

REPORT NUMBER: SINCAP-MGA-2016-055

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

**ADAM OPEL AG
2016 Buick Cascada Premium 1SP Convertible
NHTSA No.: O20160102**

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



Test Date: July 28, 2016

Final Report Date: September 7, 2016

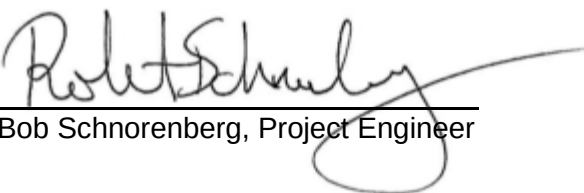
FINAL REPORT

**U.S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Office of Crashworthiness Standards
Mail Code: NRM-110
1200 New Jersey Ave, SE
Room W43-410
Washington, DC 20590**

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Approval Date: September 7, 2016

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

Technical Report Documentation Page

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15. <i>Supplementary Notes</i>																																																											
16. <i>Abstract</i> A 55/28 km/h 90° Moving Deformable Barrier NCAP Side Impact Test was conducted on the 2016 Buick Cascada Premium 1SP 2-Door Convertible 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 July 28, 2016. The impact velocity of the Moving Deformable Barrier (MDB) was 61.55 km/h, and the ambient temperature at the struck (driver's) side of the target vehicle at the time of impact was 22.1°C. The target vehicle post-test maximum crush was 149 mm at level 3. The test vehicle's performance was as follows:																																																											
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17. <i>Key Words</i> New Car Assessment Program (NCAP) Side Impact MDB ES-2re SID-IIs		18. <i>Distribution Statement</i> Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services Division, NPO-411 1200 New Jersey Ave, SE Washington, DC 20590 e-mail: tis@nhtsa.dot.gov FAX: 202-493-2833																																																									
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SECTION 1

TEST PURPOSE AND PROCEDURE

This moving deformable barrier side impact test is part of the MY 2016 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. DTNH22-14-D-00353. The purpose of this test is to generate comparative side impact performance in a 2016 Buick Cascada Premium 1SP 2-Door Convertible. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Side NCAP Laboratory Test Procedure dated October 2015.

SECTION 2 SUMMARY OF TEST RESULTS

A 2016 Buick Cascada Premium 1SP 2-Door Convertible was impacted on the left (driver's) side by a Moving Deformable Barrier (MDB) which was moving forward in a 27° crabbed position to the tow road guidance system at a velocity of 61.55 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 July 28, 2016. 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 October 2015. 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
Primary Head CG Angular Rate Sensors
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	17
Maximum Thorax Rib Deflection	mm	44	20
Total Abdominal Force	N	2500	181
Pubic Symphysis Force	N	6000	1535
Resultant Lower Spine Acceleration	Gs	82*	24

	Passenger ATD (SID-IIs)		
Measurement Description	Units	Threshold	Result
Head Injury Criteria (HIC ₃₆)	N/A	1000	467
Resultant Lower Spine Acceleration	Gs	82	51
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2474
Maximum Thoracic Rib Deflection	mm	38*	9
Maximum Abdomen Rib Deflection	mm	45*	8

*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	No		No	
Side Torso/Pelvis Airbag	No		No	
Seat Belt Pretensioner	Yes	Yes	No	
Seat Belt Load Limiter	Yes		No	
Other: Side Torso/Head Airbag	Yes	Yes	No	

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

GENERAL COMMENTS

Left Lower A-Post Y recorded no valid data after 25ms.

Left Lower B-Post Y was not installed.

Left Mid B-Post Y was not installed.

Left Rear Sill Y recorded questionable data.

Photo No. 030, 032, 046, 058, 060, 073 show an incorrect test date.

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: 2016 Buick Cascada Premium 1SP Convertible
Test Program: NCAP Side MDB Impact Test

NHTSA No. O20160102
Test Date: 7/28/2016

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	O20160102	Traction Control System (TCS)	Yes
Model Year	2016	Auto-Leveling System	No
Make	Buick	Automatic Door Locks (ADL)	Yes
Model	Cascada Premium 1SP	Power Window Auto-Reverse	Yes
Body Style	Convertible	Other Optional Feature	N/A
VIN	W04WT3N51GG060405	Driver Front Airbag	Yes
Body Color	Graystone Metallic	Driver Curtain Airbag	No
Odometer Reading (km/mi)	111km / 69mi	Driver Head/Torso Airbag	Yes
Engine Displacement (L)	1.6L	Driver Torso Airbag	No
Type/No. Cylinders	4	Driver Torso/Pelvis Airbag	No
Engine Placement	Lateral	Driver Pelvis Airbag	No
Transmission Type	Automatic	Driver Knee Airbag	Yes
Transmission Speeds	6	Rear Pass. Curtain Airbag	No
Overdrive	Yes	Rear Pass. Head/Torso Airbag	No
Final Drive	FWD	Rear Pass. Torso Airbag	No
Roof Rack	No	Rear Pass. Torso/Pelvis Airbag	No
Sunroof/T-Top	Yes	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	Yes	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?	No
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DATA FROM CERTIFICATION LABEL

Manufactured By	ADAM OPEL AG	GVWR (kg)	2170
Date of Manufacture	01/16	GAWR Front (kg)	1150
Vehicle Type	Passenger Car	GAWR Rear (kg)	1020

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity (DSC)	2	2		4	
Capacity Weight (VCW) (kg)				336	(A)
DSC x 68.04 kg				272	(B)
Rated Cargo and Luggage Weight (RCLW) (kg)				64	(A-B)

VEHICLE SEAT TYPE

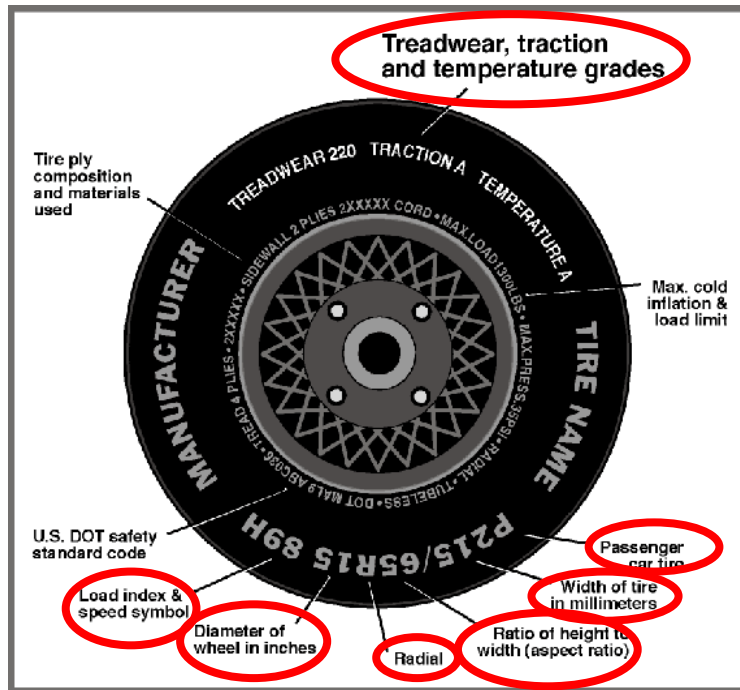
Seating Location	Type of Seat Pan				Type of Seat Back		
	Bucket	Bench	Split Bench	Contoured	Fixed	Adjustable	
						Manual	Power
Front Seat	X						X
Rear or Second Row Seat	X				X		
Third Row Seat							

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

Test Vehicle: 2016 Buick Cascada Premium 1SP Convertible
 Test Program: NCAP Side MDB Impact Test

NHTSA No. O20160102
 Test Date: 7/28/2016

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	240	240
Recommended Tire Size	P245/40R20	P245/40R20
Tire Size on Vehicle	245/40R20	245/40R20
Tire Manufacturer	Bridgestone	Bridgestone
Tire Model	Potenza	Potenza
Treadwear	400	400
Traction	A	A
Temperature Grade	A	A
Tire Plies Sidewall	3 Polyester	3 Polyester
Tire Plies Body	2 Polyester, 2 Steel, 1 Nylon	2 Polyester, 2 Steel, 1 Nylon
Load Index/Speed Symbol	95V	95V
Tire Material	Rubber	Rubber
DOT Safety Code Left	7XWA PR4 4715	7XWA PR4 4715
DOT Safety Code Right	7XWA PR4 4715	7XWA PR4 4715

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

Test Vehicle: 2016 Buick Cascada Premium 1SP Convertible
 Test Program: NCAP Side MDB Impact Test

NHTSA No. 020160102
 Test Date: 7/28/2016

TEST PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	255	250	250	250
Tire Placard	kPa	240	240	240	240
Owner's Manual	kPa	240	240	240	240
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
Tire Pressure	200 ± 21	kPa	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	531.5	389.5		568.5	468.5		565.5	477.5	
Right	kg	516.5	361.0		527.0	420.5		520.0	428.5	
Ratio	%	58.3%	41.7%		55.2%	44.8%		54.5%	45.5%	
Totals	kg	1048.0	750.5	1798.5	1095.5	889.0	1984.5	1085.5	906.0	1991.5

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1798.5	(A)
Sum of Actual Weight of 2 P572 ATDs Used	kg	129	(B)
Rated Cargo/Luggage Weight (RCLW)	kg	64	(C)
Calculated Test Vehicle Target Weight (TVTW)	kg	1991.5	(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	725	720	Yes
Right Front	mm	742	733	Yes
Right Rear	mm	738	740	Yes
Left Rear	mm	718	727	Yes
Vehicle CG (Aft of Front Axle)	mm	1231	1208	
Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline)	mm	38	19	

*** 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: 2016 Buick Cascada Premium 1SP Convertible
Test Program: NCAP Side MDB Impact Test

NHTSA No. O20160102
Test Date: 7/28/2016

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Weight of Ballast, if any	40
None	

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

Test Vehicle: 2016 Buick Cascada Premium 1SP Convertible
 Test Program: NCAP Side MDB Impact Test

NHTSA No. O20160102
 Test Date: 7/28/2016

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	23.4	12.4	17.9
Front Passenger Seat	23.0	12.0	17.5
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	Forward- Most
Driver Seat	17.9	0	Max	64	64	64
			Mid	32	32	32
			Min	0	0	0
Front Passenger Seat	17.5	0	Max	64	64	64
			Mid	32	32	32
			Min	0	0	0
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: 2016 Buick Cascada Premium 1SP Convertible
 Test Program: NCAP Side MDB Impact Test

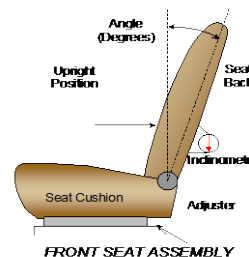
NHTSA No. O20160102
 Test Date: 7/28/2016

SEAT FORE/AFT POSITIONS

Seat	Total Fore/Aft Travel		Test Position from Forward-Most Position	
	mm	Detents (1 st as 1)	mm	Detent (1 st as 0)
Driver Seat	185		93	
Front Passenger Seat	185		93	
Front Center Seat				
Struck Side Rear Seat	Fixed		Fixed	
Non-Struck Side Rear Seat	Fixed		Fixed	
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 October 2015. 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 (1 st as 1)	Degrees	Detent (1 st as 0)
Driver Seat	52.4		2.6	
Front Passenger Seat	53.5		2.4	
Front Center Seat				
Struck Side Rear Seat	Fixed		N/A	
Non-Struck Side Rear Seat	Fixed		N/A	
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: 2016 Buick Cascada Premium 1SP Convertible
 Test Program: NCAP Side MDB Impact Test

NHTSA No. O20160102
 Test Date: 7/28/2016

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	Fixed	
Rear Seat	Fixed	

HEAD RESTRAINT ADJUSTMENT

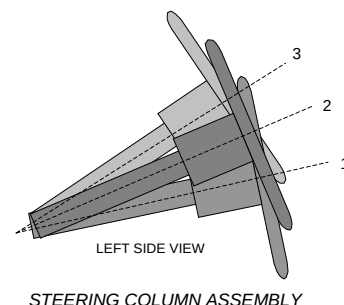
The driver's head restraint is adjusted to the highest and most full forward in-use position. The struck-side rear passenger's head restraint is adjusted to the lowest and most full forward in-use position.

	Total # of Positions	Placed in Position #
Driver Seat	7	6 (Lowest as 0) / Foremost
Rear Seat	Fixed	

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.

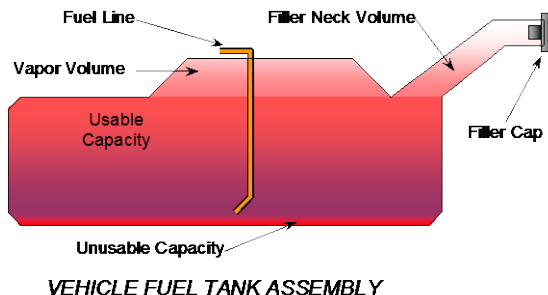
	Wheel Angle (deg)	Fore/Aft Position (mm)
Lowermost, Position 1	69.7	225
Geometric Center, Position 2	67.5	198
Uppermost, Position 3	65.2	170
Telescoping Steering Wheel Travel		55
Test Position	67.5	198



FUEL PUMP

Describe the fuel pump type, details about how it operates and the location of the fuel filler pipe.

The test vehicle is equipped with an electronic fuel pump. Ignition Stage 2 will activate the fuel pump to prime the system. The filler neck is located on the driver's side.



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

Test Vehicle: 2016 Buick Cascada Premium 1SP Convertible
Test Program: NCAP Side MDB Impact Test

NHTSA No. O20160102
Test Date: 7/28/2016

FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of Standard Tank (see Form No. 1)	56.0
Usable Capacity of Optional Tank (see Form No. 1)	
Usable Capacity of Standard Tank as Specified in Owner's Manual	56.0
Usable Capacity of Optional Tank as Specified in Owner's Manual	
93% of Usable Capacity	52.1
Actual Amount of Solvent Used	51.9
1/3 of Usable Capacity	18.7

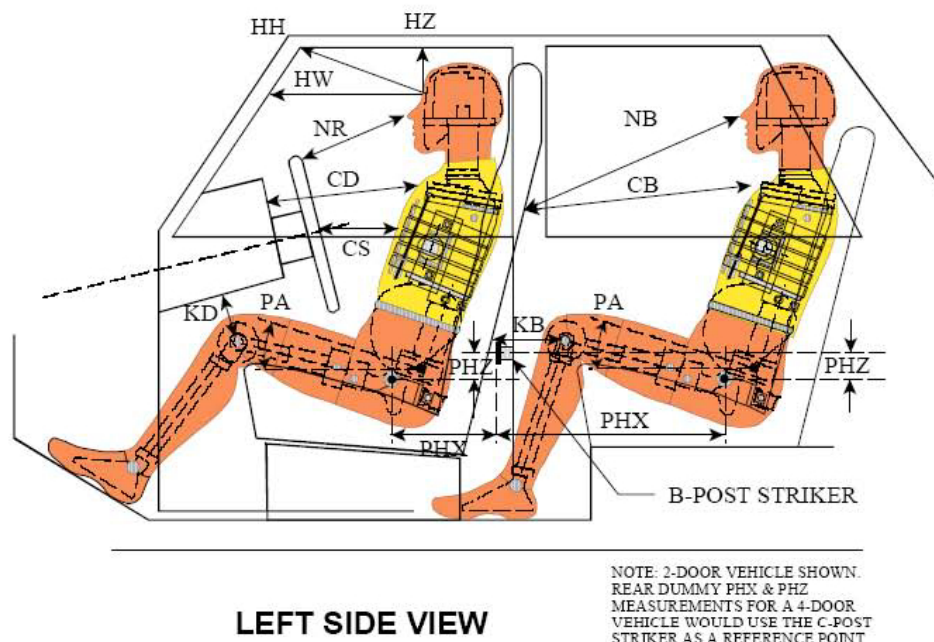
Is the actual amount of solvent used in the test equal to 93% + 1%
of the Usable Capacity stated in Form No. 1?

YES

DATA SHEET NO. 3 DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2016 Buick Cascada Premium 1SP Convertible
Test Program: NCAP Side MDB Impact Test

NHTSA No. O20160102
Test Date: 7/28/2016



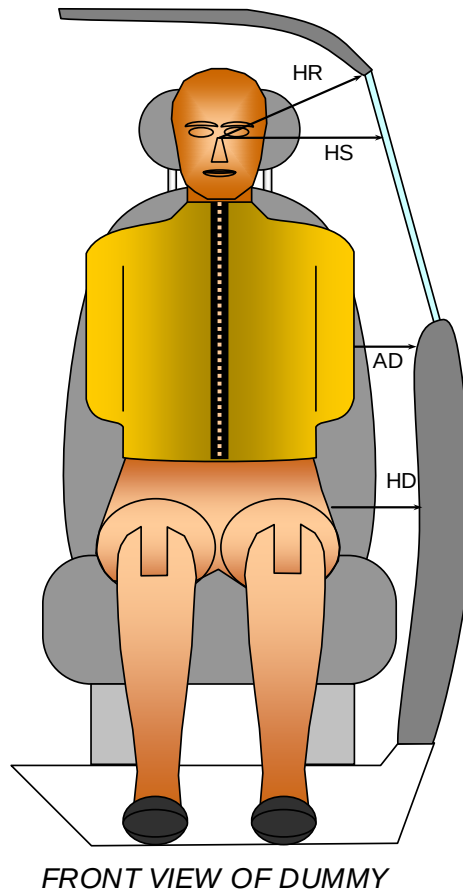
DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Pass. Code	Measurement Description	Driver		Passenger	
			Length (mm)	Angle (°)	Length (mm)	Angle (°)
HH		Head to Header	490	13.2		
HW		Head to Windshield	812	0		
HZ	HZ	Head to Roof Liner	182	90	222	90
NR	NB	Nose to Rim/Seat Back	503	8.4	413	14.4
CD	CB	Chest to Dashboard/Seat Back	682	9.3	393	7.8
CS		Chest to Steering Wheel	465	1.5		
KDL	KBL	Left Knee to Dash/Seat Back	229	52.1	136	13.4
KDR	KBR	Right Knee to Dash/Seat Back	194	48.5	133	37.4
PAX	PAX	Pelvic Tilt Angle X		23.8		25.4
PAY	PAY	Pelvic Tilt Angle Y		-0.8		0.6
PHX	PHX	Hip Point to Striker (X-Axis)	428		-379	
PHZ	PHZ	Hip Point to Striker (Z-Axis)	219		163	

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

Test Vehicle: 2016 Buick Cascada Premium 1SP Convertible
 Test Program: NCAP Side MDB Impact Test

NHTSA No. O20160102
 Test Date: 7/28/2016



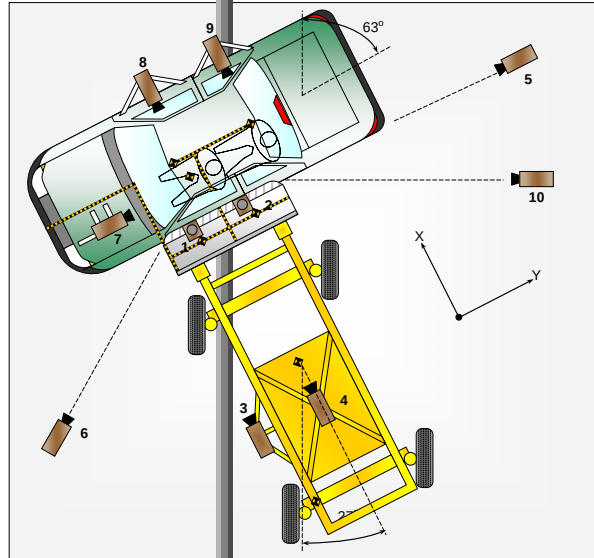
DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver	Passenger
HR	Head to Side Header	mm	212	250
HS	Head to Side Window	mm	314	392
AD	Arm to Door	mm	112	113
HD	Hip Point to Door	mm	159	105

DATA SHEET NO. 5 CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2016 Buick Cascada Premium 1SP Convertible
Test Program: NCAP Side MDB Impact Test

NHTSA No. O20160102
Test Date: 7/28/2016



CAMERA LOCATIONS AND DATA

No.	Camera View	Coordinates (mm)			Lens Length (mm)	Operating Frame Rate (fps)
		X*	Y*	Z*		
1	Overhead Overall	120	-60	-4430	14	1000
2	Overhead Close-Up	30	0	-4330	20	1000
3	Left Impact Point (MDB)				50	1000
4	Side Overall (MDB)				16	1000
5	Rear	-70	5770	-1170	24	1000
6	Left Front	-1890	-5490	-1290	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

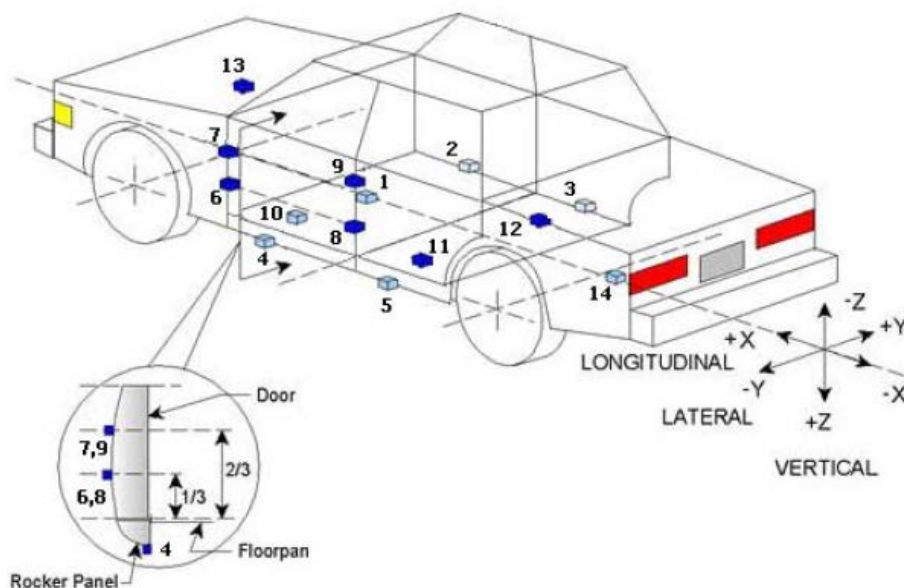
INSTRUMENTATION

	Number of Channels
Driver Dummy	16
Passenger Dummy	19
Vehicle Structure	21
MDB Accelerometers	5
MDB Contacts	2
Total	63

DATA SHEET NO. 6 TEST VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2016 Buick Cascada Premium 1SP Convertible
Test Program: NCAP Side MDB Impact Test

NHTSA No. O20160102
Test Date: 7/28/2016



TEST VEHICLE ACCELEROMETER LOCATIONS

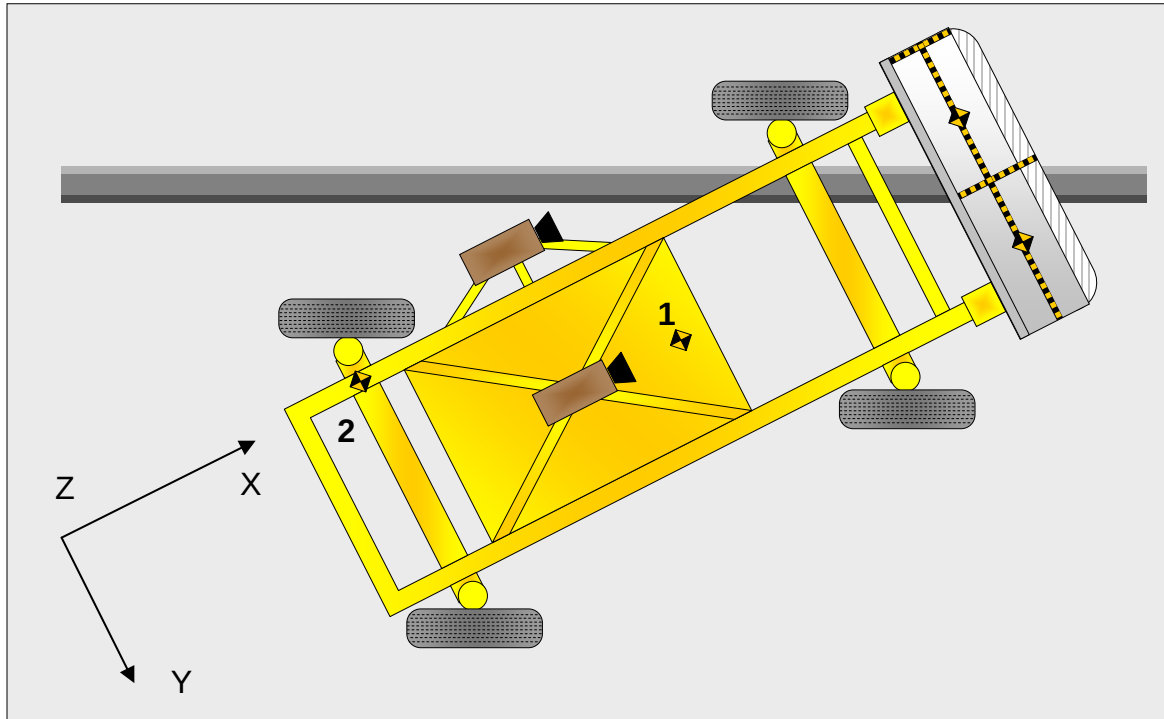
Accelerometer Location				
No.	ID	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2578	201	-175
2	Right Sill at Front Seat	2043	736	-194
3	Right Sill at Rear Seat	1434	736	-206
4	Left Sill at Front Door	2560	-736	-190
5	Left Sill at Rear Door	1555	-736	-194
6	Left Lower A-Post	3142	-806	-575
7	Left Middle A-Post	3165	-802	-775
8	Left Lower B-Post			
9	Left Middle B-Post			
10	Front Seat Track	2362	-354	-253
11	Rear Seat Structure	1930	-350	-367
12	Rt. Rear Occ. Compartment	1955	384	-186
13	Engine Block	4045	-5	-817
14	Rear Above Axle	1178	0	-508

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

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

Test Vehicle: 2016 Buick Cascada Premium 1SP Convertible
 Test Program: NCAP Side MDB Impact Test

NHTSA No. O20160102
 Test Date: 7/28/2016



MDB ACCELEROMETER LOCATIONS

No.	Accelerometer Location	Coordinates (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: 2016 Buick Cascada Premium 1SP Convertible
Test Program: NCAP Side MDB Impact Test

NHTSA No. 020160102
Test Date: 7/28/2016

TEST DUMMY INFORMATION AND CONTACT POINTS

Description	Front Seat Dummy (ES-2re)	Rear Seat Dummy (SID-IIs)
Face	SAB, Headrest	Door Panel
Top of Head	SAB	Door Panel
Left Side of Head	SAB	Door Panel
Back of Head	SAB, Headrest	Door Panel, Seat Back
Left Shoulder	SAB	Door Panel
Upper Torso	SAB, Seat Back	Door Panel
Lower Torso	SAB, Seat Back	Door Panel
Left Hip	Seat Cushion	Door Panel, Seat Cushion
Left Knee	Door Panel	Door Panel

POST-TEST DOOR PERFORMANCE

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

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	LF Window Cracked
Other Notable Effects	None

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

Test Vehicle: 2016 Buick Cascada Premium 1SP Convertible
Test Program: NCAP Side MDB Impact Test

NHTSA No. O20160102
Test Date: 7/28/2016

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	No		No	
Side Torso/Pelvis Airbag	No		No	
Seat Belt Pretensioner	Yes	Yes	No	
Seat Belt Load Limiter	Yes		No	
Other: Side Torso/Head Airbag	Yes	Yes	No	

IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vehicle Wheel Base	mm		2696
Vertical Impact Reference Line (Aft of Front Axle) (Intended Impact Point)	mm		408
Actual Impact Point (Aft of Front Axle)	mm		394
Horizontal Offset (+forward / -rearward)	mm	+/- 50 of intended impact point	14
Vertical Offset (+down / -up)	mm	+/- 20 of intended impact point	-1

DATA SHEET NO. 9
MDB SUMMARY OF RESULTS

Test Vehicle: 2016 Buick Cascada Premium 1SP Convertible
Test Program: NCAP Side MDB Impact Test

NHTSA No. O20160102
Test Date: 7/28/2016

MDB SPECIFICATIONS

Measurement Description	Length (mm)
Overall Width of Framework Carriage	1250
Overall Length Including Honeycomb Face	4119
Wheelbase of Framework Carriage	2588
CG Location aft of Front Axle	1138

MDB WEIGHTS

	Units	Front Axle	Rear Axle	Total
Left	kg	406.0	283.3	
Right	kg	357.9	316.4	
Ratio	%	56.0	44.0	
Totals	kg	763.9	599.7	1363.5

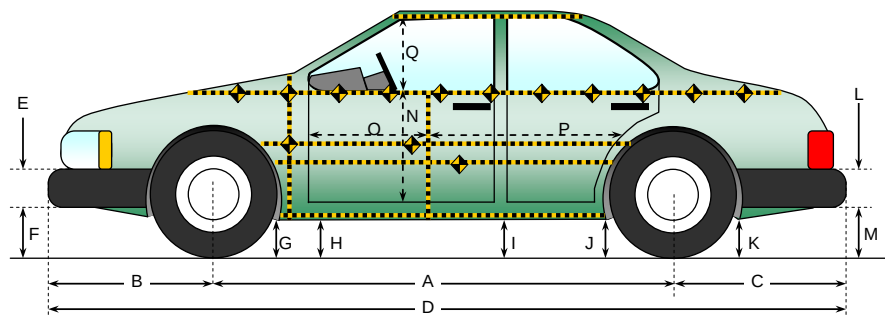
SPEED AND ANGLE AT IMPACT DATA

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	61.55
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	61.64
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	89.7
MDB Forward Line of Motion to Target Vehicle CL	degrees	62.5 to 63.5	62.9
MDB Crabbed Angle to MDB Forward Line of Motion	degrees	26 to 28	27.3

DATA SHEET NO. 10 **TEST VEHICLE PROFILE MEASUREMENTS**

Test Vehicle: 2016 Buick Cascada Premium 1SP Convertible
Test Program: NCAP Side MDB Impact Test

NHTSA No. O20160102
Test Date: 7/28/2016



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

LEFT SIDE VIEW

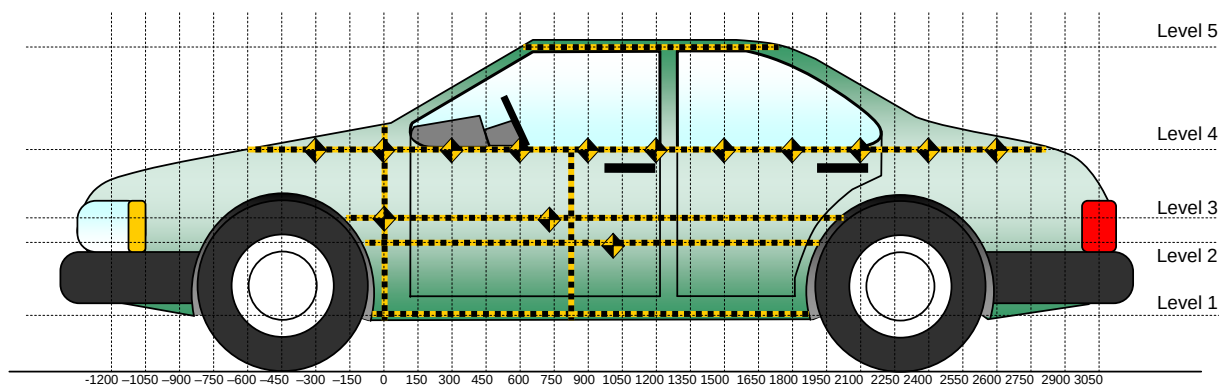
VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2696	2699	-3
B	Front Axle to FSOV	975	994	-19
C	Rear Axle to RSOV	1050	1054	-4
D	Total Length at Centerline	4741	4747	-6
E	Front Bumper Thickness	100	100	0
F	Front Bumper Bottom to Ground	150	153	-3
G	Sill Height at Front Wheel Well	156	152	4
H	Sill Height at Front Door Leading Edge	162	157	5
I	Sill Height at B Pillar	160	161	-1
J1	Sill Height at Rear Wheel Well	149	157	-8
J2	Pinch Weld Height at Rear Wheel Well	157	167	-10
K	Sill Height Aft of Rear Wheel Well	194	184	10
L	Rear Bumper Thickness	90	90	0
M	Rear Bumper Bottom to Ground	266	264	2
N	Sill Height to Window Bottom Sill	760	726	34
O	Front Door Leading Edge to Impact CL	773	768	5
P	Rear Door Trailing Edge to Impact CL	628	614	14
Q	Front Window Opening	N/A	N/A	N/A
R	Right Side Length	3680	3673	7
S	Left Side Length	3680	3680	0
T	Vehicle Width at B Post	1782	1659	123

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

Test Vehicle: 2016 Buick Cascada Premium 1SP Convertible
 Test Program: NCAP Side MDB Impact Test

NHTSA No. O20160102
 Test Date: 7/28/2016



All Measurements Shown in mm

LEFT SIDE VIEW

MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Measurement Description	Height Above Ground	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	216	31	1350
2	Occupant H-Point	486	127	450
3	Mid Door	599	149	1050
4	Window Sill	921	68	1050
5	Window Top	N/A	N/A	N/A

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: 2016 Buick Cascada Premium 1SP Convertible
 Test Program: NCAP Side MDB Impact Test

NHTSA No. O20160102
 Test Date: 7/28/2016

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-2100															
-1950															
-1800															
-1650															
-1500															
-1350															
-1200															
-1050															
-900															
-750															
-600															
-450				300					303					3	
-300				291					302					11	
-150				288					301					13	
0	241	188	189	285		247	211	211	294		6	23	22	9	
150	244	199	195	275		258	282	290	273		14	83	95	-2	
300	242	202	195	269		255	326	314	284		13	124	119	15	
450	241	204	196	263		252	331	325	296		11	127	129	33	
600	240	207	198	260		249	328	334	306		9	121	136	46	
750	238	211	202	256		248	325	343	308		10	114	141	52	
900	238	215	205	253		248	322	349	317		10	107	144	64	
1050	239	220	208	248		252	316	357	316		13	96	149	68	
1200	239	225	211	242		263	323	345	305		24	98	134	63	
1350	240	229	214	237		271	290	298	299		31	61	84	62	
1500	240	229	216	232		264	289	303	283		24	60	87	51	
1650	242	220	214	235		257	291	302	272		15	71	88	37	
1800	245	202	213	240		251	272	293	264		6	70	80	24	
1950			188	245				207	264				19	19	
2100				250					249					-1	
2250				256					258					2	
2400				266					266					0	
2550				280					277					-3	
2700				296					291					-5	
2850															
3000															
3150															
3300															
3450															
3600															
3750															
3900															

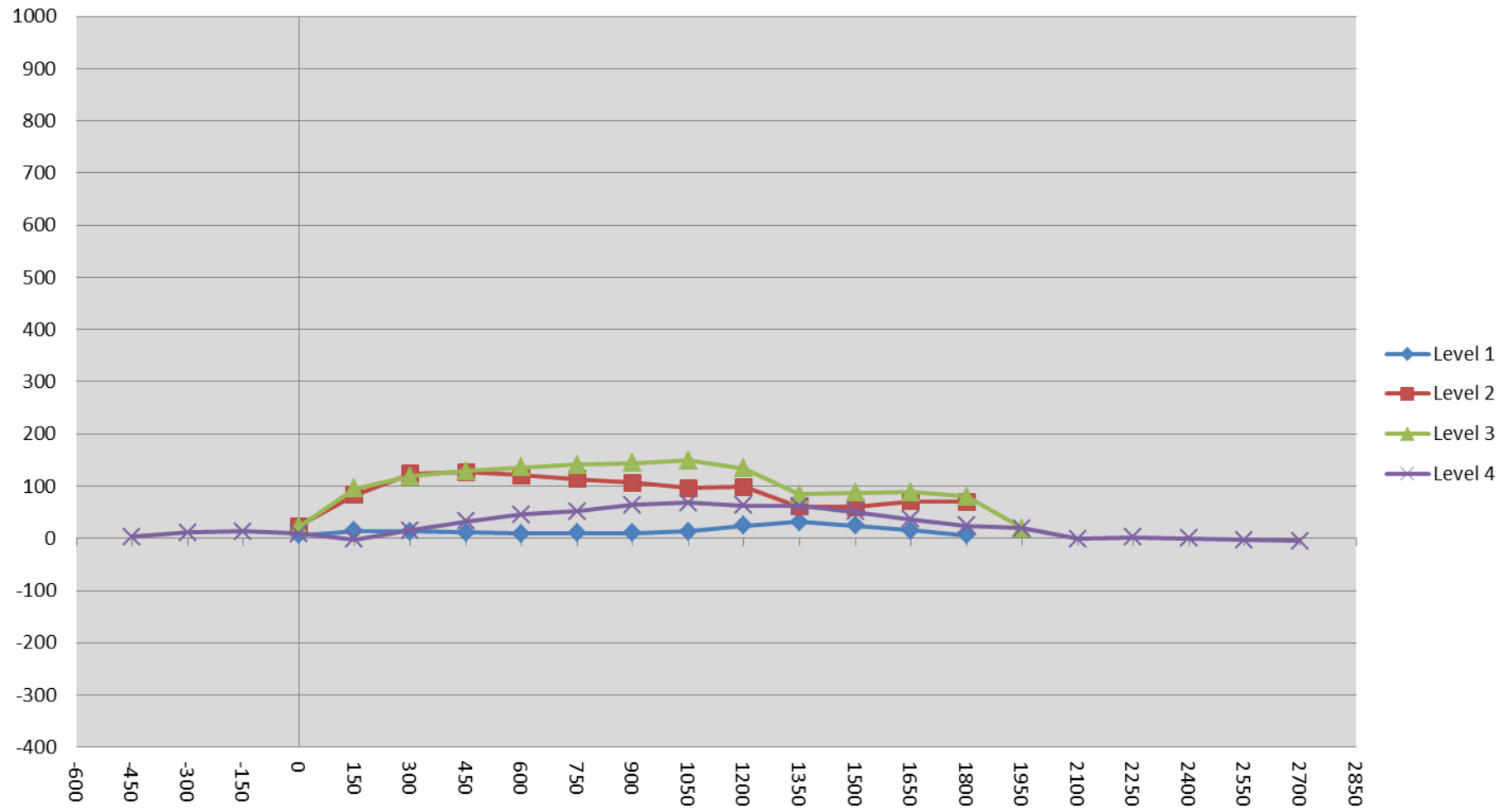
NOTE: Pre-test measurements are taken when the vehicle is in the "As Tested" weight condition. Vehicle measurements forward of the vertical impact reference line are negative. The crush profile grid is established prior to the test based on an estimated impact point.

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

Test Vehicle: 2016 Buick Cascada Premium 1SP Convertible
Test Program: NCAP Side MDB Impact Test

NHTSA No. O20160102
Test Date: 7/28/2016

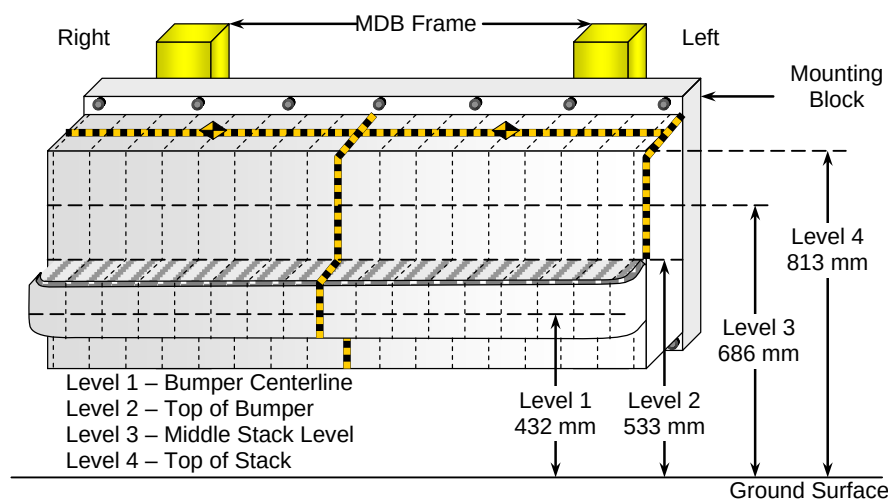
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DATA SHEET NO. 12 **MDB EXTERIOR STATIC CRUSH MEASUREMENTS**

Test Vehicle: 2016 Buick Cascada Premium 1SP Convertible
 Test Program: NCAP Side MDB Impact Test

NHTSA No. O20160102
 Test Date: 7/28/2016



FRONT VIEW

MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE

Vertical Location			From Centerline		Maximum Crush
Row	Description	Height	Distance	Direction	
A	Center of Bumper	432	500	Right	302
B	Top of Bumper	533	800	Right	238
C	Mid-Level	686	800	Left	192
D	Top of Stack	813	800	Left	206

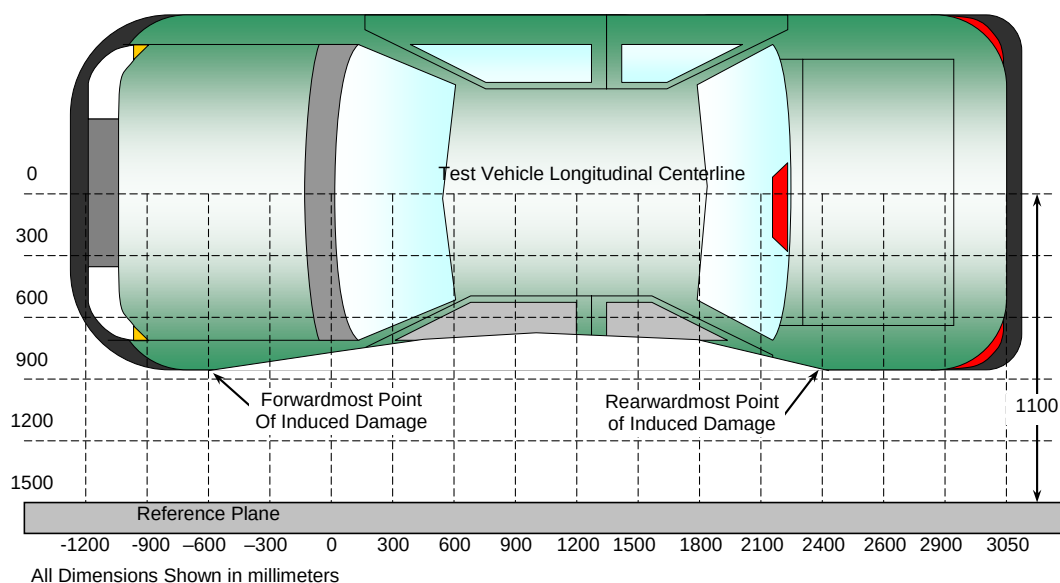
DEFORMABLE BARRIER STATIC CRUSH

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	165	141	127	134	157	115	106	87	85	87	105	107	125	148	167	180	206
3	148	140	140	159	180	130	99	84	80	79	75	78	84	96	113	139	192
2	238	48	226	238	225	209	204	200	196	191	188	185	182	180	180	185	184
1	288	290	291	302	291	277	258	260	256	249	247	251	245	247	248	266	279

DATA SHEET NO. 13 **VEHICLE AND MDB DAMAGE PROFILE DISTANCES**

Test Vehicle: 2016 Buick Cascada Premium 1SP Convertible
 Test Program: NCAP Side MDB Impact Test

NHTSA No. O20160102
 Test Date: 7/28/2016



TOP VIEW

VEHICLE DAMAGE PROFILE DISTANCES

DPD	Distance from Impact Point (mm)	Level	Post-Test (mm)	Pre-Test (mm)	Max. Static Crush (mm)
1	1975	3	201	212	-11
2	1556	3	299	215	84
3	1137	3	354	210	144
4	719	3	340	201	139
5	300	3	314	195	119
6	-119	3	199	193	6

MDB DAMAGE PROFILE DISTANCES

DPD	Distance from Impact Point (mm)	Level	Post-Test (mm)	Pre-Test (mm)	Max. Static Crush (mm)
1	800 mm right of center	1	764	476	288
2	480 mm right of center	1	749	465	284
3	160 mm right of center	1	729	461	268
4	160 mm left of center	1	705	461	244
5	480 mm left of center	1	720	465	255
6	800 mm left of center	1	755	476	279

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

Test Vehicle: 2016 Buick Cascada Premium 1SP Convertible
 Test Program: NCAP Side MDB Impact Test

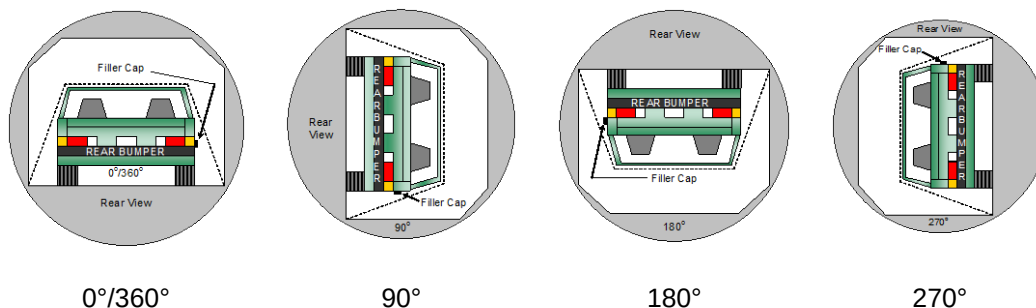
NHTSA No. O20160102
 Test Date: 7/28/2016

Test Time: 10:35 am

Temperature: 22.1 °C

- A. From impact until vehicle motion ceases: 0.0 oz.
 (Maximum Allowable = 1 ounce)
- B. For the 5 minute period after motion ceases: 0.0 oz.
- C. For the following 25 minutes: None
 (Maximum Allowable = 1 ounce / 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°	112	300	412
90° to 180°	112	300	412
180° to 270°	107	300	407
270° to 360°	114	300	414

FMVSS 301 ROLLOVER SPILLAGE TABLE (units in ounces)

Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0° to 90°	0.0	0.0	0.0	
90° to 180°	0.0	0.0	0.0	
180° to 270°	0.0	0.0	0.0	
270° to 360°	0.0	0.0	0.0	

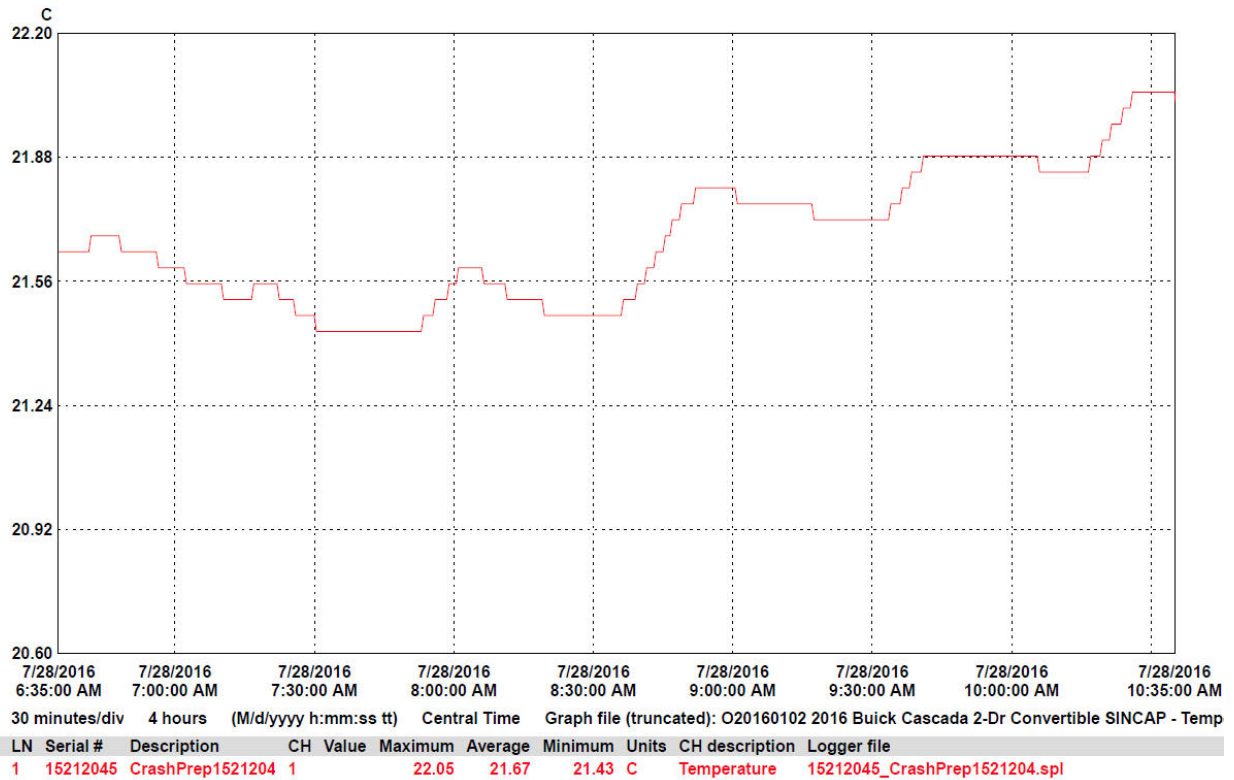
ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

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: 2016 Buick Cascada Premium 1SP Convertible
 Test Program: NCAP Side MDB Impact Test

NHTSA No. O20160102
 Test Date: 7/28/2016



**APPENDIX A
PHOTOGRAPHS**

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Photo No. 001 - As Delivered Right Front Three-Quarter View of Test Vehicle



Photo No. 002 - As Delivered Left Rear Three-Quarter View of Test Vehicle

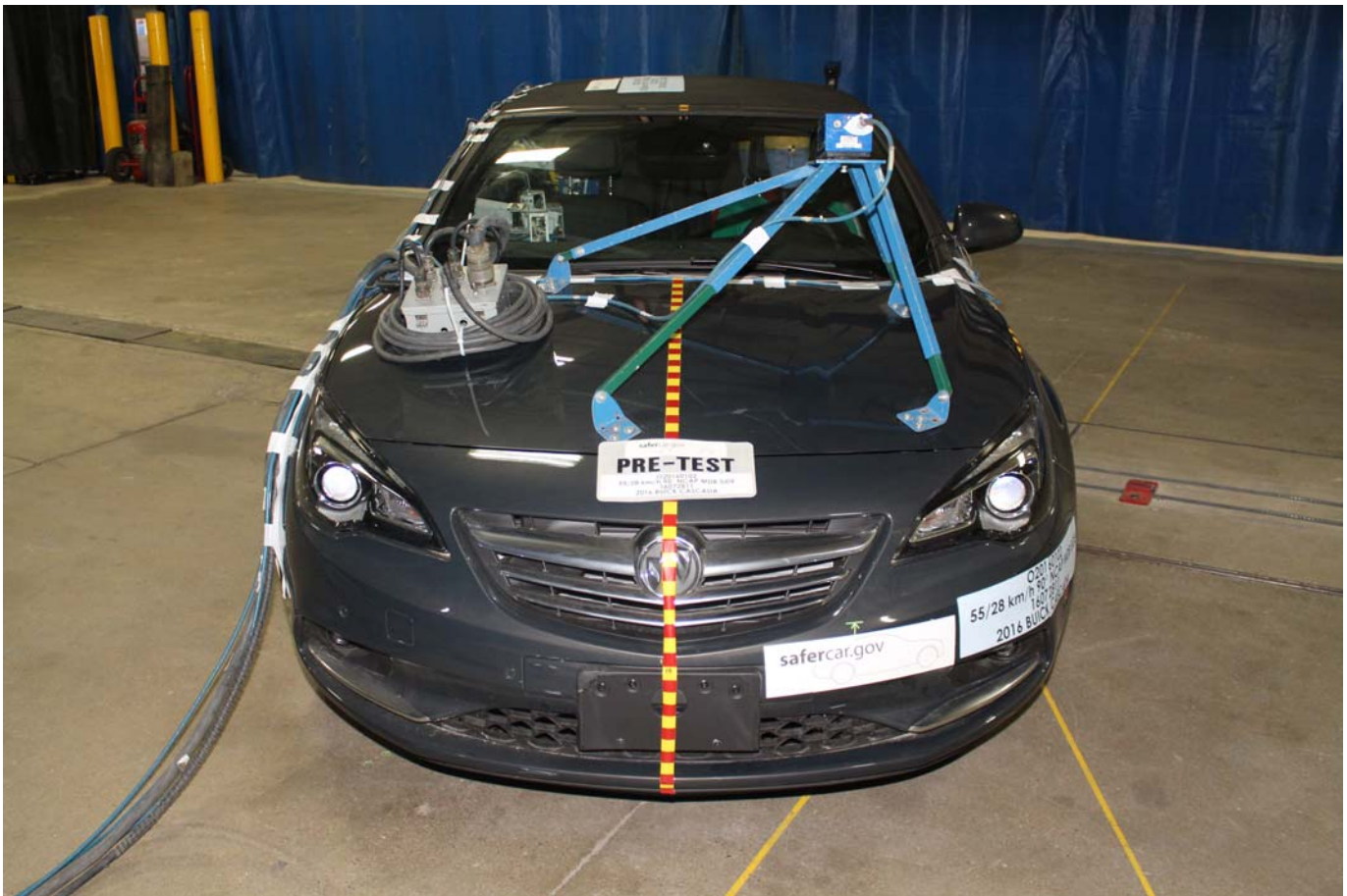


Photo No. 003 - Pre-Test Frontal View of Test Vehicle



Photo No. 004 - Post-Test Frontal View of Test Vehicle



Photo No. 005 - Pre-Test Left Front Three-Quarter View of Test Vehicle

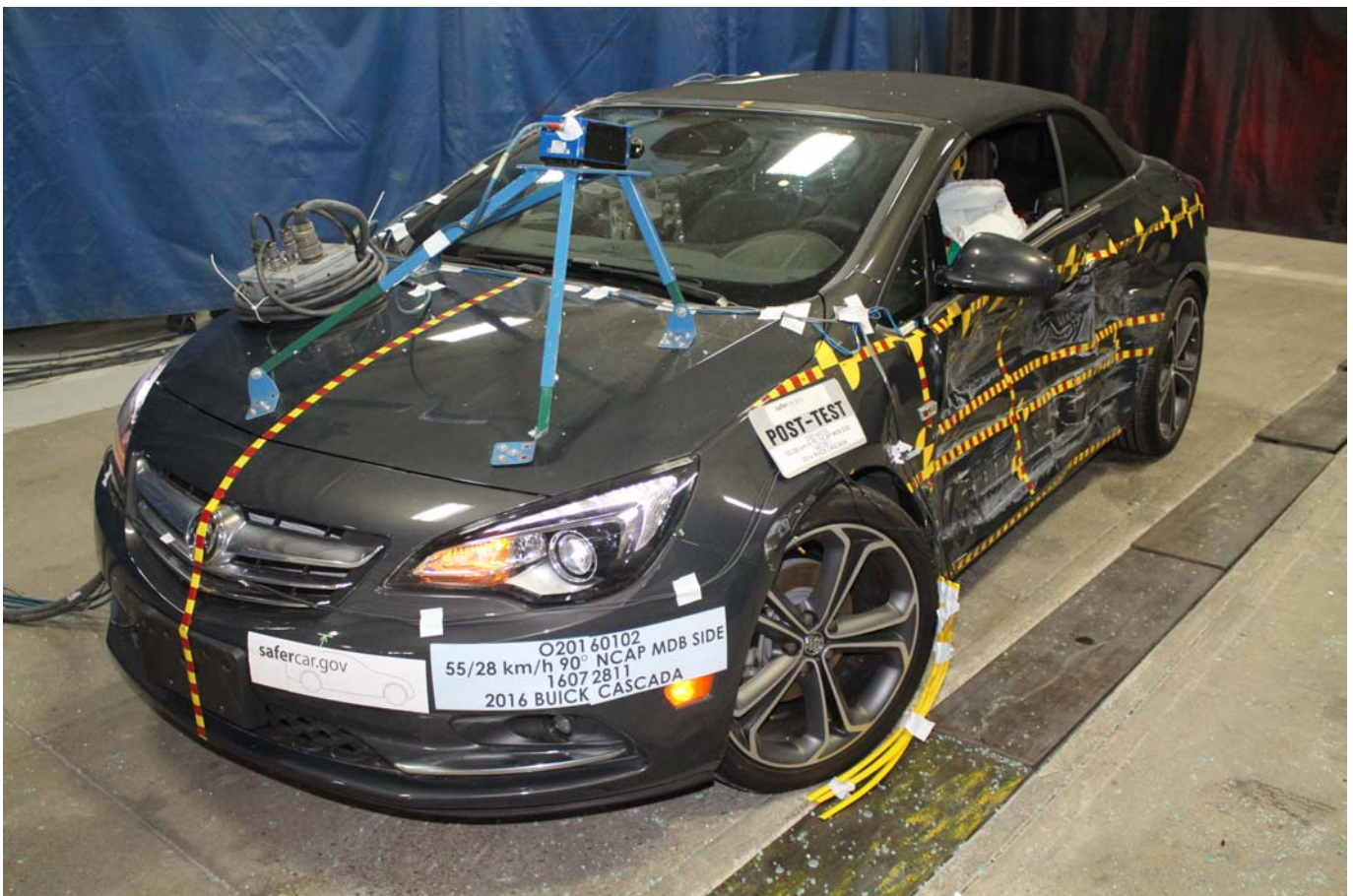


Photo No. 006 - Post-Test Left Front Three-Quarter View of Test Vehicle



Photo No. 007 - Pre-Test Left Side View of Test Vehicle

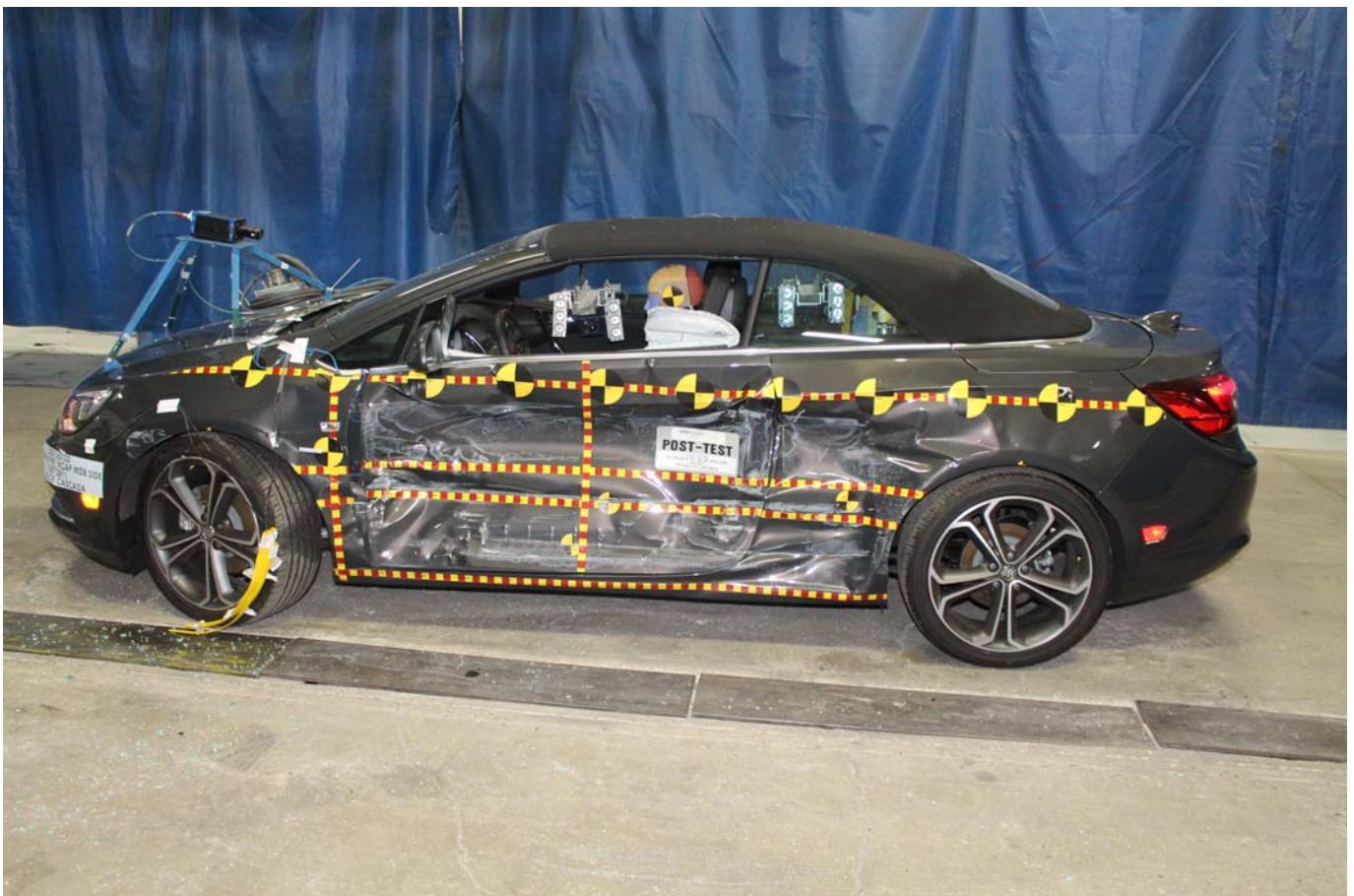


Photo No. 008 - Post-Test Left Side View of Test Vehicle



Photo No. 009 - Pre-Test Left Three-Quarter Rear View of Test Vehicle

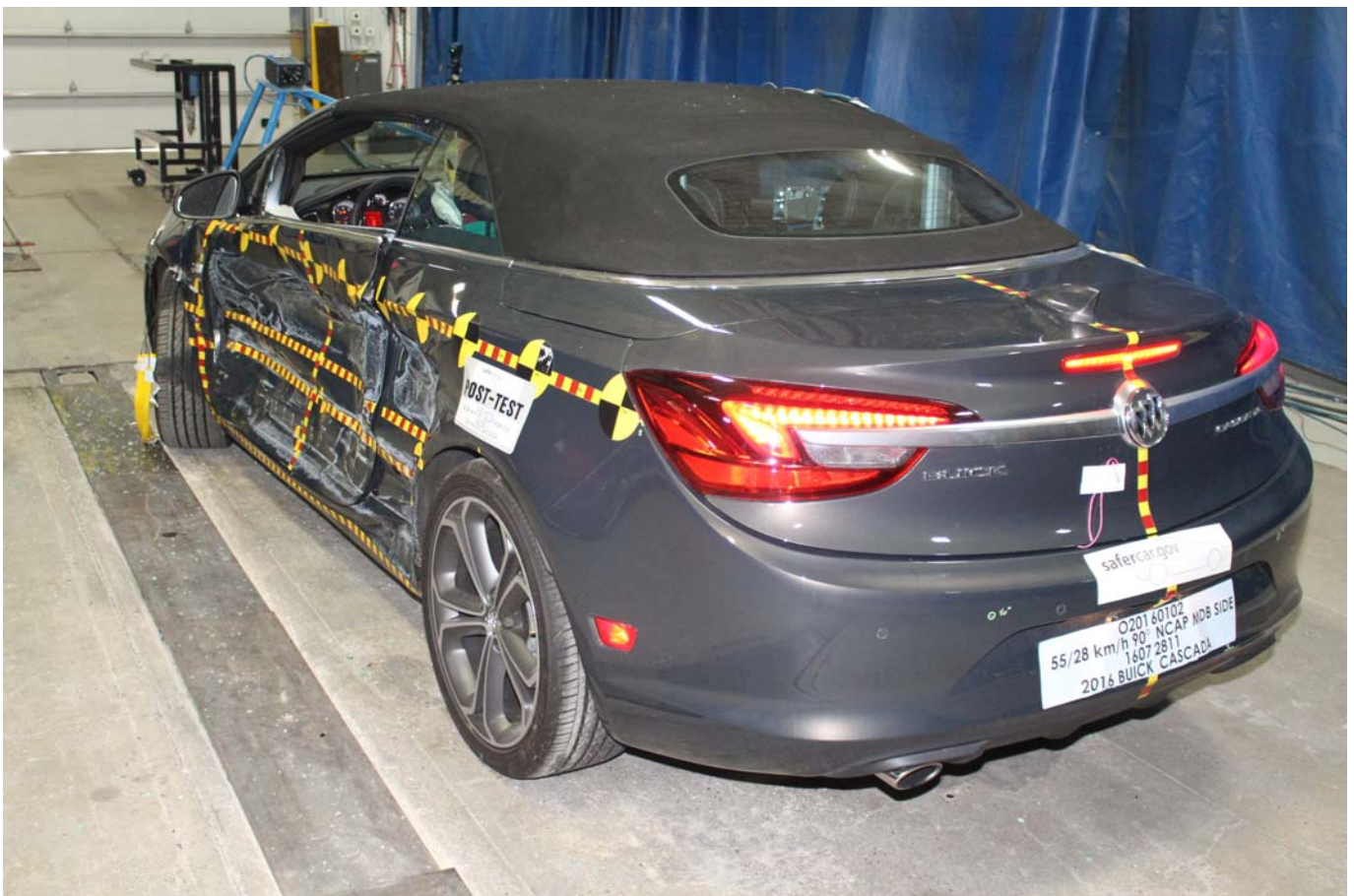


Photo No. 010 - Post-Test Left Three-Quarter Rear View of Test Vehicle



Photo No. 011 - Pre-Test Rear View of Test Vehicle

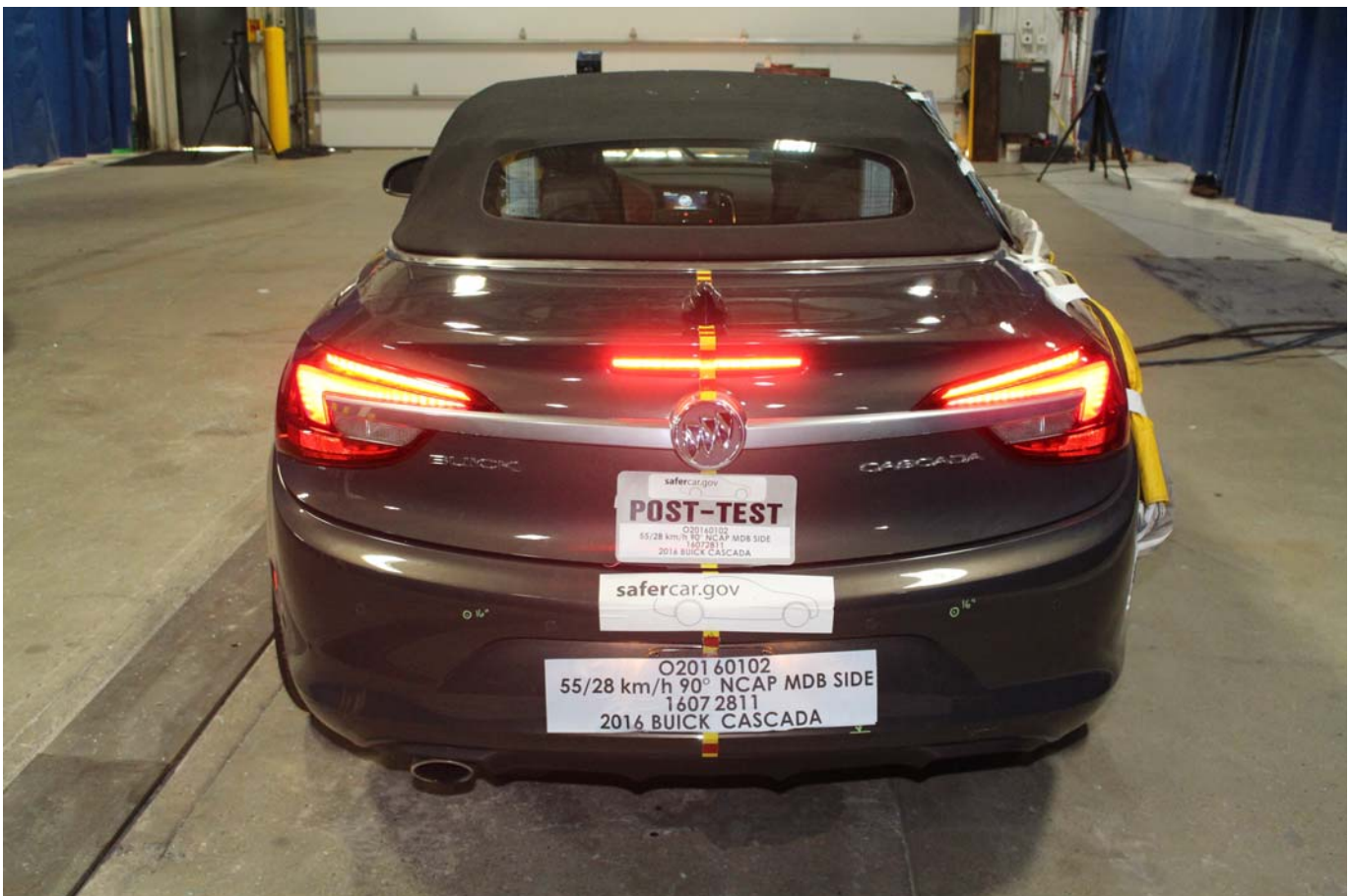


Photo No. 012 - Post-Test Rear View of Test Vehicle



Photo No. 013 - Pre-Test Right Side View of Test Vehicle



Photo No. 014 - Post-Test Right Side View of Test Vehicle



Photo No. 015 - Pre-Test Overhead View of Test Area



Photo No. 016 - Post-Test Overhead View of Test Area



Photo No. 017 - Pre-Test Left Side View of MDB Positioned Against Side of Test Vehicle



Photo No. 018 - Pre-Test Right Side View of MDB Positioned Against Side of Test Vehicle



Photo No. 019 - Pre-Test Close-Up View of Impact Point Target



Photo No. 020 - Post-Test Close-Up View of Impact Point Target



Photo No. 021 - Pre-Test Left Front Door Latch Close-Up



Photo No. 022 - Post-Test Left Front Door Latch Close-Up

PHOTOGRAPH NOT APPLICABLE

Photo No. 023 - Pre-Test Left Rear Door Latch Close-Up

PHOTOGRAPH NOT APPLICABLE

Photo No. 024 - Post-Test Left Rear Door Latch Close-Up



Photo No. 025 - Pre-Test Front Close-Up View of Driver Dummy



Photo No. 026 - Post-Test Front Close-Up View of Driver Dummy



Photo No. 027 - Pre-Test Left Side View of Driver Dummy Showing Belt and Chalking



Photo No. 028 - Pre-Test Left Side View of Driver Dummy Shoulder and Door Top View

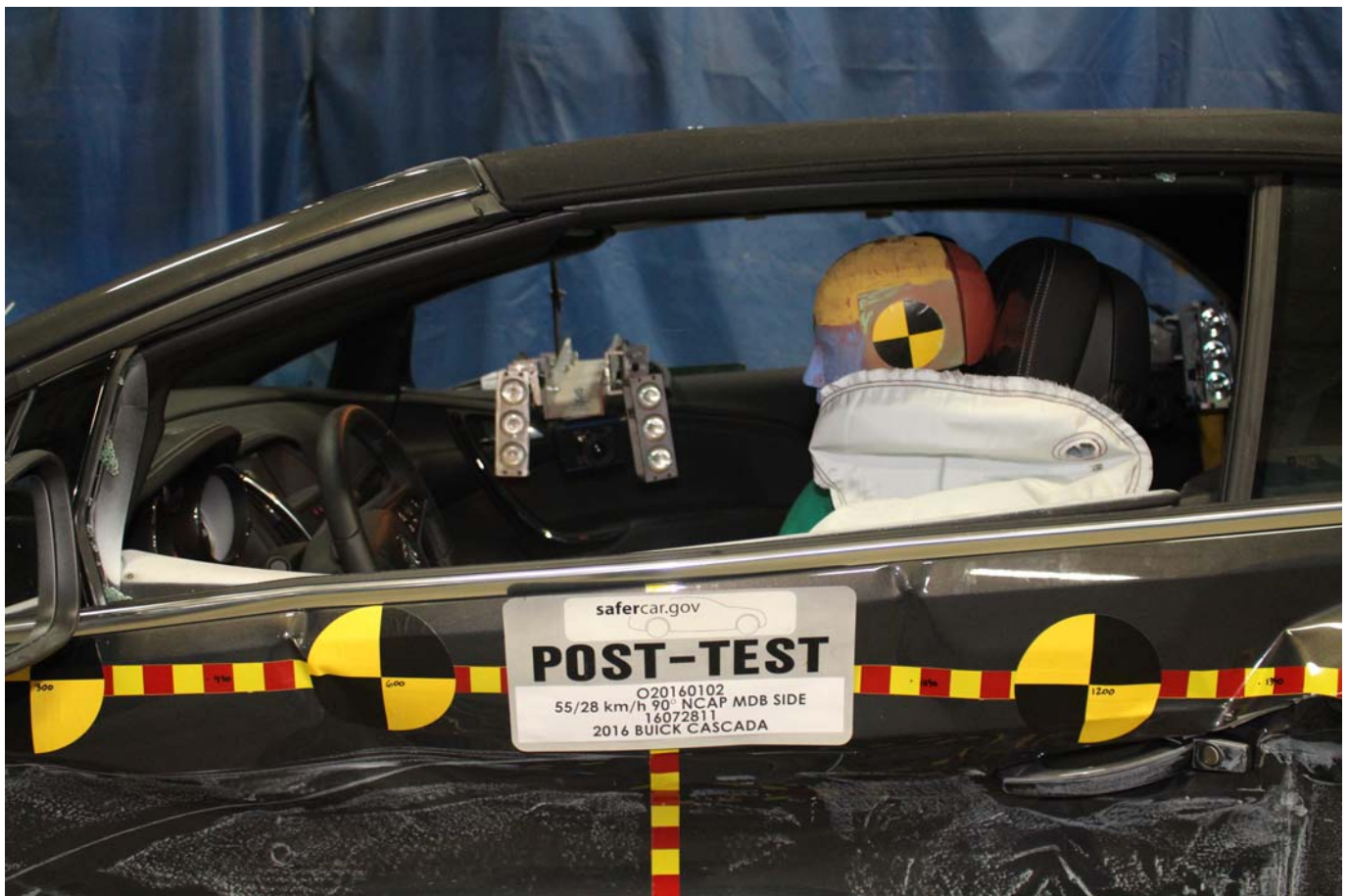


Photo No. 029 - Post-Test Left Side View of Driver Dummy Shoulder and Door Top View



Photo No. 030 - Pre-Test Frontal View of Driver Seat Back Prior to Dummy Positioning



Photo No. 031 - Pre-Test Frontal View of Driver Dummy Head and Shoulders in Relation to Head Restraint



Photo No. 032 - Pre-Test Frontal View of Driver Seat Pan Prior to Dummy Positioning



Photo No. 033 - Pre-Test Overhead View of Driver Dummy Thighs on Seat Pan



Photo No. 034 - Pre-Test Placement of Driver Dummy's Feet



Photo No. 035 - Pre-Test View of Belt Anchorage for Driver Dummy



Photo No. 036 - Pre-Test Left Side View of Steering Wheel





Photo No. 039 - Pre-Test Close-Up Left Side View of Driver Seat Track

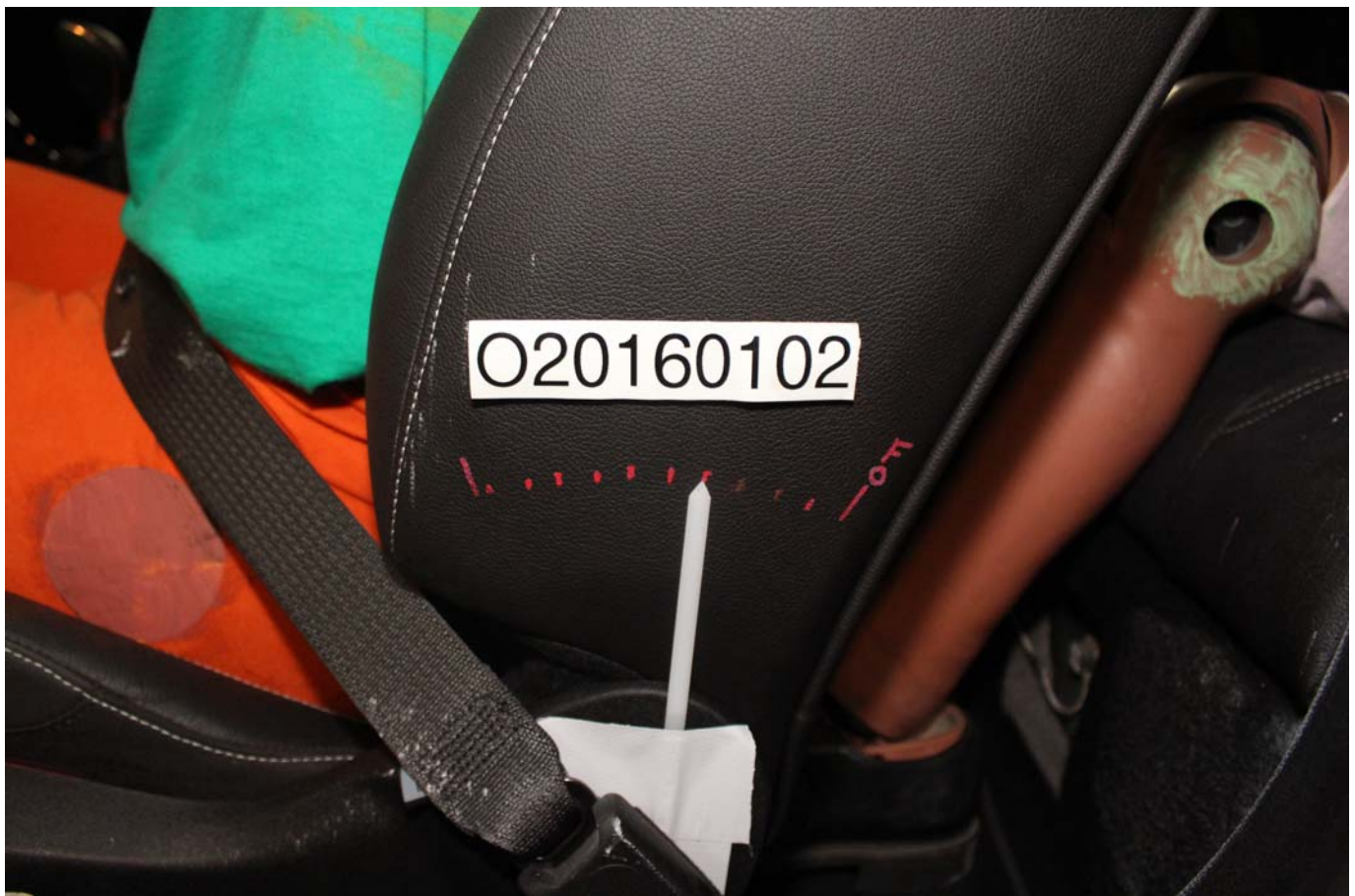


Photo No. 040 - Pre-Test Close-Up Left Side View of Driver Seat Back



Photo No. 041 - Pre-Test Close-Up View of Driver Seat Back or Head Restraint



Photo No. 042 - Pre-Test Driver Dummy and Door Clearance View



Photo No. 043 - Post-Test Driver Dummy and Door Clearance View



Photo No. 044 - Pre-Test Right Side View of Driver Dummy and Front Seat of Occupant Compartment



Photo No. 045 - Post-Test Right Side View of Driver Dummy and Front Seat of Occupant Compartment



Photo No. 046 - Pre-Test Driver Inner Door Panel View



Photo No. 047 - Post-Test Driver Inner Door Panel View



Photo No. 048 - Post-Test Driver Dummy Close-up Head Contact with Vehicle Interior View



Photo No. 049 - Post-Test Driver Dummy Close-up Head Contact with Side Airbag View



Photo No. 050 - Post-Test Driver Dummy Close-up Torso Contact with Vehicle Interior View



Photo No. 051 - Post-Test Driver Dummy Close-up Torso Contact with Side Airbag View



Photo No. 052 - Post-Test Driver Dummy Close-up Pelvis Contact with Vehicle Interior View

PHOTOGRAPH NOT APPLICABLE

Photo No. 053 - Post-Test Driver Dummy Close-up Pelvis Contact with Side Airbag View



Photo No. 054 - Post-Test Driver Dummy Close-up Knee Contact View

PHOTOGRAPH NOT APPLICABLE

Photo No. 055 - Pre-Test Left Side View of Rear Passenger Dummy Showing Belt and Chalking



Photo No. 056 - Pre-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View



Photo No. 057 - Post-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View



Photo No. 058 - Pre-Test Frontal View of Rear Passenger Seat Back Prior to Dummy Positioning



Photo No. 059 - Pre-Test Frontal View of Rear Passenger Dummy Head and Shoulders in Relation to Head



Photo No. 060 - Pre-Test Overhead View of Rear Passenger Seat Pan Prior to Dummy Positioning

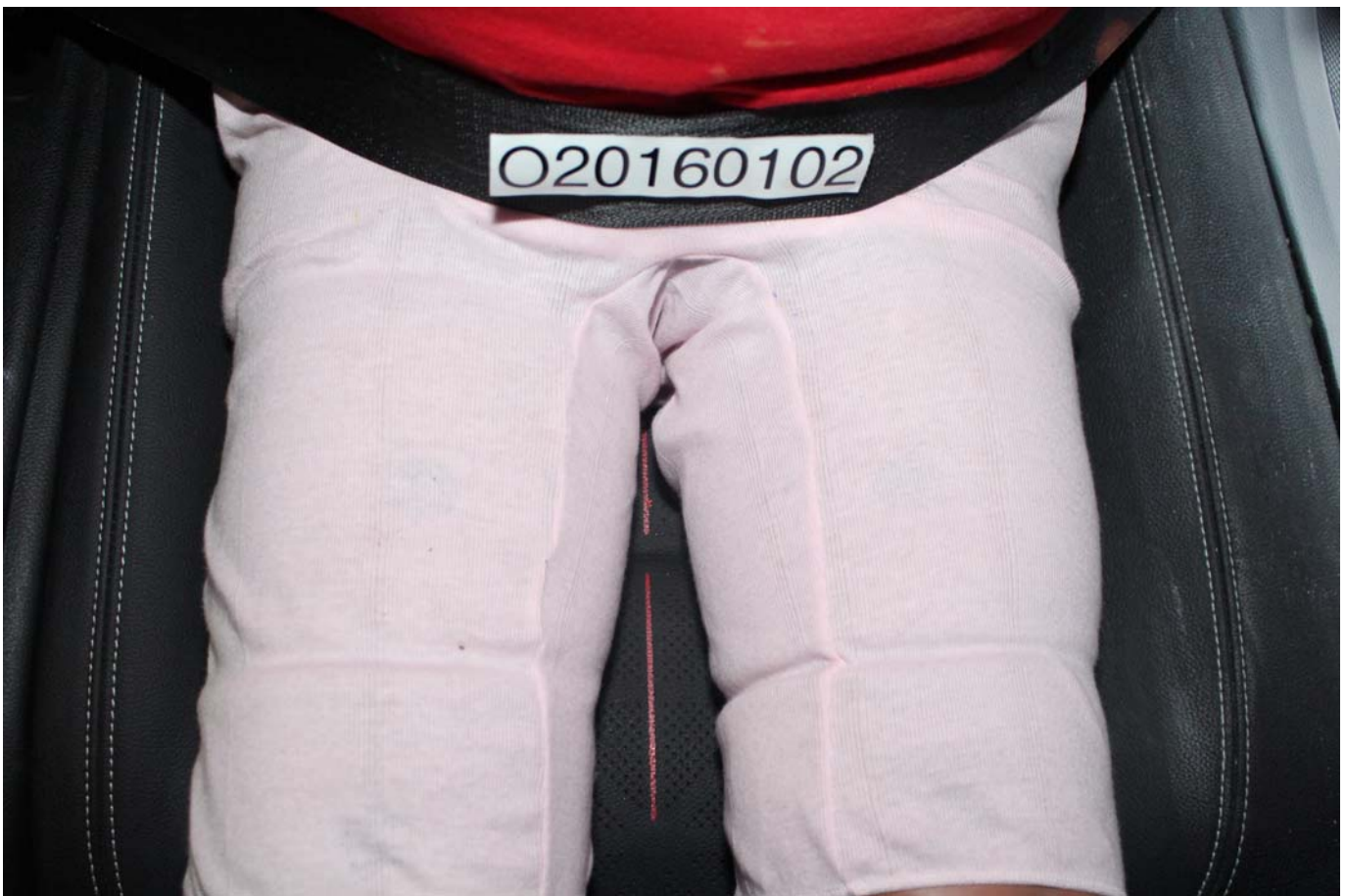


Photo No. 061 - Pre-Test Overhead View of Rear Passenger Dummy Thighs on Seat Pan



Photo No. 062 - Pre-Test View of Rear Passenger Dummy's Neck Showing Position of Adjustable Neck



Photo No. 063 - Pre-Test View of Rear Passenger Dummy's Head Showing Dummy's Head is Level



Photo No. 064 - Pre-Test Placement of Rear Passenger Dummy's Feet



Photo No. 065 - Pre-Test View of Belt Anchorage for Rear Passenger Dummy

PHOTOGRAPH NOT APPLICABLE

Photo No. 066 - Pre-Test Close-Up Left Side View of Rear Passenger Seat Track

PHOTOGRAPH NOT APPLICABLE

Photo No. 067 - Pre-Test Close-Up Left Side View of Rear Passenger Seat Back

PHOTOGRAPH NOT APPLICABLE

Photo No. 068 - Pre-Test Close-up View of Rear Passenger Seat Back or Head Restraint



Photo No. 069 - Pre-Test Rear Passenger Dummy and Door Clearance View



Photo No. 070 - Post-Test Rear Passenger Dummy and Door Clearance View



Photo No. 071 - Pre-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment



Photo No. 072 - Post-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment



Photo No. 073 - Pre-Test Rear Passenger Inner Door Panel View



Photo No. 074 - Post-Test Rear Passenger Inner Door Panel View



Photo No. 075 - Post-Test Rear Passenger Dummy Close-up Head Contact with Vehicle Interior View

PHOTOGRAPH NOT APPLICABLE

Photo No. 076 - Post-Test Rear Passenger Dummy Close-up Head Contact with Side Airbag View



Photo No. 077 - Post-Test Rear Passenger Dummy Close-up Torso Contact with Vehicle Interior View

PHOTOGRAPH NOT APPLICABLE

Photo No. 078 - Post-Test Rear Passenger Dummy Close-up Torso Contact with Side Airbag View



Photo No. 079 - Post-Test Rear Passenger Dummy Close-up Pelvis Contact with Vehicle Interior View

PHOTOGRAPH NOT APPLICABLE

Photo No. 080 - Post-Test Rear Passenger Dummy Close-up Pelvis Contact with Side Airbag View

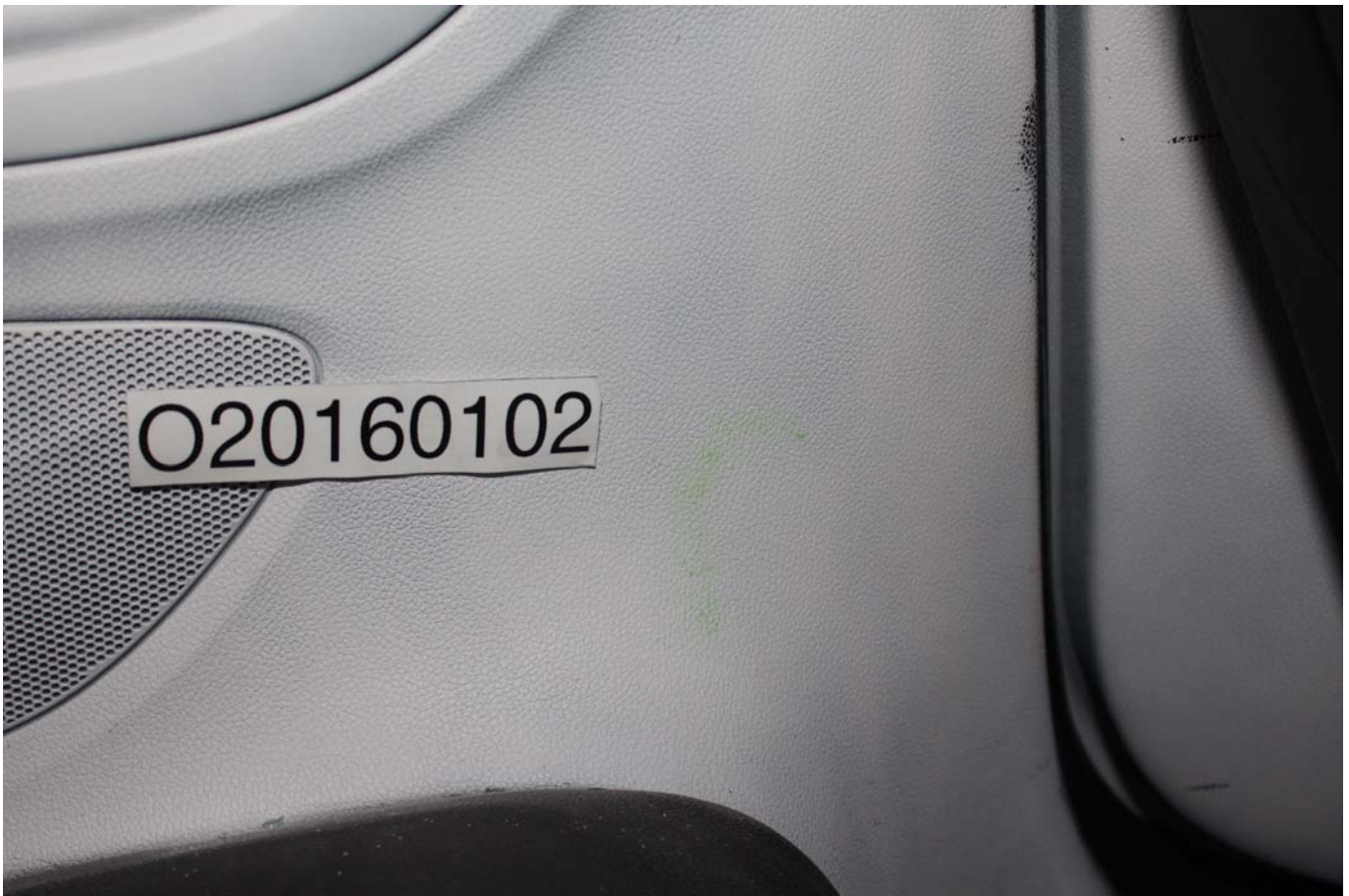


Photo No. 081 - Post-Test Rear Passenger Dummy Close-up Knee Contact View



Photo No. 082 - Pre-Test View of Fuel Filler Cap or Fuel Filler Neck



Photo No. 083 - Post-Test View of Fuel Filler Cap or Fuel Filler Neck



Photo No. 084 - Pre-Test Front View of MDB Impactor Face



Photo No. 085 - Post-Test Front View of MDB Impactor Face



Photo No. 086 - Pre-Test Top View of MDB Impactor Face



Photo No. 087 - Post-Test Top View of MDB Impactor Face



Photo No. 088 - Pre-Test Left Side View of MDB Impactor Face



Photo No. 089 - Post-Test Left Side View of MDB Impactor Face



Photo No. 090 - Pre-Test Right Side View of MDB Impactor Face



Photo No. 091 - Post-Test Right Side View of MDB Impactor Face



Photo No. 092 - Close-Up View of Vehicle's Certification Label



Photo No. 093 - Close-Up View of Vehicle's Tire Information Placard or Label



Photo No. 094 - Pre-Test Ballast View



Photo No. 095 - Post-Test Primary and Redundant Speed Trap Read-Out



Photo No. 096 - FMVSS No. 301 Static Rollover 0 Degrees



Photo No. 097 - FMVSS No. 301 Static Rollover 90 Degrees

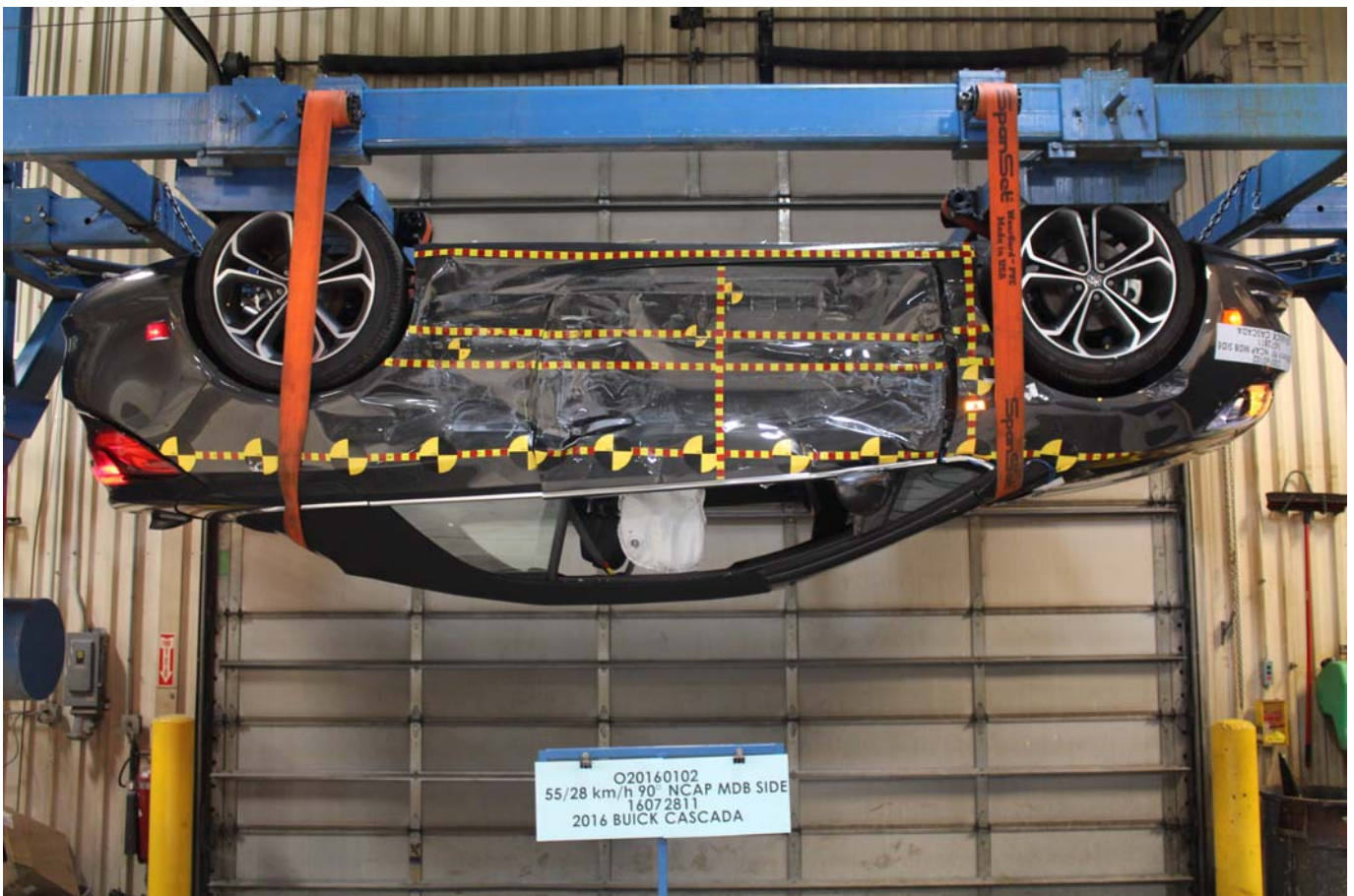


Photo No. 098 - FMVSS No. 301 Static Rollover 180 Degrees

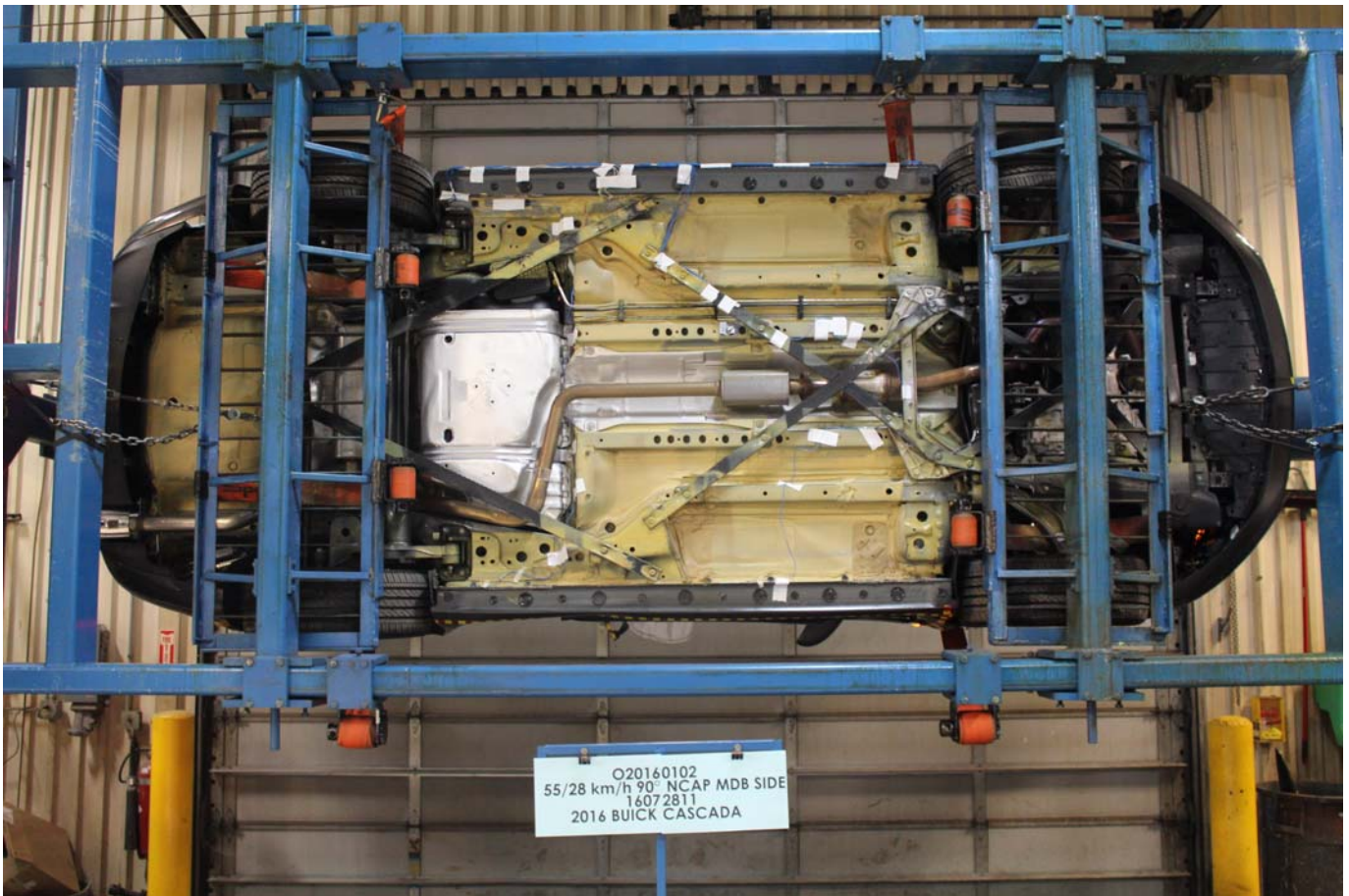


Photo No. 099 - FMVSS No. 301 Static Rollover 270 Degrees



Photo No. 100 - FMVSS No. 301 Static Rollover 360 Degrees



Photo No. 101 - Impact Event



**2016 CASCADA PREMIUM
1SP**



**EXTERIOR: GRAYSTONE METALLIC
INTERIOR: JET BLACK/JET BLACK
ACCENTS**

**ENGINE, 1.6L TURBO 4-CYLINDER
TRANSMISSION, 6 SPD AUTOMATIC**

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STANDARD EQUIPMENT STANDARD EQUIPMENT LISTED BELOW ARE INCLUDED AT NO EXTRA CHARGE IN THE STANDARD VEHICLE PRICE SHOWN • TWO MAINTENANCE VISITS OIL & FILTER • 4 WHEEL TIRE ROTATION SEE WWW.BUICK.COM OR DEALER FOR DETAILS • 6 YEAR / 70,000 MILE POWERTRAIN LIMITED WARRANTY SEE DEALER FOR DETAILS • 4 YEAR/50,000 MILE LIMITED BUMPER-TO-BUMPER WARRANTY SEE DEALER FOR DETAILS MECHANICAL • ENGINE, 1.6L TURBO 4-CYLINDER SIDI DOHC WITH VVT • TRANSMISSION, 6 SPD AUTOMATIC • SUSPENSION, SPORT TUNED SAFETY & SECURITY • STABILITRAK-STABILITY CONTROL SYSTEM INCLUDES TRACTION	CONTROL • BRAKES, 4-WHEEL ANTILOCK, 4-WHEEL DISC, • AIR BAGS, DRIVER & PASSENGER • FRONTAL, KNEE & SIDE-IMPACT • TIRE PRESSURE MONITOR WITH DISPLAY • ELECTRONIC PARKING BRAKE • THEFT DETERRANT SYSTEM • REAR VISION CAMERA • WINDSHIELD WIPERS, RAIN SENSING • AUTO ON/OFF HEADLAMPS WITH TUNNEL DETECTION • FRONT AND REAR PARKING ASSIST • FORWARD COLLISION ALERT • LANE DEPARTURE WARNING • FRONT & REAR AIR DEFLECTORS INTERIOR • REMOTE VEHICLE START INCLUDES REMOTE KEYLESS ENTRY • 8-WAY POWER DRIVER AND	PASSENGER SPORT BUCKET SEATS WITH POWER LUMBAR & EASY ENTRY SYSTEM • FRONT AND REAR HEAT-REFLECTIVE LEATHER APPOINTED SEATS • HEATED DRIVER & FRONT PASSENGER SEATS • ELECTRONIC SEAT BELT PRESENTERS • 50/50 FOLD FLAT REAR SEATS • AIR CONDITIONING, DUAL-ZONE AUTOMATIC W/ INDIVIDUAL DRIVER/FRONT PASSENGER CONTROLS • HEATED STEERING WHEEL • AUDIO SYSTEM WITH NAVIGATION, 7" DIAGONAL TOUCH DISPLAY • AM/FM STEREO, CD/DVD PLAYER & MP3 • AUDIO SYSTEM, PREMIUM 7-SPEAKER SYSTEM • XM RADIO + SERVICE	SUBSCRIPTION SOLD SEPARATELY BY SIRIUSXM AFTER 3 MONTHS • STEERING WHEEL CONTROLS, AUDIO AND PHONE INTERFACE • INSIDE REARVIEW MIRROR, AUTO DIMMING • VISORS, DRIVER/FRONT PASSENGER W/ ILLUMINATED VANITY MIRRORS • PREMIUM FLOOR MATS • LEATHER WRAP STEERING WHEEL EXTERIOR • FRONT FOG LAMPS • POWER DUAL OUTSIDE MIRRORS, HEATED • WHEELS, 20" ALUMINUM ALLOY • CONVERTIBLE ROOF - FOLDING, ACOUSTICALLY AND THERMALLY INSULATED • DAYTIME RUNNING LAMPS, LED • HEADLAMPS - ARTICULATING, HIGH INTENSITY DISCHARGE • W/ AUTOMATIC LEVELING SYSTEM	CONNECTIVITY FEATURES • 4G LTE W/FIR) HOTSPOT WITH LIMITED DATA TRIAL AND MORE, (SUBJECT TO TERMS SEE ONSTAR.COM) • ONSTAR(R) INCLUDES 5 YR BASIC PLAN PLUS 6 MTH SERVICE W/ AUTOMATIC CRASH RESPONSE, NAVIGATION & MORE (SUBJECT TO TERMS SEE ONSTAR.COM) OPTIONS & PRICING MANUFACTURER'S SUGGESTED RETAIL PRICE <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">STANDARD VEHICLE PRICE</td> <td style="text-align: right;">\$36,065.00</td> </tr> </table> OPTIONS INSTALLED BY THE MANUFACTURER (MAY REPLACE STANDARD EQUIPMENT PRICING) <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">GRAYSTONE METALLIC</td> <td style="text-align: right;">395.00</td> </tr> <tr> <td style="text-align: center;">TOTAL OPTIONS</td> <td style="text-align: right;">\$395.00</td> </tr> <tr> <td style="text-align: center;">TOTAL VEHICLE & OPTIONS</td> <td style="text-align: right;">\$36,460.00</td> </tr> <tr> <td style="text-align: center;">DESTINATION CHARGE</td> <td style="text-align: right;">925.00</td> </tr> </table>	STANDARD VEHICLE PRICE	\$36,065.00	GRAYSTONE METALLIC	395.00	TOTAL OPTIONS	\$395.00	TOTAL VEHICLE & OPTIONS	\$36,460.00	DESTINATION CHARGE	925.00	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right;">TOTAL VEHICLE PRICE*</td> <td style="text-align: right;">\$37,385.00</td> </tr> </table>	TOTAL VEHICLE PRICE*	\$37,385.00
STANDARD VEHICLE PRICE	\$36,065.00																
GRAYSTONE METALLIC	395.00																
TOTAL OPTIONS	\$395.00																
TOTAL VEHICLE & OPTIONS	\$36,460.00																
DESTINATION CHARGE	925.00																
TOTAL VEHICLE PRICE*	\$37,385.00																

EPA DOT Fuel Economy and Environment

Fuel Economy

23

combined city/hwy

4.3 gallons per 100 miles

Subcompact cars range from 15 to 119 MPG. The best vehicle rates 119 MPG.

You spend \$750 more in fuel costs over 5 years compared to the average new vehicle.

Annual fuel cost \$1,950

Fuel Economy & Greenhouse Gas Rating (multiple only)

1 5 10 Best

Smog Rating (single only)

1 5 10 Best

fuelconomy.gov

GOVERNMENT 5-STAR SAFETY RATINGS

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

Source: National Highway Traffic Safety Administration (NHTSA)
www.safercar.gov or 1-888-327-4236

PARTS CONTENT INFORMATION

FOR VEHICLES IN THIS CARLINE:
U.S./CANADIAN PARTS CONTENT: 6%
MAJOR SOURCES OF FOREIGN PARTS CONTENT: POLAND 31%

NOTE: PARTS CONTENT DOES NOT INCLUDE FINAL ASSEMBLY, DISTRIBUTION, OR OTHER NON-PARTS COSTS.

FOR THIS VEHICLE:
FINAL ASSEMBLY POINT: GLIWICE, POLAND
COUNTRY OF ORIGIN: ENGINE: HUNGARY
TRANSMISSION: MEXICO

This label has been applied pursuant to Federal law - Do not remove prior to delivery to the ultimate purchaser. *Includes Manufacturer's Recommended 30-day Service. Does not include dealer installed options and accessories not listed above, local taxes or license fees.

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ORDER NO. 604046 SALES CODE E
 SALES MODEL CODE ENTRY
 DEALER NO. 04086
 FINAL ASSEMBLY
 COUNTRY: POLAND
VIN W04W73N51G060405
 DEALER TO WHOM DELIVERED
ANDERSON BUICK GMC
 10125 YORK RD.
 COCKEYSVILLE, MD 21030-3305

7953

R2

5

Photo No. 102 - Monroney Label

Head Restraints

⚠ Warning

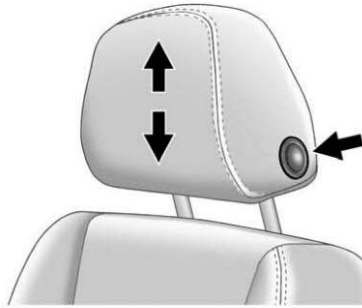
With head restraints that are not installed and adjusted properly, there is a greater chance that occupants will suffer a neck/spinal injury in a crash. Do not drive until the head restraints for all occupants are installed and adjusted properly.



Adjust the head restraint so that the top of the restraint is at the same height as the top of the occupant's head. This position reduces the chance of a neck injury in a crash.

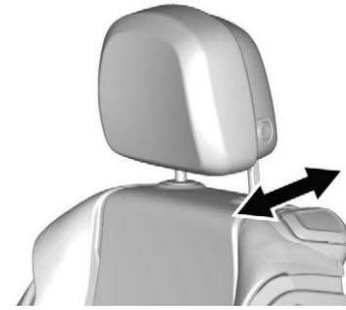
Front Seats

The vehicle's front seats have adjustable head restraints in the outboard seating positions.



To raise or lower the head restraint, press the button on the side of the head restraint, and pull up or push the head restraint down, and release the button. Pull and push on

the head restraint after the button is released to make sure that it is locked in place.



To adjust the head restraint forward, grasp the head restraint and pull forward to the desired locked position. To adjust the head restraint rearward, grasp the head restraint and pull forward fully, until the mechanism releases and allows the head restraint to return to the full rear position.

Photo No. 103 - 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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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

Passenger Head Angular Velocity (X)
Passenger Head Angular Velocity (Y)
Passenger Head Angular Velocity (Z)
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)

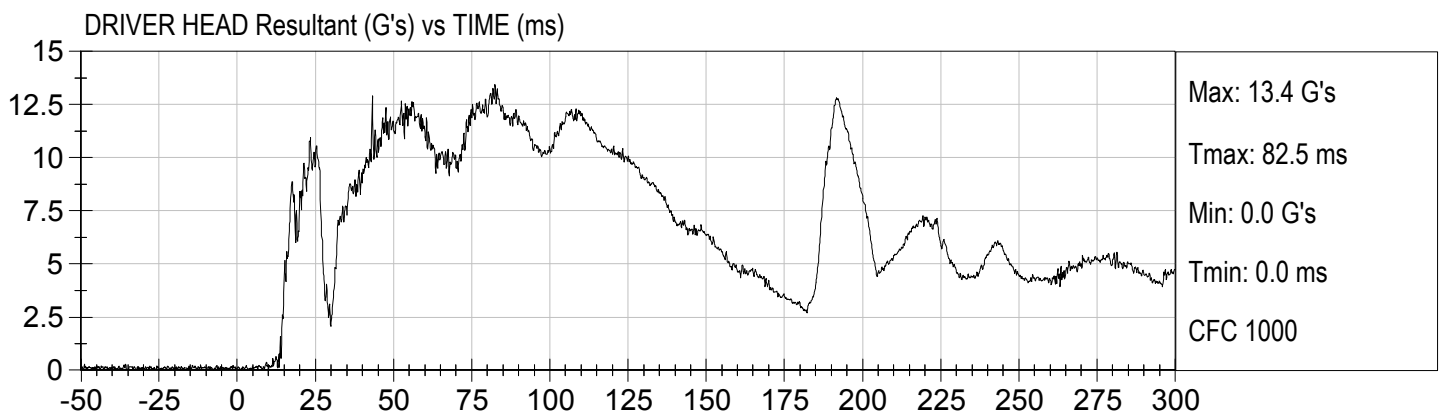
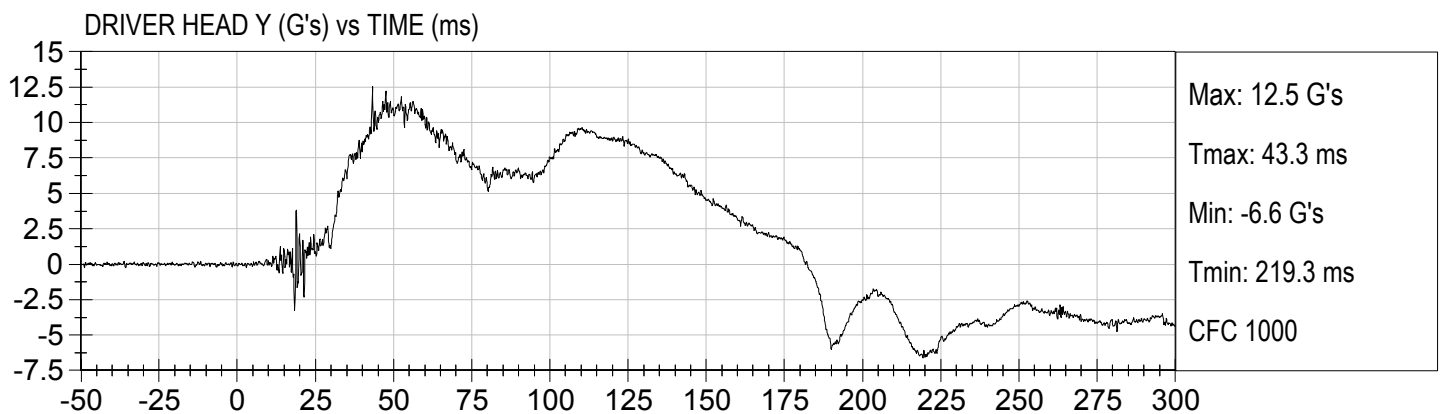
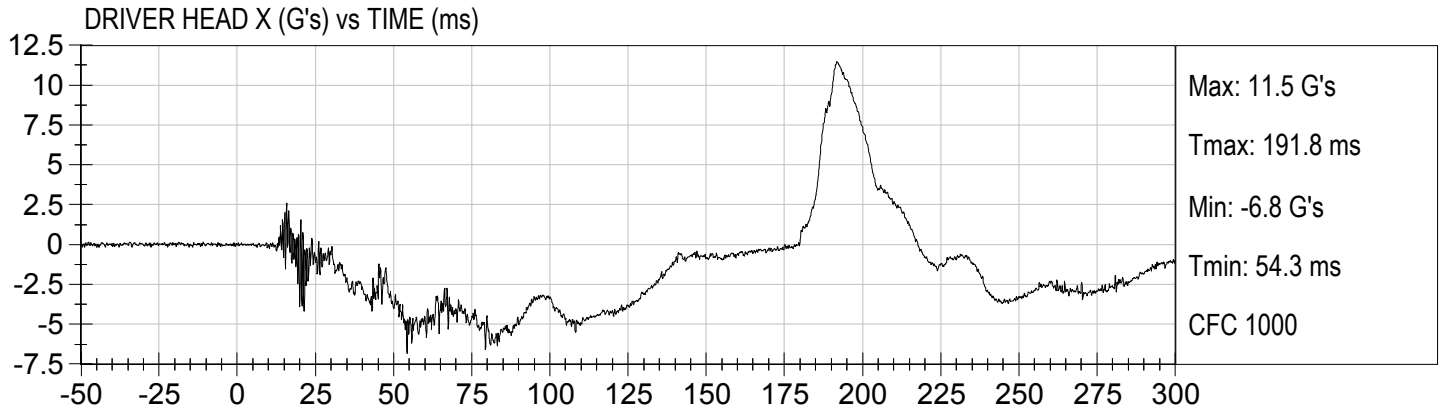
MDB Center of Gravity Acceleration (Z)

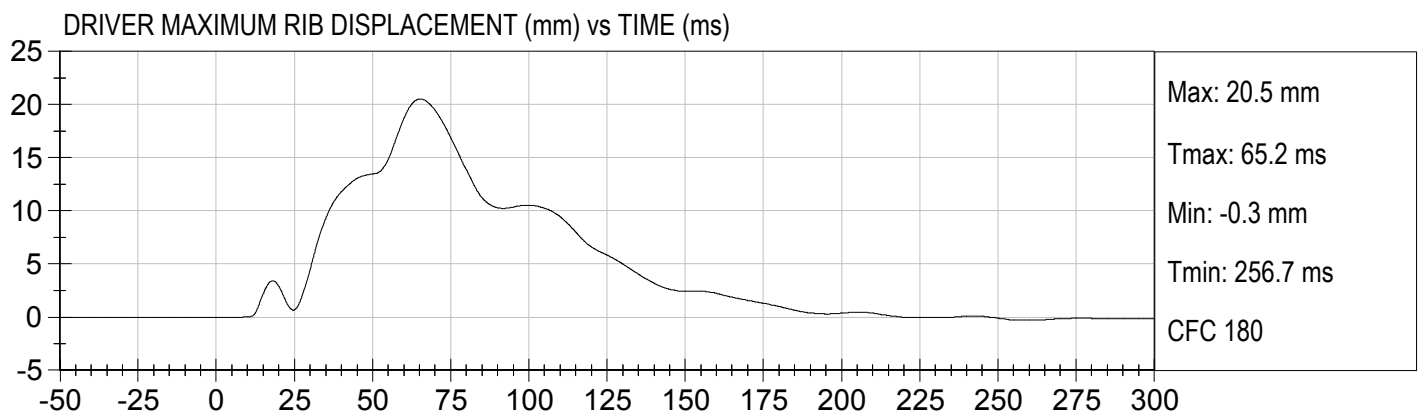
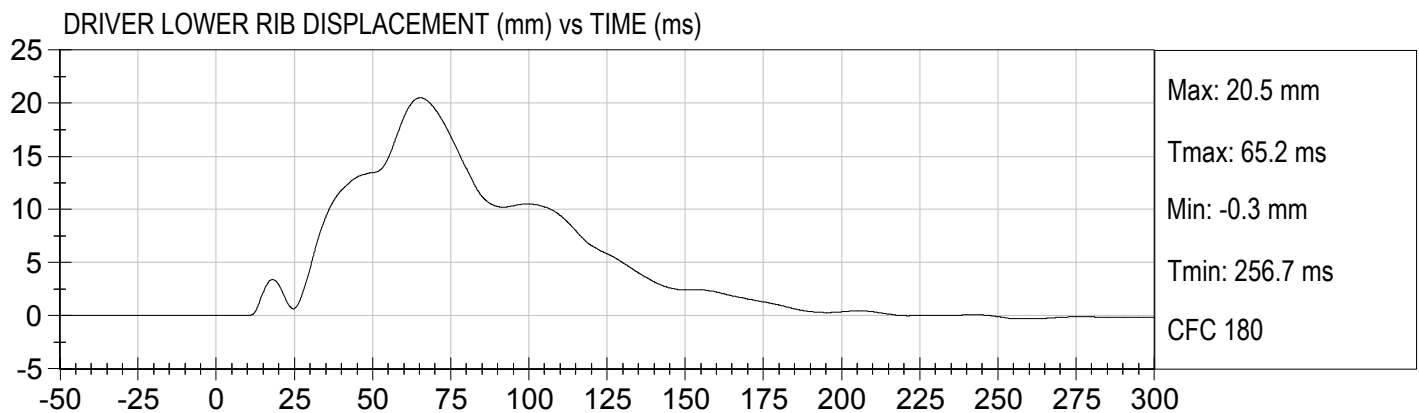
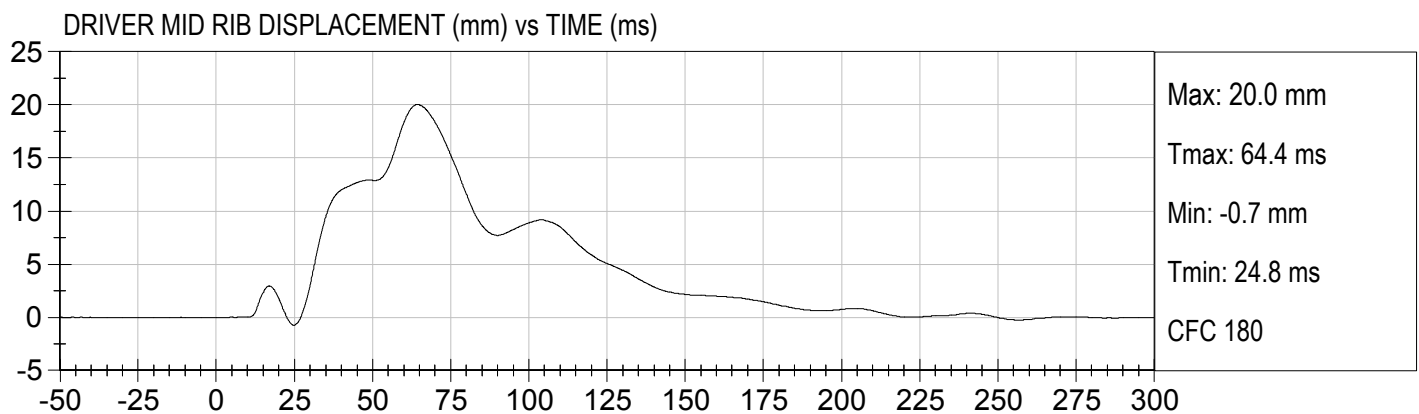
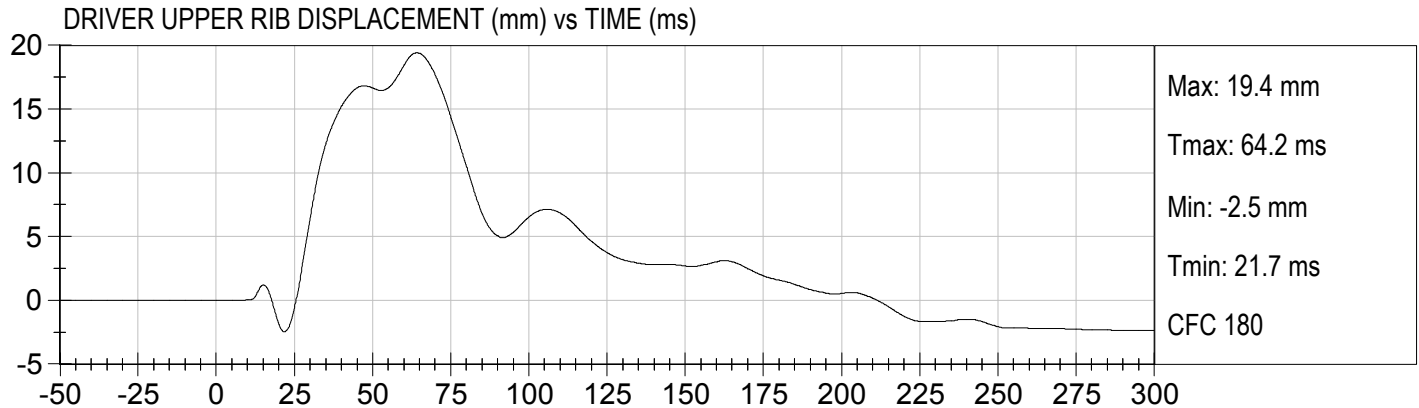
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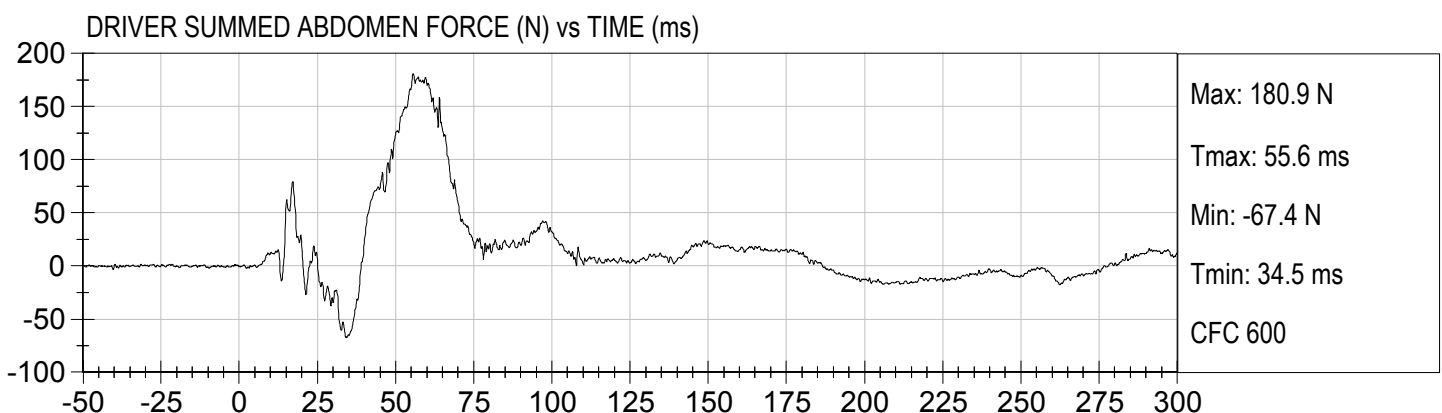
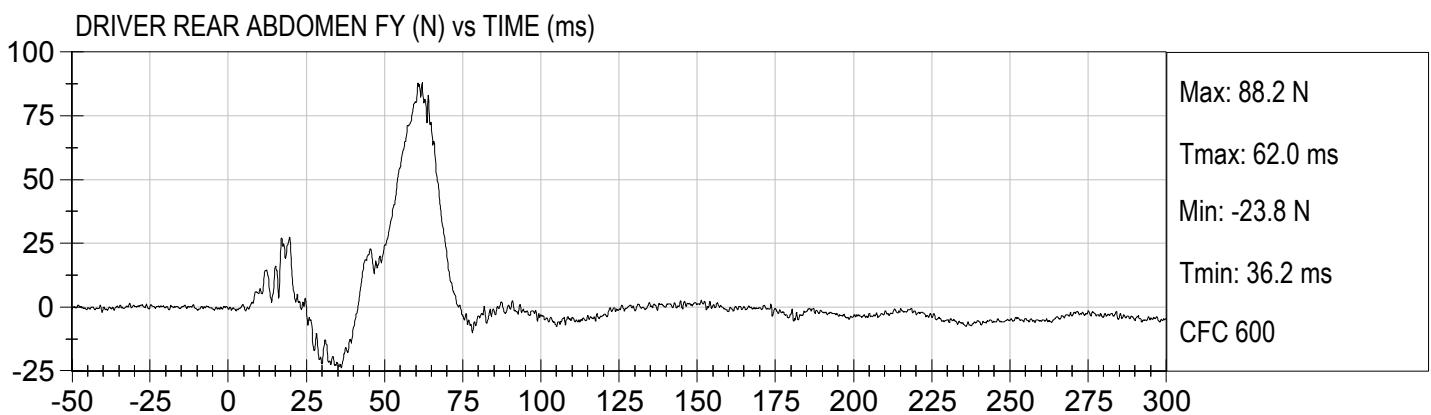
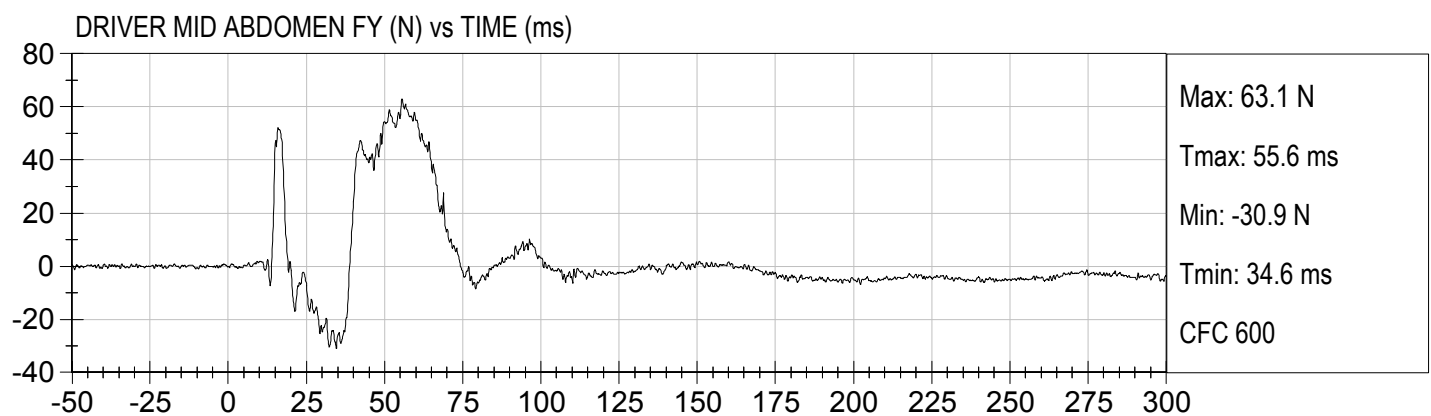
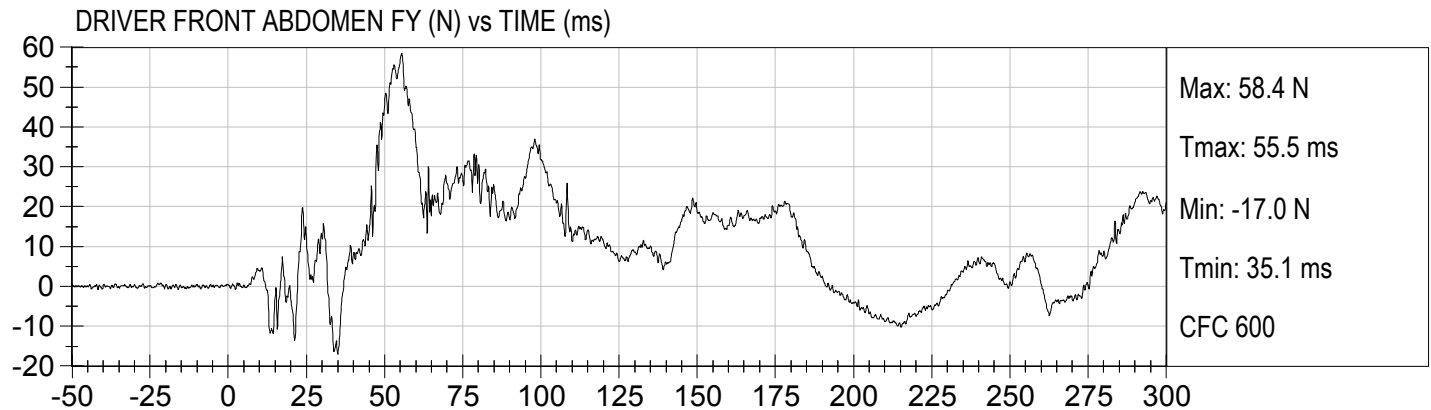
MDB Rear Acceleration (Y)

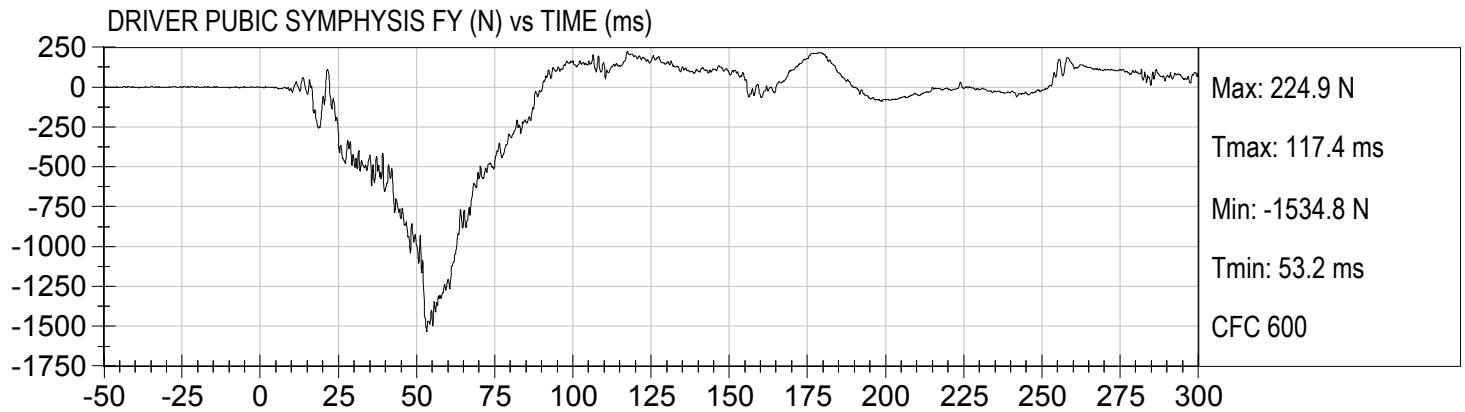
Left MDB Contact Switch

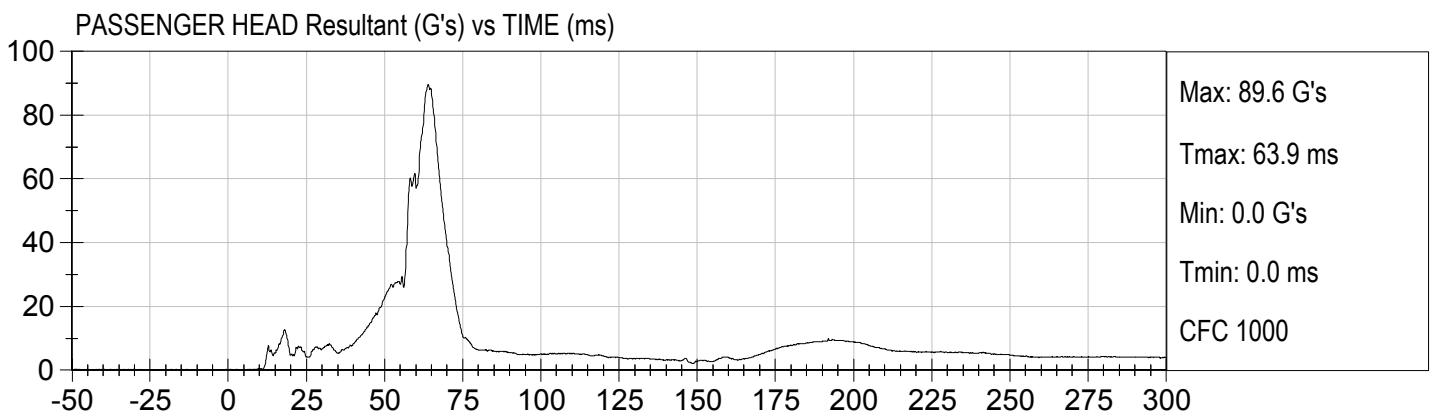
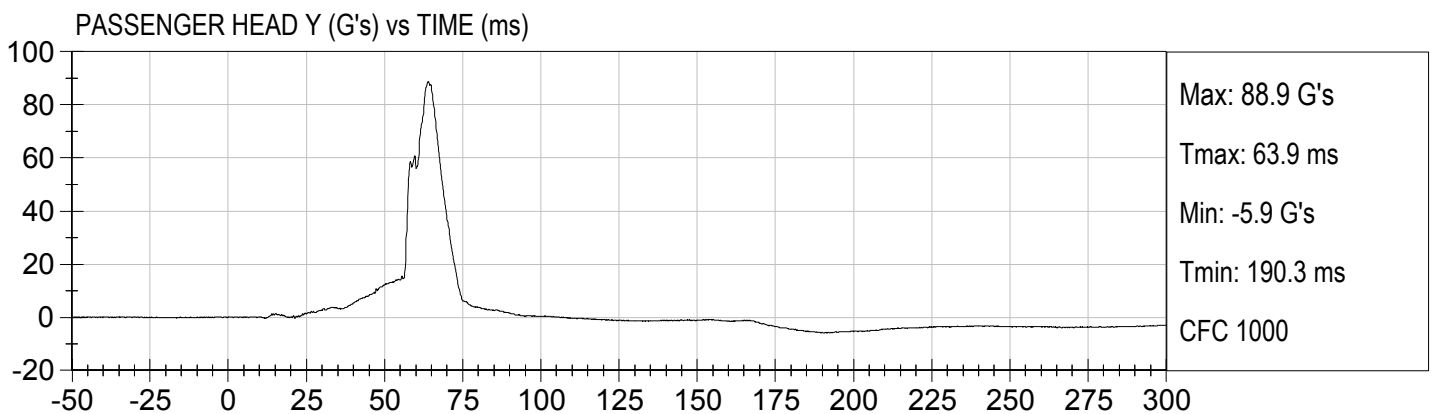
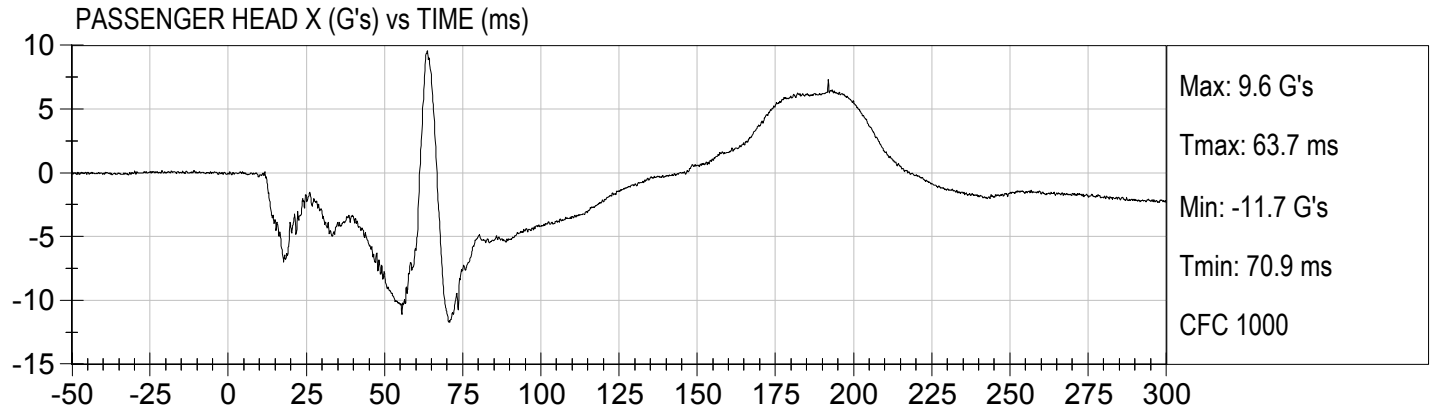
Right MDB Contact Switch

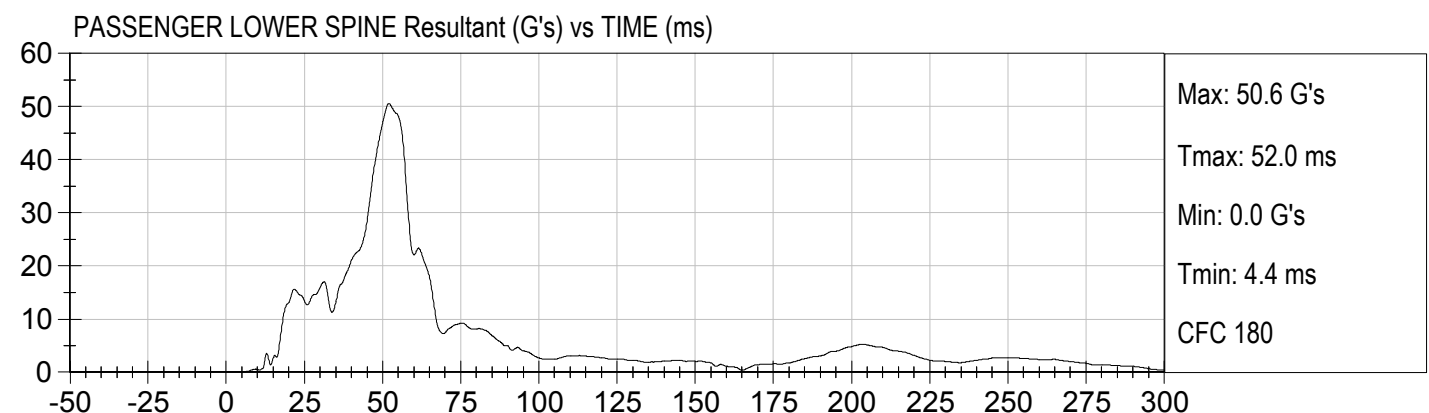
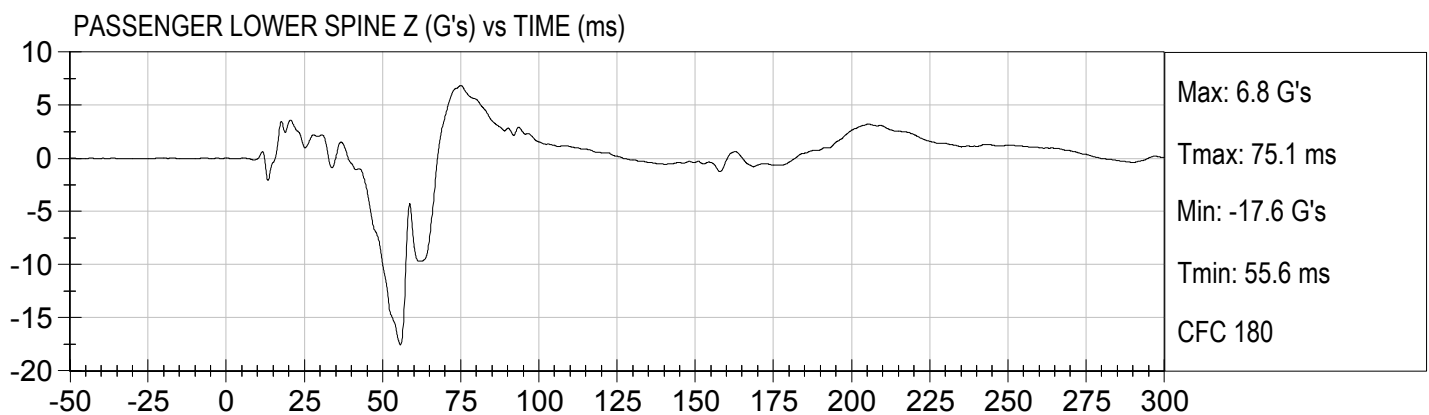
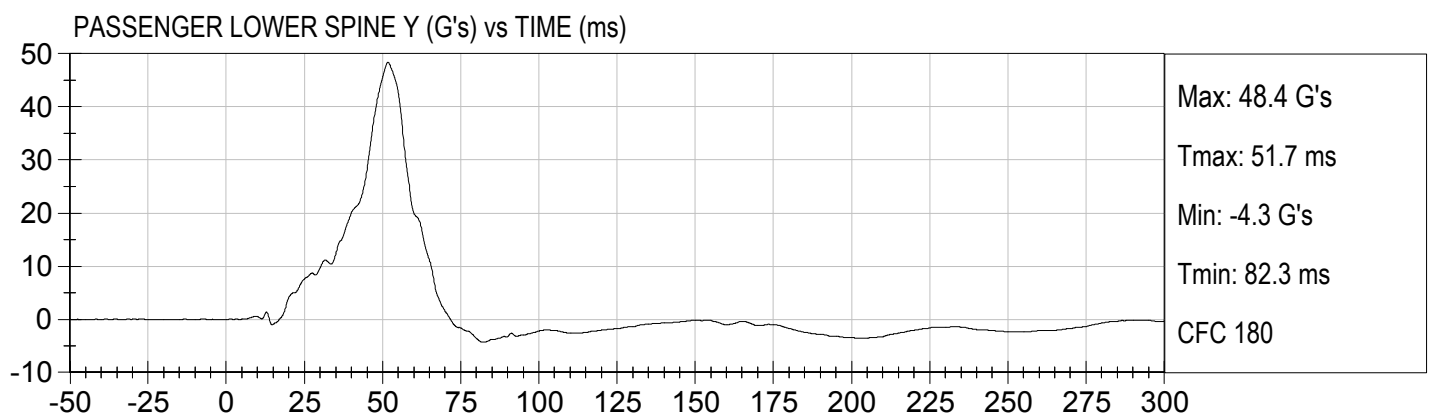
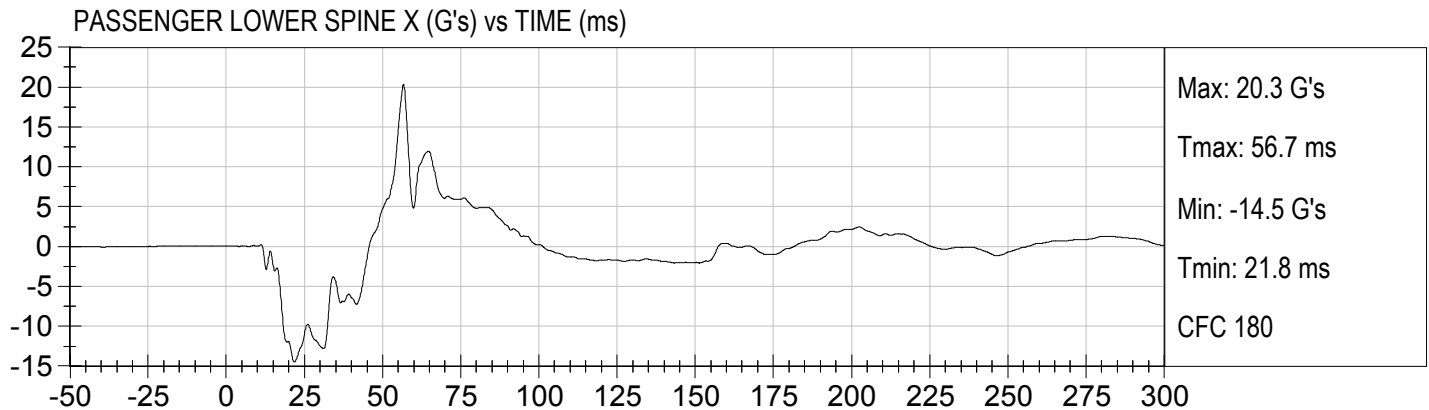


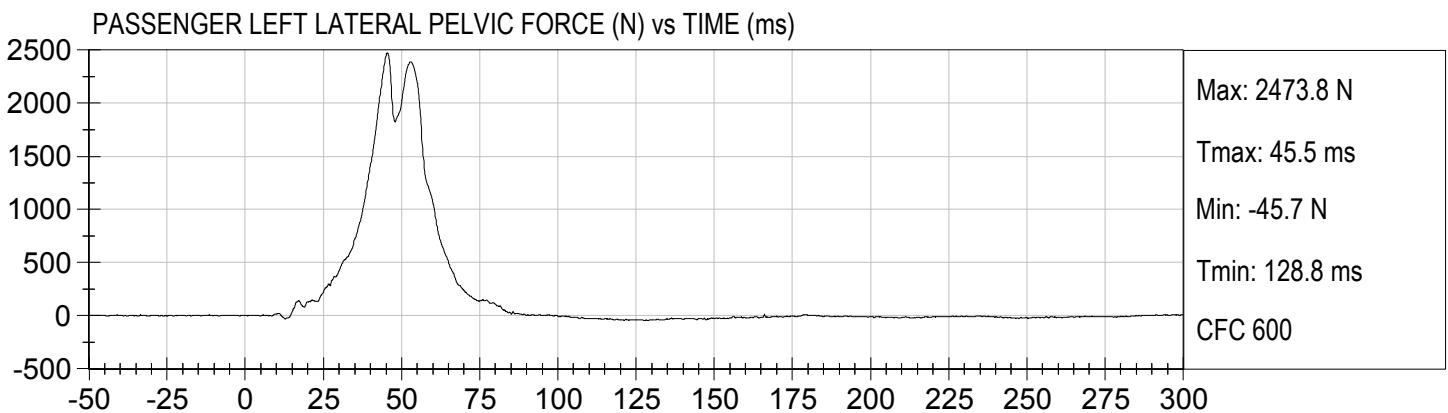
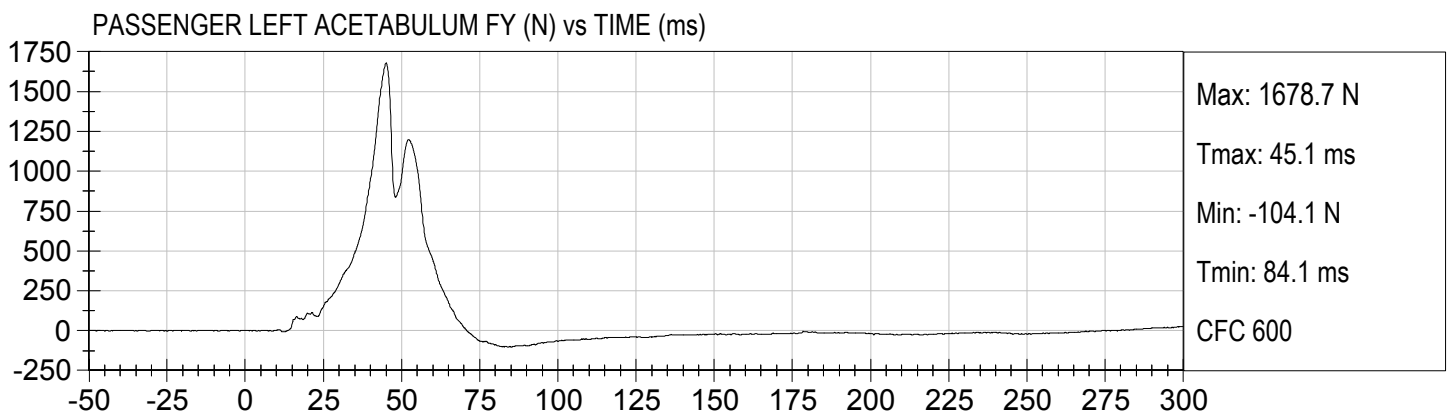
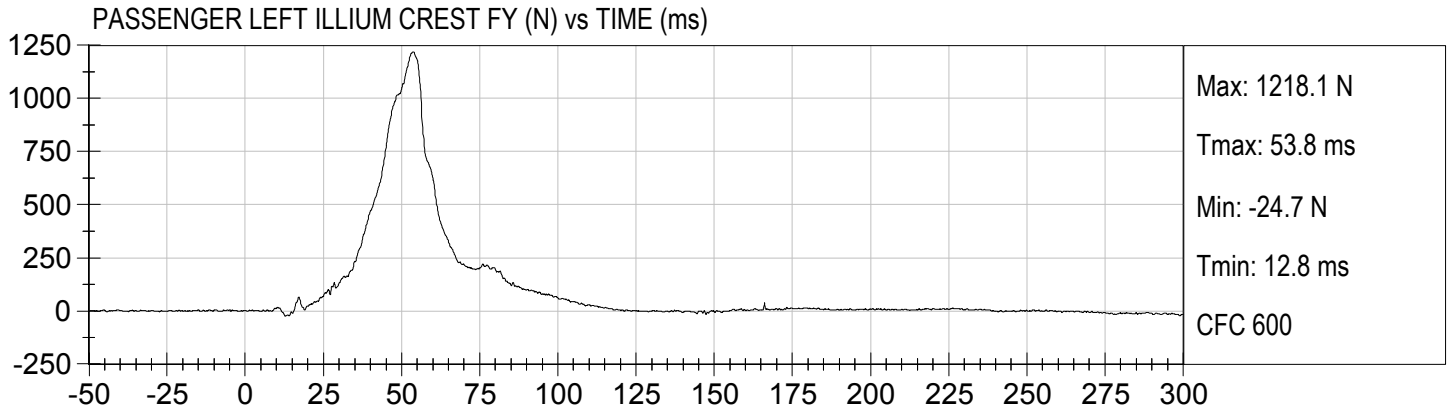












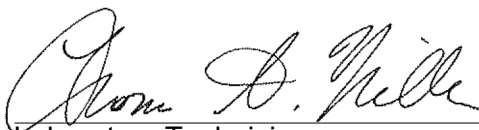
APPENDIX C
DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

ES-2re External Measurements
SN: 032

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

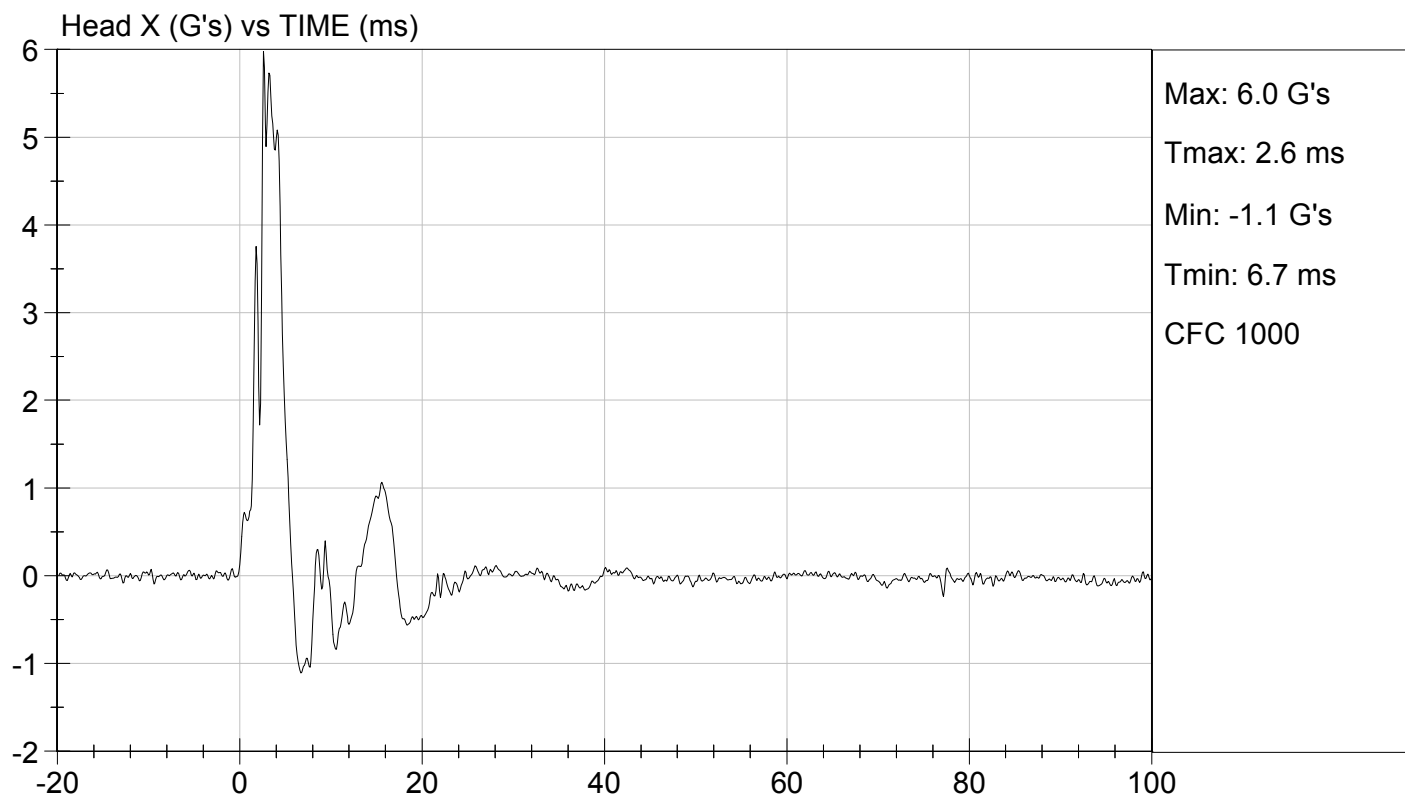
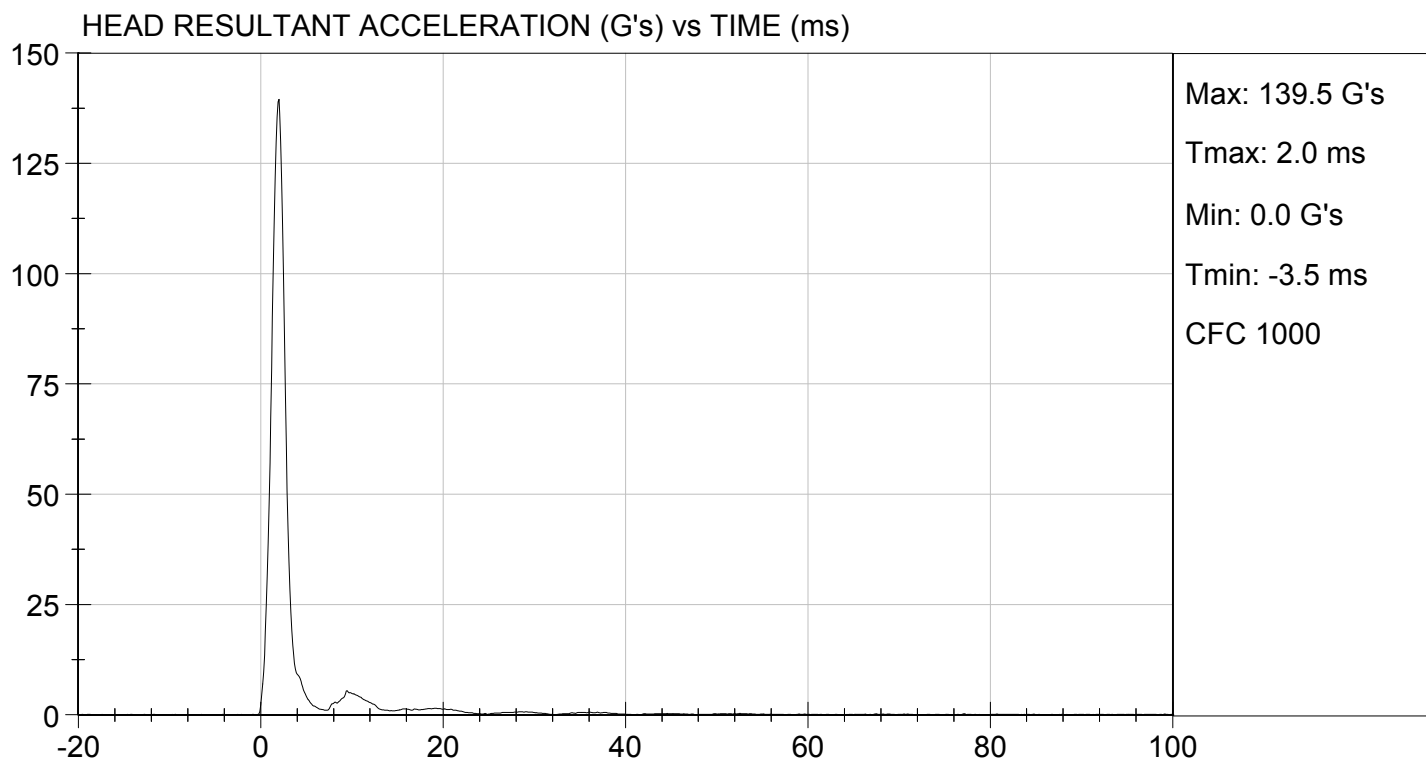
MGA RESEARCH CORPORATION**HEAD DROP TEST****ES-2re DUMMY****ATD Serial No:** 032**Test ID:** D162401

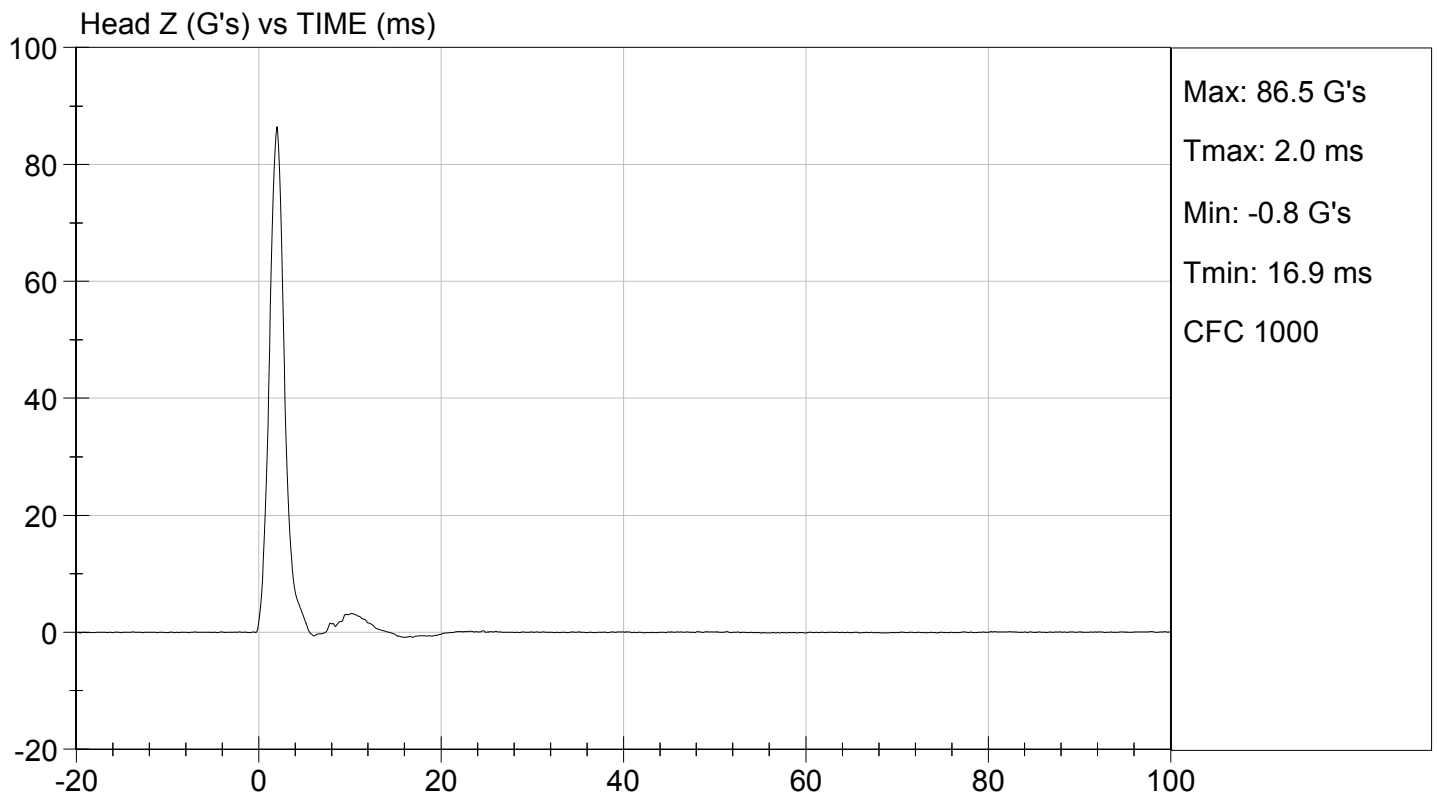
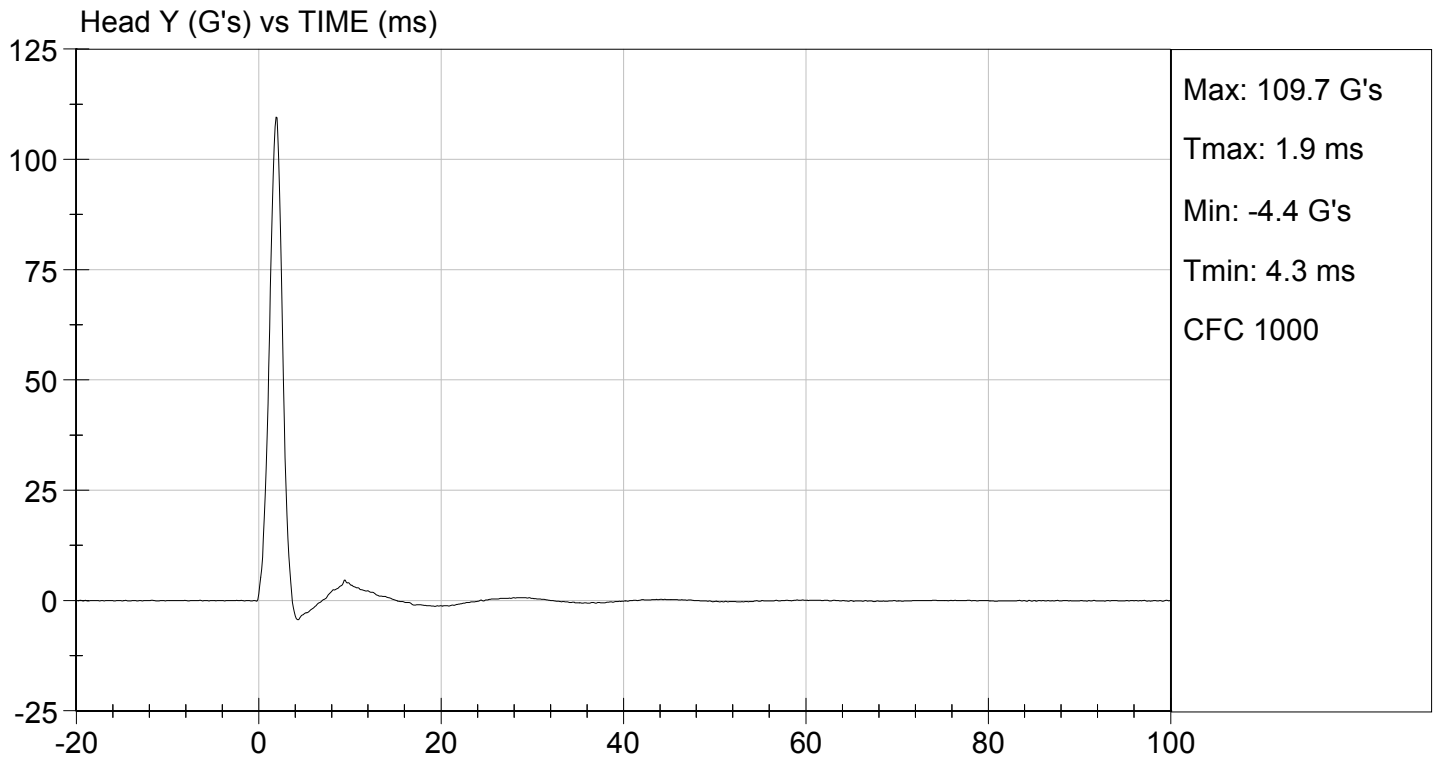
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Peak Resultant Acceleration	G's	125 to 155	140	Pass
Peak Longitudinal Acceleration	G's	<= +/- 15.0	6.0	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

07/14/2016
Test Date


Approved By





MGA RESEARCH CORPORATION
NECK PENDULUM TEST
ES-2re DUMMY

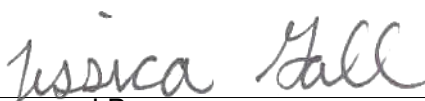
ATD Serial No: 032

Test I.D: D162402

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity		%	10 to 70	47	Pass
Pendulum Speed		m/s	3.30 to 3.50	3.39	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	51.3	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	57.3	Pass
Head Rotation Decay Time to 0 Degree		ms	53.0 to 88.0	57.5	Pass
Overall Results					Pass


 Laboratory Technician

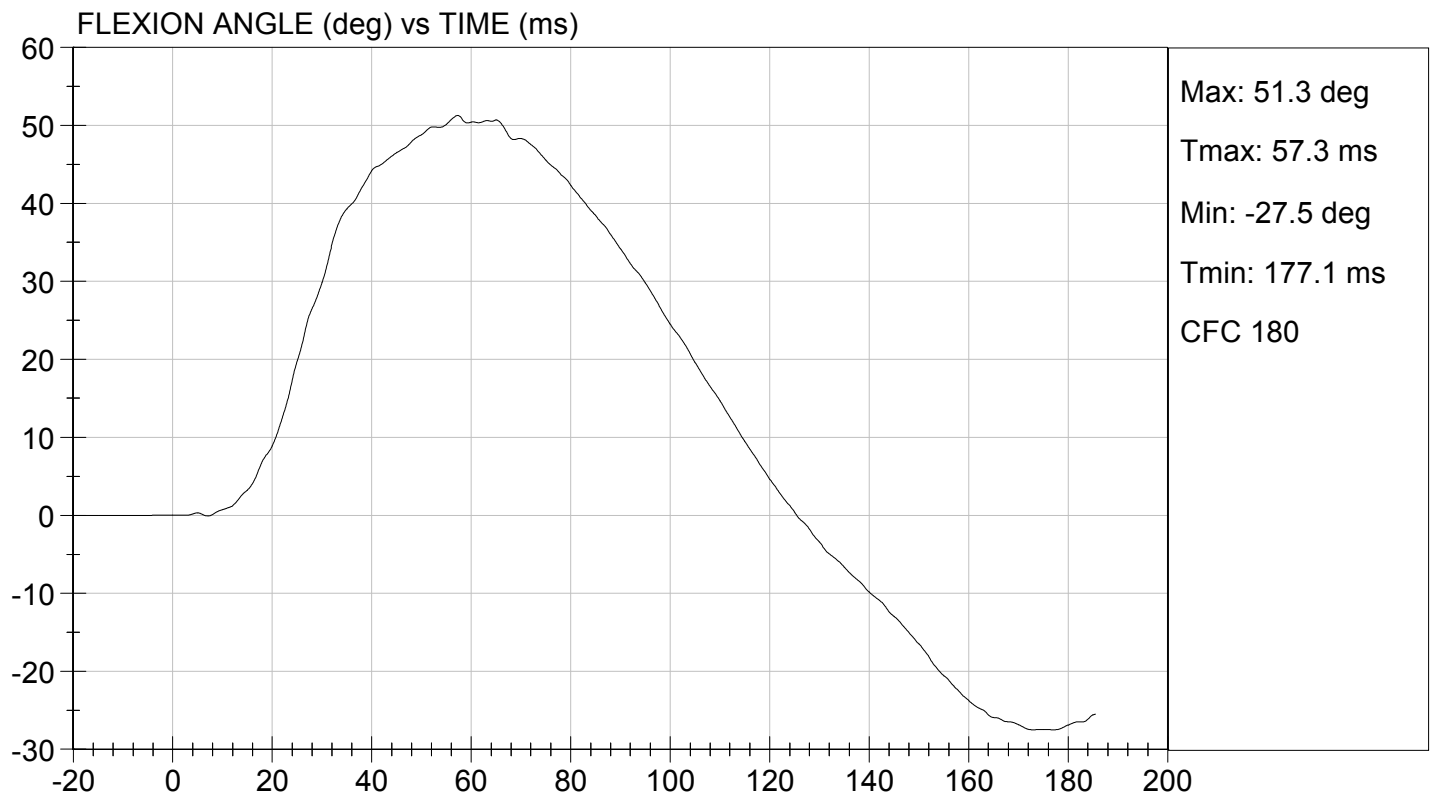
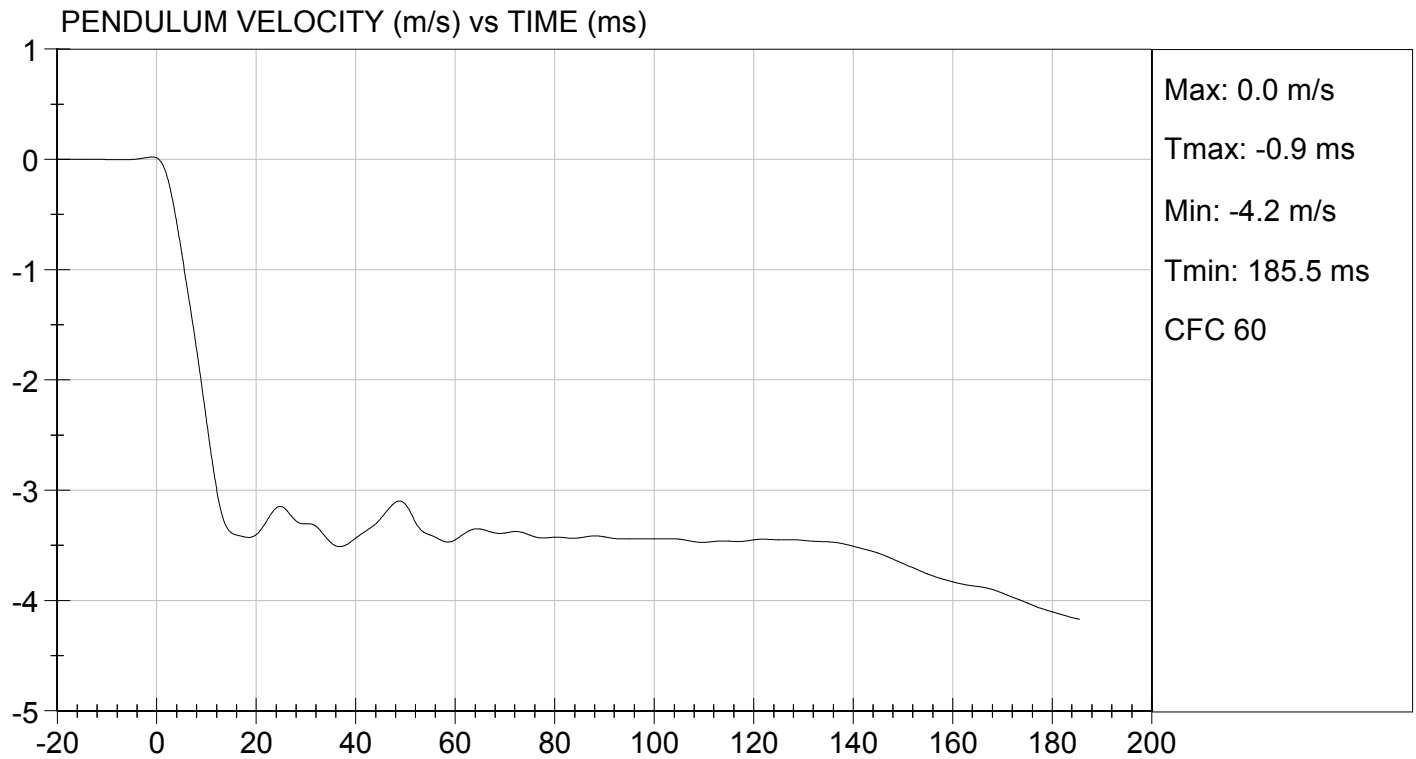
07/14/2016
 Test Date


 Approved By



TEST DESC: NECK BENDING
VELOCITY: 11.11 ft/s, 3.39 m/s

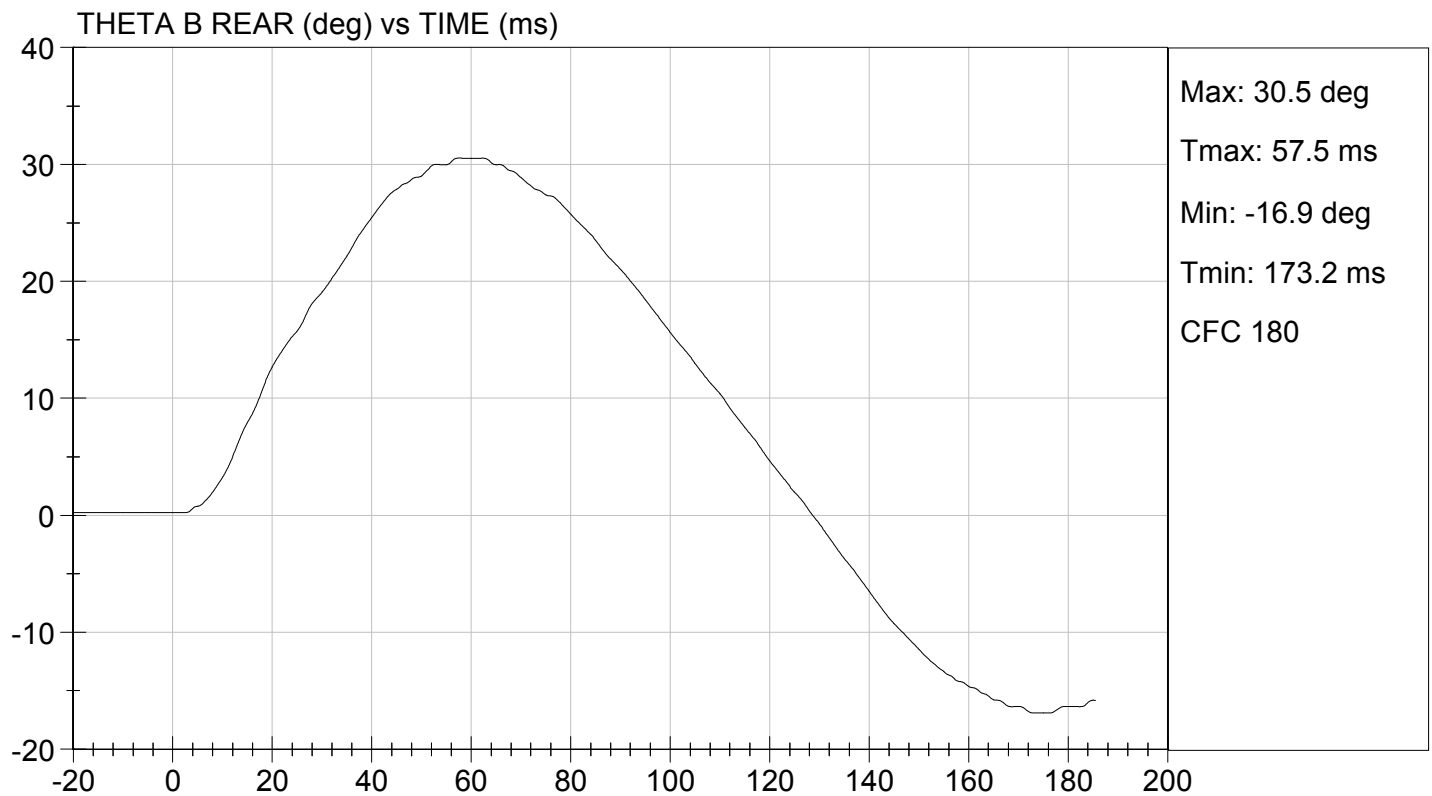
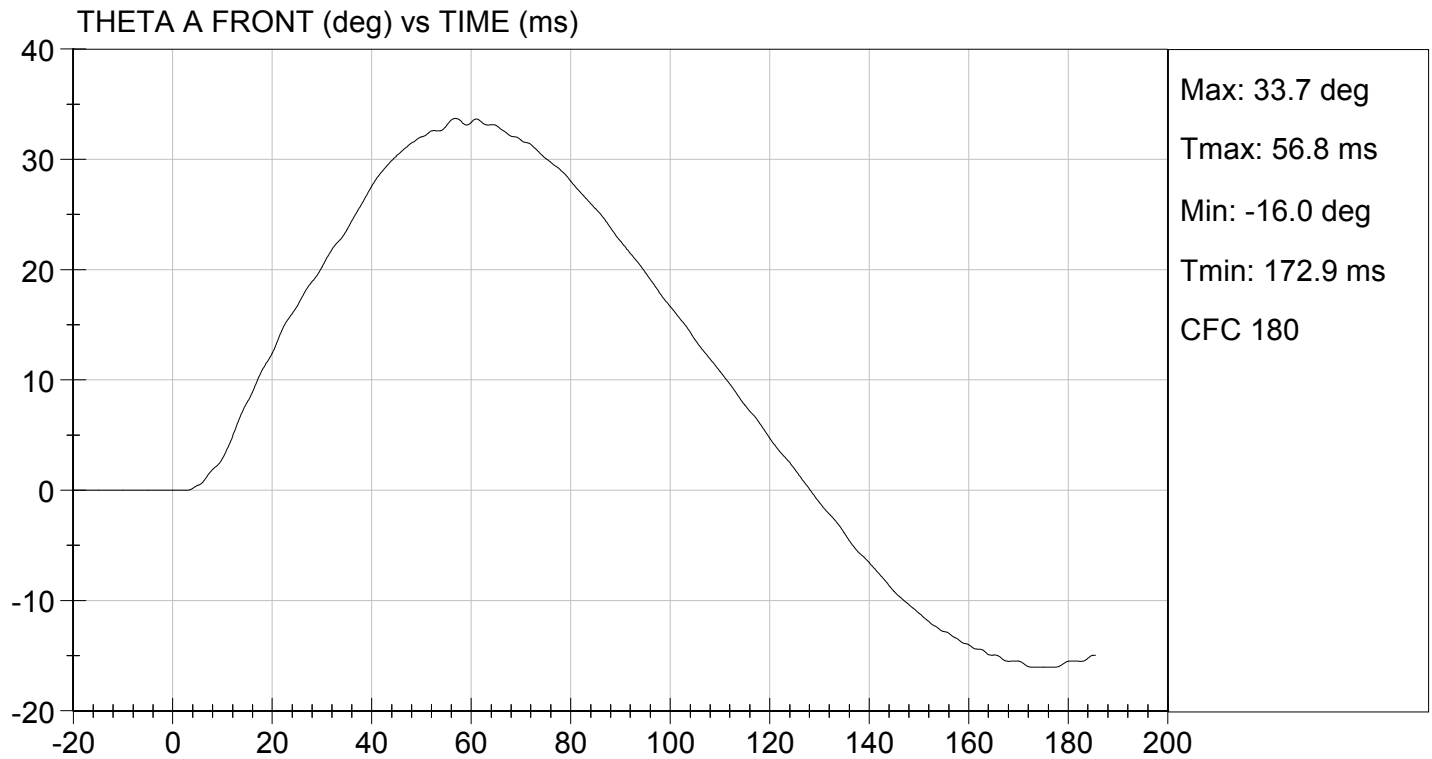
TEST DATE: 07/14/2016
TEST #: D162402





TEST DESC: NECK BENDING
VELOCITY: 11.11 ft/s, 3.39 m/s

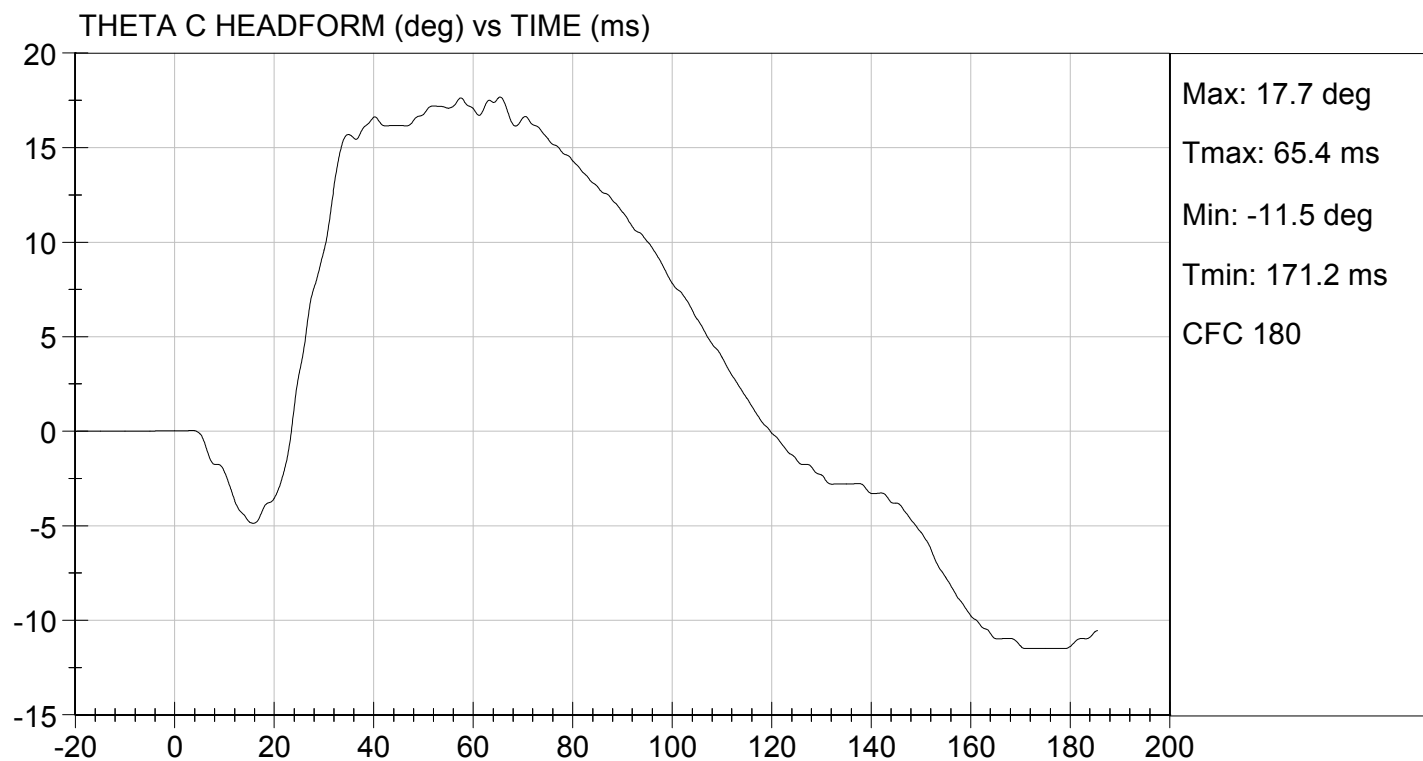
TEST DATE: 07/14/2016
TEST #: D162402





TEST DESC: NECK BENDING
VELOCITY: 11.11 ft/s, 3.39 m/s

TEST DATE: 07/14/2016
TEST #: D162402



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

ES-2re DUMMY

ATD Serial No: 032

Test I.D: D162403

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	46	Pass
Pendulum Speed	m/s	4.20 to 4.40	4.34	Pass
Peak Impactor Acceleration	G's	7.5 to 10.5	8.7	Pass
Overall Test Results				Pass


Laboratory Technician

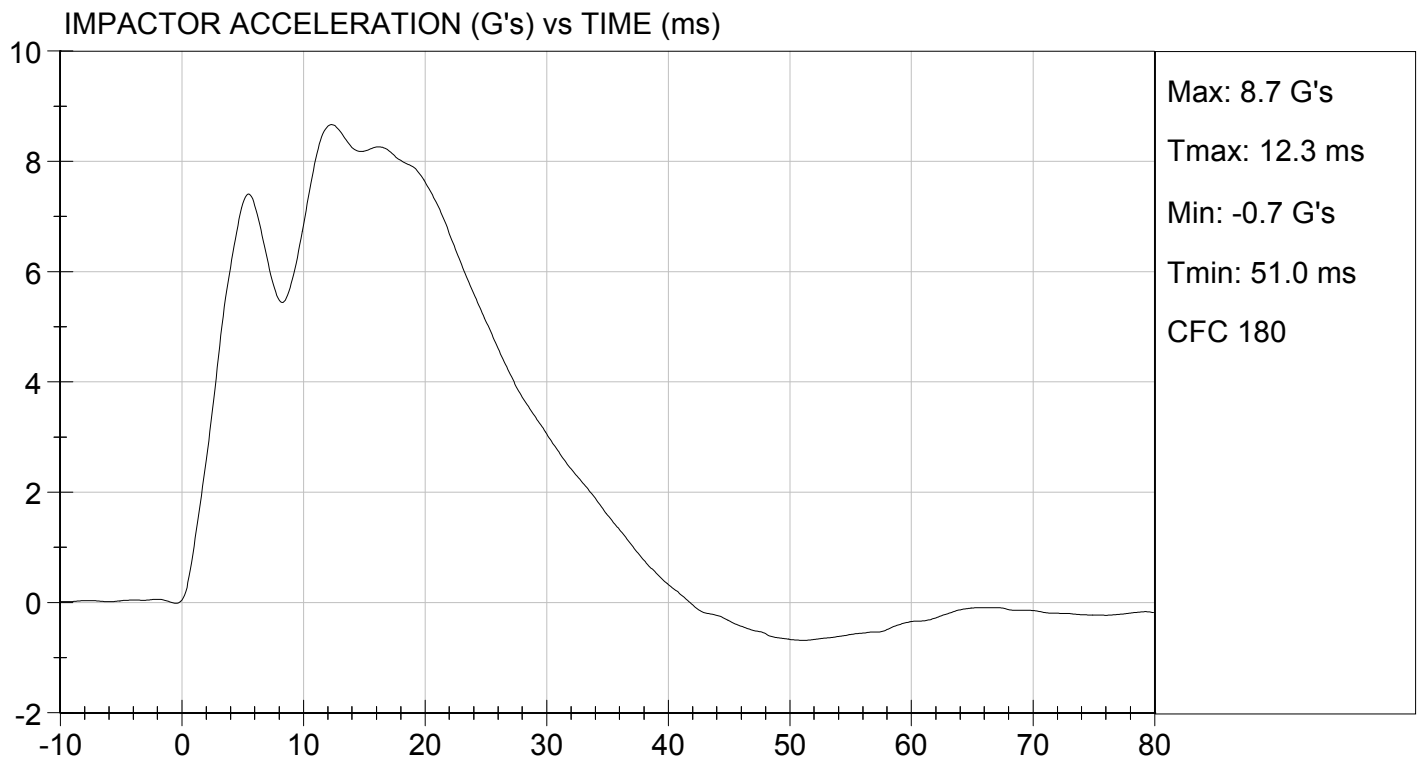
07/14/2016
Test Date


Approved By



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

TEST DATE: 07/14/2016
TEST #: D162403



MGA RESEARCH CORPORATION

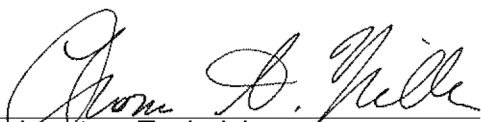
UPPER RIB TEST

ES-2re DUMMY

ATD Serial No: 032

Test I.D: D162404

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Displacement at 459 mm	mm	36.0 to 40.0	38.6	Pass
Displacement at 815 mm	mm	46.0 to 51.0	48.6	Pass
Overall Test Results				Pass

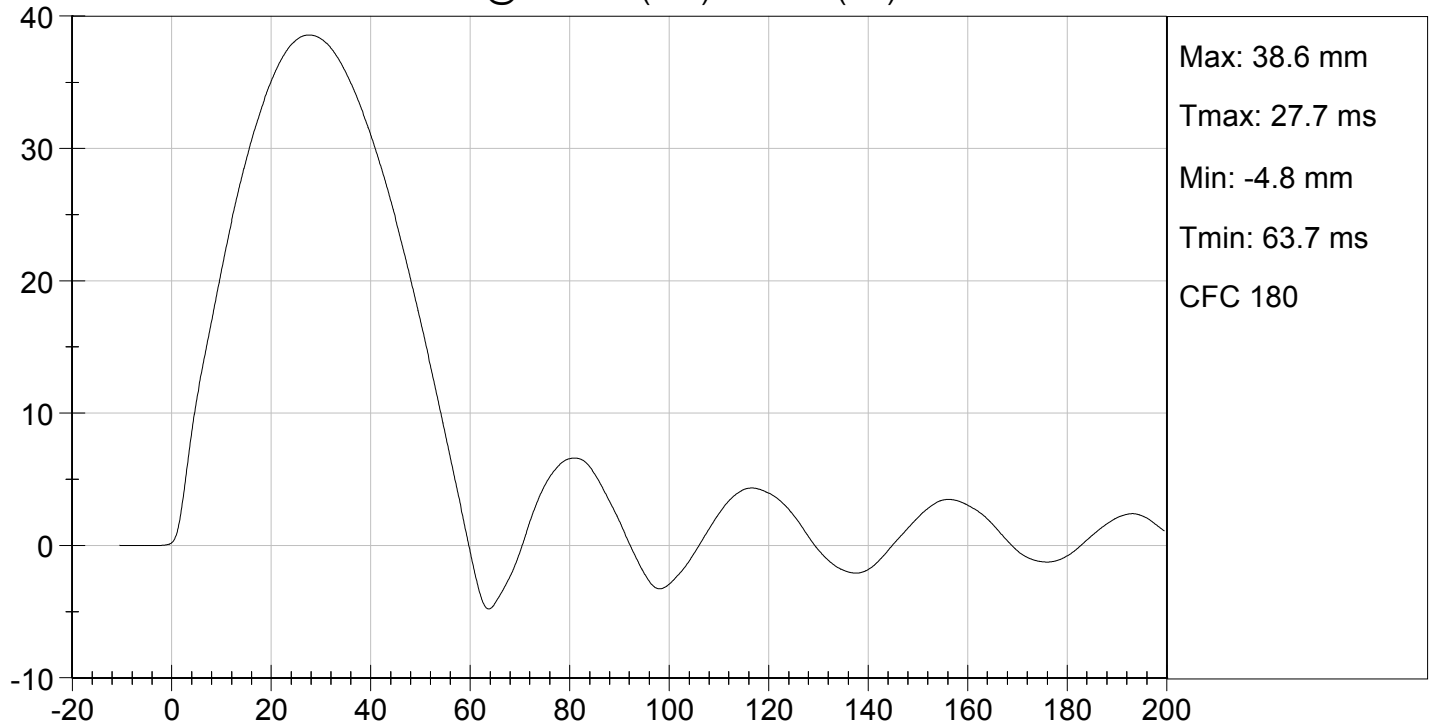

Laboratory Technician

07/14/2016
Test Date

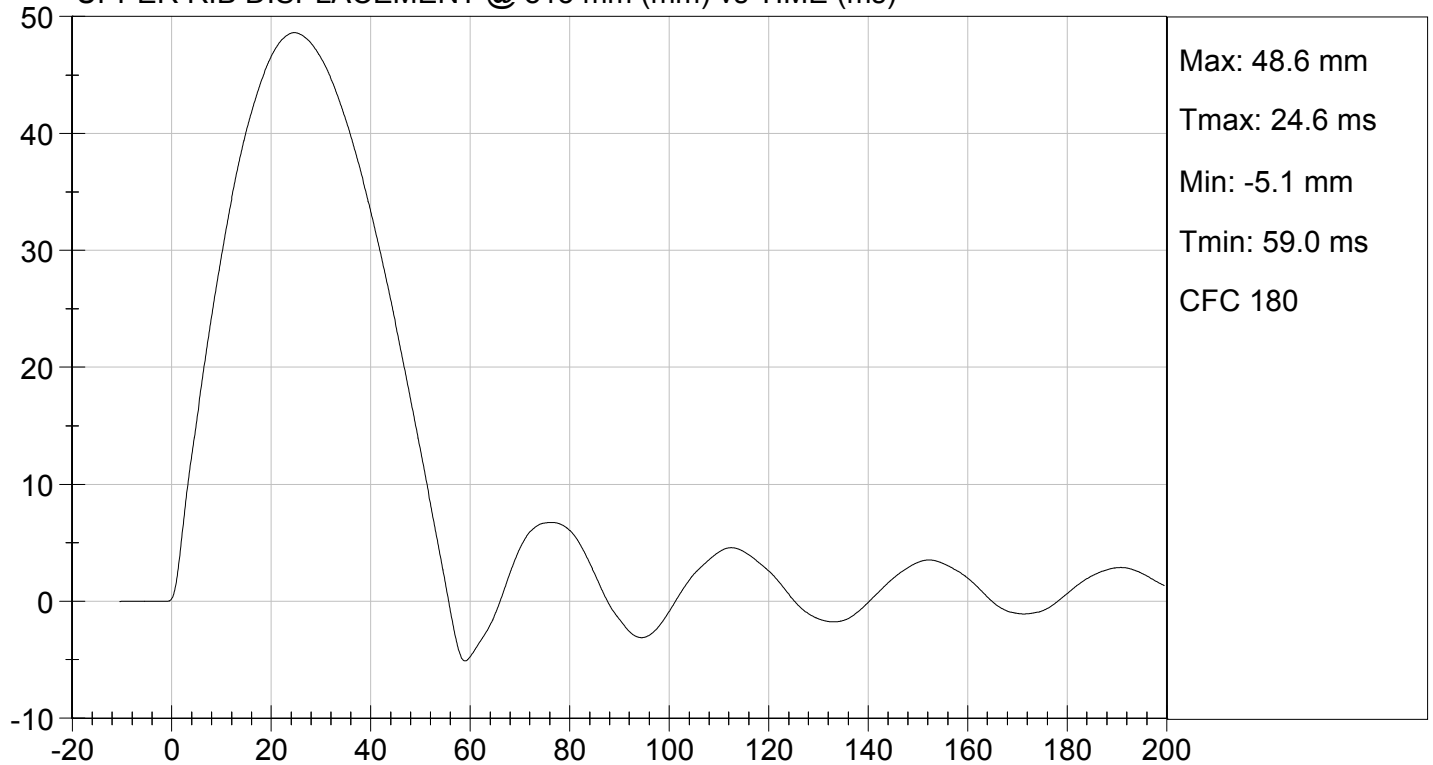

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UPPER RIB DISPLACEMENT @ 459 mm (mm) vs TIME (ms)



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



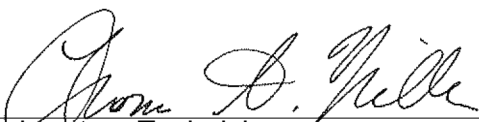
MGA RESEARCH CORPORATION

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

ATD Serial No: 032

Test I.D: D162405

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Displacement at 459 mm	mm	36.0 to 40.0	38.5	Pass
Displacement at 815 mm	mm	46.0 to 51.0	48.7	Pass
Overall Test Results				Pass

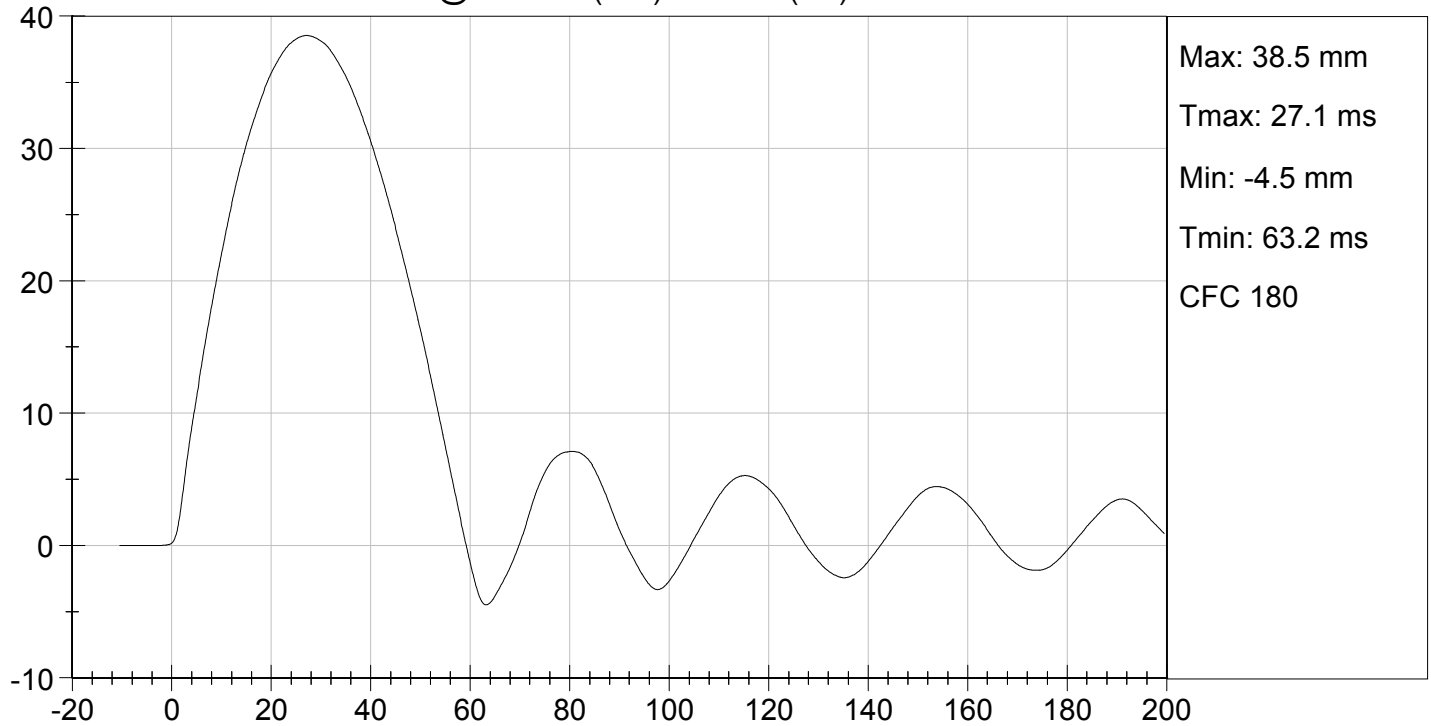

Laboratory Technician

07/14/2016
Test Date

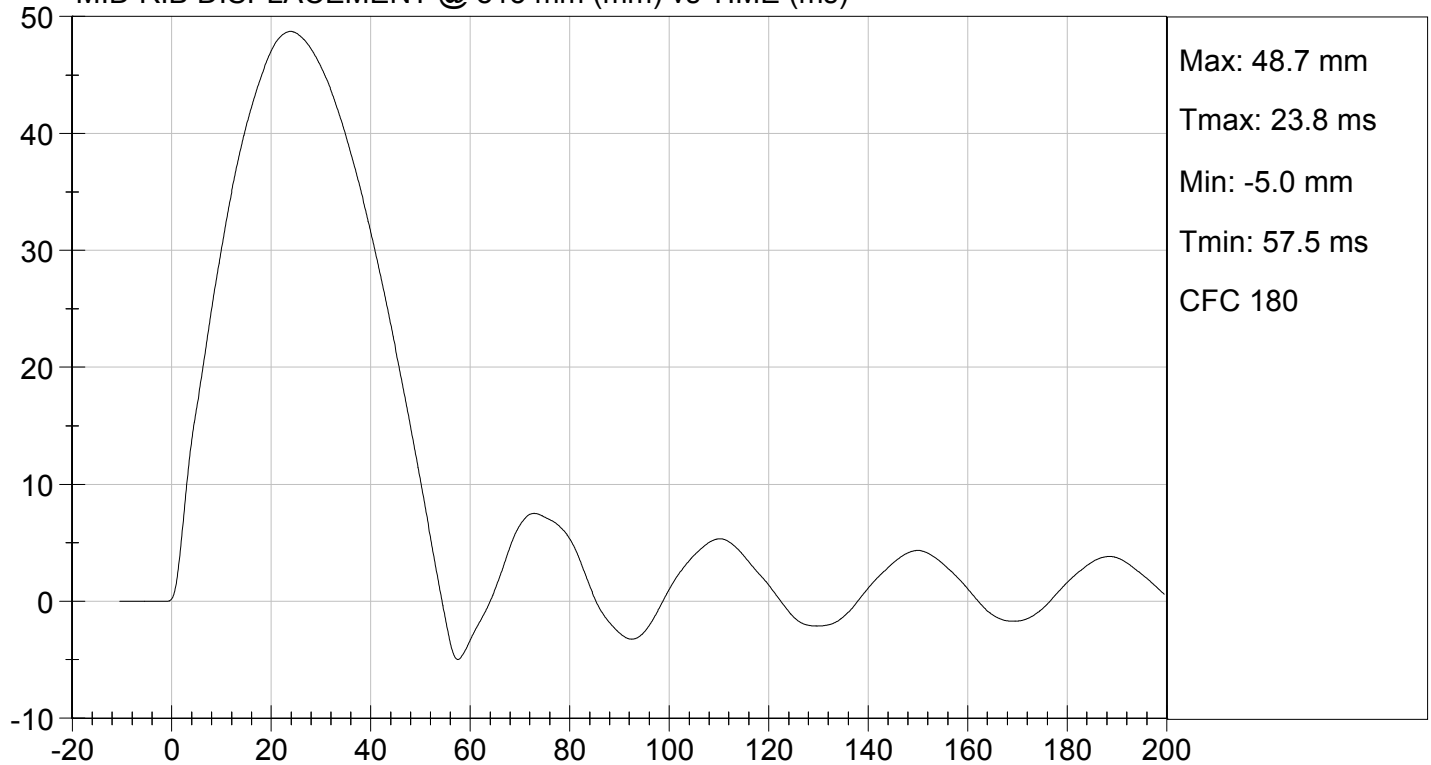

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MID RIB DISPLACEMENT @ 459 mm (mm) vs TIME (ms)



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



MGA RESEARCH CORPORATION

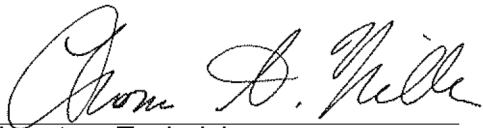
LOWER RIB TEST

ES-2re DUMMY

ATD Serial No: 032

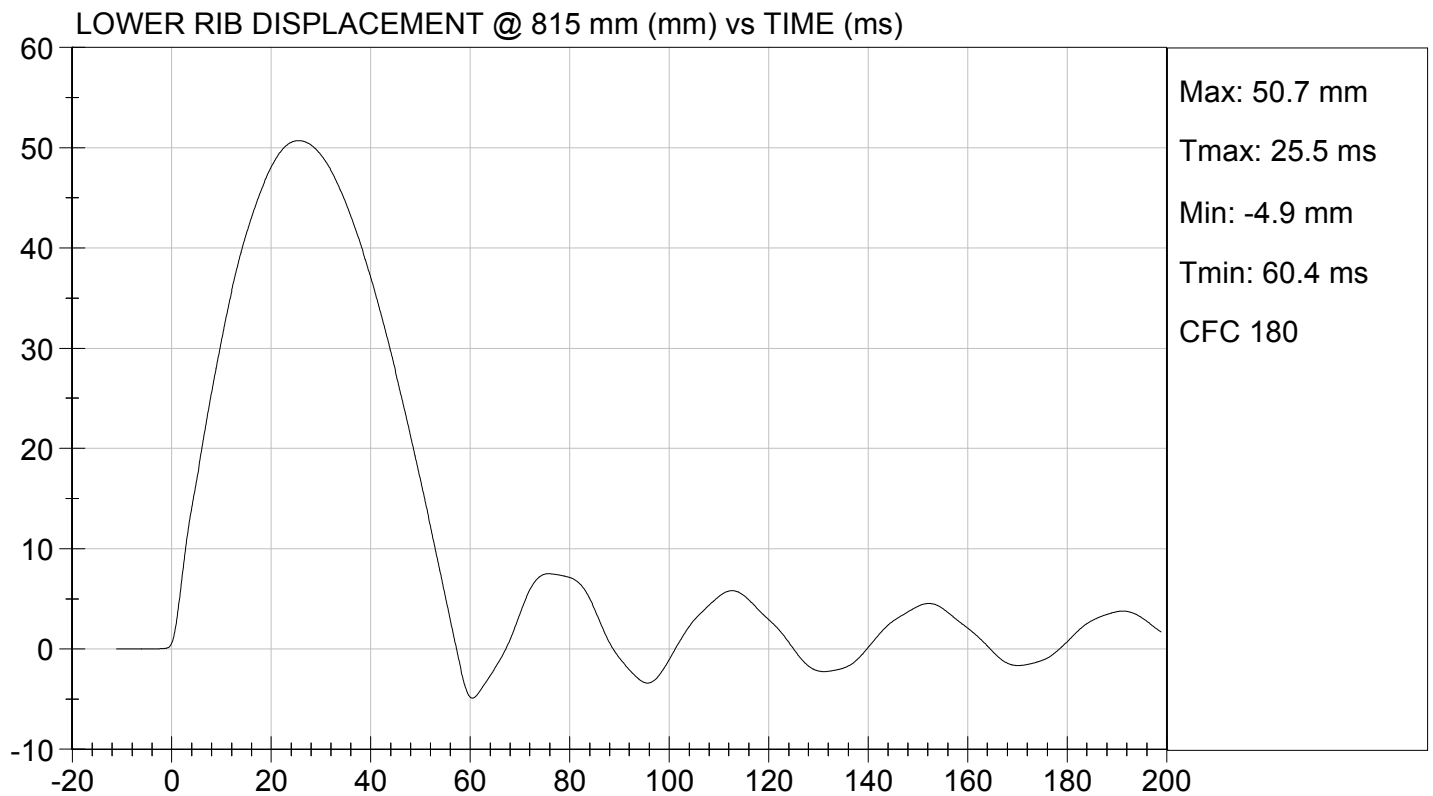
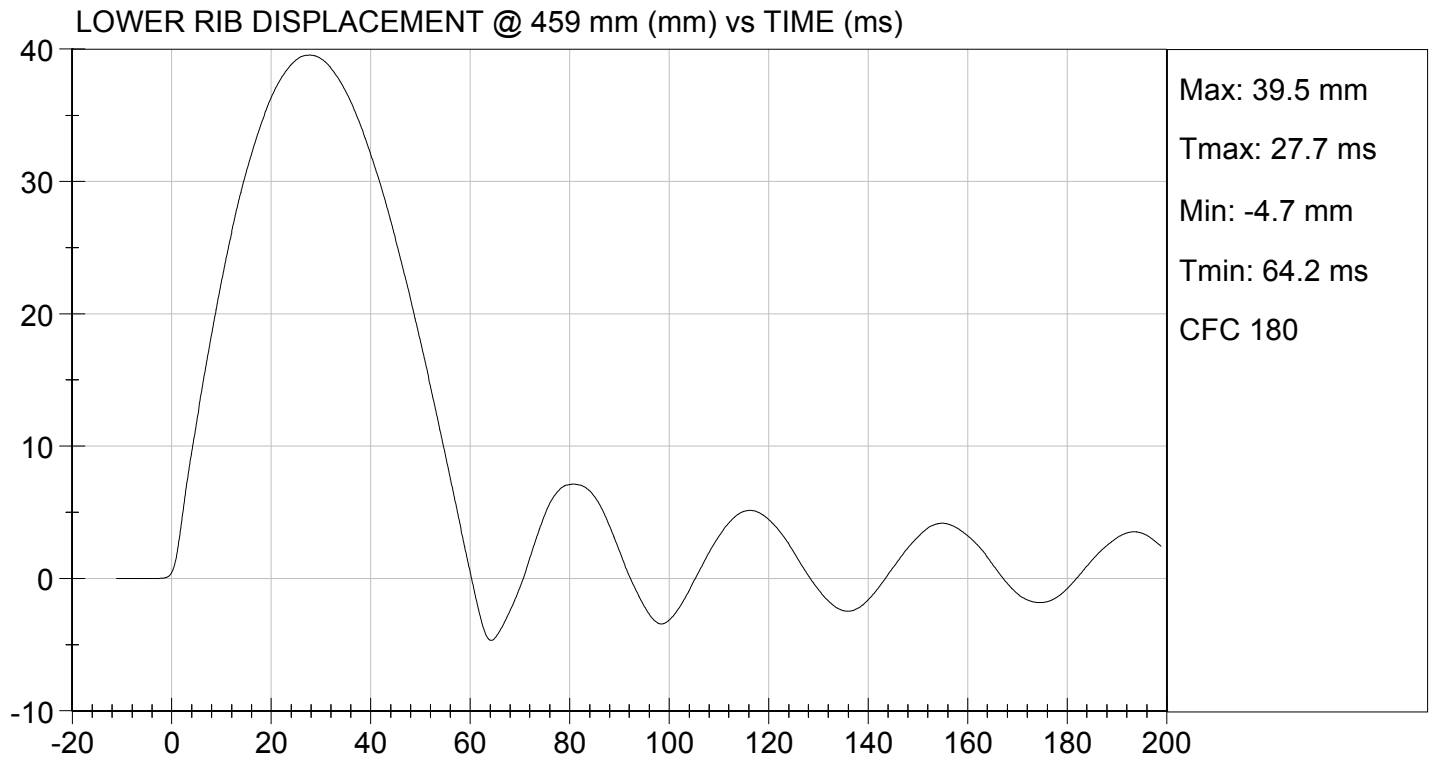
Test I.D: D162406

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Displacement at 459 mm	mm	36.0 to 40.0	39.5	Pass
Displacement at 815 mm	mm	46.0 to 51.0	50.7	Pass
			Overall Test Results	Pass


Laboratory Technician

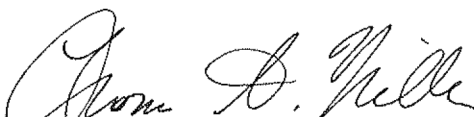
07/14/2016
Test Date


Approved By



MGA RESEARCH CORPORATION**THORAX IMPACT TEST****ES-2re DUMMY****ATD Serial No:** 032**Test I.D:** D162400

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.8	Pass
Humidity	%	10 to 70	46	Pass
Probe Speed	m/s	5.40 to 5.60	5.52	Pass
Maximum Impactor Force (after 6 ms)	N	5100 to 6200	5855	Pass
Upper Rib Displacement	mm	34.0 to 41.0	38.0	Pass
Middle Rib Displacement	mm	37.0 to 45.0	40.9	Pass
Lower Rib Displacement	mm	37.0 to 44.0	40.7	Pass
Overall Test Results				Pass


Laboratory Technician

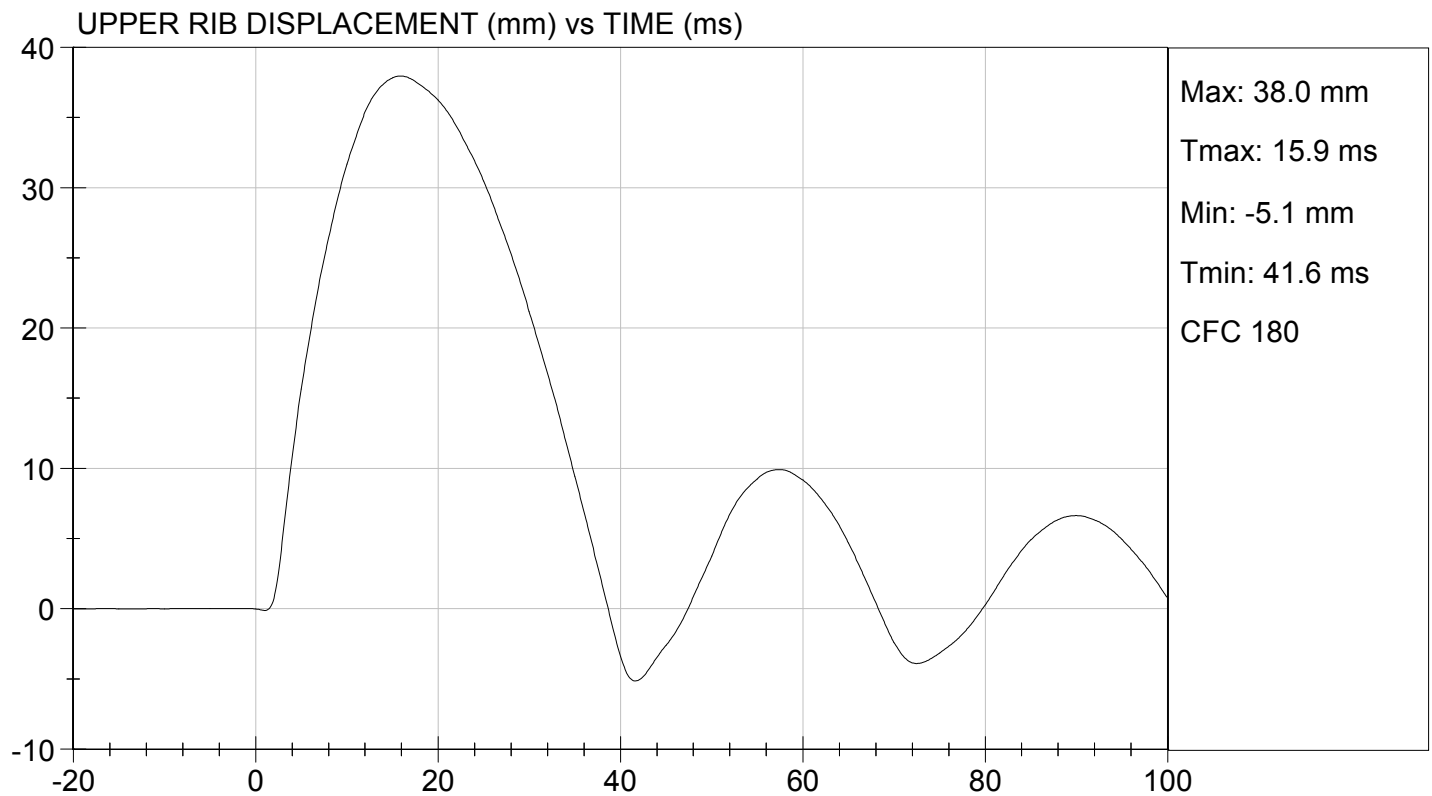
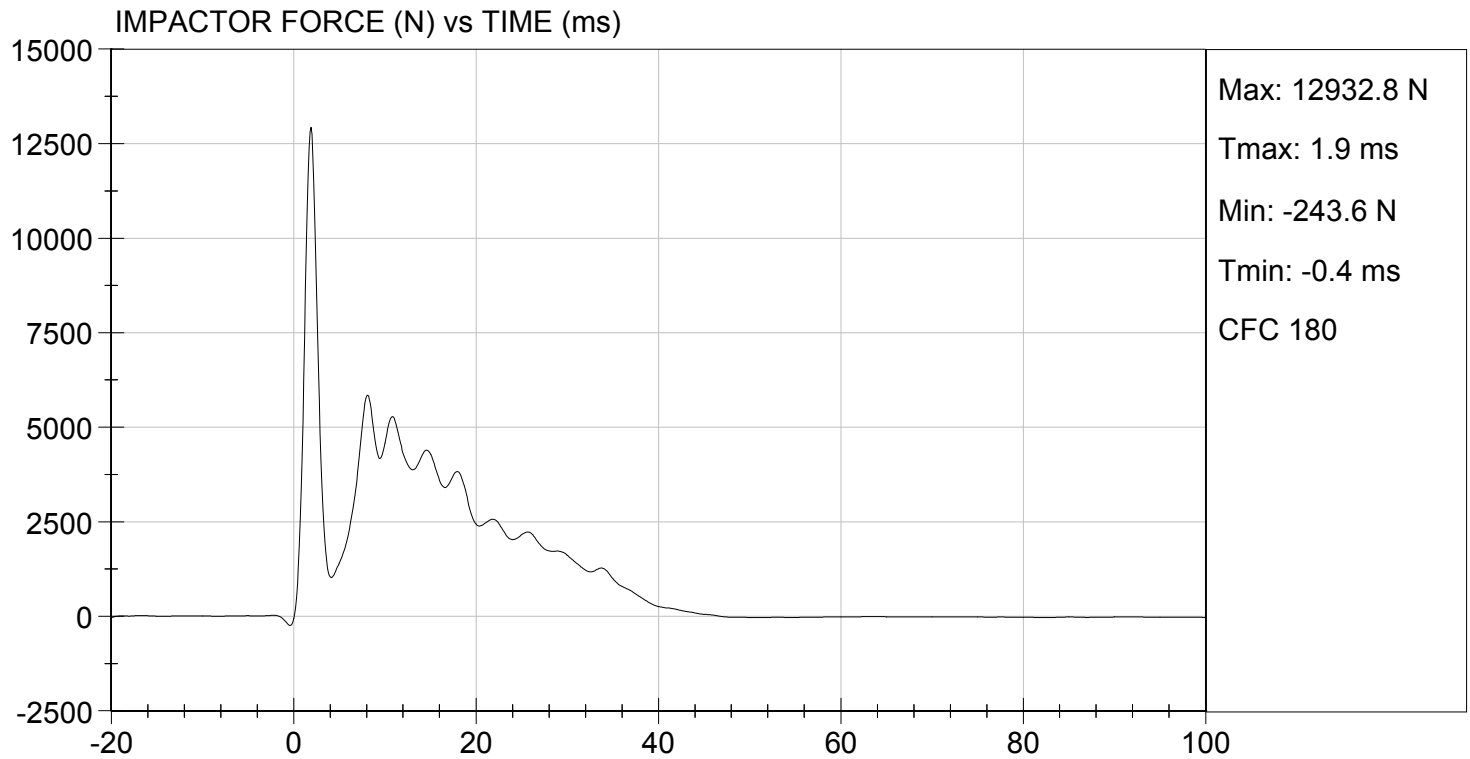
07/14/2016
Test Date


Approved By



TEST DESC: THORAX IMPACT
VELOCITY: 18.12 ft/s, 5.52 m/s

TEST DATE: 07/14/2016
TEST #: D162400

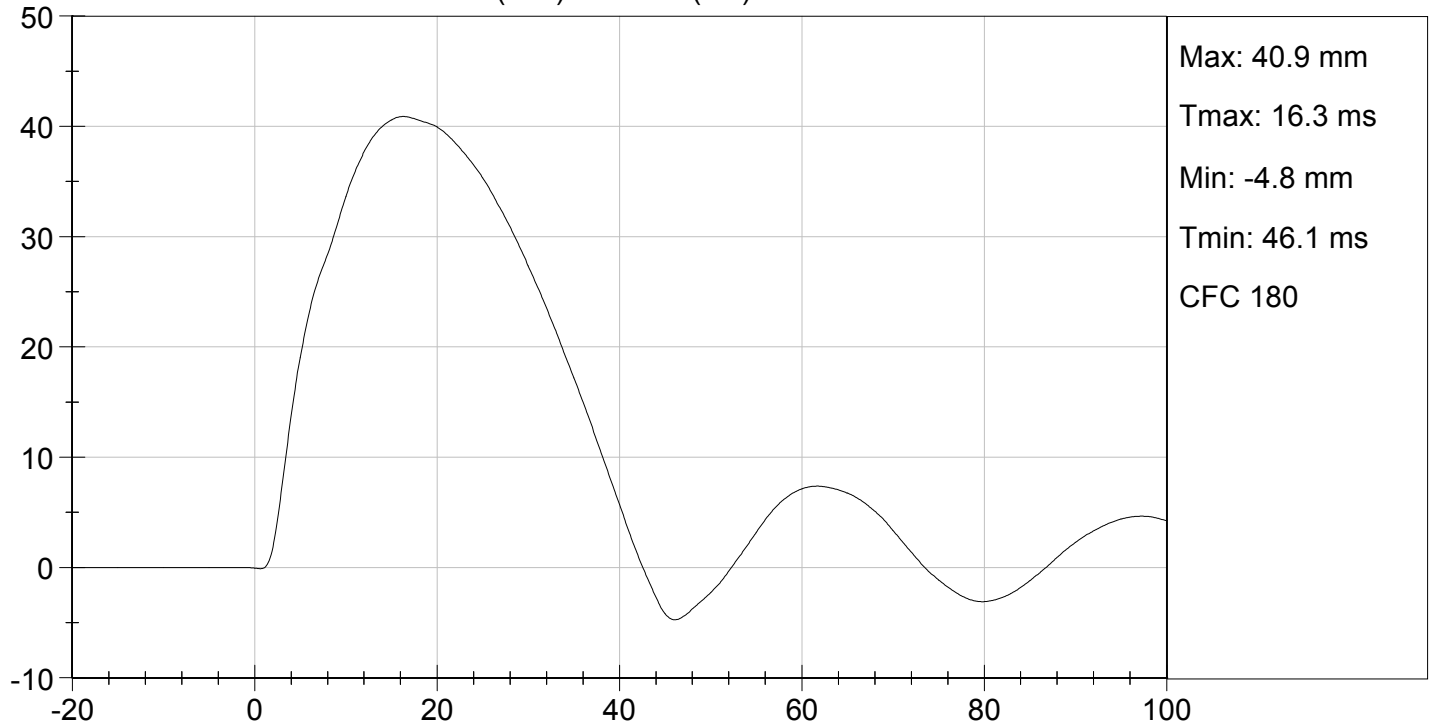




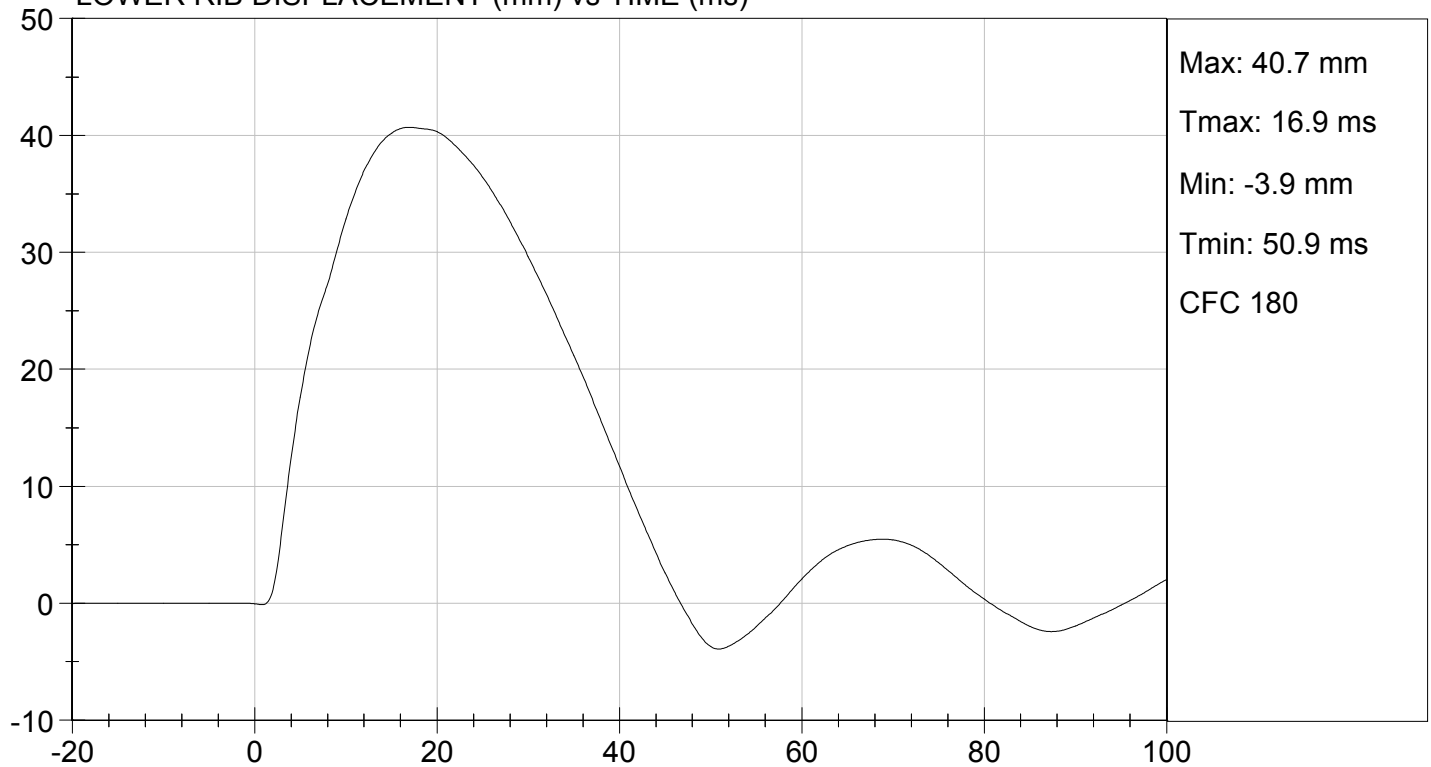
TEST DESC: THORAX IMPACT
VELOCITY: 18.12 ft/s, 5.52 m/s

TEST DATE: 07/14/2016
TEST #: D162400

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:** D162407

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	46	Pass
Probe Speed	m/s	3.90 to 4.10	4.00	Pass
Maximum Impactor Force	N	4000 to 4800	4539	Pass
Time of Maximum Impactor Force	ms	10.6 to 13.0	11.6	Pass
Maximum Total Abdomen Force	N	2200 to 2700	2380	Pass
Time of Maximum Abdomen Force	ms	10.0 to 12.3	11.6	Pass
Overall Test Results				Pass


Laboratory Technician

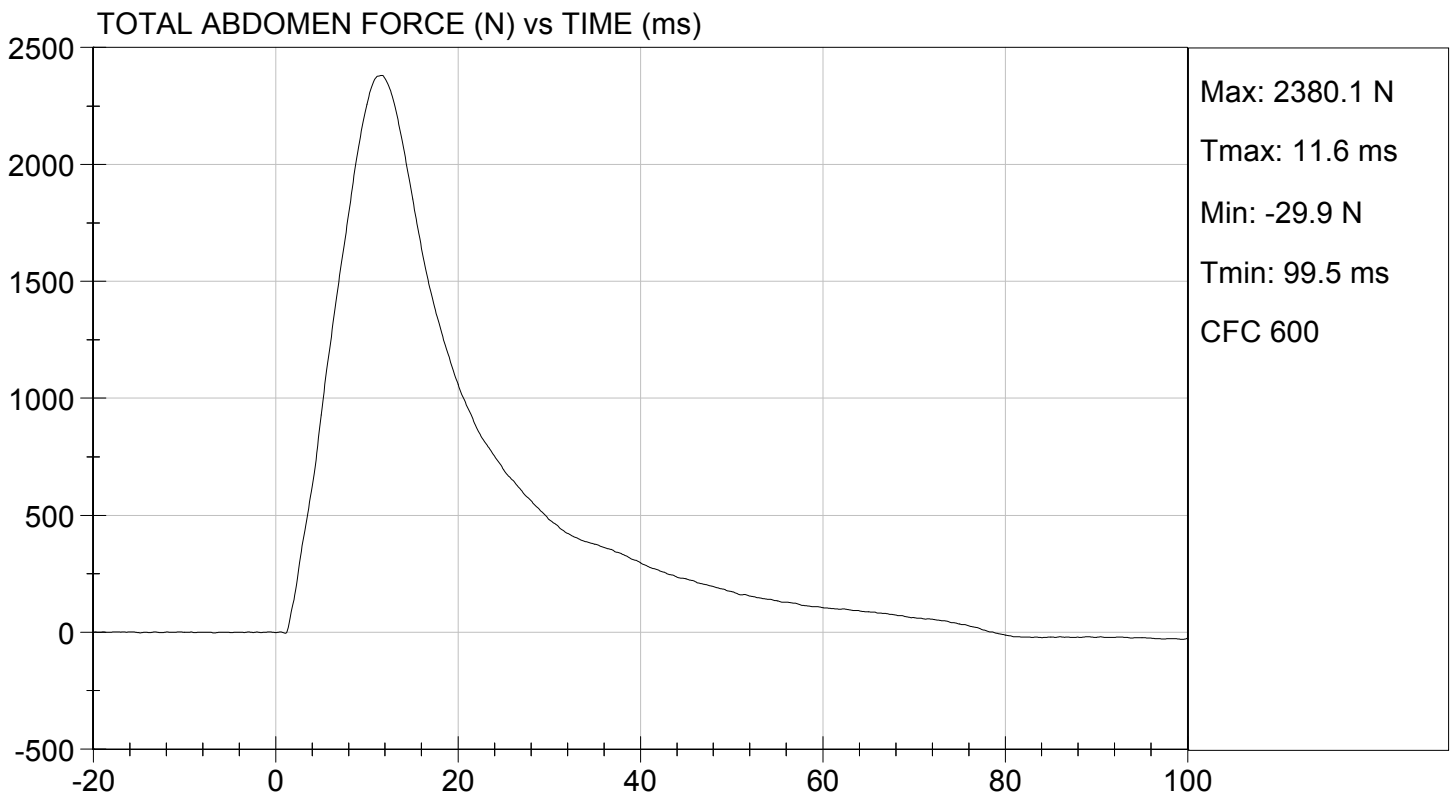
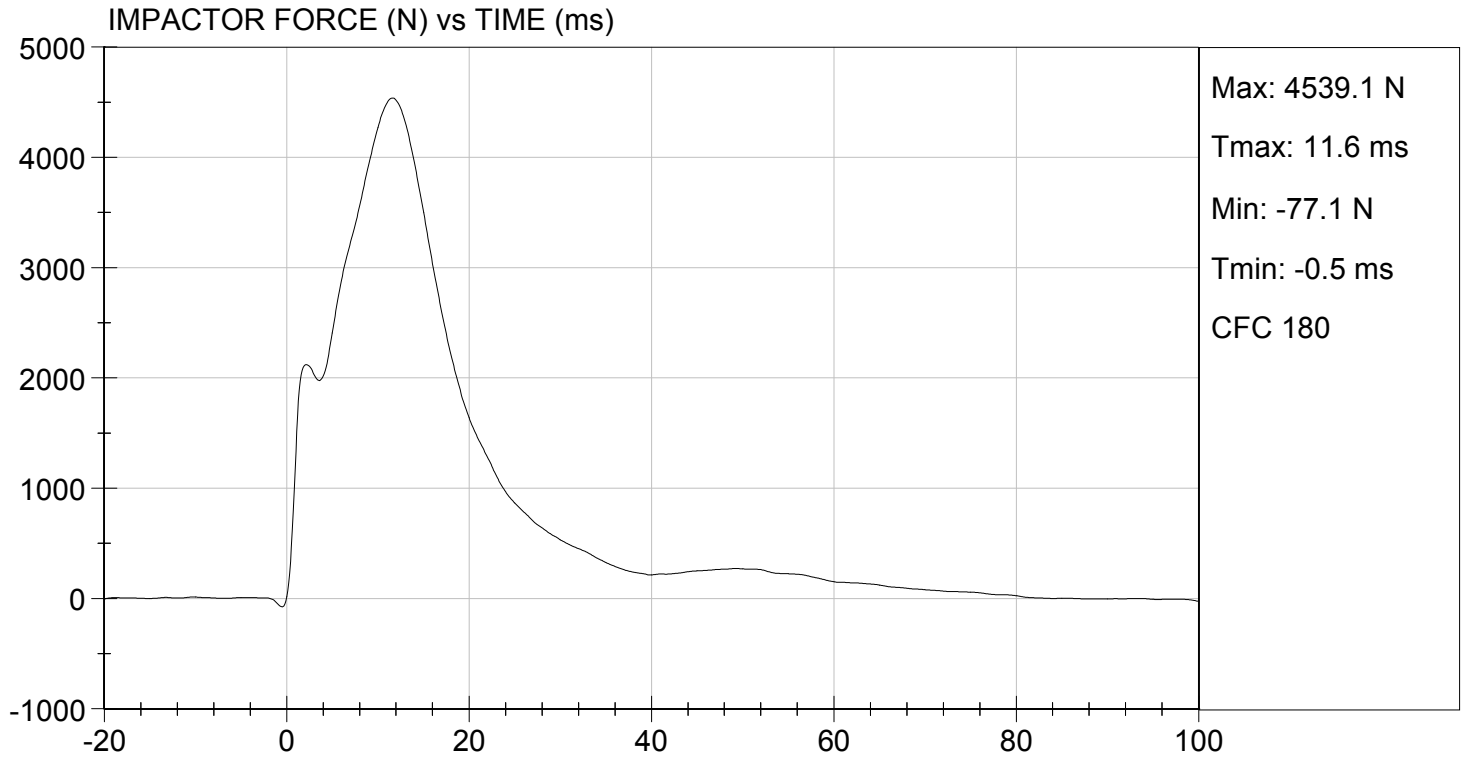
07/14/2016
Test Date


Approved By



TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.12 ft/s, 4.00 m/s

TEST DATE: 07/14/2016
TEST #: D162407

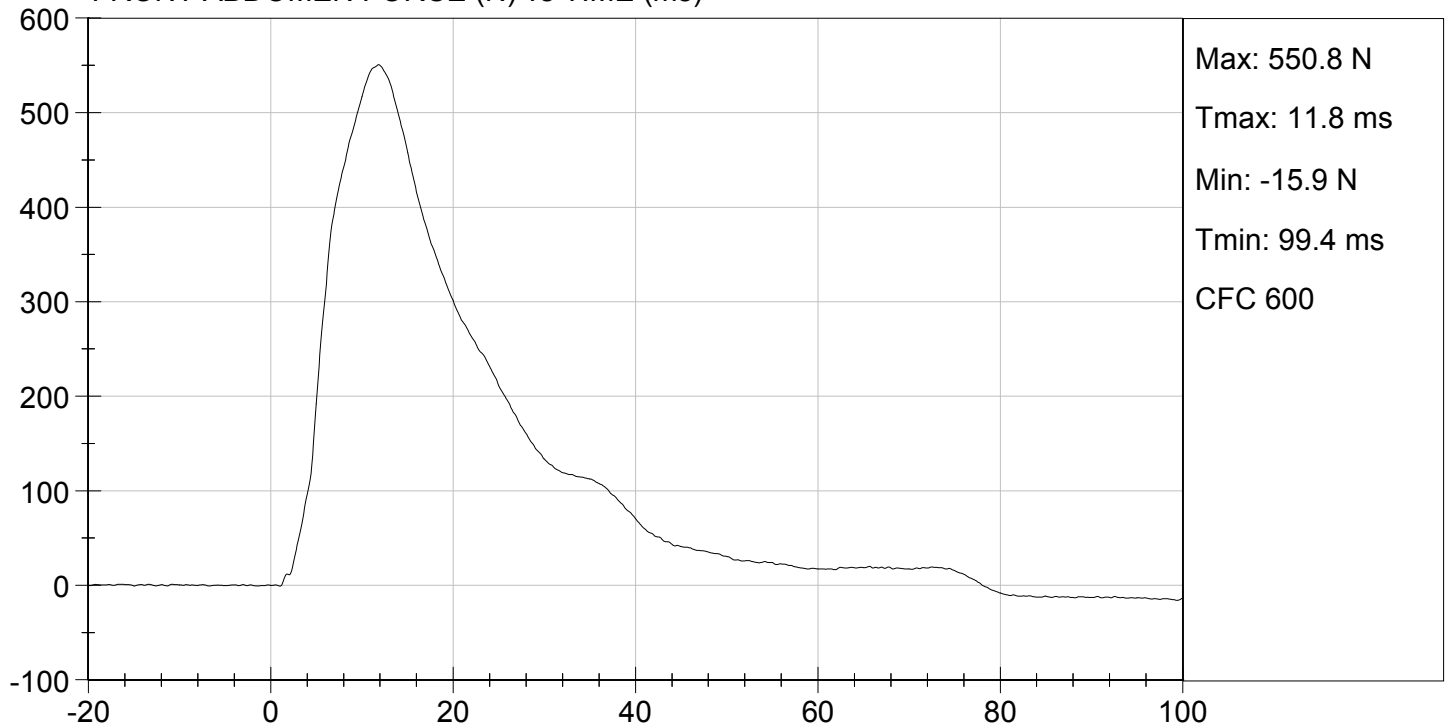




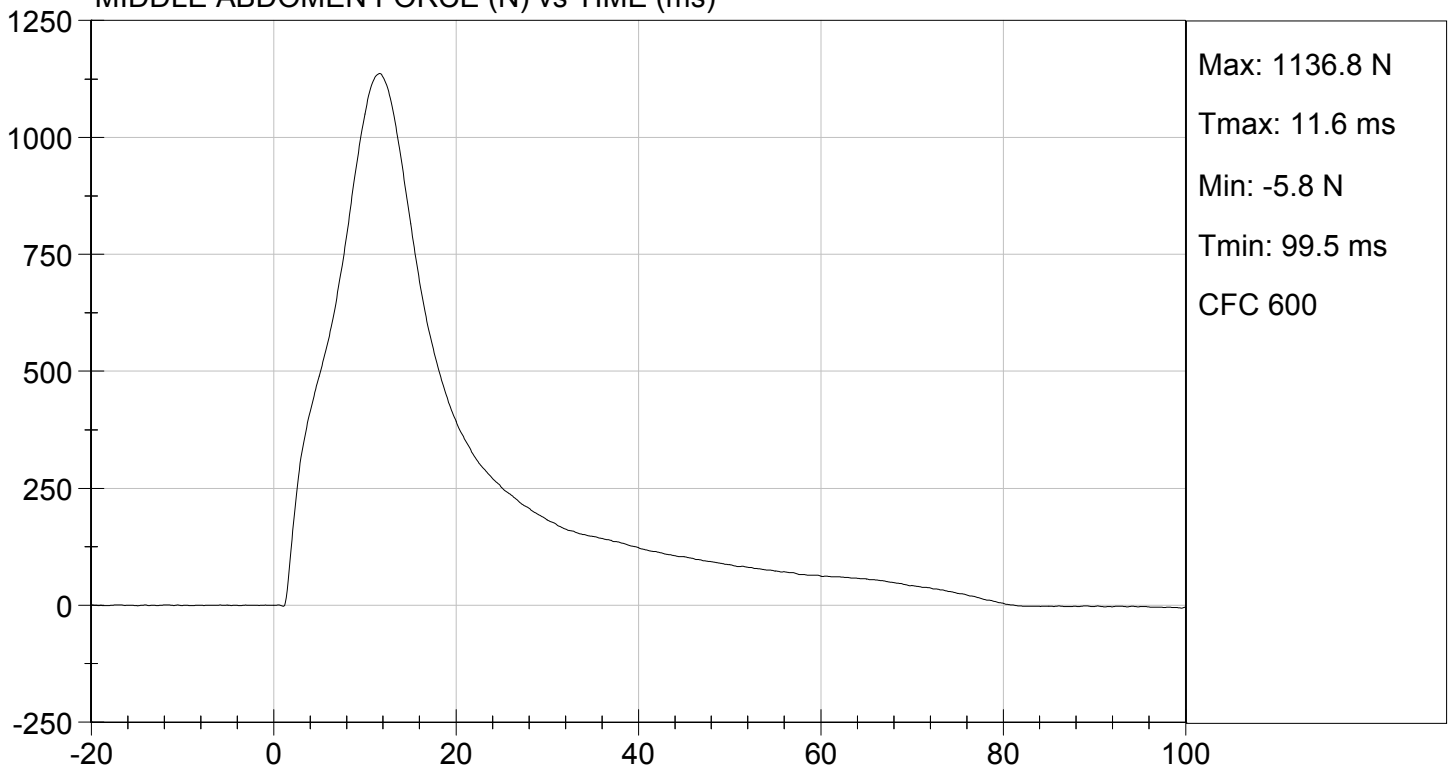
TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.12 ft/s, 4.00 m/s

TEST DATE: 07/14/2016
TEST #: D162407

FRONT ABDOMEN FORCE (N) vs TIME (ms)



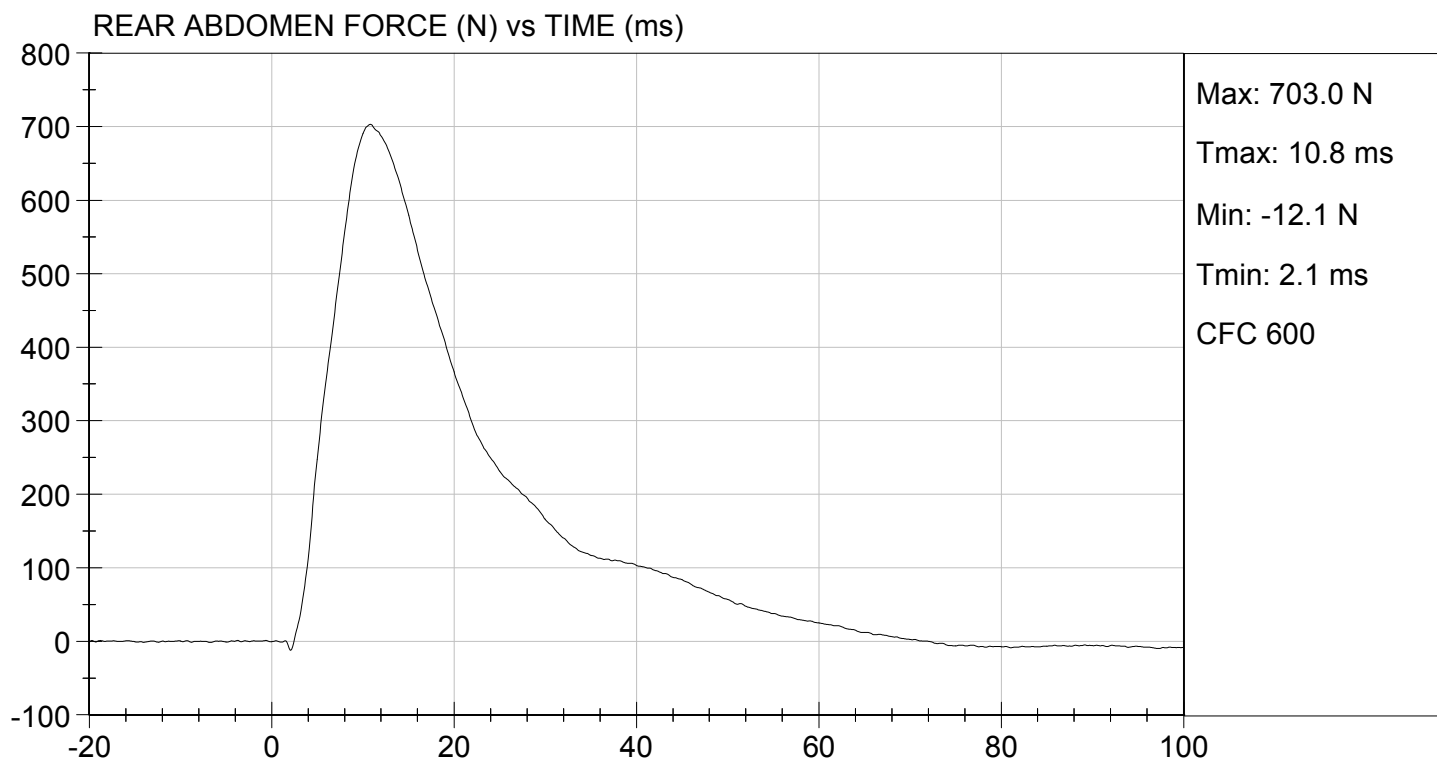
MIDDLE ABDOMEN FORCE (N) vs TIME (ms)





TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.12 ft/s, 4.00 m/s

TEST DATE: 07/14/2016
TEST #: D162407



MGA RESEARCH CORPORATION

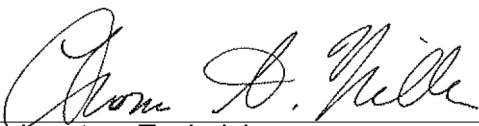
ABDOMEN TEST

ES-2re DUMMY

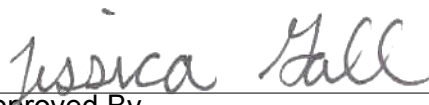
ATD Serial No: 032

Test I.D: D162407

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	46	Pass
Probe Speed	m/s	3.90 to 4.10	4.00	Pass
Maximum Impactor Force	N	4000 to 4800	4539	Pass
Time of Maximum Impactor Force	ms	10.6 to 13.0	11.6	Pass
Maximum Total Abdomen Force	N	2200 to 2700	2380	Pass
Time of Maximum Abdomen Force	ms	10.0 to 12.3	11.6	Pass
Overall Test Results				Pass


Laboratory Technician

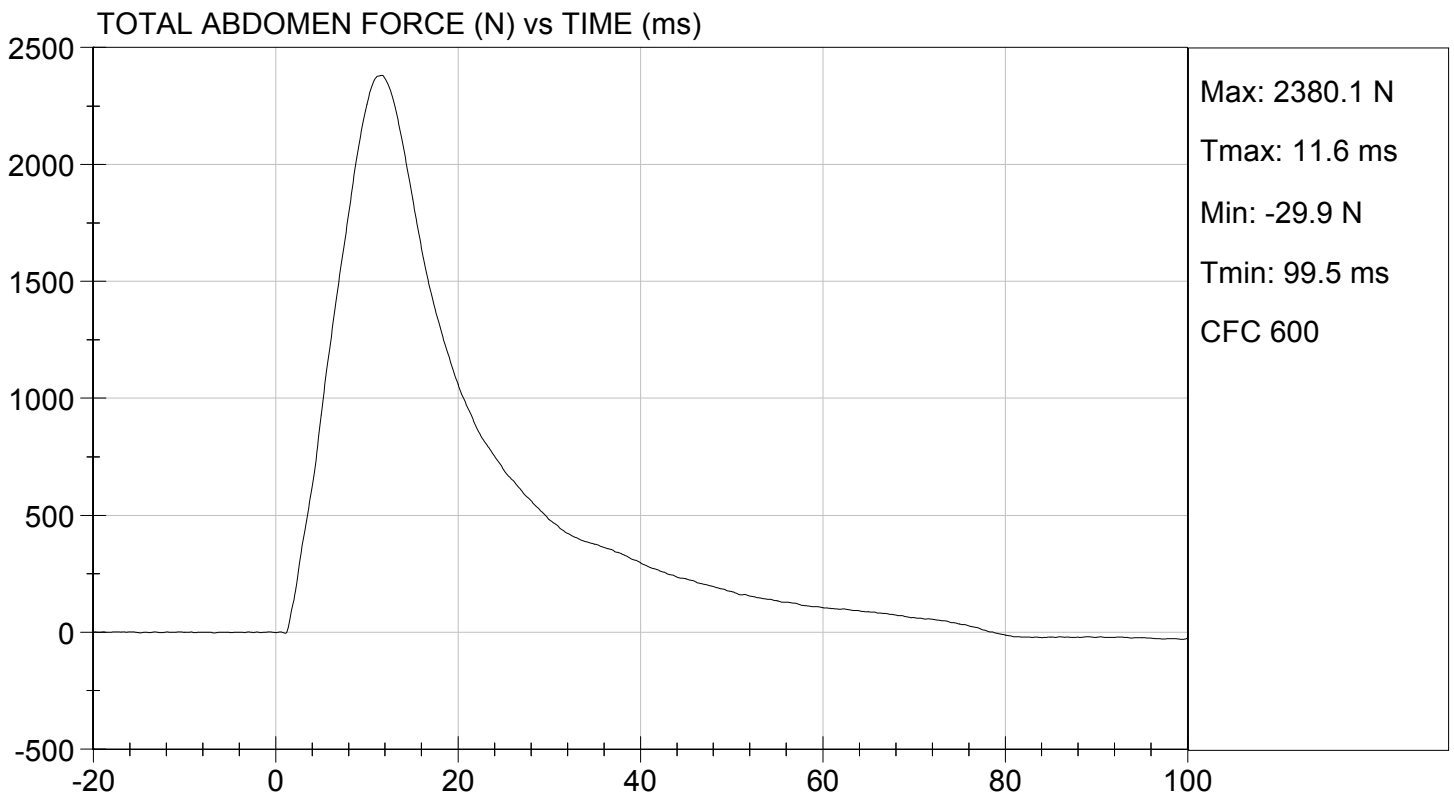
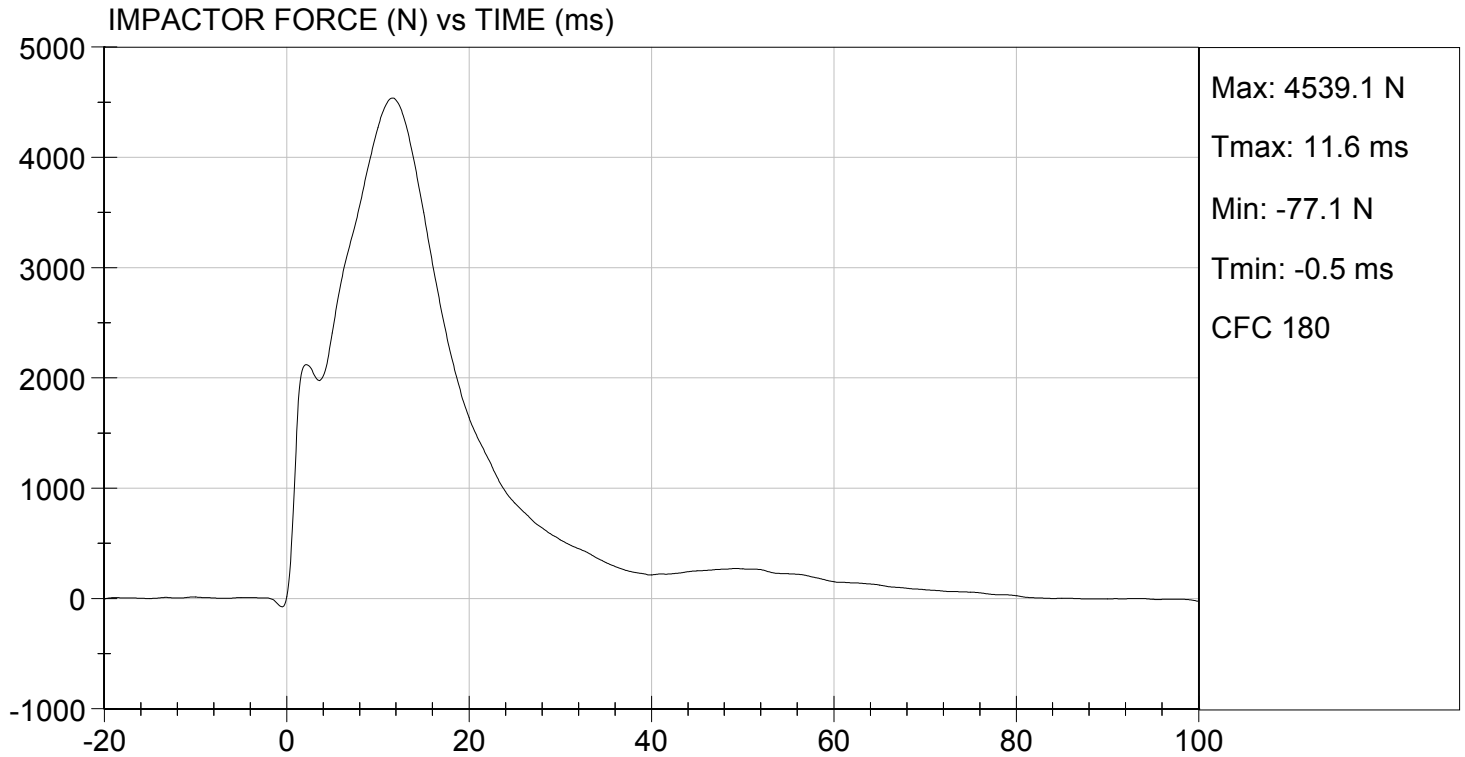
07/14/2016
Test Date


Approved By



TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.12 ft/s, 4.00 m/s

TEST DATE: 07/14/2016
TEST #: D162407

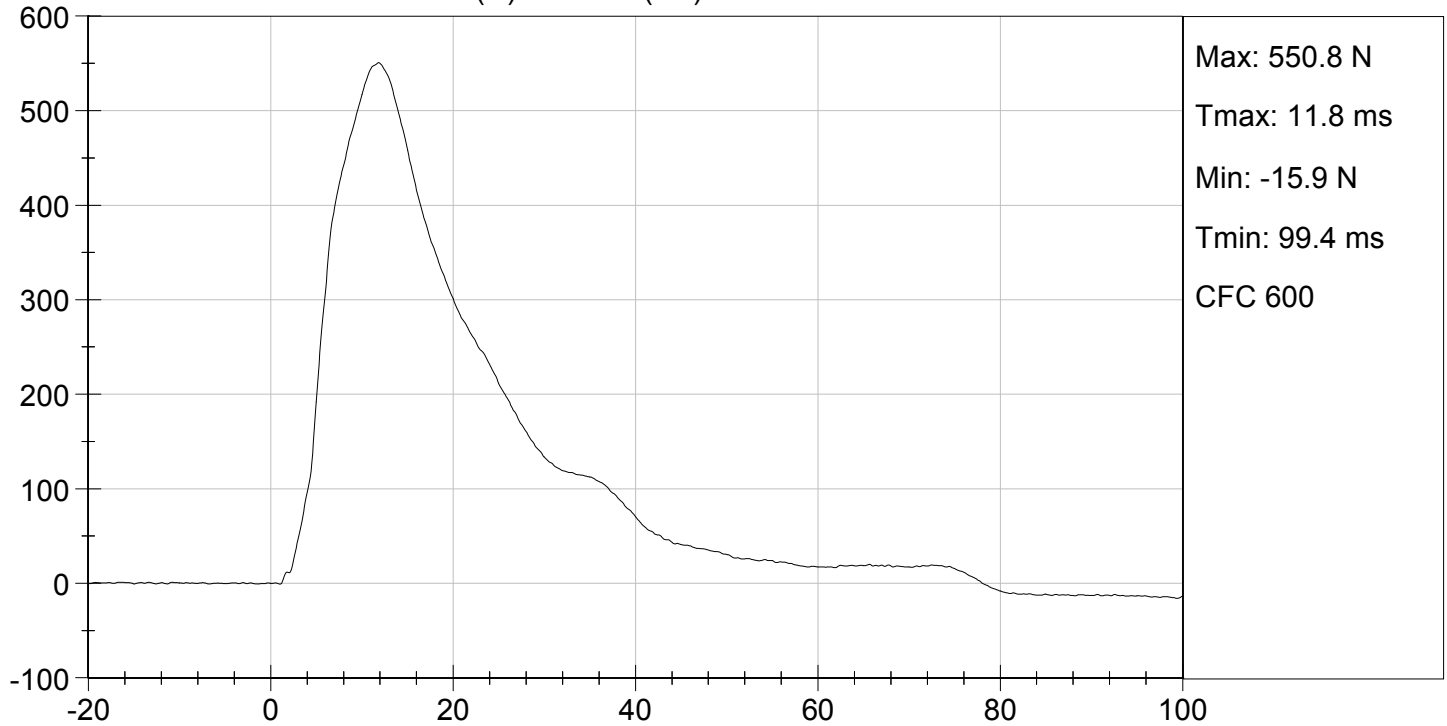




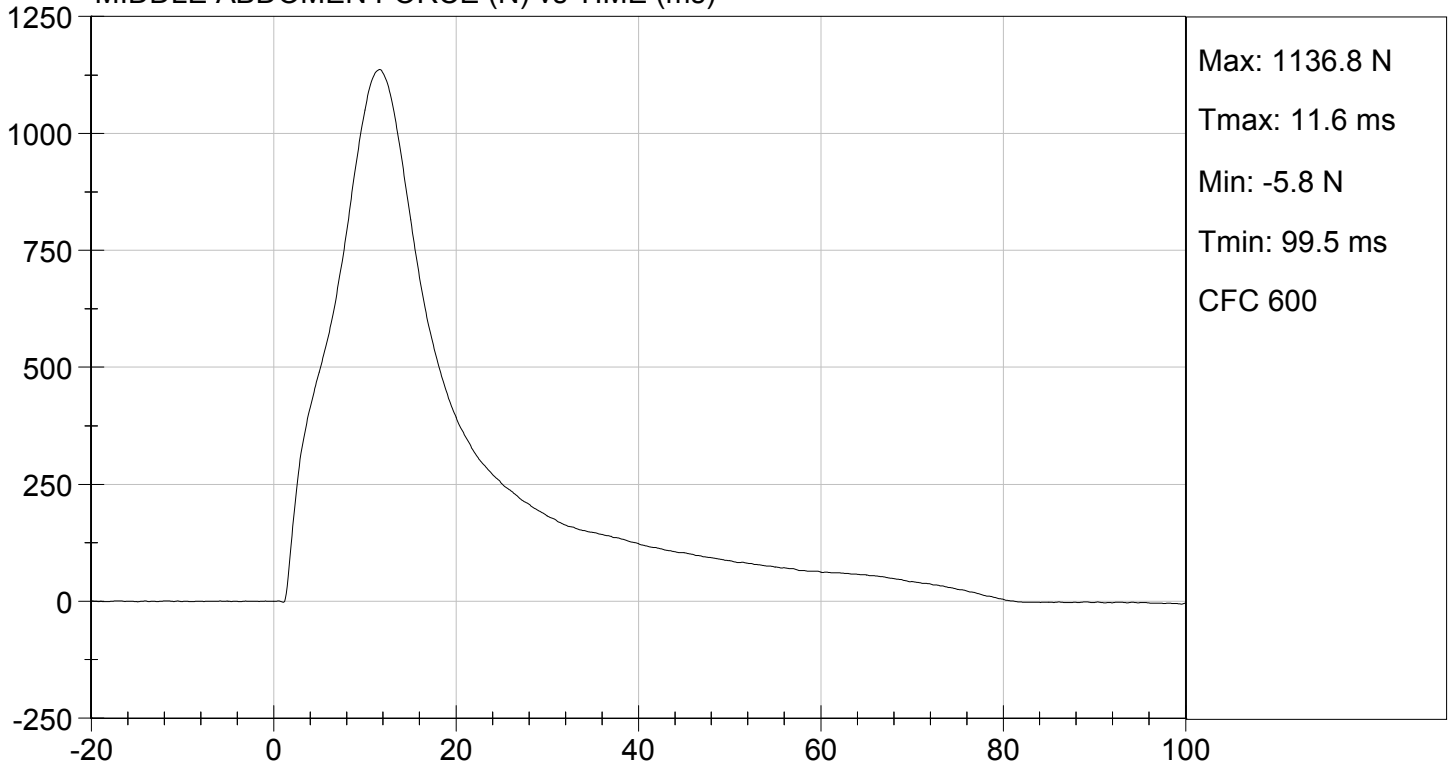
TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.12 ft/s, 4.00 m/s

TEST DATE: 07/14/2016
TEST #: D162407

FRONT ABDOMEN FORCE (N) vs TIME (ms)



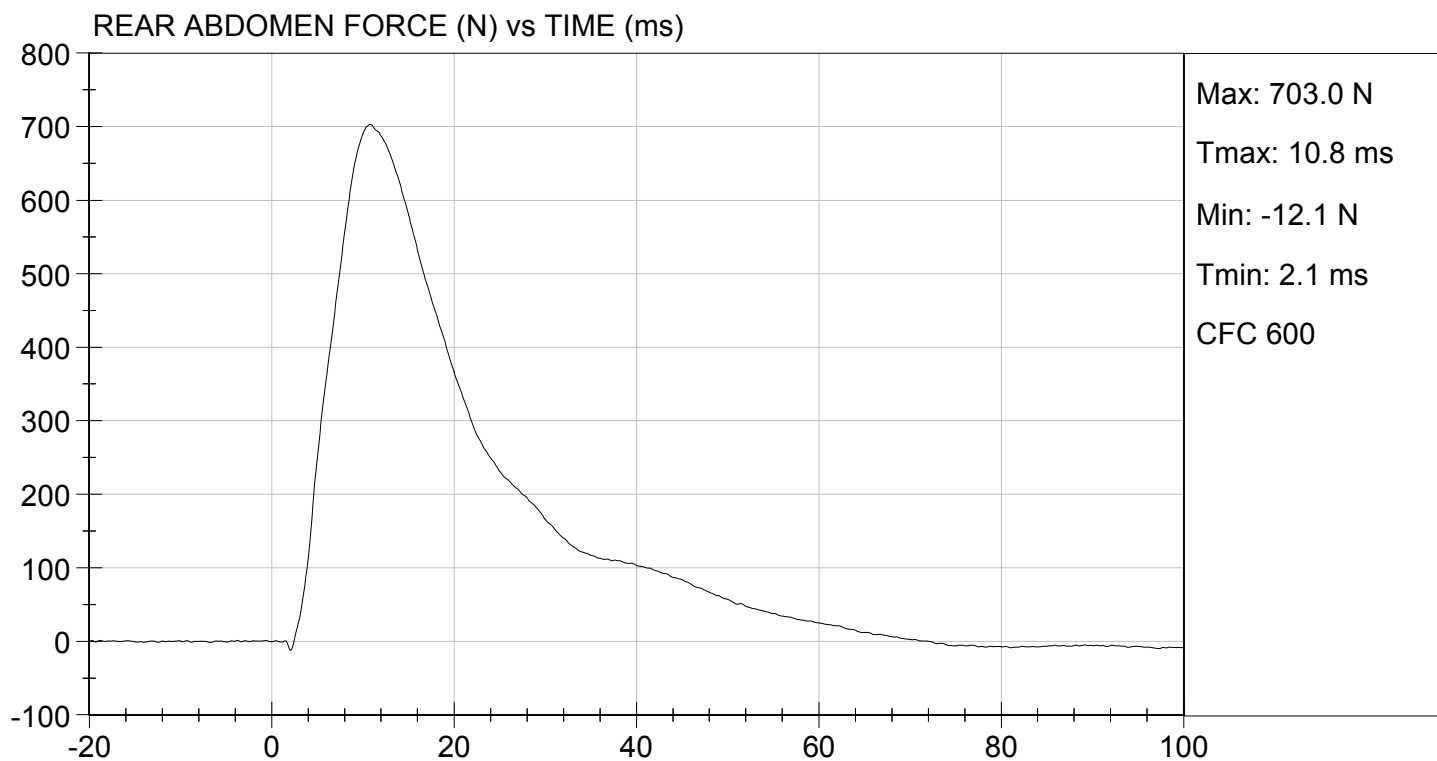
MIDDLE ABDOMEN FORCE (N) vs TIME (ms)





TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.12 ft/s, 4.00 m/s

TEST DATE: 07/14/2016
TEST #: D162407



MGA RESEARCH CORPORATION
LUMBAR SPINE TEST
ES-2re DUMMY

ATD Serial No: 032

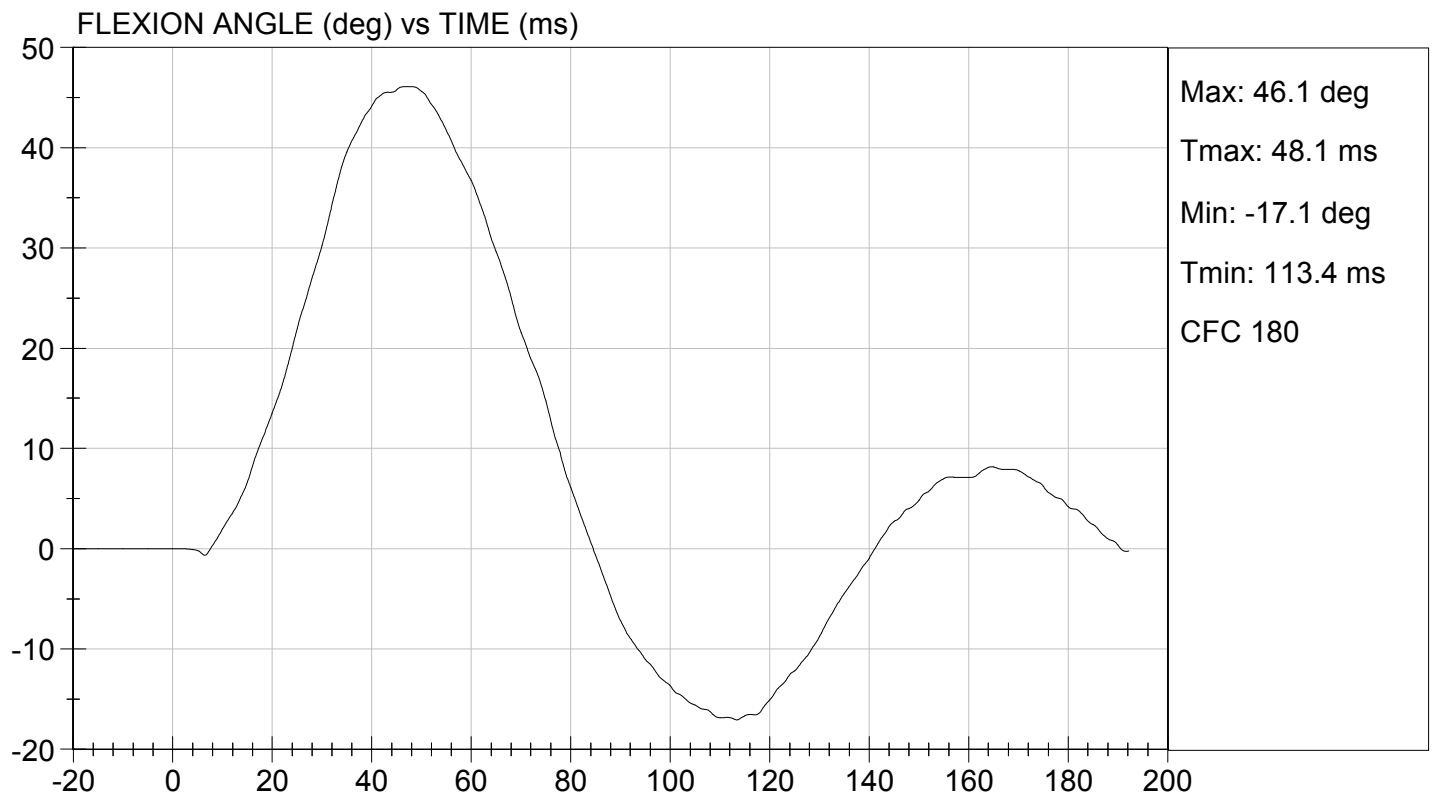
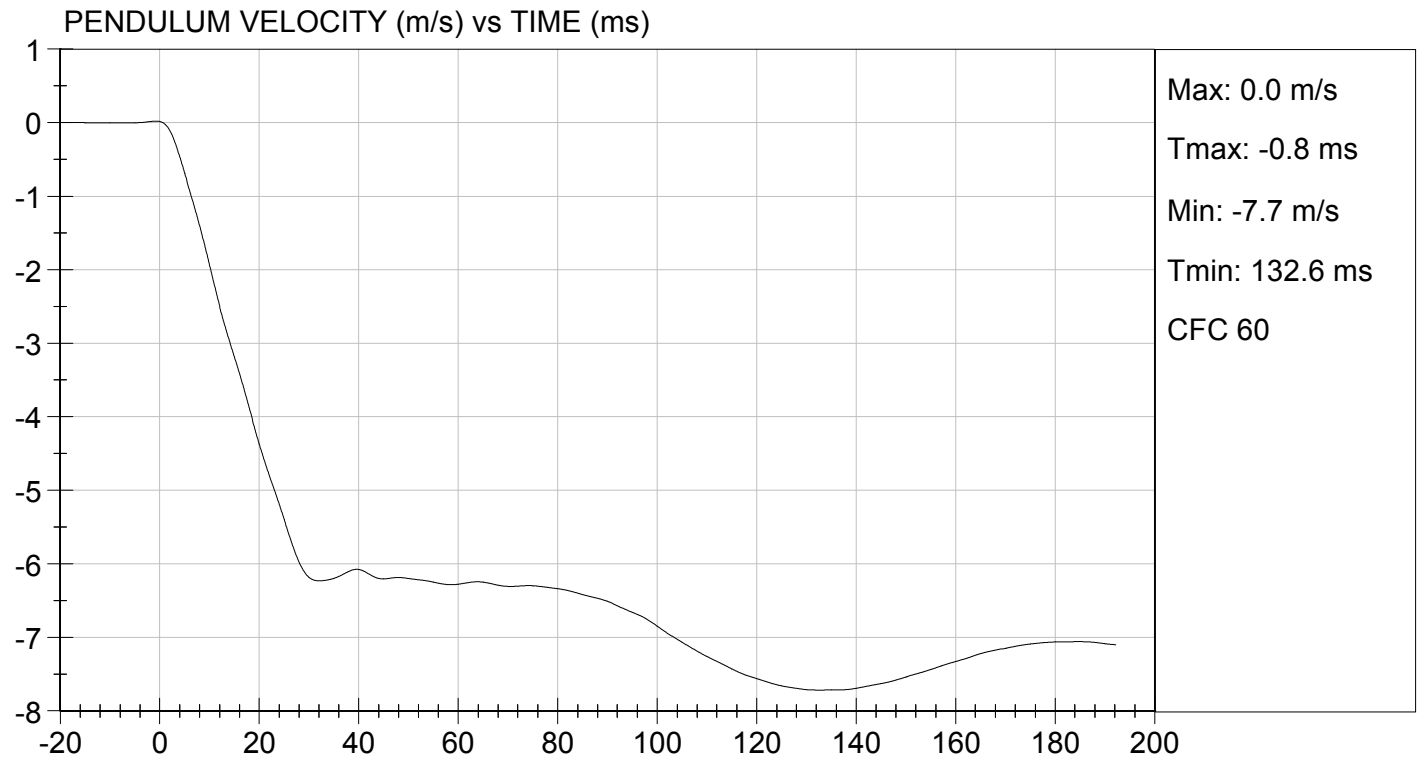
Test I.D: D162408

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity		%	10 to 70	49	Pass
Pendulum Speed		m/s	5.95 to 6.15	6.12	Pass
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	-0.02	Pass
	3.7 ms	m/s	-0.425 to -0.24	-0.400	Pass
	27 ms	m/s	-6.50 to -5.80	-5.80	Pass
	30 ms	m/s	>= -6.50	-6.19	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	46.1	Pass
Time of Maximum Flexion Angle		ms	39.0 to 53.0	48.1	Pass
Headform Rotation Decay to Initial Position		ms	37 to 57	47	Pass
Overall Results					Pass


 Laboratory Technician

07/14/2016
 Test Date

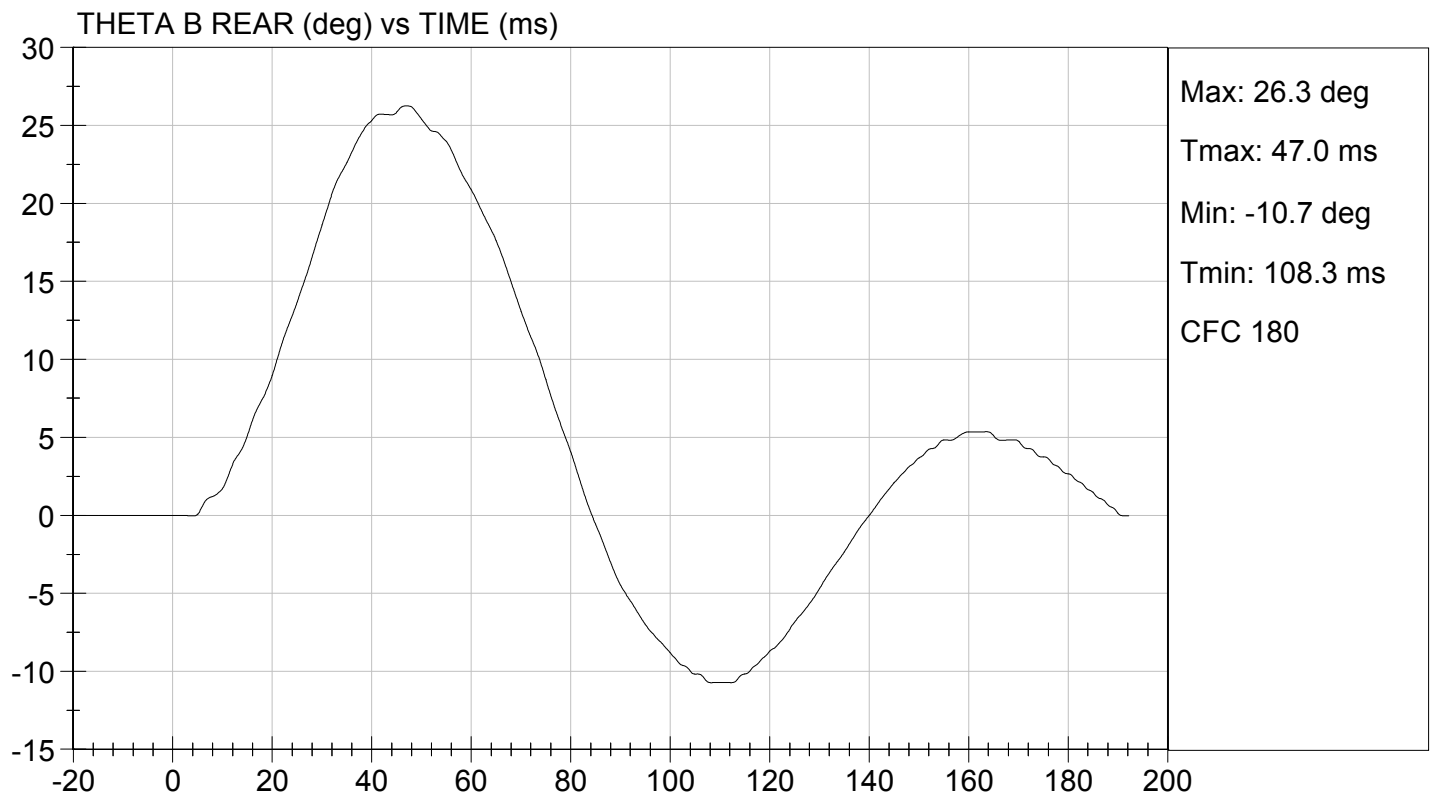
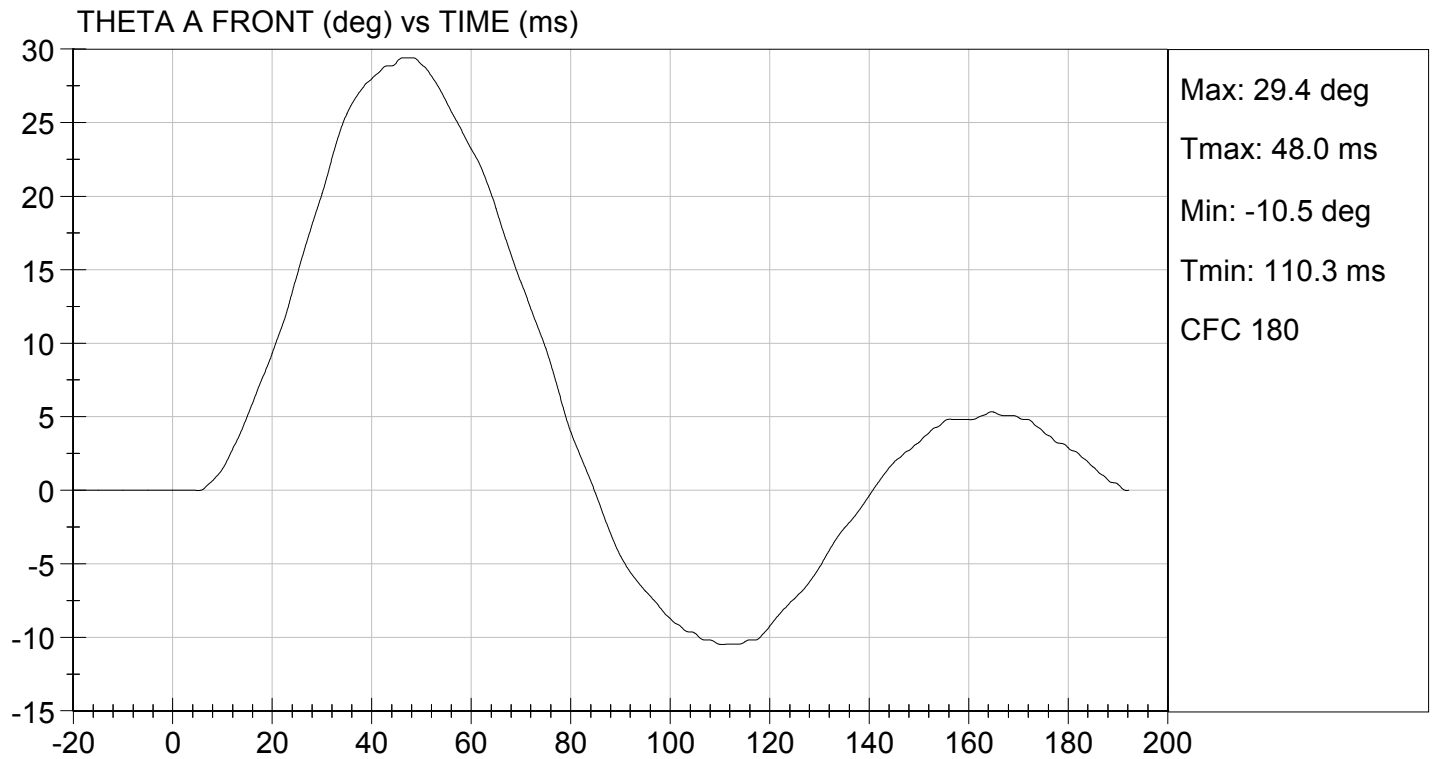

 Approved By





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

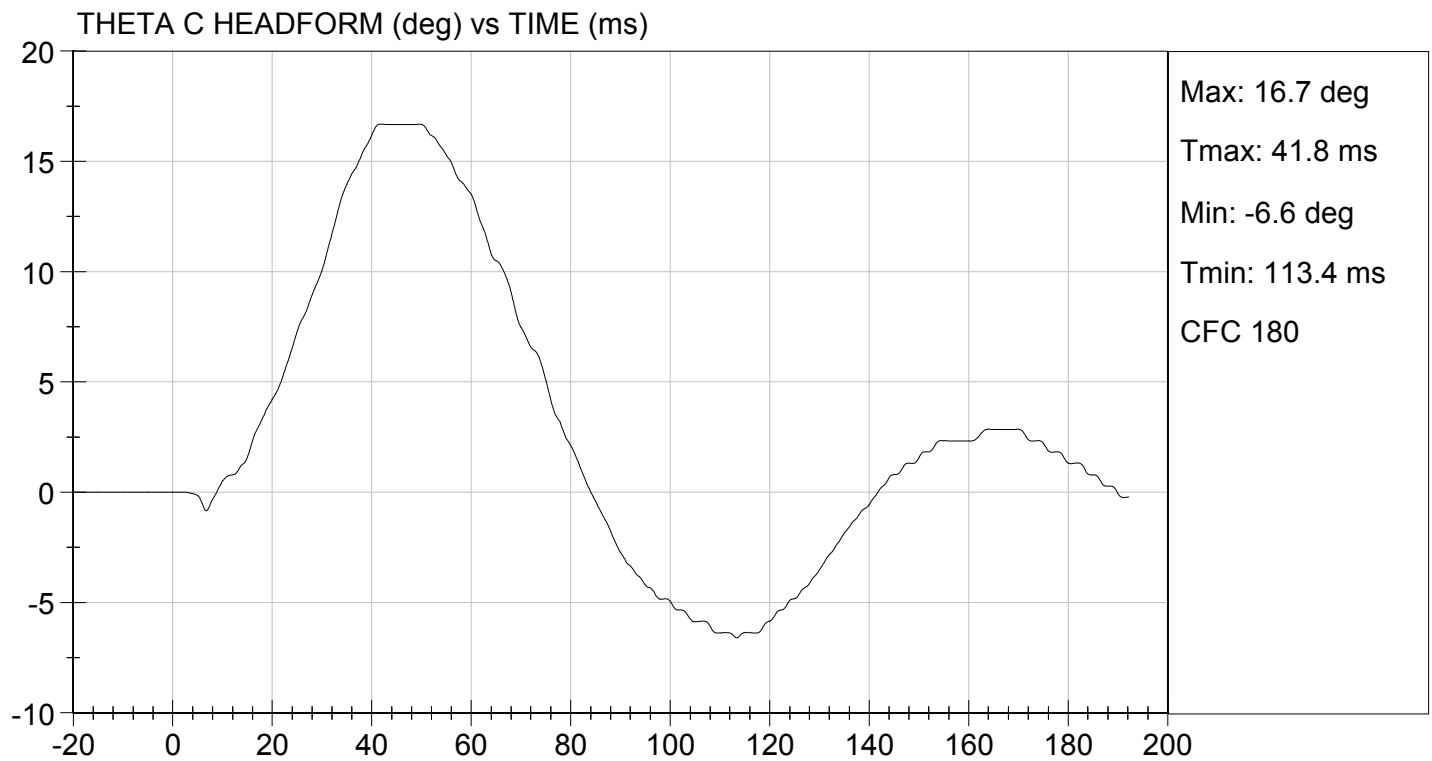
TEST DATE: 07/14/2016
TEST #: D162408





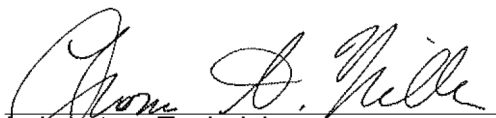
TEST DESC: LUMBAR BENDING
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 07/14/2016
TEST #: D162408



MGA RESEARCH CORPORATION**PELVIS TEST
ES-2re DUMMY****ATD Serial No:** 032**Test I.D:** D162409

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	46	Pass
Probe Speed	m/s	4.20 to 4.40	4.30	Pass
Maximum Impactor Force	N	4700 to 5400	4851	Pass
Time of Maximum Impactor Force	ms	11.8 to 16.1	13.5	Pass
Maximum Pubic Force	N	1230 to 1590	1305	Pass
Time of Maximum Pubic Force	ms	12.2 to 17.0	15.6	Pass
Overall Test Results				Pass


Laboratory Technician

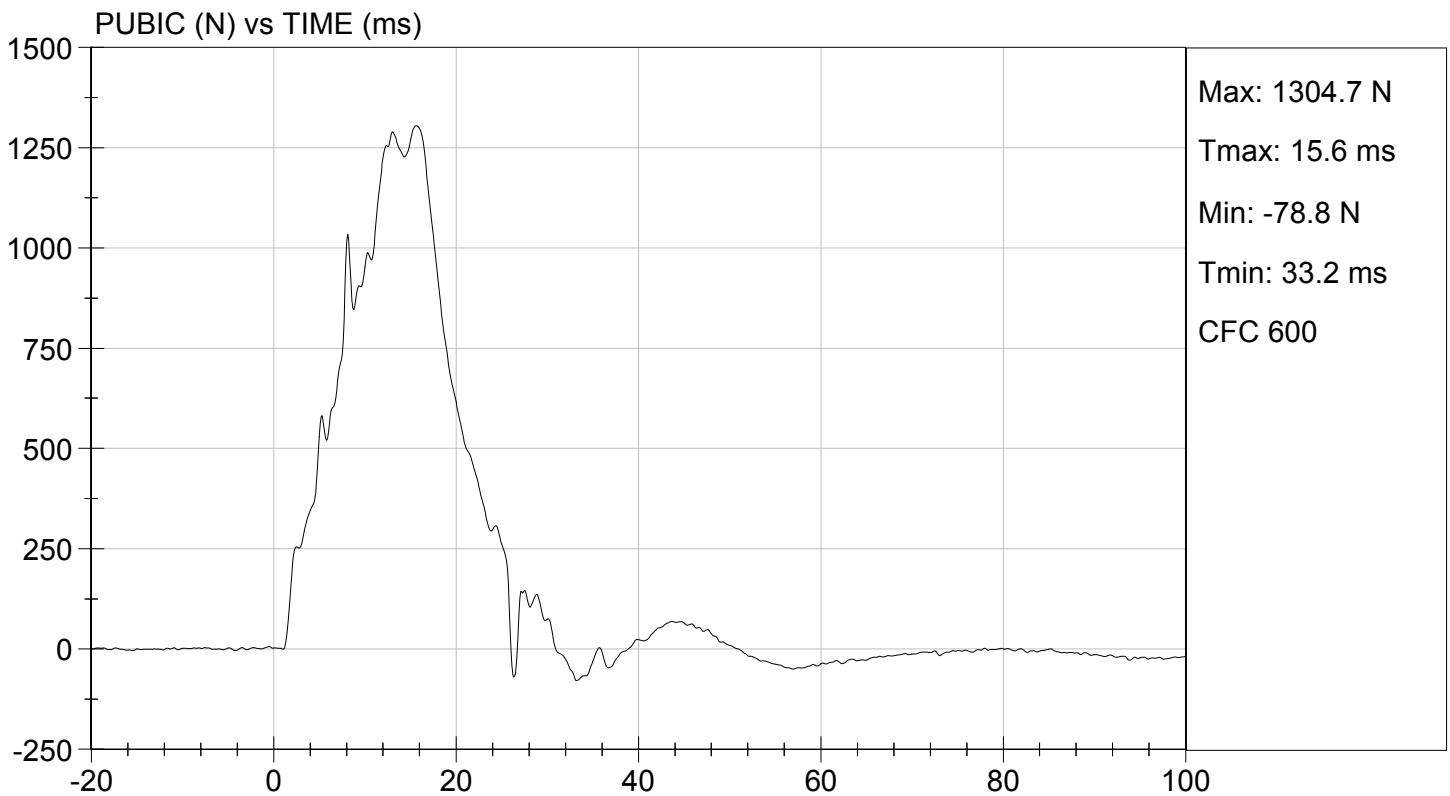
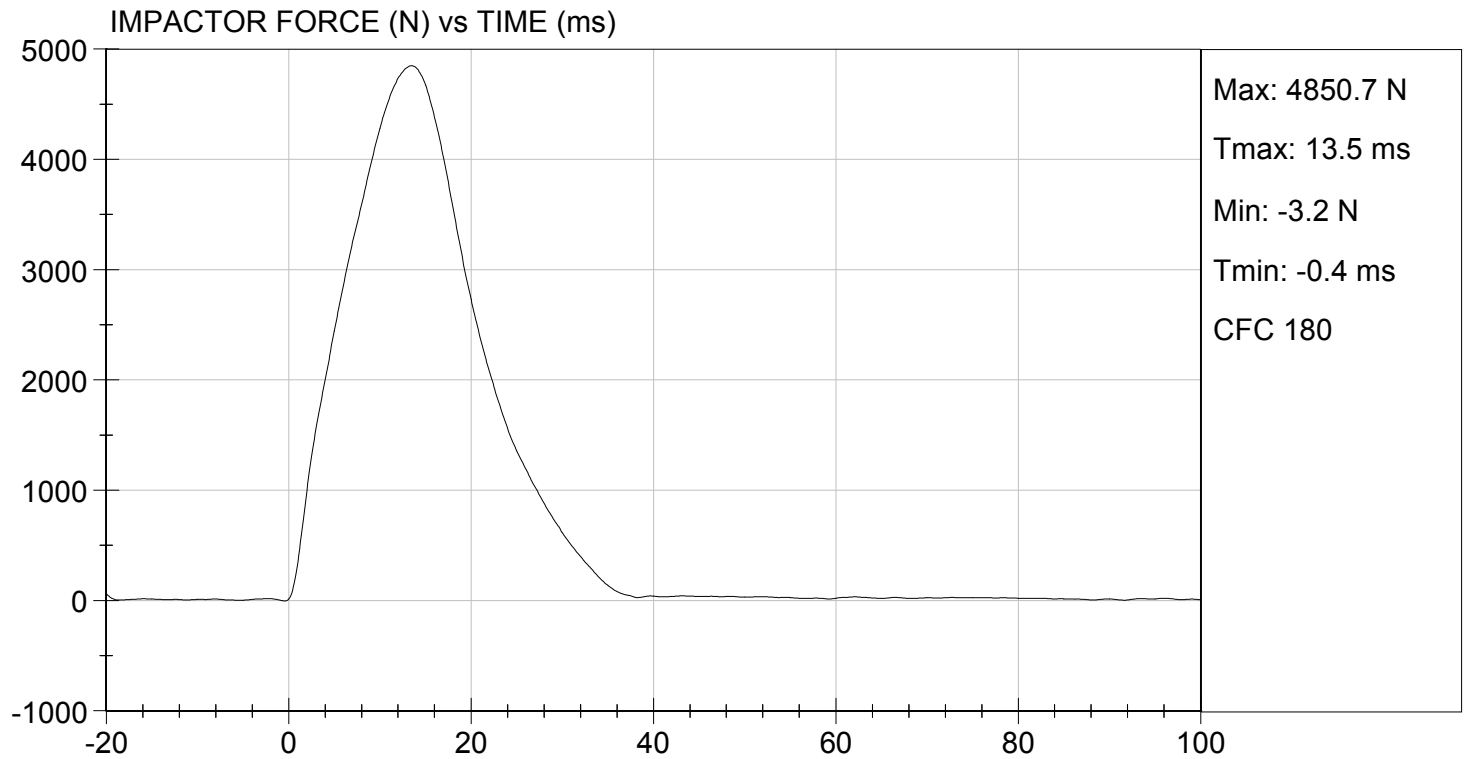
07/14/2016
Test Date


Approved By



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

TEST DATE: 07/14/2016
TEST #: D162409



ES-2re External Measurements
SN: 032

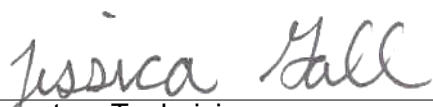
No.	Name	Spec. (mm)	Result	Pass/Fail
1	Sitting Height	900 - 918	915	Pass
2	Seat to Shoulder Joint	558 - 572	568	Pass
3	Seat to Lower Face of Thoracic Spine Box	346 - 356	355	Pass
4	Seat to Hip Joint (center of bolt)	97 - 103	98	Pass
5	Sole to Seat, Sitting	333 - 451	440	Pass
6	Head Width	152 - 158	157	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

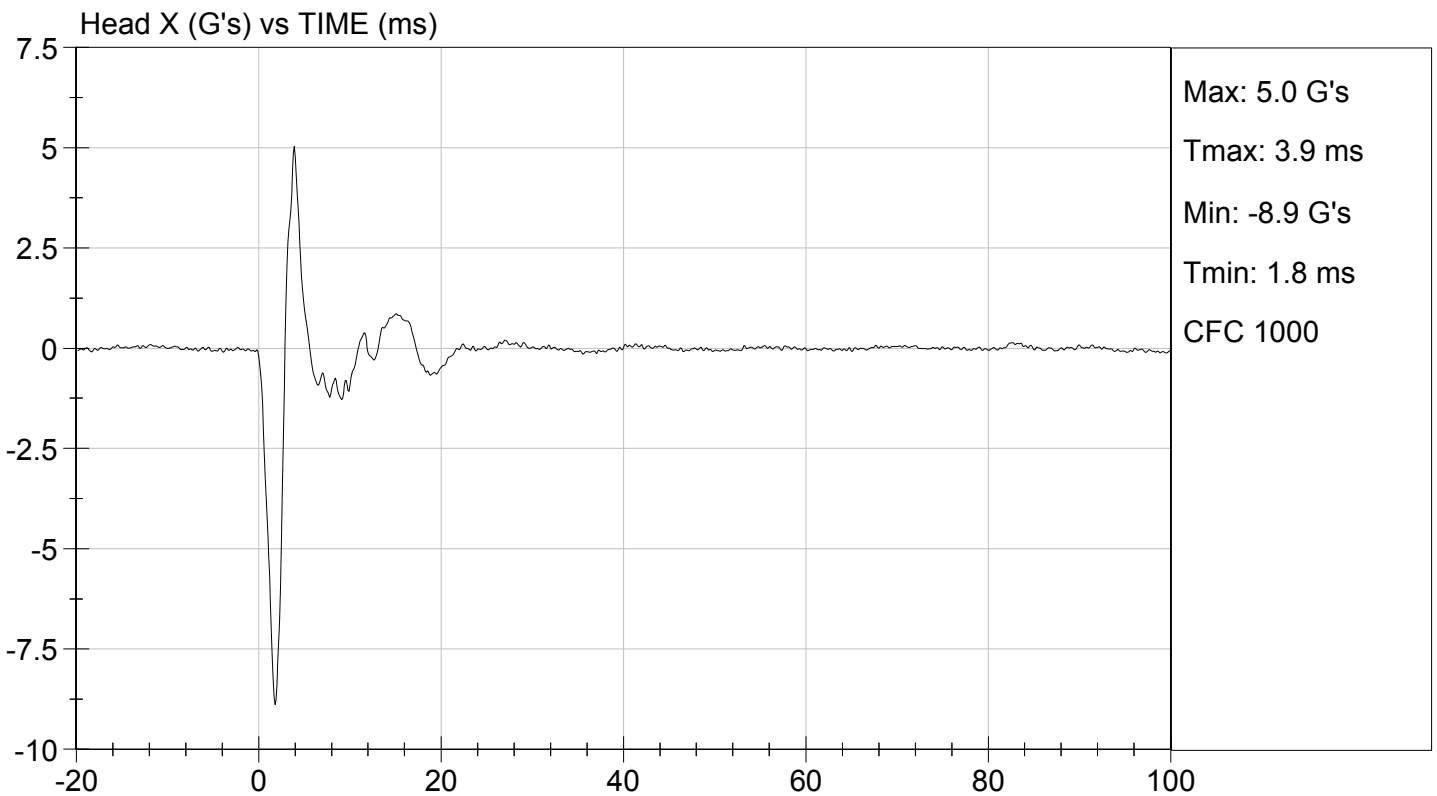
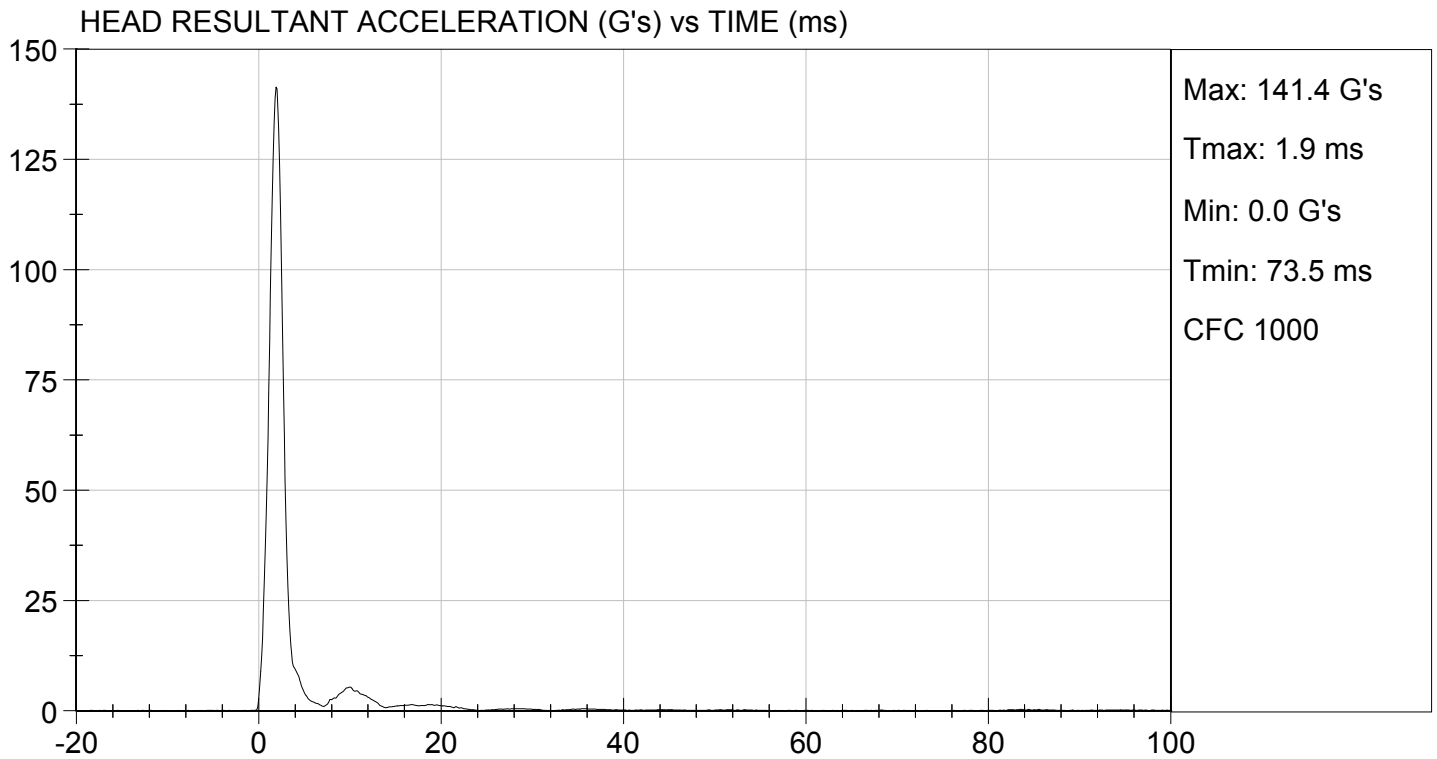
Test ID: D162571

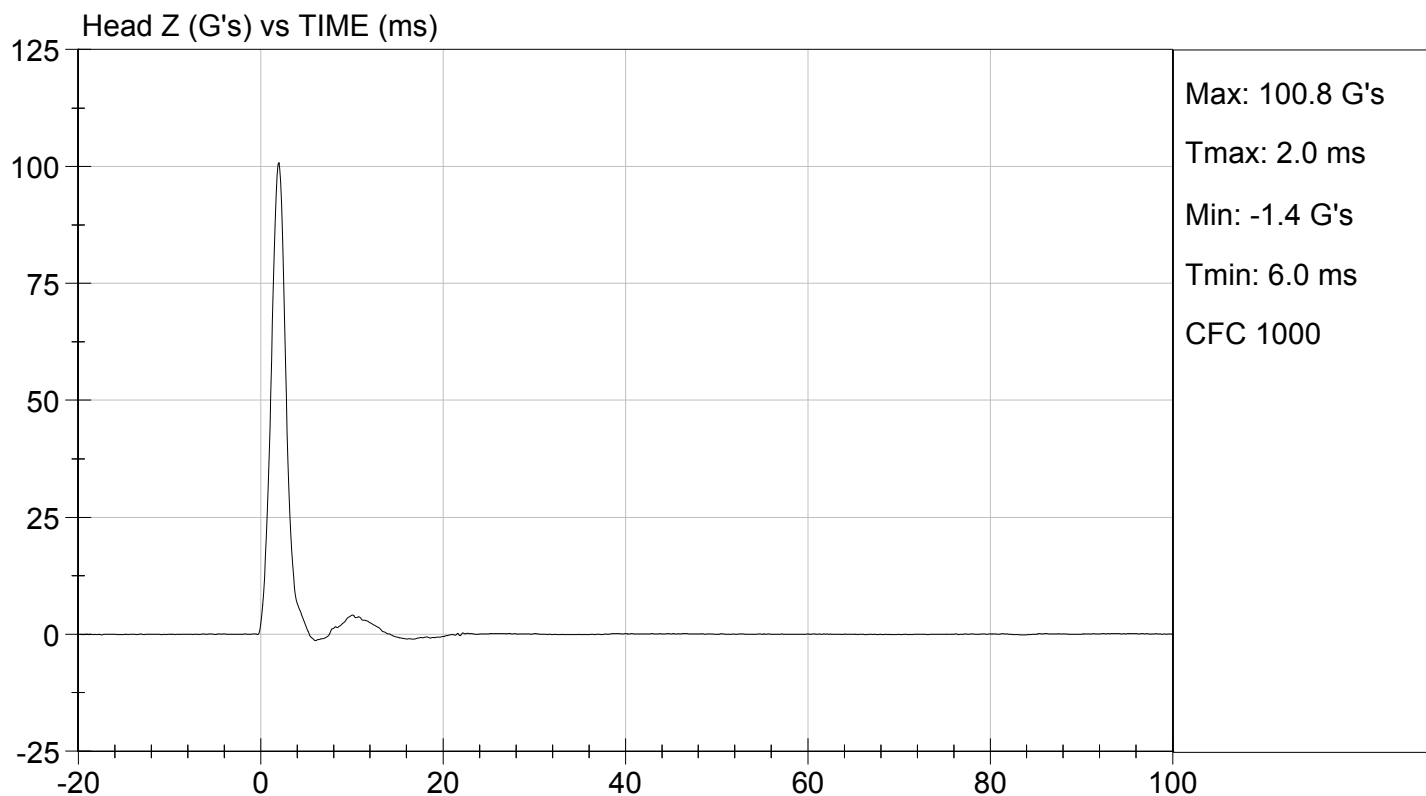
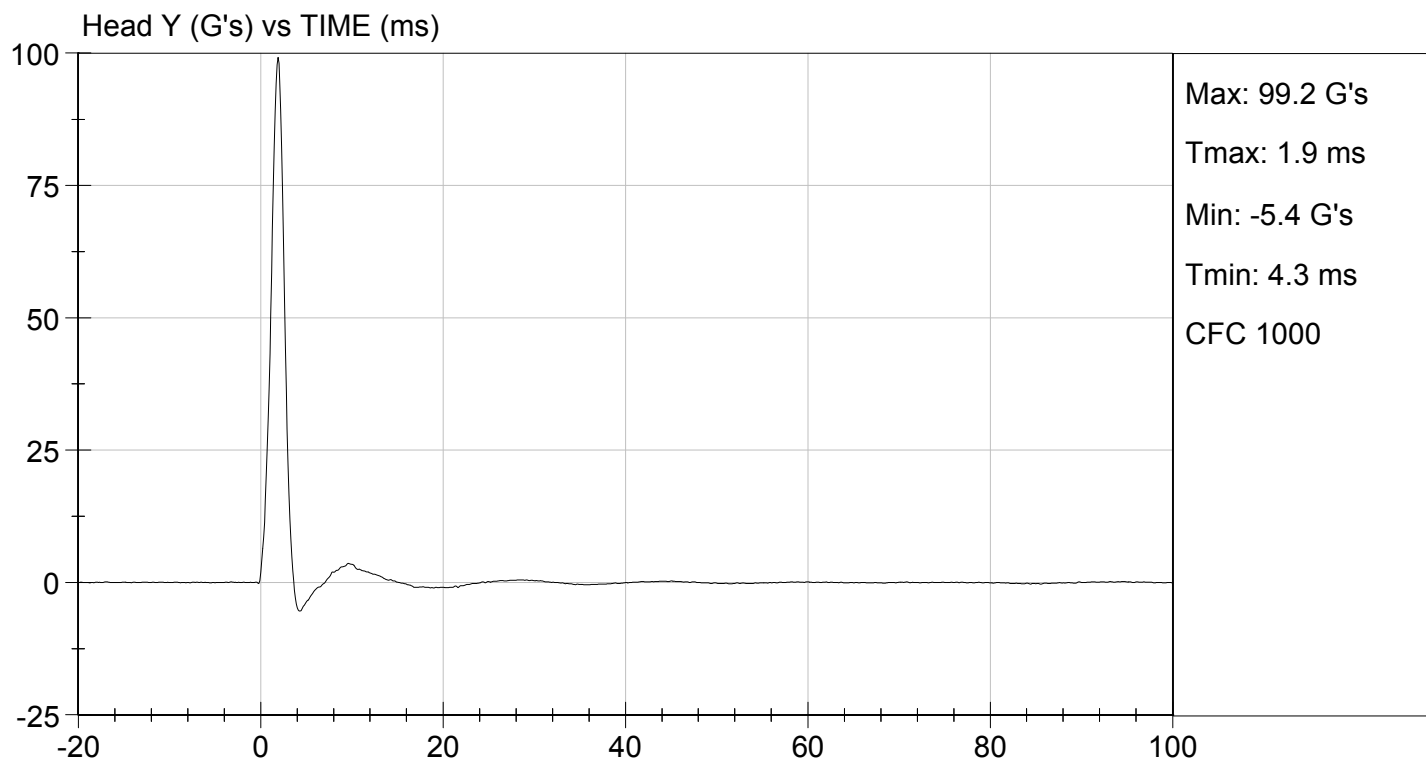
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	49	Pass
Peak Resultant Acceleration	G's	125 to 155	141	Pass
Peak Longitudinal Acceleration	G's	<= +/- 15.0	-8.9	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

07/29/2016
Test Date


Approved By



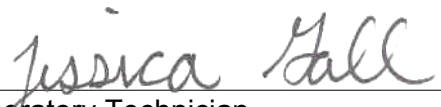


MGA RESEARCH CORPORATION
NECK PENDULUM TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D162572

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity		%	10 to 70	50	Pass
Pendulum Speed		m/s	3.30 to 3.50	3.41	Pass
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	-0.04	Pass
	3 ms	m/s	-0.25 to -0.375	-0.34	Pass
	14 ms	m/s	-3.20 to -3.70	-3.26	Pass
	17 ms	m/s	>= -3.70	-3.35	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	52.7	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	64.7	Pass
Head Rotation Decay Time to 0 Degree		ms	53.0 to 88.0	63.9	Pass
Overall Results					Pass


 Laboratory Technician

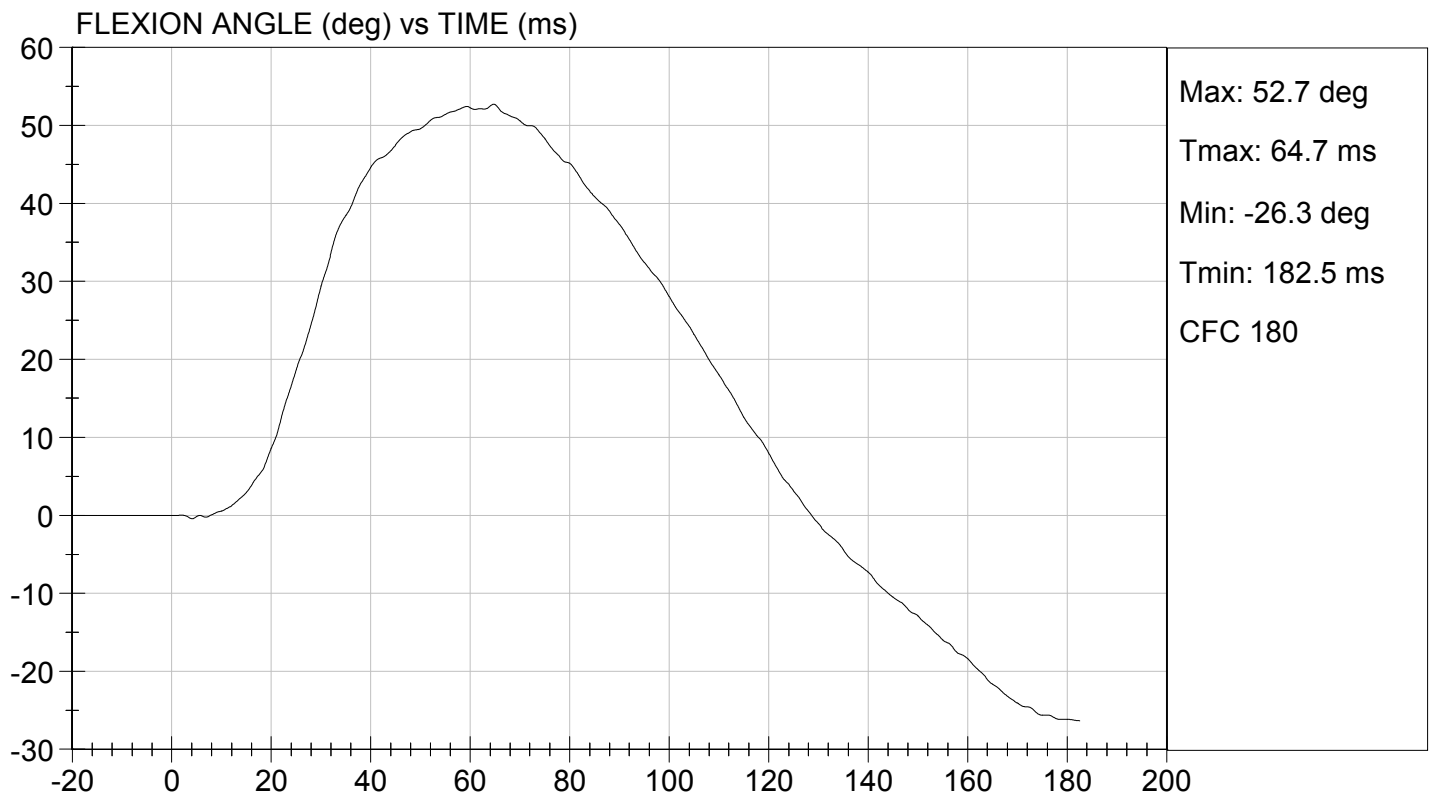
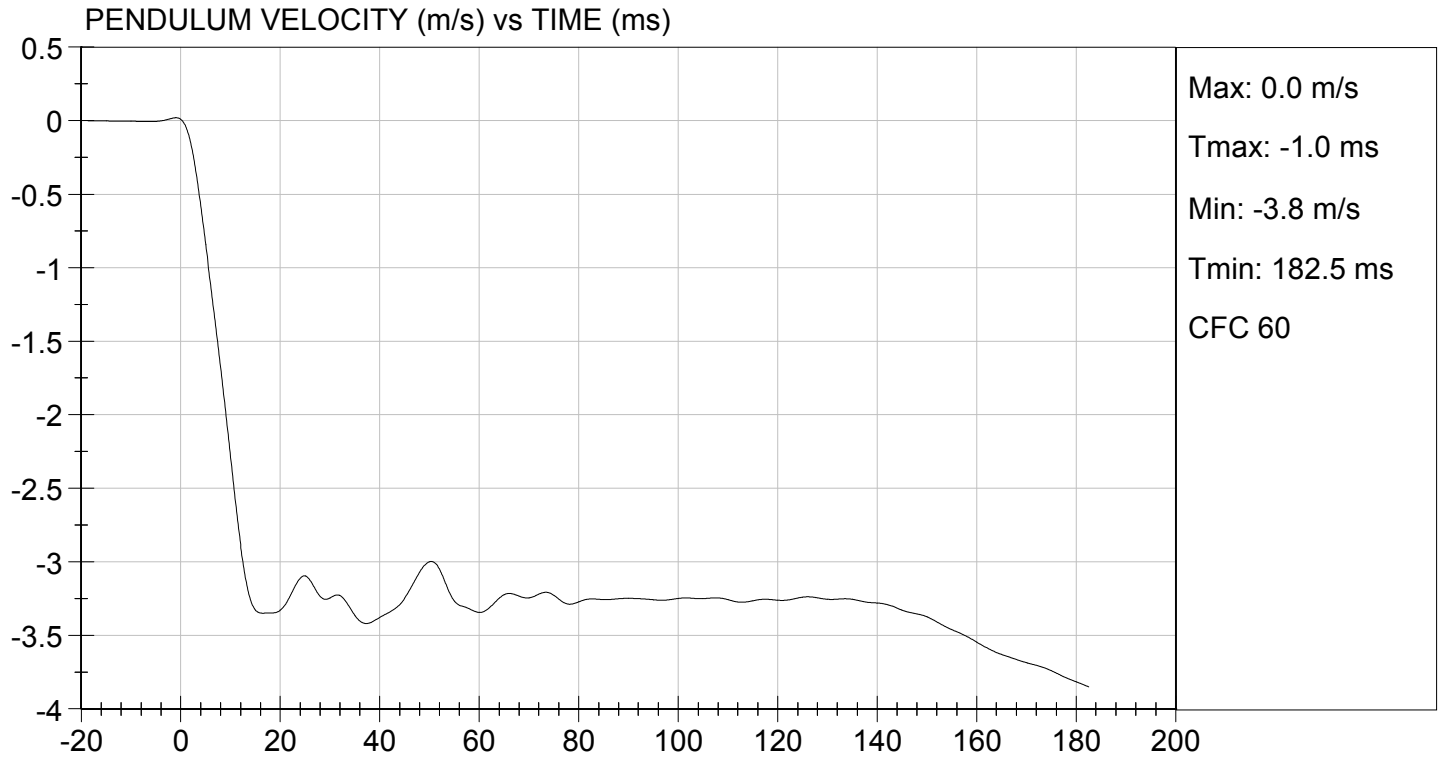

 Approved By

07/29/2016
 Test Date



TEST DESC: NECK BENDING
VELOCITY: 11.18 ft/s, 3.41 m/s

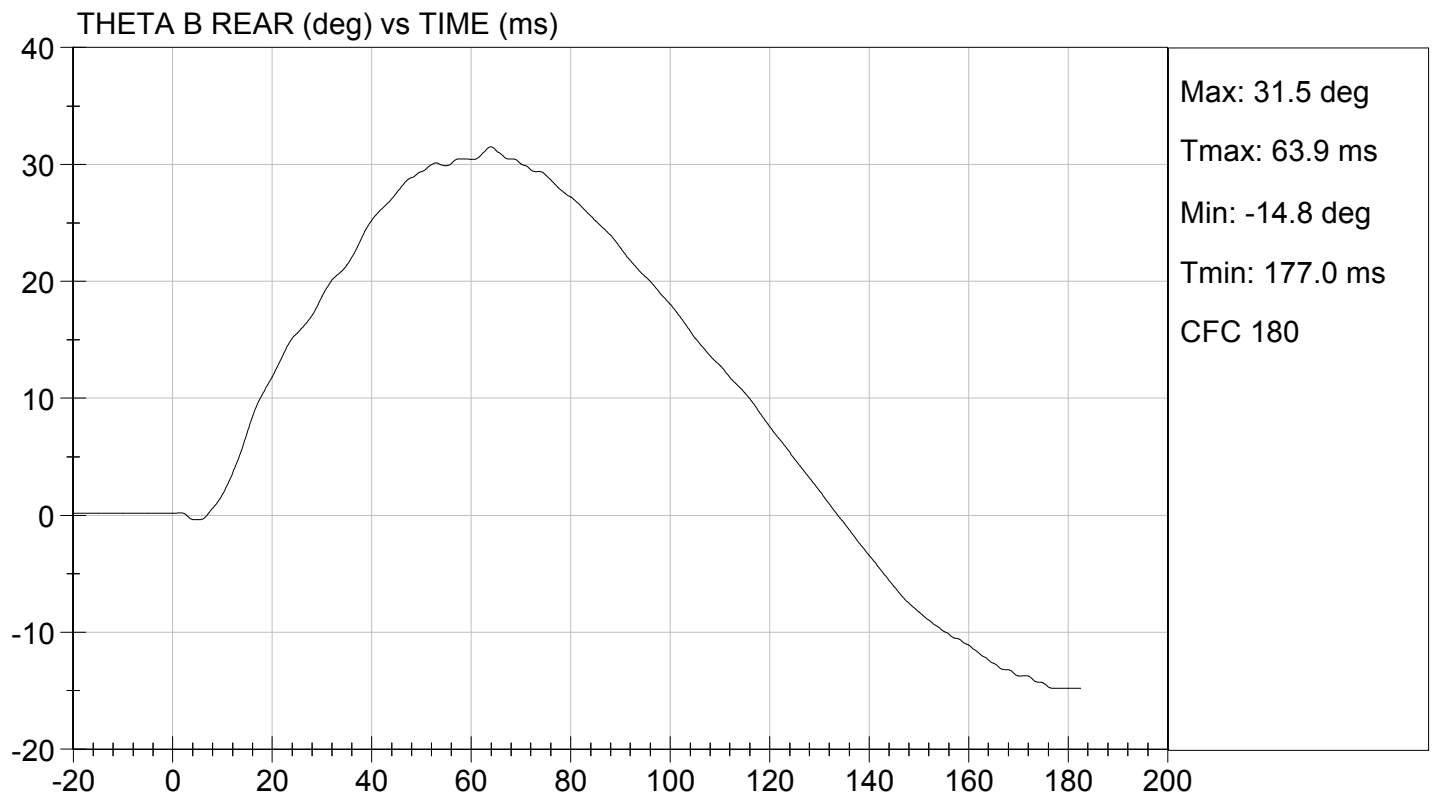
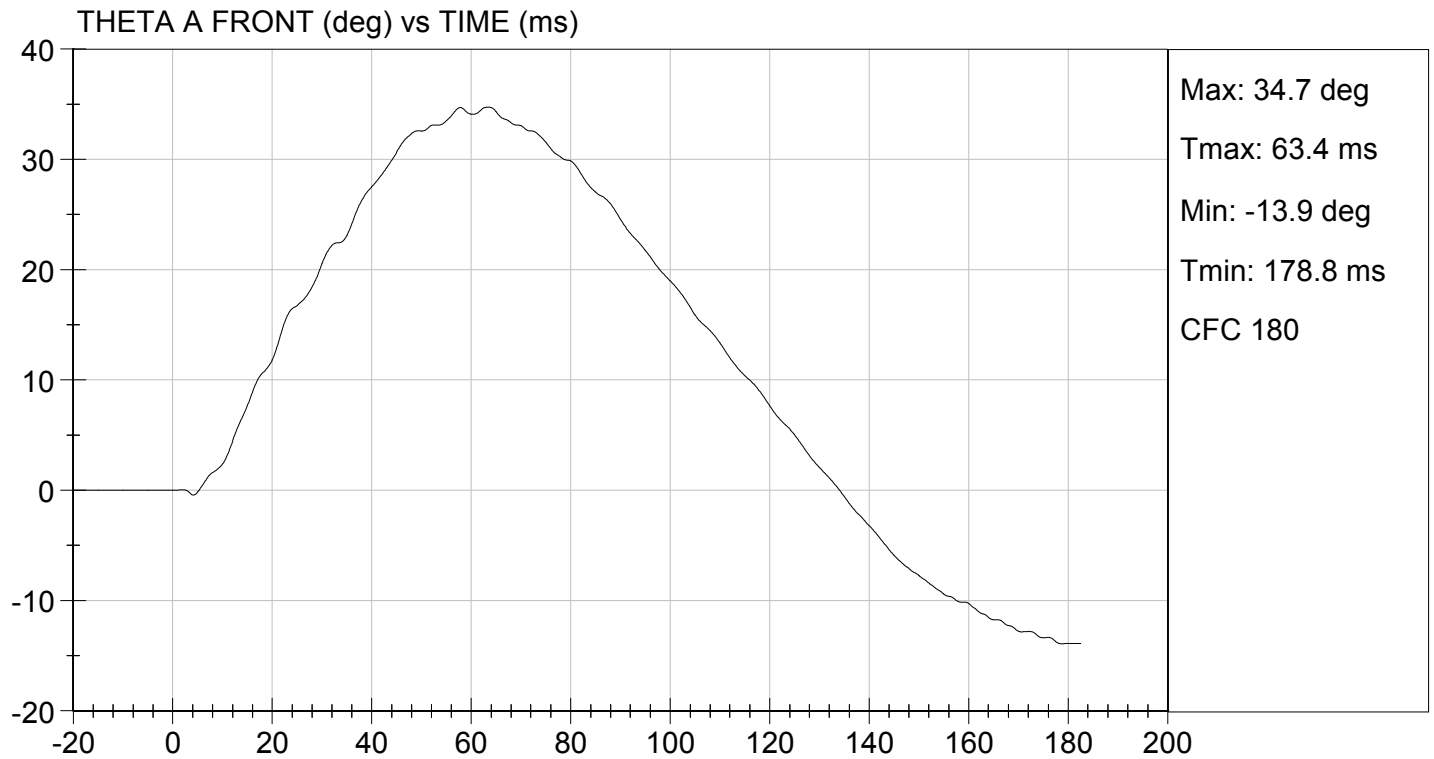
TEST DATE: 07/29/2016
TEST #: D162572





TEST DESC: NECK BENDING
VELOCITY: 11.18 ft/s, 3.41 m/s

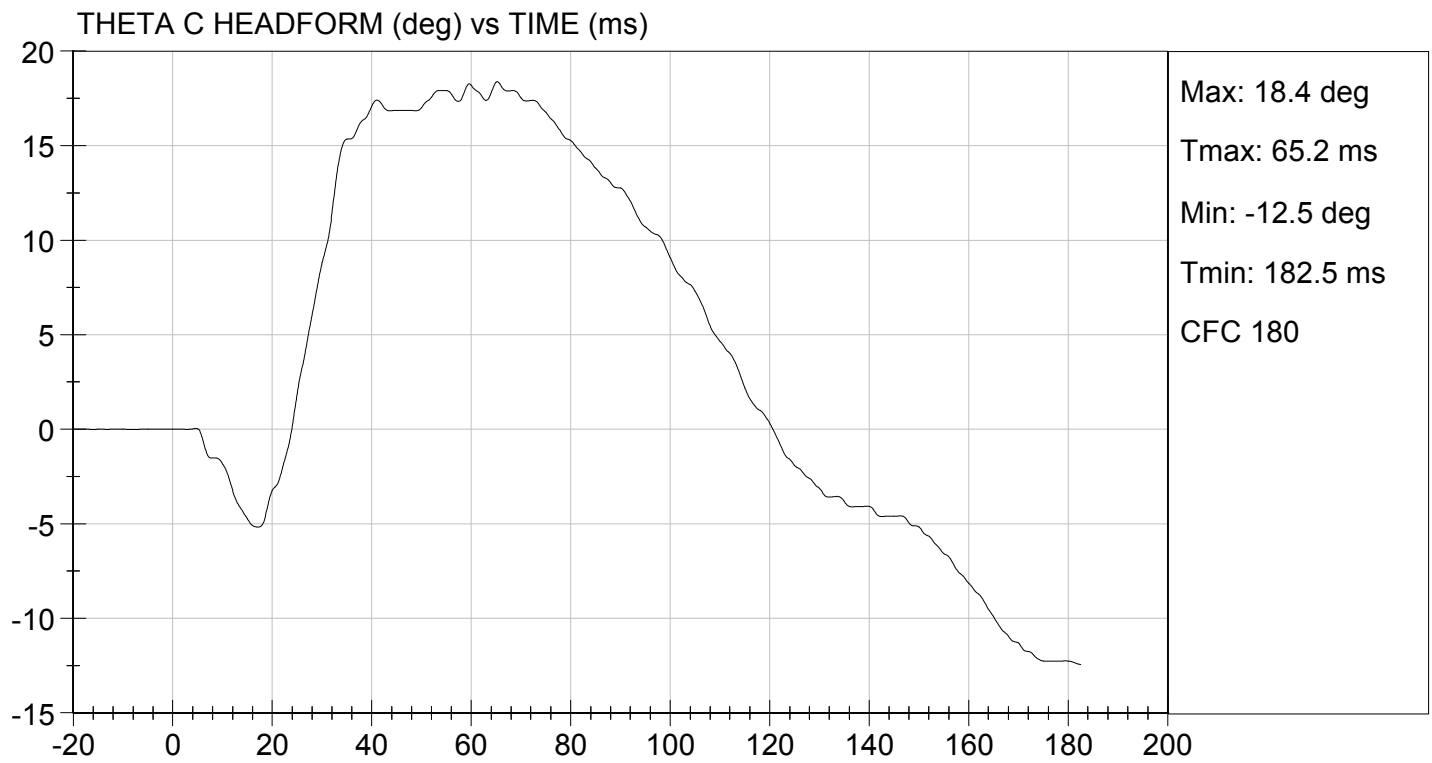
TEST DATE: 07/29/2016
TEST #: D162572





TEST DESC: NECK BENDING
VELOCITY: 11.18 ft/s, 3.41 m/s

TEST DATE: 07/29/2016
TEST #: D162572



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

ES-2re DUMMY

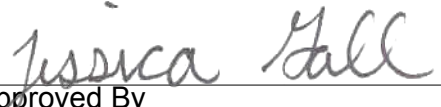
ATD Serial No: 032

Test I.D: D162573

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	51	Pass
Pendulum Speed	m/s	4.20 to 4.40	4.38	Pass
Peak Impactor Acceleration	G's	7.5 to 10.5	8.4	Pass
Overall Test Results				Pass


Laboratory Technician

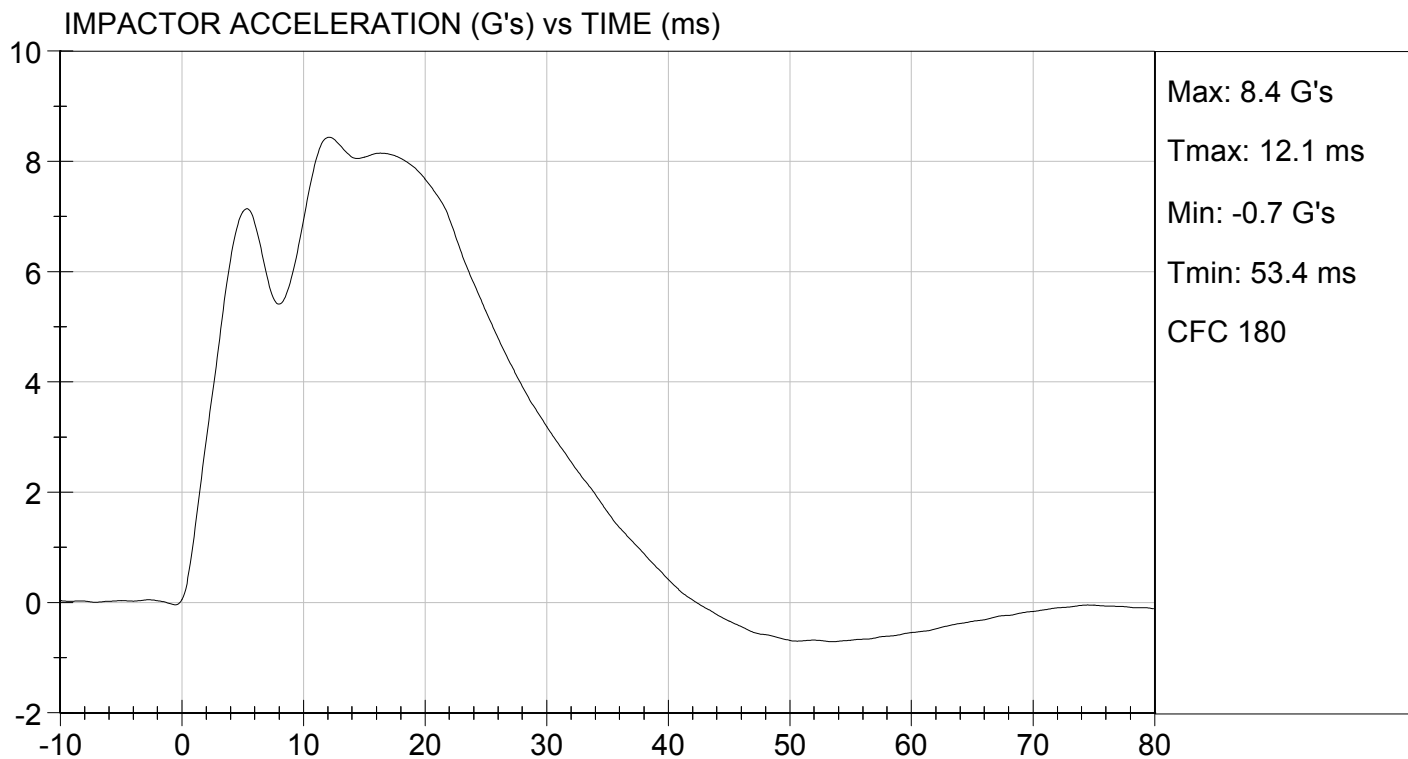
07/29/2016
Test Date


Approved By



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

TEST DATE: 07/29/2016
TEST #: D162573



MGA RESEARCH CORPORATION

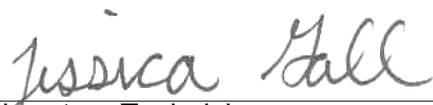
UPPER RIB TEST

ES-2re DUMMY

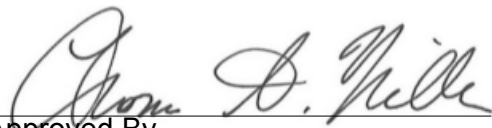
ATD Serial No: 032

Test I.D: D162574

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	50	Pass
Displacement at 459 mm	mm	36.0 to 40.0	39.2	Pass
Displacement at 815 mm	mm	46.0 to 51.0	49.1	Pass
Overall Test Results				Pass

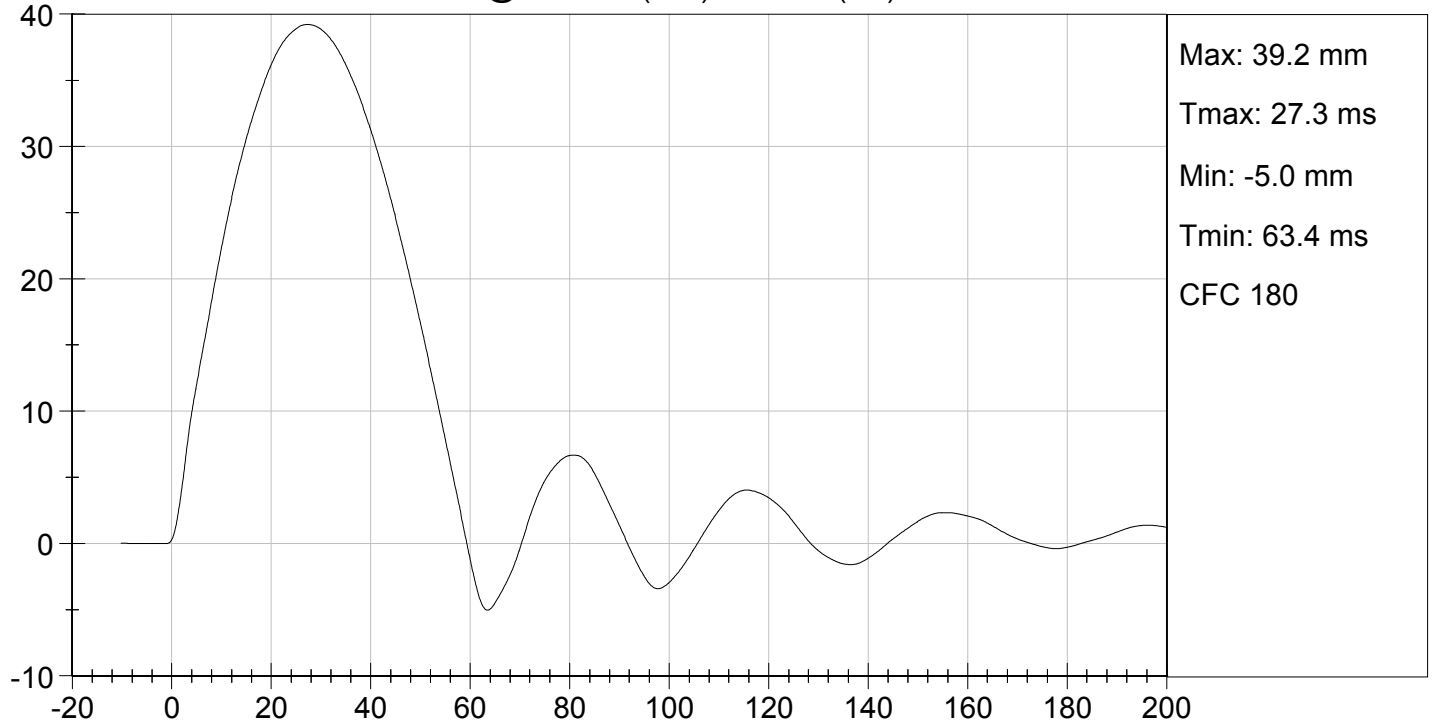

Laboratory Technician

07/29/2016
Test Date

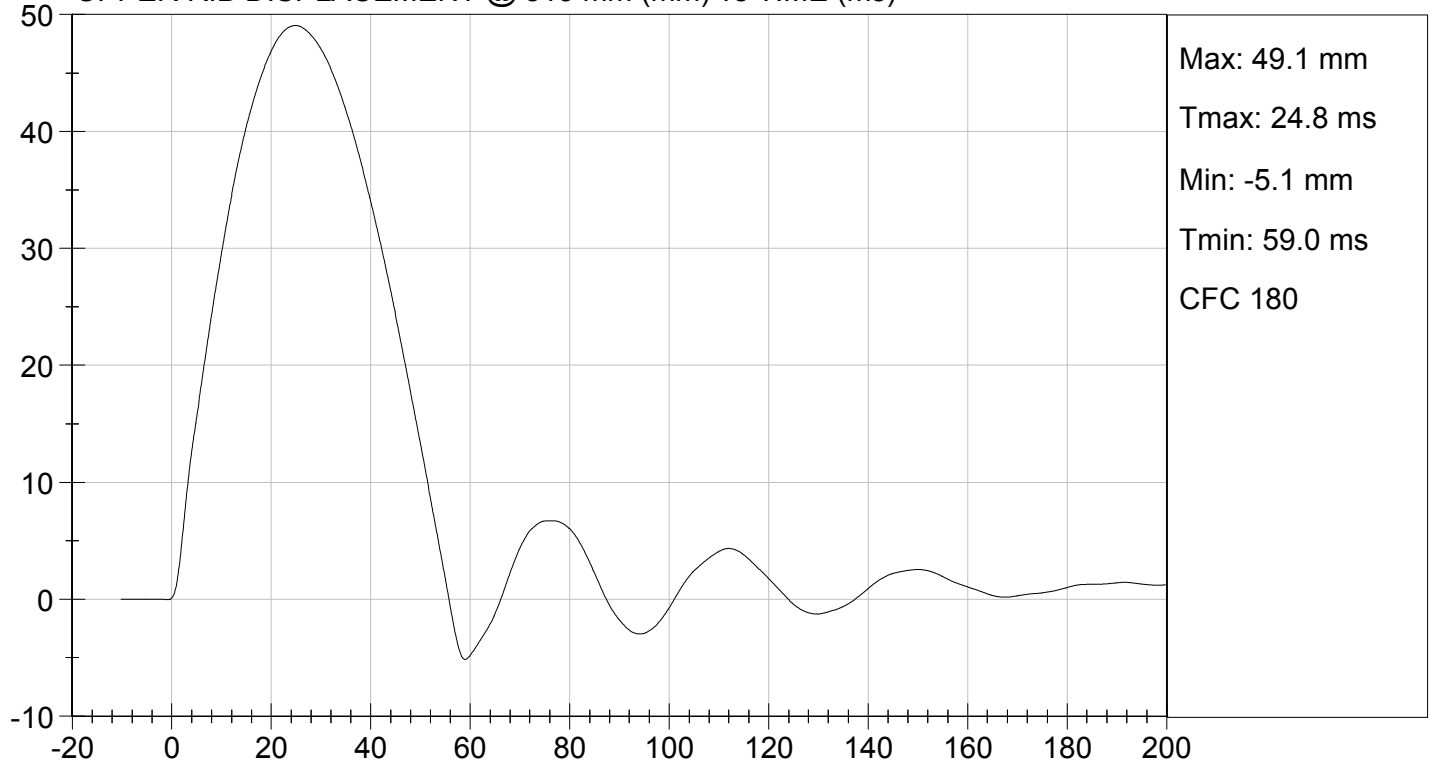

Approved By



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



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



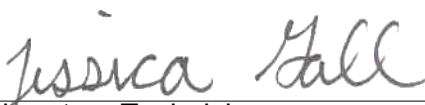
MGA RESEARCH CORPORATION

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

ATD Serial No: 032

Test I.D: D162575

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	50	Pass
Displacement at 459 mm	mm	36.0 to 40.0	39.1	Pass
Displacement at 815 mm	mm	46.0 to 51.0	48.6	Pass
Overall Test Results				Pass

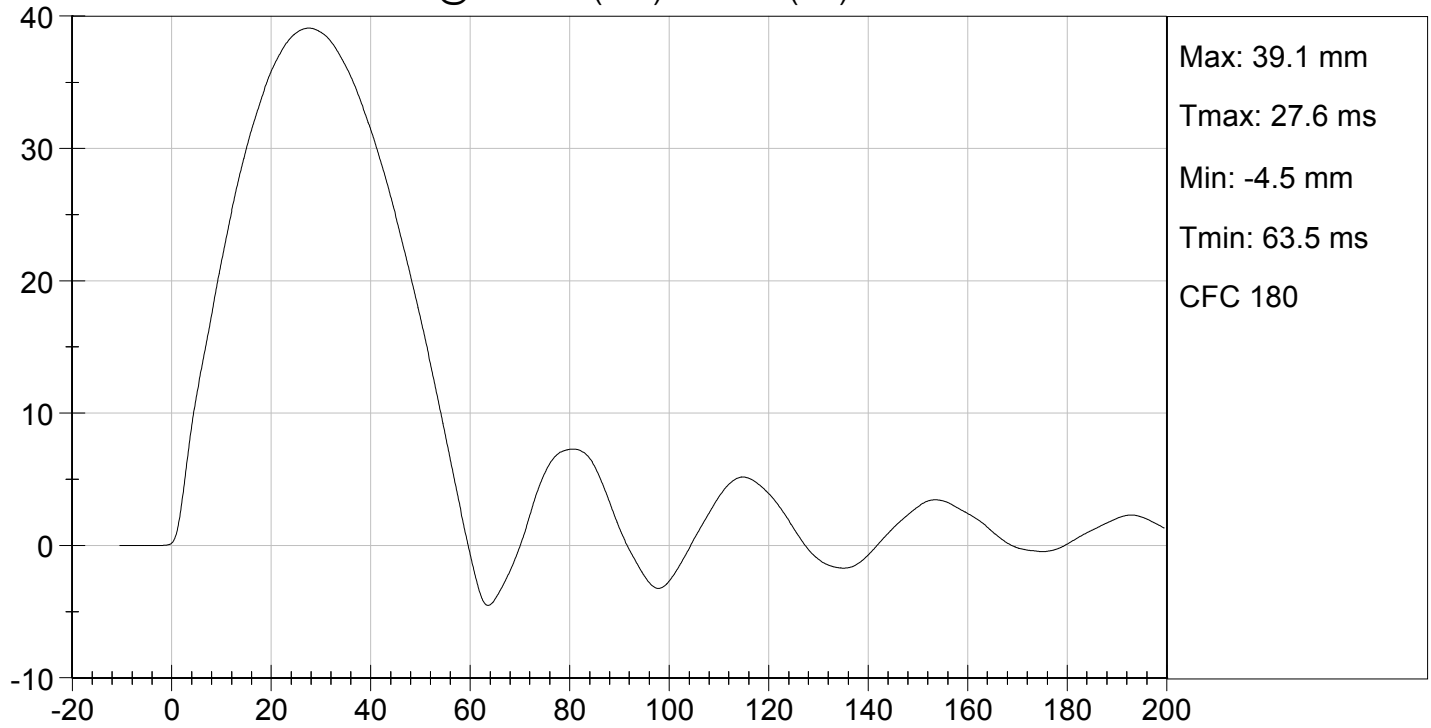

Laboratory Technician


Approved By

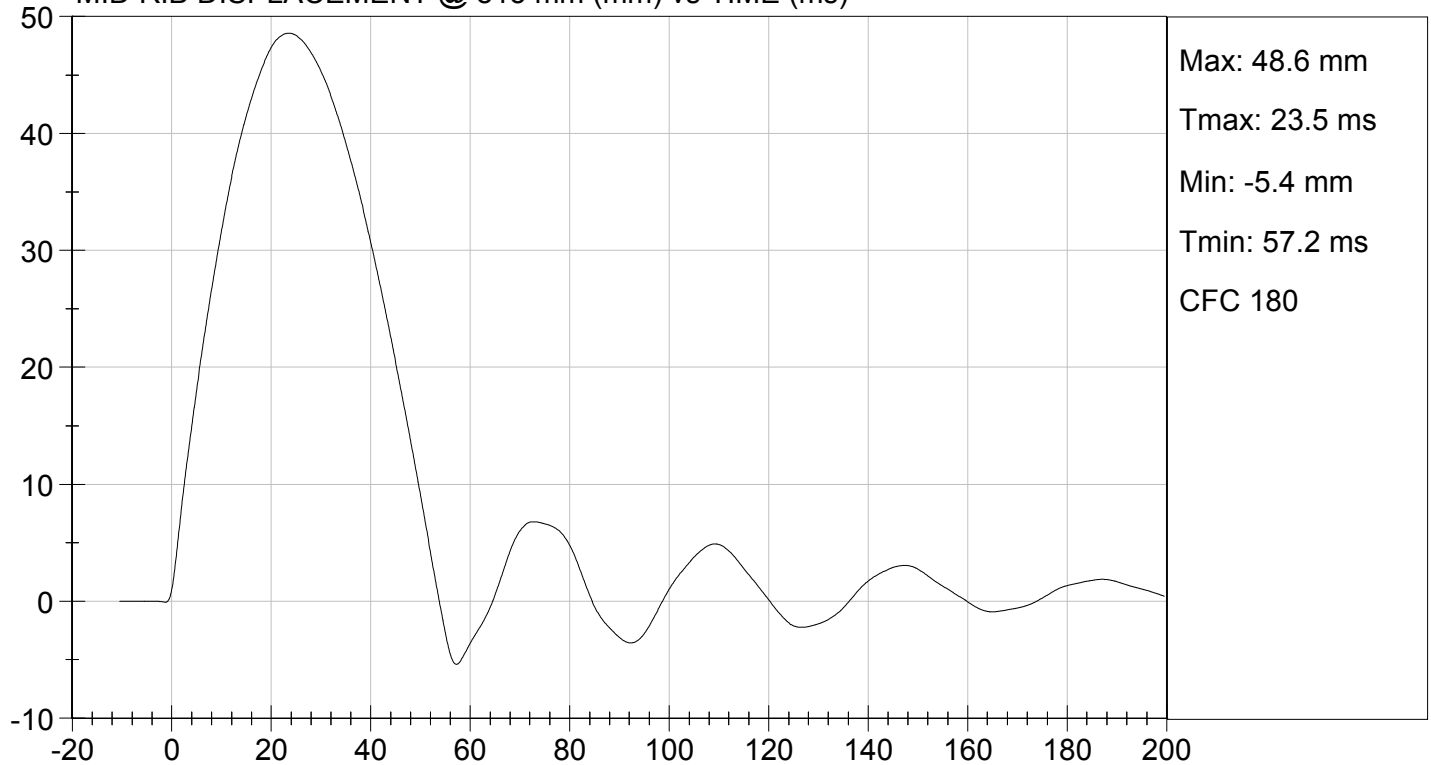
07/29/2016
Test Date



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



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



MGA RESEARCH CORPORATION

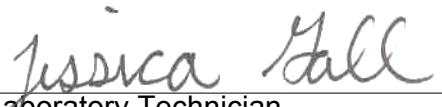
LOWER RIB TEST

ES-2re DUMMY

ATD Serial No: 032

Test I.D: D162576

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	50	Pass
Displacement at 459 mm	mm	36.0 to 40.0	38.6	Pass
Displacement at 815 mm	mm	46.0 to 51.0	50.2	Pass
Overall Test Results			Pass	

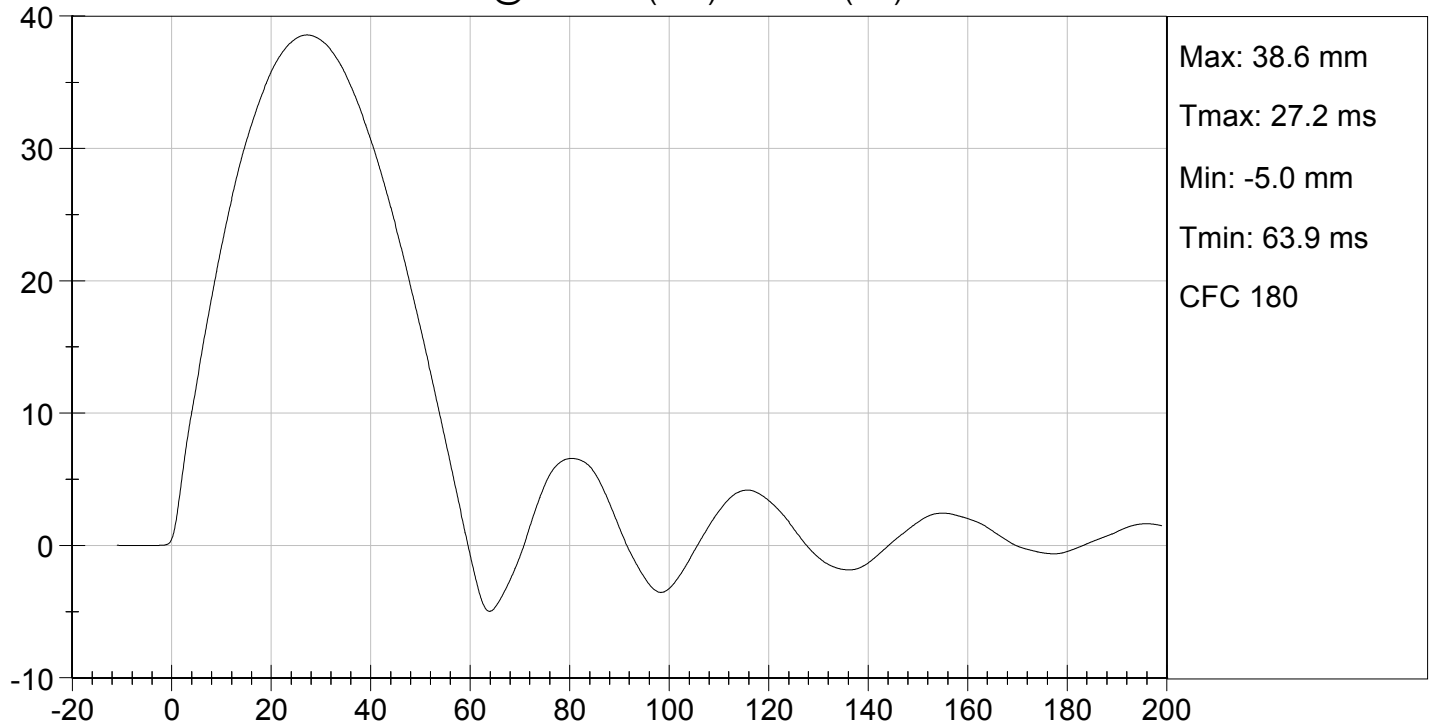

Laboratory Technician

07/29/2016
Test Date

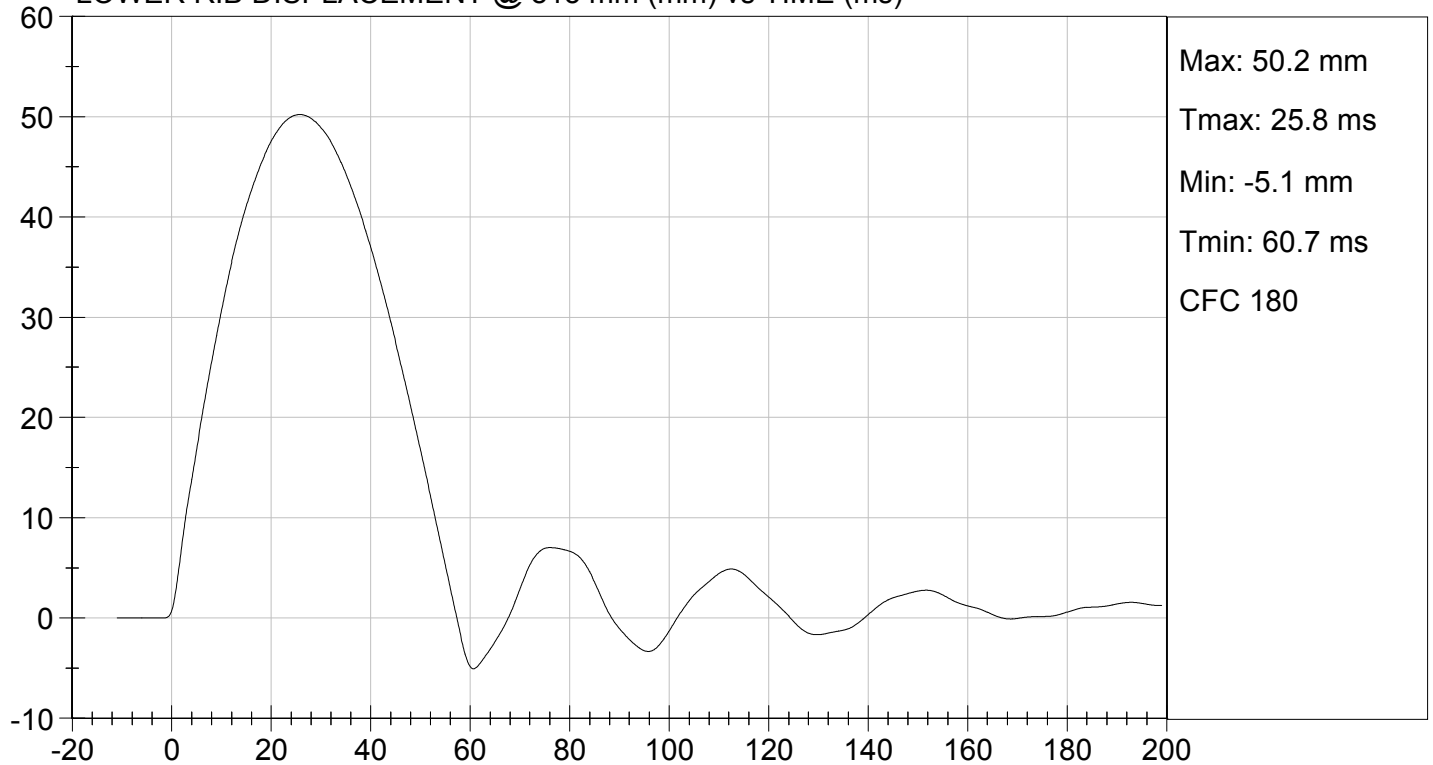

Approved By



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: D162570

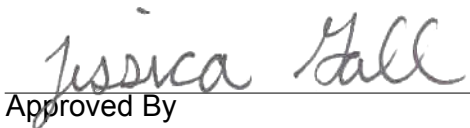
Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Humidity	%	10 to 70	51	Pass
Probe Speed	m/s	5.40 to 5.60	5.58	Pass
Maximum Impactor Force (after 6 ms)	N	5100 to 6200	5544	Pass
Upper Rib Displacement	mm	34.0 to 41.0	39.1	Pass
Middle Rib Displacement	mm	37.0 to 45.0	41.8	Pass
Lower Rib Displacement	mm	37.0 to 44.0	41.6	Pass
Overall Test Results				Pass



Laboratory Technician

07/29/2016

Test Date

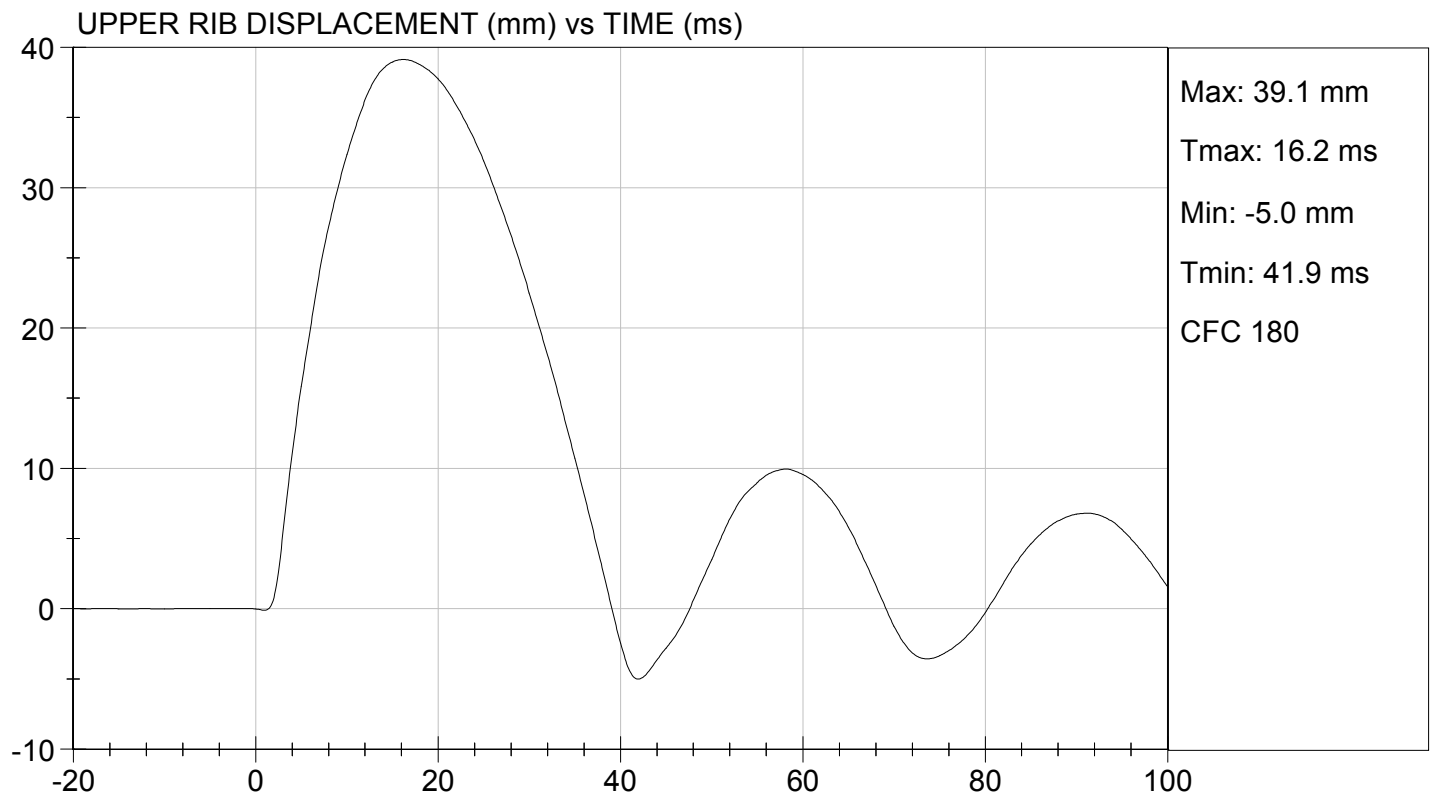
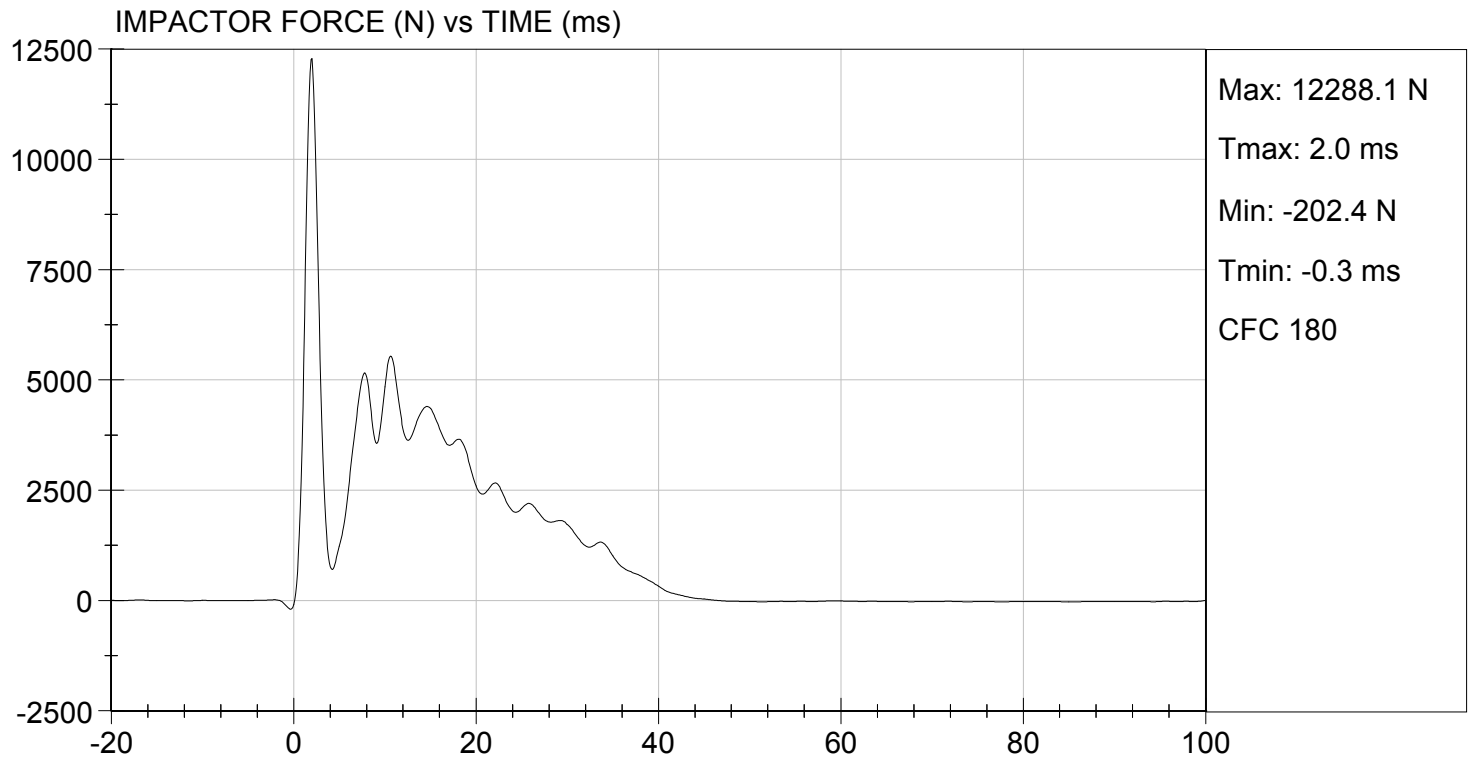


Approved By



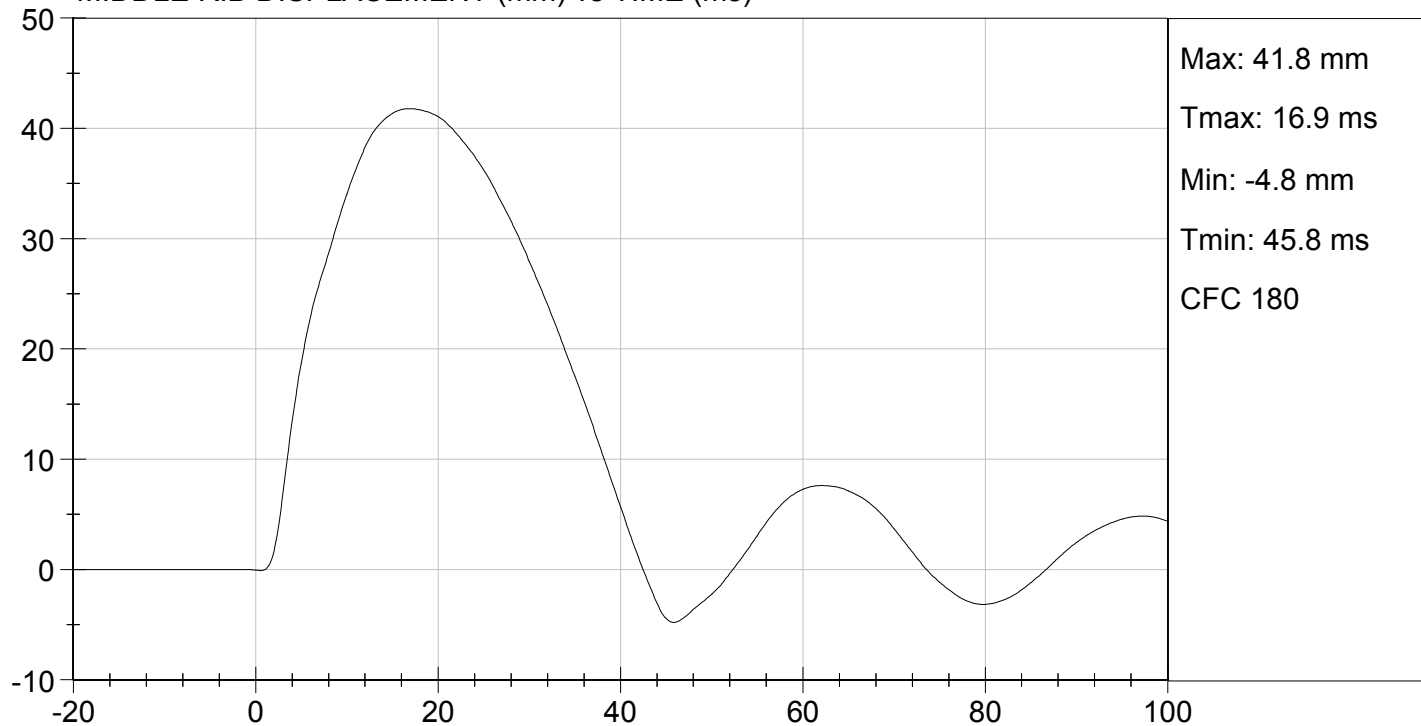
TEST DESC: THORAX IMPACT
VELOCITY: 18.32 ft/s, 5.58 m/s

TEST DATE: 07/29/2016
TEST #: D162570

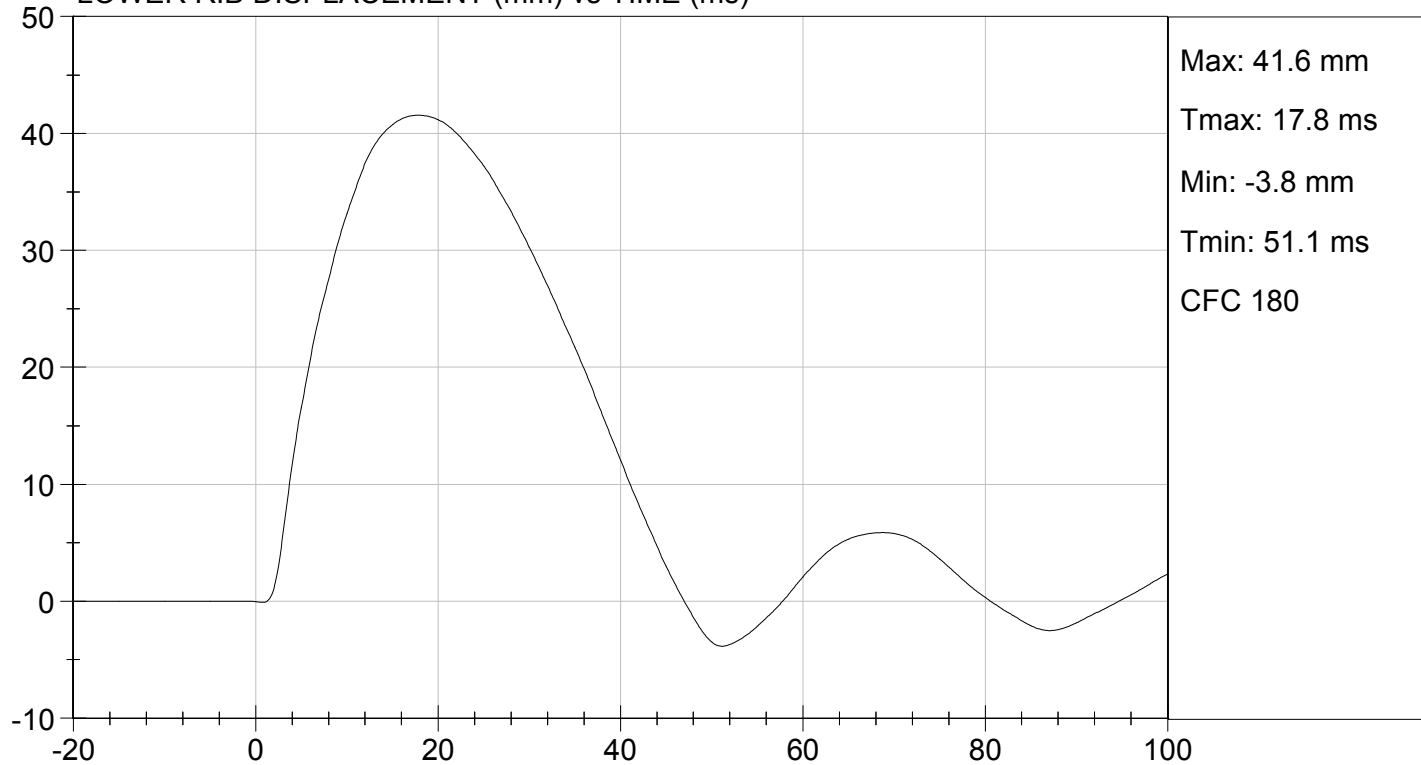




MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



LOWER RIB DISPLACEMENT (mm) vs TIME (ms)

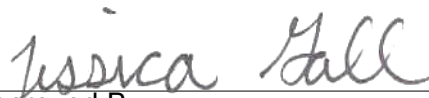


MGA RESEARCH CORPORATION**ABDOMEN TEST****ES-2re DUMMY****ATD Serial No:** 032**Test I.D:** D162577

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	51	Pass
Probe Speed	m/s	3.90 to 4.10	4.06	Pass
Maximum Impactor Force	N	4000 to 4800	4321	Pass
Time of Maximum Impactor Force	ms	10.6 to 13.0	11.6	Pass
Maximum Total Abdomen Force	N	2200 to 2700	2349	Pass
Time of Maximum Abdomen Force	ms	10.0 to 12.3	11.5	Pass
Overall Test Results				Pass



Laboratory Technician07/29/2016

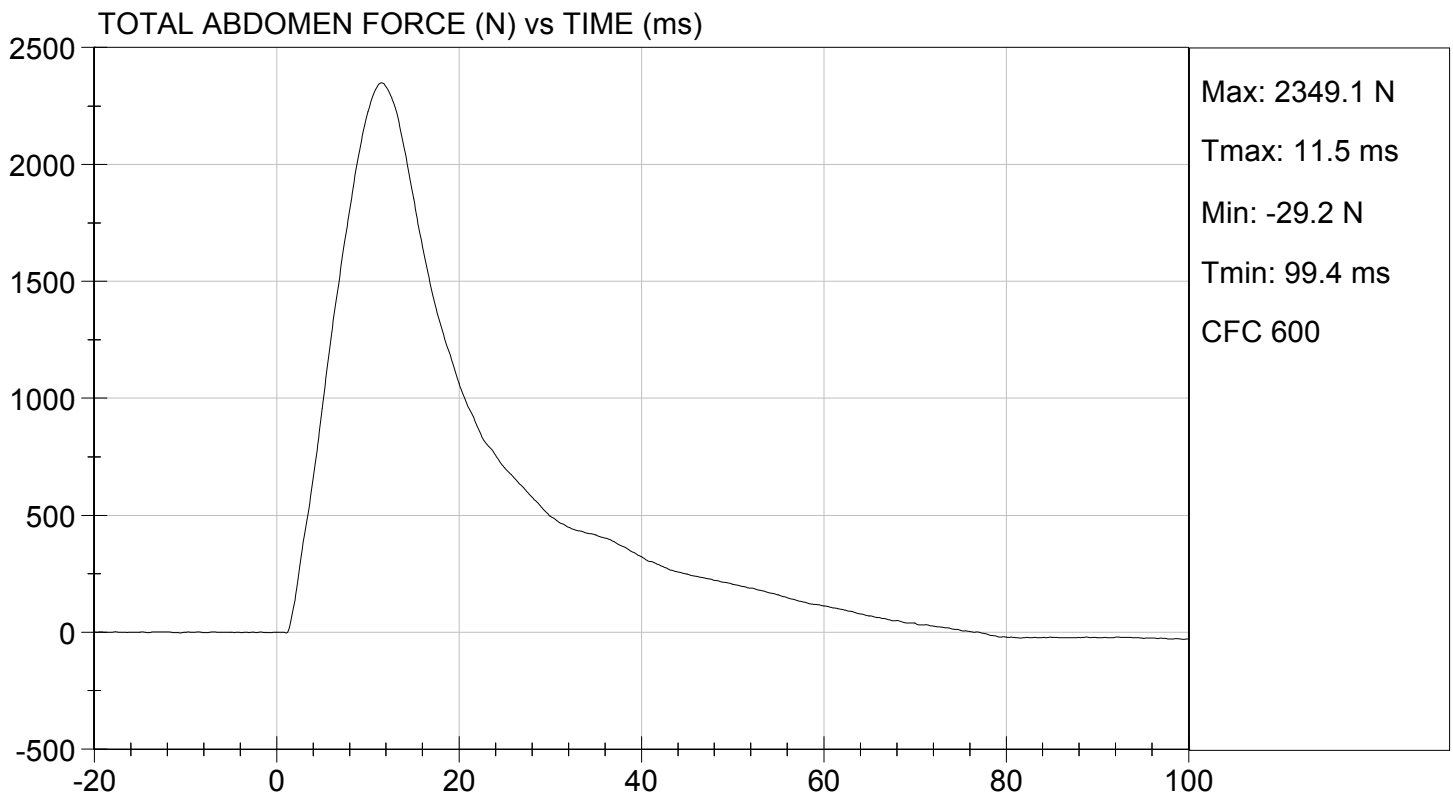
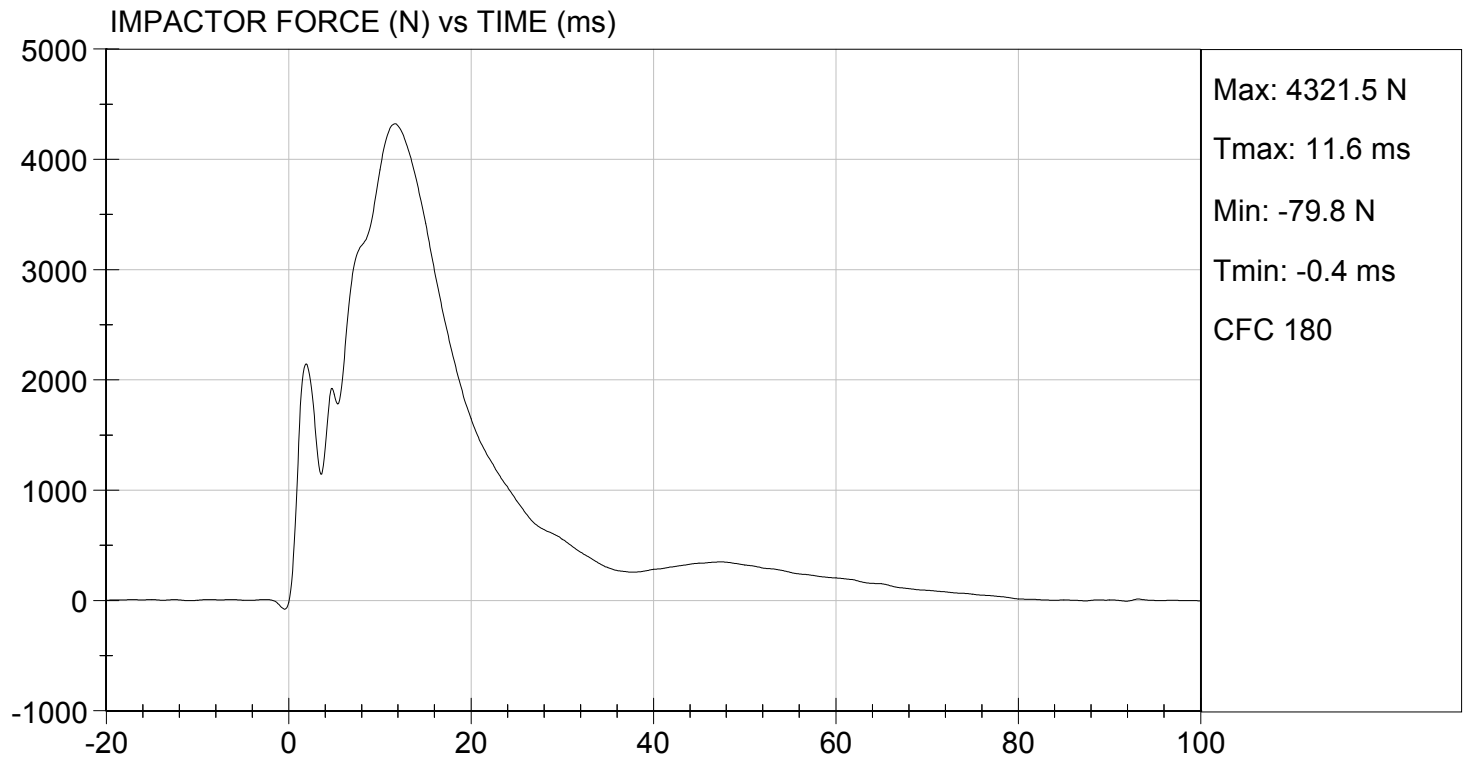
Test Date

Approved By



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

TEST DATE: 07/29/2016
TEST #: D162577

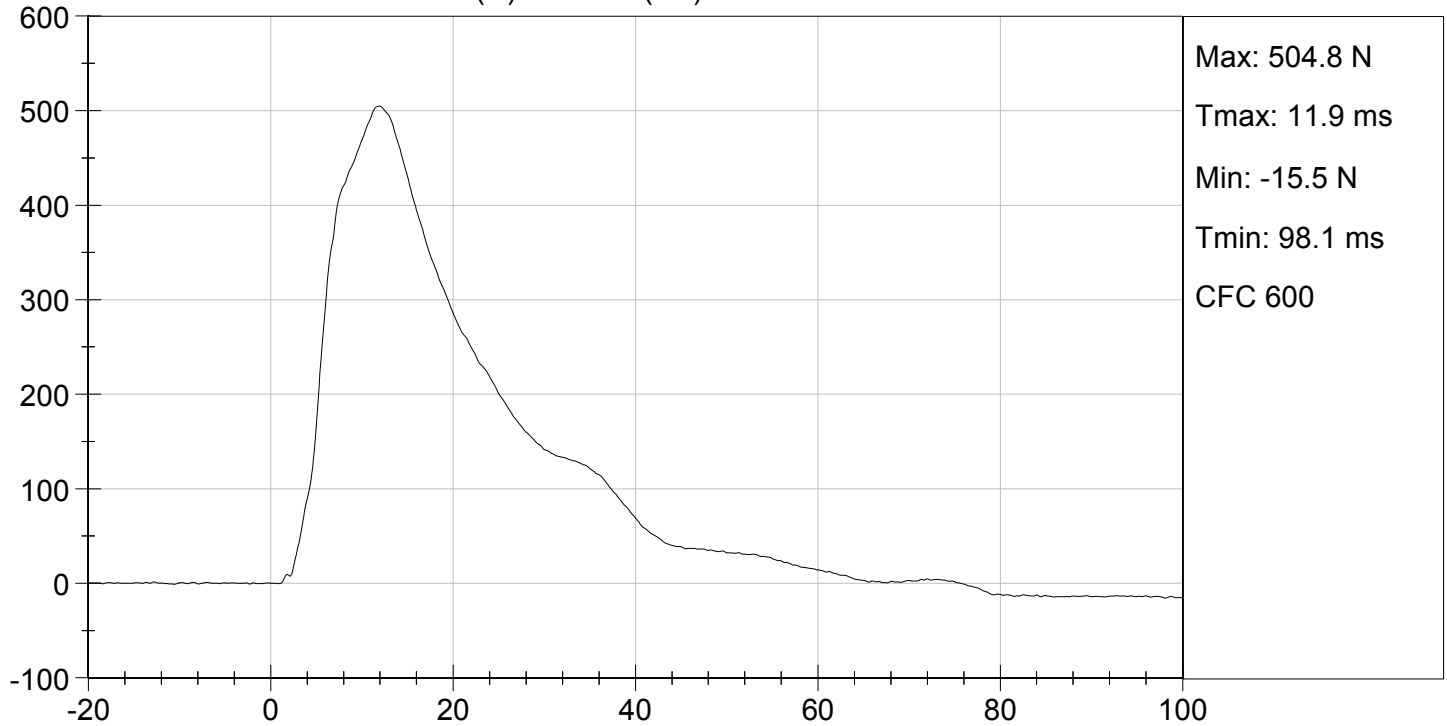




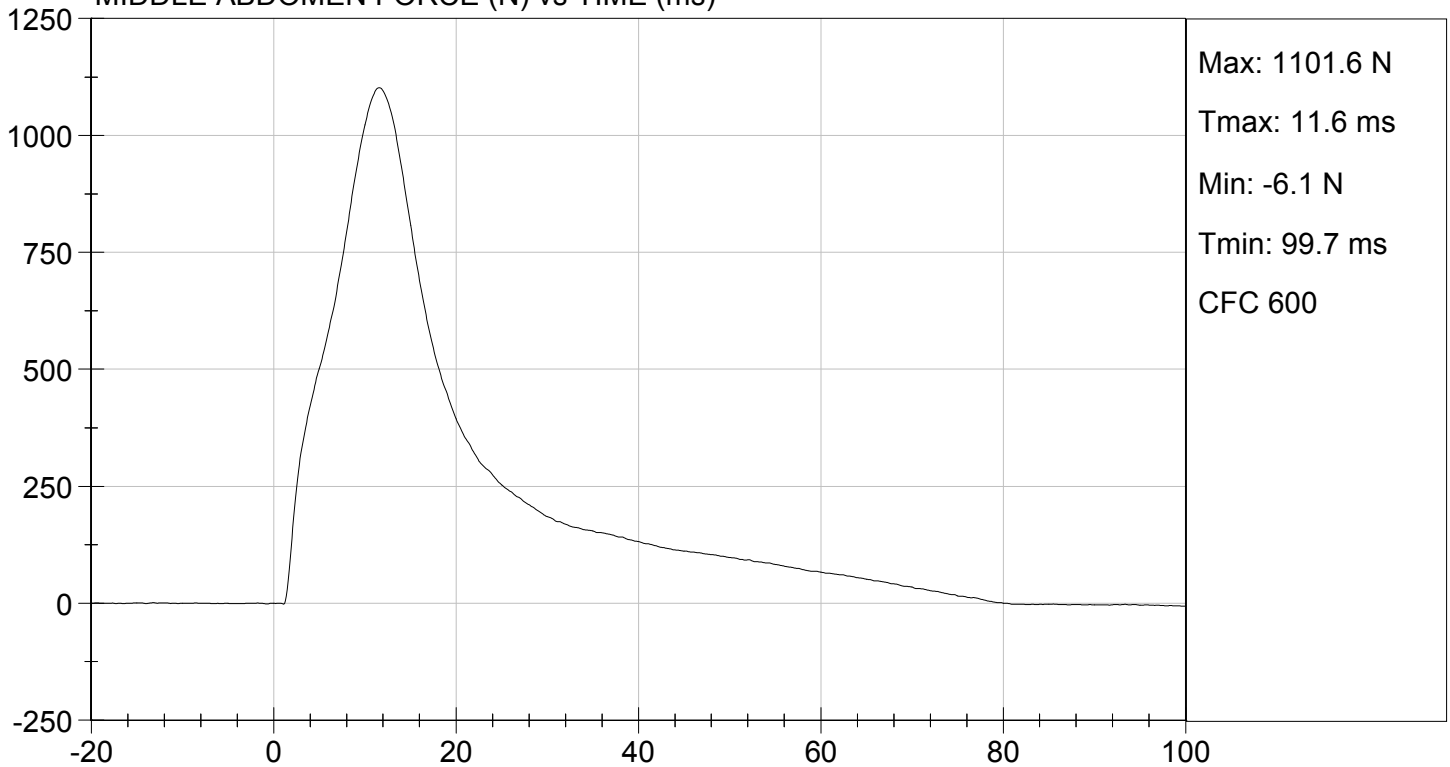
TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.33 ft/s, 4.06 m/s

TEST DATE: 07/29/2016
TEST #: D162577

FRONT ABDOMEN FORCE (N) vs TIME (ms)



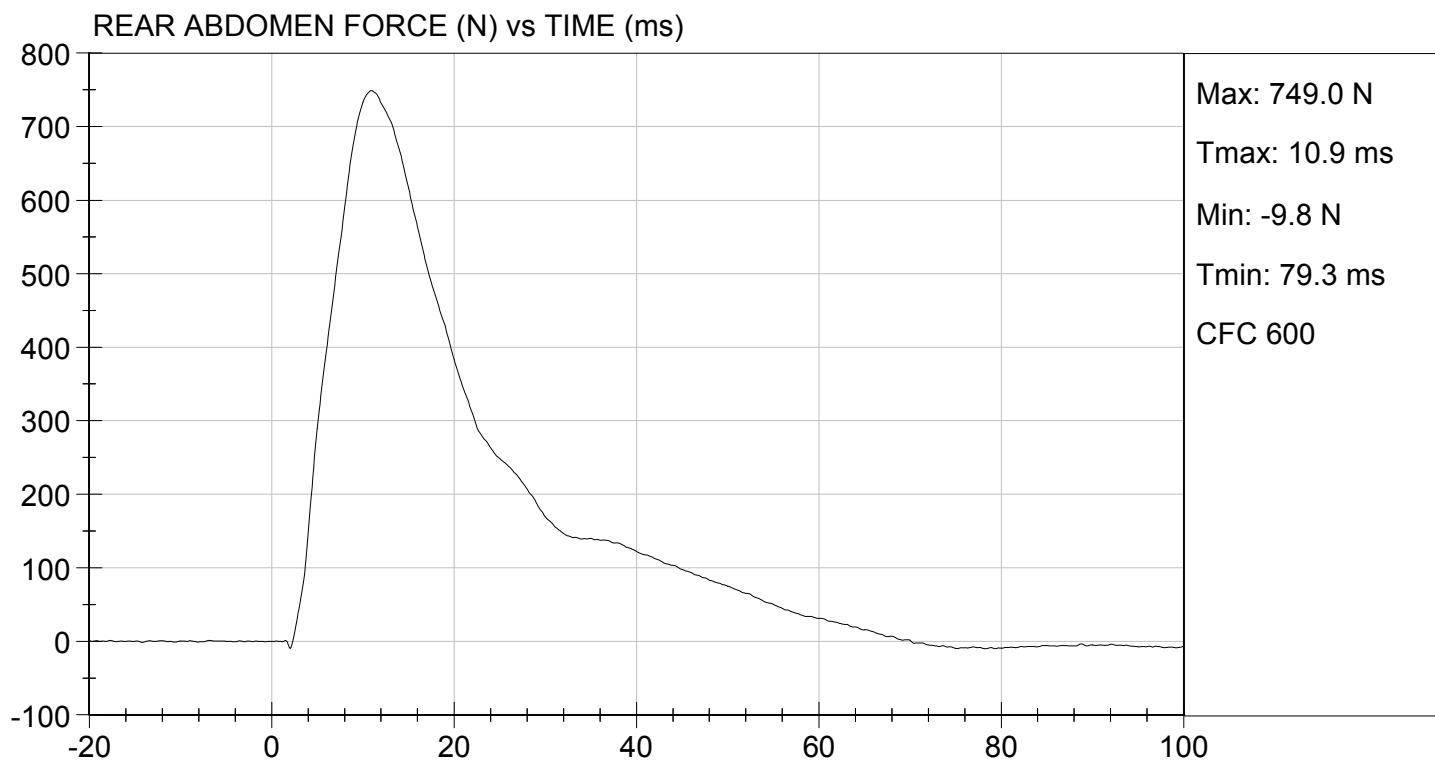
MIDDLE ABDOMEN FORCE (N) vs TIME (ms)





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

TEST DATE: 07/29/2016
TEST #: D162577



MGA RESEARCH CORPORATION
LUMBAR SPINE TEST
ES-2re DUMMY

ATD Serial No: 032

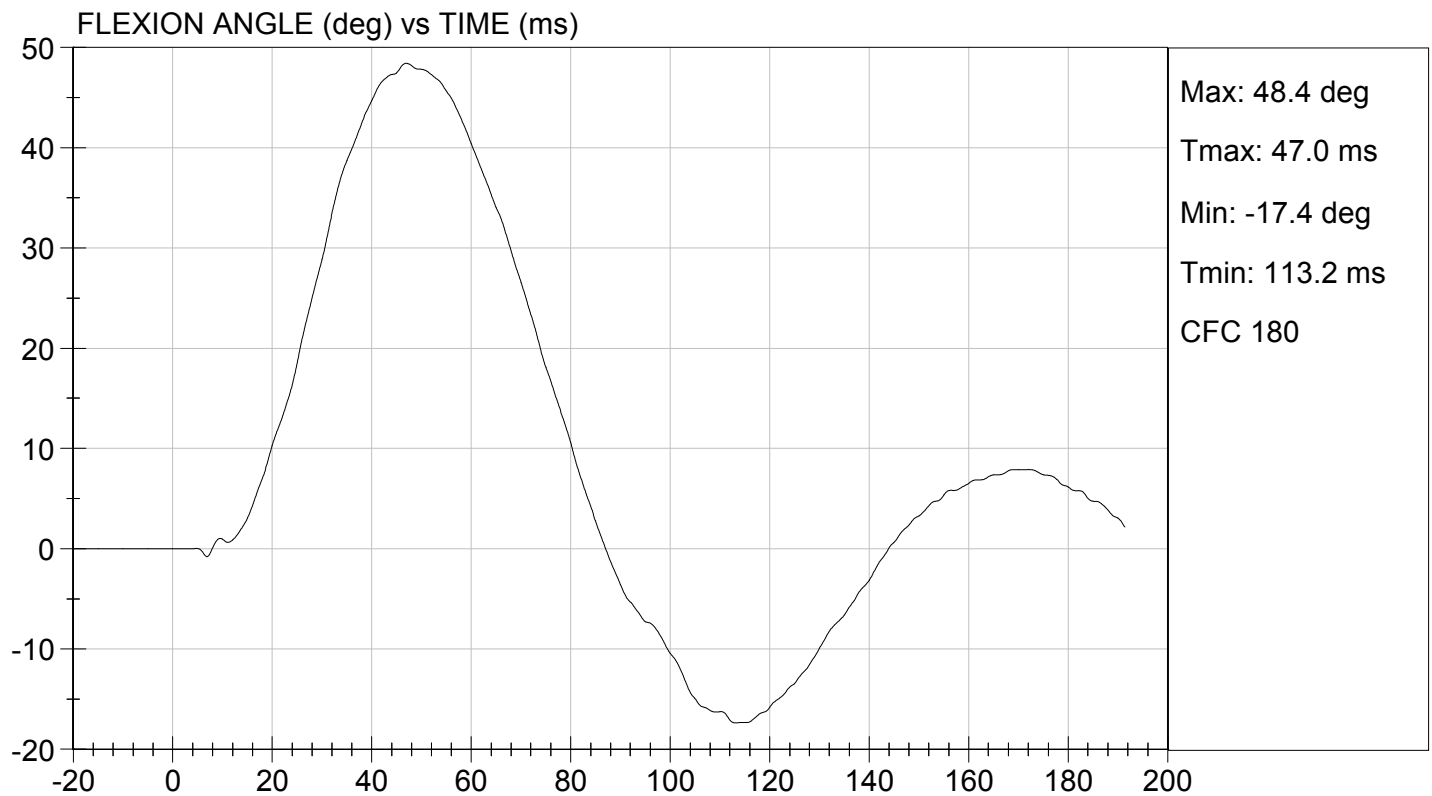
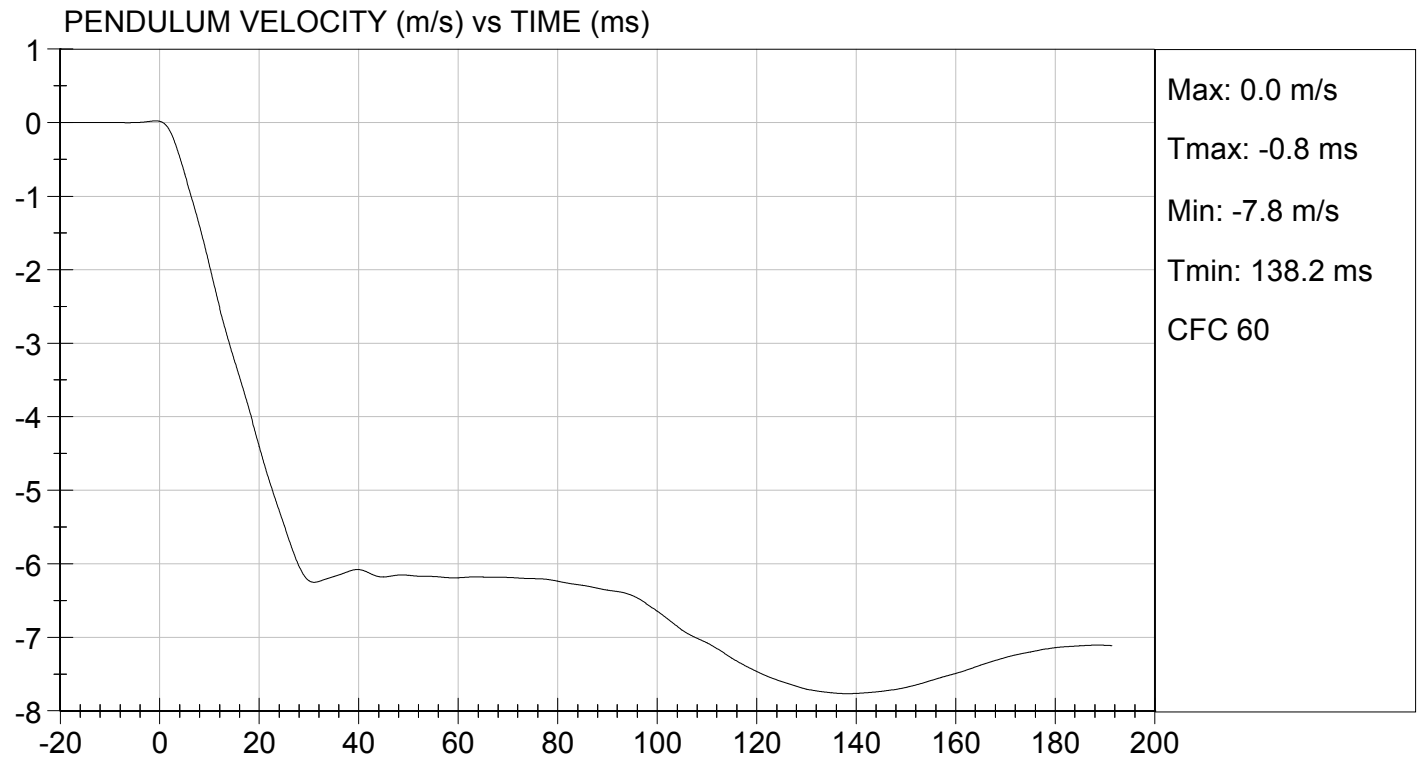
Test I.D: D162578

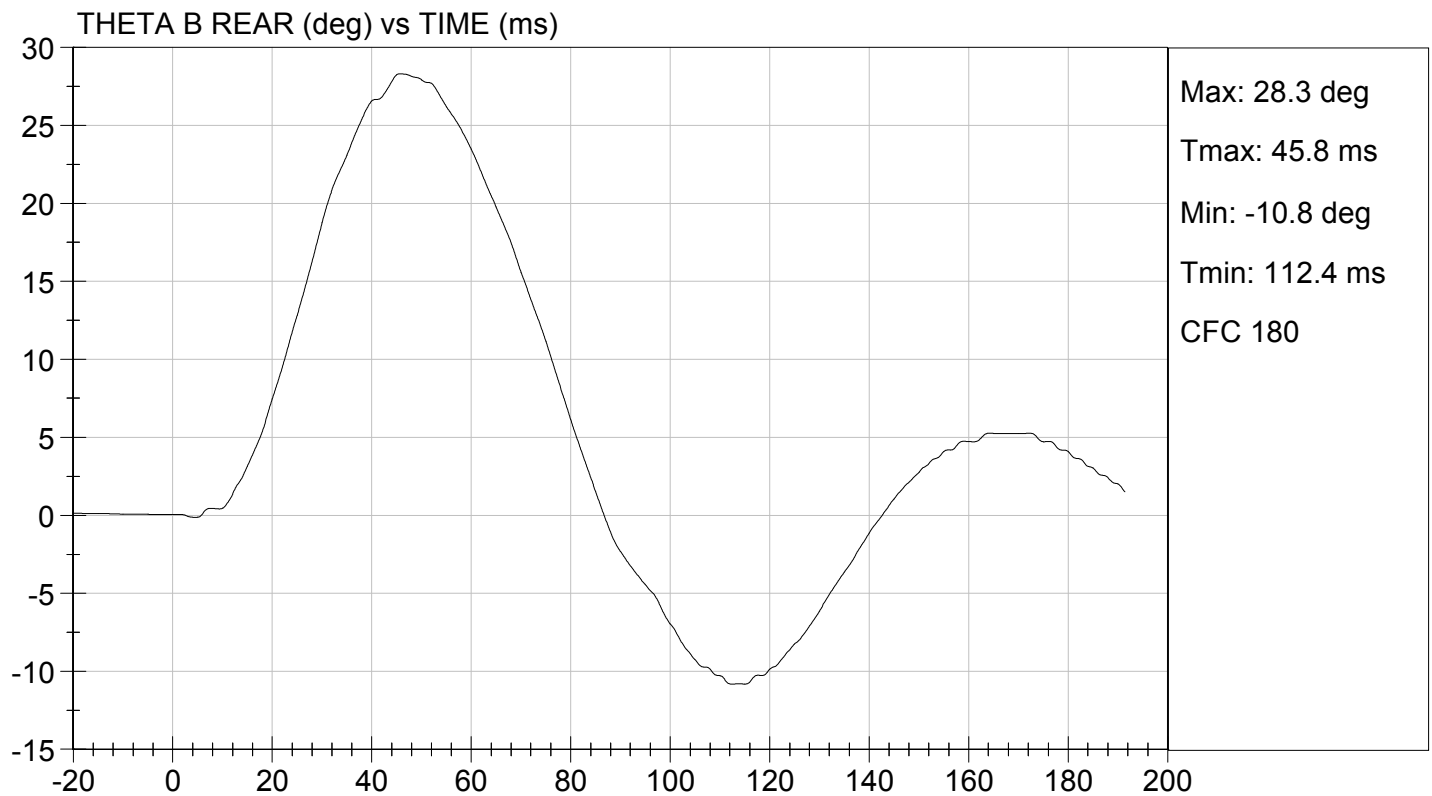
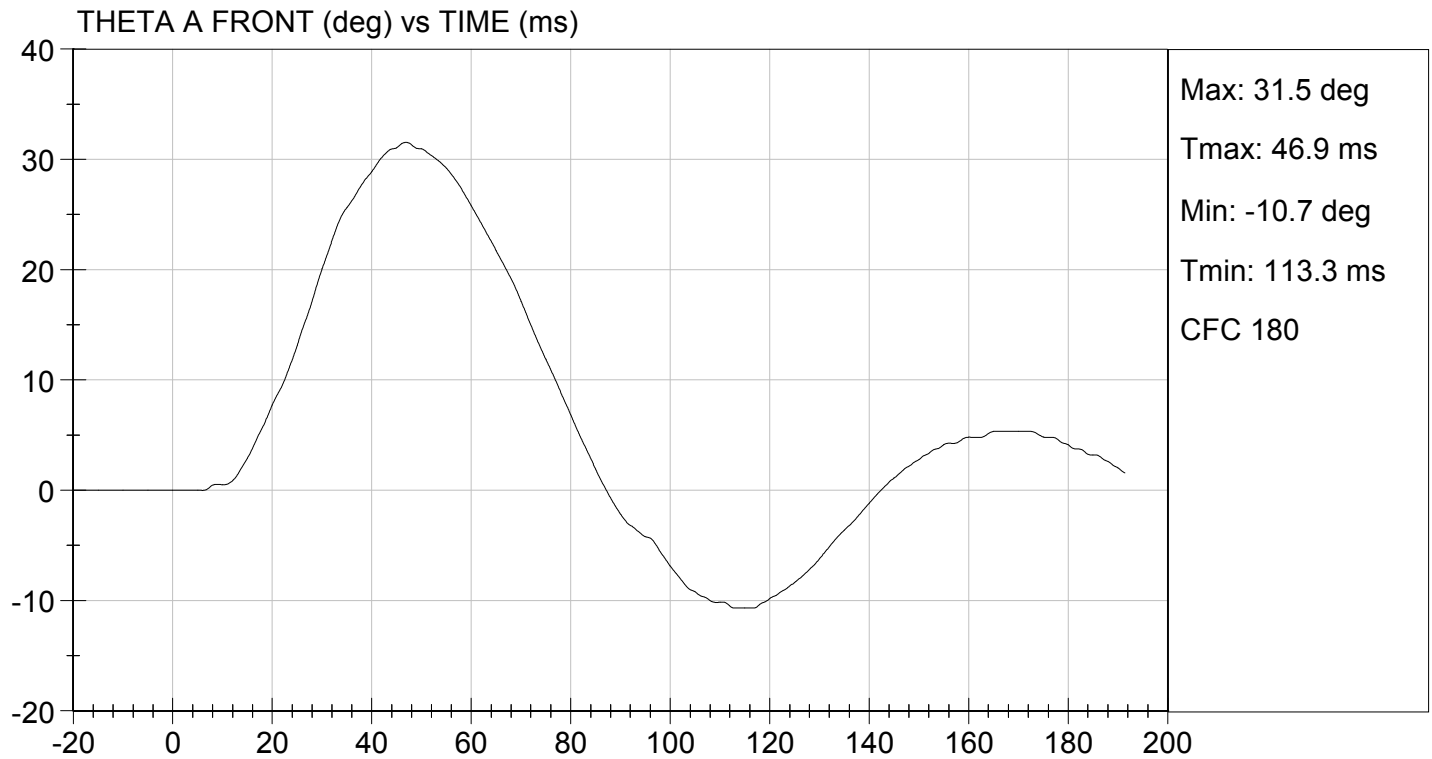
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity		%	10 to 70	50	Pass
Pendulum Speed		m/s	5.95 to 6.15	6.12	Pass
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	-0.02	Pass
	3.7 ms	m/s	-0.425 to -0.24	-0.407	Pass
	27 ms	m/s	-6.50 to -5.80	-5.86	Pass
	30 ms	m/s	>= -6.50	-6.23	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	48.4	Pass
Time of Maximum Flexion Angle		ms	39.0 to 53.0	47.0	Pass
Headform Rotation Decay to Initial Position		ms	37 to 57	46	Pass
Overall Results					Pass


 Laboratory Technician

07/29/2016
 Test Date


 Approved By

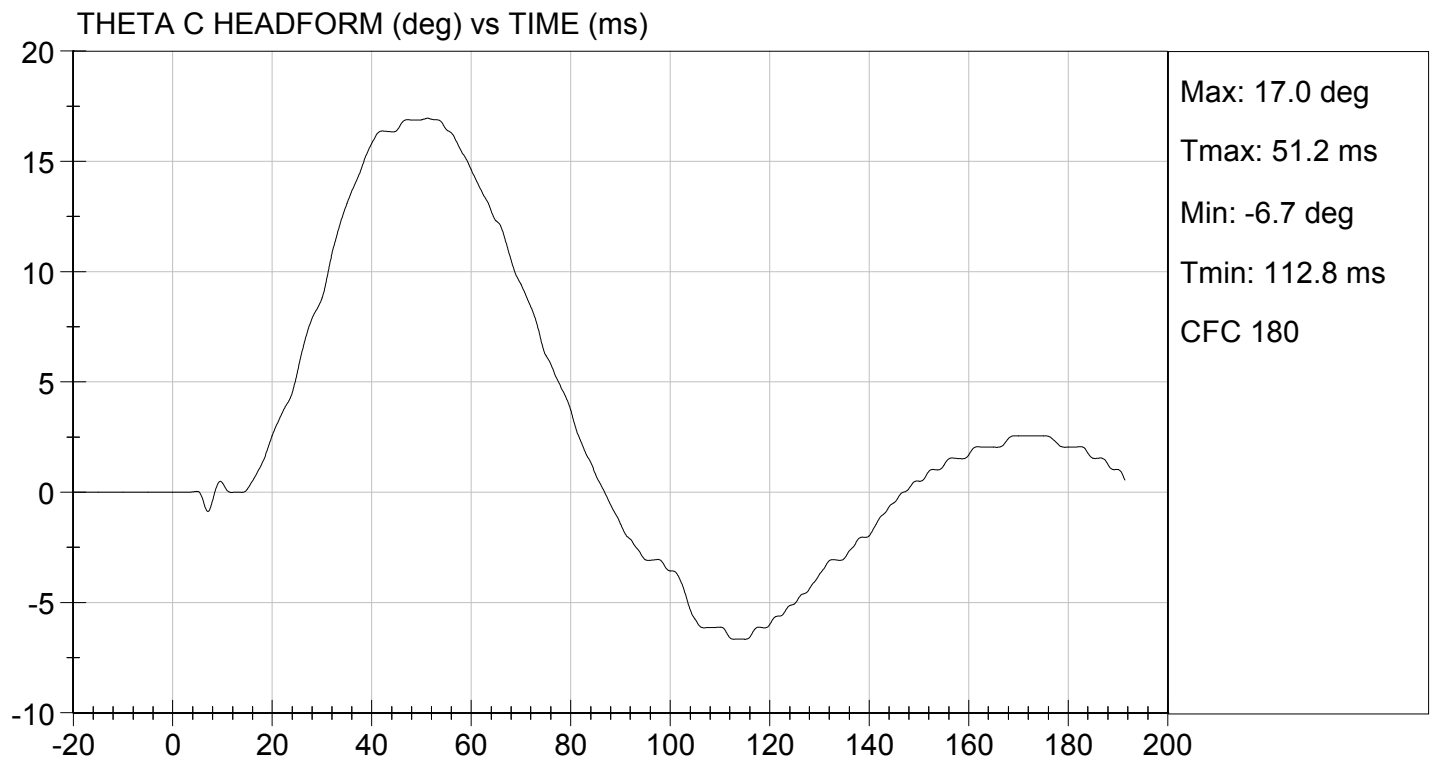






TEST DESC: LUMBAR BENDING
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 07/29/2016
TEST #: D162578



MGA RESEARCH CORPORATION**PELVIS TEST****ES-2re DUMMY****ATD Serial No:** 032**Test I.D:** D162579

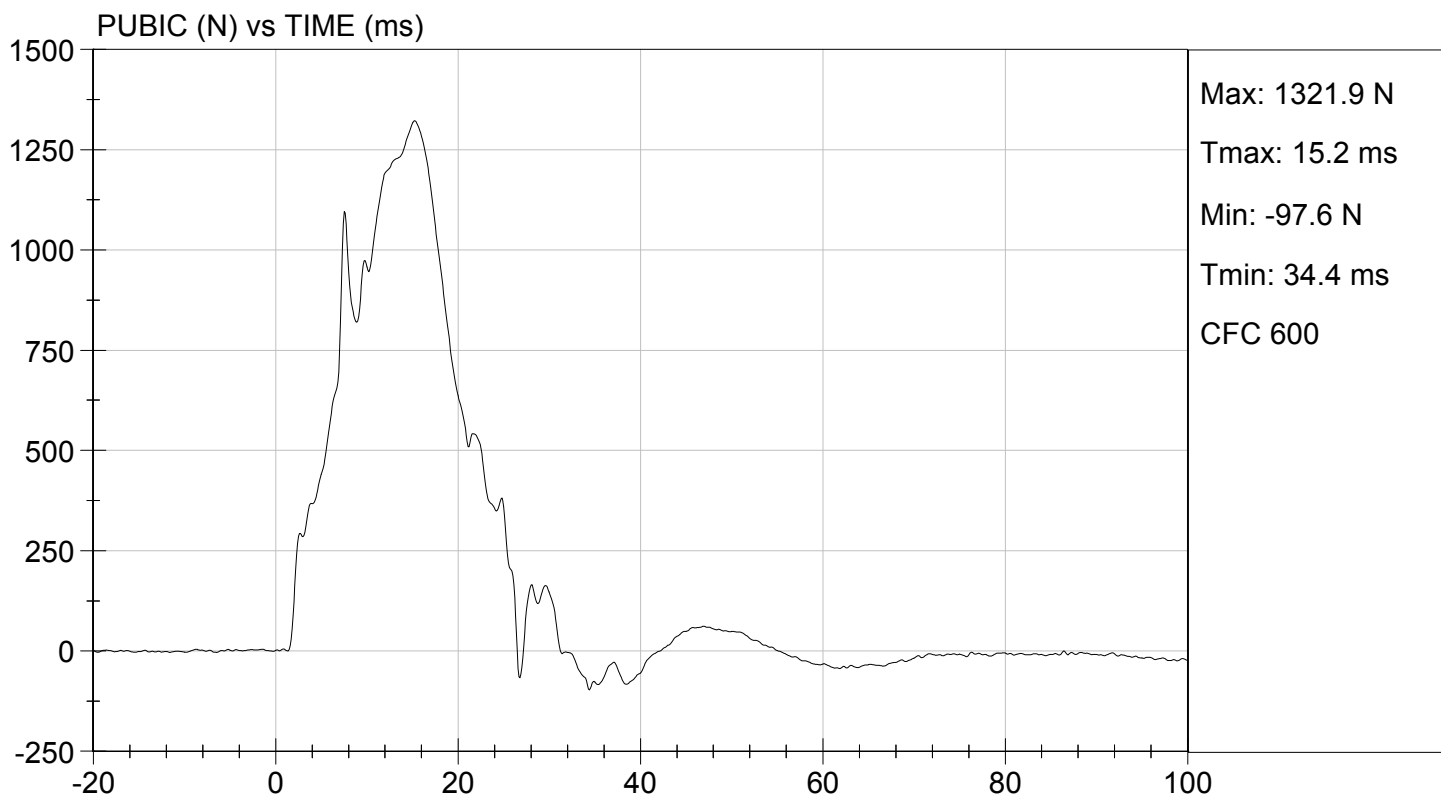
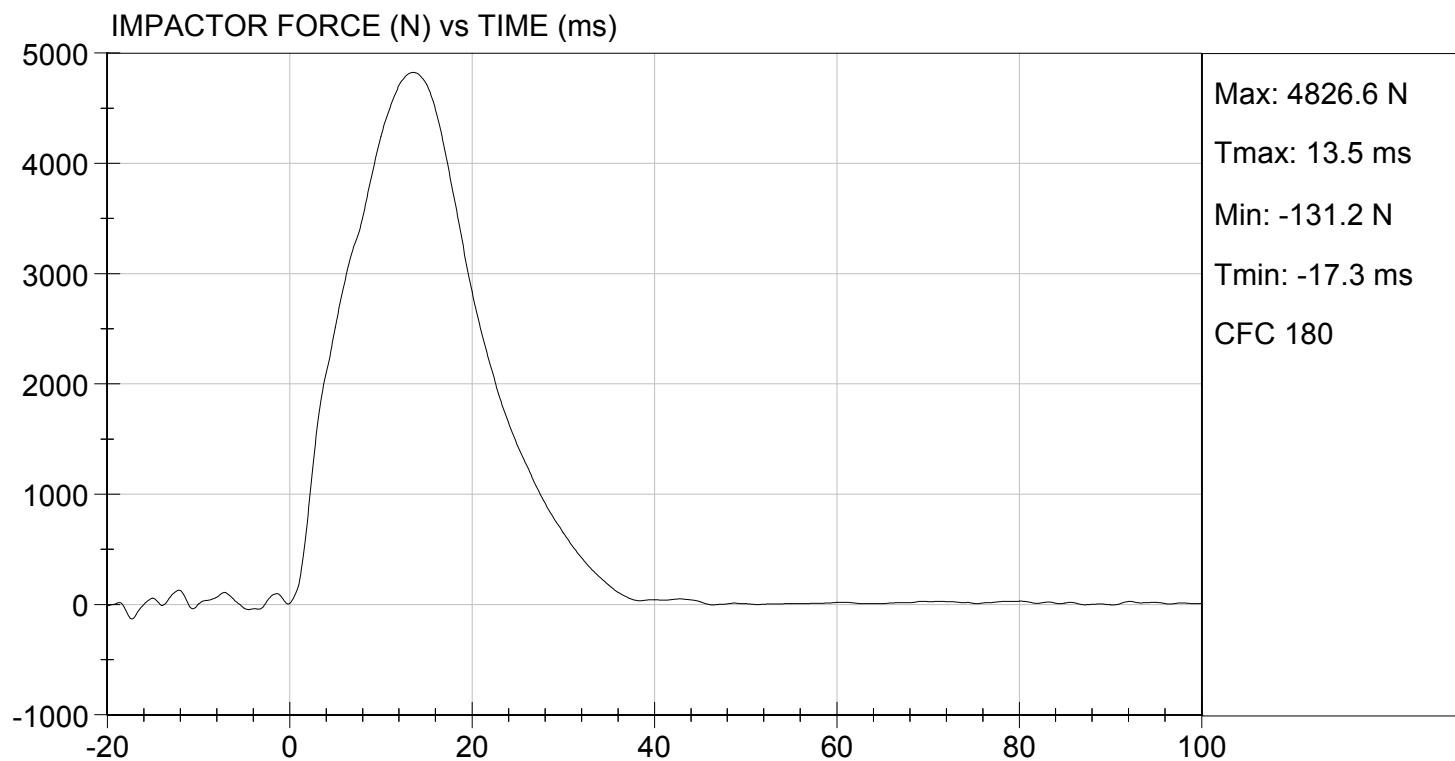
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	51	Pass
Probe Speed	m/s	4.20 to 4.40	4.34	Pass
Maximum Impactor Force	N	4700 to 5400	4827	Pass
Time of Maximum Impactor Force	ms	11.8 to 16.1	13.5	Pass
Maximum Pubic Force	N	1230 to 1590	1322	Pass
Time of Maximum Pubic Force	ms	12.2 to 17.0	15.2	Pass
Overall Test Results				Pass


Laboratory Technician07/29/2016
Test Date
Approved By



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

TEST DATE: 07/29/2016
TEST #: D162579



SID-IIsD External Measurements
SN: 306

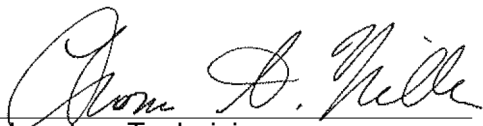
No.	Name	Spec. (mm)	Result	Pass/Fail
A	Sitting Height	772 - 788	785	Pass
B	Shoulder Pivot Height	437 - 453	449	Pass
C	H-point Height	79 - 89	86	Pass
D	H-point from Seatback	141 - 151	147	Pass
E	Shoulder Pivot from Backline	97 - 107	99	Pass
F	Thigh Clearance	119 -135	120	Pass
G	Head Breadth	140 - 148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

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

ATD Serial No: 306

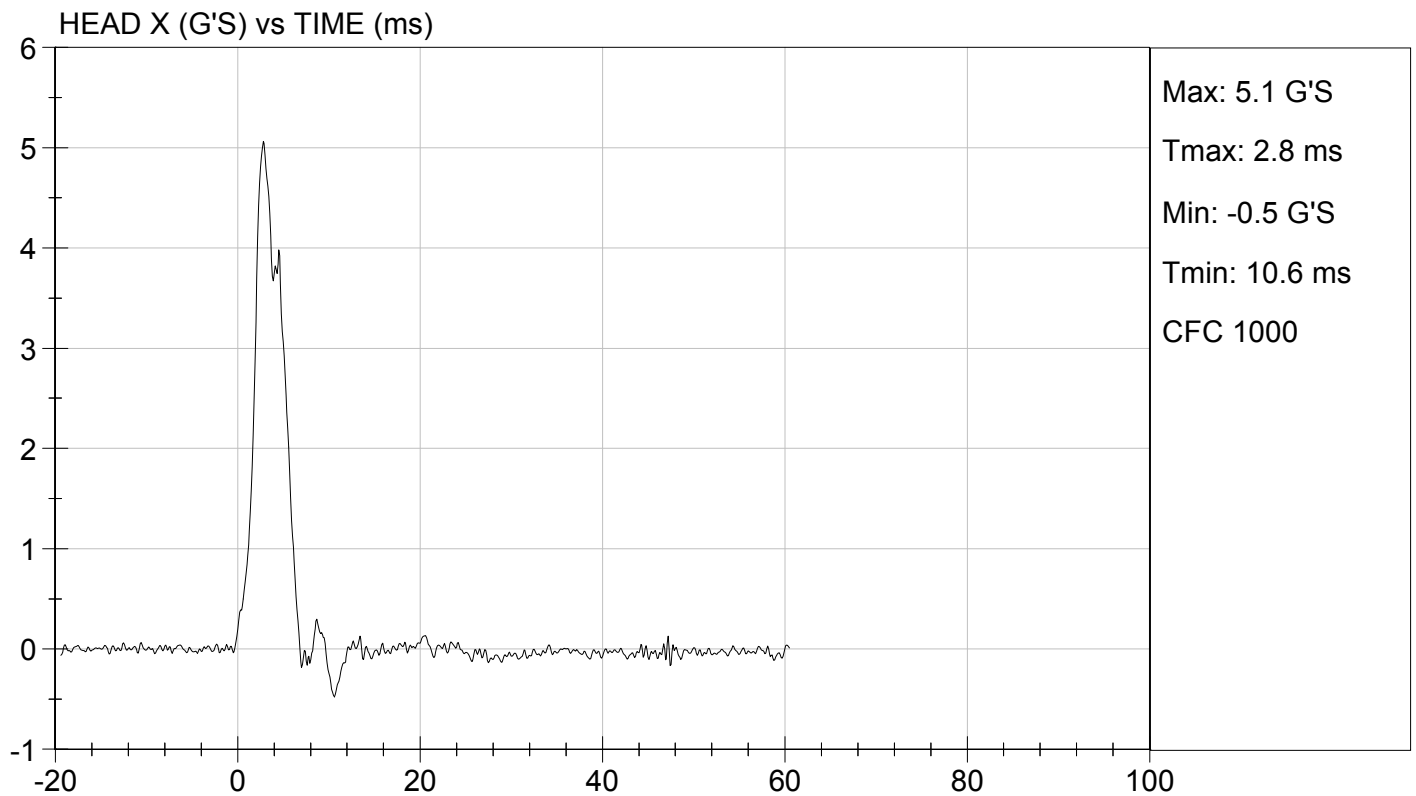
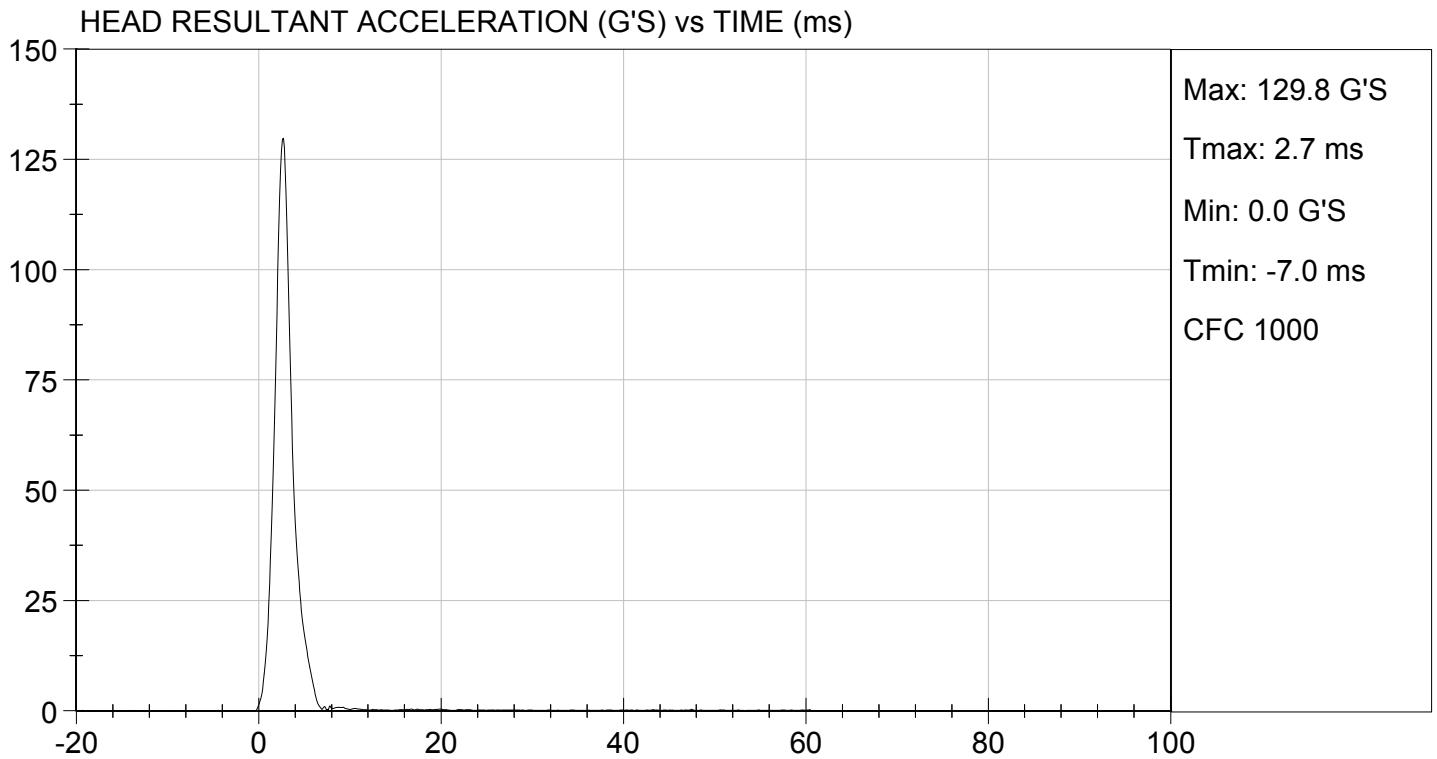
Test ID: D162411

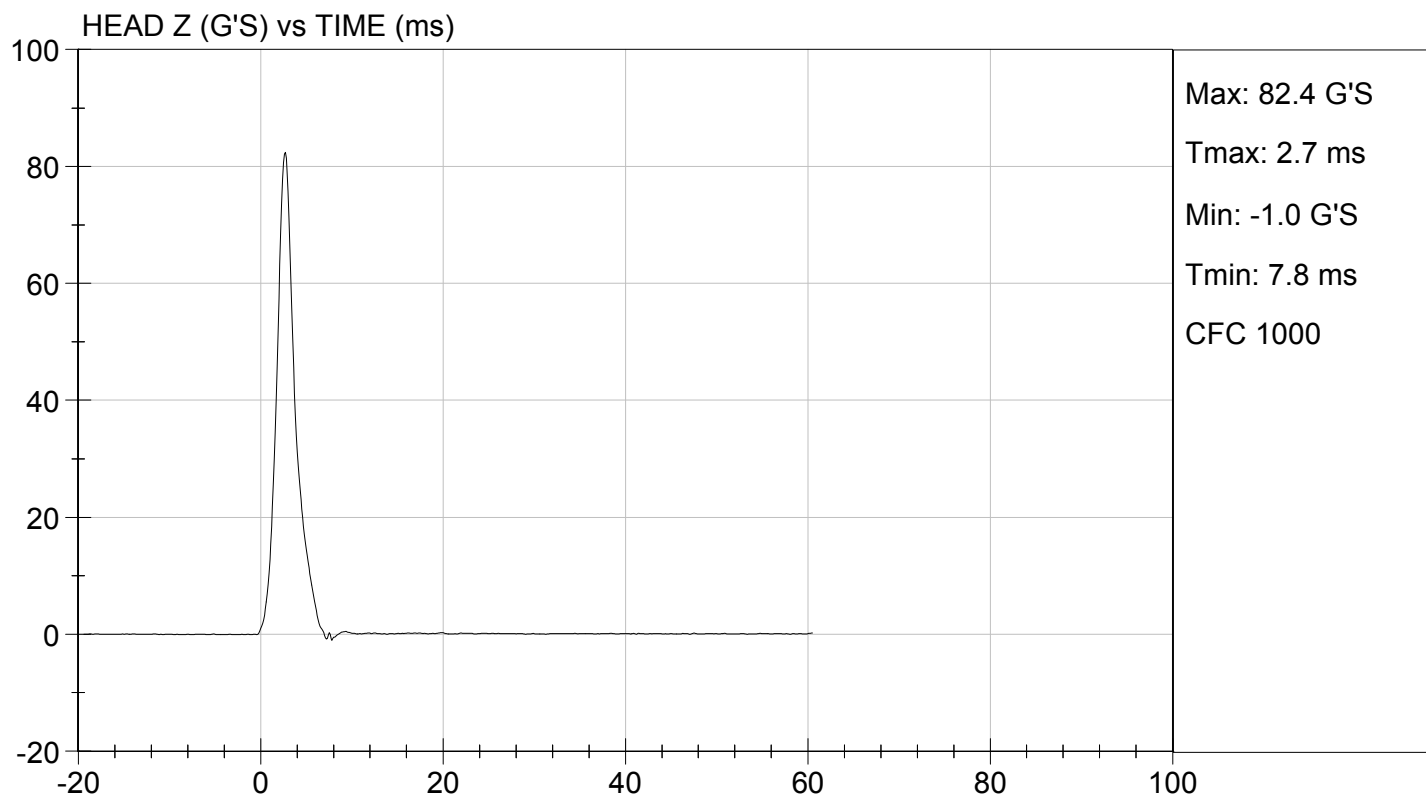
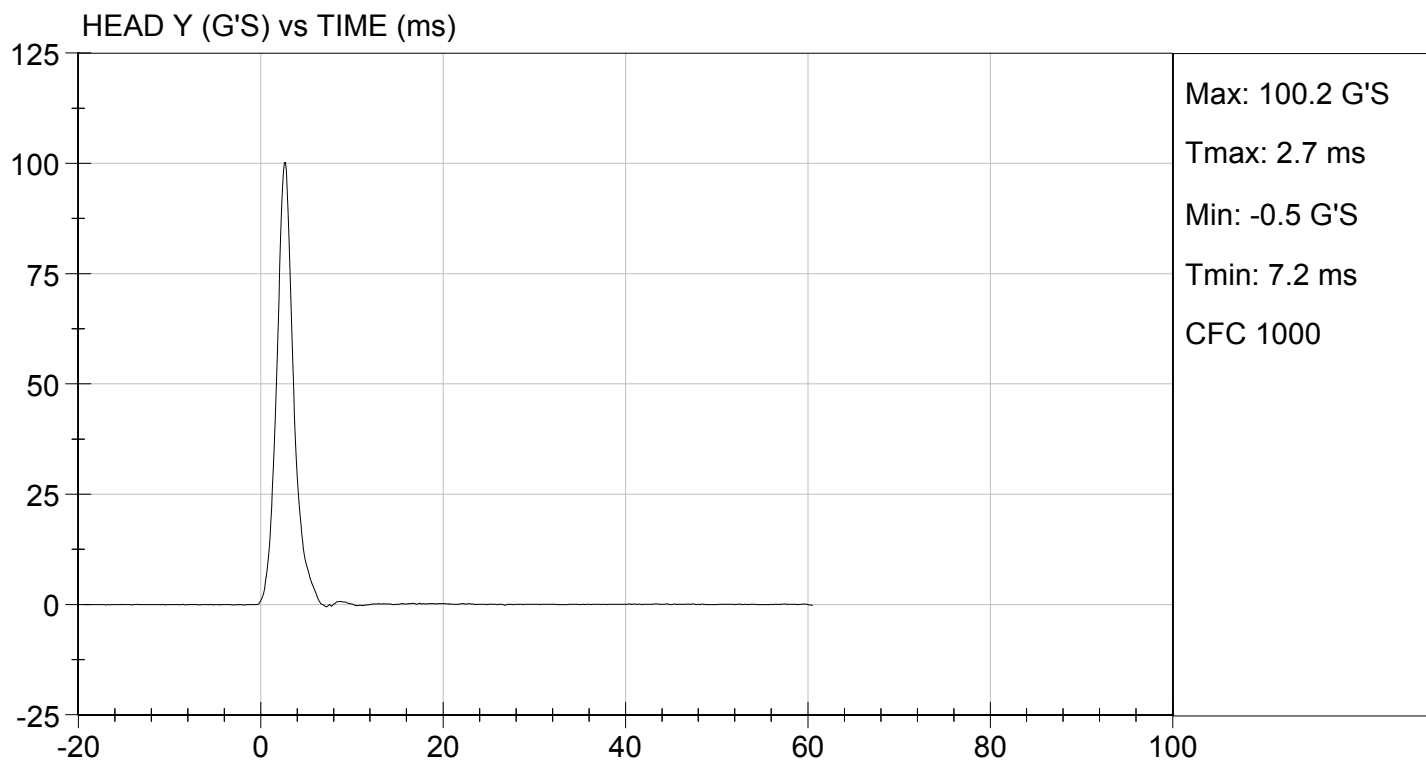
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Peak Resultant Acceleration	G's	115 to 137	130	Pass
Peak Longitudinal Acceleration	G's	+/- 15	5.1	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	<15%	Yes	Pass
Overall Test Results			Pass	


Laboratory Technician

07/14/2016
Test Date


Approved By





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

ATD Serial No: 306

Test I.D: D162412

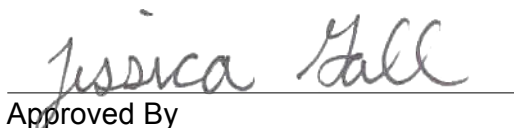
Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.2	Pass
Humidity		%	10 to 70	47	Pass
Impact Velocity		m/s	5.51 to 5.63	5.58	Pass
Pendulum Velocity	10 ms	m/s	2.20 to 2.80	2.69	Pass
	15 ms	m/s	3.30 to 4.10	3.95	Pass
	20 ms	m/s	4.40 to 5.40	5.32	Pass
	25 ms	m/s	5.40 to 6.10	5.60	Pass
	25-100 ms	m/s	5.50 to 6.20	5.65	Pass
Maximum D-Plane Rotation		deg	71 to 81	72	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	62	Pass
Maximum Occipital Condyle Moment		Nm	-44 to -36	-39	Pass
Time of Moment Decay to 0 Nm		ms	102 to 126	116	Pass
Overall Test Results					Pass



Laboratory Technician

07/14/2016

Test Date

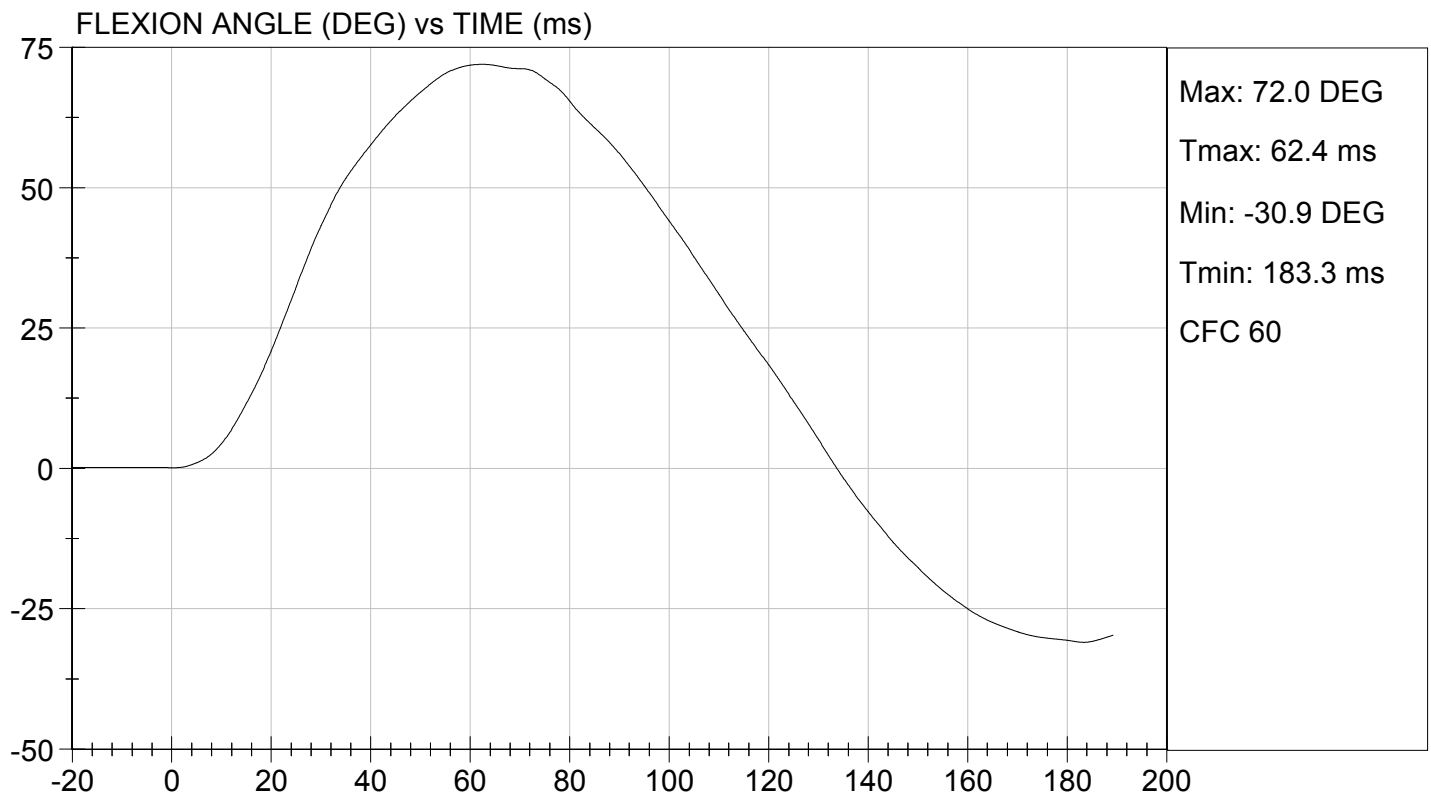
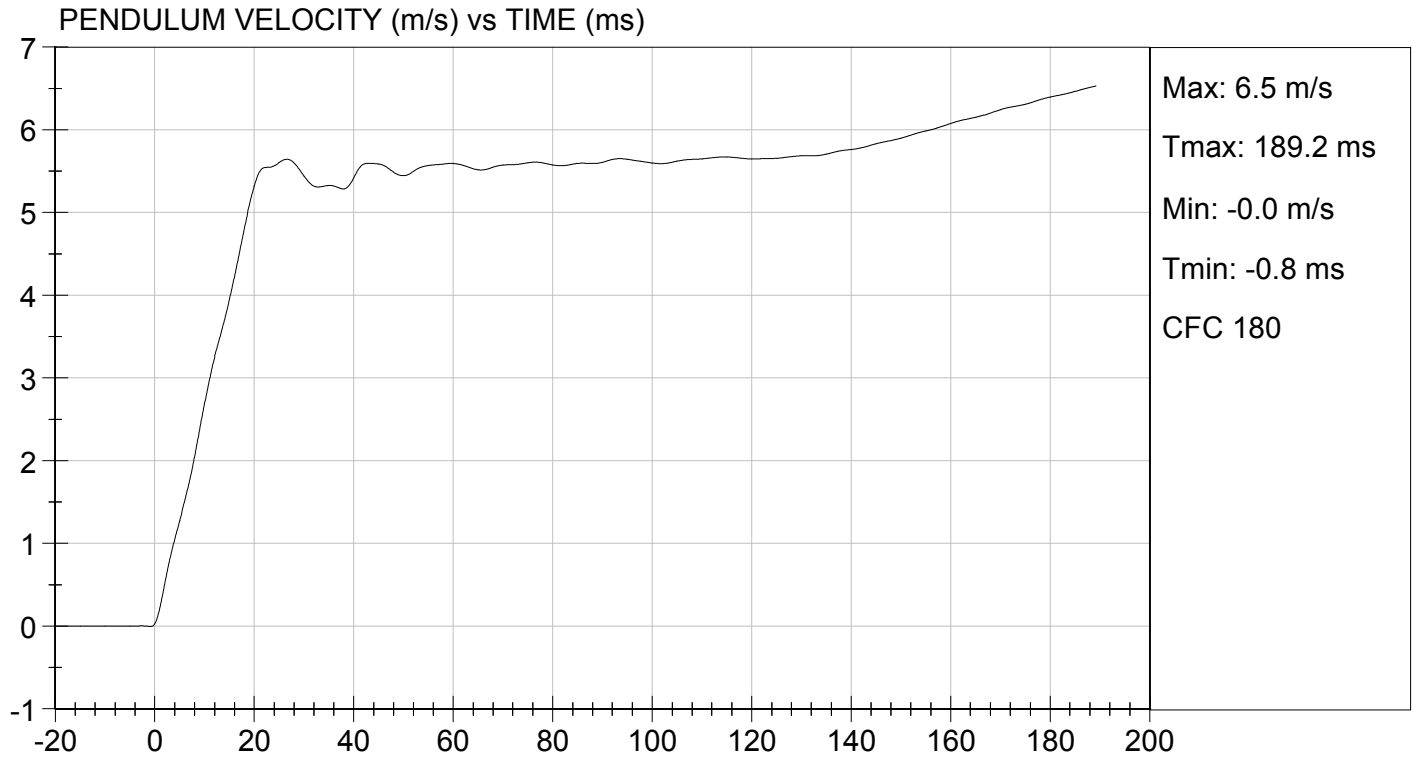


Approved By



TEST DESC: NECK BENDING
VELOCITY: 18.32 ft/s, 5.58 m/s

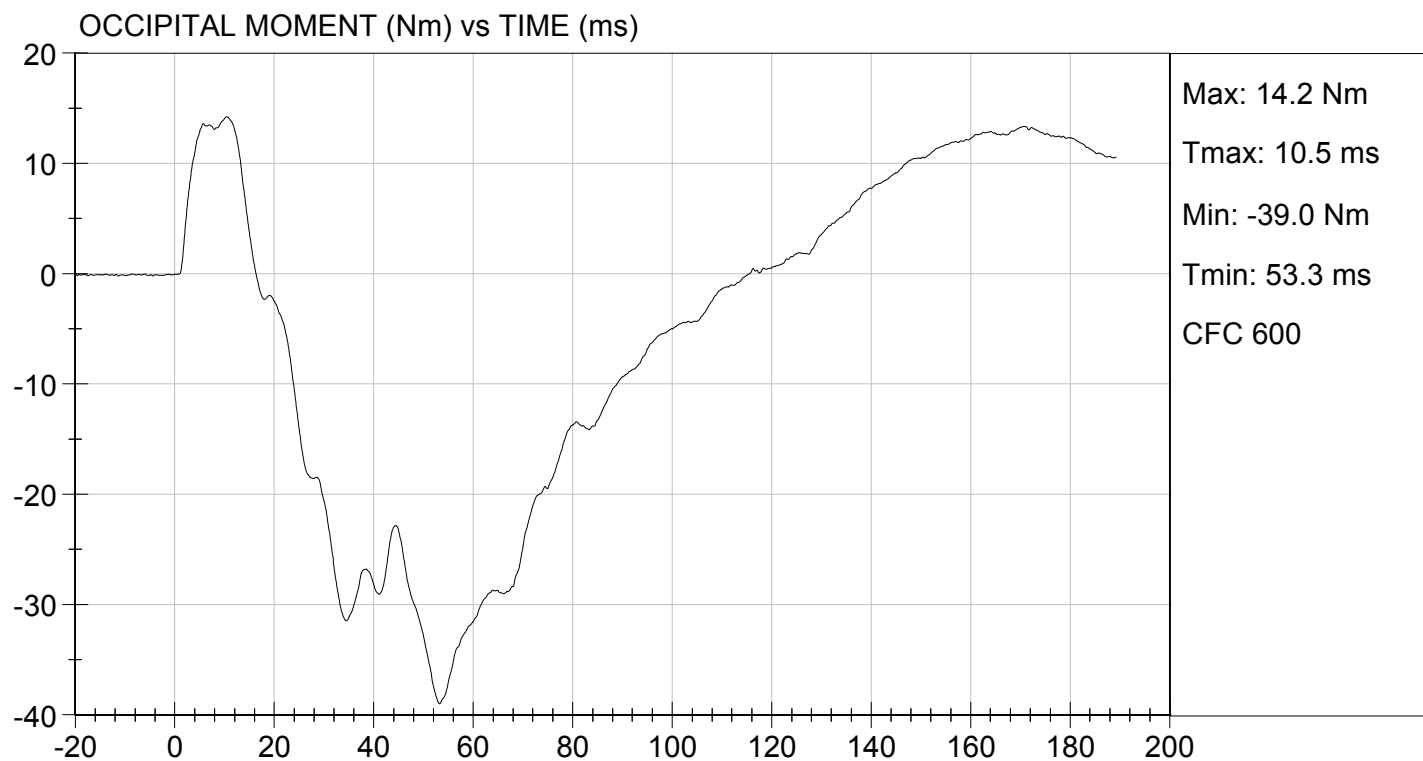
TEST DATE: 07/14/2016
TEST #: D162412





TEST DESC: NECK BENDING
VELOCITY: 18.32 ft/s, 5.58 m/s

TEST DATE: 07/14/2016
TEST #: D162412

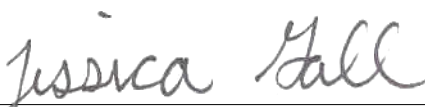


MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

Test ID: D162413

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	49	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Maximum Probe Acceleration	G's	13 to 18	15	Pass
Shoulder Displacement	mm	28 to 37	30	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	19	Pass
			Overall Test Results	Pass


Laboratory Technician

07/14/2016

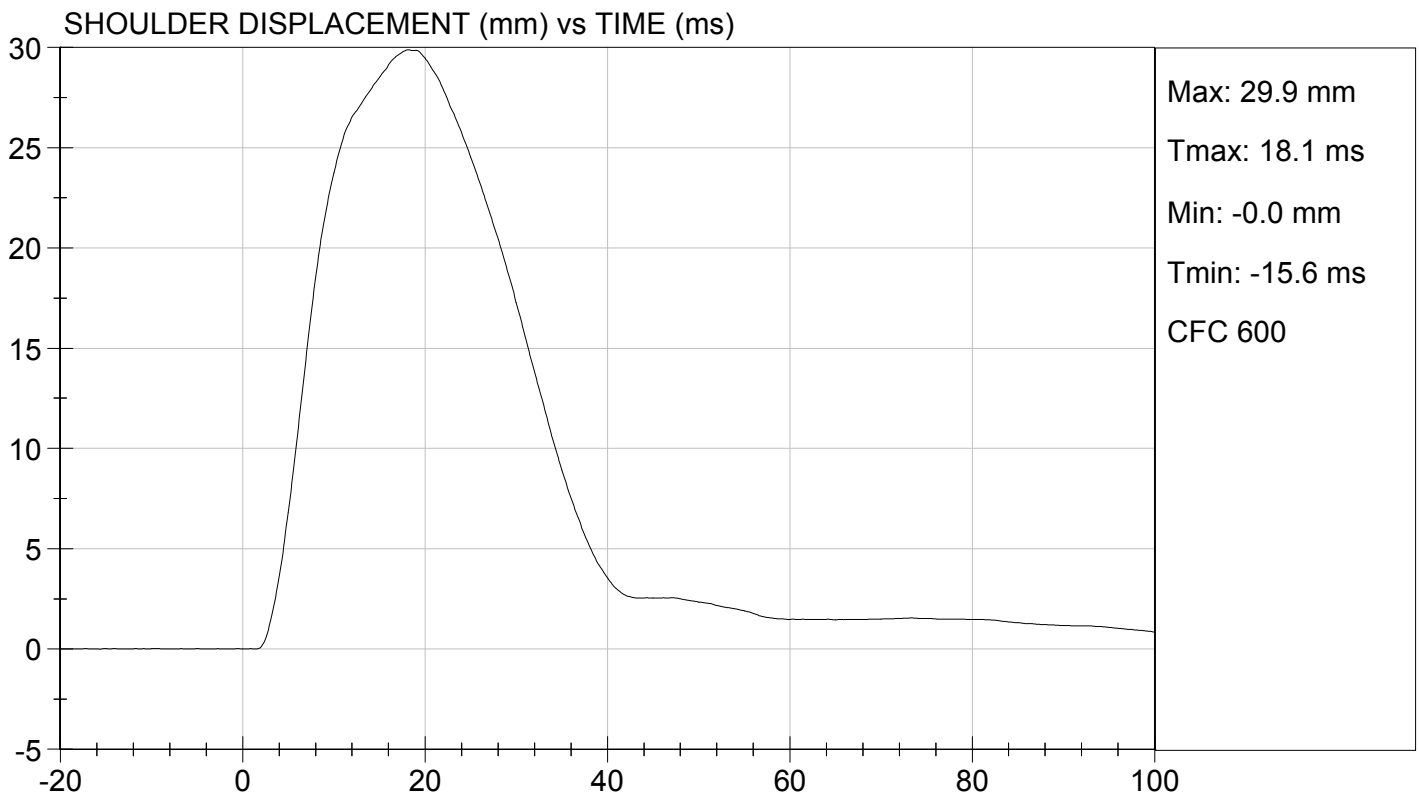
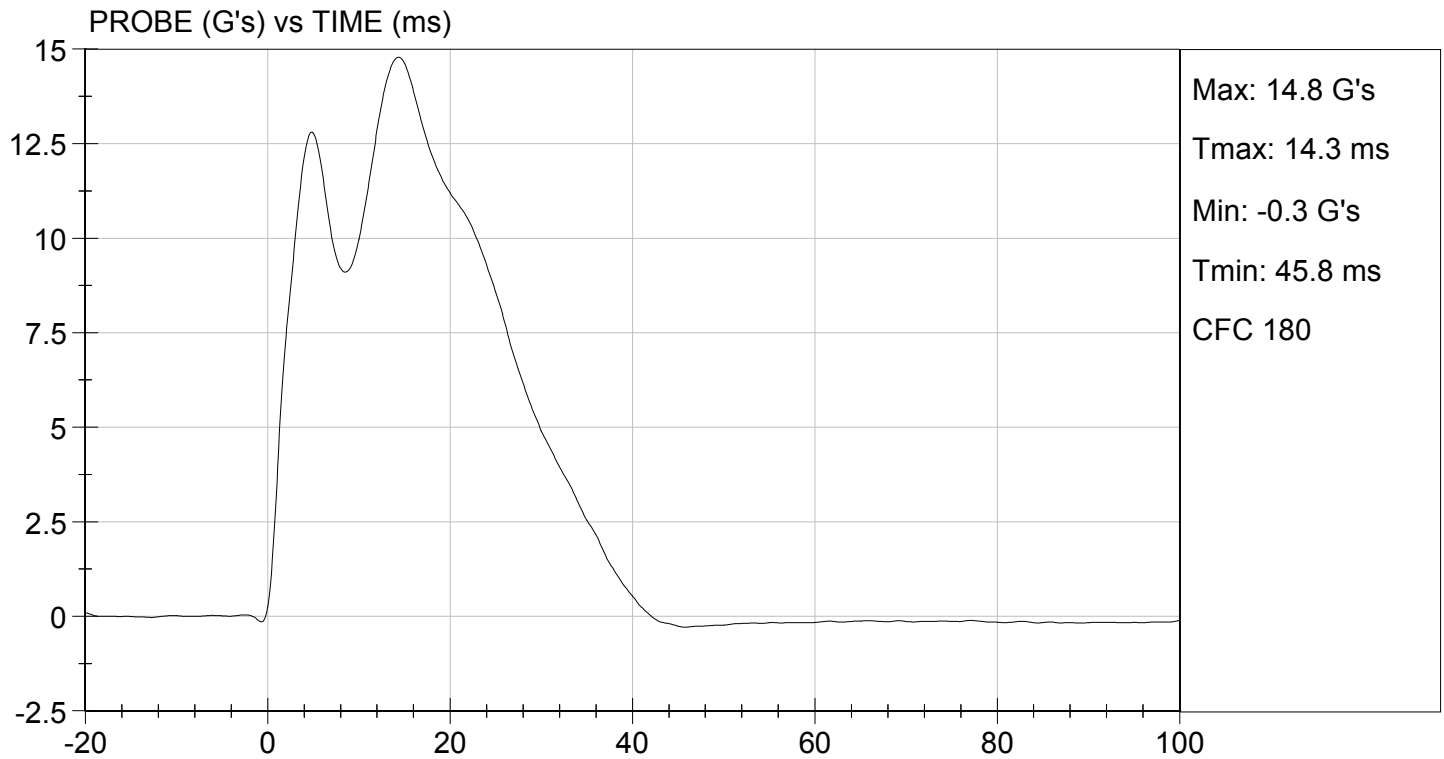
Test Date


Approved By



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

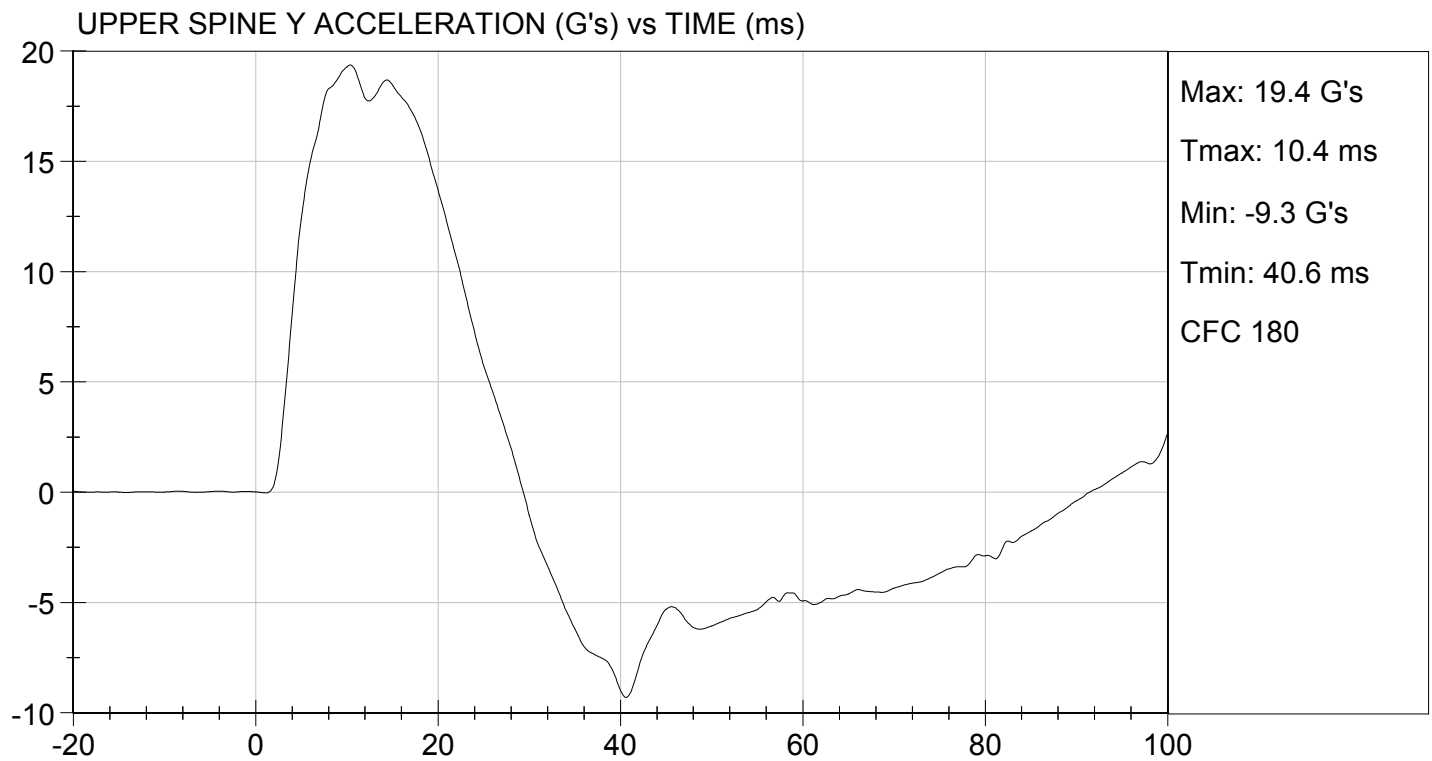
TEST DATE: 07/14/2016
TEST #: D162413





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

TEST DATE: 07/14/2016
TEST #: D162413



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

ATD Serial No: 306

Test I.D: D162414

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.9	Pass
Humidity	%	10 to 70	49	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Maximum Probe Acceleration	G's	30 to 36	32	Pass
Shoulder Displacement	mm	31 to 40	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	38	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	32	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

Adam D. Miller
Approved By

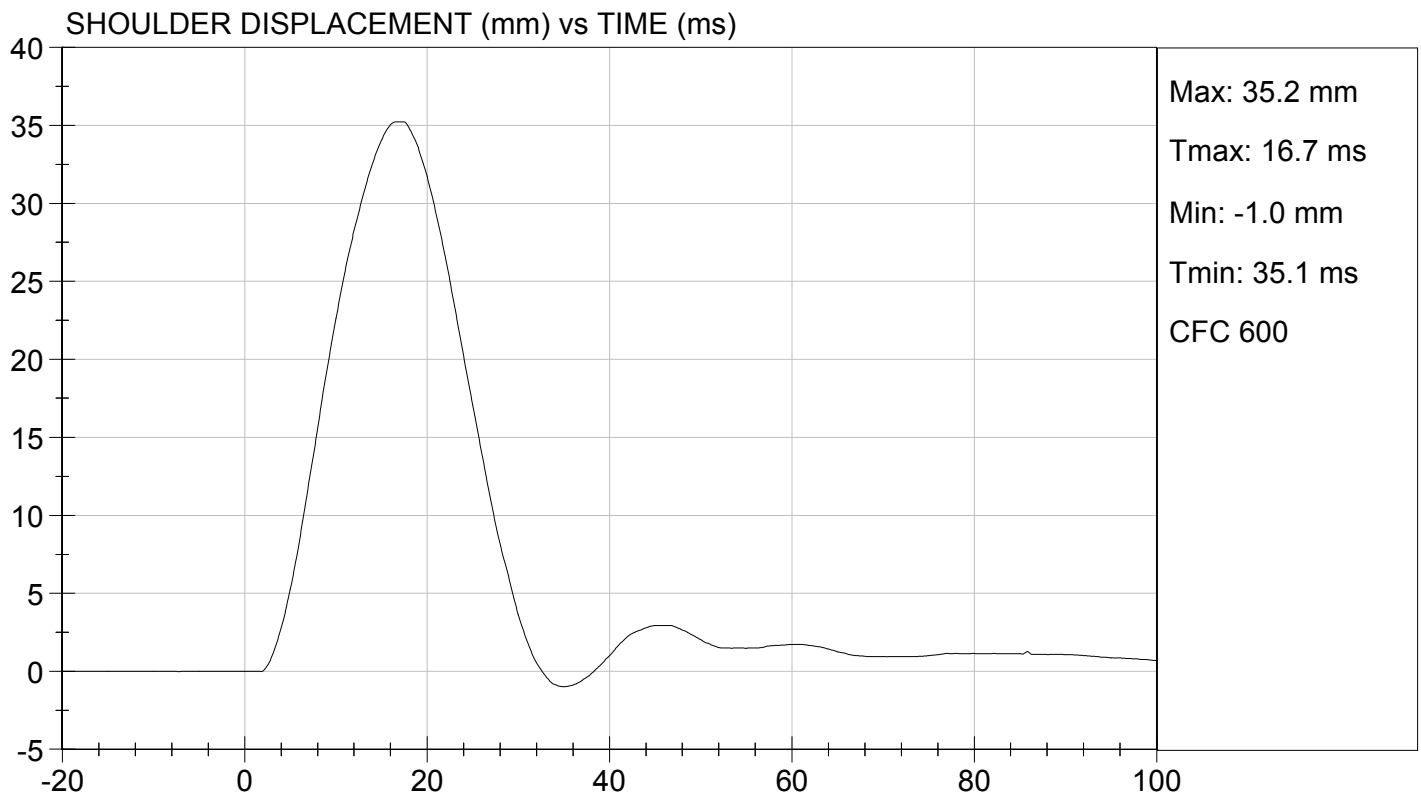
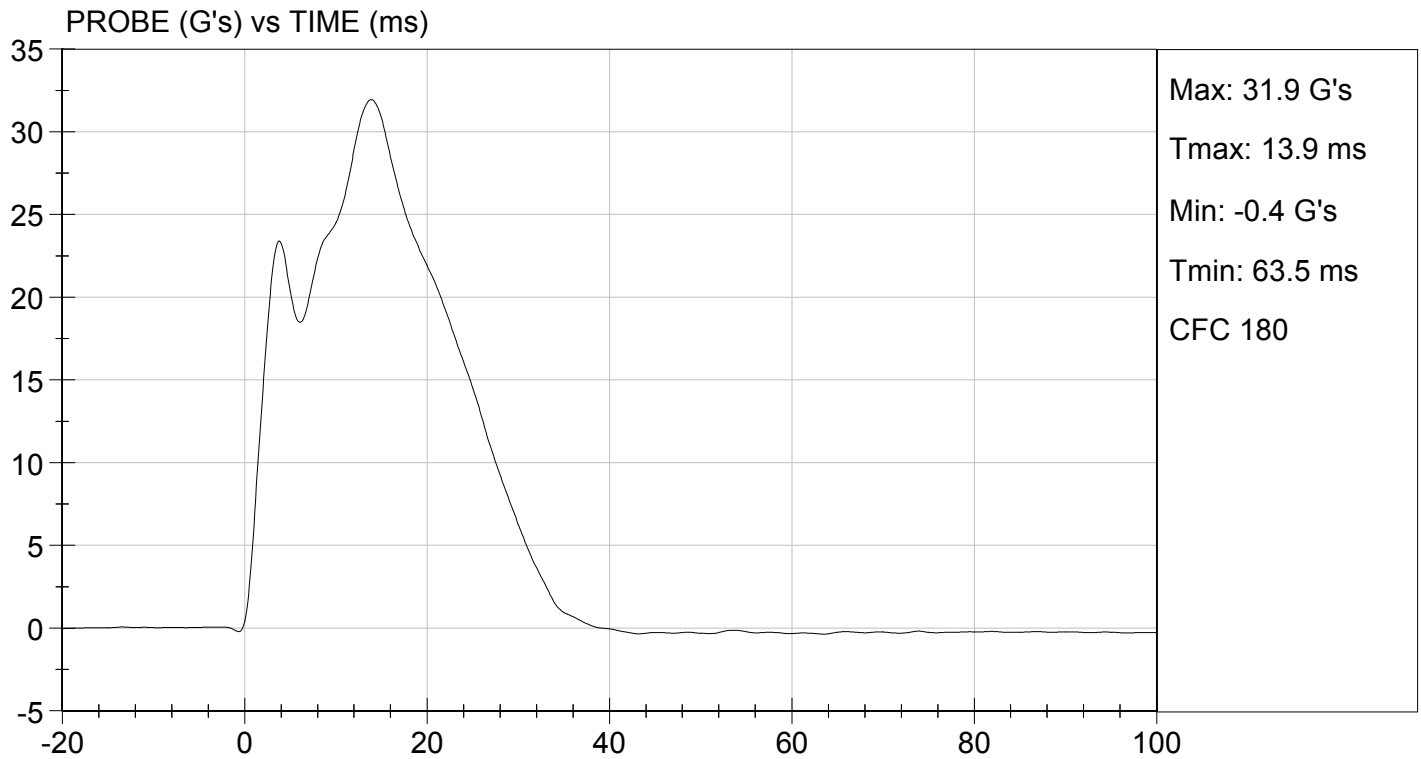
07/14/2016

Test Date



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

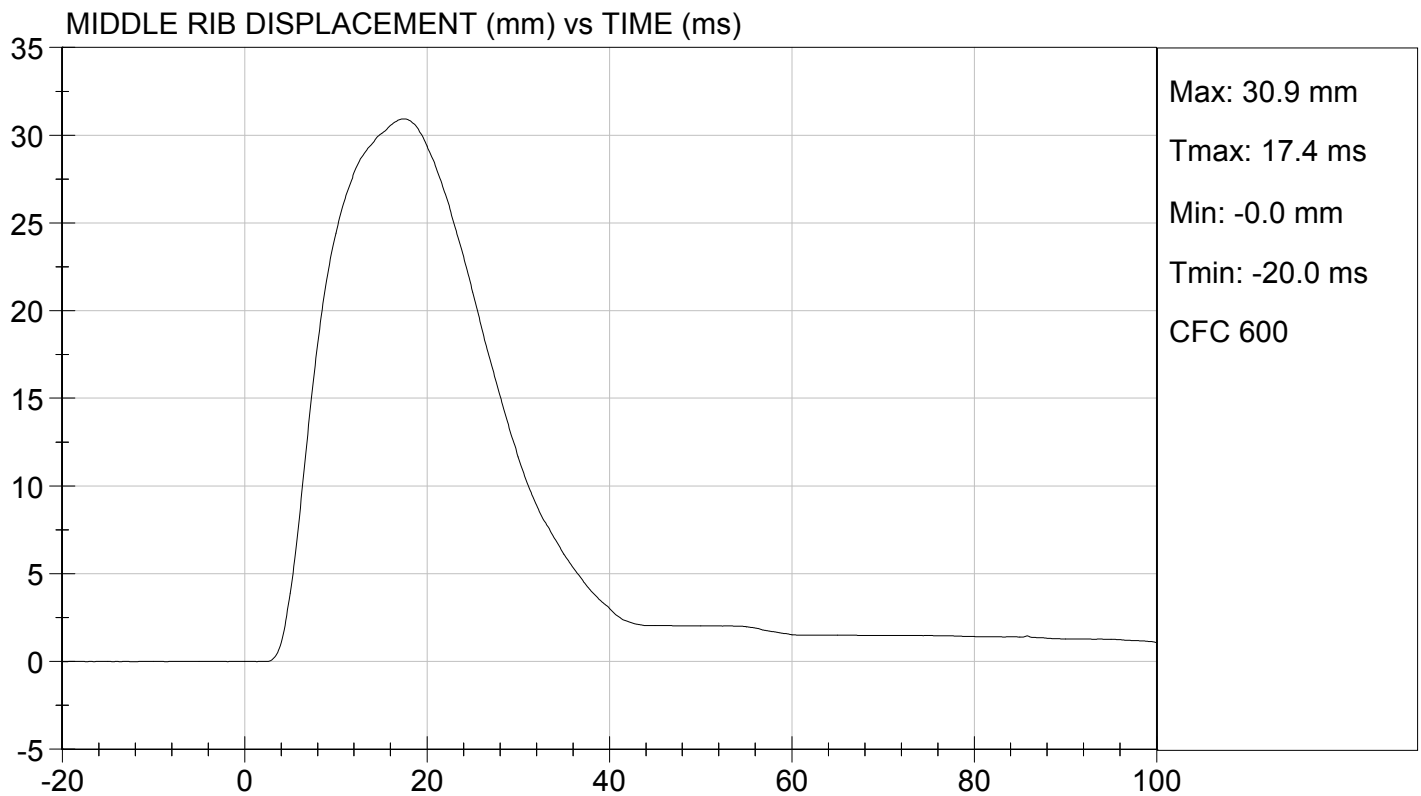
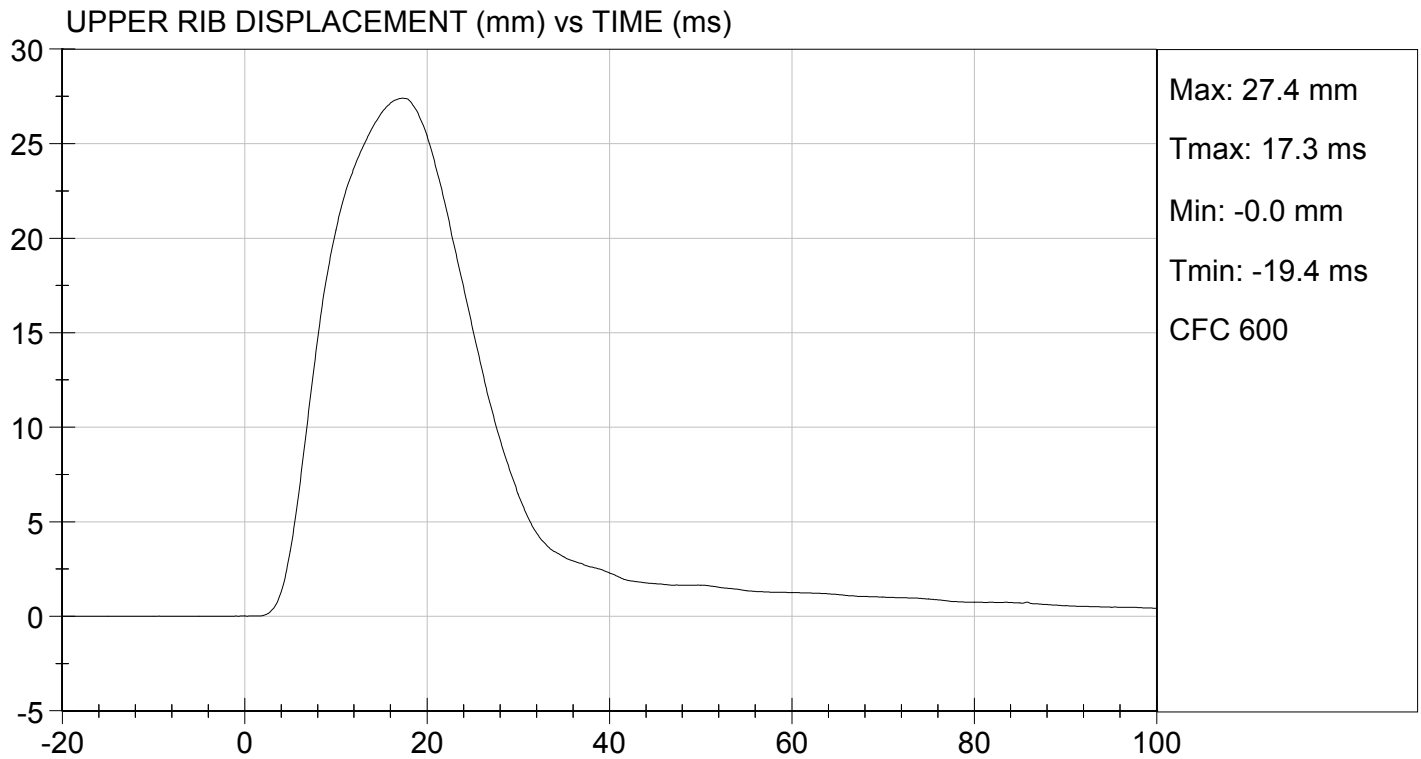
TEST DATE: 07/14/2016
TEST #: D162414





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

TEST DATE: 07/14/2016
TEST #: D162414

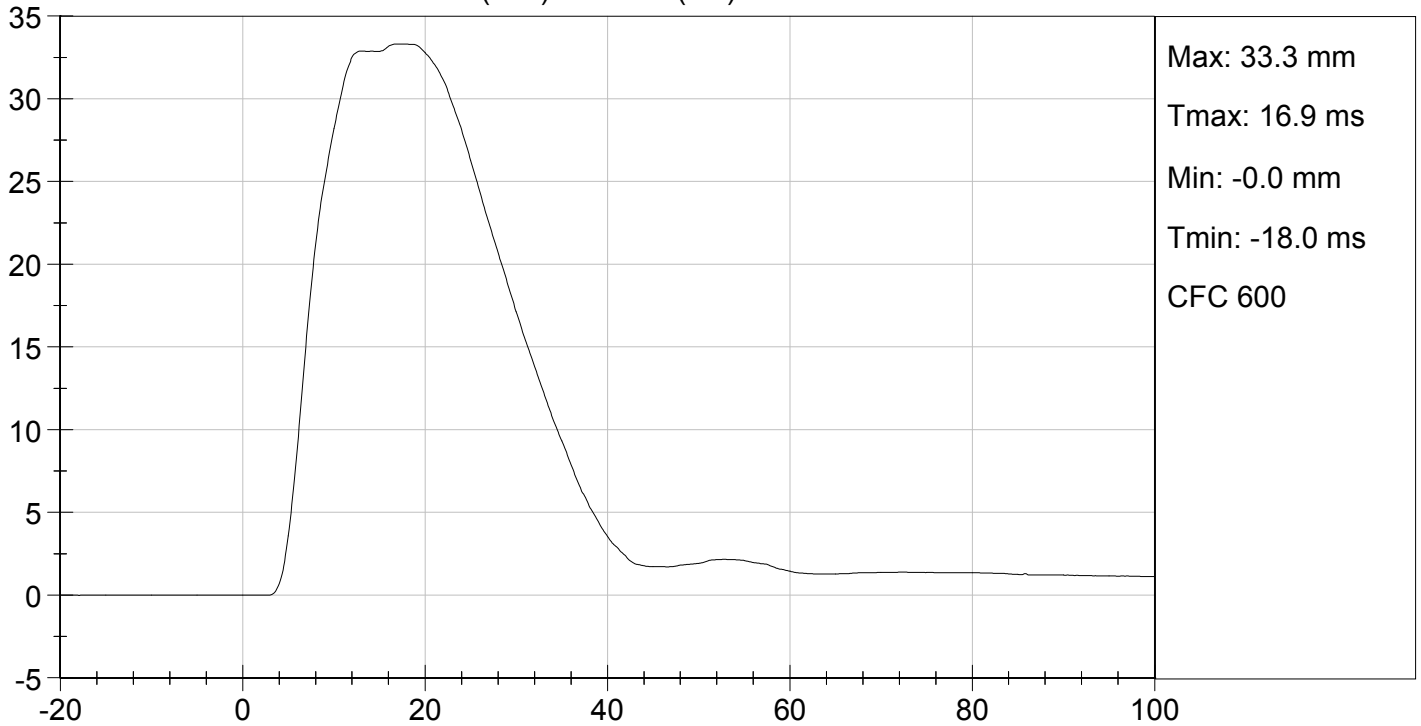




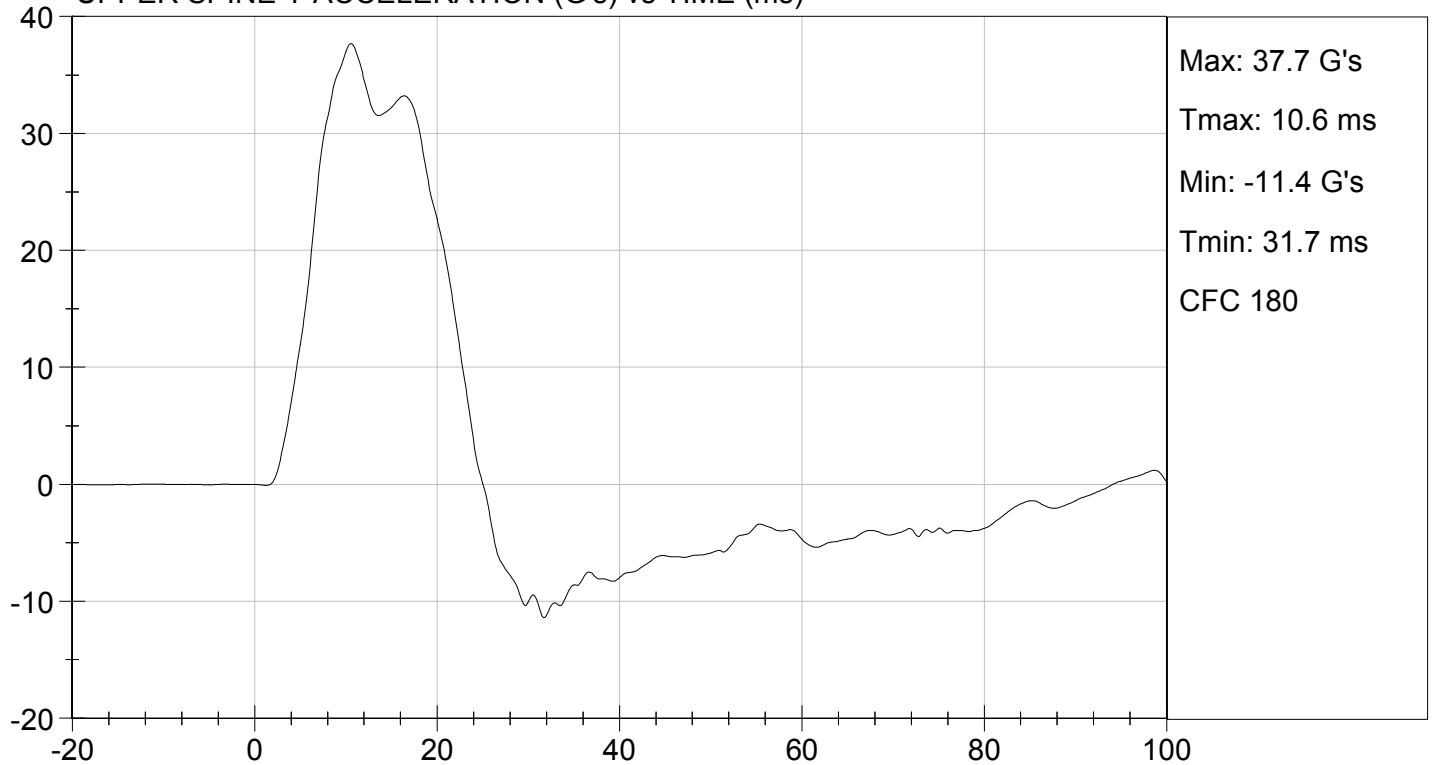
TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 07/14/2016
TEST #: D162414

LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



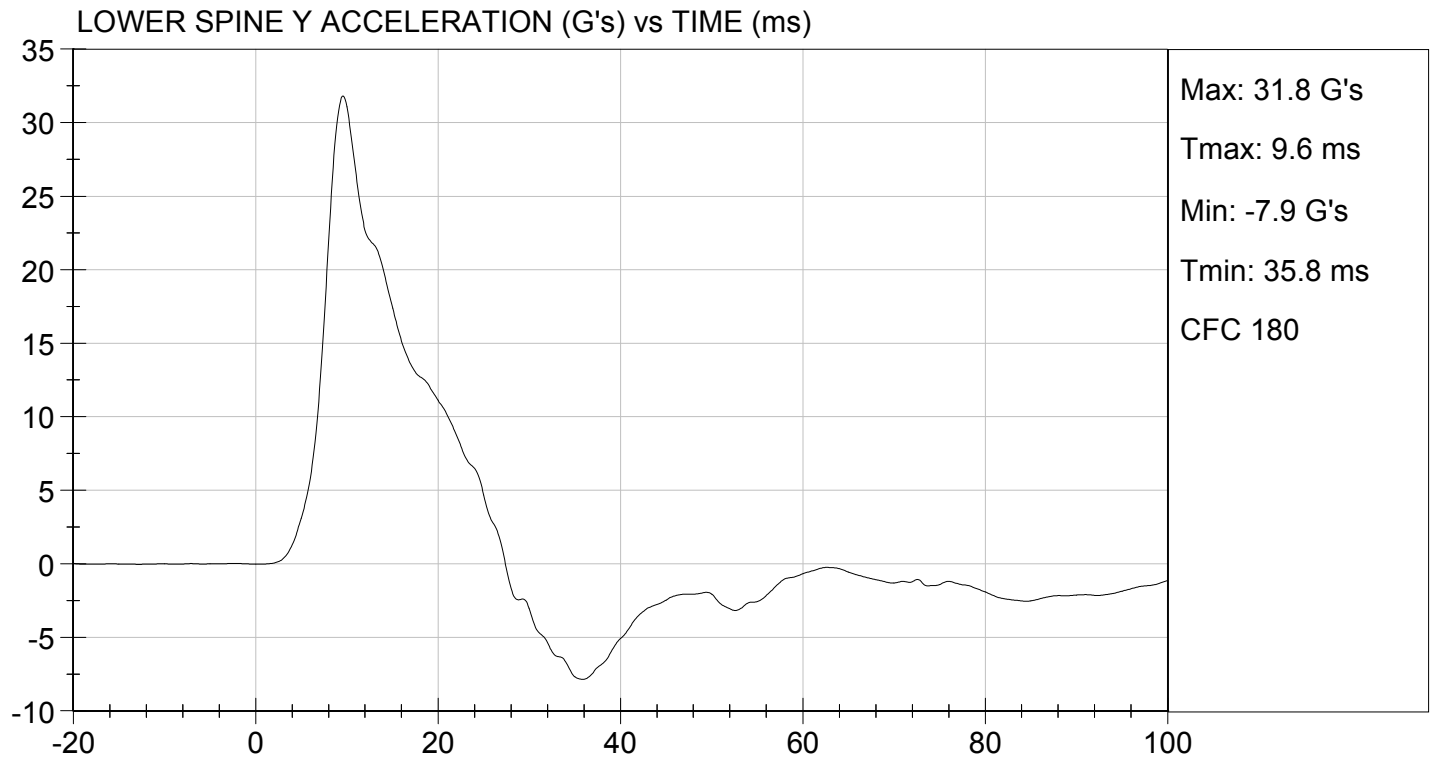
UPPER SPINE Y ACCELERATION (G's) vs TIME (ms)





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

TEST DATE: 07/14/2016
TEST #: D162414



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

ATD Serial No: 306

Test I.D: D162415

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.9	Pass
Humidity	%	10 to 70	49	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Maximum Probe Acceleration	G's	14 to 18	15	Pass
Upper Rib Displacement	mm	32 to 40	38	Pass
Middle Rib Displacement	mm	39 to 45	41	Pass
Lower Rib Displacement	mm	35 to 43	38	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 17	15	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	9	Pass
Overall Test Results				Pass


 Laboratory Technician

07/14/2016

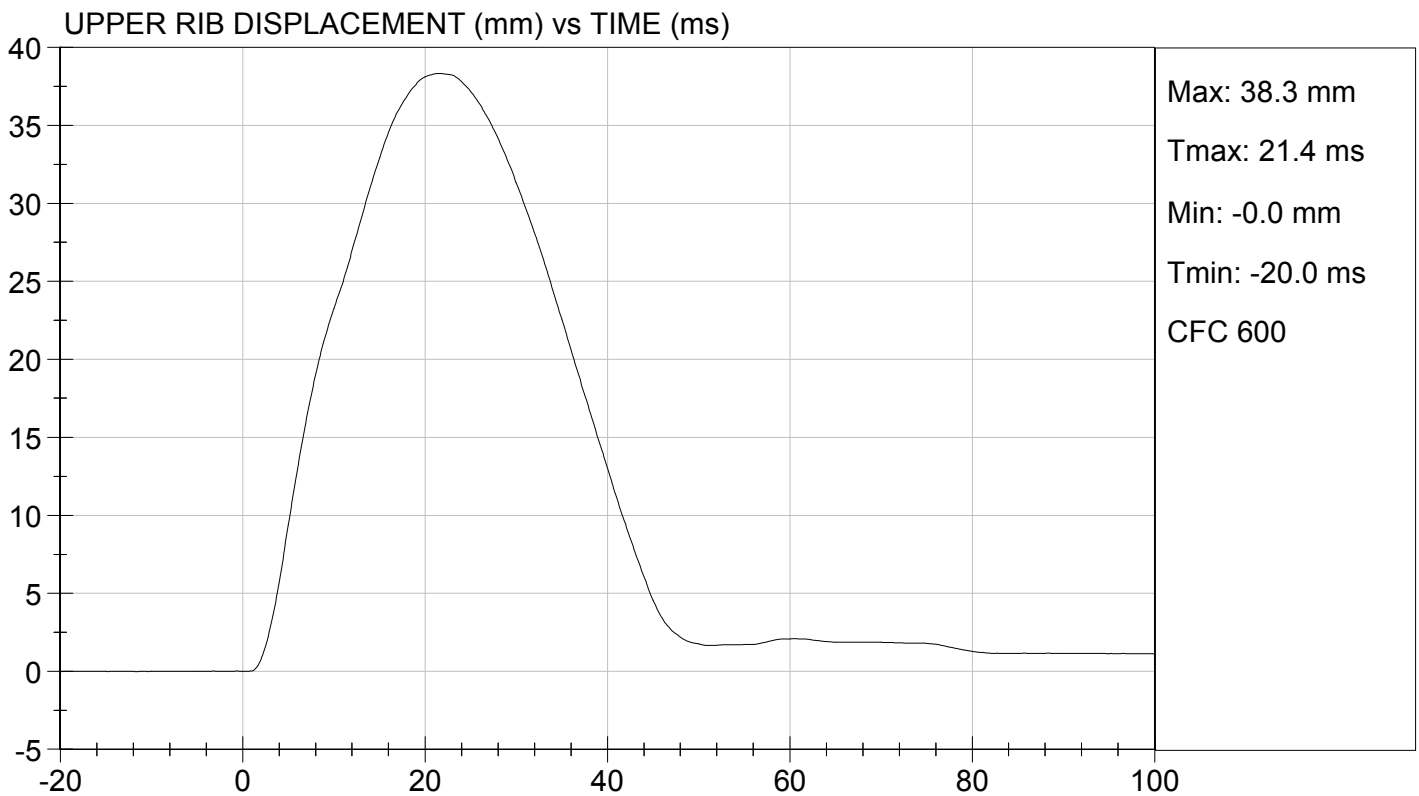
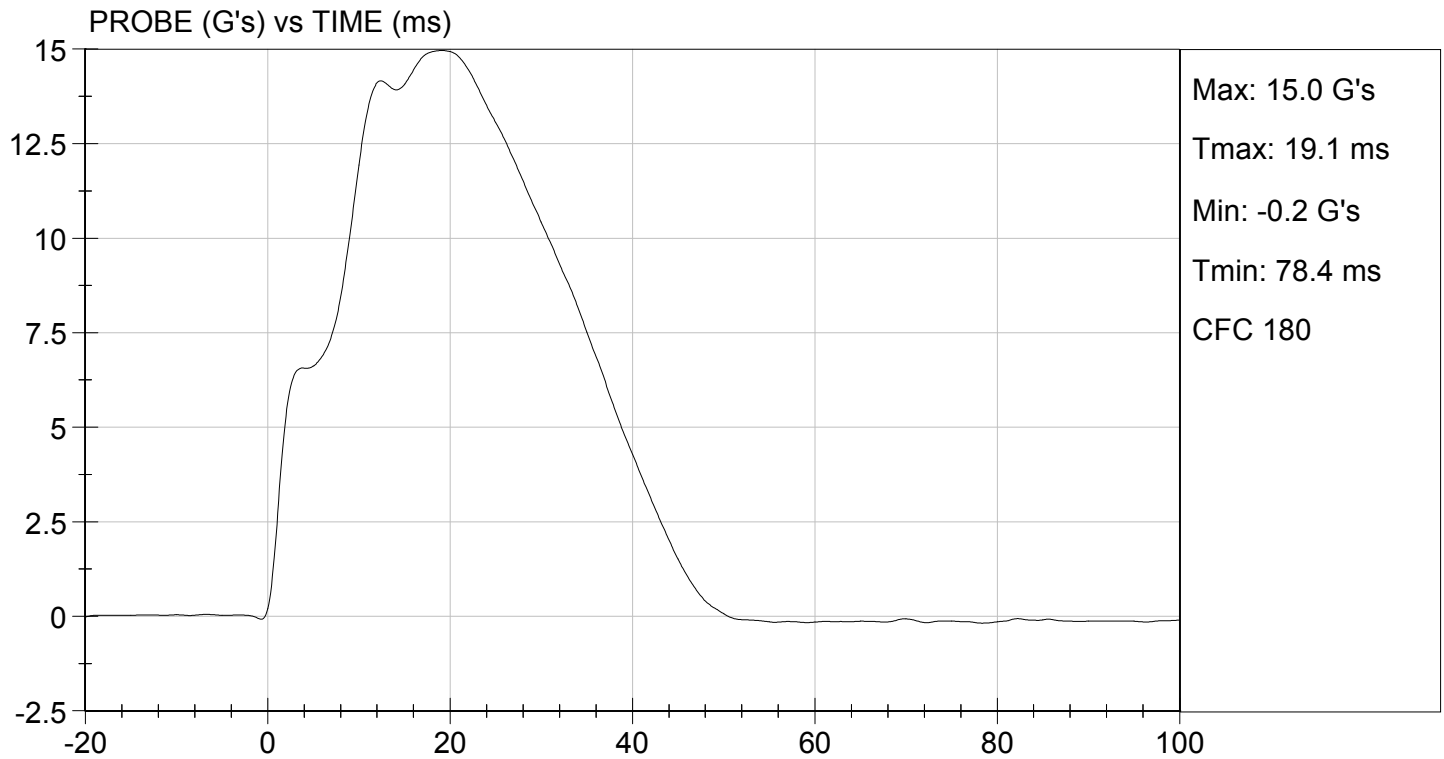
Test Date


 Approved By



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

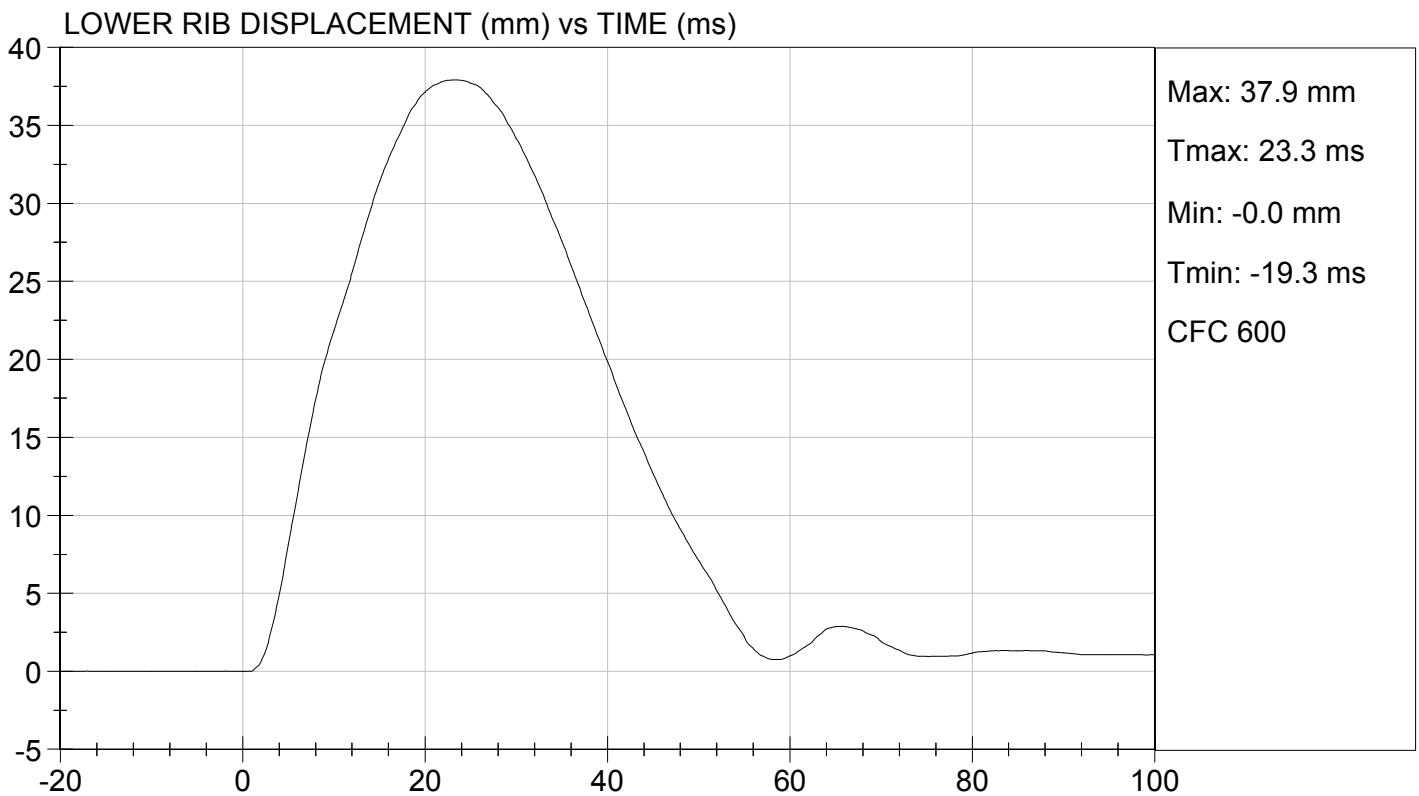
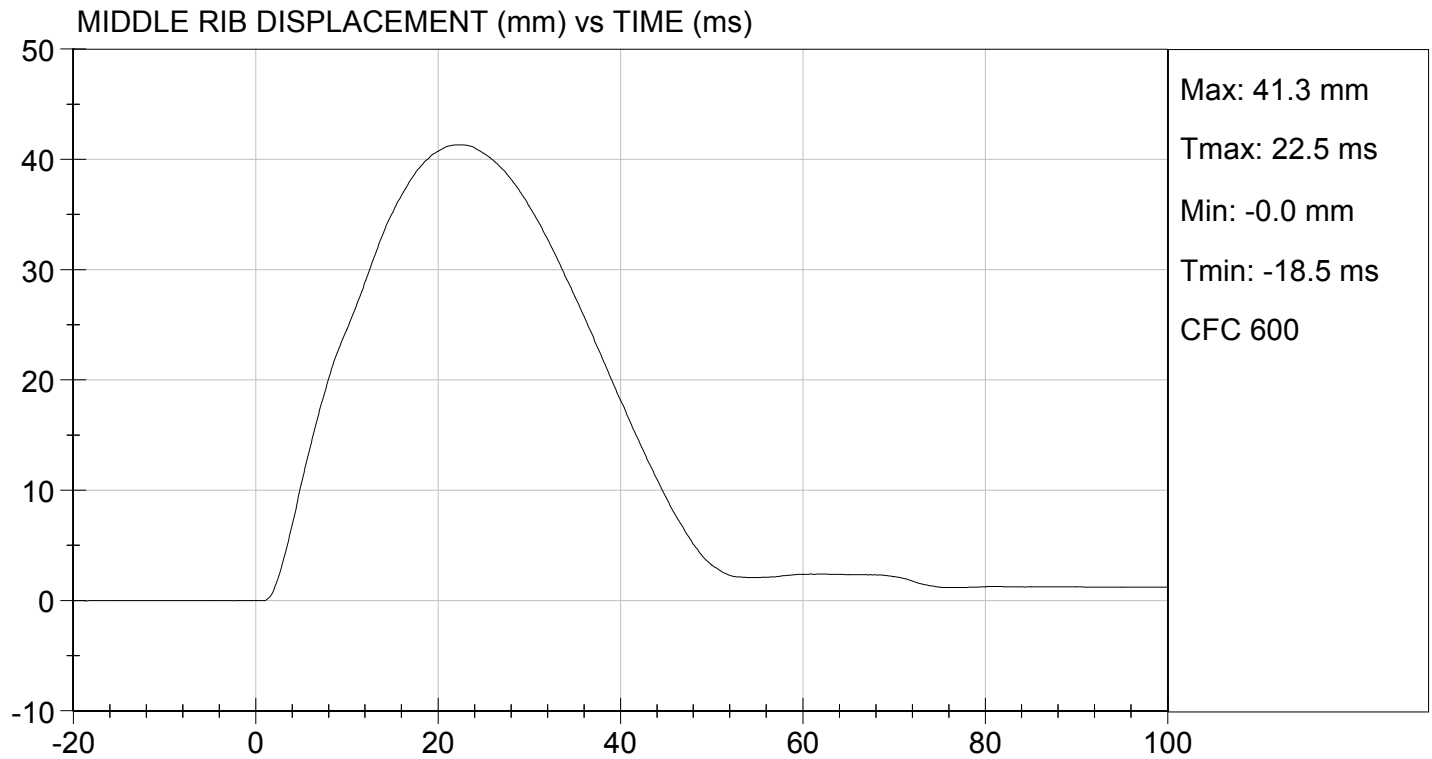
TEST DATE: 07/14/2016
TEST #: D162415





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

TEST DATE: 07/14/2016
TEST #: D162415

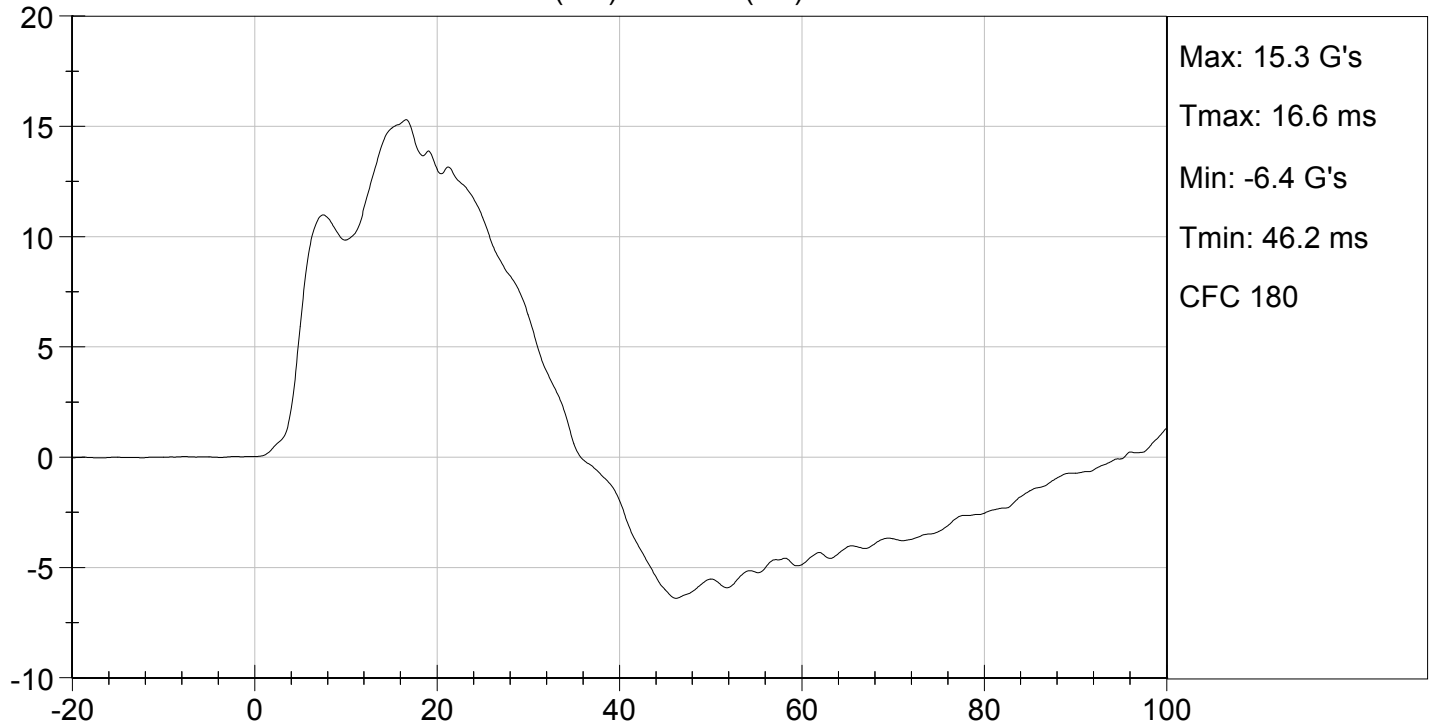




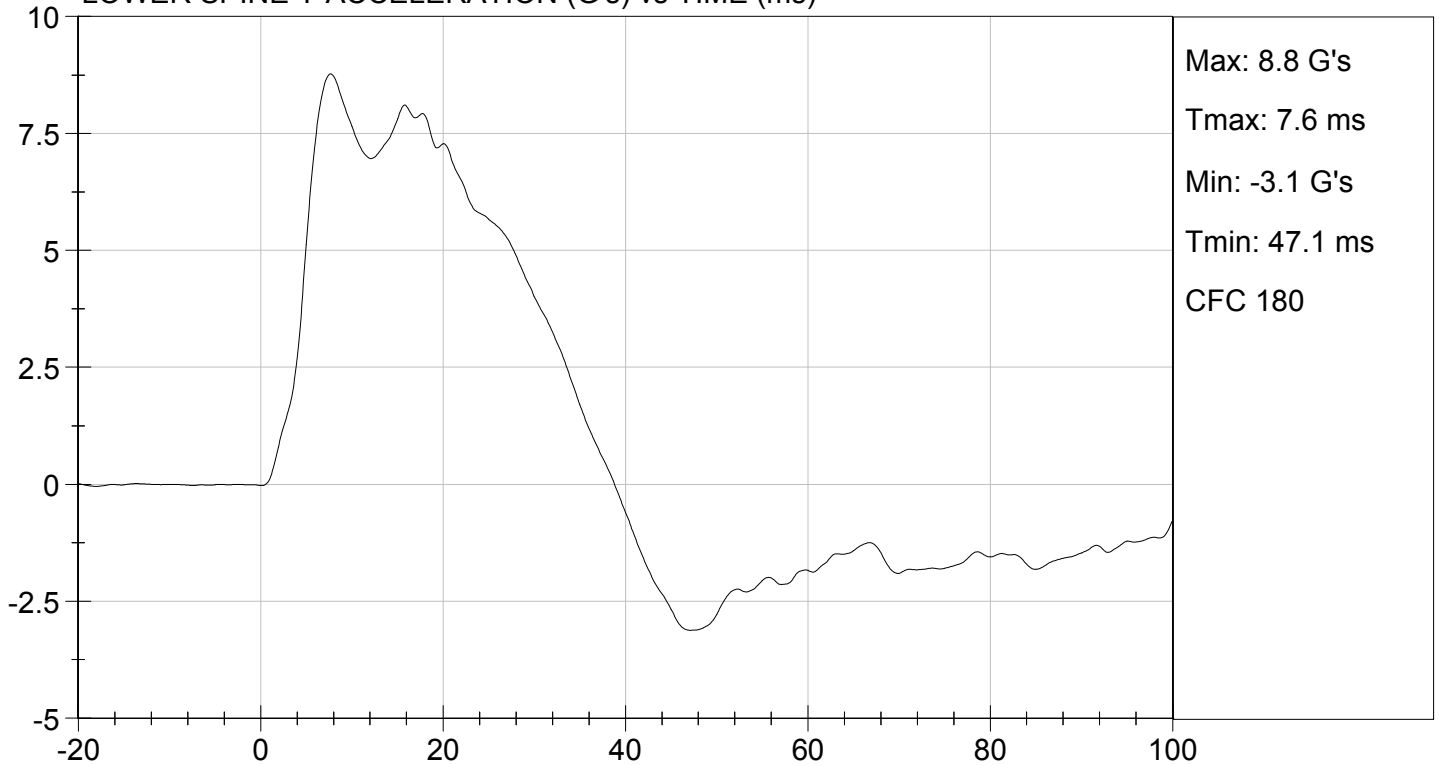
TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.37 ft/s, 4.38 m/s

TEST DATE: 07/14/2016
TEST #: D162415

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



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



MGA RESEARCH CORPORATION

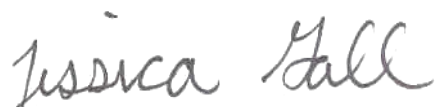
ABDOMINAL IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

Test I.D: D162416

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.9	Pass
Humidity	%	10 to 70	49	Pass
Impact Velocity	m/s	4.20 to 4.40	4.27	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	38	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	11	Pass
Overall Test Results				Pass


Laboratory Technician


Approved By

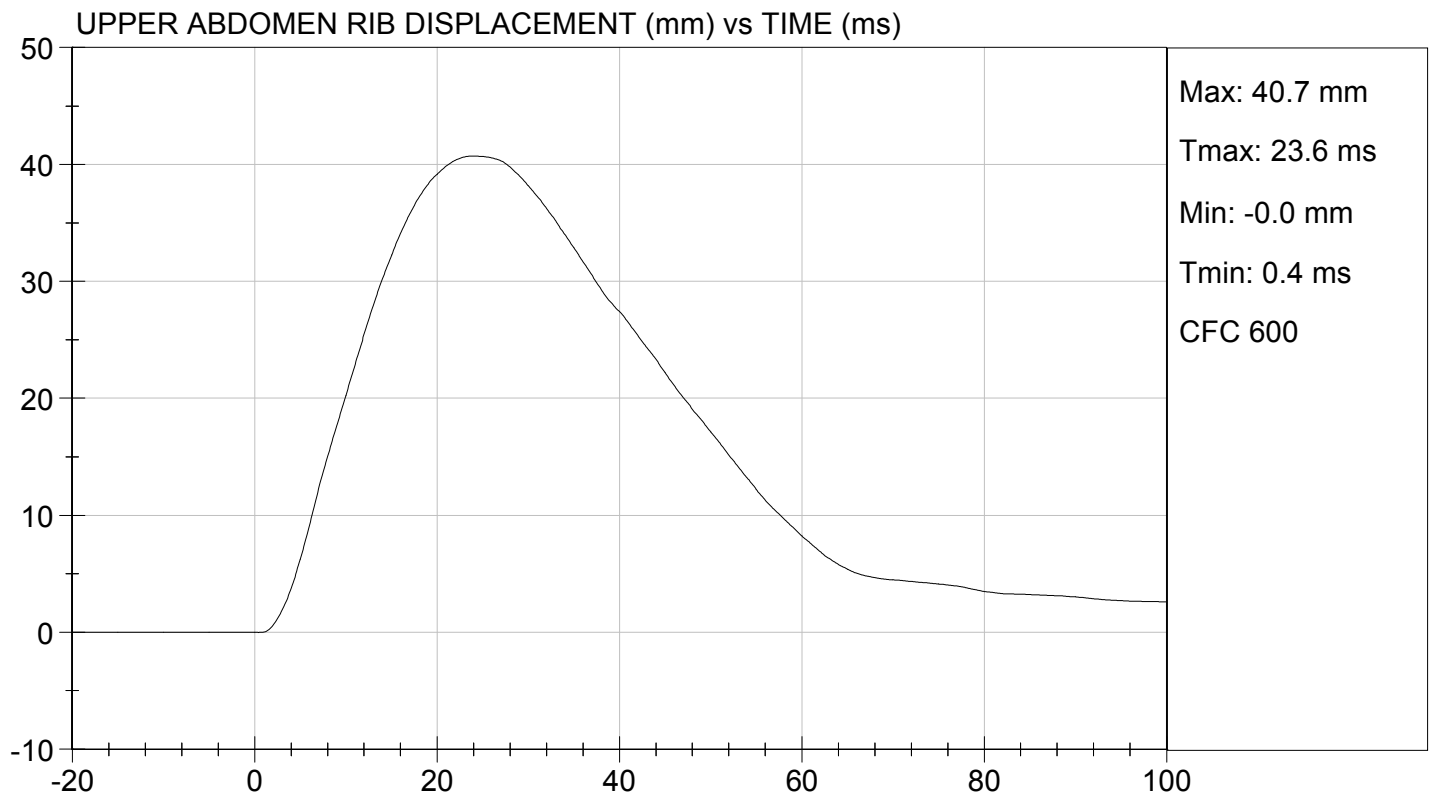
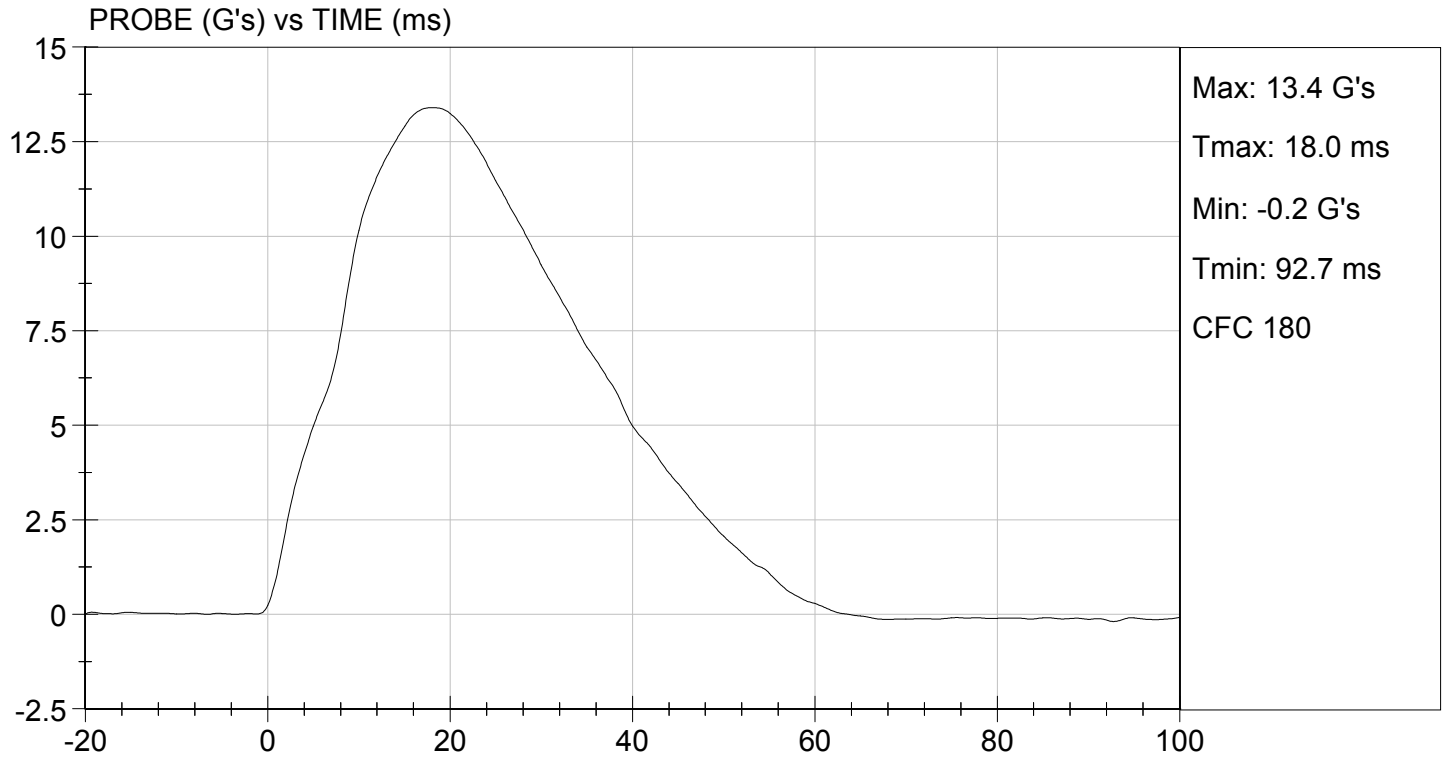
07/14/2016

Test Date



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

TEST DATE: 07/14/2016
TEST #: D162416

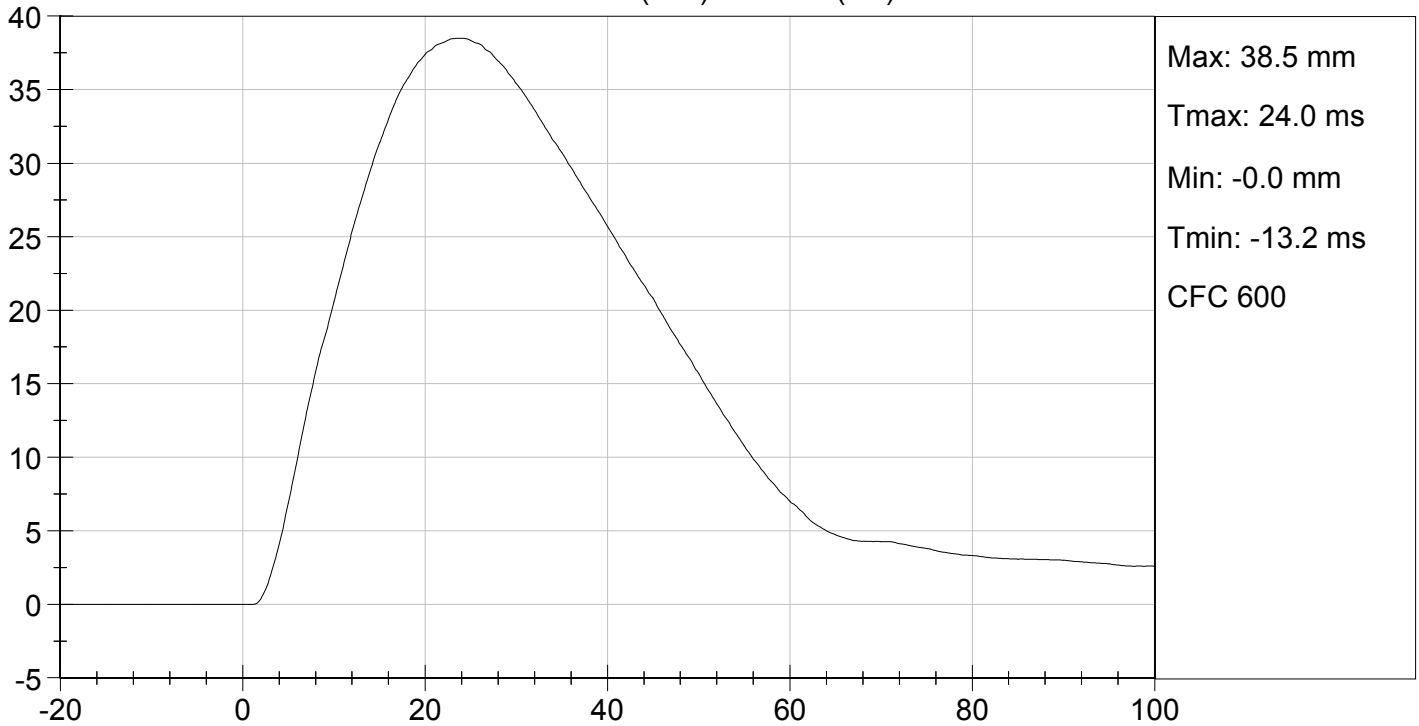




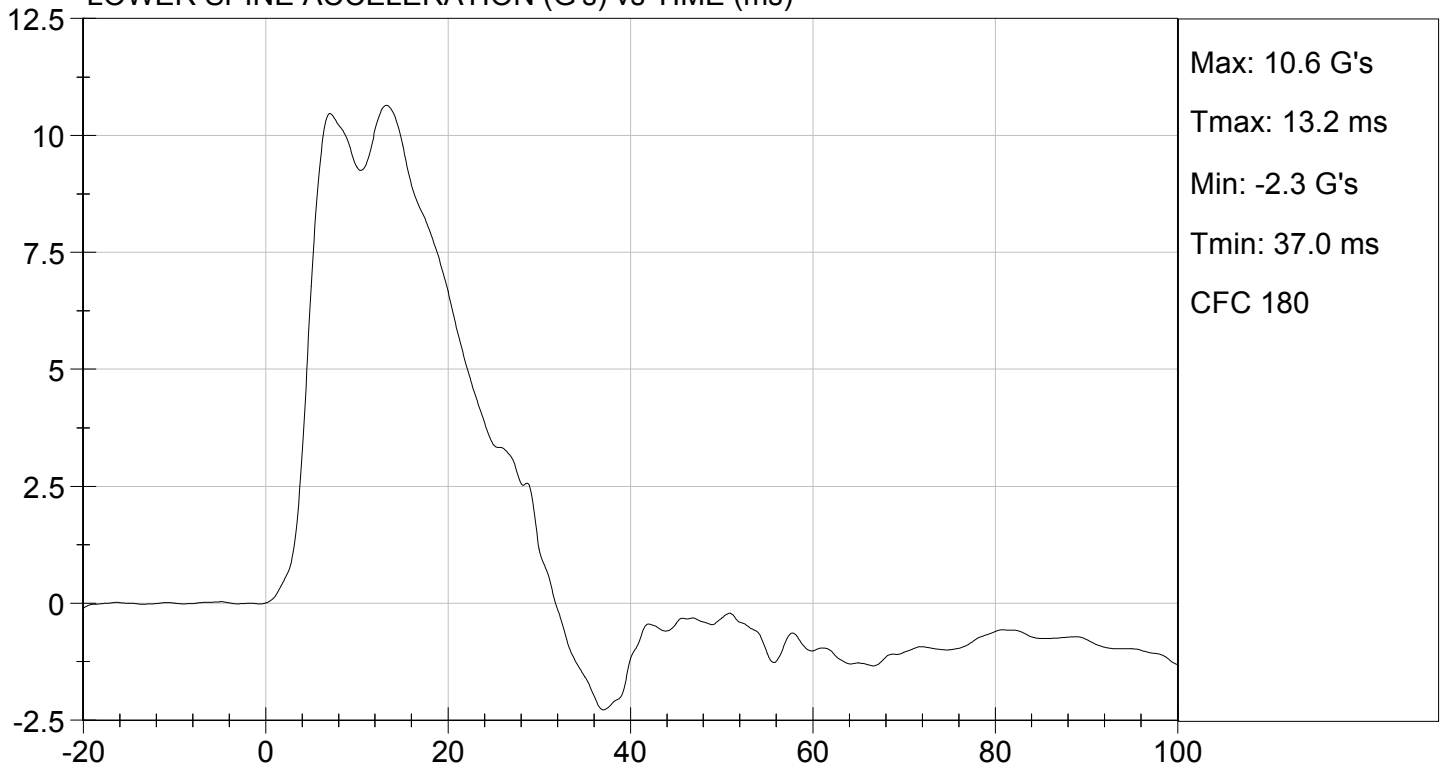
TEST DESC: ABDOMEN IMPACT
VELOCITY: 14.01 ft/s, 4.27 m/s

TEST DATE: 07/14/2016
TEST #: D162416

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



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



MGA RESEARCH CORPORATION

PELVIS IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

Test I.D: D162417

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.9	Pass
Humidity	%	10 to 70	49	Pass
Impact Velocity	m/s	6.60 to 6.80	6.68	Pass
Maximum Probe Acceleration	G's	38 to 47	44	Pass
Pelvis Y Acceleration After 6 ms	G's	34 to 42	40	Pass
Peak Acetabulum Force	N	3600 to 4300	4,111	Pass
Overall Test Results				Pass


Laboratory Technician

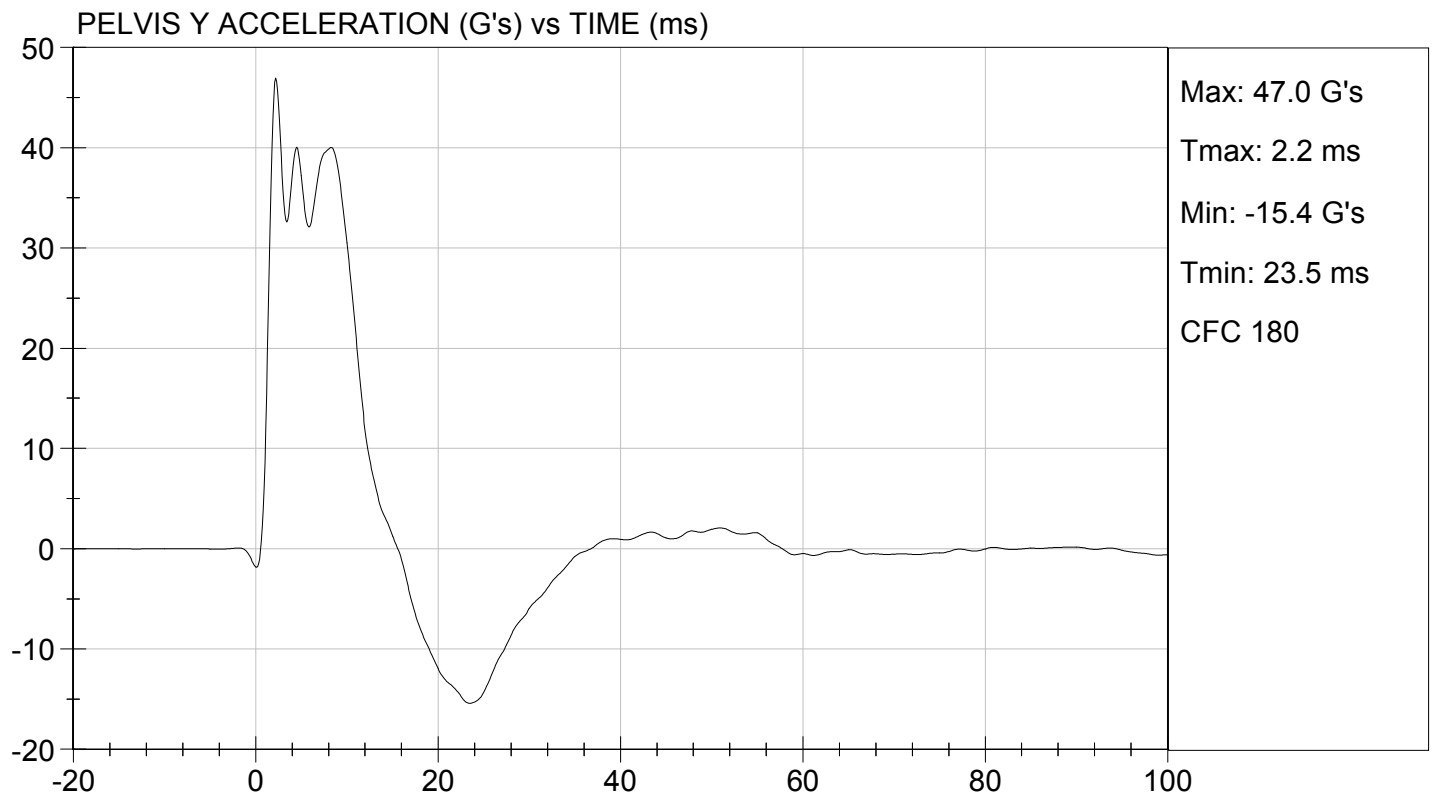
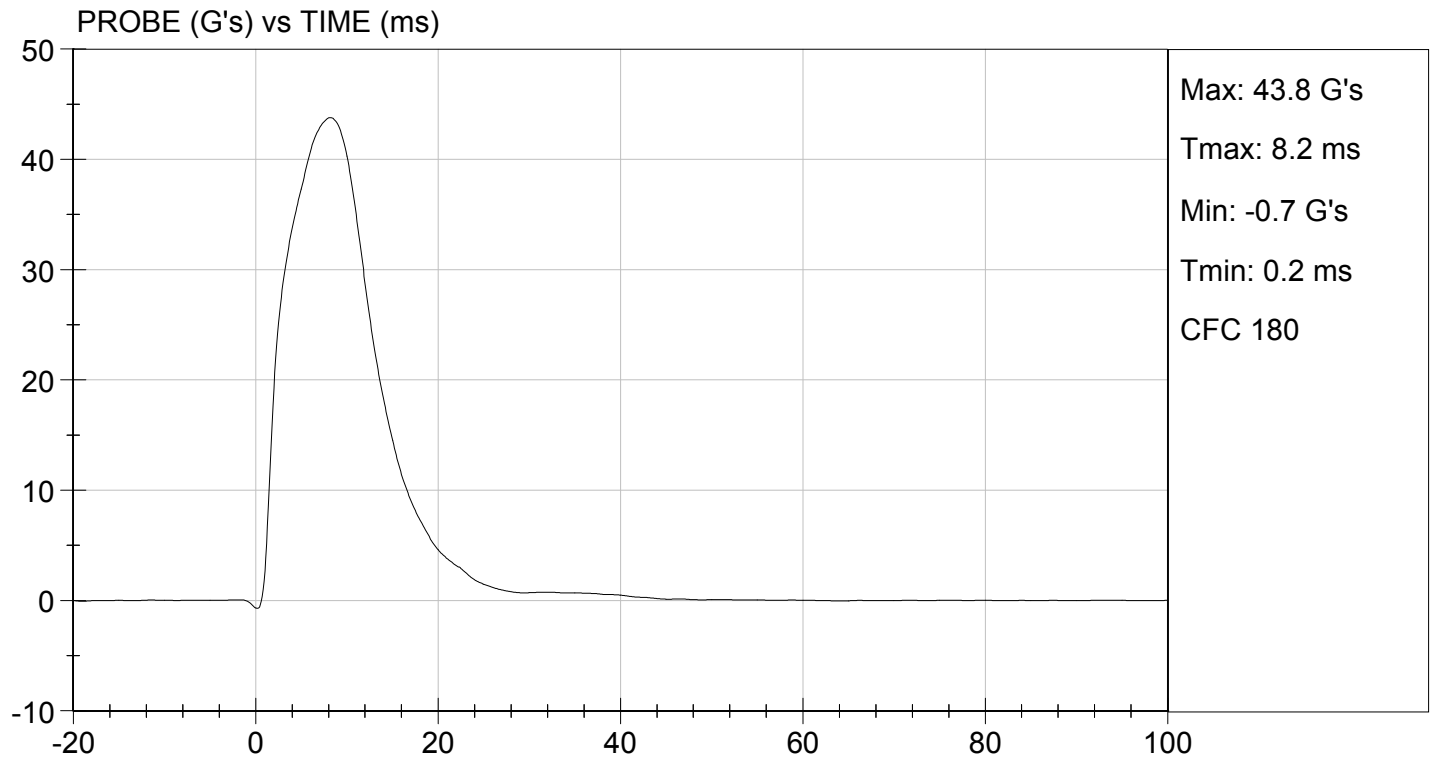

Approved By

07/14/2016
Test Date



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

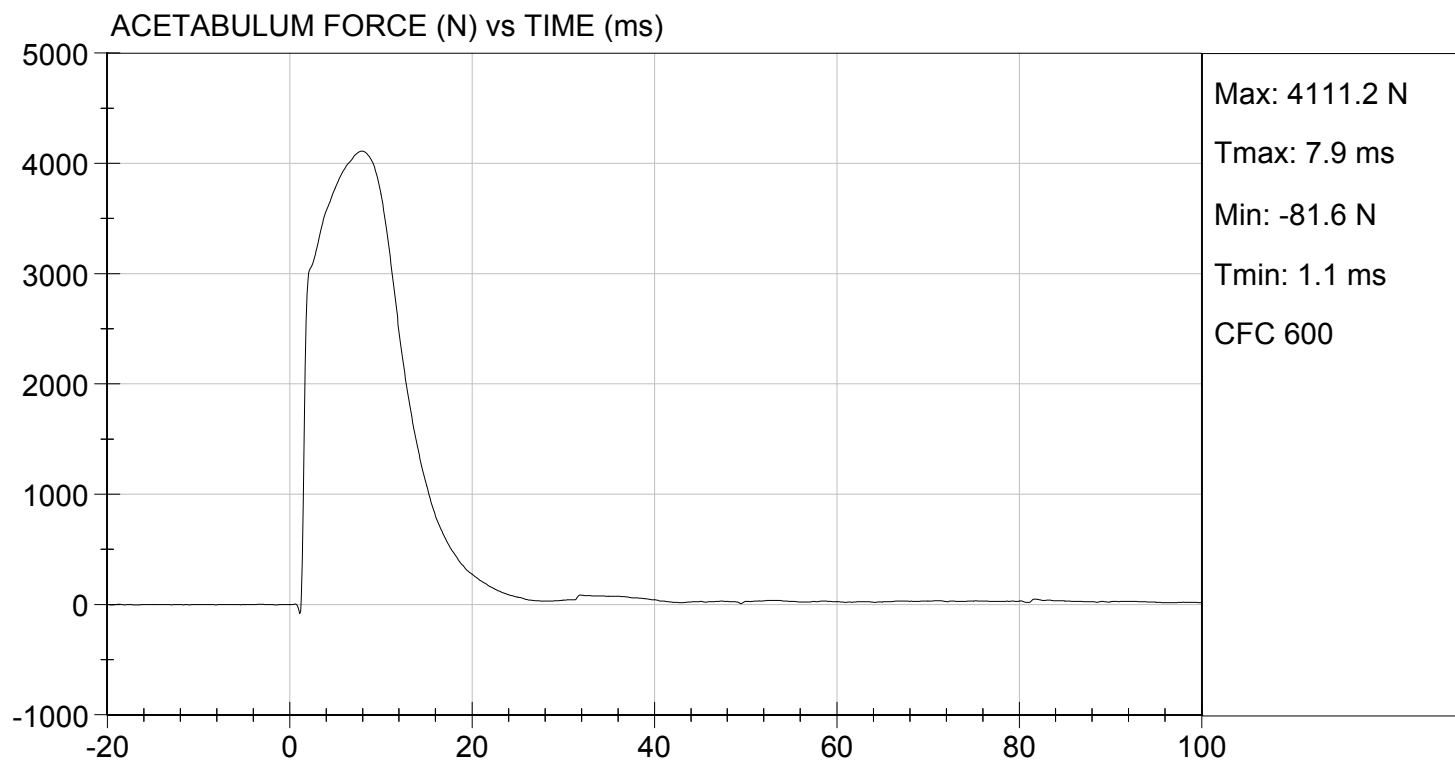
TEST DATE: 07/14/2016
TEST #: D162417





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

TEST DATE: 07/14/2016
TEST #: D162417



MGA RESEARCH CORPORATION

ILIAC IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

Test I.D: D162418

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.9	Pass
Humidity	%	10 to 70	49	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	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	4,560	Pass
Overall Test Results			Pass	

Jessica Hall
Laboratory Technician

Adam D. Miller
Approved By

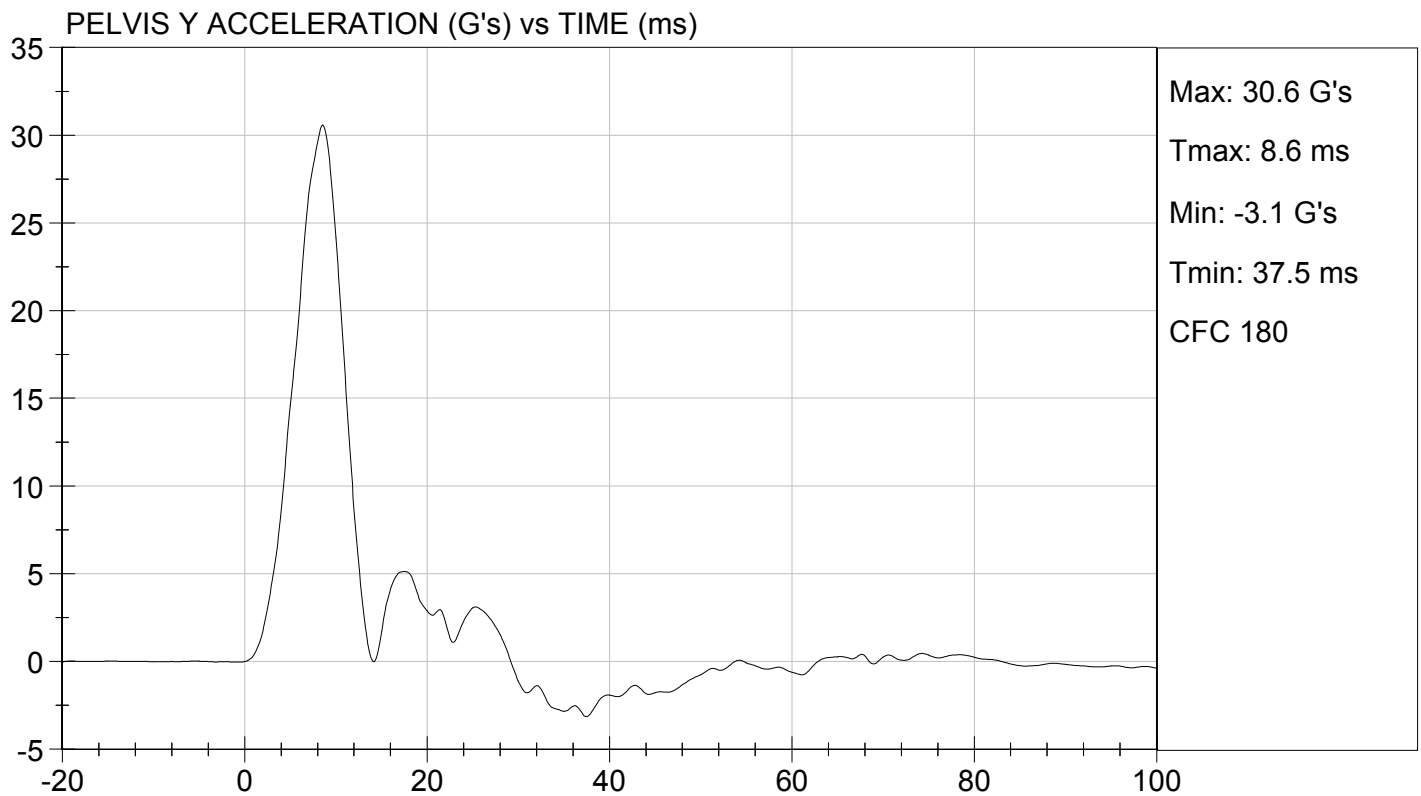
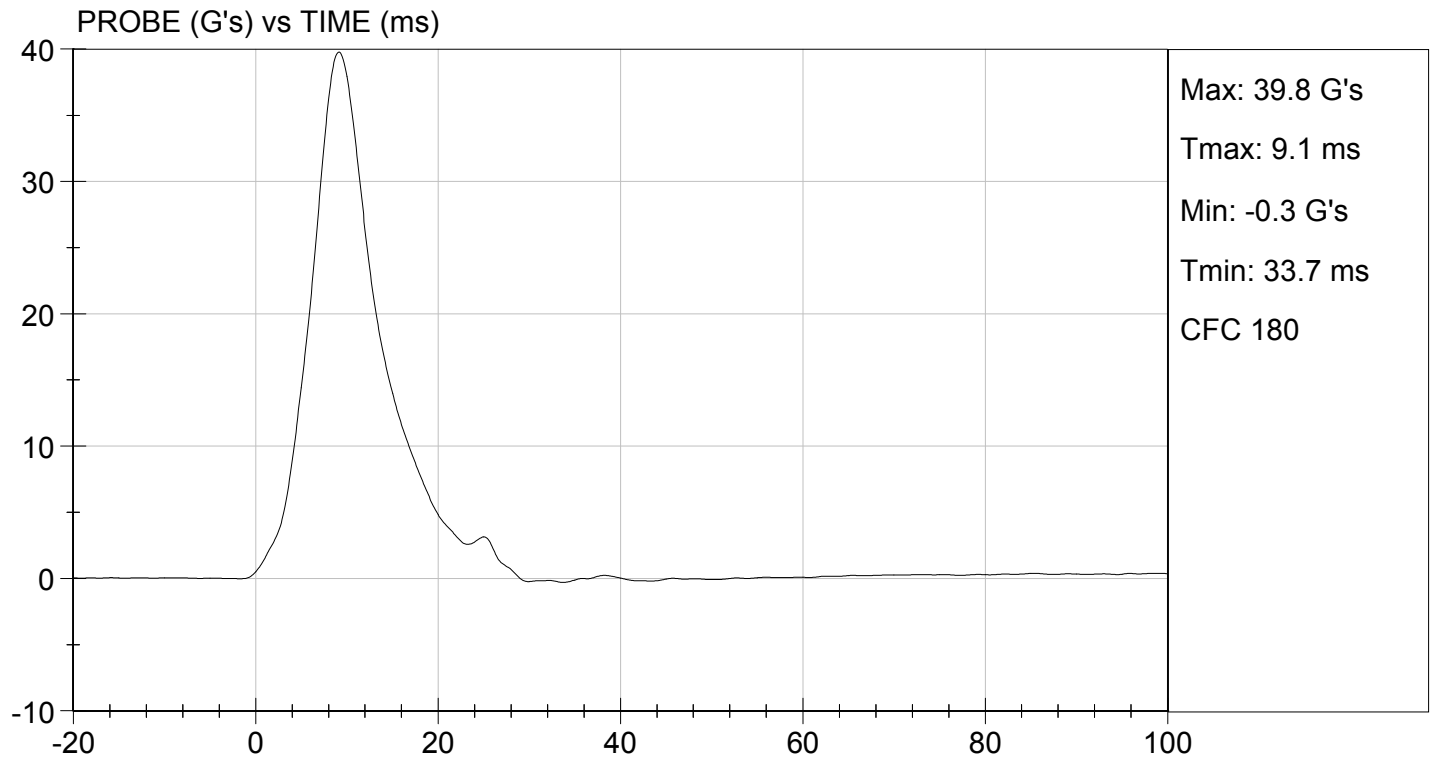
07/14/2016

Test Date



TEST DESC: ILLIAC
VELOCITY: 14.12 ft/s, 4.30 m/s

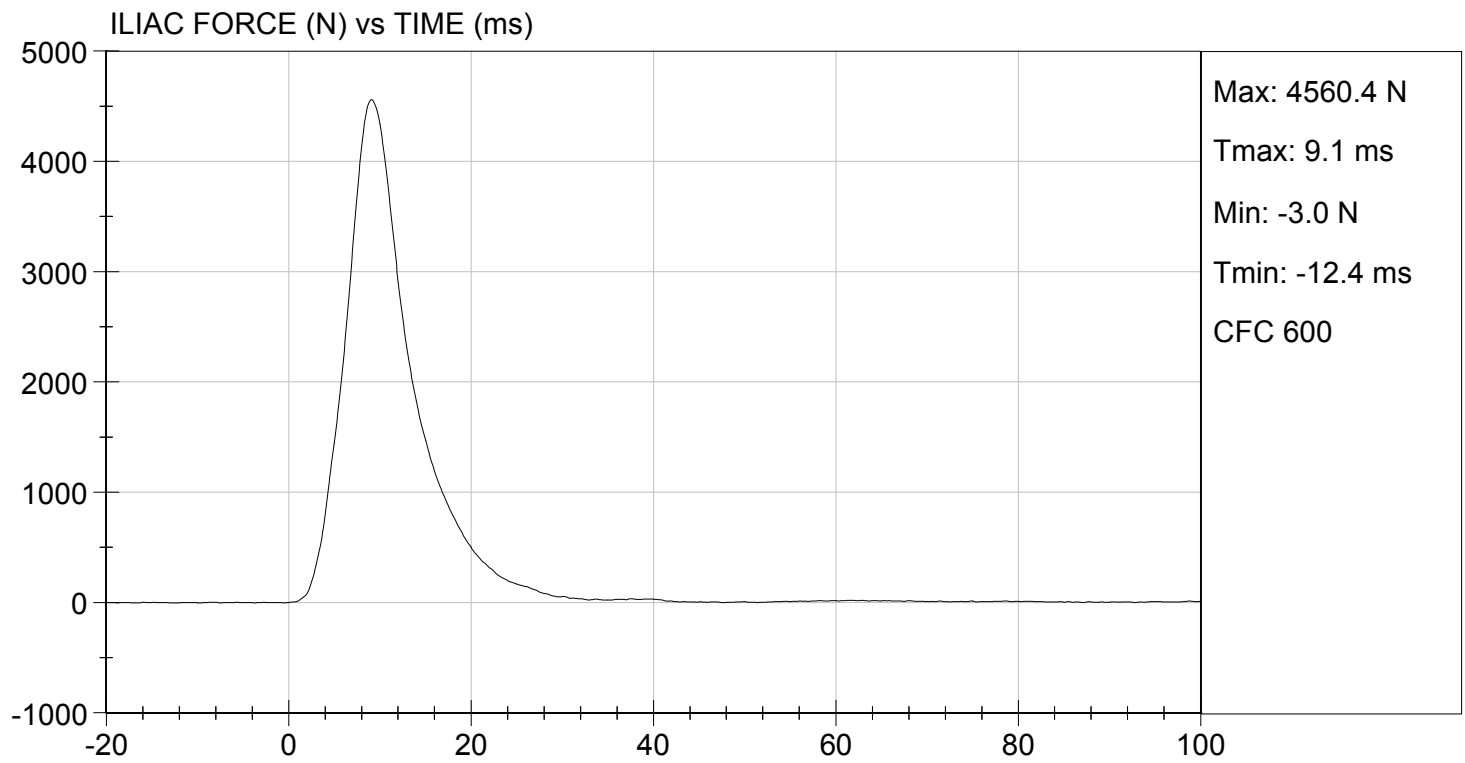
TEST DATE: 07/14/2016
TEST #: D162418





TEST DESC: ILLIAC
VELOCITY: 14.12 ft/s, 4.30 m/s

TEST DATE: 07/14/2016
TEST #: D162418



SID-IIsD External Measurements
SN: 306

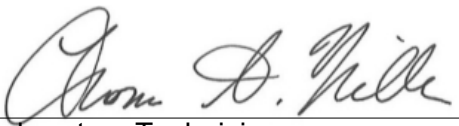
No.	Name	Spec. (mm)	Result	Pass/Fail
A	Sitting Height	772 - 788	785	Pass
B	Shoulder Pivot Height	437 - 453	449	Pass
C	H-point Height	79 - 89	86	Pass
D	H-point from Seatback	141 - 151	147	Pass
E	Shoulder Pivot from Backline	97 - 107	99	Pass
F	Thigh Clearance	119 -135	120	Pass
G	Head Breadth	140 - 148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

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

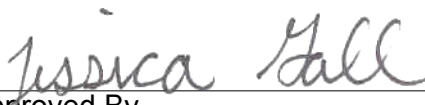
ATD Serial No: 306

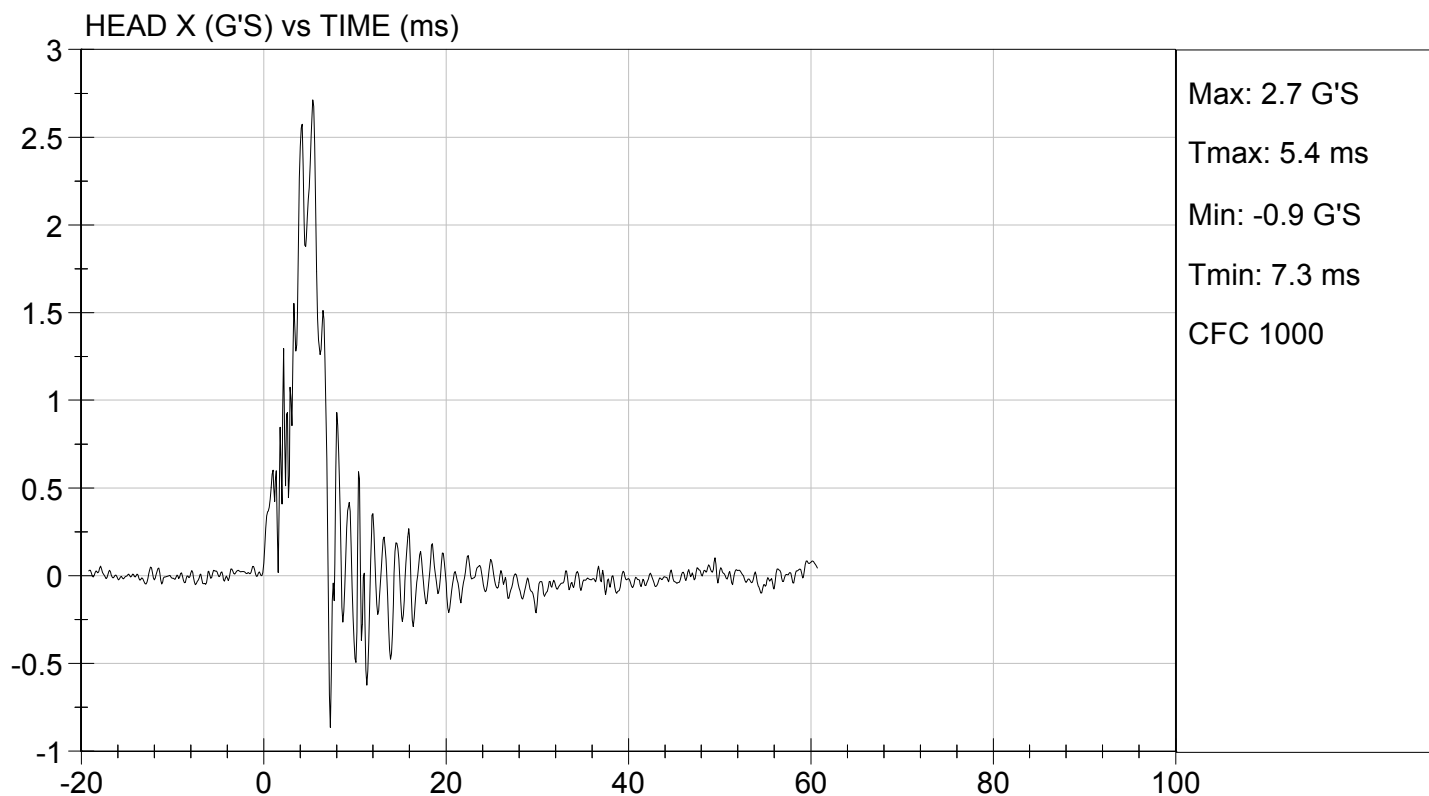
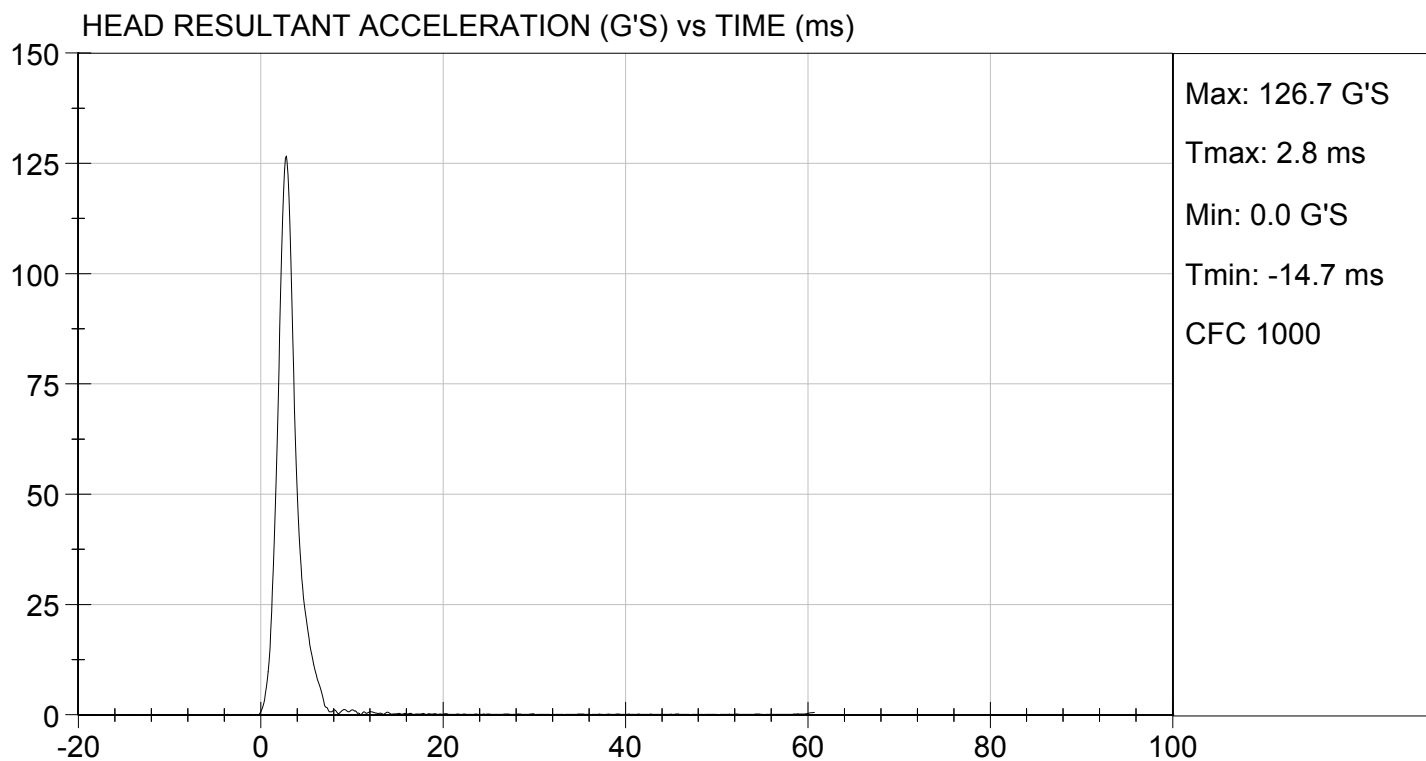
Test ID: D162561

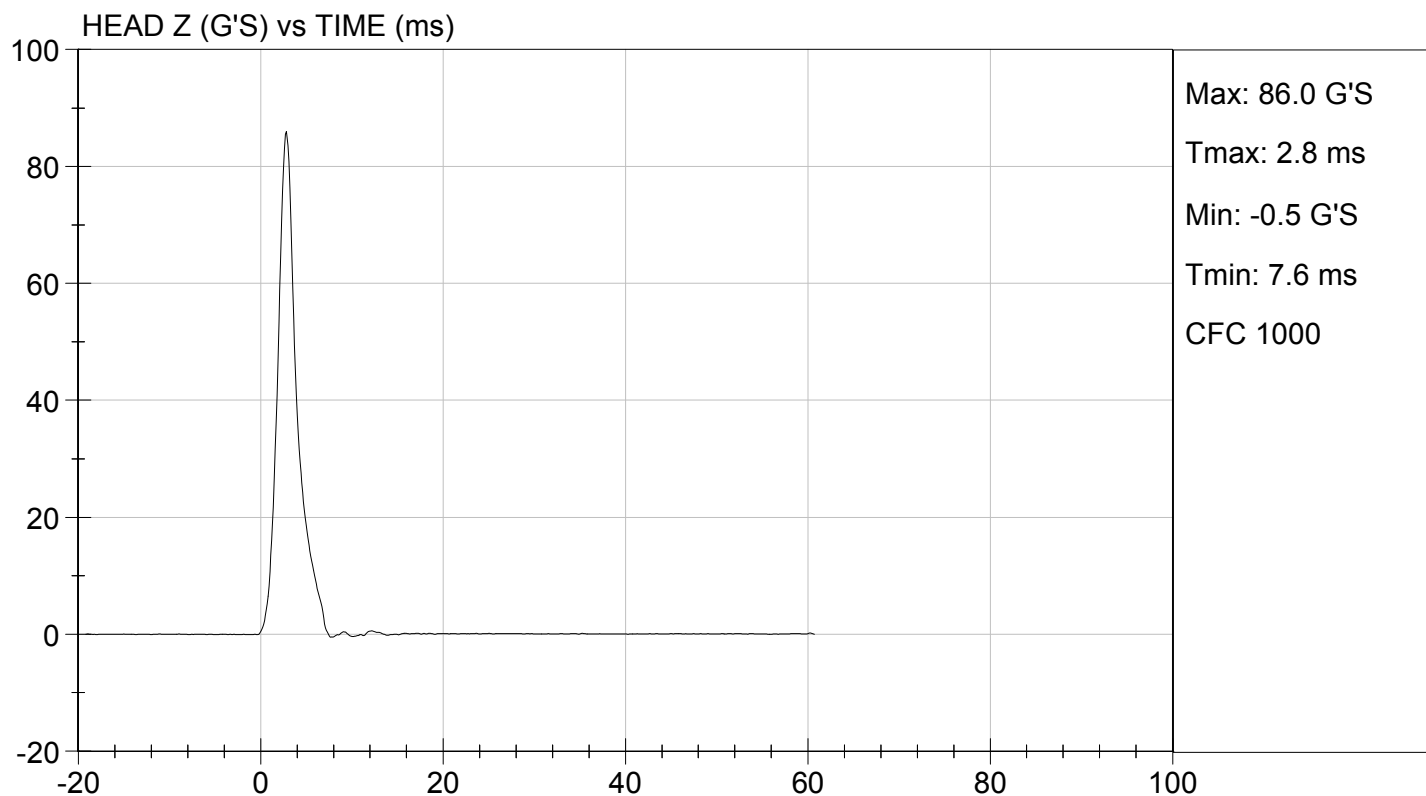
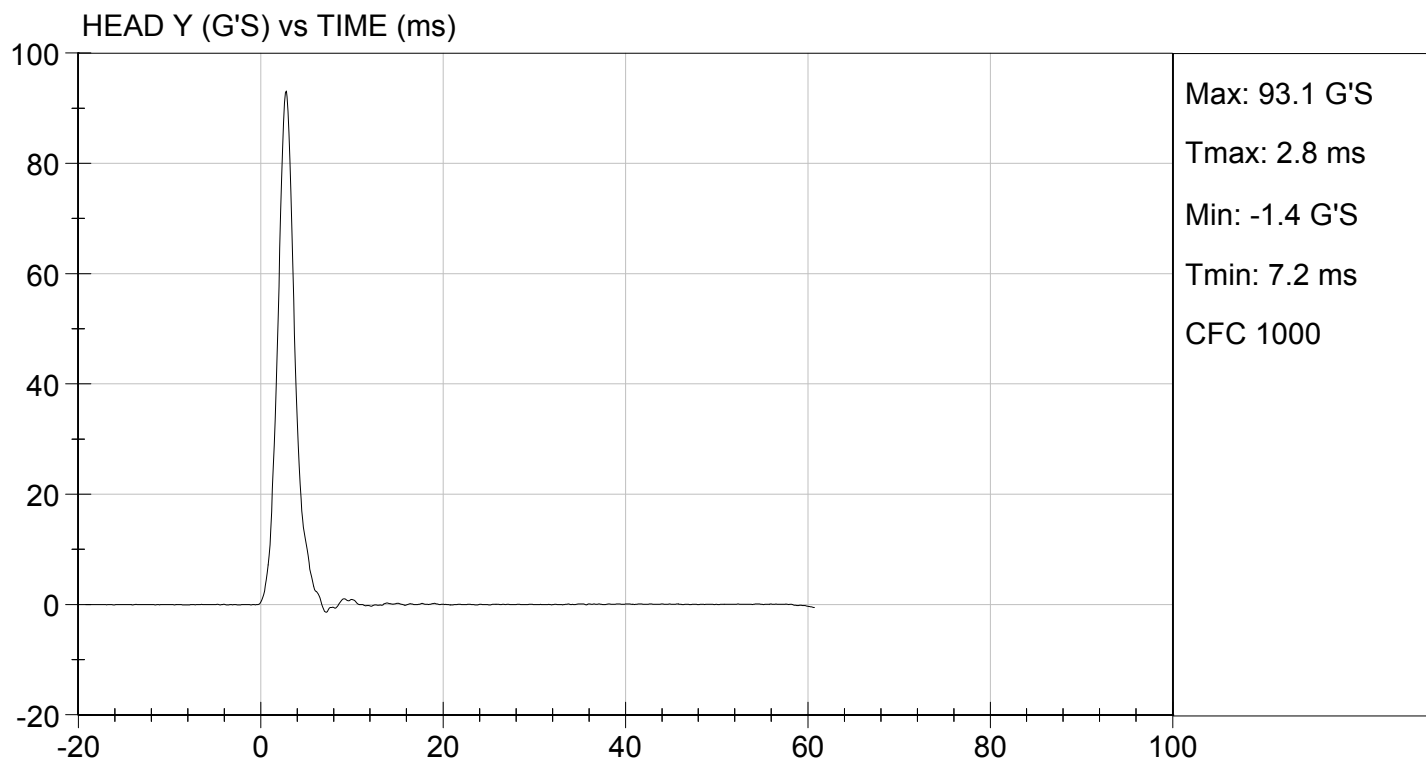
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	51	Pass
Peak Resultant Acceleration	G's	115 to 137	127	Pass
Peak Longitudinal Acceleration	G's	+/- 15	2.7	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	<15%	Yes	Pass
Overall Test Results			Pass	


Laboratory Technician

07/28/2016
Test Date


Approved By



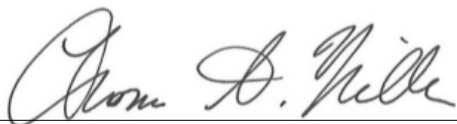


MGA RESEARCH CORPORATION
LATERAL NECK PENDULUM TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

Test I.D: D162562

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.7	Pass
Humidity		%	10 to 70	51	Pass
Impact Velocity		m/s	5.51 to 5.63	5.58	Pass
Pendulum Velocity	10 ms	m/s	2.20 to 2.80	2.74	Pass
	15 ms	m/s	3.30 to 4.10	3.93	Pass
	20 ms	m/s	4.40 to 5.40	5.16	Pass
	25 ms	m/s	5.40 to 6.10	5.50	Pass
	25-100 ms	m/s	5.50 to 6.20	5.51	Pass
Maximum D-Plane Rotation		deg	71 to 81	72	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	65	Pass
Maximum Occipital Condyle Moment		Nm	-44 to -36	-40	Pass
Time of Moment Decay to 0 Nm		ms	102 to 126	110	Pass
Overall Test Results					Pass



Laboratory Technician

07/28/2016

Test Date

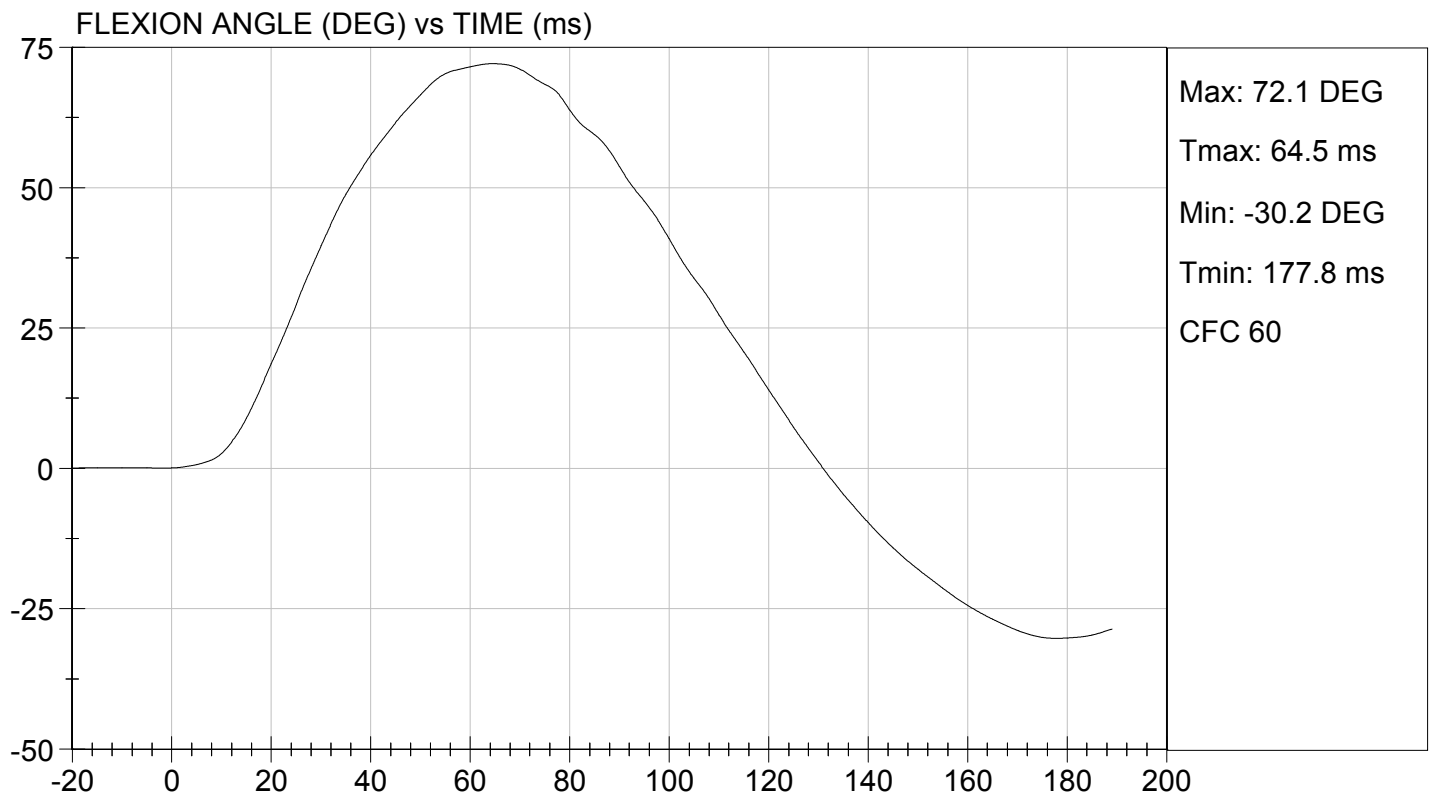
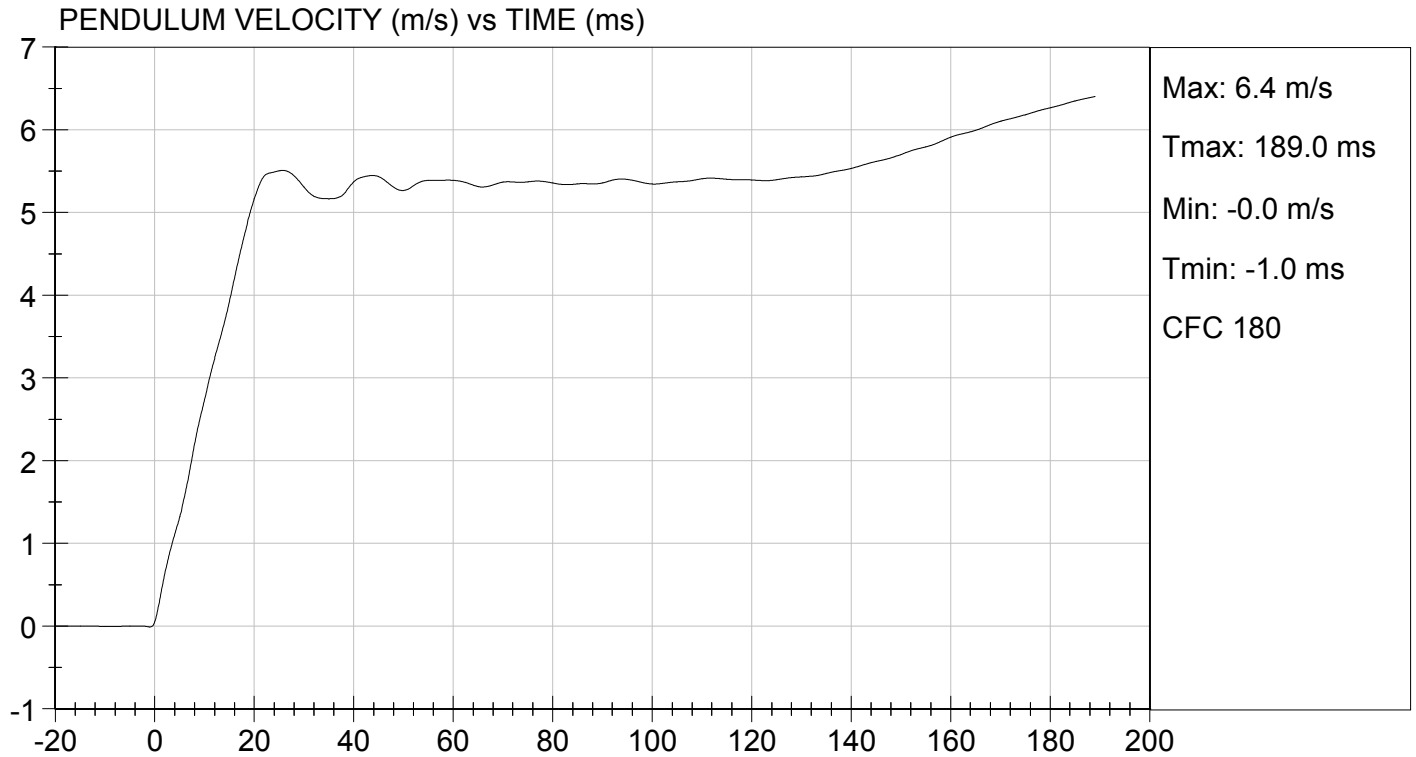


Approved By



TEST DESC: NECK BENDING
VELOCITY: 18.32 ft/s, 5.58 m/s

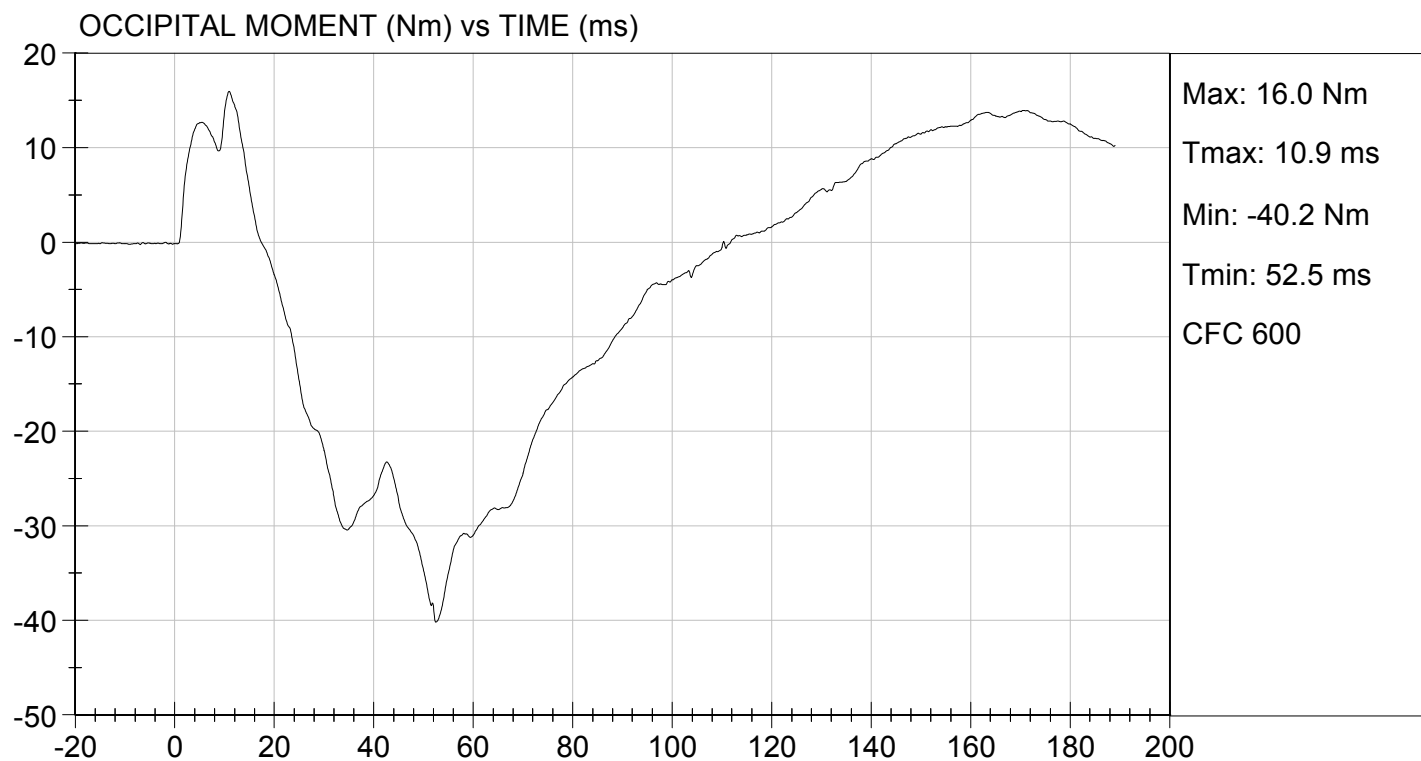
TEST DATE: 07/28/2016
TEST #: D162562





TEST DESC: NECK BENDING
VELOCITY: 18.32 ft/s, 5.58 m/s

TEST DATE: 07/28/2016
TEST #: D162562

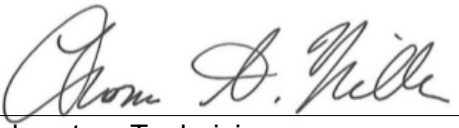


MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

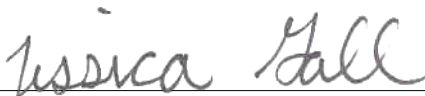
Test ID: D162563

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	50	Pass
Impact Velocity	m/s	4.20 to 4.40	4.37	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	19	Pass
			Overall Test Results	Pass


Laboratory Technician

07/28/2016

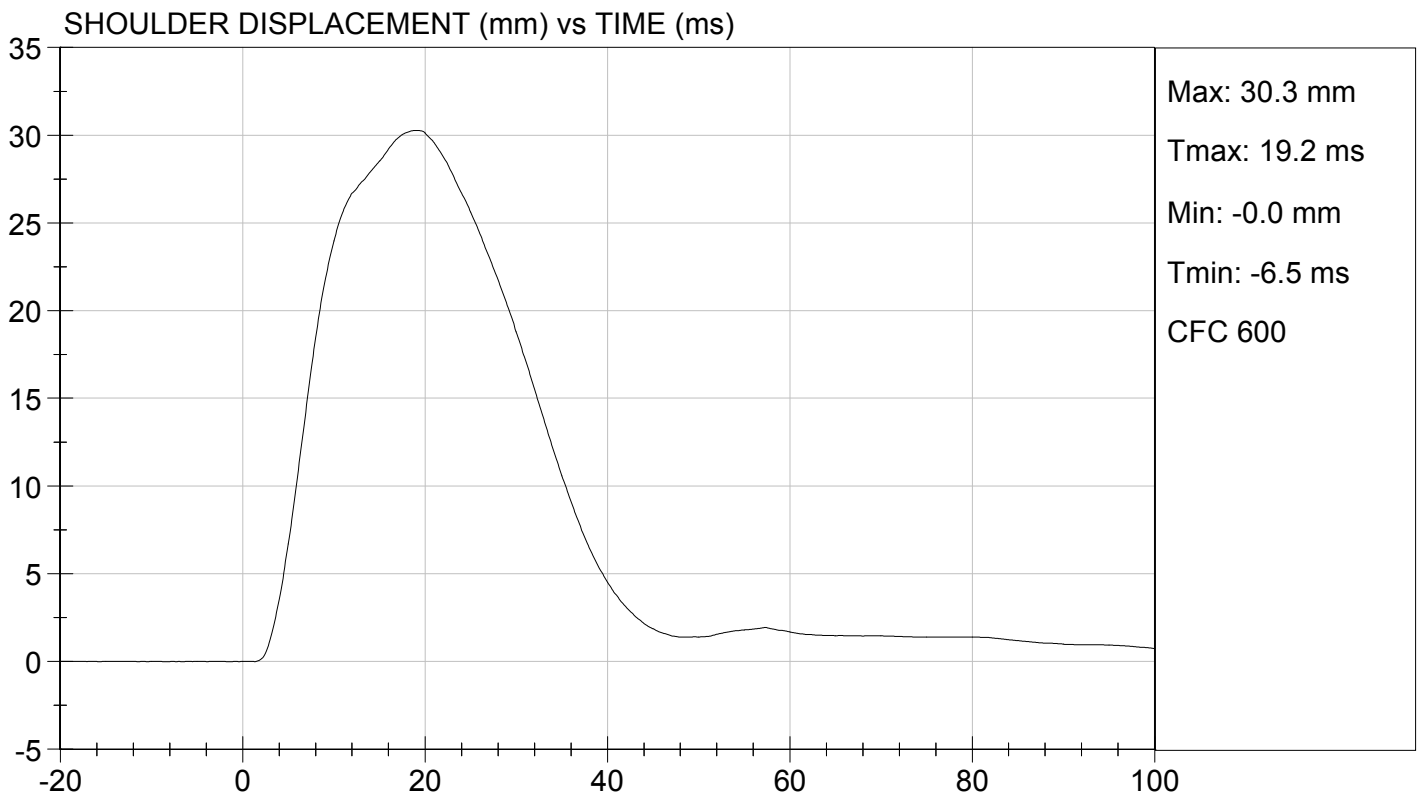
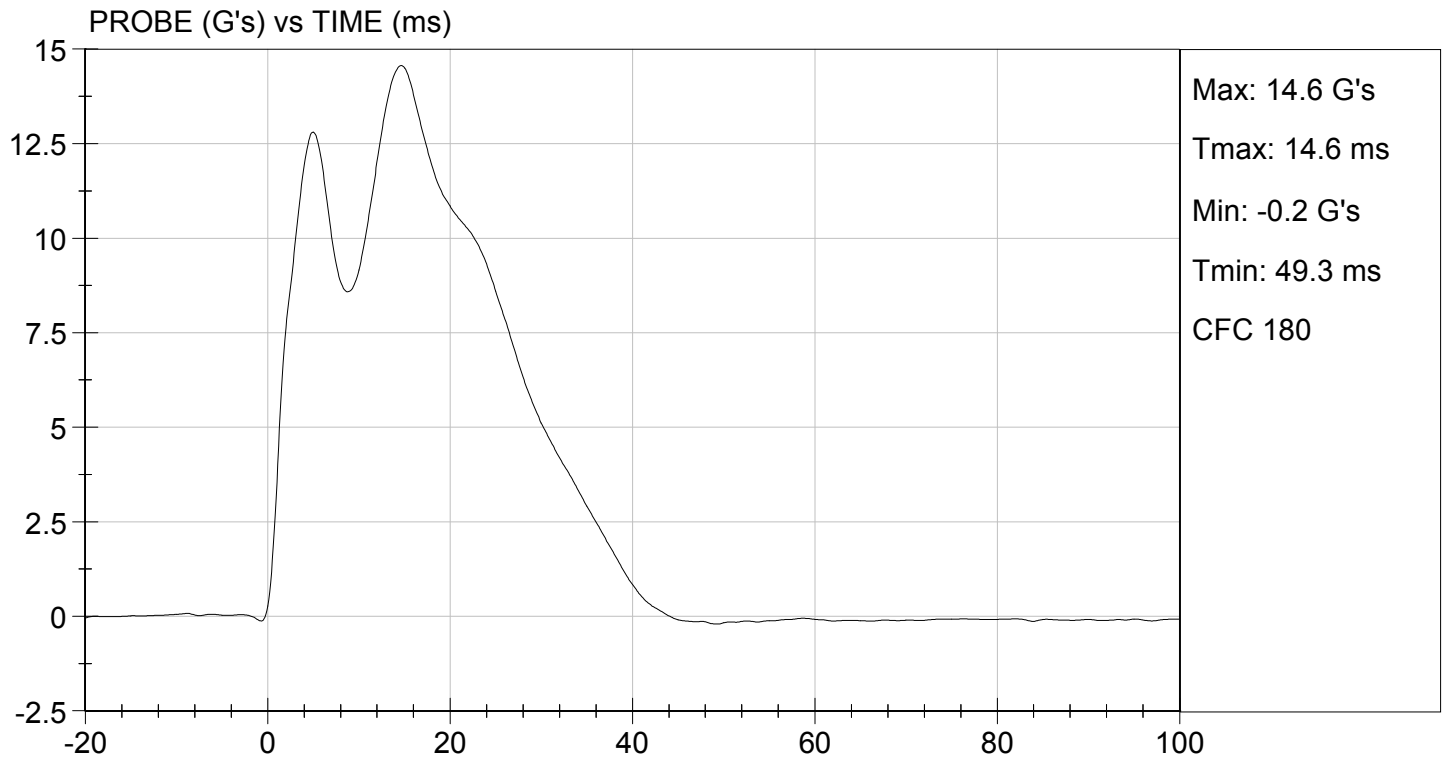
Test Date


Approved By



TEST DESC: SHOULDER IMPACT
VELOCITY: 14.34 ft/s, 4.37 m/s

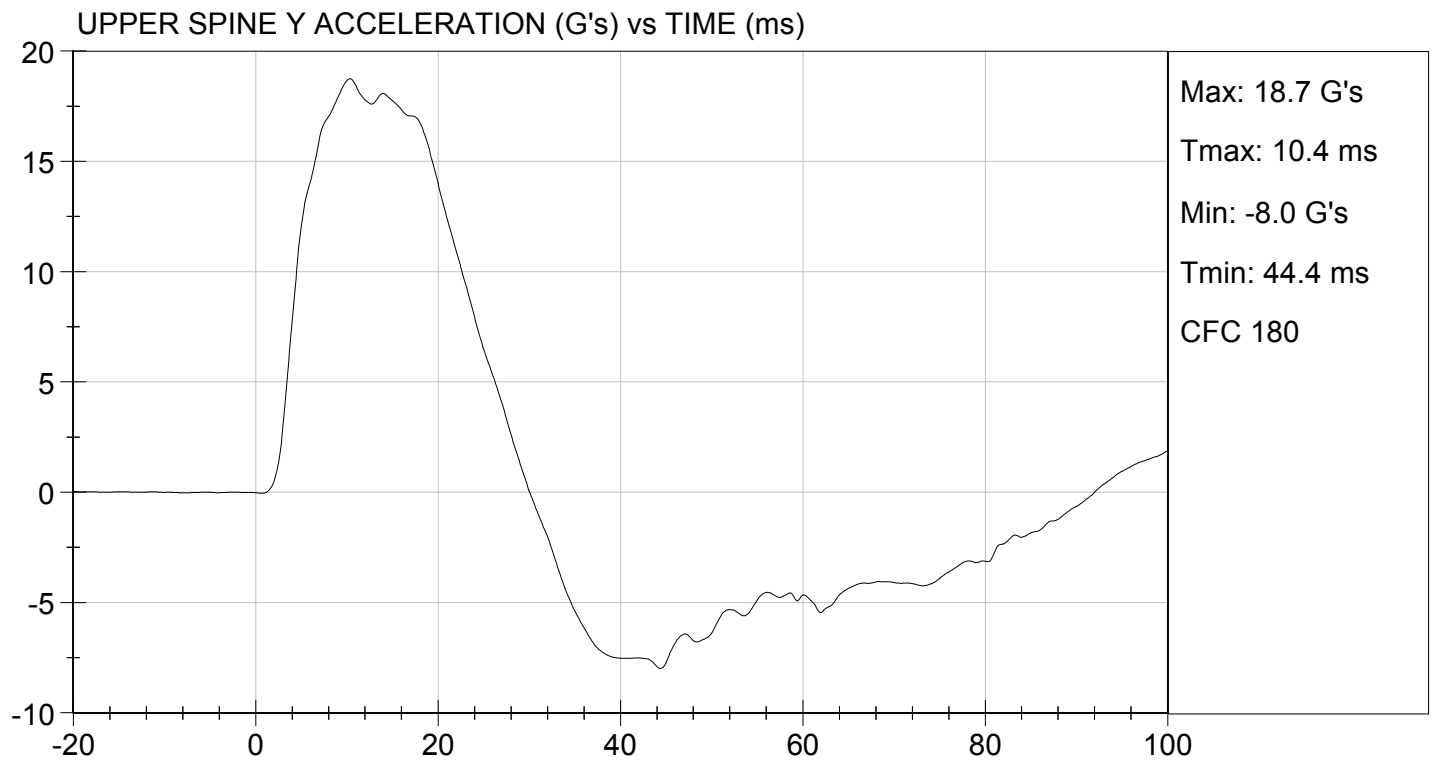
TEST DATE: 07/28/2016
TEST #: D162563





TEST DESC: SHOULDER IMPACT
VELOCITY: 14.34 ft/s, 4.37 m/s

TEST DATE: 07/28/2016
TEST #: D162563

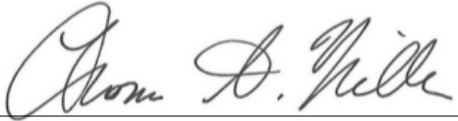


MGA RESEARCH CORPORATION
THORAX (WITH ARM) IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

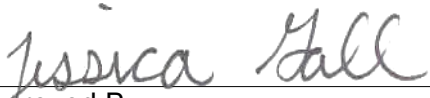
ATD Serial No: 306

Test I.D: D162564

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.7	Pass
Humidity	%	10 to 70	50	Pass
Impact Velocity	m/s	6.60 to 6.80	6.68	Pass
Maximum Probe Acceleration	G's	30 to 36	32	Pass
Shoulder Displacement	mm	31 to 40	36	Pass
Upper Rib Displacement	mm	25 to 32	29	Pass
Middle Rib Displacement	mm	30 to 36	32	Pass
Lower Rib Displacement	mm	32 to 38	35	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	37	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	33	Pass
Overall Test Results				Pass


Laboratory Technician

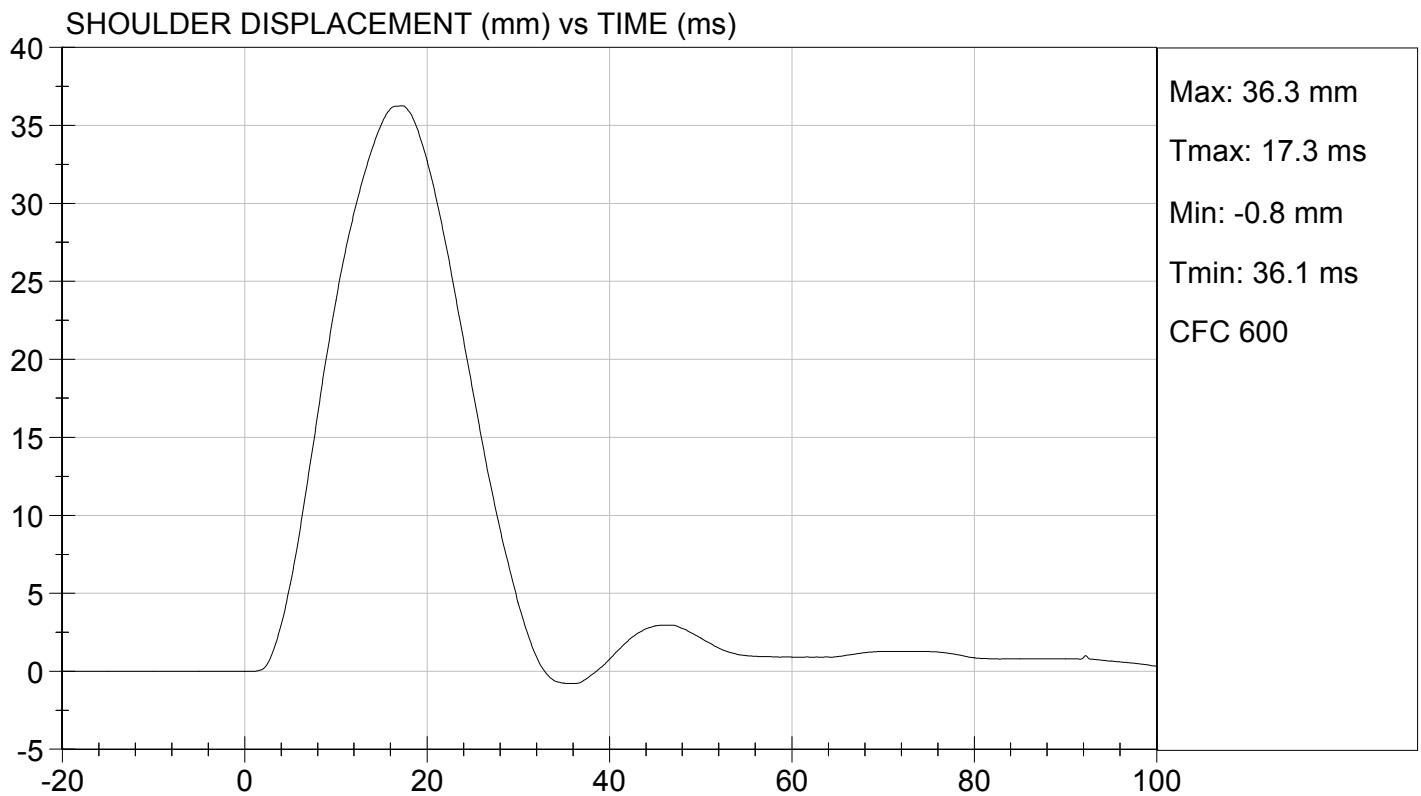
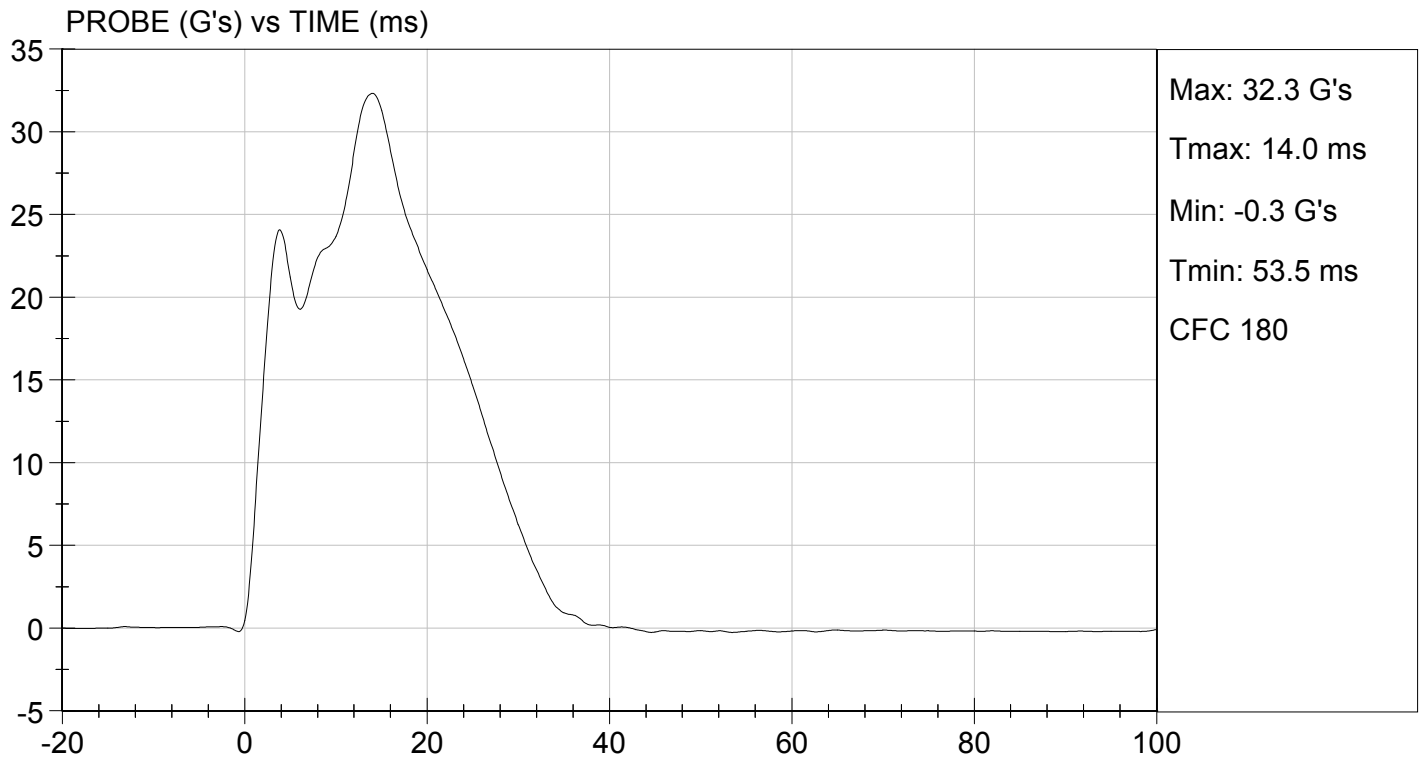
07/28/2016
Test Date


Approved By



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

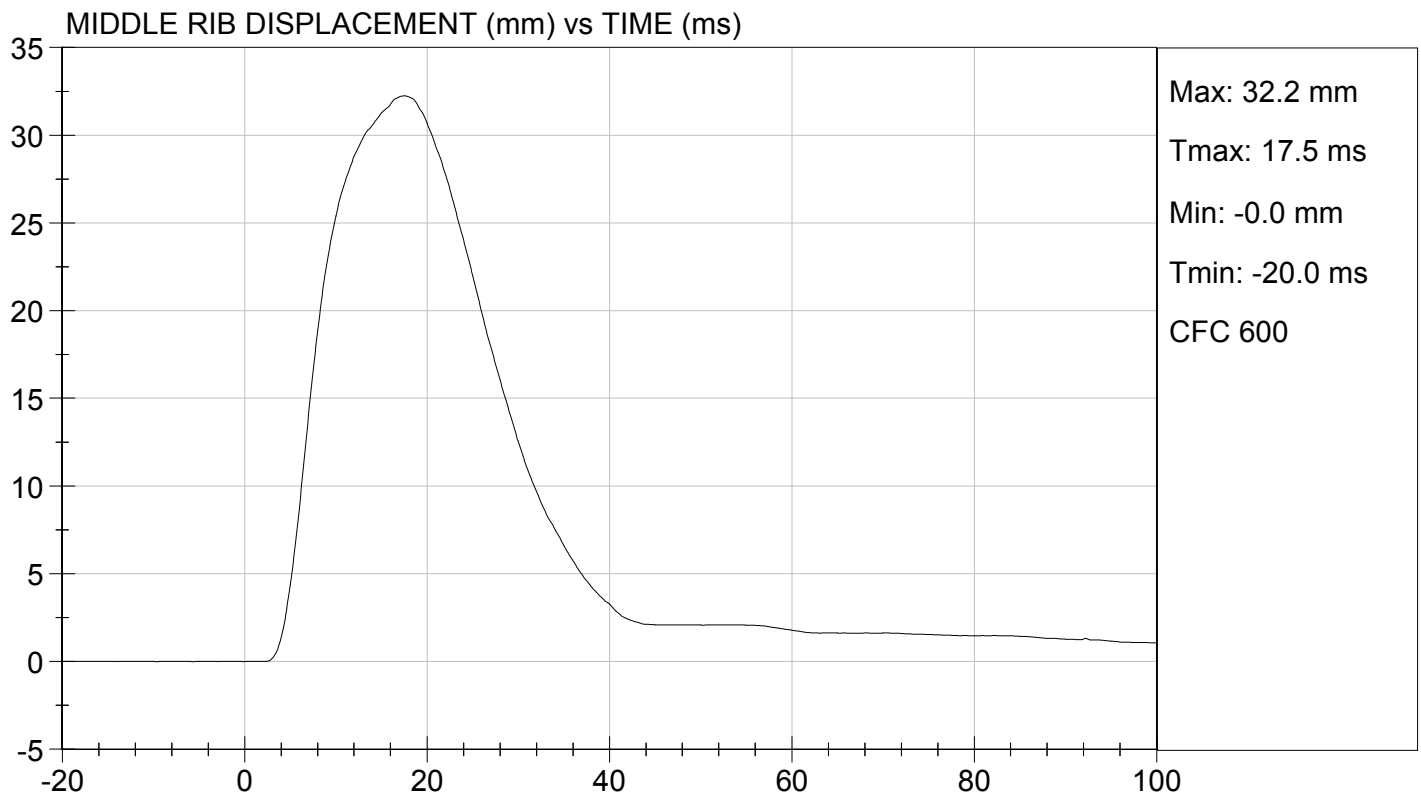
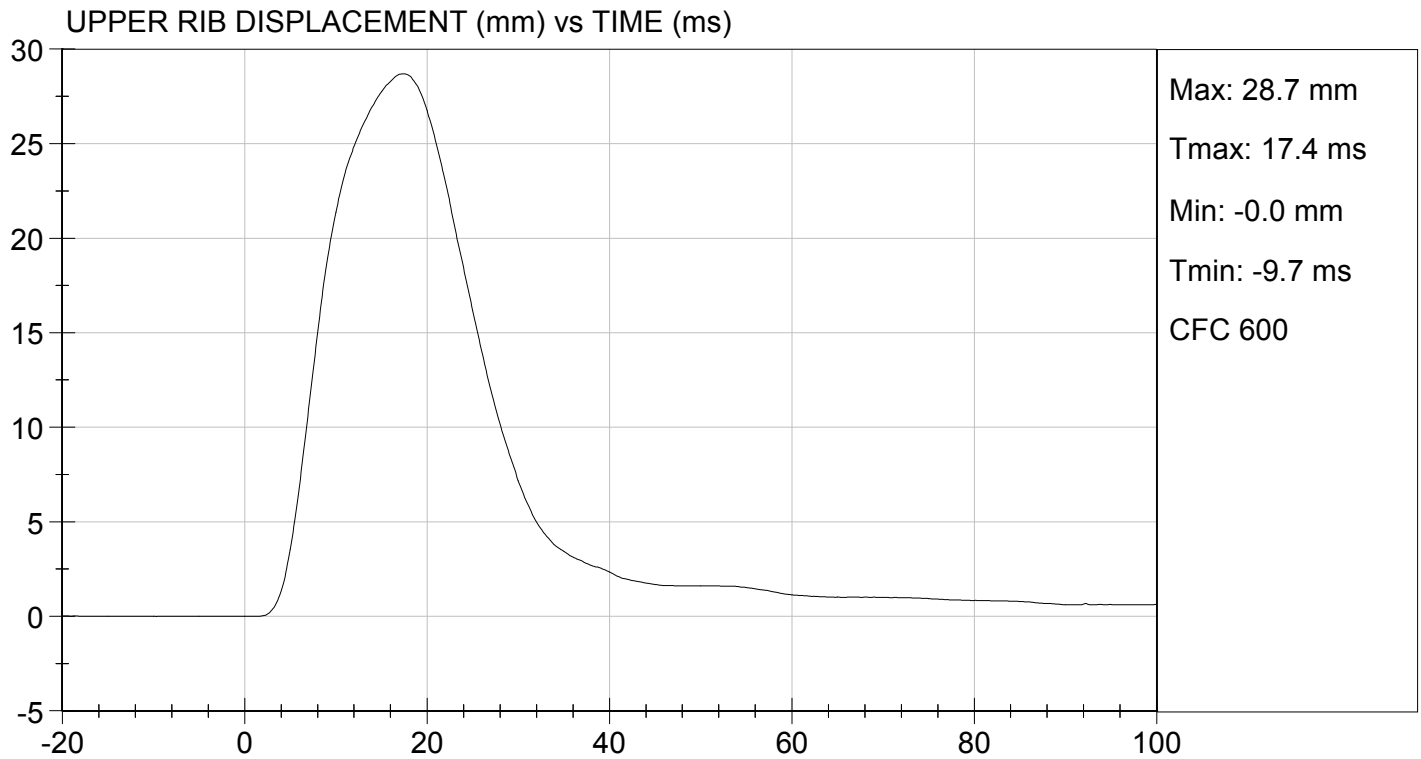
TEST DATE: 07/28/2016
TEST #: D162564





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

TEST DATE: 07/28/2016
TEST #: D162564

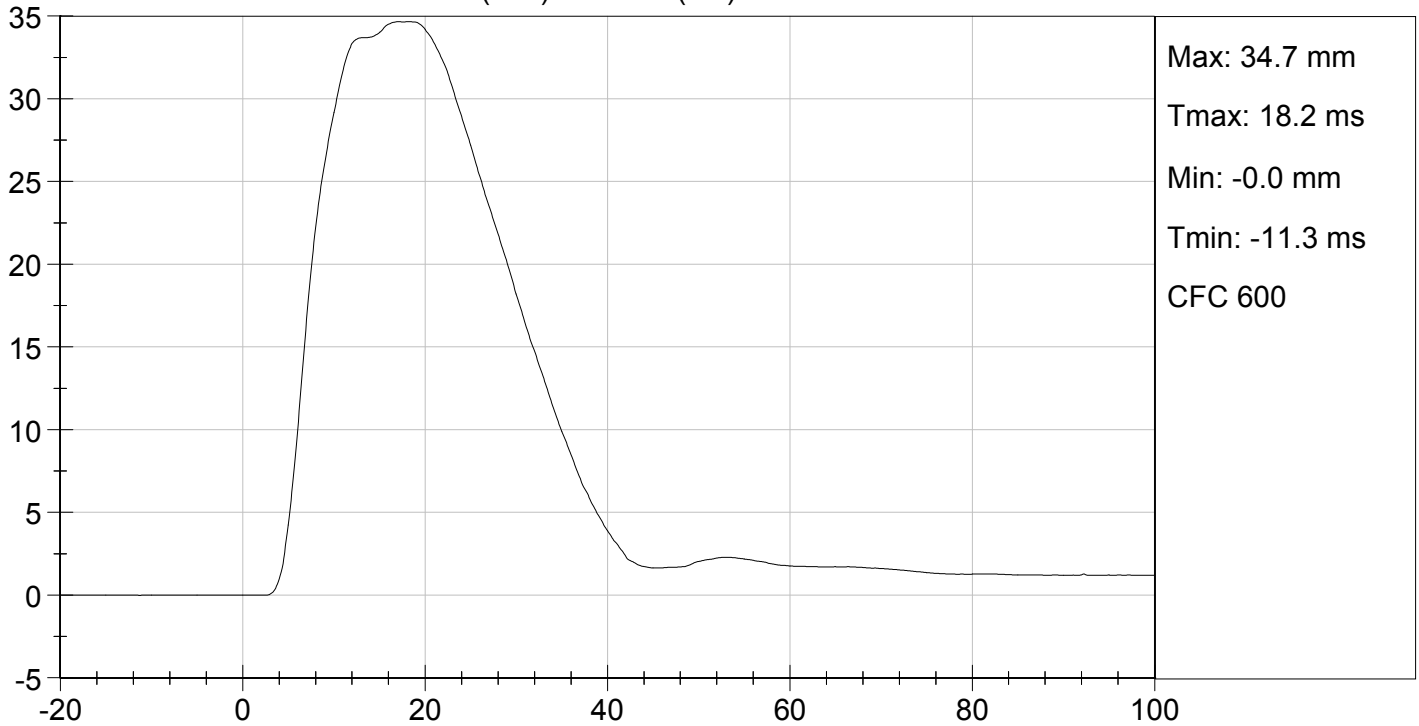




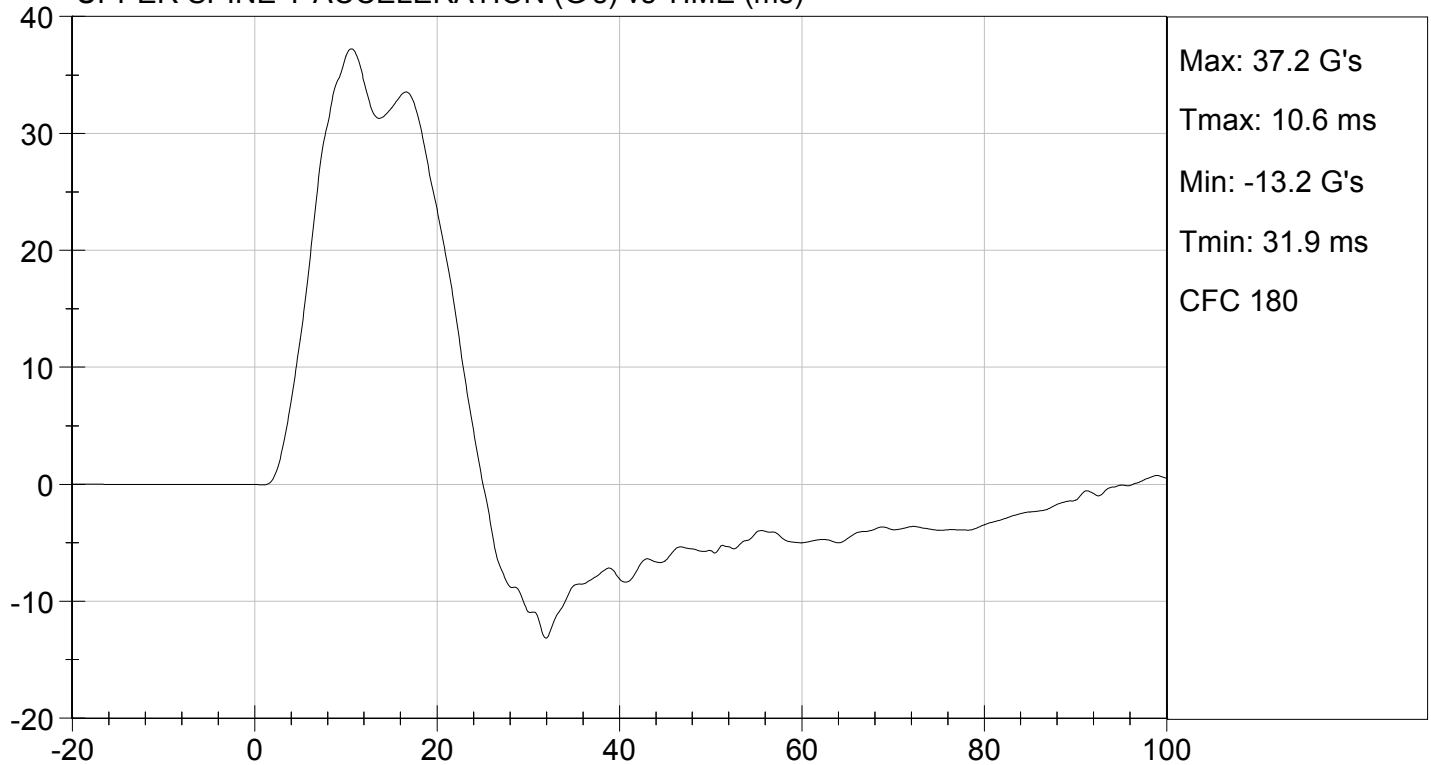
TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 21.93 ft/s, 6.68 m/s

TEST DATE: 07/28/2016
TEST #: D162564

LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



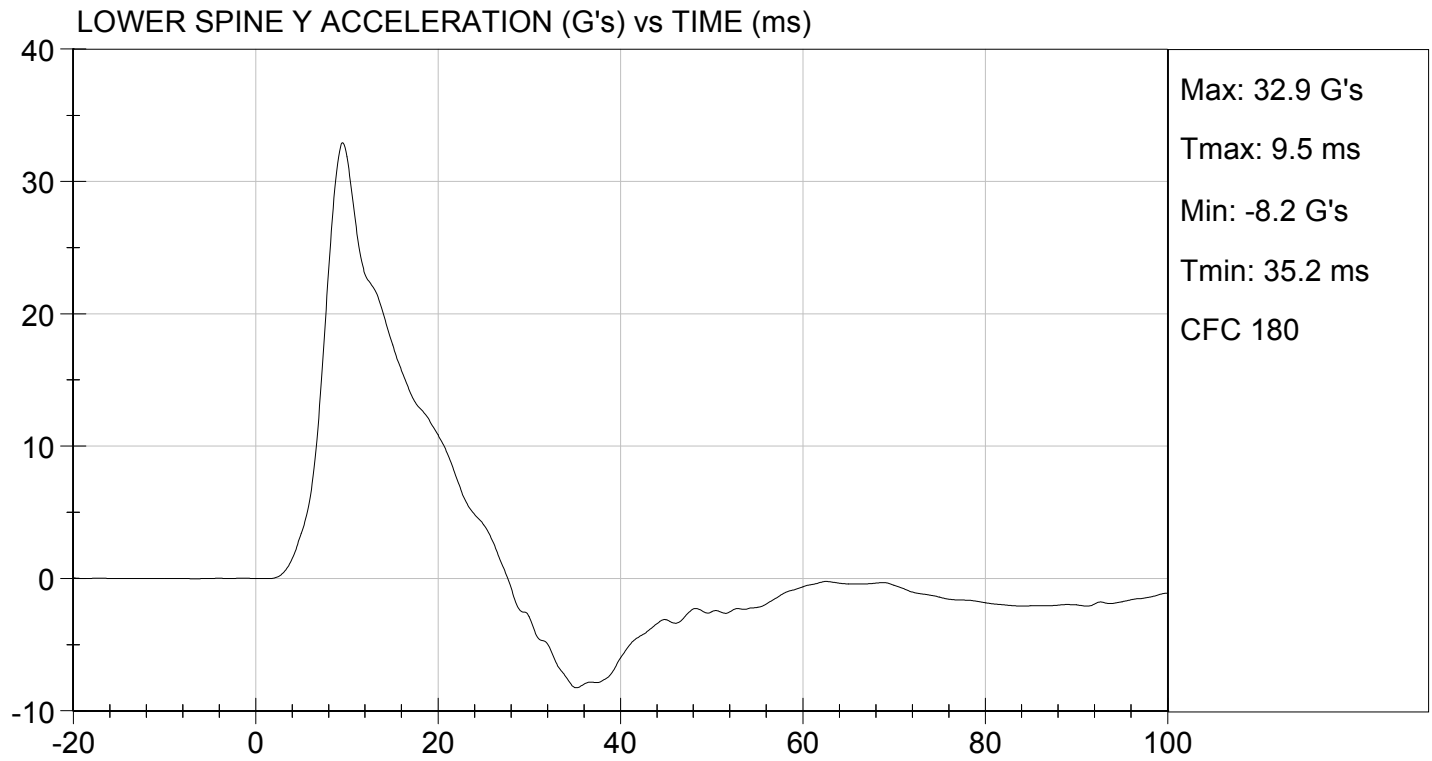
UPPER SPINE Y ACCELERATION (G's) vs TIME (ms)





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

TEST DATE: 07/28/2016
TEST #: D162564



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

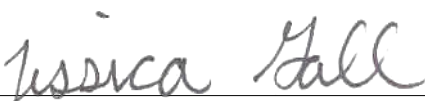
ATD Serial No: 306

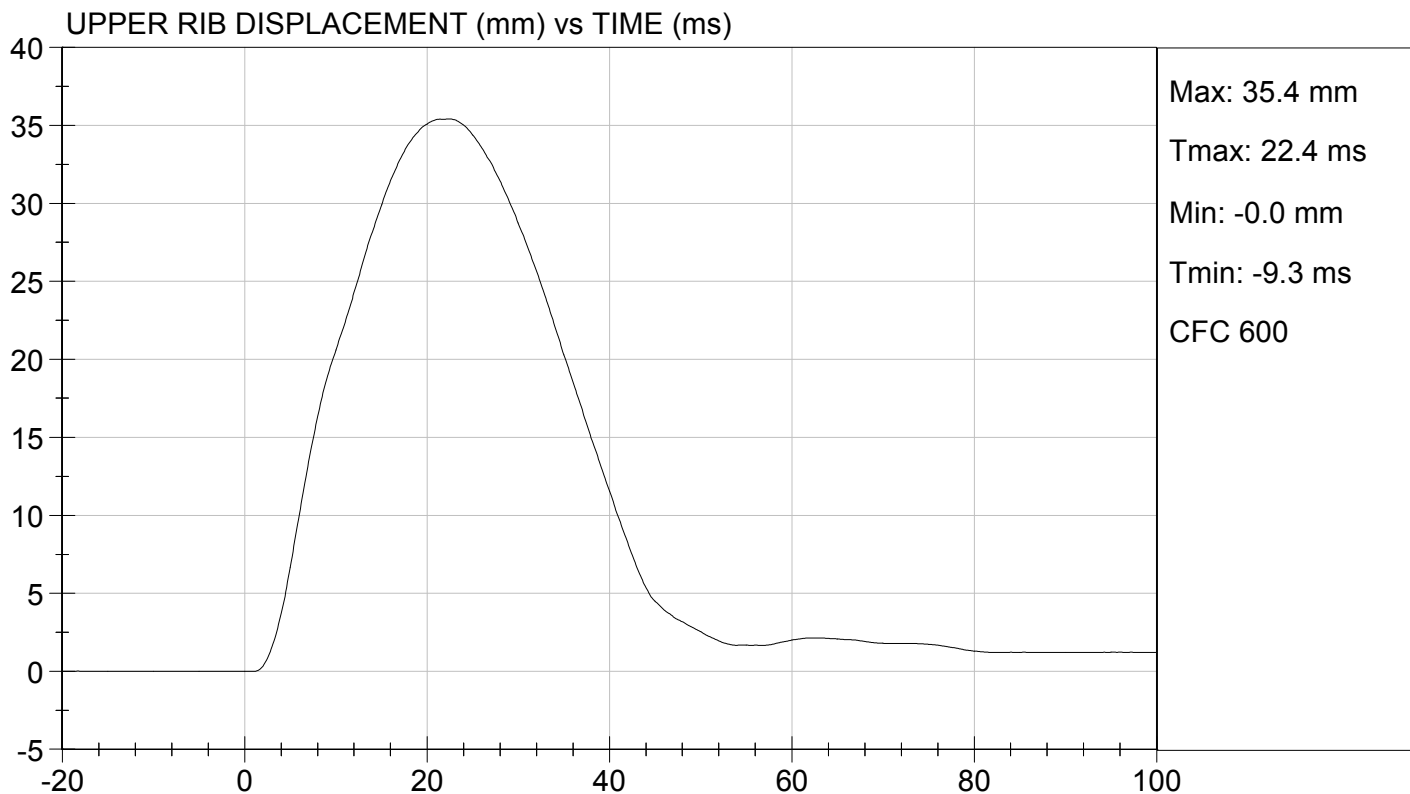
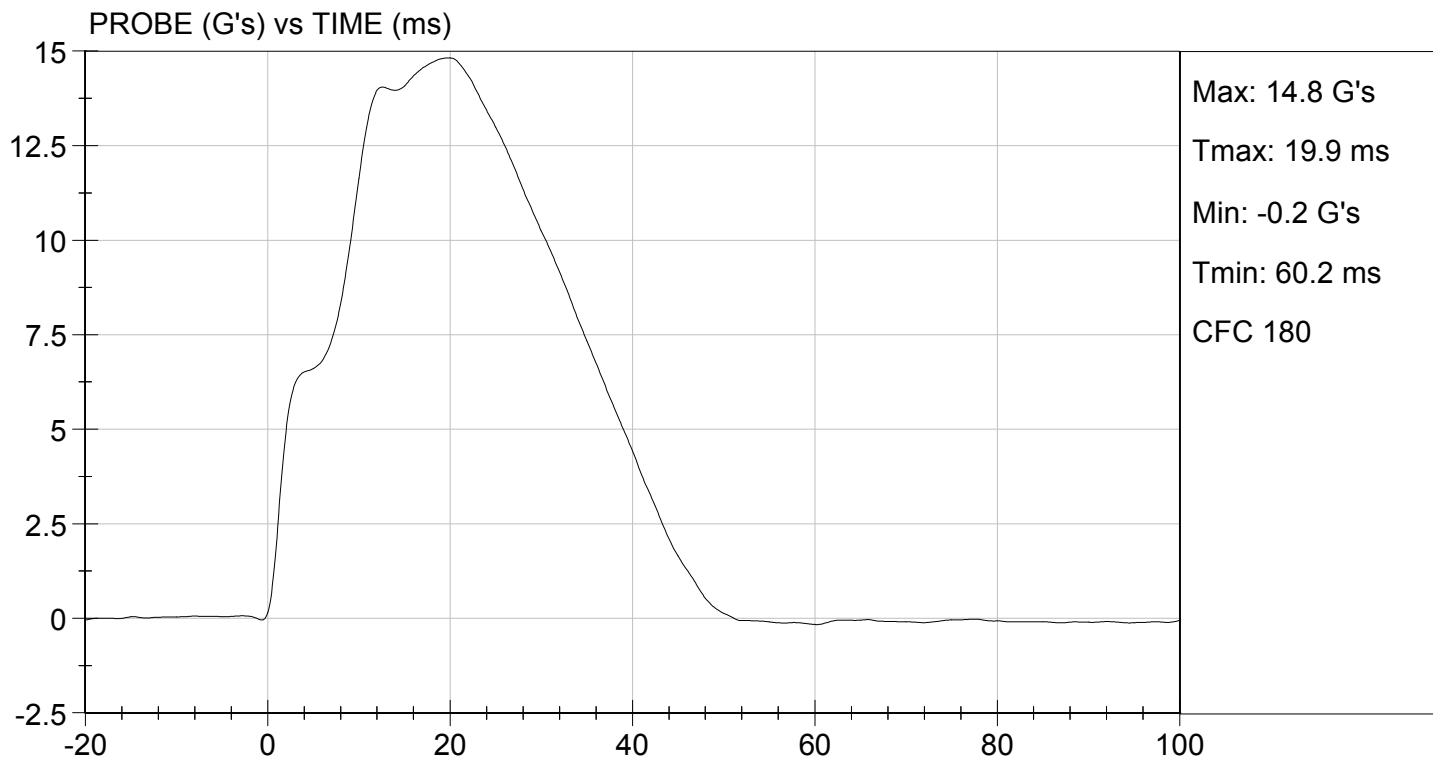
Test I.D: D162565

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.7	Pass
Humidity	%	10 to 70	50	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Maximum Probe Acceleration	G's	14 to 18	15	Pass
Upper Rib Displacement	mm	32 to 40	35	Pass
Middle Rib Displacement	mm	39 to 45	41	Pass
Lower Rib Displacement	mm	35 to 43	41	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


 Laboratory Technician

07/28/2016
 Test Date


 Approved By

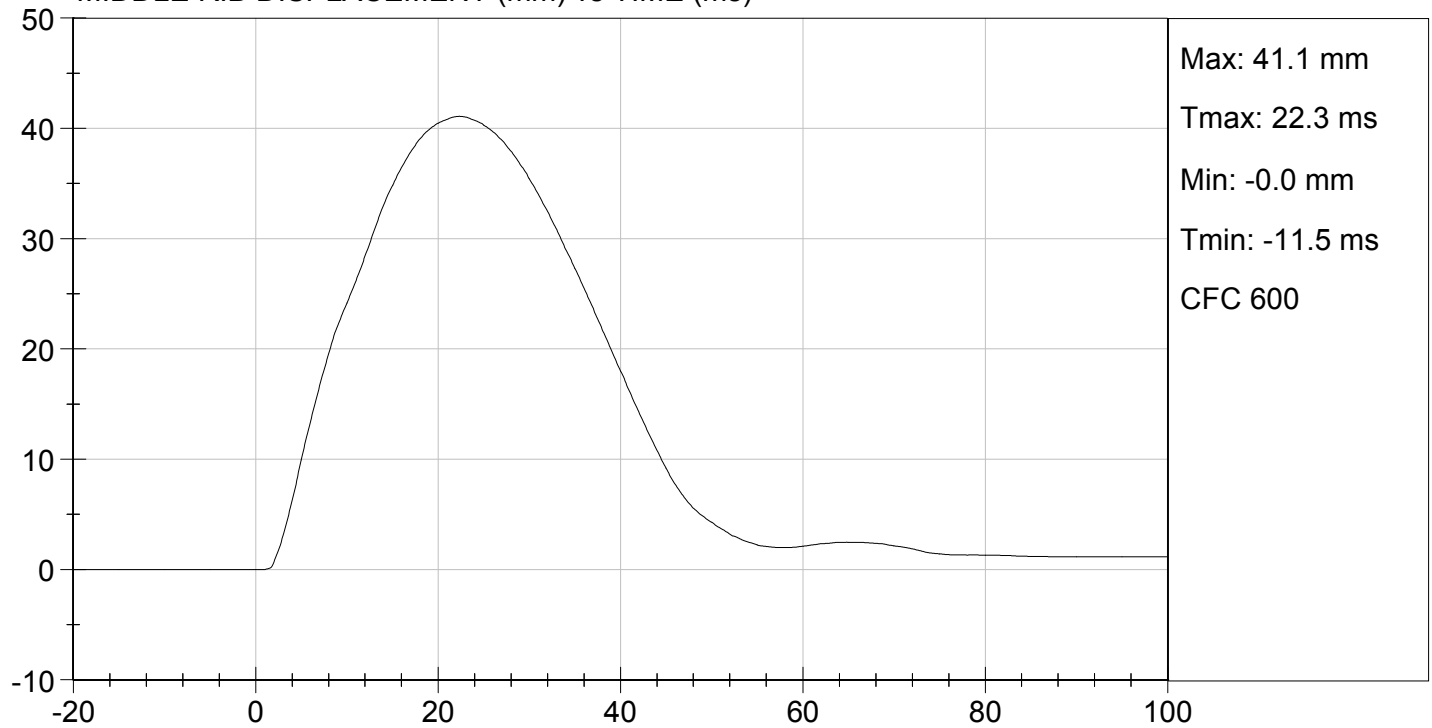




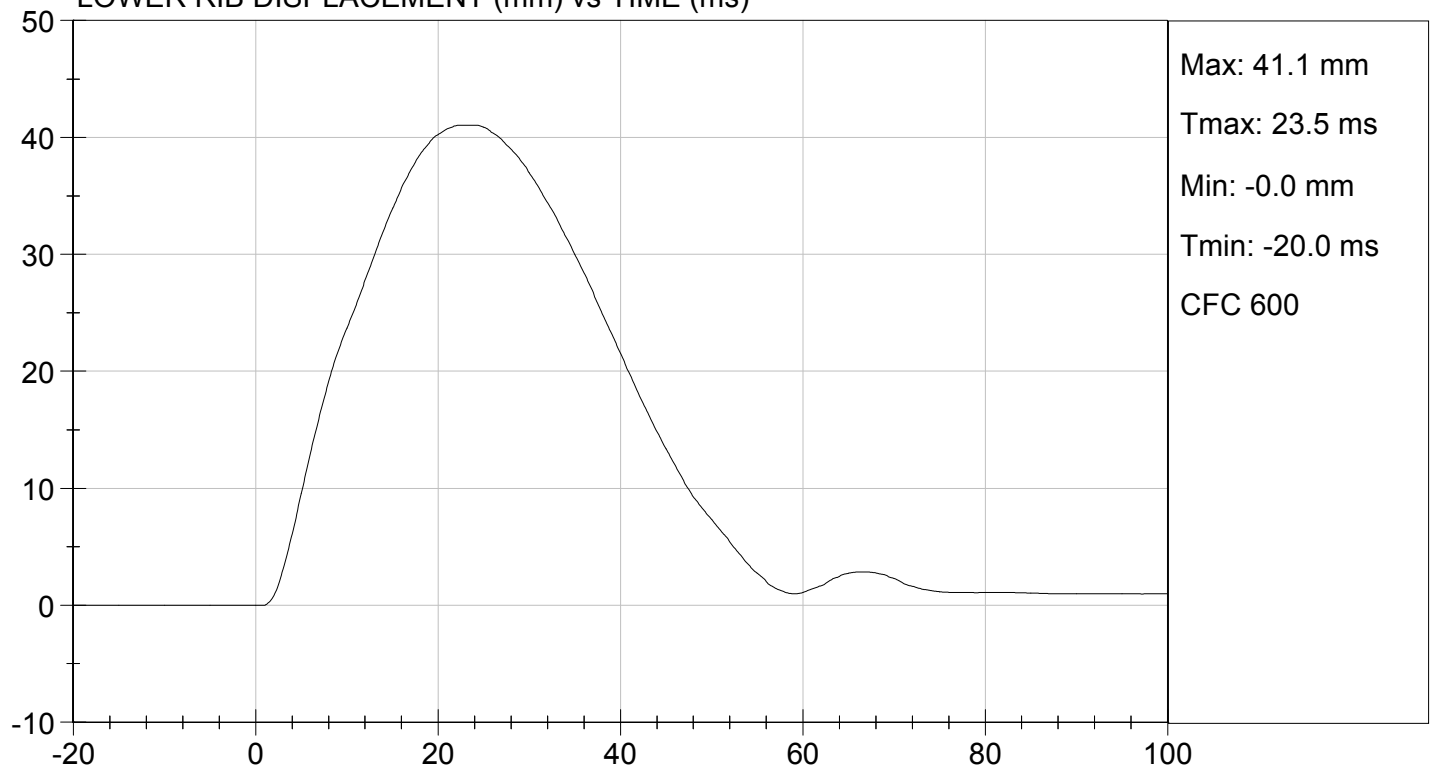
TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 07/28/2016
TEST #: D162565

MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



LOWER RIB DISPLACEMENT (mm) vs TIME (ms)

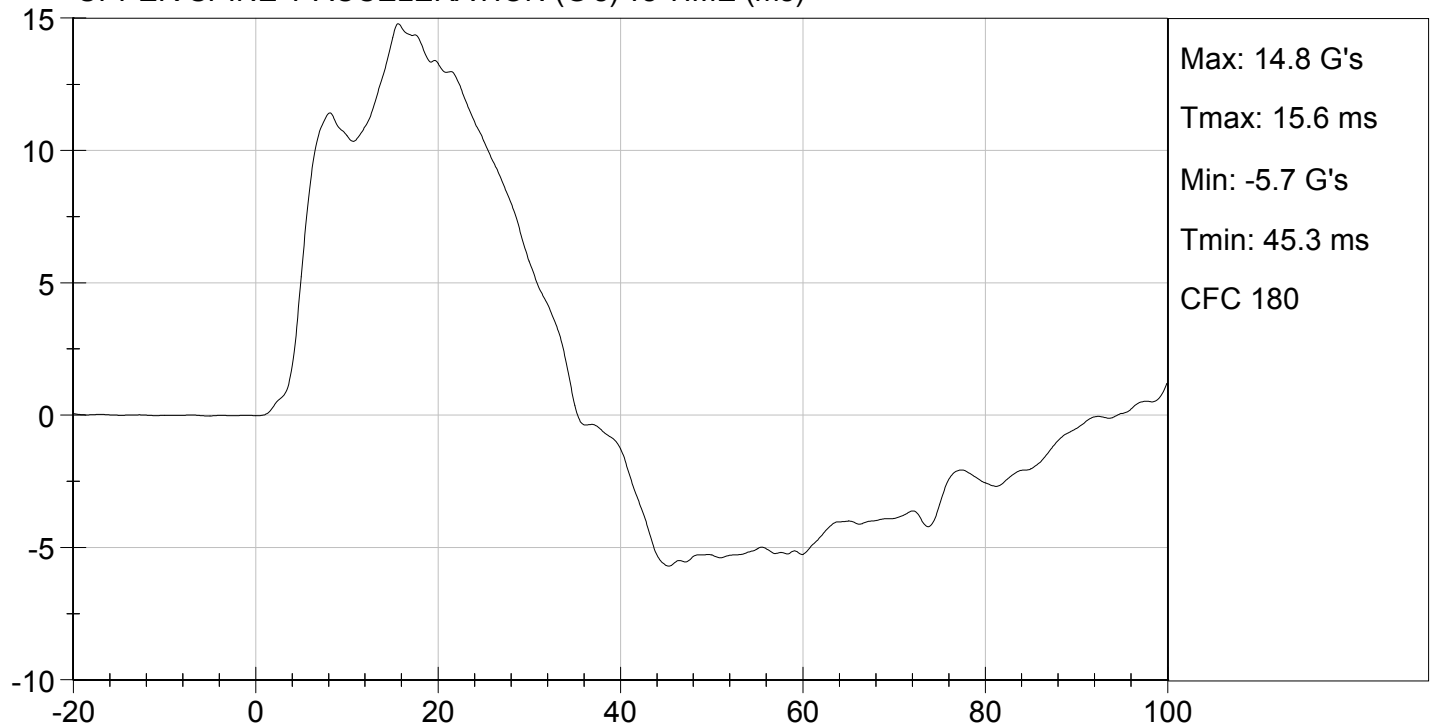




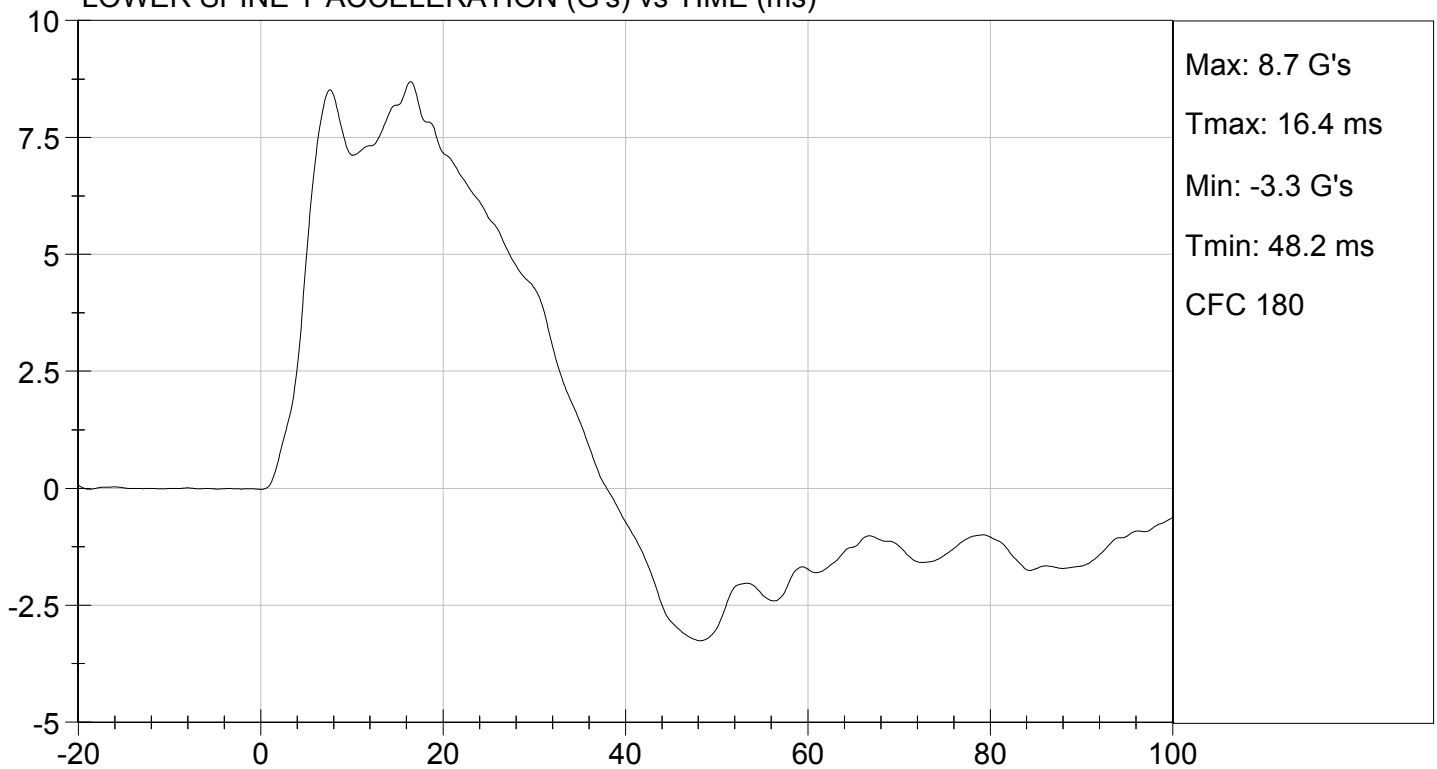
TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 07/28/2016
TEST #: D162565

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



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



MGA RESEARCH CORPORATION

ABDOMINAL IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

Test I.D: D162566

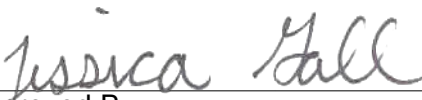
Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.7	Pass
Humidity	%	10 to 70	50	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Maximum Probe Acceleration	G's	12 to 16	13	Pass
Upper Abdomen Rib Displacement	mm	36 to 47	41	Pass
Lower Abdomen Rib Displacement	mm	33 to 44	40	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	11	Pass
Overall Test Results				Pass



Laboratory Technician

07/28/2016

Test Date

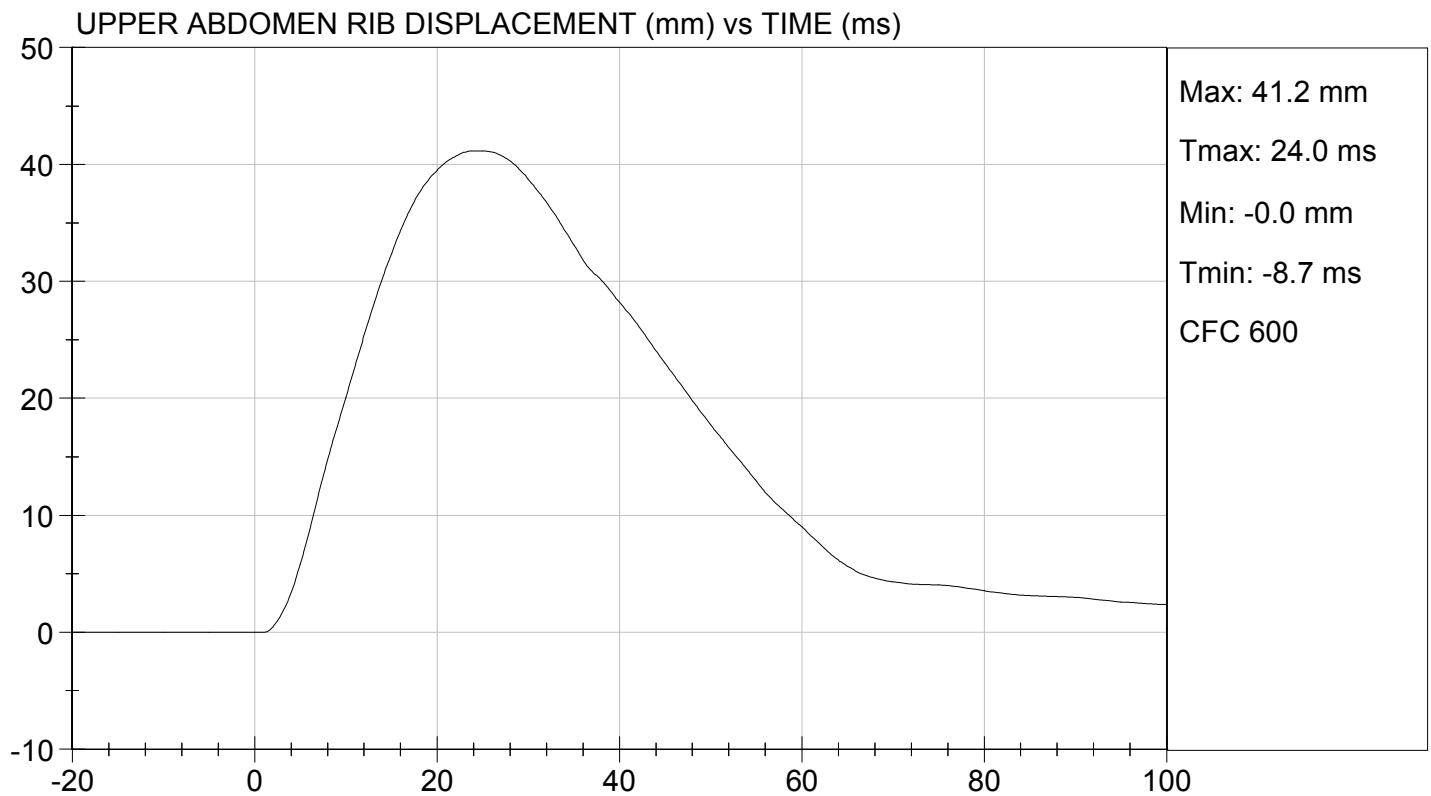
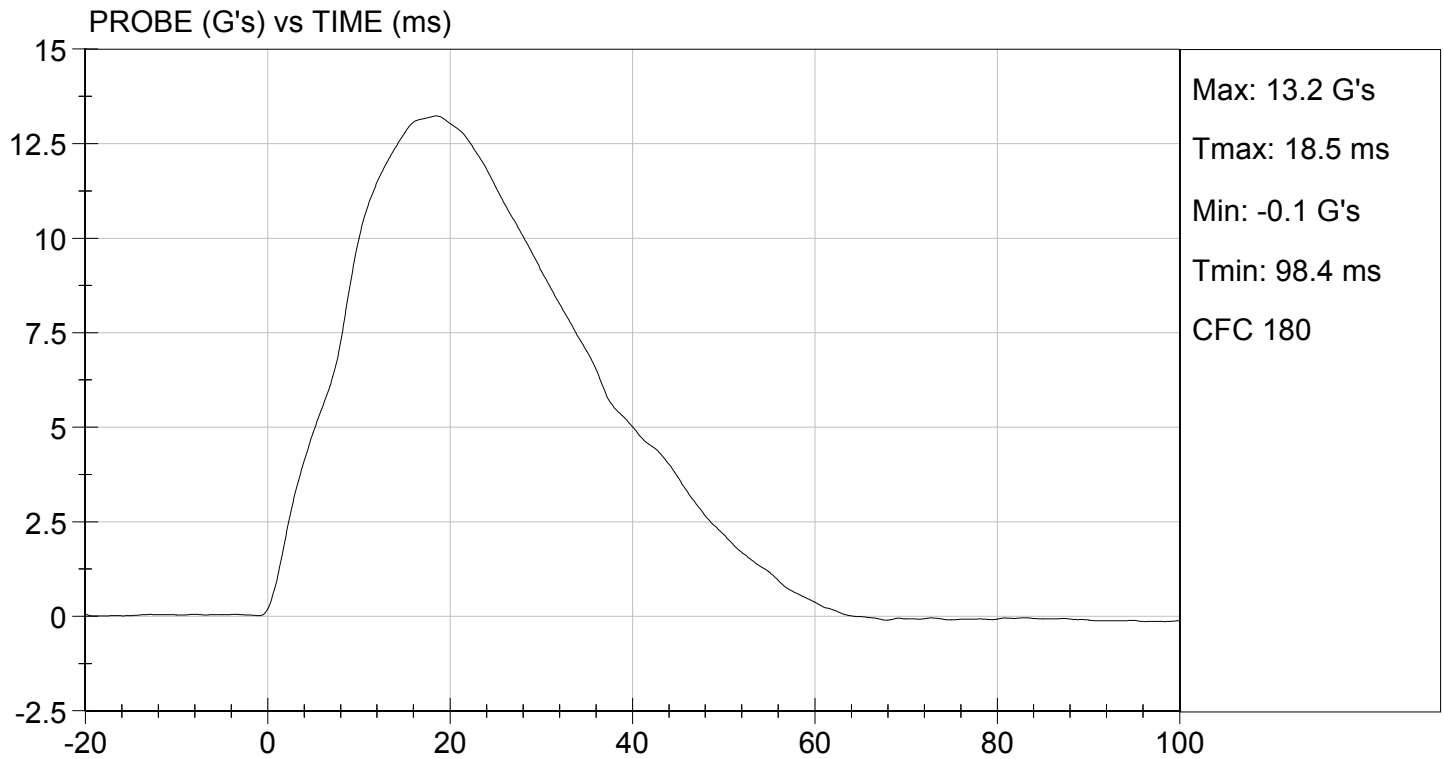


Approved By



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

TEST DATE: 07/28/2016
TEST #: D162566

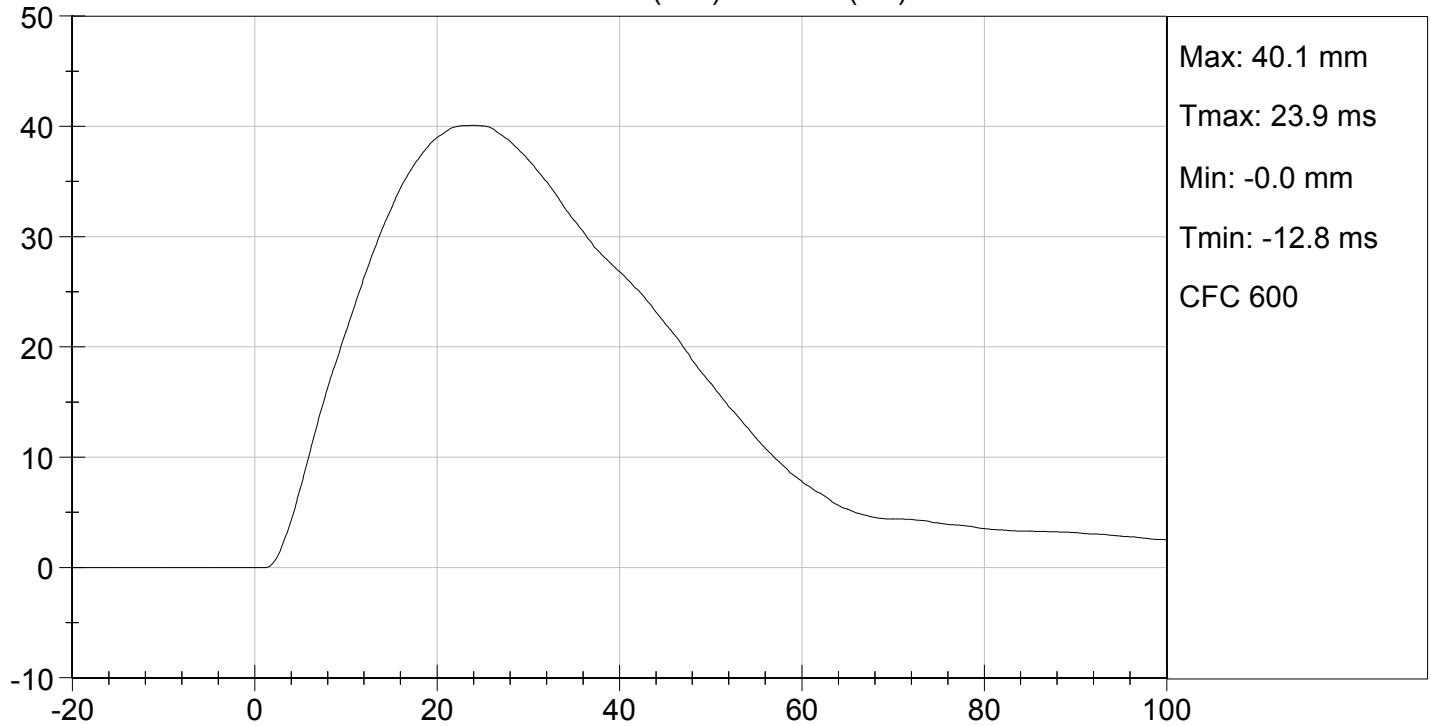




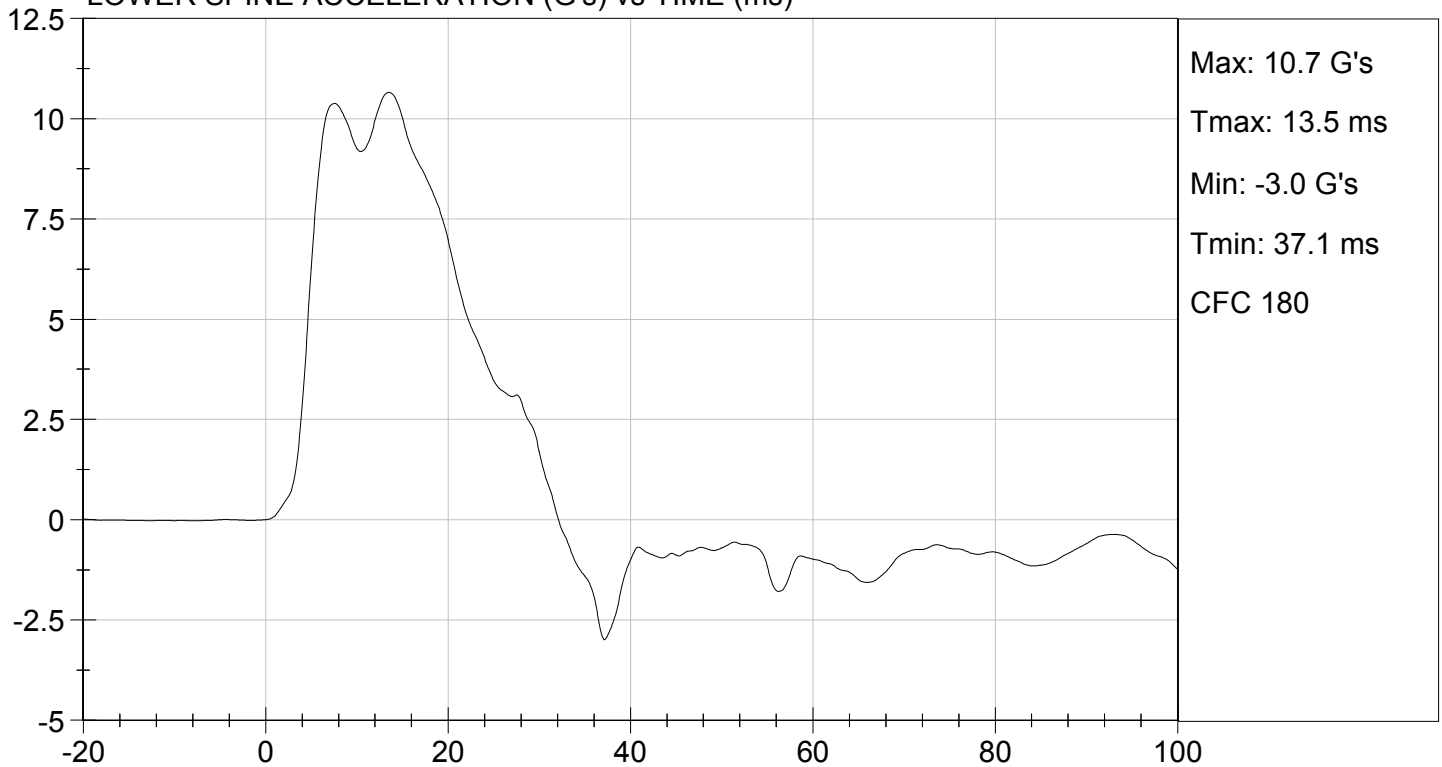
TEST DESC: ABDOMEN IMPACT
VELOCITY: 14.12 ft/s, 4.30 m/s

TEST DATE: 07/28/2016
TEST #: D162566

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



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



MGA RESEARCH CORPORATION

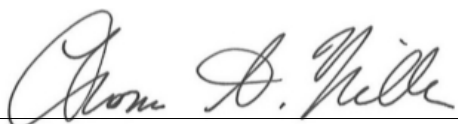
PELVIS IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

Test I.D: D162567

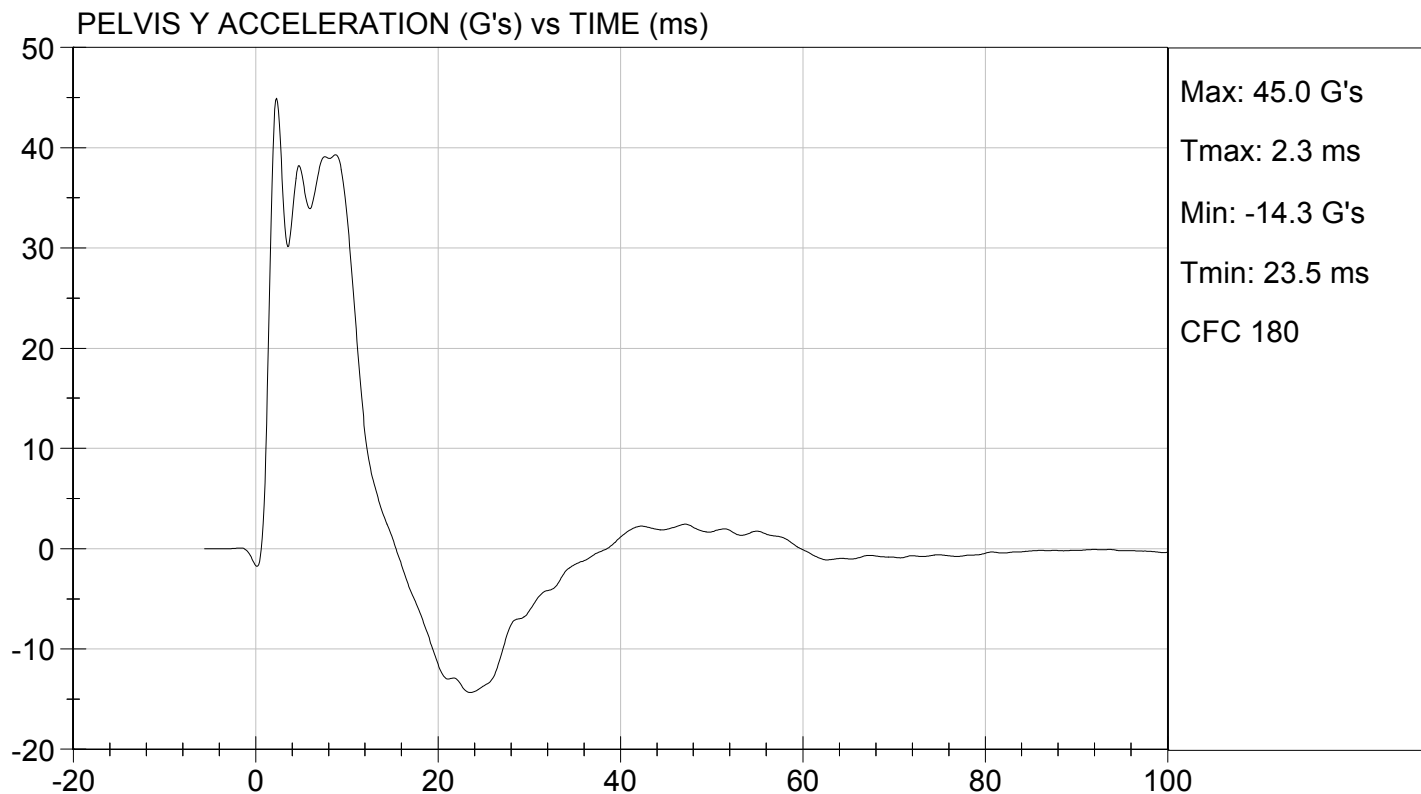
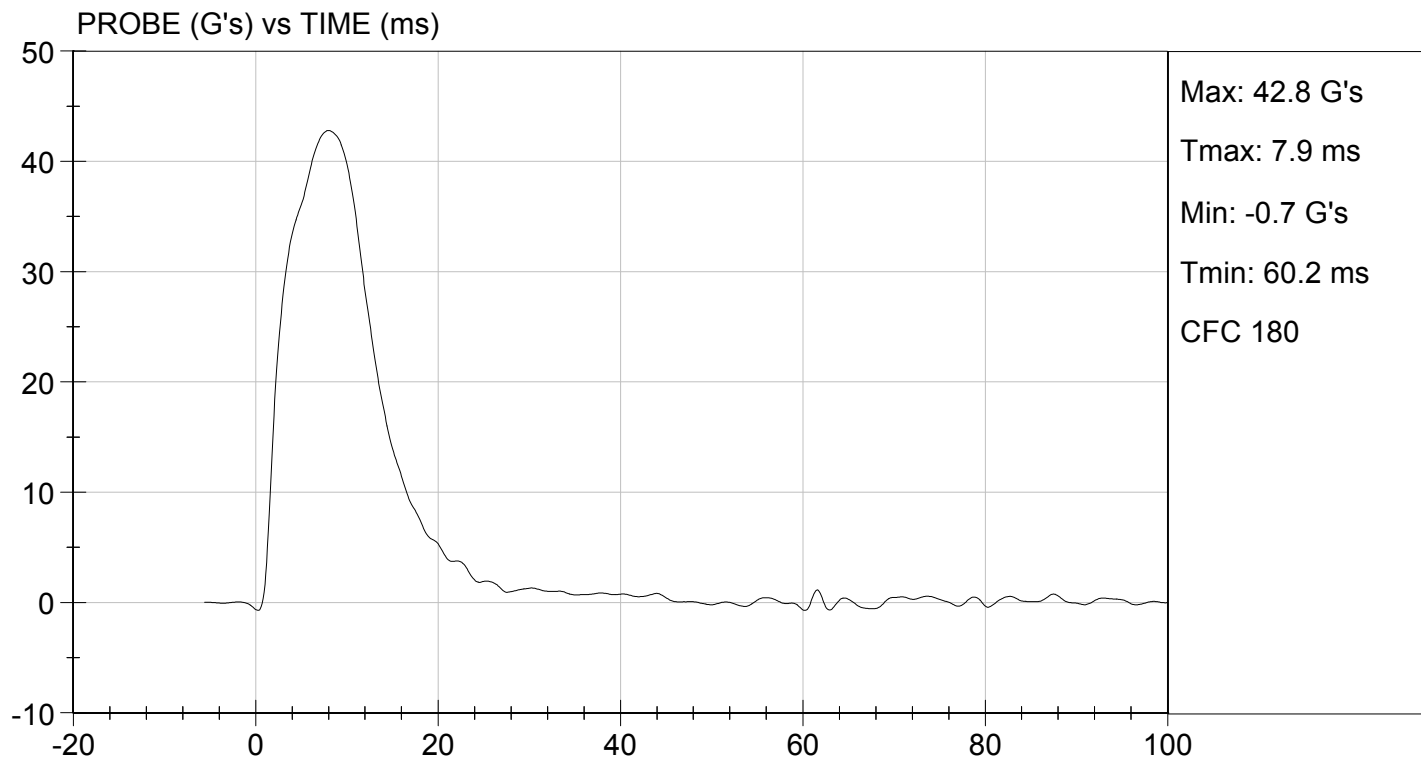
Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.7	Pass
Humidity	%	10 to 70	50	Pass
Impact Velocity	m/s	6.60 to 6.80	6.68	Pass
Maximum Probe Acceleration	G's	38 to 47	43	Pass
Pelvis Y Acceleration After 6 ms	G's	34 to 42	39	Pass
Peak Acetabulum Force	N	3600 to 4300	4,011	Pass
Overall Test Results				Pass


Laboratory Technician

07/28/2016

Test Date

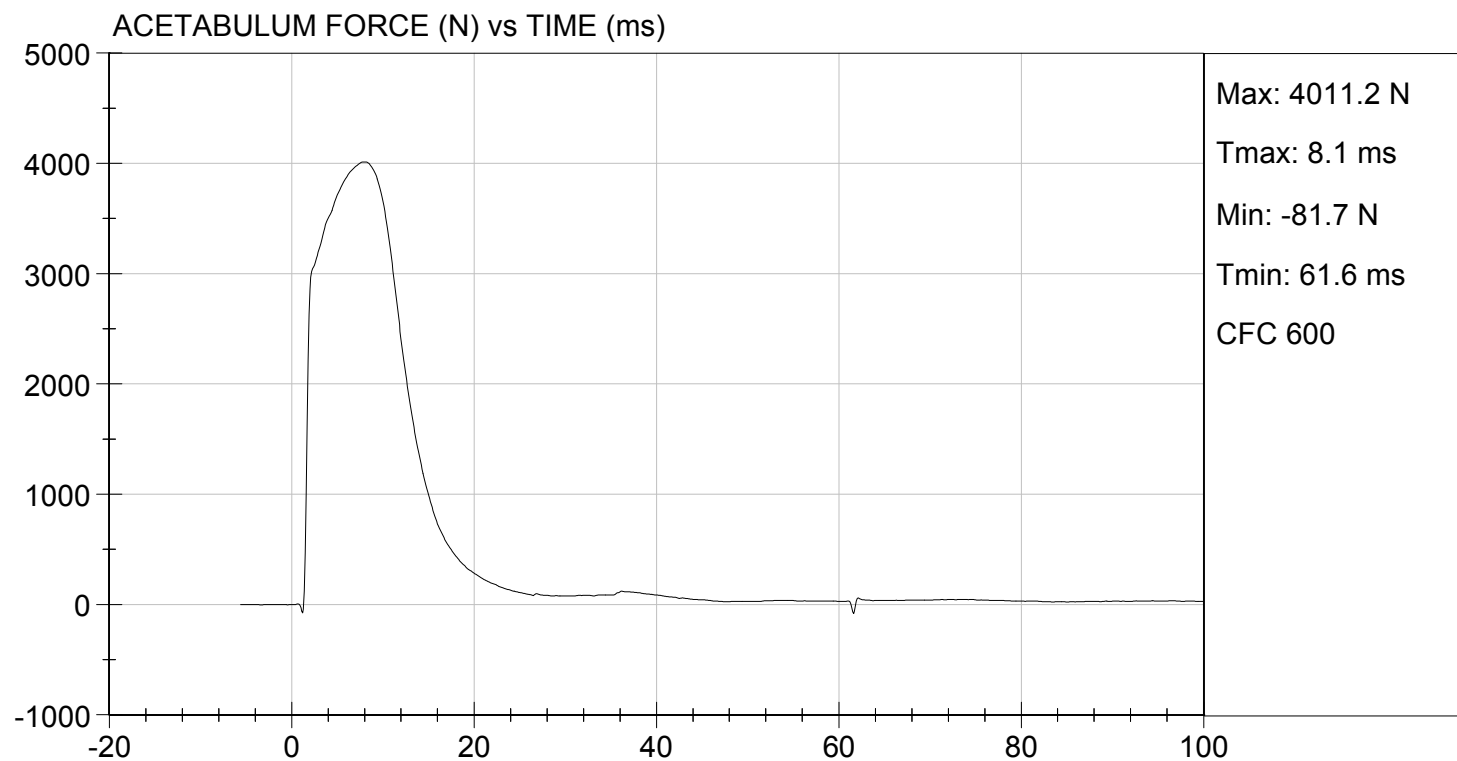

Approved By





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

TEST DATE: 07/28/2016
TEST #: D162567



MGA RESEARCH CORPORATION

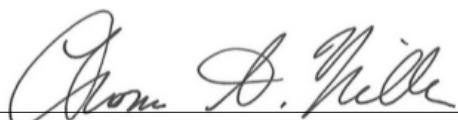
ILIAC IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

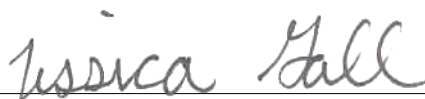
Test I.D: D162568

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.7	Pass
Humidity	%	10 to 70	50	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Maximum Probe Acceleration	G's	36 to 45	39	Pass
Pelvis Y Acceleration	G's	28 to 39	31	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4,432	Pass
Overall Test Results				Pass


Laboratory Technician

07/28/2016

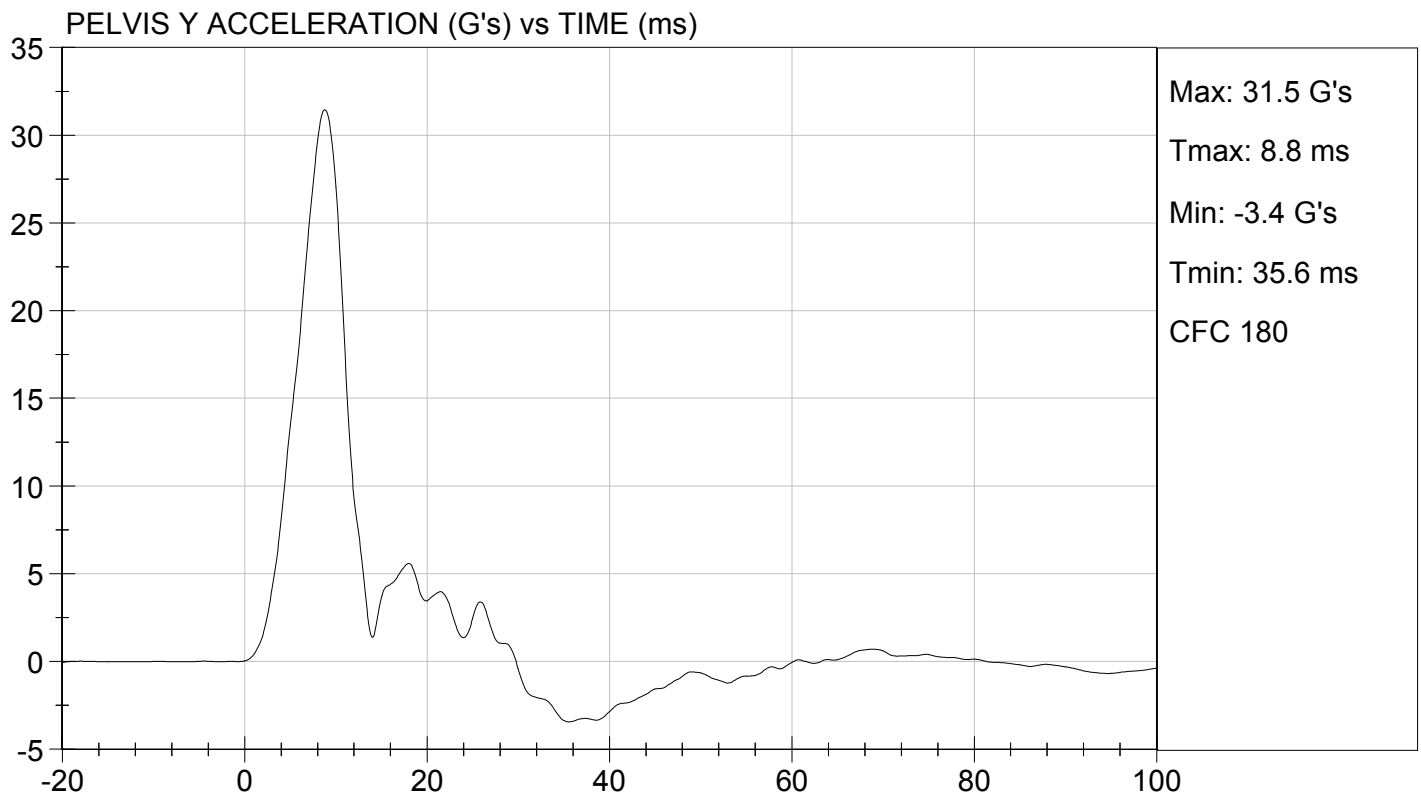
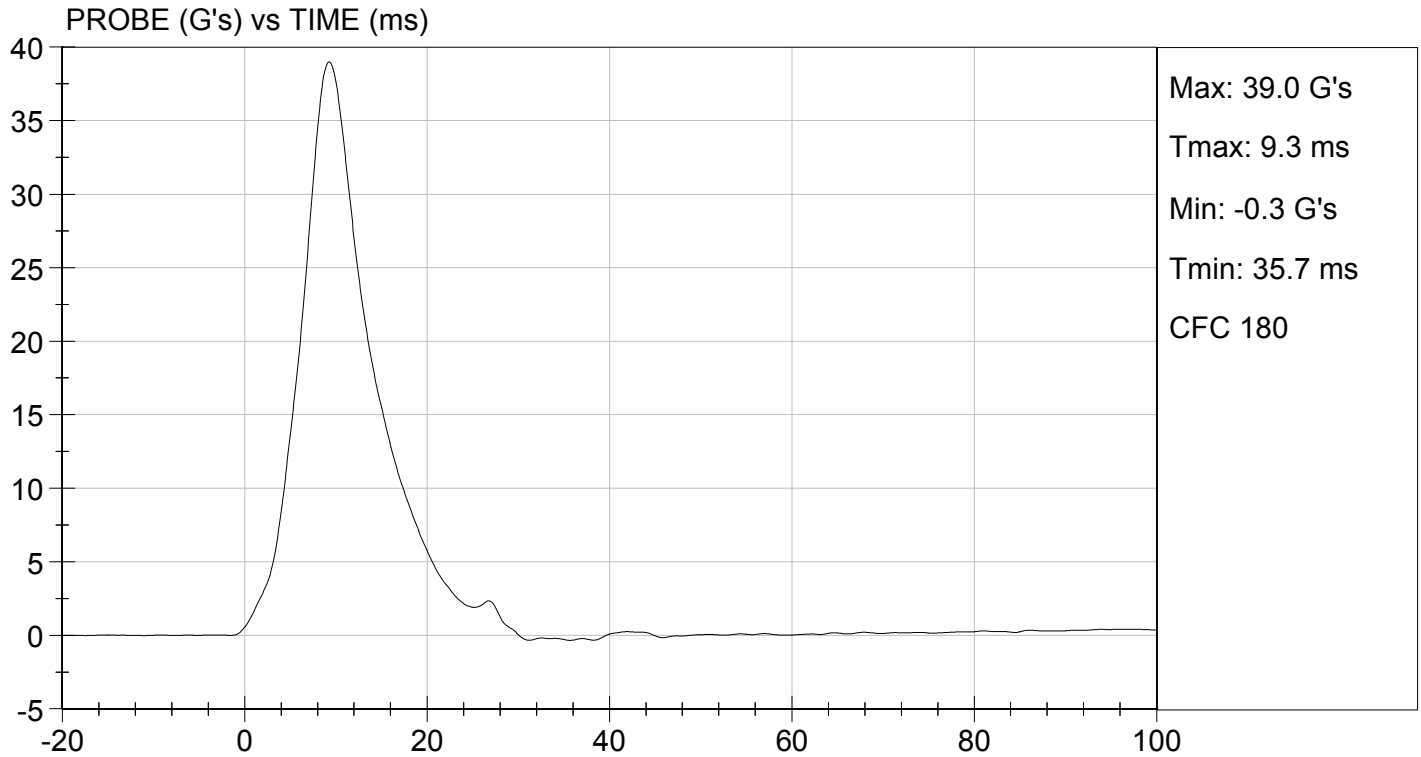
Test Date


Approved By



TEST DESC: ILLIAC
VELOCITY: 14.12 ft/s, 4.30 m/s

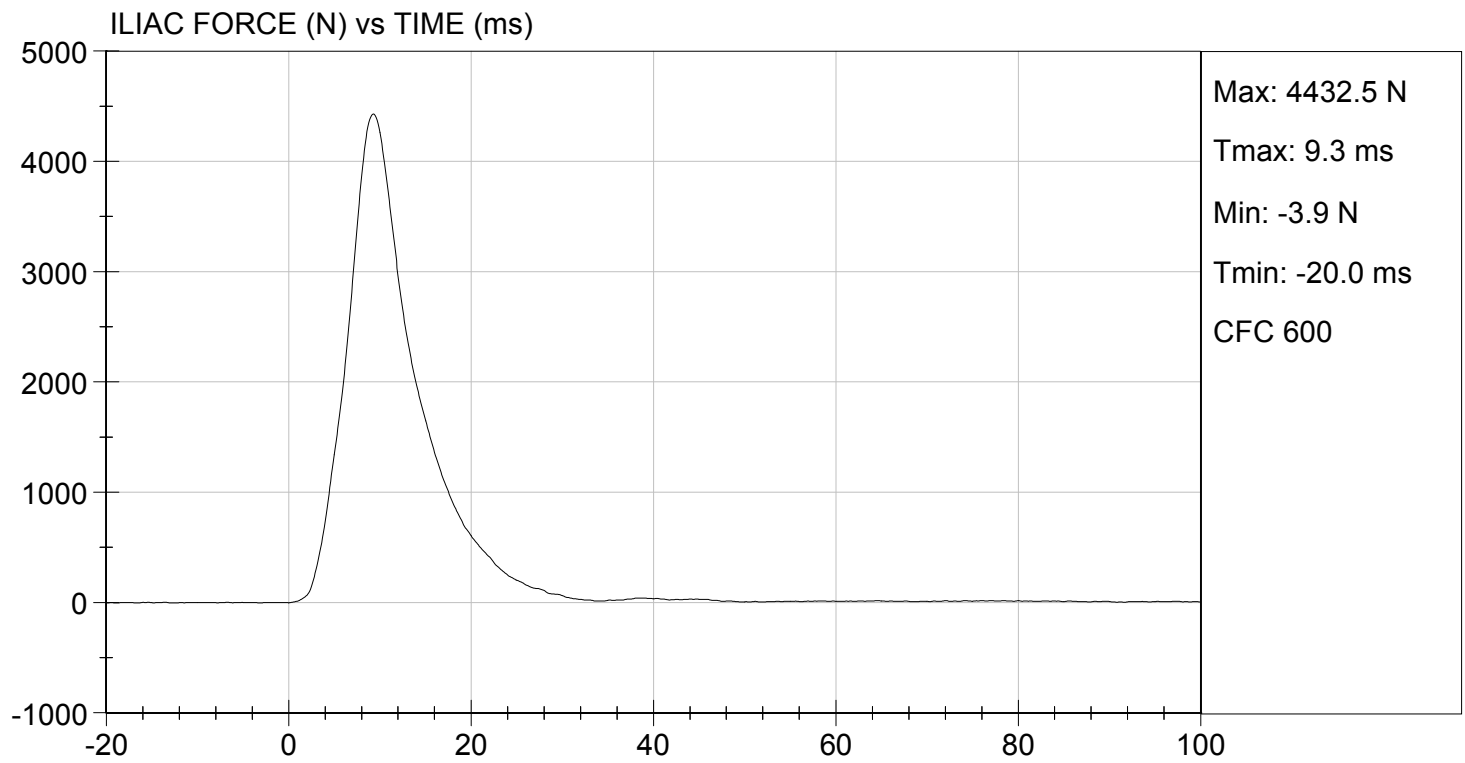
TEST DATE: 07/28/2016
TEST #: D162568



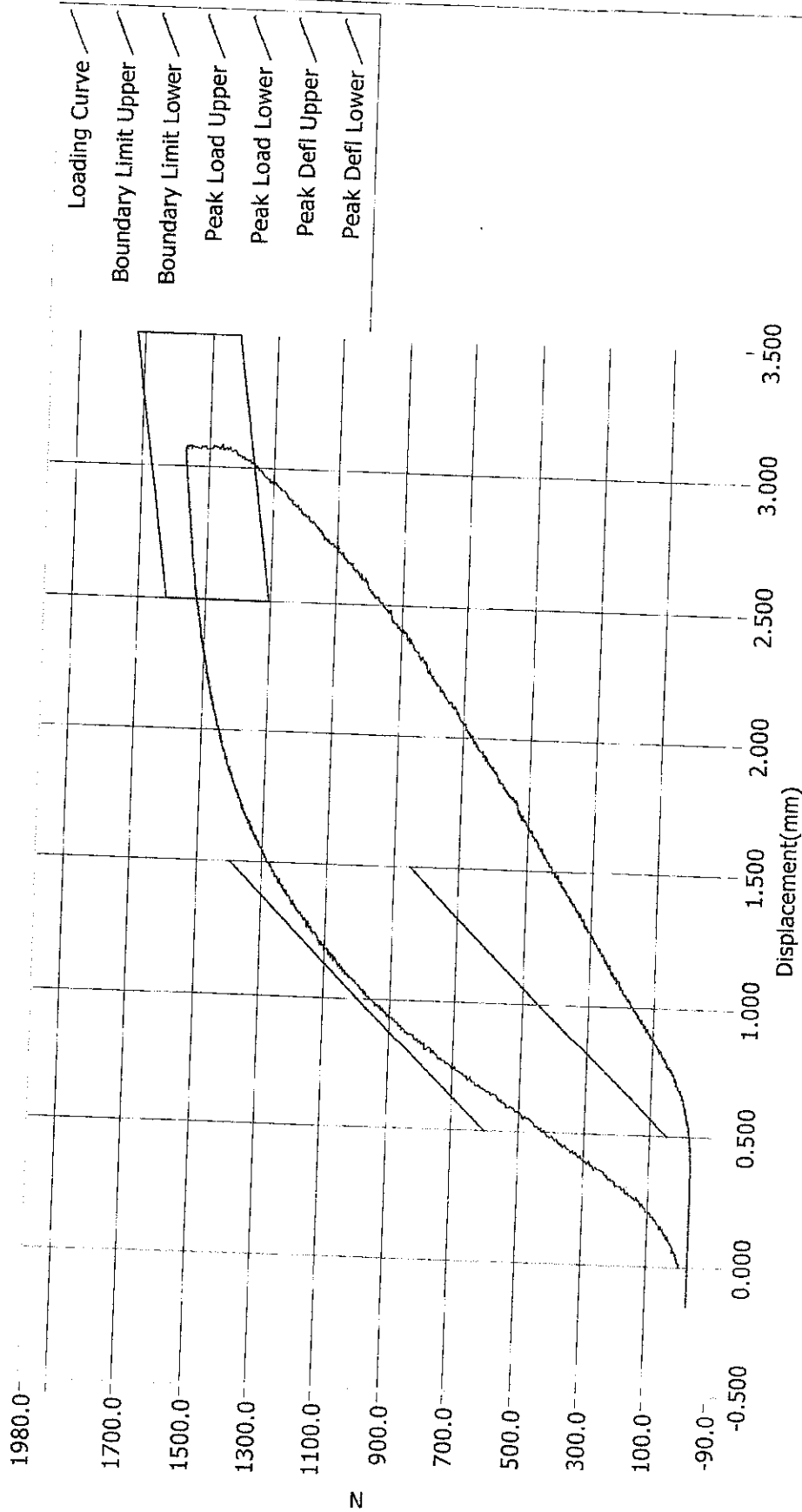


TEST DESC: ILLIAC
VELOCITY: 14.12 ft/s, 4.30 m/s

TEST DATE: 07/28/2016
TEST #: D162568



Resultant Data - SIDIIs Plug Compression

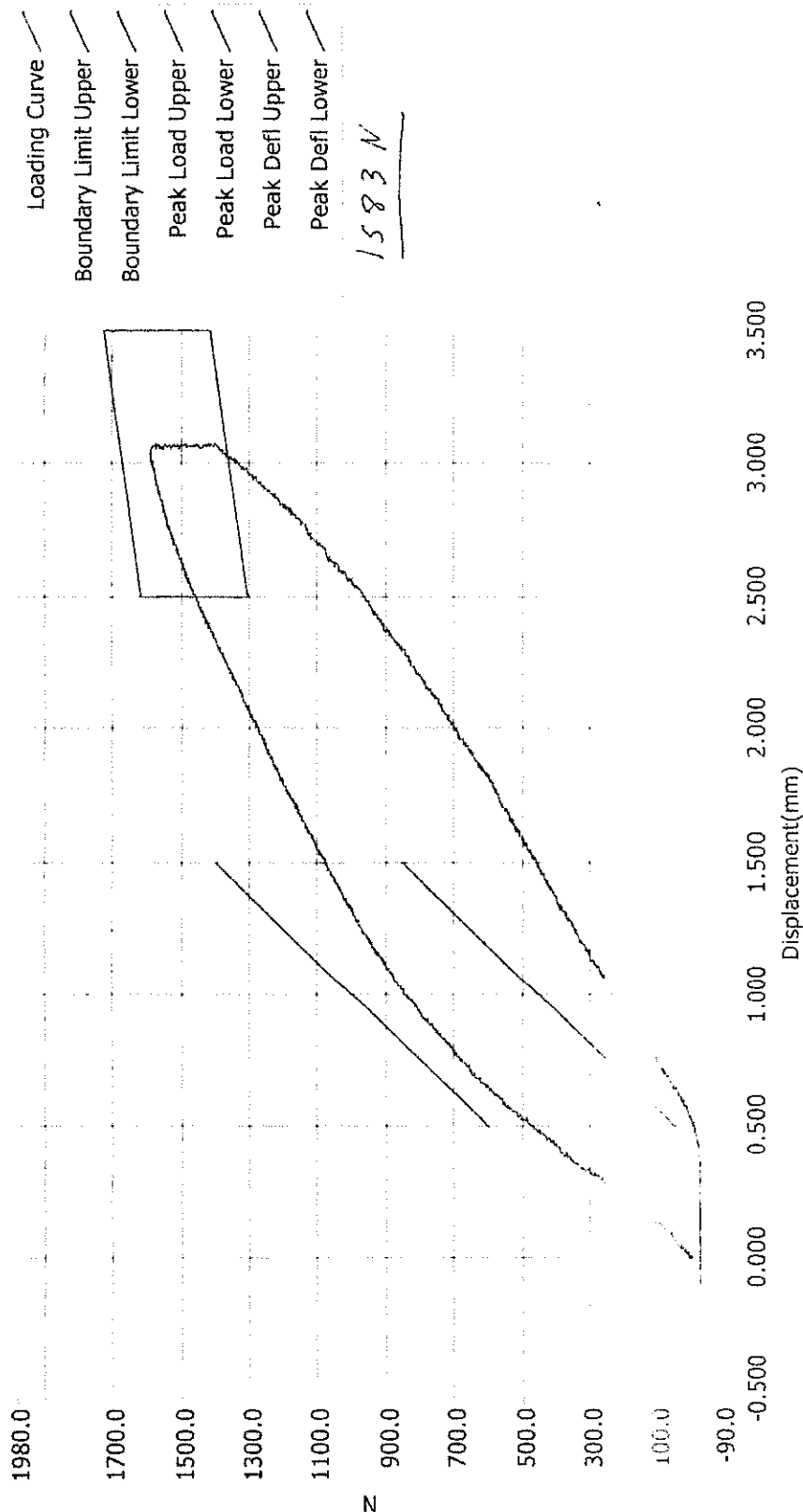


ATD Calibration Lab

<u>Test ID</u>	<u>Part Serial Number</u>	<u>Test Date</u>	<u>Test Time</u>
	80988	12/2/2014	6:17 PM
<u>Cert ID</u>	<u>ATD Serial Number</u>	<u>ATD Type</u>	
	N/A	SIDIIs	

Current Date : 12/2/2014 Current Time : 18:22:16

Resultant Data - SIDIIs Plug Compression



ATD Calibration Lab

Test ID	Part Serial Number	Test Date	Test Time
	71461	12/20/2013	12:38 AM
Cert ID	ATD Serial Number	ATD Type	
	N/A	SIDIIs	

Current Date : 12/20/2013 Current Time : 00:38:53

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	P79741	Endevco	07/08/16
		Y	P79743	Endevco	07/08/16
		Z	P79744	Endevco	07/08/16
		Xr	P79586	Endevco	07/08/16
		Yr	P79590	Endevco	07/08/16
		Zr	P79592	Endevco	07/08/16
Thorax Rib Displacement Potentiometers	Upper	Y	G176	Honeywell	07/14/16
	Middle	Y	G169	Honeywell	07/14/16
	Lower	Y	G164	Honeywell	07/14/16
Abdomen Load Cells	Forward	Y	ABG1532	Denton	11/19/15
	Middle	Y	ABG1534	Denton	11/19/15
	Rear	Y	ABG1535	Denton	11/19/15
Lower Spine Accelerometers (T12)		X	P85161	Endevco	06/07/16
		Y	P85162	Endevco	06/07/16
		Z	P85163	Endevco	06/07/16
Public Symphysis Load Cell		Y	PG461	Denton	11/19/15

Table 2 – Dummy Instrumentation (SID-IIs)

				SID-IIs S/N 306			
				Serial Number	Manufacturer	Calibration Date	
Head CG Accelerometers				X	P88705	Endevco	03/28/2016
				Y	P88706	Endevco	03/28/2016
				Z	P88707	Endevco	03/28/2016
				Xr	P88711	Endevco	03/28/2016
				Yr	P88712	Endevco	03/28/2016
				Zr	P88713	Endevco	03/28/2016
Head Angular Rate Sensors				X	ARS7416	DTS	07/15/14
				Y	ARS7442	DTS	07/15/14
				Z	ARS7475	DTS	07/15/14
Displacement Potentiometers	Thoracic Rib	Upper	Y	G033	FTSS	03/29/2016	
		Middle	Y	G1261	FTSS	03/29/2016	
		Lower	Y	G1270	FTSS	03/29/2016	
	Abdominal Rib	Upper	Y	G032	FTSS	03/29/2016	
		Lower	Y	G1304	FTSS	03/29/2016	
Lower Spine Accelerometers (T12)				X	P88348	Endevco	03/28/2016
				Y	P88666	Endevco	03/28/2016
				Z	P88667	Endevco	03/28/2016
Acetabulum Load Cell				Y	ACG269	Denton	05/06/16
Iliac Wing Load Cell				Y	IWG282	Denton	01/08/16
Pelvis Plug (struck side)					80988	FTSS	12/02/14
Pelvis Plug (non-struck side)					71461	FTSS	12/20/13

Table 3 – Vehicle Instrumentation

			Serial Number	Manufacturer	Calibration Date
1	Vehicle Center of Gravity	X	PCB492	PCB	05/26/16
	Vehicle Center of Gravity	Y	PCB494	PCB	05/26/16
	Vehicle Center of Gravity	Z	PCB493	PCB	05/26/16
2	Right Sill at Front Seat	X	P78708	Endevco	06/06/16
	Right Sill at Front Seat	Y	P78709	Endevco	06/06/16
	Right Sill at Front Seat	Z	P78710	Endevco	06/06/16
3	Right Sill at Rear Seat	X	PCB330	PCB	02/04/16
	Right Sill at Rear Seat	Y	PCB329	PCB	02/04/16
	Right Sill at Rear Seat	Z	PCB331	PCB	02/04/16
4	Left Sill at Front Door	Y	PCB293	PCB	02/03/16
5	Left Sill at Rear Door	Y	PCB422	PCB	04/22/16
6	Left A-Post Lower	Y	PCB155	PCB	04/22/16
7	Left A-Post Middle	Y	PCB156	PCB	04/22/16
8	Left B-Post Lower	Y			
9	Left B-Post Middle	Y			
10	Front Seat Track	Y	PCB260	PCB	06/07/16
11	Rear Seat Track or Structure	Y	P90709	Endevco	04/05/16
12	Right Rear Occ. Compartment	Y	PCB421	PCB	04/22/16
13	Engine Block	X	PCB576	PCB	06/13/16
	Engine Block	Y	PCB423	PCB	04/22/16
14	Rear Floorpan Above Axle	X	PCB366	PCB	02/04/16
	Rear Floorpan Above Axle	Y	PCB365	PCB	02/04/16
	Rear Floorpan Above Axle	Z	PCB367	PCB	02/04/16

Table 4 – MDB Instrumentation

		Serial Number	Manufacturer	Calibration Date
MDB Center of Gravity	X	PCB677D	PCB	11/20/2015
MDB Center of Gravity	Y	PCB676D	PCB	11/20/2015
MDB Center of Gravity	Z	PCB675D	PCB	11/20/2015
Left Frame at Rear Axle Centerline	X	PCB495D	PCB	11/30/2015
Left Frame at Rear Axle Centerline	Y	PCB494D	PCB	11/30/2015