

REPORT NUMBER: NCAP-MGA-2014-008

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

**GENERAL MOTORS DE MEXICO, S. DE R.L. DE C.V.
2014 Chevrolet Silverado 1500 4WD LT Crew Cab
NHTSA No.: M20140103**

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



Test Date: July 30, 2013

Final Report Date: August 22, 2013

FINAL REPORT

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

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Approval Date: August 22, 2013

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

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16. Abstract A 56.3 km/h NCAP Frontal Impact Test was conducted on a 2014 Chevrolet Silverado 1500 4WD LT Crew Cab 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 July 30, 2013. The impact velocity was 56.6 km/h and the ambient temperature at the barrier face at the time of impact was 21.9°C. The target vehicle post-test maximum crush was 665 mm located at the vehicle's centerline. The test vehicle's performance was as follows:																																																							
<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <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>298</td> <td>235</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>52</td> <td>9</td> <td>9</td> </tr> <tr> <td>Nij</td> <td>N/A</td> <td>1</td> <td>1</td> <td>0.38</td> <td>0.34</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4170</td> <td>2620</td> <td>1807</td> <td>734</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4000</td> <td>2520</td> <td>840</td> <td>290</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10008</td> <td>6805</td> <td>775</td> <td>1496</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10008</td> <td>6805</td> <td>1558</td> <td>677</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	298	235	Maximum Chest Compression	mm	63	52	9	9	Nij	N/A	1	1	0.38	0.34	Neck Tension	N	4170	2620	1807	734	Neck Compression	N	4000	2520	840	290	Left Femur Force	N	10008	6805	775	1496	Right Femur Force	N	10008	6805	1558	677
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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 load cell barrier consisting of 176 load cells was impacted by a 2014 Chevrolet Silverado 1500 4WD LT Crew Cab at a velocity of 56.6 km/h. The test was performed at MGA Research Corporation on July 30, 2013. 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. Seat belt load cells were also installed on the driver's shoulder belt and the passenger's lap and shoulder belts to measure dummy torso and pelvic section loading.

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 640 channels of data were recorded on an on-board data acquisition system. Appendix B contains the 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 665 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 bolster. 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 left knee contacted the glove box.

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)	298	0.38	1807	840	47	9	775	1558
Passenger (5 th)	235	0.34	734	290	37	9	1496	677

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

TEST NOTES

Bottom of Engine X has no valid data after 16 ms.

Load Cell K-16 MY has no valid data.

Driver Lap Belt load cell was not installed 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: 2014 Chevrolet Silverado 1500 4WD LT Crew Cab
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140103
Test Date: 07/30/2013

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	M20140103	Traction Control System (TCS)	Yes
Model Year	2014	Power Steering	Yes
Make	Chevrolet	Power Window Auto-Reverse	Yes
Model	Silverado 1500 Crew Cab	Driver Frontal Airbag	Yes
Body Style	Truck	Driver Curtain Airbag	Yes
VIN	3GCUKREC1EG106446	Driver Head/Torso Airbag	No
Body Color	Victory Red	Driver Torso Airbag	No
Odometer (km/mi)	166 / 103	Driver Torso/Pelvis Airbag	Yes
Engine Displacement (L)	5.3	Driver Pelvis Airbag	No
Type/No. Cylinders	8	Driver Knee Airbag	No
Engine Placement	Longitudinal	Front Pass. Frontal Airbag	Yes
Transmission Type	Automatic	Front Pass. Curtain Airbag	Yes
Transmission Speeds	6	Front Pass. Head/Torso Airbag	No
Overdrive	Yes	Front Pass. Torso Airbag	No
Final Drive	4-Wheel Drive	Front Pass. Torso/Pelvis Airbag	Yes
Roof Rack	No	Front Pass. Pelvis Airbag	No
Sunroof/T-Top	No	Front Pass. Knee Airbag	No
Running Boards	No	Driver Pretensioner	Yes
Tilt Steering Wheel	Yes	Driver Load Limiter	Yes
Power Seats	Driver Only	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?

No

DATA FROM CERTIFICATION LABEL

Manufactured By	General Motors De Mexico, S. De R.L. De C.V.
Date of Manufacture	05/13

GVWR (kg)	3266
GAWR Front (kg)	1792
GAWR Rear (kg)	1792

VEHICLE SEATING AND WEIGHT CAPACITY DATA

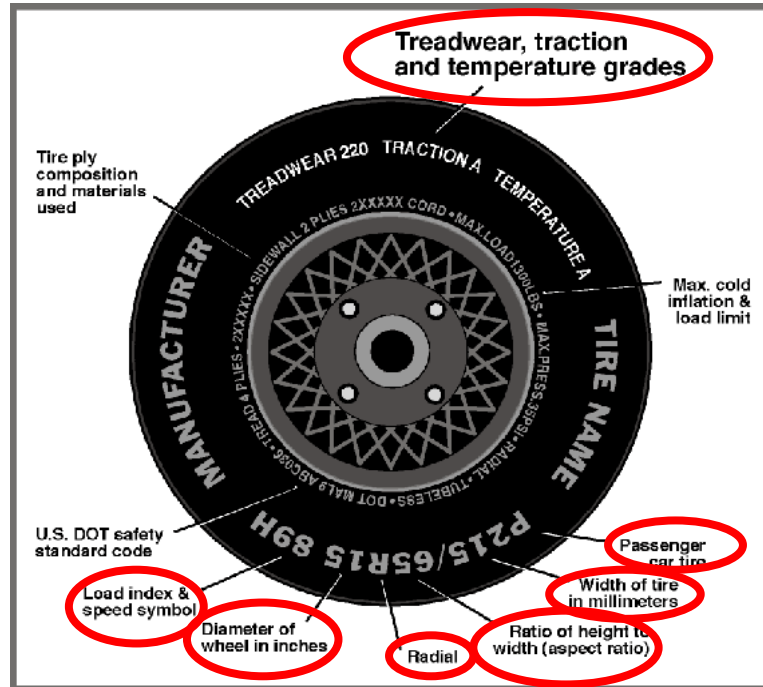
Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Split Bench		
Designated Seating Capacity (DSC)	3	3		6
Capacity Weight (VCW) (kg)				728
Cargo Weight (RCLW) (kg)				320

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

Test Vehicle: 2014 Chevrolet Silverado 1500 4WD LT Crew Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140103
 Test Date: 07/30/2013

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	240	240
Recommended Tire Size	P265/65R18	P265/65R18
Tire Size on Vehicle	P265/65R18	P265/65R18
Tire Manufacturer	Goodyear	Goodyear
Tire Model	Assure	Assure
Treadwear	600	600
Traction	A	A
Temperature Grade	B	B
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 2 Steel, 1 Polyamide	2 Polyester, 2 Steel, 1 Polyamide
Load Index/Speed Symbol	112T	112T
Tire Material	Rubber	Rubber
DOT Safety Code Left	PJXPJK1R 1213	PJXPJK1R 1213
DOT Safety Code Right	PJXPJK1R 1213	PJXPJK1R 1213

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

Test Vehicle: 2014 Chevrolet Silverado 1500 4WD LT Crew Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140103
 Test Date: 07/30/2013

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	751.2	519.8		795.6	628.2	
Right	kg	744.8	502.6		772.0	592.0	
Ratio	%	59.4	40.6		56.2	43.8	
Totals	kg	1496.0	1022.4	2518.4	1567.6	1220.2	2787.8

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	2518.4
Weight of 1 P572E ATD & 1 P572O ATD	kg	140.6
Rated Cargo/Luggage Weight (RCLW)	kg	136
Calculated Vehicle Target Weight (TVTW)	kg	2795.0

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	918	927	981	1001	1583
As Tested	mm	910	916	958	960	1707
Post Test	mm	920	962	948	952	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	3900
Total Vehicle Length at Left Side	mm	5845
Total Vehicle Length at Centerline	mm	6080
Total Vehicle Length at Right Side	mm	5845
Weight of Ballast in Cargo Area	kg	90.7
Weight of Vehicle Components Removed	kg	0.0
Amount of Stoddard Solvent in Fuel Tank	L	90.8

List of components removed to meet test weight: None.

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

Test Vehicle: 2014 Chevrolet Silverado 1500 4WD LT Crew Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140103
 Test Date: 07/30/2013

TARGET VEHICLE STRUCTURAL MEASUREMENT

	Elements	Pre-Test (mm)
1	Total Length	6080
2	Total Width	2020
3	Bumper Top Height	660
4	Bumper Bottom Height	310
5	Longitudinal Member Top Height	600
6	Distance between Longitudinal Members	720
7	Longitudinal Member Width	90
8	Engine Top Height	1205
9	Engine Bottom Height	325
10	Engine and Gearbox Width	580
11	Front Bumper-Engine Distance	780
12	Front Shock Absorber Fixing Height	800
13	Bonnet Leading Edge Height	1150
14	Front Shock Absorber Fixing Width	1000
15	Front Bumper – Front Axle Distance	980
16	Front Axle – A-Pillar Distance	670
17	A-Pillar – B-Pillar Distance	1020
18	B-Pillar – Rear Axle Distance	2220
19	B-Pillar – C-Pillar Distance	1015
20	Roof Sill Bottom Height	1720
21	Roof Sill Top Height	1780
22	Floor Sill Bottom Height	375
23	Floor Sill Top Height	390

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

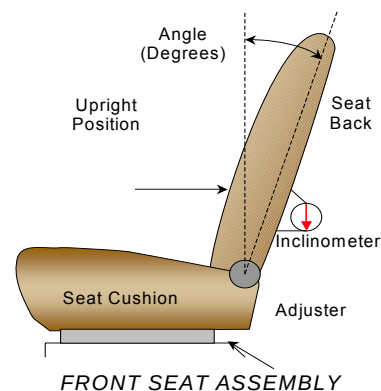
Test Vehicle: 2014 Chevrolet Silverado 1500 4WD LT Crew Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140103
 Test Date: 07/30/2013

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	3.0° on headrest post
Passenger Seat Back Angle	-0.7° on headrest post



SEAT FORE/AFT POSITIONS

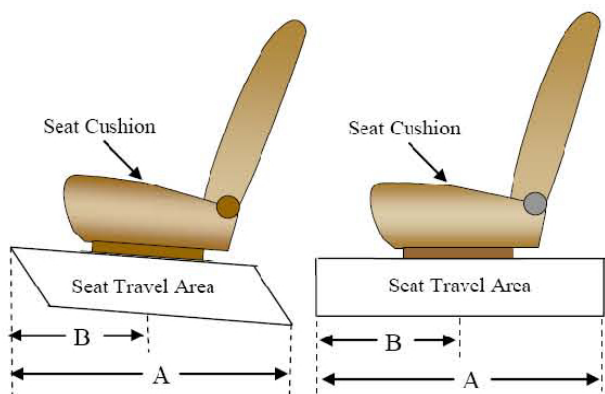
The driver and passenger seat fore/aft positions are adjusted following Appendix F, "Driver & Passenger Dummy Seating & Positioning Procedures" in the NCAP Test Procedure dated September 2012.

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	334 mm	167 mm (foremost as 0)
Passenger Seat	43 Detents (1 st as 1)	0 Detent (1 st 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: 2014 Chevrolet Silverado 1500 4WD LT Crew Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140103
 Test Date: 07/30/2013

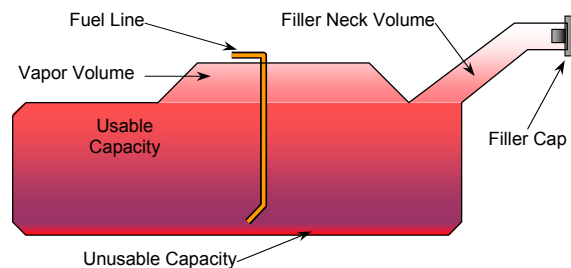
FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of "Standard Tank"	97.5
Usable Capacity of "Optional Tank"	
92-94% of Usable Capacity	89.7 to 91.7
Actual Amount of Solvent used	90.8
1/3 of Usable Capacity	32.5

FUEL PUMP

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

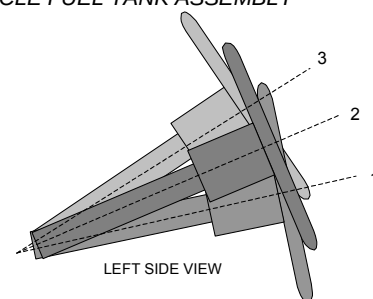
The vehicle is equipped with an electric fuel pump. Fuel pump will run when engine is running. Also, it will run briefly when ignition key is turned to the "on" position without starting the engine. The fuel pipe is on the left side.



VEHICLE FUEL TANK ASSEMBLY

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 ASSEMBLY

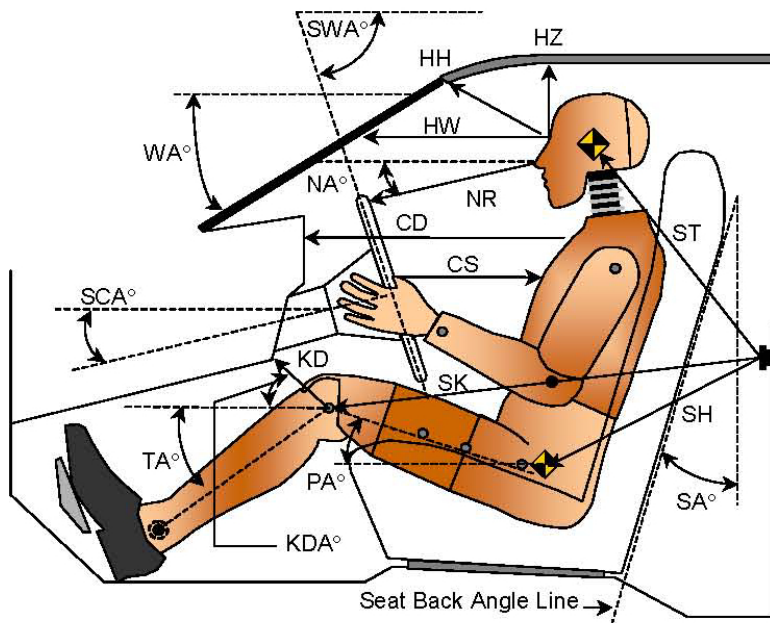
STEERING COLUMN POSITION

	Degrees	Fore/Aft Position (mm)
Lowermost Position 1	78.4	210
Geometric Center Position 2	68.7	190
Uppermost Position 3	59.0	170
Telescoping Steering Wheel Travel		40
Test Position	69.0	190

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2014 Chevrolet Silverado 1500 4WD LT Crew Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140103
 Test Date: 07/30/2013



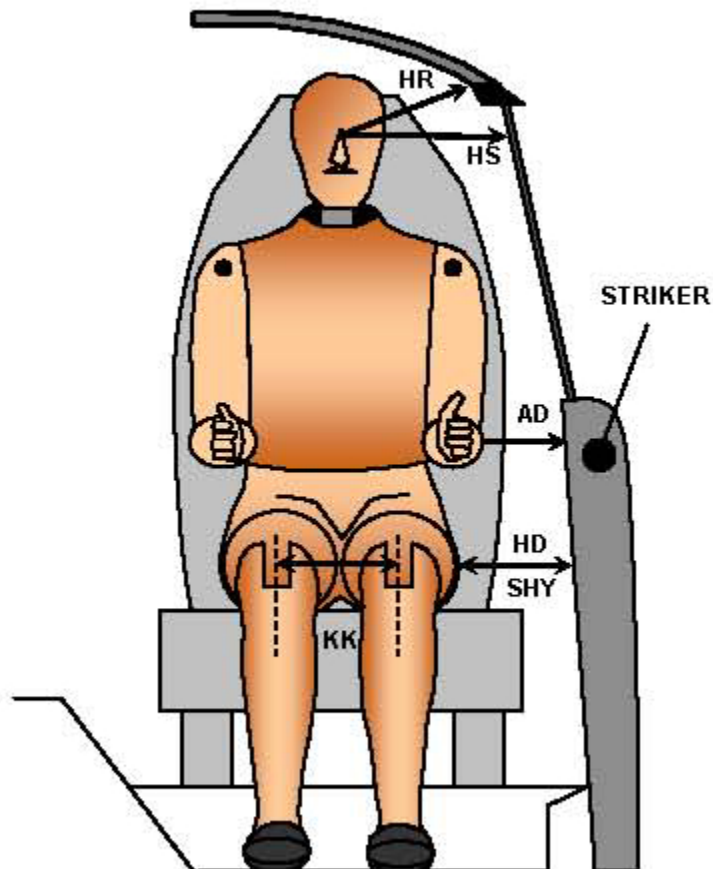
LEFT SIDE VIEW

Code	Measurement Description	Driver S/N 036		Passenger S/N 634	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		32.2		
SWA°	Steering Wheel Angle		69.0		
SCA°	Steering Column Angle		21.0		
SA°	Seat Back Angle (on headrest post)		3.0		-0.7
HZ	Head to Roof (Z)	300	90.0	328	90.0
HH	Head to Header	464	25.6	426	32.1
HW	Head to Windshield	772	0.0	797	0.0
NR	Nose to Rim	380	4.0		
CD	Chest to Dash	571		437	
CS	Chest to Steering Hub	313	4.6		
RA	Rim to Abdomen	212	0.0		
KDL	Left Knee to Dash	177	30.6	138	29.3
KDR	Right Knee to Dash	168	28.8	147	33.2
PA°	Pelvic Angle		24.3		20.6
TA°	Tibia Angle		47.0		54.1
SK	Striker to Knee	595	81.4	640	81.8
ST	Striker to Head	603	10.3	574	16.8
SH	Striker to H-Point	233	112.6	330	96.8

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2014 Chevrolet Silverado 1500 4WD LT Crew Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140103
 Test Date: 07/30/2013



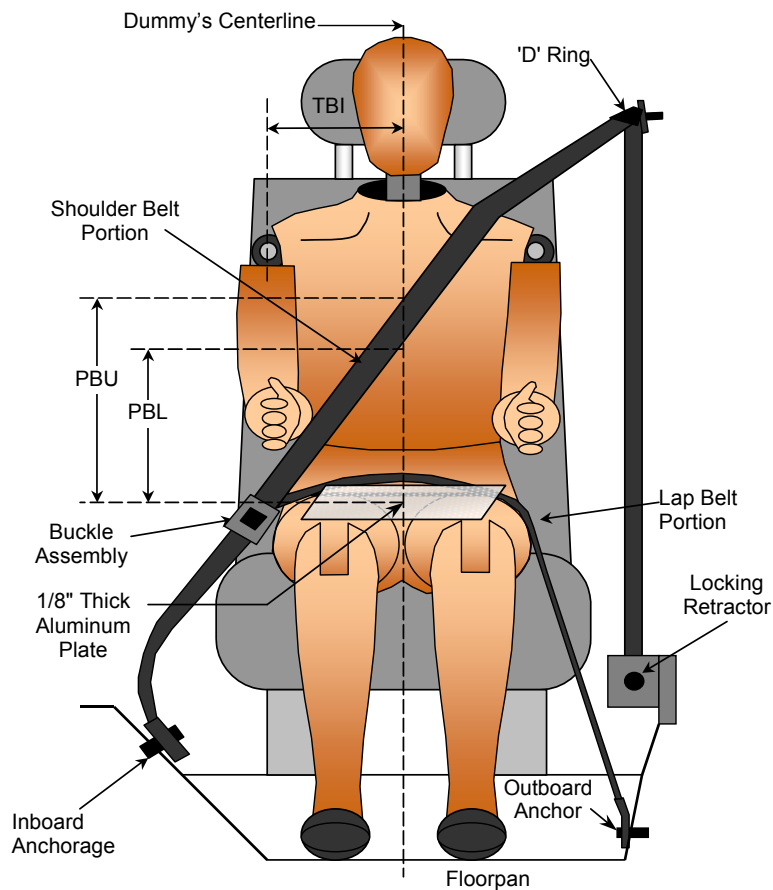
FRONT VIEW OF DUMMY

Code	Measurement Description	Driver S/N 036	Passenger S/N 634
		Length (mm)	
AD	Arm to Door	157	101
HD	H-Point to Door	137	163
HR	Head to Side Header	275	303
HS	Head to Side Window	351	350
KK	Knee to Knee	340	215
SHY	Striker to H-Point (Y Direction)	275	290
AA	Ankle to Ankle	355	160

DATA SHEET NO. 5 SEAT BELT POSITIONING DATA

Test Vehicle: 2014 Chevrolet Silverado 1500 4WD LT Crew Cab
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140103
Test Date: 07/30/2013



FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	360	325
PBL - Top surface of reference to belt lower edge	mm	280	240

BELT LENGTH DATA

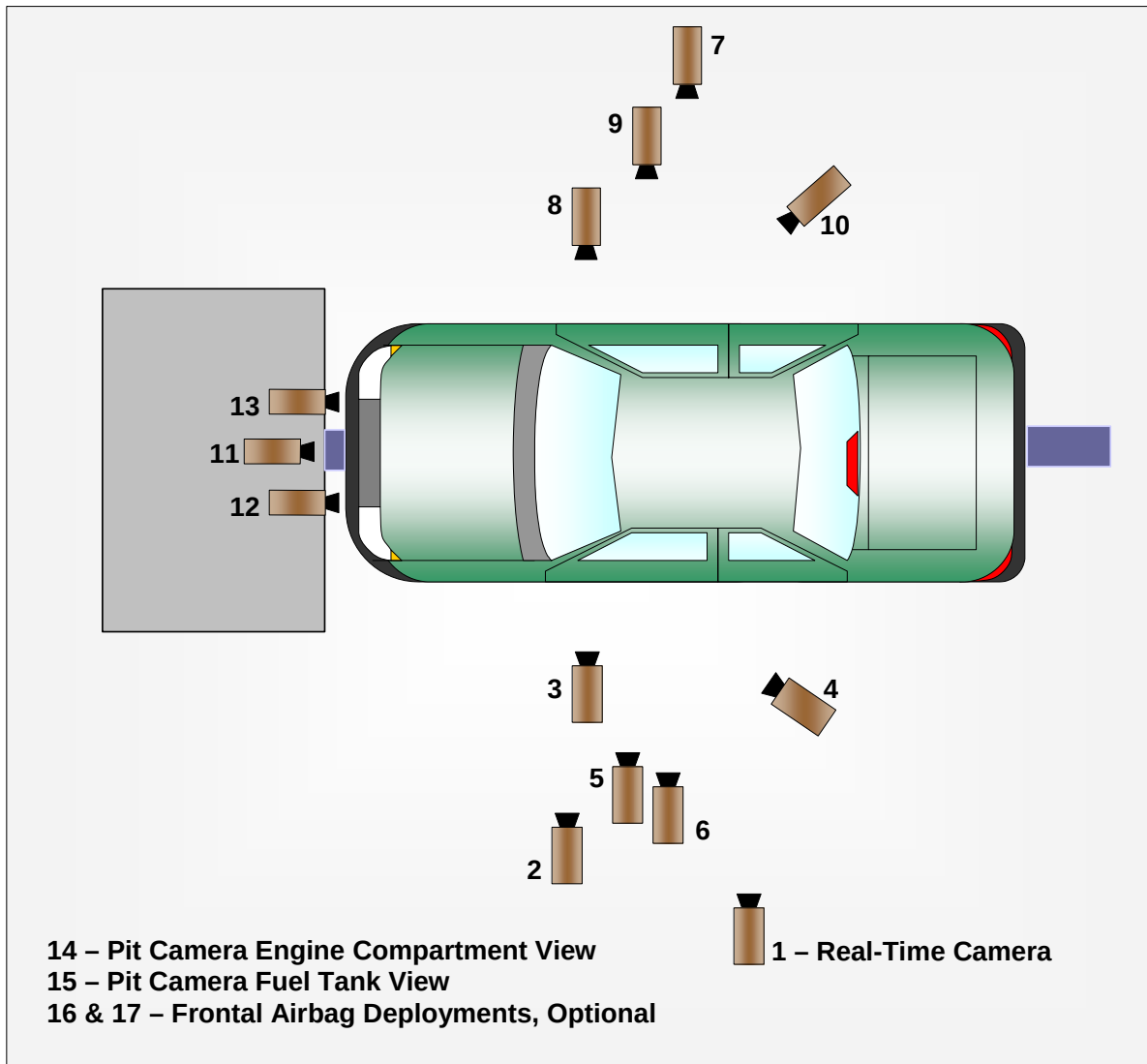
Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as measured on ATD	mm	825	870
Lap Belt Length as measured on ATD	mm	420	485
Remainder of belt on reel	mm	1855	1715
Total Belt Length for Continuous Webbing Systems	mm	3100	3070

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

Test Vehicle: 2014 Chevrolet Silverado 1500 4WD LT Crew Cab
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140103
Test Date: 07/30/2013

CAMERA POSITIONS FOR FRONTAL IMPACTS



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

Test Vehicle: 2014 Chevrolet Silverado 1500 4WD LT Crew Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140103
 Test Date: 07/30/2013

CAMERA LOCATIONS

No.	Camera View	Coordinates (mm)			Lens (mm)	Speed (fps)
		X*	Y*	Z*		
1	Real-Time Left Overall					30
2	Driver Close-Up	1630	-7070	-1820	35	1000
3	Left Front Half	1450	-5450	-1440	24	1000
4	Left Angle	5650	-5700	-1920	5650	1000
5	Steering Column - Top	590	-5250	-1160	24	1000
6	Steering Column - Bottom	570	-5240	-760	24	1000
7	Right Overall	2480	6550	-1510	16	1000
8	Passenger Close-Up	1690	7000	-1880	35	1000
9	Right Front Half	1370	5670	-1470	24	1000
10	Right Angle	6040	5190	-1970	50	1000
11	Windshield	-80	0	-2830	24	1000
12	Driver Windshield	200	-400	-2030	8.5	1000
13	Passenger Windshield	200	420	-2010	8.5	1000
14	Pit Front	990	0	3150	24	1000
15	Pit Rear	3270	0	3150	24	1000
16	Onboard Driver Side (optional)					
17	Onboard Passenger Side (optional)					
18	Real-Time Pan View					30

***COORDINATES:**

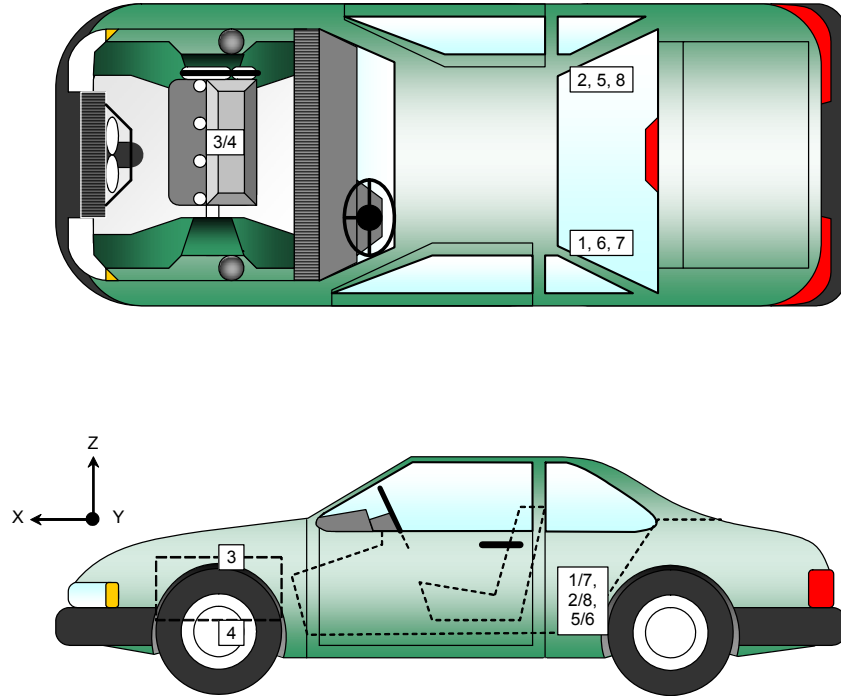
- +X = forward of impact plane
- +Y = right of monorail centerline
- +Z = below ground level

Cameras 16 & 17 were not used for this test.

DATA SHEET NO. 7 VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2014 Chevrolet Silverado 1500 4WD LT Crew Cab
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140103
Test Date: 07/30/2013



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Crossmember Accelerometer – X Direction	3224	-515	-565
2	Right Rear Crossmember Accelerometer – X Direction	3224	485	-565
3	Engine Top X	5152	40	-125
4	Engine Bottom X	4843	60	-325
5	Left Rear Crossmember Accelerometer – Z Direction	3224	-515	-565
6	Right Rear Crossmember Accelerometer – Z Direction	3224	485	-565
7	Left Rear Crossmember Accelerometer Redundant – X Direction	3224	-515	-565
8	Right Rear Crossmember Accelerometer Redundant – X Direction	3224	485	-565

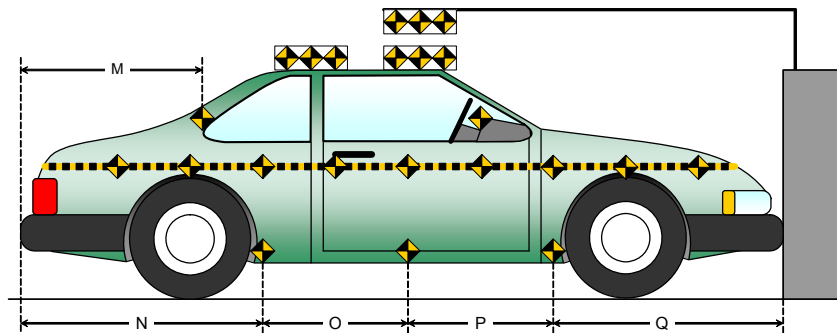
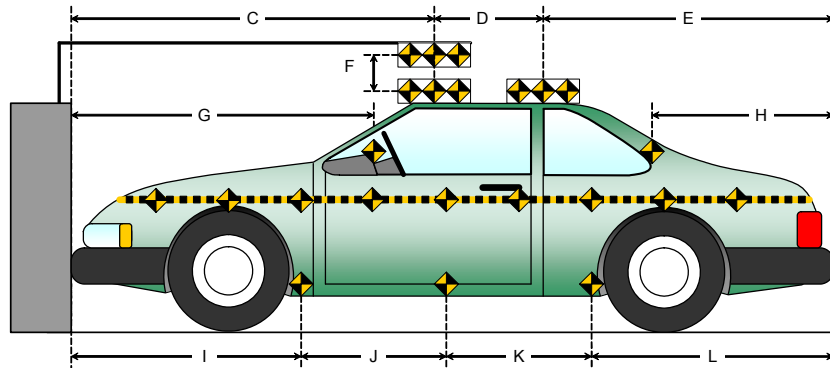
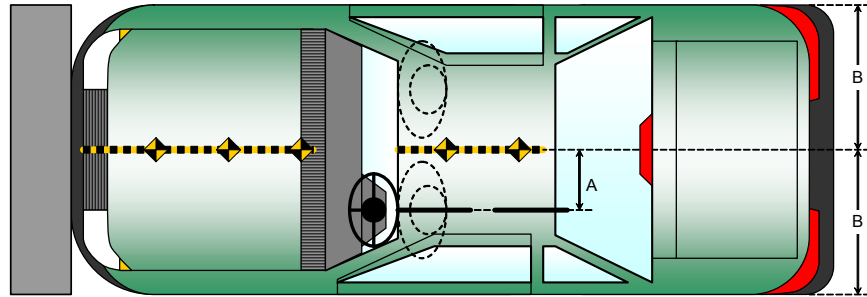
Reference Points: X - Rear Surface of Vehicle (+ forward)
Y - Vehicle Centerline (+ to right)
Z - Ground Plane (+ down)

DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2014 Chevrolet Silverado 1500 4WD LT Crew Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140103
 Test Date: 07/30/2013

Item	Value (mm)
A	440
B	1010
C	2610
D	660
E	2810
F	55
G	
H	2350
I	1677
J	1014
K	1014
L	2375
M	2350
N	2375
O	1014
P	1014
Q	1677



DATA SHEET NO. 9 **LOAD CELL LOCATIONS ON FIXED BARRIER**

Test Vehicle: 2014 Chevrolet Silverado 1500 4WD LT Crew Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140103
 Test Date: 07/30/2013

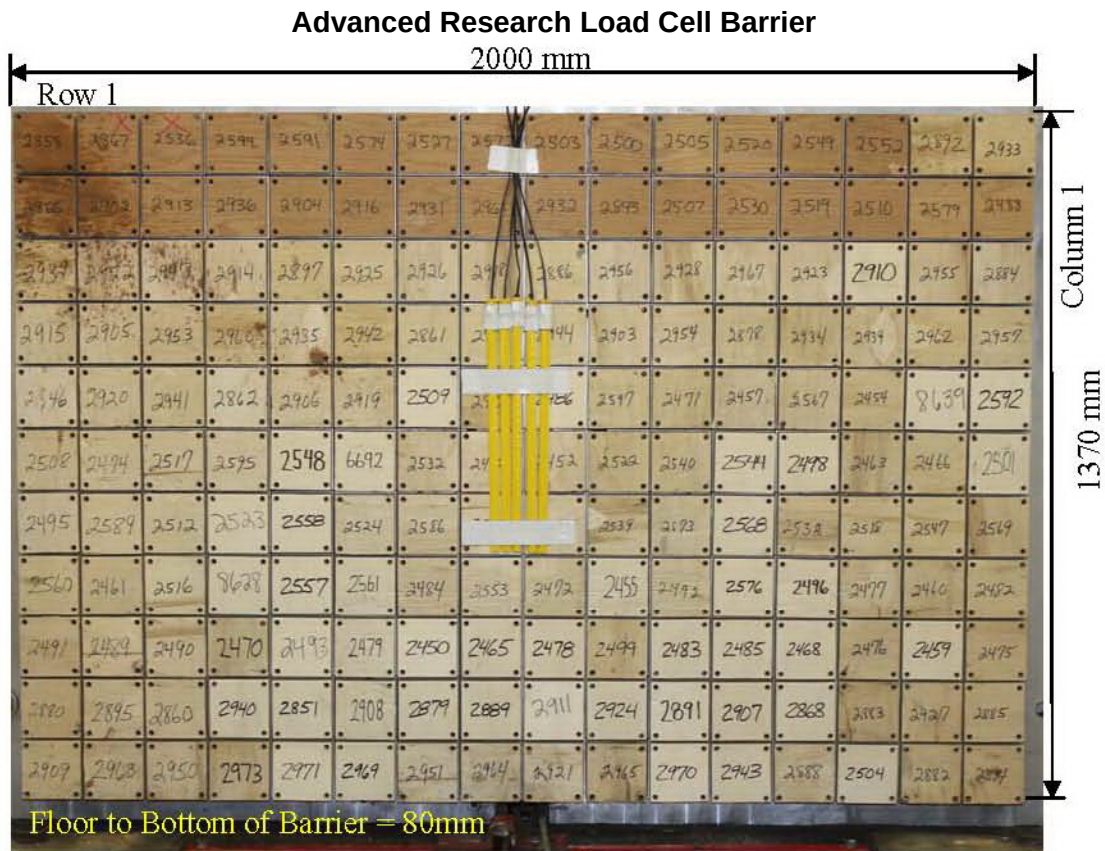


Photo for Reference Only

Centerline															
A-16	A-15	A-14	A-13	A-12	A-11	A-10	A-09	A-08	A-07	A-06	A-05	A-04	A-03	A-02	A-01
B-16	B-15	B-14	B-13	B-12	B-11	B-10	B-09	B-08	B-07	B-06	B-05	B-04	B-03	B-02	B-01
C-16	C-15	C-14	C-13	C-12	C-11	C-10	C-09	C-08	C-07	C-06	C-05	C-04	C-03	C-02	C-01
D-16	D-15	D-14	D-13	D-12	D-11	D-10	D-09	D-08	D-07	D-06	D-05	D-04	D-03	D-02	D-01
E-16	E-15	E-14	E-13	E-12	E-11	E-10	E-09	E-08	E-07	E-06	E-05	E-04	E-03	E-02	E-01
F-16	F-15	F-14	F-13	F-12	F-11	F-10	F-09	F-08	F-07	F-06	F-05	F-04	F-03	F-02	F-01
G-16	G-15	G-14	G-13	G-12	G-11	G-10	G-09	G-08	G-07	G-06	G-05	G-04	G-03	G-02	G-01
H-16	H-15	H-14	H-13	H-12	H-11	H-10	H-09	H-08	H-07	H-06	H-05	H-04	H-03	H-02	H-01
I-16	I-15	I-14	I-13	I-12	I-11	I-10	I-09	I-08	I-07	I-06	I-05	I-04	I-03	I-02	I-01
J-16	J-15	J-14	J-13	J-12	J-11	J-10	J-09	J-08	J-07	J-06	J-05	J-04	J-03	J-02	J-01
K-16	K-15	K-14	K-13	K-12	K-11	K-10	K-09	K-08	K-07	K-06	K-05	K-04	K-03	K-02	K-01

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: 2014 Chevrolet Silverado 1500 4WD LT Crew Cab
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140103
Test Date: 07/30/2013

INSTRUMENTATION

Driver Dummy Data Channels	52
Passenger Dummy Data Channels	52
Vehicle Structure Accelerometers	8
Barrier Channels	528
Total	640

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: 2014 Chevrolet Silverado 1500 4WD LT Crew Cab
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140103
Test Date: 07/30/2013

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

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

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	20
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	900
Center	mm	910
Right Side	mm	930
Average	mm	913

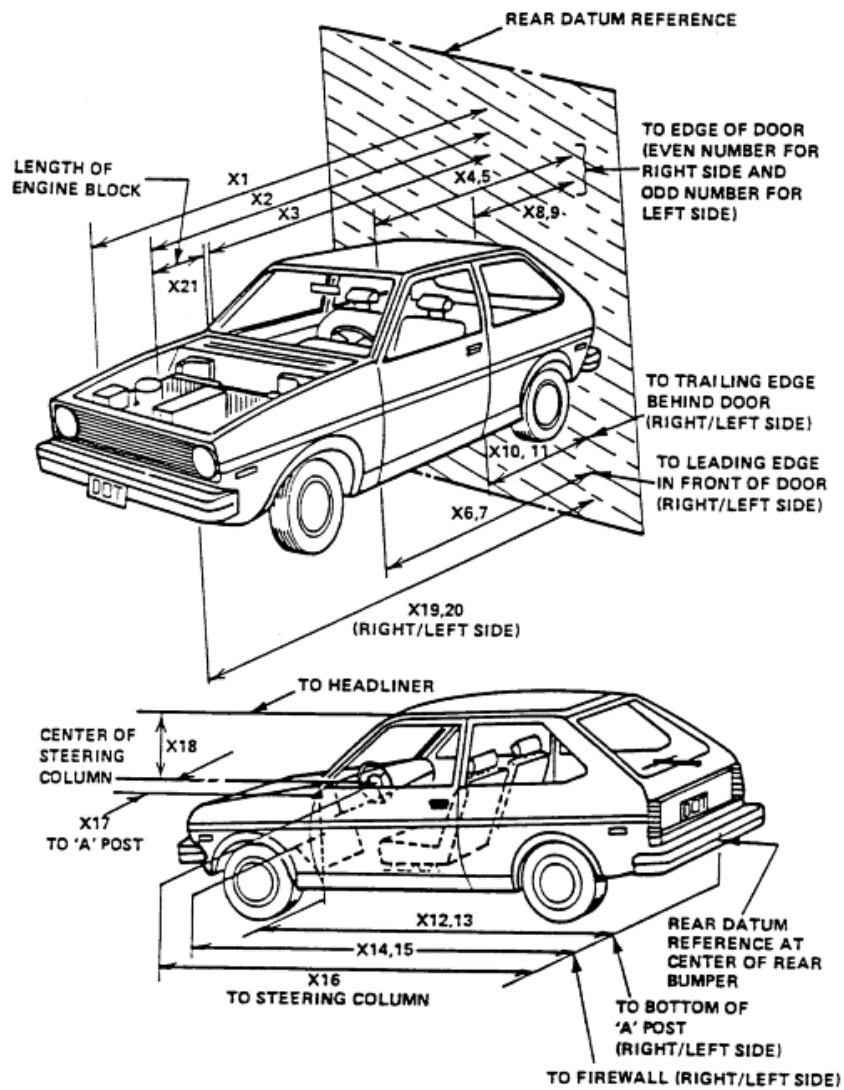
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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	No		No	
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes		Yes	

DATA SHEET NO. 12 VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2014 Chevrolet Silverado 1500 4WD LT Crew Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140103
 Test Date: 07/30/2013



DATA SHEET NO. 12 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2014 Chevrolet Silverado 1500 4WD LT Crew Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140103
 Test Date: 07/30/2013

RSOV (Rear Surface of Vehicle)

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	mm	6080	5415	665
2	RSOV to Front of Engine	mm	5100	5039	61
3	RSOV to Firewall	mm	4890	4845	45
4	RSOV to Upper Leading Edge of Right Door	mm	4488	4486	2
5	RSOV to Upper Leading Edge of Left Door	mm	4488	4485	3
6	RSOV to Lower Leading Edge of Right Door	mm	4470	4470	0
7	RSOV to Lower Leading Edge of Left Door	mm	4470	4469	1
8	RSOV to Upper Trailing Edge of Right Door	mm	3353	3350	3
9	RSOV to Upper Trailing Edge of Left Door	mm	3353	3353	0
10	RSOV to Lower Trailing Edge of Right Door	mm	3360	3360	0
11	RSOV to Lower Trailing Edge of Left Door	mm	3360	3360	0
12	RSOV to Bottom of "A" Post of Right Side	mm	4450	4445	5
13	RSOV to Bottom of "A" Post of Left Side	mm	4450	4447	3
14	RSOV to Firewall, Right Side	mm	4845	4837	8
15	RSOV to Firewall, Left Side	mm	4825	4820	5
16	RSOV to Steering Column	mm	3980	4000	-20
17	Center of Steering Column to "A" Post	mm	390	365	25
18	Center of Steering Column to Headliner	mm	408	385	23
19	RSOV to Right Side of Front Bumper	mm	5845	5507	338
20	RSOV to Left Side of Front Bumper	mm	5845	5496	349
21	Length of Engine Block	mm	600	600	0
RD	RSOV to Right Side of Dash Panel	mm	4200	4200	0
CD	RSOV to Center of Dash Panel	mm	4225	4225	0
LD	RSOV to Left Side of Dash Panel	mm	4190	4190	0

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2014 Chevrolet Silverado 1500 4WD LT Crew Cab
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140103
Test Date: 07/30/2013

VEHICLE INFORMATION

VIN: 3GCUKREC1EG106446 Wheelbase (mm): 3900
Vehicle Size Category: Truck Test Weight (kg): 2787.8

ACCELEROMETER DATA

Accelerometer Locations: As per measurements on Page 15

Cal. Procedure/Interval: MGA procedure / 6 month

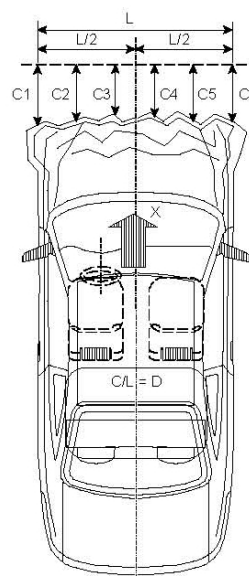
Integration Algorithm: Trapezoidal

Linearity: > 99%

Impact Velocity (km/h): 56.6

Velocity Change (km/h): 64.9

Time of Separation (msec): 130.8



CRUSH PROFILE

Collision Deformation Classification: Frontal

Midpoint of Damage: Centerline

Damage Region Length (mm): 1944

Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	5845	5496	349
C2	Crush zone 2 at left side	mm	5978	5442	536
C3	Crush zone 3 at left side	mm	6048	5397	651
C4	Crush zone 4 at right side	mm	6048	5400	648
C5	Crush zone 5 at right side	mm	5978	5433	545
C6	Crush zone 6 at right side	mm	5845	5507	338
L	C1 TO C6	mm	1944	1937	7

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Chevrolet Silverado 1500 4WD LT Crew Cab
Test Program: NCAP Frontal Barrier Impact Test

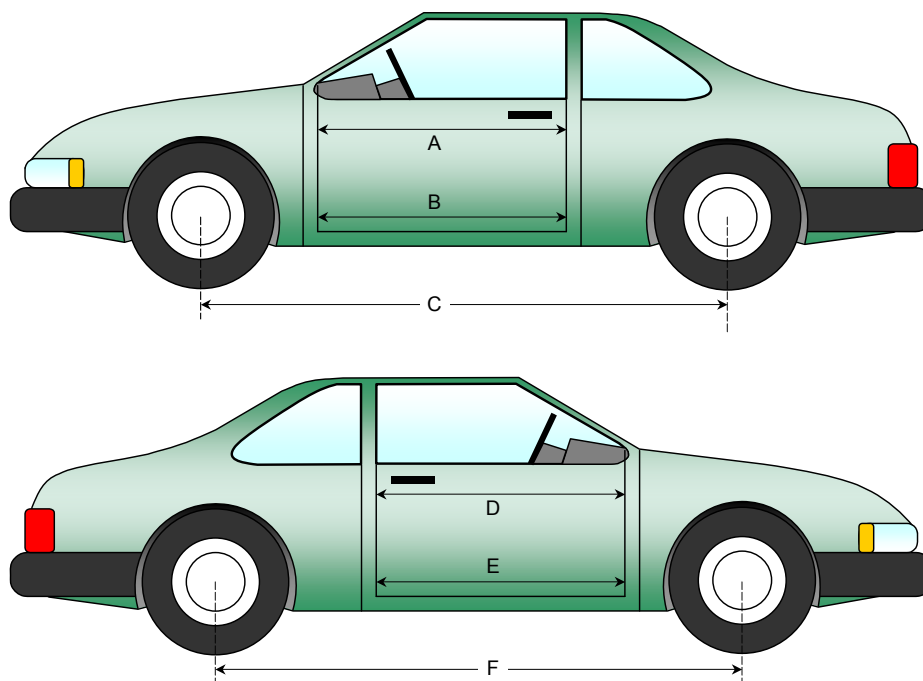
NHTSA No.: M20140103
Test Date: 07/30/2013

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1047	1047	0
B	Left Side Lower	mm	994	994	0
D	Right Side Upper	mm	1047	1047	0
E	Right Side Lower	mm	994	994	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	3900	3820	80
F	Right Side Wheelbase	mm	3900	3815	85



DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

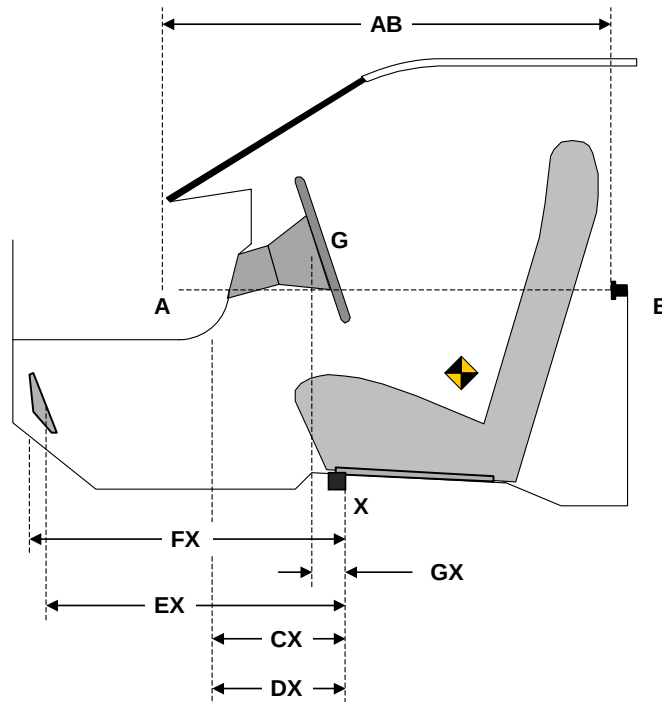
Test Vehicle: 2014 Chevrolet Silverado 1500 4WD LT Crew Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140103
 Test Date: 07/30/2013

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	772	772	0
CX	Left Knee Bolster to X	mm	288	291	-3
DX	Right Knee Bolster to X	mm	298	285	13
EX	Brake Pedal to X	mm	555	590	-35
FX	Foot Rest to X	mm	646	650	-4
GX	Center of Steering Column Wheel Hub to X	mm	107	117	-10

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: 2014 Chevrolet Silverado 1500 4WD LT Crew Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140103
 Test Date: 07/30/2013

Windshield Mounting Details:

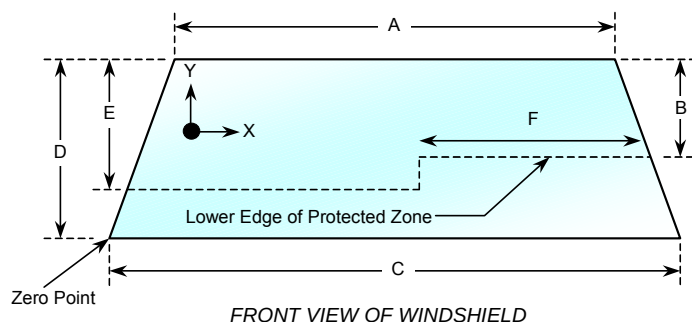
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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: 21.9°C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2288	2288	100
Right Side	2288	2288	100
Total	4576	4576	100



Item	Units	Value
A	mm	1368
B	mm	438
C	mm	1616
D	mm	796
E	mm	450
F	mm	666

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:	<u>2014 Chevrolet Silverado 1500 4WD LT Crew Cab</u>	NHTSA No.:	<u>M20140103</u>
Test Program:	<u>NCAP Frontal Barrier Impact Test</u>	Test Date:	<u>07/30/2013</u>

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21.9°C Test Time: 3:27 p.m.

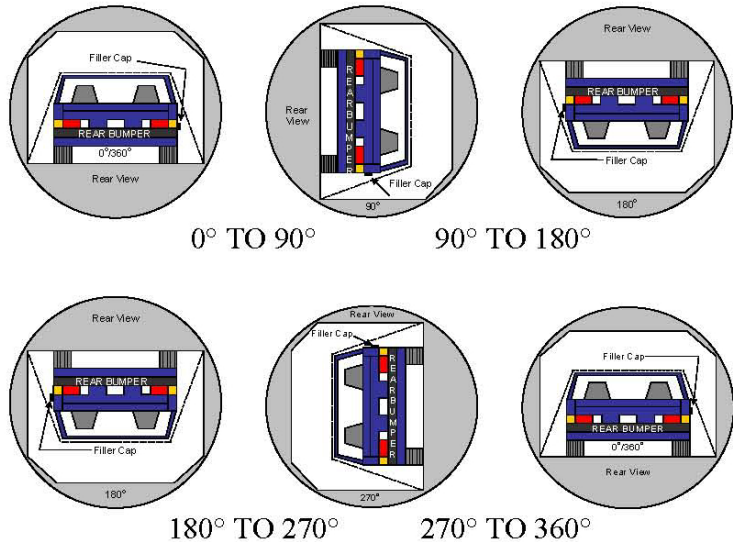
- | | |
|--|--------------|
| A. From impact until vehicle motion ceases:
(Maximum allowable = 1 oz.) | <u>0</u> oz. |
| B. For the 5 minute period after motion ceases:
(Maximum allowable = 5 oz.) | <u>0</u> oz. |
| C. For the following 25 minutes:
(Maximum allowable = 1 oz./minute) | <u>0</u> oz. |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

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

Test Vehicle: 2014 Chevrolet Silverado 1500 4WD LT Crew Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140103
 Test Date: 07/30/2013

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°	159	300	459
90° to 180°	142	300	442
180° to 270°	145	300	445
270° to 360°	168	300	468

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

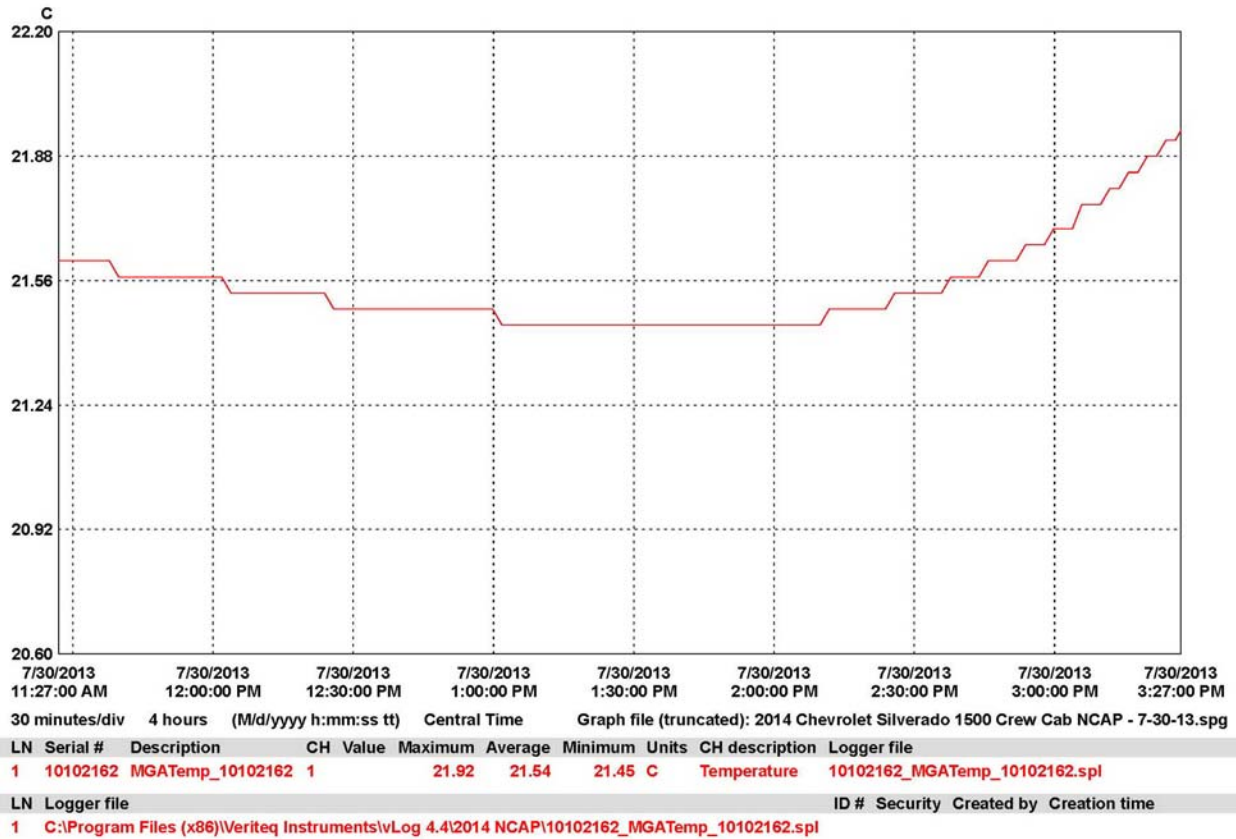
SOLVENT SPILLAGE LOCATION TABLE

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: 2014 Chevrolet Silverado 1500 4WD LT Crew Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140103
 Test Date: 07/30/2013



**APPENDIX A
PHOTOGRAPHS**

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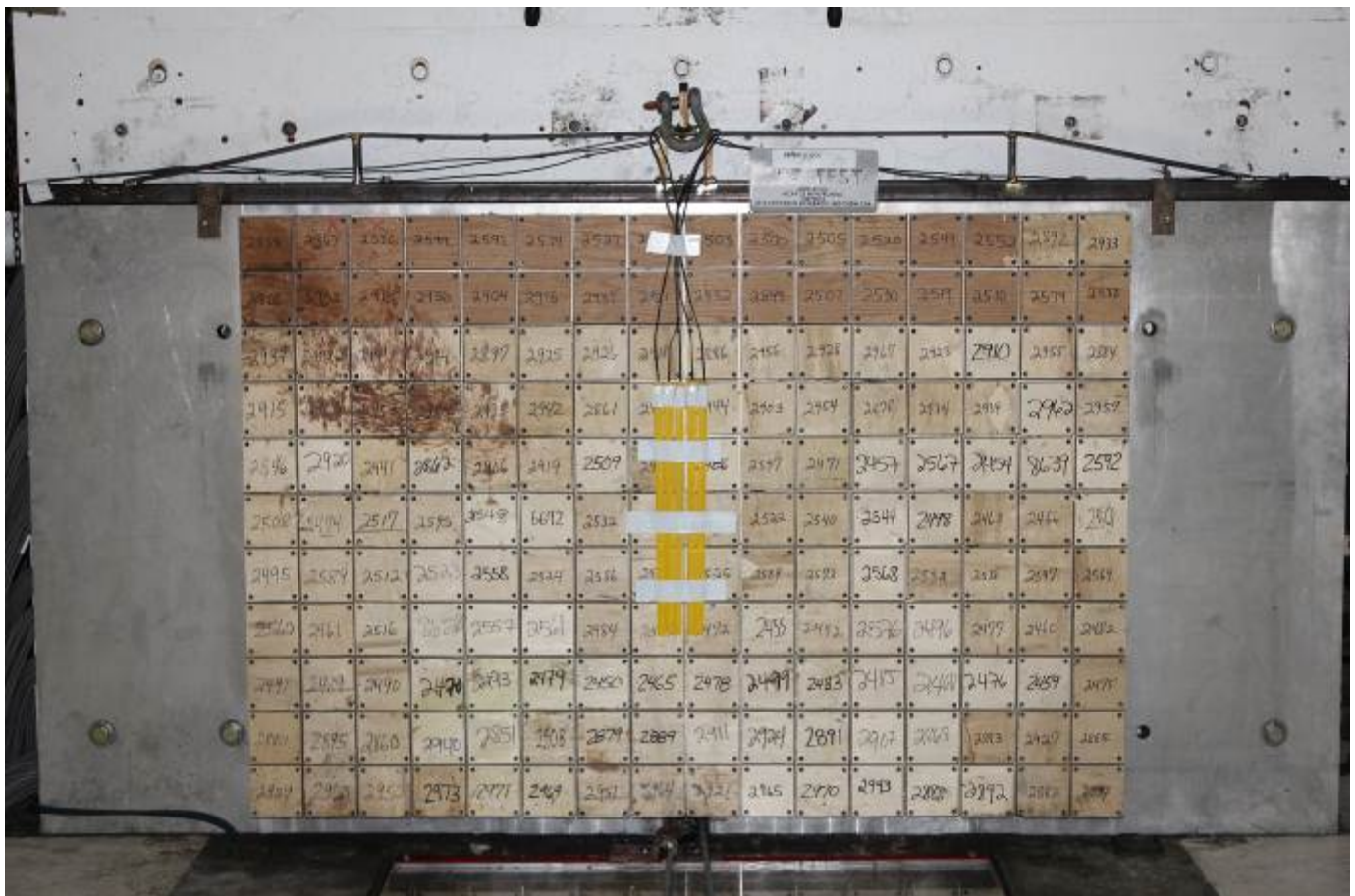
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Load Cell Location



Load Cell Wall

M20140103

GM MFD BY GENERAL MOTORS DE MEXICO, S. DE R.L. DE C.V. 05/13

GVWR	GAWR FRT	GAWR RR
3266 KG	1792 KG	1792 KG
7200 LB	3950 LB	3950 LB

THIS VEHICLE CONFORMS TO ALL APPLICABLE U.S. FEDERAL MOTOR VEHICLE SAFETY STANDARDS IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE.

3GCUKREC1EG106446 TYPE: TRUCK

MODEL: K15743

KBTS	TIRE SIZE	SPEED RTG	RIM	COLD TIRE PRESSURE
FRT	P265/65R18	T	18X8.5J	240KPA(35PSI)
RR	P265/65R18	T	18X8.5J	240KPA(35PSI)
SPA	P265/70R17	S	17X7.5J	240KPA(35PSI)

SEE OWNER'S MANUAL  FOR MORE INFORMATION.

Manufacturer's Label

 **TIRE AND LOADING INFORMATION**

SEATING CAPACITY TOTAL 6 FRONT 3 REAR 3

The combined weight of occupants and cargo should never exceed 728 kg or 1605 lbs.

TIRE	ORIGINAL SIZE		COLD TIRE PRESSURE
FRONT	P265/65R18	T	240 kPa, 35 PSI
REAR	P265/65R18	T	240 kPa, 35 PSI
SPARE	P265/70R17	S	240 kPa, 35 PSI

SEE OWNER'S MANUAL FOR ADDITIONAL INFORMATION

3GCUKREC1EG106446

M20140103

Tire Placard



2014 Chevrolet Silverado 1500 AWD Crew Cab 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



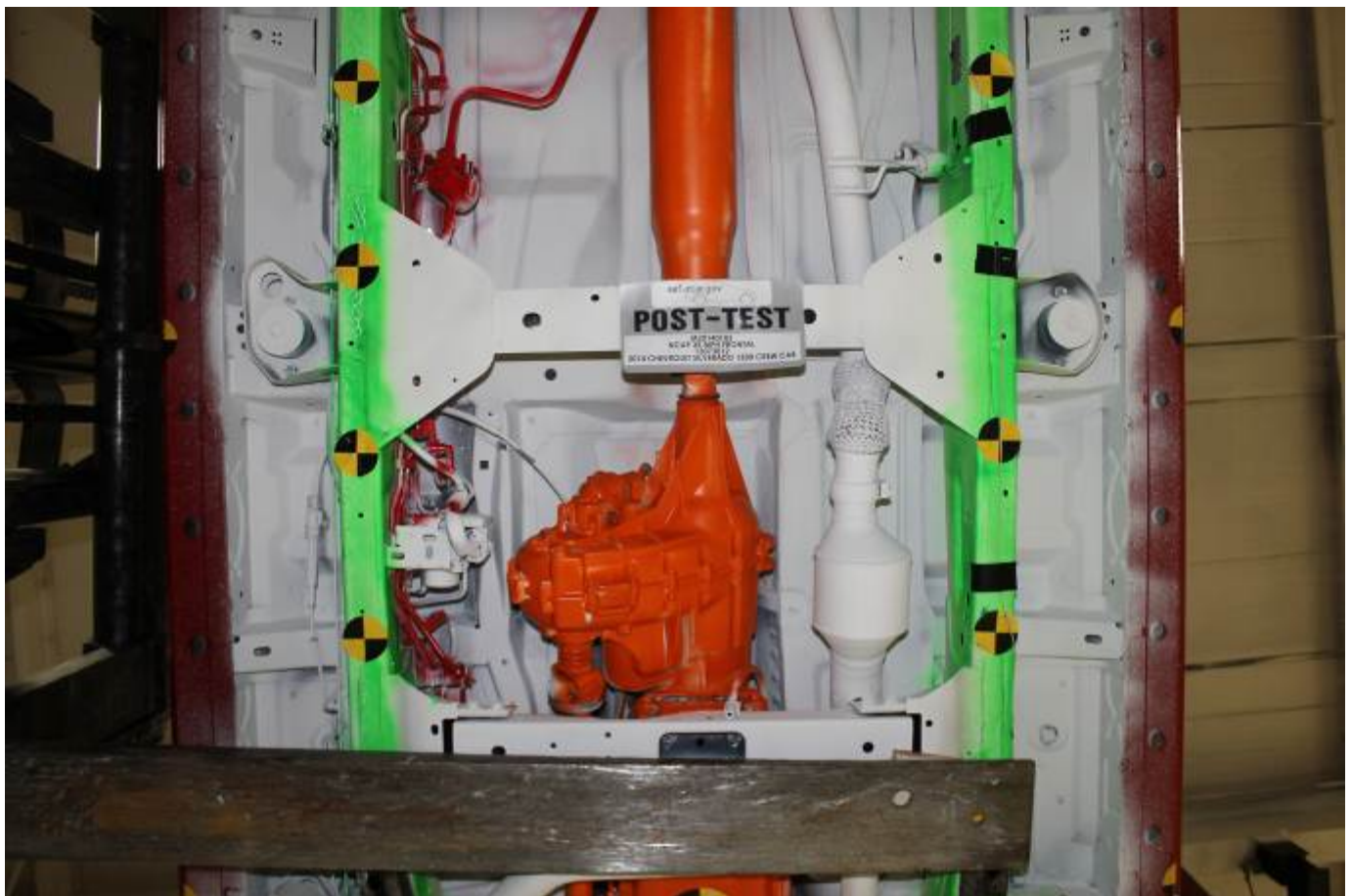
Pre-Test Front Underbody View



Post-Test Front Underbody View



Pre-Test Mid Front Underbody View



Post-Test Mid Front Underbody View



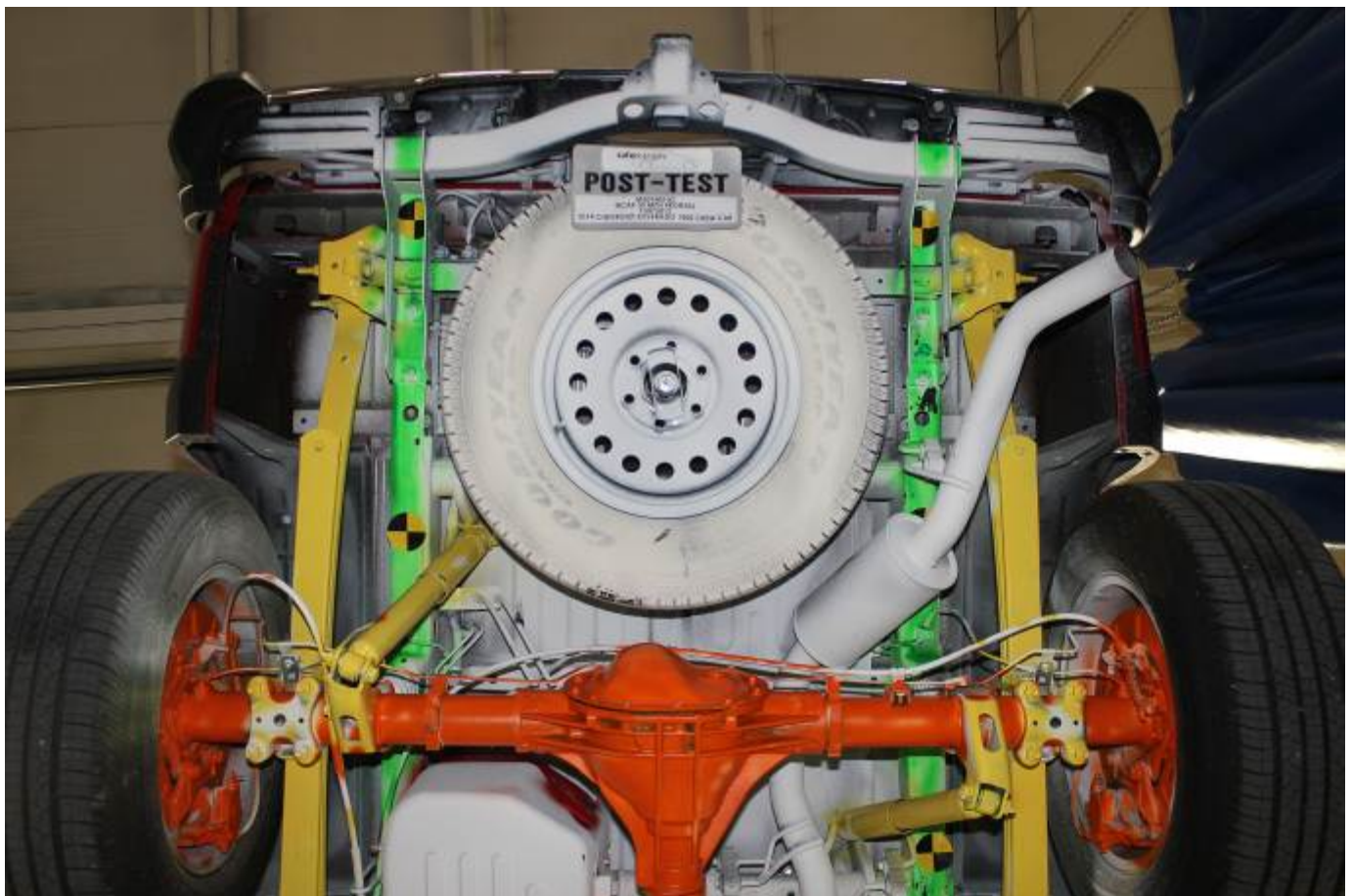
Pre-Test Mid Rear Underbody View



Post-Test Mid Rear Underbody View



Pre-Test Rear Underbody View



Post-Test Rear Underbody View



Pre-Test Dummy Cable Routing



Pre-Test Dummy Cable Routing



Pre-Test Dummy Cable Routing



Post-Test Dummy Cable Routing



Post-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



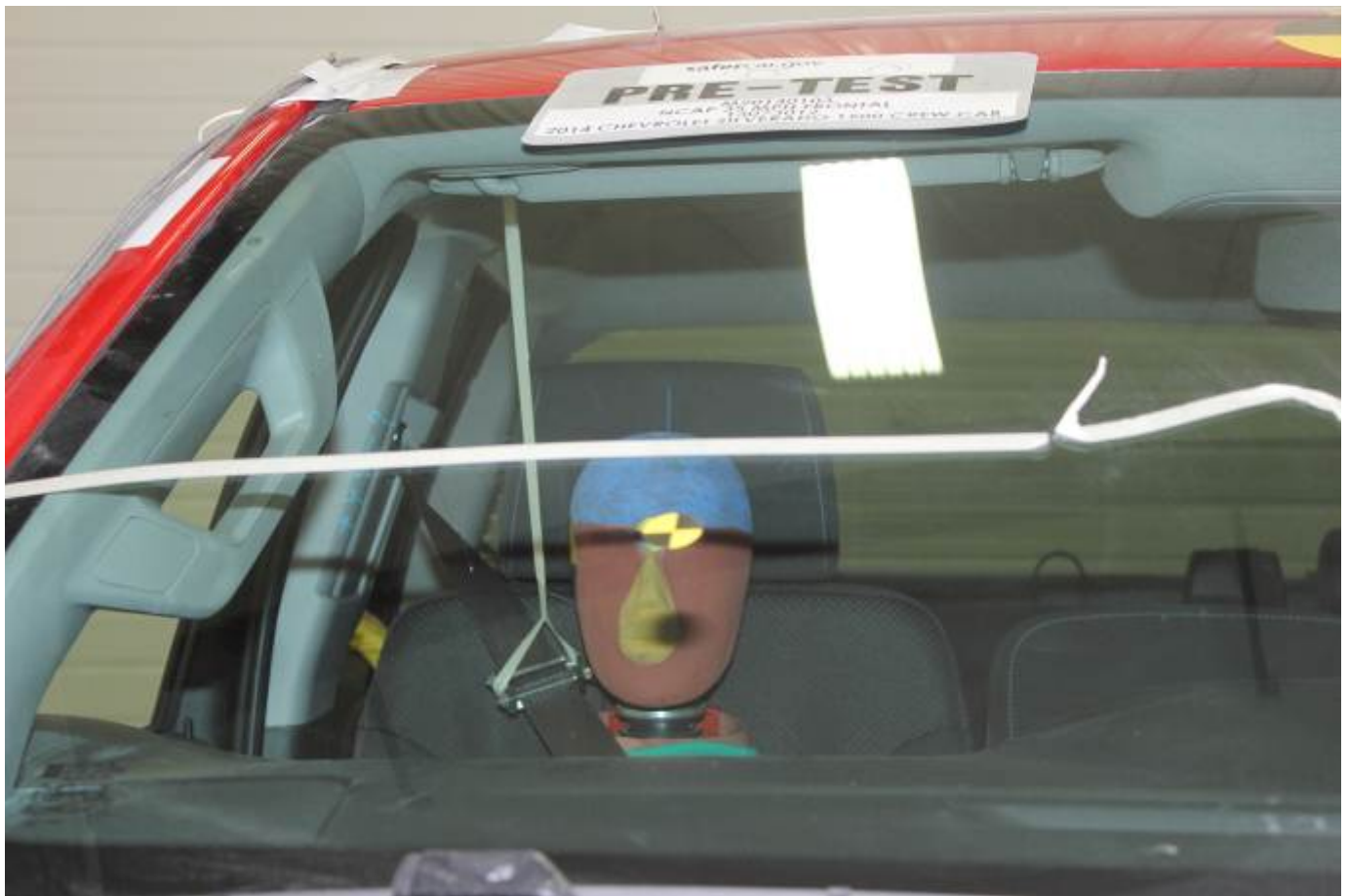
Post-Test Driver Dummy Contact with Knee Bolster



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 (without dummy)



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



Pre-Test Passenger's Side Floorpan



Post-Test Passenger's Side Floorpan



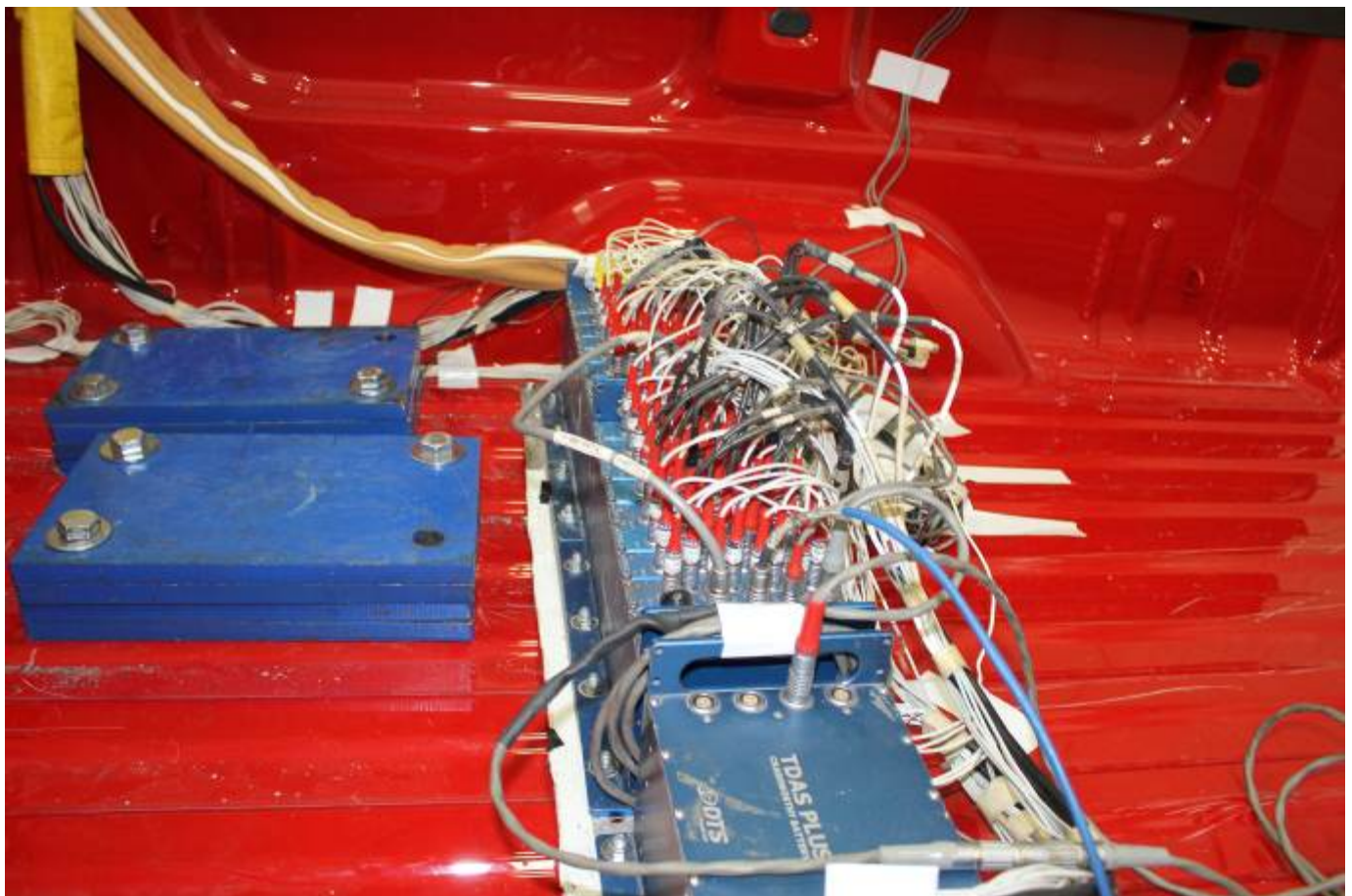
Post-Test Passenger Dummy Contact with Airbag



Post-Test Passenger Dummy Contact with Headrest



Post-Test Passenger Dummy Contact with Glove Box



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



2014 Chevrolet Silverado 1500 AWD Crew Cab Frontal Impact Event

APPENDIX B
DUMMY RESPONSE DATA TRACES

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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 CG X Redundant
 Driver Head CG Y Redundant
 Driver Head CG Z Redundant
 Driver 9 Axis Head X Arm Y
 Driver 9 Axis Head X Arm Z
 Driver 9 Axis Head Y Arm X
 Driver 9 Axis Head Y Arm Z
 Driver 9 Axis Head Z Arm X
 Driver 9 Axis Head Z Arm Y
 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: Not Installed
Driver Shoulder Belt Force
Passenger Head CG X Redundant
Passenger Head CG Y Redundant
Passenger Head CG Z Redundant
Passenger 9 Axis Head X Arm Y
Passenger 9 Axis Head X Arm Z
Passenger 9 Axis Head Y Arm X
Passenger 9 Axis Head Y Arm Z
Passenger 9 Axis Head Z Arm X
Passenger 9 Axis Head Z Arm Y
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

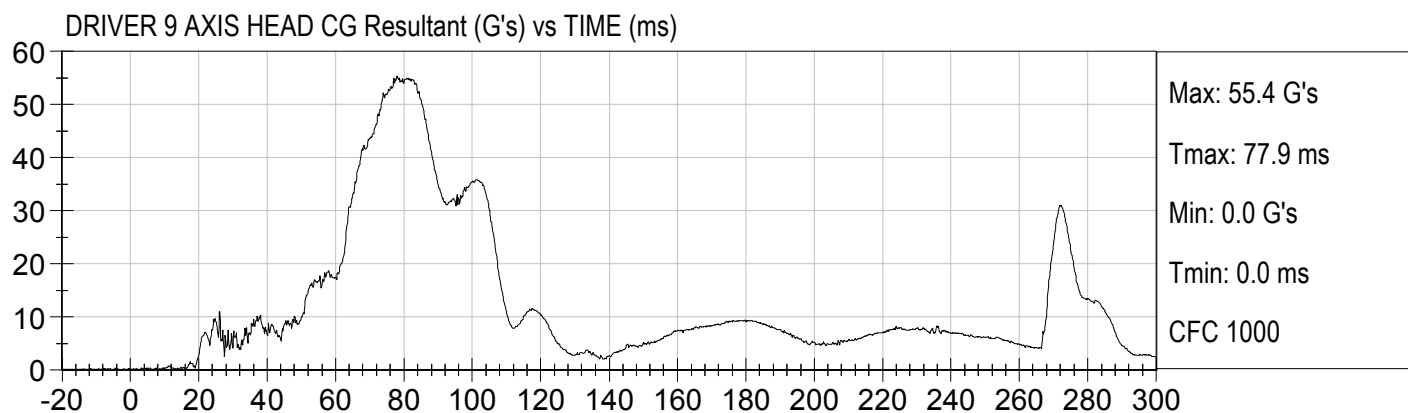
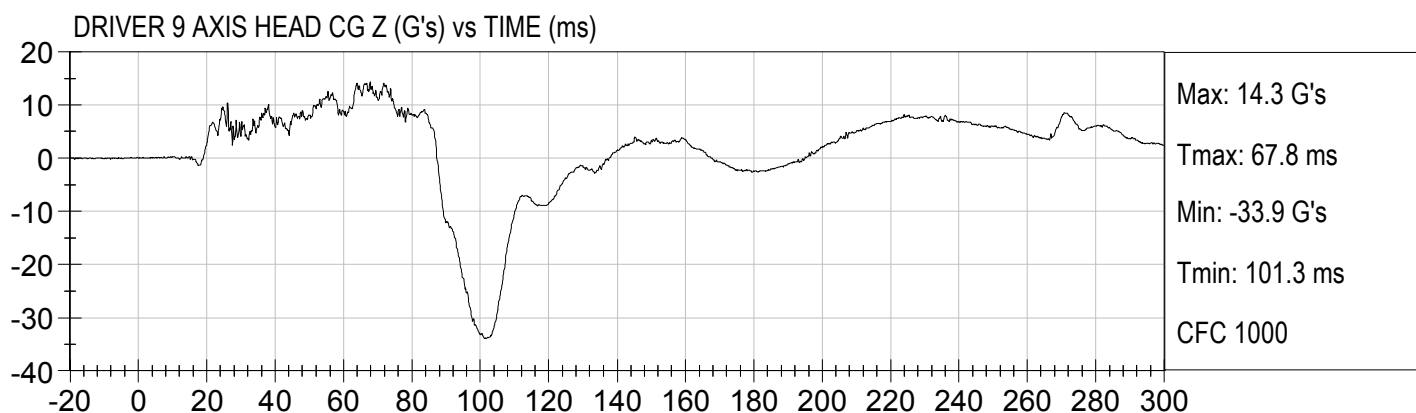
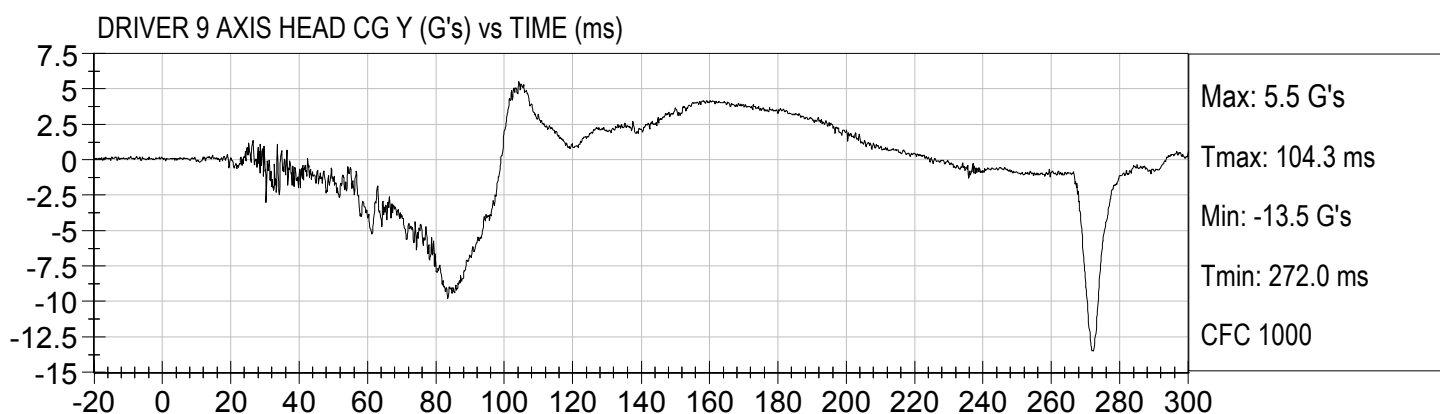
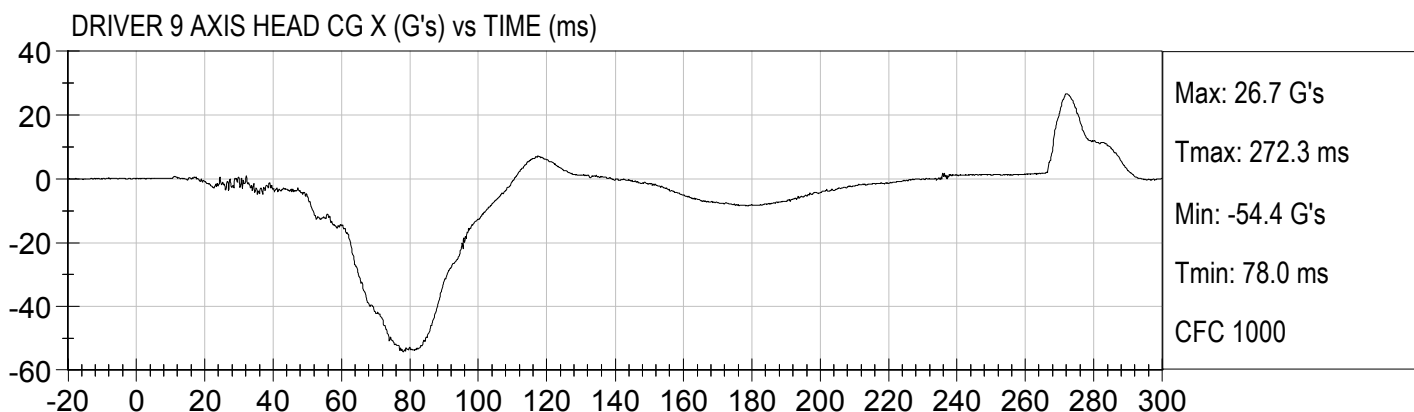
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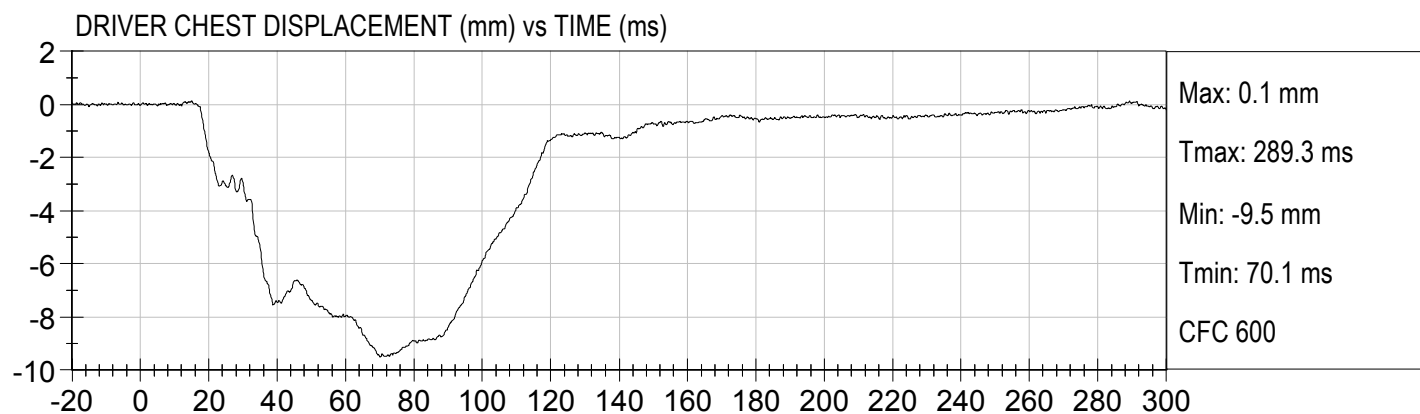
Right Rear Seat Crossmember Z

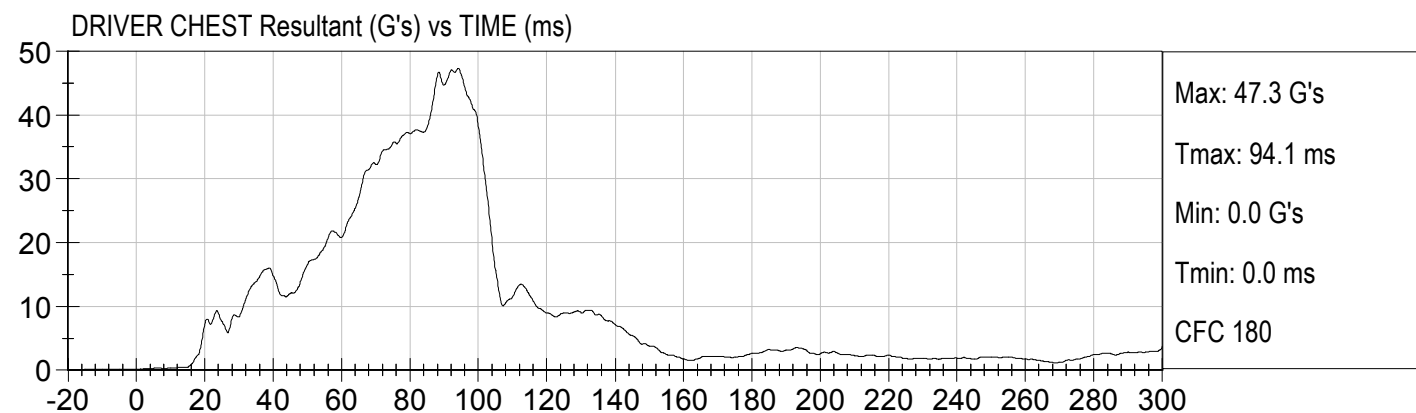
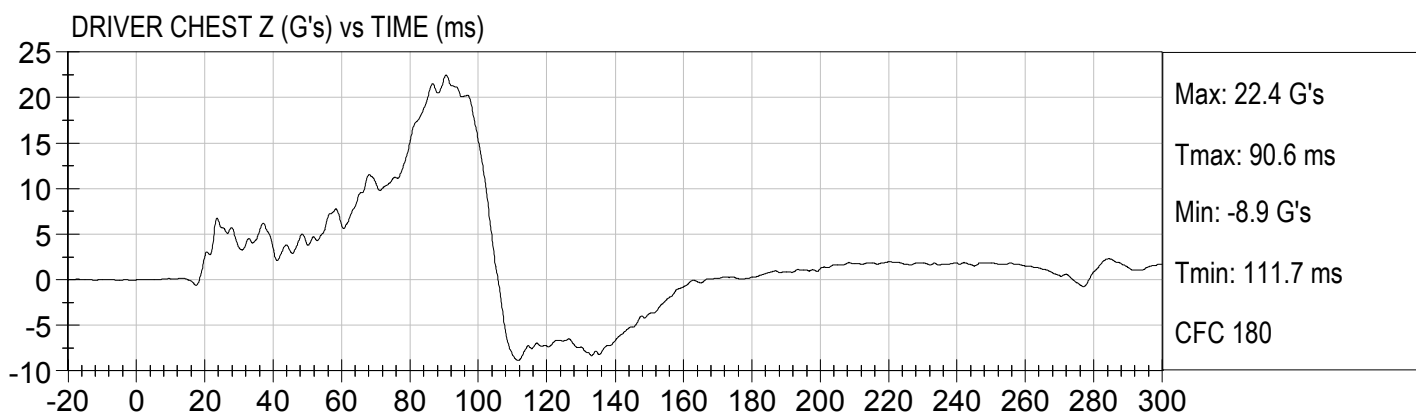
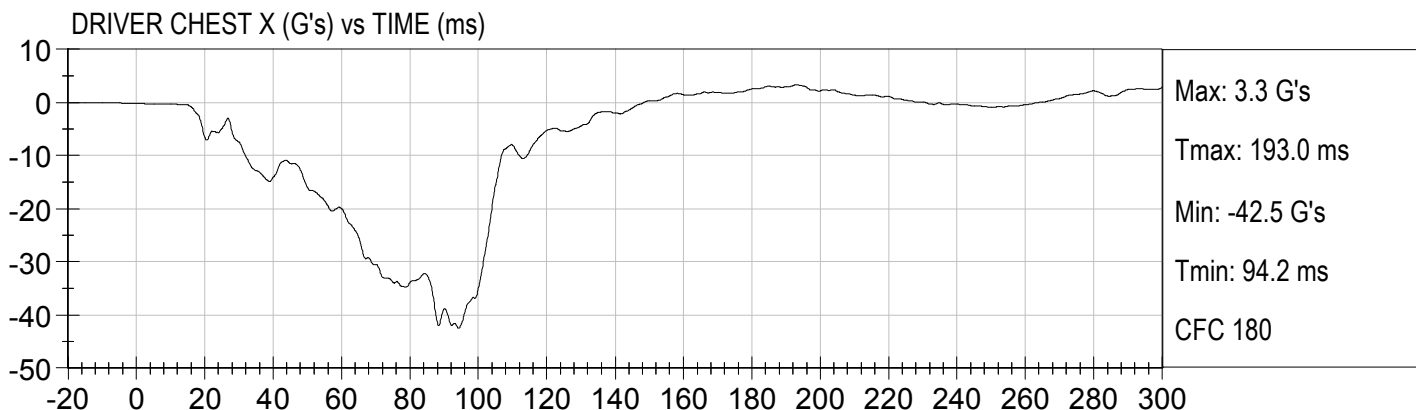
Left Rear Seat Crossmember Xr

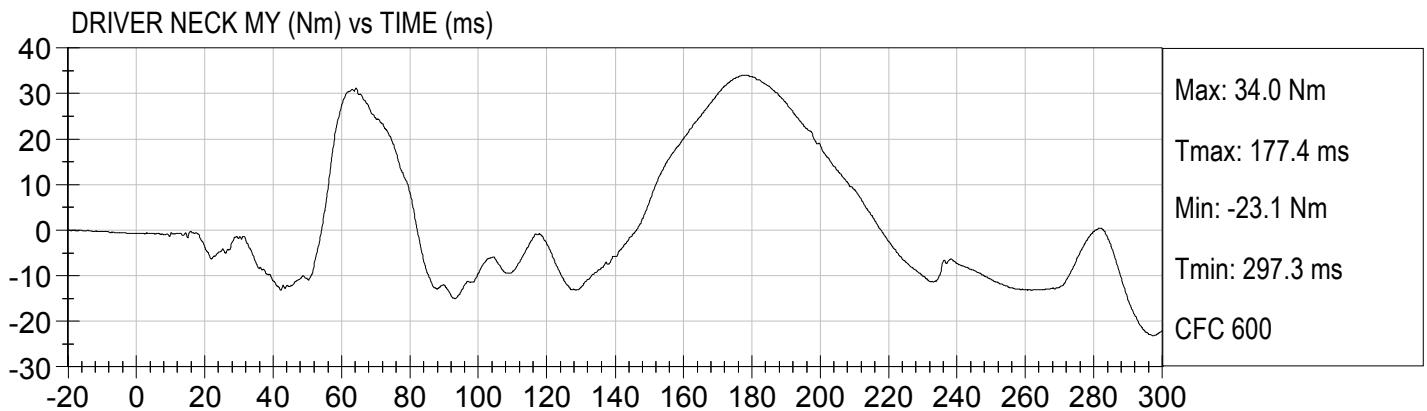
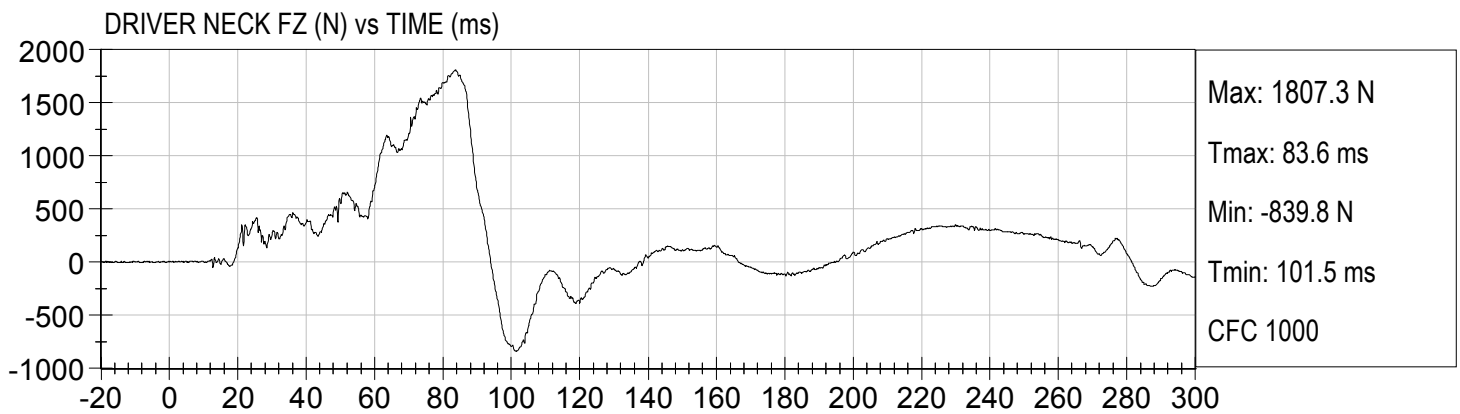
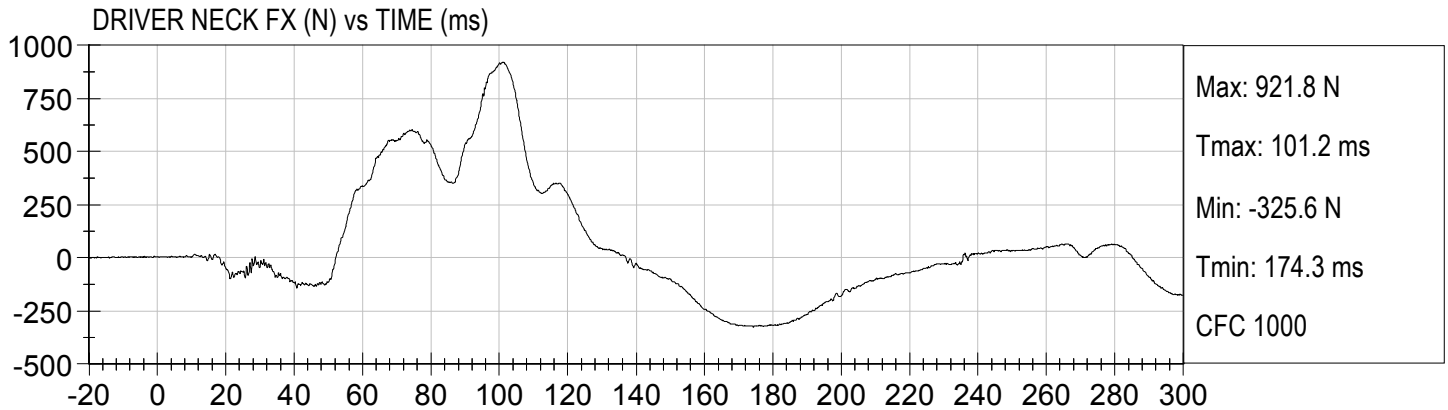
Right Rear Seat Crossmember Xr

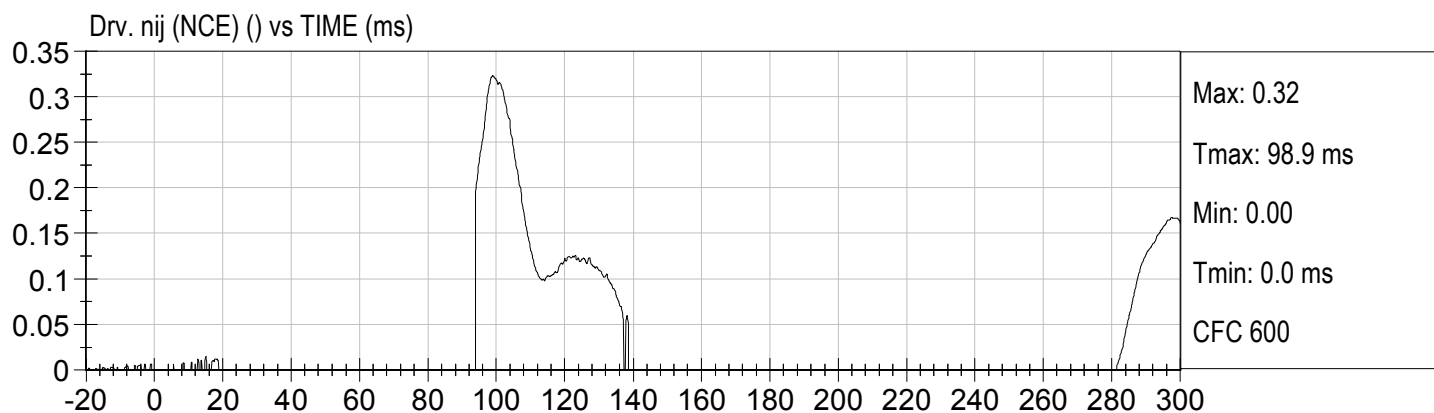
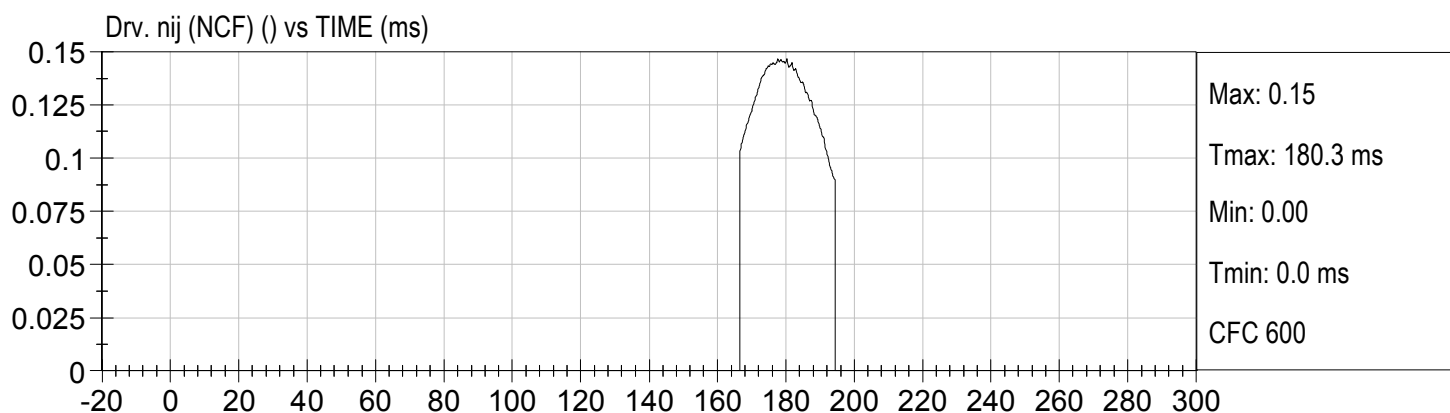
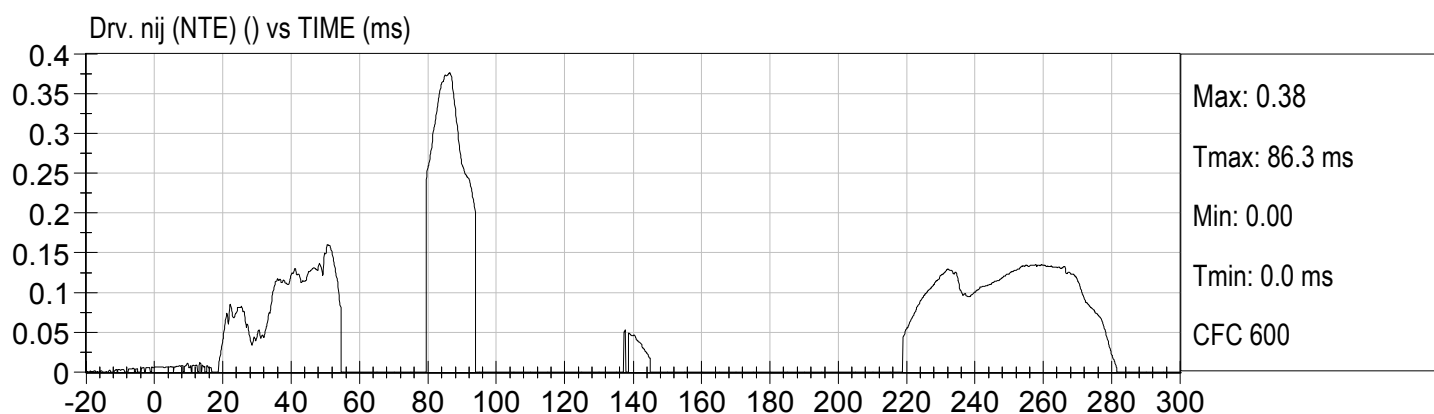
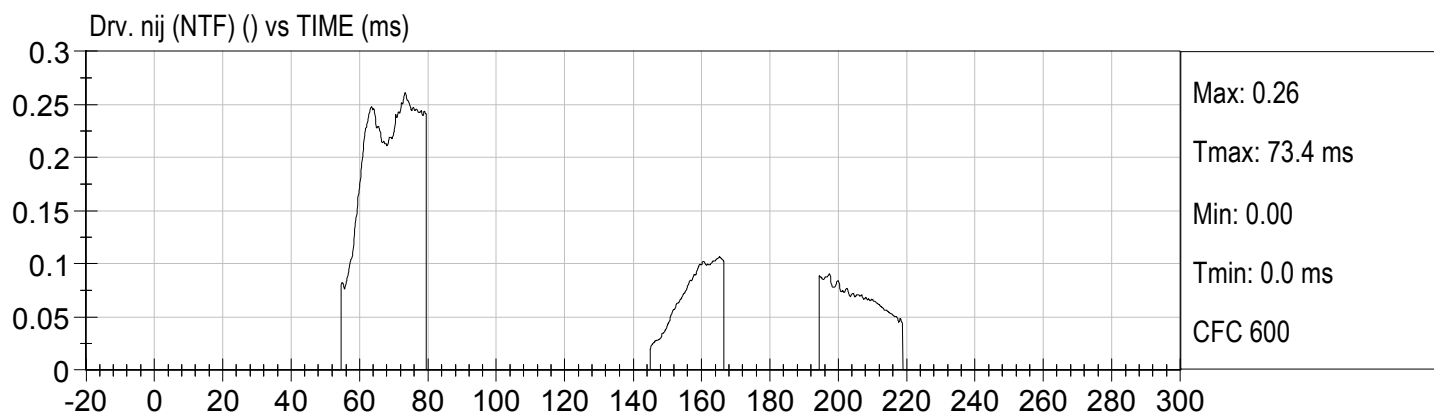
Advanced Research Load Cell Barrier – 528 channels

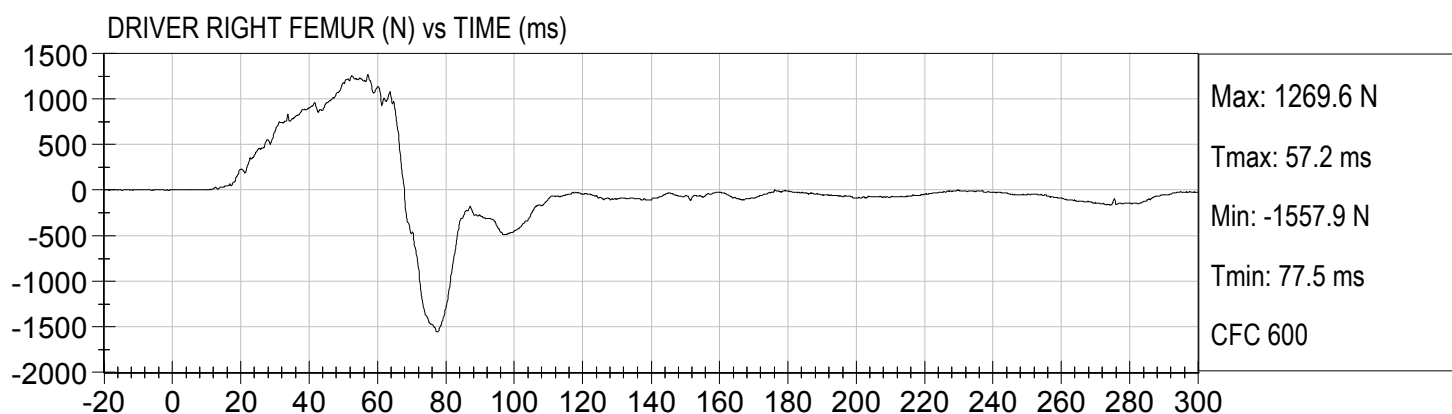
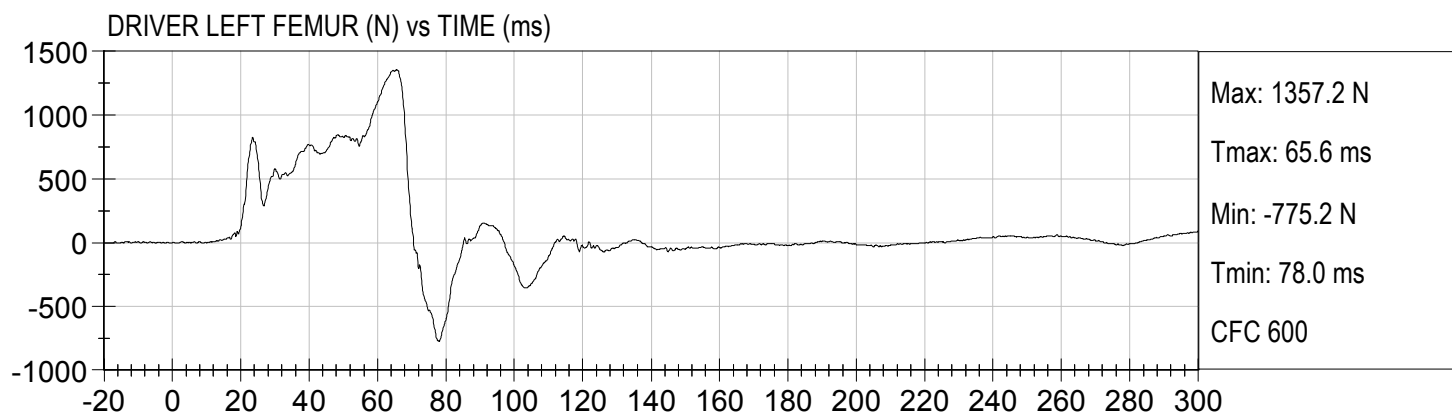






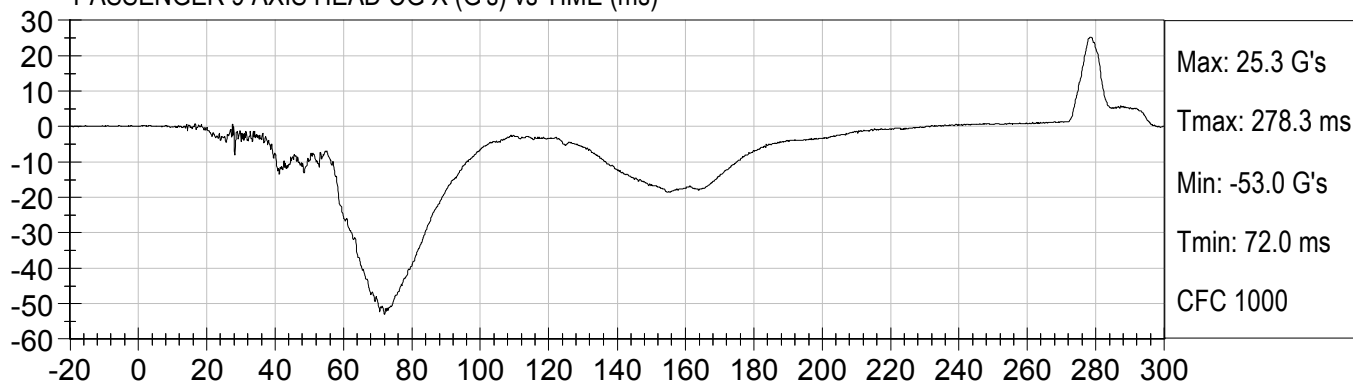




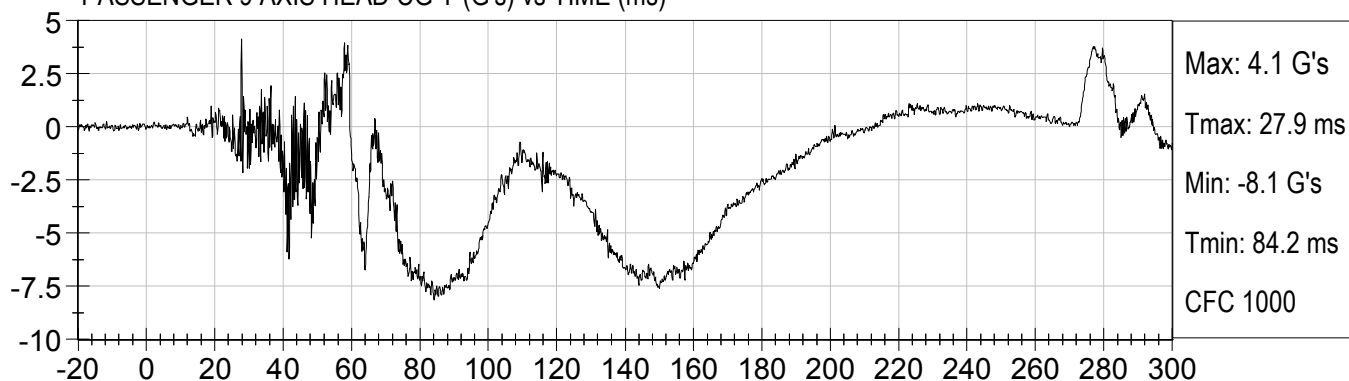




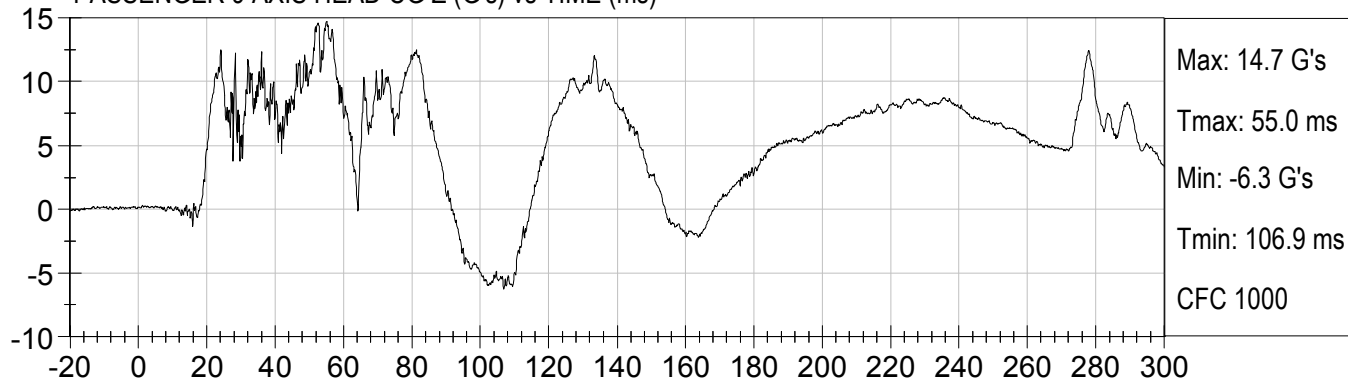
PASSENGER 9 AXIS HEAD CG X (G's) vs TIME (ms)



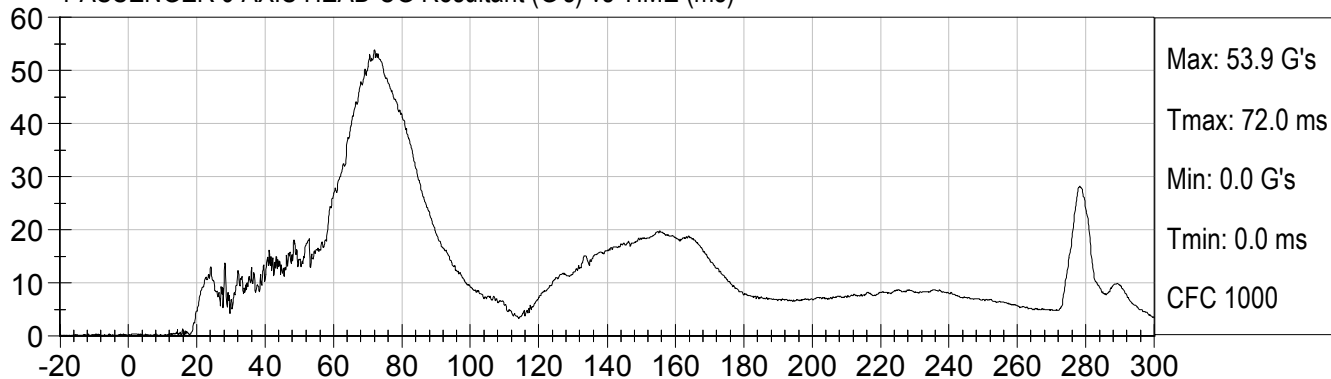
PASSENGER 9 AXIS HEAD CG Y (G's) vs TIME (ms)

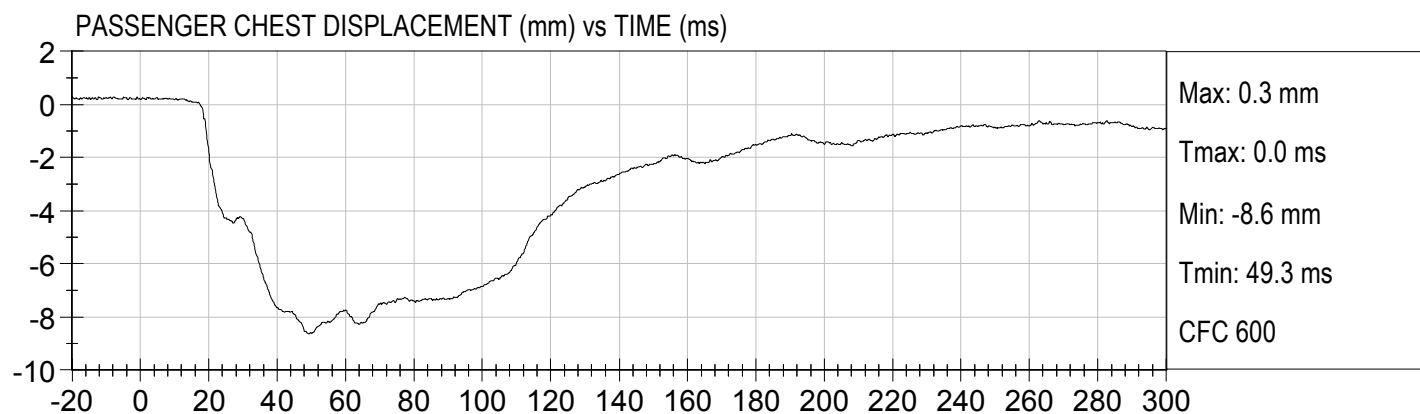


PASSENGER 9 AXIS HEAD CG Z (G's) vs TIME (ms)



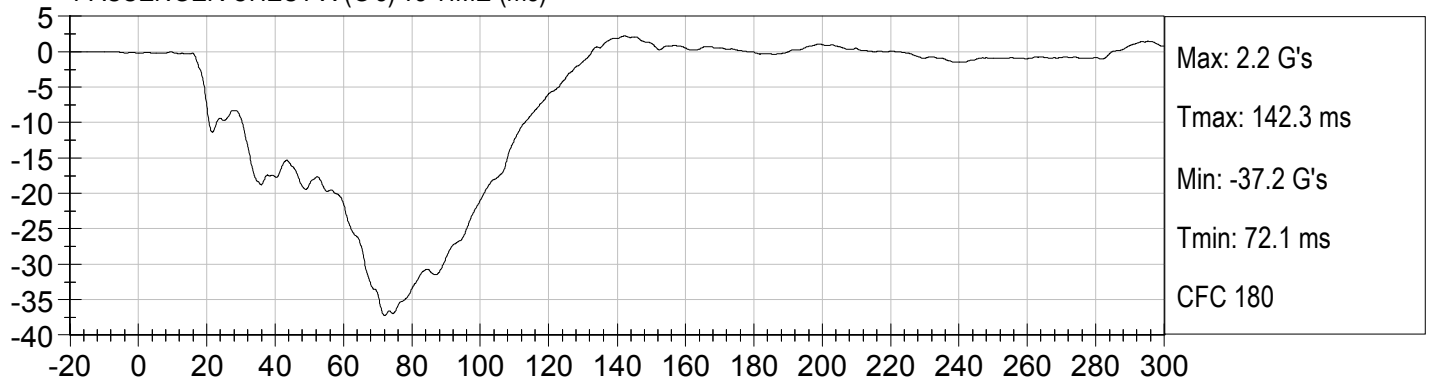
PASSENGER 9 AXIS HEAD CG Resultant (G's) vs TIME (ms)



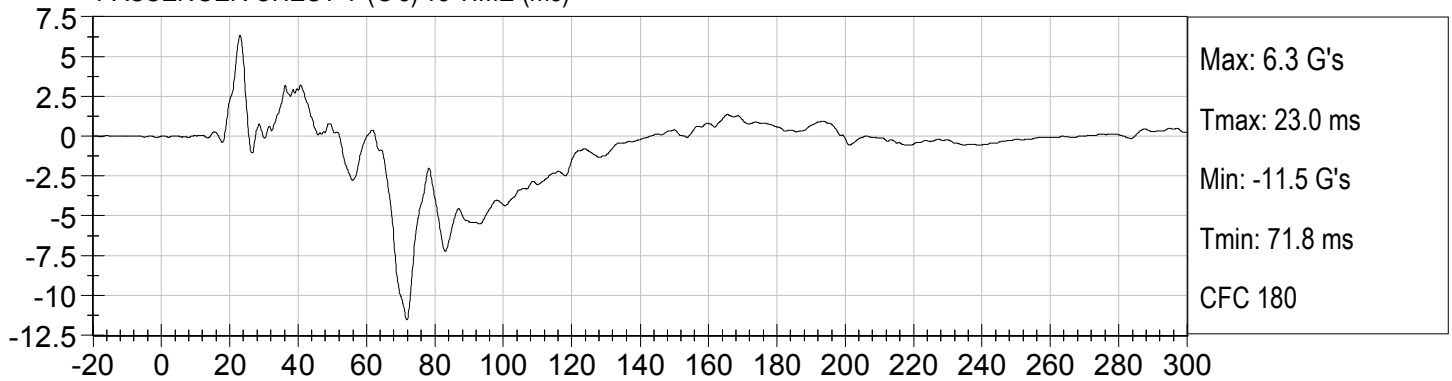




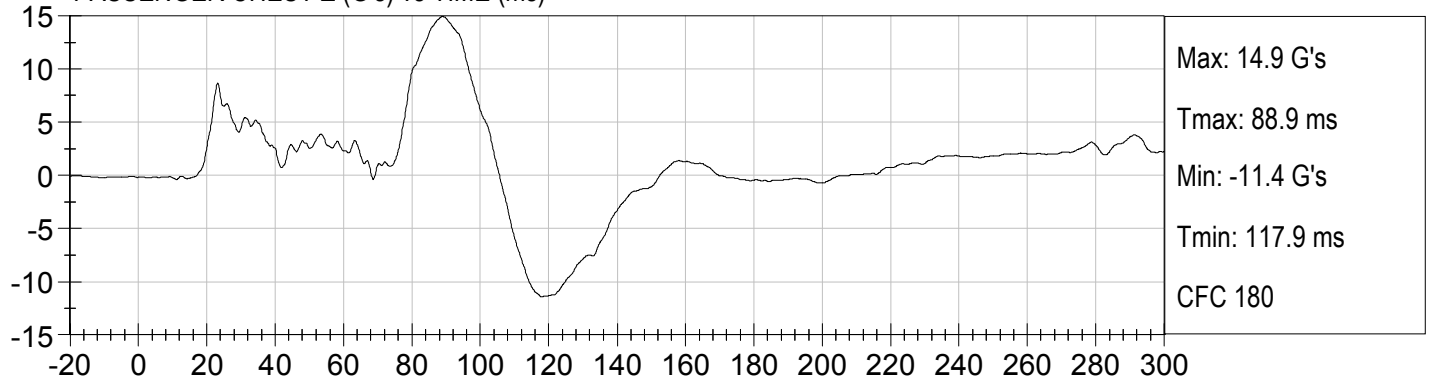
PASSENGER CHEST X (G's) vs TIME (ms)



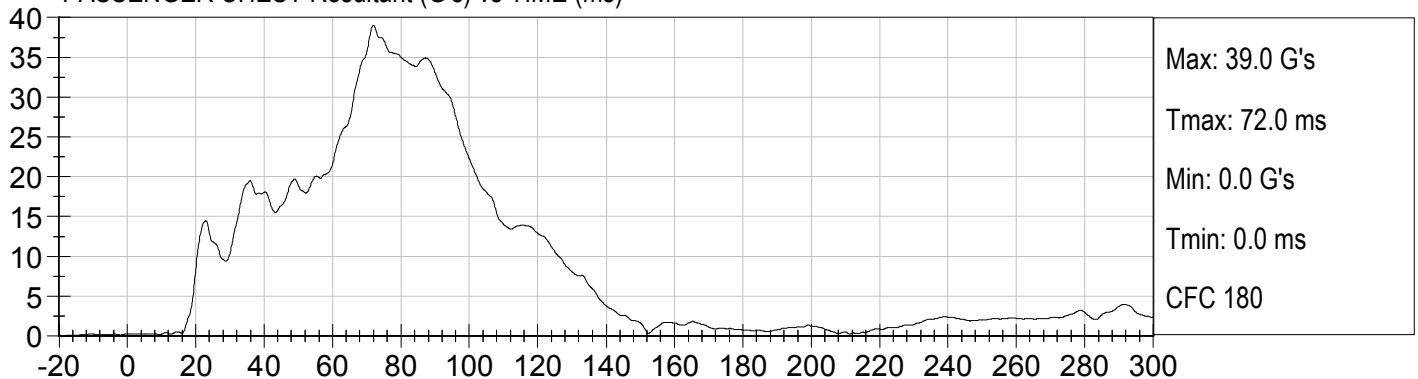
PASSENGER CHEST Y (G's) vs TIME (ms)

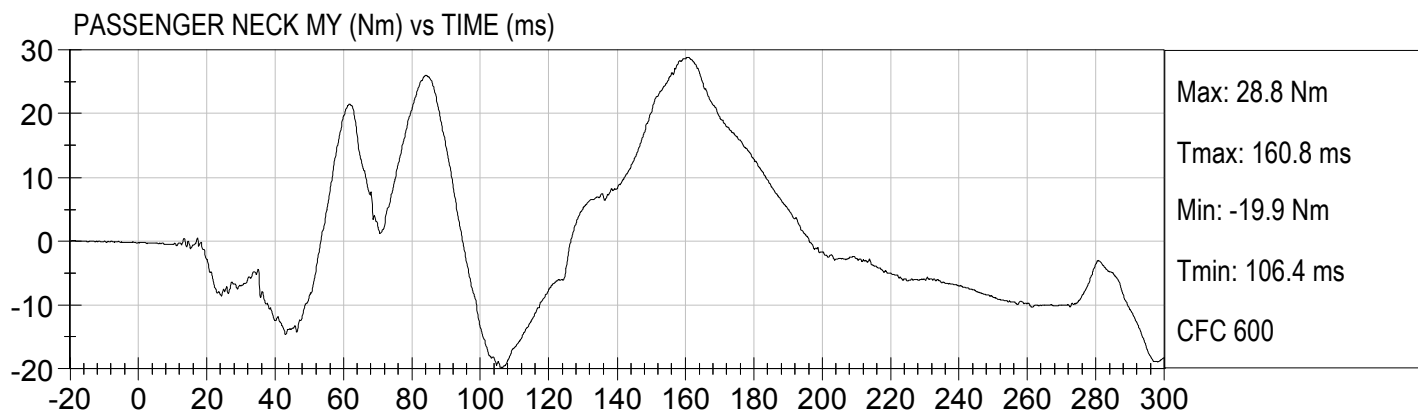
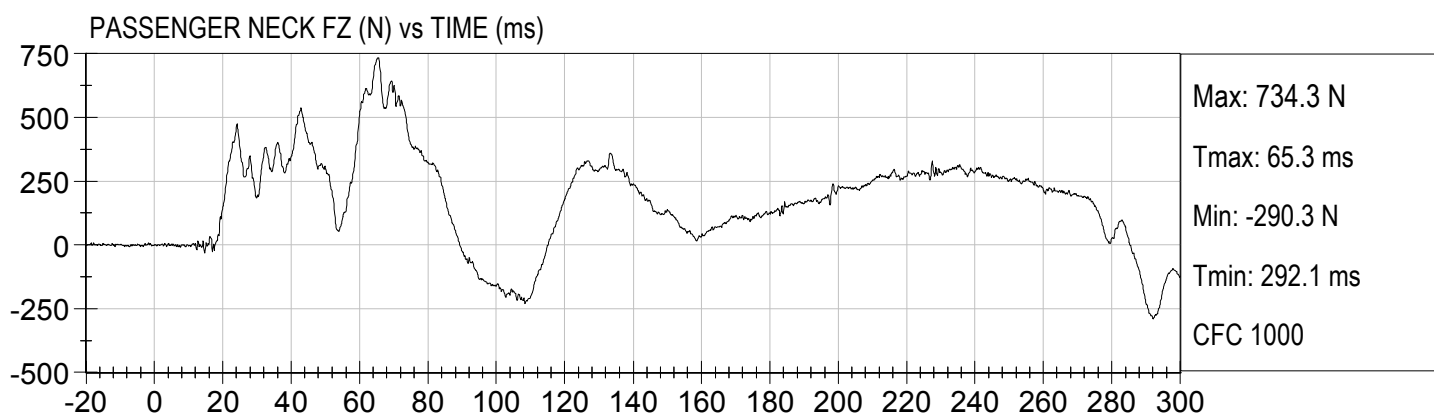
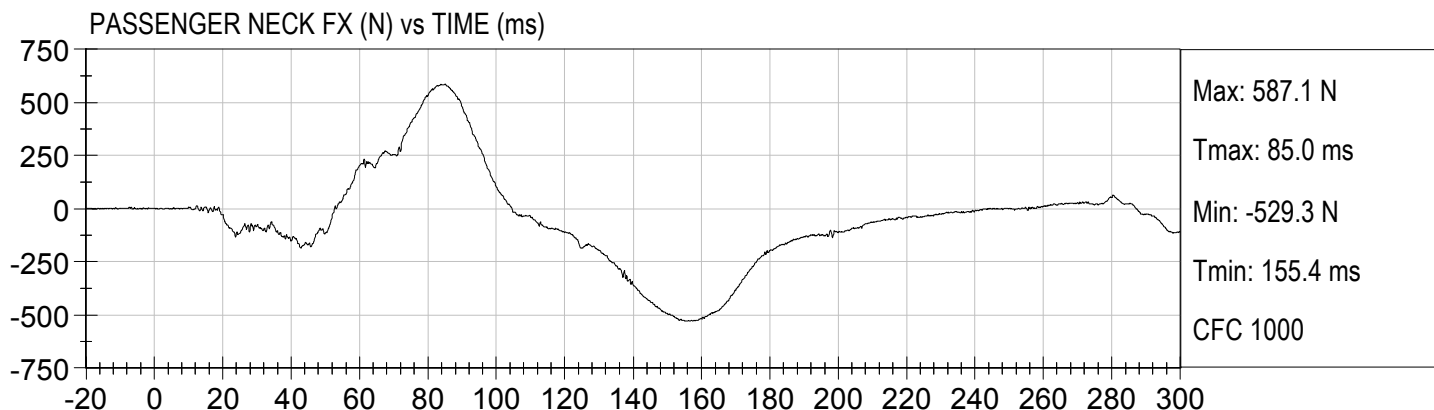


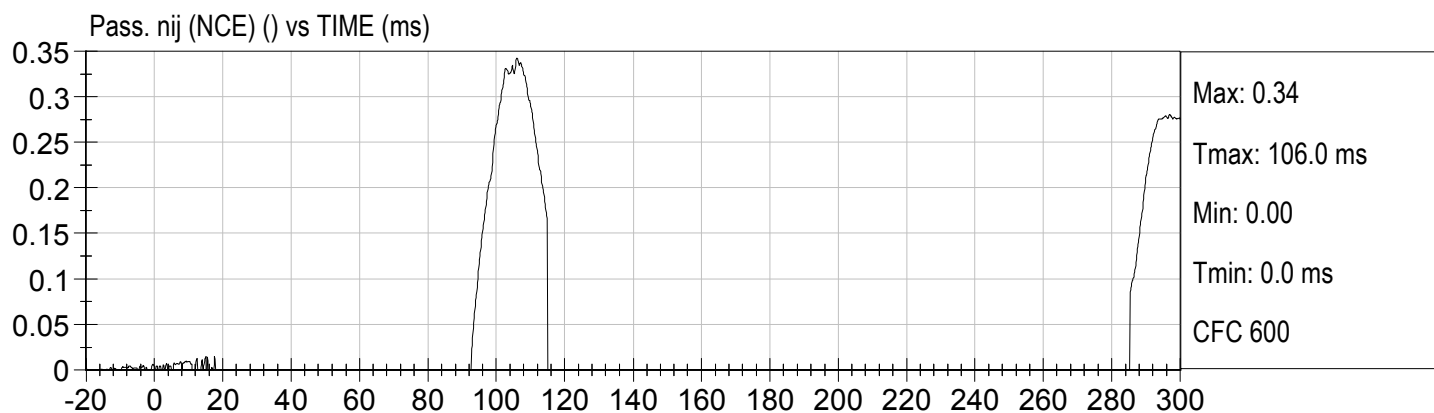
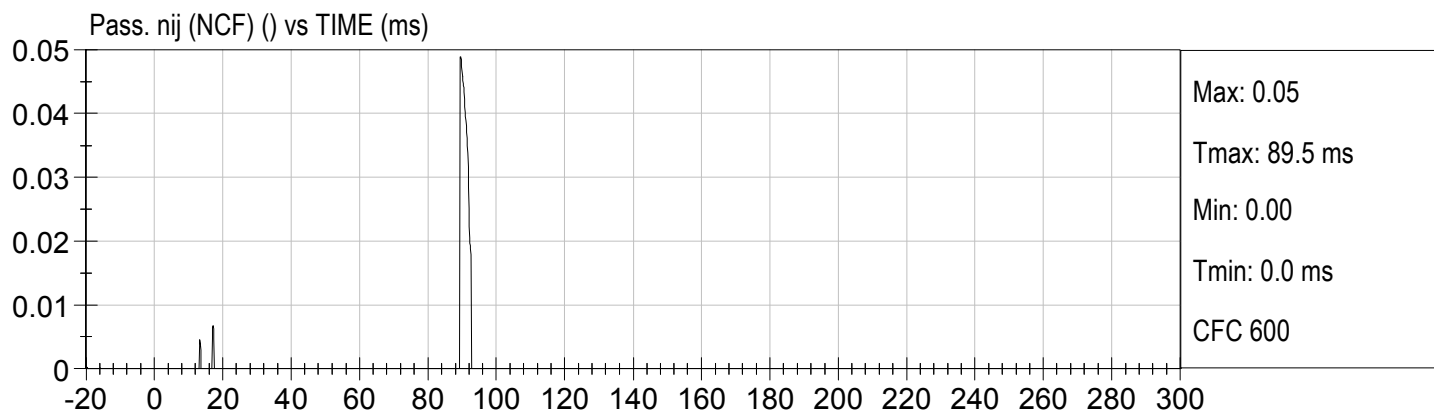
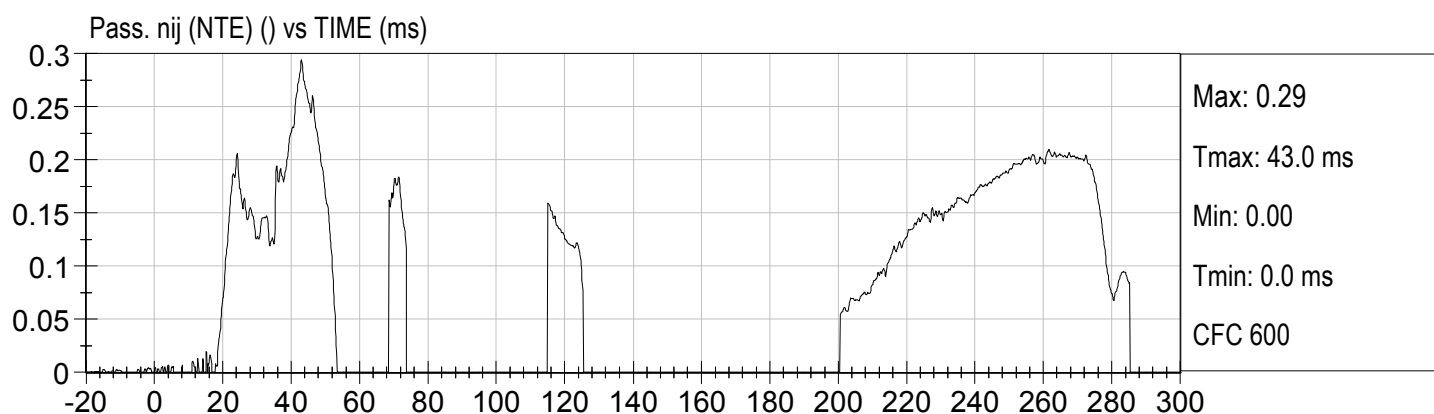
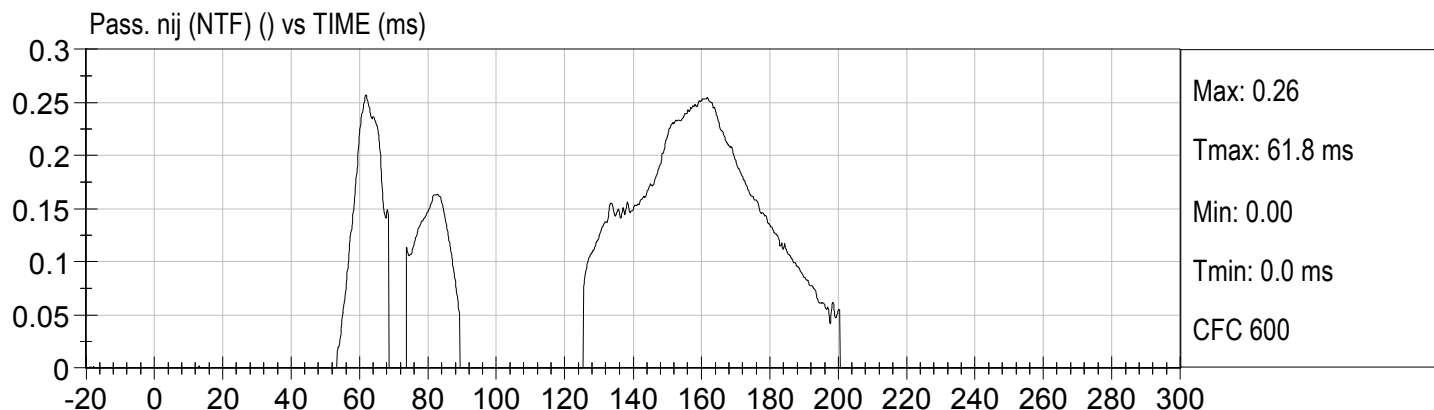
PASSENGER CHEST Z (G's) vs TIME (ms)

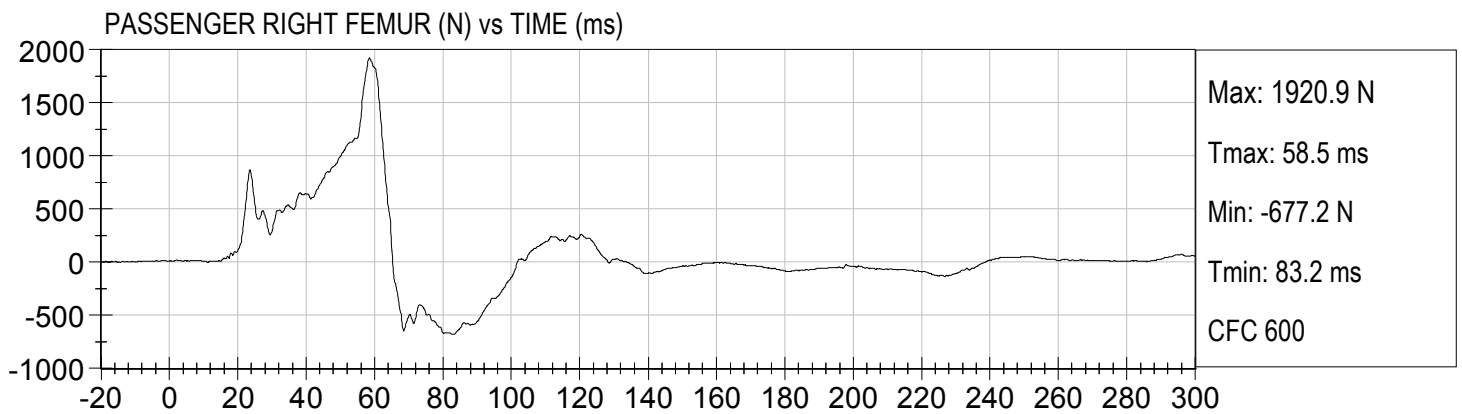
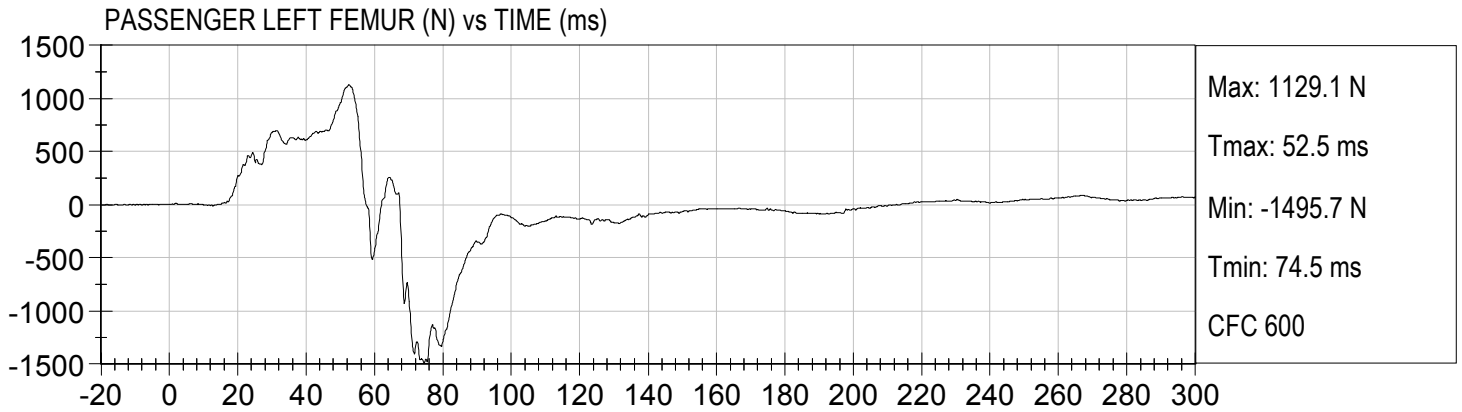


PASSENGER CHEST Resultant (G's) vs TIME (ms)









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

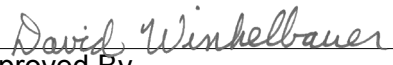
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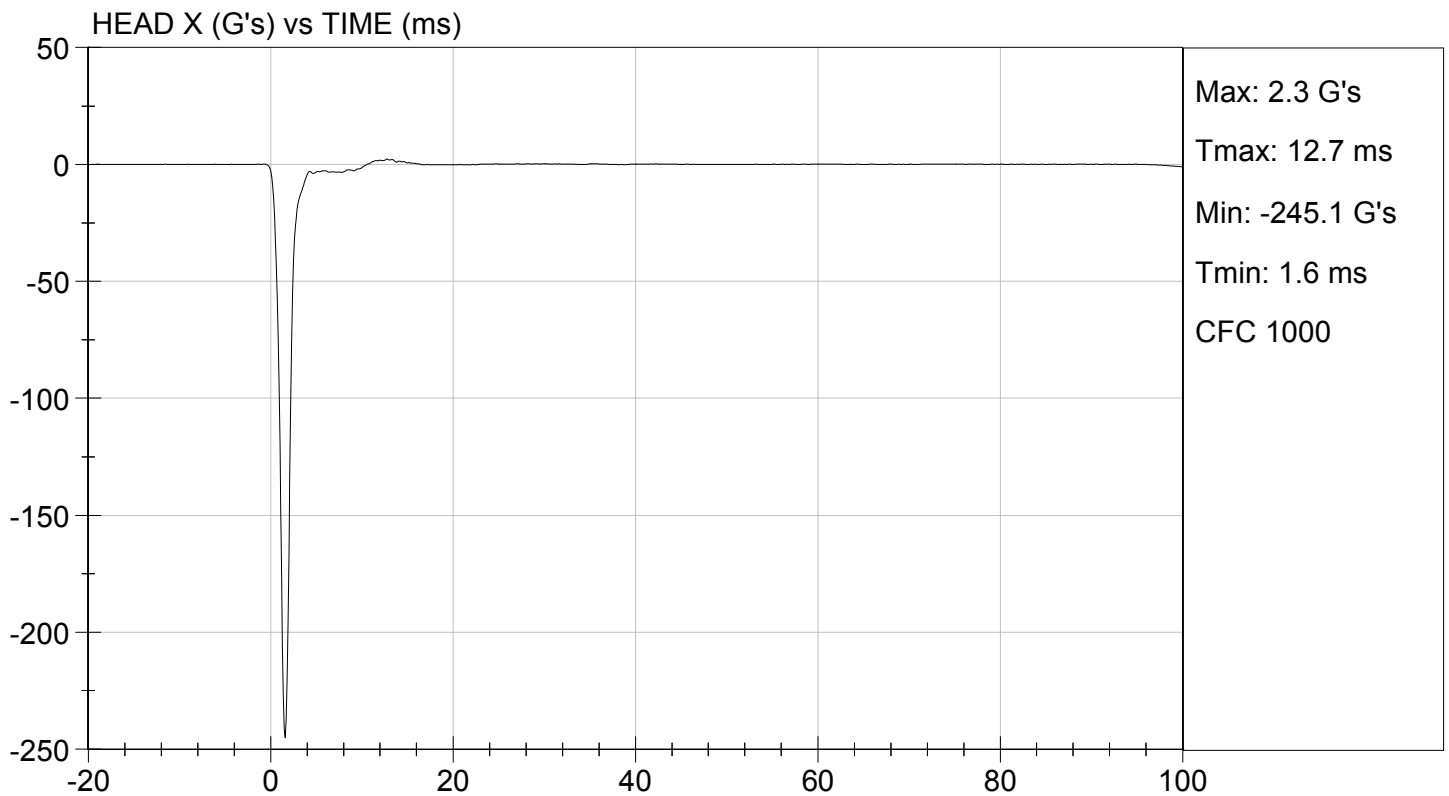
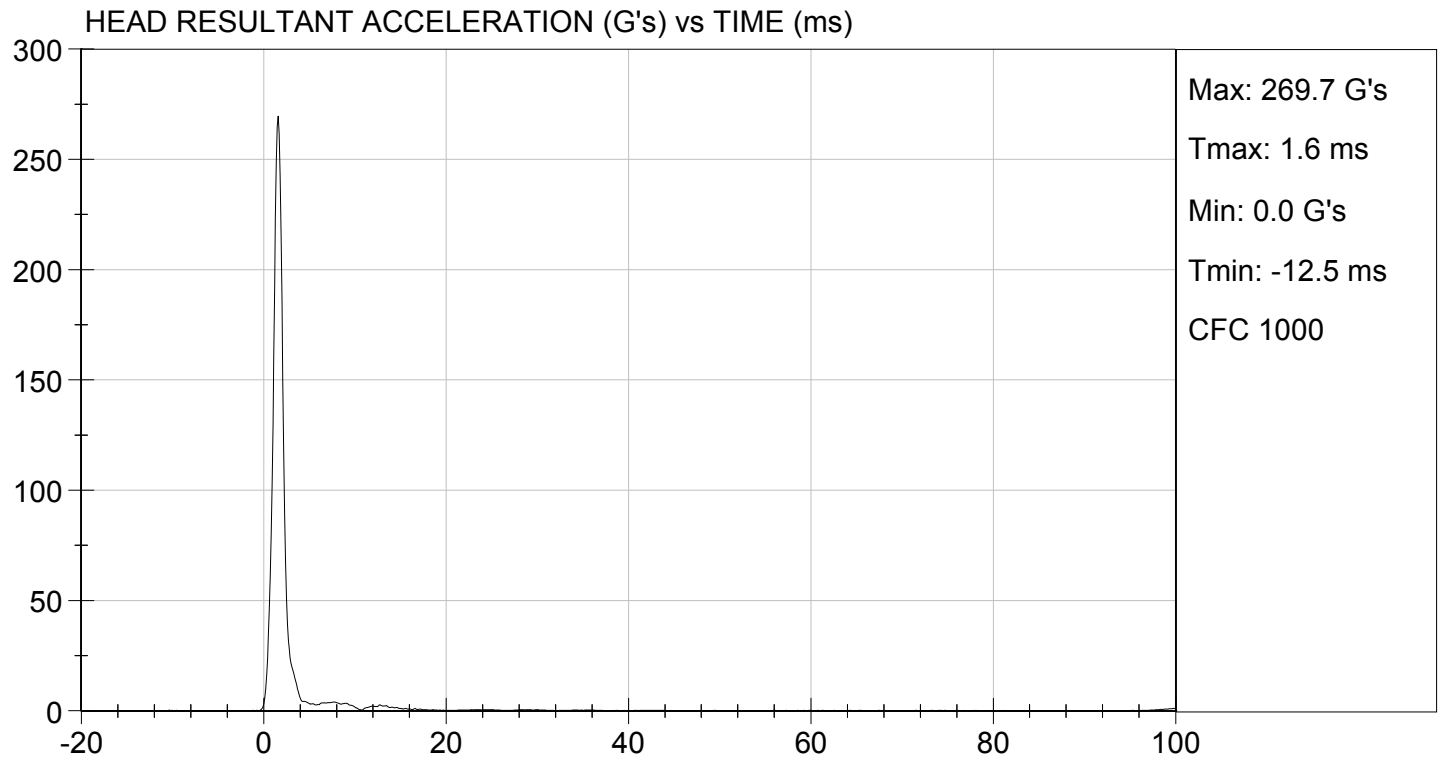
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	51	Pass
Peak Resultant Acceleration	G's	225 to 275	270	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	2.4	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

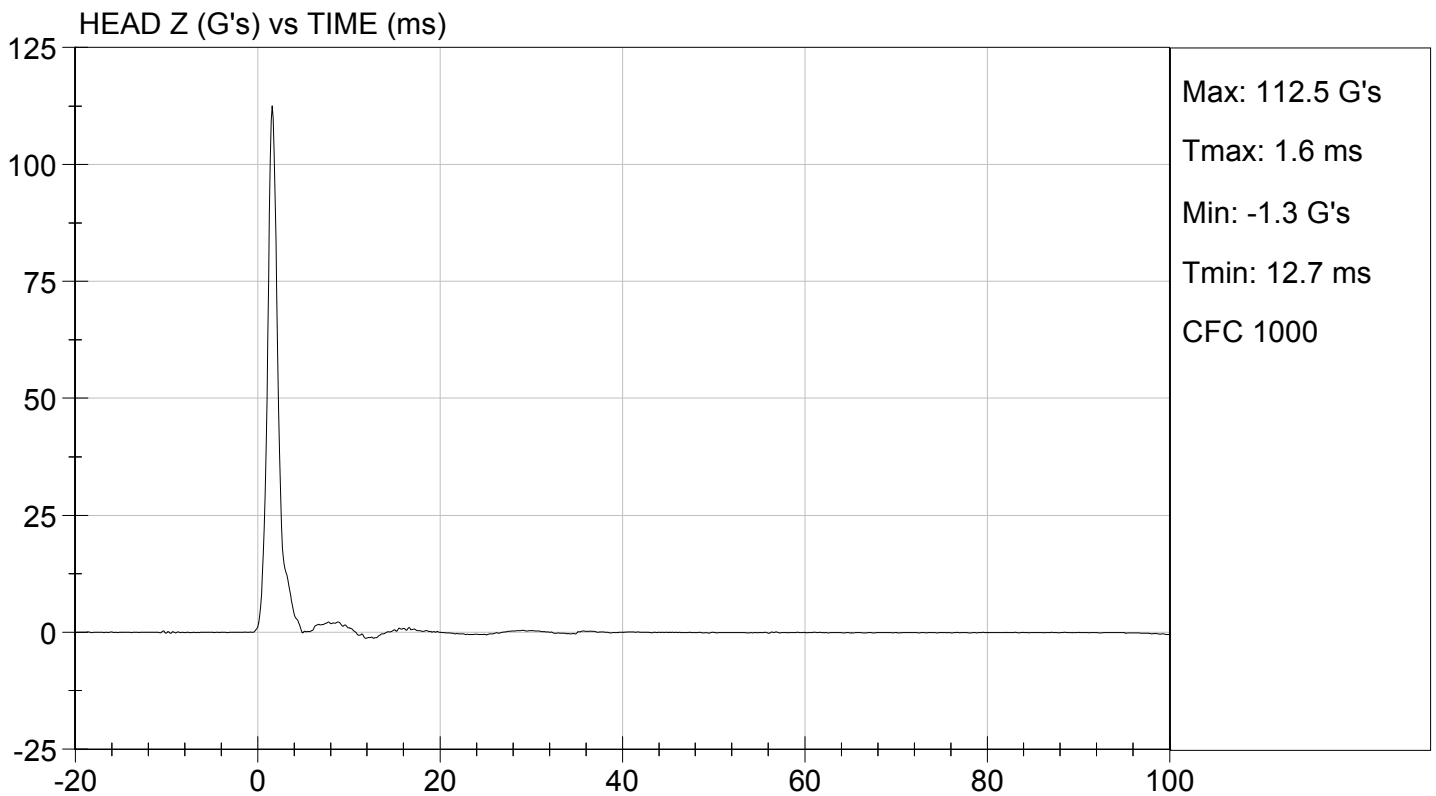
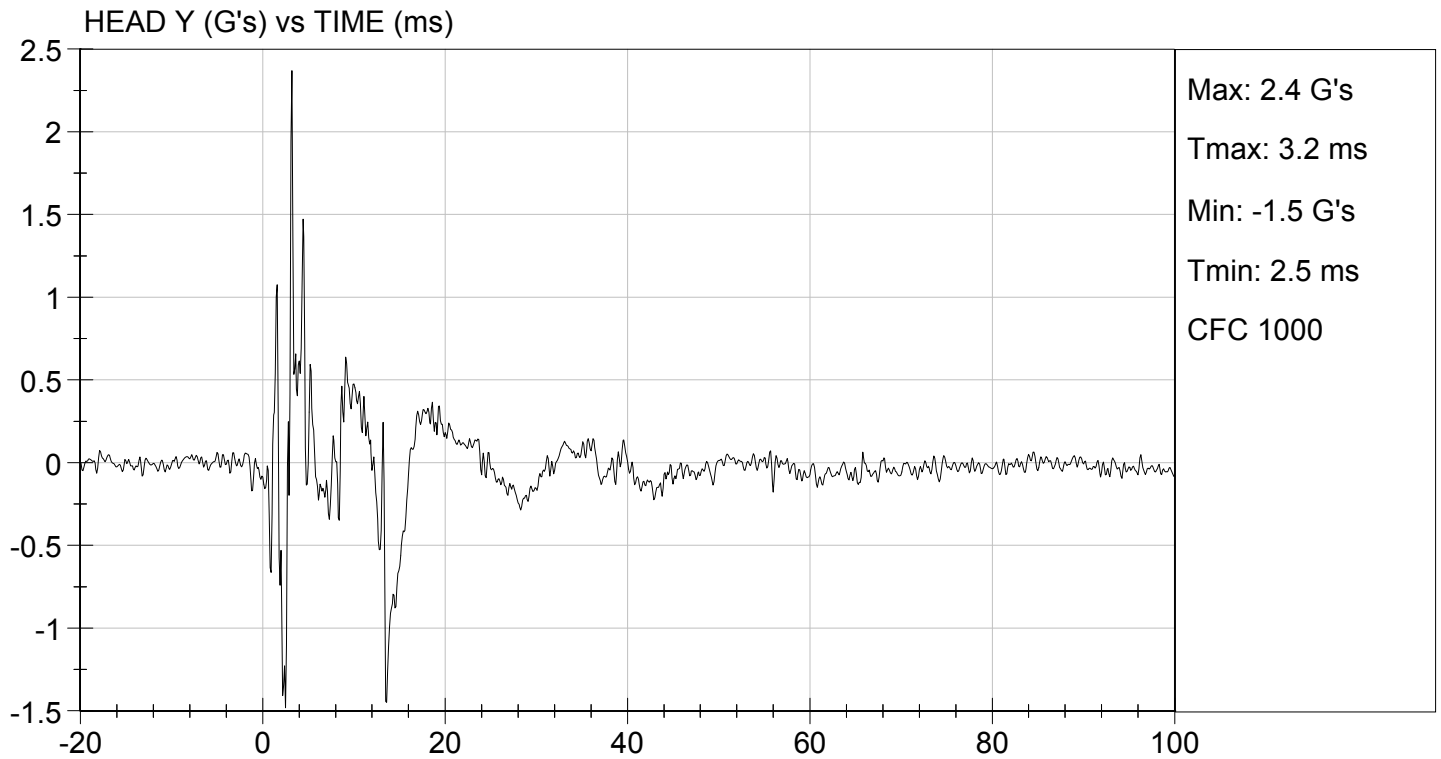

Laboratory Technician

07/12/2013

Test Date


Approved By





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

ATD Serial No: 036

Test I.D: D132252

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	51	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.01	Pass
	20 ms	G's	17.60 to 22.60	18.50	Pass
	30 ms	G's	12.50 to 18.50	12.91	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	12.8	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	37.6	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	69.5	Pass
	Time	ms	57.0 to 64.0	58.6	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	117.4	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	95.1	Pass
	Time	ms	47.0 to 58.0	51.4	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	97.8	Pass
Overall Test Results					Pass

Jessica Hall
Laboratory Technician

07/11/2013

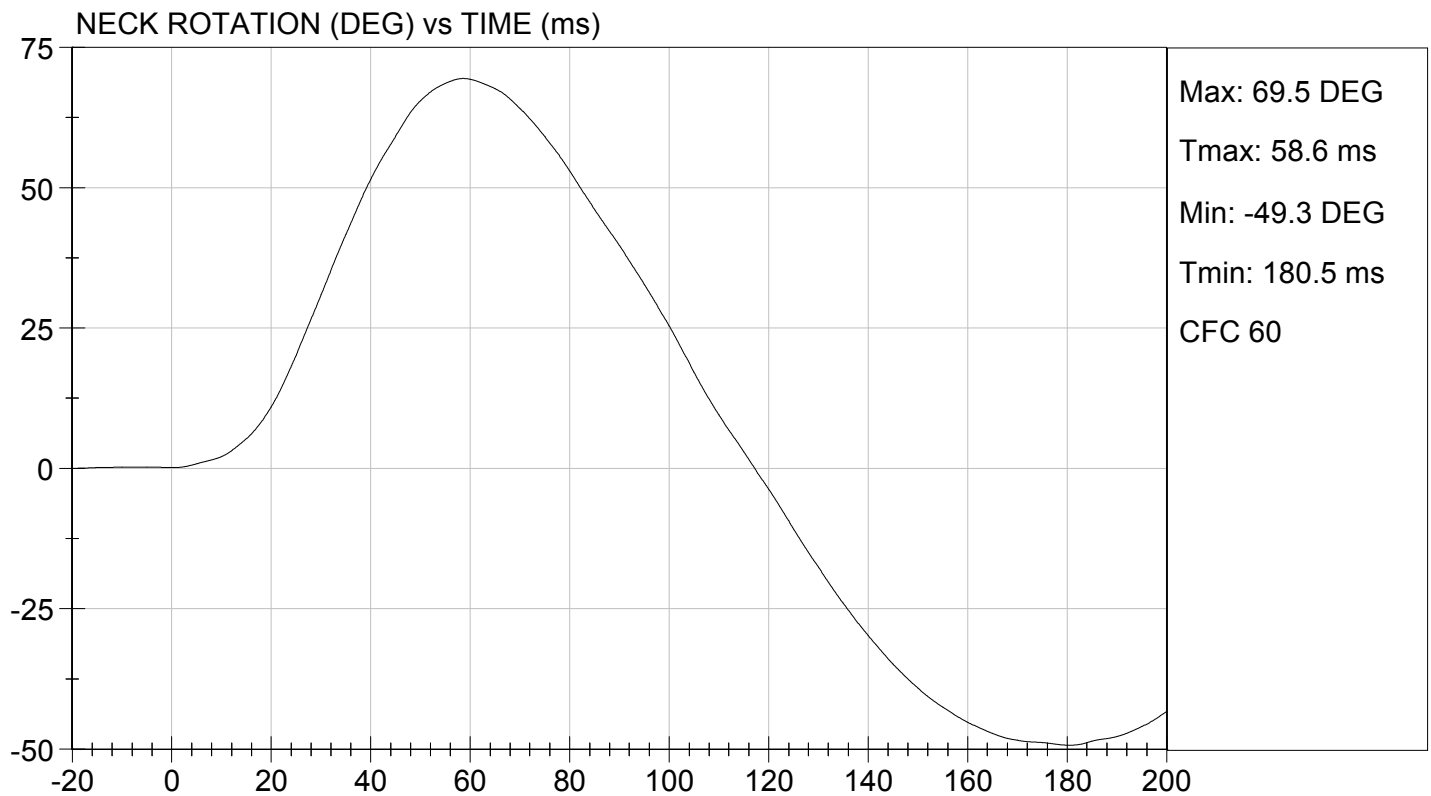
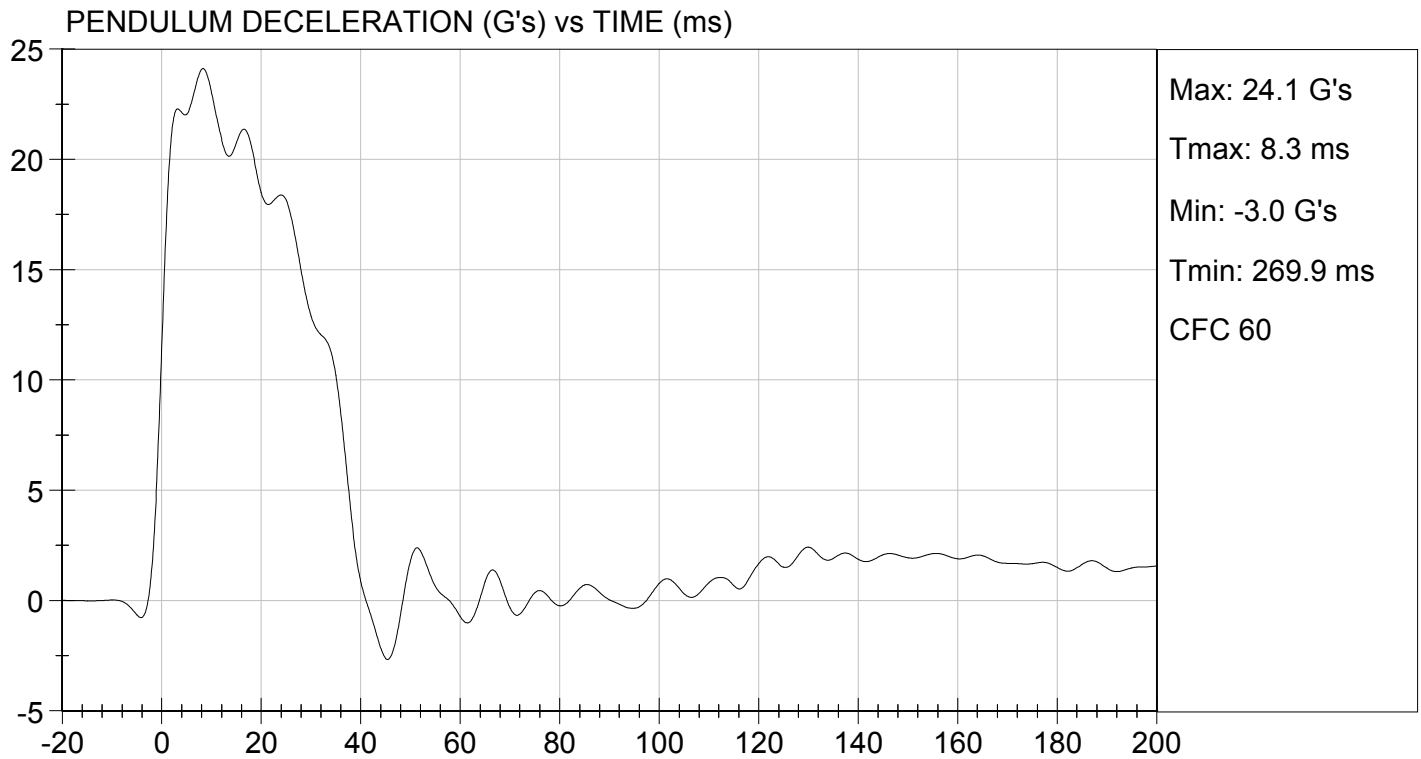
Test Date

David Winkelbauer
Approved By



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

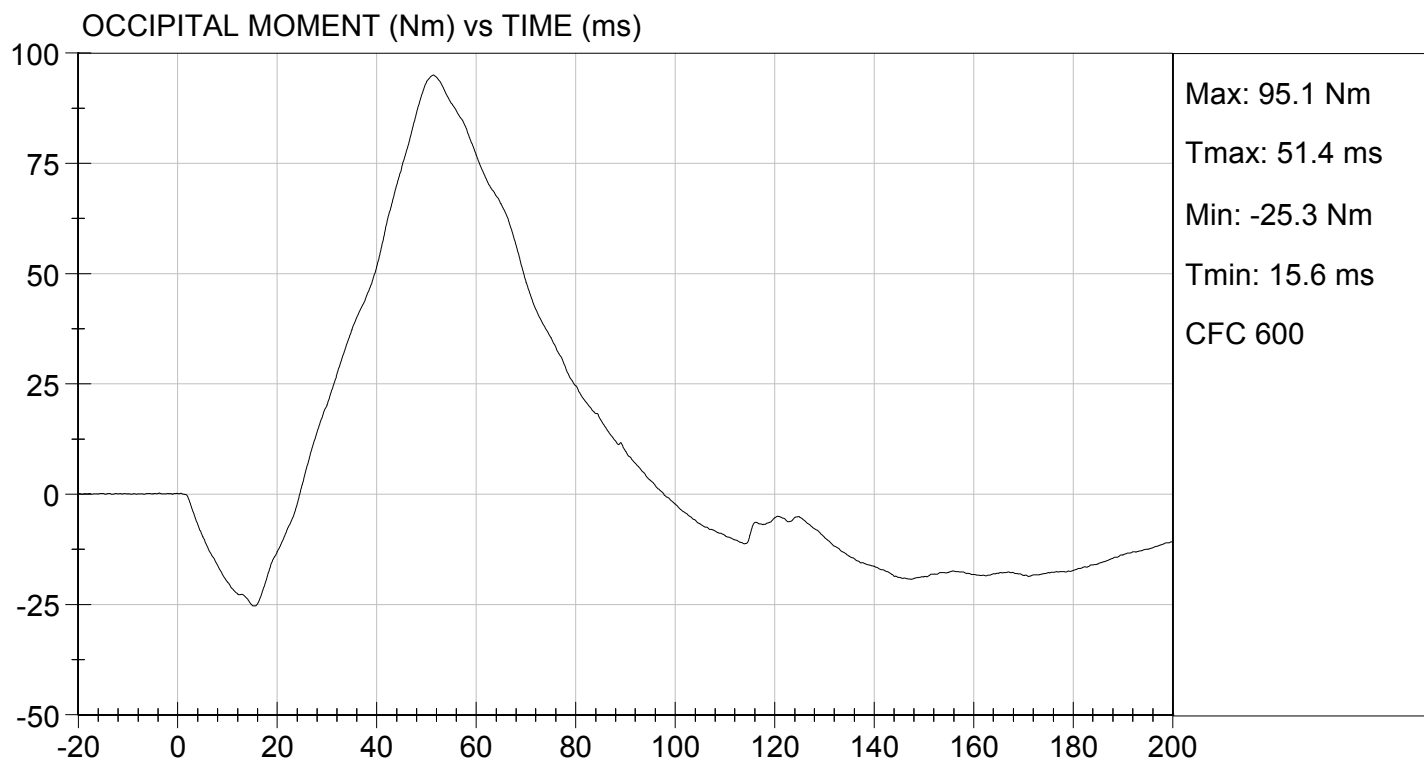
TEST DATE: 07/11/2013
TEST #: D132252





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

TEST DATE: 07/11/2013
TEST #: D132252

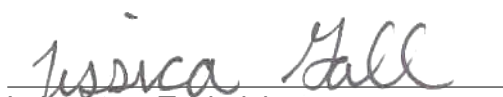


MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036

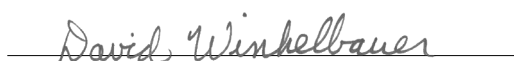
Test I.D: D13225

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity		%	10 to 70	47	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.13	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	19.79	Pass
	20 ms	G's	14.00 to 19.00	16.67	Pass
	30 ms	G's	11.00 to 16.00	14.26	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	38.3	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	97.4	Pass
	Time	ms	72.0 to 82.0	76.0	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	156.3	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-68.2	Pass
	Time	ms	65.0 to 79.0	70.0	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	143.0	Pass
Overall Test Results					Pass


 Laboratory Technician

07/11/2013

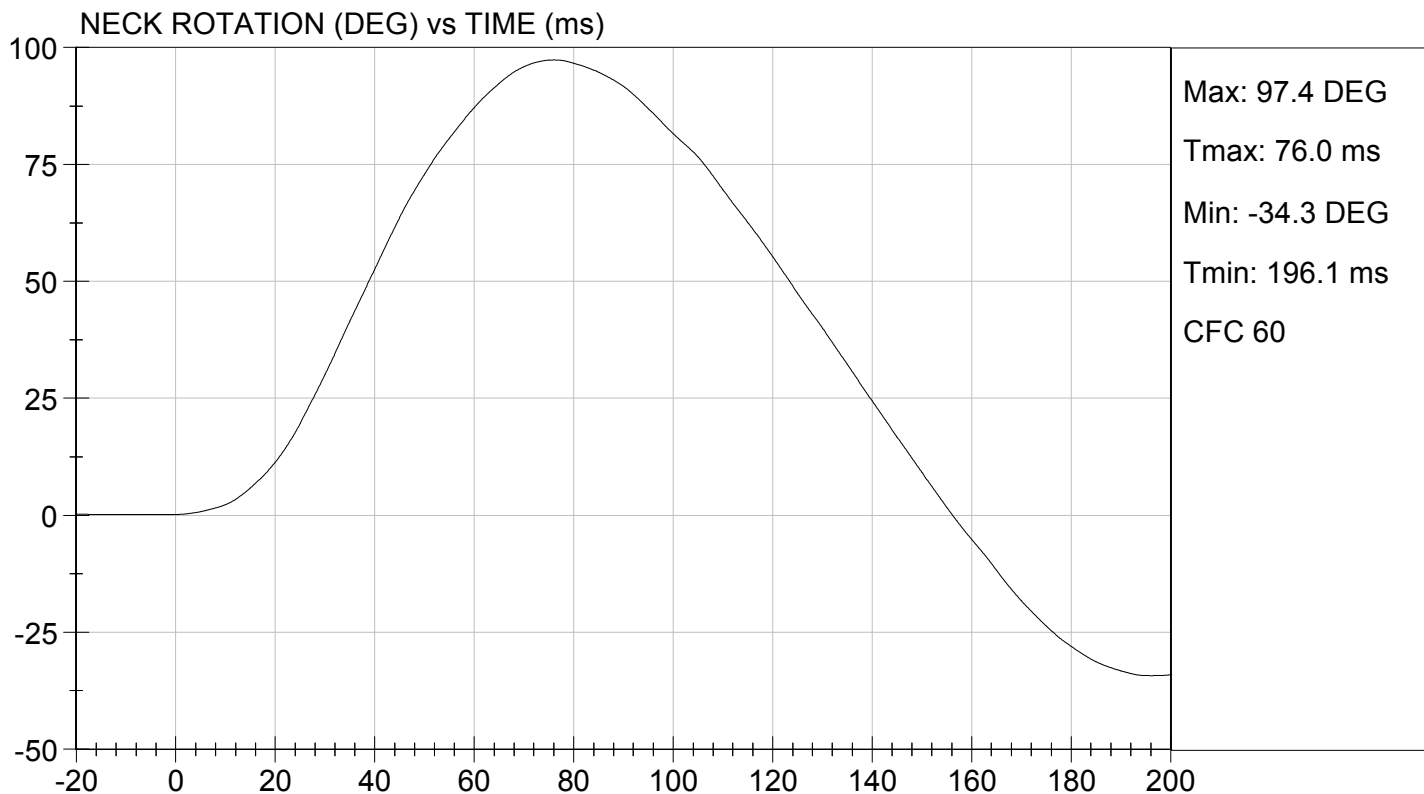
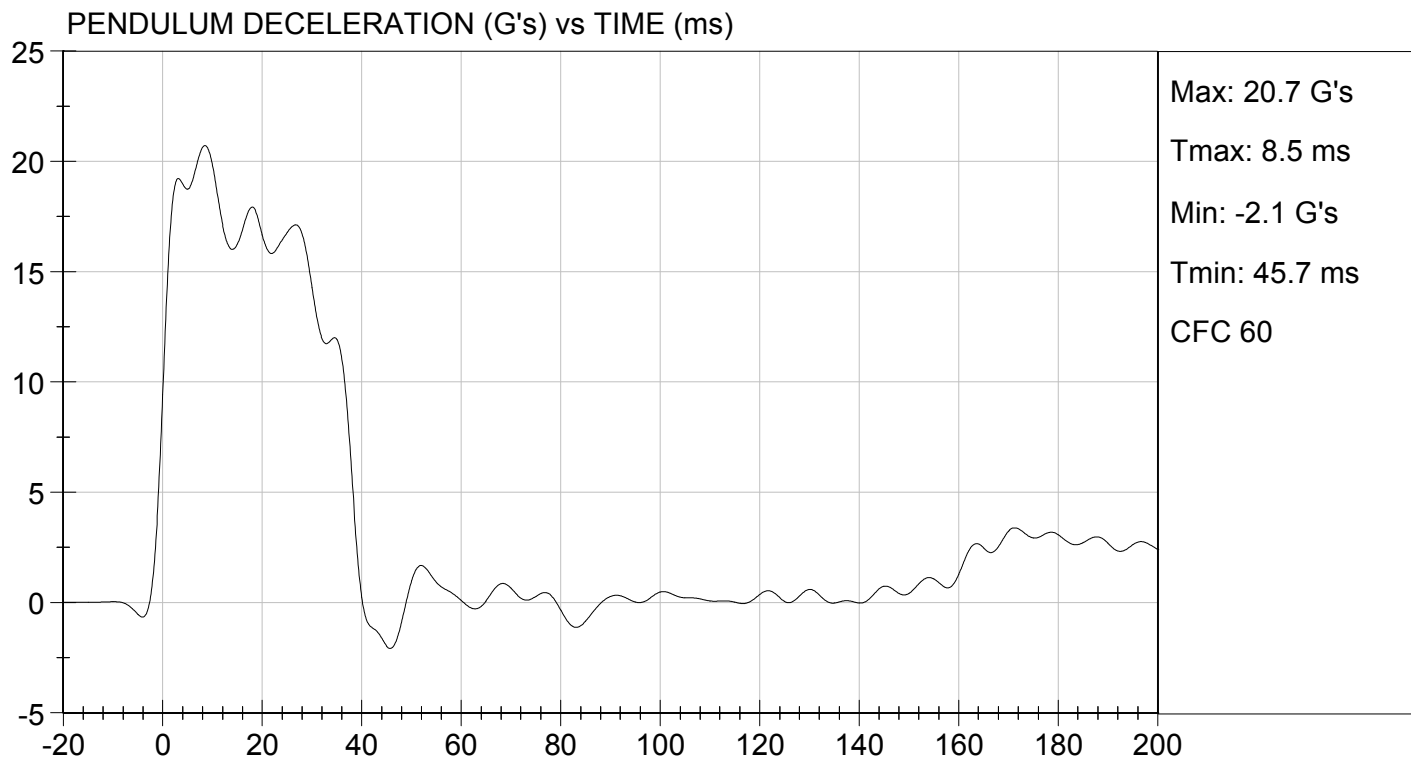
Test Date


 Approved By



TEST DESC: NECK EXTENSION
VELOCITY: 20.12 ft/s, 6.13 m/s

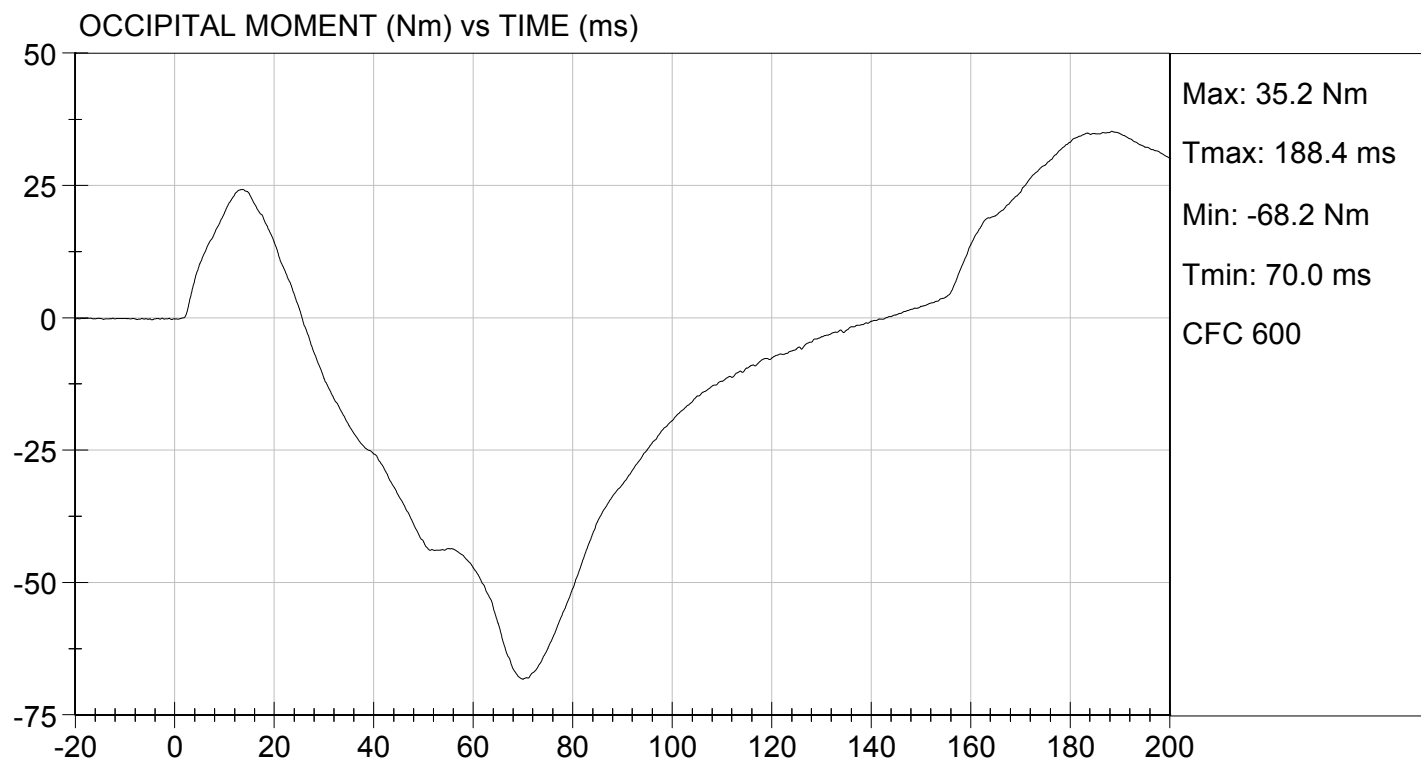
TEST DATE: 07/11/2013
TEST #: D13225





TEST DESC: NECK EXTENSION
VELOCITY: 20.12 ft/s, 6.13 m/s

TEST DATE: 07/11/2013
TEST #: D13225



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036

Test I.D: D132254

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	47	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,309	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.42	Pass
Internal Hysteresis	%	69 to 85	73	Pass
			Overall Test Results	Pass


Laboratory Technician

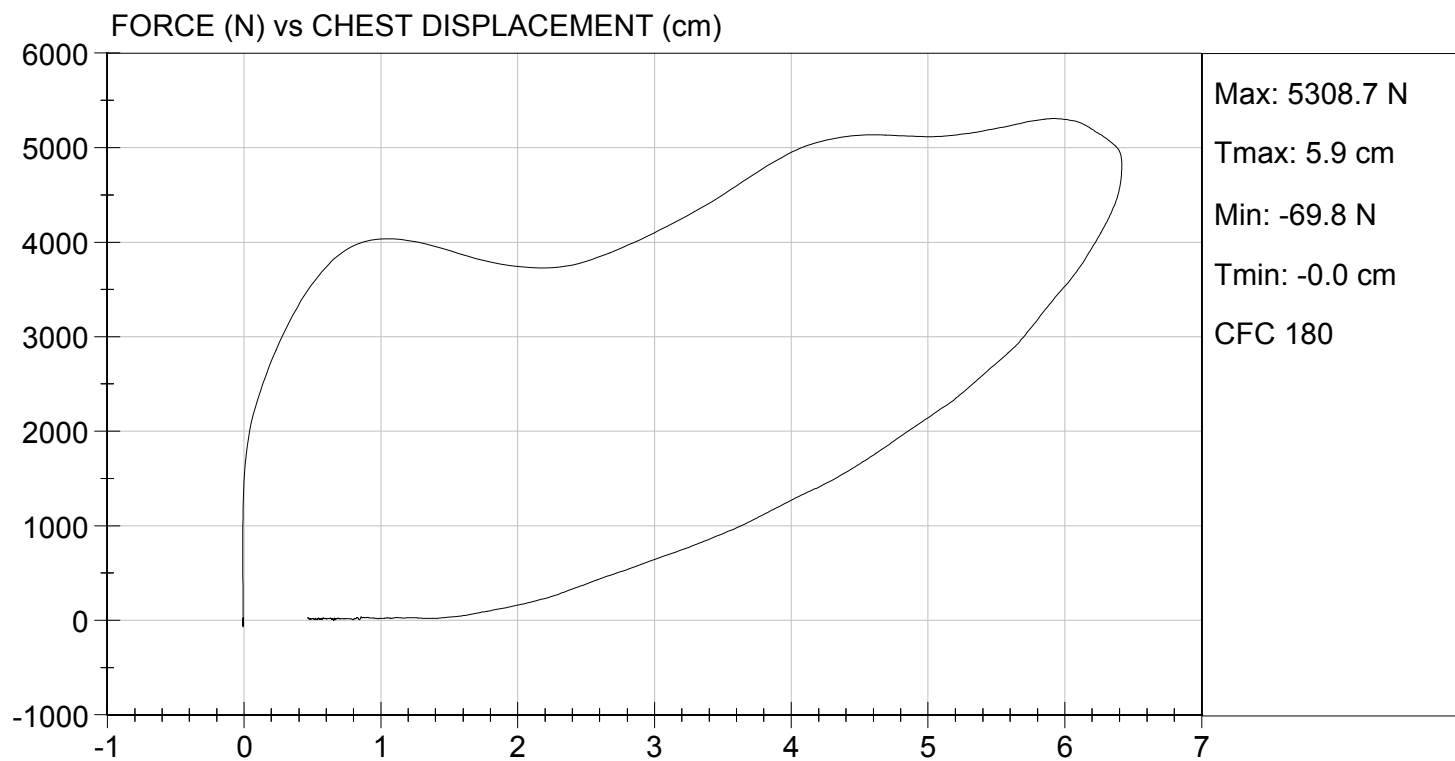
07/12/2013
Test Date


Approved By



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

TEST DATE: 07/12/2013
TEST #: D132254



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

ATD Serial No: 036

Test I.D: D132255

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	51	Pass
Probe Velocity	m/s	2.07 to 2.13	2.08	Pass
Peak Probe Force	N	4715 to 5782	5,548	Pass
Overall Test Results				Pass


Laboratory Technician

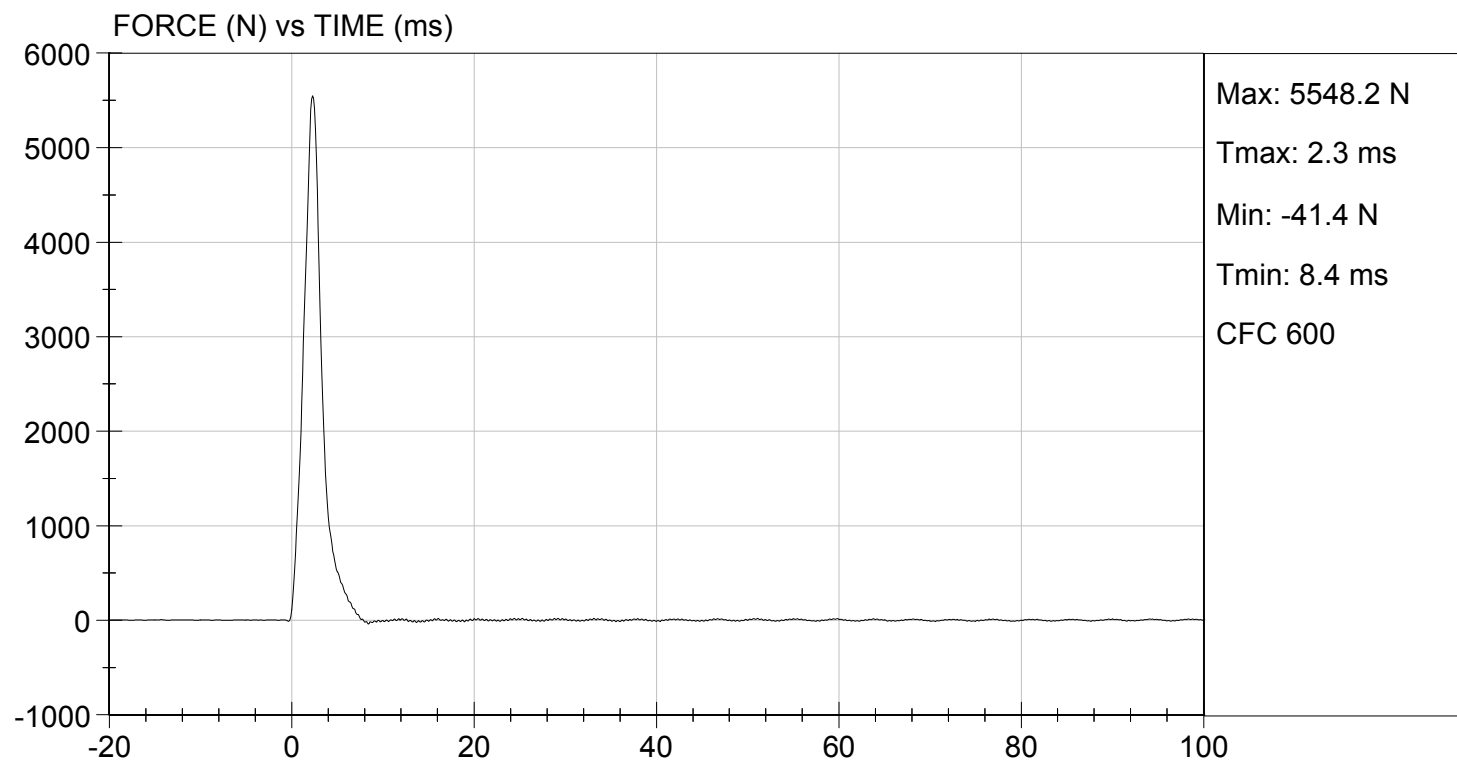
07/11/2013
Test Date


Approved By



TEST DESC: RIGHT KNEE
VELOCITY: 6.82 ft/s, 2.08 m/s

TEST DATE: 07/11/2013
TEST #: D132255



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

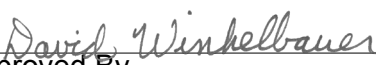
ATD Serial No: 036

Test I.D: D132256

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	51	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	N	4715 to 5782	4,733	Pass
Overall Test Results				Pass


Laboratory Technician

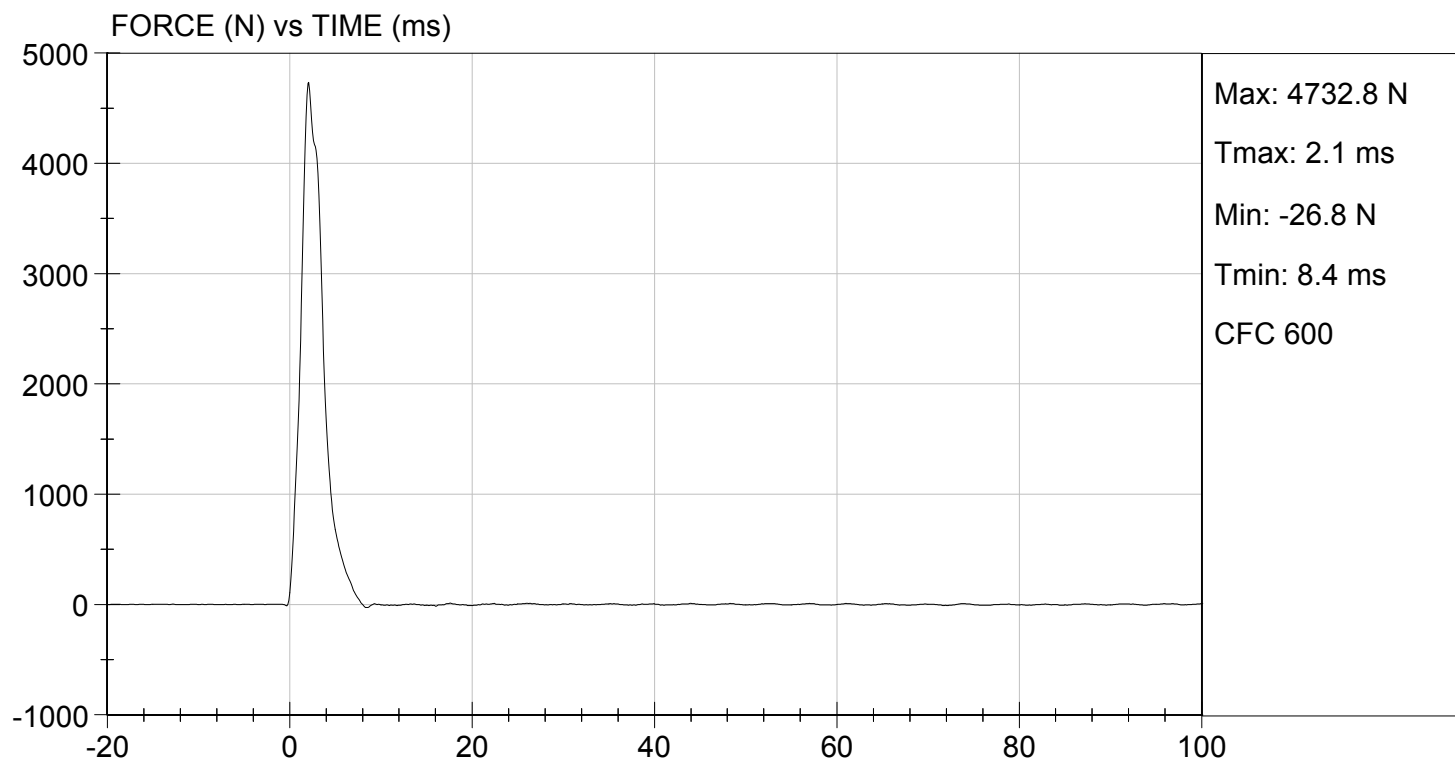
07/11/2013
Test Date


Approved By



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

TEST DATE: 07/11/2013
TEST #: D132256



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

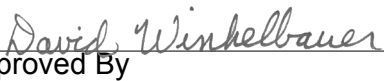
ATD Serial No: 036

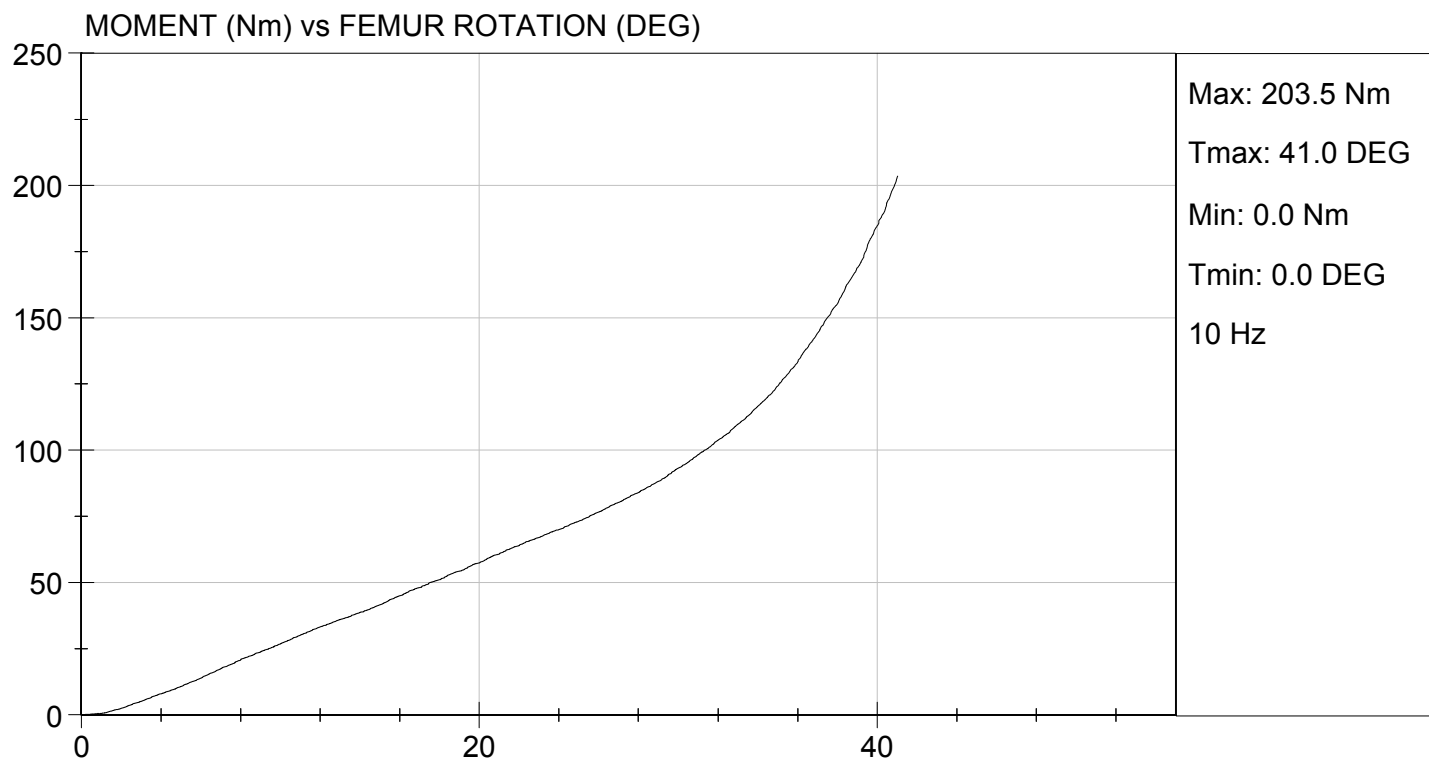
Test I.D: D132250

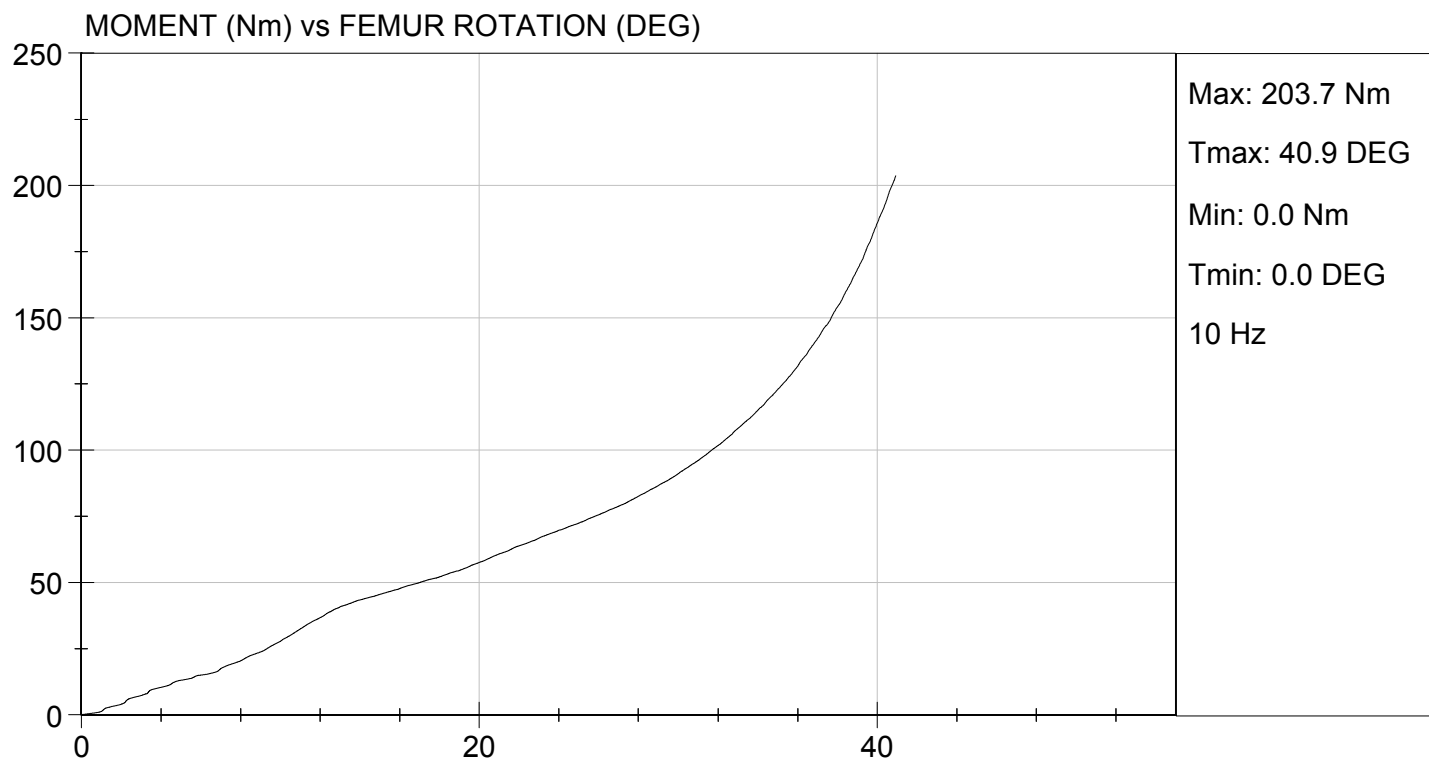
Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.2	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	44	44	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.1	6.2	Pass
30 Degrees	Nm	94.9 Nm Max	93.2	91.1	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	41.0	40.9	Pass
Overall Test Results					Pass


Laboratory Technician

07/11/2013
Test Date


Approved By





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

ATD Serial No: 036

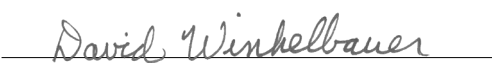
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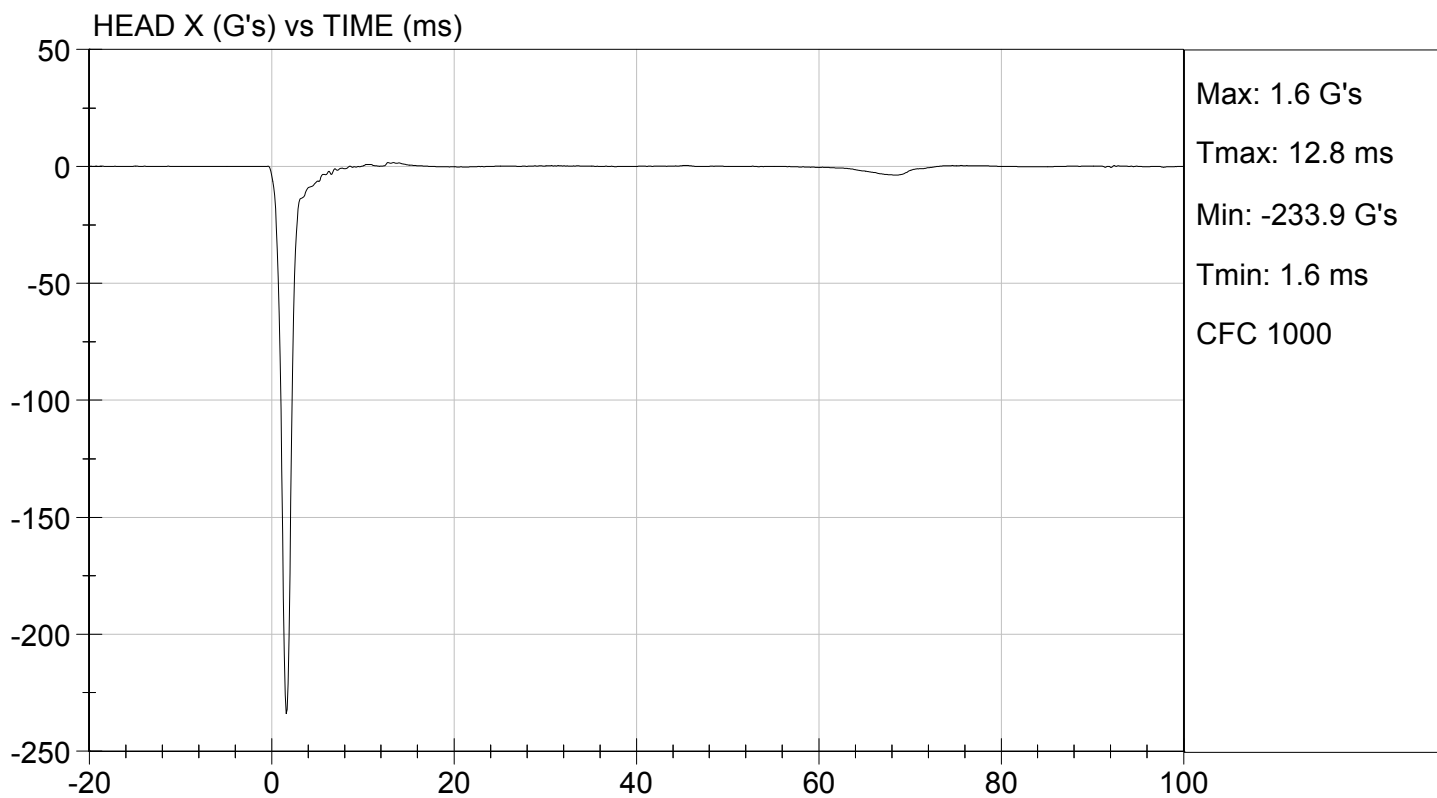
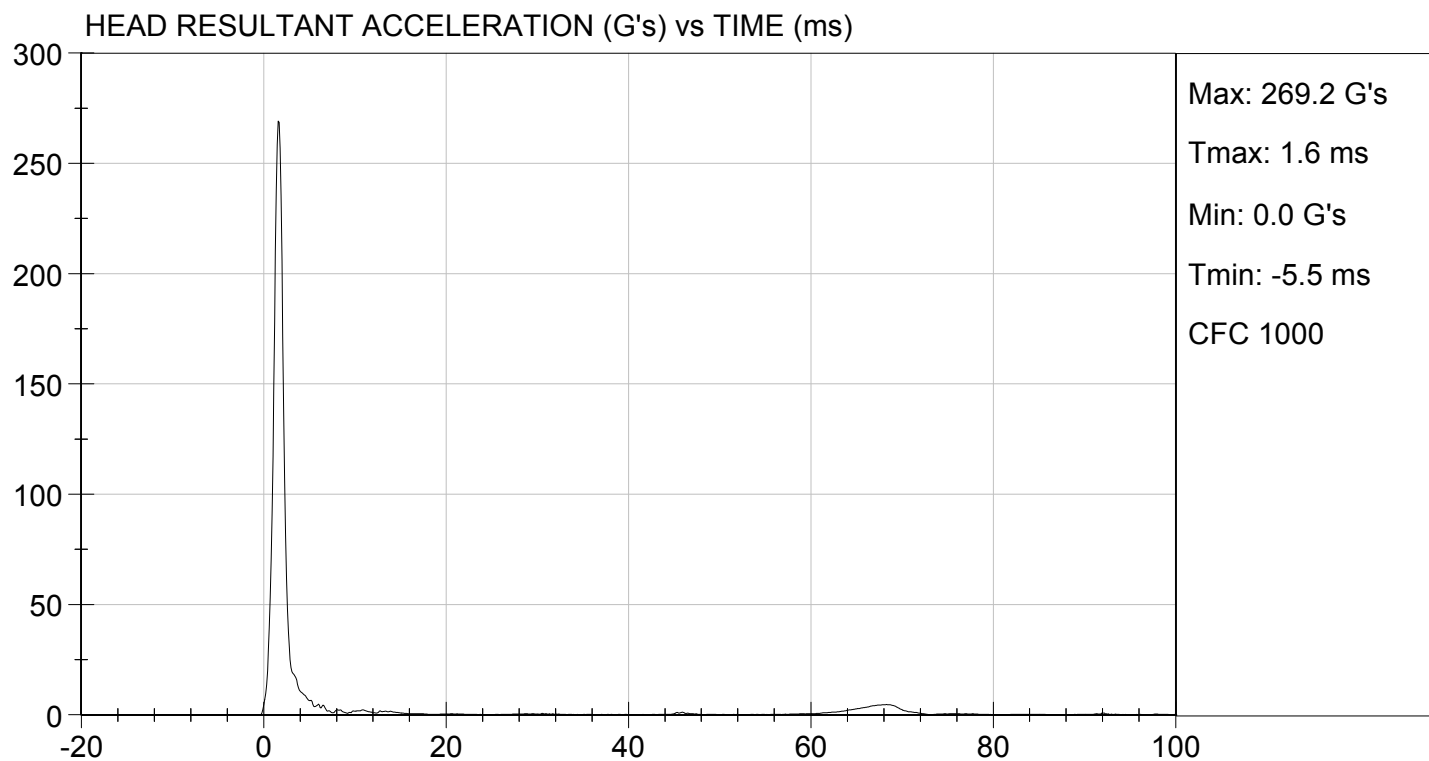
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	54	Pass
Peak Resultant Acceleration	G's	225 to 275	269	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-12.0	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

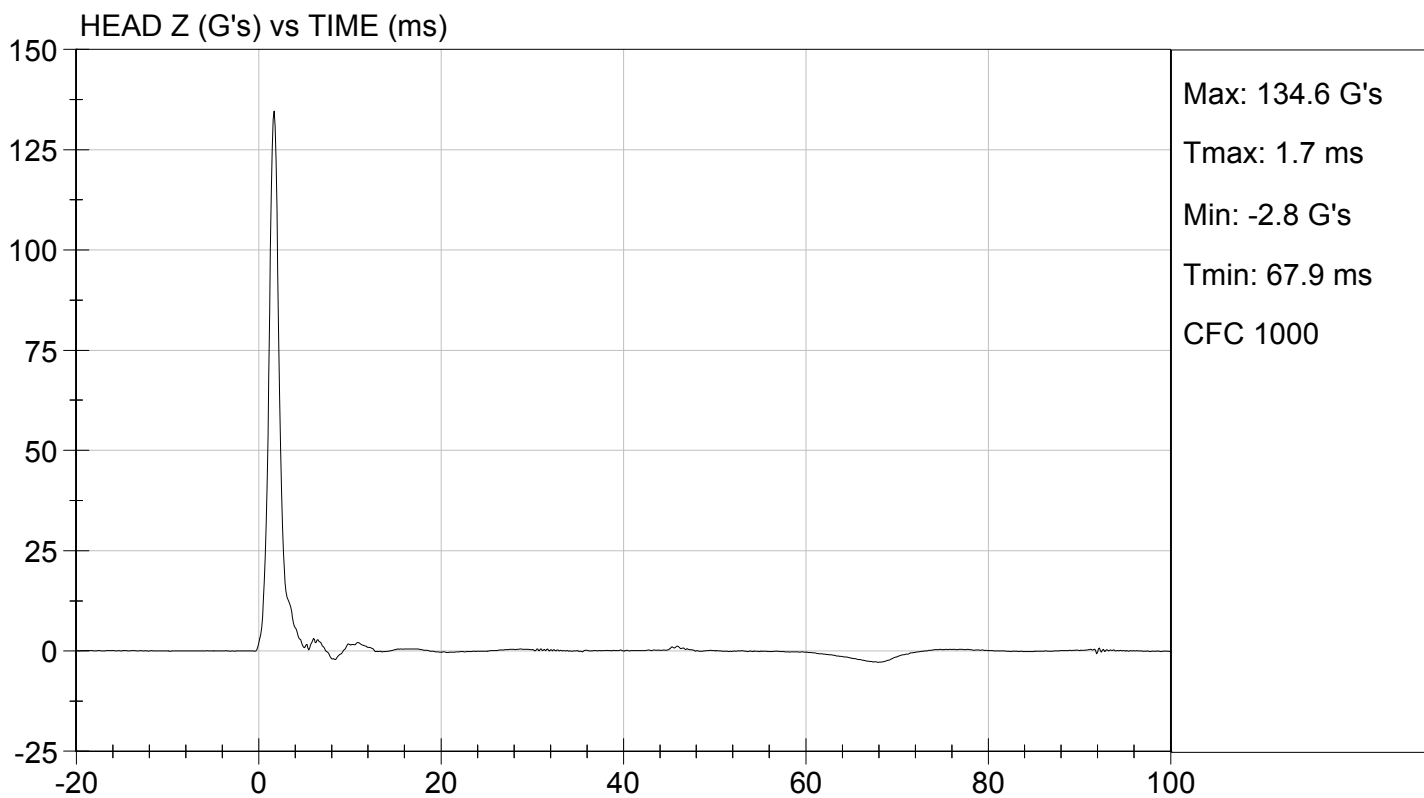
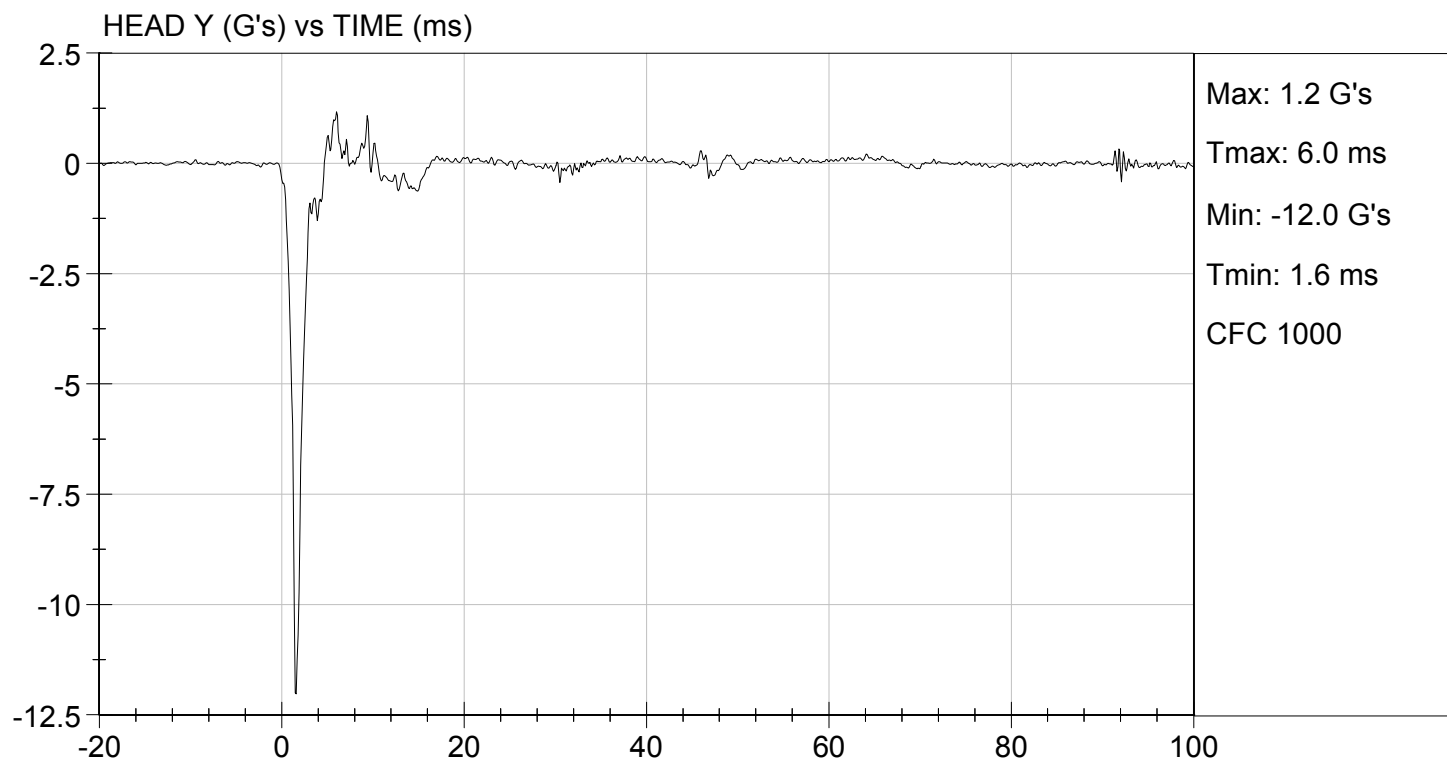

Laboratory Technician

07/31/2013

Test Date


Approved By





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

ATD Serial No: 036

Test I.D: D132502

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	50	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.05	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.20	Pass
	20 ms	G's	17.60 to 22.60	19.81	Pass
	30 ms	G's	12.50 to 18.50	14.93	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	14.8	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	35.7	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	70.9	Pass
	Time	ms	57.0 to 64.0	58.0	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	115.5	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	94.0	Pass
	Time	ms	47.0 to 58.0	49.3	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	97.5	Pass
Overall Test Results					Pass

Jessica Hall
Laboratory Technician

07/31/2013

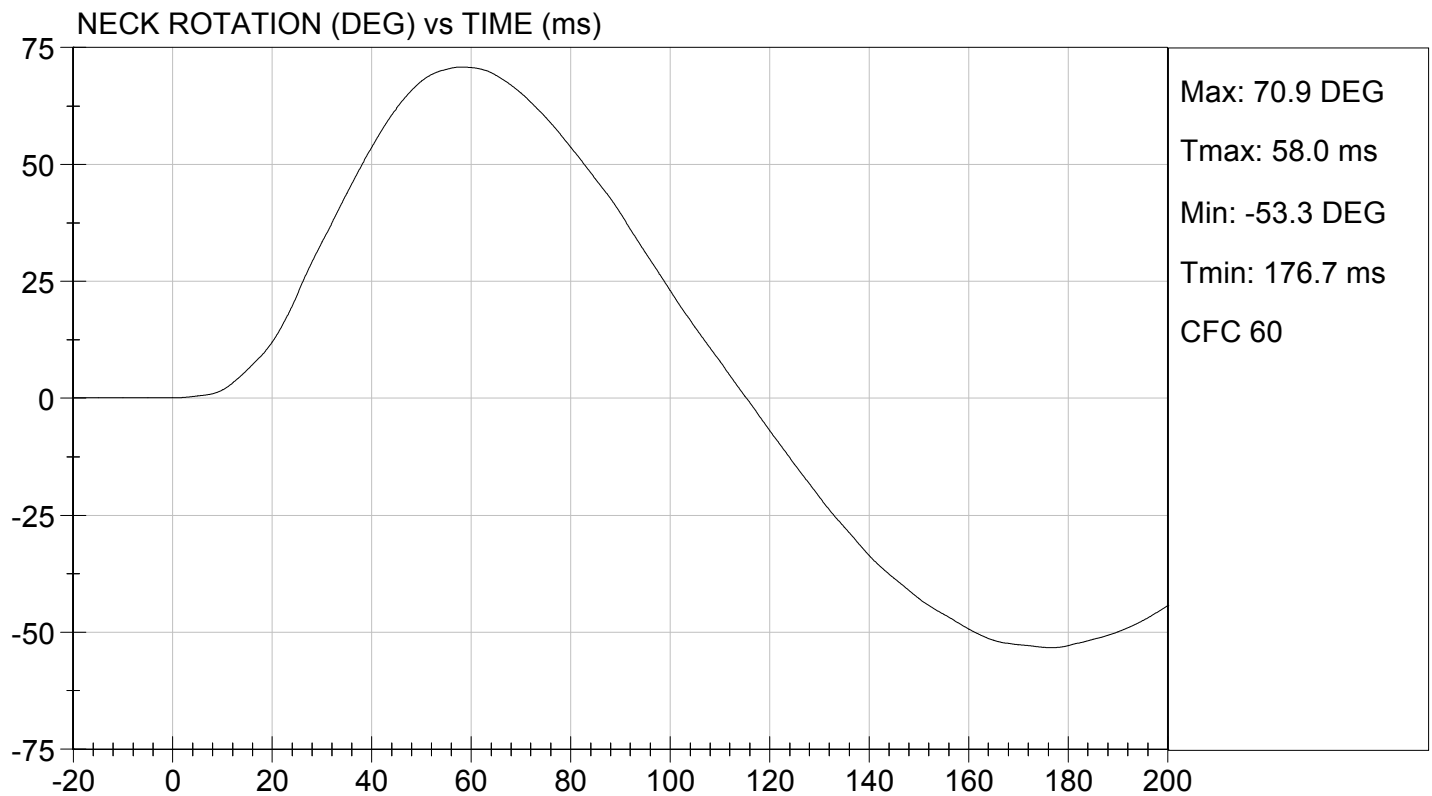
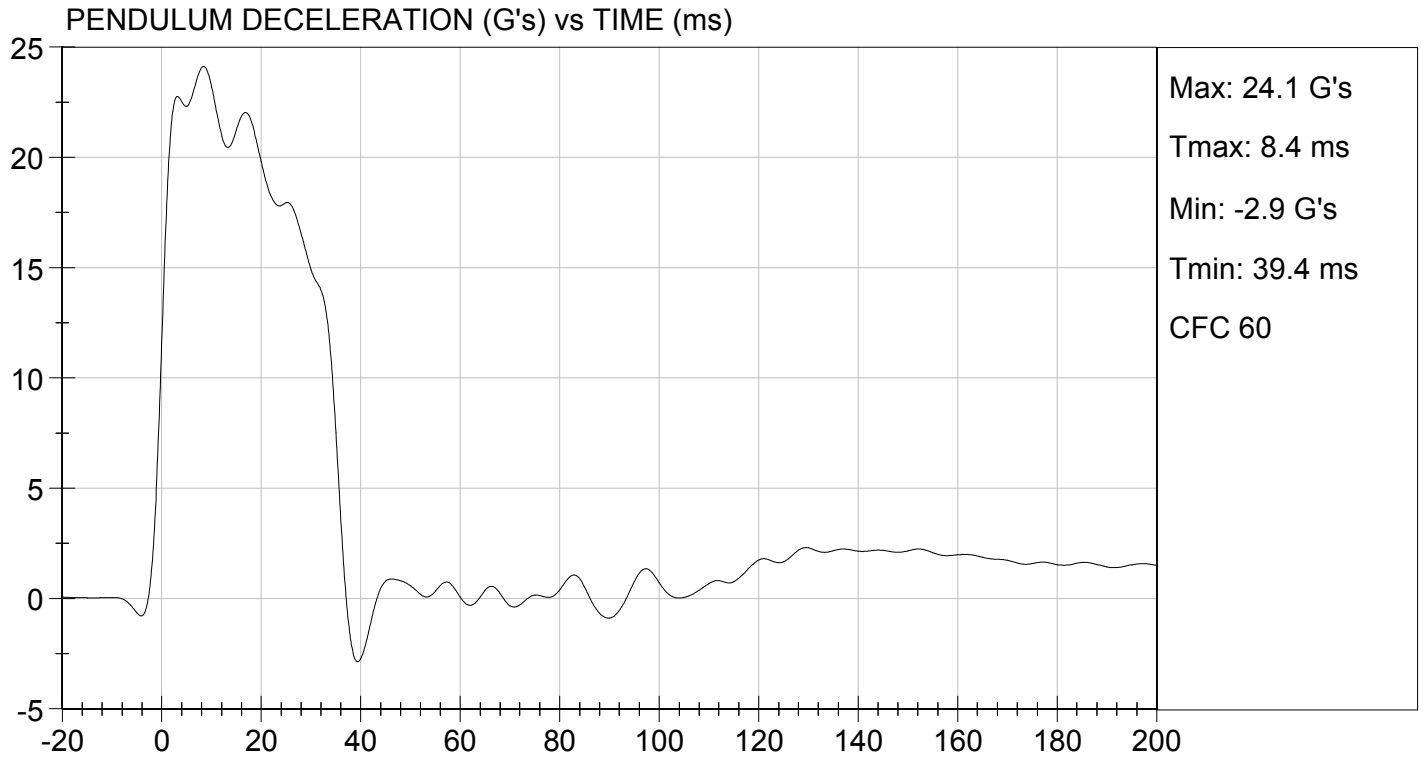
Test Date

David Winkelbauer
Approved By



TEST DESC: NECK FLEXION
VELOCITY: 23.14 ft/s, 7.05 m/s

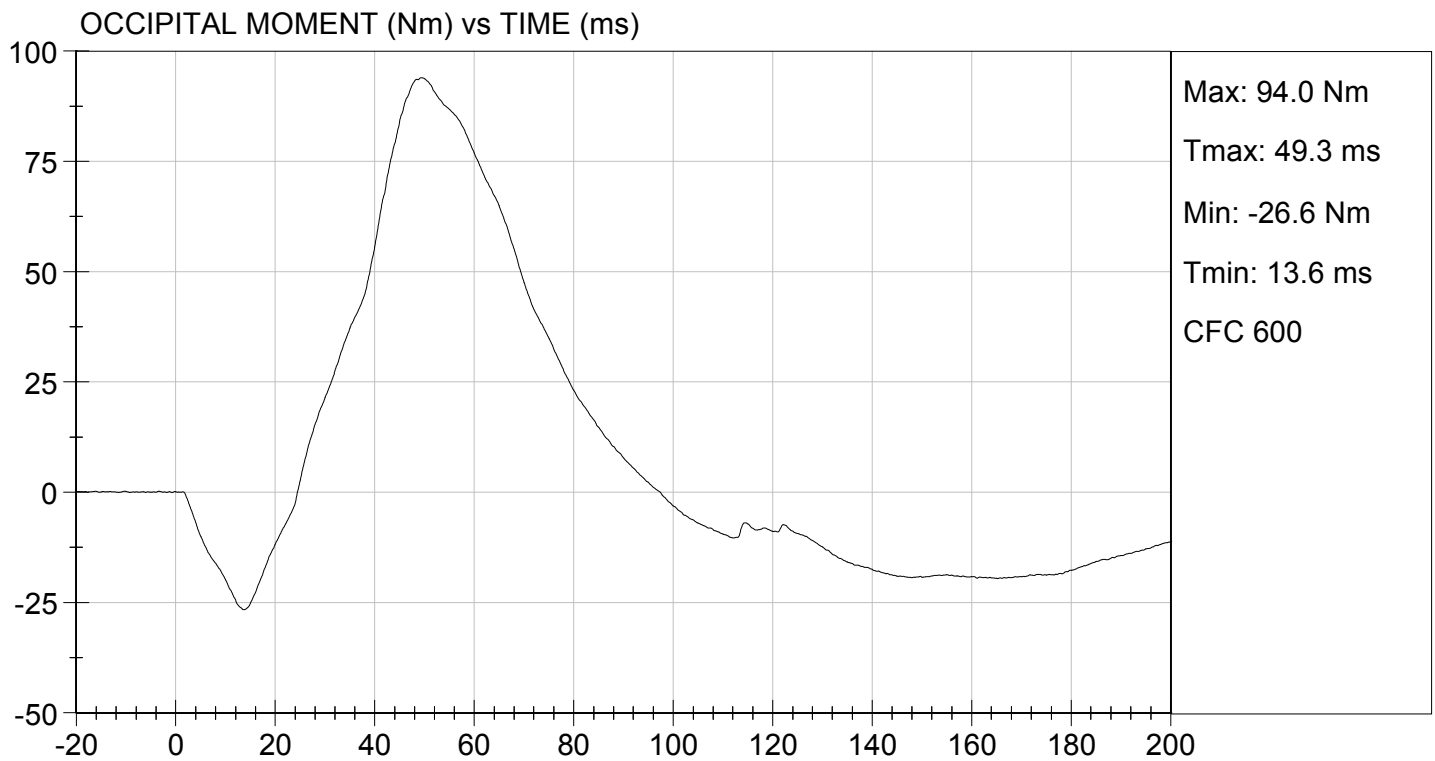
TEST DATE: 07/31/2013
TEST #: D132502





TEST DESC: NECK FLEXION
VELOCITY: 23.14 ft/s, 7.05 m/s

TEST DATE: 07/31/2013
TEST #: D132502

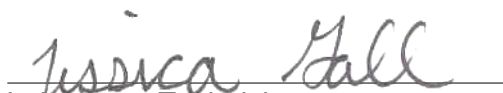


MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036

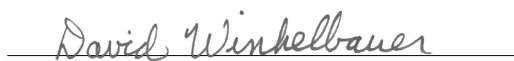
Test I.D: D132503

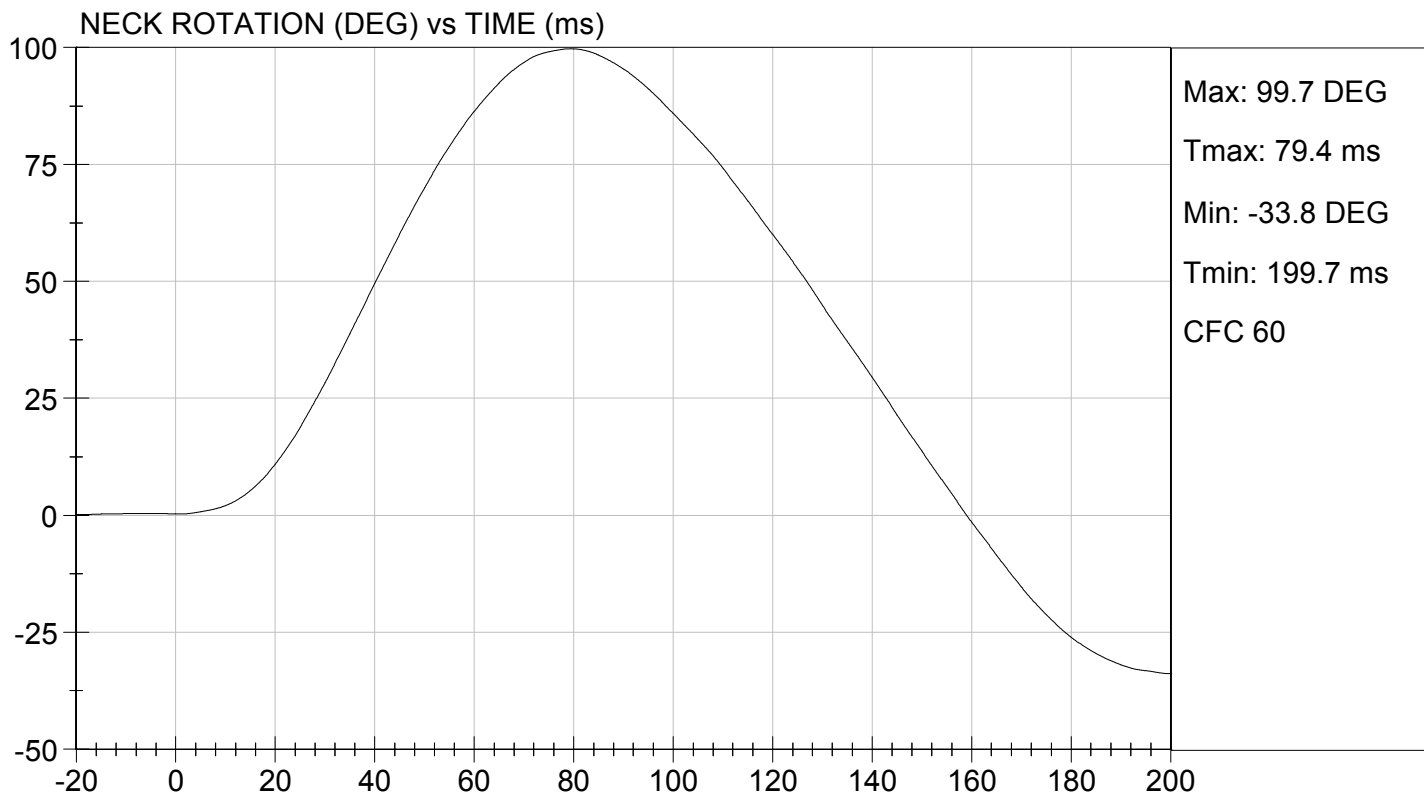
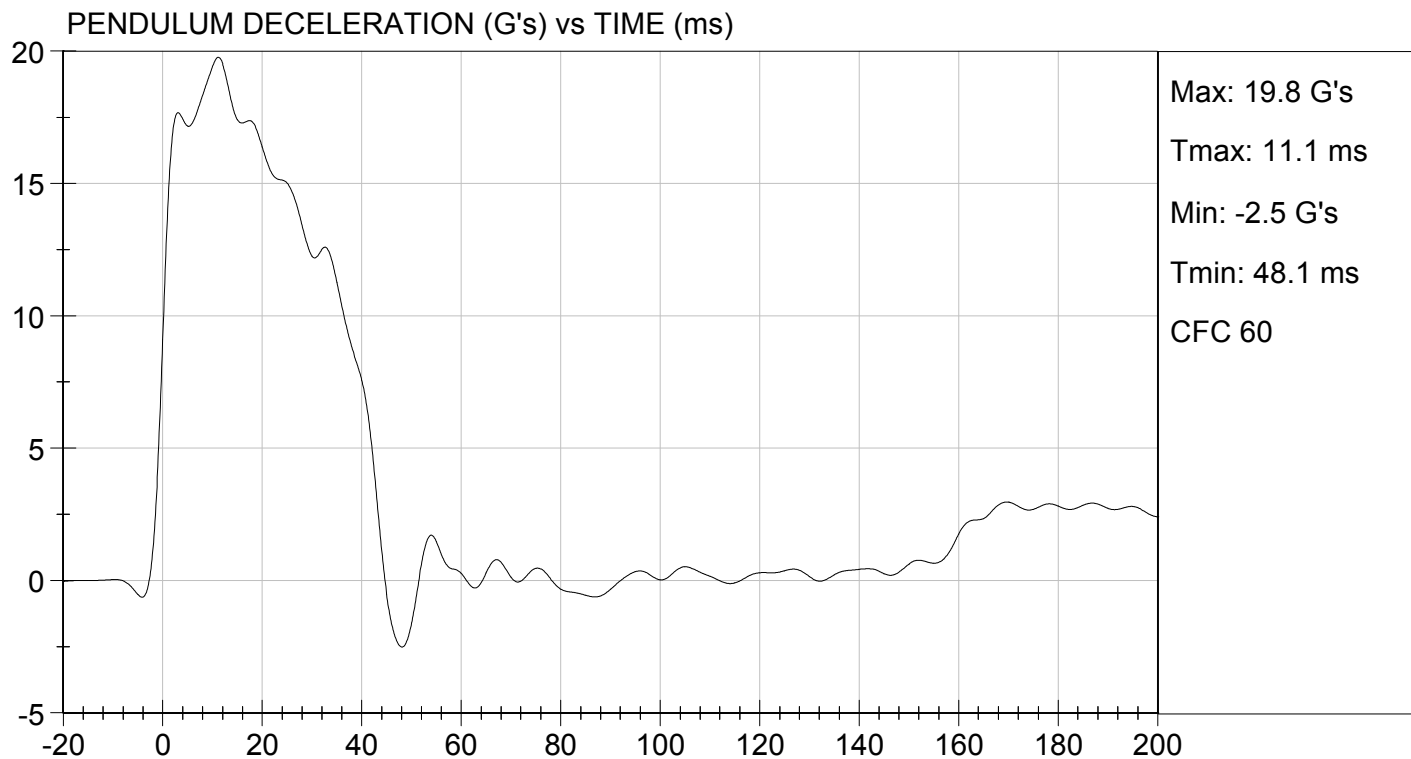
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity		%	10 to 70	50	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	19.43	Pass
	20 ms	G's	14.00 to 19.00	16.38	Pass
	30 ms	G's	11.00 to 16.00	12.25	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	12.6	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	42.2	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	99.7	Pass
	Time	ms	72.0 to 82.0	79.4	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	159.2	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-66.2	Pass
	Time	ms	65.0 to 79.0	73.0	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	146.1	Pass
Overall Test Results					Pass


Laboratory Technician

07/31/2013

Test Date

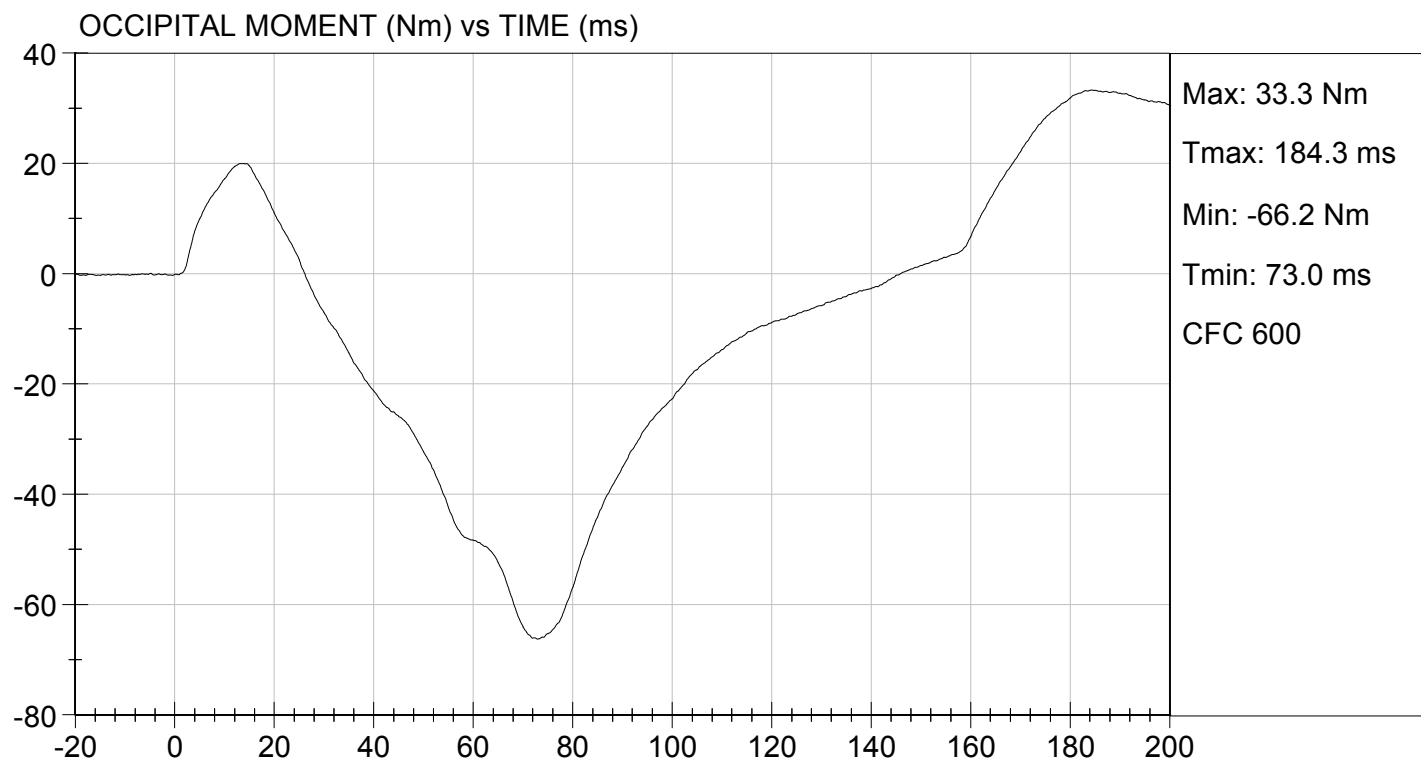

Approved By





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

TEST DATE: 07/31/2013
TEST #: D132503



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036

Test I.D: D132504

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Probe Velocity	m/s	6.58 to 6.82	6.68	Pass
Peak Probe Force	N	5159 to 5893	5,233	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.65	Pass
Internal Hysteresis	%	69 to 85	72	Pass
			Overall Test Results	Pass


Laboratory Technician

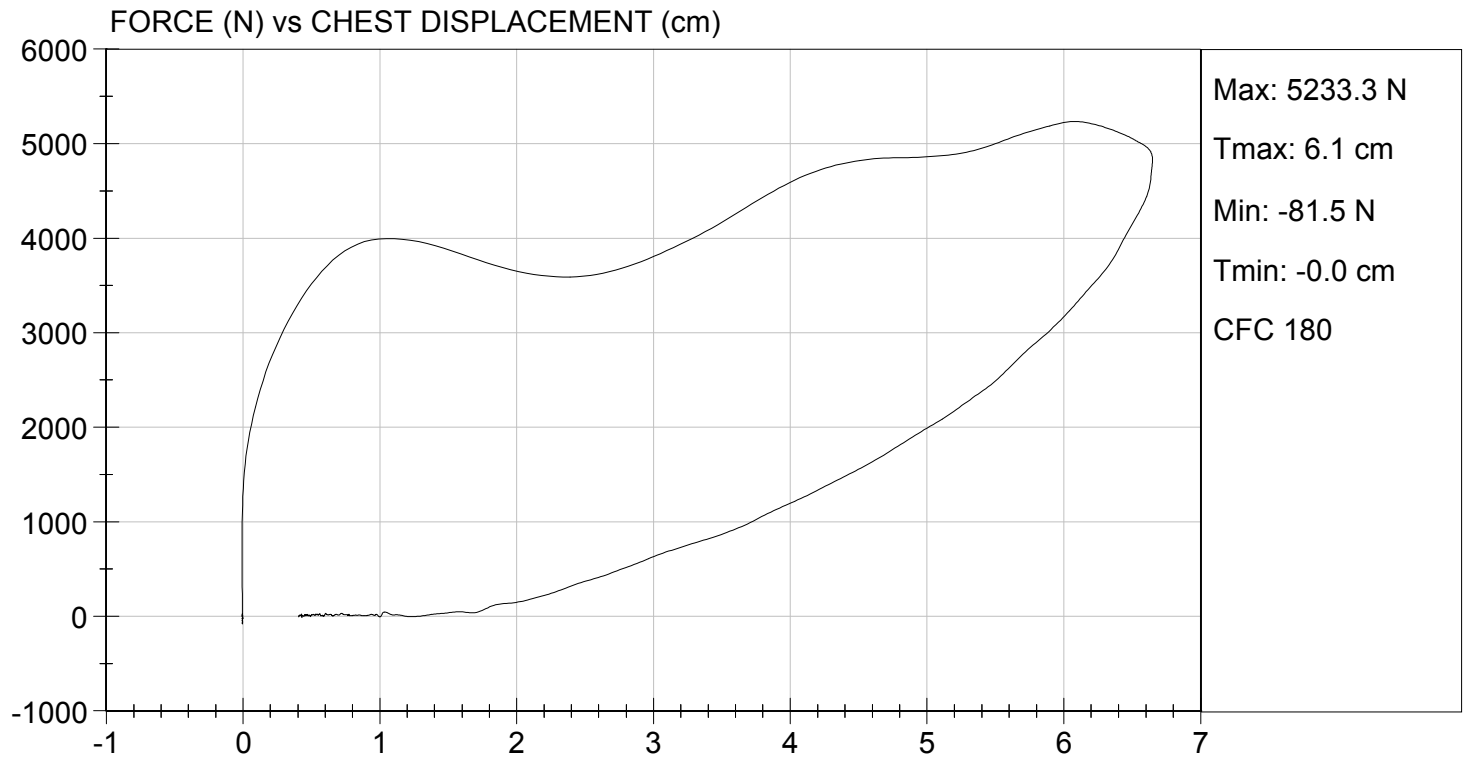
07/31/2013
Test Date


Approved By



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

TEST DATE: 07/31/2013
TEST #: D132504



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

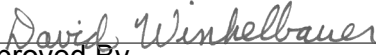
ATD Serial No: 036

Test I.D: D132505

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	50	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	N	4715 to 5782	5,228	Pass
Overall Test Results				Pass


Laboratory Technician

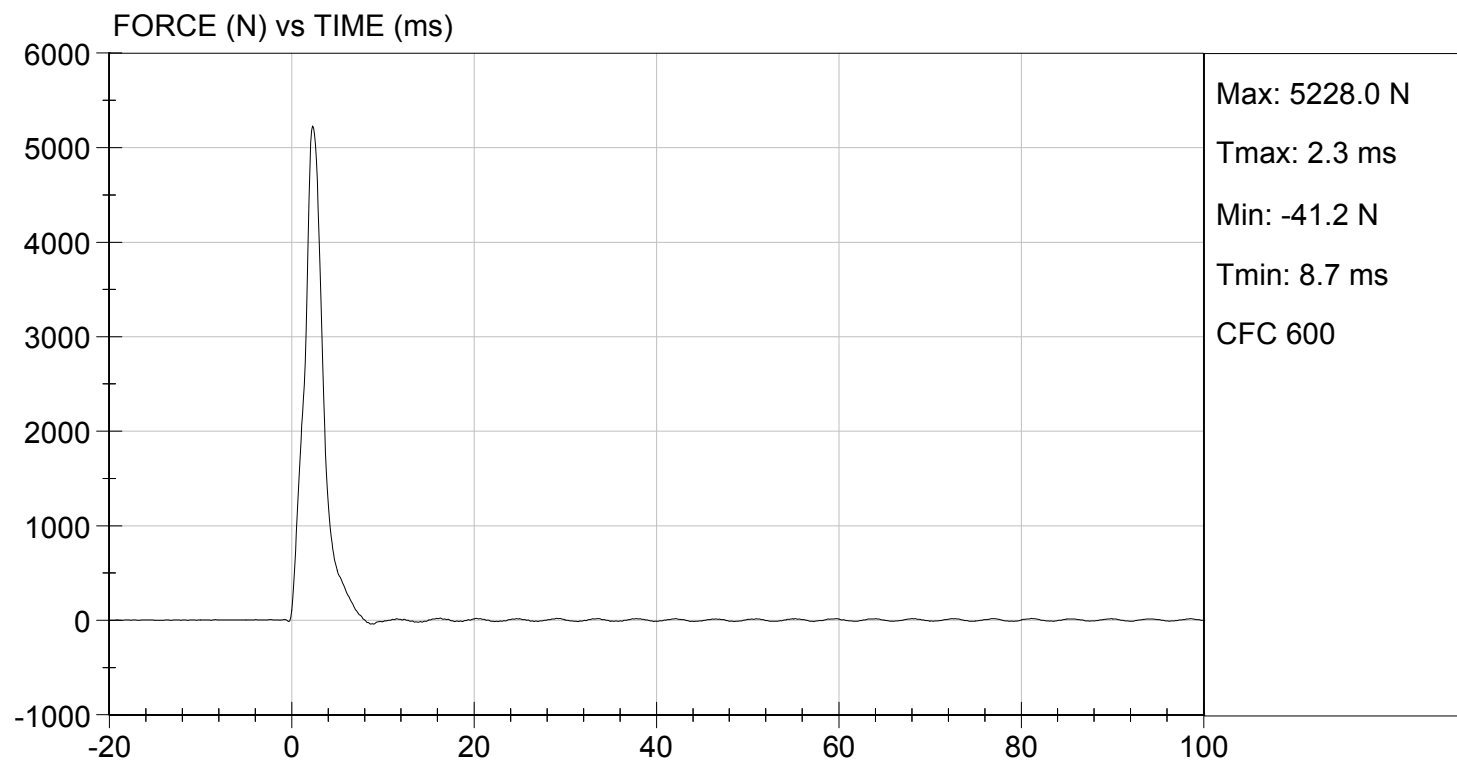
07/31/2013
Test Date


Approved By



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

TEST DATE: 07/31/2013
TEST #: D132505



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

ATD Serial No: 036

Test I.D: D132506

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	50	Pass
Probe Velocity	m/s	2.07 to 2.13	2.08	Pass
Peak Probe Force	N	4715 to 5782	5,145	Pass
Overall Test Results				Pass


Laboratory Technician

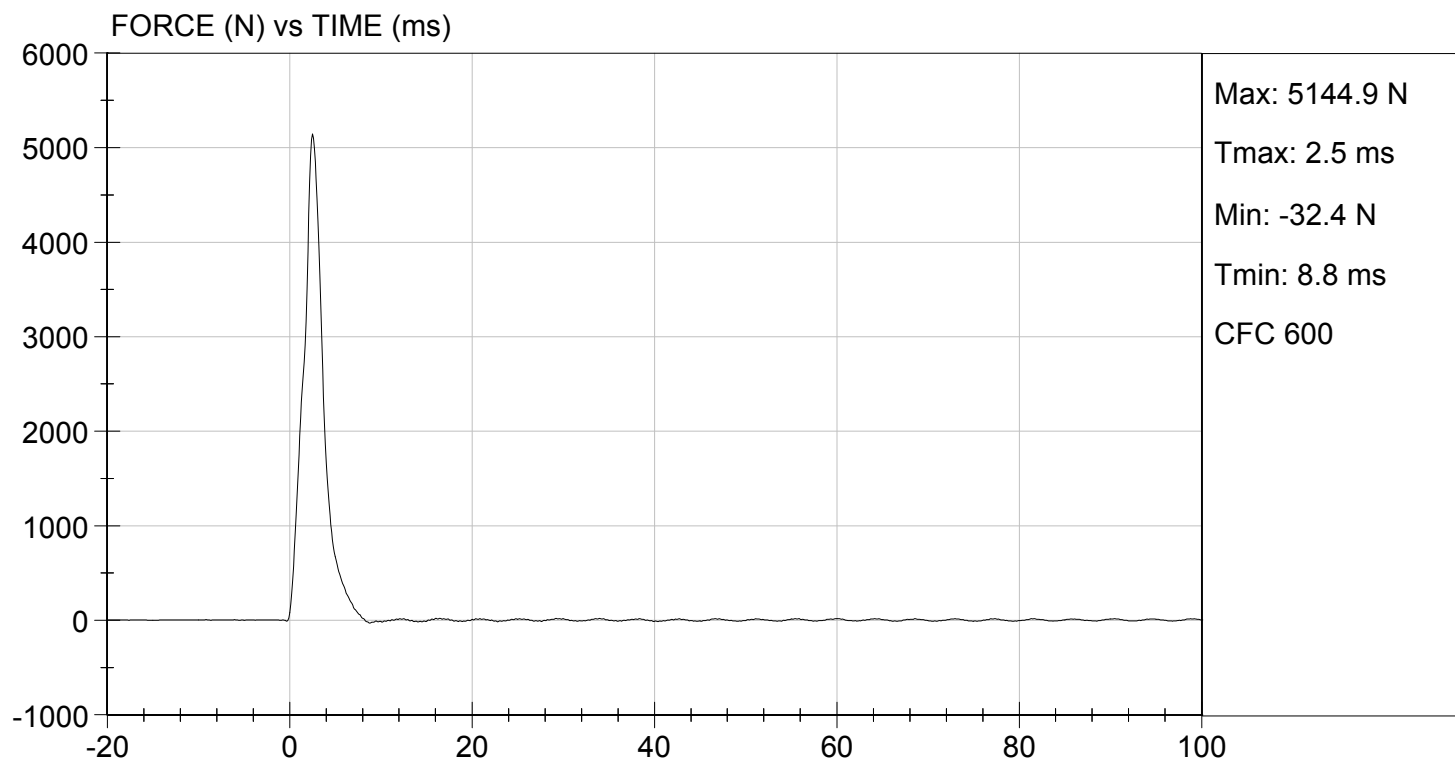
07/31/2013
Test Date


Approved By



TEST DESC: LEFT KNEE
VELOCITY: 6.81 ft/s, 2.08 m/s

TEST DATE: 07/31/2013
TEST #: D132506



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

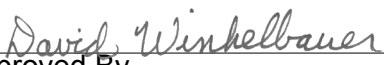
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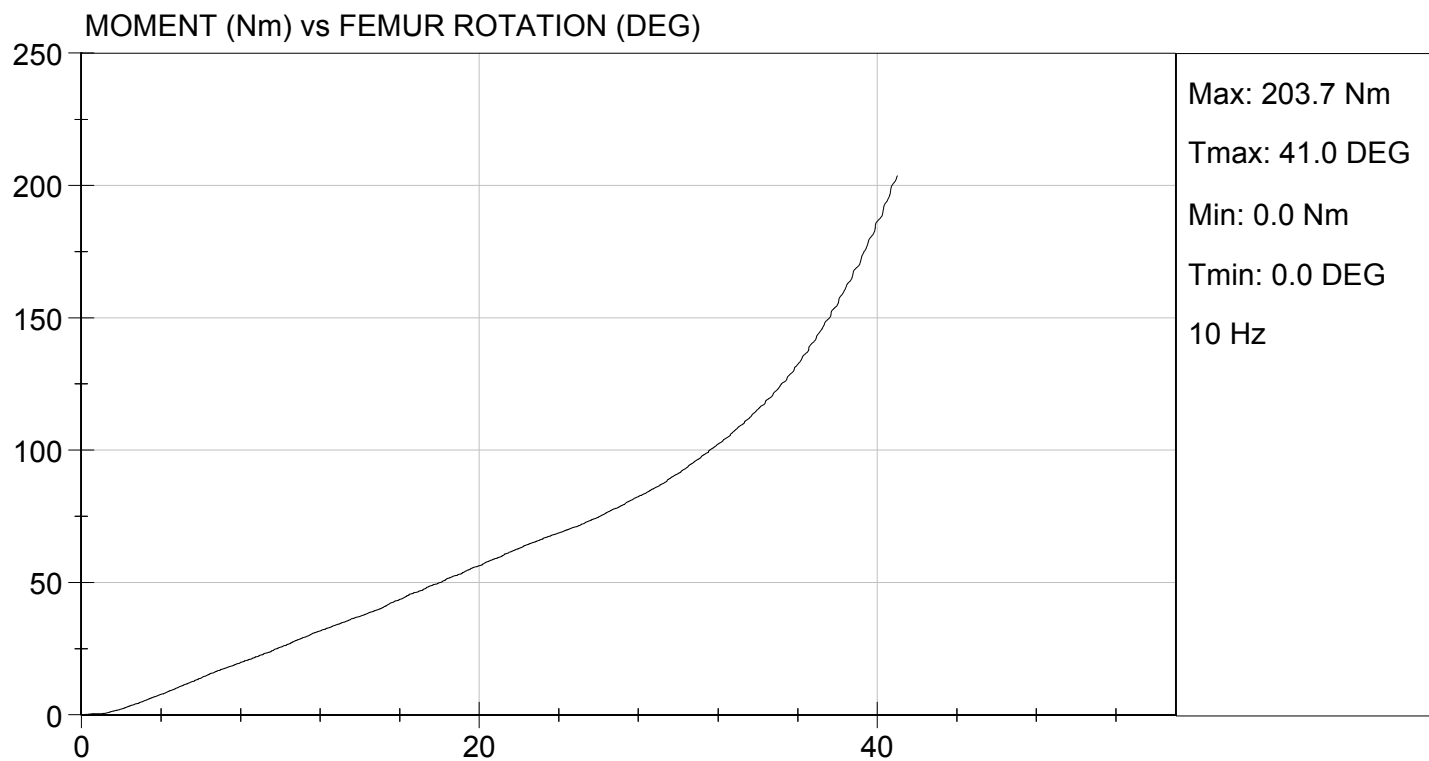
Test I.D: D132500

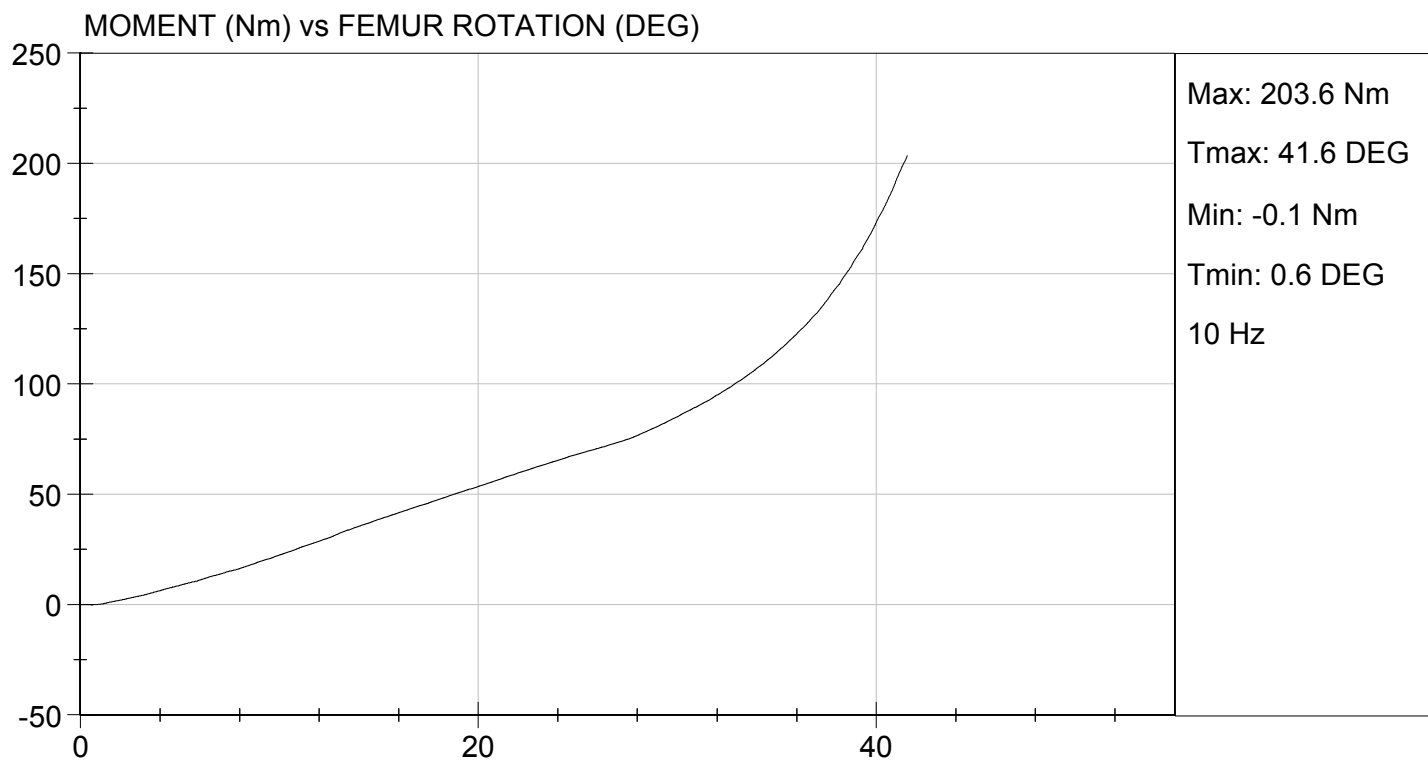
Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	54	54	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.2	6.2	Pass
30 Degrees	Nm	94.9 Nm Max	91.2	85.1	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	41.0	41.6	Pass
Overall Test Results					Pass


Laboratory Technician

07/31/2013
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
P	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: D132431

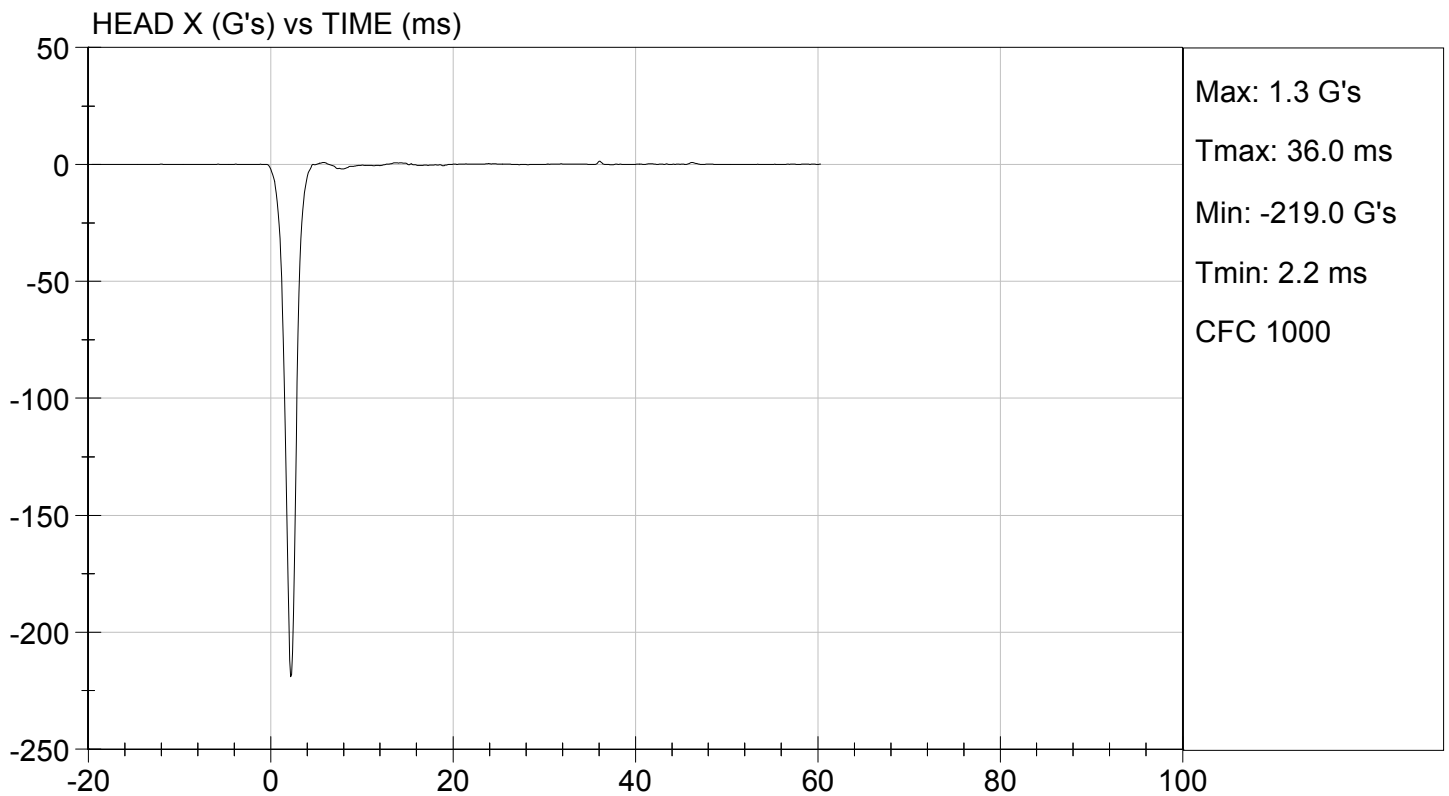
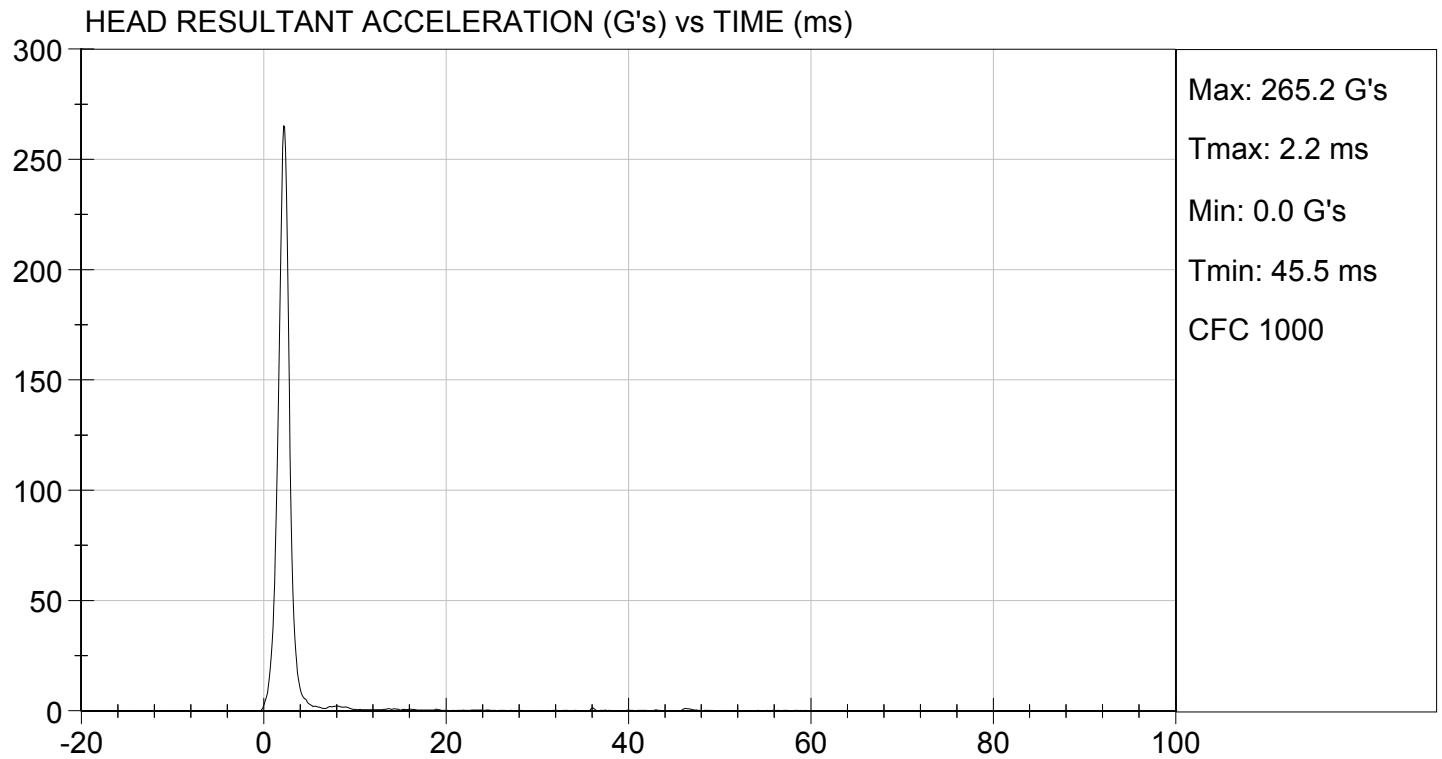
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Peak Resultant Acceleration	G's	250 to 300	265	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-8.1	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
			Overall Test Results	Pass

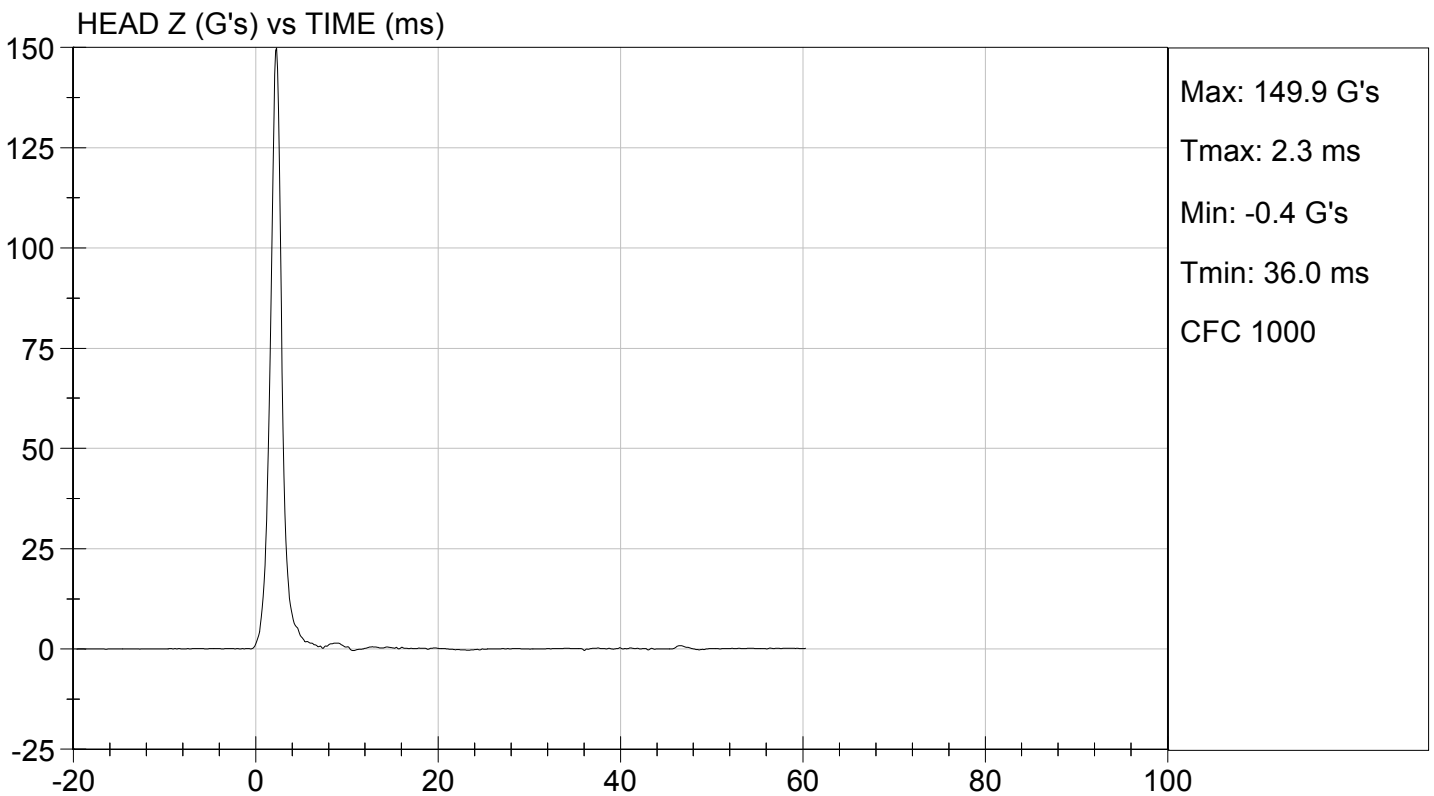
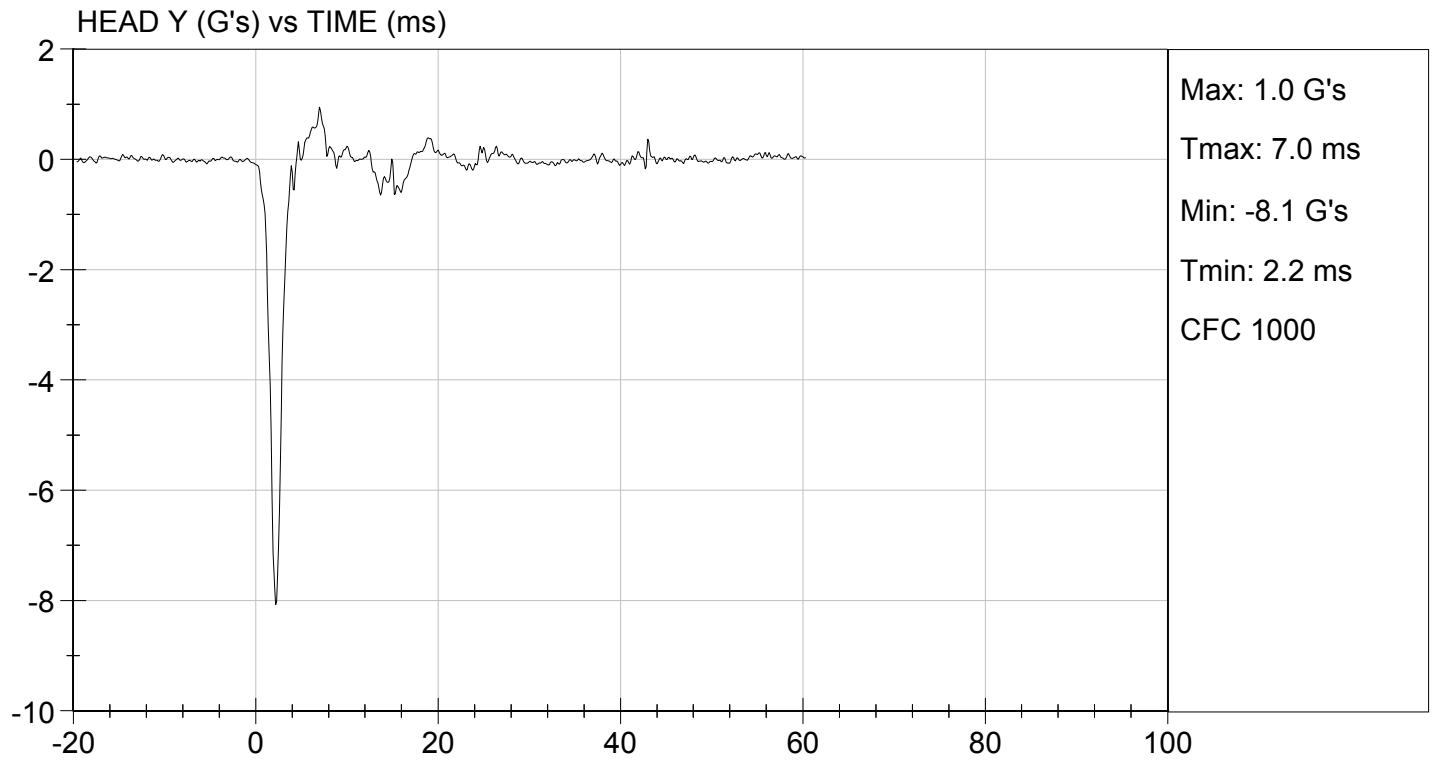
Laboratory Technician

07/24/2013

Test Date

Approved By





MGA RESEARCH CORPORATION**NECK FLEXION TEST****HYBRID III 5TH PERCENTILE**ATD Serial No: 634Test I.D: D132432

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	44	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.4	Pass
	20 ms	m/s	4.0 to 5.0	4.5	Pass
	30 ms	m/s	5.8 to 7.0	6.2	Pass
D Plane Rotation	Max	deg	77 to 91	83	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	69	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	84	Pass
Overall Results					Pass

Laboratory Technician

07/24/2013

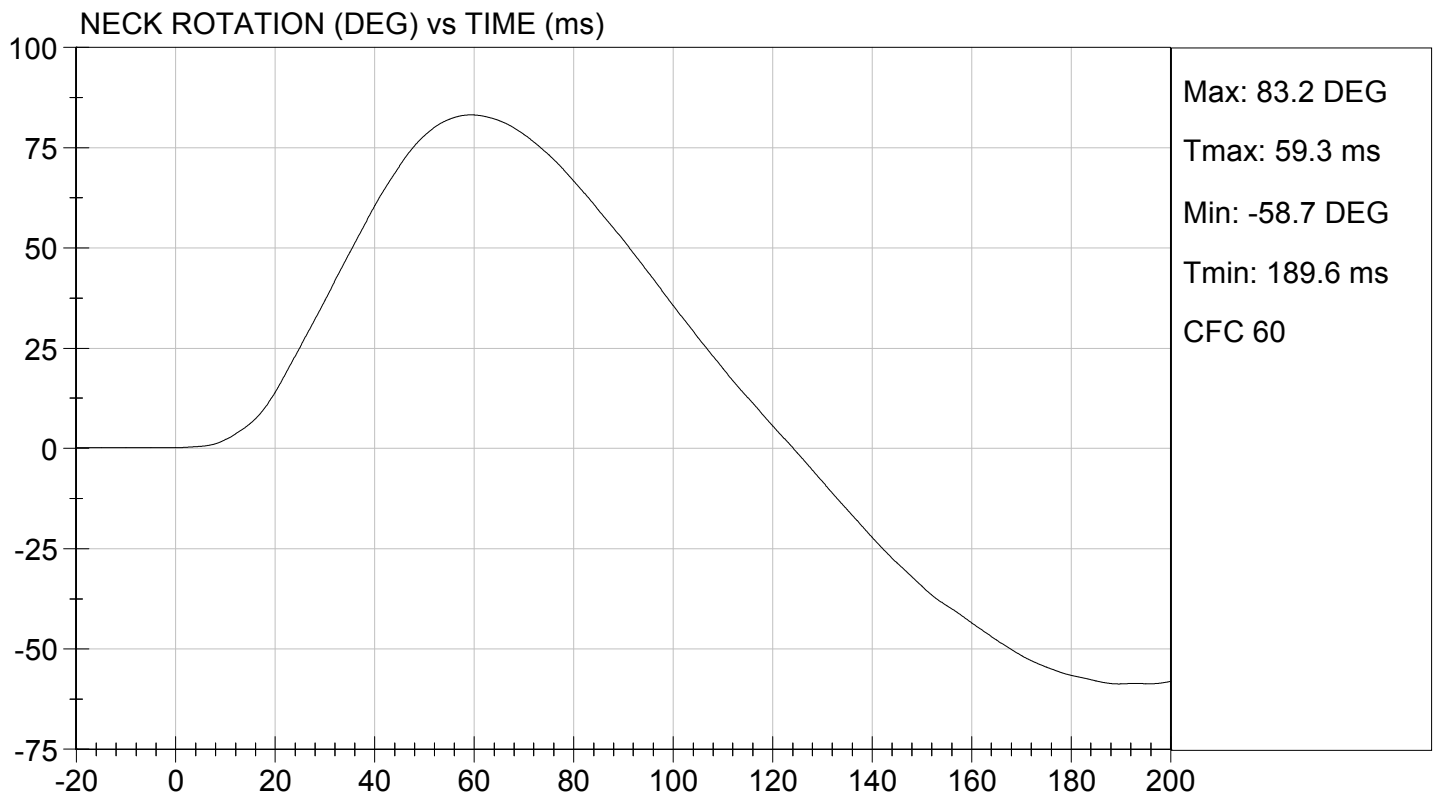
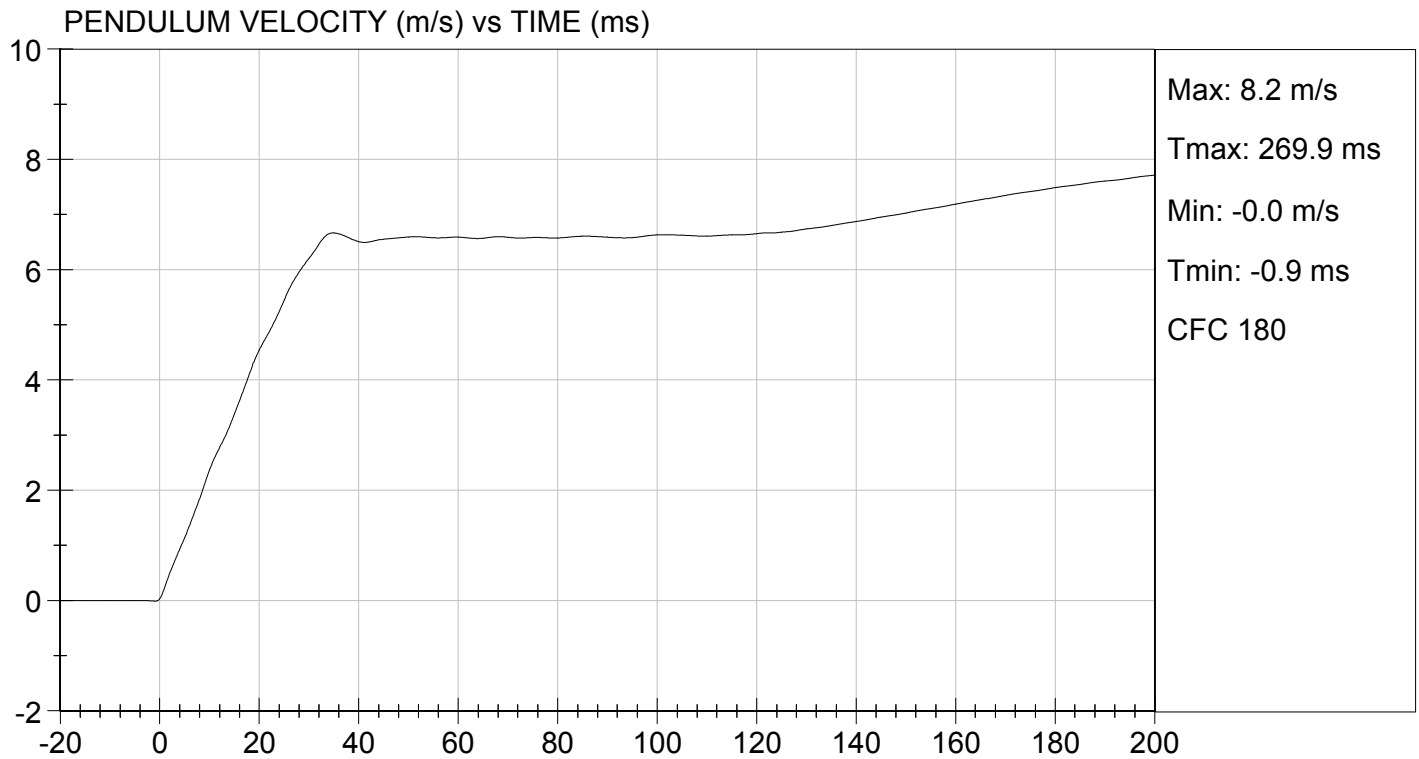
Test Date

Approved By



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

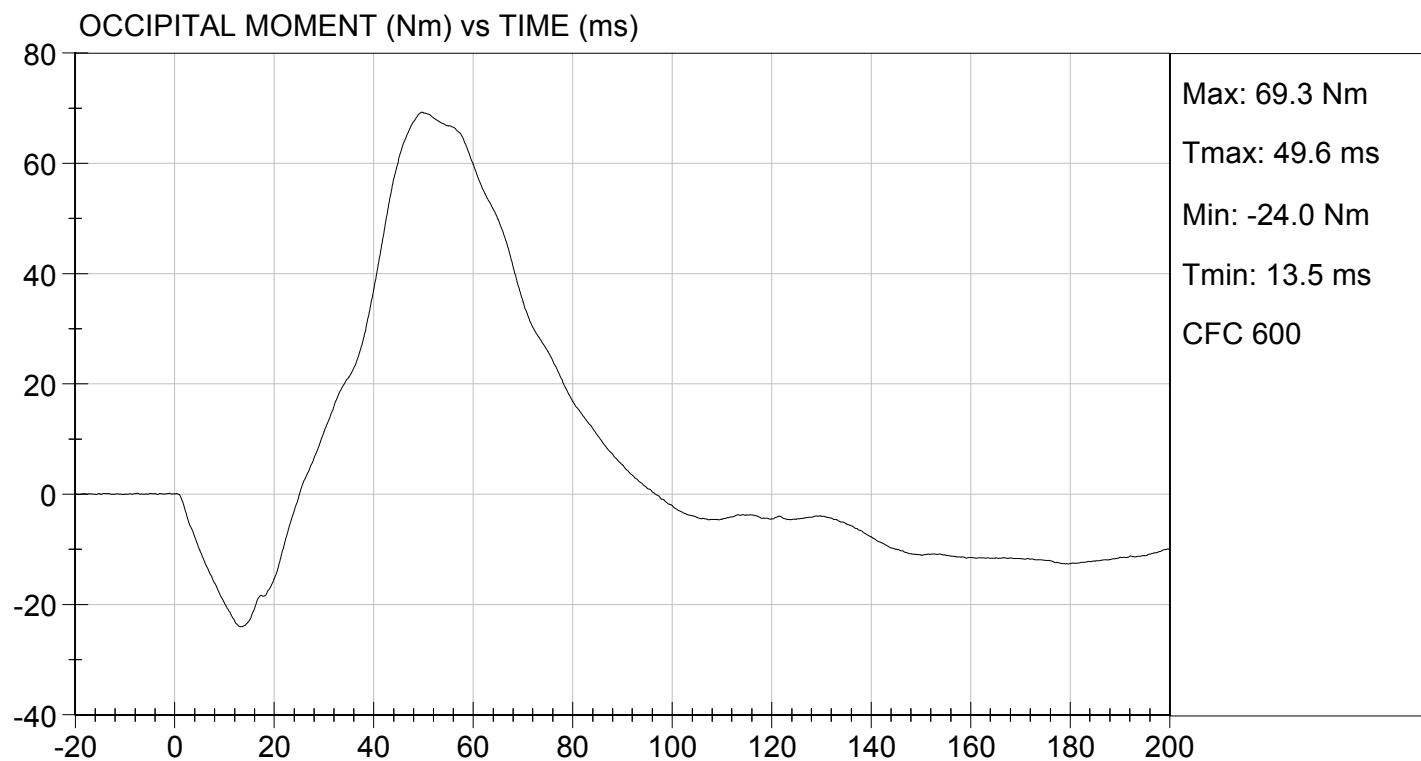
TEST DATE: 07/24/2013
TEST #: D132432





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

TEST DATE: 07/24/2013
TEST #: D132432



MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D132433

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	44	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	4.7	Pass
D Plane Rotation	Max	deg	99 to 114	102	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-54	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	103	Pass
Overall Results					Pass

Laboratory Technician

07/24/2013

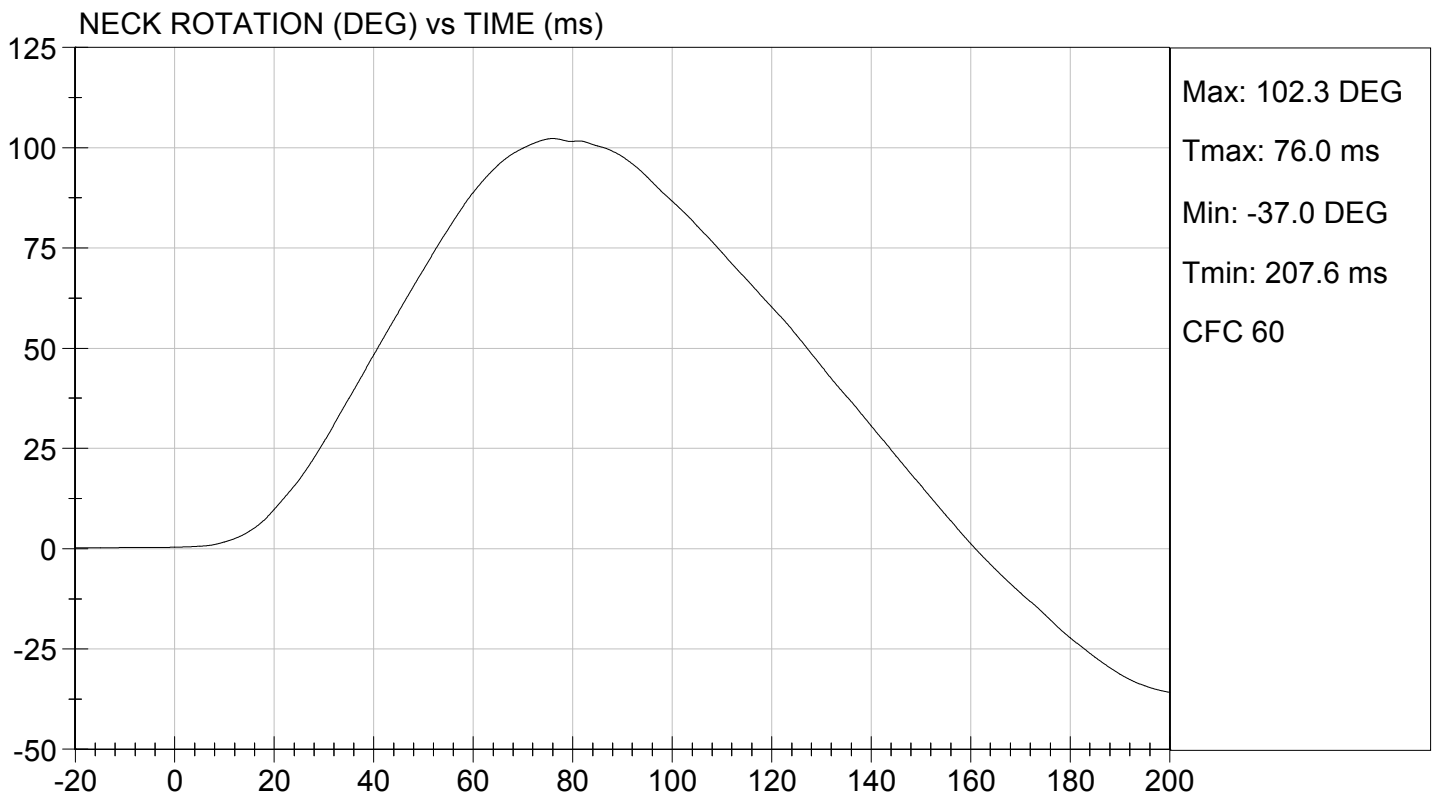
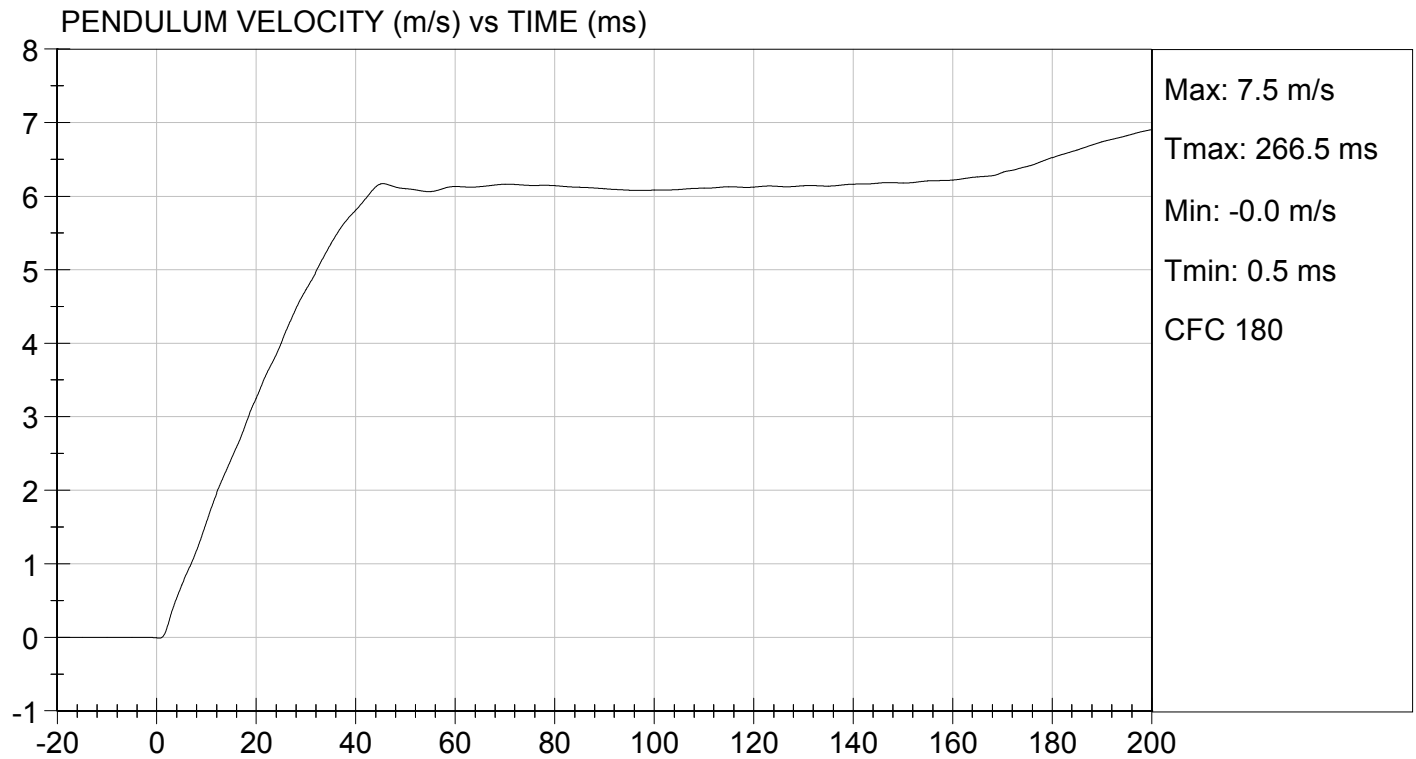
Test Date

Approved By



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

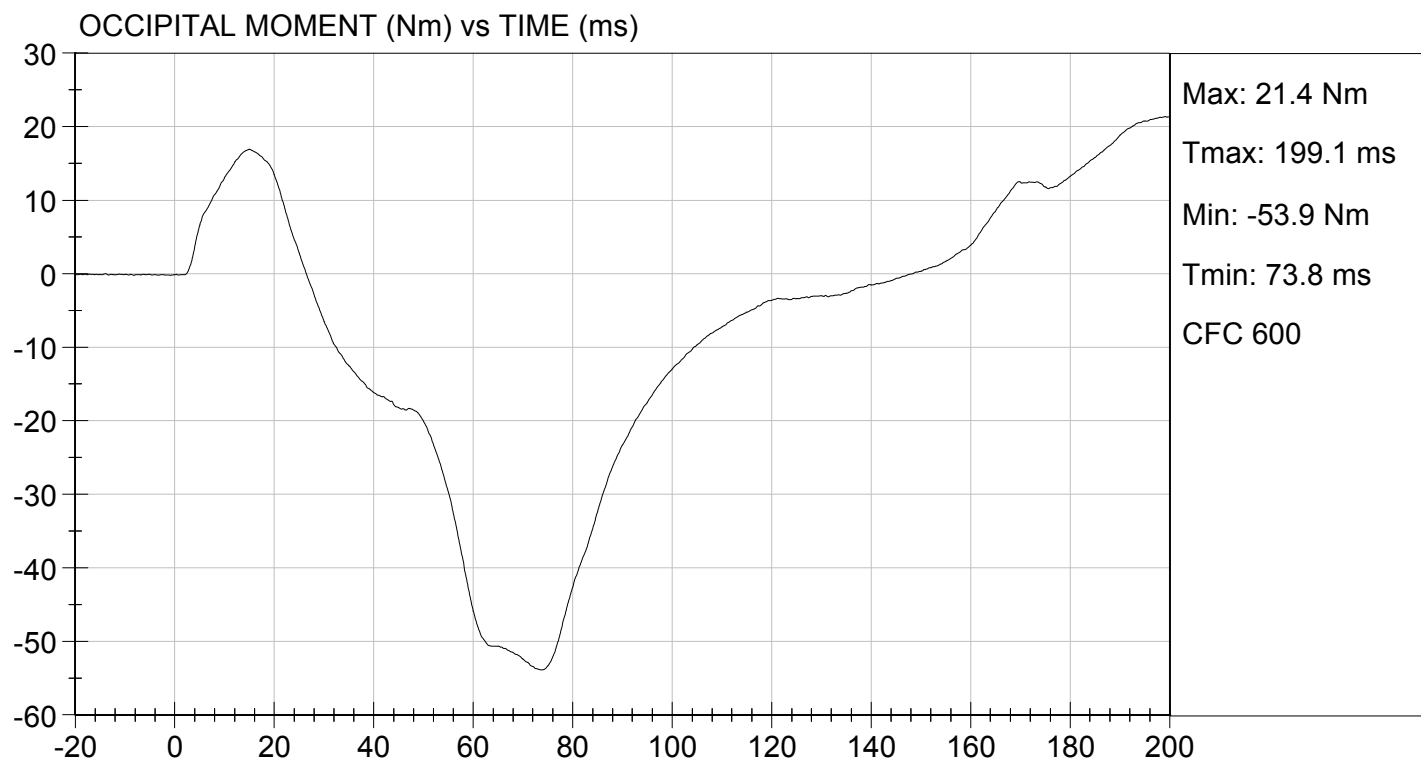
TEST DATE: 07/24/2013
TEST #: D132433





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

TEST DATE: 07/24/2013
TEST #: D132433



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D132434

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Relative Humidity	%	10 to 70	39	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	4185	Pass
Internal Hysteresis	%	69 to 85	72	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4281	Pass
			Overall Test Results	Pass

Laboratory Technician

07/24/2013

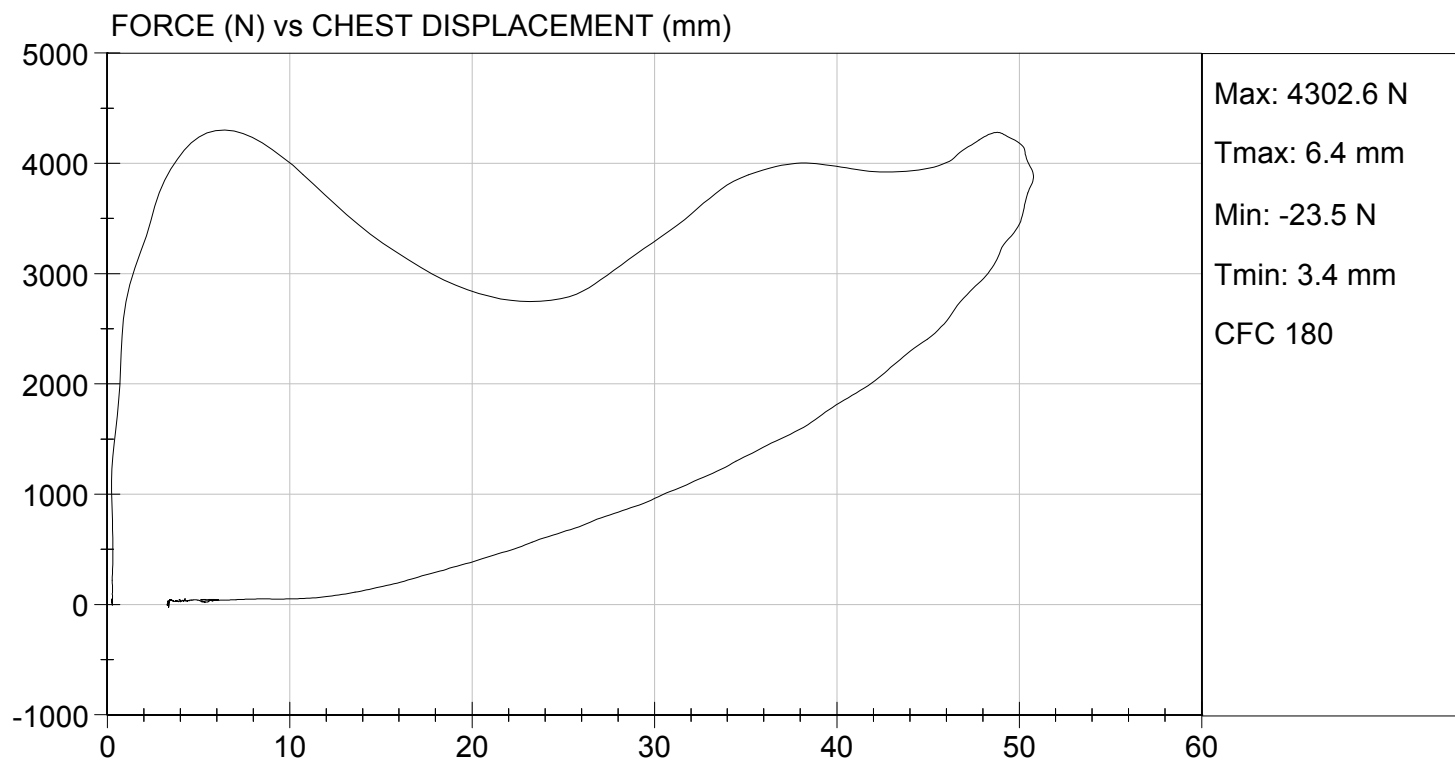
Test Date

Approved By



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

TEST DATE: 07/24/2013
TEST #: D132434



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D132435

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
Probe Speed	m/s	2.07 to 2.13	2.13	Pass
Maximum Force	N	3450 to 4060	3633	Pass
Overall Test Results				Pass

Laboratory Technician

07/24/2013

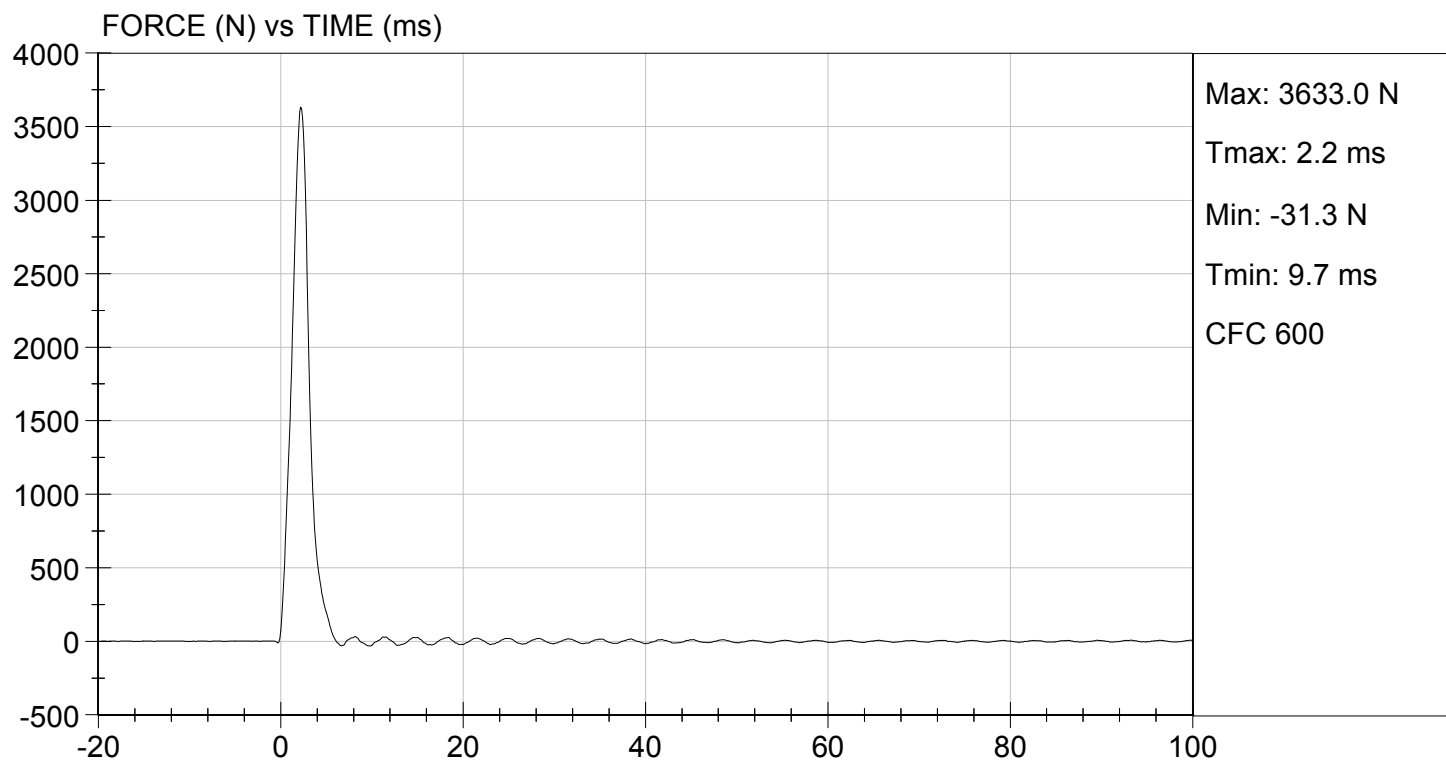
Test Date

Approved By



TEST DESC: RIGHT KNEE
VELOCITY: 6.98 ft/s, 2.13 m/s

TEST DATE: 07/24/2013
TEST #: D132435



MGA RESEARCH CORPORATION

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

ATD Serial No: 634

Test I.D: D132436

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
Probe Speed	m/s	2.07 to 2.13	2.13	Pass
Maximum Force	N	3450 to 4060	3525	Pass
Overall Test Results				Pass

Laboratory Technician

07/24/2013

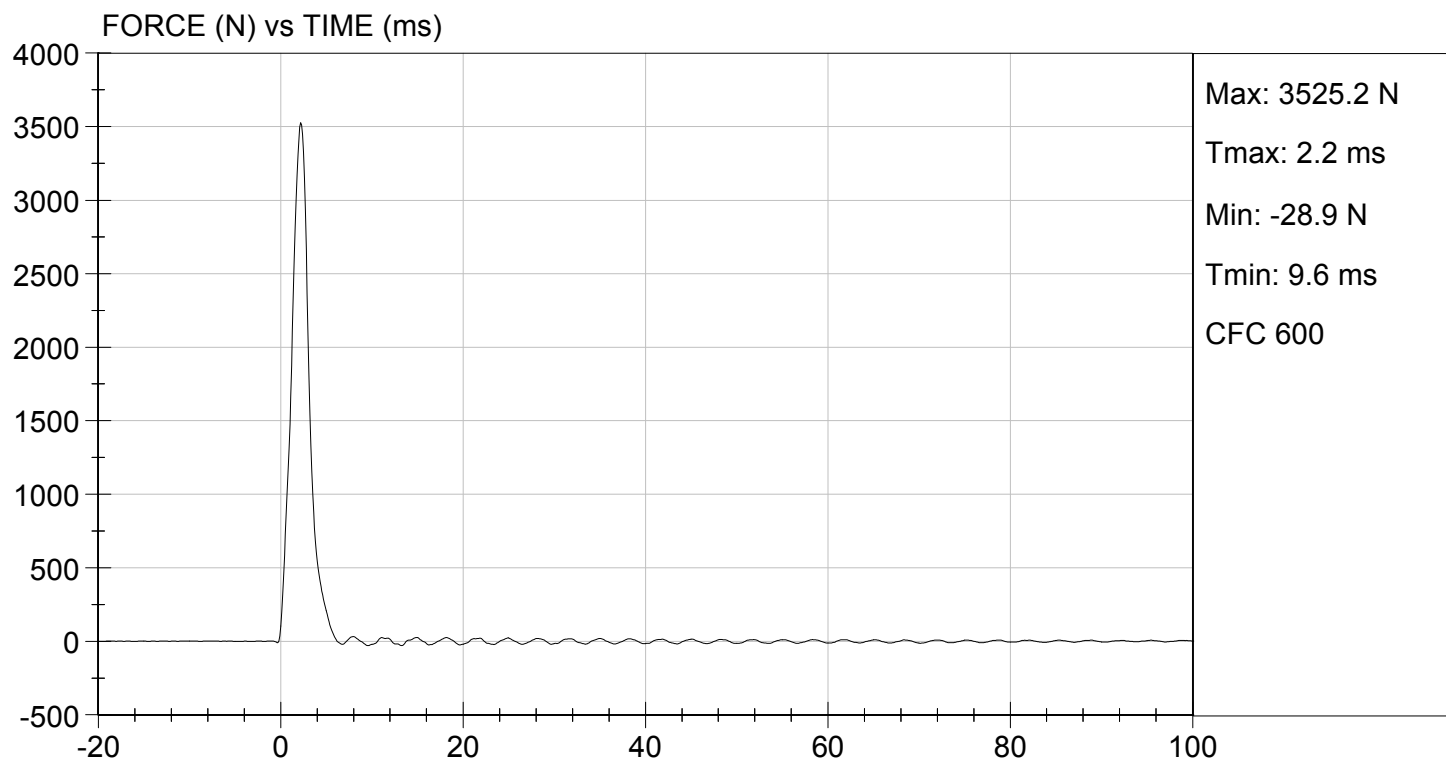
Test Date

Approved By



TEST DESC: LEFT KNEE
VELOCITY: 7.00 ft/s, 2.13 m/s

TEST DATE: 07/24/2013
TEST #: D132436



MGA RESEARCH CORPORATION**TORSO FLEXION TEST****HYBRID III 5TH PERCENTILE****ATD Serial No:** 634**Test I.D:** D132437

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	44	Pass
Initial Angle	deg	0 to 20	19	Pass
Return Angle	deg	+/- 8	5	Pass
Force at 45 deg	N	320 to 390	364	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.9	Pass
Overall Result				Pass

07/24/2013Laboratory TechnicianTest DateApproved By

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

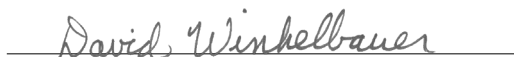
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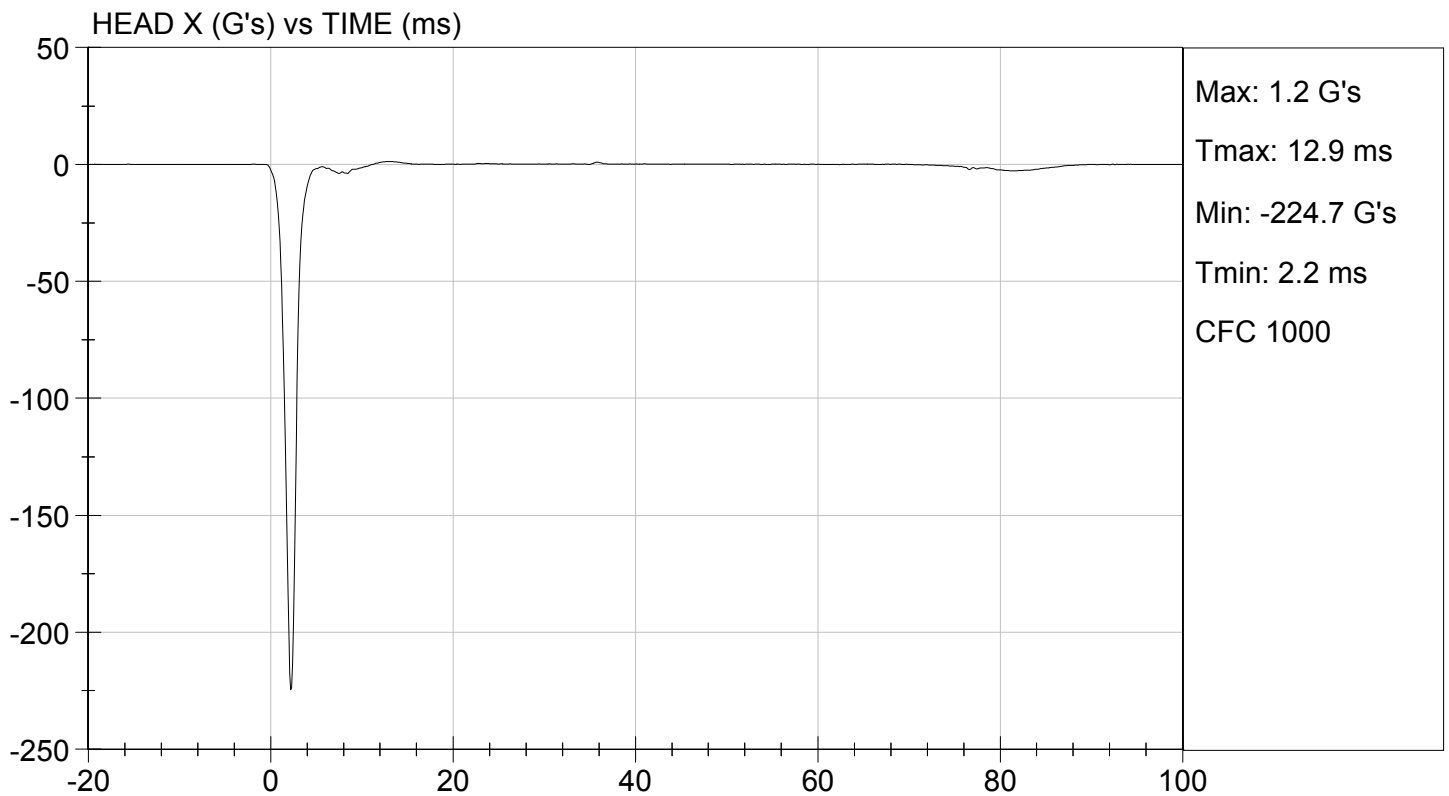
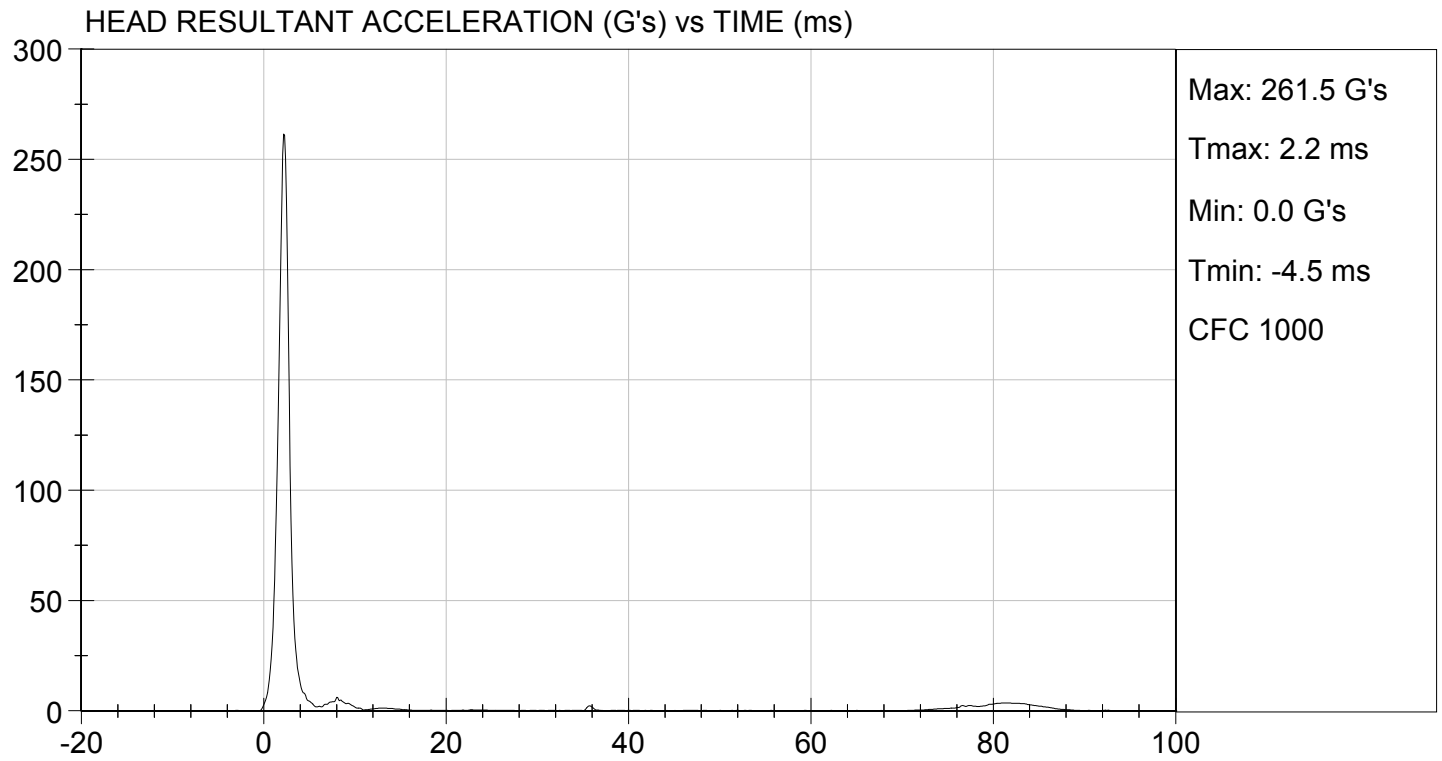
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	50	Pass
Peak Resultant Acceleration	G's	250 to 300	261	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-4.9	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

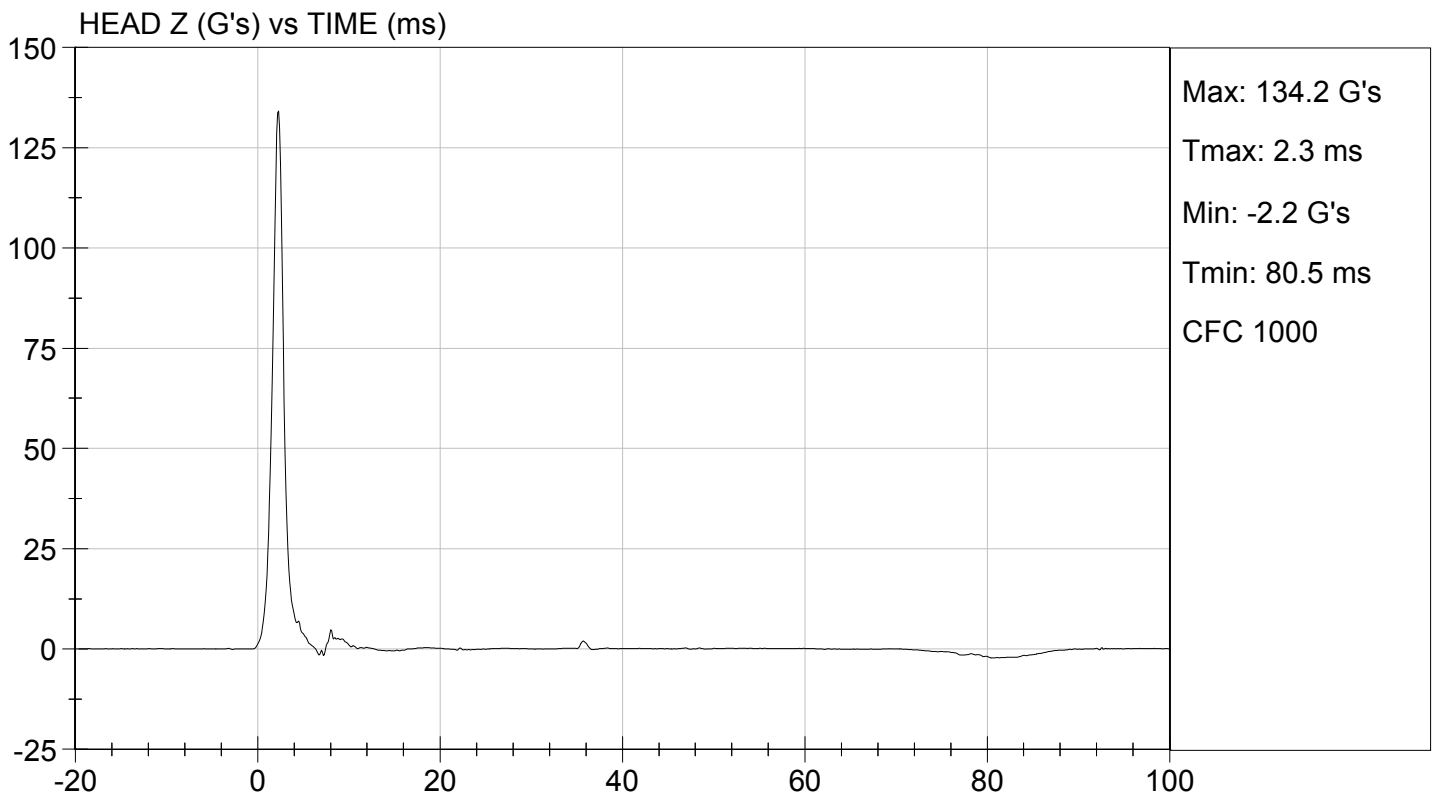
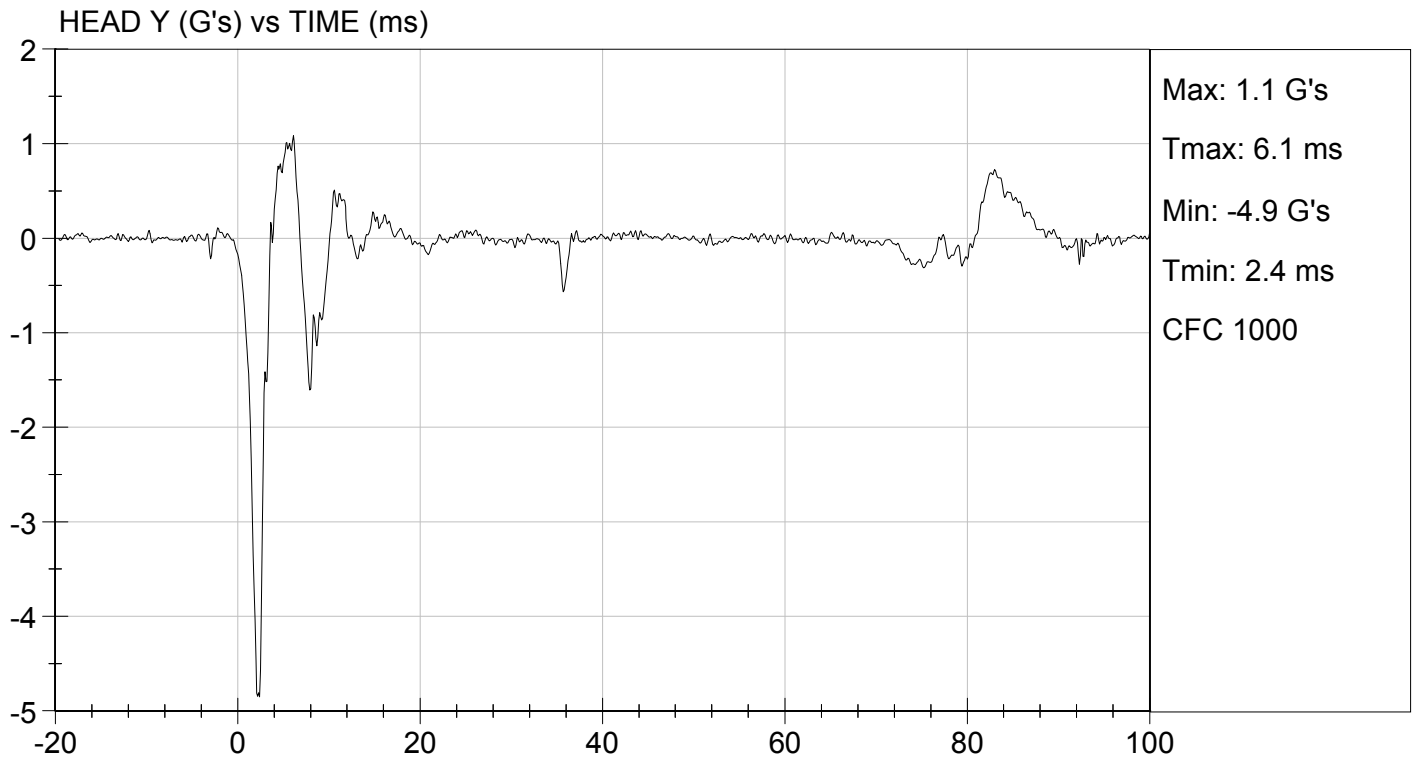

Laboratory Technician

07/31/2013

Test Date


Approved By





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D132512

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	52	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.05	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.4	Pass
	20 ms	m/s	4.0 to 5.0	4.5	Pass
	30 ms	m/s	5.8 to 7.0	6.1	Pass
D Plane Rotation	Max	deg	77 to 91	86	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	69	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	87	Pass
Overall Results					Pass

Jessica Hall
 Laboratory Technician

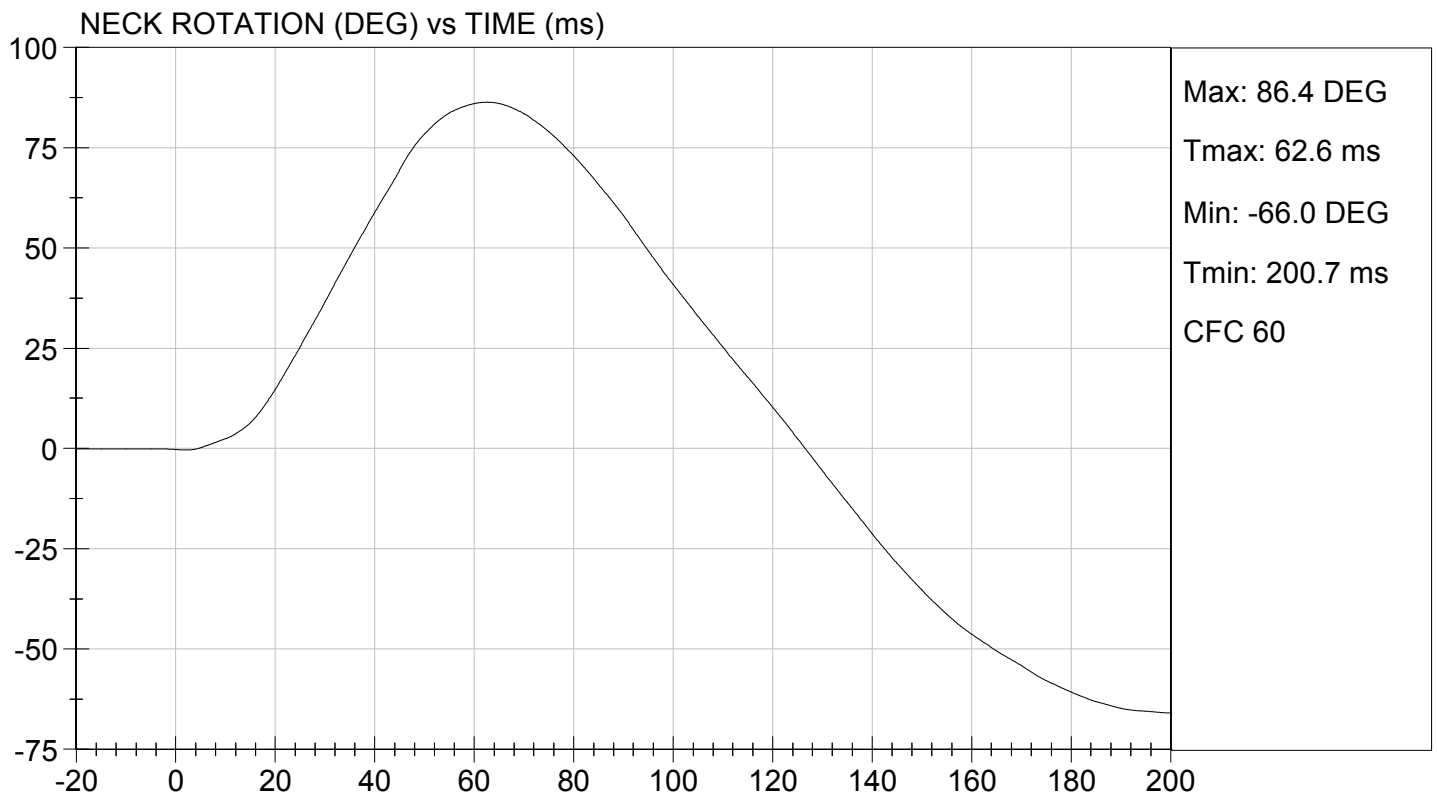
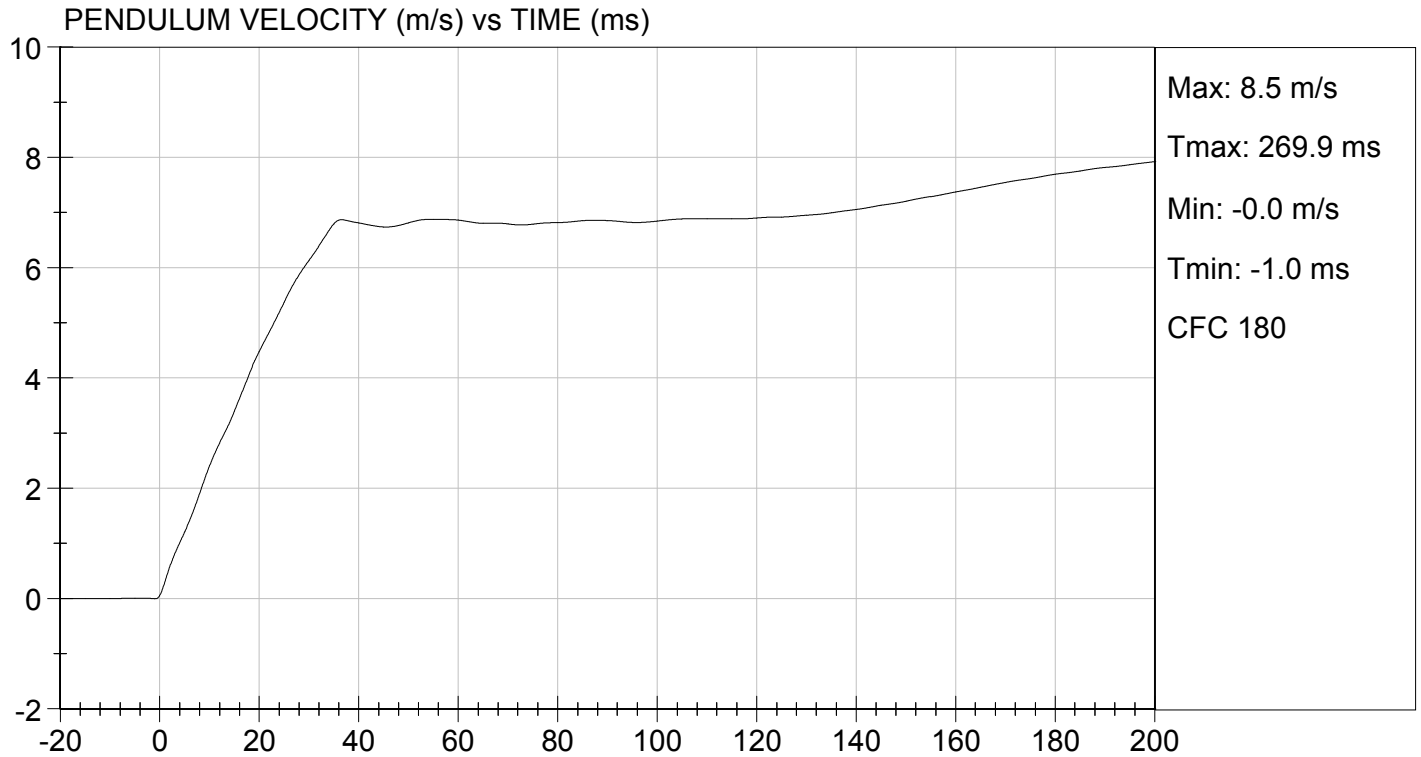
07/31/2013
 Test Date

David Winkelbauer
 Approved By



TEST DESC: NECK FLEXION
VELOCITY: 23.14 ft/s, 7.05 m/s

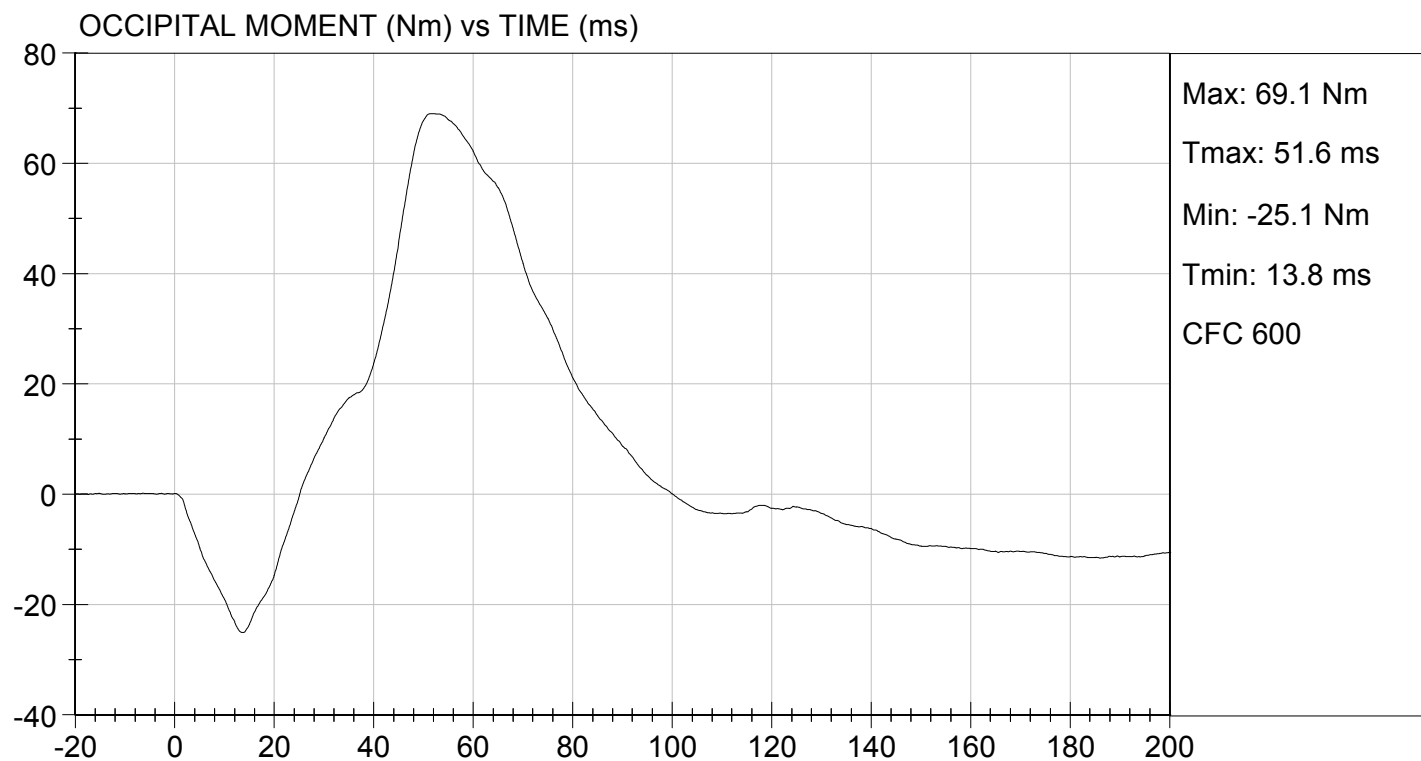
TEST DATE: 07/31/2013
TEST #: D132512





TEST DESC: NECK FLEXION
VELOCITY: 23.14 ft/s, 7.05 m/s

TEST DATE: 07/31/2013
TEST #: D132512



MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D132513

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	52	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.7	Pass
	20 ms	m/s	3.1 to 3.9	3.7	Pass
	30 ms	m/s	4.6 to 5.6	5.3	Pass
D Plane Rotation	Max	deg	99 to 114	106	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-57	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	95	Pass
Overall Results					Pass


Laboratory Technician

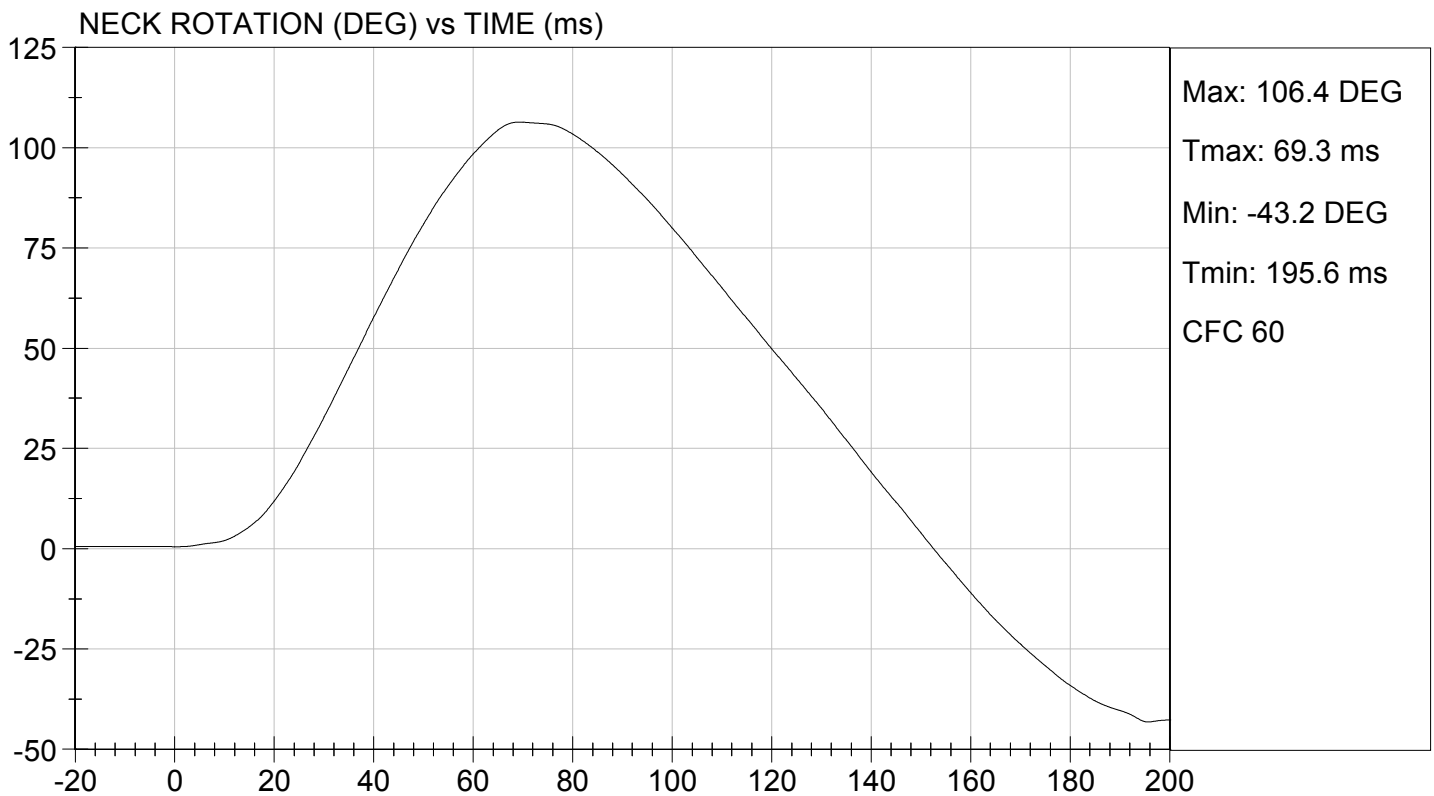
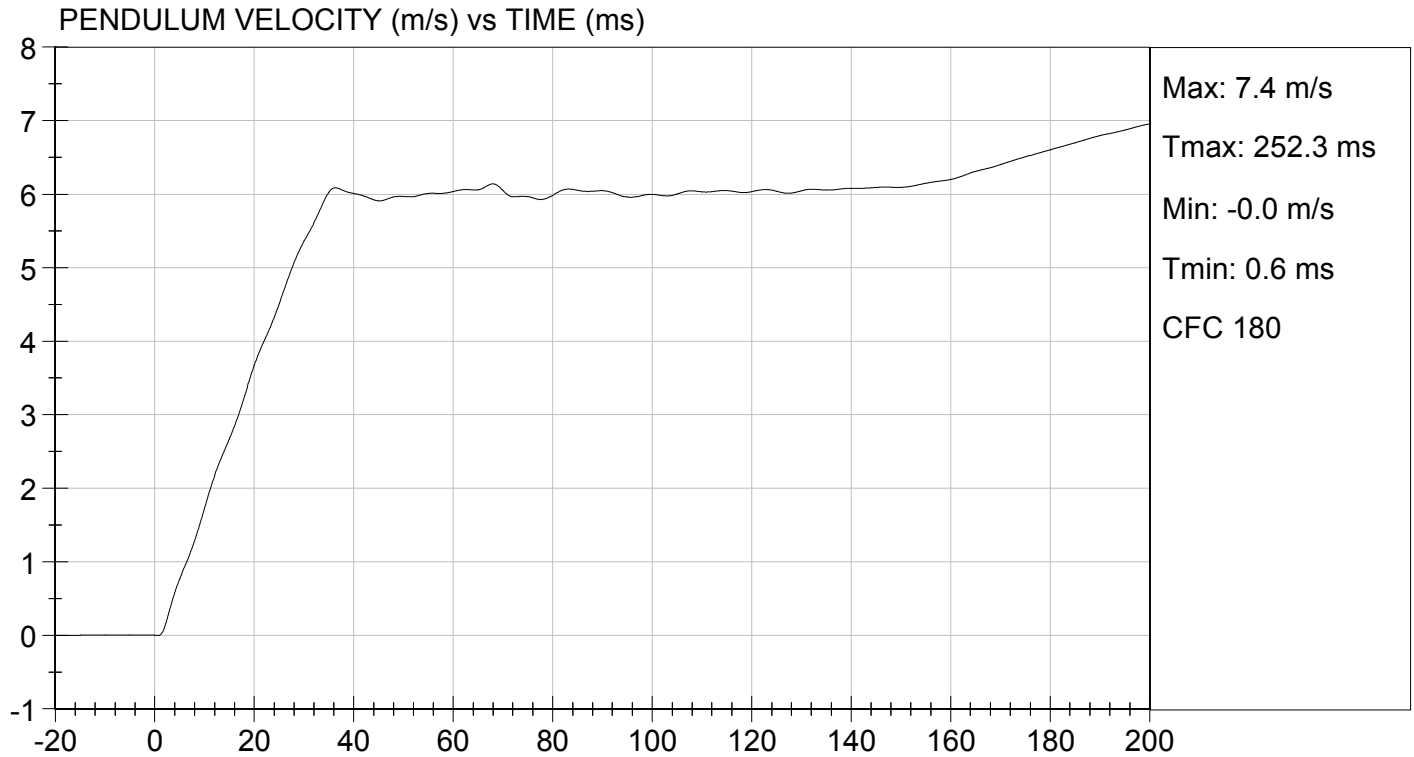
07/31/2013
Test Date


Approved By



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

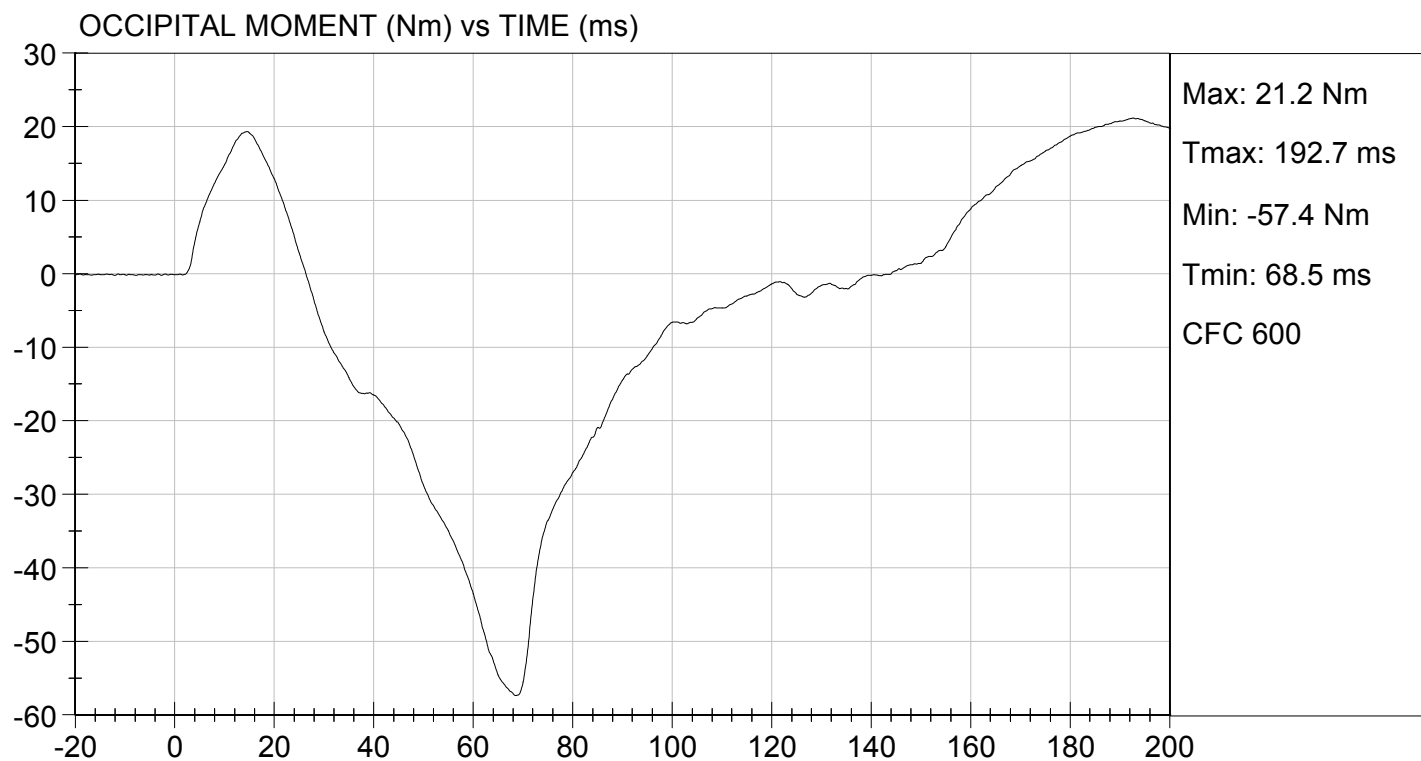
TEST DATE: 07/31/2013
TEST #: D132513





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

TEST DATE: 07/31/2013
TEST #: D132513



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D132514

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Relative Humidity	%	10 to 70	47	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	4287	Pass
Internal Hysteresis	%	69 to 85	72	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4302	Pass
Overall Test Results				Pass


Laboratory Technician

07/31/2013

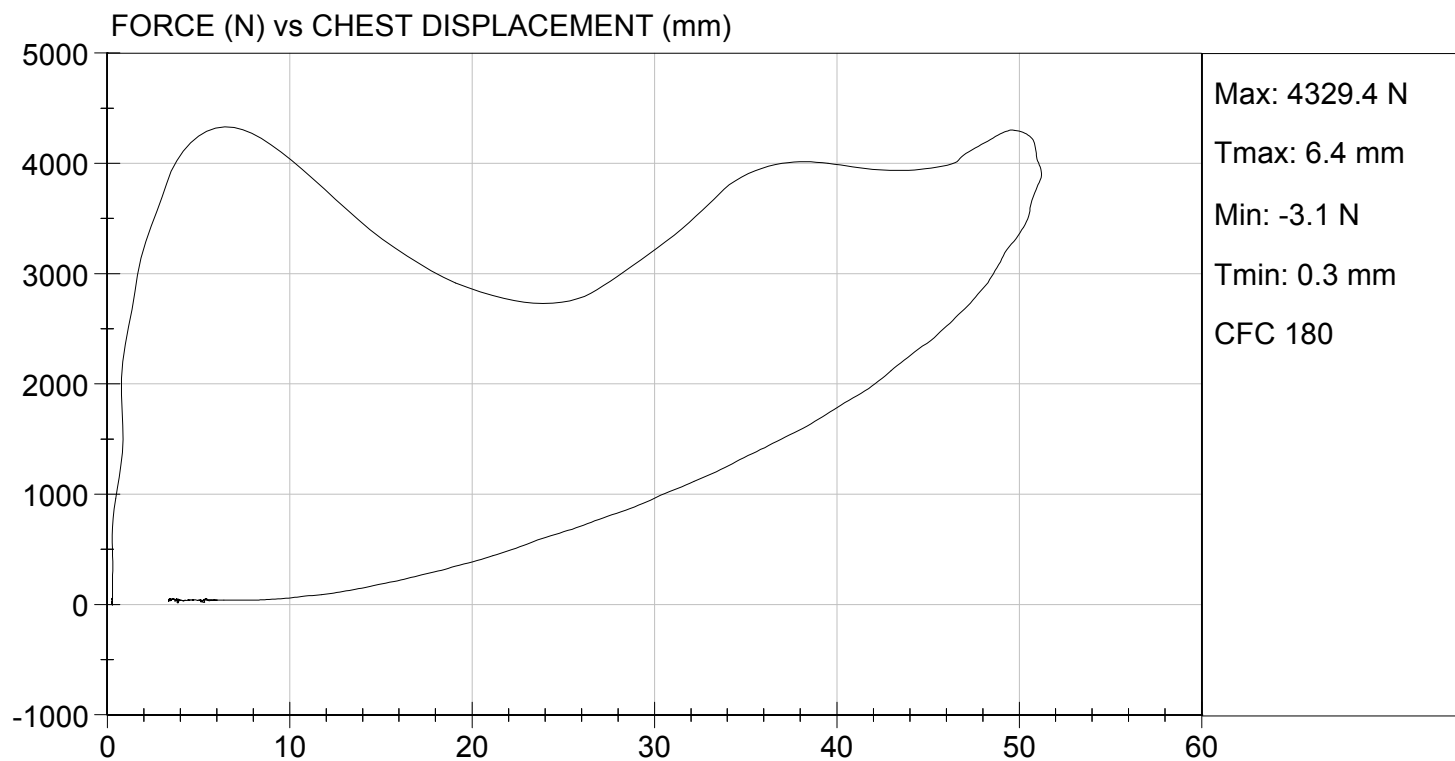
Test Date


Approved By



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

TEST DATE: 07/31/2013
TEST #: D132514



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D132515

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	50	Pass
Probe Speed	m/s	2.07 to 2.13	2.09	Pass
Maximum Force	N	3450 to 4060	3795	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

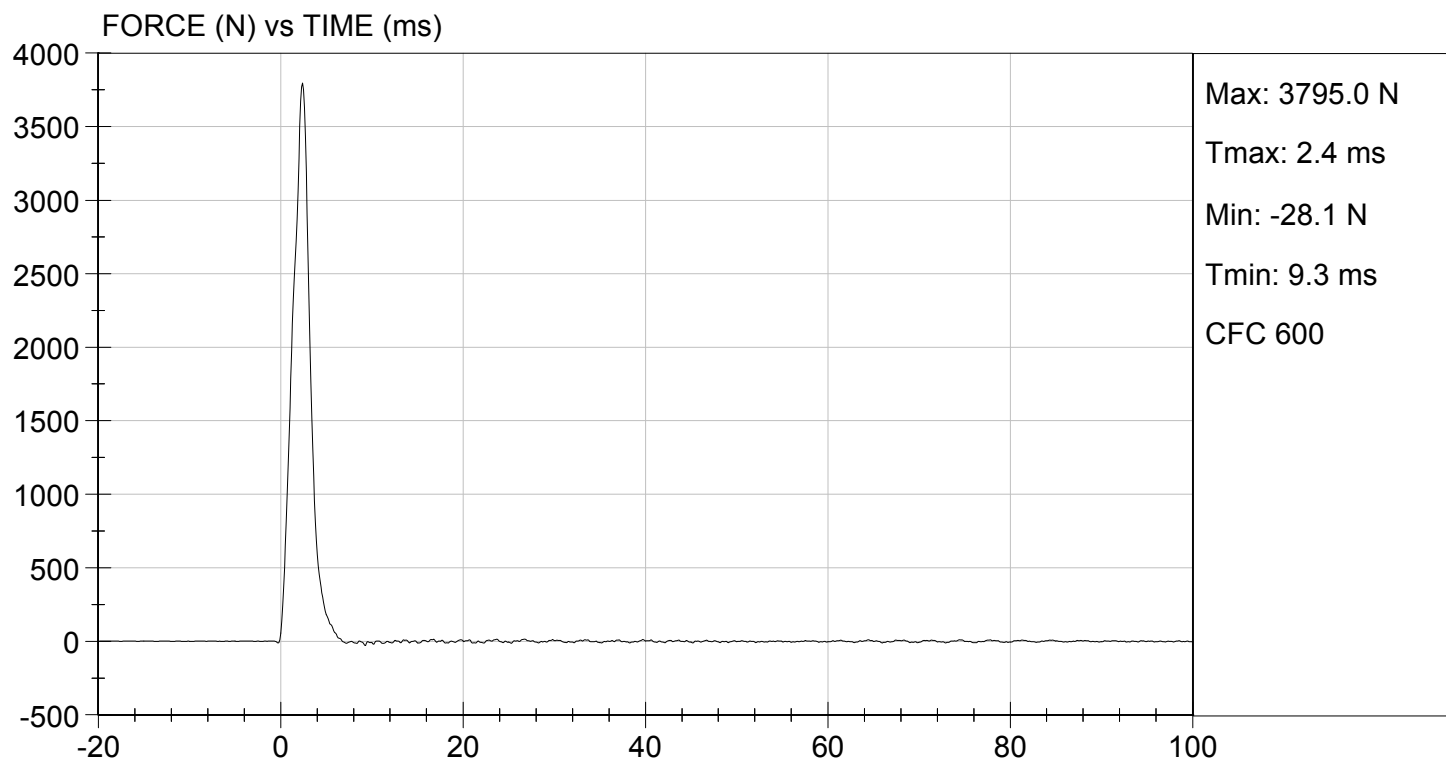
07/31/2013
Test Date

David Winkelbauer
Approved By



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

TEST DATE: 07/31/2013
TEST #: D132515



MGA RESEARCH CORPORATION

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

ATD Serial No: 634

Test I.D: D132516

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	50	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3592	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

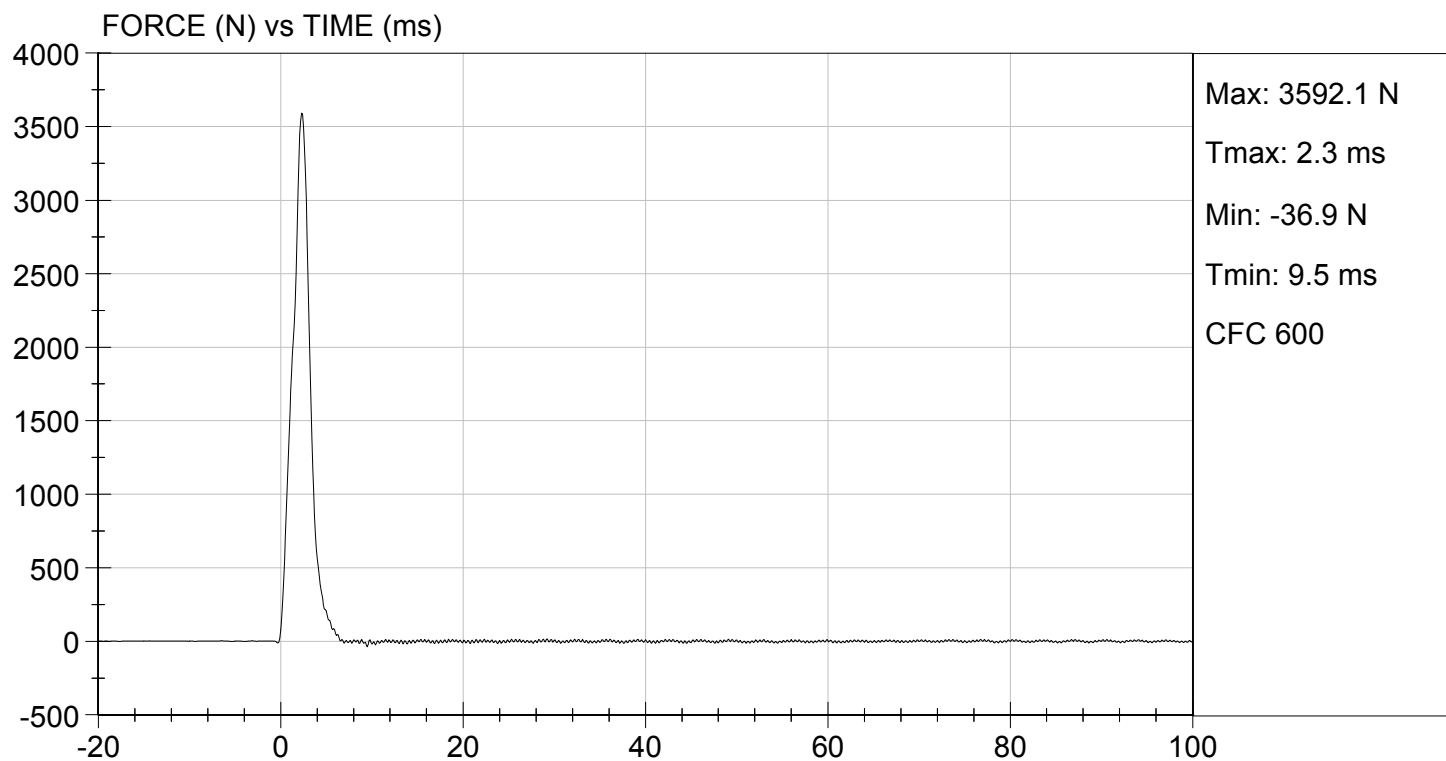
07/31/2013
Test Date

David Winkelbauer
Approved By



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

TEST DATE: 07/31/2013
TEST #: D132516



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D132517

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	50	Pass
Initial Angle	deg	0 to 20	16	Pass
Return Angle	deg	+/- 8	6	Pass
Force at 45 deg	N	320 to 390	350	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.9	Pass
Overall Result			Pass	

Jessica Hall
Laboratory Technician

07/31/2013

Test Date

David Winkelbauer
Approved By