

**REPORT NUMBER: NCAP-MGA-2016-052**

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

**HONDA OF CANADA MFG.  
2016 Honda Civic LX 2-Door Coupe  
NHTSA No.: O20165313**

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



**Test Date: July 12, 2016**

**Final Report Date: September 6, 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**

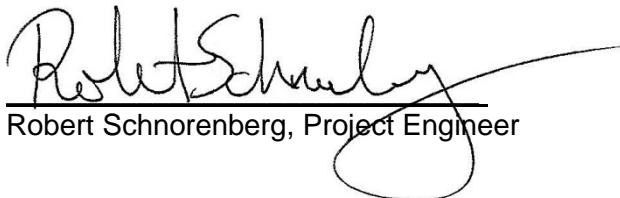
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Approved by:



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Approval Date: September 6, 2016

#### FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: \_\_\_\_\_

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

Date: \_\_\_\_\_

## Technical Report Documentation Page

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<p><b>16. Abstract</b></p> <p>A 56.3 km/h NCAP Frontal Impact Test was conducted on a 2016 Honda Civic LX 2-Door Coupe in accordance with the specifications of the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure. This test was conducted to obtain data indicative of FMVSS 208, 212, 219 (partial), and 301 performance. The test was conducted at MGA Research Corporation in Burlington, Wisconsin on July 12, 2016.</p> <p>The impact velocity of the vehicle was 56.17 km/h and the ambient temperature at the barrier face at the time of impact was 21.8°C. The target vehicle post-test maximum crush was 468mm located to the right of the vehicle's centerline. The test vehicle's performance was as follows:</p> <table border="1" style="margin-left: auto; margin-right: auto; width: fit-content; border-collapse: collapse;"> <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 (HIC<sub>15</sub>)</td> <td>N/A</td> <td>700</td> <td>149</td> <td>700</td> <td>390</td> </tr> <tr> <td>Maximum Chest</td> <td>mm</td> <td>63</td> <td>25</td> <td>52</td> <td>16</td> </tr> <tr> <td>Nij</td> <td>N/A</td> <td>1</td> <td>0.26</td> <td>1</td> <td>0.36</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4170</td> <td>921</td> <td>2620</td> <td>689</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4000</td> <td>544</td> <td>2520</td> <td>223</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10008</td> <td>875</td> <td>6805</td> <td>1452</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10008</td> <td>1681</td> <td>6805</td> <td>887</td> </tr> </tbody> </table>						Measurement Description	Units	Driver ATD		Passenger ATD		Threshold	Result	Threshold	Result	Head Injury Criteria (HIC <sub>15</sub> )	N/A	700	149	700	390	Maximum Chest	mm	63	25	52	16	Nij	N/A	1	0.26	1	0.36	Neck Tension	N	4170	921	2620	689	Neck Compression	N	4000	544	2520	223	Left Femur Force	N	10008	875	6805	1452	Right Femur Force	N	10008	1681	6805	887
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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 Honda Civic LX 2-Door Coupe at a velocity of 56.17 km/h. The test was performed at MGA Research Corporation on July 12, 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 50<sup>th</sup> percentile male anthropomorphic test device (ATD), was placed in the driver seating position and one Part 572O 5<sup>th</sup> 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 468mm to the right 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 steering column shroud. 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 glovebox.

The occupant data is summarized below:

ATD position	HIC <sub>15</sub>	Nij	Neck Tension (N)	Neck Comp. (N)	3ms Chest Clip (Gs)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50 <sup>th</sup> )	149	0.26	921	544	47	25	875	1681
Passenger (5 <sup>th</sup> )	390	0.36	689	233	40	16	1452	887

The test data can be found on the NHTSA website at [www.nhtsa.dot.gov](http://www.nhtsa.dot.gov).

#### TEST NOTES

Barrier K-16 My recorded no valid data.  
Barrier F-01 Fx recorded no valid data.  
Barrier F-01 Mz 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.  
Barrier C-02 Mz recorded questionable data.  
Barrier C-06 Fx recorded questionable 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 Honda Civic LX 2-Door Coupe  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20165313  
 Test Date: 7/12/2016

**TEST VEHICLE INFORMATION AND OPTIONS**

NHTSA No.	O20165313	Traction Control System (TCS)	Yes
Model Year	2016	Power Steering	Yes
Make	Honda	Power Window Auto-Reverse	Yes
Model	Civic LX	Driver Frontal Airbag	Yes
Body Style	2-Door Coupe	Driver Curtain Airbag	Yes
VIN	2HGFC4B50GH306091	Driver Head/Torso Airbag	No
Body Color	Modern Steel Metallic	Driver Torso Airbag	No
Odometer (km/mi)	80km / 50mi	Driver Torso/Pelvis Airbag	Yes
Engine Displacement (L)	2.0 L	Driver Pelvis Airbag	No
Type/No. Cylinders	4	Driver Knee Airbag	No
Engine Placement	Lateral	Front Pass. Frontal Airbag	Yes
Transmission Type	Automatic	Front Pass. Curtain Airbag	Yes
Transmission Speeds	CVT	Front Pass. Head/Torso Airbag	No
Overdrive	Yes	Front Pass. Torso Airbag	No
Final Drive	FWD	Front Pass. Torso/Pelvis Airbag	Yes
Roof Rack	No	Front Pass. Pelvis Airbag	No
Sunroof/T-Top	No	Front Pass. Knee Airbag	No
Running Boards	No	Driver Pretensioner	Yes
Tilt Steering Wheel	Yes	Driver Load Limiter	Yes
Power Seats	No	Front Pass. Pretensioner	Yes
Anti-Lock Brakes (ABS)	Yes	Front Pass. Load Limiter	Yes
Automatic Door Locks (ADLs)	Yes	Other	N/A

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

No

**DATA FROM CERTIFICATION LABEL**

Manufactured By	HONDA OF CANADA MFG.	GVWR (kg)	1695
Date of Manufacture	05/16	GAWR Front (kg)	900
		GAWR Rear (kg)	810

**VEHICLE SEATING AND WEIGHT CAPACITY DATA**

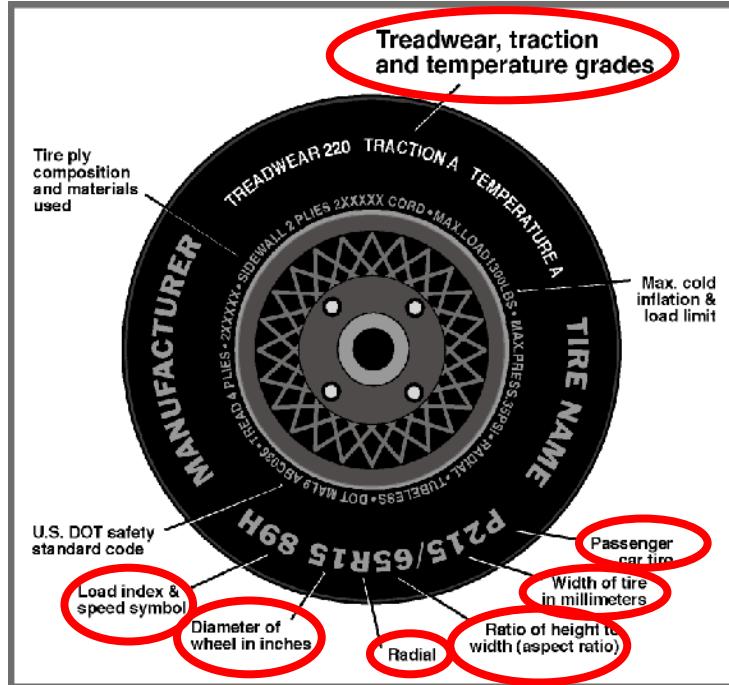
Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Contoured		
Designated Seating Capacity (DSC)	2	3		5
Capacity Weight (VCW) (kg)				385
Cargo Weight (RCLW) (kg)				45

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

Test Vehicle: 2016 Honda Civic LX 2-Door Coupe  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20165313  
 Test Date: 7/12/2016

**VEHICLE TIRE INFORMATION**



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	220	220
Recommended Tire Size	215/55R16	215/55R16
Tire Size on Vehicle	215/55R16	215/55R16
Tire Manufacturer	Firestone	Firestone
Tire Model	FT140	FT140
Treadwear	560	560
Traction	A	A
Temperature Grade	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	1 Polyester, 2 Steel, 1 Nylon	1 Polyester, 2 Steel, 1 Nylon
Load Index/Speed Symbol	93H	93H
Tire Material	Rubber	Rubber
DOT Safety Code Left	W2B3 FT0 1416	W2B3 FT0 1416
DOT Safety Code Right	W2B3 FT0 1416	W2B3 FT0 1416

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

Test Vehicle: 2016 Honda Civic LX 2-Door Coupe  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20165313  
 Test Date: 7/12/2016

**TEST VEHICLE WEIGHTS**

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	380.0	242.5		416.5	300.5	
Right	kg	390.0	230.5		420.0	285.0	
Ratio	%	61.9%	38.1%		58.8%	41.2%	
Totals	kg	770.0	473.0	1243.0	836.5	585.5	1422.0

**TARGET TEST WEIGHT CALCULATION**

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1243.0
Weight of 1 P572E ATD & 1 P572O ATD	kg	141
Rated Cargo/Luggage Weight (RCLW)	kg	45
Calculated Test Vehicle Target Weight (TVTW)	kg	1429

**TEST VEHICLE ATTITUDES AND CG**

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	677	676	688	695	1028
As Tested	mm	659	666	655	661	1113
Post Test	mm	765	677	707	605	

**GENERAL TEST VEHICLE DATA**

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2702
Total Vehicle Length at Left Side	mm	4274
Total Vehicle Length at Centerline	mm	4490
Total Vehicle Length at Right Side	mm	4274
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: Rear seat cushion and seatbacks, LF/RF side mirrors, LR/RR taillight, rear fascia, rear spoiler trim.

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 Honda Civic LX 2-Door Coupe  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20165313  
 Test Date: 7/12/2016

**TARGET VEHICLE STRUCTURAL MEASUREMENT**

	Elements	Pre-Test (mm)
1	Total Length	4490
2	Total Width	1777
3	Bumper Top Height	530
4	Bumper Bottom Height	430
5	Longitudinal Member Top Height	512
6	Distance between Longitudinal Members	922
7	Longitudinal Member Width	55
8	Engine Top Height	833
9	Engine Bottom Height	154
10	Engine and Gearbox Width	875
11	Front Bumper-Engine Distance	320
12	Front Shock Absorber Fixing Height	812
13	Bonnet Leading Edge Height	738
14	Front Shock Absorber Fixing Width	1147
15	Front Bumper – Front Axle Distance	899
16	Front Axle – A-Pillar Distance	443
17	A-Pillar – B-Pillar Distance	1364
18	B-Pillar – Rear Axle Distance	924
19	B-Pillar – C-Pillar Distance	930
20	Roof Sill Bottom Height	1265
21	Roof Sill Top Height	1365
22	Floor Sill Bottom Height	183
23	Floor Sill Top Height	373

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

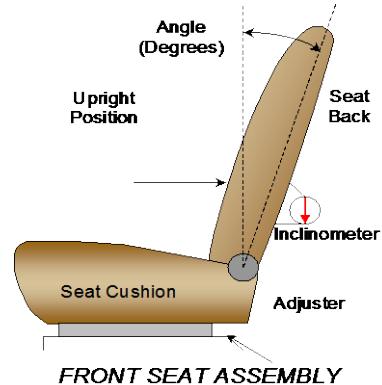
Test Vehicle: 2016 Honda Civic LX 2-Door Coupe  
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NHTSA No.: O20165313  
 Test Date: 7/12/2016

**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	0.8° on headrest post guide
Passenger Seat Back Angle	-1.7° on headrest post guide



**SEAT FORE/AFT POSITIONS**

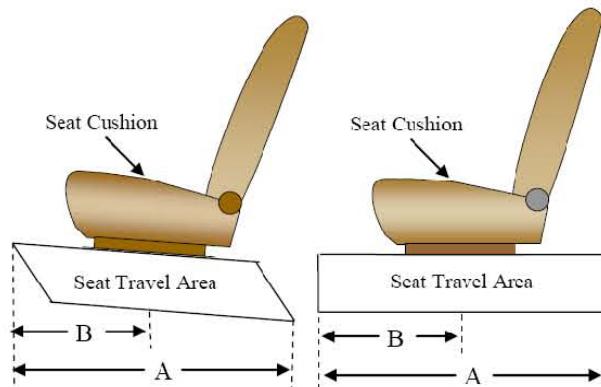
The driver and passenger seat fore/aft positions are adjusted following Appendix F, "Driver & Passenger Dummy Seating & Positioning Procedures" in the NCAP Test Procedure dated October 2015.

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	290 mm / 25 detents	150 mm / 10 <sup>th</sup> detent (1 <sup>st</sup> as 0)
Passenger Seat	240 mm / 25 detents	0 mm / 0 <sup>th</sup> detent (1 <sup>st</sup> as 0)

**SEAT BELT UPPER ANCHORAGES**

The seat belt upper anchorages are positioned 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 Honda Civic LX 2-Door Coupe  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20165313  
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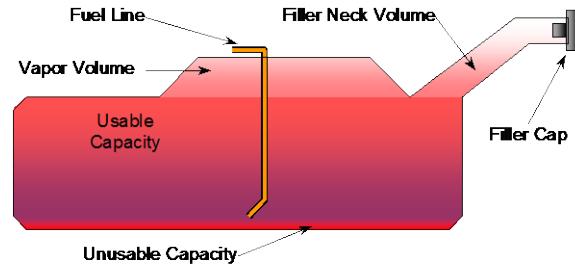
**FUEL TANK CAPACITY DATA**

	Liters
Usable Capacity of "Standard Tank"	46.9
Usable Capacity of "Optional Tank"	
92-94% of Usable Capacity	43.1 to 44.1
Actual Amount of Solvent used	43.5
1/3 of Usable Capacity	15.6

**FUEL PUMP**

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

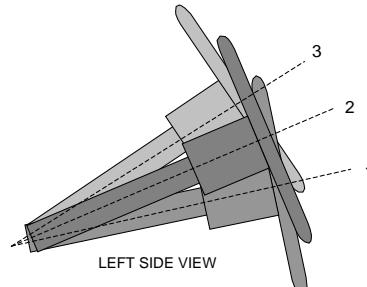
The test vehicle is equipped with an electronic fuel pump. Ignition Stage 2 will activate the fuel pump to prime the system. The filler neck is located on the driver' side.



**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**

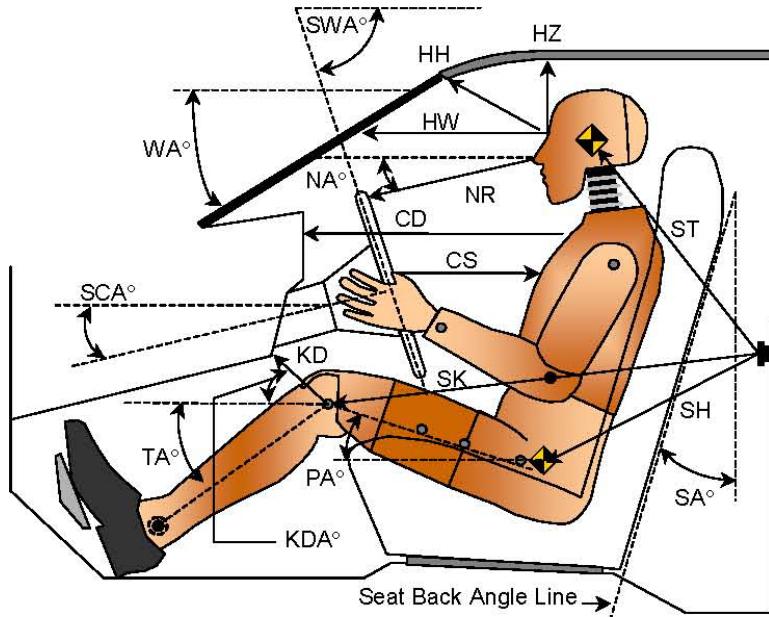
**STEERING COLUMN POSITION**

	Degrees	Fore/Aft Position (mm)
Lowermost Position 1	73.0	161
Geometric Center Position 2	70.2	181
Uppermost Position 3	67.4	200
Telescoping Steering Wheel Travel		39
Test Position	70.2	181

**DATA SHEET NO. 3**  
**DUMMY LONGITUDINAL CLEARANCE DIMENSIONS**

Test Vehicle: 2016 Honda Civic LX 2-Door Coupe  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20165313  
 Test Date: 7/12/2016



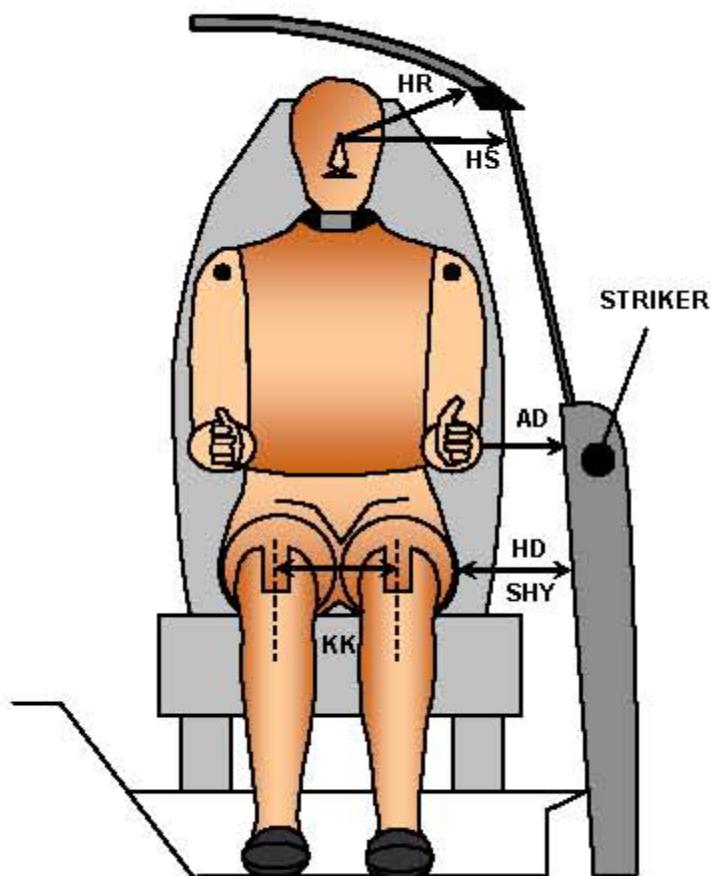
**LEFT SIDE VIEW**

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		26.2		
SWA°	Steering Wheel Angle		70.2		
SCA°	Steering Column Angle		19.8		
SA°	Seat Back Angle		0.8		-1.7
HZ	Head to Roof (Z)	197	90	203	90
HH	Head to Header	349	26.8	295	43.9
HW	Head to Windshield	682	0	688	0
NR	Nose to Rim	378	7.1		
CD	Chest to Dash	519		369	
CS	Chest to Steering Hub	318	2.2		
RA	Rim to Abdomen	201	0		
KDL	Left Knee to Dash	176	28.3	120	47.9
KDR	Right Knee to Dash	165	29.4	128	48.8
PA°	Pelvic Angle		23.7		20.2
TA°	Tibia Angle		39.4		39.2
SK	Striker to Knee	850	96.3	949	100.5
ST	Striker to Head	523	46.8	579	54.9
SH	Striker to H-Point	538	118.8	643	109.9

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

Test Vehicle: 2016 Honda Civic LX 2-Door Coupe  
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: 020165313  
Test Date: 7/12/2016



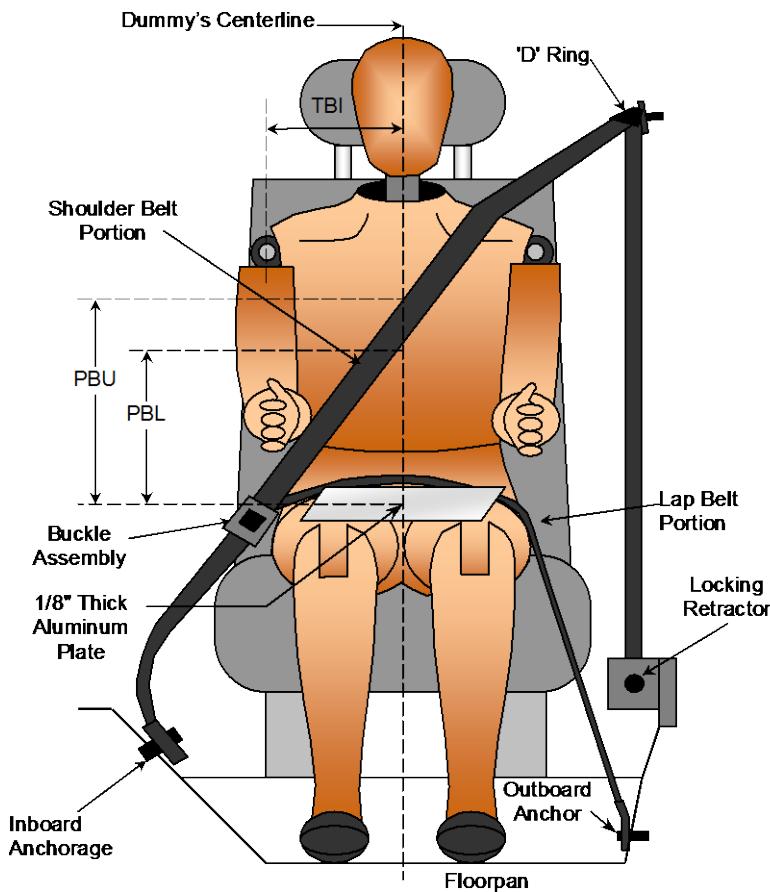
## **FRONT VIEW OF DUMMY**

Code	Measurement Description	Driver	Passenger
		Length (mm)	
AD	Arm to Door	131	90
HD	H-Point to Door	160	171
HR	Head to Side Header	224	253
HS	Head to Side Window	344	355
KK	Knee to Knee	355	228
SHY	Striker to H-Point (Y Direction)	293	305
AA	Ankle to Ankle	357	172

**DATA SHEET NO. 5**  
**SEAT BELT POSITIONING DATA**

Test Vehicle: 2016 Honda Civic LX 2-Door Coupe  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20165313  
 Test Date: 7/12/2016



**FRONT VIEW OF DUMMY**

**SEAT BELT POSITIONING MEASUREMENTS**

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	355	320
PBL - Top surface of reference to belt lower edge	mm	270	240

**BELT LENGTH DATA**

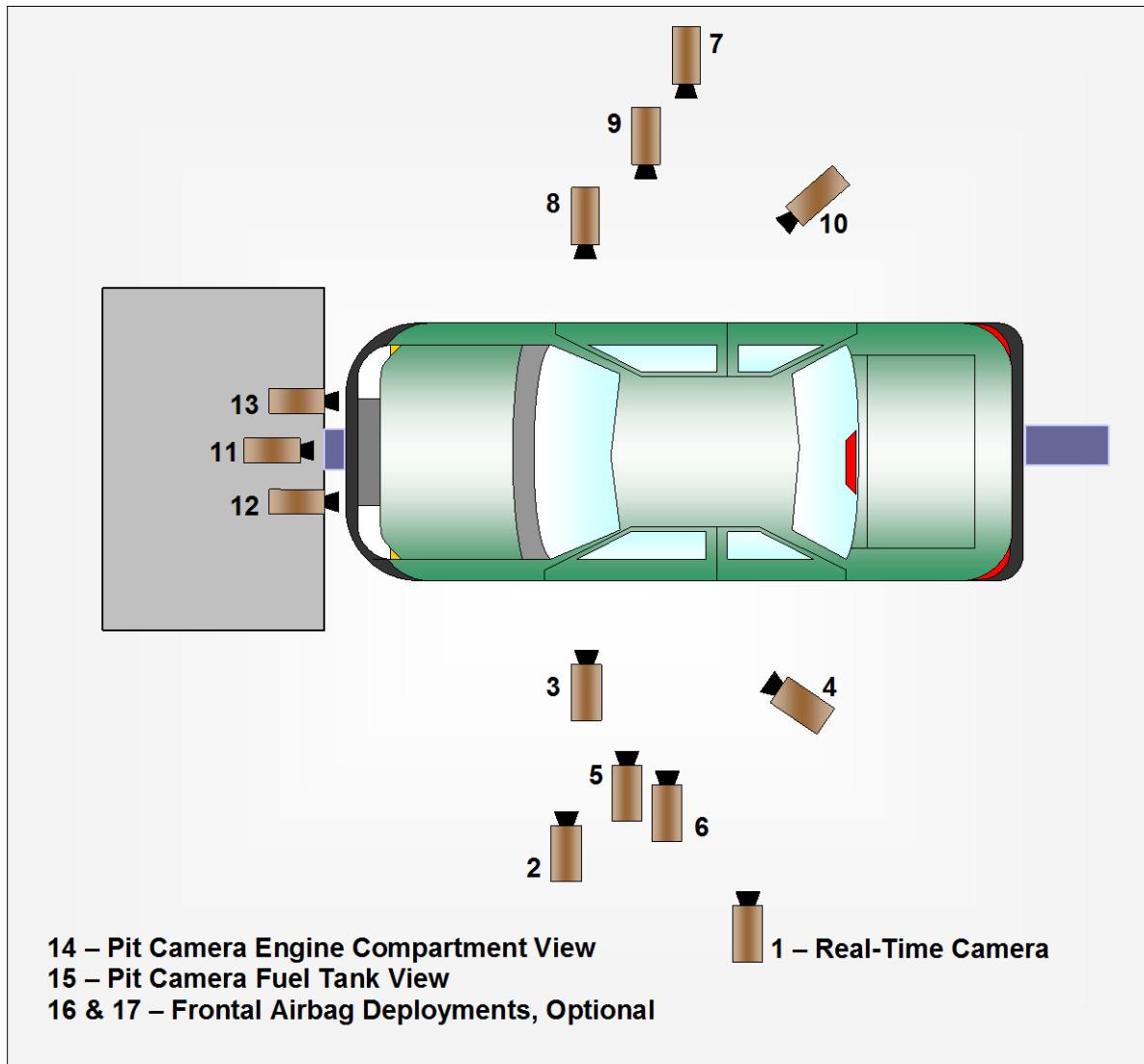
Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as measured on ATD	mm	1050	1105
Lap Belt Length as measured on ATD	mm	740	815
Remainder of belt on reel	mm	1010	880
Total Belt Length for Continuous Webbing Systems	mm	3350	3350

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

Test Vehicle: 2016 Honda Civic LX 2-Door Coupe  
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20165313  
Test Date: 7/12/2016

**CAMERA POSITIONS FOR FRONTAL IMPACTS**



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

Test Vehicle: 2016 Honda Civic LX 2-Door Coupe  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20165313  
 Test Date: 7/12/2016

**CAMERA LOCATIONS**

No.	Camera View	Coordinates (mm)			Lens (mm)	Speed (fps)
		X*	Y*	Z*		
1	Real-Time Left Overall					30
2	Driver Close-Up	-1470	-6340	-2040	35	1000
3	Left Front Half	-1310	-5300	-1240	24	1000
4	Left Angle	-6470	-4960	-2050	50	1000
5	Steering Column - Top					
6	Steering Column - Bottom					
7	Right Overall	-2060	6320	-1150	20	1000
8	Passenger Close-Up	-1490	6720	-2000	35	1000
9	Right Front Half	-1280	5180	-1200	24	1000
10	Right Angle	-5810	4960	-2030	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	-1040	0	3150	24	1000
15	Pit Rear	-3010	0	3150	24	1000
16	Onboard Driver Side				12	1000
17	Onboard Passenger Side				12	1000
18	Real-Time Pan View					30

\*COORDINATES:

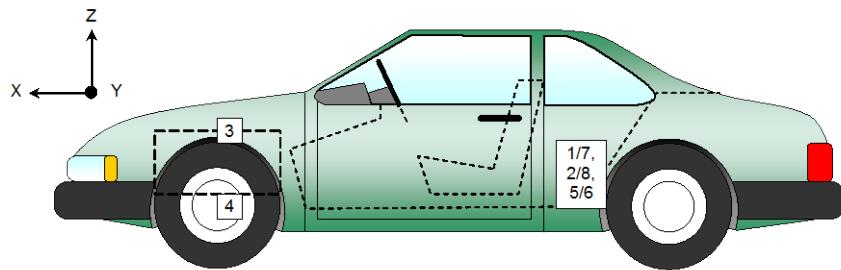
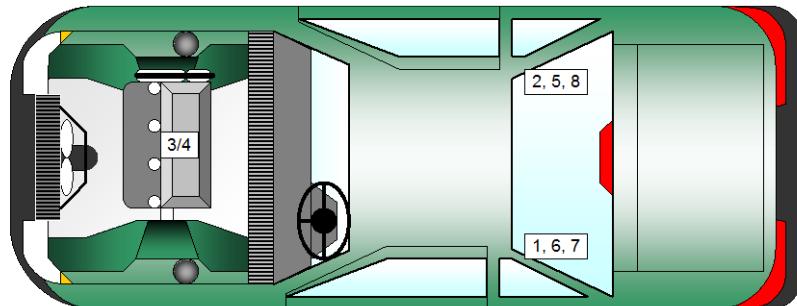
- +X = forward of impact plane
- +Y = right of monorail centerline
- +Z = below ground level

Cameras 5 & 6 were not used for this test.

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

Test Vehicle: 2016 Honda Civic LX 2-Door Coupe  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20165313  
 Test Date: 7/12/2016



**VEHICLE ACCELEROMETER PRE-TEST LOCATIONS**

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Crossmember Accelerometer – X Direction	1811	-380	-214
2	Right Rear Crossmember Accelerometer – X Direction	1811	390	-228
3	Engine Top X	3806	158	-818
4	Engine Bottom X	3829	235	-150
5	Left Rear Crossmember Accelerometer – Z Direction	1811	-380	-214
6	Right Rear Crossmember Accelerometer – Z Direction	1811	390	-228
7	Left Rear Crossmember Accelerometer Redundant – X Direction	1811	-423	-214
8	Right Rear Crossmember Accelerometer Redundant – X Direction	1811	432	-228

Reference Points: X - Rear Surface of Vehicle (+ forward)

Y - Vehicle Centerline (+ to right)

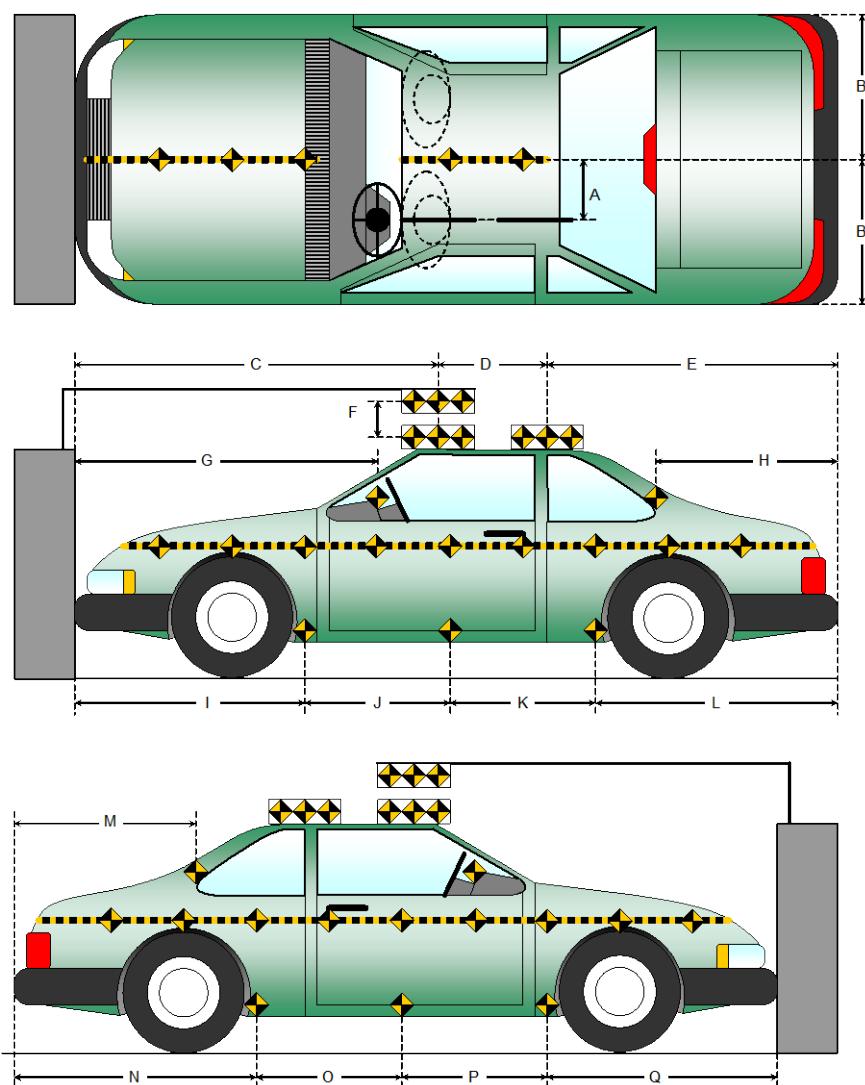
Z - Ground Plane (+ down)

**DATA SHEET NO. 8**  
**PHOTOGRAPHIC REFERENCE TARGET LOCATIONS**

Test Vehicle: 2016 Honda Civic LX 2-Door Coupe  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20165313  
 Test Date: 7/12/2016

Item	Value (mm)
A	367
B	889
C	2250
D	618
E	1622
F	240
G	
H	786
I	1340
J	919
K	919
L	1312
M	786
N	1312
O	919
P	919
Q	1340



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

Test Vehicle: 2016 Honda Civic LX 2-Door Coupe  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20165313  
 Test Date: 7/12/2016

**Advanced Research Load Cell Barrier**

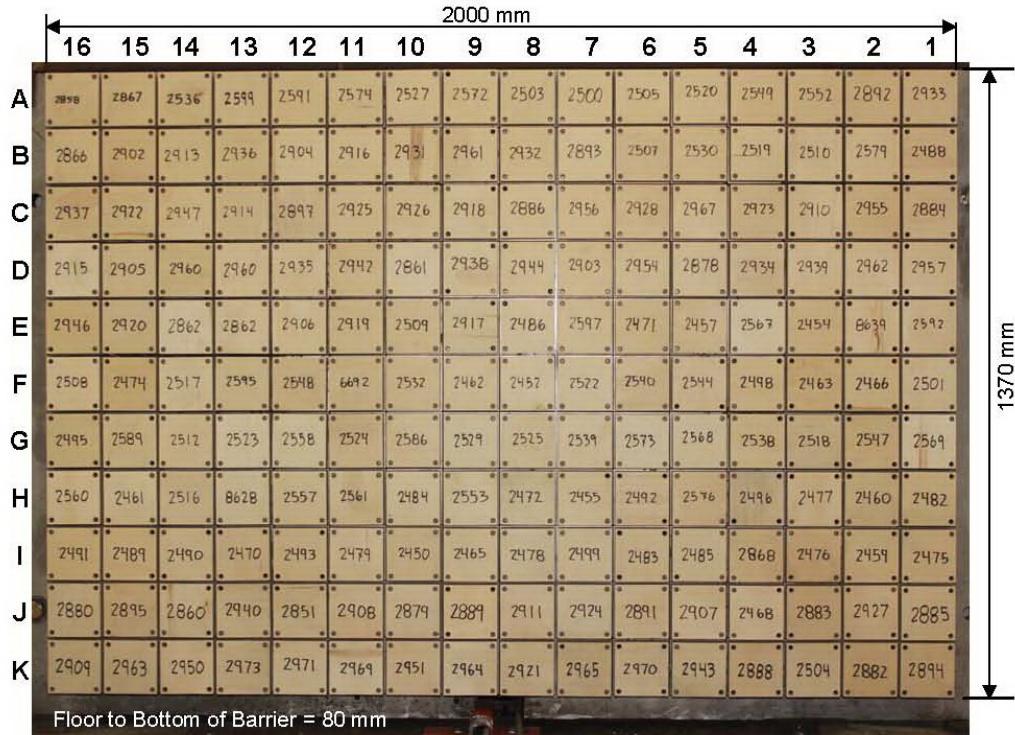


Photo for Reference Only

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 Honda Civic LX 2-Door Coupe  
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20165313  
Test Date: 7/12/2016

**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 Honda Civic LX 2-Door Coupe  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20165313  
 Test Date: 7/12/2016

**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	Steering Column Shroud	Glovebox
Right Knee Contact	Steering Column Shroud	Glovebox

**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	None
Window Damage	None
Other Notable Effects	None

**VEHICLE REBOUND FROM BARRIER**

Measured Parameter	Units	Value
Left Side	mm	780
Center	mm	690
Right Side	mm	790
Average	mm	753

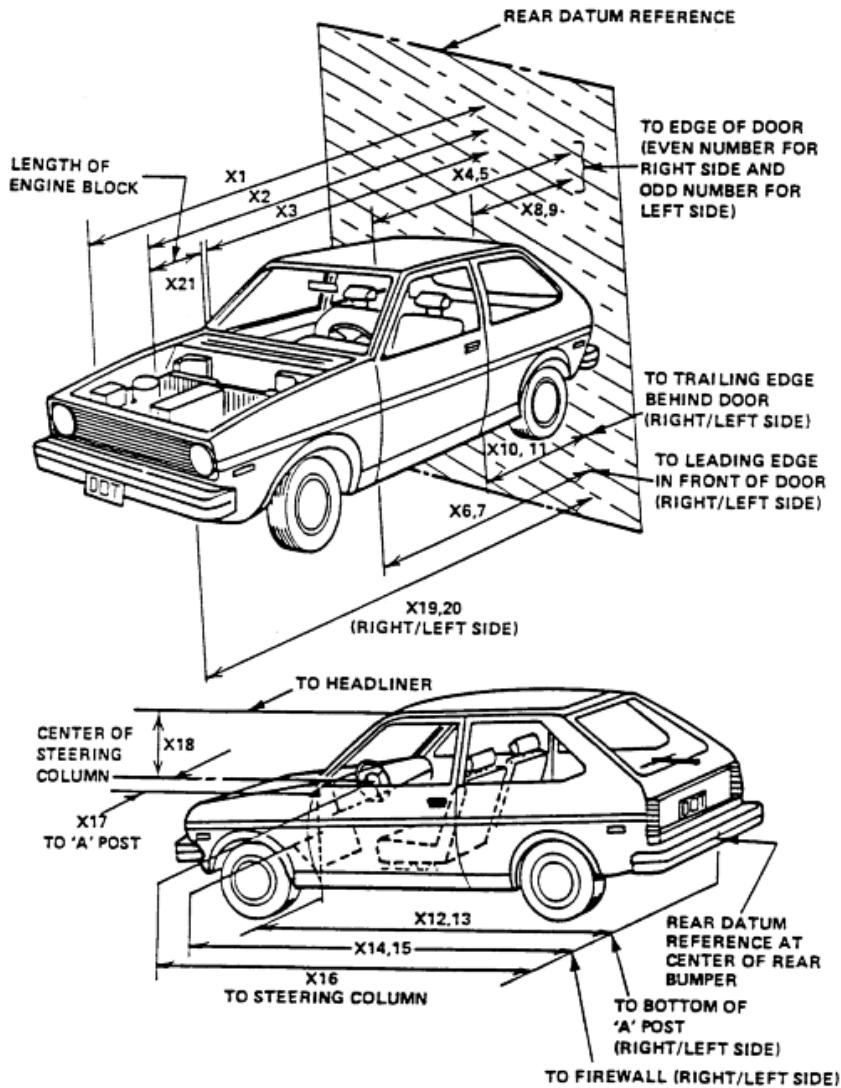
**SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION**

Restraint Type	Driver (Occupant 1)		Passenger (Occupant 2)	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	Yes	Yes	Yes
Curtain Side Airbag	Yes	No	Yes	Yes
Torso/Pelvis Side Airbag	Yes	No	Yes	Yes
Knee Airbag	No		No	
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes		Yes	

**DATA SHEET NO. 12**  
**VEHICLE PROFILE MEASUREMENTS**

Test Vehicle: 2016 Honda Civic LX 2-Door Coupe  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20165313  
 Test Date: 7/12/2016



**DATA SHEET NO. 12 (CONTINUED)**  
**VEHICLE PROFILE MEASUREMENTS**

Test Vehicle: 2016 Honda Civic LX 2-Door Coupe  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20165313  
 Test Date: 7/12/2016

**RSOV (Rear Surface of Vehicle)**

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	mm	4490	4038	452
2	RSOV to Front of Engine	mm	4058	3854	204
3	RSOV to Firewall	mm	3492	3445	47
4	RSOV to Upper Leading Edge of Right Door	mm	3088	3044	44
5	RSOV to Upper Leading Edge of Left Door	mm	3088	3093	-5
6	RSOV to Lower Leading Edge of Right Door	mm	3063	3017	46
7	RSOV to Lower Leading Edge of Left Door	mm	3062	3072	-10
8	RSOV to Upper Trailing Edge of Right Door	mm	1709	1664	45
9	RSOV to Upper Trailing Edge of Left Door	mm	1709	1712	-3
10	RSOV to Lower Trailing Edge of Right Door	mm	1821	1762	59
11	RSOV to Lower Trailing Edge of Left Door	mm	1821	1829	-8
12	RSOV to Bottom of "A" Post of Right Side	mm	3147	3078	69
13	RSOV to Bottom of "A" Post of Left Side	mm	3145	3131	14
14	RSOV to Firewall, Right Side	mm	3321	3279	42
15	RSOV to Firewall, Left Side	mm	3309	3306	3
16	RSOV to Steering Column	mm	2595	2684	-89
17	Center of Steering Column to "A" Post	mm	381	387	-6
18	Center of Steering Column to Headliner	mm	427	453	-26
19	RSOV to Right Side of Front Bumper	mm	4274	3899	375
20	RSOV to Left Side of Front Bumper	mm	4274	3947	327
21	Length of Engine Block	mm	525	525	0
RD	RSOV to Right Side of Dash Panel	mm	2920	2838	82
CD	RSOV to Center of Dash Panel	mm	2912	2858	54
LD	RSOV to Left Side of Dash Panel	mm	2891	2880	11

**DATA SHEET NO. 13**  
**ACCIDENT INVESTIGATION DIVISION DATA**

Test Vehicle: 2016 Honda Civic LX 2-Door Coupe  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20165313  
 Test Date: 7/12/2016

### VEHICLE INFORMATION

VIN:	<u>2HGFC4B50GH306091</u>	Wheelbase (mm):	<u>2702</u>
Vehicle Size Category:	<u>Passenger Car</u>	Test Weight (kg):	<u>1422.0</u>

### ACCELEROMETER DATA

Accelerometer Locations: As per measurements on Page 15

Cal. Procedure/Interval: MGA procedure / 6 month

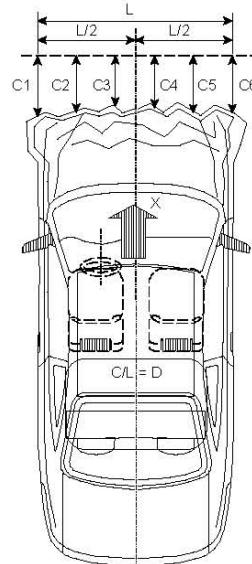
Integration Algorithm: Trapezoidal

Linearity: > 99%

Impact Velocity (km/h): 56.17

Velocity Change (km/h): 66.0

Time of Separation (msec): 99



### CRUSH PROFILE

Collision Deformation Classification: Frontal

Midpoint of Damage: Centerline

Damage Region Length (mm): 1532

Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4274	3947	327
C2	Crush zone 2 at left side	mm	4425	3988	437
C3	Crush zone 3 at left side	mm	4474	4013	461
C4	Crush zone 4 at right side	mm	4474	4006	468
C5	Crush zone 5 at right side	mm	4425	3975	450
C6	Crush zone 6 at right side	mm	4274	3899	375
L	C1 TO C6	mm	1532	1494	38

**DATA SHEET NO. 14**  
**VEHICLE INTRUSION MEASUREMENTS**

Test Vehicle: 2016 Honda Civic LX 2-Door Coupe  
 Test Program: NCAP Frontal Barrier Impact Test

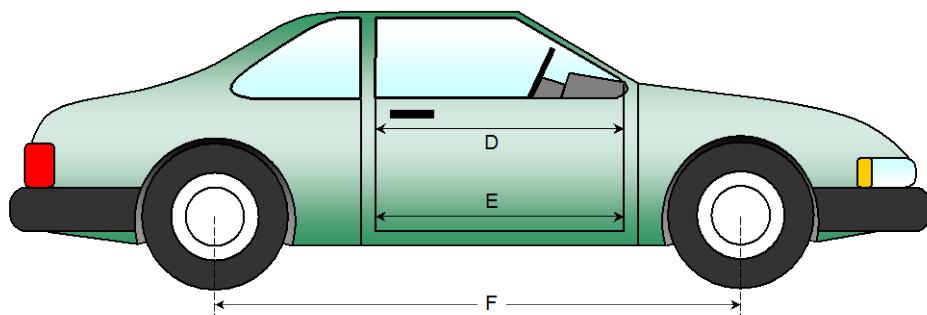
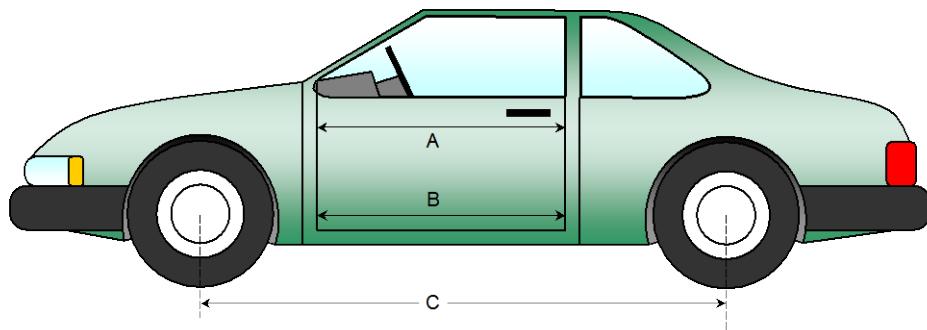
NHTSA No.: O20165313  
 Test Date: 7/12/2016

**DOOR OPENING WIDTH**

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1292	1292	0
B	Left Side Lower	mm	1272	1272	0
D	Right Side Upper	mm	1292	1292	0
E	Right Side Lower	mm	1272	1272	0

**WHEELBASE MEASUREMENTS**

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2702	2597	105
F	Right Side Wheelbase	mm	2702	2565	137



**DATA SHEET NO. 14 (CONTINUED)**  
**VEHICLE INTRUSION MEASUREMENTS**

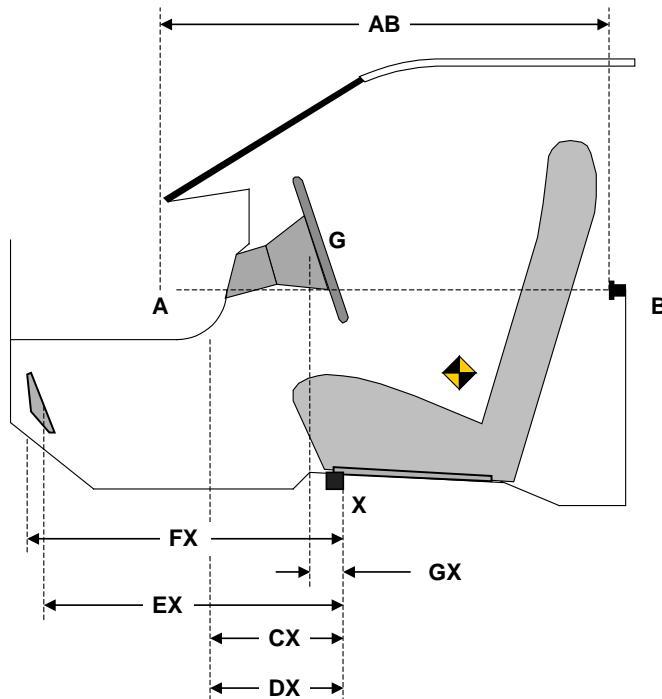
Test Vehicle: 2016 Honda Civic LX 2-Door Coupe  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20165313  
 Test Date: 7/12/2016

**DRIVER COMPARTMENT INTRUSION**

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	998	998	0
CX	Left Knee Bolster to X	mm	249	253	-4
DX	Right Knee Bolster to X	mm	263	257	6
EX	Brake Pedal to X	mm	590	584	6
FX	Foot Rest to X	mm	603	581	22
GX	Center of Steering Column Wheel Hub to X	mm	71	137	-66

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 Honda Civic LX 2-Door Coupe  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20165313  
 Test Date: 7/12/2016

Windshield Mounting Details:

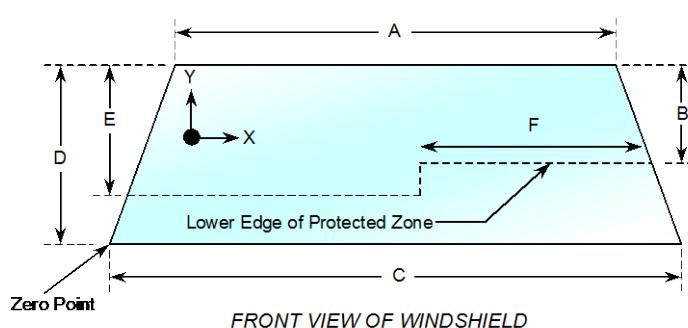
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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: 21.8° C.

**WINDSHIELD PERIPHERY MEASUREMENTS**

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2191	2191	100.0
Right Side	2205	2205	100.0
Total	4396	4396	100.0



Item	Units	Value
A	mm	1190
B	mm	471
C	mm	1618
D	mm	794
E	mm	543
F	mm	533

**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: 2016 Honda Civic LX 2-Door Coupe  
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20165313  
Test Date: 7/12/2016

**FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA**

Temperature at Time of Impact: 21.8°C      Test Time: 10:41 a.m.

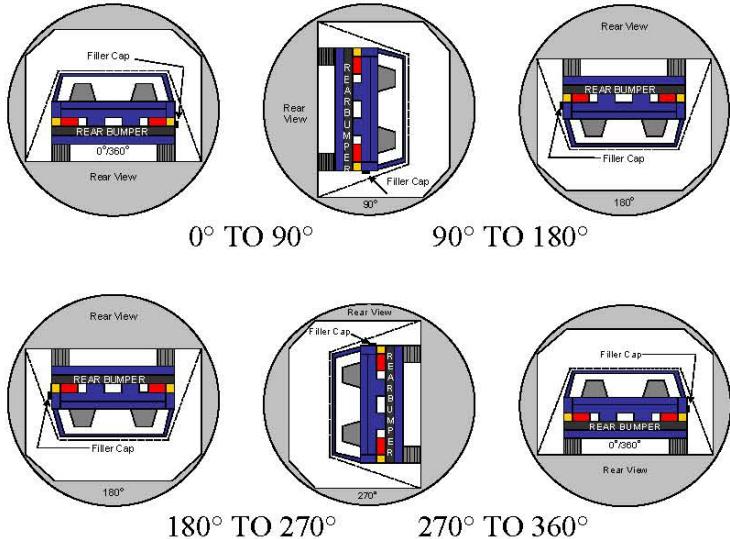
- A. From impact until vehicle motion ceases: 0 oz.  
(Maximum allowable = 1 oz.)
- B. For the 5 minute period after motion ceases: 0 oz.  
(Maximum allowable = 5 oz.)
- C. For the following 25 minutes: 0 oz.  
(Maximum allowable = 1 oz./minute)
- D. Spillage: None

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

Test Vehicle: 2016 Honda Civic LX 2-Door Coupe  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20165313  
 Test Date: 7/12/2016

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°	114	300	414
90° to 180°	110	300	410
180° to 270°	107	300	407
270° to 360°	111	300	411

**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

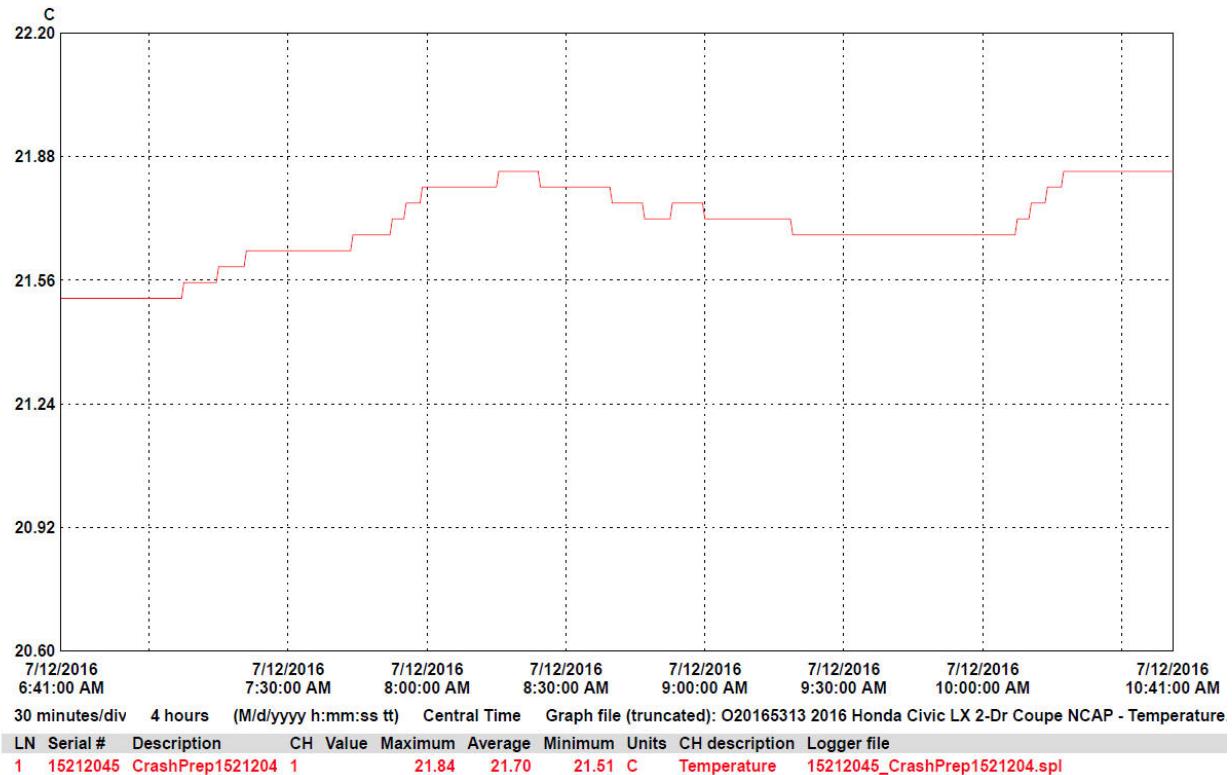
**SOLVENT SPILLAGE LOCATION TABLE**

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 Honda Civic LX 2-Door Coupe  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20165313  
 Test Date: 7/12/2016



**APPENDIX A**  
**PHOTOGRAPHS**

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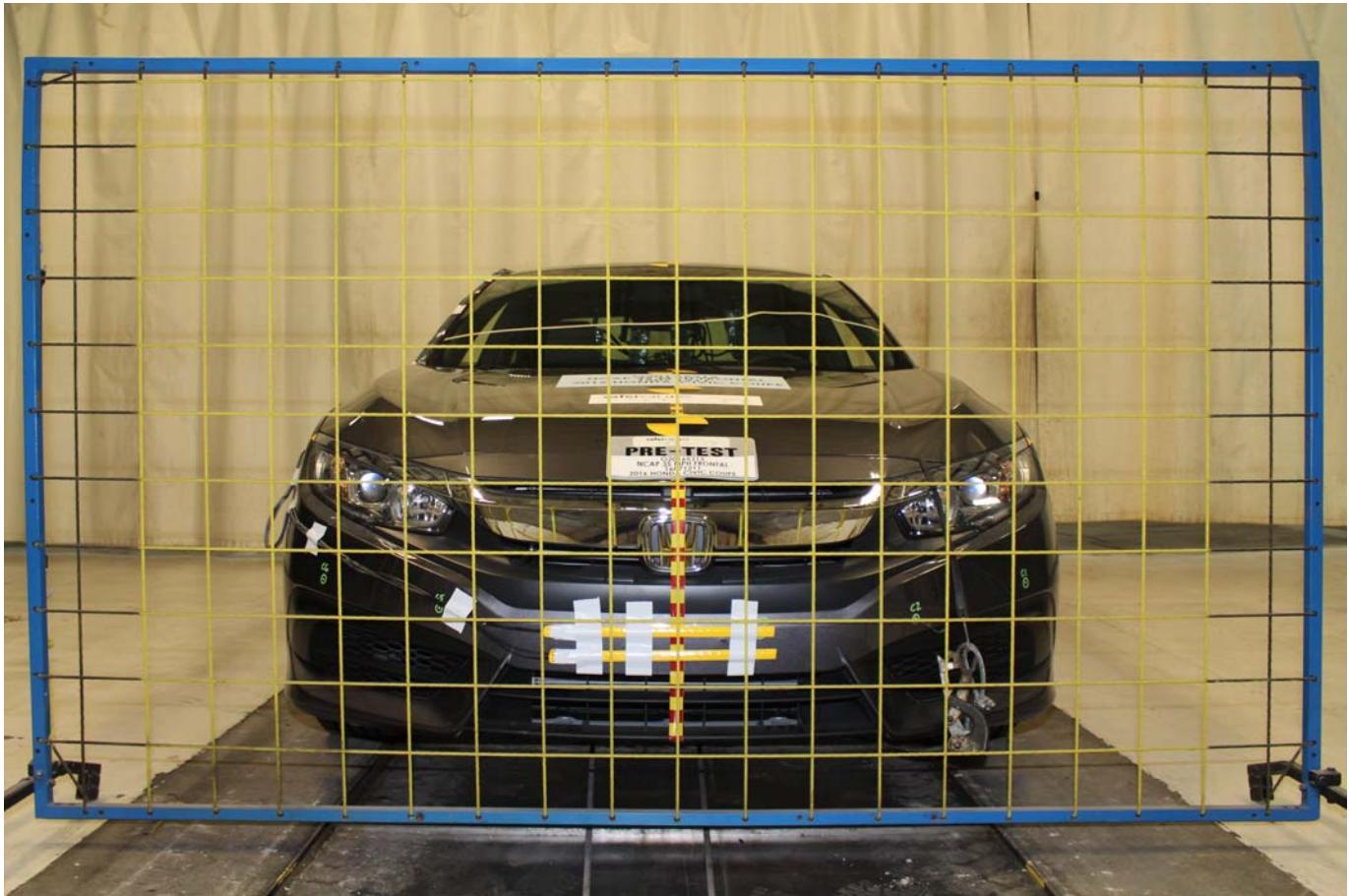


Photo No. 001 - Load Cell Location



Photo No. 002 - Pre-Test Load Cell Wall

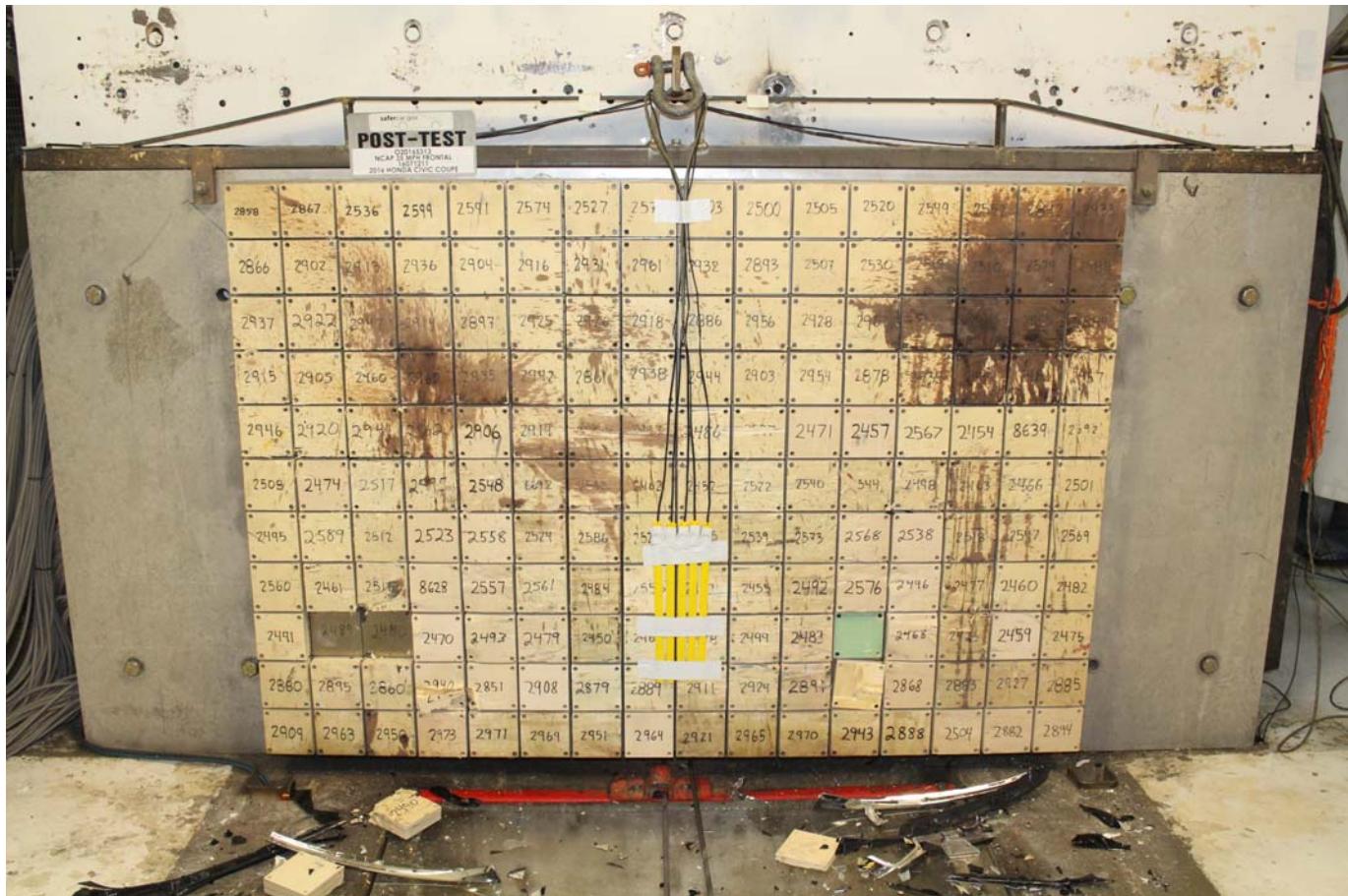


Photo No. 003 - Post-Test Load Cell Wall



Photo No. 004 - Manufacturer's Label



Photo No. 005 - Tire Placard



Photo No. 006 - 2016 Honda Civic LX Coupe Frontal As Delivered



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

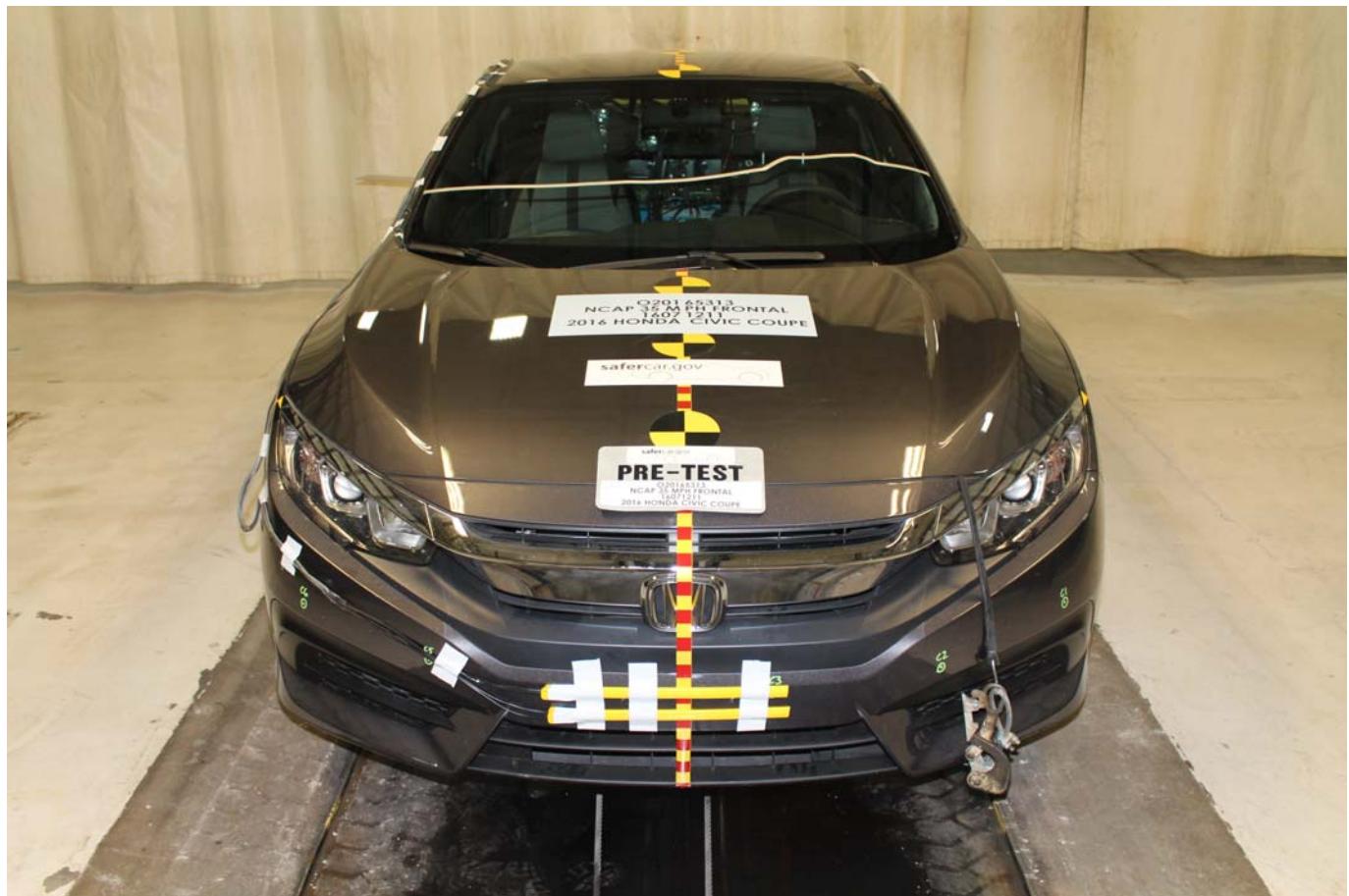


Photo No. 008 - Pre-Test Front View of Test Vehicle

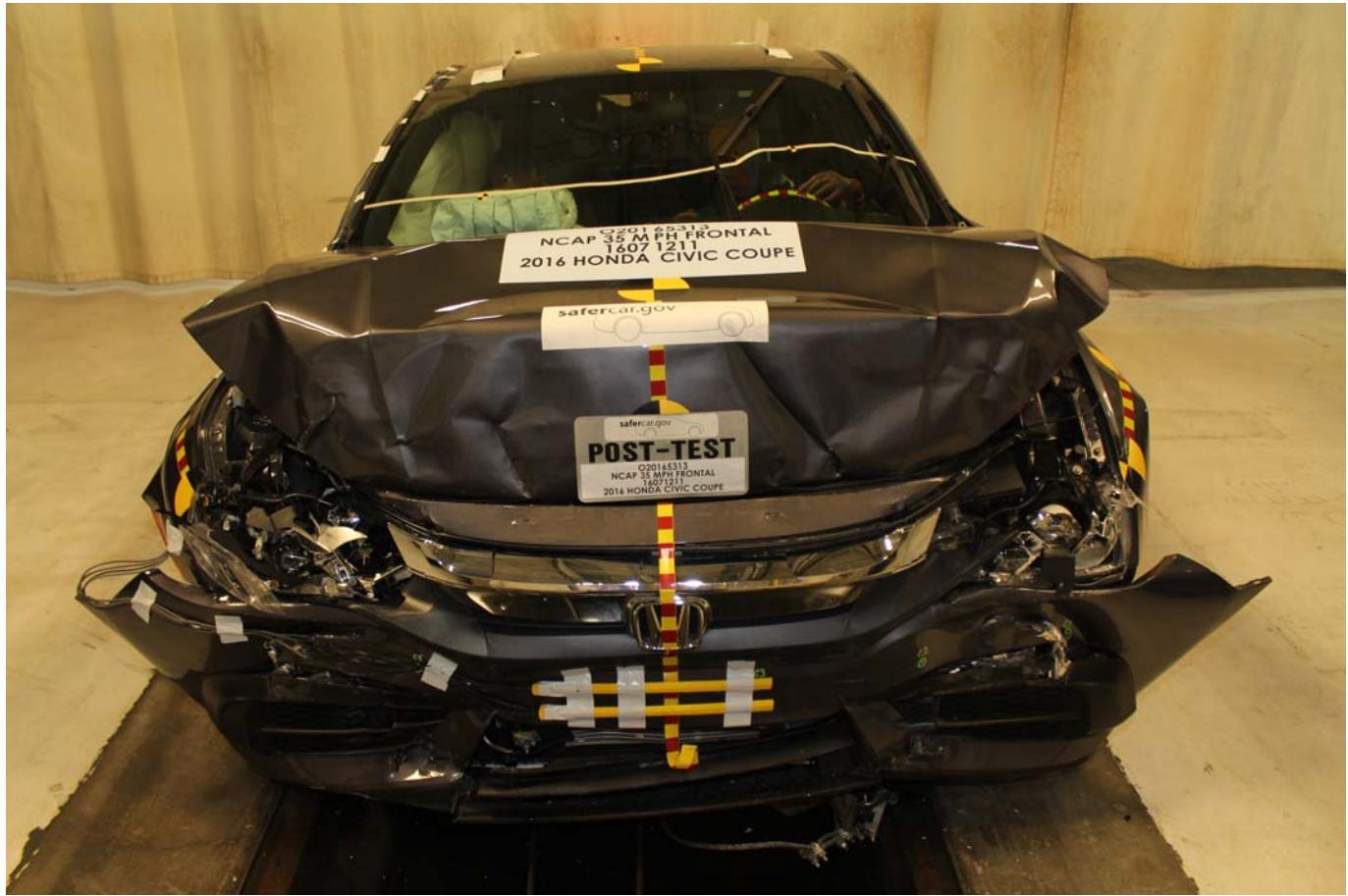


Photo No. 009 - Post-Test Front View of Test Vehicle



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

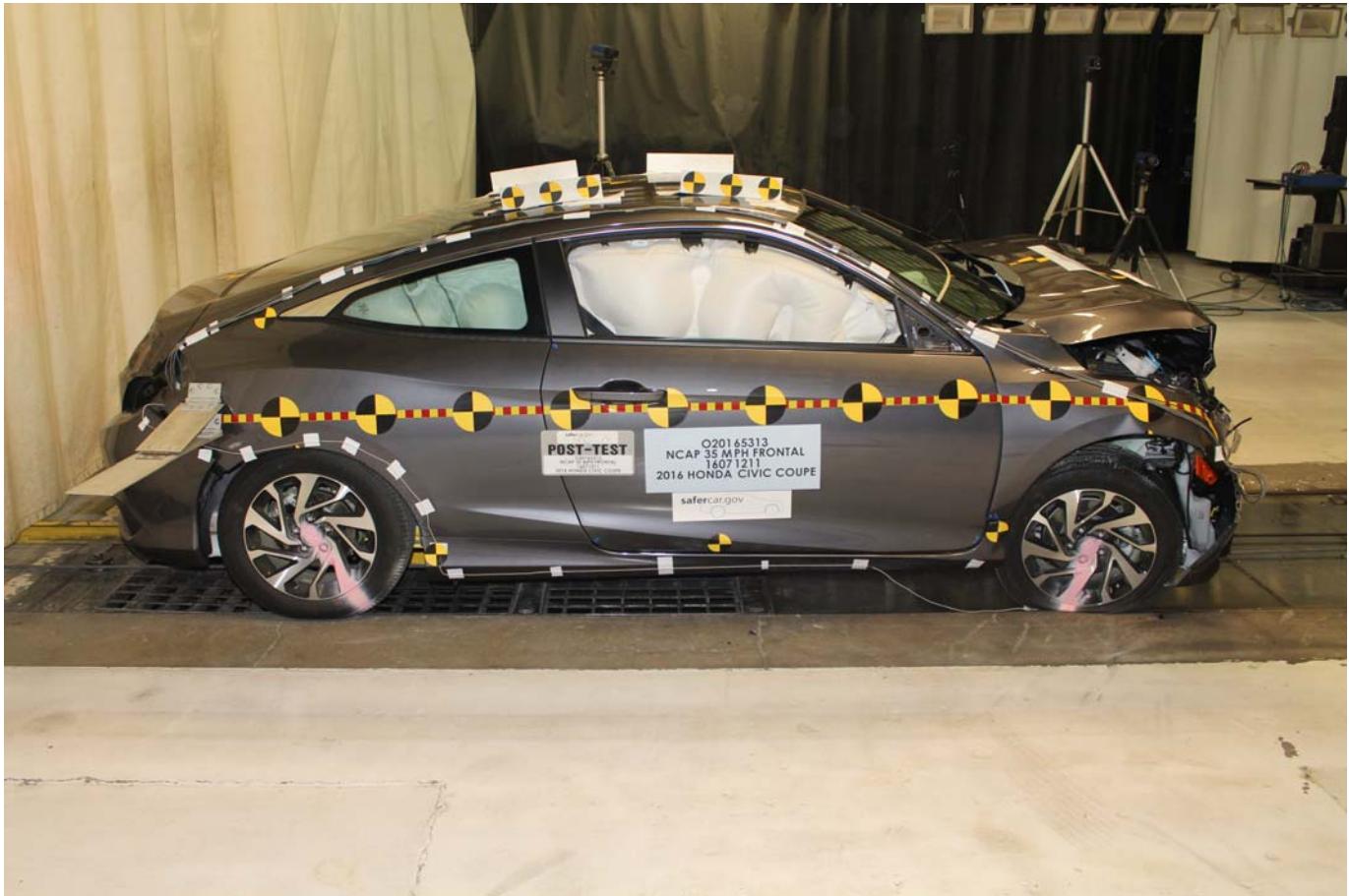


Photo No. 013 - Post-Test Right View of Test Vehicle



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

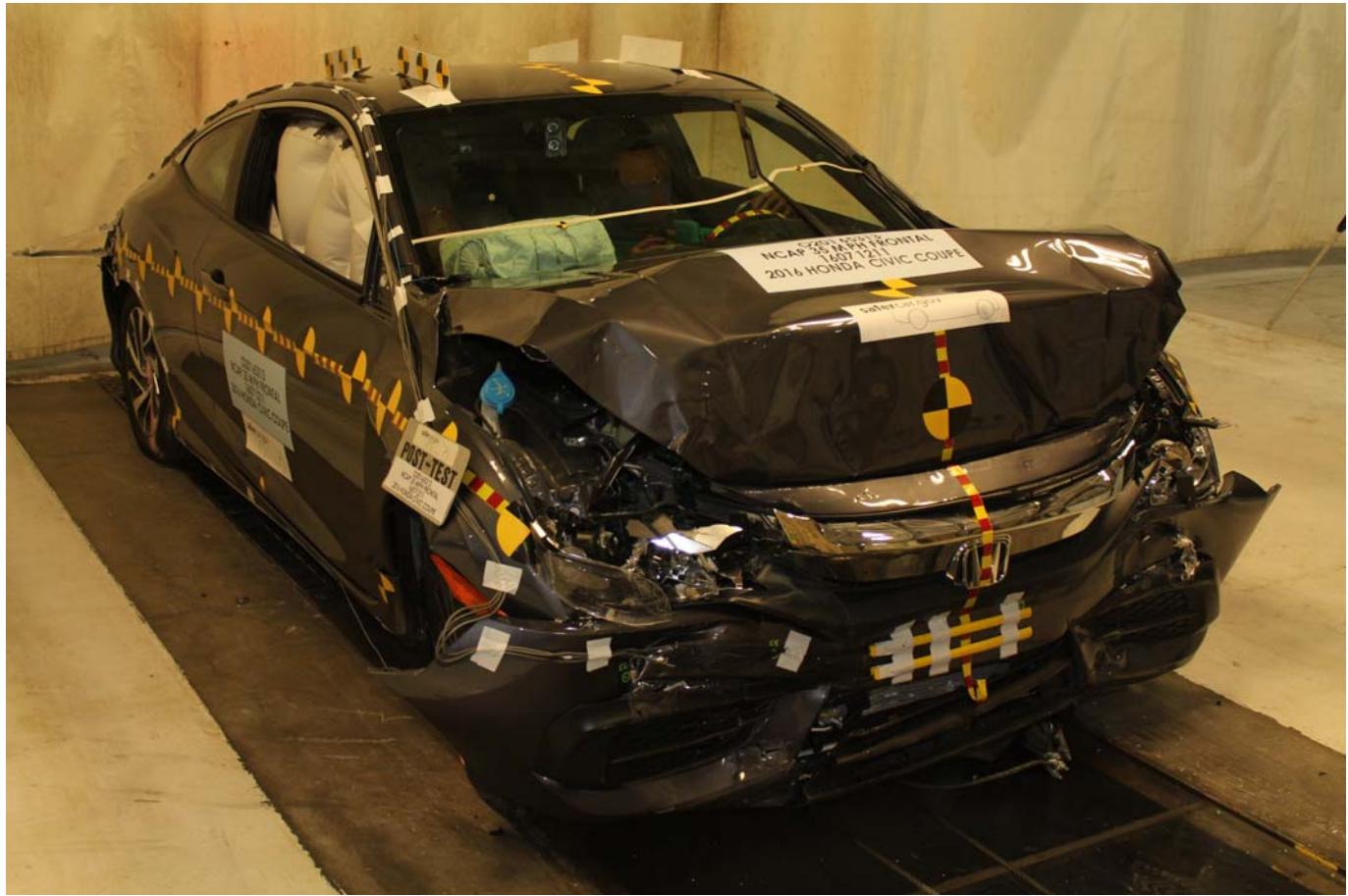


Photo No. 015 - Post-Test Right Front 3-4 View

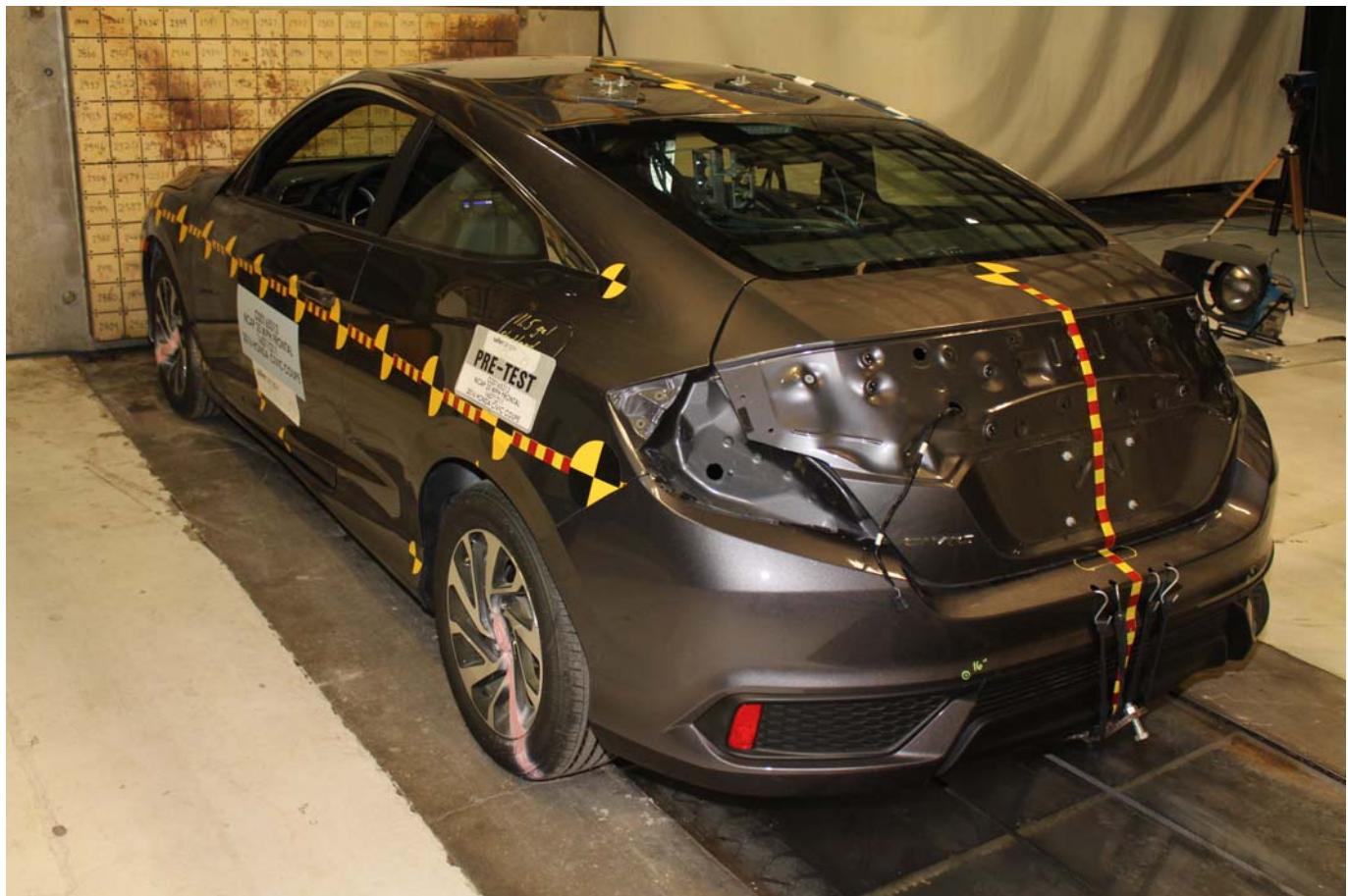


Photo No. 016 - Pre-Test Left Rear 3-4 View



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

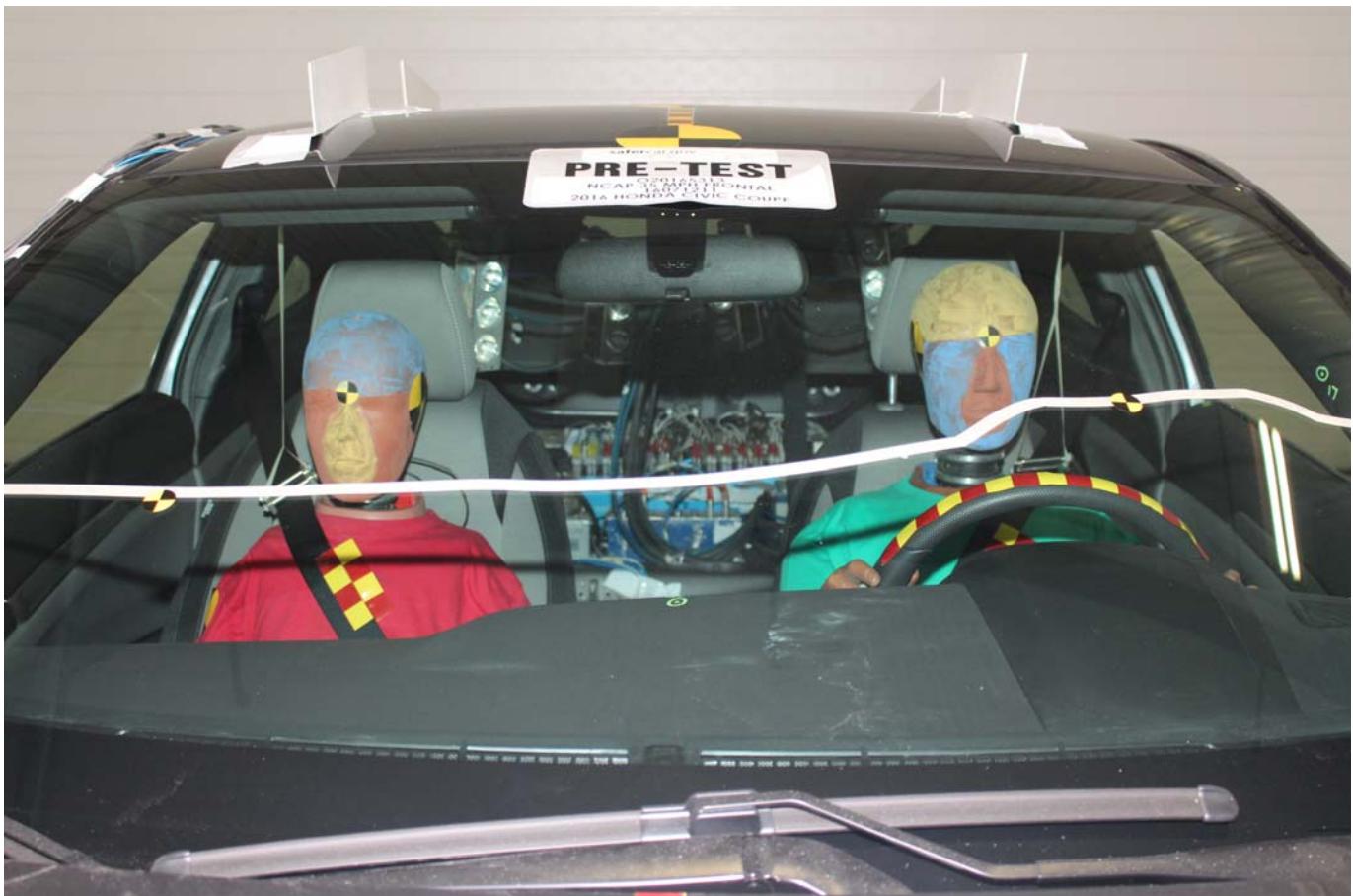


Photo No. 018 - Pre-Test Windshield View



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

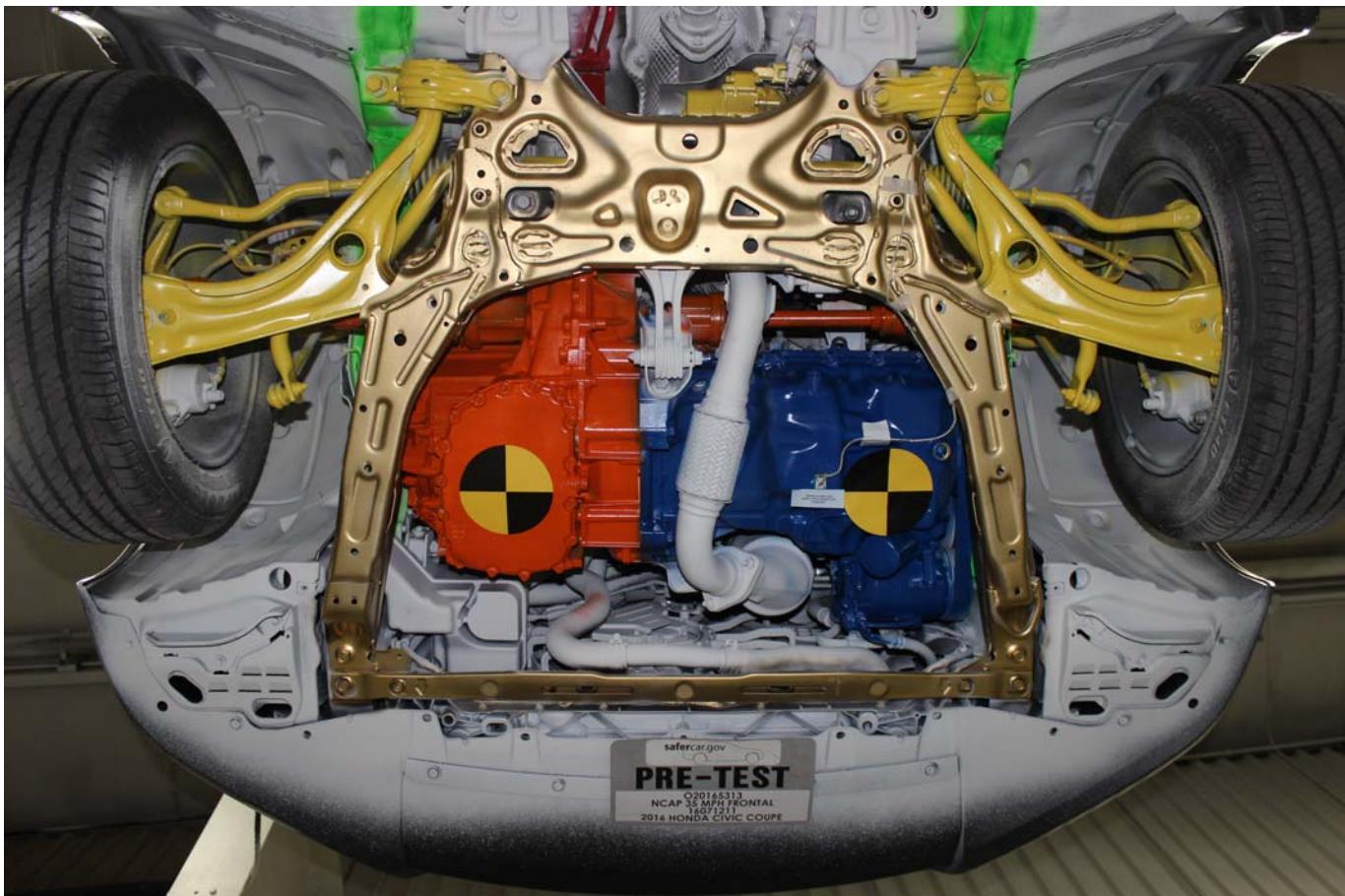


Photo No. 024 - Pre-Test Front Underbody View

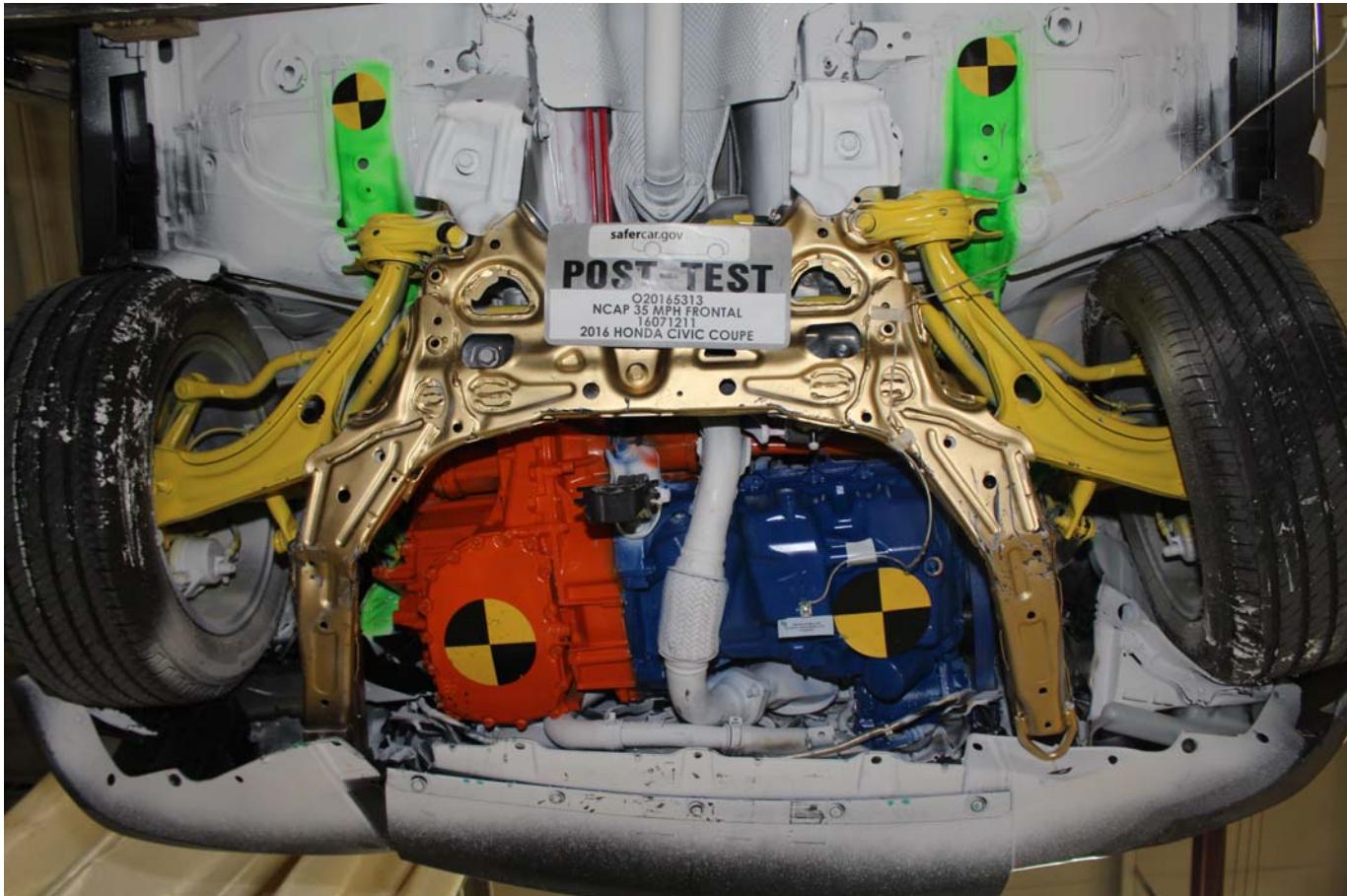


Photo No. 025 - Post-Test Front Underbody View



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)

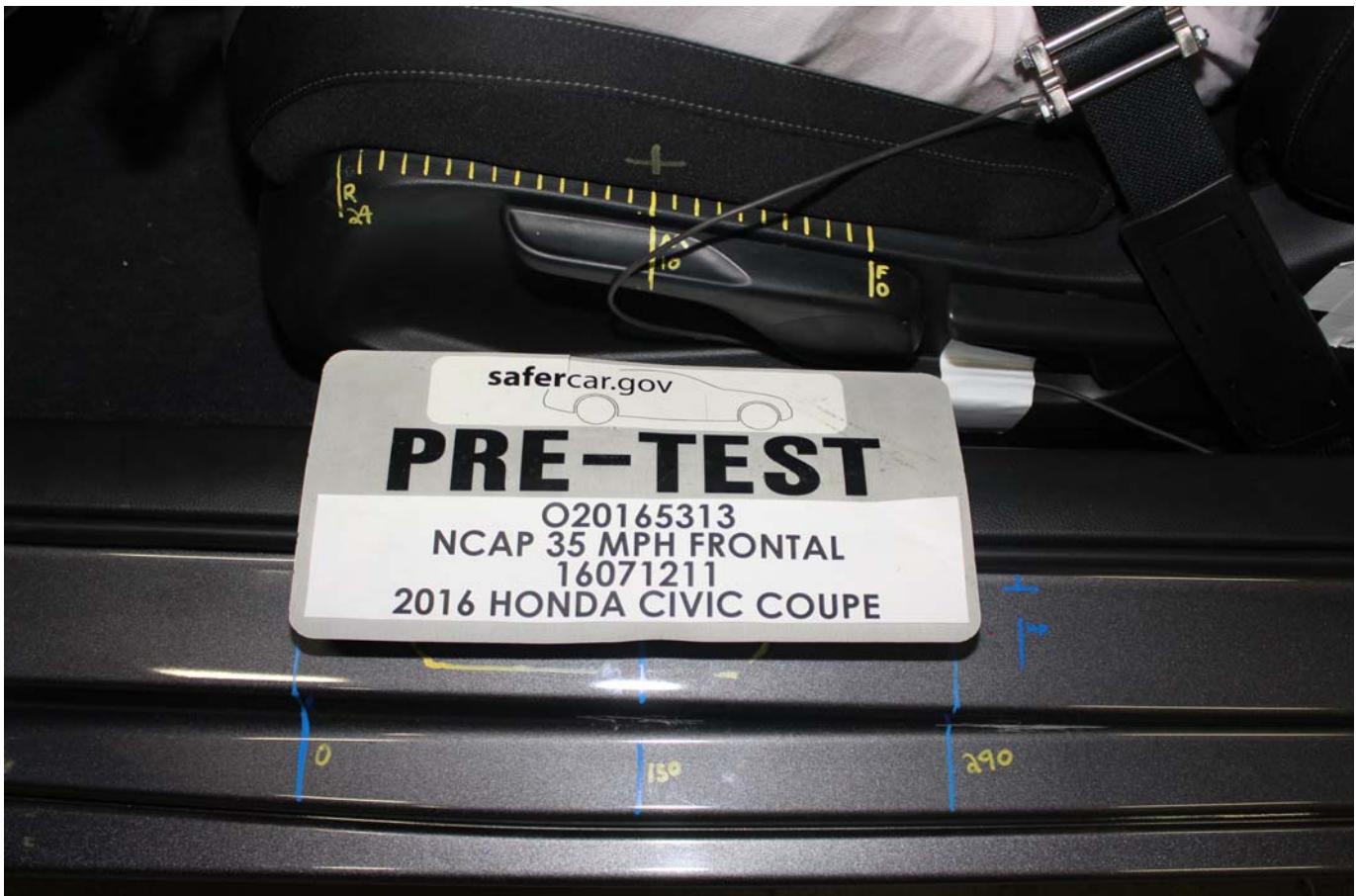


Photo No. 036 - Pre-Test Driver's Seat Fore-Aft Markings

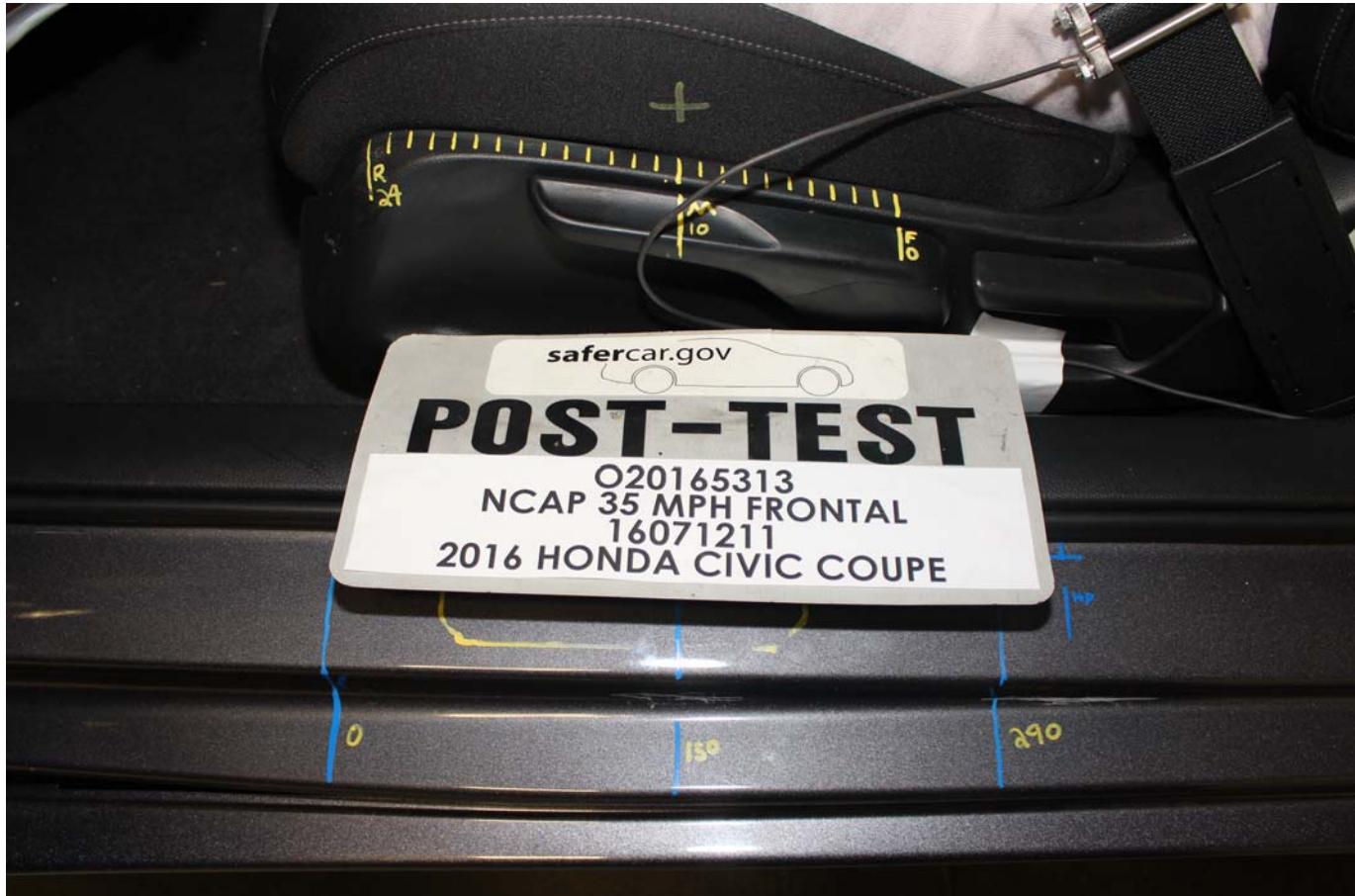


Photo No. 037 - Post-Test Driver's Seat Fore-Aft Markings



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. 051 - Pre-Test Passenger Dummy Front View



Photo No. 052 - Post-Test Passenger Dummy Front View



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

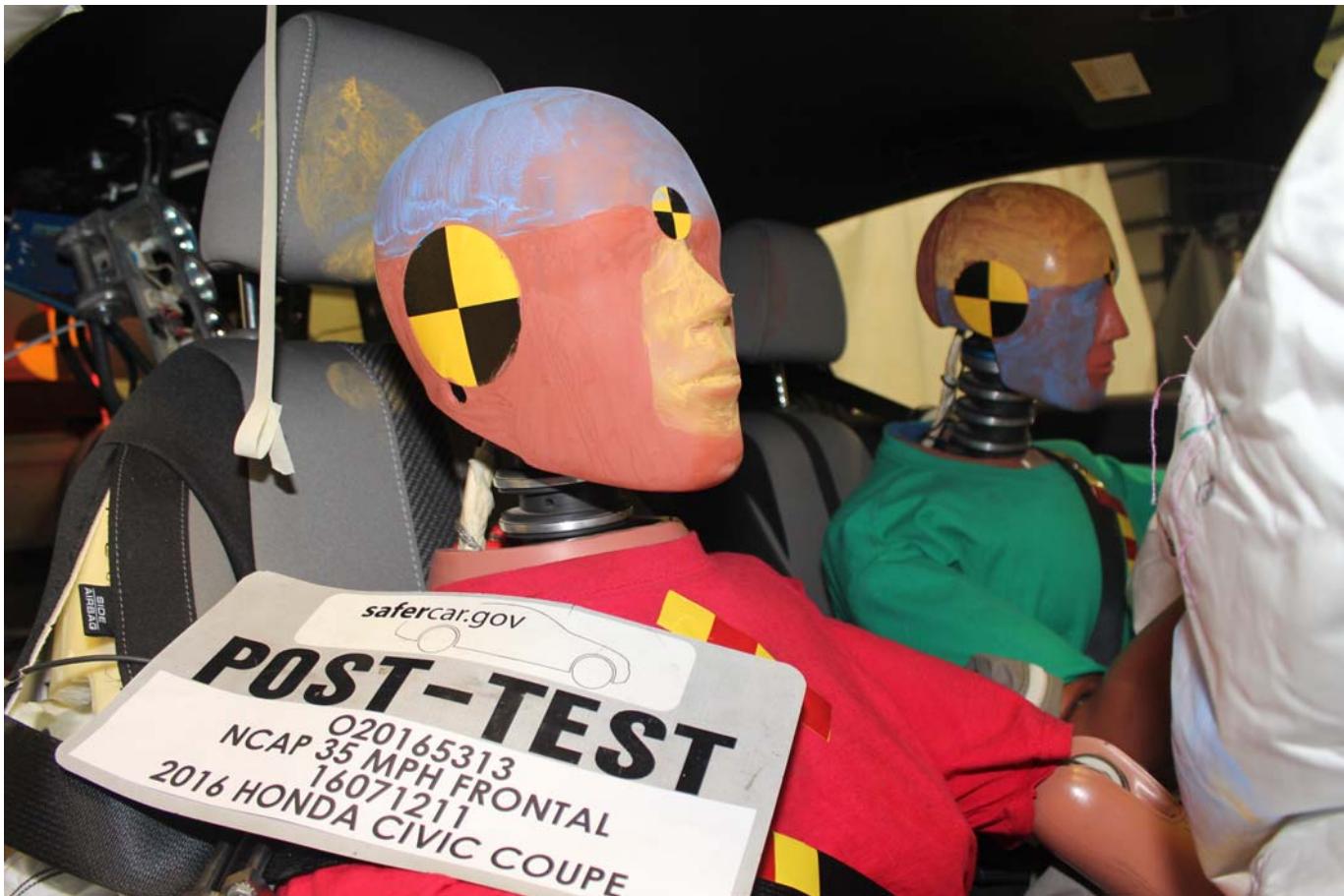


Photo No. 067 - Post-Test Passenger Dummy Face



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

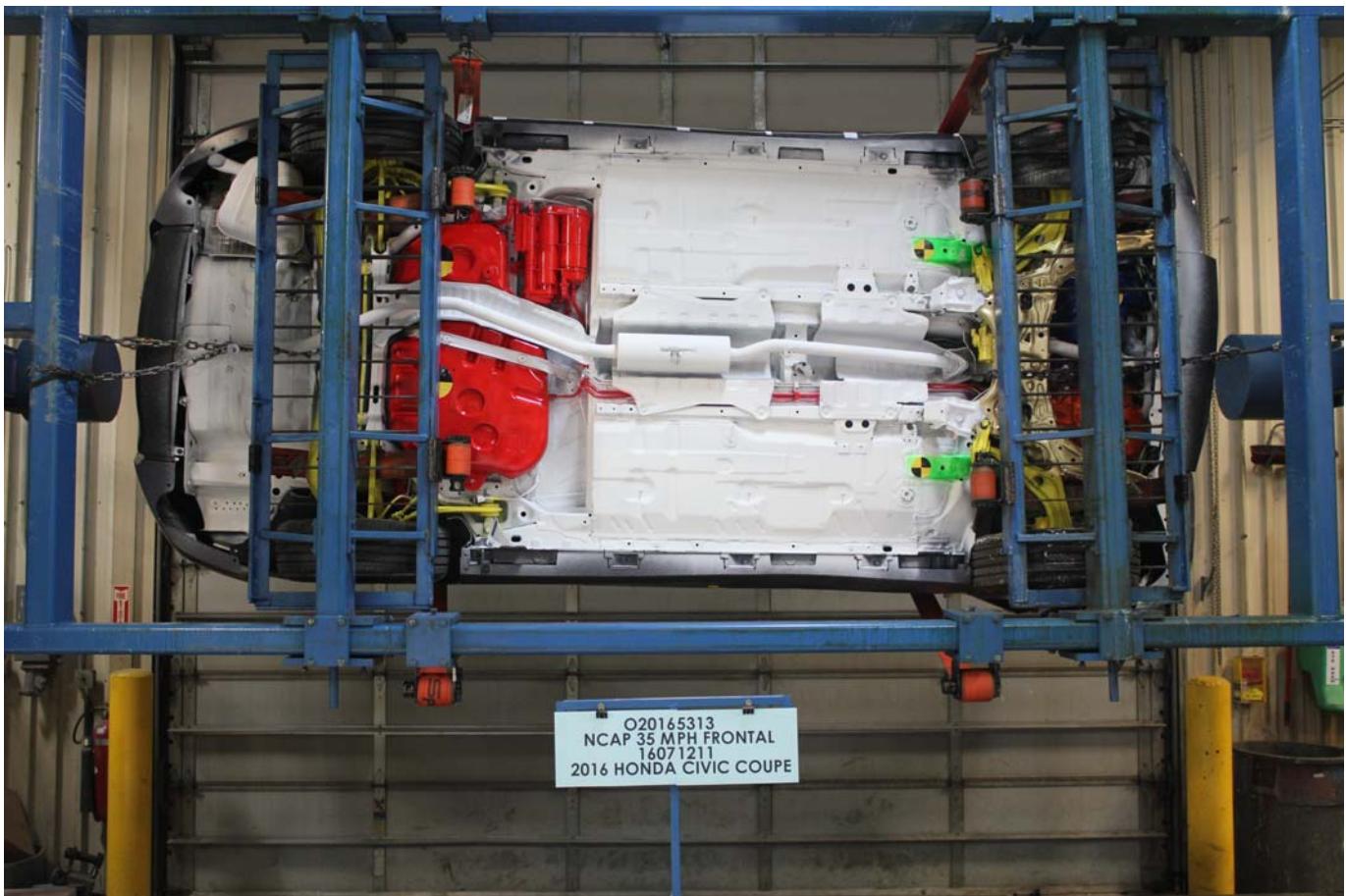


Photo No. 074 - Vehicle at 90 Degrees on Static Rollover Device

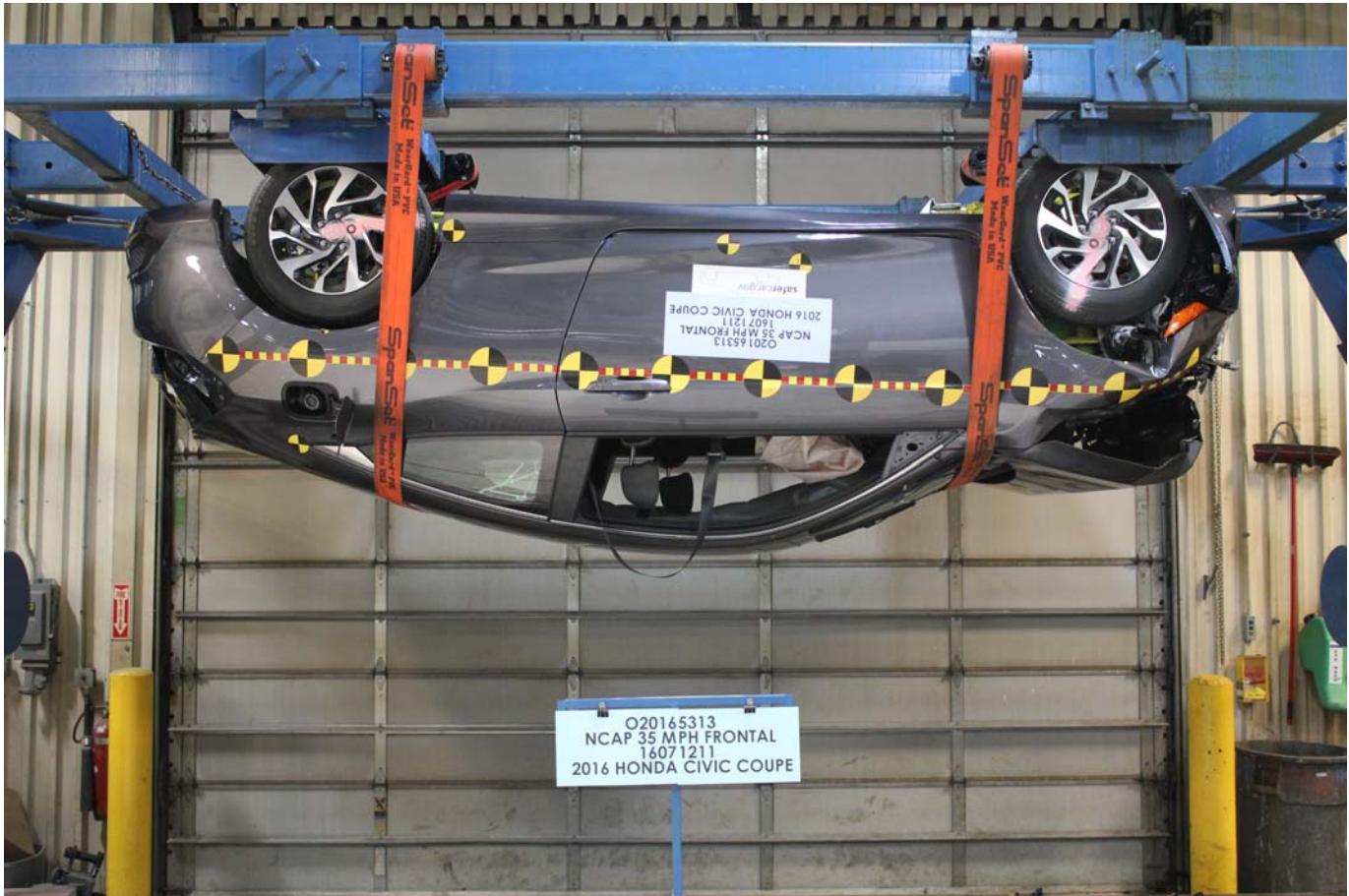


Photo No. 075 - Vehicle at 180 Degrees on Static Rollover Device



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 Honda Civic LX Coupe Frontal Impact Event



2016 CIVIC 2.0L 2DR LX

EXT: MODERN STEEL M. ENGINE NUMBER: K20C2-1334952  
INT: BLACK/GRAY

**STANDARD EQUIPMENT AT NO EXTRA COST**

- **TECHNICAL FEATURES \***
  - 158hp 2.0-Liter DOHC 16-Valve i-VTEC 4-Cylinder Engine
  - Continuously Variable Transmission (CVT)
  - 4-Wheel Disc Brakes
  - Hill Start Assist
  - Electric Power-Assisted Rack-and-Pinion Steering
- **SAFETY FEATURES \***
  - Driver's and Front Passenger's Dual-Stage Airbags (SRS), Driver's and Front Passengers Side Airbags w/ SmartVert Side Impact Protection System and Rollover Sensor
  - Vehicle Stability Assist (VSA)
  - Anti-Lock Braking System (ABS)
  - Electronic Brake Distribution (EBD)
  - Brake Assist
  - Tire Pressure Monitoring System
  - ACE Body Structure
  - LED Daytime Running Lights
  - LATCH System for Child Seats
- **INTERIOR FEATURES \***
  - Audio System with 4 Speakers
  - 5-Inch Color LCD Screen w/ Multi-View Rear Camera
  - Steering Wheel Mounted Controls

H4le301  
19 miles  
05/16

Manufacturer's Suggested Retail Price

**\$19,850.00**

Full Tank of Fuel

No Charge

-Honda Roadside Assistance 3YR/36K Mile Warranty Term

Destination and Handling 835.00

**TOTAL VEHICLE PRICE**  
(Includes Pre-Delivery Service) **\$20,685.00**

License and title fees, state and local taxes and dealer options and accessories are not included in the manufacturer's suggested retail price.

PAULY HONDA  
1111 S. MILWAUKEE AVE,  
LIBERTYVILLE, IL 60048  
VIN: 2HGFC4B50GH06091

PORT OF ENTRY: BUFFALO  
DELIVERY POINT: SCHAUMBURG  
SHIP: ROW/SPACE: 516-015  
TRANS METHOD: N50 ELWOOD

ORIG. DLR: 206740  
REF. NO.: 40870  
HN CODE: HN-4180  
EMISSIONS: 50 STATE  
COMP. PO. NO.: 708107  
DEALER: 206740

EPA DOT Fuel Economy and Environment

Gssoline Vehicle

Fuel Economy

**34 MPG**

combined city/hwy 30 city 41 highway

2.9 gallons per 100 miles

These estimates reflect new EPA methods beginning with 2017 models.

Compact cars range from 14 to 116 MPG. The best vehicle rates 116 MPG.

You **SAVE**  
**\$2,500**  
in fuel costs  
over 5 years  
compared to the  
average new vehicle.

Annual fuel Cost

**\$1,300**

Fuel Economy & Greenhouse Gas Rating (Fueleconomy.gov only)



This vehicle emits 258 grams CO<sub>2</sub> per mile. The best emits 0 grams per mile (calorie only). Producing and consuming fuel also creates emissions. Learn more at fueleconomy.gov.

fueleconomy.gov

Calculate personalized estimates and compare vehicles



PARTS CONTENT INFORMATION

FOR VEHICLES IN THIS CARLINE U.S./Canadian Parts Content: 70 %

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

GOVERNMENT 5-STAR SAFETY RATING

Overall Vehicle Score

Not Rated

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

Frontal Crash	Driver Passenger	Not Rated Not Rated
Based on the risk of injury in a frontal impact.		

Side Crash	Front seat Rear seat	Not Rated Not Rated
Based on the risk of injury in a side impact.		

Rollover	Not Rated	
Based on the risk of rollover in a single vehicle crash.		

Star Ratings range from 1 to 5 stars (\*\*\*\*\*) with 5 being the highest.  
Source: National Highway Traffic Safety Administration (NHTSA)  
[www.safercar.gov](http://www.safercar.gov) or 1-888-327-4236

This vehicle is equipped with bumpers that can withstand an impact of 2.5 miles per hour with no damage to the vehicle's body and safety systems, although the bumper and related components may sustain damage. The bumper system on this vehicle conforms to the current federal bumper standard of 2.5 miles per hour.

Photo No. 079 - Monroney Label Photograph

**APPENDIX B**  
**DUMMY RESPONSE DATA TRACES**

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Figure No. 35. Passenger Left Femur Force vs. Time	B-12
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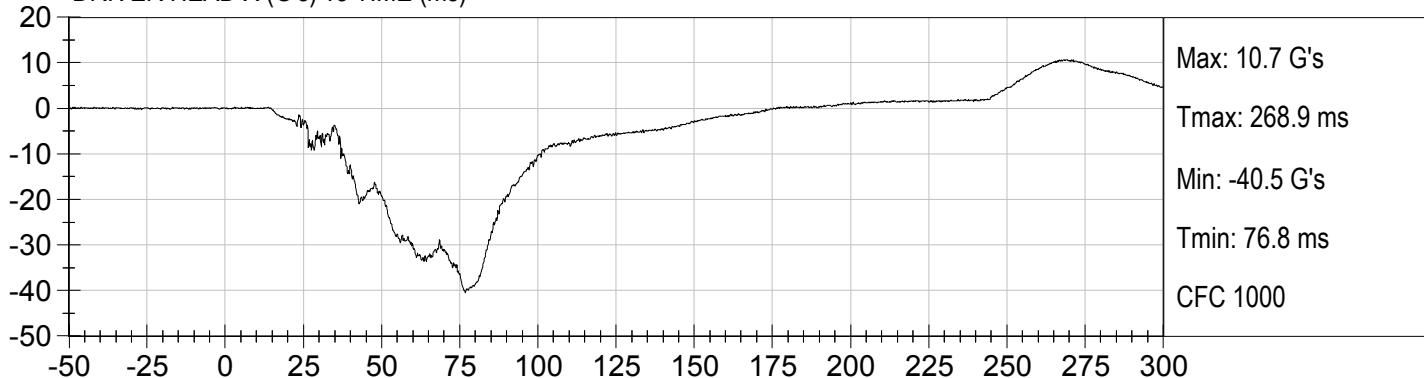
**The following additional dummy and vehicle response data can be found in the R&D section of the NHTSA website at [www.nhtsa.dot.gov](http://www.nhtsa.dot.gov)**

- Driver Head X Redundant
- 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

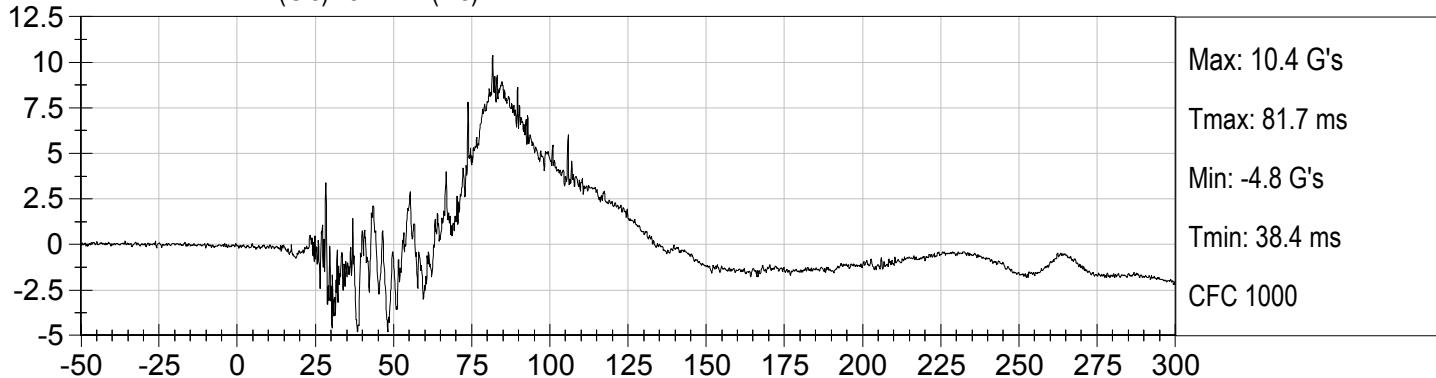
Driver Left Upper Tibia Force Z  
Driver Left Lower Tibia Moment X  
Driver Left Lower Tibia Moment Y  
Driver Left Lower Tibia Force Z  
Driver Right Upper Tibia Moment X  
Driver Right Upper Tibia Moment Y  
Driver Right Upper Tibia Force Z  
Driver Right Lower Tibia Moment X  
Driver Right Lower Tibia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

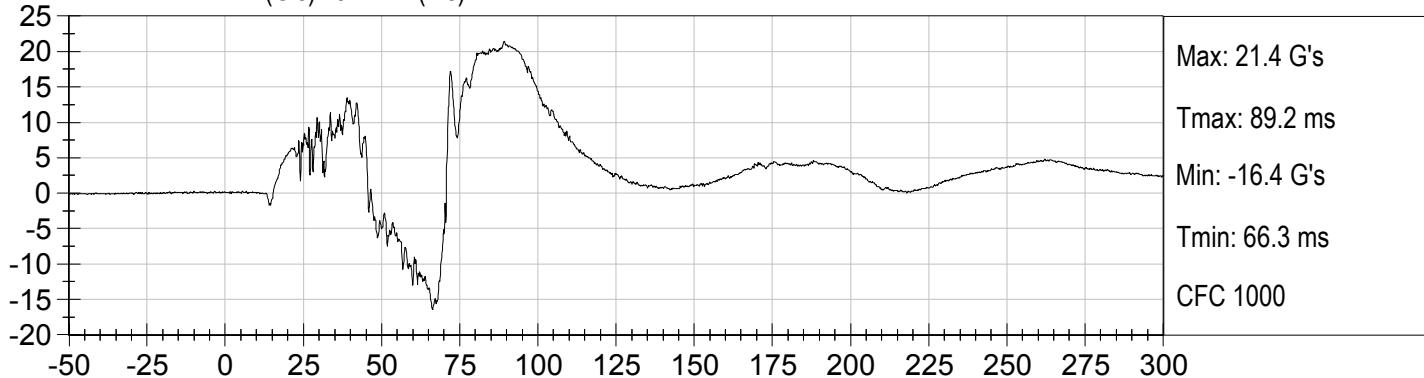
DRIVER HEAD X (G's) vs TIME (ms)



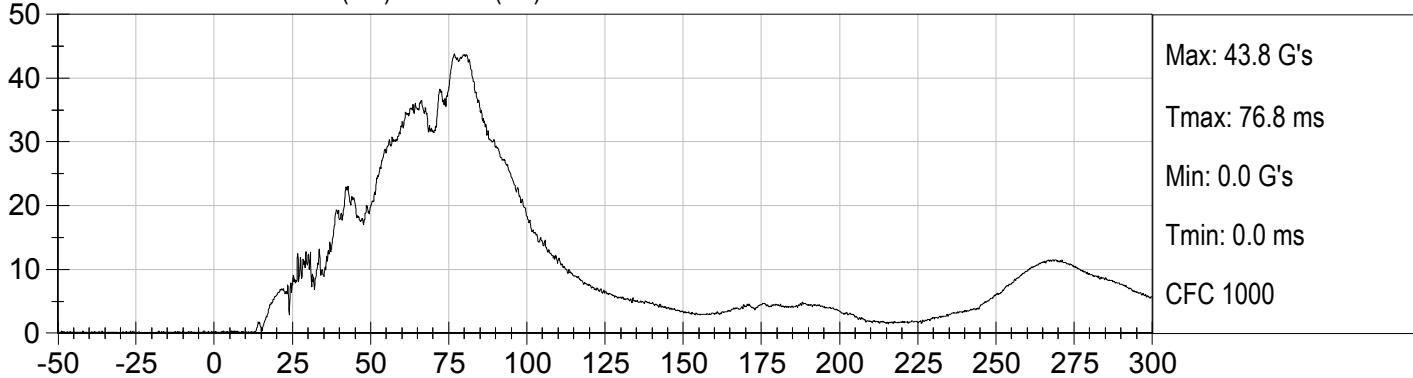
DRIVER HEAD Y (G's) vs TIME (ms)

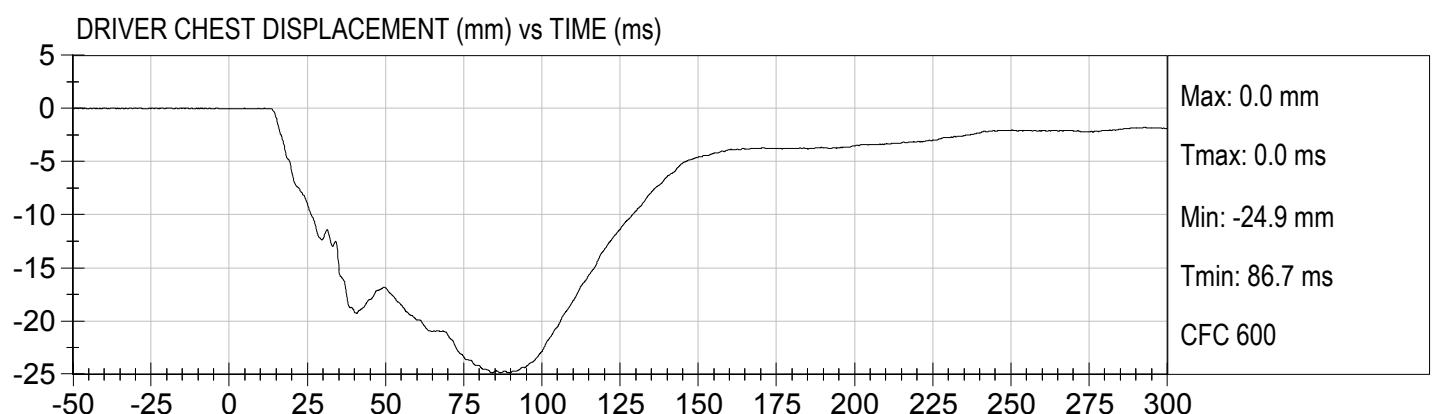


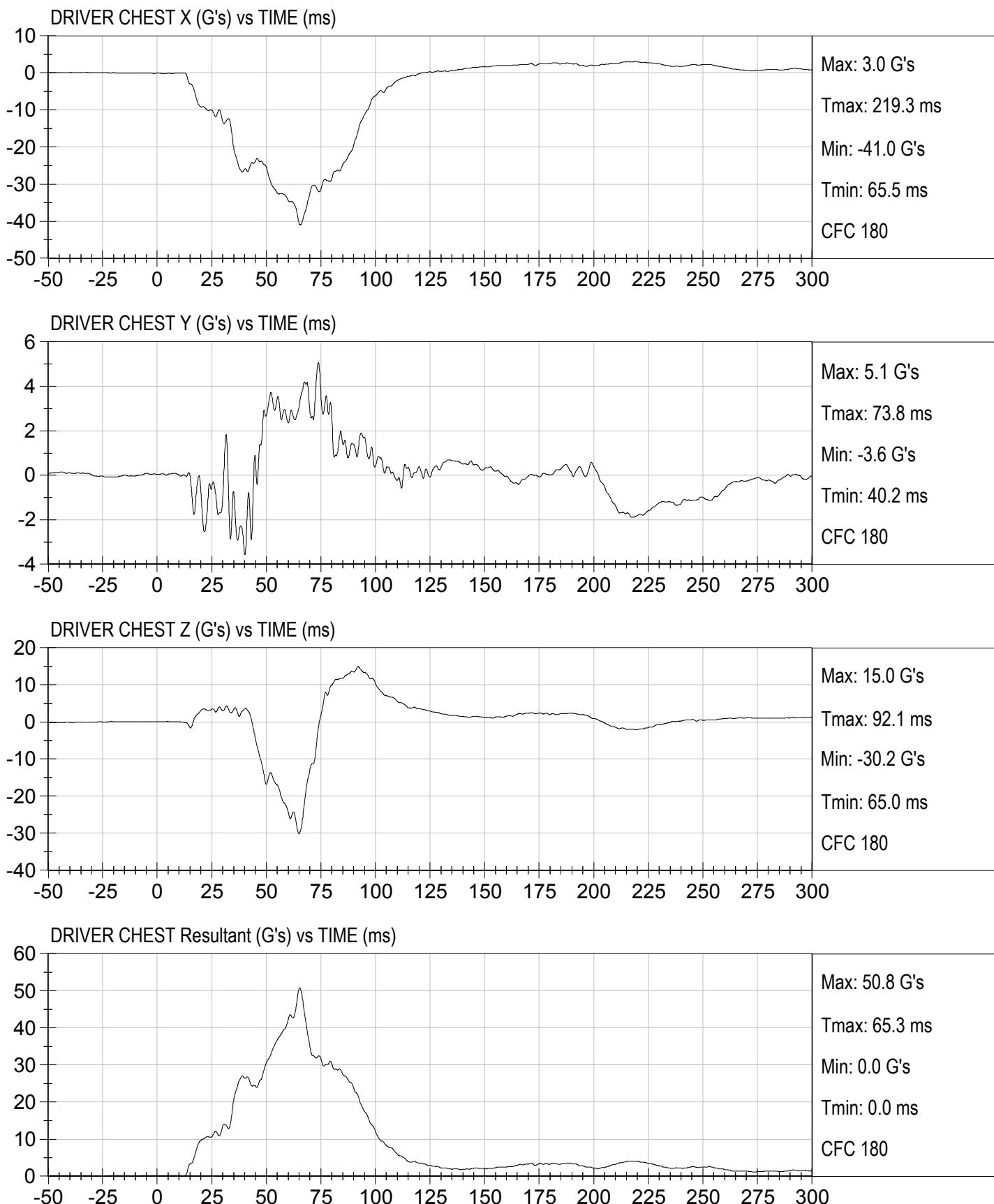
DRIVER HEAD Z (G's) vs TIME (ms)



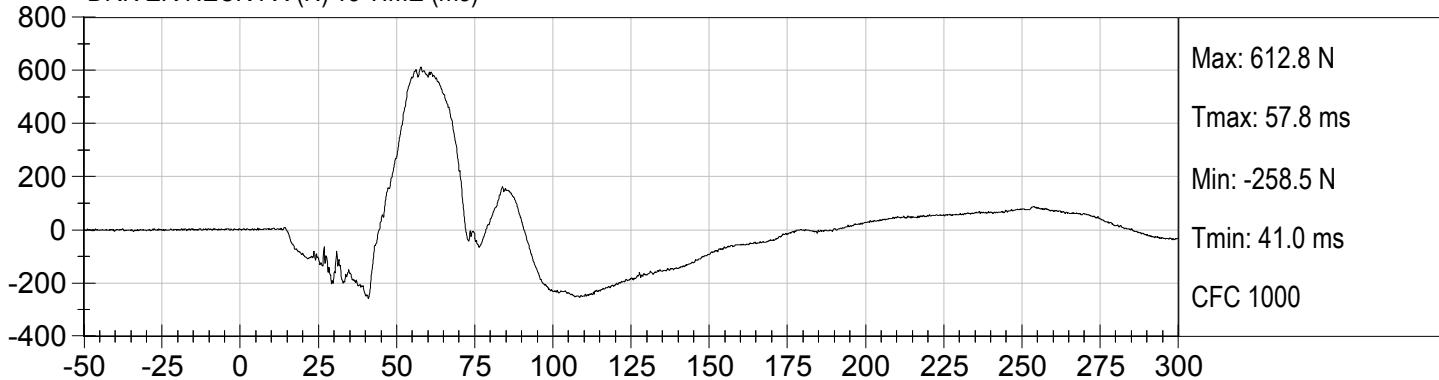
DRIVER HEAD Resultant (G's) vs TIME (ms)



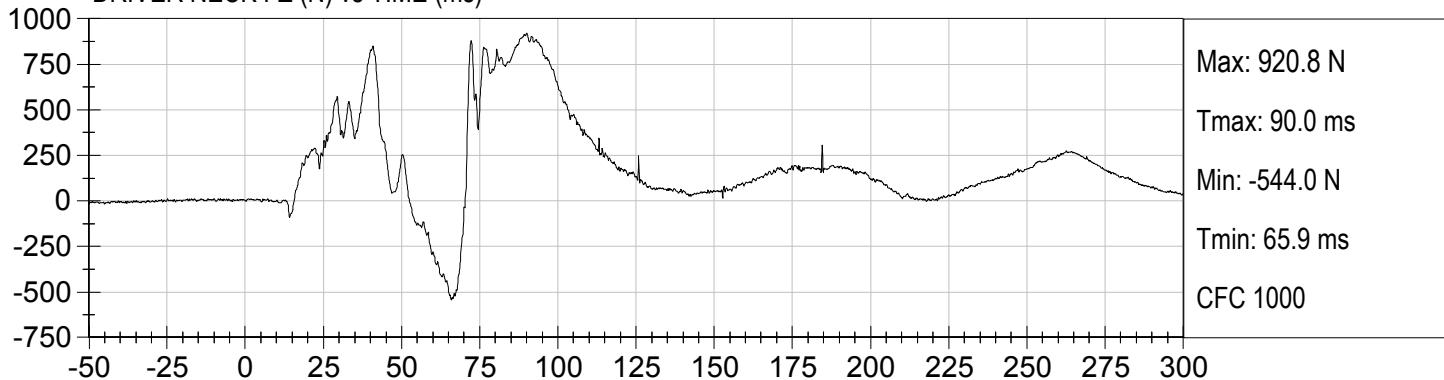




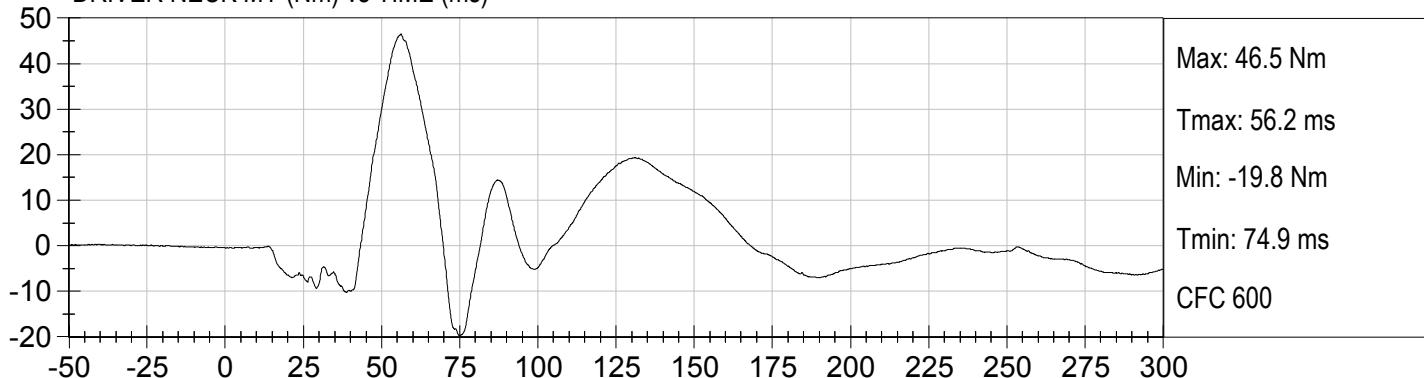
DRIVER NECK FX (N) vs TIME (ms)

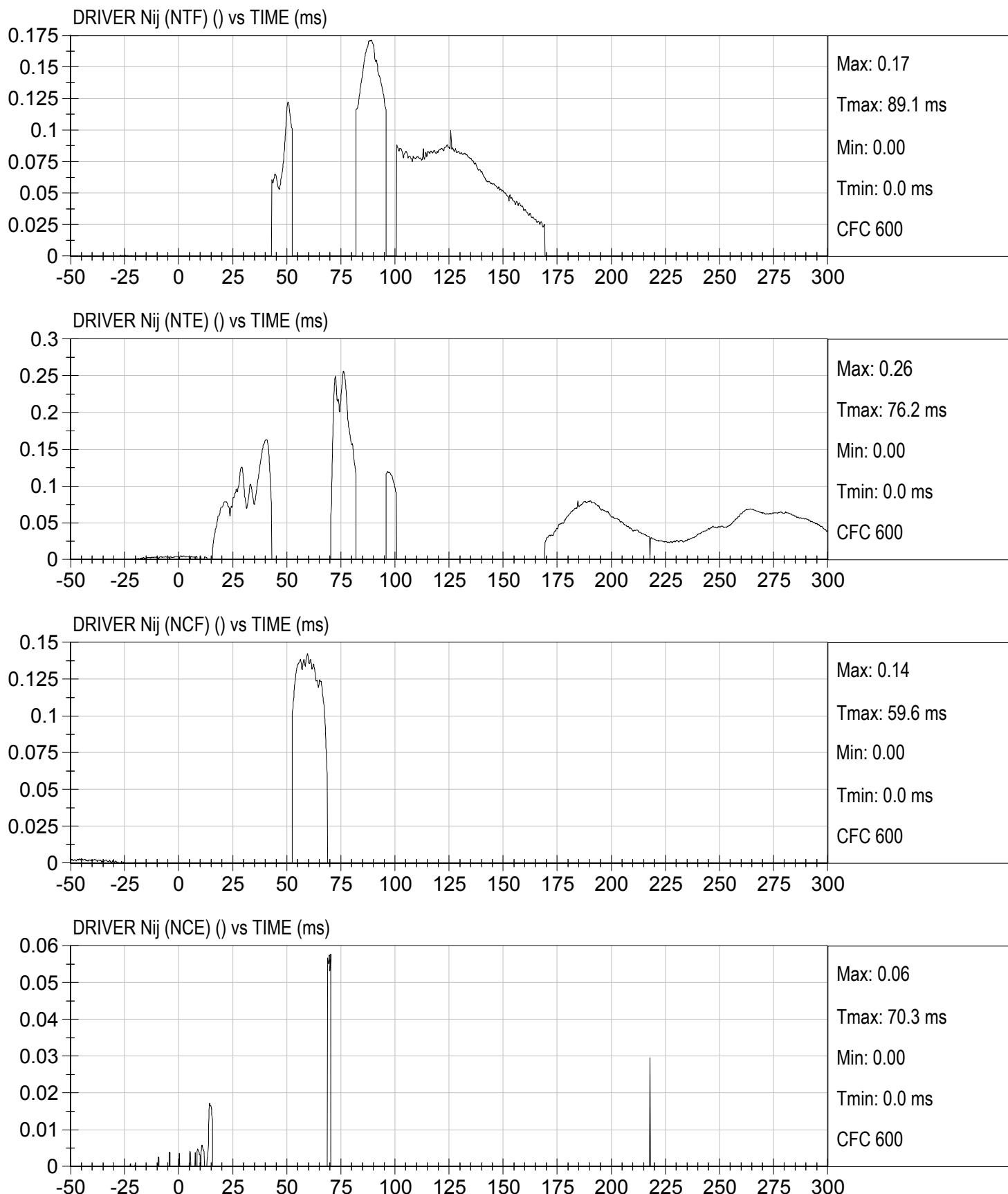


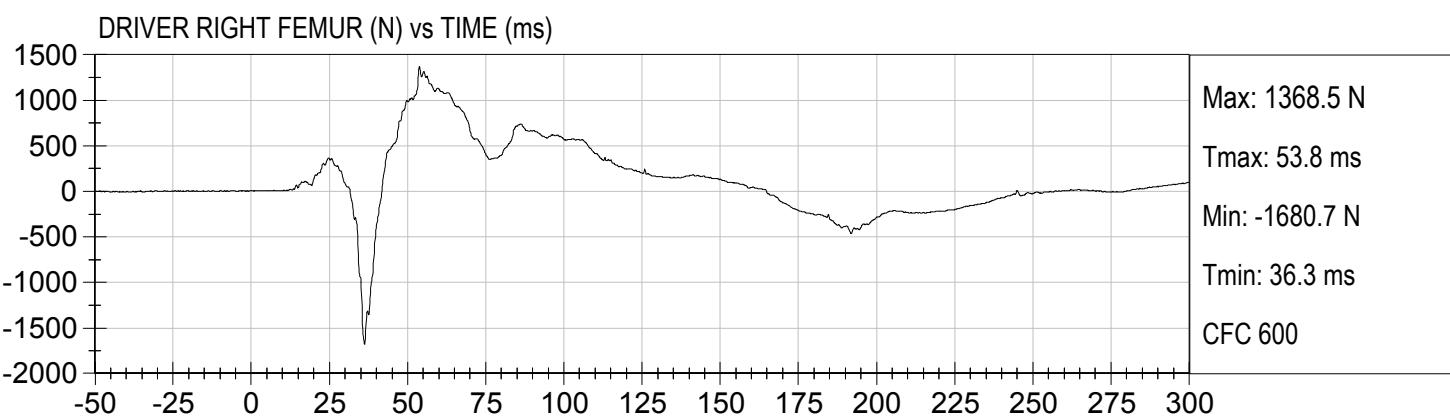
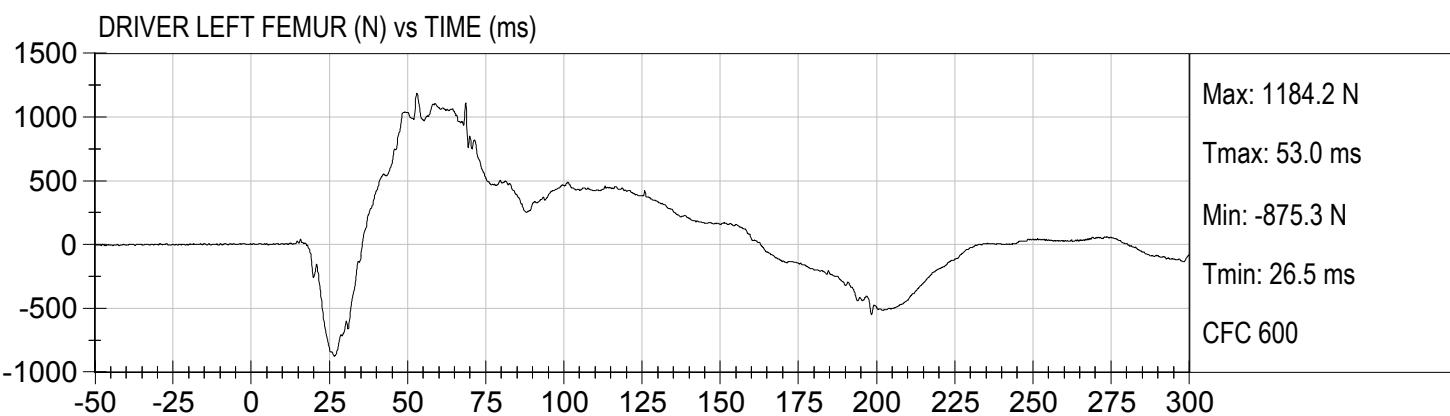
DRIVER NECK FZ (N) vs TIME (ms)

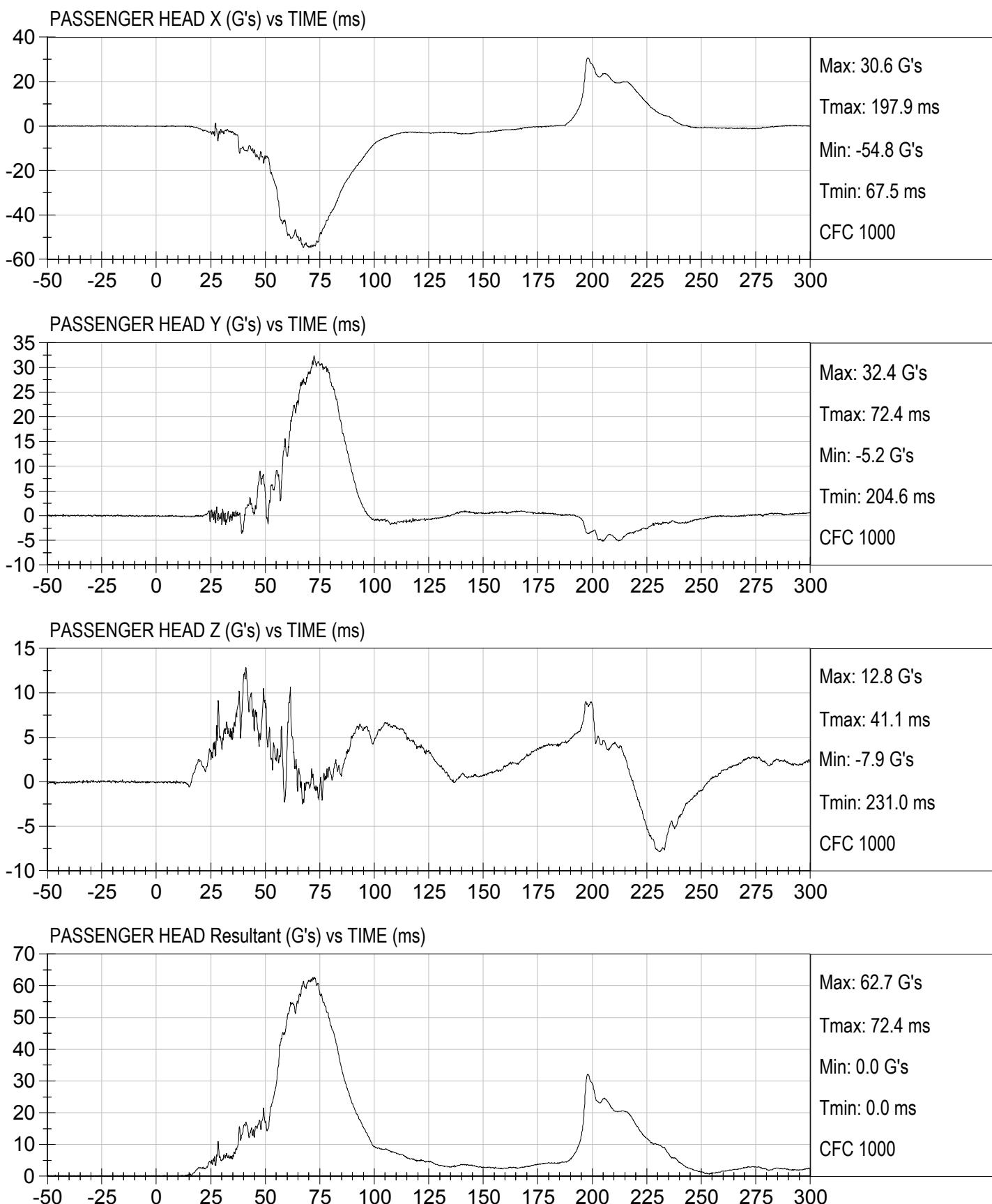


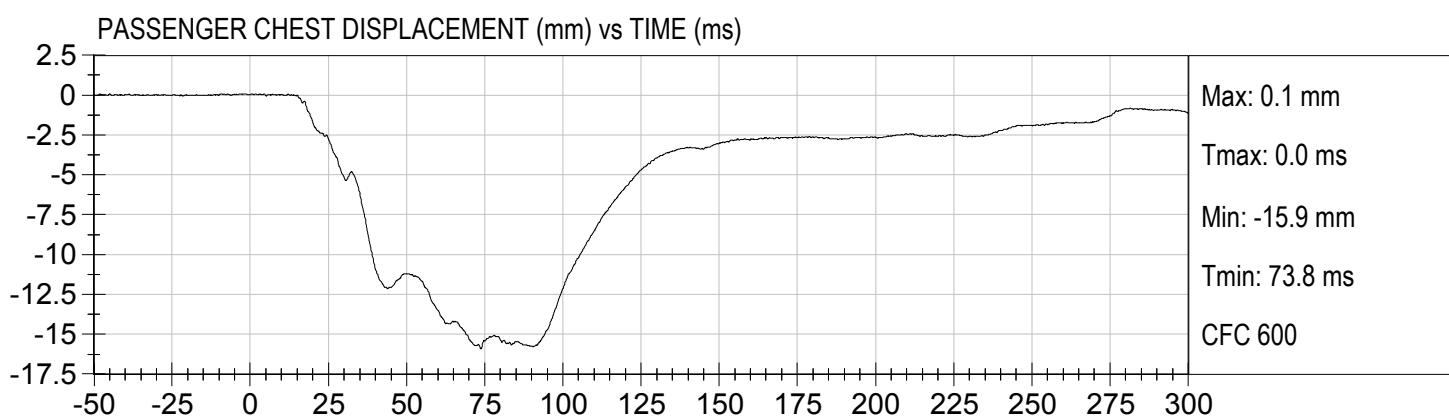
DRIVER NECK MY (Nm) vs TIME (ms)

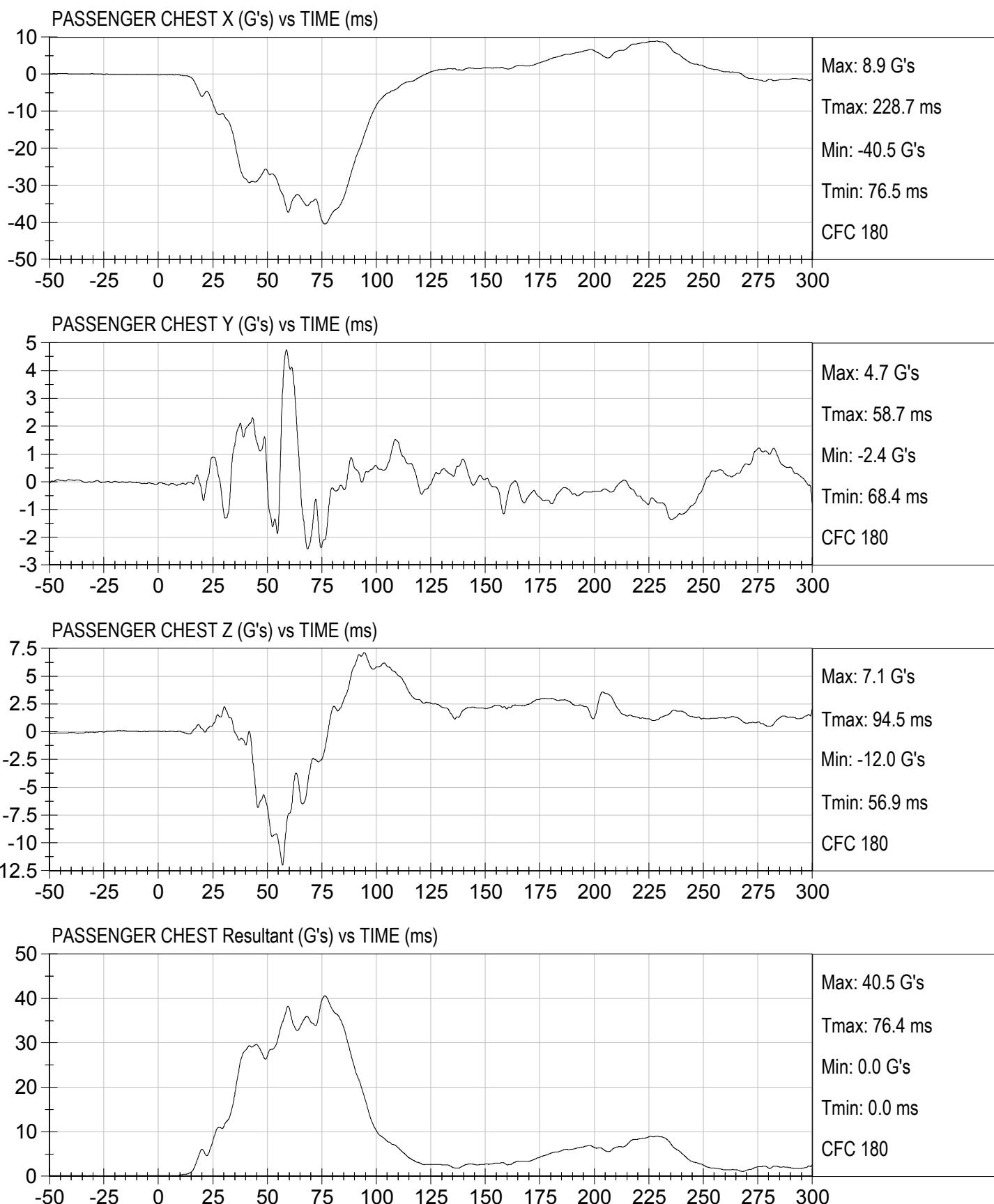




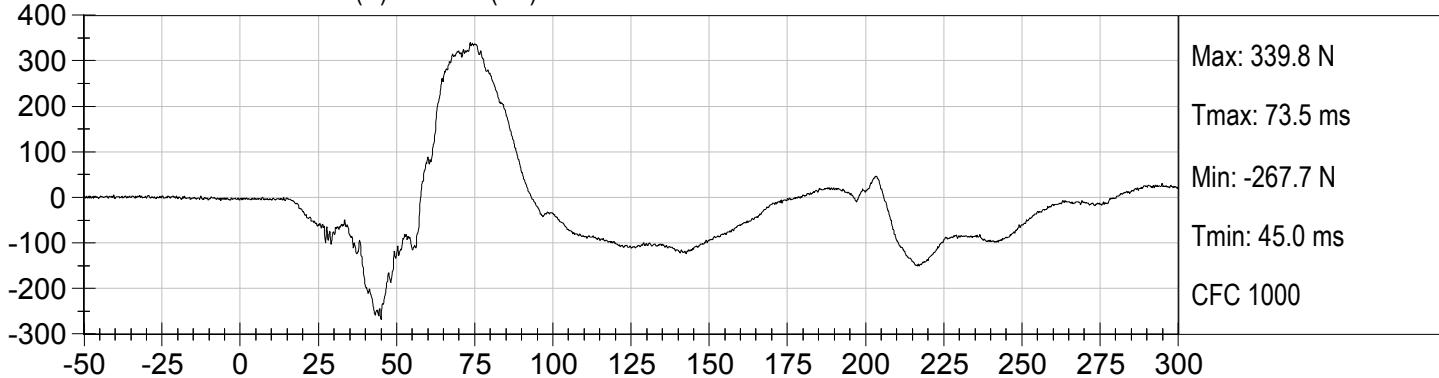




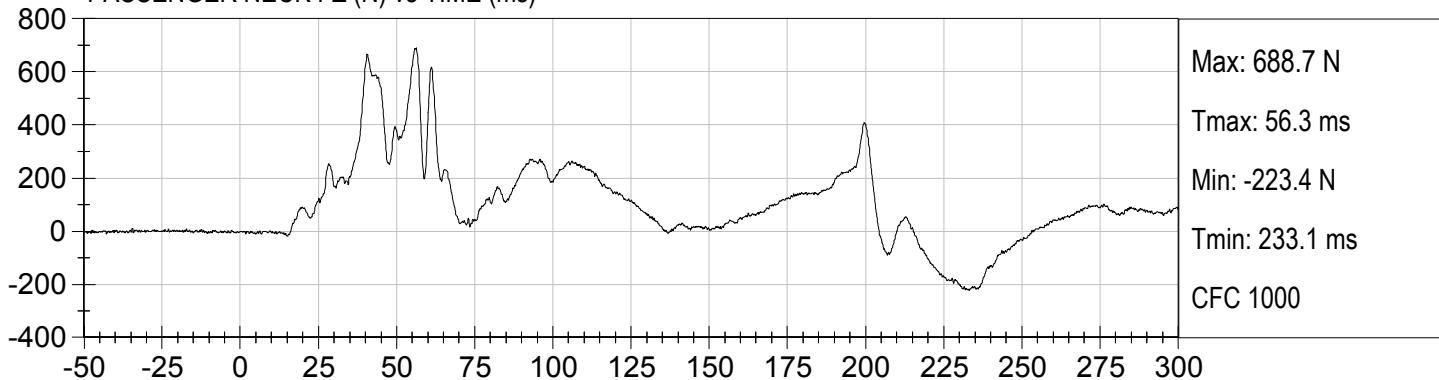




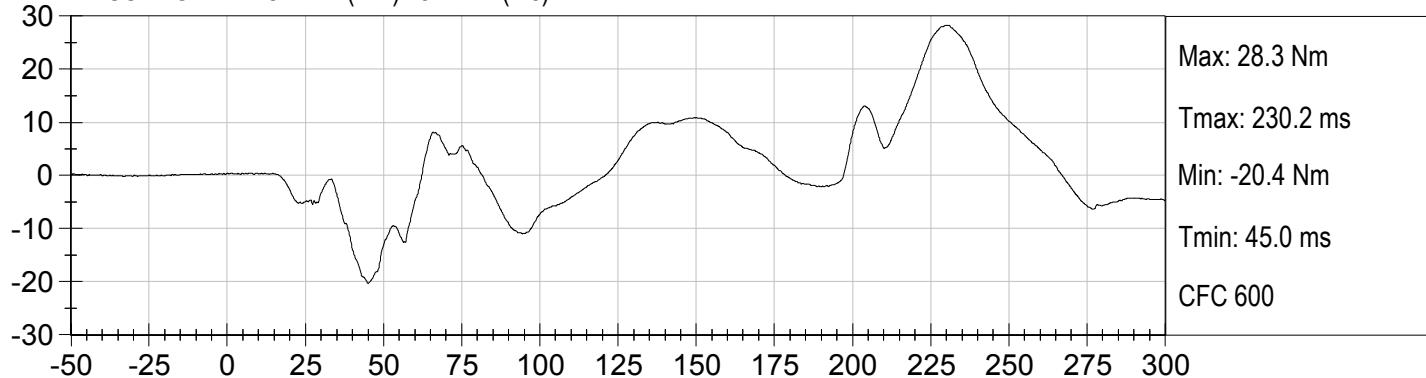
PASSENGER NECK FX (N) vs TIME (ms)

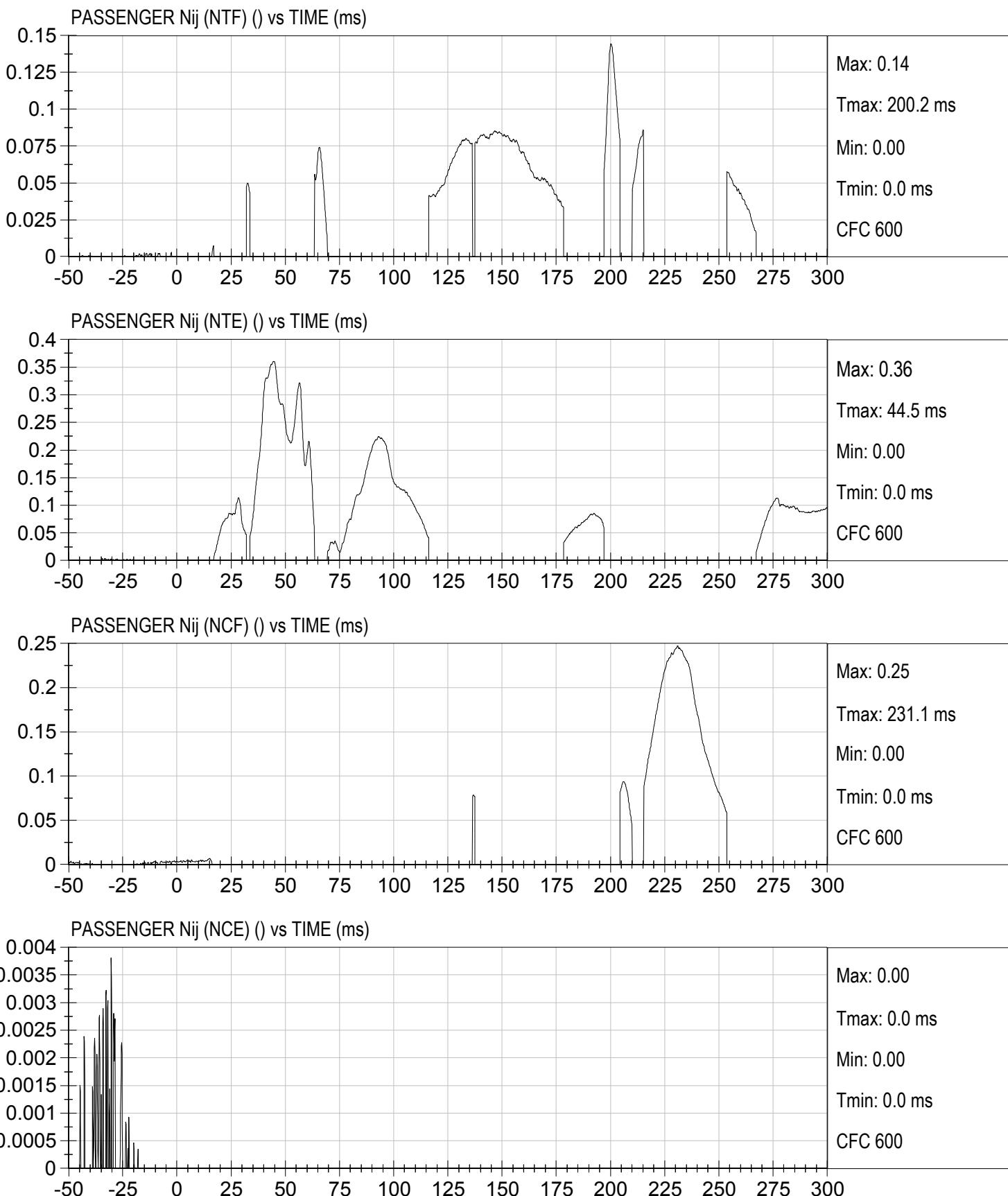


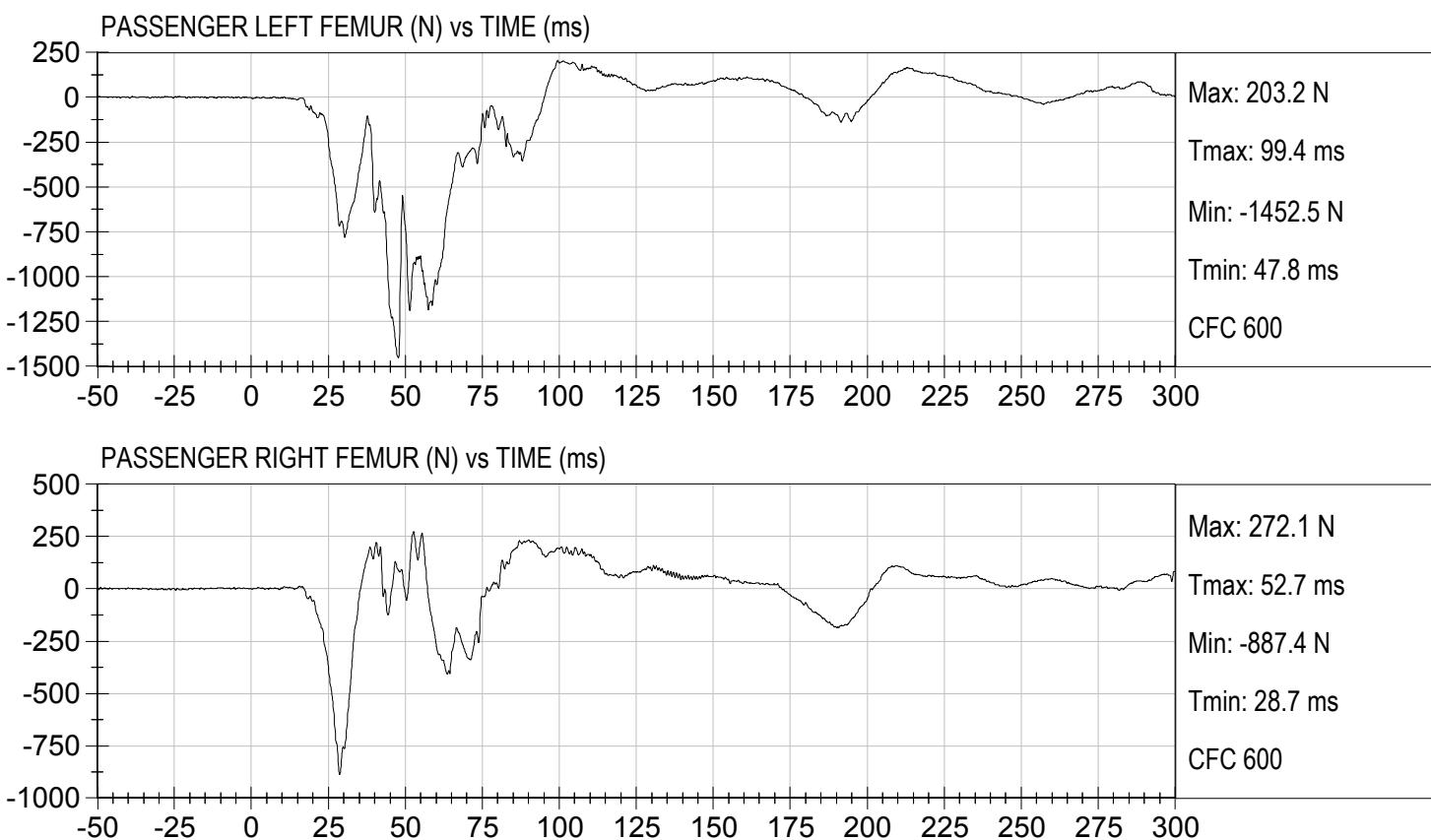
PASSENGER NECK FZ (N) vs TIME (ms)



PASSENGER NECK MY (Nm) vs TIME (ms)







**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 (WTH 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

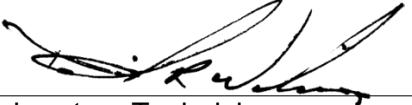
**NOTE:** THE H-POINT IS LOCATED 1.83 INCHES FORWARD AND 2.57 INCHES DOWN FROM THE CENTER OF THE PELVIS ANGLE REFERENCE HOLE.

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

ATD Serial No: 351

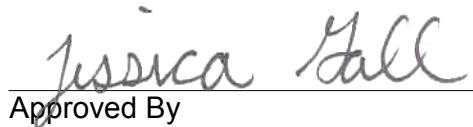
Test ID: D162261

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

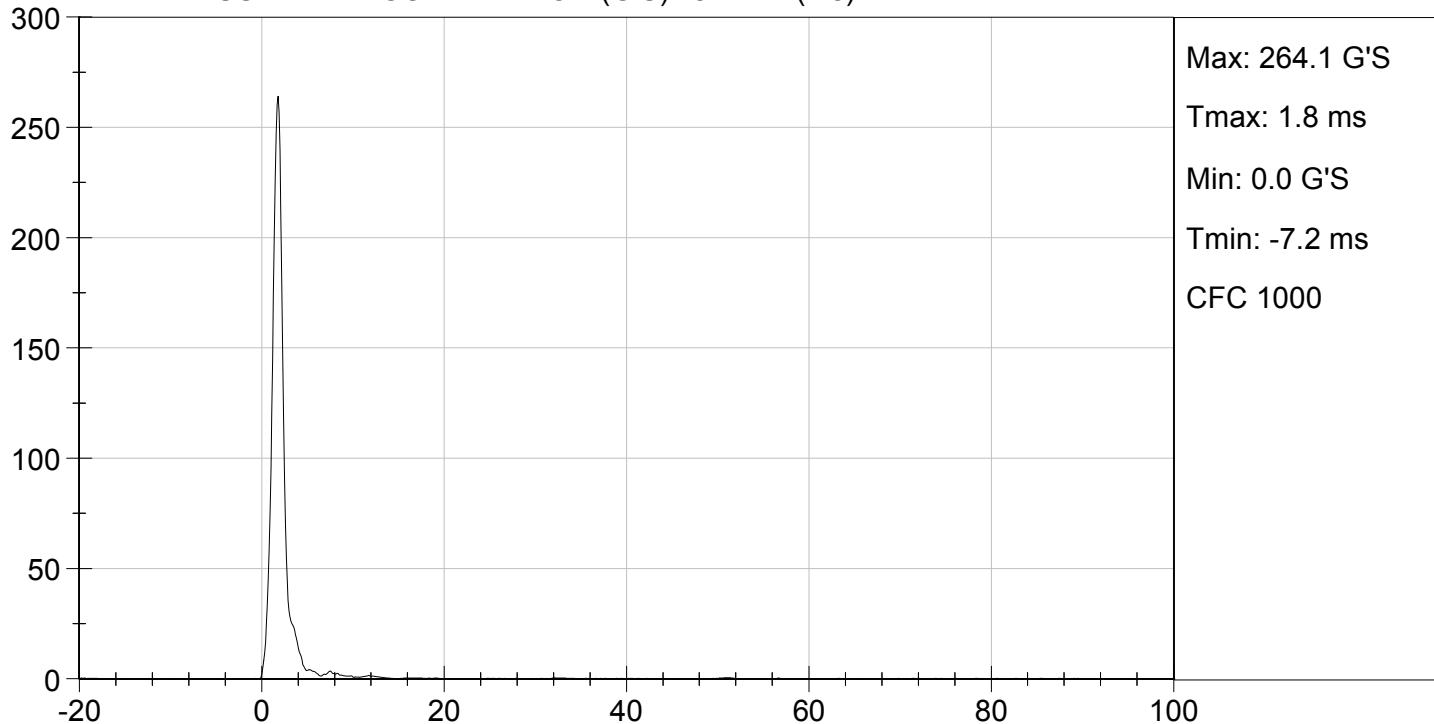


TEST DESC: HEAD DROP

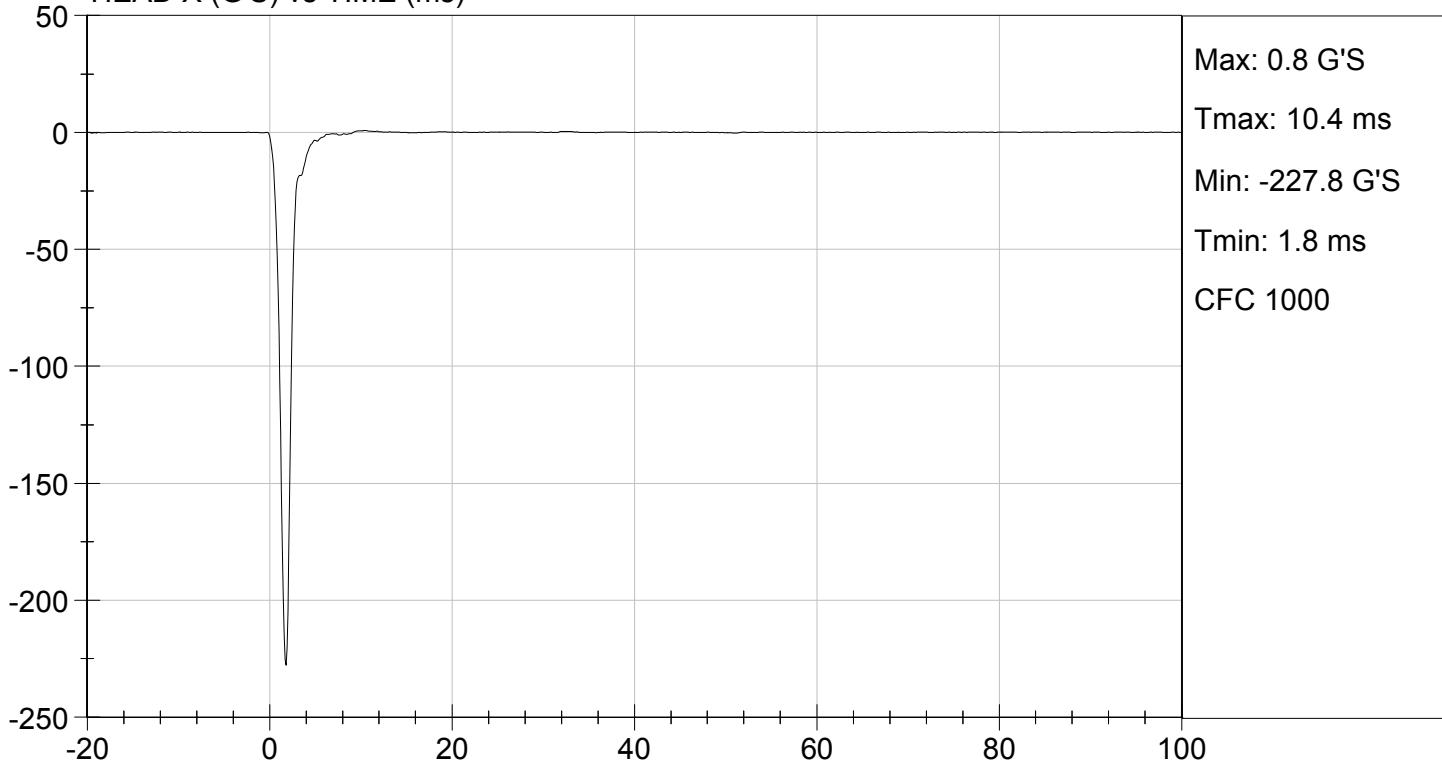
TEST DATE: 06/30/2016

TEST #: D162261

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



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

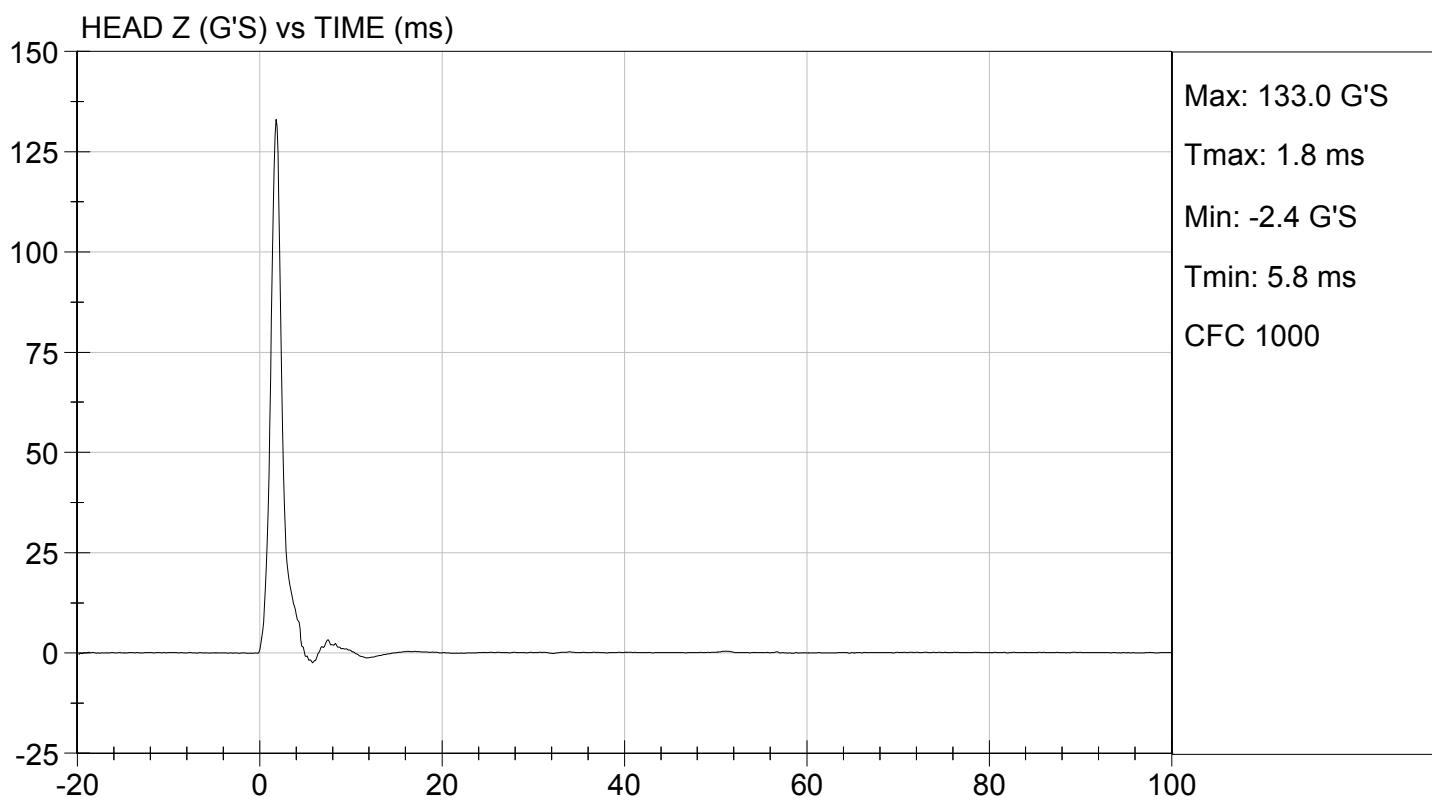
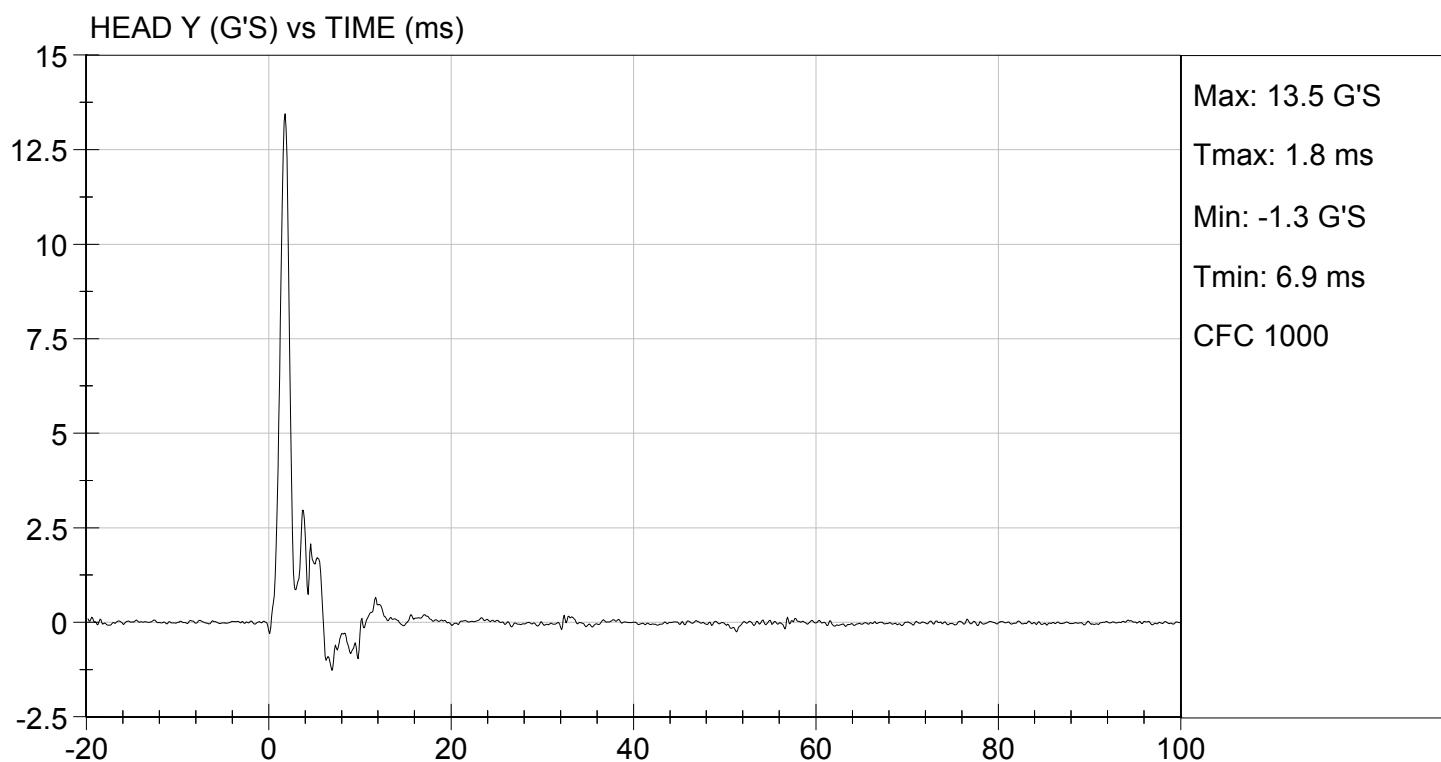




TEST DESC: HEAD DROP

TEST DATE: 06/30/2016

TEST #: D162261



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

**ATD Serial No:** 351

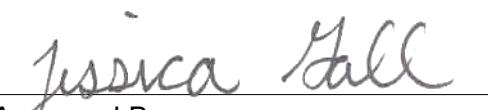
**Test I.D:** D162262

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	

  
Glenn D. Miller  
Laboratory Technician

06/30/2016

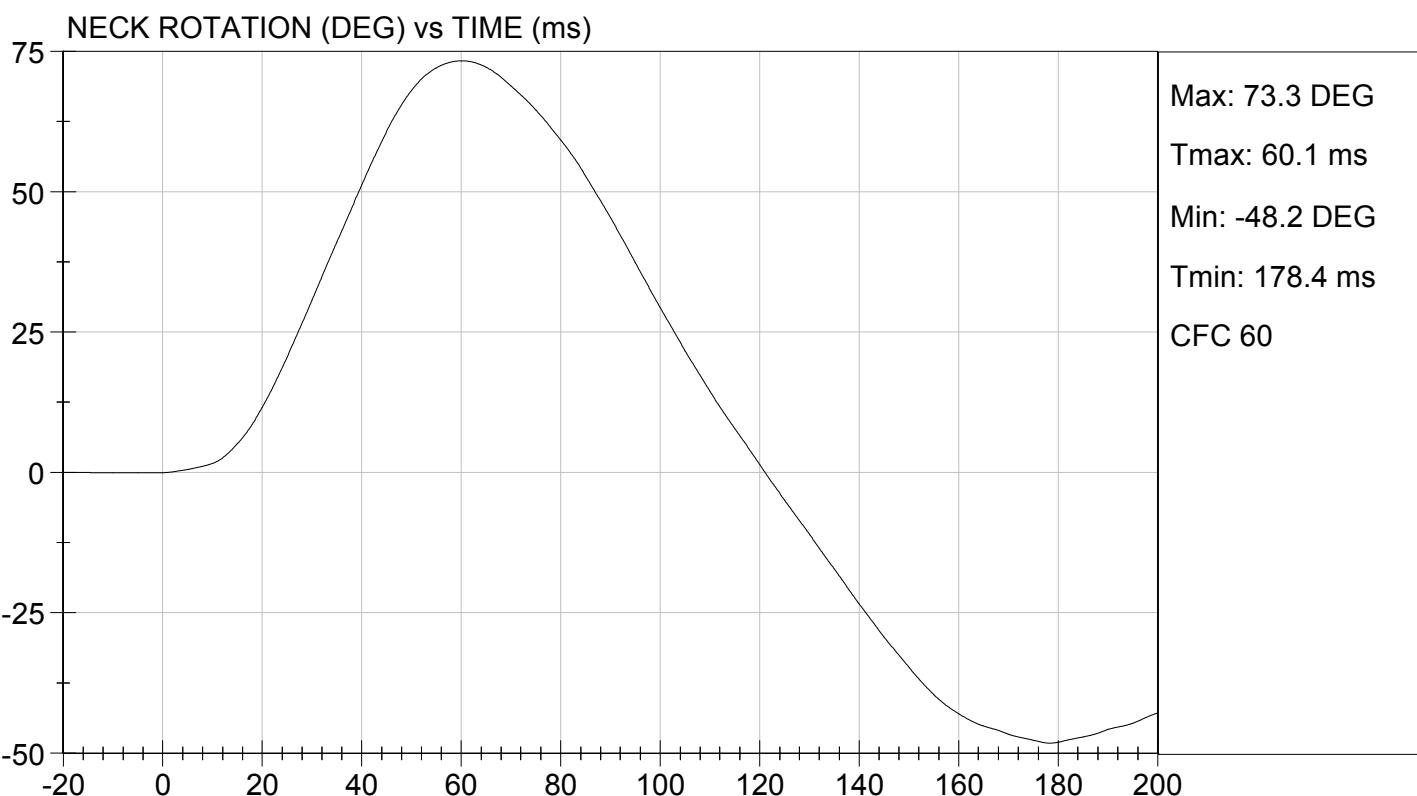
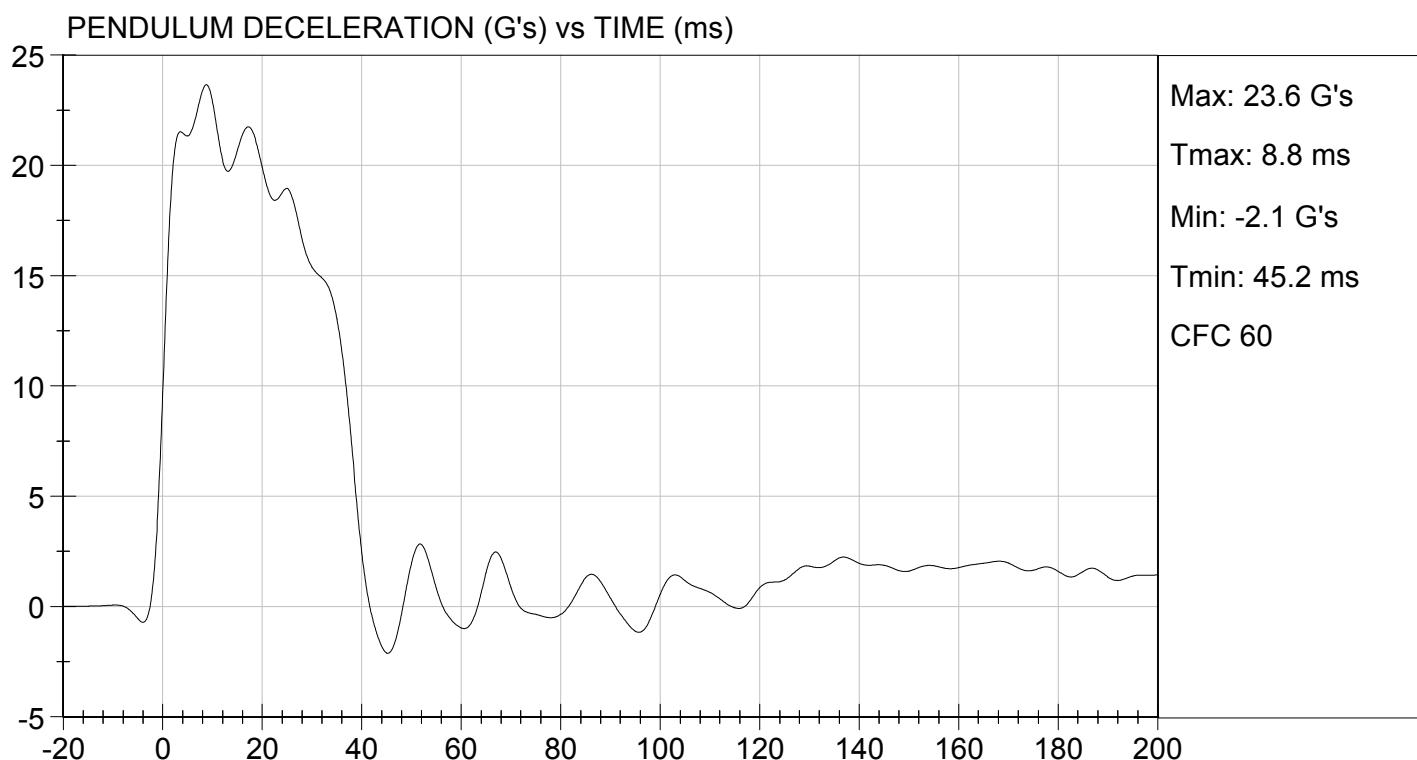
Test Date

  
Jessica Hall  
Approved By



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

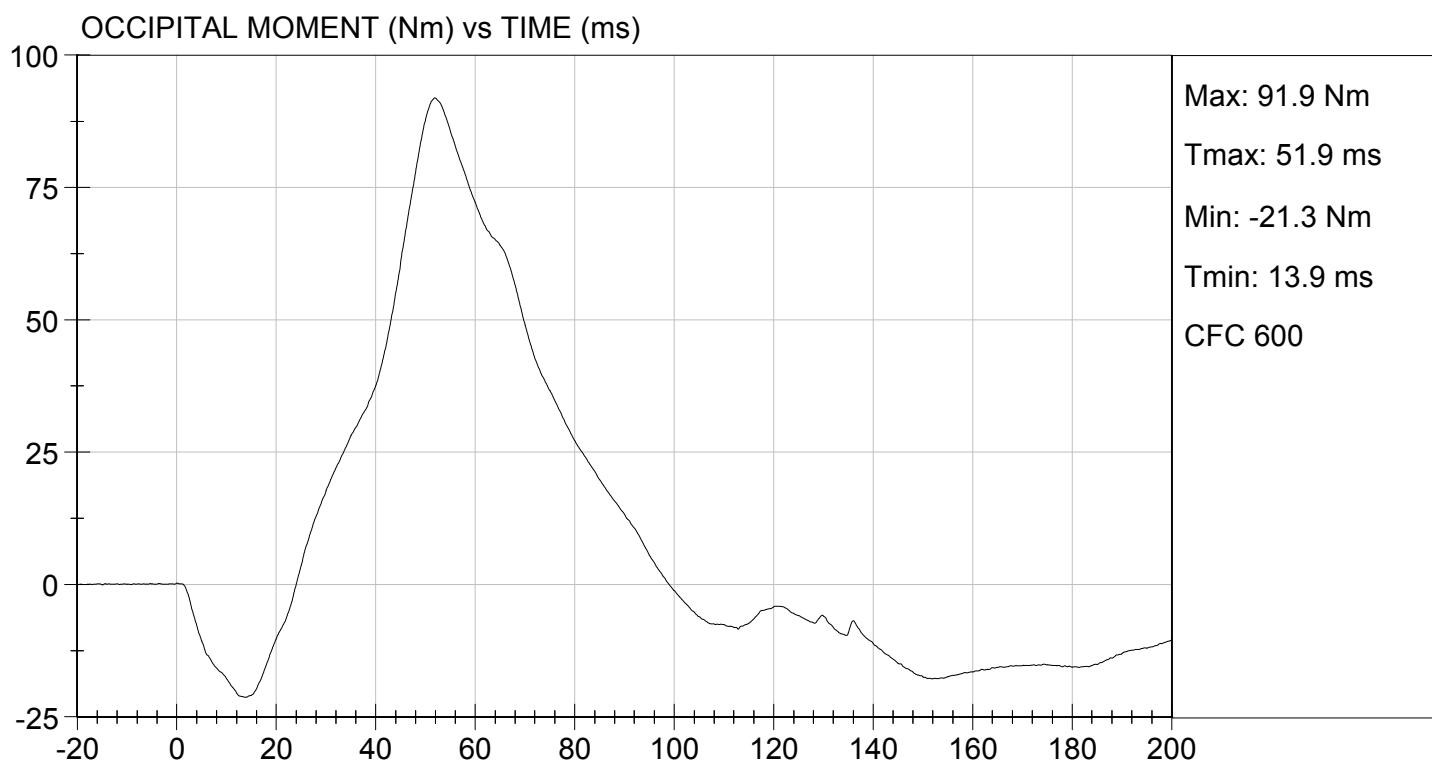
TEST DATE: 06/30/2016  
TEST #: D162262





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	

*Jessica Hall*  
Jessica Hall  
 Laboratory Technician

*John D. Yule*  
John D. Yule  
 Approved By

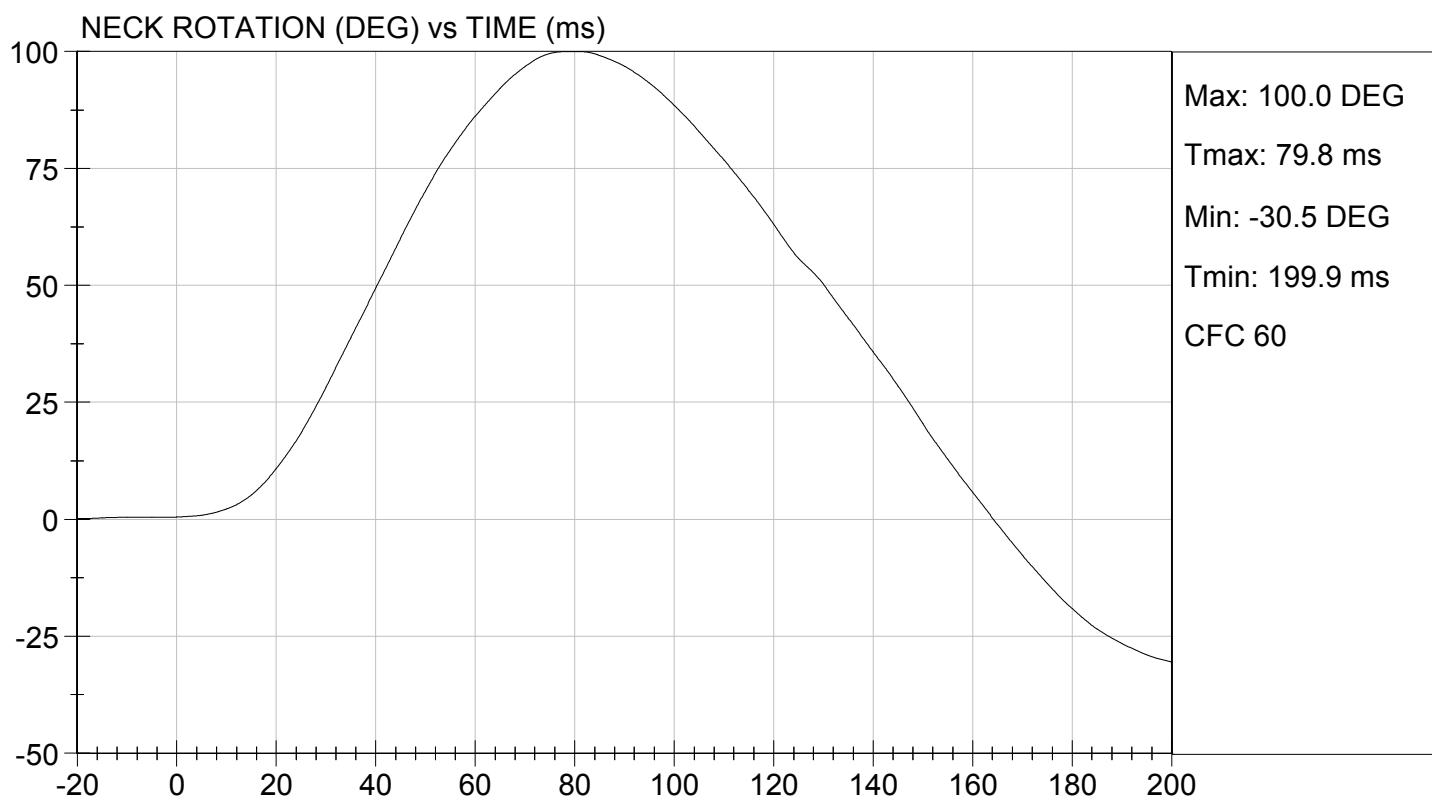
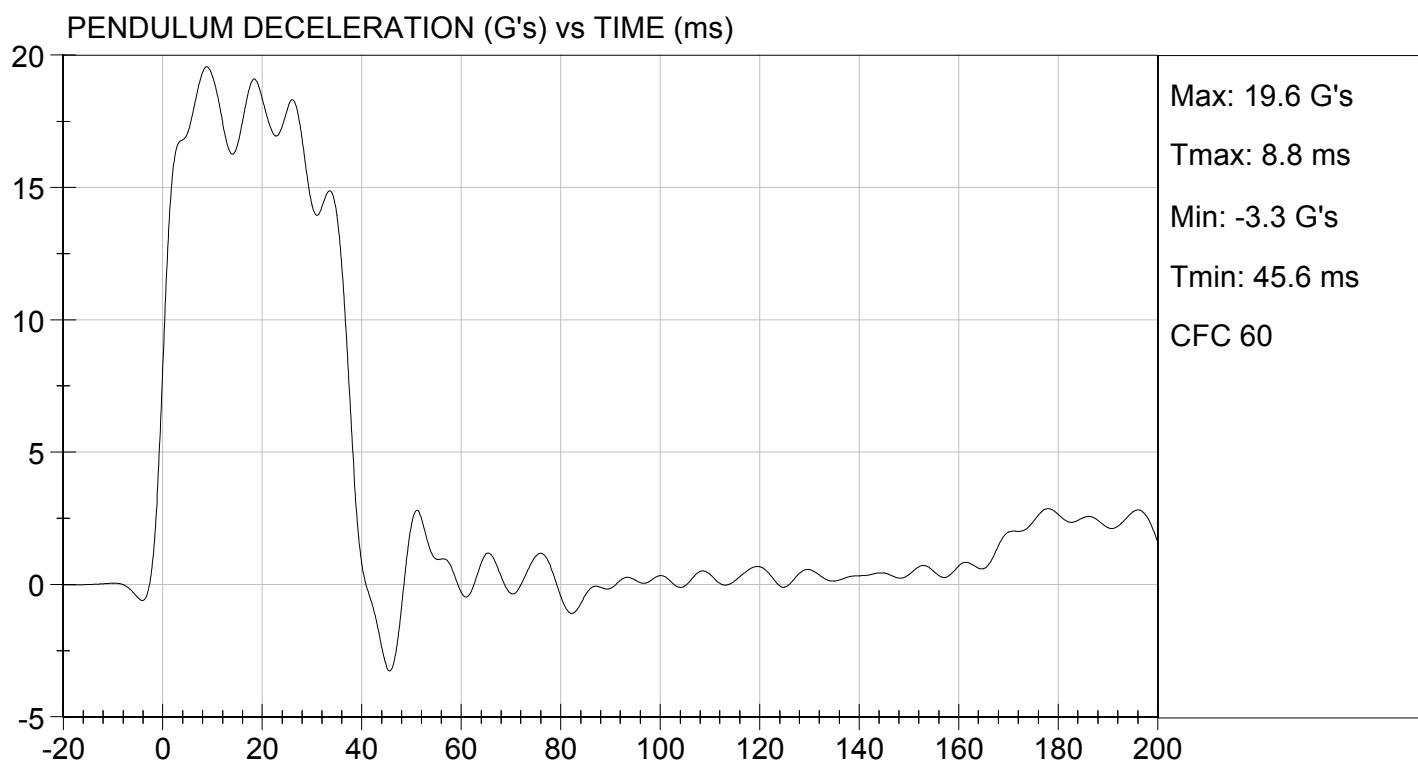
06/30/2016

Test Date



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

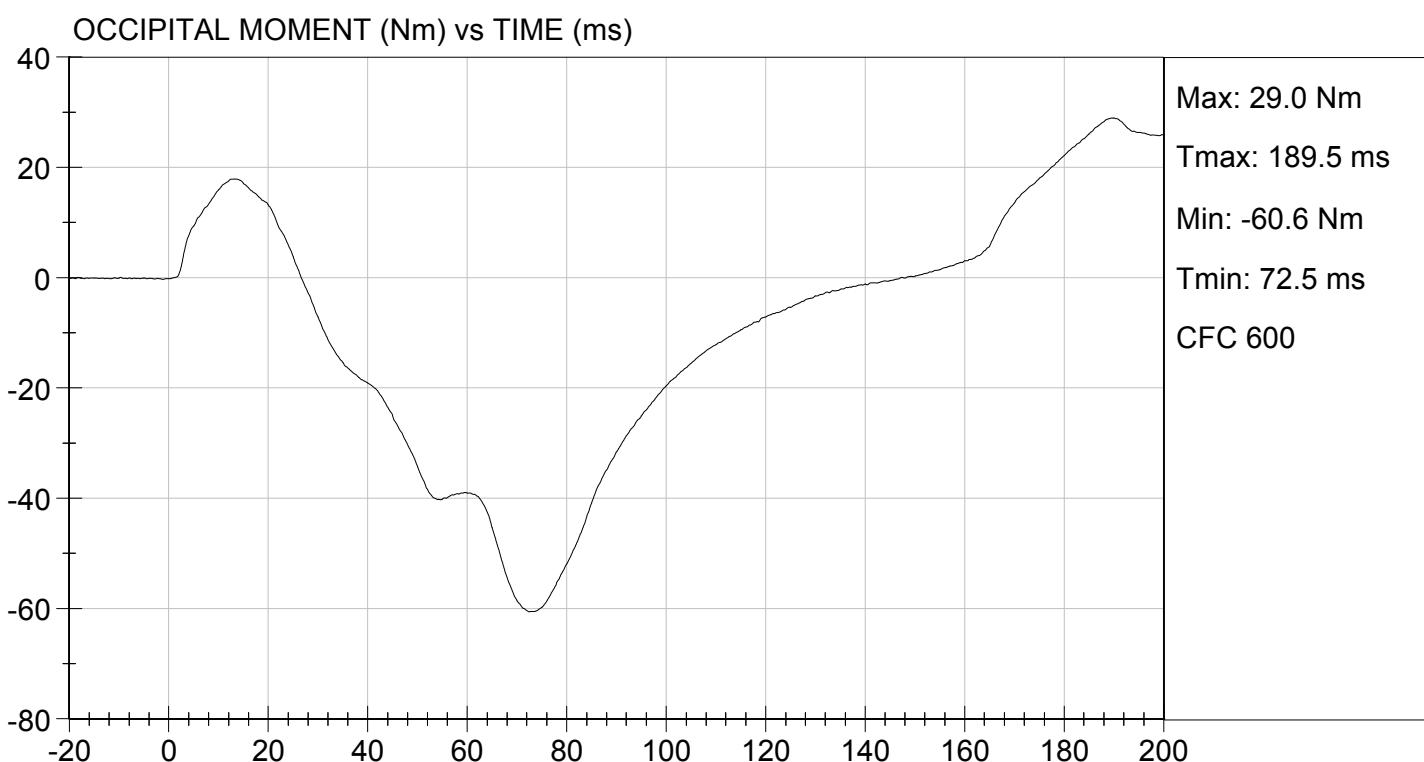
TEST DATE: 06/30/2016  
TEST #: D162263





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

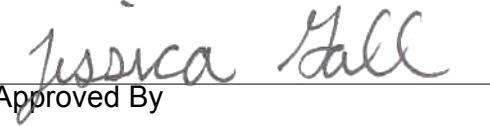
Test I.D: D162264

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

  
John D. Yule  
Laboratory Technician

06/30/2016

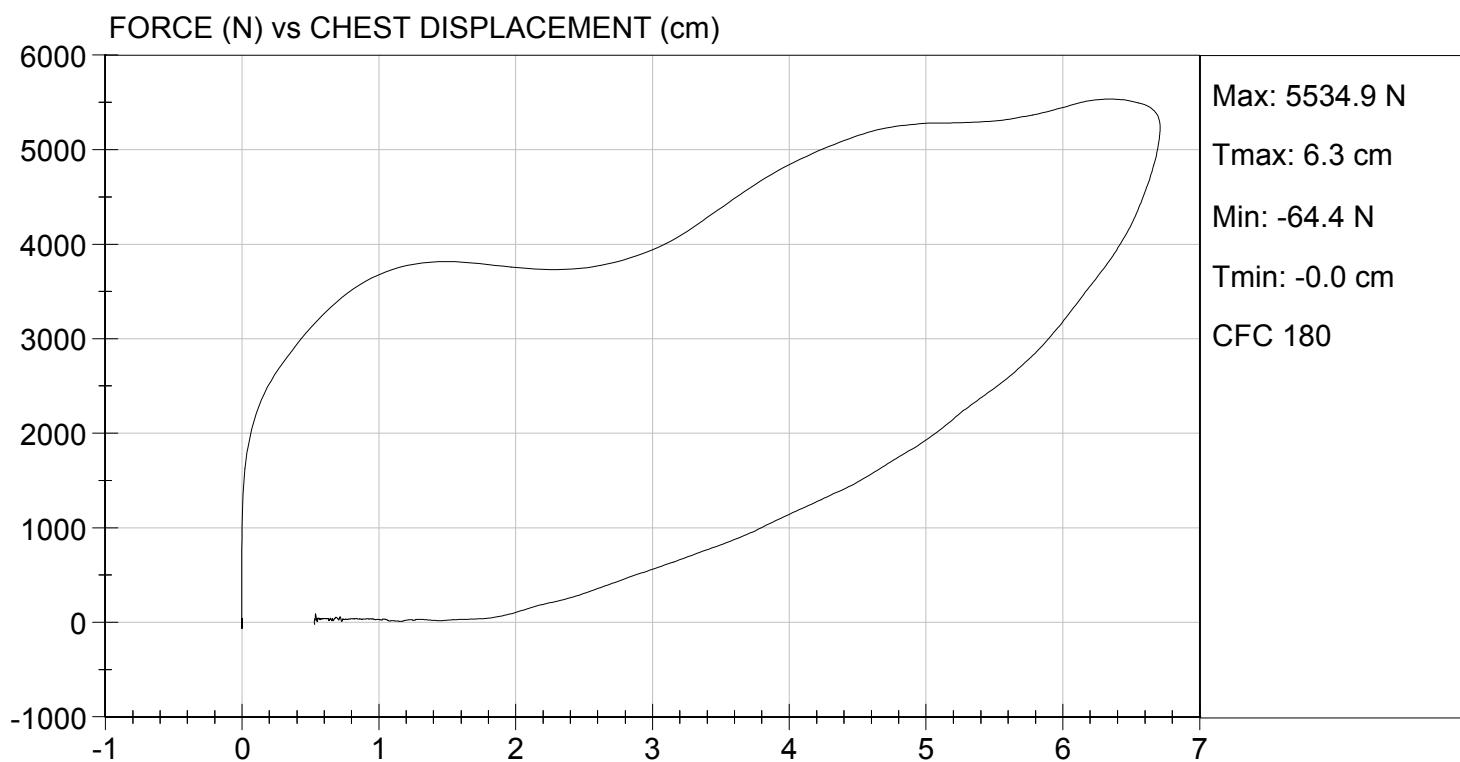
Test Date

  
Approved By  
Jessica Hall



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

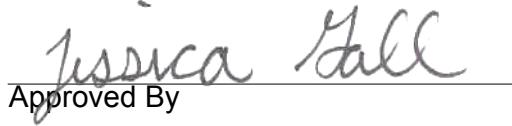
Test I.D: D162265

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

  
\_\_\_\_\_  
Karen D. Yule  
Laboratory Technician

06/30/2016

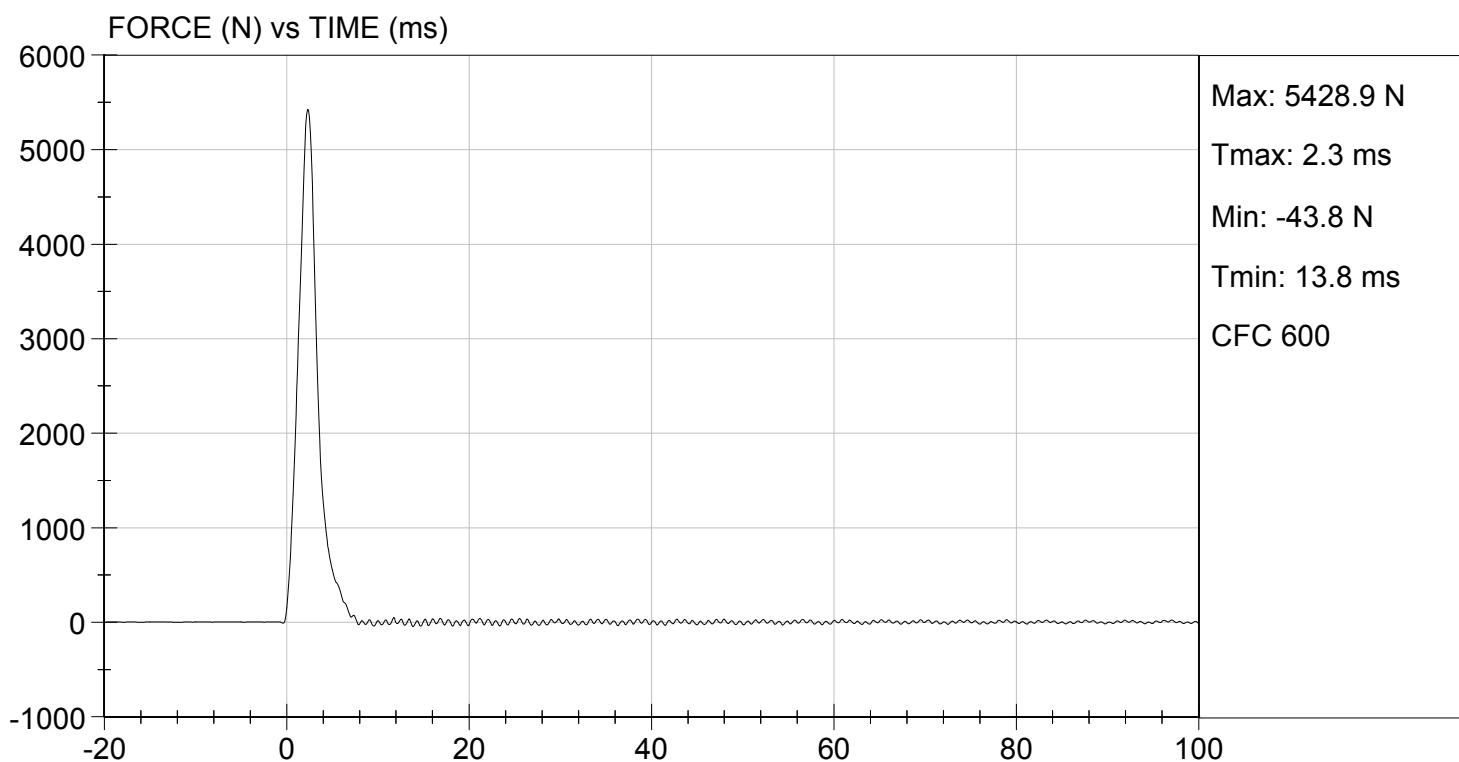
Test Date

  
\_\_\_\_\_  
Approved By  
Jessica Hall



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

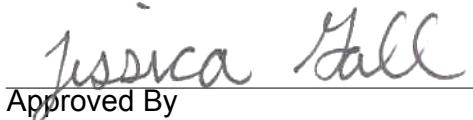
**Test I.D:** D162266

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

06/30/2016

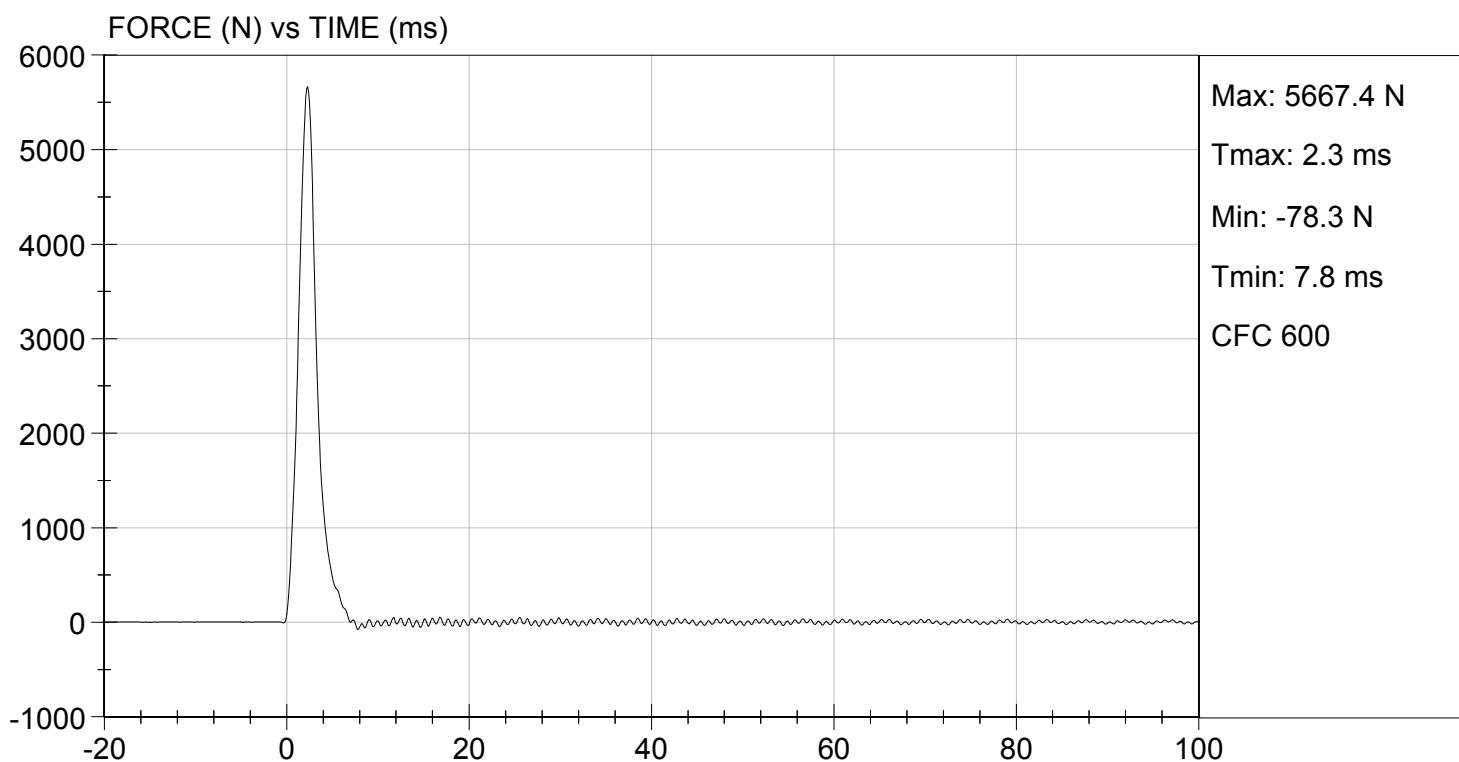
Test Date

  
\_\_\_\_\_  
Approved By



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

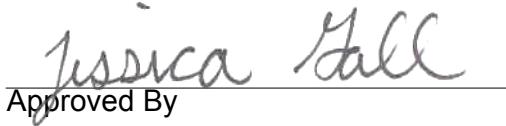
**Test I.D:** D162260

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

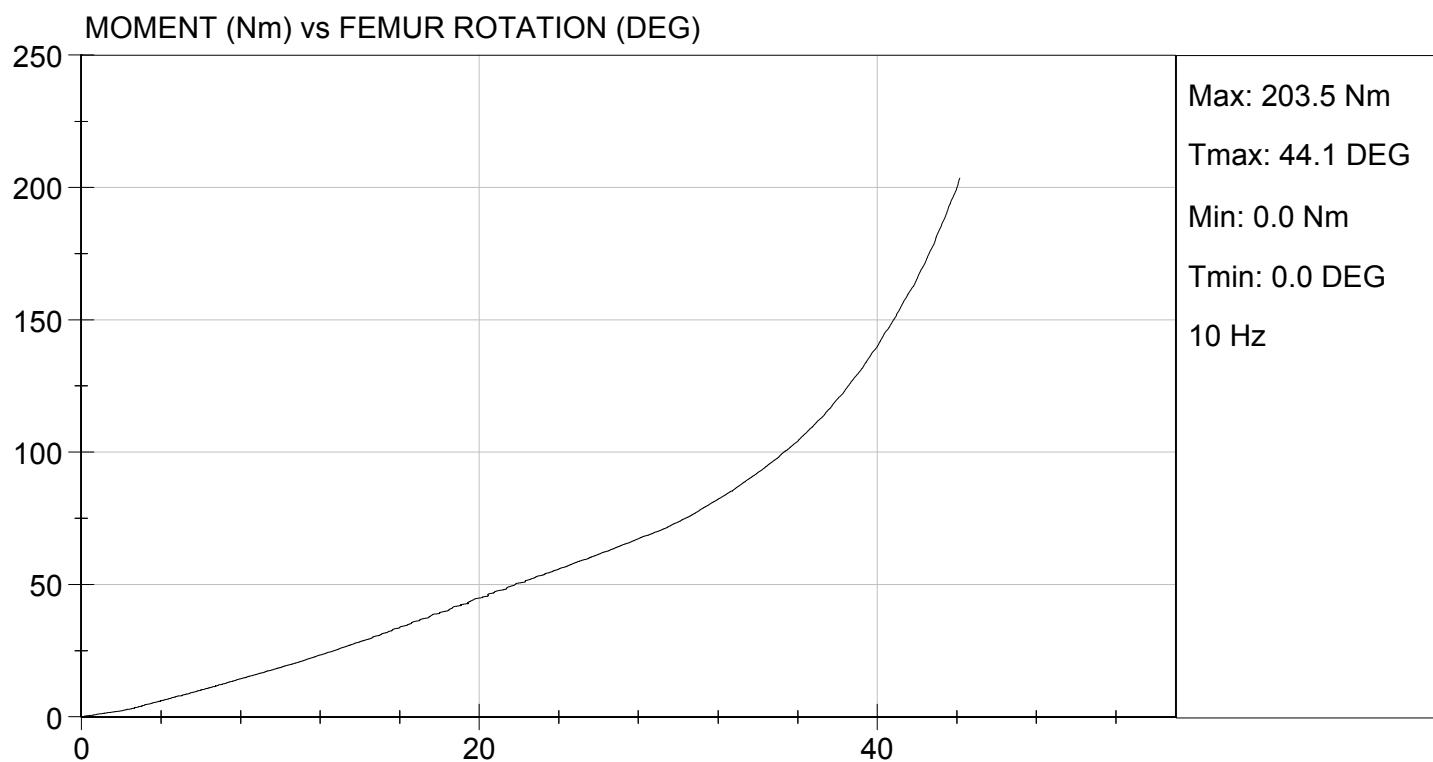
  
\_\_\_\_\_  
Approved By



TEST DESC: RIGHT HIP FEMUR FLEXION

TEST DATE: 06/30/2016

TEST #: D162269

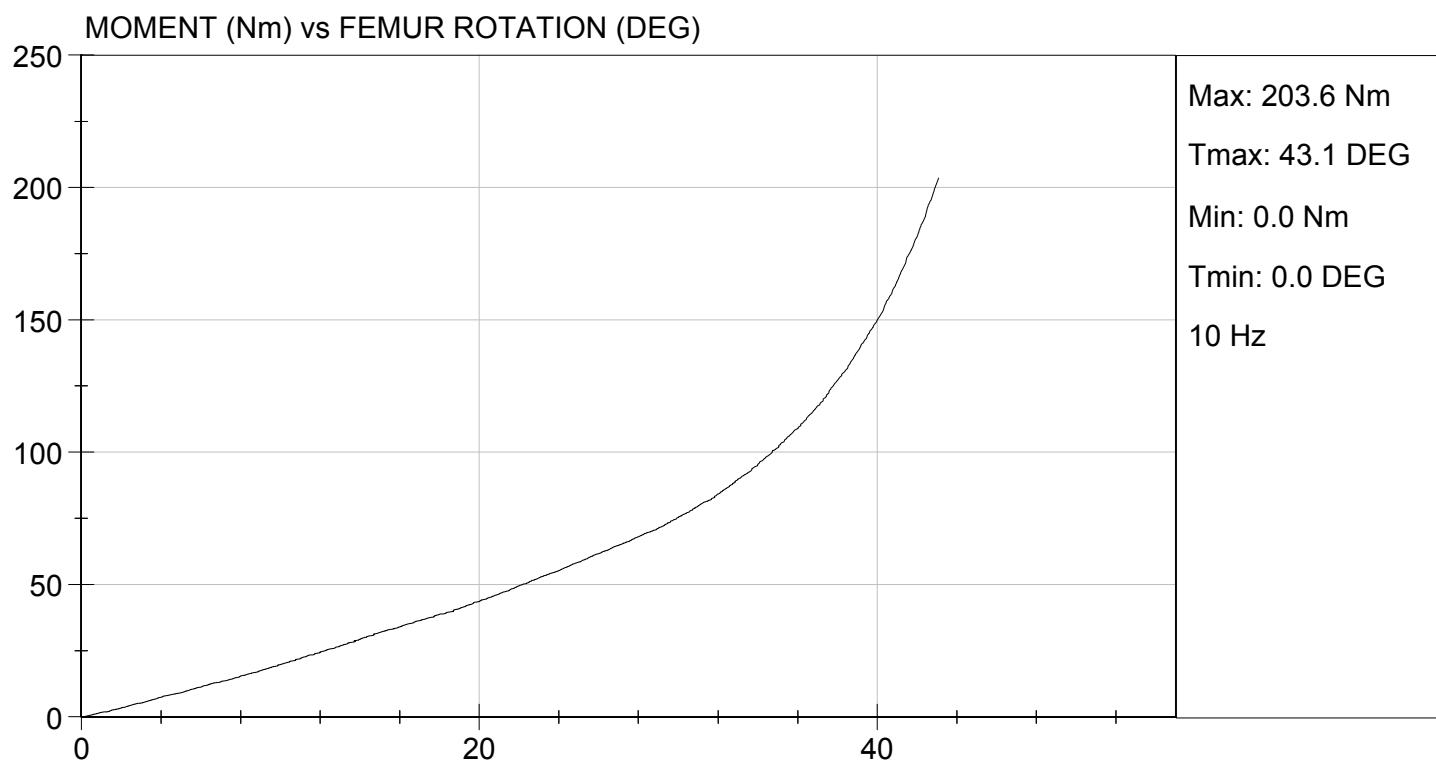




TEST DESC: LEFT HIP FEMUR FLEXION

TEST DATE: 06/30/2016

TEST #: D162260

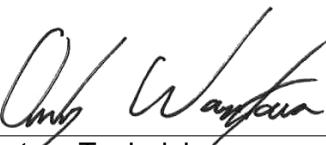


**MGA RESEARCH CORPORATION**  
**HEAD DROP TEST**  
**HYBRID III 50TH PERCENTILE MALE**

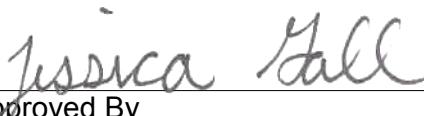
ATD Serial No: 351

Test ID: D162351

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
Peak Resultant Acceleration	G's	225 to 275	266	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	11.6	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

  
\_\_\_\_\_  
Laboratory Technician

07/12/2016  
Test Date

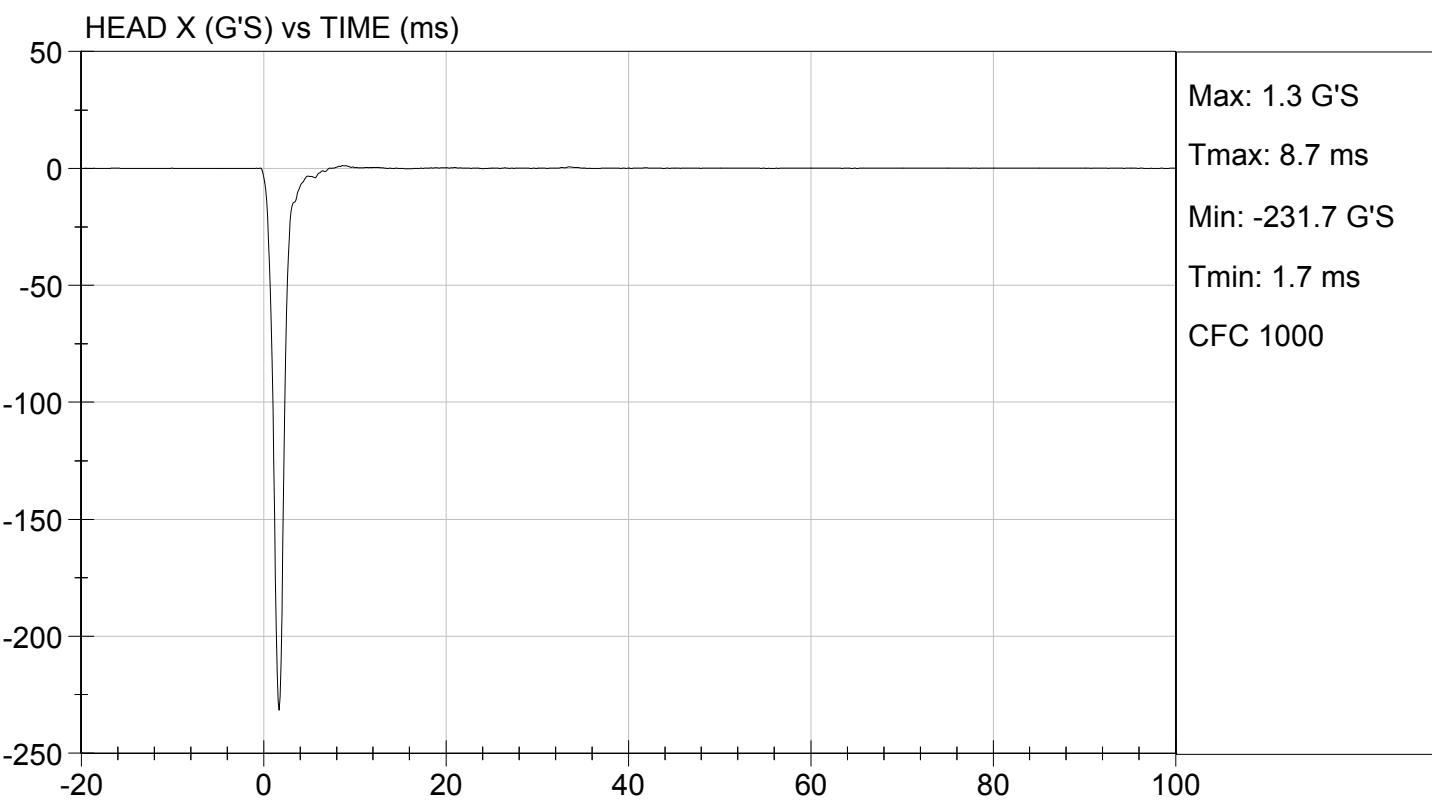
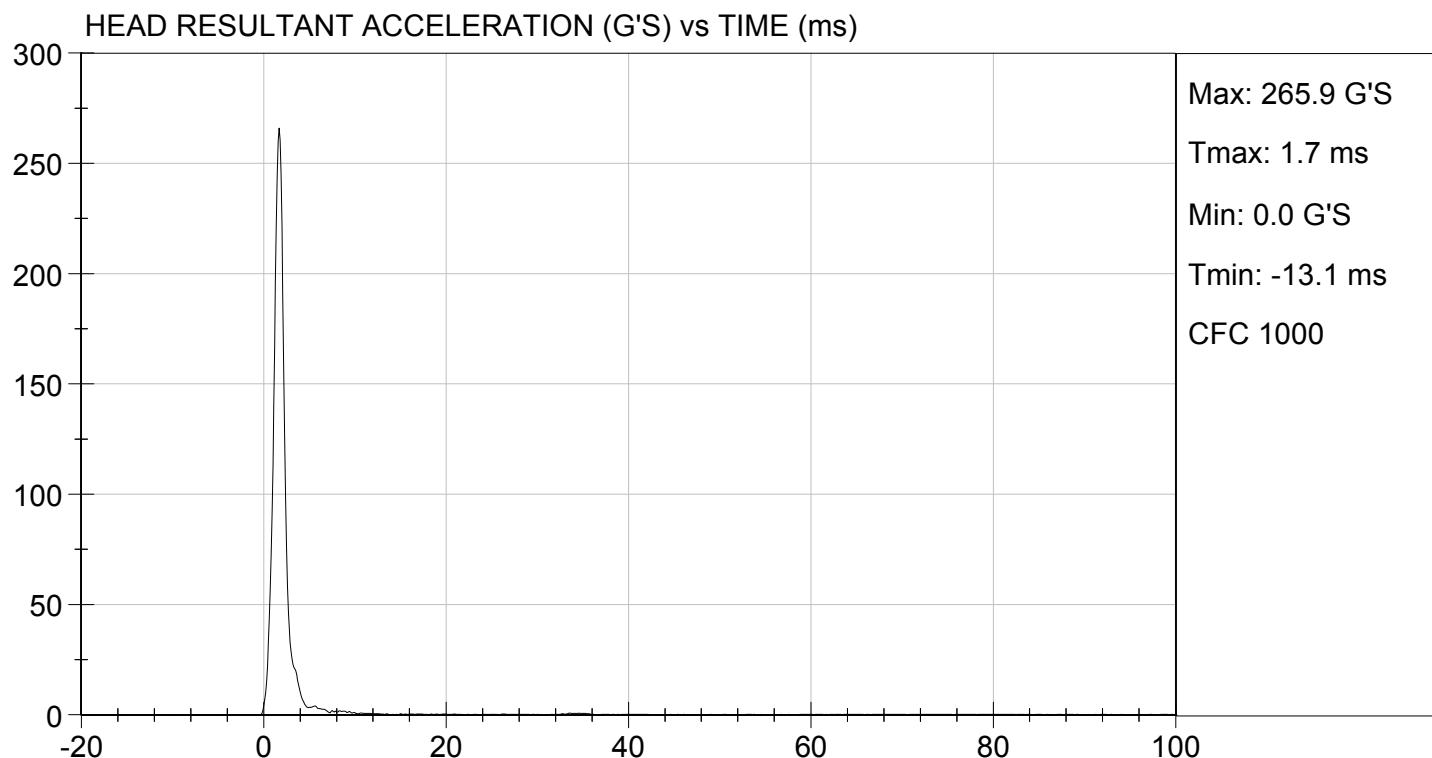
  
\_\_\_\_\_  
Approved By



TEST DESC: HEAD DROP

TEST DATE: 07/12/2016

TEST #: D162351

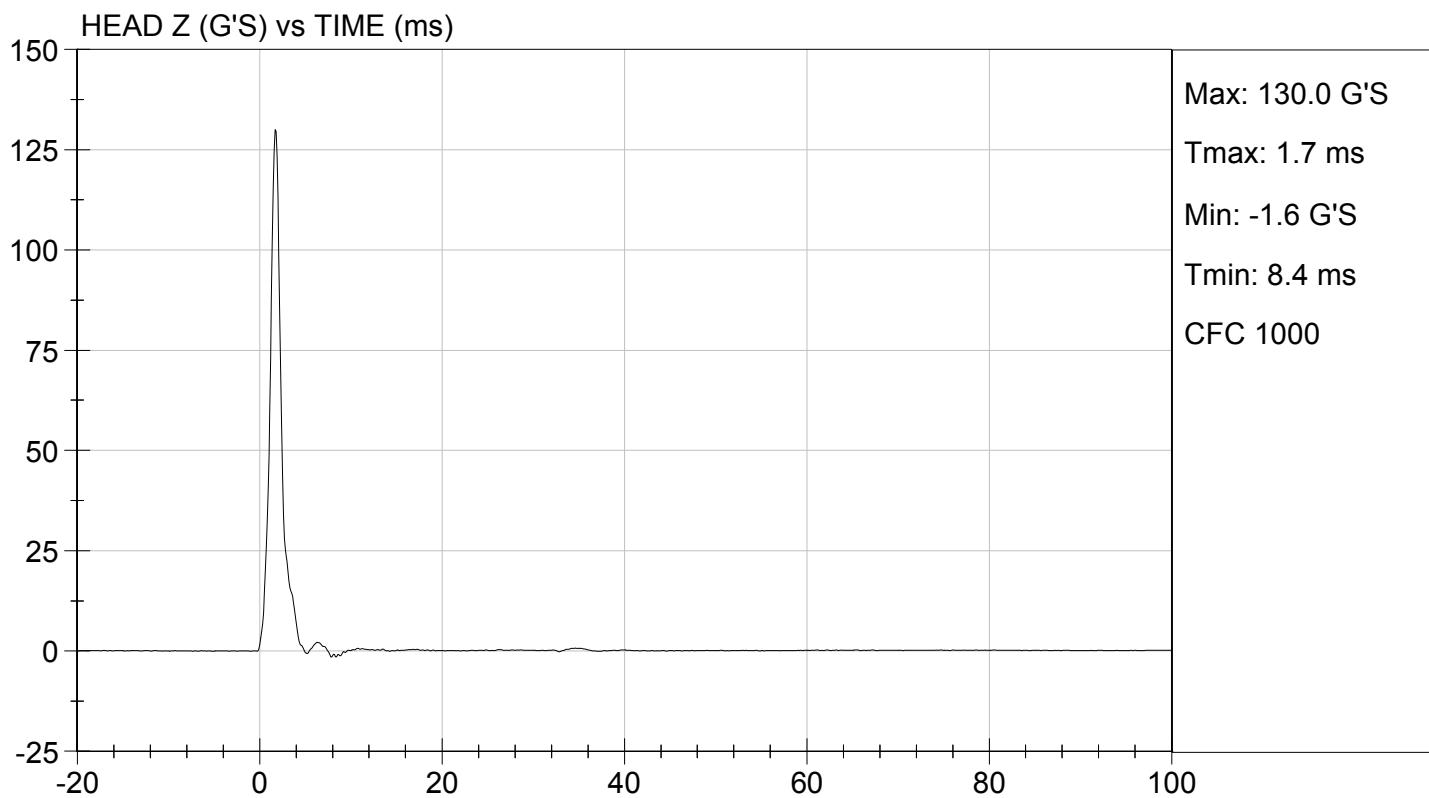
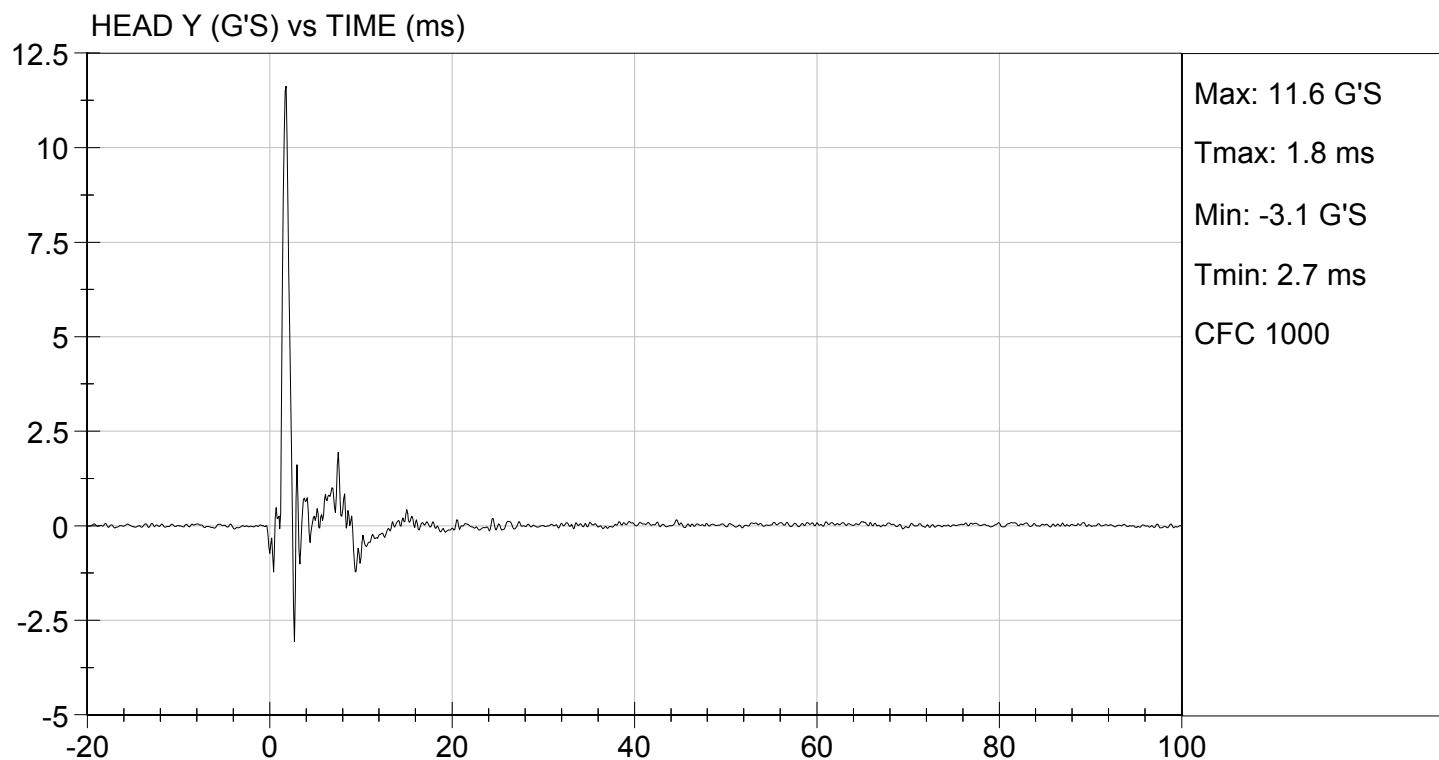




TEST DESC: HEAD DROP

TEST DATE: 07/12/2016

TEST #: D162351



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

**ATD Serial No:** 351

**Test I.D:** D162352

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 Velocity	m/s	6.89 to 7.13	7.06	Pass	
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	22.93	Pass
	20 ms	G's	17.60 to 22.60	22.44	Pass
	30 ms	G's	12.50 to 18.50	17.24	Pass
Peak Pendulum Deceleration After 30 ms	G's	<= 29.0	17.1	Pass	
Deceleration Decay Time to Cross 5 G's	ms	34.0 to 42.0	34.9	Pass	
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	72.0	Pass
	Time	ms	57.0 to 64.0	57.9	Pass
"D" Plane Rotation Decay Time To Zero Crossing	ms	113.0 to 128.0	117.9	Pass	
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	89.1	Pass
	Time	ms	47.0 to 58.0	48.9	Pass
Positive Moment Decay Time To Zero Crossing	ms	97.0 to 107.0	97.6	Pass	
Overall Test Results				Pass	

Jessica Hall  
 Laboratory Technician

07/12/2016

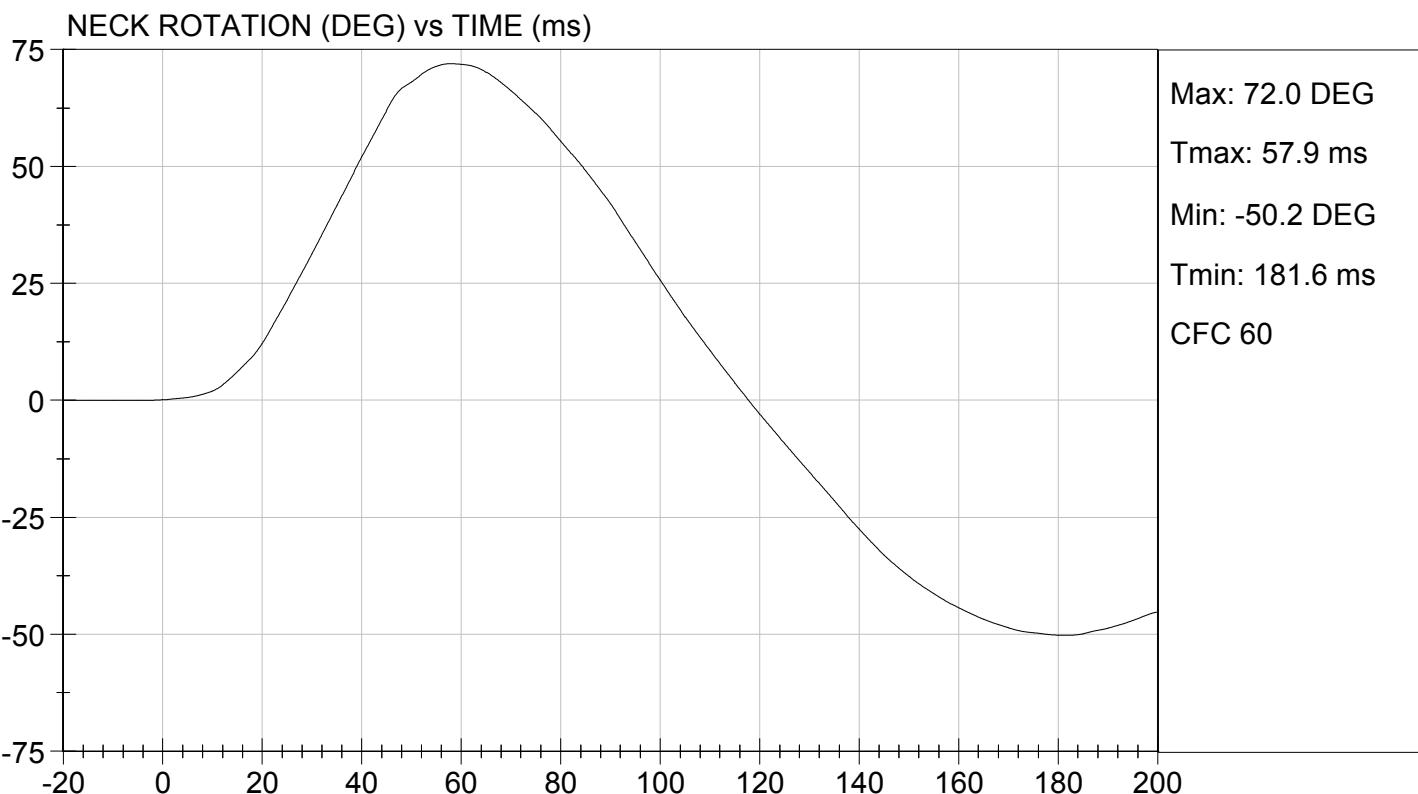
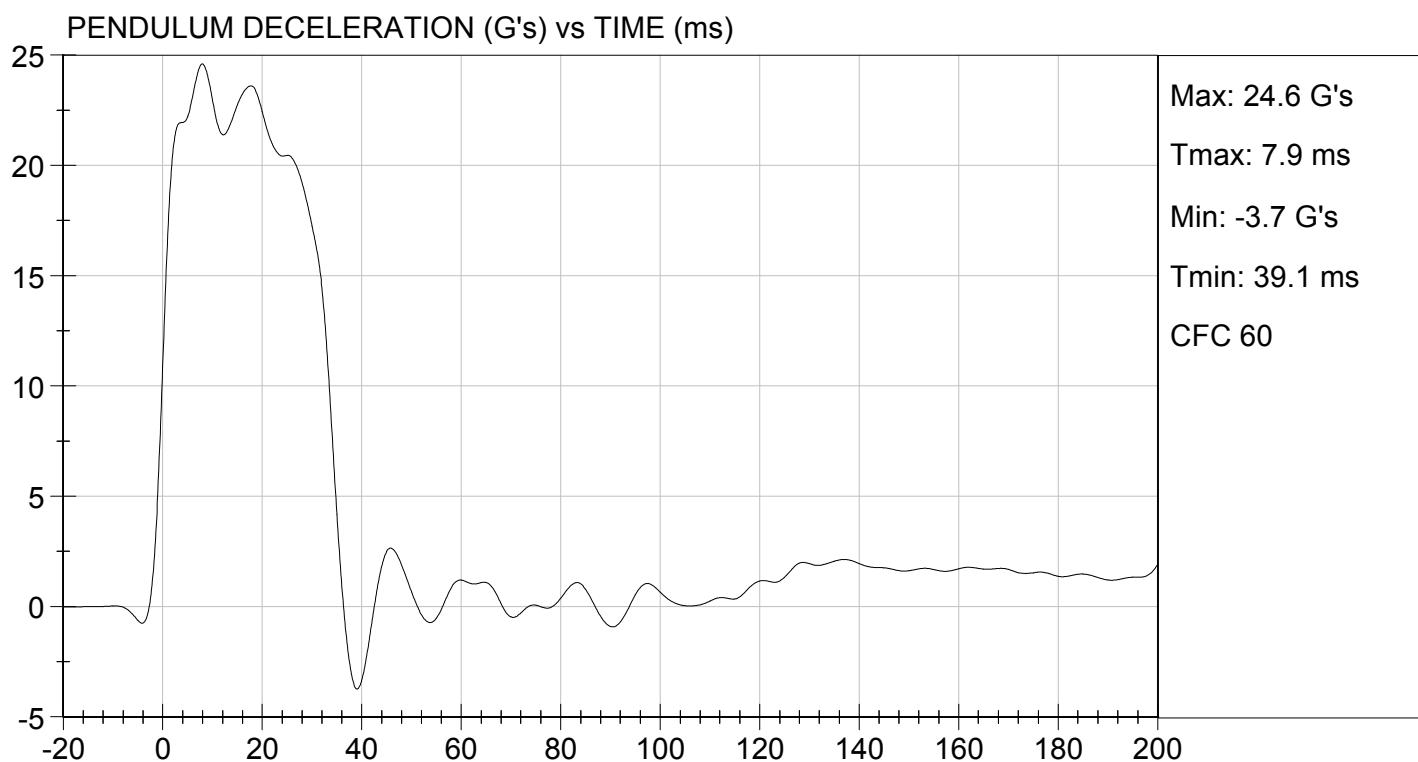
Test Date

John D. Miller  
 Approved By



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

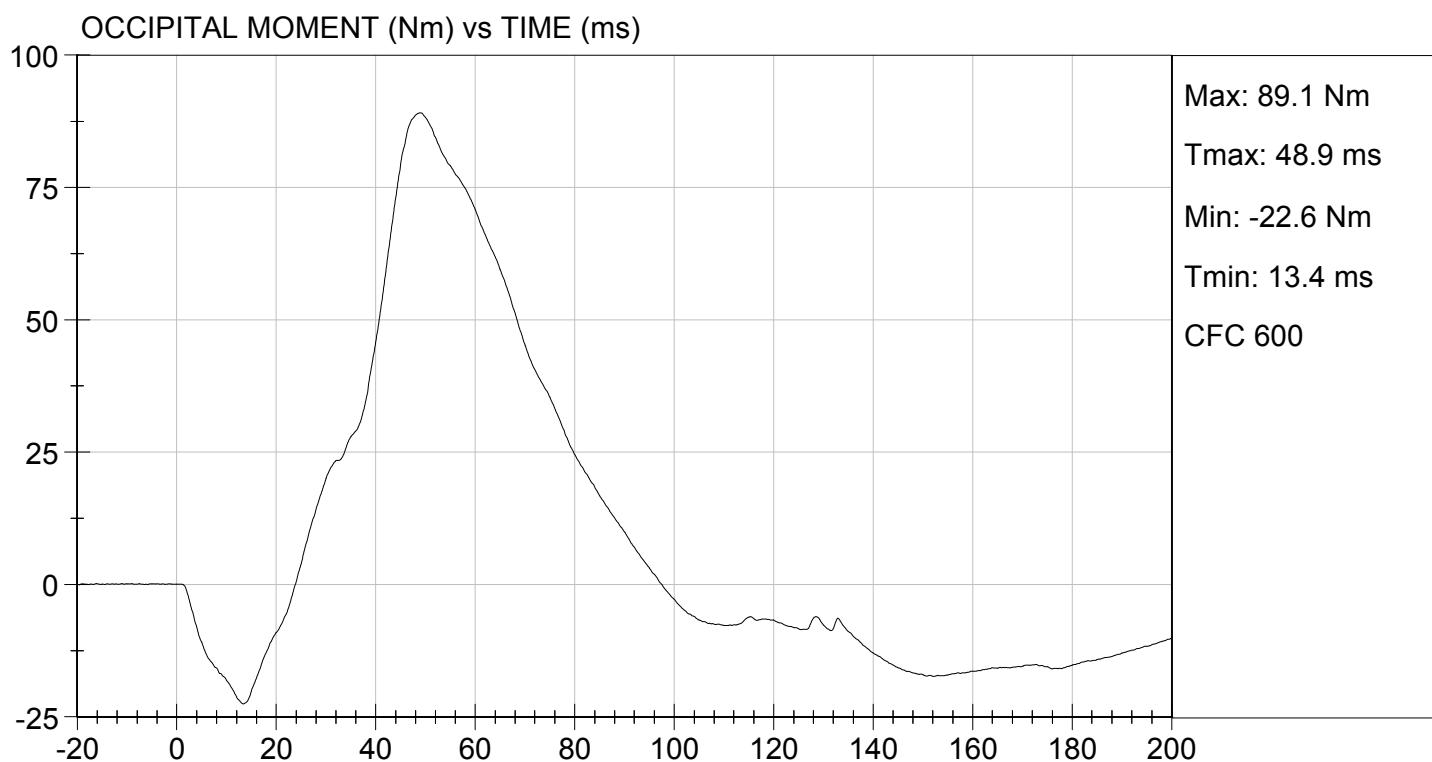
TEST DATE: 07/12/2016  
TEST #: D162352





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

TEST DATE: 07/12/2016  
TEST #: D162352



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

**ATD Serial No:** 351

**Test I.D:** D162353

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 Velocity	m/s	5.95 to 6.19	6.05	Pass	
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	17.65	Pass
	20 ms	G's	14.00 to 19.00	17.71	Pass
	30 ms	G's	11.00 to 16.00	14.44	Pass
Peak Pendulum Deceleration After 30 ms	G's	<= 22.0	14.6	Pass	
Deceleration Decay Time to Cross 5 G's	ms	38.0 to 46.0	38.7	Pass	
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	92.4	Pass
	Time	ms	72.0 to 82.0	79.1	Pass
"D" Plane Rotation Decay Time To Zero Crossing	ms	147.0 to 174.0	158.9	Pass	
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-58.1	Pass
	Time	ms	65.0 to 79.0	71.1	Pass
Negative Moment Decay Time To Zero Crossing	ms	120.0 to 148.0	147.5	Pass	
Overall Test Results				Pass	

Jessica Hall  
 Laboratory Technician

07/12/2016

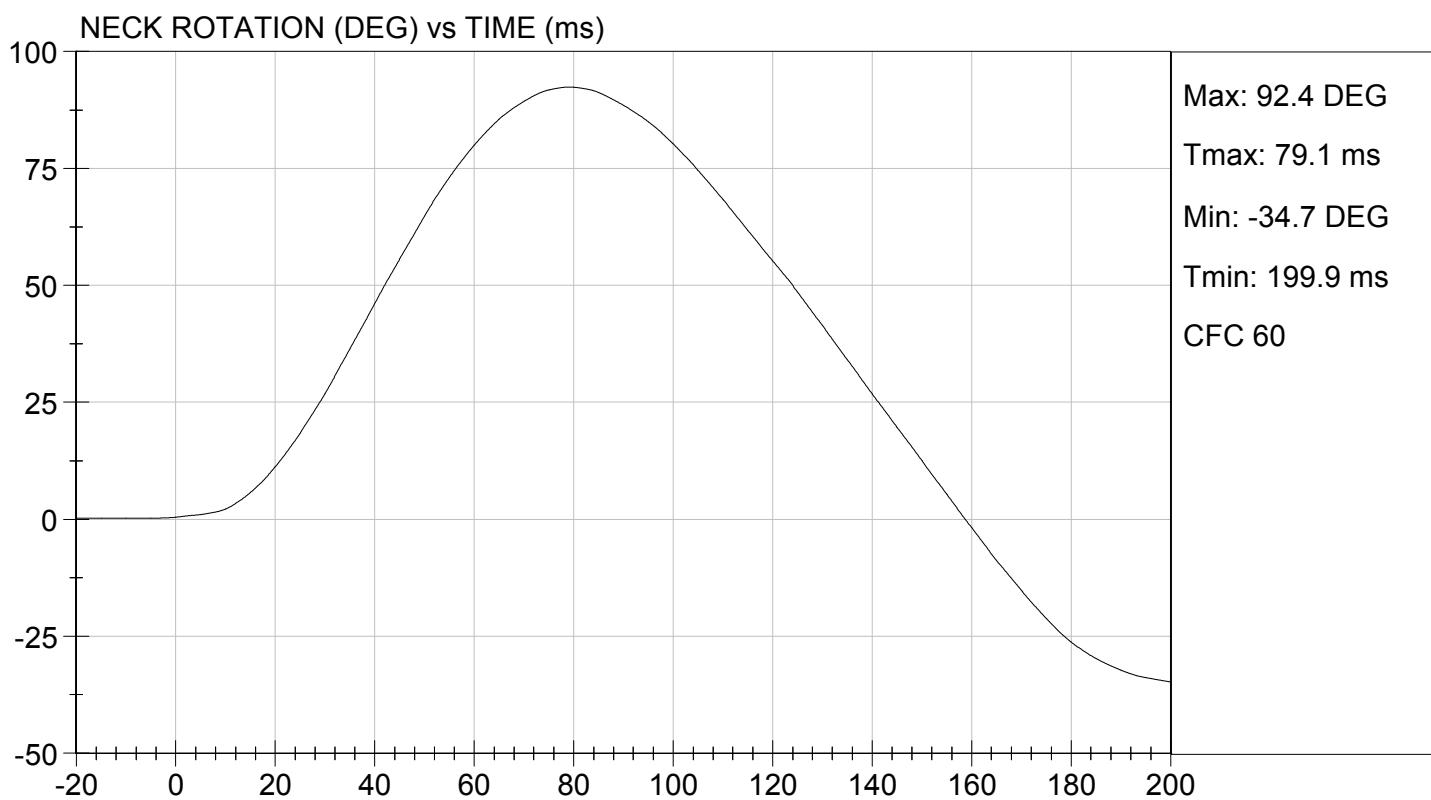
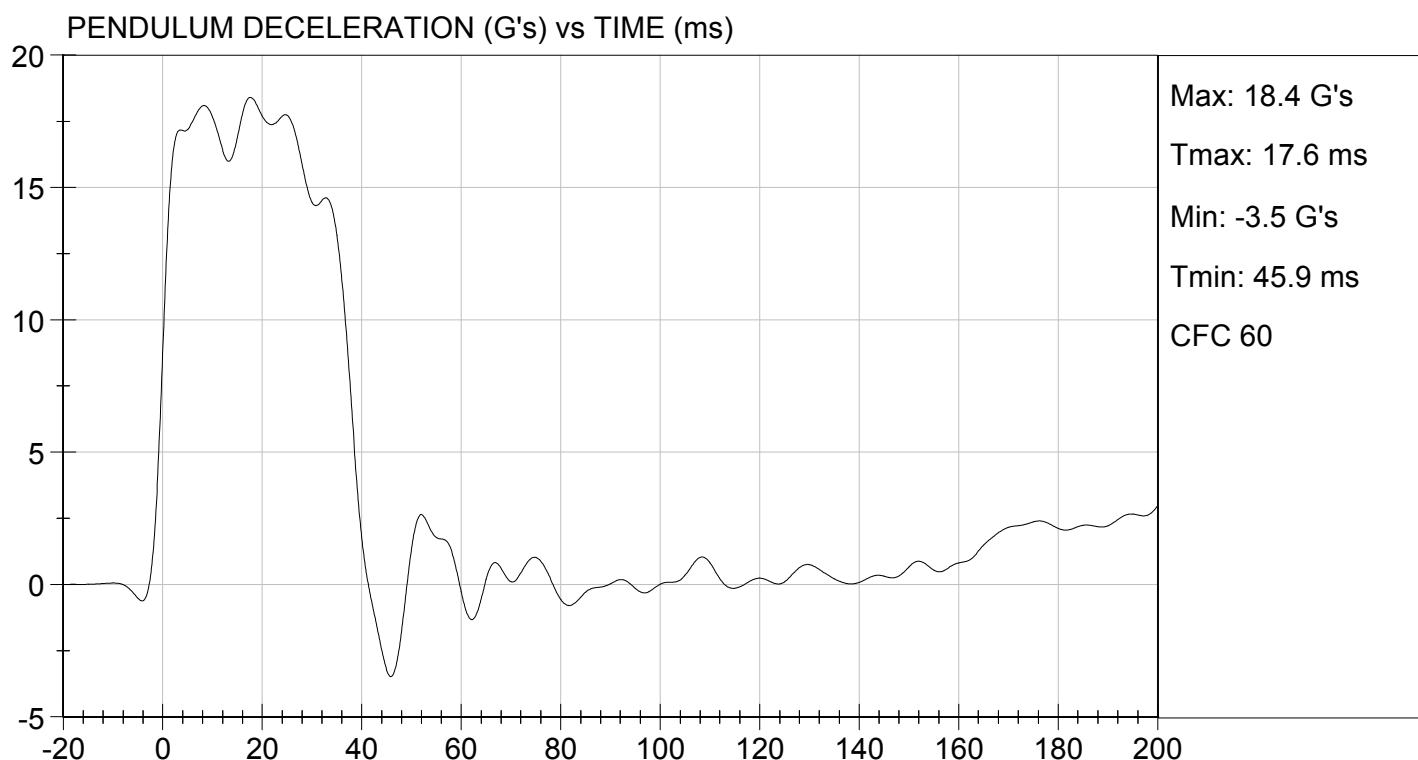
Test Date

John D. Yule  
 Approved By



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

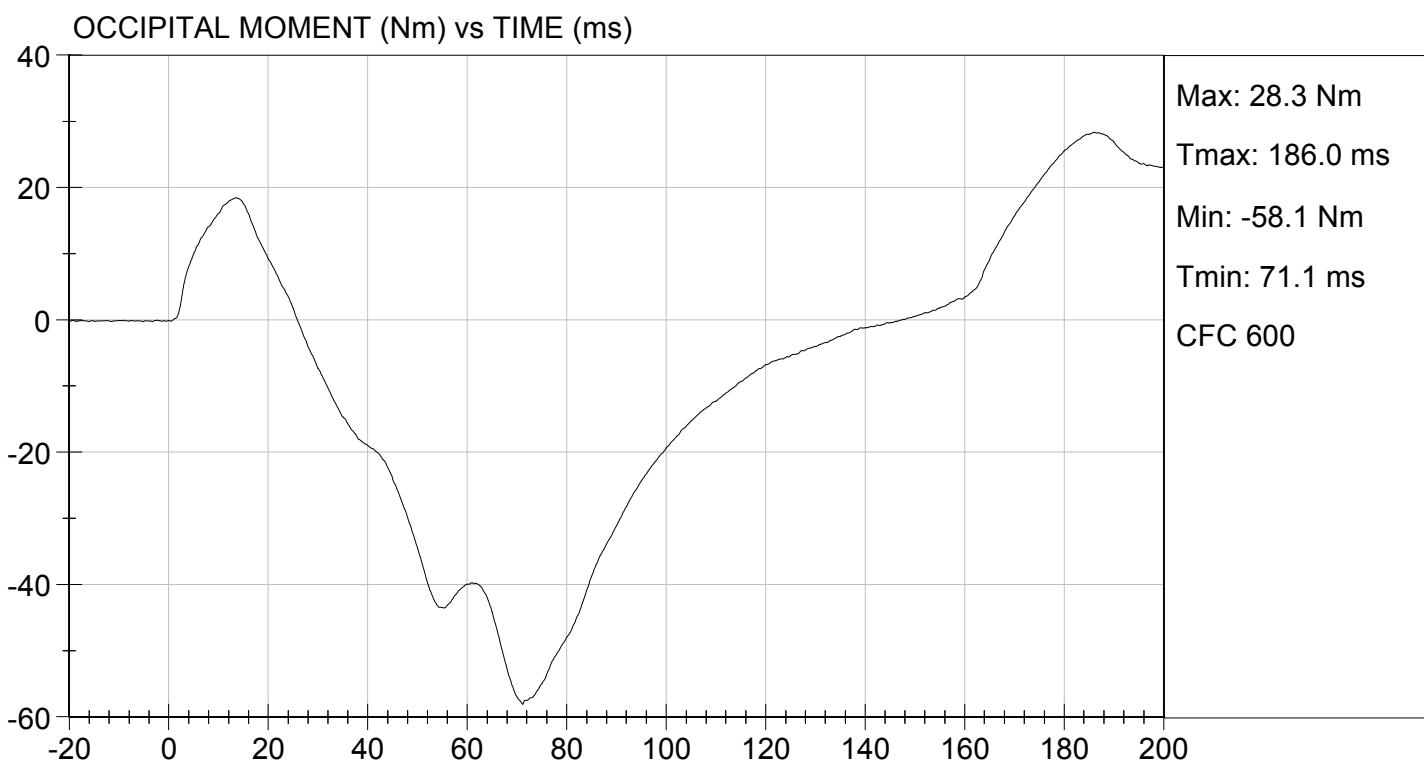
TEST DATE: 07/12/2016  
TEST #: D162353





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

TEST DATE: 07/12/2016  
TEST #: D162353



MGA RESEARCH CORPORATION  
THORAX IMPACT  
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

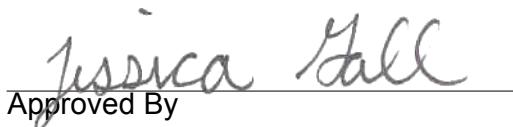
Test I.D: D162354

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Probe Velocity	m/s	6.58 to 6.82	6.60	Pass
Peak Probe Force	N	5159 to 5893	5,512	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.80	Pass
Internal Hysteresis	%	69 to 85	73	Pass
Overall Test Results				Pass

  
John D. Yule  
Laboratory Technician

07/12/2016

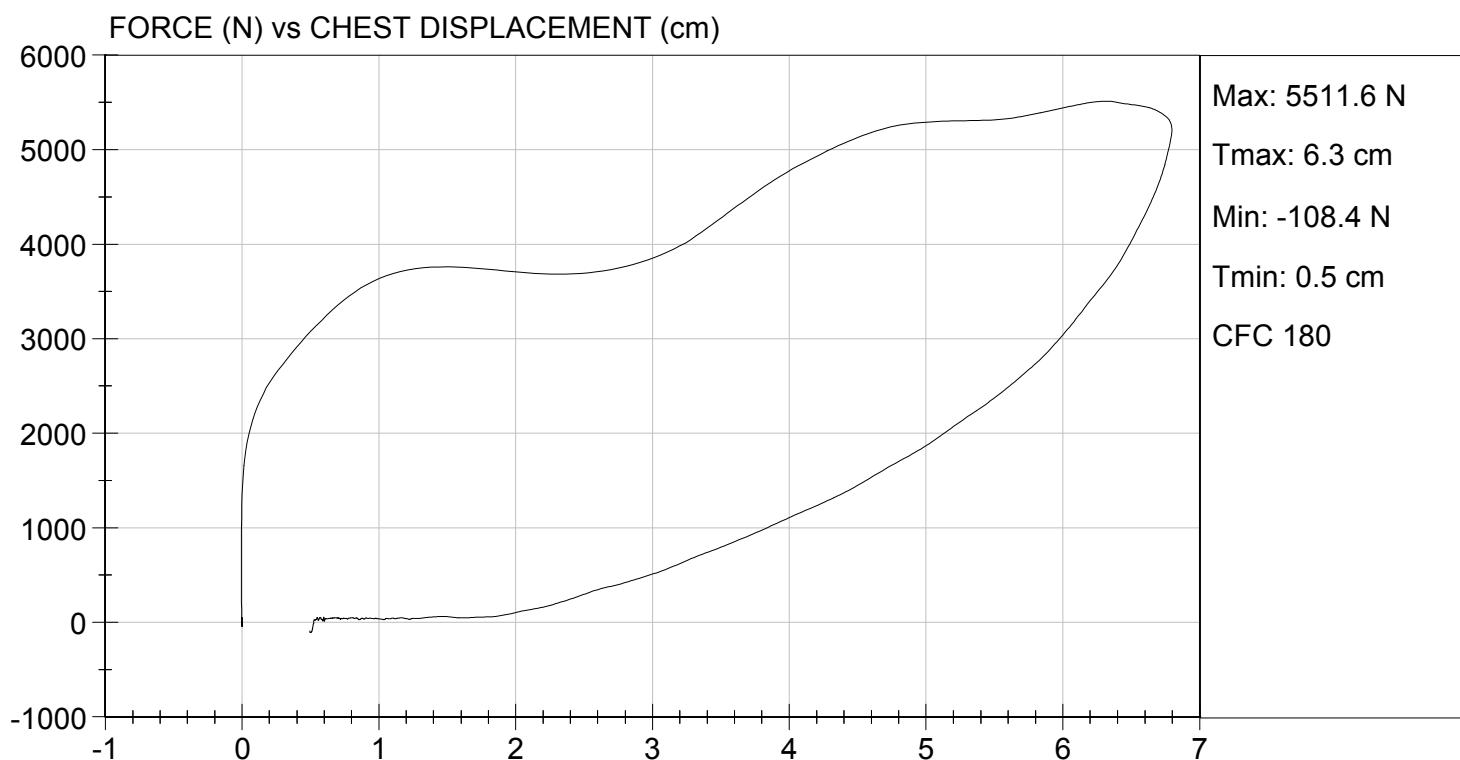
Test Date

  
Approved By  
Jessica Hall



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

TEST DATE: 07/12/2016  
TEST #: D162354

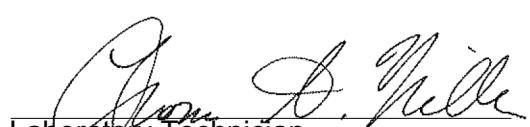


**MGA RESEARCH CORPORATION**  
**RIGHT KNEE IMPACT TEST**  
**HYBRID III 50TH PERCENTILE MALE**

**ATD Serial No:** 351

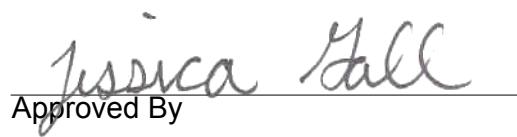
**Test I.D:** D162355

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 Velocity	m/s	2.07 to 2.13	2.08	Pass
Peak Probe Force	N	4715 to 5782	4,820	Pass
Overall Test Results				Pass

  
\_\_\_\_\_  
Laboratory Technician

07/12/2016

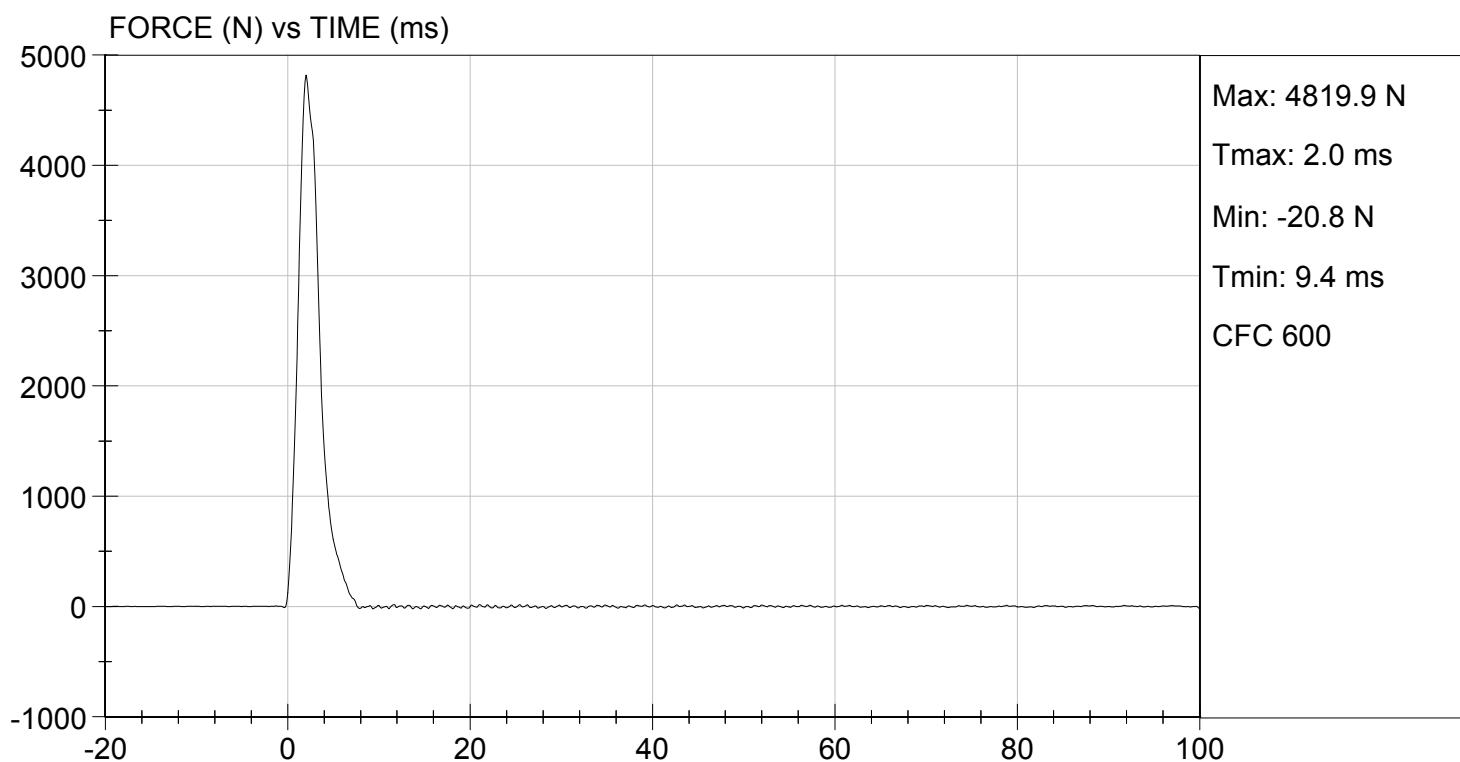
Test Date

  
\_\_\_\_\_  
Approved By



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

TEST DATE: 07/12/2016  
TEST #: D162355



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

**ATD Serial No:** 351

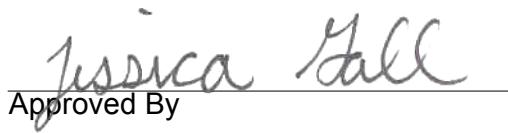
**Test I.D:** D162356

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 Velocity	m/s	2.07 to 2.13	2.08	Pass
Peak Probe Force	N	4715 to 5782	5,339	Pass
Overall Test Results				Pass

  
John D. Yule  
Laboratory Technician

07/12/2016

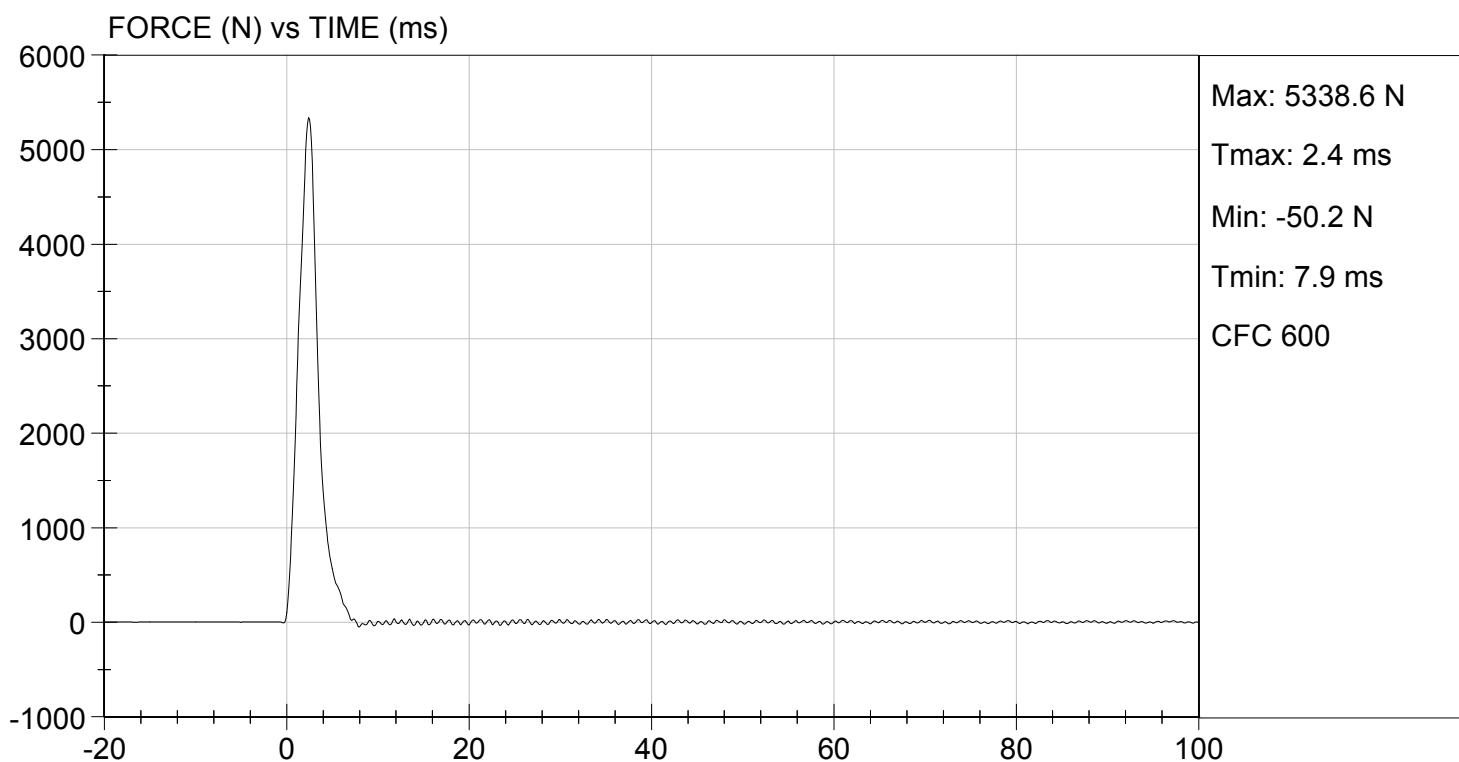
Test Date

  
Approved By  
Jessica Hall



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

TEST DATE: 07/12/2016  
TEST #: D162356



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

**ATD Serial No:** 351

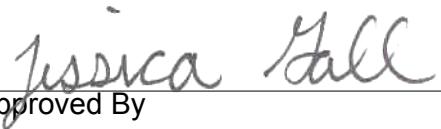
**Test I.D:** D162350

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.5	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	50	50	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.2	6.2	Pass
30 Degrees	Nm	94.9 Nm Max	70.2	80.3	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	44.5	43.1	Pass
Overall Test Results					Pass

  
\_\_\_\_\_  
Laboratory Technician

07/12/2016

Test Date

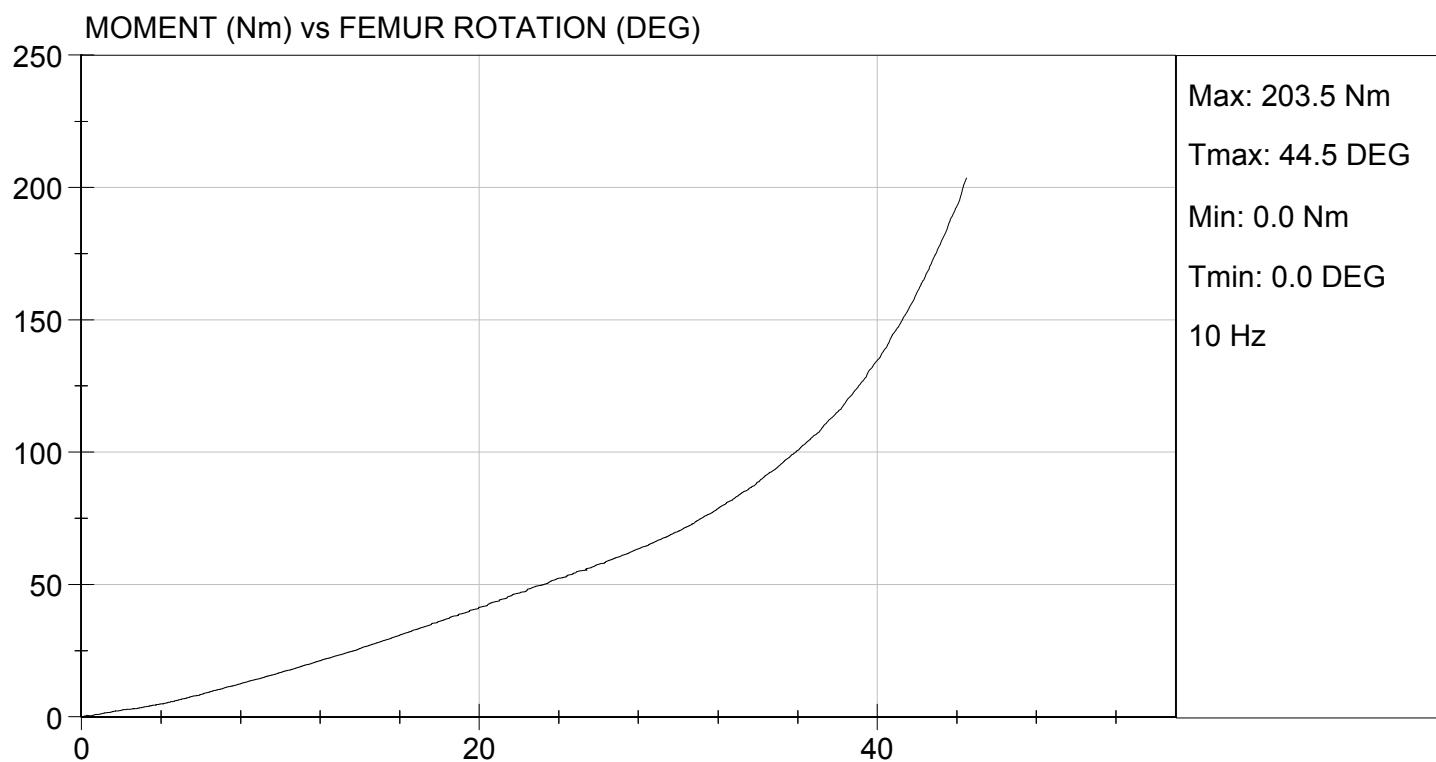
  
\_\_\_\_\_  
Approved By



TEST DESC: RIGHT HIP FEMUR FLEXION

TEST DATE: 07/12/2016

TEST #: D162359

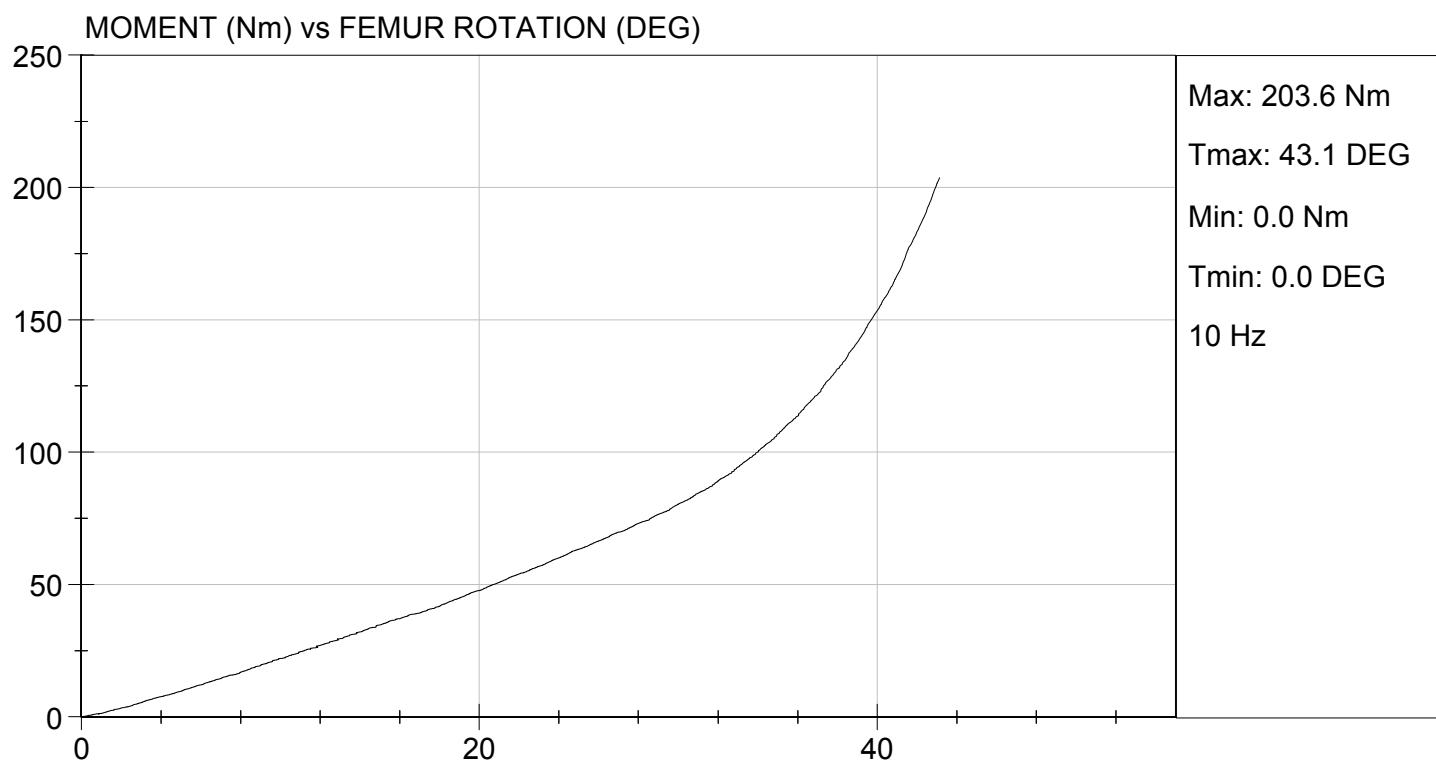




TEST DESC: LEFT HIP FEMUR FLEXION

TEST DATE: 07/12/2016

TEST #: D162350



**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 $304.8 \pm 5.1$ 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 (WTH CHEST JACKET)	Measured $345.4 \pm 12.7$ mm above seat surface	850.9-881.3	868.7
Z	WAIST CIRCUMFERENCE	Measured $165.1 \pm 5.1$ 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: 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

Jessica Hall  
Laboratory Technician

06/30/2016  
Test Date

John D. Miller  
Approved By

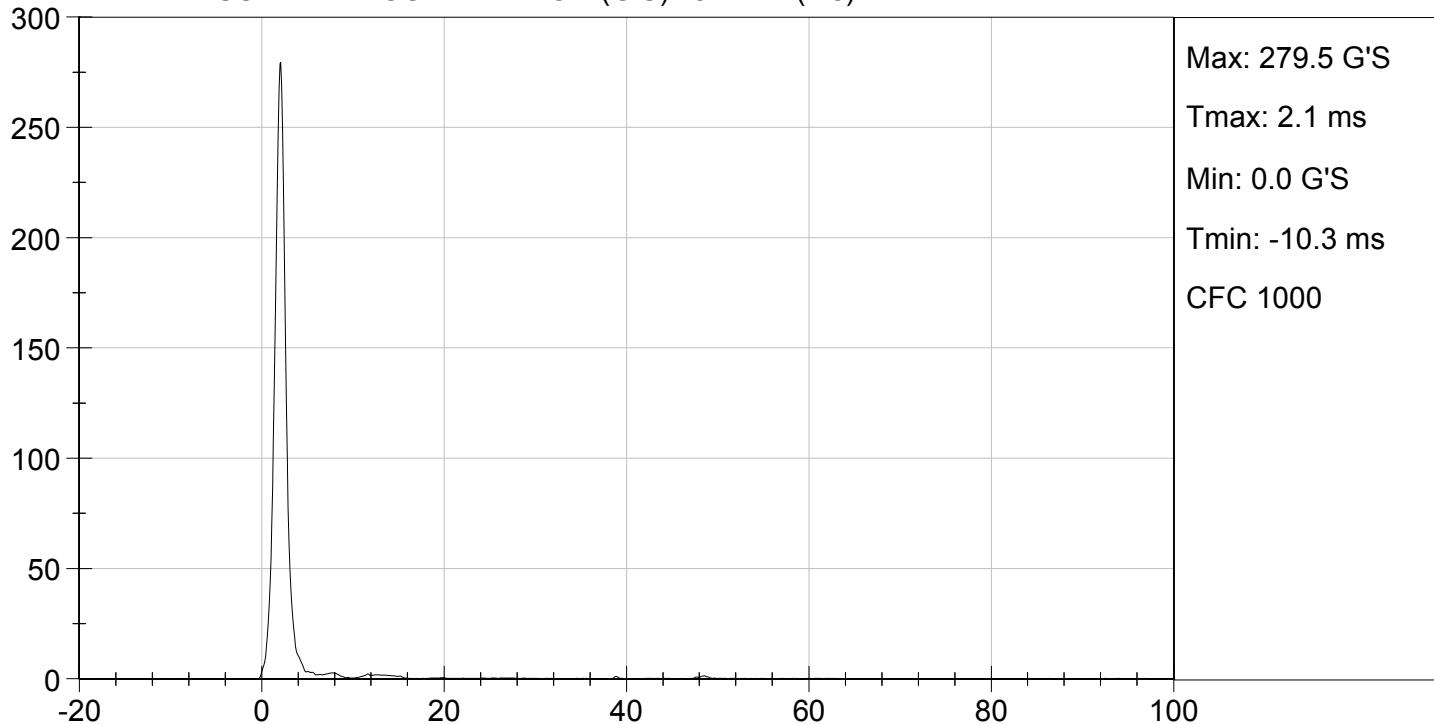


TEST DESC: HEAD DROP

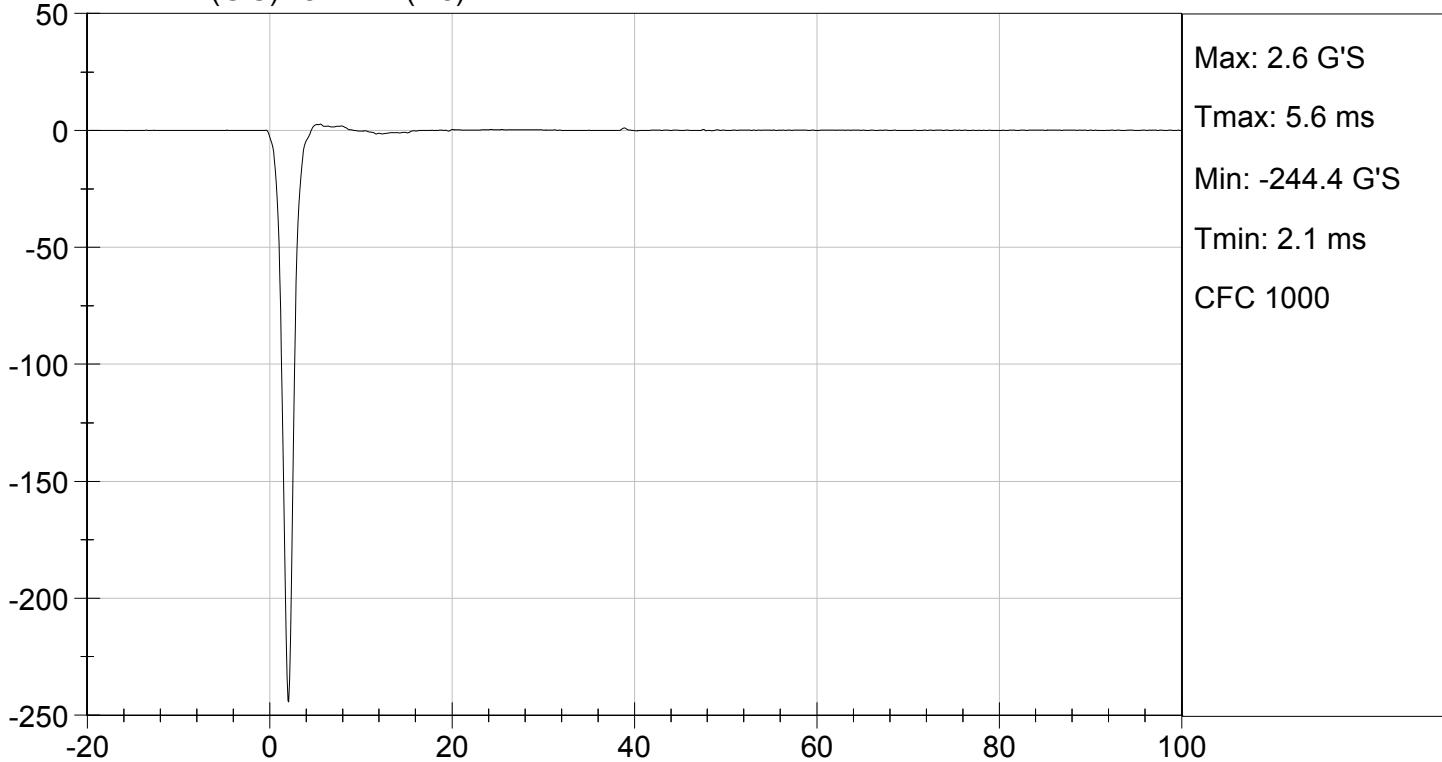
TEST DATE: 06/30/2016

TEST #: D162271

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



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

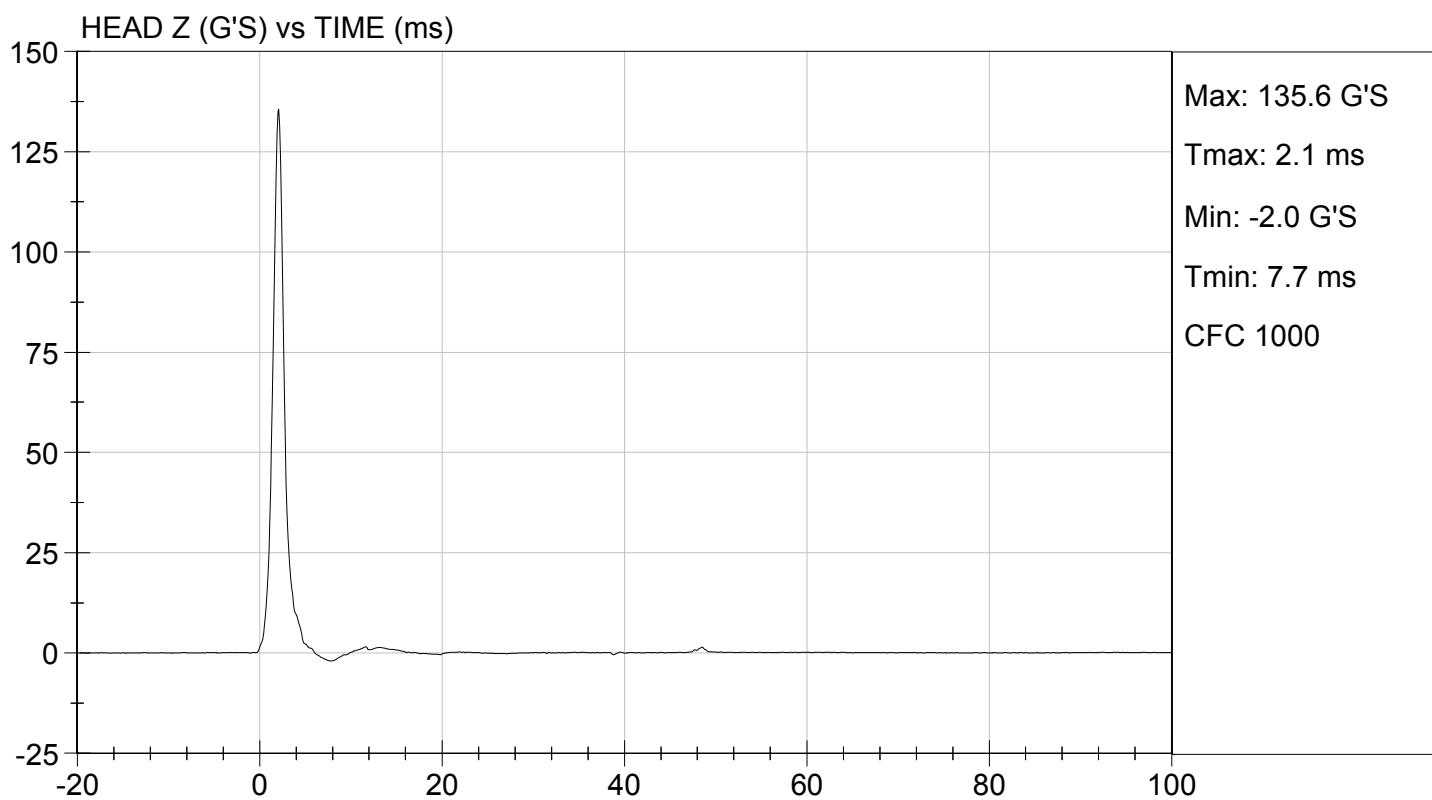
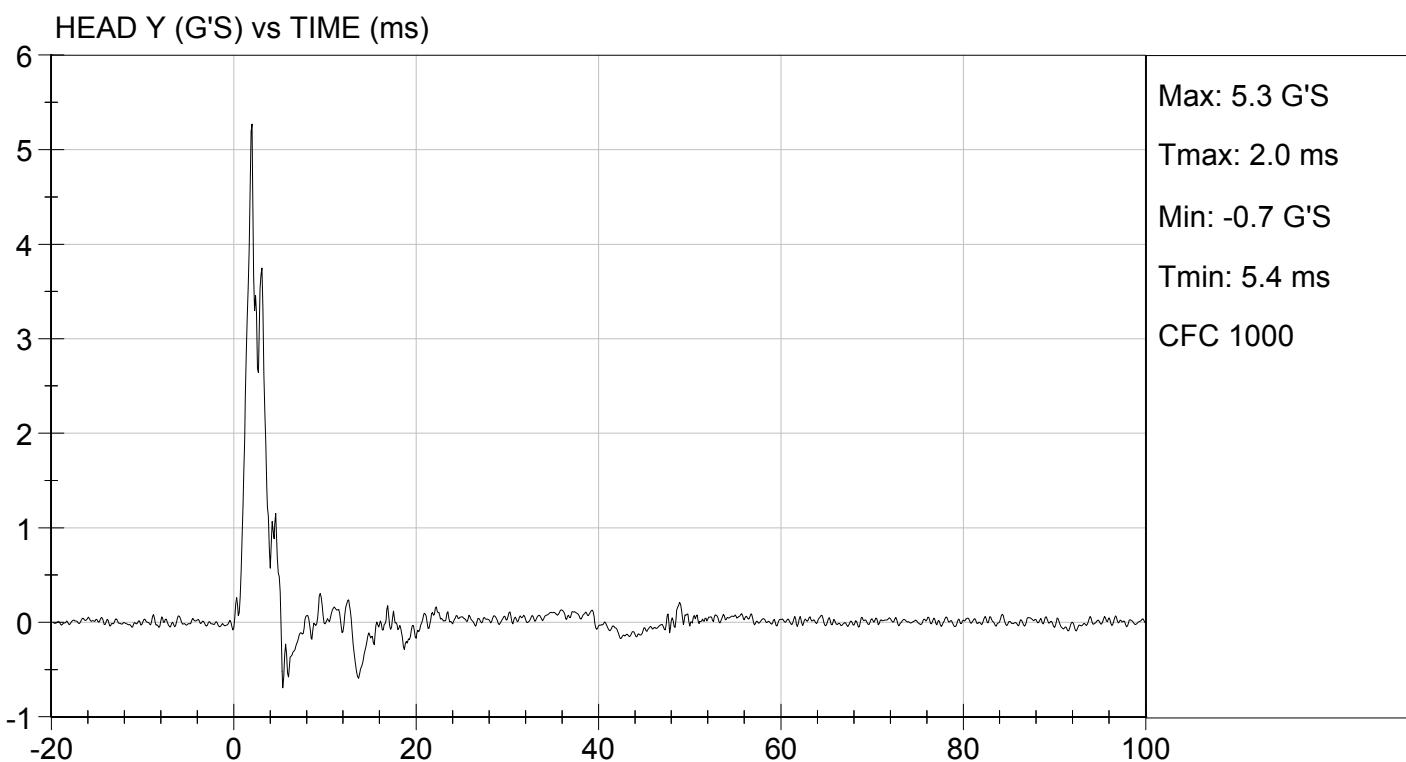




TEST DESC: HEAD DROP

TEST DATE: 06/30/2016

TEST #: D162271



**MGA RESEARCH CORPORATION****NECK FLEXION TEST****HYBRID III 5TH PERCENTILE**ATD Serial No: 634Test I.D: D162272

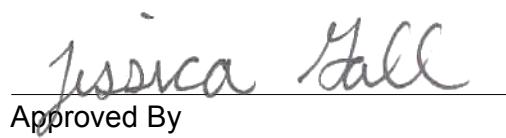
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Pendulum Speed	m/s	6.89 to 7.13	7.06	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.3
	20 ms	m/s	4.0 to 5.0	4.6
	30 ms	m/s	5.8 to 7.0	6.7
D Plane Rotation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



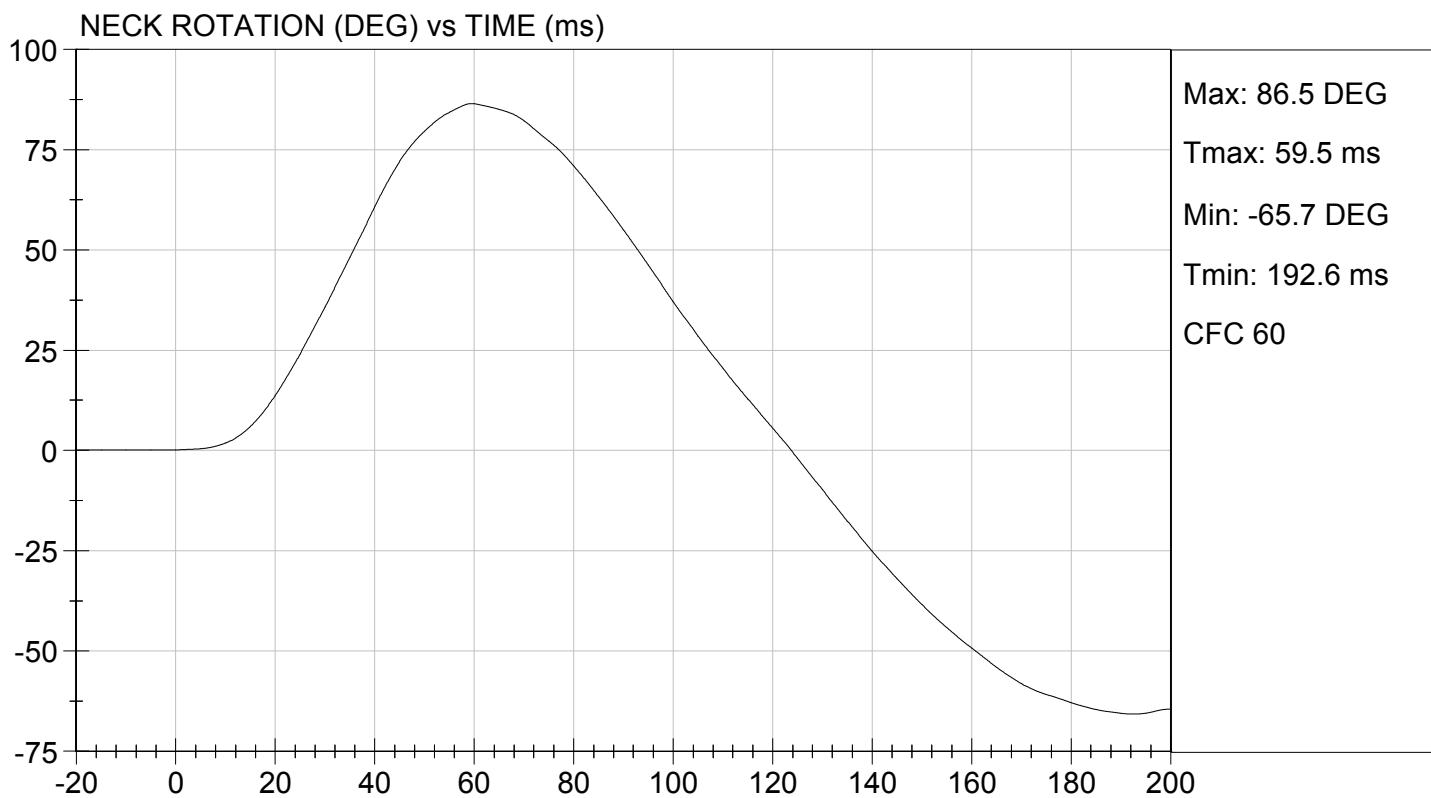
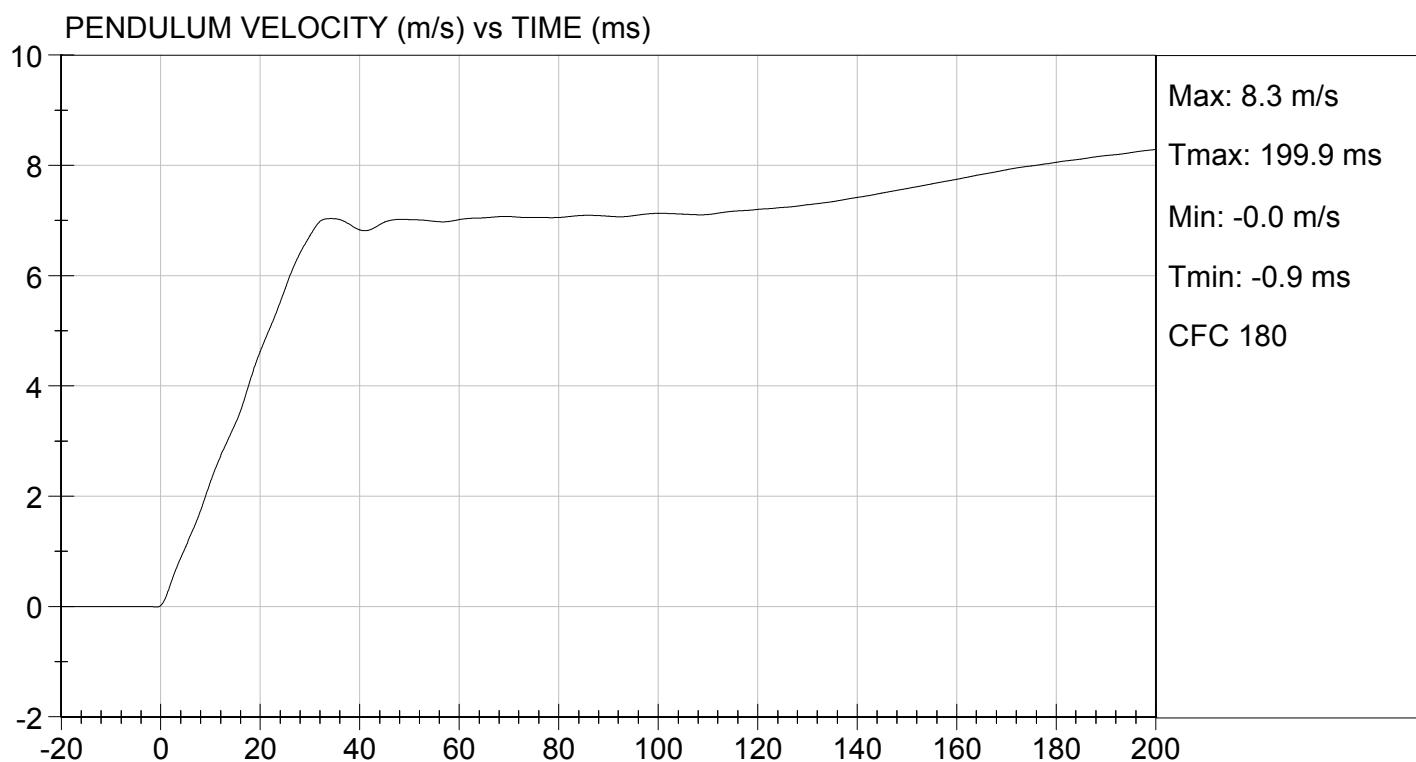
Approved By

C-44



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

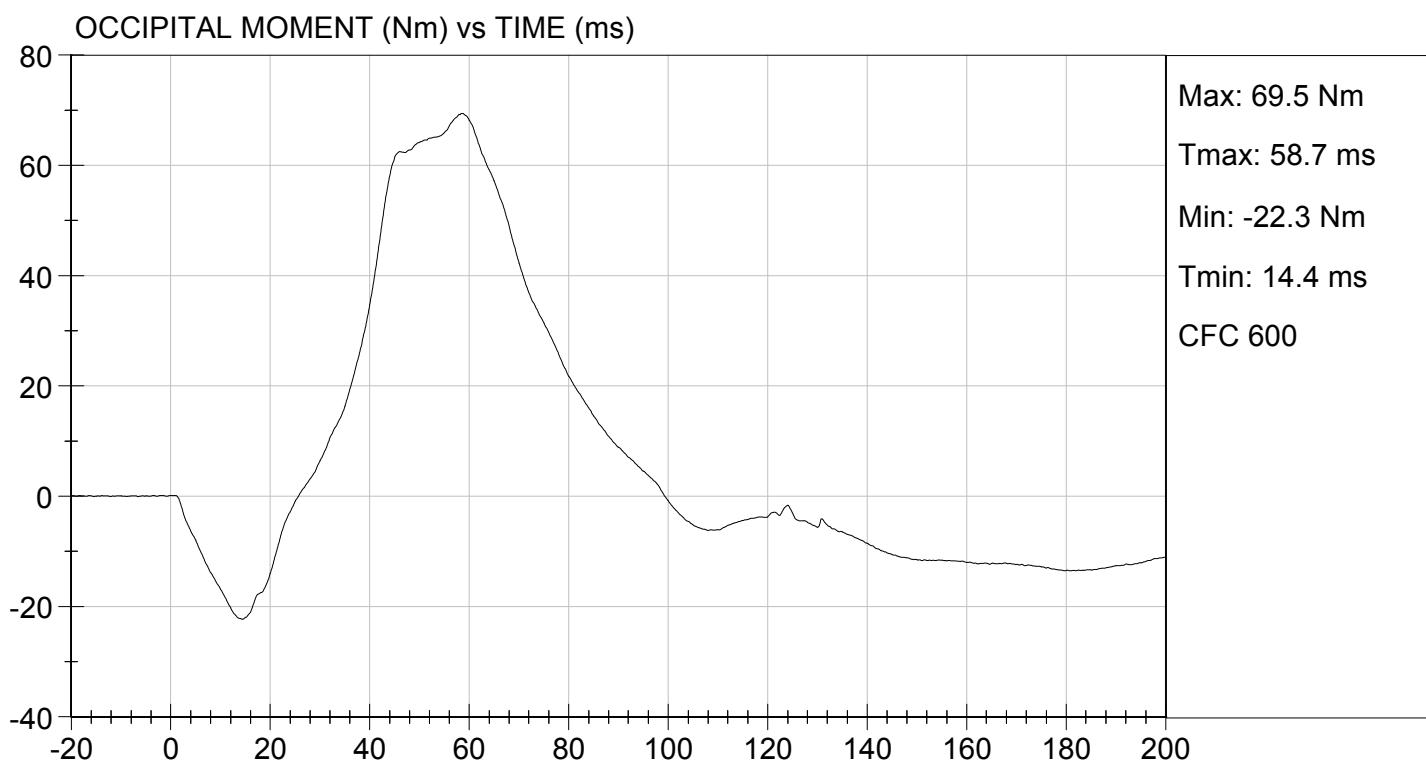
TEST DATE: 06/30/2016  
TEST #: D162272





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

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

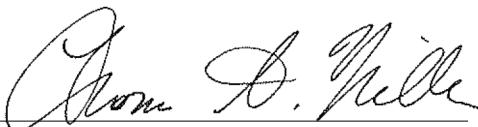


**MGA RESEARCH CORPORATION**  
**NECK EXTENSION TEST**  
**HYBRID III 5TH PERCENTILE**

**ATD Serial No:** 634

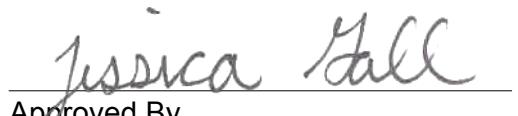
**Test I.D:** D162273

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	

  
Tom D. Yule  
 Laboratory Technician

06/30/2016

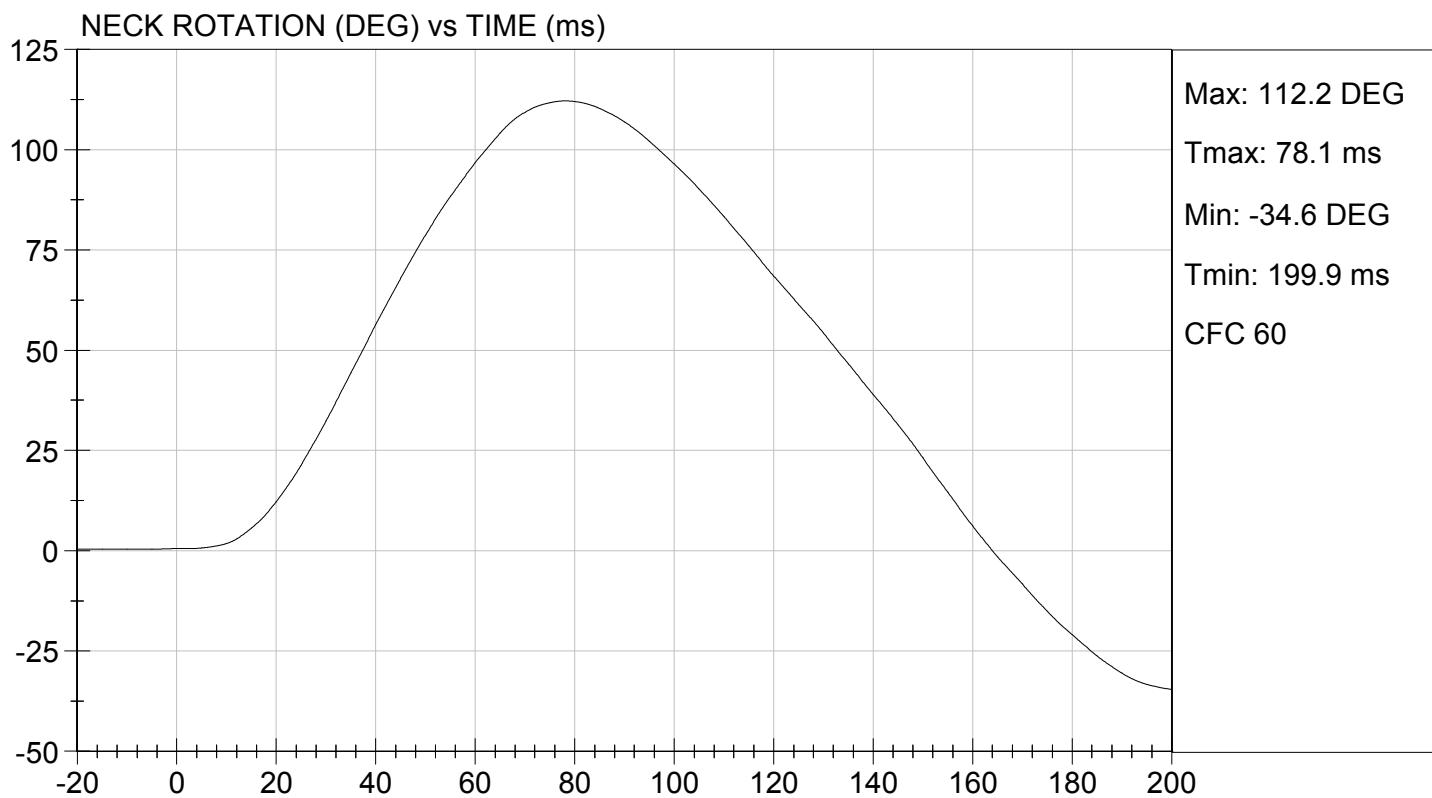
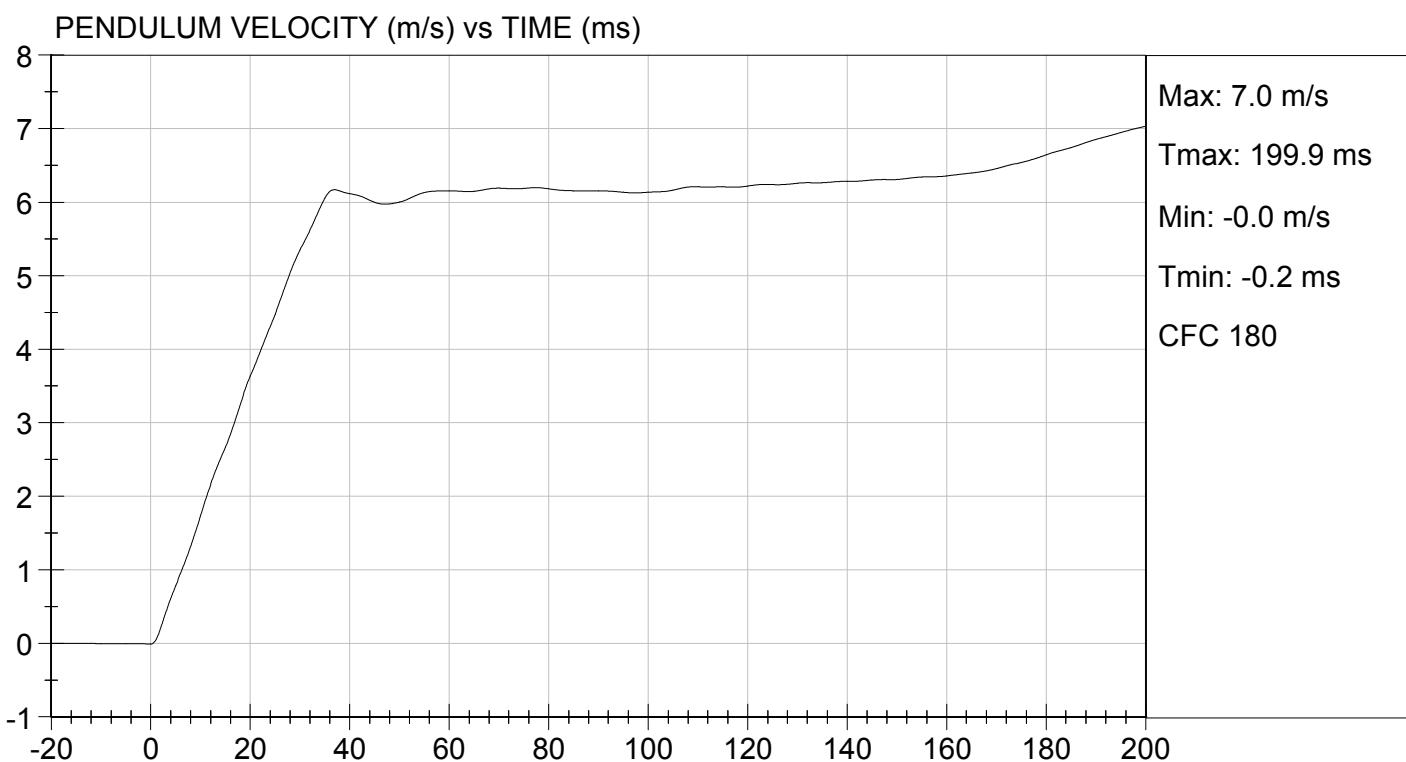
Test Date

  
Jessica Hall  
 Approved By



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

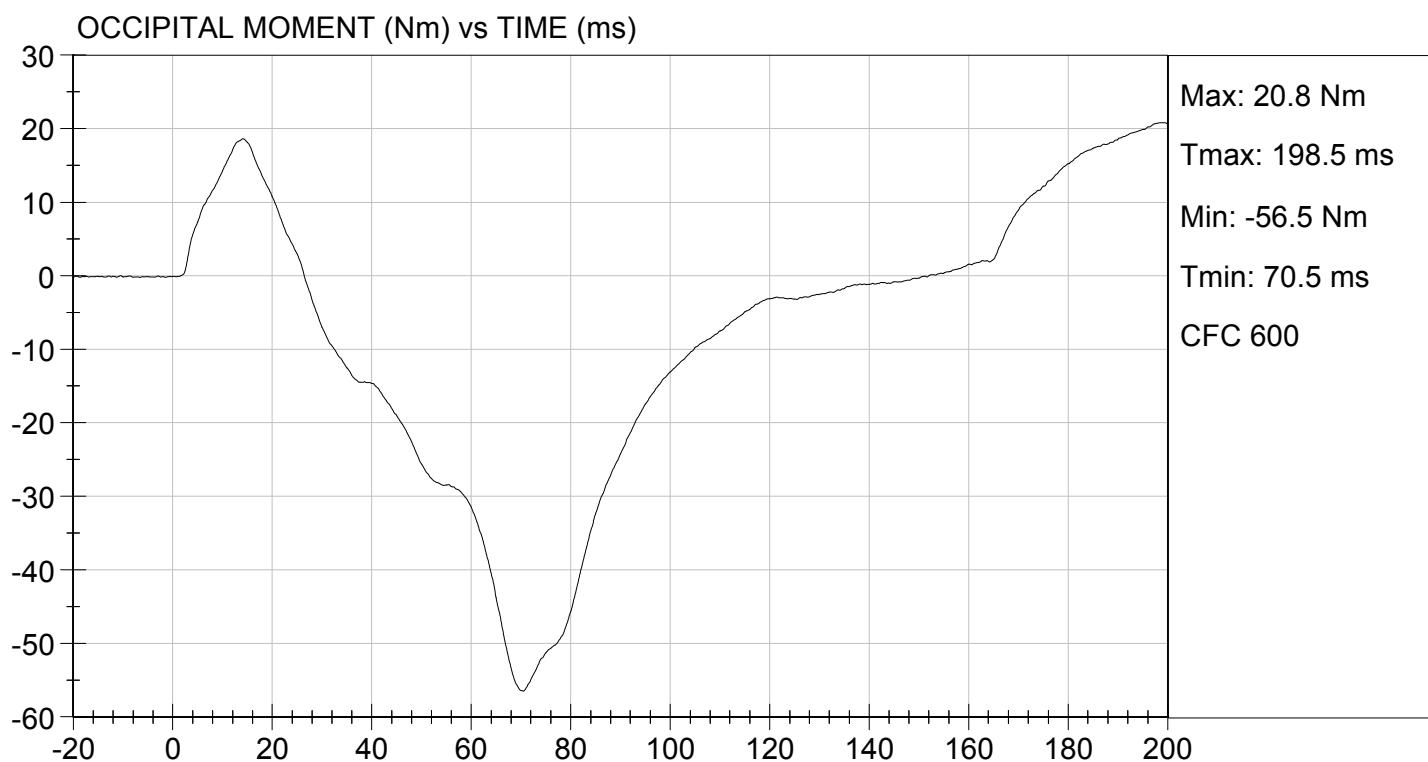
TEST DATE: 06/30/2016  
TEST #: D162273





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

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

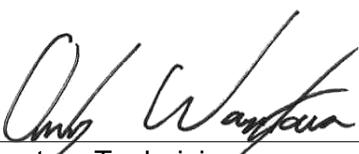


MGA RESEARCH CORPORATION  
THORAX IMPACT  
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

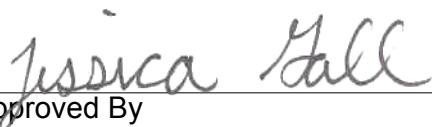
Test I.D: D162274

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

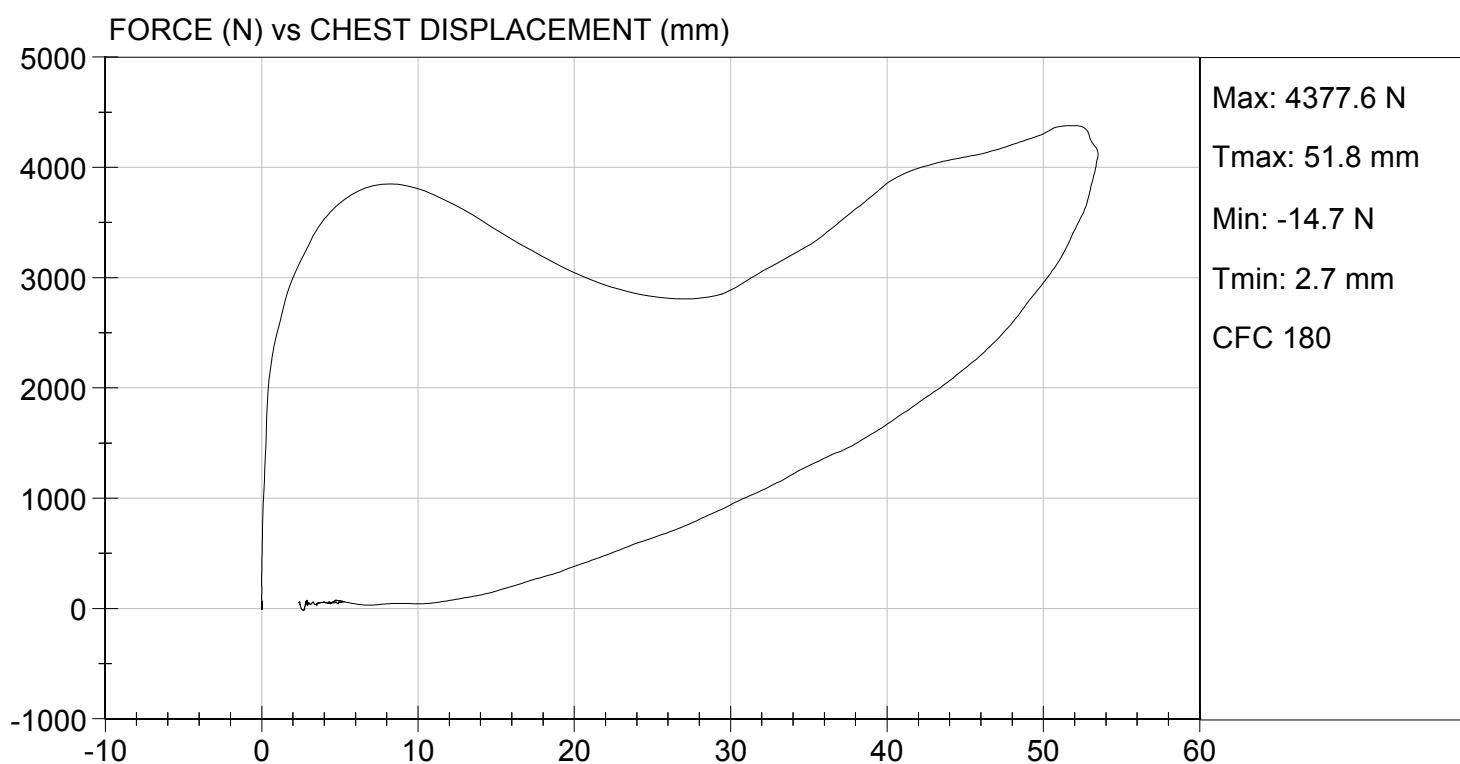
Test Date

  
\_\_\_\_\_  
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

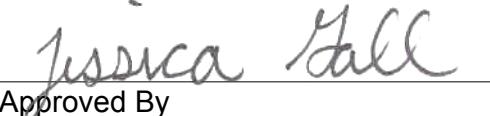
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Probe Speed	m/s	2.07 to 2.13	2.11	Pass
Maximum Force	N	3450 to 4060	3950	Pass
Overall Test Results				Pass



Glenn D. Miller  
Laboratory Technician

06/30/2016

Test Date

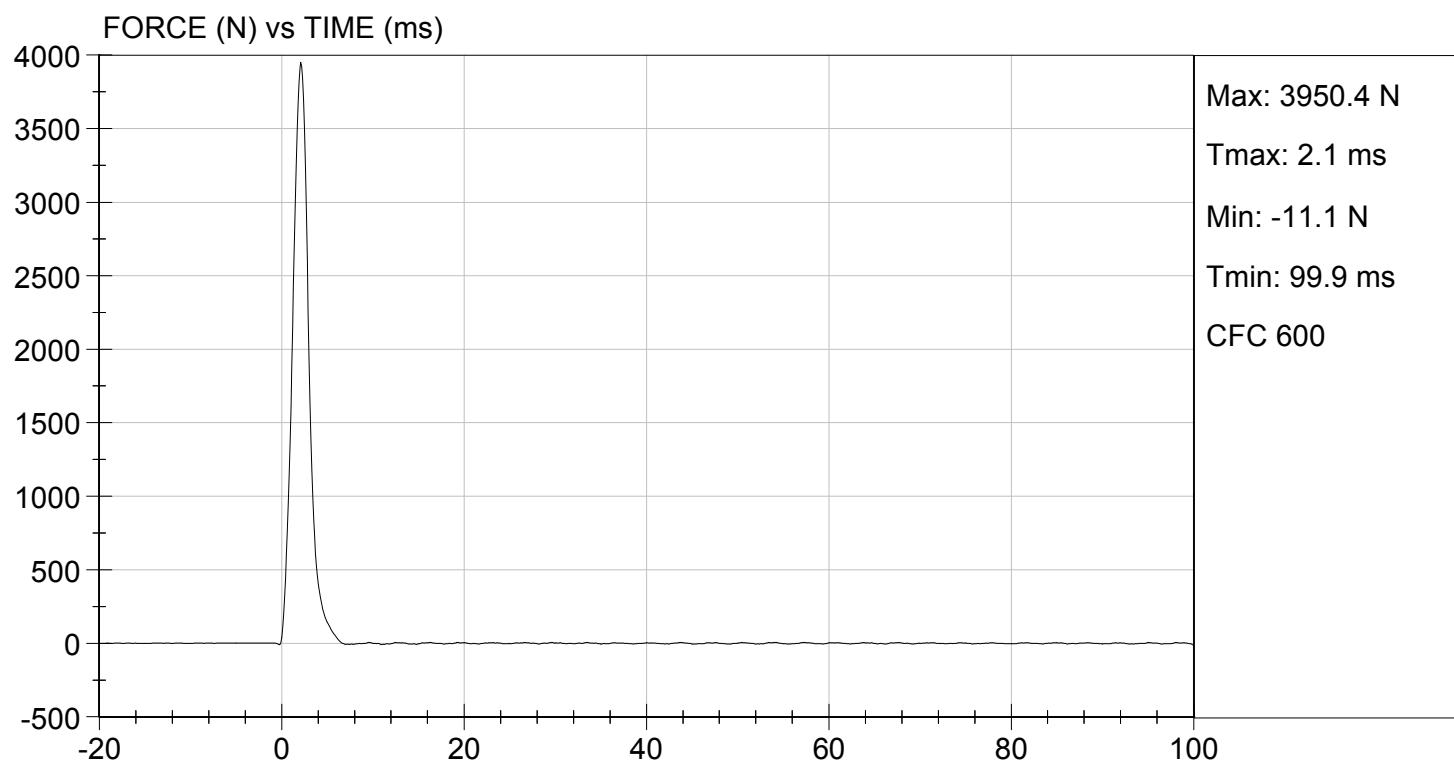


Jessica Hall  
Approved By



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

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



**MGA RESEARCH CORPORATION**

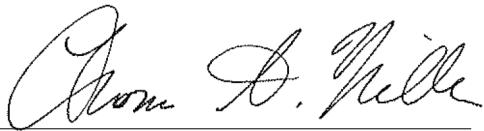
**LEFT KNEE IMPACT TEST**

**HYBRID III 5TH PERCENTILE**

**ATD Serial No:** 634

**Test I.D:** D162276

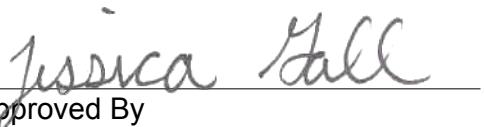
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Probe Speed	m/s	2.07 to 2.13	2.08	Pass
Maximum Force	N	3450 to 4060	3690	Pass
Overall Test Results				Pass



Laboratory Technician

06/30/2016

Test Date

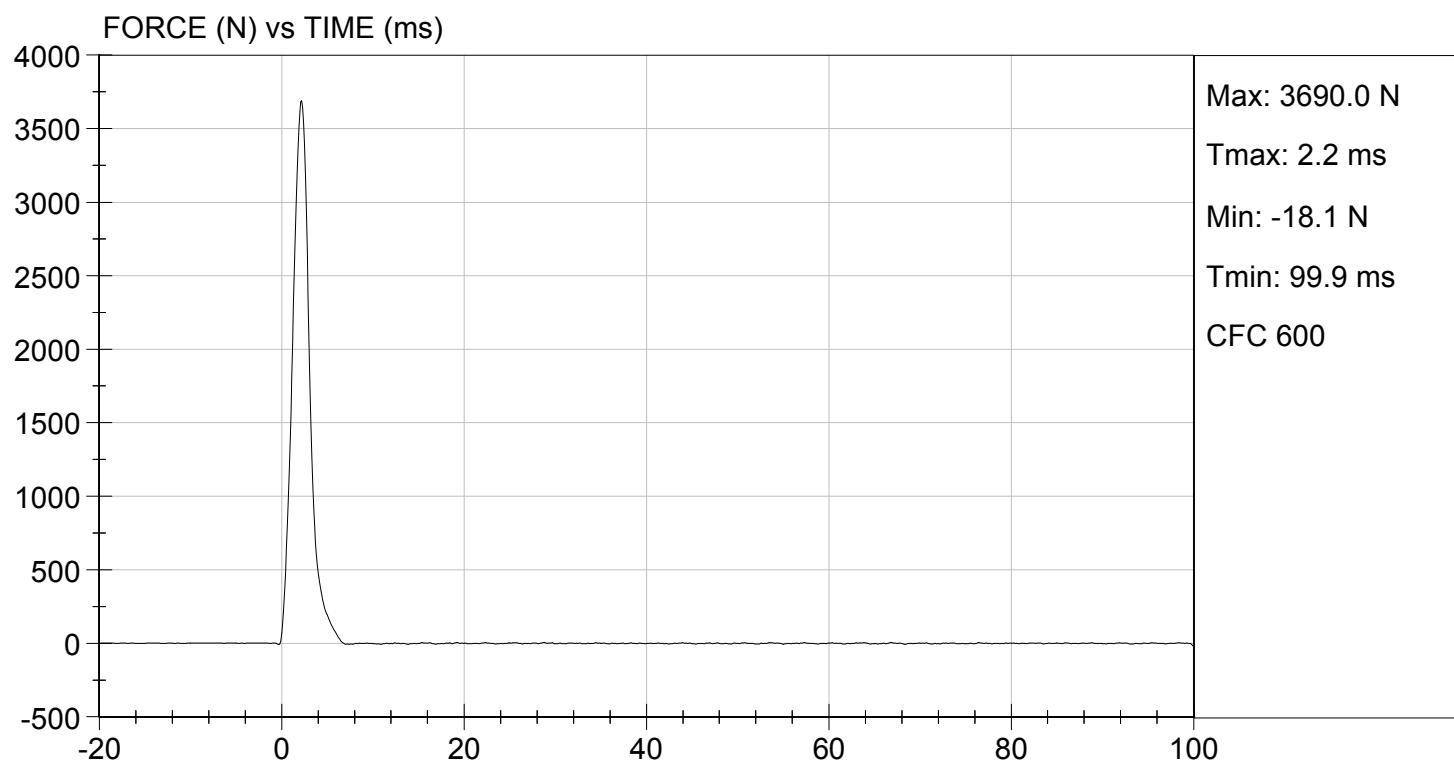


Approved By



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

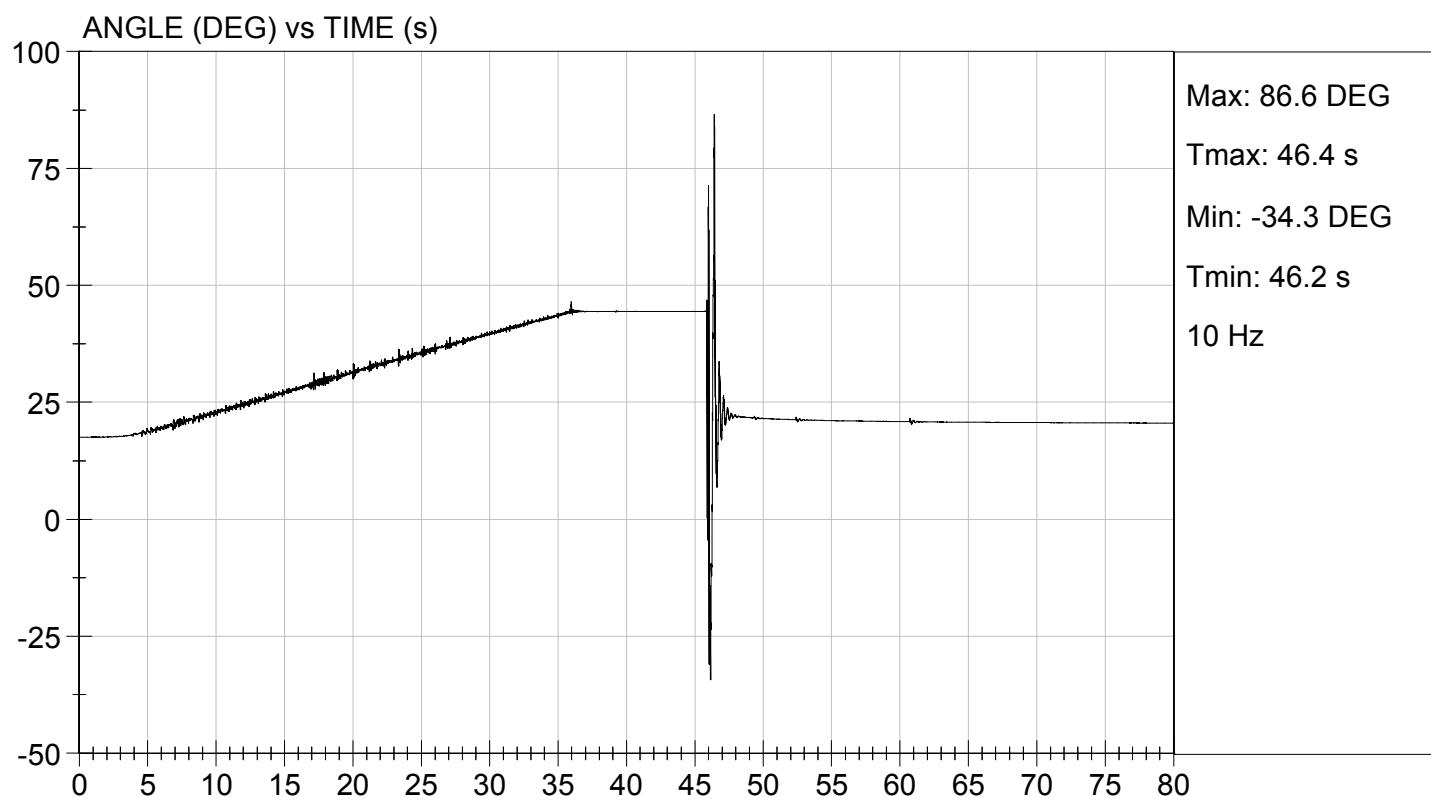
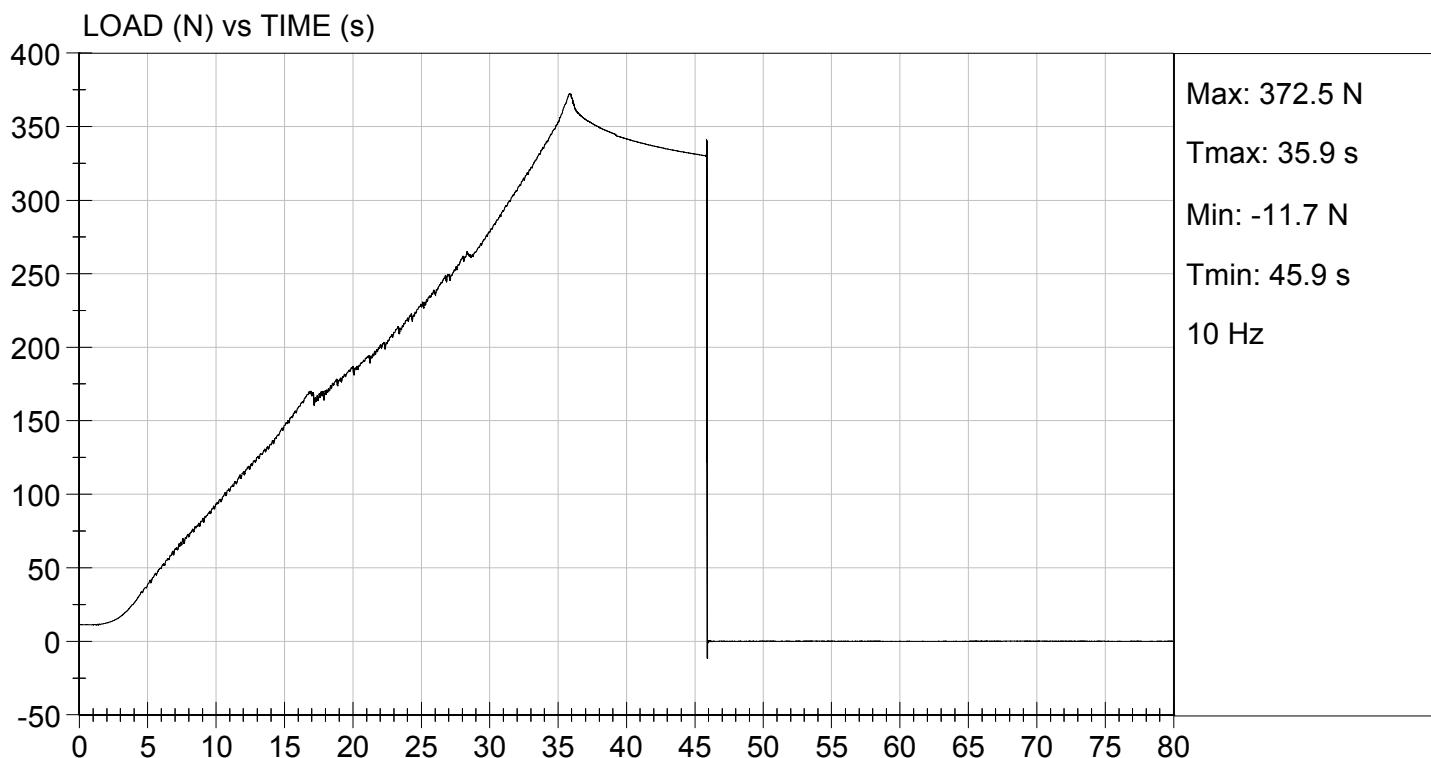
  
Approved By



TEST DESC: LUMBAR FLEXION

TEST DATE: 07/01/2016

TEST #: D162277I



**MGA RESEARCH CORPORATION**  
**HEAD DROP TEST**  
**HYBRID III 5TH PERCENTILE**

ATD Serial No: 634

Test ID: D162341

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
Peak Resultant Acceleration	G's	250 to 300	276	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-2.0	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

  
\_\_\_\_\_  
Laboratory Technician

07/12/2016  
\_\_\_\_\_  
Test Date

  
\_\_\_\_\_  
Approved By

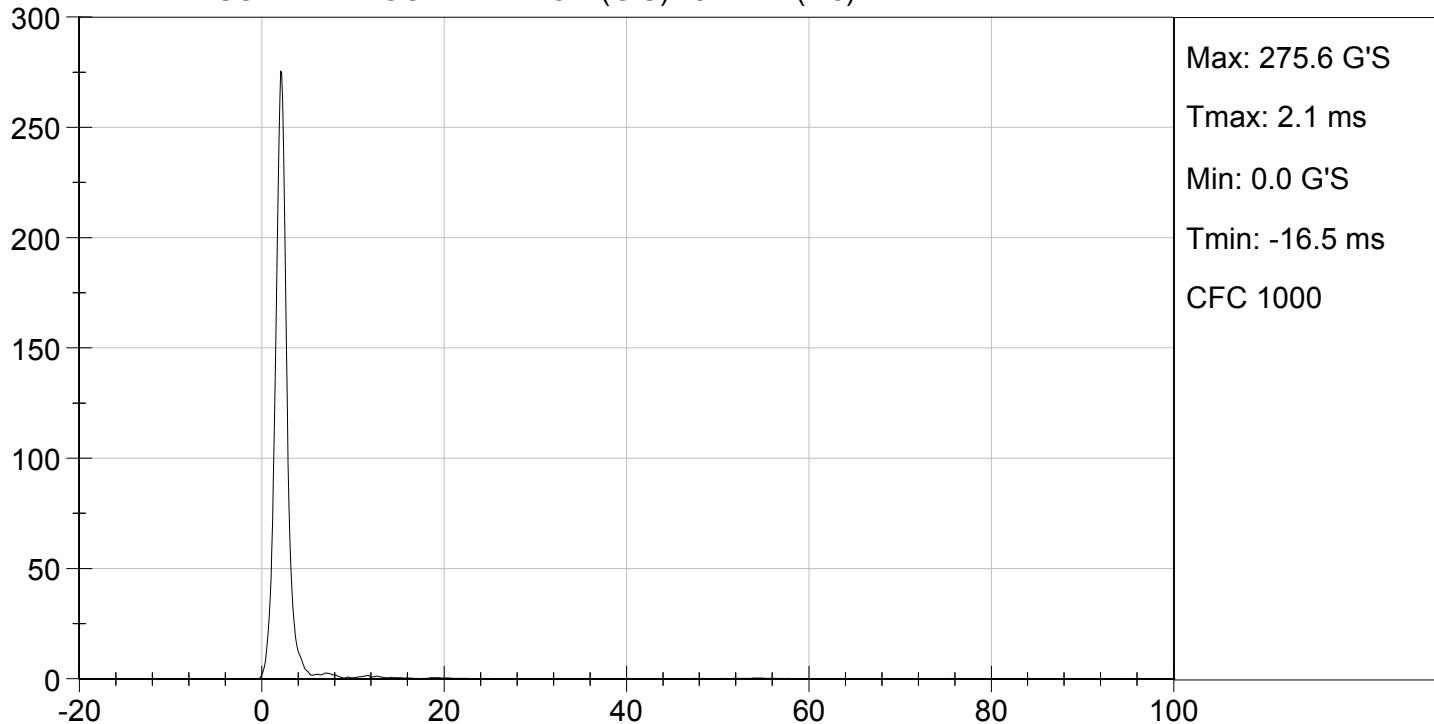


TEST DESC: HEAD DROP

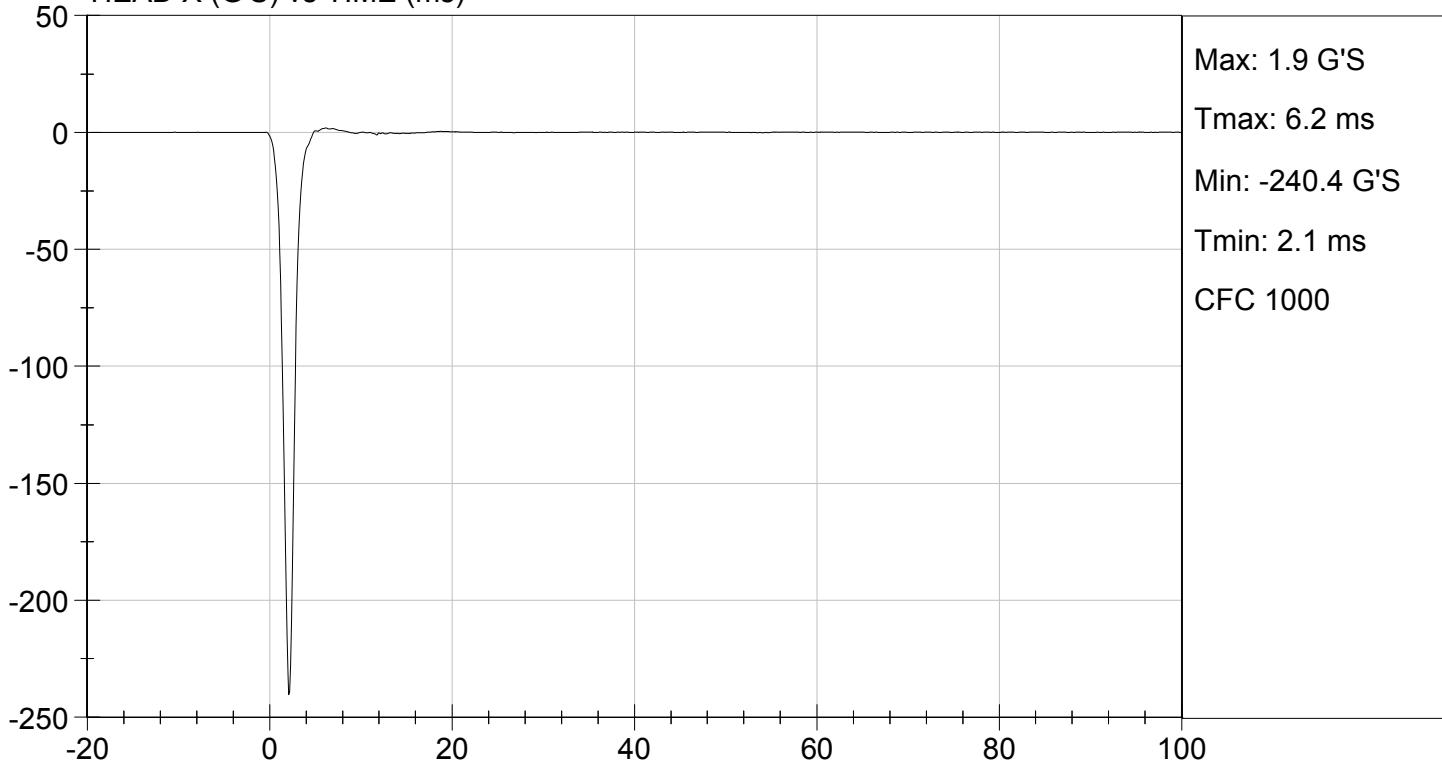
TEST DATE: 07/12/2016

TEST #: D162341

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



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

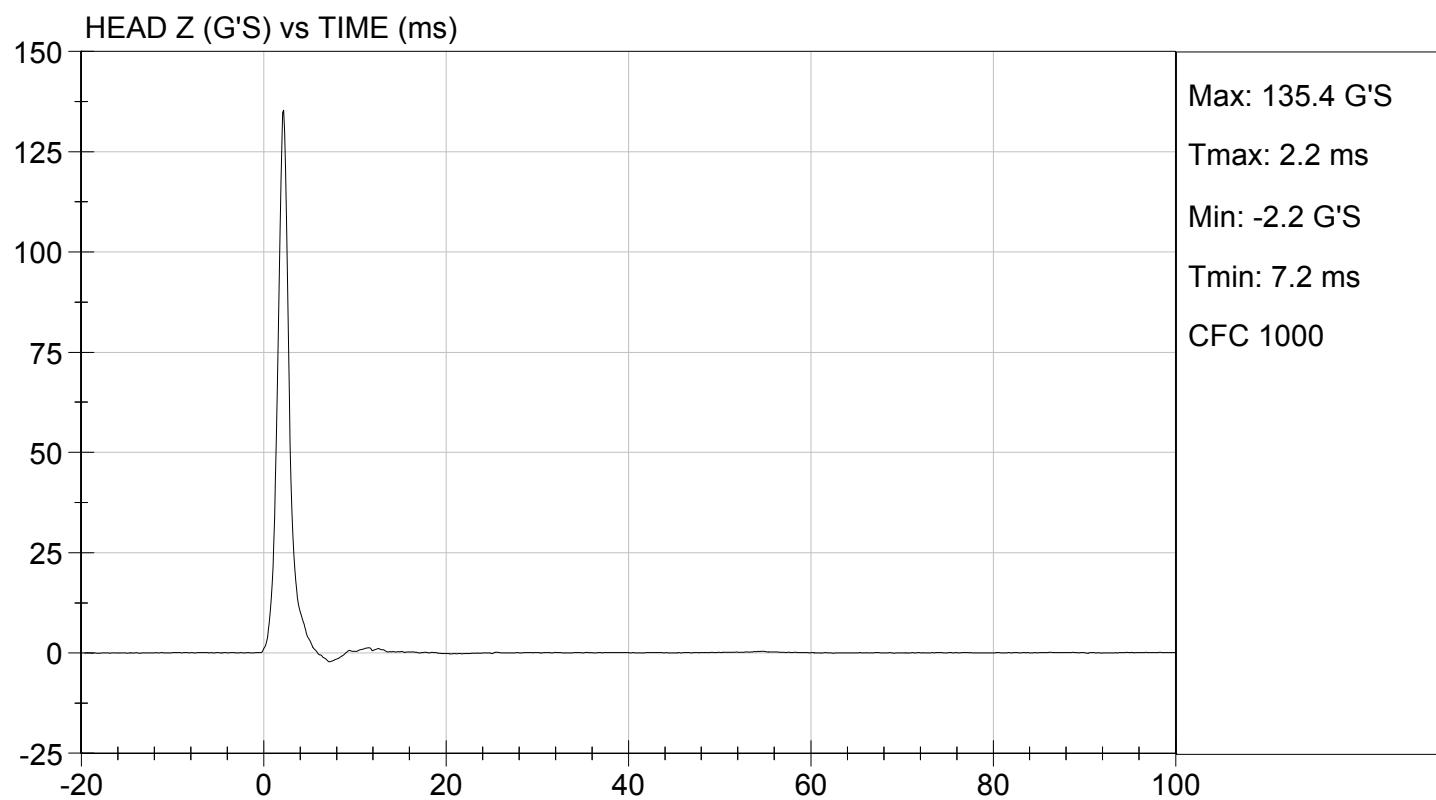
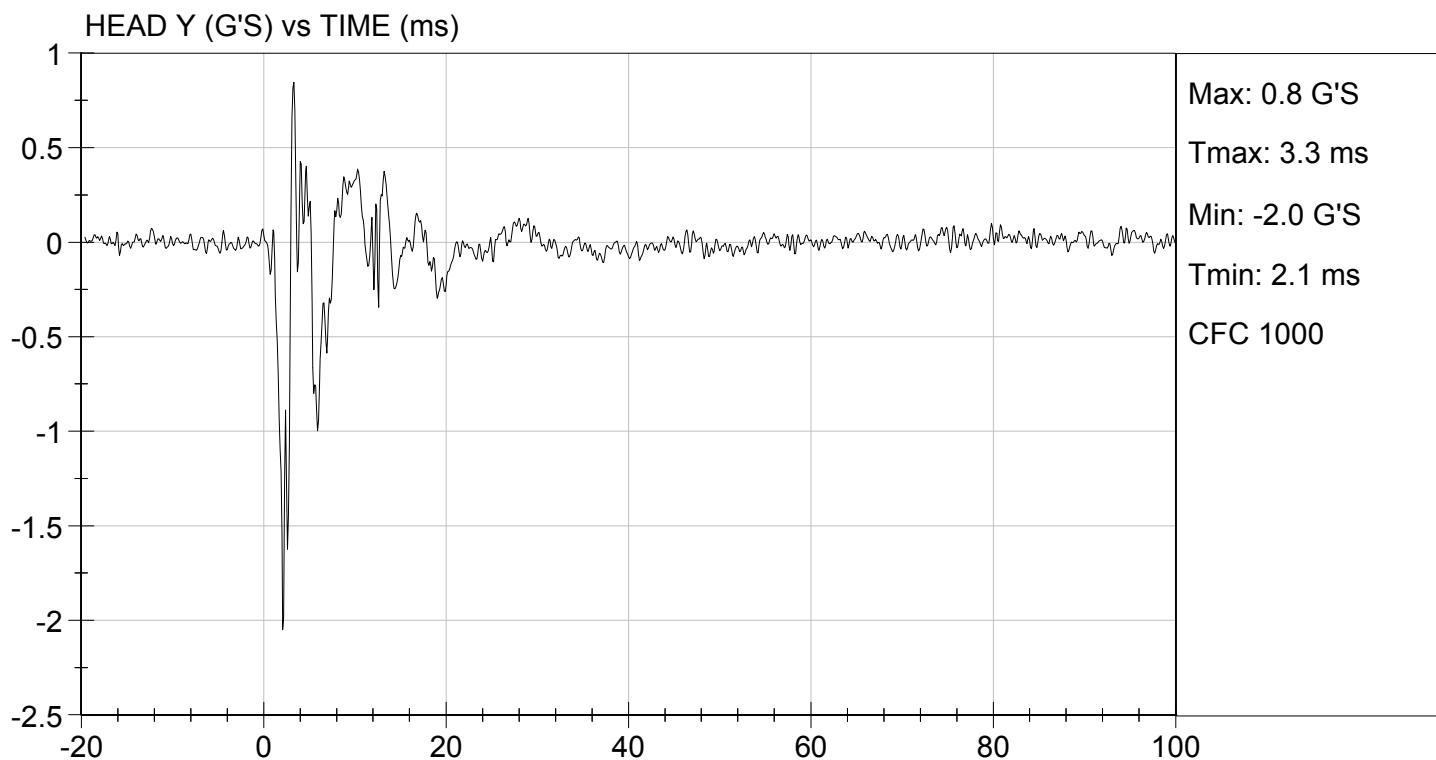




TEST DESC: HEAD DROP

TEST DATE: 07/12/2016

TEST #: D162341



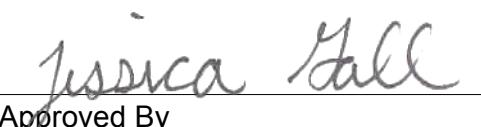
**MGA RESEARCH CORPORATION****NECK FLEXION TEST****HYBRID III 5TH PERCENTILE**ATD Serial No: 634Test I.D: D162342

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	2.4
	20 ms	m/s	4.0 to 5.0	4.8
	30 ms	m/s	5.8 to 7.0	7.0
D Plane Rotation	Max	deg	77 to 91	86
Occipital Condyle Moment within Rotation Corridor	Nm	69 to 83	70	Pass
Positive Moment Time Curve Decay to 10 Nm	ms	80 to 100	85	Pass
Overall Results				Pass

  
\_\_\_\_\_  
Laboratory Technician

07/12/2016

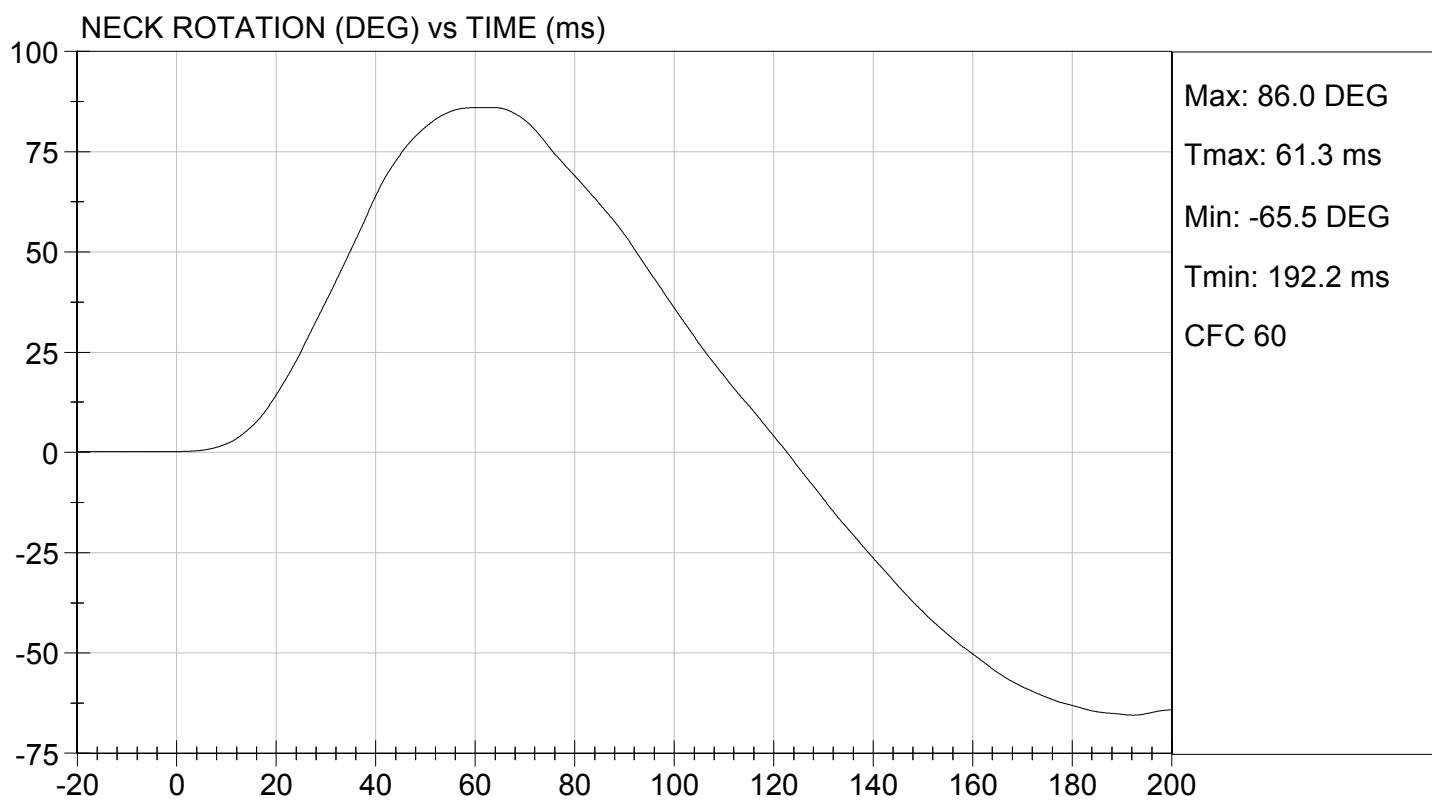
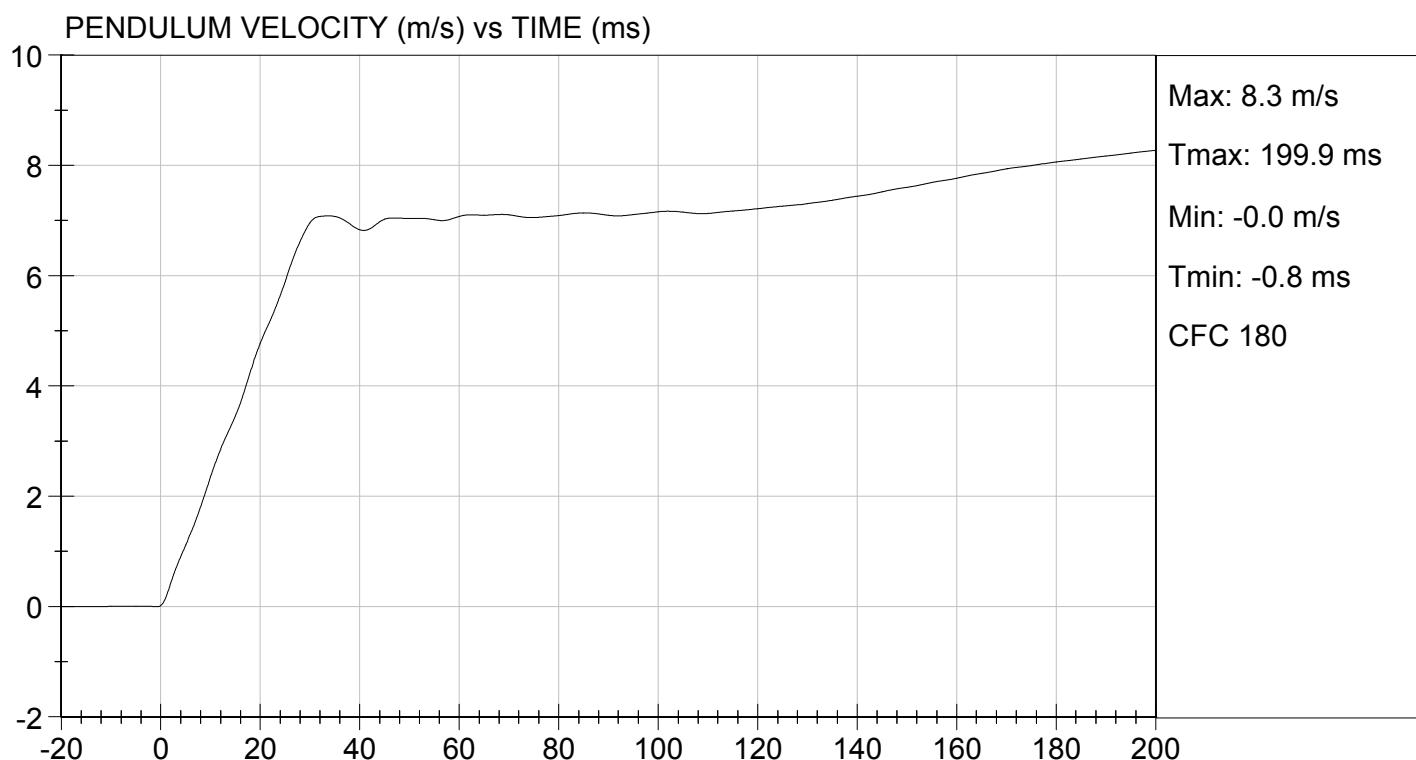
Test Date

  
\_\_\_\_\_  
Approved By



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

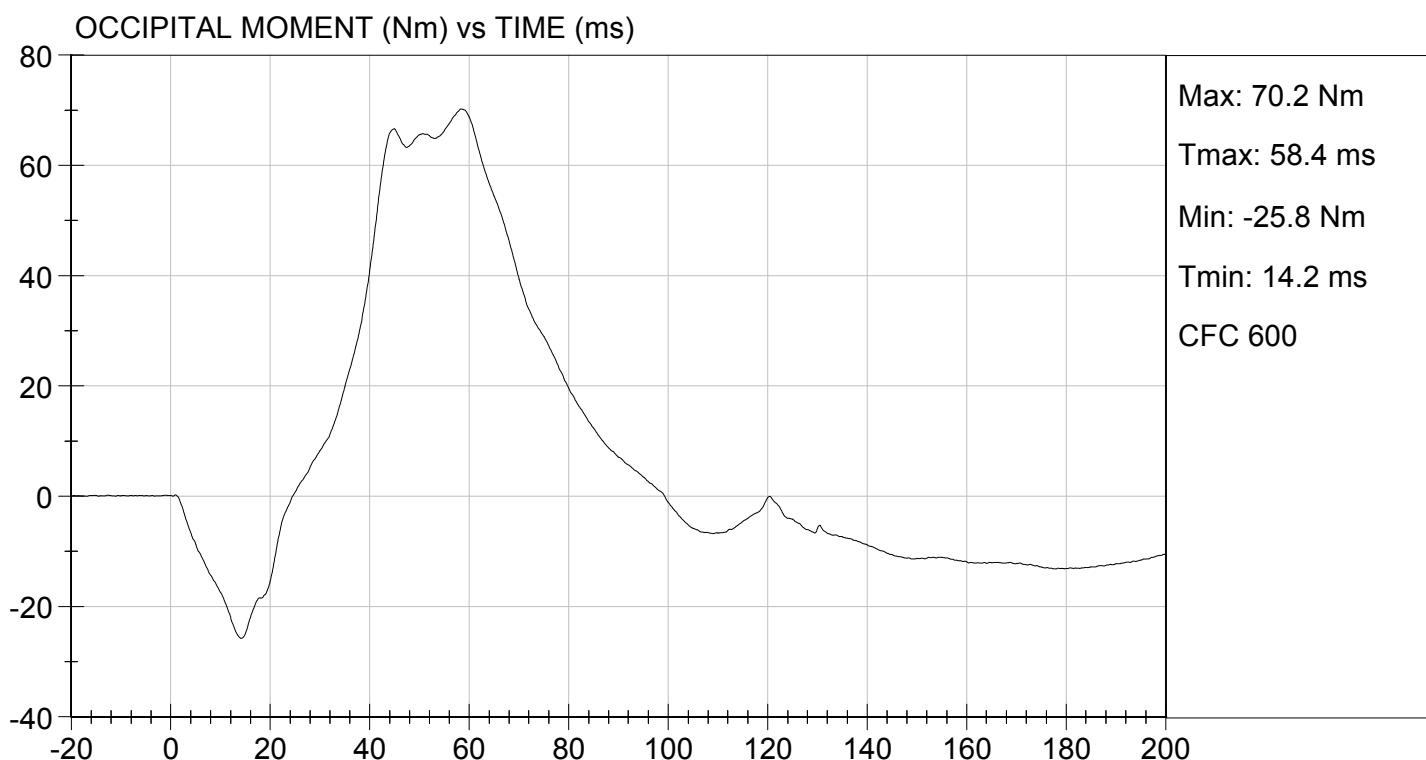
TEST DATE: 07/12/2016  
TEST #: D162342





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

TEST DATE: 07/12/2016  
TEST #: D162342



**MGA RESEARCH CORPORATION**  
**NECK EXTENSION TEST**  
**HYBRID III 5TH PERCENTILE**

**ATD Serial No:** 634

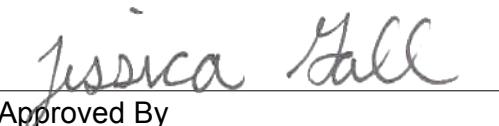
**Test I.D:** D162343

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	1.7	Pass
	20 ms	m/s	3.1 to 3.9	3.6	Pass
	30 ms	m/s	4.6 to 5.6	5.2	Pass
D Plane Rotation	Max	deg	99 to 114	113	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

07/12/2016

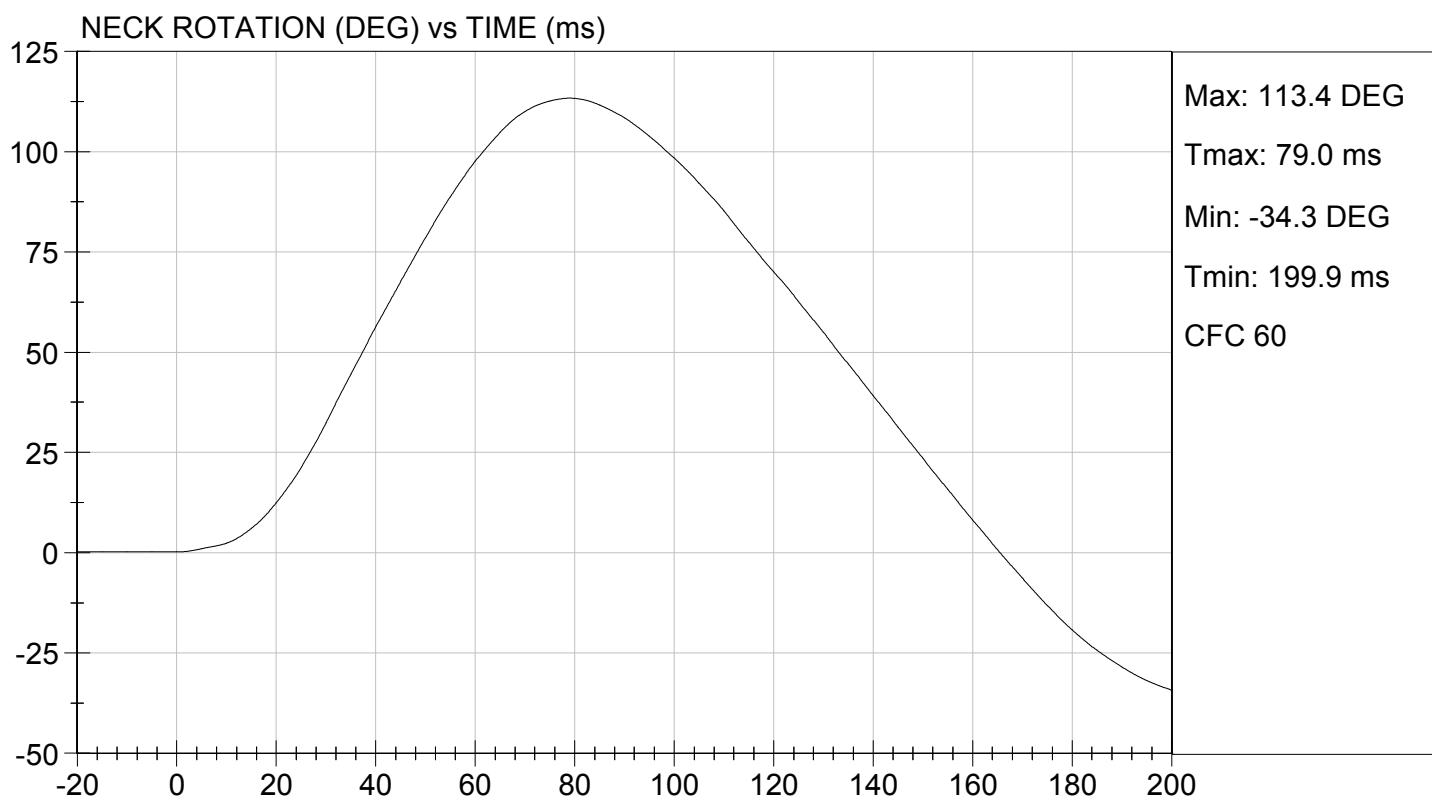
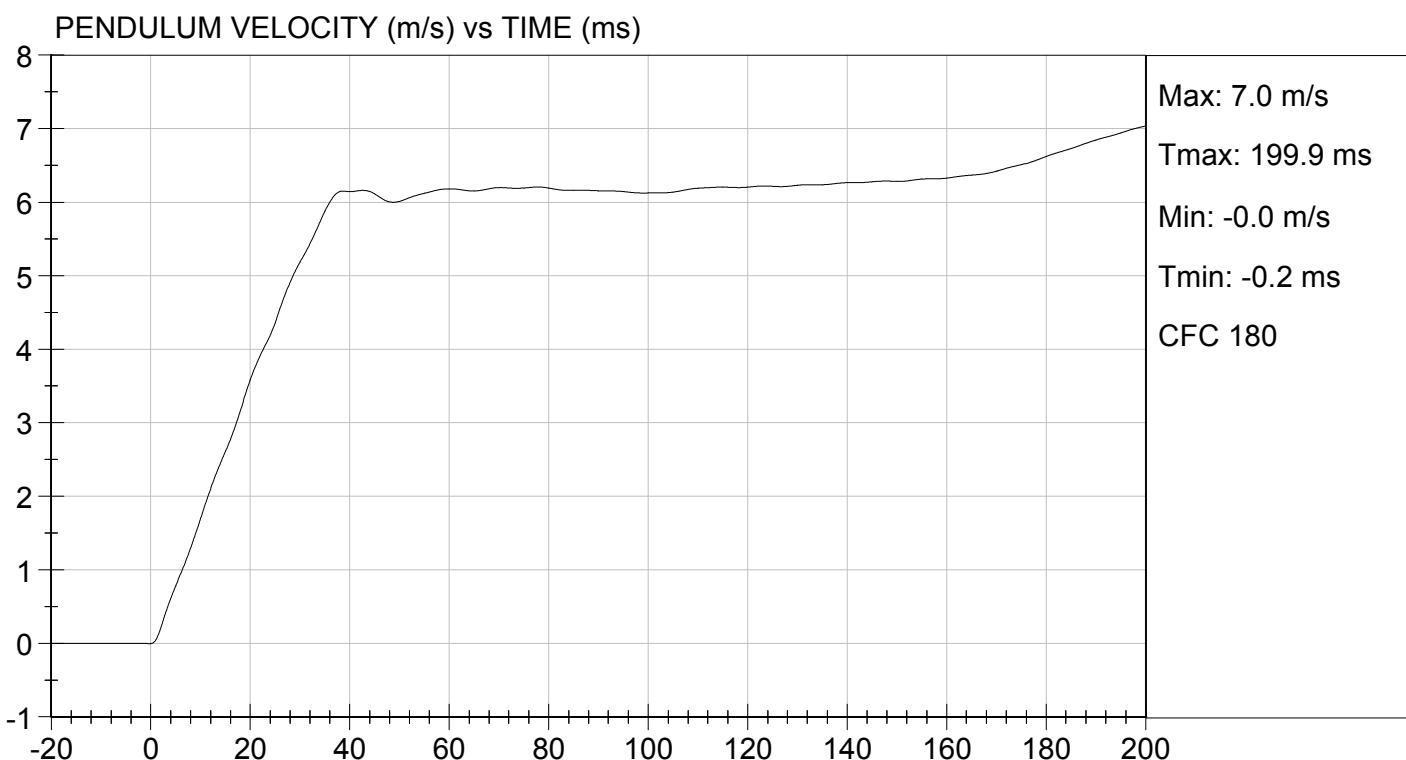
Test Date

  
 Approved By



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

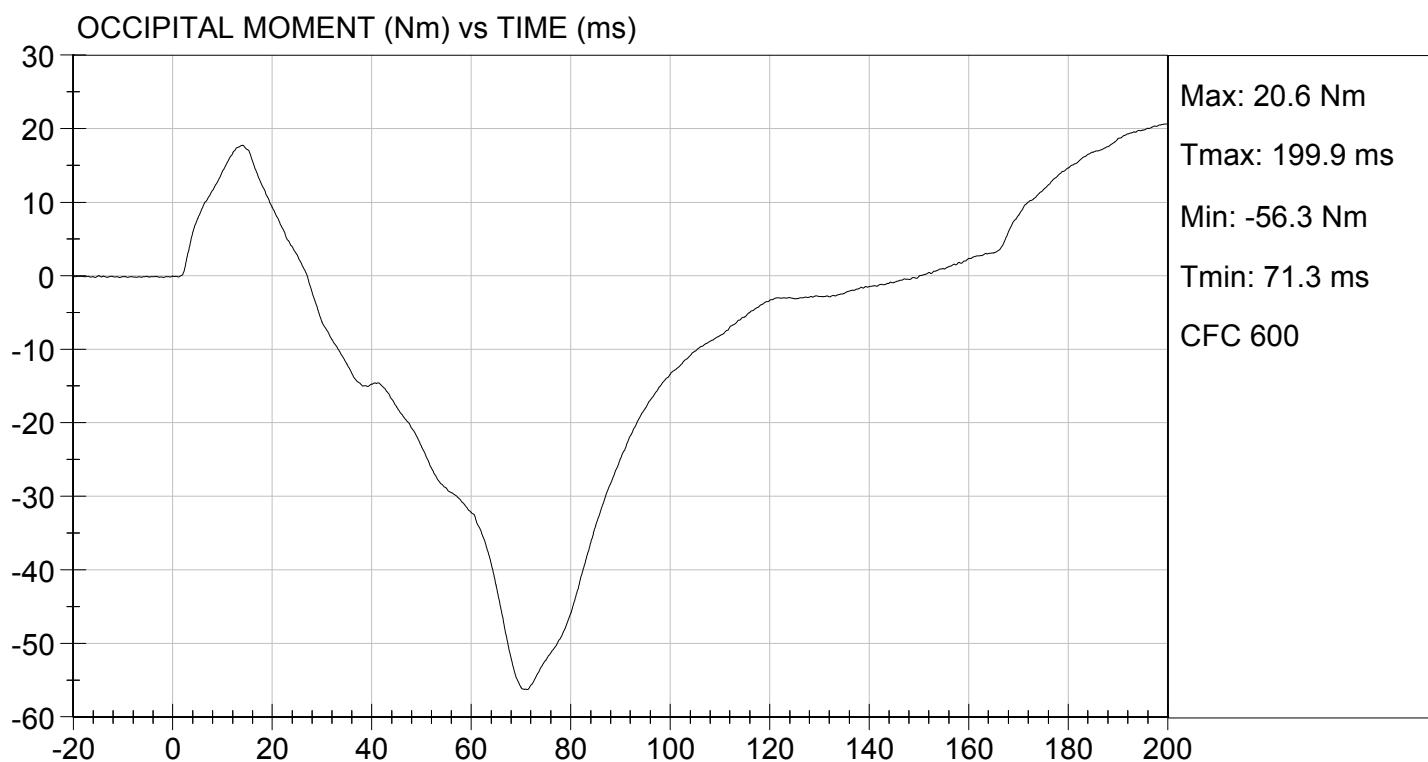
TEST DATE: 07/12/2016  
TEST #: D162343





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

TEST DATE: 07/12/2016  
TEST #: D162343

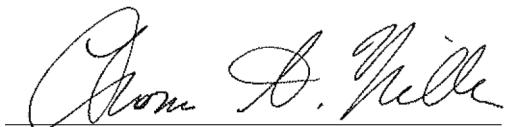


MGA RESEARCH CORPORATION  
THORAX IMPACT  
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D162344

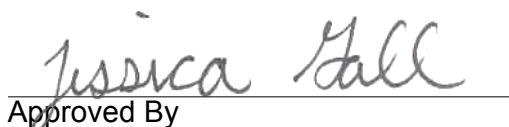
Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Relative Humidity	%	10 to 70	48	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	53	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4375	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4297	Pass
Overall Test Results				Pass



Laboratory Technician

07/12/2016

Test Date

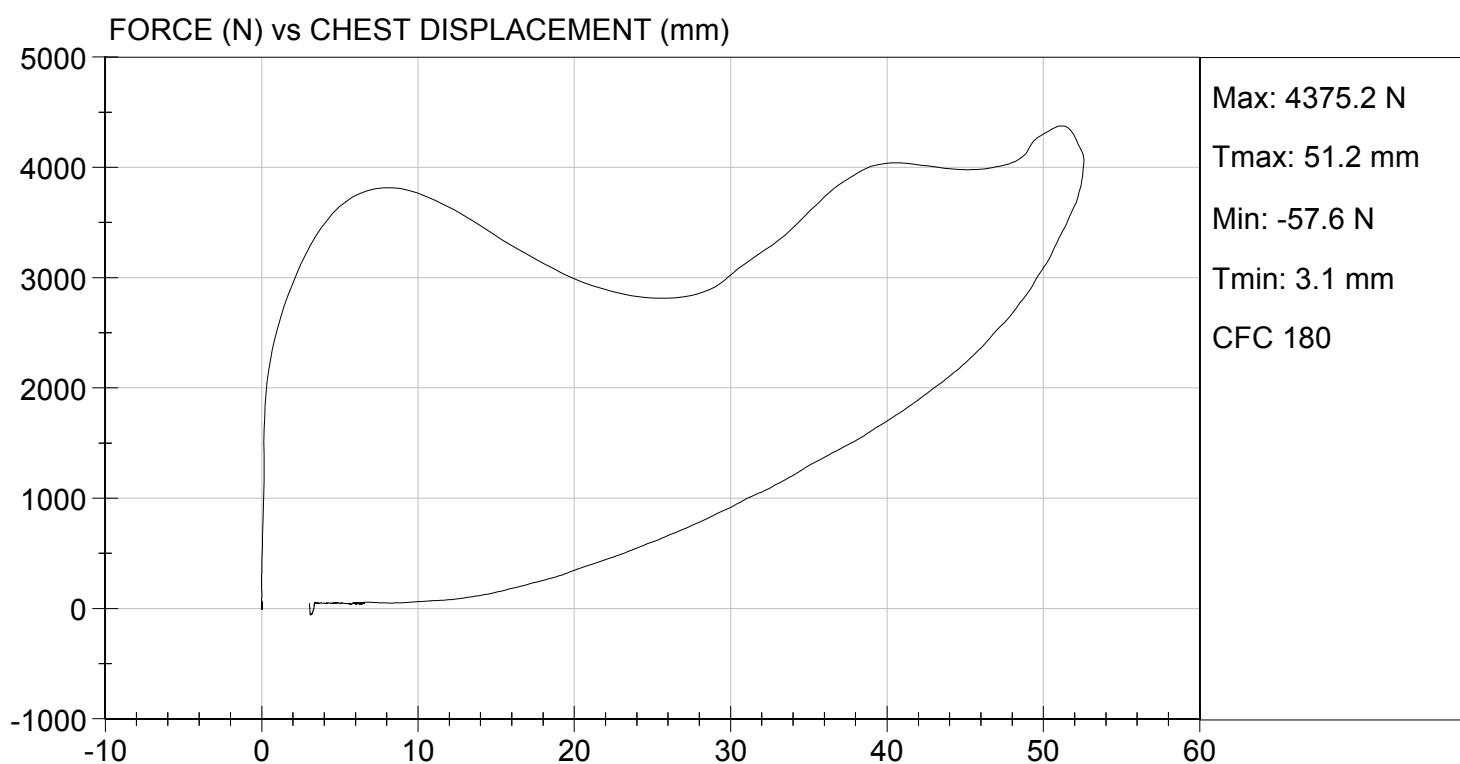


Approved By



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

TEST DATE: 07/12/2016  
TEST #: D162344



**MGA RESEARCH CORPORATION**

**RIGHT KNEE IMPACT TEST**

**HYBRID III 5TH PERCENTILE**

ATD Serial No: 634

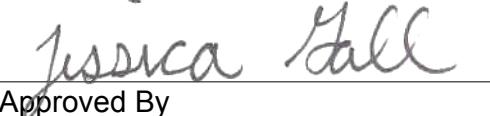
Test I.D: D162345

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	2.07	Pass
Maximum Force	N	3450 to 4060	3725	Pass
Overall Test Results				Pass

  
\_\_\_\_\_  
Glenn D. Yule  
Laboratory Technician

07/12/2016

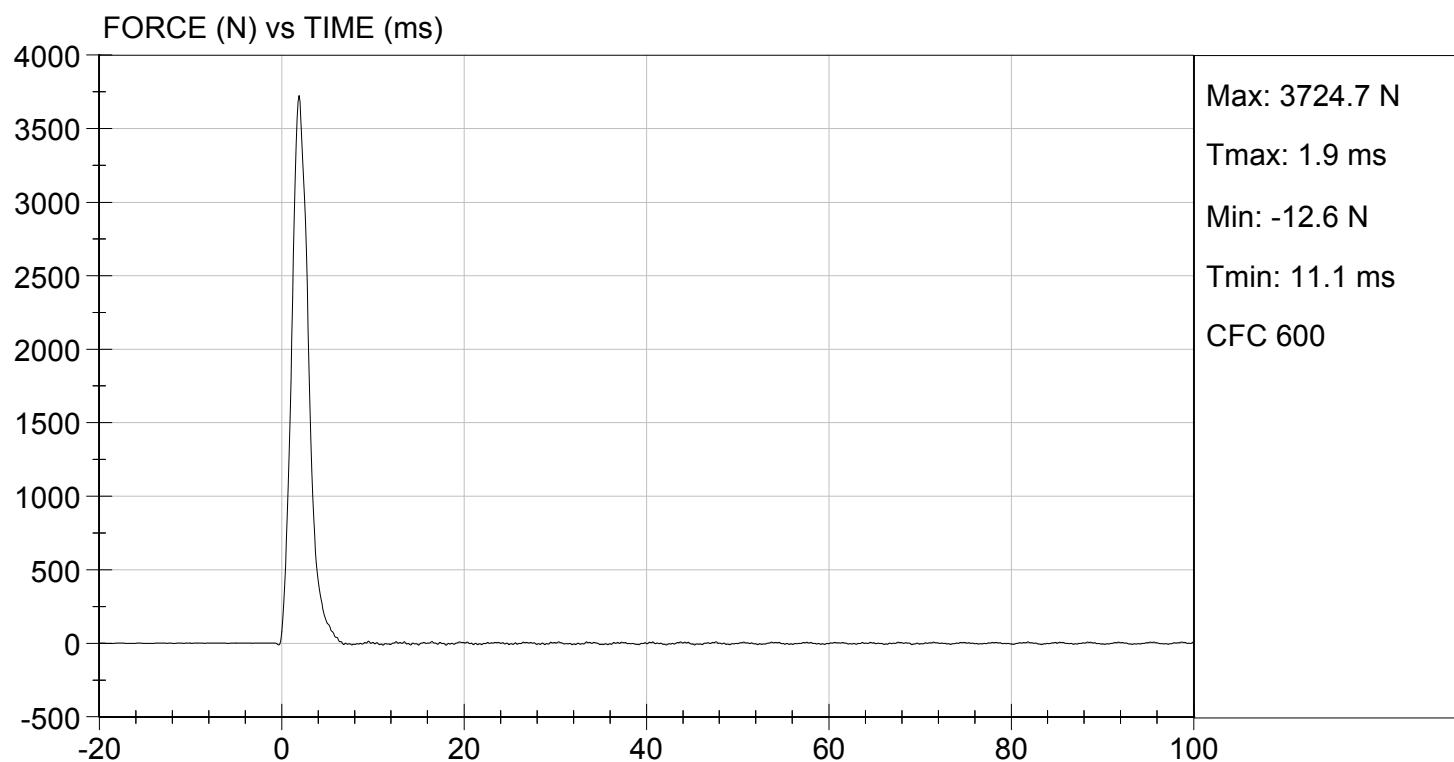
Test Date

  
\_\_\_\_\_  
Approved By  
Jessica Hall



TEST DESC: RIGHT KNEE  
VELOCITY: 6.78 ft/s, 2.07 m/s

TEST DATE: 07/12/2016  
TEST #: D162345



**MGA RESEARCH CORPORATION**

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

**ATD Serial No:** 634

**Test I.D:** D162346

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	2.09	Pass
Maximum Force	N	3450 to 4060	3919	Pass
Overall Test Results				Pass

  
Glenn D. Yule  
Laboratory Technician

07/12/2016

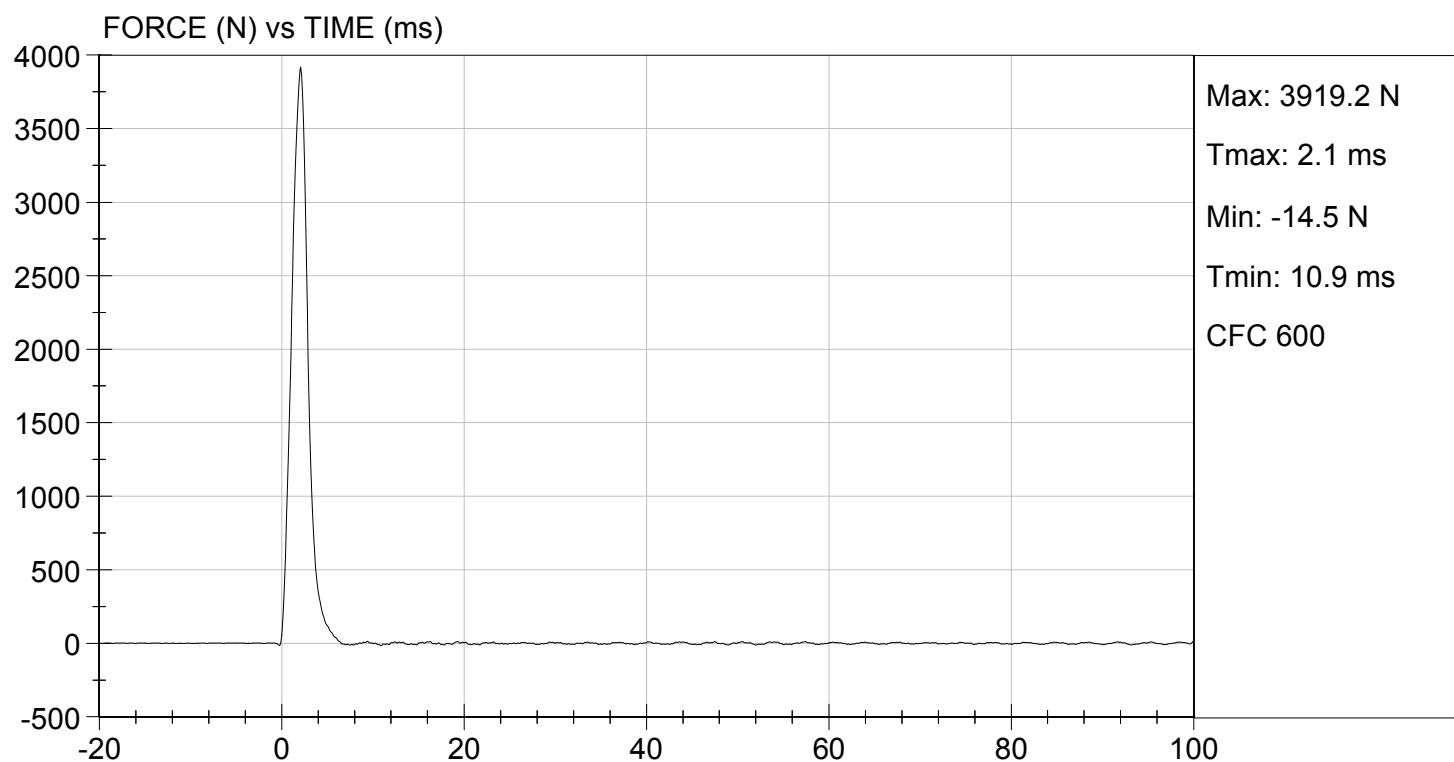
Test Date

  
Approved By  
Jessica Hall



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

TEST DATE: 07/12/2016  
TEST #: D162346



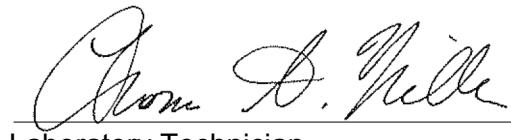
MGA RESEARCH CORPORATION

TORSO FLEXION TEST  
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D162347

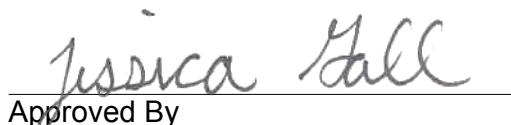
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Initial Angle	deg	0 to 20	19	Pass
Return Angle	deg	+/- 8	4	Pass
Force at 45 deg	N	320 to 390	361	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.7	Pass
Overall Result				Pass



Laboratory Technician

07/12/2016

Test Date



Approved By



TEST DESC: LUMBAR FLEXION

TEST DATE: 07/12/2016

TEST #: D162347

