REPORT NUMBER: SINCAP-MGA-2016-048

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

VOLVO CAR CORPORATION
2016 Volvo XC90 T8 AWD Inscription 5-Door SUV
NHTSA No.: O20165905

MGA RESEARCH CORPORATION
5000 Warren Road
Burlington, WI 53105

Test Date: April 26, 2016

Final Report Date: June 10, 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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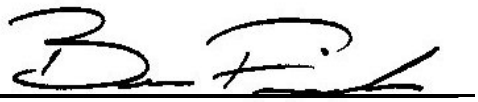
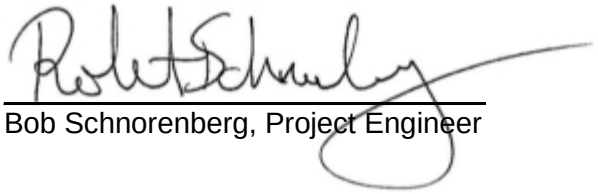
Prepared by: 
Ben Fischer, Project Engineer

Approved by: 
Bob Schnorenberg, Project Engineer

Approval Date: June 10, 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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4. Title and Subtitle Final Report of New Car Assessment Program Side Impact MDB Testing of 2016 Volvo XC90 T8 AWD Inscription 5-Door SUV, NHTSA No.: O20165905		*5. Report Date* June 10, 2016 *6. Performing Organization Code* MGA
7. Author(s) Ben Fischer, Project Engineer		*8. Performing Organization Report No.* SINCAP-MGA-2016-048
9. Performing Organization Name and Address MGA Research Corporation 5000 Warren Road Burlington, WI 53105		*10. Work Unit No.* *11. Contract or Grant No.* DTNH22-14-D-00353
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Crashworthiness Standards (NRM-110) 1200 New Jersey Ave, SE, Room W43-410 Washington, D.C. 20590		*13. Type of Report and Period Covered:* Final Test Report April 26, 2016 to June 10, 2016 *14. Sponsoring Agency Code* NRM-110

15. Supplementary Notes

16. Abstract

A 55/28 km/h 90° Moving Deformable Barrier NCAP Side Impact Test was conducted on the 2016 Volvo XC90 T8 AWD Inscription 5-Door SUV 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 April 26, 2016.

The impact velocity of the Moving Deformable Barrier (MDB) was 61.44 km/h, and the ambient temperature at the struck (driver's) side of the target vehicle at the time of impact was 21.4°C. The target vehicle post-test maximum crush was 185 mm at level 2. The test vehicle's performance was as follows:

		Driver ATD (ES-2re)	
Measurement Description	**Units**	Threshold	**Result**
Head Injury Criteria (HIC_{36})	N/A	1000	45
Maximum Thorax Rib Deflection	mm	44	19
Total Abdominal Force	N	2500	594
Pubic Symphysis Force	N	6000	940
Resultant Lower Spine Acceleration	Gs	82*	20

		Passenger ATD (SID-IIs)	
Measurement Description	**Units**	Threshold	**Result**
Head Injury Criteria (HIC_{36})	N/A	1000	91
Resultant Lower Spine Acceleration	Gs	82	40
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2677
Maximum Thoracic Rib Deflection	mm	38*	12
Maximum Abdomen Rib Deflection	mm	45*	12

*Proposed IARV

The doors on the struck side of the vehicle did not separate from the body at the hinges or latches and the opposite doors did not open during the side impact event.

17. Key Words New Car Assessment Program (NCAP) Side Impact MDB ES-2re SID-IIs	*18. Distribution Statement* Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services Division, NPO-411 1200 New Jersey Ave, SE Washington, DC 20590 e-mail: tis@nhtsa.dot.gov FAX: 202-493-2833

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SECTION 1
TEST PURPOSE AND PROCEDURE

This moving deformable barrier side impact test is part of the MY 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 Volvo XC90 T8 AWD Inscription 5-Door SUV. 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 Volvo XC90 T8 AWD Inscription 5-Door SUV 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 61.44 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 April 26, 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	45
Maximum Thorax Rib Deflection	mm	44	19
Total Abdominal Force	N	2500	594
Pubic Symphysis Force	N	6000	940
Resultant Lower Spine Acceleration	Gs	82*	20

		Passenger ATD (SID-IIs)	
Measurement Description	**Units**	Threshold	**Result**
Head Injury Criteria (HIC_{36})	N/A	1000	91
Resultant Lower Spine Acceleration	Gs	82	40
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2677
Maximum Thoracic Rib Deflection	mm	38*	12
Maximum Abdomen Rib Deflection	mm	45*	12

*Proposed IARV

Supplemental restraint information is given below:

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

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

GENERAL COMMENTS

Left Front Sill Y recorded no valid data.
Left Rear Sill Y recorded no valid data.
Left Lower A-Post Y recorded no valid data.
Driver Seat Track Y recorded no valid data.
MDB CG X, Y, and Z recorded no valid data after 34ms.

SECTION 3
OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2016 Volvo XC90 T8 AWD Inscription 5-Door SUV NHTSA No. O20165905
Test Program: NCAP Side MDB Impact Test Test Date: 4/26/2016

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	O20165905
Model Year	2016
Make	Volvo
Model	XC90 T8 AWD Inscription
Body Style	5-Door SUV
VIN	YV4BC0PL8G1066023
Body Color	Luminous Sand Metallic
Odometer Reading (km/mi)	19km / 12mi
Engine Displacement (L)	2.0 L
Type/No. Cylinders	4
Engine Placement	Lateral
Transmission Type	Automatic
Transmission Speeds	8
Overdrive	Yes
Final Drive	AWD
Roof Rack	No
Sunroof/T-Top	Yes
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	Yes
Anti-Lock Brakes (ABS)	Yes

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

Does owner's manual provide instruction to turn off automatic door locks?	No

DATA FROM CERTIFICATION LABEL

Manufactured By	VOLVO CAR CORPORATION
Date of Manufacture	01/16
Vehicle Type	MPV

GVWR (kg)	3010
GAWR Front (kg)	1420
GAWR Rear (kg)	1628

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity (DSC)	2	3	2	7	
Capacity Weight (VCW) (kg)				550	(A)
DSC x 68.04 kg				476	(B)
Rated Cargo and Luggage Weight (RCLW) (kg)				74	(A-B)

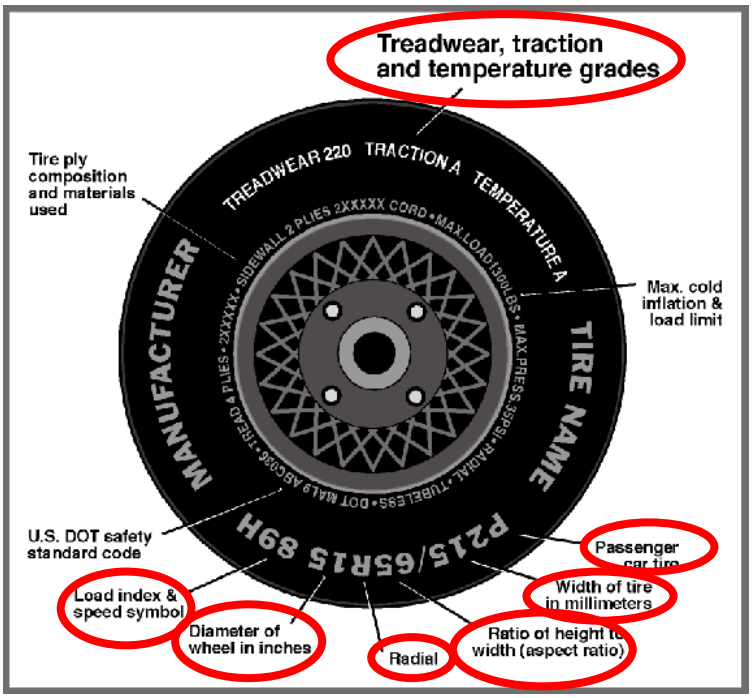
VEHICLE SEAT TYPE

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			w/ Lever	
Third Row Seat			X			w/ Lever	

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

Test Vehicle: 2016 Volvo XC90 T8 AWD Inscription 5-Door SUV NHTSA No. O20165905
Test Program: NCAP Side MDB Impact Test Test Date: 4/26/2016

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	275	275
Cold Pressure (kPa)	290	290
Recommended Tire Size	275/45R20	275/45R20
Tire Size on Vehicle	275/45R20	275/45R20
Tire Manufacturer	Pirelli	Pirelli
Tire Model	Scorpion Verde	Scorpion Verde
Treadwear	600	600
Traction	A	A
Temperature Grade	A	A
Tire Plies Sidewall	2 Rayon	2 Rayon
Tire Plies Body	2 Rayon, 2 Steel, 1 Polyamide	2 Rayon, 2 Steel, 1 Polyamide
Load Index/Speed Symbol	110V	110V
Tire Material	Rubber	Rubber
DOT Safety Code Left	937B P992 3415	937B P992 4915
DOT Safety Code Right	937B P992 5015	937B P992 4915

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

Test Vehicle: 2016 Volvo XC90 T8 AWD Inscription 5-Door SUV NHTSA No. O20165905
Test Program: NCAP Side MDB Impact Test Test Date: 4/26/2016

TEST PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	295	295	295	295
Tire Placard	kPa	290	290	290	290
Owner's Manual	kPa	290	290	290	290
As Tested	kPa	290	290	290	290

MDB TIRE SPECIFICATIONS

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

TEST VEHICLE AXLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	615.5	559.5		660.0	636.5		649.5	658.0	
Right	kg	596.0	541.5		612.5	598.5		600.5	607.5	
Ratio	%	52.4%	47.6%		50.7%	49.3%		49.7%	50.3%	
Totals	kg	1211.5	1101.0	2312.5	1272.5	1235.0	2507.5	1250.0	1265.5	2515.5

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	2312.5	(A)
Sum of Actual Weight of 2 P572 ATDs Used	kg	129	(B)
Rated Cargo/Luggage Weight (RCLW)	kg	74	(C)
Calculated Test Vehicle Target Weight (TVTW)	kg	2515.5	(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	836	828	Yes
Right Front	mm	841	833	Yes
Right Rear	mm	842	841	Yes
Left Rear	mm	833	841	Yes
Vehicle CG (Aft of Front Axle)	mm	1501	1470	
Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline)	mm	33	14	

*** 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

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

Test Vehicle: 2016 Volvo XC90 T8 AWD Inscription 5-Door SUV NHTSA No. O20165905
Test Program: NCAP Side MDB Impact Test Test Date: 4/26/2016

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

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

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

Test Vehicle: 2016 Volvo XC90 T8 AWD Inscription 5-Door SUV NHTSA No. O20165905
Test Program: NCAP Side MDB Impact Test Test Date: 4/26/2016

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	29.0	14.2	21.6
Front Passenger Seat	27.5	12.2	19.9
Front Center Seat			
Struck Side Rear Seat	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed
Rear Center Seat	Fixed	Fixed	Fixed

SEAT HEIGHT AND ANGLE

Seat	As-Tested SCRL Angle (Mid)	As-Tested SCRP Height (mm)	SCRP Height Position	SCRP Height (mm)		
				Rear-Most	Mid	Forward-Most
Driver Seat	21.6	0	Max	60	60	60
			Mid	30	30	30
			Min	0	0	0
Front Passenger Seat	19.9	0	Max	60	60	60
			Mid	30	30	30
			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	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed

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

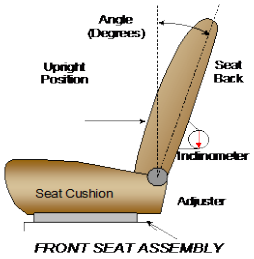
Test Vehicle: 2016 Volvo XC90 T8 AWD Inscription 5-Door SUV NHTSA No. O20165905
Test Program: NCAP Side MDB Impact Test Test Date: 4/26/2016

SEAT FORE/AFT POSITIONS

Seat	Total Fore/Aft Travel		Test Position from Forward-Most Position	
	mm	Detents (1st as 1)	mm	Detent (1st as 0)
Driver Seat	264		132	
Front Passenger Seat	264		132	
Front Center Seat				
Struck Side Rear Seat	120	13	120	12
Non-Struck Side Rear Seat	120	13	120	12
Rear Center Seat	120	13	120	12

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 (1st as 1)	Degrees	Detent (1st as 0)
Driver Seat	69.9		21.9	
Front Passenger Seat	73.6		21.9	
Front Center Seat				
Struck Side Rear Seat	10.3	7	16.6	0
Non-Struck Side Rear Seat	10.3	7	16.6	0
Rear Center Seat	10.3	7	16.6	0

Seat backs angle measured with level on seatback.

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

Test Vehicle: 2016 Volvo XC90 T8 AWD Inscription 5-Door SUV NHTSA No. O20165905
Test Program: NCAP Side MDB Impact Test Test Date: 4/26/2016

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	4	0 (Uppermost as 0)
Rear Seat	4	2 (Uppermost as 0)

HEAD RESTRAINT ADJUSTMENT

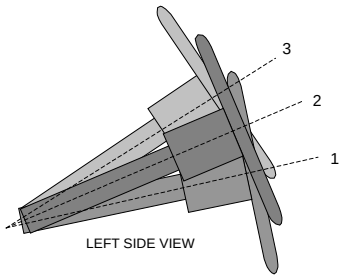
The driver's head restraint is adjusted to the highest and most full forward in-use position. The struck-side rear passenger's head restraint is adjusted to the lowest and most full forward in-use position.

	Total # of Positions	Placed in Position #
Driver Seat	Fixed	
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	70.0	301
Geometric Center, Position 2	67.0	275
Uppermost, Position 3	64.0	248
Telescoping Steering Wheel Travel		53
Test Position	67.0	275

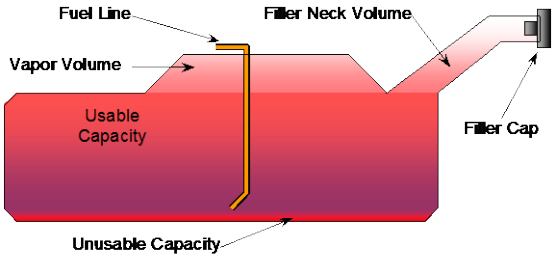


STEERING COLUMN ASSEMBLY

FUEL PUMP

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

The fuel pump operates only when the engine is running. The filler neck is located on the passenger's side.



VEHICLE FUEL TANK ASSEMBLY

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

Test Vehicle: 2016 Volvo XC90 T8 AWD Inscription 5-Door SUV NHTSA No. O20165905
Test Program: NCAP Side MDB Impact Test Test Date: 4/26/2016

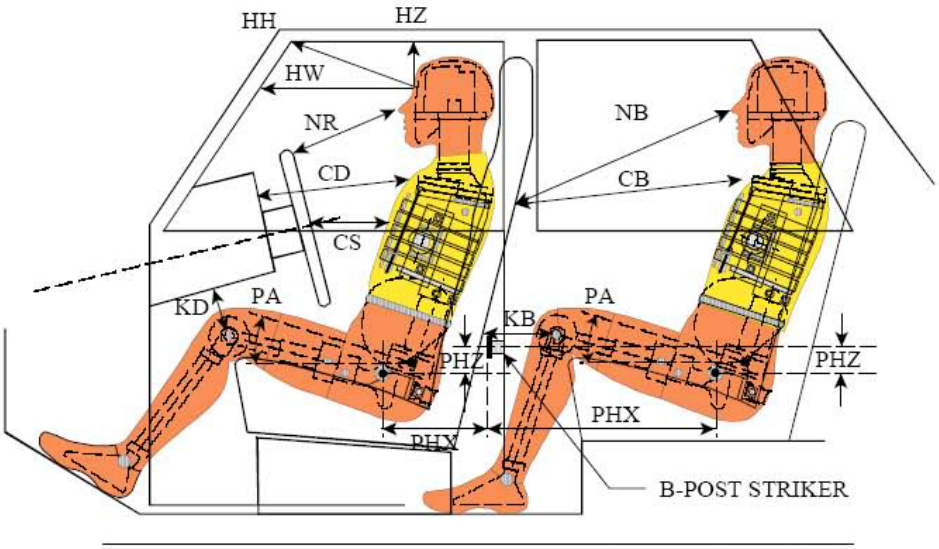
FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of Standard Tank (see Form No. 1)	50.0
Usable Capacity of Optional Tank (see Form No. 1)	
Usable Capacity of Standard Tank as Specified in Owner's Manual	50.0
Usable Capacity of Optional Tank as Specified in Owner's Manual	
93% of Usable Capacity	46.5
Actual Amount of Solvent Used	46.6
1/3 of Usable Capacity	16.7

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 Volvo XC90 T8 AWD Inscription 5-Door SUV NHTSA No. O20165905
Test Program: NCAP Side MDB Impact Test Test Date: 4/26/2016



LEFT SIDE VIEW

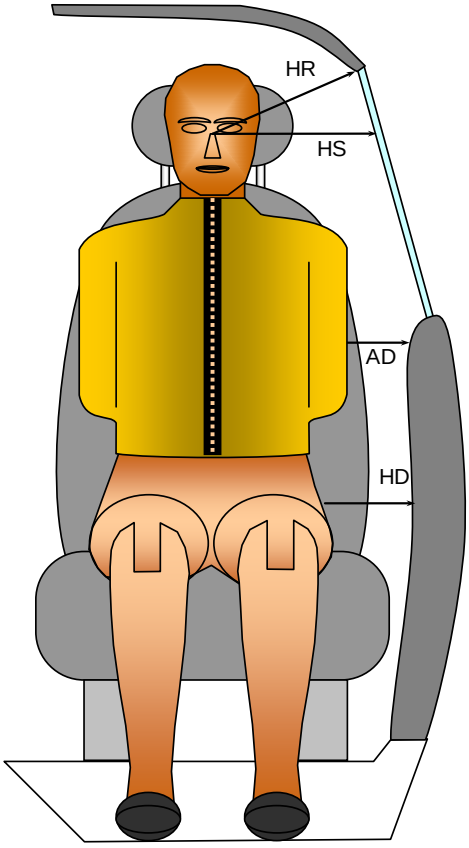
NOTE: 2-DOOR VEHICLE SHOWN. REAR DUMMY PHX & PHZ MEASUREMENTS FOR A 4-DOOR VEHICLE WOULD USE THE C-POST STRIKER AS A REFERENCE POINT

DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Pass. Code	Measurement Description	Driver		Passenger	
			Length (mm)	Angle (°)	Length (mm)	Angle (°)
HH		Head to Header	459	17.0		
HW		Head to Windshield	680	0		
HZ	HZ	Head to Roof Liner	175	90	273	90
NR	NB	Nose to Rim/Seat Back	492	14.8	495	18.0
CD	CB	Chest to Dashboard/Seat Back	635	4.4	468	4.7
CS		Chest to Steering Wheel	417	12.3		
KDL	KBL	Left Knee to Dash/Seat Back	198	40.9	290	22.9
KDR	KBR	Right Knee to Dash/Seat Back	204	35.1	288	22.0
PAX	PAX	Pelvic Tilt Angle X		22.4		20.4
PAY	PAY	Pelvic Tilt Angle Y		-0.4		0.2
PHX	PHX	Hip Point to Striker (X-Axis)	144		188	
PHZ	PHZ	Hip Point to Striker (Z-Axis)	156		114	

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2016 Volvo XC90 T8 AWD Inscription 5-Door SUV NHTSA No. O20165905
Test Program: NCAP Side MDB Impact Test Test Date: 4/26/2016



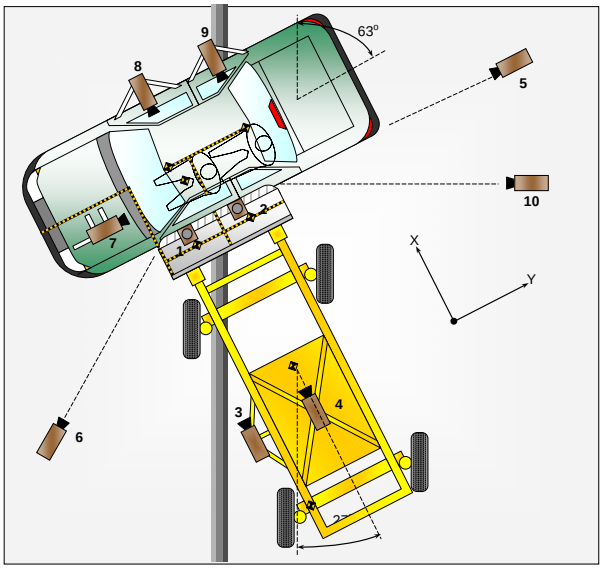
FRONT VIEW OF DUMMY

DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver	Passenger
HR	Head to Side Header	mm	205	266
HS	Head to Side Window	mm	337	346
AD	Arm to Door	mm	102	128
HD	Hip Point to Door	mm	182	145

DATA SHEET NO. 5
CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2016 Volvo XC90 T8 AWD Inscription 5-Door SUV NHTSA No. O20165905
Test Program: NCAP Side MDB Impact Test Test Date: 4/26/2016



CAMERA LOCATIONS AND DATA

No.	Camera View	Coordinates (mm)			Lens Length (mm)	Operating Frame Rate (fps)
		X*	Y*	Z*		
1	Overhead Overall	120	-100	-4330	14	1000
2	Overhead Close-Up	0	0	-4330	20	1000
3	Left Impact Point (MDB)				50	1000
4	Side Overall (MDB)				16	1000
5	Rear	-60	5950	-1310	24	1000
6	Left Front	2000	-5890	-1310	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

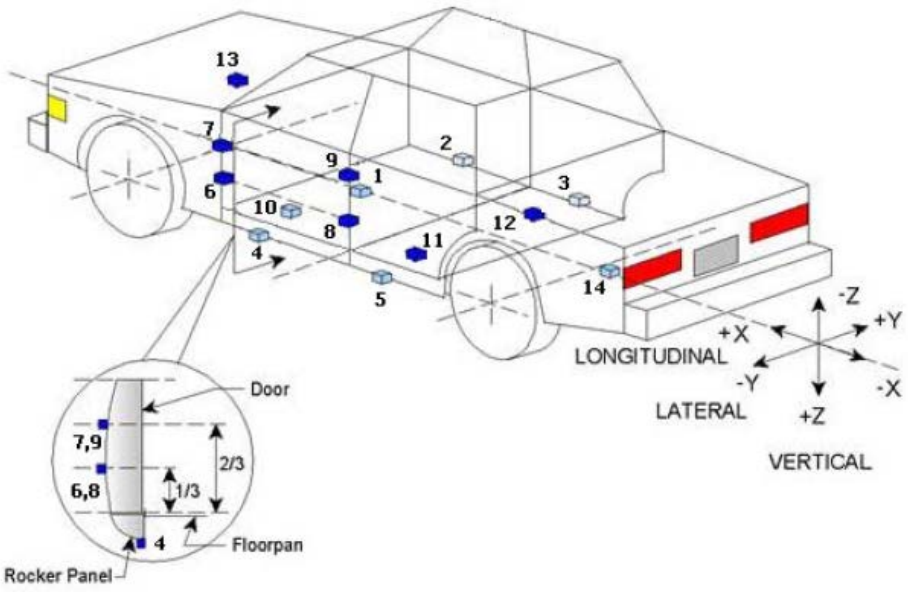
Reference: Impact Point projected to Ground; +X = To Front of MDB, + Y = To Right of MDB, +Z = Down
* All measurements accurate to ± 6 mm

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 Volvo XC90 T8 AWD Inscription 5-Door SUV NHTSA No. O20165905
Test Program: NCAP Side MDB Impact Test Test Date: 4/26/2016



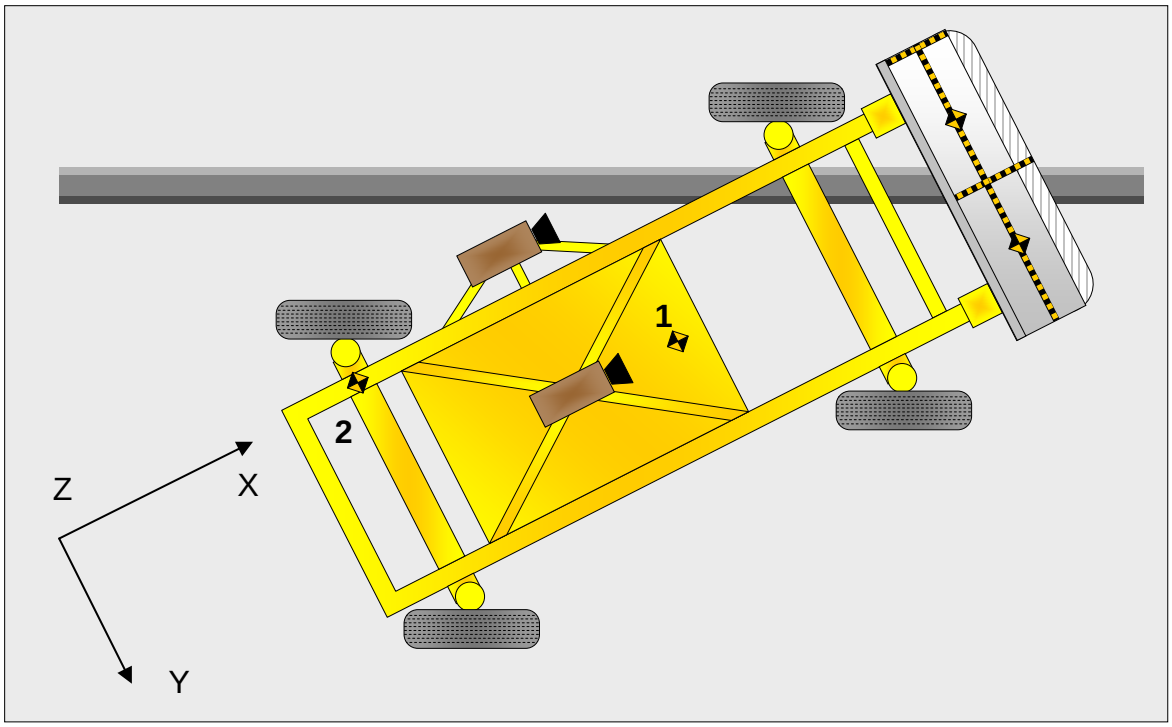
TEST VEHICLE ACCELEROMETER LOCATIONS

Accelerometer Location				
No.	ID	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2576	183	-275
2	Right Sill at Front Seat	2472	760	-297
3	Right Sill at Rear Seat	1520	760	-305
4	Left Sill at Front Door	2935	-760	-296
5	Left Sill at Rear Door	1892	-760	-307
6	Left Lower A-Post	3402	855	-648
7	Left Middle A-Post	3405	855	-945
8	Left Lower B-Post			
9	Left Middle B-Post			
10	Front Seat Track	2392	-390	-394
11	Rear Seat Structure	1960	-403	-560
12	Rt. Rear Occ. Compartment	2024	423	-279
13	Engine Block	4218	0	-929
14	Rear Above Axle	695	0	-630

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 Volvo XC90 T8 AWD Inscription 5-Door SUV NHTSA No. O20165905
Test Program: NCAP Side MDB Impact Test Test Date: 4/26/2016



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 Volvo XC90 T8 AWD Inscription 5-Door SUV NHTSA No. O20165905
Test Program: NCAP Side MDB Impact Test Test Date: 4/26/2016

TEST DUMMY INFORMATION AND CONTACT POINTS

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

POST-TEST DOOR PERFORMANCE

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

POST-TEST SEAT PERFORMANCE

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

POST-TEST STRUCTURAL OBSERVATIONS

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

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

Test Vehicle: 2016 Volvo XC90 T8 AWD Inscription 5-Door SUV NHTSA No. O20165905
Test Program: NCAP Side MDB Impact Test Test Date: 4/26/2016

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

IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vehicle Wheel Base	mm		2984
Vertical Impact Reference Line (Aft of Front Axle) (Intended Impact Point)	mm		508
Actual Impact Point (Aft of Front Axle)	mm		515
Horizontal Offset (+forward / -rearward)	mm	+/- 50 of intended impact point	-7
Vertical Offset (+down / -up)	mm	+/- 20 of intended impact point	-5

DATA SHEET NO. 9
MDB SUMMARY OF RESULTS

Test Vehicle: 2016 Volvo XC90 T8 AWD Inscription 5-Door SUV NHTSA No. O20165905
Test Program: NCAP Side MDB Impact Test Test Date: 4/26/2016

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

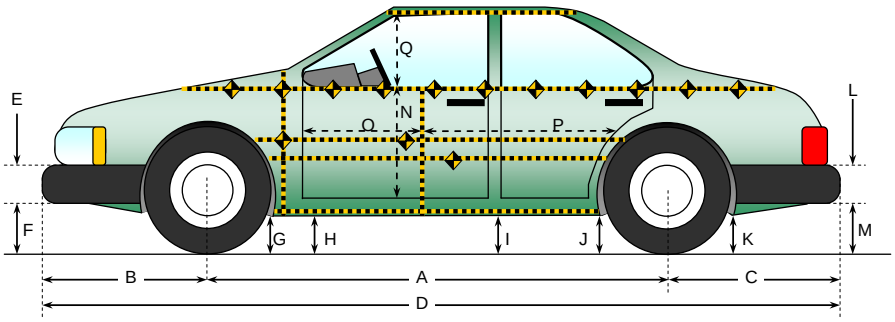
	Units	Front Axle	Rear Axle	Total
Left	kg	406.0	283.3	
Right	kg	357.9	316.4	
Ratio	%	56.0	44.0	
Totals	kg	763.9	599.7	1363.5

SPEED AND ANGLE AT IMPACT DATA

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	61.44
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	61.56
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	89.6
MDB Forward Line of Motion to Target Vehicle CL	degrees	62.5 to 63.5	63.0
MDB Crabbed Angle to MDB Forward Line of Motion	degrees	26 to 28	27.4

DATA SHEET NO. 10
TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2016 Volvo XC90 T8 AWD Inscription 5-Door SUV NHTSA No. O20165905
Test Program: NCAP Side MDB Impact Test Test Date: 4/26/2016



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

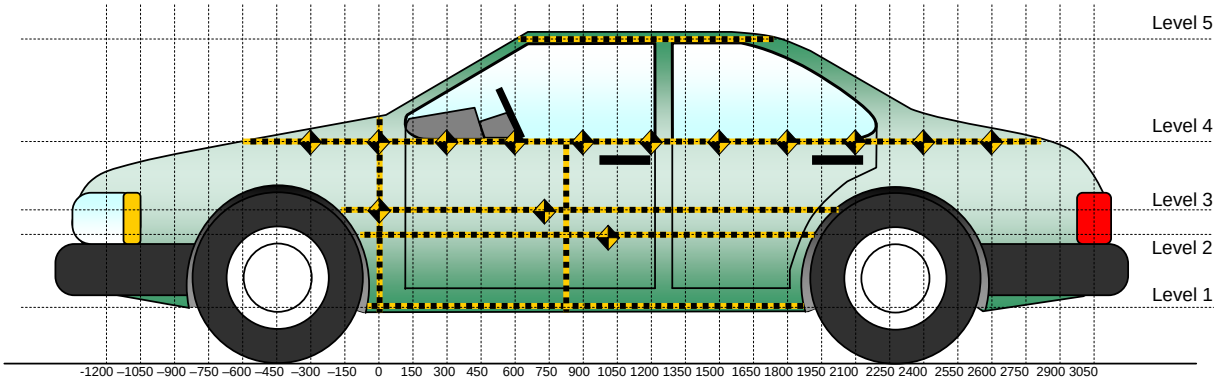
LEFT SIDE VIEW

VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2984	2981	3
B	Front Axle to FSOV	908	903	5
C	Rear Axle to RSOV	1048	1075	-27
D	Total Length at Centerline	4940	4959	-19
E	Front Bumper Thickness	127	127	0
F	Front Bumper Bottom to Ground	290	293	-3
G	Sill Height at Front Wheel Well	281	266	15
H	Sill Height at Front Door Leading Edge	252	263	-11
I	Sill Height at B Pillar	309	282	27
J1	Sill Height at Rear Wheel Well	302	279	23
J2	Pinch Weld Height at Rear Wheel Well	232	235	-3
K	Sill Height Aft of Rear Wheel Well	297	293	4
L	Rear Bumper Thickness	100	100	0
M	Rear Bumper Bottom to Ground	387	403	-16
N	Sill Height to Window Bottom Sill	854	774	80
O	Front Door Leading Edge to Impact CL	751	741	10
P	Rear Door Trailing Edge to Impact CL	1308	1231	77
Q	Front Window Opening	474	465	9
R	Right Side Length	4026	4033	-7
S	Left Side Length	4026	4023	3
T	Vehicle Width at B Post	1921	1798	123

DATA SHEET NO. 11
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2016 Volvo XC90 T8 AWD Inscription 5-Door SUV NHTSA No. O20165905
Test Program: NCAP Side MDB Impact Test Test Date: 4/26/2016



All Measurements Shown in mm

LEFT SIDE VIEW

MAXIMUM EXTERIOR CRUSH MEAUREMENTS

Level	Measurement Description	Height Above Ground	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	325	13	1500
2	Occupant H-Point	726	185	1650
3	Mid Door	784	183	1800
4	Window Sill	1136	22	1350
5	Window Top	1700	1	2100

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

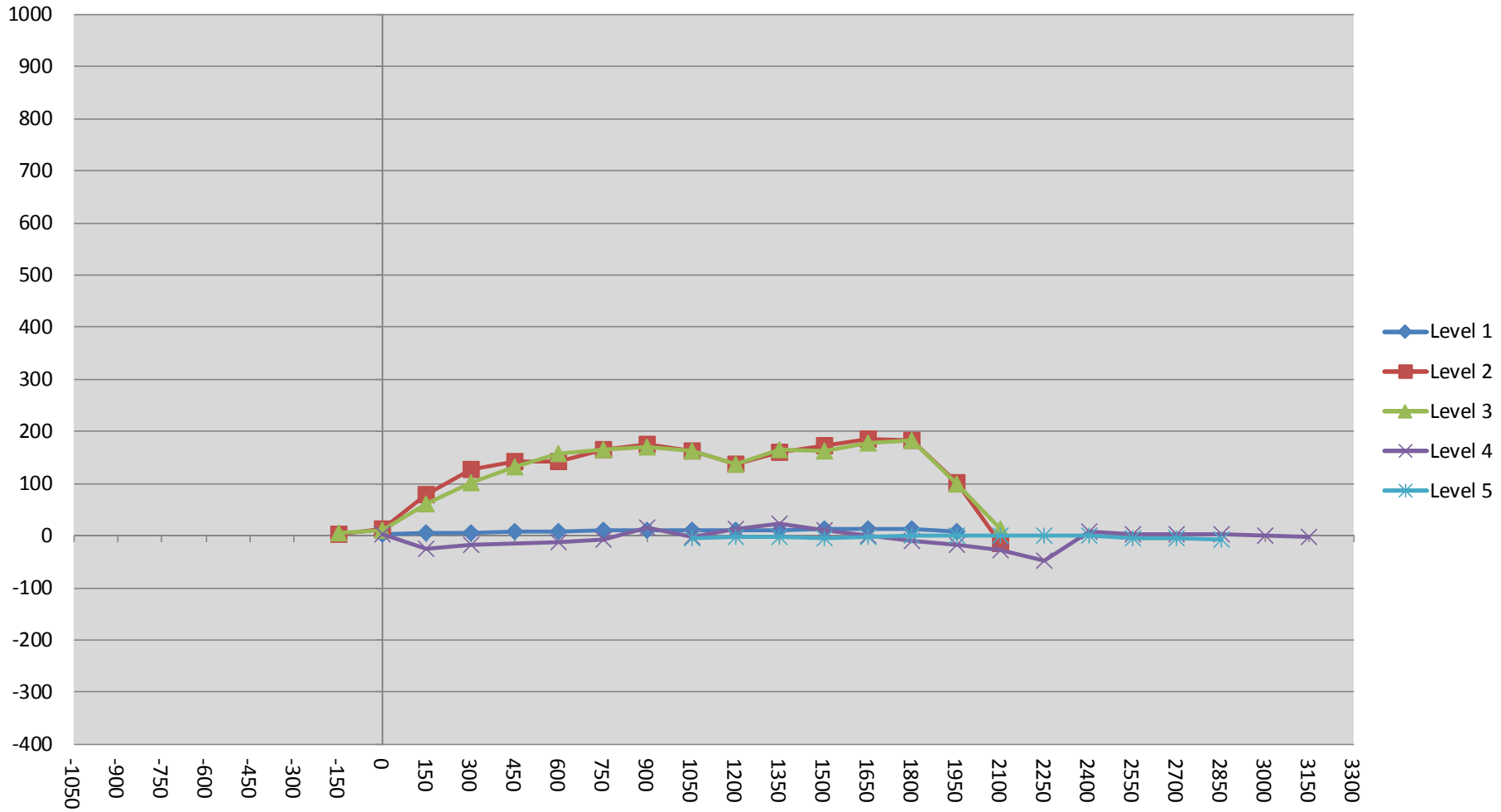
Test Vehicle: 2016 Volvo XC90 T8 AWD Inscription 5-Door SUV NHTSA No. O20165905
Test Program: NCAP Side MDB Impact Test Test Date: 4/26/2016

	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															
-150		132	143				135	148				3	5		
0	208	149	150	284		211	163	160	287		3	14	10	3	
150	210	158	155	269		215	237	217	245		5	79	62	-24	
300	214	156	153	255		219	282	255	237		5	126	102	-18	
450	213	154	152			220	297	284			7	143	132		
600	213	153	150	232		221	296	308	220		8	143	158	-12	
750	211	152	150	220		222	316	316	213		11	164	166	-7	
900	209	153	150	213		220	328	320	228		11	175	170	15	
1050	209	153	150	205	500	220	316	313	204	496	11	163	163	-1	-4
1200	206	155	153	200	481	217	292	290	212	478	11	137	137	12	-3
1350	206	156	154	196	472	217	317	318	218	469	11	161	164	22	-3
1500	204	157	155	192	468	217	330	318	203	464	13	173	163	11	-4
1650	203	158	158	190	463	216	343	337	190	462	13	185	179	0	-1
1800	204	157	157	191	465	216	339	340	181	465	12	182	183	-10	0
1950	226	151	150	192	464	233	252	250	174	464	7	101	100	-18	0
2100		137	144	198	467		123	157	171	468		-14	13	-27	1
2250				201	472				153	473				-48	1
2400				205	475				213	475				8	0
2550				212	490				216	486				4	-4
2700				219	506				222	500				3	-6
2850				227	532				229	524				2	-8
3000				239					239					0	
3150				252					250					-2	
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.

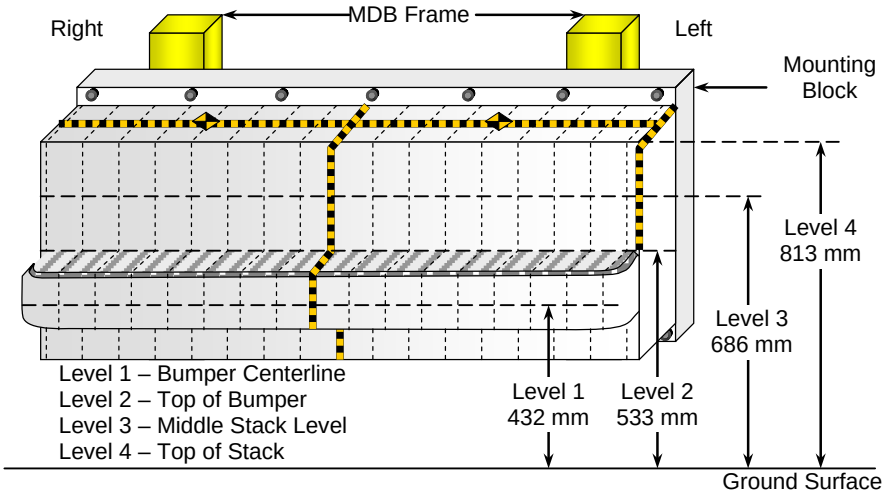
DATA SHEET NO. 11 (CONTINUED)
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2016 Volvo XC90 T8 AWD Inscription 5-Door SUV NHTSA No. O20165905
Test Program: NCAP Side MDB Impact Test Test Date: 4/26/2016



DATA SHEET NO. 12
MDB EXTERIOR STATIC CRUSH MEASUREMENTS

Test Vehicle: 2016 Volvo XC90 T8 AWD Inscription 5-Door SUV NHTSA No. O20165905
Test Program: NCAP Side MDB Impact Test Test Date: 4/26/2016



FRONT VIEW

MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE

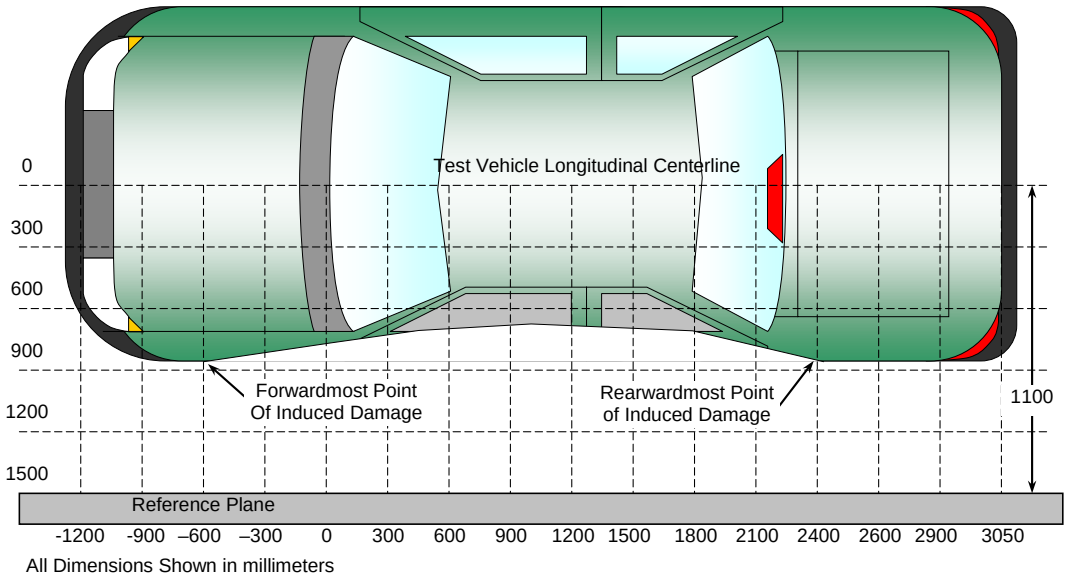
Vertical Location			From Centerline		Maximum Crush
Row	Description	Height	Distance	Direction	
A	Center of Bumper	432	700	Left	249
B	Top of Bumper	533	800	Left	197
C	Mid-Level	686	800	Left	175
D	Top of Stack	813	800	Left	231

DEFORMABLE BARRIER STATIC CRUSH

Stack	Distance Right of Center (mm)								C_L	Distance Left of Center (mm)							
Level	800	700	600	500	400	300	200	100	0	100	200	300	400	500	600	700	800
4	120	119	121	129	135	139	155	140	119	112	112	119	136	141	168	197	231
3	111	98	95	100	109	129	135	115	93	88	96	93	91	97	109	131	175
2	150	155	141	135	135	144	146	134	138	150	159	168	166	169	171	174	197
1	242	235	239	238	238	241	239	240	238	240	241	241	242	241	243	249	249

DATA SHEET NO. 13
VEHICLE AND MDB DAMAGE PROFILE DISTANCES

Test Vehicle: 2016 Volvo XC90 T8 AWD Inscription 5-Door SUV NHTSA No. O20165905
Test Program: NCAP Side MDB Impact Test Test Date: 4/26/2016



TOP VIEW

VEHICLE DAMAGE PROFILE DISTANCES

DPD	Distance from Impact Point (mm)	Level	Post-Test (mm)	Pre-Test (mm)	Max. Static Crush (mm)
1	2075	3	169	153	16
2	1665	3	338	158	180
3	1255	3	299	153	146
4	845	3	316	150	166
5	435	3	283	152	131
6	25	3	163	151	12

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	718	476	242
2	480 mm right of center	1	704	465	239
3	160 mm right of center	1	701	461	239
4	160 mm left of center	1	701	461	240
5	480 mm left of center	1	709	465	244
6	800 mm left of center	1	725	476	249

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

Test Vehicle: 2016 Volvo XC90 T8 AWD Inscription 5-Door SUV NHTSA No. O20165905
Test Program: NCAP Side MDB Impact Test Test Date: 4/26/2016

Test Time: 2:40 pm Temperature: 21.4 °C

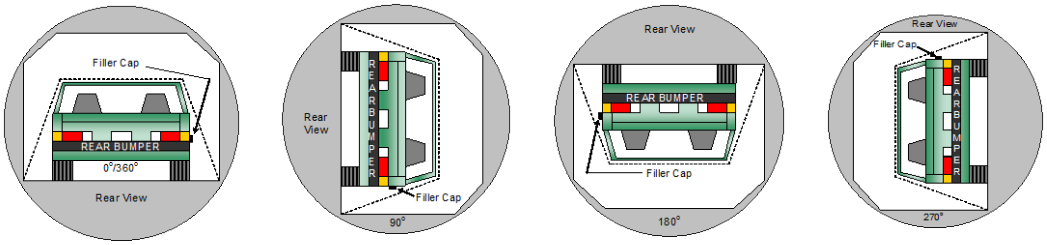
A. From impact until vehicle motion ceases: 0.0 oz.
(Maximum Allowable = 1 ounce)

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



0°/360° 90° 180° 270°

ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	112	300	412
90° to 180°	108	300	408
180° to 270°	108	300	408
270° to 360°	110	300	410

FMVSS 301 ROLLOVER SPILLAGE TABLE (units in ounces)

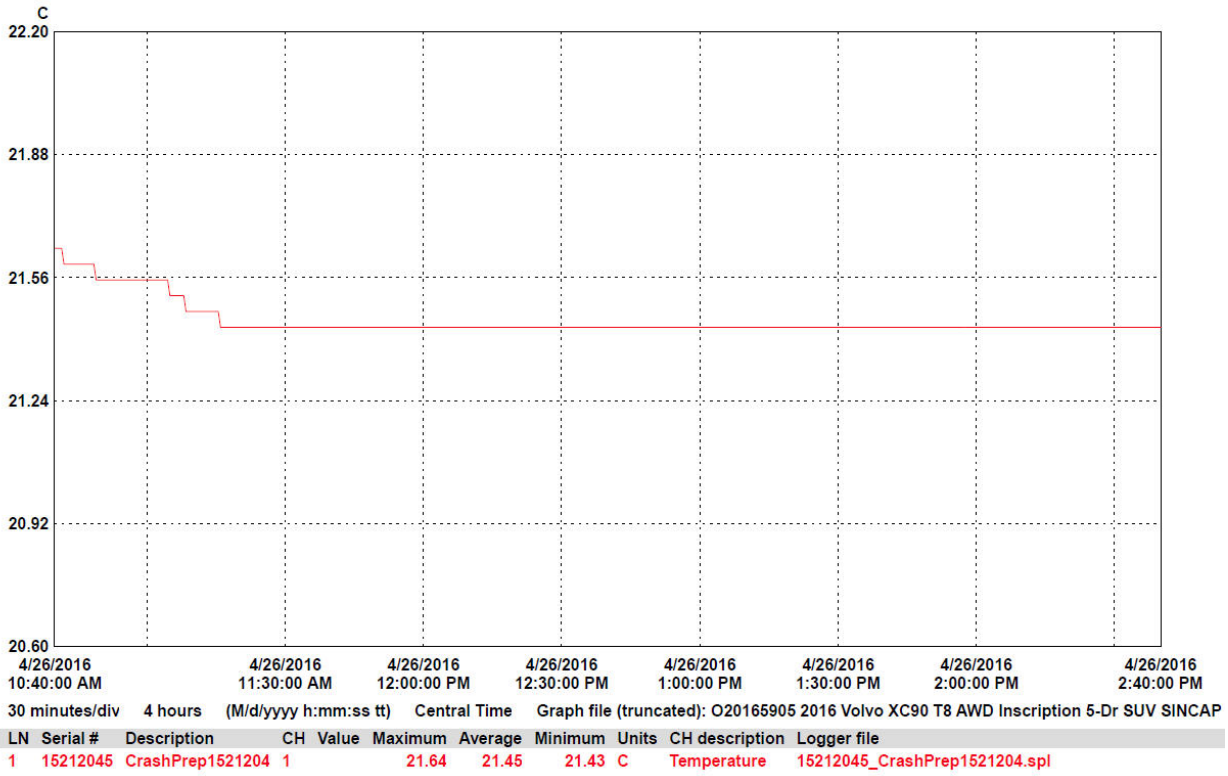
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0° to 90°	0.0	0.0	0.0	
90° to 180°	0.0	0.0	0.0	
180° to 270°	0.0	0.0	0.0	
270° to 360°	0.0	0.0	0.0	

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 Volvo XC90 T8 AWD Inscription 5-Door SUV NHTSA No. O20165905
Test Program: NCAP Side MDB Impact Test Test Date: 4/26/2016



LN	Serial #	Description	CH	Value	Maximum	Average	Minimum	Units	CH description	Logger file
1	15212045	CrashPrep1521204	1		21.64	21.45	21.43	C	Temperature	15212045_CrashPrep1521204.spl

APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

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

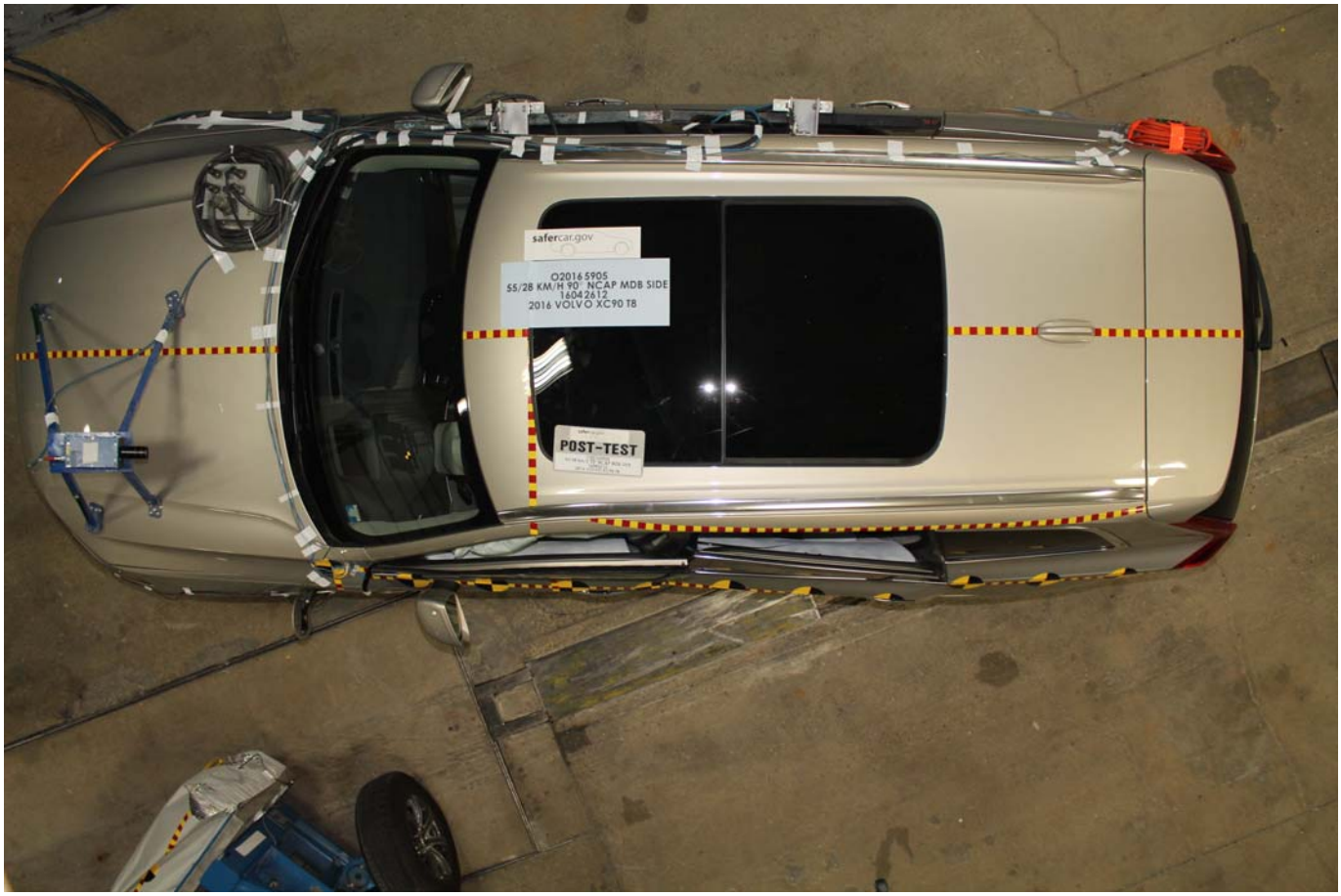


Photo No. 016 - Post-Test Overhead View of Test Area

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

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

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. 037 - Pre-Test View of Disengaged Parking Brake

Photo No. 038 - Pre-Test View of Parking Brake

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

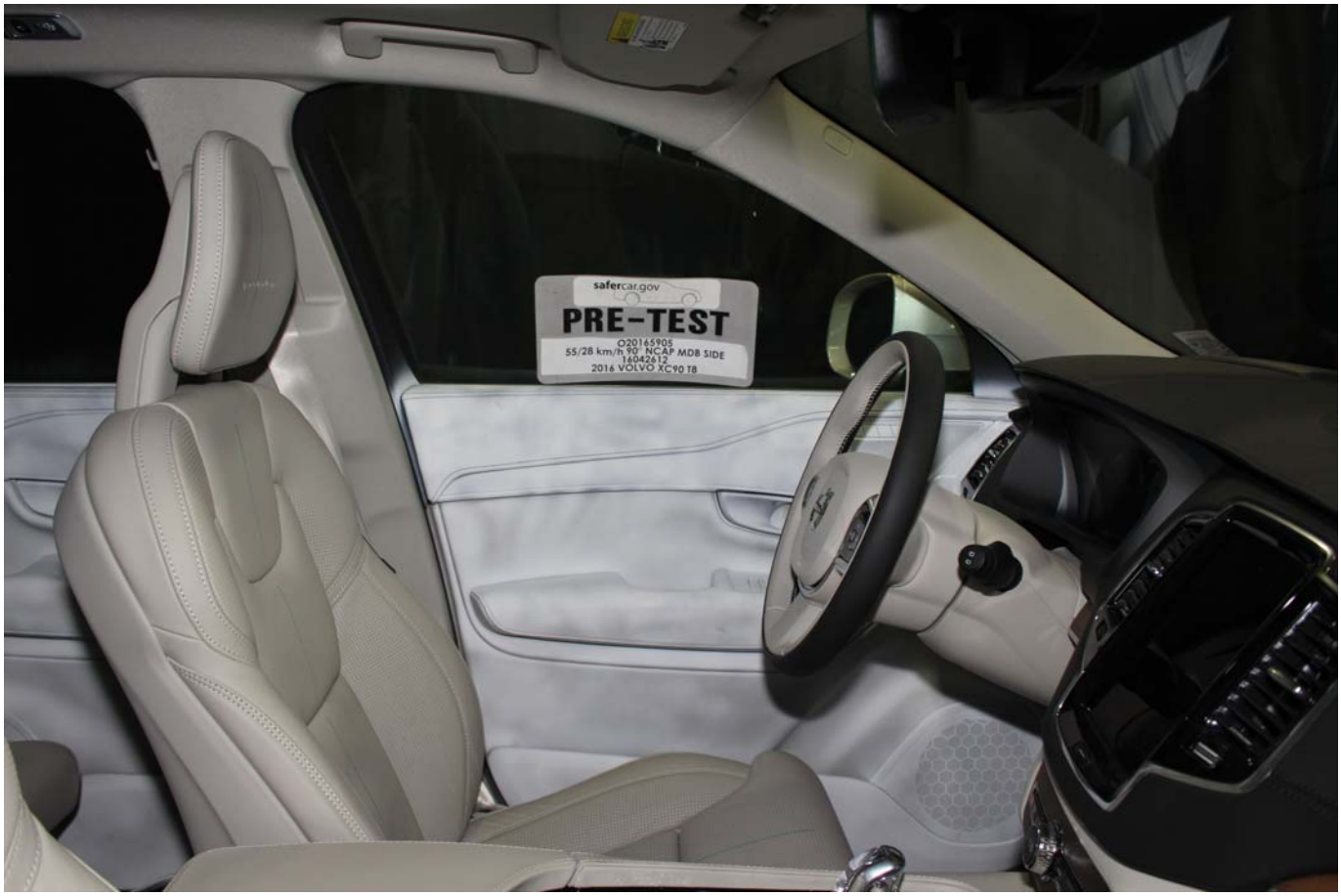


Photo No. 046 - Pre-Test Driver Inner Door Panel View

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

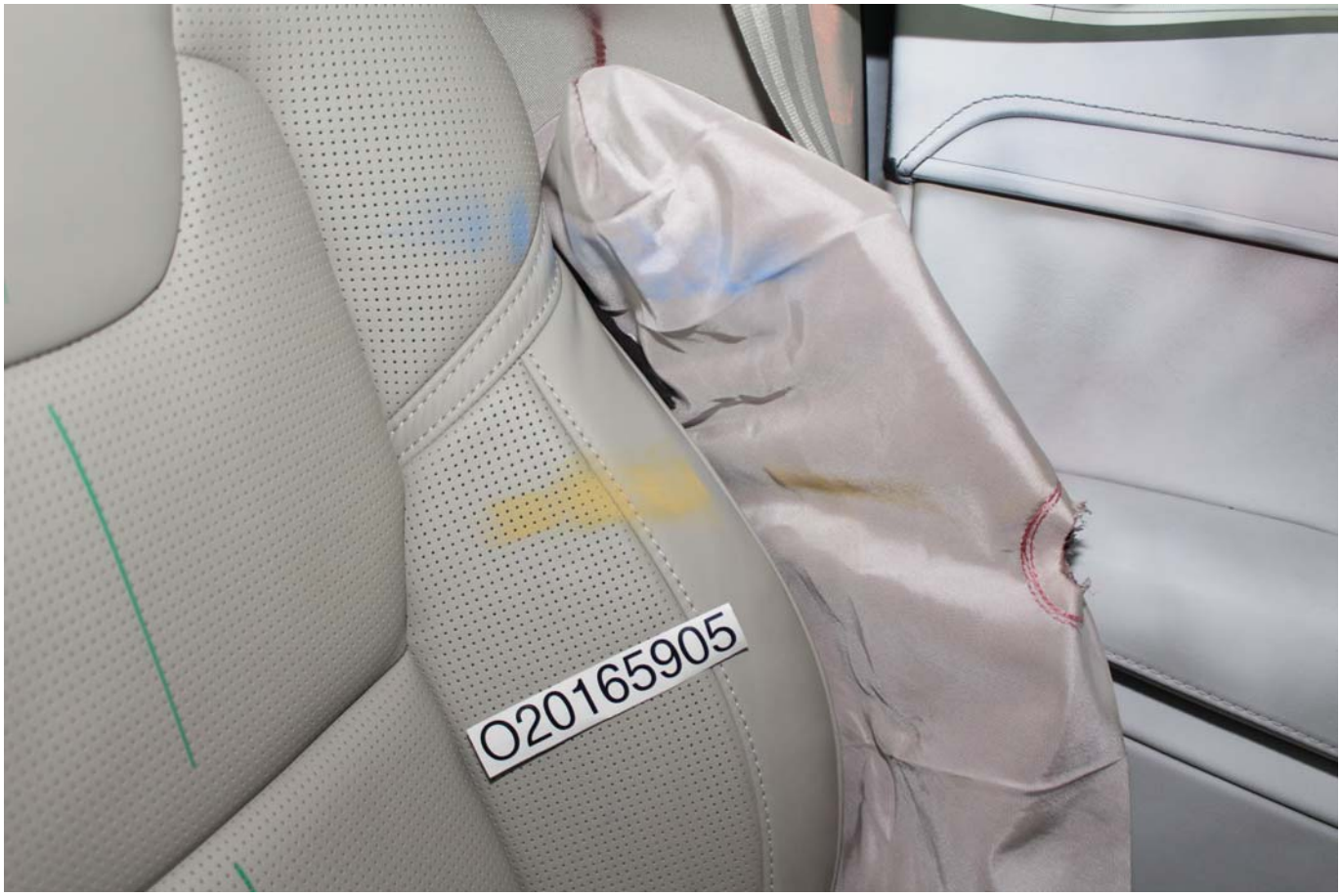


Photo No. 050 - Post-Test Driver Dummy Close-up Torso Contact with Vehicle Interior View

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

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

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

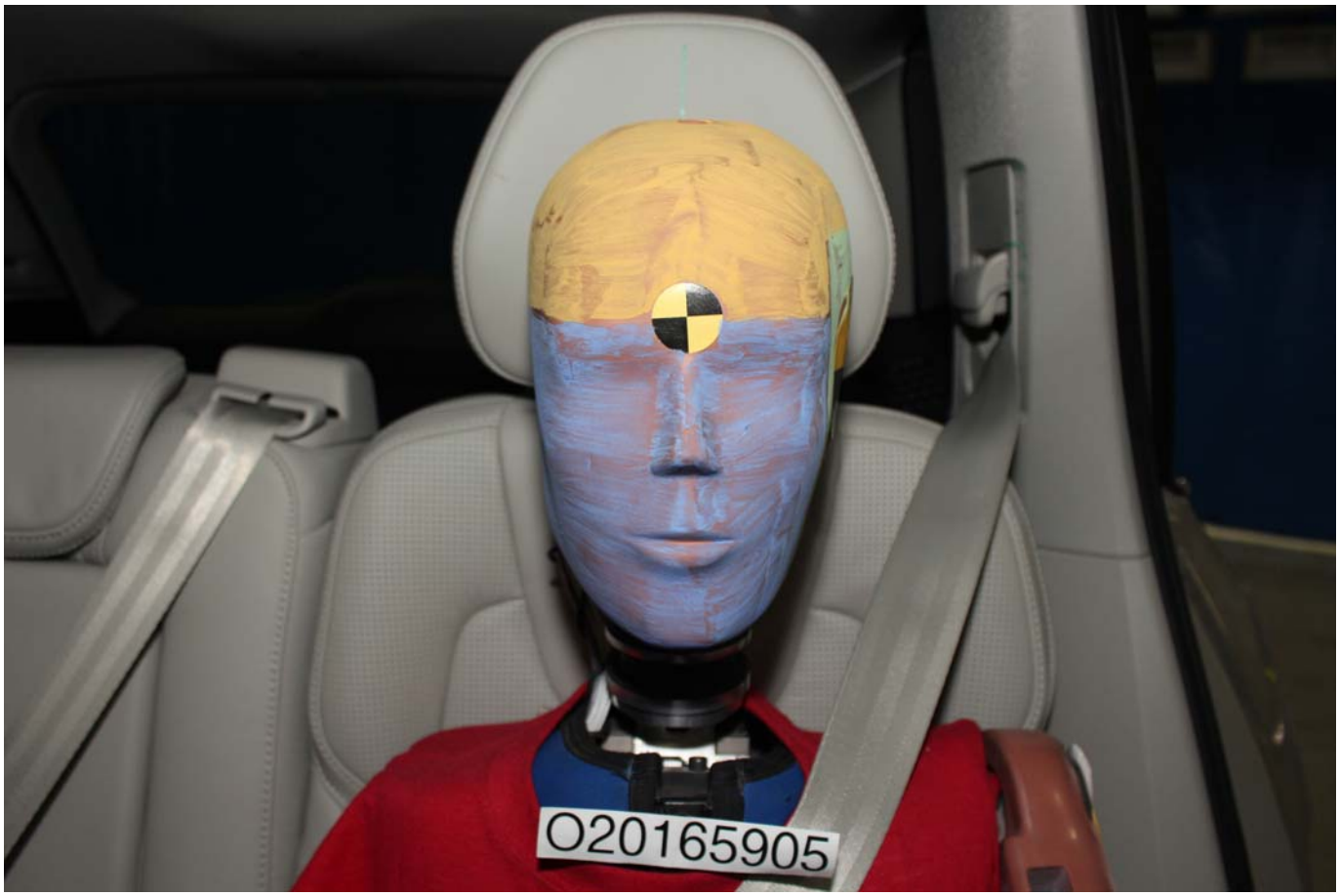


Photo No. 059 - Pre-Test Frontal View of Rear Passenger Dummy Head and Shoulders in Relation to Head

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

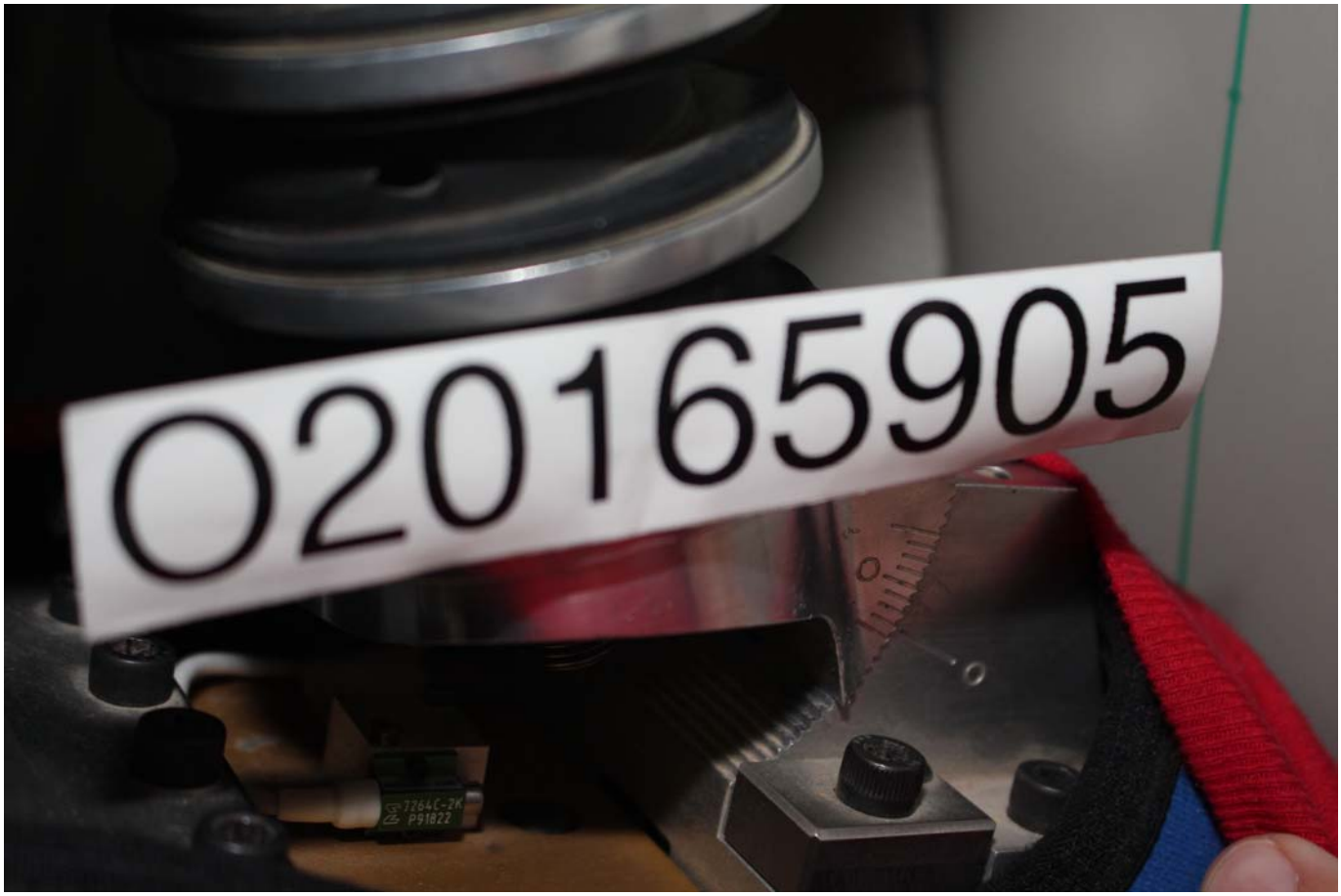


Photo No. 062 - Pre-Test View of Rear Passenger Dummy's Neck Showing Position of Adjustable Neck

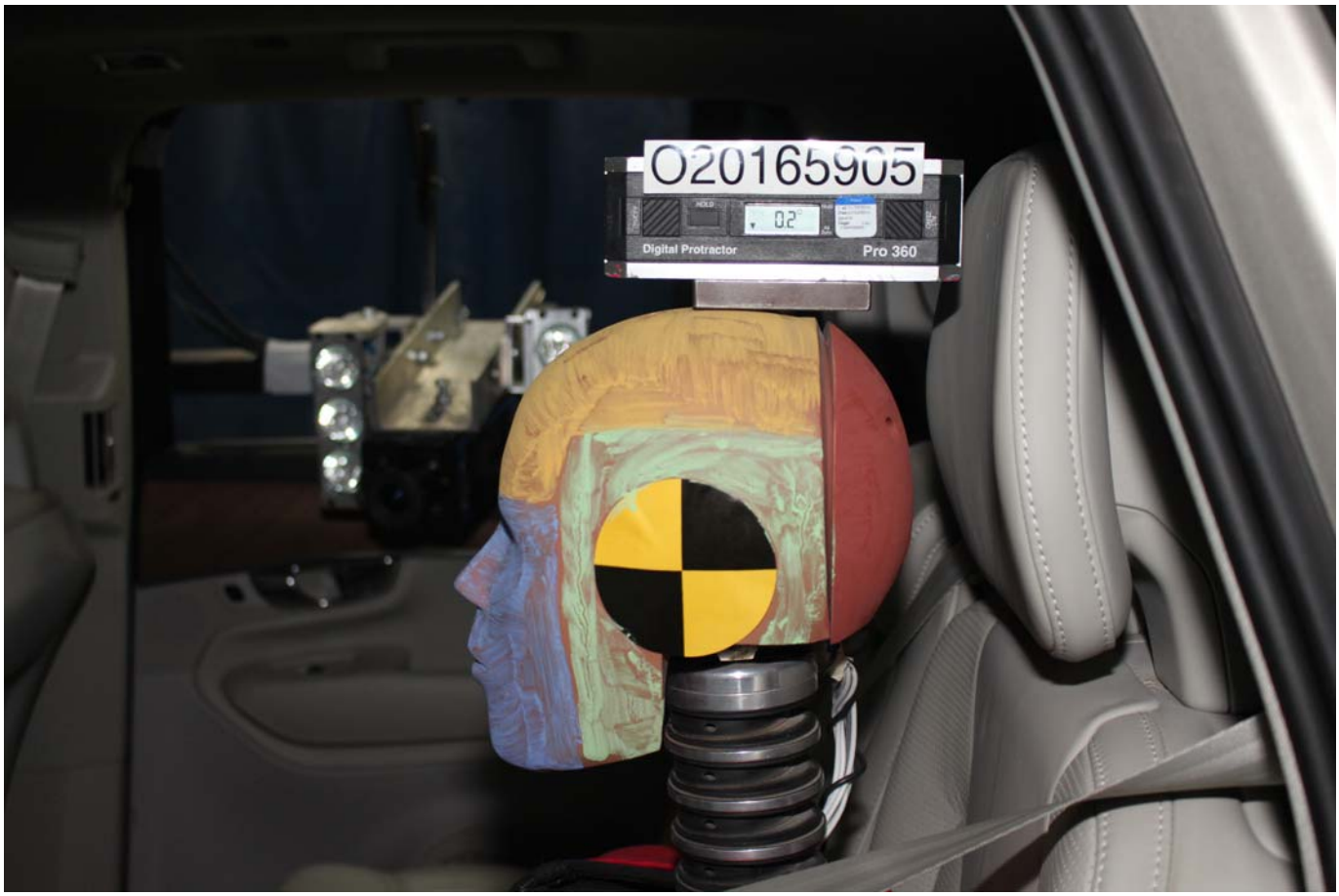


Photo No. 063 - Pre-Test View of Rear Passenger Dummy's Head Showing Dummy's Head is Level

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

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

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

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

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

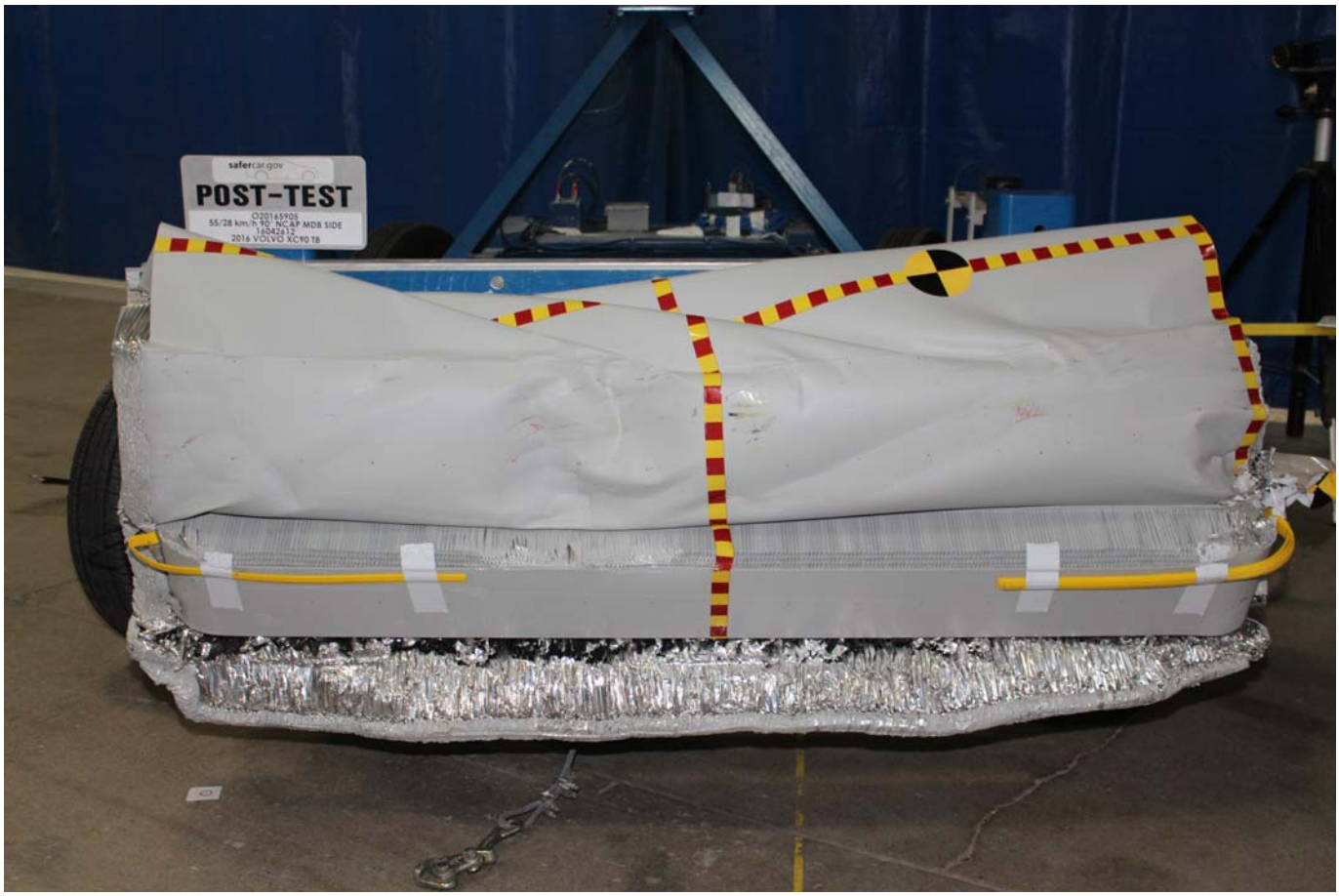


Photo No. 085 - Post-Test Front View of MDB Impactor Face

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

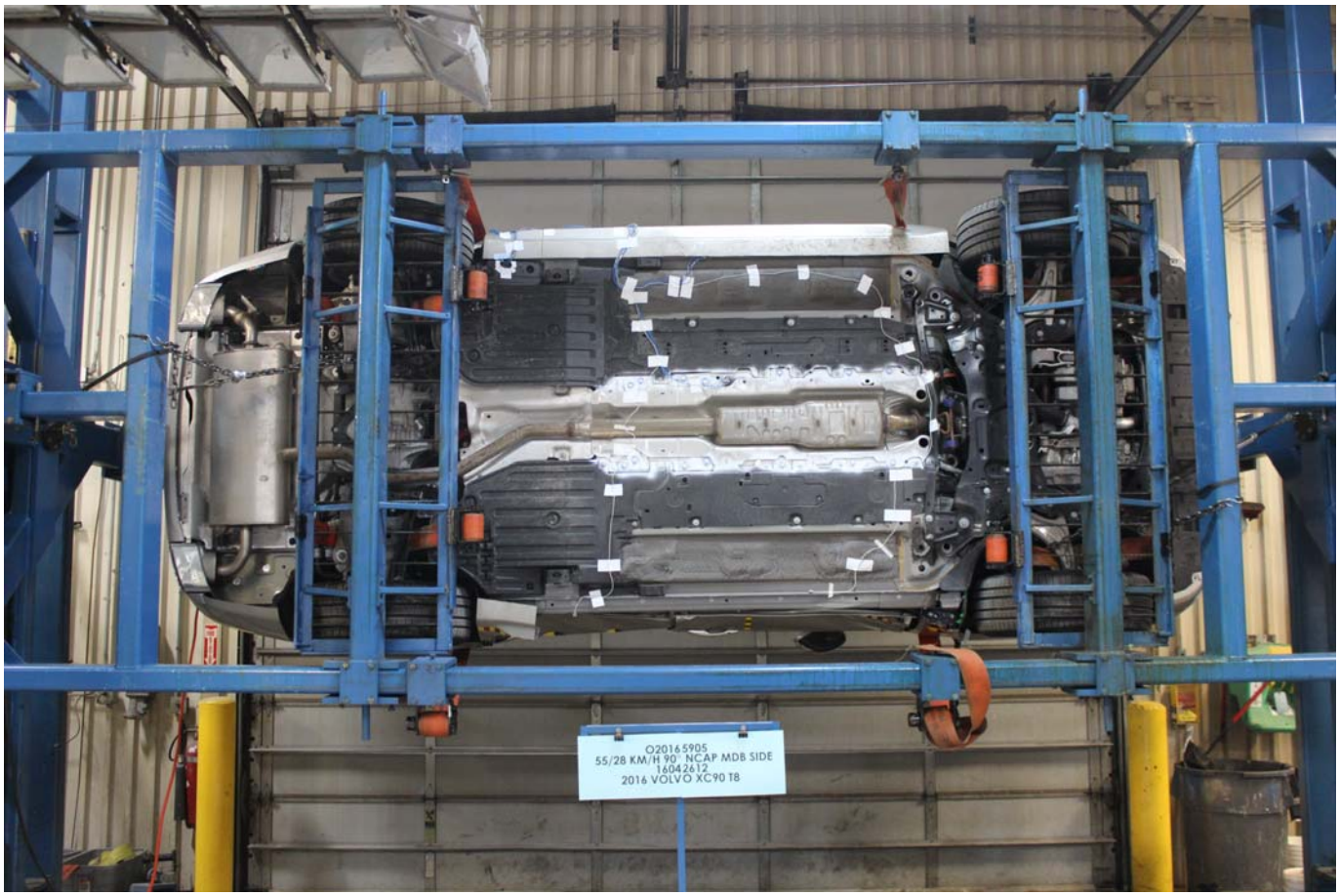
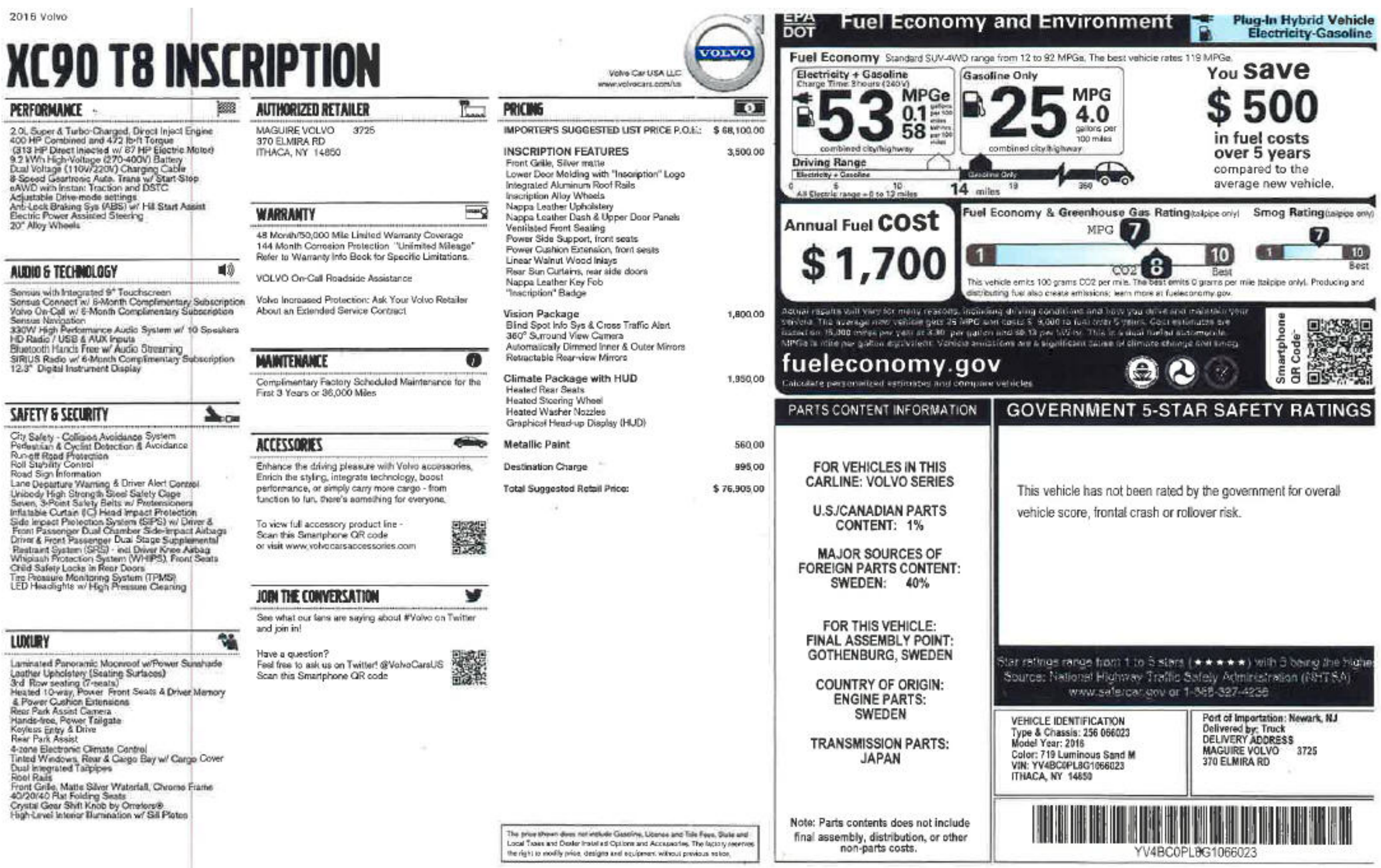


Photo No. 099 - FMVSS No. 301 Static Rollover 270 Degrees

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

Photo No. 101 - Impact Event



2016 Volvo

XC90 T8 INSCRIPTION

PERFORMANCE

2.0L Super & Turbo-Charged, Direct Inject Engine
400 HP Combined and 472 lb-ft Torque
(313 HP Direct Injected w/ 87 HP Electric Motor)
9.2 kWh High-Voltage (270-400V) Battery
Dual Voltage (110V/220V) Charging Cable
8-Speed Geartronic Auto. Trans w/ Start-Stop
eAWD with Instant Traction and DSTC
Adjustable Drive-mode settings
Anti-Lock Braking Sys (ABS) w/ Hill Start Assist
Electric Power Assisted Steering
20" Alloy Wheels

AUDIO & TECHNOLOGY

Sensus with Integrated 9" Touchscreen
Sensus Connect w/ 6-Month Complimentary Subscription
Volvo On-Call w/ 6-Month Complimentary Subscription
Sensus Navigation
330W High Performance Audio System w/ 10 Speakers
HD Radio / USB & AUX Inputs
Bluetooth Hands Free w/ Audio Streaming
SIRIUS Radio w/ 6-Month Complimentary Subscription
12.3" Digital Instrument Display

SAFETY & SECURITY

City Safety - Collision Avoidance System
Pedestrian & Cyclist Detection & Avoidance
Run-off Road Protection
Roll Stability Control
Road Sign Information
Lane Departure Warning & Driver Alert Control
Unibody High Strength Steel Safety Cage
Seven, 3-Point Safety Belts w/ Pretensioners
Inflatable Curtain (IC) Head Impact Protection
Side Impact Protection System (SIPS) w/ Driver & Front Passenger Dual Chamber Side-impact Airbags
Driver & Front Passenger Dual Stage Supplemental Restraint System (SRS) - incl Driver Knee Airbag
Whiplash Protection System (WHIPS), Front Seats
Child Safety Locks in Rear Doors
Tire Pressure Monitoring System (TPMS)
LED Headlights w/ High Pressure Cleaning

LUXURY

Laminated Panoramic Moonroof w/Power Sunshade
Leather Upholstery (Seating Surfaces)
3rd Row seating (7-seats)
Heated 10-way, Power Front Seats & Driver Memory & Power Cushion Extensions
Rear Park Assist Camera
Hands-free, Power Tailgate
Keyless Entry & Drive
Rear Park Assist
4-zone Electronic Climate Control
Tinted Windows, Rear & Cargo Bay w/ Cargo Cover
Dual Integrated Tailpipes
Roof Rails
Front Grille, Matte Silver Waterfall, Chrome Frame
40/20/40 Flat Folding Seats
Crystal Gear Shift Knob by Orrefors®
High-Level Interior Illumination w/ Sill Plates

AUTHORIZED RETAILER

MAGUIRE VOLVO 3725
370 ELMIRA RD
ITHACA, NY 14850

WARRANTY

48 Month/50,000 Mile Limited Warranty Coverage
144 Month Corrosion Protection "Unlimited Mileage"
Refer to Warranty Info Book for Specific Limitations.

VOLVO On-Call Roadside Assistance

Volvo Increased Protection: Ask Your Volvo Retailer About an Extended Service Contract

MAINTENANCE

Complimentary Factory Scheduled Maintenance for the First 3 Years or 36,000 Miles

ACCESSORIES

Enhance the driving pleasure with Volvo accessories. Enrich the styling, integrate technology, boost performance, or simply carry more cargo - from function to fun, there's something for everyone.

To view full accessory product line - Scan this Smartphone QR code or visit www.volvocarsaccessories.com

JOIN THE CONVERSATION

See what our fans are saying about #Volvo on Twitter and join in!

Have a question? Feel free to ask us on Twitter! @VolvoCarsUS
Scan this Smartphone QR code

Volvo Car USA LLC
www.volvocars.com/us

PRICING

IMPORTER'S SUGGESTED LIST PRICE P.O.E.:	$ 68,100.00
INSCRIPTION FEATURES Front Grille, Silver matte Lower Door Molding with "Inscription" Logo Integrated Aluminum Roof Rails Inscription Alloy Wheels Nappa Leather Upholstery Nappa Leather Dash & Upper Door Panels Ventilated Front Seating Power Side Support, front seats Power Cushion Extension, front seats Linear Walnut Wood Inlays Rear Sun Curtains, rear side doors Nappa Leather Key Fob "Inscription" Badge	3,500.00
Vision Package Blind Spot Info Sys & Cross Traffic Alert 360° Surround View Camera Automatically Dimmed Inner & Outer Mirrors Retractable Rear-view Mirrors	1,800.00
Climate Package with HUD Heated Rear Seats Heated Steering Wheel Heated Washer Nozzles Graphical Head-up Display (HUD)	1,950.00
Metallic Paint	560.00
Destination Charge	995.00
Total Suggested Retail Price:	$ 76,905.00

EPA DOT Fuel Economy and Environment — Plug-In Hybrid Vehicle Electricity-Gasoline

Fuel Economy Standard SUV-4WD range from 12 to 92 MPGe. The best vehicle rates 119 MPGe.

Electricity + Gasoline: 53 MPGe combined city/highway; 0.1 gallons per 100 miles; 58 kW-hrs per 100 miles

Gasoline Only: 25 MPG combined city/highway; 4.0 gallons per 100 miles

Driving Range: Electricity + Gasoline; Gasoline Only; All Electric range = 0 to 12 miles; 14 miles; 350

You save $ 500 in fuel costs over 5 years compared to the average new vehicle.

Annual Fuel cost $ 1,700

Fuel Economy & Greenhouse Gas Rating (tailpipe only): MPG 7; CO2 8 (1–10, Best)

Smog Rating (tailpipe only): 7 (1–10, Best)

This vehicle emits 100 grams CO2 per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel also create emissions; learn more at fueleconomy.gov.

fueleconomy.gov
Calculate personalized estimates and compare vehicles

Smartphone QR Code

PARTS CONTENT INFORMATION

FOR VEHICLES IN THIS CARLINE: VOLVO SERIES

U.S./CANADIAN PARTS CONTENT: 1%

MAJOR SOURCES OF FOREIGN PARTS CONTENT: SWEDEN: 40%

FOR THIS VEHICLE: FINAL ASSEMBLY POINT: GOTHENBURG, SWEDEN

COUNTRY OF ORIGIN: ENGINE PARTS: SWEDEN

TRANSMISSION PARTS: JAPAN

Note: Parts contents does not include final assembly, distribution, or other non-parts costs.

GOVERNMENT 5-STAR SAFETY RATINGS

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

VEHICLE IDENTIFICATION
Type & Chassis: 256 066023
Model Year: 2016
Color: 719 Luminous Sand M
VIN: YV4BC0PL8G1066023
ITHACA, NY 14850

Port of Importation: Newark, NJ
Delivered by: Truck
DELIVERY ADDRESS
MAGUIRE VOLVO 3725
370 ELMIRA RD

YV4BC0PL8G1066023

Photo No. 102 - Monroney Label

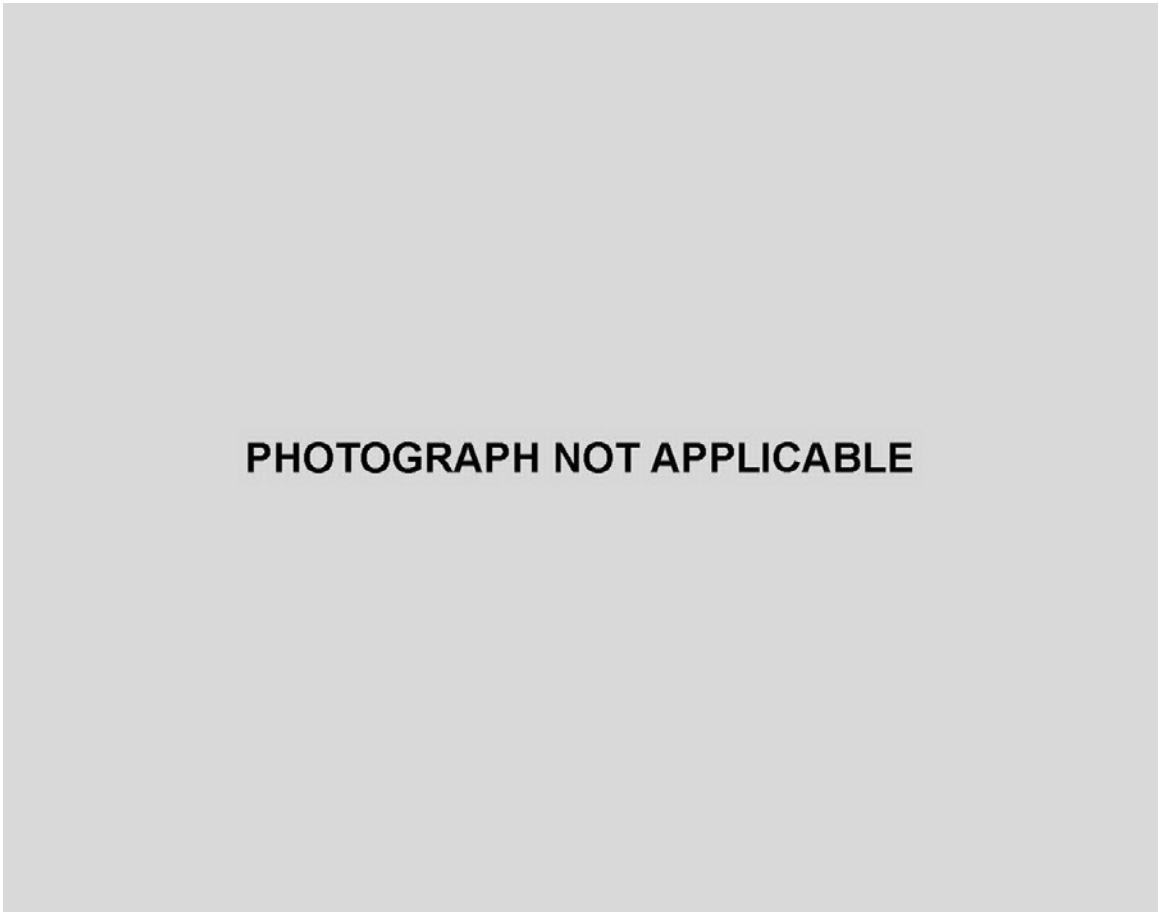


Photo No. 103 - Head Restraint Use and Adjustment Information from Vehicle Owner’s Manual

APPENDIX B
DUMMY RESPONSE DATA PLOTS

TABLE OF DATA PLOTS
Driver Dummy Instrumentation Plots

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)

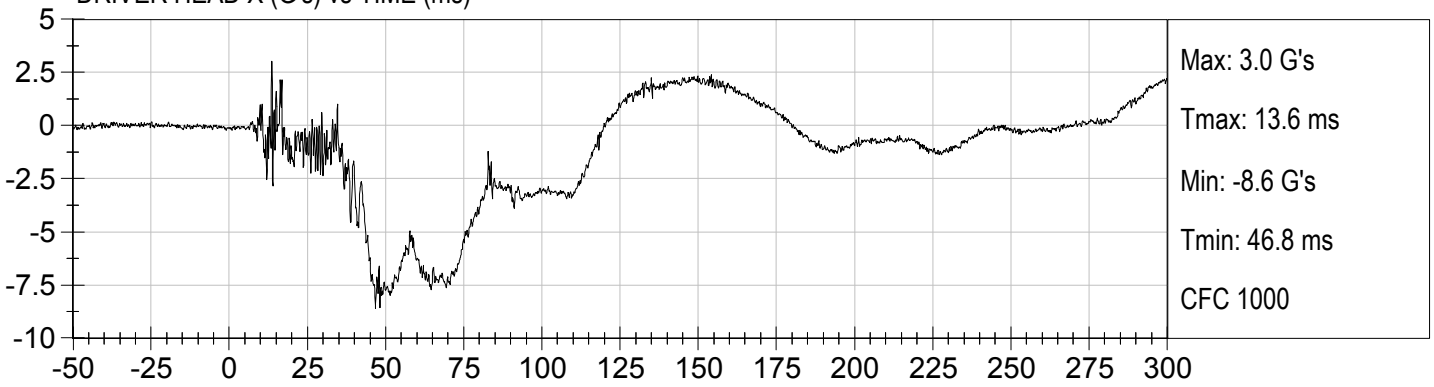
MDB Rear Acceleration (X)

MDB Rear Acceleration (Y)

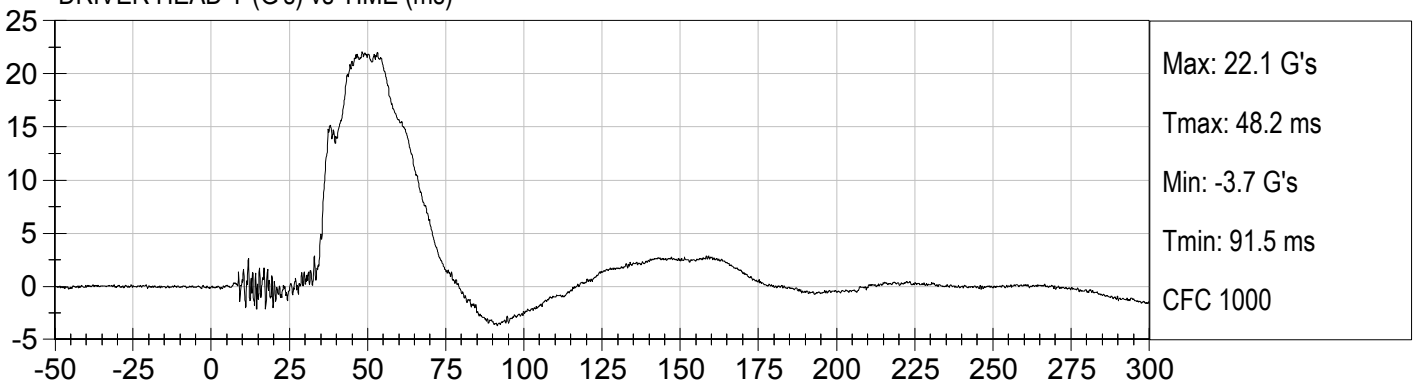
Left MDB Contact Switch

Right MDB Contact Switch

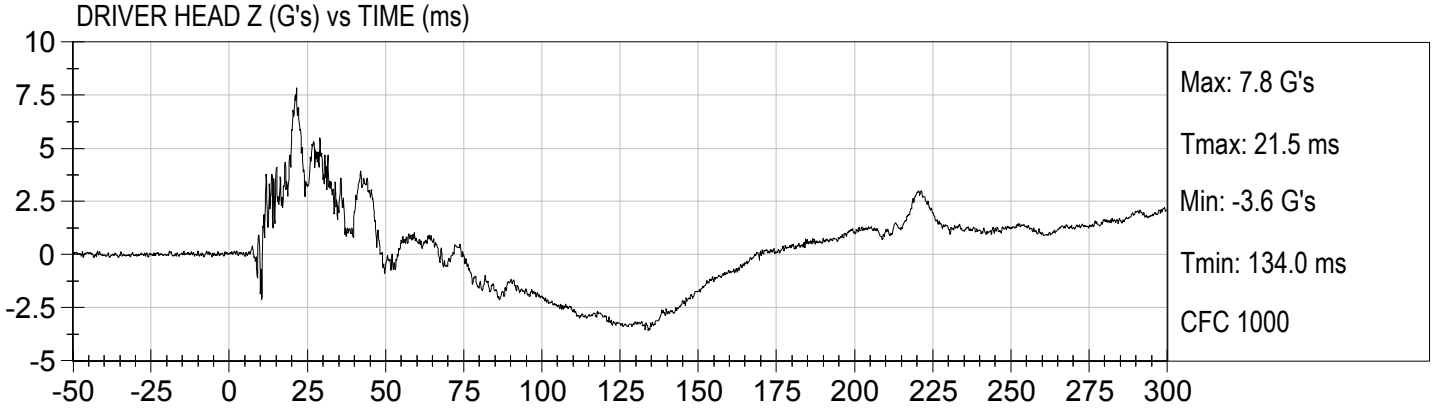
DRIVER HEAD X (G's) vs TIME (ms)



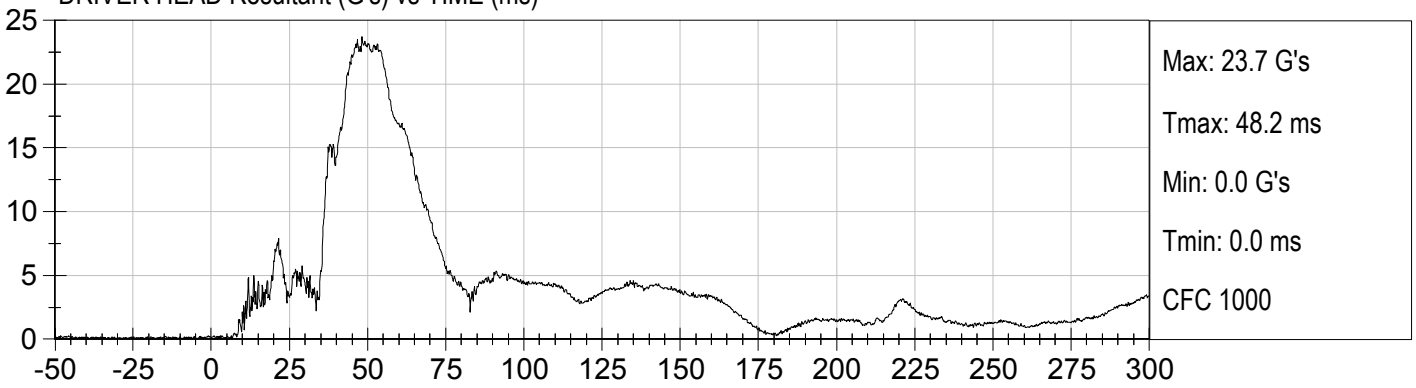
DRIVER HEAD Y (G's) vs TIME (ms)



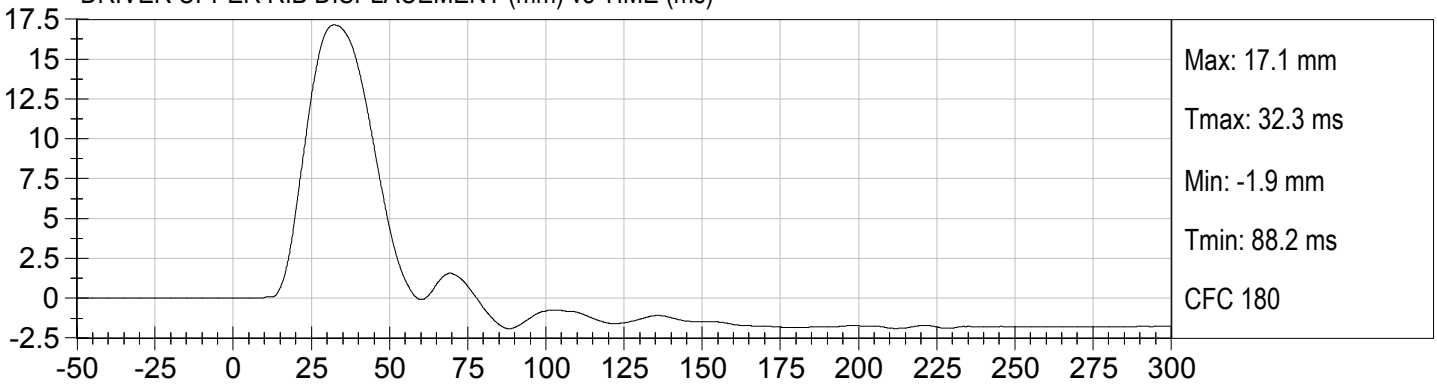
DRIVER HEAD Z (G's) vs TIME (ms)



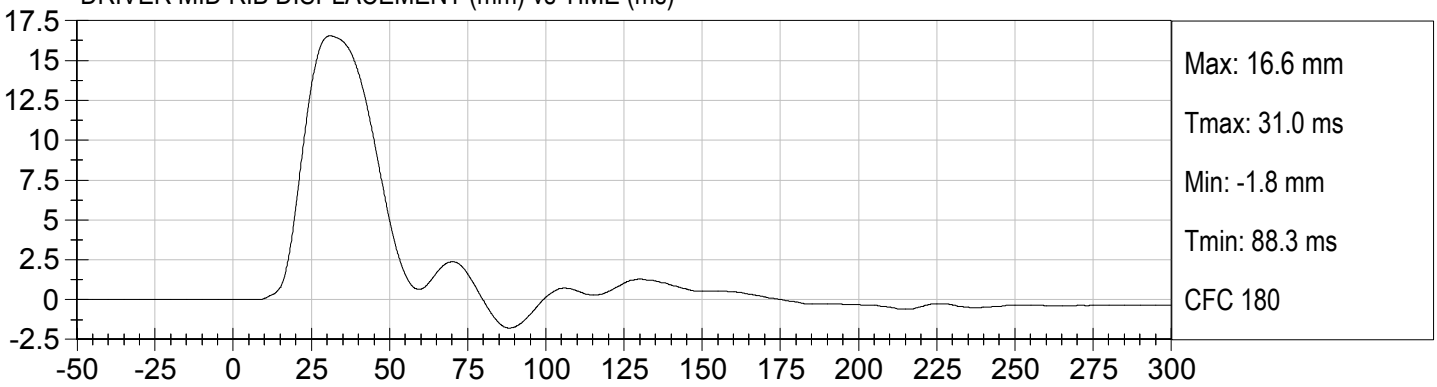
DRIVER HEAD Resultant (G's) vs TIME (ms)



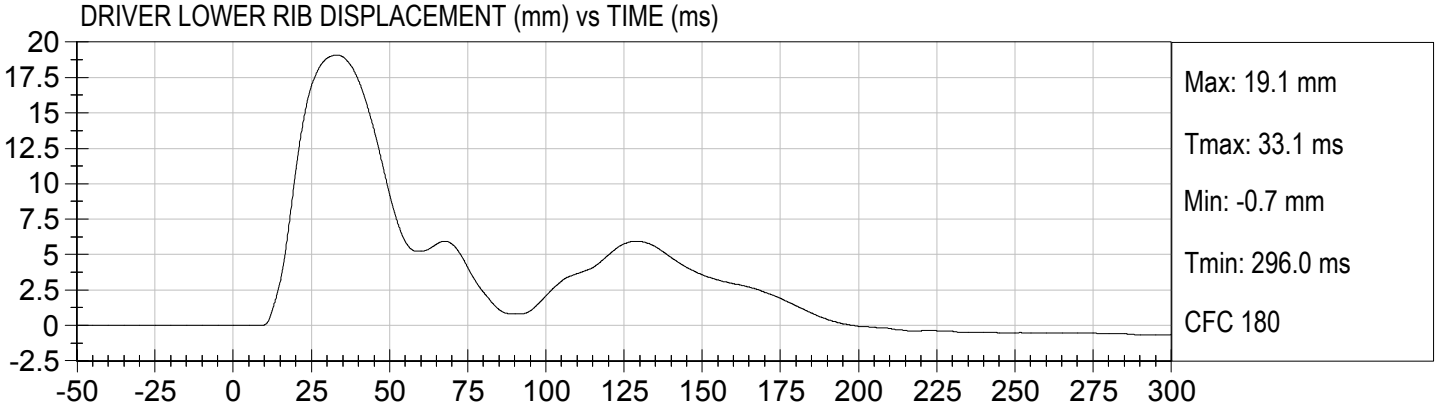
DRIVER UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



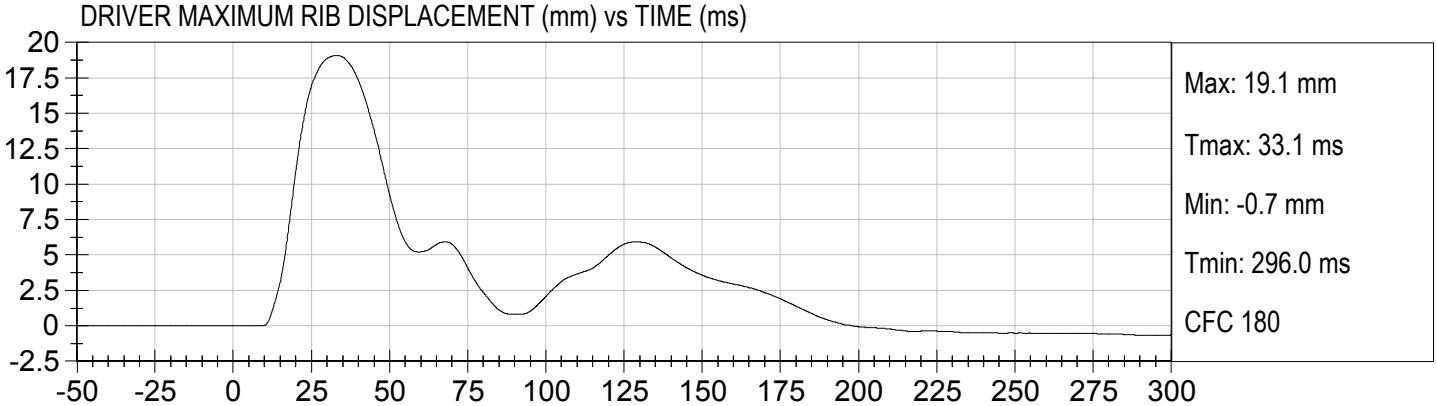
DRIVER MID RIB DISPLACEMENT (mm) vs TIME (ms)



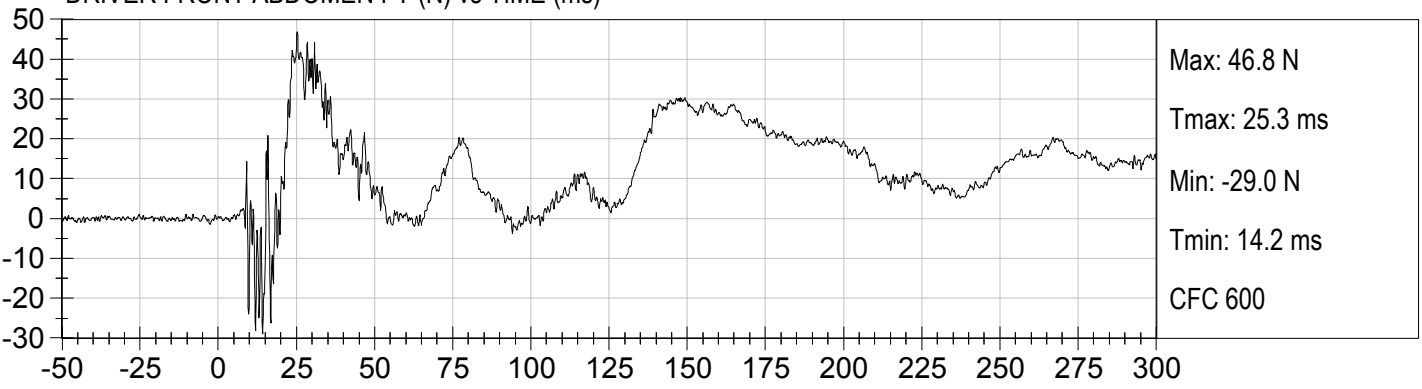
DRIVER LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



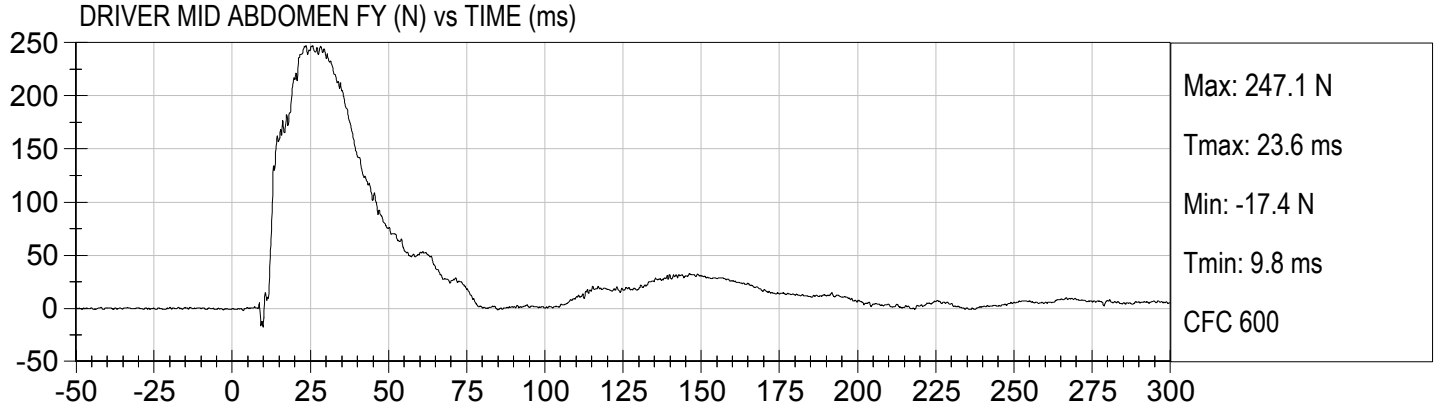
DRIVER MAXIMUM RIB DISPLACEMENT (mm) vs TIME (ms)



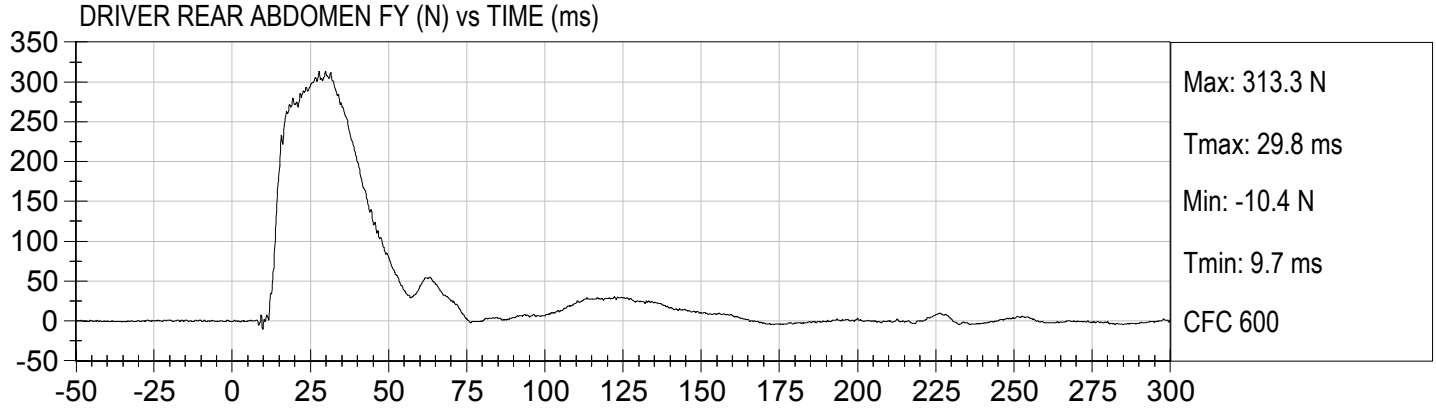
DRIVER FRONT ABDOMEN FY (N) vs TIME (ms)



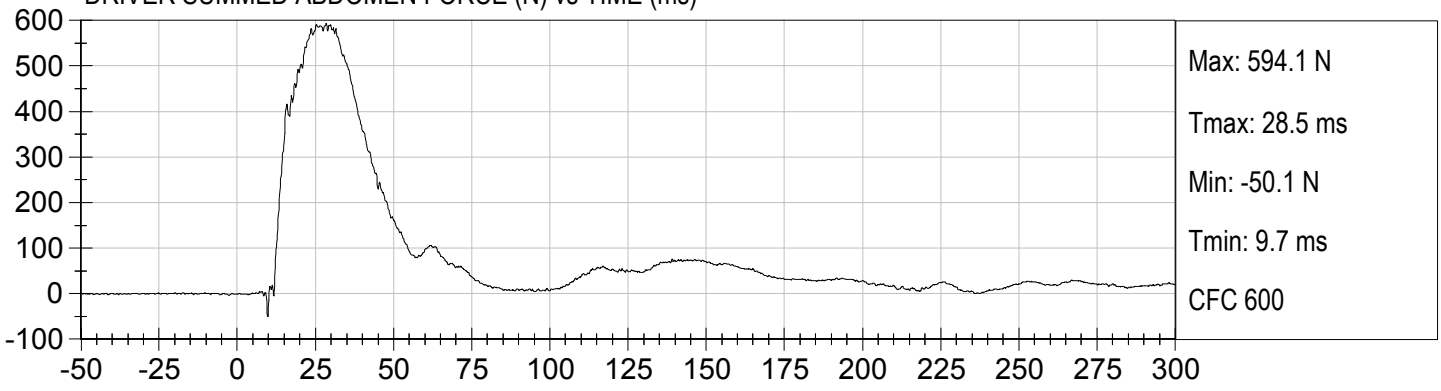
DRIVER MID ABDOMEN FY (N) vs TIME (ms)

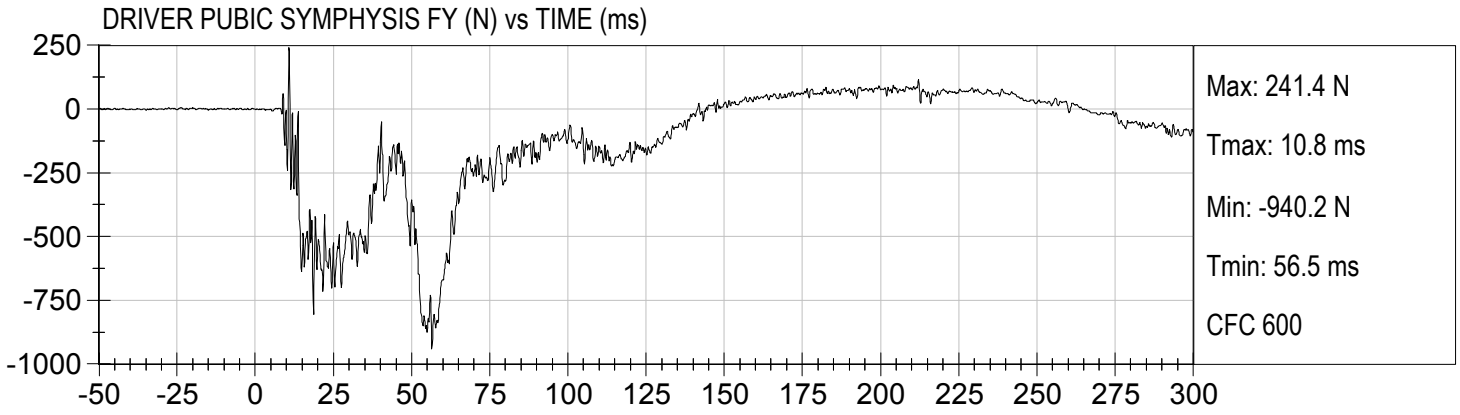


DRIVER REAR ABDOMEN FY (N) vs TIME (ms)

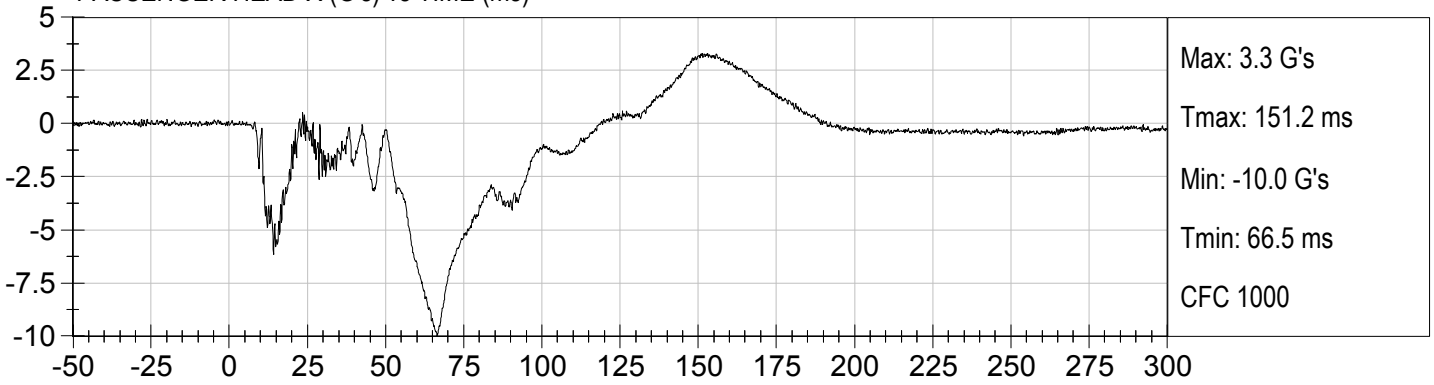


DRIVER SUMMED ABDOMEN FORCE (N) vs TIME (ms)

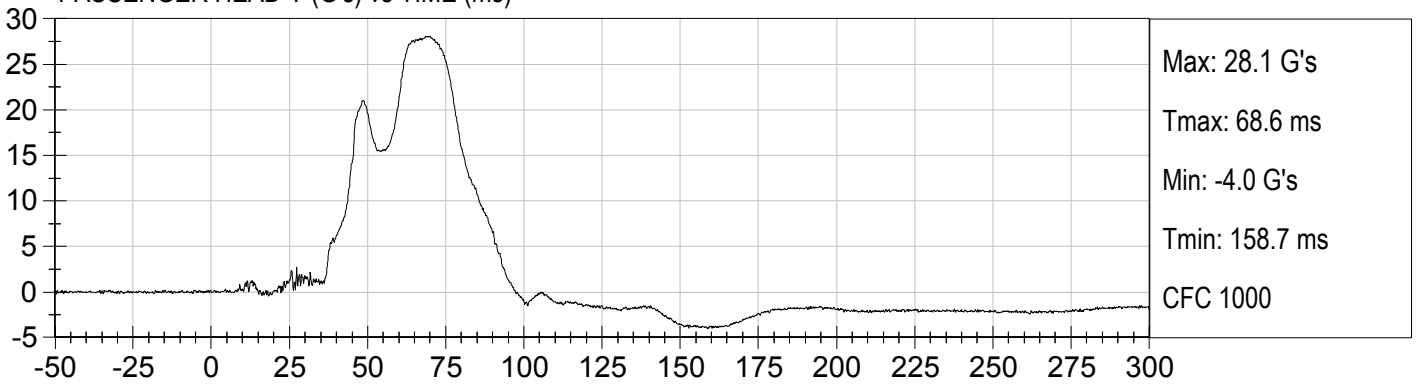



DRIVER PUBIC SYMPHYSIS FY (N) vs TIME (ms)
250
0
-250
-500
-750
-1000
-50
-25
0
25
50
75
100
125
150
175
200
225
250
275
300
Max: 241.4 N
Tmax: 10.8 ms
Min: -940.2 N
Tmin: 56.5 ms
CFC 600

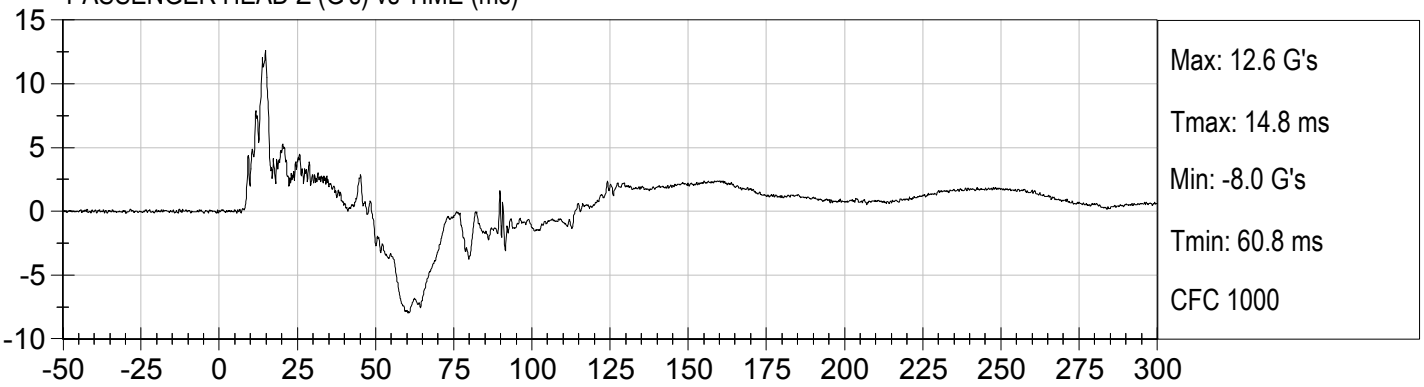
PASSENGER HEAD X (G's) vs TIME (ms)



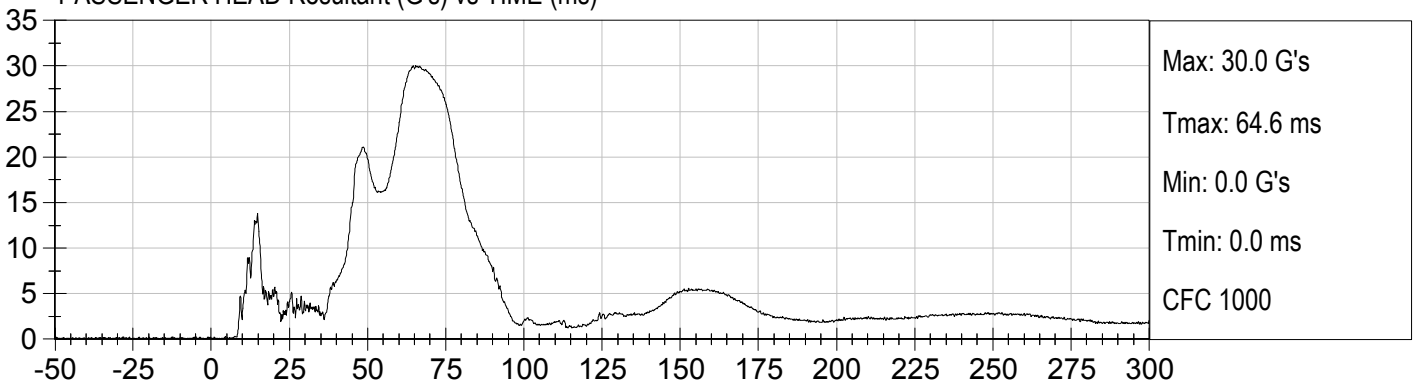
PASSENGER HEAD Y (G's) vs TIME (ms)



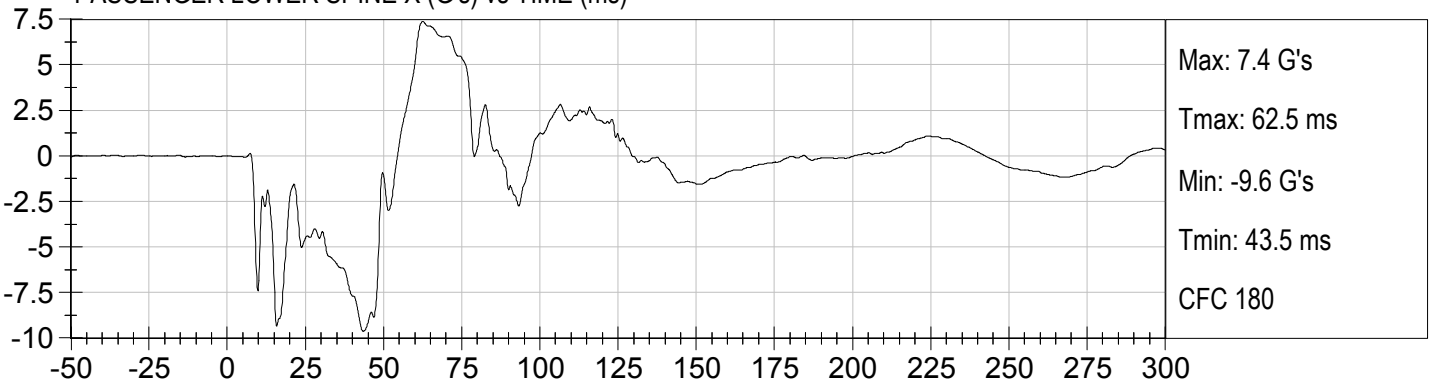
PASSENGER HEAD Z (G's) vs TIME (ms)



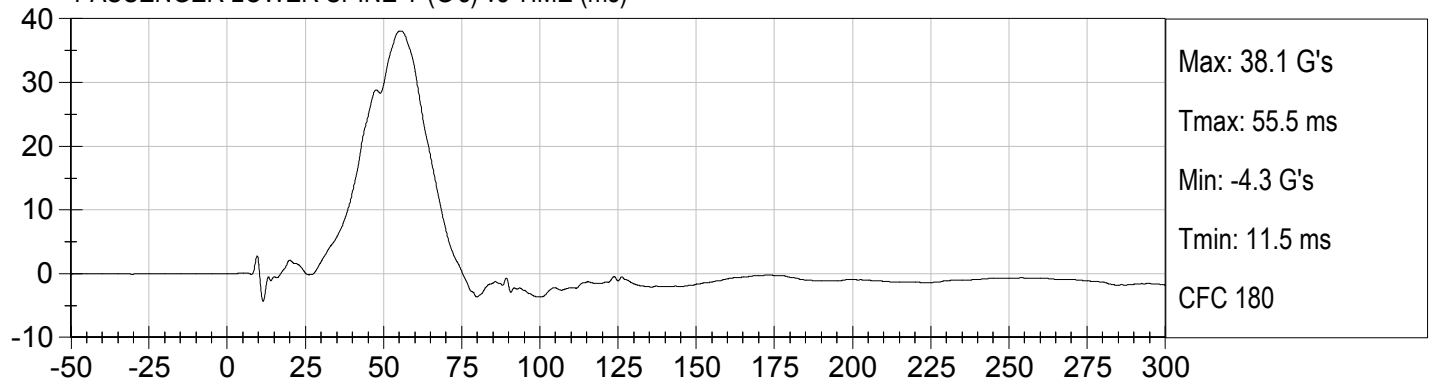
PASSENGER HEAD Resultant (G's) vs TIME (ms)



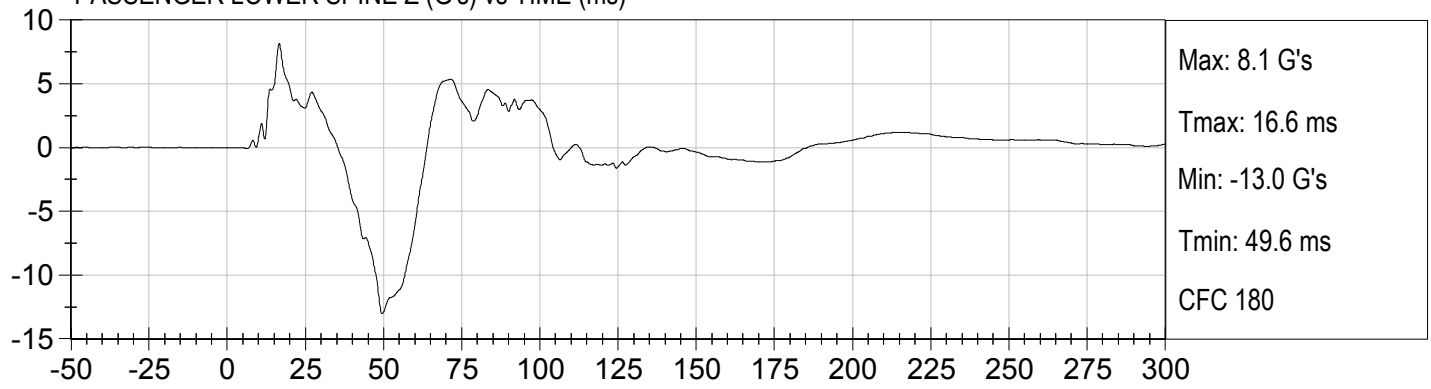
PASSENGER LOWER SPINE X (G's) vs TIME (ms)



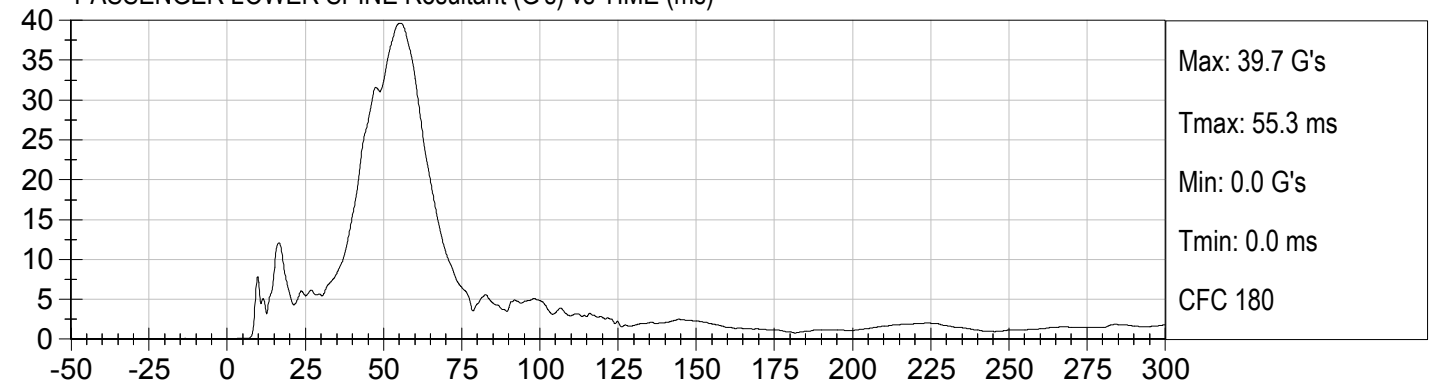
PASSENGER LOWER SPINE Y (G's) vs TIME (ms)



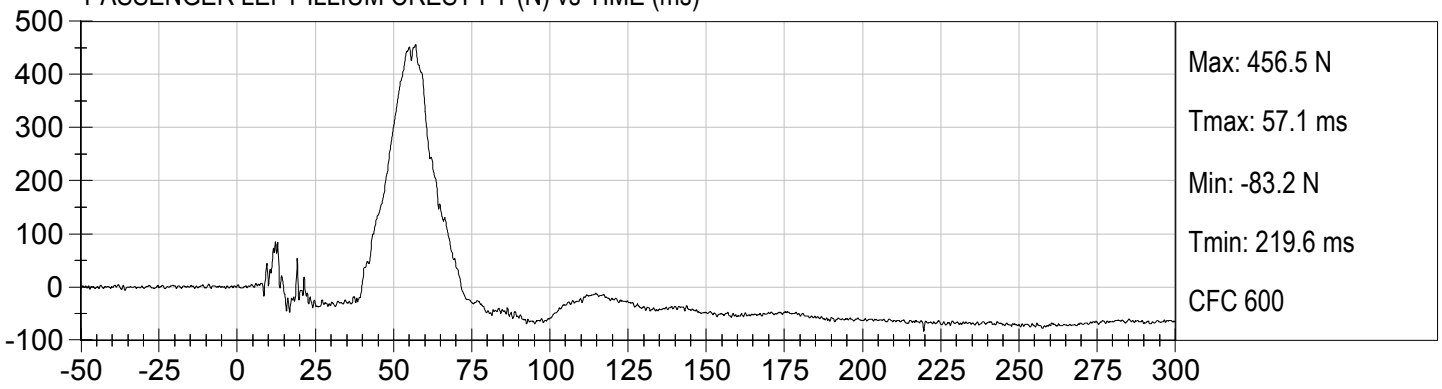
PASSENGER LOWER SPINE Z (G's) vs TIME (ms)



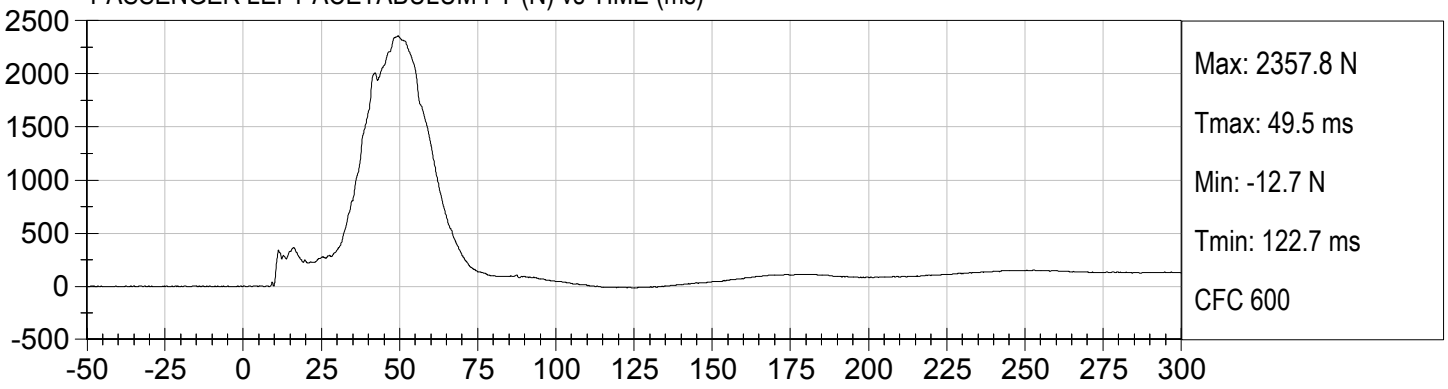
PASSENGER LOWER SPINE Resultant (G's) vs TIME (ms)



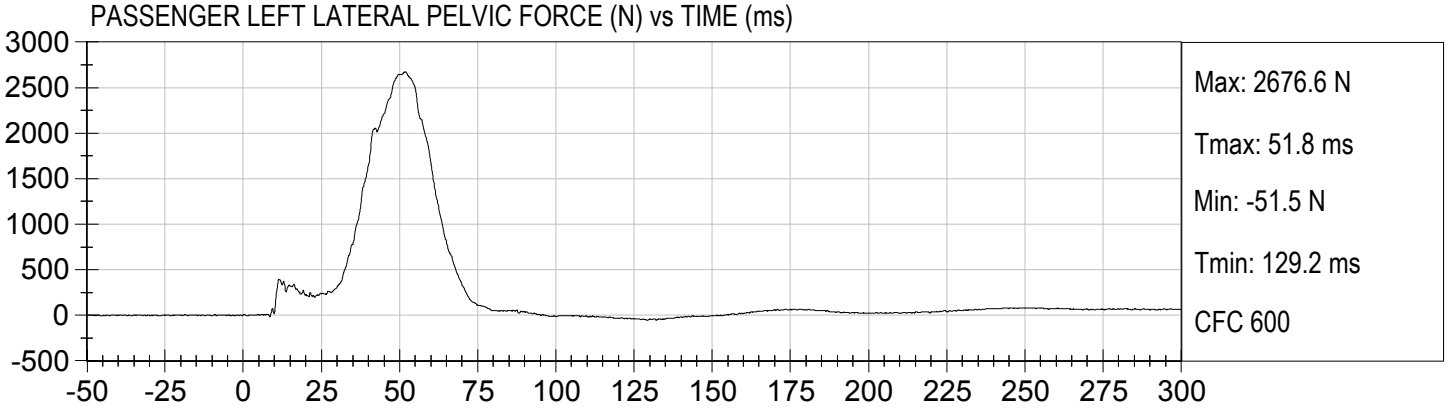
PASSENGER LEFT ILLIUM CREST FY (N) vs TIME (ms)



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



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



APPENDIX C
DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

ES-2re External Measurements
SN: 032

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

MGA RESEARCH CORPORATION

HEAD DROP TEST

ES-2re DUMMY

ATD Serial No: 032 **Test ID:** D161001

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	37	Pass
Peak Resultant Acceleration	G's	125 to 155	142	Pass
Peak Longitudinal Acceleration	G's	<= +/- 15.0	11.5	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
		Overall Test Results		Pass

Laboratory Technician

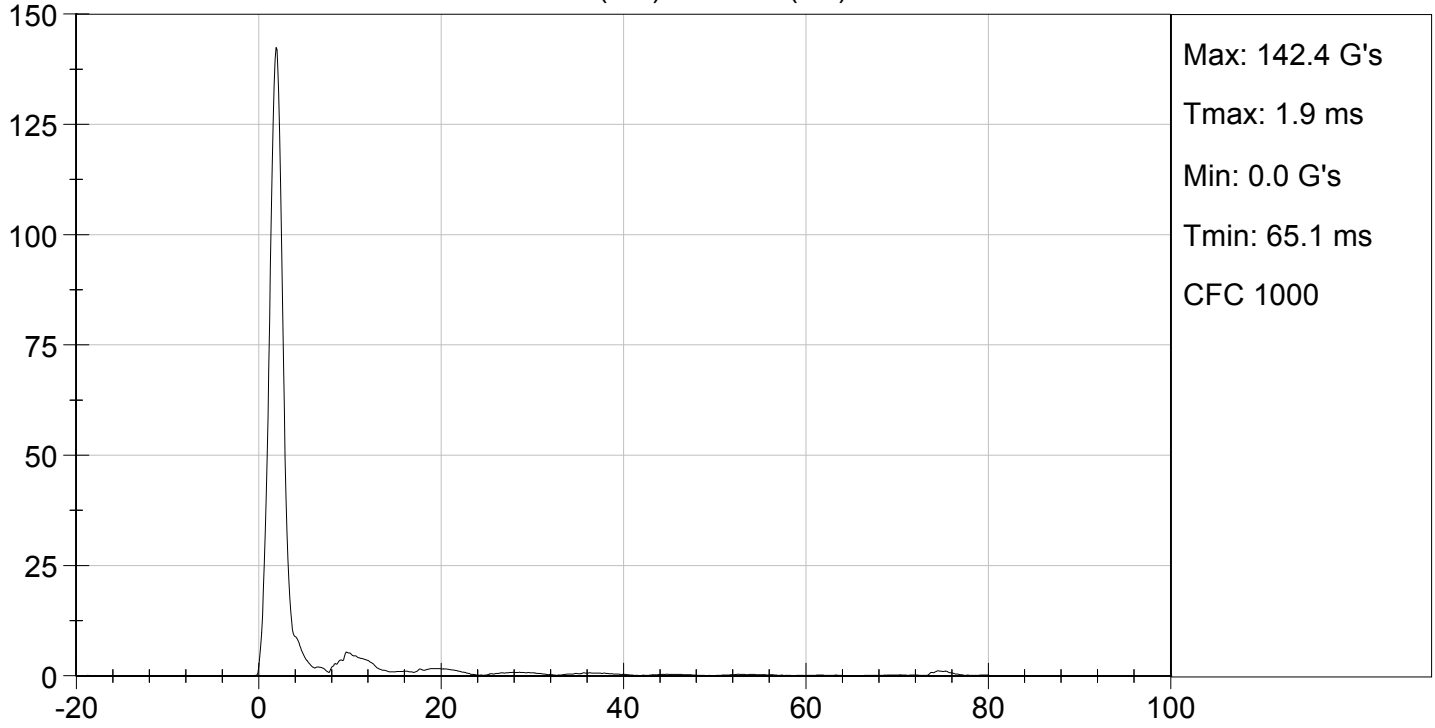
03/10/2016
Test Date

Approved By

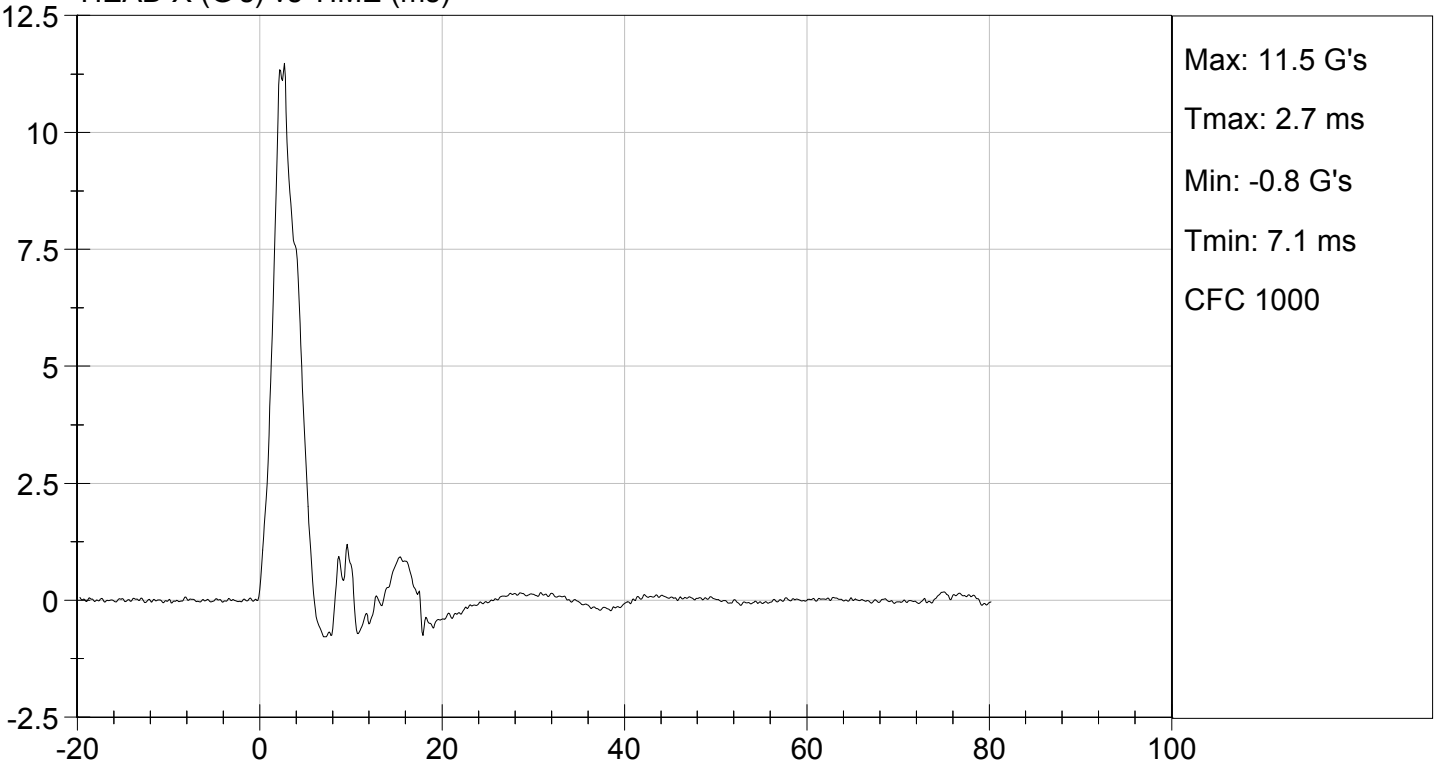
TEST DESC: HEAD DROP

TEST DATE: 03/10/2016
TEST #: D161001

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



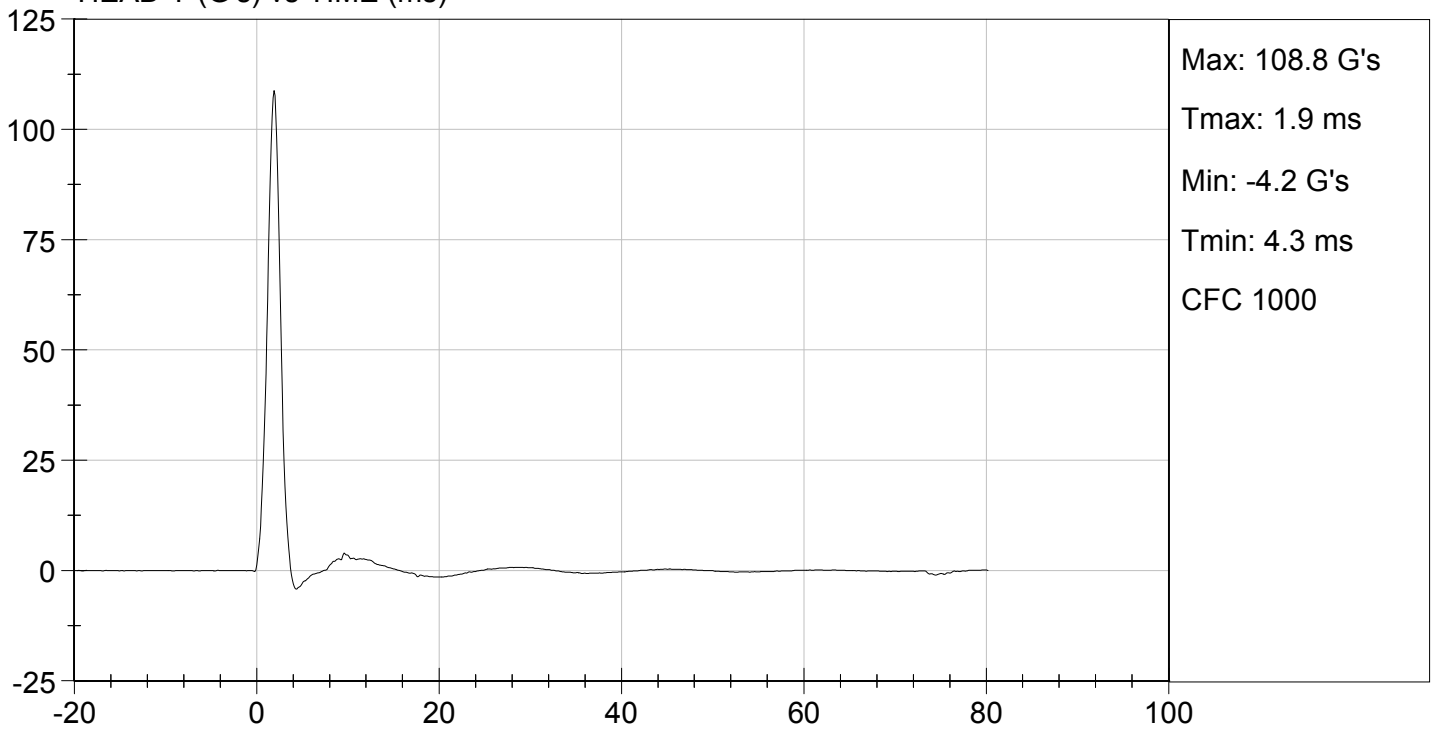
HEAD X (G's) vs TIME (ms)



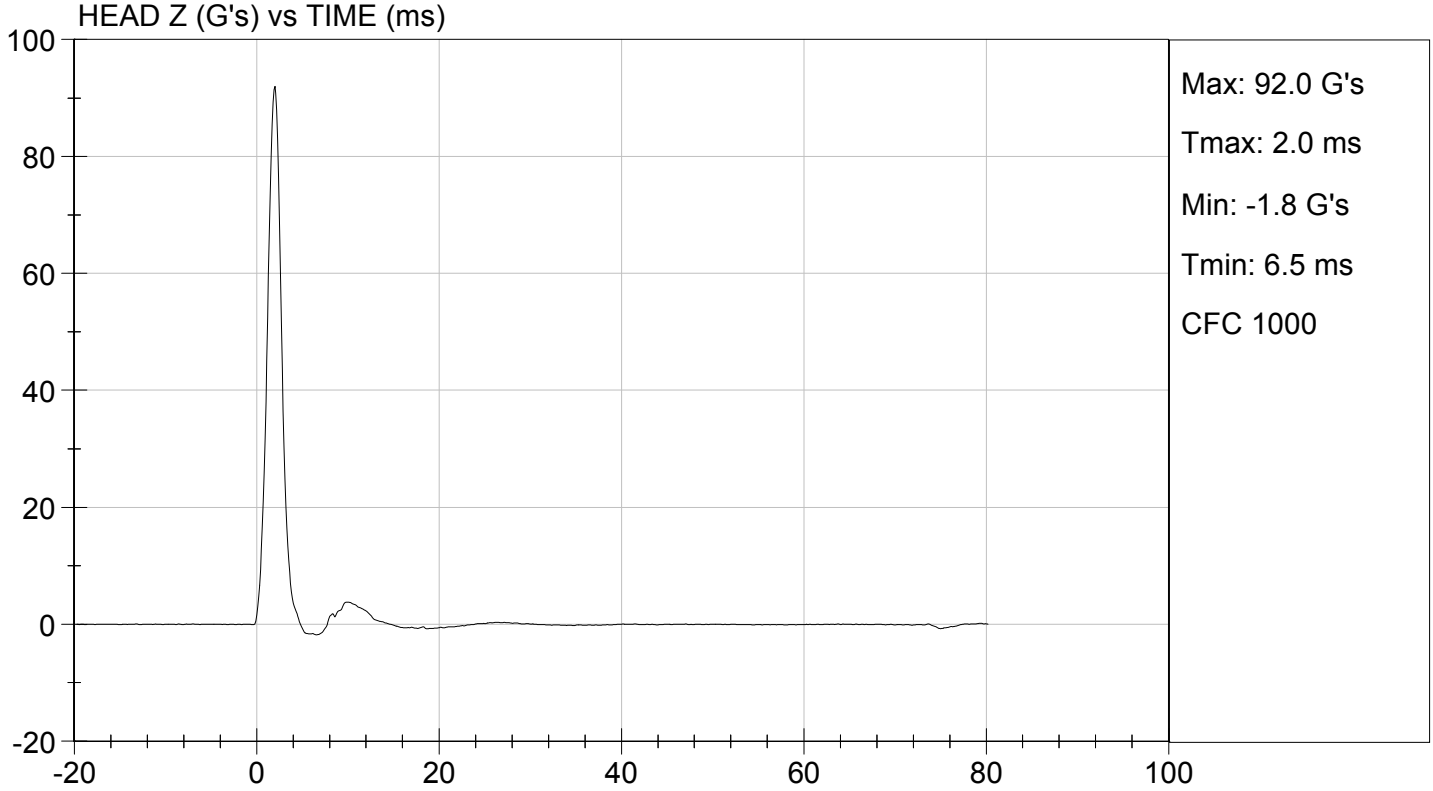
TEST DESC: HEAD DROP

TEST DATE: 03/10/2016
TEST #: D161001

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



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



MGA RESEARCH CORPORATION

NECK PENDULUM TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D161002

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	37	Pass
Pendulum Speed		m/s	3.30 to 3.50	3.39	Pass
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	-0.04	Pass
	3 ms	m/s	-0.25 to -0.375	-0.33	Pass
	14 ms	m/s	-3.20 to -3.70	-3.30	Pass
	17 ms	m/s	>= -3.70	-3.47	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	50.0	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	58.3	Pass
Head Rotation Decay Time to 0 Degree		ms	53.0 to 88.0	59.4	Pass
			Overall Results		Pass

Laboratory Technician

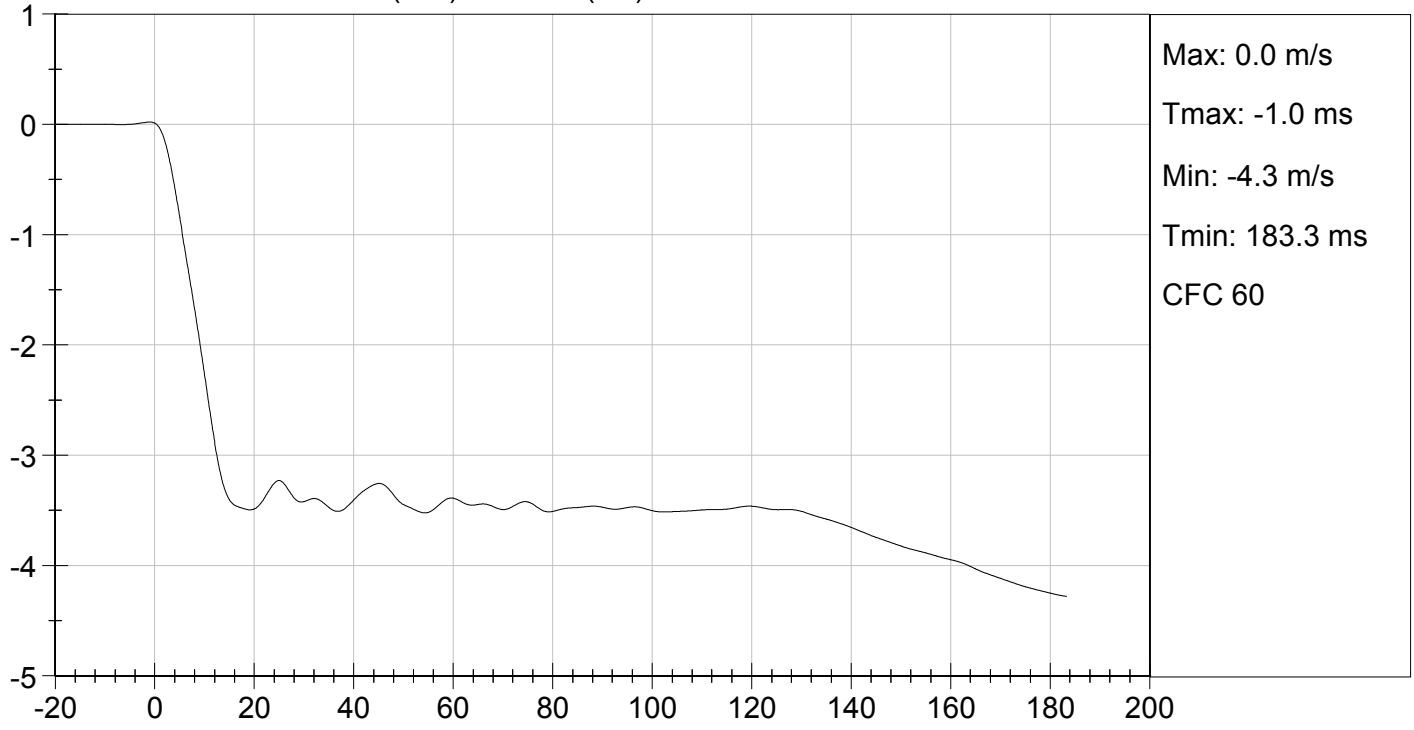
03/10/2016
Test Date

Approved By

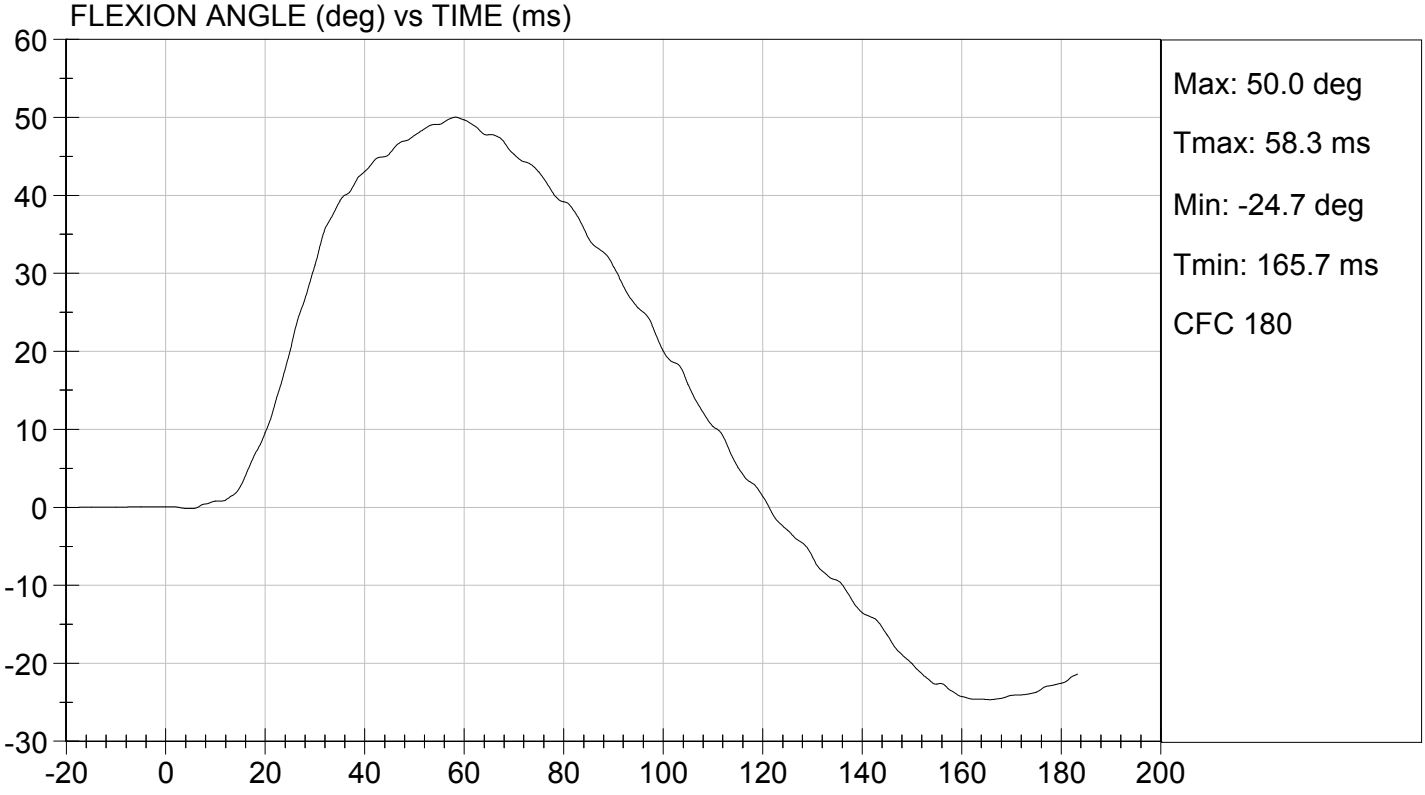
TEST DESC: NECK BENDING
VELOCITY: 11.11 ft/s, 3.39 m/s

TEST DATE: 03/10/2016
TEST #: D161002

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



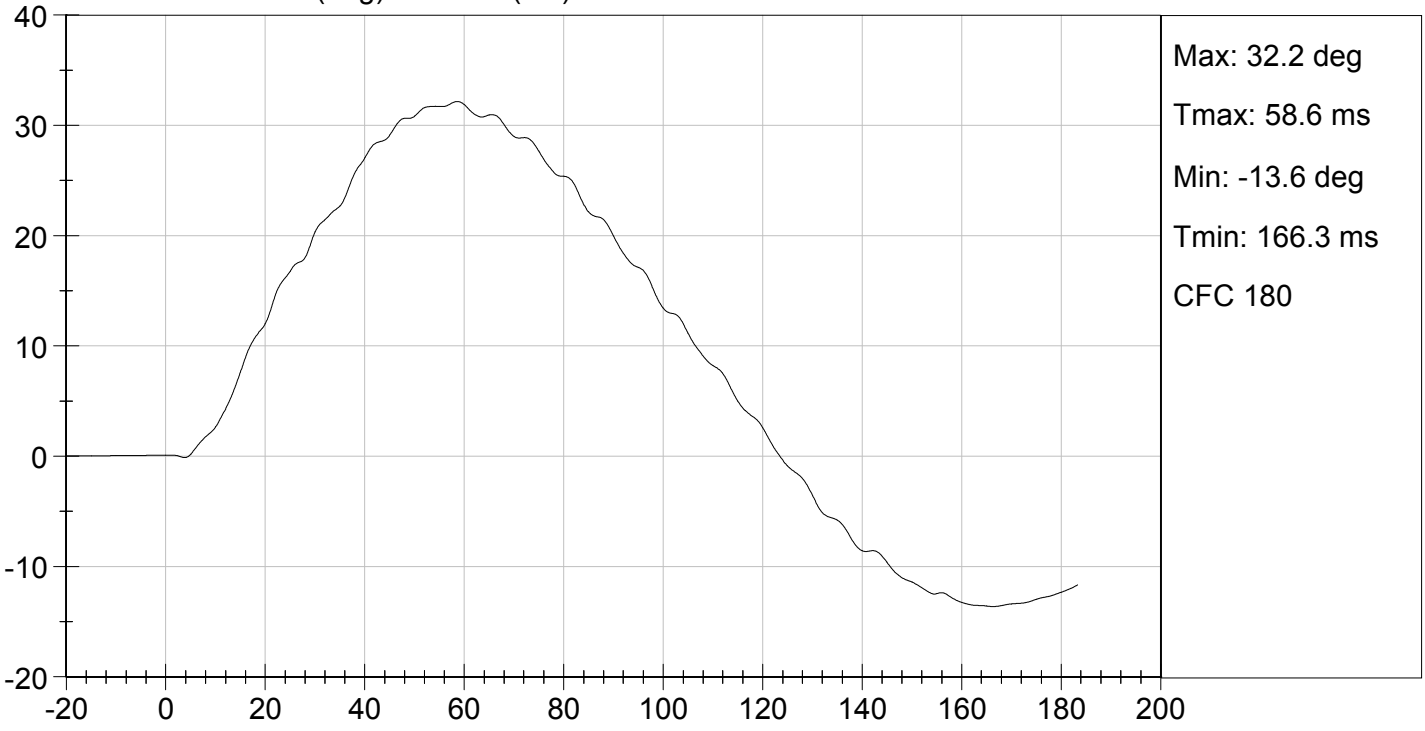
FLEXION ANGLE (deg) vs TIME (ms)



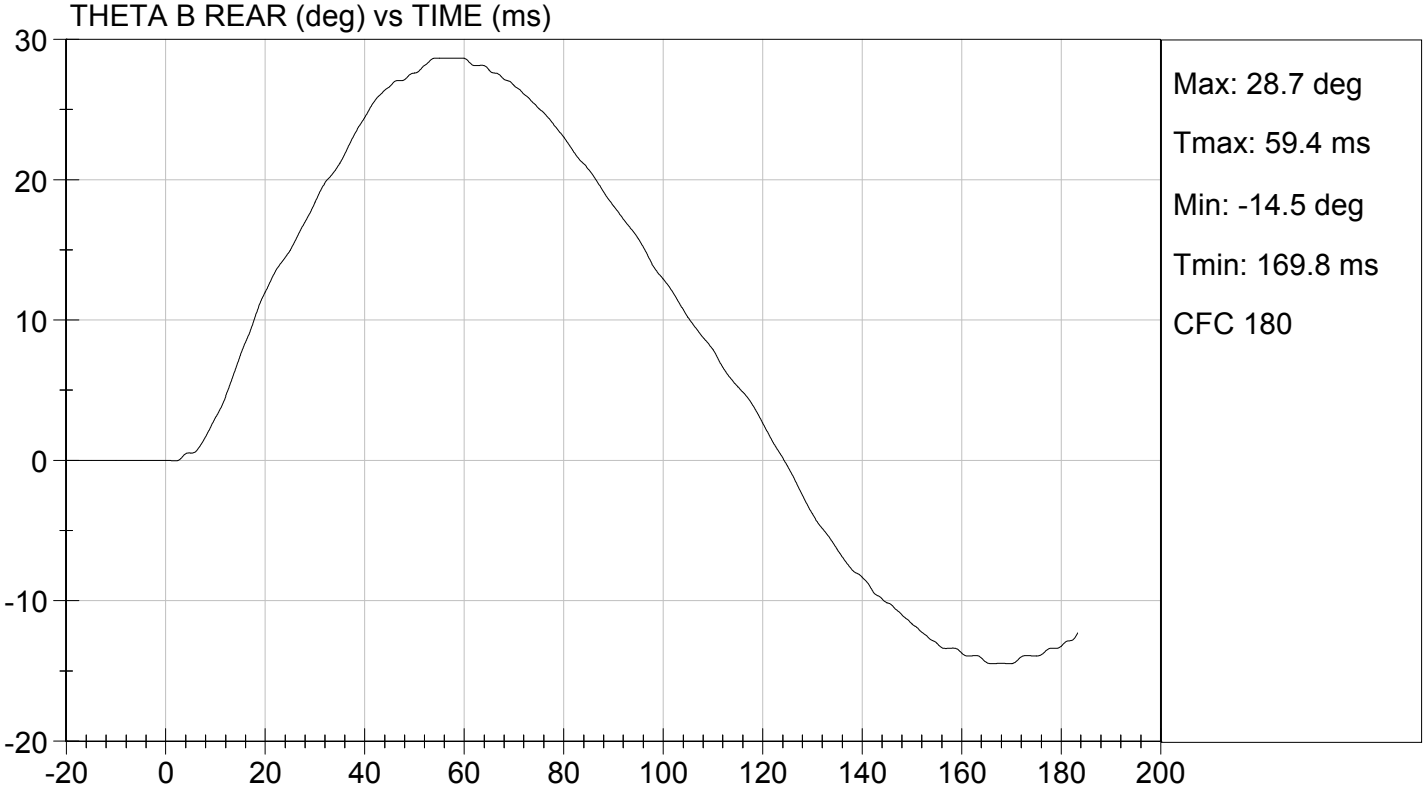
TEST DESC: NECK BENDING
VELOCITY: 11.11 ft/s, 3.39 m/s

TEST DATE: 03/10/2016
TEST #: D161002

THETA A FRONT (deg) vs TIME (ms)

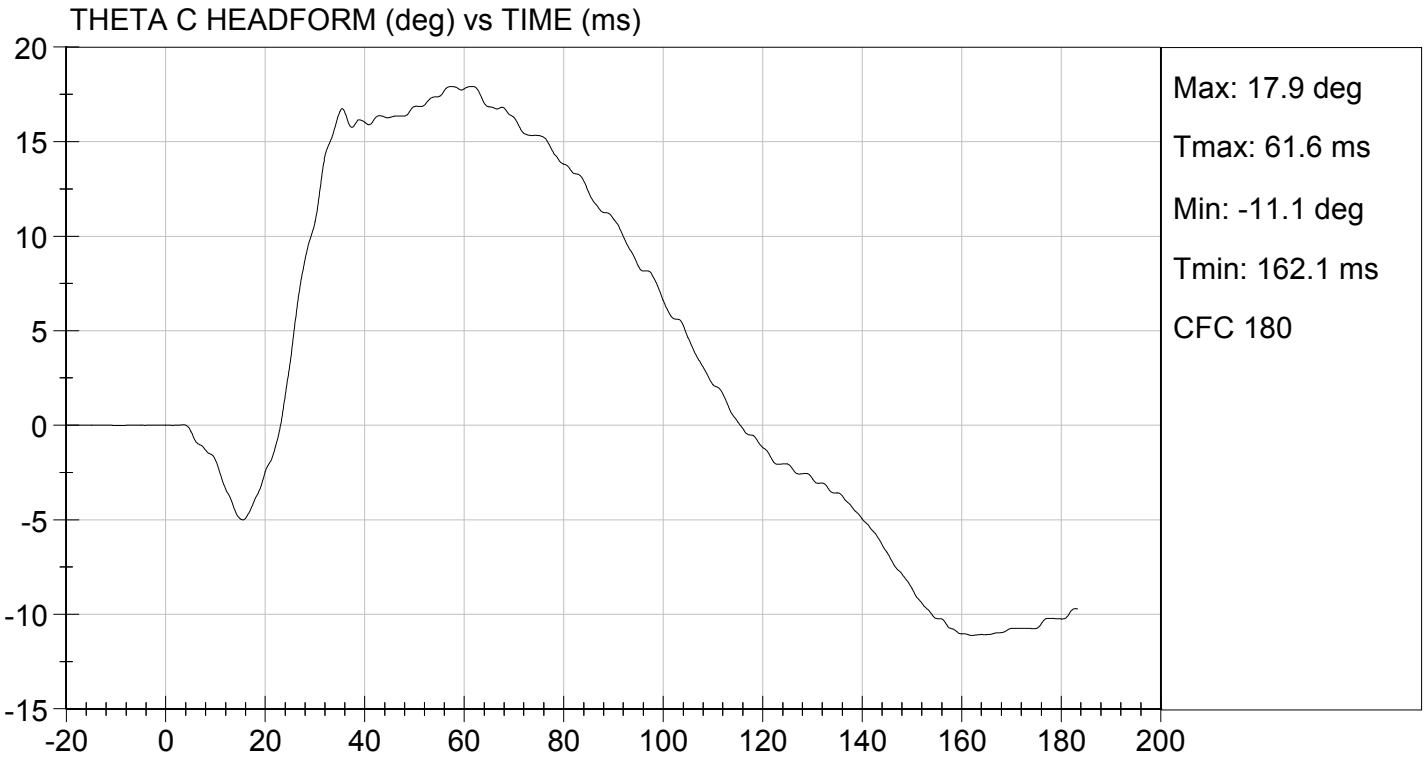


THETA B REAR (deg) vs TIME (ms)



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

TEST DATE: 03/10/2016
TEST #: D161002



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D161003

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	32	Pass
Pendulum Speed	m/s	4.20 to 4.40	4.38	Pass
Peak Impactor Acceleration	G's	7.5 to 10.5	9.7	Pass
		Overall Test Results		Pass

Laboratory Technician

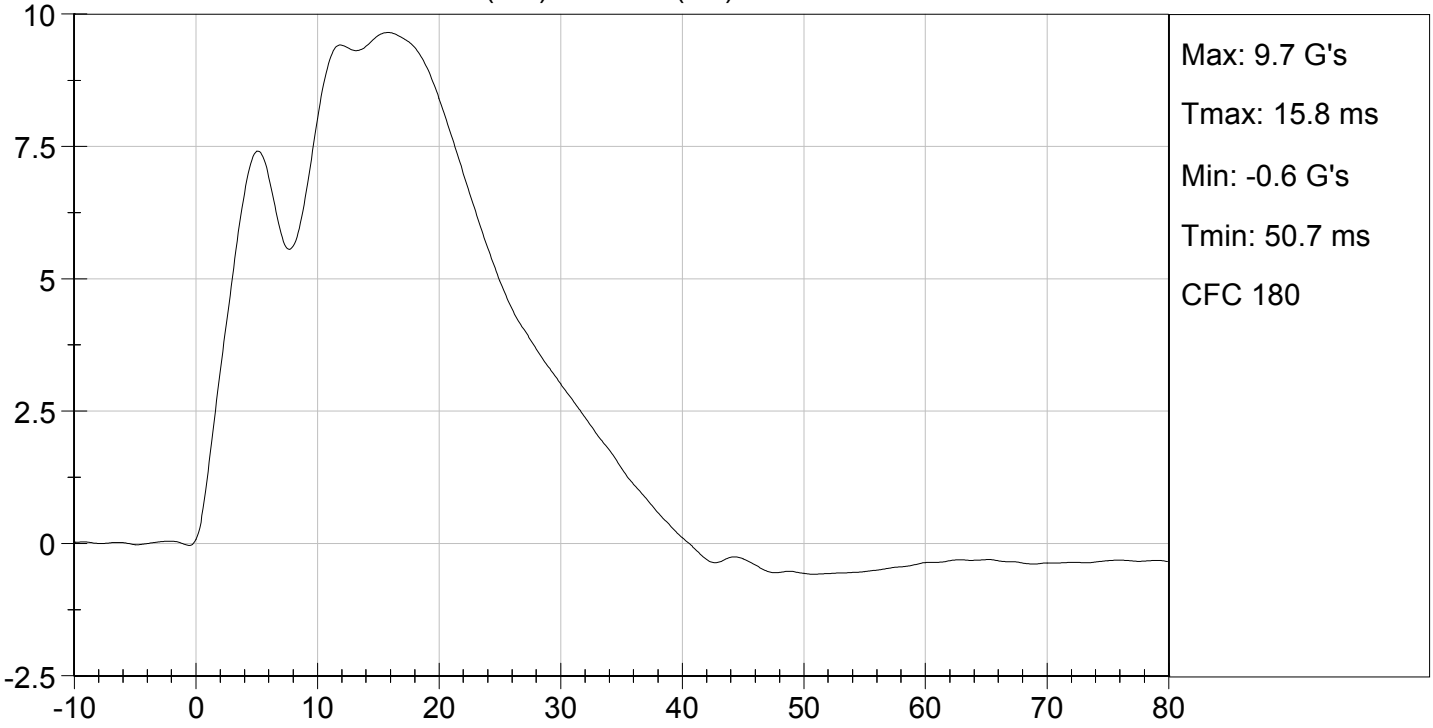
03/11/2016
Test Date

Approved By

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

TEST DATE: 03/11/2016
TEST #: D161003

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



MGA RESEARCH CORPORATION

UPPER RIB TEST

ES-2re DUMMY

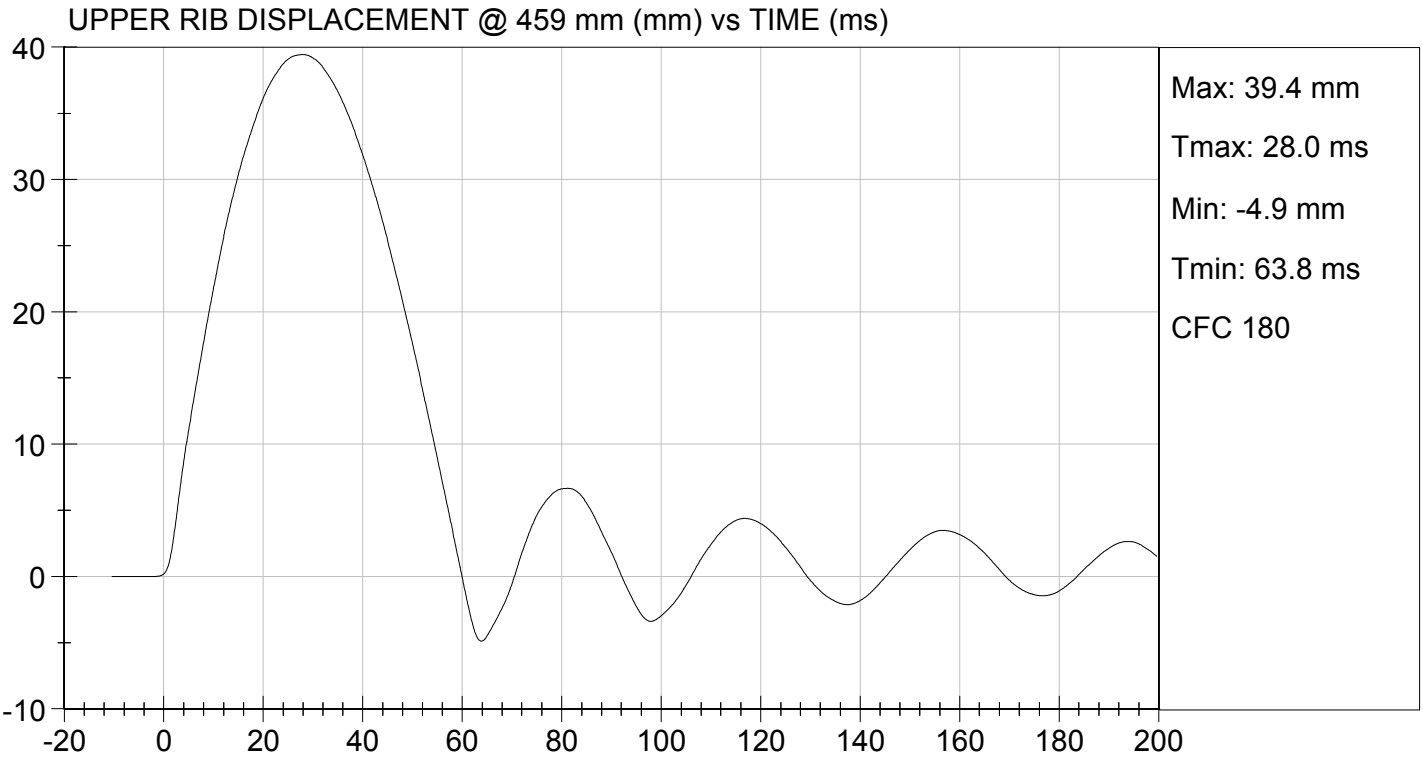
ATD Serial No: 032 **Test I.D:** D161004

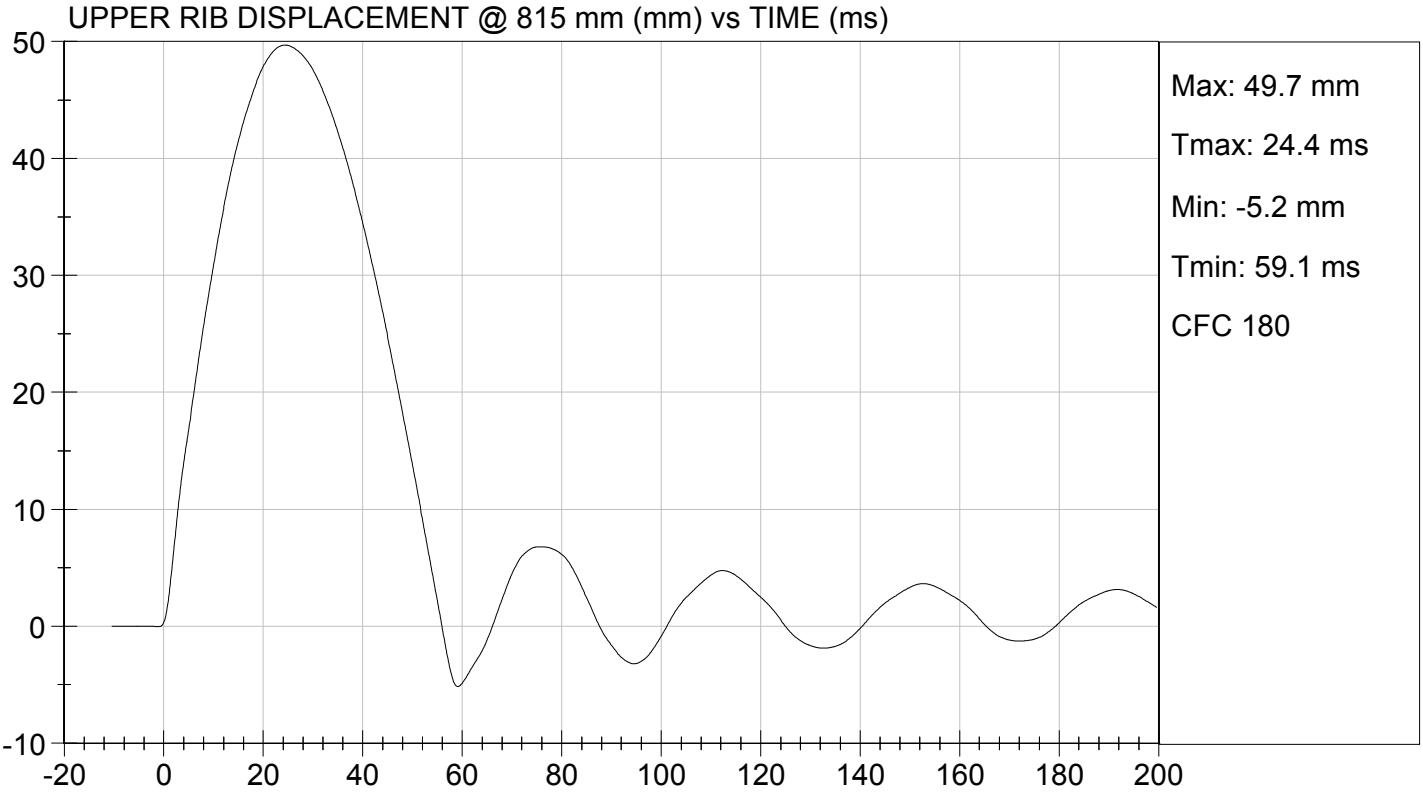
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	37	Pass
Displacement at 459 mm	mm	36.0 to 40.0	39.4	Pass
Displacement at 815 mm	mm	46.0 to 51.0	49.7	Pass
		Overall Test Results		Pass

Laboratory Technician

03/10/2016
Test Date

Approved By


UPPER RIB DISPLACEMENT @ 459 mm (mm) vs TIME (ms)
40
30
20
10
0
-10
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 39.4 mm
Tmax: 28.0 ms
Min: -4.9 mm
Tmin: 63.8 ms
CFC 180


UPPER RIB DISPLACEMENT @ 815 mm (mm) vs TIME (ms)
50
40
30
20
10
0
-10
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 49.7 mm
Tmax: 24.4 ms
Min: -5.2 mm
Tmin: 59.1 ms
CFC 180

MGA RESEARCH CORPORATION

MID RIB TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D161005

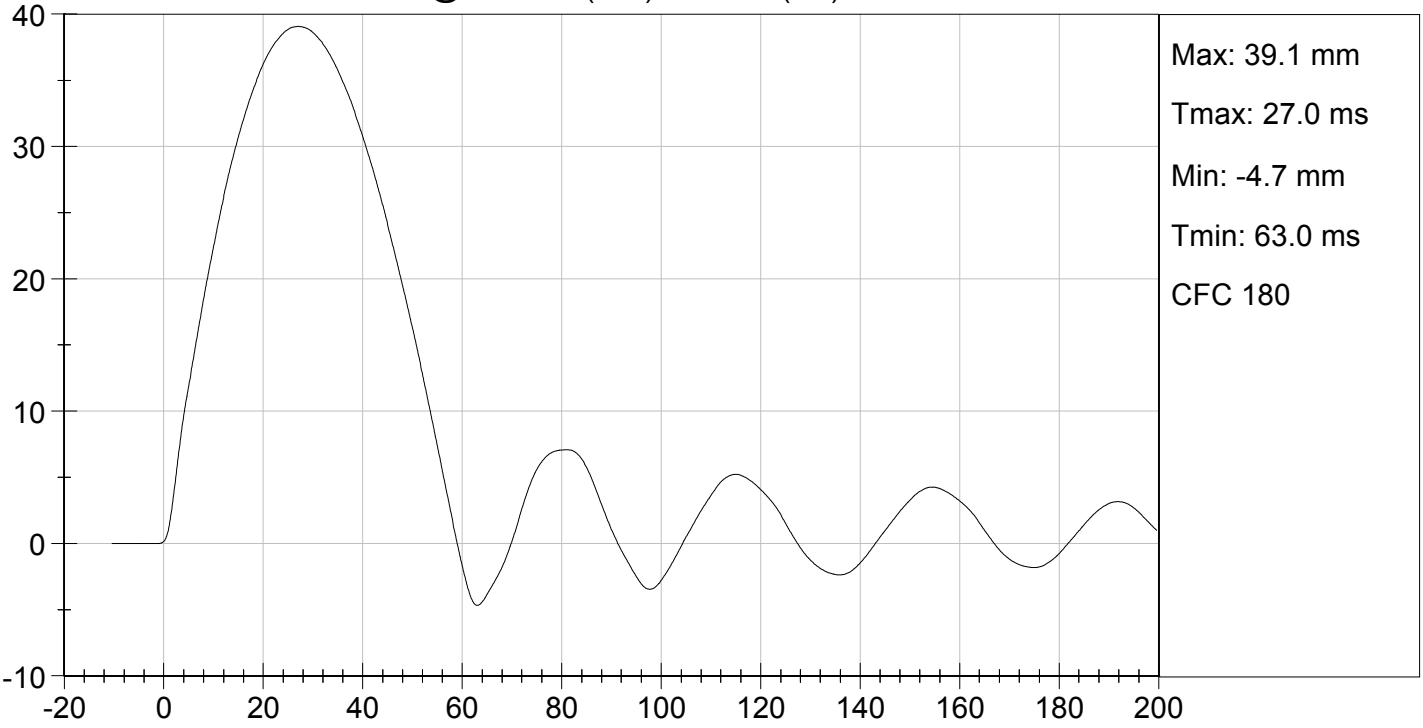
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	37	Pass
Displacement at 459 mm	mm	36.0 to 40.0	39.1	Pass
Displacement at 815 mm	mm	46.0 to 51.0	48.9	Pass
		Overall Test Results		Pass

Laboratory Technician

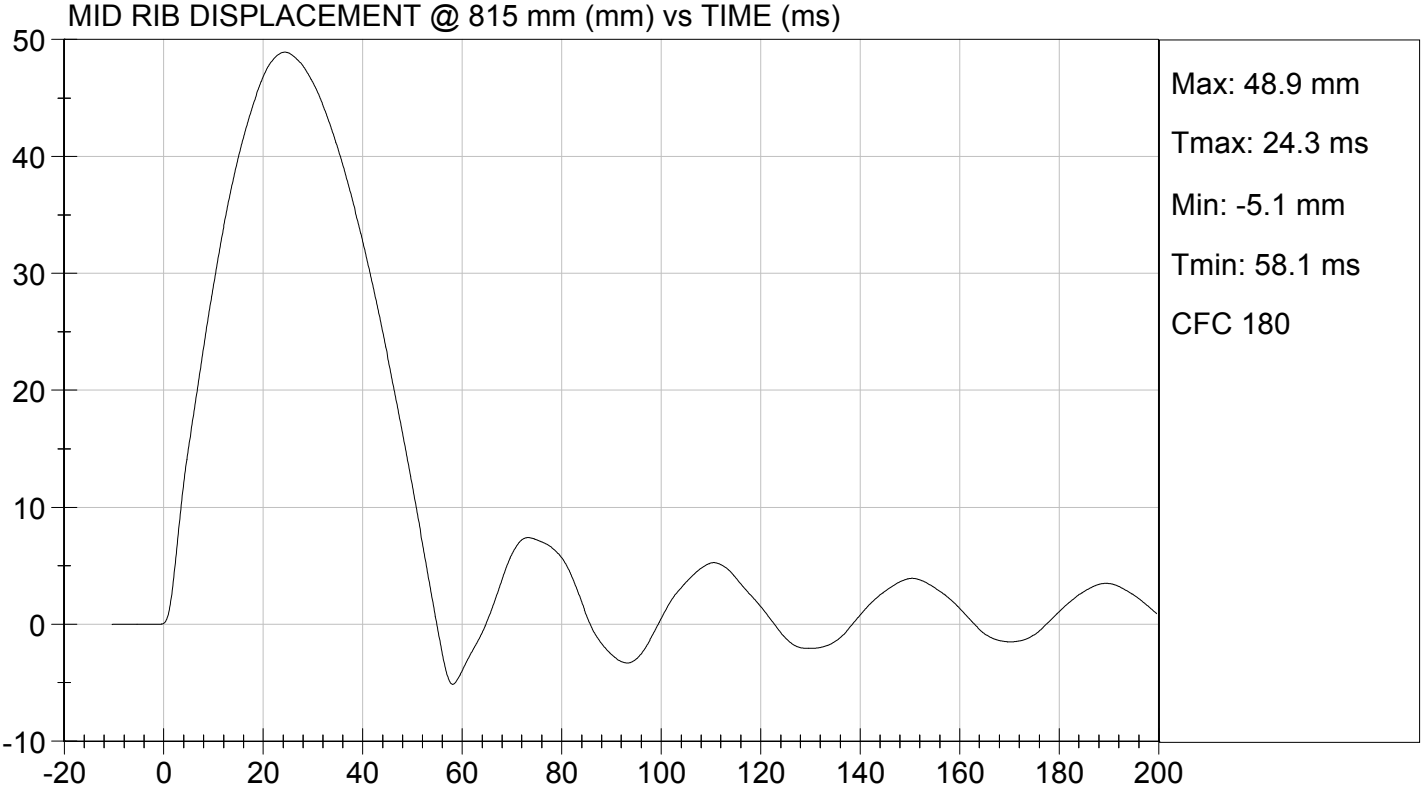
03/10/2016
Test Date

Approved By

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



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



MGA RESEARCH CORPORATION

LOWER RIB TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D161006

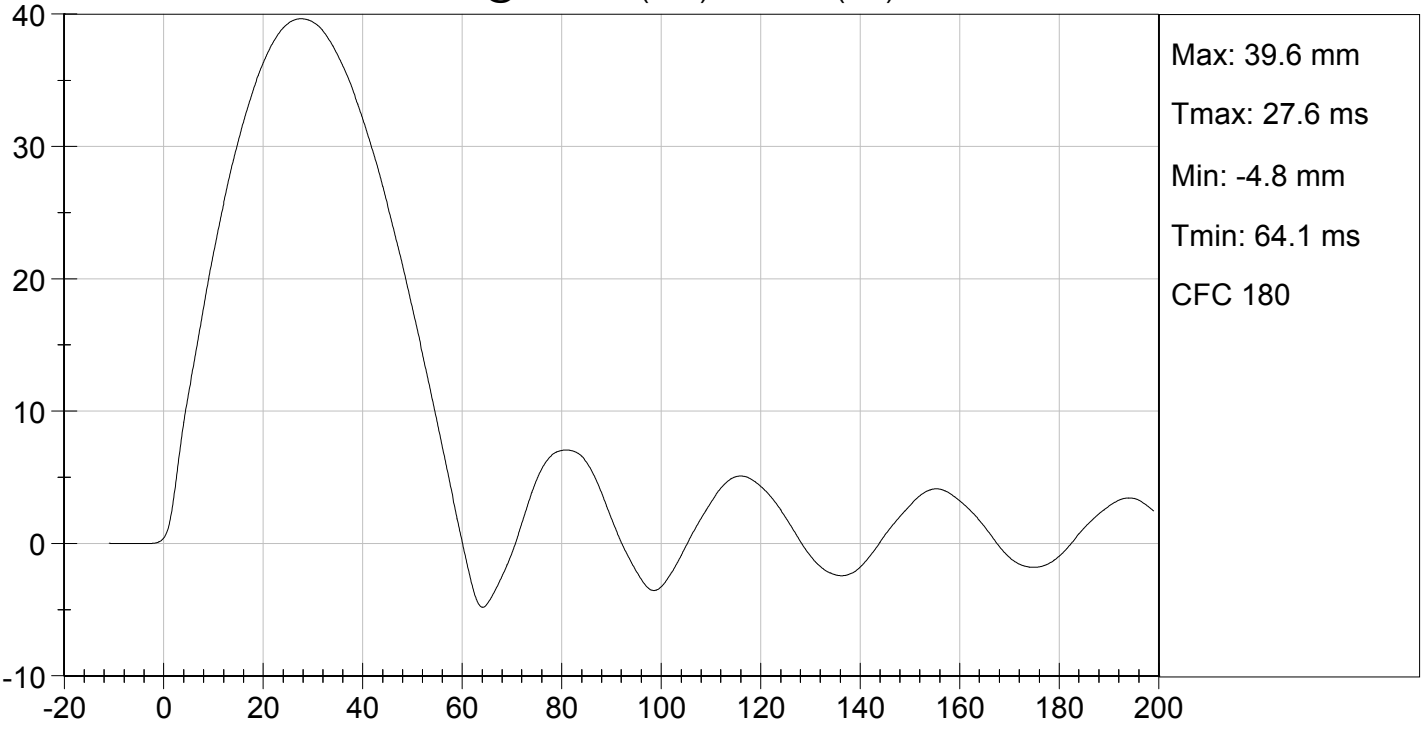
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	37	Pass
Displacement at 459 mm	mm	36.0 to 40.0	39.7	Pass
Displacement at 815 mm	mm	46.0 to 51.0	50.1	Pass
		Overall Test Results		Pass

Laboratory Technician

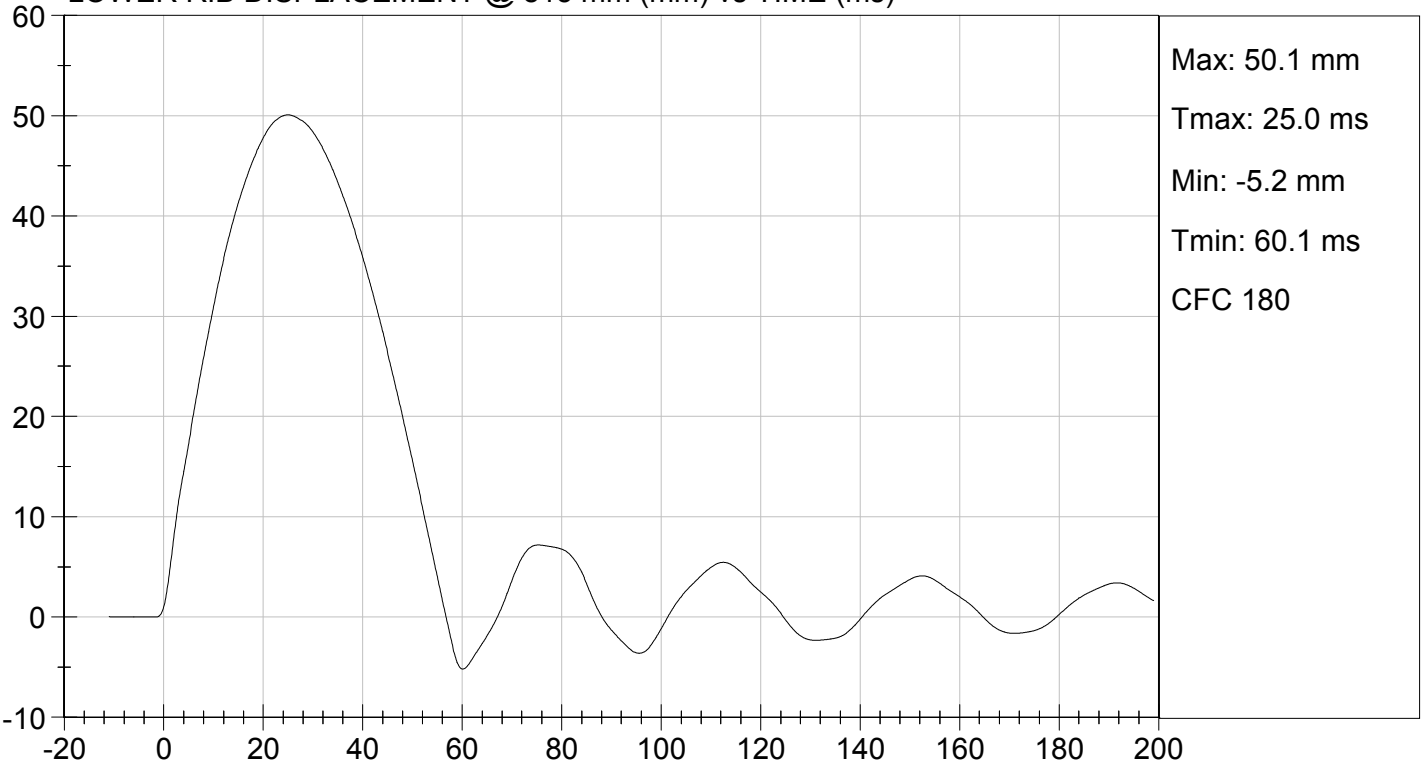
03/10/2016
Test Date

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:** D161000

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Humidity	%	10 to 70	32	Pass
Probe Speed	m/s	5.40 to 5.60	5.40	Pass
Maximum Impactor Force (after 6 ms)	N	5100 to 6200	5963	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	42.1	Pass
		Overall Test Results		Pass

Laboratory Technician

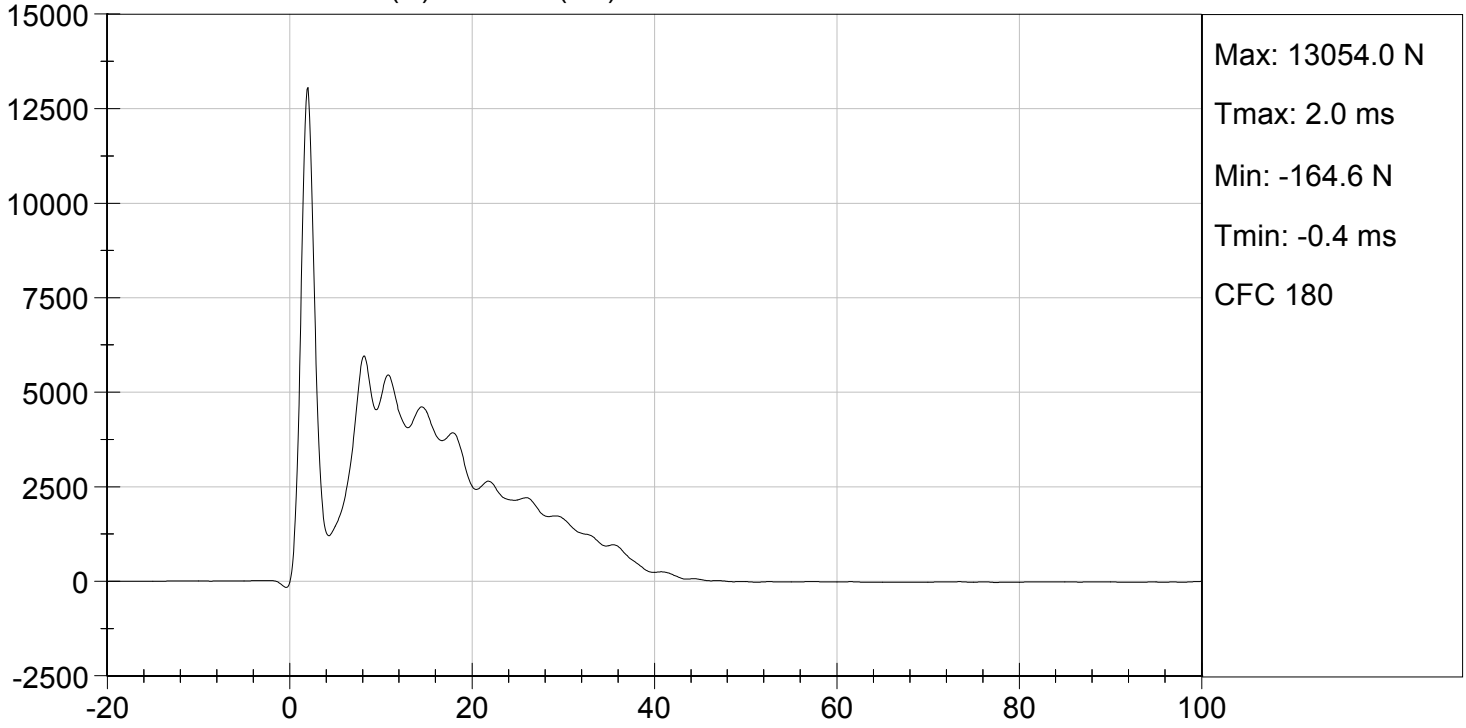
03/11/2016
Test Date

Approved By

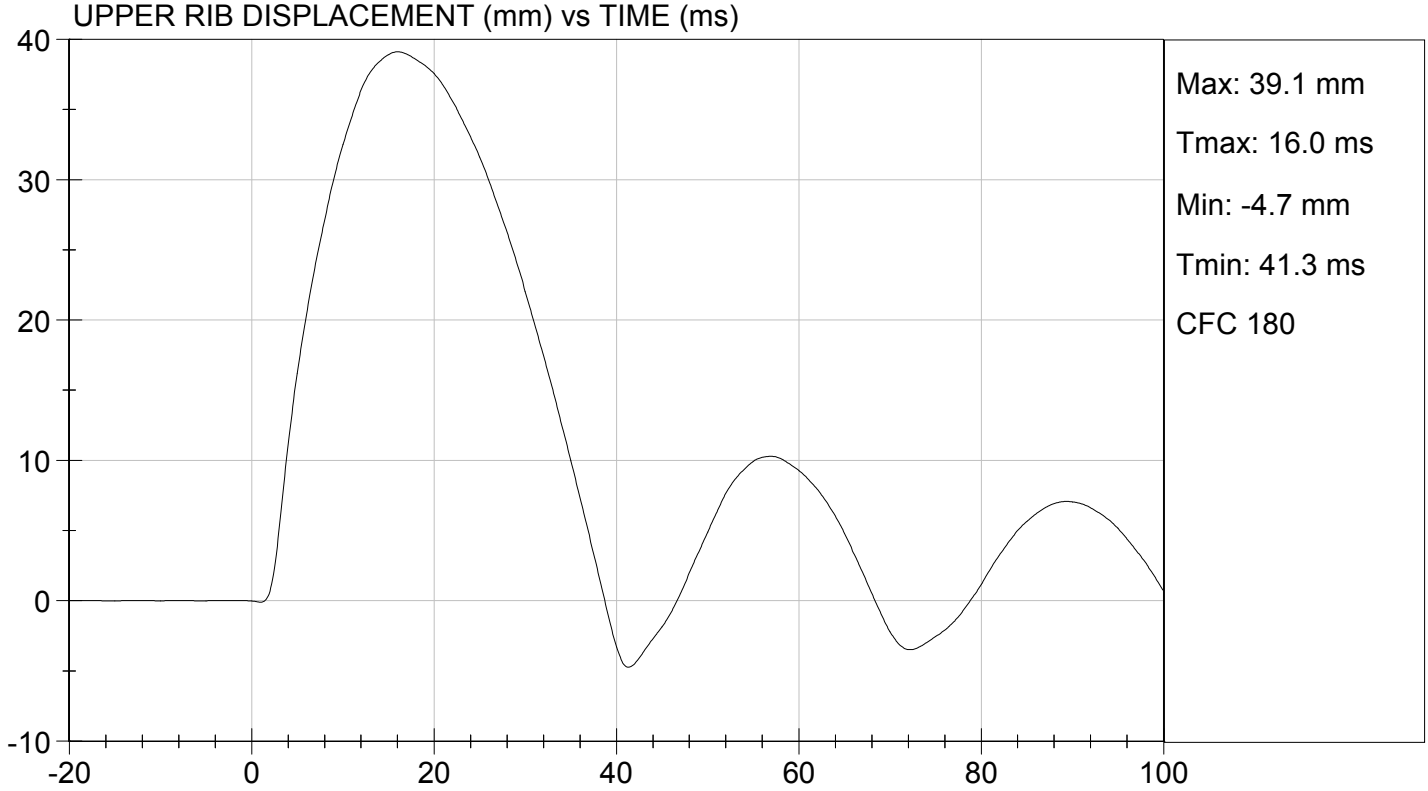
TEST DESC: THORAX IMPACT
VELOCITY: 17.73 ft/s, 5.40 m/s

TEST DATE: 03/11/2016
TEST #: D161000

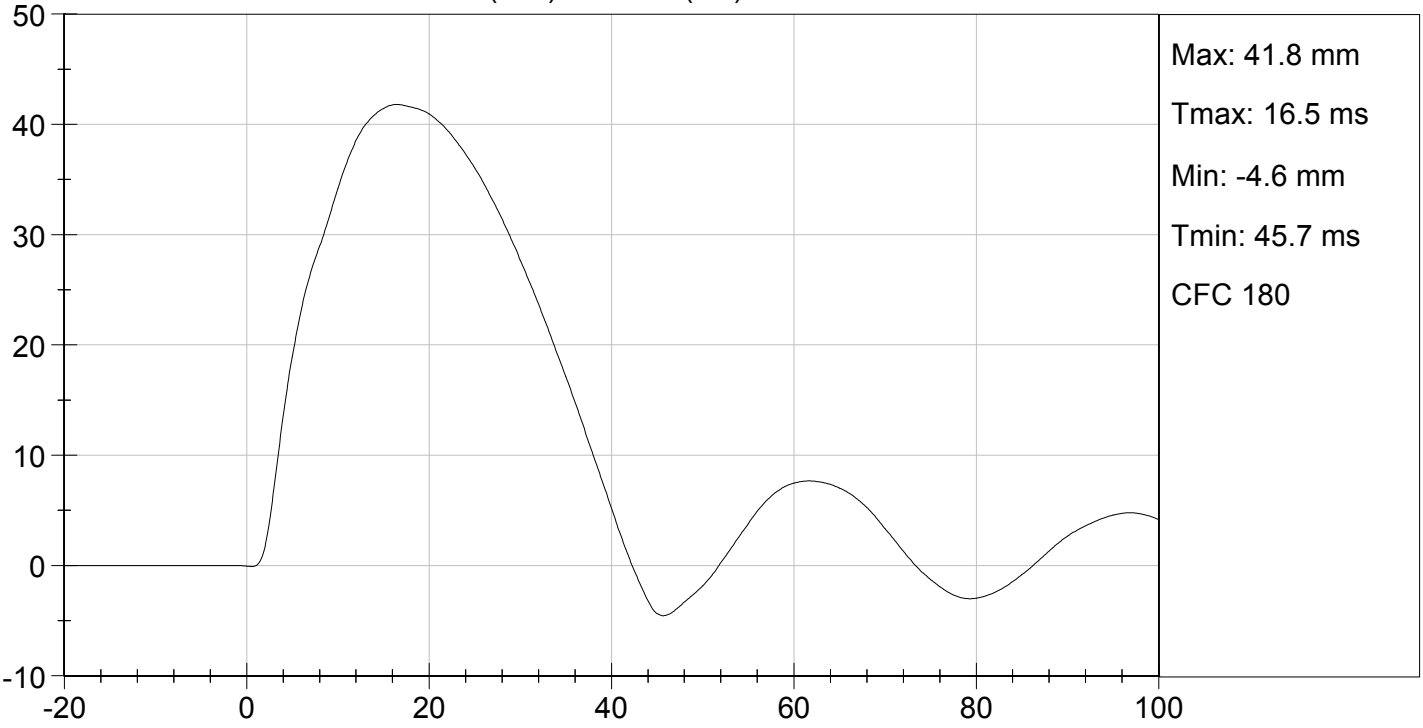
IMPACTOR FORCE (N) vs TIME (ms)



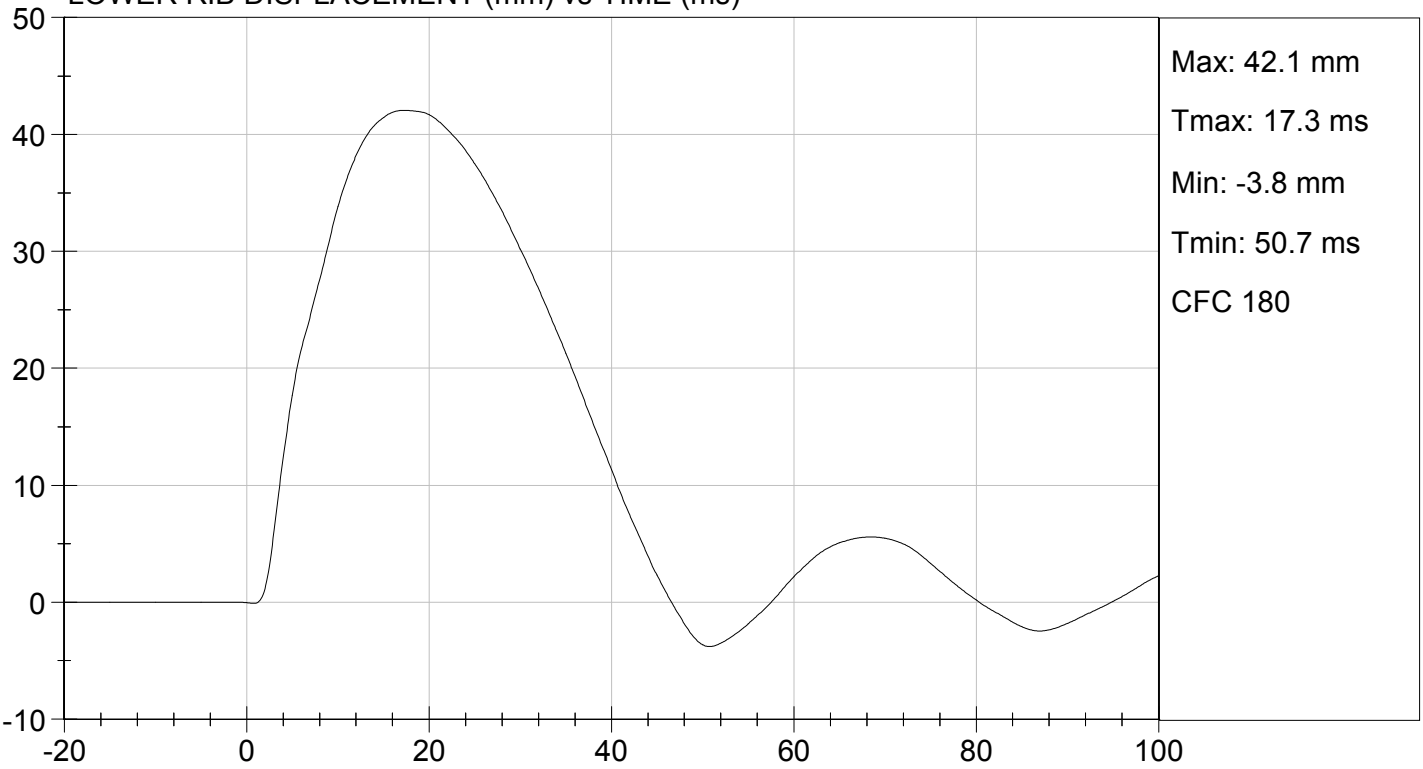
UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

ABDOMEN TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D161007

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	32	Pass
Probe Speed	m/s	3.90 to 4.10	3.91	Pass
Maximum Impactor Force	N	4000 to 4800	4518	Pass
Time of Maximum Impactor Force	ms	10.6 to 13.0	12.1	Pass
Maximum Total Abdomen Force	N	2200 to 2700	2381	Pass
Time of Maximum Abdomen Force	ms	10.0 to 12.3	11.8	Pass
		Overall Test Results		Pass

Laboratory Technician

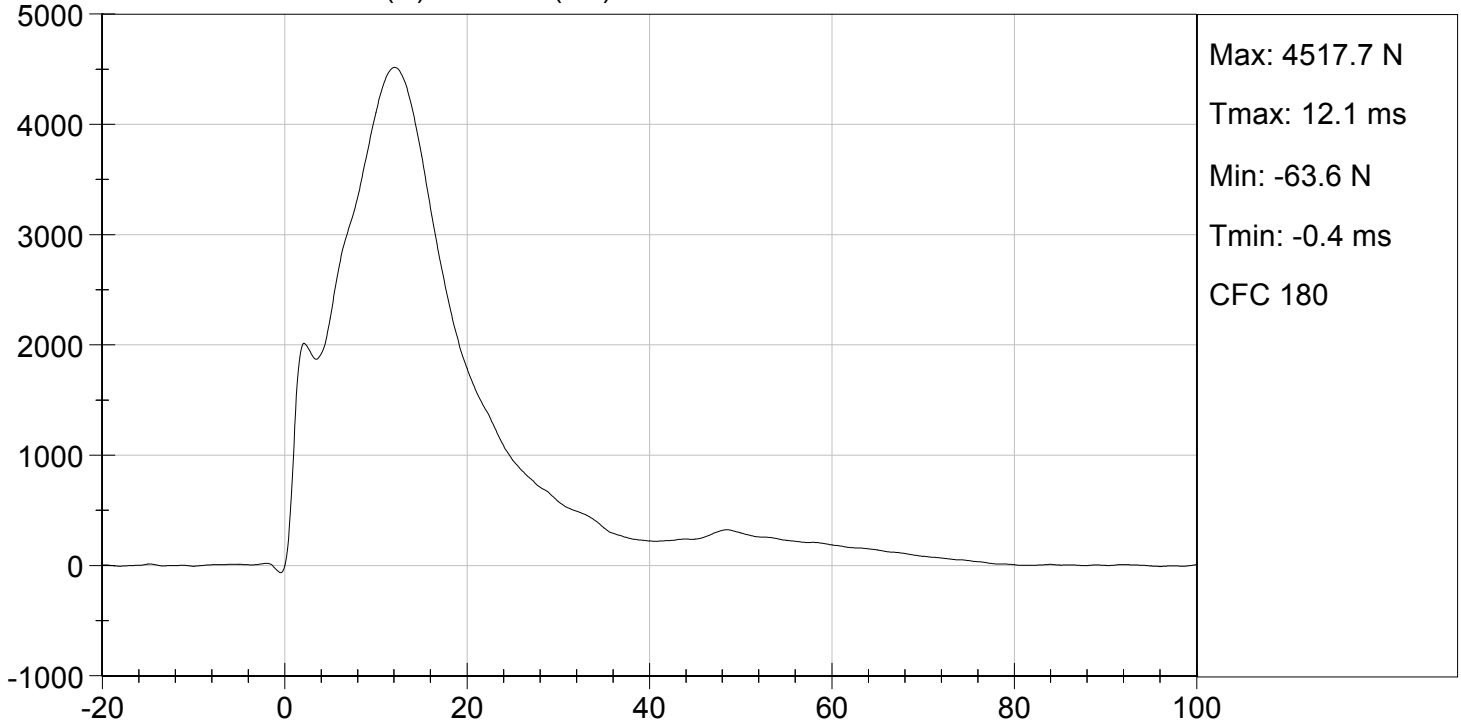
03/11/2016
Test Date

Approved By

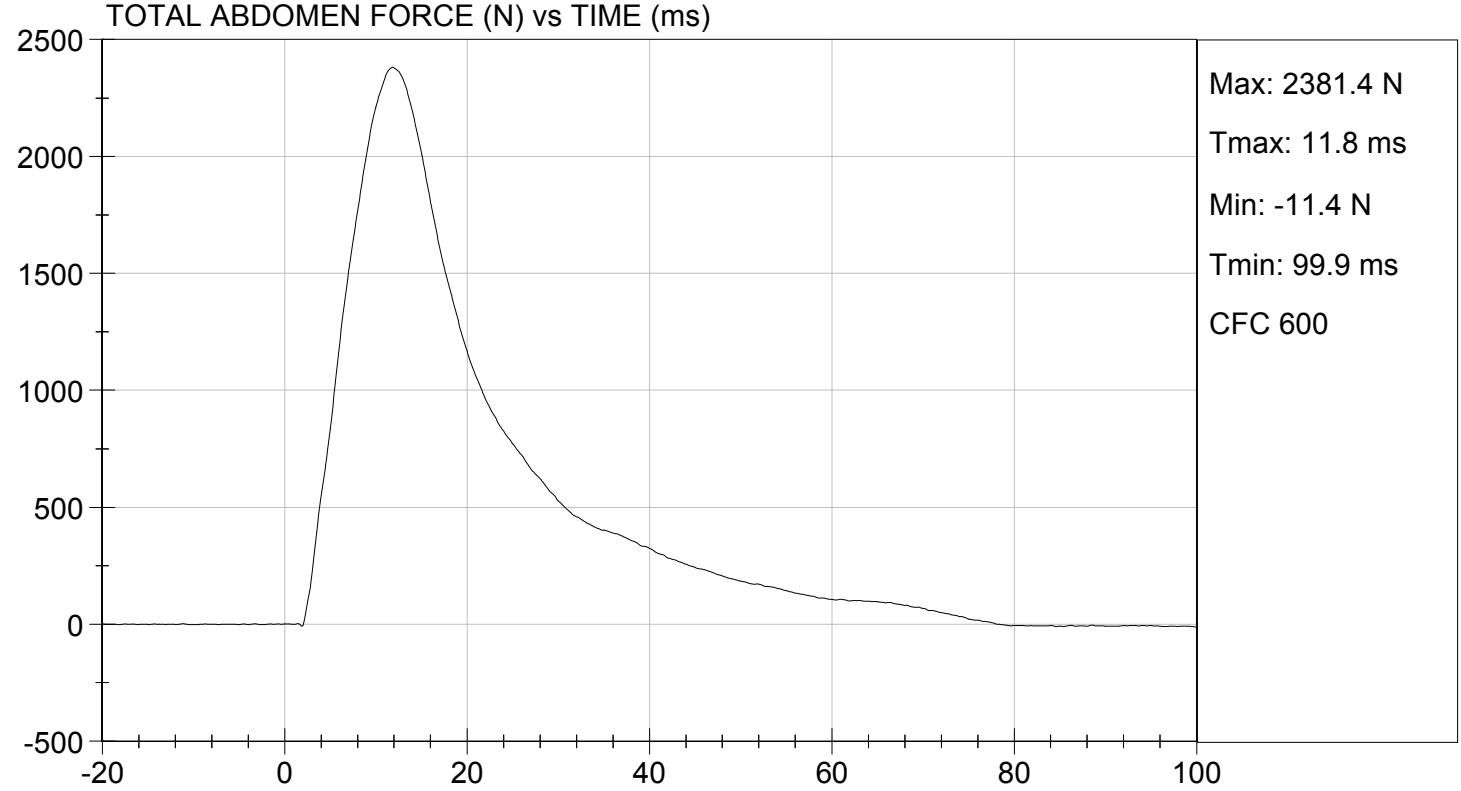
TEST DESC: ABDOMEN IMPACT
VELOCITY: 12.82 ft/s, 3.91 m/s

TEST DATE: 03/11/2016
TEST #: D161007

IMPACTOR FORCE (N) vs TIME (ms)



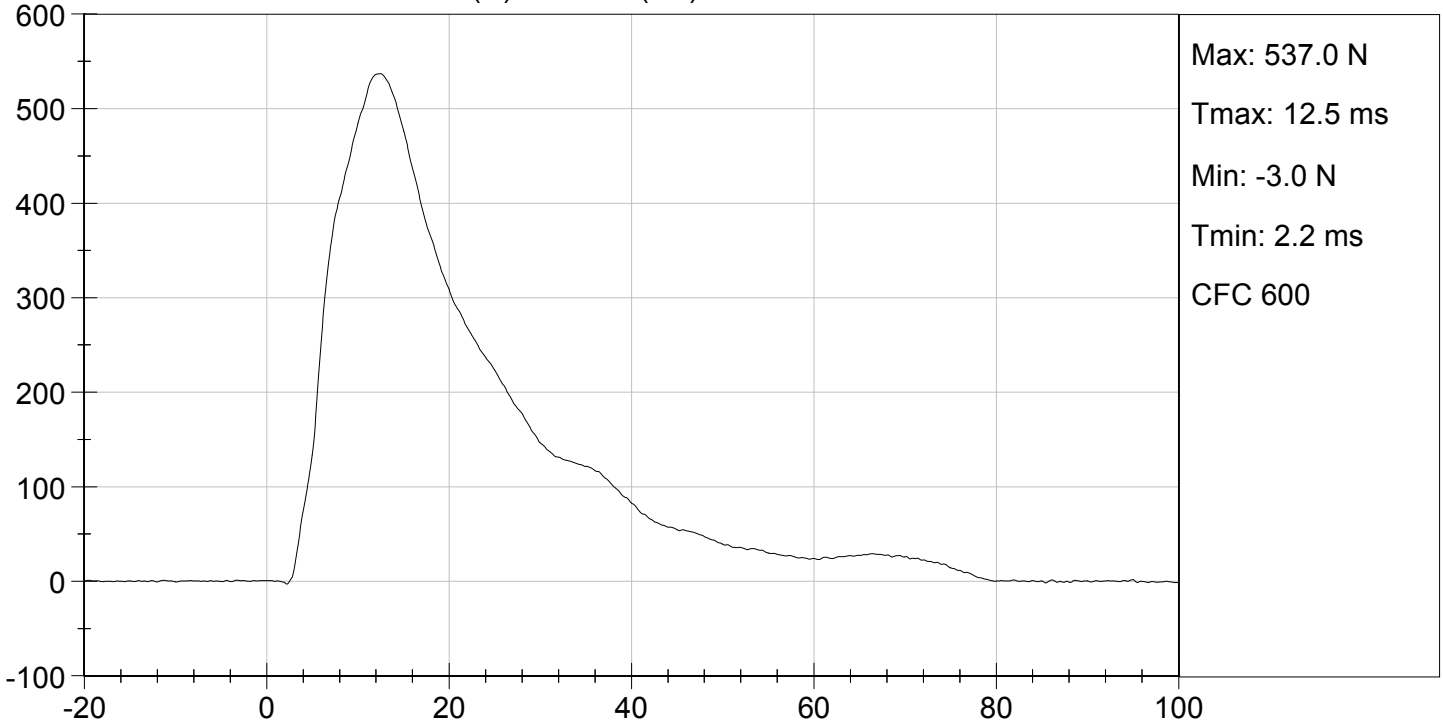
TOTAL ABDOMEN FORCE (N) vs TIME (ms)



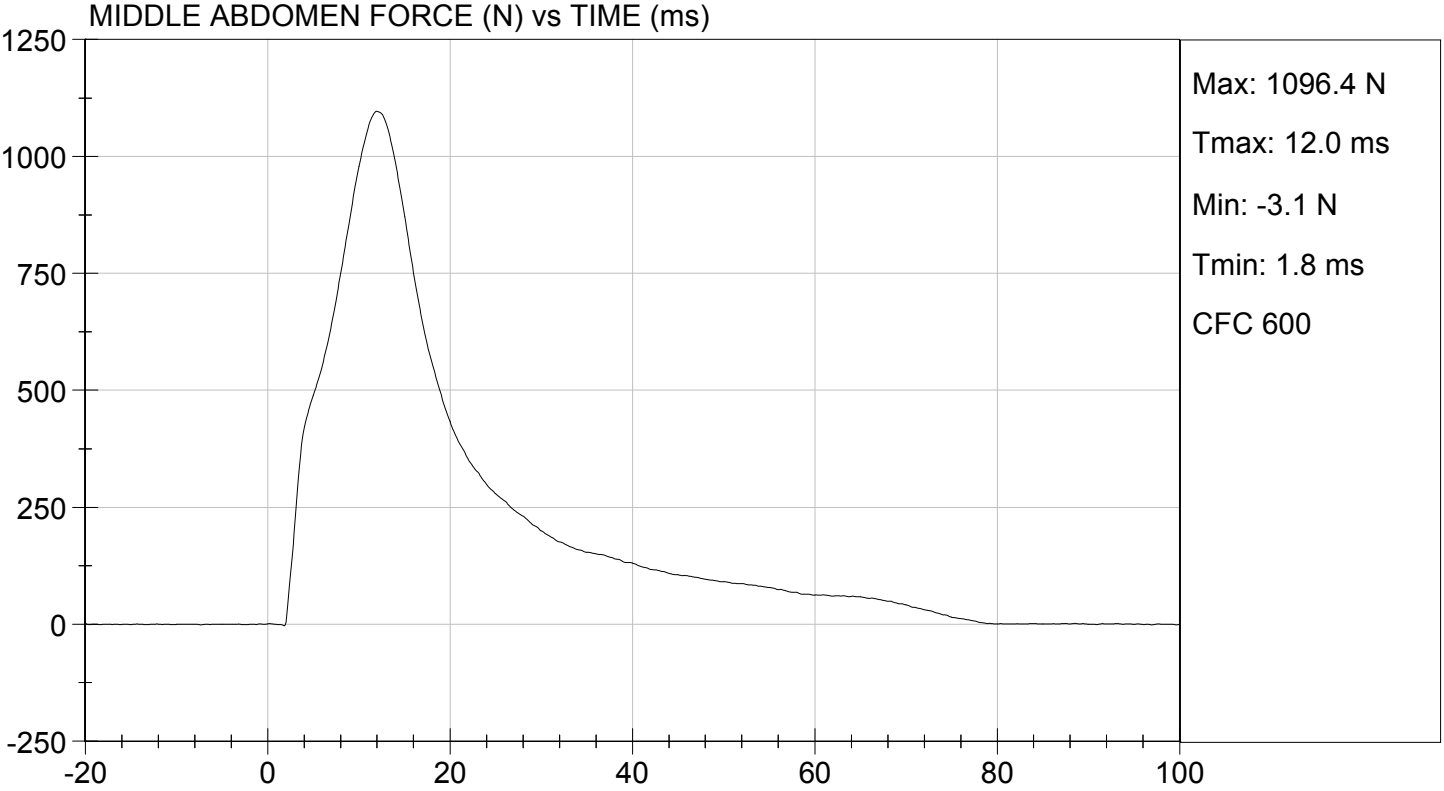
TEST DESC: ABDOMEN IMPACT
VELOCITY: 12.82 ft/s, 3.91 m/s

TEST DATE: 03/11/2016
TEST #: D161007

FRONT ABDOMEN FORCE (N) vs TIME (ms)



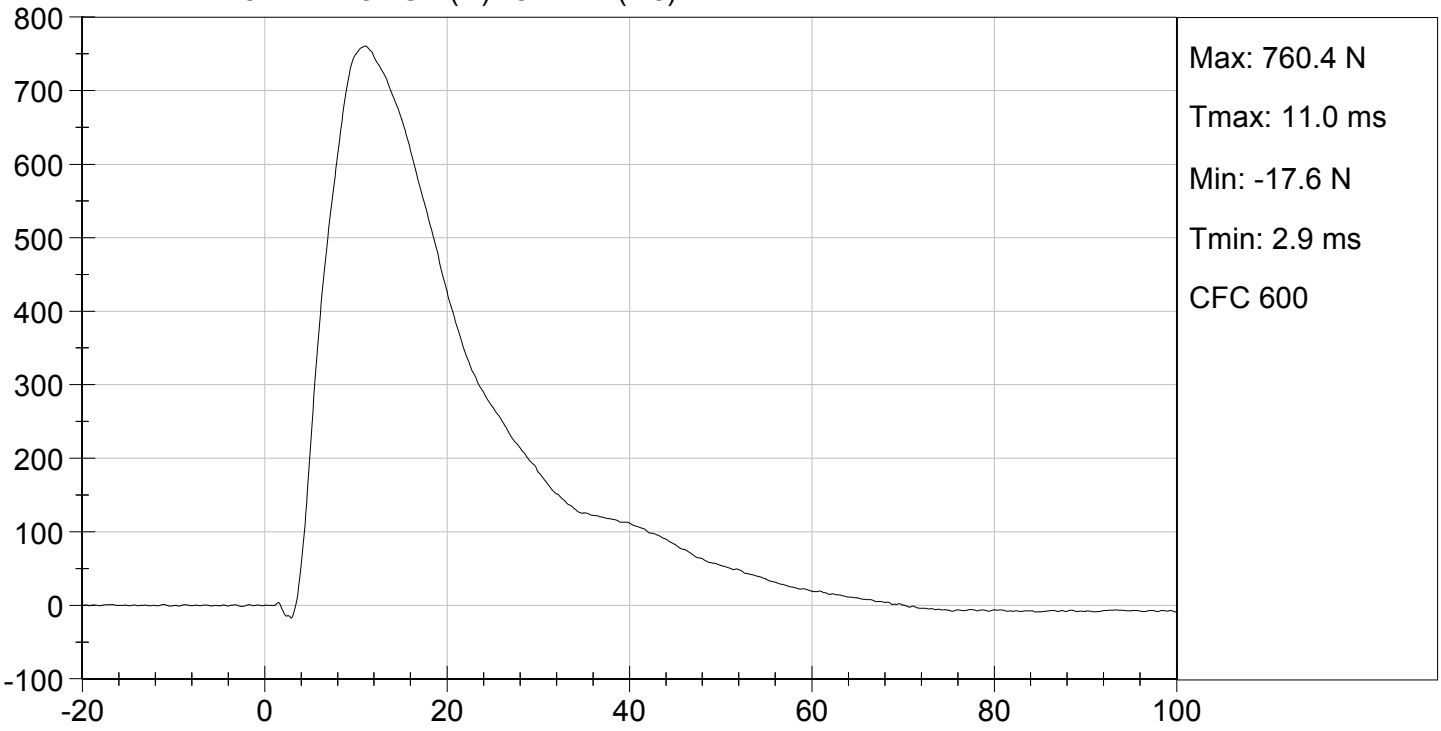
MIDDLE ABDOMEN FORCE (N) vs TIME (ms)



TEST DESC: ABDOMEN IMPACT
VELOCITY: 12.82 ft/s, 3.91 m/s

TEST DATE: 03/11/2016
TEST #: D161007

REAR ABDOMEN FORCE (N) vs TIME (ms)



MGA RESEARCH CORPORATION

LUMBAR SPINE TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D161008

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	37	Pass
Pendulum Speed		m/s	5.95 to 6.15	6.05	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	-0.409	Pass
	27 ms	m/s	-6.50 to -5.80	-5.82	Pass
	30 ms	m/s	>= -6.50	-6.14	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	48.9	Pass
Time of Maximum Flexion Angle		ms	39.0 to 53.0	46.9	Pass
Headform Rotation Decay to Initial Position		ms	37 to 57	45	Pass
			Overall Results		Pass

Jessica Hall
Laboratory Technician

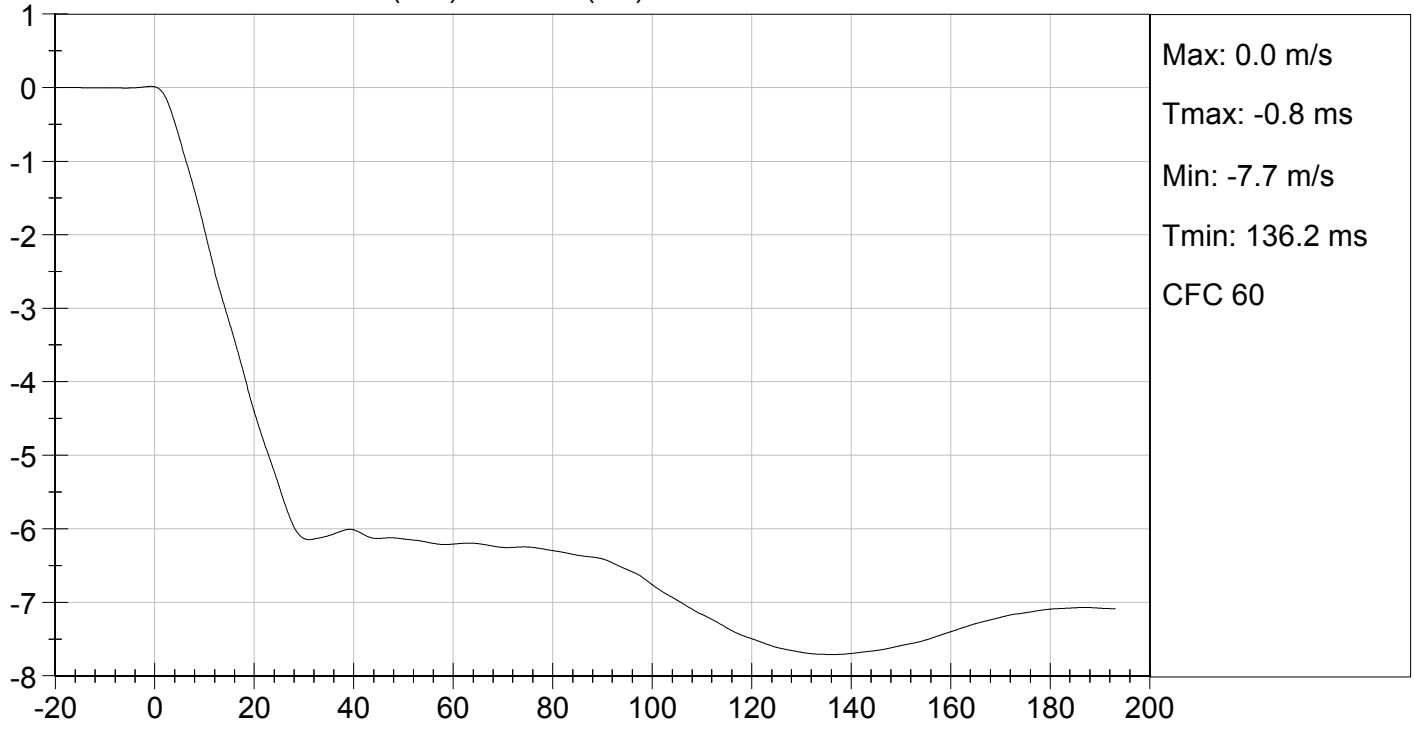
03/10/2016
Test Date

Thom A. Hille
Approved By

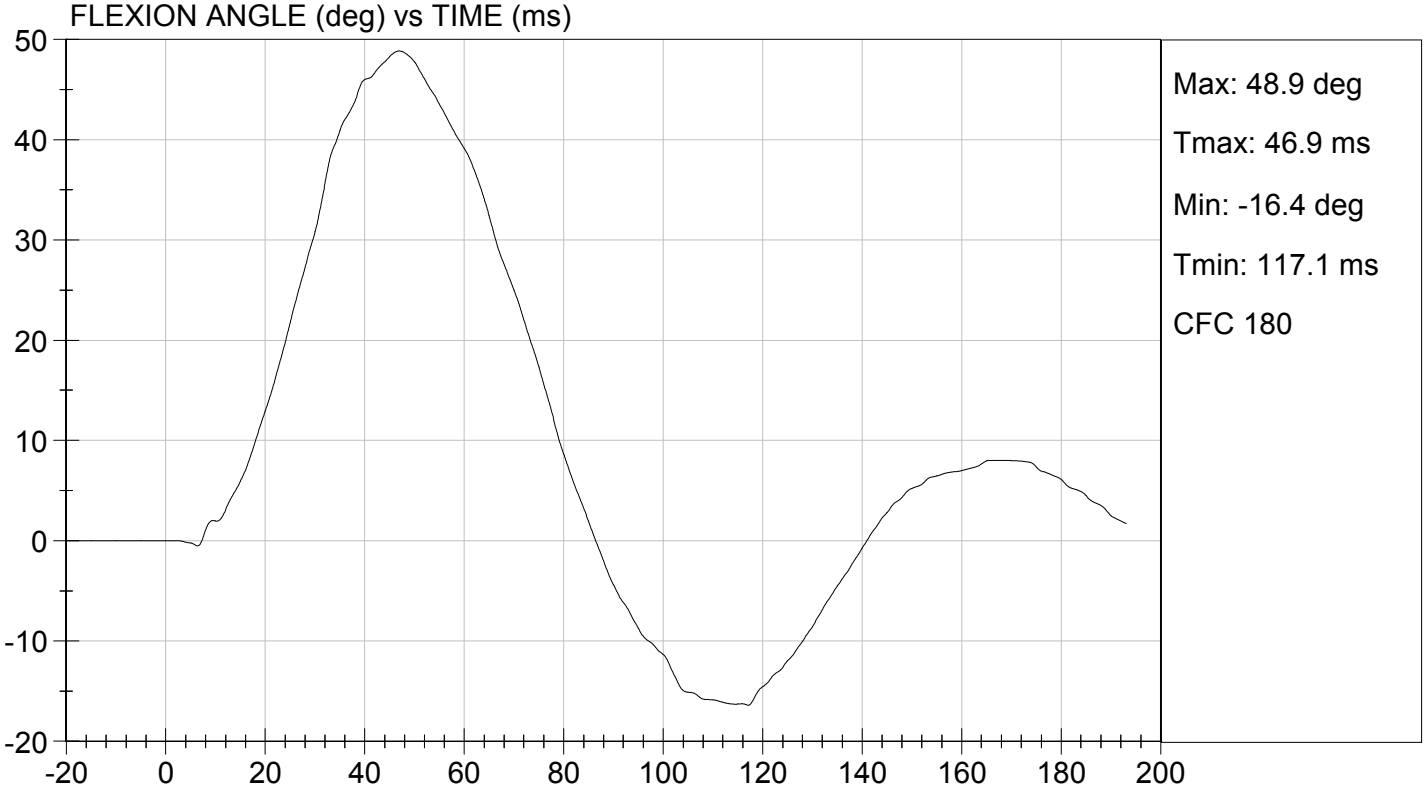
TEST DESC: LUMBAR BENDING
VELOCITY: 19.84 ft/s, 6.05 m/s

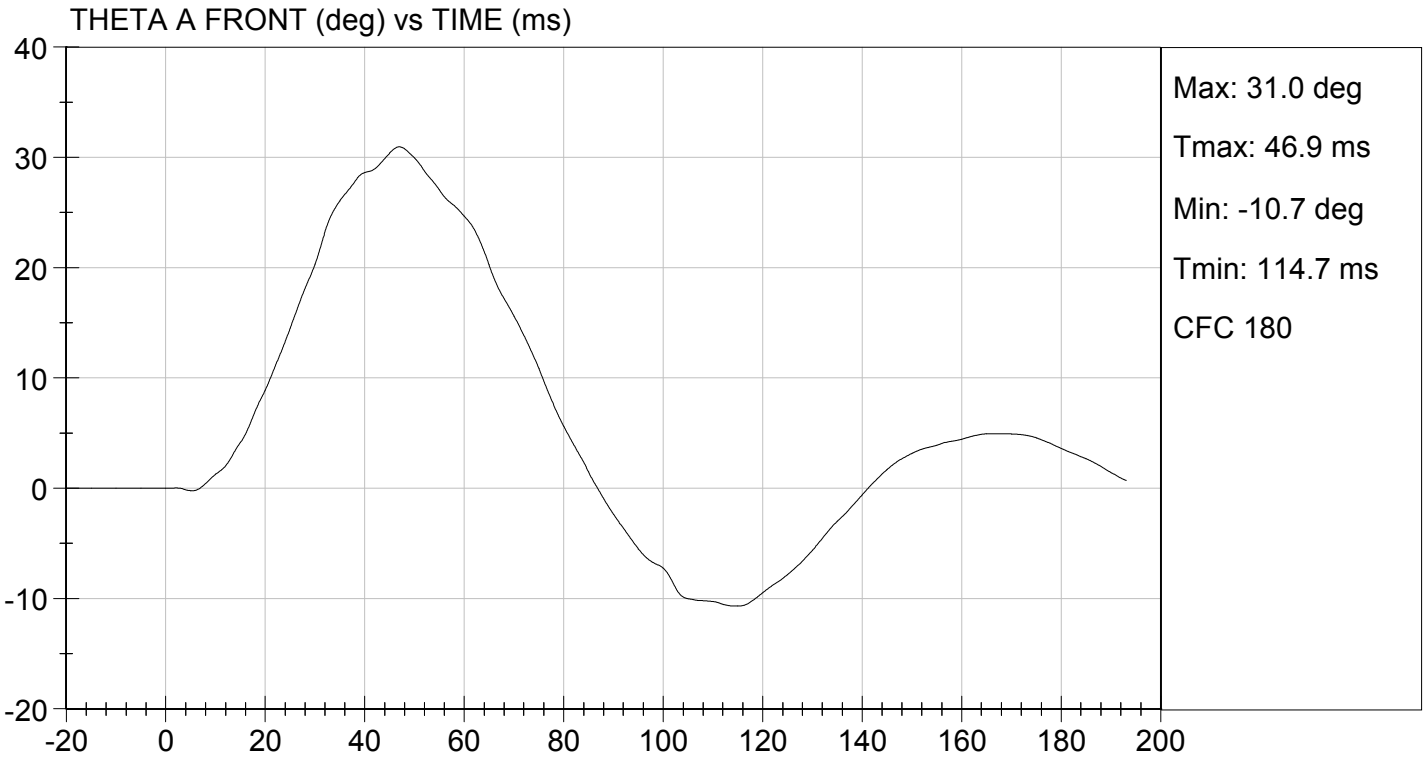
TEST DATE: 03/10/2016
TEST #: D161008

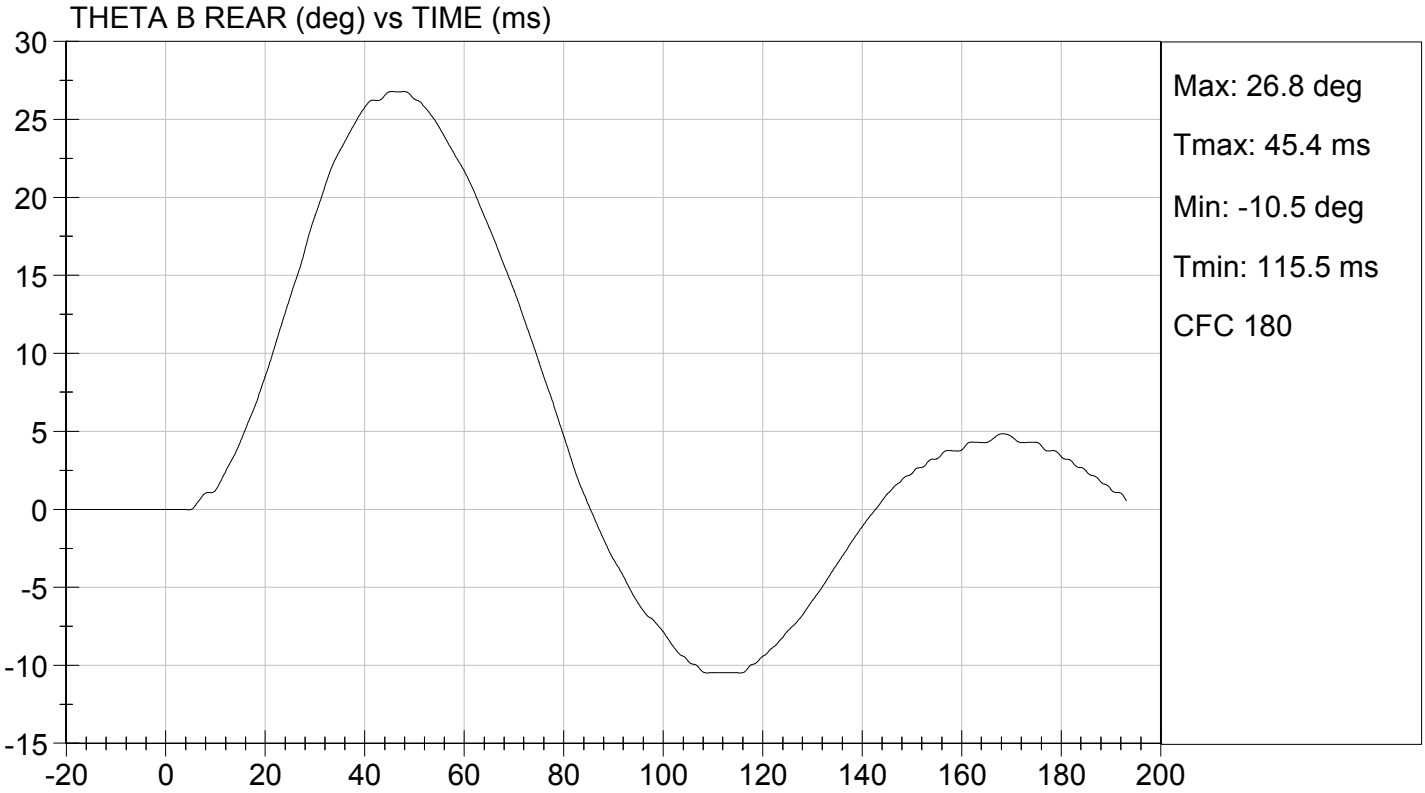
PENDULUM VELOCITY (m/s) vs TIME (ms)



FLEXION ANGLE (deg) vs TIME (ms)

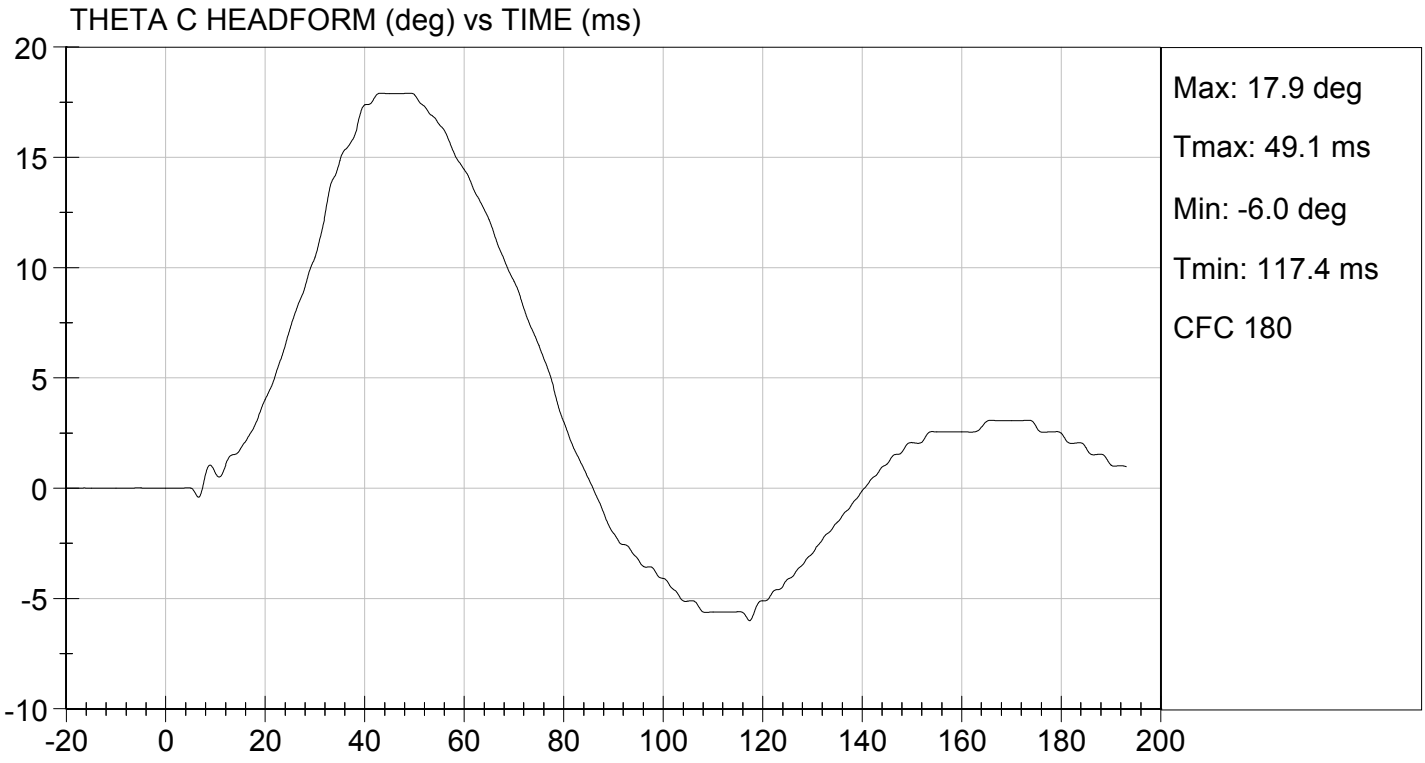



THETA A FRONT (deg) vs TIME (ms)
40
30
20
10
0
-10
-20
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 31.0 deg
Tmax: 46.9 ms
Min: -10.7 deg
Tmin: 114.7 ms
CFC 180


THETA B REAR (deg) vs TIME (ms)
30
25
20
15
10
5
0
-5
-10
-15
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 26.8 deg
Tmax: 45.4 ms
Min: -10.5 deg
Tmin: 115.5 ms
CFC 180

TEST DESC: LUMBAR BENDING
VELOCITY: 19.84 ft/s, 6.05 m/s

TEST DATE: 03/10/2016
TEST #: D161008



MGA RESEARCH CORPORATION

PELVIS TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D161009

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	32	Pass
Probe Speed	m/s	4.20 to 4.40	4.30	Pass
Maximum Impactor Force	N	4700 to 5400	5005	Pass
Time of Maximum Impactor Force	ms	11.8 to 16.1	13.6	Pass
Maximum Pubic Force	N	1230 to 1590	1324	Pass
Time of Maximum Pubic Force	ms	12.2 to 17.0	13.3	Pass
		Overall Test Results		Pass

Laboratory Technician

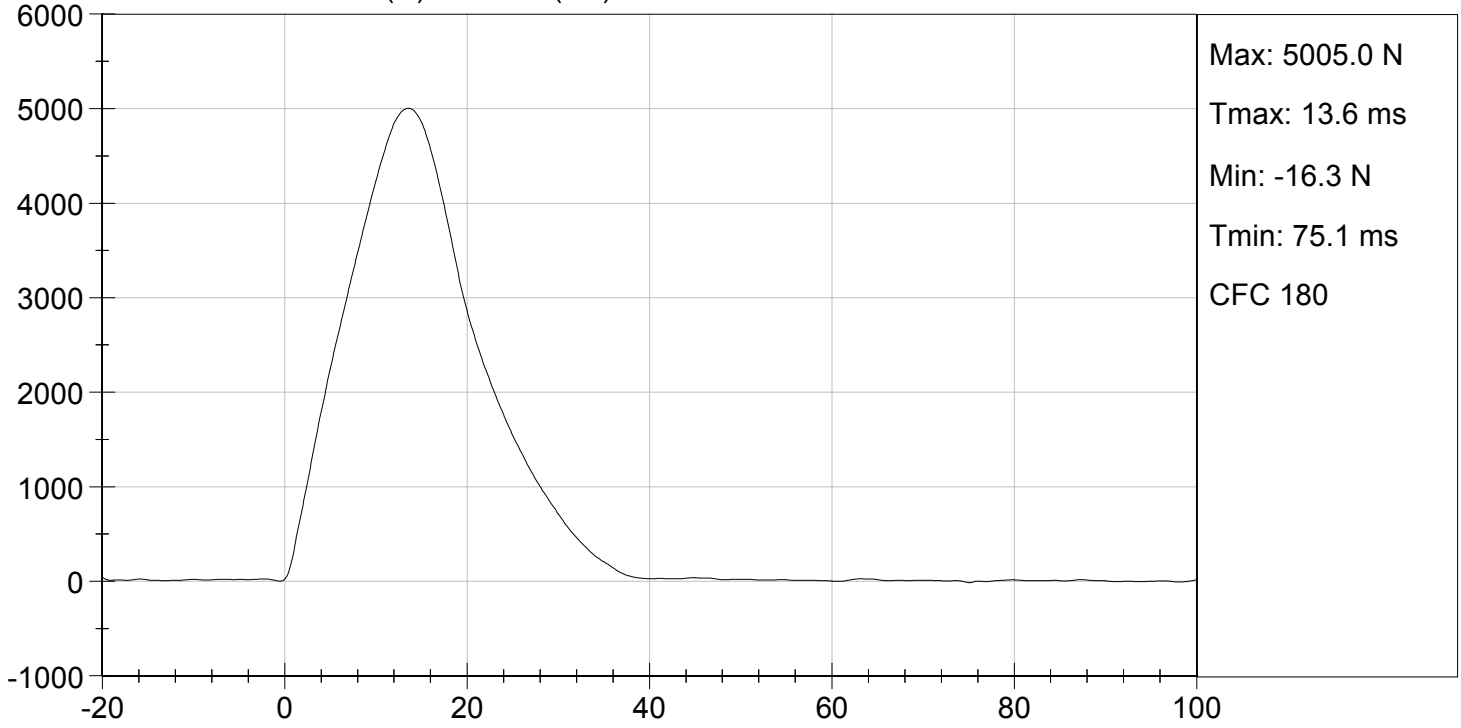
03/11/2016
Test Date

Approved By

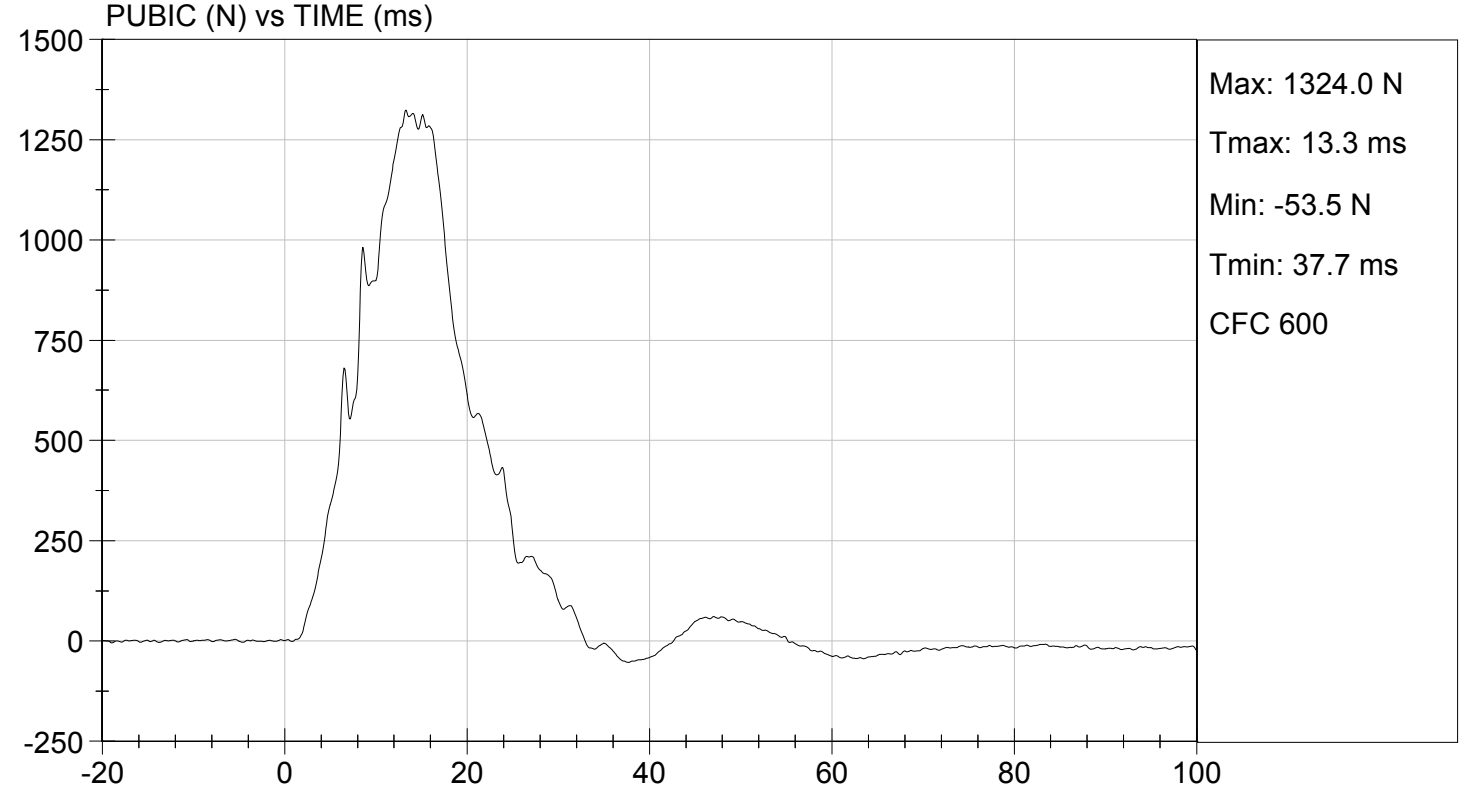
TEST DESC: PELVIS IMPACT
VELOCITY: 14.12 ft/s, 4.3 m/s

TEST DATE: 03/11/2016
TEST #: D161009

IMPACTOR FORCE (N) vs TIME (ms)



PUBIC (N) vs TIME (ms)



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:** D161491

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	32	Pass
Peak Resultant Acceleration	G's	125 to 155	139	Pass
Peak Longitudinal Acceleration	G's	<= +/- 15.0	8.8	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
		Overall Test Results		Pass

Laboratory Technician

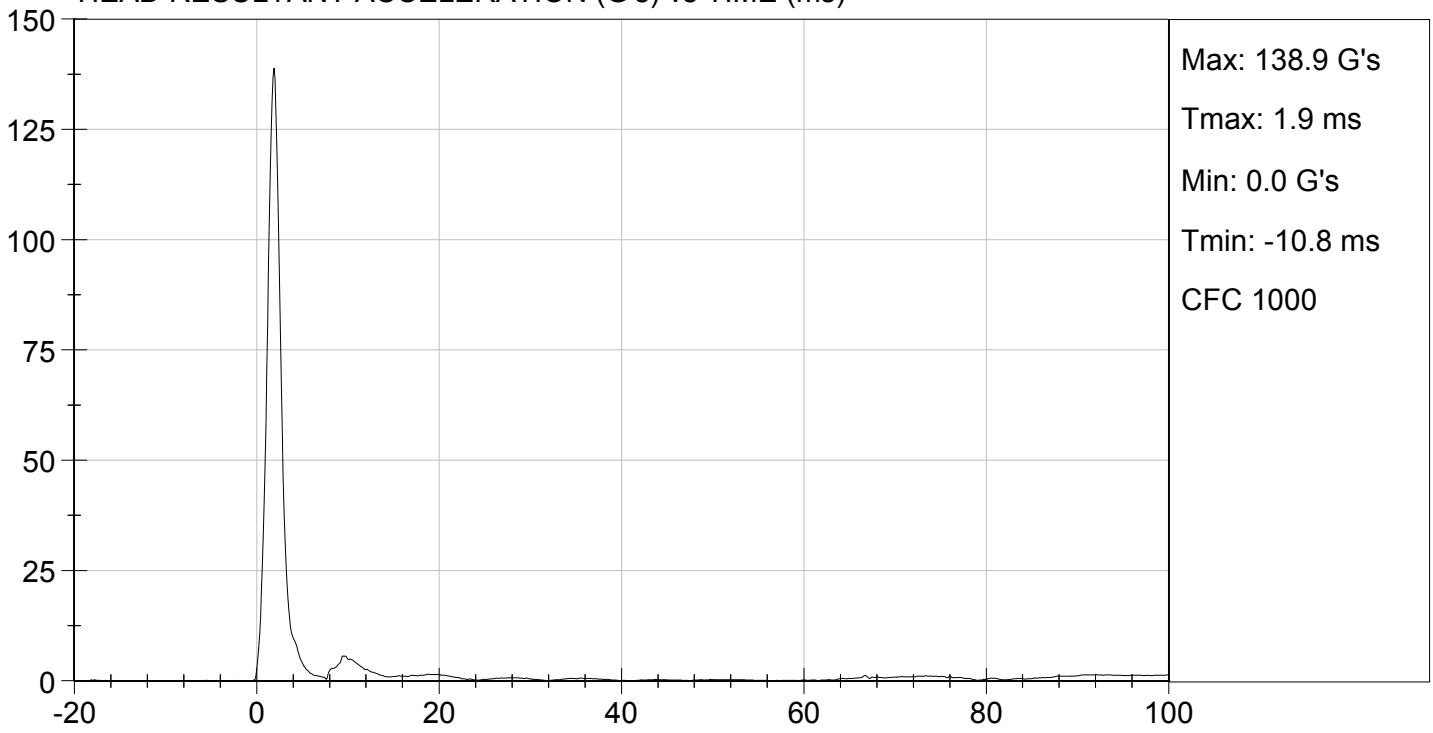
04/27/2016
Test Date

Approved By

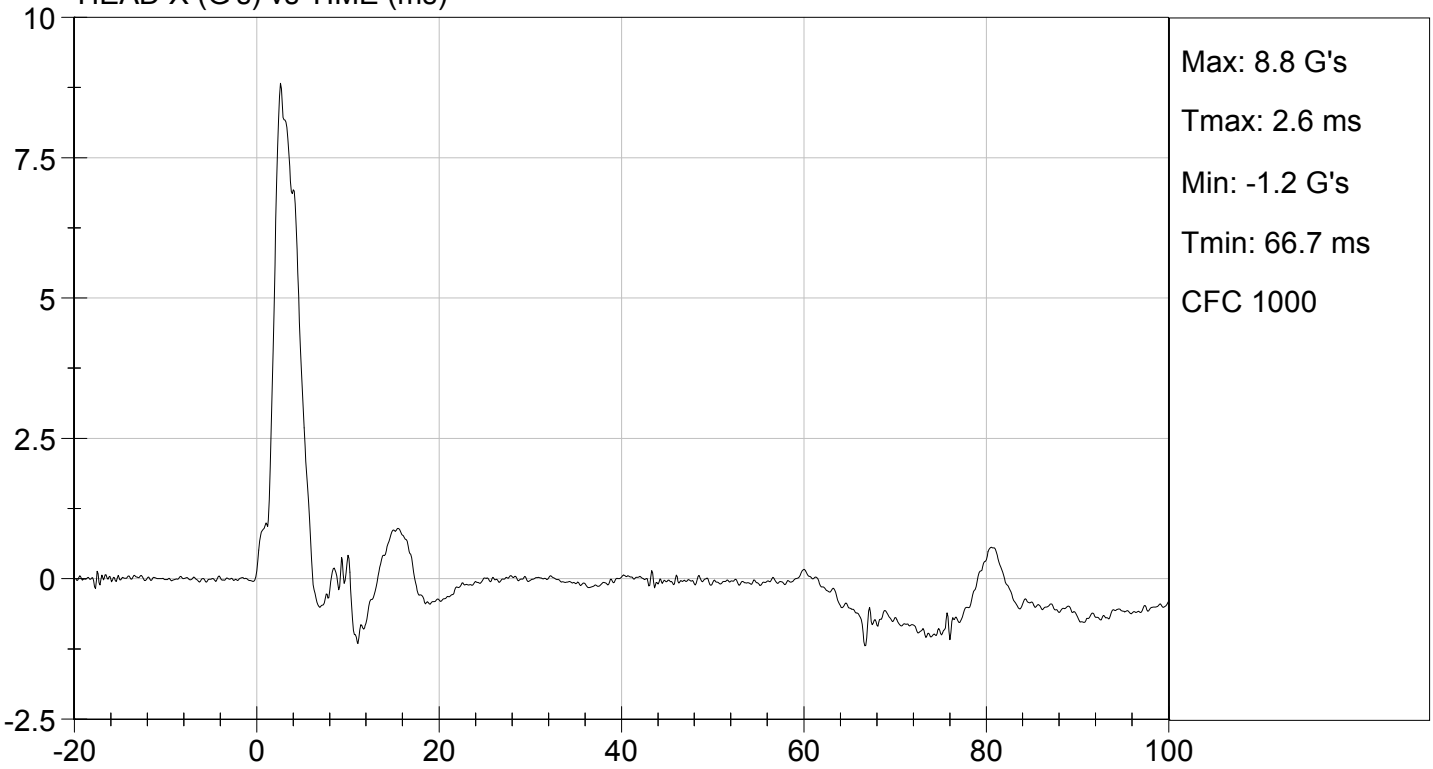
TEST DESC: HEAD DROP

TEST DATE: 04/27/2016
TEST #: D161491

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



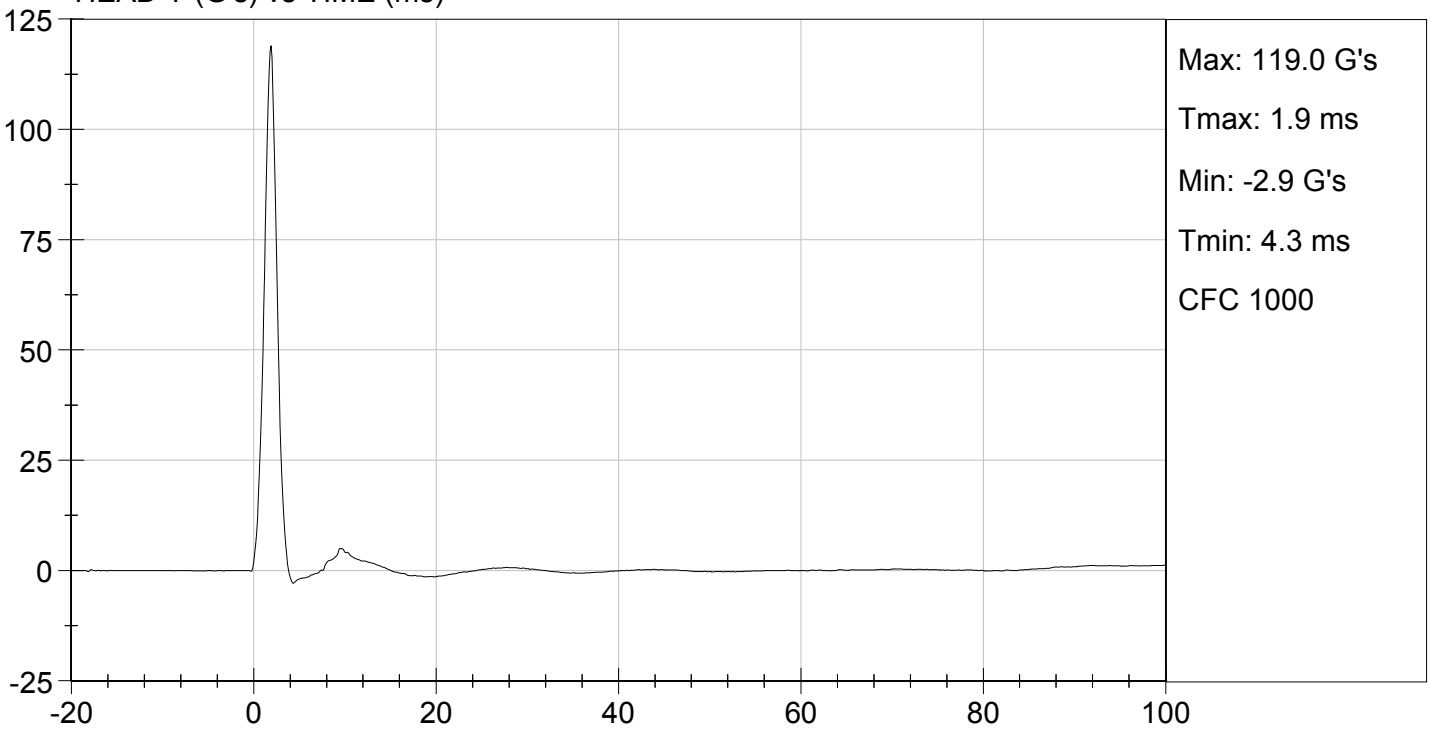
HEAD X (G's) vs TIME (ms)



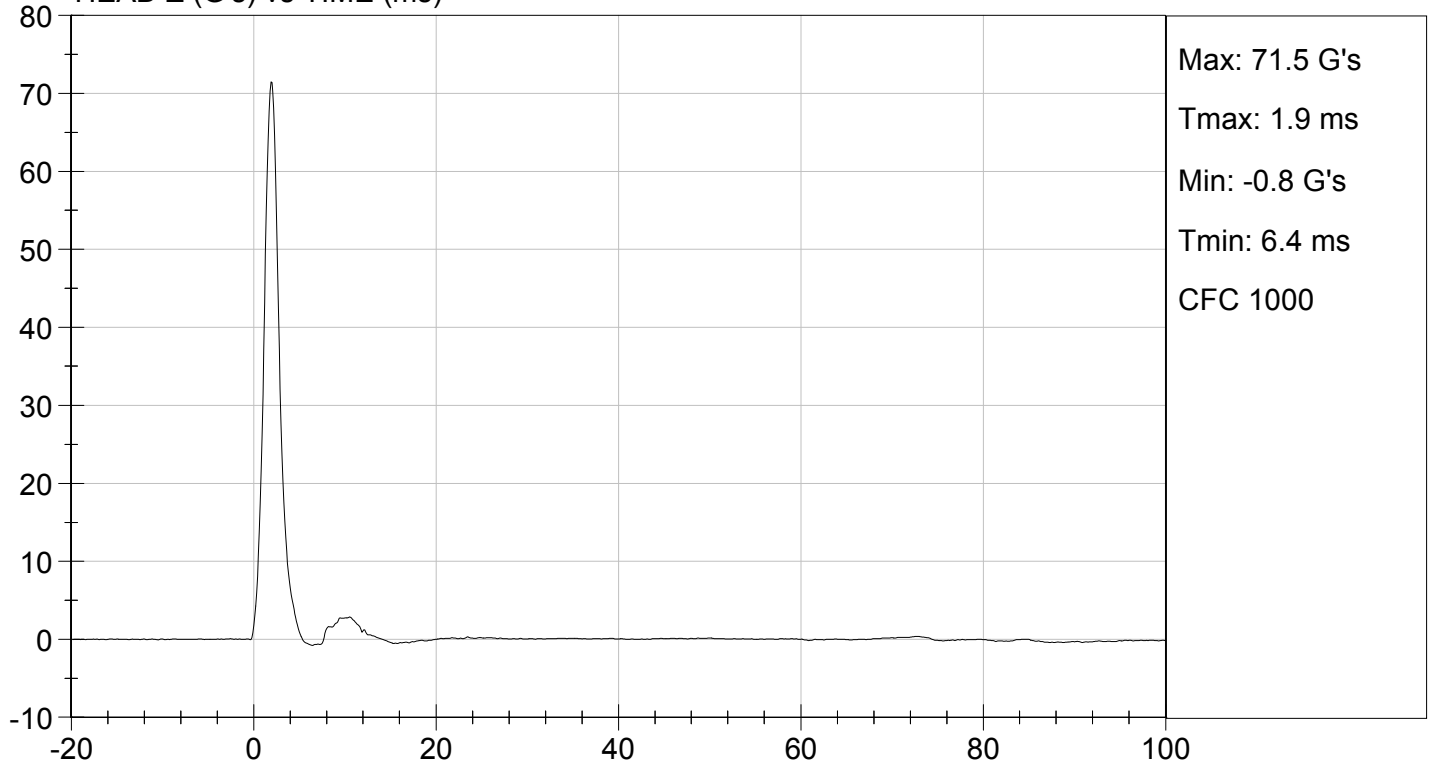
TEST DESC: HEAD DROP

TEST DATE: 04/27/2016
TEST #: D161491

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



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



MGA RESEARCH CORPORATION

NECK PENDULUM TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D161492

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	32	Pass
Pendulum Speed		m/s	3.30 to 3.50	3.46	Pass
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	-0.03	Pass
	3 ms	m/s	-0.25 to -0.375	-0.32	Pass
	14 ms	m/s	-3.20 to -3.70	-3.23	Pass
	17 ms	m/s	>= -3.70	-3.47	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	49.6	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	59.3	Pass
Head Rotation Decay Time to 0 Degree		ms	53.0 to 88.0	60.1	Pass
			Overall Results		Pass

Jessica Hall

Laboratory Technician

04/27/2016

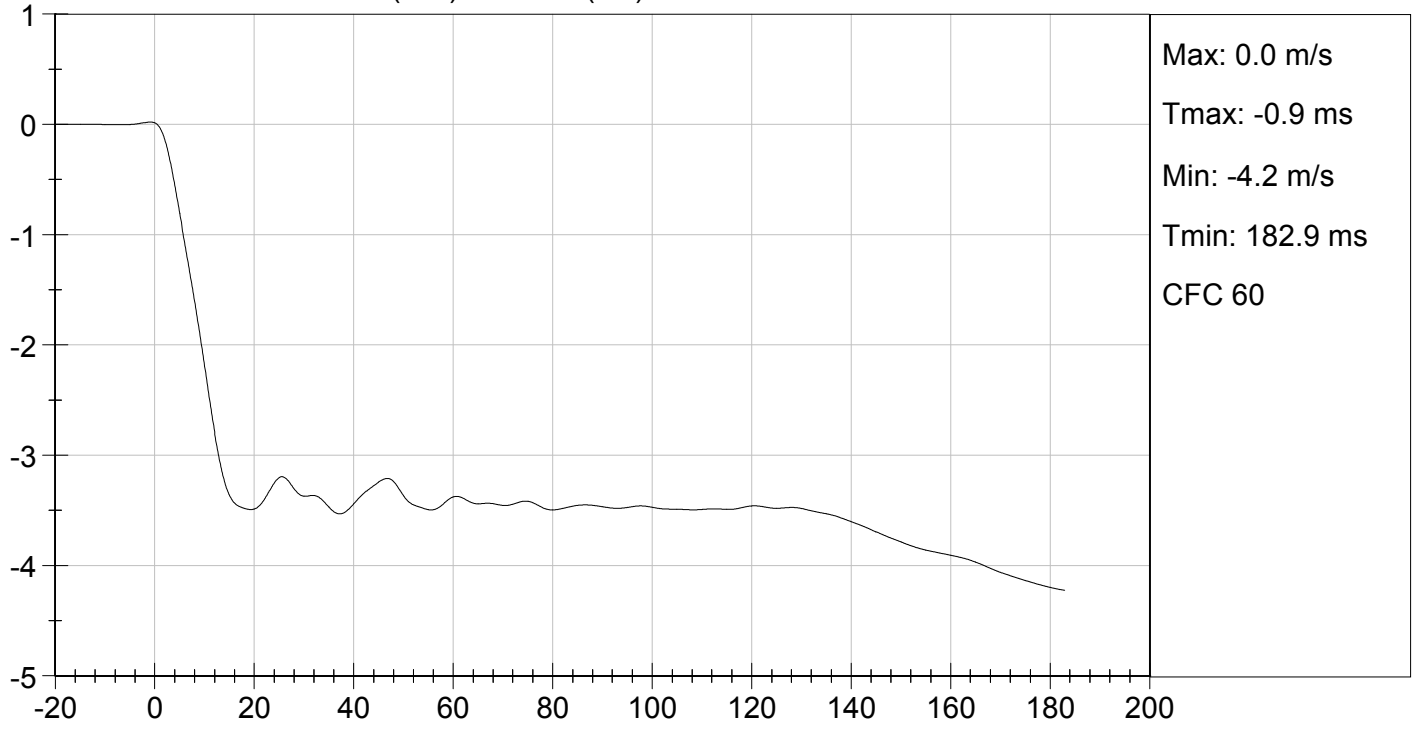
Test Date

Approved By

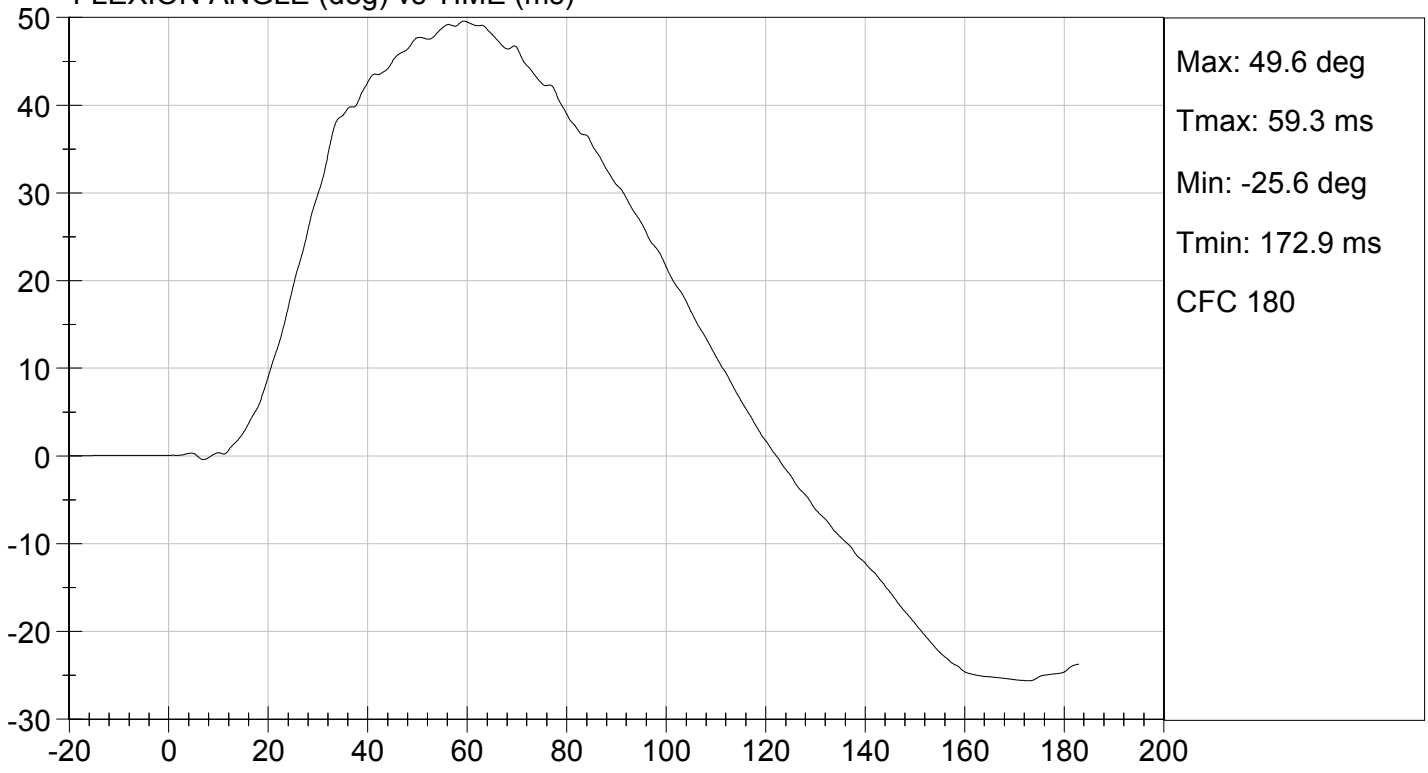
TEST DESC: NECK BENDING
VELOCITY: 11.34 ft/s, 3.46 m/s

TEST DATE: 04/27/2016
TEST #: D161492

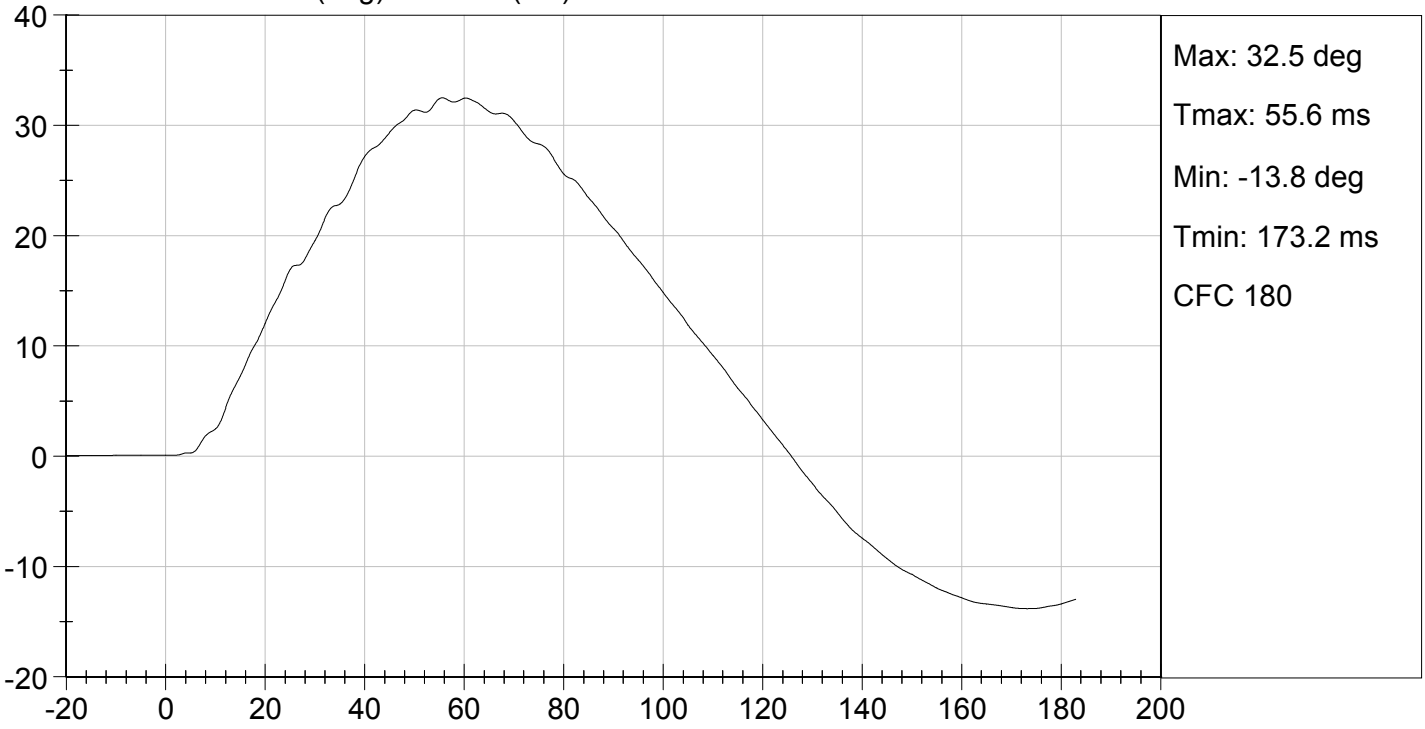
PENDULUM VELOCITY (m/s) vs TIME (ms)



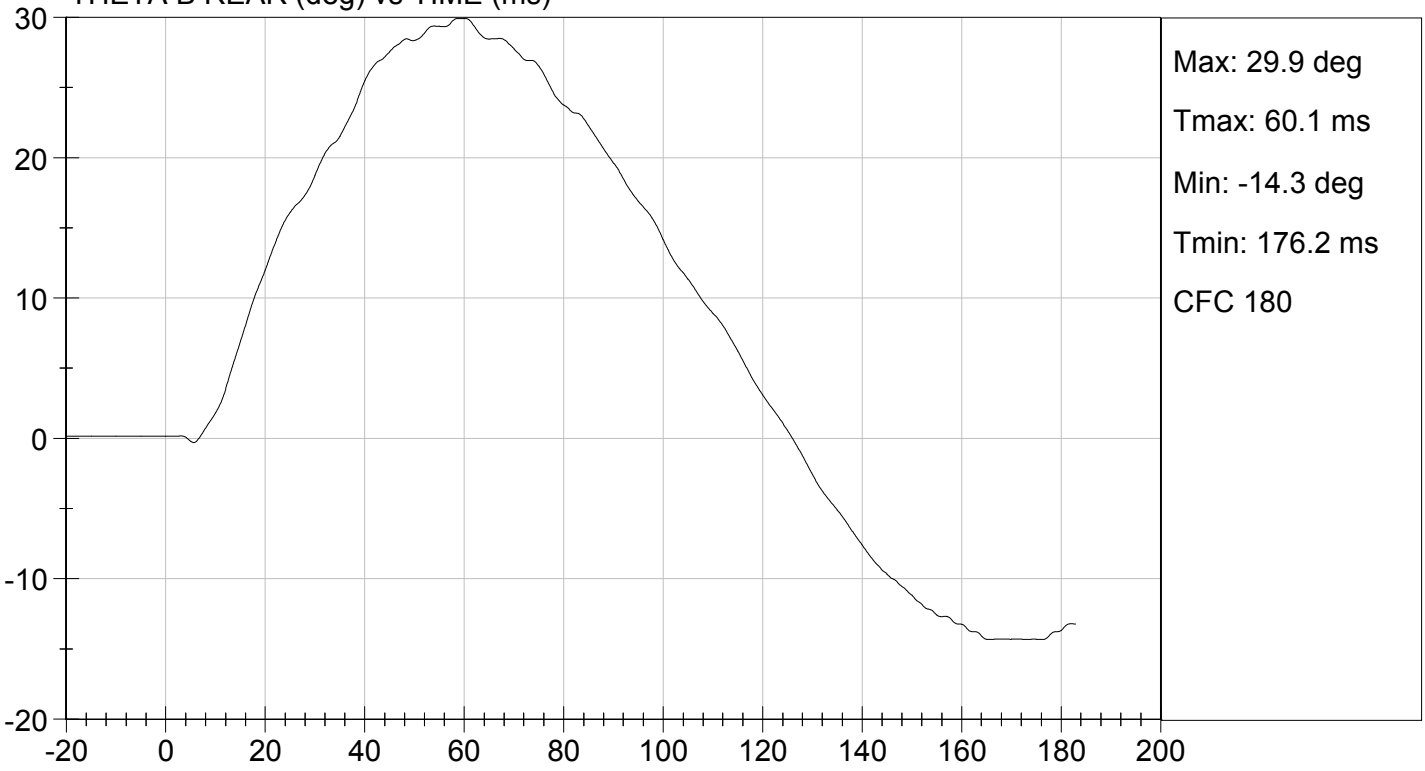
FLEXION ANGLE (deg) vs TIME (ms)



THETA A FRONT (deg) vs TIME (ms)

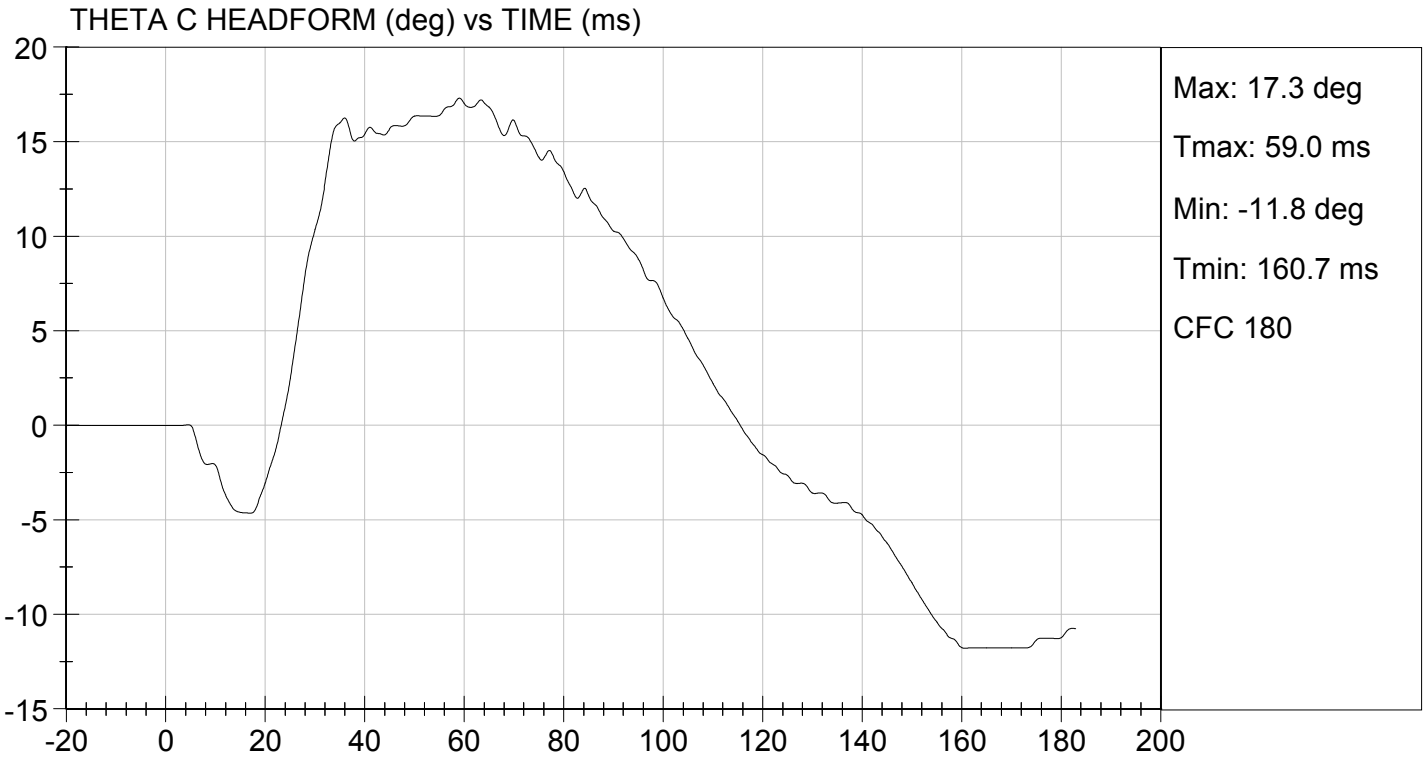


THETA B REAR (deg) vs TIME (ms)



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

TEST DATE: 04/27/2016
TEST #: D161492



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D161493

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	27	Pass
Pendulum Speed	m/s	4.20 to 4.40	4.34	Pass
Peak Impactor Acceleration	G's	7.5 to 10.5	9.9	Pass
		Overall Test Results		Pass

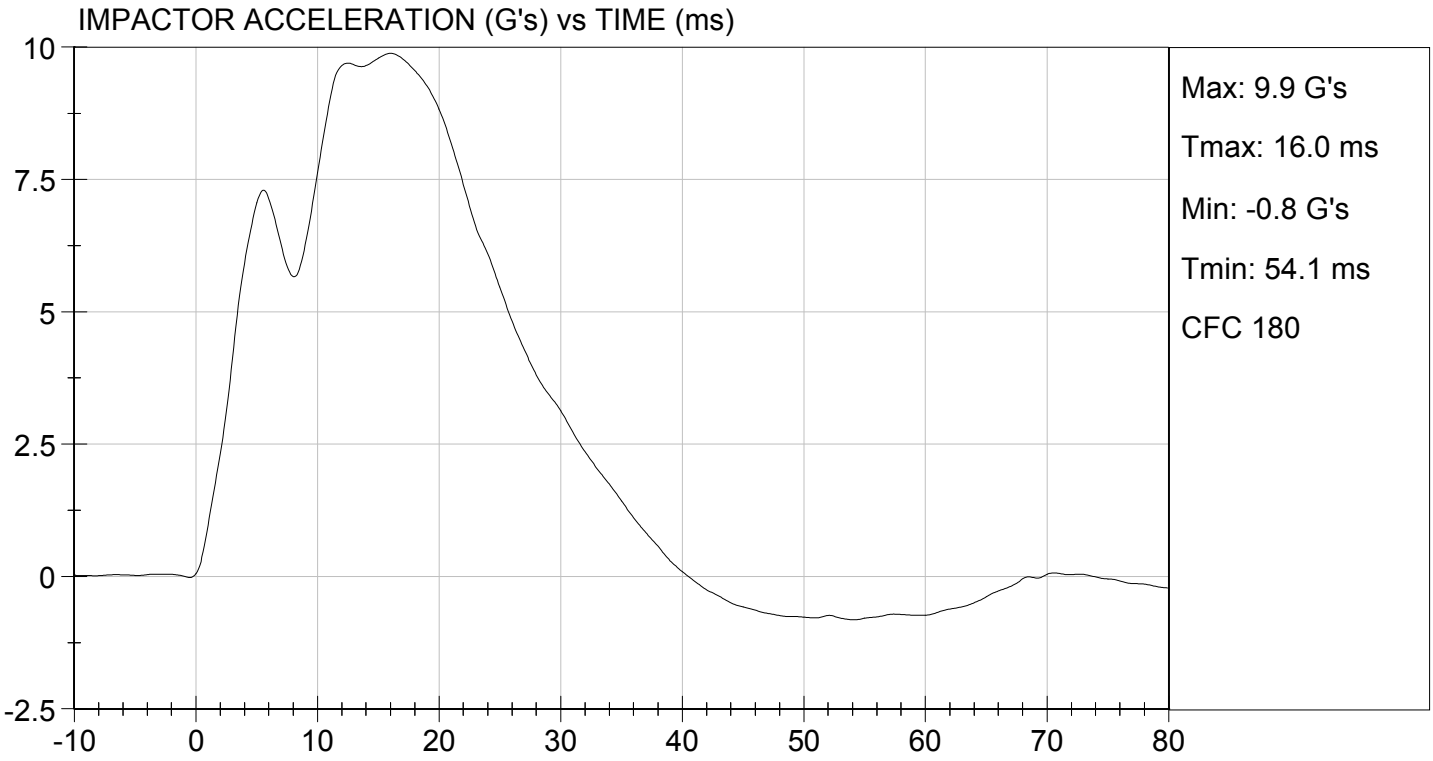
Laboratory Technician

04/27/2016
Test Date

Approved By

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

TEST DATE: 04/27/2016
TEST #: D161493



MGA RESEARCH CORPORATION

UPPER RIB TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D161494

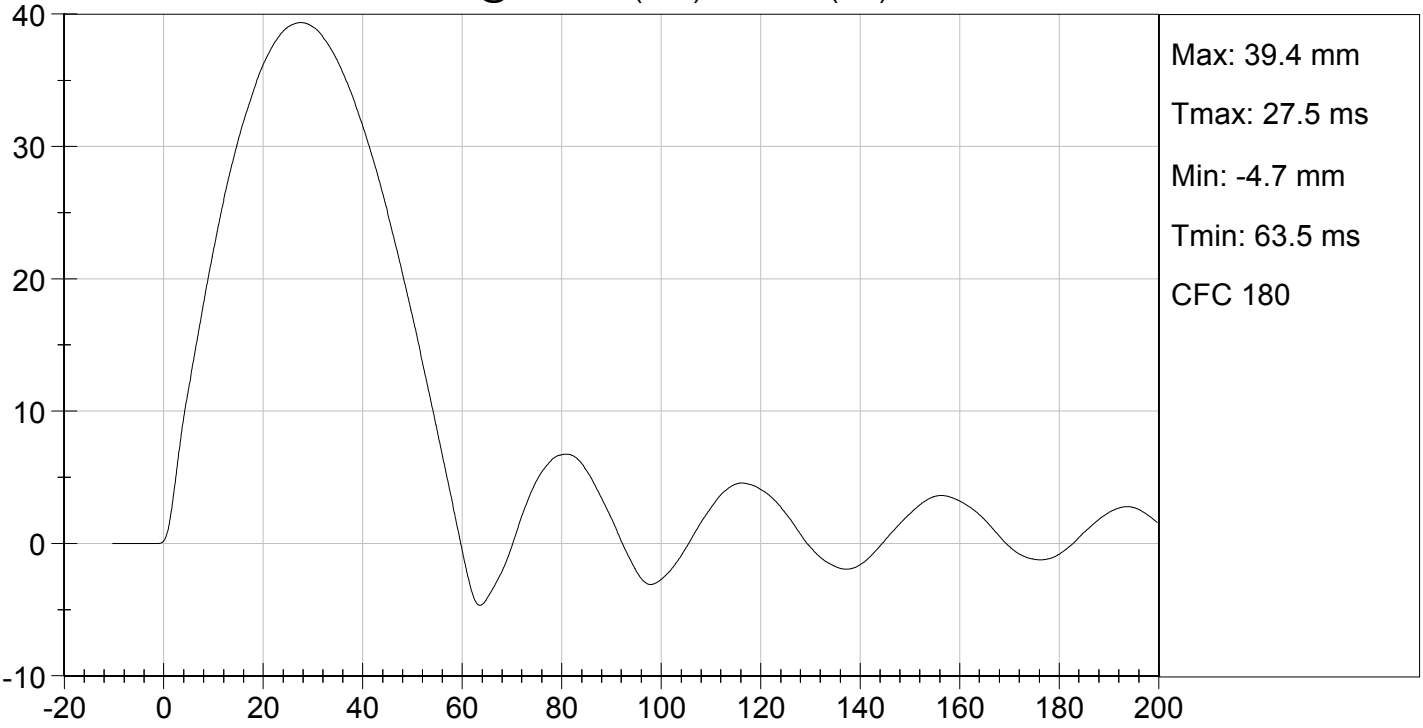
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	31	Pass
Displacement at 459 mm	mm	36.0 to 40.0	39.4	Pass
Displacement at 815 mm	mm	46.0 to 51.0	49.4	Pass
		Overall Test Results		Pass

Laboratory Technician

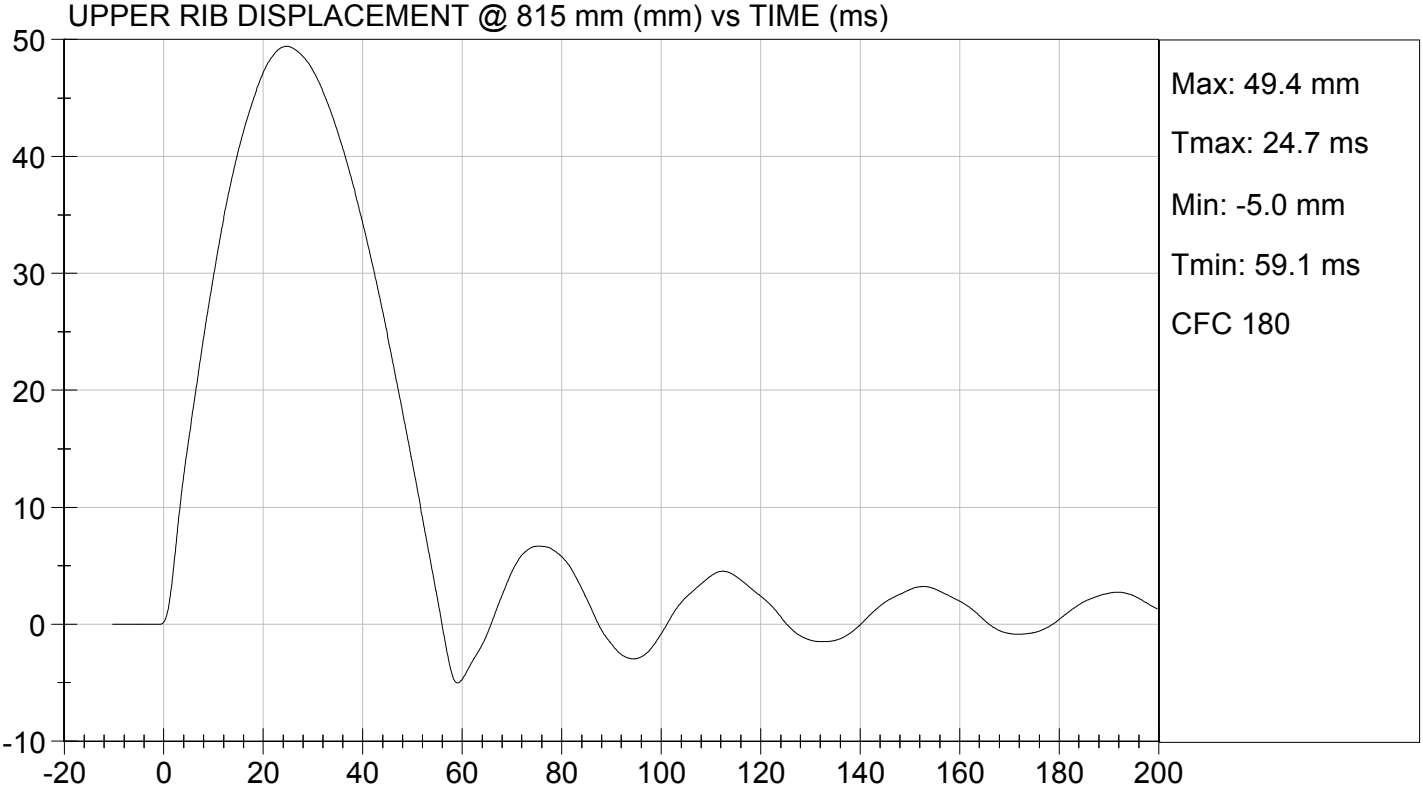
04/27/2016
Test Date

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:** D161495

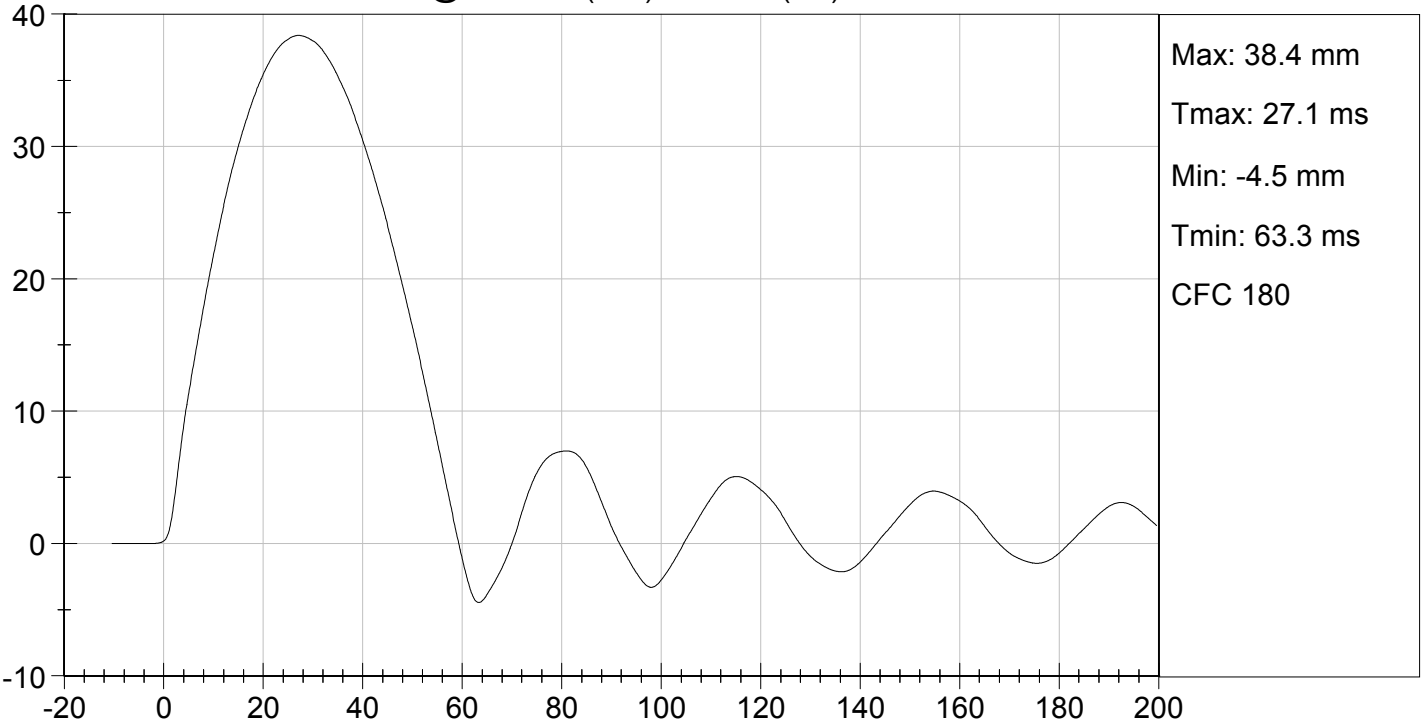
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	31	Pass
Displacement at 459 mm	mm	36.0 to 40.0	38.4	Pass
Displacement at 815 mm	mm	46.0 to 51.0	48.7	Pass
		Overall Test Results		Pass

Laboratory Technician

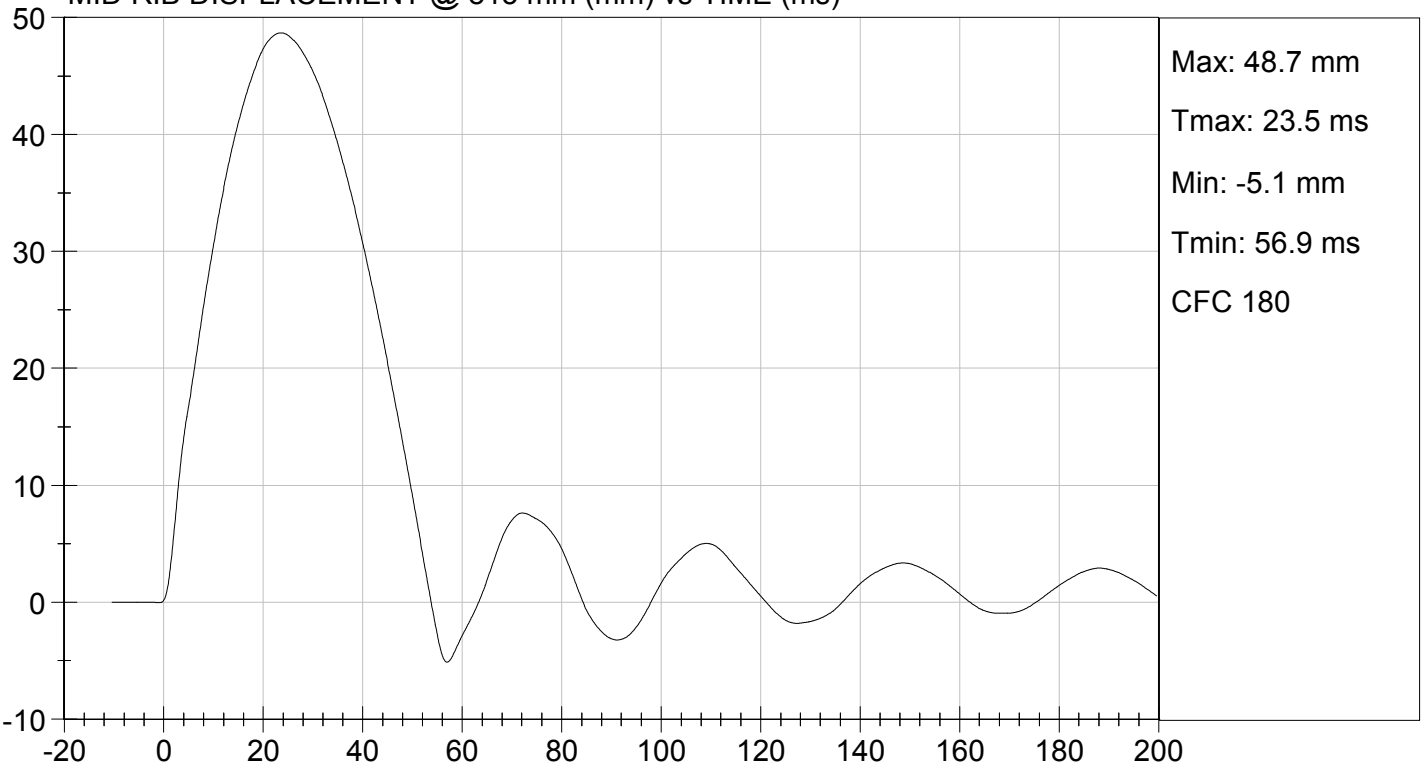
04/27/2016
Test Date

Approved By

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



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



MGA RESEARCH CORPORATION

LOWER RIB TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D161496

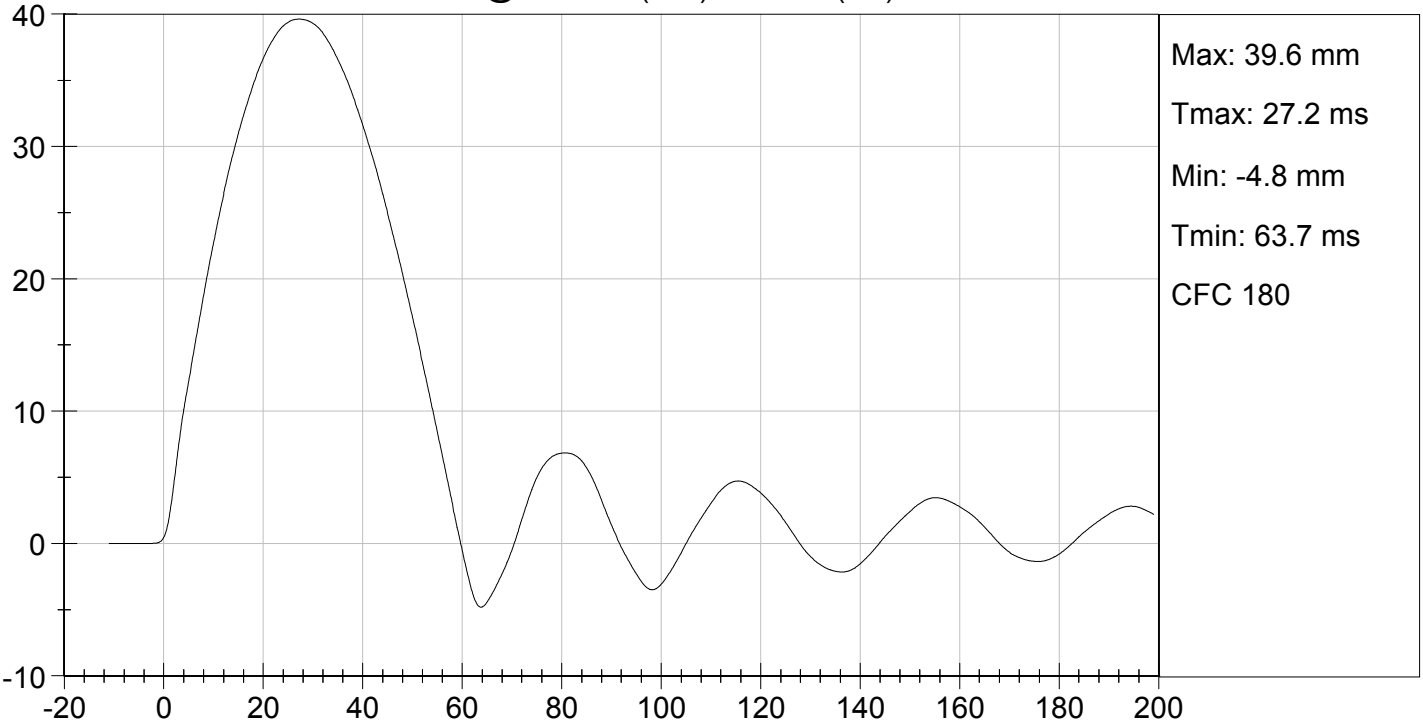
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	31	Pass
Displacement at 459 mm	mm	36.0 to 40.0	39.6	Pass
Displacement at 815 mm	mm	46.0 to 51.0	50.5	Pass
		Overall Test Results		Pass

Laboratory Technician

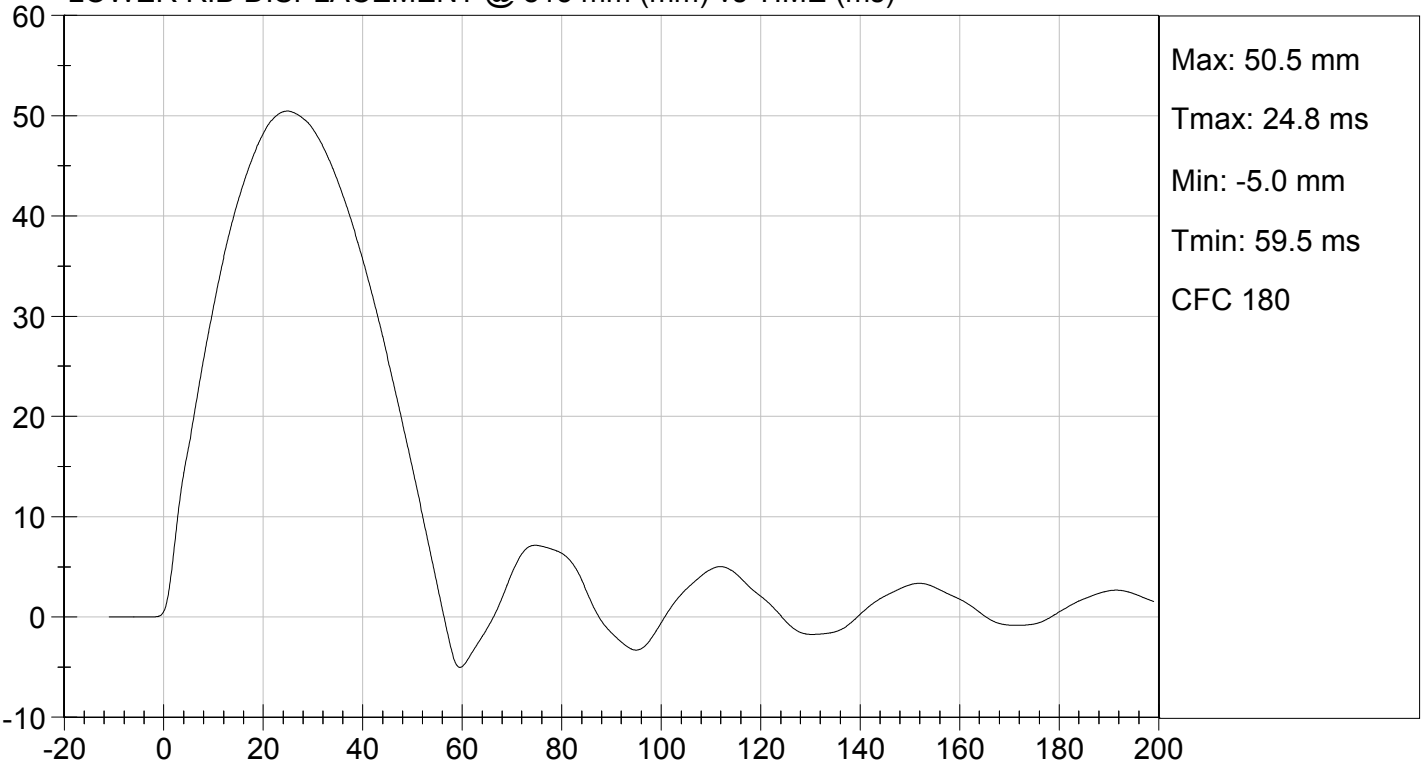
04/27/2016
Test Date

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:** D161490

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Humidity	%	10 to 70	27	Pass
Probe Speed	m/s	5.40 to 5.60	5.40	Pass
Maximum Impactor Force (after 6 ms)	N	5100 to 6200	5732	Pass
Upper Rib Displacement	mm	34.0 to 41.0	38.9	Pass
Middle Rib Displacement	mm	37.0 to 45.0	41.7	Pass
Lower Rib Displacement	mm	37.0 to 44.0	41.7	Pass
		Overall Test Results		Pass

Laboratory Technician

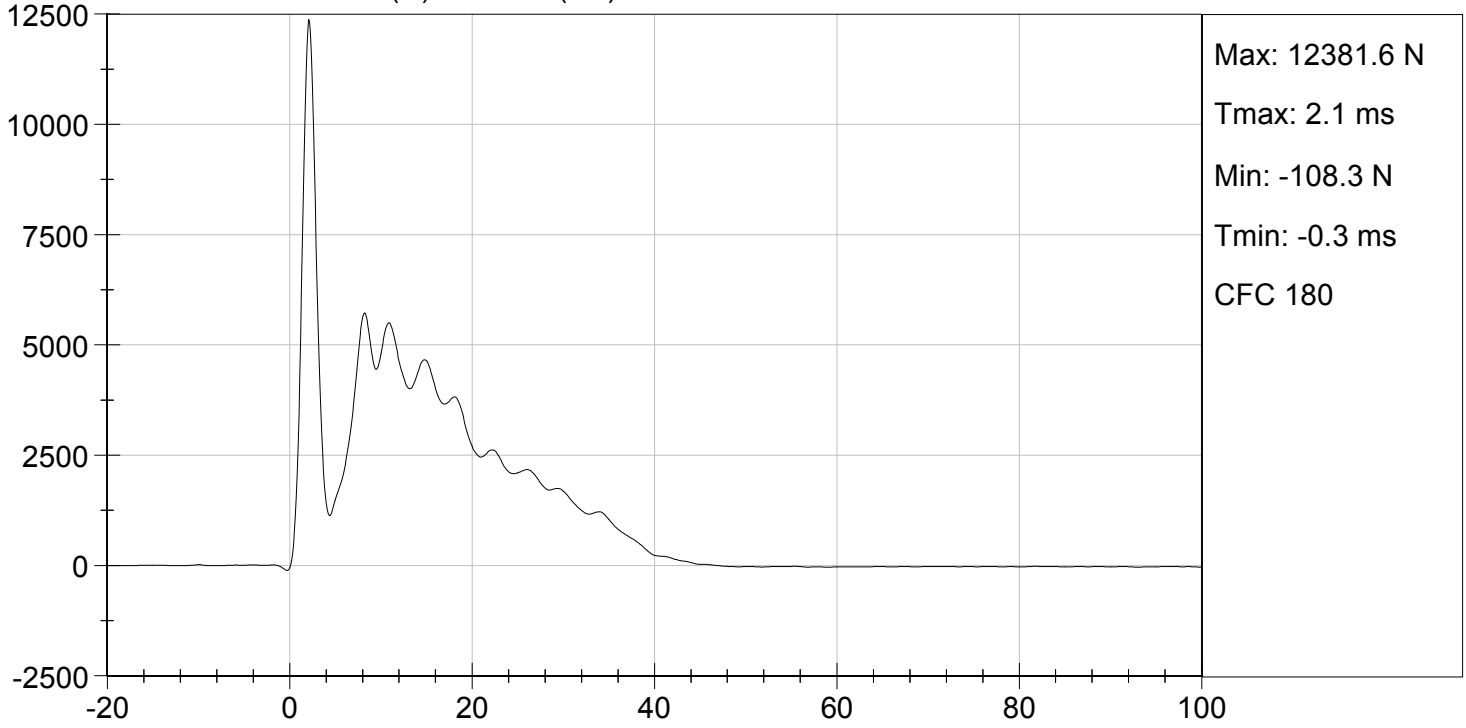
04/27/2016
Test Date

Approved By

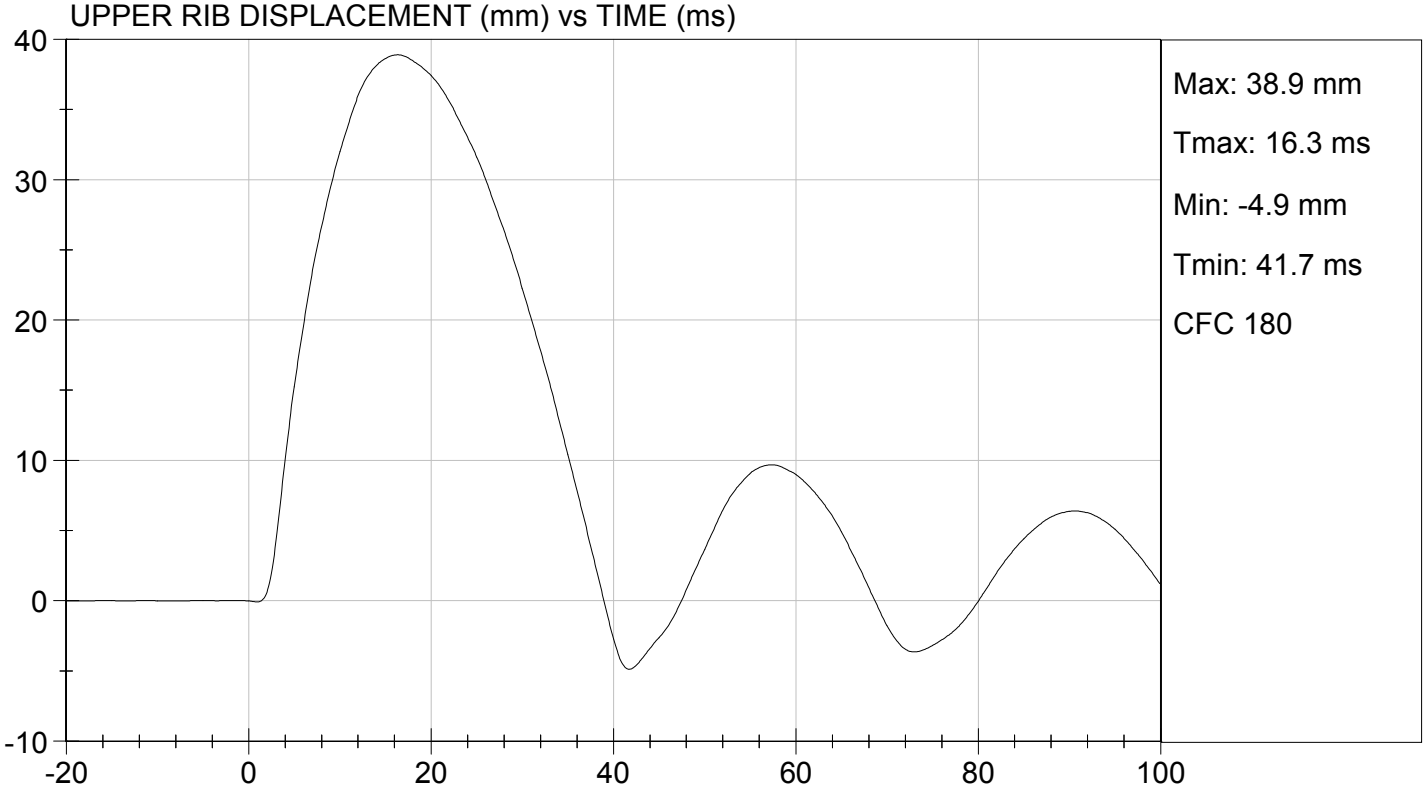
TEST DESC: THORAX IMPACT
VELOCITY: 17.73 ft/s, 5.40 m/s

TEST DATE: 04/27/2016
TEST #: D161490

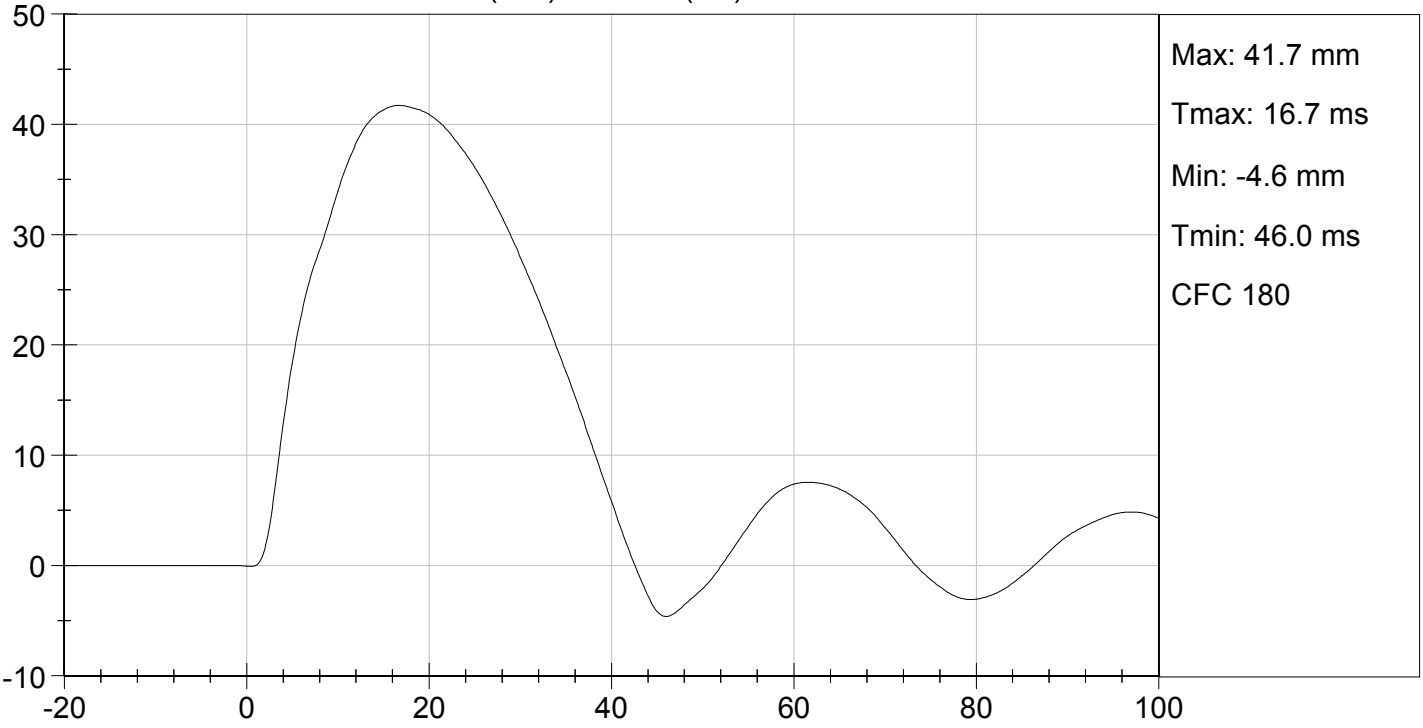
IMPACTOR FORCE (N) vs TIME (ms)



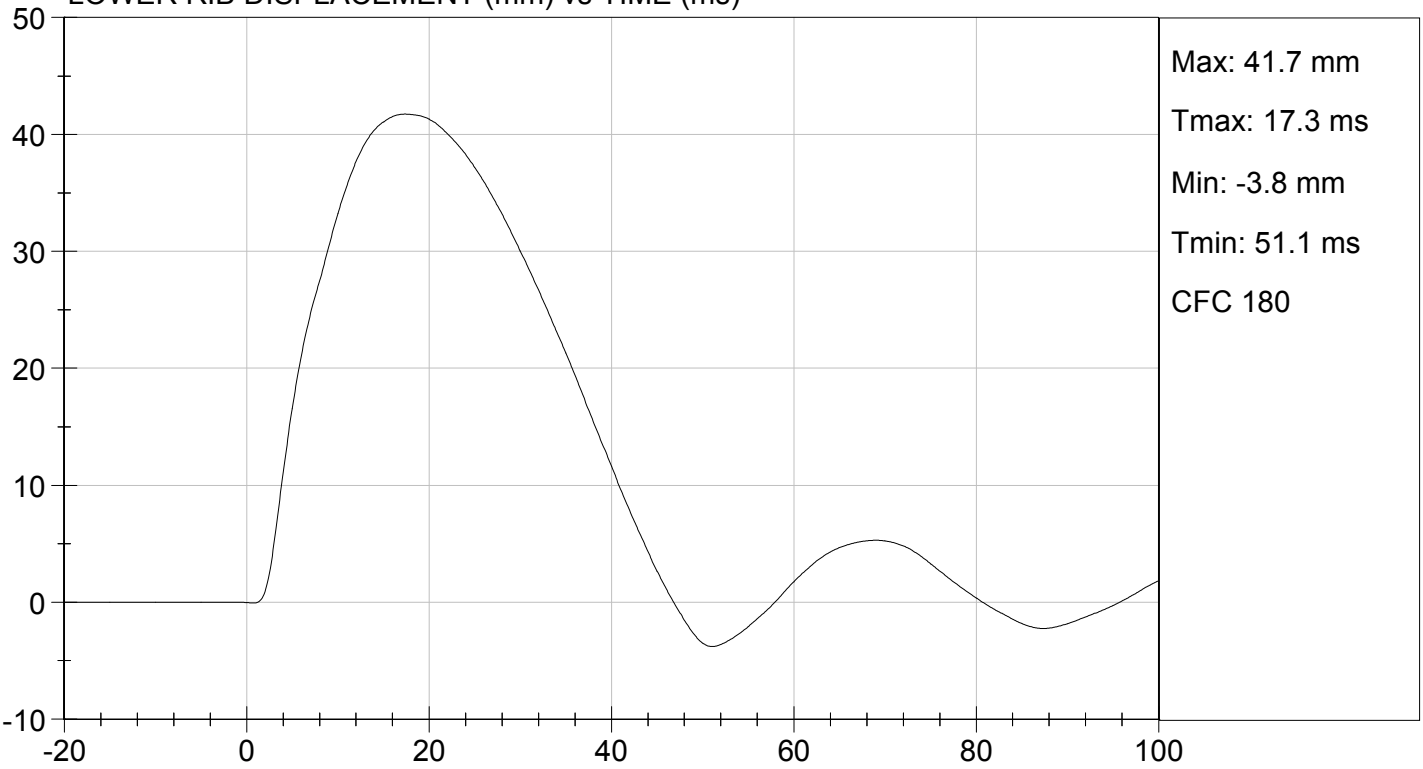
UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

ABDOMEN TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D161497

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	27	Pass
Probe Speed	m/s	3.90 to 4.10	4.10	Pass
Maximum Impactor Force	N	4000 to 4800	4395	Pass
Time of Maximum Impactor Force	ms	10.6 to 13.0	12.0	Pass
Maximum Total Abdomen Force	N	2200 to 2700	2320	Pass
Time of Maximum Abdomen Force	ms	10.0 to 12.3	11.5	Pass
		Overall Test Results		Pass

Laboratory Technician

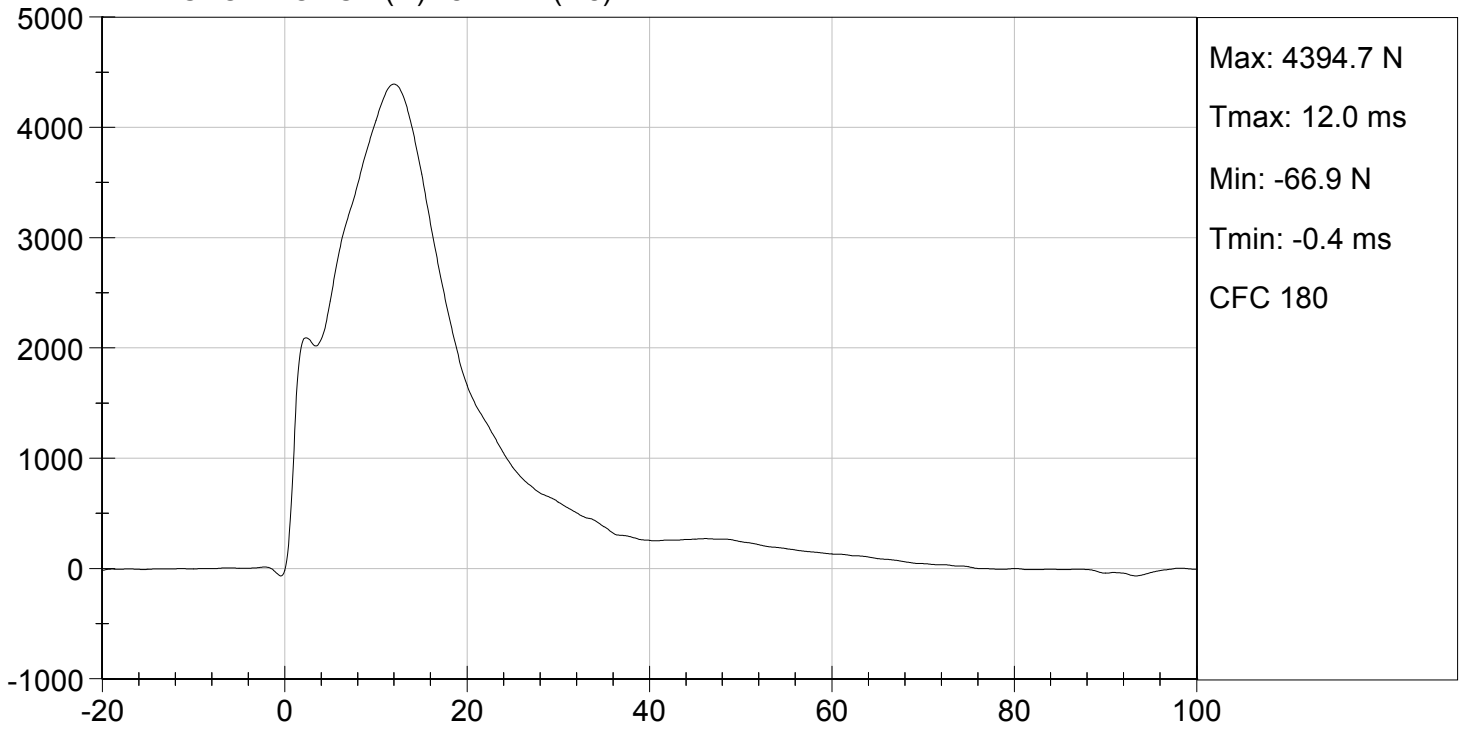
04/27/2016
Test Date

Approved By

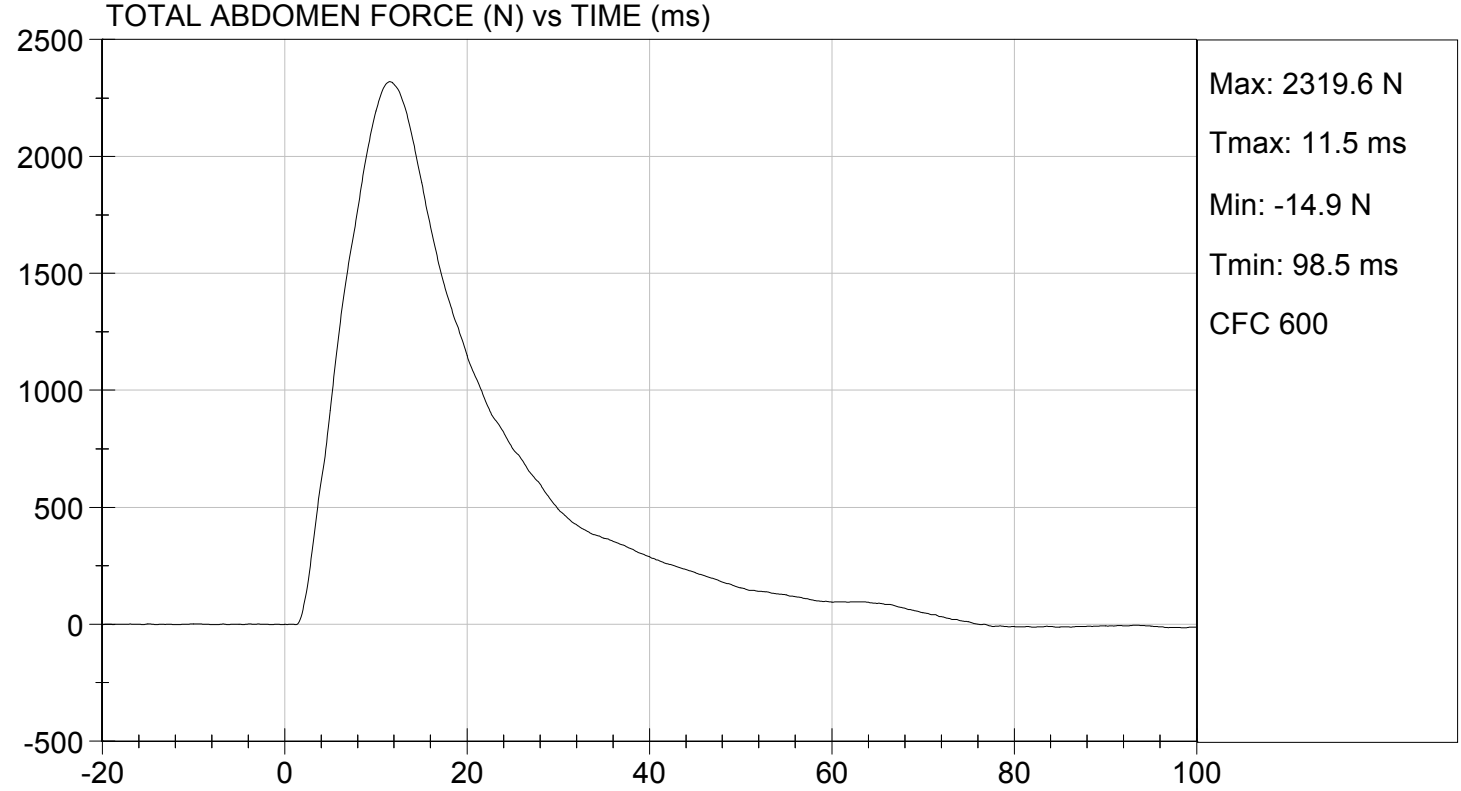
TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.44 ft/s, 4.10 m/s

TEST DATE: 04/27/2016
TEST #: D161497

IMPACTOR FORCE (N) vs TIME (ms)



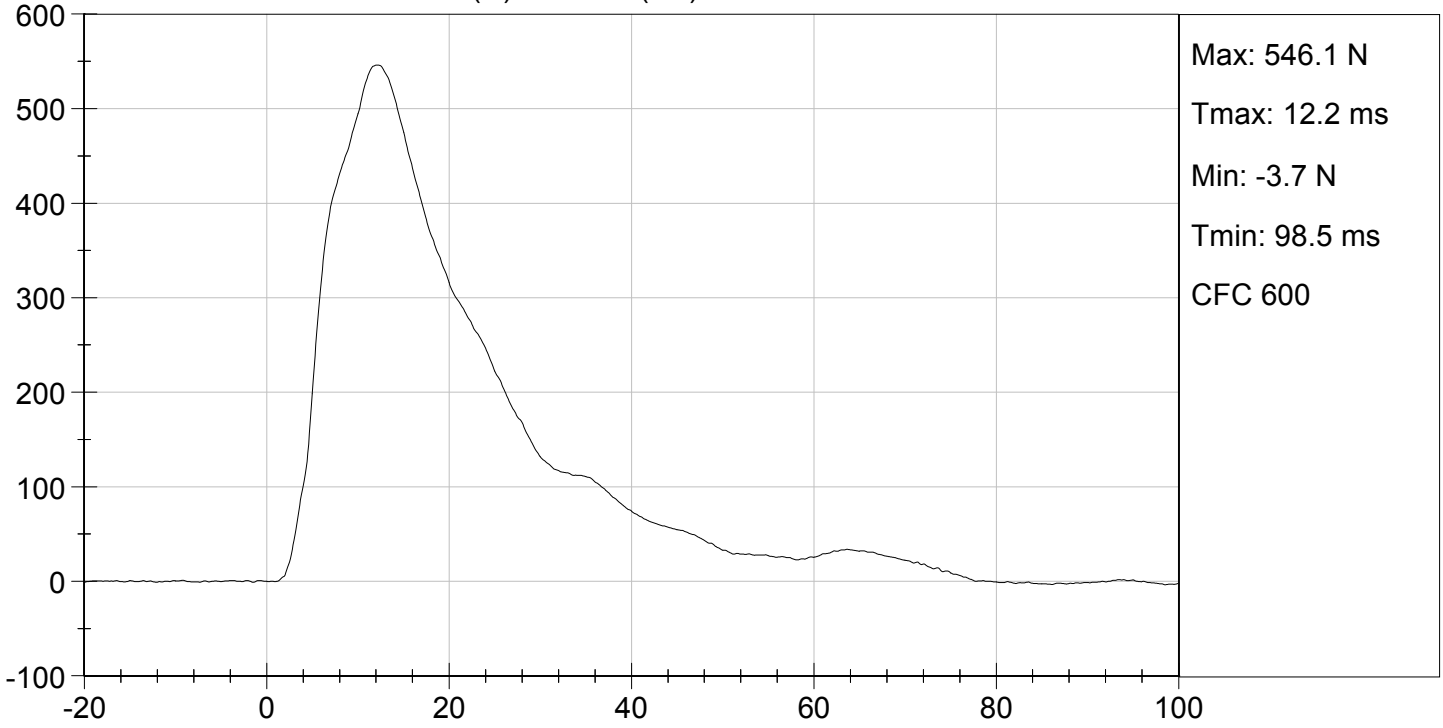
TOTAL ABDOMEN FORCE (N) vs TIME (ms)



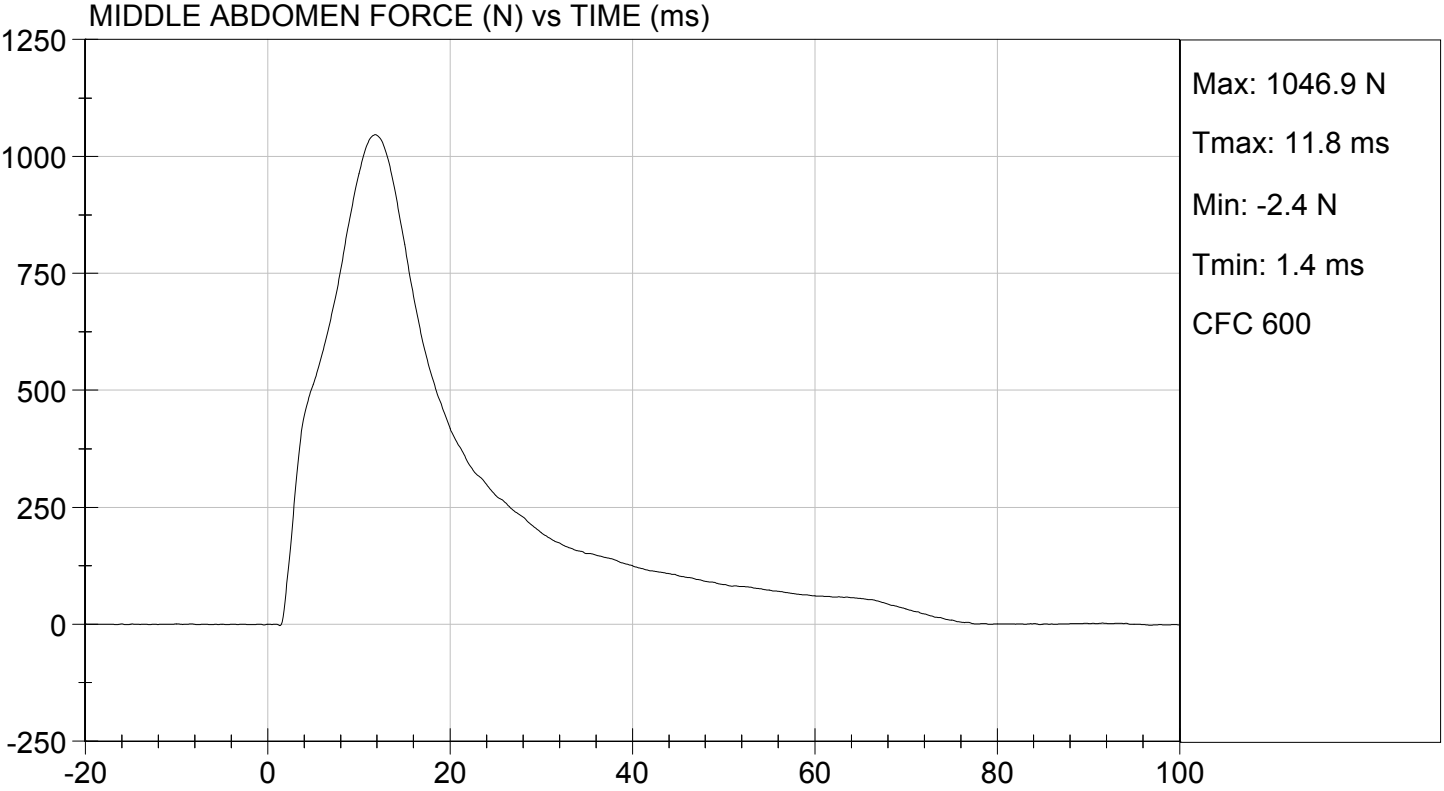
TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.44 ft/s, 4.10 m/s

TEST DATE: 04/27/2016
TEST #: D161497

FRONT ABDOMEN FORCE (N) vs TIME (ms)



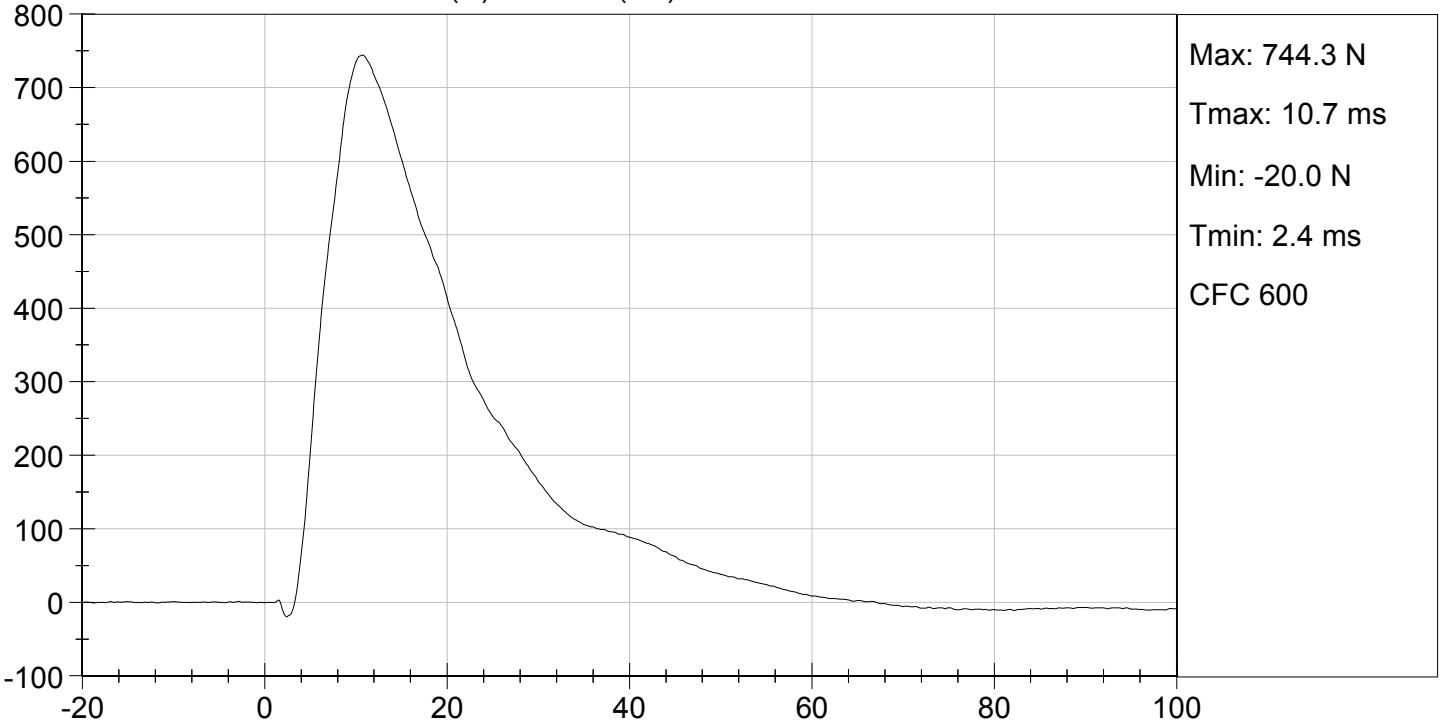
MIDDLE ABDOMEN FORCE (N) vs TIME (ms)



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

TEST DATE: 04/27/2016
TEST #: D161497

REAR ABDOMEN FORCE (N) vs TIME (ms)



MGA RESEARCH CORPORATION

LUMBAR SPINE TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D161498

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	32	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	-0.416	Pass
	27 ms	m/s	-6.50 to -5.80	-5.81	Pass
	30 ms	m/s	>= -6.50	-6.27	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	45.5	Pass
Time of Maximum Flexion Angle		ms	39.0 to 53.0	43.9	Pass
Headform Rotation Decay to Initial Position		ms	37 to 57	46	Pass
			Overall Results		Pass

Jessica Hall
Laboratory Technician

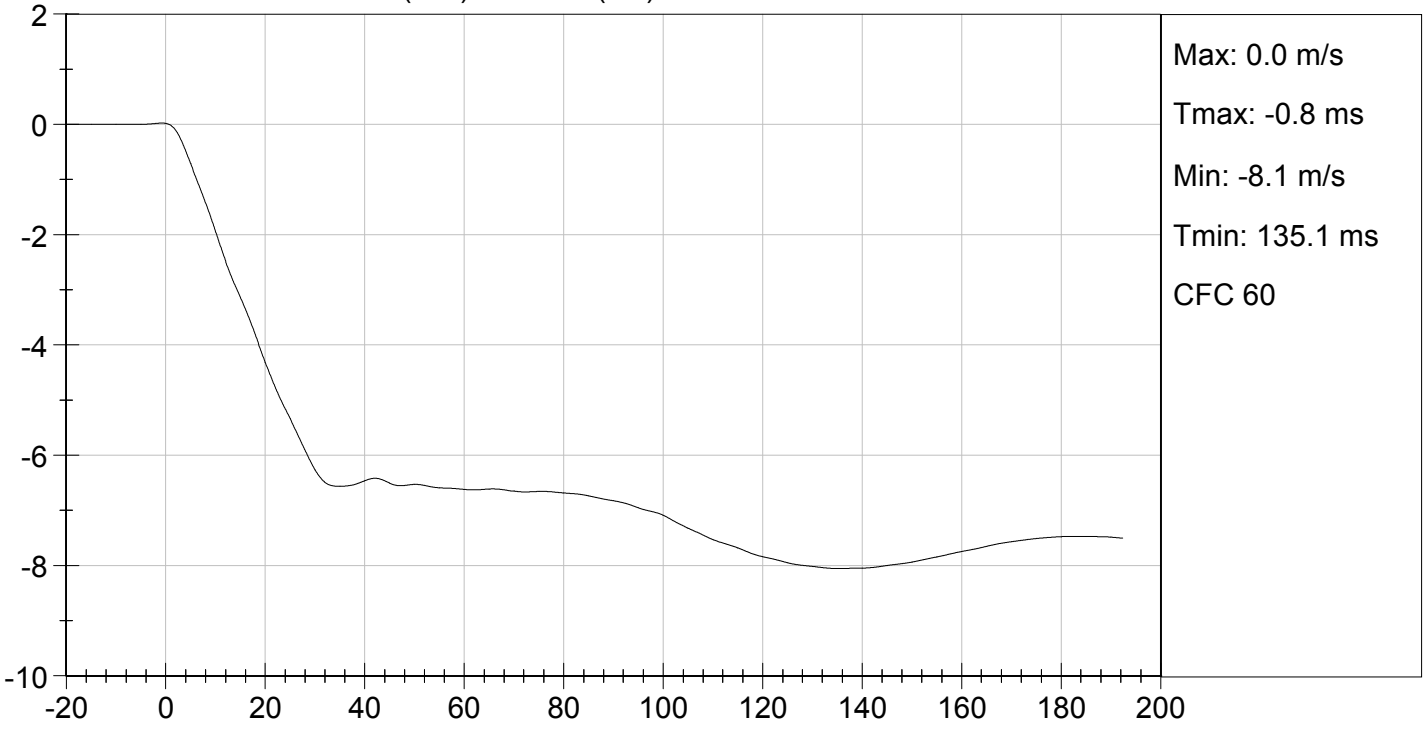
04/27/2016
Test Date

Thomas D. Miller
Approved By

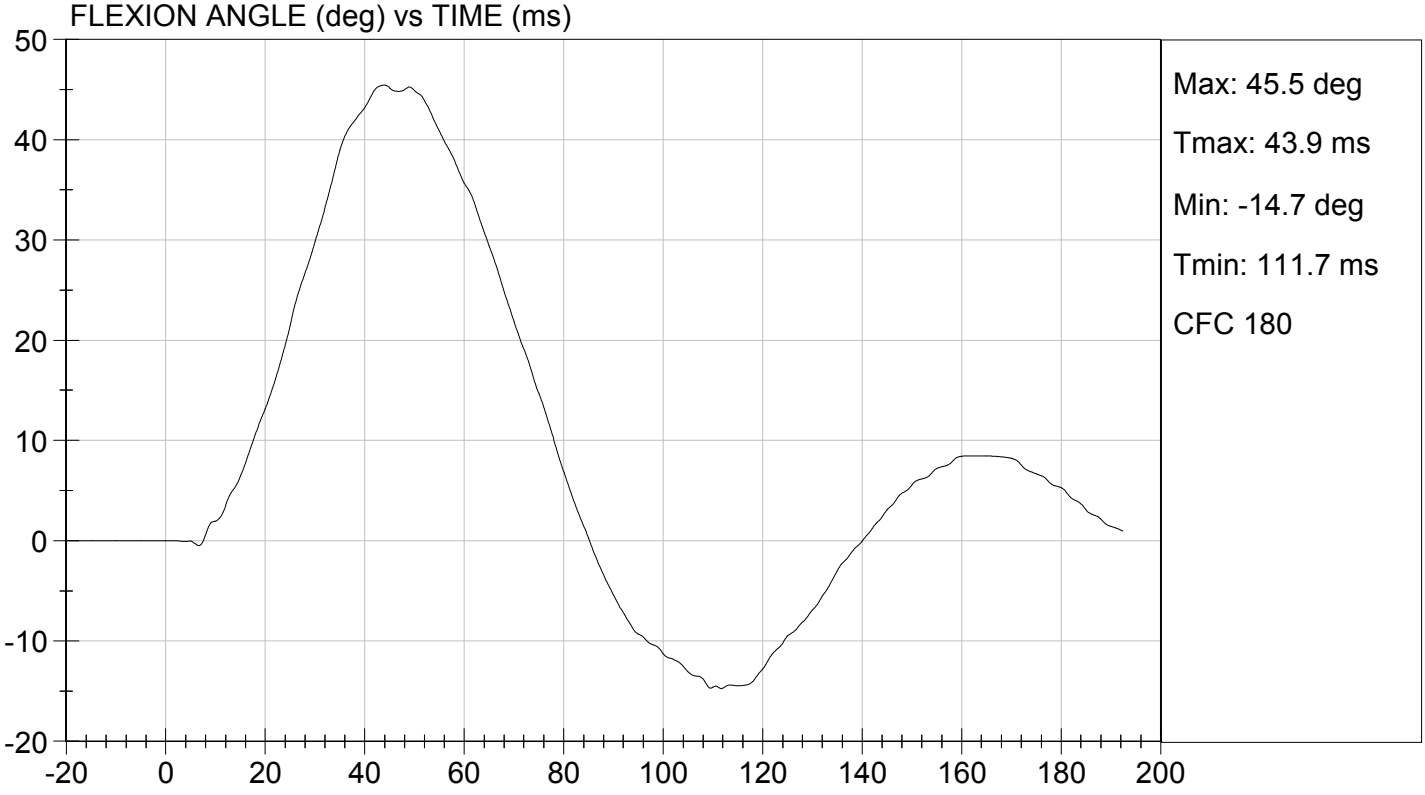
TEST DESC: LUMBAR BENDING
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 04/27/2016
TEST #: D161498

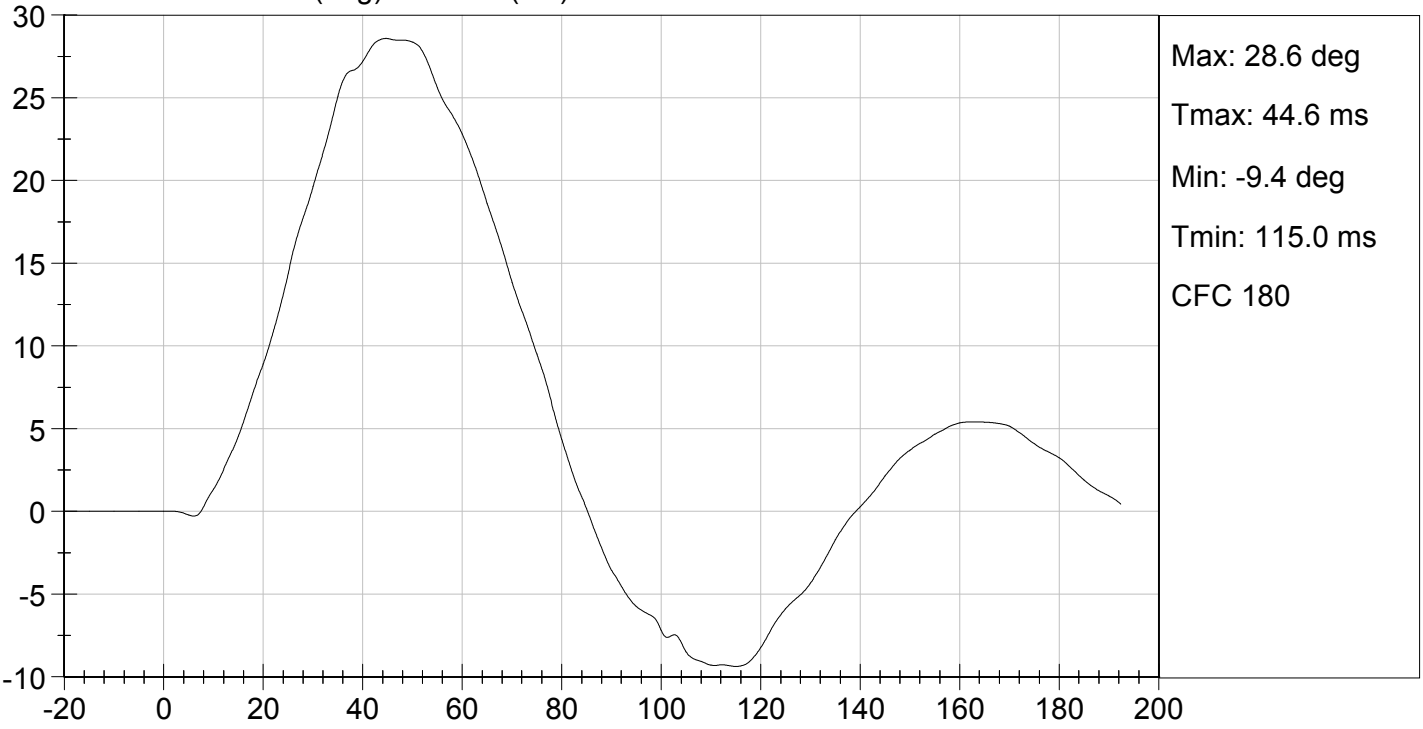
PENDULUM VELOCITY (m/s) vs TIME (ms)



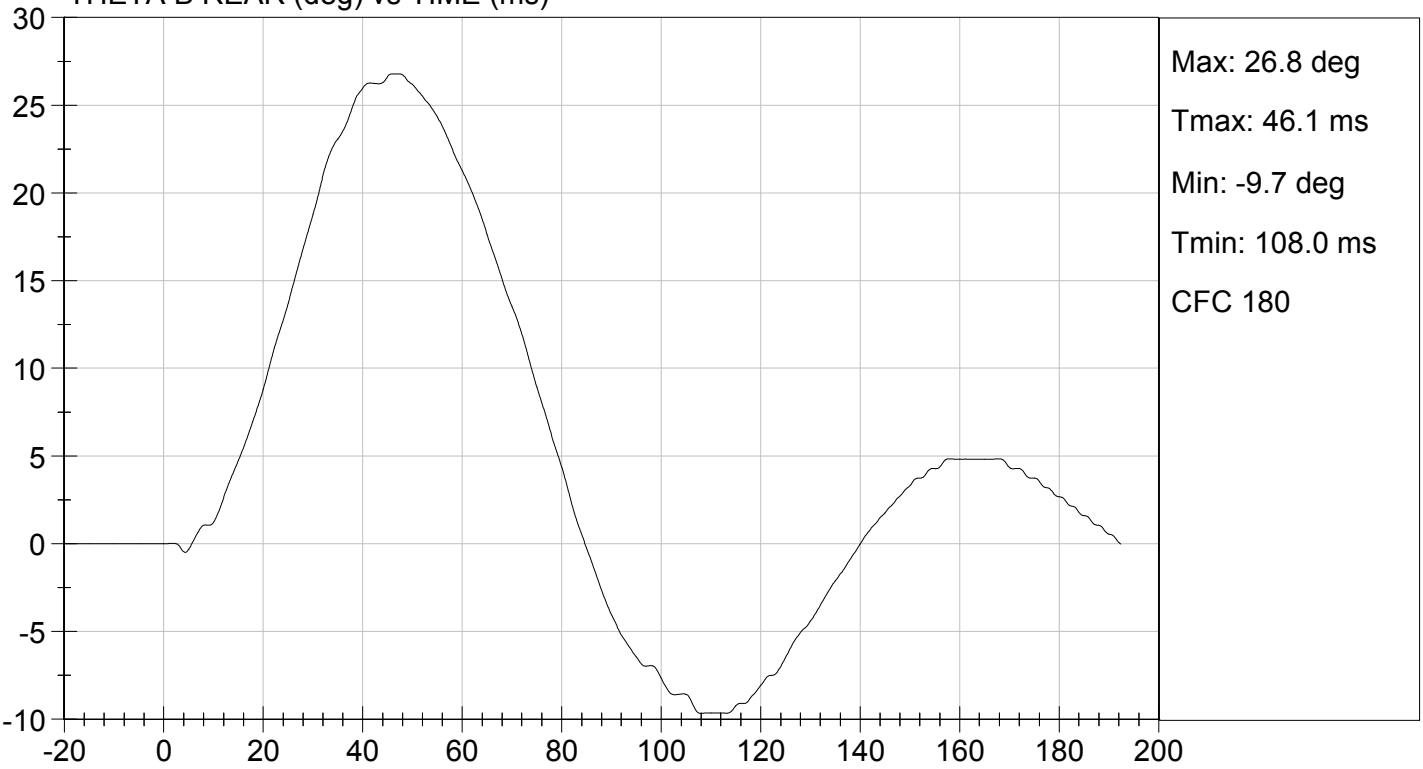
FLEXION ANGLE (deg) vs TIME (ms)



THETA A FRONT (deg) vs TIME (ms)

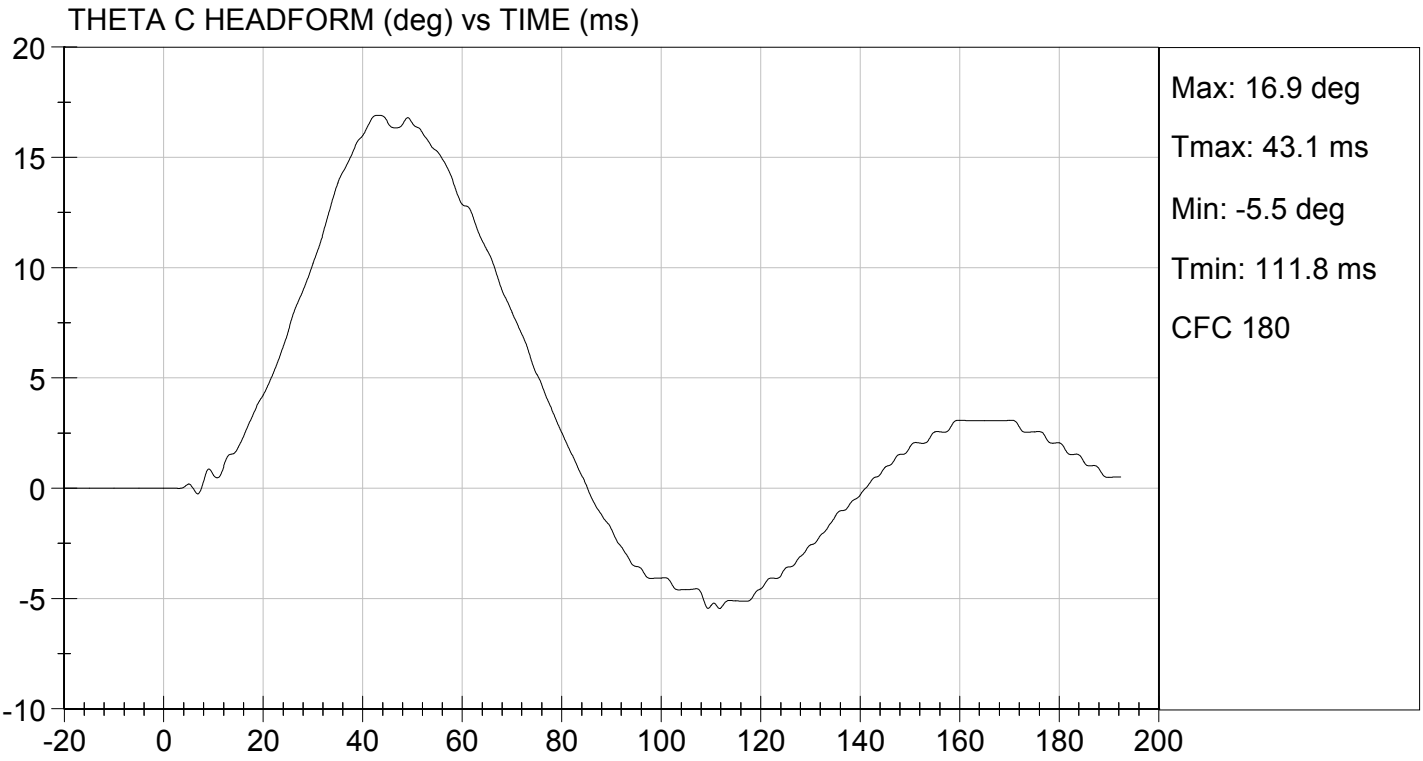


THETA B REAR (deg) vs TIME (ms)



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

TEST DATE: 04/27/2016
TEST #: D161498



MGA RESEARCH CORPORATION

PELVIS TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D161499

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	27	Pass
Probe Speed	m/s	4.20 to 4.40	4.30	Pass
Maximum Impactor Force	N	4700 to 5400	4982	Pass
Time of Maximum Impactor Force	ms	11.8 to 16.1	14.0	Pass
Maximum Pubic Force	N	1230 to 1590	1365	Pass
Time of Maximum Pubic Force	ms	12.2 to 17.0	13.7	Pass
		Overall Test Results		Pass

Laboratory Technician

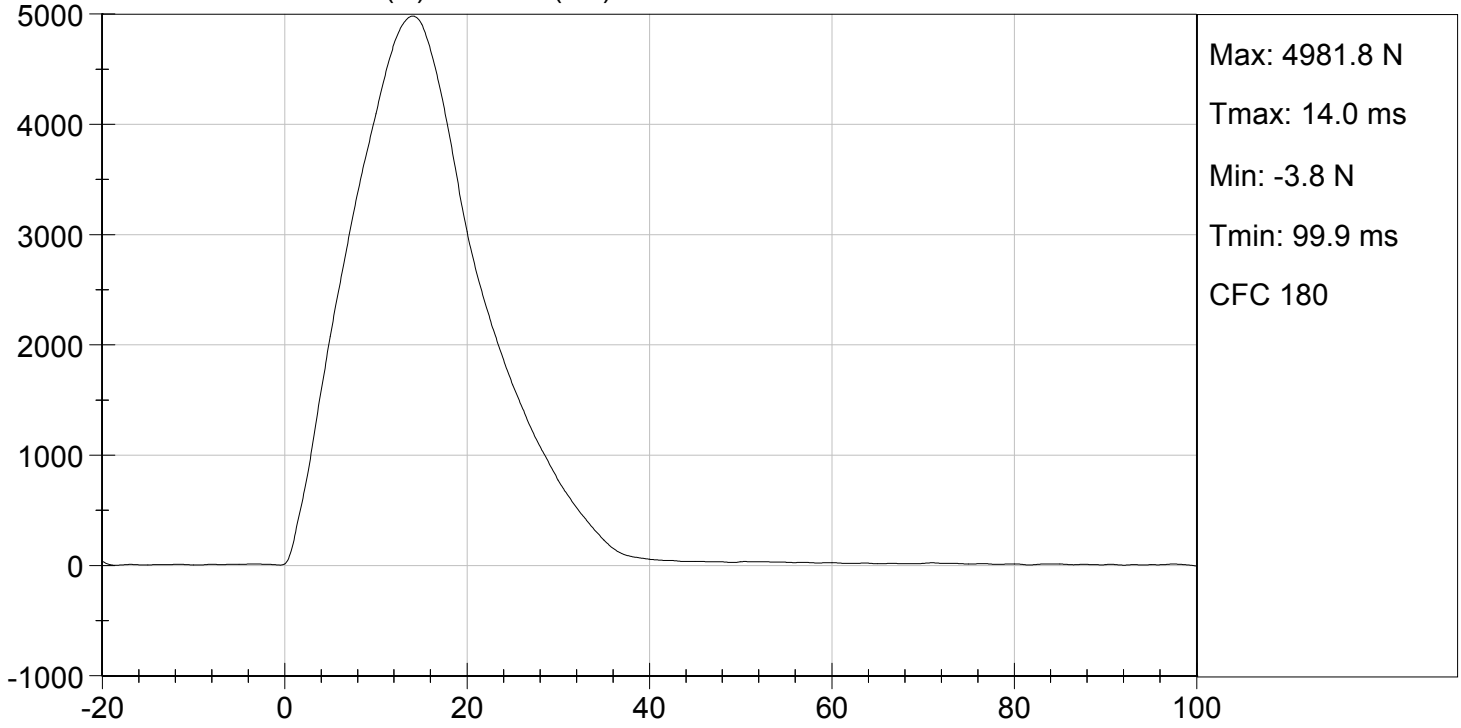
04/27/2016
Test Date

Approved By

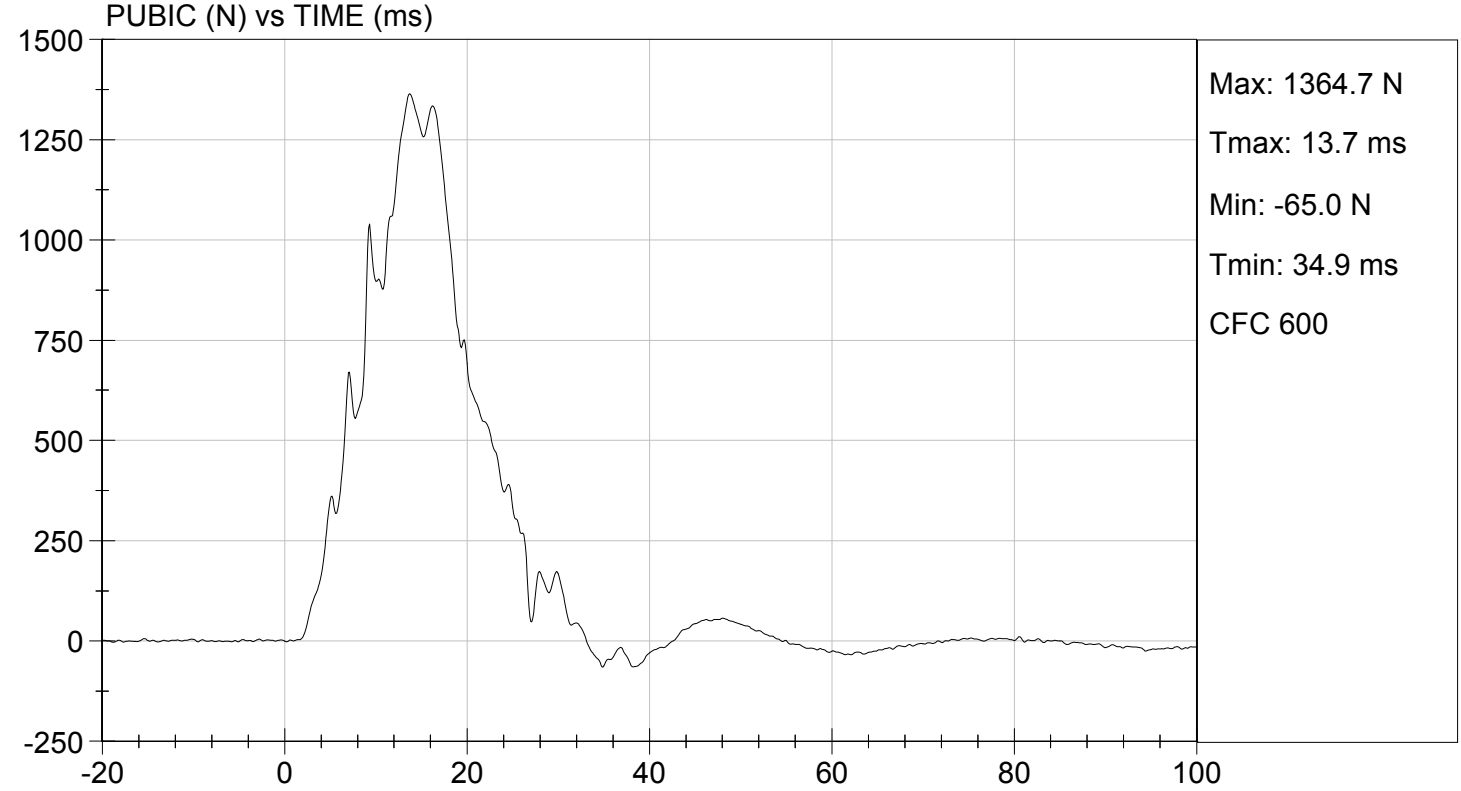
TEST DESC: PELVIS IMPACT
VELOCITY: 14.12 ft/s, 4.3 m/s

TEST DATE: 04/27/2016
TEST #: D161499

IMPACTOR FORCE (N) vs TIME (ms)



PUBIC (N) vs TIME (ms)



SID-IIsD External Measurements
SN: 306

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

MGA RESEARCH CORPORATION

HEAD DROP TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test ID:** D16991

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	32	Pass
Peak Resultant Acceleration	G's	115 to 137	117	Pass
Peak Longitudinal Acceleration	G's	+/- 15	2.3	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	<15%	Yes	Pass
		Overall Test Results		Pass

Laboratory Technician

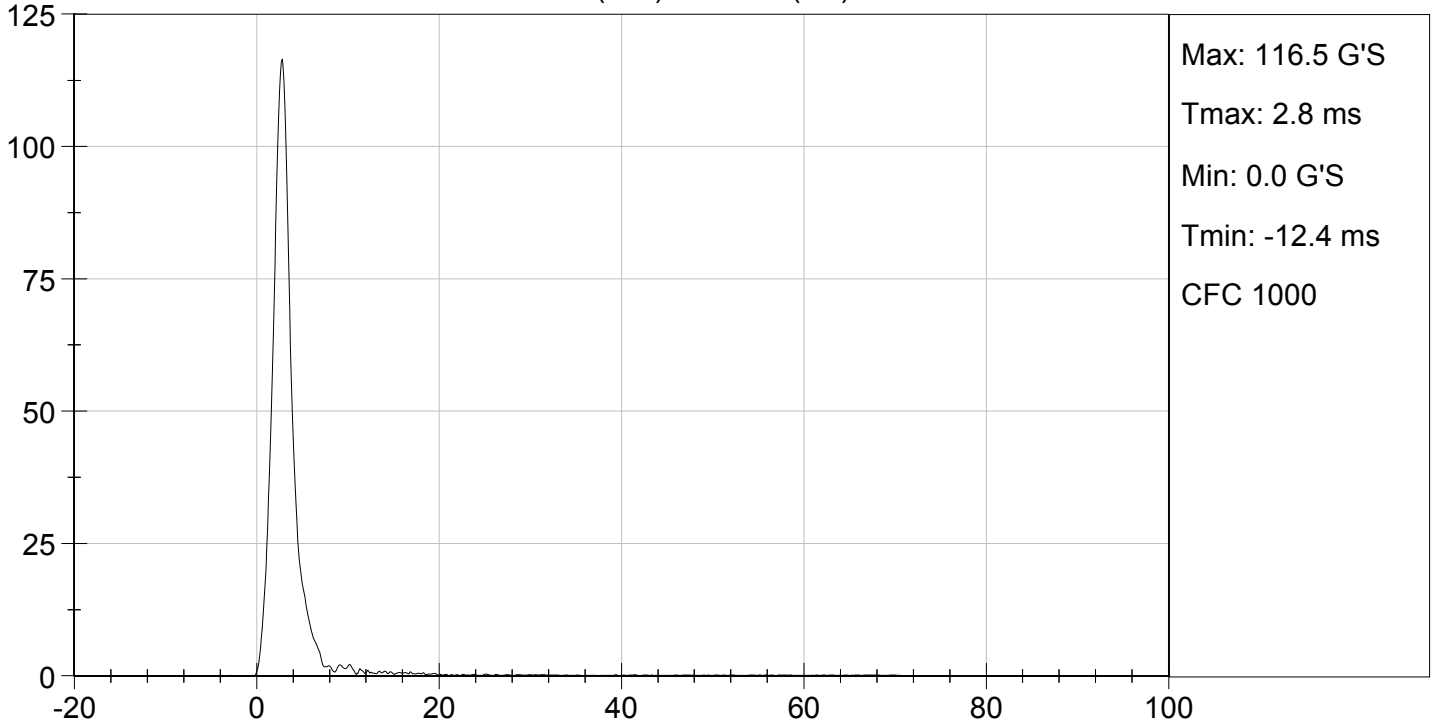
03/11/2016
Test Date

Approved By

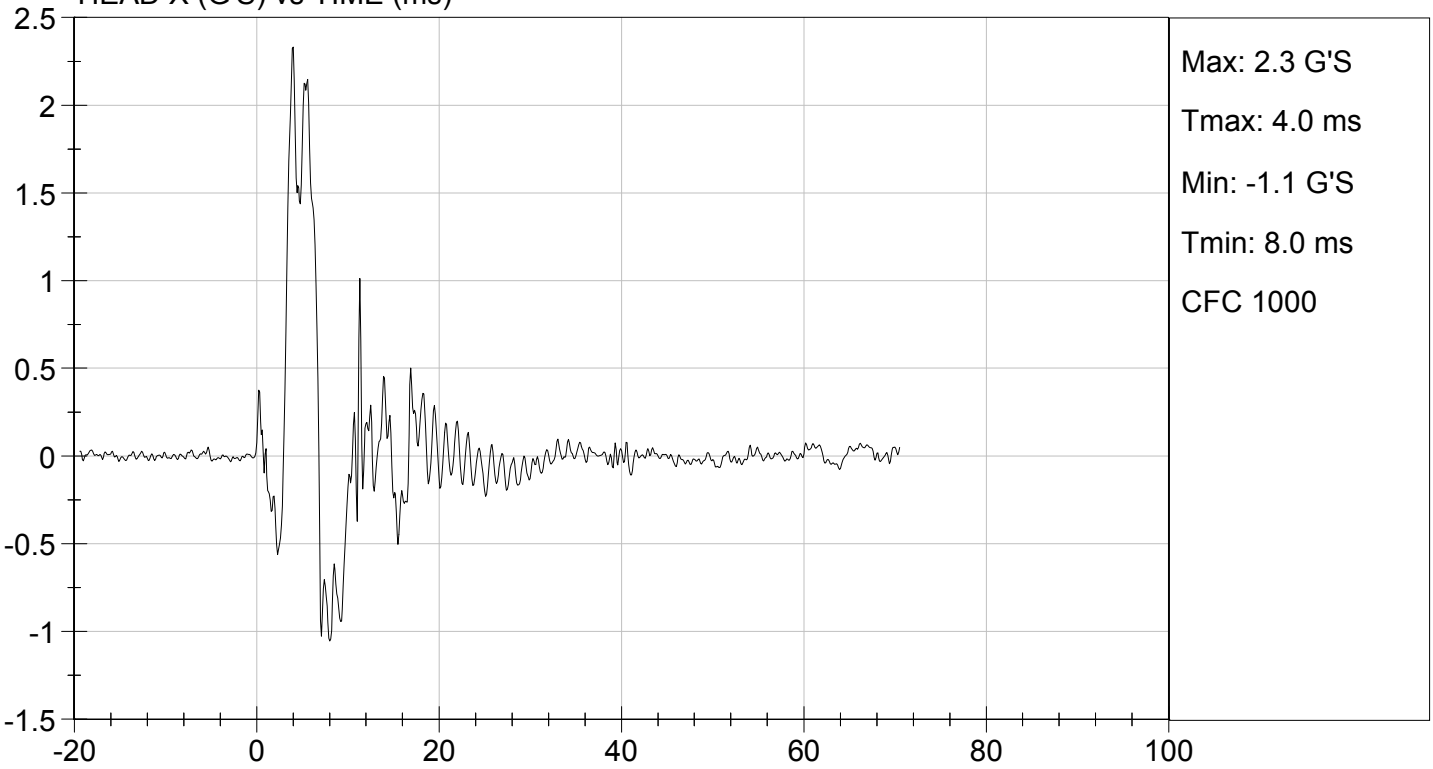
TEST DESC: HEAD DROP

TEST DATE: 03/11/2016
TEST #: D16991

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



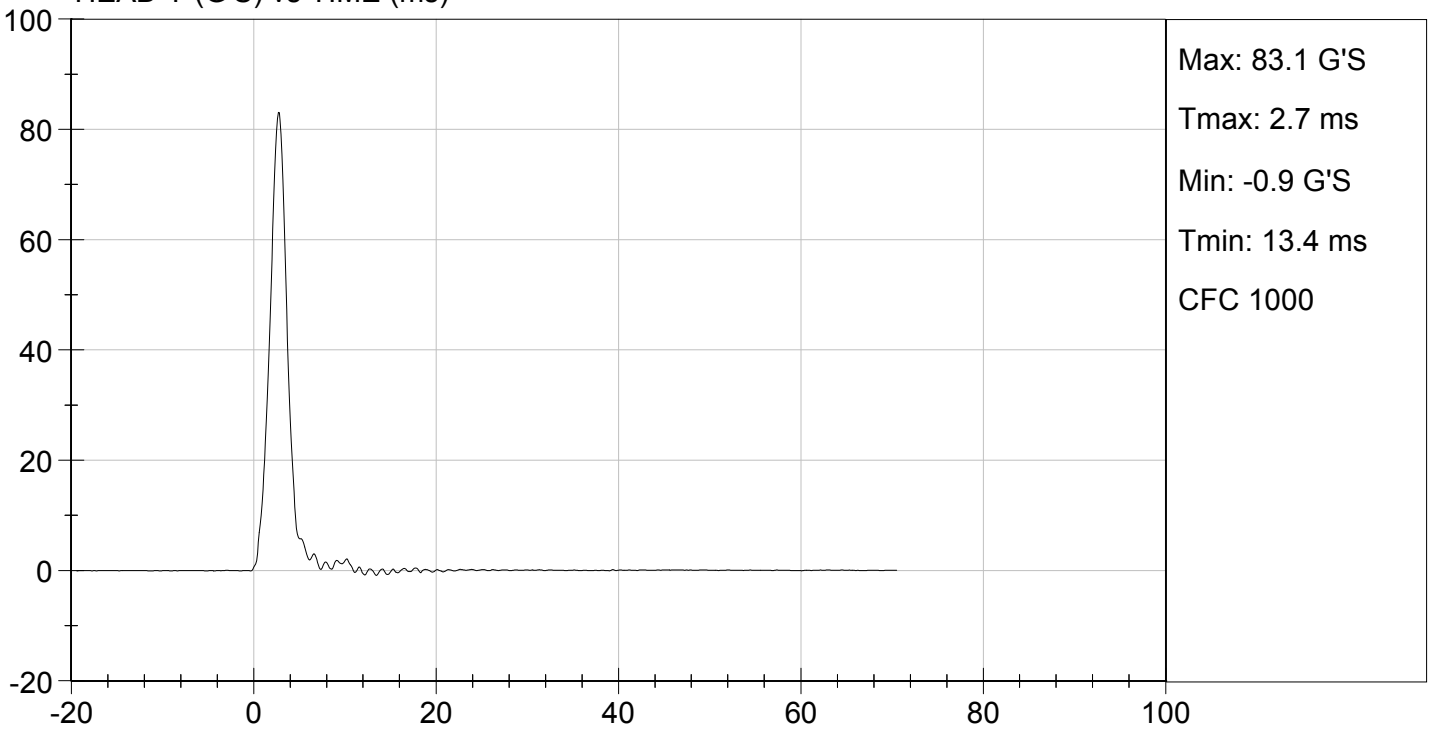
HEAD X (G'S) vs TIME (ms)



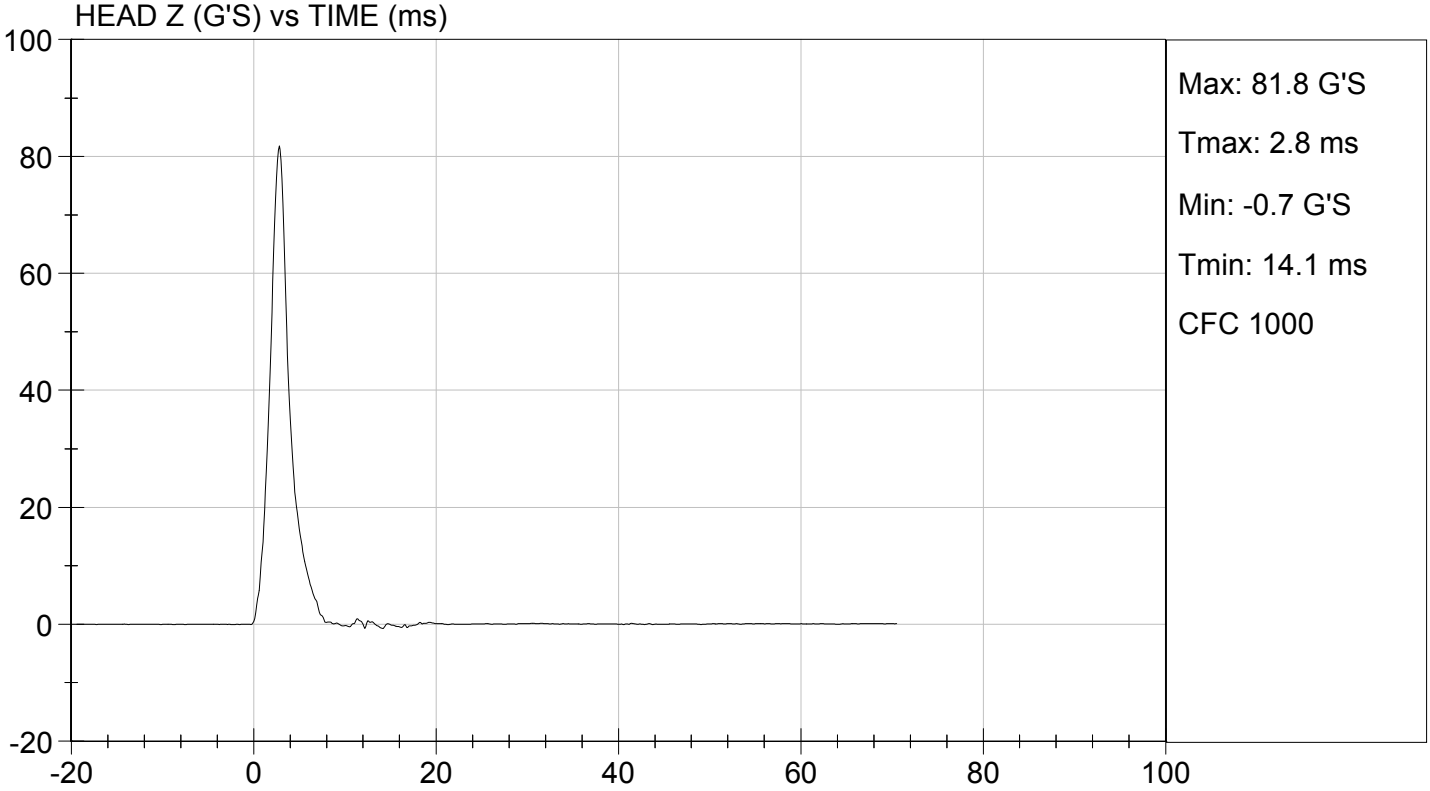
TEST DESC: HEAD DROP

TEST DATE: 03/11/2016
TEST #: D16991

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



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



MGA RESEARCH CORPORATION

LATERAL NECK PENDULUM TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D16992

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.6	Pass
Humidity		%	10 to 70	34	Pass
Impact Velocity		m/s	5.51 to 5.63	5.58	Pass
Pendulum Velocity	10 ms	m/s	2.20 to 2.80	2.41	Pass
	15 ms	m/s	3.30 to 4.10	3.42	Pass
	20 ms	m/s	4.40 to 5.40	4.62	Pass
	25 ms	m/s	5.40 to 6.10	5.58	Pass
	25-100 ms	m/s	5.50 to 6.20	5.68	Pass
Maximum D-Plane Rotation		deg	71 to 81	71	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	61	Pass
Maximum Occipital Condyle Moment		Nm	-44 to -36	-39	Pass
Time of Moment Decay to 0 Nm		ms	102 to 126	113	Pass
			Overall Test Results		Pass

Jessica Hall

Laboratory Technician

03/11/2016

Test Date

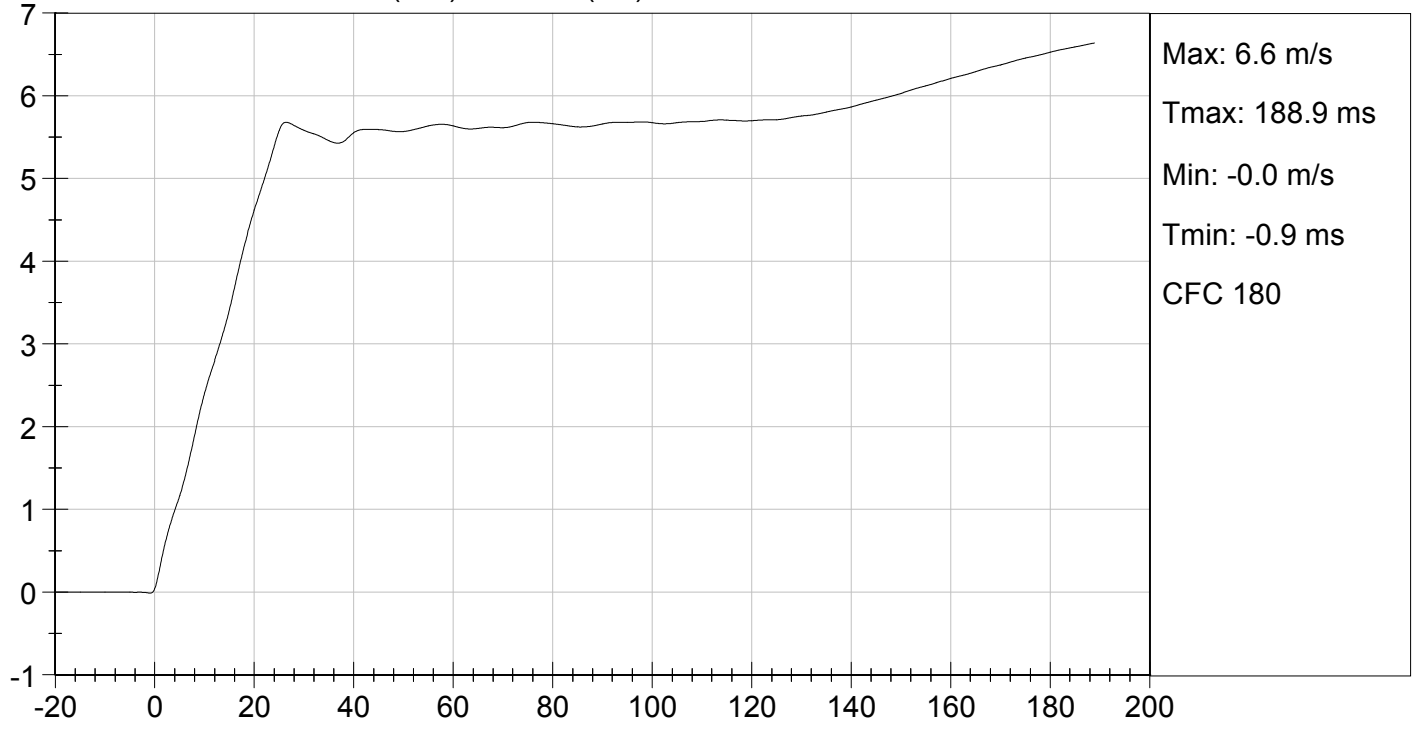
Thom A. Hille

Approved By

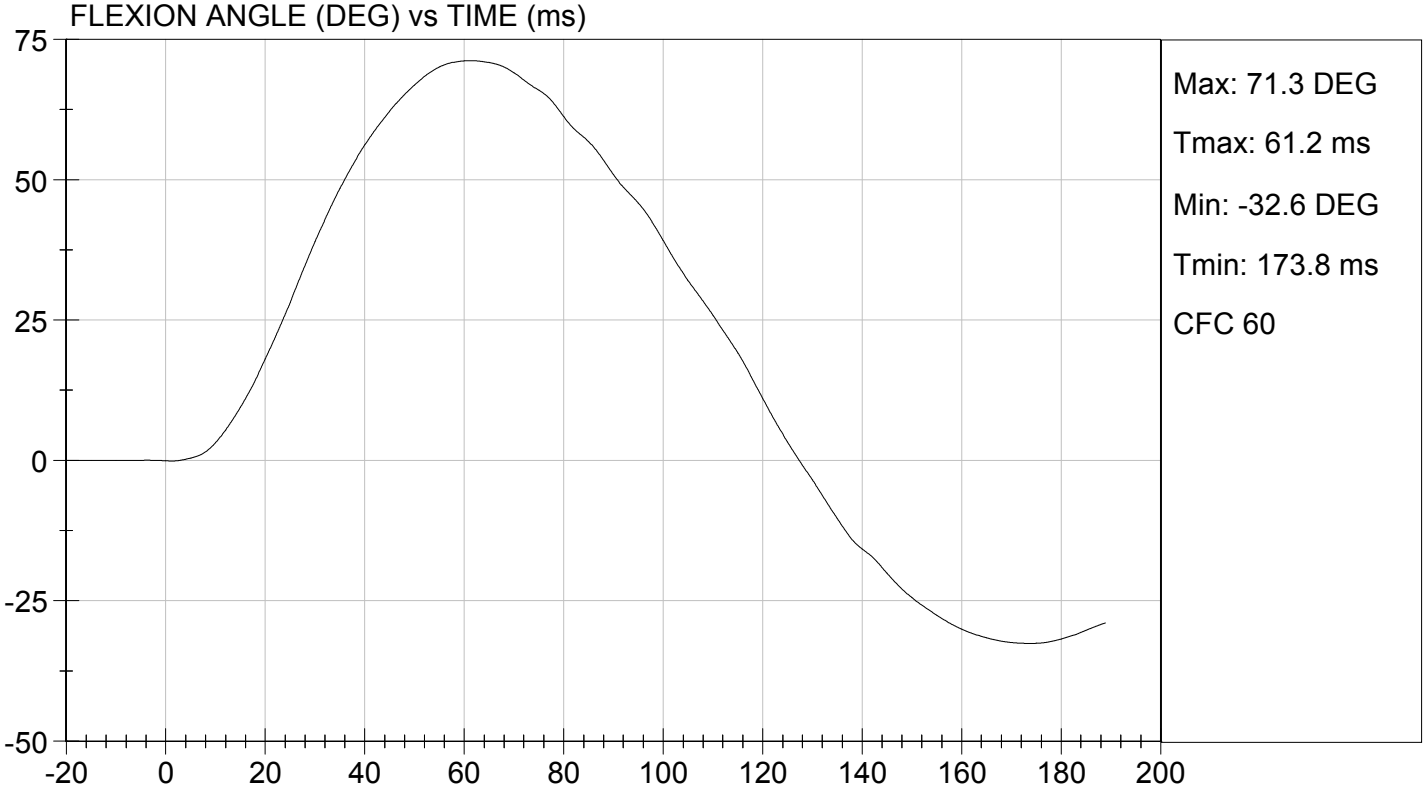
TEST DESC: NECK BENDING
VELOCITY: 18.31 ft/s, 5.58 m/s

TEST DATE: 03/11/2016
TEST #: D16992

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



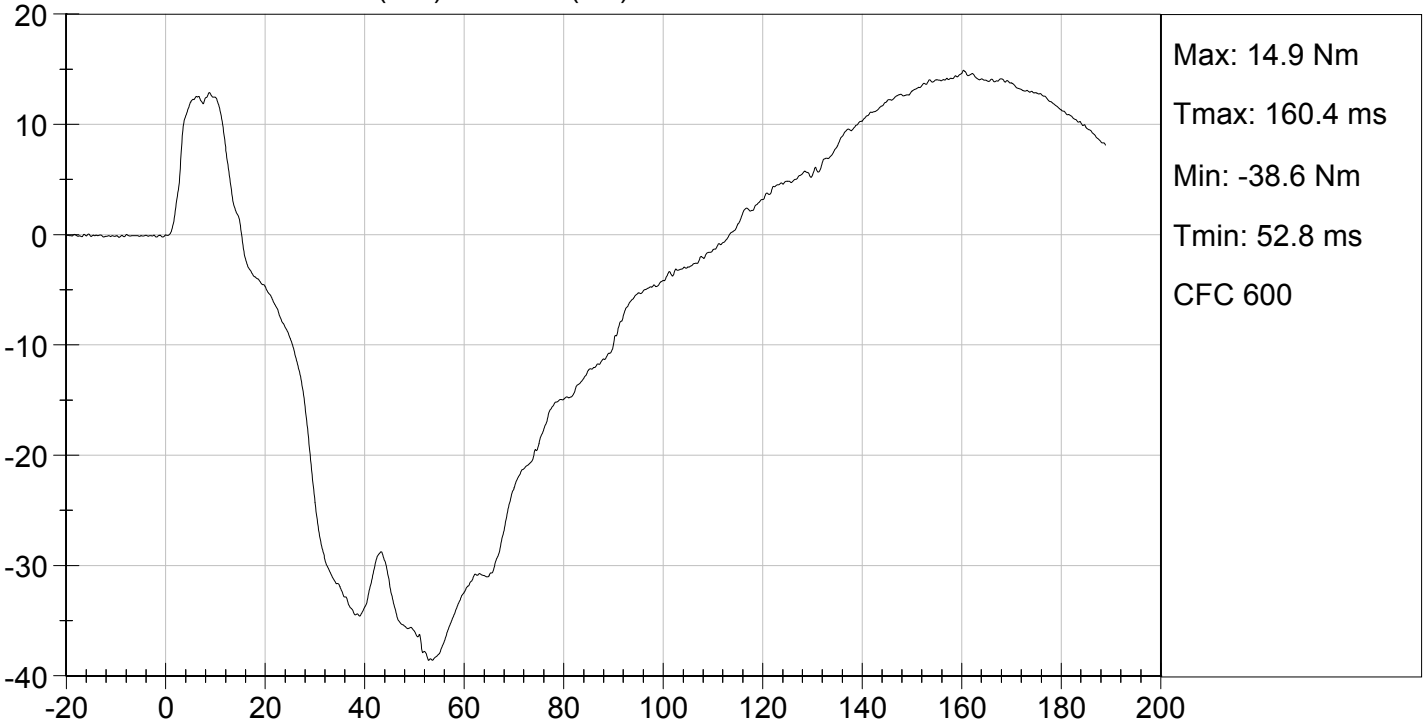
FLEXION ANGLE (DEG) vs TIME (ms)



TEST DESC: NECK BENDING
VELOCITY: 18.31 ft/s, 5.58 m/s

TEST DATE: 03/11/2016
TEST #: D16992

OCCIPITAL MOMENT (Nm) vs TIME (ms)



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test ID:** D16993

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	37	Pass
Impact Velocity	m/s	4.20 to 4.40	4.20	Pass
Maximum Probe Acceleration	G's	13 to 18	15	Pass
Shoulder Displacement	mm	28 to 37	30	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	18	Pass
		Overall Test Results		Pass

Laboratory Technician

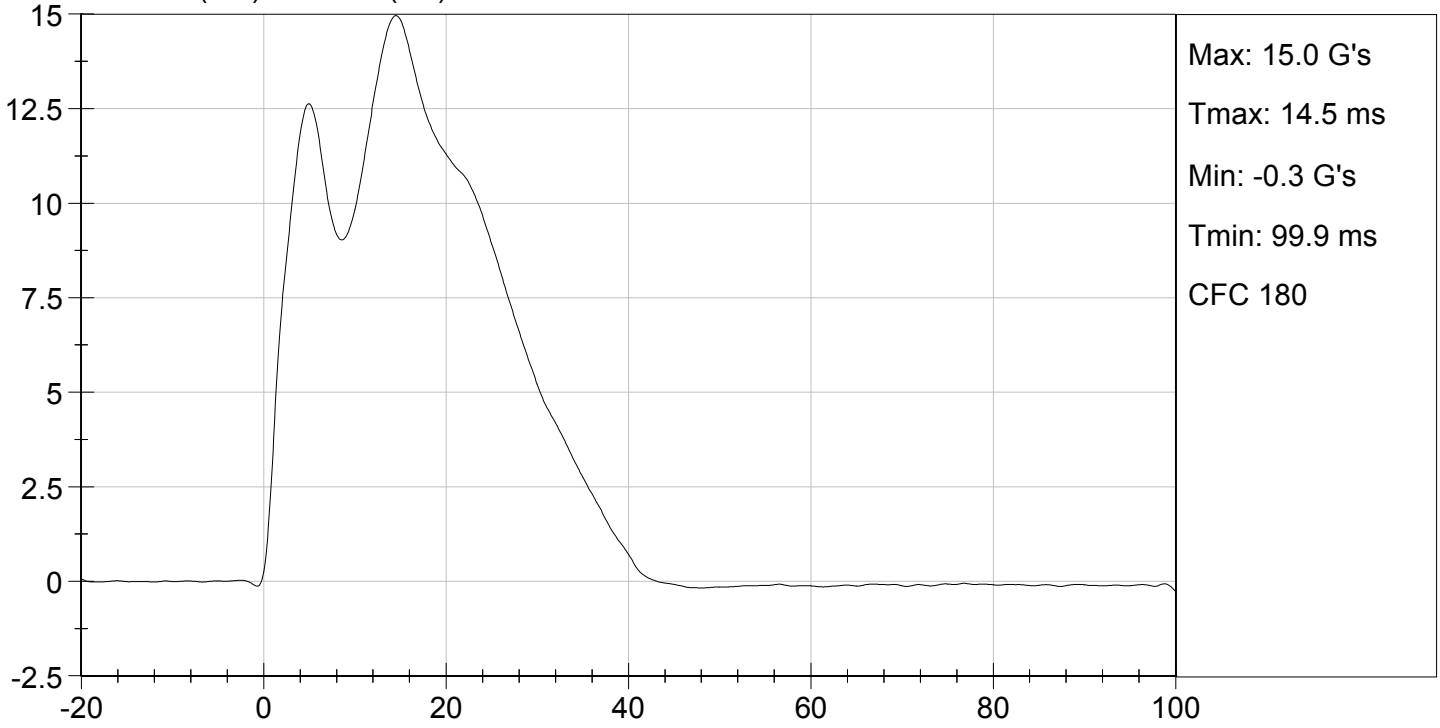
03/10/2016
Test Date

Approved By

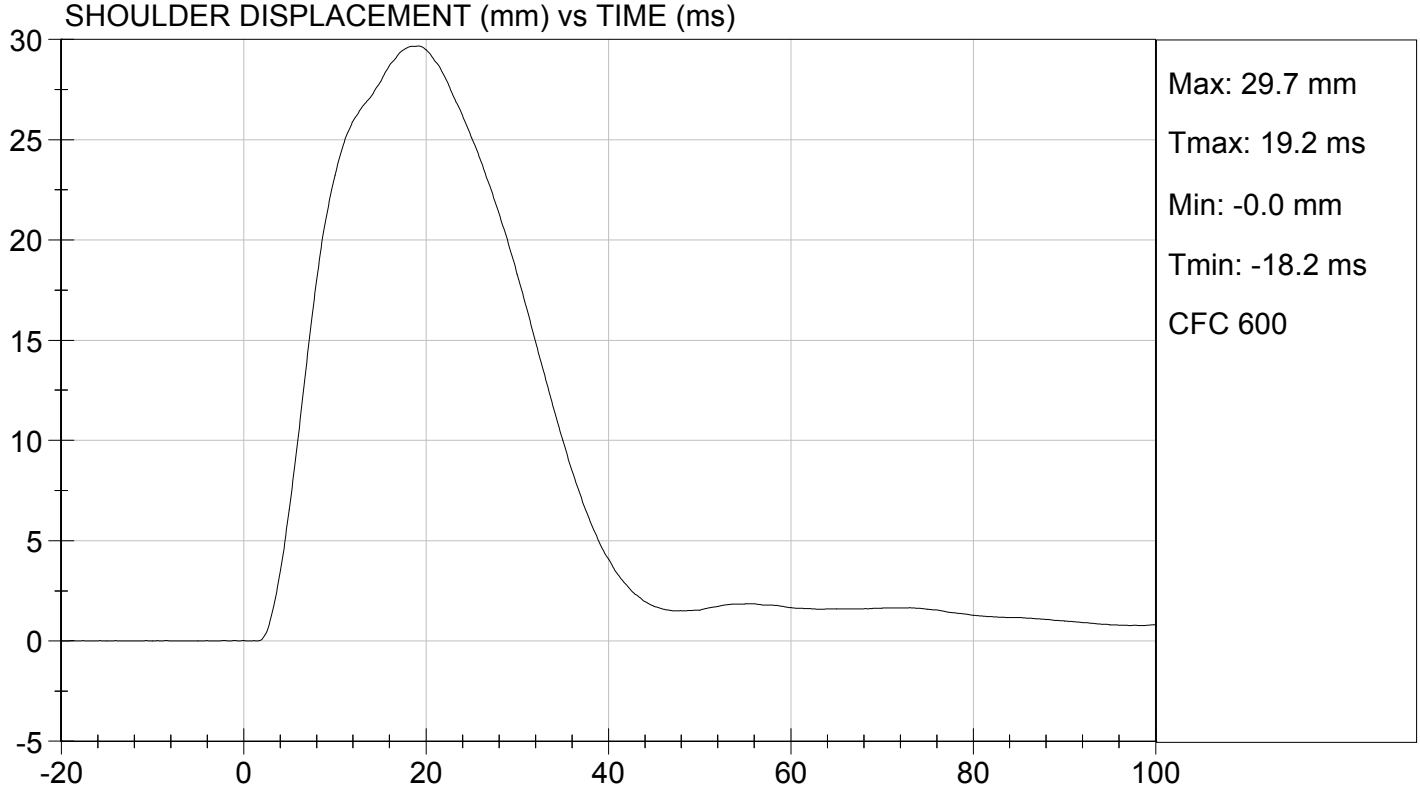
TEST DESC: SHOULDER IMPACT
VELOCITY: 13.78 ft/s, 4.20 m/s

TEST DATE: 03/10/2016
TEST #: D16993

PROBE (G's) vs TIME (ms)



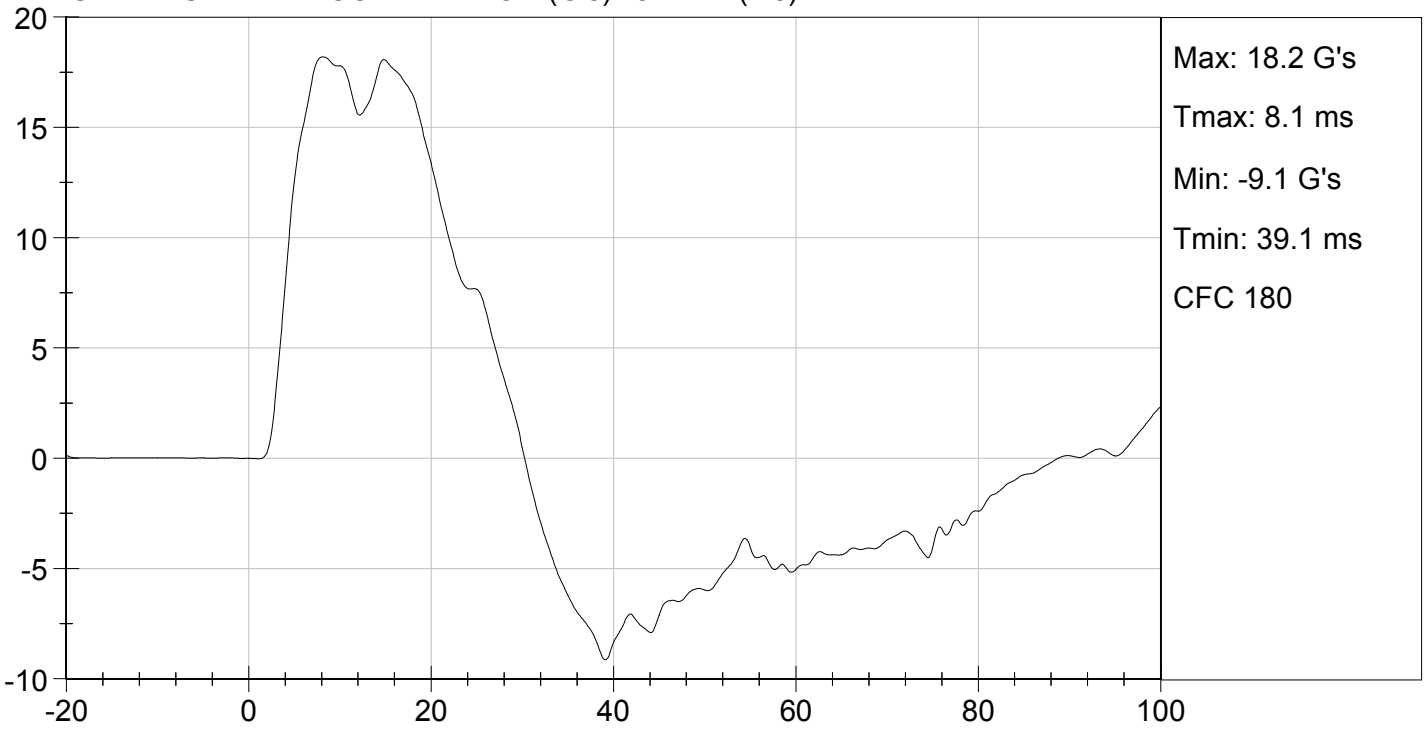
SHOULDER DISPLACEMENT (mm) vs TIME (ms)



TEST DESC: SHOULDER IMPACT
VELOCITY: 13.78 ft/s, 4.20 m/s

TEST DATE: 03/10/2016
TEST #: D16993

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



MGA RESEARCH CORPORATION

THORAX (WITH ARM) IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D16994

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Humidity	%	10 to 70	36	Pass
Impact Velocity	m/s	6.60 to 6.80	6.60	Pass
Maximum Probe Acceleration	G's	30 to 36	33	Pass
Shoulder Displacement	mm	31 to 40	34	Pass
Upper Rib Displacement	mm	25 to 32	28	Pass
Middle Rib Displacement	mm	30 to 36	31	Pass
Lower Rib Displacement	mm	32 to 38	34	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	38	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	33	Pass
		Overall Test Results		Pass

Laboratory Technician

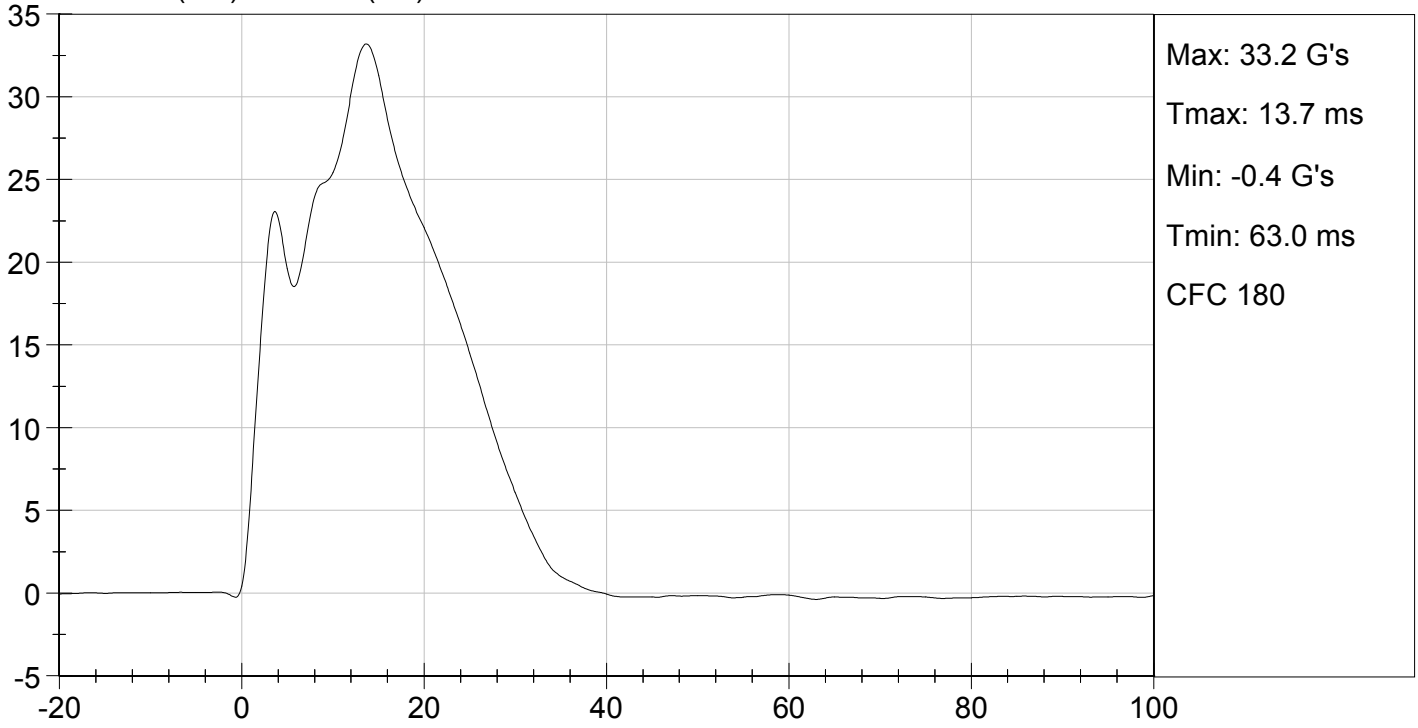
03/10/2016
Test Date

Approved By

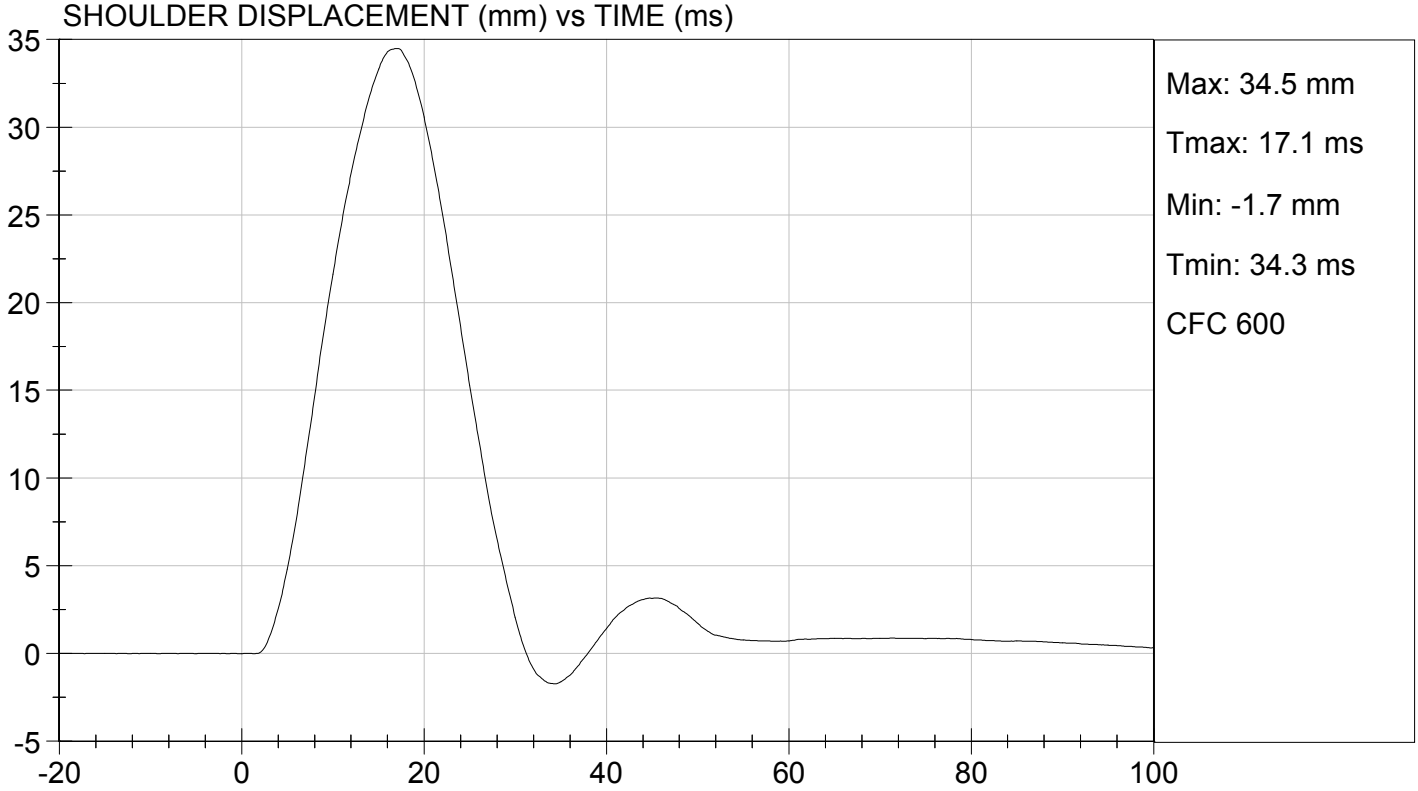
TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 21.65 ft/s, 6.60 m/s

TEST DATE: 03/10/2016
TEST #: D16994

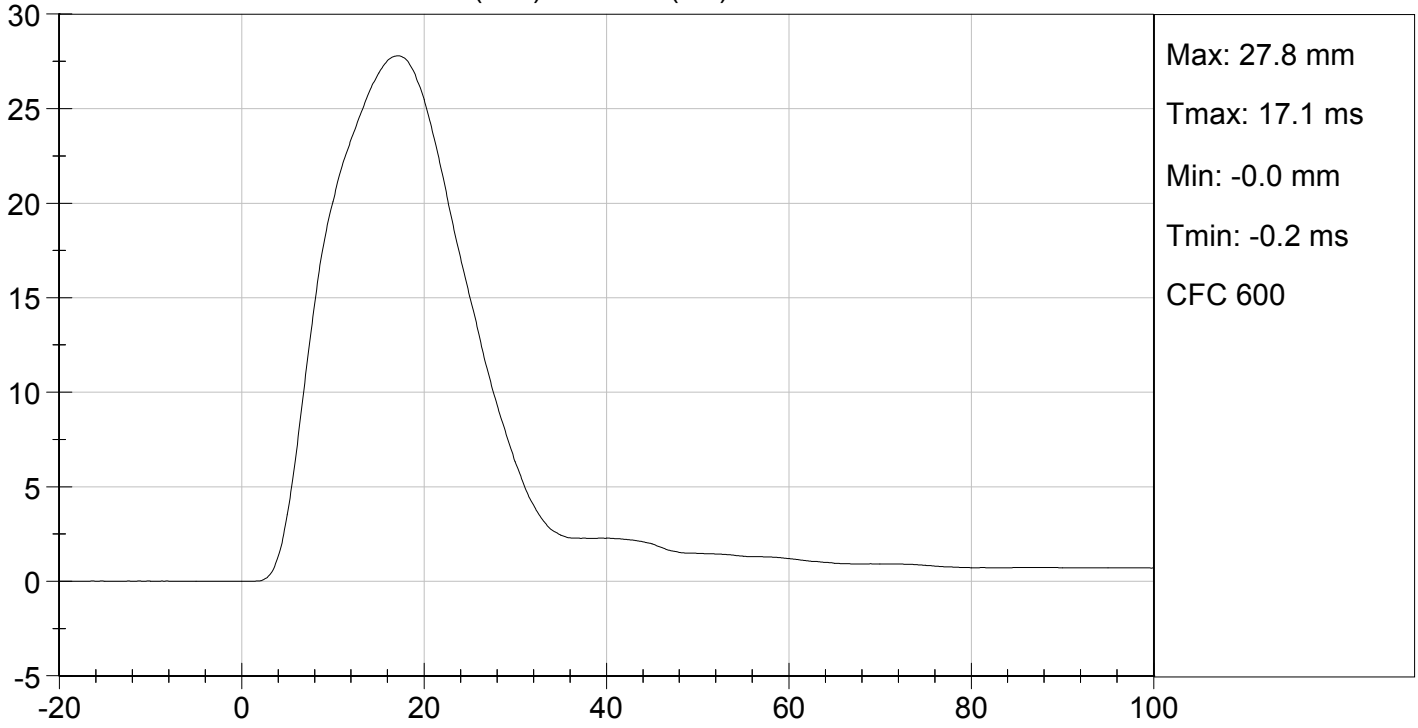
PROBE (G's) vs TIME (ms)



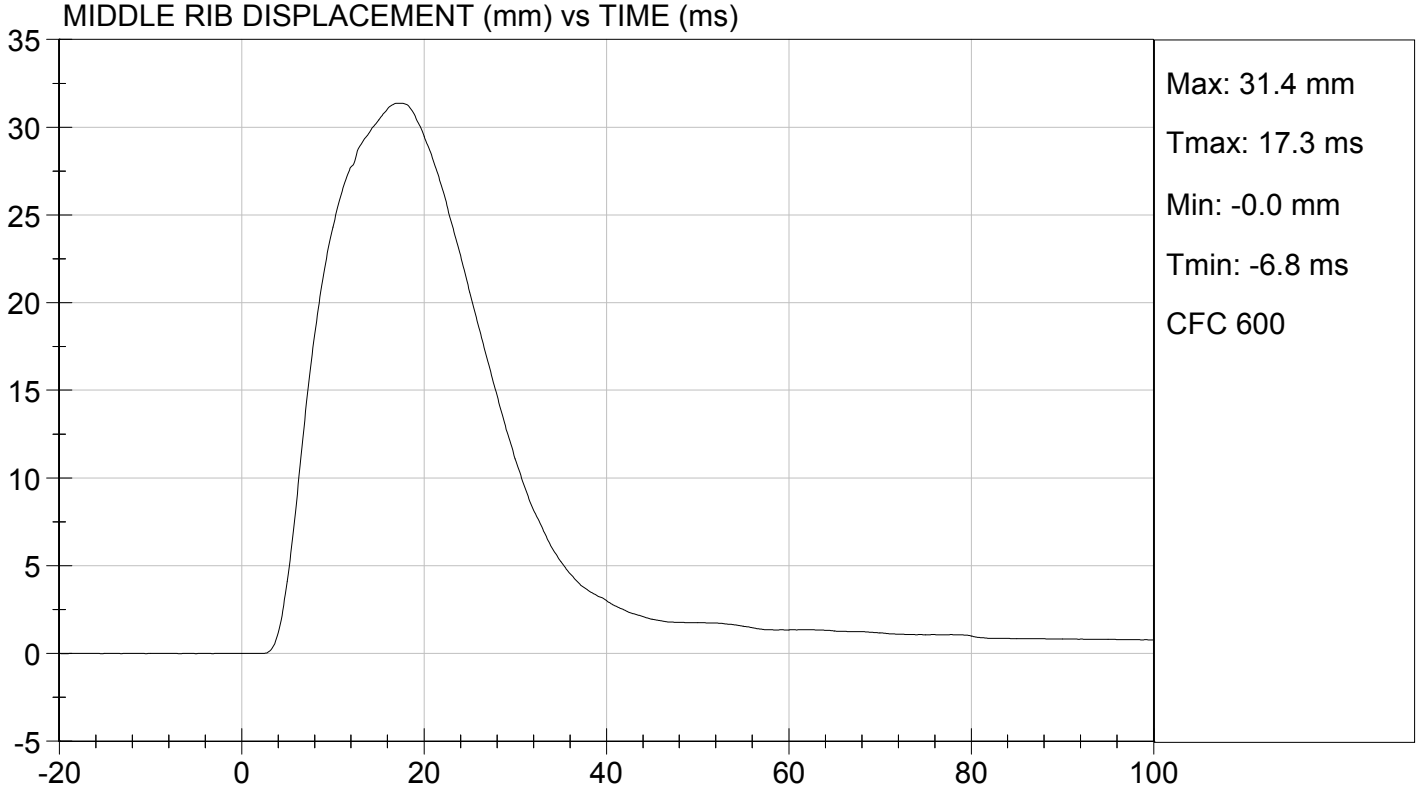
SHOULDER DISPLACEMENT (mm) vs TIME (ms)



UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



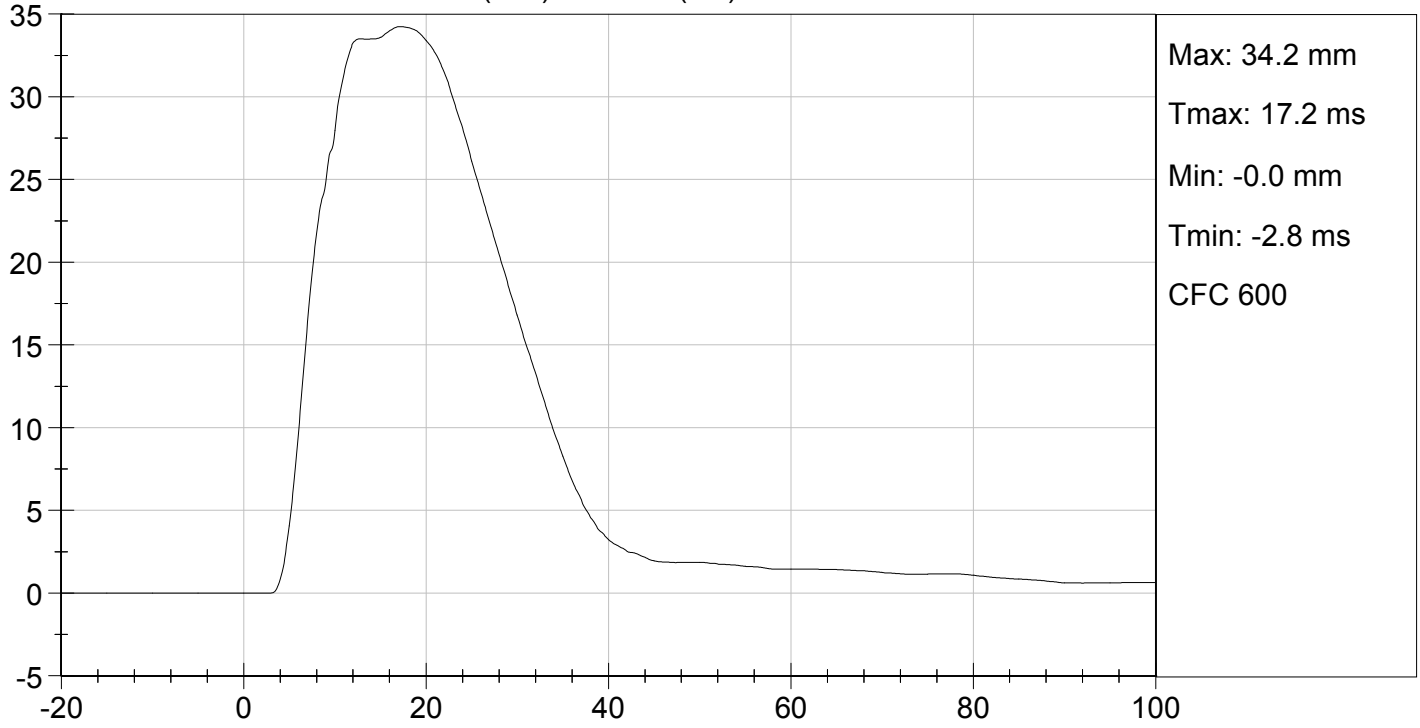
MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



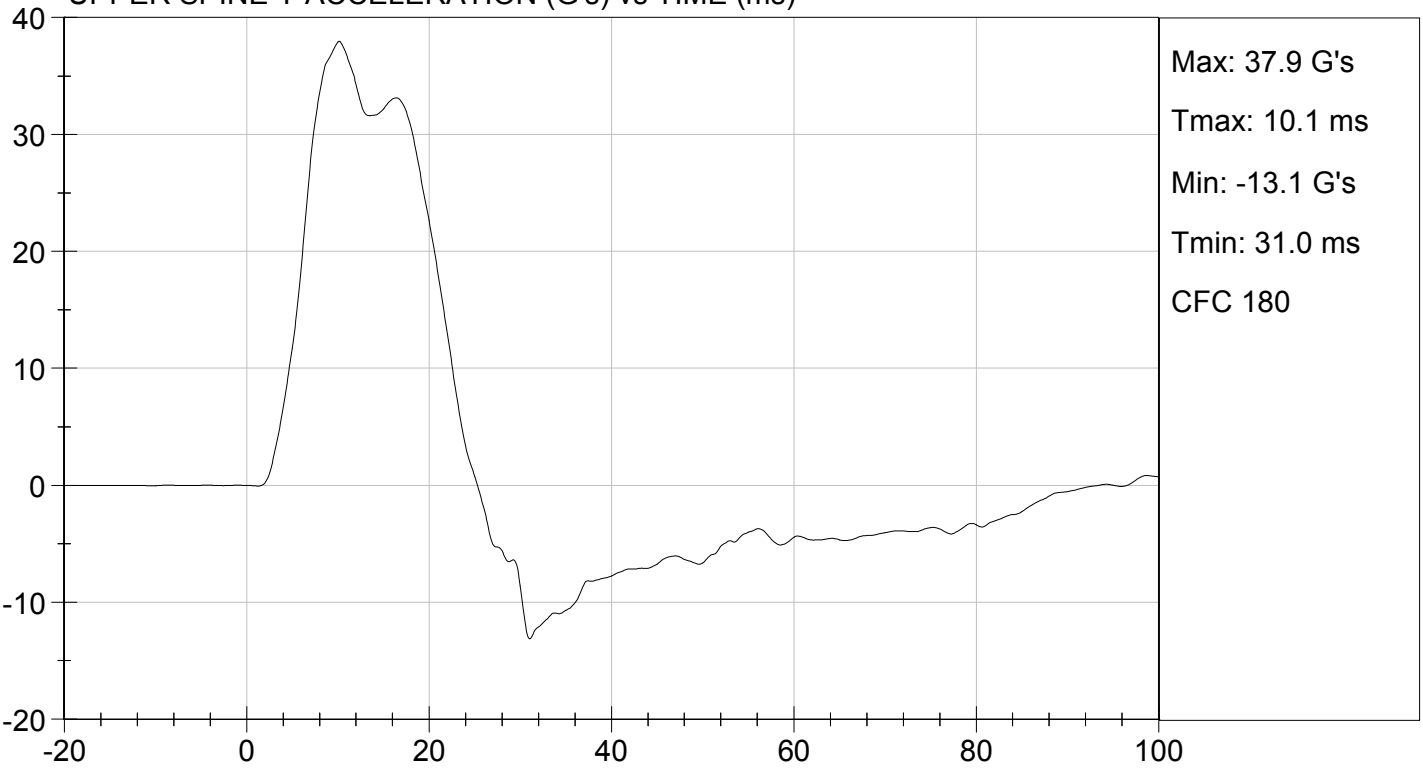
TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 21.65 ft/s, 6.60 m/s

TEST DATE: 03/10/2016
TEST #: D16994

LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



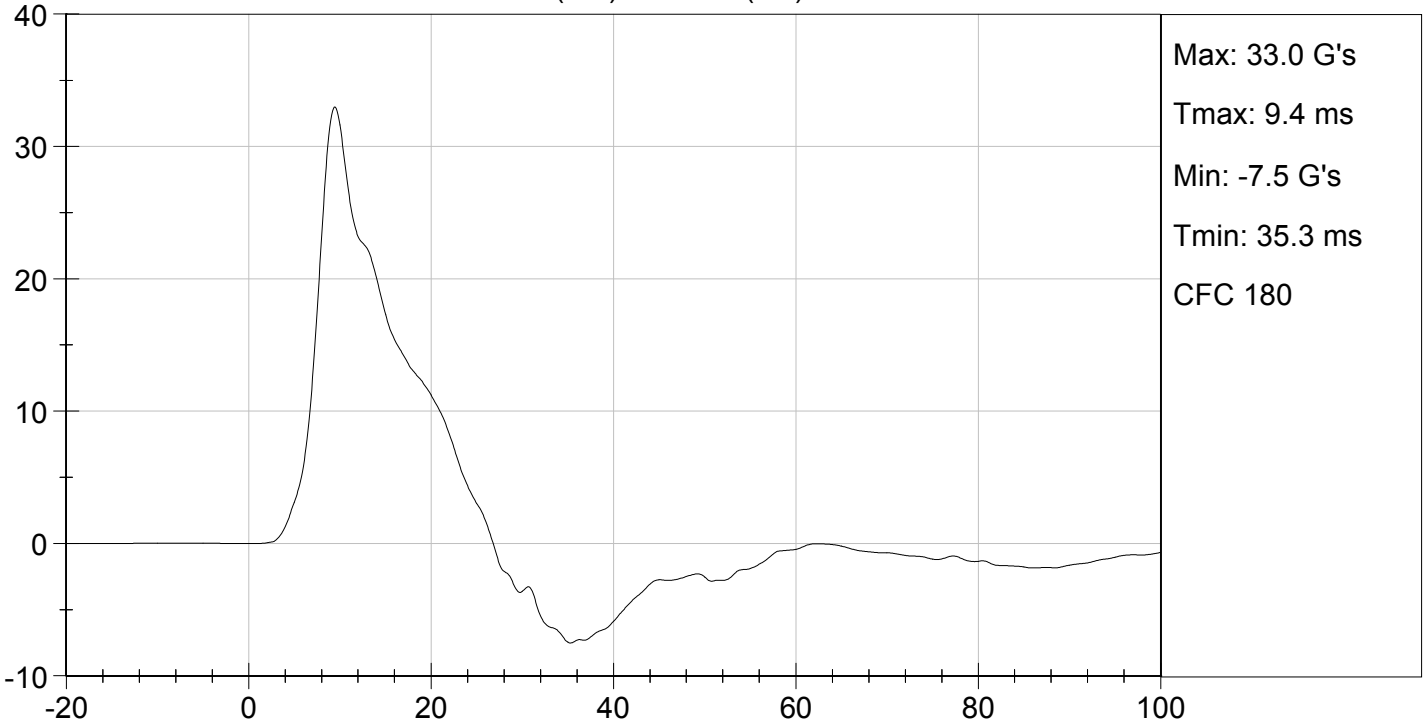
UPPER SPINE Y ACCELERATION (G's) vs TIME (ms)



TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 21.65 ft/s, 6.60 m/s

TEST DATE: 03/10/2016
TEST #: D16994

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



MGA RESEARCH CORPORATION

THORAX (WITHOUT ARM) IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D16995

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Humidity	%	10 to 70	36	Pass
Impact Velocity	m/s	4.20 to 4.40	4.20	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	40	Pass
Lower Rib Displacement	mm	35 to 43	39	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 17	14	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	8	Pass
		Overall Test Results		Pass

Laboratory Technician

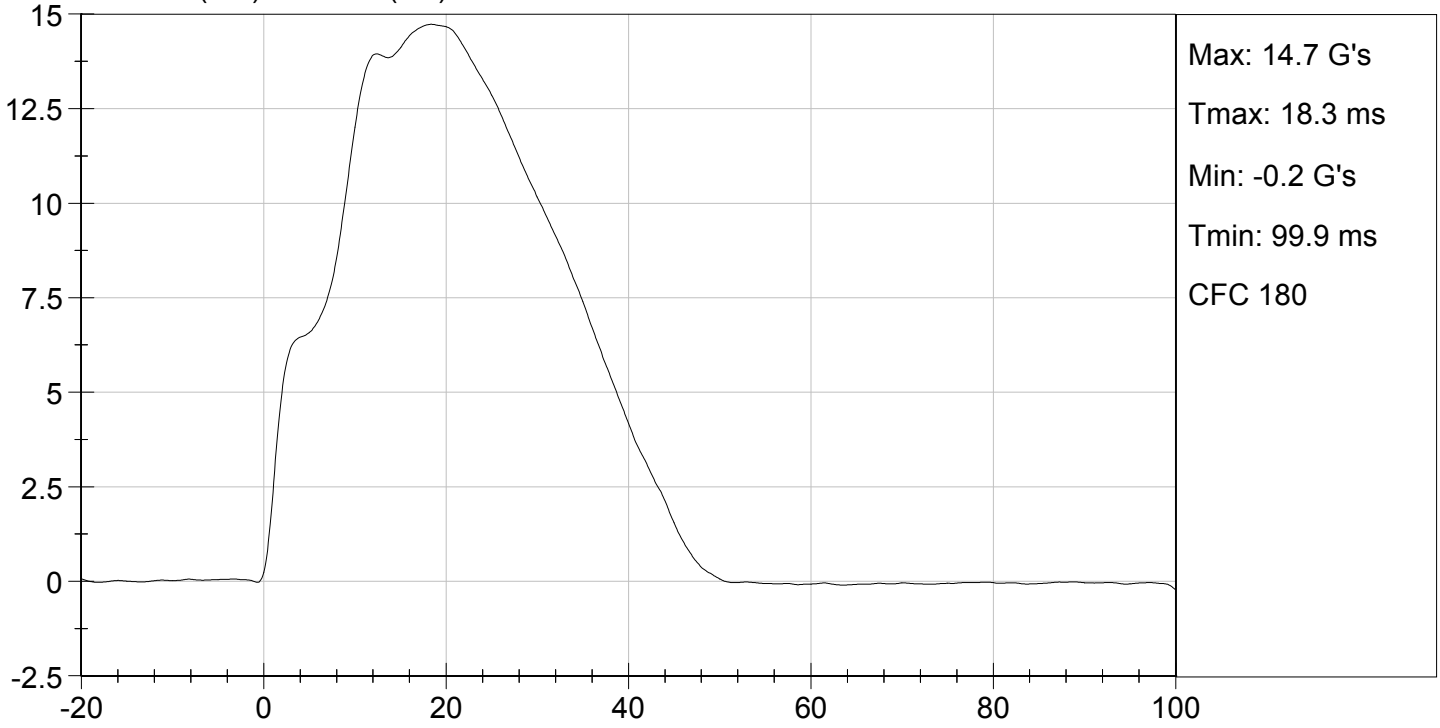
03/10/2016
Test Date

Approved By

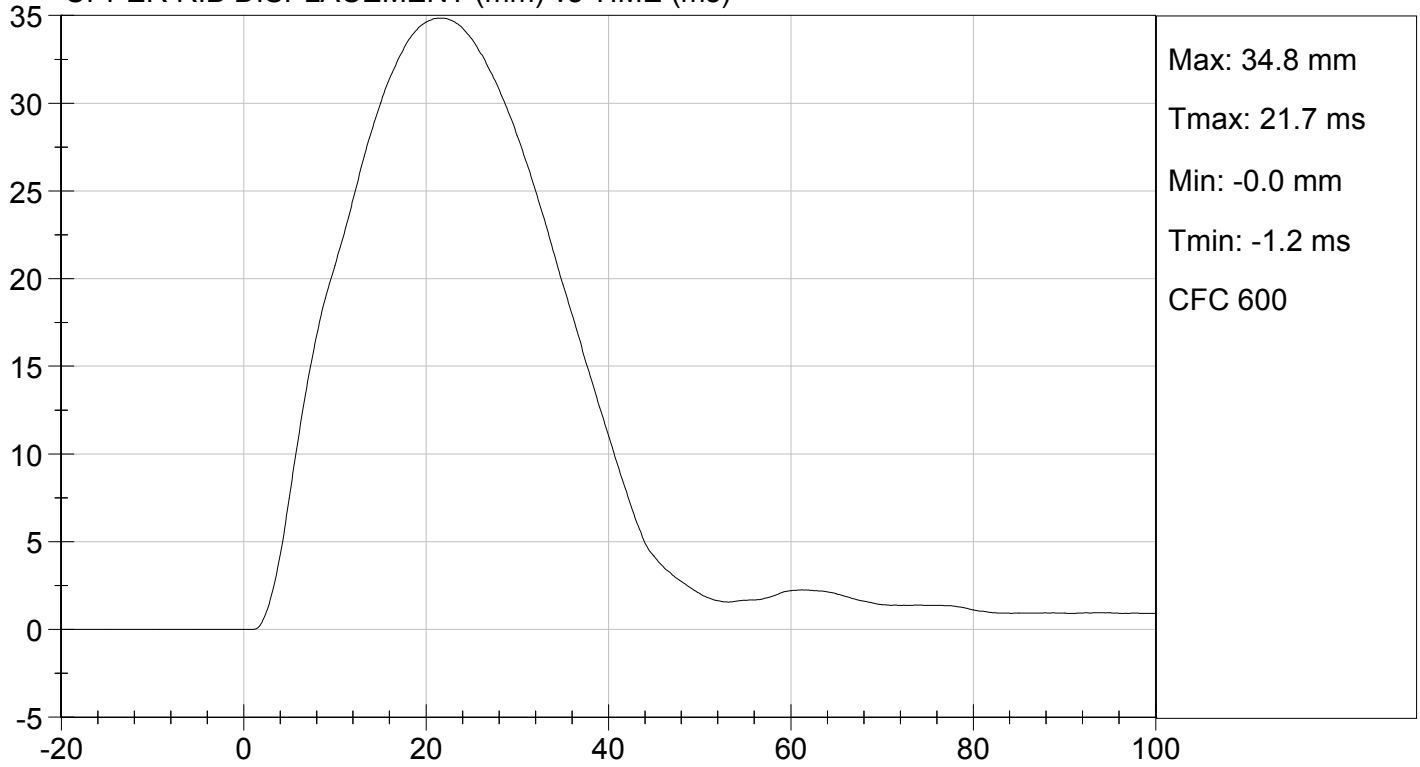
TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 13.78 ft/s, 4.20 m/s

TEST DATE: 03/10/2016
TEST #: D16995

PROBE (G's) vs TIME (ms)



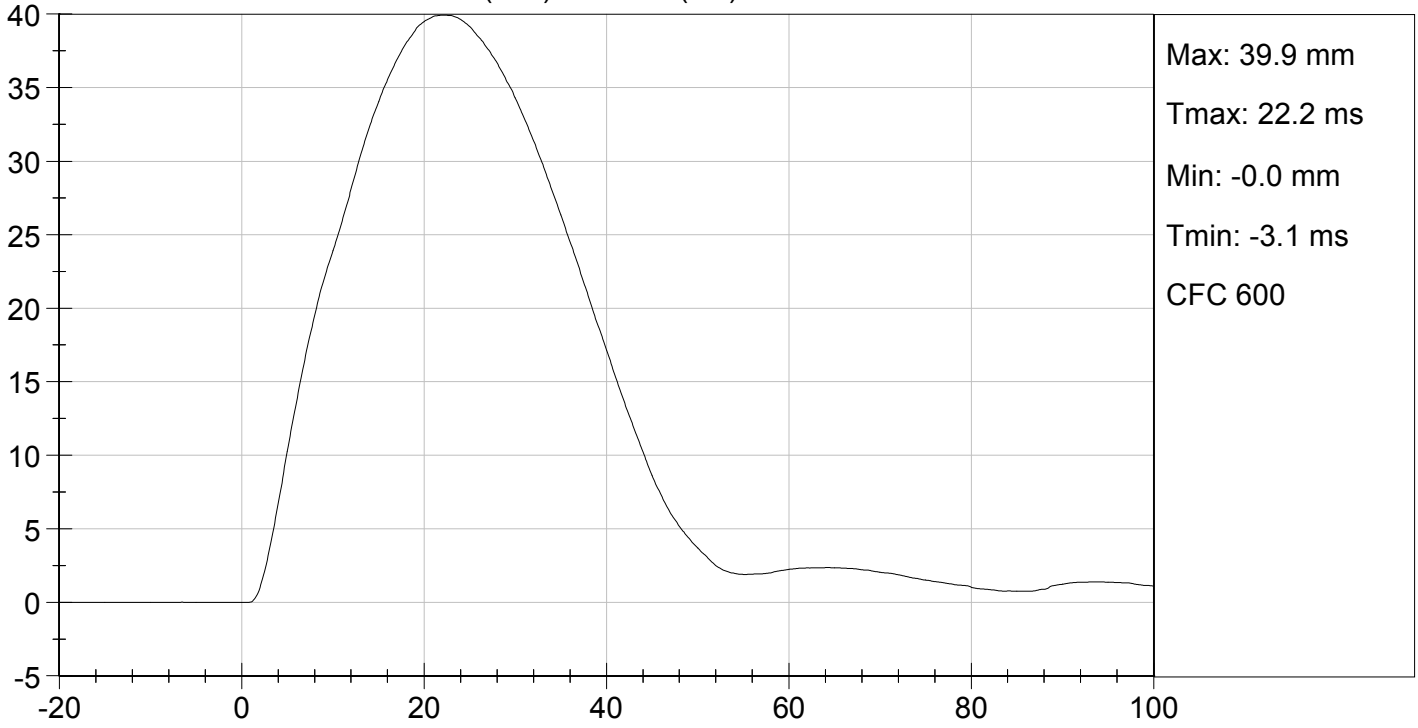
UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



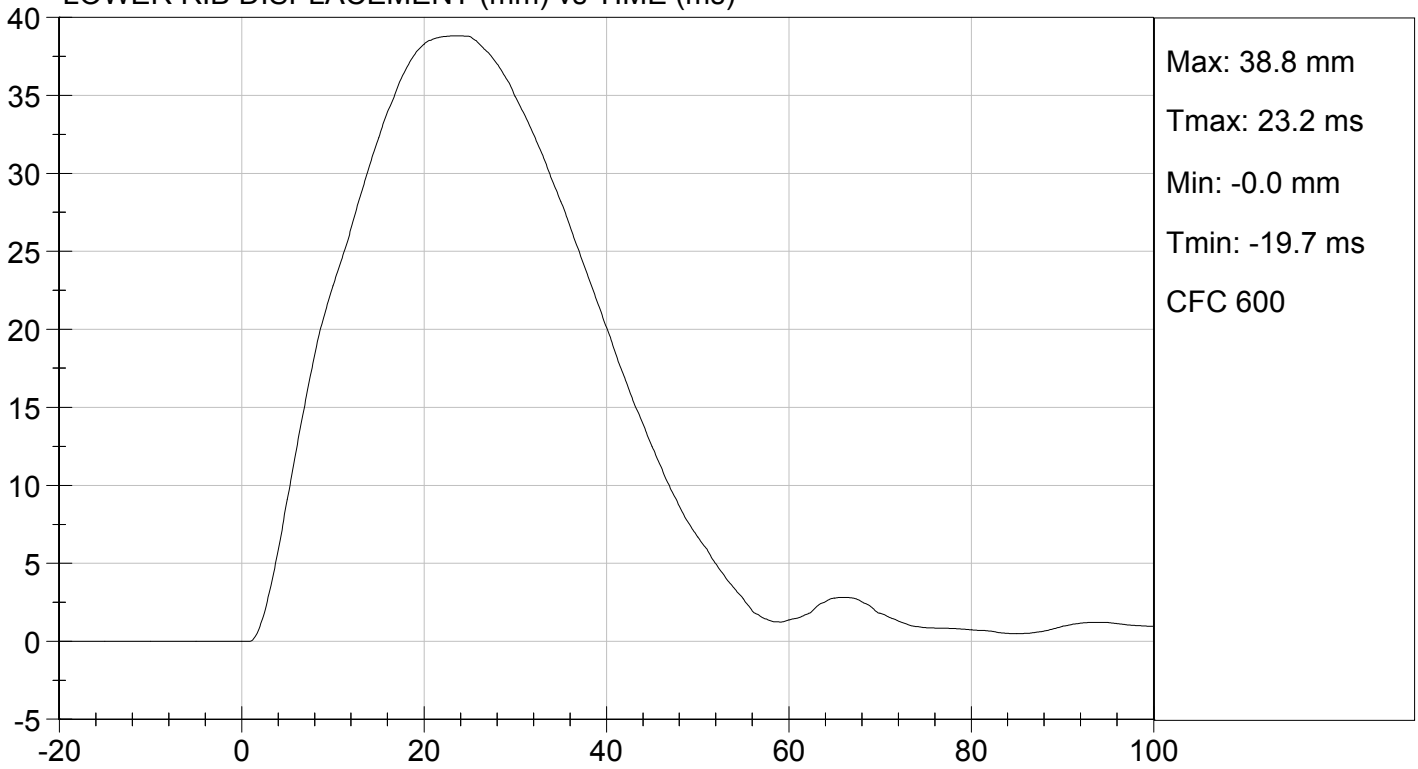
TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 13.78 ft/s, 4.20 m/s

TEST DATE: 03/10/2016
TEST #: D16995

MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



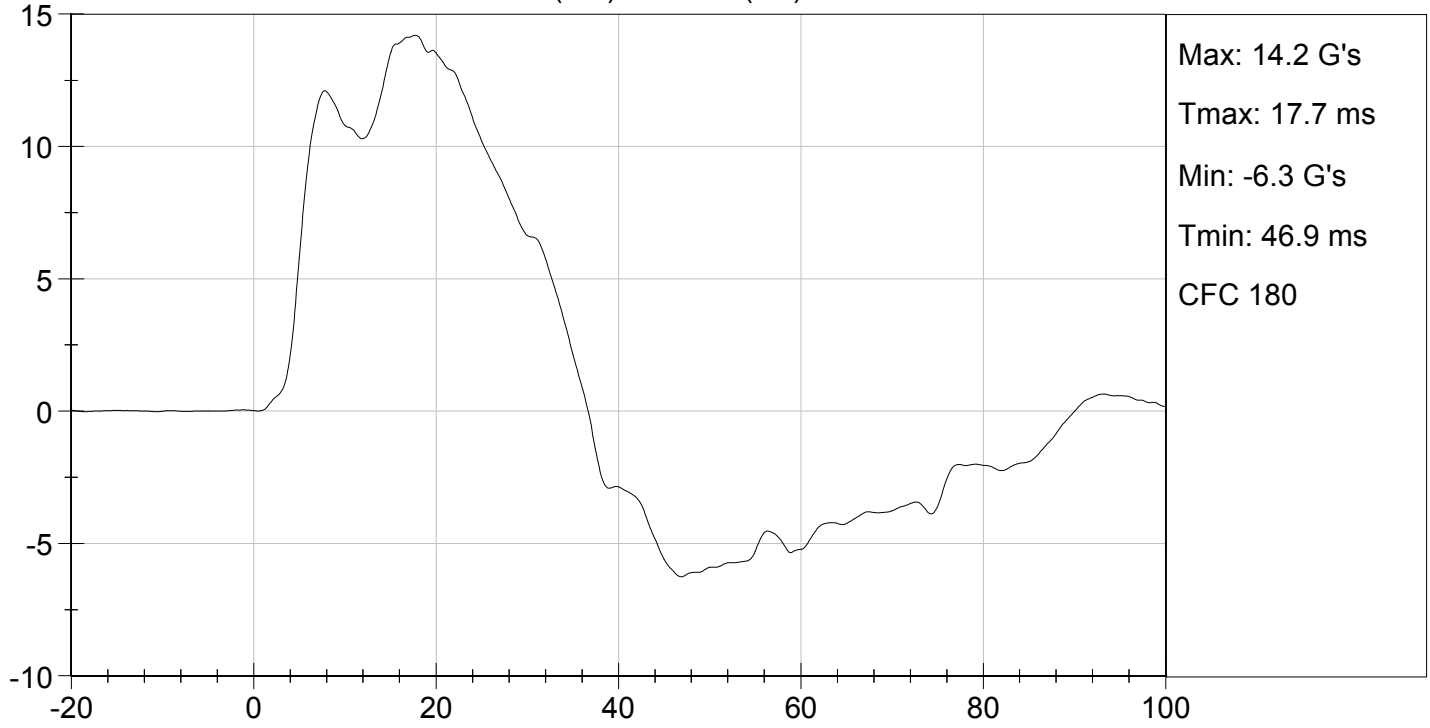
LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



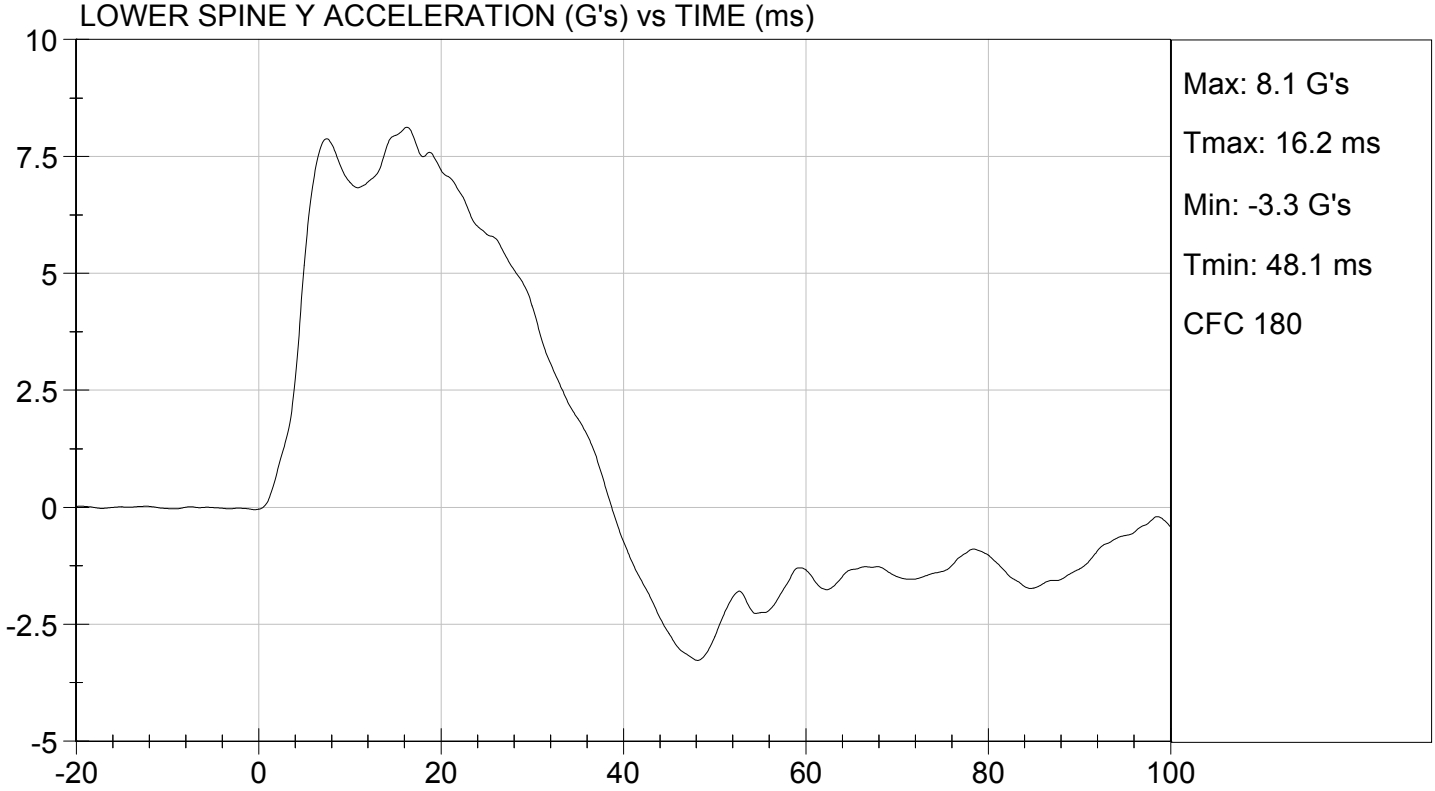
TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 13.78 ft/s, 4.20 m/s

TEST DATE: 03/10/2016
TEST #: D16995

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:** D16996

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	37	Pass
Impact Velocity	m/s	4.20 to 4.40	4.23	Pass
Maximum Probe Acceleration	G's	12 to 16	14	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

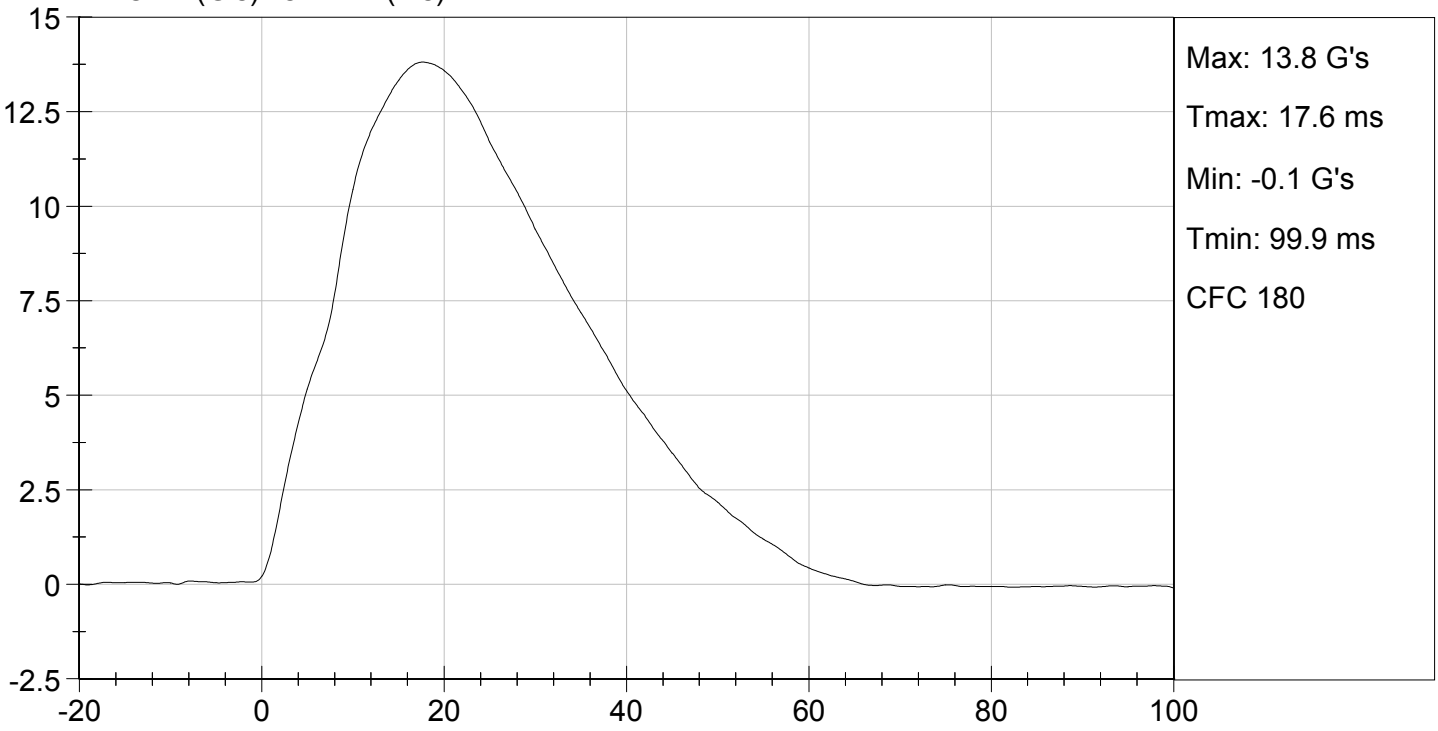
03/10/2016
Test Date

Approved By

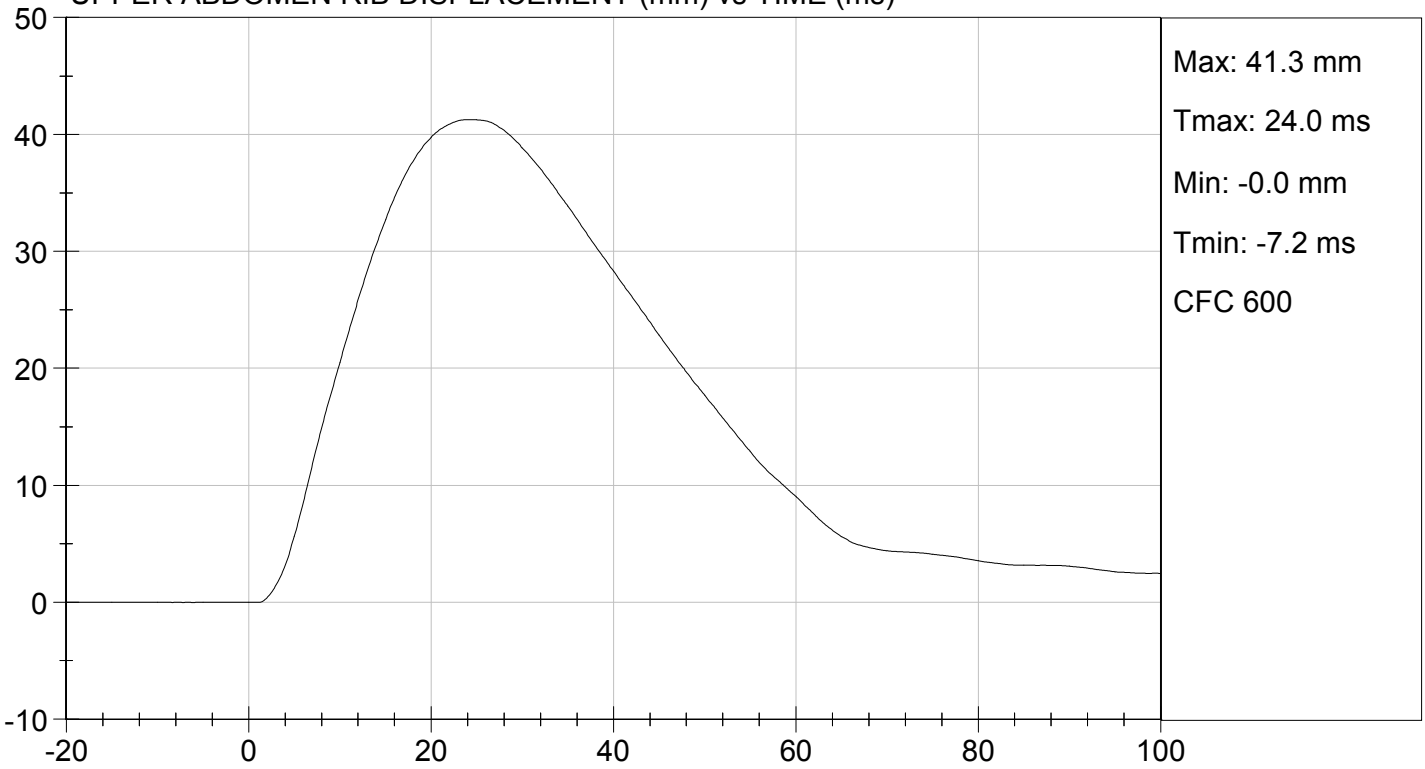
TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.89 ft/s, 4.23 m/s

TEST DATE: 03/10/2016
TEST #: D16996

PROBE (G's) vs TIME (ms)



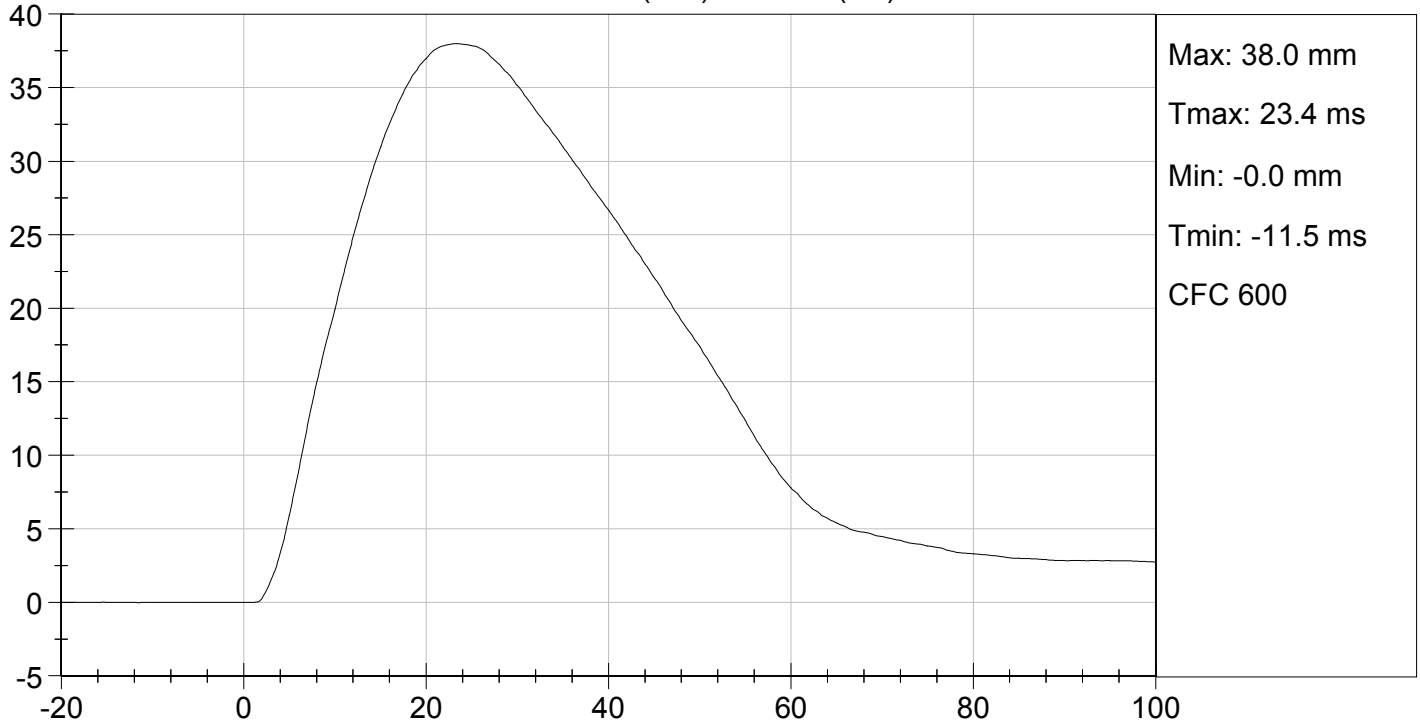
UPPER ABDOMEN RIB DISPLACEMENT (mm) vs TIME (ms)



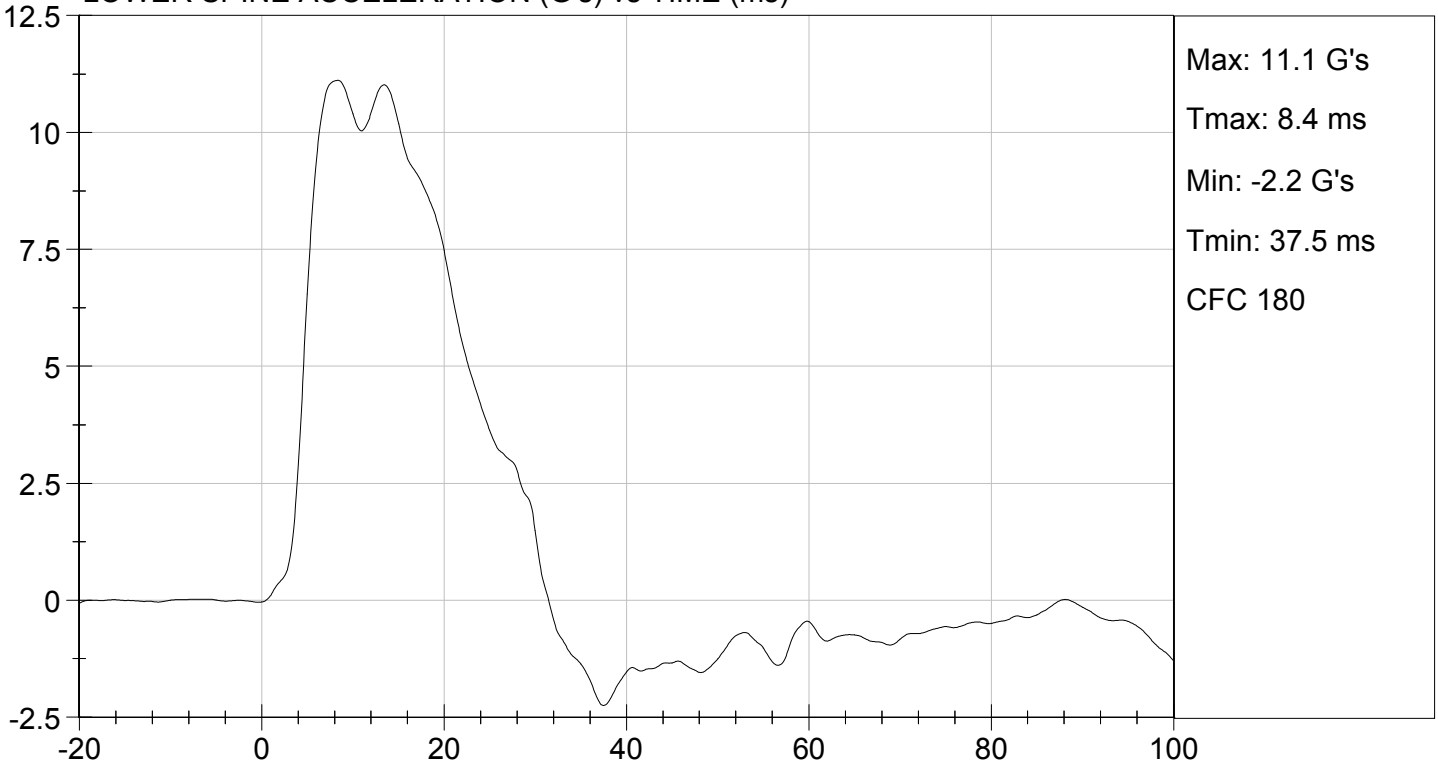
TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.89 ft/s, 4.23 m/s

TEST DATE: 03/10/2016
TEST #: D16996

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:** D16997

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Humidity	%	10 to 70	32	Pass
Impact Velocity	m/s	6.60 to 6.80	6.68	Pass
Maximum Probe Acceleration	G's	38 to 47	42	Pass
Pelvis Y Acceleration After 6 ms	G's	34 to 42	35	Pass
Peak Acetabulum Force	N	3600 to 4300	3,692	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

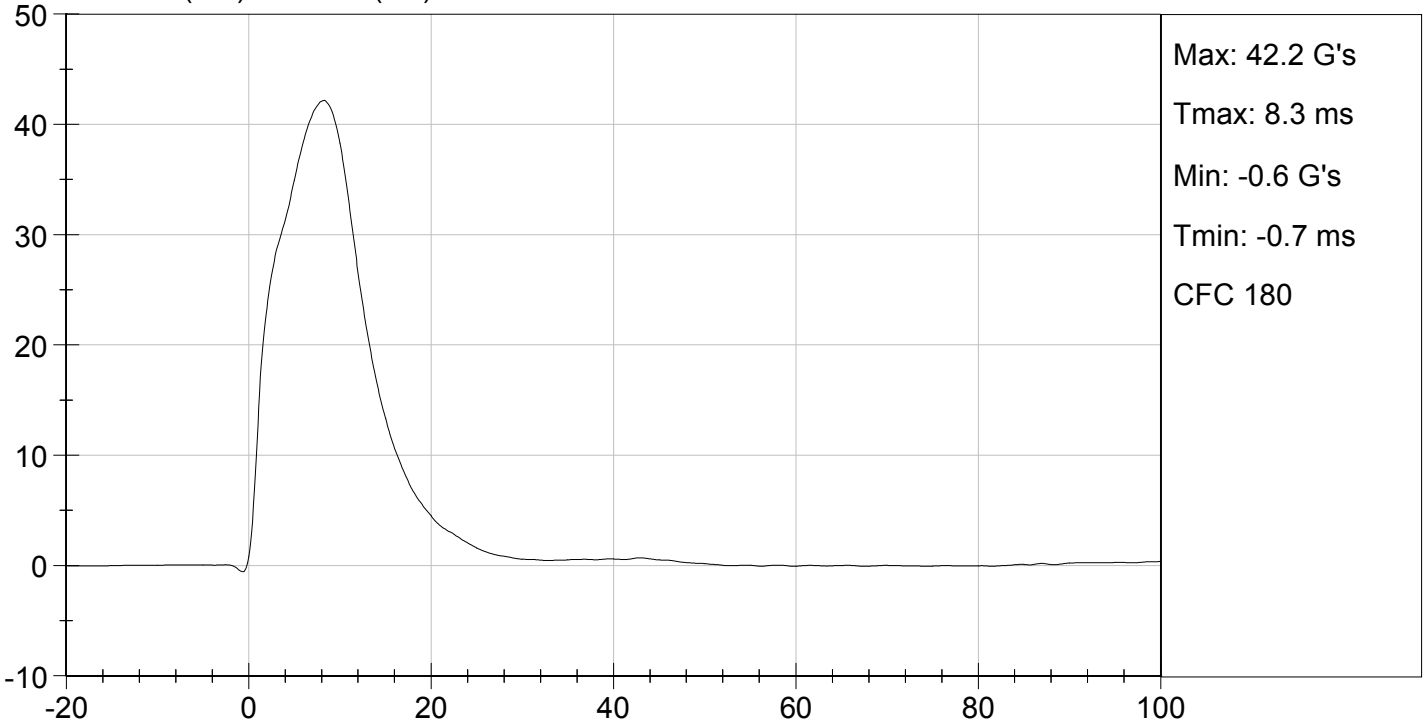
03/11/2016
Test Date

Thom D. Hille
Approved By

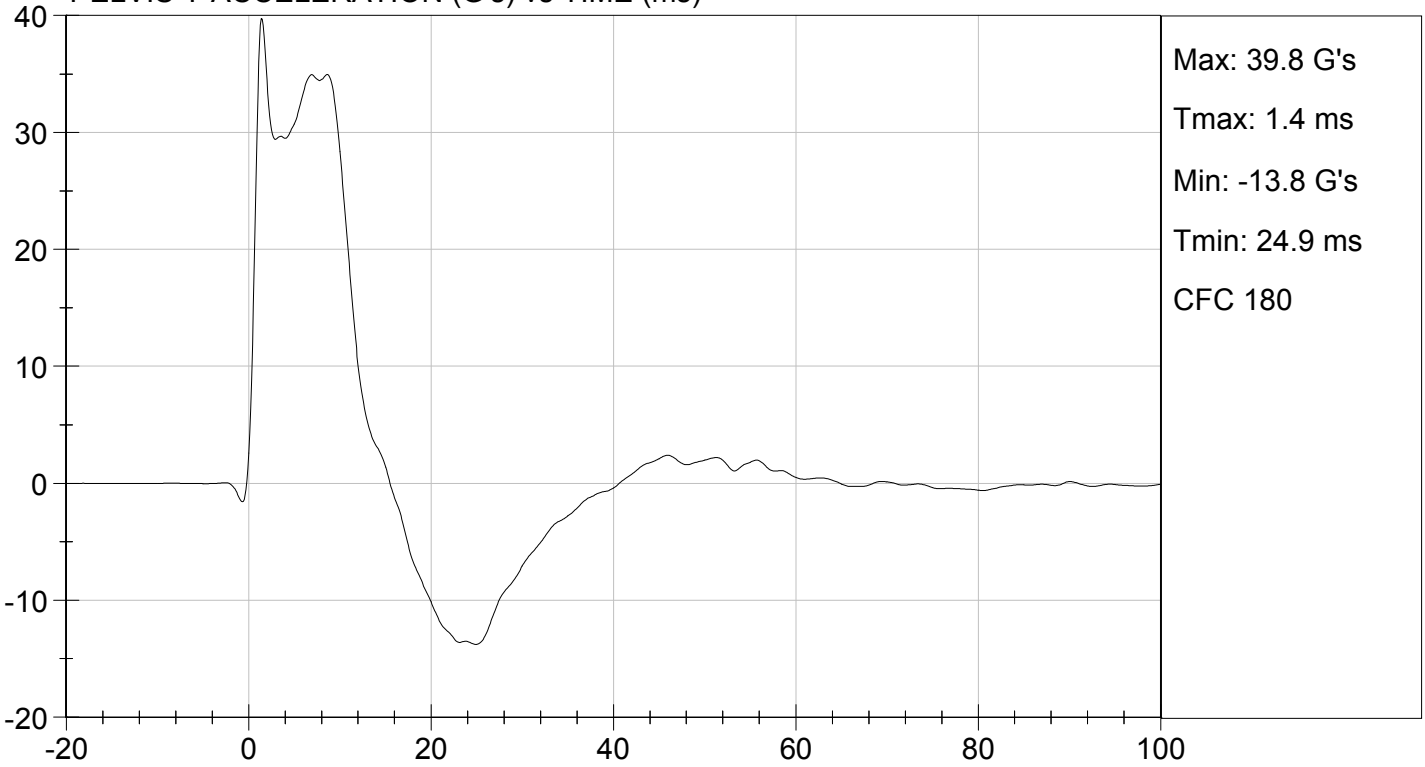
TEST DESC: PELVIS IMPACT
VELOCITY: 21.93 ft/s, 6.68 m/s

TEST DATE: 03/11/2016
TEST #: D16997

PROBE (G's) vs TIME (ms)

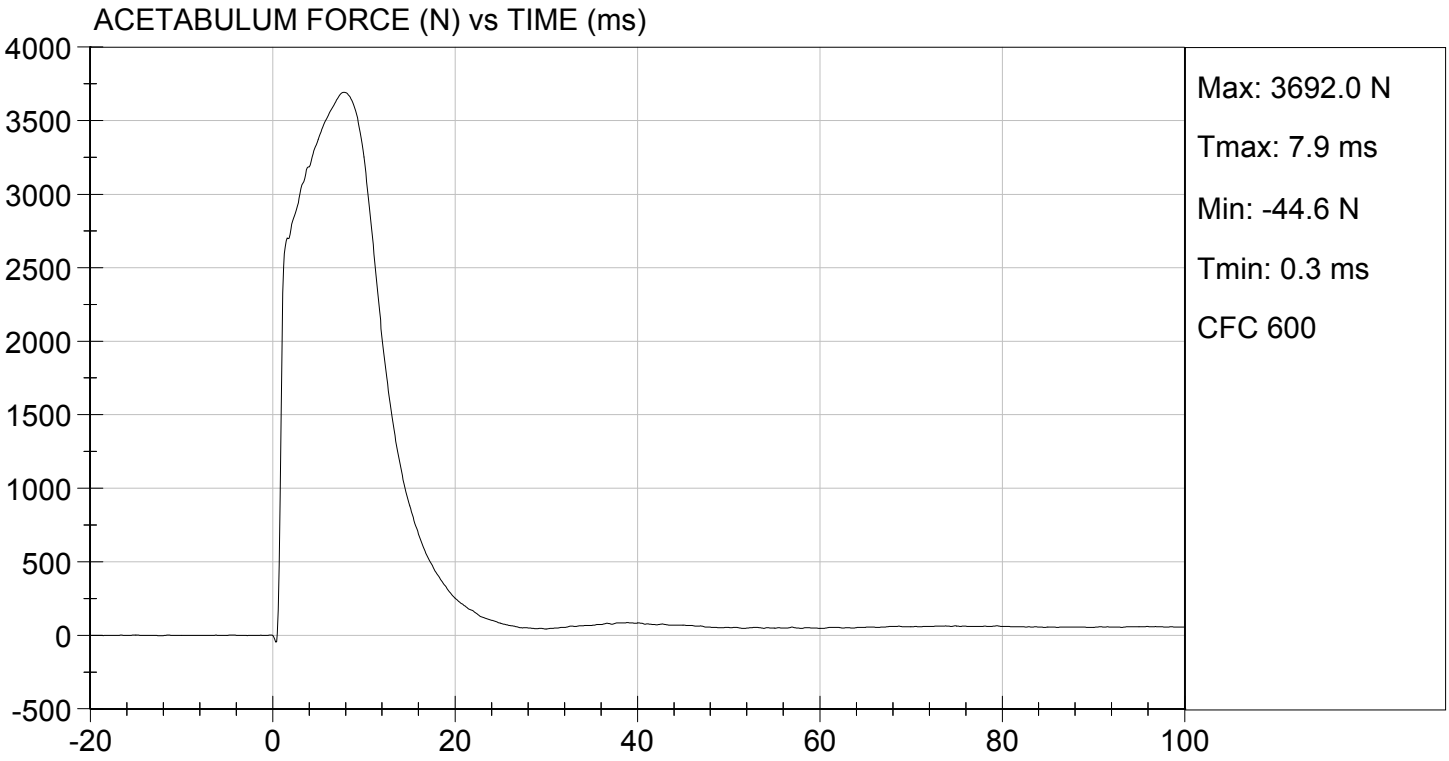


PELVIS Y ACCELERATION (G's) vs TIME (ms)



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

TEST DATE: 03/11/2016
TEST #: D16997



MGA RESEARCH CORPORATION

ILIAC IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D16998

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	37	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Maximum Probe Acceleration	G's	36 to 45	40	Pass
Pelvis Y Acceleration	G's	28 to 39	34	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4,790	Pass
		Overall Test Results		Pass

Laboratory Technician

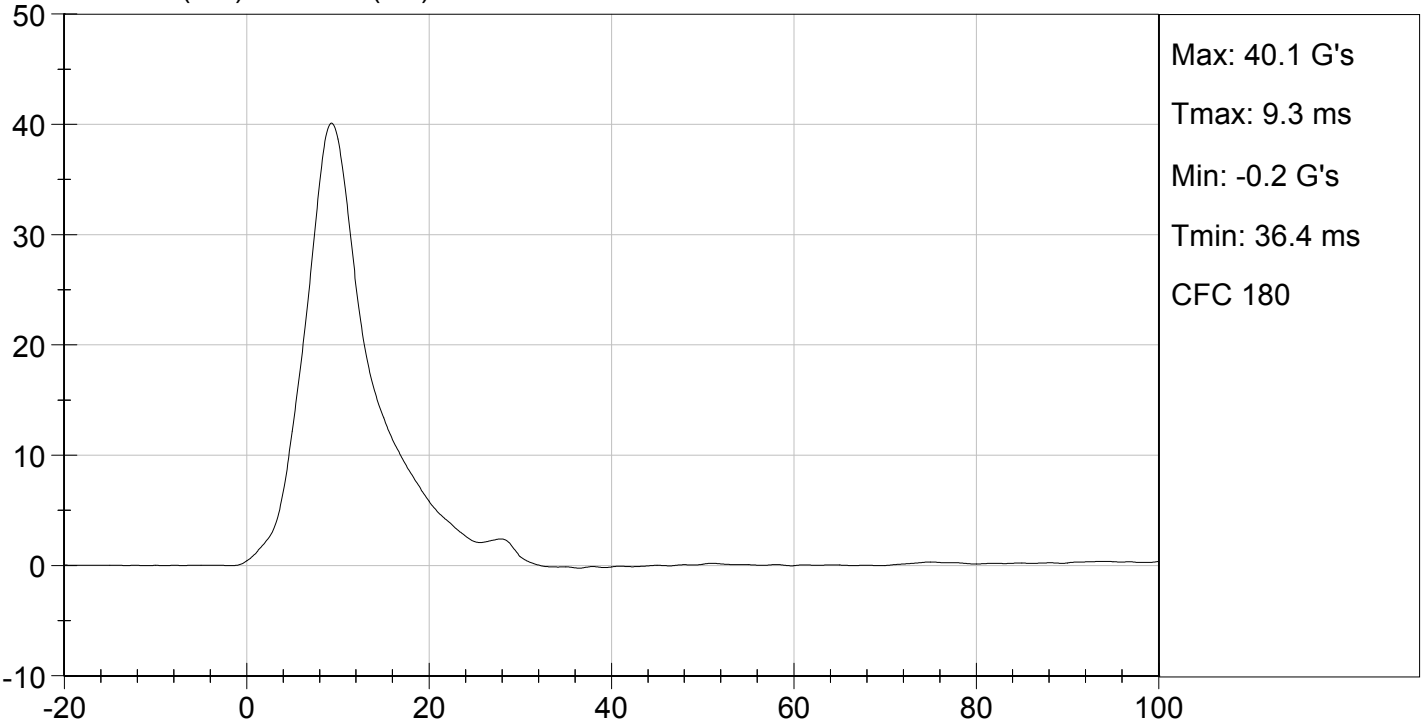
03/10/2016
Test Date

Approved By

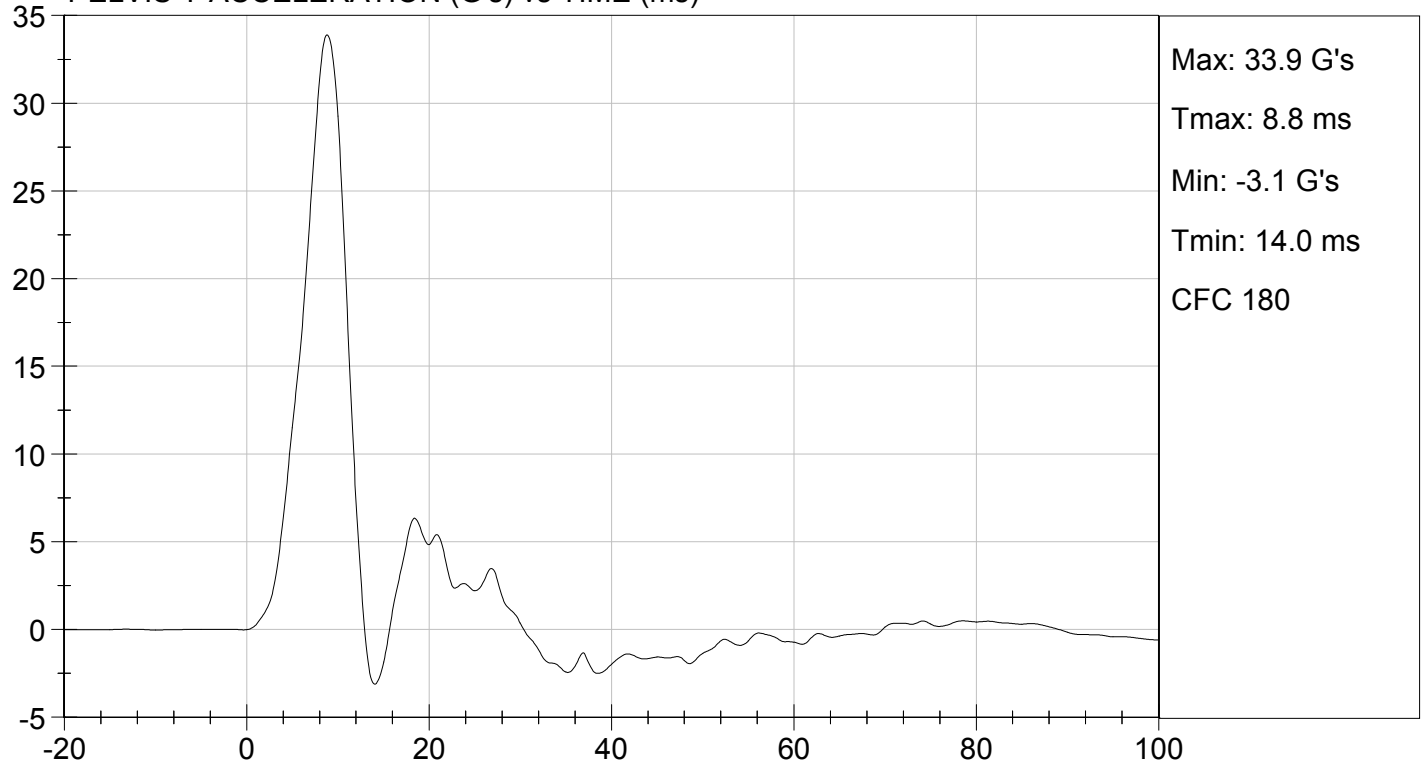
TEST DESC: ILLIAC
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 03/10/2016
TEST #: D16998

PROBE (G's) vs TIME (ms)

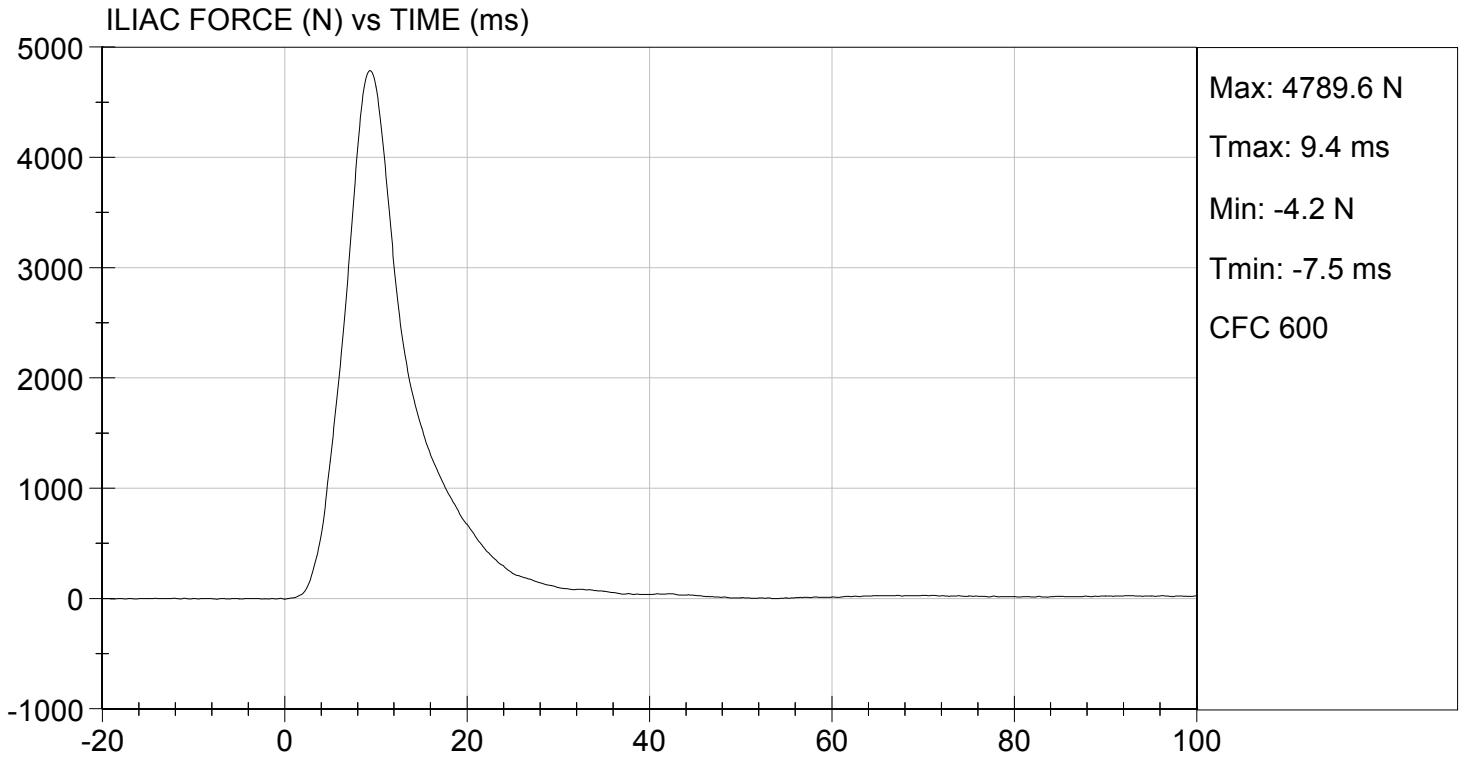


PELVIS Y ACCELERATION (G's) vs TIME (ms)



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

TEST DATE: 03/10/2016
TEST #: D16998



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:** D161481

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.6	Pass
Laboratory Relative Humidity	%	10 to 70	32	Pass
Peak Resultant Acceleration	G's	115 to 137	117	Pass
Peak Longitudinal Acceleration	G's	+/- 15	10.4	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	<15%	Yes	Pass
		Overall Test Results		Pass

Laboratory Technician

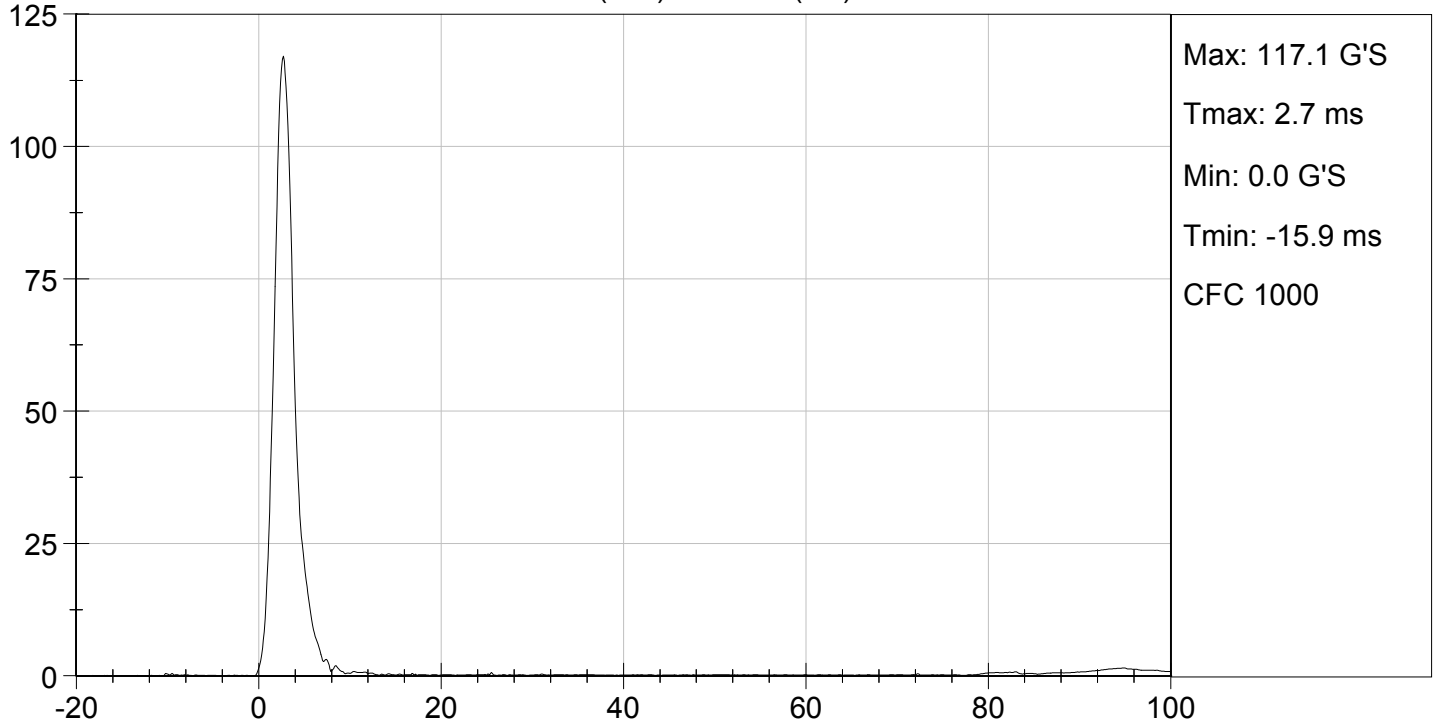
04/27/2016
Test Date

Approved By

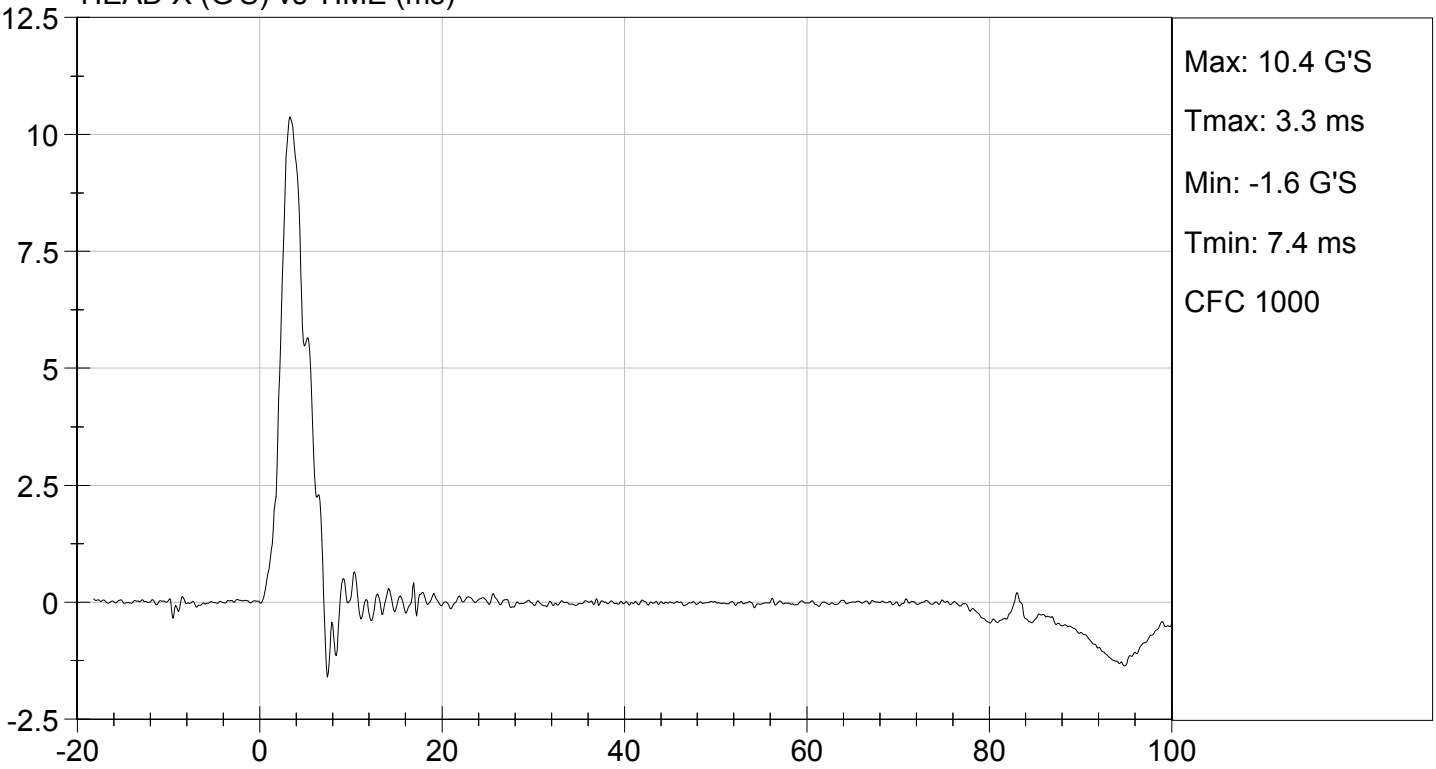
TEST DESC: HEAD DROP

TEST DATE: 04/27/2016
TEST #: D161481

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



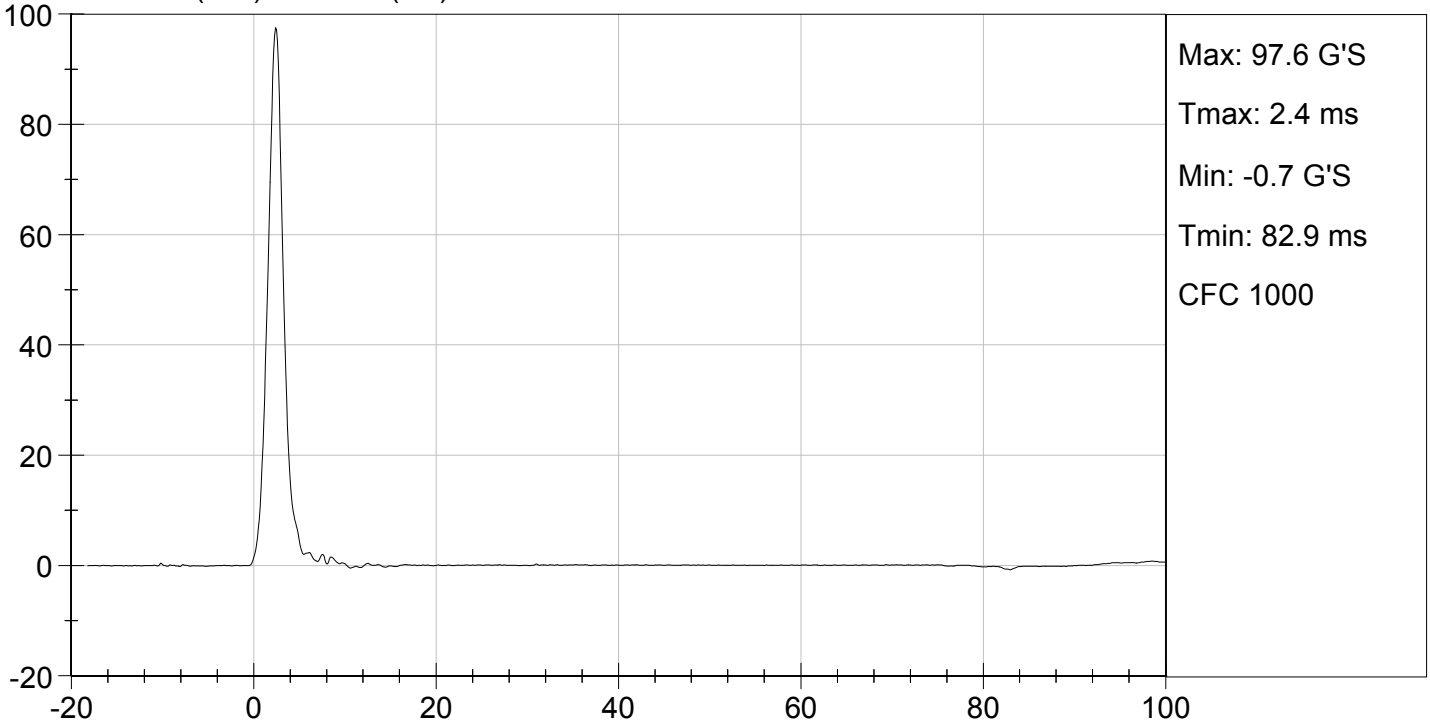
HEAD X (G'S) vs TIME (ms)



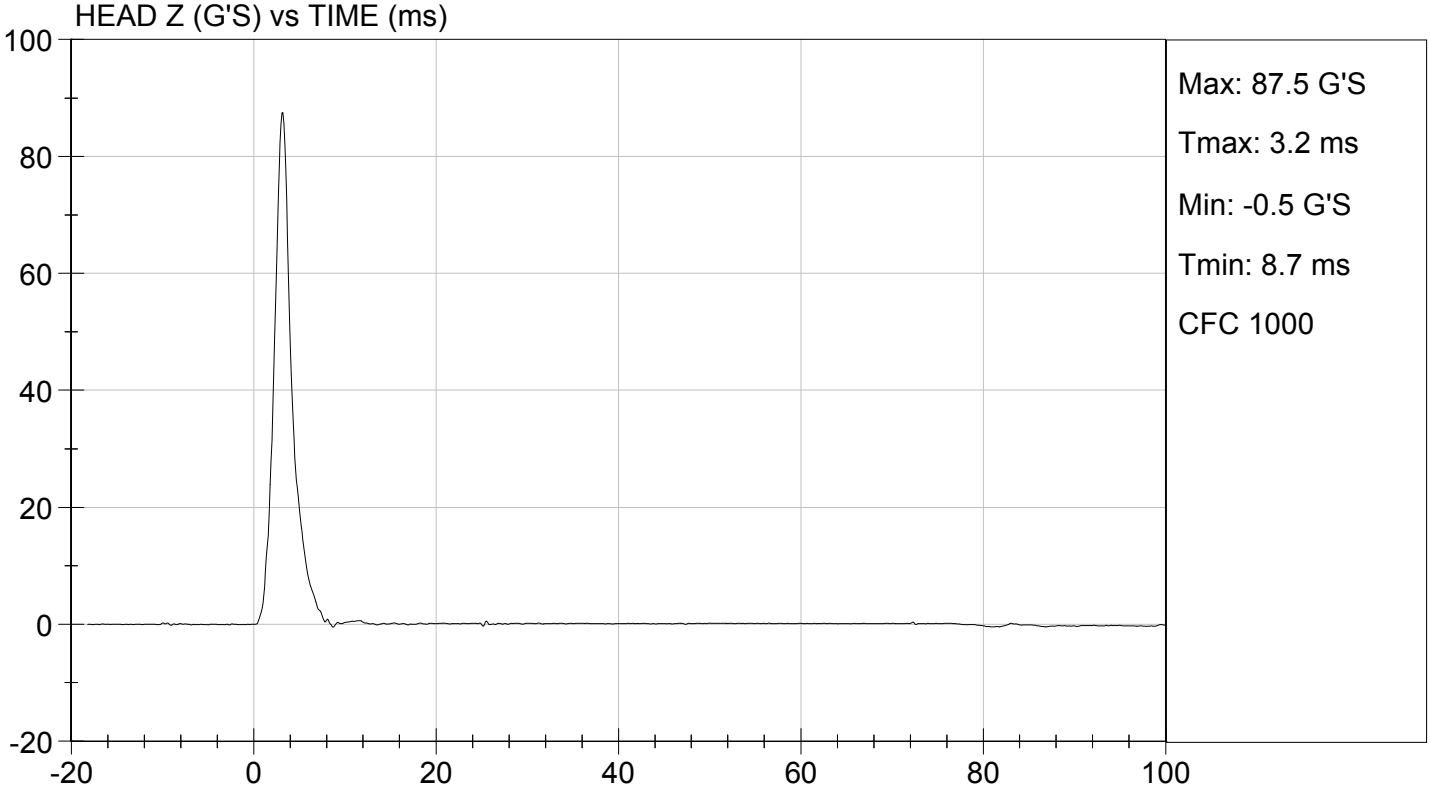
TEST DESC: HEAD DROP

TEST DATE: 04/27/2016
TEST #: D161481

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



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



MGA RESEARCH CORPORATION

LATERAL NECK PENDULUM TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D161482

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.1	Pass
Humidity		%	10 to 70	32	Pass
Impact Velocity		m/s	5.51 to 5.63	5.58	Pass
Pendulum Velocity	10 ms	m/s	2.20 to 2.80	2.27	Pass
	15 ms	m/s	3.30 to 4.10	3.31	Pass
	20 ms	m/s	4.40 to 5.40	4.51	Pass
	25 ms	m/s	5.40 to 6.10	5.43	Pass
	25-100 ms	m/s	5.50 to 6.20	5.72	Pass
Maximum D-Plane Rotation		deg	71 to 81	71	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	61	Pass
Maximum Occipital Condyle Moment		Nm	-44 to -36	-40	Pass
Time of Moment Decay to 0 Nm		ms	102 to 126	116	Pass
			Overall Test Results		Pass

Jessica Hall

Laboratory Technician

04/27/2016

Test Date

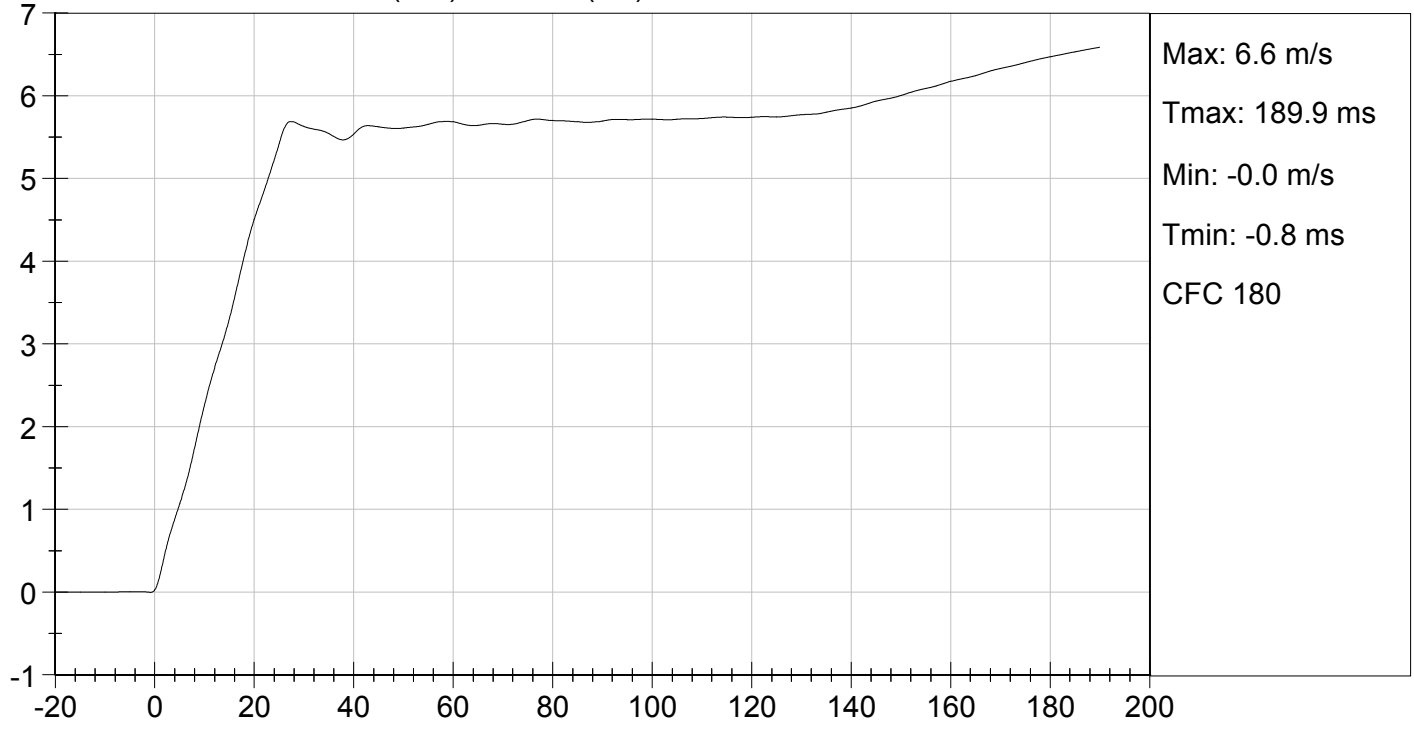
Thomas D. Hille

Approved By

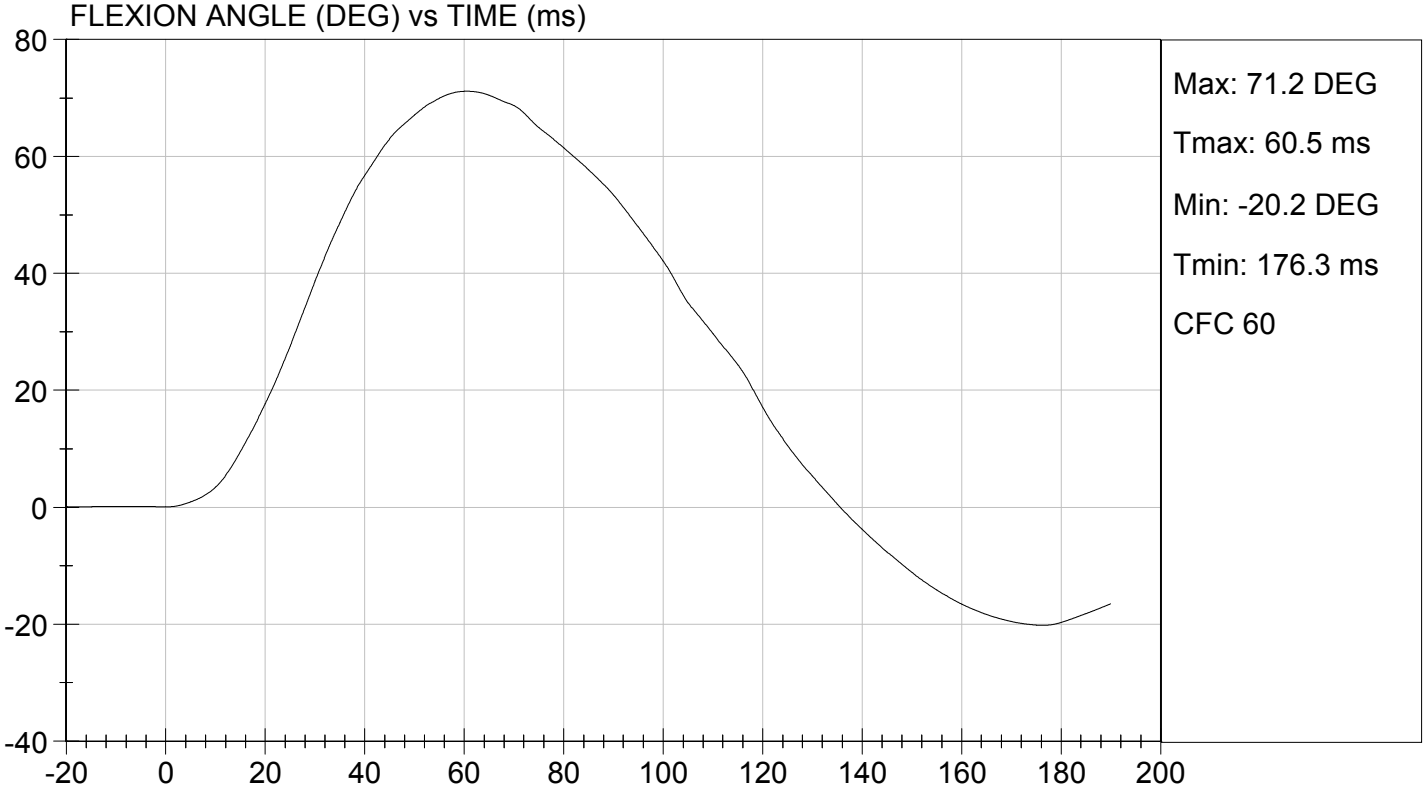
TEST DESC: NECK BENDING
VELOCITY: 18.31 ft/s, 5.58 m/s

TEST DATE: 04/27/2016
TEST #: D161482

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

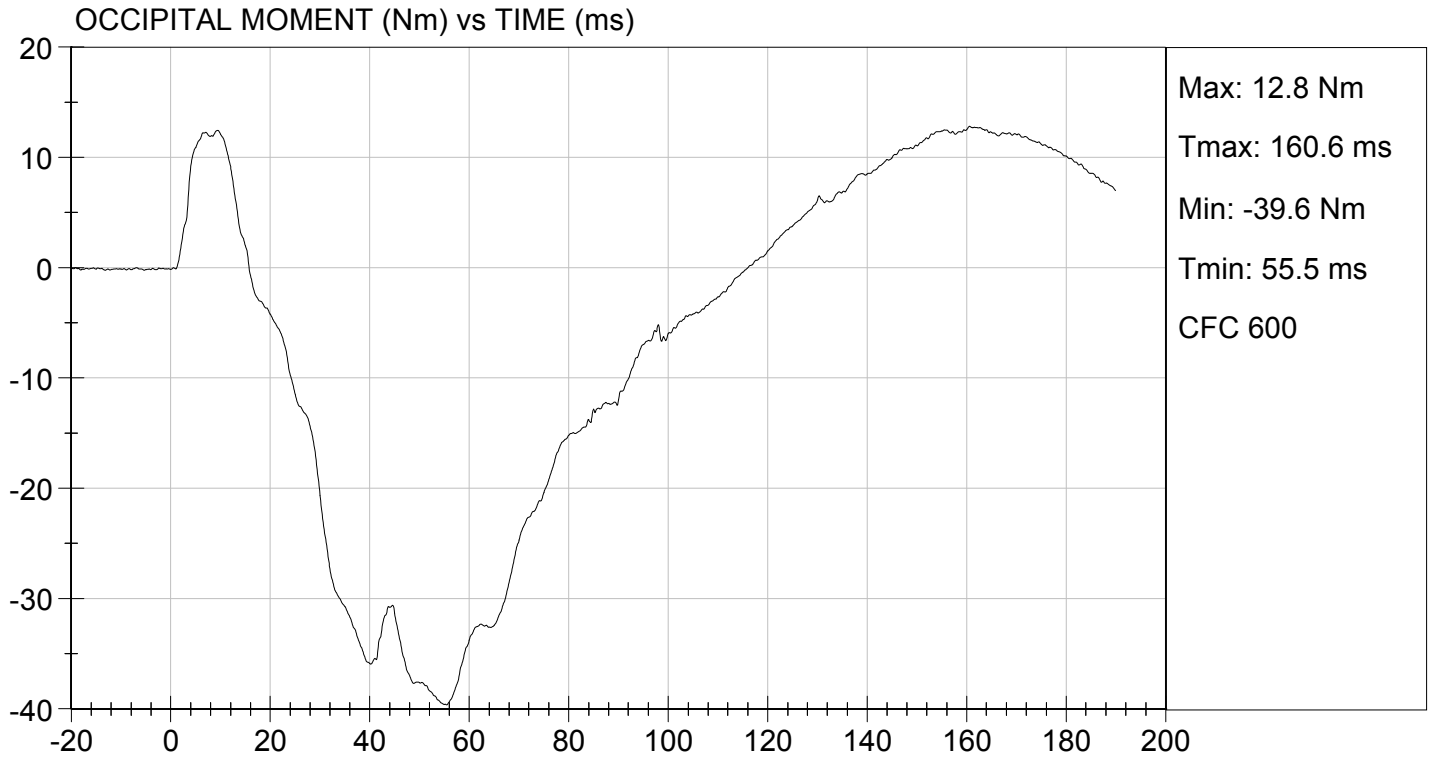


FLEXION ANGLE (DEG) vs TIME (ms)



TEST DESC: NECK BENDING
VELOCITY: 18.31 ft/s, 5.58 m/s

TEST DATE: 04/27/2016
TEST #: D161482



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test ID:** D161483

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	32	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Maximum Probe Acceleration	G's	13 to 18	15	Pass
Shoulder Displacement	mm	28 to 37	29	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	19	Pass
		Overall Test Results		Pass

Laboratory Technician

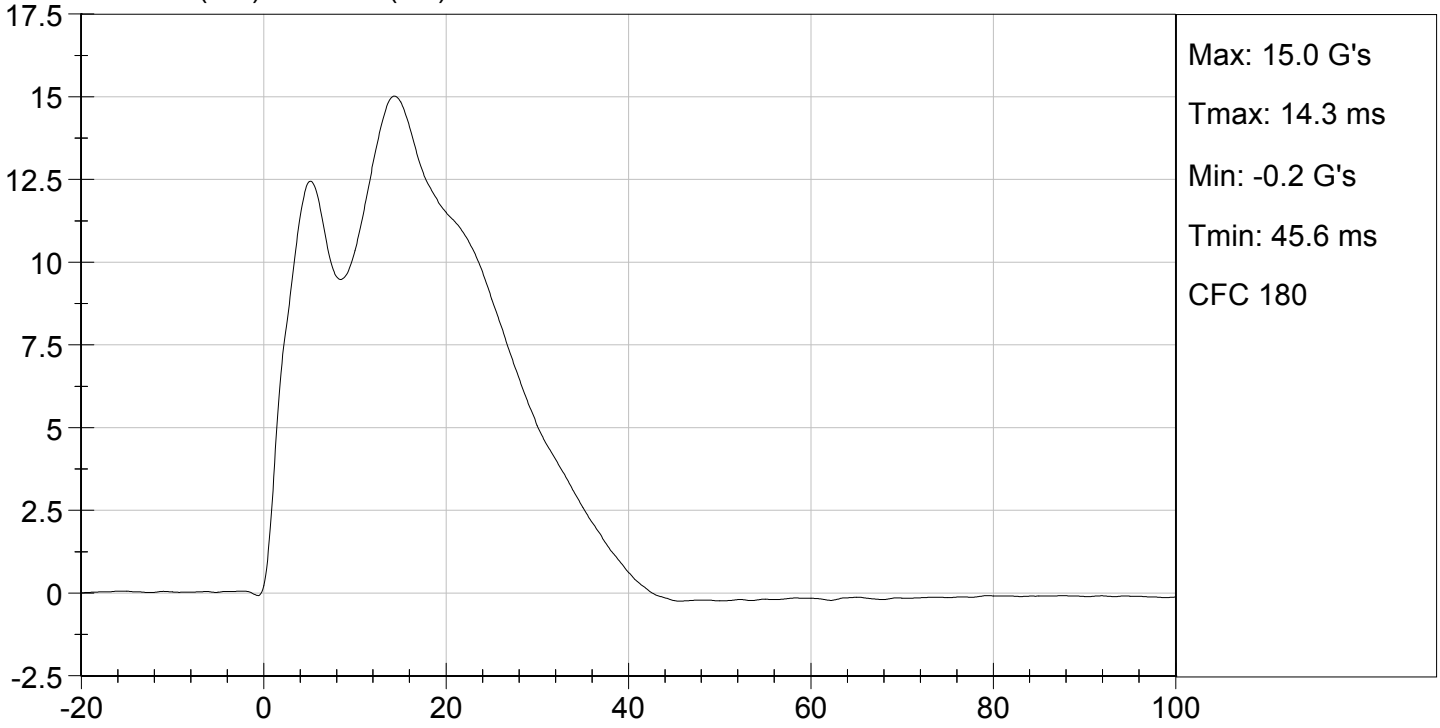
04/27/2016
Test Date

Approved By

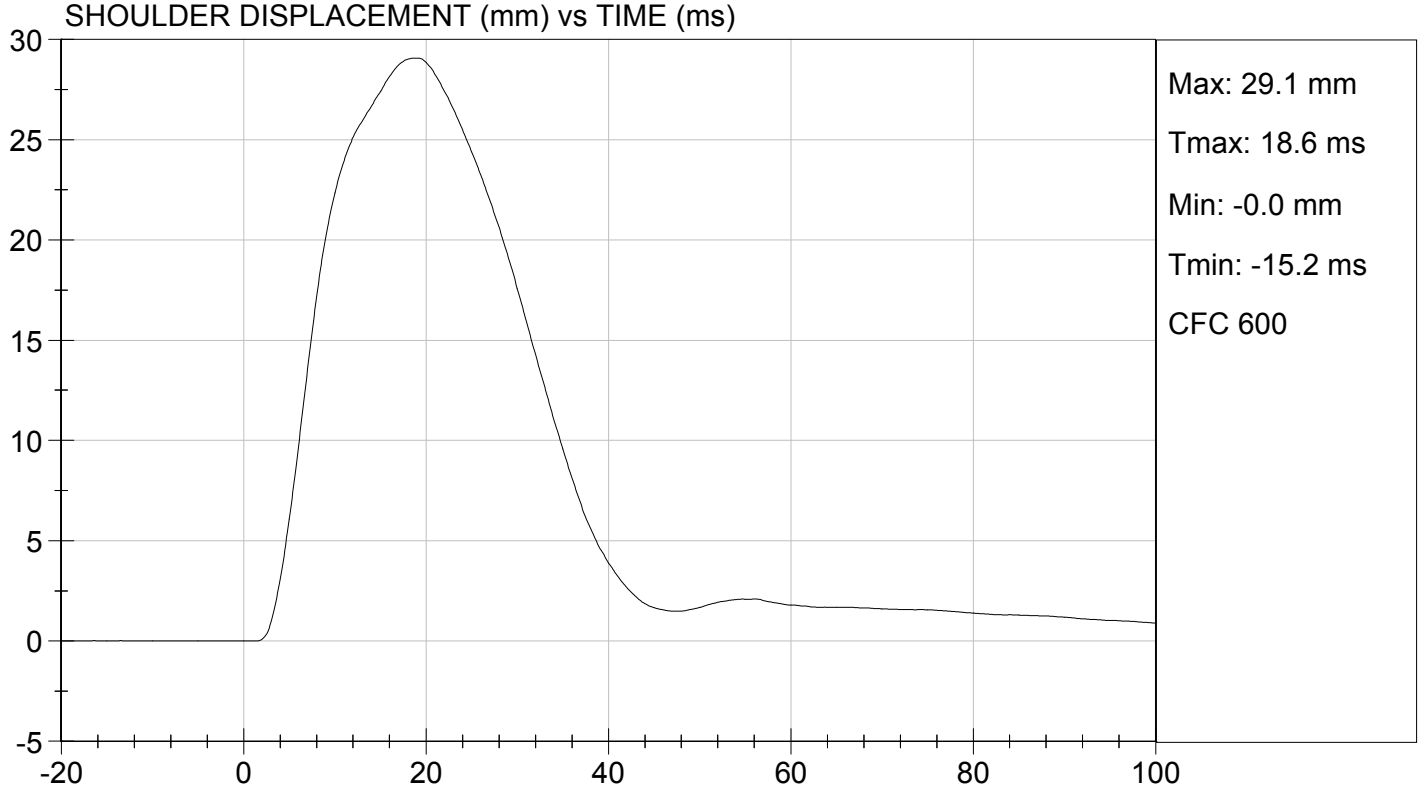
TEST DESC: SHOULDER IMPACT
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 04/27/2016
TEST #: D161483

PROBE (G's) vs TIME (ms)

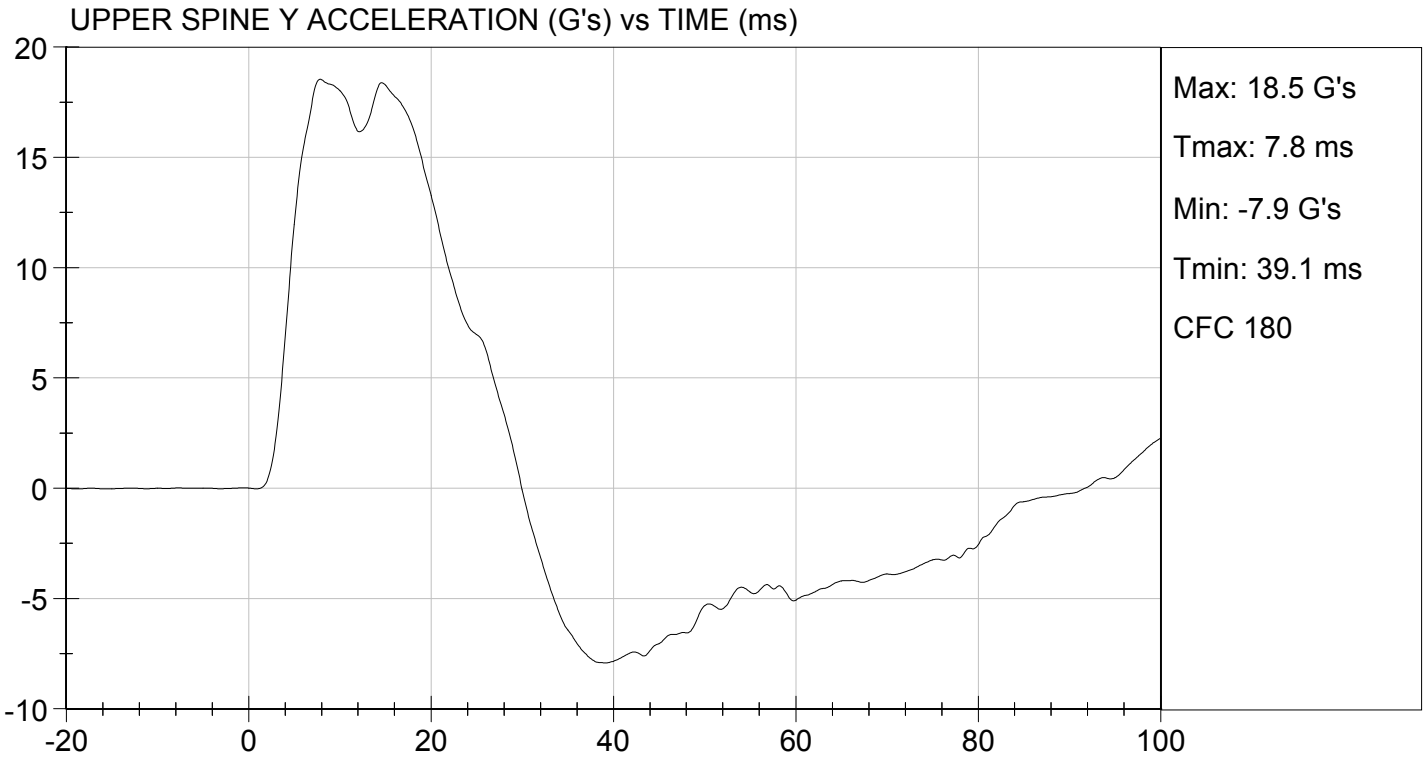


SHOULDER DISPLACEMENT (mm) vs TIME (ms)



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

TEST DATE: 04/27/2016
TEST #: D161483



MGA RESEARCH CORPORATION

THORAX (WITH ARM) IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D161484

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Humidity	%	10 to 70	32	Pass
Impact Velocity	m/s	6.60 to 6.80	6.60	Pass
Maximum Probe Acceleration	G's	30 to 36	34	Pass
Shoulder Displacement	mm	31 to 40	35	Pass
Upper Rib Displacement	mm	25 to 32	28	Pass
Middle Rib Displacement	mm	30 to 36	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	34	Pass
		Overall Test Results		Pass

Laboratory Technician

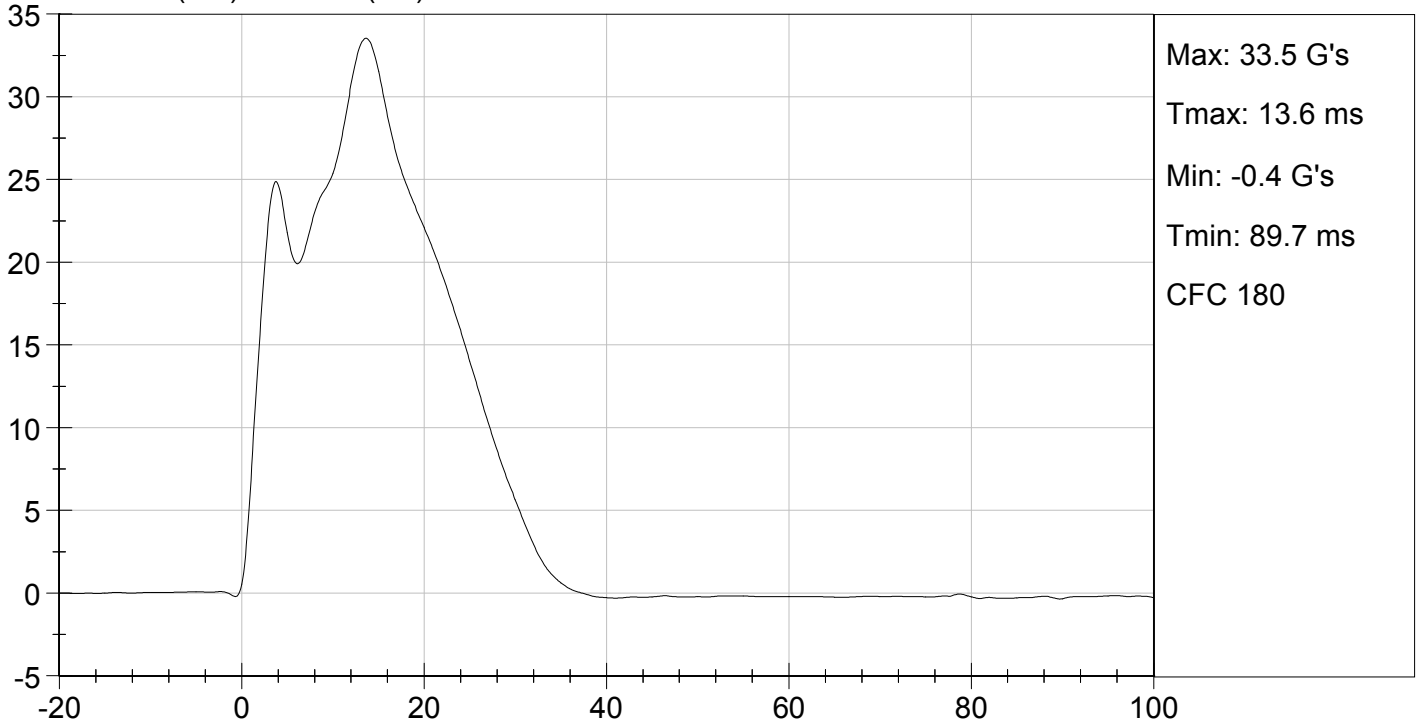
04/27/2016
Test Date

Approved By

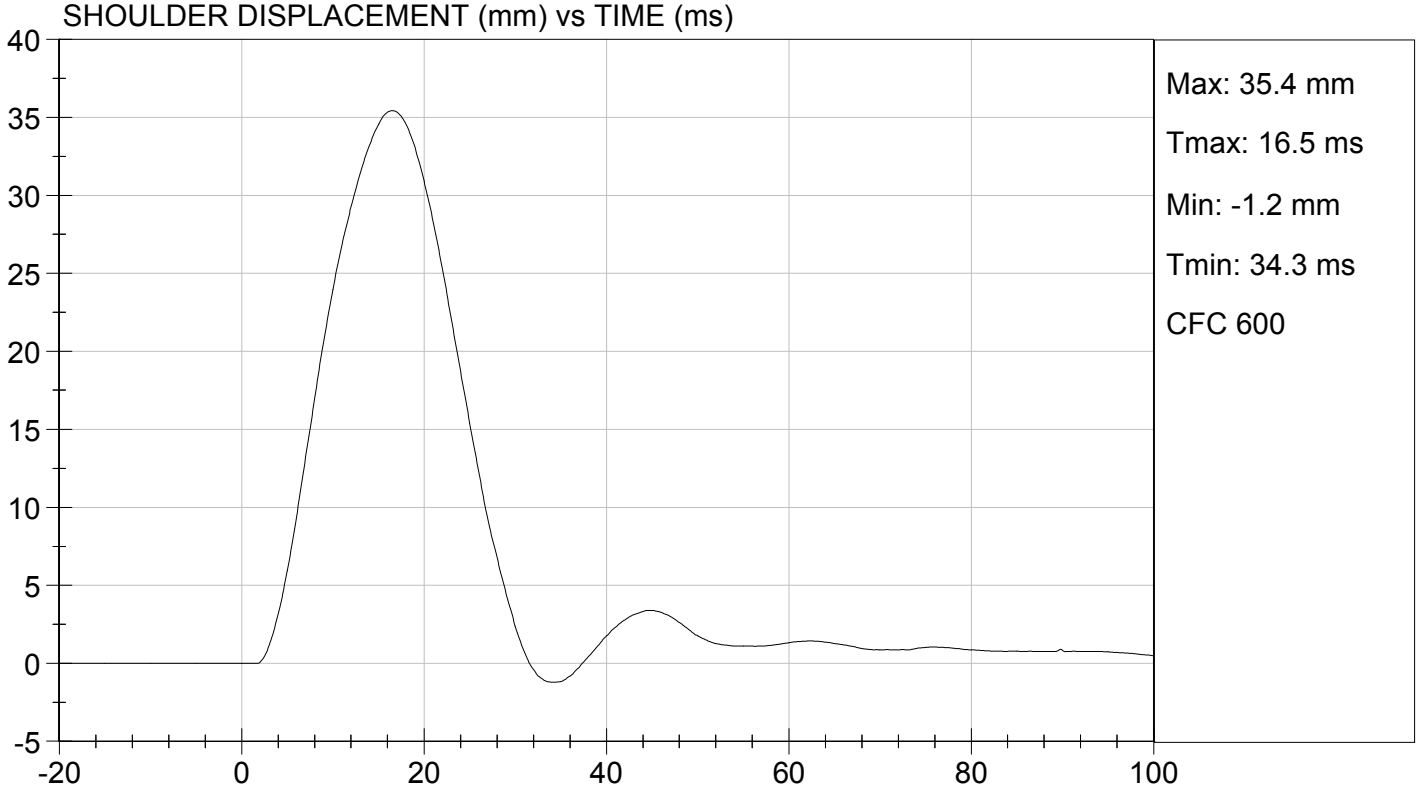
TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 21.65 ft/s, 6.60 m/s

TEST DATE: 04/27/2016
TEST #: D161484

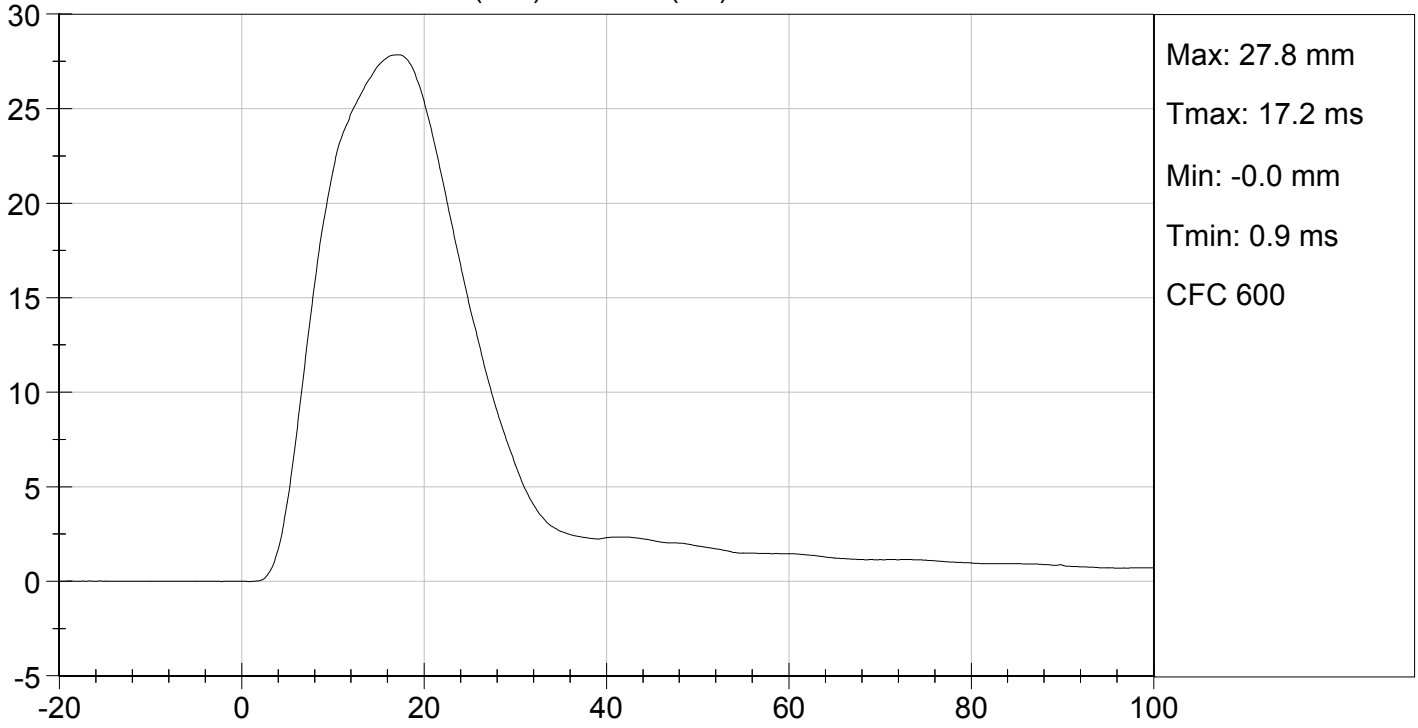
PROBE (G's) vs TIME (ms)



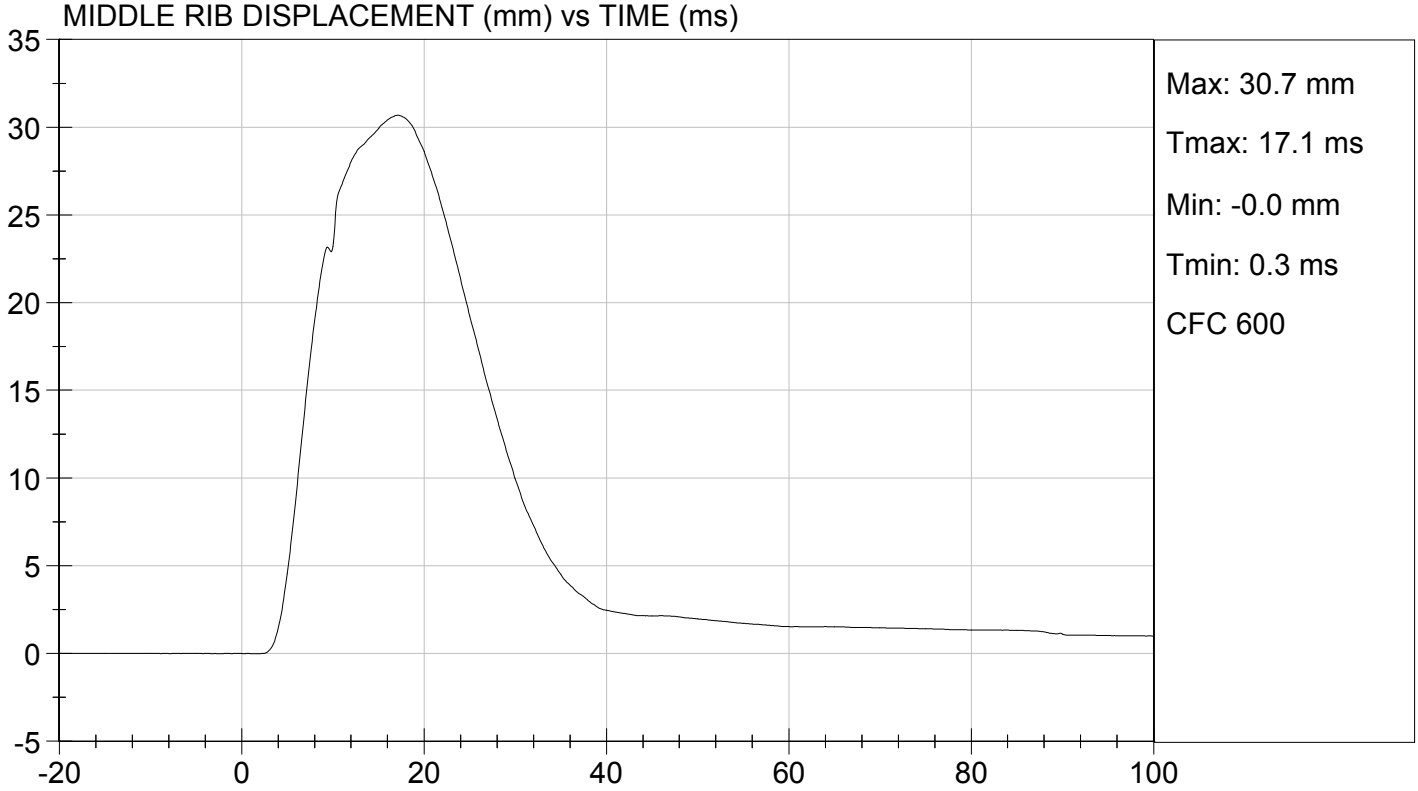
SHOULDER DISPLACEMENT (mm) vs TIME (ms)



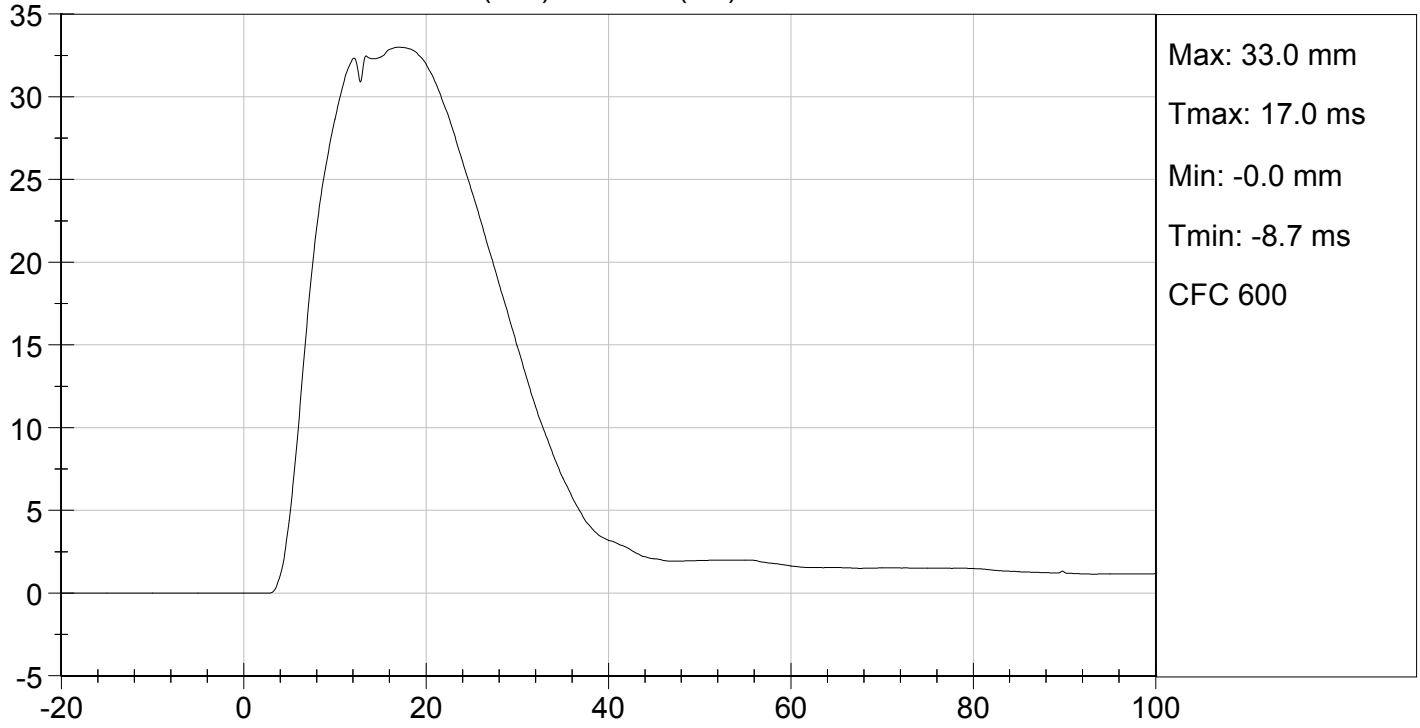
UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



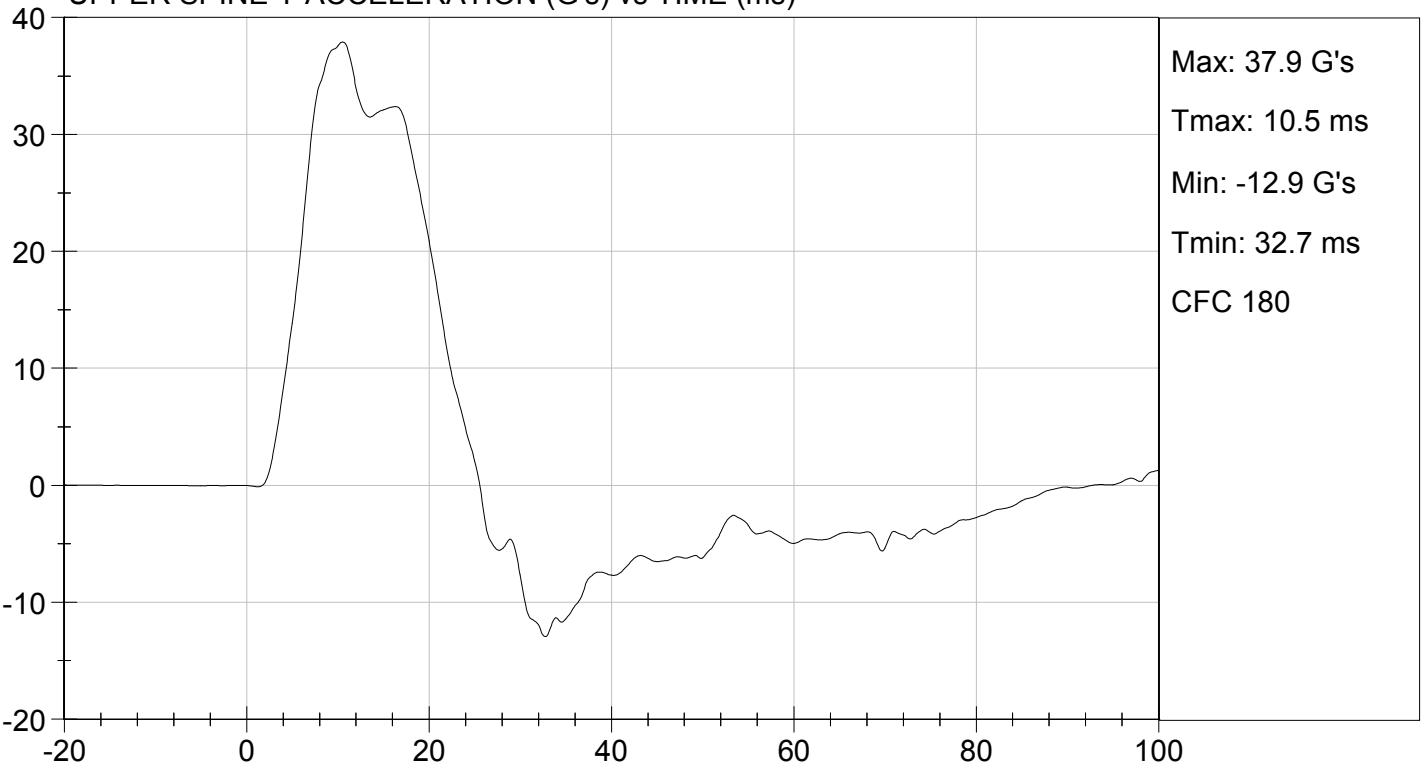
MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



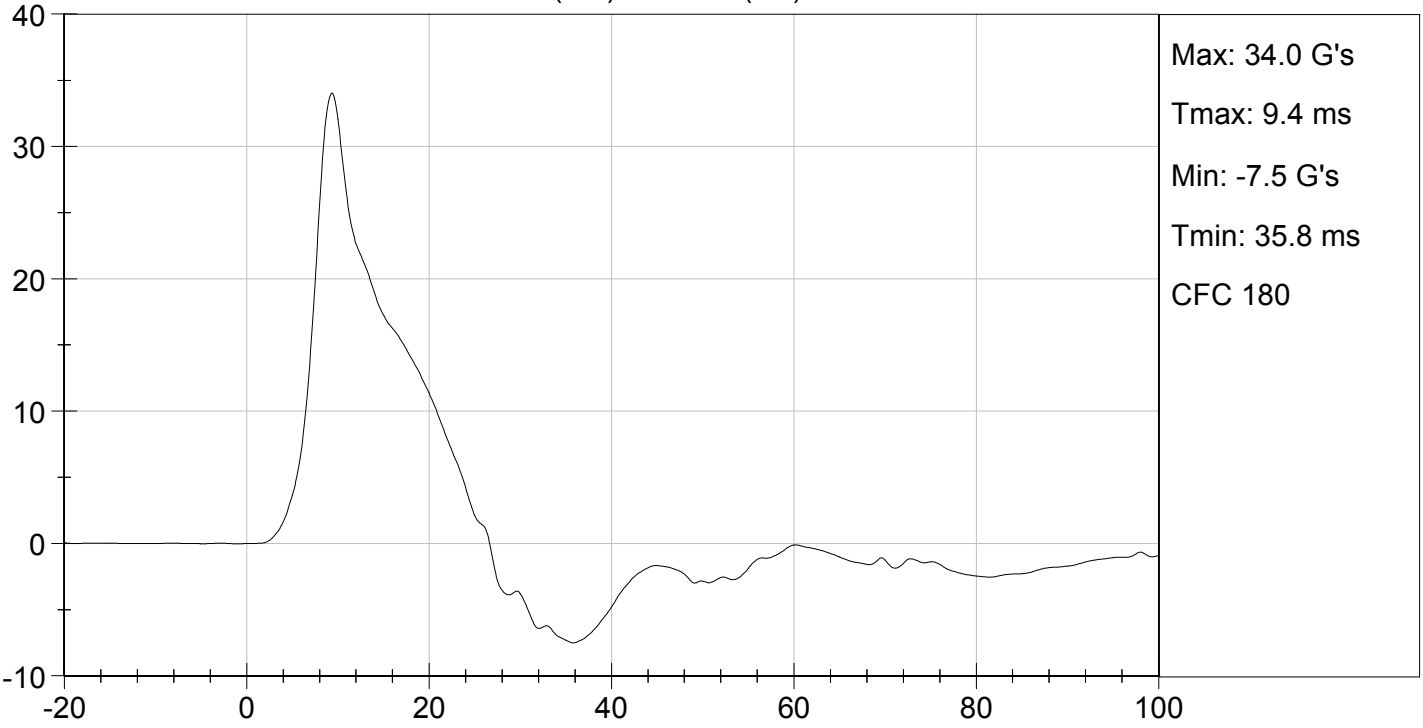
UPPER SPINE Y ACCELERATION (G's) vs TIME (ms)



TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 21.65 ft/s, 6.60 m/s

TEST DATE: 04/27/2016
TEST #: D161484

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



MGA RESEARCH CORPORATION

THORAX (WITHOUT ARM) IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D161485

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Humidity	%	10 to 70	32	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Maximum Probe Acceleration	G's	14 to 18	15	Pass
Upper Rib Displacement	mm	32 to 40	37	Pass
Middle Rib Displacement	mm	39 to 45	40	Pass
Lower Rib Displacement	mm	35 to 43	37	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 17	14	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	8	Pass
		Overall Test Results		Pass

Laboratory Technician

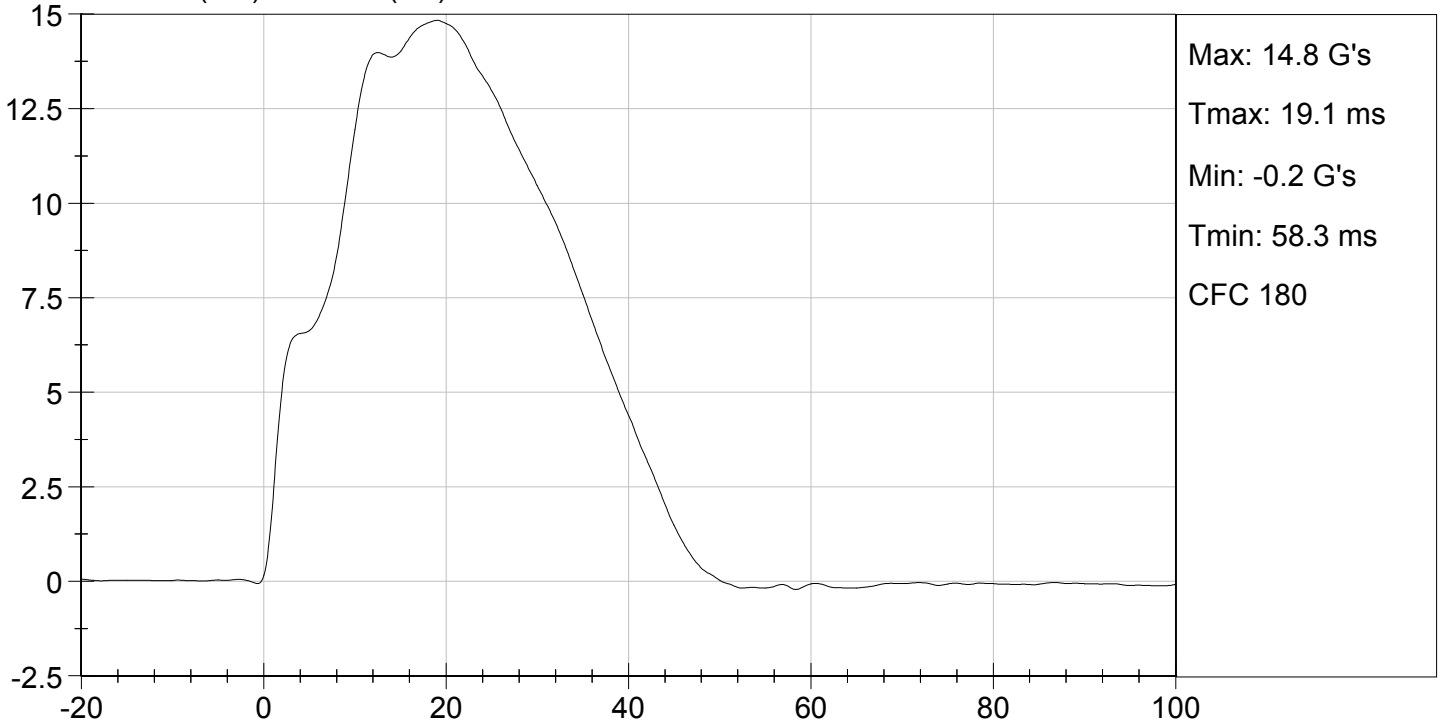
04/27/2016
Test Date

Approved By

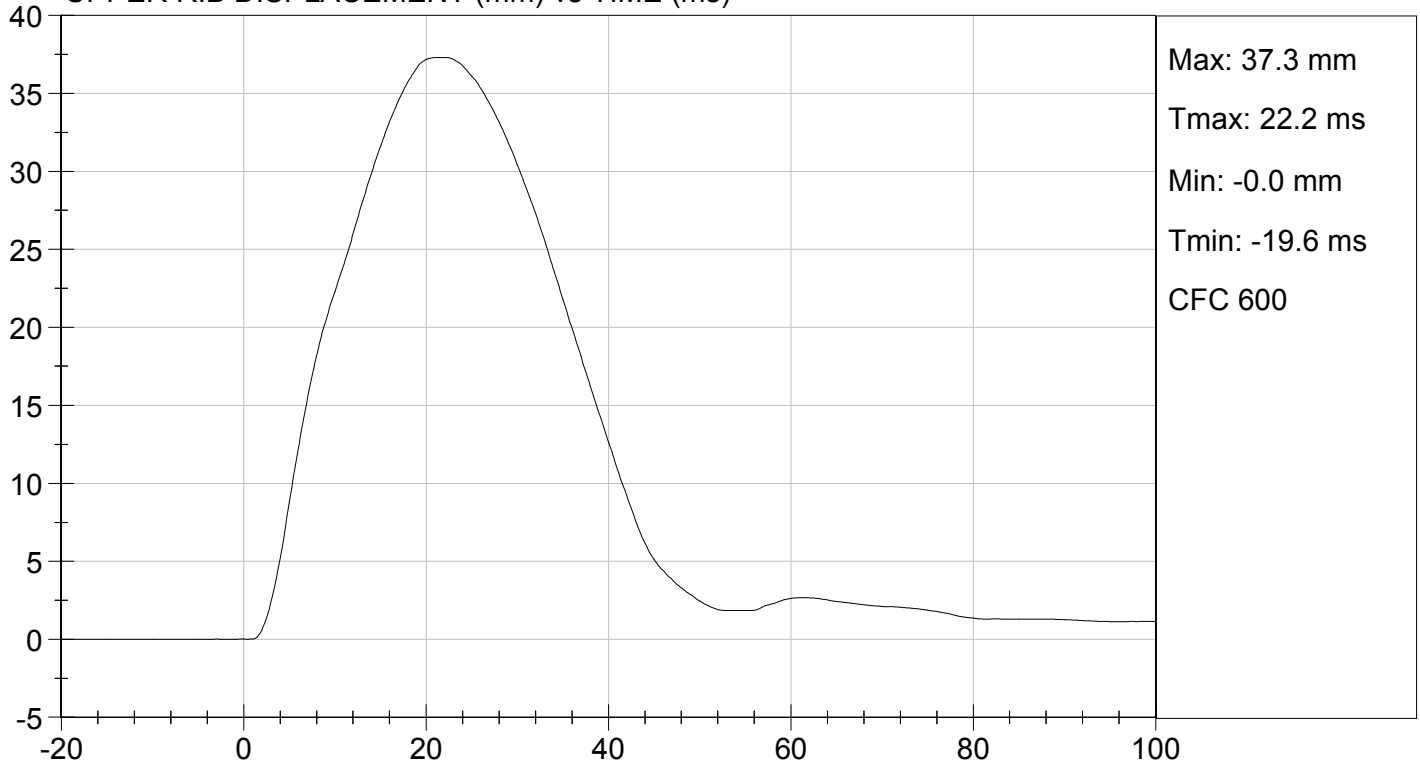
TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.12 ft/s, 4.30 m/s

TEST DATE: 04/27/2016
TEST #: D161485

PROBE (G's) vs TIME (ms)



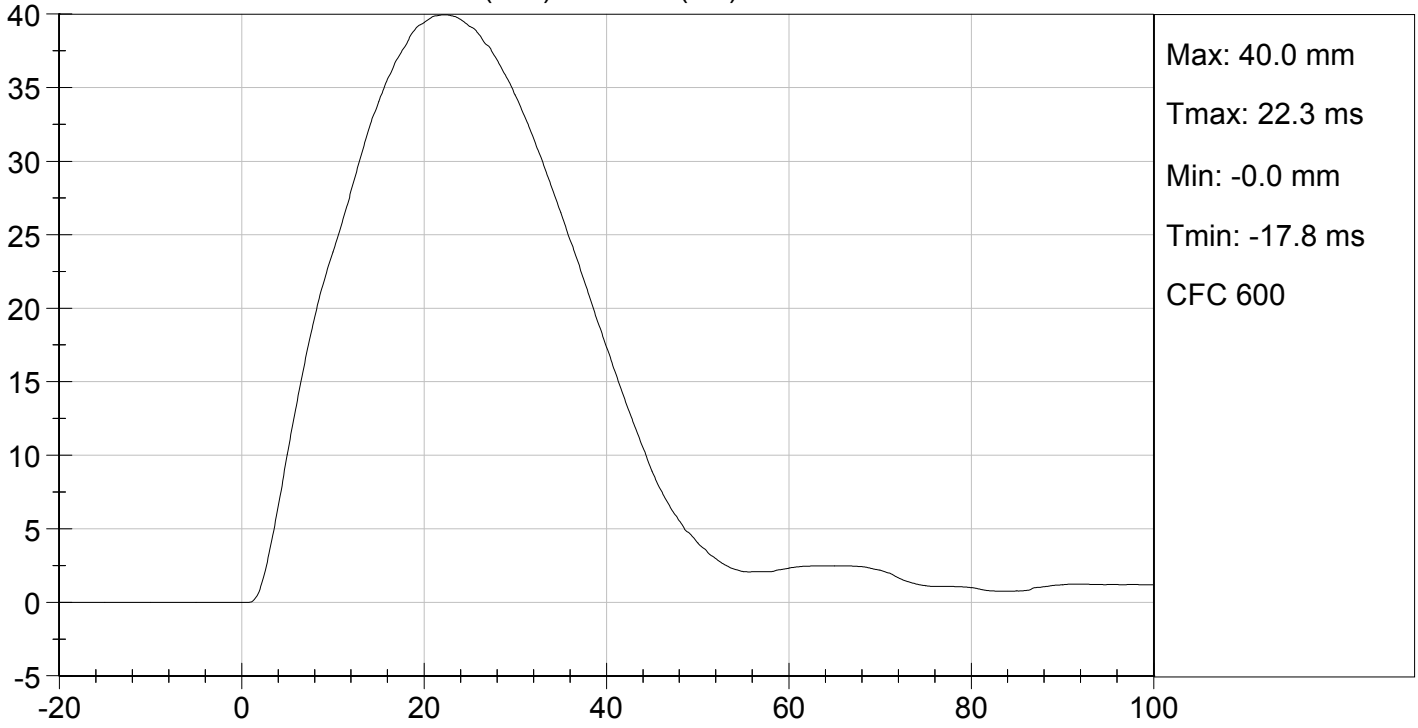
UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



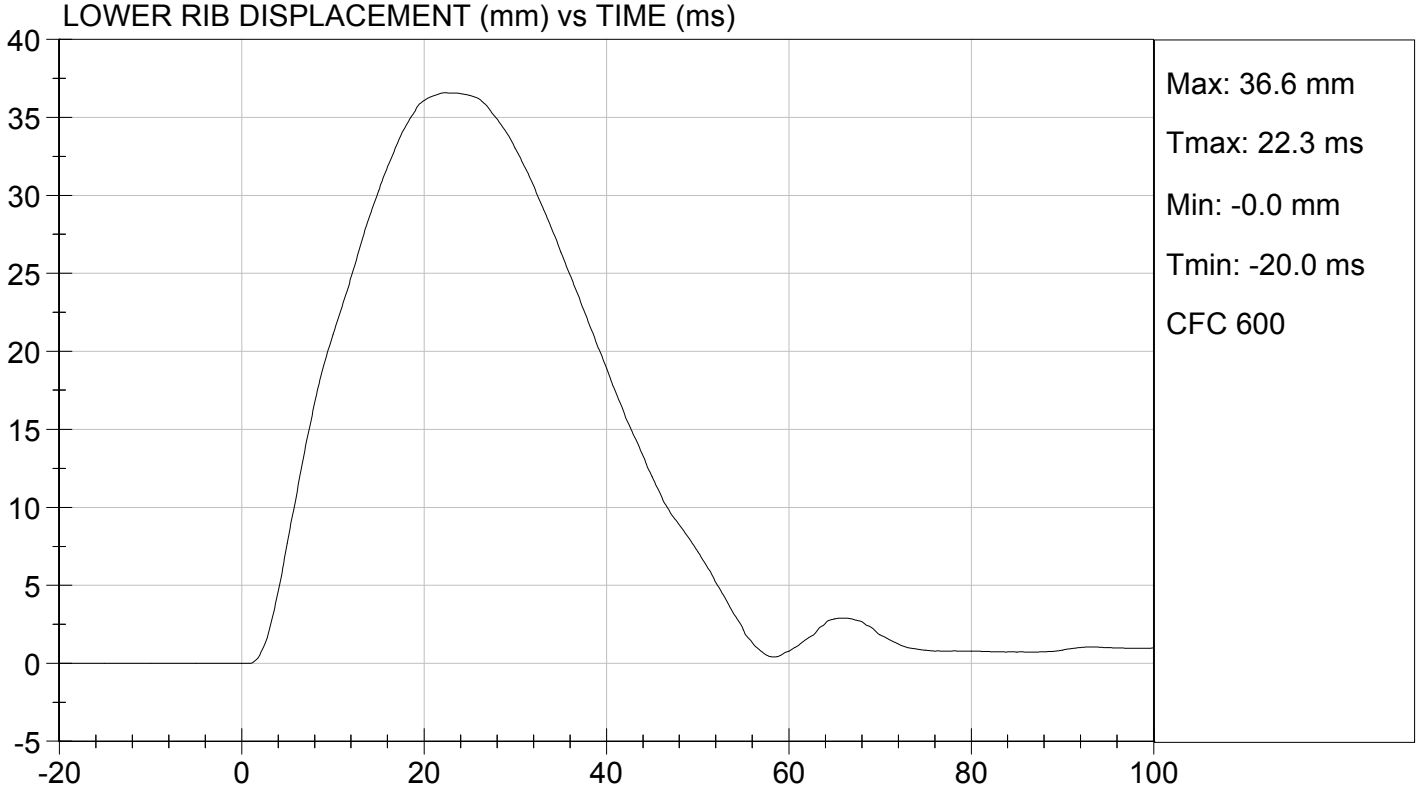
TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.12 ft/s, 4.30 m/s

TEST DATE: 04/27/2016
TEST #: D161485

MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



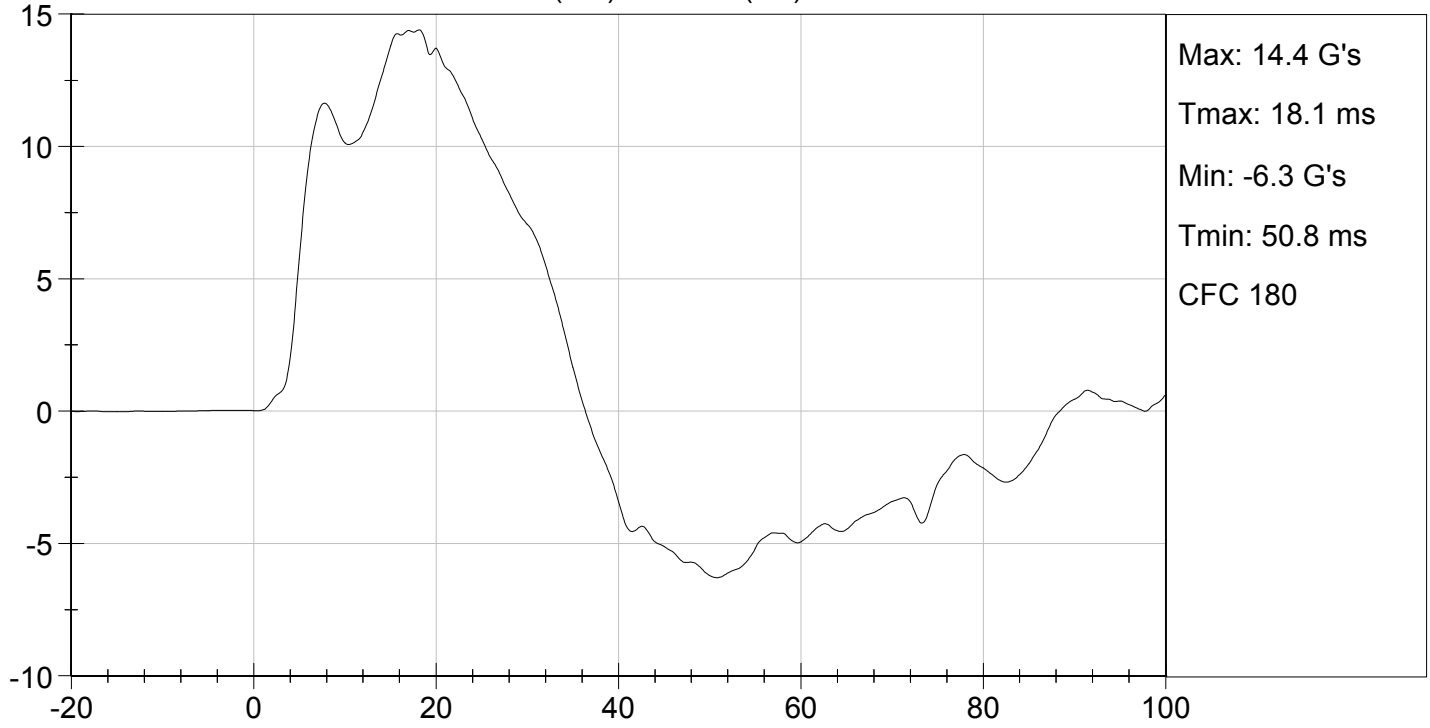
LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



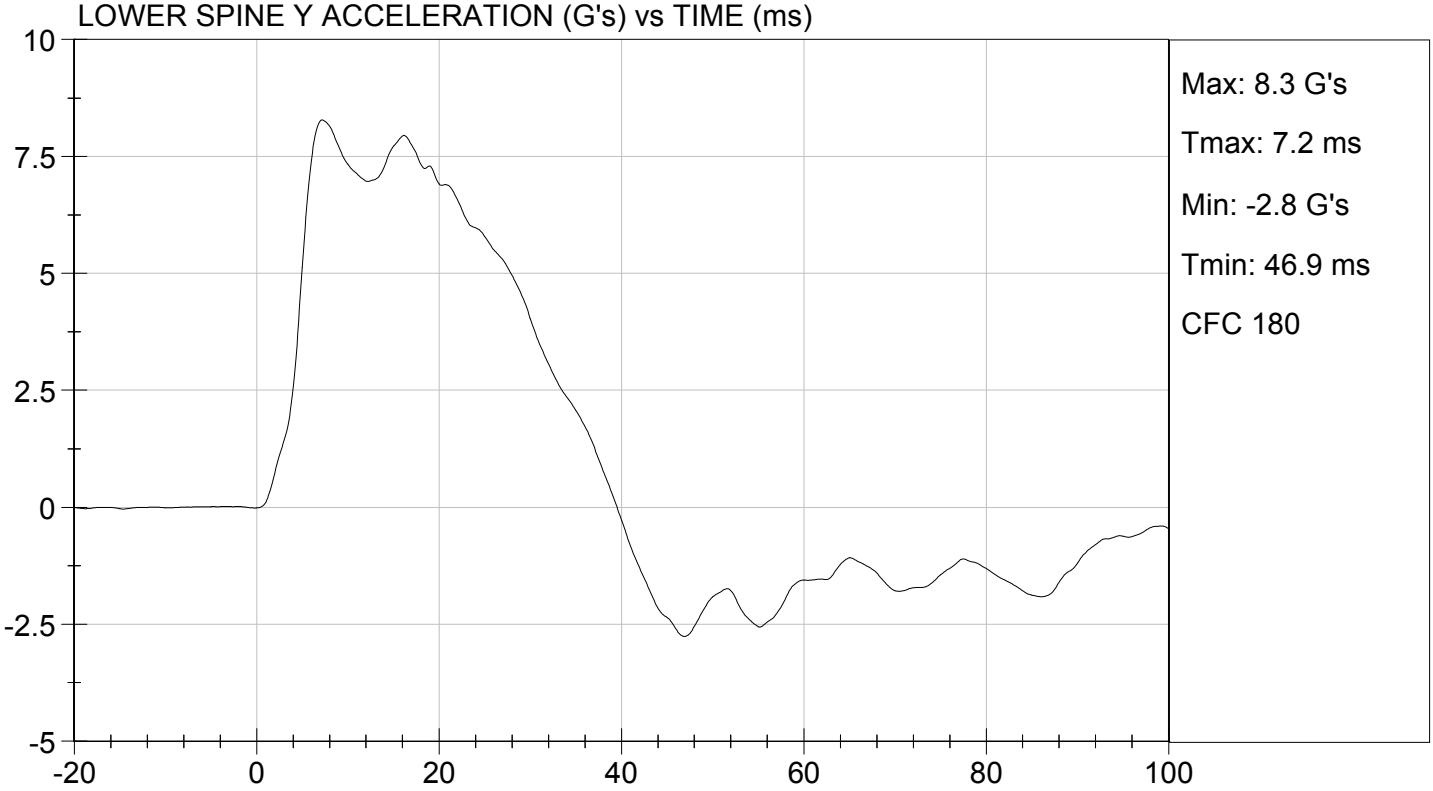
TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.12 ft/s, 4.30 m/s

TEST DATE: 04/27/2016
TEST #: D161485

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:** D161486

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Humidity	%	10 to 70	32	Pass
Impact Velocity	m/s	4.20 to 4.40	4.27	Pass
Maximum Probe Acceleration	G's	12 to 16	14	Pass
Upper Abdomen Rib Displacement	mm	36 to 47	38	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

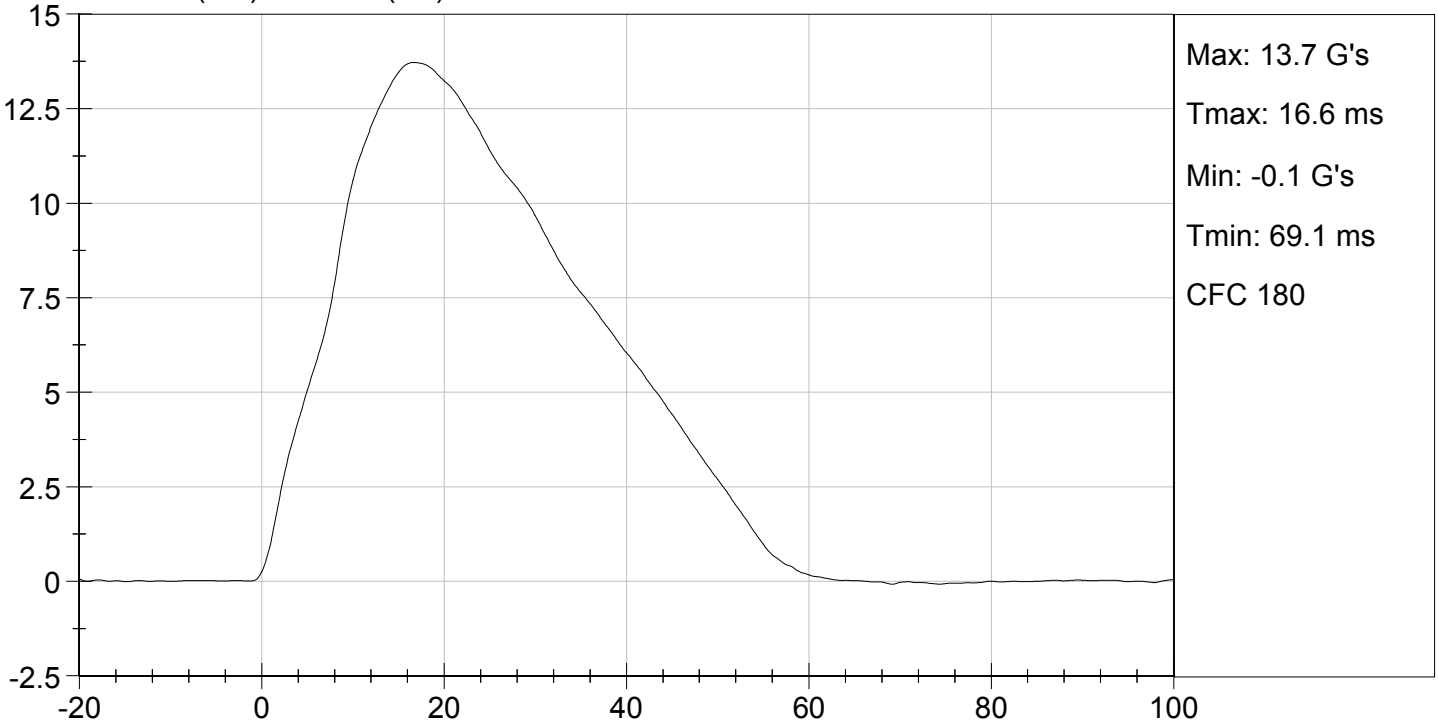
04/27/2016
Test Date

Approved By

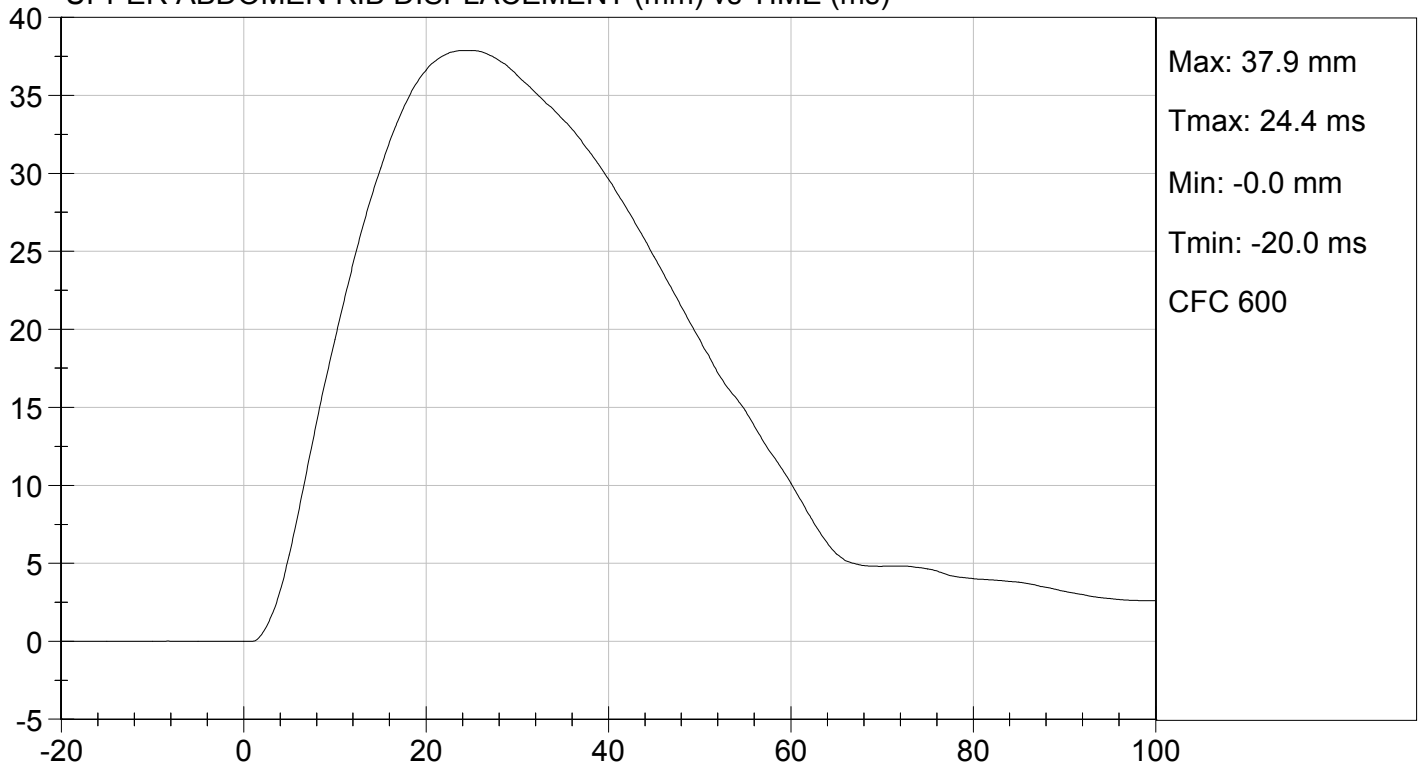
TEST DESC: ABDOMEN IMPACT
VELOCITY: 14.01 ft/s, 4.27 m/s

TEST DATE: 04/27/2016
TEST #: D161486

PROBE (G's) vs TIME (ms)



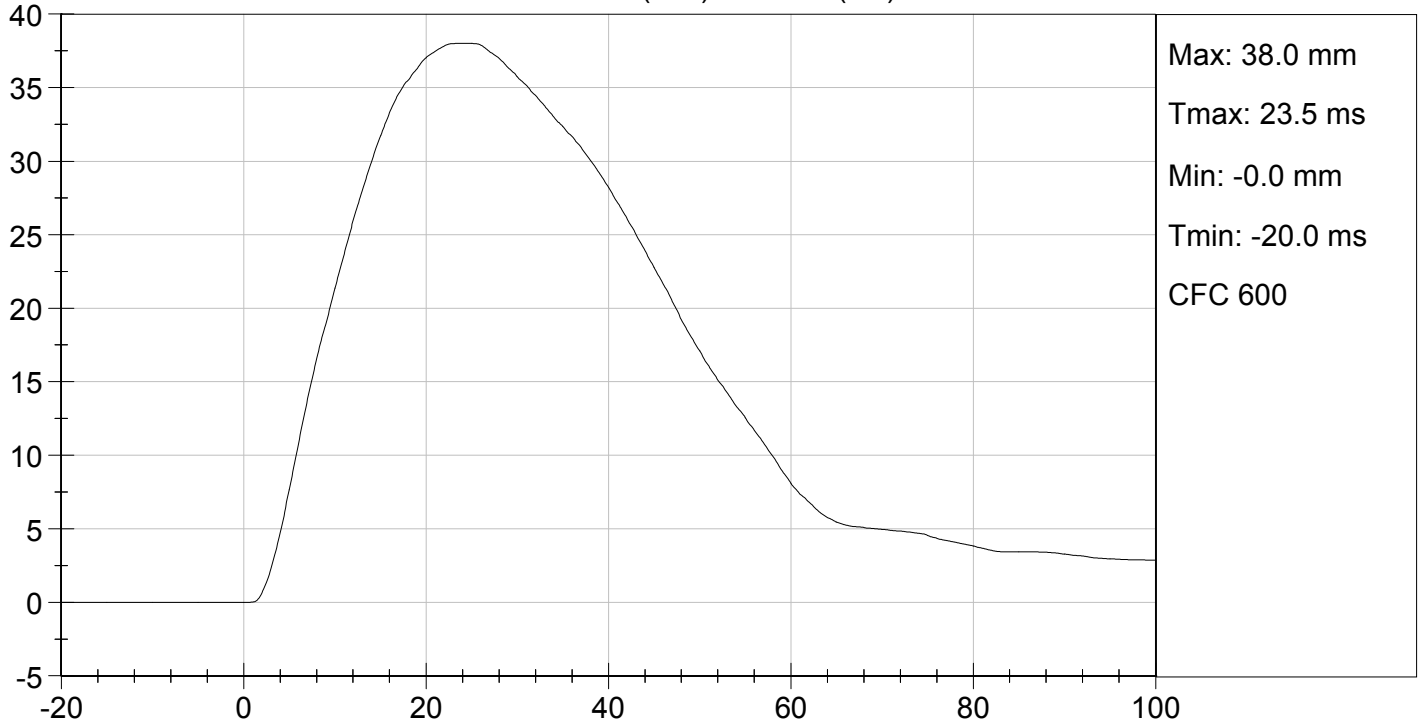
UPPER ABDOMEN RIB DISPLACEMENT (mm) vs TIME (ms)



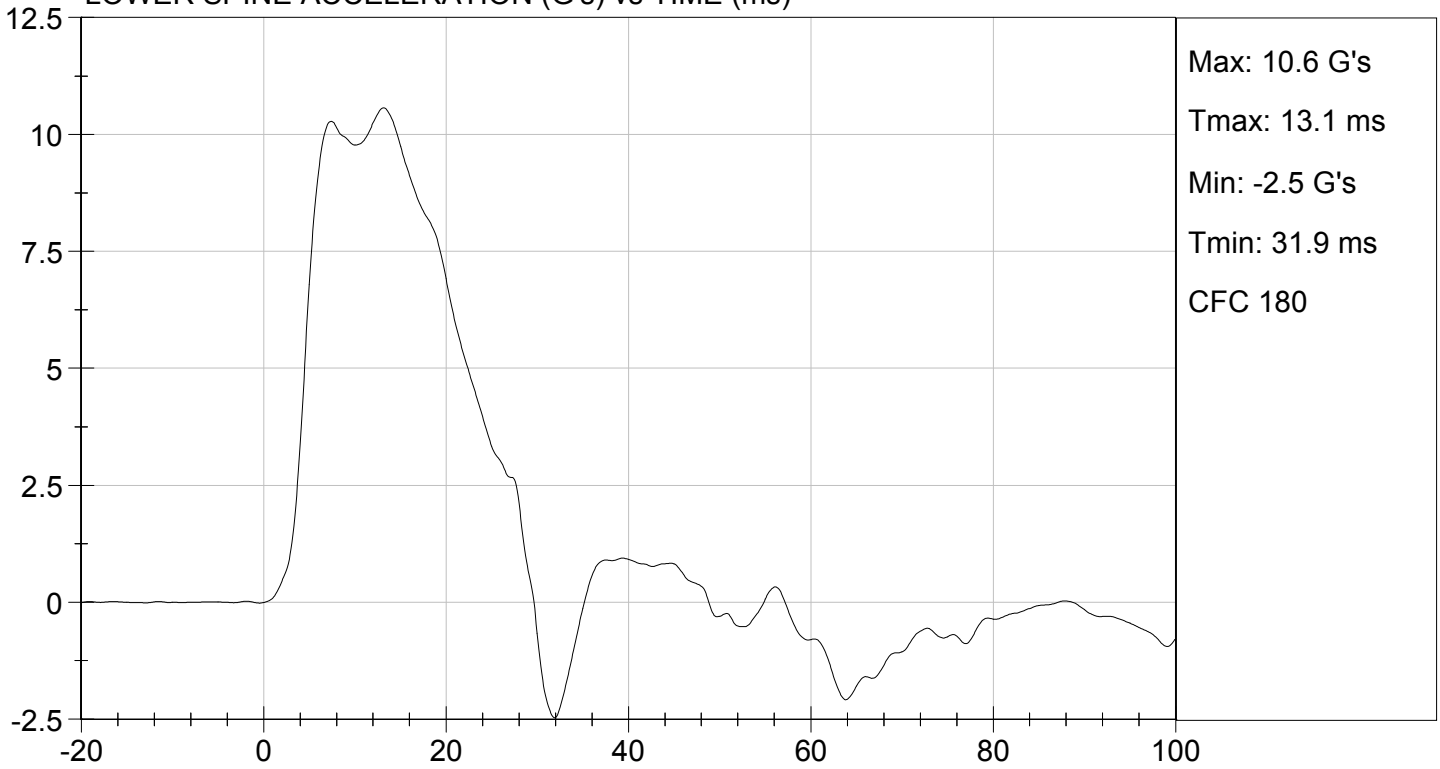
TEST DESC: ABDOMEN IMPACT
VELOCITY: 14.01 ft/s, 4.27 m/s

TEST DATE: 04/27/2016
TEST #: D161486

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:** D161487

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.9	Pass
Humidity	%	10 to 70	35	Pass
Impact Velocity	m/s	6.60 to 6.80	6.60	Pass
Maximum Probe Acceleration	G's	38 to 47	42	Pass
Pelvis Y Acceleration After 6 ms	G's	34 to 42	42	Pass
Peak Acetabulum Force	N	3600 to 4300	3,719	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

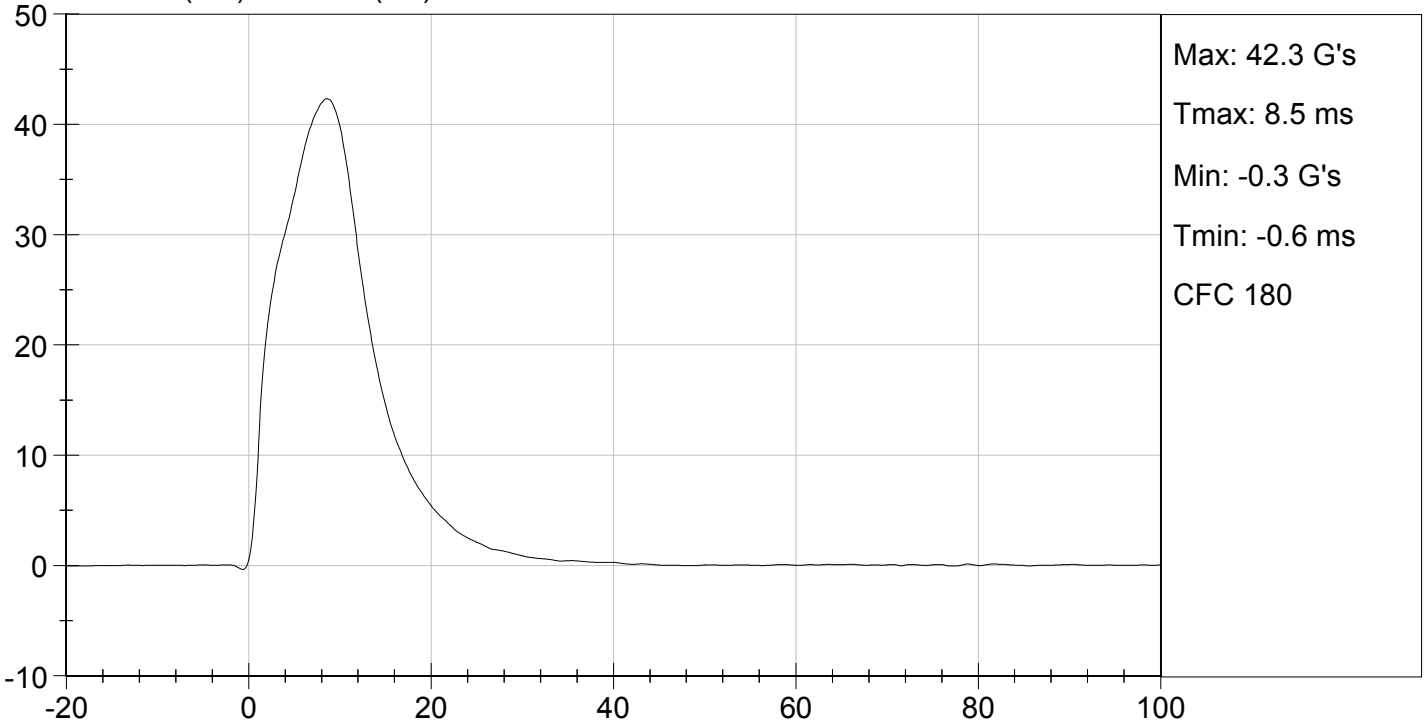
04/29/2016
Test Date

Thom A. Hille
Approved By

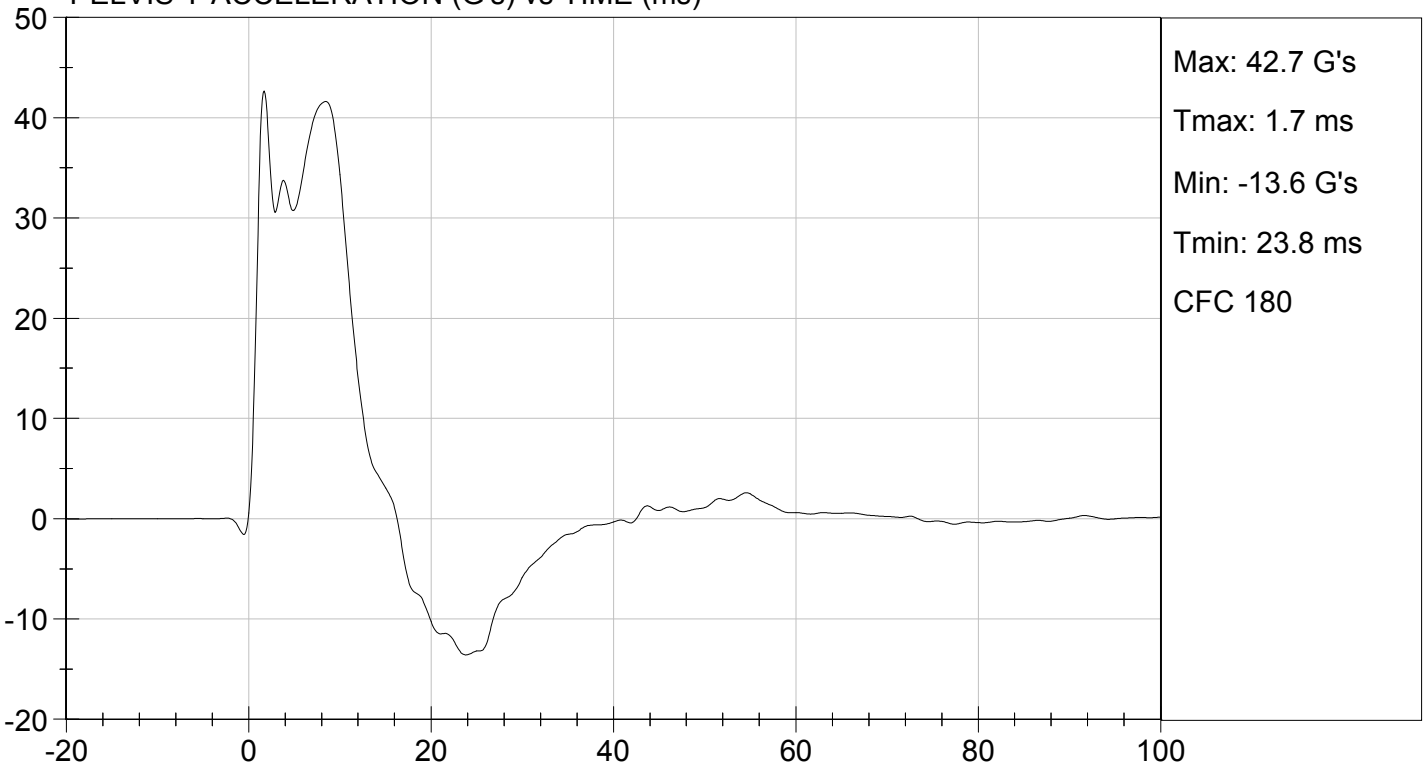
TEST DESC: PELVIS IMPACT
VELOCITY: 21.65 ft/s, 6.60 m/s

TEST DATE: 04/29/2016
TEST #: D161487

PROBE (G's) vs TIME (ms)

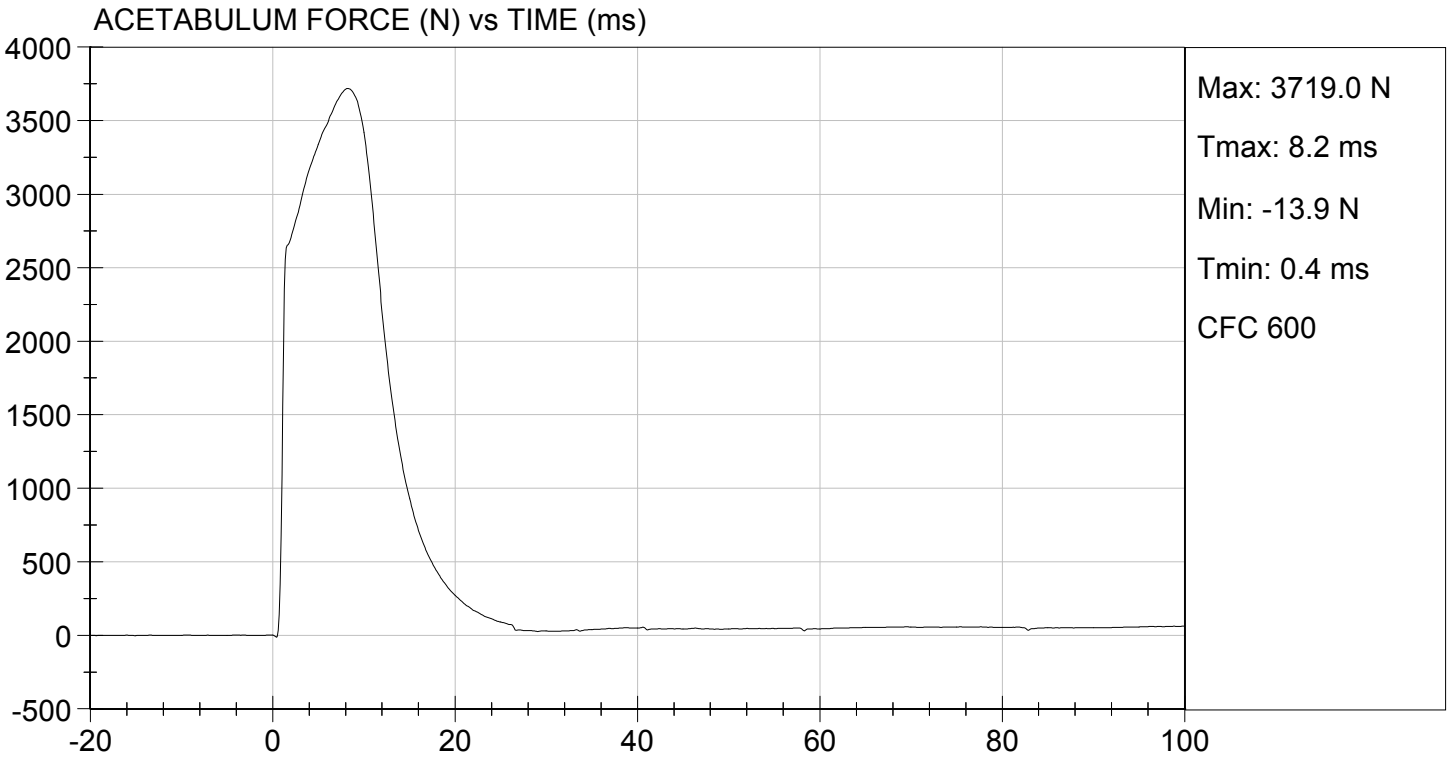


PELVIS Y ACCELERATION (G's) vs TIME (ms)



TEST DESC: PELVIS IMPACT
VELOCITY: 21.65 ft/s, 6.60 m/s

TEST DATE: 04/29/2016
TEST #: D161487



MGA RESEARCH CORPORATION

ILIAC IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D161488

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Humidity	%	10 to 70	29	Pass
Impact Velocity	m/s	4.20 to 4.40	4.27	Pass
Maximum Probe Acceleration	G's	36 to 45	39	Pass
Pelvis Y Acceleration	G's	28 to 39	29	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4,529	Pass
		Overall Test Results		Pass

Laboratory Technician

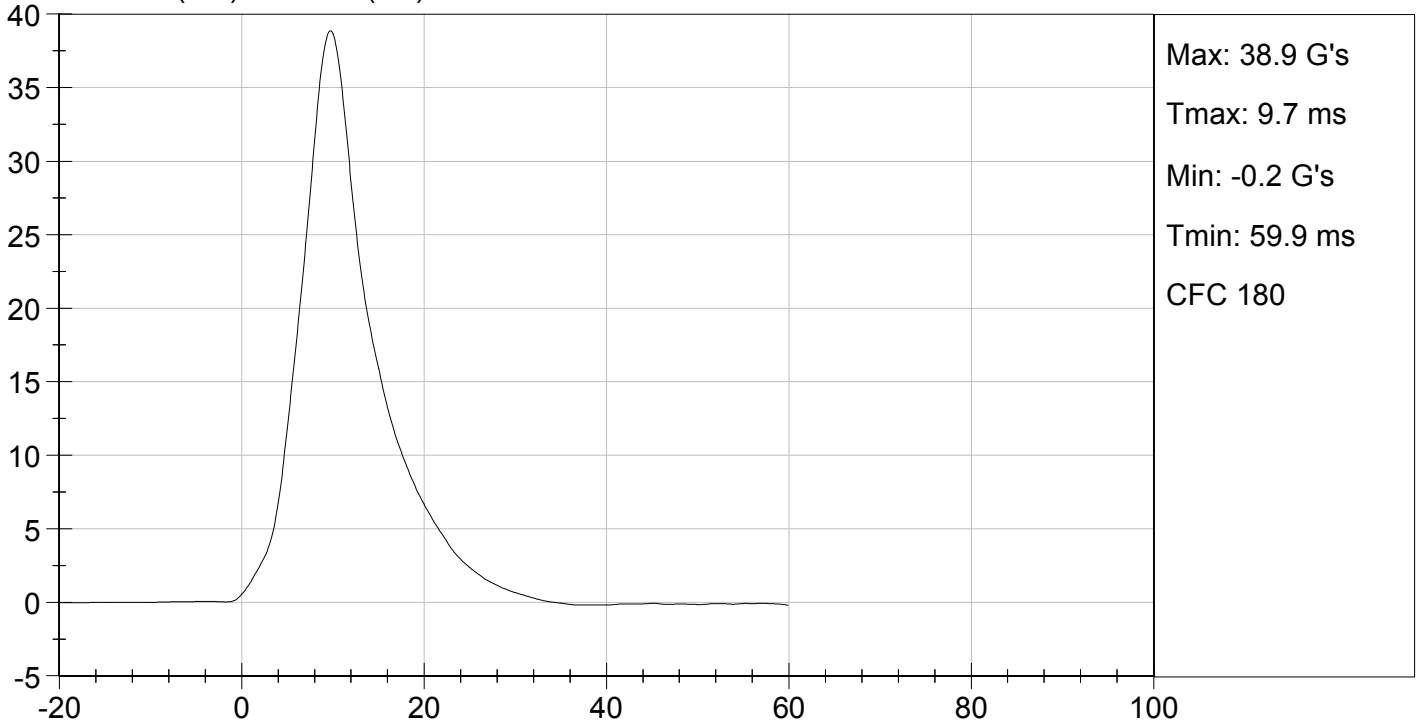
04/27/2016
Test Date

Approved By

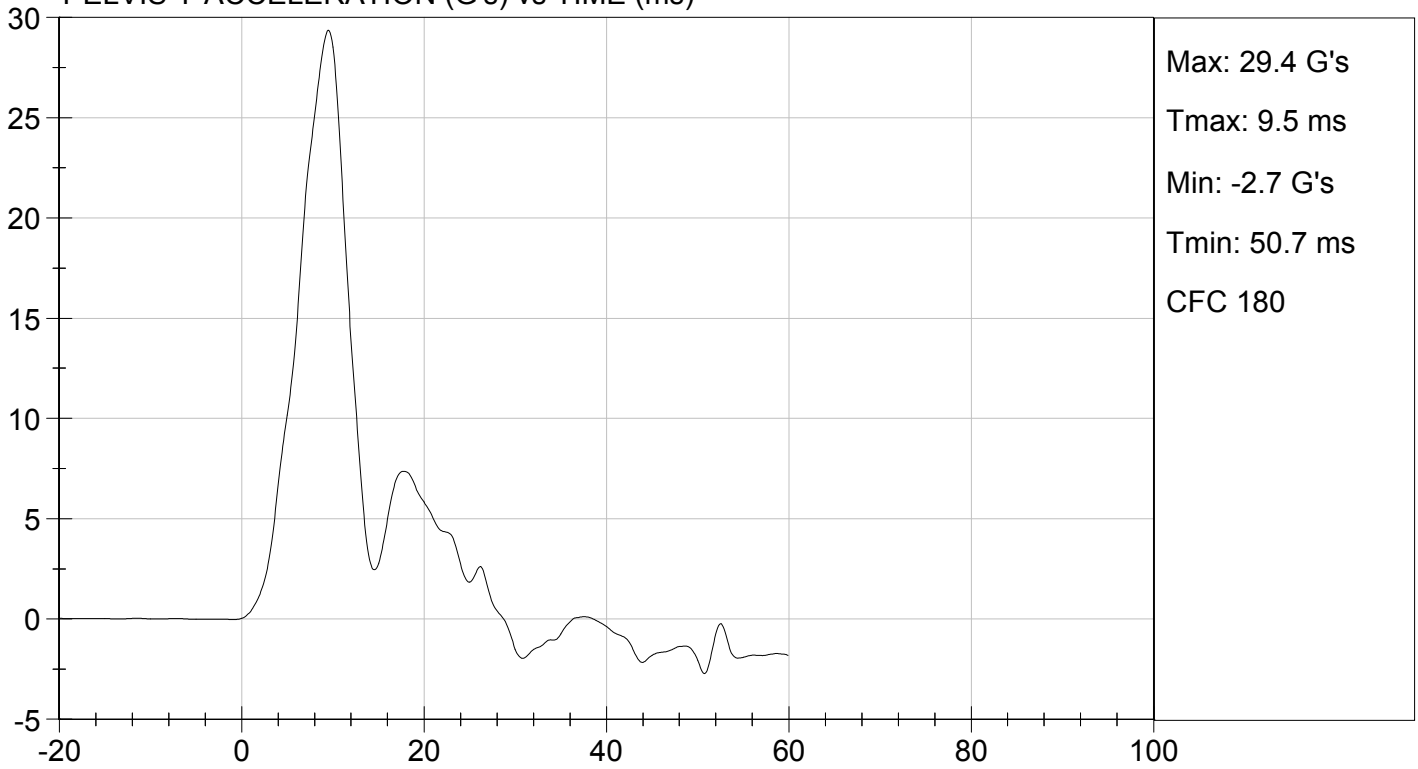
TEST DESC: ILLIAC
VELOCITY: 14.01 ft/s, 4.27 m/s

TEST DATE: 04/27/2016
TEST #: D161488

PROBE (G's) vs TIME (ms)

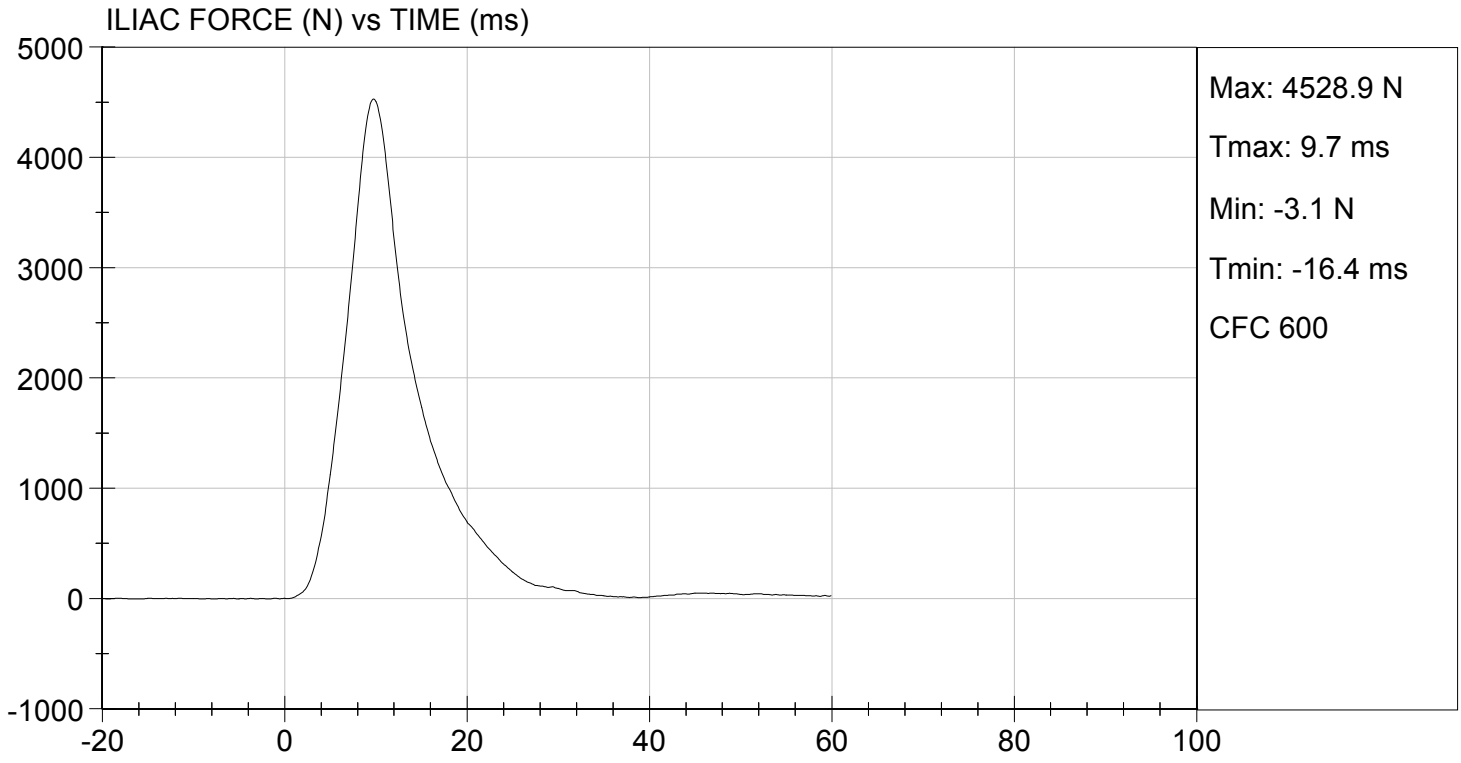


PELVIS Y ACCELERATION (G's) vs TIME (ms)

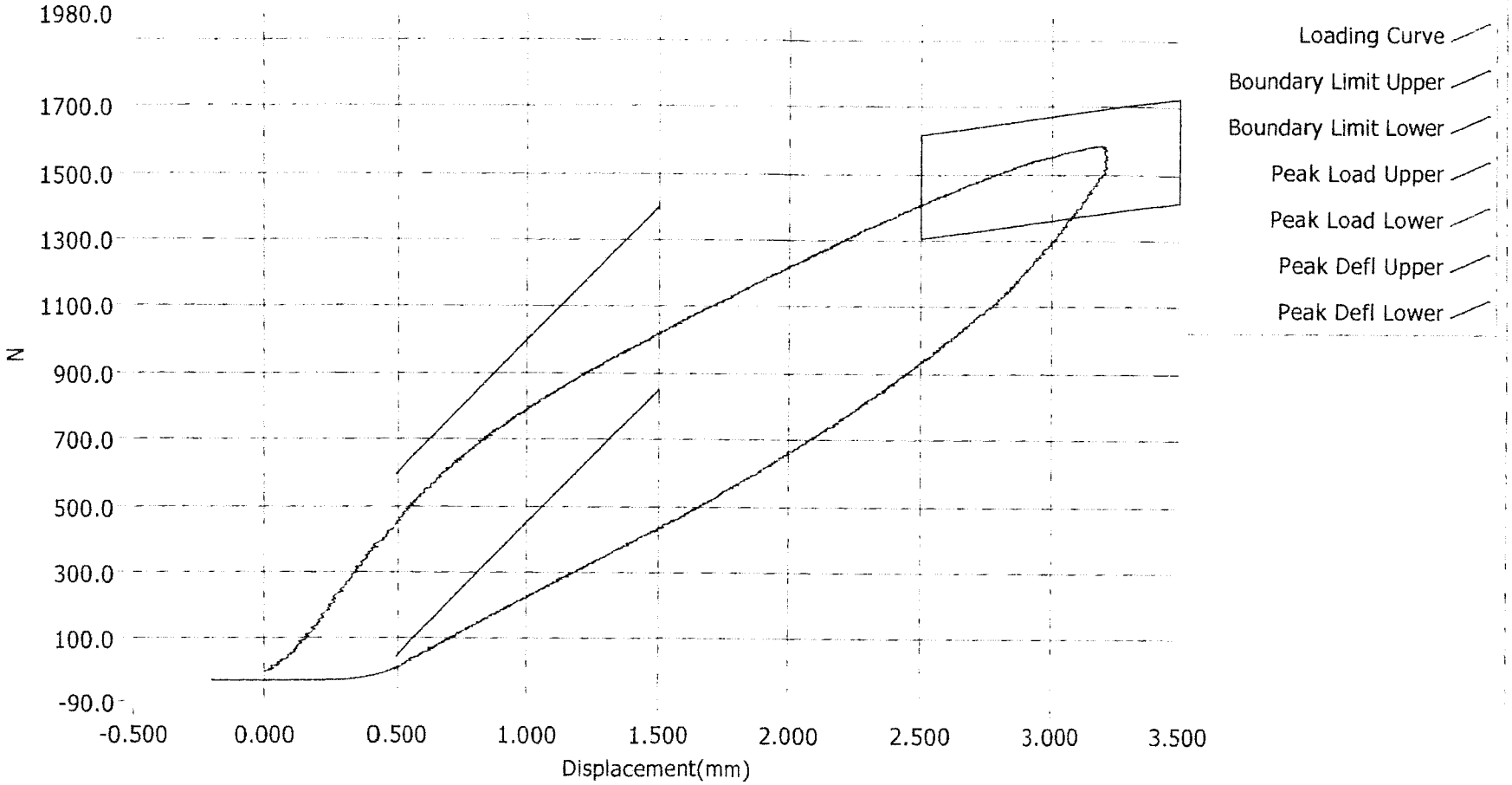


TEST DESC: ILLIAC
VELOCITY: 14.01 ft/s, 4.27 m/s

TEST DATE: 04/27/2016
TEST #: D161488



Resultant Data - SIDIIs Plug Compression



ATD Calibration Lab

Test ID	Part Serial Number	Test Date	Test Time
	53236	3/27/2012	3:29 PM
Cert ID	ATD Serial Number	ATD Type	
	N/A	SIDIIs	

Current Date : 3/27/2012 Current Time : 15:29:49

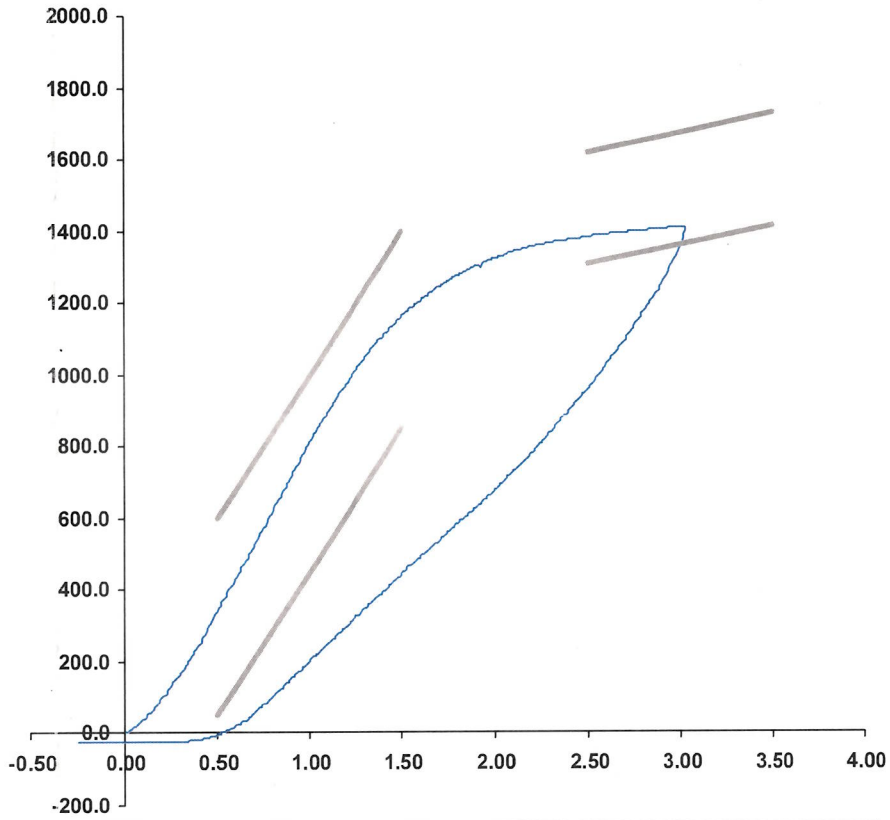
SACO RESEARCH

SID-IIs Pelvis Plug Certification Test

Plug S/N 10260
Test Number 624
Report Number 627
Test Date 11/8/2014 4:55:58 PM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	338.83	50.00	600.00
Force @ 1.5 mm (N)	1,161.08	850.00	1,400.00
Force @ 2.5 mm (N)	1,382.52	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,409.12	1,361.00	1,673.00

Force (-N) vs Extension (-mm)



Testing Machine STM-20 5965542
Load Cell S/N (TI240813), Units (LBS) 1000

Crosshead Speed (mm / min) or Rate 12.7
Extension or Position Measured by XHD_100 (XHD100)

Notes:

Operator

Part Number 180-4450

Template No 107 09-Dec-14
SACO Research

By : dlC Date : 11/8/14

SACO Research 39655 Bordeaux Place Murrieta, CA 92562 Tel 310-694-2082 FAX

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	P79600	Endevco	01/19/16
		Y	P83187	Endevco	01/19/16
		Z	P83188	Endevco	01/19/16
		Xr	P84445	Endevco	01/19/16
		Yr	P84449	Endevco	01/19/16
		Zr	P88720	Endevco	01/19/16
Thorax Rib Displacement Potentiometers	Upper	Y	G176	Honeywell	01/19/16
	Middle	Y	G169	Honeywell	01/19/16
	Lower	Y	G164	Honeywell	01/19/16
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	P88695	Endevco	12/08/15
		Y	P88696	Endevco	12/08/15
		Z	P88697	Endevco	12/08/15
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	P79414	Endevco	10/05/15
			Y	P79409	Endevco	10/05/15
			Z	P79422	Endevco	10/05/15
			Xr	P79640	Endevco	10/05/15
			Yr	P79639	Endevco	10/05/15
			Zr	P79641	Endevco	10/05/15
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	Servo	10/06/15
		Middle	Y	G1261	FTSS	10/06/15
		Lower	Y	G1270	FTSS	10/06/15
	Abdominal Rib	Upper	Y	G032	FTSS	10/06/15
		Lower	Y	G1304	FTSS	10/06/15
Lower Spine Accelerometers (T12)			X	P82310	Endevco	09/23/15
			Y	P82113	Endevco	09/23/15
			Z	P82114	Endevco	09/23/15
Acetabulum Load Cell			Y	ACG111	Denton	04/08/15
Iliac Wing Load Cell			Y	IWG226	Denton	04/08/15
Pelvis Plug (struck side)				53236	FTSS	03/27/12
Pelvis Plug (non-struck side)				10260	SACO	11/08/14

Table 3 – Vehicle Instrumentation

			Serial Number	Manufacturer	Calibration Date
1	Vehicle Center of Gravity	X	PCB392	PCB	12/15/2015
	Vehicle Center of Gravity	Y	PCB391	PCB	12/15/2015
	Vehicle Center of Gravity	Z	PCB393	PCB	12/15/2015
2	Right Sill at Front Seat	X	PCB213	PCB	04/12/2016
	Right Sill at Front Seat	Y	PCB212	PCB	04/12/2016
	Right Sill at Front Seat	Z	PCB211	PCB	04/12/2016
3	Right Sill at Rear Seat	X	PCB244	PCB	12/09/2015
	Right Sill at Rear Seat	Y	PCB246	PCB	12/09/2015
	Right Sill at Rear Seat	Z	PCB245	PCB	12/09/2015
4	Left Sill at Front Door	Y	P82291	Endevco	02/26/2016
5	Left Sill at Rear Door	Y	P88155	Endevco	04/06/2016
6	Left A-Post Lower	Y	PCB359	PCB	02/04/2016
7	Left A-Post Middle	Y	PCB360	PCB	02/04/2016
8	Left B-Post Lower	Y			
9	Left B-Post Middle	Y			
10	Front Seat Track	Y	P78284	Endevco	12/14/2015
11	Rear Seat Track or Structure	Y	P79610	Endevco	01/13/2016
12	Right Rear Occ. Compartment	Y	P90646	Endevco	04/06/2016
13	Engine Block	X	P67518	Endevco	01/21/2016
	Engine Block	Y	P67517	Endevco	01/21/2016
14	Rear Floorpan Above Axle	X	PCB285	PCB	03/04/2016
	Rear Floorpan Above Axle	Y	PCB284	PCB	03/04/2016
	Rear Floorpan Above Axle	Z	PCB283	PCB	03/04/2016

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