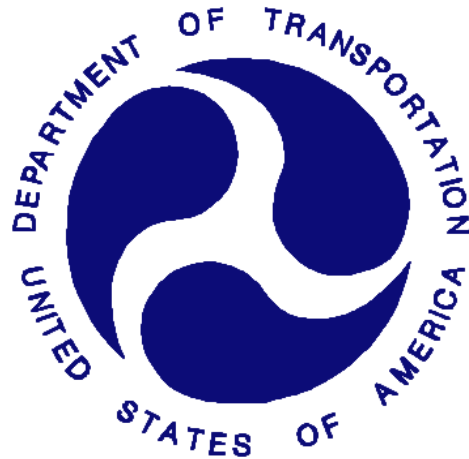


REPORT NUMBER: NCAP-MGA-2013-029

**NEW CAR ASSESSMENT PROGRAM (NCAP)
Frontal Barrier Impact Test**

**GENERAL MOTORS LLC
2013 Chevrolet Cruze LS 4-Dr Sedan
NHTSA No.: GD0101**

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



Test Date: November 5, 2012

Final Report Date: November 15, 2012

FINAL REPORT

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

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Prepared by: 
Donna Janovicz, Project Manager

Approved by: 
Ben Fischer, Project Engineer

Approval Date: November 15, 2012

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

Technical Report Documentation Page

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16. Abstract A 56.3 km/h NCAP Frontal Impact Test was conducted on a 2013 Chevrolet Cruze LS 4-Dr Sedan in accordance with the specifications of the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and foot well intrusion performance. The test was conducted at MGA Research Corporation in Burlington, Wisconsin, on November 5, 2012. The impact velocity was 56.2 km/h and the ambient temperature at the barrier face at the time of impact was 20.7°C. The target vehicle post-test maximum crush was 526 mm located at the vehicle's centerline. The test vehicle's performance was as follows: <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th rowspan="2">Units</th> <th colspan="2">Threshold</th> <th rowspan="2">Driver ATD</th> <th rowspan="2">Passenger ATD</th> </tr> <tr> <th>50th</th> <th>5th</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₁₅)</td> <td>N/A</td> <td>700</td> <td>700</td> <td>328</td> <td>267</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>52</td> <td>12</td> <td>9</td> </tr> <tr> <td>Nij</td> <td>N/A</td> <td>1</td> <td>1</td> <td>0.23</td> <td>0.44</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4170</td> <td>2620</td> <td>717</td> <td>768</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4000</td> <td>2520</td> <td>147</td> <td>202</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10008</td> <td>6805</td> <td>1512</td> <td>753</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10008</td> <td>6805</td> <td>1773</td> <td>1376</td> </tr> </tbody> </table>						Measurement Description	Units	Threshold		Driver ATD	Passenger ATD	50 th	5 th	Head Injury Criteria (HIC ₁₅)	N/A	700	700	328	267	Maximum Chest Compression	mm	63	52	12	9	Nij	N/A	1	1	0.23	0.44	Neck Tension	N	4170	2620	717	768	Neck Compression	N	4000	2520	147	202	Left Femur Force	N	10008	6805	1512	753	Right Femur Force	N	10008	6805	1773	1376
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SECTION 1 PURPOSE AND SUMMARY OF TEST

PURPOSE

This 56.3 km/h frontal barrier impact test is part of the Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under contract number DTNH22-12-D-00258. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for consumer information purposes.

The 56.3 km/h frontal barrier impact was conducted in accordance with the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure.

SUMMARY

A flat rigid barrier was impacted by a 2013 Chevrolet Cruze LS 4-Dr Sedan at a velocity of 56.2 km/h. The test was performed at MGA Research Corporation on November 5, 2012. Pre-test and post-test photographs of the vehicle and dummies can be found in Appendix A.

Two (2) real-time cameras and fourteen (14) high-speed cameras were used to document the frontal barrier impact event. Camera locations and other pertinent camera information can be found in this report.

One Part 572E 50th percentile male anthropomorphic test device (ATD), was placed in the driver seating position and one Part 572O 5th percentile female test device (ATD) was placed in the right-front passenger seating position according to dummy placement instructions specified in the Frontal NCAP Laboratory Test Procedure.

Both ATDs were fully instrumented with head, chest and pelvis tri-axial accelerometers, chest displacement potentiometers, upper neck transducers, right/left femur load cells, and lower leg instrumentation.

The driver (position 1) ATD (Serial No. 036) and the right-front passenger (position 2) ATD (Serial No. 634) were calibrated previous to this test. Certification details, along with instrumentation calibration data, are found in Appendix C of this report.

The 100 channels of data were recorded on an on-board data acquisition system. Appendix B contains the vehicle and dummy response data traces.

There was 100 percent windshield retention and no intrusion into the protected zone of the windshield during the event. There was no Stoddard Solvent leakage after the event or during any phase of the static rollover.

The maximum static crush of the vehicle was 526 mm and both the driver and passenger side doors remained closed during the impact event and were operable after the impact.

The driver's visible contact points were as follows: The driver's head and chest contacted the airbag. The driver's head also contacted the headrest. The driver's knees contacted the knee airbag. The passenger's visible contact points were as follows: The passenger's head and chest contacted the airbag. The passenger's head also contacted the headrest. The passenger's knees contacted the knee airbag.

The occupant data is summarized below:

ATD position	HIC ₁₅	Nij	Neck Tension (N)	Neck Comp. (N)	3ms Chest Clip (Gs)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50 th)	328	0.23	717	147	44	12	1512	1773
Passenger (5 th)	267	0.44	768	202	37	9	753	1376

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

TEST NOTES

Top of Engine X has no valid data after 12 ms.
The load cell barrier data was not collected for this test.

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

SECTION 2
OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2013 Chevrolet Cruze LS 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: GD0101
Test Date: 11/05/2012

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	GD0101	Traction Control System (TCS)	Yes
Model Year	2013	Power Steering	Yes
Make	Chevrolet	Power Window Auto-Reverse	Yes
Model	Cruze	Driver Frontal Airbag	Yes
Body Style	Sedan	Driver Curtain Airbag	Yes
VIN	1G1PB5SH2D7118596	Driver Head/Torso Airbag	No
Body Color	Jet Black	Driver Torso Airbag	No
Odometer (km/mi)	105 / 65	Driver Torso/Pelvis Airbag	Yes
Engine Displacement (L)	1.8	Driver Pelvis Airbag	No
Type/No. Cylinders	4	Driver Knee Airbag	Yes
Engine Placement	Lateral	Front Pass. Frontal Airbag	Yes
Transmission Type	Manual	Front Pass. Curtain Airbag	Yes
Transmission Speeds	6	Front Pass. Head/Torso Airbag	No
Overdrive	Yes	Front Pass. Torso Airbag	No
Final Drive	Front Wheel Drive	Front Pass. Torso/Pelvis Airbag	Yes
Roof Rack	No	Front Pass. Pelvis Airbag	No
Sunroof/T-Top	No	Front Pass. Knee Airbag	Yes
Running Boards	No	Driver Pretensioner	Yes
Tilt Steering Wheel	Yes	Driver Load Limiter	Yes
Power Seats	No	Front Pass. Pretensioner	Yes
Anti-Lock Brakes (ABS)	Yes	Front Pass. Load Limiter	Yes
Automatic Door Locks (ADLs)	Yes	Other	N/A

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

DATA FROM CERTIFICATION LABEL

Manufactured By	General Motors LLC	GVWR (kg)	1826
Date of Manufacture	08/12	GAWR Front (kg)	946
		GAWR Rear (kg)	880

VEHICLE SEATING AND WEIGHT CAPACITY DATA

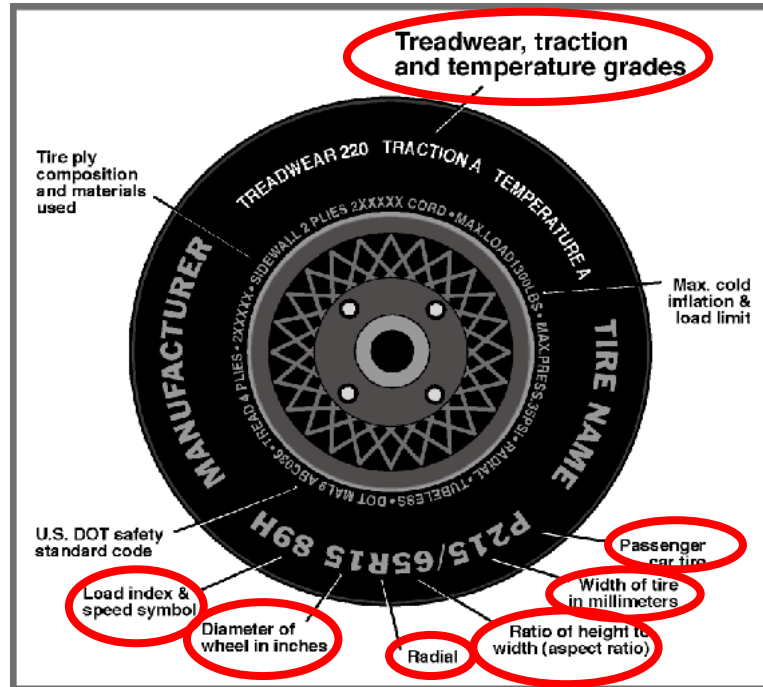
Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench		
Designated Seating Capacity (DSC)	2	3		5
Capacity Weight (VCW) (kg)				408
Cargo Weight (RCLW) (kg)				68

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

Test Vehicle: 2013 Chevrolet Cruze LS 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: GD0101
 Test Date: 11/05/2012

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	240	240
Recommended Tire Size	P215/60R16	P215/60R16
Tire Size on Vehicle	P215/60R16	P215/60R16
Tire Manufacturer	Firestone	Firestone
Tire Model	FR 710	FR 710
Treadwear	560	560
Traction	B	B
Temperature Grade	B	B
Tire Plies Sidewall	1	1
Tire Plies Body	4	4
Load Index/Speed Symbol	94S	94S
Tire Material	Rubber	Rubber
DOT Safety Code Left	VGX8 CKD	VGX8 CKD
DOT Safety Code Right	VGX8 CKD	VGX8 CKD

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

Test Vehicle: 2013 Chevrolet Cruze LS 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: GD0101
 Test Date: 11/05/2012

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	423.7	288.5		463.1	351.5	
Right	kg	415.5	269.4		445.5	338.8	
Ratio	%	60.1	39.9		56.8	43.2	
Totals	kg	839.2	557.9	1397.1	908.6	690.3	1598.9

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1397.1
Weight of 1 P572E ATD & 1 P572O ATD	kg	140.6
Rated Cargo/Luggage Weight (RCLW)	kg	68
Calculated Vehicle Target Weight (TVTW)	kg	1605.7

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	698	698	700	708	1074
As Tested	mm	691	695	666	671	1161
Post Test	mm	716	779	645	688	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2690
Total Vehicle Length at Left Side	mm	4388
Total Vehicle Length at Centerline	mm	4595
Total Vehicle Length at Right Side	mm	4388
Weight of Ballast in Cargo Area	kg	63.1
Weight of Vehicle Components Removed	kg	22.2
Amount of Stoddard Solvent in Fuel Tank	L	54.9

List of components removed: Right taillight, spare tire, jack and tools, spare tire cover, right trunk carpet, trunk rear sill plastic.

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

Test Vehicle: 2013 Chevrolet Cruze LS 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: GD0101
 Test Date: 11/05/2012

TARGET VEHICLE STRUCTURAL MEASUREMENT

	Elements	Pre-Test (mm)
1	Total Length	4595
2	Total Width	1752
3	Bumper Top Height	546
4	Bumper Bottom Height	415
5	Longitudinal Member Top Height	554
6	Distance between Longitudinal Members	882
7	Longitudinal Member Width	122
8	Engine Top Height	815
9	Engine Bottom Height	190
10	Engine and Gearbox Width	828
11	Front Bumper-Engine Distance	415
12	Front Shock Absorber Fixing Height	897
13	Bonnet Leading Edge Height	775
14	Front Shock Absorber Fixing Width	1150
15	Front Bumper – Front Axle Distance	901
16	Front Axle – A-Pillar Distance	434
17	A-Pillar – B-Pillar Distance	1115
18	B-Pillar – Rear Axle Distance	1147
19	B-Pillar – C-Pillar Distance	719
20	Roof Sill Bottom Height	1315
21	Roof Sill Top Height	1437
22	Floor Sill Bottom Height	175
23	Floor Sill Top Height	337

DATA SHEET NO. 2

SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

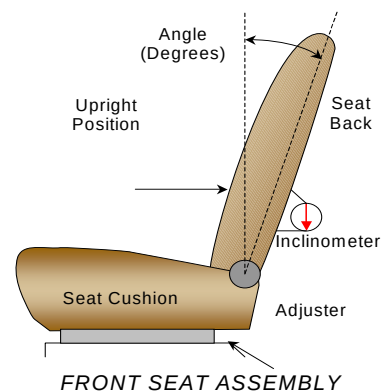
Test Vehicle: 2013 Chevrolet Cruze LS 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: GD0101
 Test Date: 11/05/2012

NOMINAL DESIGN RIDING POSITION

The driver seat back is positioned as close as possible to the manufacturer's design angle. For the passenger seat back, seat back is adjusted following Appendix F, "Driver & Passenger Dummy Seating & Positioning Procedures" in the NCAP Test Procedure dated September 2012.

	Degrees
Driver Seat Back Angle	8.6° on headrest post
Passenger Seat Back Angle	6.3° on headrest post



SEAT FORE/AFT POSITIONS

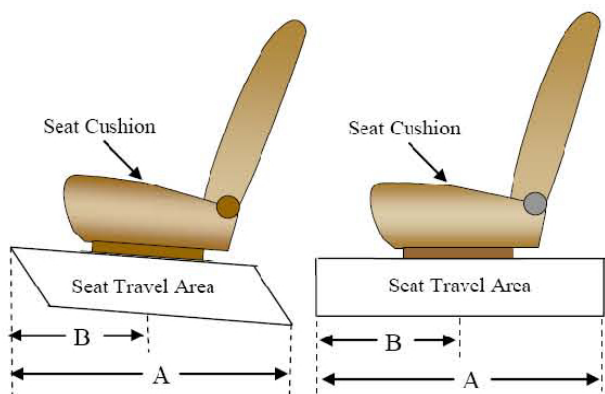
The driver and passenger seat fore/aft positions are adjusted following Appendix F, "Driver & Passenger Dummy Seating & Positioning Procedures" in the NCAP Test Procedure dated September 2012.

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	53 detents (1 st as 0), 330 mm	20 th detent (foremost as 0)
Passenger Seat	49 detents, 244 mm	0 detent (foremost as 0)

SEAT BELT UPPER ANCHORAGES

The seat belt upper anchorages are positioning following the manufacturer's specified position as listed in Form 1.

	Total # of Positions	Placed in Position #
Driver Seat	5 (1 st as 1)	0 (uppermost as 0)
Passenger Seat	5 (1 st as 1)	0 (uppermost as 0)



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

Test Vehicle: 2013 Chevrolet Cruze LS 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: GD0101
 Test Date: 11/05/2012

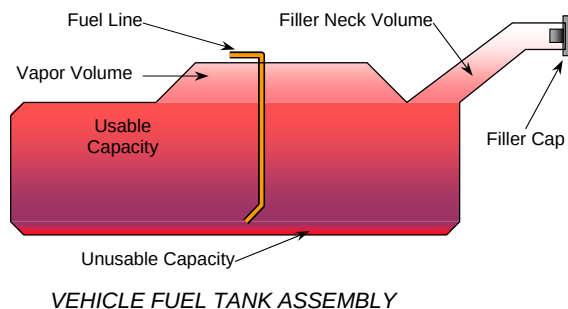
FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of "Standard Tank"	59.0
Usable Capacity of "Optional Tank"	
92-94% of Usable Capacity	54.3 to 55.5
Actual Amount of Solvent used	54.9
1/3 of Usable Capacity	19.7

FUEL PUMP

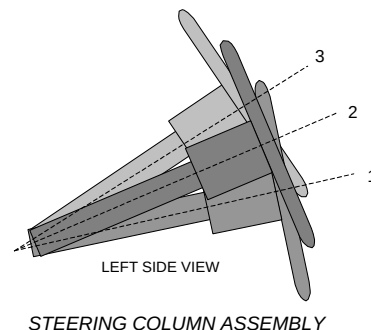
Describe the fuel pump type, its behavior, and the location of the fuel filler pipe.

The vehicle is equipped with an electric fuel pump. The fuel pump will activate when the ignition key is turned to the 'Run' position. When the working fuel system pressure is activated; the pump will turn OFF. The fuel pipe is on the right side.



STEERING COLUMN ADJUSTMENT

Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes when moved through its full range of motion. An aluminum plate is placed across the rim of the steering wheel, an inclinometer is placed on the plate and the angle is measured.



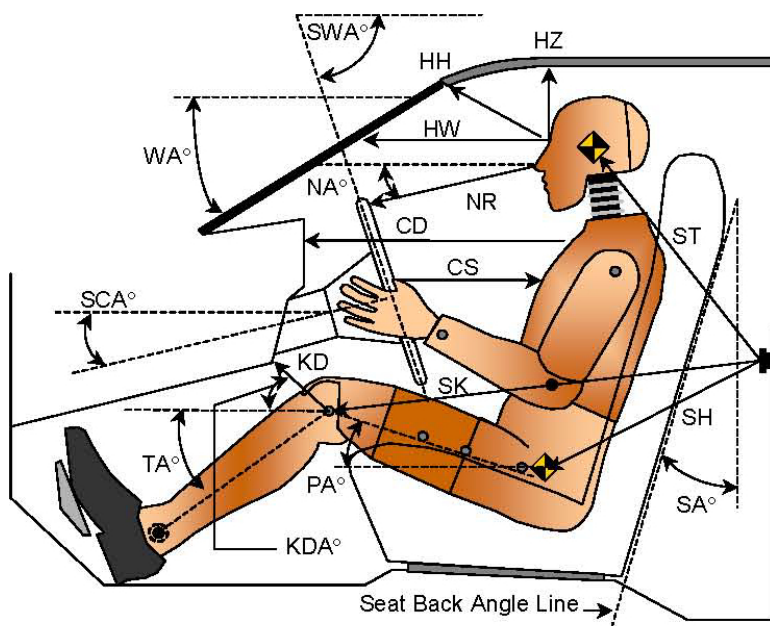
STEERING COLUMN POSITION

	Degrees	Fore/Aft Position (mm)
Lowermost Position 1	70.4	223
Geometric Center Position 2	68.2	195
Uppermost Position 3	66.0	167
Telescoping Steering Wheel Travel		56
Test Position	68.2	195

DATA SHEET NO. 3 DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2013 Chevrolet Cruze LS 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: GD0101
Test Date: 11/05/2012



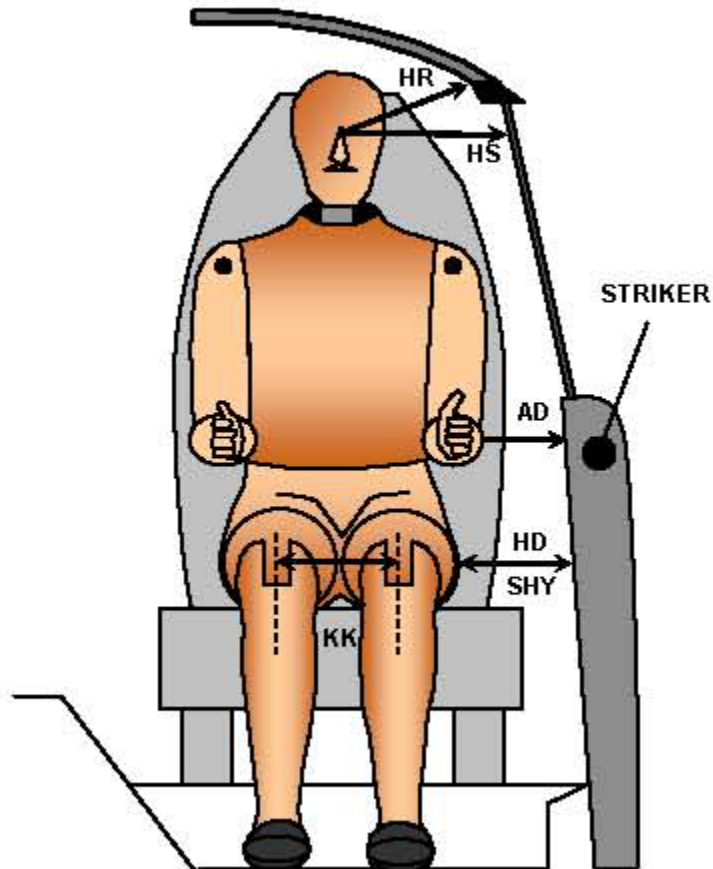
LEFT SIDE VIEW

Code	Measurement Description	Driver S/N 036		Passenger S/N 634	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		24.3		
SWA°	Steering Wheel Angle		68.2		
SCA°	Steering Column Angle		21.8		
SA°	Seat Back Angle (on headrest post)		8.6		6.3
HZ	Head to Roof (Z)	238	90	246	90
HH	Head to Header	368	27.0	310	43.3
HW	Head to Windshield	736	0	713	0
NR	Nose to Rim	424	10.4		
CD	Chest to Dash	560		447	
CS	Chest to Steering Hub	357	4.6		
RA	Rim to Abdomen	232	0		
KDL	Left Knee to Dash	189	33.5	148	41.6
KDR	Right Knee to Dash	166	34.7	161	30.5
PA°	Pelvic Angle		24.6		20.6
TA°	Tibia Angle		39.8		41.4
SK	Striker to Knee	514	95.3	584	97.5
ST	Striker to Head	444	4.6	409	20.0
SH	Striker to H-Point	239	143.8	302	123.8

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2013 Chevrolet Cruze LS 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: GD0101
 Test Date: 11/05/2012



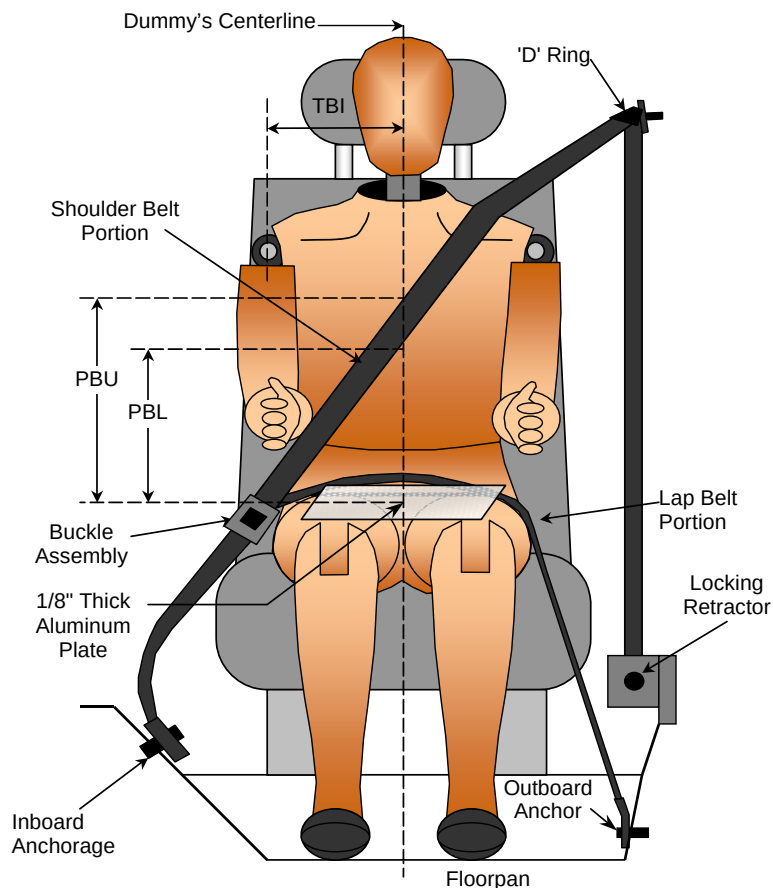
FRONT VIEW OF DUMMY

Code	Measurement Description	Driver S/N 036	Passenger S/N 634
		Length (mm)	
AD	Arm to Door	123	111
HD	H-Point to Door	152	182
HR	Head to Side Header	226	253
HS	Head to Side Window	340	461
KK	Knee to Knee	315	226
SHY	Striker to H-Point (Y Direction)	265	295
AA	Ankle to Ankle	345	163

DATA SHEET NO. 5 SEAT BELT POSITIONING DATA

Test Vehicle: 2013 Chevrolet Cruze LS 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: GD0101
Test Date: 11/05/2012



FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	355	335
PBL - Top surface of reference to belt lower edge	mm	285	250

BELT LENGTH DATA

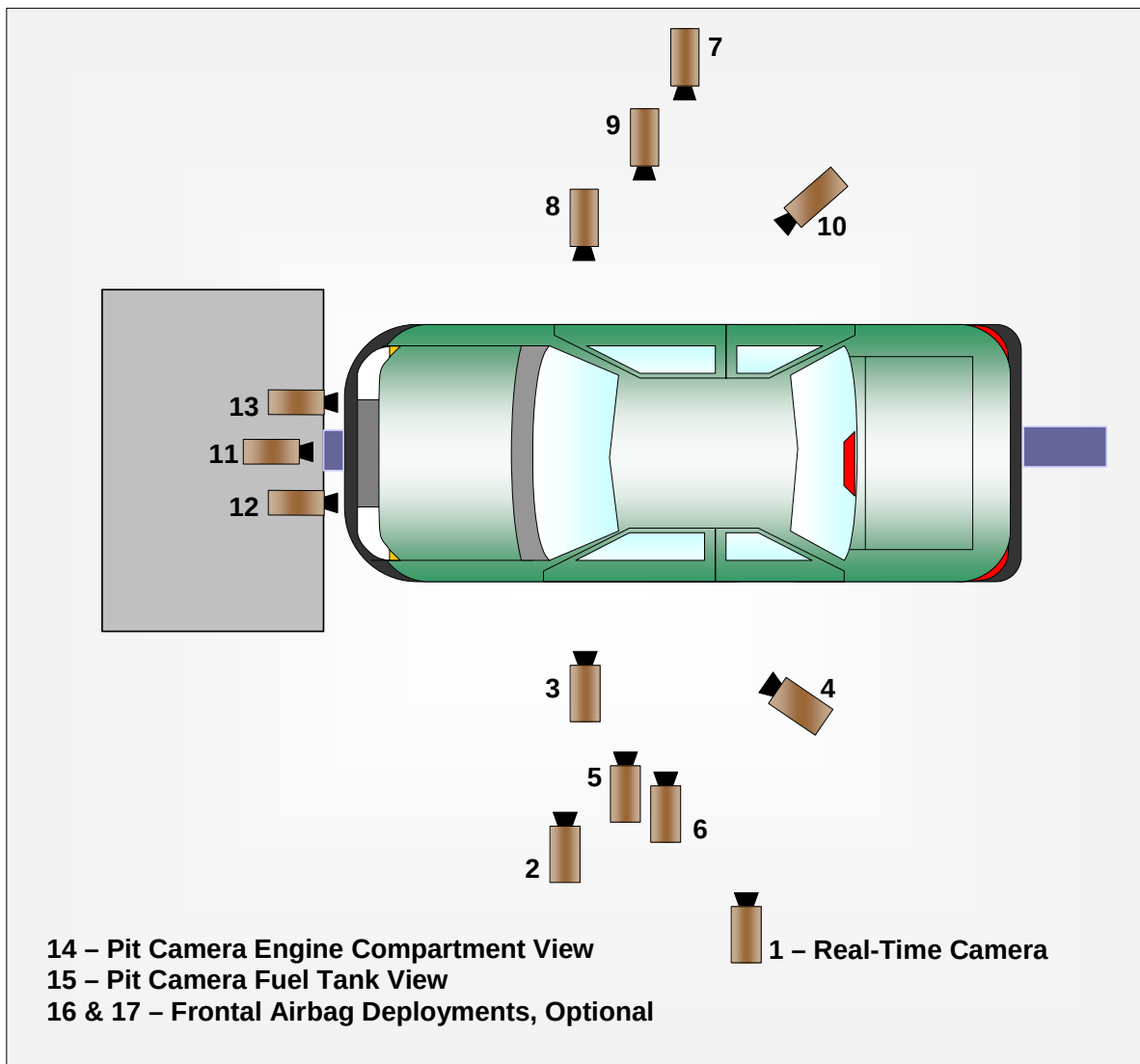
Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as measured on ATD	mm	800	835
Lap Belt Length as measured on ATD	mm	440	460
Remainder of belt on reel	mm	1920	1865
Total Belt Length for Continuous Webbing Systems	mm	3160	3160

DATA SHEET NO. 6
HIGH-SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2013 Chevrolet Cruze LS 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: GD0101
Test Date: 11/05/2012

CAMERA POSITIONS FOR FRONTAL IMPACTS



DATA SHEET NO. 6 (CONTINUED)
CAMERA LOCATIONS AND DATA

Test Vehicle: 2013 Chevrolet Cruze LS 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: GD0101
 Test Date: 11/05/2012

CAMERA LOCATIONS

No.	Camera View	Coordinates (mm)			Lens (mm)	Speed (fps)
		X*	Y*	Z*		
1	Real-Time Left Overall					30
2	Driver Close-Up	1510	-6550	-1850	35	1000
3	Left Front Half	1220	-4930	-1260	24	1000
4	Left Angle	5930	-4910	-2030	50	1000
5	Steering Column - Top	600	-5050	-1260	24	1000
6	Steering Column - Bottom	580	-5000	-860	24	1000
7	Right Overall	2160	6340	-1370	20	1000
8	Passenger Close-Up	1600	6920	-1890	35	1000
9	Right Front Half	1360	4900	-1330	24	1000
10	Right Angle	5990	4860	-2030	50	1000
11	Windshield	-60	0	-2810	24	1000
12	Driver Windshield	220	-450	-2030	12.5	1000
13	Passenger Windshield	220	450	-2740	12.5	1000
14	Pit Front	1420	0	3150	24	1000
15	Pit Rear	3310	0	3150	24	1000
16	Onboard Driver Side (optional)					
17	Onboard Passenger Side (optional)					
18	Real-Time Pan View					30

***COORDINATES:**

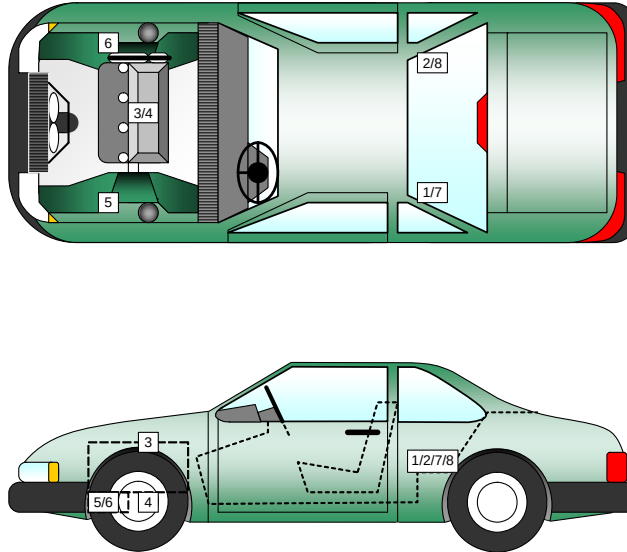
- +X = forward of impact plane
- +Y = right of monorail centerline
- +Z = below ground level

Cameras 16 & 17 were not used for this test.

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

Test Vehicle: 2013 Chevrolet Cruze LS 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: GD0101
 Test Date: 11/05/2012



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Accelerometer – X Direction	1875	-377	-187
2	Right Rear Accelerometer – X Direction	1904	305	-240
3	Engine Top X	3790	10	-824
4	Engine Bottom X	3736	-113	-272
5	Left Rear Accelerometer – Z Direction	1875	-377	-187
6	Right Rear Accelerometer – Z Direction	1904	305	-240
7	Left Rear Accelerometer Redundant – X Direction	1875	-377	-187
8	Right Rear Accelerometer Redundant – X Direction	1904	305	-240

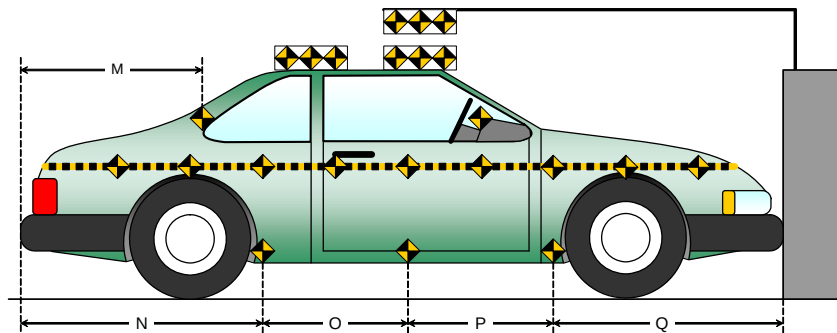
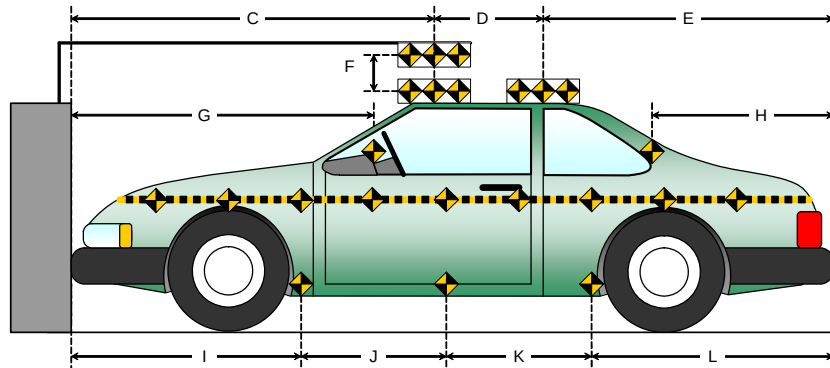
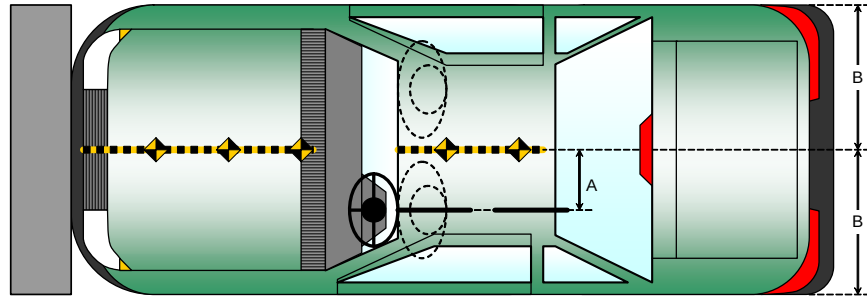
Reference Points: X - Rear Surface of Vehicle (+ forward)
 Y - Vehicle Centerline (+ to right)
 Z - Ground Plane (+ down)

DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2013 Chevrolet Cruze LS 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: GD0101
 Test Date: 11/05/2012

Item	Value (mm)
A	343
B	876
C	2405
D	665
E	1525
F	230
G	
H	1021
I	1380
J	915
K	915
L	1385
M	1021
N	1385
O	915
P	915
Q	1380



DATA SHEET NO. 9
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2013 Chevrolet Cruze LS 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: GD0101
 Test Date: 11/05/2012

Advanced Research Load Cell Barrier

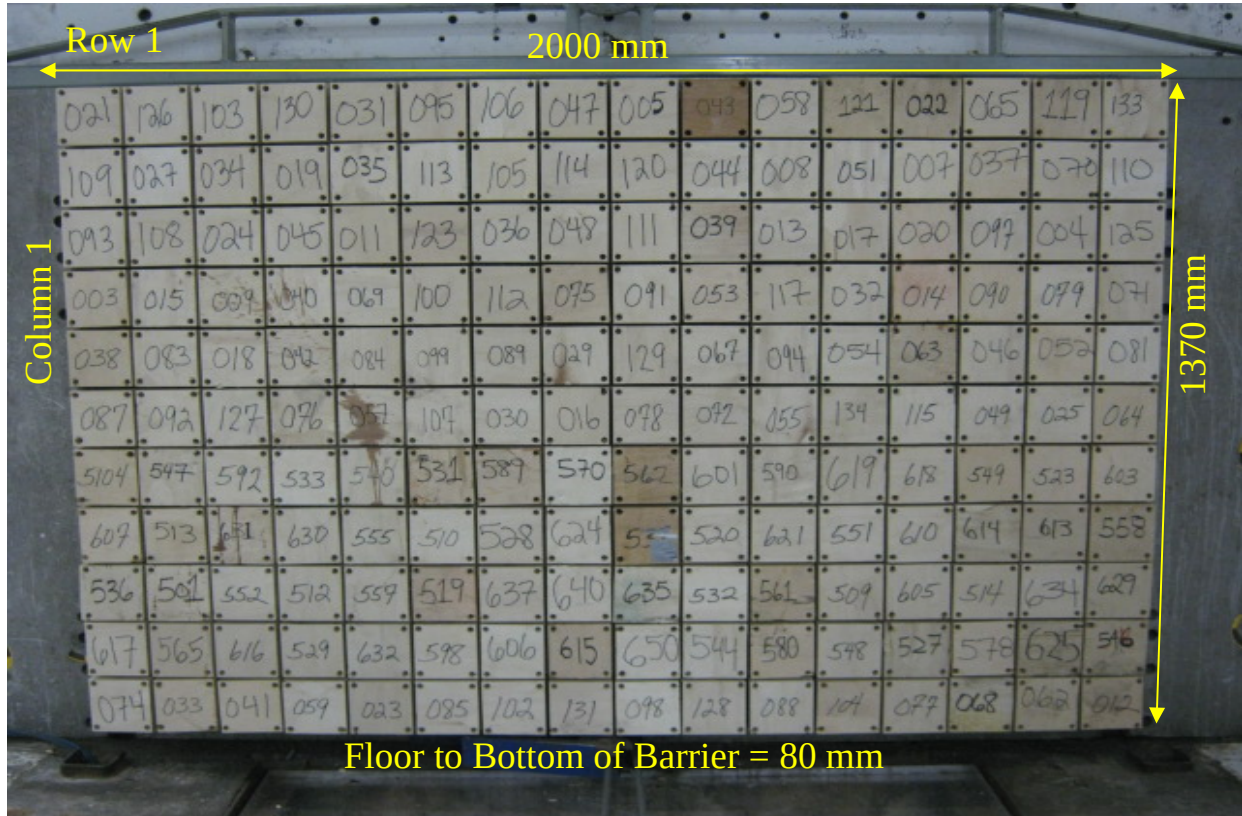


Photo for Reference Only

Centerline															
1-1	1-2	1-3	1-4	1-5	1-6	1-7	1-8	1-9	1-10	1-11	1-12	1-13	1-14	1-15	1-16
2-1	2-2	2-3	2-4	2-5	2-6	2-7	2-8	2-9	2-10	2-11	2-12	2-13	2-14	2-15	2-16
3-1	3-2	3-3	3-4	3-5	3-6	3-7	3-8	3-9	3-10	3-11	3-12	3-13	3-14	3-15	3-16
4-1	4-2	4-3	4-4	4-5	4-6	4-7	4-8	4-9	4-10	4-11	4-12	4-13	4-14	4-15	4-16
5-1	5-2	5-3	5-4	5-5	5-6	5-7	5-8	5-9	5-10	5-11	5-12	5-13	5-14	5-15	5-16
6-1	6-2	6-3	6-4	6-5	6-6	6-7	6-8	6-9	6-10	6-11	6-12	6-13	6-14	6-15	6-16
7-1	7-2	7-3	7-4	7-5	7-6	7-7	7-8	7-9	7-10	7-11	7-12	7-13	7-14	7-15	7-16
8-1	8-2	8-3	8-4	8-5	8-6	8-7	8-8	8-9	8-10	8-11	8-12	8-13	8-14	8-15	8-16
9-1	9-2	9-3	9-4	9-5	9-6	9-7	9-8	9-9	9-10	9-11	9-12	9-13	9-14	9-15	9-16
10-1	10-2	10-3	10-4	10-5	10-6	10-7	10-8	10-9	10-10	10-11	10-12	10-13	10-14	10-15	10-16
11-1	11-2	11-3	11-4	11-5	11-6	11-7	11-8	11-9	11-10	11-11	11-12	11-13	11-14	11-15	11-16

Load Cells are 121 mm x 121 mm with a 7 mm gap in between each load cell.

DATA SHEET NO. 10
TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2013 Chevrolet Cruze LS 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: GD0101
Test Date: 11/05/2012

INSTRUMENTATION

Driver Dummy Data Channels	46
Passenger Dummy Data Channels	46
Vehicle Structure Accelerometers	8
Barrier Channels	0
Total	100

CAMERA COVERAGE

High-Speed Vehicle Onboard	0
High-Speed Offboard	14
Real-Time	2
Total	16

**DATA SHEET NO. 11
POST-TEST OBSERVATIONS**

Test Vehicle: 2013 Chevrolet Cruze LS 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: GD0101
Test Date: 11/05/2012

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Passenger
Dummy Type / Serial No.	HIIL 50% / 036	HIIL 5% / 634
Head Contact	Airbag, Headrest	Airbag, Headrest
Upper Torso Contact	Airbag	Airbag
Lower Torso Contact	None	None
Left Knee Contact	Knee Airbag	Knee Airbag
Right Knee Contact	Knee Airbag	Knee Airbag

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Passenger
Locked/Unlocked Doors	Doors were locked	Doors were locked
Front Door Opening	Door remained closed and latched; Door opened without tools	Door remained closed and latched; Door opened without tools
Rear Door Opening	Door remained closed and latched; Door opened without tools	Door remained closed and latched; Door opened without tools
Seat Track Shift (mm)	0	0
Seat Back Failure	None	None

POST TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Windshield Damage	None
Window Damage	None
Other Notable Effects	None

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	668
Center	mm	604
Right Side	mm	663
Average	mm	645

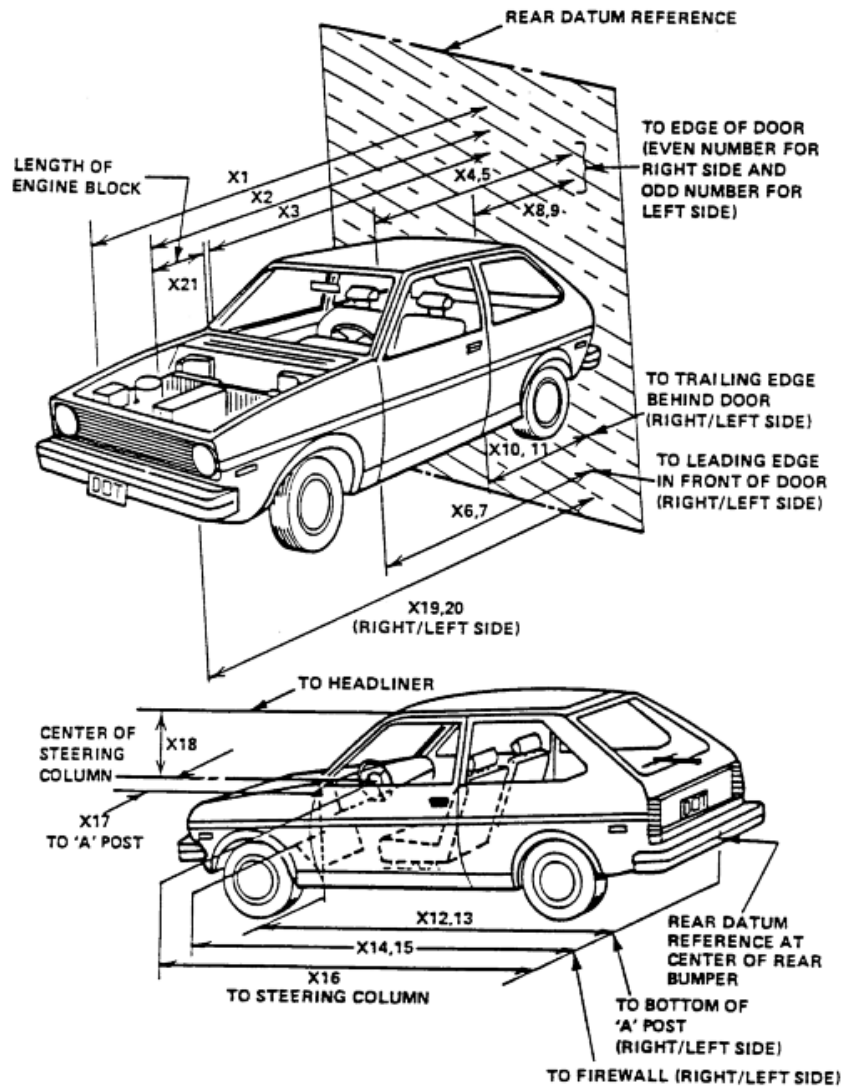
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Left Front (Driver) P1		Right Front (Passenger) P2	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	Yes	Yes	Yes
Curtain Side Airbag	Yes	No	Yes	No
Torso/Pelvis Side Airbag	Yes	No	Yes	No
Knee Airbag	Yes	Yes	Yes	Yes
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes		Yes	
Other	No		No	

DATA SHEET NO. 12 VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2013 Chevrolet Cruze LS 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: GD0101
Test Date: 11/05/2012



DATA SHEET NO. 12 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2013 Chevrolet Cruze LS 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: GD0101
 Test Date: 11/05/2012

RSOV (Rear Surface of Vehicle)

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	mm	4595	4069	526
2	RSOV to Front of Engine	mm	4045	3812	233
3	RSOV to Firewall	mm	3520	3484	36
4	RSOV to Upper Leading Edge of Right Door	mm	3072	3081	-9
5	RSOV to Upper Leading Edge of Left Door	mm	3072	3077	-5
6	RSOV to Lower Leading Edge of Right Door	mm	3100	3102	-2
7	RSOV to Lower Leading Edge of Left Door	mm	3100	3104	-4
8	RSOV to Upper Trailing Edge of Right Door	mm	2040	2044	-4
9	RSOV to Upper Trailing Edge of Left Door	mm	2040	2042	-2
10	RSOV to Lower Trailing Edge of Right Door	mm	2077	2077	0
11	RSOV to Lower Trailing Edge of Left Door	mm	2077	2082	-5
12	RSOV to Bottom of "A" Post of Right Side	mm	3114	3110	4
13	RSOV to Bottom of "A" Post of Left Side	mm	3114	3114	0
14	RSOV to Firewall, Right Side	mm	3510	3520	-10
15	RSOV to Firewall, Left Side	mm	3510	3486	24
16	RSOV to Steering Column	mm	2626	2671	-45
17	Center of Steering Column to "A" Post	mm	390	367	23
18	Center of Steering Column to Headliner	mm	440	430	10
19	RSOV to Right Side of Front Bumper	mm	4388	3981	407
20	RSOV to Left Side of Front Bumper	mm	4388	4021	367
21	Length of Engine Block	mm	410	410	0
RD	RSOV to Right Side of Dash Panel	mm	2840	2817	23
CD	RSOV to Center of Dash Panel	mm	2901	2871	30
LD	RSOV to Left Side of Dash Panel	mm	2836	2838	-2

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2013 Chevrolet Cruze LS 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: GD0101
Test Date: 11/05/2012

VEHICLE INFORMATION

VIN: 1G1PB5SH2D7118596 Wheelbase (mm): 2690
Vehicle Size Category: Passenger Test Weight (kg): 1598.9

ACCELEROMETER DATA

Accelerometer Locations: As per measurements on Page 15

Cal. Procedure/Interval: MGA procedure / 6 month

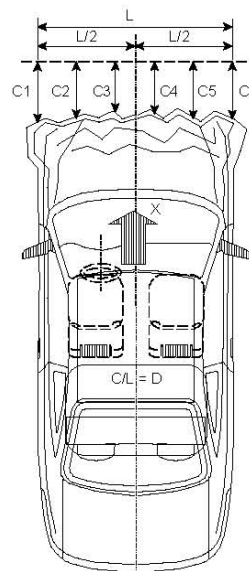
Integration Algorithm: Trapezoidal

Linearity: > 99%

Impact Velocity (km/h): 56.2

Velocity Change (km/h): 65.1

Time of Separation (msec): 105.6



CRUSH PROFILE

Collision Deformation Classification: Frontal

Midpoint of Damage: Centerline

Damage Region Length (mm): 1224

Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4388	4021	367
C2	Crush zone 2 at left side	mm	4493	4031	462
C3	Crush zone 3 at left side	mm	4542	4059	483
C4	Crush zone 4 at right side	mm	4542	4047	495
C5	Crush zone 5 at right side	mm	4493	4002	491
C6	Crush zone 6 at right side	mm	4388	3981	407
L	C1 TO C6	mm	1224	1200	24

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2013 Chevrolet Cruze LS 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

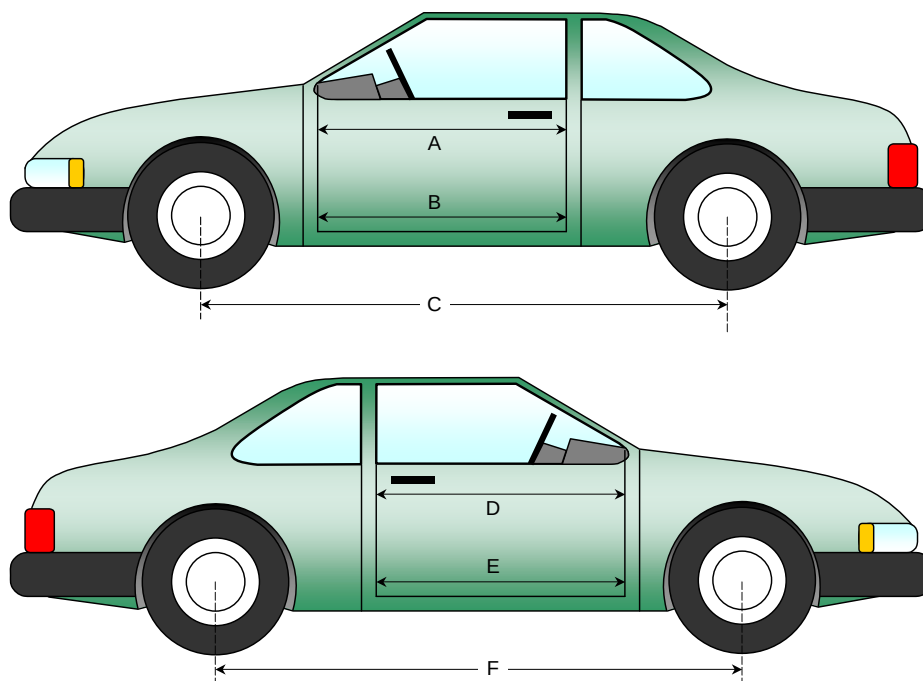
NHTSA No.: GD0101
Test Date: 11/05/2012

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	940	940	0
B	Left Side Lower	mm	885	885	0
D	Right Side Upper	mm	940	945	-5
E	Right Side Lower	mm	885	885	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2690	2640	50
F	Right Side Wheelbase	mm	2690	2644	46



DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

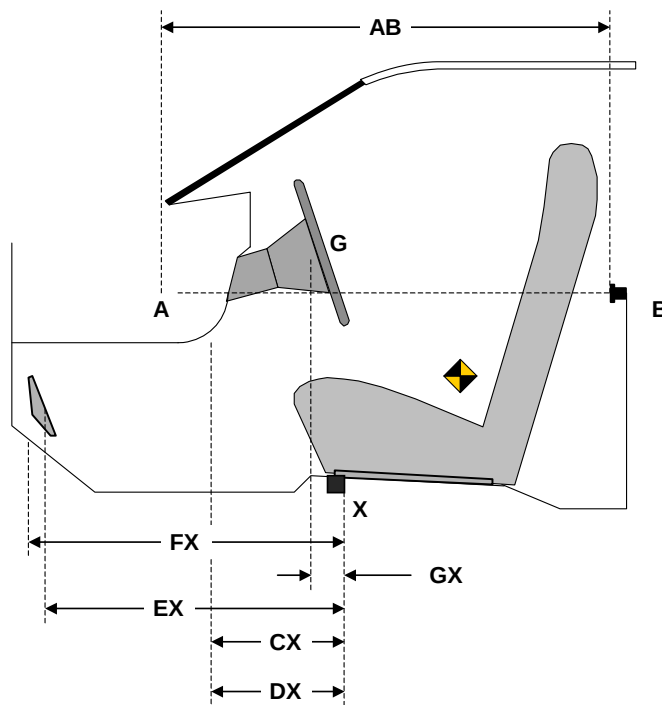
Test Vehicle: 2013 Chevrolet Cruze LS 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: GD0101
 Test Date: 11/05/2012

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	783	783	0
CX	Left Knee Bolster to X	mm	254	245	9
DX	Right Knee Bolster to X	mm	238	229	9
EX	Brake Pedal to X	mm	578	554	24
FX	Foot Rest to X	mm	637	627	10
GX	Center of Steering Column Wheel Hub to X	mm	57	95	-38

X = Front of Seat Track (stationary)



DRIVER COMPARTMENT

DATA SHEET NO. 15
SUMMARY OF FMVSS 212, FMVSS 219 (PARTIAL) DATA, AND 301 DATA

Test Vehicle: 2013 Chevrolet Cruze LS 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: GD0101
 Test Date: 11/05/2012

Windshield Mounting Details:

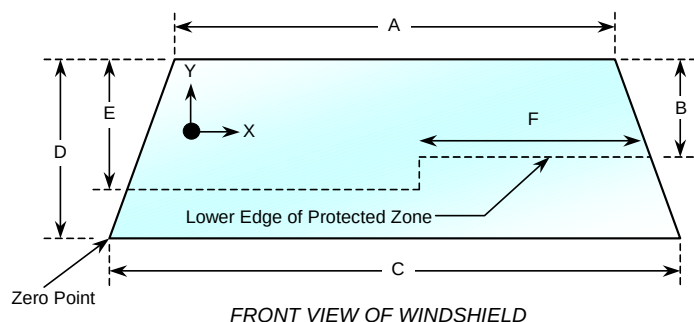
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

The standard requires that the post-test retention measurement be a minimum of 75 percent of the pre-test total periphery measurement for vehicles not equipped with occupant passive restraints and 50 percent for each side of the windshield for vehicles which are equipped with occupant passive restraints.

Temperature of windshield molding during test: 20.7°C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2125	2125	100
Right Side	2125	2125	100
Total	4250	4250	100



Item	Units	Value
A	mm	1138
B	mm	534
C	mm	1468
D	mm	822
E	mm	540
F	mm	452

AREA OF PROTECTED ZONE FAILURES - NONE

A. Provide coordinates of the area that the protected zone was penetrated more than 0.25 inches by a vehicle component other than one that is normally in contact with the windshield. **None**

X	Y

B. Provide coordinates of the area beneath the protected zone that the inner surface of the windshield was penetrated by a vehicle component. **None**

X	Y

DATA SHEET NO. 15 (CONTINUED)
SUMMARY OF FMVSS 212, FMVSS 219 (PARTIAL), AND 301 DATA

Test Vehicle: 2013 Chevrolet Cruze LS 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: GD0101
Test Date: 11/05/2012

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 20.7°C Test Time: 12:16 p.m.

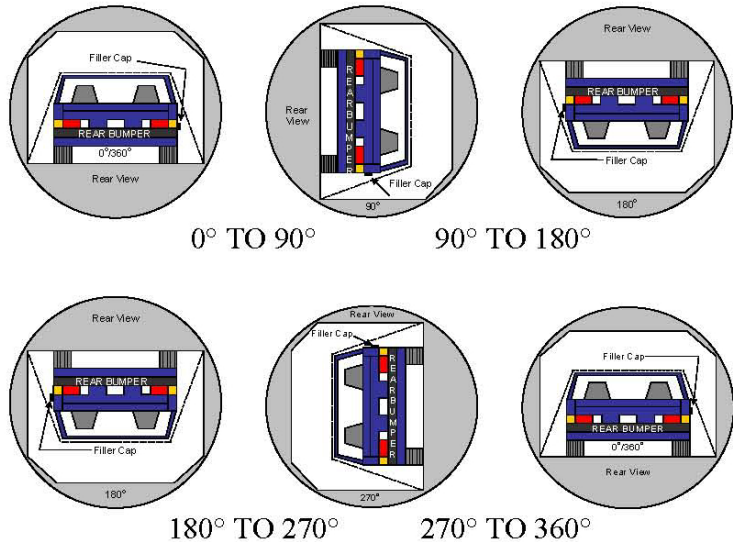
- A. From impact until vehicle motion ceases: 0 oz.
(Maximum allowable = 1 oz.)
- B. For the 5 minute period after motion ceases: 0 oz.
(Maximum allowable = 5 oz.)
- C. For the following 25 minutes: 0 oz.
(Maximum allowable = 1 oz./minute)
- D. Spillage: None

DATA SHEET NO. 16 **FMVSS 301 STATIC ROLLOVER RESULTS**

Test Vehicle: 2013 Chevrolet Cruze LS 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: GD0101
 Test Date: 11/05/2012

1. The specified fixture rollover rate for each 90° of rotation is 60 to 180 seconds.
2. The position hold time at each position is 300 seconds (minimum).
3. Details of Stoddard Solvent spillage: **None**



SOLVENT COLLECTION TIME TABLE IN SECONDS

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

FMVSS 301 SPILLAGE TABLE (units in ounces)

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

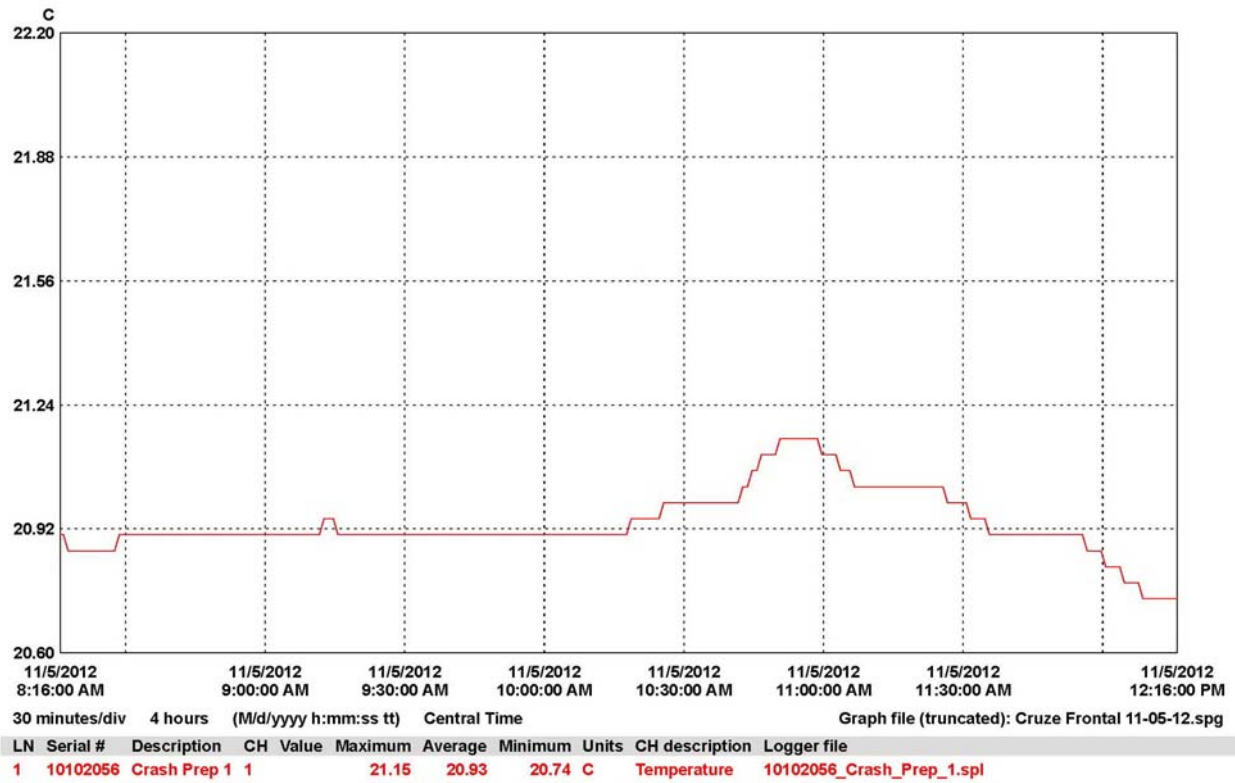
SOLVENT SPILLAGE LOCATION TABLE

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

DATA SHEET NO. 17 **DUMMY/VEHICLE TEMPERATURE STABILIZATION DATA**

Test Vehicle: 2013 Chevrolet Cruze LS 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: GD0101
 Test Date: 11/05/2012



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PHOTOGRAPH NOT APPLICABLE

Load Cell Location

PHOTOGRAPH NOT APPLICABLE

Load Cell Wall



Manufacturer's Label



Tire Placard



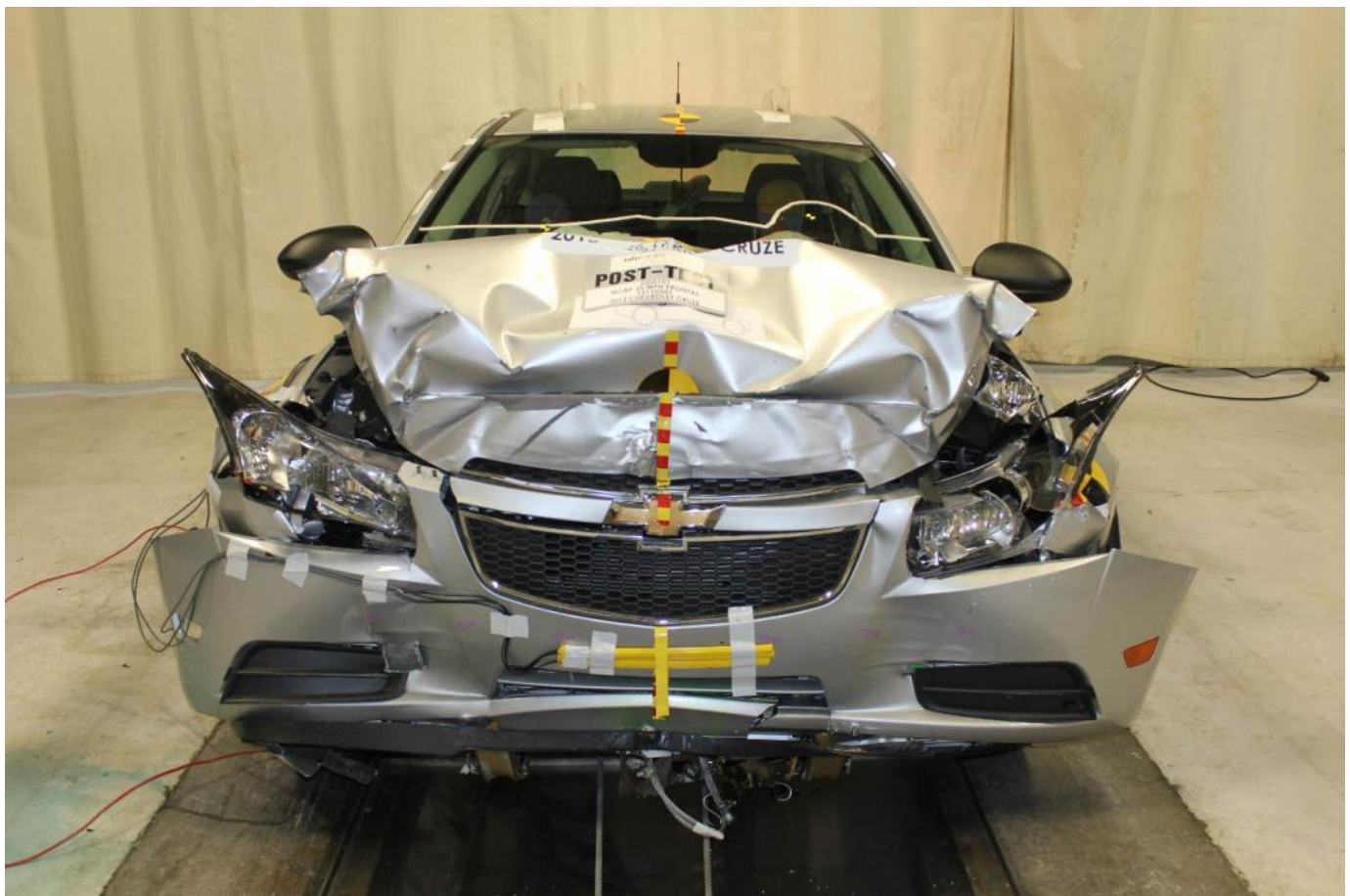
2013 Chevrolet Cruze LS Frontal As Delivered



Left Rear 3-4 View, As Received



Pre-Test Front View of Test Vehicle



Post-Test Front View of Test Vehicle



Pre-Test Left View of Test Vehicle



Post-Test Left View of Test Vehicle



Pre-Test Right View of Test Vehicle



Post-Test Right View of Test Vehicle



Pre-Test Right Front 3-4 View



Post-Test Right Front 3-4 View



Pre-Test Left Rear 3-4 View



Post-Test Left Rear 3-4 View



Pre-Test Windshield View



Post-Test Windshield View



Pre-Test Engine Compartment View



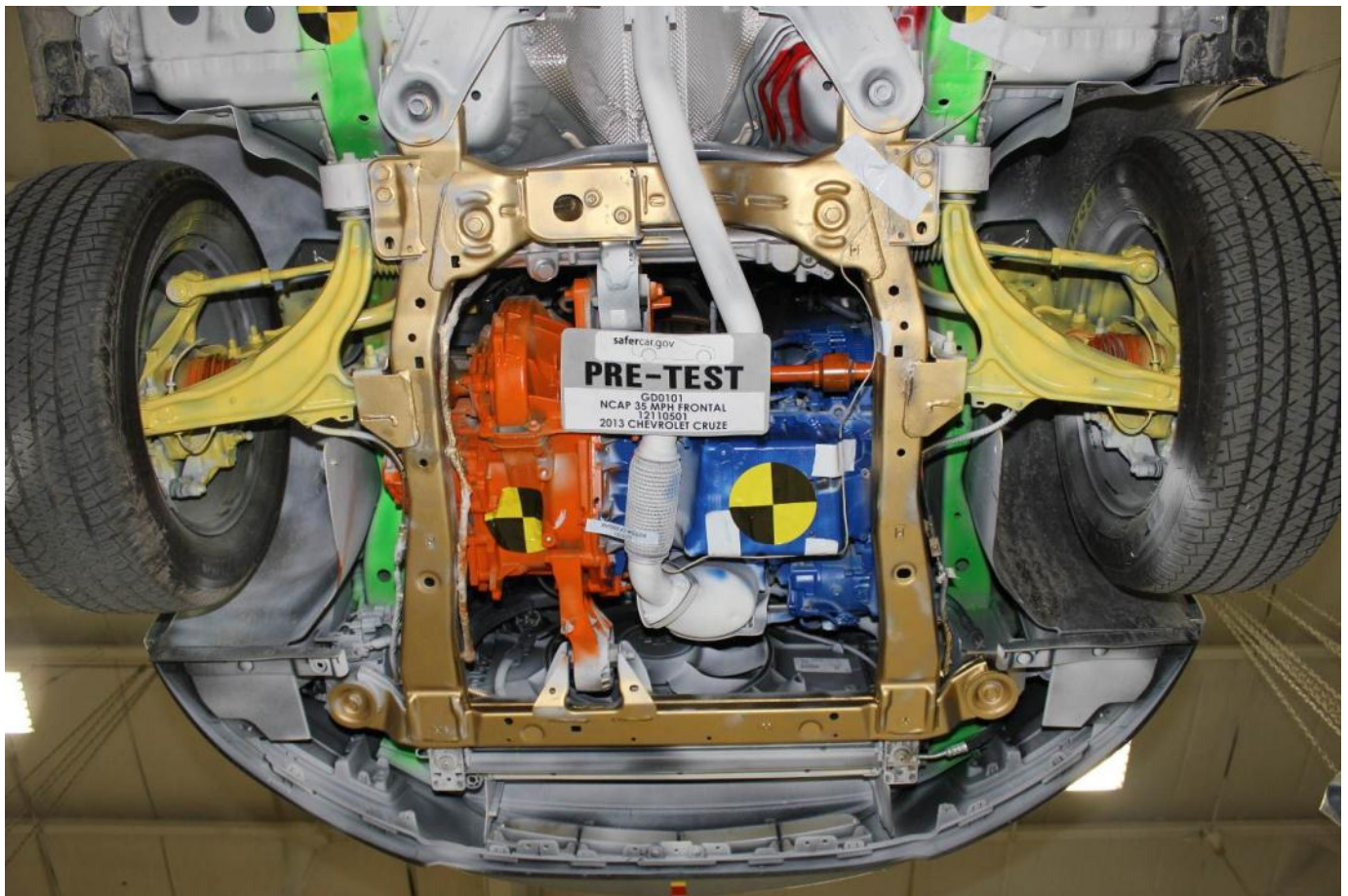
Post-Test Engine Compartment View



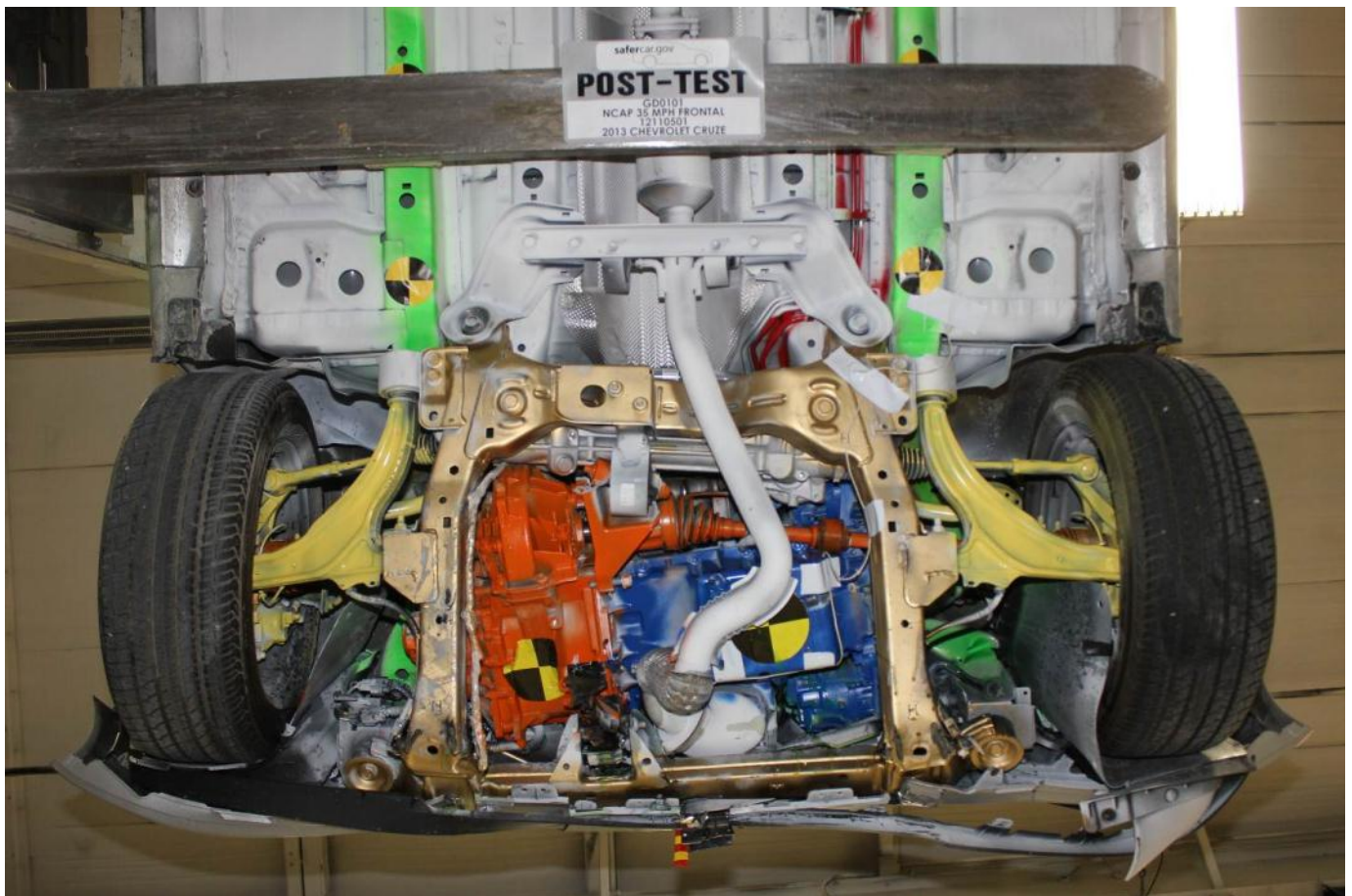
Pre-Test Fuel Filler Cap View



Post-Test Fuel Filler Cap View



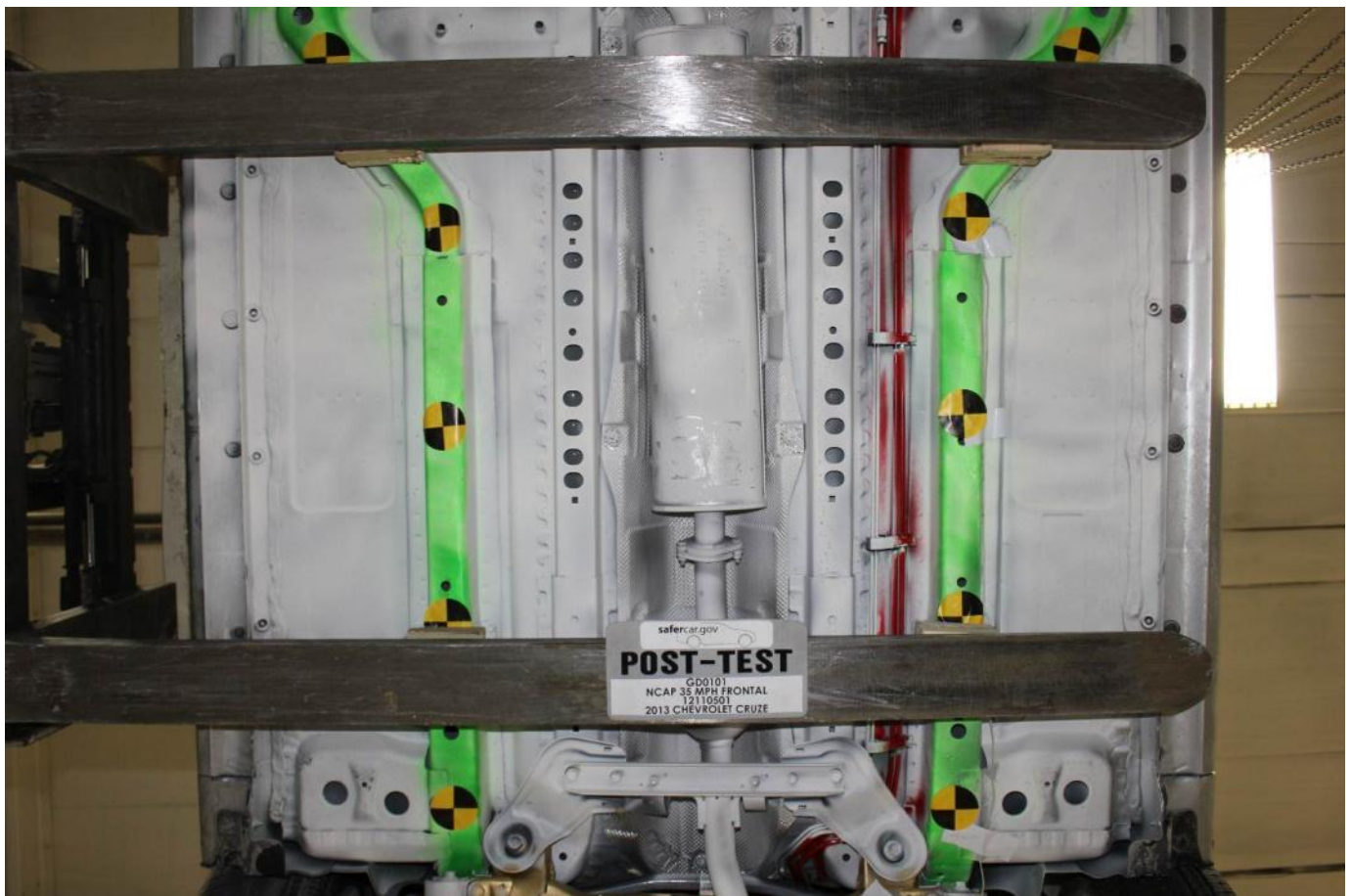
Pre-Test Front Underbody View



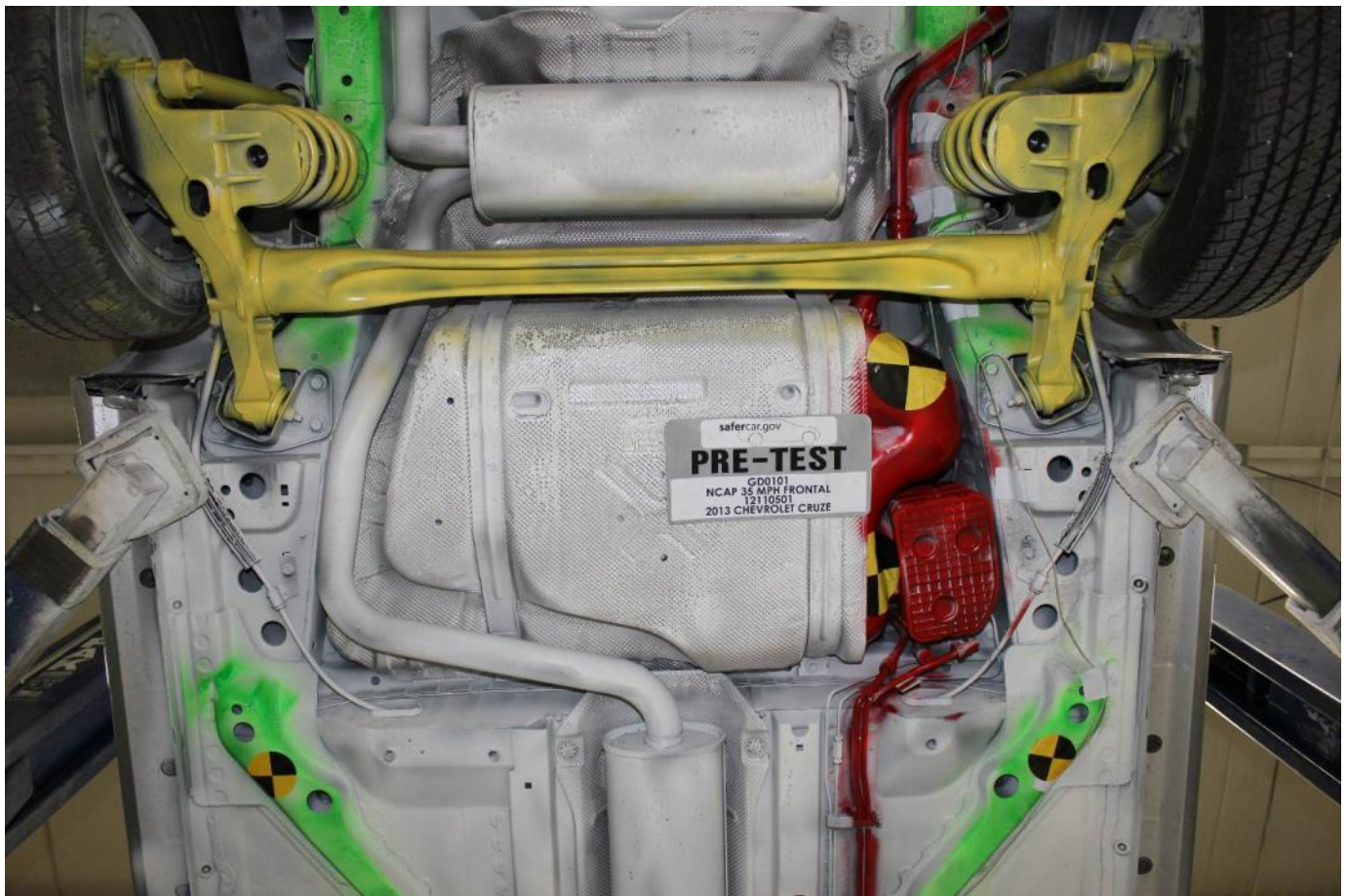
Post-Test Front Underbody View



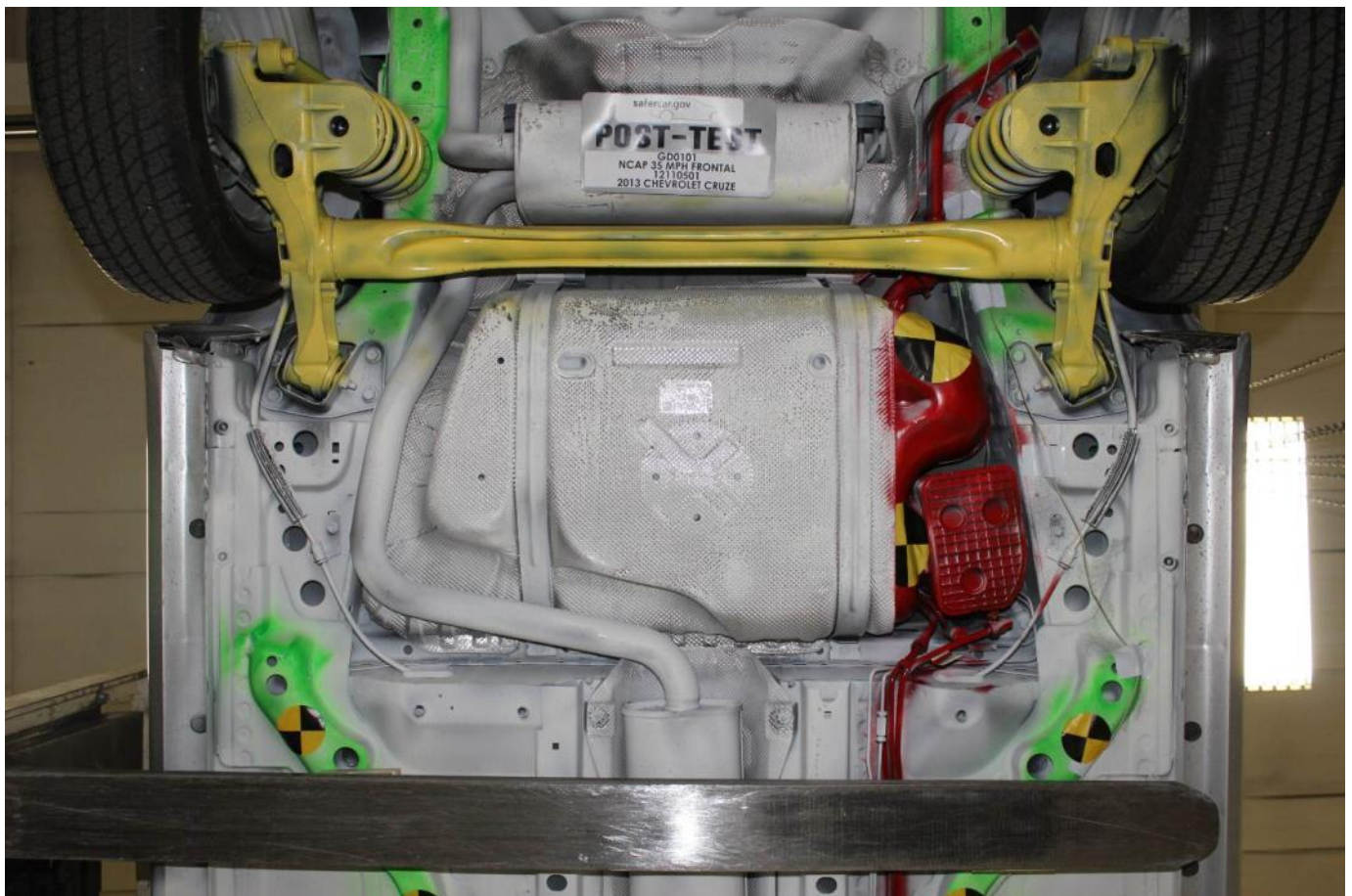
Pre-Test Mid Front Underbody View



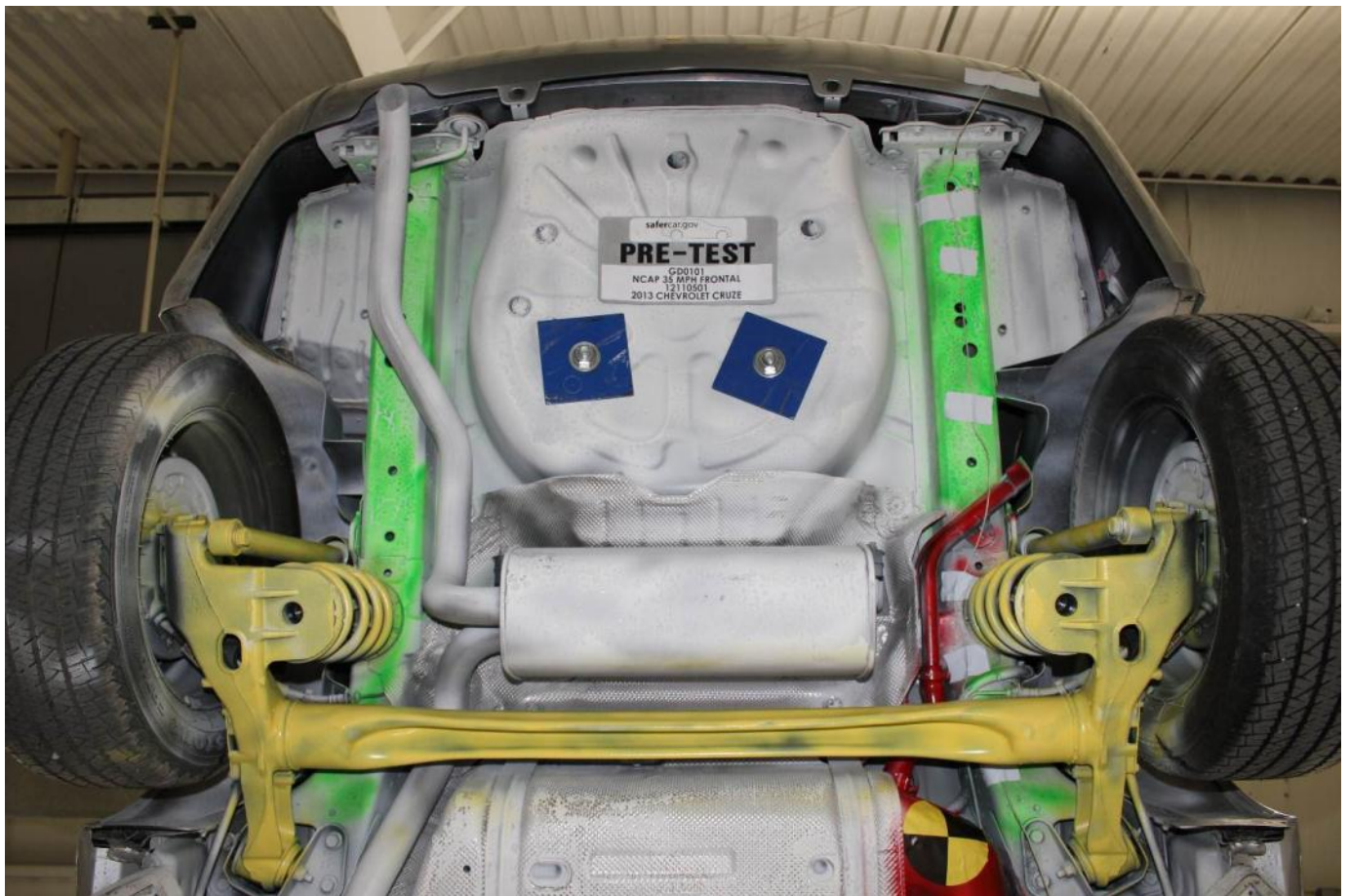
Post-Test Mid Front Underbody View



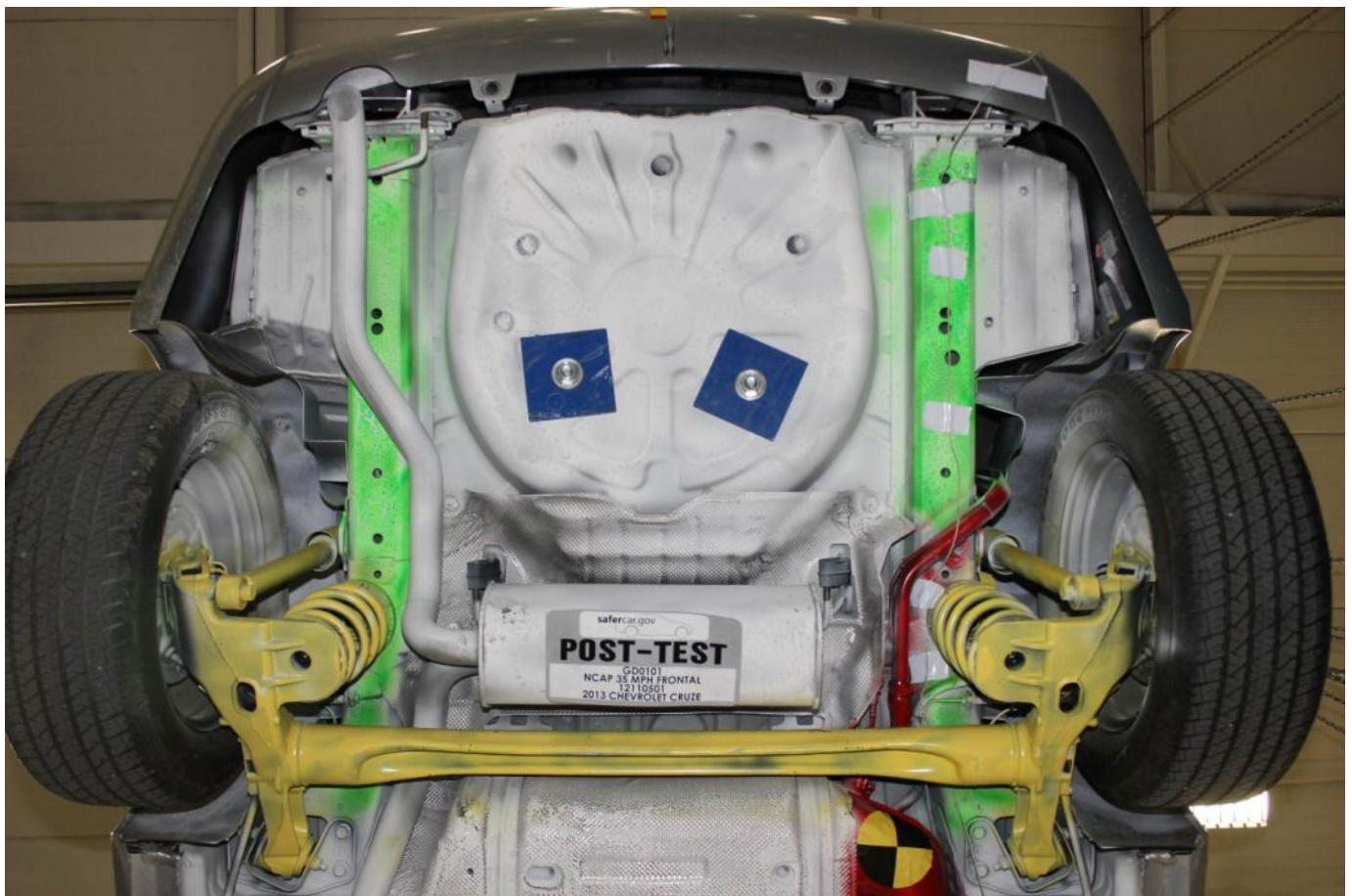
Pre-Test Mid Rear Underbody View



Post-Test Mid Rear Underbody View



Pre-Test Rear Underbody View



Post-Test Rear Underbody View



Pre-Test Dummy Cable Routing



Post-Test Dummy Cable Routing



Pre-Test Driver Dummy Front View



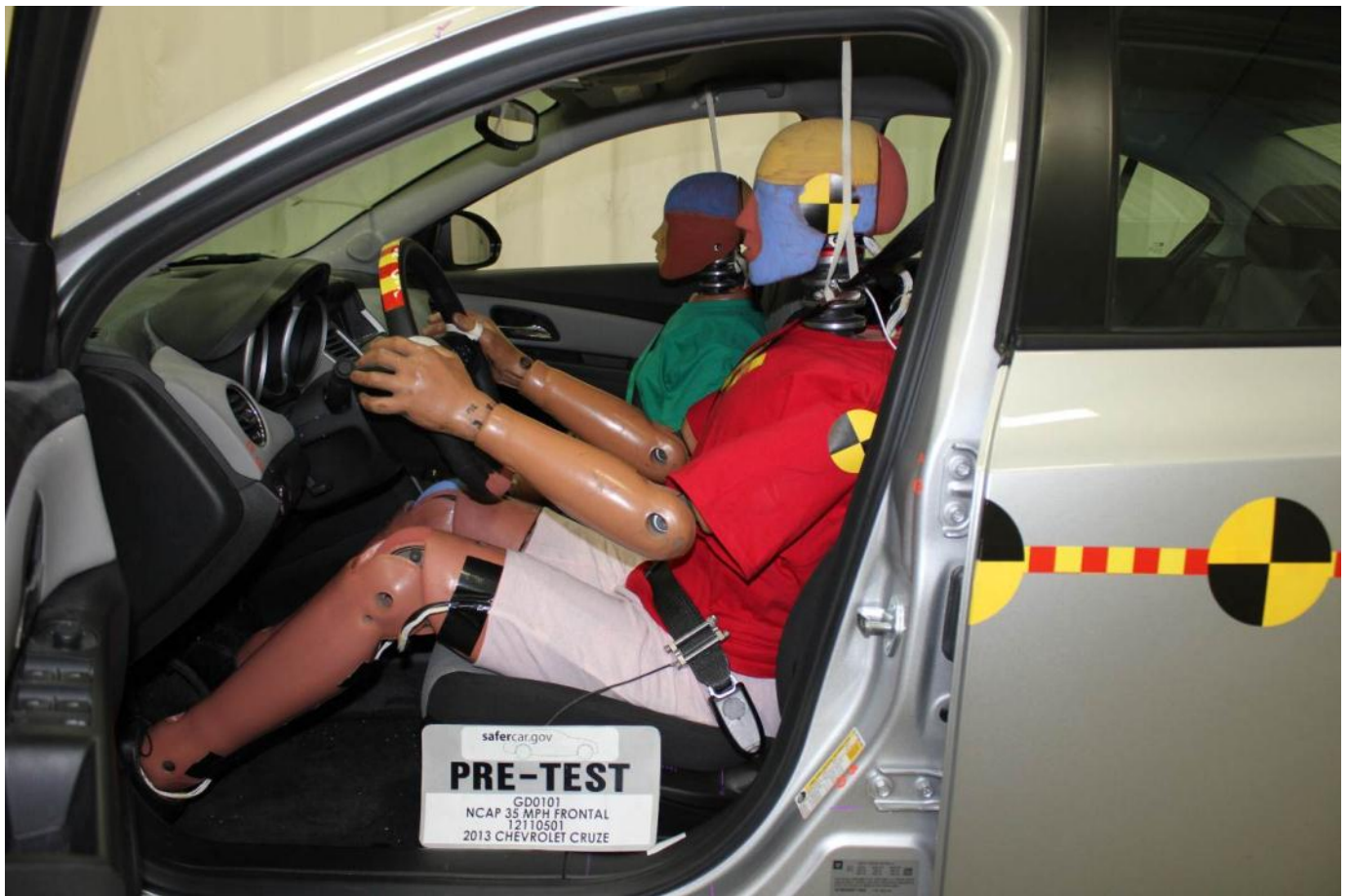
Post-Test Driver Dummy Front View



Pre-Test Driver Dummy Window View



Post-Test Driver Dummy Window View



Pre-Test Driver Dummy and Vehicle Interior (Door Open)



Post-Test Driver Dummy and Vehicle Interior (Door Open)



Pre-Test Driver's Seat Fore-Aft Markings



Post-Test Driver's Seat Fore-Aft Markings



Pre-Test View of Belt Anchorage for Driver Dummy



Post-Test View of Belt Anchorage for Driver Dummy



Pre-Test Driver Dummy Feet



Post-Test Driver Dummy Feet



Pre-Test Driver's Side Knee Bolster (without dummy)



Post-Test Driver's Side Knee Bolster (without dummy)



Pre-Test Driver's Side Floorpan



Post-Test Driver's Side Floorpan



Post-Test Driver Dummy Face



Post-Test Driver Dummy Contact with Airbag



Post-Test Driver Dummy Contact with Headrest



Post-Test Driver Dummy Contact with Knee Airbag



Pre-Test View of the Steering Wheel



Post-Test View of the Steering Wheel



Pre-Test Passenger Dummy Front View



Post-Test Passenger Dummy Front View



Pre-Test Passenger Dummy Window View



Post-Test Passenger Dummy Window View



Pre-Test Passenger Dummy and Vehicle Interior (Door Open)



Post-Test Passenger Dummy and Vehicle Interior (Door Open)



Pre-Test Passenger's Seat Fore-Aft Markings



Post-Test Passenger's Seat Fore-Aft Markings



Pre-Test View of Belt Anchorage for Passenger Dummy



Post-Test View of Belt Anchorage for Passenger Dummy



Pre-Test Passenger Dummy Feet



Post-Test Passenger Dummy Feet



Pre-Test Passenger's Side Knee Bolster



Post-Test Passenger's Side Knee Bolster (without dummy)



Pre-Test Passenger's Side Floorpan



Post-Test Passenger's Side Floorpan



Post-Test Passenger Dummy Contact with Airbag



Post-Test Passenger Dummy Contact with Headrest



Post-Test Passenger Dummy Contact with Knee Airbag



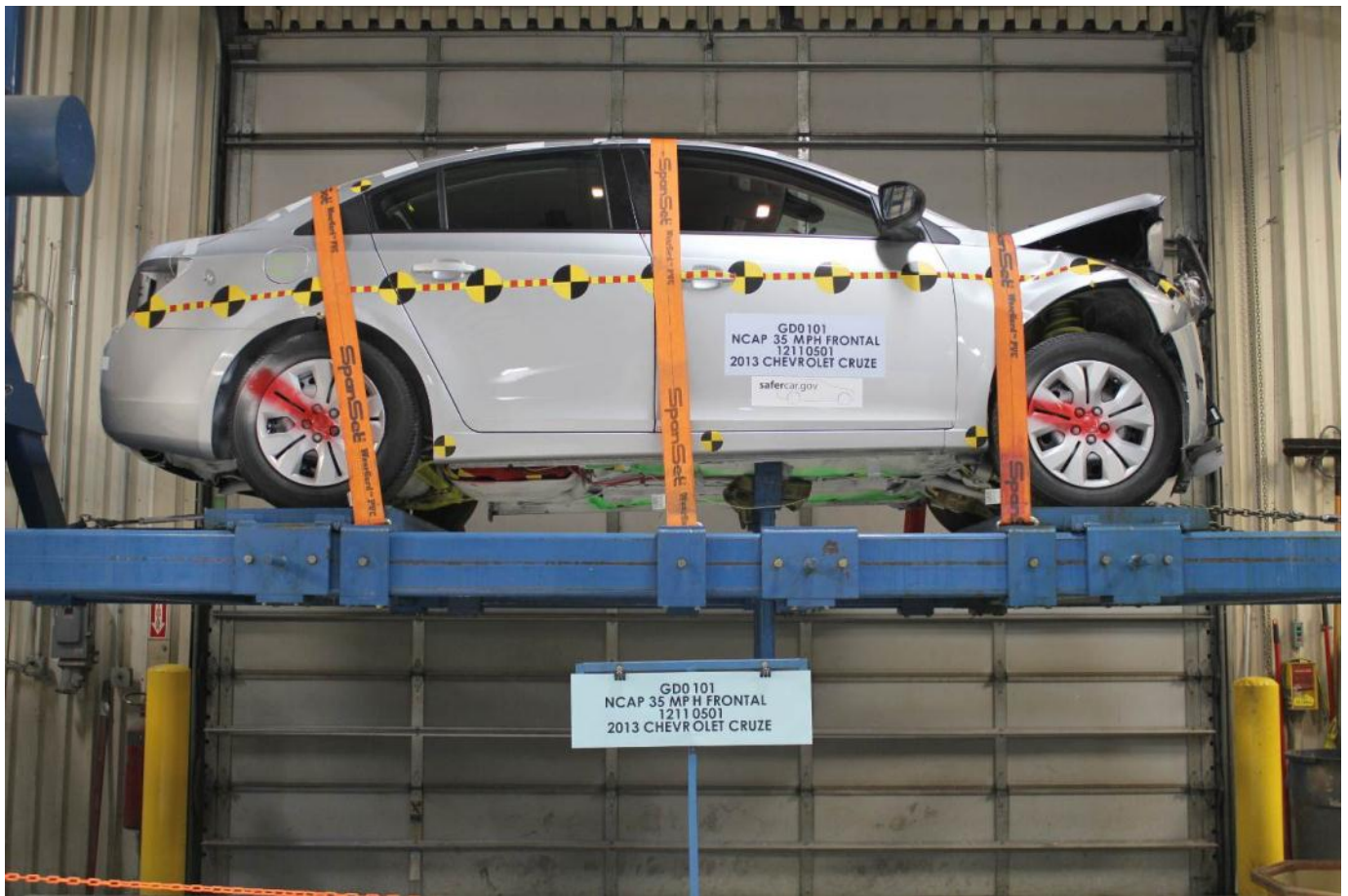
Ballast Installed in Vehicle

PHOTOGRAPH NOT APPLICABLE

Post-Test Stoddard Solvent Spillage Location View



Post-Test Speed Trap Read-Out



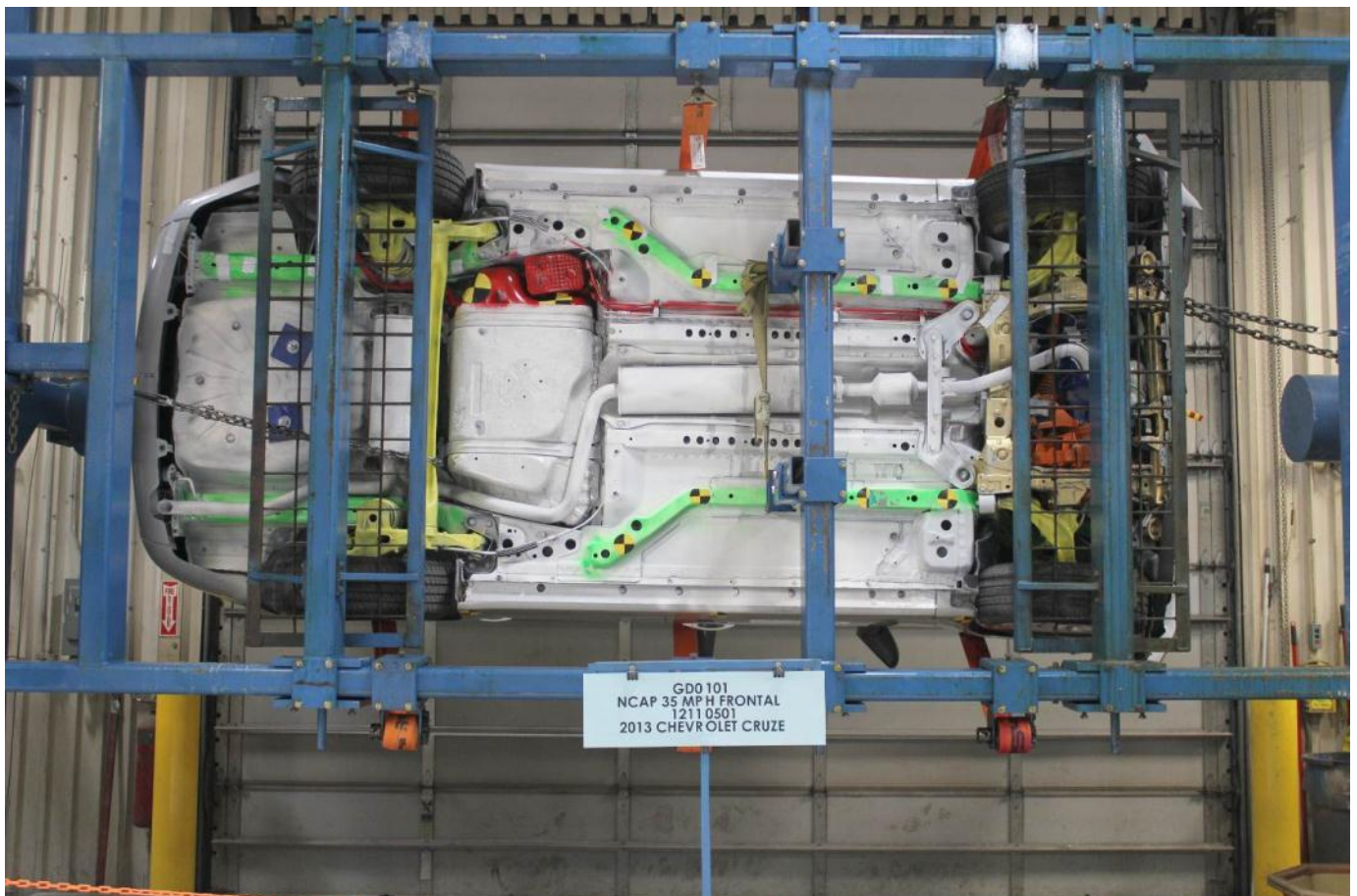
Vehicle at 0° on Static Rollover Device



Vehicle at 90° on Static Rollover Device



Vehicle at 180° on Static Rollover Device



Vehicle at 270° on Static Rollover Device



Vehicle at 360° on Static Rollover Device



2013 Chevrolet Cruze LS Frontal Impact Event



2013 CRUZE LS

EXTERIOR: SILVER ICE METALLIC
INTERIOR: JET BLACK / MEDIUM
TITANIUM

ENGINE: 1.8L ECOTEC VVT, DOHC
TRANSMISSION: 6 SPEED MANUAL

Visit us at www.chevy.com

STANDARD EQUIPMENT

ITEMS LISTED BELOW ARE INCLUDED AT NO EXTRA CHARGE IN THE STANDARD VEHICLE PRICE SHOWN.

• 5 YEAR / 100,000 MILE
POWERTRAIN LIMITED WARRANTY
SEE DEALER FOR DETAILS

MECHANICAL

• ENGINE, 1.8L ECOTEC VVT DOHC
4 CYL.
• TRANSMISSION, 6 SPEED MANUAL
• OIL LIFE MONITOR SYSTEM

SAFETY & SECURITY

• AIRBAGS, DRIVER & FRONT
PASSENGER FRONTAL KNEE SIDE
IMPACT & HEAD CURTAIN; REAR
OUTBOARD PASSENGERS SIDE
IMPACT & HEAD CURTAIN
• STABILITRAK® STABILITY CONTROL
SYSTEM W/ TRACTION CONTROL
• 4 WHEEL ANTILOCK BRAKES,
FRONT DISC/REAR DRUM
• REAR DR LOCKS, CHILD SECURITY

• REAR CHILD SEAT LATCH ANCHORS
• THEFT DETERENT SYSTEM,
CONTENT THEFT ALARM
• DAYTIME RUNNING LAMPS
• REMOTE KEYLESS ENTRY
• POWER DOOR LOCKS WITH
LOCKOUT PROTECTION
• 6 MTHS ONSTAR DIRECTIONS AND
CONNECTIONS WITH AUTOMATIC
CRASH RESPONSE & TURN-BY-TURN
NAVIGATION (ASK DEALER ABOUT
GEOGRAPHIC COVERAGE)
• TIRE PRESSURE MONITOR

INTERIOR

• BLUETOOTH® FOR PHONE
• INTERIOR LIGHTING, THEATER
DIMMING
• SEAT TRIM, DELUXE CLOTH
• FRONT BUCKET SEATS
• SEAT ADJUSTER, DRIVER, 6 WAY
MANUAL
• SEAT ADJUSTER, PASSENGER,

6 WAY MANUAL

• REAR SEAT, 60/40 SPLIT
FOLDING SEATBACK
• POWER WINDOWS, EXPRESS DOWN
• AIR CONDITIONING
• AM/FM STEREO, CD PLAYER
• USB AUDIO INTERFACE
• AUXILIARY AUDIO INPUT JACK
• XM RADIO + SERVICE
SUBSCRIPTION SOLD SEPARATELY
BY SIRIUSXM AFTER 3 MTHS
• DRIVER INFO CENTER,
PERSONALIZATION, WARNING,
MESSAGES AND VEHICLE INFO
• VISORS, DRIVER / FRT PASSENGER
W/ VANITY MIRRORS
• STEERING COLUMN, TILT &
TELESCOPING
• FLOOR MATS
• ACOUSTIC INSULATION PKG
• MIRROR, MANUAL INSIDE RR VIEW
• AUDIO SYSTEM, 6 SPEAKER
• STEERING WHEEL CONTROL

EXTERIOR

• REAR WINDOW ELECTRIC DEFOGGER
• GLASS, SOLAR RAY LIGHT TINTED
• WINDSHIELD WIPERS
VARIABLE & INTERMITTENT
• OUTSIDE MIRRORS, POWER
ADJUSTABLE
• WHEEL COVERS, SILVER PAINTED
• WHEELS, 16" STEEL
• TIRES, ALL SEASON BLACKWALL
• TIRE, COMPACT SPARE & WHEEL

OPTIONS & PRICING

MANUFACTURER'S SUGGESTED RETAIL PRICE

STANDARD VEHICLE PRICE \$17,130.00

OPTIONS INSTALLED BY THE MANUFACTURER (MAY REPLACE
STANDARD EQUIPMENT SHOWN)

TOTAL OPTIONS \$0.00

TOTAL VEHICLE & OPTIONS \$17,130.00

DESTINATION CHARGE 795.00

TOTAL VEHICLE PRICE* \$17,925.00



Fuel Economy and Environment

Gasoline Vehicle

Fuel Economy
29 MPG
combined city/hwy
25 city
36 highway
3.4 gallons per 100 miles

Mid-size cars range from 13 to 39 MPG.
The best vehicle rates 112 MPG.

You save
\$2,350
in fuel costs
over 5 years
compared to the
average new vehicle.

Annual fuel cost
\$1,850

Fuel Economy & Greenhouse Gas Rating (tailpipe only)



Smog Rating (tailpipe only)



Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 23 MPG and costs \$11.60 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$3.55 per gallon. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

fuel economy.gov
Calculate personalized estimates and compare vehicles



GOVERNMENT 5-STAR SAFETY RATINGS

Overall Vehicle Score

★★★★★

Based on the combined ratings of frontal, side and rollover.
Should ONLY be compared to other vehicles of similar size and weight.

Frontal Crash
Driver Passenger
★★★★★
★★★★★

Based on the risk of injury in a frontal impact.
Should ONLY be compared to other vehicles of similar size and weight.

Side Crash
Front seat Rear seat
★★★★★
★★★★★

Based on the risk of injury in a side impact.

Rollover

★★★★

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

Star ratings range from 1 to 5 stars (★★★★★) with 5 being the highest.

Source: National Highway Traffic Safety Administration (NHTSA)

www.safercar.gov or 1-888-327-4236

PARTS CONTENT INFORMATION

FOR VEHICLES IN THIS CARLINE:
U.S./CANADIAN PARTS CONTENT: 56%

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

FOR THIS VEHICLE:
FINAL ASSEMBLY POINT:
LORDSTOWN, OH U.S.A.
COUNTRY OF ORIGIN:
ENGINE: GERMANY
TRANSMISSION: AUSTRIA

This label has been applied pursuant to Federal law - Do not remove prior to delivery to the ultimate purchaser. *Includes Manufacturer's Recommended Pre-Delivery Service. Does not include dealer installed options and accessories not listed above. See back of license plate.

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GM/USA, INC./USA - 09/09/2009

ORDER NO. 00000000 SALES CODE E

SALES MODEL CODE 1P469

DEALER NO 11461

FINAL ASSEMBLY:

LORDSTOWN, OH U.S.A.

VIN 1G1PB5SH2D7118506

DEALER TO WHOM DELIVERED

PIEMONTE'S DUNDEE CHEVROLET, INC.

PO BOX 68

DUNDEE, IL 60118-0068



UU
1G1A740696

Monroney Label

APPENDIX B
DUMMY RESPONSE DATA TRACES

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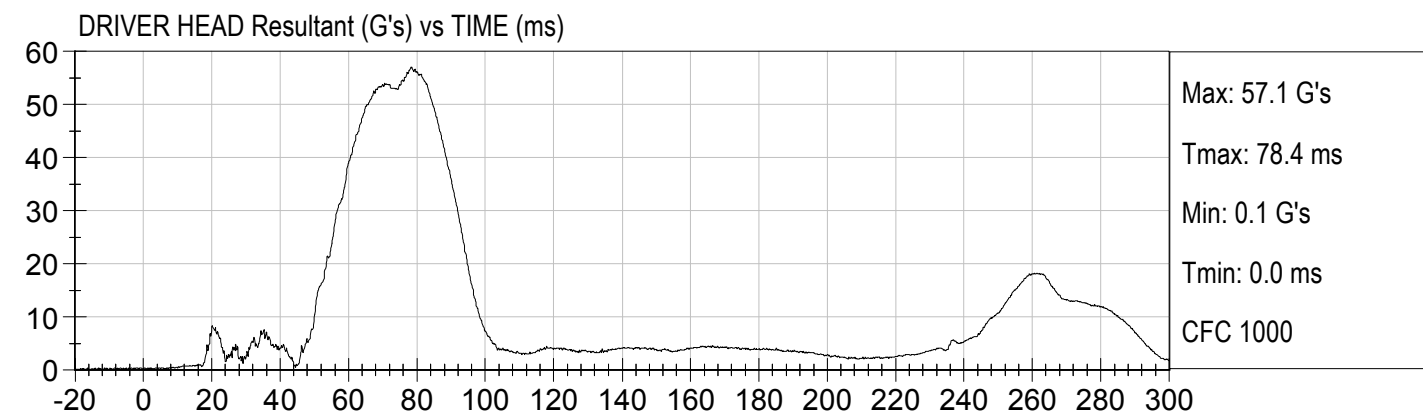
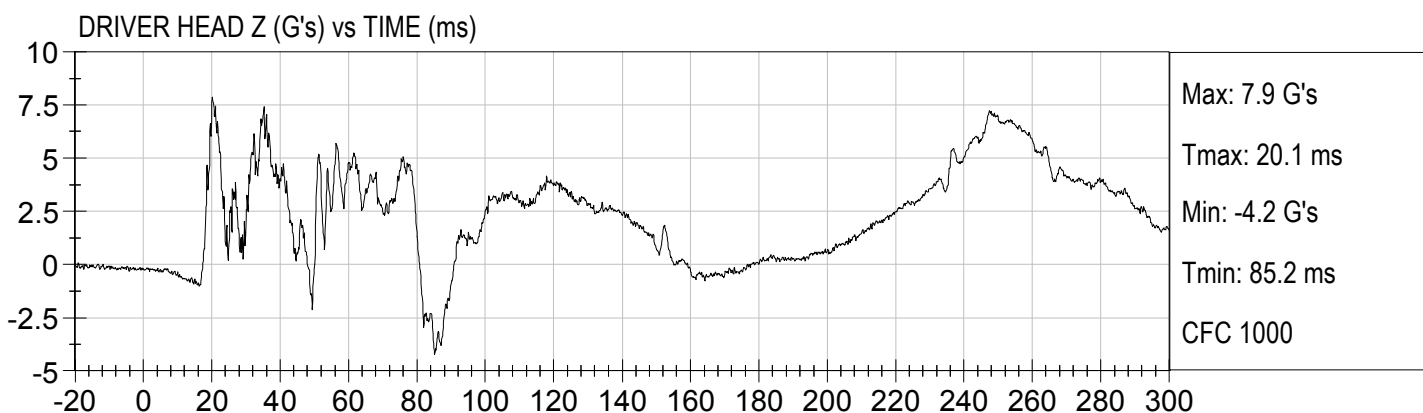
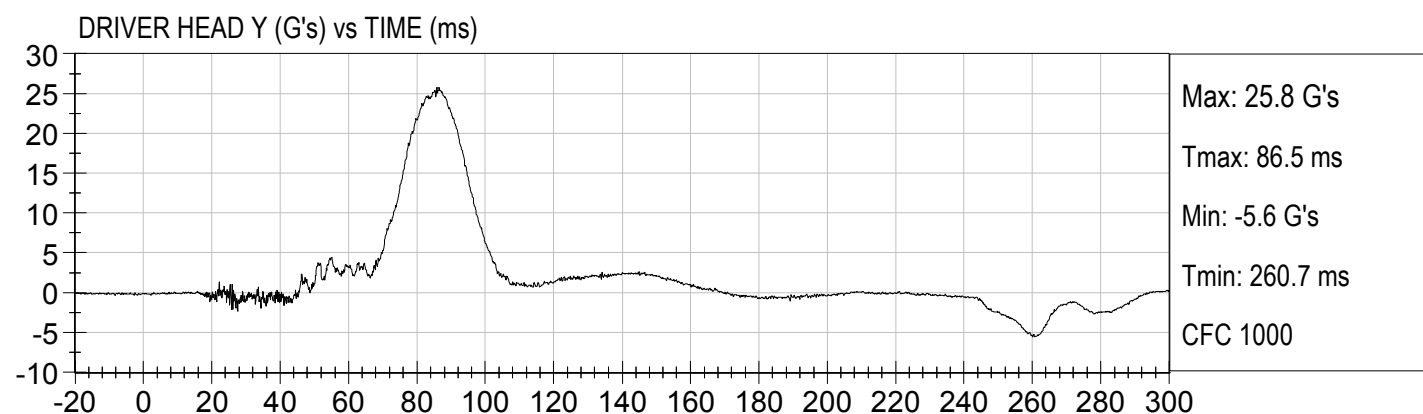
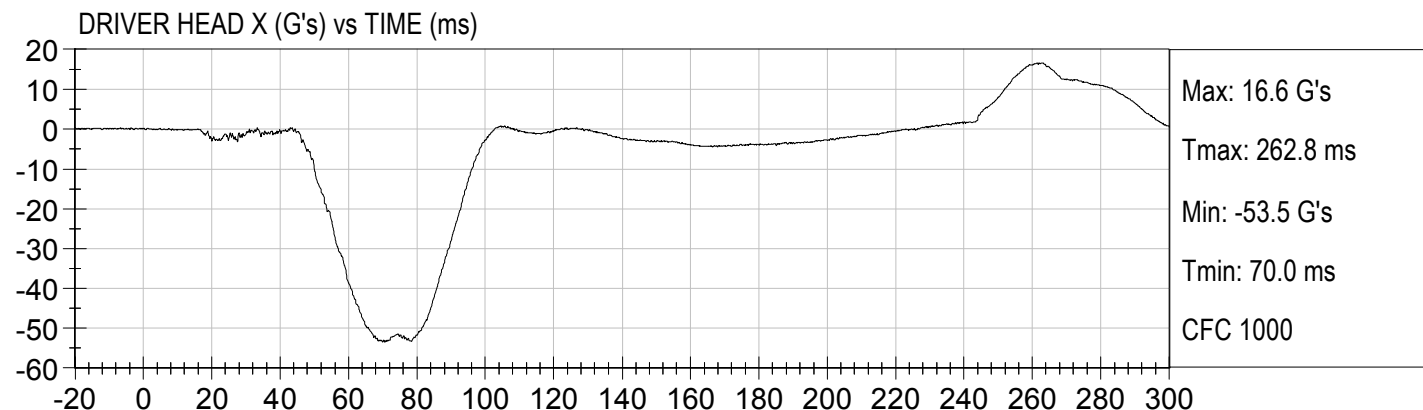
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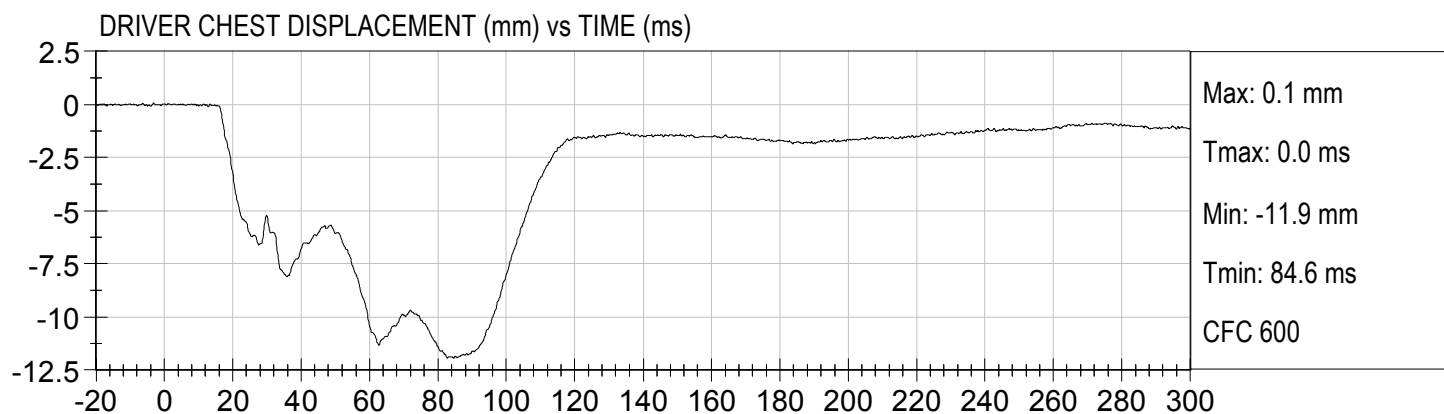
The following additional dummy and vehicle response data can be found in the R&D section of the NHTSA website at www.nhtsa.dot.gov

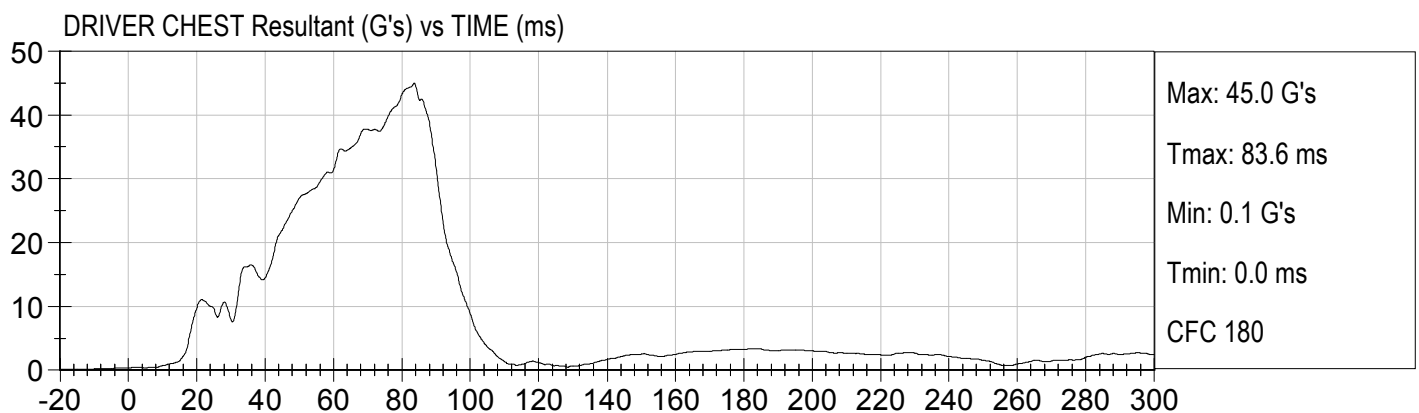
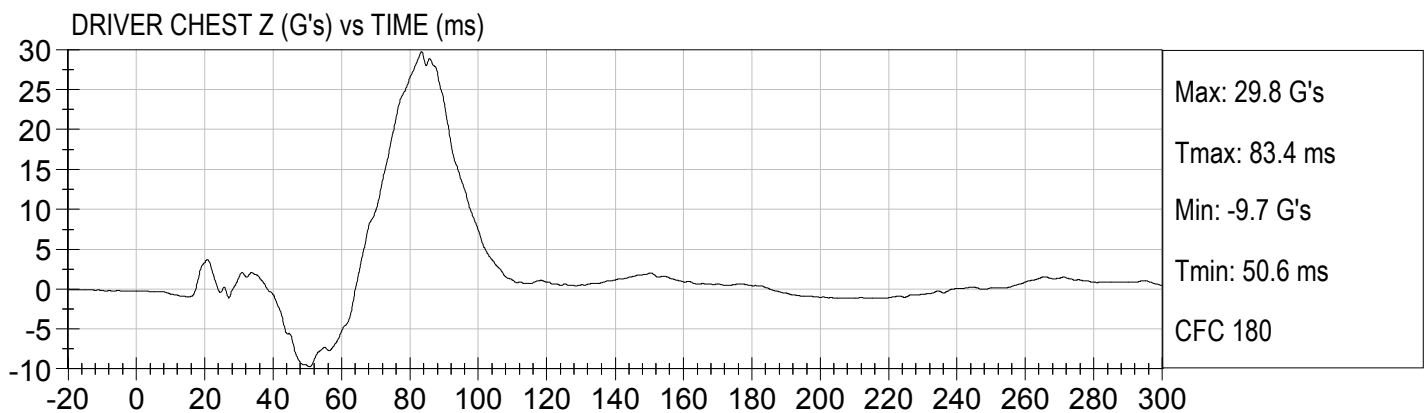
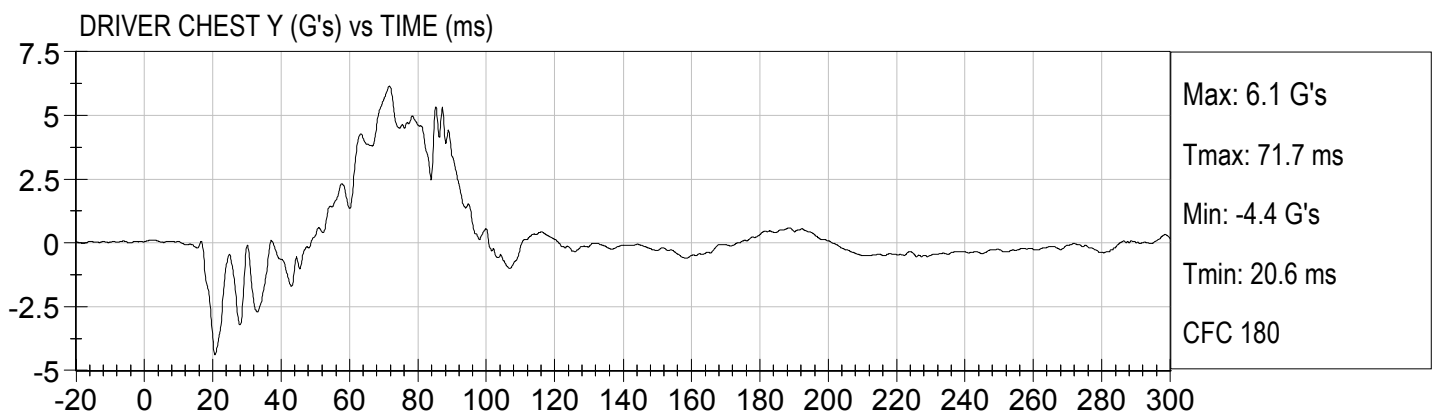
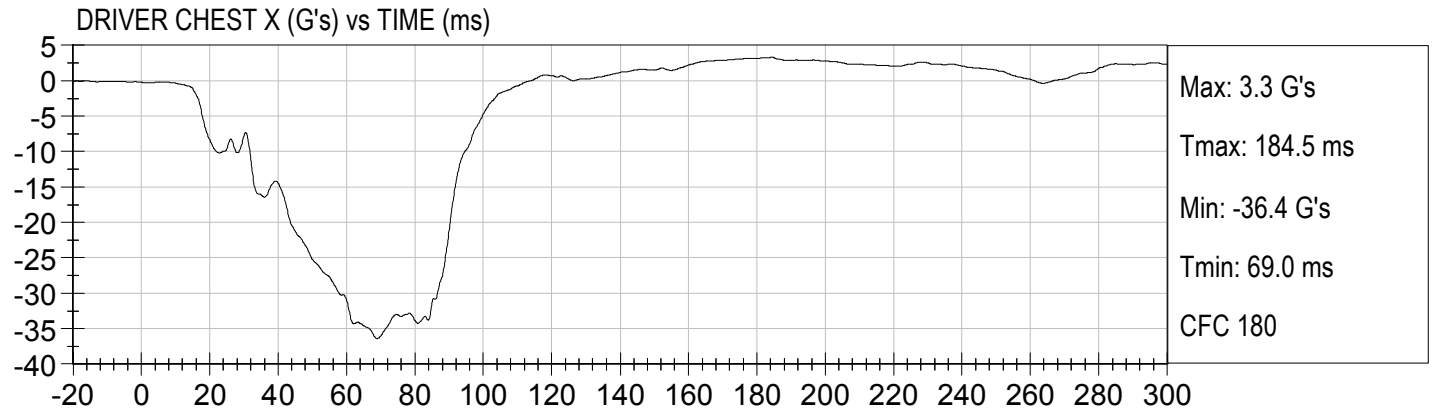
Driver Head X Redundant
 Driver Head Y Redundant
 Driver Head Z Redundant
 Driver Upper Neck Force Y
 Driver Upper Neck Moment X
 Driver Upper Neck Moment Z
 Driver Chest X Redundant
 Driver Chest Y Redundant
 Driver Chest Z Redundant
 Driver Pelvis X
 Driver Pelvis Y
 Driver Pelvis Z
 Driver Left Femur Redundant
 Driver Right Femur Redundant
 Driver Left Upper Tibia Moment X
 Driver Left Upper Tibia Moment Y
 Driver Left Upper Tibia Force Z
 Driver Left Lower Tibia Moment X

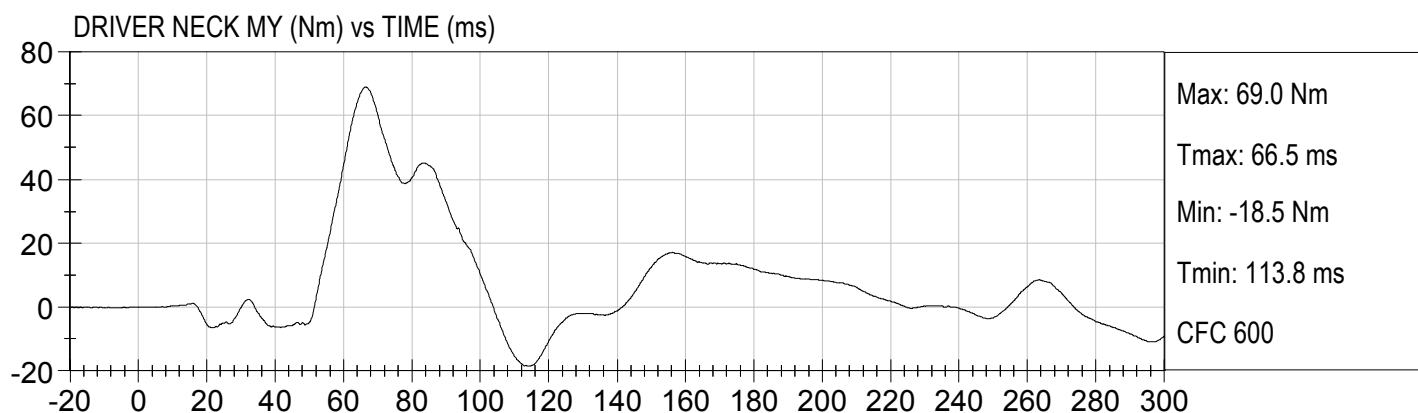
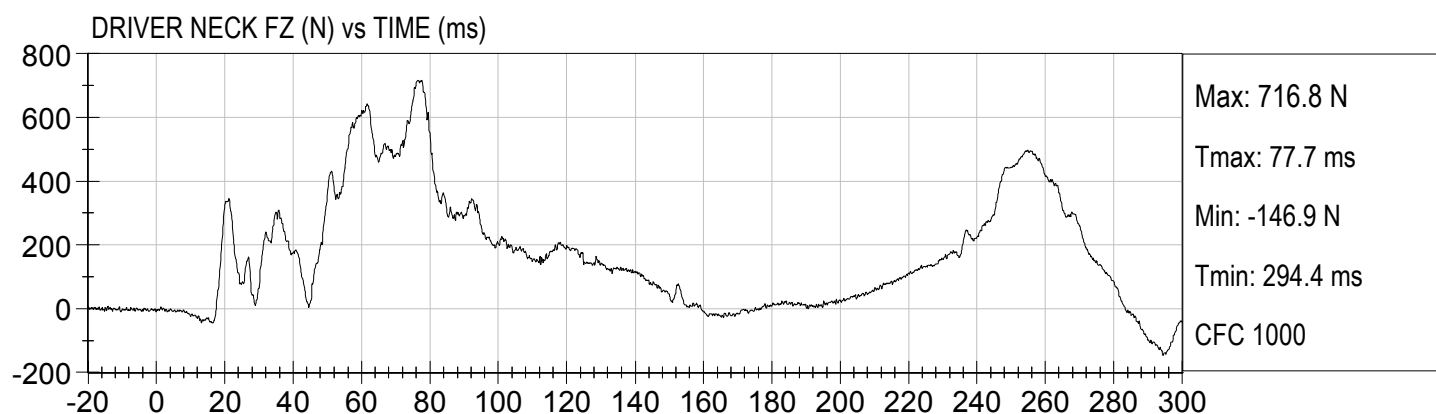
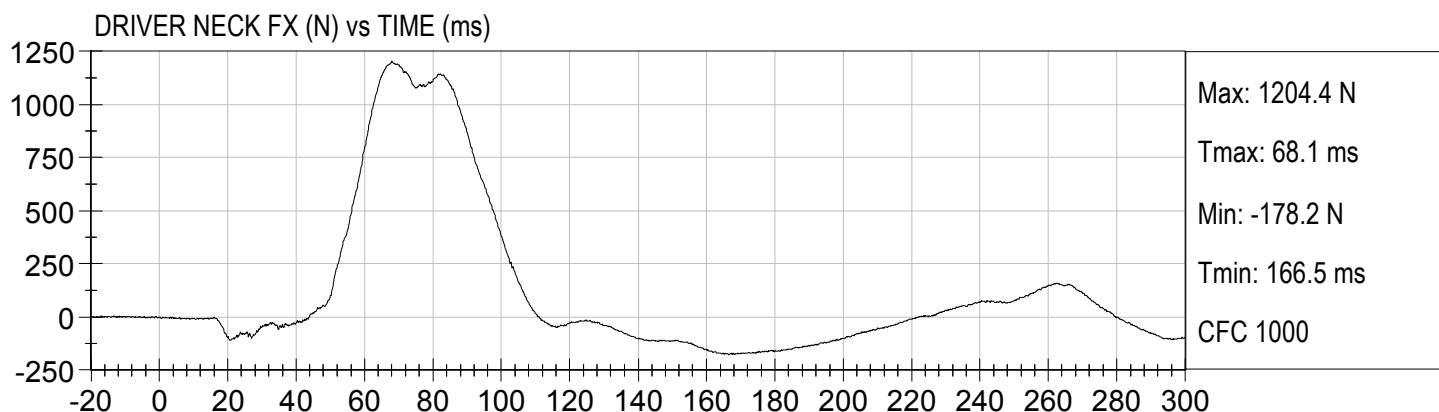
Driver Left Lower Tibia Moment Y
Driver Left Lower Tibia Force Z
Driver Right Upper Tibia Moment X
Driver Right Upper Tibia Moment Y
Driver Right Upper Tibia Force Z
Driver Right Lower Tibia Moment X
Driver Right Lower Tibia Moment Y
Driver Right Lower Tibia Force Z
Driver Left Foot Fore Z
Driver Left Foot Aft X
Driver Left Foot Aft Z
Driver Right Foot Fore Z
Driver Right Foot Aft X
Driver Right Foot Aft Z
Driver Lap Belt Force
Driver Shoulder Belt Force
Passenger Head X Redundant
Passenger Head Y Redundant
Passenger Head Z Redundant
Passenger Upper Neck Force Y
Passenger Upper Neck Moment X
Passenger Upper Neck Moment Z
Passenger Chest X Redundant
Passenger Chest Y Redundant
Passenger Chest Z Redundant
Passenger Pelvis X
Passenger Pelvis Y
Passenger Pelvis Z
Passenger Left Femur Redundant
Passenger Right Femur Redundant
Passenger Left Upper Tibia Moment X

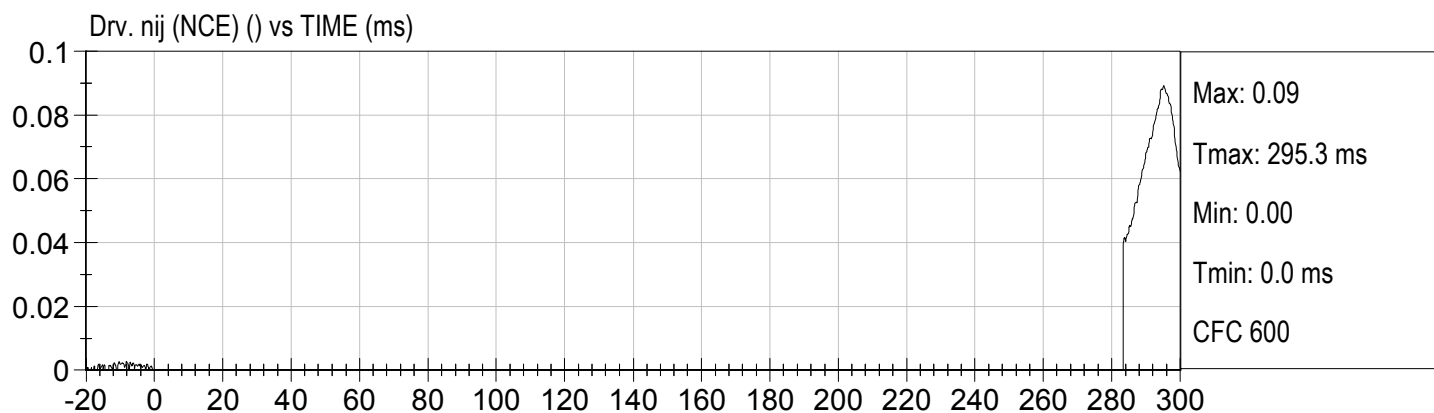
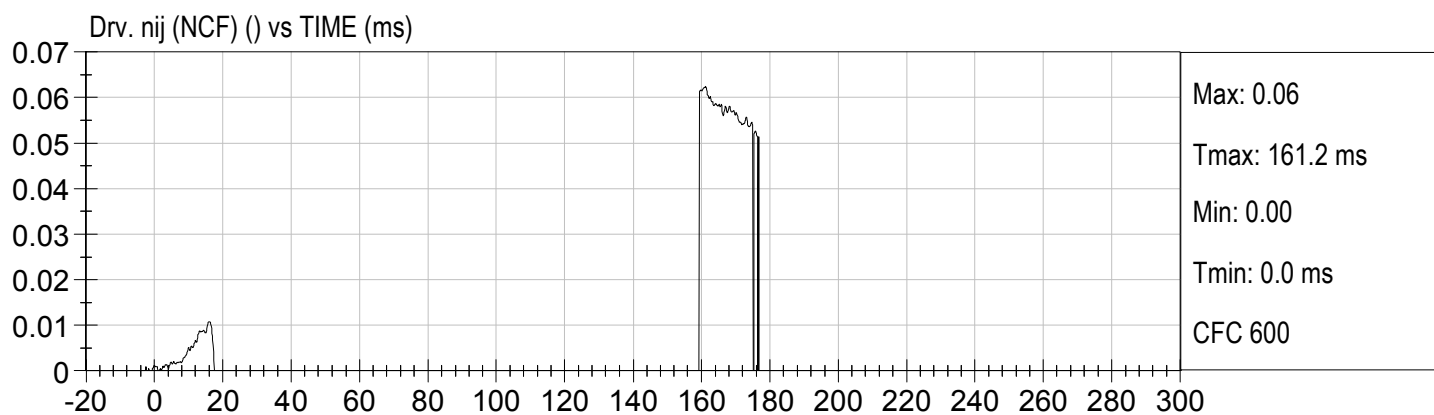
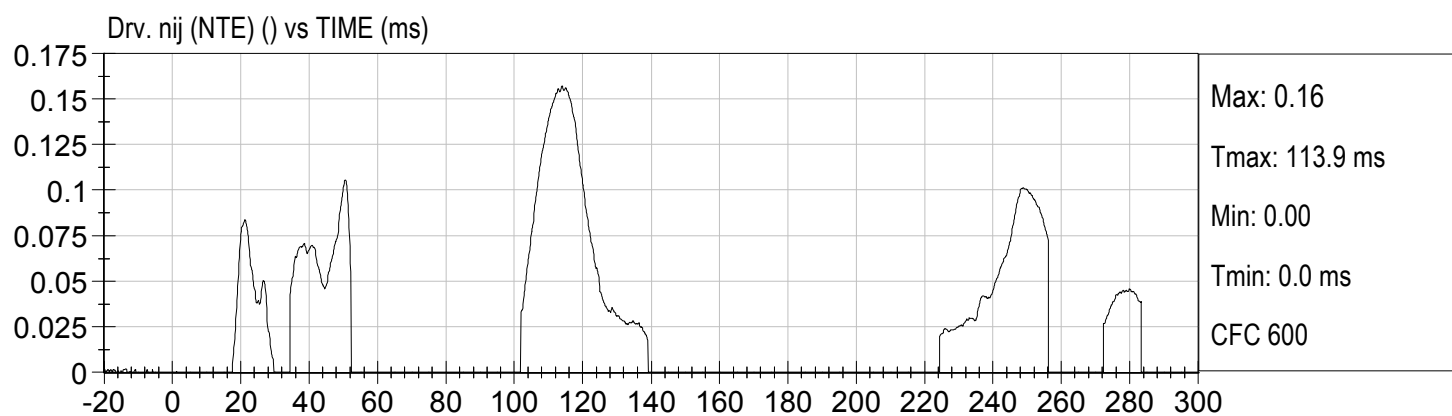
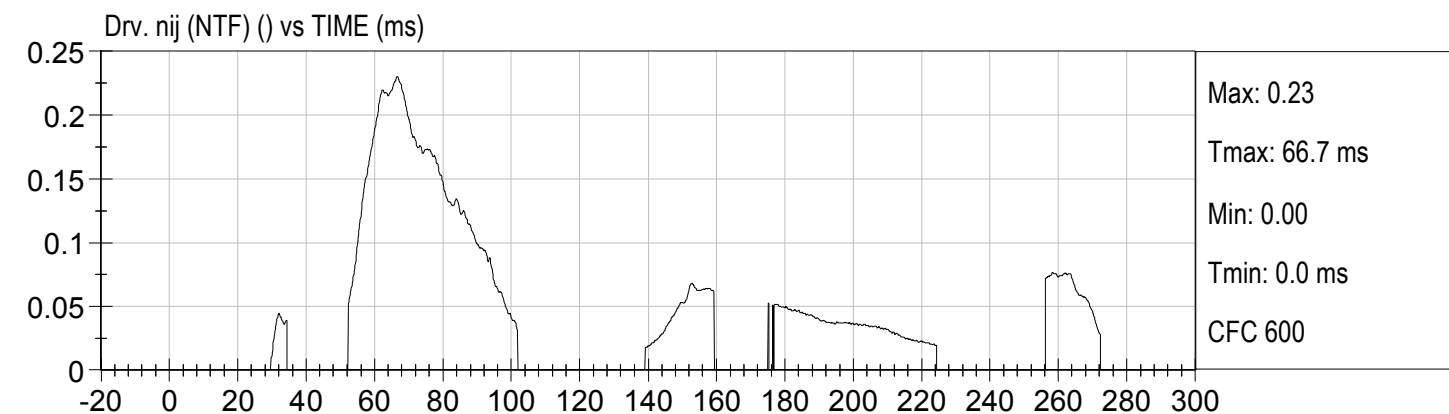
Passenger Left Upper Tibia Moment Y
Passenger Left Upper Tibia Force Z
Passenger Left Lower Tibia Moment X
Passenger Left Lower Tibia Moment Y
Passenger Left Lower Tibia Force Z
Passenger Right Upper Tibia Moment X
Passenger Right Upper Tibia Moment Y
Passenger Right Upper Tibia Force Z
Passenger Right Lower Tibia Moment X
Passenger Right Lower Tibia Moment Y
Passenger Right Lower Tibia Force Z
Passenger Left Foot Fore Z
Passenger Left Foot Aft X
Passenger Left Foot Aft Z
Passenger Right Foot Fore Z
Passenger Right Foot Aft X
Passenger Right Foot Aft Z
Passenger Lap Belt Force
Passenger Shoulder Belt Force
Left Rear Seat Crossmember X
Right Rear Seat Crossmember X
Vehicle Engine Top X
Vehicle Engine Bottom X
Left Rear Seat Crossmember Z
Right Rear Seat Crossmember Z
Left Rear Seat Crossmember Xr
Right Rear Seat Crossmember Xr

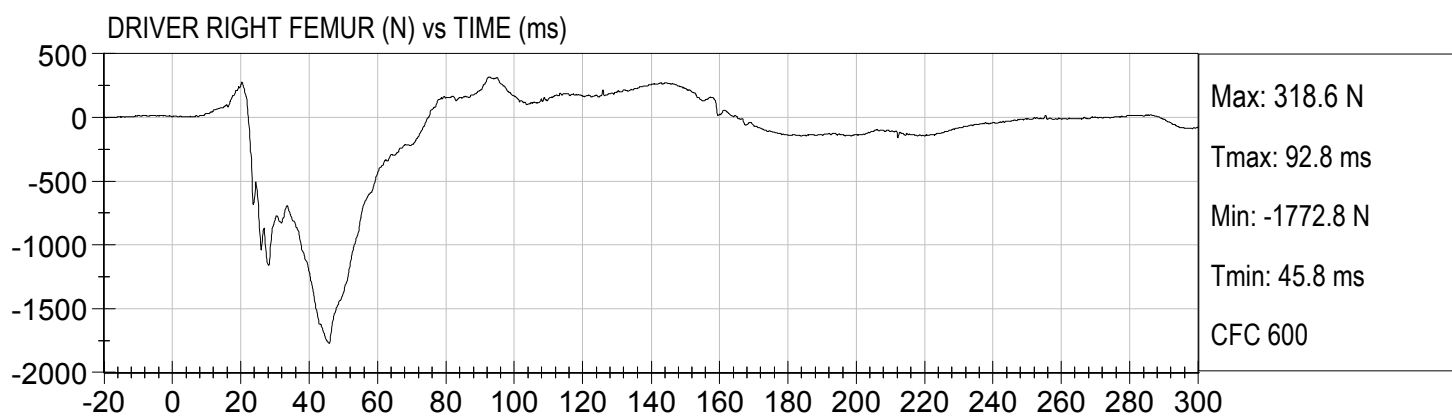
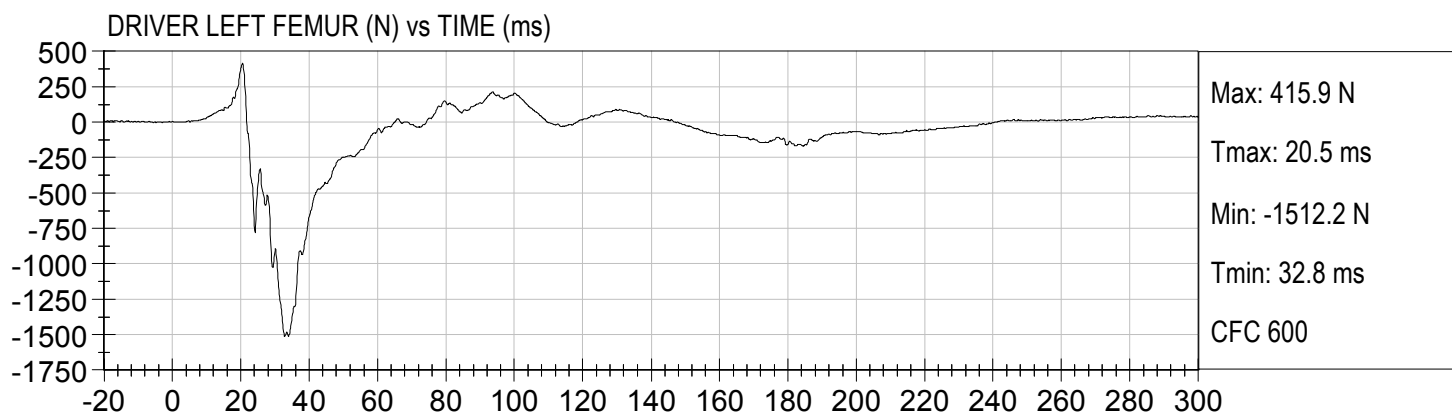


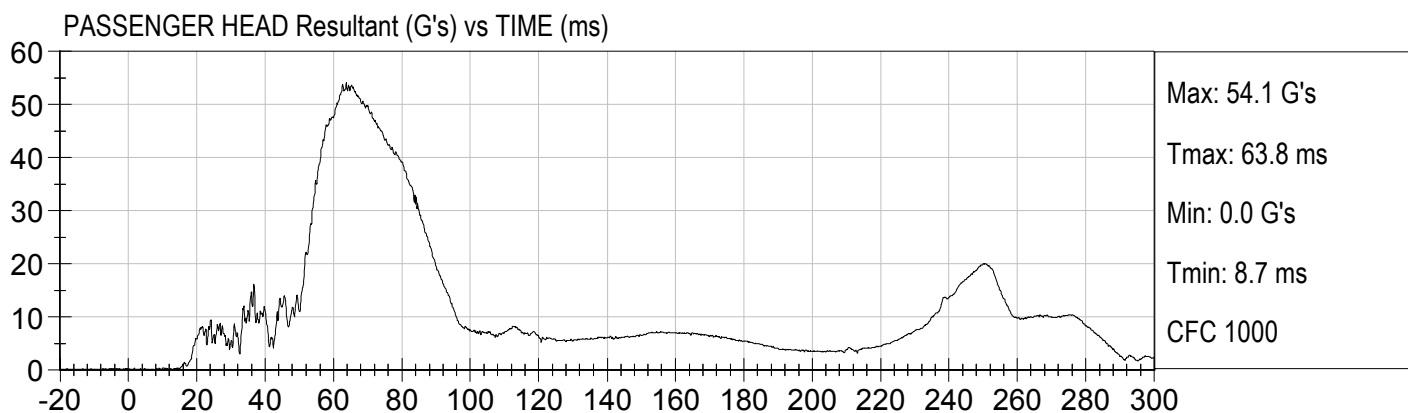
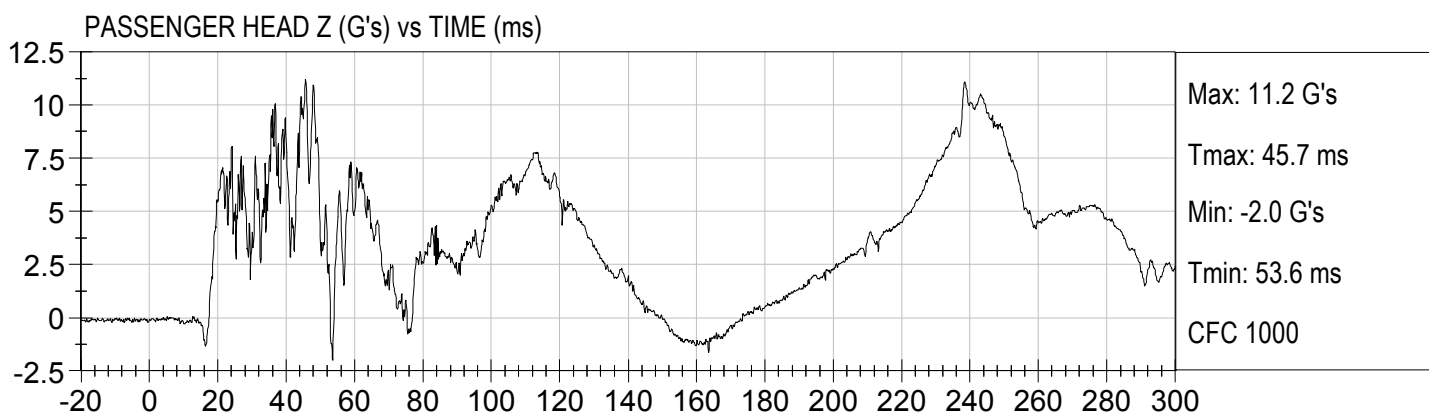
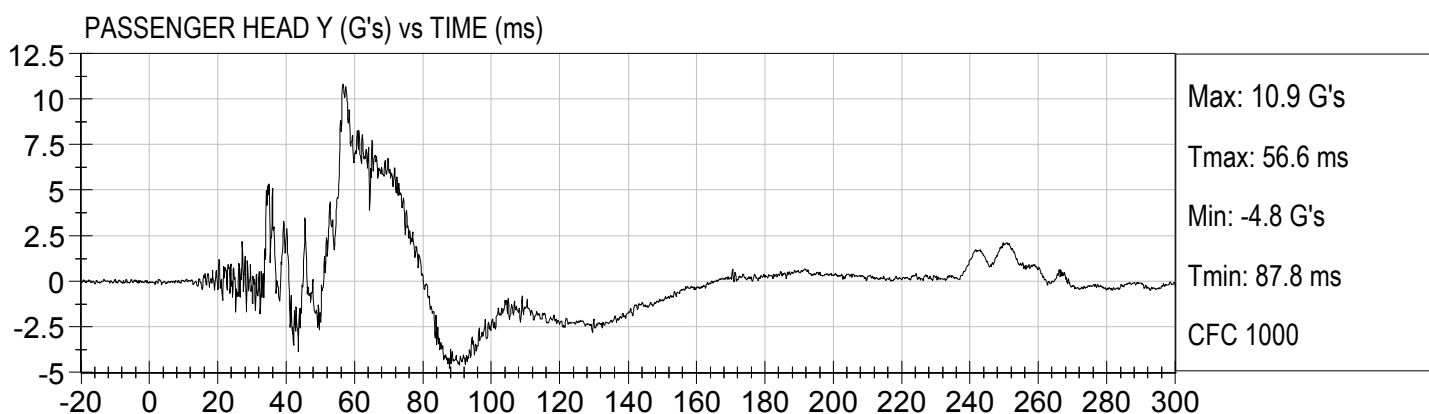
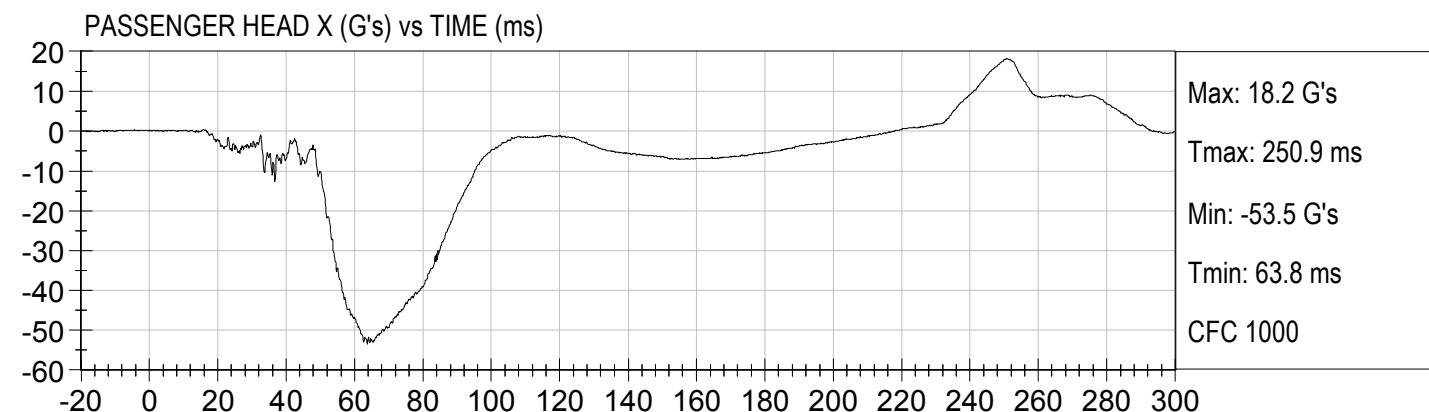


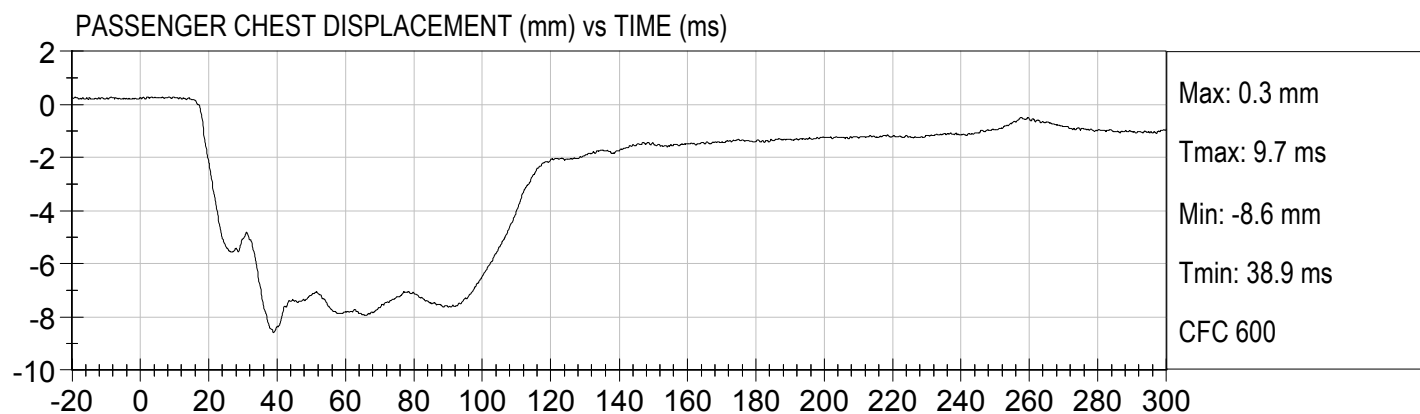


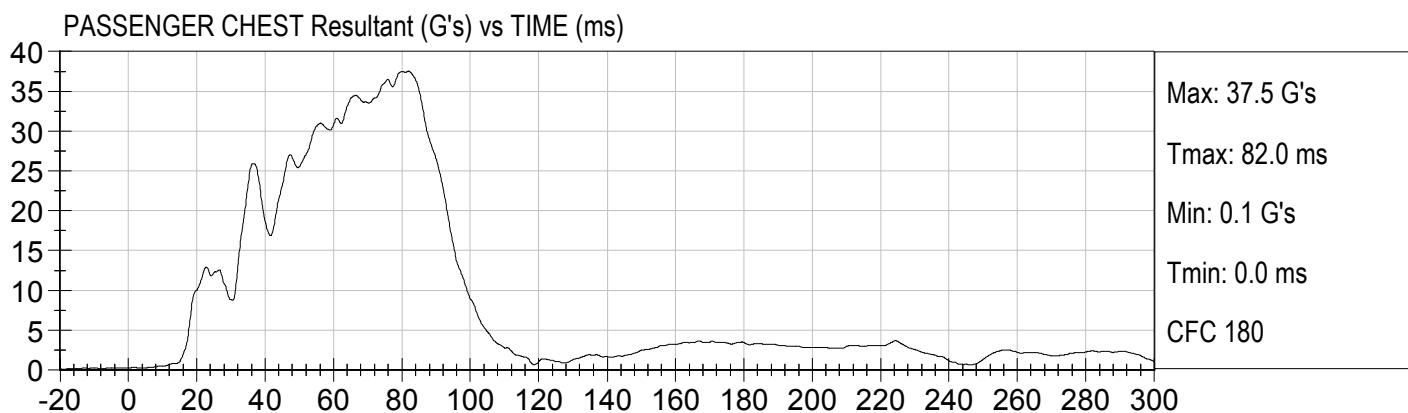
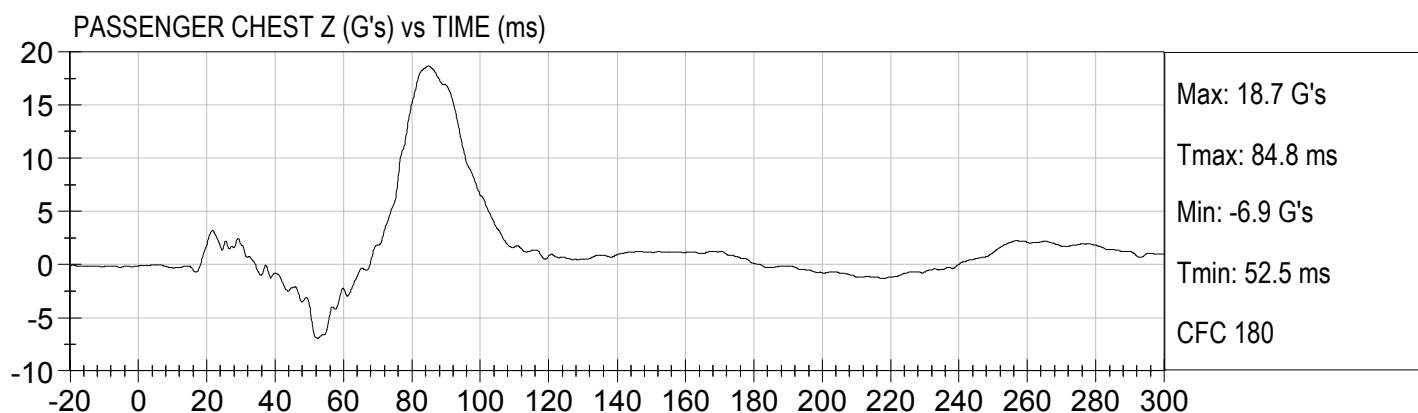
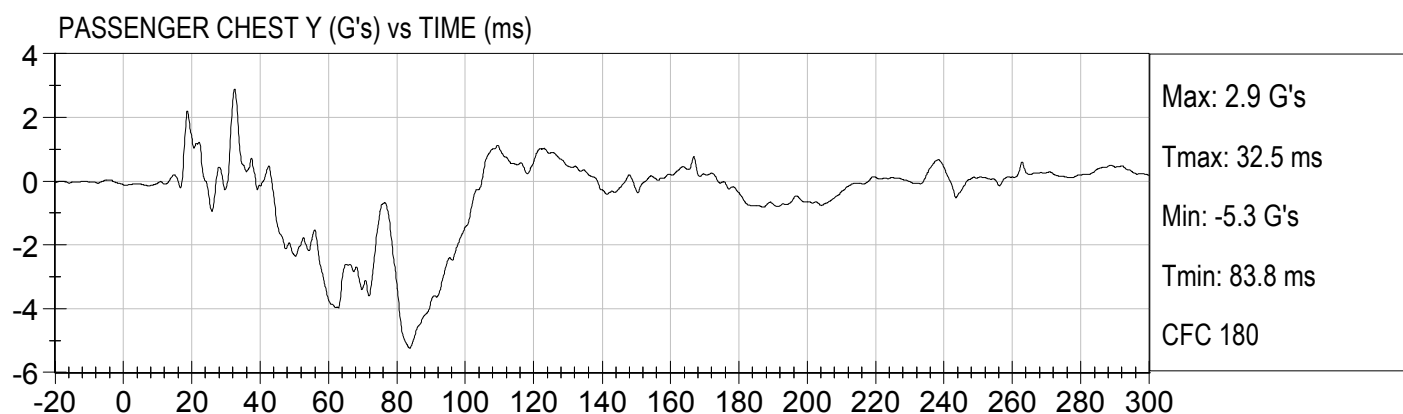
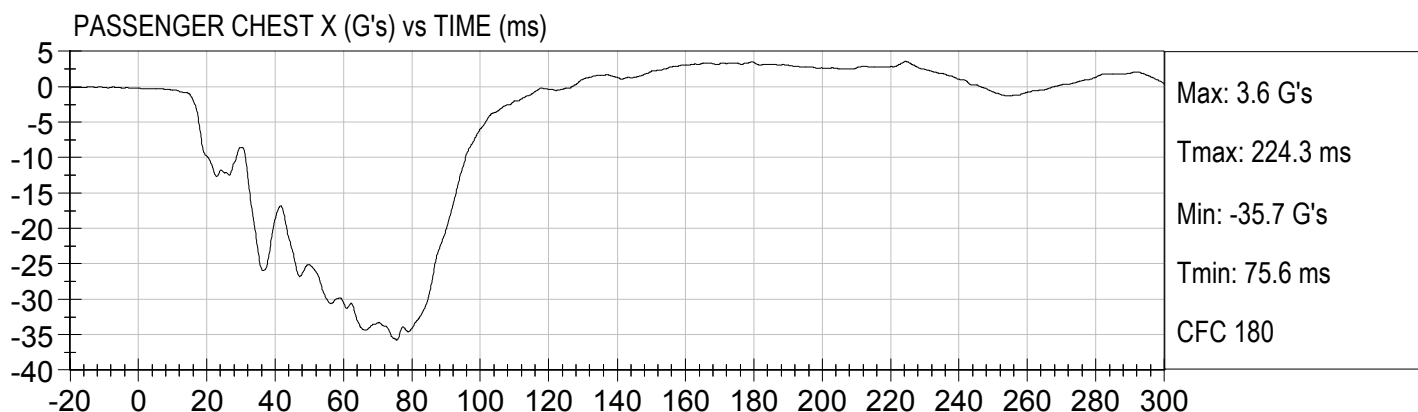


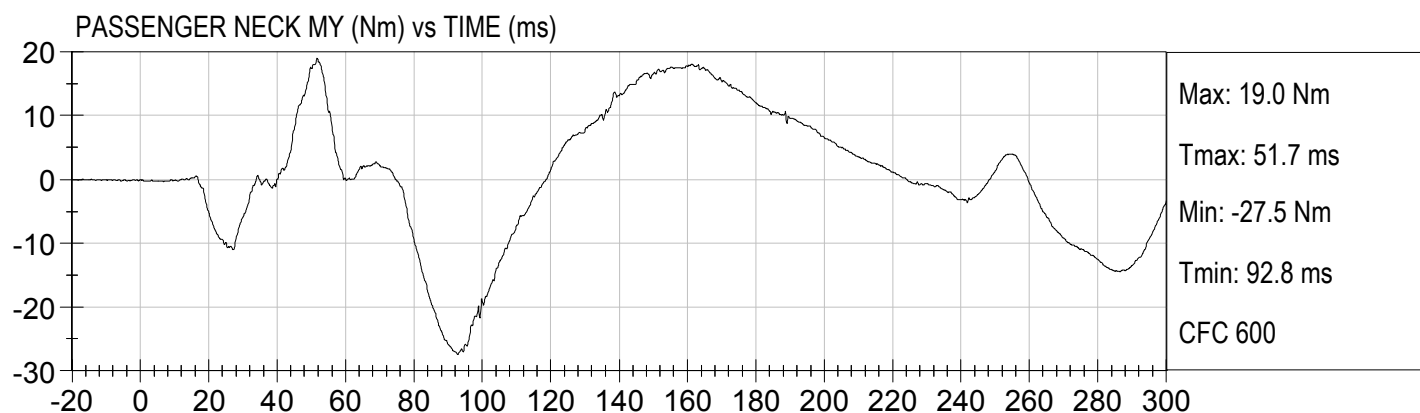
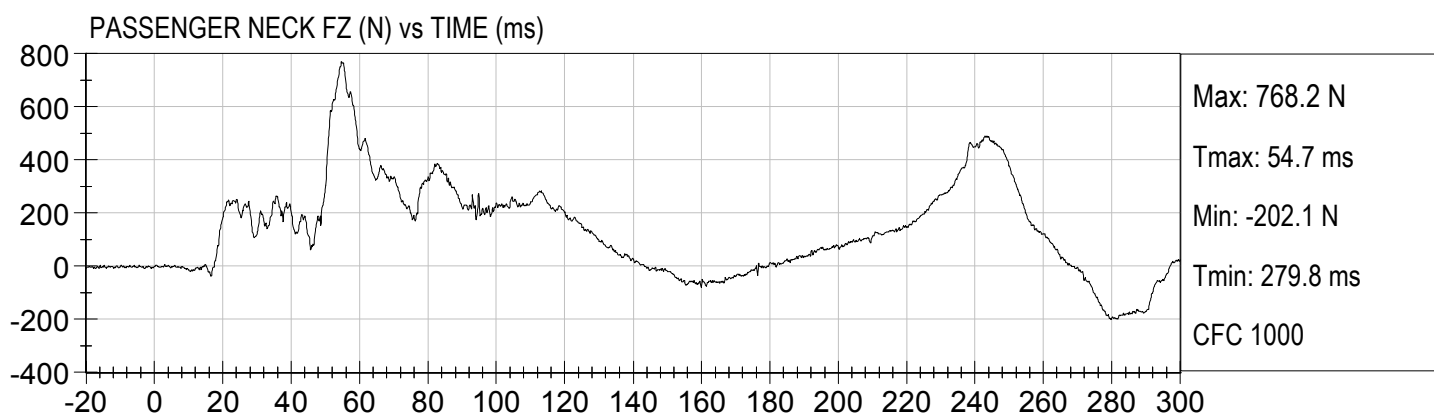
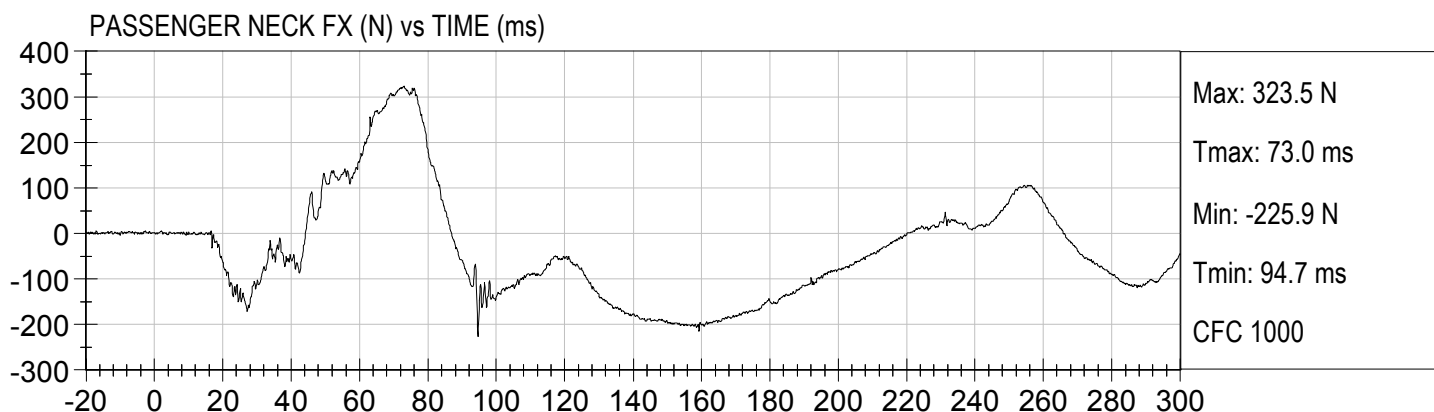


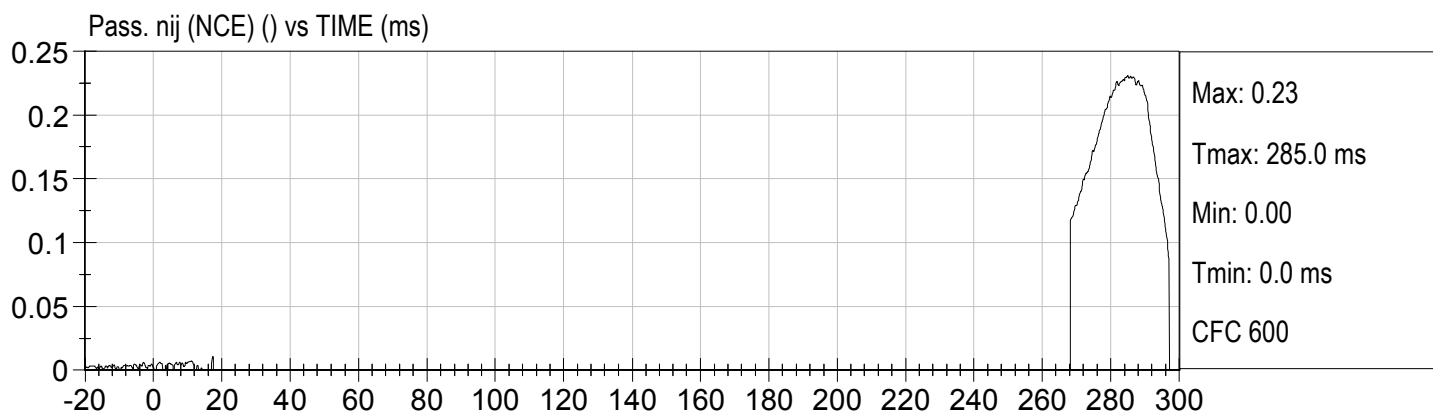
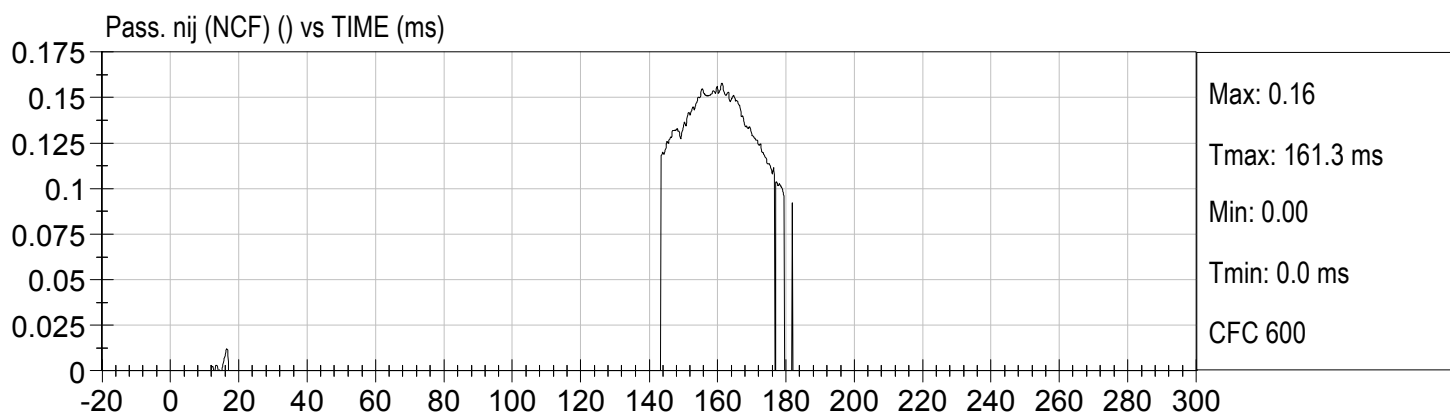
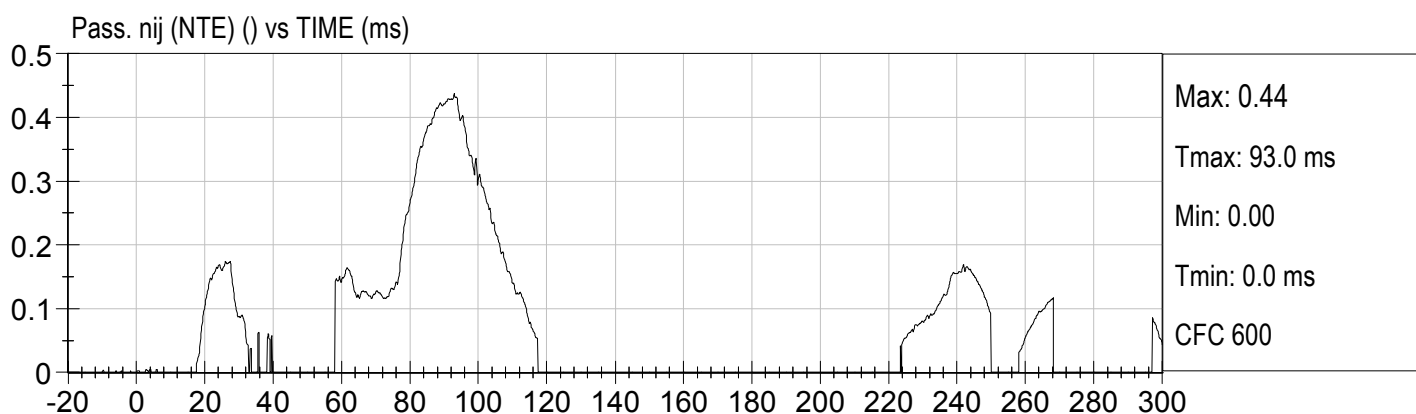
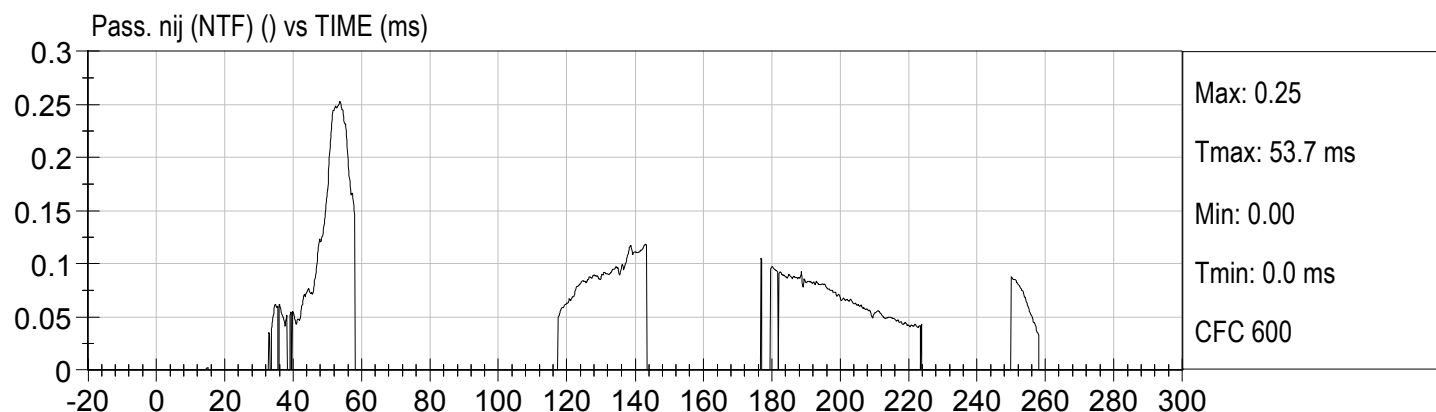


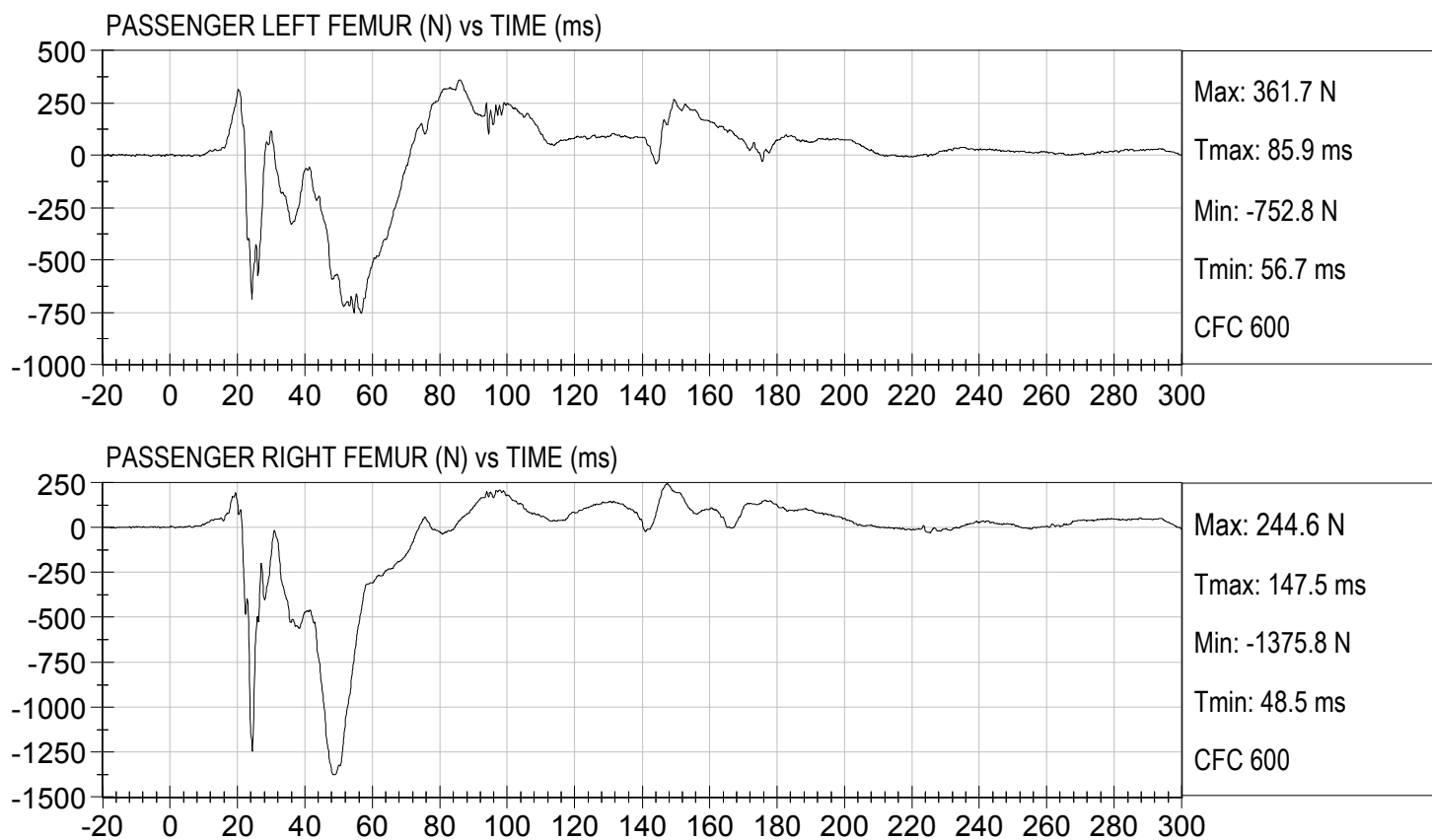












APPENDIX C
DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

Hybrid III, 50th External Measurements
SN: 036

HYBRID III, PART 572, SUBPART E EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (inches)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	34.6–35.0	34.7
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	19.9-20.5	20.0
C	H-POINT HEIGHT	Reference	3.3-3.5	3.4
D	H-POINT LOCATION FROM BACKLINE	Reference	5.3-5.5	5.4
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	3.3-3.7	3.6
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	5.5-6.1	5.8
G	BACK OF ELBOW TO WRIST PIVOT	back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	11.4-12.0	11.5
H	HEAD BACK TO BACKLINE	Back of Skull cap skin to seat rear vertical surface (Reference)	1.6-1.8	1.7
I	SHOULDER TO- ELBOW LENGTH	Measure from the highest point on top of the shoulder clevis to the lowest part of the flesh on the elbow in line with the elbow pivot bolt.	13.0-13.6	13.0
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	7.5-8.3	7.9
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	22.8-23.8	23.8
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	16.9-17.9	17.3
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	19.1-19.7	19.5
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	17.8-18.8	17.9

HYBRID III, SUBPART E EXTERIOR DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS		ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 16.9-17.1 in. above seat surface	8.4-9.0	8.8
P	FOOT LENGTH	Tip of toe to rear of heel	9.9-10.5	10.0
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	16.3-17.2	16.4
W	FOOT BREADTH	The widest part of the foot	3.6-4.2	4.1
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 16.9-17.1 in. above seat surface	38.2-39.4	38.4
Z	WAIST CIRCUMFERENCE	Measured 8.9-9.1 in. above seat surface	32.9-34.1	34.0
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	16.9-17.1	17.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	8.9-9.1	9.0

NOTE: THE H-POINT IS LOCATED 1.83 INCHES FORWARD AND 2.57 INCHES DOWN FROM THE CENTER OF THE PELVIS ANGLE REFERENCE HOLE.

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036

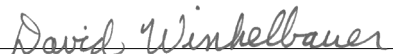
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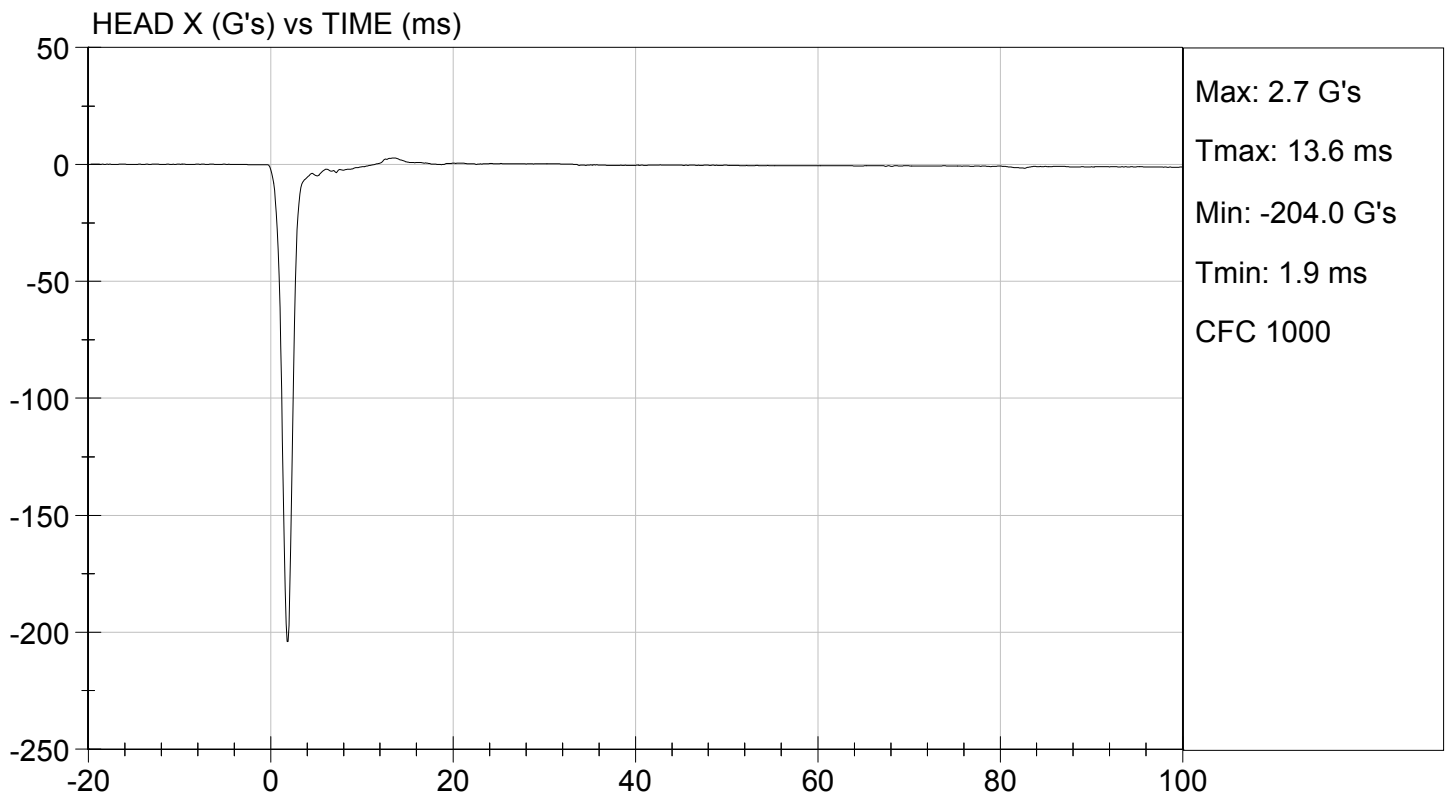
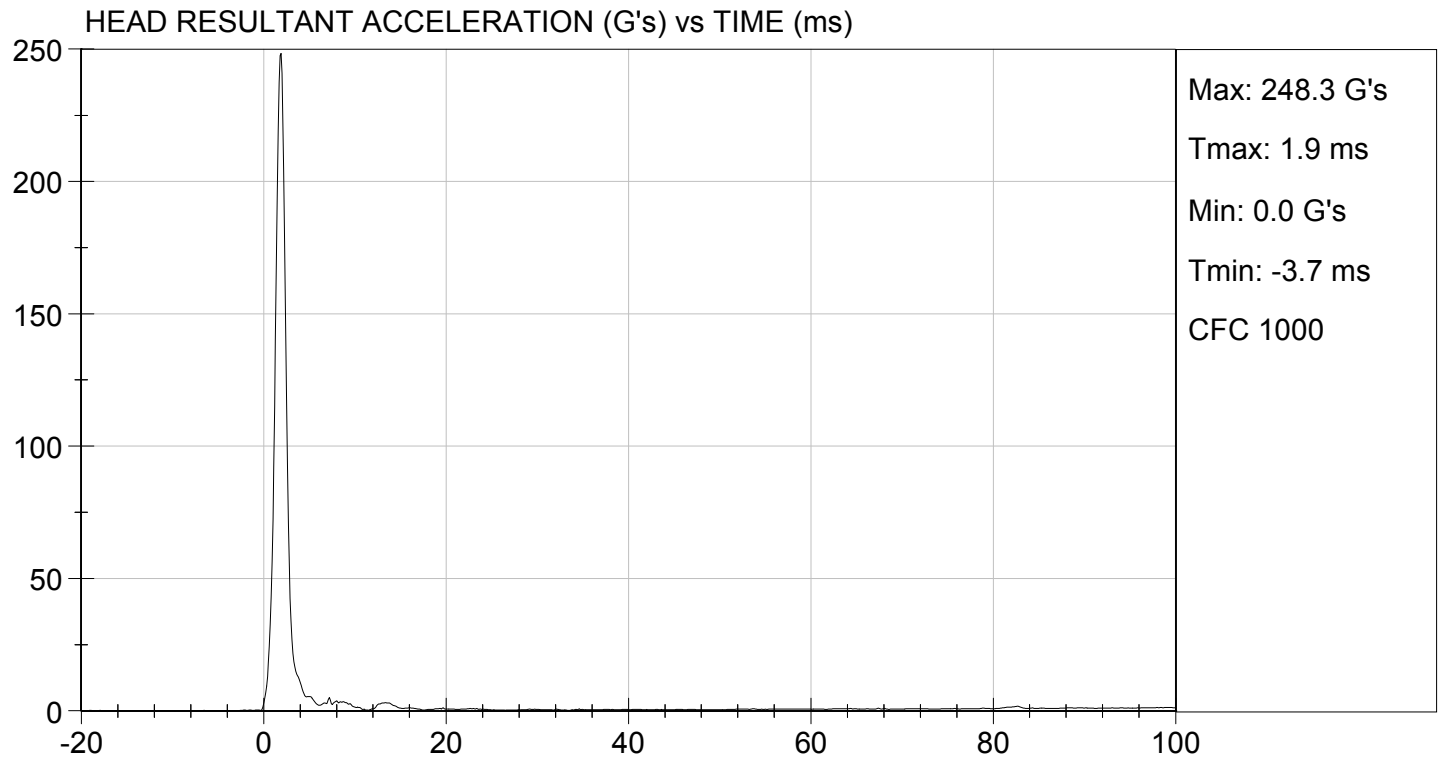
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Peak Resultant Acceleration	G's	225 to 275	248	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	3.7	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

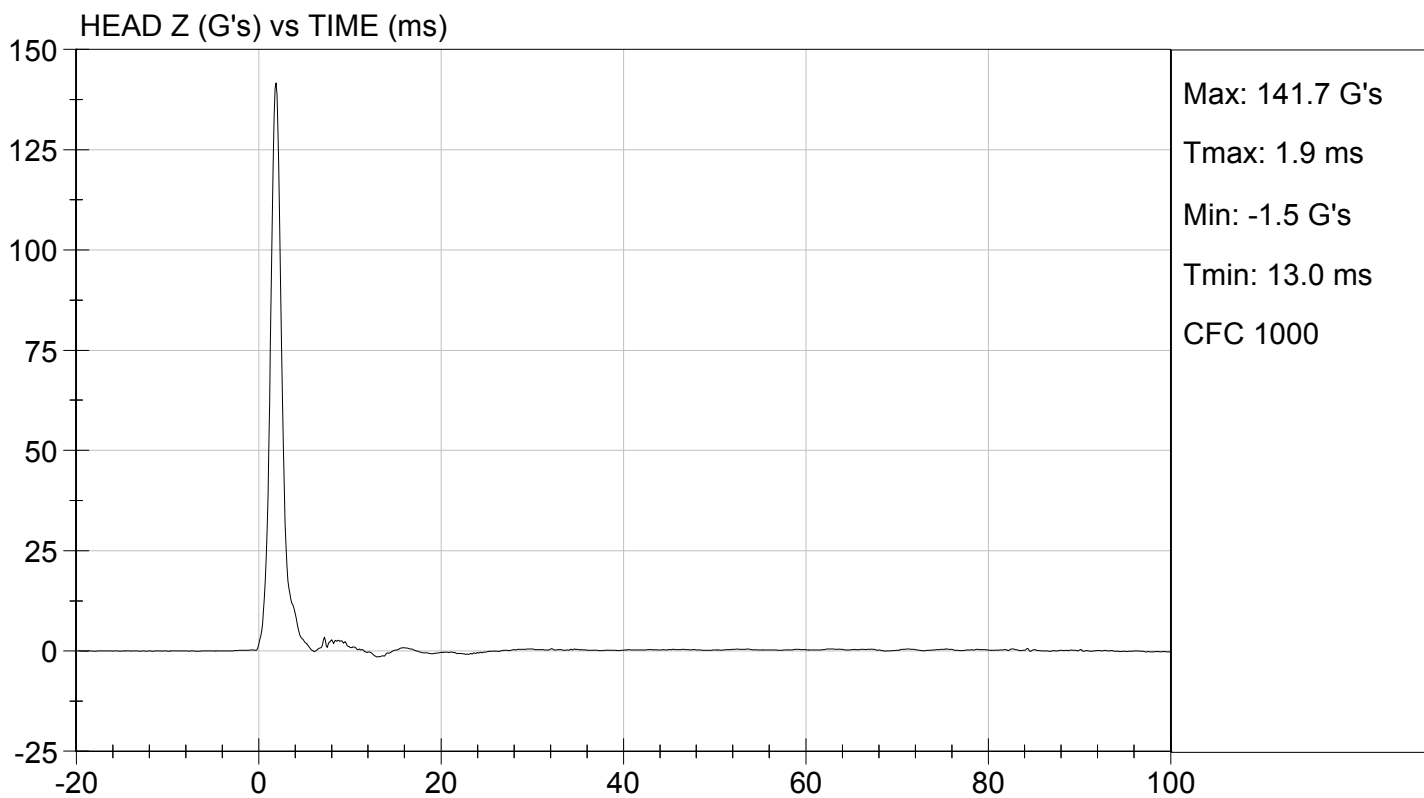
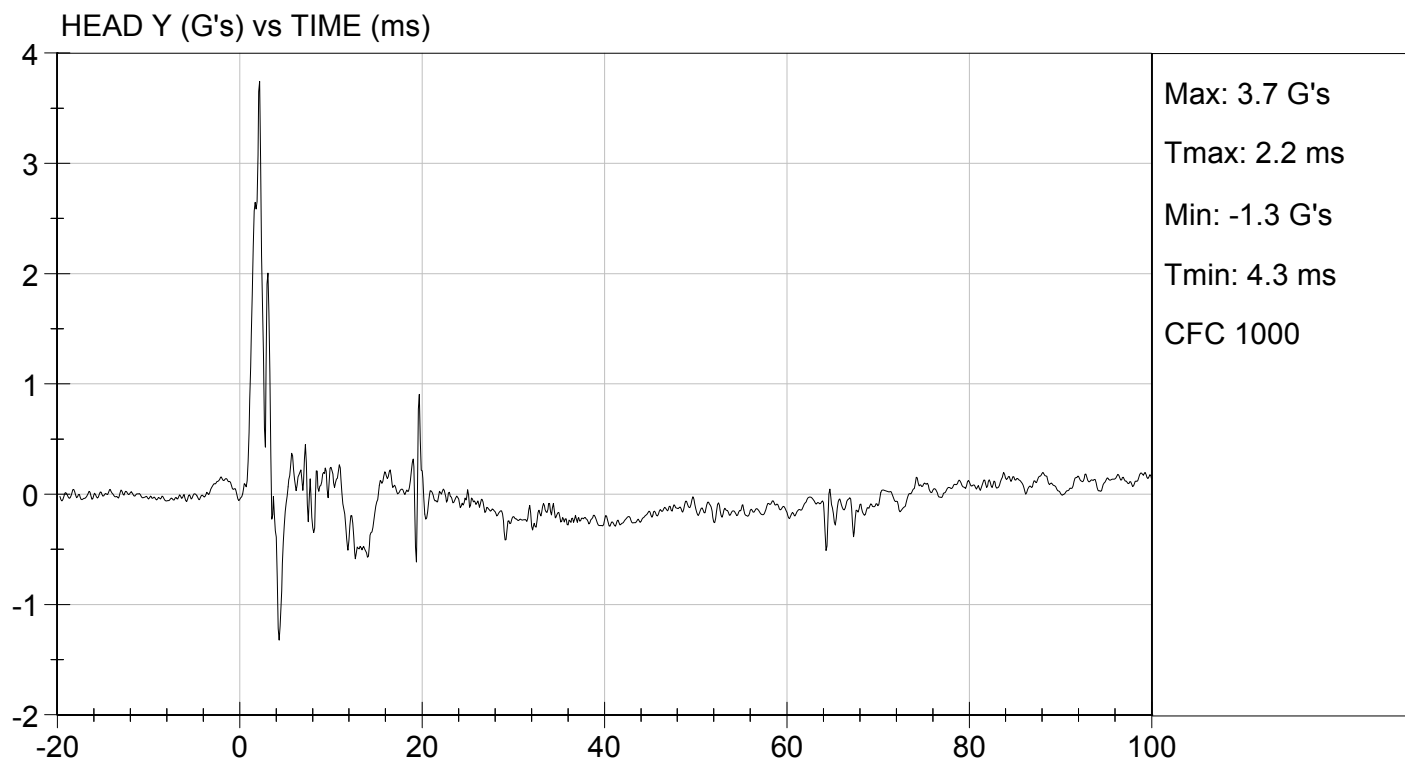

Laboratory Technician

10/29/2012

Test Date


Approved By





MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036

Test I.D: D124102

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	28	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.96	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	24.30	Pass
	20 ms	G's	17.60 to 22.60	19.07	Pass
	30 ms	G's	12.50 to 18.50	15.00	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	14.9	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	34.8	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	70.4	Pass
	Time	ms	57.0 to 64.0	60.0	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	120.8	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	88.1	Pass
	Time	ms	47.0 to 58.0	48.3	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	98.4	Pass
Overall Test Results					Pass

Jessica Hall
Laboratory Technician

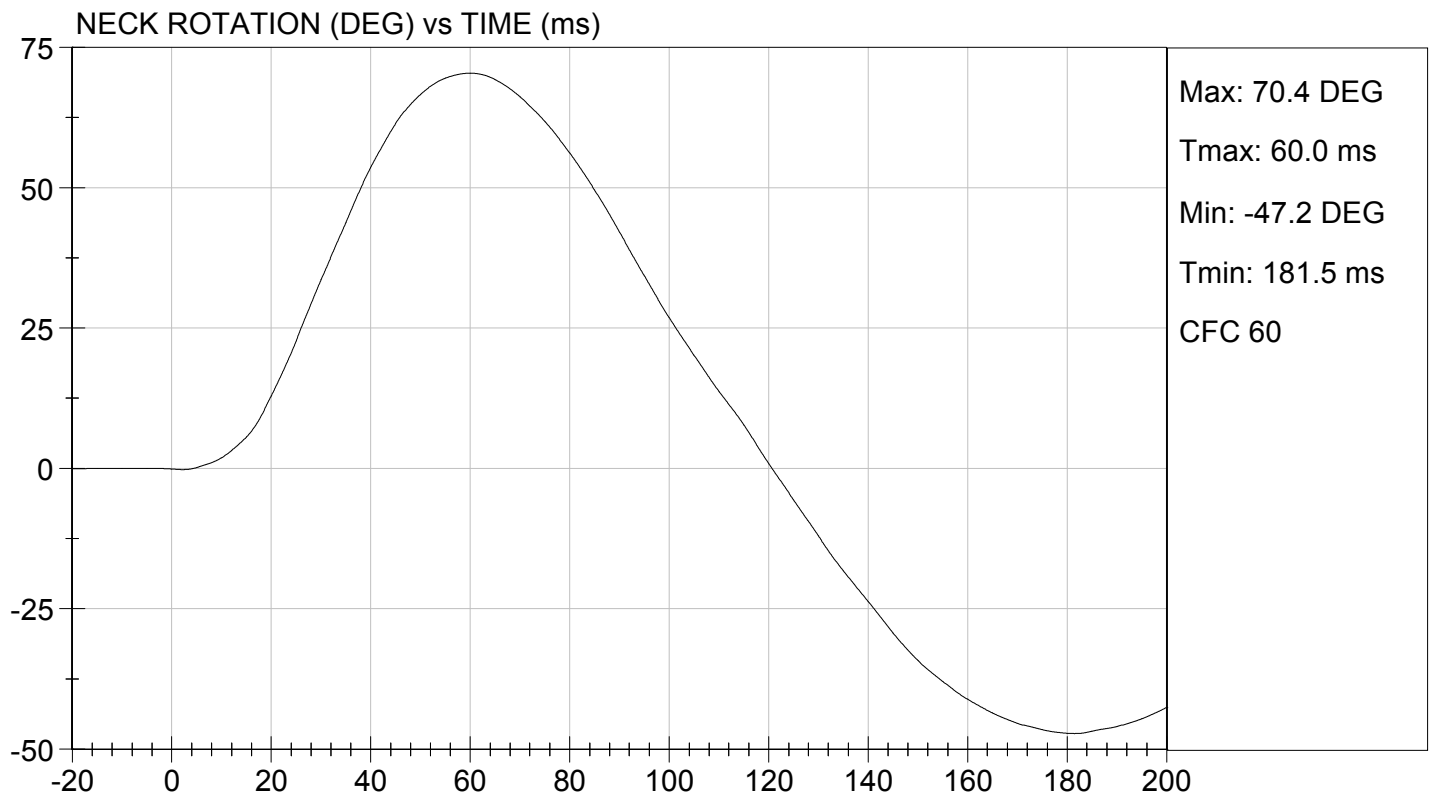
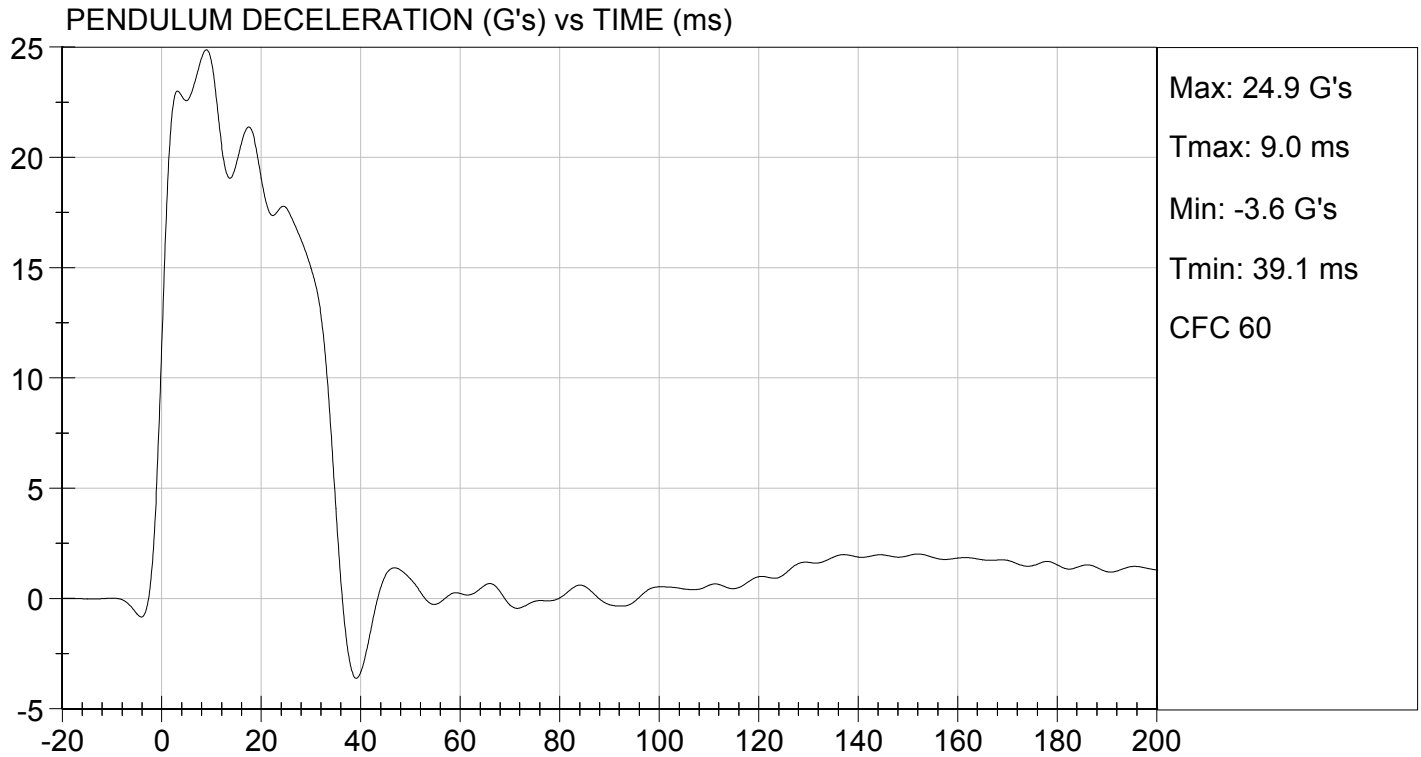
10/29/2012
Test Date

David Winkelbauer
Approved By



TEST DESC: NECK FLEXION
VELOCITY: 22.83 ft/s, 6.96 m/s

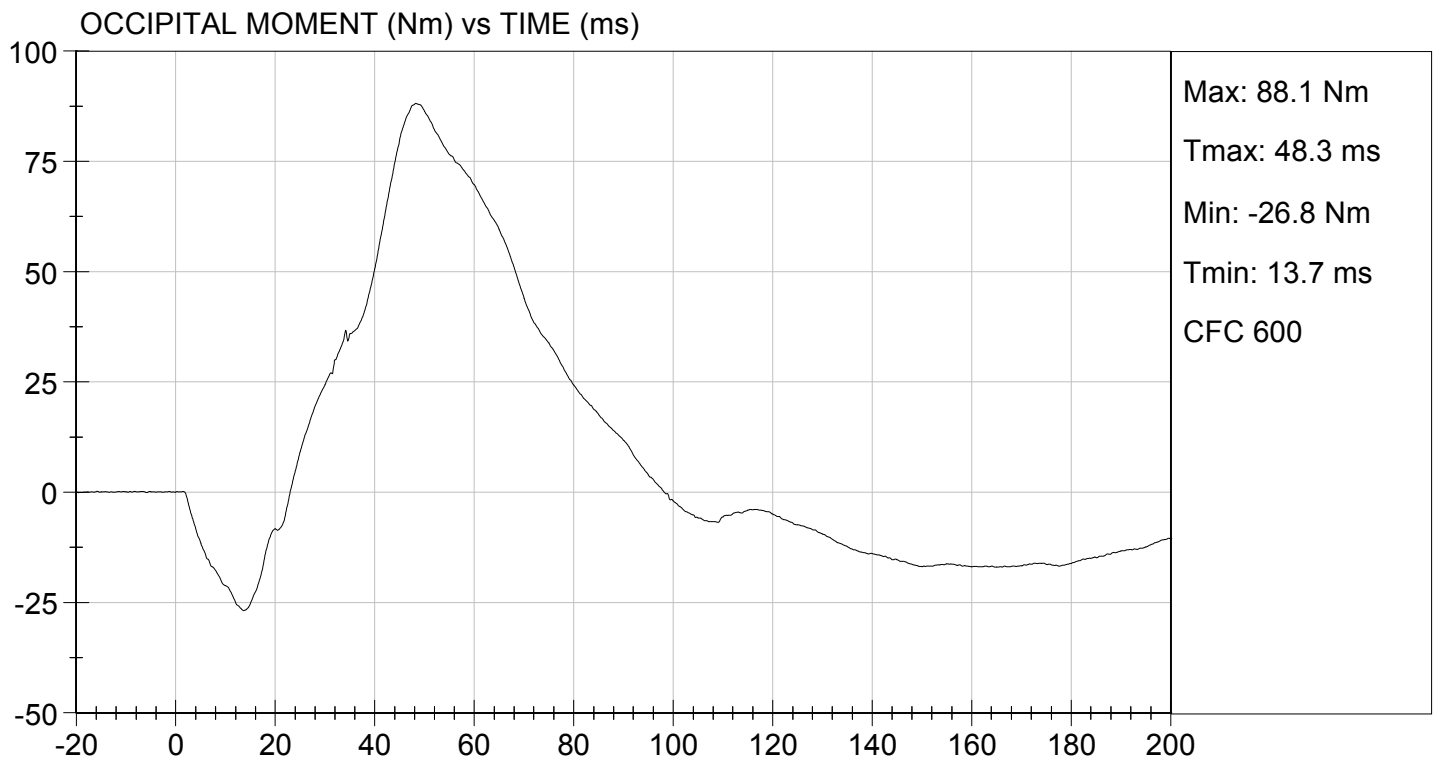
TEST DATE: 10/29/2012
TEST #: D124102





TEST DESC: NECK FLEXION
VELOCITY: 22.83 ft/s, 6.96 m/s

TEST DATE: 10/29/2012
TEST #: D124102



MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 50TH PERCENTILE MALE

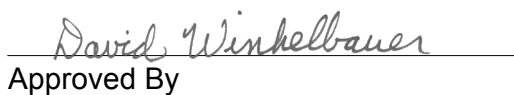
ATD Serial No: 036

Test I.D: D124103

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	28	Pass
Pendulum Velocity		m/s	5.95 to 6.19	5.98	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	19.92	Pass
	20 ms	G's	14.00 to 19.00	17.58	Pass
	30 ms	G's	11.00 to 16.00	13.59	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	14.1	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	38.7	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	96.6	Pass
	Time	ms	72.0 to 82.0	79.1	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	163.0	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-59.7	Pass
	Time	ms	65.0 to 79.0	70.7	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	146.8	Pass
Overall Test Results					Pass


Laboratory Technician

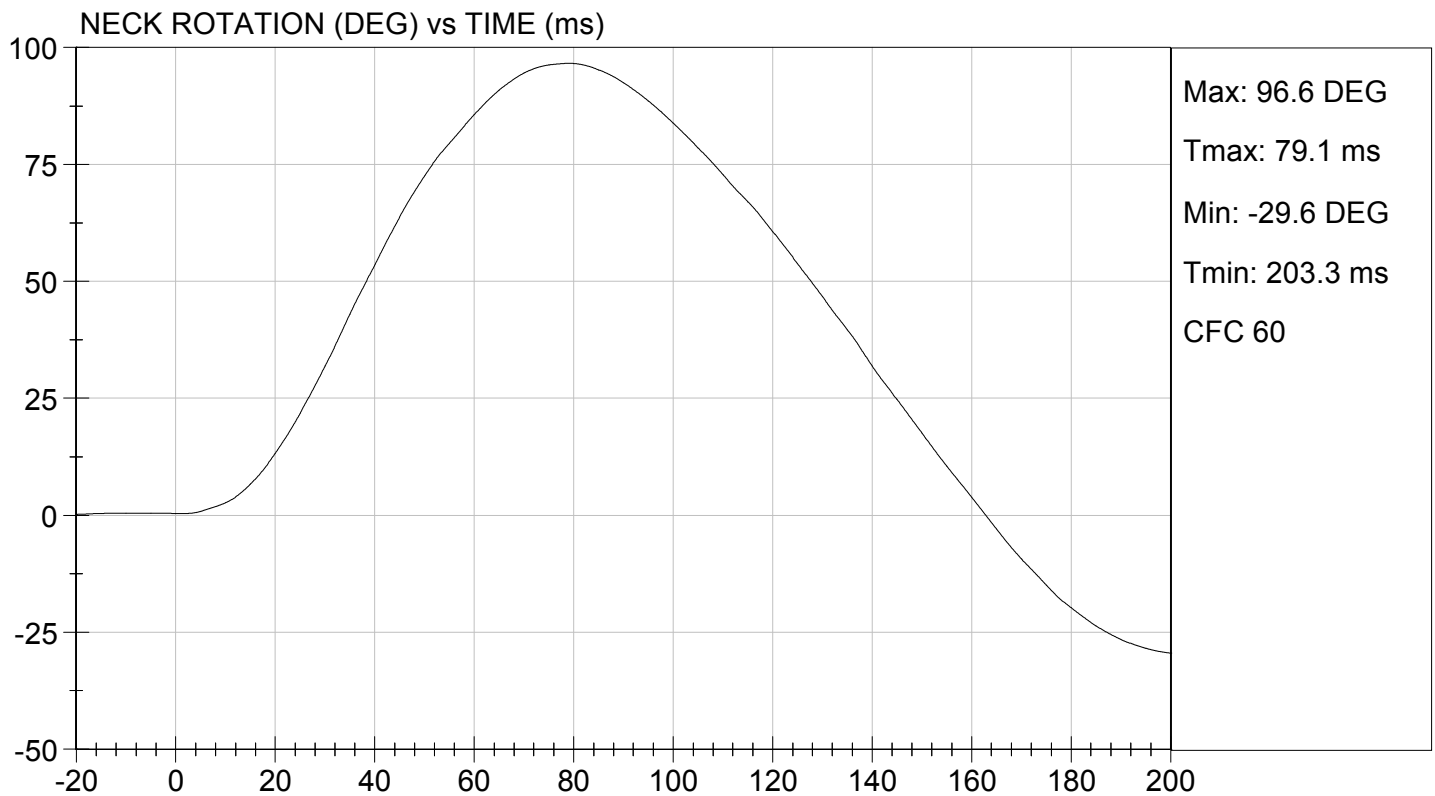
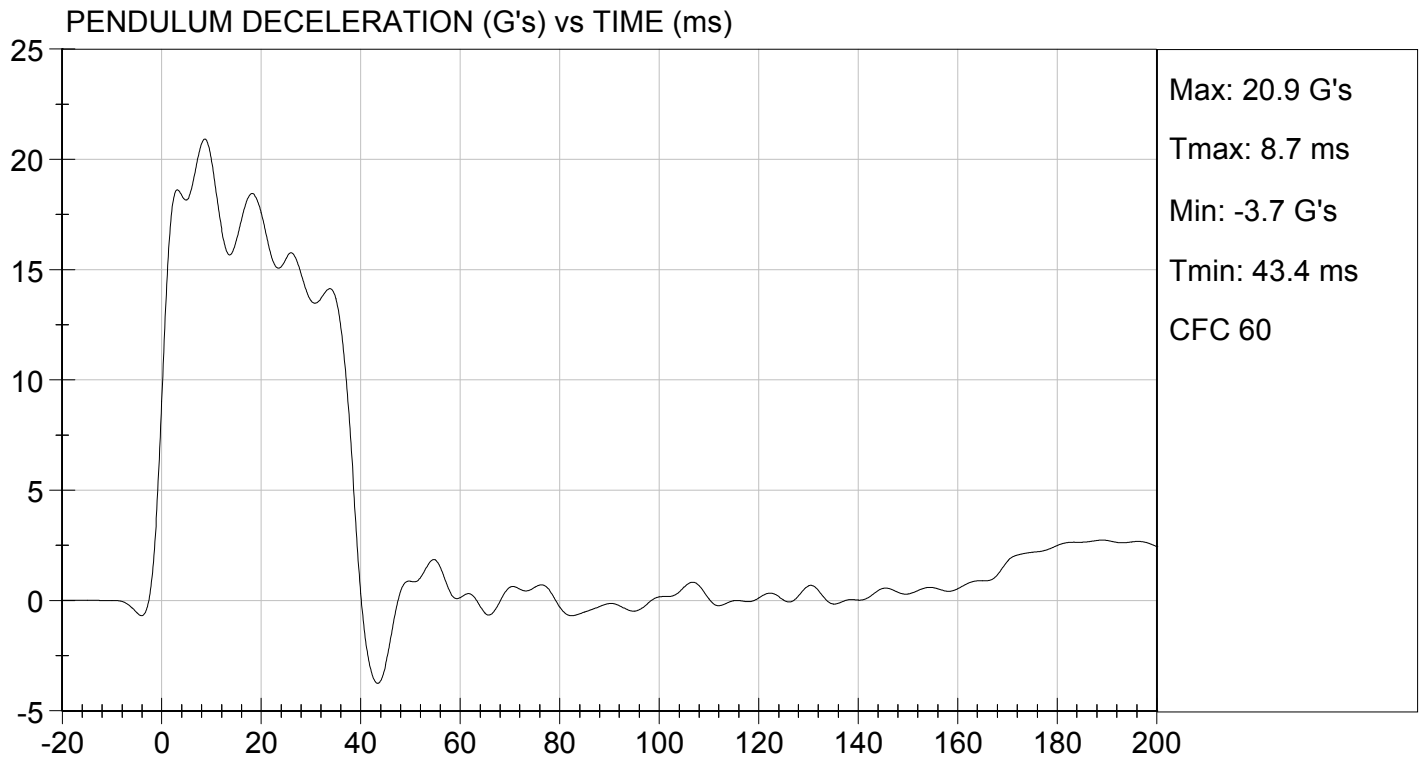
10/29/2012
Test Date


Approved By



TEST DESC: NECK EXTENSION
VELOCITY: 19.61 ft/s, 5.98 m/s

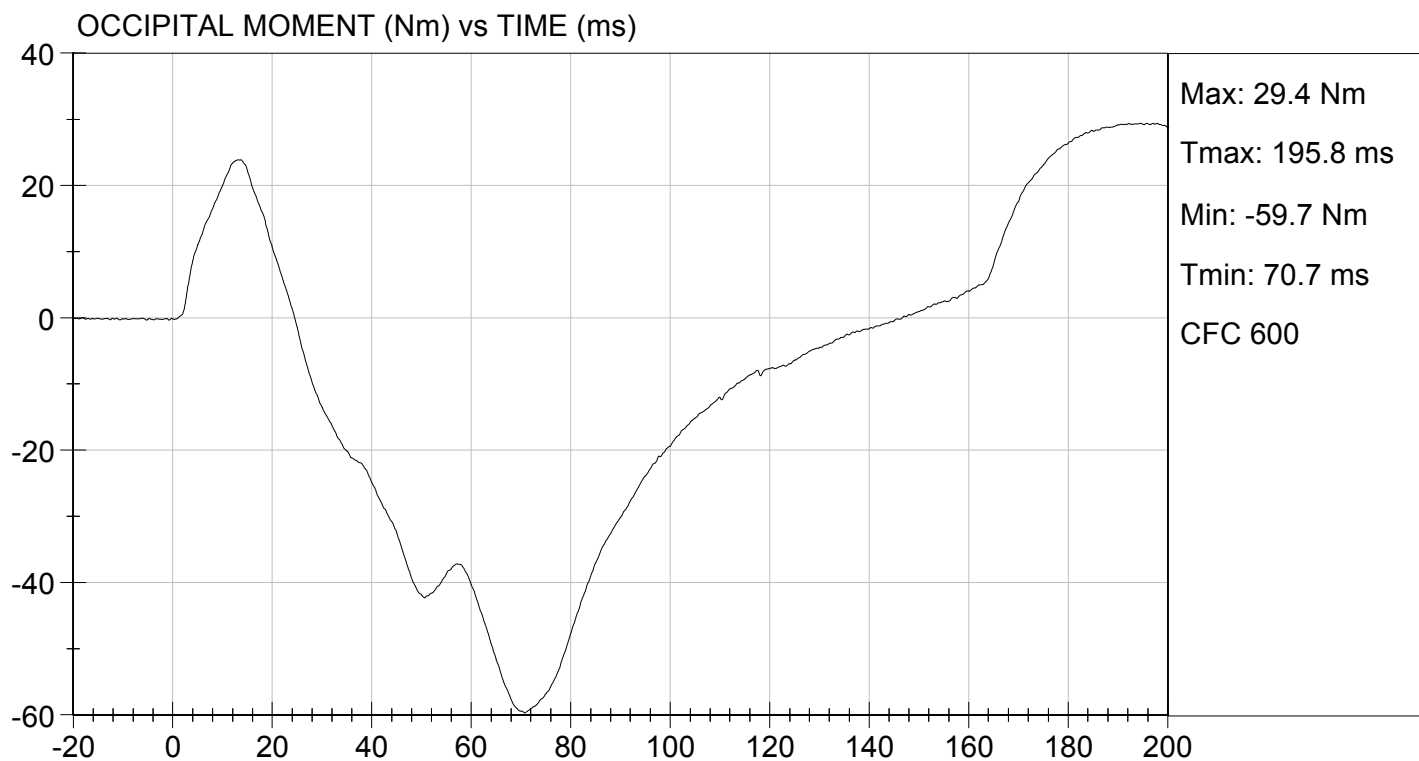
TEST DATE: 10/29/2012
TEST #: D124103





TEST DESC: NECK EXTENSION
VELOCITY: 19.61 ft/s, 5.98 m/s

TEST DATE: 10/29/2012
TEST #: D124103

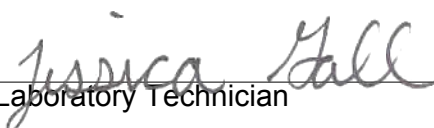


MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036

Test I.D: D124104

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	26	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,359	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	7.11	Pass
Internal Hysteresis	%	69 to 85	70	Pass
			Overall Test Results	Pass


Laboratory Technician

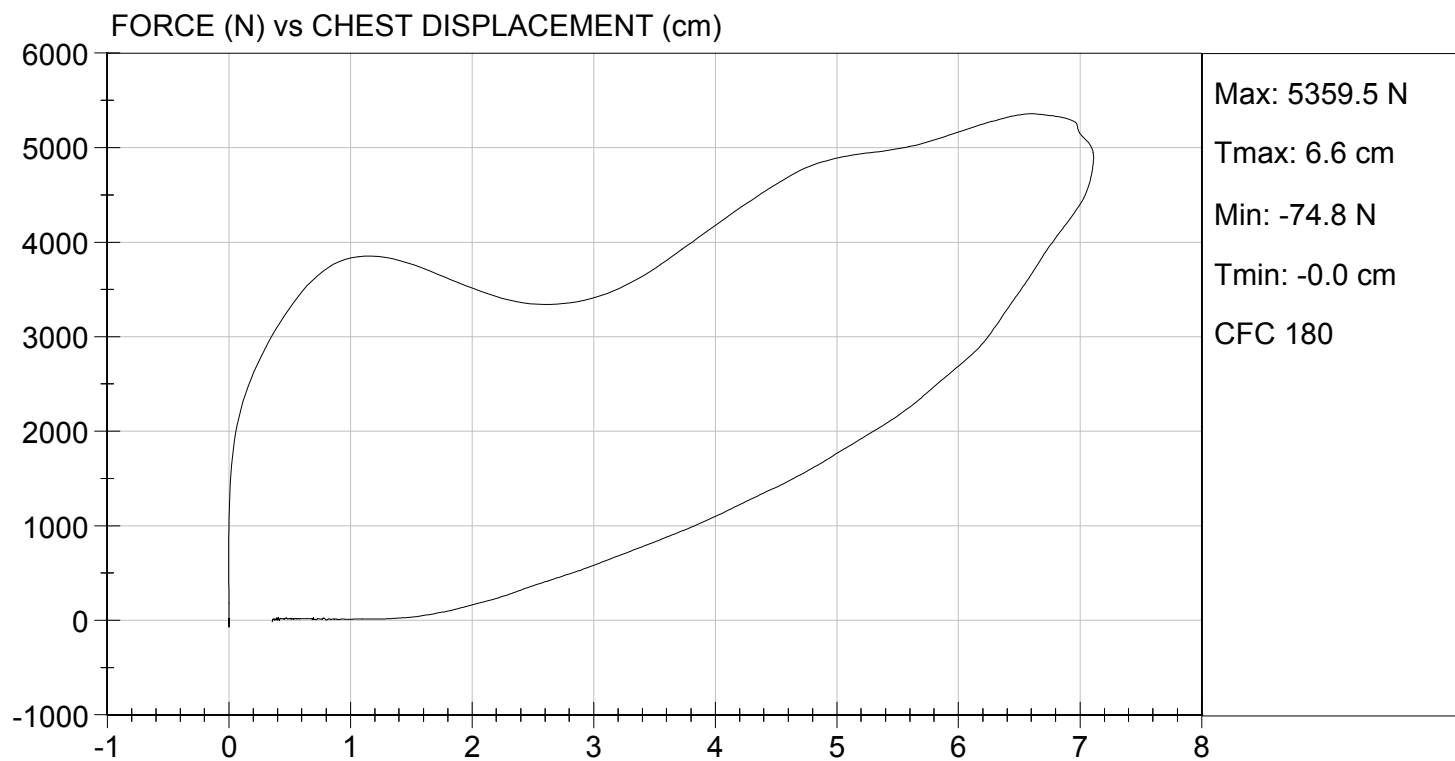
10/30/2012
Test Date


Approved By



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

TEST DATE: 10/30/2012
TEST #: D124104



MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036

Test I.D: D124105

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Probe Velocity	m/s	2.07 to 2.13	2.11	Pass
Peak Probe Force	N	4715 to 5782	4,960	Pass
Overall Test Results				Pass


Laboratory Technician

10/29/2012

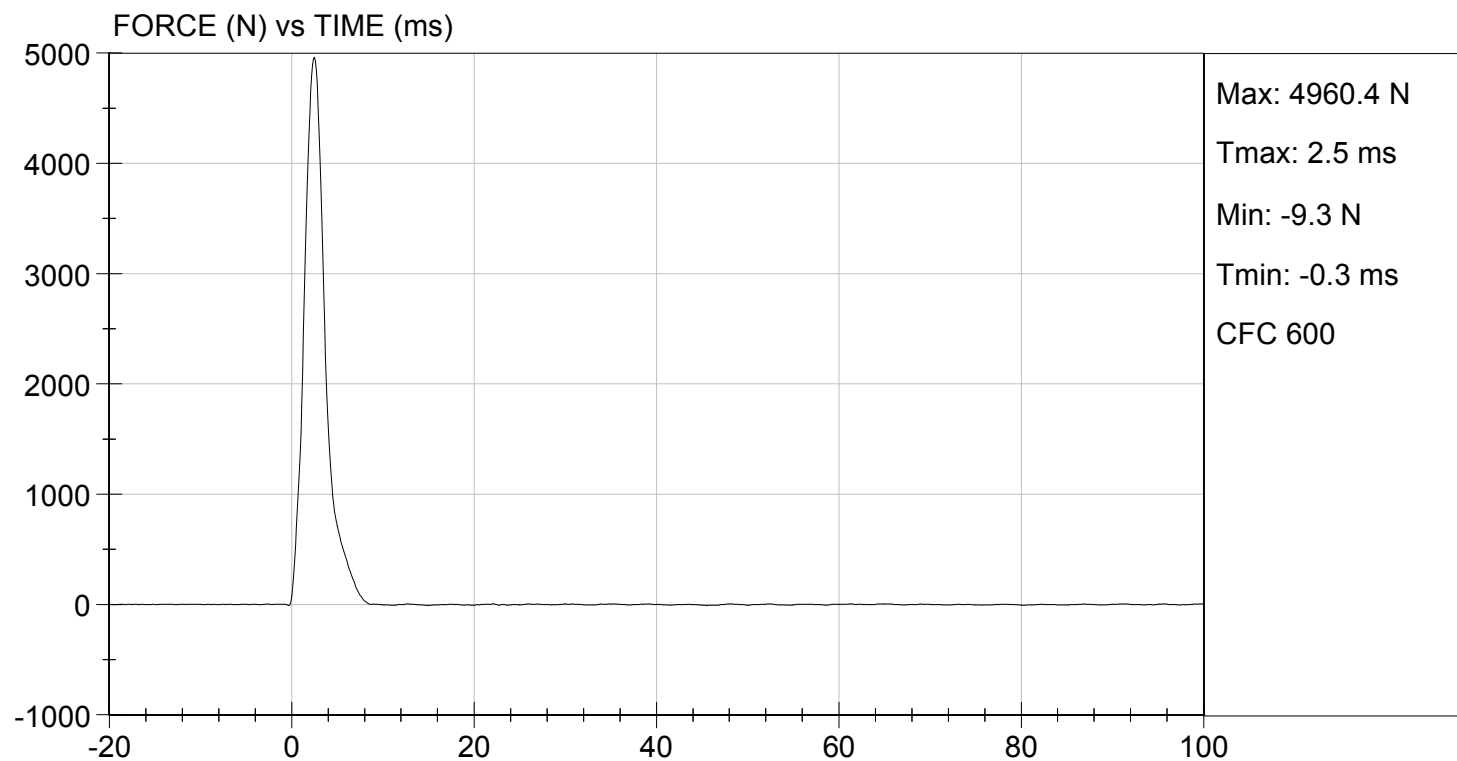
Test Date


Approved By



TEST DESC: RIGHT KNEE
VELOCITY: 6.92 ft/s, 2.11 m/s

TEST DATE: 10/29/2012
TEST #: D124105



MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036

Test I.D: D124106

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Probe Velocity	m/s	2.07 to 2.13	2.11	Pass
Peak Probe Force	N	4715 to 5782	4,942	Pass
Overall Test Results				Pass


Laboratory Technician

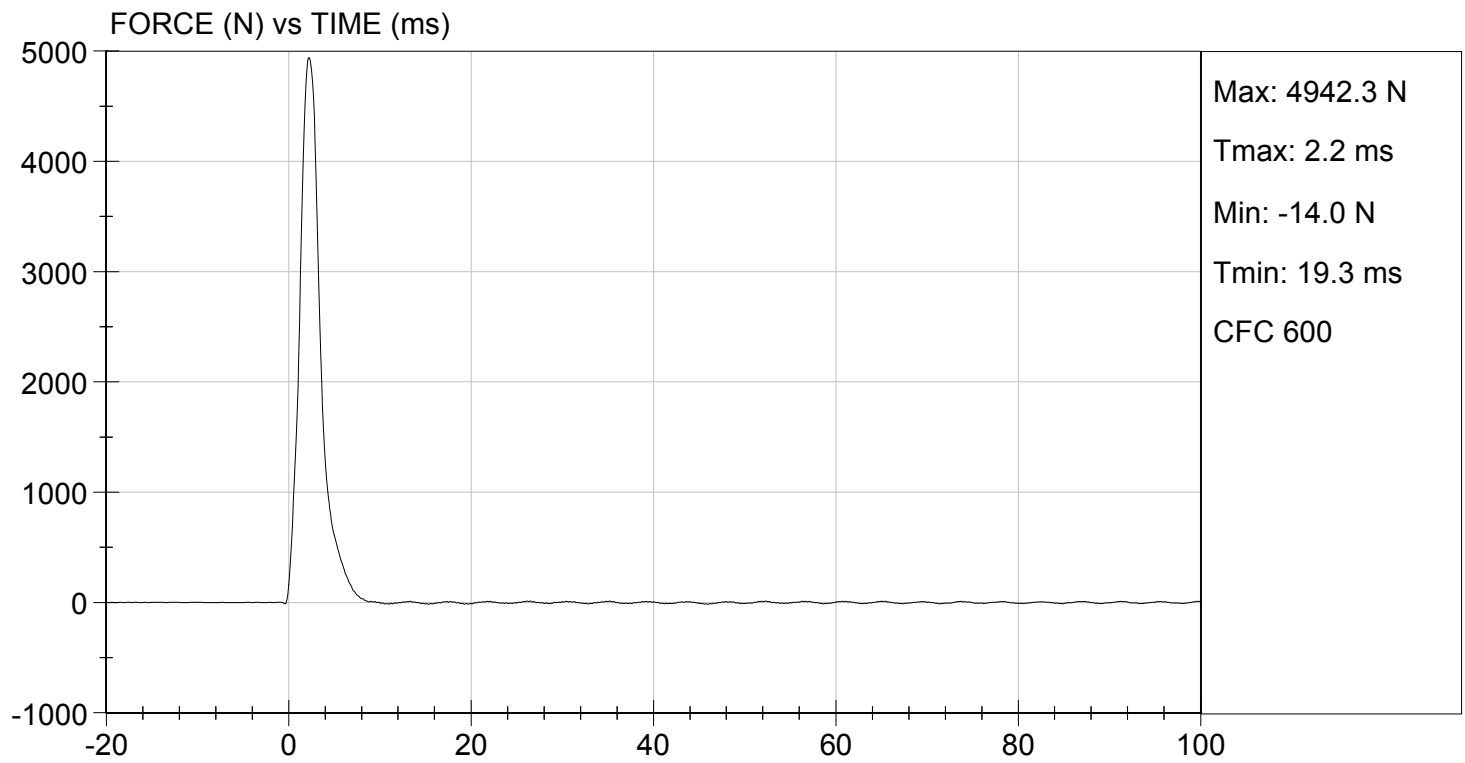
10/29/2012
Test Date


Approved By



TEST DESC: LEFT KNEE
VELOCITY: 6.92 ft/s, 2.11 m/s

TEST DATE: 10/29/2012
TEST #: D124106



MGA RESEARCH CORPORATION
HIP-FEMUR FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

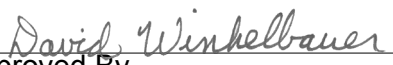
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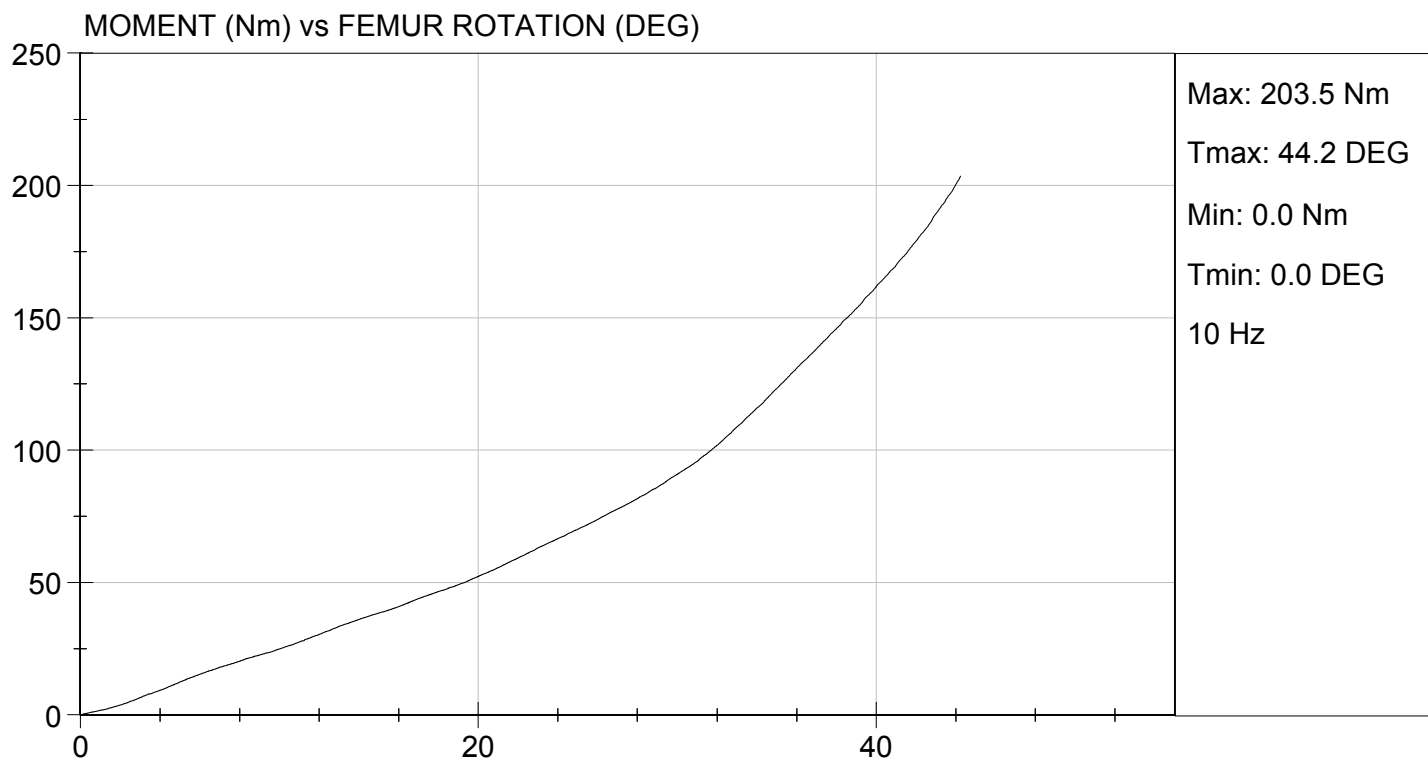
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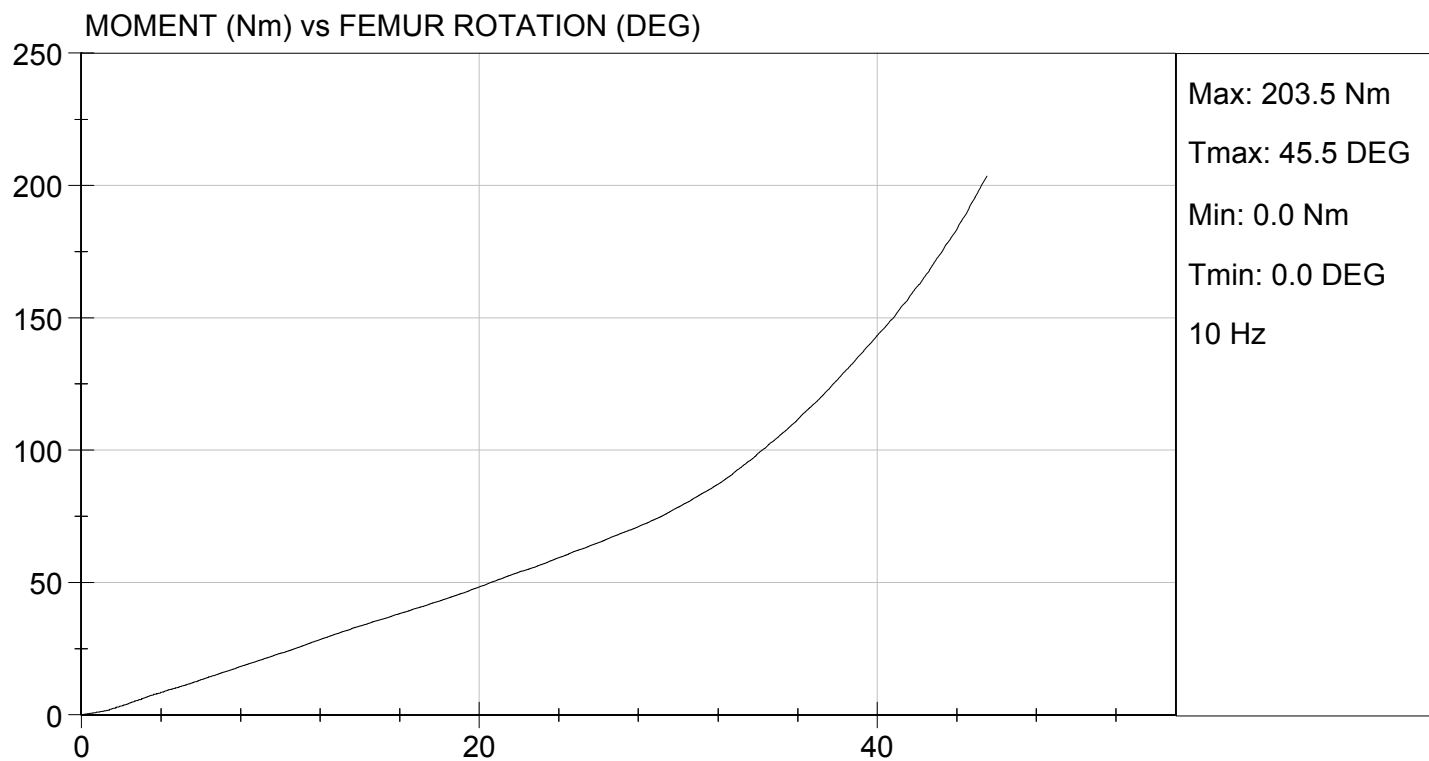
Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.5	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	23	23	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.2	6.2	Pass
30 Degrees	Nm	94.9 Nm Max	90.9	78.4	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	44.2	45.5	Pass
Overall Test Results					Pass


Laboratory Technician

10/29/2012
Test Date


Approved By



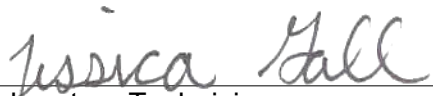


MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036

Test ID: D124211

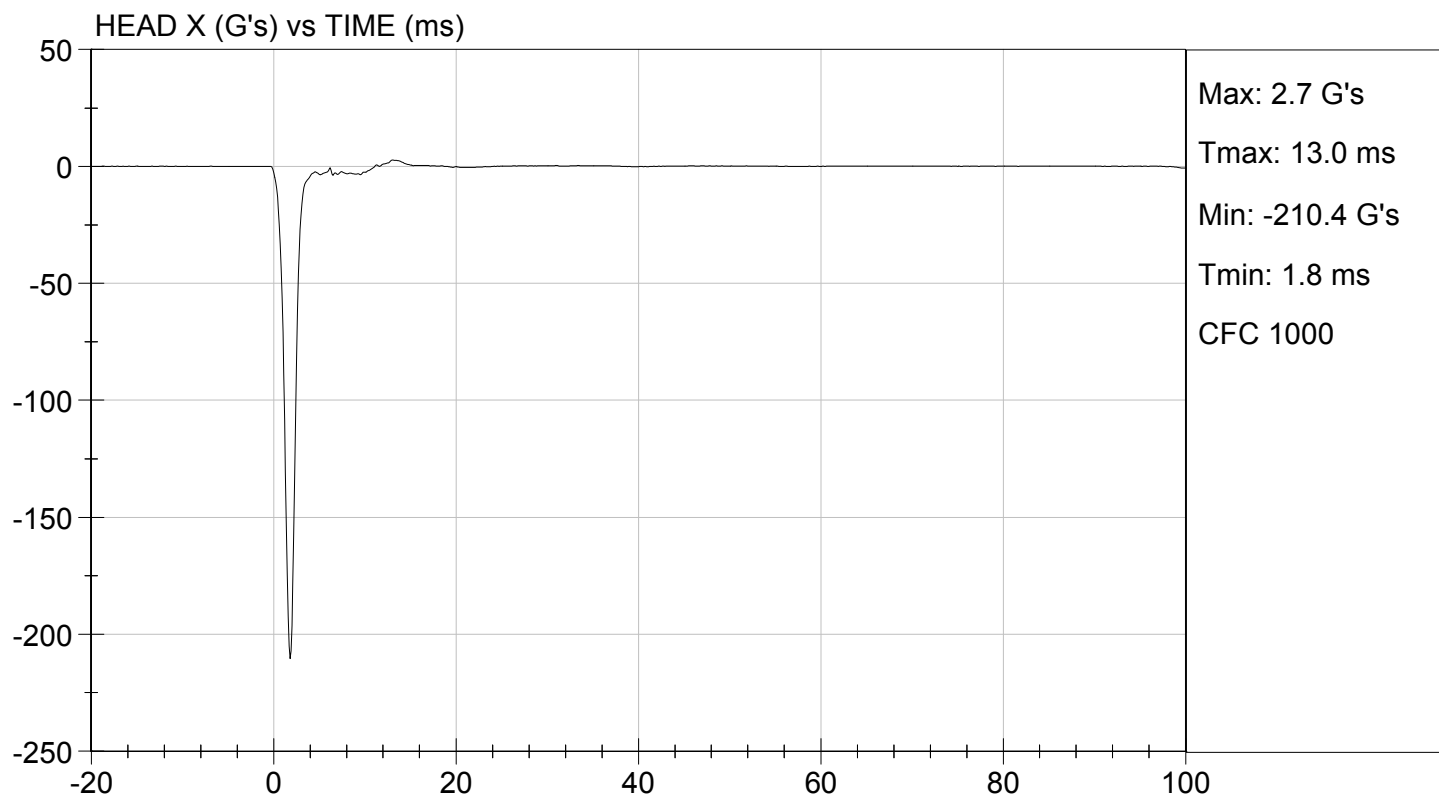
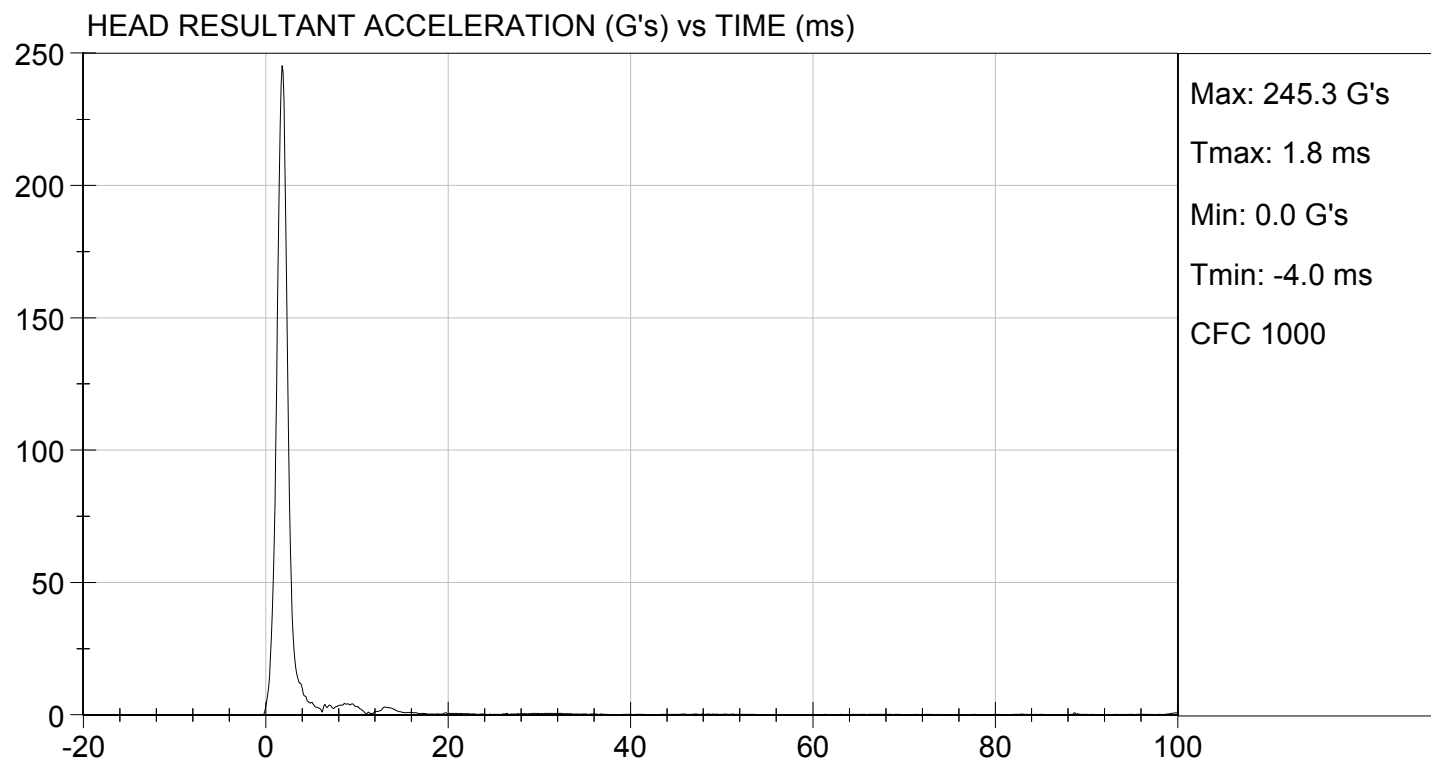
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	27	Pass
Peak Resultant Acceleration	G's	225 to 275	245	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	3.8	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

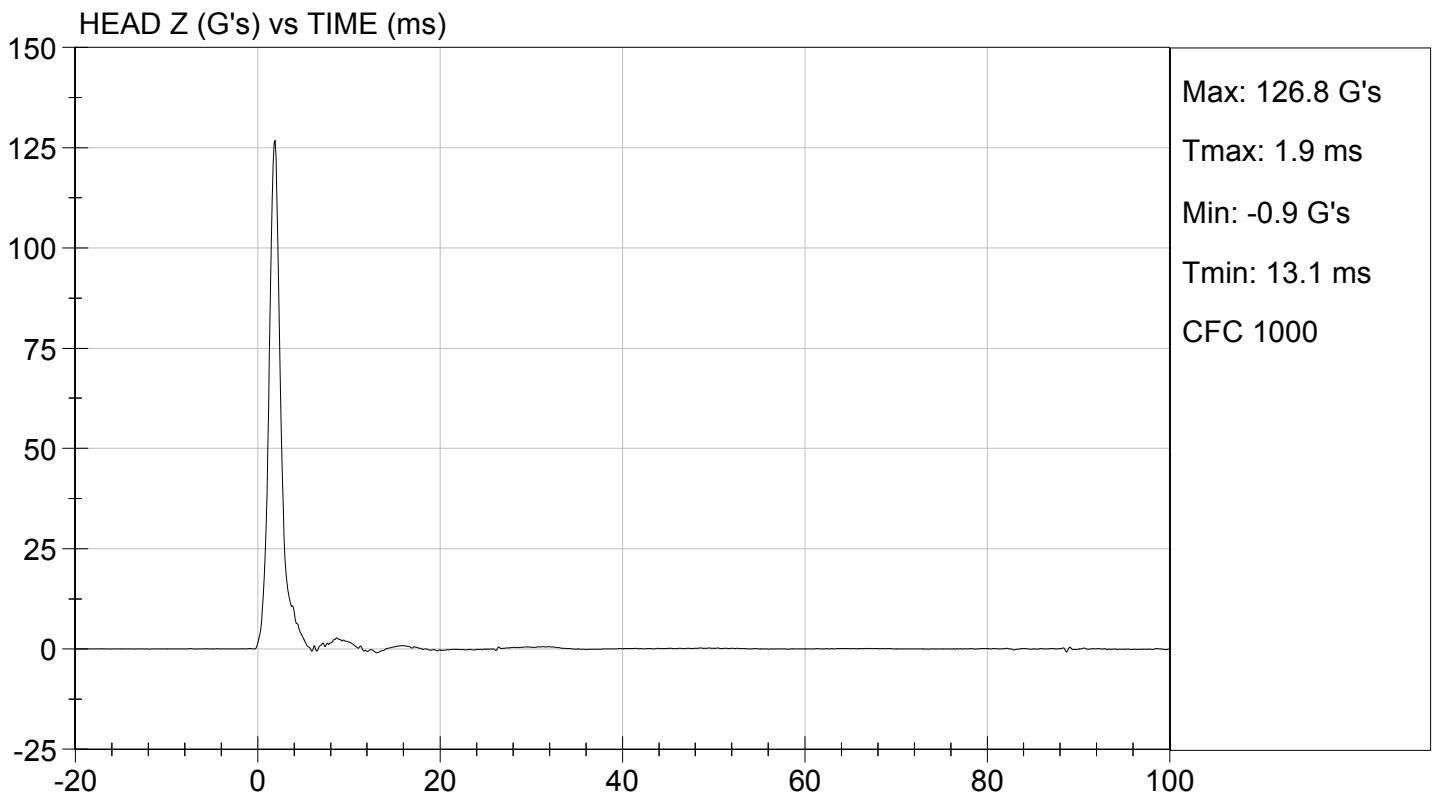
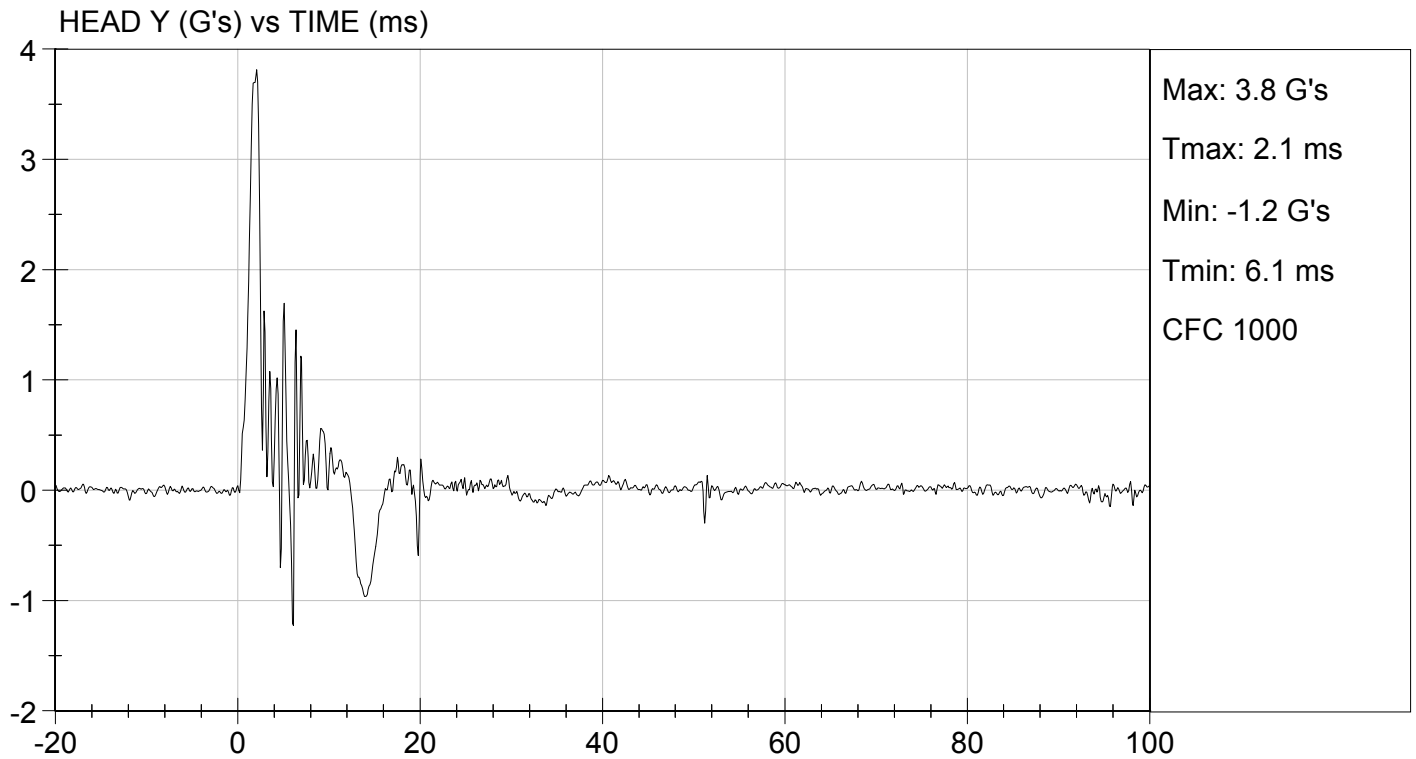

Laboratory Technician

11/05/2012

Test Date


Approved By



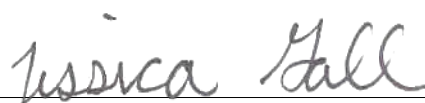


MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036

Test I.D: D124212

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.9	Pass
Laboratory Relative Humidity		%	10 to 70	27	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.39	Pass
	20 ms	G's	17.60 to 22.60	17.82	Pass
	30 ms	G's	12.50 to 18.50	14.4	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	14.3	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	36.0	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	66.7	Pass
	Time	ms	57.0 to 64.0	60.2	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	120.3	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	88.7	Pass
	Time	ms	47.0 to 58.0	49.6	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	100.9	Pass
Overall Test Results					Pass


 Laboratory Technician

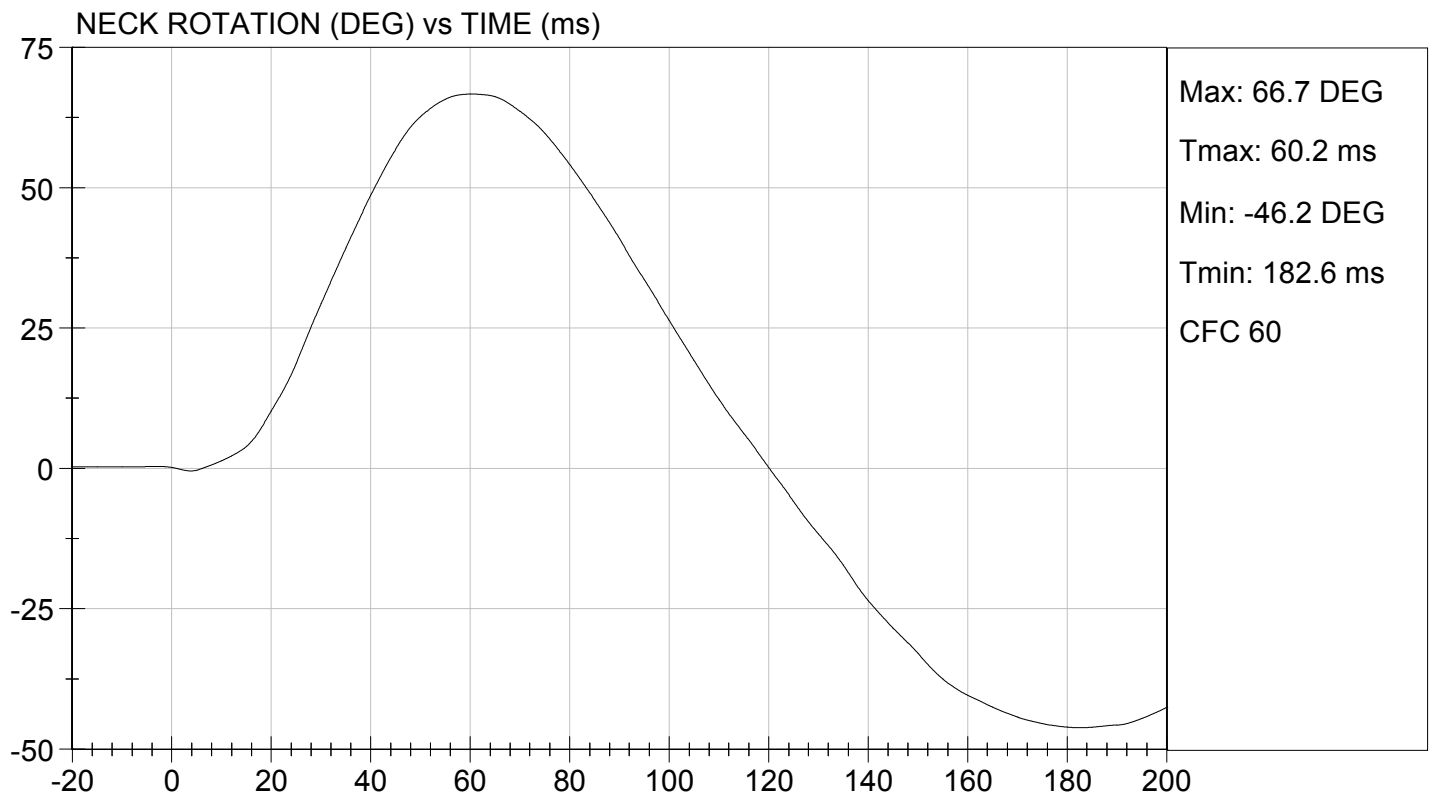
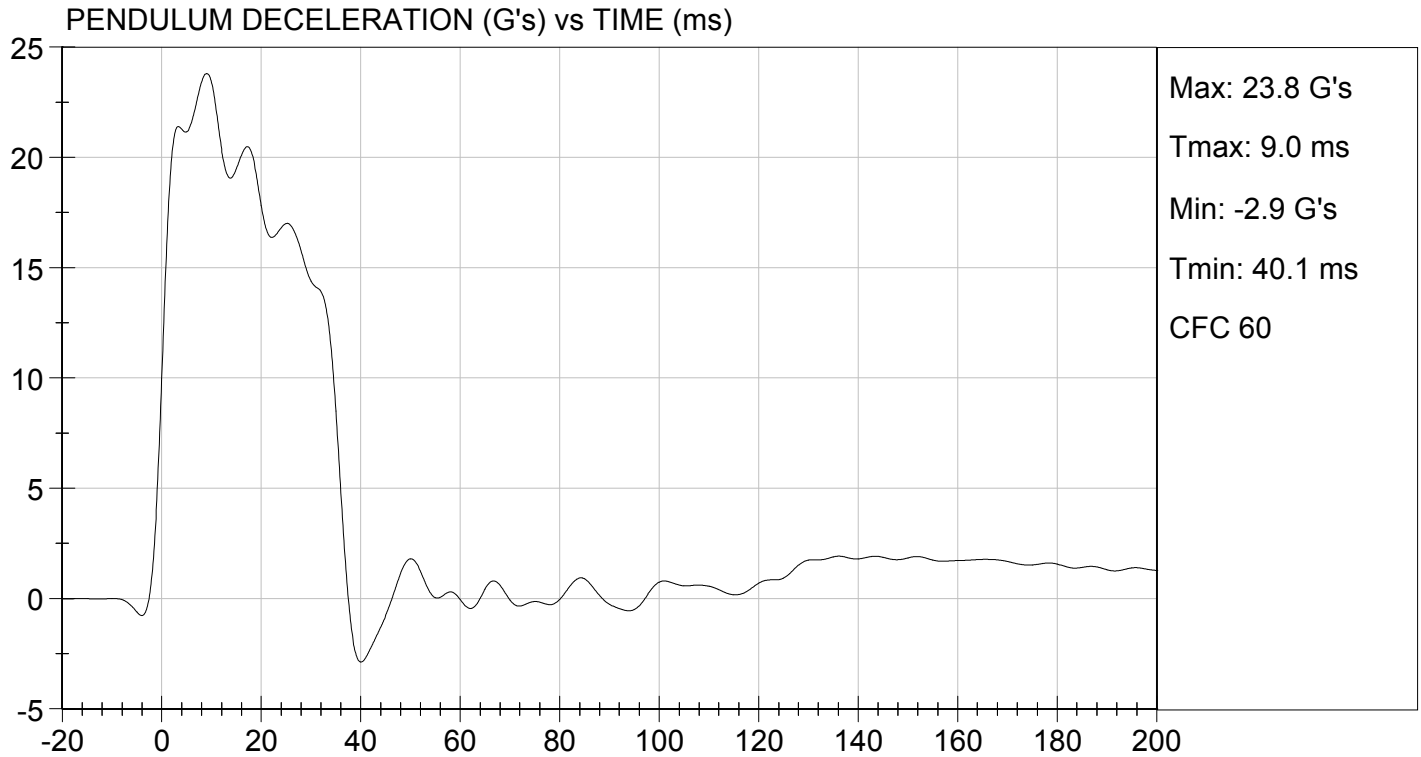
11/05/2012
 Test Date


 Approved By



TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

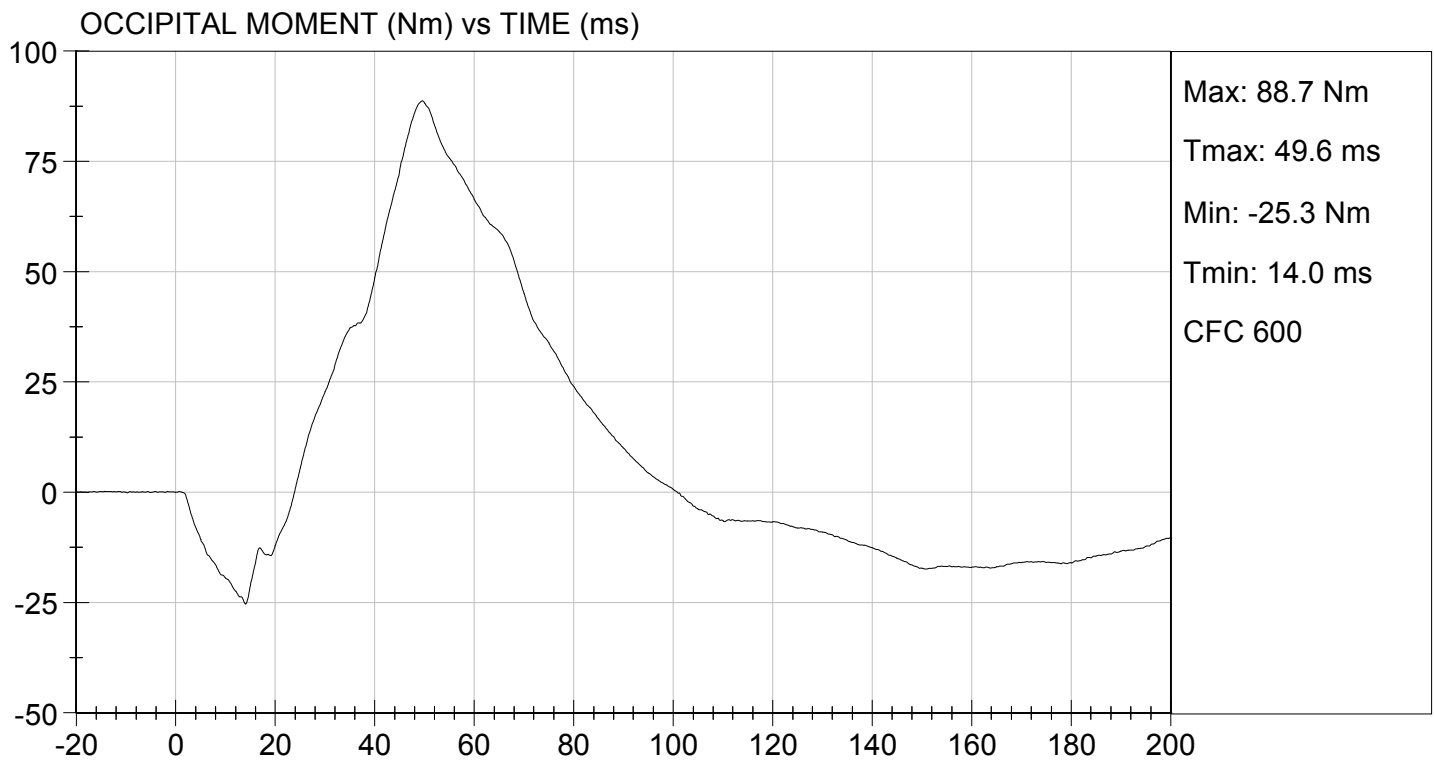
TEST DATE: 11/05/2012
TEST #: D124212





TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

TEST DATE: 11/05/2012
TEST #: D124212

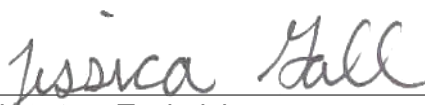


MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036

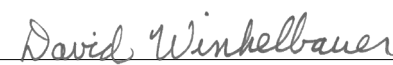
Test I.D: D124213

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.9	Pass
Laboratory Relative Humidity		%	10 to 70	27	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.05	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	20.10	Pass
	20 ms	G's	14.00 to 19.00	17.03	Pass
	30 ms	G's	11.00 to 16.00	14.04	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	14.0	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	38.2	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	97.1	Pass
	Time	ms	72.0 to 82.0	78.3	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	163.3	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-62.0	Pass
	Time	ms	65.0 to 79.0	70.7	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	146.3	Pass
Overall Test Results					Pass


 Laboratory Technician

11/05/2012

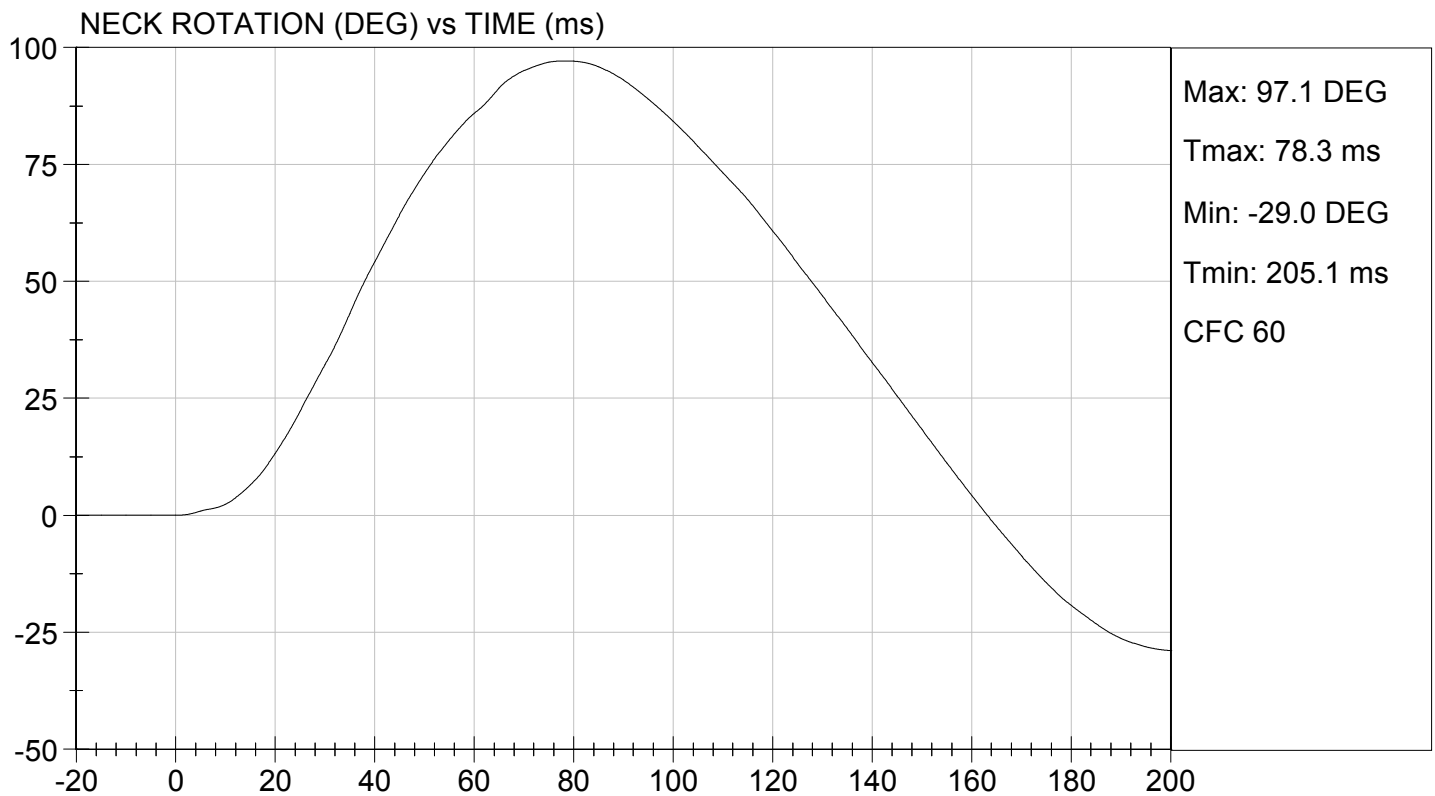
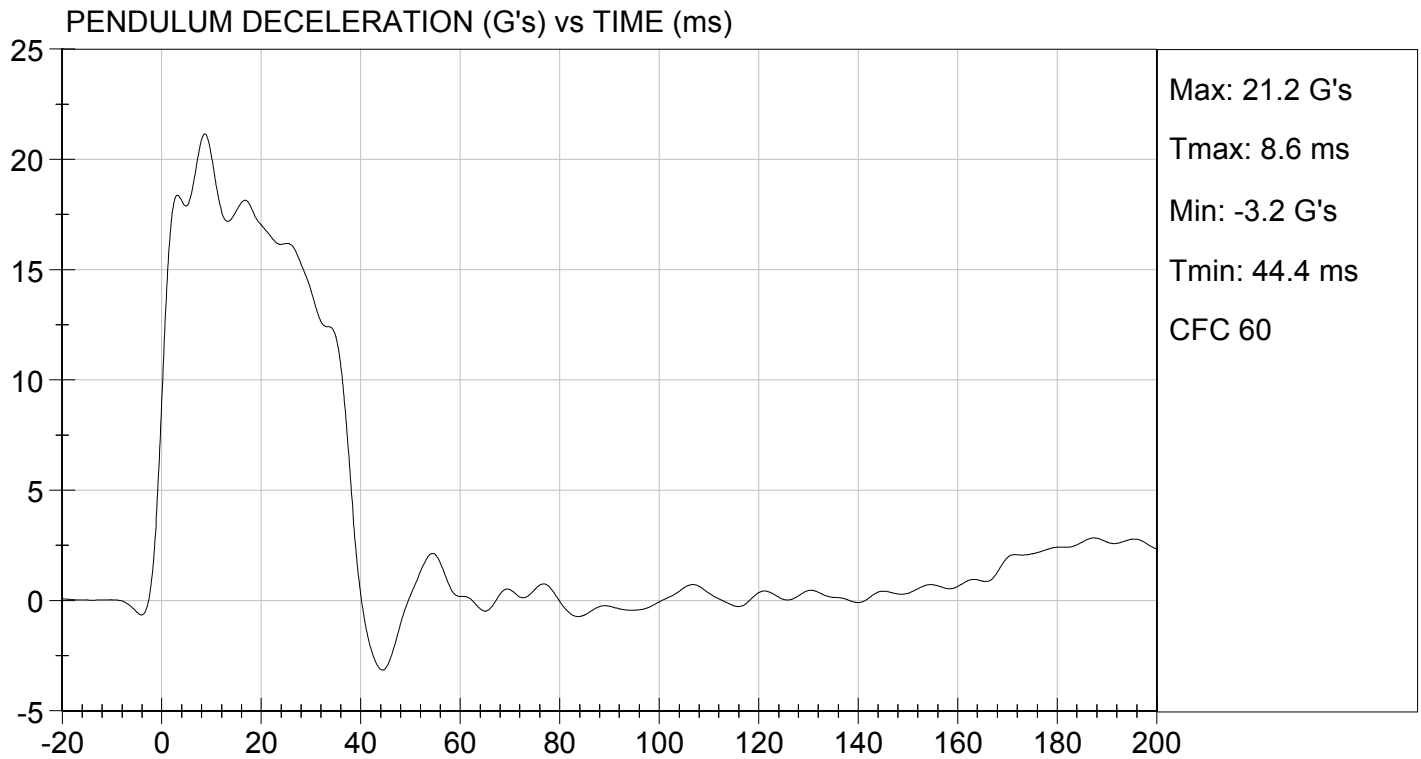
Test Date


 Approved By



TEST DESC: NECK EXTENSION
VELOCITY: 19.84 ft/s, 6.05 m/s

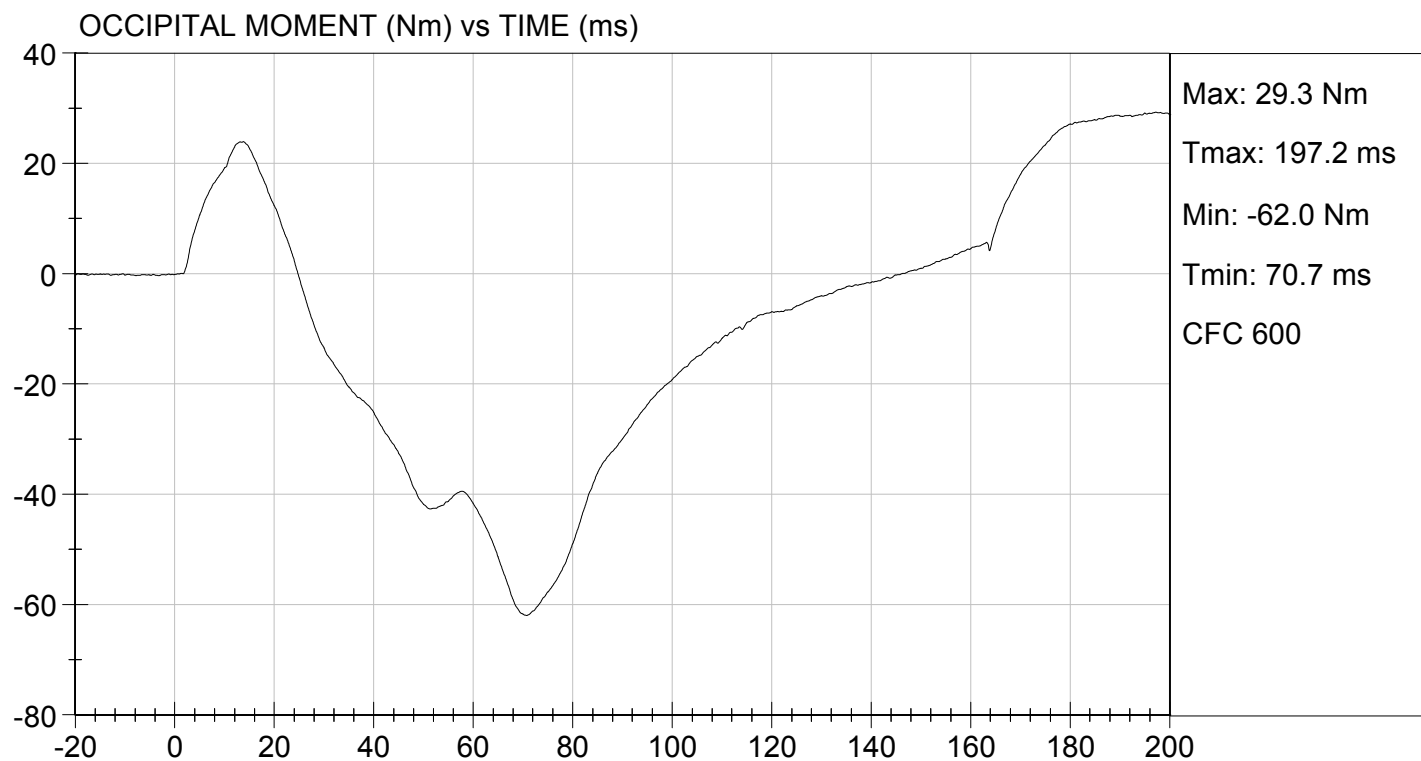
TEST DATE: 11/05/2012
TEST #: D124213





TEST DESC: NECK EXTENSION
VELOCITY: 19.84 ft/s, 6.05 m/s

TEST DATE: 11/05/2012
TEST #: D124213



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036

Test I.D: D124214

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	27	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,560	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.64	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Overall Test Results			Pass	


Laboratory Technician

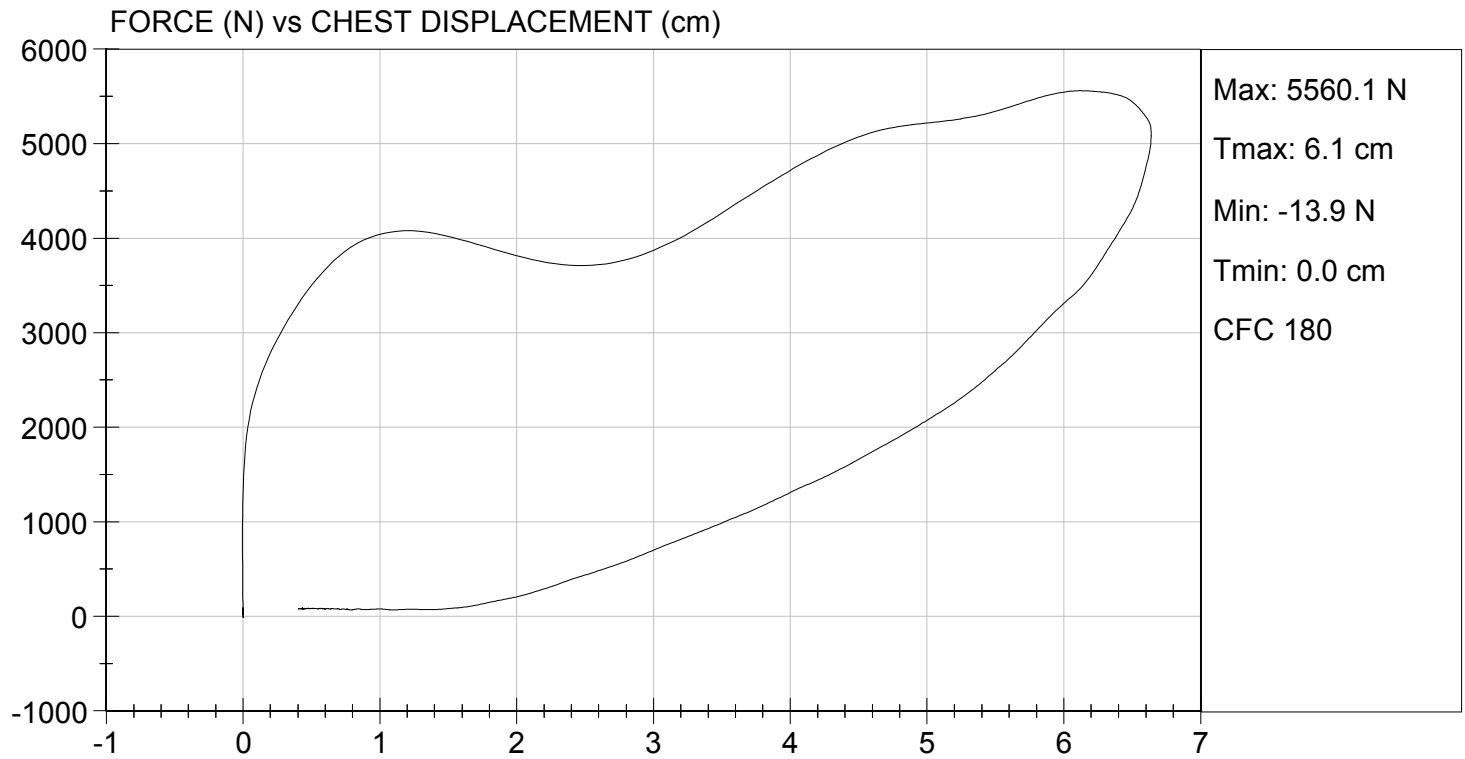
11/06/2012
Test Date


Approved By



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

TEST DATE: 11/06/2012
TEST #: D124214

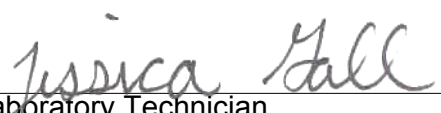


MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036

Test I.D: D124215

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	N	4715 to 5782	5,079	Pass
Overall Test Results				Pass


Laboratory Technician

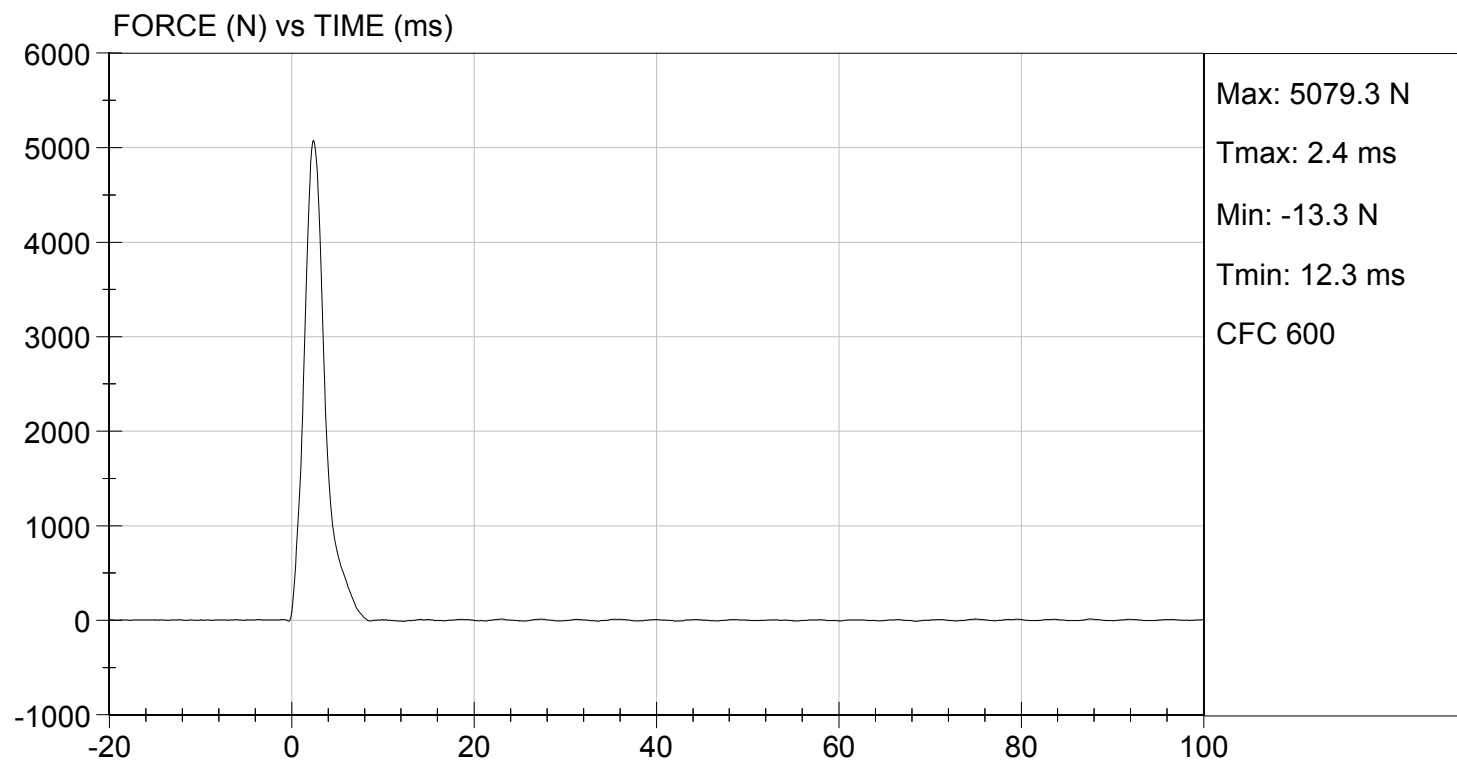
11/06/2012
Test Date


Approved By



TEST DESC: RIGHT KNEE
VELOCITY: 6.94 ft/s, 2.12 m/s

TEST DATE: 11/06/2012
TEST #: D124215



MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036

Test I.D: D124216

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Probe Velocity	m/s	2.07 to 2.13	2.09	Pass
Peak Probe Force	N	4715 to 5782	5,253	Pass
Overall Test Results				Pass


Laboratory Technician

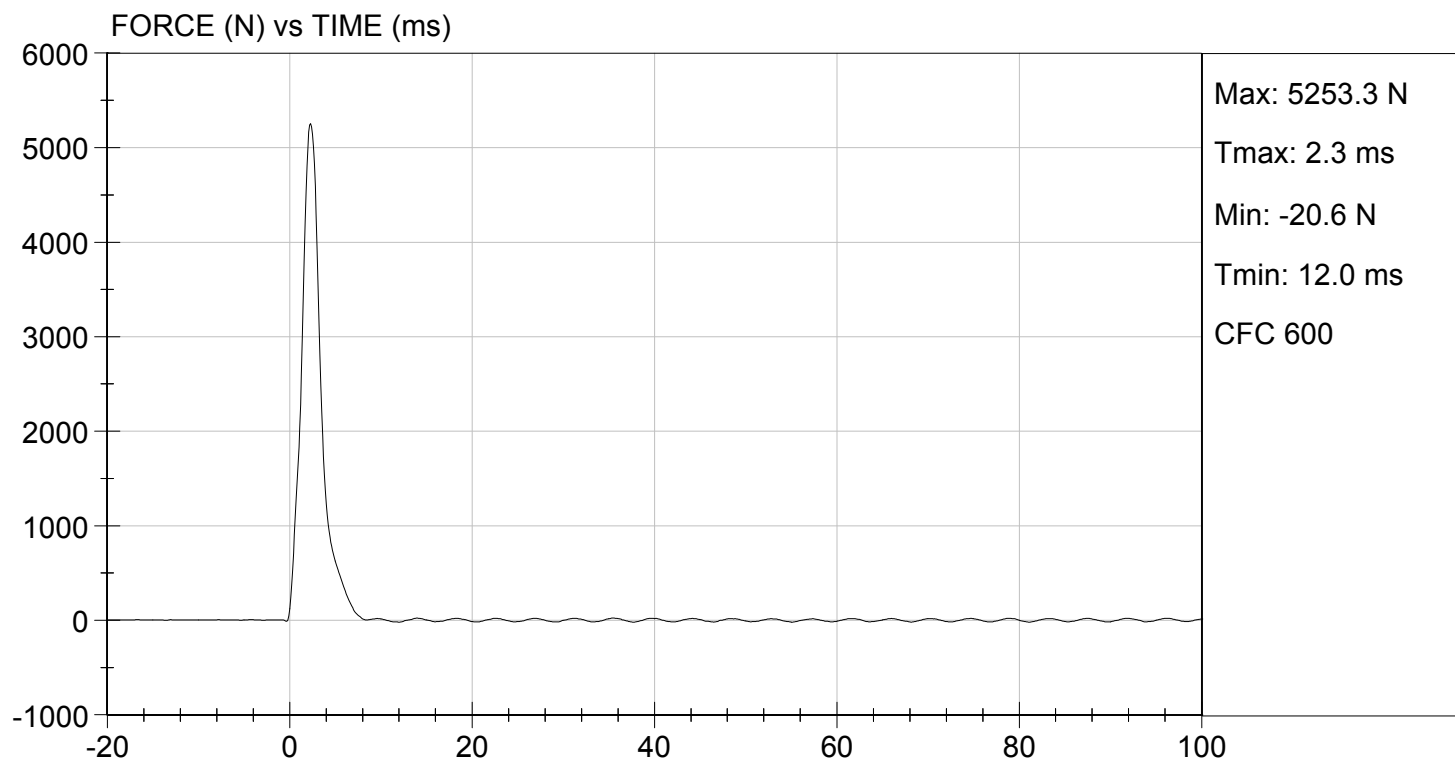
11/06/2012
Test Date


Approved By



TEST DESC: LEFT KNEE
VELOCITY: 6.86 ft/s, 2.09 m/s

TEST DATE: 11/06/2012
TEST #: D124216



MGA RESEARCH CORPORATION
HIP-FEMUR FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036

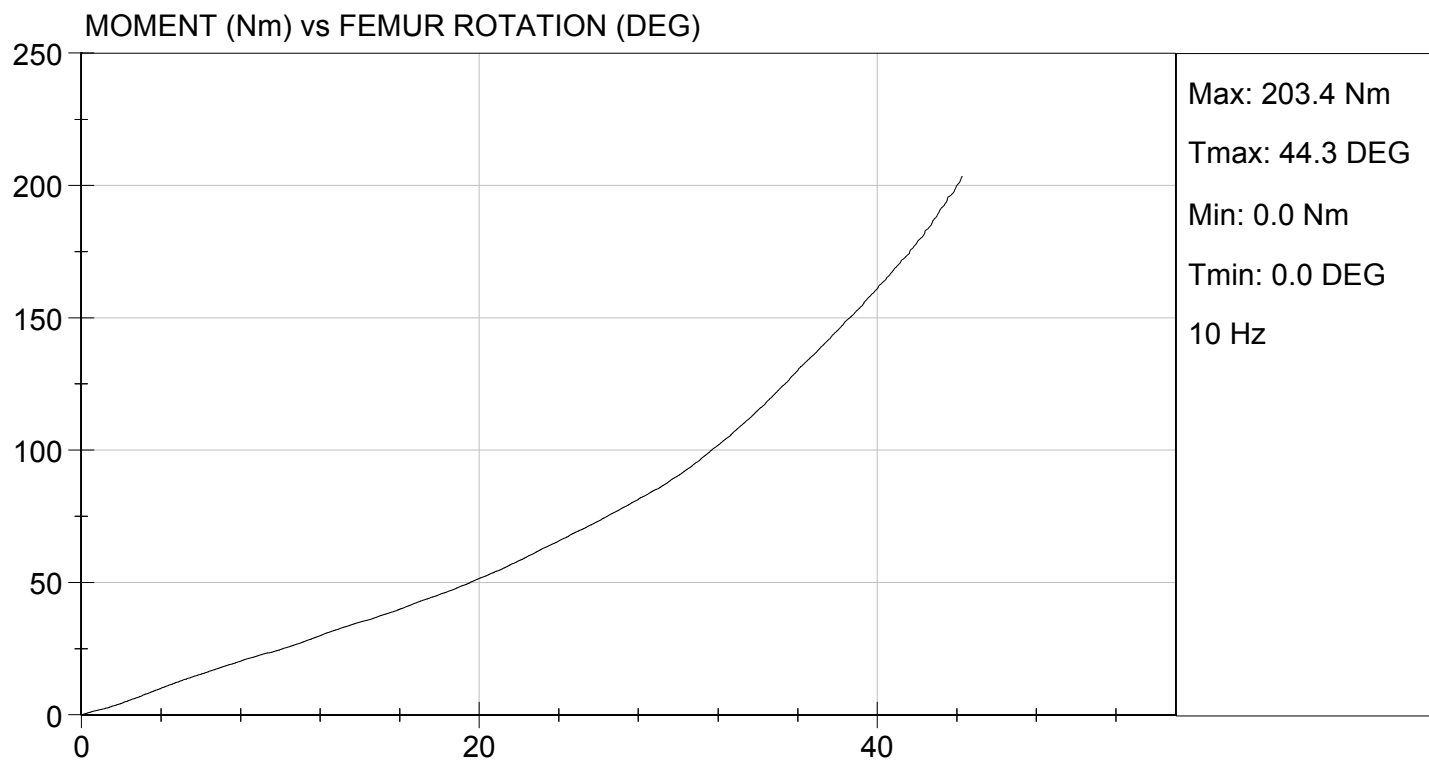
Test I.D: D124210

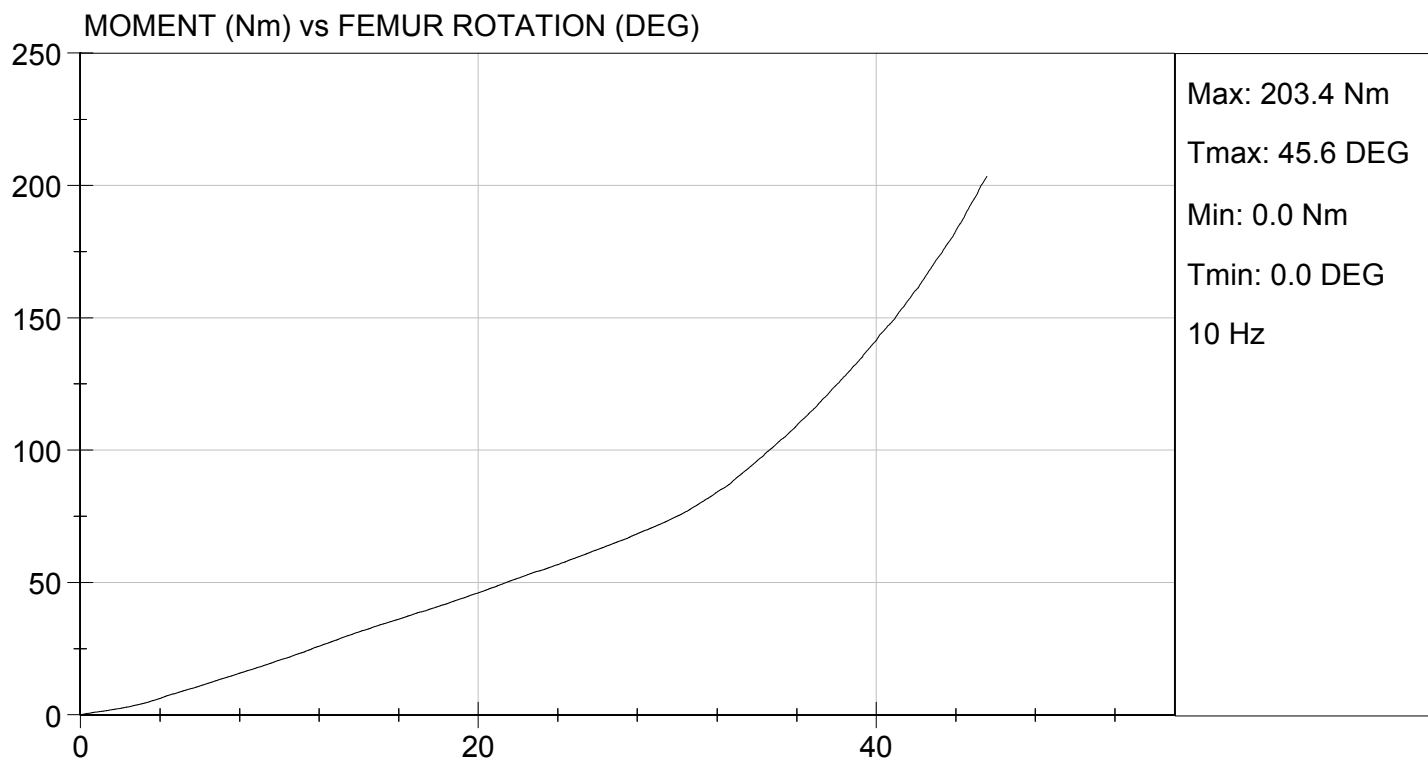
Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.0	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	27	27	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.2	6.3	Pass
30 Degrees	Nm	94.9 Nm Max	90.4	75.1	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	44.3	45.6	Pass
Overall Test Results					Pass


 Laboratory Technician

11/05/2012
 Test Date


 Approved By





Hybrid III, 5th External Measurements
SN: 634

HYBRID III, PART 572, SUBPART O EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	774.7-800.1	784.6
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	449.0
C	H-POINT HEIGHT	Reference	81.3-86.3	85.0
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	145.0
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	79.2
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	125.6
G	BACK OF ELBOW TO WRIST PIVOT	back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	243.9-259.1	253.4
H	HEAD BACK TO BACKLINE	Back of Skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	45.0
I	SHOULDER TO- ELBOW LENGTH	Measure from the highest point on top of the shoulder clevis to the lowest part of the flesh on the elbow in line with the elbow pivot bolt.	276.8-297.2	277.8
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	197.5
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	520.7-546.1	541.4
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376.0	362.1
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	400.4
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	414-439.4	428.6

HYBRID III, SUBPART O EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 304.8 ± 5.1 mm above seat surface	175.3-190.5	181.6
eP	FOOT LENGTH	Tip of toe to rear of heel	218.5-233.7	224.7
Q	STANDING HEIGHT	(THEORETICAL)	1501.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	The rear surface of the buttocks to the knee pivot bolt	457.2-482.6	482.0
S	HEAD BREADTH	The widest part of the head	137.1-147.3	139.6
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	179.2
U	HIP BREADTH	The widest part of the hip	299.7-314.9	306.1
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	355.5
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	90.0
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	528.3-548.7	540.6
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	868.7
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	786.8
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	332.7-358.1	345.4
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	160.1-170.2	165.1

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test ID: D123961

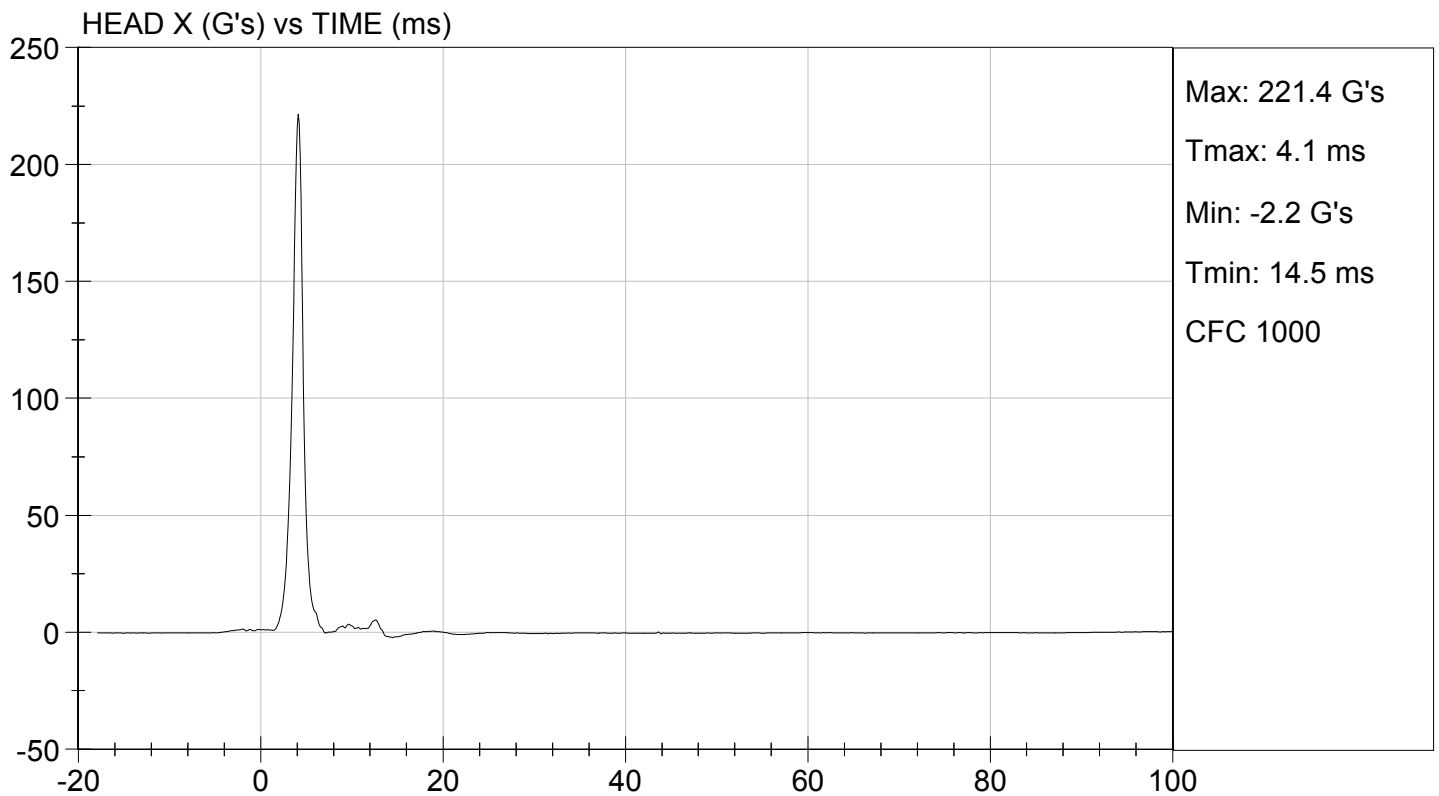
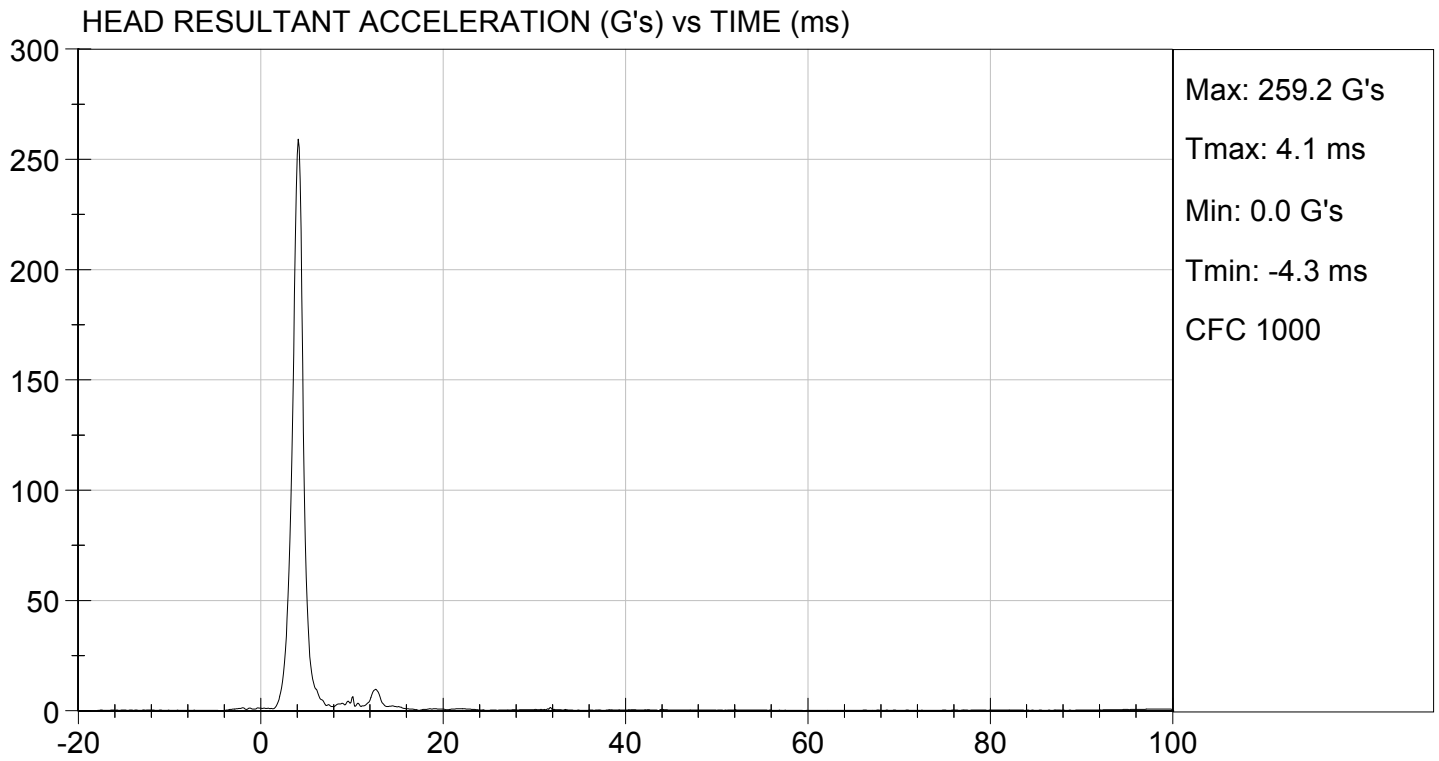
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Peak Resultant Acceleration	G's	250 to 300	259	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	4.0	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
			Overall Test Results	Pass

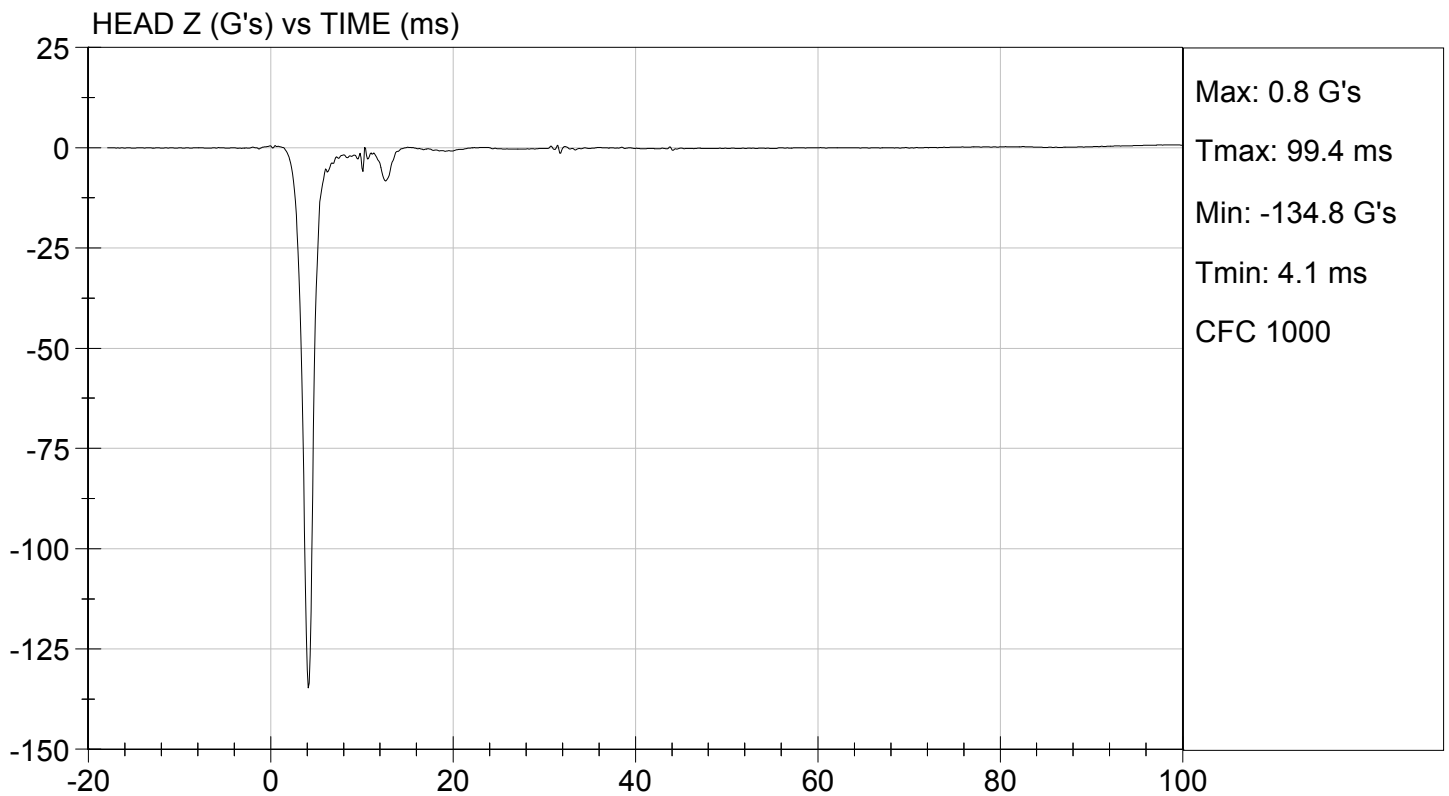
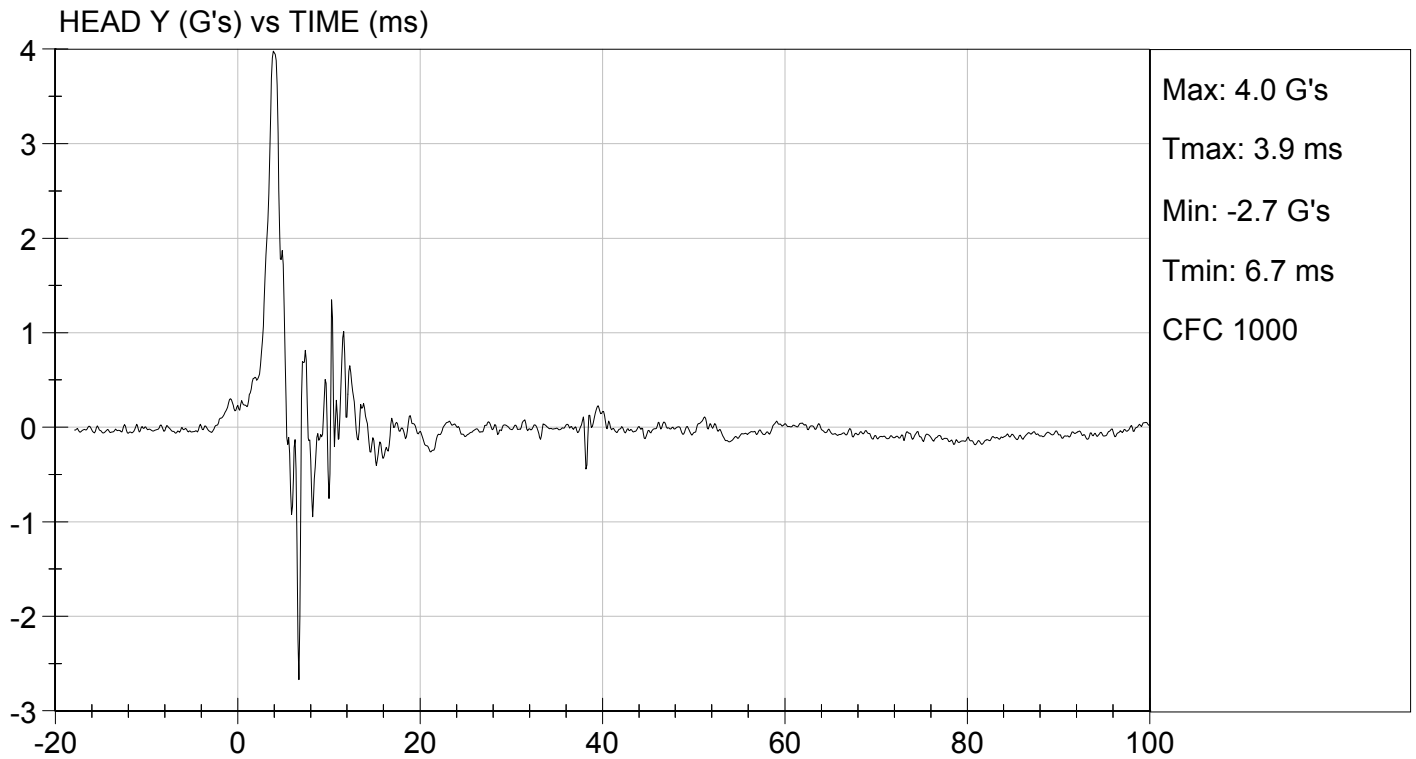

Laboratory Technician

10/17/2012

Test Date


Approved By





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D123962

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity		%	10 to 70	45	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.3	Pass
	20 ms	m/s	4.0 to 5.0	4.7	Pass
	30 ms	m/s	5.8 to 7.0	6.4	Pass
D Plane Rotation	Max	deg	77 to 91	87	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	71	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	86	Pass
Overall Results					Pass

Jessica Hall
 Laboratory Technician

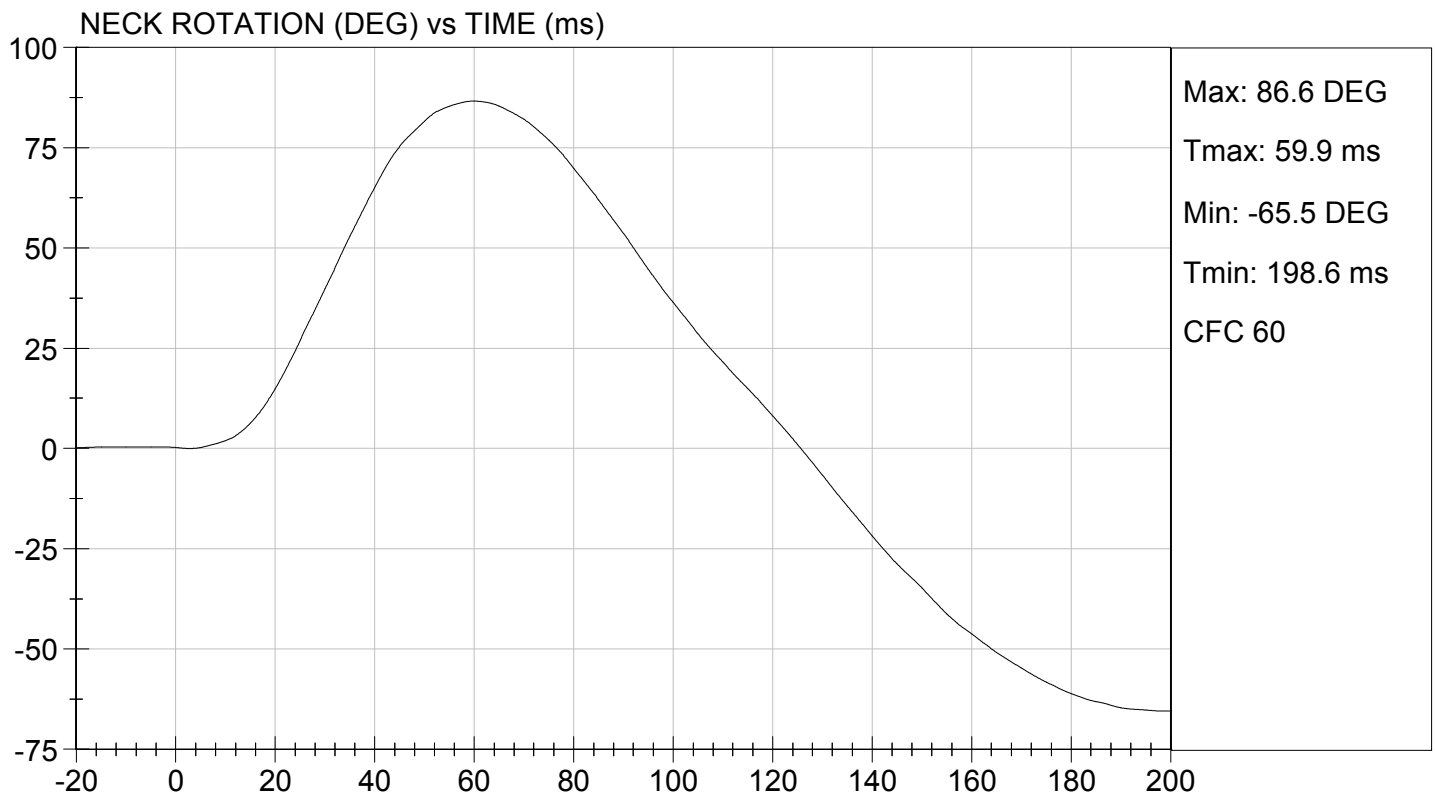
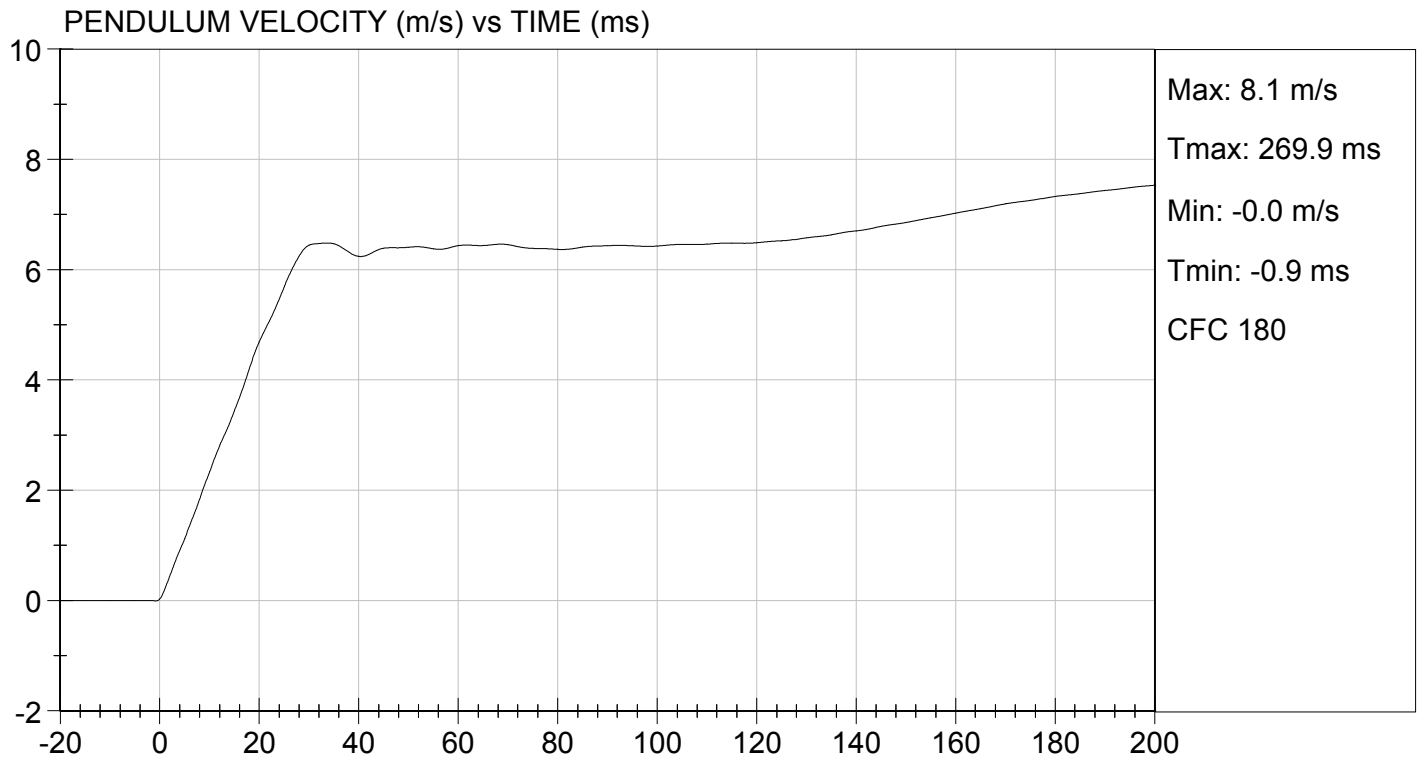
10/17/2012
 Test Date

David Winkelbauer
 Approved By



TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

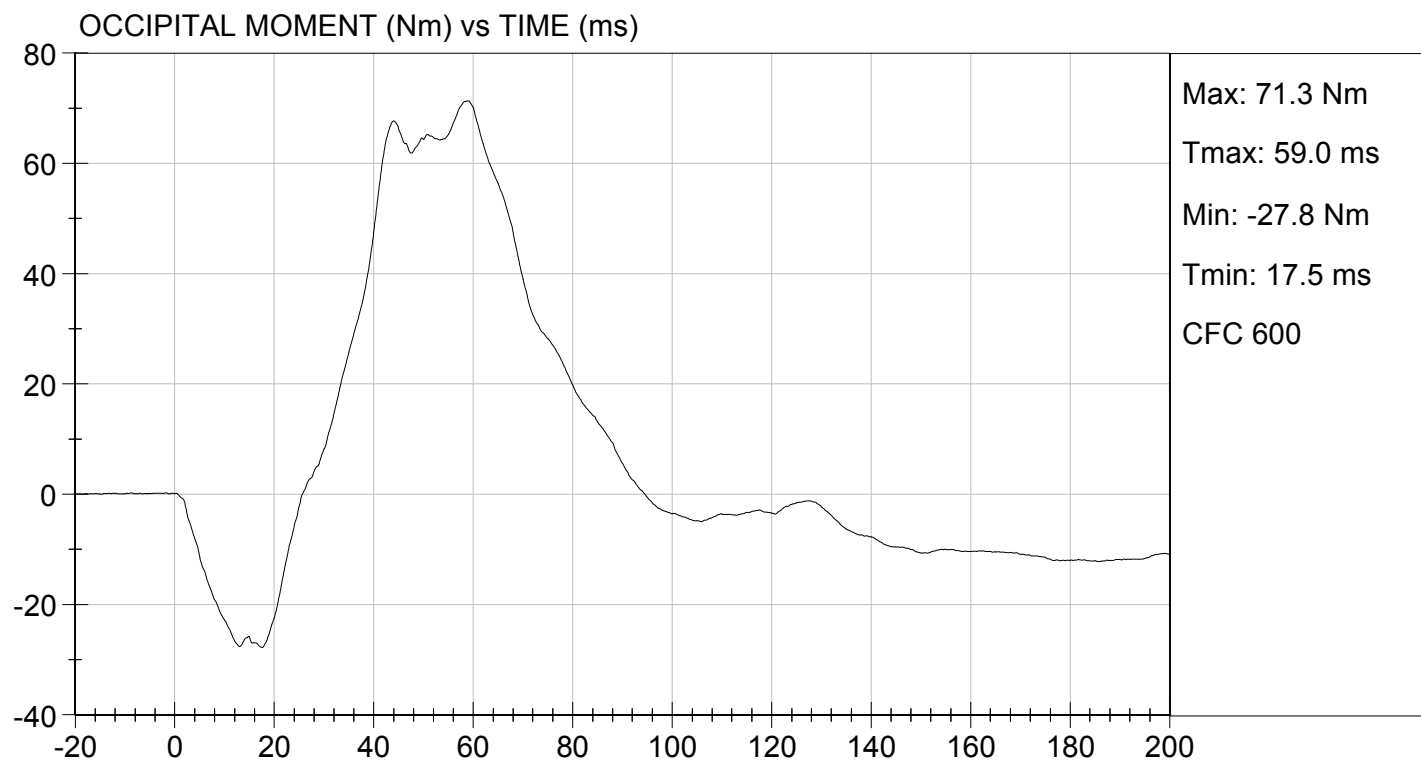
TEST DATE: 10/17/2012
TEST #: D123962





TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

TEST DATE: 10/17/2012
TEST #: D123962



MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D123963

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity		%	10 to 70	45	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.6	Pass
	20 ms	m/s	3.1 to 3.9	3.3	Pass
	30 ms	m/s	4.6 to 5.6	4.8	Pass
D Plane Rotation	Max	deg	99 to 114	107	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-59	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	95	Pass
Overall Results					Pass

Jessica Gall
Laboratory Technician

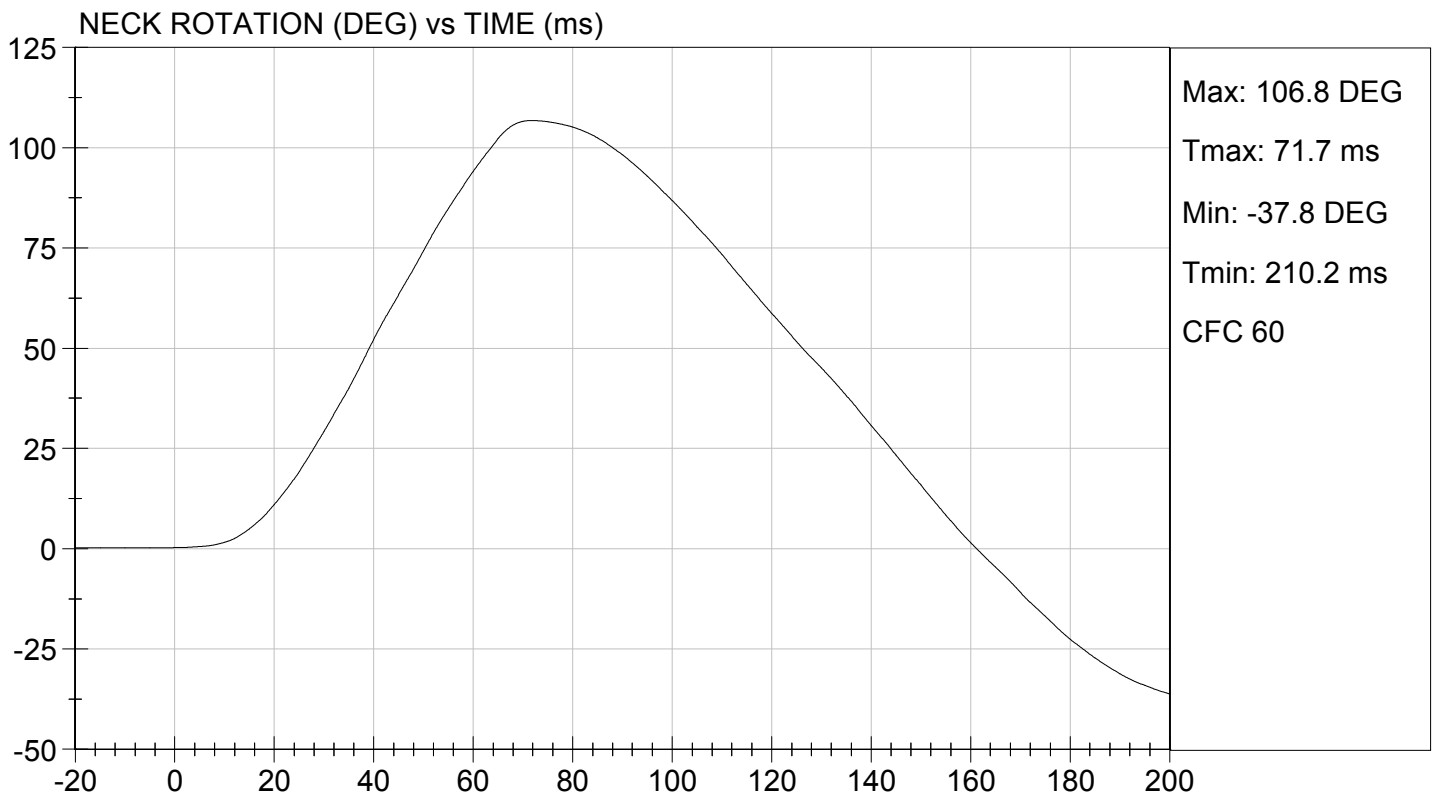
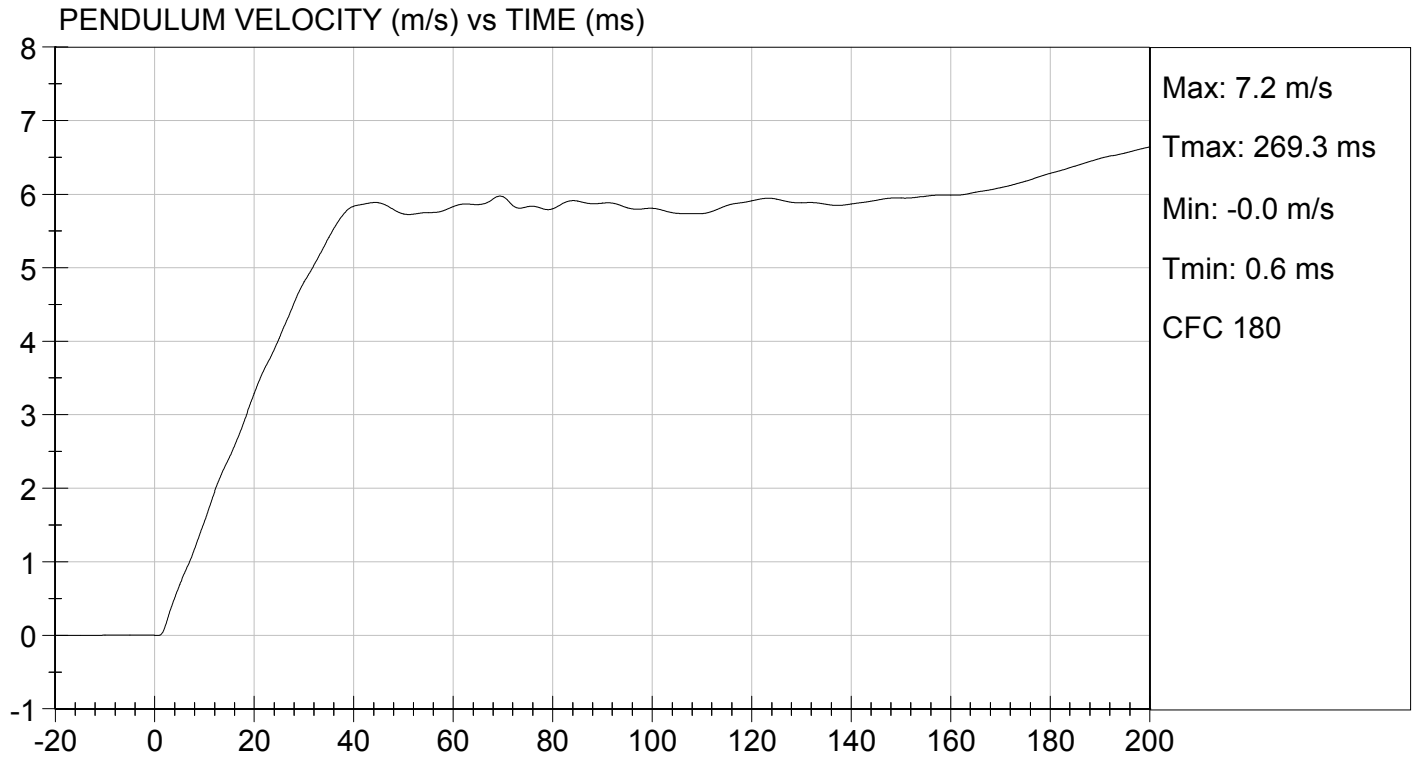
10/17/2012
Test Date

David Winkelbauer
Approved By



TEST DESC: NECK EXTENSION
VELOCITY: 20.08 ft/s, 6.12 m/s

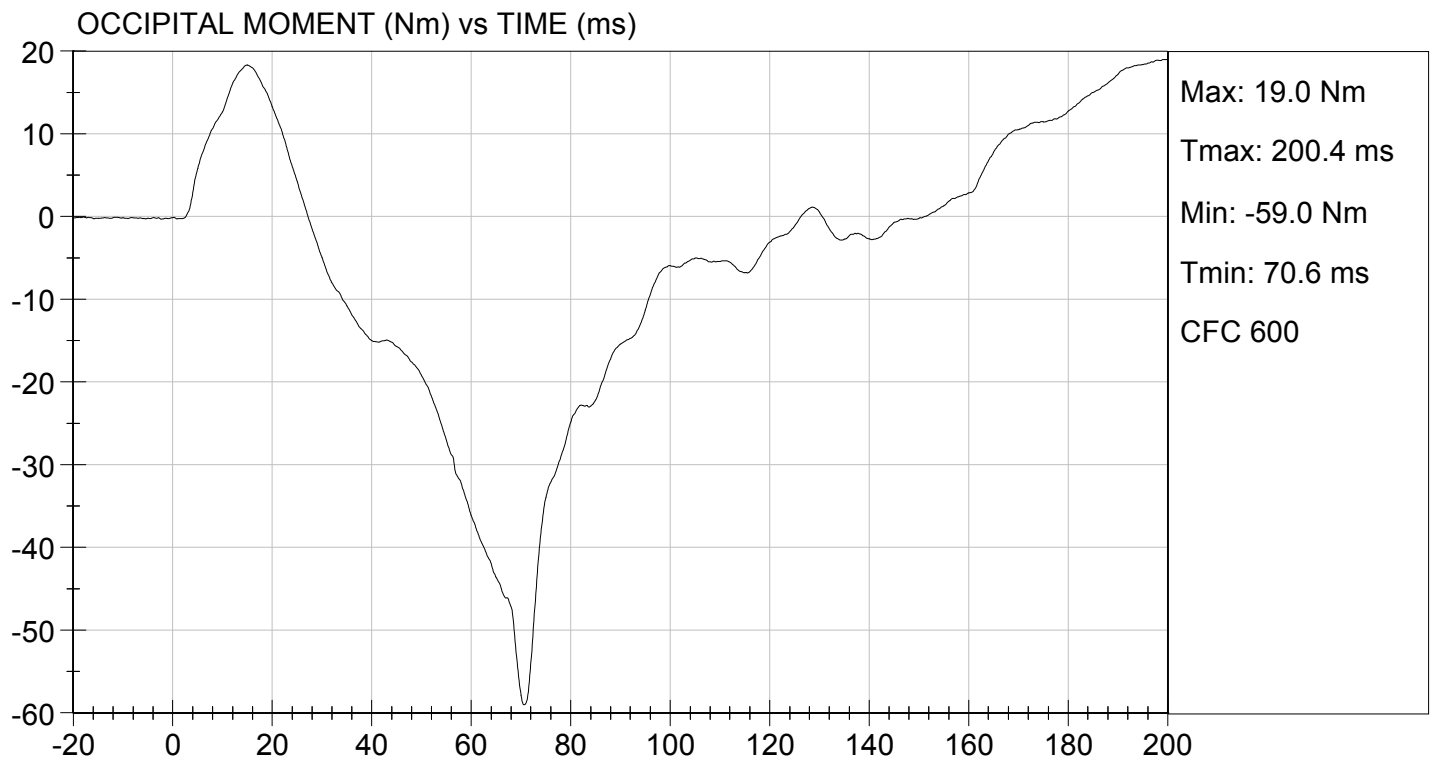
TEST DATE: 10/17/2012
TEST #: D123963





TEST DESC: NECK EXTENSION
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 10/17/2012
TEST #: D123963

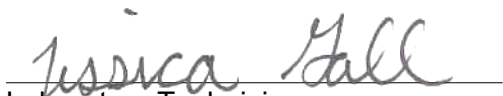


MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

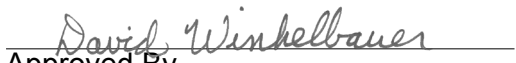
Test I.D: D123964

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	22.0	Pass
Relative Humidity	%	10 to 70	49	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	51	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4186	Pass
Internal Hysteresis	%	69 to 85	73	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4191	Pass
Overall Test Results				Pass


Laboratory Technician

10/17/2012

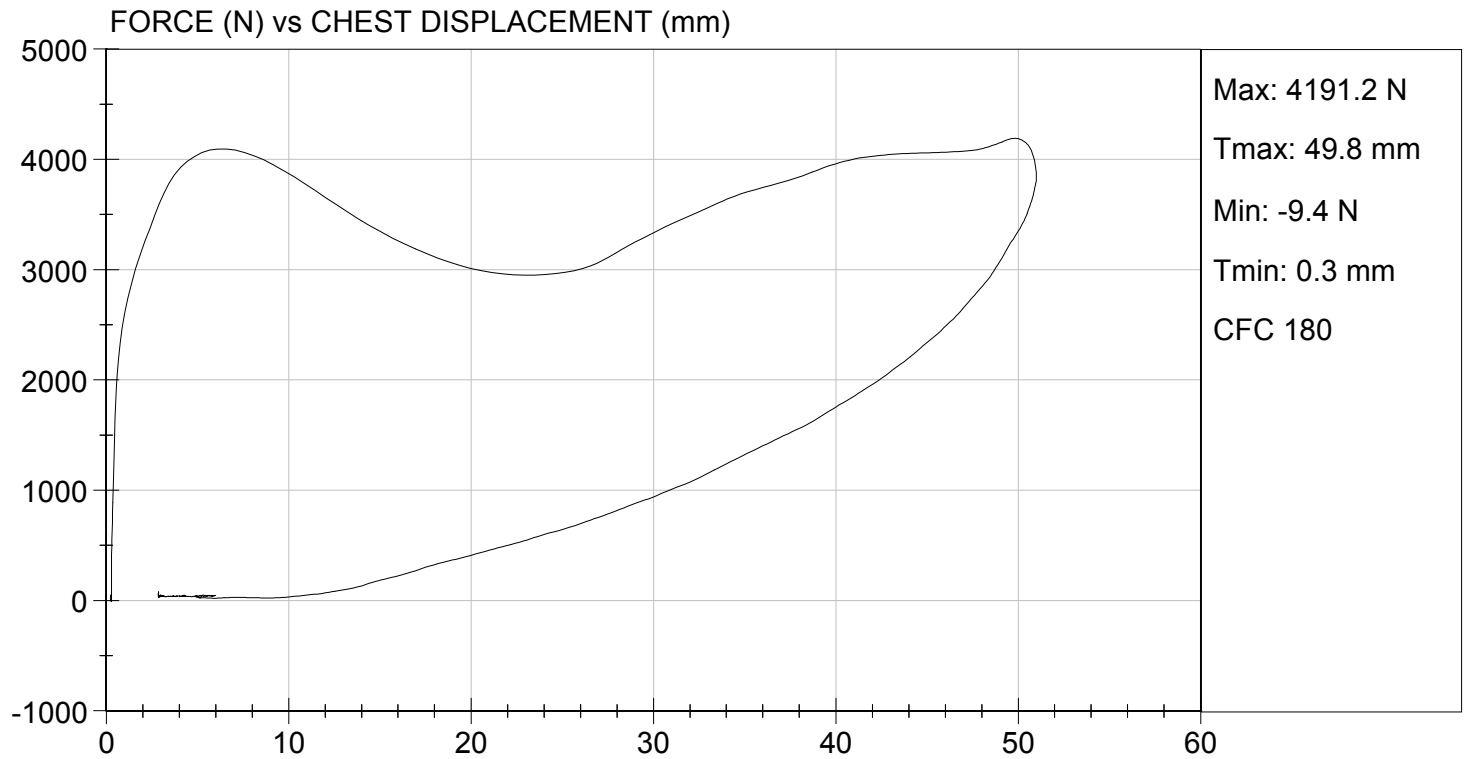
Test Date


Approved By



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

TEST DATE: 10/17/2012
TEST #: D123964



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D123965

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3953	Pass
Overall Test Results				Pass


Laboratory Technician

10/17/2012

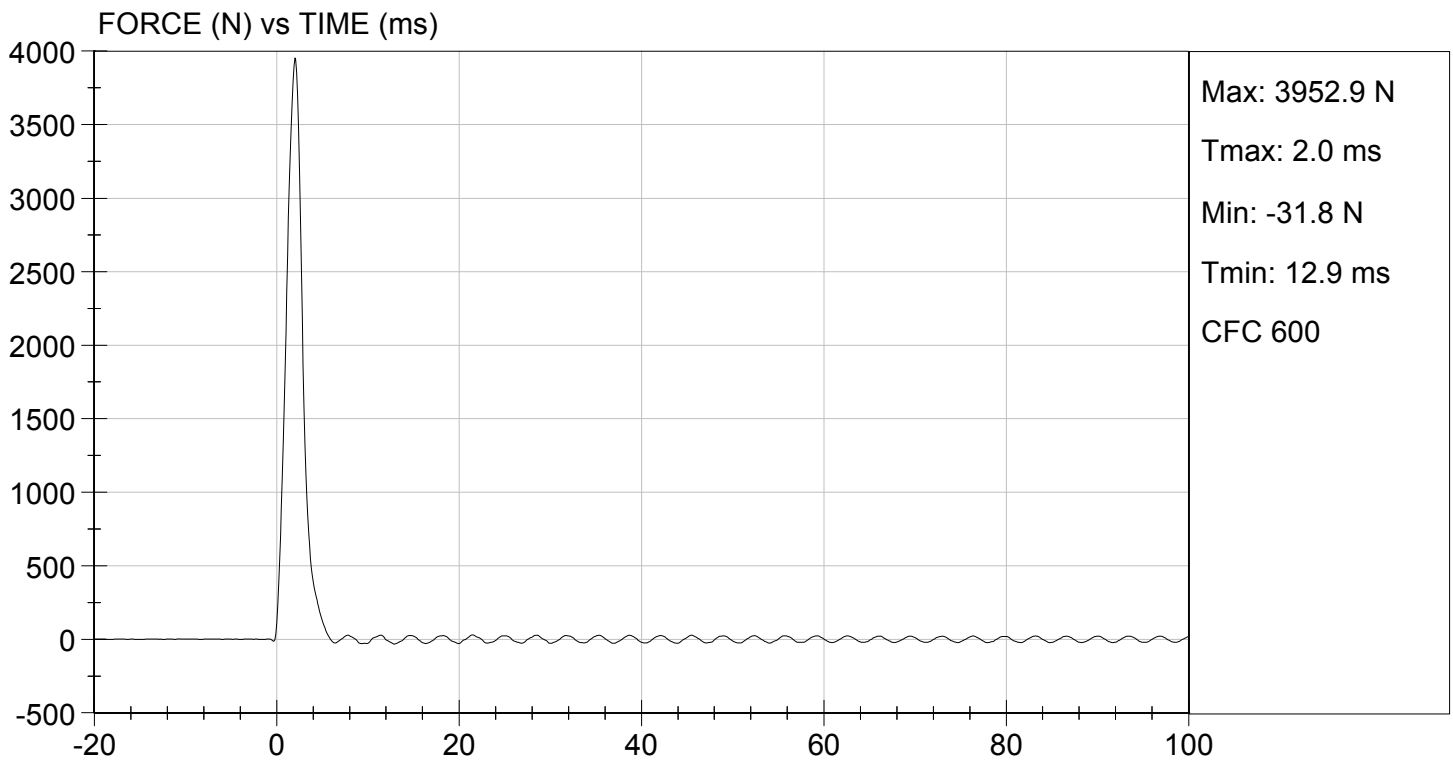
Test Date


Approved By



TEST DESC: RIGHT KNEE
VELOCITY: 6.97 ft/s, 2.12 m/s

TEST DATE: 10/17/2012
TEST #: D123965



MGA RESEARCH CORPORATION

**LEFT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE**

ATD Serial No: 634

Test I.D: D123966

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3877	Pass
Overall Test Results				Pass

Jessica Gall
Laboratory Technician

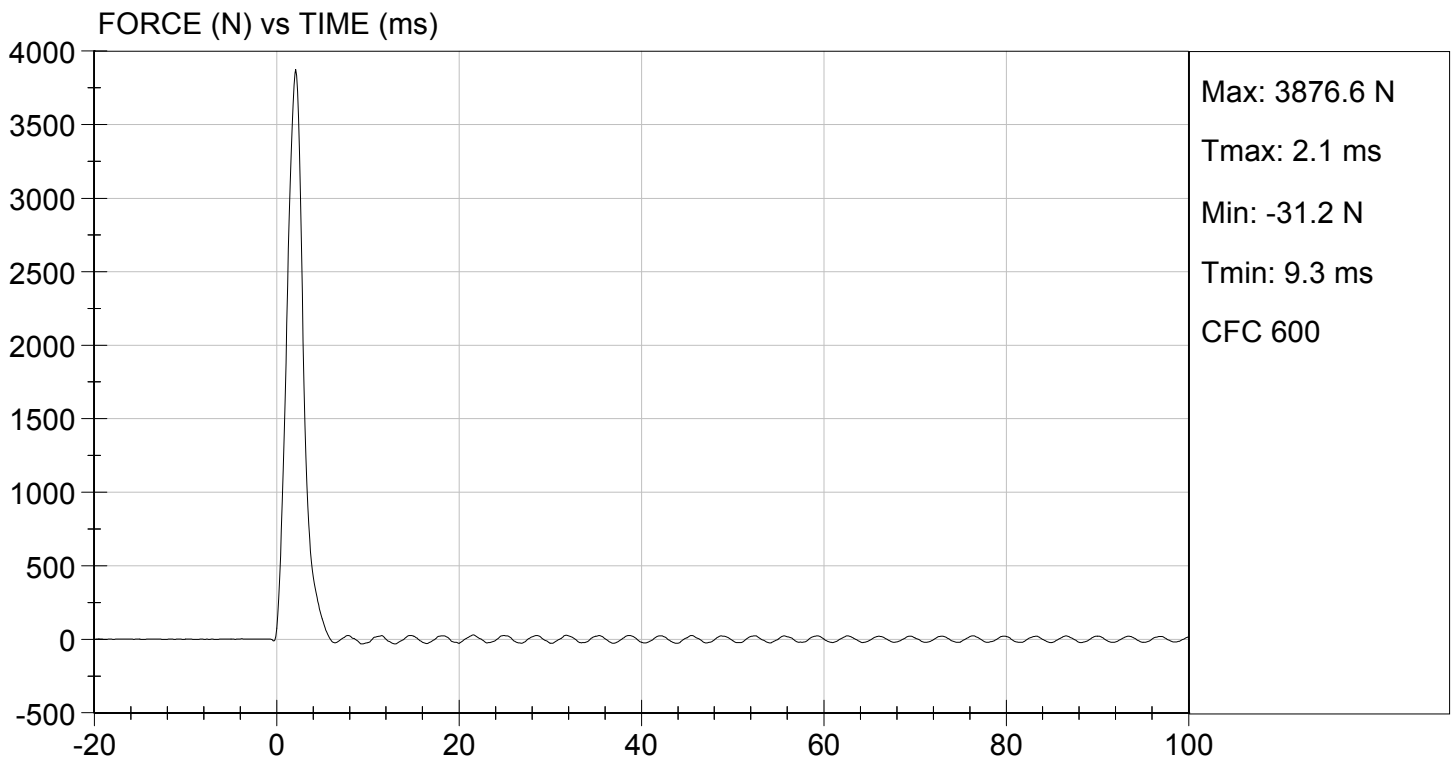
10/17/2012
Test Date

David Winkelbauer
Approved By



TEST DESC: LEFT KNEE
VELOCITY: 6.97 ft/s, 2.12 m/s

TEST DATE: 10/17/2012
TEST #: D123966



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D123967

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	44	Pass
Initial Angle	deg	0 to 20	16	Pass
Return Angle	deg	+/- 8	3	Pass
Force at 45 deg	N	320 to 390	348	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.9	Pass
Overall Result				Pass

Jessica Hall
Laboratory Technician

10/17/2012

Test Date

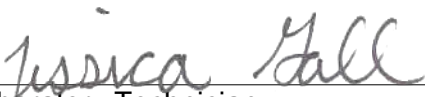
David Winkelbauer
Approved By

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test ID: D124221

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	27	Pass
Peak Resultant Acceleration	G's	250 to 300	258	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	10.0	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

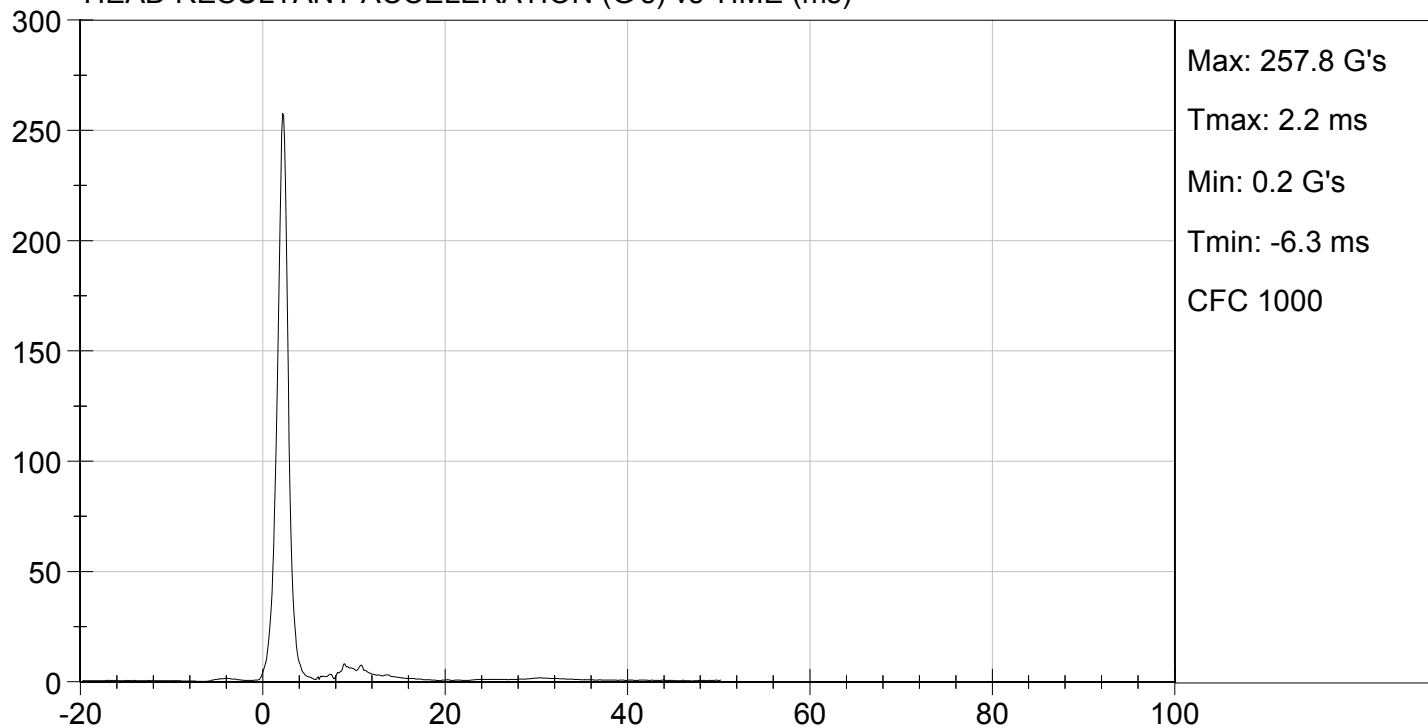
11/06/2012

Test Date

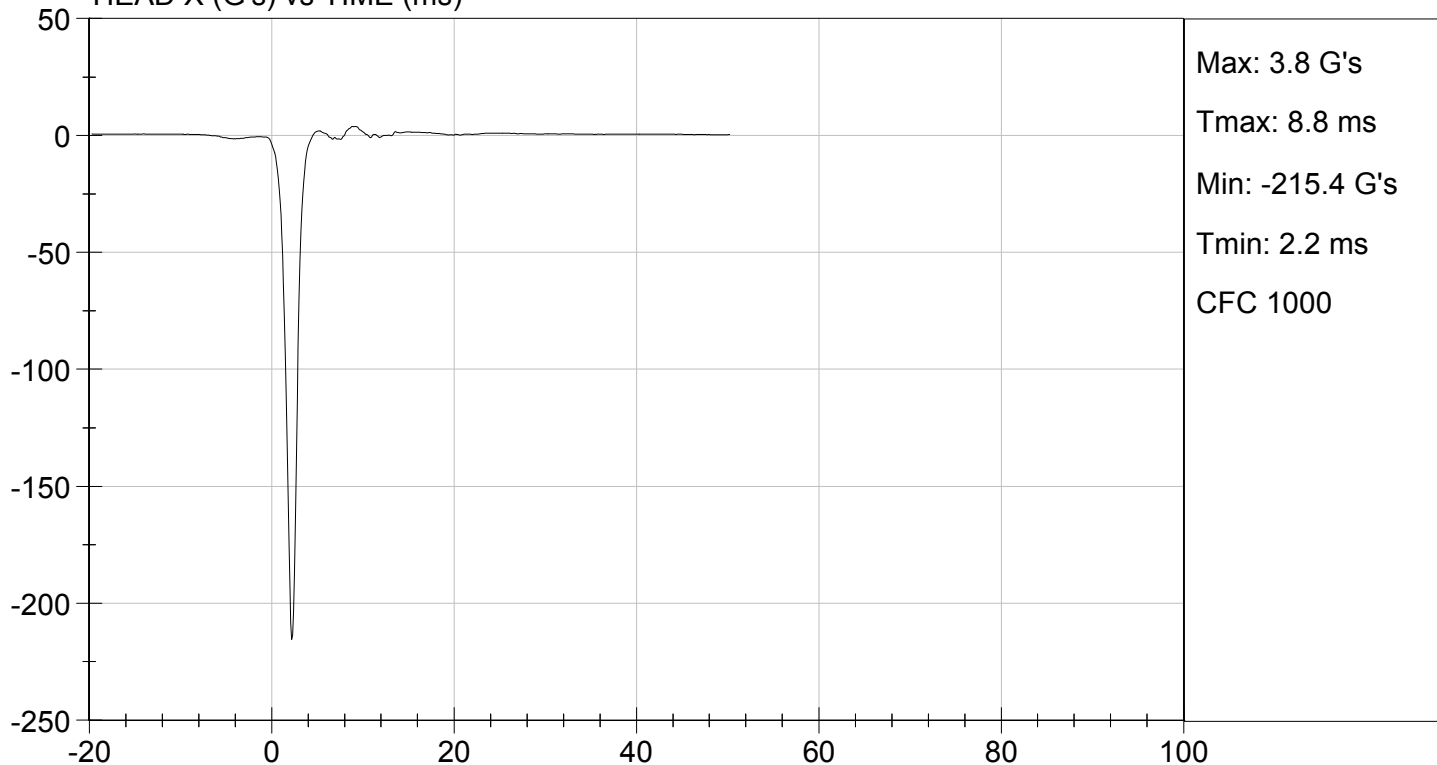

Approved By

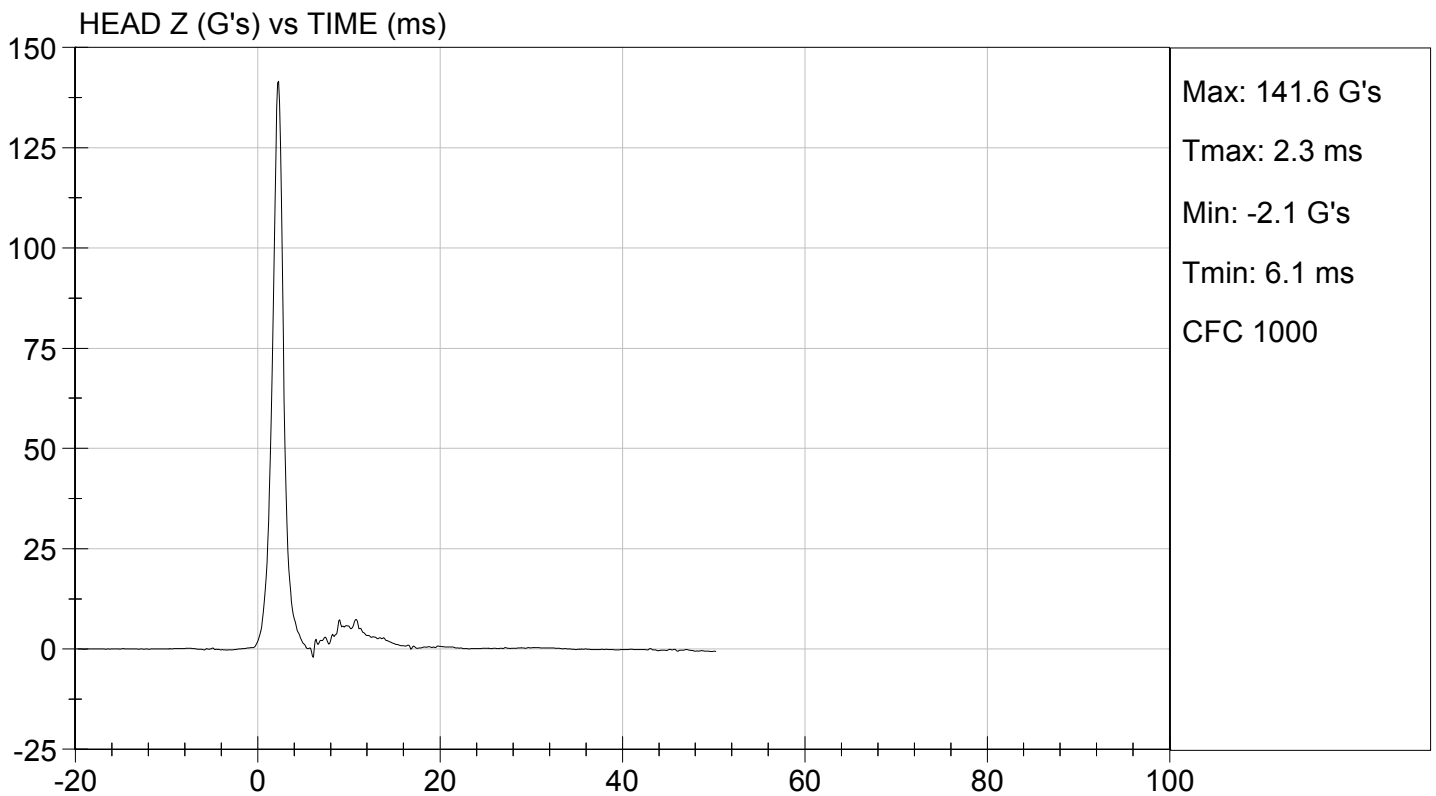
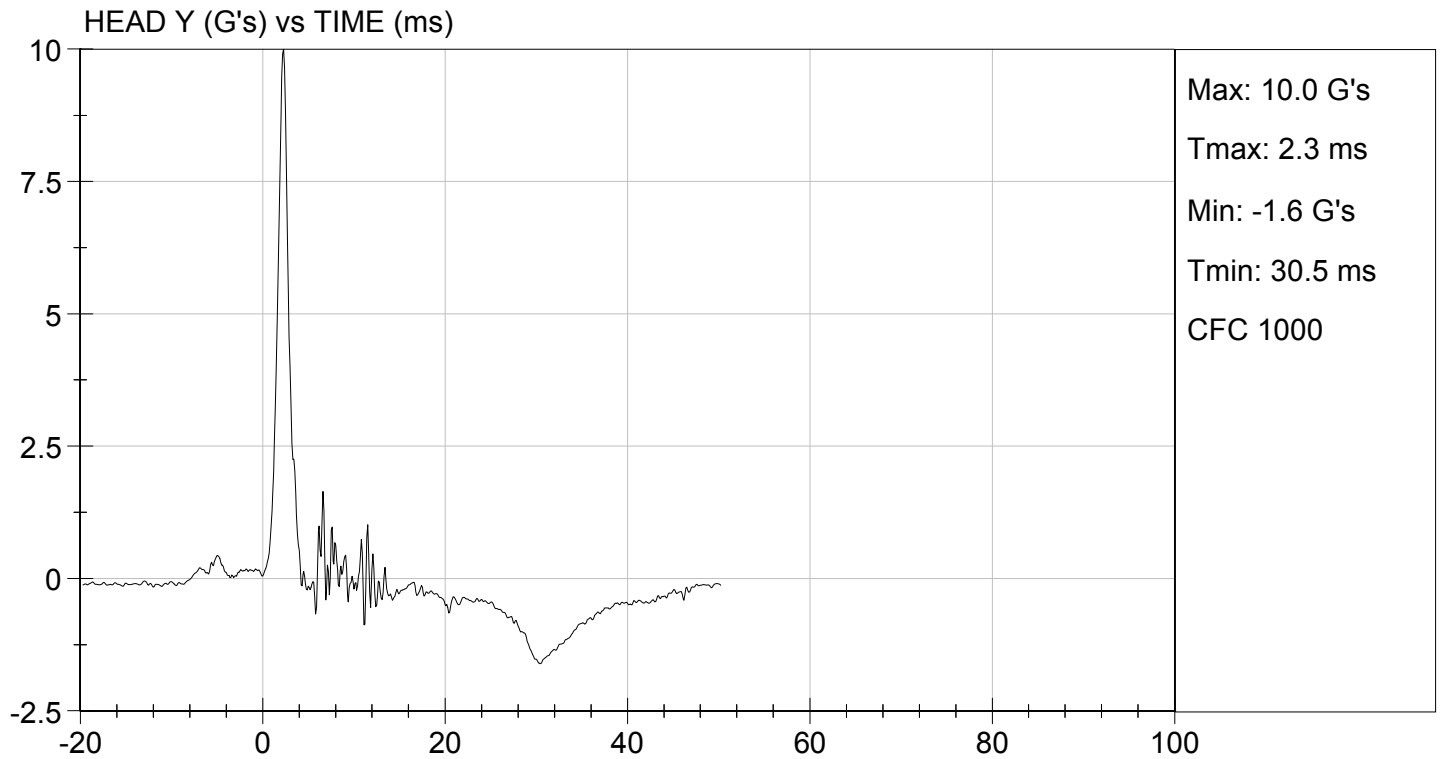


HEAD RESULTANT ACCELERATION (G's) vs TIME (ms)



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





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D124222

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.0	Pass
Laboratory Relative Humidity		%	10 to 70	27	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.5	Pass
	20 ms	m/s	4.0 to 5.0	4.6	Pass
	30 ms	m/s	5.8 to 7.0	6.4	Pass
D Plane Rotation	Max	deg	77 to 91	83	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	69.4	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	87	Pass
Overall Results					Pass

Jessica Hall
Laboratory Technician

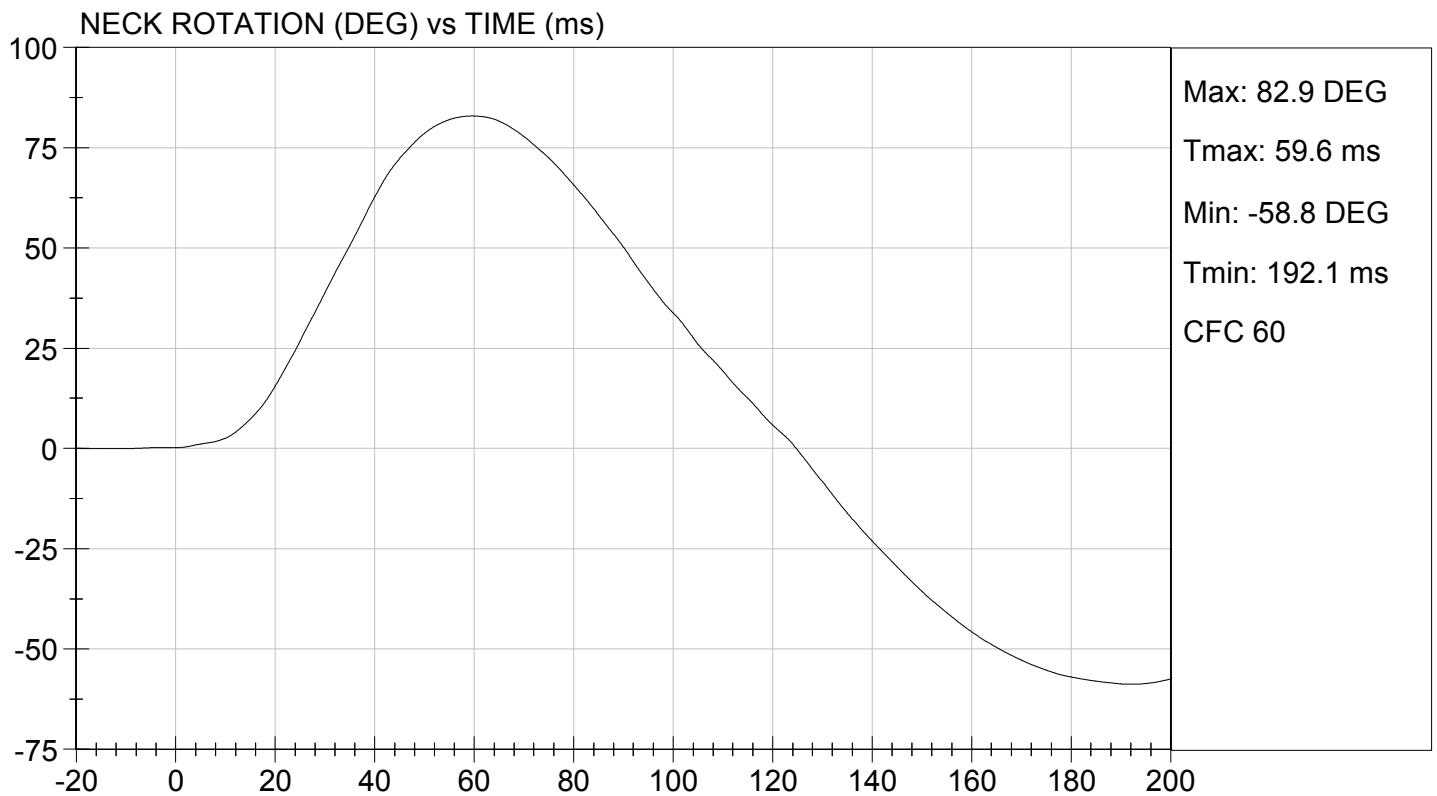
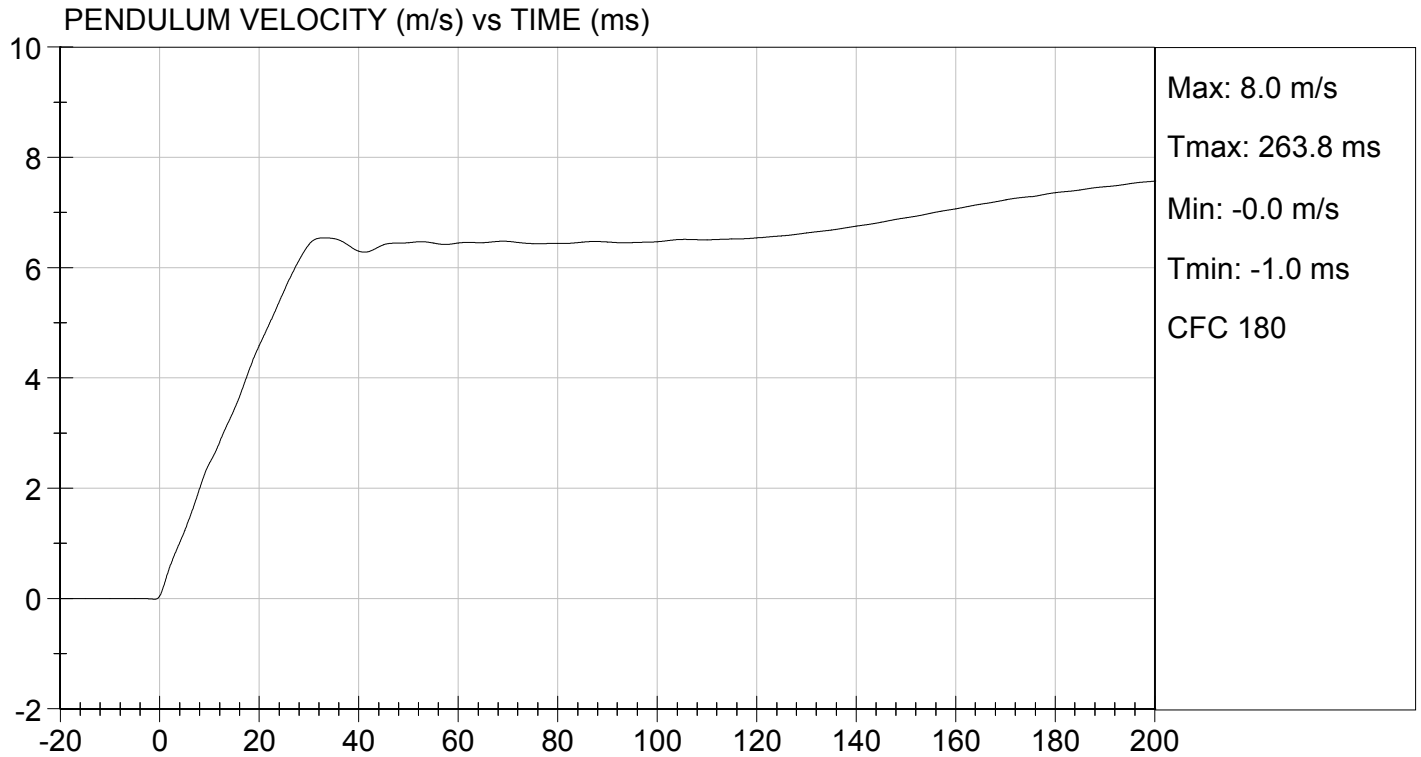
11/05/2012
Test Date

David Winkelbauer
Approved By



TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

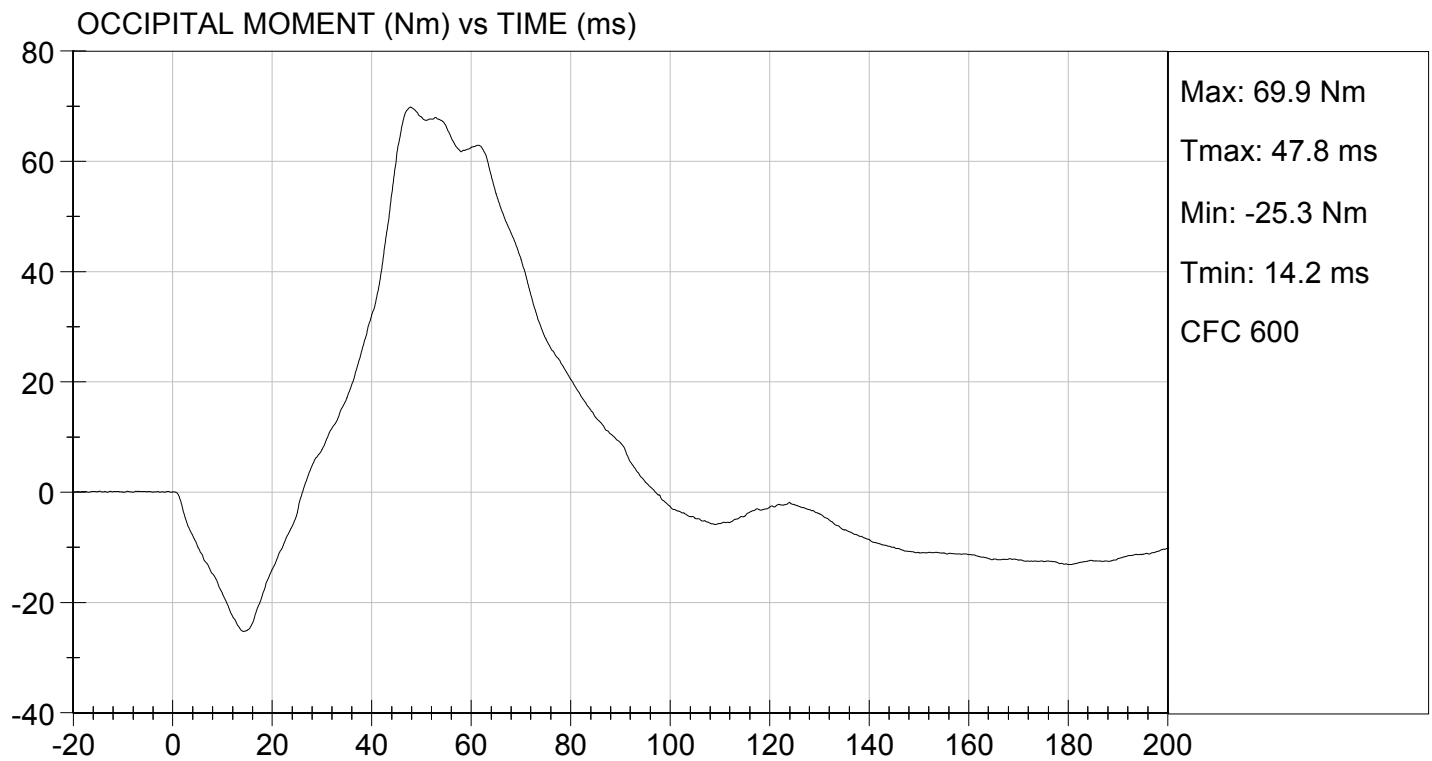
TEST DATE: 11/05/2012
TEST #: D124222





TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

TEST DATE: 11/05/2012
TEST #: D124222

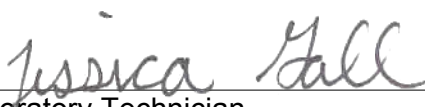


MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D124223

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.0	Pass
Laboratory Relative Humidity		%	10 to 70	27	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.05	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.8	Pass
	20 ms	m/s	3.1 to 3.9	3.6	Pass
	30 ms	m/s	4.6 to 5.6	5.1	Pass
D Plane Rotation	Max	deg	99 to 114	102	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-57.0	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	98	Pass
Overall Results					Pass


 Laboratory Technician

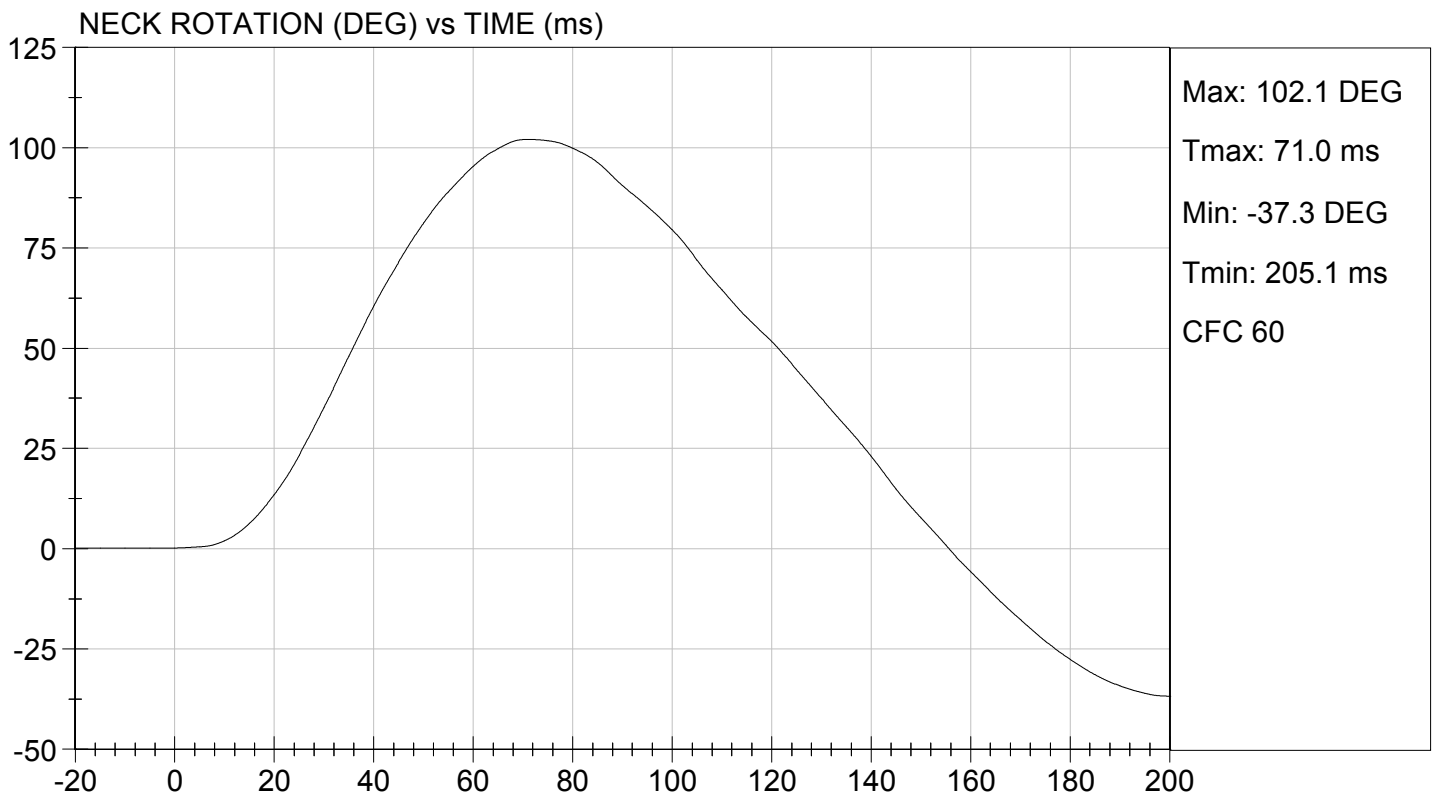
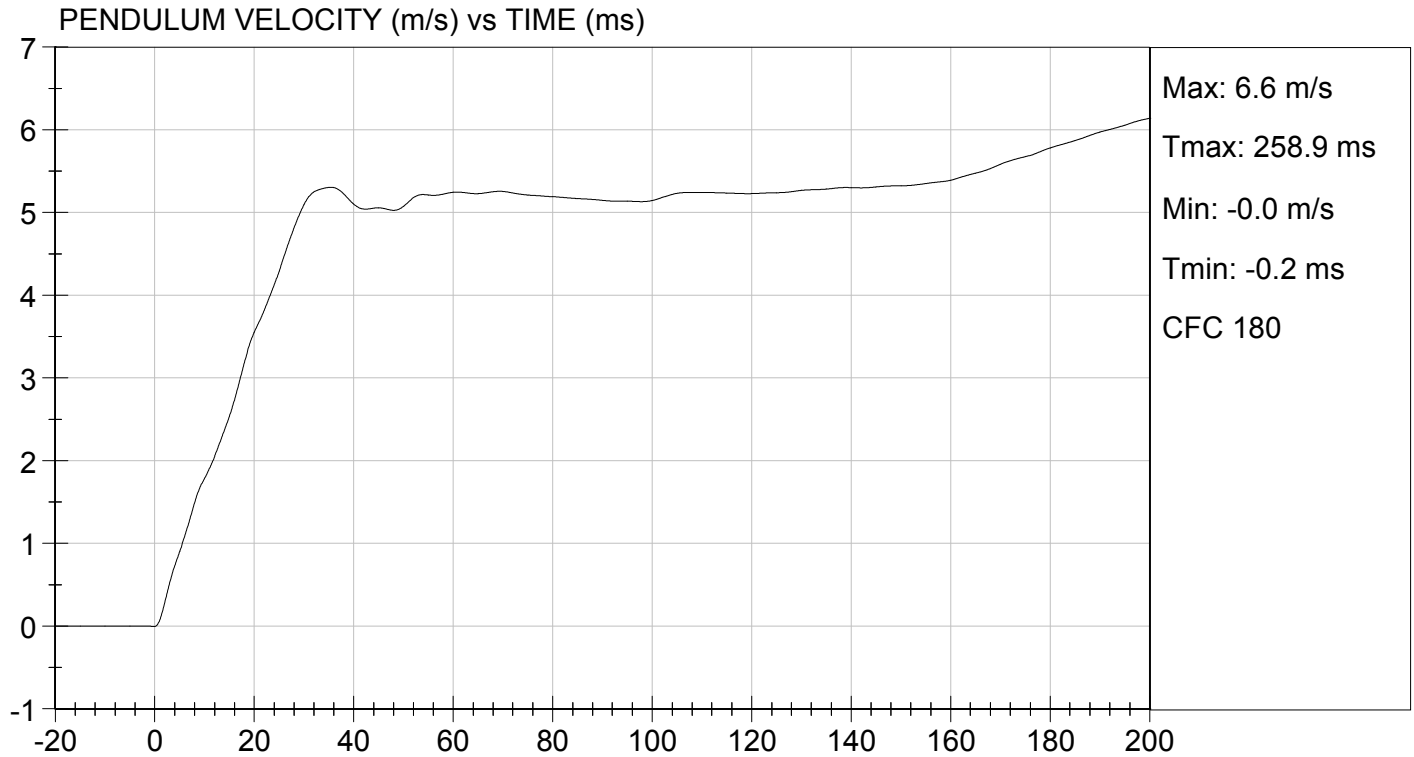
11/05/2012
 Test Date


 Approved By



TEST DESC: NECK EXTENSION
VELOCITY: 19.84 ft/s, 6.05 m/s

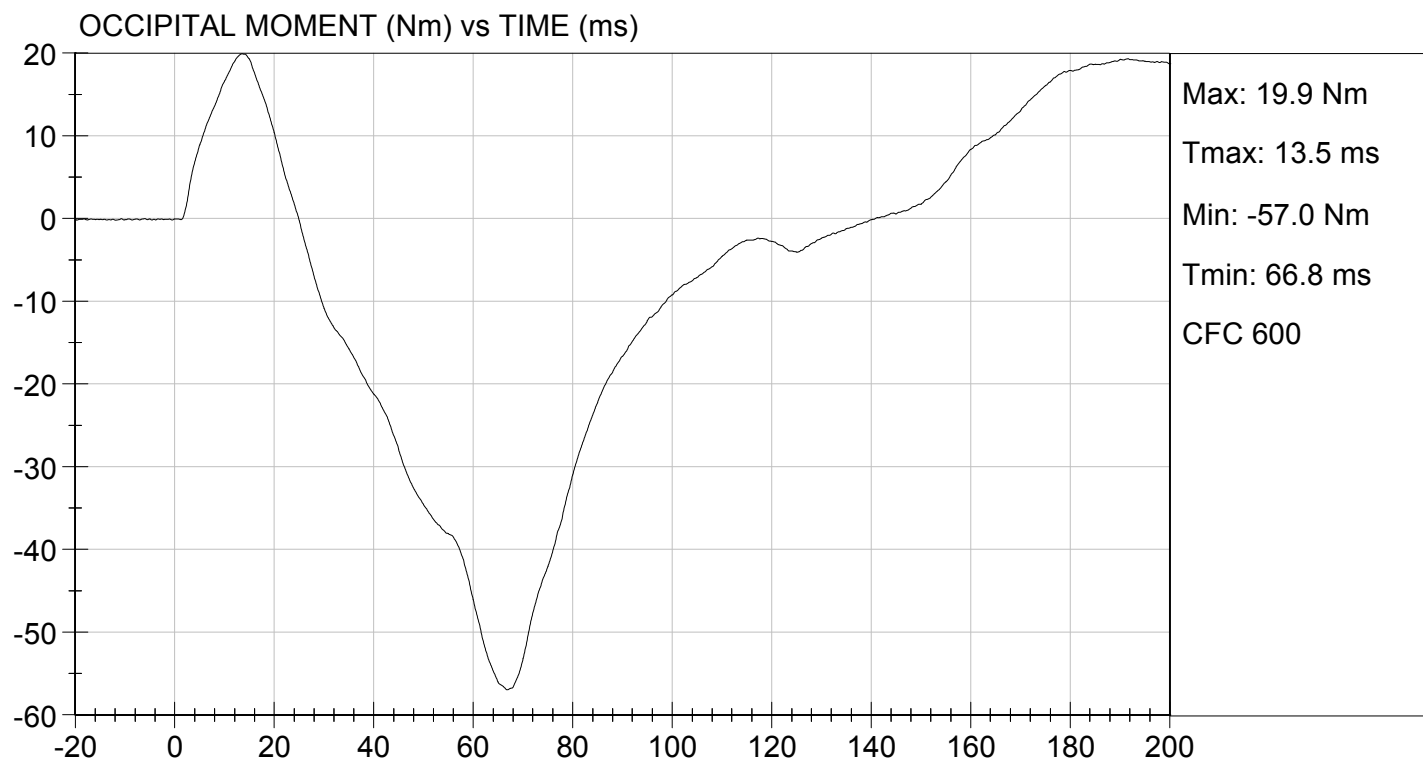
TEST DATE: 11/05/2012
TEST #: D124223





TEST DESC: NECK EXTENSION
VELOCITY: 19.84 ft/s, 6.05 m/s

TEST DATE: 11/05/2012
TEST #: D124223

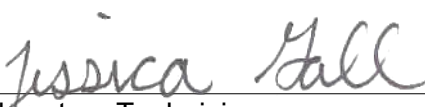


MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D124224

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.0	Pass
Relative Humidity	%	10 to 70	27	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	53	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4220	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4153	Pass
Overall Test Results				Pass


Laboratory Technician

11/06/2012

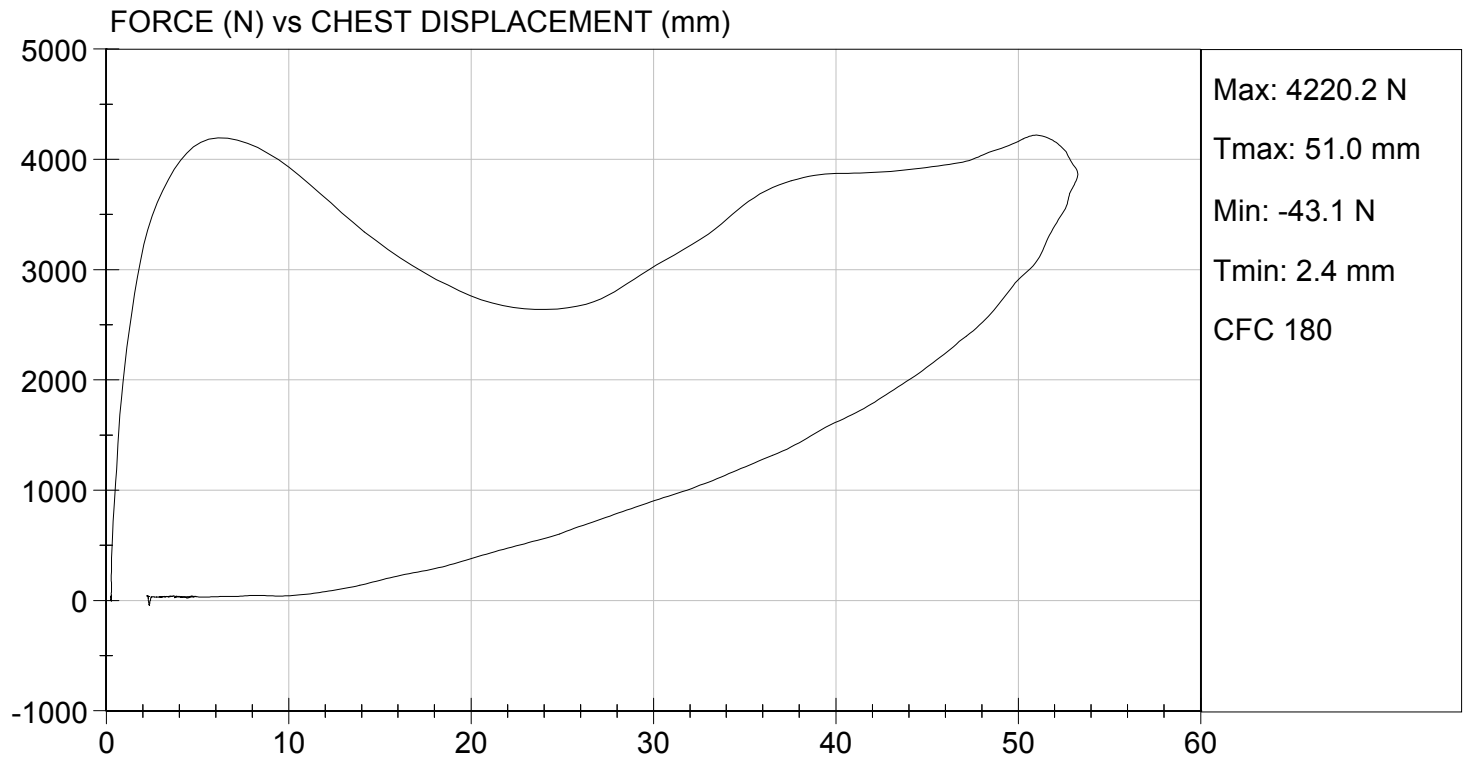
Test Date


Approved By



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

TEST DATE: 11/06/2012
TEST #: D124224



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D124225

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3807	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

11/06/2012

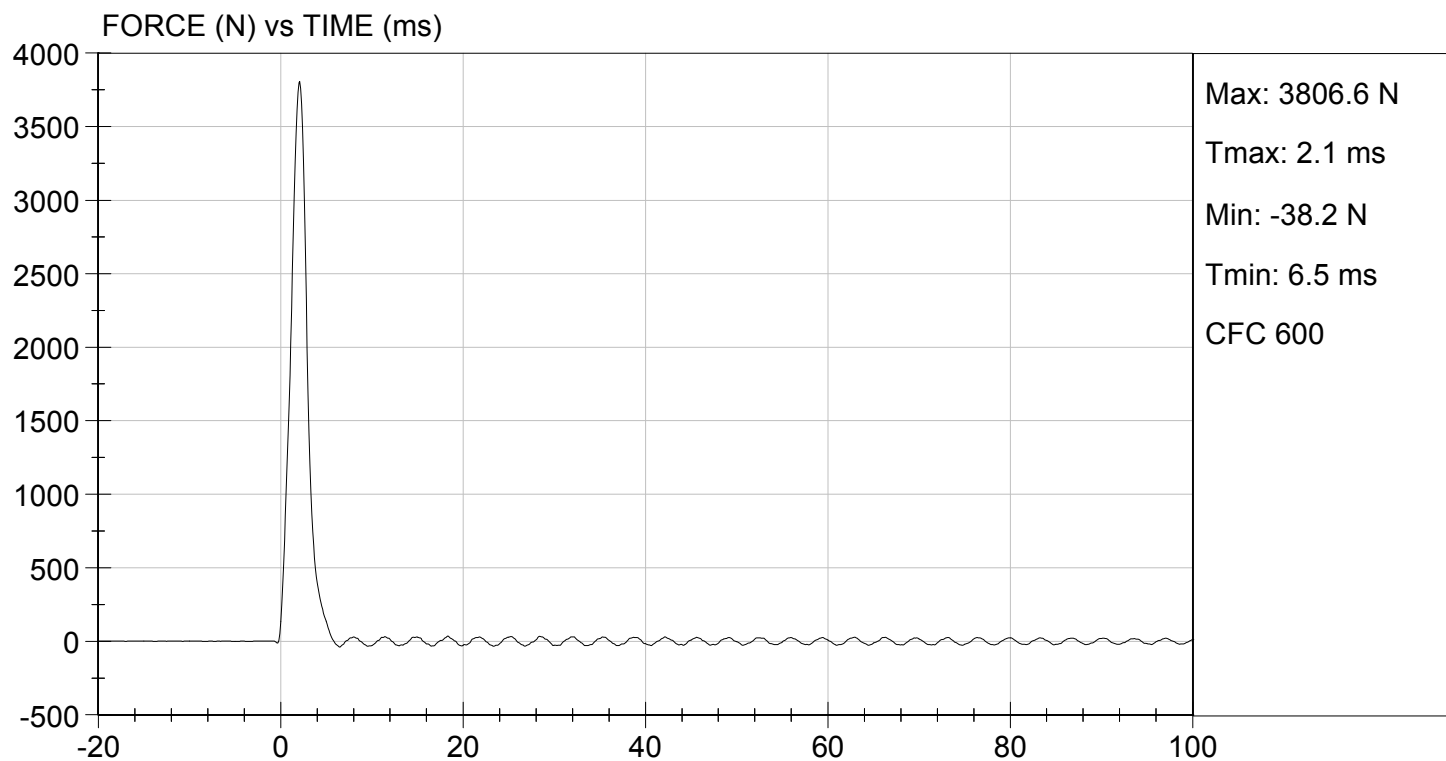
Test Date

David Winkelbauer
Approved By



TEST DESC: RIGHT KNEE
VELOCITY: 6.97 ft/s, 2.12 m/s

TEST DATE: 11/06/2012
TEST #: D124225



MGA RESEARCH CORPORATION

**LEFT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE**

ATD Serial No: 634

Test I.D: D124226

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3974	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

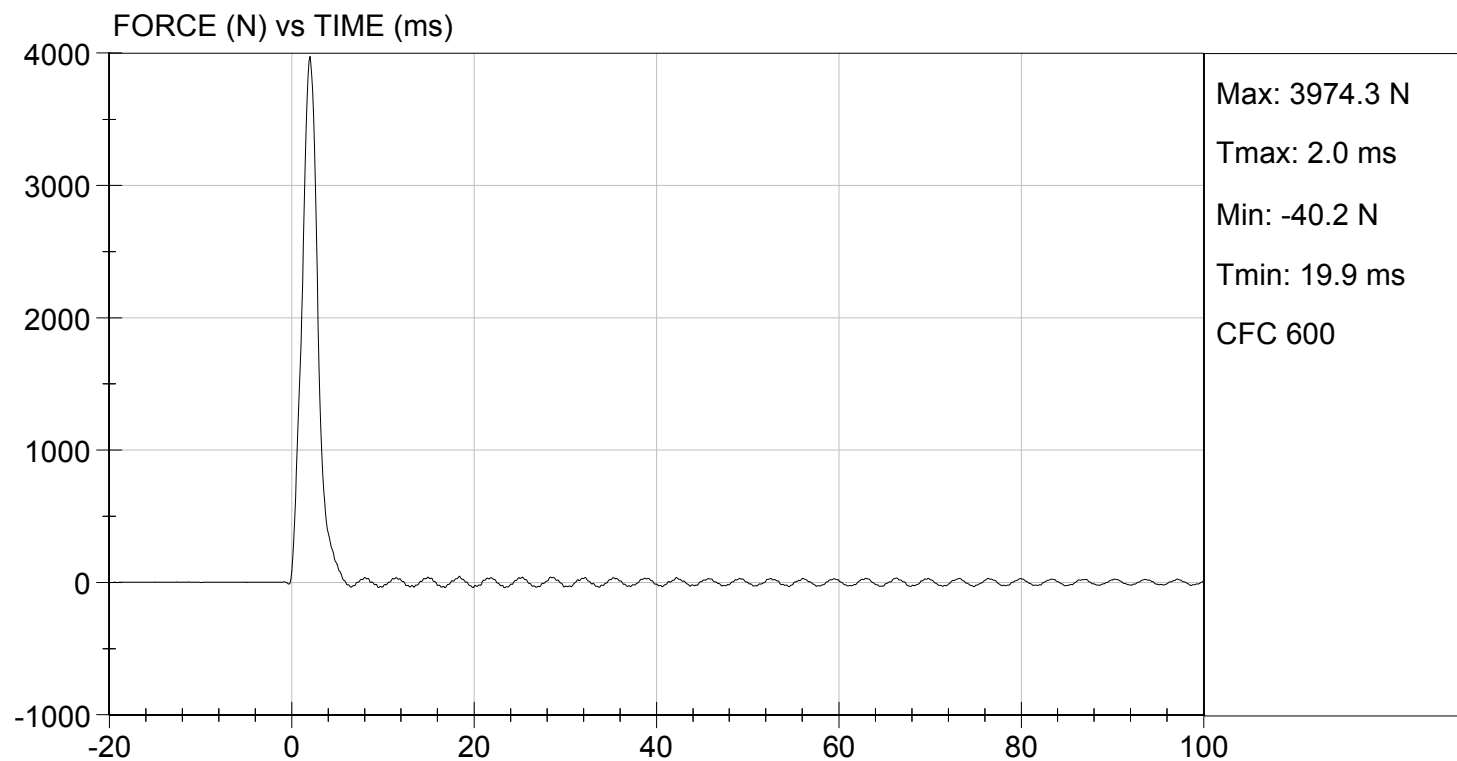
11/06/2012
Test Date

David Winkelbauer
Approved By



TEST DESC: LEFT KNEE
VELOCITY: 6.97 ft/s, 2.12 m/s

TEST DATE: 11/06/2012
TEST #: D124226



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D124227

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	27	Pass
Initial Angle	deg	0 to 20	16	Pass
Return Angle	deg	+/- 8	5	Pass
Force at 45 deg	N	320 to 390	360	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.9	Pass
Overall Result				Pass

Jessica Hall
Laboratory Technician

11/05/2012

Test Date

David Winkelbauer
Approved By