

REPORT NUMBER: NCAP-MGA-2016-050

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

**ADAM OPEL AG
2016 Buick Cascada Premium 1SP 2-Door Convertible
NHTSA No.: O20160100**

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



Test Date: June 30, 2016

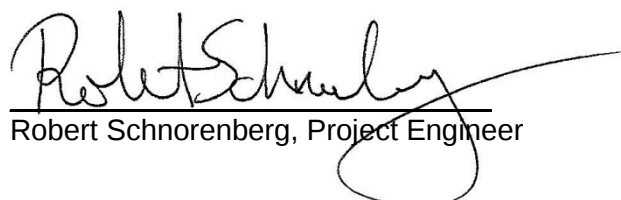
Final Report Date: September 7, 2016

FINAL REPORT

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

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Approval Date: September 7, 2016

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

Technical Report Documentation Page

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16. Abstract A 56.3 km/h NCAP Frontal Impact Test was conducted on a 2016 Buick Cascada Premium 1SP 2-Door Convertible 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), and 301 performance. The test was conducted at MGA Research Corporation in Burlington, Wisconsin on June 30, 2016. The impact velocity of the vehicle was 56.21 km/h and the ambient temperature at the barrier face at the time of impact was 22.1°C. The target vehicle post-test maximum crush was 491mm located to the left of 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">Driver ATD</th> <th colspan="2">Passenger ATD</th> </tr> <tr> <th>Threshold</th> <th>Result</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₁₅)</td> <td>N/A</td> <td>700</td> <td>188</td> <td>700</td> <td>377</td> </tr> <tr> <td>Maximum Chest</td> <td>mm</td> <td>63</td> <td>28</td> <td>52</td> <td>19</td> </tr> <tr> <td>Nij</td> <td>N/A</td> <td>1</td> <td>0.27</td> <td>1</td> <td>0.38</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4170</td> <td>841</td> <td>2620</td> <td>883</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4000</td> <td>136</td> <td>2520</td> <td>198</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10008</td> <td>675</td> <td>6805</td> <td>345</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10008</td> <td>577</td> <td>6805</td> <td>507</td> </tr> </tbody> </table>				Measurement Description	Units	Driver ATD		Passenger ATD		Threshold	Result	Threshold	Result	Head Injury Criteria (HIC ₁₅)	N/A	700	188	700	377	Maximum Chest	mm	63	28	52	19	Nij	N/A	1	0.27	1	0.38	Neck Tension	N	4170	841	2620	883	Neck Compression	N	4000	136	2520	198	Left Femur Force	N	10008	675	6805	345	Right Femur Force	N	10008	577	6805	507
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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 2016 Buick Cascada Premium 1SP 2-Door Convertible at a velocity of 56.21 km/h. The test was performed at MGA Research Corporation on June 30, 2016. 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, driver's lap belt, passenger's shoulder belt, and passenger's lap belt to measure dummy torso section loading.

The driver (position 1) ATD (Serial No. 351) 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 634 channels of data were recorded on a 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 491mm to the left of the vehicle centerline 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 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 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)	188	0.27	841	136	46	28	675	577
Passenger (5 th)	377	0.38	883	198	42	19	345	507

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

TEST NOTES

Barrier K-16 My recorded no valid data.
Barrier C-04 Fx recorded no valid data.
Barrier C-04 My recorded no valid data.
Barrier C-04 Mz recorded no valid data.

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: 2016 Buick Cascada Premium 1SP 2-Door Convertible
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160100
 Test Date: 6/30/2016

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	O20160100	Traction Control System (TCS)	Yes
Model Year	2016	Power Steering	Yes
Make	Buick	Power Window Auto-Reverse	Yes
Model	Cascada Premium 1SP	Driver Frontal Airbag	Yes
Body Style	2-Door Convertible	Driver Curtain Airbag	No
VIN	W04WT3N59GG053900	Driver Head/Torso Airbag	Yes
Body Color	Carbon Black Metallic	Driver Torso Airbag	No
Odometer (km/mi)	166km / 103mi	Driver Torso/Pelvis Airbag	No
Engine Displacement (L)	1.6 L	Driver Pelvis Airbag	No
Type/No. Cylinders	4	Driver Knee Airbag	Yes
Engine Placement	Lateral	Front Pass. Frontal Airbag	Yes
Transmission Type	Auto	Front Pass. Curtain Airbag	No
Transmission Speeds	6	Front Pass. Head/Torso Airbag	Yes
Overdrive	Yes	Front Pass. Torso Airbag	No
Final Drive	FWD	Front Pass. Torso/Pelvis Airbag	No
Roof Rack	No	Front Pass. Pelvis Airbag	No
Sunroof/T-Top	Yes	Front Pass. Knee Airbag	Yes
Running Boards	No	Driver Pretensioner	Yes
Tilt Steering Wheel	Yes	Driver Load Limiter	Yes
Power Seats	Yes	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	ADAM OPEL AG
Date of Manufacture	01/16

GVWR (kg)	2170
GAWR Front (kg)	1150
GAWR Rear (kg)	1020

VEHICLE SEATING AND WEIGHT CAPACITY DATA

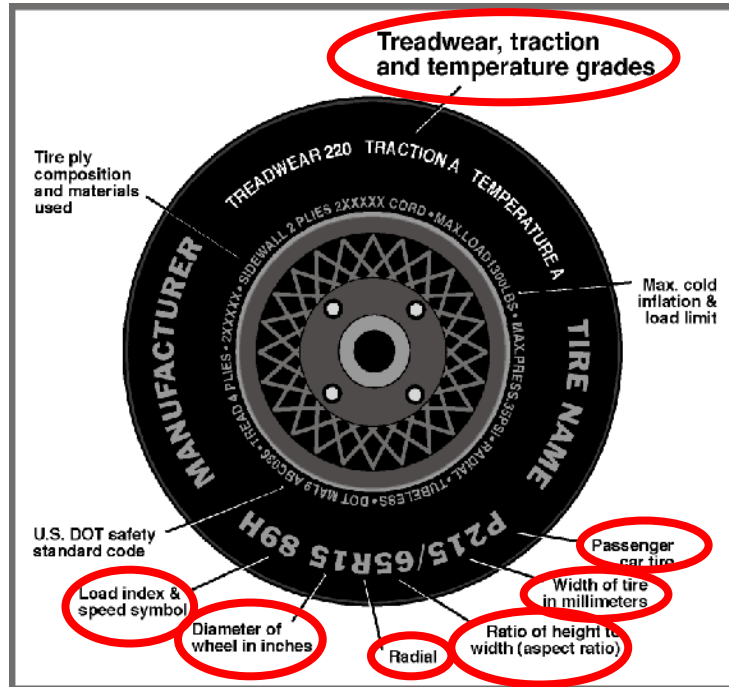
Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bucket		
Designated Seating Capacity (DSC)	2	2		4
Capacity Weight (VCW) (kg)				336
Cargo Weight (RCLW) (kg)				64

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

Test Vehicle: 2016 Buick Cascada Premium 1SP 2-Door Convertible
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160100
 Test Date: 6/30/2016

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	240	240
Recommended Tire Size	245/40R20	245/40R20
Tire Size on Vehicle	245/40R20	245/40R20
Tire Manufacturer	Bridgestone	Bridgestone
Tire Model	Potenza	Potenza
Treadwear	400	400
Traction	A	A
Temperature Grade	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 2 Steel, 1 Nylon	2 Polyester, 2 Steel, 1 Nylon
Load Index/Speed Symbol	95V	95V
Tire Material	Rubber	Rubber
DOT Safety Code Left	7XWA PR4 4315	7XWA PR4 4315
DOT Safety Code Right	7XWA PR4 4315	7XWA PR4 4315

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

Test Vehicle: 2016 Buick Cascada Premium 1SP 2-Door Convertible
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160100
 Test Date: 6/30/2016

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	540.5	386.0		559.0	474.5	
Right	kg	519.5	359.0		532.5	438.0	
Ratio	%	58.7%	41.3%		54.5%	45.5%	
Totals	kg	1060.0	745.0	1805.0	1091.5	912.5	2004.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1805.0
Weight of 1 P572E ATD & 1 P572O ATD	kg	141
Rated Cargo/Luggage Weight (RCLW)	kg	64
Calculated Test Vehicle Target Weight (TVTW)	kg	2010.0

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	737	743	752	762	1117
As Tested	mm	726	734	717	726	1232
Post Test	mm	755	754	714	721	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2706
Total Vehicle Length at Left Side	mm	4536
Total Vehicle Length at Centerline	mm	4742
Total Vehicle Length at Right Side	mm	4536
Weight of Ballast in Cargo Area	kg	0
Weight of Vehicle Components Removed	kg	31
Amount of Stoddard Solvent in Fuel Tank	L	51.9

List of components removed to meet test weight: LR/RR headrests, LF/RF side mirror.

List of components removed for instrumentation, data box, and equipment installation: Cargo area carpet and trim, LR/RR floor mat, jack and tool kit, spare tire and cover.

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

Test Vehicle: 2016 Buick Cascada Premium 1SP 2-Door Convertible
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160100
 Test Date: 6/30/2016

TARGET VEHICLE STRUCTURAL MEASUREMENT

	Elements	Pre-Test (mm)
1	Total Length	4742
2	Total Width	1782
3	Bumper Top Height	533
4	Bumper Bottom Height	450
5	Longitudinal Member Top Height	582
6	Distance between Longitudinal Members	868
7	Longitudinal Member Width	130
8	Engine Top Height	887
9	Engine Bottom Height	177
10	Engine and Gearbox Width	785
11	Front Bumper-Engine Distance	400
12	Front Shock Absorber Fixing Height	906
13	Bonnet Leading Edge Height	860
14	Front Shock Absorber Fixing Width	1220
15	Front Bumper – Front Axle Distance	1041
16	Front Axle – A-Pillar Distance	400
17	A-Pillar – B-Pillar Distance	1351
18	B-Pillar – Rear Axle Distance	952
19	B-Pillar – C-Pillar Distance	684
20	Roof Sill Bottom Height	1335
21	Roof Sill Top Height	1412
22	Floor Sill Bottom Height	150
23	Floor Sill Top Height	434

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

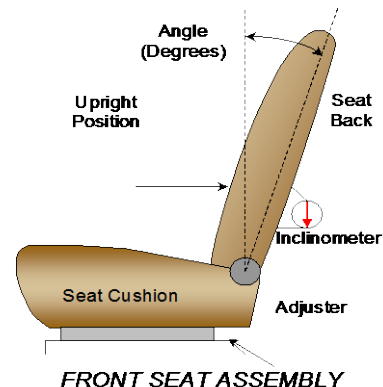
Test Vehicle: 2016 Buick Cascada Premium 1SP 2-Door Convertible
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160100
Test Date: 6/30/2016

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 October 2015.

	Degrees
Driver Seat Back Angle	2.4° on headrest post
Passenger Seat Back Angle	-5.3° on headrest post



SEAT FORE/AFT POSITIONS

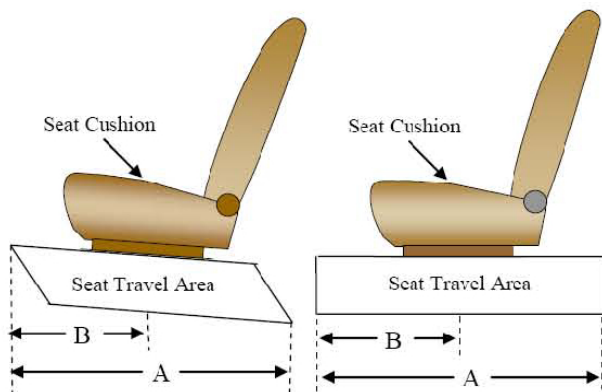
The driver and passenger seat fore/aft positions are adjusted following Appendix F, "Driver & Passenger Dummy Seating & Positioning Procedures" in the NCAP Test Procedure dated October 2015.

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	250 mm	125 mm
Passenger Seat	185 mm	0 mm

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	Fixed	
Passenger Seat	Fixed	



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

Test Vehicle: 2016 Buick Cascada Premium 1SP 2-Door Convertible
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160100
 Test Date: 6/30/2016

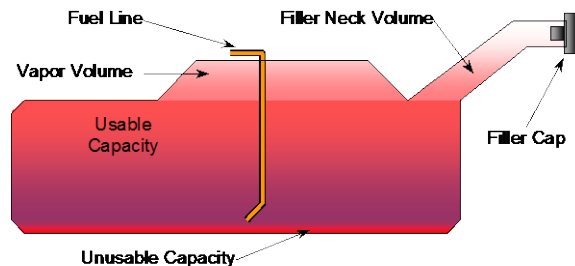
FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of "Standard Tank"	56.0
Usable Capacity of "Optional Tank"	
92-94% of Usable Capacity	51.5 to 52.6
Actual Amount of Solvent used	51.9
1/3 of Usable Capacity	15.5

FUEL PUMP

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

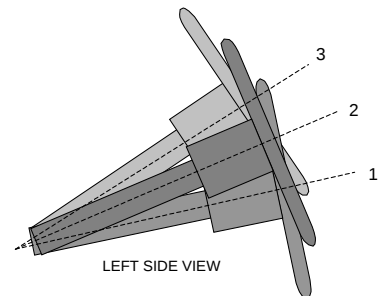
The test vehicle is equipped with an electronic fuel pump. Pump will run when engine is running. Also, it will run briefly when ignition key is turned to the "on" position without starting the engine. The filler neck is located on the passenger's side.



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

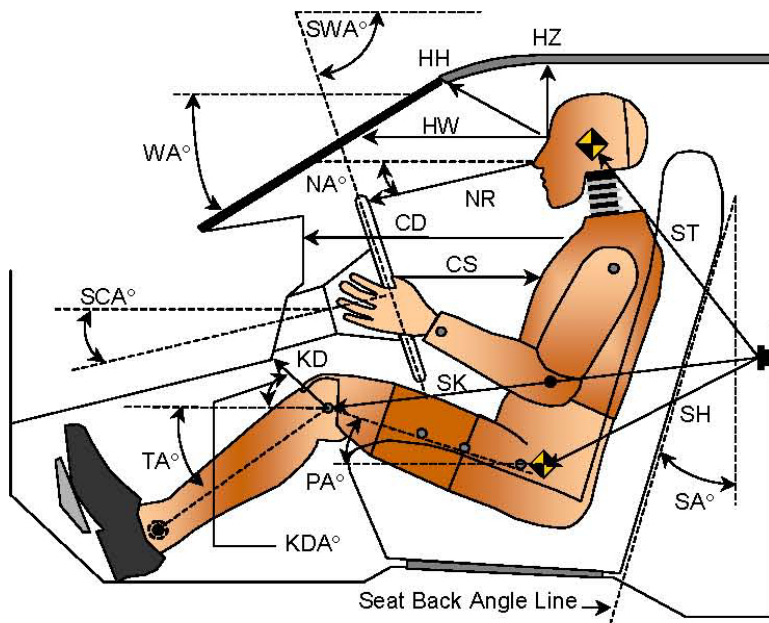
STEERING COLUMN POSITION

	Degrees	Fore/Aft Position (mm)
Lowermost Position 1	69.2	170
Geometric Center Position 2	67.1	198
Uppermost Position 3	69.1	225
Telescoping Steering Wheel Travel		55
Test Position	67.1	198

DATA SHEET NO. 3 DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2016 Buick Cascada Premium 1SP 2-Door Convertible
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160100
 Test Date: 6/30/2016



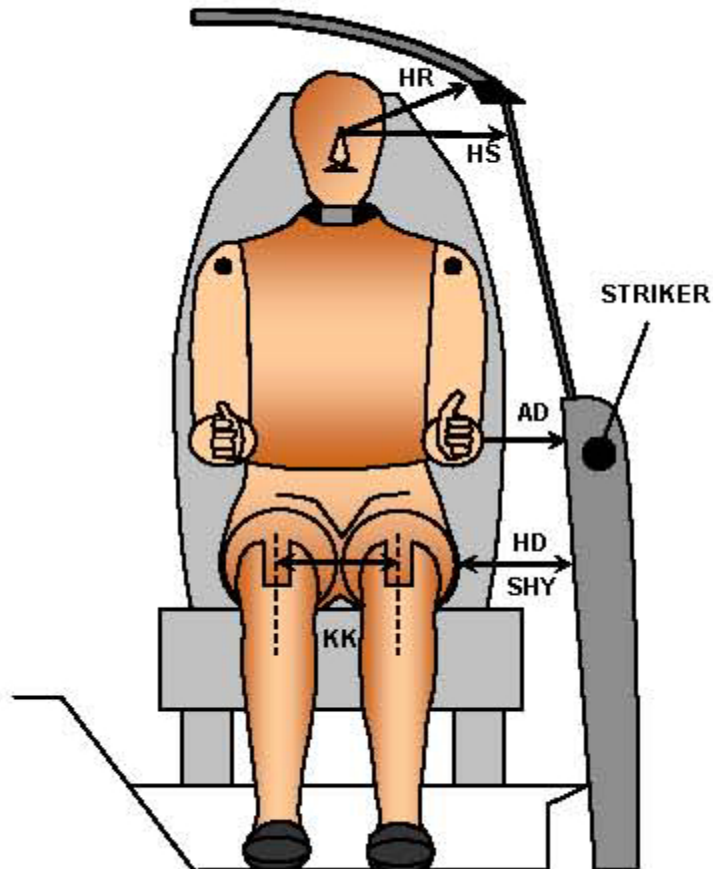
LEFT SIDE VIEW

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		20.4		
SWA°	Steering Wheel Angle		67.1		
SCA°	Steering Column Angle		22.9		
SA°	Seat Back Angle		2.4		-5.3
HZ	Head to Roof (Z)	214	90	190	90
HH	Head to Header	411	21.6	341	32.1
HW	Head to Windshield	766	0	753	0
NR	Nose to Rim	409	7.2		
CD	Chest to Dash	567		446	
CS	Chest to Steering Hub	343	1.8		
RA	Rim to Abdomen	208	0		
KDL	Left Knee to Dash	206	42.4	162	33.8
KDR	Right Knee to Dash	166	41.5	173	32.6
PA°	Pelvic Angle		23.6		18.9
TA°	Tibia Angle		38.1		46.3
SK	Striker to Knee	831	94.1	706	96.8
ST	Striker to Head	548	43.6	587	52.5
SH	Striker to H-Point	520	114.3	578	107.0

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2016 Buick Cascada Premium 1SP 2-Door Convertible
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160100
 Test Date: 6/30/2016



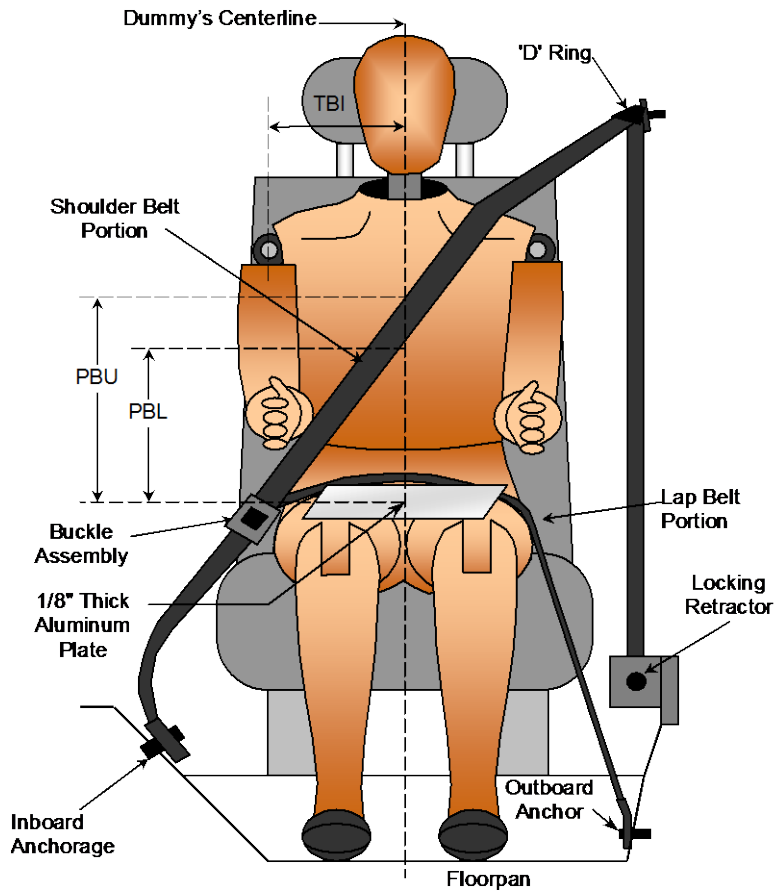
FRONT VIEW OF DUMMY

Code	Measurement Description	Driver	Passenger
		Length (mm)	
AD	Arm to Door	139	102
HD	H-Point to Door	166	180
HR	Head to Side Header	226	236
HS	Head to Side Window	332	349
KK	Knee to Knee	328	227
SHY	Striker to H-Point (Y Direction)	273	301
AA	Ankle to Ankle	298	172

DATA SHEET NO. 5 SEAT BELT POSITIONING DATA

Test Vehicle: 2016 Buick Cascada Premium 1SP 2-Door Convertible
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160100
 Test Date: 6/30/2016



FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	350	275
PBL - Top surface of reference to belt lower edge	mm	270	195

BELT LENGTH DATA

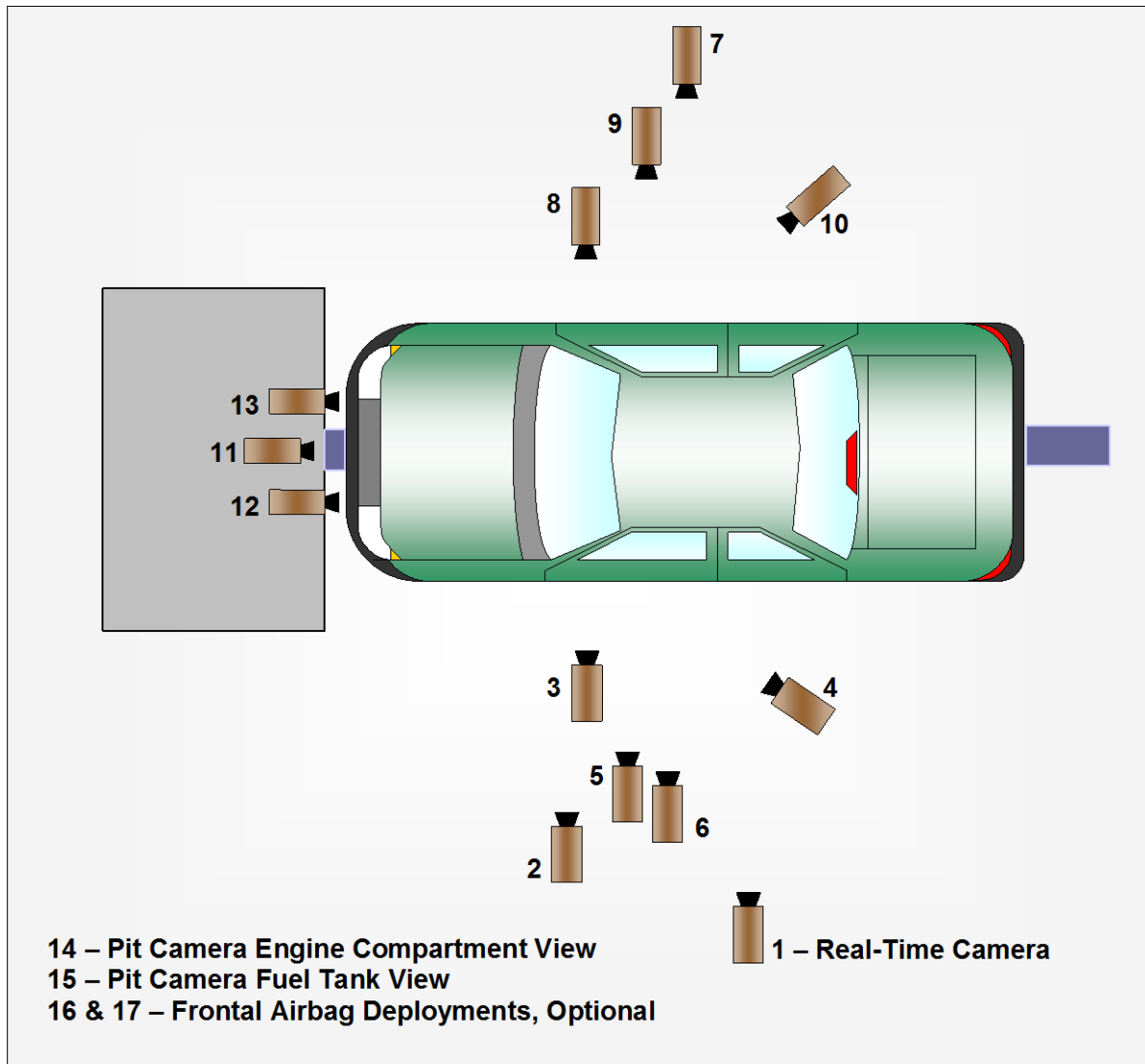
Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as measured on ATD	mm	950	1010
Lap Belt Length as measured on ATD	mm	610	725
Remainder of belt on reel	mm	1140	965
Total Belt Length for Continuous Webbing Systems	mm	3000	3000

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

Test Vehicle: 2016 Buick Cascada Premium 1SP 2-Door Convertible
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160100
Test Date: 6/30/2016

CAMERA POSITIONS FOR FRONTAL IMPACTS



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

Test Vehicle: 2016 Buick Cascada Premium 1SP 2-Door Convertible
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160100
 Test Date: 6/30/2016

CAMERA LOCATIONS

No.	Camera View	Coordinates (mm)			Lens (mm)	Speed (fps)
		X*	Y*	Z*		
1	Real-Time Left Overall					30
2	Driver Close-Up	-1620	-6290	-2040	35	1000
3	Left Front Half	-1280	-5070	-1120	24	1000
4	Left Angle	-5540	-5040	-2050	50	1000
5	Steering Column - Top					
6	Steering Column - Bottom					
7	Right Overall	-2230	6500	-1310	20	1000
8	Passenger Close-Up	-1680	6740	-2010	35	1000
9	Right Front Half	-1470	5300	-1230	24	1000
10	Right Angle	-5610	5000	-2040	50	1000
11	Windshield	450	0	-2810	20	1000
12	Driver Windshield	-30	-450	-2030	8.5	1000
13	Passenger Windshield	-30	450	-2030	8.5	1000
14	Pit Front	-960	0	3150	24	1000
15	Pit Rear	-3080	0	3150	24	1000
16	Onboard Driver Side				12	1000
17	Onboard Passenger Side				12	1000
18	Real-Time Pan View					30

***COORDINATES:**

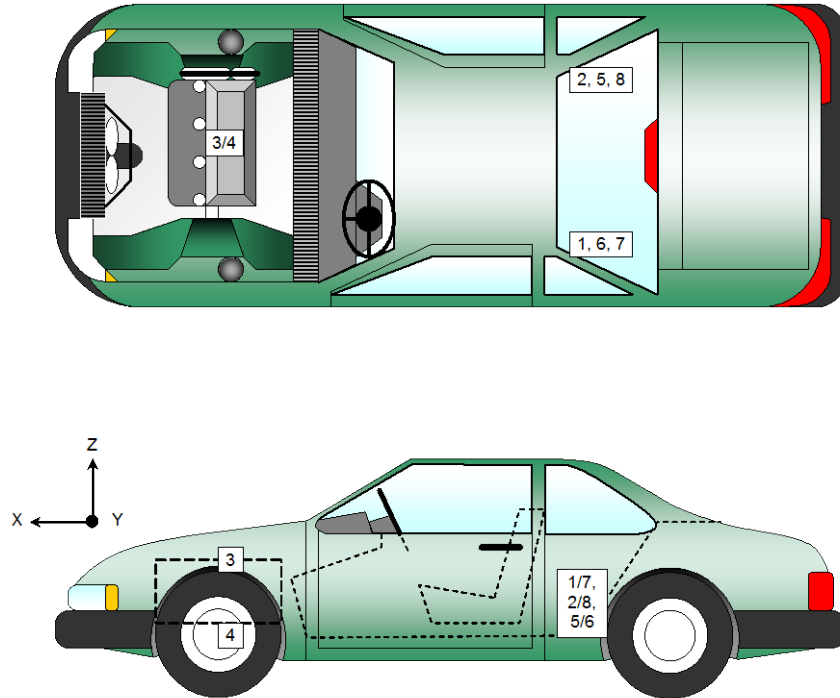
+X = forward of impact plane
 +Y = right of monorail centerline
 +Z = below ground level

Cameras 5 & 6 were not used for this test.

DATA SHEET NO. 7 VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2016 Buick Cascada Premium 1SP 2-Door Convertible
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160100
Test Date: 6/30/2016



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Crossmember Accelerometer – X Direction	2046	-356	-245
2	Right Rear Crossmember Accelerometer – X Direction	2028	376	-250
3	Engine Top X	3873	85	-881
4	Engine Bottom X	3917	0	-175
5	Left Rear Crossmember Accelerometer – Z Direction	2046	-356	-245
6	Right Rear Crossmember Accelerometer – Z Direction	2028	376	-250
7	Left Rear Crossmember Accelerometer Redundant – X Direction	2056	-356	-257
8	Right Rear Crossmember Accelerometer Redundant – X Direction	2068	387	-262

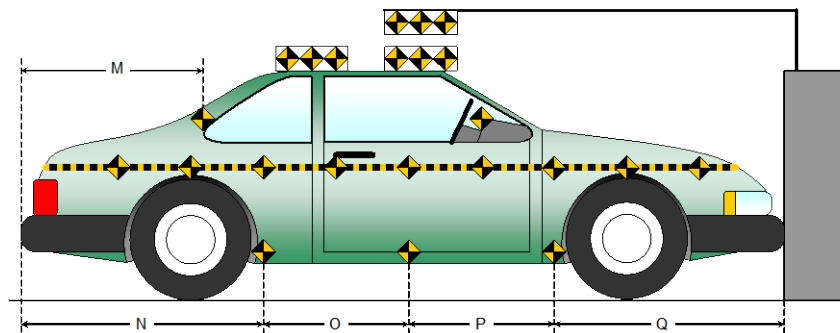
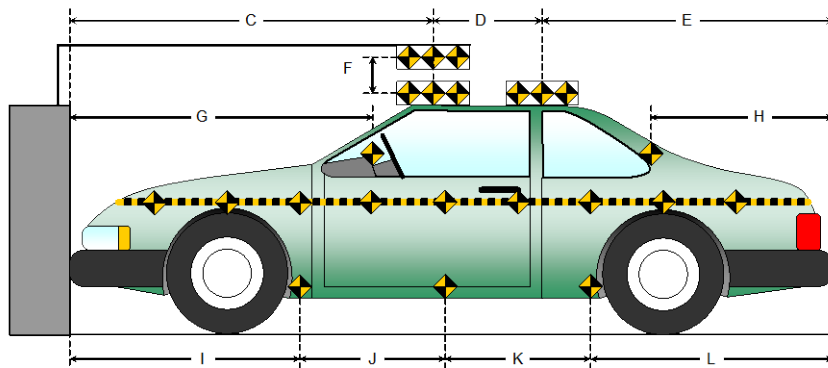
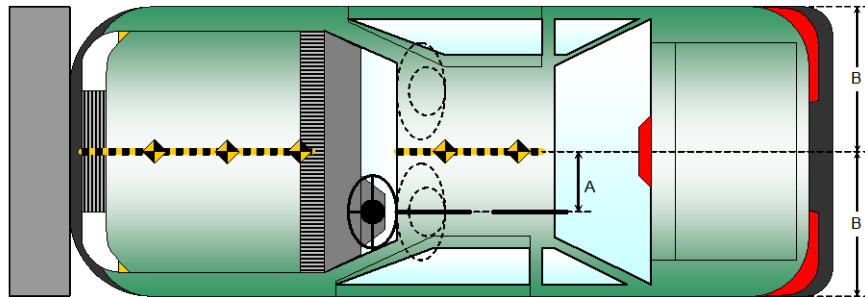
Reference Points: X - Rear Surface of Vehicle (+ forward)
Y - Vehicle Centerline (+ to right)
Z - Ground Plane (+ down)

DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2016 Buick Cascada Premium 1SP 2-Door Convertible
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160100
 Test Date: 6/30/2016

Item	Value (mm)
A	
B	891
C	
D	
E	
F	
G	
H	1257
I	1417
J	916
K	916
L	1434
M	1257
N	1434
O	916
P	916
Q	1417



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

Test Vehicle: 2016 Buick Cascada Premium 1SP 2-Door Convertible
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160100
 Test Date: 6/30/2016

Advanced Research Load Cell Barrier

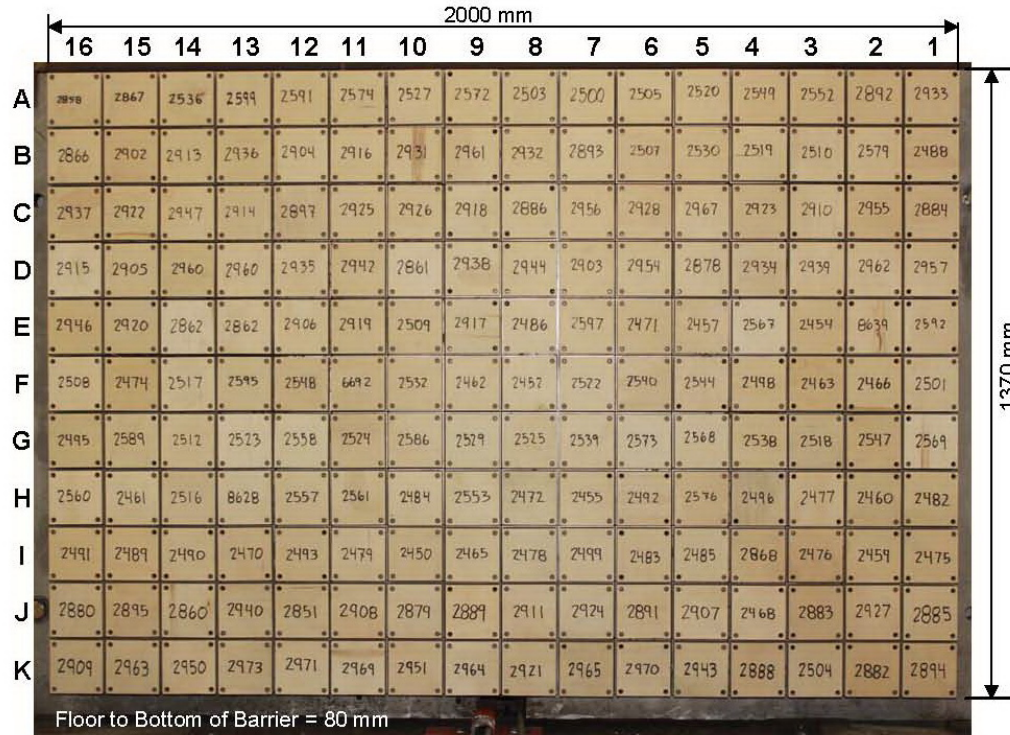


Photo for Reference Only

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: 2016 Buick Cascada Premium 1SP 2-Door Convertible
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160100
Test Date: 6/30/2016

INSTRUMENTATION

Driver Dummy Data Channels	49
Passenger Dummy Data Channels	49
Vehicle Structure Accelerometers	8
Barrier Channels	528
Total	634

CAMERA COVERAGE

High-Speed Vehicle Onboard	2
High-Speed Offboard	12
Real-Time	2
Total	16

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

Test Vehicle: 2016 Buick Cascada Premium 1SP 2-Door Convertible
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160100
Test Date: 6/30/2016

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Passenger
Dummy Type / Serial No.	HIII 50% / 351	HIII 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		
Seat Track Shift (mm)	0	0
Seat Back Failure	None	None

POST TEST STRUCTURAL OBSERVATIONS

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

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	1315
Center	mm	1304
Right Side	mm	1285
Average	mm	1301

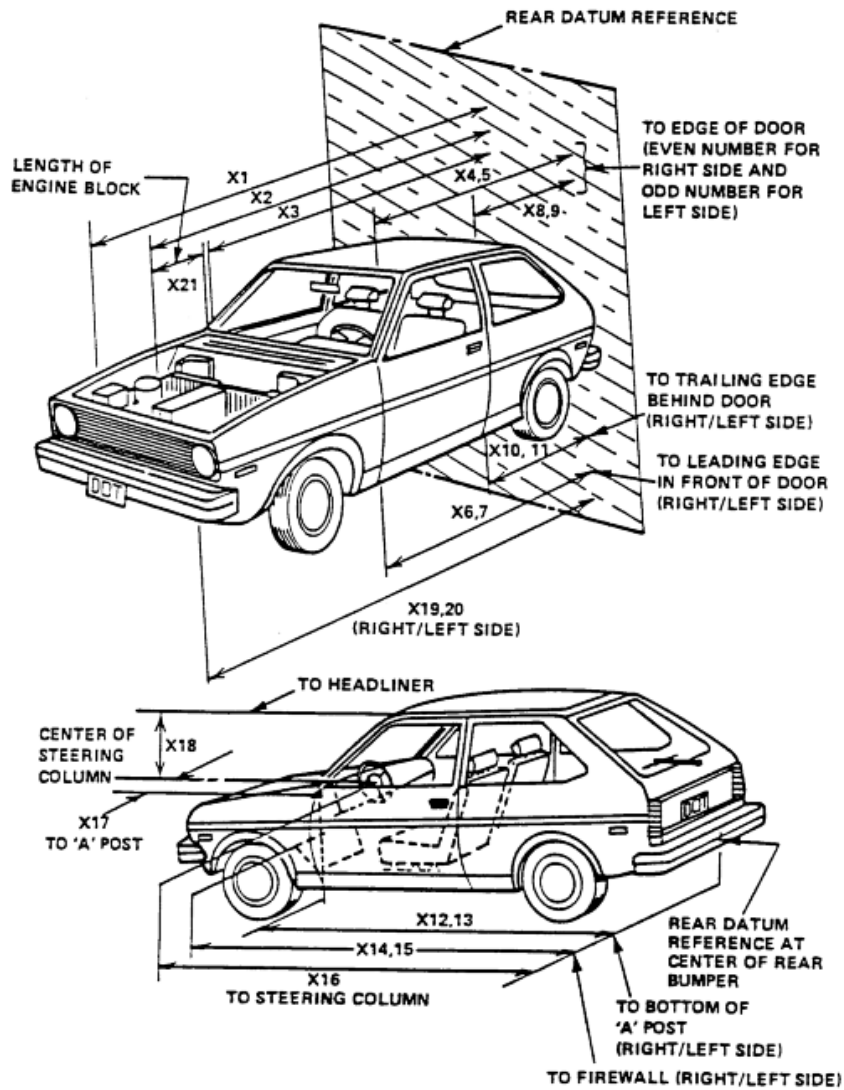
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Driver (Occupant 1)		Passenger (Occupant 2)	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	Yes	Yes	Yes
Curtain Side Airbag	No		No	
Head/Torso 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	

DATA SHEET NO. 12 VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2016 Buick Cascada Premium 1SP 2-Door Convertible
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160100
 Test Date: 6/30/2016



DATA SHEET NO. 12 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2016 Buick Cascada Premium 1SP 2-Door Convertible
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160100
 Test Date: 6/30/2016

RSOV (Rear Surface of Vehicle)

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	mm	4742	4281	461
2	RSOV to Front of Engine	mm	4188	3934	254
3	RSOV to Firewall	mm	3618	3615	3
4	RSOV to Upper Leading Edge of Right Door	mm	3160	3192	-32
5	RSOV to Upper Leading Edge of Left Door	mm	3160	3189	-29
6	RSOV to Lower Leading Edge of Right Door	mm	3143	3159	-16
7	RSOV to Lower Leading Edge of Left Door	mm	3143	3160	-17
8	RSOV to Upper Trailing Edge of Right Door	mm	1838	1863	-25
9	RSOV to Upper Trailing Edge of Left Door	mm	1838	1864	-26
10	RSOV to Lower Trailing Edge of Right Door	mm	1869	1896	-27
11	RSOV to Lower Trailing Edge of Left Door	mm	1869	1888	-19
12	RSOV to Bottom of "A" Post of Right Side	mm	3154	3166	-12
13	RSOV to Bottom of "A" Post of Left Side	mm	3154	3170	-16
14	RSOV to Firewall, Right Side	mm	3635	3646	-11
15	RSOV to Firewall, Left Side	mm	3636	3593	43
16	RSOV to Steering Column	mm	2741	2781	-40
17	Center of Steering Column to "A" Post	mm	372	369	3
18	Center of Steering Column to Headliner	mm	390	396	-6
19	RSOV to Right Side of Front Bumper	mm	4536	4186	350
20	RSOV to Left Side of Front Bumper	mm	4536	4227	309
21	Length of Engine Block	mm	589	589	0
RD	RSOV to Right Side of Dash Panel	mm	2967	2946	21
CD	RSOV to Center of Dash Panel	mm	2997	2970	27
LD	RSOV to Left Side of Dash Panel	mm	2932	2957	-25

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2016 Buick Cascada Premium 1SP 2-Door Convertible
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160100
Test Date: 6/30/2016

VEHICLE INFORMATION

VIN: W04WT3N59GG053900 Wheelbase (mm): 2706
Vehicle Size Category: Passenger Car Test Weight (kg): 2004.0

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): 56.21

Velocity Change (km/h): 65.6

Time of Separation (msec): 91

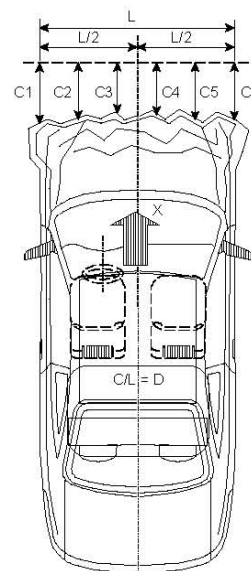
CRUSH PROFILE

Collision Deformation Classification: Frontal

Midpoint of Damage: Centerline

Damage Region Length (mm): 1172

Impact Mode: Frontal



No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4536	4227	309
C2	Crush zone 2 at left side	mm	4618	4199	419
C3	Crush zone 3 at left side	mm	4663	4172	491
C4	Crush zone 4 at right side	mm	4663	4220	443
C5	Crush zone 5 at right side	mm	4618	4229	389
C6	Crush zone 6 at right side	mm	4536	4186	350
L	C1 TO C6	mm	1172	1147	25

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2016 Buick Cascada Premium 1SP 2-Door Convertible
Test Program: NCAP Frontal Barrier Impact Test

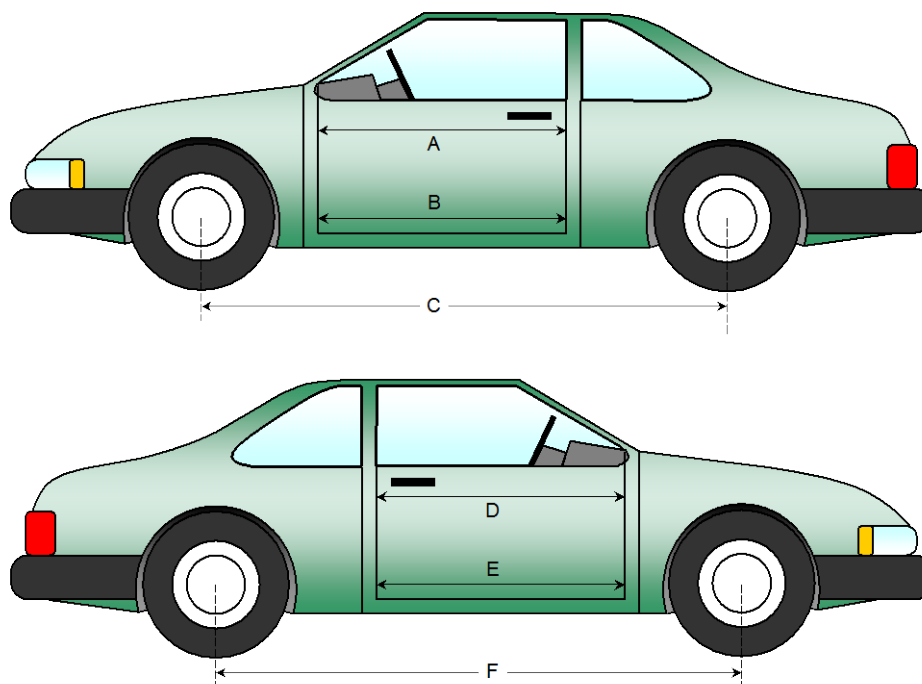
NHTSA No.: O20160100
Test Date: 6/30/2016

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1210	1210	0
B	Left Side Lower	mm	1116	1116	0
D	Right Side Upper	mm	1210	1210	0
E	Right Side Lower	mm	1116	1116	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2706	2643	63
F	Right Side Wheelbase	mm	2706	2679	27



DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

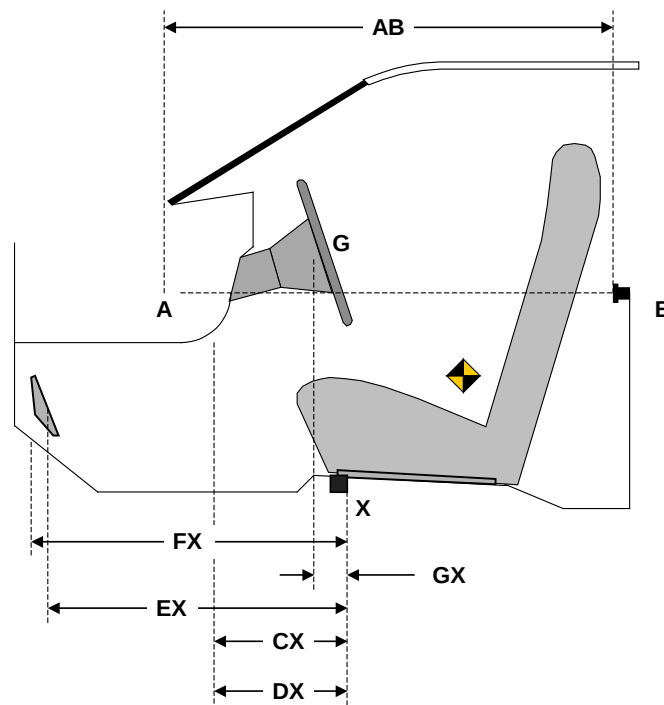
Test Vehicle: 2016 Buick Cascada Premium 1SP 2-Door Convertible
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160100
 Test Date: 6/30/2016

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	933	933	0
CX	Left Knee Bolster to X	mm	292	294	-2
DX	Right Knee Bolster to X	mm	251	250	1
EX	Brake Pedal to X	mm	587	612	-25
FX	Foot Rest to X	mm	625	609	16
GX	Center of Steering Column Wheel Hub to X	mm	79	130	-51

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: 2016 Buick Cascada Premium 1SP 2-Door Convertible
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160100
 Test Date: 6/30/2016

Windshield Mounting Details:

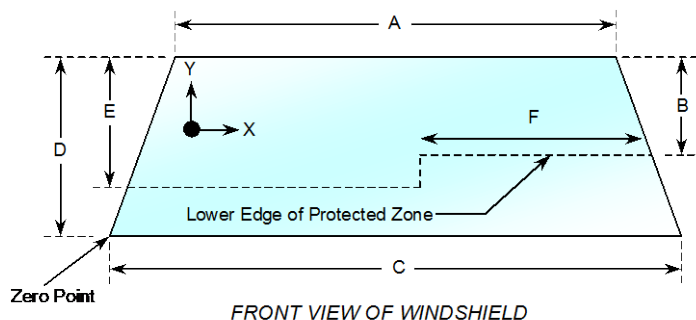
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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: 22.1° C.

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2073	2073	100.0
Right Side	2073	2073	100.0
Total	4146	4146	100.0



Item	Units	Value
A	mm	1115
B	mm	443
C	mm	1396
D	mm	817
E	mm	451
F	mm	521

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>2016 Buick Cascada Premium 1SP 2-Door Convertible</u>	NHTSA No.:	<u>O20160100</u>
Test Program:	<u>NCAP Frontal Barrier Impact Test</u>	Test Date:	<u>6/30/2016</u>

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 22.1°C Test Time: 10:46 a.m.

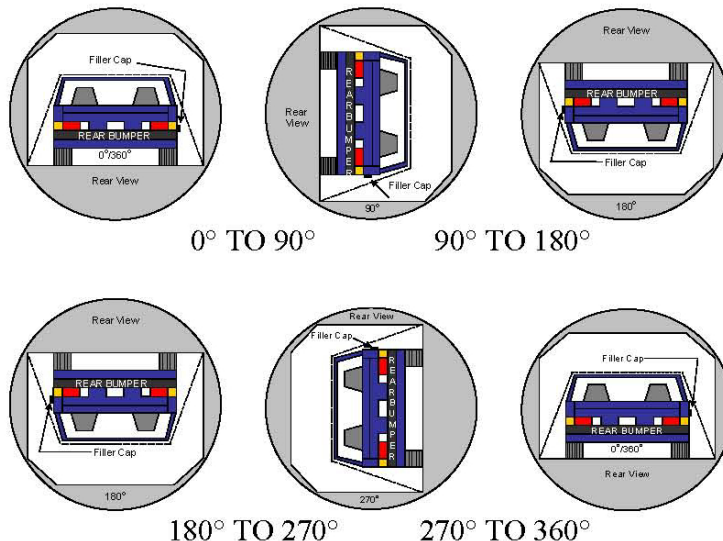
- | | |
|--|------------------|
| A. From impact until vehicle motion ceases:
(Maximum allowable = 1 oz.) | <u> 0 </u> oz. |
| B. For the 5 minute period after motion ceases:
(Maximum allowable = 5 oz.) | <u> 0 </u> oz. |
| C. For the following 25 minutes:
(Maximum allowable = 1 oz./minute) | <u> 0 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

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

Test Vehicle: 2016 Buick Cascada Premium 1SP 2-Door Convertible
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160100
 Test Date: 6/30/2016

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°	113	300	413
90° to 180°	111	300	411
180° to 270°	106	300	406
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

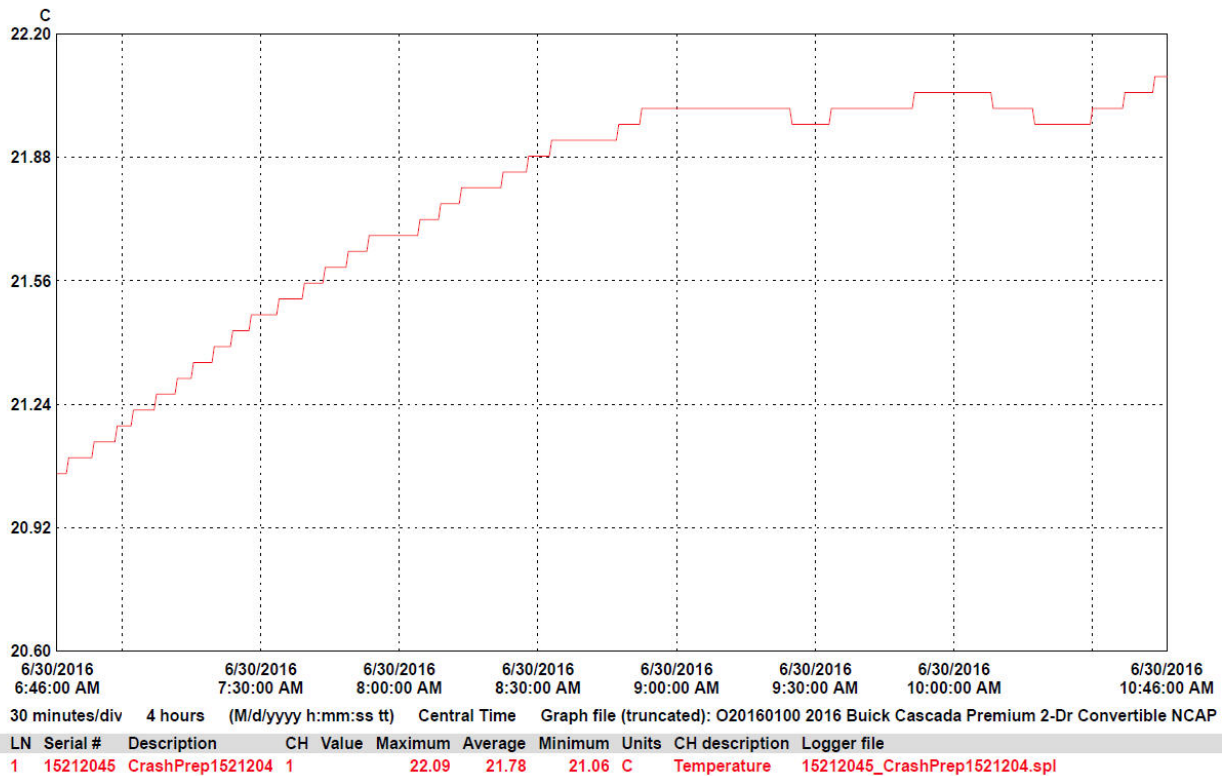
SOLVENT SPILLAGE LOCATION TABLE

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: 2016 Buick Cascada Premium 1SP 2-Door Convertible
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160100
 Test Date: 6/30/2016



**APPENDIX A
PHOTOGRAPHS**

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Photo No. 001 - Load Cell Location



Photo No. 002 - Pre-Test Load Cell Wall



Photo No. 003 - Post-Test Load Cell Wall



Photo No. 004 - Manufacturer's Label



Photo No. 005 - Tire Placard



Photo No. 006 - 2016 Buick Cascada Frontal As Delivered



Photo No. 007 - Left Rear 3-4 View, As Received



Photo No. 008 - Pre-Test Front View of Test Vehicle

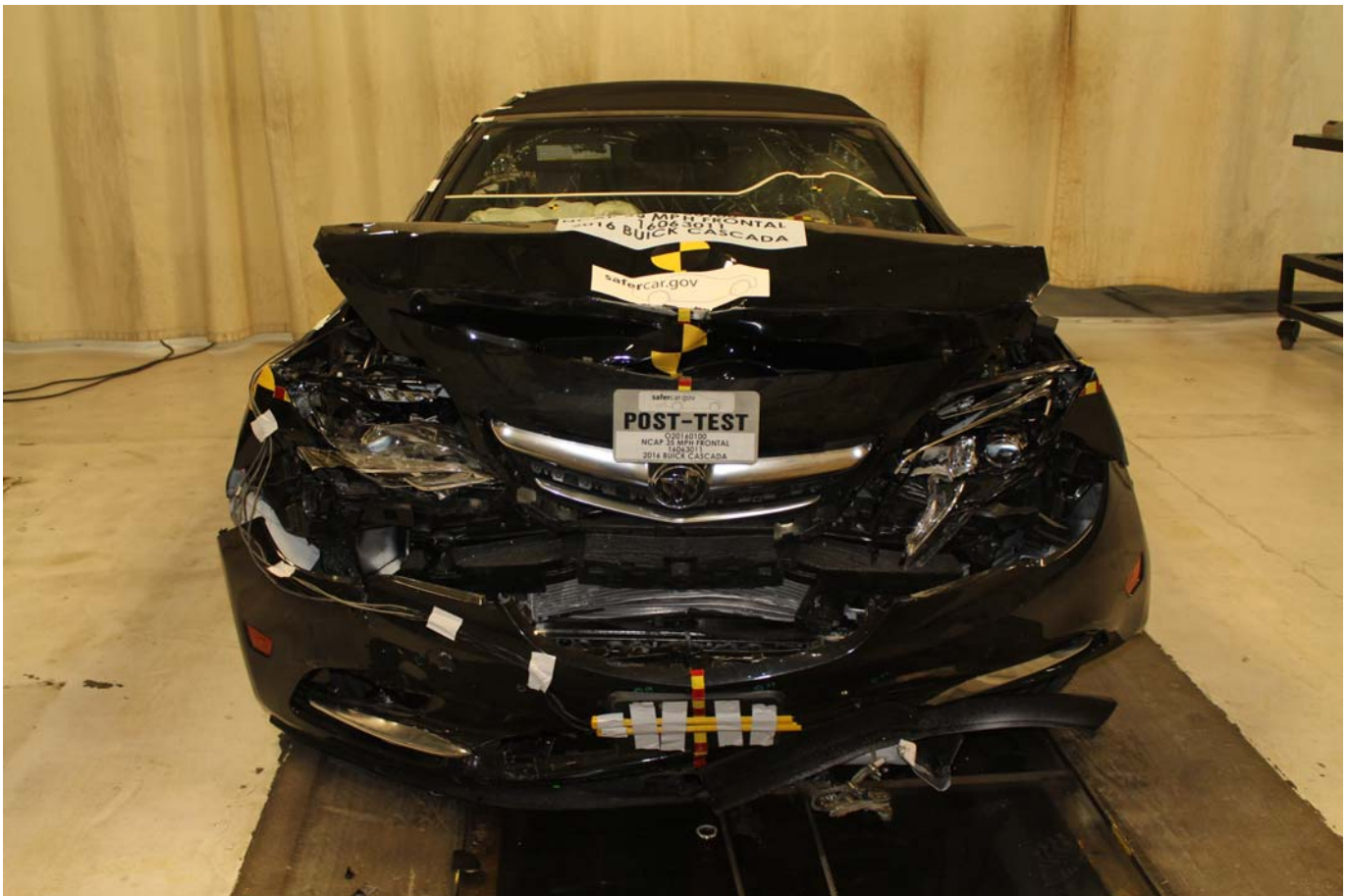


Photo No. 009 - Post-Test Front View of Test Vehicle



Photo No. 010 - Pre-Test Left View of Test Vehicle

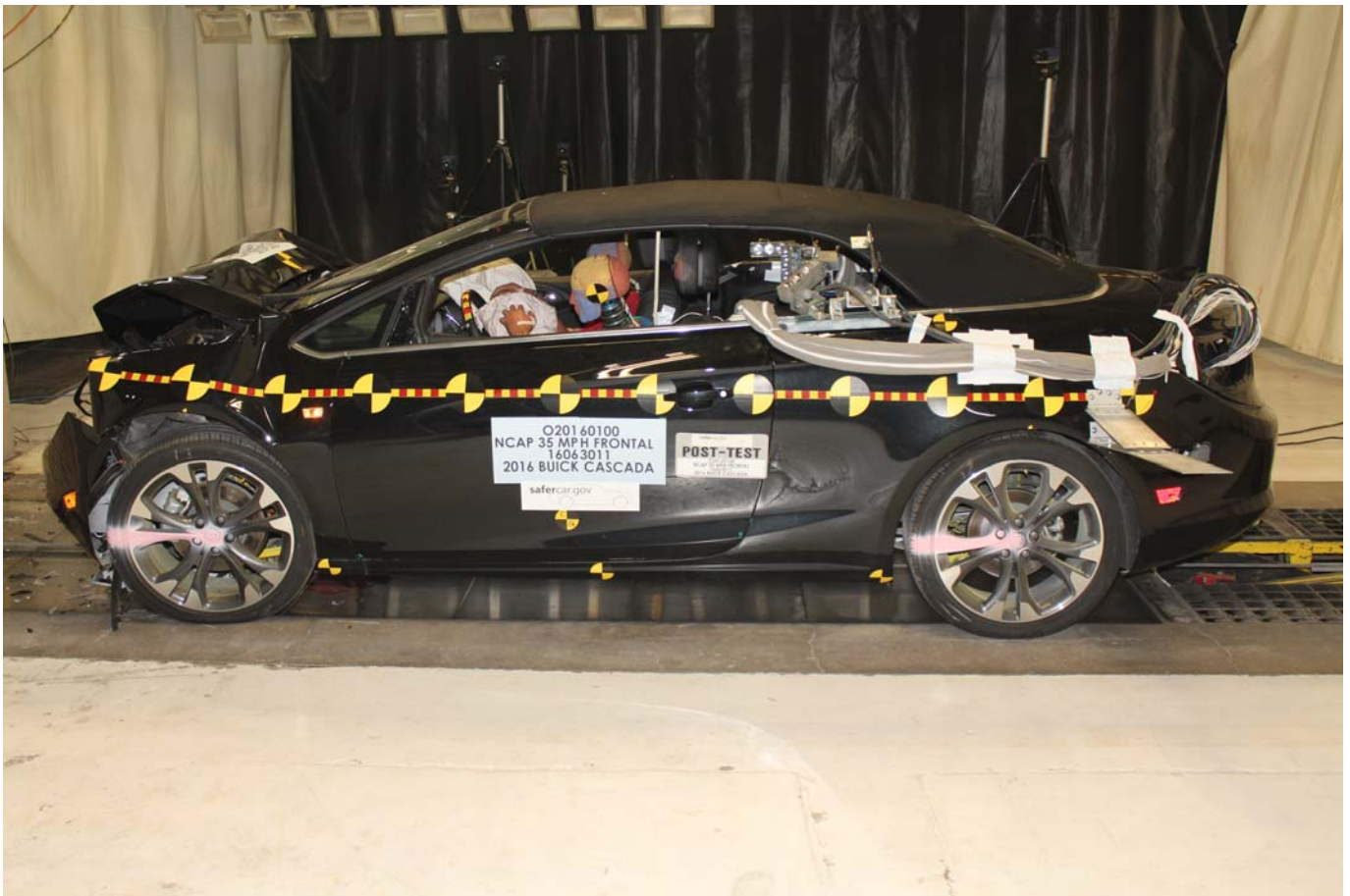


Photo No. 011 - Post-Test Left View of Test Vehicle



Photo No. 012 - Pre-Test Right View of Test Vehicle



Photo No. 013 - Post-Test Right View of Test Vehicle



Photo No. 014 - Pre-Test Right Front 3-4 View



Photo No. 015 - Post-Test Right Front 3-4 View

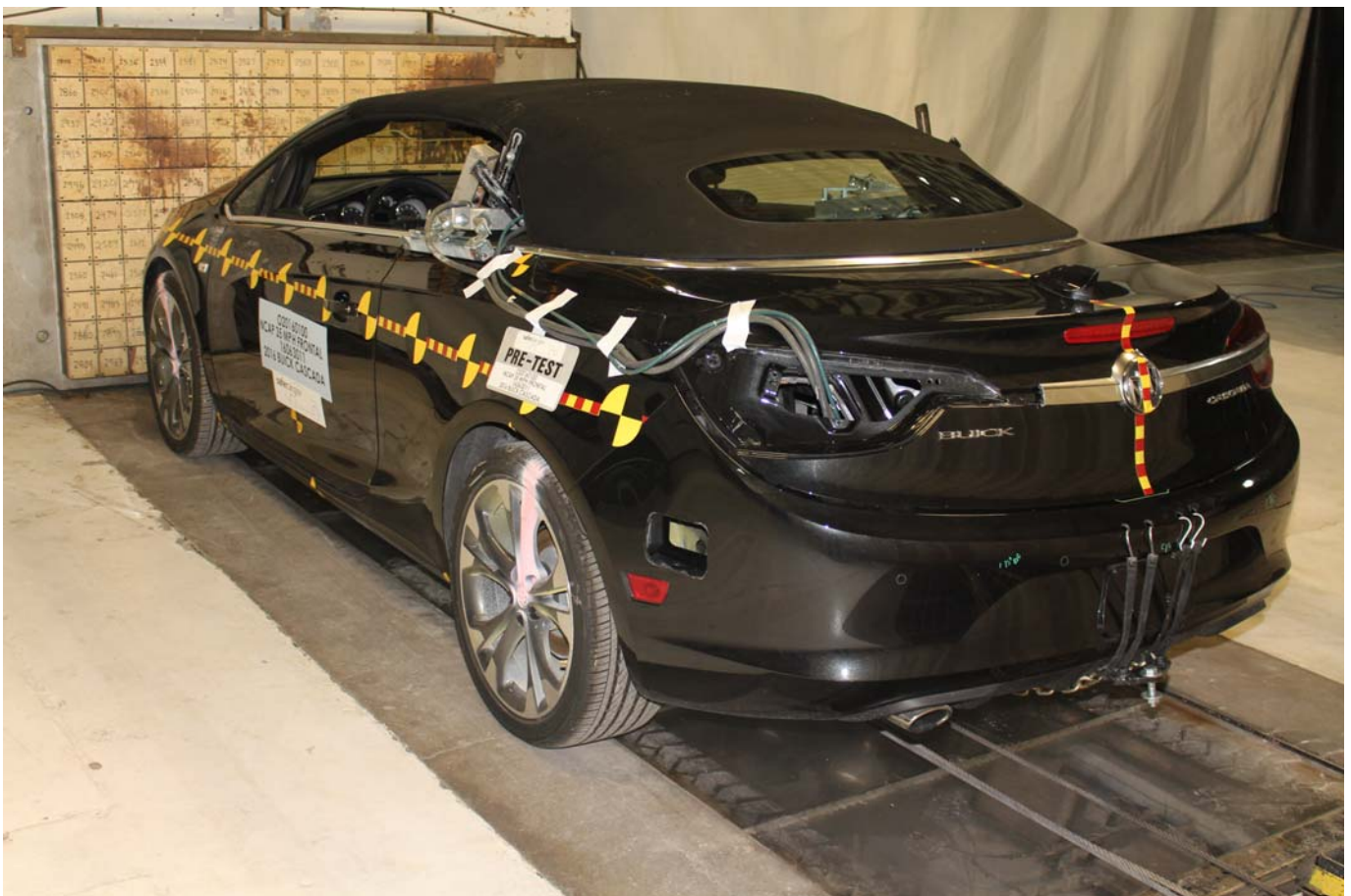


Photo No. 016 - Pre-Test Left Rear 3-4 View



Photo No. 017 - Post-Test Left Rear 3-4 View



Photo No. 018 - Pre-Test Windshield View



Photo No. 019 - Post-Test Windshield View



Photo No. 020 - Pre-Test Engine Compartment View



Photo No. 021 - Post-Test Engine Compartment View

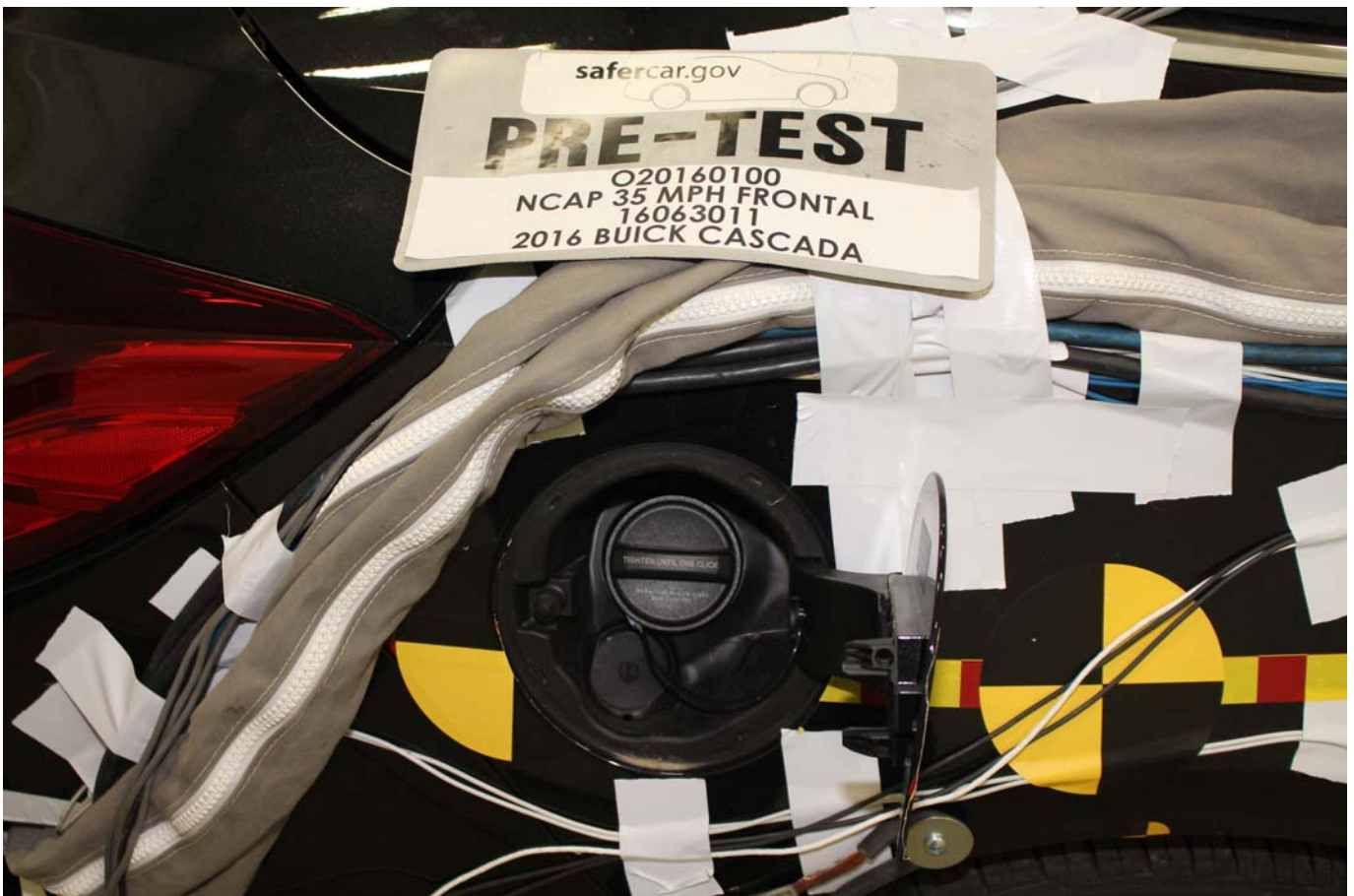


Photo No. 022 - Pre-Test Fuel Filler Cap View

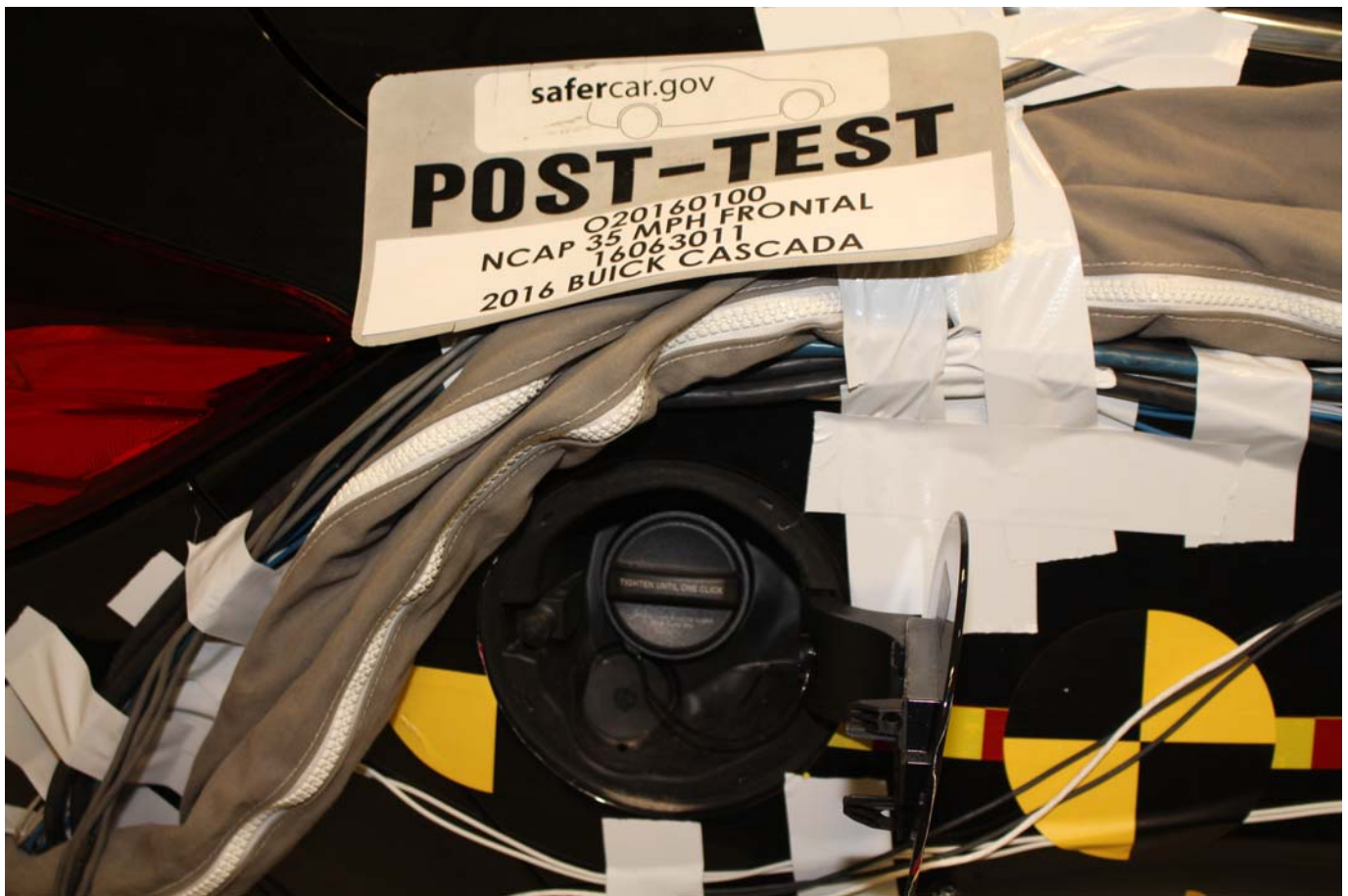


Photo No. 023 - Post-Test Fuel Filler Cap View

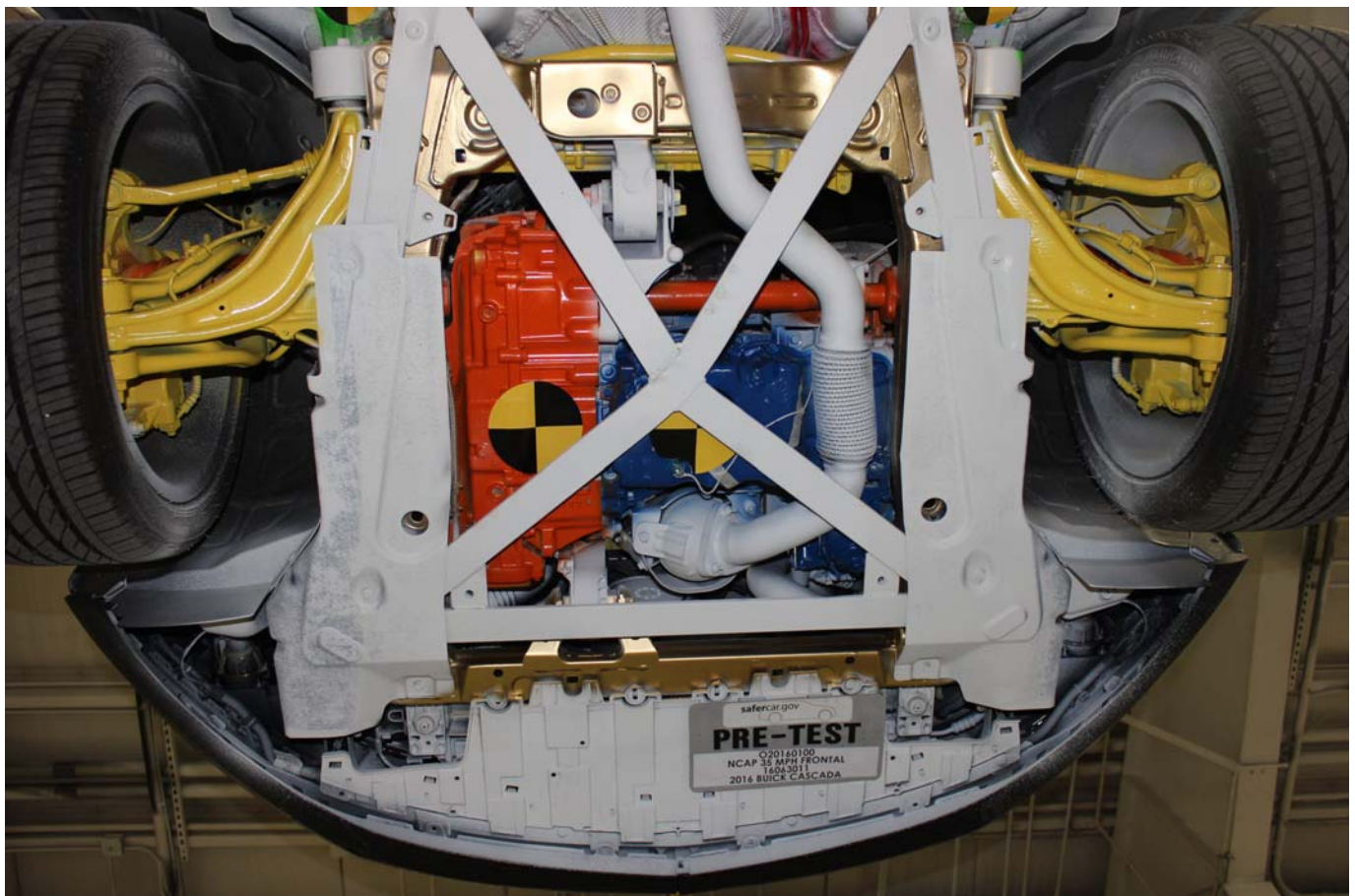


Photo No. 024 - Pre-Test Front Underbody View

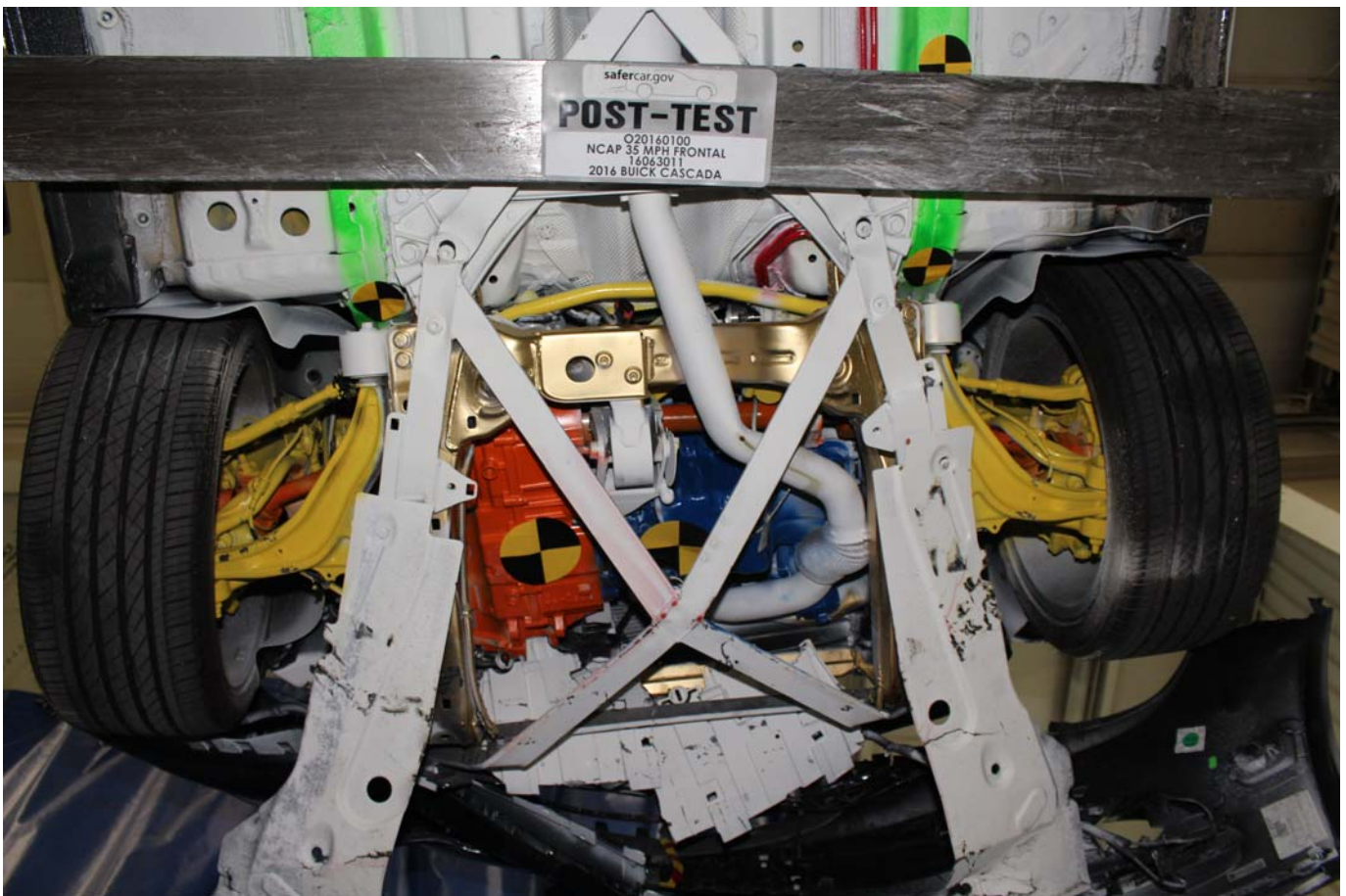


Photo No. 025 - Post-Test Front Underbody View



Photo No. 026 - Pre-Test Rear Underbody View



Photo No. 027 - Post-Test Rear Underbody View



Photo No. 028 - Pre-Test Dummy Cable Routing



Photo No. 029 - Post-Test Dummy Cable Routing

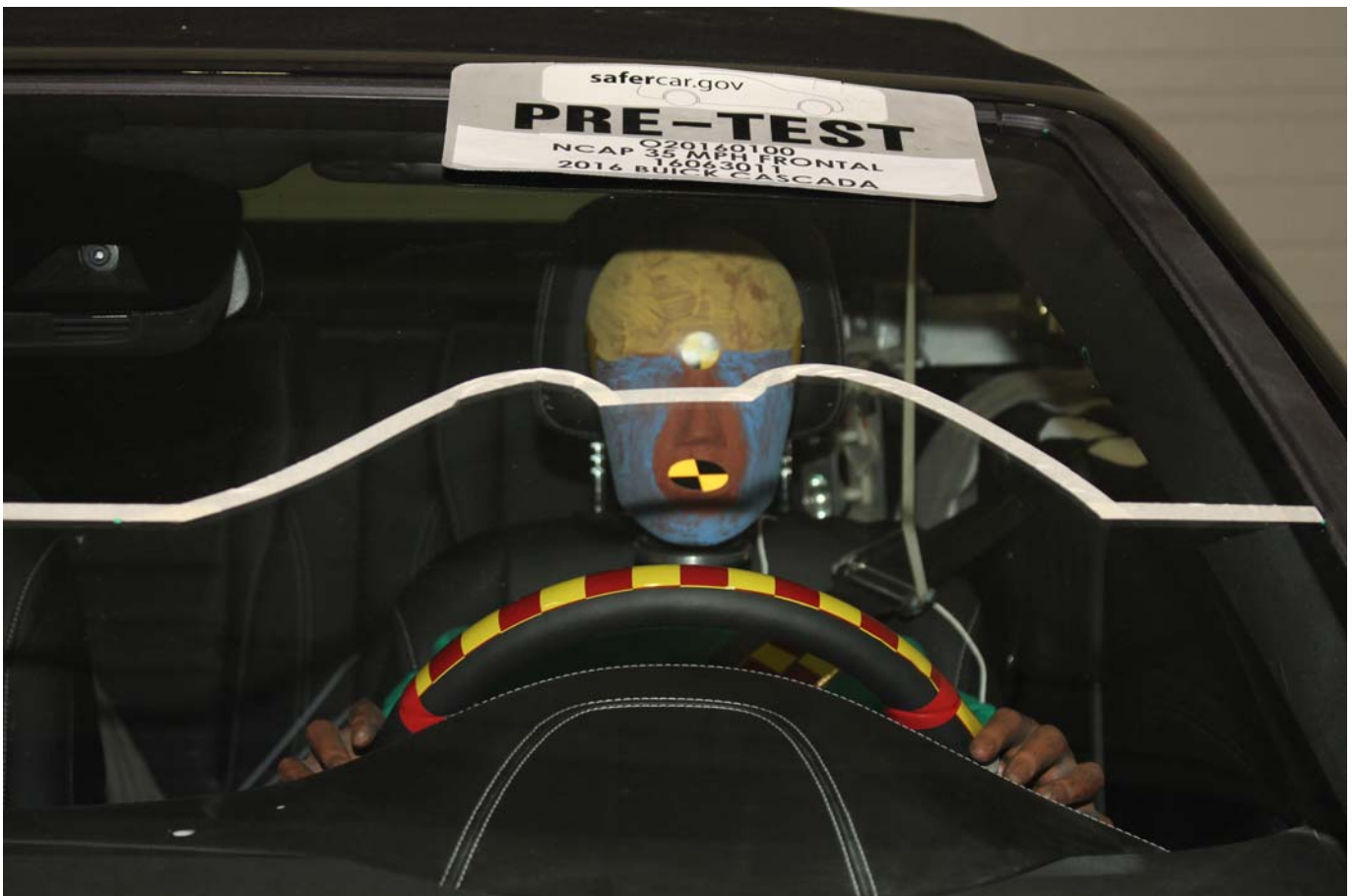


Photo No. 030 - Pre-Test Driver Dummy Front View



Photo No. 031 - Post-Test Driver Dummy Front View



Photo No. 032 - Pre-Test Driver Dummy Window View



Photo No. 033 - Post-Test Driver Dummy Window View

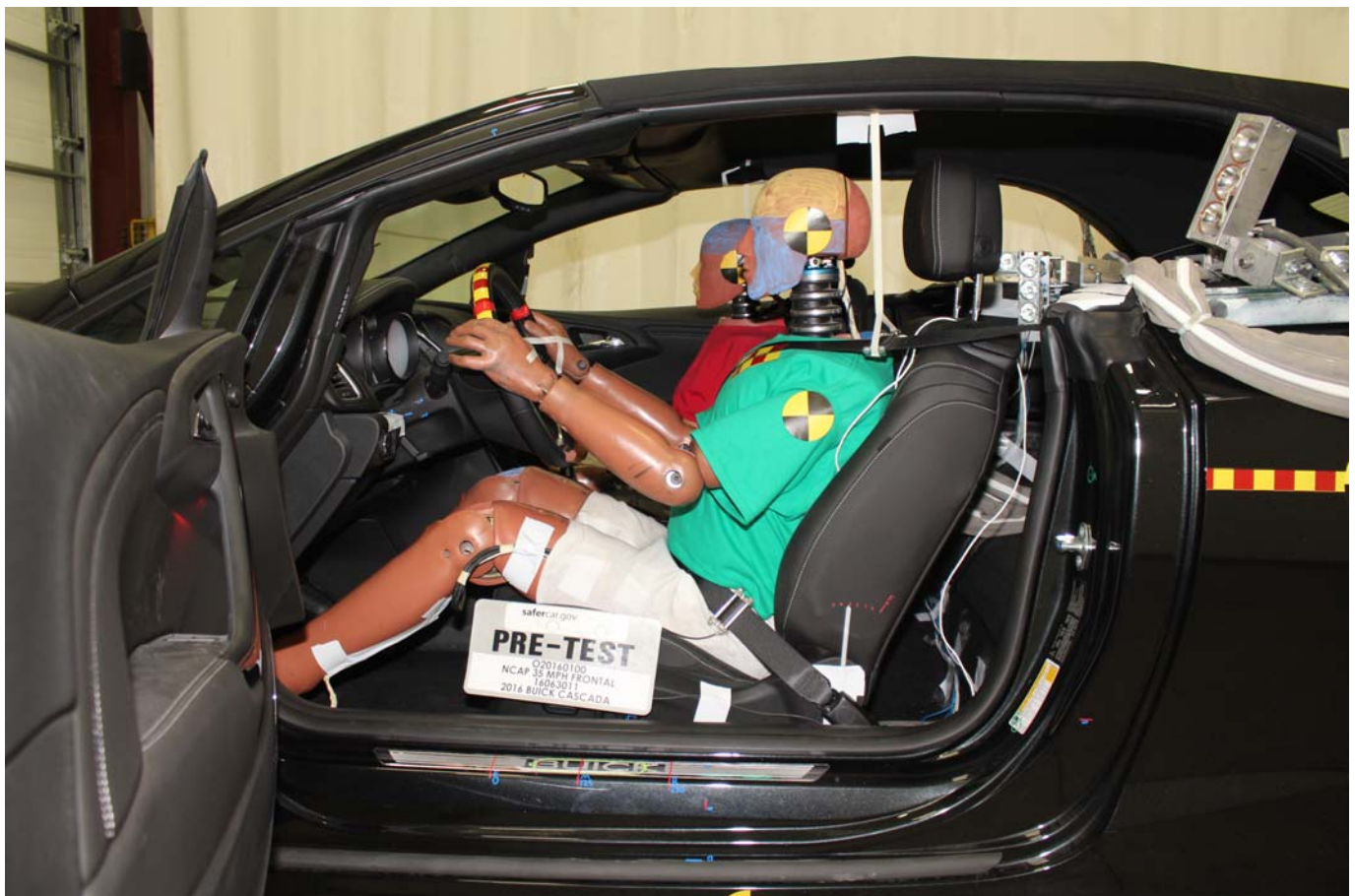


Photo No. 034 - Pre-Test Driver Dummy and Vehicle Interior (Door Open)



Photo No. 035 - Post-Test Driver Dummy and Vehicle Interior (Door Open)



Photo No. 036 - Pre-Test Driver's Seat Fore-Aft Markings



Photo No. 037 - Post-Test Driver's Seat Fore-Aft Markings



Photo No. 038 - Pre-Test View of Belt Anchorage for Driver Dummy

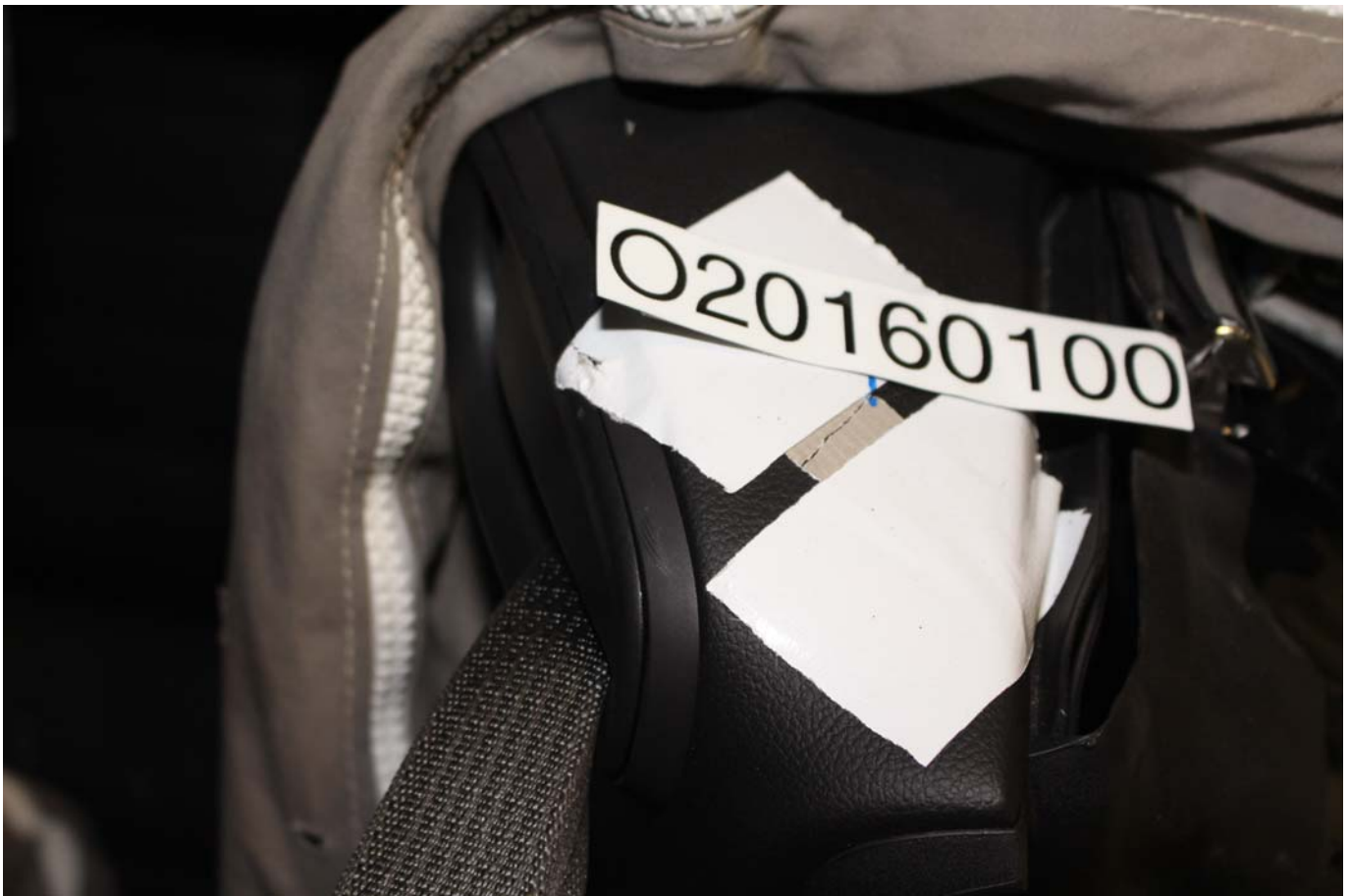


Photo No. 039 - Post-Test View of Belt Anchorage for Driver Dummy



Photo No. 040 - Pre-Test Driver Dummy Feet



Photo No. 041 - Post-Test Driver Dummy Feet



Photo No. 042 - Pre-Test Driver's Side Knee Bolster (without dummy)



Photo No. 043 - Post-Test Driver's Side Knee Bolster (without dummy)



Photo No. 044 - Pre-Test Driver's Side Floorpan



Photo No. 045 - Post-Test Driver's Side Floorpan



Photo No. 046 - Post-Test Driver Dummy Face

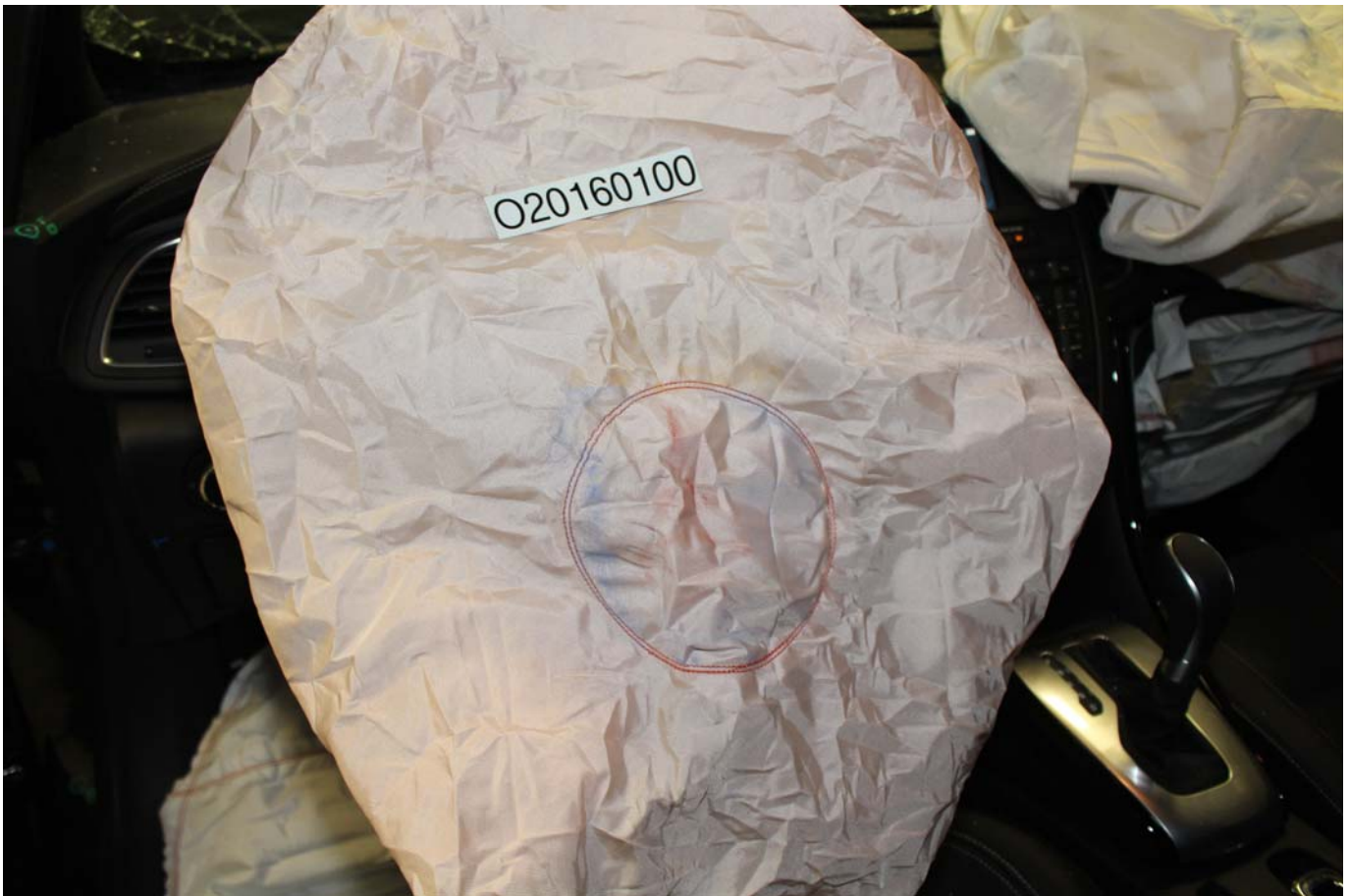


Photo No. 047 - Post-Test Driver Dummy Contact with Airbag



Photo No. 048 - Post-Test Driver Dummy Contact with Headrest



Photo No. 049 - Pre-Test View of the Steering Wheel



Photo No. 050 - Post-Test View of the Steering Wheel



Photo No. 053 - Pre-Test Passenger Dummy Window View



Photo No. 054 - Post-Test Passenger Dummy Window View



Photo No. 055 - Pre-Test Passenger Dummy and Vehicle Interior (Door Open)



Photo No. 056 - Post-Test Passenger Dummy and Vehicle Interior (Door Open)



Photo No. 057 - Pre-Test Passenger's Seat Fore-Aft Markings



Photo No. 058 - Post-Test Passenger's Seat Fore-Aft Markings



Photo No. 059 - Pre-Test View of Belt Anchorage for Passenger Dummy



Photo No. 060 - Post-Test View of Belt Anchorage for Passenger Dummy



Photo No. 061 - Pre-Test Passenger Dummy Feet



Photo No. 062 - Post-Test Passenger Dummy Feet



Photo No. 063 - Pre-Test Passenger's Side Knee Bolster (without dummy)



Photo No. 064 - Post-Test Passenger's Side Knee Bolster (without dummy)



Photo No. 065 - Pre-Test Passenger's Side Floorpan



Photo No. 066 - Post-Test Passenger's Side Floorpan

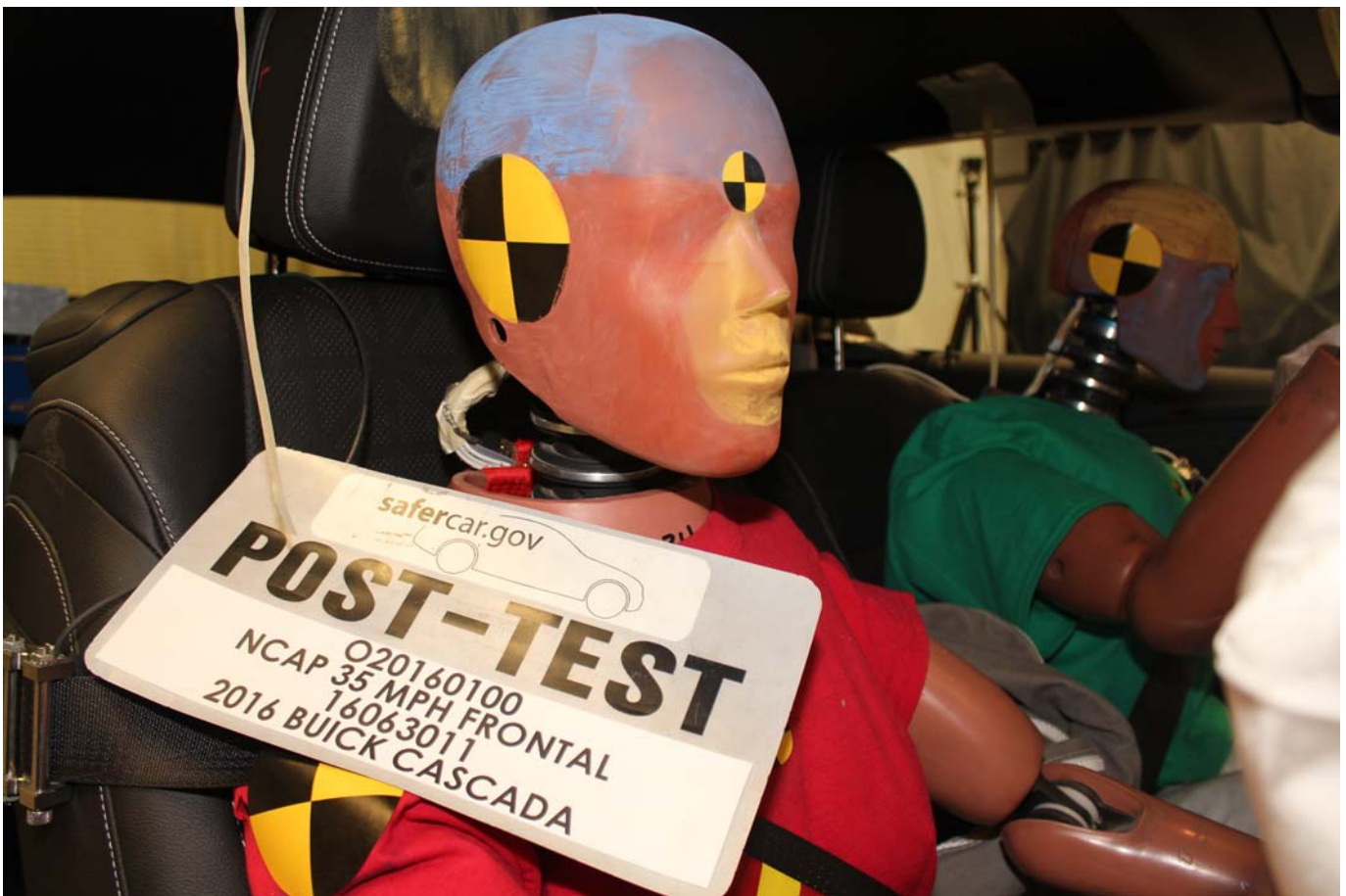


Photo No. 067 - Post-Test Passenger Dummy Face



Photo No. 068 - Post-Test Passenger Dummy Contact with Airbag



Photo No. 069 - Post-Test Passenger Dummy Contact with Headrest

PHOTOGRAPH NOT APPLICABLE

Photo No. 070 - Ballast Installed in Vehicle

PHOTOGRAPH NOT APPLICABLE

Photo No. 071 - Post-Test Stoddard Solvent Spillage Location View



Photo No. 072 - Post-Test Speed Trap Read-Out



Photo No. 073 - Vehicle at 0 Degree on Static Rollover Device



Photo No. 074 - Vehicle at 90 Degrees on Static Rollover Device



Photo No. 075 - Vehicle at 180 Degrees on Static Rollover Device

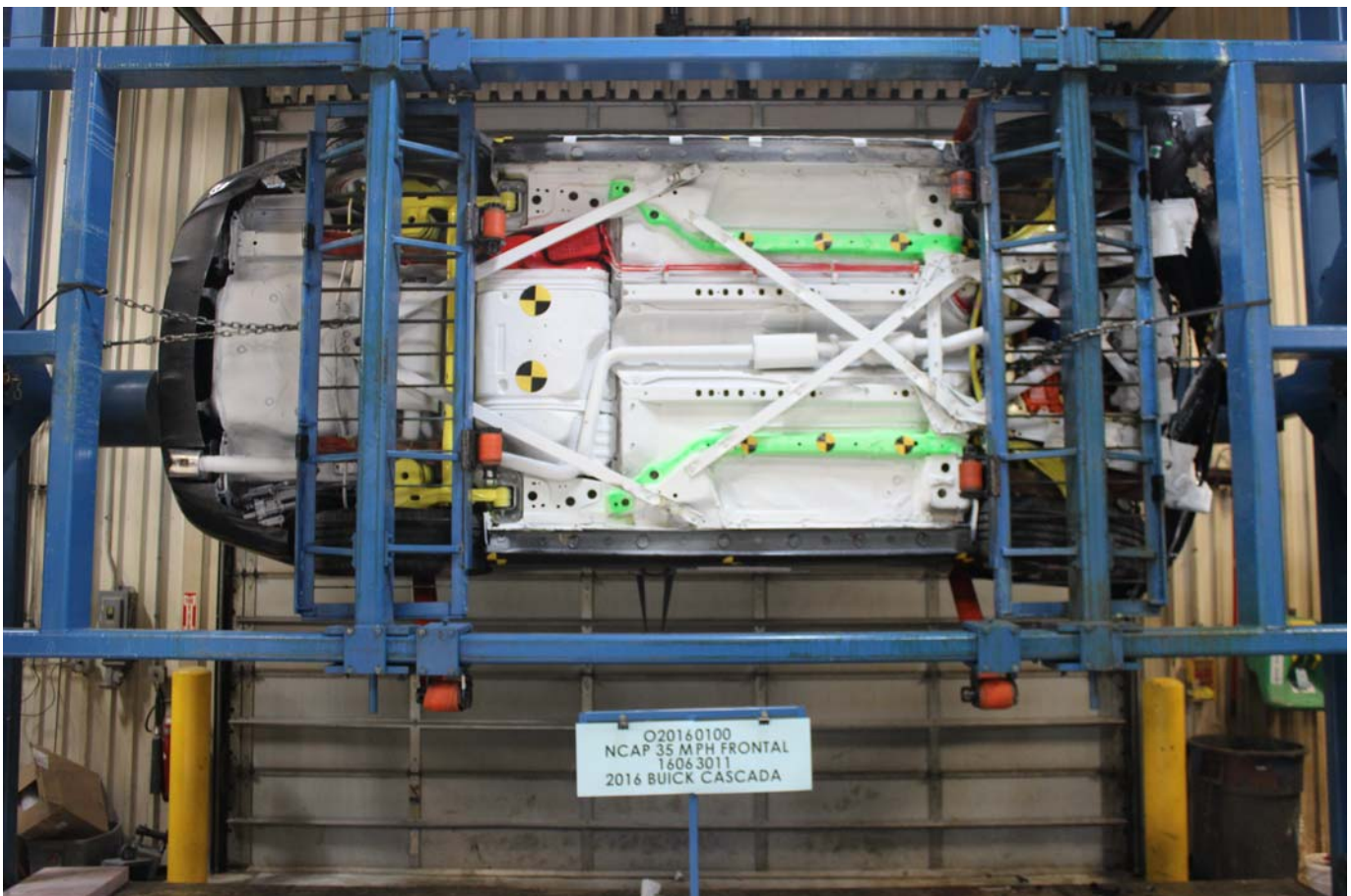


Photo No. 076 - Vehicle at 270 Degrees on Static Rollover Device



Photo No. 077 - Vehicle at 360 Degrees on Static Rollover Device



Photo No. 078 - 2016 Buick Cascada Frontal Impact Event



2016 CASCADA PREMIUM 1SP



EXTERIOR: CARBON BLACK METALLIC
INTERIOR: JET BLACK/JET BLACK
ACCENTS

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

Visit us at www.buick.com

STANDARD EQUIPMENT

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

- TWO MAINTENANCE VISITS OIL & FILTER
- 4 WHEEL TIRE ROTATION SEE WWW.BUICK.COM OR DEALER FOR DETAILS
- 6 YEAR / 70,000 MILE POWERTRAIN LIMITED WARRANTY SEE DEALER FOR DETAILS
- 4 YEAR/50,000 MILE LIMITED BUMPER-TO-BUMPER WARRANTY SEE DEALER FOR DETAILS

MECHANICAL

- ENGINE, 1.6L TURBO 4-CYLINDER SOI DOHC WITH VVT
- TRANSMISSION, 6 SPD AUTOMATIC
- SUSPENSION, SPORT TUNED

SAFETY & SECURITY

- STABILITRAK STABILITY CONTROL SYSTEM INCLUDES TRACTION

CONTROL

- BRAKES, 4-WHEEL ANTILOCK, 4-WHEEL DISC
- AIR BAGS, DRIVER & PASSENGER FRONTAL, KNEE & SIDE-IMPACT
- TIRE PRESSURE MONITOR WITH DISPLAY
- ELECTRONIC PARKING BRAKE
- THEFT DETERRENT SYSTEM
- REAR VISION CAMERA
- WINDSHIELD WIPERS, RAIN SENSING
- AUTO ON/OFF HEADLAMPS WITH TUNNEL DETECTION
- FRONT AND REAR PARKING ASSIST
- FORWARD COLLISION ALERT
- LANE DEPARTURE WARNING
- FRONT & REAR AIR DEFLECTORS

INTERIOR

- REMOTE VEHICLE START INCLUDES REMOTE KEYLESS ENTRY
- 8-WAY POWER DRIVER AND

PASSENGER SPORT BUCKET SEATS WITH POWER LUMBAR & EASY ENTRY SYSTEM

- FRONT AND REAR HEAT-REFLECTIVE LEATHER APPOINTED SEATS
- HEATED DRIVER & FRONT PASSENGER SEATS
- ELECTRONIC SEAT BELT PRESENTERS
- 50/50 FOLD FLAT REAR SEATS
- AIR CONDITIONING, DUAL-ZONE AUTOMATIC W/ INDIVIDUAL DRIVER/ FRONT PASSENGER CONTROLS
- HEATED STEERING WHEEL
- AUDIO SYSTEM WITH NAVIGATION, 7" DIAGONAL TOUCH DISPLAY AM/FM STEREO, CD/DVD PLAYER & MP3
- AUDIO SYSTEM, PREMIUM 7-SPEAKER SYSTEM
- XM RADIO + SERVICE

- SUBSCRIPTION SOLD SEPARATELY BY SIRIUSXM AFTER 3 MONTHS
- STEERING WHEEL CONTROLS, AUDIO AND PHONE INTERFACE
 - INSIDE REARVIEW MIRROR, AUTO DIMMING
 - VISORS, DRIVER/FRONT PASSENGER W/ ILLUMINATED VANITY MIRRORS
 - PREMIUM FLOOR MATS
 - LEATHER WRAP STEERING WHEEL

EXTERIOR

- FRONT FOG LAMPS
- POWER DUAL OUTSIDE MIRRORS, HEATED
- WHEELS, 20" ALUMINUM ALLOY
- CONVERTIBLE ROOF - FOLDING, ACOUSTICALLY AND THERMALLY INSULATED
- DAYTIME RUNNING LAMPS, LED
- HEADLAMPS - ARTICULATING, HIGH INTENSITY DISCHARGE
- W/ AUTOMATIC LEVELING SYSTEM

CONNECTIVITY FEATURES

- 4G LTE Wi-Fi® HOTSPOT WITH LIMITED DATA TRIAL AND MORE. (SUBJECT TO TERMS SEE ONSTAR.COM)
- ONSTAR® INCLUDES 5 YR BASIC PLAN PLUS 6 MTH SERVICE W/ AUTOMATIC CRASH RESPONSE, NAVIGATION & MORE. (SUBJECT TO TERMS SEE ONSTAR.COM)

OPTIONS & PRICING

MANUFACTURER'S SUGGESTED RETAIL PRICE

STANDARD VEHICLE PRICE **\$36,065.00**

OPTIONAL EQUIPMENT BY THE MANUFACTURER (MAY REPLACE STANDARD EQUIPMENT CHARGE)

CARBON BLACK METALLIC **\$95.00**

TOTAL OPTIONS **\$395.00**

TOTAL VEHICLE & OPTIONS **\$36,460.00**

DESTINATION CHARGE **\$25.00**

TOTAL VEHICLE PRICE* **\$37,385.00**

EPA DOT Fuel Economy and Environment

Gasoline Vehicle

Fuel Economy
23 MPG
combined city/highway
4.3 gallons per 100 miles

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

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

Annual fuel cost \$1,950

Fuel Economy & Greenhouse Gas Rating (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 26 MPG and costs \$9,500 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$2.45 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

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

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



Equipped with the safety and connectivity of OnStar®
Visit onstar.com for details
onstar.com/emergency

PARTS CONTENT INFORMATION

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

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

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

This dealer has been approved pursuant to Federal law to OnStar. OnStar is not responsible for the accuracy of the information provided. OnStar is not responsible for the accuracy of the information provided. OnStar is not responsible for the accuracy of the information provided.

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ORDER NO. 1508077 SALES CODE 5
SALES MODEL CODE 4V757
DEALER NO. 0011
FINAL ASSEMBLY POINT: POLAND
VIN: W00WTF369G053900
DEALER TO WHOM DELIVERED:
WIN KELLY CHEVROLET BUICK GMC
12421 AUTO DR
CLARKSVILLE, MD 21029-1266



R2
5

Photo No. 079 - Monroney Label Photograph

APPENDIX B
DUMMY RESPONSE DATA TRACES

TABLE OF DATA PLOTS

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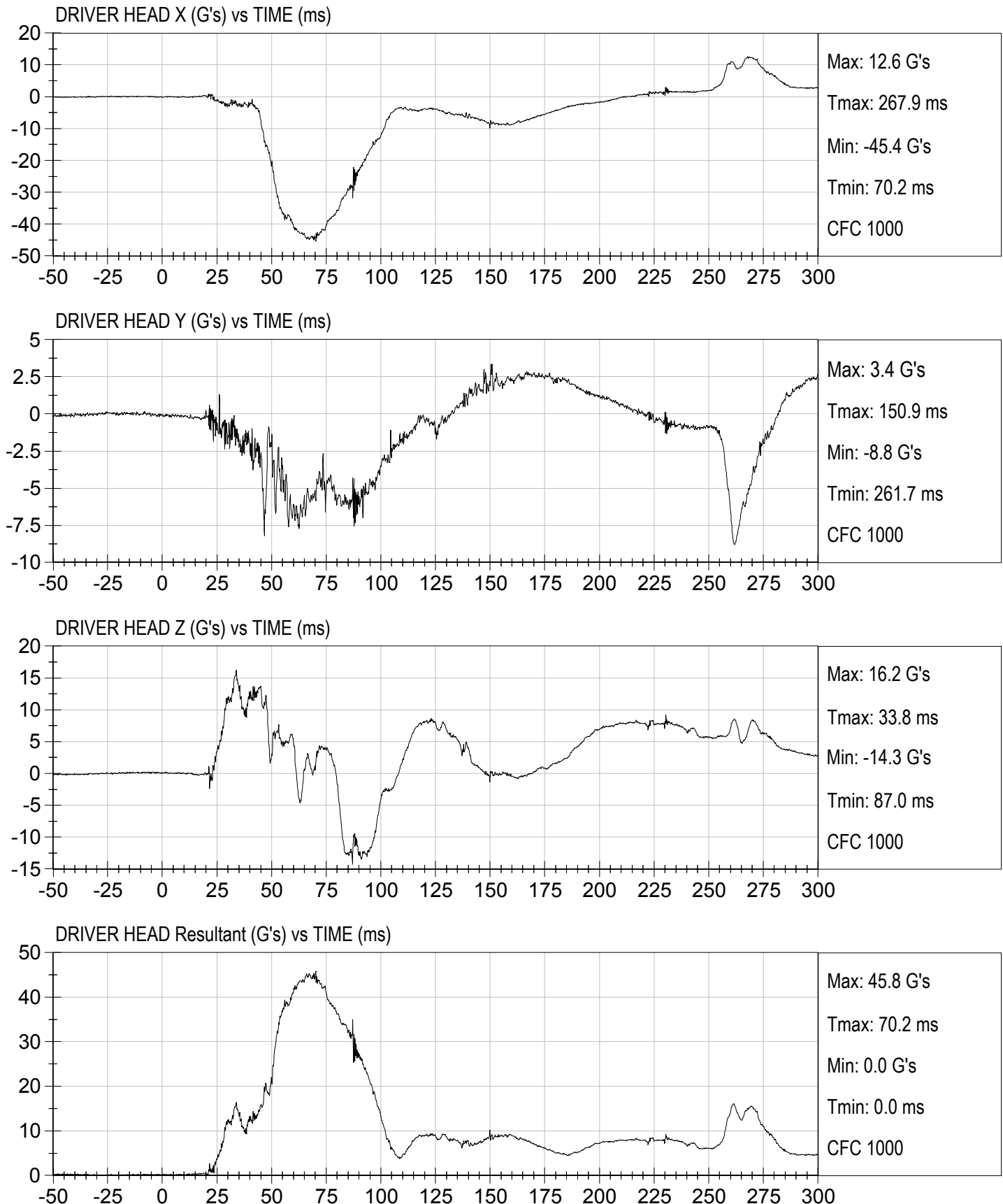
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Figure No. 28.	Passenger Neck Force X vs. Time	B-10
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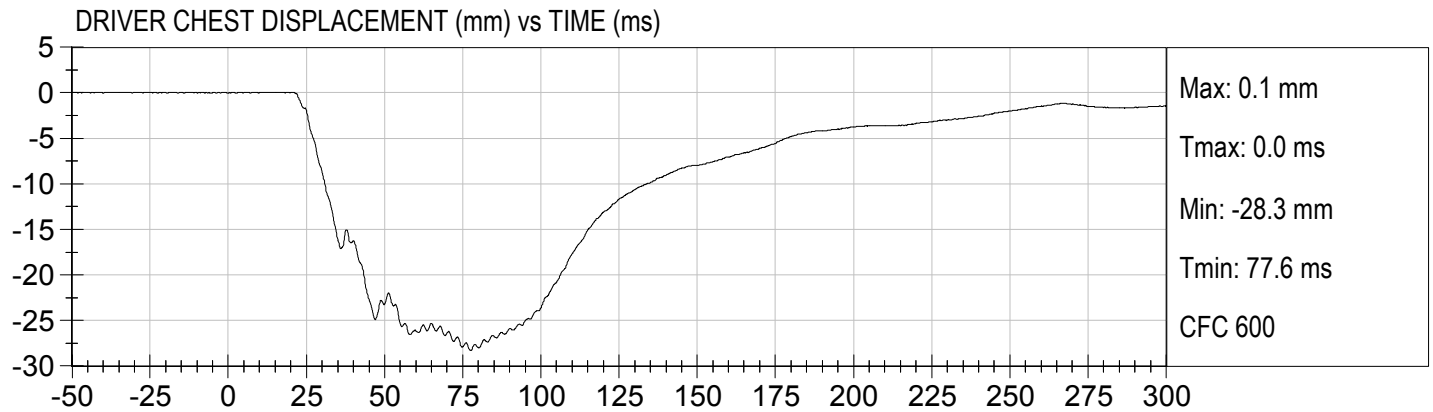
The following additional dummy and vehicle response data can be found in the R&D section of the NHTSA website at www.nhtsa.dot.gov

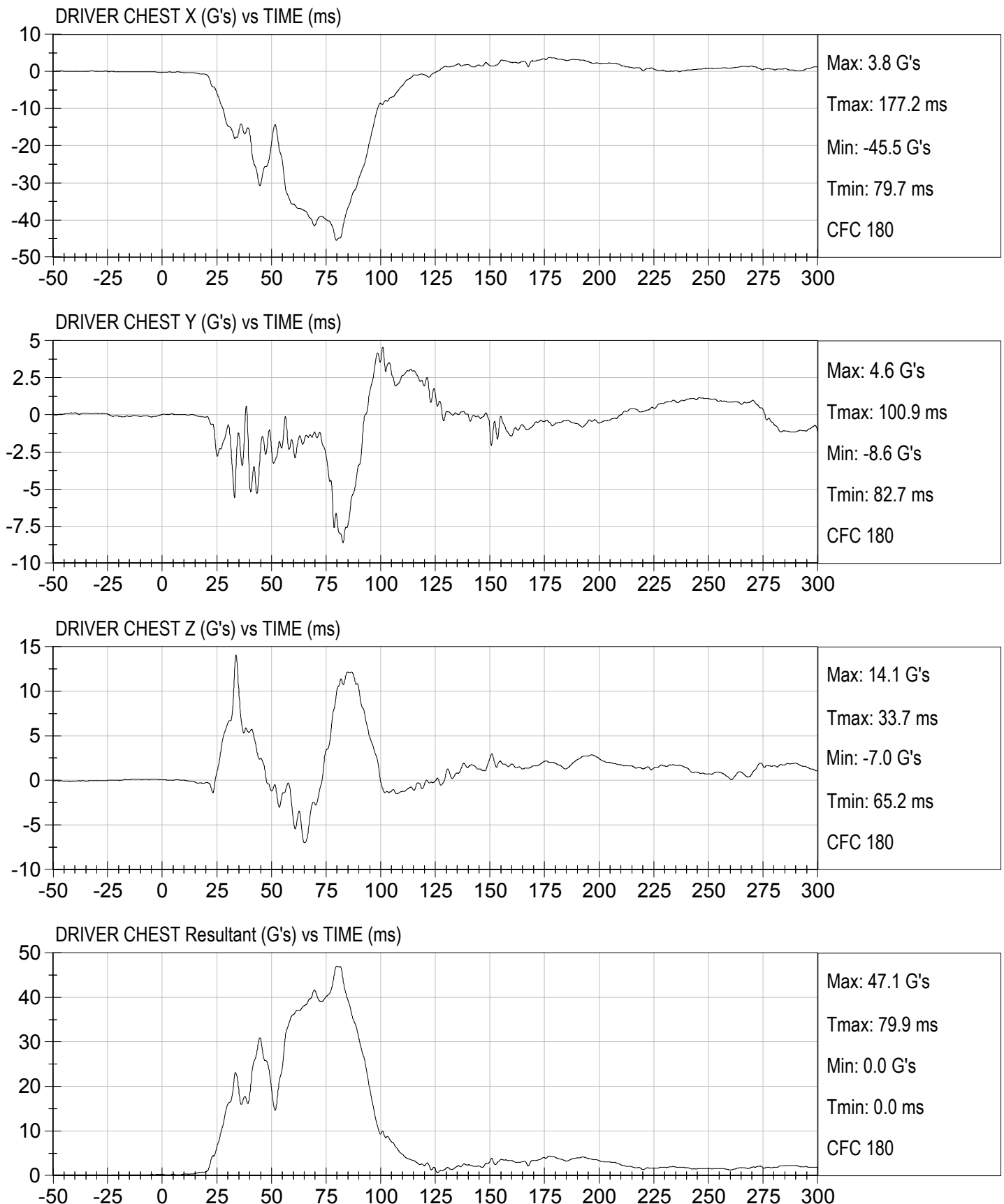
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 Driver Head Y Redundant
 Driver Head Z Redundant
 Driver Head Angular Velocity X
 Driver Head Angular Velocity Y
 Driver Head Angular Velocity Z
 Driver Upper Neck Force Y
 Driver Upper Neck Moment X
 Driver Upper Neck Moment Z
 Driver Chest X Redundant
 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

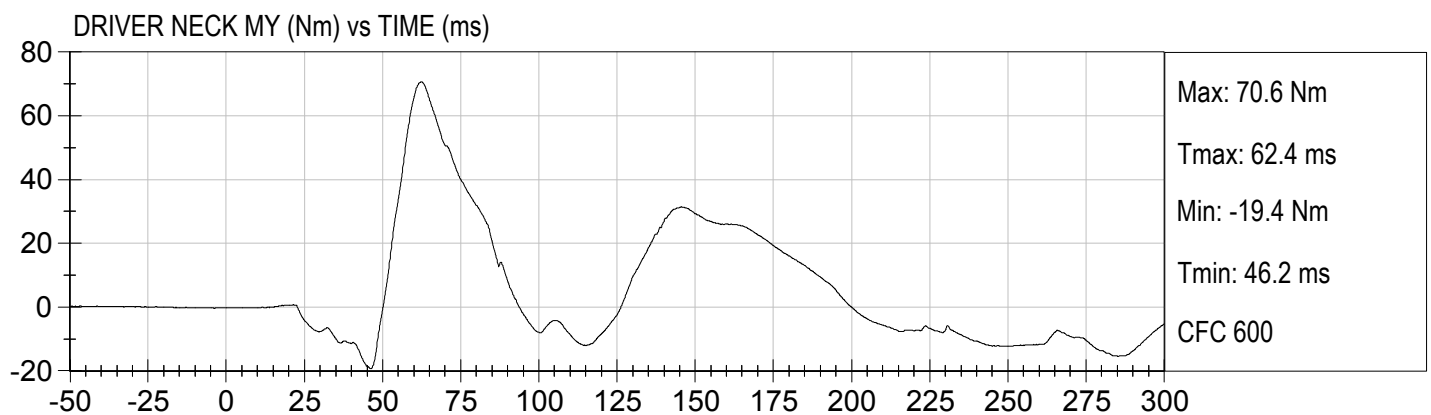
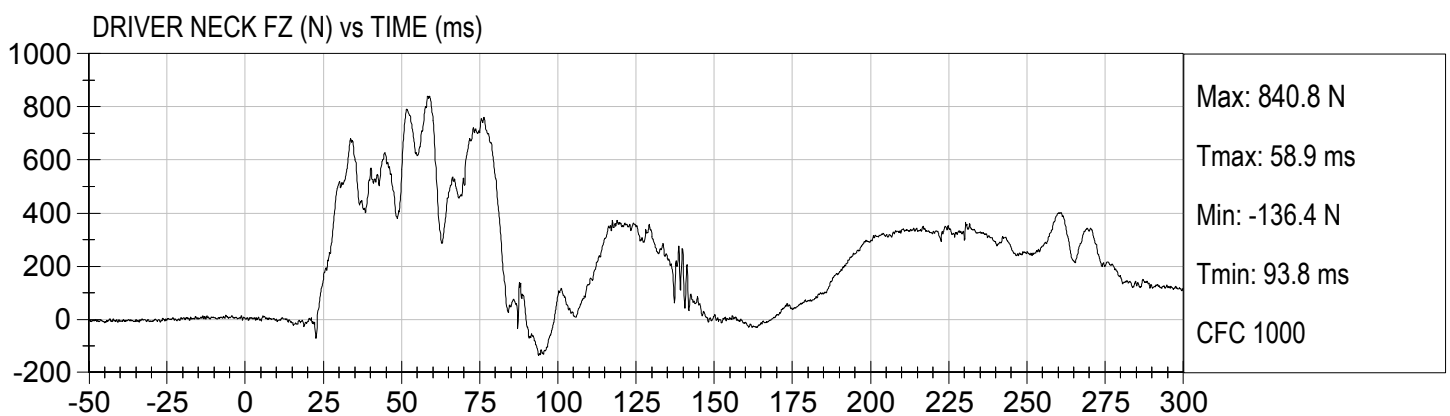
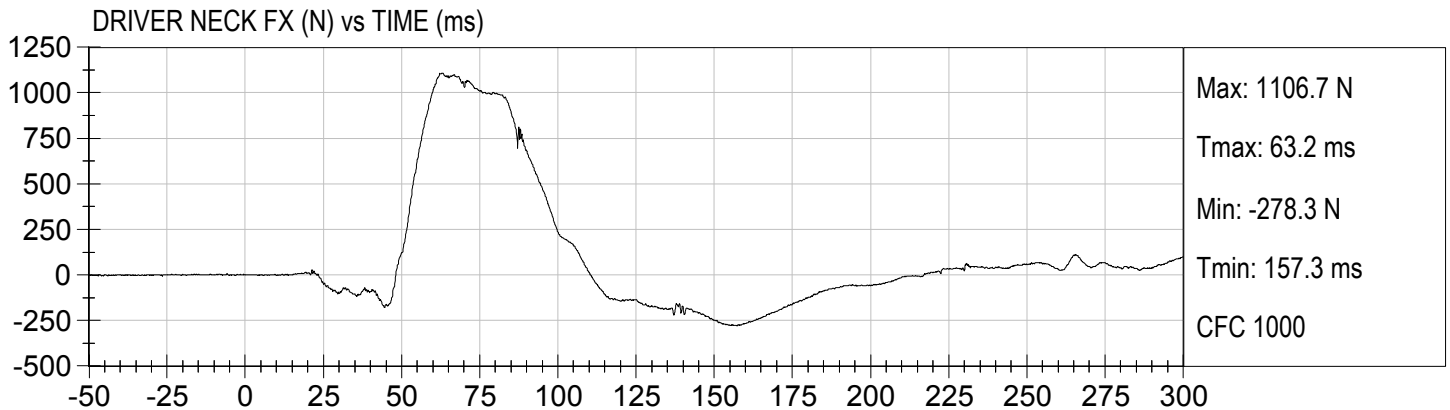
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Driver Left Lower Tibia Moment X
Driver Left Lower Tibia Moment Y
Driver Left Lower Tibia Force Z
Driver Right Upper Tibia Moment X
Driver Right Upper Tibia Moment Y
Driver Right Upper Tibia Force Z
Driver Right Lower Tibia Moment X
Driver Right Lower 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 Head Angular Velocity X
Passenger Head Angular Velocity Y
Passenger Head Angular Velocity Z
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

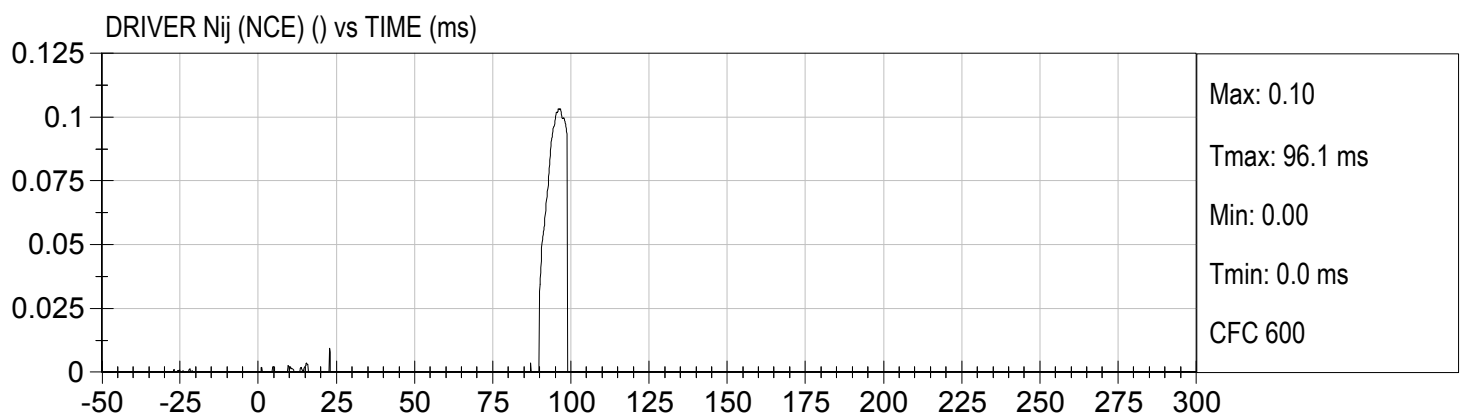
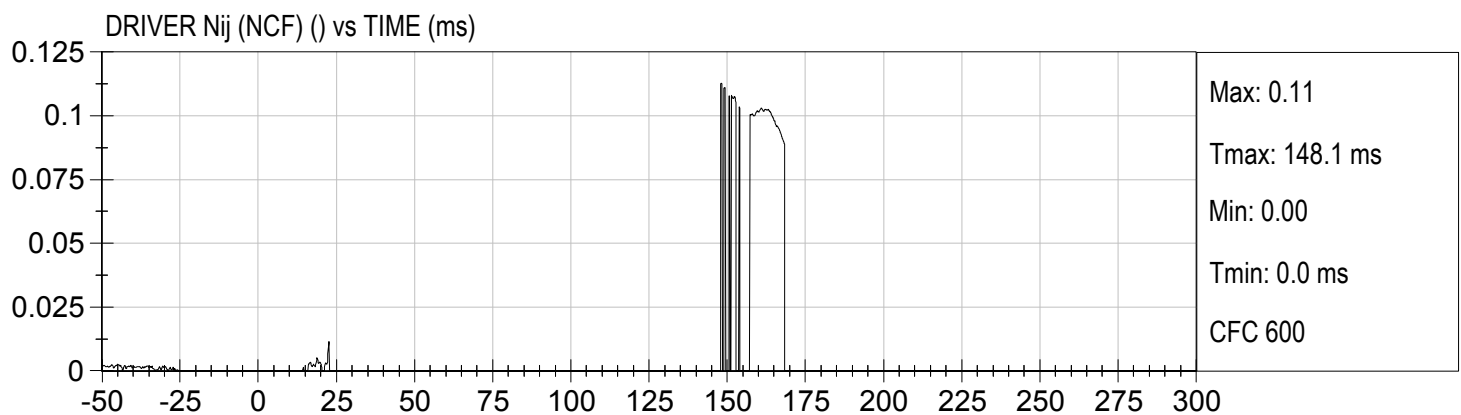
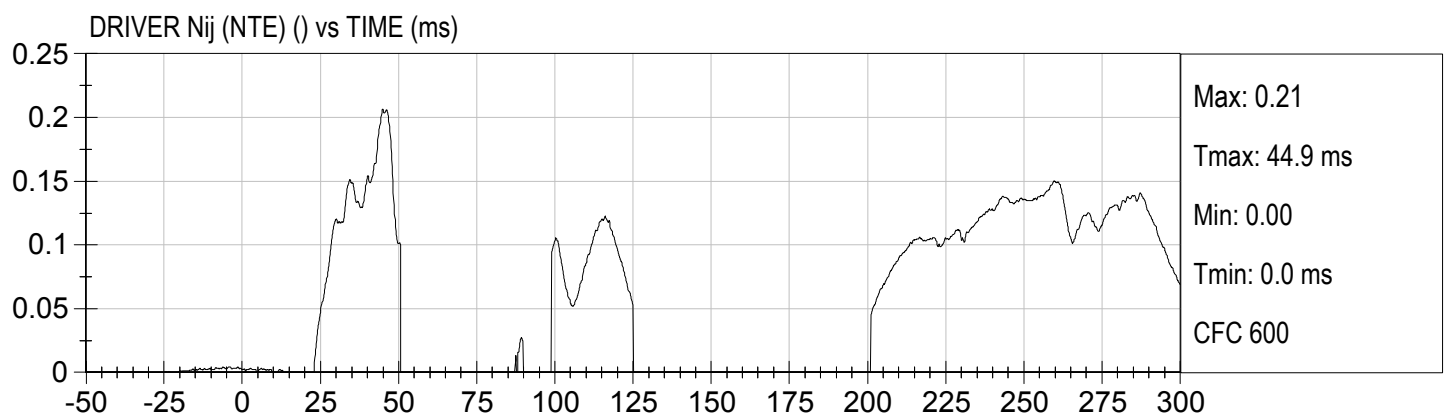
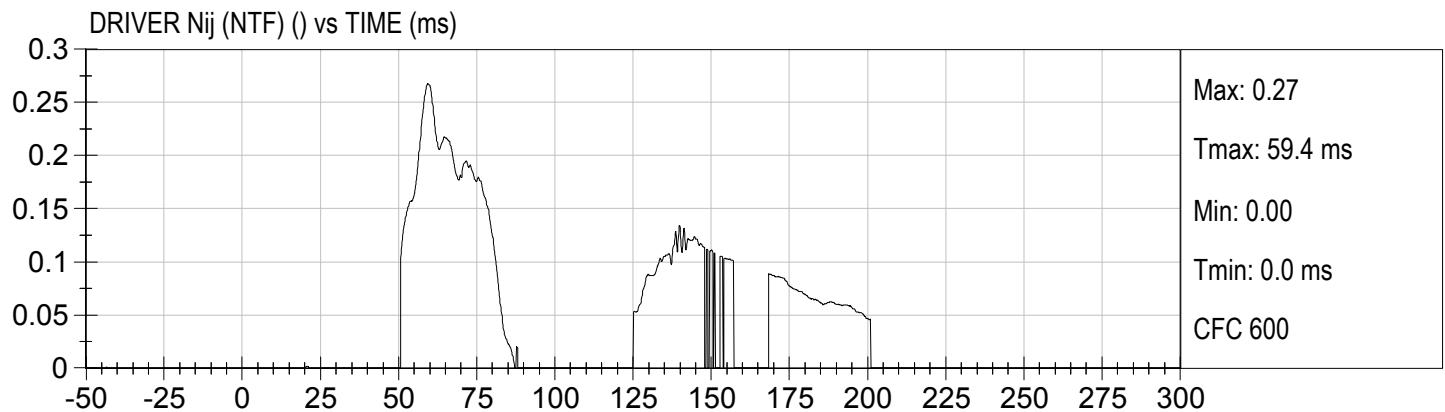
Passenger Pelvis Z
Passenger Left Femur Redundant
Passenger Right Femur Redundant
Passenger Left Upper Tibia Moment X
Passenger Left Upper Tibia Moment Y
Passenger Left Upper Tibia Force Z
Passenger Left Lower Tibia Moment X
Passenger Left Lower Tibia Moment Y
Passenger Left Lower Tibia Force Z
Passenger 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
Advanced Research Load Cell Barrier – 528 channels

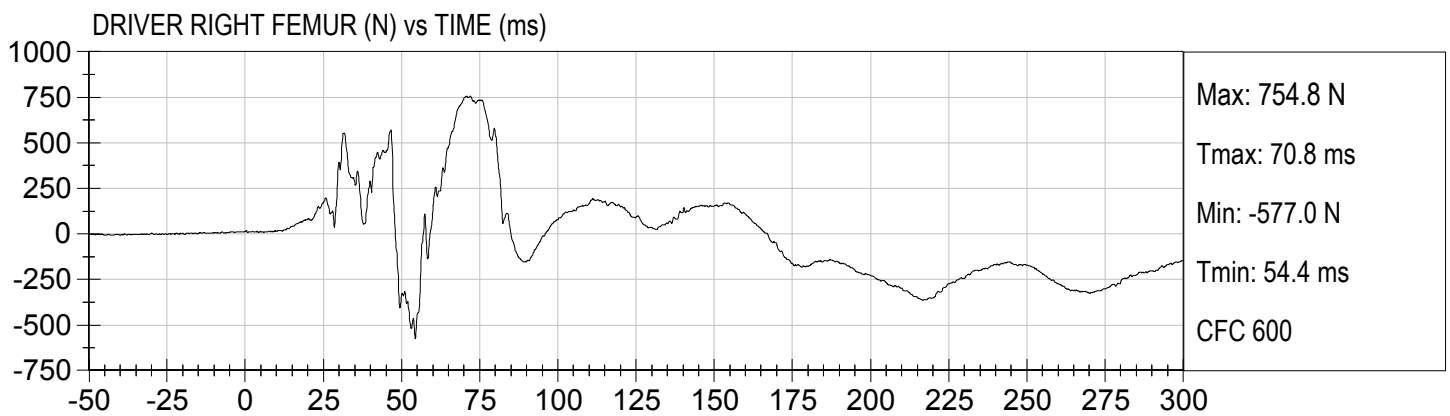
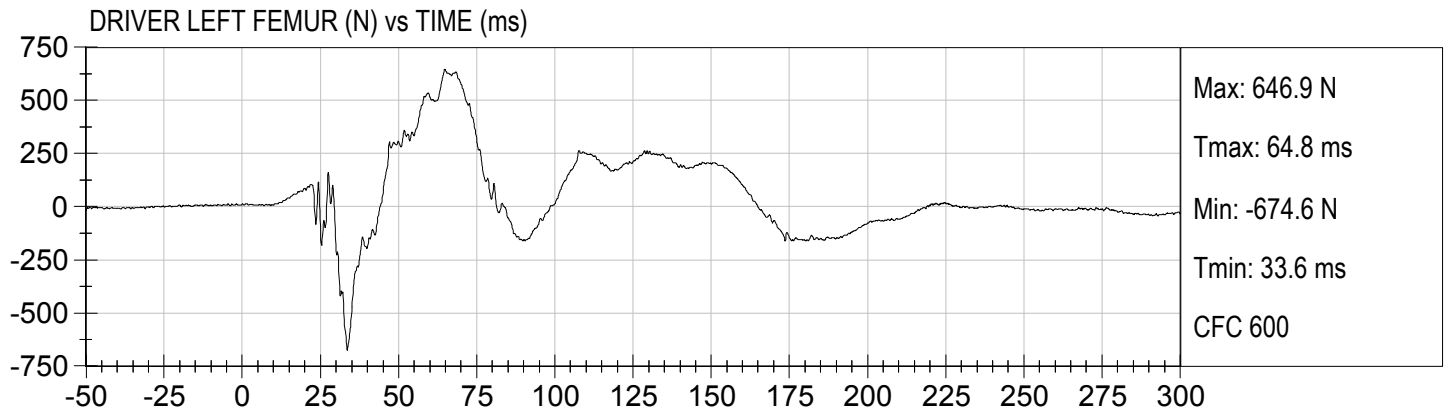


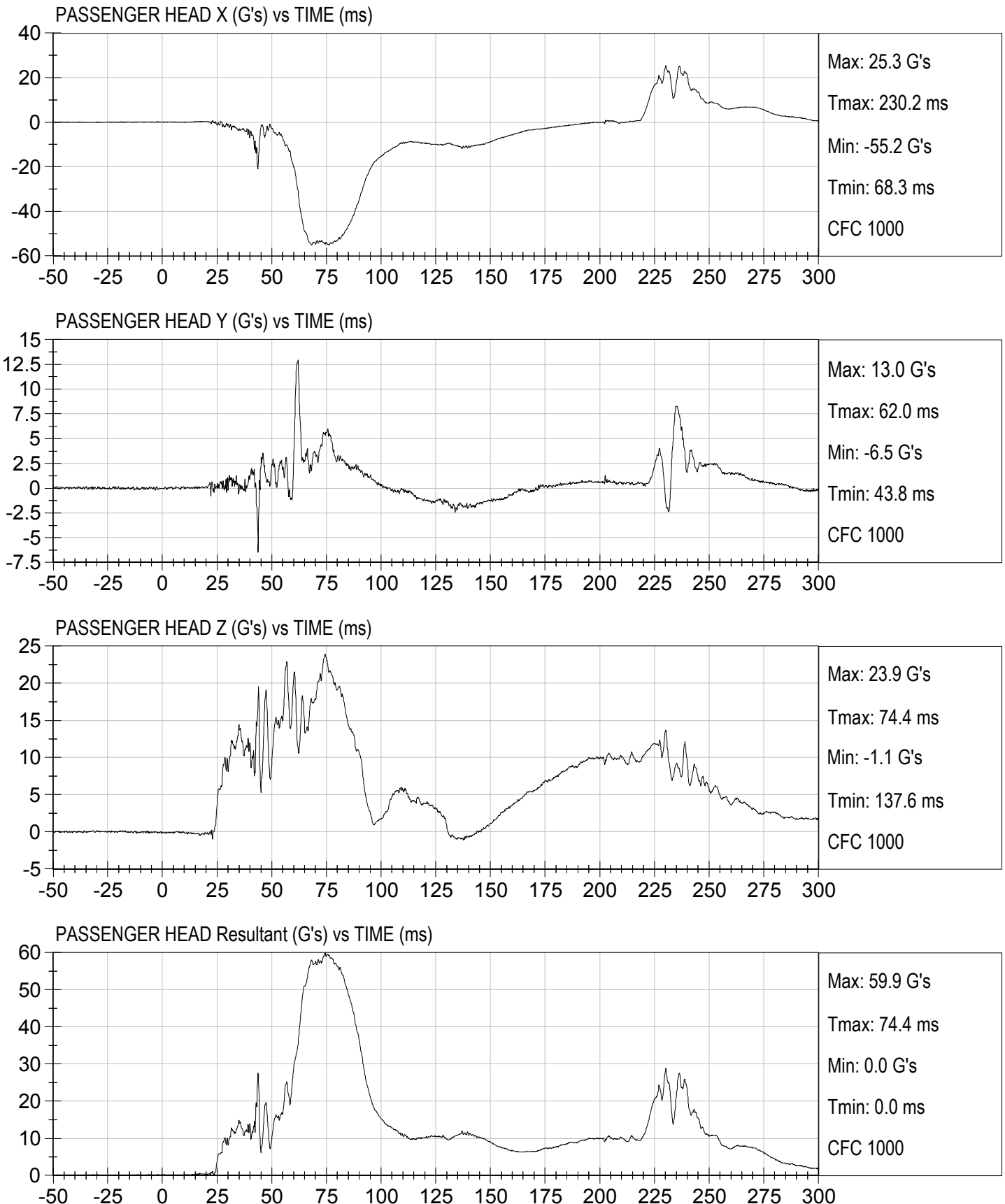


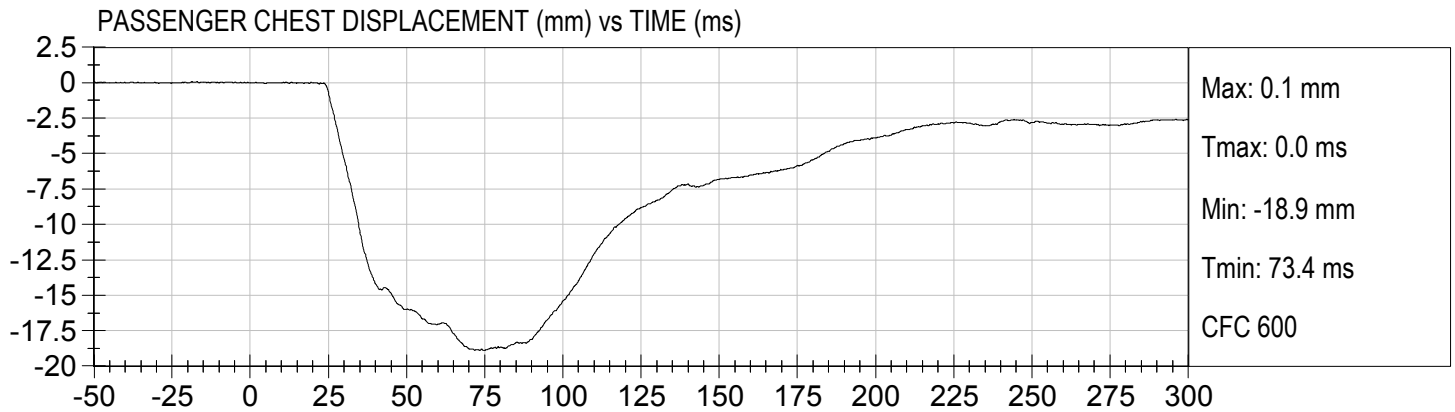


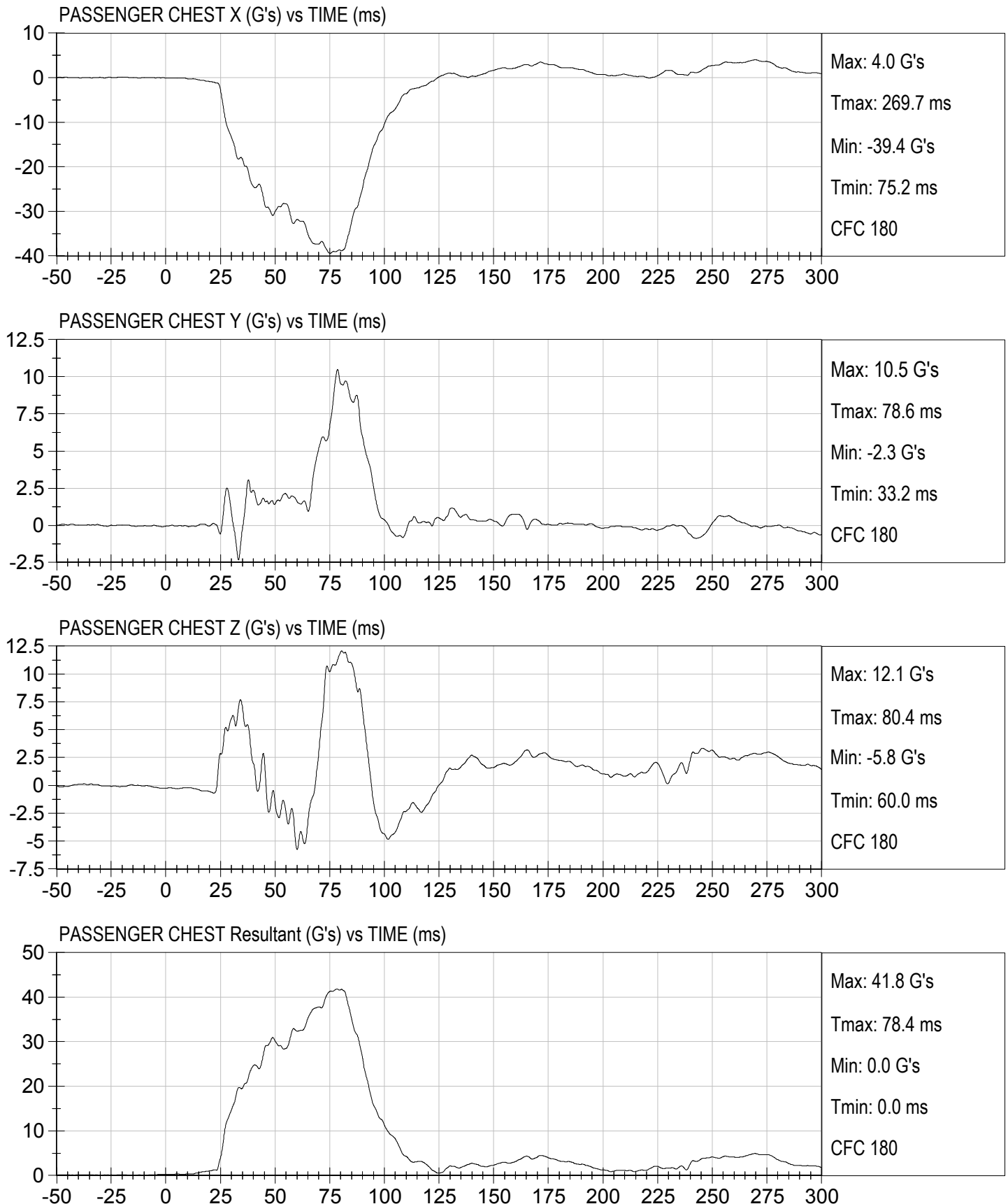


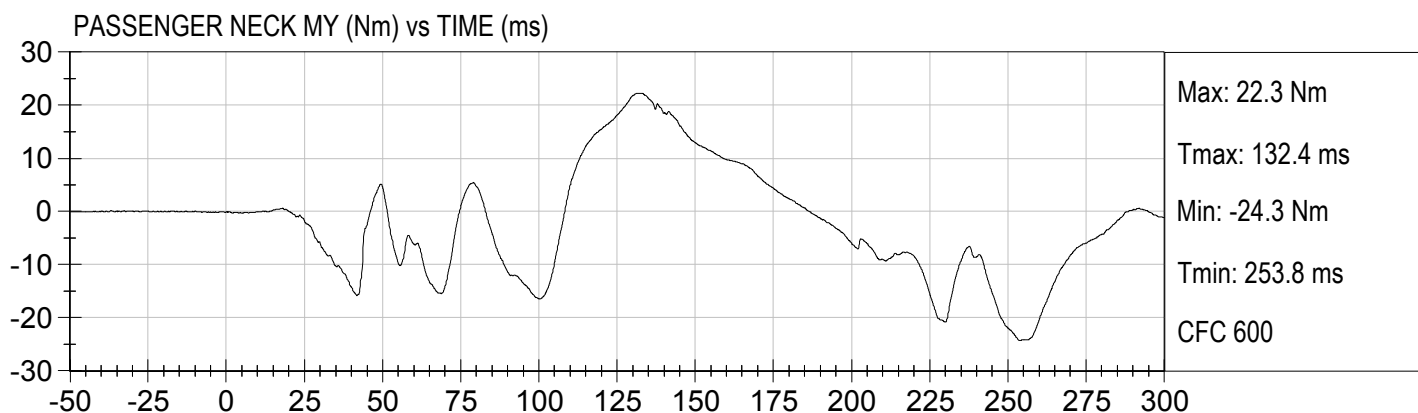
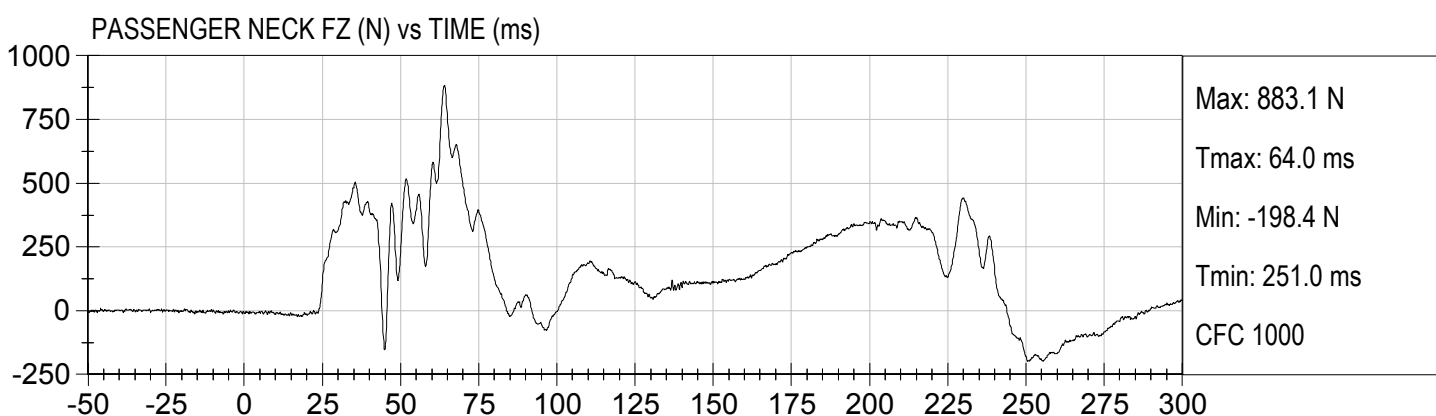
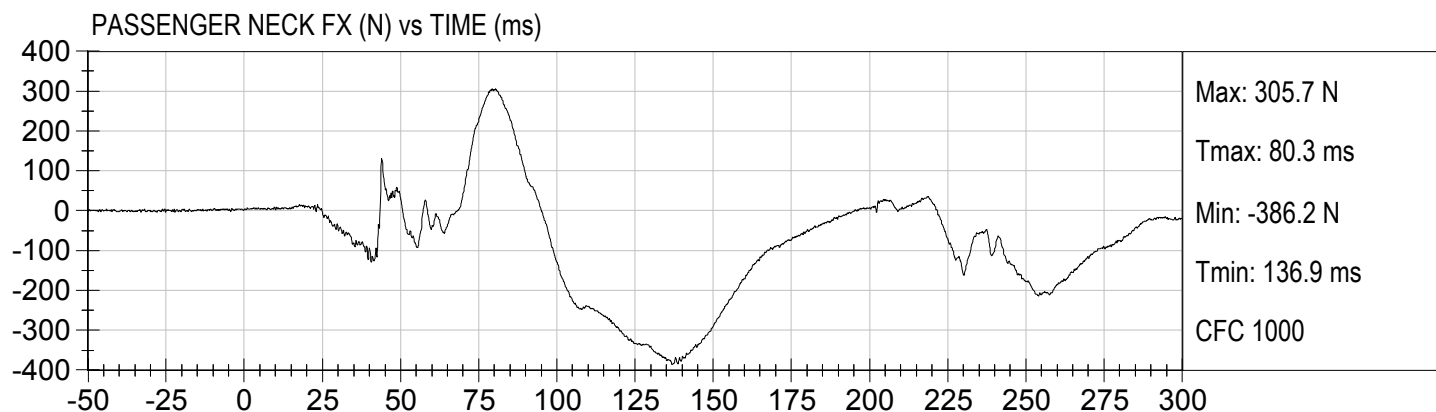


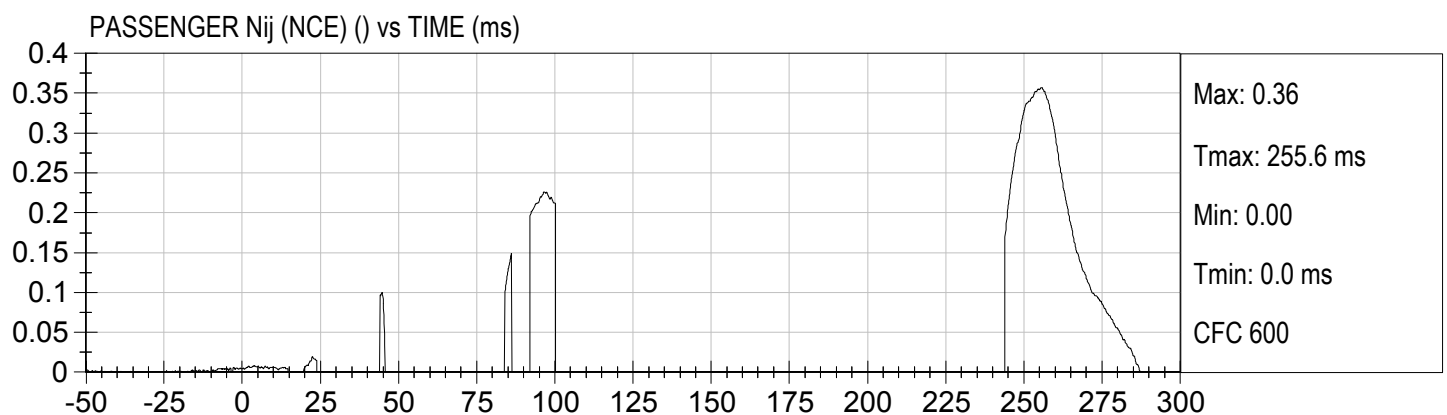
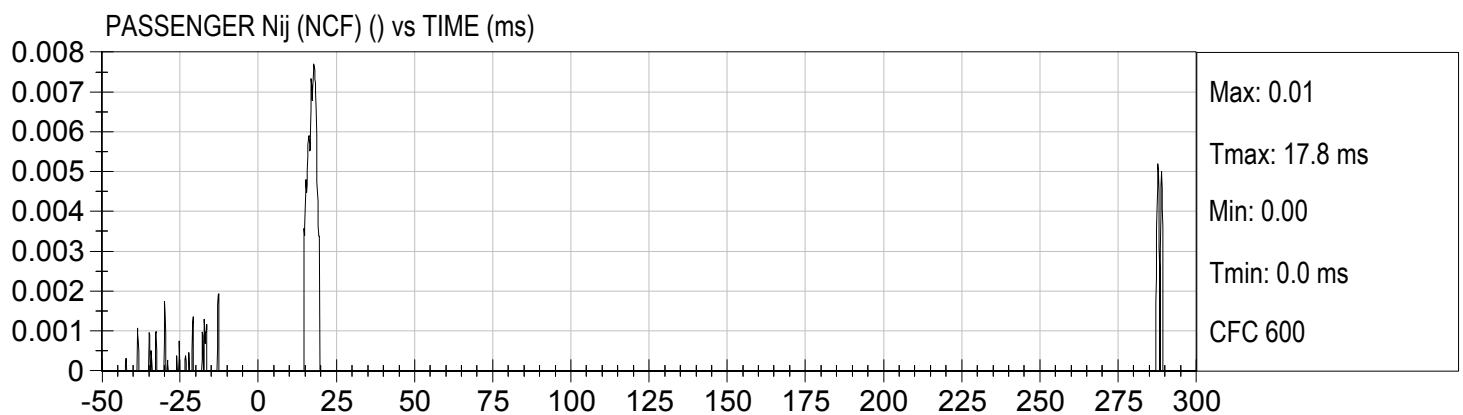
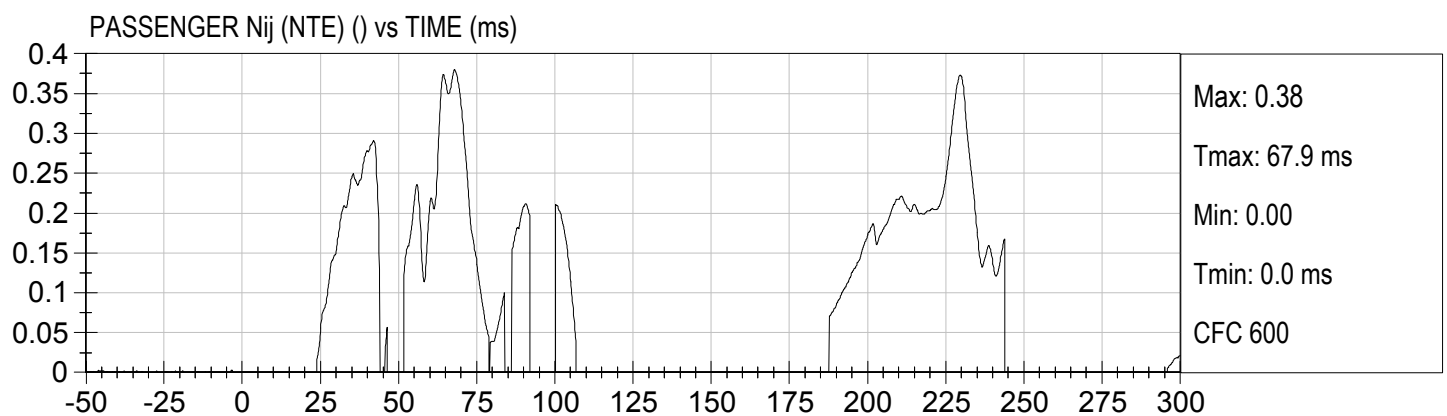
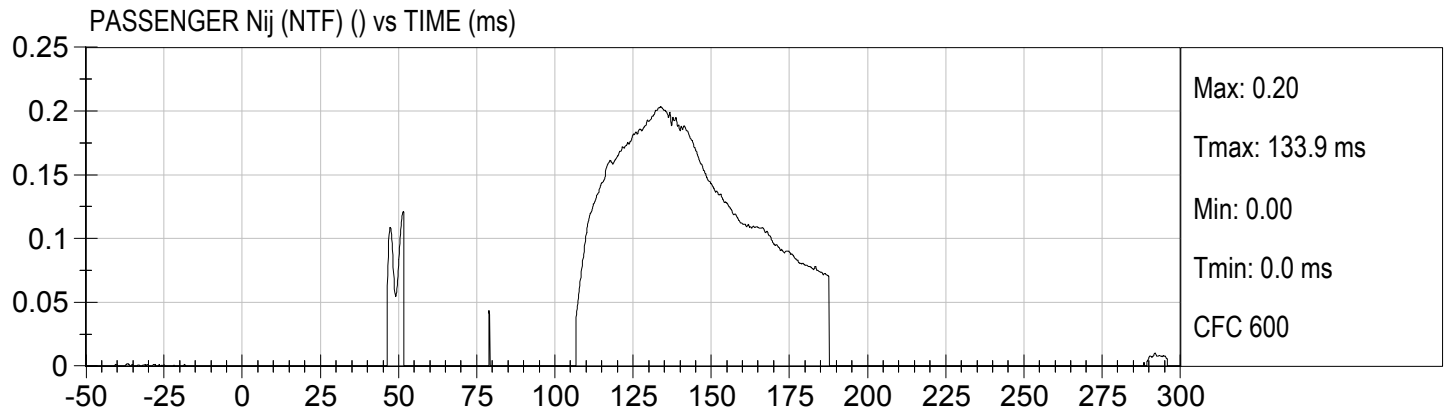


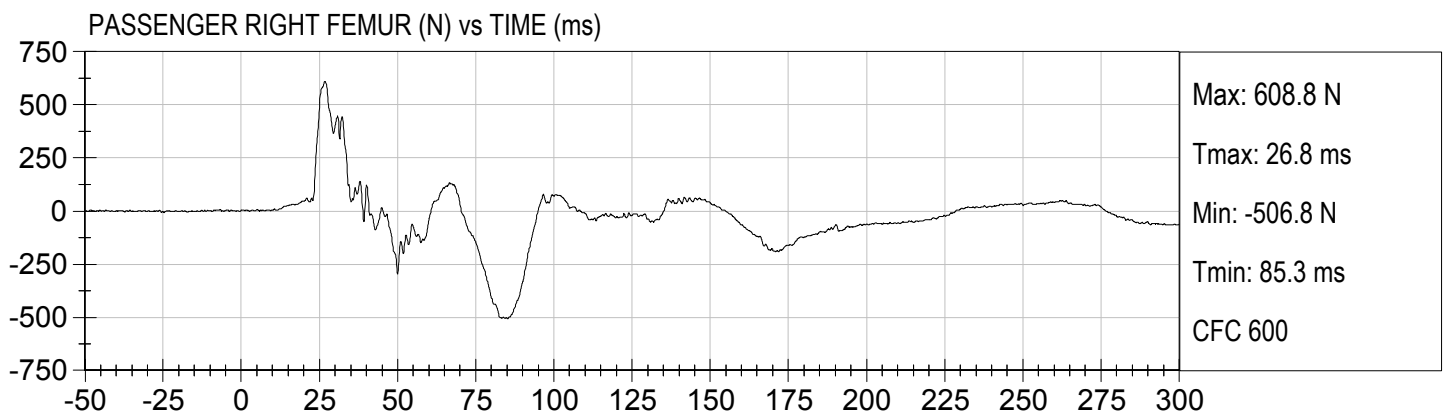
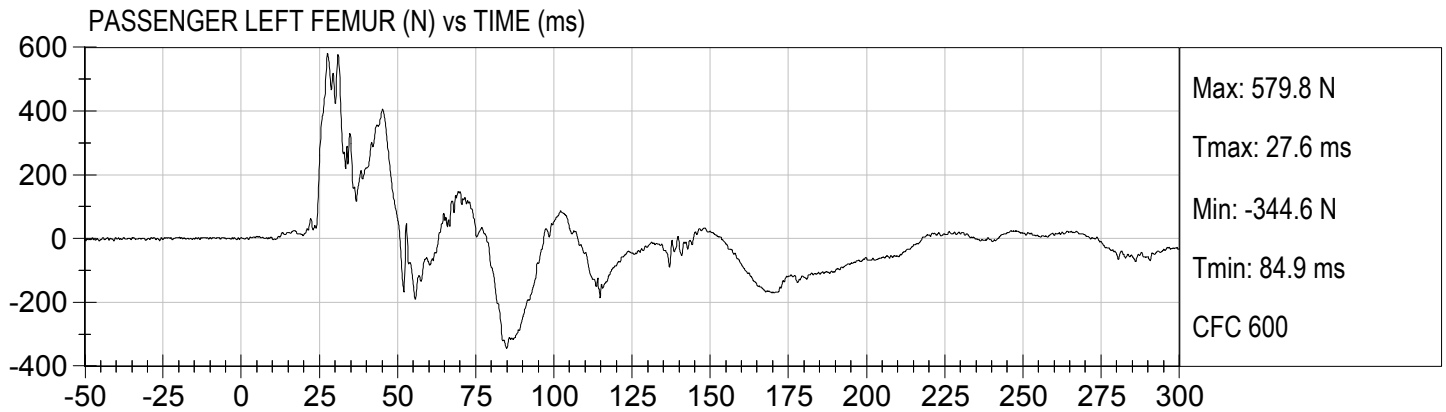












APPENDIX C
DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

Hybrid III, 50th External Measurements
SN: 351

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	34.8
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	5.5
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	3.3-3.7	3.5
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	5.5-6.1	6.0
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	11.8
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	13.3
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	7.5-8.3	7.8
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	17.0
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	18.8

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	8.5
P	FOOT LENGTH	Tip of toe to rear of heel	9.9-10.5	10.3
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	16.3-17.2	16.5
W	FOOT BREADTH	The widest part of the foot	3.6-4.2	4.0
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 16.9-17.1 in. above seat surface	38.2-39.4	39.2
Z	WAIST CIRCUMFERENCE	Measured 8.9-9.1 in. above seat surface	32.9-34.1	33.7
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

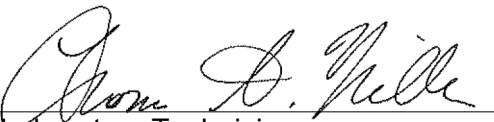
NOTE: THE H-POINT IS LOCATED 1.83 INCHES FORWARD AND 2.57 INCHES DOWN FROM THE CENTER OF THE PELVIS ANGLE REFERENCE HOLE.

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

ATD Serial No: 351

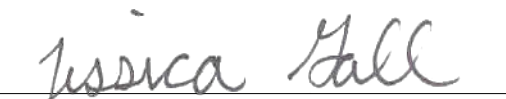
Test ID: D162071

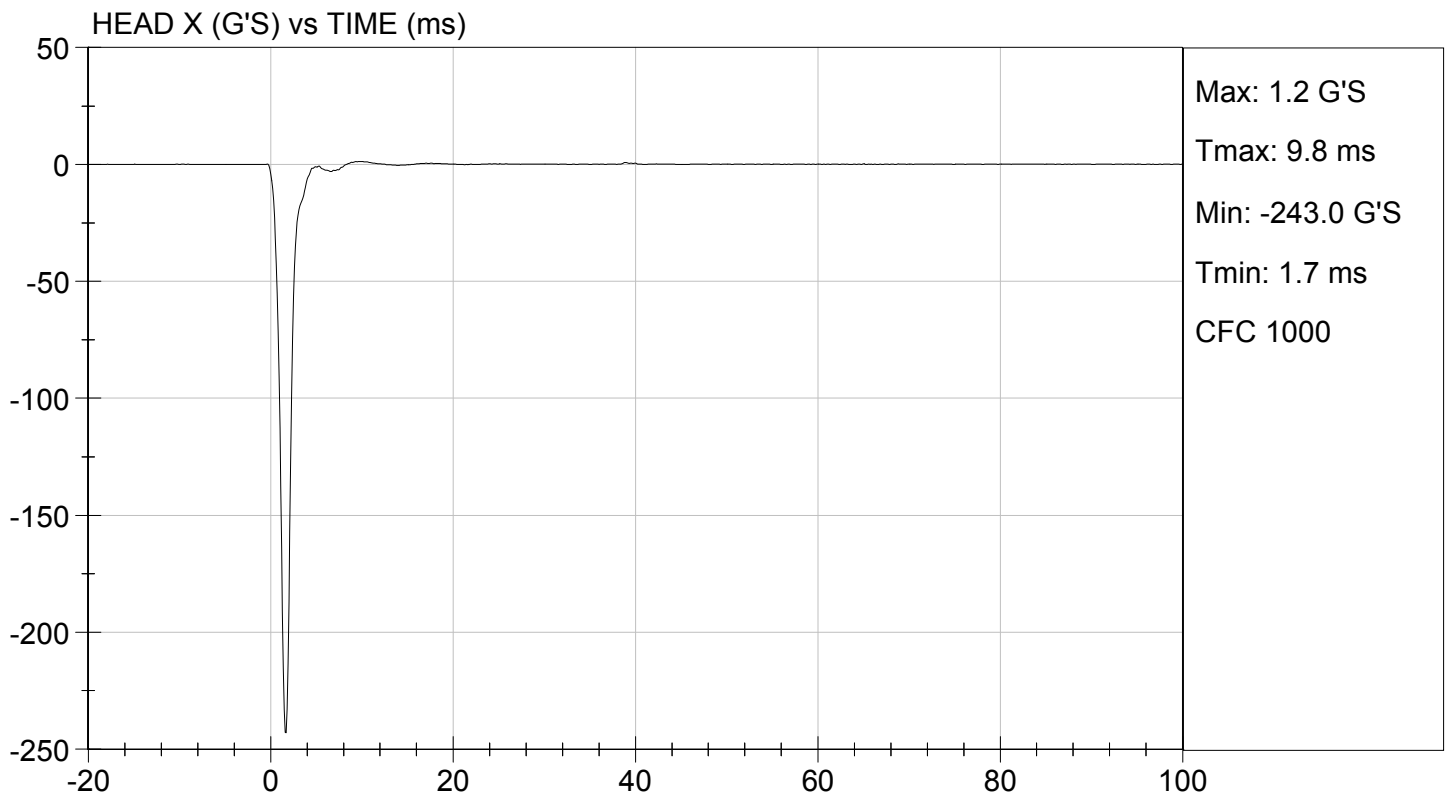
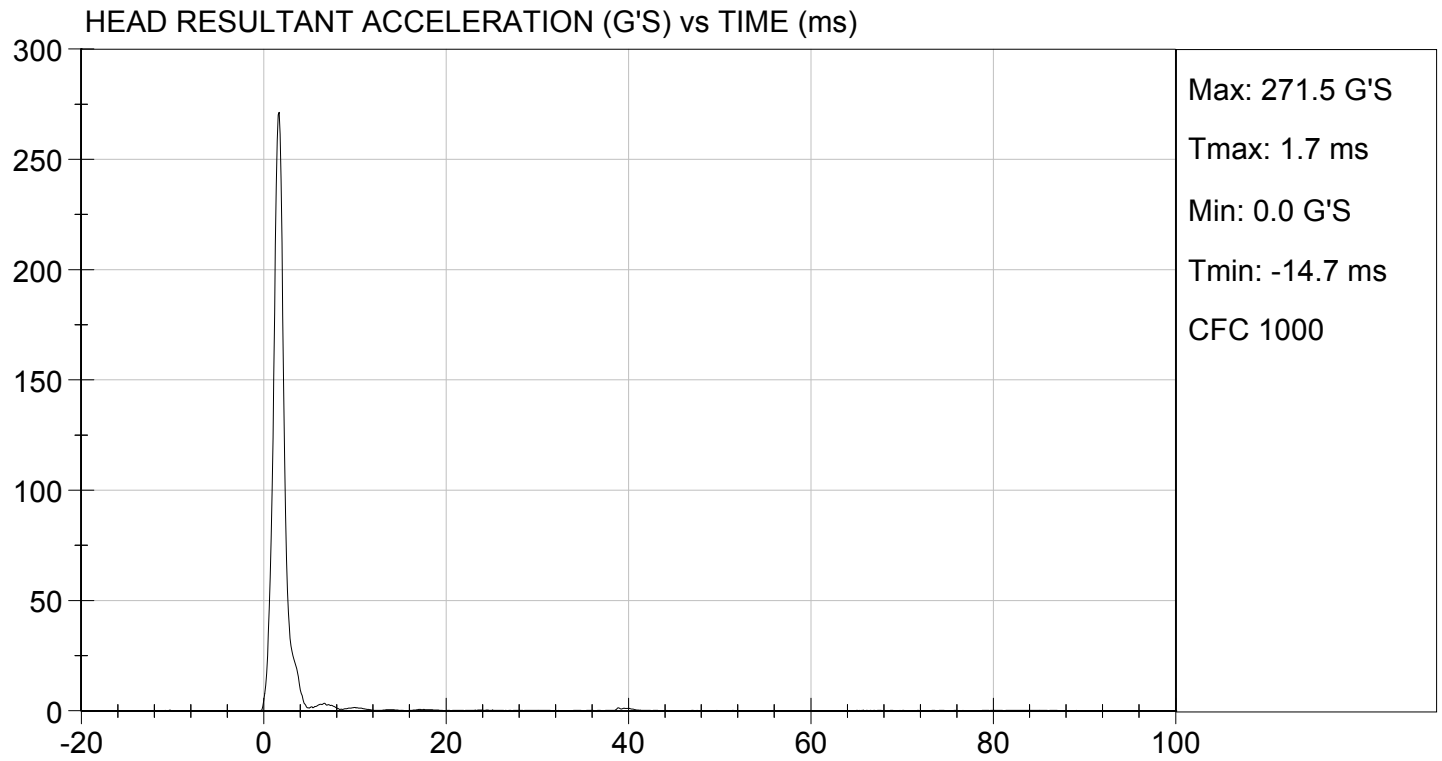
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	51	Pass
Peak Resultant Acceleration	G's	225 to 275	271	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	8.7	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

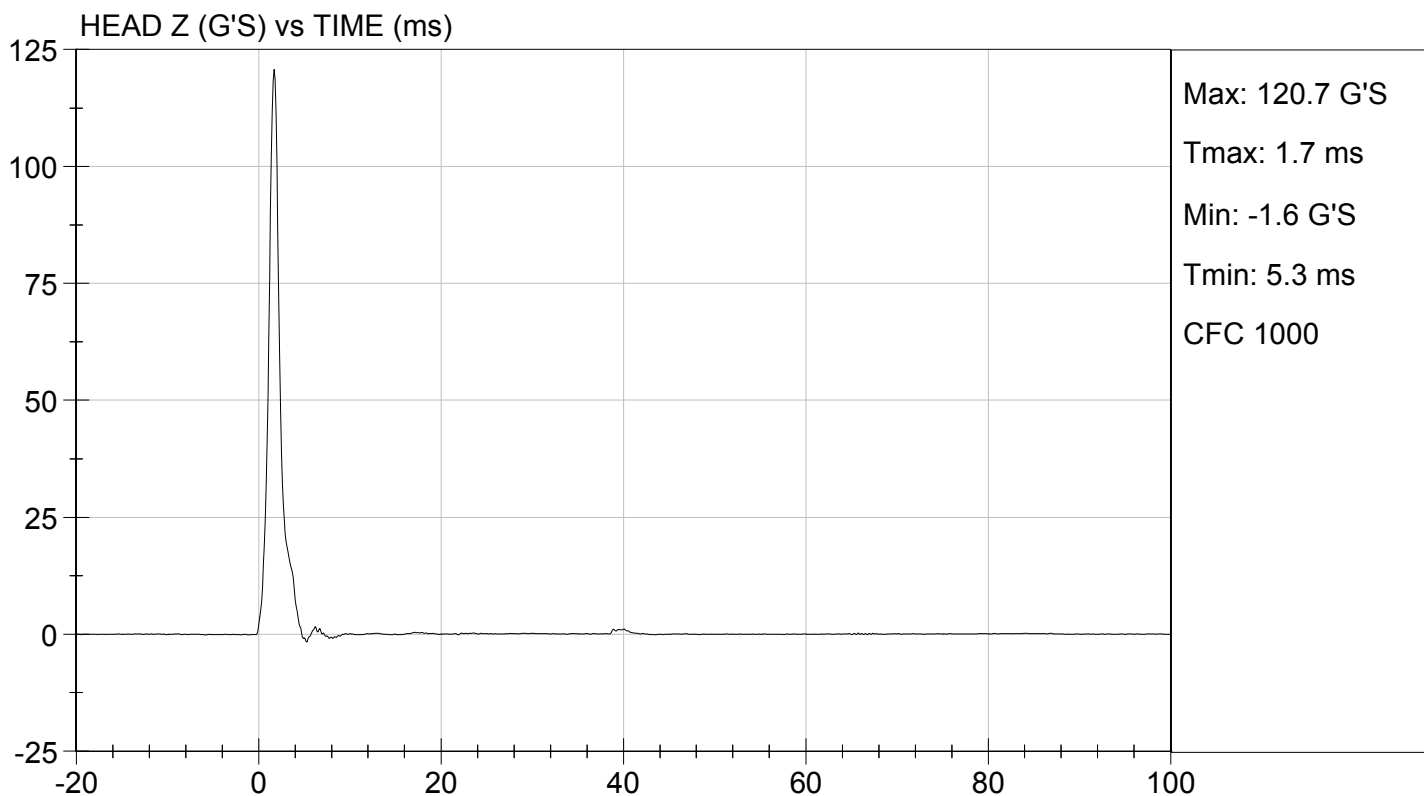
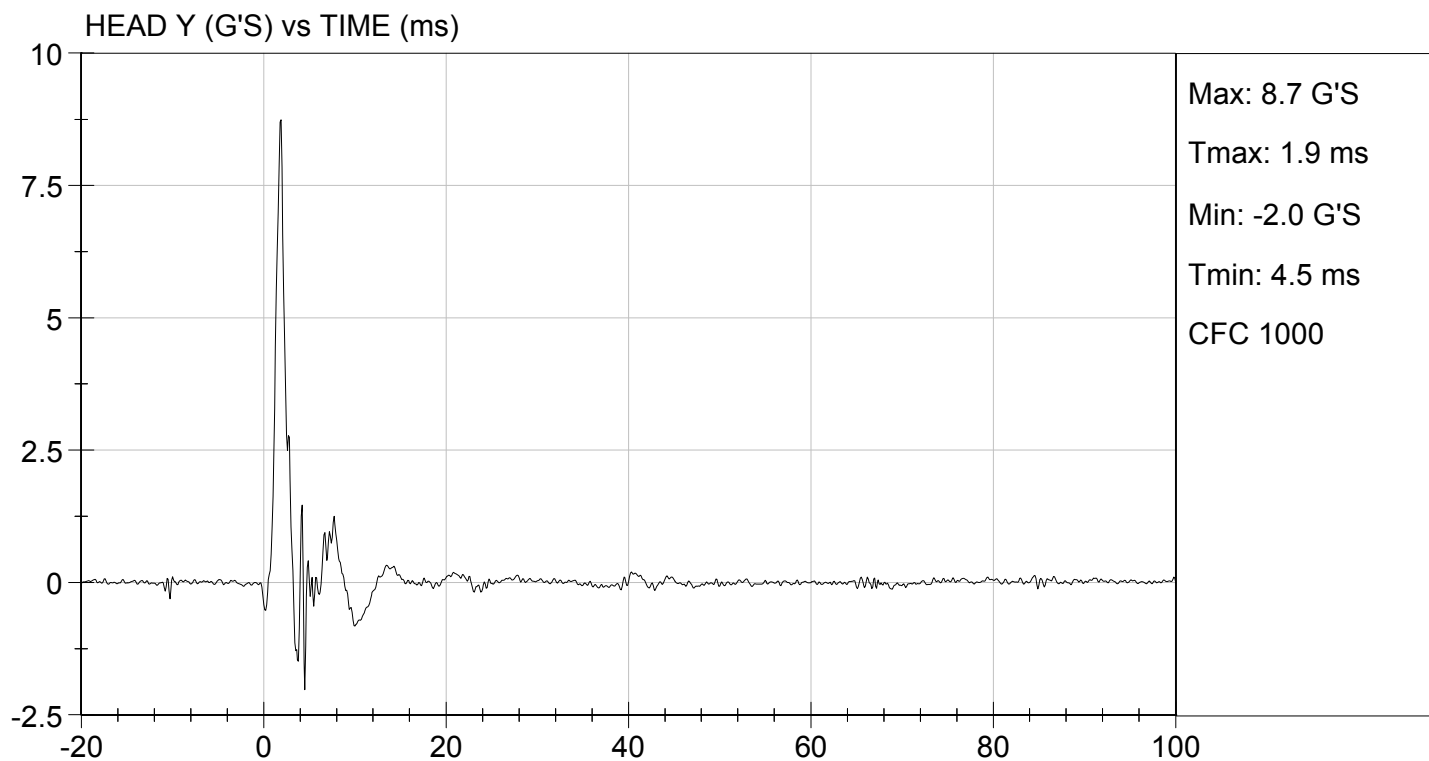

Laboratory Technician

06/15/2016

Test Date


Approved By



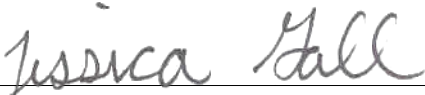


MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

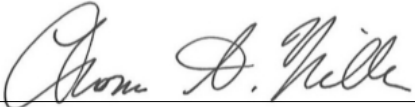
Test I.D: D162072

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22.1	Pass
Laboratory Relative Humidity		%	10 to 70	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	23.74	Pass
	20 ms	G's	17.60 to 22.60	21.51	Pass
	30 ms	G's	12.50 to 18.50	15.70	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	15.7	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	35.6	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	72.3	Pass
	Time	ms	57.0 to 64.0	57.6	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	117.3	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	91.4	Pass
	Time	ms	47.0 to 58.0	48.0	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	97.4	Pass
Overall Test Results					Pass


 Laboratory Technician

06/15/2016

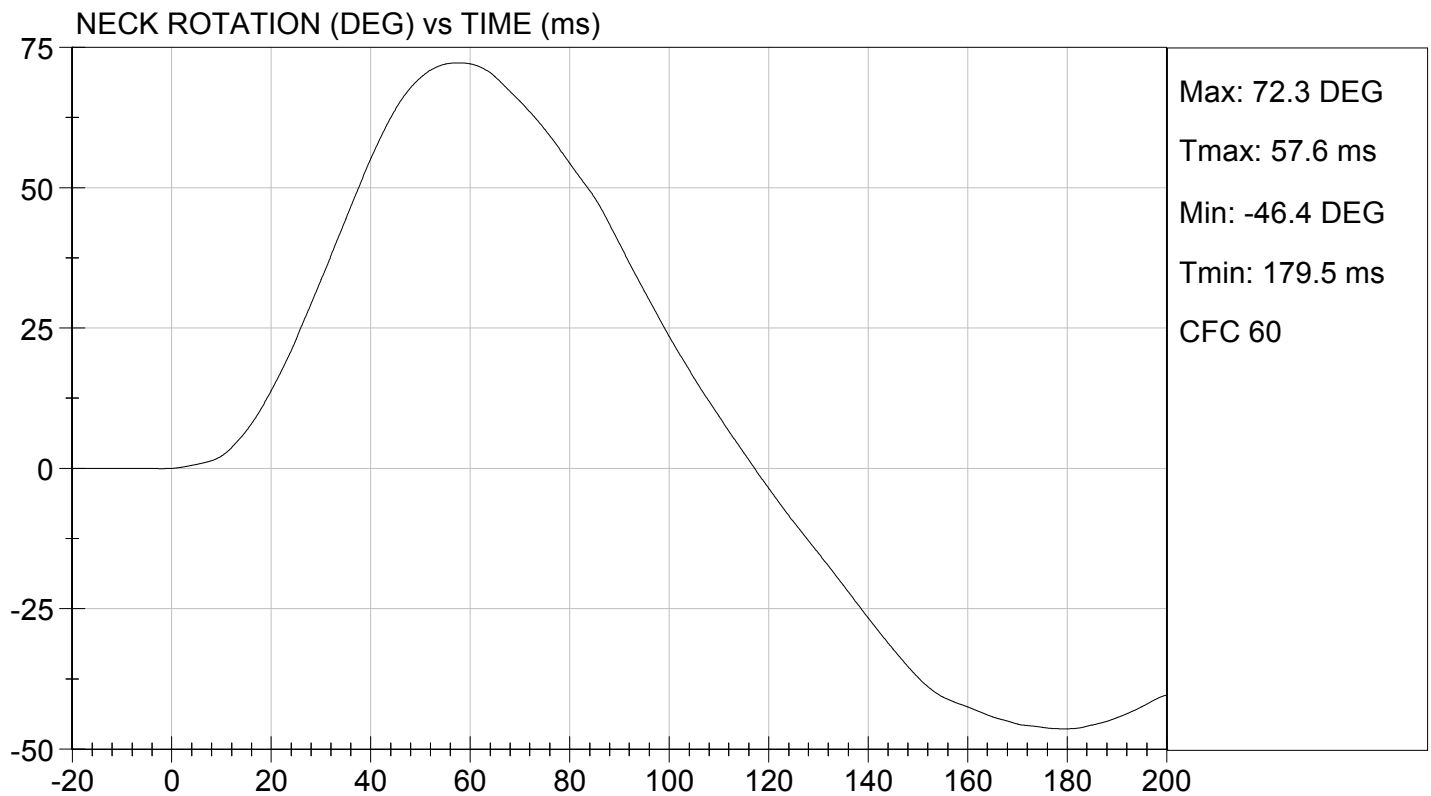
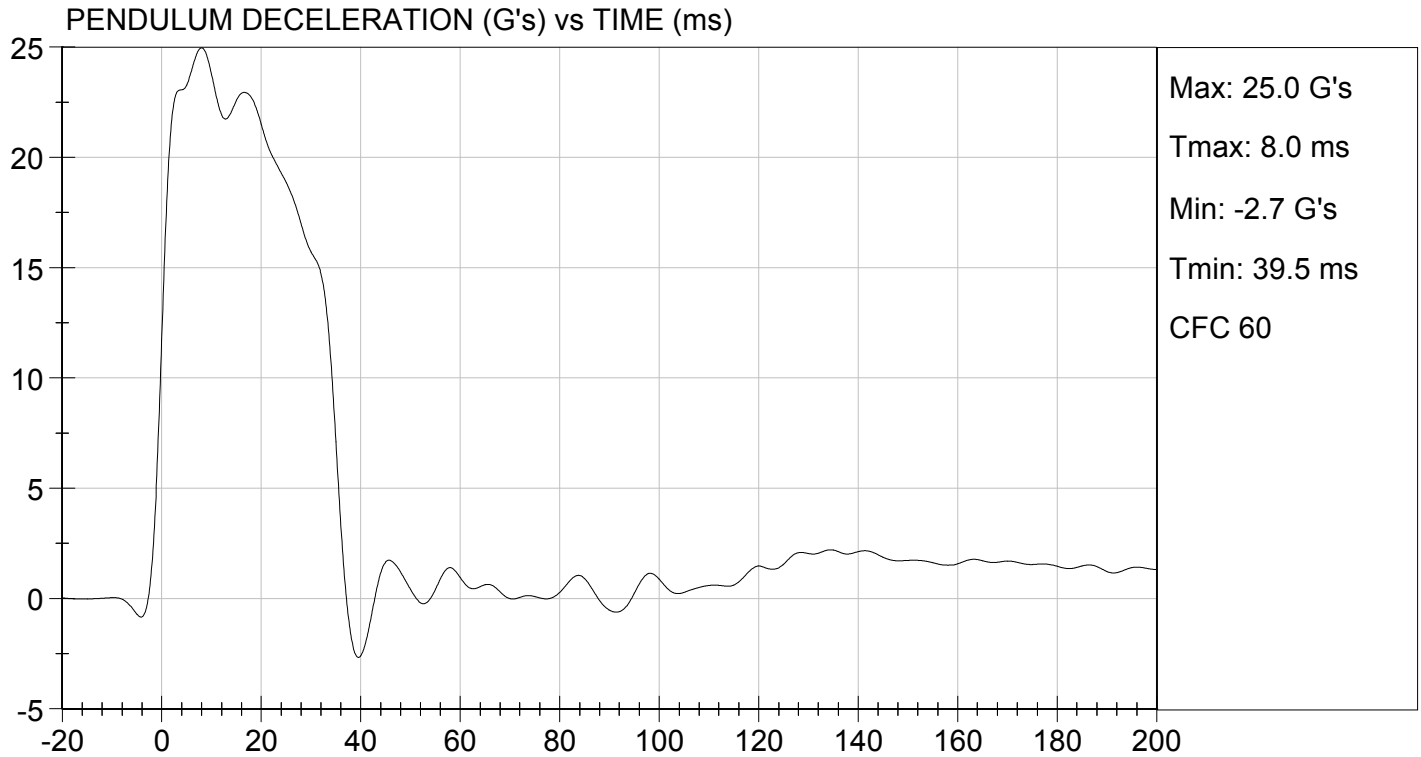
Test Date


 Approved By



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

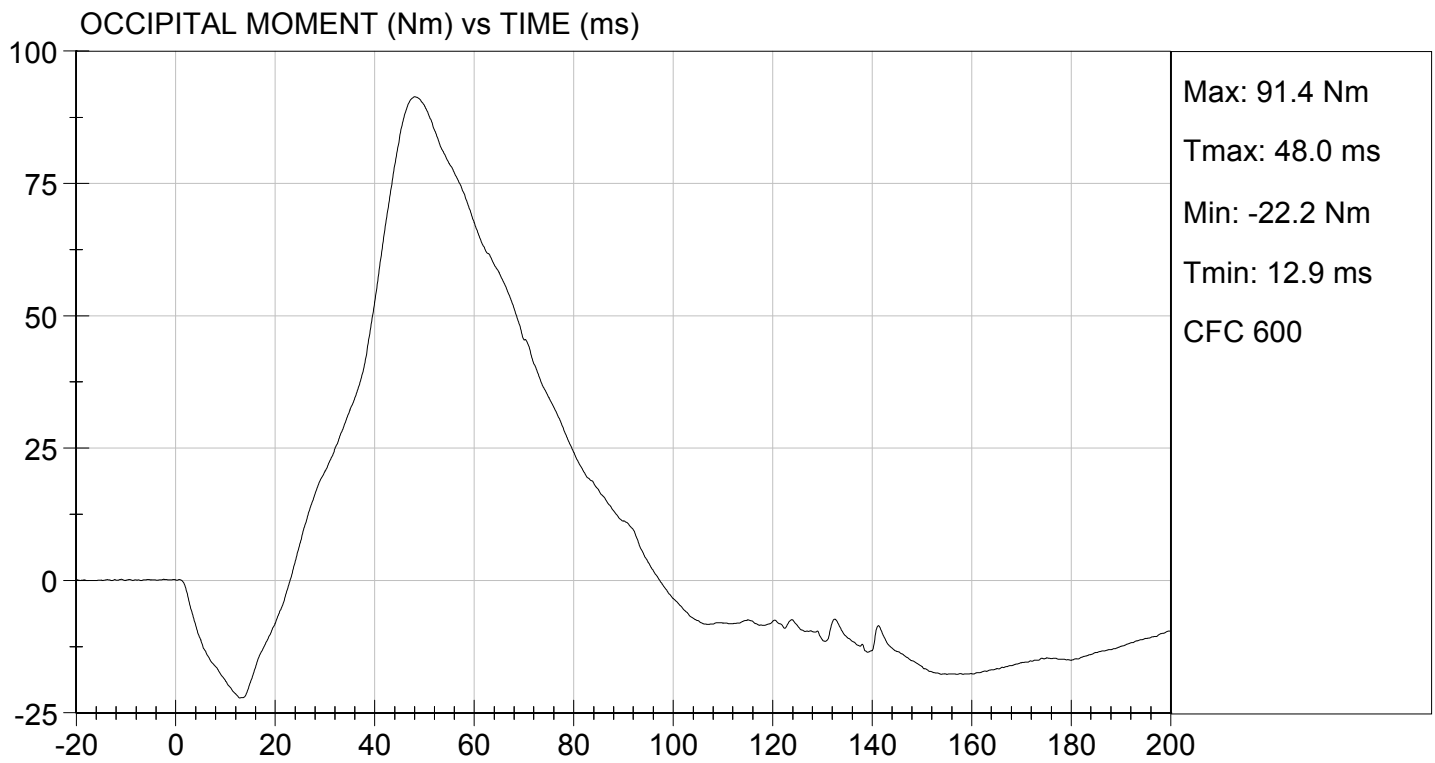
TEST DATE: 06/15/2016
TEST #: D162072





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

TEST DATE: 06/15/2016
TEST #: D162072

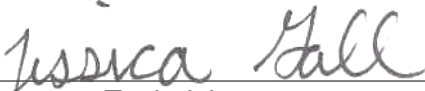


MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D: D162073

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22.1	Pass
Laboratory Relative Humidity		%	10 to 70	51	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	18.79	Pass
	20 ms	G's	14.00 to 19.00	16.71	Pass
	30 ms	G's	11.00 to 16.00	13.37	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	13.4	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	39.7	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	96.0	Pass
	Time	ms	72.0 to 82.0	76.5	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	158.9	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-61.5	Pass
	Time	ms	65.0 to 79.0	71.9	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	144.3	Pass
Overall Test Results					Pass


Laboratory Technician

06/15/2016

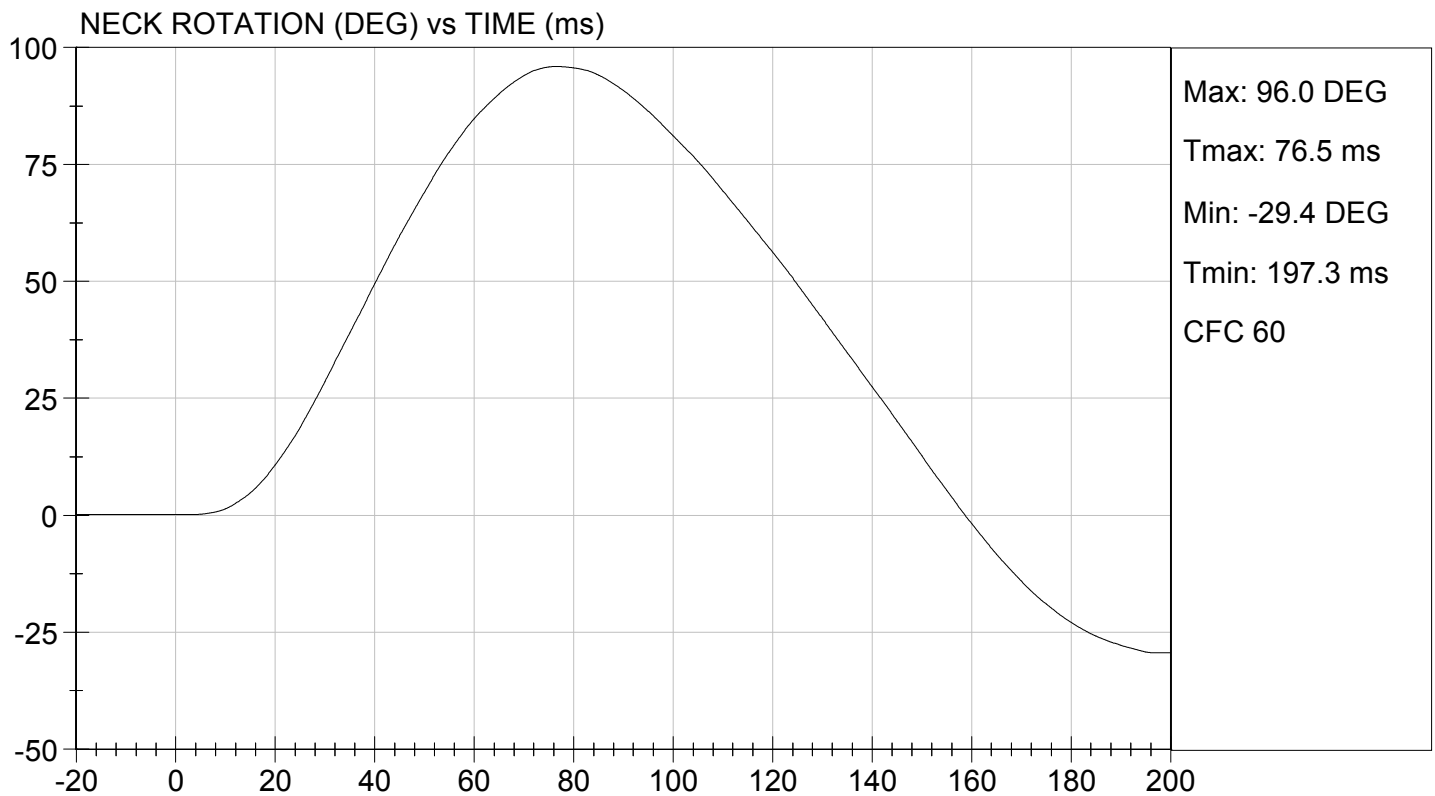
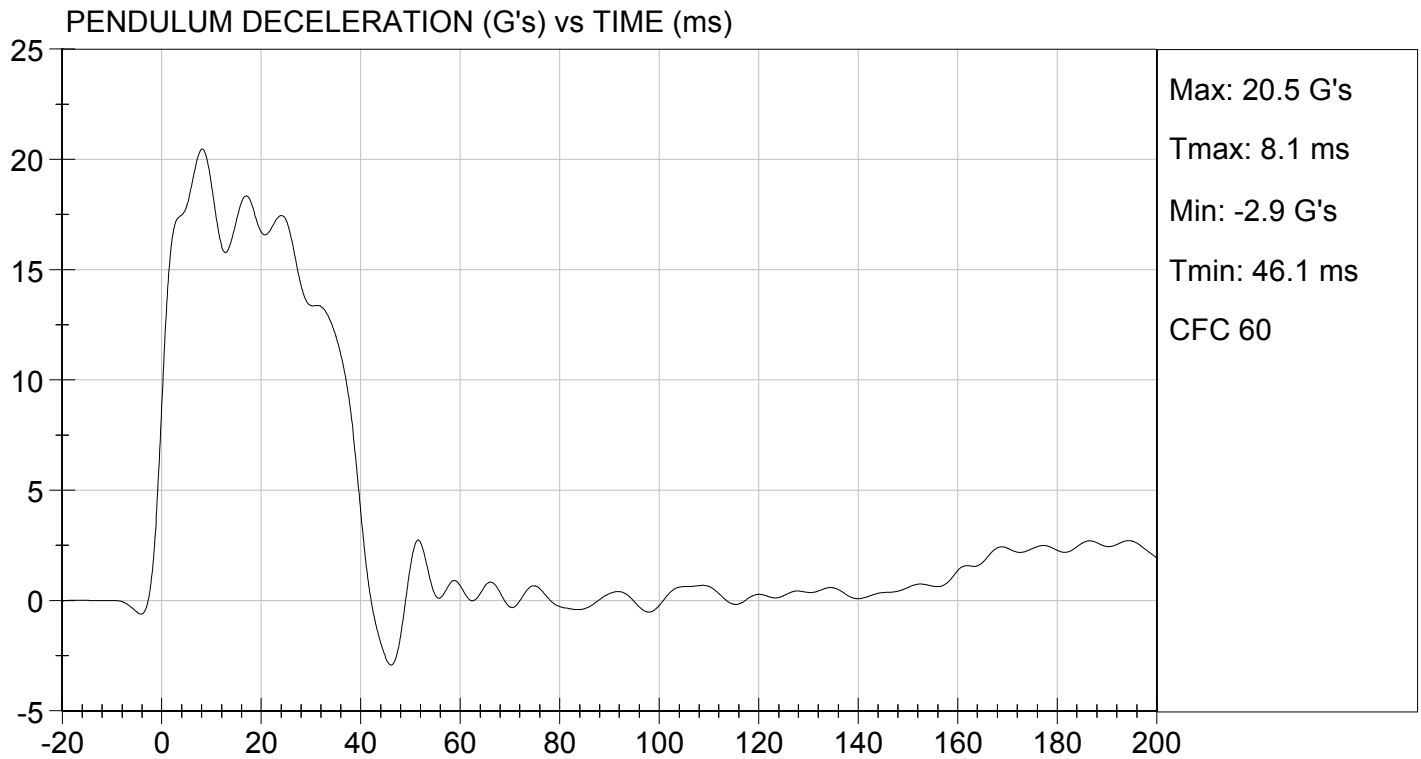
Test Date


Approved By



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

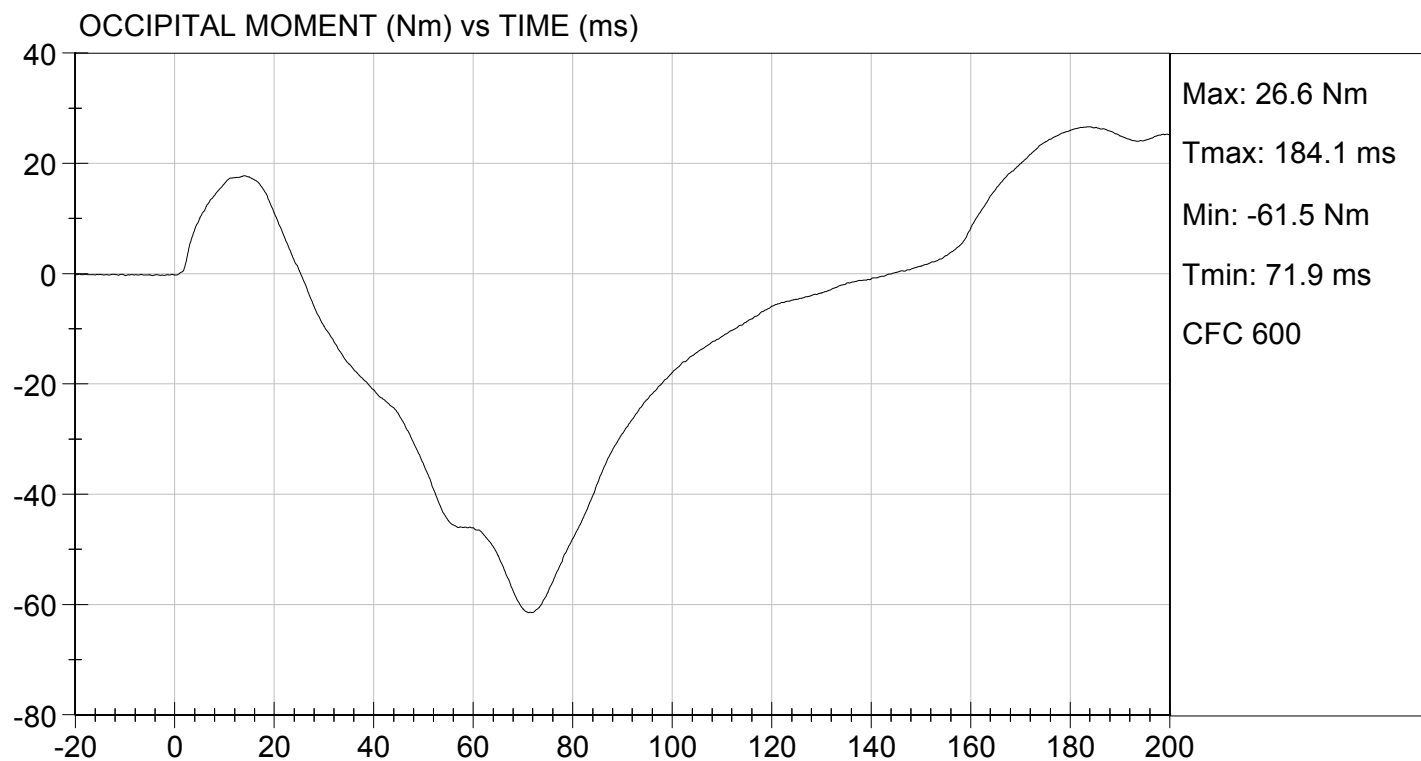
TEST DATE: 06/15/2016
TEST #: D162073





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

TEST DATE: 06/15/2016
TEST #: D162073

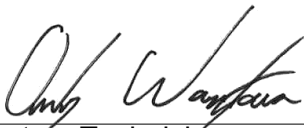


MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D: D162074

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,621	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.76	Pass
Internal Hysteresis	%	69 to 85	72	Pass
			Overall Test Results	Pass



Laboratory Technician

06/16/2016
Test Date

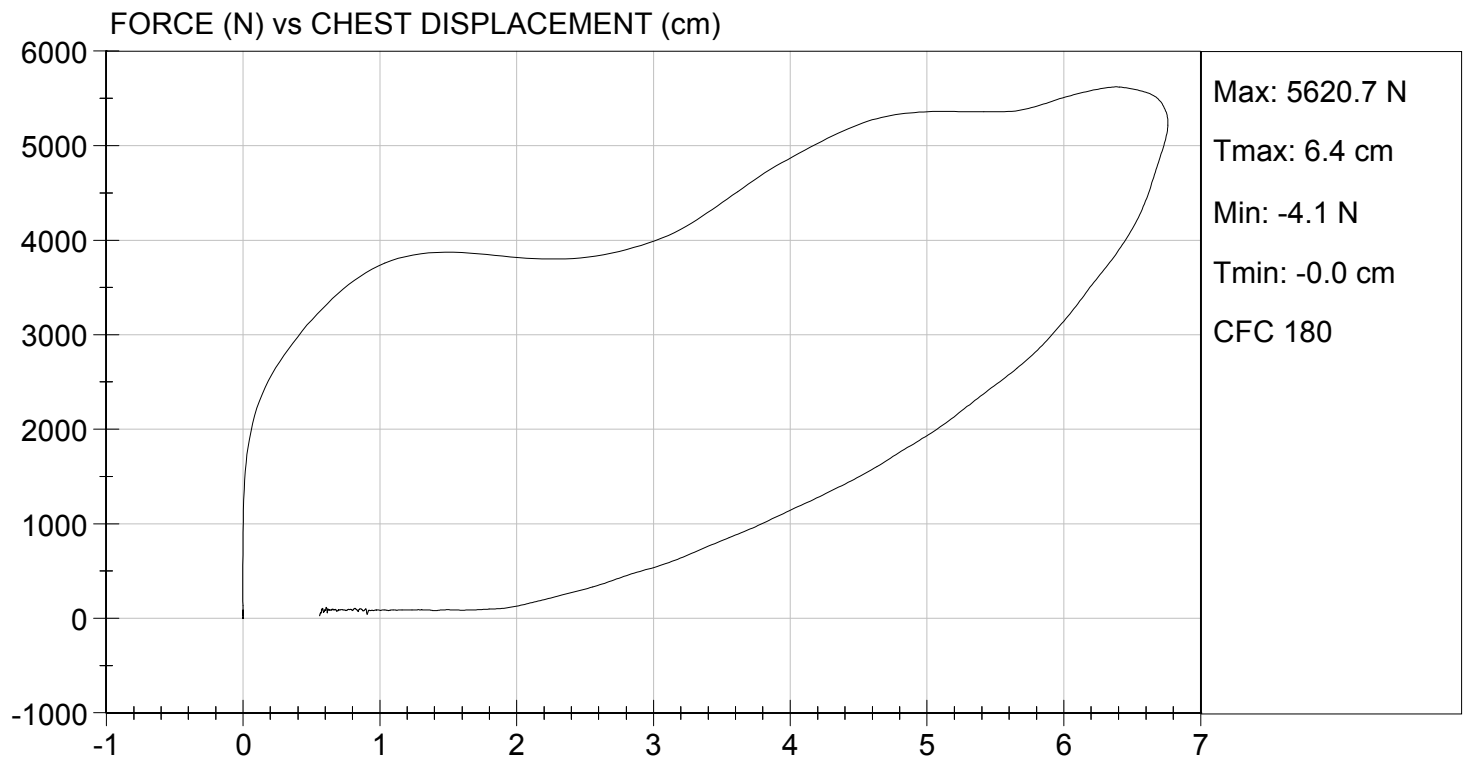


Approved By



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

TEST DATE: 06/16/2016
TEST #: D162074



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

ATD Serial No: 351

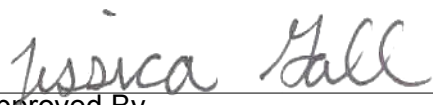
Test I.D: D162075

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	46	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	N	4715 to 5782	5,567	Pass
Overall Test Results				Pass



Laboratory Technician

06/16/2016
Test Date

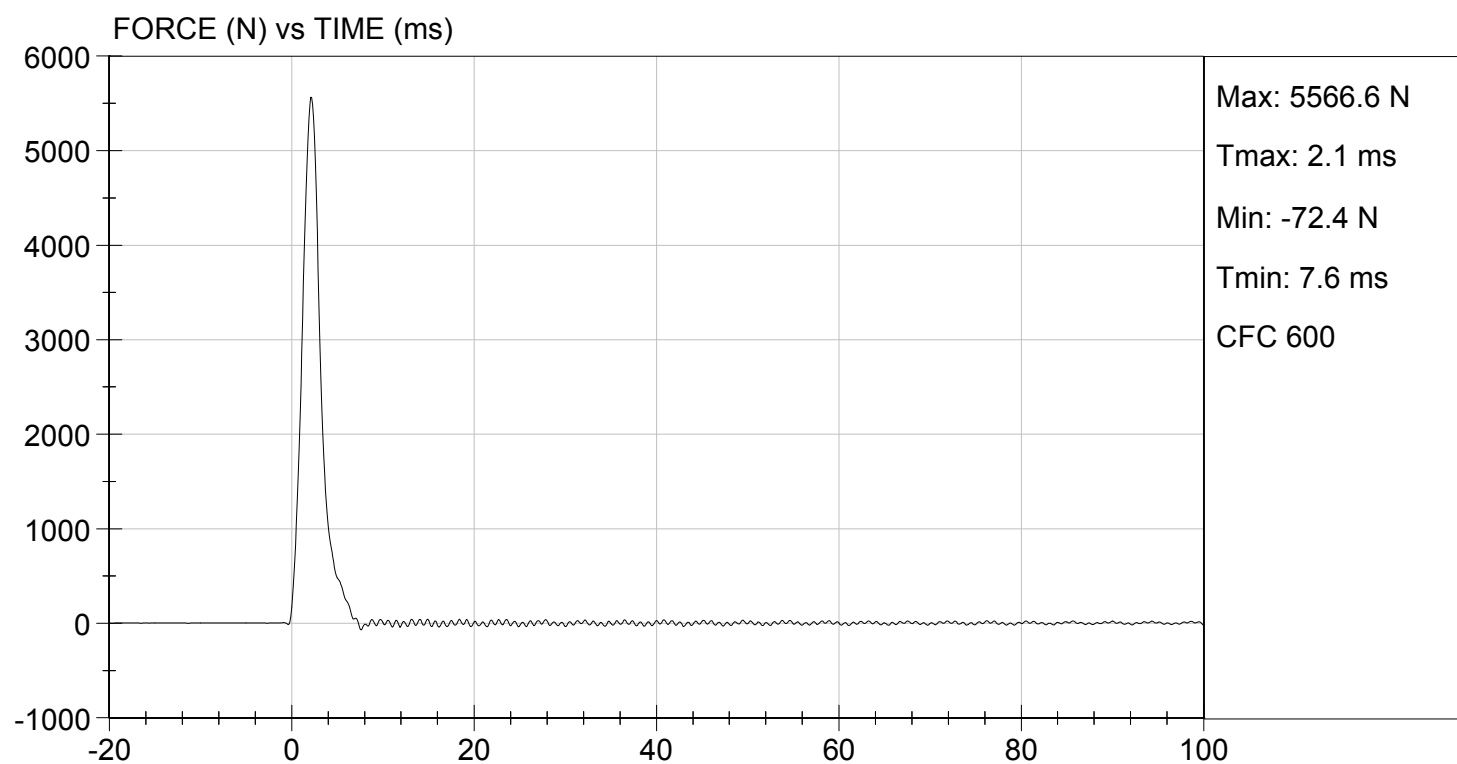


Approved By



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

TEST DATE: 06/16/2016
TEST #: D162075



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

ATD Serial No: 351

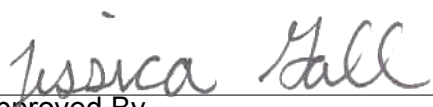
Test I.D: D162076

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	46	Pass
Probe Velocity	m/s	2.07 to 2.13	2.09	Pass
Peak Probe Force	N	4715 to 5782	5,154	Pass
Overall Test Results				Pass



Laboratory Technician

06/16/2016
Test Date

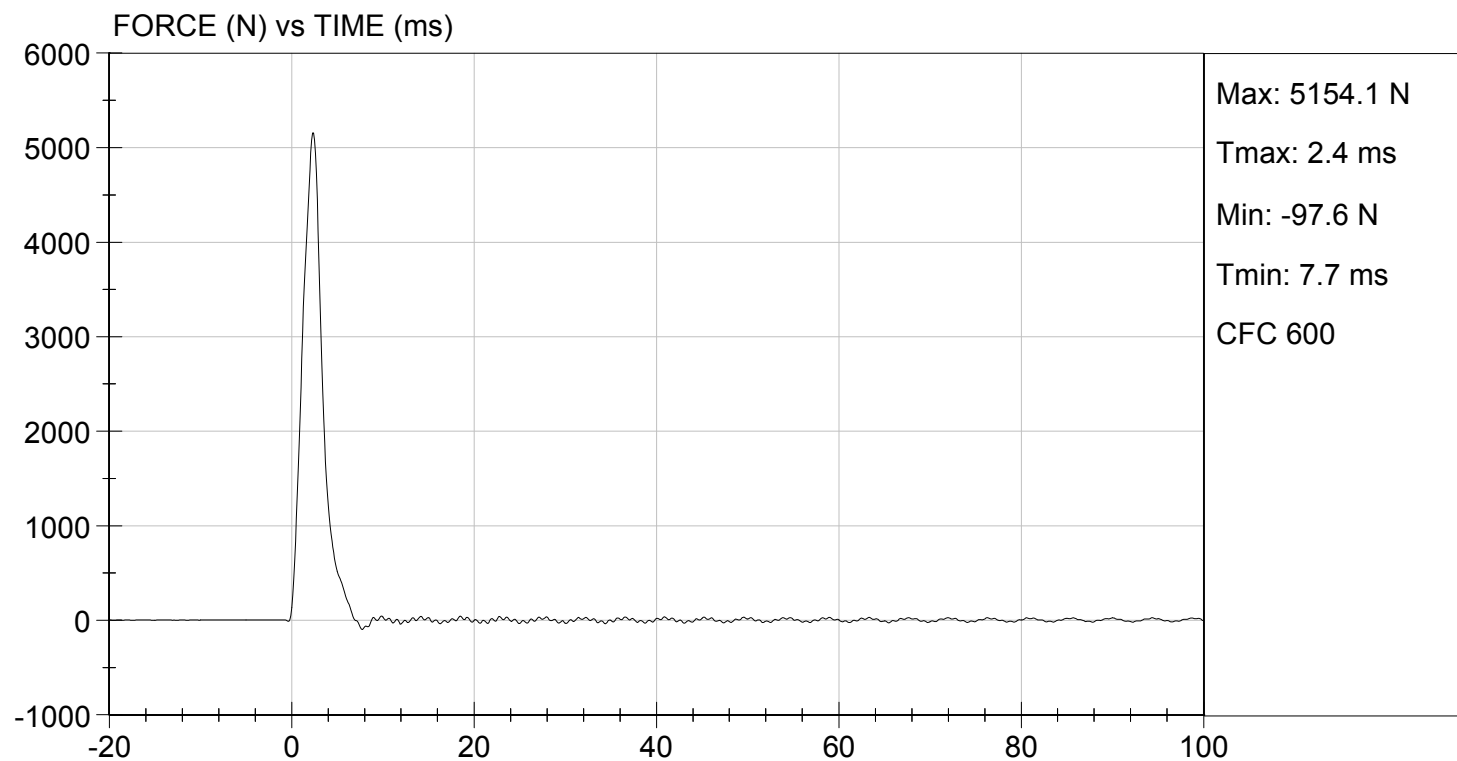


Approved By



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

TEST DATE: 06/16/2016
TEST #: D162076

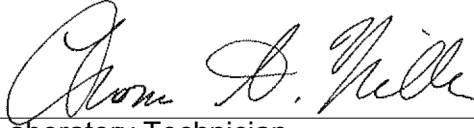


MGA RESEARCH CORPORATION
HIP-FEMUR FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

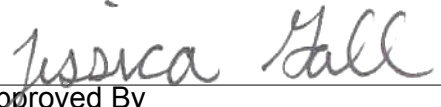
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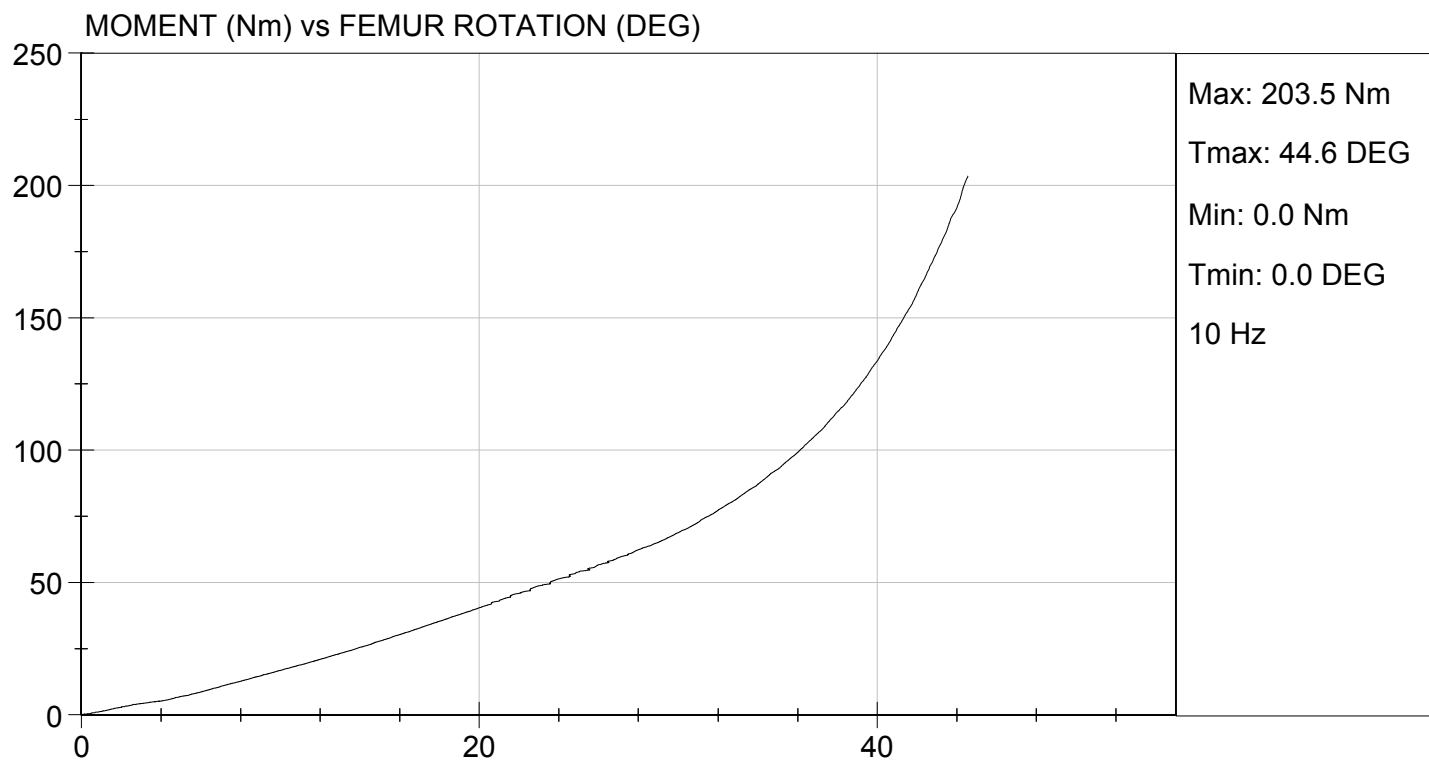
Test I.D: D162070

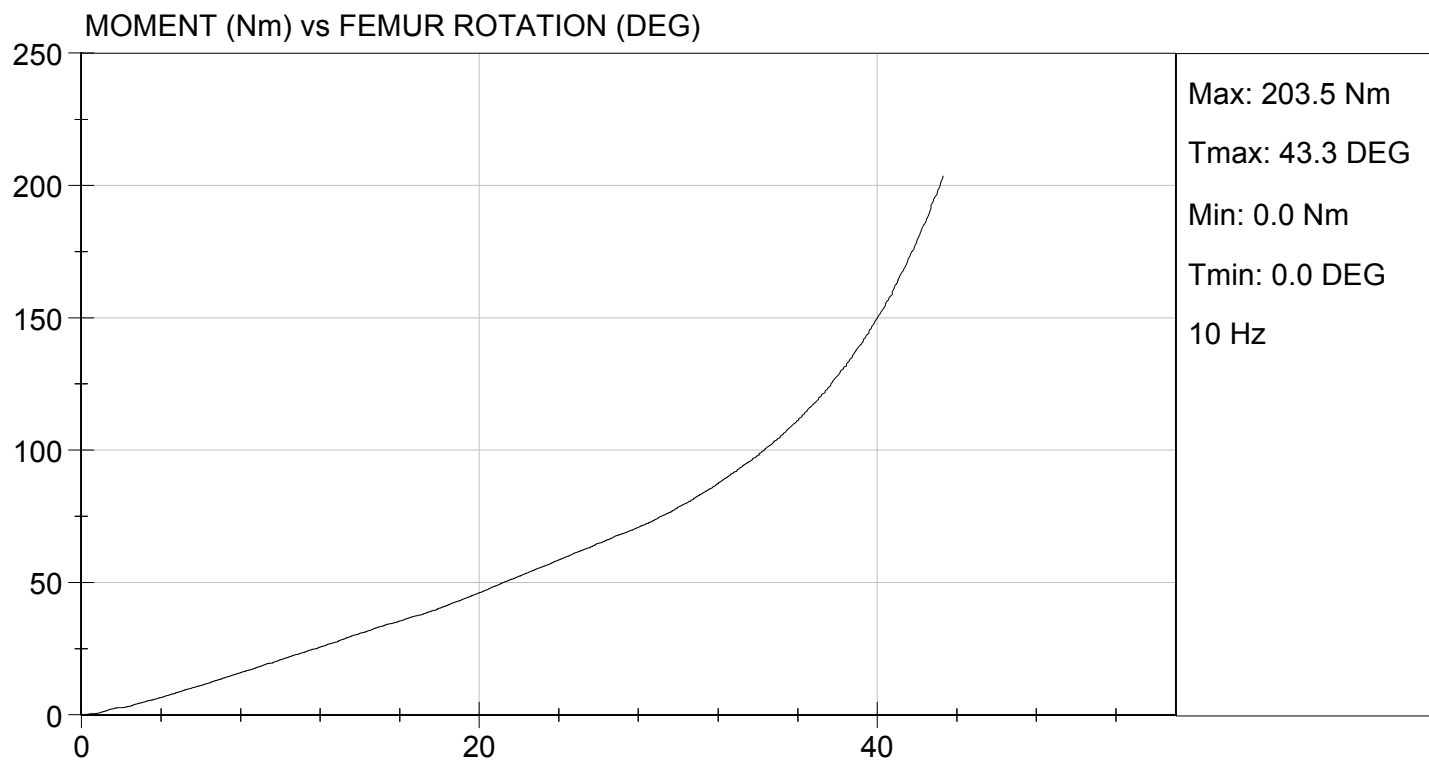
Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	22.1	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	51	51	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.2	6.3	Pass
30 Degrees	Nm	94.9 Nm Max	68.8	78.5	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	44.6	43.3	Pass
Overall Test Results					Pass


 Laboratory Technician

06/15/2016
 Test Date


 Approved By



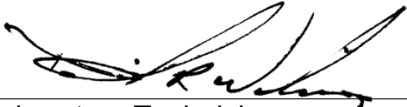


MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 50TH PERCENTILE MALE

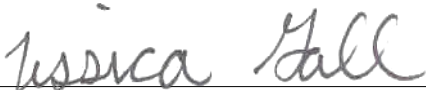
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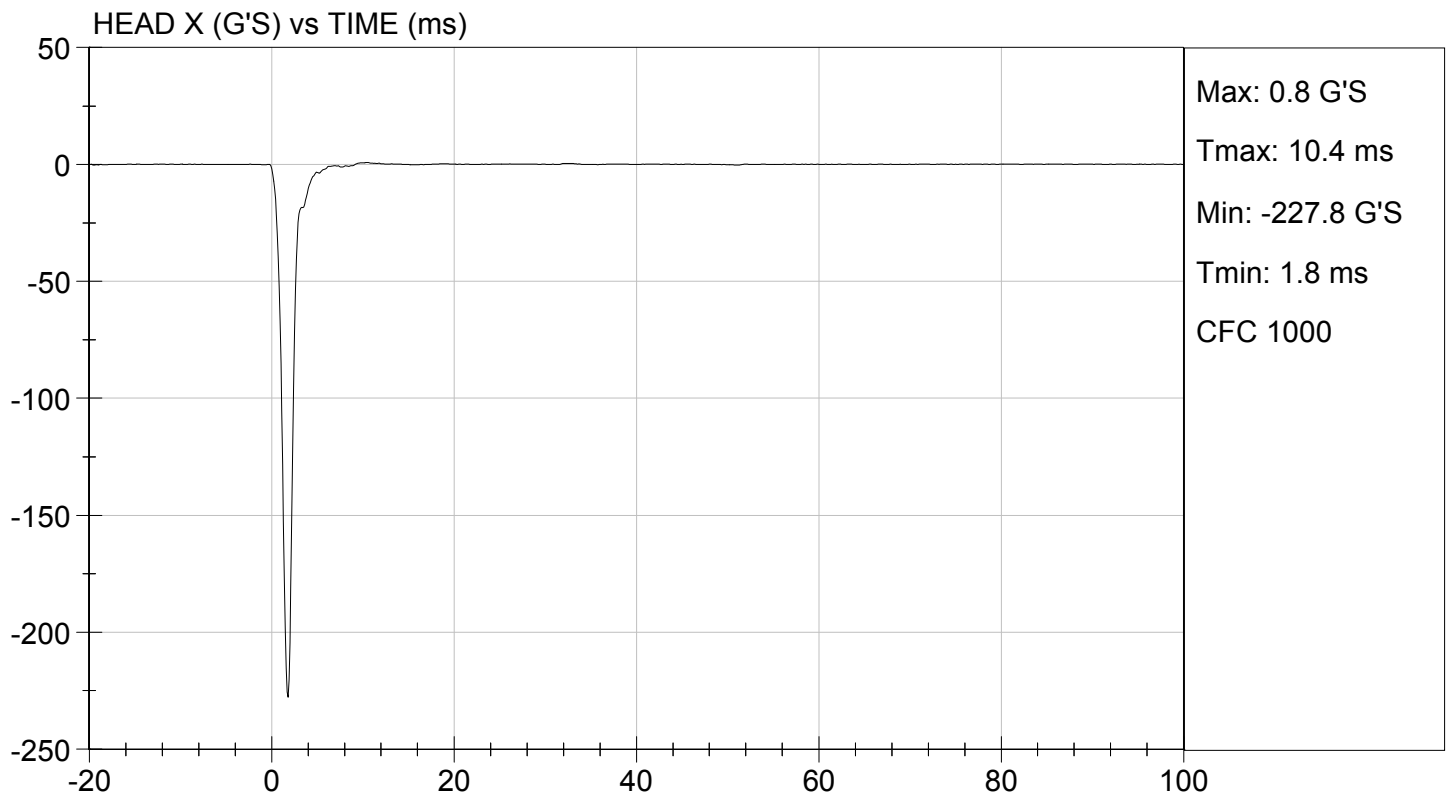
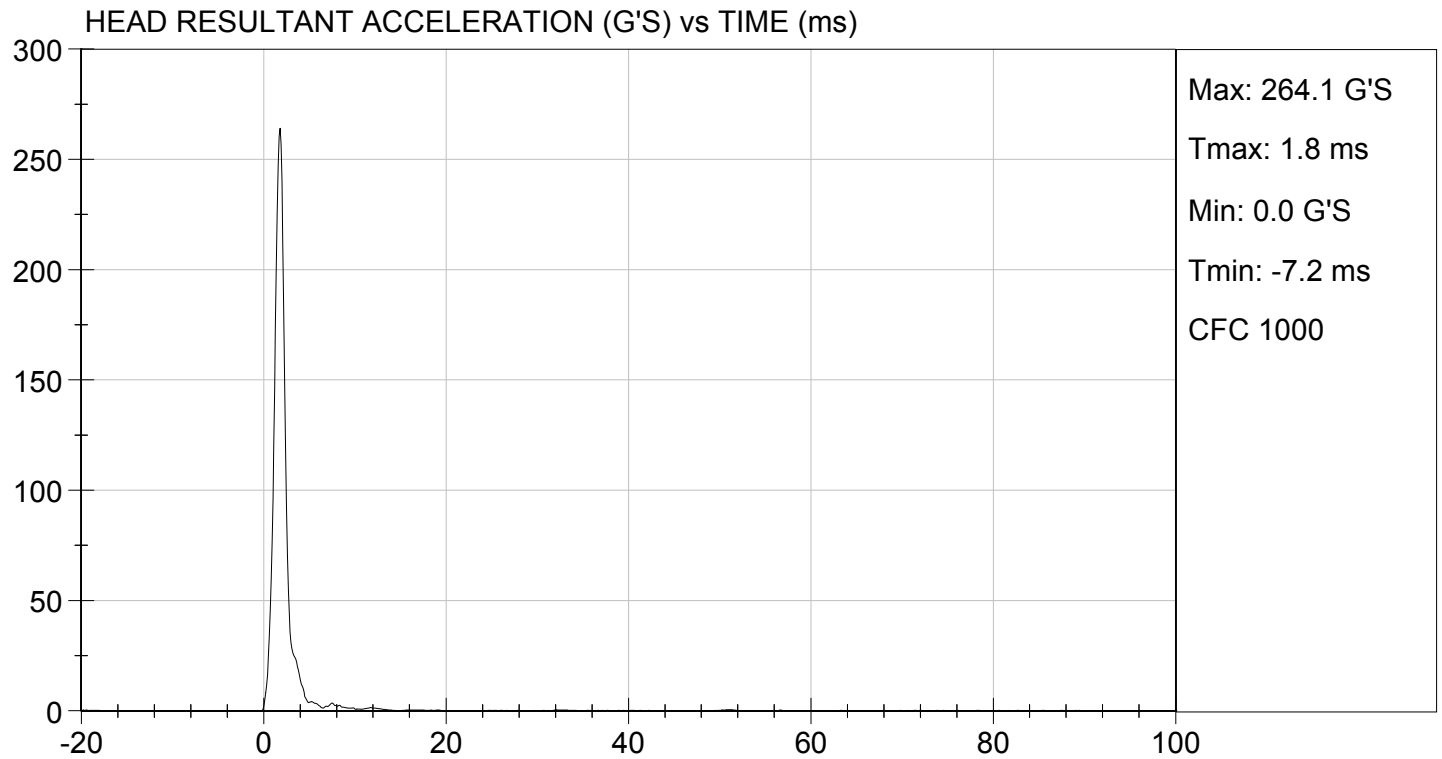
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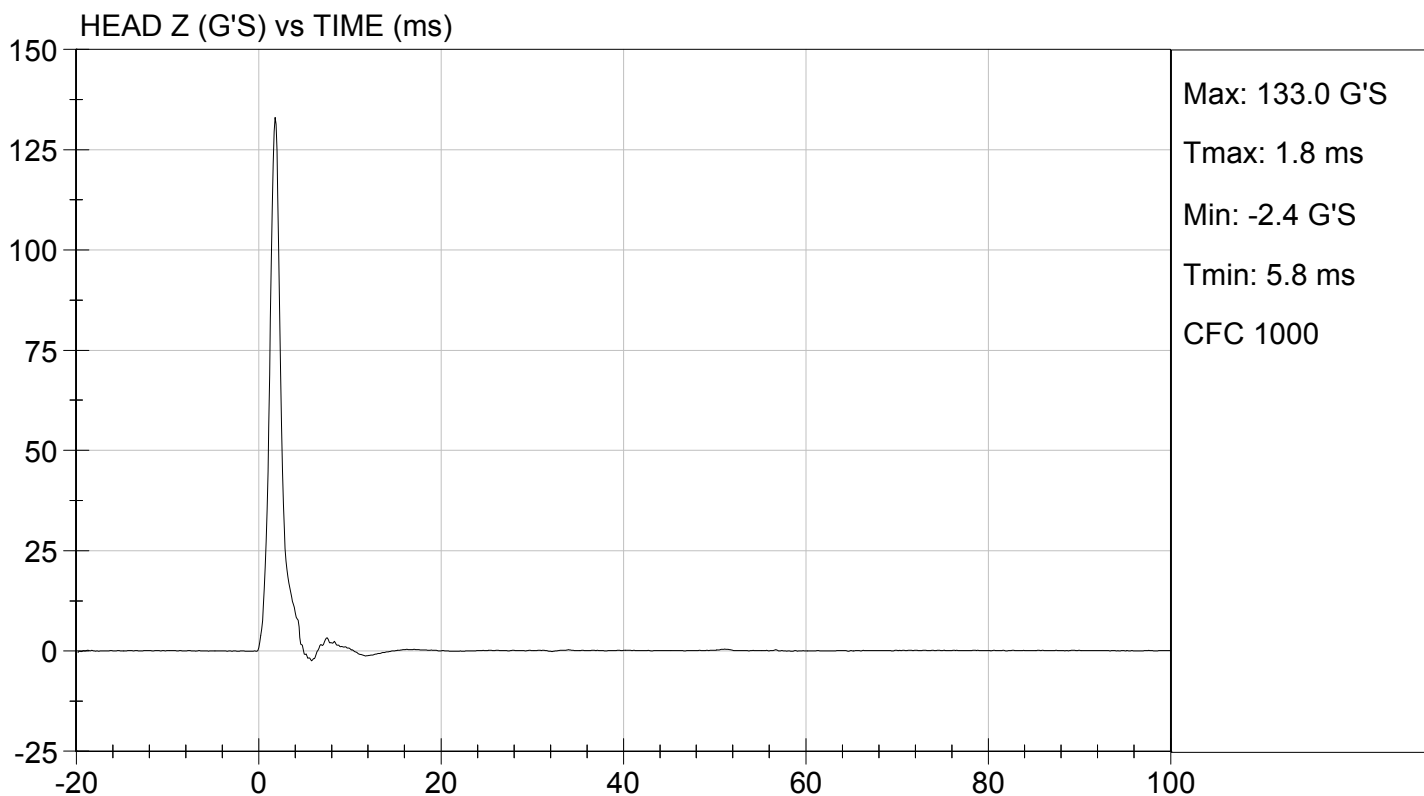
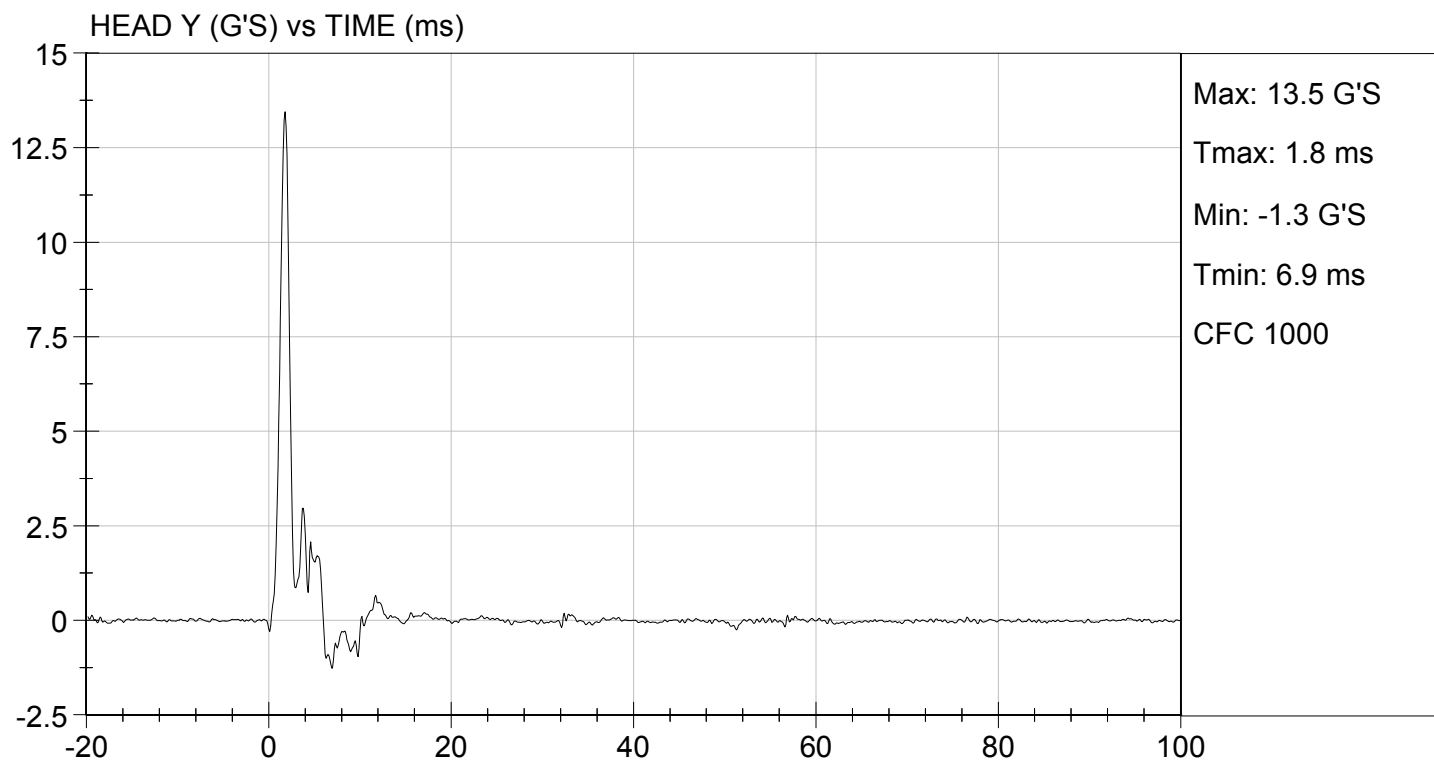
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Peak Resultant Acceleration	G's	225 to 275	264	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	13.5	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

06/30/2016
Test Date


Approved By



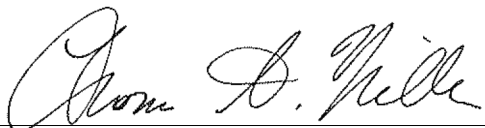


MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D: D162262

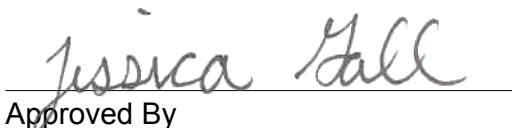
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.0	Pass
Laboratory Relative Humidity		%	10 to 70	46	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	22.86	Pass
	20 ms	G's	17.60 to 22.60	19.92	Pass
	30 ms	G's	12.50 to 18.50	15.38	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	15.3	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	39.0	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	73.3	Pass
	Time	ms	57.0 to 64.0	60.1	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	121.2	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	91.9	Pass
	Time	ms	47.0 to 58.0	51.9	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	99.1	Pass
Overall Test Results					Pass



Laboratory Technician

06/30/2016

Test Date

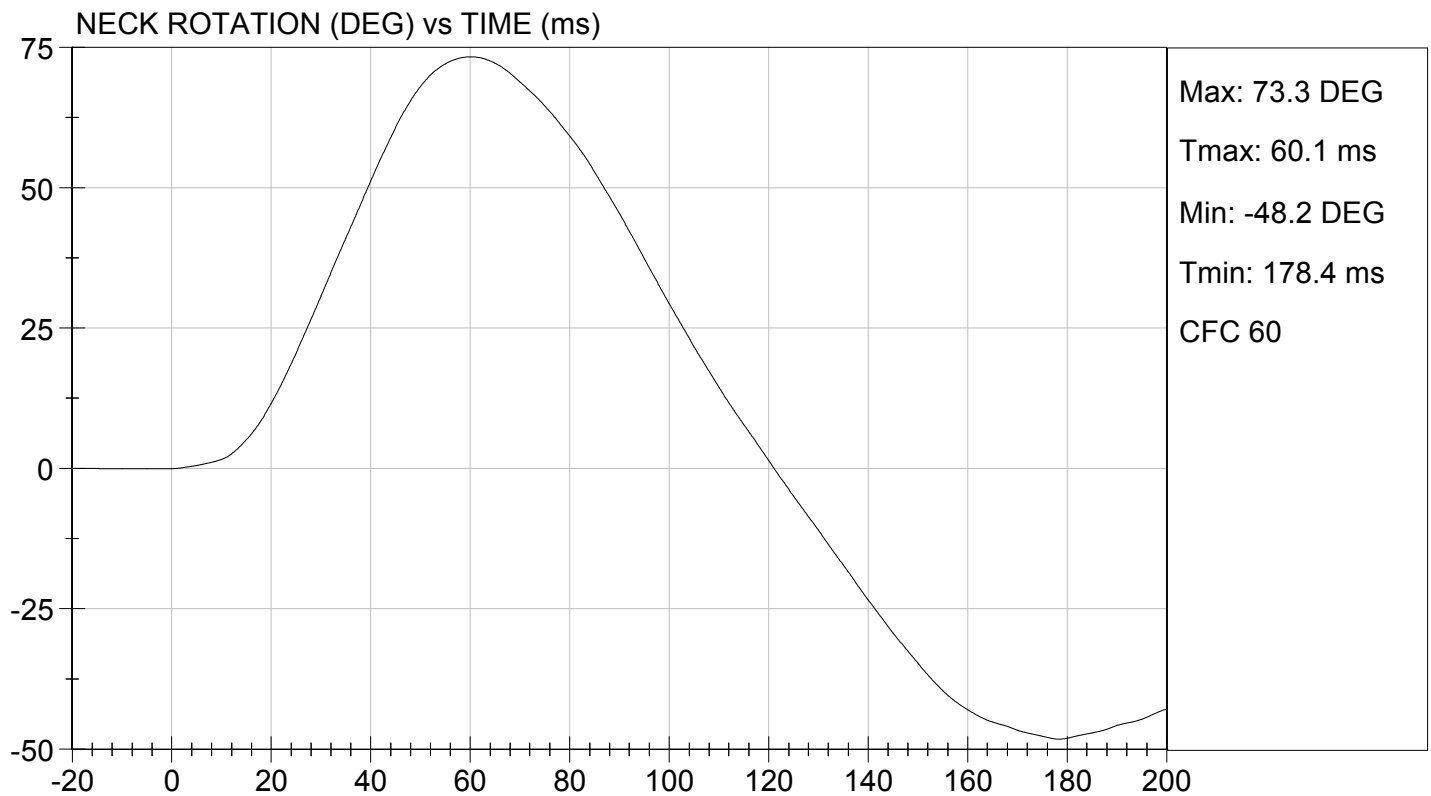
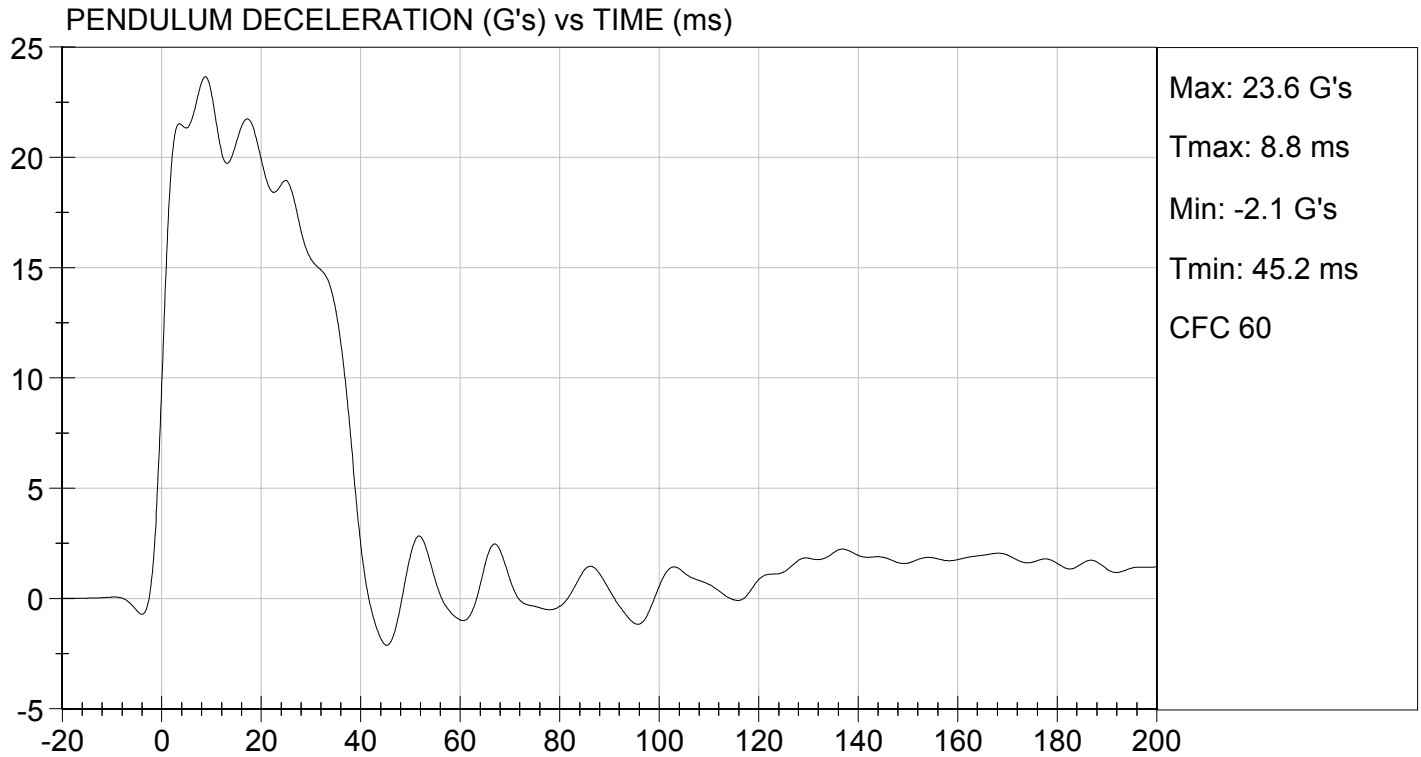


Approved By



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

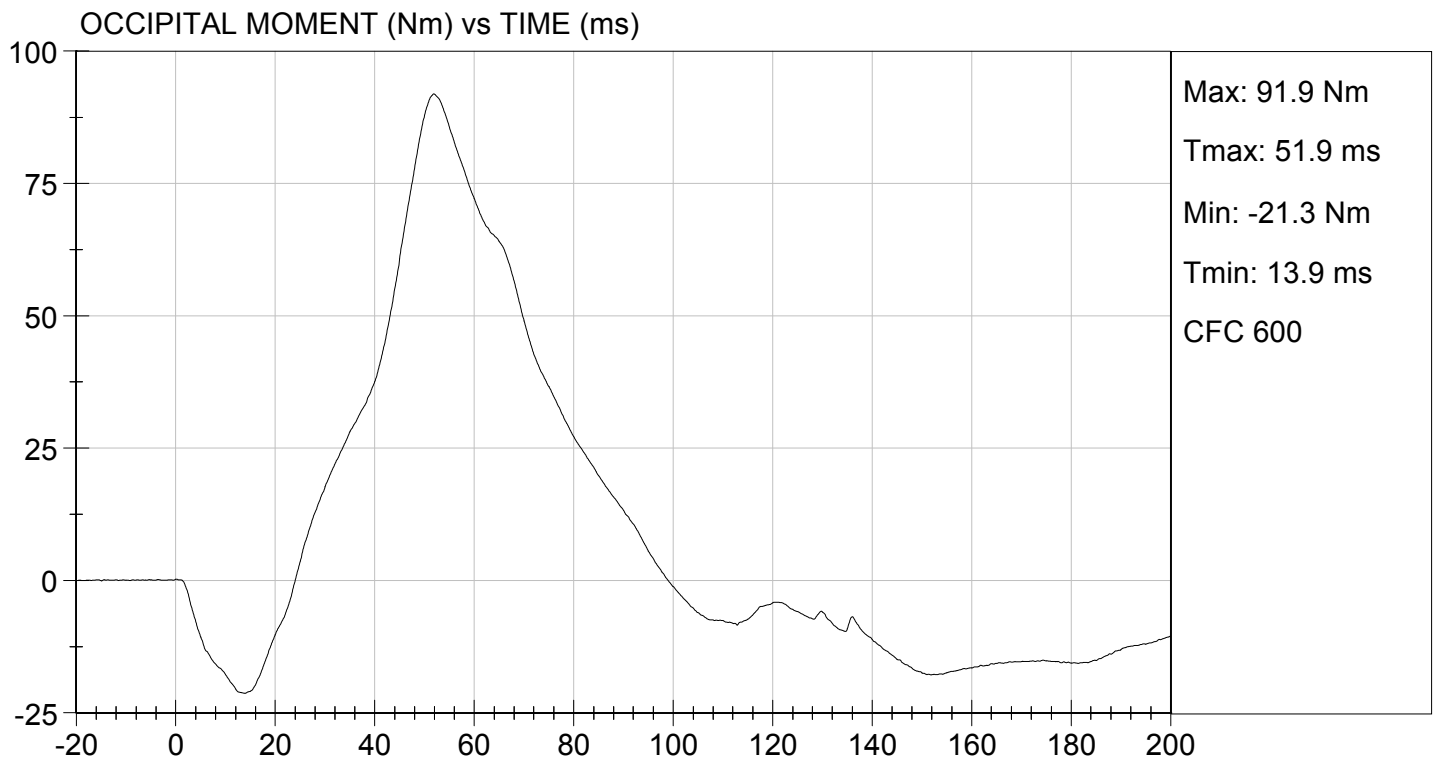
TEST DATE: 06/30/2016
TEST #: D162262





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

TEST DATE: 06/30/2016
TEST #: D162262



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

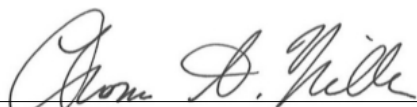
ATD Serial No: 351

Test I.D: D162263

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	46	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.05	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	19.19	Pass
	20 ms	G's	14.00 to 19.00	18.37	Pass
	30 ms	G's	11.00 to 16.00	14.32	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	14.9	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	100.0	Pass
	Time	ms	72.0 to 82.0	79.8	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	164.4	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-60.6	Pass
	Time	ms	65.0 to 79.0	72.5	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	147.3	Pass
Overall Test Results					Pass


 Laboratory Technician

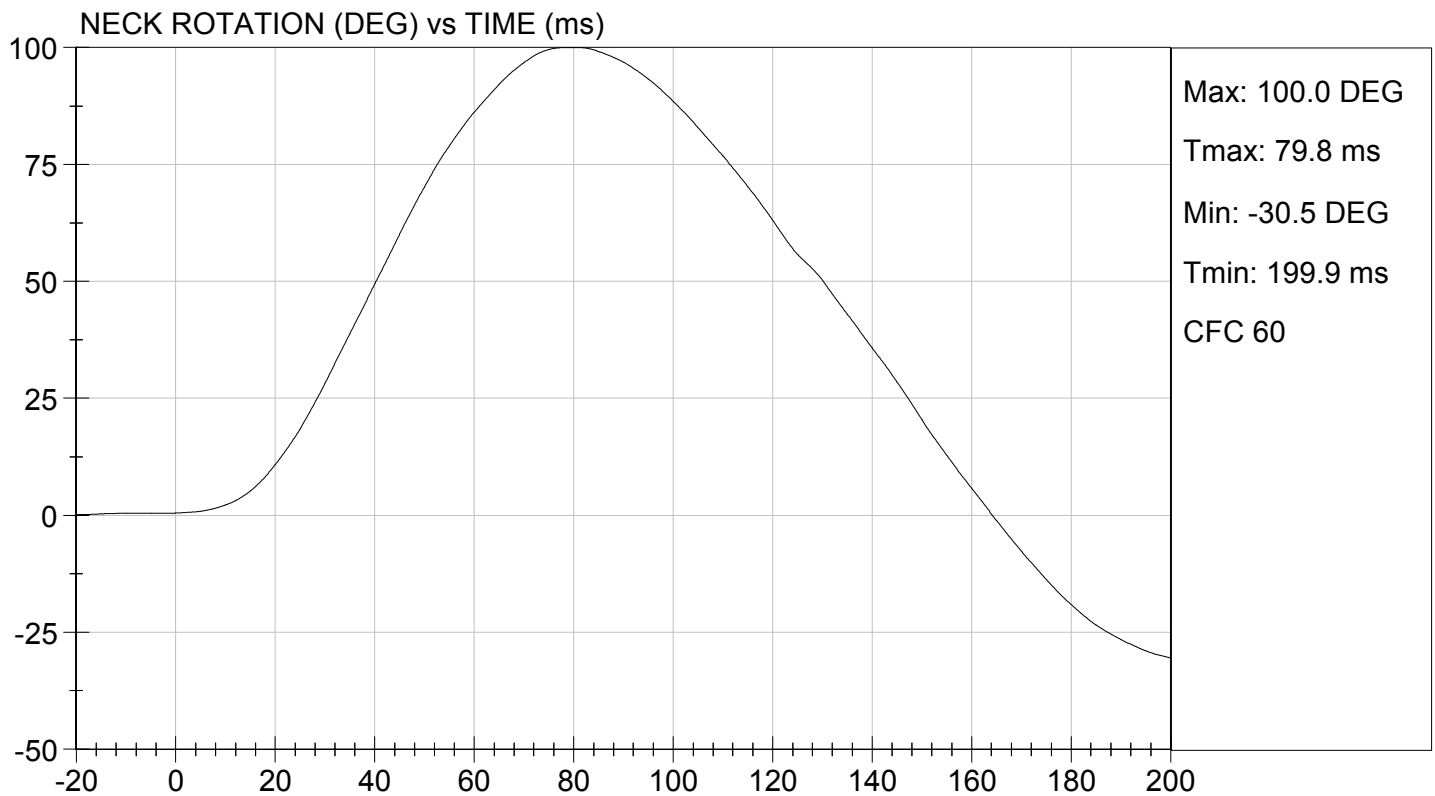
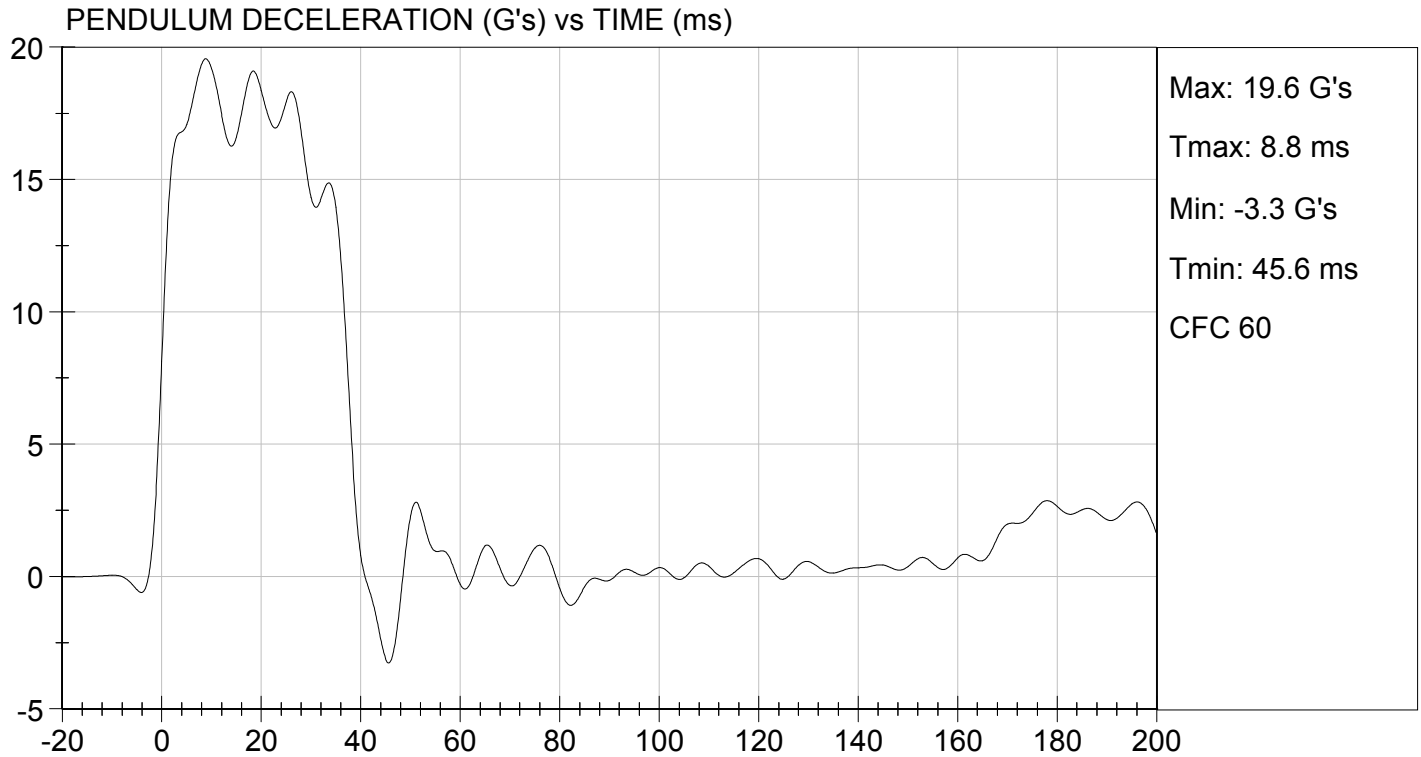
06/30/2016
 Test Date


 Approved By



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

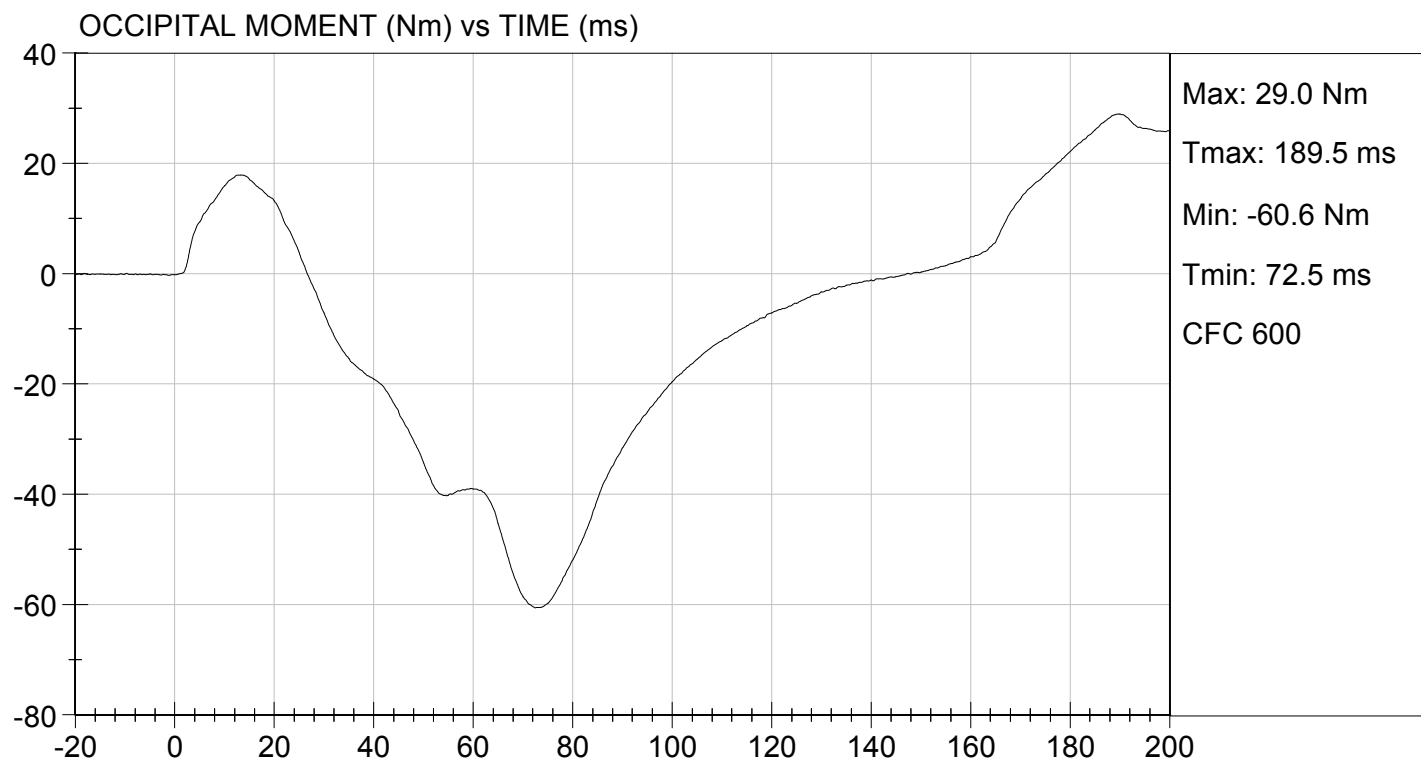
TEST DATE: 06/30/2016
TEST #: D162263





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

TEST DATE: 06/30/2016
TEST #: D162263



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

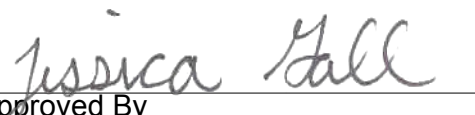
ATD Serial No: 351

Test I.D: D162264

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	6.60	Pass
Peak Probe Force	N	5159 to 5893	5,535	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.71	Pass
Internal Hysteresis	%	69 to 85	73	Pass
			Overall Test Results	Pass


Laboratory Technician

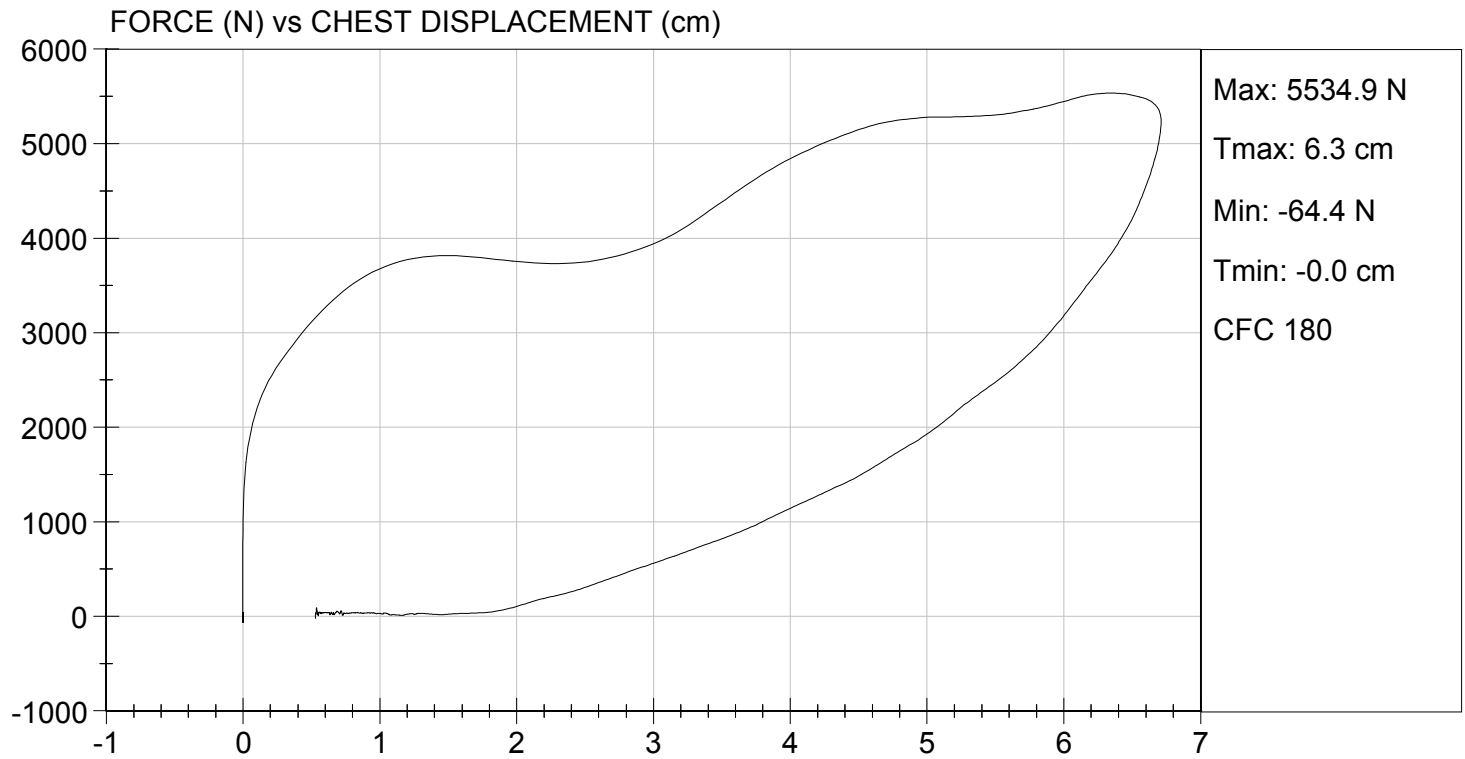
06/30/2016
Test Date


Approved By



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

TEST DATE: 06/30/2016
TEST #: D162264



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

ATD Serial No: 351

Test I.D: D162265

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	46	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	N	4715 to 5782	5,429	Pass
Overall Test Results				Pass


Laboratory Technician

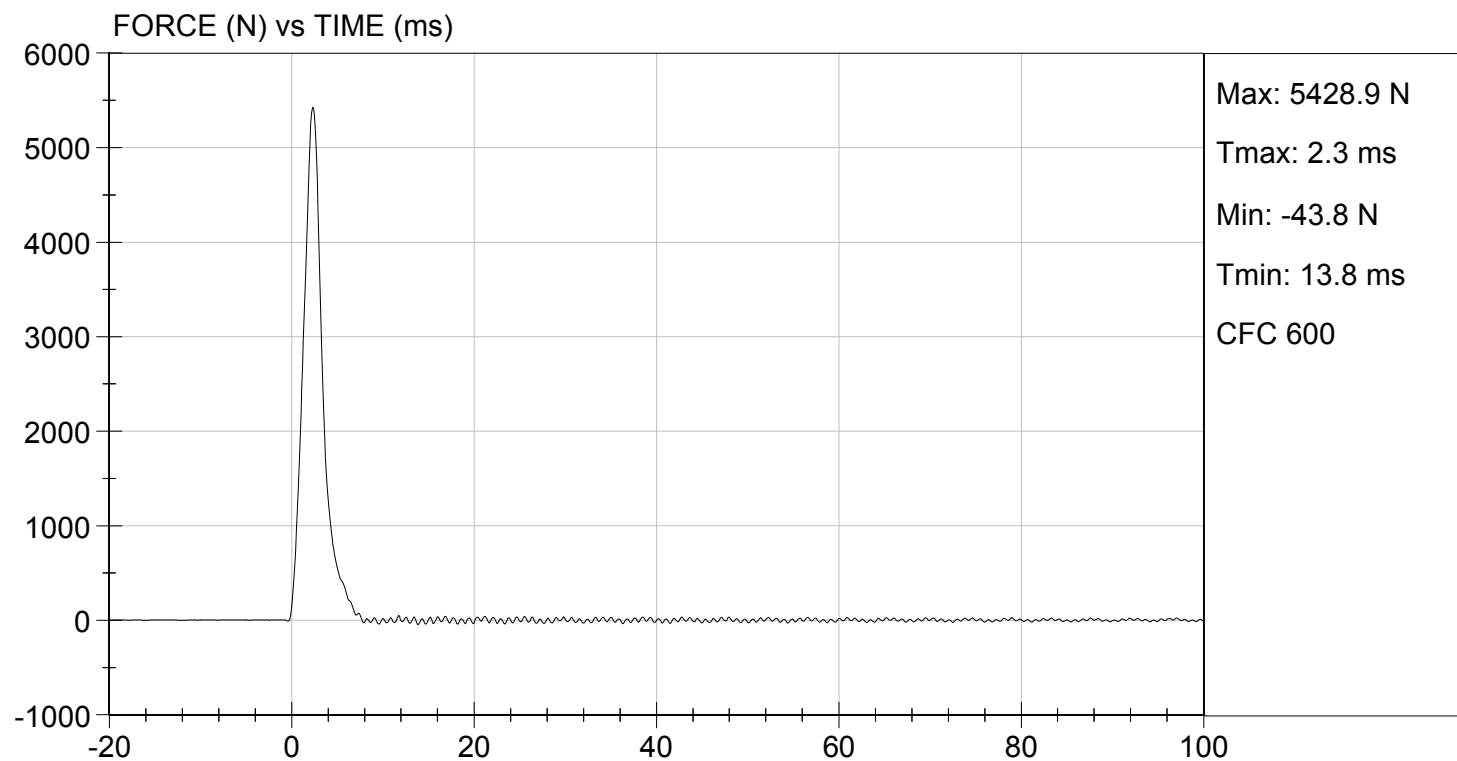
06/30/2016
Test Date


Approved By



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

TEST DATE: 06/30/2016
TEST #: D162265



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

ATD Serial No: 351

Test I.D: D162266

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	46	Pass
Probe Velocity	m/s	2.07 to 2.13	2.09	Pass
Peak Probe Force	N	4715 to 5782	5,667	Pass
Overall Test Results				Pass


Laboratory Technician


Approved By

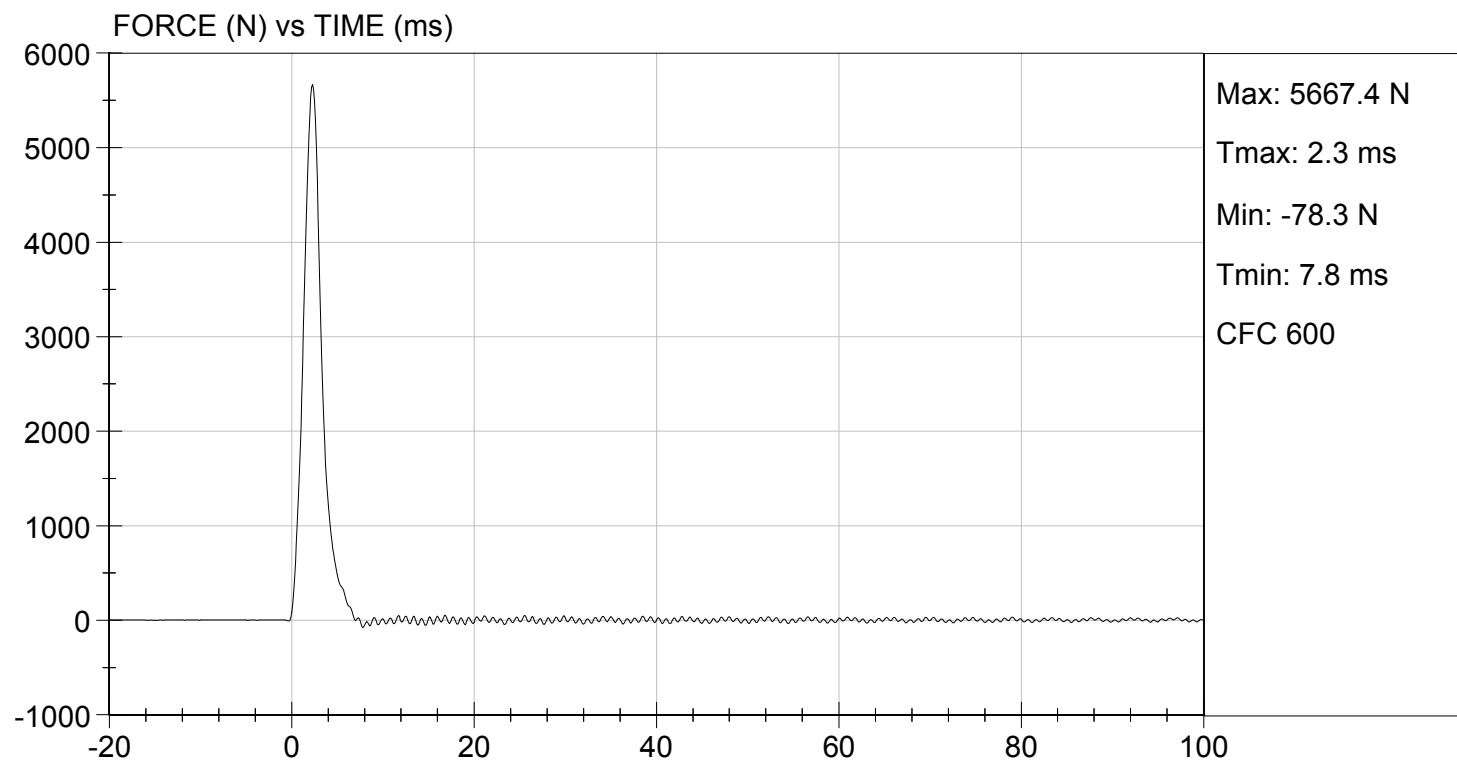
06/30/2016

Test Date



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

TEST DATE: 06/30/2016
TEST #: D162266



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

ATD Serial No: 351

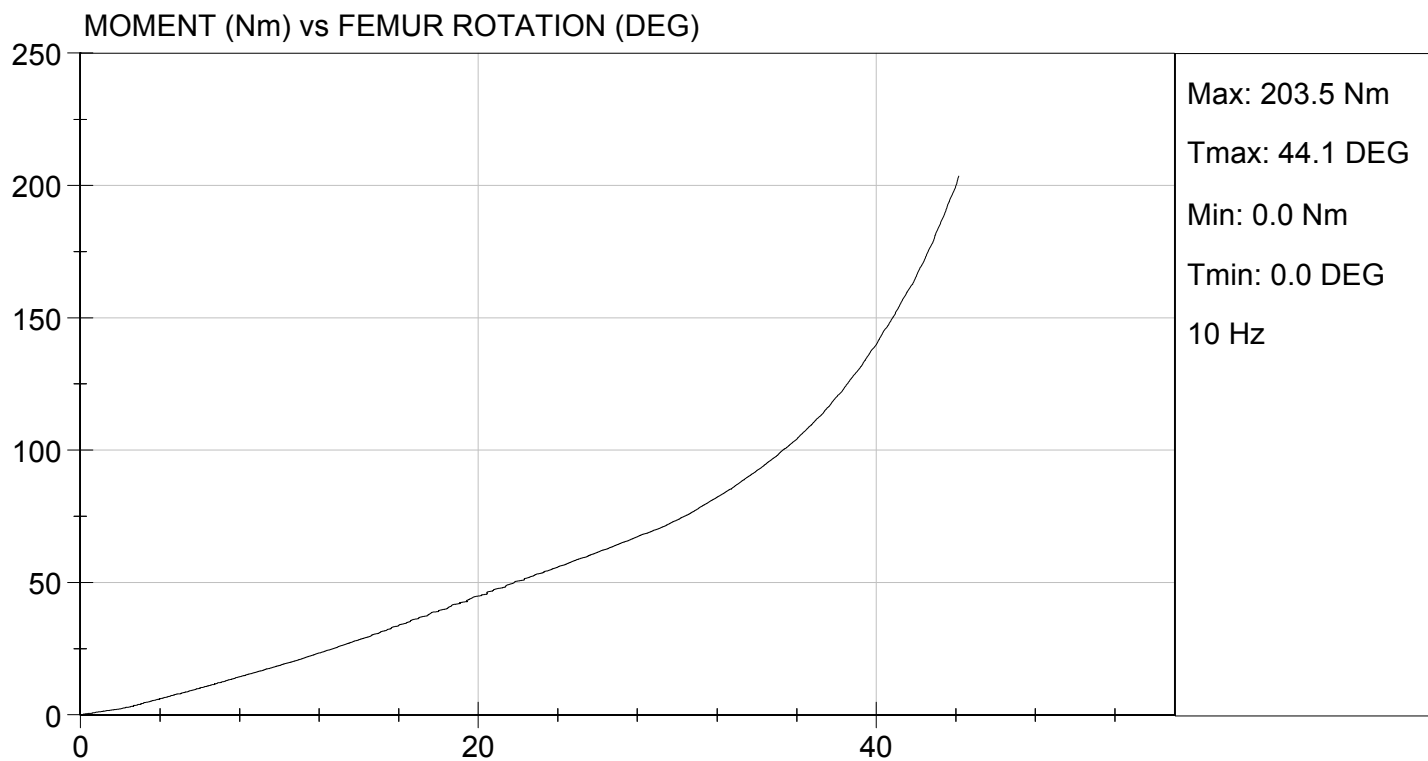
Test I.D: D162260

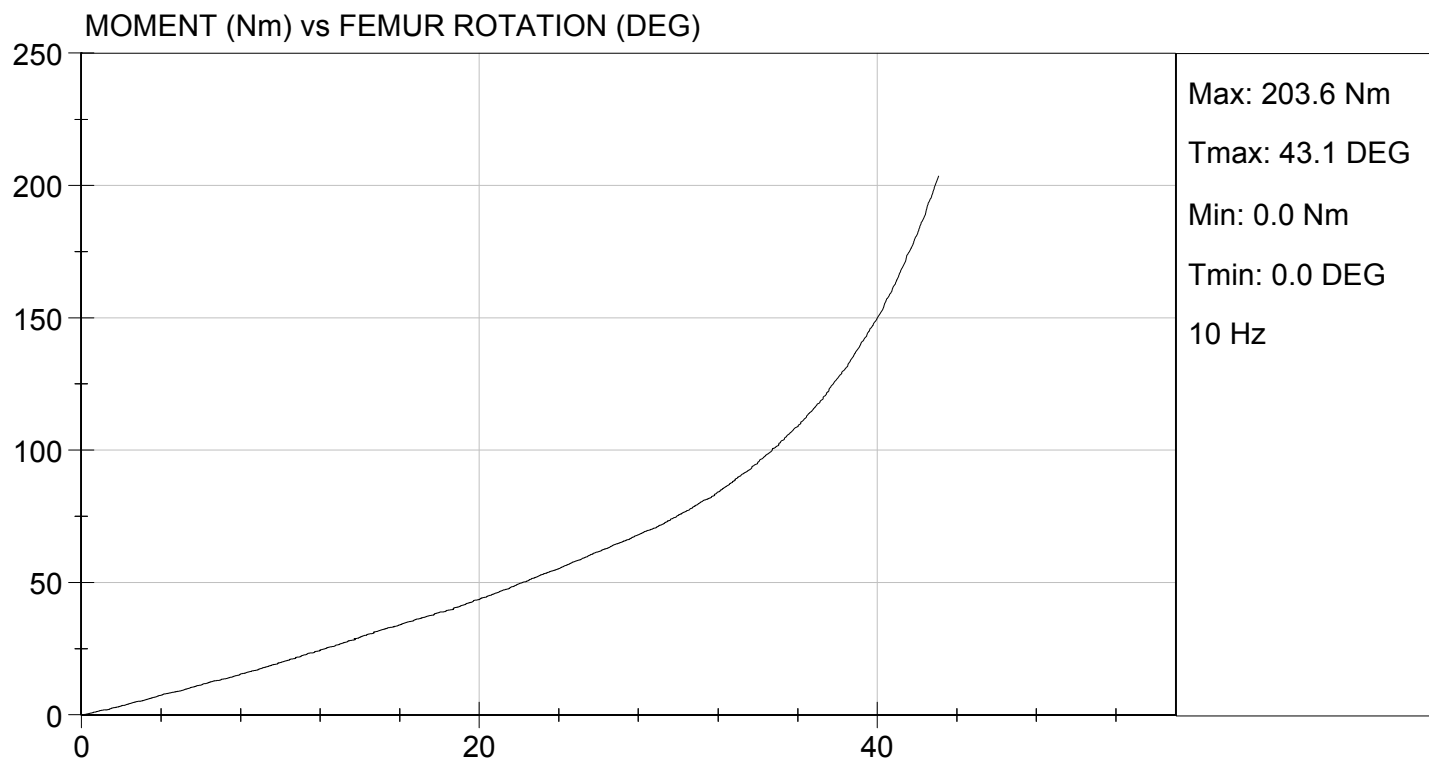
Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.2	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	47	47	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.2	6.2	Pass
30 Degrees	Nm	94.9 Nm Max	73.7	75.4	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	44.1	43.1	Pass
Overall Test Results					Pass


 Laboratory Technician

06/30/2016
 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: D162191

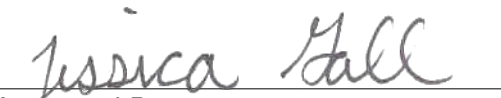
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	49	Pass
Peak Resultant Acceleration	G's	250 to 300	290	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-2.1	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass



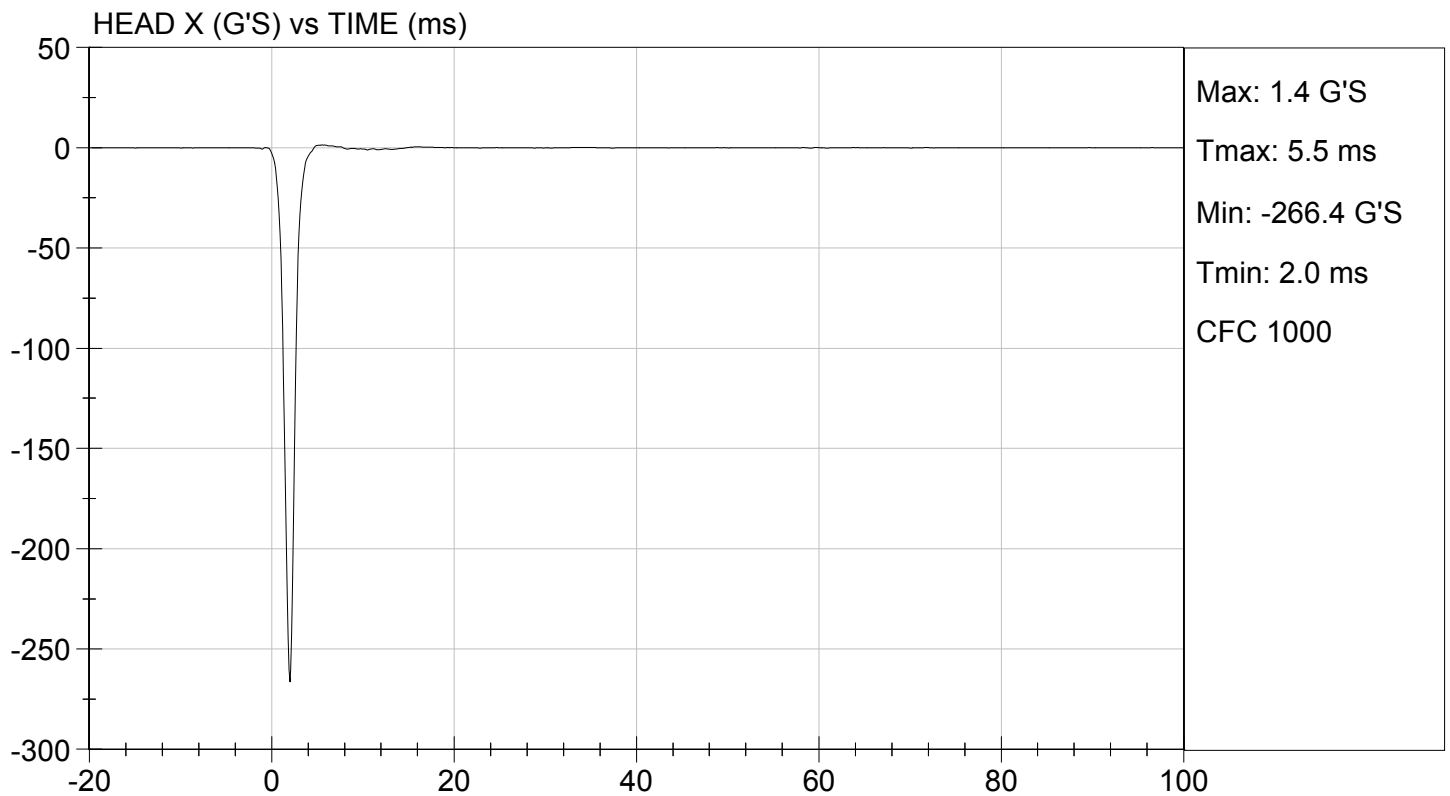
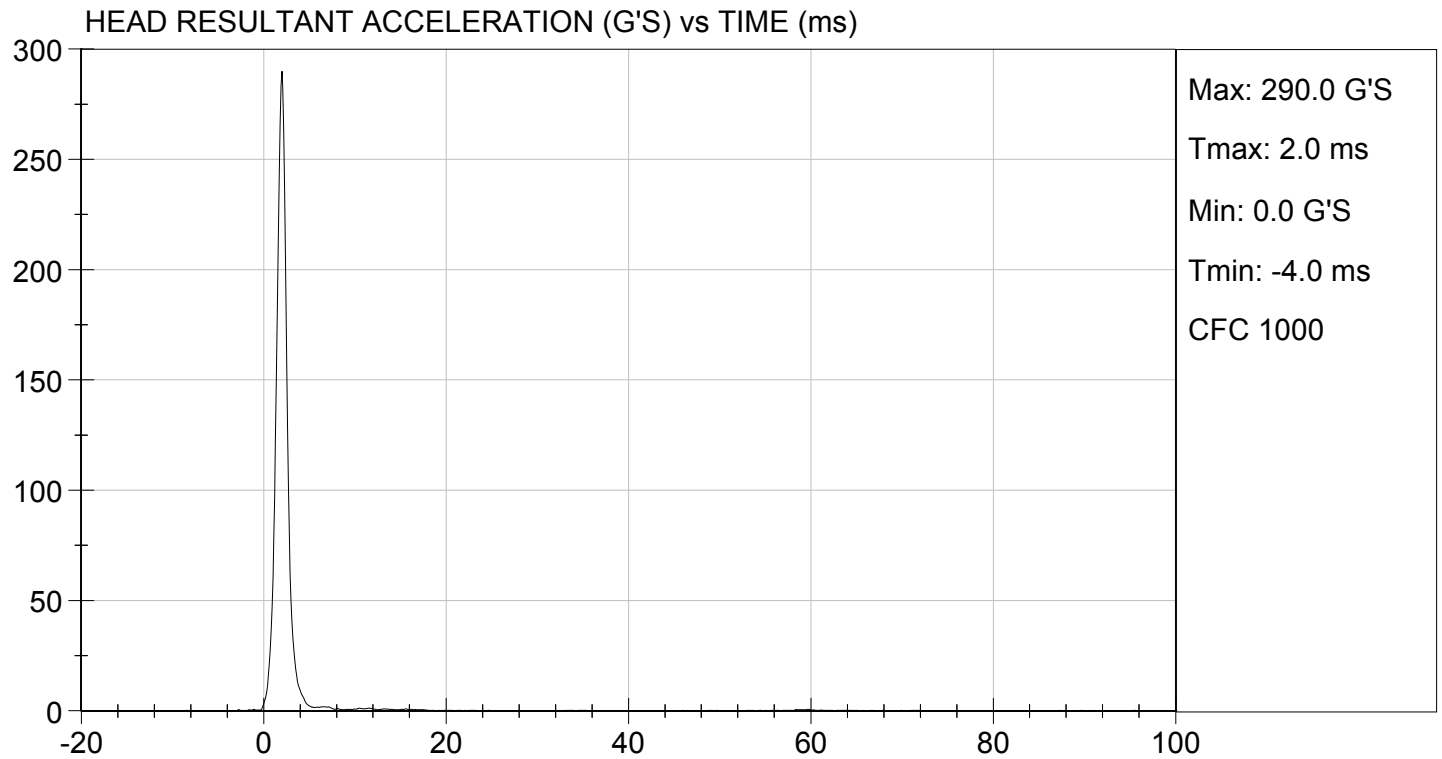
Laboratory Technician

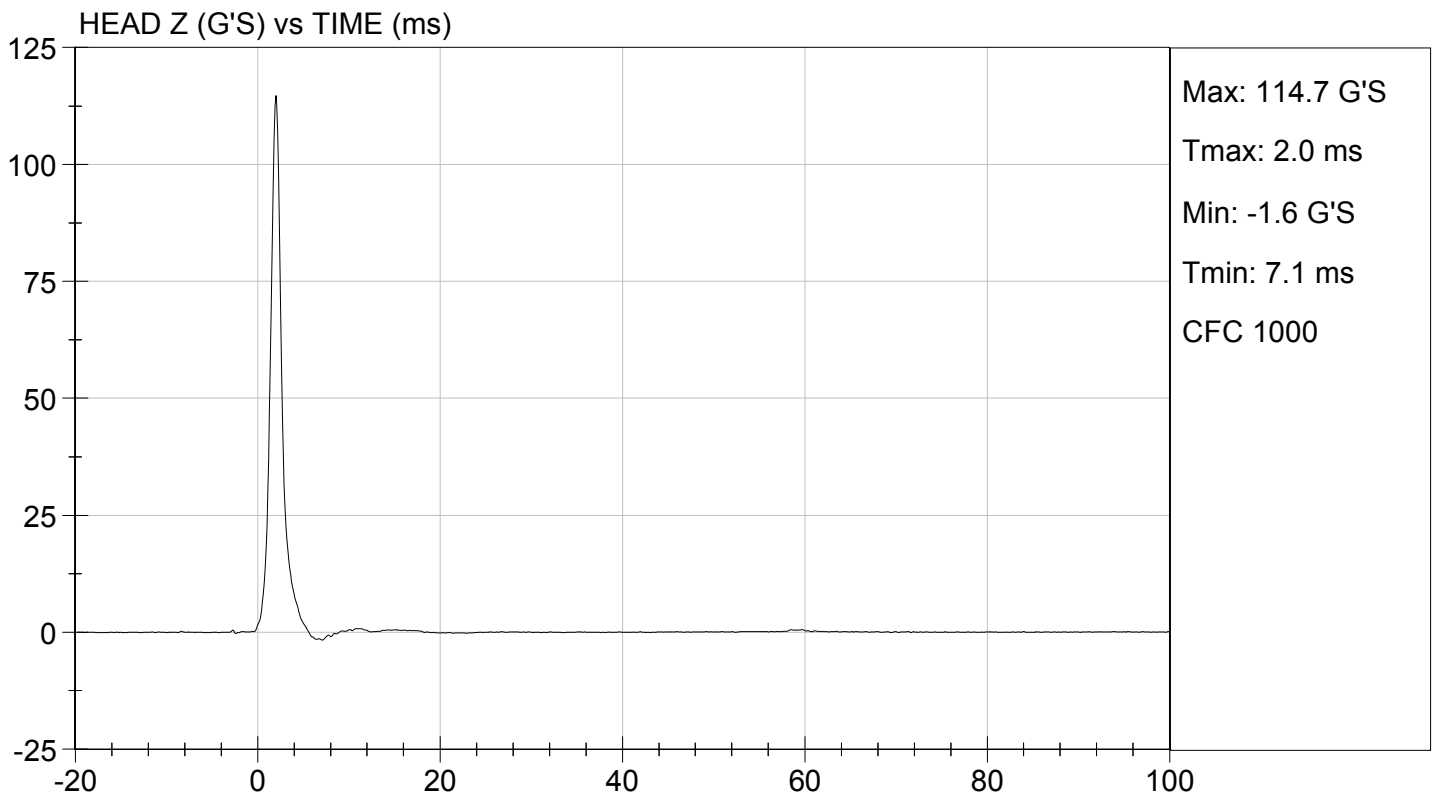
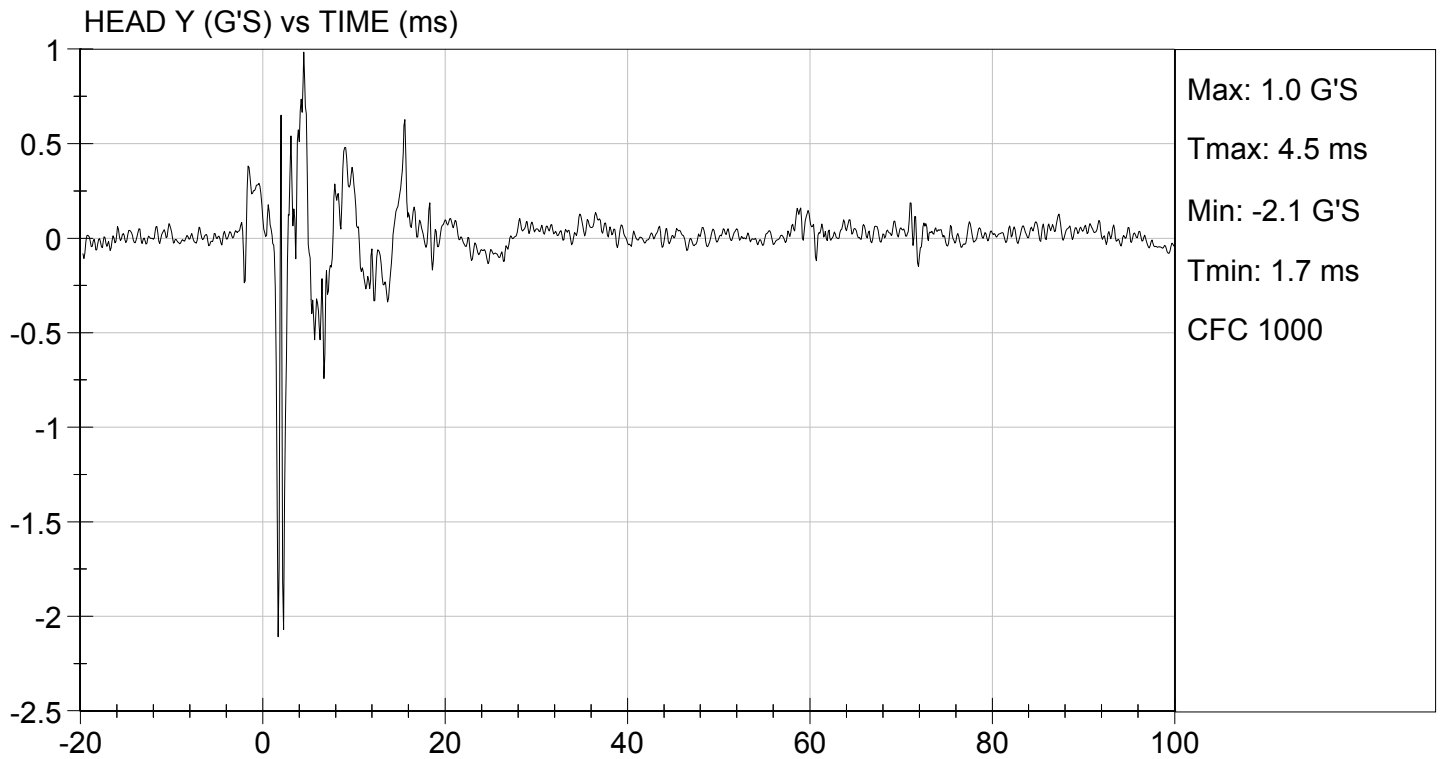
06/23/2016

Test Date



Approved By





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D162192

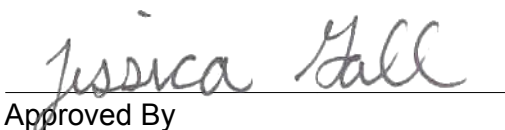
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity		%	10 to 70	49	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.2	Pass
	20 ms	m/s	4.0 to 5.0	4.5	Pass
	30 ms	m/s	5.8 to 7.0	6.6	Pass
D Plane Rotation	Max	deg	77 to 91	82	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	70	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	86	Pass
Overall Results					Pass



Laboratory Technician

06/24/2016

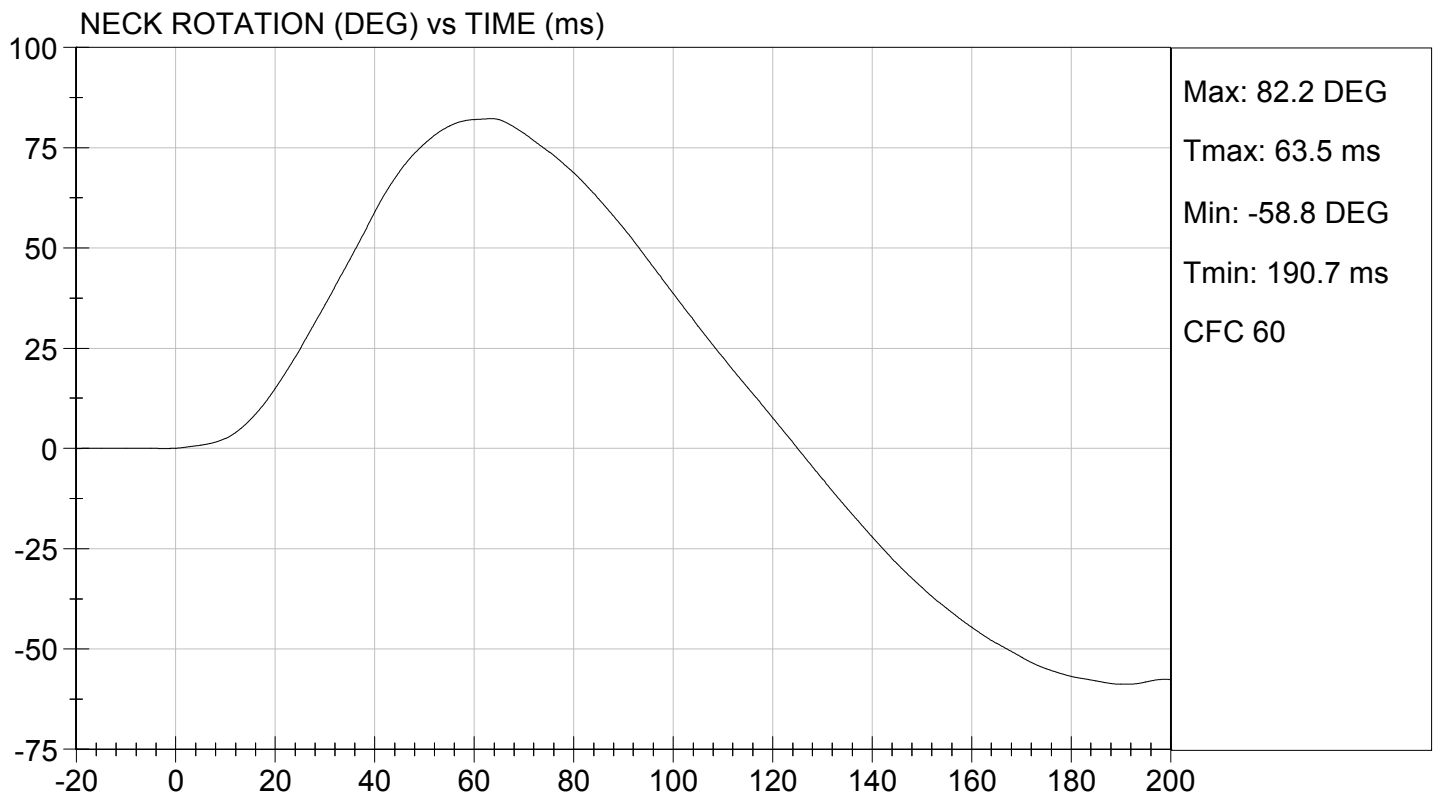
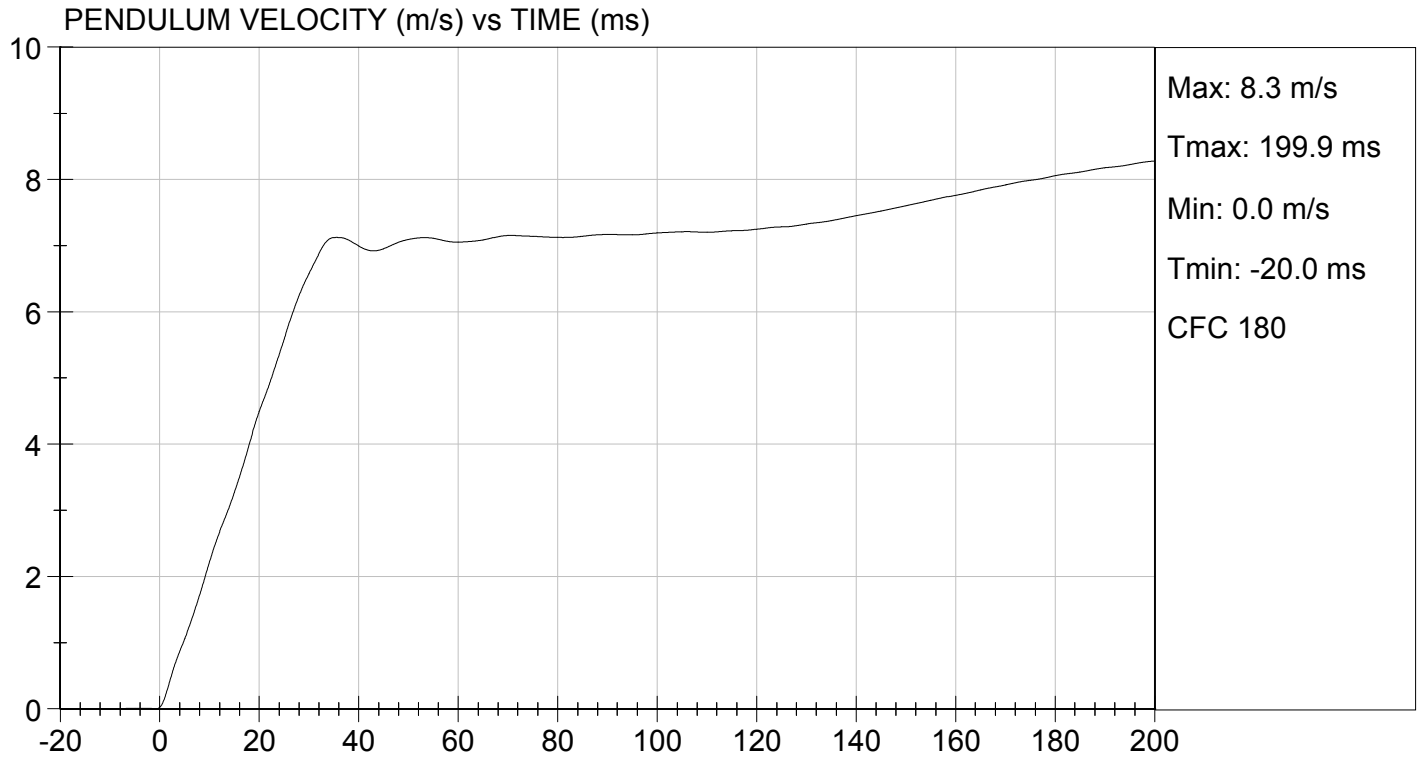
Test Date


Approved By



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

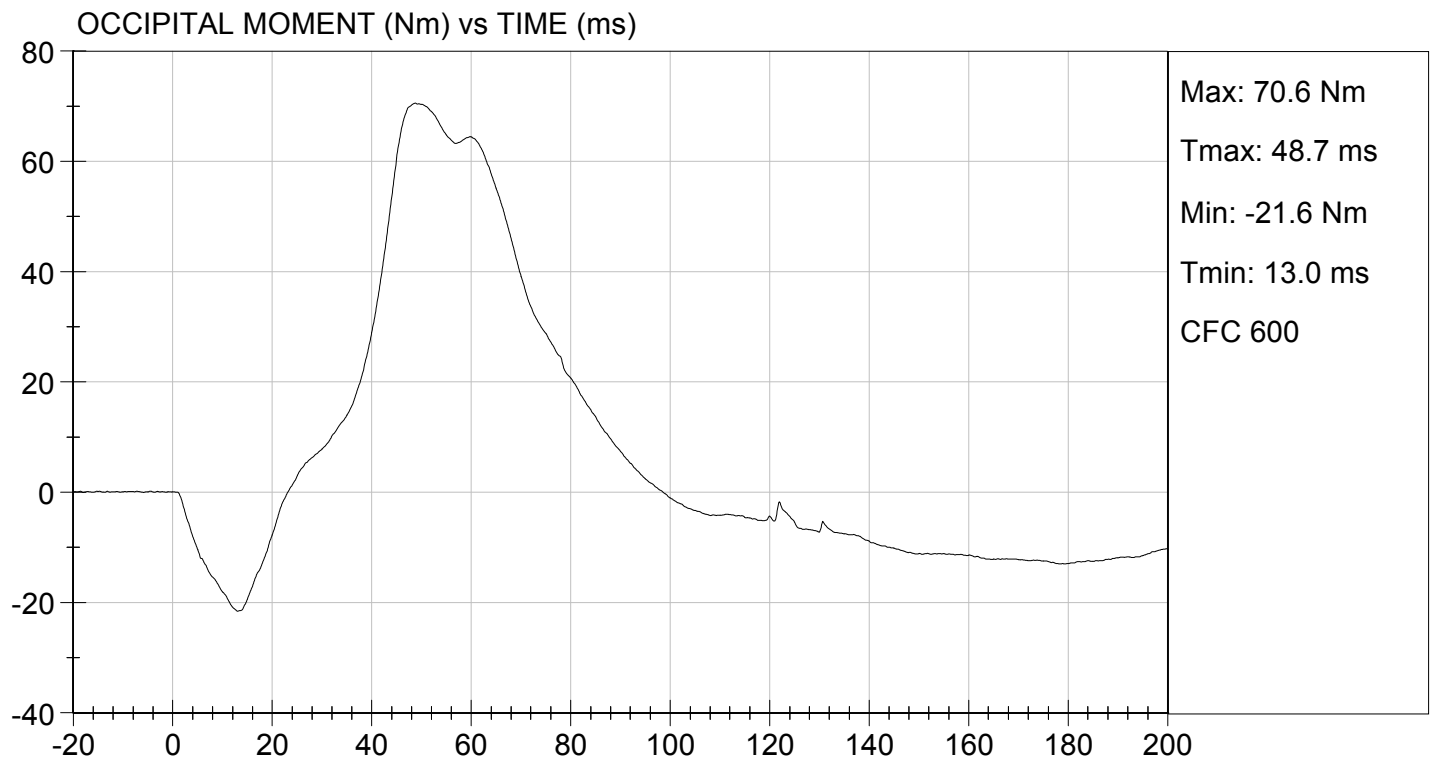
TEST DATE: 06/24/2016
TEST #: D162192





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

TEST DATE: 06/24/2016
TEST #: D162192

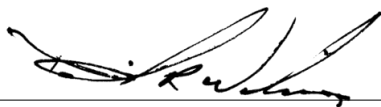


MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D162193

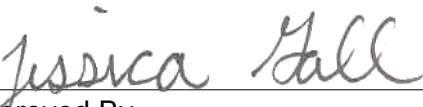
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity		%	10 to 70	49	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.8	Pass
	20 ms	m/s	3.1 to 3.9	3.7	Pass
	30 ms	m/s	4.6 to 5.6	5.4	Pass
D Plane Rotation	Max	deg	99 to 114	108	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-56	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	100	Pass
Overall Results					Pass



Laboratory Technician

06/24/2016

Test Date

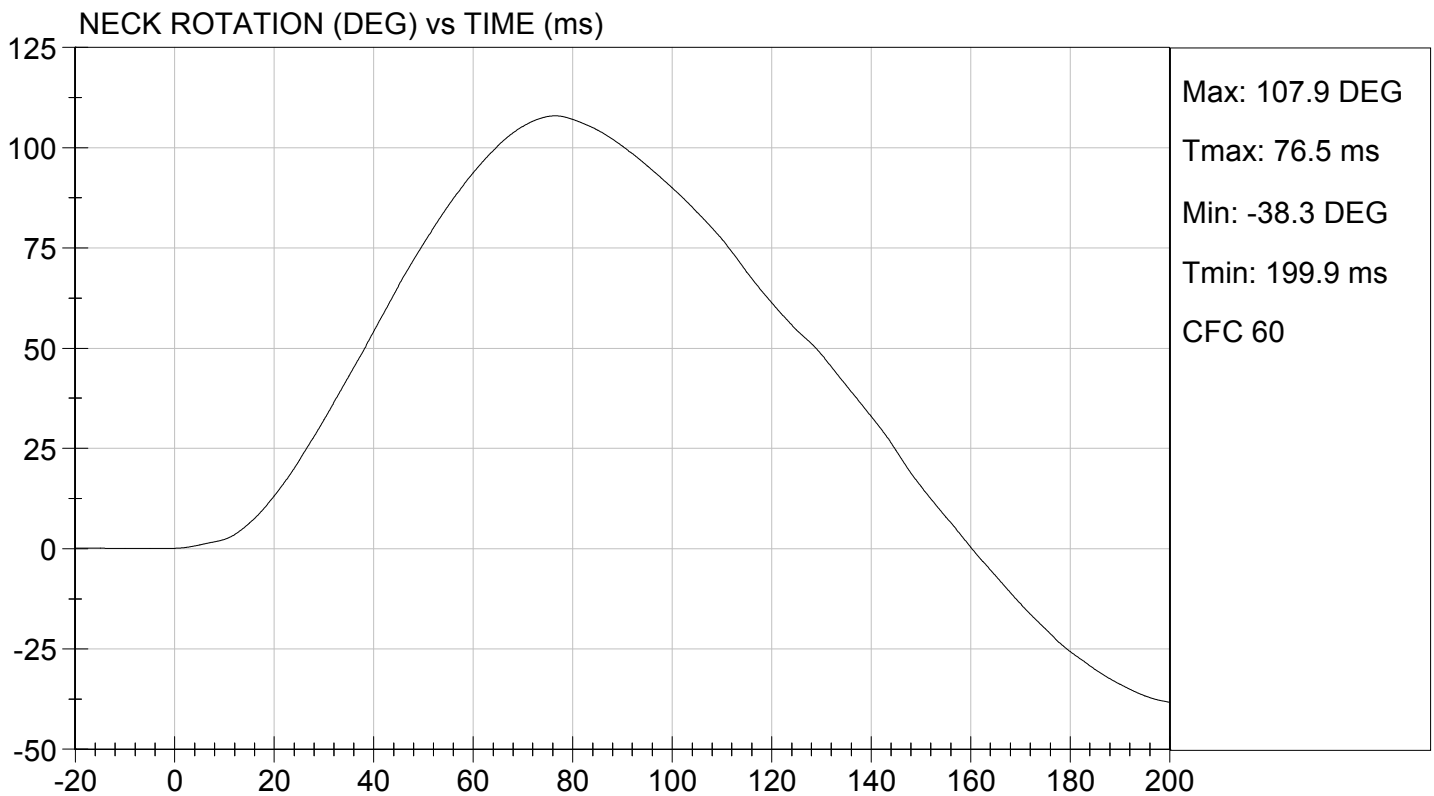
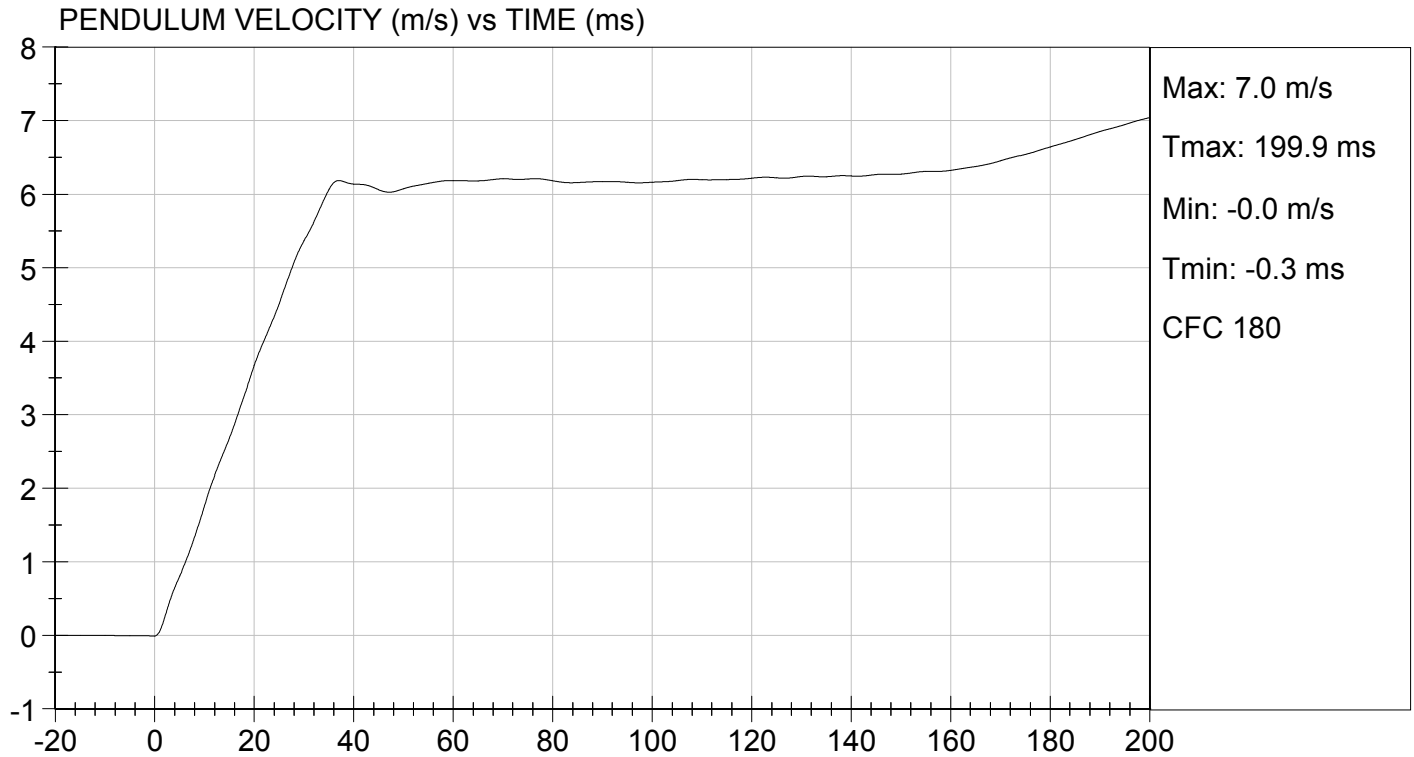


Approved By



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

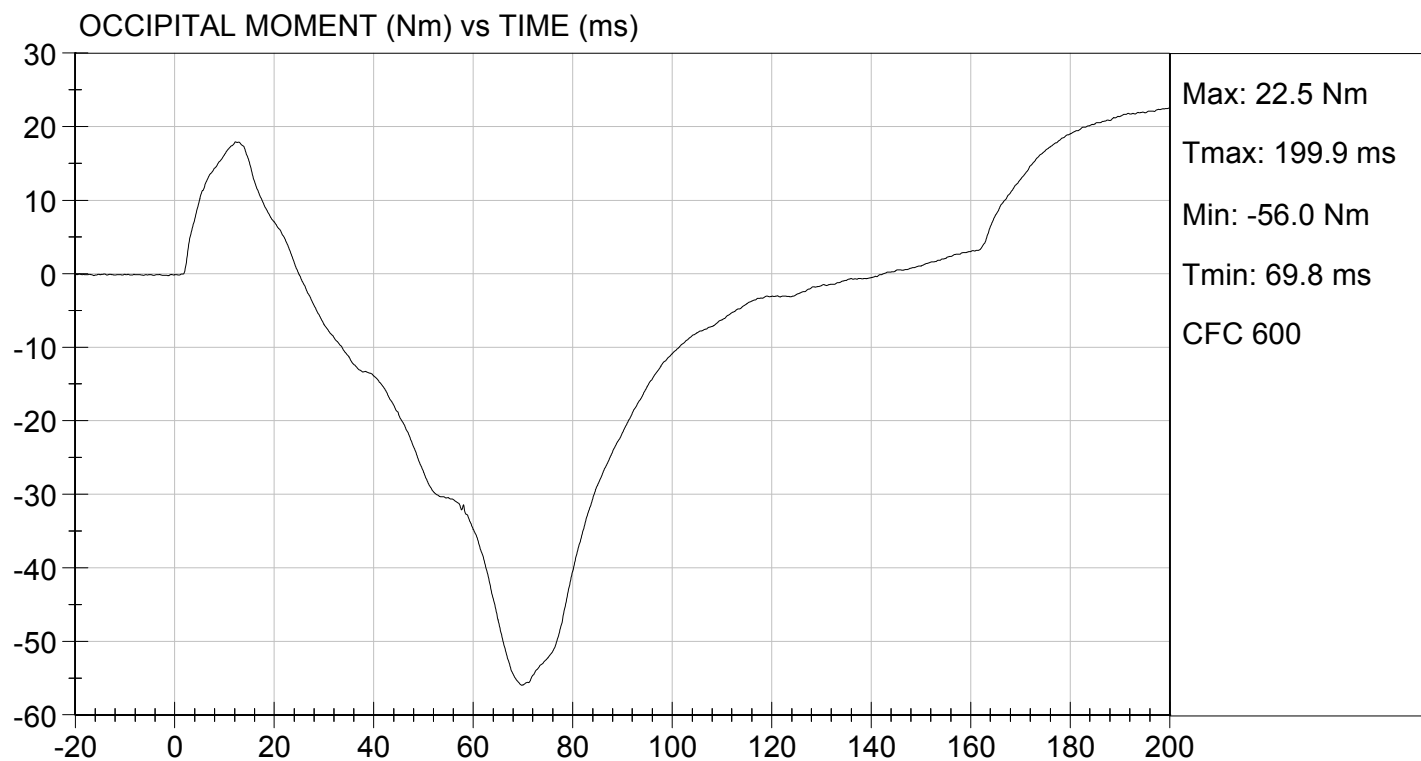
TEST DATE: 06/24/2016
TEST #: D162193





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

TEST DATE: 06/24/2016
TEST #: D162193



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D162194

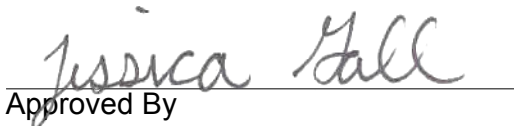
Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Relative Humidity	%	10 to 70	49	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	54	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4381	Pass
Internal Hysteresis	%	69 to 85	70	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4261	Pass
Overall Test Results				Pass



Laboratory Technician

06/24/2016

Test Date

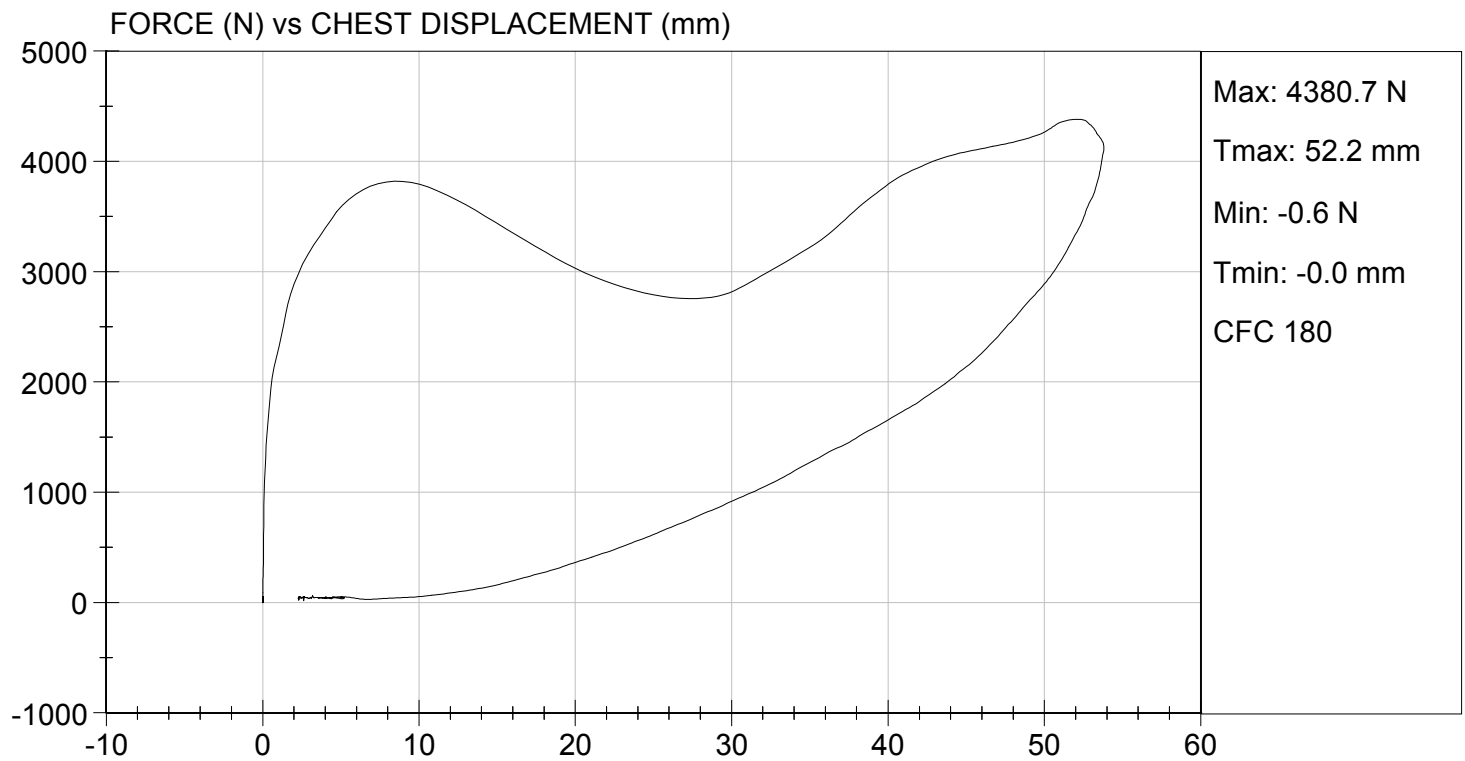


Approved By



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

TEST DATE: 06/24/2016
TEST #: D162194



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634

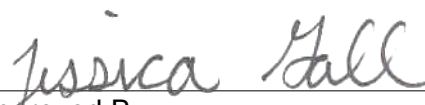
Test I.D: D162195

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	49	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3845	Pass
Overall Test Results				Pass



Laboratory Technician

06/24/2016
Test Date

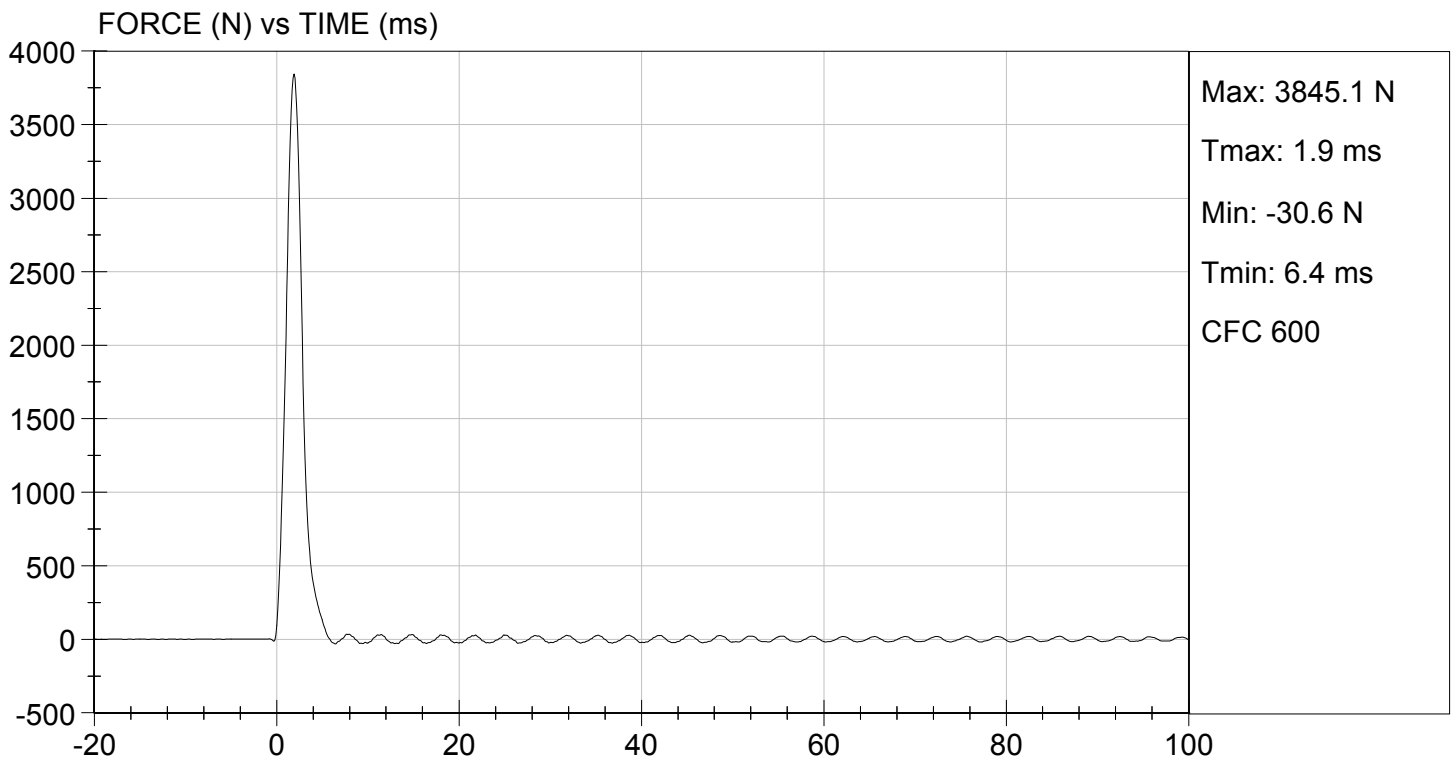


Approved By



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

TEST DATE: 06/24/2016
TEST #: D162195



MGA RESEARCH CORPORATION

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

ATD Serial No: 634

Test I.D: D162196

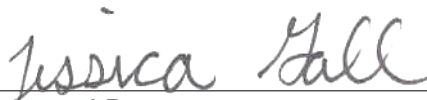
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	49	Pass
Probe Speed	m/s	2.07 to 2.13	2.11	Pass
Maximum Force	N	3450 to 4060	3864	Pass
Overall Test Results				Pass



Laboratory Technician

06/24/2016

Test Date

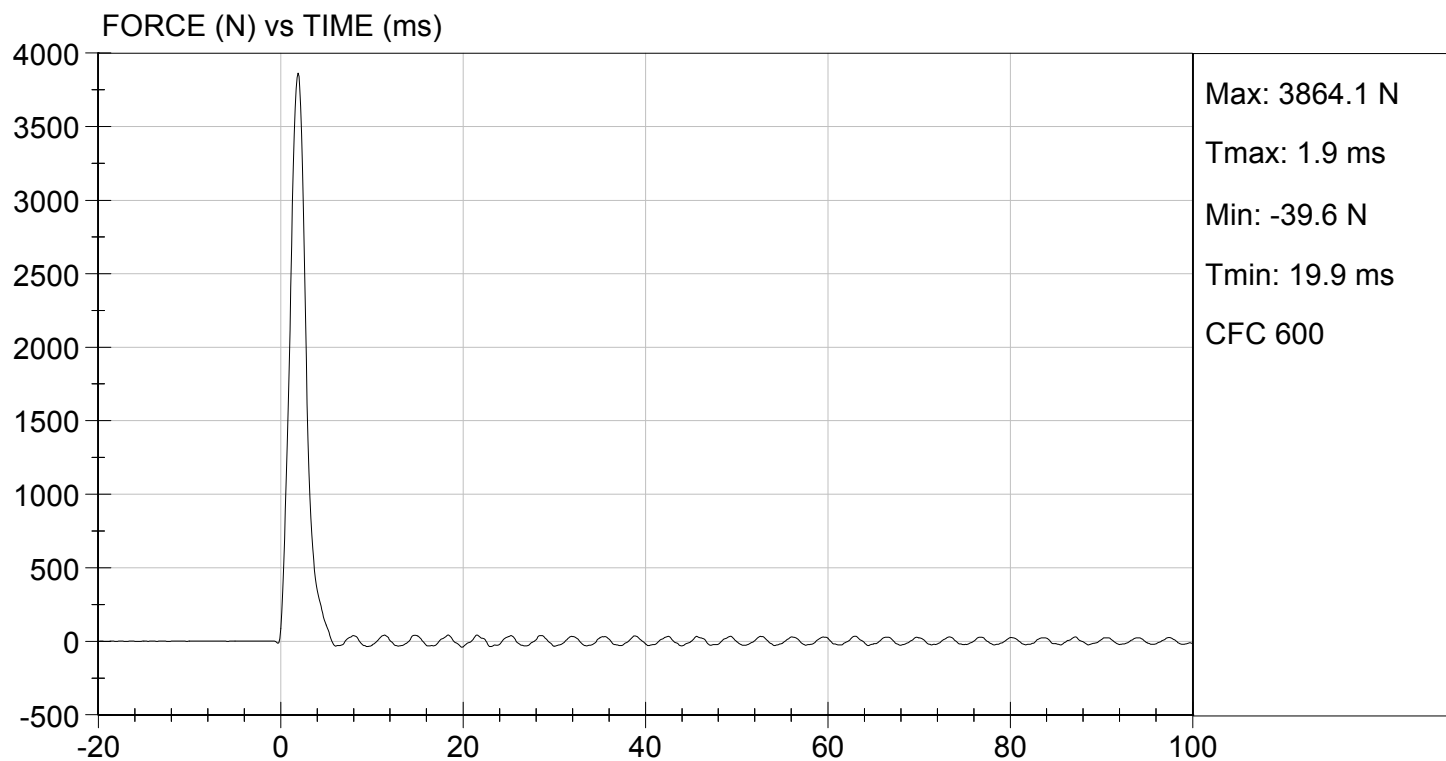


Approved By



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

TEST DATE: 06/24/2016
TEST #: D162196



MGA RESEARCH CORPORATION

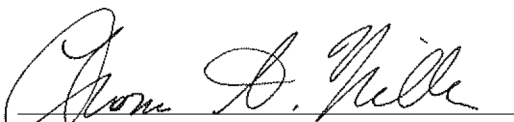
TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634

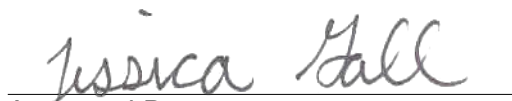
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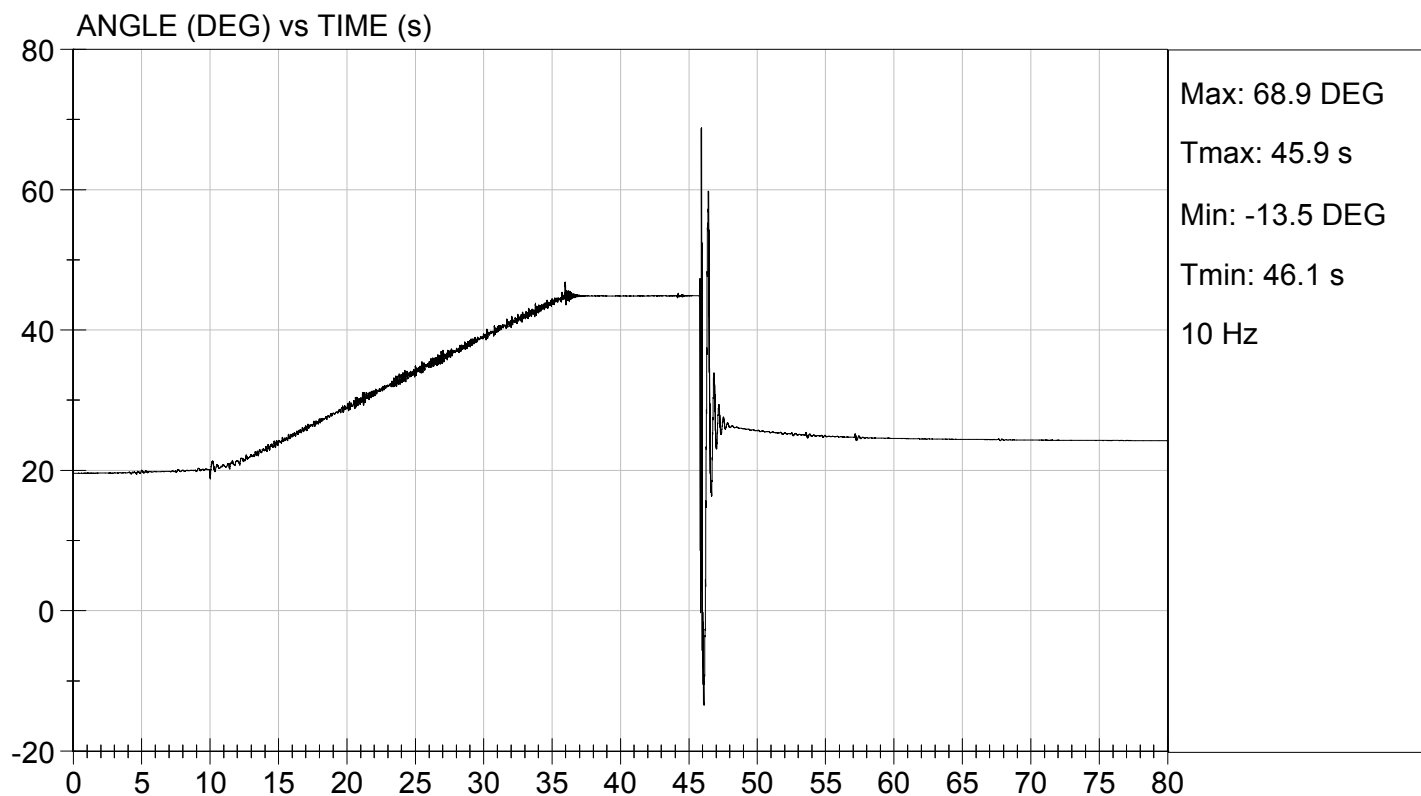
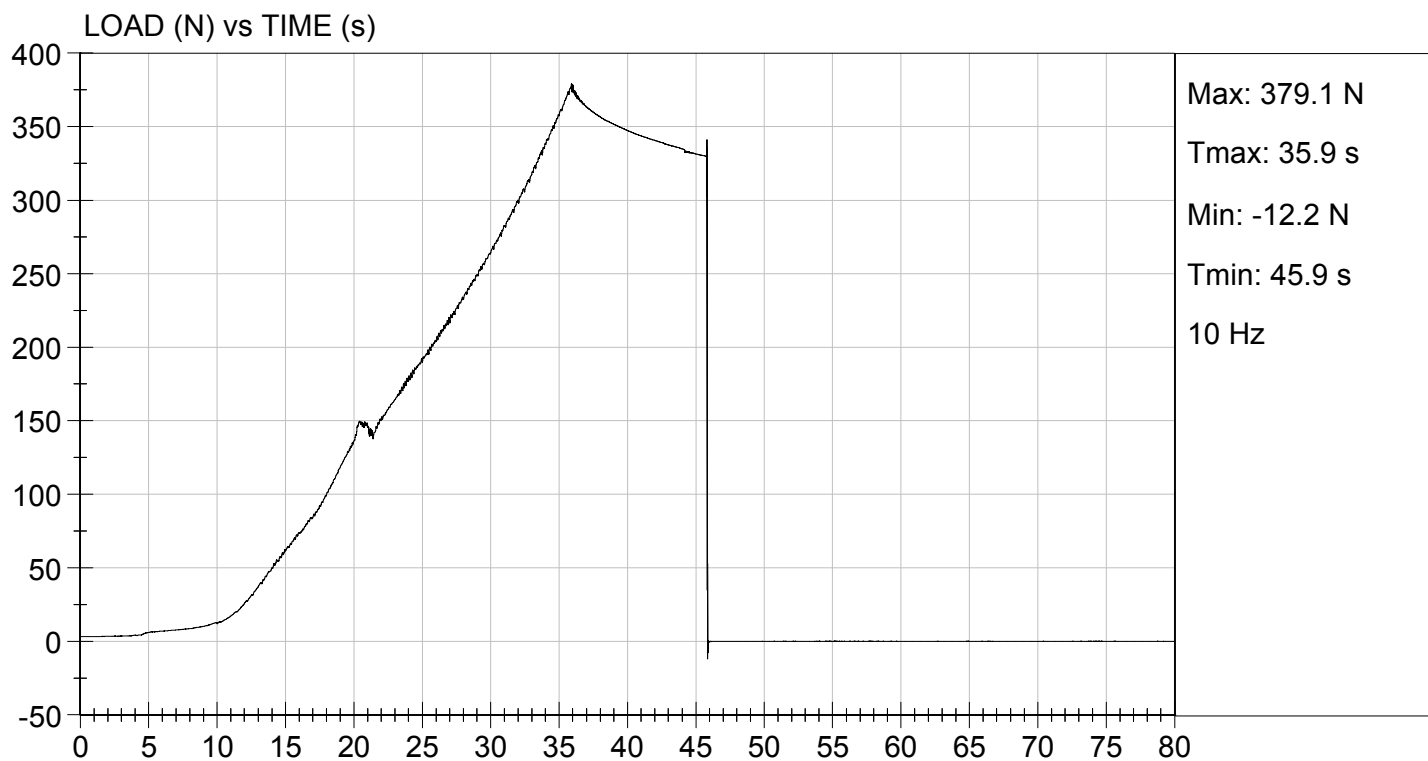
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	49	Pass
Initial Angle	deg	0 to 20	20	Pass
Return Angle	deg	+/- 8	5	Pass
Force at 45 deg	N	320 to 390	379	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.9	Pass
Overall Result				Pass


Laboratory Technician

06/24/2016

Test Date


Approved By



MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

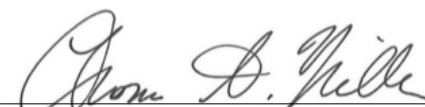
Test ID: D162271

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Peak Resultant Acceleration	G's	250 to 300	280	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	5.3	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
			Overall Test Results	Pass

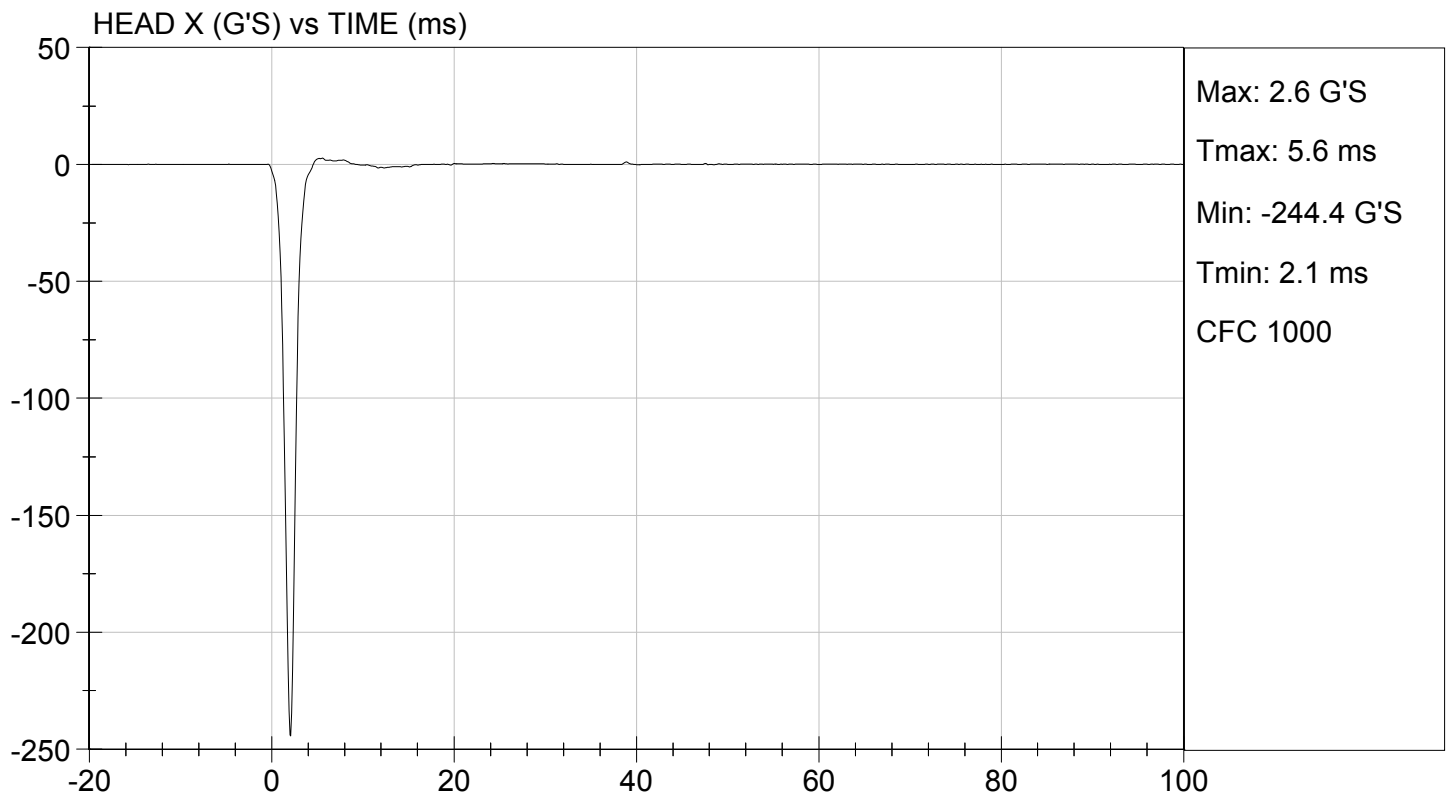
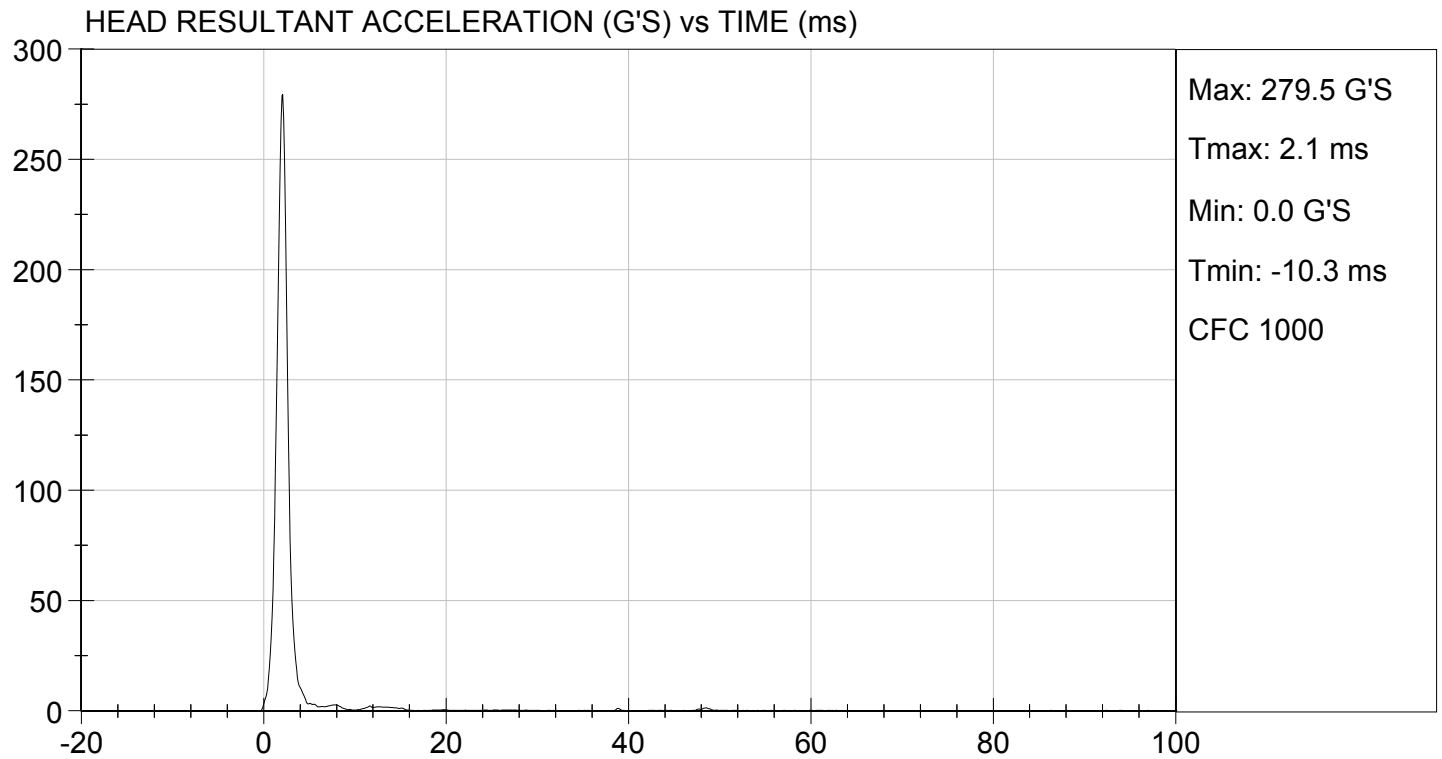


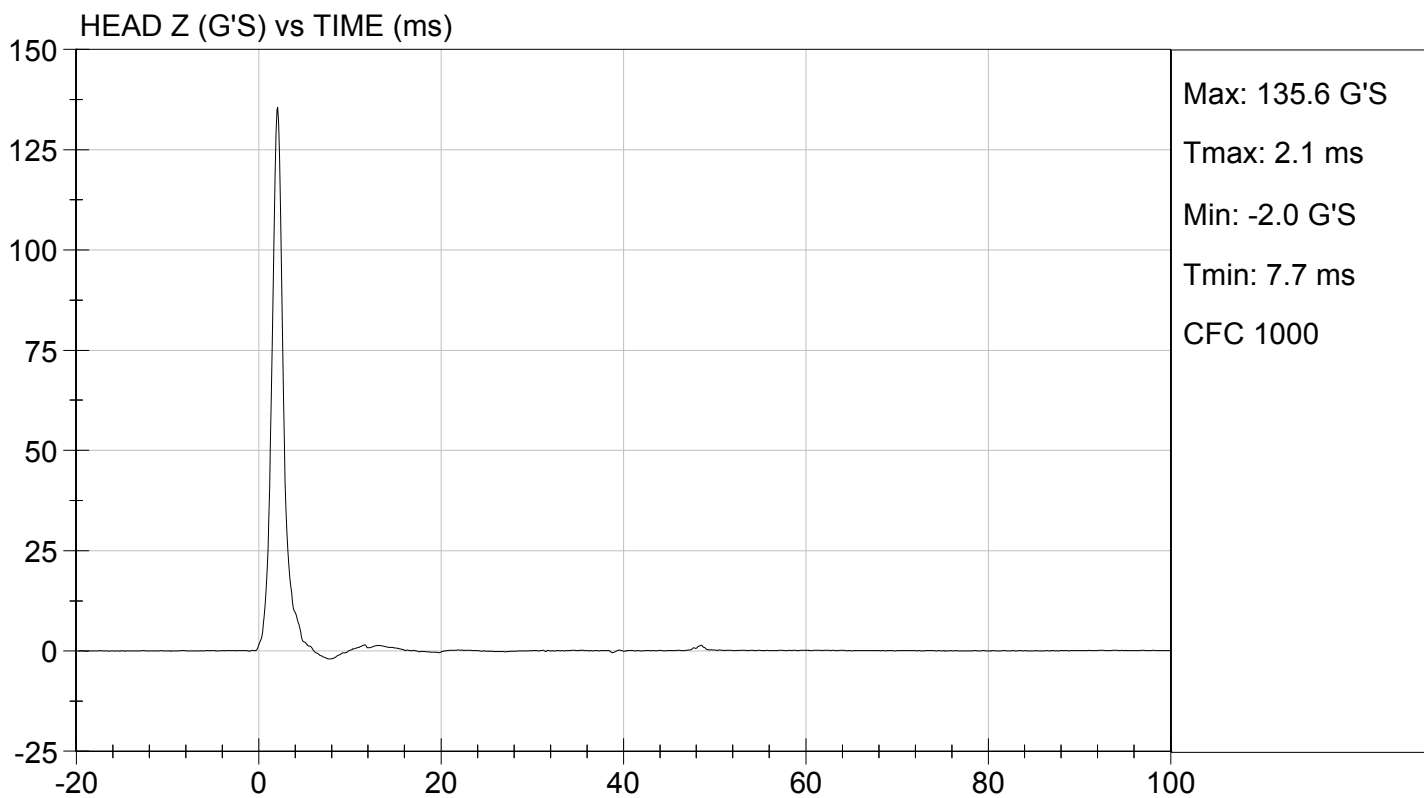
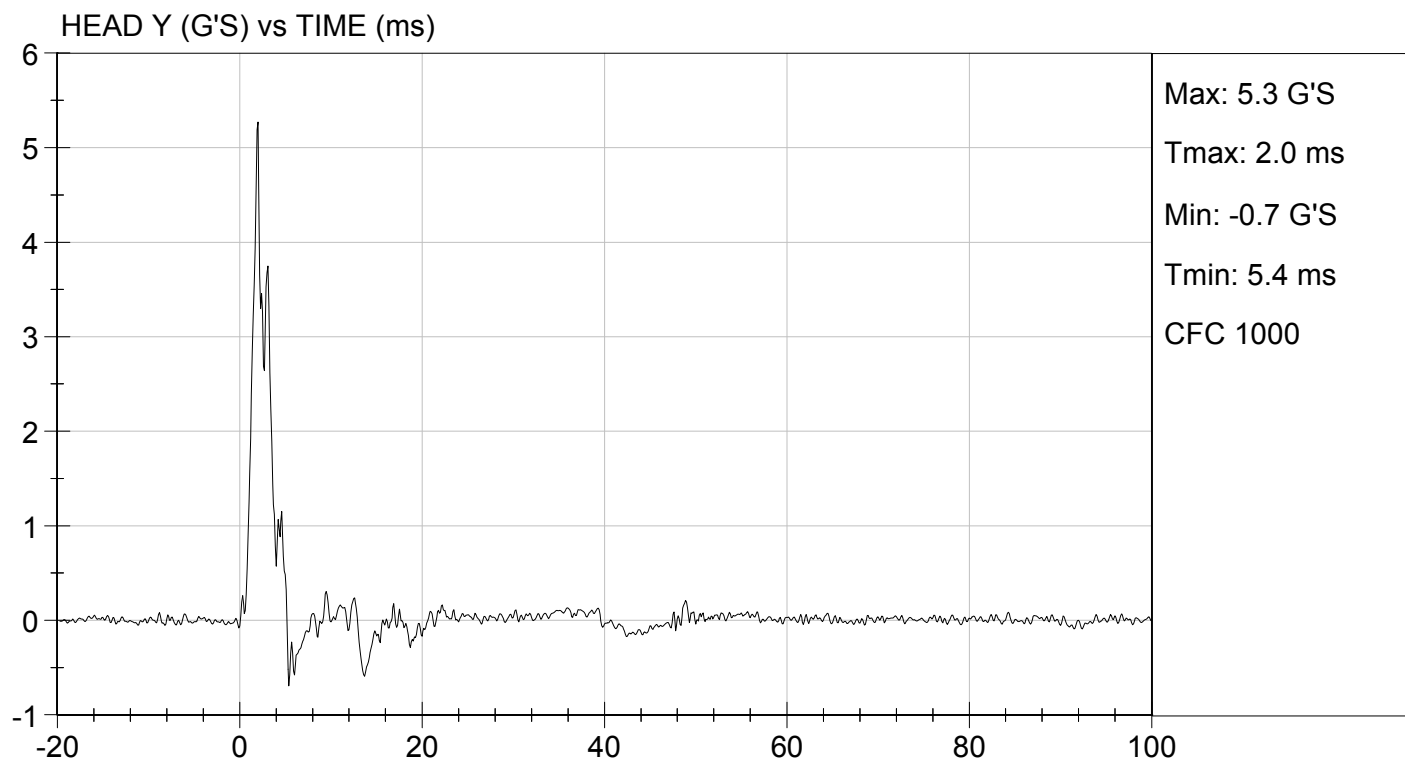
Laboratory Technician

06/30/2016
Test Date



Approved By





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D162272

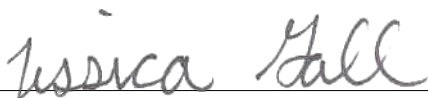
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.0	Pass
Laboratory Relative Humidity		%	10 to 70	46	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.3	Pass
	20 ms	m/s	4.0 to 5.0	4.6	Pass
	30 ms	m/s	5.8 to 7.0	6.7	Pass
D Plane Rotation	Max	deg	77 to 91	87	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



Laboratory Technician

06/30/2016

Test Date

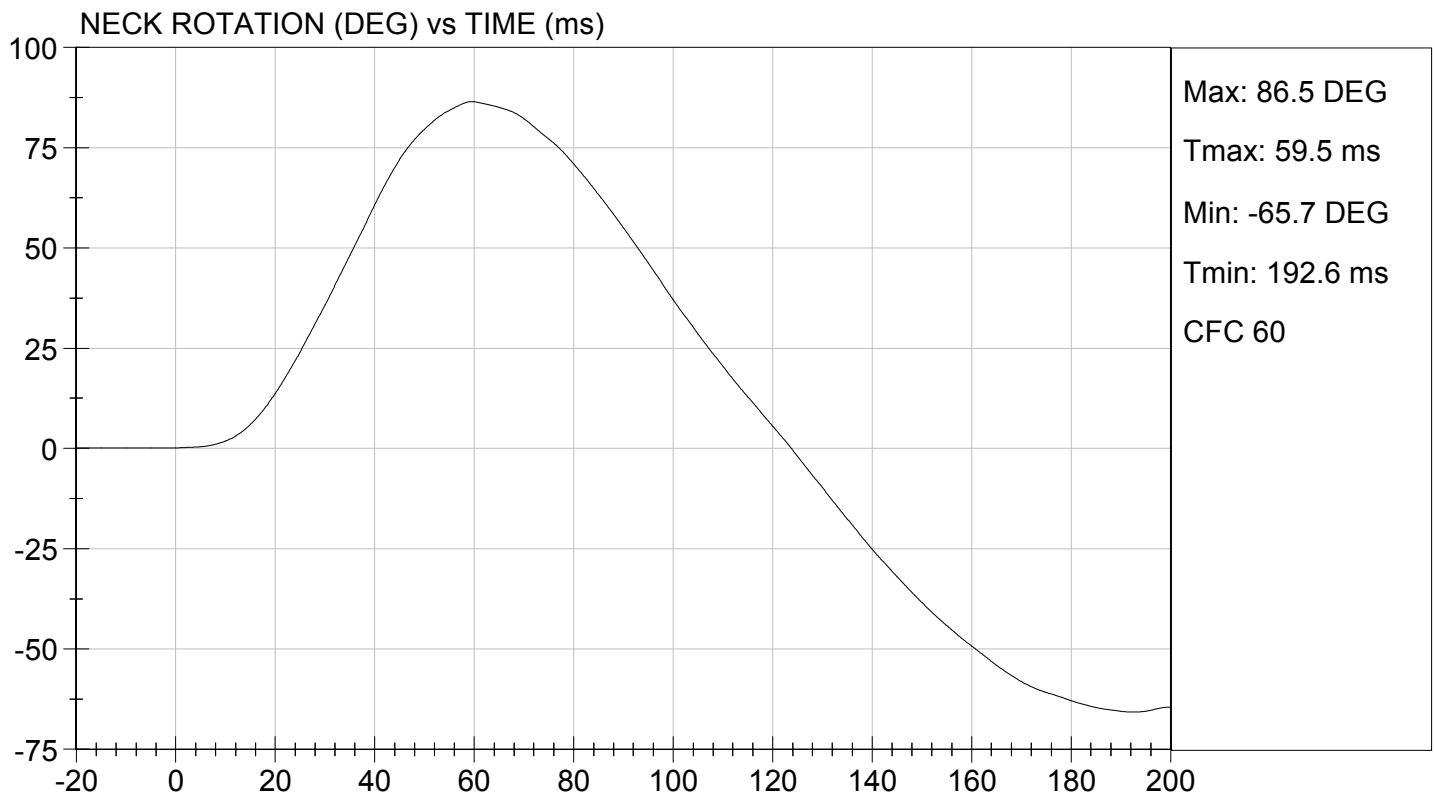
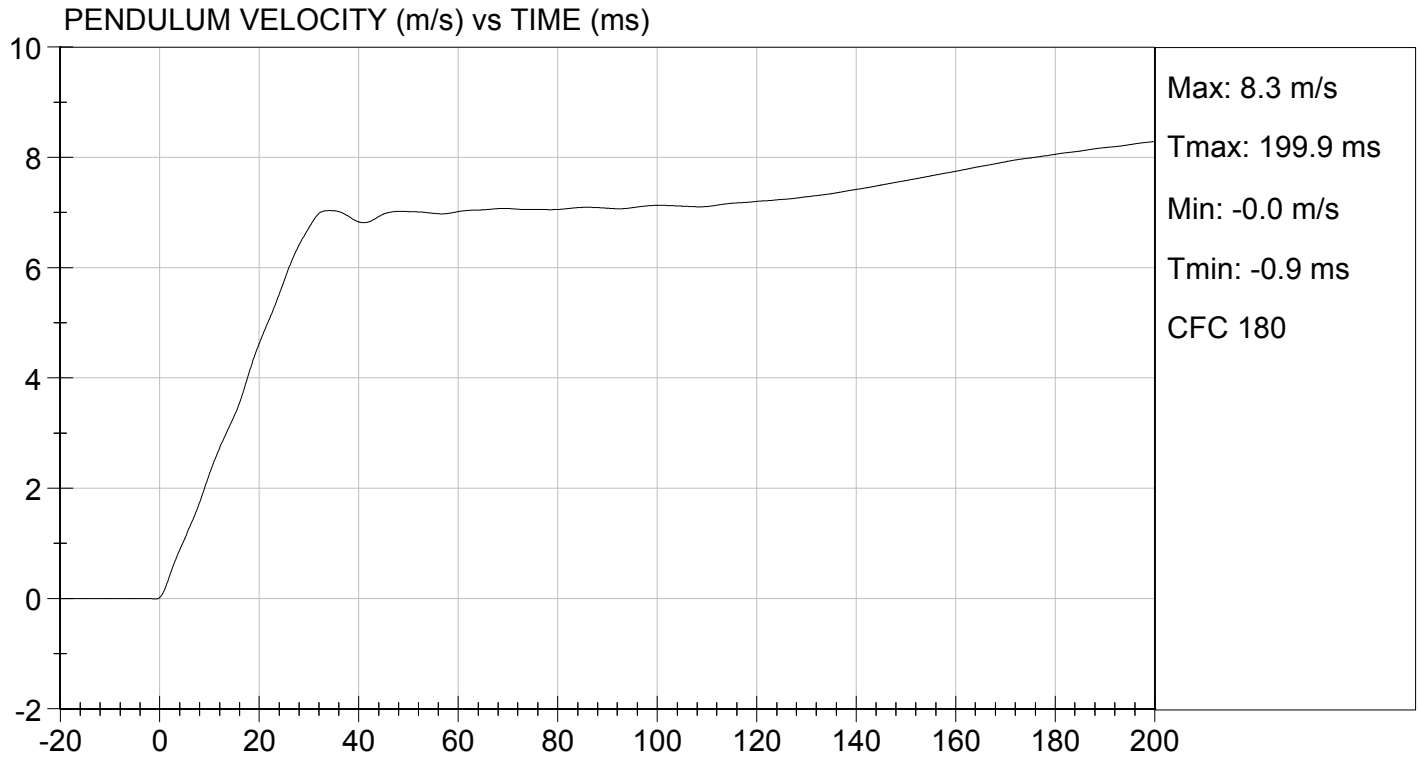


Approved By



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

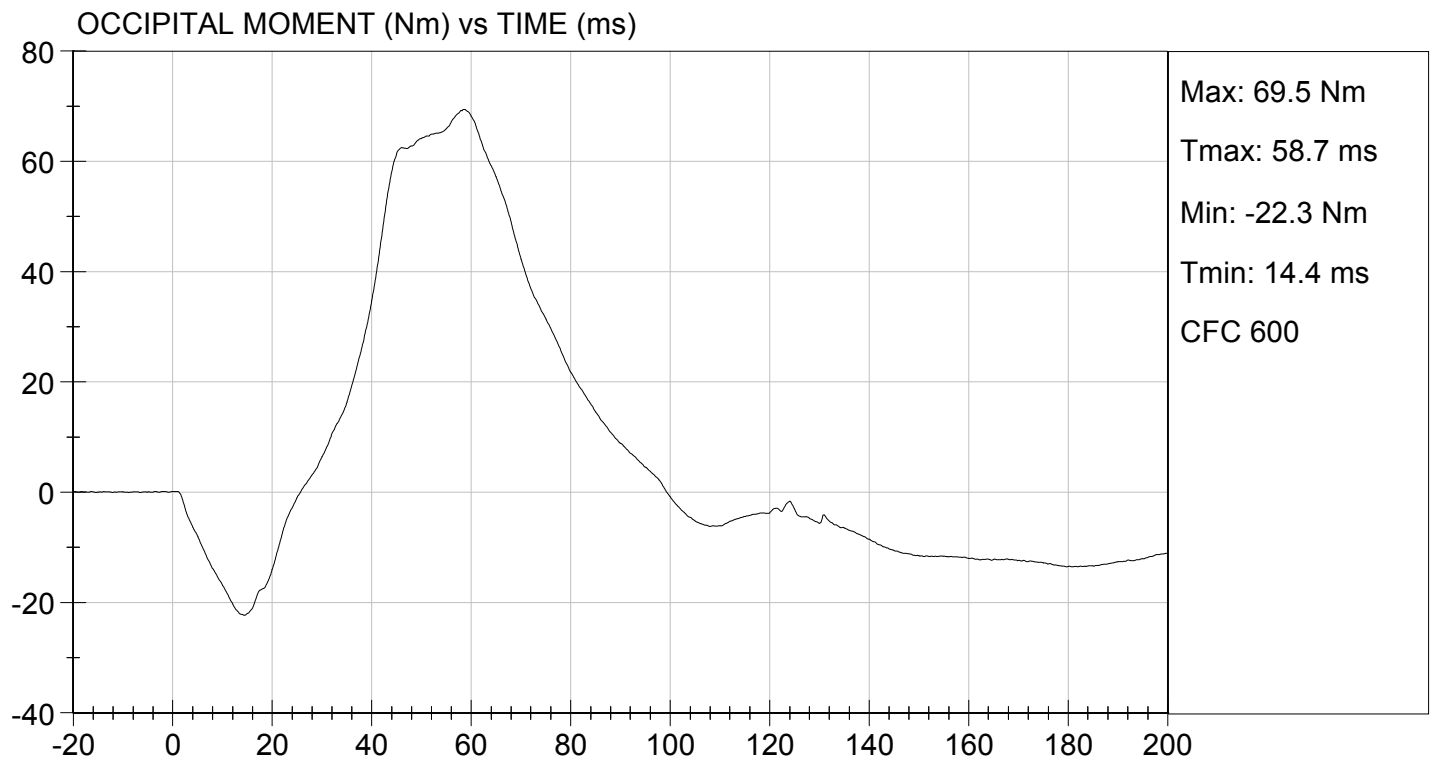
TEST DATE: 06/30/2016
TEST #: D162272





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

TEST DATE: 06/30/2016
TEST #: D162272

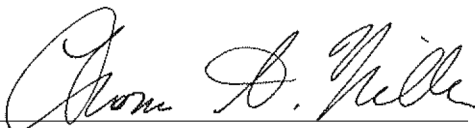


MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

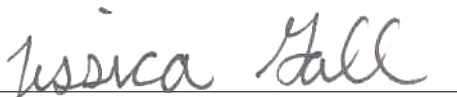
ATD Serial No: 634

Test I.D: D162273

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	46	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	3.6	Pass
	30 ms	m/s	4.6 to 5.6	5.3	Pass
D Plane Rotation	Max	deg	99 to 114	112	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-56	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	104	Pass
Overall Results					Pass


 Laboratory Technician

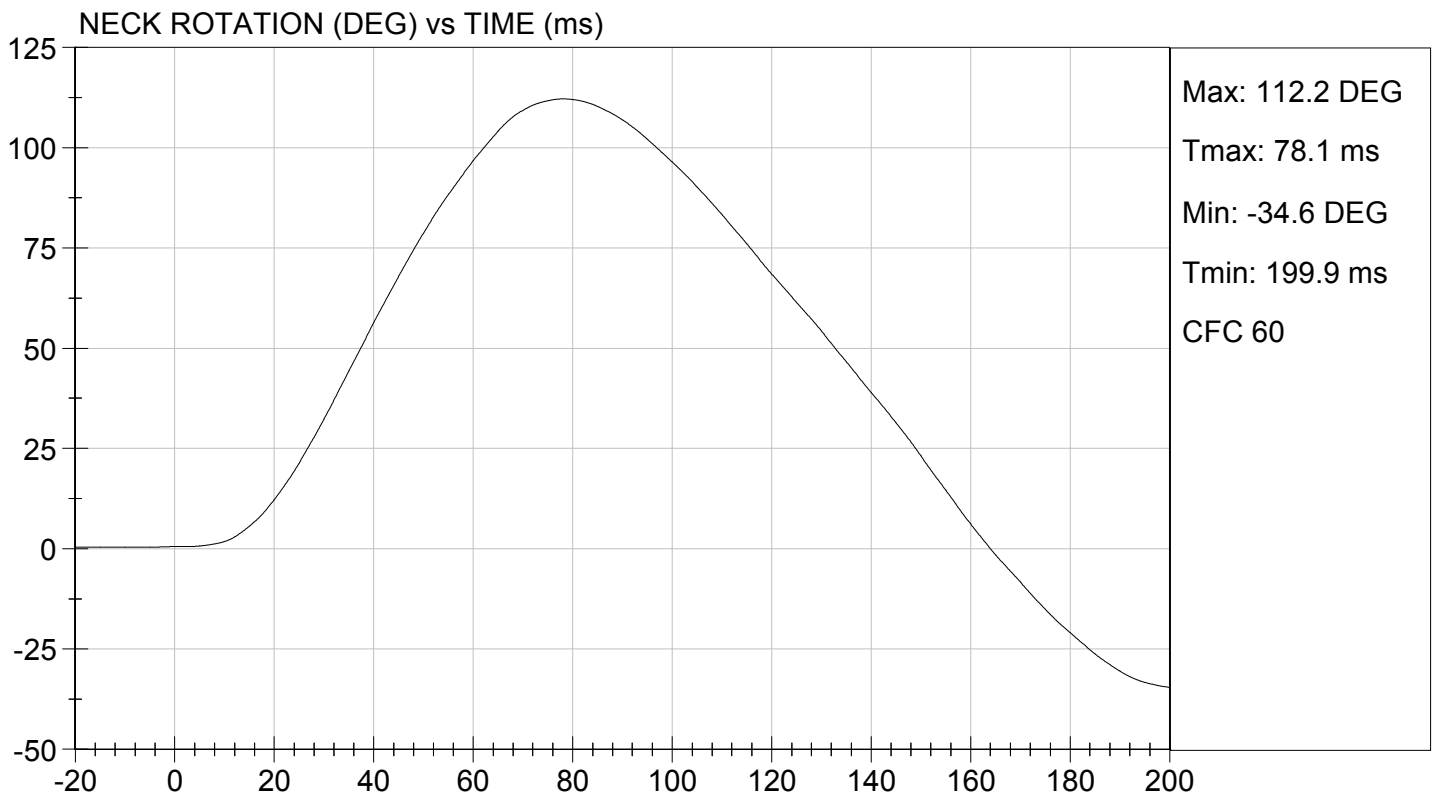
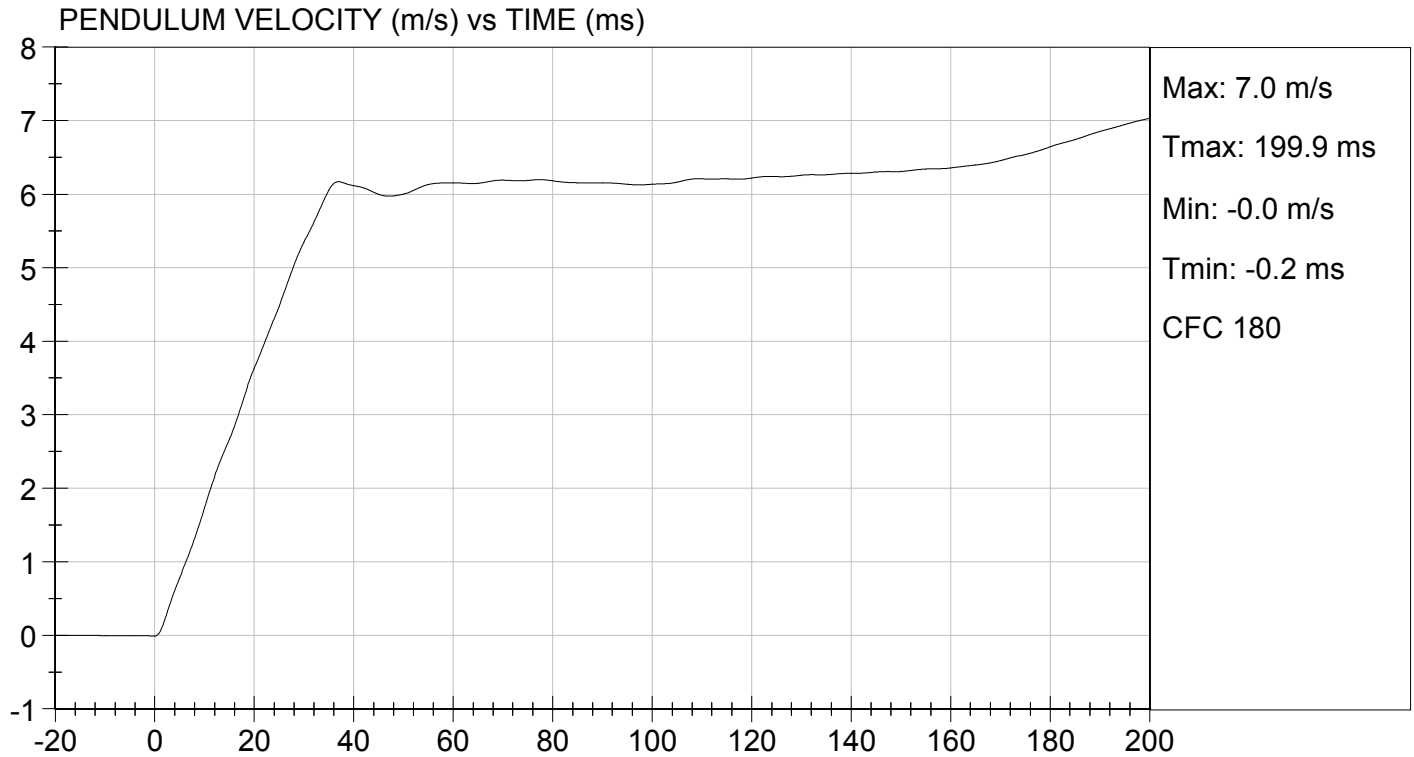
06/30/2016
 Test Date


 Approved By



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

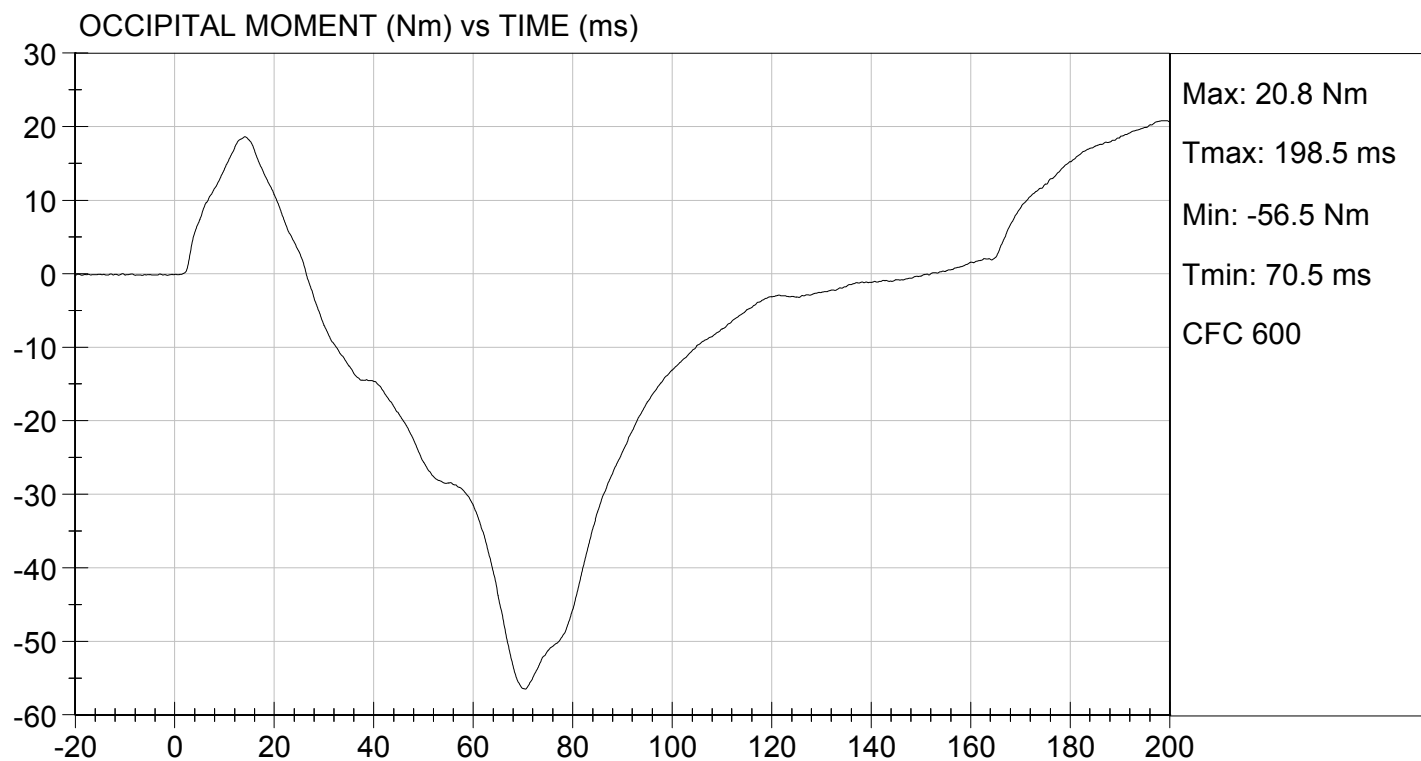
TEST DATE: 06/30/2016
TEST #: D162273





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

TEST DATE: 06/30/2016
TEST #: D162273

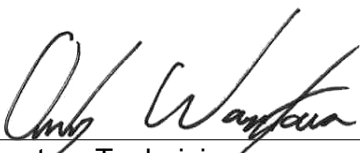


MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D162274

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Relative Humidity	%	10 to 70	50	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	54	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4378	Pass
Internal Hysteresis	%	69 to 85	70	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4297	Pass
Overall Test Results				Pass


Laboratory Technician

07/01/2016

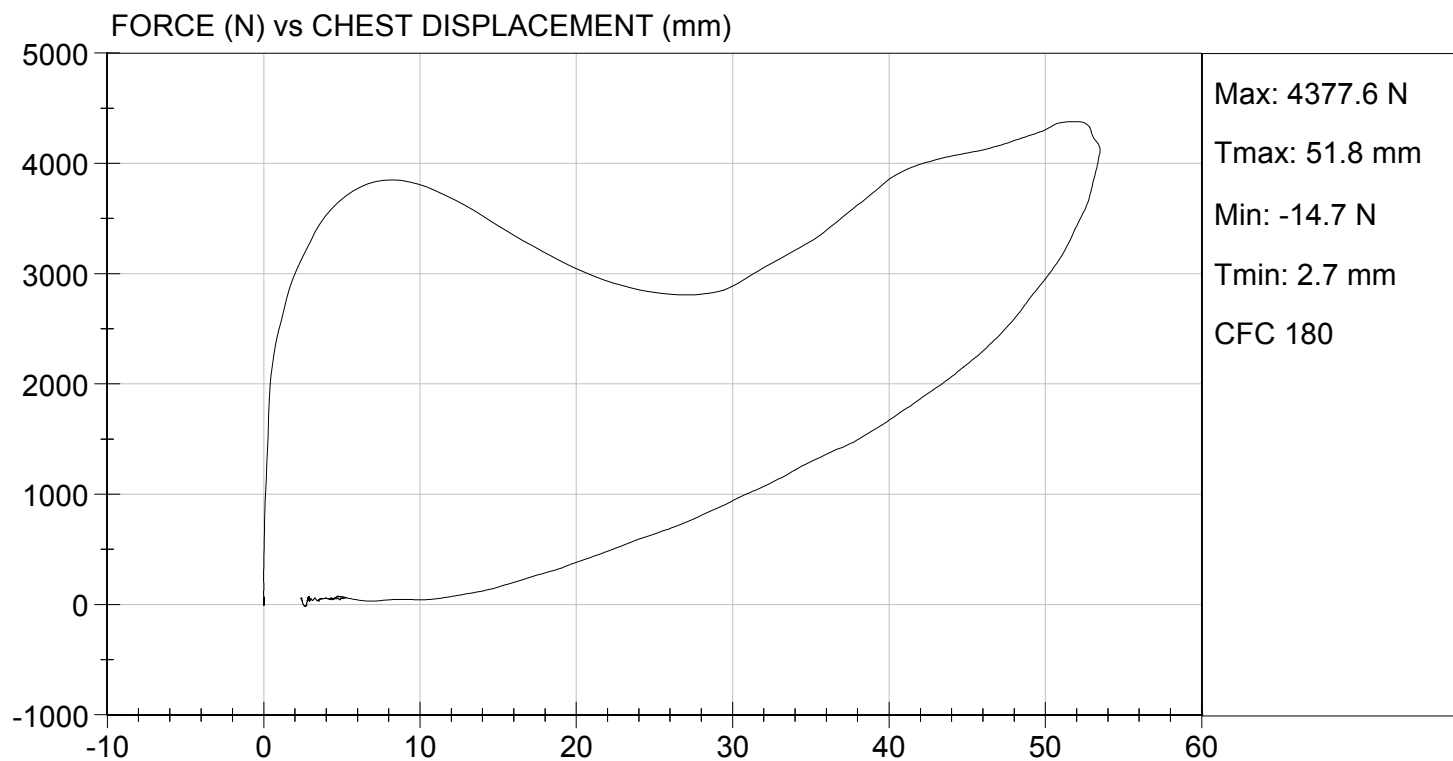
Test Date


Approved By



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

TEST DATE: 07/01/2016
TEST #: D162274



MGA RESEARCH CORPORATION

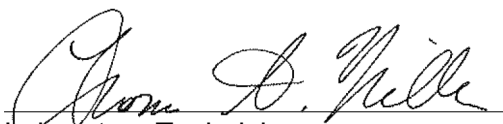
RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D162275

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	46	Pass
Probe Speed	m/s	2.07 to 2.13	2.11	Pass
Maximum Force	N	3450 to 4060	3950	Pass
Overall Test Results				Pass


Laboratory Technician

06/30/2016

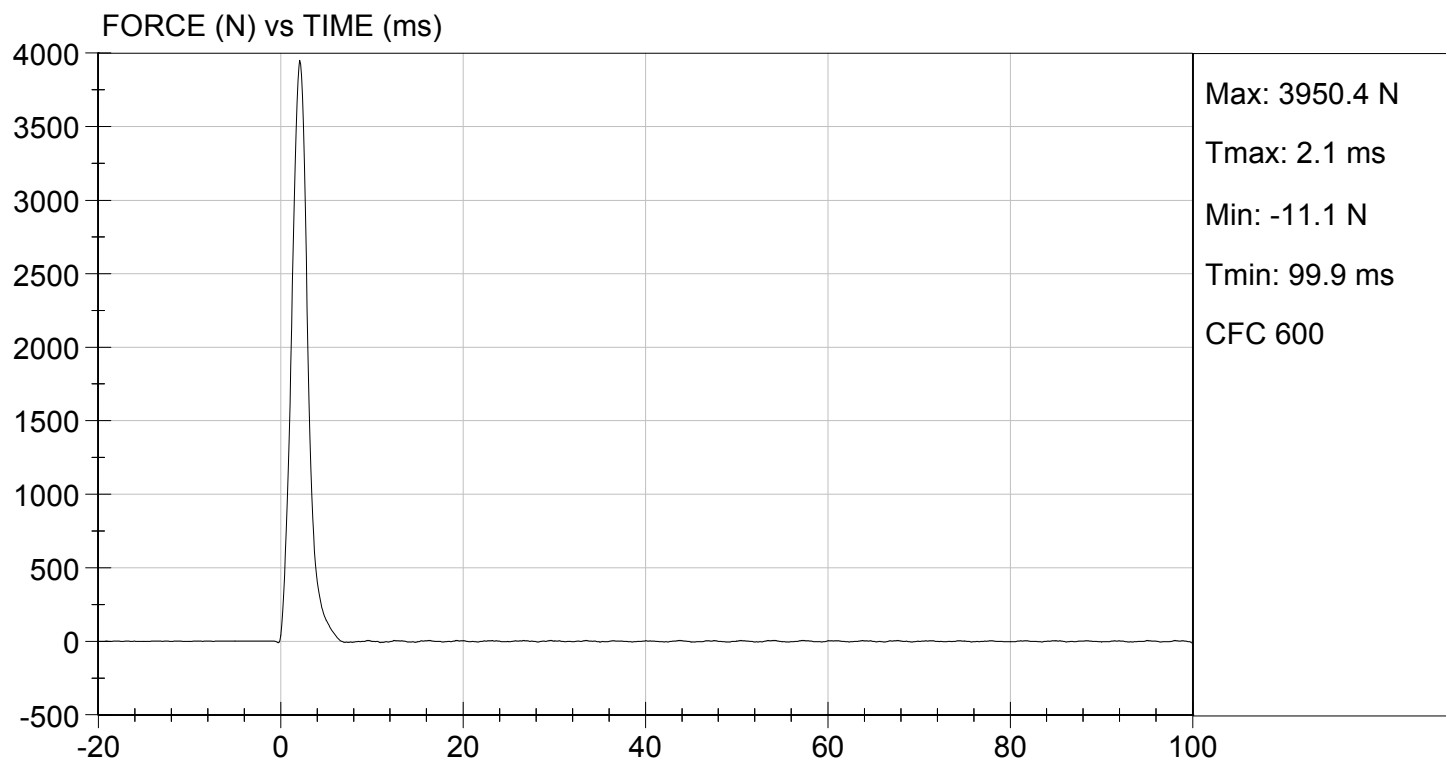
Test Date


Approved By



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

TEST DATE: 06/30/2016
TEST #: D162275



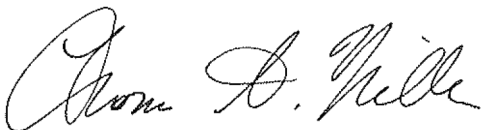
MGA RESEARCH CORPORATION

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

ATD Serial No: 634

Test I.D: D162276

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	46	Pass
Probe Speed	m/s	2.07 to 2.13	2.08	Pass
Maximum Force	N	3450 to 4060	3690	Pass
Overall Test Results				Pass



Laboratory Technician

06/30/2016

Test Date

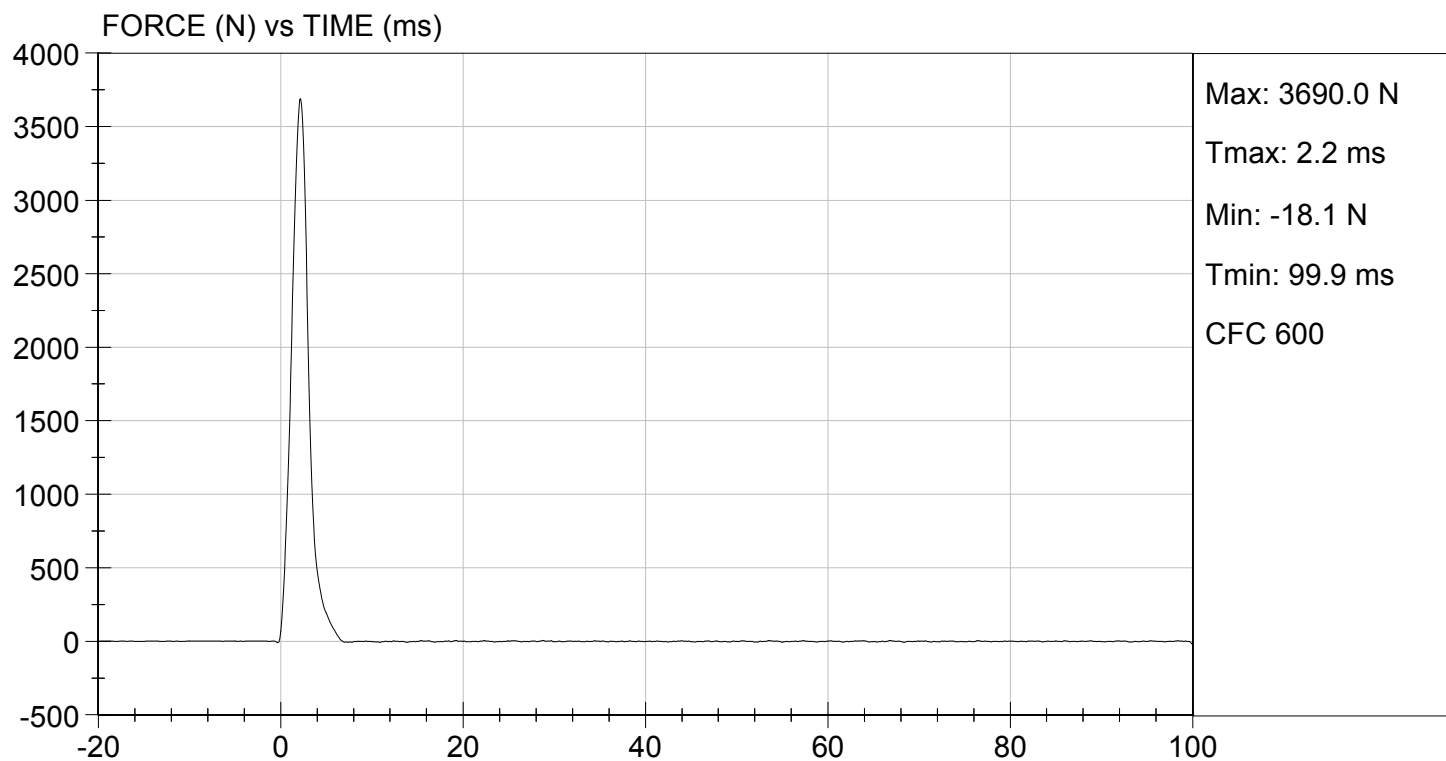


Approved By



TEST DESC: LEFT KNEE
VELOCITY: 6.83 ft/s, 2.08 m/s

TEST DATE: 06/30/2016
TEST #: D162276



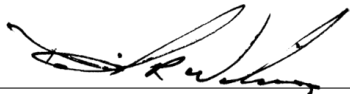
MGA RESEARCH CORPORATION

**TORSO FLEXION TEST
HYBRID III 5TH PERCENTILE**

ATD Serial No: 634

Test I.D: D162277

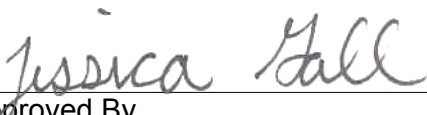
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	49	Pass
Initial Angle	deg	0 to 20	18	Pass
Return Angle	deg	+/- 8	3	Pass
Force at 45 deg	N	320 to 390	372	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.8	Pass
Overall Result				Pass



Laboratory Technician

07/01/2016

Test Date



Approved By

