 Degree		ms	53.0 to 88.0	61.1	Pass
Overall Results					Pass

Maxime Chamberland
Laboratory Technician

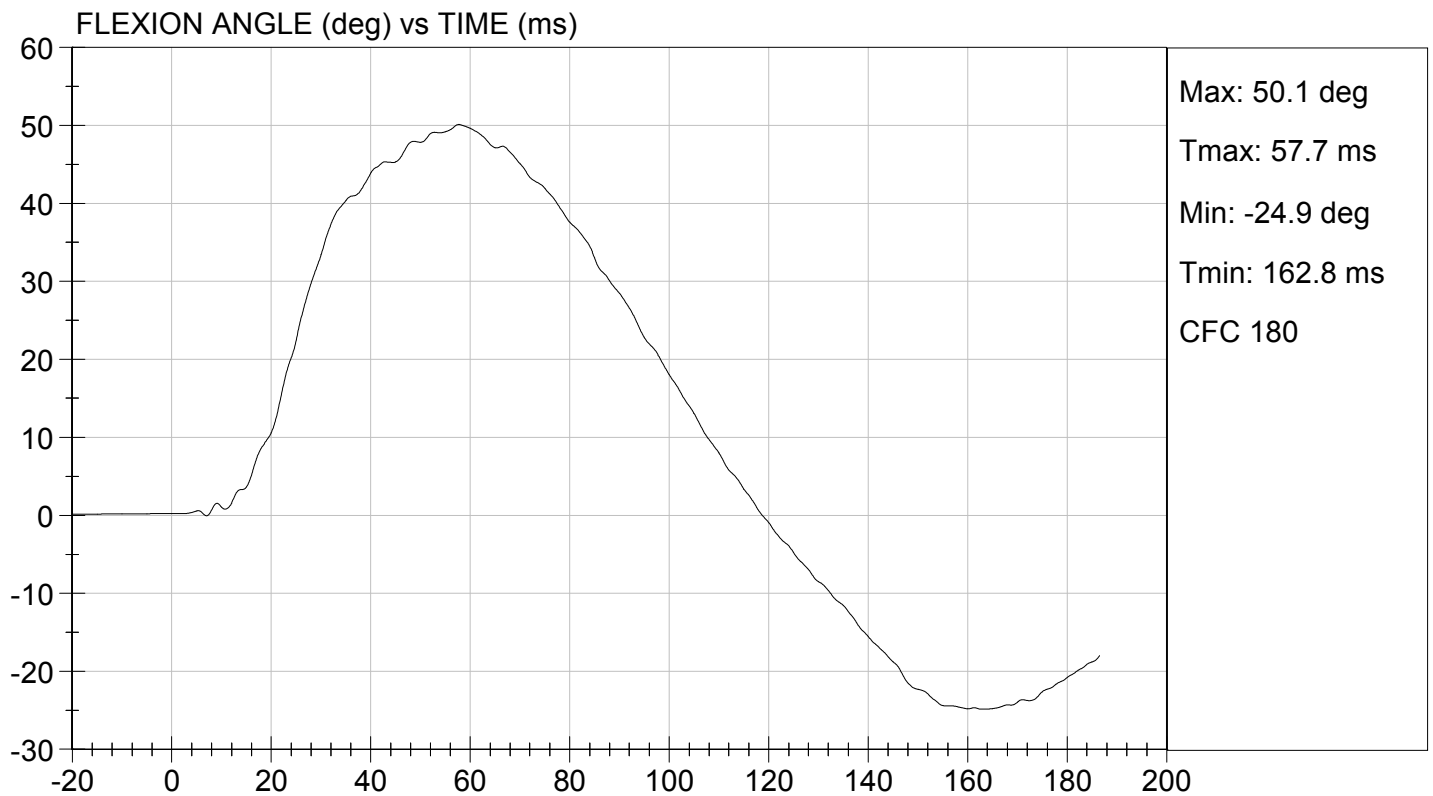
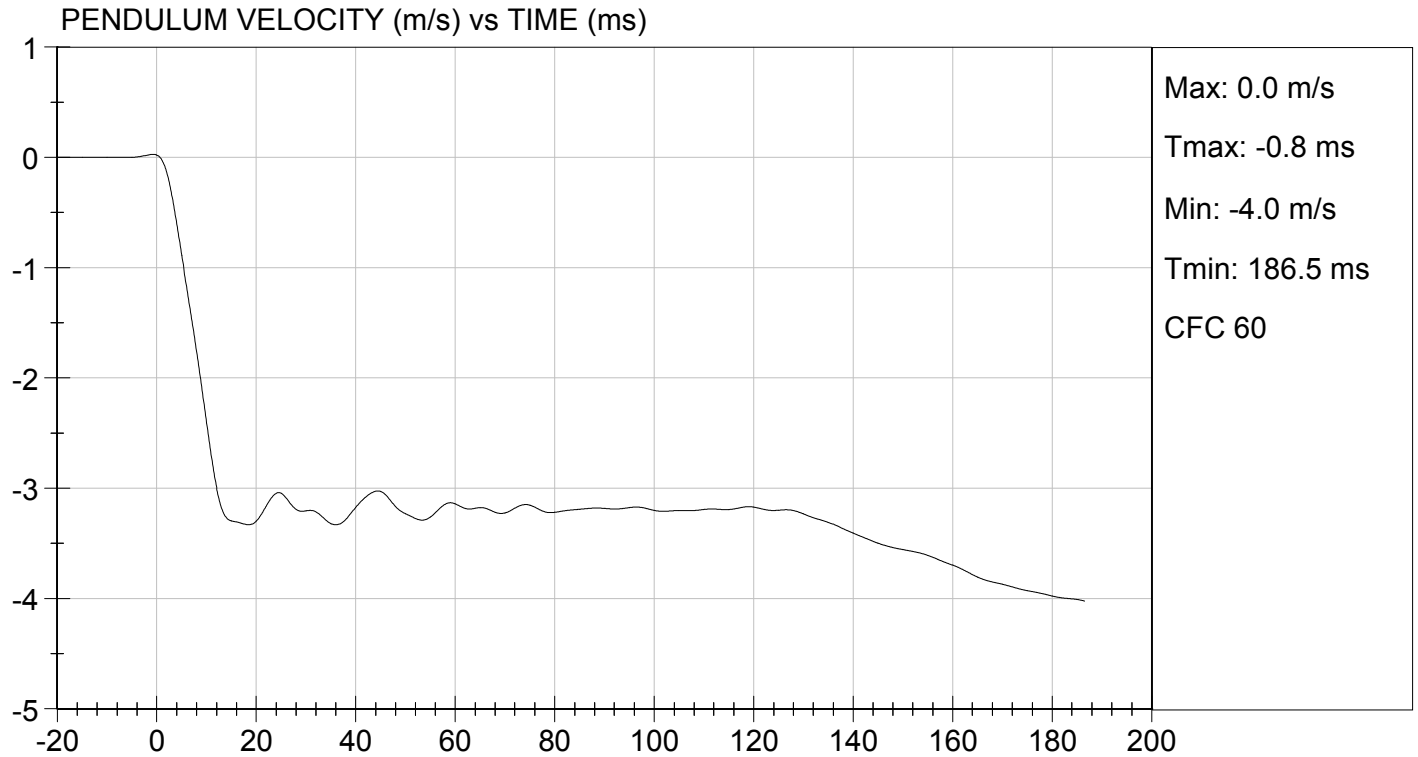
11/13/2014
Test Date

Jessica Hall
Approved By



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

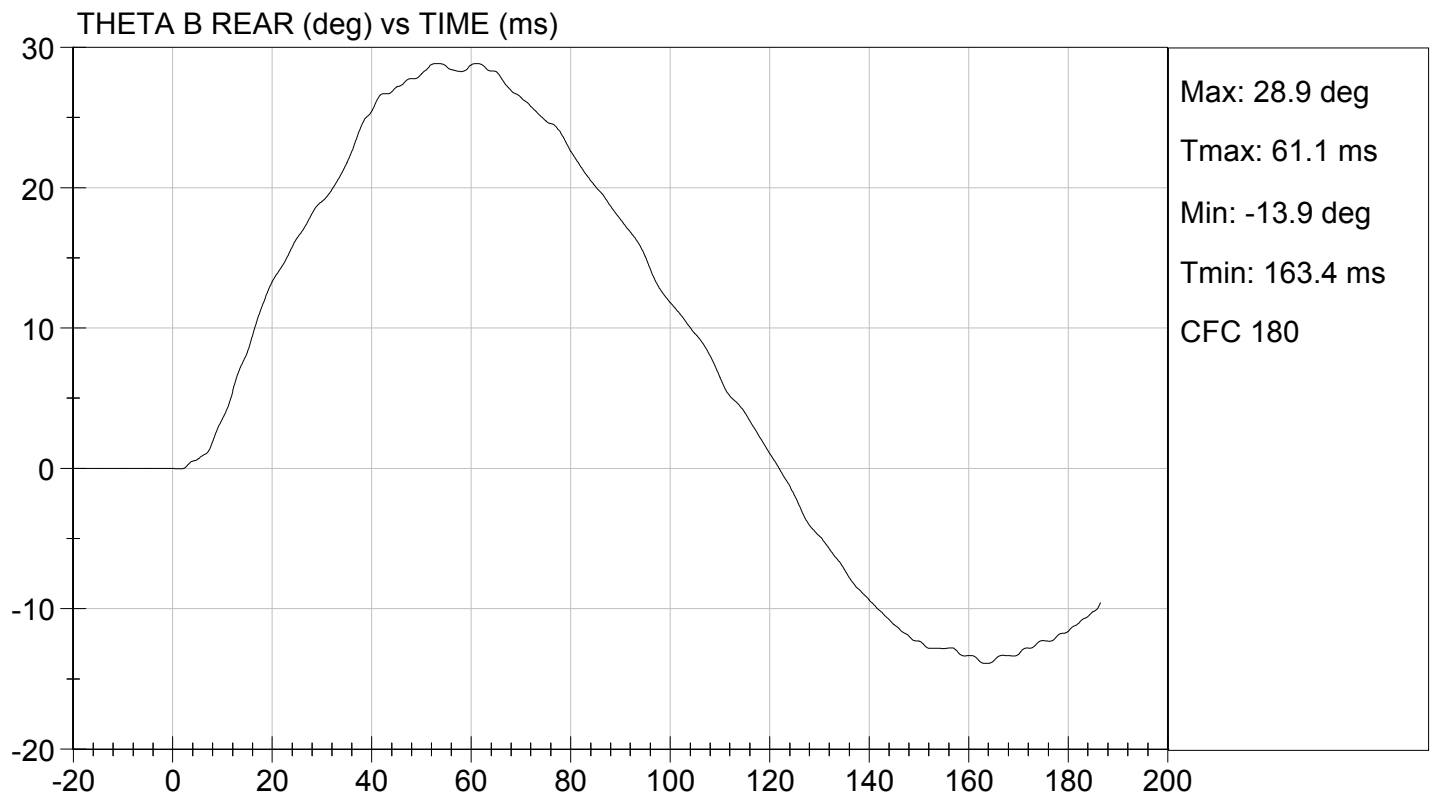
TEST DATE: 11/13/2014
TEST #: D143992





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

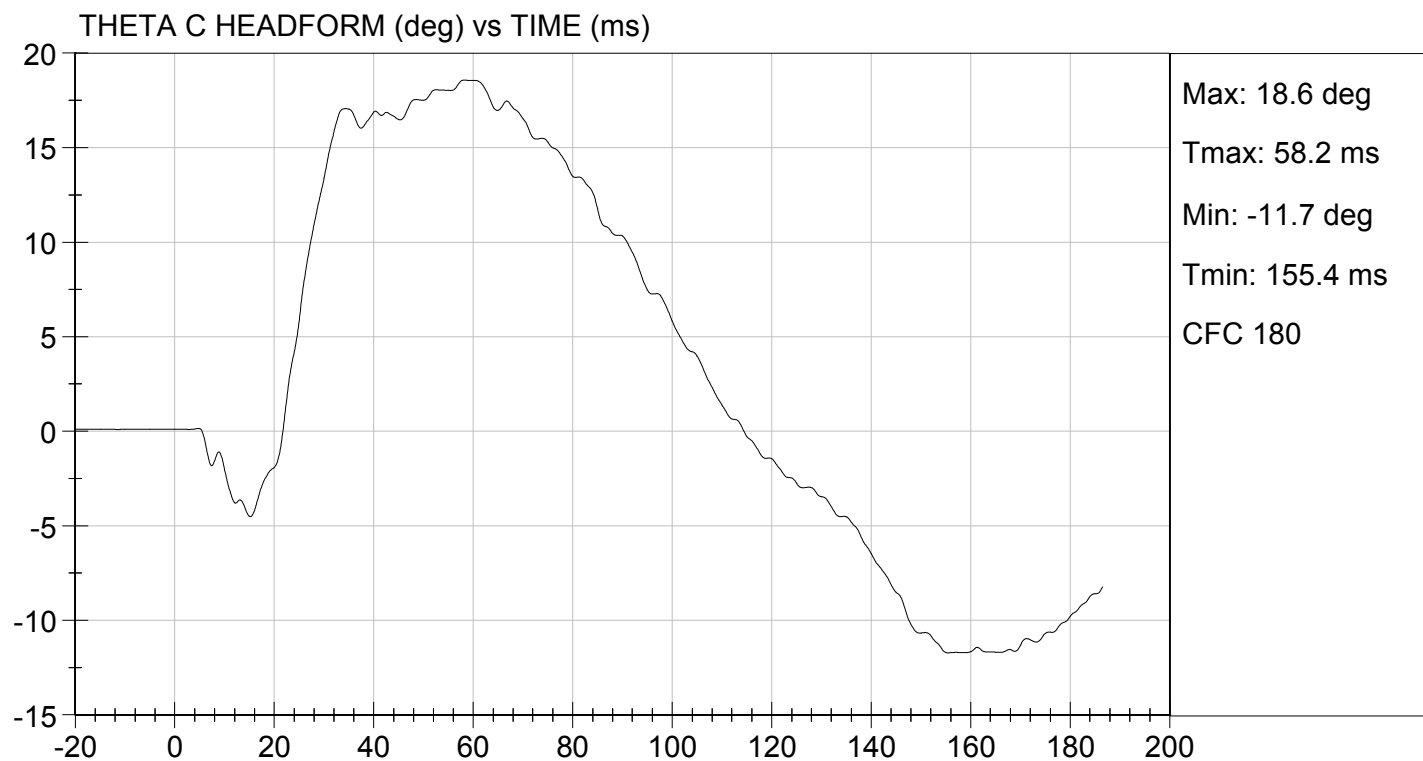
TEST DATE: 11/13/2014
TEST #: D143992





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

TEST DATE: 11/13/2014
TEST #: D143992



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

ES-2re DUMMY

ATD Serial No: 032

Test I.D: D143993

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Pendulum Speed	m/s	4.20 to 4.40	4.38	Pass
Peak Impactor Acceleration	G's	7.5 to 10.5	9.0	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

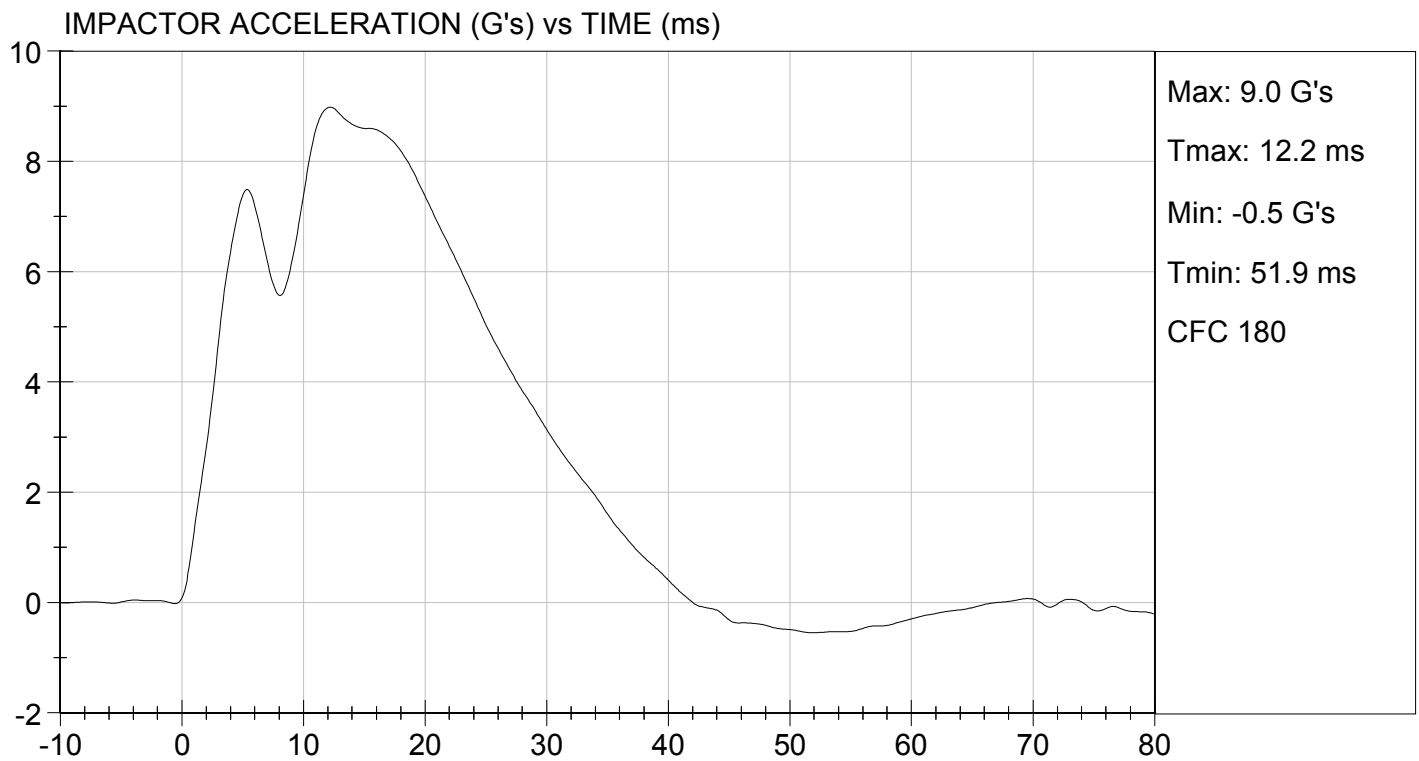
11/13/2014
Test Date

Jessica Hall
Approved By



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

TEST DATE: 11/13/2014
TEST #: D143993



MGA RESEARCH CORPORATION

UPPER RIB TEST

ES-2re DUMMY

ATD Serial No: 032

Test I.D: D143994

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Displacement at 459 mm	mm	36.0 to 40.0	39.1	Pass
Displacement at 815 mm	mm	46.0 to 51.0	48.2	Pass
Overall Test Results				Pass

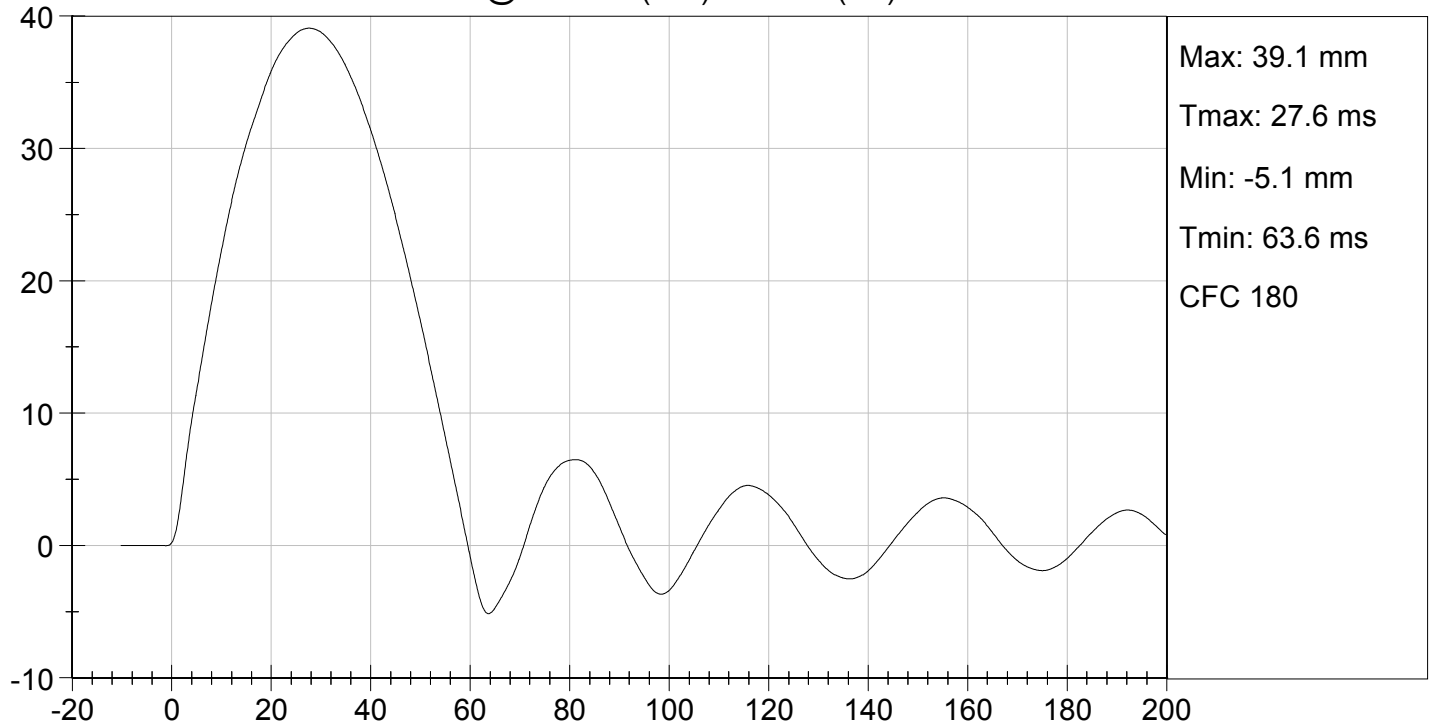
David Schoedel
Laboratory Technician

11/13/2014
Test Date

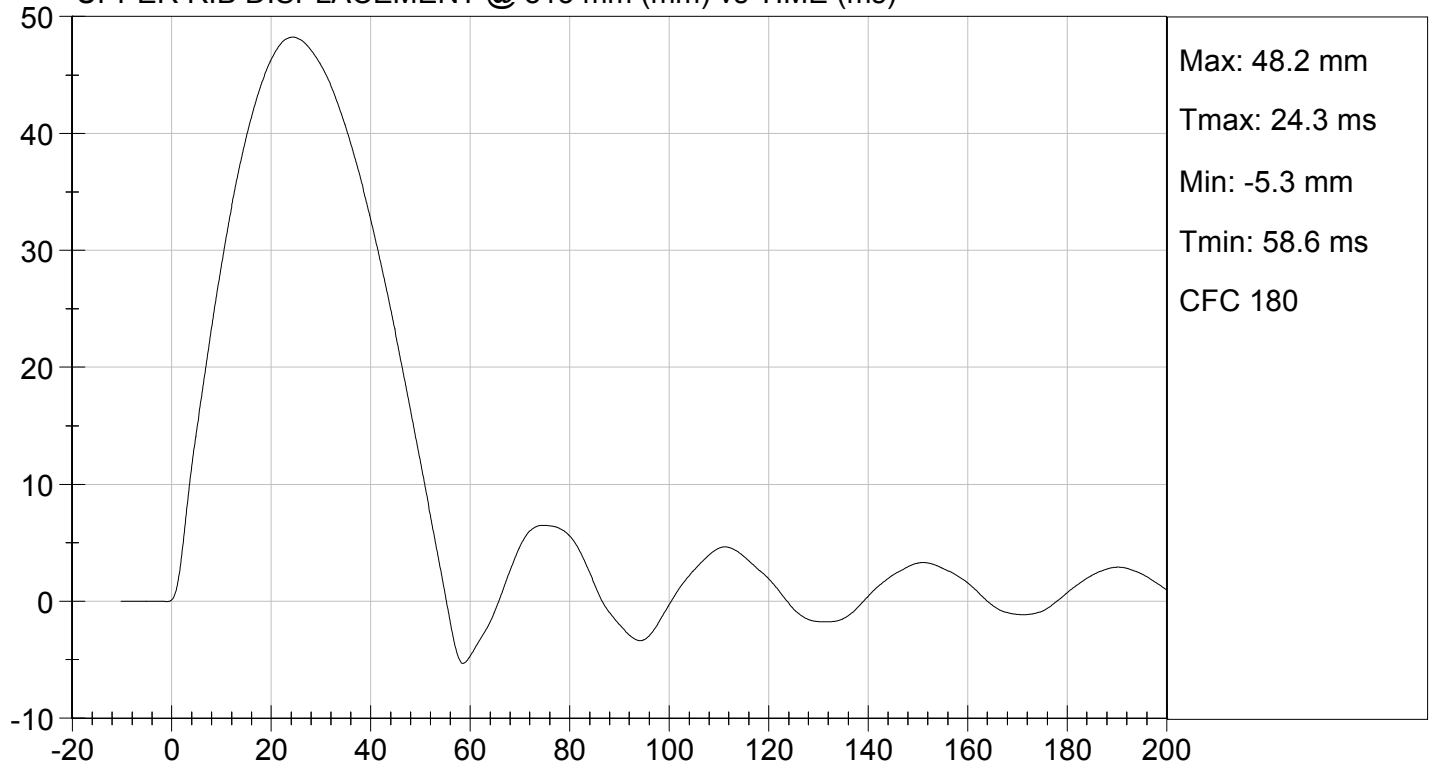
Jessica Hall
Approved By



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: D143995

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Displacement at 459 mm	mm	36.0 to 40.0	38.6	Pass
Displacement at 815 mm	mm	46.0 to 51.0	48.7	Pass
Overall Test Results				Pass

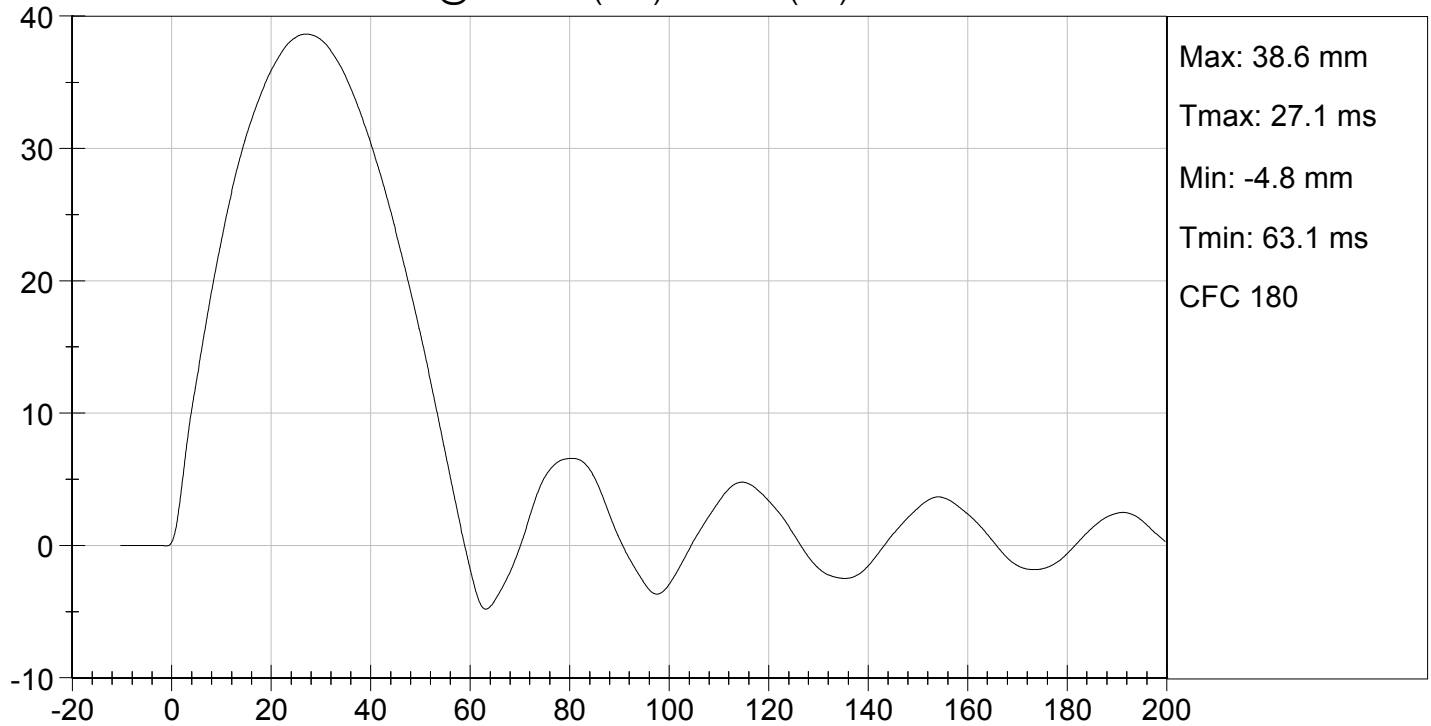
David Schoedel
Laboratory Technician

11/13/2014
Test Date

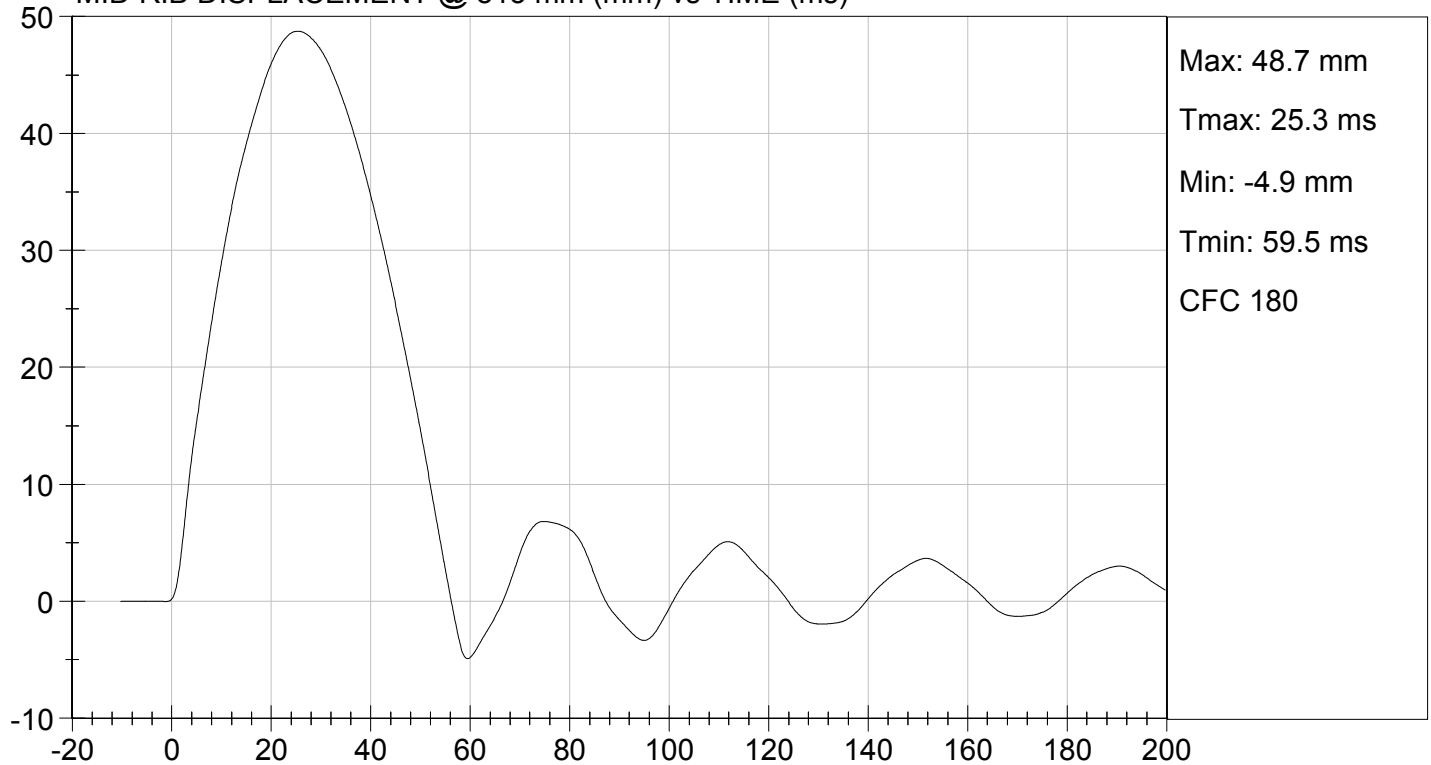
Jessica Hall
Approved By



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: D143996

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Displacement at 459 mm	mm	36.0 to 40.0	39.3	Pass
Displacement at 815 mm	mm	46.0 to 51.0	49.8	Pass
			Overall Test Results	Pass

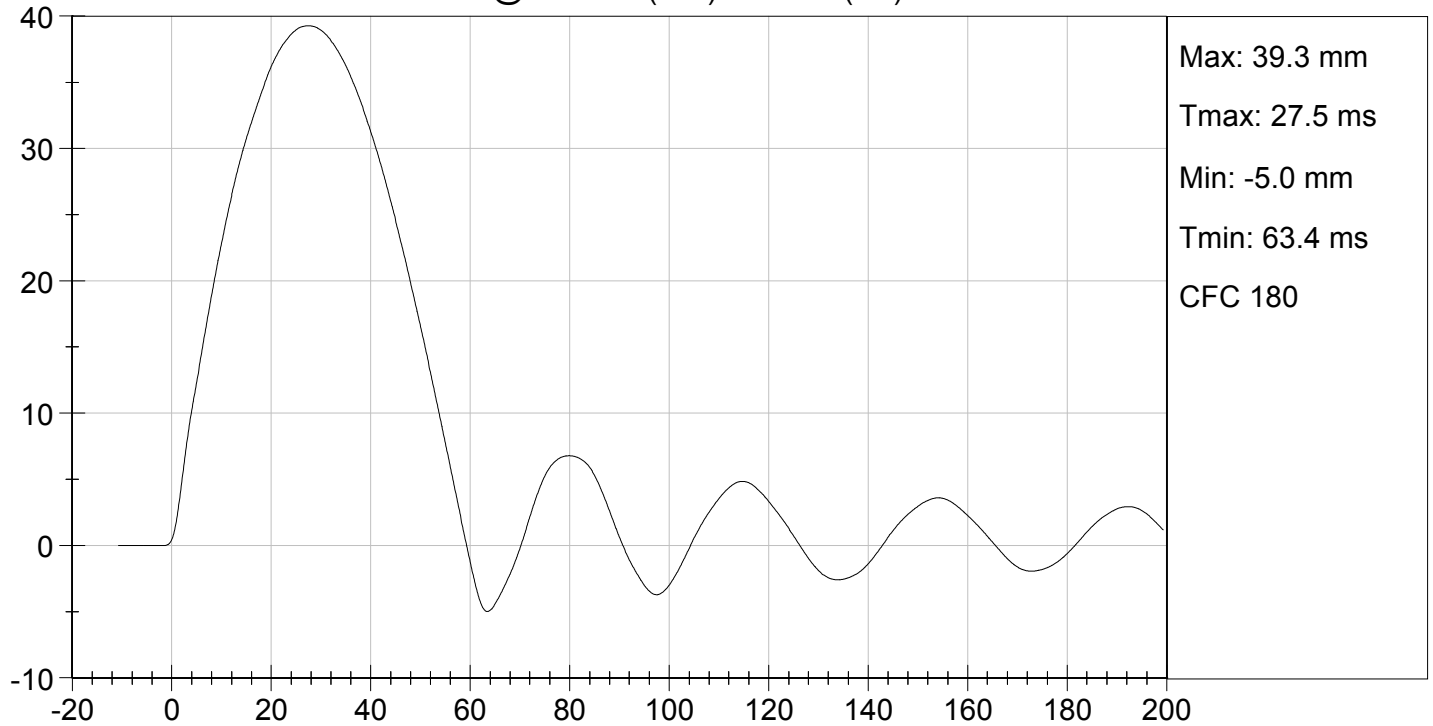
David Schoedel
Laboratory Technician

11/13/2014
Test Date

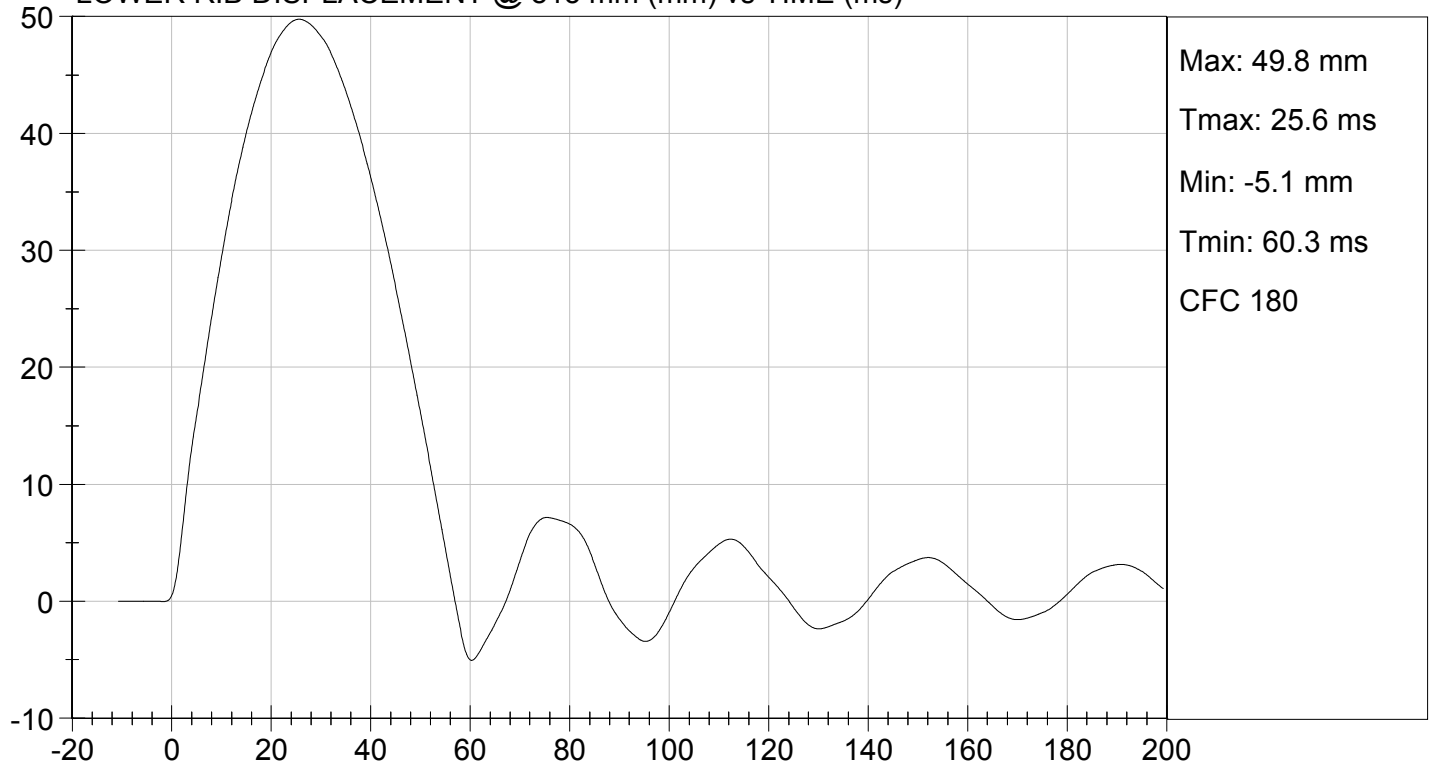
Jessica Hall
Approved By



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: D143990

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.9	Pass
Humidity	%	10 to 70	20	Pass
Probe Speed	m/s	5.40 to 5.60	5.58	Pass
Maximum Impactor Force (after 6 ms)	N	5100 to 6200	5732	Pass
Upper Rib Displacement	mm	34.0 to 41.0	39.1	Pass
Middle Rib Displacement	mm	37.0 to 45.0	42.2	Pass
Lower Rib Displacement	mm	37.0 to 44.0	41.4	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

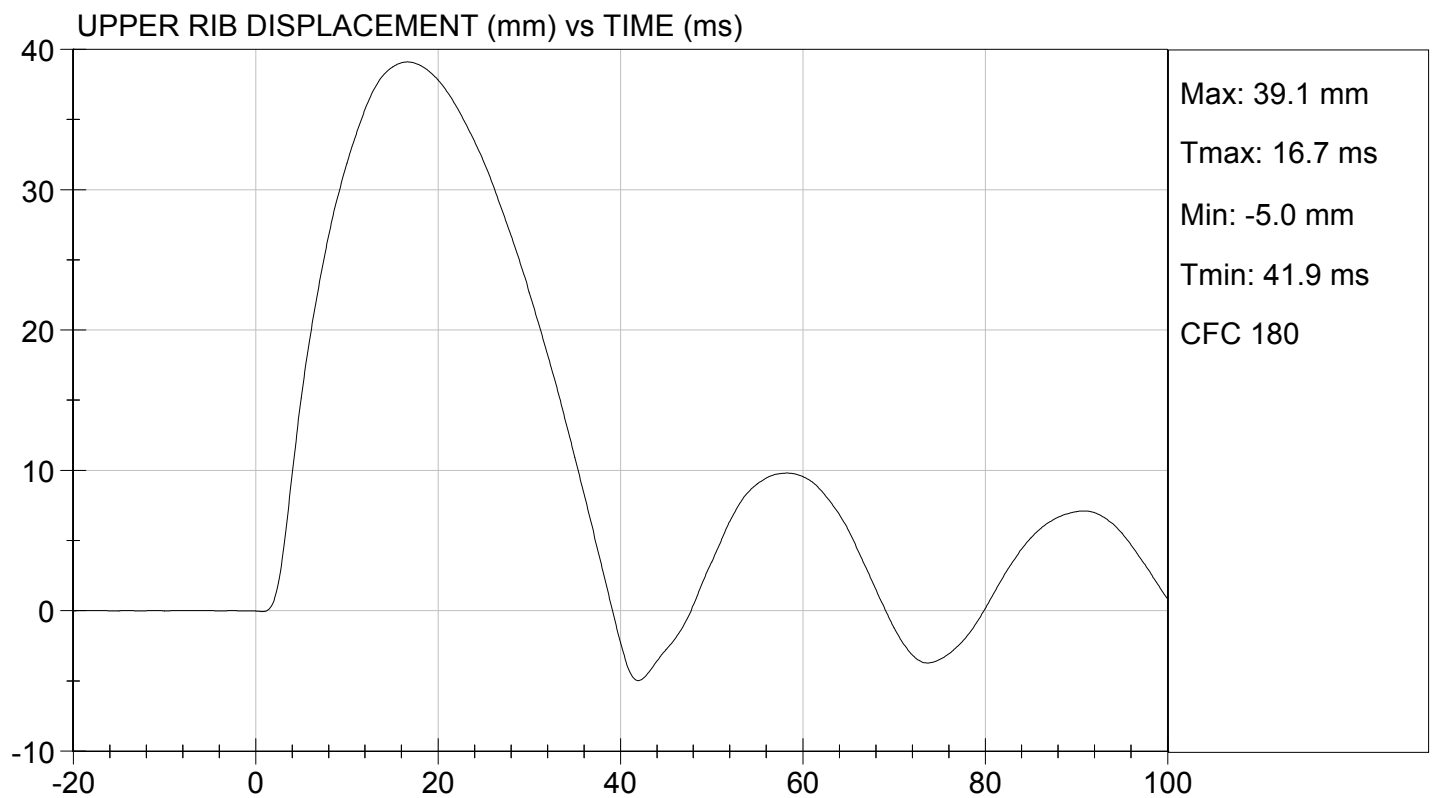
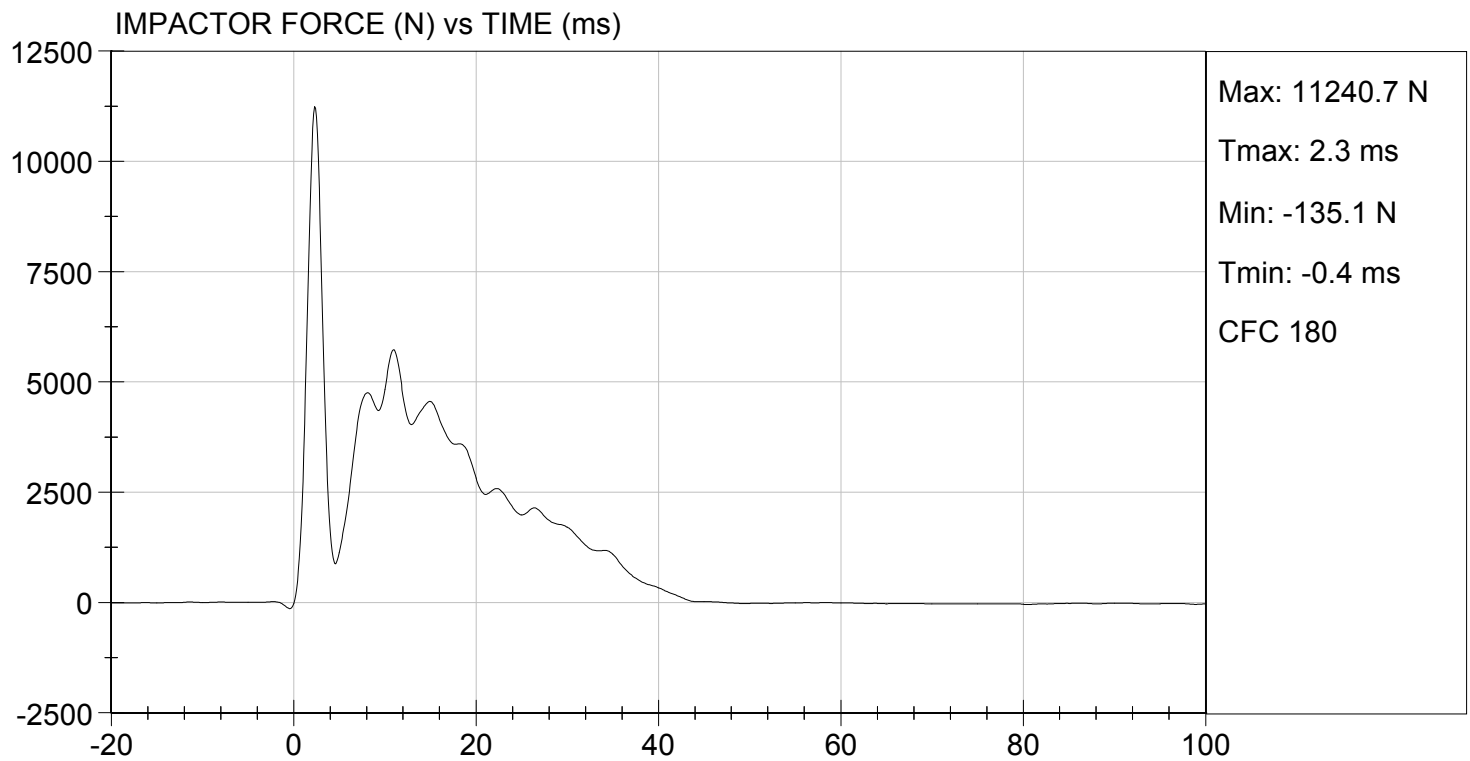
11/13/2014
Test Date

Jessica Hall
Approved By



TEST DESC: THORAX IMPACT
VELOCITY: 18.32 ft/s, 5.58 m/s

TEST DATE: 11/13/2014
TEST #: D143990

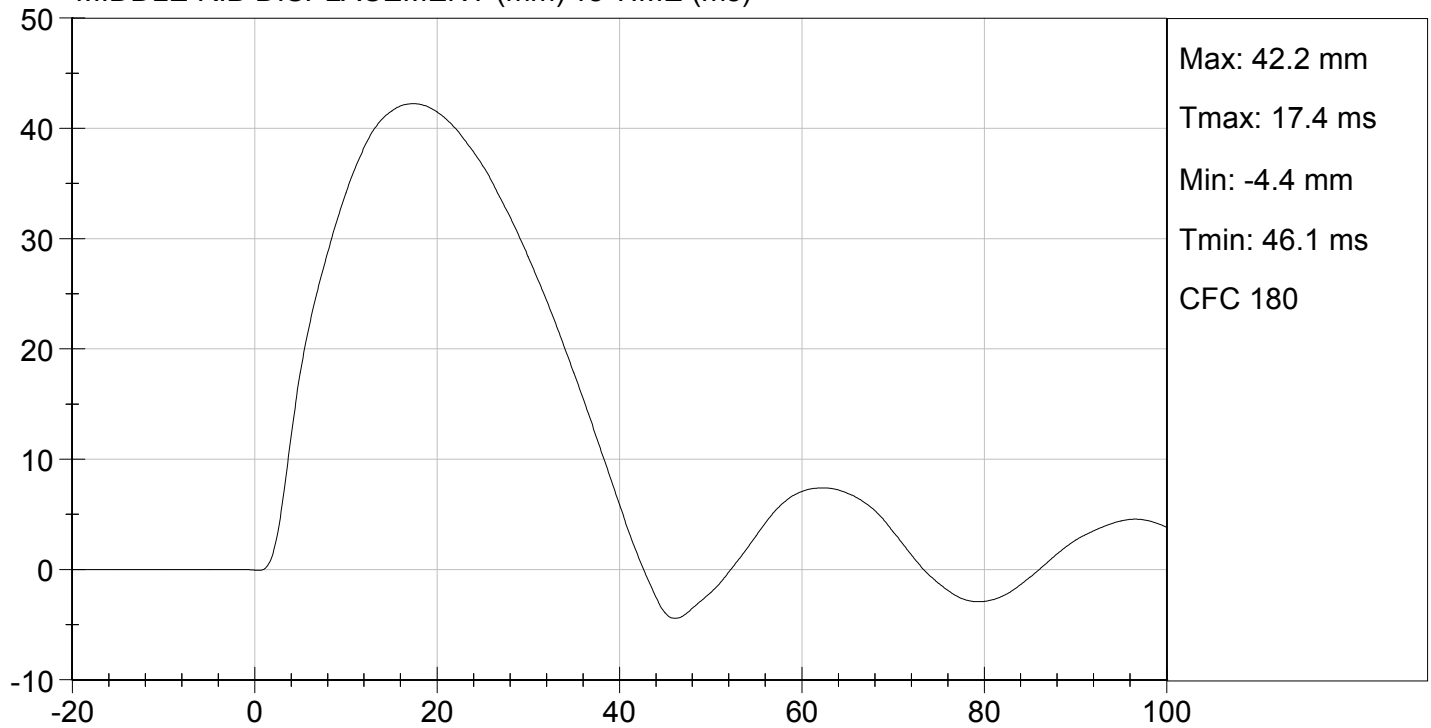




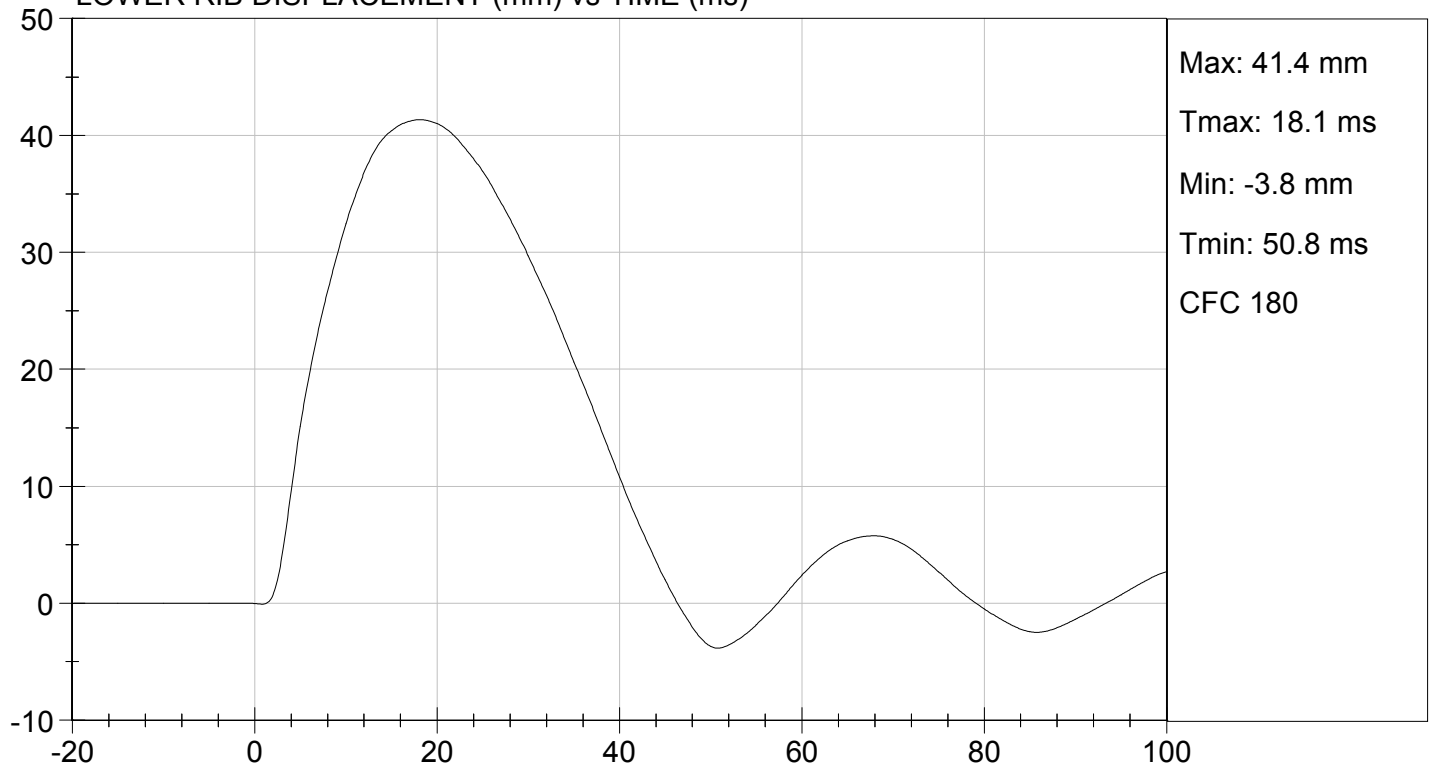
TEST DESC: THORAX IMPACT
VELOCITY: 18.32 ft/s, 5.58 m/s

TEST DATE: 11/13/2014
TEST #: D143990

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: D143997

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Probe Speed	m/s	3.90 to 4.10	4.06	Pass
Maximum Impactor Force	N	4000 to 4800	4385	Pass
Time of Maximum Impactor Force	ms	10.6 to 13.0	11.3	Pass
Maximum Total Abdomen Force	N	2200 to 2700	2266	Pass
Time of Maximum Abdomen Force	ms	10.0 to 12.3	10.7	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

11/13/2014

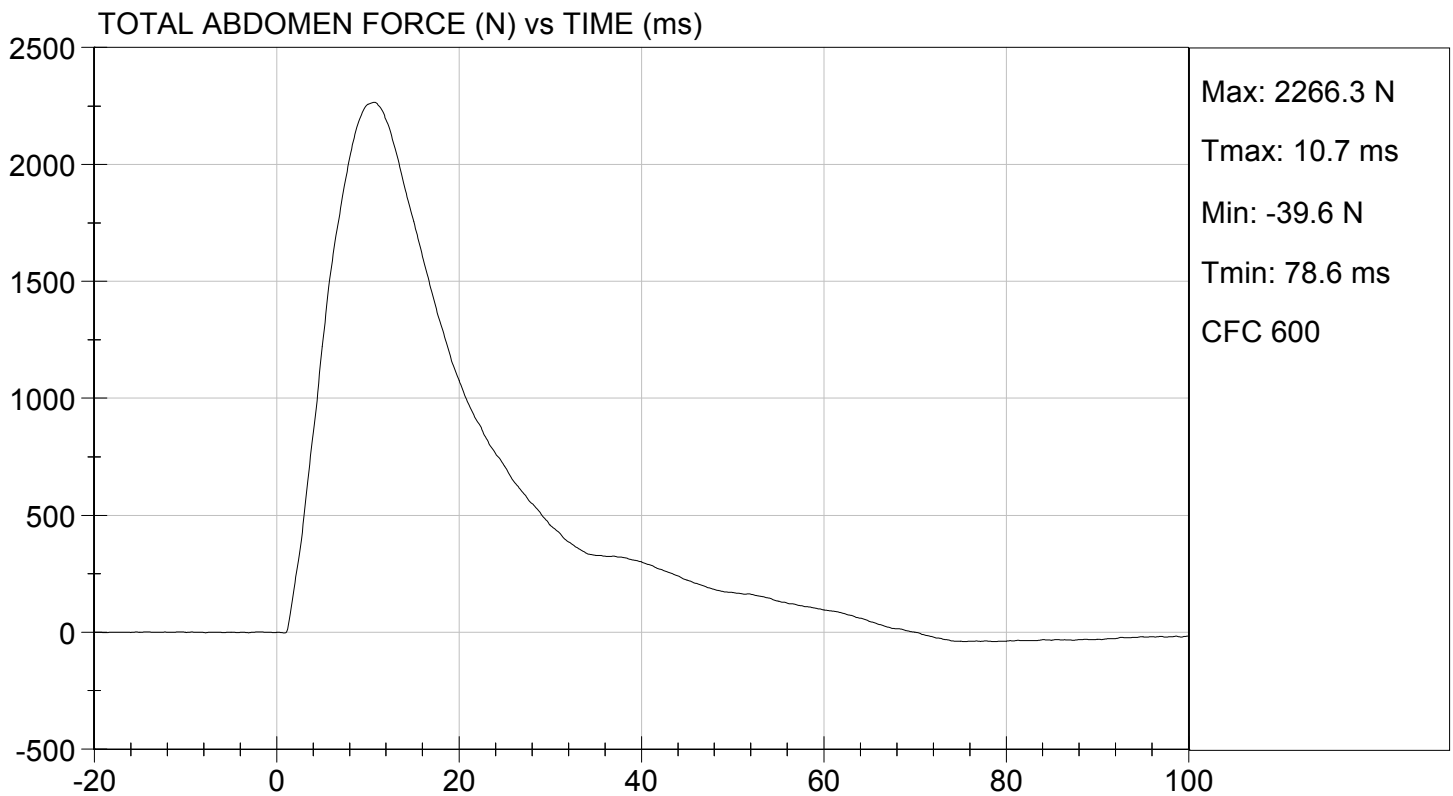
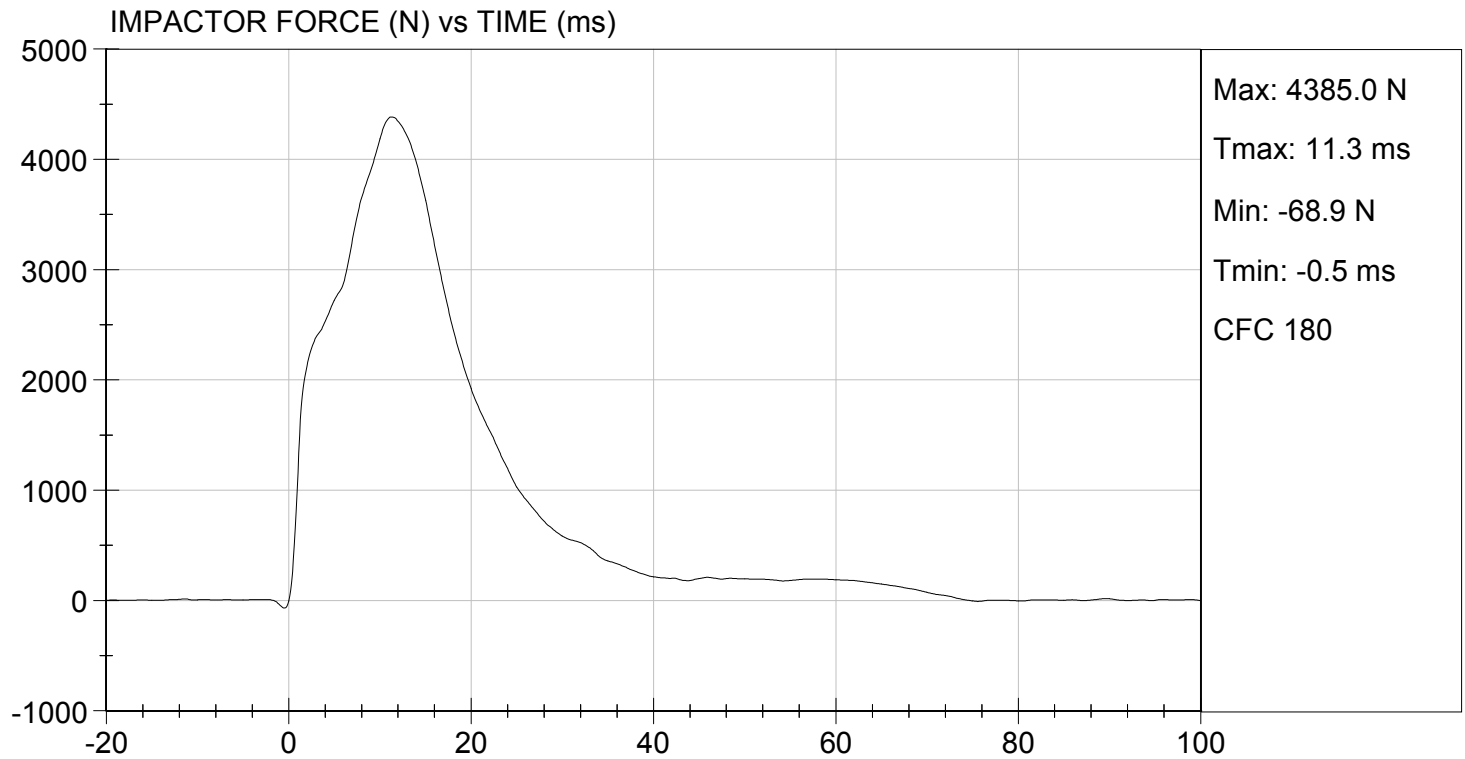
Test Date

Jessica Hall
Approved By



TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.33 ft/s, 4.06 m/s

TEST DATE: 11/13/2014
TEST #: D143997

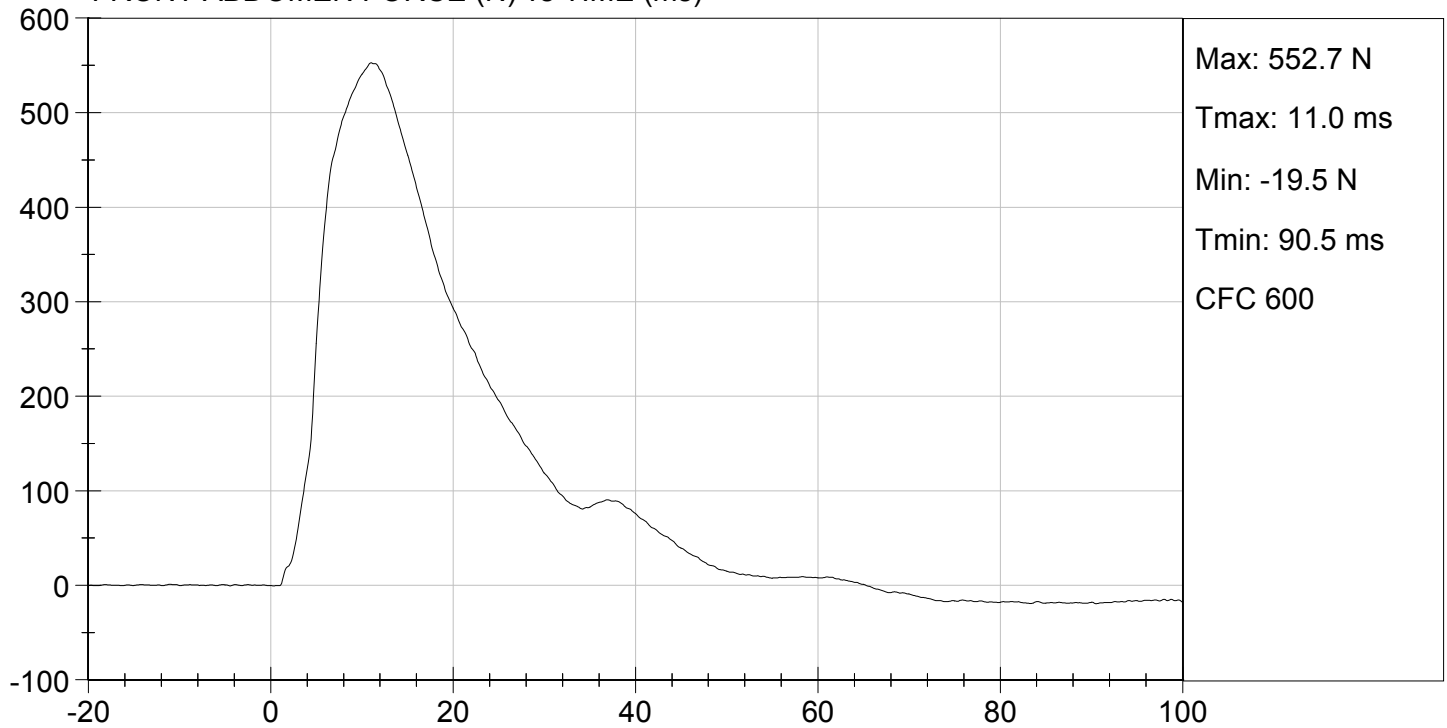




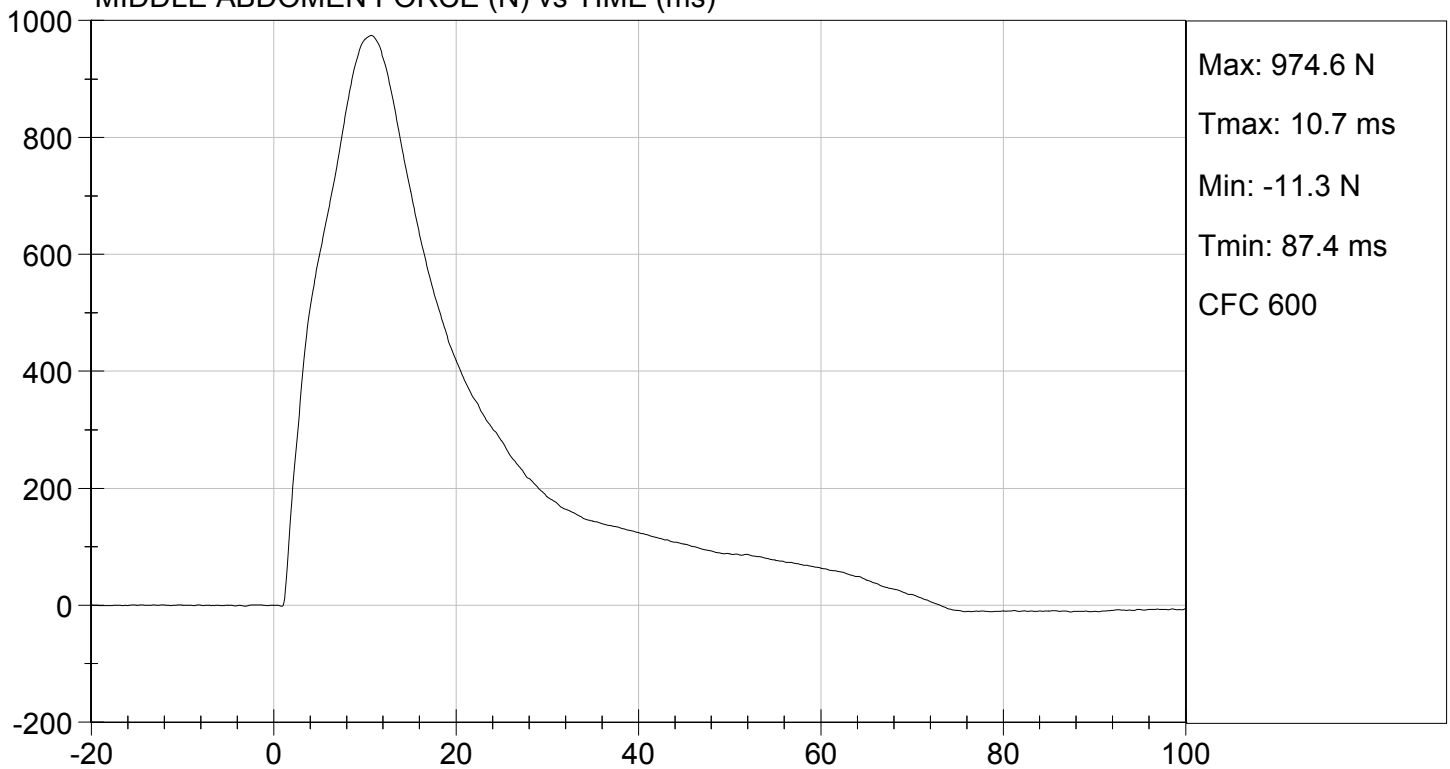
TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.33 ft/s, 4.06 m/s

TEST DATE: 11/13/2014
TEST #: D143997

FRONT ABDOMEN FORCE (N) vs TIME (ms)



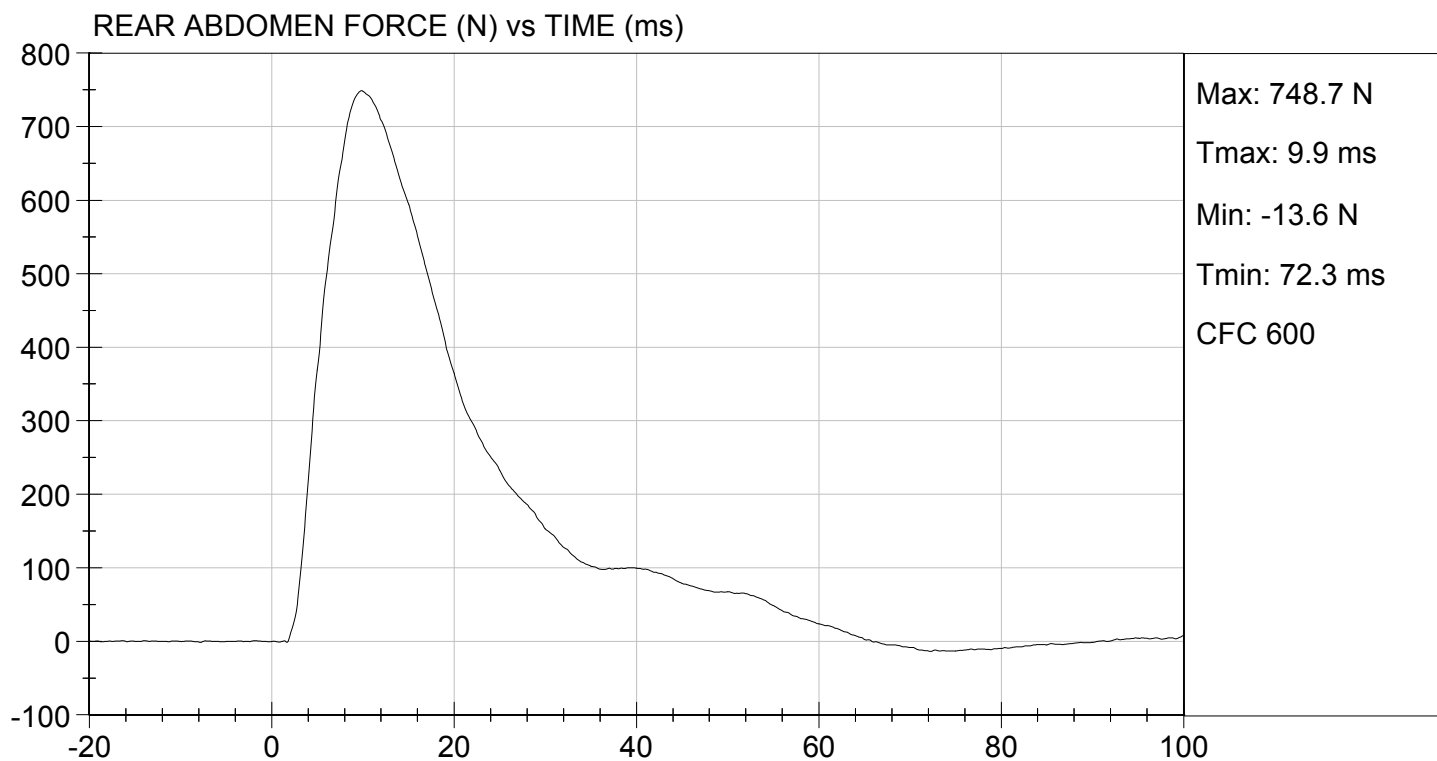
MIDDLE ABDOMEN FORCE (N) vs TIME (ms)





TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.33 ft/s, 4.06 m/s

TEST DATE: 11/13/2014
TEST #: D143997



MGA RESEARCH CORPORATION
LUMBAR SPINE TEST
ES-2re DUMMY

ATD Serial No: 032

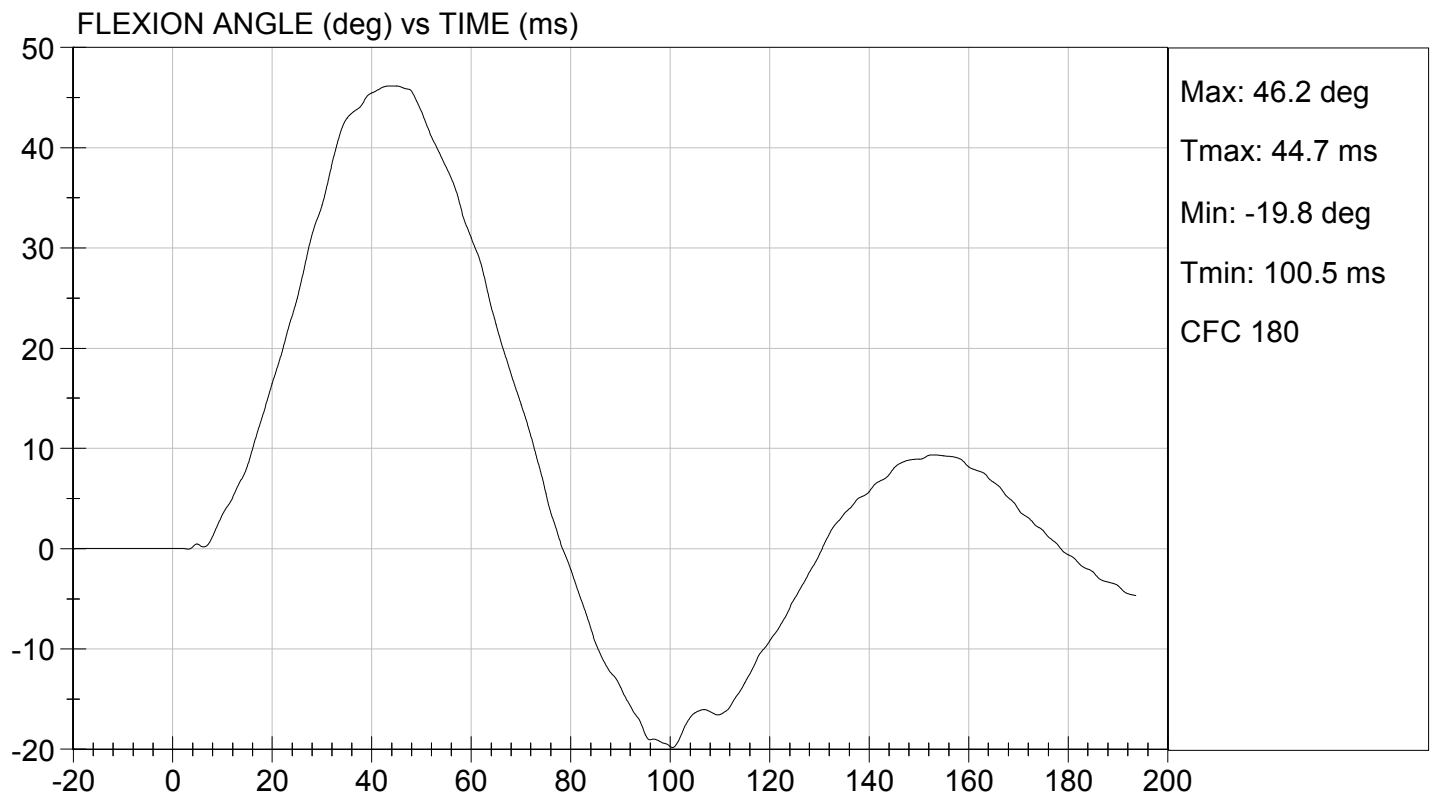
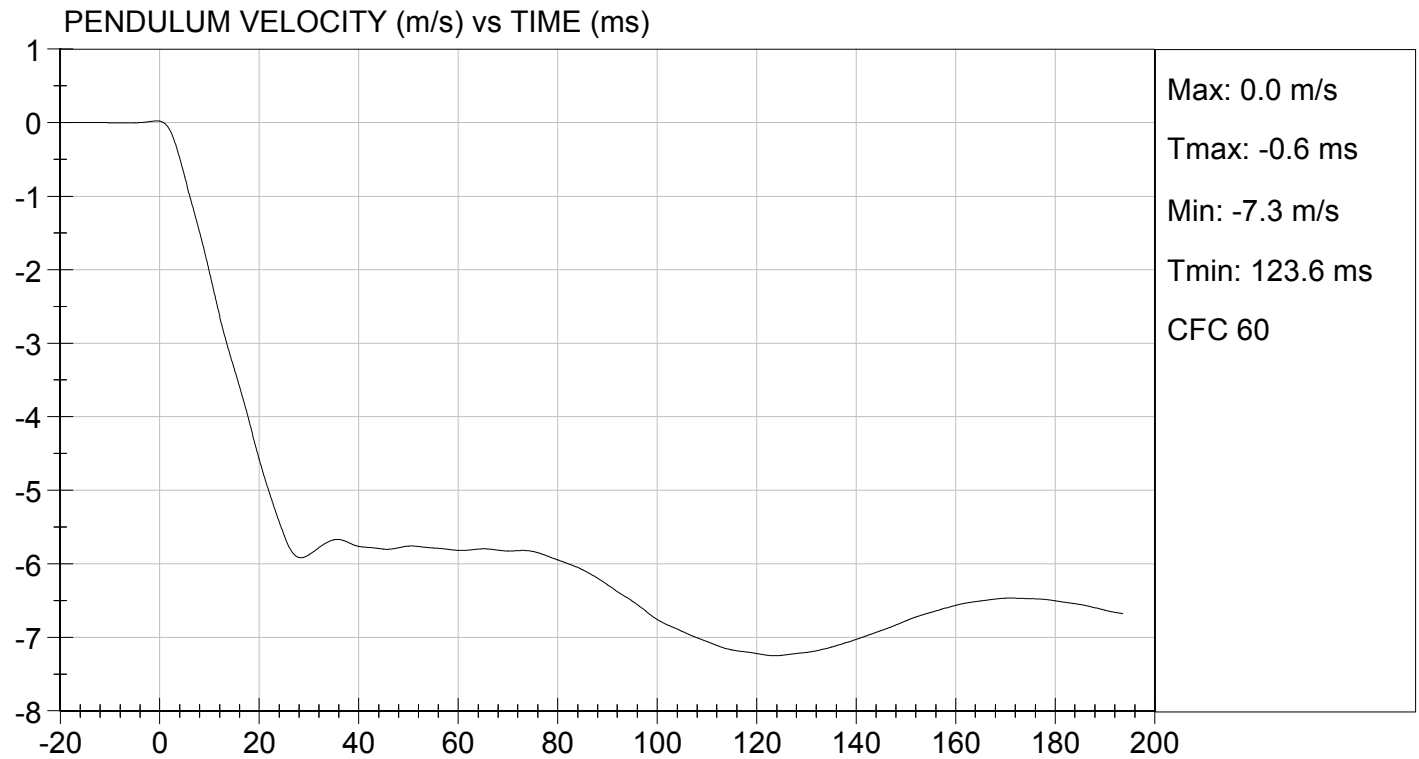
Test I.D: D143998

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22.1	Pass
Laboratory Relative Humidity		%	10 to 70	21	Pass
Pendulum Speed		m/s	5.95 to 6.15	6.12	Pass
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	-0.01	Pass
	3.7 ms	m/s	-0.425 to -0.24	-0.416	Pass
	27 ms	m/s	-6.50 to -5.80	-5.87	Pass
	30 ms	m/s	>= -6.50	-5.88	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	46.2	Pass
Time of Maximum Flexion Angle		ms	39.0 to 53.0	44.7	Pass
Headform Rotation Decay to Initial Position		ms	37 to 57	42	Pass
Overall Results					Pass

David Schoedel
Laboratory Technician

11/13/2014
Test Date

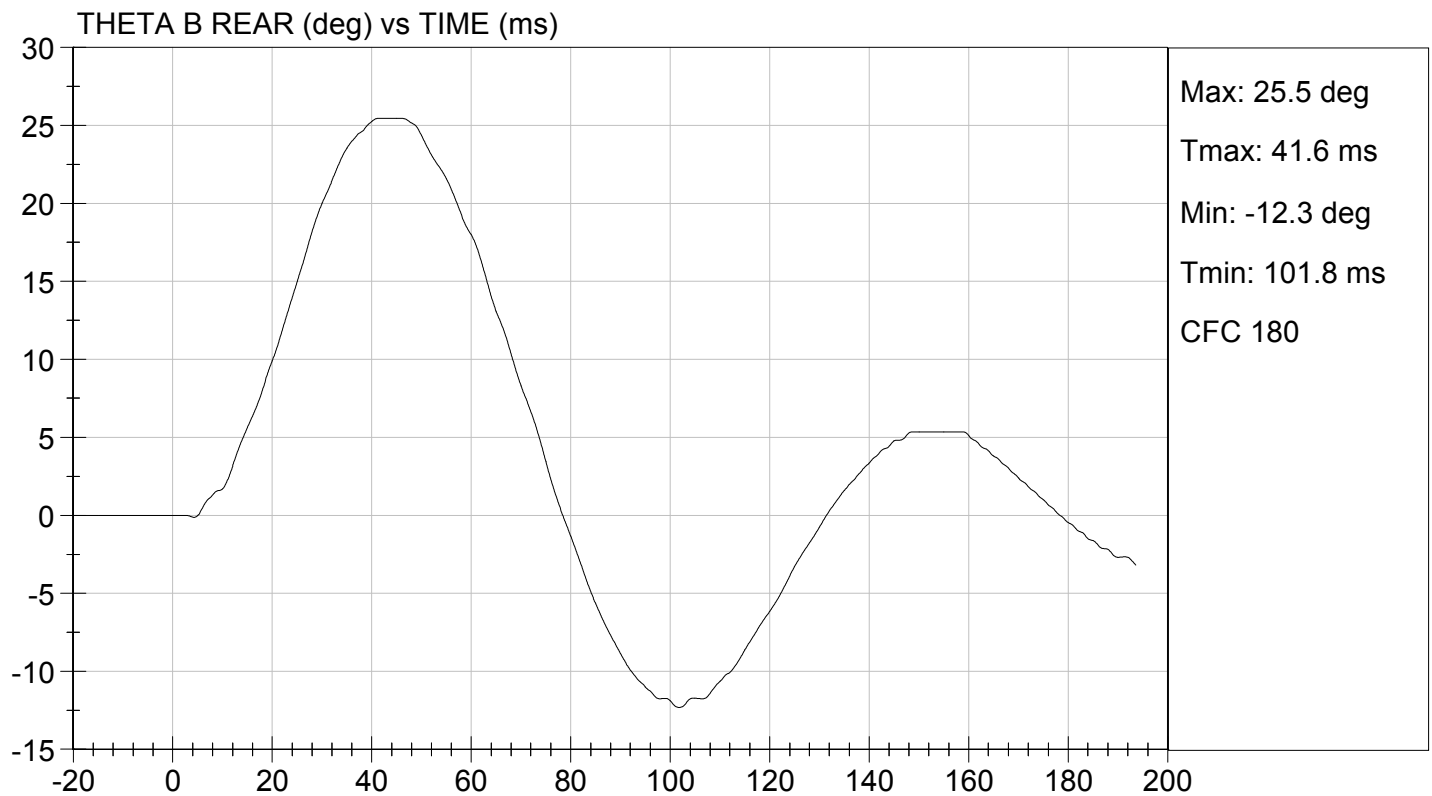
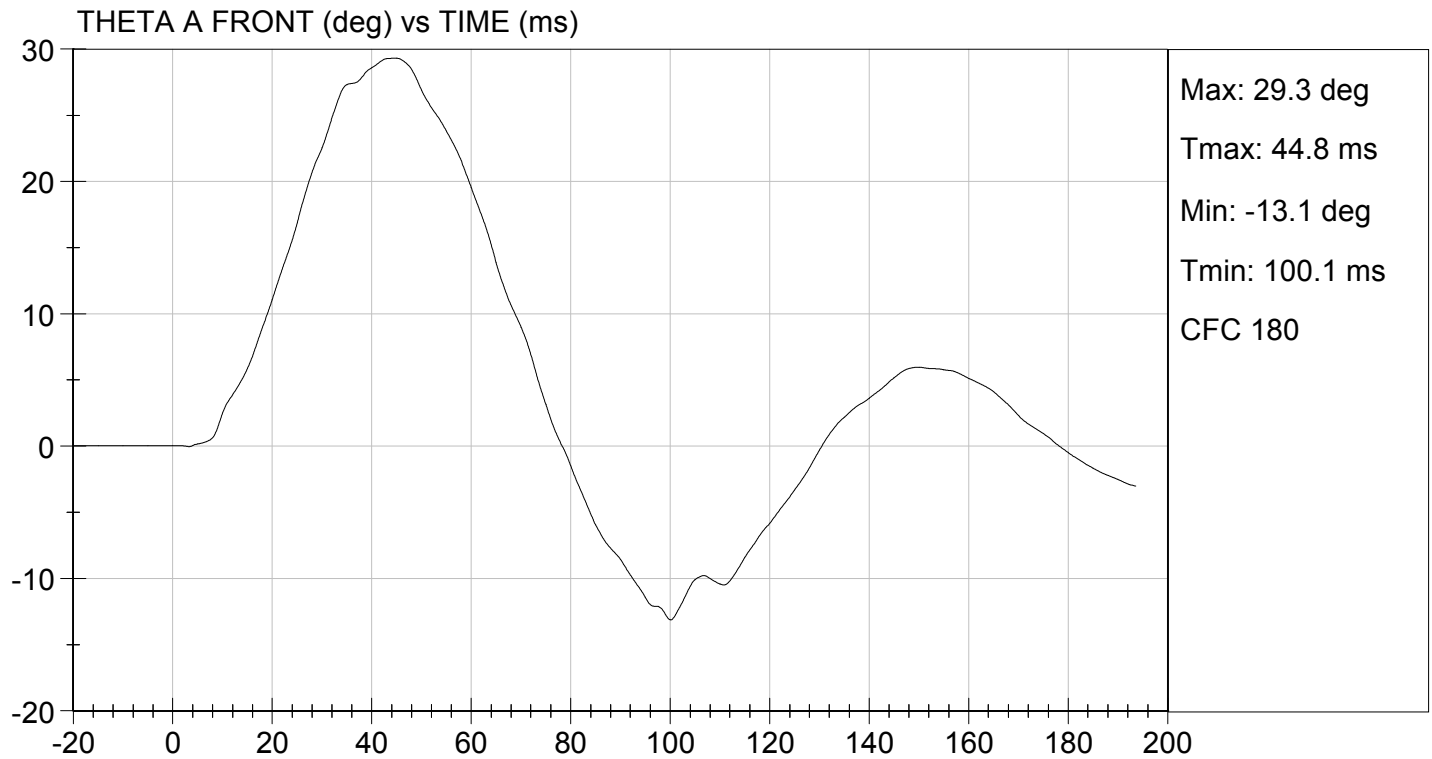
Jessica Hall
Approved By





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

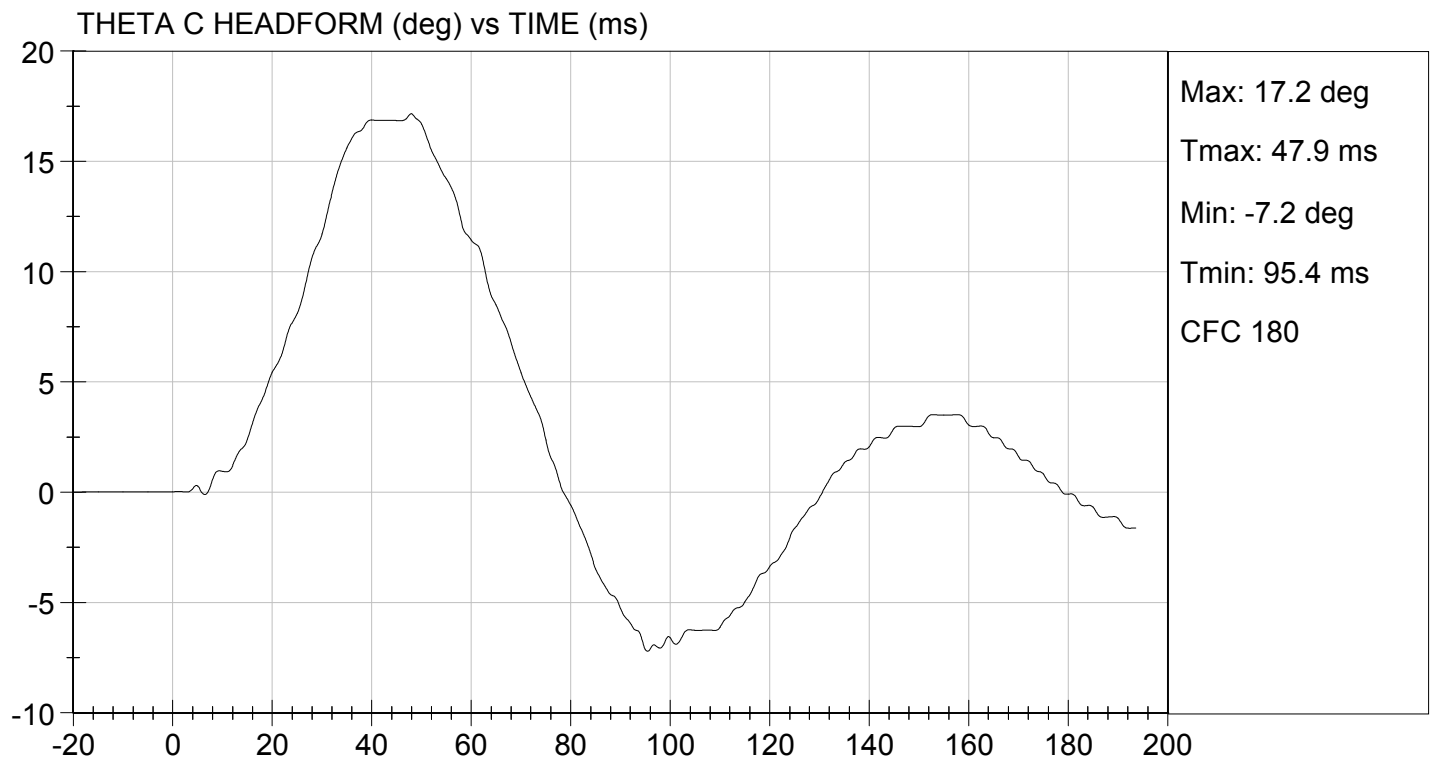
TEST DATE: 11/13/2014
TEST #: D143998





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

TEST DATE: 11/13/2014
TEST #: D143998



MGA RESEARCH CORPORATION

**PELVIS TEST
ES-2re DUMMY**

ATD Serial No: 032

Test I.D: D143999

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Probe Speed	m/s	4.20 to 4.40	4.38	Pass
Maximum Impactor Force	N	4700 to 5400	4915	Pass
Time of Maximum Impactor Force	ms	11.8 to 16.1	13.3	Pass
Maximum Pubic Force	N	1230 to 1590	1328	Pass
Time of Maximum Pubic Force	ms	12.2 to 17.0	14.2	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

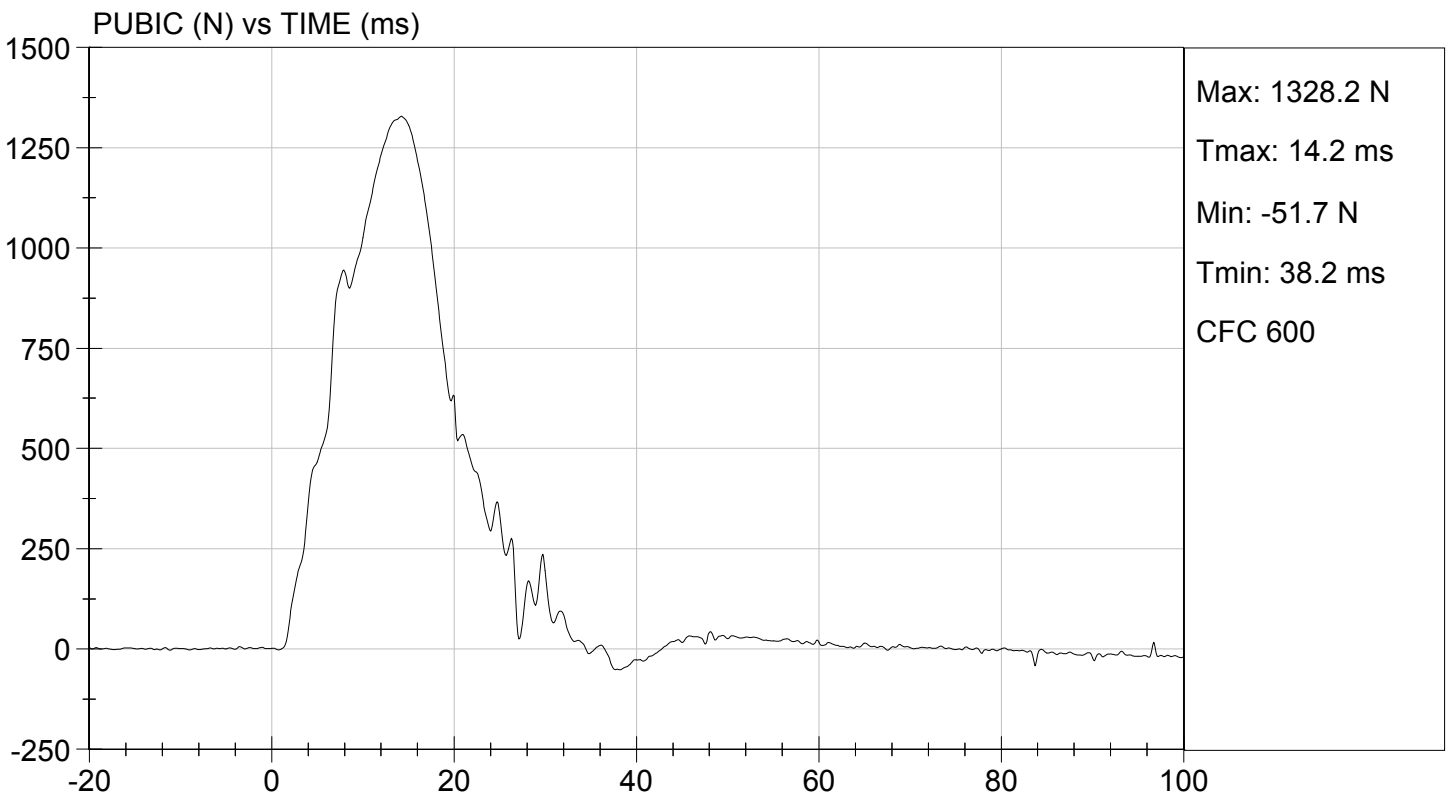
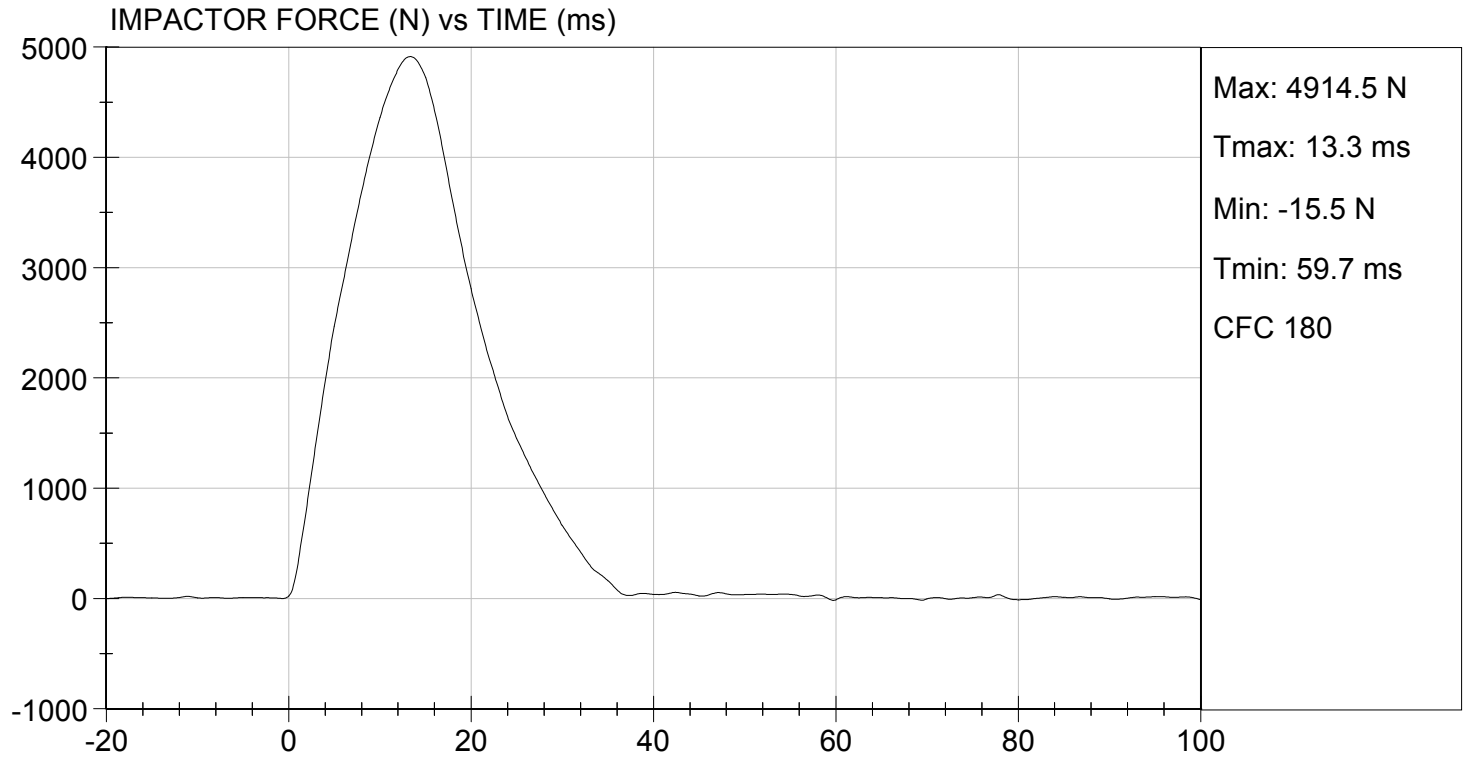
11/13/2014
Test Date

Jessica Hall
Approved By



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

TEST DATE: 11/13/2014
TEST #: D143999



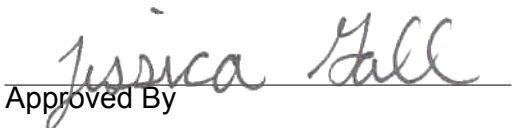
MGA RESEARCH CORPORATION**HEAD DROP TEST****ES-2re DUMMY**ATD Serial No: 032Test ID: D144111

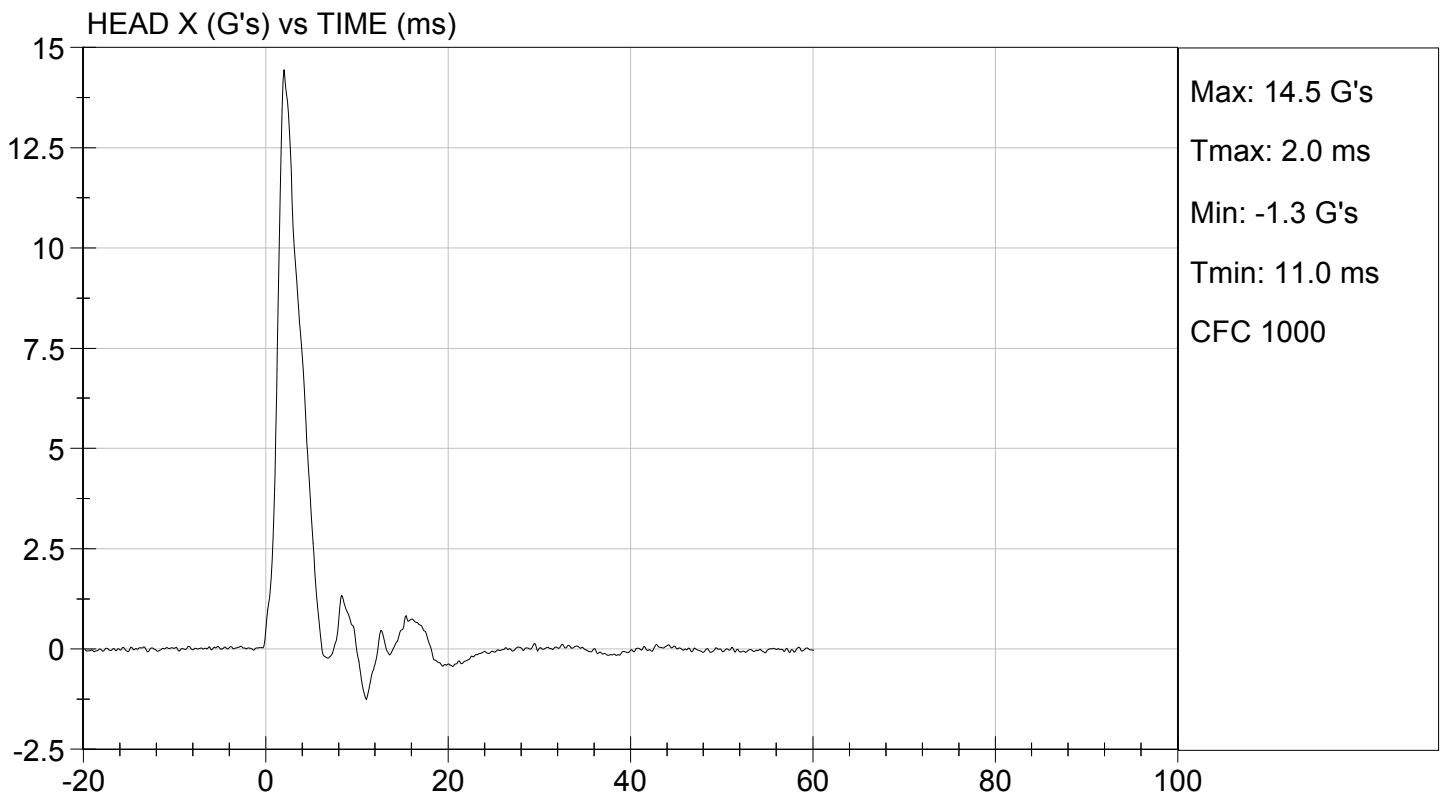
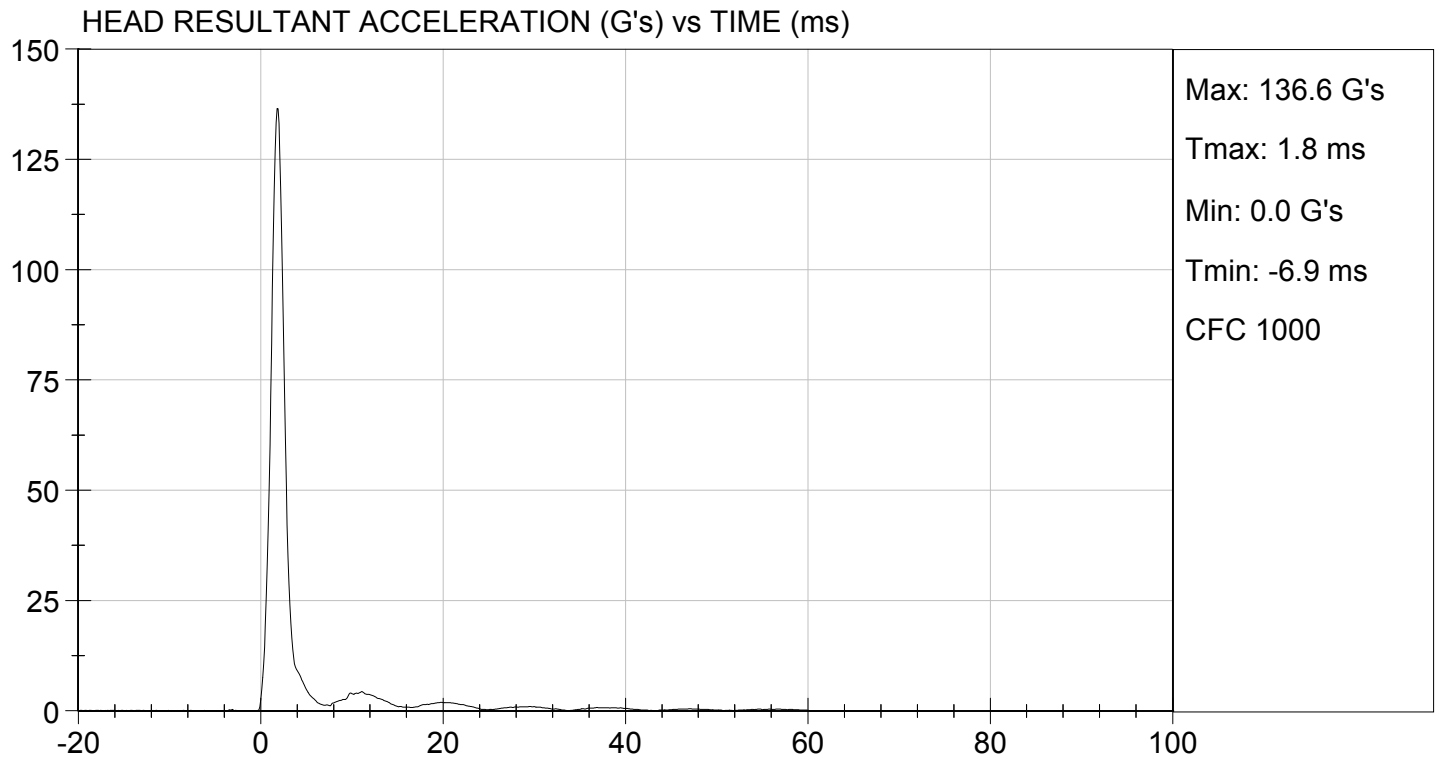
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	18	Pass
Peak Resultant Acceleration	G's	125 to 155	137	Pass
Peak Longitudinal Acceleration	G's	<= +/- 15.0	14.5	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
Overall Test Results				Pass

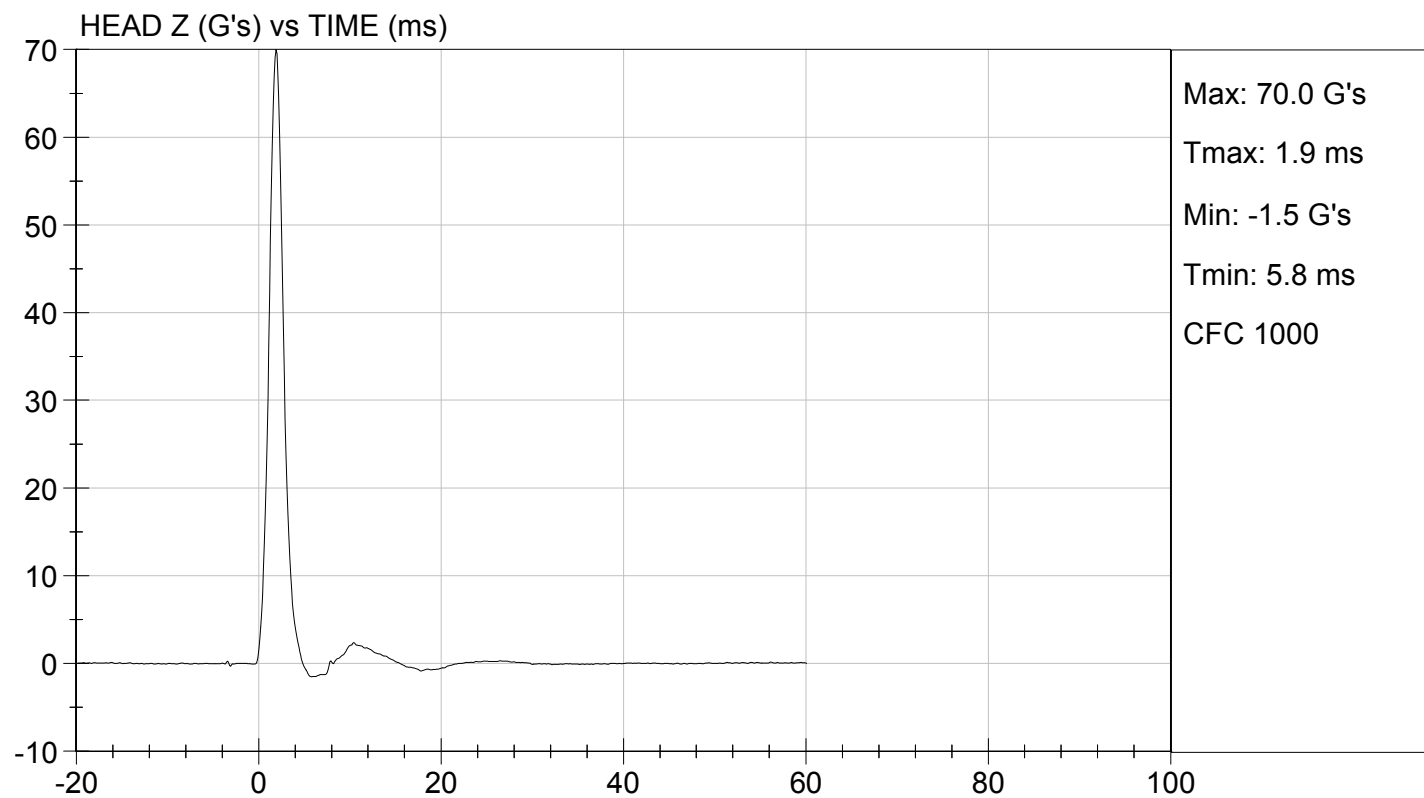
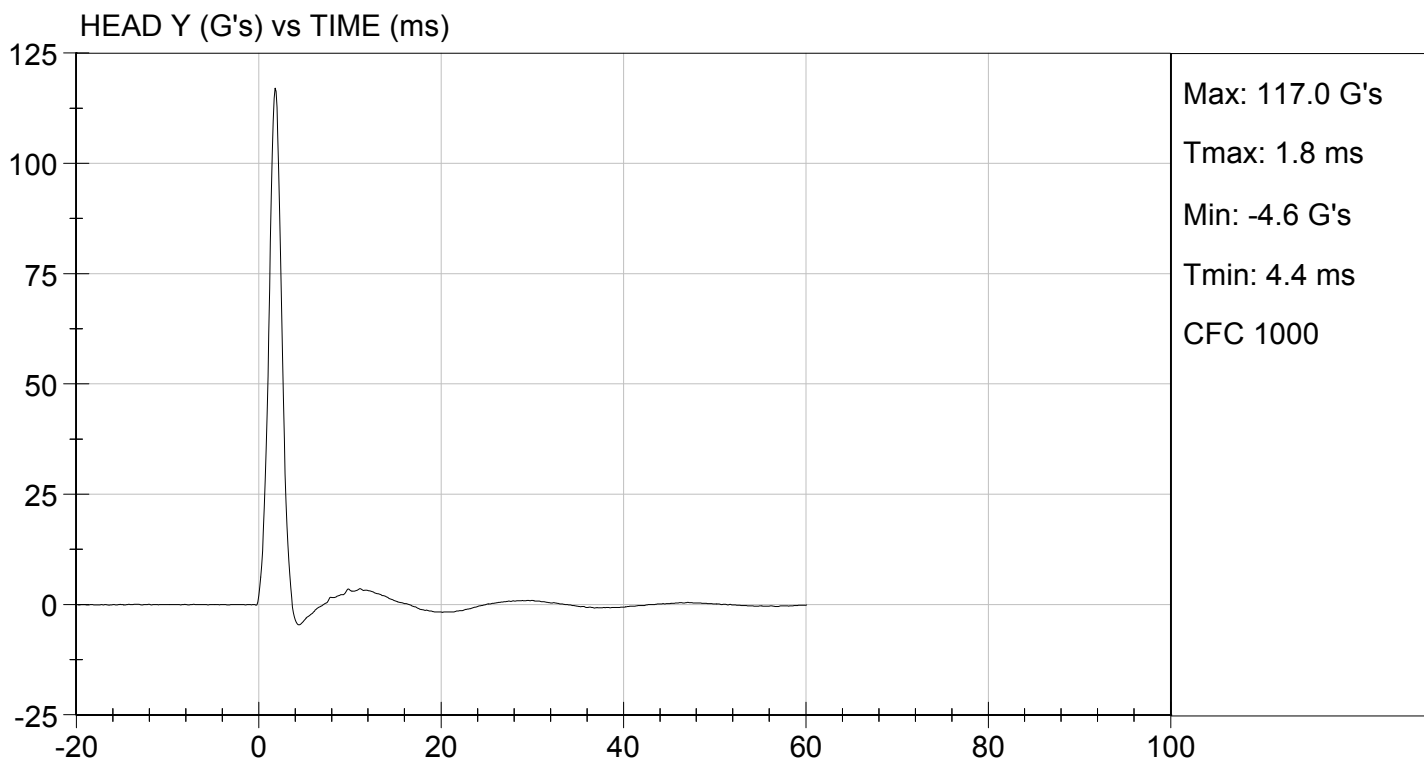

Laboratory Technician

11/19/2014

Test Date


Approved By





MGA RESEARCH CORPORATION
NECK PENDULUM TEST
ES-2re DUMMY

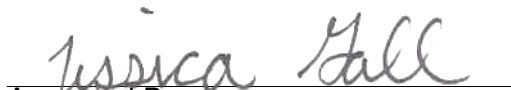
ATD Serial No: 032

Test I.D: D144112

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	16	Pass
Pendulum Speed		m/s	3.30 to 3.50	3.48	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	-3.33	Pass
	17 ms	m/s	>= -3.70	-3.42	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	49.8	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	54.6	Pass
Head Rotation Decay Time to 0 Degree		ms	53.0 to 88.0	53.3	Pass
Overall Results					Pass


 Laboratory Technician

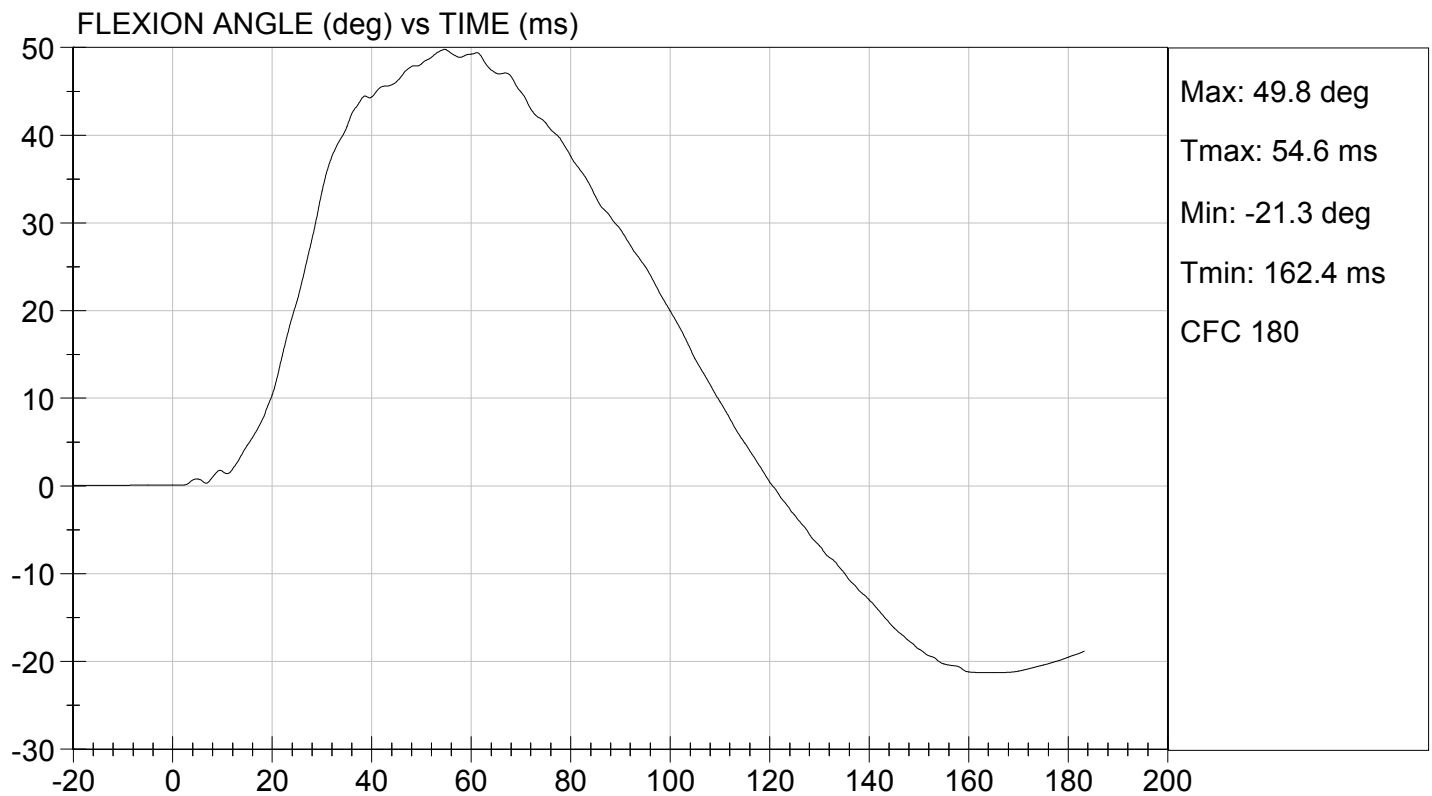
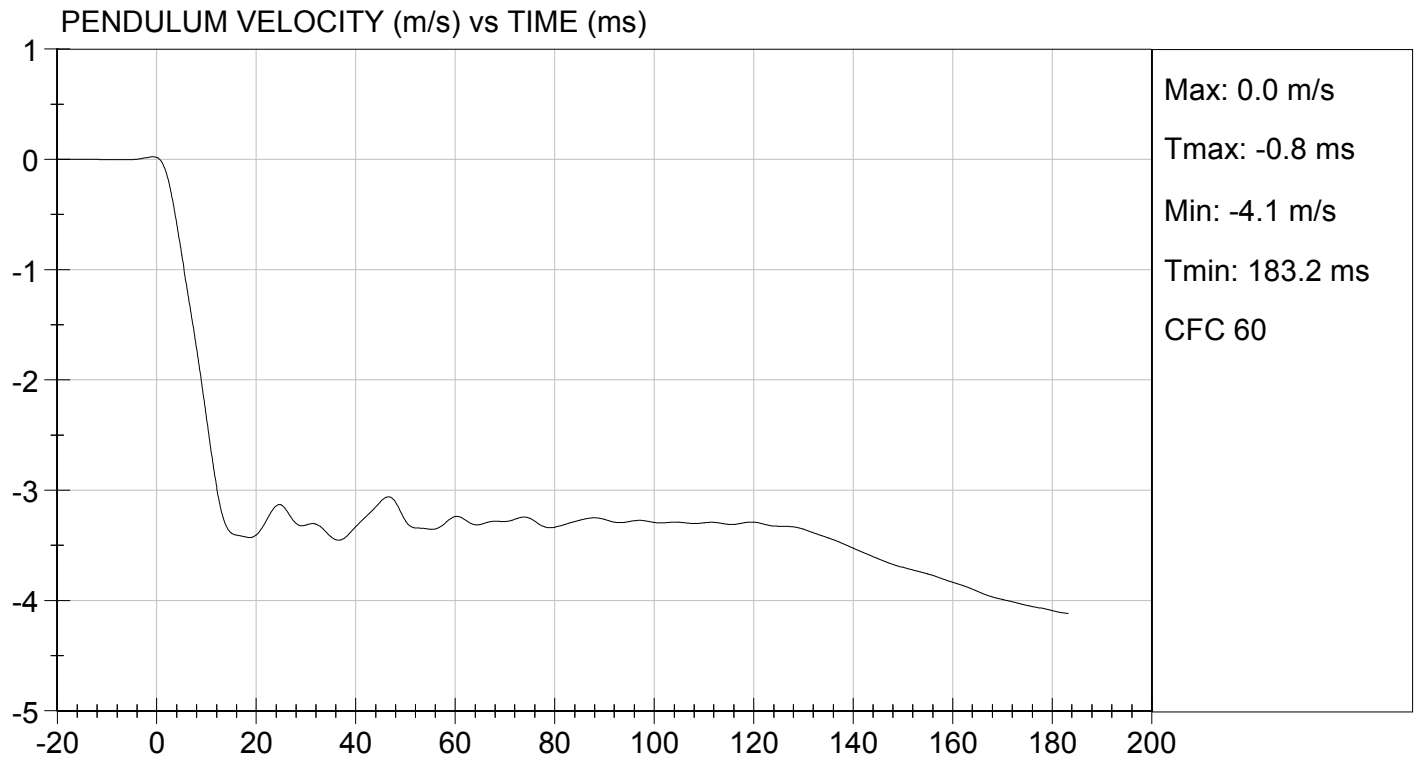
11/20/2014
 Test Date


 Approved By



TEST DESC: NECK BENDING
VELOCITY: 11.42 ft/s, 3.48 m/s

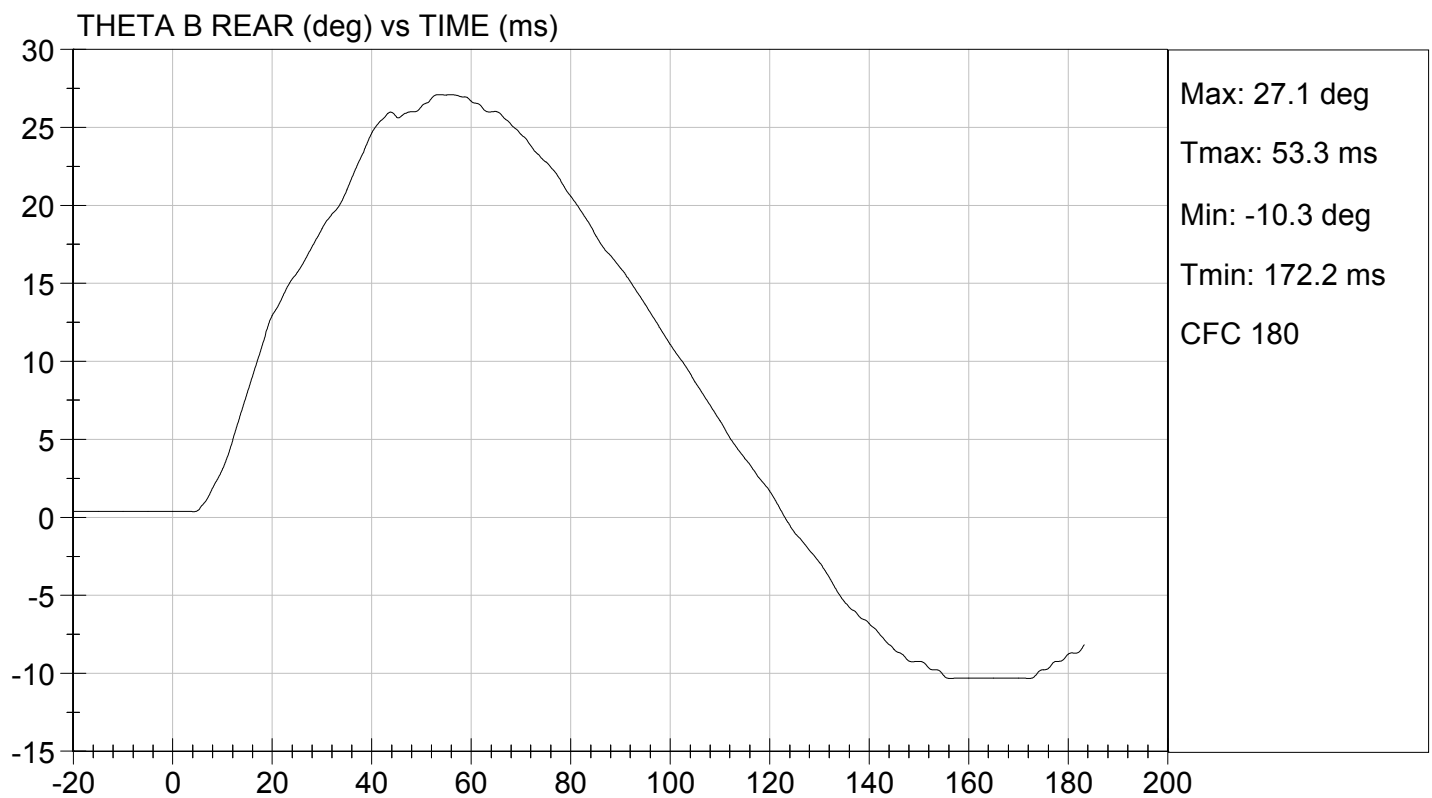
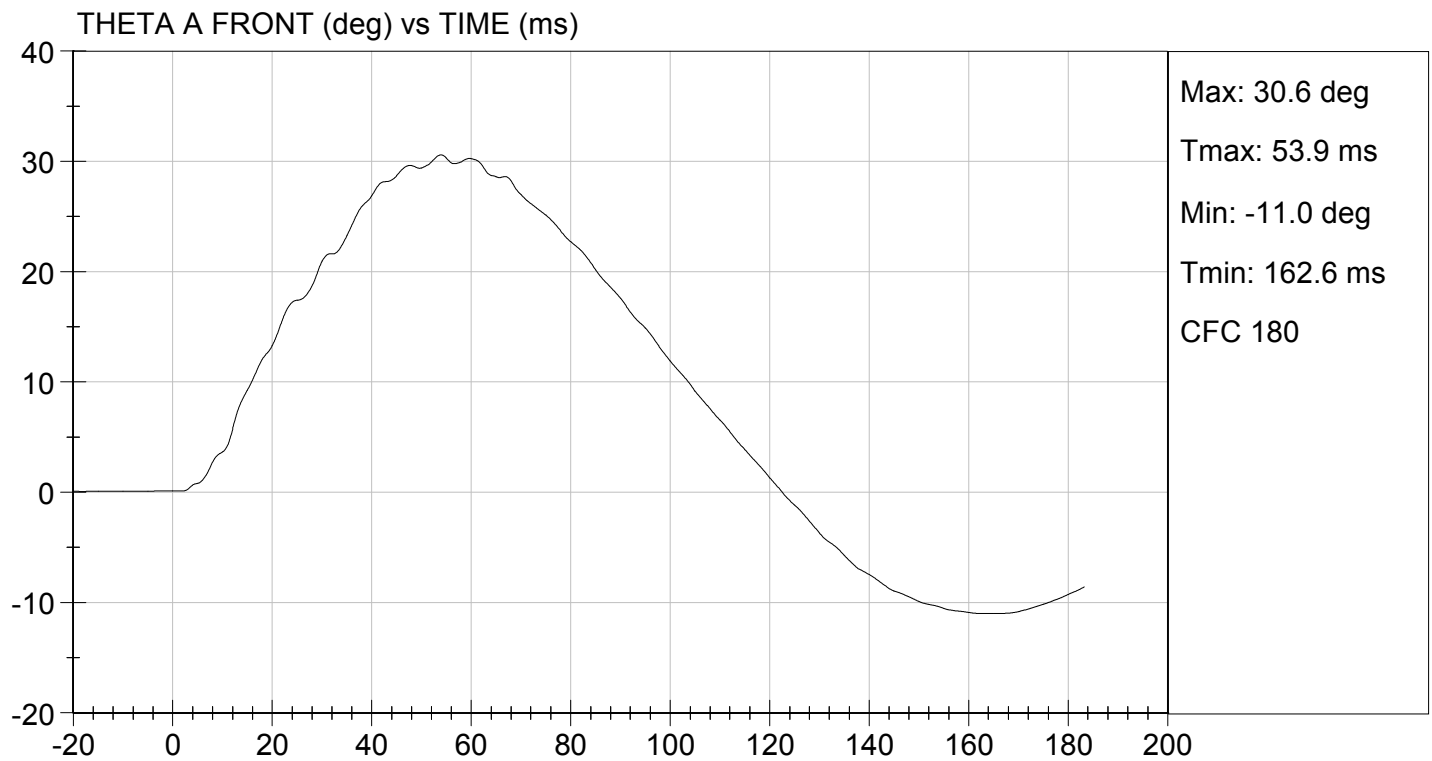
TEST DATE: 11/20/2014
TEST #: D144112





TEST DESC: NECK BENDING
VELOCITY: 11.42 ft/s, 3.48 m/s

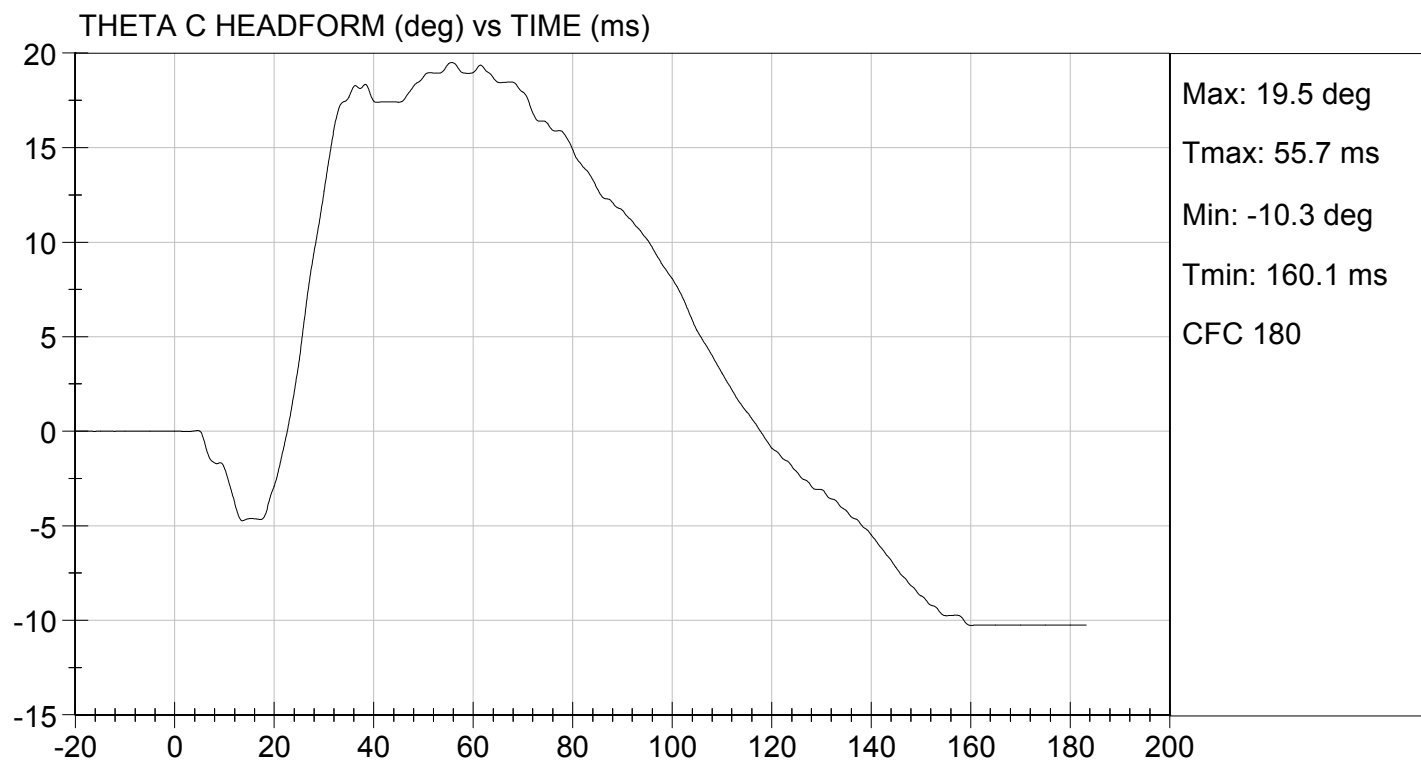
TEST DATE: 11/20/2014
TEST #: D144112





TEST DESC: NECK BENDING
VELOCITY: 11.42 ft/s, 3.48 m/s

TEST DATE: 11/20/2014
TEST #: D144112



MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D144113

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	17	Pass
Pendulum Speed	m/s	4.20 to 4.40	4.38	Pass
Peak Impactor Acceleration	G's	7.5 to 10.5	9.4	Pass
Overall Test Results				Pass


Laboratory Technician

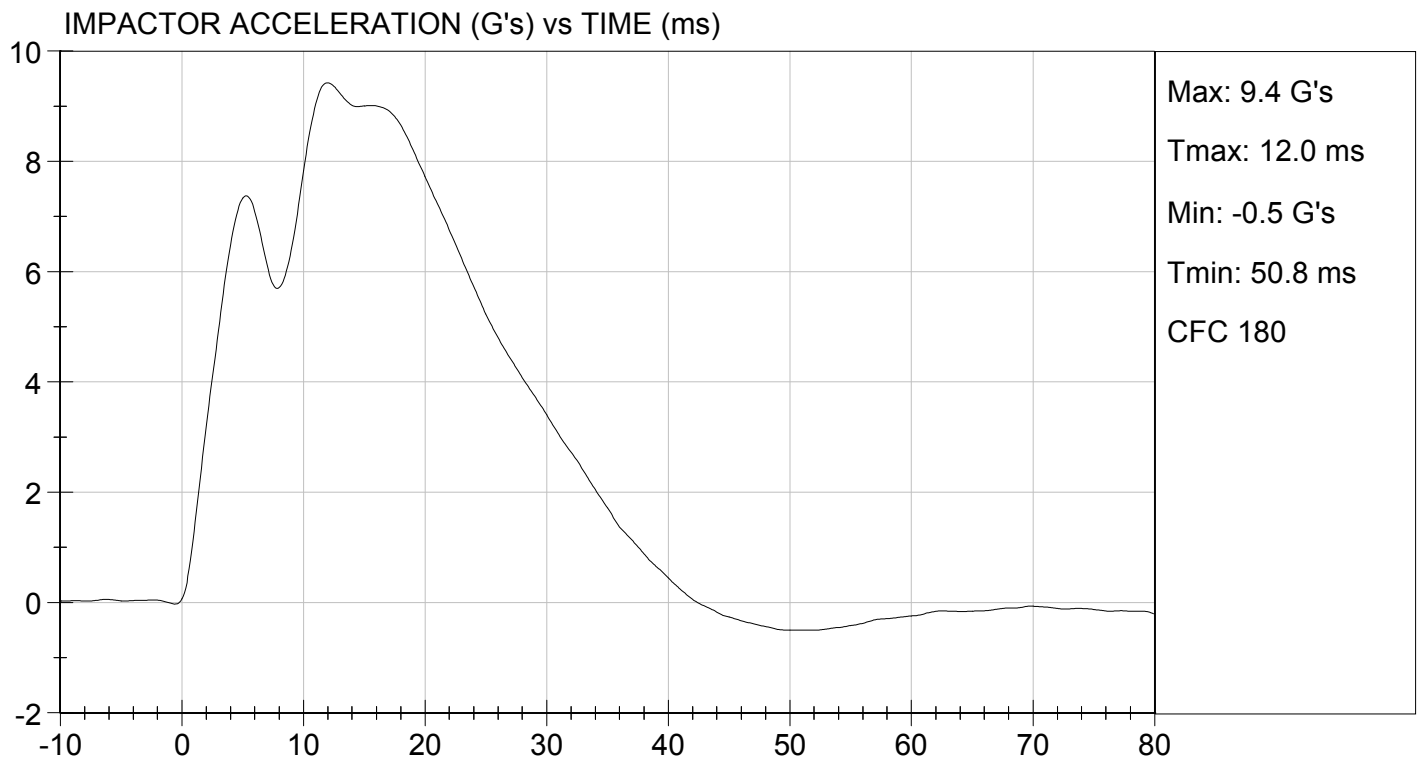
11/20/2014
Test Date


Approved By



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

TEST DATE: 11/20/2014
TEST #: D144113



MGA RESEARCH CORPORATION

UPPER RIB TEST

ES-2re DUMMY

ATD Serial No: 032

Test I.D: D144114

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	17	Pass
Displacement at 459 mm	mm	36.0 to 40.0	38.7	Pass
Displacement at 815 mm	mm	46.0 to 51.0	48.5	Pass
Overall Test Results				Pass


Laboratory Technician

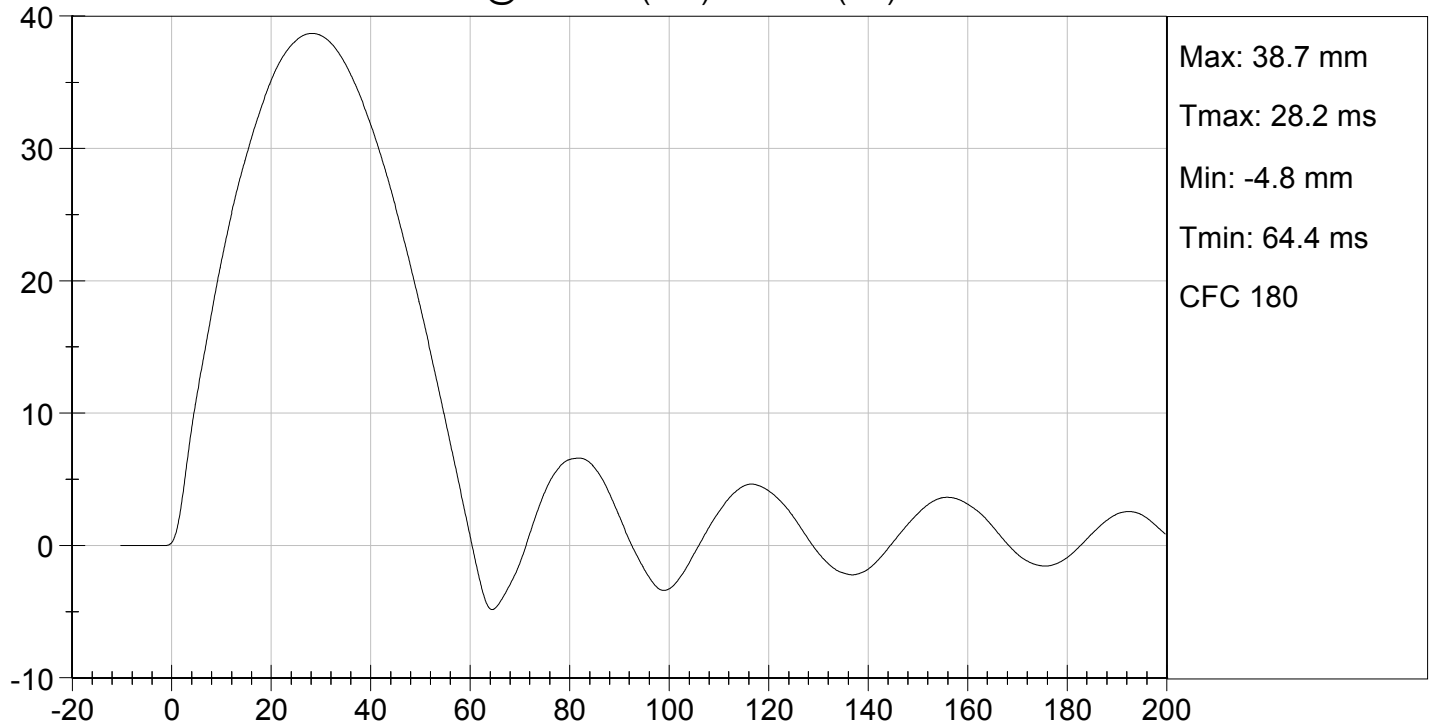
11/19/2014

Test Date

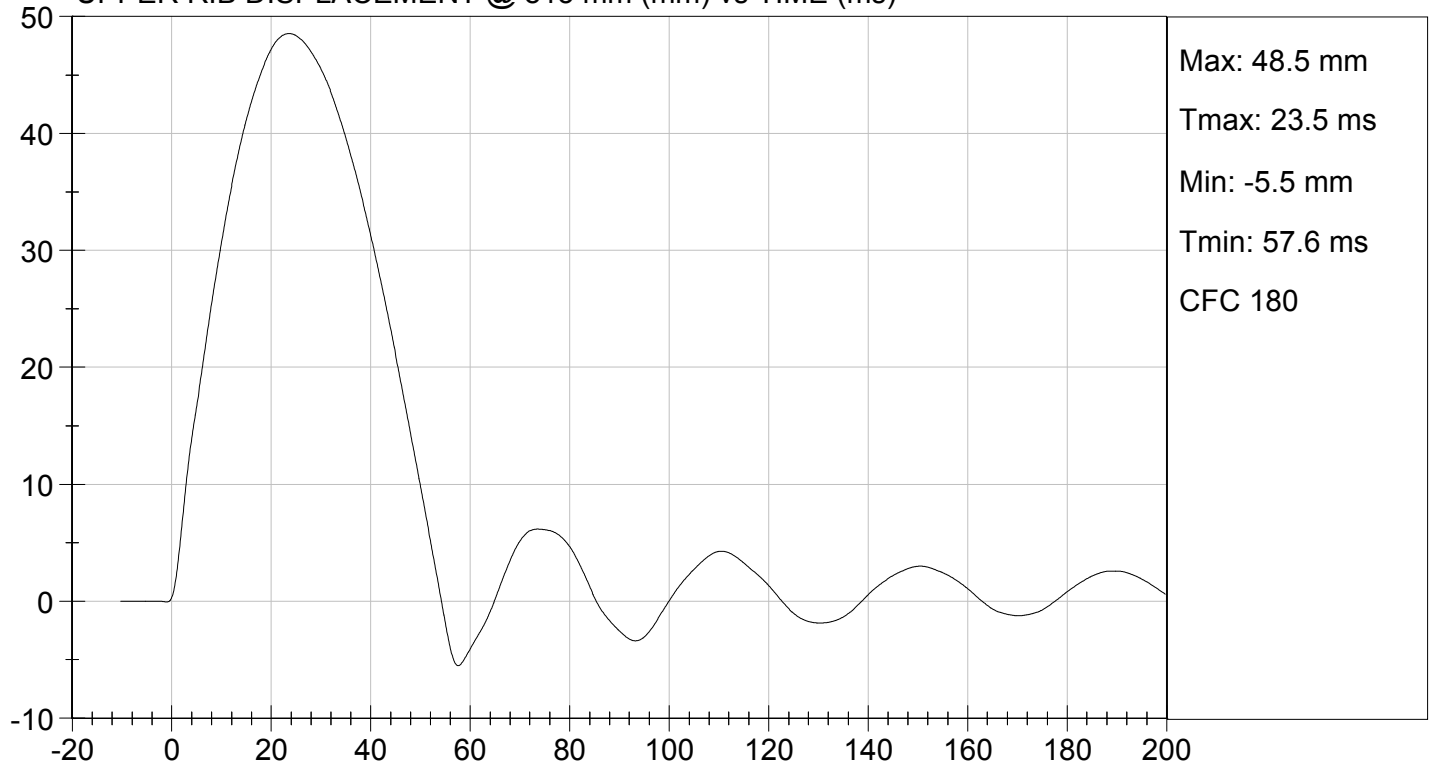

Approved By



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: D144115

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	17	Pass
Displacement at 459 mm	mm	36.0 to 40.0	38.5	Pass
Displacement at 815 mm	mm	46.0 to 51.0	48.6	Pass
Overall Test Results				Pass


Laboratory Technician

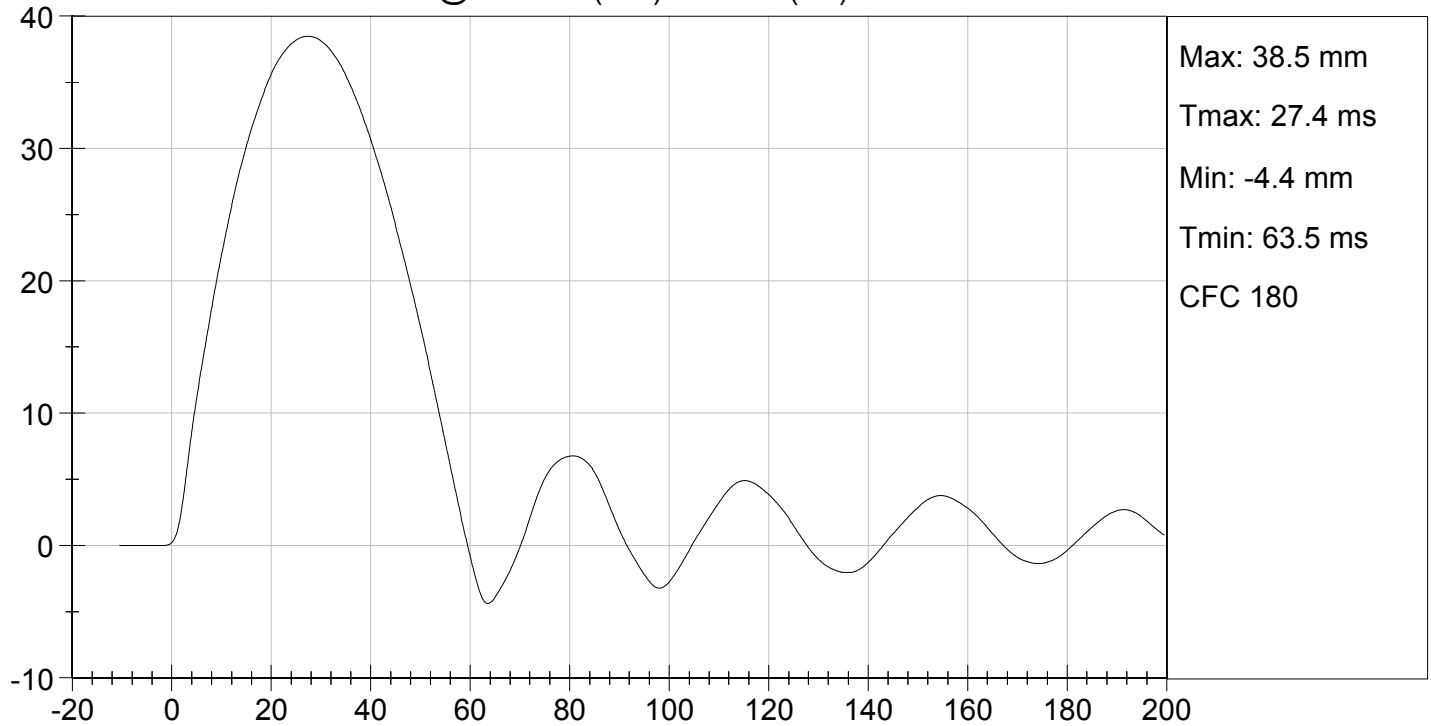
11/19/2014

Test Date

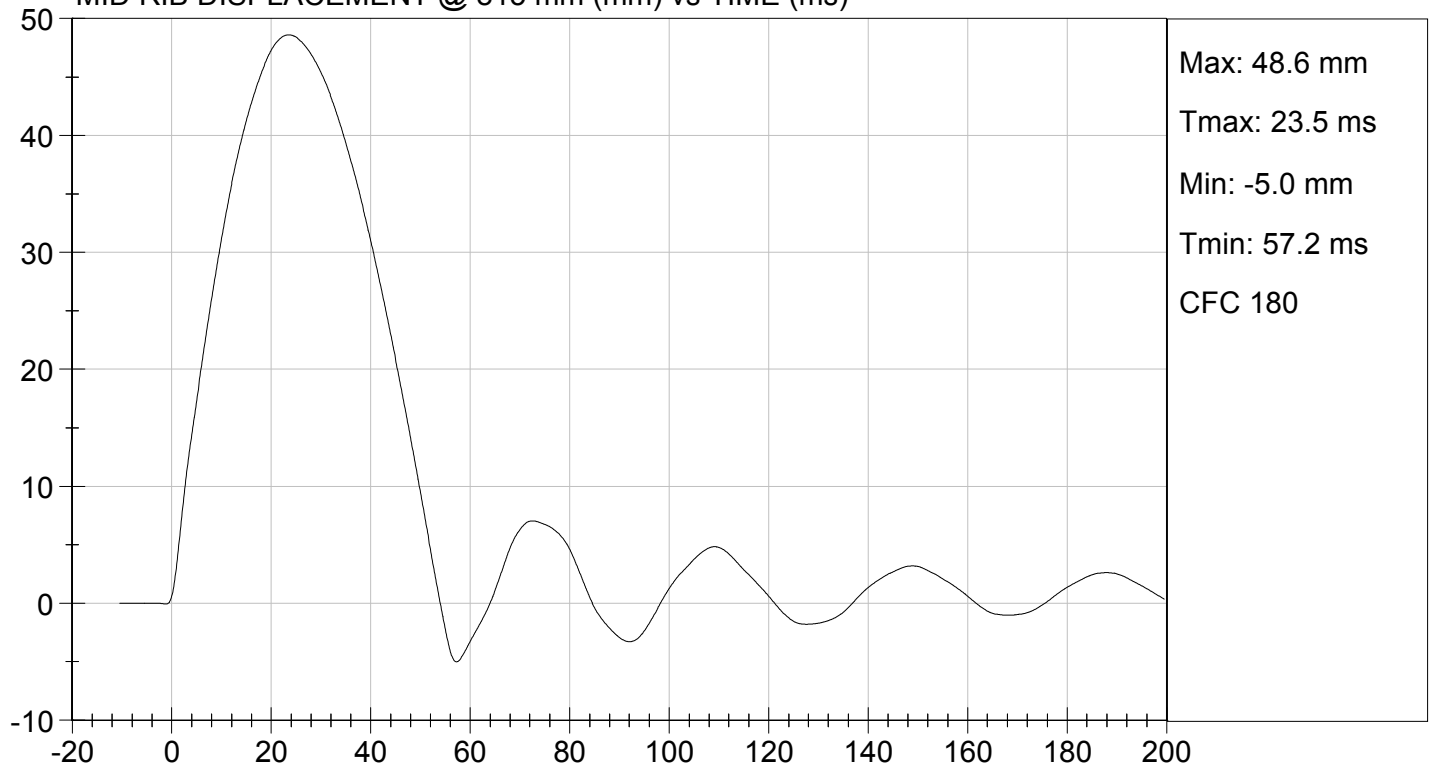

Approved By



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

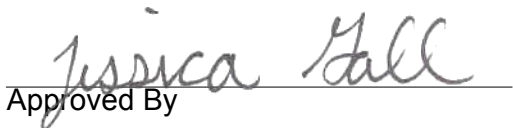
Test I.D: D144116

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	17	Pass
Displacement at 459 mm	mm	36.0 to 40.0	38.7	Pass
Displacement at 815 mm	mm	46.0 to 51.0	49.6	Pass
Overall Test Results				Pass


Laboratory Technician

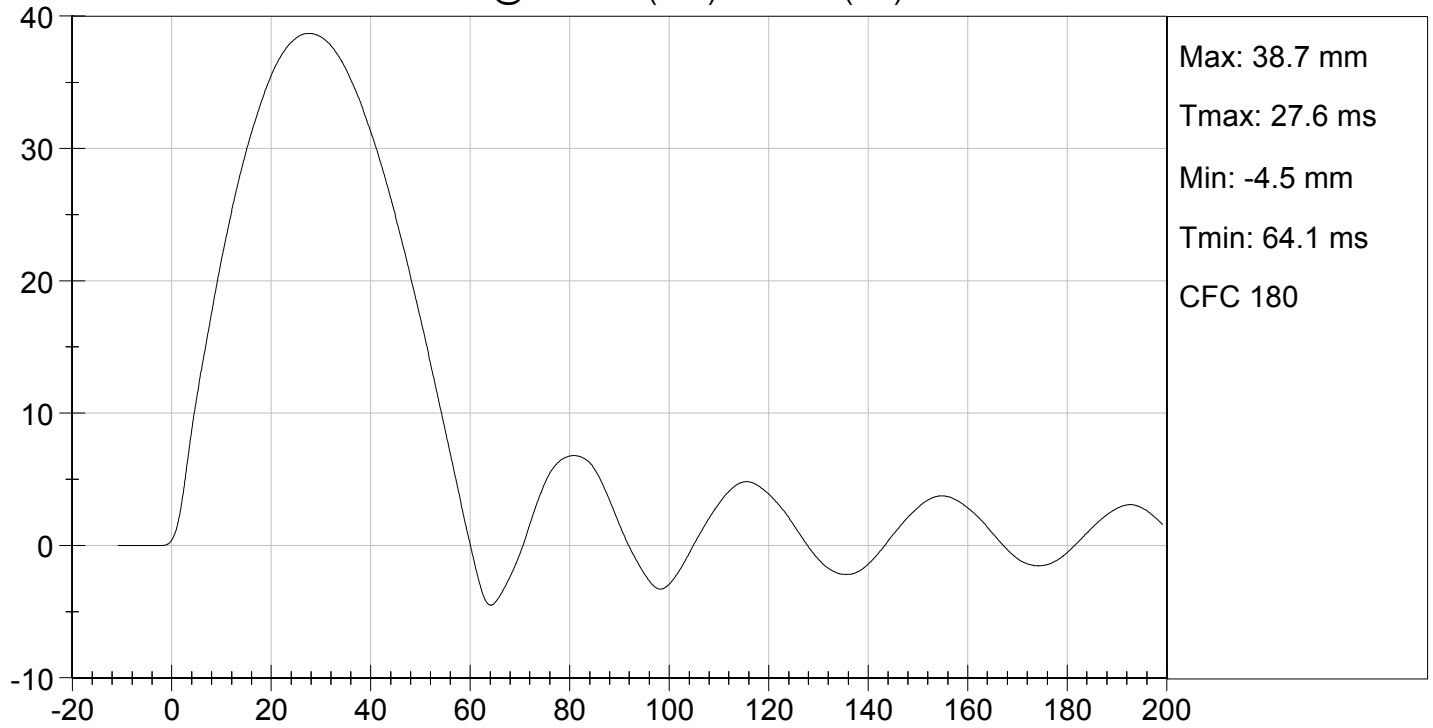
11/19/2014

Test Date

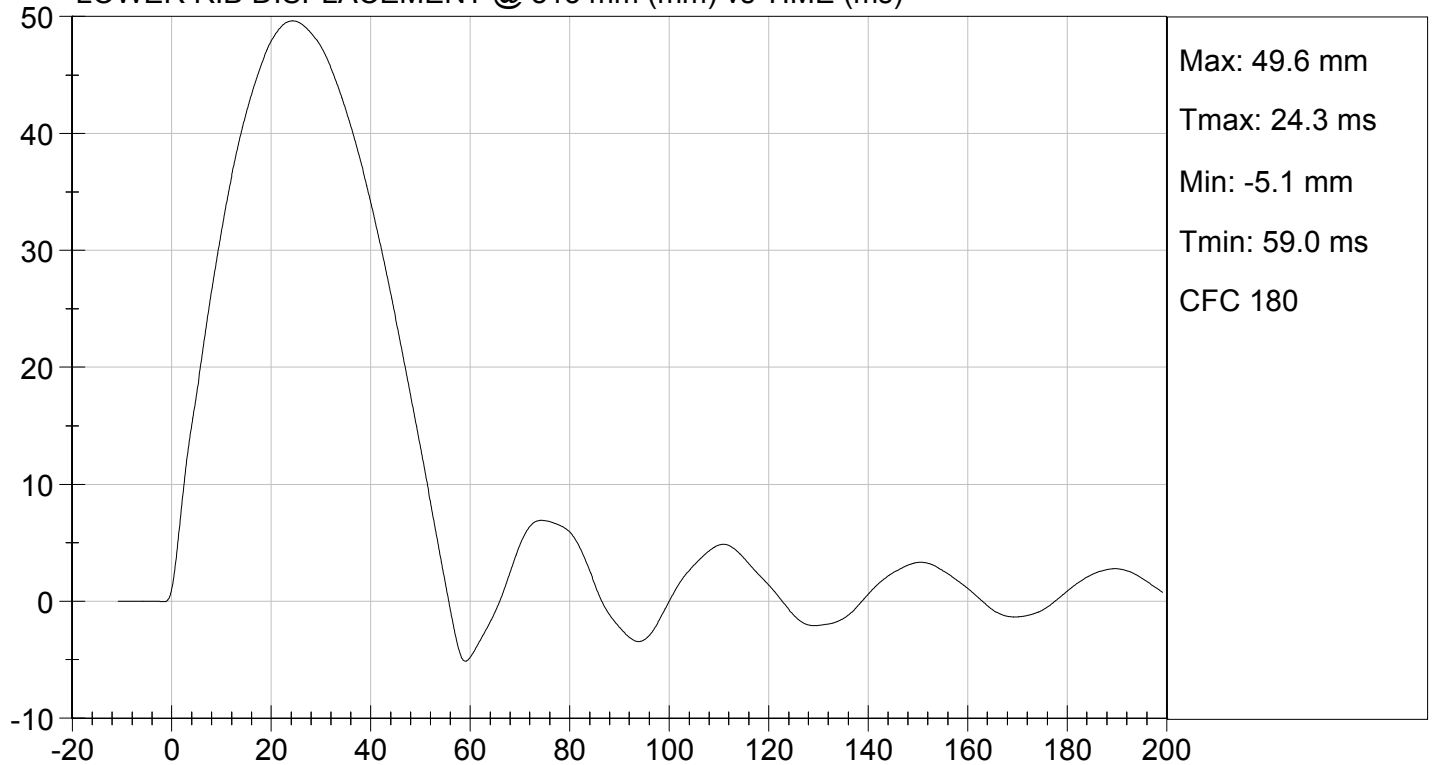

Approved By



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:** D144110

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Humidity	%	10 to 70	17	Pass
Probe Speed	m/s	5.40 to 5.60	5.58	Pass
Maximum Impactor Force (after 6 ms)	N	5100 to 6200	5481	Pass
Upper Rib Displacement	mm	34.0 to 41.0	38.8	Pass
Middle Rib Displacement	mm	37.0 to 45.0	41.9	Pass
Lower Rib Displacement	mm	37.0 to 44.0	40.6	Pass
Overall Test Results				Pass


Laboratory Technician

11/20/2014

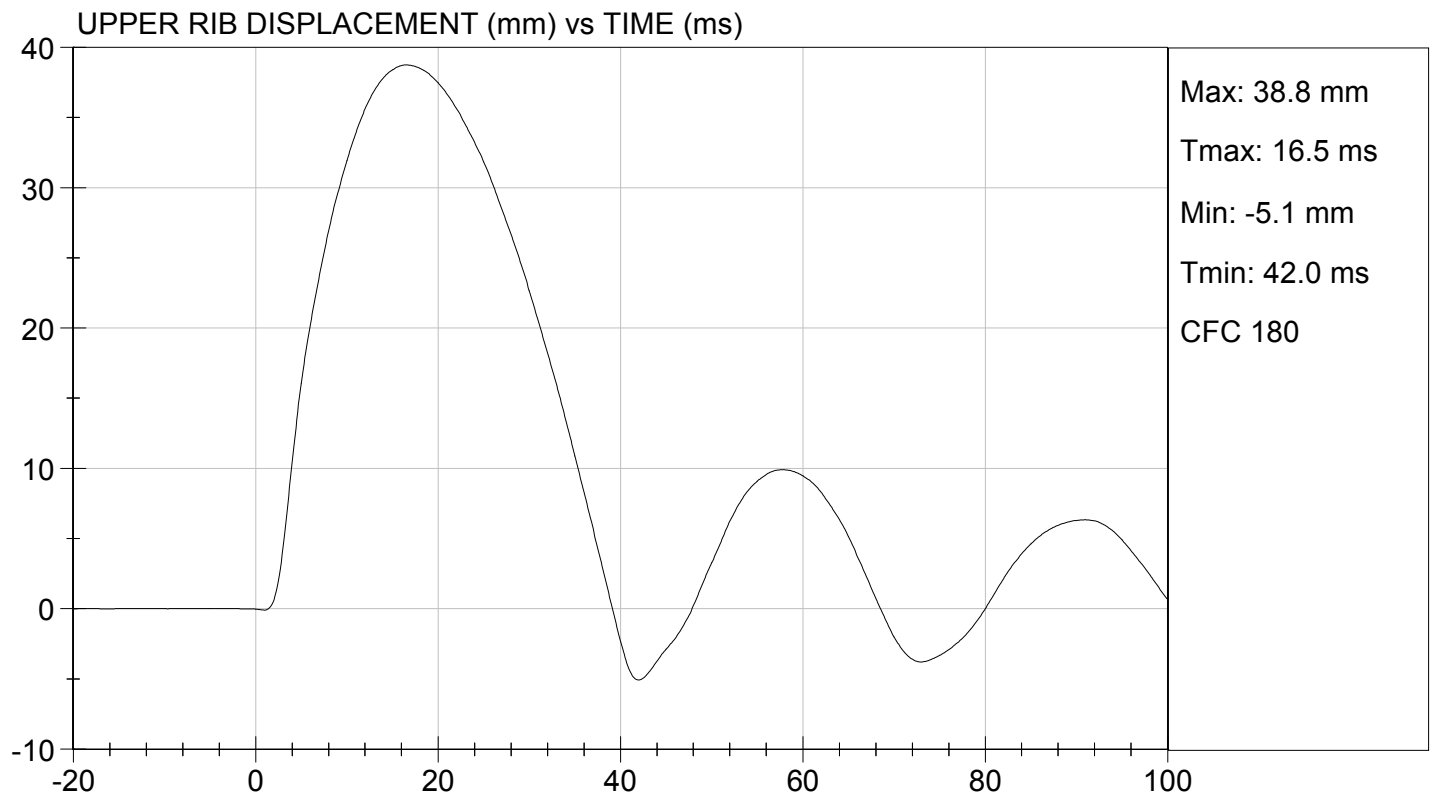
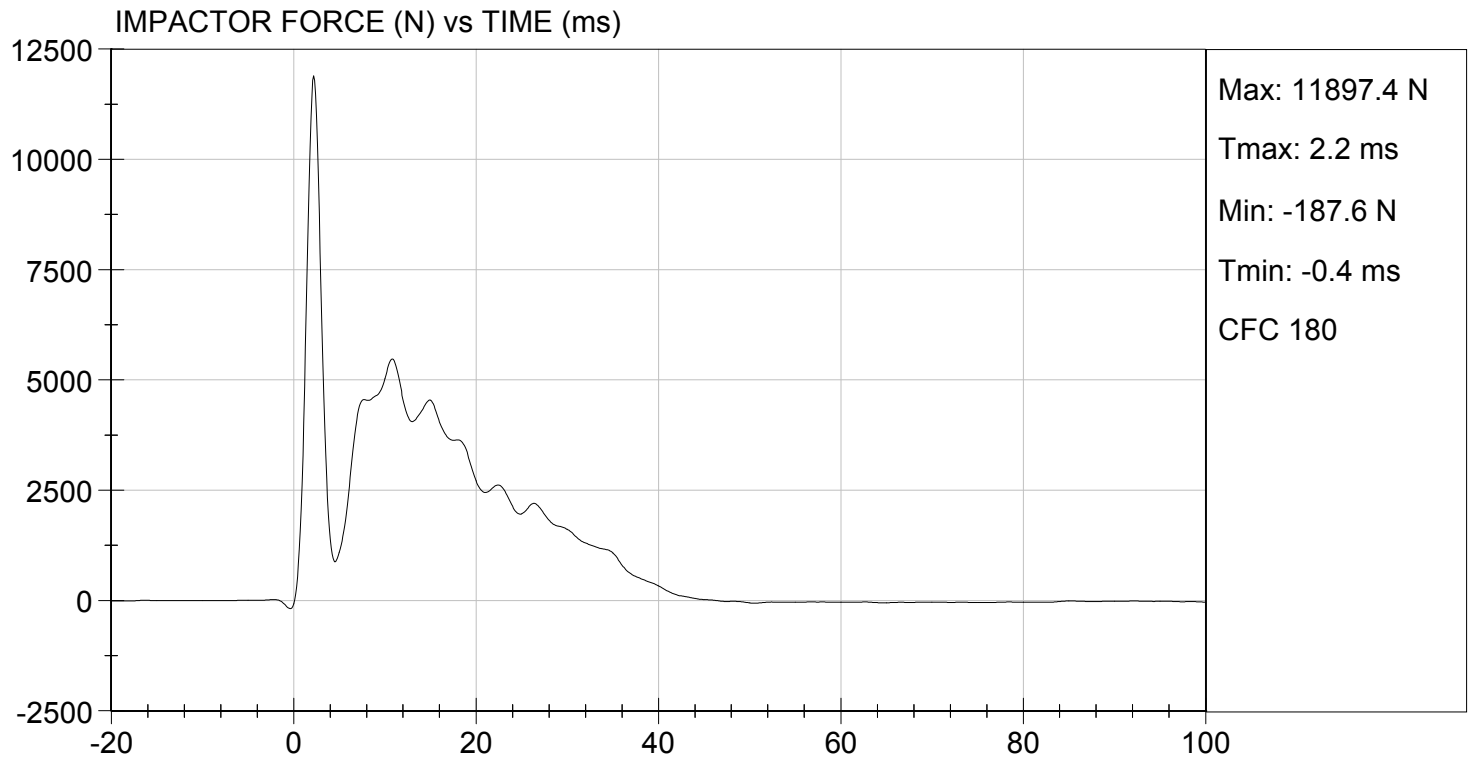
Test Date


Approved By



TEST DESC: THORAX IMPACT
VELOCITY: 18.32 ft/s, 5.58 m/s

TEST DATE: 11/20/2014
TEST #: D144110

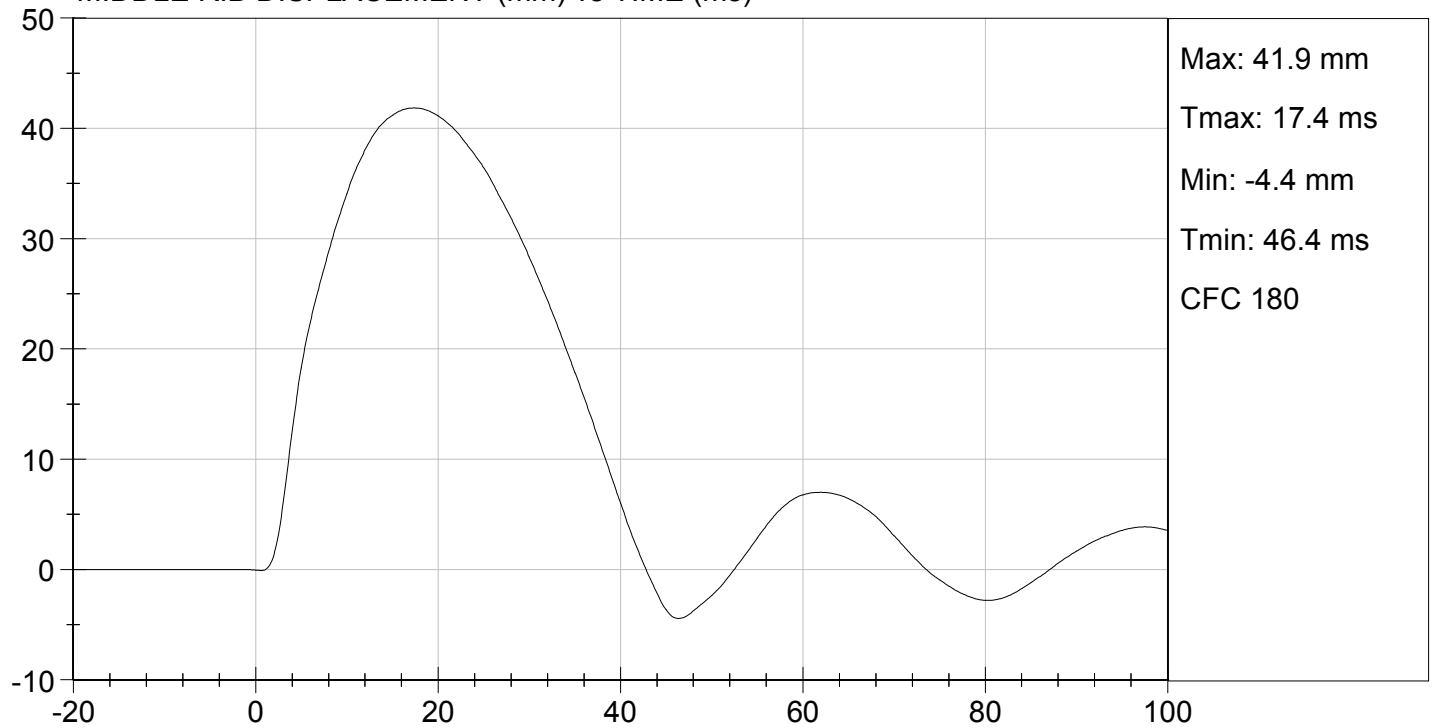




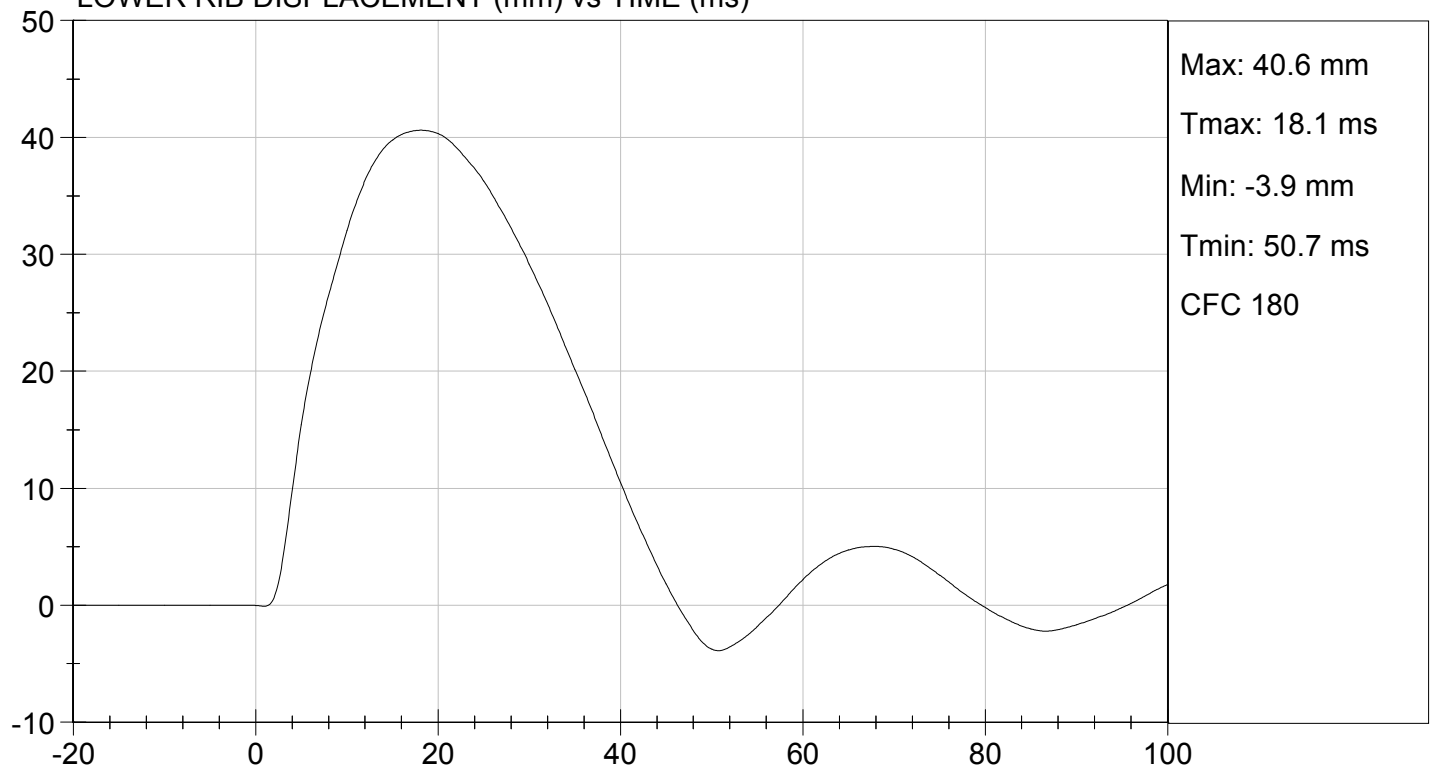
TEST DESC: THORAX IMPACT
VELOCITY: 18.32 ft/s, 5.58 m/s

TEST DATE: 11/20/2014
TEST #: D144110

MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

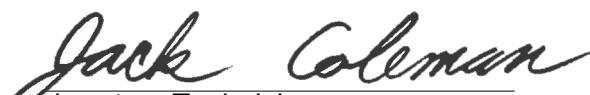
ABDOMEN TEST

ES-2re DUMMY

ATD Serial No: 032

Test I.D: D144117

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	17	Pass
Probe Speed	m/s	3.90 to 4.10	4.06	Pass
Maximum Impactor Force	N	4000 to 4800	4654	Pass
Time of Maximum Impactor Force	ms	10.6 to 13.0	10.6	Pass
Maximum Total Abdomen Force	N	2200 to 2700	2372	Pass
Time of Maximum Abdomen Force	ms	10.0 to 12.3	10.5	Pass
Overall Test Results				Pass


Laboratory Technician

11/20/2014

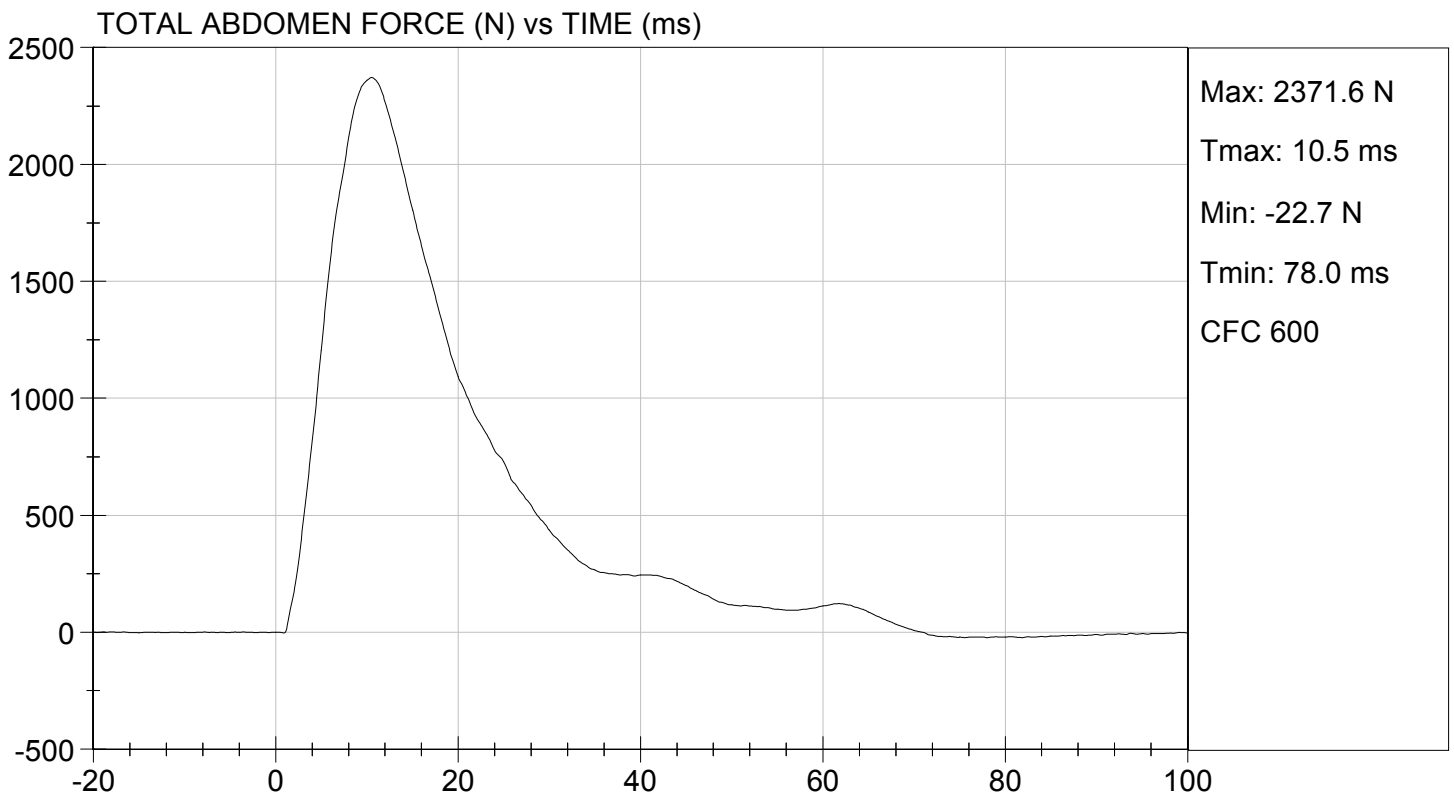
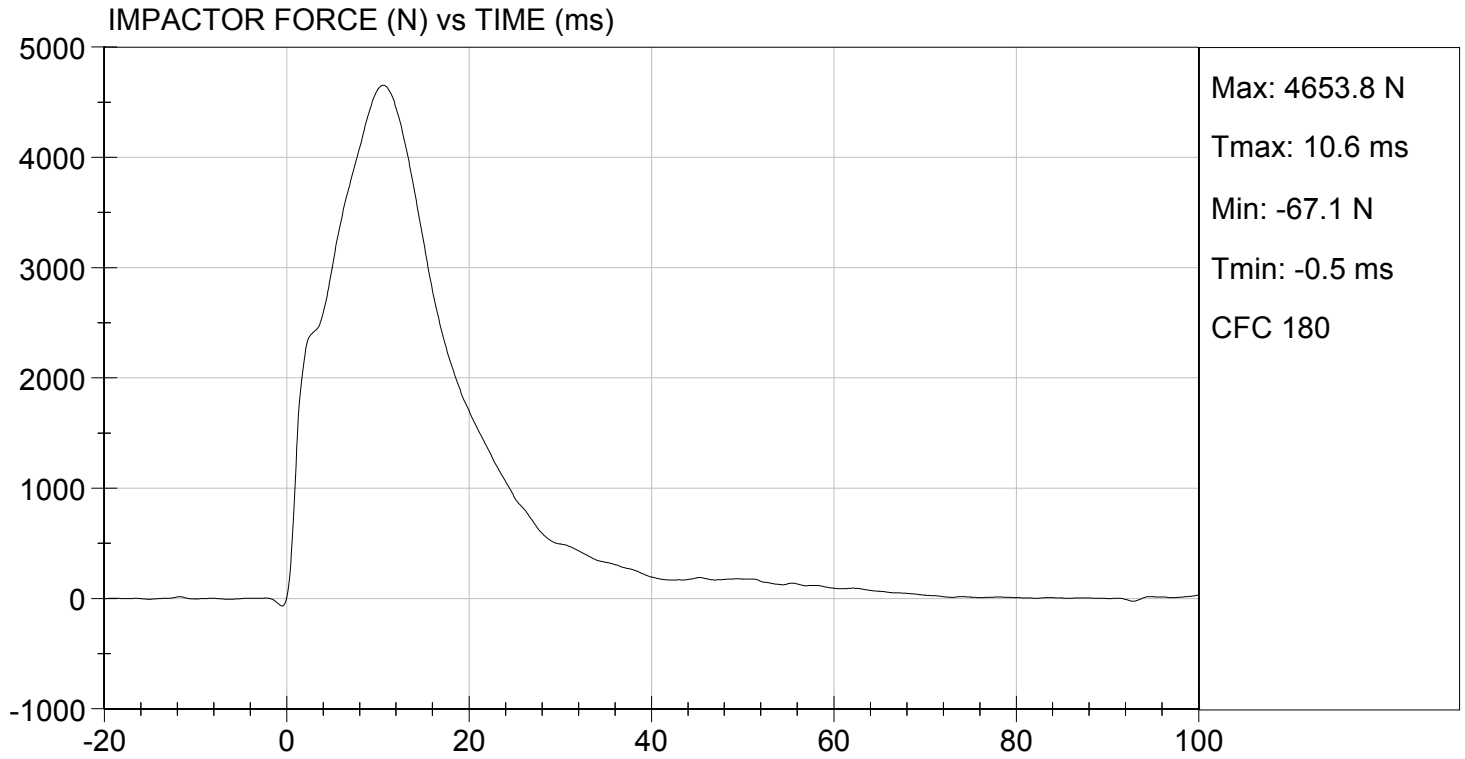
Test Date


Approved By



TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.33 ft/s, 4.06 m/s

TEST DATE: 11/20/2014
TEST #: D144117

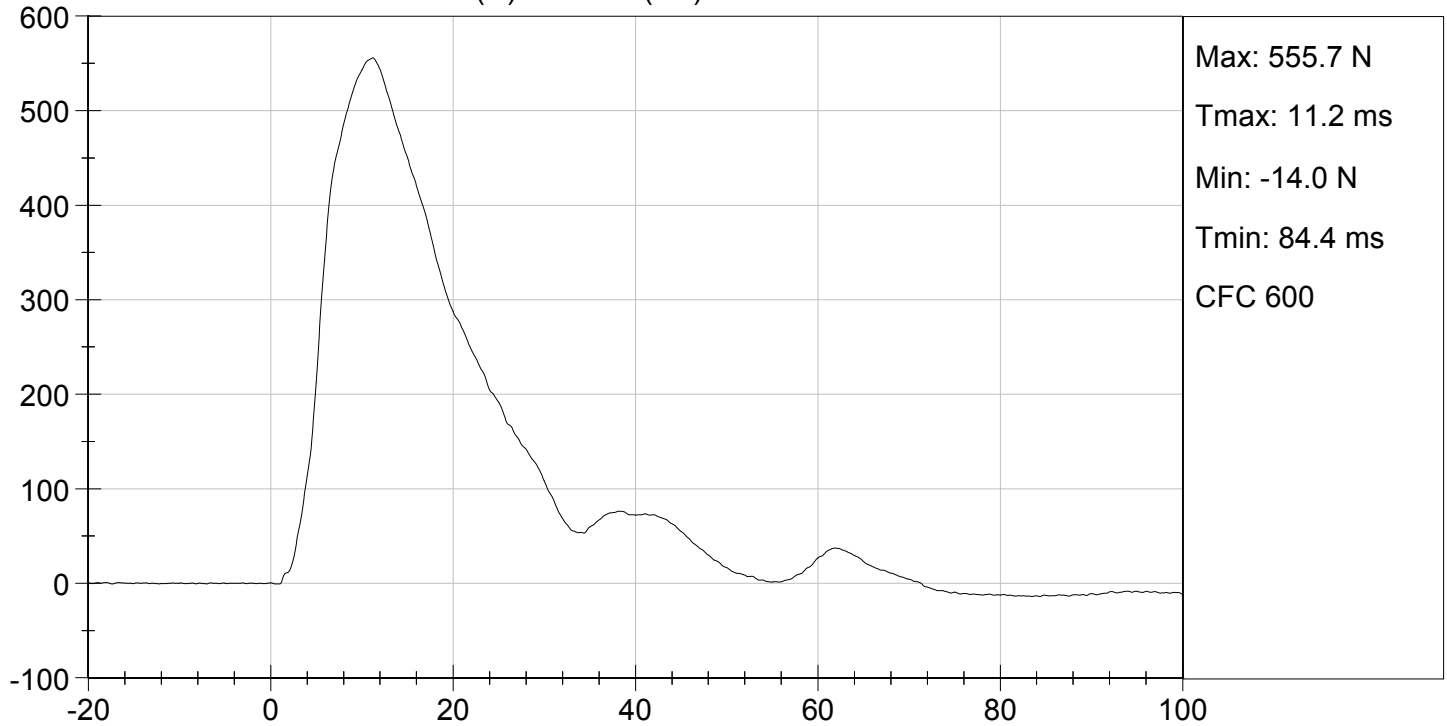




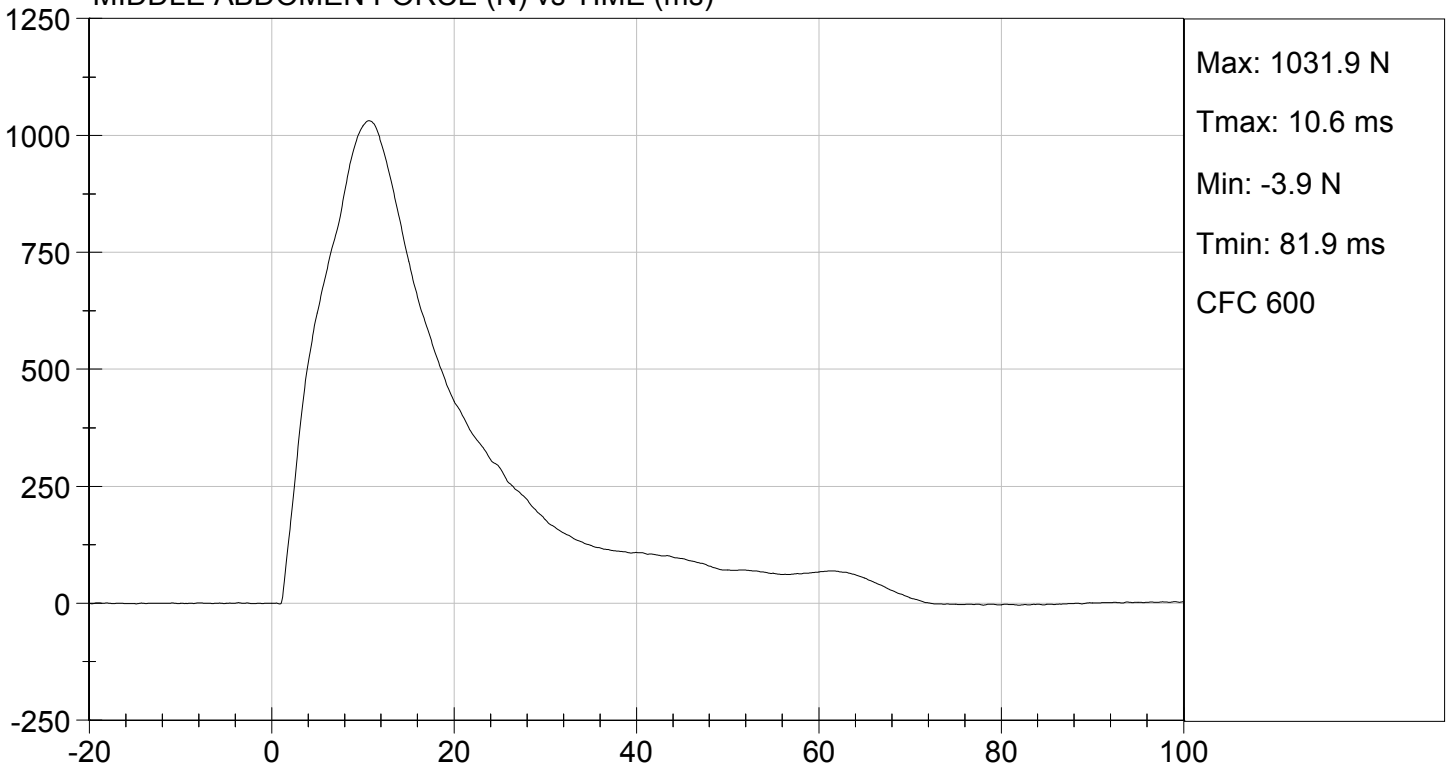
TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.33 ft/s, 4.06 m/s

TEST DATE: 11/20/2014
TEST #: D144117

FRONT ABDOMEN FORCE (N) vs TIME (ms)



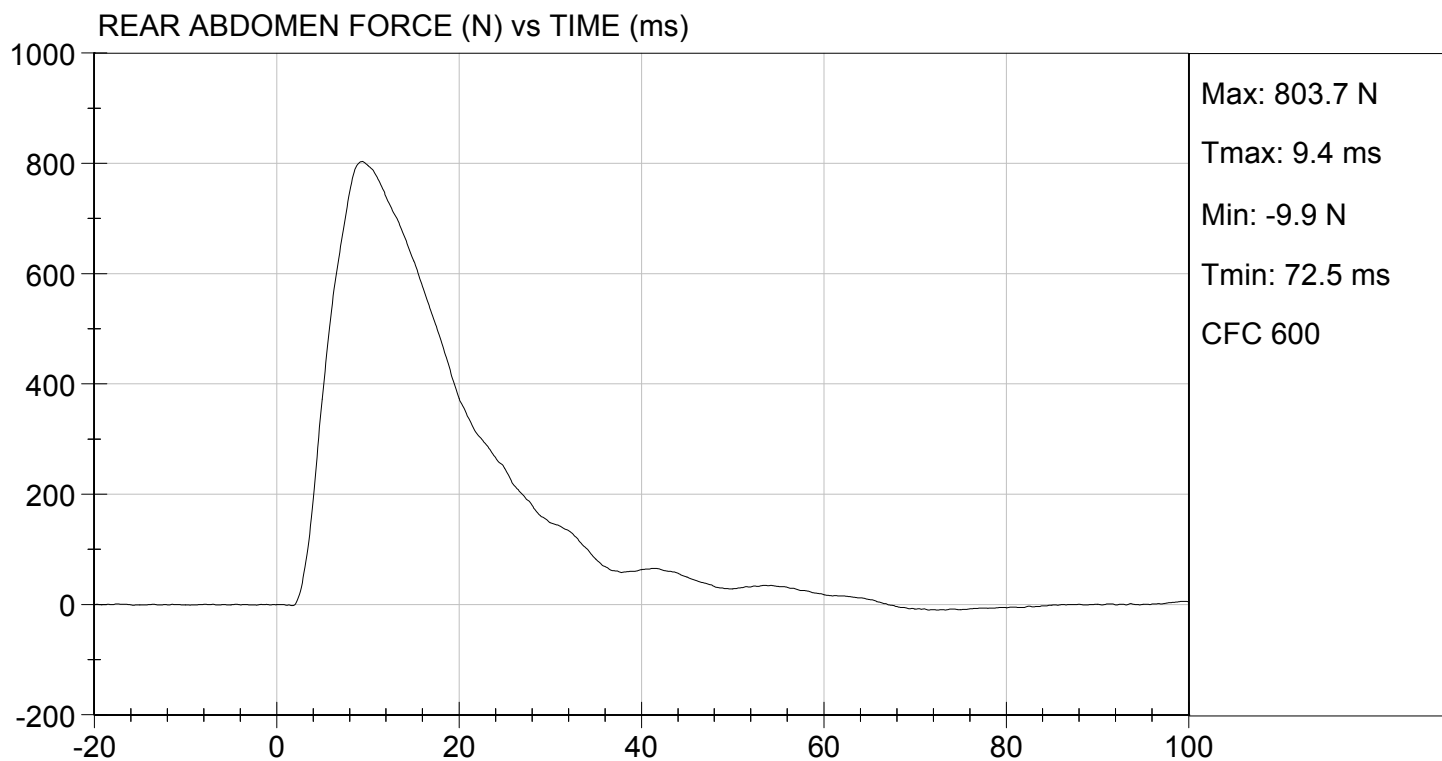
MIDDLE ABDOMEN FORCE (N) vs TIME (ms)





TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.33 ft/s, 4.06 m/s

TEST DATE: 11/20/2014
TEST #: D144117



MGA RESEARCH CORPORATION
LUMBAR SPINE TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D144118

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity		%	10 to 70	18	Pass
Pendulum Speed		m/s	5.95 to 6.15	6.15	Pass
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	-0.02	Pass
	3.7 ms	m/s	-0.425 to -0.24	-0.417	Pass
	27 ms	m/s	-6.50 to -5.80	-5.95	Pass
	30 ms	m/s	>= -6.50	-6.49	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	45.3	Pass
Time of Maximum Flexion Angle		ms	39.0 to 53.0	46.2	Pass
Headform Rotation Decay to Initial Position		ms	37 to 57	45	Pass
Overall Results					Pass

David Schoedel
Laboratory Technician

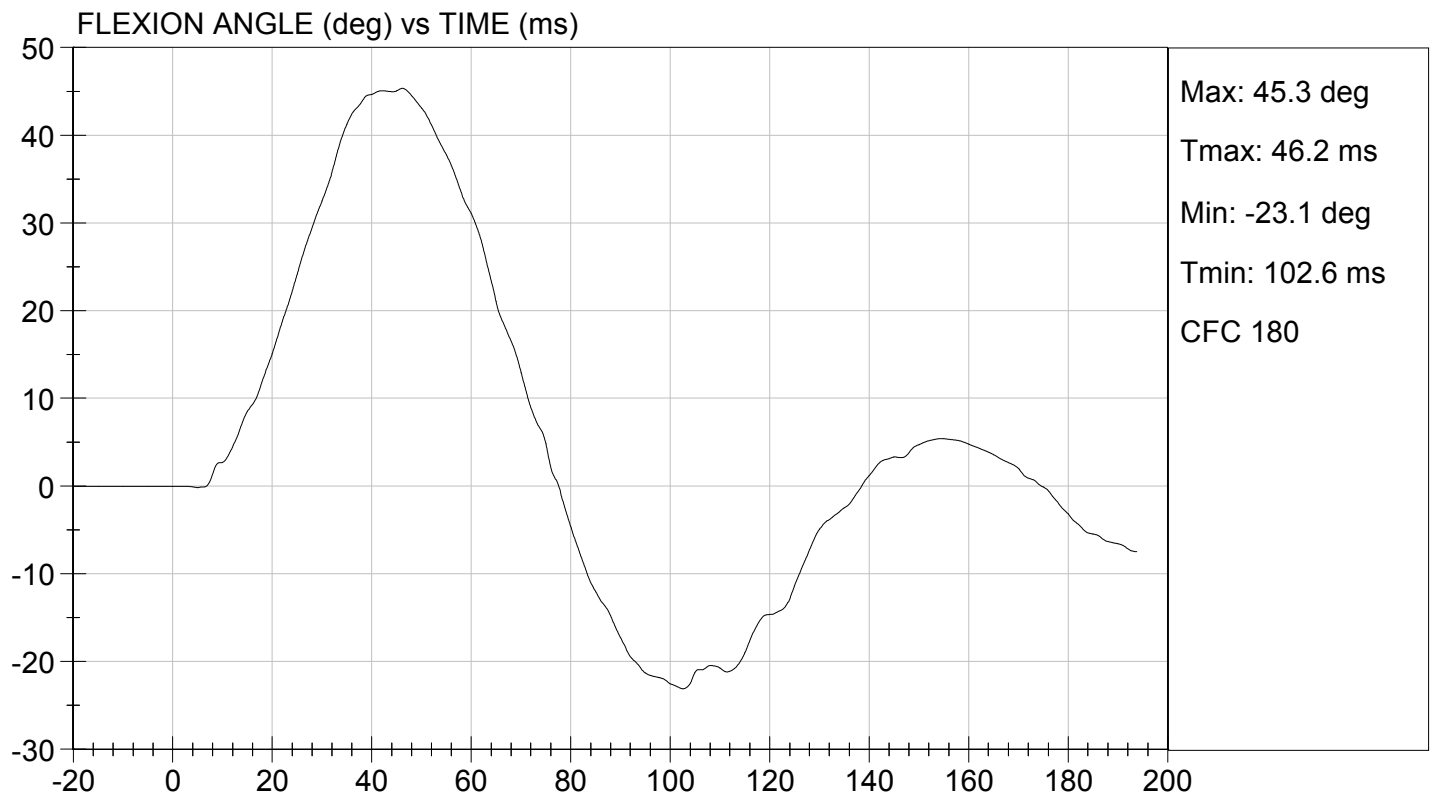
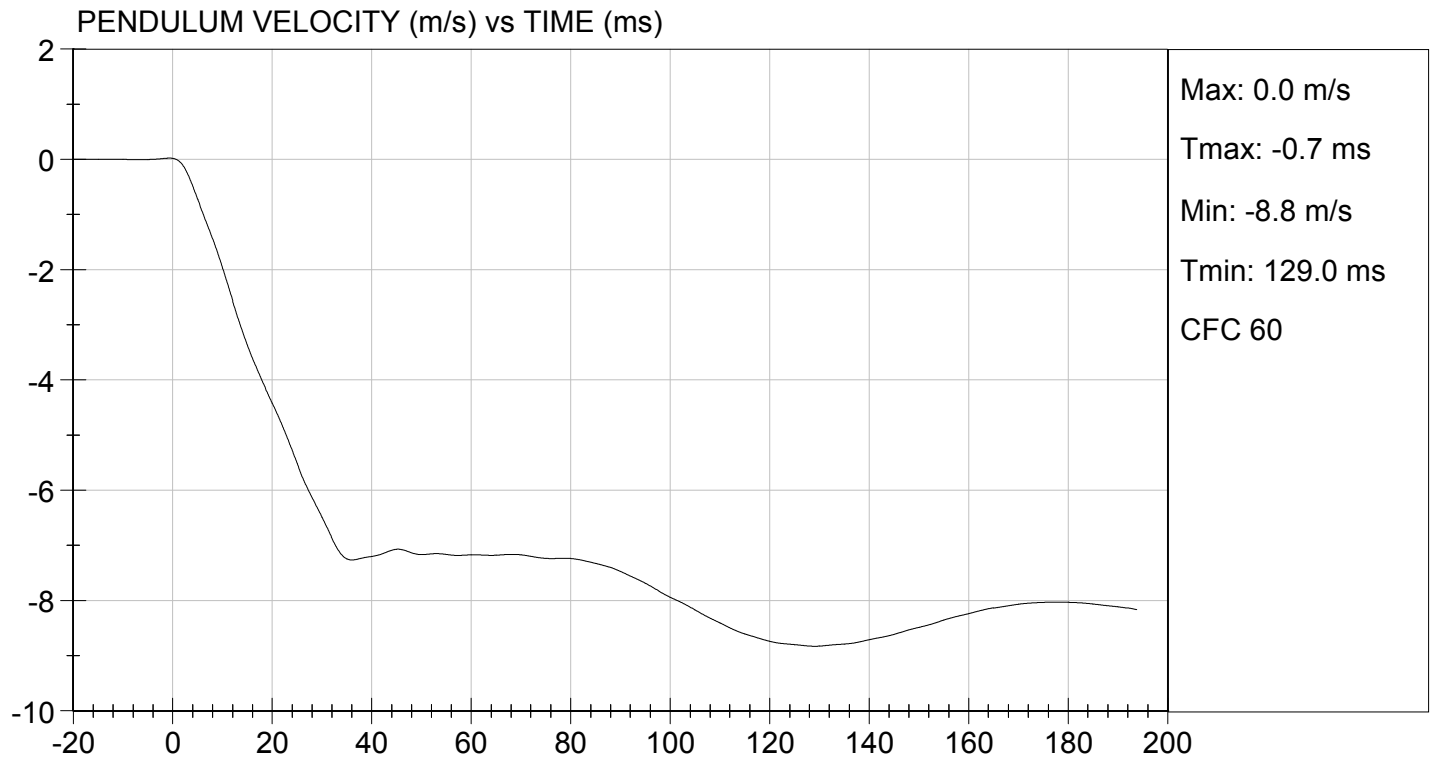
Jessica Hall
Approved By

11/19/2014
Test Date



TEST DESC: LUMBAR BENDING
VELOCITY: 20.18 ft/s, 6.15 m/s

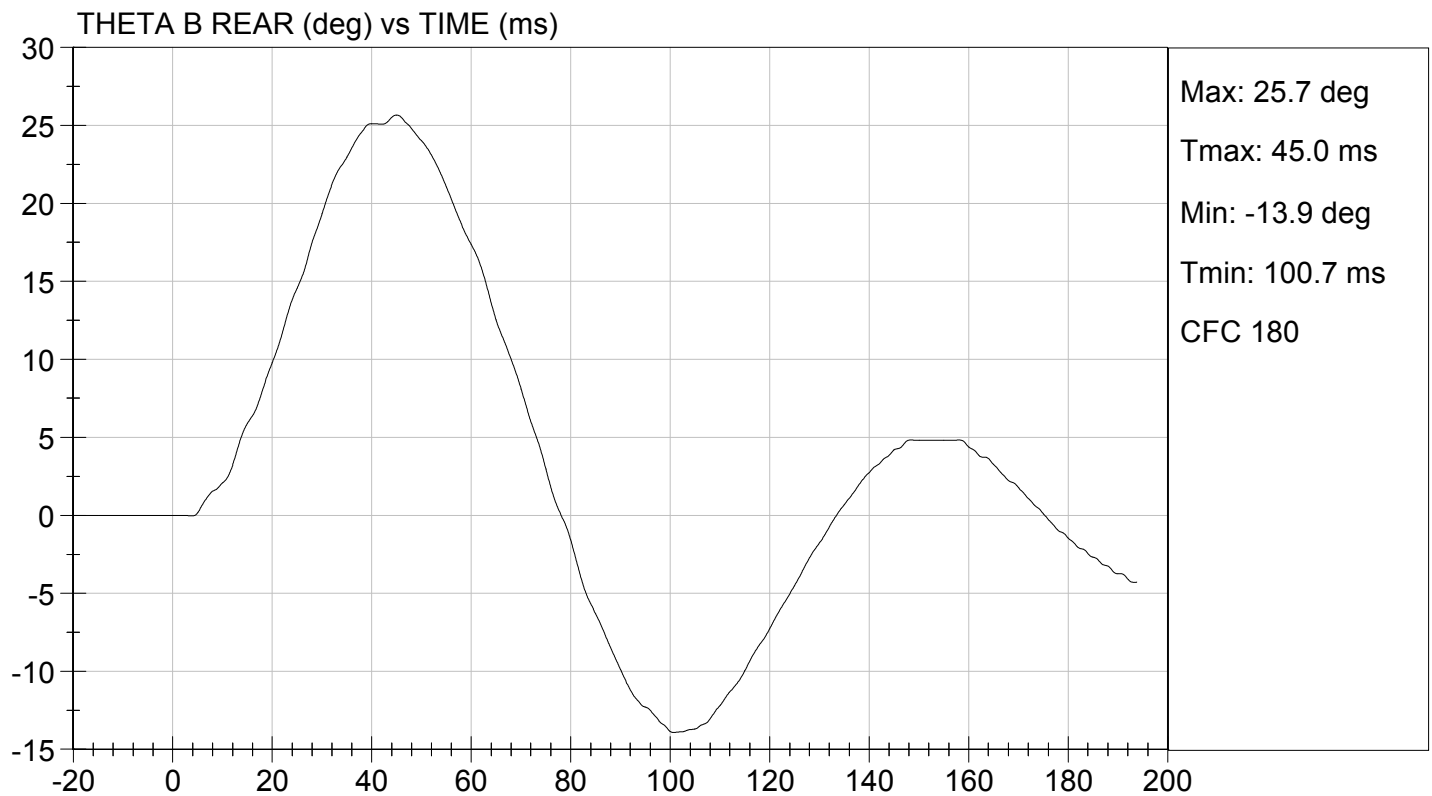
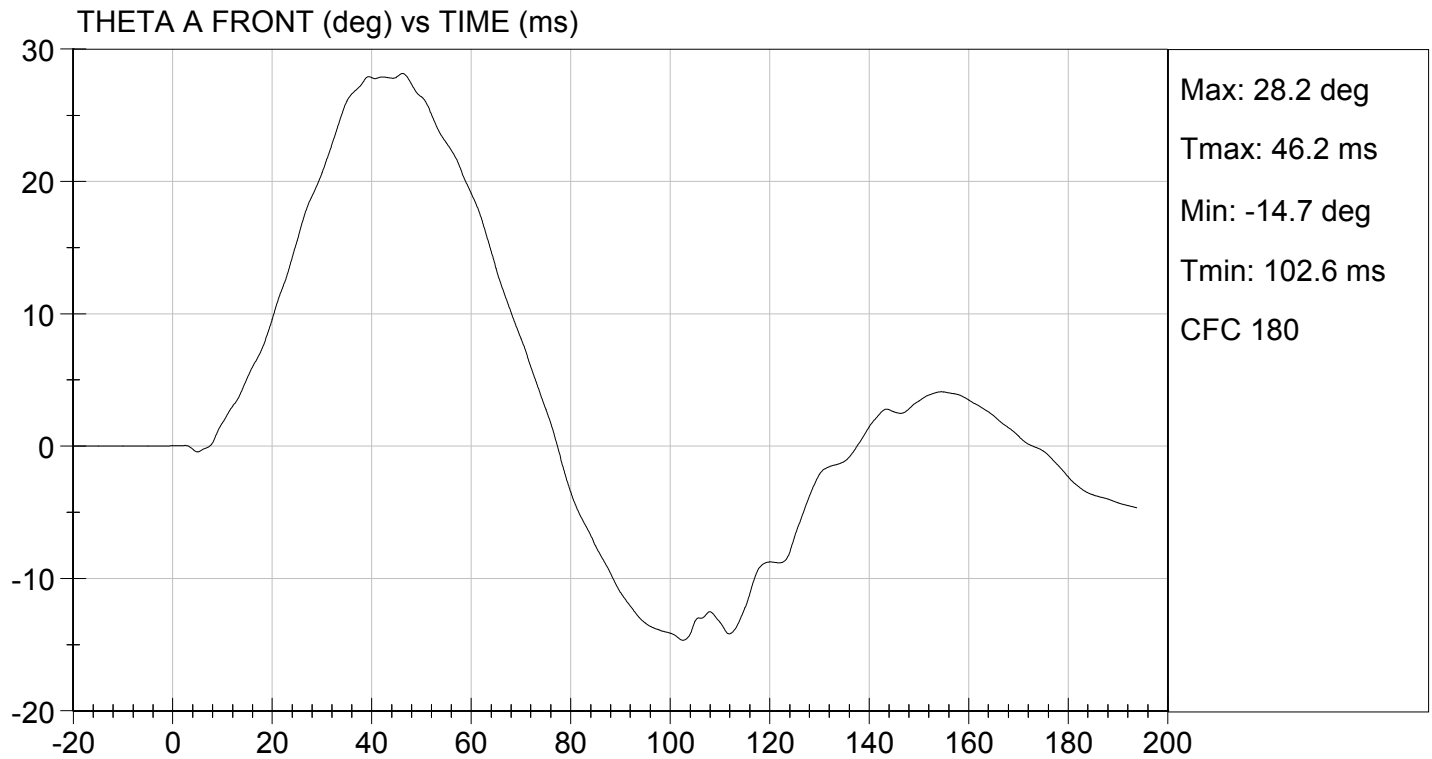
TEST DATE: 11/19/2014
TEST #: D144118





TEST DESC: LUMBAR BENDING
VELOCITY: 20.18 ft/s, 6.15 m/s

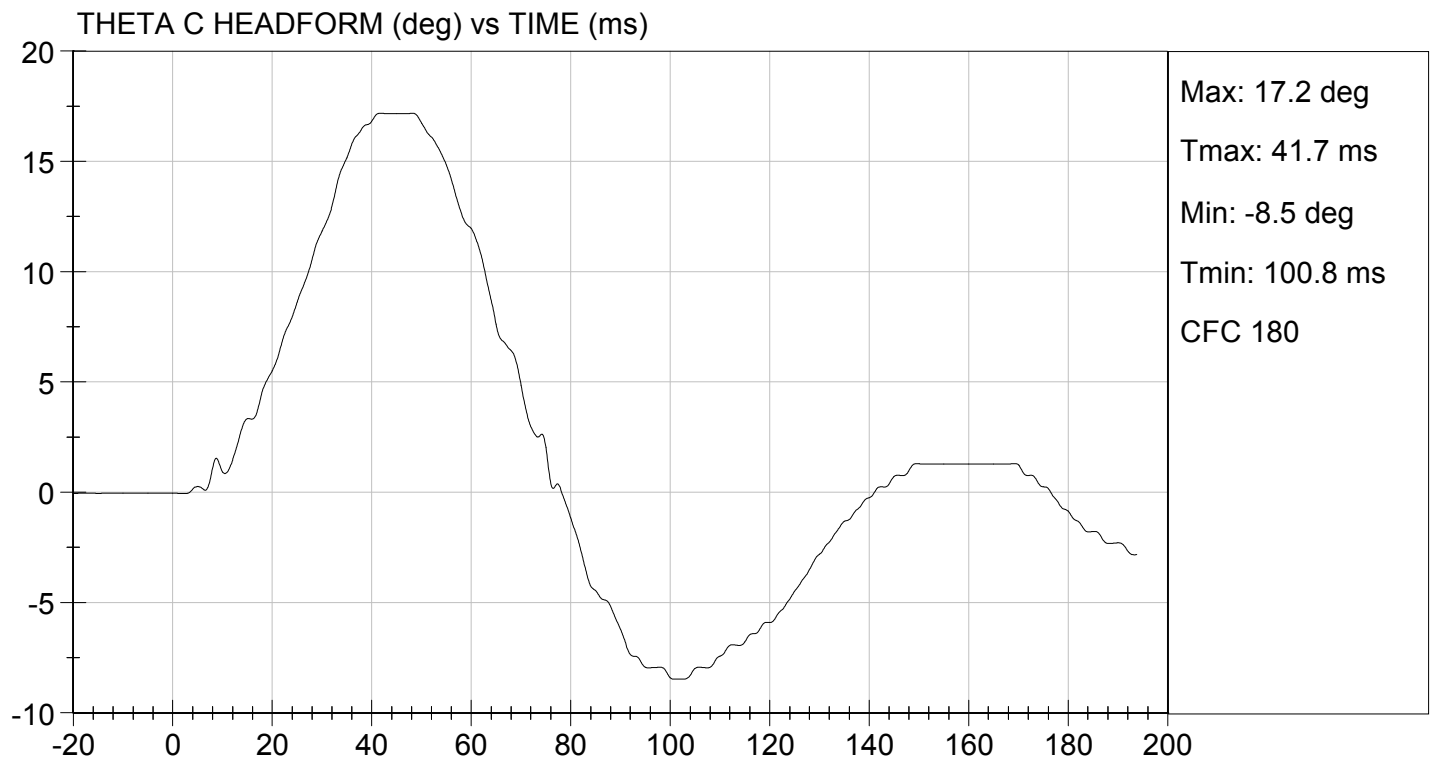
TEST DATE: 11/19/2014
TEST #: D144118





TEST DESC: LUMBAR BENDING
VELOCITY: 20.18 ft/s, 6.15 m/s

TEST DATE: 11/19/2014
TEST #: D144118



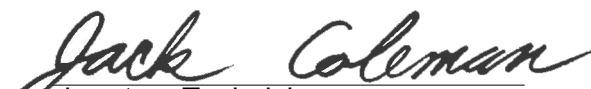
MGA RESEARCH CORPORATION

**PELVIS TEST
ES-2re DUMMY**

ATD Serial No: 032

Test I.D: D144119

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	17	Pass
Probe Speed	m/s	4.20 to 4.40	4.27	Pass
Maximum Impactor Force	N	4700 to 5400	4834	Pass
Time of Maximum Impactor Force	ms	11.8 to 16.1	13.4	Pass
Maximum Pubic Force	N	1230 to 1590	1309	Pass
Time of Maximum Pubic Force	ms	12.2 to 17.0	14.2	Pass
Overall Test Results				Pass


Laboratory Technician

11/20/2014

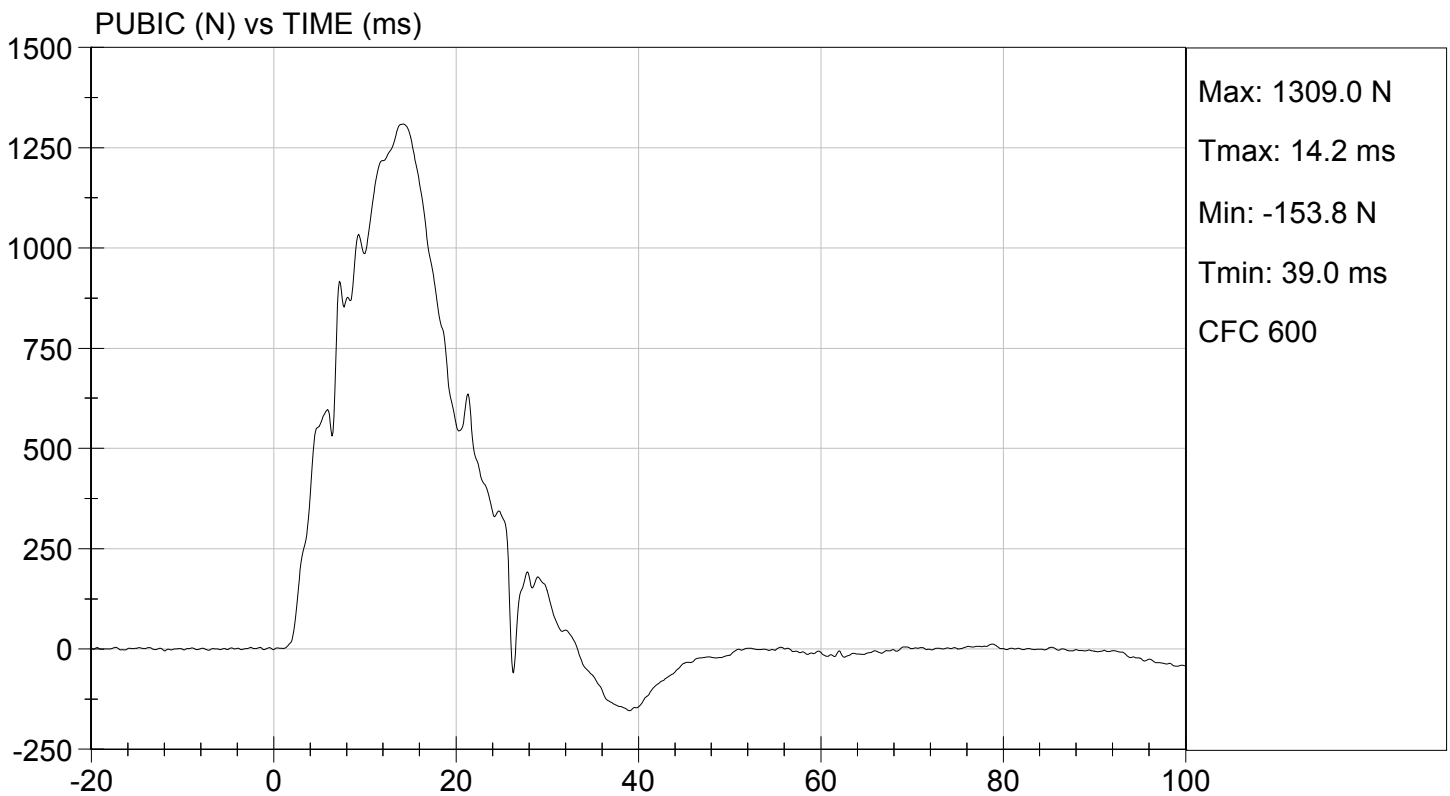
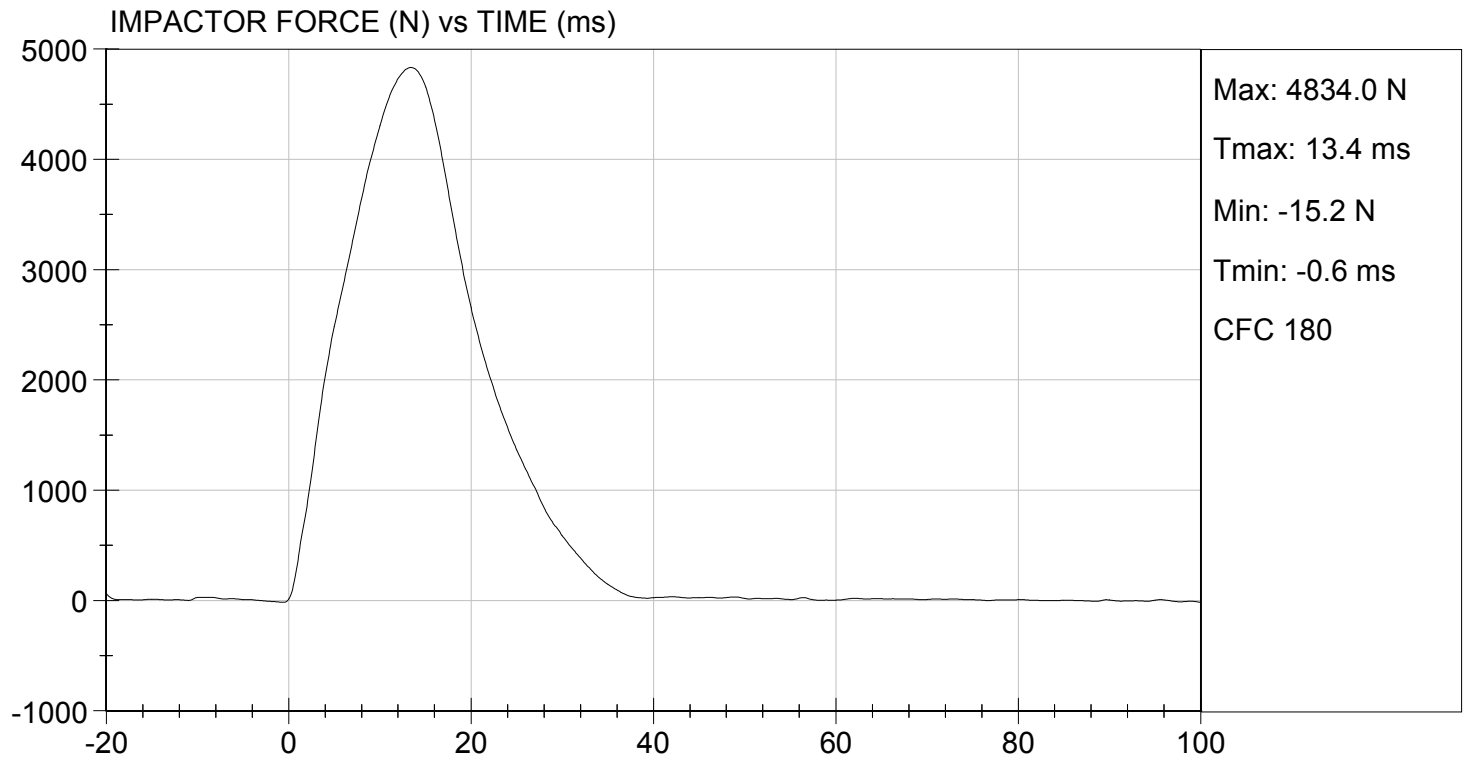
Test Date


Approved By



TEST DESC: PELVIS IMPACT
VELOCITY: 14.01 ft/s, 4.27 m/s

TEST DATE: 11/20/2014
TEST #: D144119



SID-IIsD External Measurements
SN: 296

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

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

ATD Serial No: 296

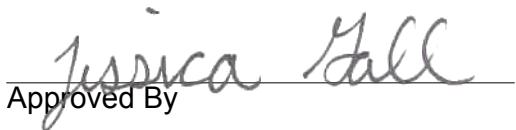
Test ID: D144001

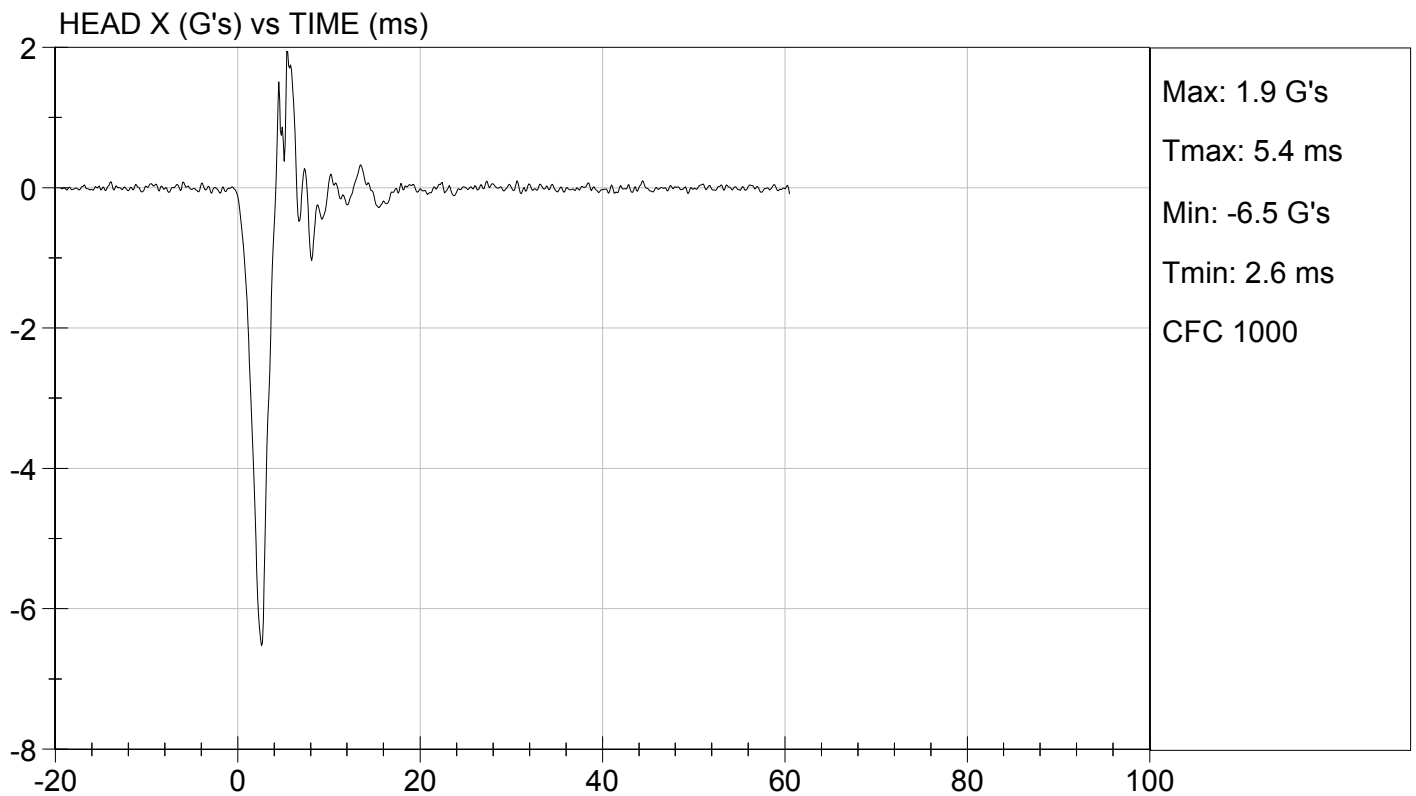
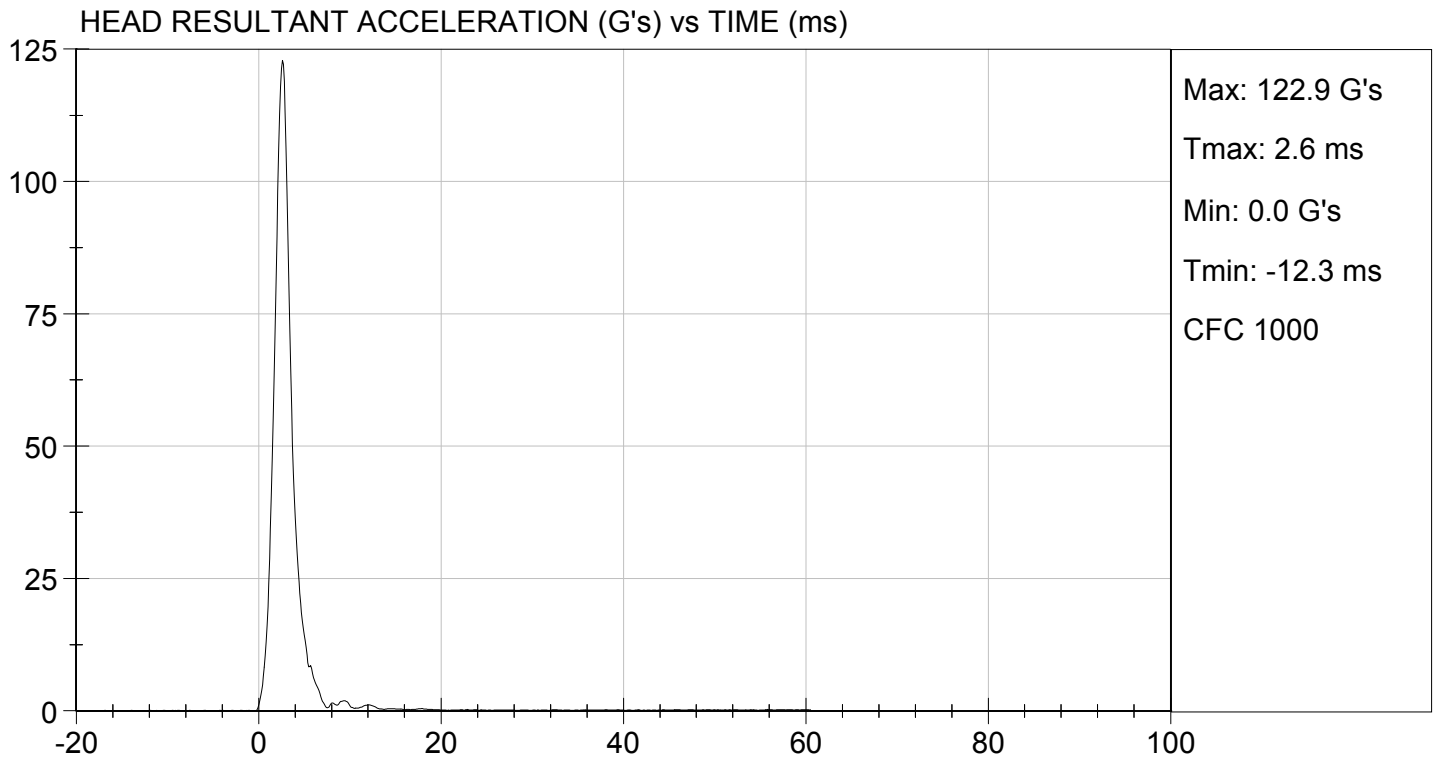
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	19	Pass
Peak Resultant Acceleration	G's	115 to 137	123	Pass
Peak Longitudinal Acceleration	G's	+/- 15	-6.5	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	<15%	Yes	Pass
Overall Test Results			Pass	

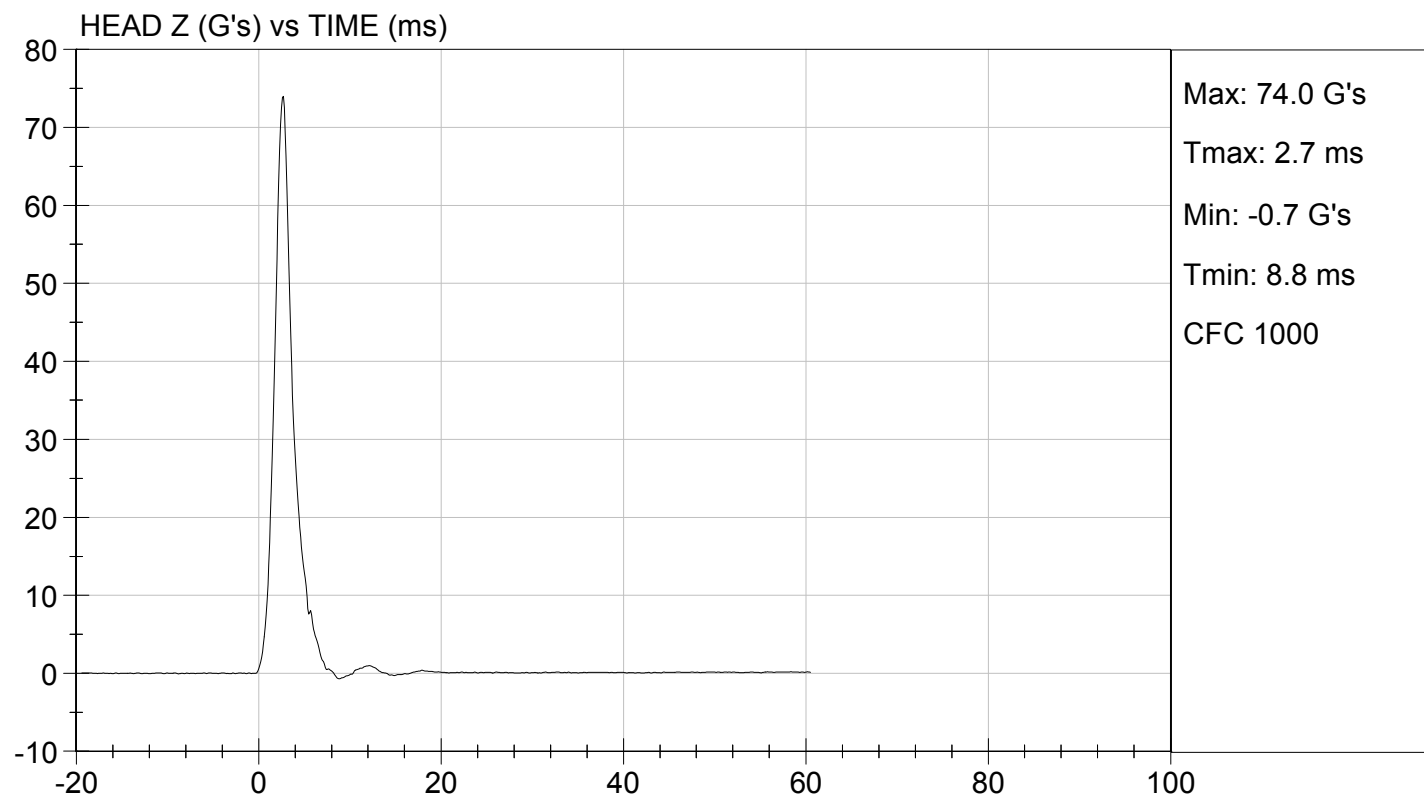
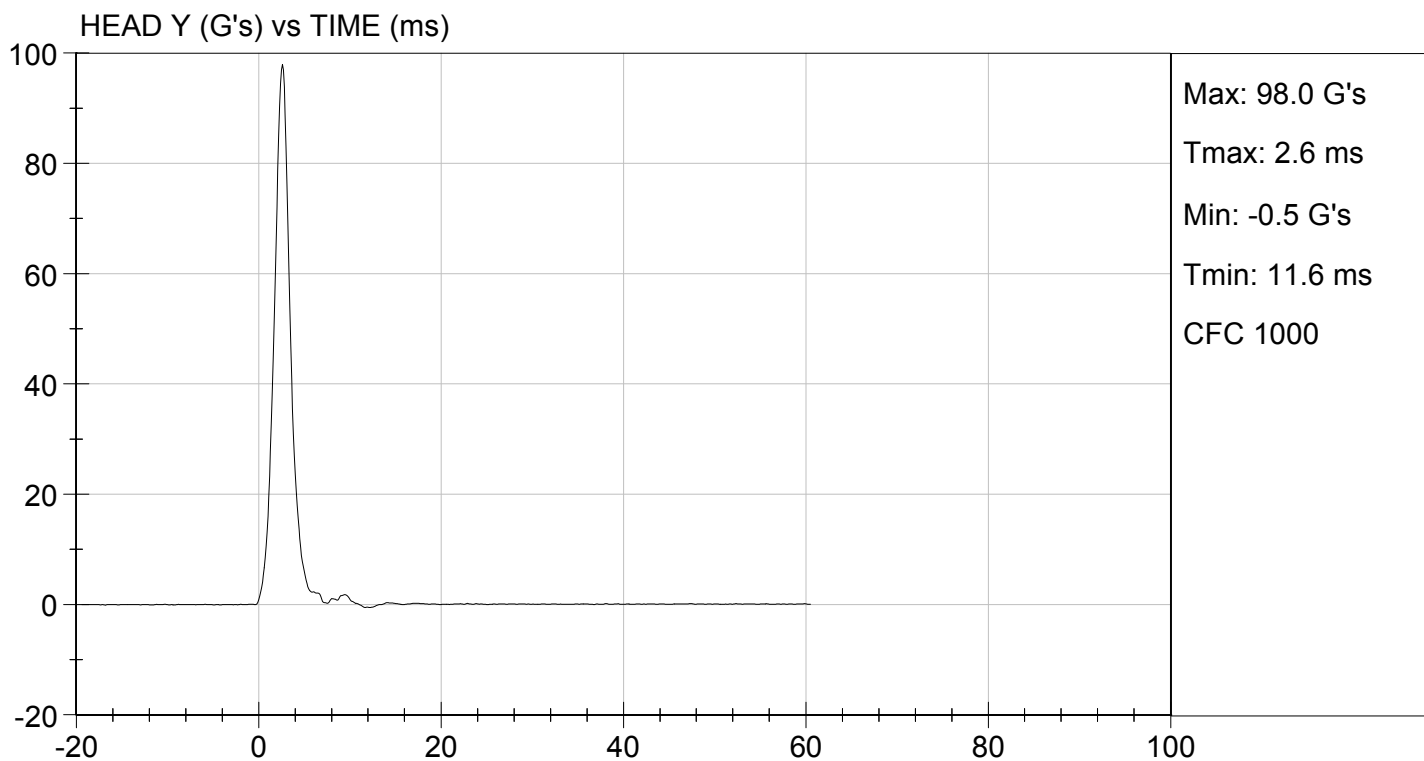

Laboratory Technician

11/12/2014

Test Date


Approved By





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

ATD Serial No: 296

Test I.D: D144002

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.9	Pass
Humidity		%	10 to 70	24	Pass
Impact Velocity		m/s	5.51 to 5.63	5.63	Pass
Pendulum Velocity	10 ms	m/s	2.20 to 2.80	2.59	Pass
	15 ms	m/s	3.30 to 4.10	3.66	Pass
	20 ms	m/s	4.40 to 5.40	4.82	Pass
	25 ms	m/s	5.40 to 6.10	5.55	Pass
	25-100 ms	m/s	5.50 to 6.20	5.56	Pass
Maximum D-Plane Rotation		deg	71 to 81	75	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

David Schoedel
Laboratory Technician

11/12/2014

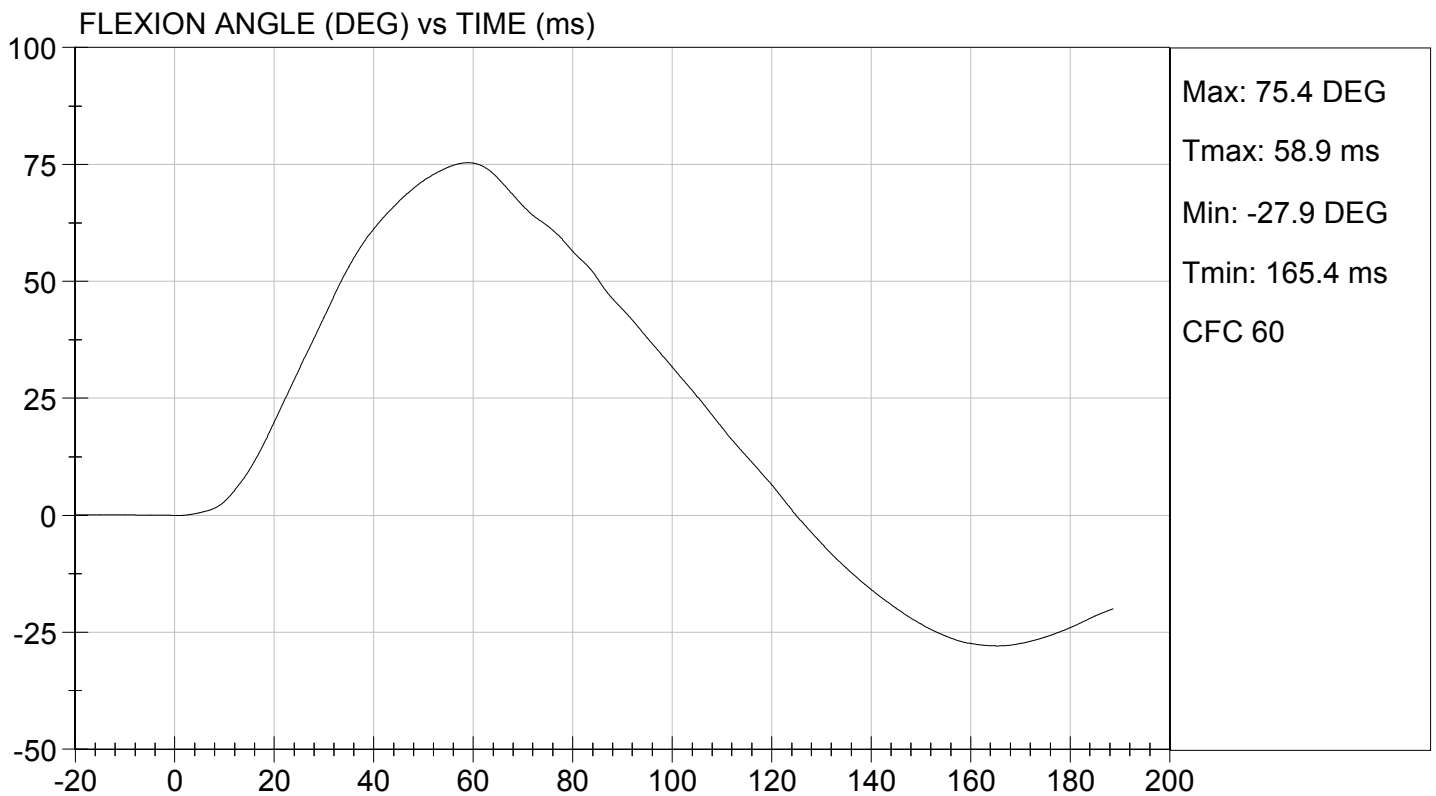
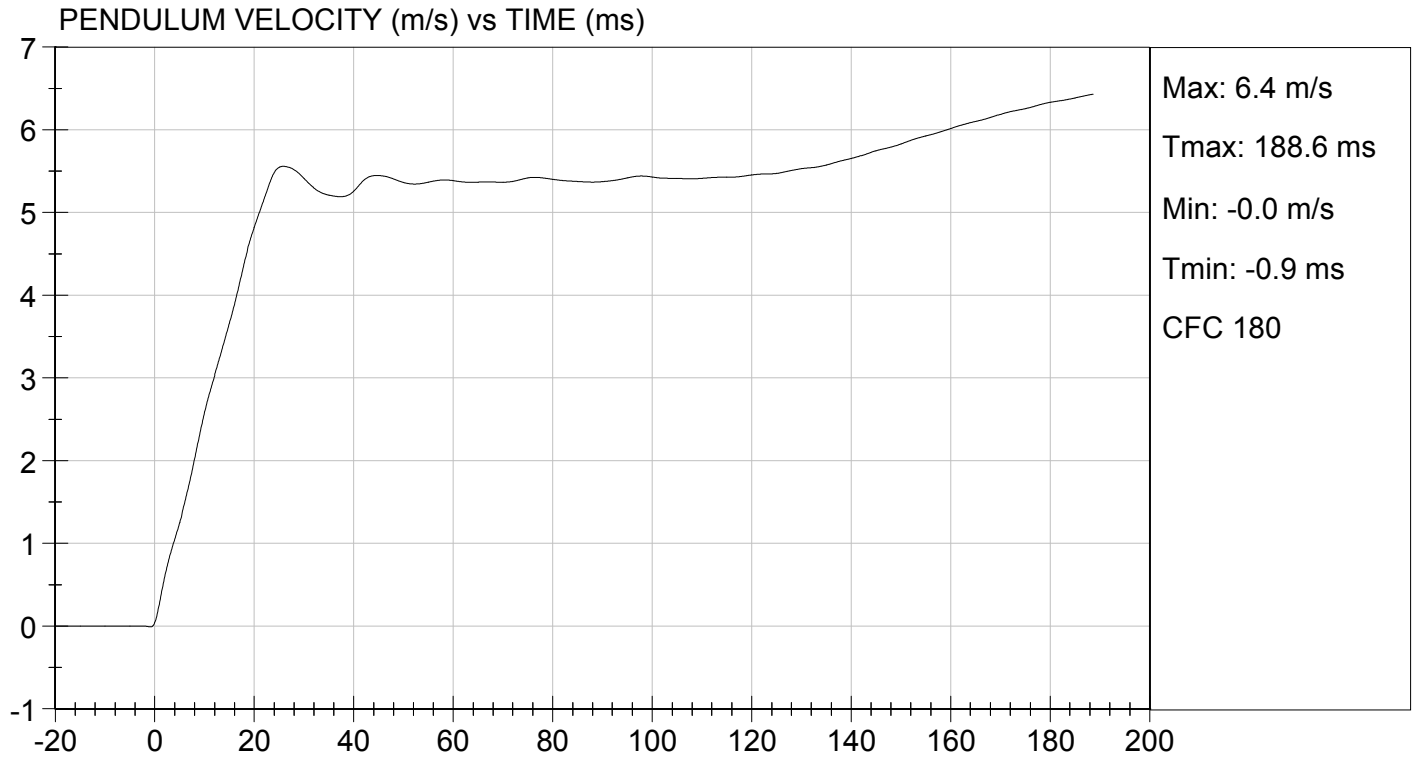
Test Date

Jessica Hall
Approved By



TEST DESC: NECK BENDING
VELOCITY: 18.47 ft/s, 5.63 m/s

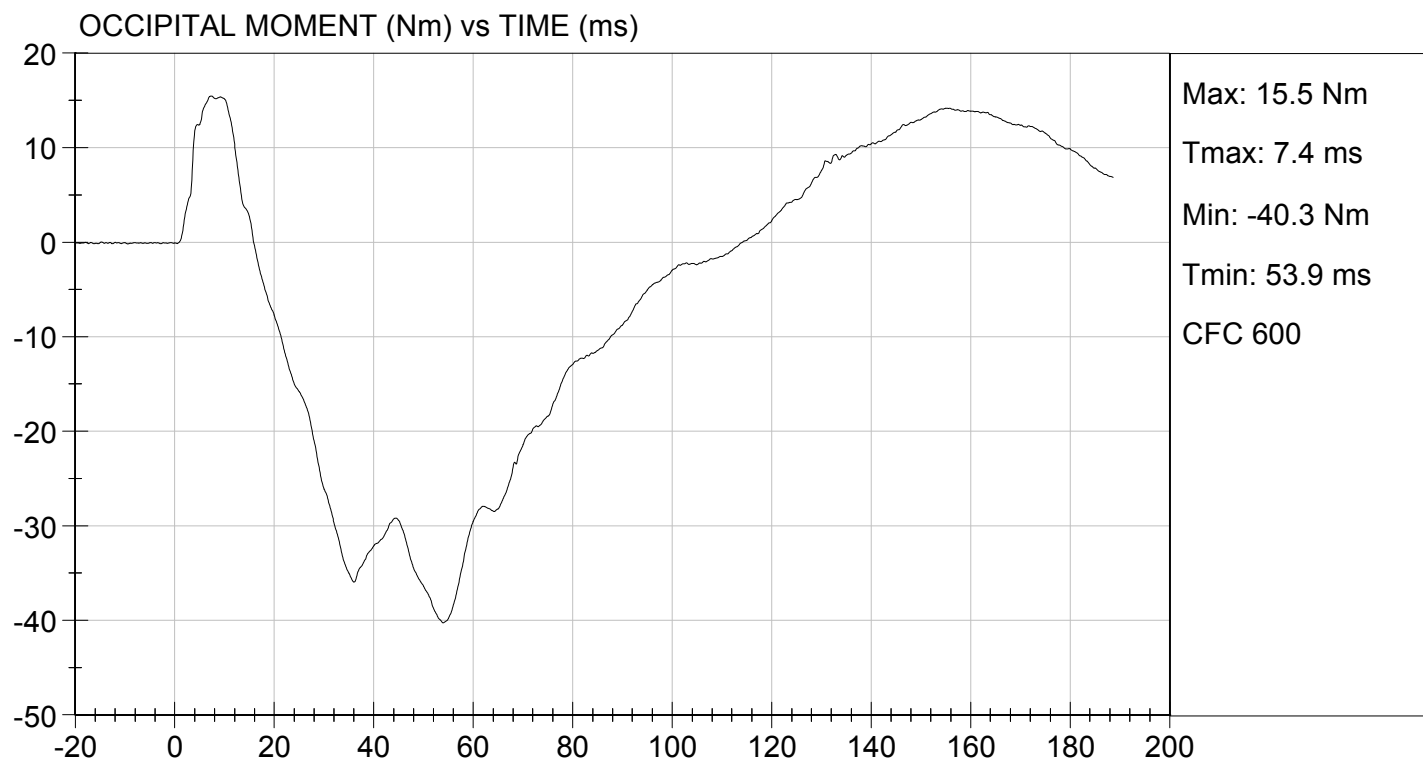
TEST DATE: 11/12/2014
TEST #: D144002





TEST DESC: NECK BENDING
VELOCITY: 18.47 ft/s, 5.63 m/s

TEST DATE: 11/12/2014
TEST #: D144002



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

ATD Serial No: 296

Test ID: D144003

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	19	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Maximum Probe Acceleration	G's	13 to 18	13	Pass
Shoulder Displacement	mm	28 to 37	32	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	18	Pass
Overall Test Results			Pass	

David Schoedel
Laboratory Technician

11/12/2014

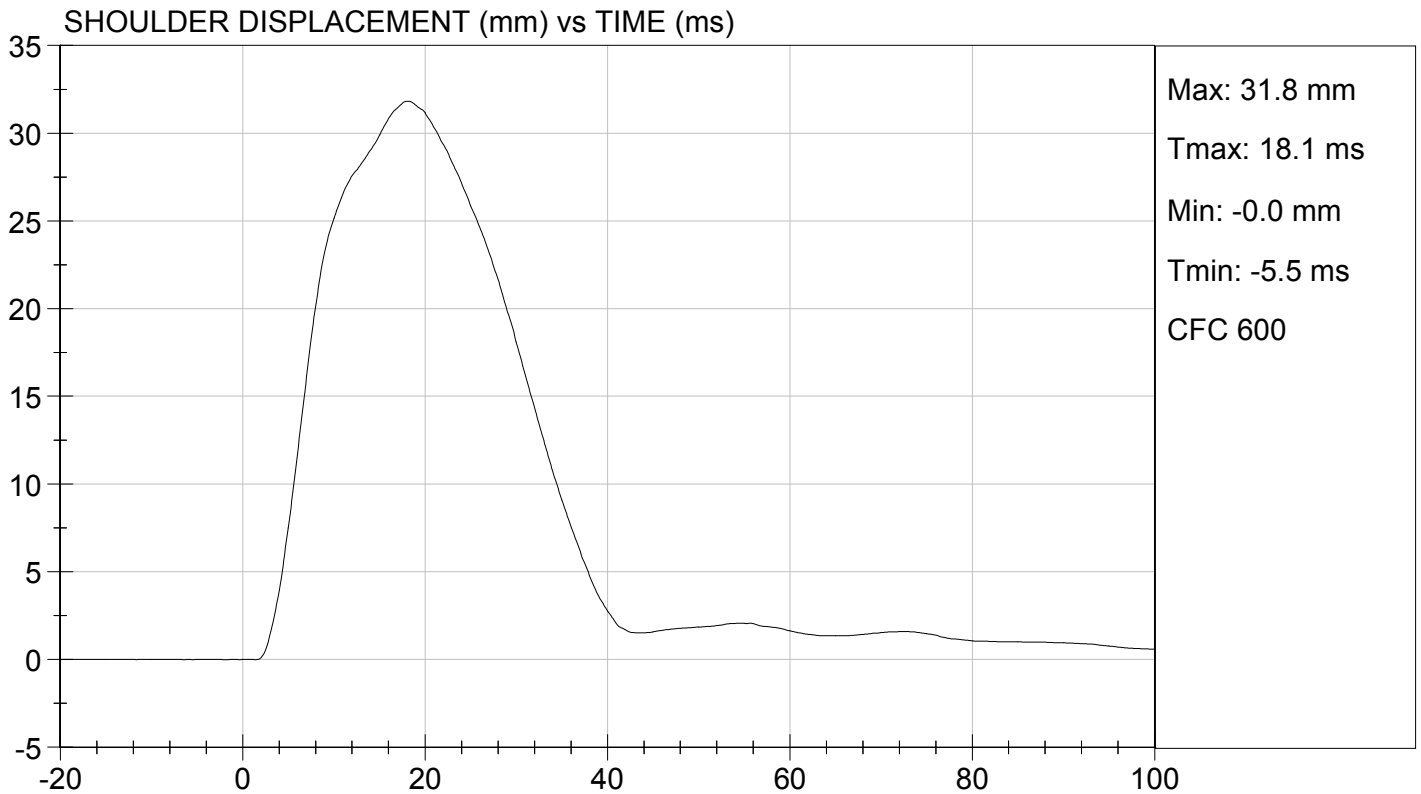
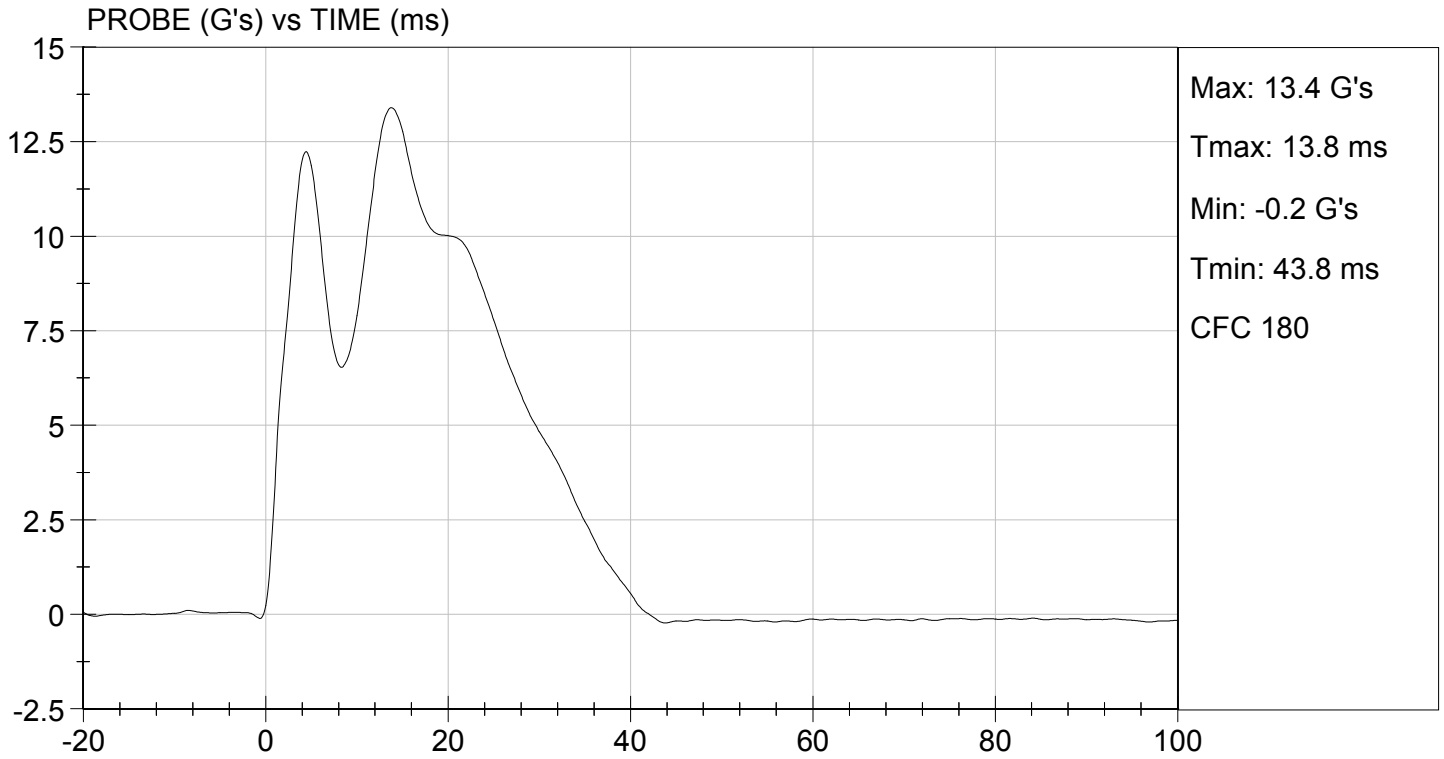
Test Date

Jessica Hall
Approved By



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

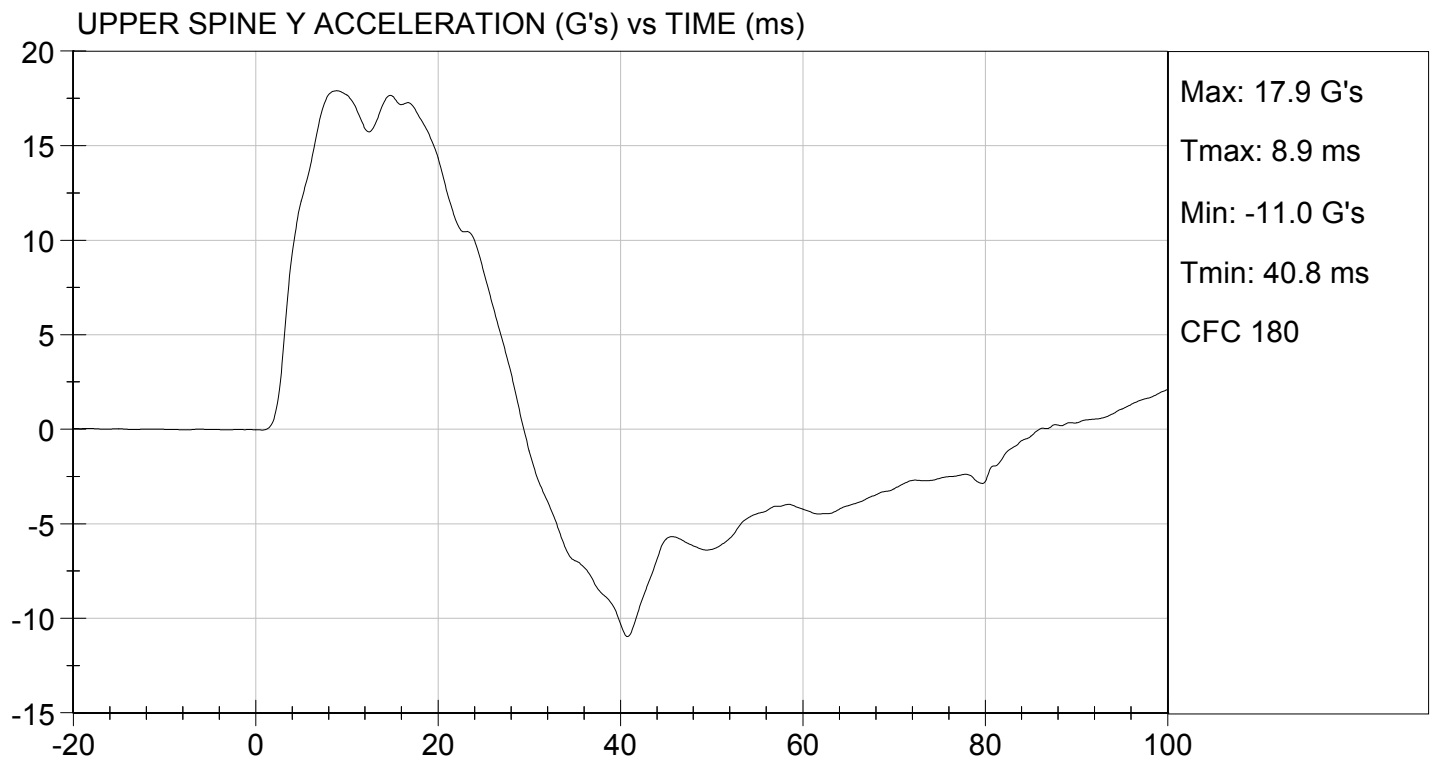
TEST DATE: 11/12/2014
TEST #: D144003





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

TEST DATE: 11/12/2014
TEST #: D144003



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

ATD Serial No: 296

Test I.D: D144004

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	19	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Maximum Probe Acceleration	G's	30 to 36	31	Pass
Shoulder Displacement	mm	31 to 40	37	Pass
Upper Rib Displacement	mm	25 to 32	29	Pass
Middle Rib Displacement	mm	30 to 36	33	Pass
Lower Rib Displacement	mm	32 to 38	35	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	34	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	30	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

11/12/2014

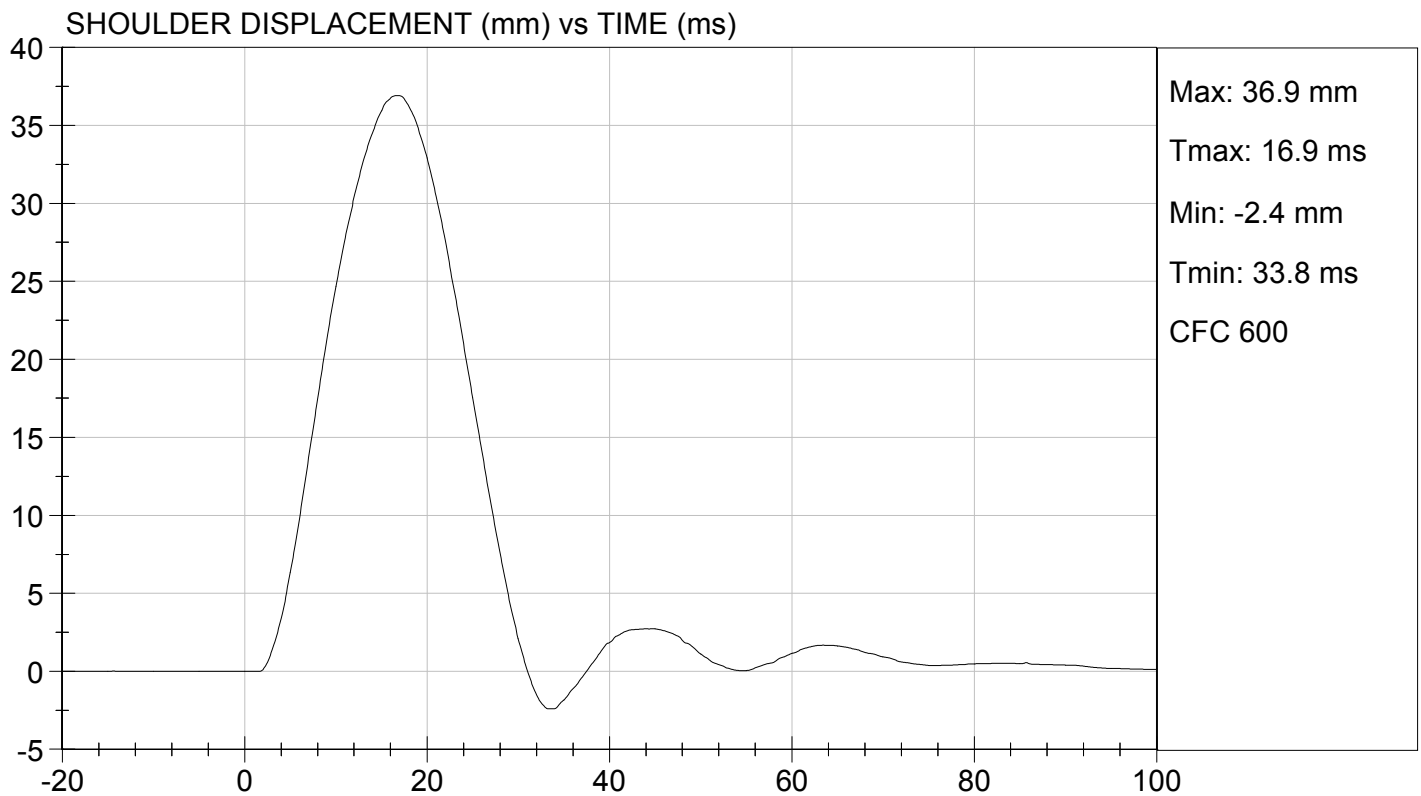
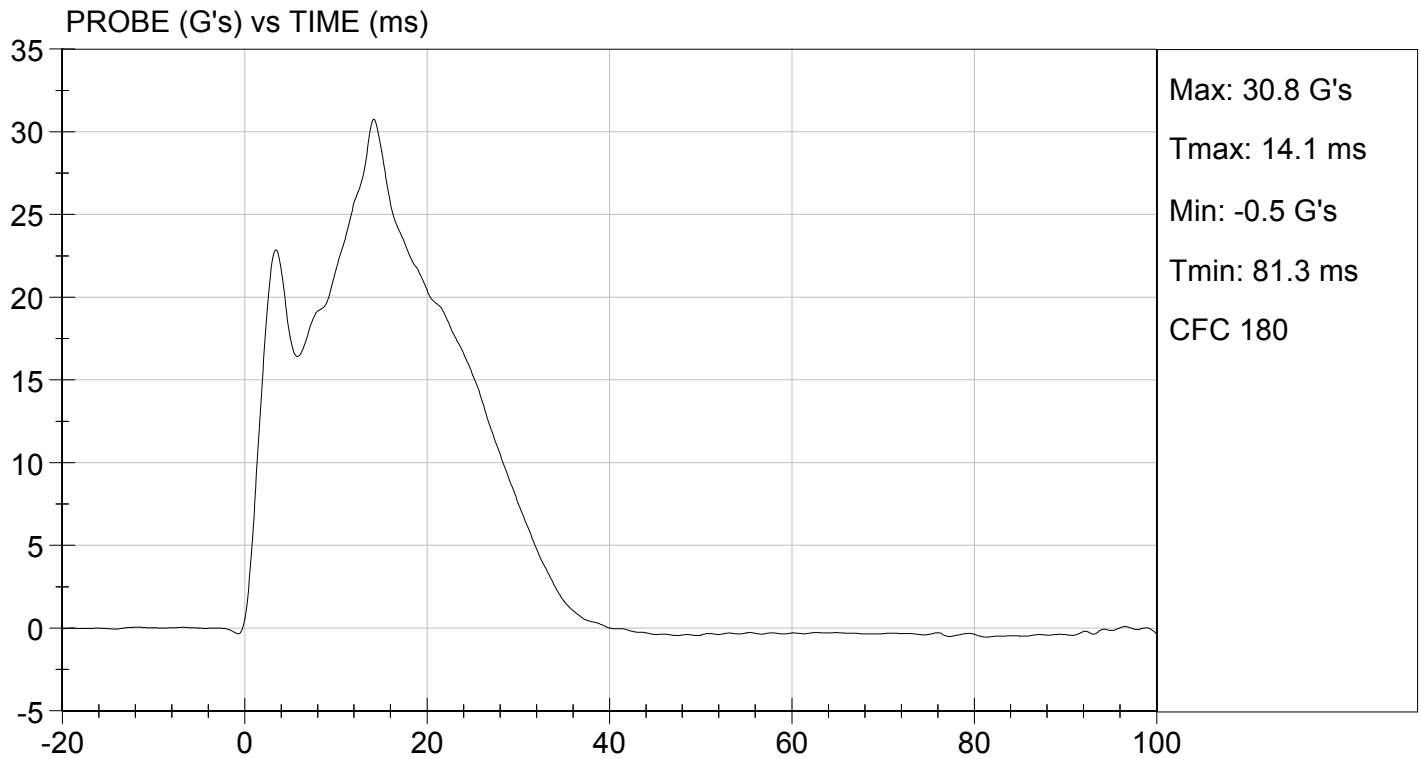
Test Date

Jessica Hall
Approved By



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

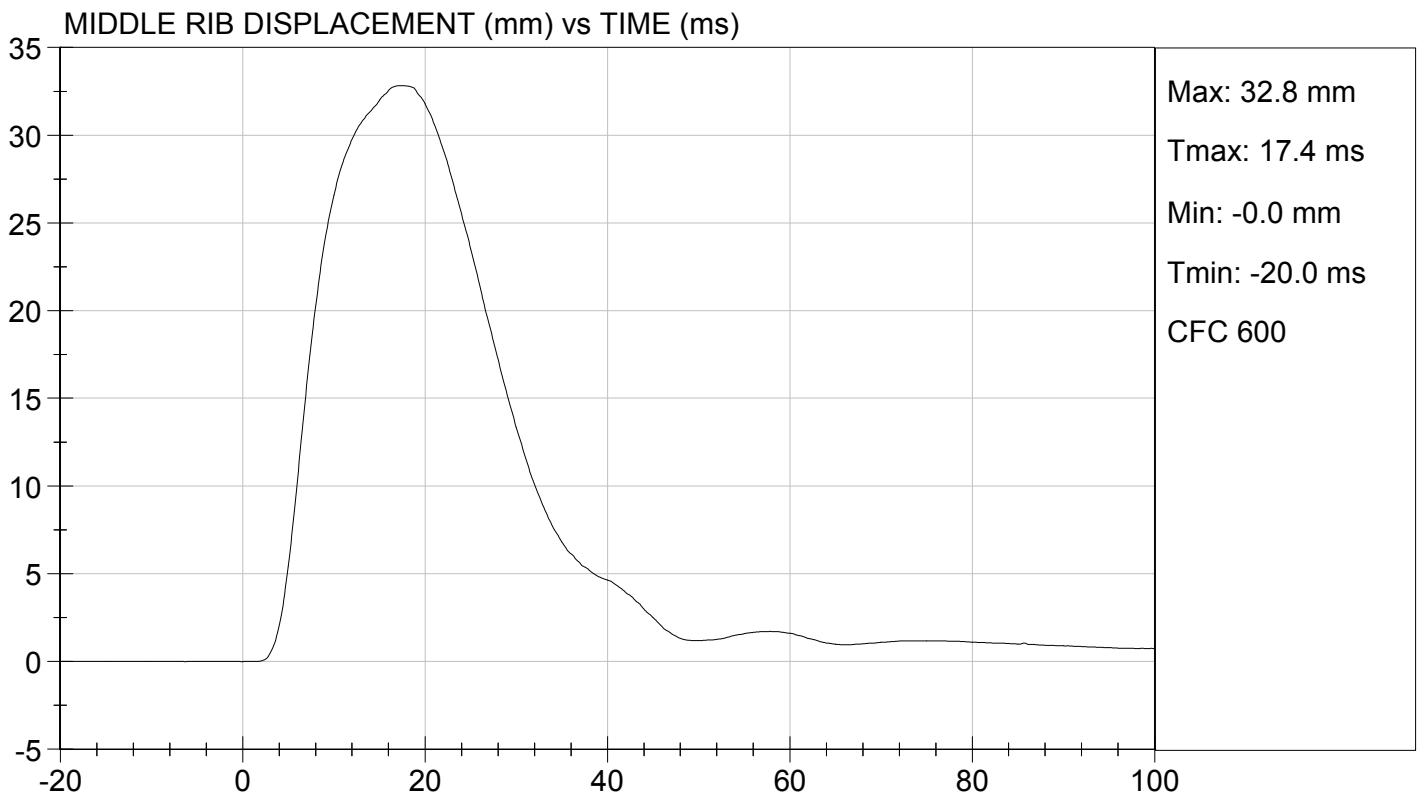
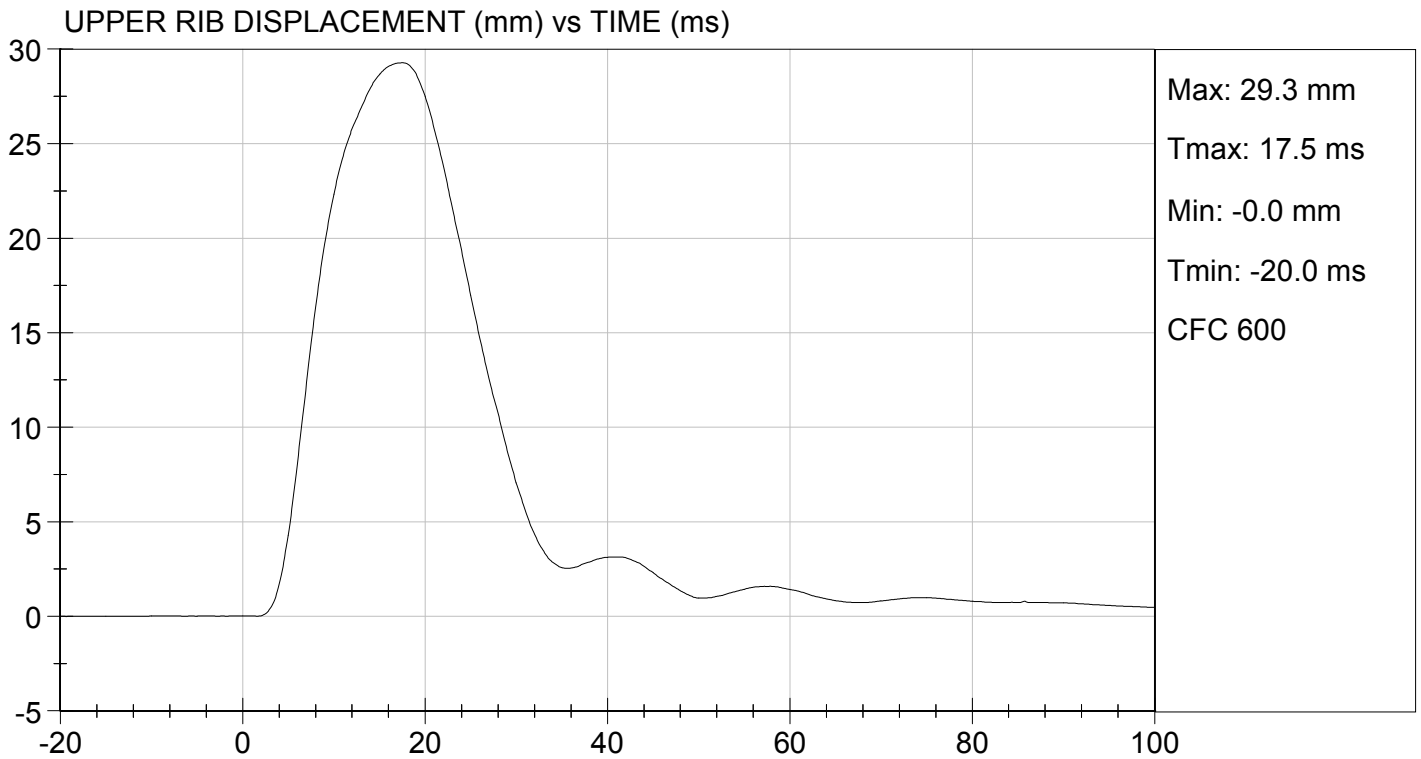
TEST DATE: 11/12/2014
TEST #: D144004





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

TEST DATE: 11/12/2014
TEST #: D144004

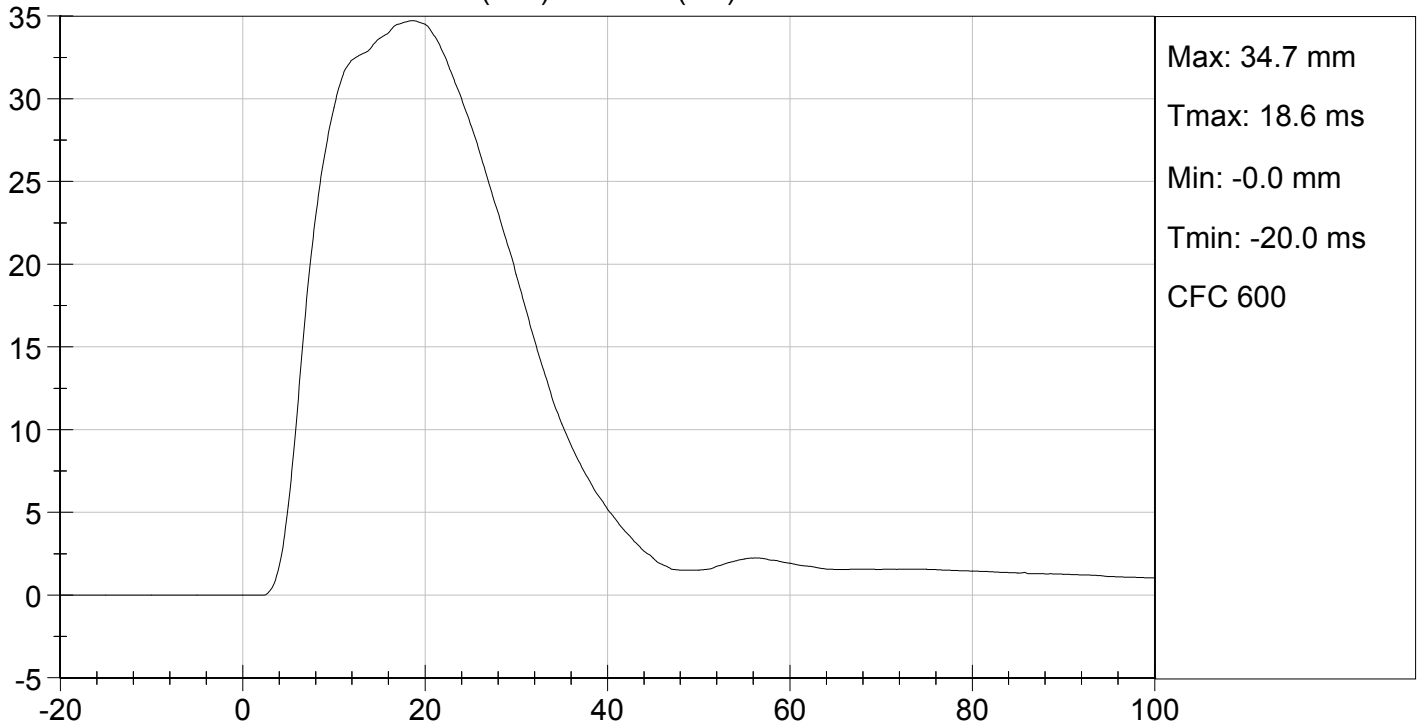




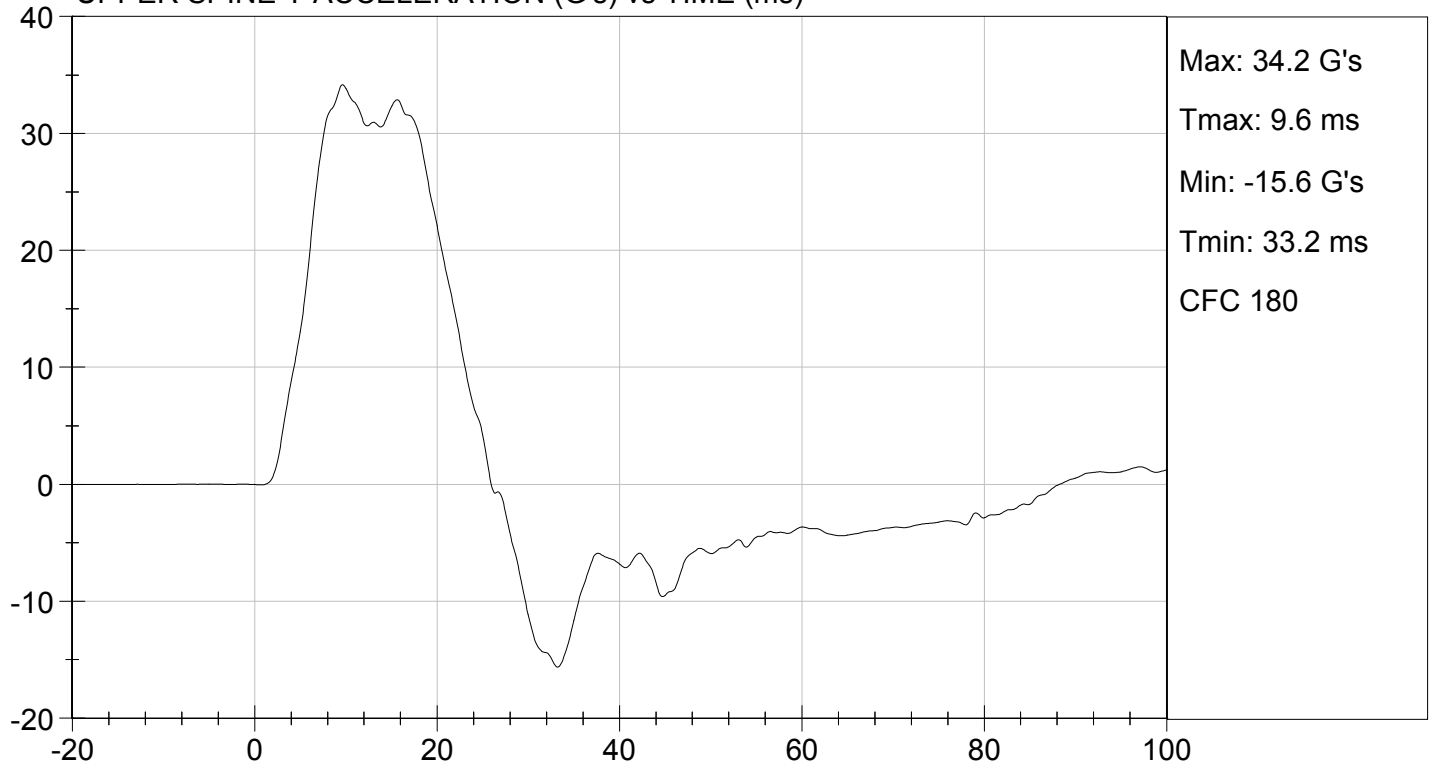
TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 11/12/2014
TEST #: D144004

LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



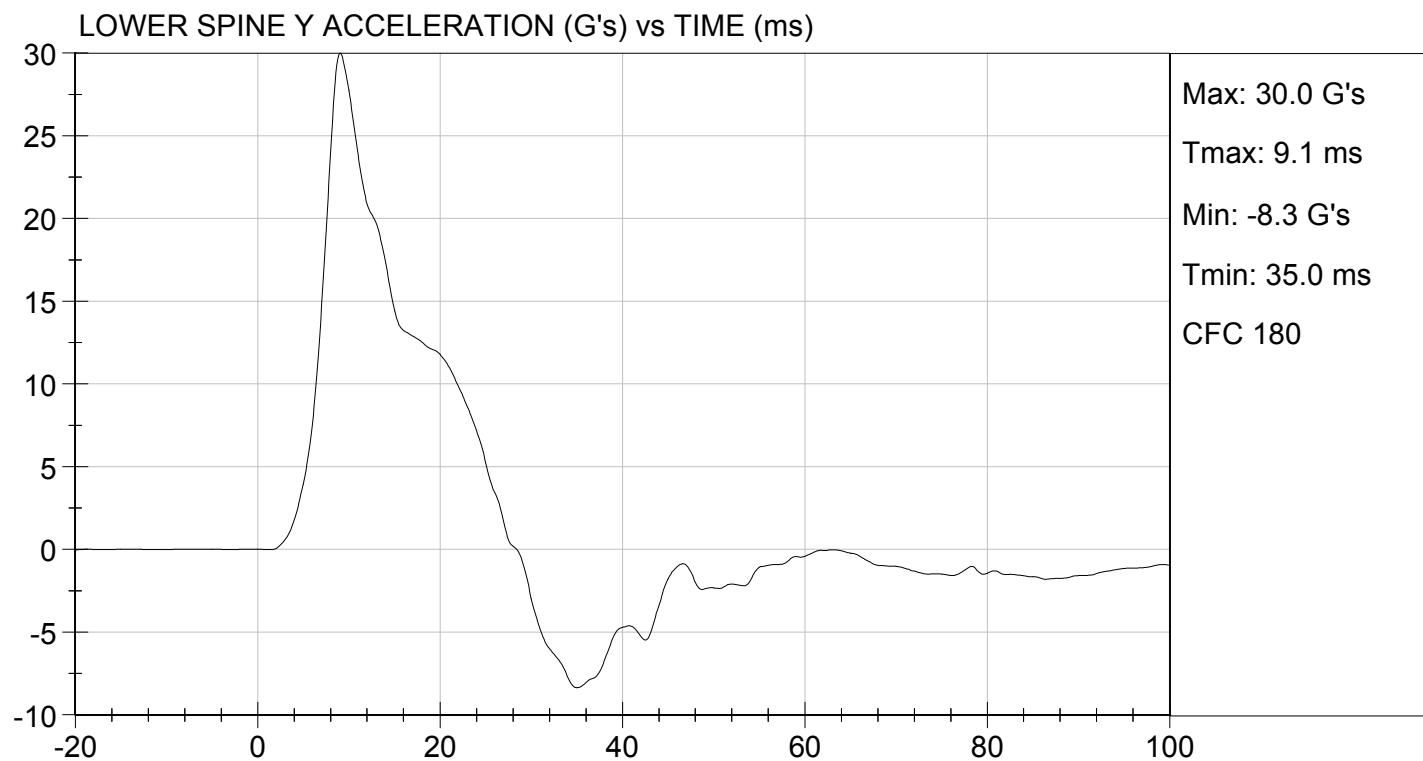
UPPER SPINE Y ACCELERATION (G's) vs TIME (ms)





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

TEST DATE: 11/12/2014
TEST #: D144004



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

ATD Serial No: 296

Test I.D: D144005

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	19	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Maximum Probe Acceleration	G's	14 to 18	15	Pass
Upper Rib Displacement	mm	32 to 40	37	Pass
Middle Rib Displacement	mm	39 to 45	42	Pass
Lower Rib Displacement	mm	35 to 43	39	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 17	13	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	8	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

11/12/2014

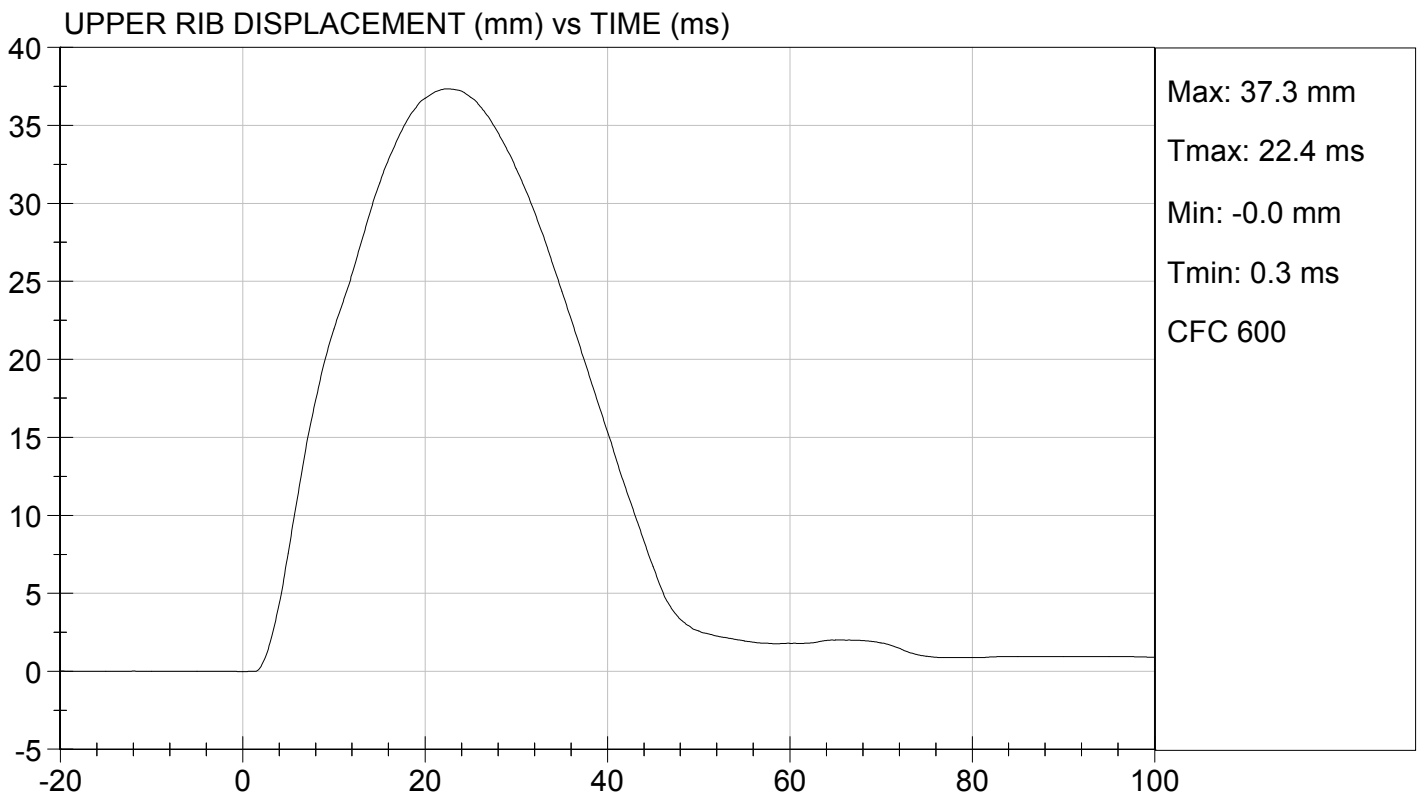
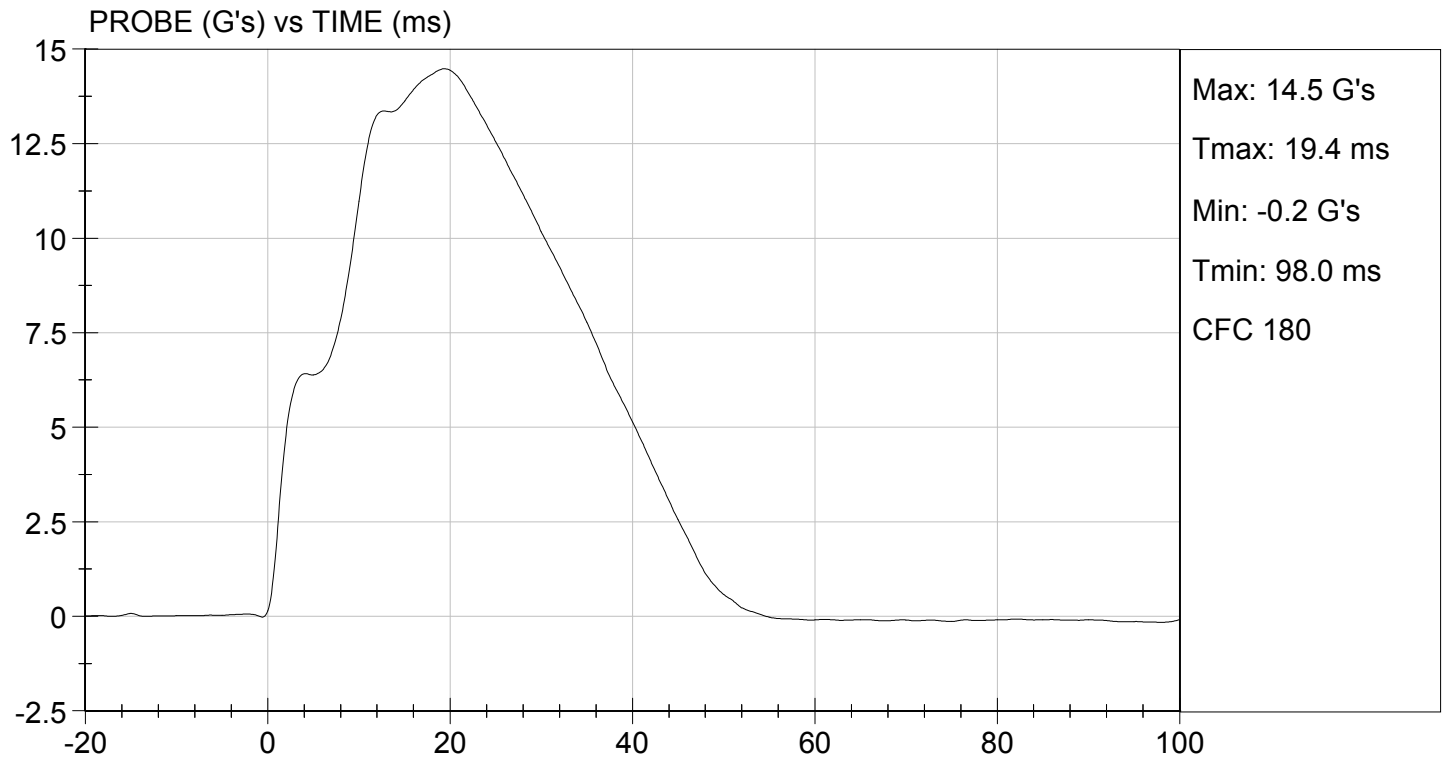
Test Date

Jessica Hall
Approved By



TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.12 ft/s, 4.30 m/s

TEST DATE: 11/12/2014
TEST #: D144005

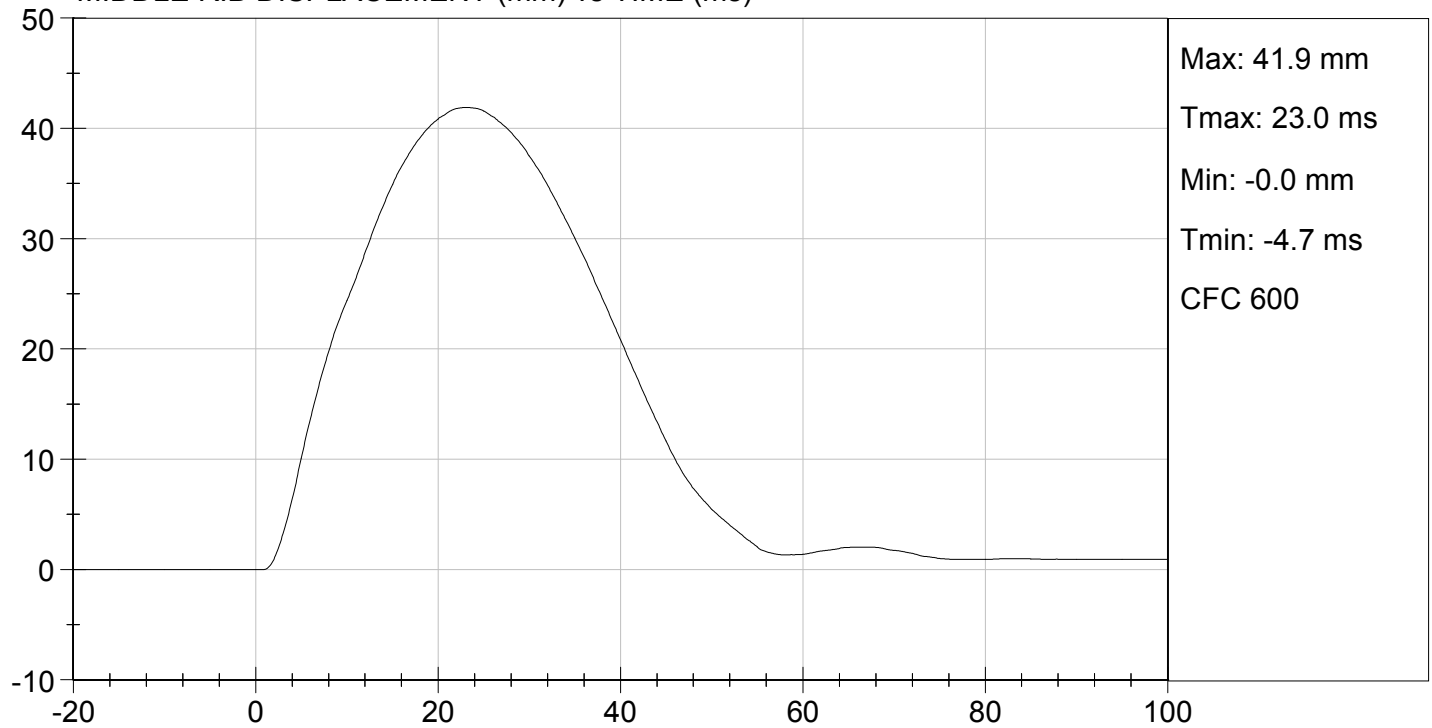




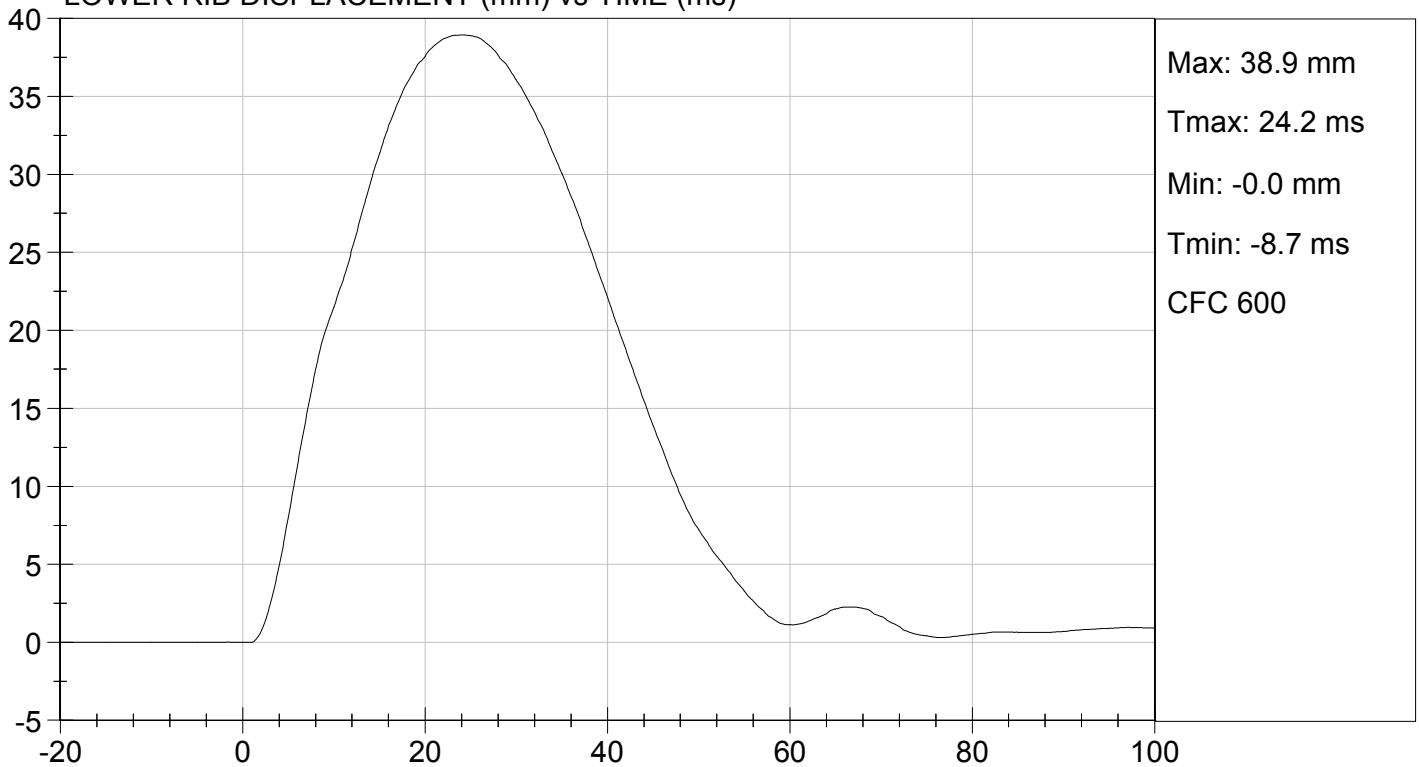
TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.12 ft/s, 4.30 m/s

TEST DATE: 11/12/2014
TEST #: D144005

MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



LOWER RIB DISPLACEMENT (mm) vs TIME (ms)

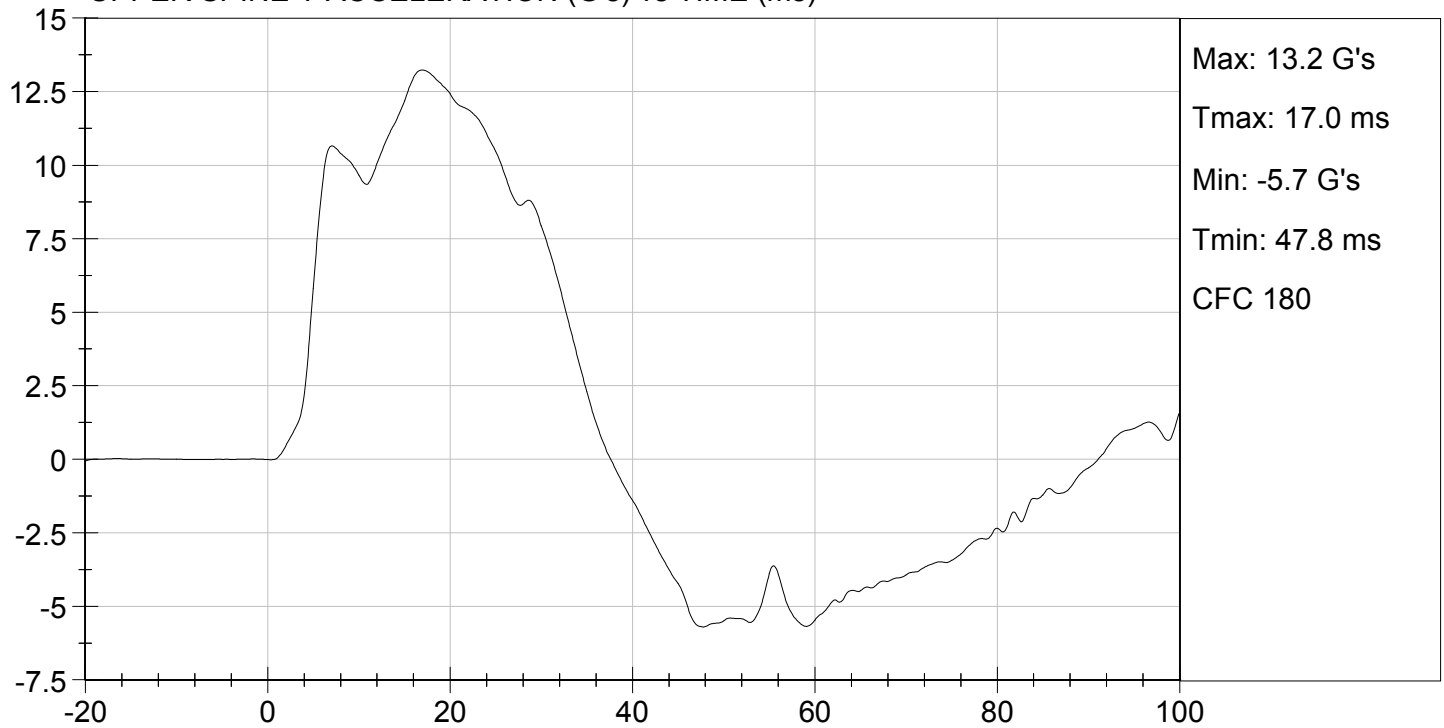




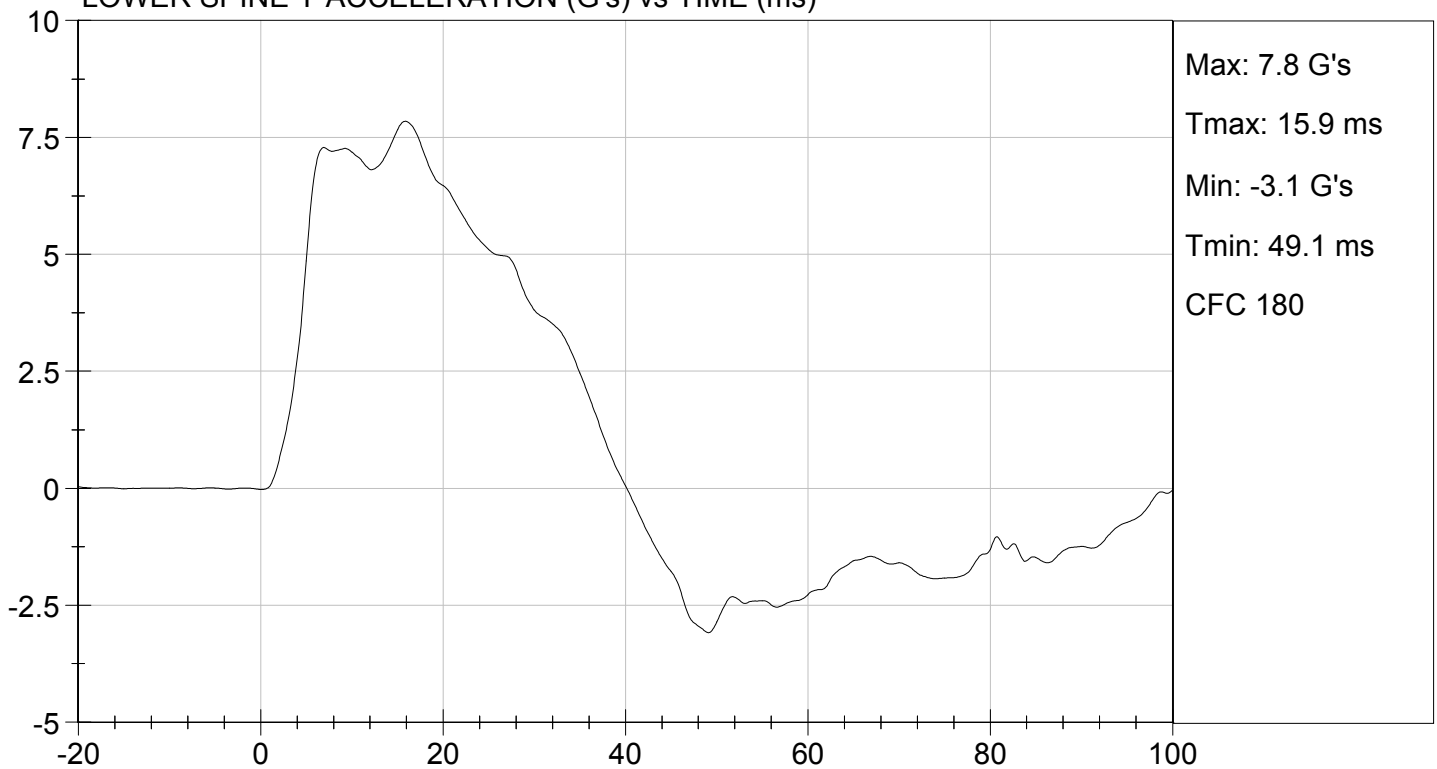
TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.12 ft/s, 4.30 m/s

TEST DATE: 11/12/2014
TEST #: D144005

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: 296

Test I.D: D144006

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	19	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Maximum Probe Acceleration	G's	12 to 16	13	Pass
Upper Abdomen Rib Displacement	mm	36 to 47	41	Pass
Lower Abdomen Rib Displacement	mm	33 to 44	41	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	10	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

11/12/2014

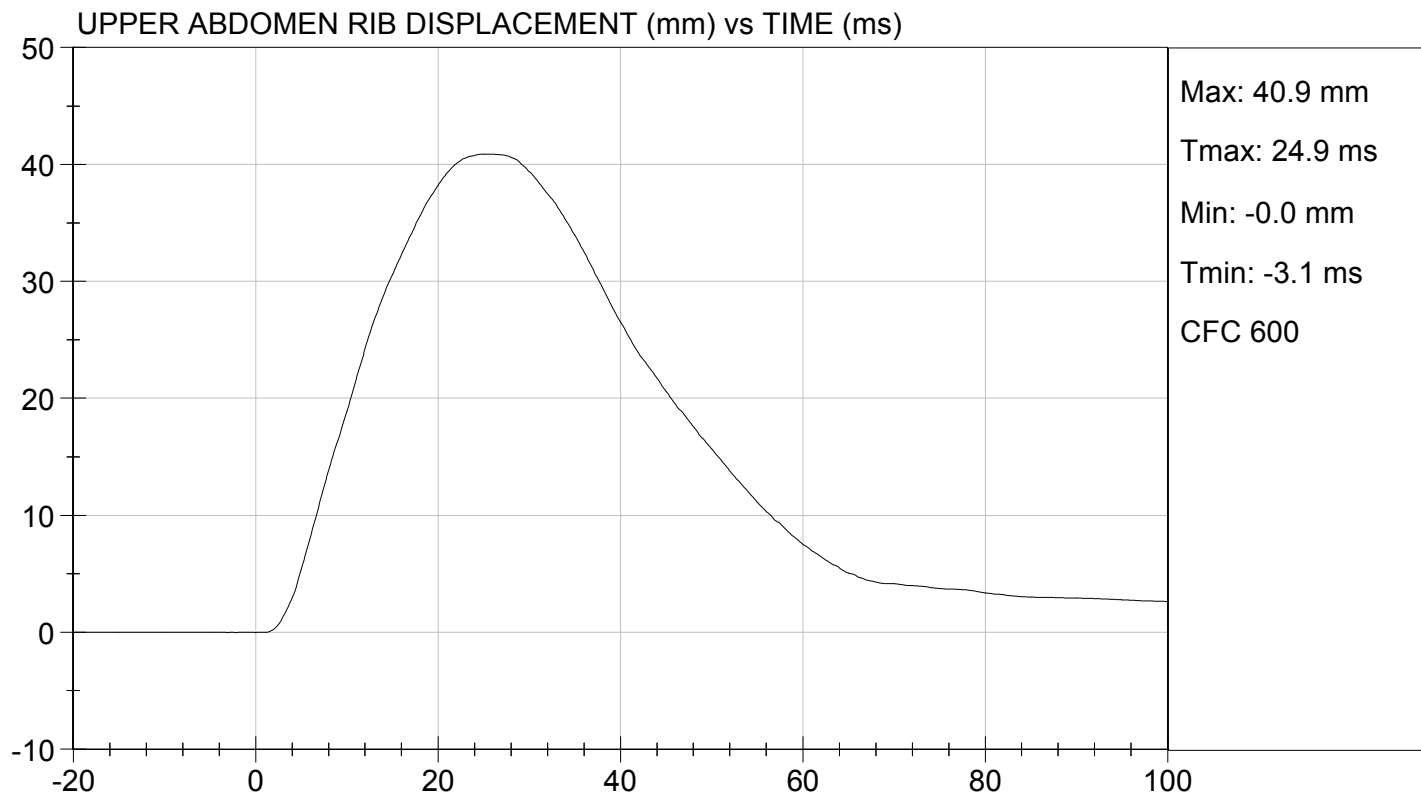
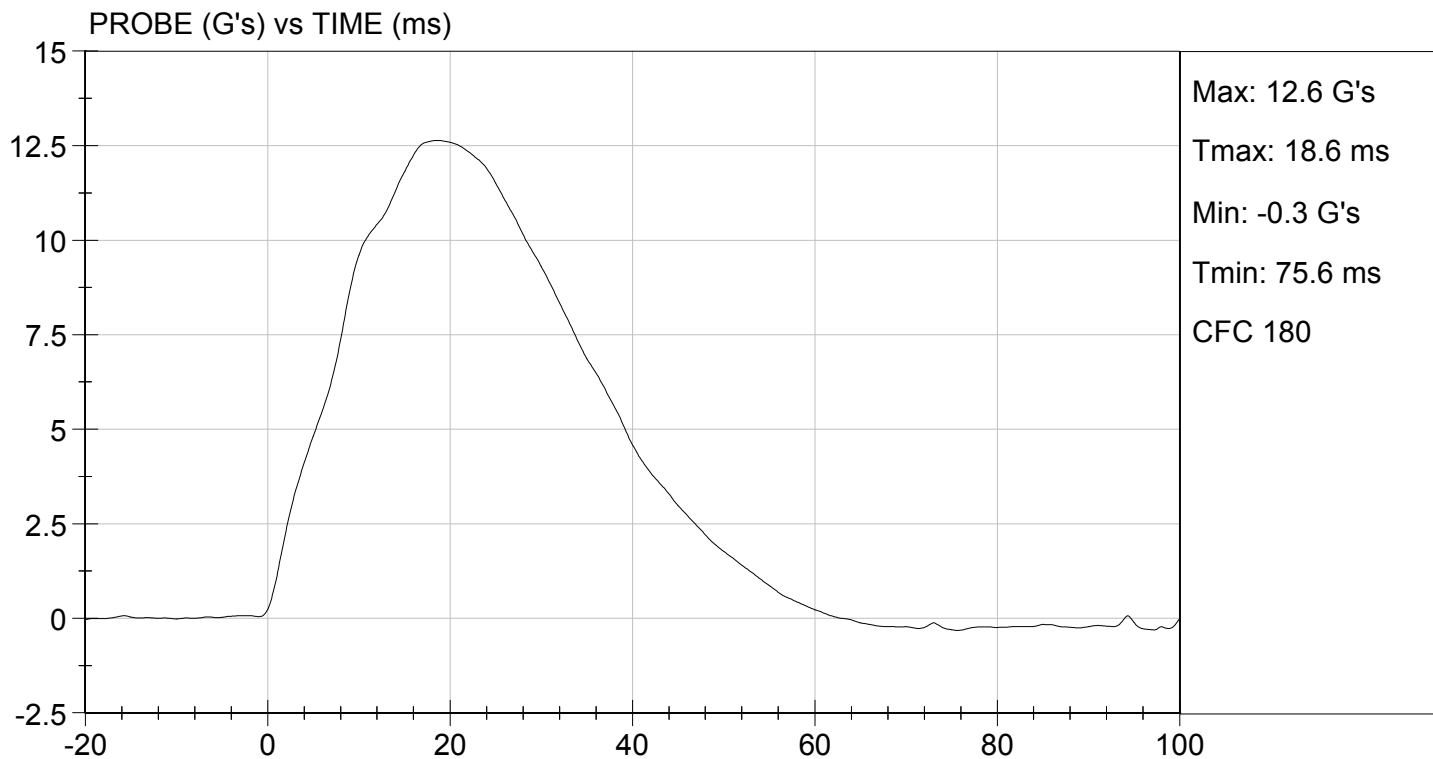
Test Date

Jessica Hall
Approved By



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

TEST DATE: 11/12/2014
TEST #: D144006

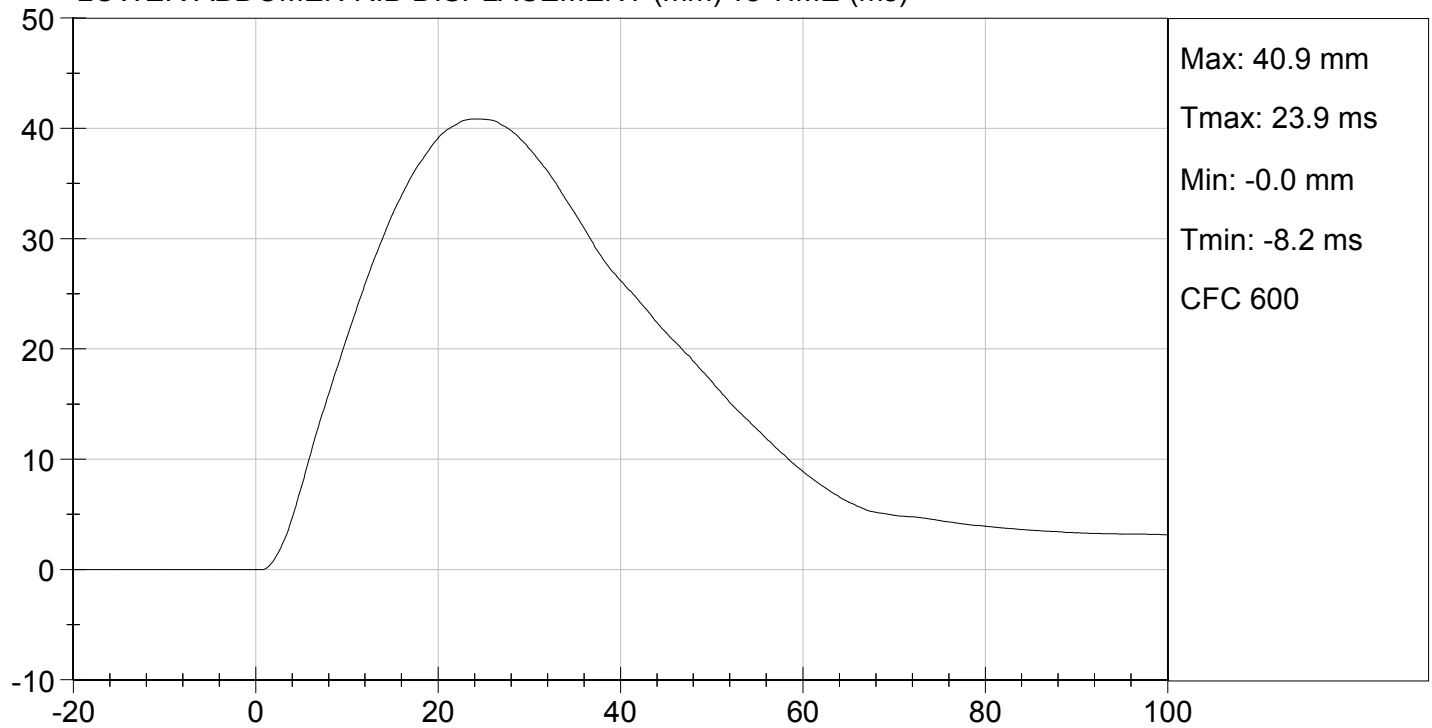




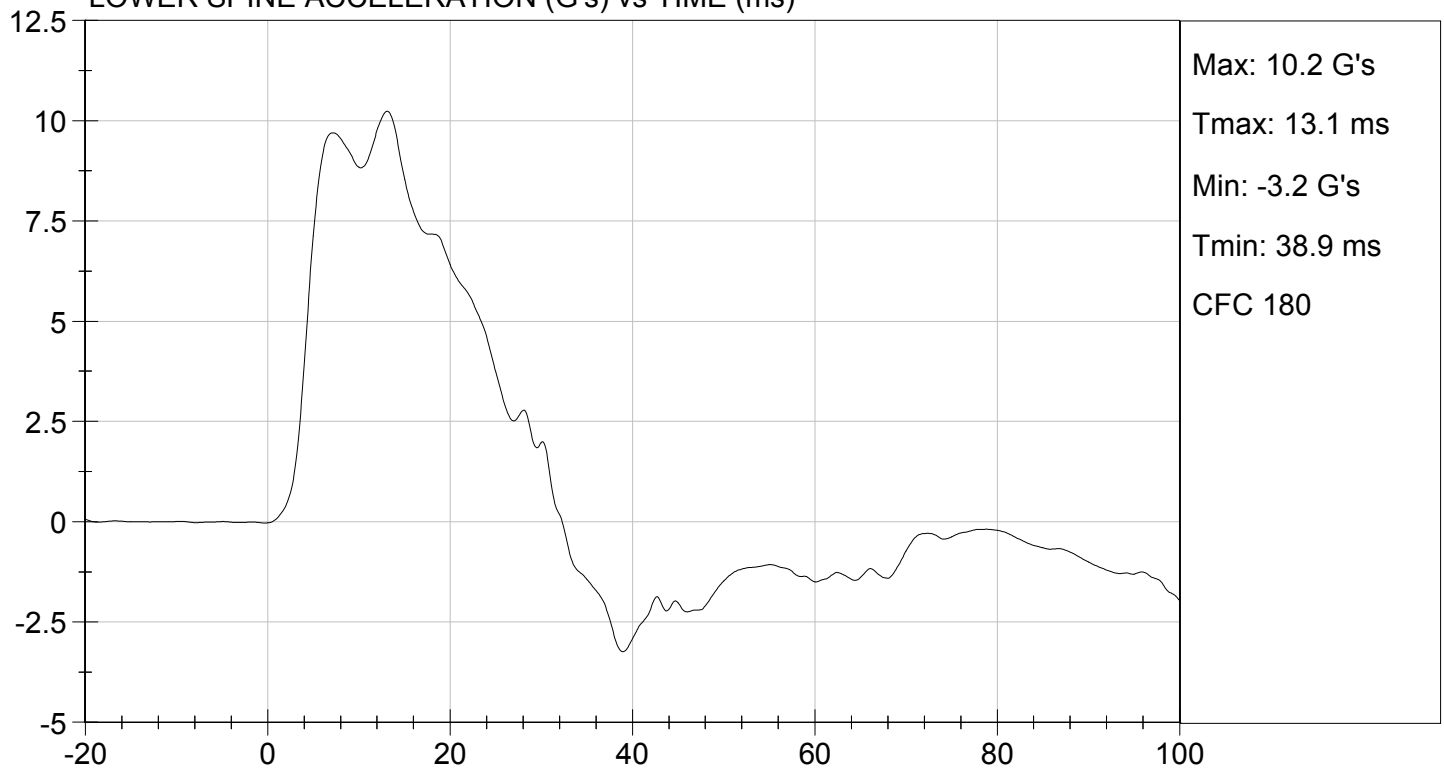
TEST DESC: ABDOMEN IMPACT
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 11/12/2014
TEST #: D144006

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



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



MGA RESEARCH CORPORATION

PELVIS IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D144007

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	19	Pass
Impact Velocity	m/s	6.60 to 6.80	6.68	Pass
Maximum Probe Acceleration	G's	38 to 47	40	Pass
Pelvis Y Acceleration After 6 ms	G's	34 to 42	37	Pass
Peak Acetabulum Force	N	3600 to 4300	4,243	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

11/12/2014

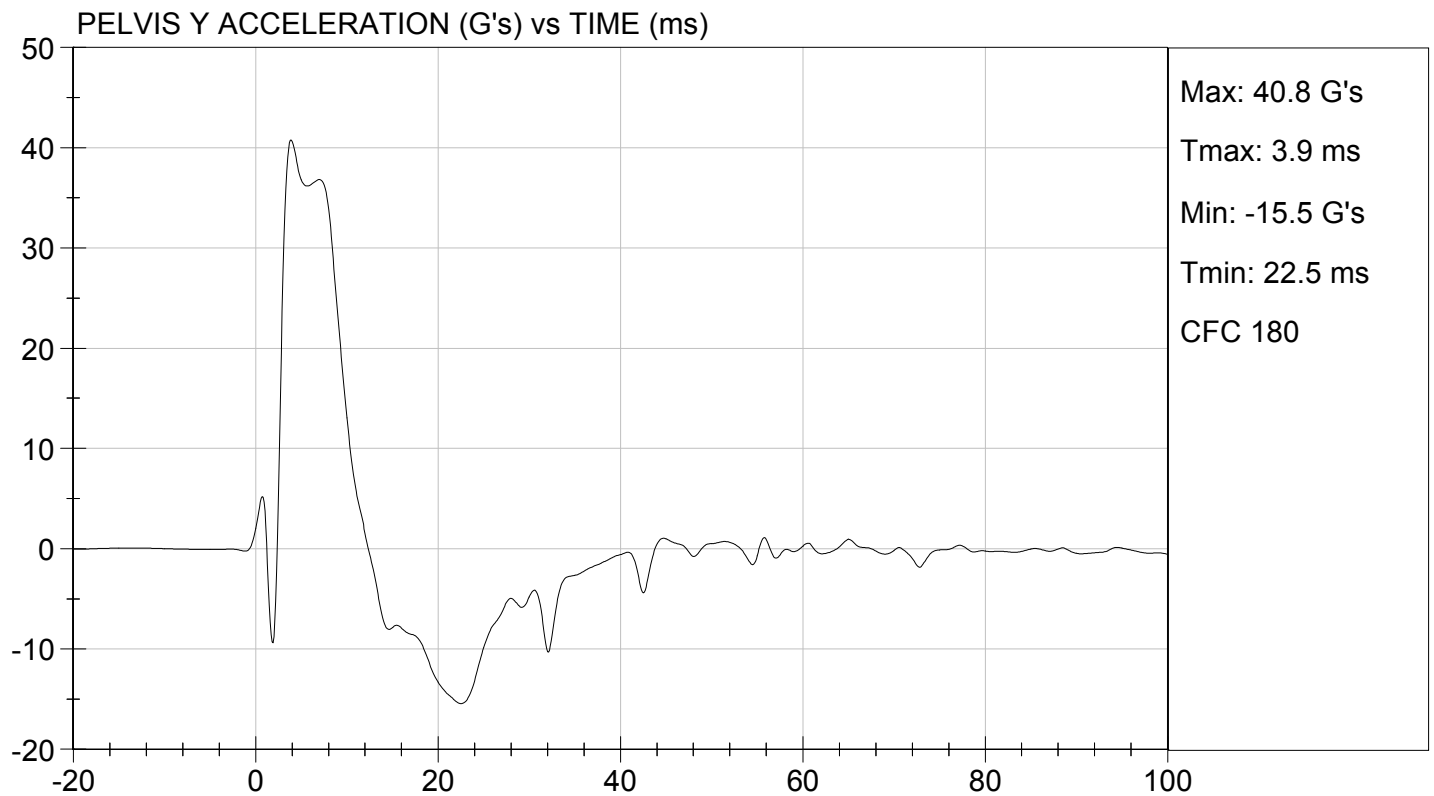
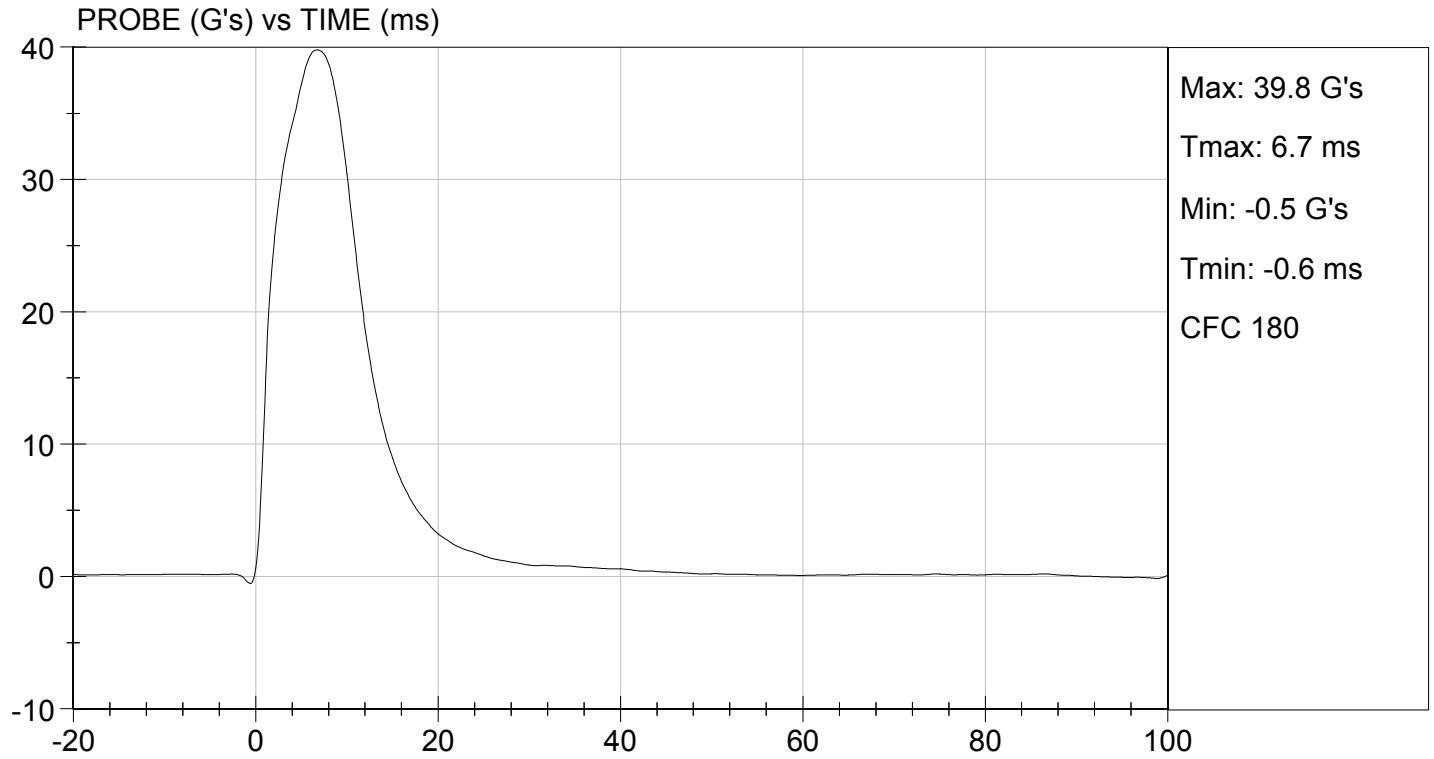
Test Date

Jessica Hall
Approved By



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

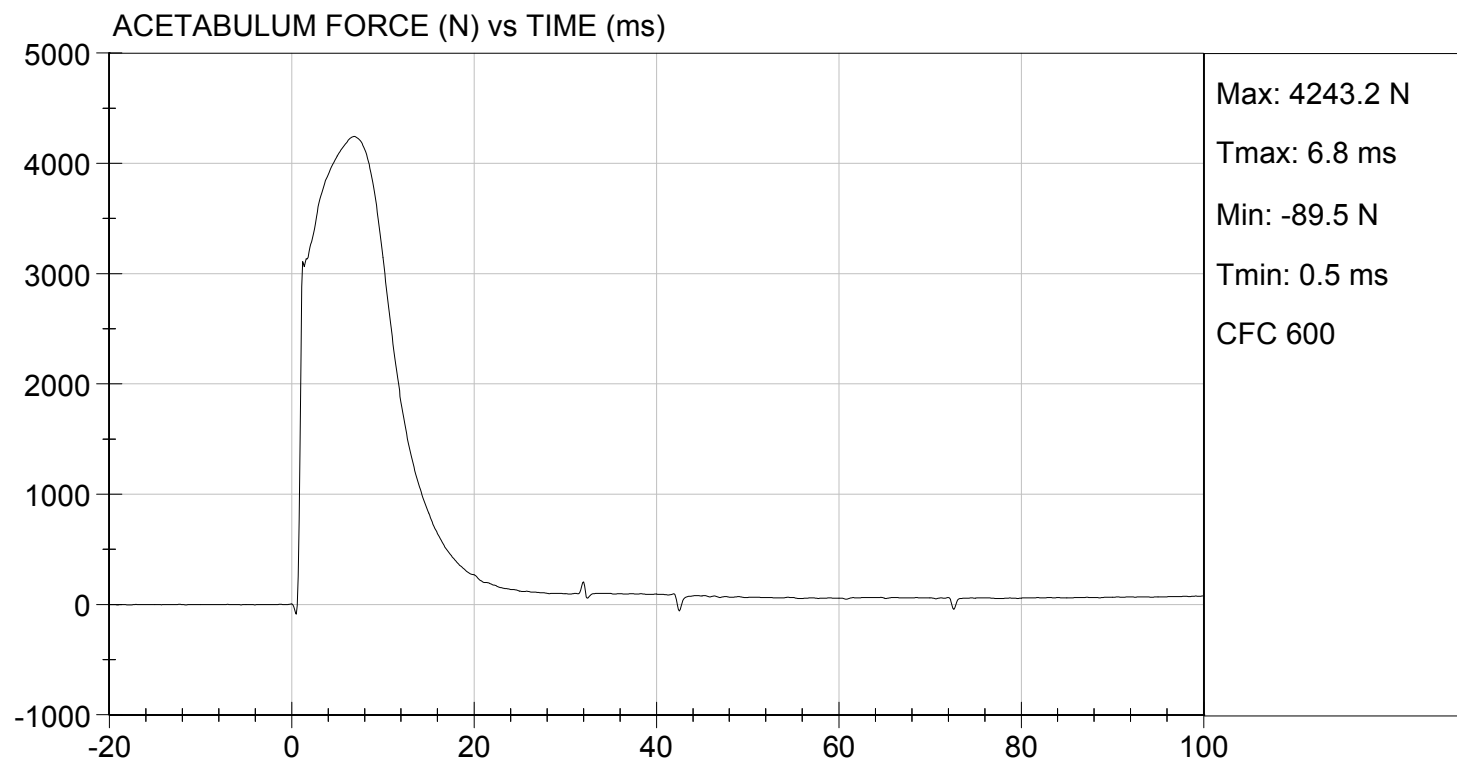
TEST DATE: 11/12/2014
TEST #: D144007





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

TEST DATE: 11/12/2014
TEST #: D144007



MGA RESEARCH CORPORATION

ILIAC IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D144008

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	19	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Maximum Probe Acceleration	G's	36 to 45	40	Pass
Pelvis Y Acceleration	G's	28 to 39	31	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4,767	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

11/12/2014

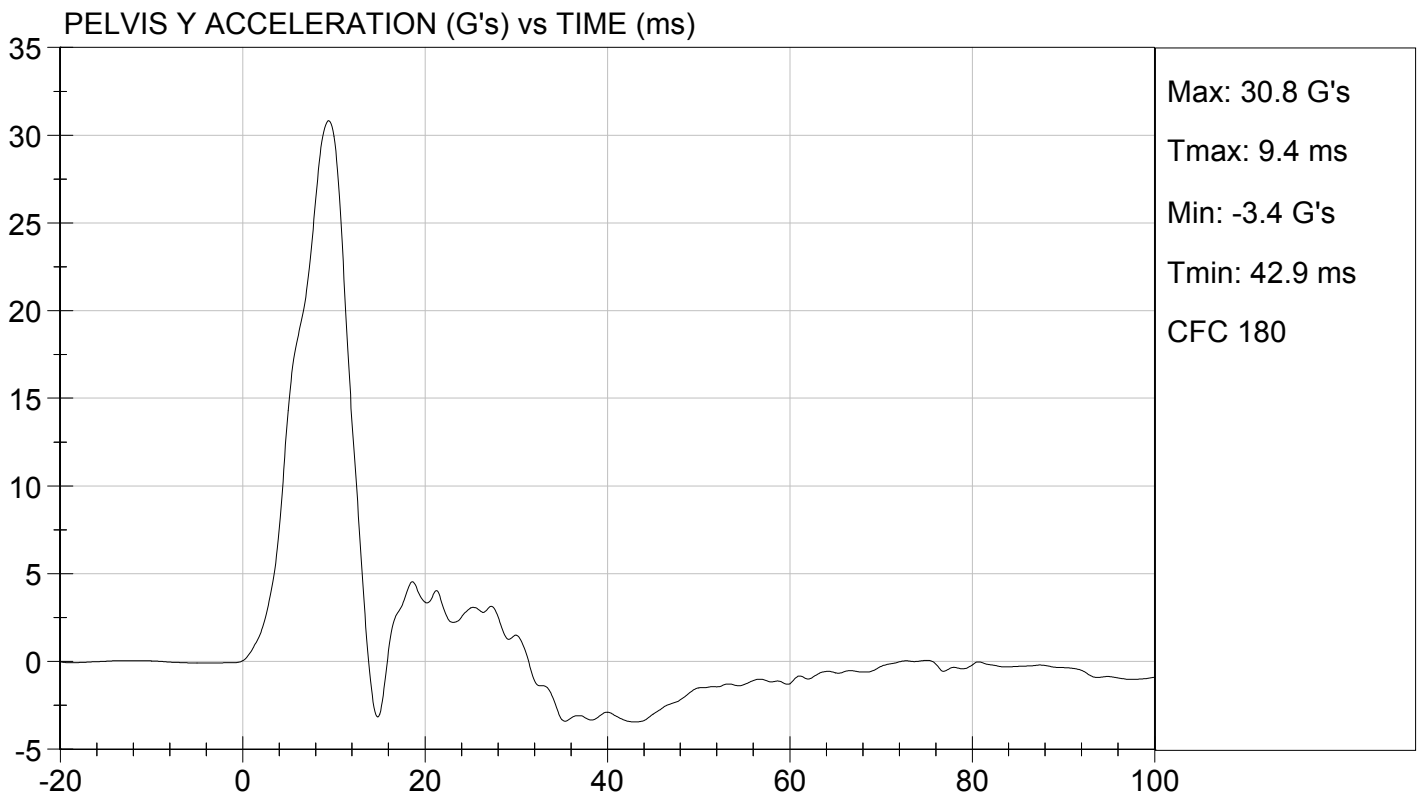
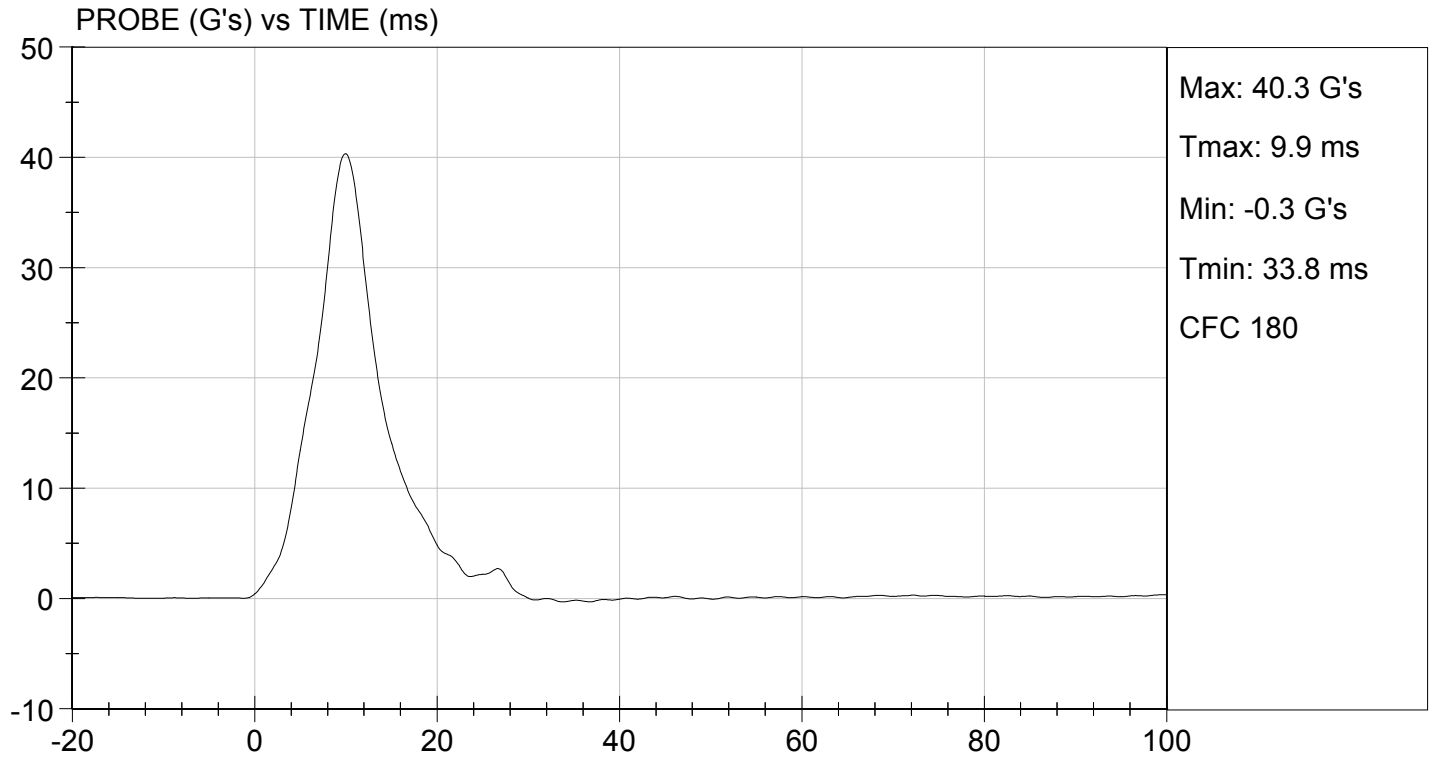
Test Date

Jessica Hall
Approved By



TEST DESC: ILLIAC
VELOCITY: 14.24 ft/s, 4.34 m/s

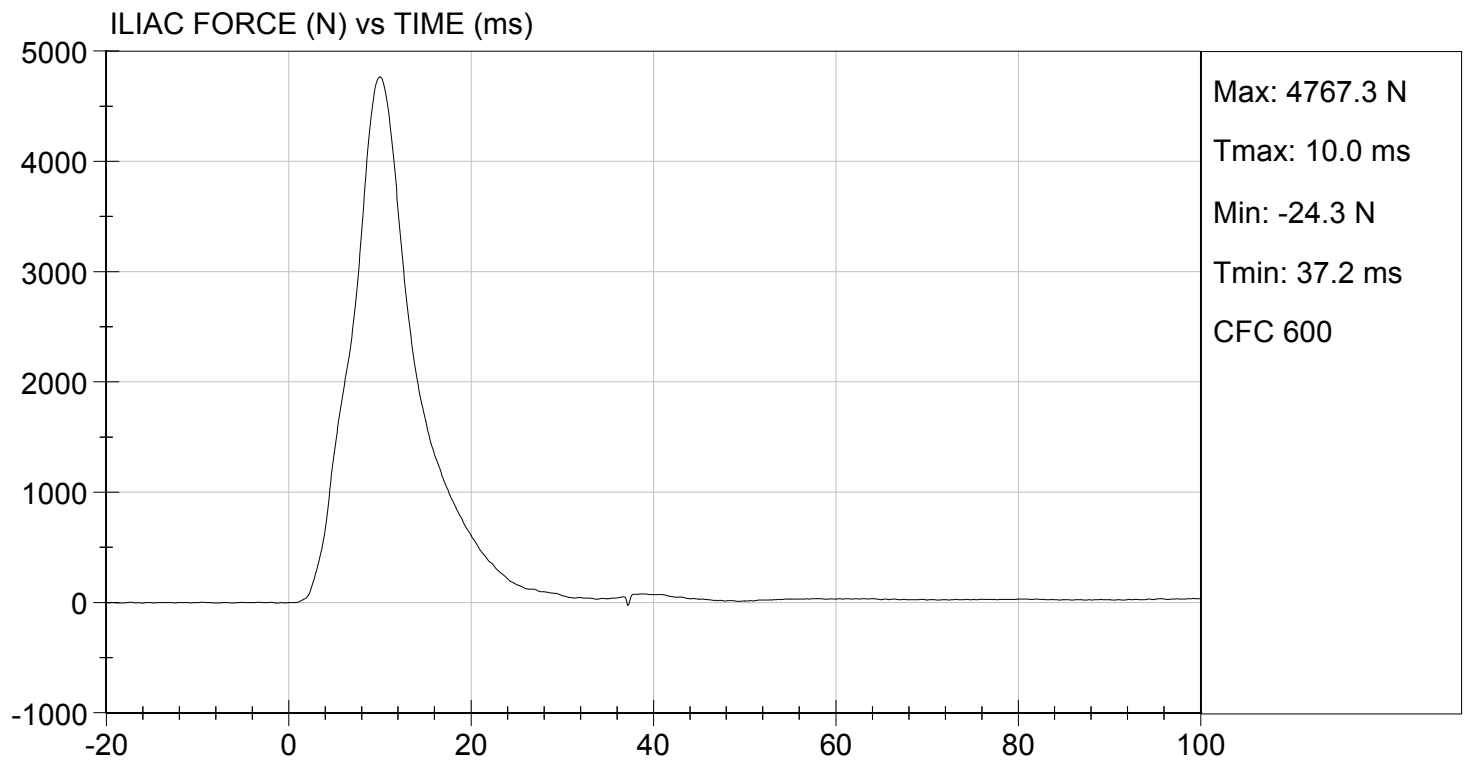
TEST DATE: 11/12/2014
TEST #: D144008





TEST DESC: ILLIAC
VELOCITY: 14.24 ft/s, 4.34 m/s

TEST DATE: 11/12/2014
TEST #: D144008



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

ATD Serial No: 296

Test ID: D144101

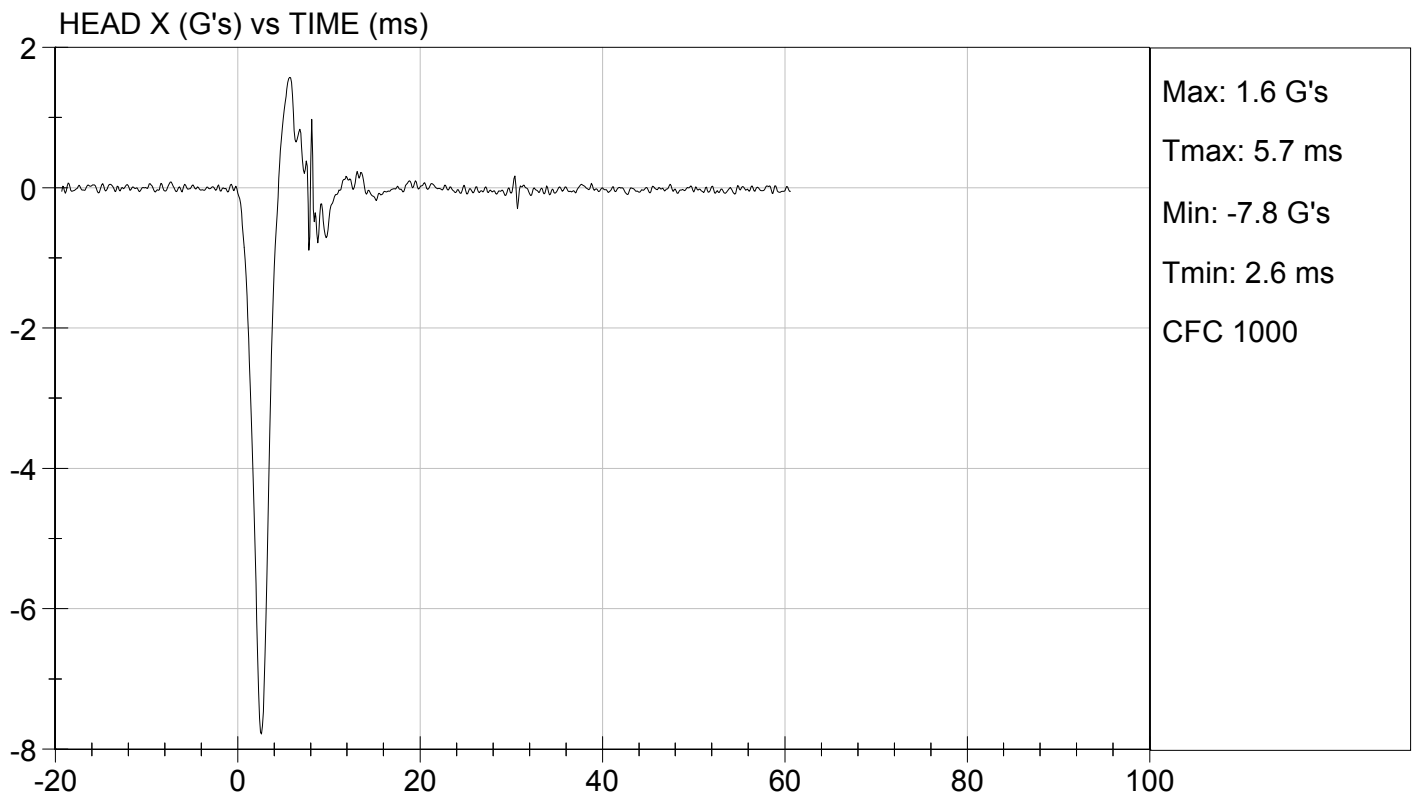
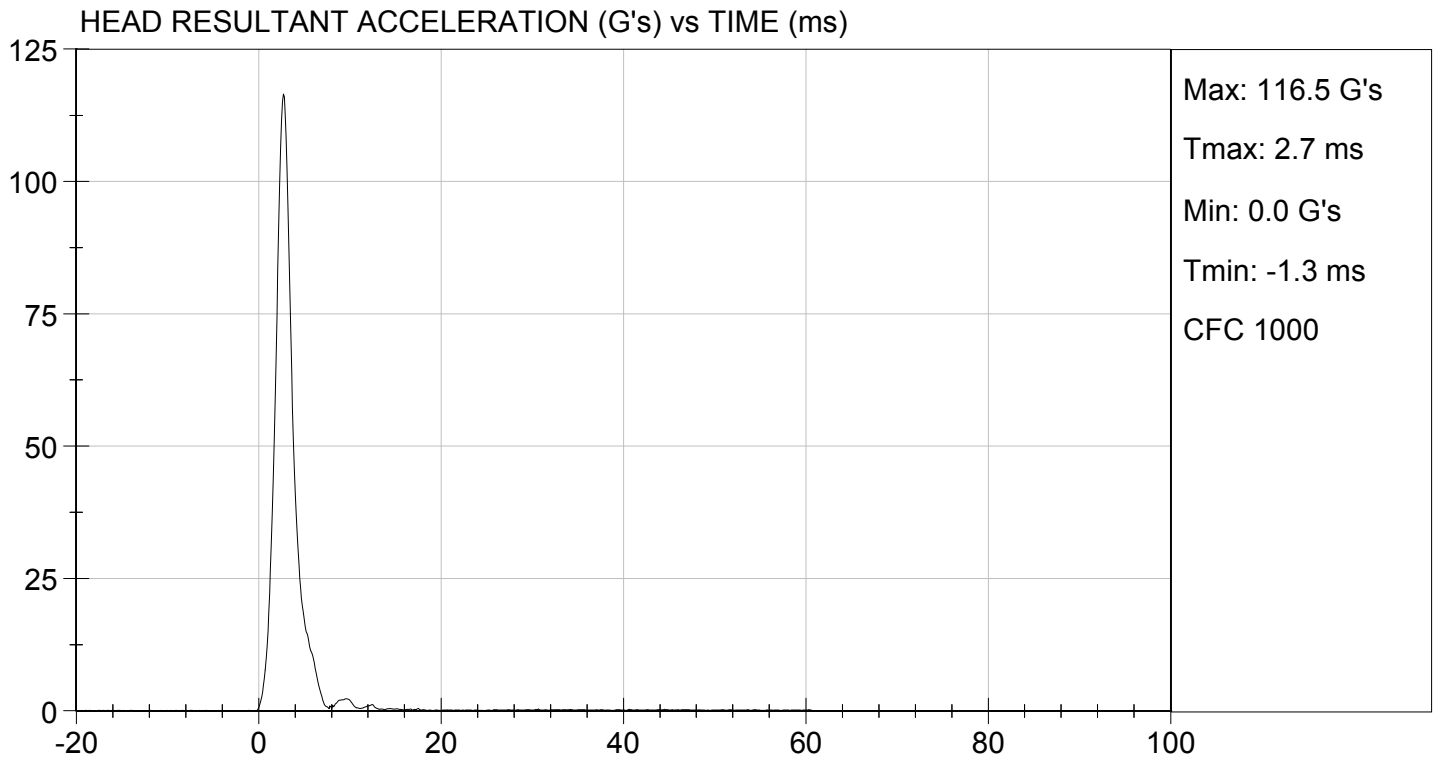
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	15	Pass
Peak Resultant Acceleration	G's	115 to 137	117	Pass
Peak Longitudinal Acceleration	G's	+/- 15	-7.8	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	<15%	Yes	Pass
Overall Test Results			Pass	

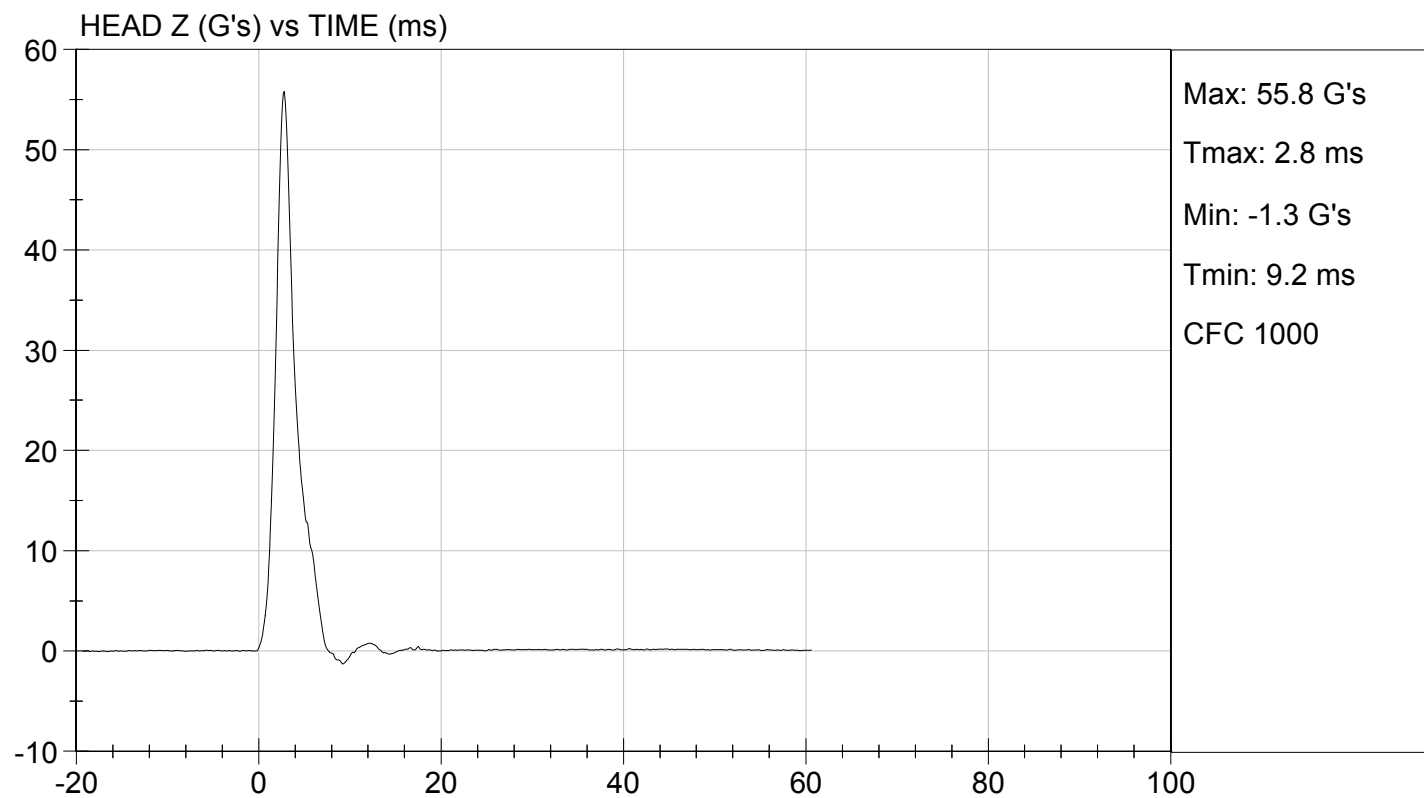
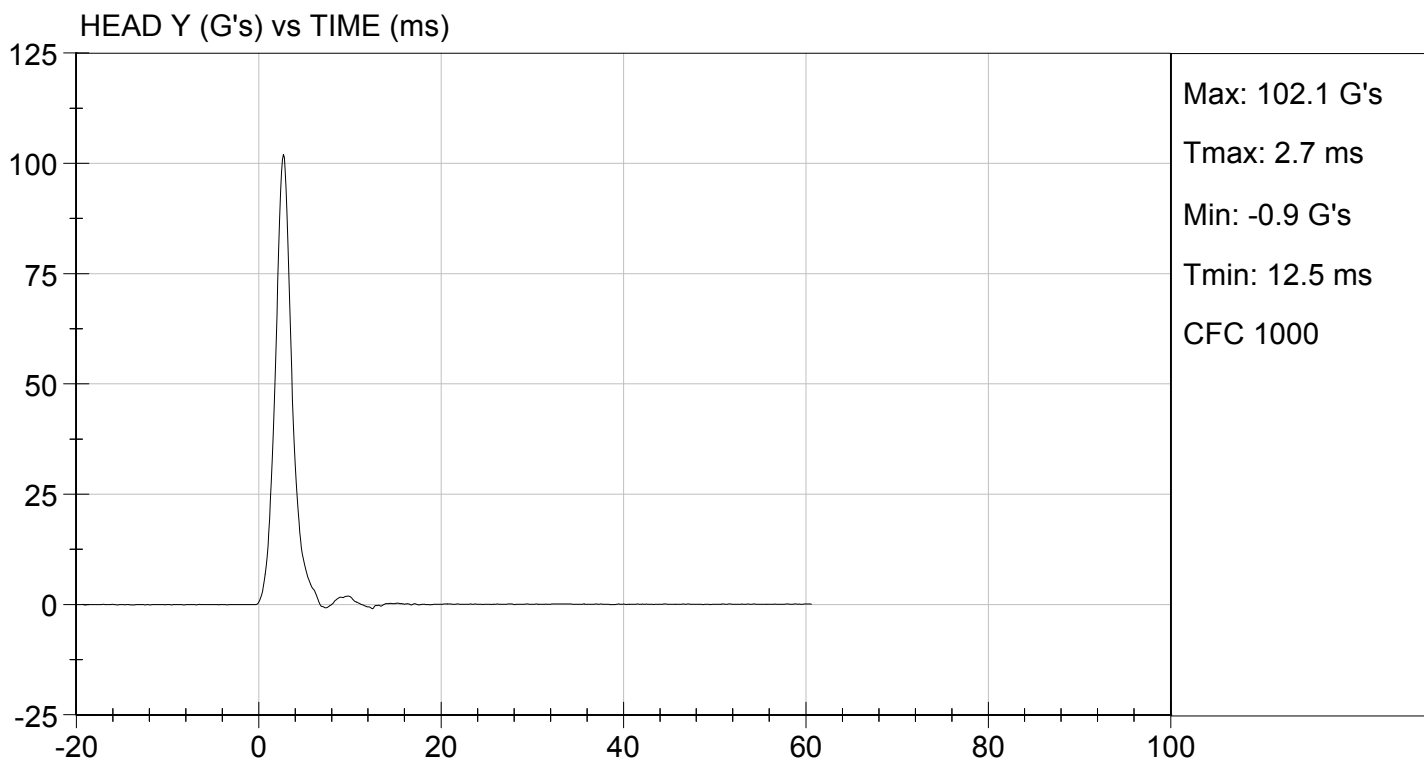

Laboratory Technician

11/19/2014

Test Date


Approved By





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

ATD Serial No: 296

Test I.D: D144102

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.8	Pass
Humidity		%	10 to 70	18	Pass
Impact Velocity		m/s	5.51 to 5.63	5.63	Pass
Pendulum Velocity	10 ms	m/s	2.20 to 2.80	2.59	Pass
	15 ms	m/s	3.30 to 4.10	3.65	Pass
	20 ms	m/s	4.40 to 5.40	4.73	Pass
	25 ms	m/s	5.40 to 6.10	5.50	Pass
	25-100 ms	m/s	5.50 to 6.20	5.55	Pass
Maximum D-Plane Rotation		deg	71 to 81	72	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	58	Pass
Maximum Occipital Condyle Moment		Nm	-44 to -36	-41	Pass
Time of Moment Decay to 0 Nm		ms	102 to 126	118	Pass
Overall Test Results					Pass

David Schoedel
Laboratory Technician

11/19/2014

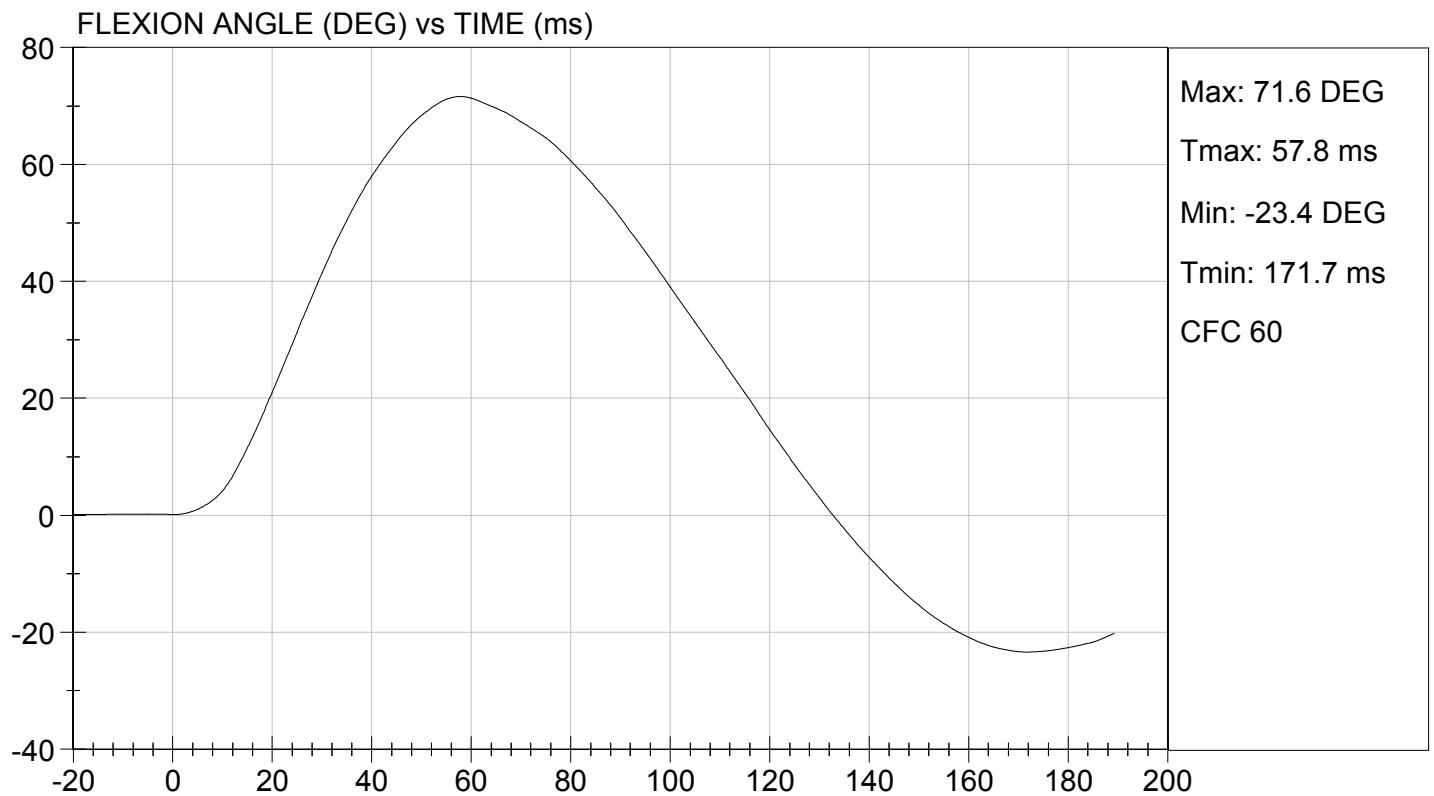
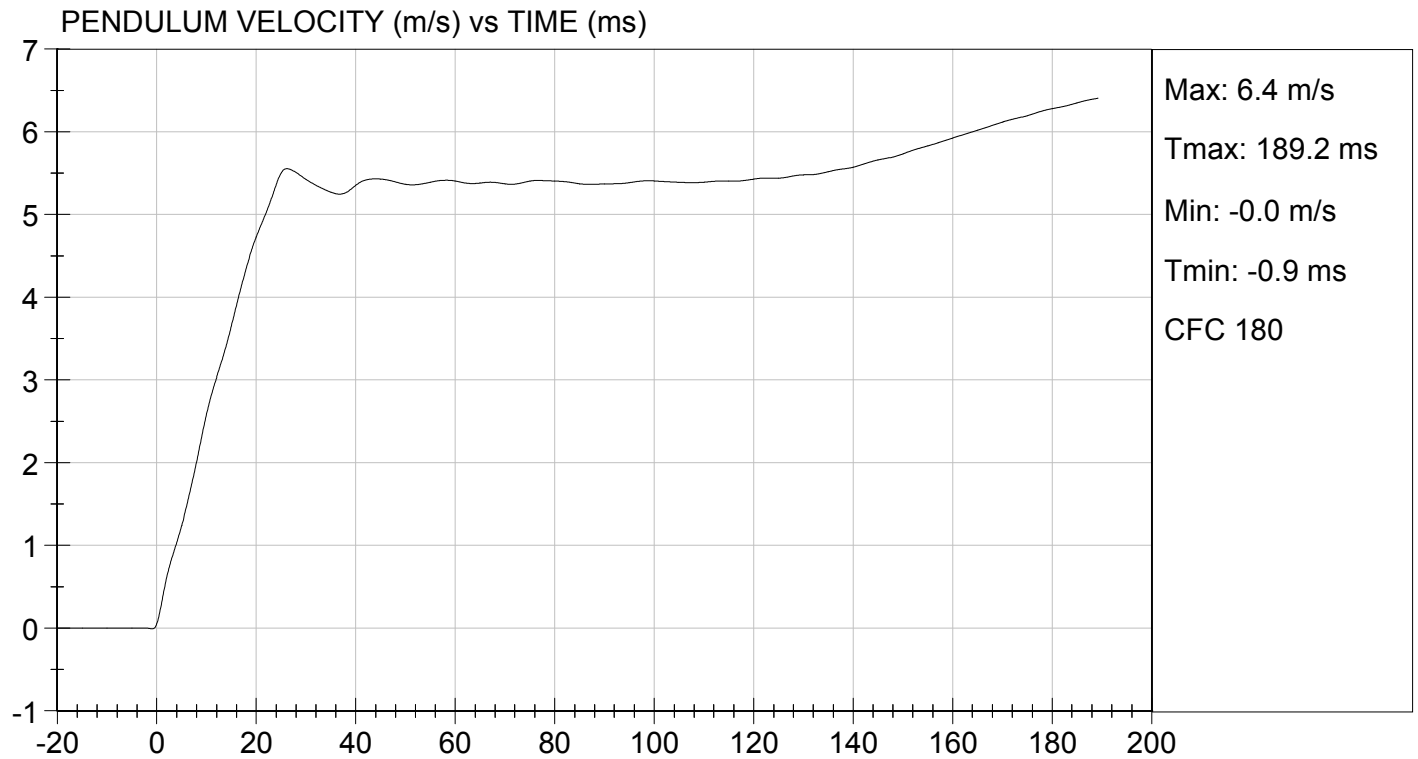
Test Date

Jessica Hall
Approved By



TEST DESC: NECK BENDING
VELOCITY: 18.47 ft/s, 5.63 m/s

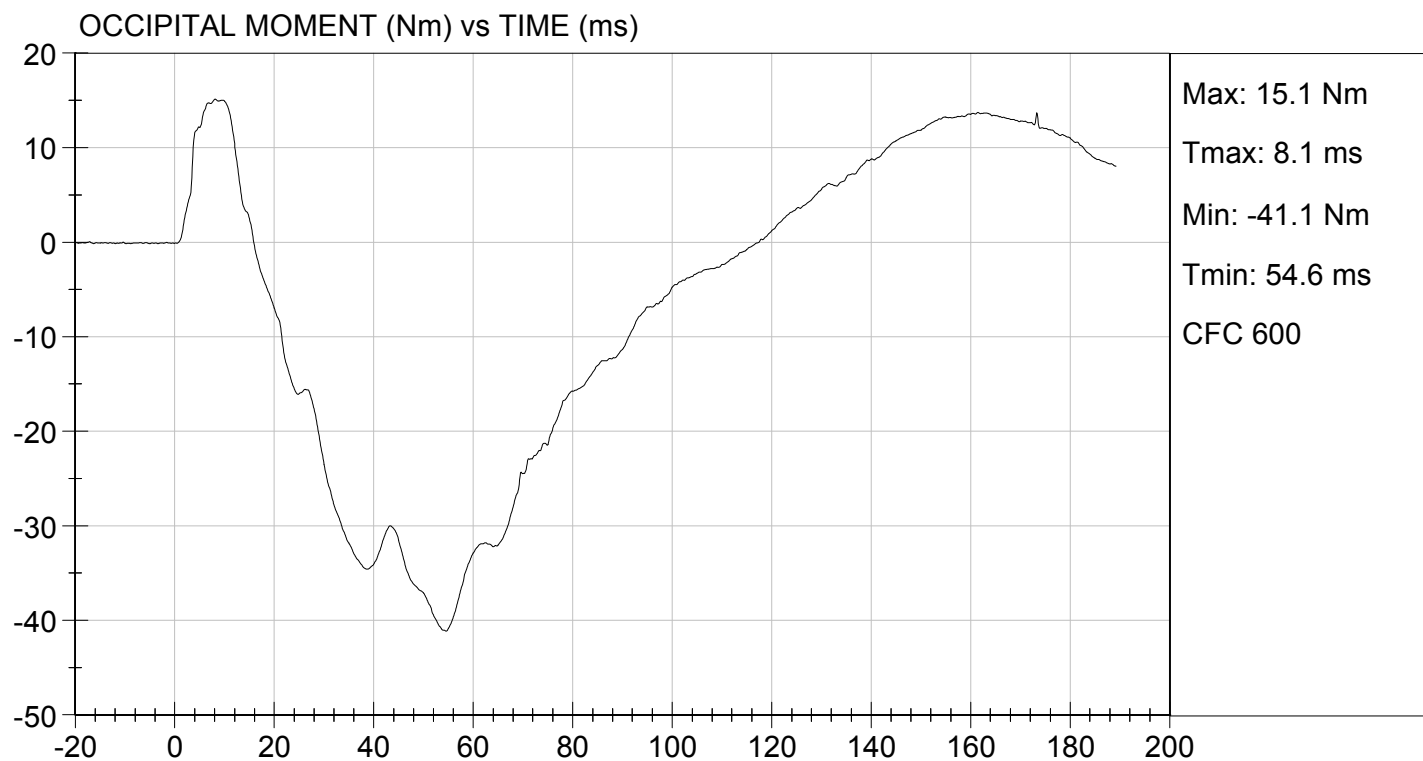
TEST DATE: 11/19/2014
TEST #: D144102





TEST DESC: NECK BENDING
VELOCITY: 18.47 ft/s, 5.63 m/s

TEST DATE: 11/19/2014
TEST #: D144102



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

ATD Serial No: 296

Test ID: D144103

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	15	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Maximum Probe Acceleration	G's	13 to 18	15	Pass
Shoulder Displacement	mm	28 to 37	30	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	17	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

11/19/2014

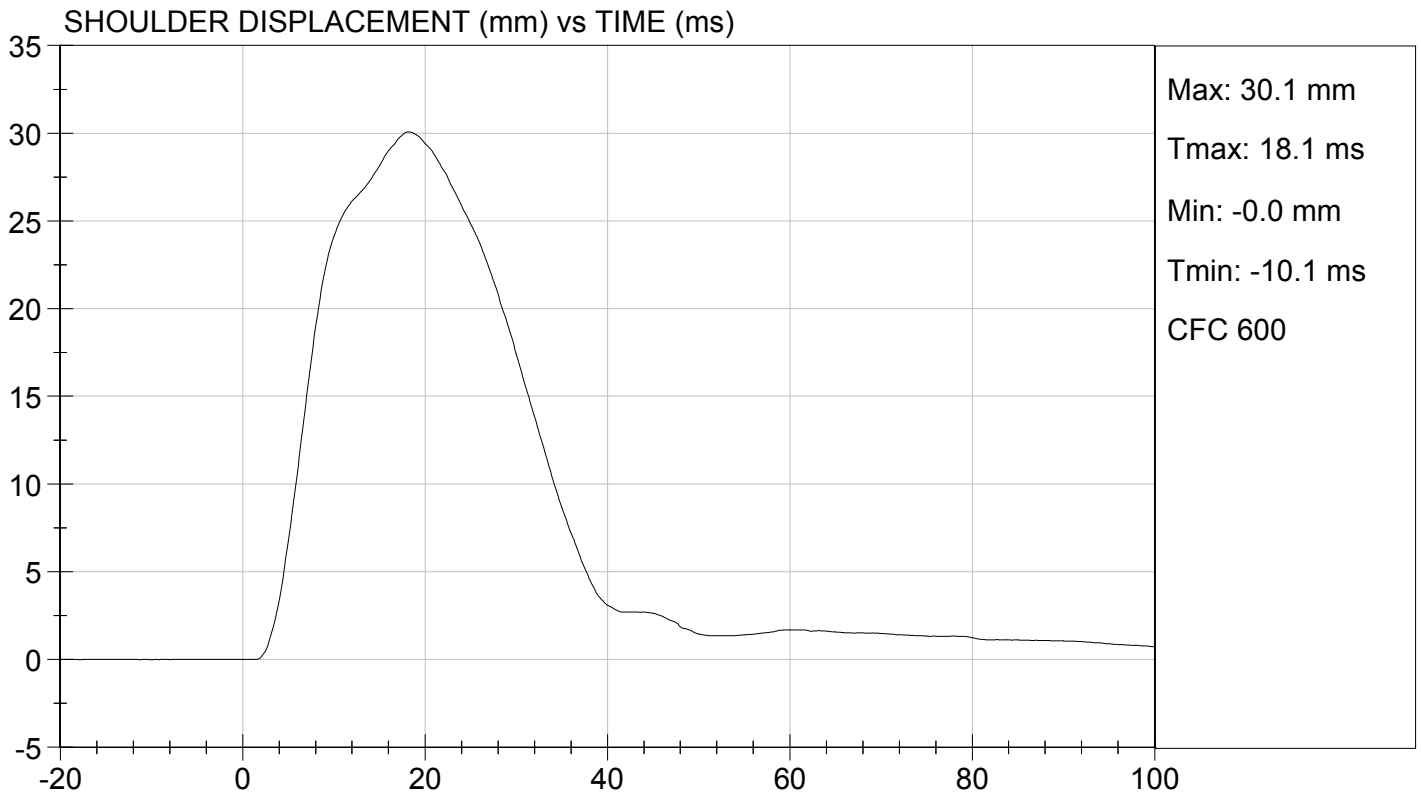
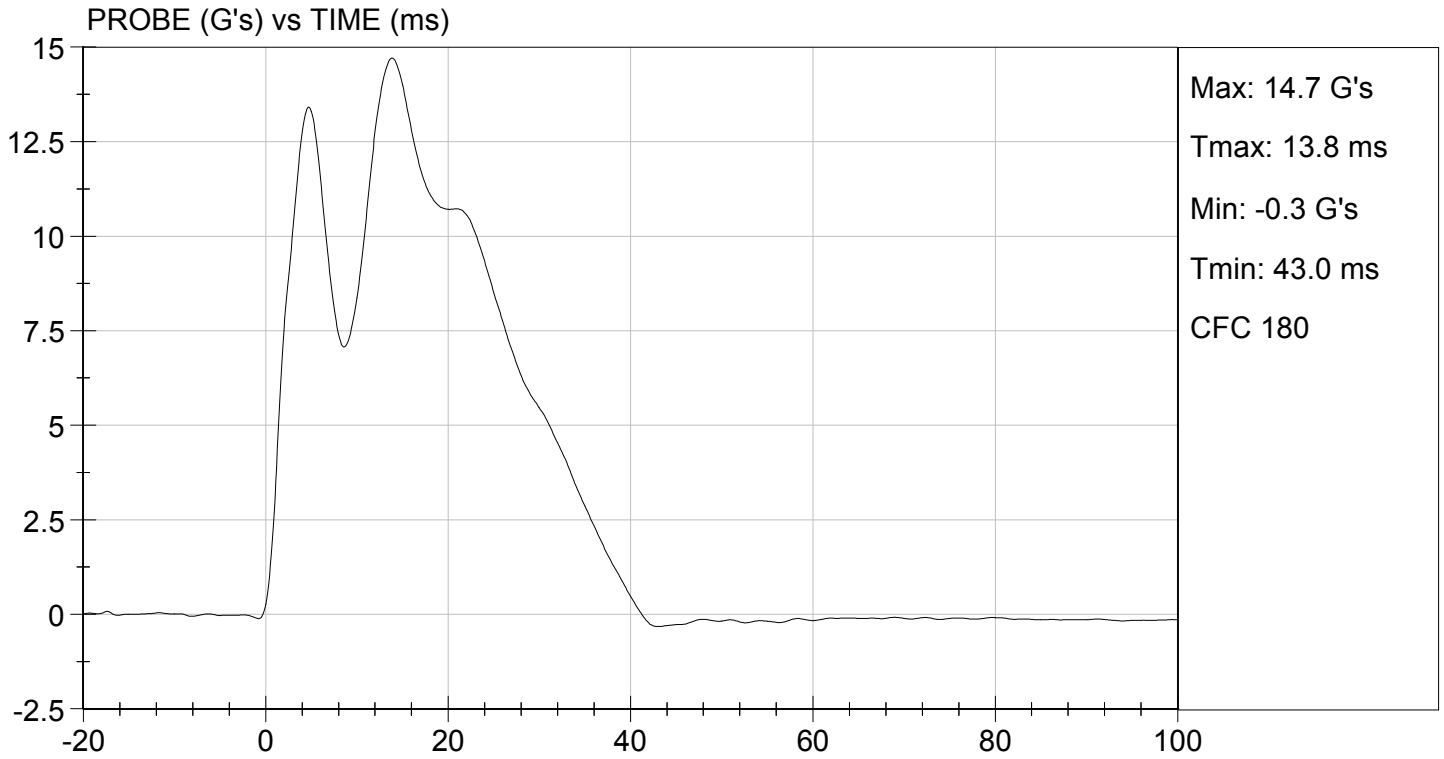
Test Date

Jessica Hall
Approved By



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

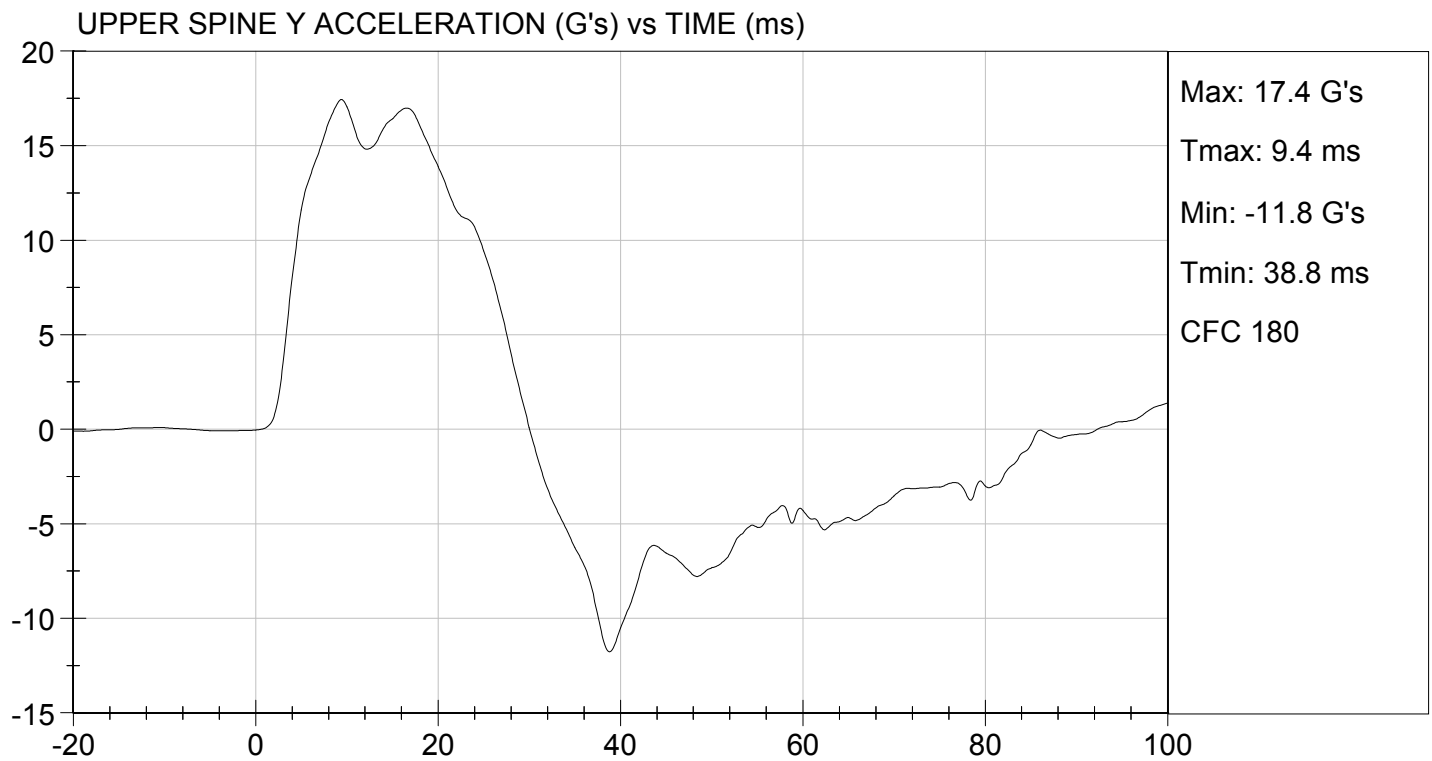
TEST DATE: 11/19/2014
TEST #: D144103





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

TEST DATE: 11/19/2014
TEST #: D144103



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

ATD Serial No: 296

Test I.D: D144104

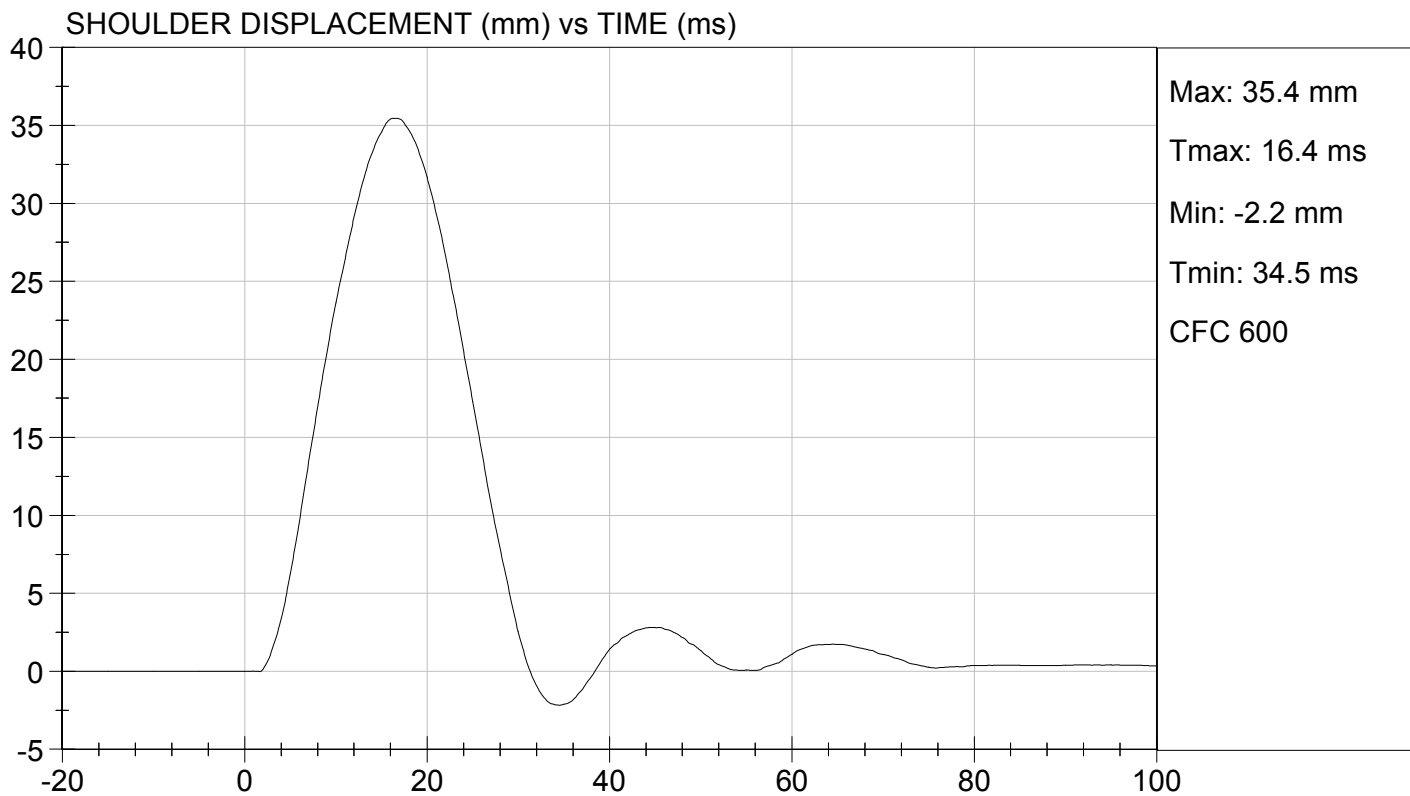
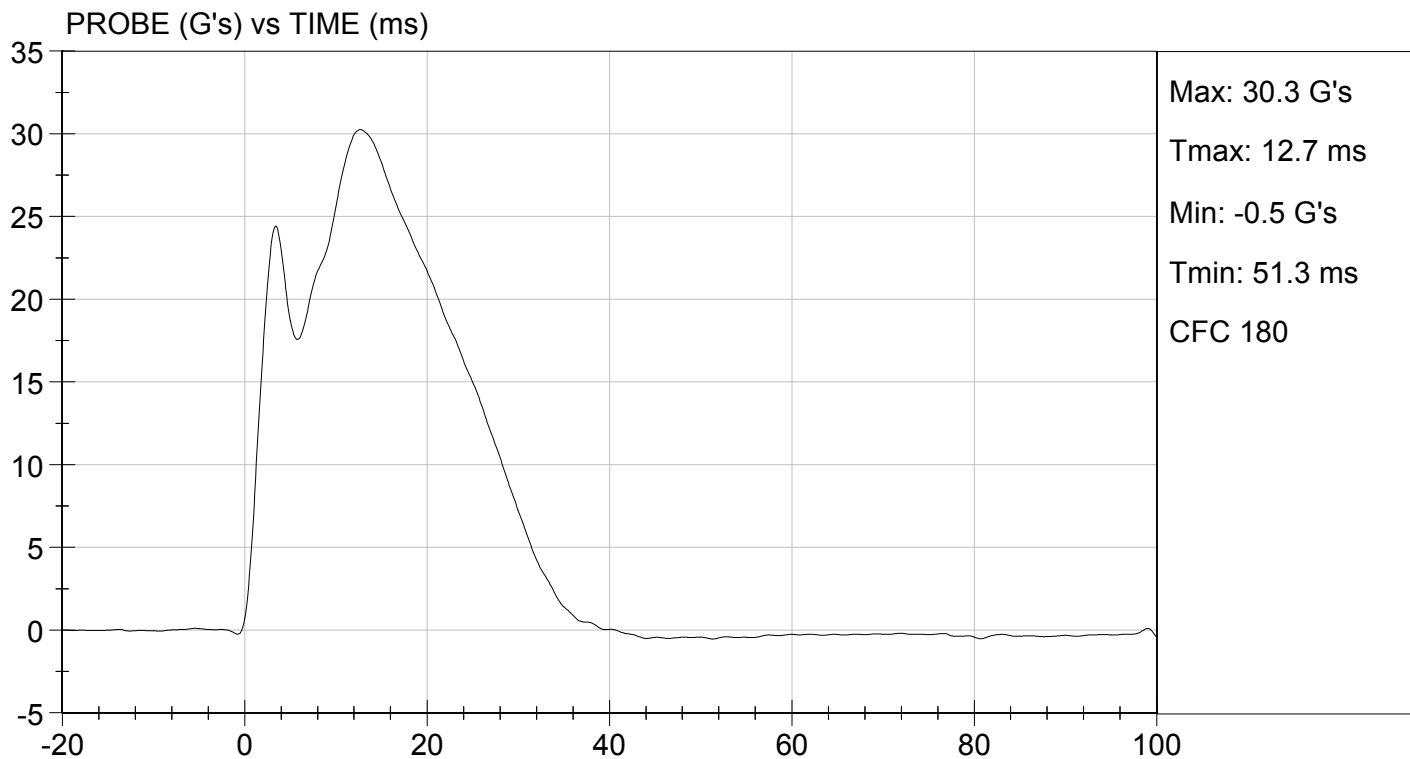
Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	22.1	Pass
Humidity	%	10 to 70	17	Pass
Impact Velocity	m/s	6.60 to 6.80	6.68	Pass
Maximum Probe Acceleration	G's	30 to 36	30	Pass
Shoulder Displacement	mm	31 to 40	35	Pass
Upper Rib Displacement	mm	25 to 32	27	Pass
Middle Rib Displacement	mm	30 to 36	31	Pass
Lower Rib Displacement	mm	32 to 38	33	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	36	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	30	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

11/20/2014

Test Date

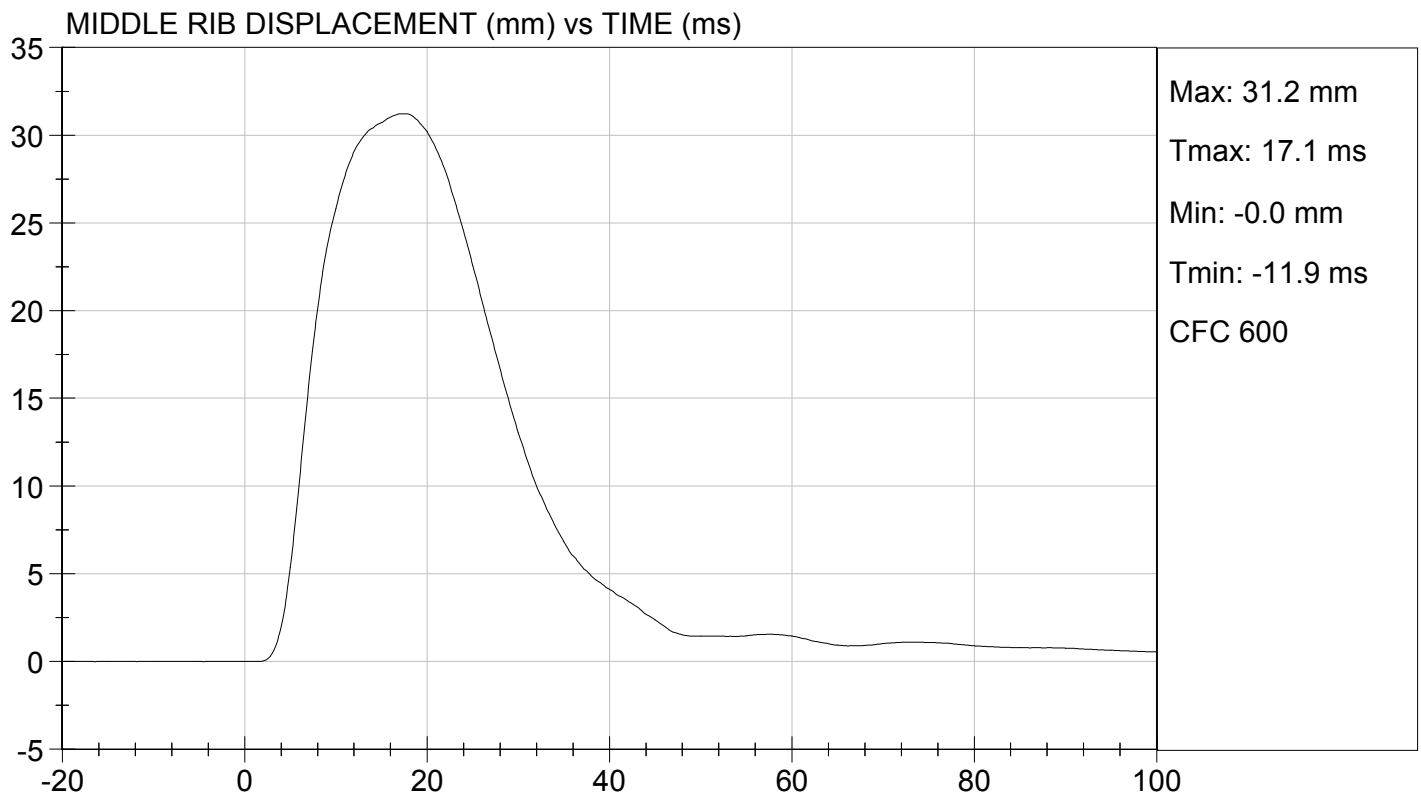
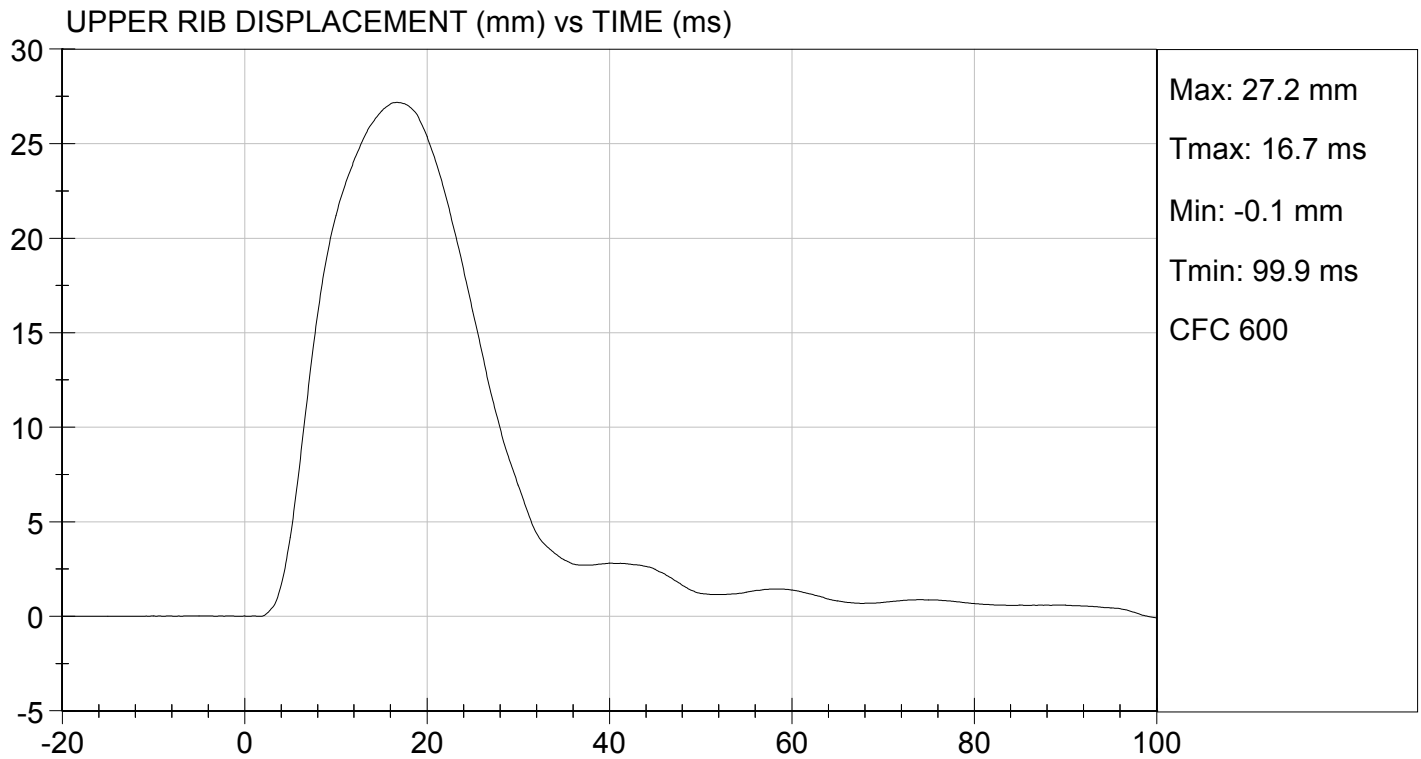
Jessica Hall
Approved By





TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 21.93 ft/s, 6.68 m/s

TEST DATE: 11/20/2014
TEST #: D144104

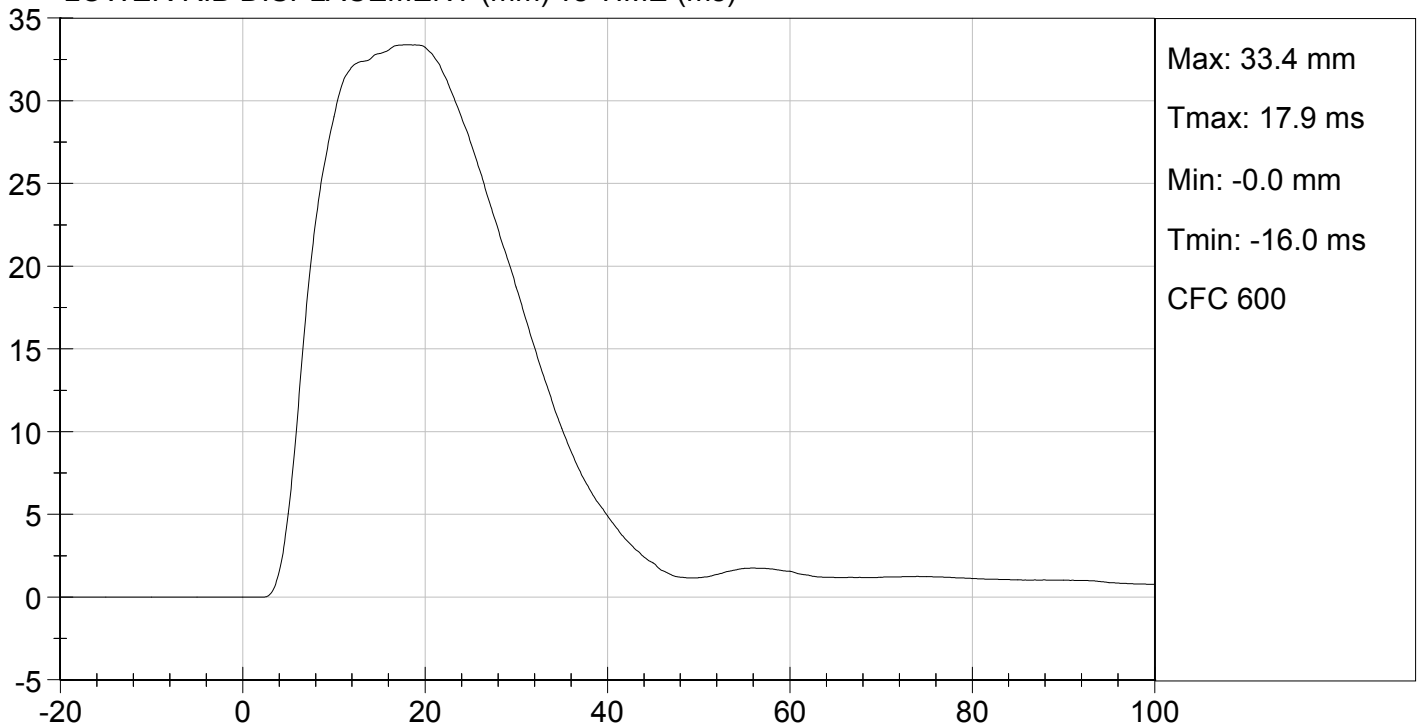




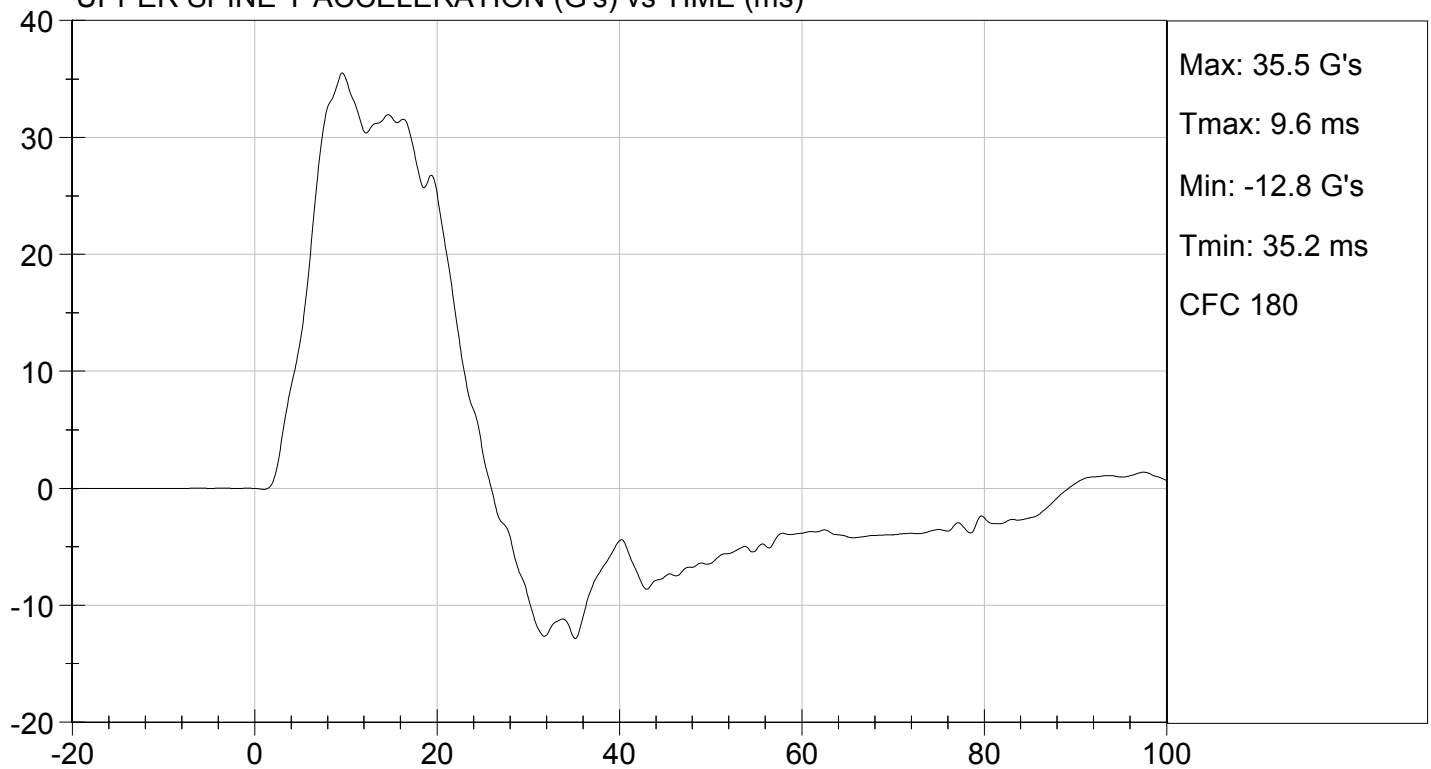
TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 21.93 ft/s, 6.68 m/s

TEST DATE: 11/20/2014
TEST #: D144104

LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



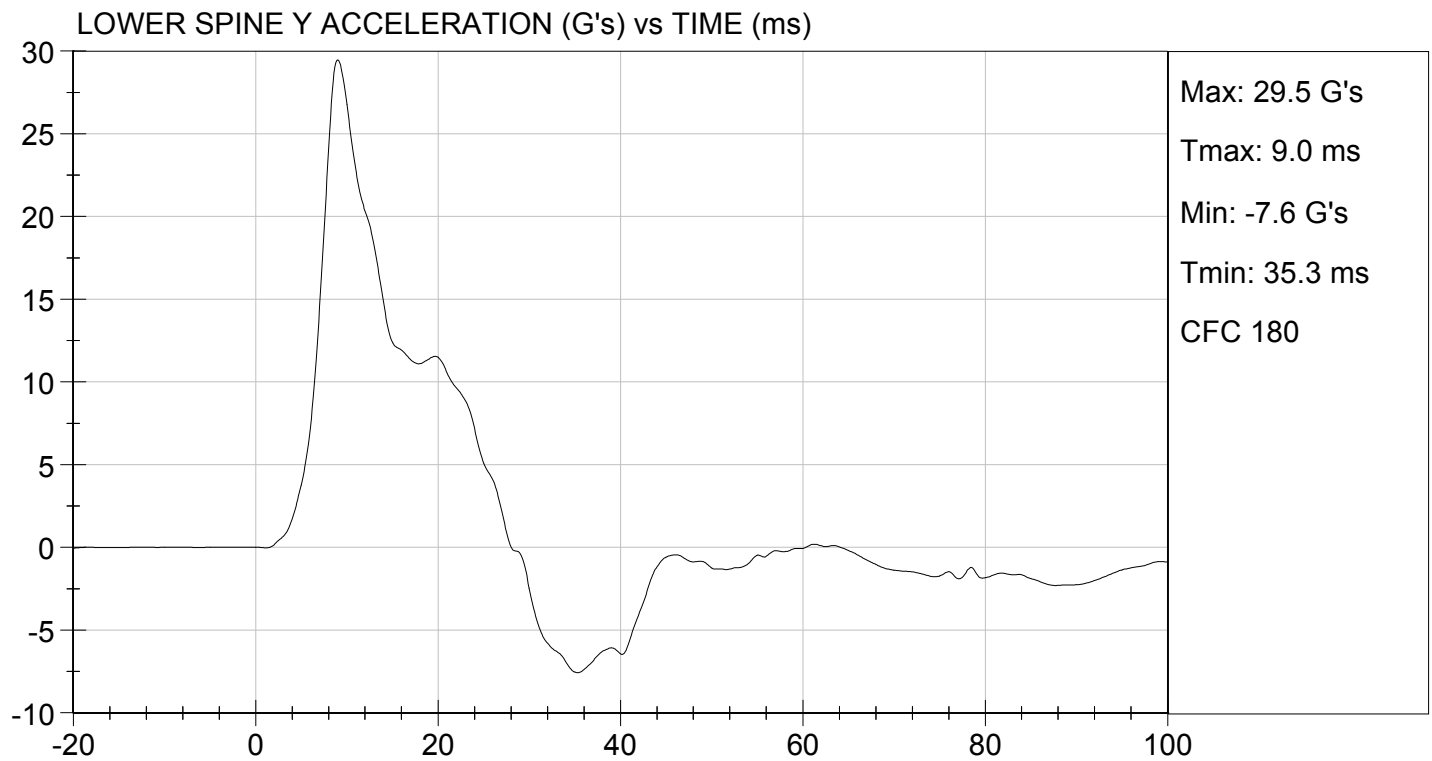
UPPER SPINE Y ACCELERATION (G's) vs TIME (ms)





TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 21.93 ft/s, 6.68 m/s

TEST DATE: 11/20/2014
TEST #: D144104



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

ATD Serial No: 296

Test I.D: D144105

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Humidity	%	10 to 70	15	Pass
Impact Velocity	m/s	4.20 to 4.40	4.23	Pass
Maximum Probe Acceleration	G's	14 to 18	15	Pass
Upper Rib Displacement	mm	32 to 40	33	Pass
Middle Rib Displacement	mm	39 to 45	41	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

David Schoedel
Laboratory Technician

11/19/2014

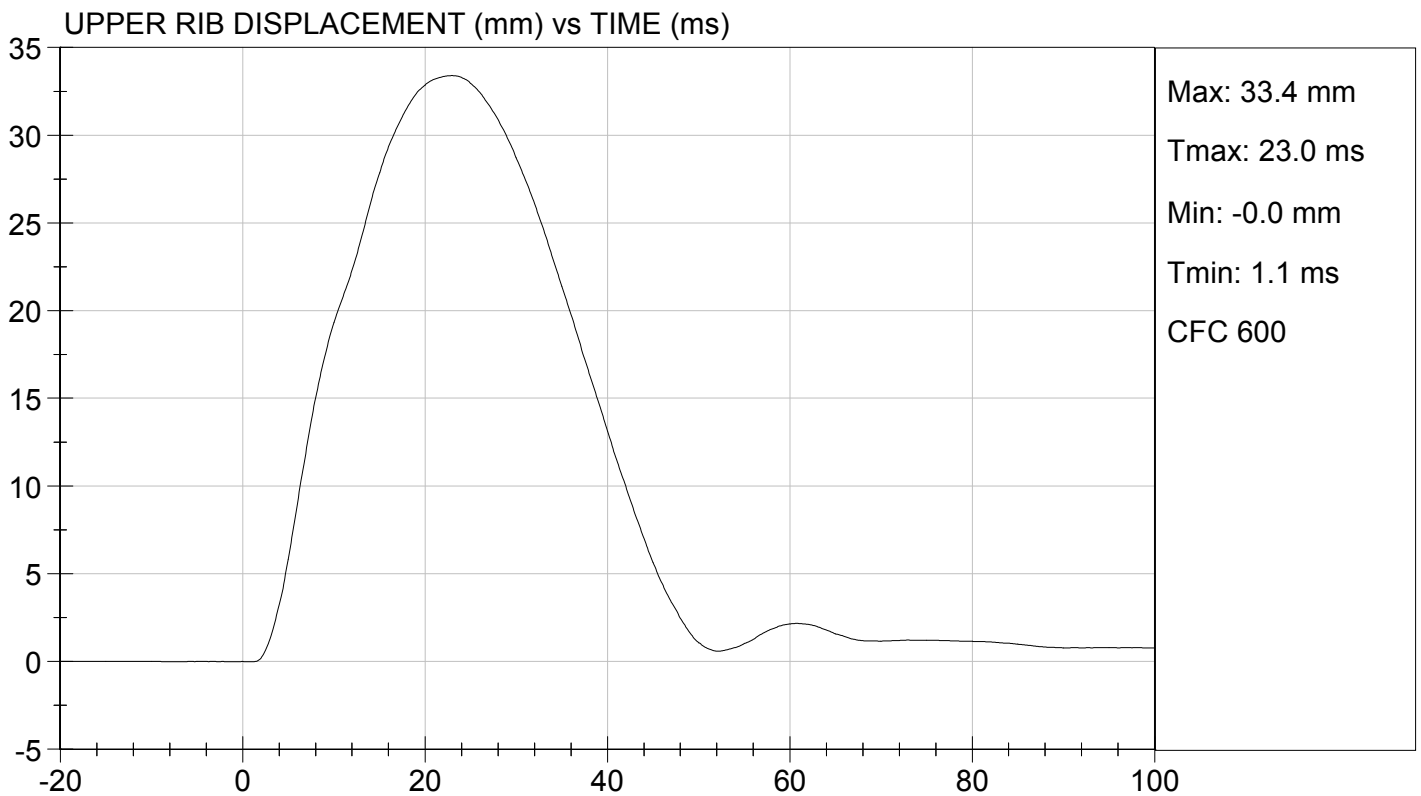
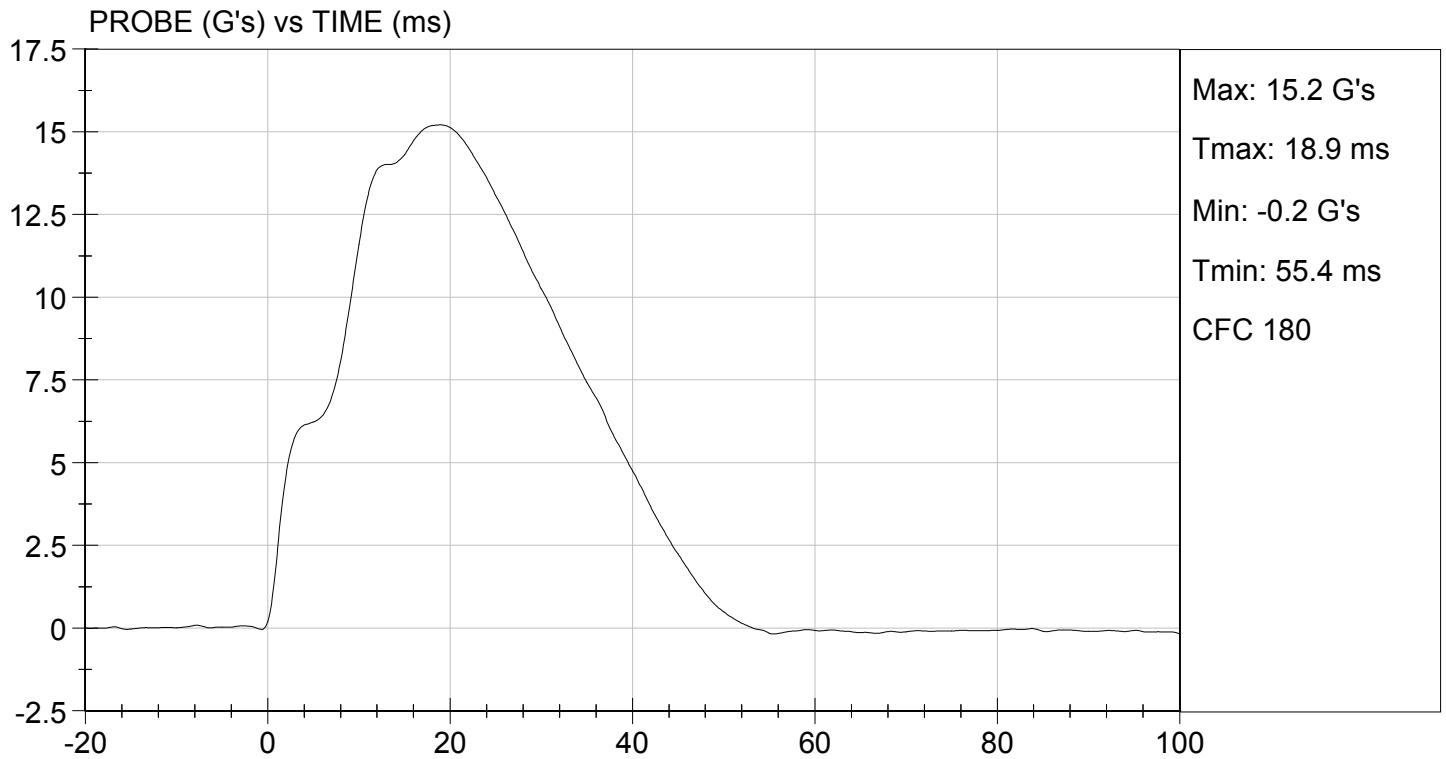
Test Date

Jessica Hall
Approved By



TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 13.89 ft/s, 4.23 m/s

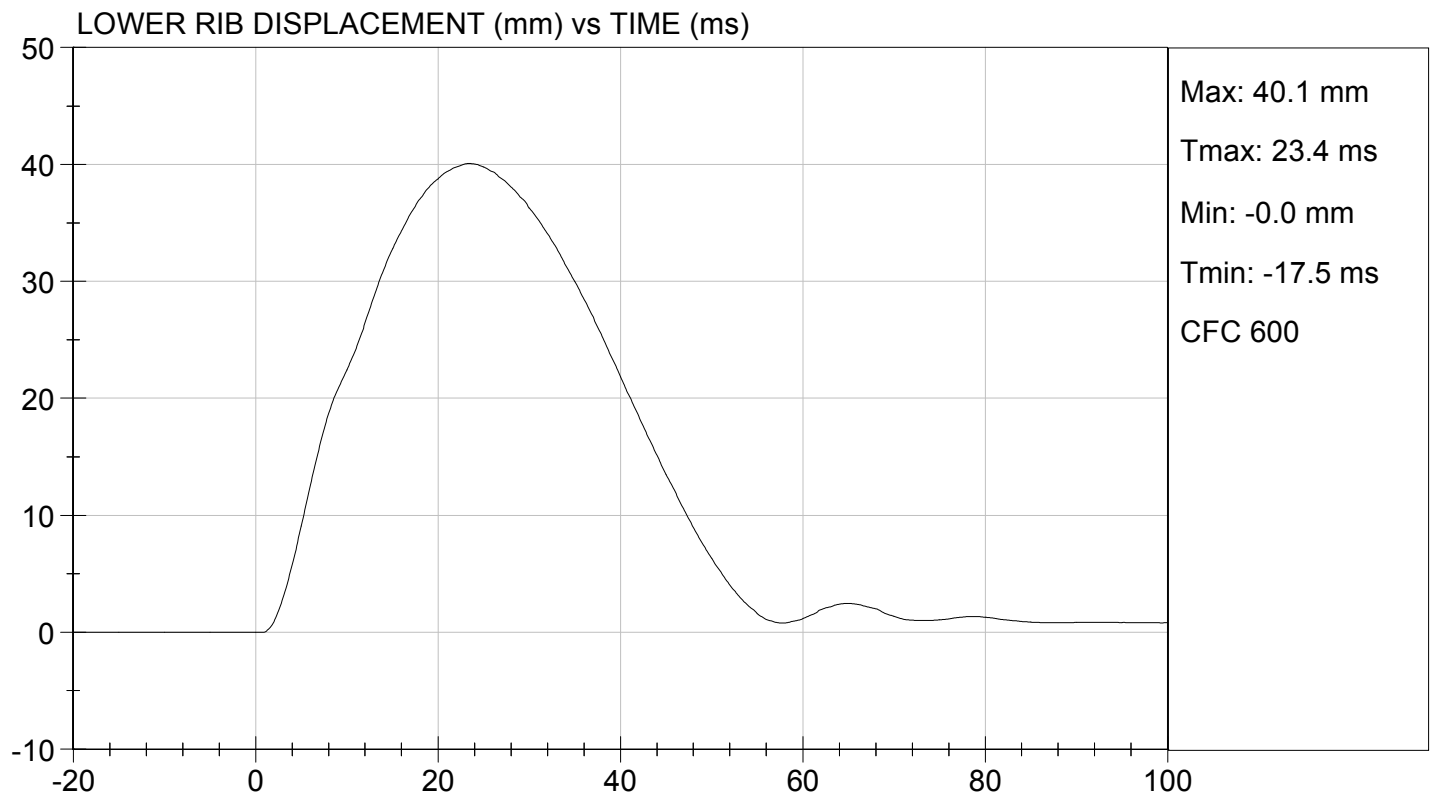
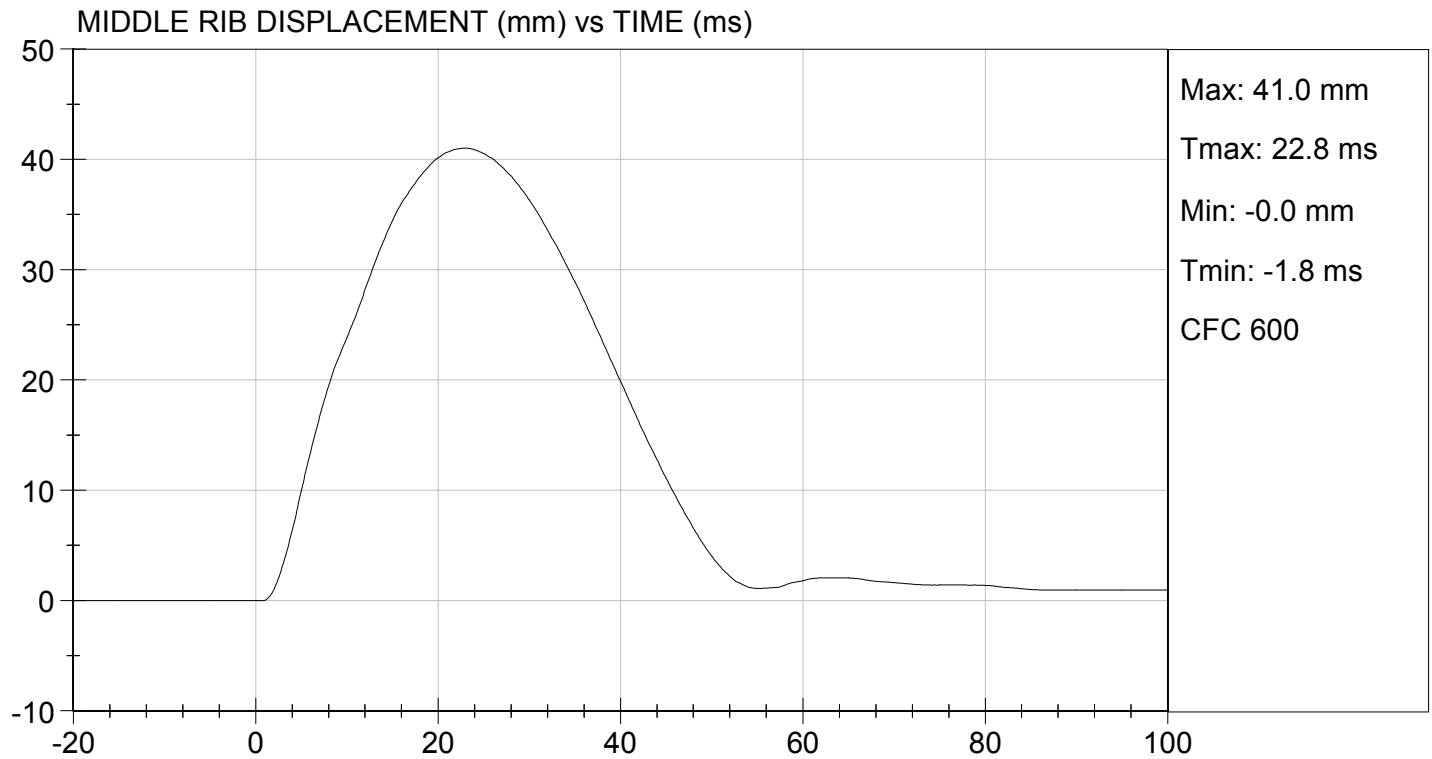
TEST DATE: 11/19/2014
TEST #: D144105





TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 13.89 ft/s, 4.23 m/s

TEST DATE: 11/19/2014
TEST #: D144105

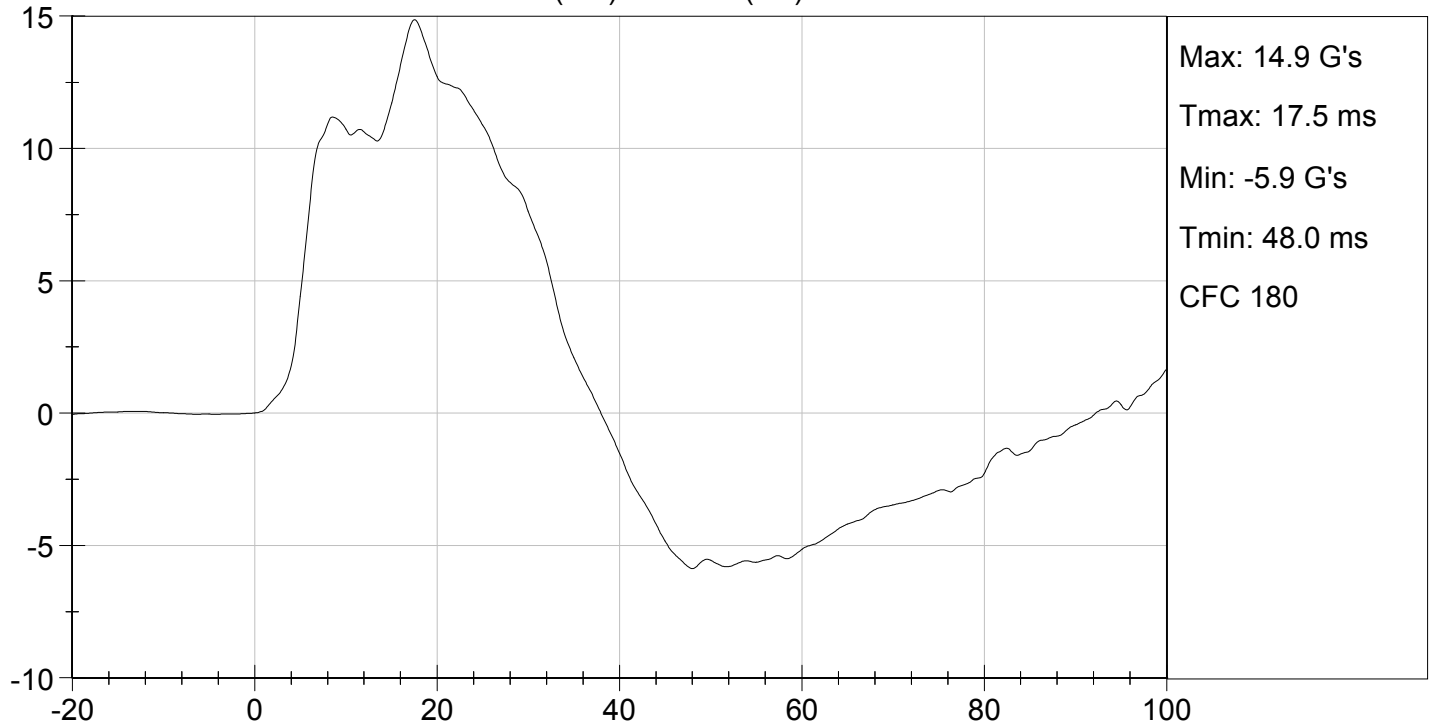




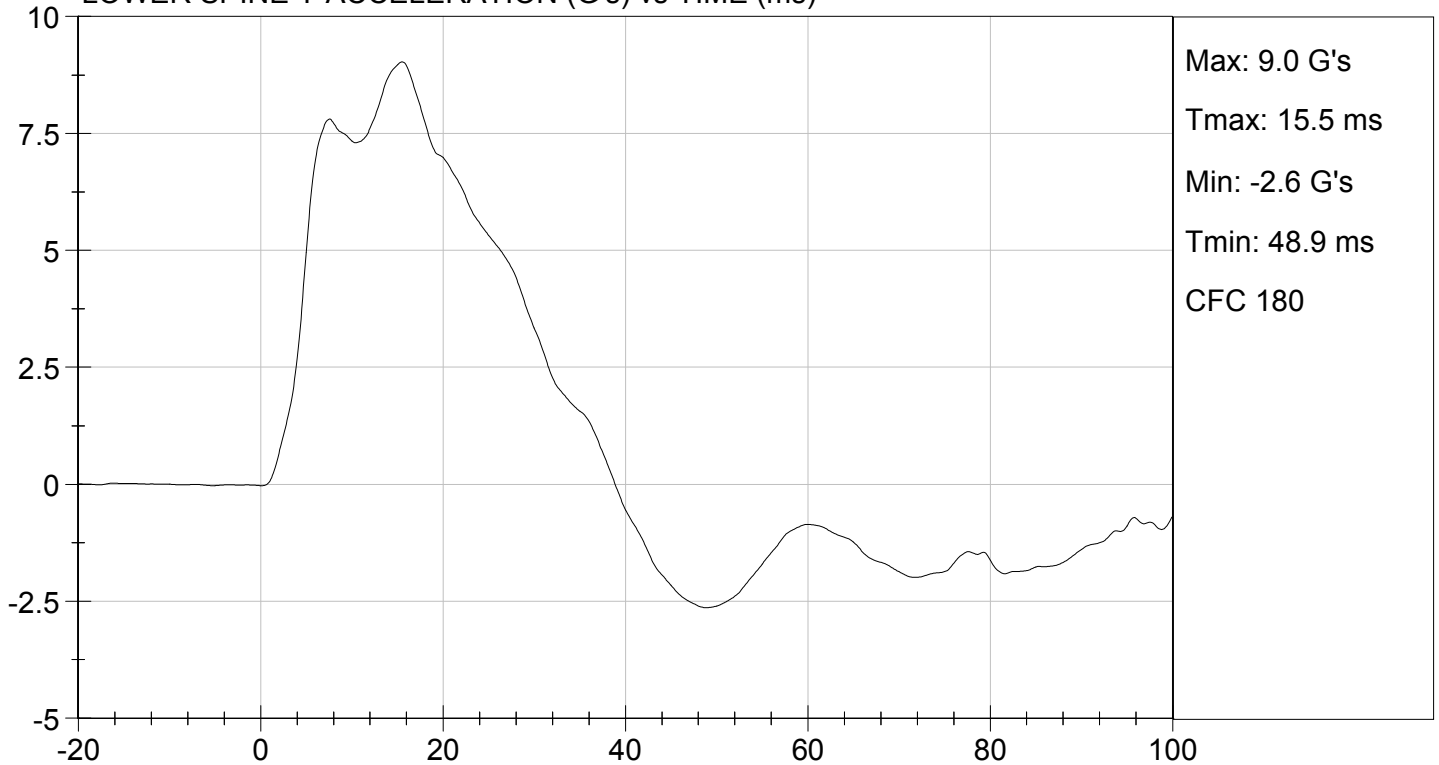
TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 13.89 ft/s, 4.23 m/s

TEST DATE: 11/19/2014
TEST #: D144105

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: 296

Test I.D: D144106

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Humidity	%	10 to 70	15	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	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	40	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	10	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

11/19/2014

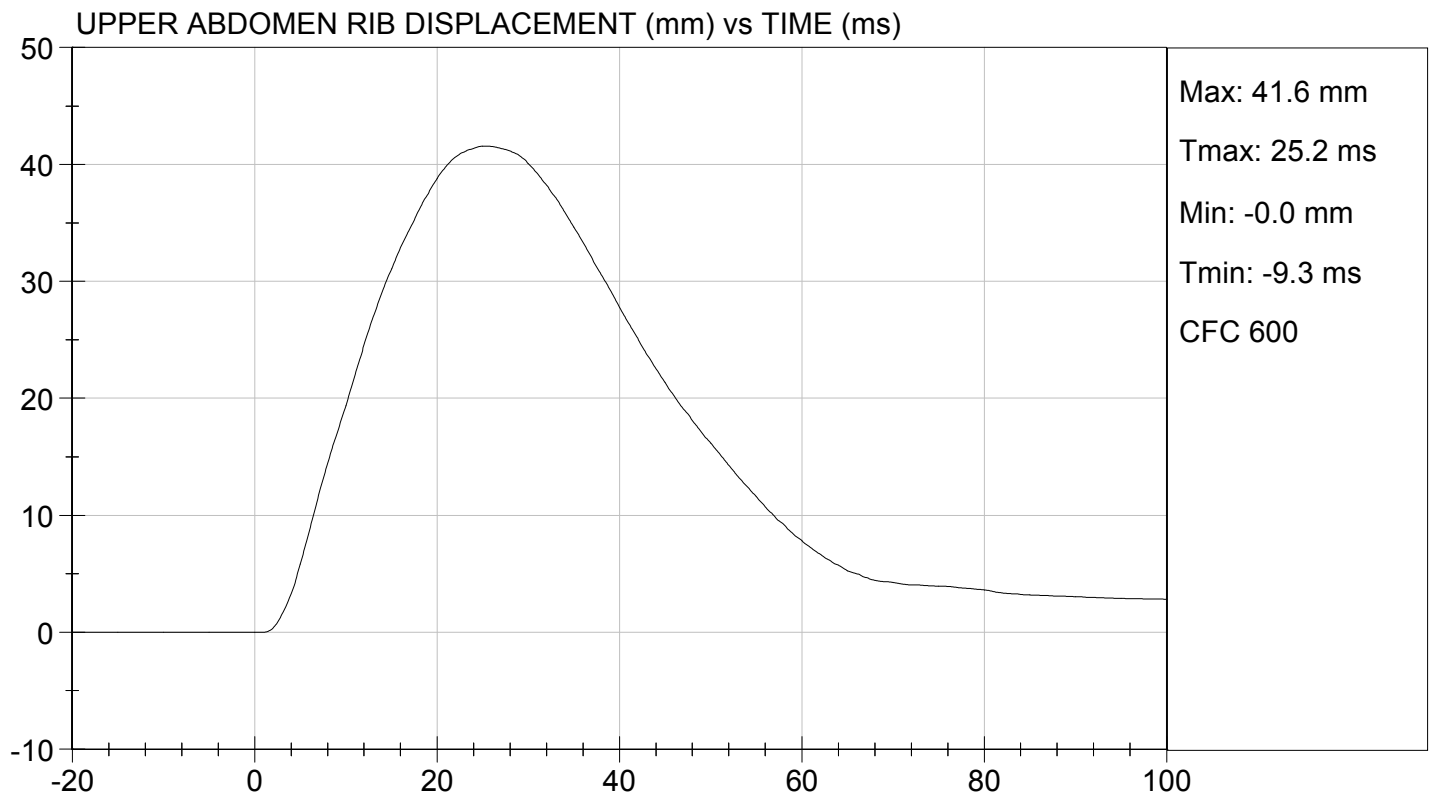
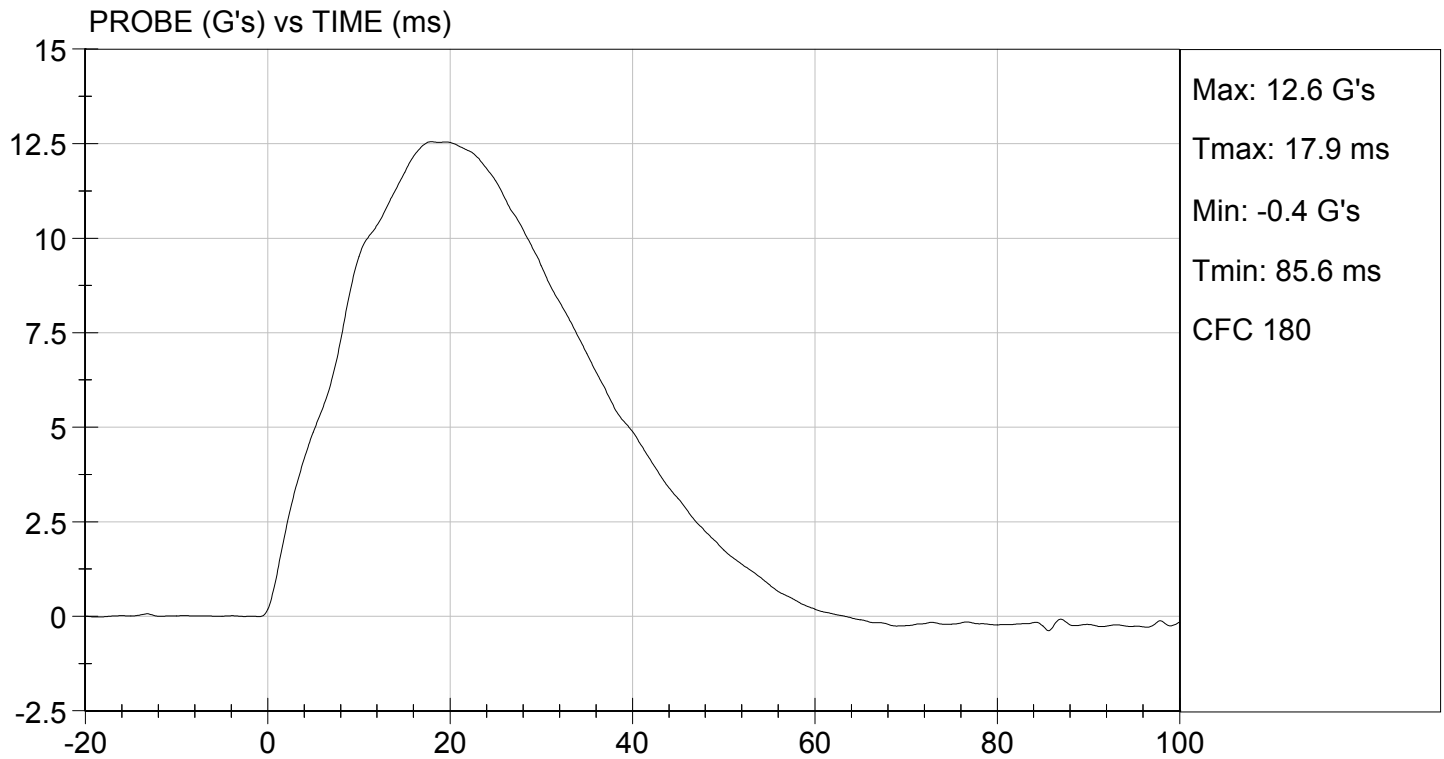
Test Date

Jessica Hall
Approved By



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

TEST DATE: 11/19/2014
TEST #: D144106

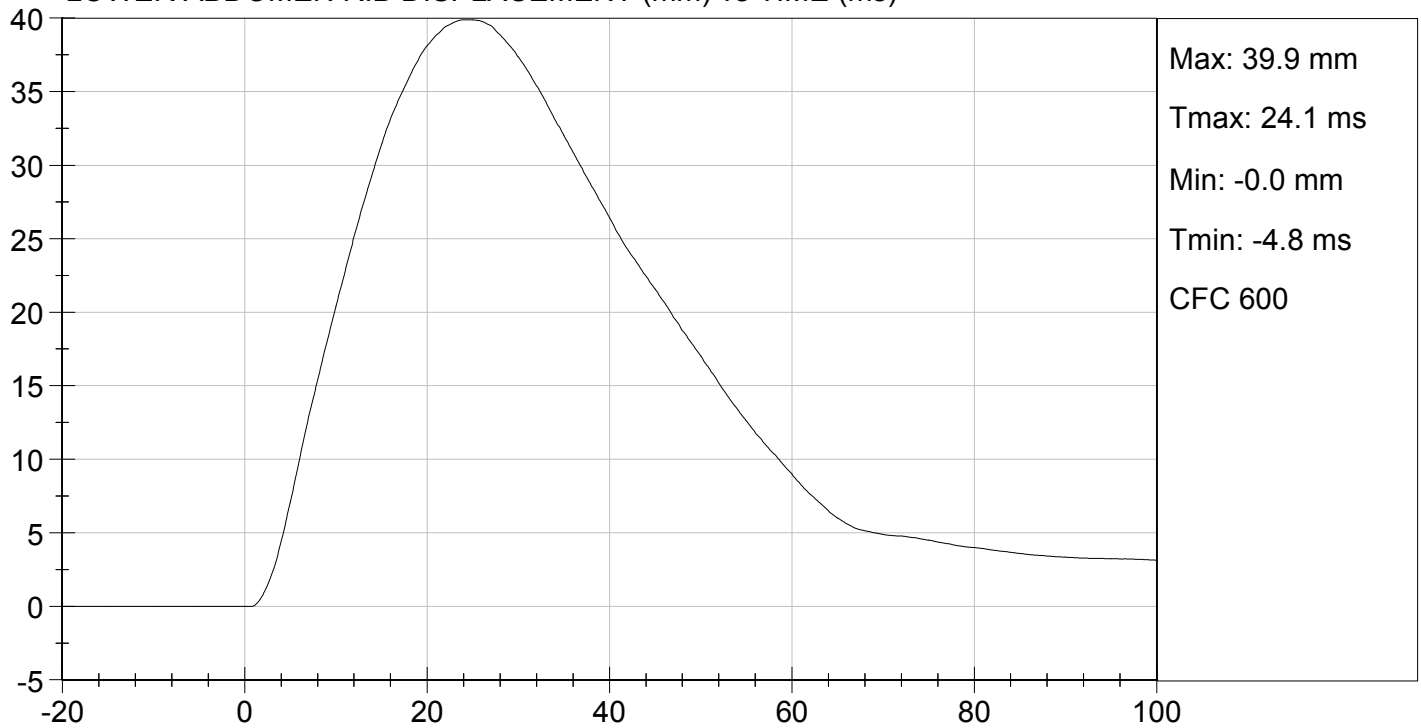




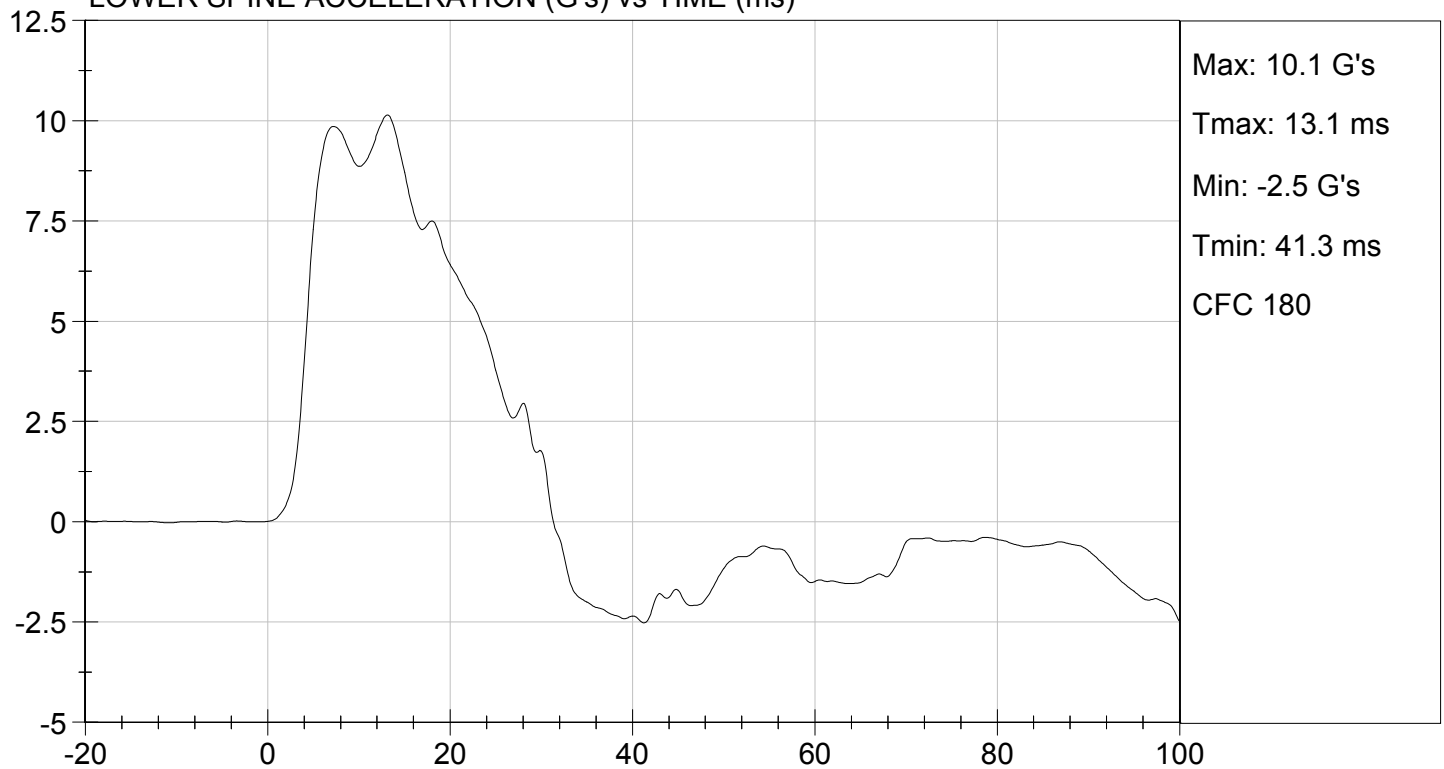
TEST DESC: ABDOMEN IMPACT
VELOCITY: 14.12 ft/s, 4.30 m/s

TEST DATE: 11/19/2014
TEST #: D144106

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



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



MGA RESEARCH CORPORATION

PELVIS IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D144107

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Humidity	%	10 to 70	15	Pass
Impact Velocity	m/s	6.60 to 6.80	6.68	Pass
Maximum Probe Acceleration	G's	38 to 47	40	Pass
Pelvis Y Acceleration After 6 ms	G's	34 to 42	39	Pass
Peak Acetabulum Force	N	3600 to 4300	4,121	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

11/19/2014

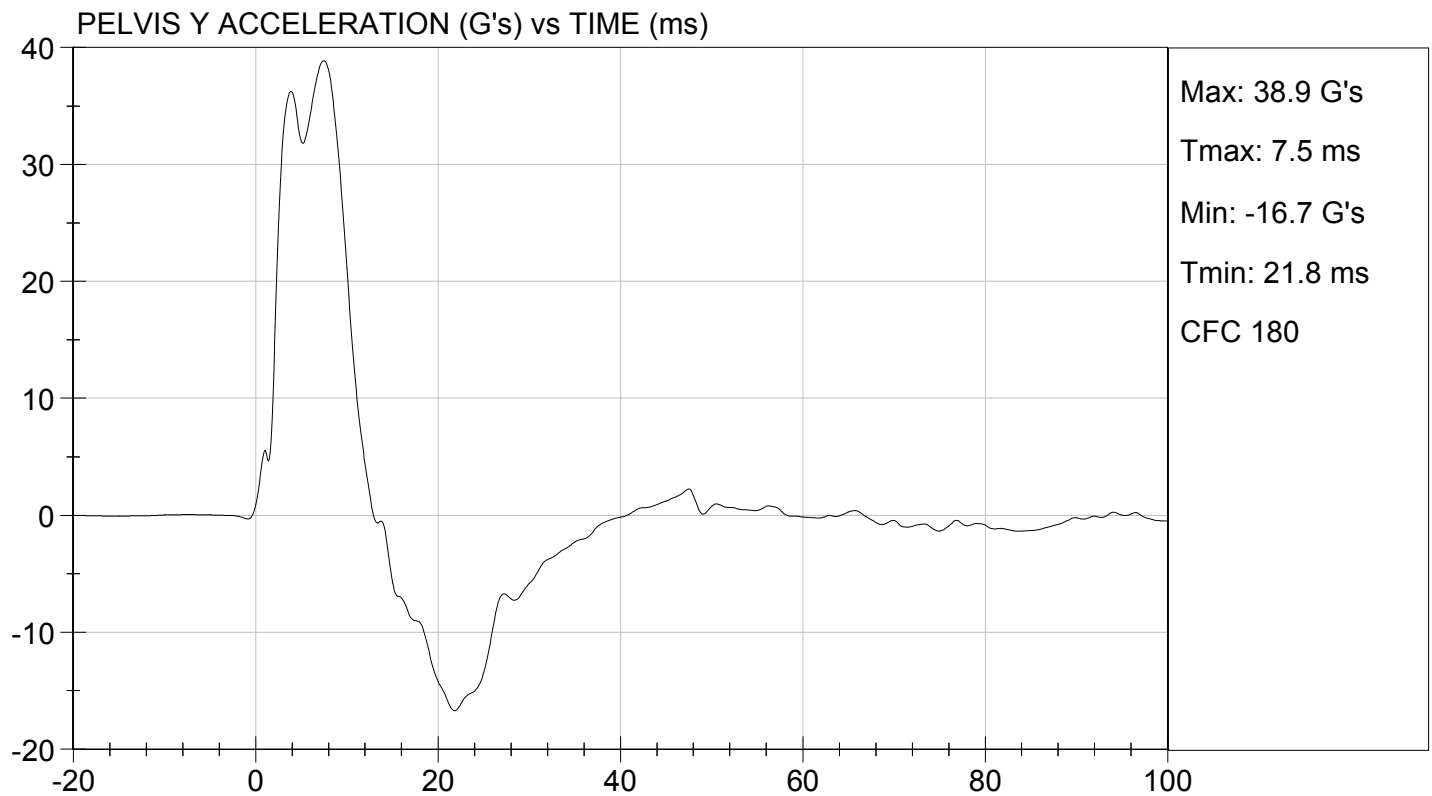
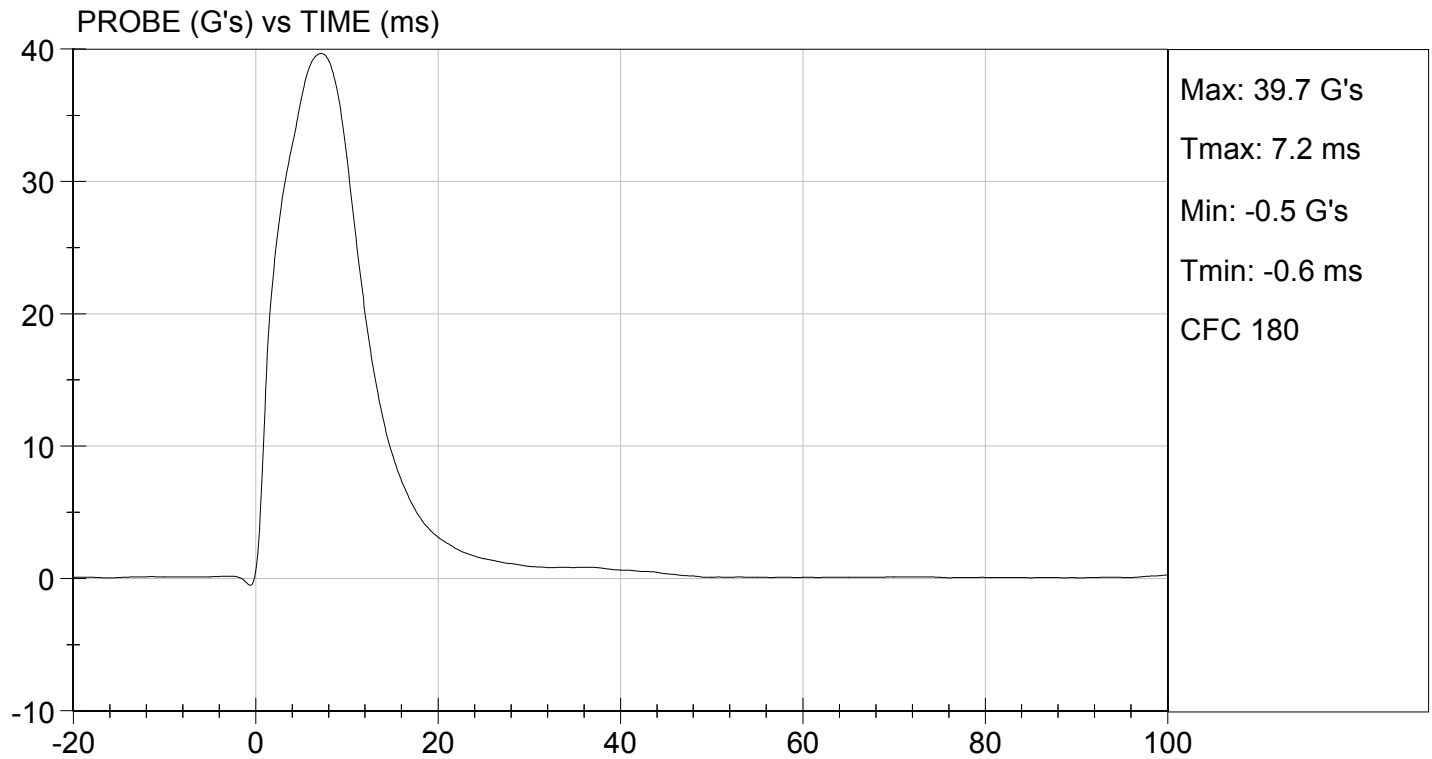
Test Date

Jessica Hall
Approved By



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

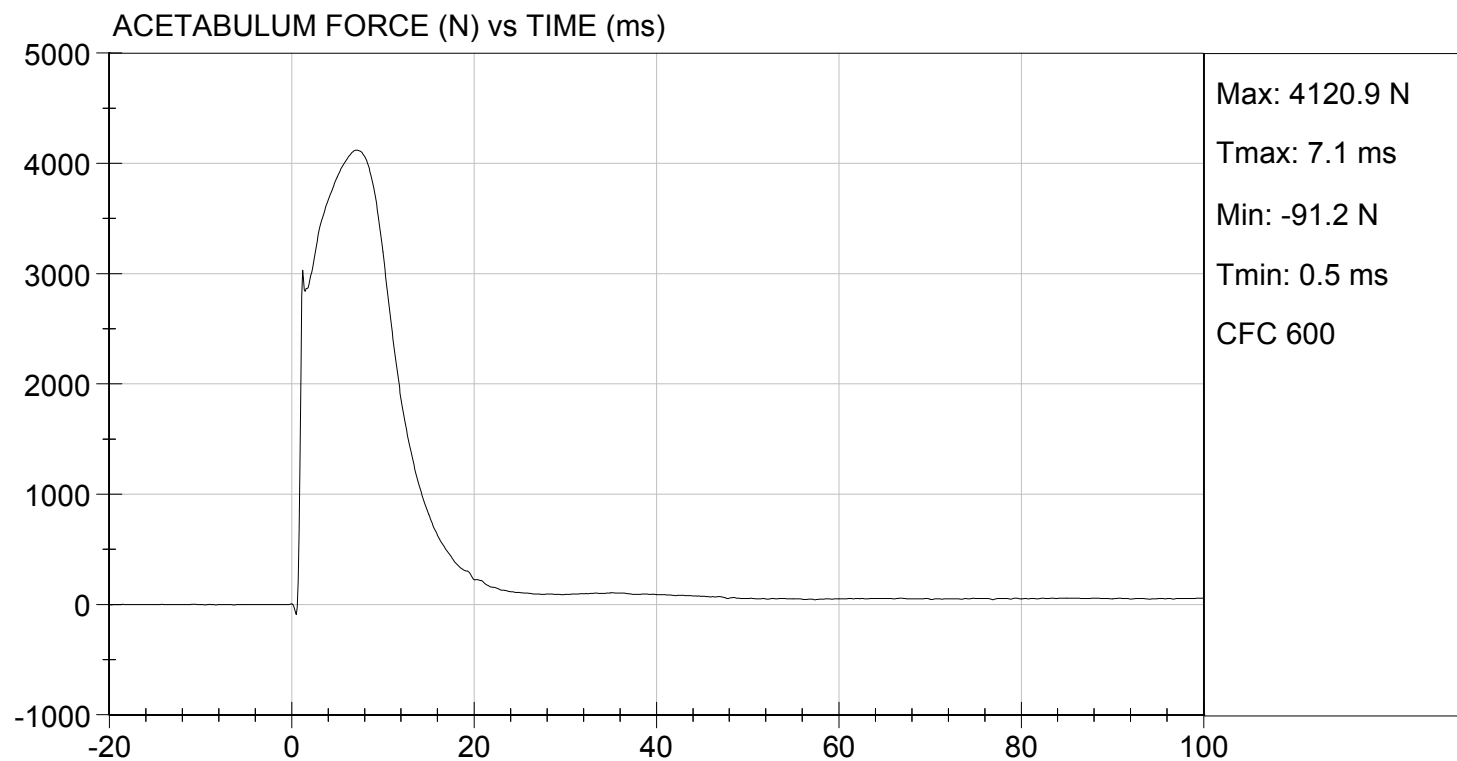
TEST DATE: 11/19/2014
TEST #: D144107





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

TEST DATE: 11/19/2014
TEST #: D144107



MGA RESEARCH CORPORATION

ILIAC IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D144108

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Humidity	%	10 to 70	15	Pass
Impact Velocity	m/s	4.20 to 4.40	4.20	Pass
Maximum Probe Acceleration	G's	36 to 45	41	Pass
Pelvis Y Acceleration	G's	28 to 39	31	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4,860	Pass
Overall Test Results				Pass

David Schoedel

Laboratory Technician

11/19/2014

Test Date

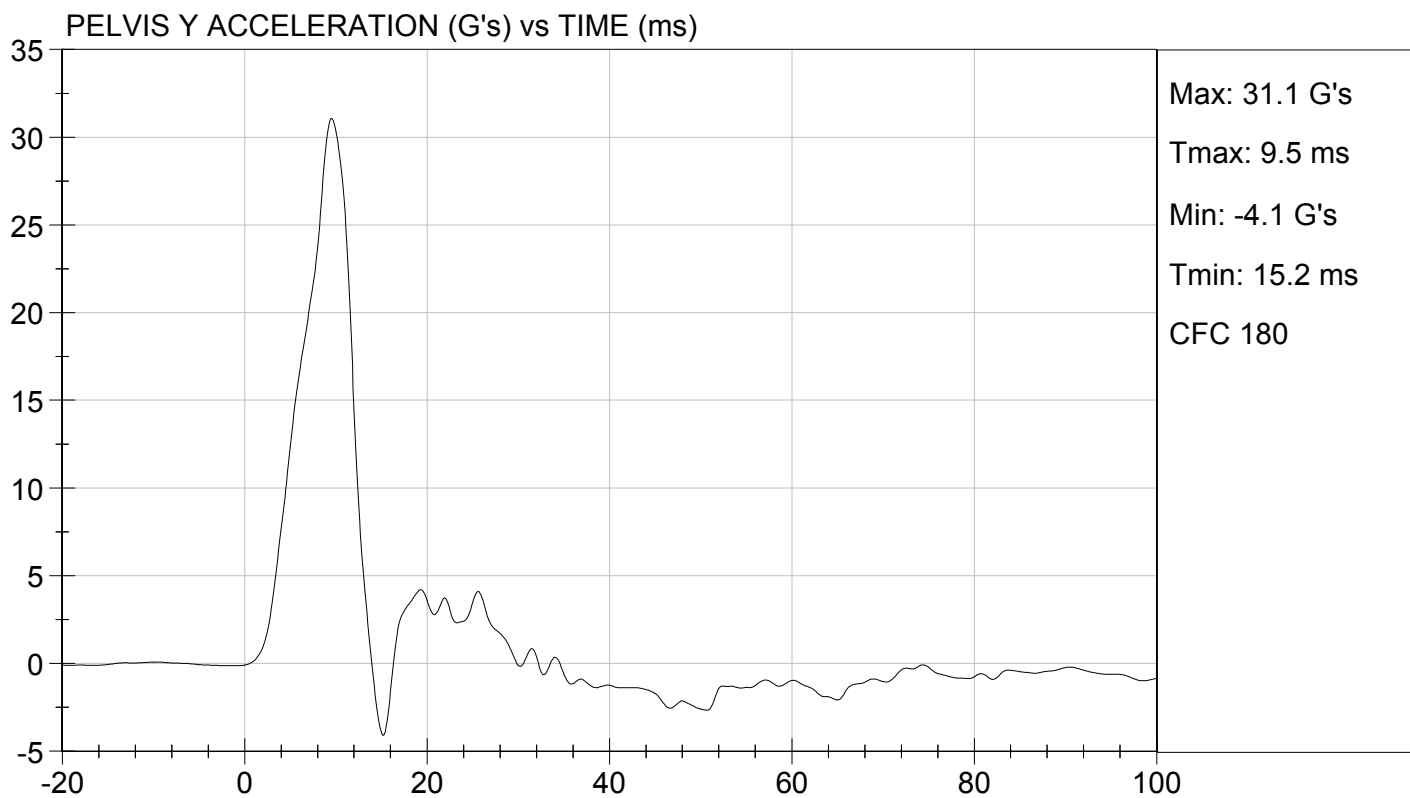
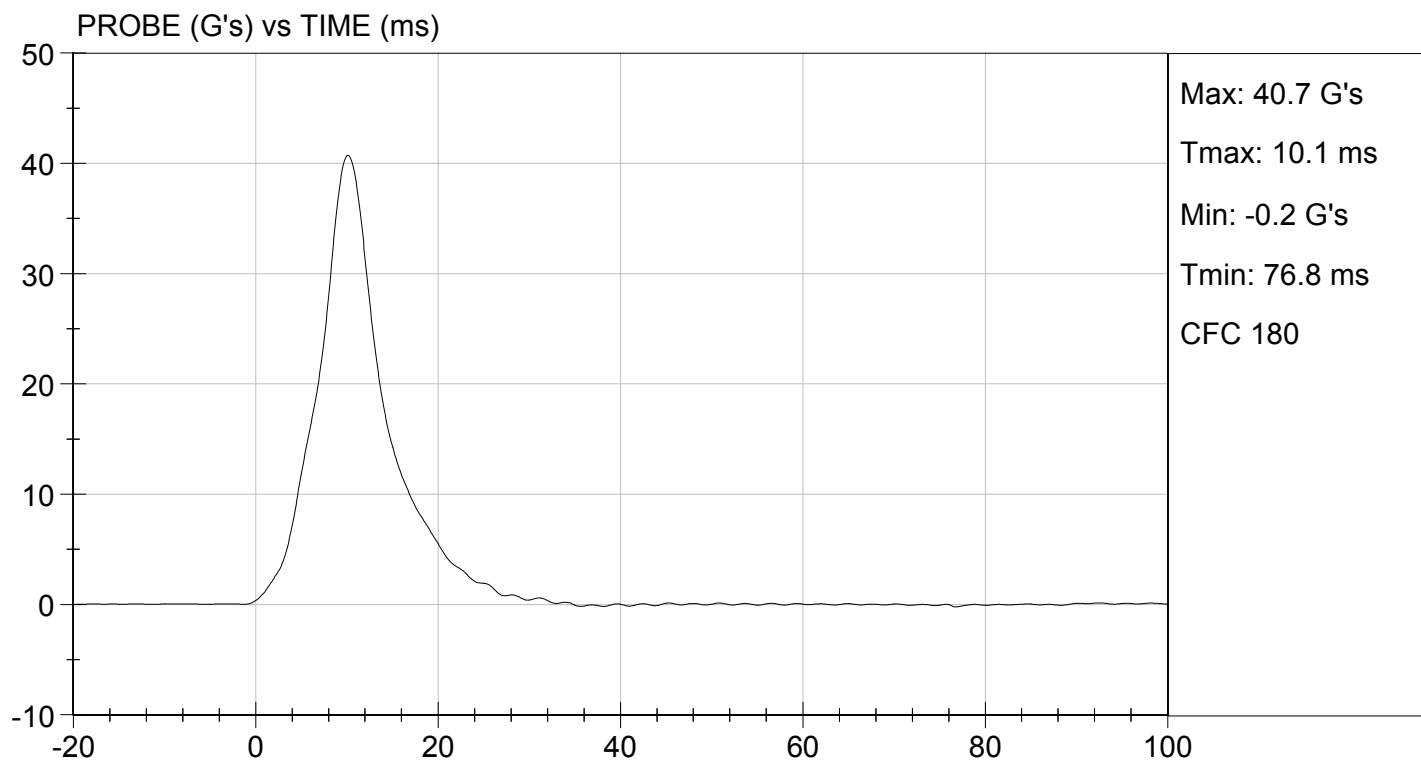
Jessica Hall

Approved By



TEST DESC: ILLIAC
VELOCITY: 13.77 ft/s, 4.20 m/s

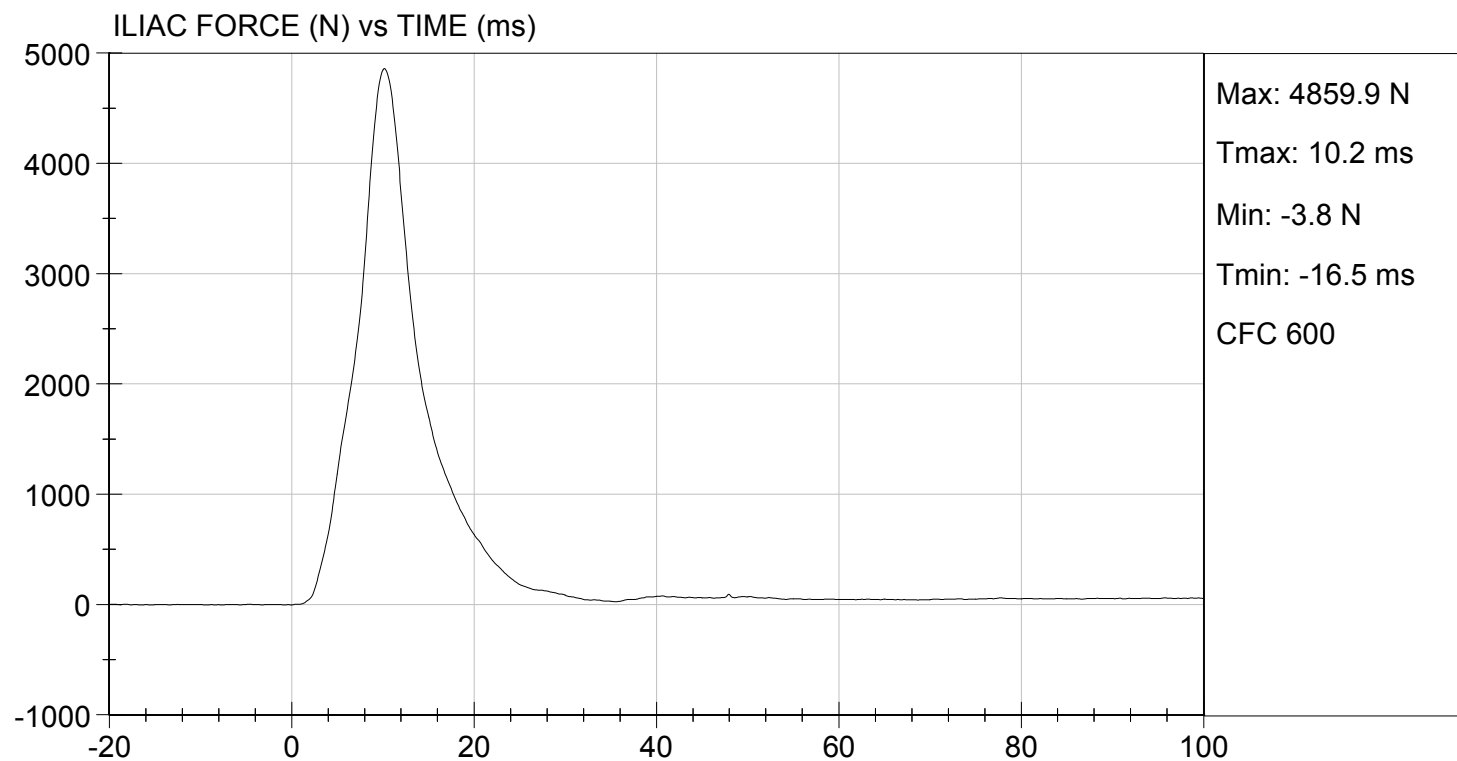
TEST DATE: 11/19/2014
TEST #: D144108



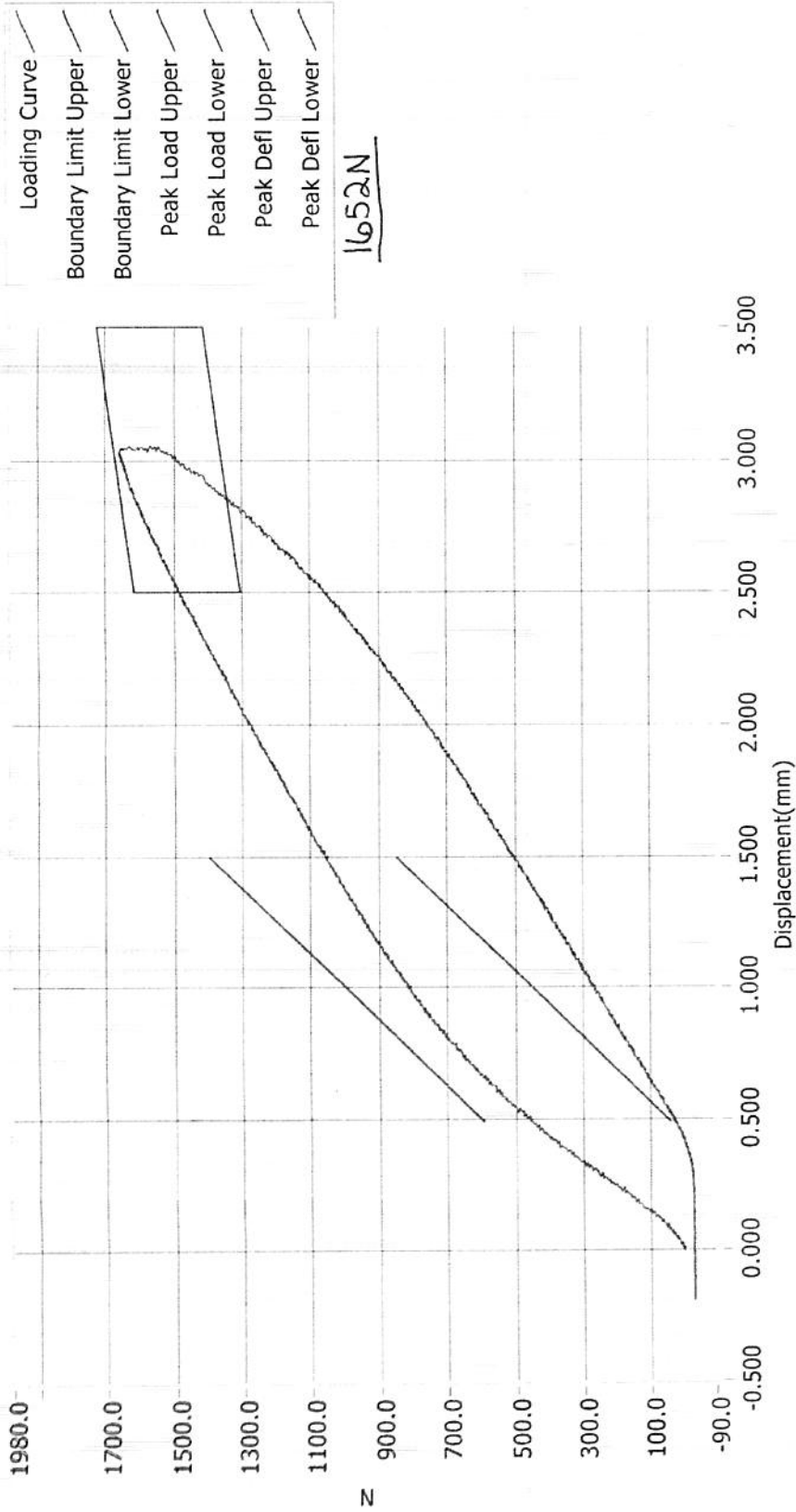


TEST DESC: ILLIAC
VELOCITY: 13.77 ft/s, 4.20 m/s

TEST DATE: 11/19/2014
TEST #: D144108



Resultant Data - SIDIIs Plug Compression

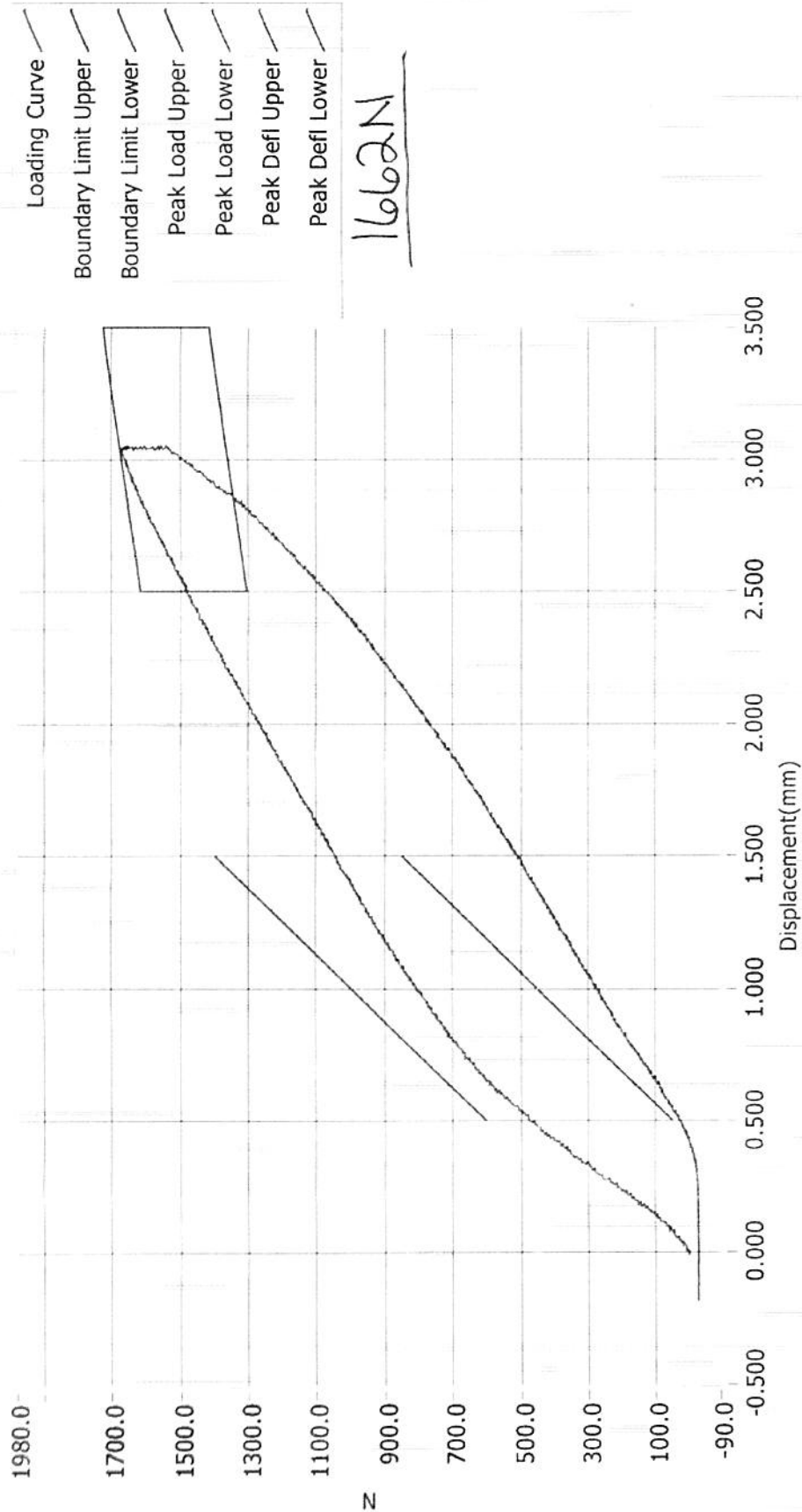


ATD Calibration Lab

Test ID	Part Serial Number	Test Date	Test Time
	70668	12/12/2013	9:08 PM
Cert ID	ATD Serial Number	ATD Type	
	N/A	SIDIIs	

Current Date : 12/12/2013 Current Time : 21:08:51

Resultant Data - SIDIIs Plug Compression



ATD Calibration Lab

Test ID	Part Serial Number	Test Date	Test Time
	70646	12/12/2013	8:42 PM
Cert ID	ATD Serial Number	ATD Type	
	N/A	SIDIIs	

Current Date : 12/12/2013 Current Time : 20:43:28

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	P79575	Endevco	08/11/14
		Y	P79577	Endevco	08/11/14
		Z	P79578	Endevco	08/11/14
		Xr	P79799	Endevco	08/11/14
		Yr	P79802	Endevco	08/11/14
		Zr	P79803	Endevco	08/11/14
Thorax Rib Displacement Potentiometers	Upper	Y	G176	Honeywell	08/11/14
	Middle	Y	G169	Honeywell	08/11/14
	Lower	Y	G164	Honeywell	08/11/14
Abdomen Load Cells	Forward	Y	ABG1532	Denton	01/09/14
	Middle	Y	ABG1534	Denton	01/09/14
	Rear	Y	ABG1535	Denton	01/09/14
Lower Spine Accelerometers (T12)		X	P78853	Endevco	08/08/14
		Y	P78861	Endevco	08/08/14
		Z	P78863	Endevco	08/08/14
Public Symphysis Load Cell		Y	PG461	Denton	01/09/14

Table 2 – Dummy Instrumentation (SID-IIs)

			SID-IIs S/N 296			
			Serial Number	Manufacturer	Calibration Date	
Head CG Accelerometers			X	P84436	Endevco	08/11/14
			Y	P84439	Endevco	08/11/14
			Z	P84440	Endevco	08/11/14
			Xr	P84450	Endevco	08/11/14
			Yr	P84456	Endevco	08/11/14
			Zr	P84457	Endevco	08/11/14
Displacement Potentiometers	Thoracic Rib	Upper	Y	G012	Servo	08/12/14
		Middle	Y	G1163	FTSS	08/12/14
		Lower	Y	G1158	FTSS	08/12/14
	Abdominal Rib	Upper	Y	G1146	FTSS	08/12/14
		Lower	Y	G1126	FTSS	08/12/14
Lower Spine Accelerometers (T12)			X	P84437	Endevco	08/11/14
			Y	P84442	Endevco	08/11/14
			Z	P84443	Endevco	08/11/14
Acetabulum Load Cell			Y	ACG268	Denton	01/09/14
Iliac Wing Load Cell			Y	IWG282	Denton	01/09/14
Pelvis Plug (struck side)				70668	FTSS	12/12/13
Pelvis Plug (non-struck side)				70646	FTSS	12/12/13

Table 3 – Vehicle Instrumentation

			Serial Number	Manufacturer	Calibration Date
1	Vehicle Center of Gravity	X	P75543	Endevco	07/18/14
	Vehicle Center of Gravity	Y	P75542	Endevco	07/18/14
	Vehicle Center of Gravity	Z	P75544	Endevco	07/18/14
2	Right Sill at Front Seat	X	P74566	Endevco	07/16/14
	Right Sill at Front Seat	Y	P74568	Endevco	07/16/14
	Right Sill at Front Seat	Z	P74567	Endevco	07/16/14
3	Right Sill at Rear Seat	X	P66779	Endevco	10/02/14
	Right Sill at Rear Seat	Y	P66778	Endevco	10/02/14
	Right Sill at Rear Seat	Z	P66780	Endevco	10/02/14
4	Left Sill at Front Door	Y	P59346	Endevco	06/06/14
5	Left Sill at Rear Door	Y	P78488	Endevco	10/02/14
6	Left A-Post Lower	Y	P73128	Endevco	11/11/14
7	Left A-Post Middle	Y	P74003	Endevco	09/23/14
8	Left B-Post Lower	Y	P74010	Endevco	11/11/14
9	Left B-Post Middle	Y	P74689	Endevco	11/11/14
10	Front Seat Track	Y	P78696	Endevco	11/11/14
11	Rear Seat Track or Structure	Y	P68889	Endevco	09/08/14
12	Right Rear Occ. Compartment	Y	P73126	Endevco	11/11/14
13	Engine Block	X	P66754	Endevco	07/01/14
	Engine Block	Y	P66753	Endevco	07/01/14
14	Rear Floorpan Above Axle	X	P77657	Endevco	07/18/14
	Rear Floorpan Above Axle	Y	P77655	Endevco	07/18/14
	Rear Floorpan Above Axle	Z	P77656	Endevco	07/18/14

Table 4 – MDB Instrumentation

		Serial Number	Manufacturer	Calibration Date
MDB Center of Gravity	X	P85036	Endevco	08/08/14
MDB Center of Gravity	Y	P85038	Endevco	08/08/14
MDB Center of Gravity	Z	P85037	Endevco	08/08/14
Left Frame at Rear Axle Centerline	X	P67517	Endevco	08/18/14
Left Frame at Rear Axle Centerline	Y	P67518	Endevco	08/18/14