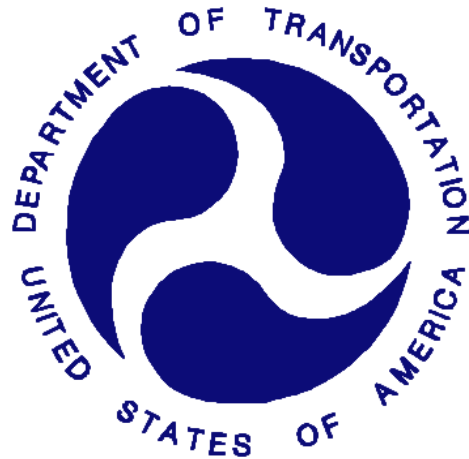


REPORT NUMBER: NCAP-MGA-2015-038

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

**TOYOTA MOTOR MANUFACTURING, TEXAS, INC.
2015 Toyota Tundra 4x4 SR Double Cab
NHTSA No.: O20155107**

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



Test Date: December 8, 2014

Final Report Date: March 5, 2015

FINAL REPORT

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

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Prepared by: 
Donna Janovicz, Project Manager

Approved by: 
Ben Fischer, Project Engineer

Approval Date: March 5, 2015

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

Technical Report Documentation Page

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15. Supplementary Notes																																																									
16. Abstract A 56.3 km/h NCAP Frontal Impact Test was conducted on a 2015 Toyota Tundra 4x4 SR Double Cab in accordance with the specifications of the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), and 301 performance. The test was conducted at MGA Research Corporation in Burlington, Wisconsin on December 8, 2014. The impact velocity of the vehicle was 56.2 km/h and the ambient temperature at the barrier face at the time of impact was 21.5°C. The target vehicle post-test maximum crush was 314 located to the right of the vehicle's centerline. The test vehicle's performance was as follows: <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th rowspan="2">Units</th> <th colspan="2">Driver ATD</th> <th colspan="2">Passenger ATD</th> </tr> <tr> <th>Threshold</th> <th>Result</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₁₅)</td> <td>N/A</td> <td>700</td> <td>178</td> <td>700</td> <td>291</td> </tr> <tr> <td>Maximum Chest</td> <td>mm</td> <td>63</td> <td>26</td> <td>52</td> <td>16</td> </tr> <tr> <td>Nij</td> <td>N/A</td> <td>1</td> <td>0.41</td> <td>1</td> <td>0.50</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4170</td> <td>1631</td> <td>2620</td> <td>912</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4000</td> <td>80</td> <td>2520</td> <td>310</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10008</td> <td>2107</td> <td>6805</td> <td>2476</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10008</td> <td>2290</td> <td>6805</td> <td>1733</td> </tr> </tbody> </table>						Measurement Description	Units	Driver ATD		Passenger ATD		Threshold	Result	Threshold	Result	Head Injury Criteria (HIC ₁₅)	N/A	700	178	700	291	Maximum Chest	mm	63	26	52	16	Nij	N/A	1	0.41	1	0.50	Neck Tension	N	4170	1631	2620	912	Neck Compression	N	4000	80	2520	310	Left Femur Force	N	10008	2107	6805	2476	Right Femur Force	N	10008	2290	6805	1733
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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 2015 Toyota Tundra 4x4 SR Double Cab at a velocity of 56.2 km/h. The test was performed at MGA Research Corporation on December 8, 2014. Pre-test and post-test photographs of the vehicle and dummies can be found in Appendix A.

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

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

Both ATDs were fully instrumented with head, chest and pelvis tri-axial accelerometers, chest displacement potentiometers, upper neck transducers, right/left femur load cells, and lower leg instrumentation. Seat belt load cells were also installed on the driver's lap belt and the passenger's lap belt to measure dummy pelvic section loading.

The driver (position 1) ATD (Serial No. 351) and the right-front passenger (position 2) ATD (Serial No. 138) were calibrated previous to this test. Certification details, along with instrumentation calibration data, are found in Appendix C of this report.

The 628 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 314 mm and both the driver and passenger side doors remained closed during the impact event and were operable after the impact.

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

The occupant data is summarized below:

ATD position	HIC ₁₅	Nij	Neck Tension (N)	Neck Comp. (N)	3ms Chest Clip (Gs)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50 th)	178	0.41	1631	80	40	26	2107	2290
Passenger (5 th)	291	0.50	912	310	43	16	2476	1733

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

TEST NOTES

Driver Pelvis X has no valid data.
Barrier K-15 MY has 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: 2015 Toyota Tundra 4x4 SR Double Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20155107
 Test Date: 12/8/2014

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	O20155107	Traction Control System (TCS)	Yes
Model Year	2015	Power Steering	Yes
Make	Toyota	Power Window Auto-Reverse	No
Model	Tundra	Driver Frontal Airbag	Yes
Body Style	Double Cab Pickup	Driver Curtain Airbag	Yes
VIN	5TFCY5F17FX017977	Driver Head/Torso Airbag	No
Body Color	Blue Ribbon Metallic	Driver Torso Airbag	No
Odometer (km/mi)	25 / 16	Driver Torso/Pelvis Airbag	Yes
Engine Displacement (L)	5.7	Driver Pelvis Airbag	No
Type/No. Cylinders	8	Driver Knee Airbag	Yes
Engine Placement	Longitudinal	Front Pass. Frontal Airbag	Yes
Transmission Type	Automatic	Front Pass. Curtain Airbag	Yes
Transmission Speeds	6	Front Pass. Head/Torso Airbag	No
Overdrive	Yes	Front Pass. Torso Airbag	No
Final Drive	4WD	Front Pass. Torso/Pelvis Airbag	Yes
Roof Rack	No	Front Pass. Pelvis Airbag	No
Sunroof/T-Top	No	Front Pass. Knee Airbag	Yes
Running Boards	No	Driver Pretensioner	Yes
Tilt Steering Wheel	Yes	Driver Load Limiter	No
Power Seats	No	Front Pass. Pretensioner	Yes
Anti-Lock Brakes (ABS)	Yes	Front Pass. Load Limiter	No
Automatic Door Locks (ADLs)	Yes	Other	N/A

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

DATA FROM CERTIFICATION LABEL

Manufactured By	Toyota Motor Manufacturing, Texas, Inc.	GVWR (kg)	3270
Date of Manufacture	10/14	GAWR Front (kg)	1815
		GAWR Rear (kg)	1885

VEHICLE SEATING AND WEIGHT CAPACITY DATA

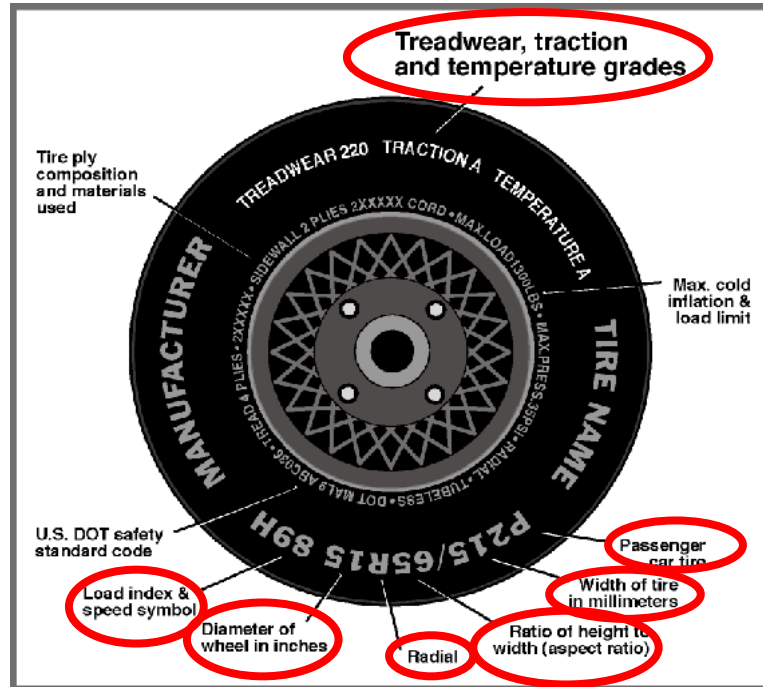
Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Split Bench		
Designated Seating Capacity (DSC)	3	3		6
Capacity Weight (VCW) (kg)				635
Cargo Weight (RCLW) (kg)				227

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

Test Vehicle: 2015 Toyota Tundra 4x4 SR Double Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20155107
 Test Date: 12/8/2014

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	210	230
Recommended Tire Size	P255/70R18	P255/70R18
Tire Size on Vehicle	P255/70R18	P255/70R18
Tire Manufacturer	Michelin	Michelin
Tire Model	LTX M/S	LTX M/S
Treadwear	720	720
Traction	A	A
Temperature Grade	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 2 Steel, 1 Polyamide	2 Polyester, 2 Steel, 1 Polyamide
Load Index/Speed Symbol	112T	112T
Tire Material	Rubber	Rubber
DOT Safety Code Left	APYV 003X 3614	APYV 003X 3614
DOT Safety Code Right	APYV 003X 3614	APYV 003X 3614

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

Test Vehicle: 2015 Toyota Tundra 4x4 SR Double Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20155107
 Test Date: 12/8/2014

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	787.0	551.5		804.5	650.5	
Right	kg	743.5	508.0		782.5	622.5	
Ratio	%	59.1	40.9		55.5	44.5	
Totals	kg	1530.5	1059.5	2590.0	1587.0	1273.0	2860.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	2590.0
Weight of 1 P572E ATD & 1 P572O ATD	kg	140.6
Rated Cargo/Luggage Weight (RCLW)	kg	136
Calculated Test Vehicle Target Weight (TVTW)	kg	2866.6

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	937	940	1003	1000	1712
As Tested	mm	927	935	981	982	1863
Post Test	mm	975	991	997	959	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	4186
Total Vehicle Length at Left Side	mm	6207
Total Vehicle Length at Centerline	mm	6308
Total Vehicle Length at Right Side	mm	6207
Weight of Ballast in Cargo Area	kg	48.1
Weight of Vehicle Components Removed	kg	5.9
Amount of Stoddard Solvent in Fuel Tank	L	98.8

List of components removed to meet test weight: None

List of components removed for instrumentation, data box, and equipment installation:
Rear floor mats, jack.

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

Test Vehicle: 2015 Toyota Tundra 4x4 SR Double Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20155107
 Test Date: 12/8/2014

TARGET VEHICLE STRUCTURAL MEASUREMENT

	Elements	Pre-Test (mm)
1	Total Length	6308
2	Total Width	2030
3	Bumper Top Height	818
4	Bumper Bottom Height	650
5	Longitudinal Member Top Height	549
6	Distance between Longitudinal Members	775
7	Longitudinal Member Width	72
8	Engine Top Height	1136
9	Engine Bottom Height	320
10	Engine and Gearbox Width	750
11	Front Bumper-Engine Distance	550
12	Front Shock Absorber Fixing Height	831
13	Bonnet Leading Edge Height	1137
14	Front Shock Absorber Fixing Width	940
15	Front Bumper – Front Axle Distance	896
16	Front Axle – A-Pillar Distance	556
17	A-Pillar – B-Pillar Distance	1165
18	B-Pillar – Rear Axle Distance	2465
19	B-Pillar – C-Pillar Distance	726
20	Roof Sill Bottom Height	1840
21	Roof Sill Top Height	1890
22	Floor Sill Bottom Height	430
23	Floor Sill Top Height	534

DATA SHEET NO. 2

SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

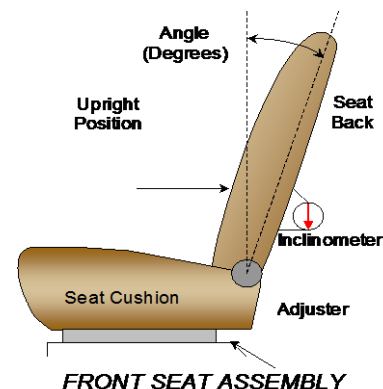
Test Vehicle: 2015 Toyota Tundra 4x4 SR Double Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20155107
 Test Date: 12/8/2014

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 August 2013.

	Degrees
Driver Seat Back Angle	1.9° on headrest post
Passenger Seat Back Angle	-2.5° on headrest post



SEAT FORE/AFT POSITIONS

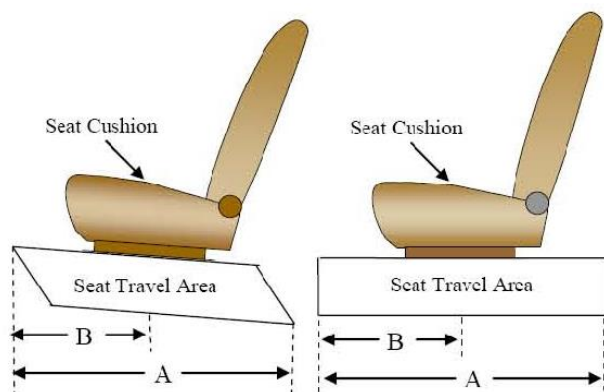
The driver and passenger seat fore/aft positions are adjusted following Appendix F, "Driver & Passenger Dummy Seating & Positioning Procedures" in the NCAP Test Procedure dated August 2013.

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	230 mm / 24 detents	120 mm / 12 th detent (1 st as 0)
Passenger Seat	230 mm / 24 detents	0 mm / 0 th detent (1 st as 0)

SEAT BELT UPPER ANCHORAGES

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

	Total # of Positions	Placed in Position #
Driver Seat	4 (1 st as 1)	1 (1 st as 0)
Passenger Seat	4 (1 st as 1)	1 (1 st as 0)



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

Test Vehicle: 2015 Toyota Tundra 4x4 SR Double Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20155107
 Test Date: 12/8/2014

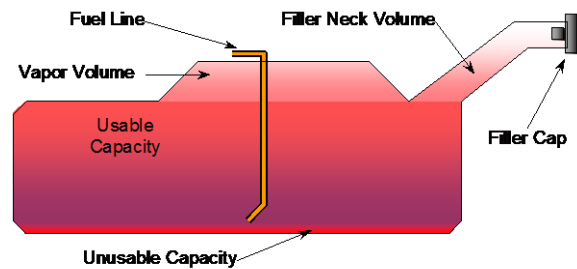
FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of "Standard Tank"	99.9
Usable Capacity of "Optional Tank"	
92-94% of Usable Capacity	91.9 to 93.9
Actual Amount of Solvent used	92.9
1/3 of Usable Capacity	33.3

FUEL PUMP

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

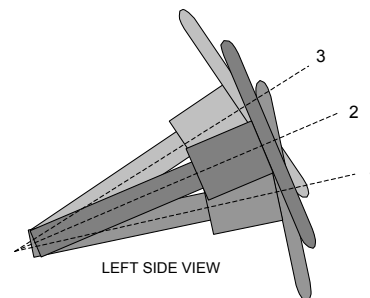
The vehicle is equipped with an electric fuel pump.
The fuel pump is activated when the ignition is
turned on. The fuel pipe is on the left side.



VEHICLE FUEL TANK ASSEMBLY

STEERING COLUMN ADJUSTMENT

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



STEERING COLUMN ASSEMBLY

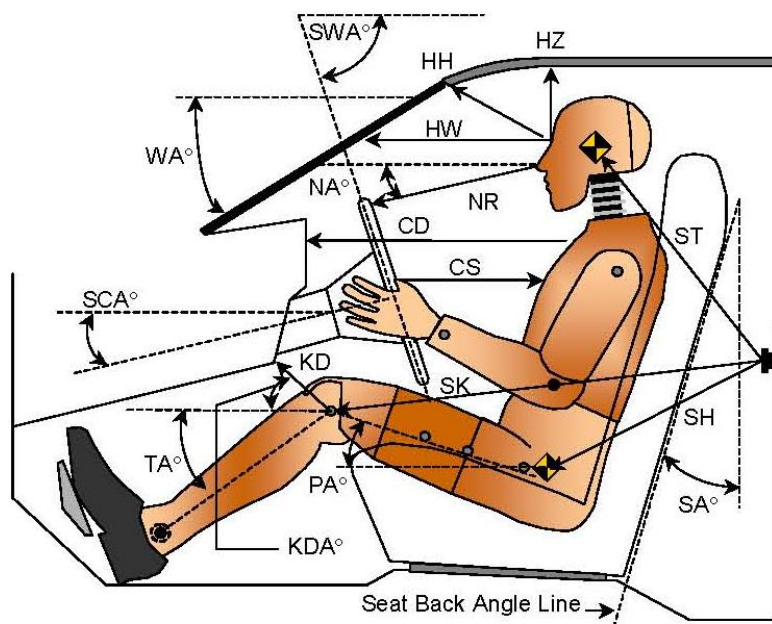
STEERING COLUMN POSITION

	Degrees	Fore/Aft Position (mm)
Lowermost Position 1	66.2	
Geometric Center Position 2	63.0	
Uppermost Position 3	59.8	
Telescoping Steering Wheel Travel		
Test Position	63.0	

DATA SHEET NO. 3 DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2015 Toyota Tundra 4x4 SR Double Cab
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20155107
Test Date: 12/8/2014



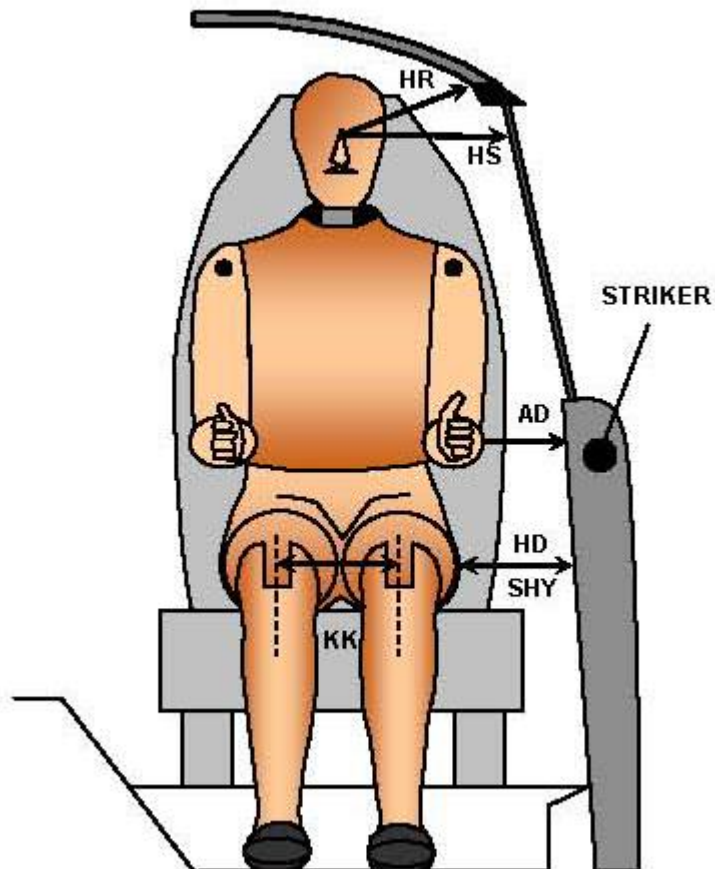
LEFT SIDE VIEW

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		26.4		
SWA°	Steering Wheel Angle		63.0		
SCA°	Steering Column Angle		27.0		
SA°	Seat Back Angle (on headrest post)		1.9		-2.5
HZ	Head to Roof (Z)	211	90.0	250	90.0
HH	Head to Header	454	18.2	367	33.3
HW	Head to Windshield	680	0.0	657	0.0
NR	Nose to Rim	460	17.8		
CD	Chest to Dash	590		432	
CS	Chest to Steering Hub	372	14.2		
RA	Rim to Abdomen	226	0.0		
KDL	Left Knee to Dash	198	23.5	104	28.1
KDR	Right Knee to Dash	192	25.1	113	30.5
PA°	Pelvic Angle		24.5		19.1
TA°	Tibia Angle		54.4		59.9
SK	Striker to Knee	614	98.7	732	96.9
ST	Striker to Head	539	14.9	510	36.8
SH	Striker to H-Point	285	128.3	404	108.3

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2015 Toyota Tundra 4x4 SR Double Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20155107
 Test Date: 12/8/2014



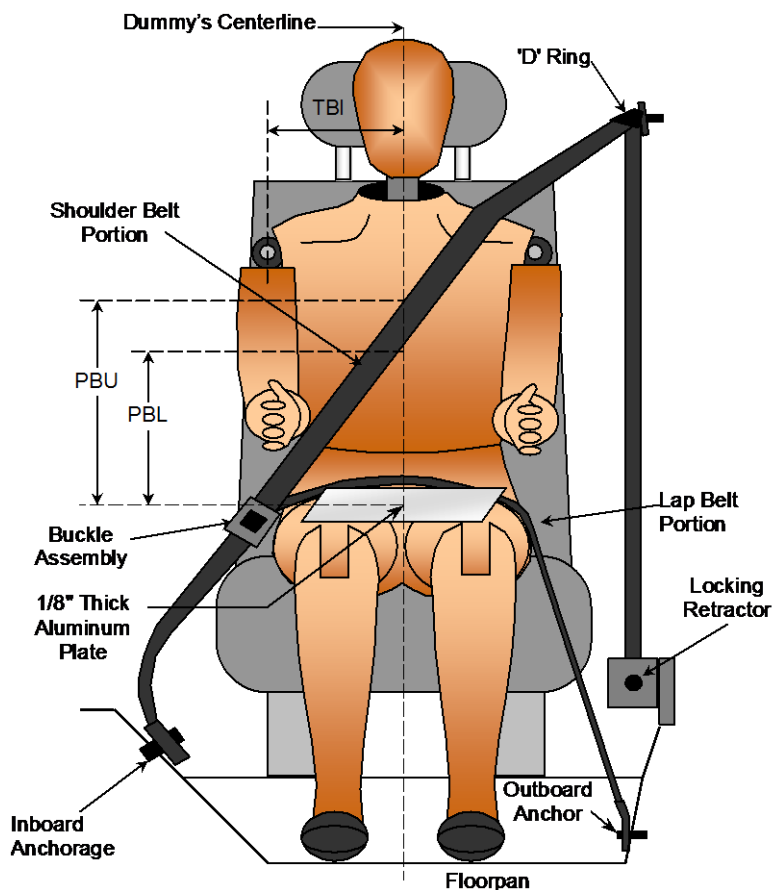
FRONT VIEW OF DUMMY

Code	Measurement Description	Driver	Passenger
		Length (mm)	
AD	Arm to Door	139	106
HD	H-Point to Door	153	209
HR	Head to Side Header	226	281
HS	Head to Side Window	317	362
KK	Knee to Knee	386	229
SHY	Striker to H-Point (Y Direction)	277	342
AA	Ankle to Ankle	360	186

DATA SHEET NO. 5 SEAT BELT POSITIONING DATA

Test Vehicle: 2015 Toyota Tundra 4x4 SR Double Cab
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20155107
Test Date: 12/8/2014



FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	370	350
PBL - Top surface of reference to belt lower edge	mm	300	270

BELT LENGTH DATA

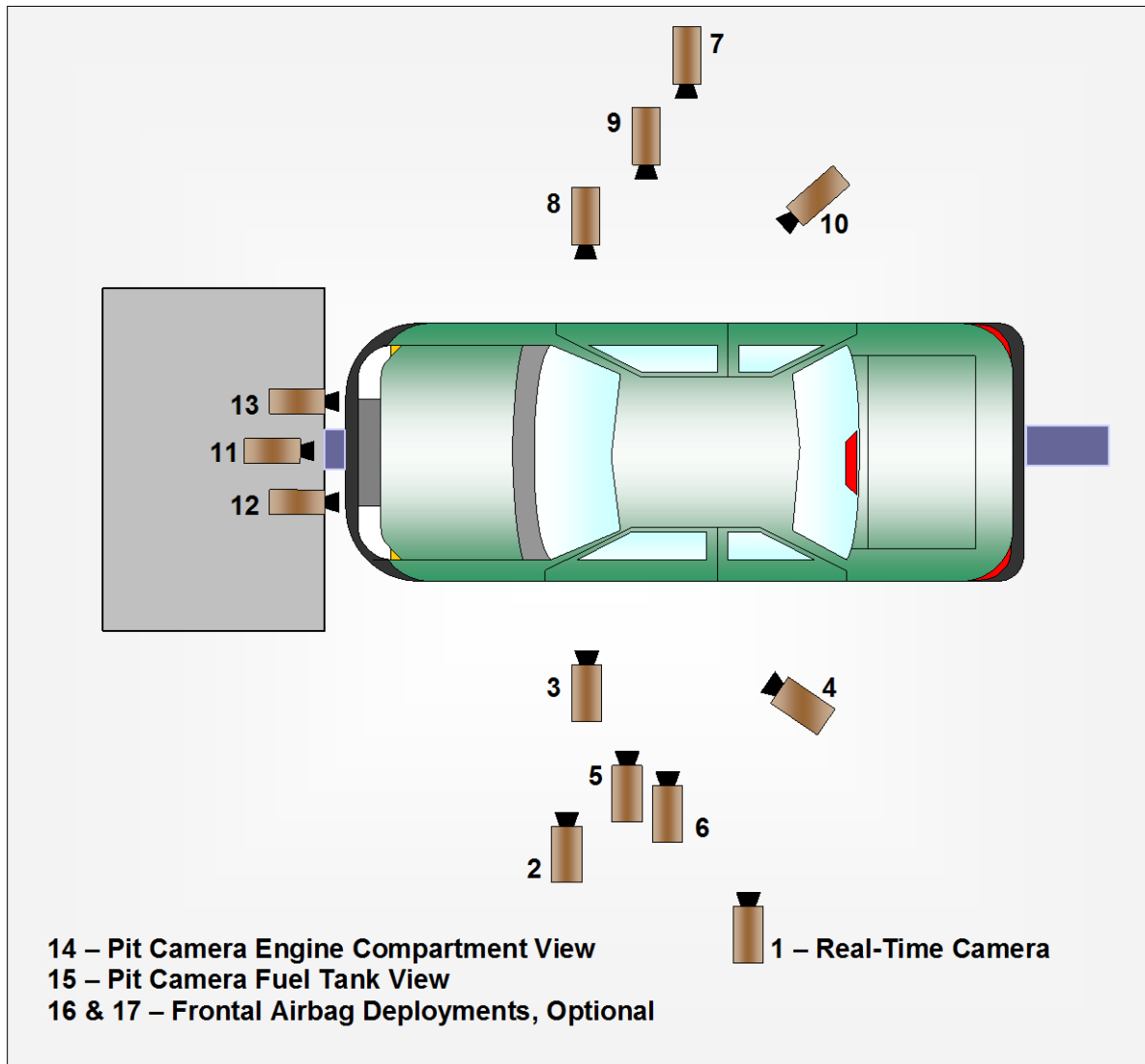
Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as measured on ATD	mm	920	985
Lap Belt Length as measured on ATD	mm	860	895
Remainder of belt on reel	mm	1460	1360
Total Belt Length for Continuous Webbing Systems	mm	3240	3240

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

Test Vehicle: 2015 Toyota Tundra 4x4 SR Double Cab
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20155107
Test Date: 12/8/2014

CAMERA POSITIONS FOR FRONTAL IMPACTS



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

Test Vehicle: 2015 Toyota Tundra 4x4 SR Double Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20155107
 Test Date: 12/8/2014

CAMERA LOCATIONS

No.	Camera View	Coordinates (mm)			Lens (mm)	Speed (fps)
		X*	Y*	Z*		
1	Real-Time Left Overall					30
2	Driver Close-Up	1410	-6800	-1910	35	1000
3	Left Front Half	1210	-5560	-1370	24	1000
4	Left Angle	5440	-5000	-1970	50	1000
5	Steering Column - Top					
6	Steering Column - Bottom					
7	Right Overall	3100	6980	-1330	16	1000
8	Passenger Close-Up	1440	6650	-1920	35	1000
9	Right Front Half	1220	5480	-1320	24	1000
10	Right Angle	5450	4760	-1950	50	1000
11	Windshield	-430	0	-2810	20	1000
12	Driver Windshield	40	-450	-2030	8.5	1000
13	Passenger Windshield	40	450	-2030	8.5	1000
14	Pit Front	1050	0	3150	24	1000
15	Pit Rear	2960	0	3150	24	1000
16	Onboard Driver Side				12	1000
17	Onboard Passenger Side				12	1000
18	Real-Time Pan View					30

***COORDINATES:**

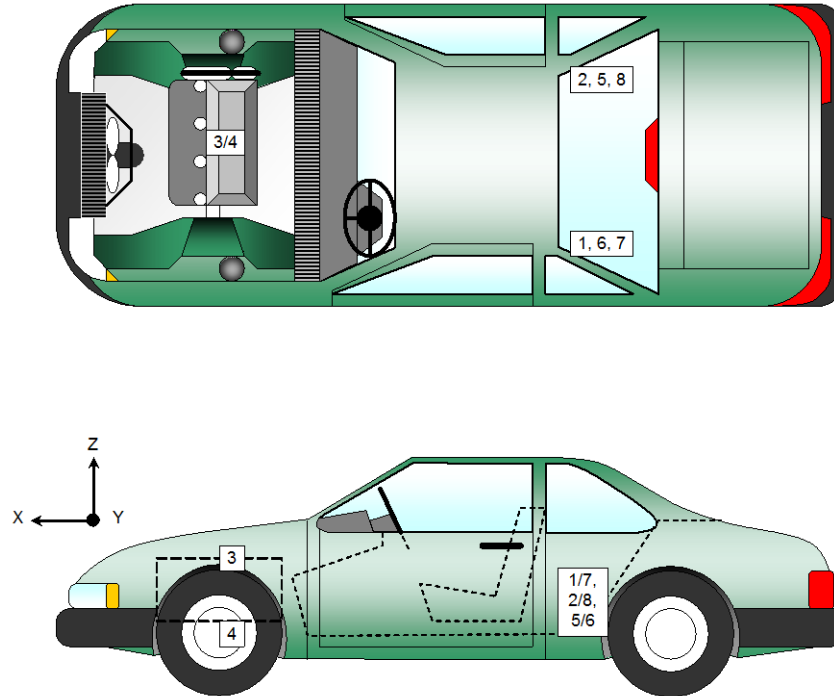
+X = forward of impact plane
 +Y = right of monorail centerline
 +Z = below ground level

Cameras 5 & 6 were not used for this test.

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

Test Vehicle: 2015 Toyota Tundra 4x4 SR Double Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20155107
 Test Date: 12/8/2014



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Crossmember Accelerometer – X Direction	3252	-365	-693
2	Right Rear Crossmember Accelerometer – X Direction	3252	420	-693
3	Engine Top X	4504	0	-1138
4	Engine Bottom X	5250	-8	-320
5	Left Rear Crossmember Accelerometer – Z Direction	3252	-365	-693
6	Right Rear Crossmember Accelerometer – Z Direction	3252	420	-693
7	Left Rear Crossmember Accelerometer Redundant – X Direction	3252	-365	-693
8	Right Rear Crossmember Accelerometer Redundant – X Direction	3252	420	-693

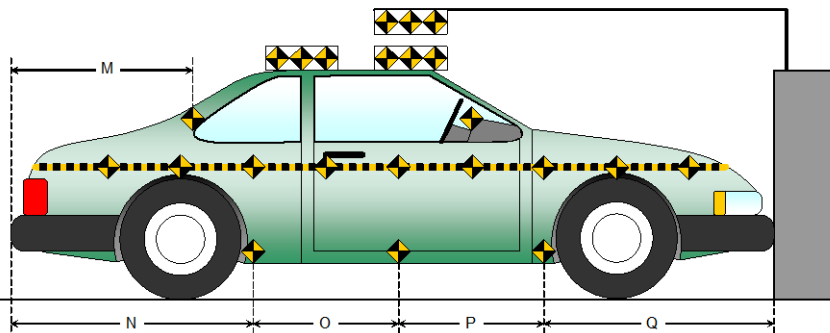
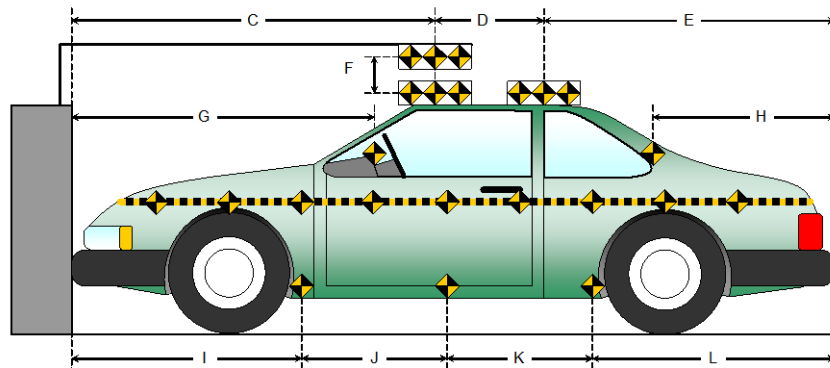
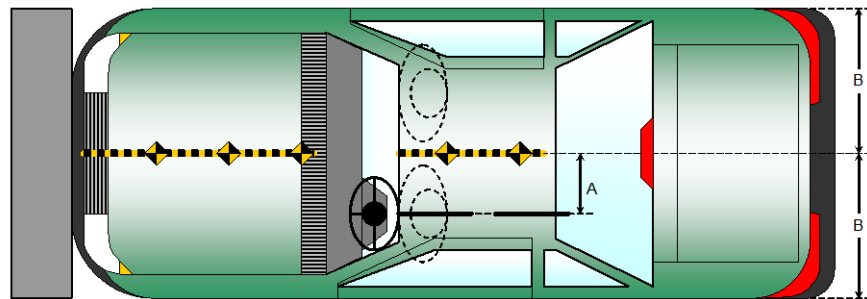
Reference Points: X - Rear Surface of Vehicle (+ forward)
 Y - Vehicle Centerline (+ to right)
 Z - Ground Plane (+ down)

DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2015 Toyota Tundra 4x4 SR Double Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20155107
 Test Date: 12/8/2014

Item	Value (mm)
A	463
B	1015
C	2360
D	606
E	3342
F	70
G	
H	2965
I	1446
J	1002
K	1002
L	2858
M	2965
N	2858
O	1002
P	1002
Q	1446



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

Test Vehicle: 2015 Toyota Tundra 4x4 SR Double Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20155107
 Test Date: 12/8/2014

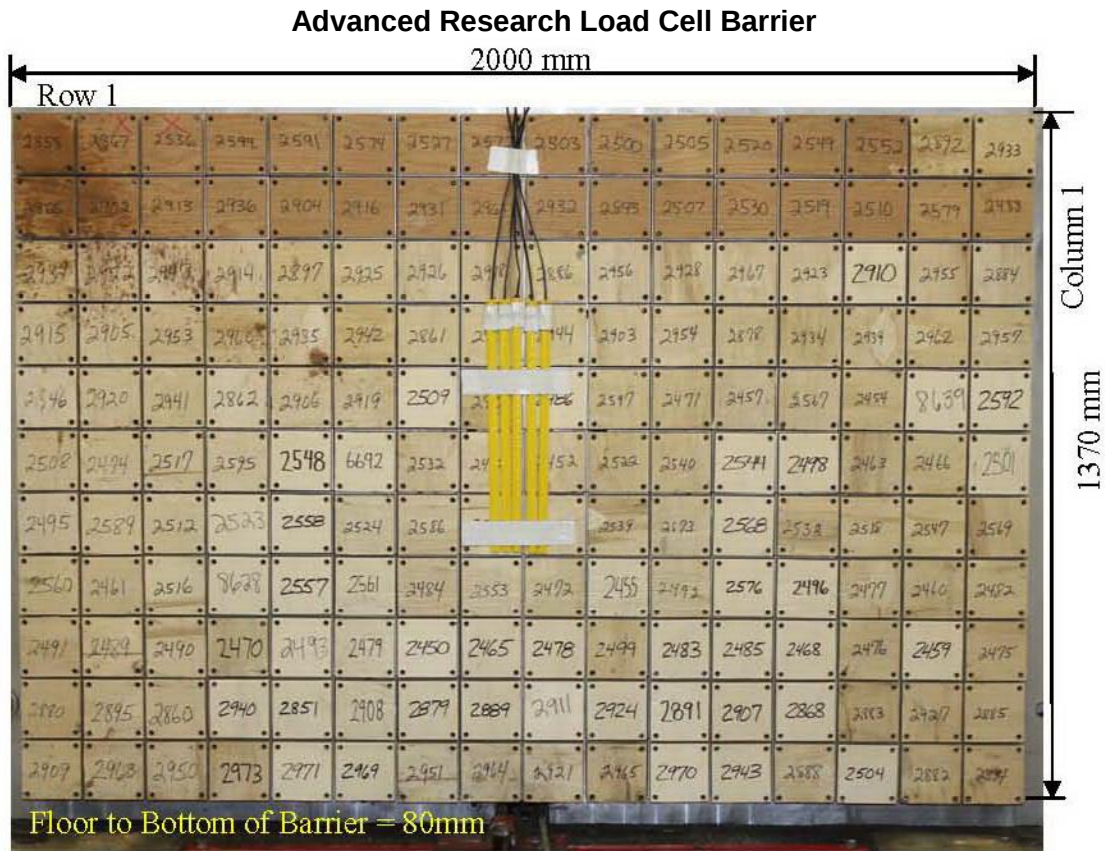


Photo for Reference Only

								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: 2015 Toyota Tundra 4x4 SR Double Cab
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20155107
Test Date: 12/8/2014

INSTRUMENTATION

Driver Dummy Data Channels	46
Passenger Dummy Data Channels	46
Vehicle Structure Accelerometers	8
Barrier Channels	528
Total	628

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: 2015 Toyota Tundra 4x4 SR Double Cab
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20155107
Test Date: 12/8/2014

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Passenger
Dummy Type / Serial No.	HIII 50% / 351	HIII 5% / 138
Head Contact	Airbag, Curtain Airbag, Headrest	Airbag, Headrest
Upper Torso Contact	Airbag	Airbag
Lower Torso Contact	None	None
Left Knee Contact	Knee Airbag	Knee Airbag
Right Knee Contact	Knee Airbag	Knee Airbag

DOOR OPENING AND SEAT TRACK INFORMATION

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

POST TEST STRUCTURAL OBSERVATIONS

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

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	930
Center	mm	880
Right Side	mm	975
Average	mm	928

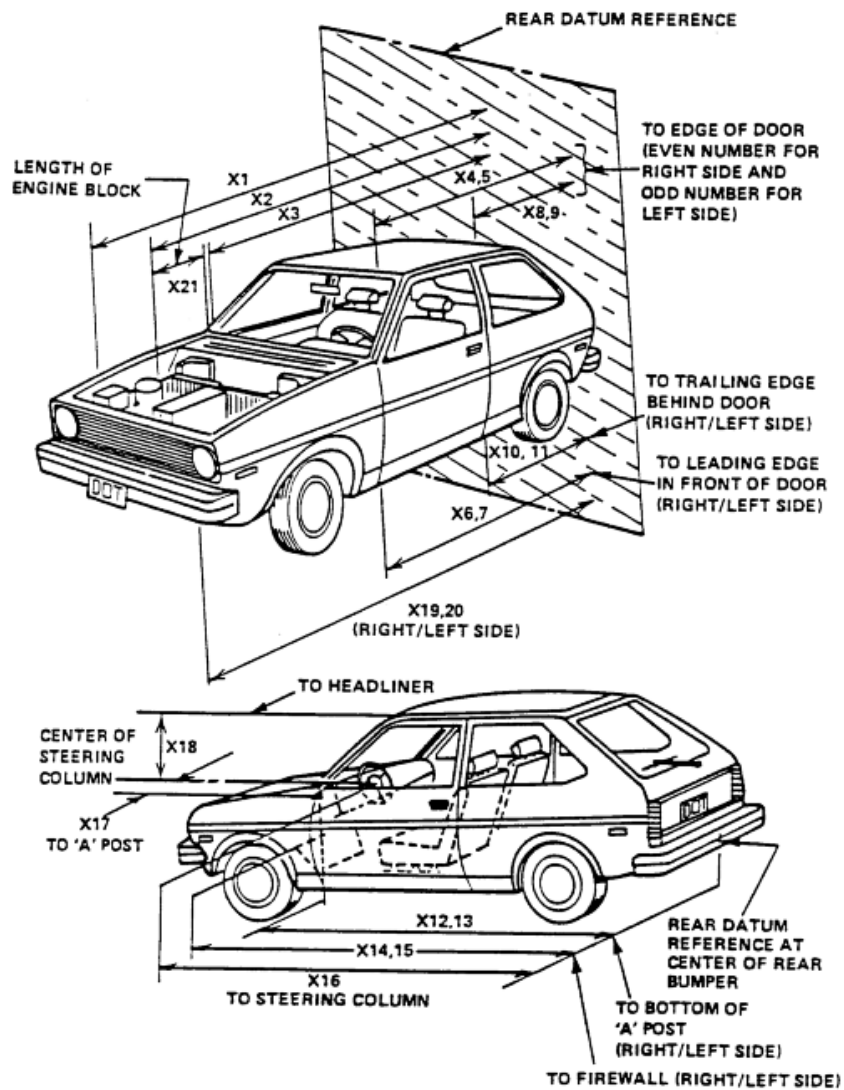
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

DATA SHEET NO. 12 VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2015 Toyota Tundra 4x4 SR Double Cab
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20155107
Test Date: 12/8/2014



DATA SHEET NO. 12 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2015 Toyota Tundra 4x4 SR Double Cab
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20155107
Test Date: 12/8/2014

RSOV (Rear Surface of Vehicle)

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	mm	6308	6024	284
2	RSOV to Front of Engine	mm	5690	5683	7
3	RSOV to Firewall	mm	5272	5353	-81
4	RSOV to Upper Leading Edge of Right Door	mm	4850	4928	-78
5	RSOV to Upper Leading Edge of Left Door	mm	4850	4926	-76
6	RSOV to Lower Leading Edge of Right Door	mm	4754	4819	-65
7	RSOV to Lower Leading Edge of Left Door	mm	4754	4803	-49
8	RSOV to Upper Trailing Edge of Right Door	mm	3675	3772	-97
9	RSOV to Upper Trailing Edge of Left Door	mm	3675	3763	-88
10	RSOV to Lower Trailing Edge of Right Door	mm	3656	3726	-70
11	RSOV to Lower Trailing Edge of Left Door	mm	3656	3713	-57
12	RSOV to Bottom of "A" Post of Right Side	mm	4783	4828	-45
13	RSOV to Bottom of "A" Post of Left Side	mm	4783	4834	-51
14	RSOV to Firewall, Right Side	mm	5162	5245	-83
15	RSOV to Firewall, Left Side	mm	5162	5238	-76
16	RSOV to Steering Column	mm	4356	4454	-98
17	Center of Steering Column to "A" Post	mm	450	493	-43
18	Center of Steering Column to Headliner	mm	455	518	-63
19	RSOV to Right Side of Front Bumper	mm	6207	5893	314
20	RSOV to Left Side of Front Bumper	mm	6207	5976	231
21	Length of Engine Block	mm	750	750	0
RD	RSOV to Right Side of Dash Panel	mm	4690	4754	-64
CD	RSOV to Center of Dash Panel	mm	4630	4721	-91
LD	RSOV to Left Side of Dash Panel	mm	4636	4728	-92

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2015 Toyota Tundra 4x4 SR Double Cab
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20155107
Test Date: 12/8/2014

VEHICLE INFORMATION

VIN: 5TFCY5F17FX017977

Wheelbase (mm): 4186

Vehicle Size Category: Truck

Test Weight (kg): 2860.0

ACCELEROMETER DATA

Accelerometer Locations: As per measurements on Page 15

Cal. Procedure/Interval: MGA procedure / 6 month

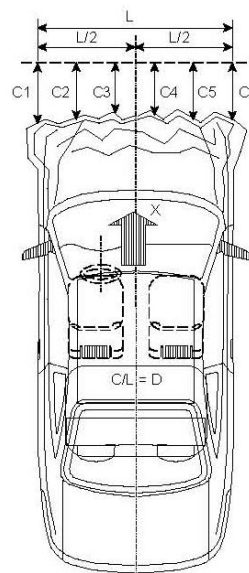
Integration Algorithm: Trapezoidal

Linearity: > 99%

Impact Velocity (km/h): 56.2

Velocity Change (km/h): 64.7

Time of Separation (msec): 121.6



CRUSH PROFILE

Collision Deformation Classification: Frontal

Midpoint of Damage: Centerline

Damage Region Length (mm): 1500

Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	6207	5976	231
C2	Crush zone 2 at left side	mm	6270	5968	302
C3	Crush zone 3 at left side	mm	6287	5991	296
C4	Crush zone 4 at right side	mm	6287	6008	279
C5	Crush zone 5 at right side	mm	6270	5999	271
C6	Crush zone 6 at right side	mm	6207	5893	314
L	C1 TO C6	mm	1500	1473	27

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2015 Toyota Tundra 4x4 SR Double Cab
 Test Program: NCAP Frontal Barrier Impact Test

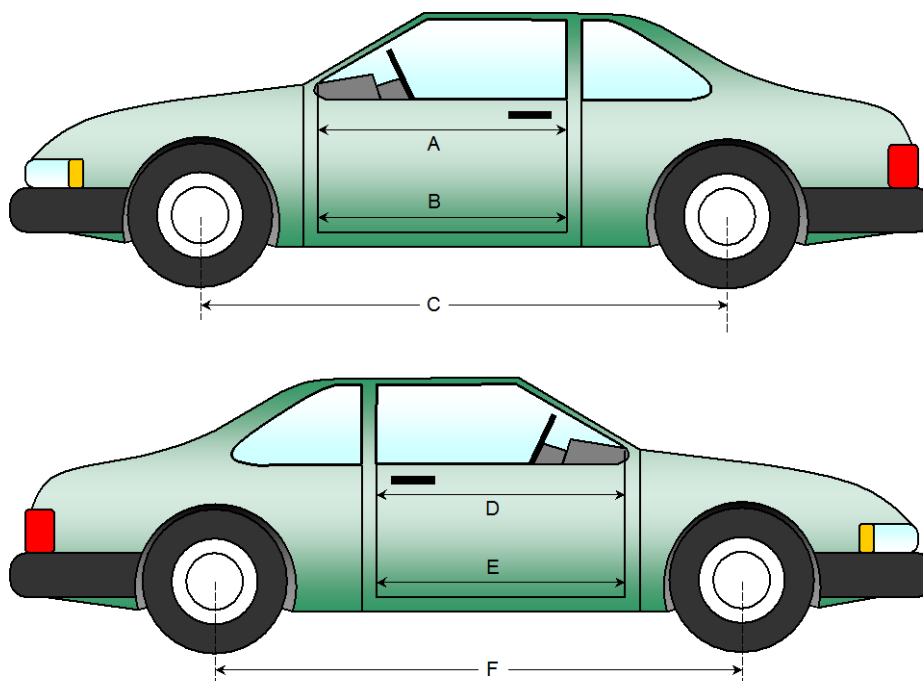
NHTSA No.: O20155107
 Test Date: 12/8/2014

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1075	1075	0
B	Left Side Lower	mm	932	932	0
D	Right Side Upper	mm	1075	1075	0
E	Right Side Lower	mm	932	932	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	4186	4145	41
F	Right Side Wheelbase	mm	4186	4153	33



DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

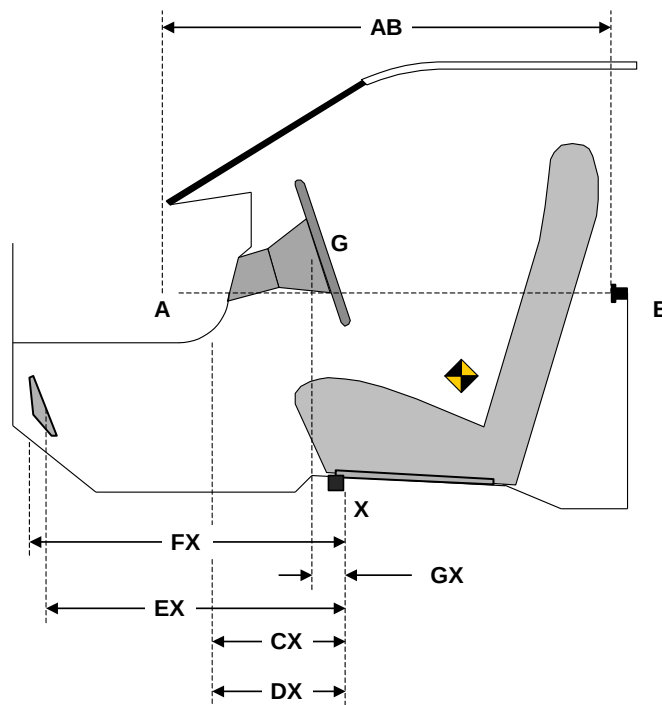
Test Vehicle: 2015 Toyota Tundra 4x4 SR Double Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20155107
 Test Date: 12/8/2014

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	760	760	0
CX	Left Knee Bolster to X	mm	288	265	23
DX	Right Knee Bolster to X	mm	275	235	40
EX	Brake Pedal to X	mm	570	532	38
FX	Foot Rest to X	mm	565	528	37
GX	Center of Steering Column Wheel Hub to X	mm	63	65	-2

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: 2015 Toyota Tundra 4x4 SR Double Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20155107
 Test Date: 12/8/2014

Windshield Mounting Details:

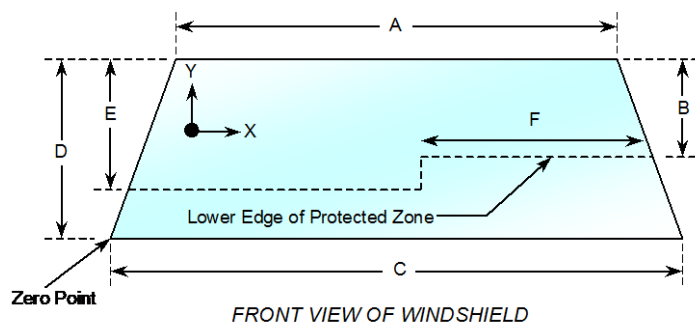
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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: 21.5° C.

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2337	2337	100
Right Side	2337	2337	100
Total	4674	4674	100



Item	Units	Value
A	mm	1390
B	mm	440
C	mm	1664
D	mm	810
E	mm	514
F	mm	514

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: 2015 Toyota Tundra 4x4 SR Double Cab
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20155107
Test Date: 12/8/2014

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21.5°C Test Time: 9:49 a.m.

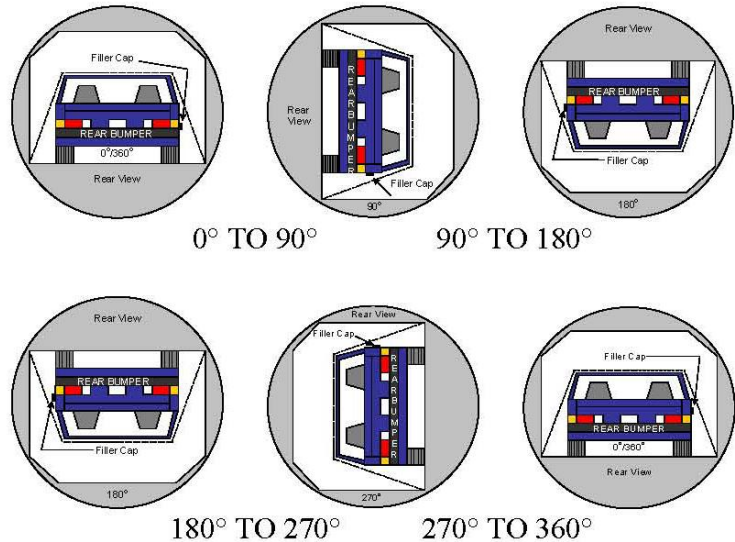
- A. From impact until vehicle motion ceases: 0 oz.
(Maximum allowable = 1 oz.)
- B. For the 5 minute period after motion ceases: 0 oz.
(Maximum allowable = 5 oz.)
- C. For the following 25 minutes: 0 oz.
(Maximum allowable = 1 oz./minute)
- D. Spillage: None

DATA SHEET NO. 16
FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2015 Toyota Tundra 4x4 SR Double Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20155107
 Test Date: 12/8/2014

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°	152	300	452
90° to 180°	136	300	436
180° to 270°	178	300	478
270° to 360°	147	300	447

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

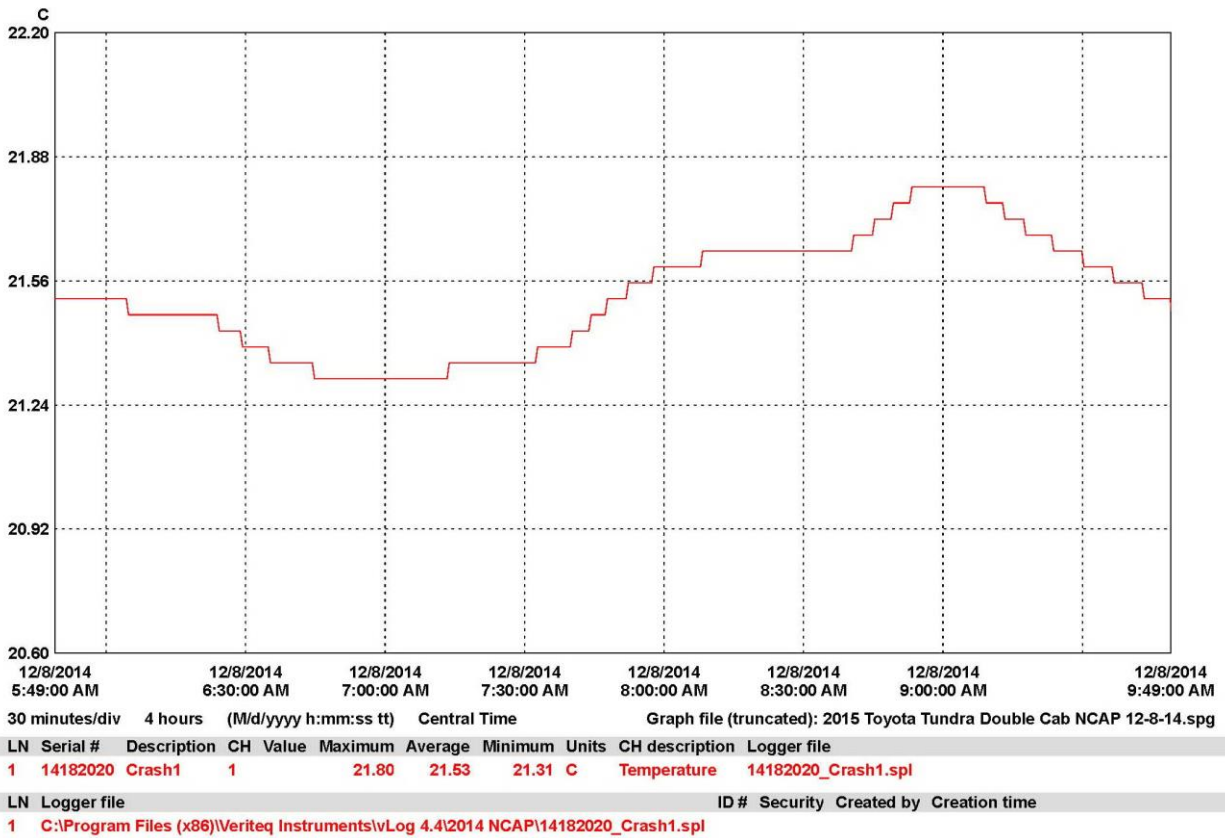
SOLVENT SPILLAGE LOCATION TABLE

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: 2015 Toyota Tundra 4x4 SR Double Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20155107
 Test Date: 12/8/2014



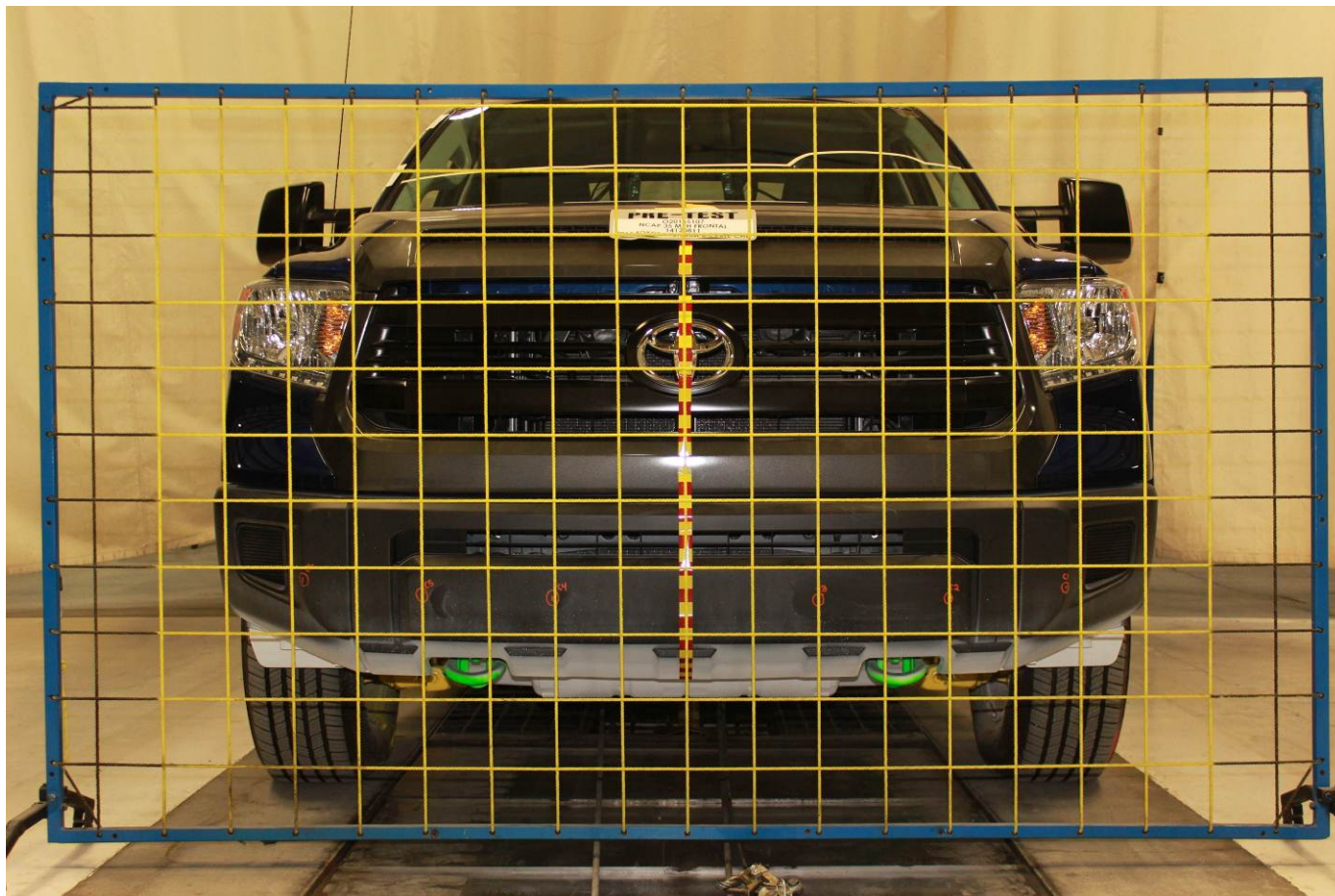
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Load Cell Location



Load Cell Wall



Manufacturer's Label



Tire Placard



Load Carrying Capacity Reduced Label



2015 Toyota Tundra Double Cab Frontal As Delivered



Left Rear 3-4 View, As Received



Pre-Test Front View of Test Vehicle



Post-Test Front View of Test Vehicle



Pre-Test Left View of Test Vehicle



Post-Test Left View of Test Vehicle



Pre-Test Right View of Test Vehicle



Post-Test Right View of Test Vehicle



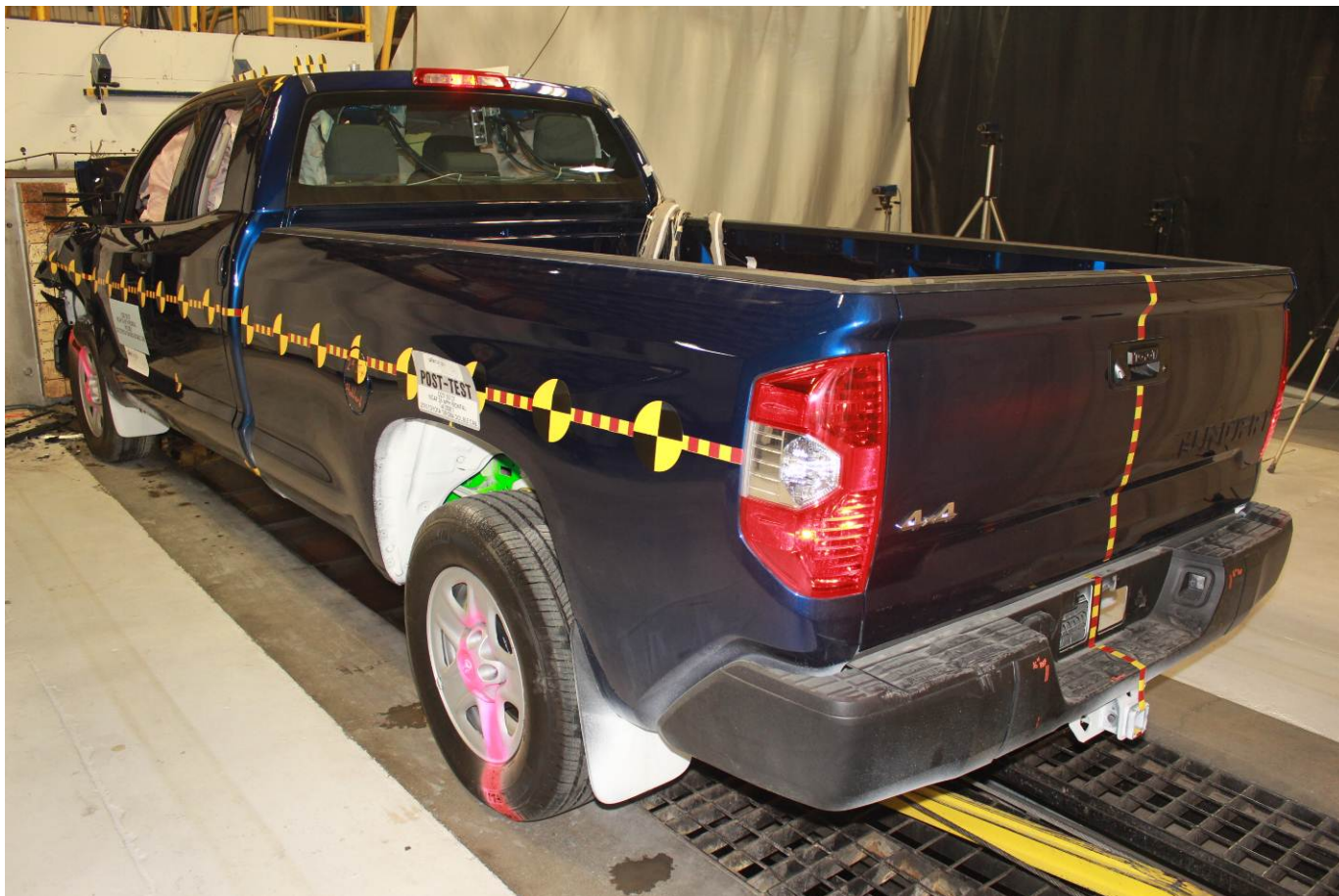
Pre-Test Right Front 3-4 View



Post-Test Right Front 3-4 View



Pre-Test Left Rear 3-4 View



Post-Test Left Rear 3-4 View



Pre-Test Windshield View



Post-Test Windshield View



Pre-Test Engine Compartment View



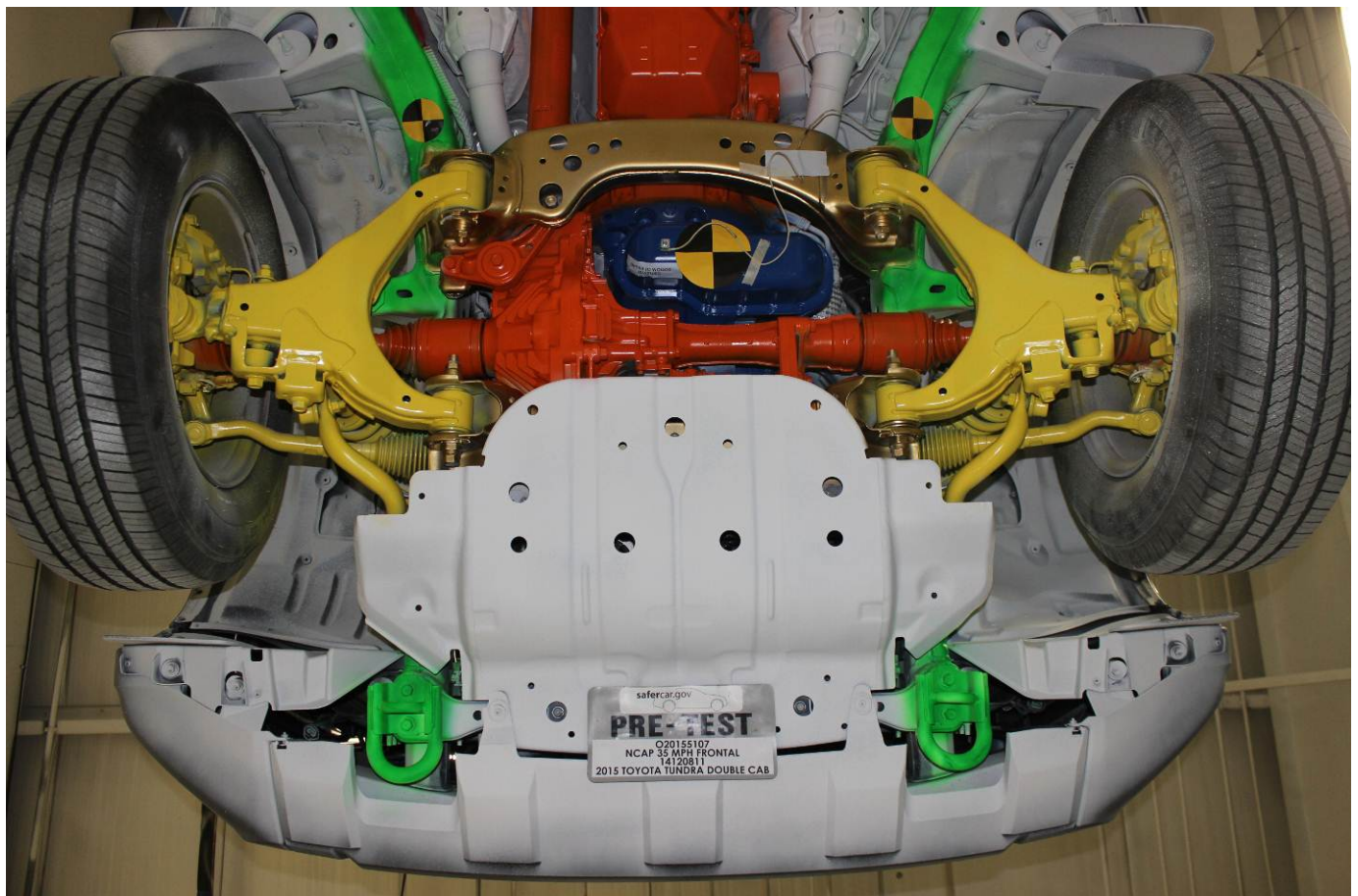
Post-Test Engine Compartment View



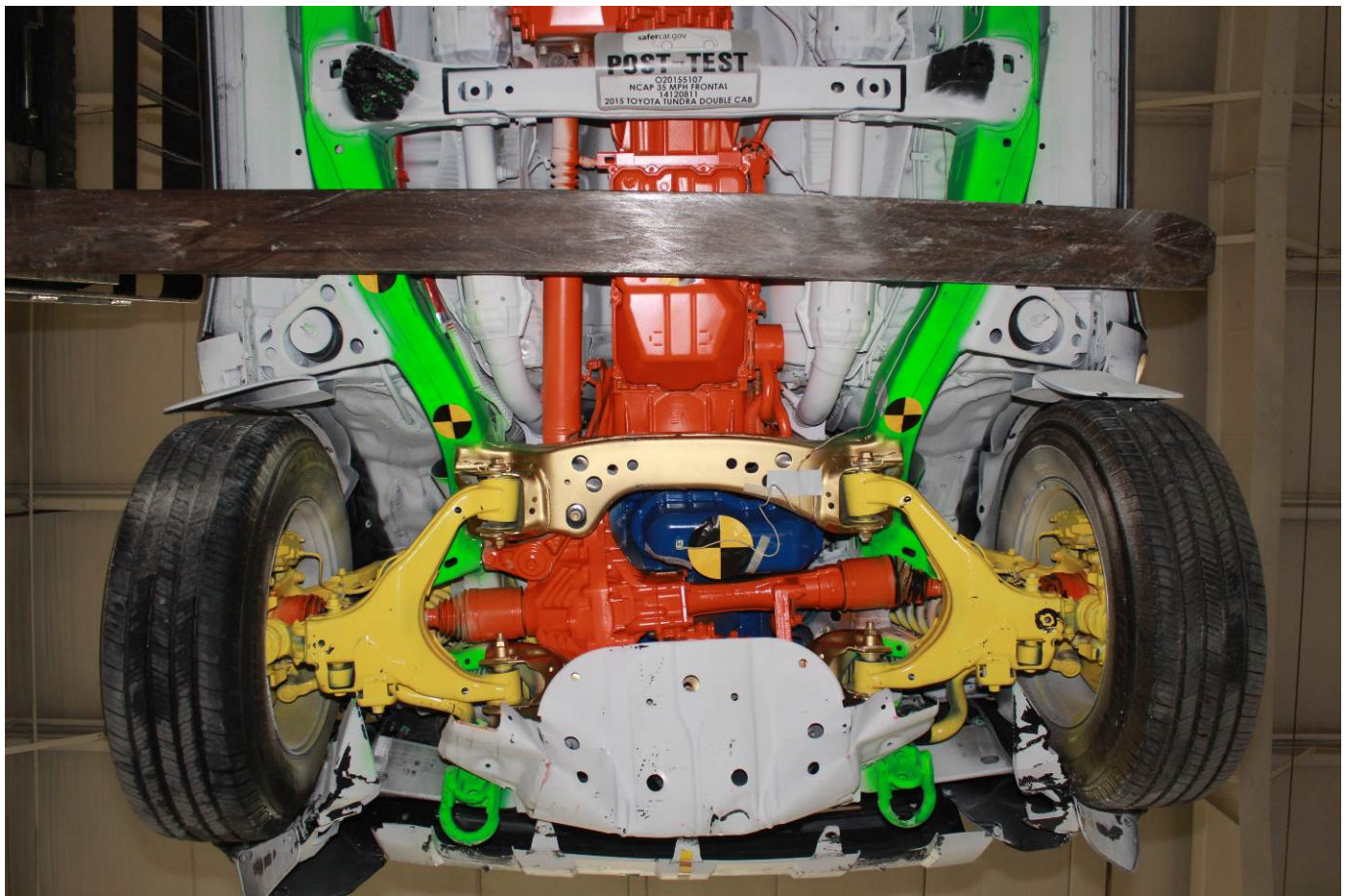
Pre-Test Fuel Filler Cap View



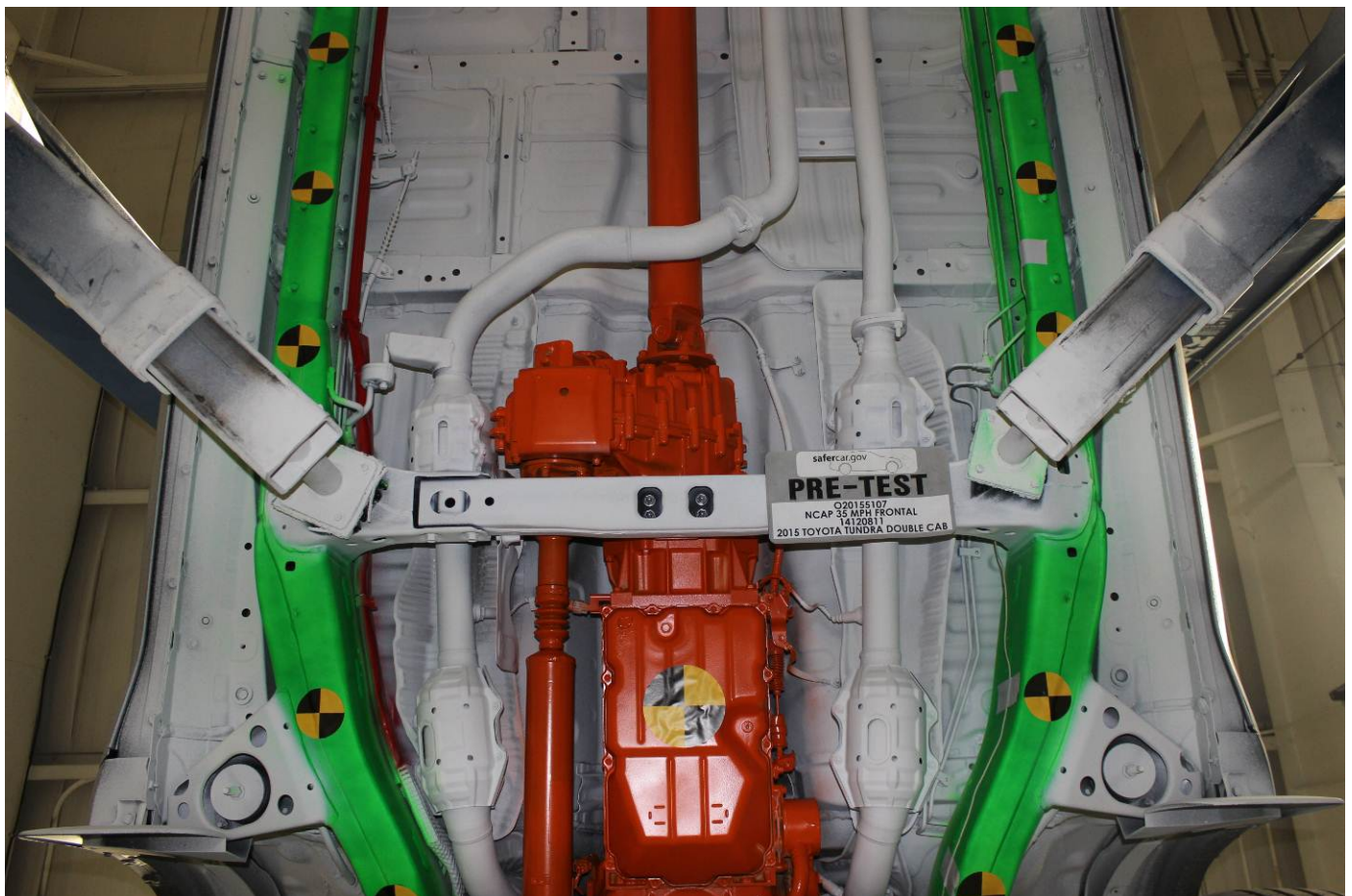
Post-Test Fuel Filler Cap View



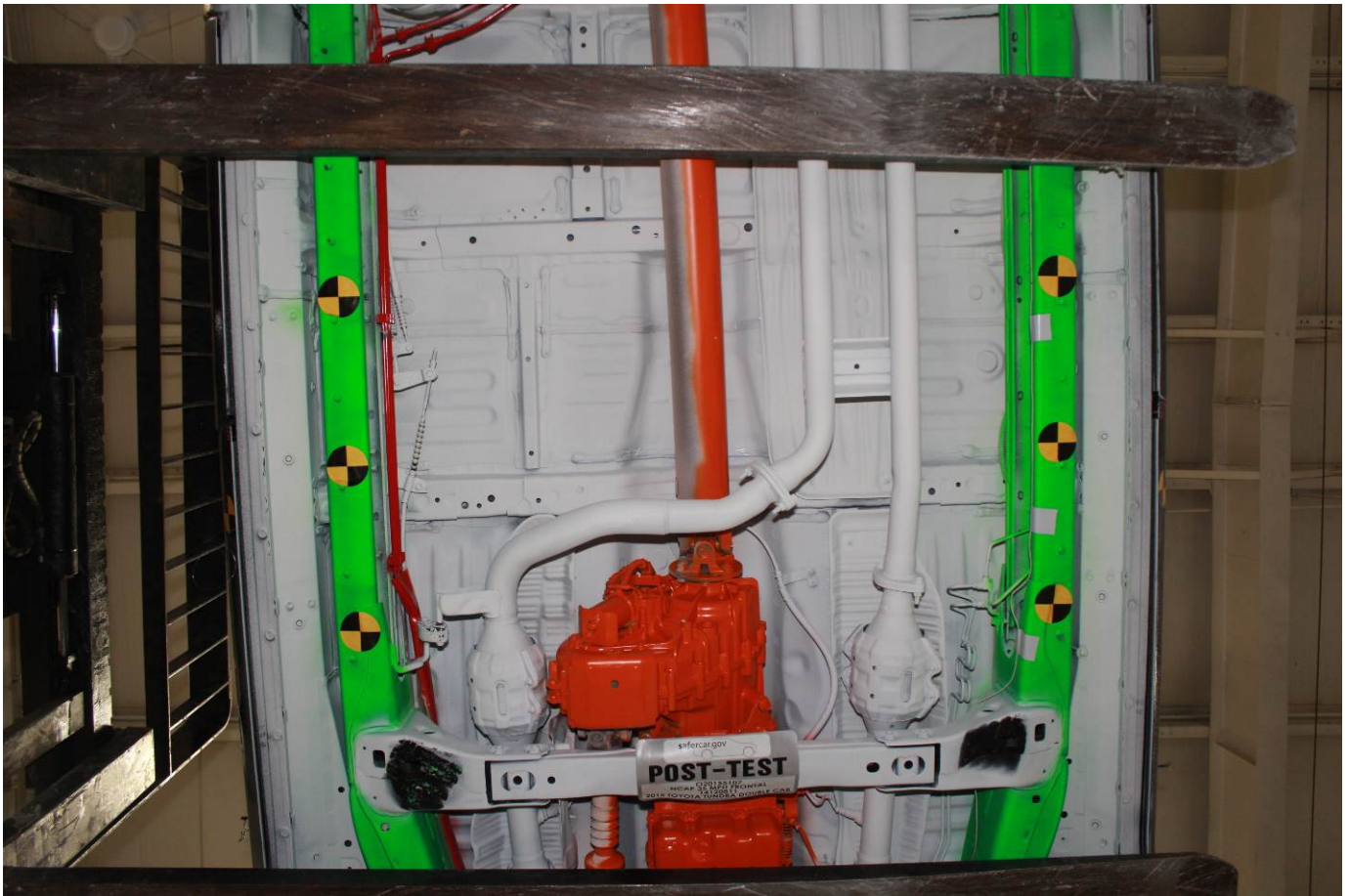
Pre-Test Front Underbody View



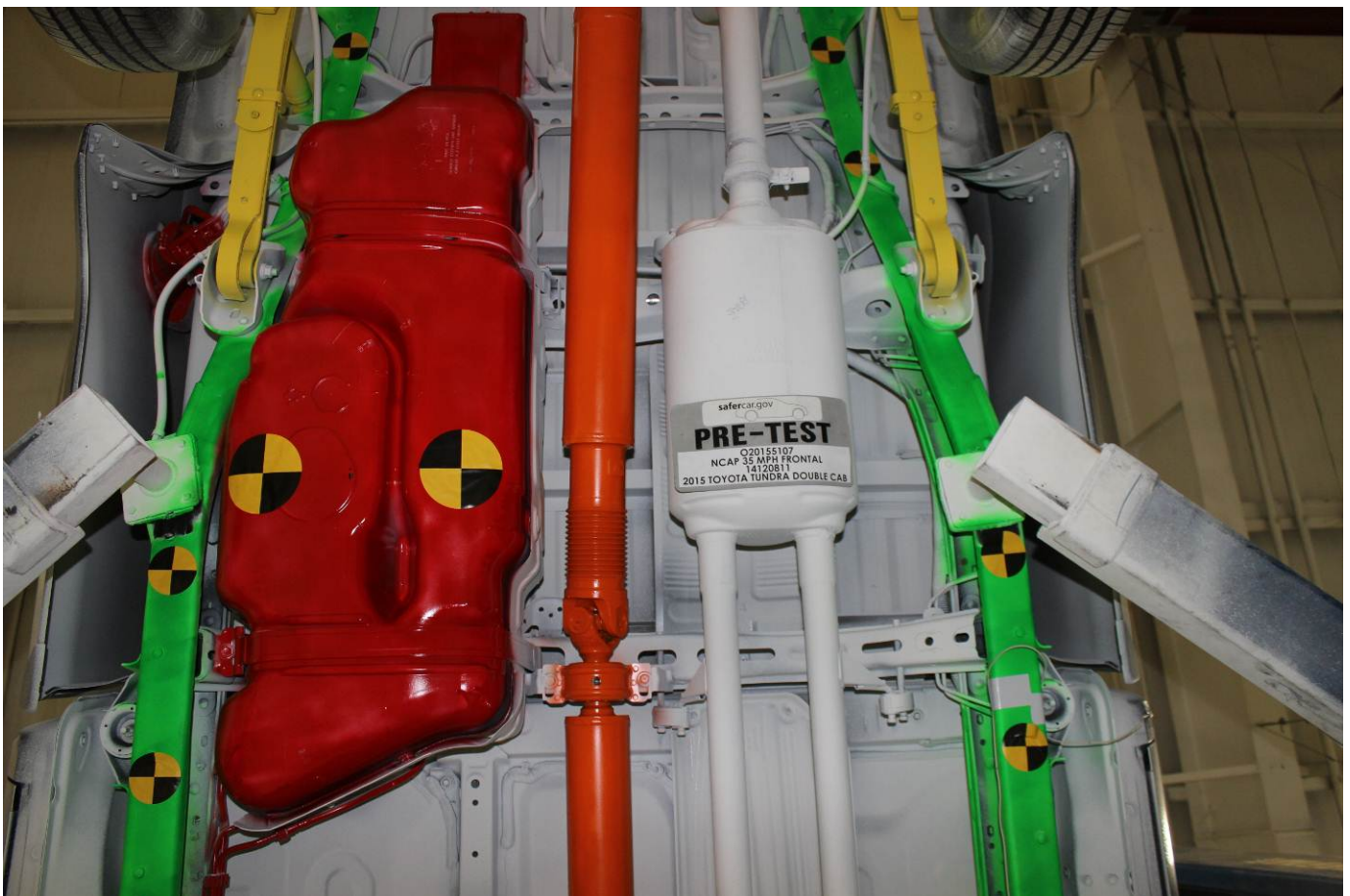
Post-Test Front Underbody View



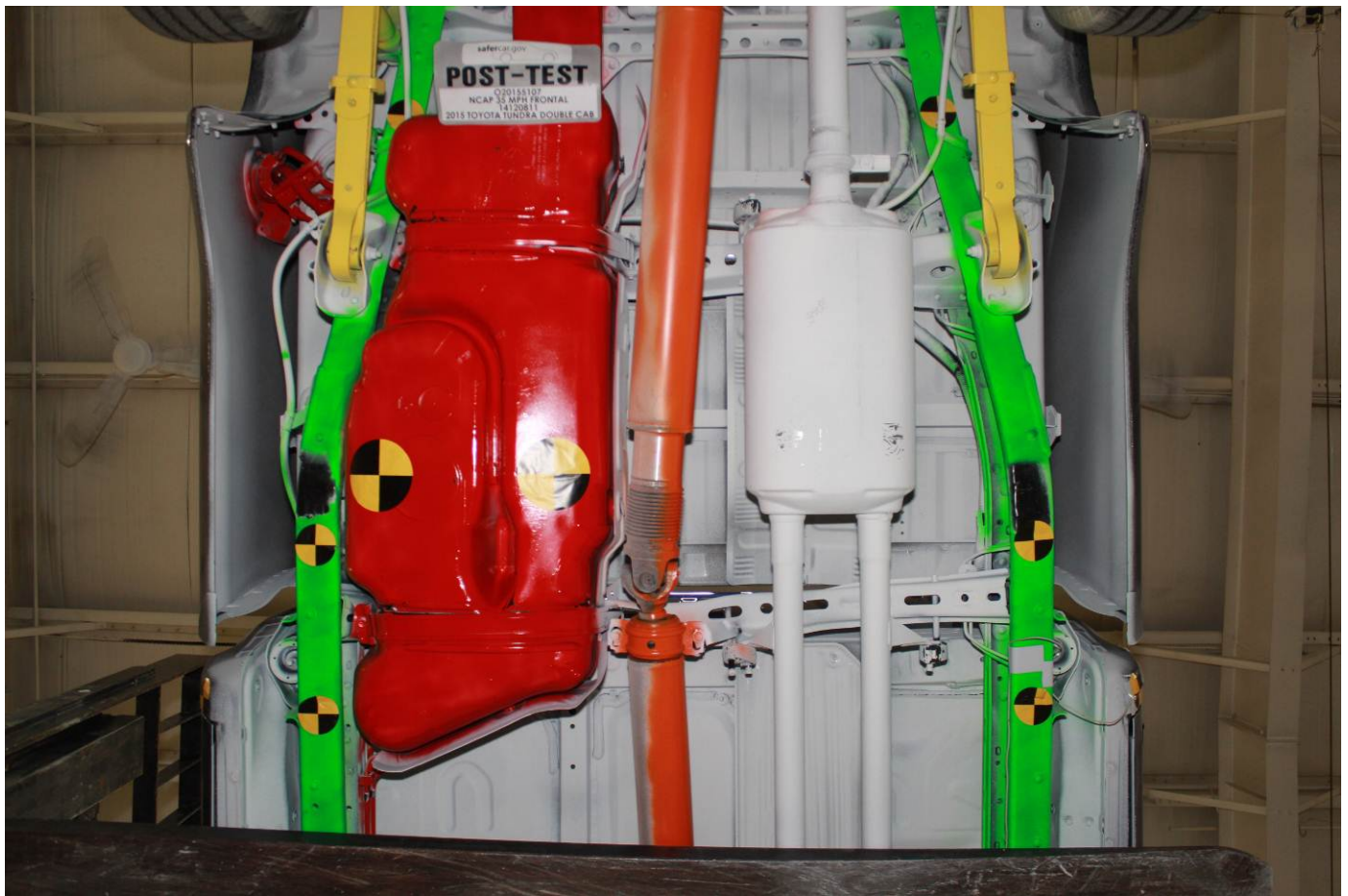
Pre-Test Mid Front Underbody View



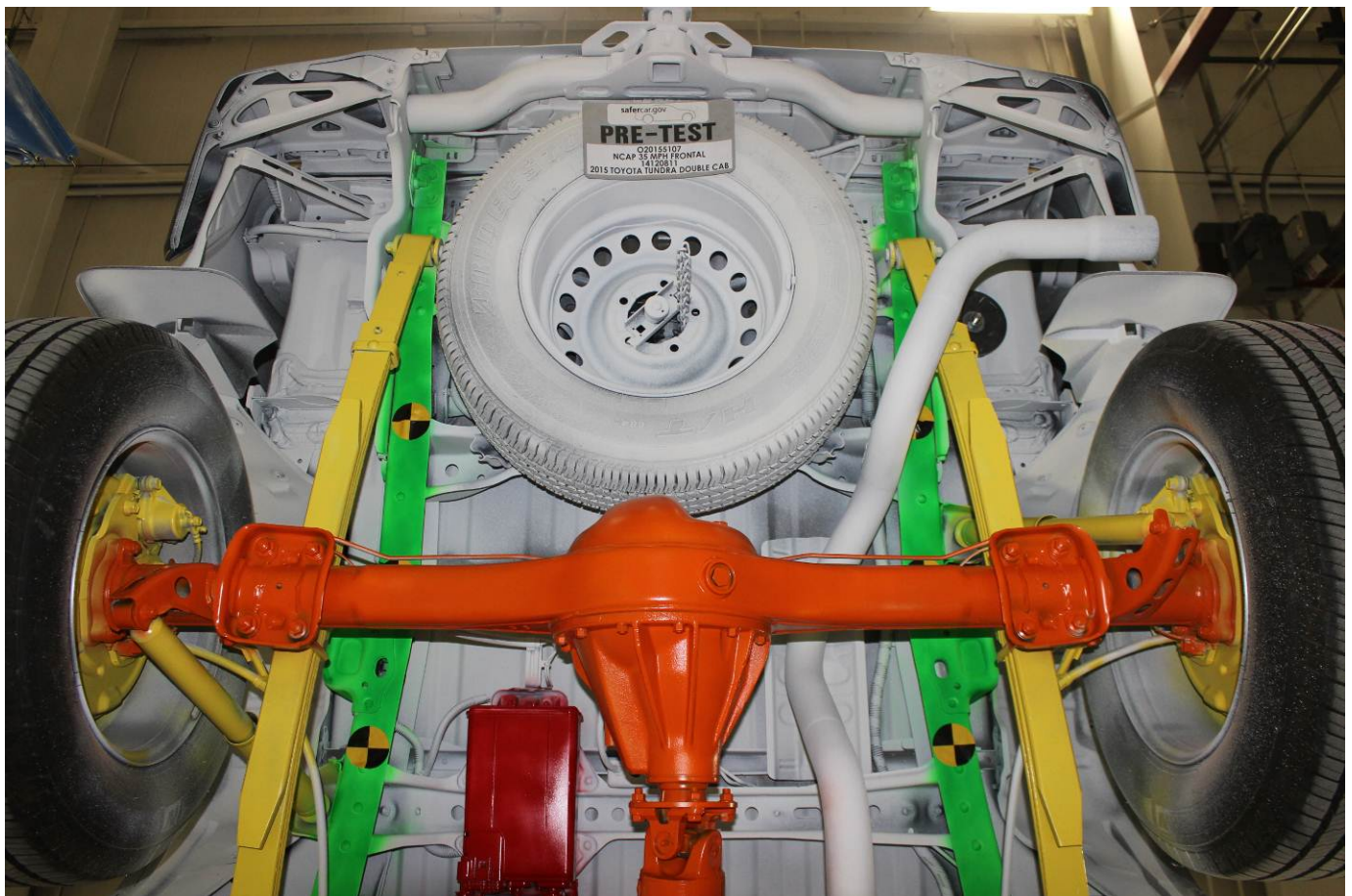
Post-Test Mid Front Underbody View



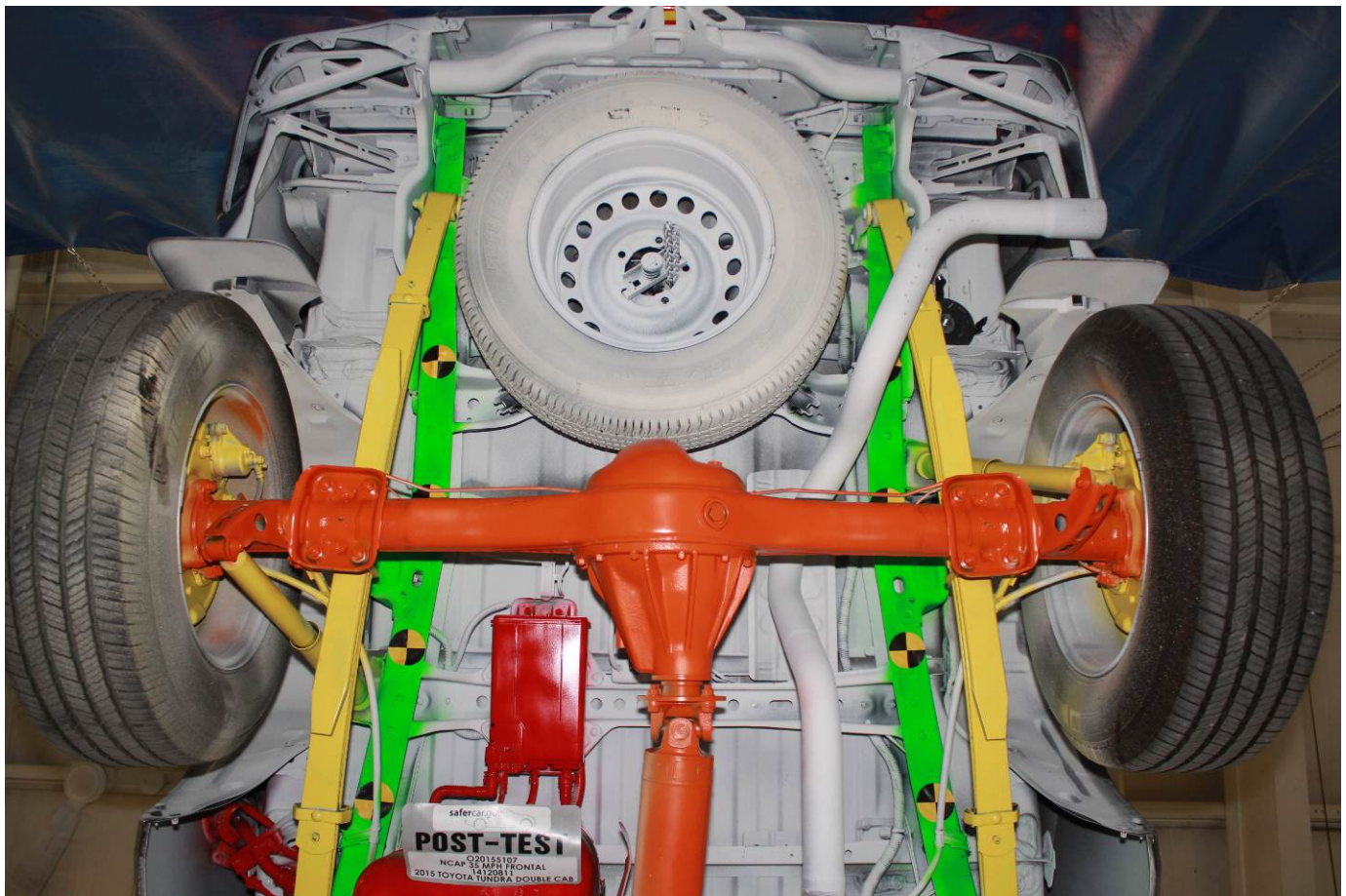
Pre-Test Mid Rear Underbody View



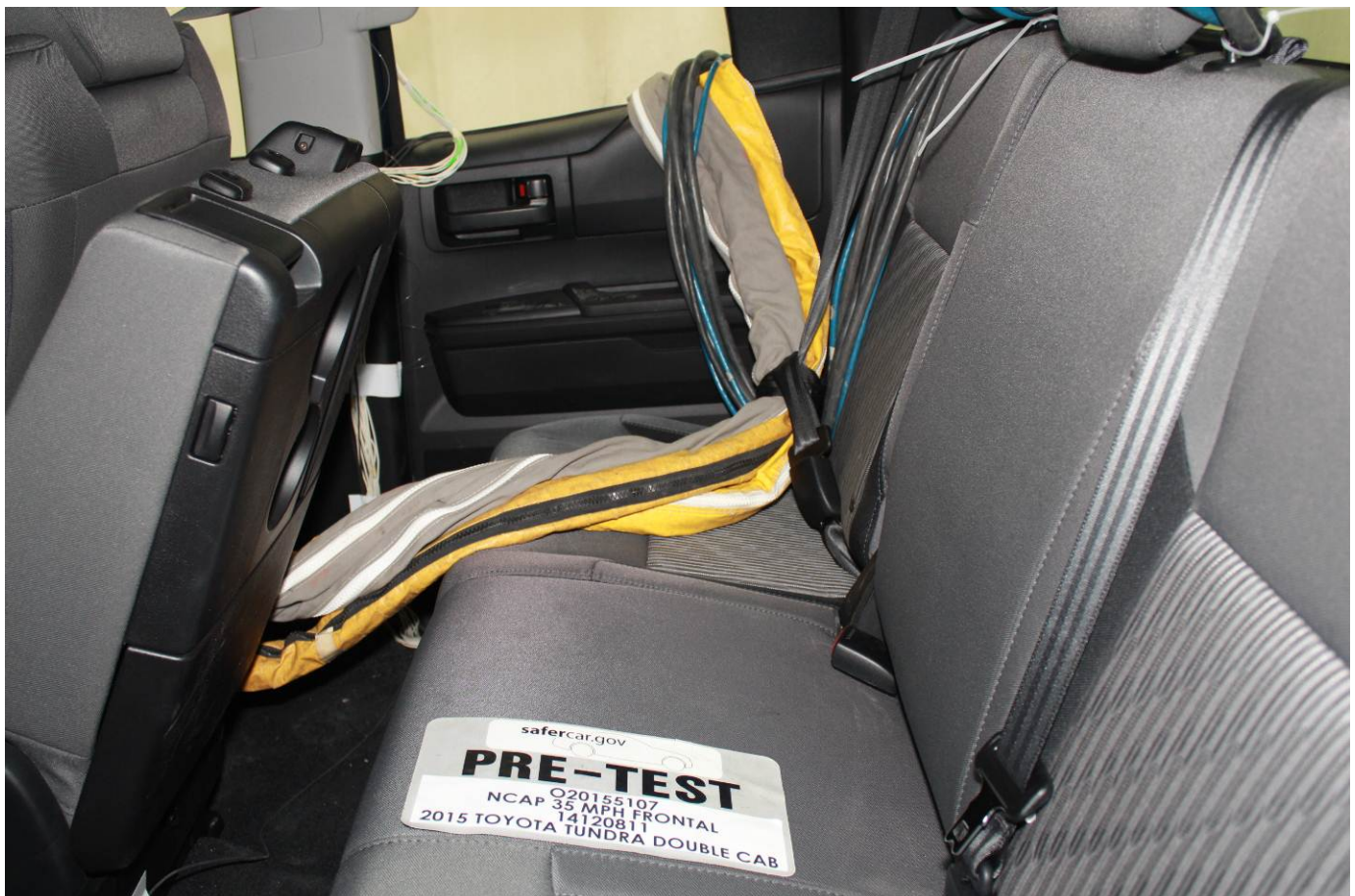
Post-Test Mid Rear Underbody View



Pre-Test Rear Underbody View



Post-Test Rear Underbody View



Pre-Test Dummy Cable Routing



Post-Test Dummy Cable Routing



Pre-Test Driver Dummy Front View



Post-Test Driver Dummy Front View



Pre-Test Driver Dummy Window View



Post-Test Driver Dummy Window View



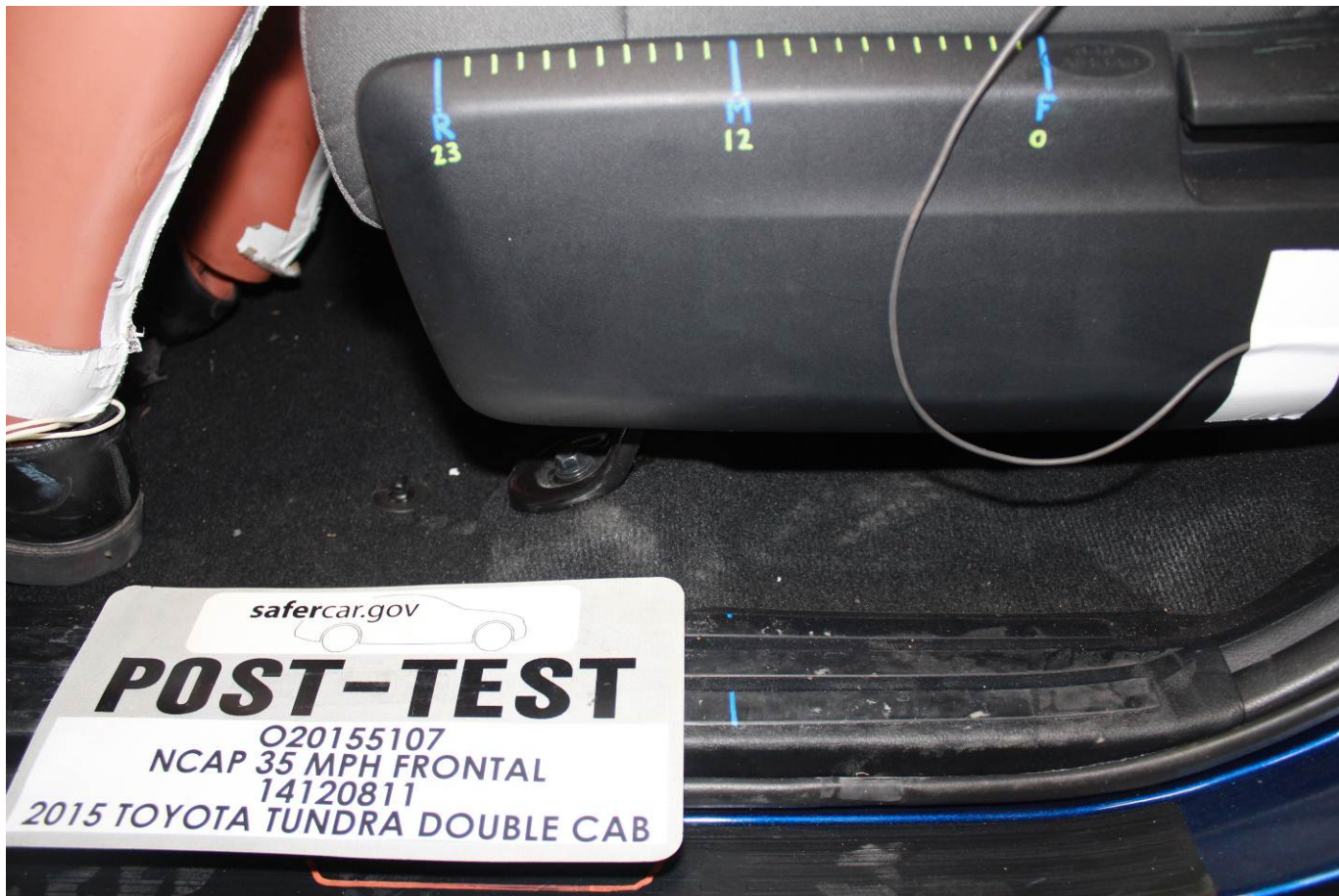
Pre-Test Driver Dummy and Vehicle Interior (Door Open)



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



Pre-Test Driver's Seat Fore-Aft Markings



Post-Test Driver's Seat Fore-Aft Markings



Pre-Test View of Belt Anchorage for Driver Dummy



Post-Test View of Belt Anchorage for Driver Dummy



Pre-Test Driver Dummy Feet



Post-Test Driver Dummy Feet



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



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



Pre-Test Driver's Side Floorpan



Post-Test Driver's Side Floorpan



Post-Test Driver Dummy Face



Post-Test Driver Dummy Contact with Airbag



Post-Test Driver Dummy Contact with Airbag



Post-Test Driver Dummy Contact with Headrest



Post-Test Driver Dummy Contact with Knee Airbag



Pre-Test View of the Steering Wheel



Post-Test View of the Steering Wheel



Pre-Test Passenger Dummy Front View



Post-Test Passenger Dummy Front View



Pre-Test Passenger Dummy Window View



Post-Test Passenger Dummy Window View



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



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



Pre-Test Passenger's Seat Fore-Aft Markings



Post-Test Passenger's Seat Fore-Aft Markings



Pre-Test View of Belt Anchorage for Passenger Dummy



Post-Test View of Belt Anchorage for Passenger Dummy



Pre-Test Passenger Dummy Feet



Post-Test Passenger Dummy Feet



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



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



Pre-Test Passenger's Side Floorpan



Post-Test Passenger's Side Floorpan



Post-Test Passenger Dummy Face



Post-Test Passenger Dummy Contact with Airbag



Post-Test Passenger Dummy Contact with Headrest



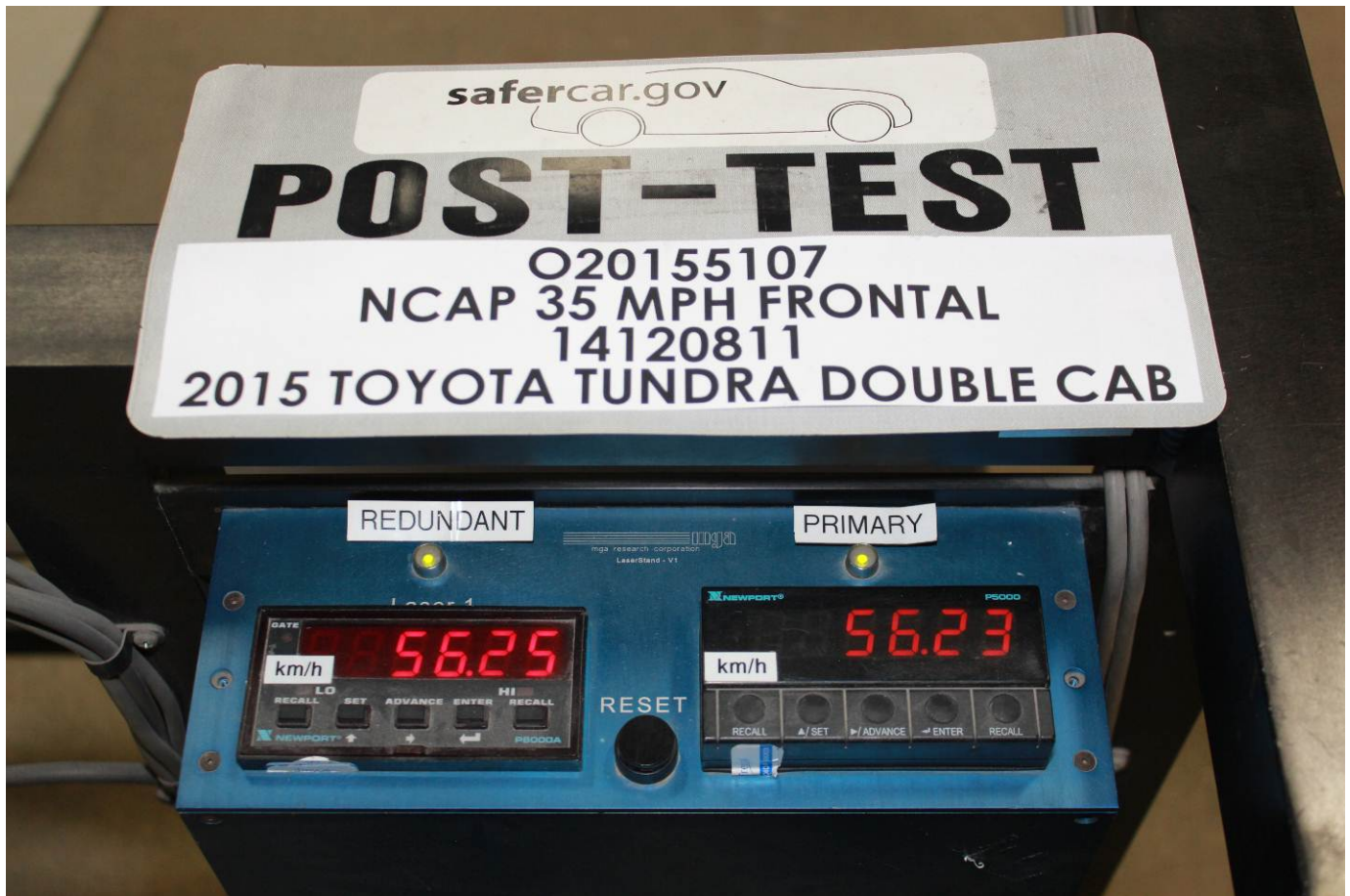
Post-Test Passenger Dummy Contact with Knee Airbag



Ballast Installed in Vehicle

PHOTOGRAPH NOT APPLICABLE

Post-Test Stoddard Solvent Spillage Location View



Post-Test Speed Trap Read-Out



Vehicle at 0 Degree on Static Rollover Device



Vehicle at 90 Degrees on Static Rollover Device



Vehicle at 180 Degrees on Static Rollover Device



Vehicle at 270 Degrees on Static Rollover Device



Vehicle at 360 Degrees on Static Rollover Device



2015 Toyota Tundra Double Cab Frontal Impact Event

TOYOTA
Let's Go Places

DESC.: **TUNDRA 4X4** SR DBL CAB 5.7L V8
VIN: **5TFCY5F17FX017977**
YR/MDL: 2015/8345A
CLR: BLUE RIBBON MET/FA13 (08T5/13)
PORT/PLANT: San Antonio, TX/TMMTX RAILHEAD:

GOVERNMENT 5-STAR SAFETY RATINGS

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.

Crash	Driver	Passenger	Not Rated
Frontal	★★★★★	★★★★★	Not Rated
Side	★★★★★	★★★★★	Not Rated
Rollover	★★★★★	★★★★★	Not Rated

Star ratings range from 1 to 5 stars (★★★★★) with 5 being the highest. Source: National Highway Traffic Safety Administration (NHTSA) www.safercar.gov or 1-888-327-4236

STANDARD EQUIPMENT

MECHANICAL & PERFORMANCE

- 5.7L FORCE V6 DOHC 30V with Dual Independent VVT-i 381 hp / 401 lb-ft
- 6-Spd Automatic Trans w/Sequential Shift
- 4WDemand Part-Time 4WD w/Elec Controlled Transfer Case, A-TRAC & Auto LSD
- TripleTech Frame
- Tow Hitch Recv, 4,300 Rear Diff
- TOW/HILL Mode, Engine Oil Cooler, Trans Oil Cooler, Heavy Duty Batt & Alt
- 4 & 7-Pin Connector
- Int Coil-Spring High-Mounted Double Wishbone Front Susp w/ Stabilizer Bar
- Trapezoidal Multi-Leaf Rear Suspension w/ Shagroned Outboard Mounted Shocks
- Power-Assisted 4 Wheel Disc Brakes
- 18" Styld SB Wheels w/ P255/70R18 Tires

SAFETY & CONVENIENCE

- Star Safety System: Vehicle Stability Ctrl, Traction Ctrl, ABS w/ Electronic Brake Force Distribution, Brake Assist & Smart Stop Technology
- Rear Backup Camera
- Manual Headlamp Level Control
- Trailer-Sway Control
- Dr & Fr Pass Advanced Airbag System
- Dr & Fr Pass Side & Knee Airbags
- Roll-Overing Curtain Airbags (ROSA)
- 3-Point Seatbelts for All Positions with Driver ELR & ALSEILER for All Passengers
- Tire Pressure Monitor System (TPMS)

EXTERIOR

- 6.1" Double-Walled Bed w/ Rail Caps
- Easy Lower and Lift Tailgate

INTERIOR

- 40/20/40 Split Fold-Down 4-Way Driver & 4-Way Passenger Adj Front Bench Seat
- Single Zone Air Conditioning
- Entune Audio (w/ App Suite/Data)
- 6.1" Touch Screen/Bluetooth/USB/AUX/CD
- Power Windows/Door Locks/Heated Mirrors
- Remote Keyless Entry System
- Cruise Control, Engine Immobilizer
- Full Tank of Gas

MANUFACTURER'S SUGGESTED RETAIL PRICE \$33,290.00

OPTIONAL EQUIPMENT

Code	Description	Price
FE	50 State Emissions	
TM	Heated Power Outside Tow Mirrors with Turn Signal Indicators and Manual-extended Feature	50.00
CT	All Weather Mats/Door Sill Protector	165.00

EPA DOT Fuel Economy and Environment

Fuel Economy

15 MPG combined city/hwy
13 city 17 highway
6.7 gallons per 100 miles

You spend \$6,500 more in fuel costs over 5 years compared to the average new vehicle..

Annual fuel cost \$3,500

Fuel Economy & Greenhouse Gas Rating (tailpipe only)

Smog Rating (tailpipe only)

3 Best 10 Worst

5 Best 10 Worst

Smartphone QR Code

fuelconomy.gov

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 24 MPG and costs \$11,000 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at 12.5¢ per gallon. MPGe is miles per gallon gasoline equivalent. Vehicle emissions are a significant cause of climate change and smog.

Monroney Label Photograph

DELIVERY PROCESSING AND HANDLING FEE 1,100.00

TOTAL \$34,695.00

Dealer Name / Address: MILHAM TOYOTA 3840 HECKTOWN ROAD EASTON PA18045

Ship to:

ToyotaCare, which covers normal factory scheduled maintenance for two years or 25,000 miles. Dealer service fees are included as part of the dealer price of the vehicle for qualifying buyers. See dealer's website for additional details.

APPENDIX B
DUMMY RESPONSE DATA TRACES

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Figure No. 3.	Driver Head Z Acceleration vs. Time	B-1
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Figure No. 16.	Driver Nij (NCE) vs. Time	B-5
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Figure No. 27.	Passenger Chest Resultant Z Acceleration vs. Time	B-9

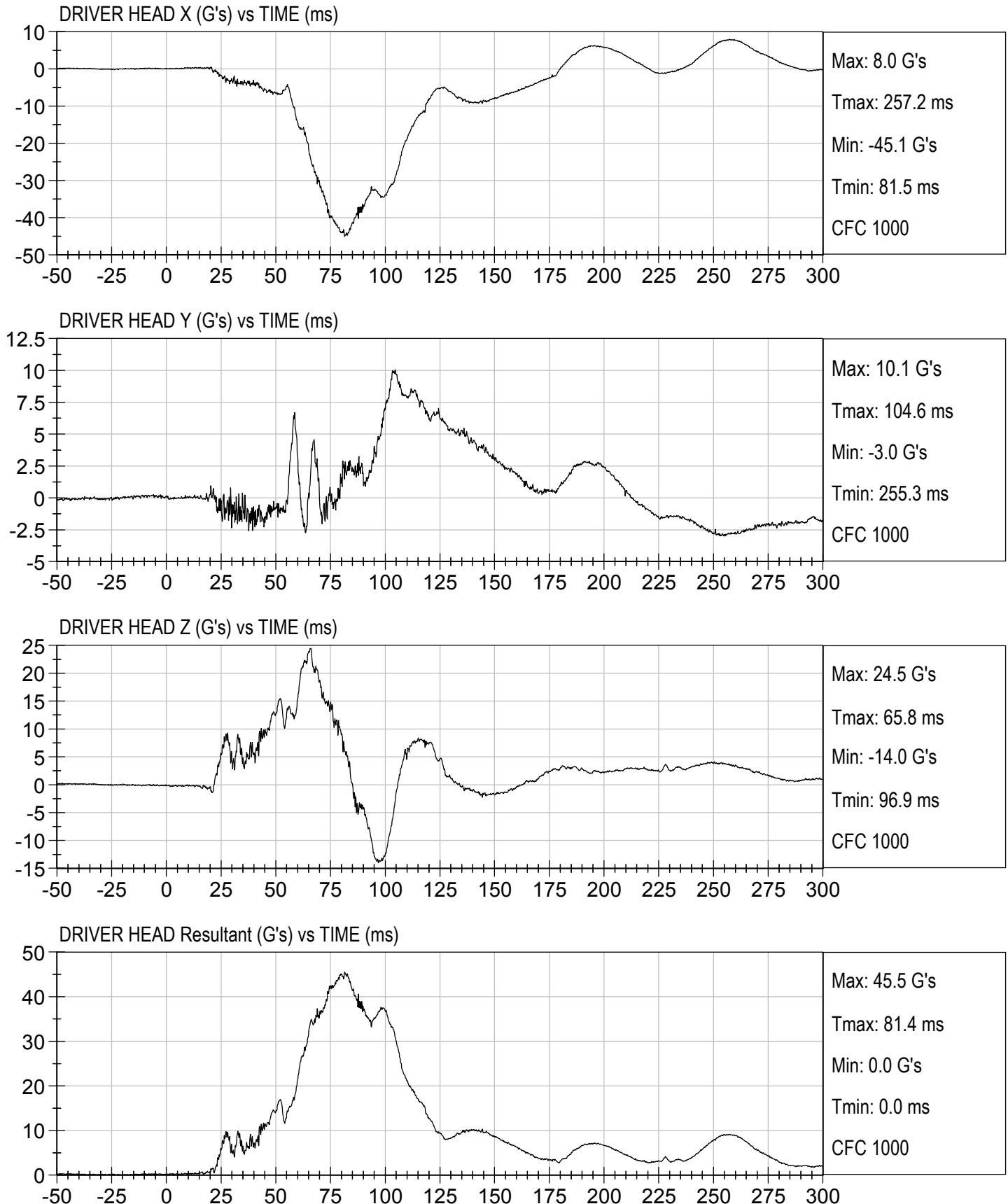
	<u>Page No.</u>
Figure No. 28. Passenger Neck Force X vs. Time	B-10
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Figure No. 31. Passenger Nij (NTF) vs. Time	B-11
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Figure No. 35. Passenger Left Femur Force vs. Time	B-12
Figure No. 36. Passenger Right Femur Force vs. Time	B-12

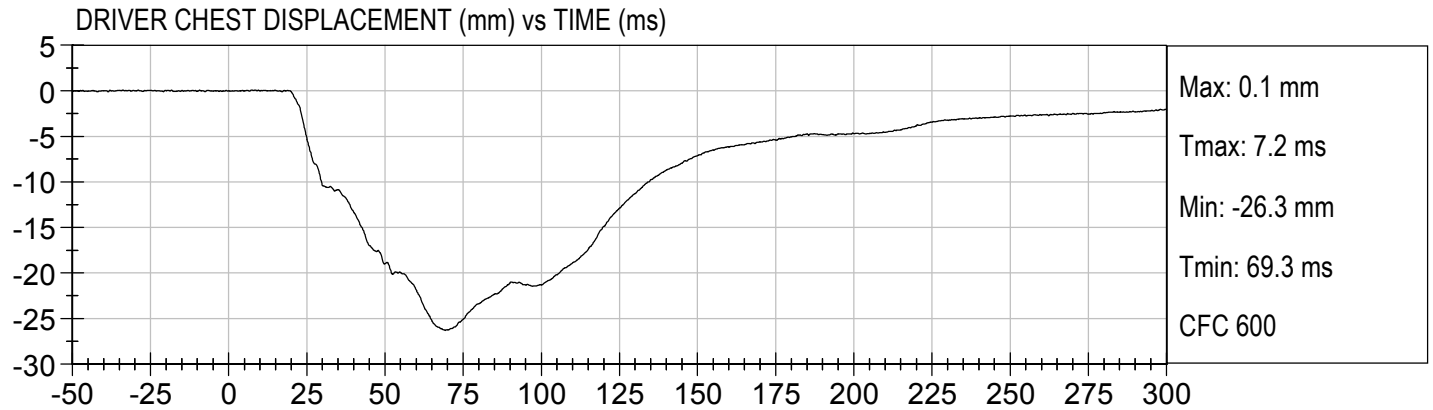
The following additional dummy and vehicle response data can be found in the R&D section of the NHTSA website at www.nhtsa.dot.gov

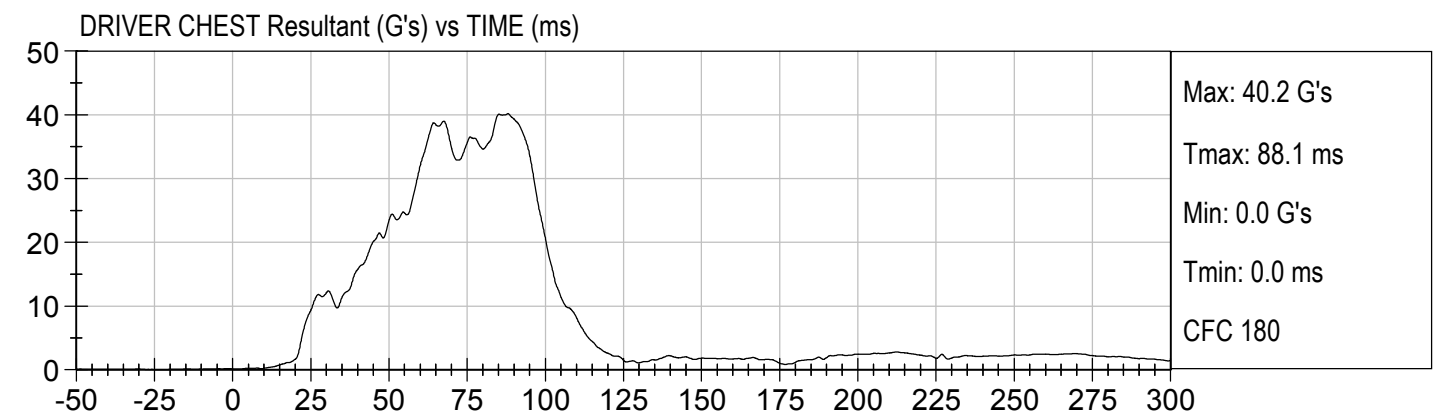
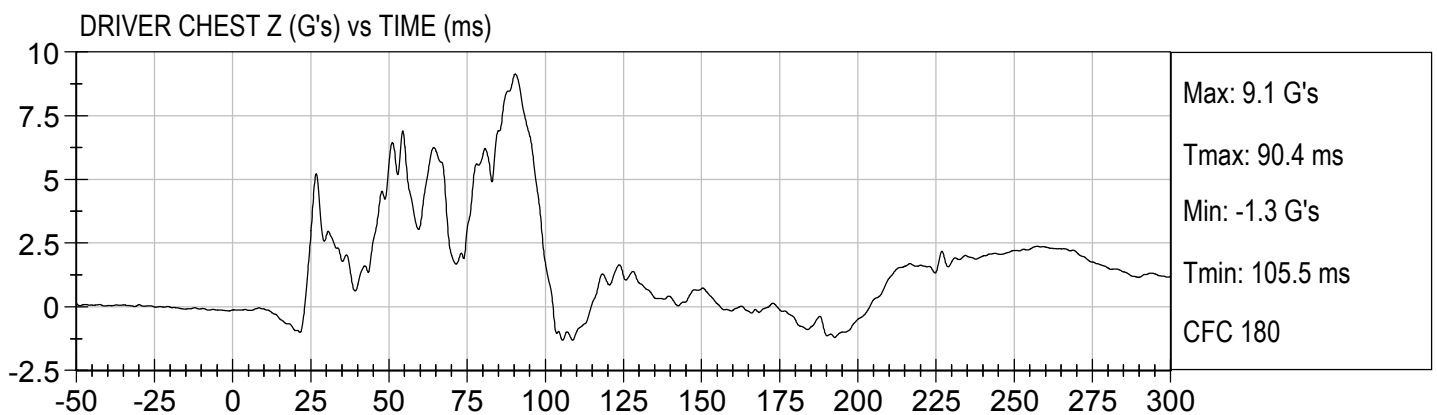
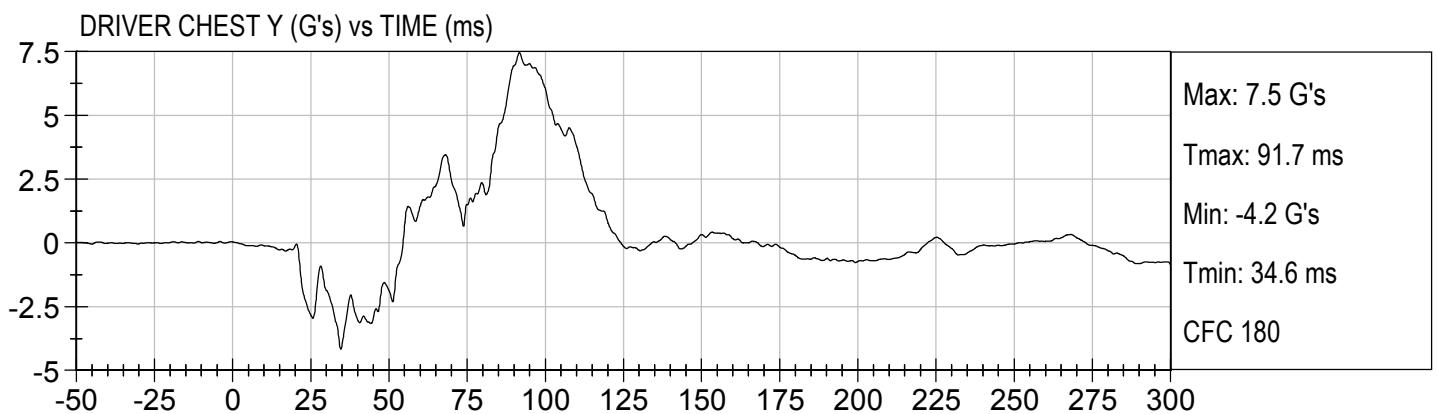
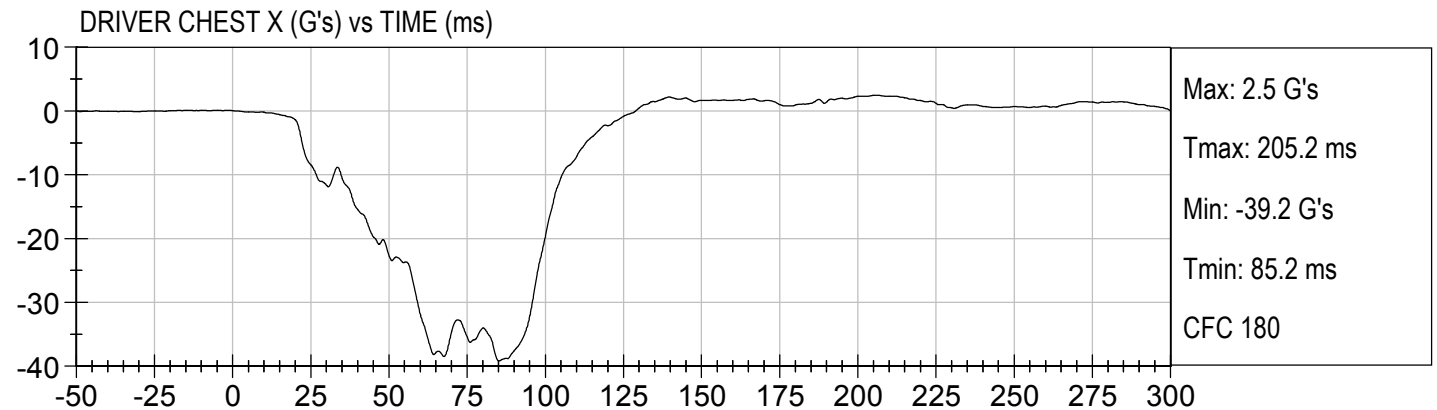
Driver Head X Redundant
 Driver Head Y Redundant
 Driver Head Z Redundant
 Driver Upper Neck Force Y
 Driver Upper Neck Moment X
 Driver Upper Neck Moment Z
 Driver Chest X Redundant
 Driver Chest Y Redundant
 Driver Chest Z Redundant
 Driver Pelvis X
 Driver Pelvis Y
 Driver Pelvis Z
 Driver Left Femur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

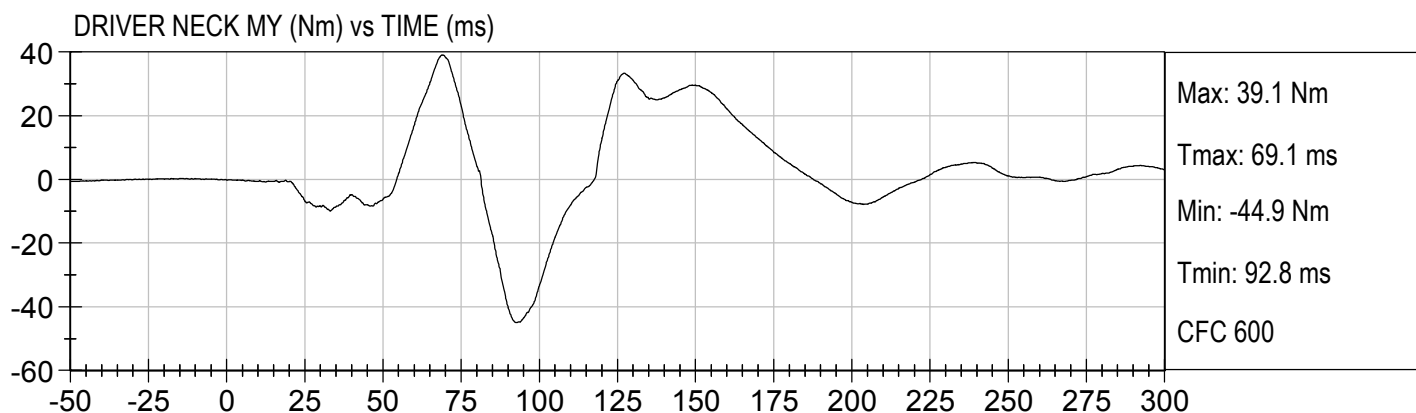
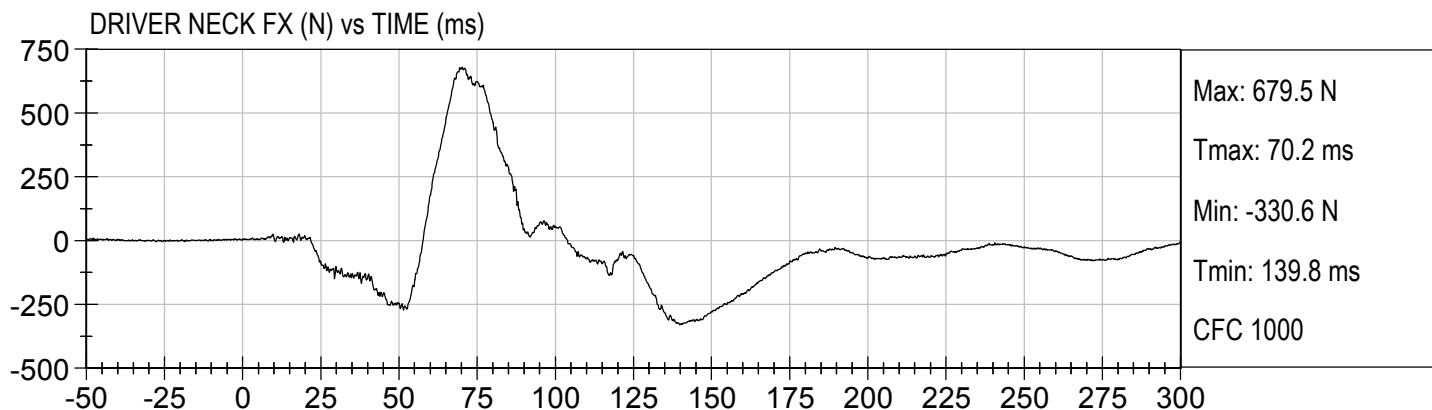
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Driver Left Lower Tibia Force Z
Driver Right Upper Tibia Moment X
Driver Right Upper Tibia Moment Y
Driver Right Upper Tibia Force Z
Driver Right Lower Tibia Moment X
Driver Right Lower Tibia Moment Y
Driver Right Lower Tibia Force Z
Driver Left Foot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

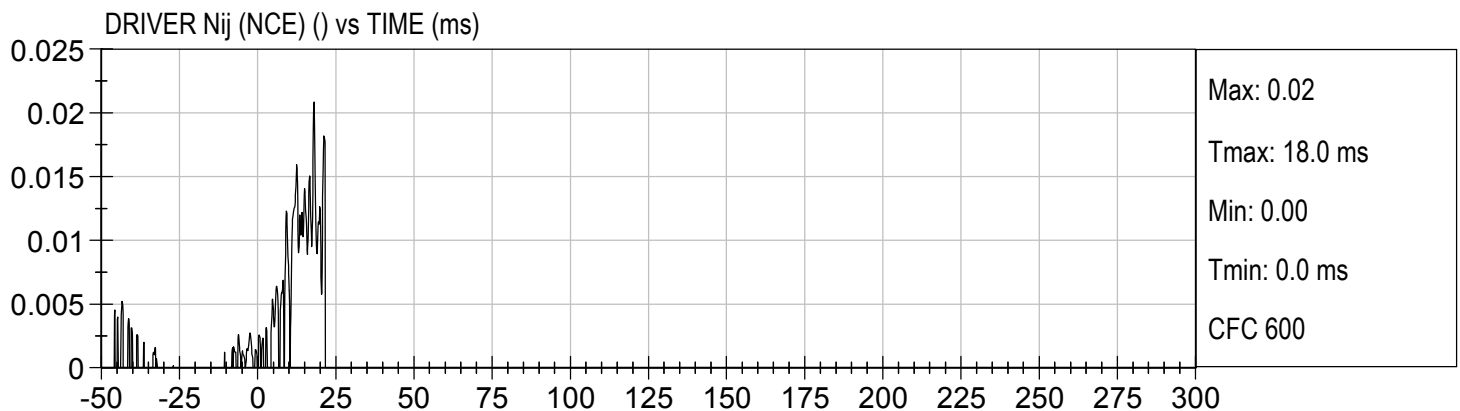
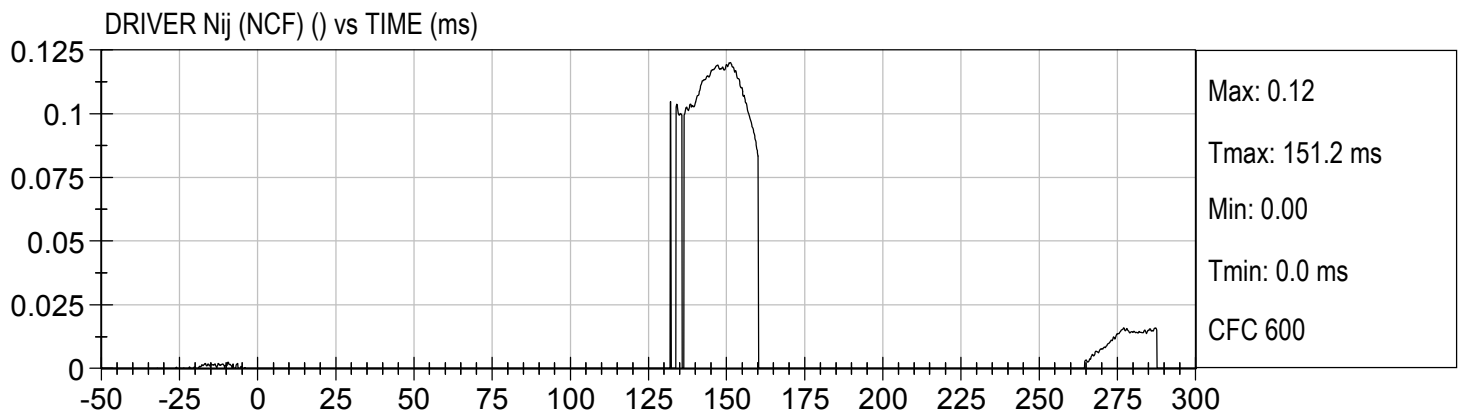
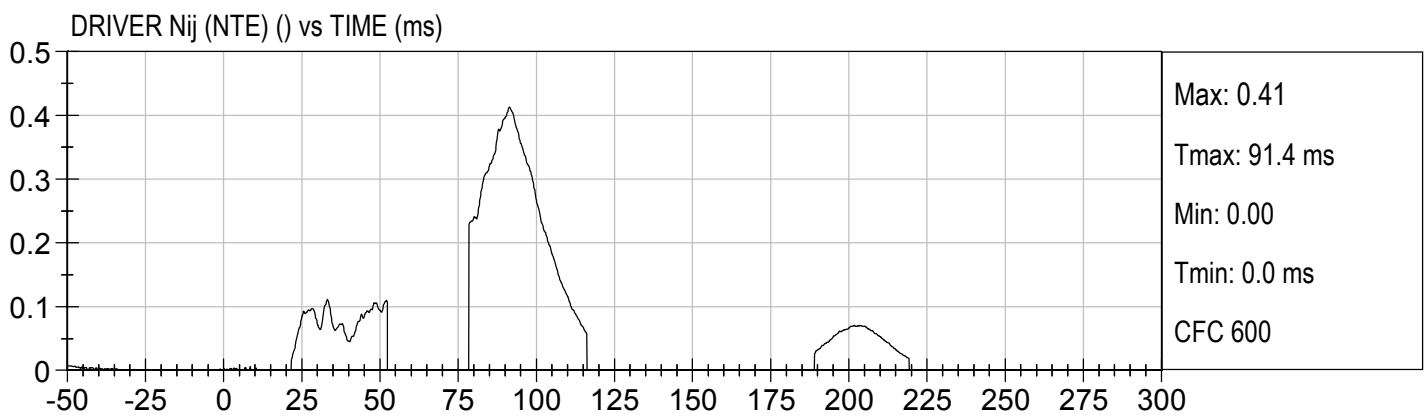
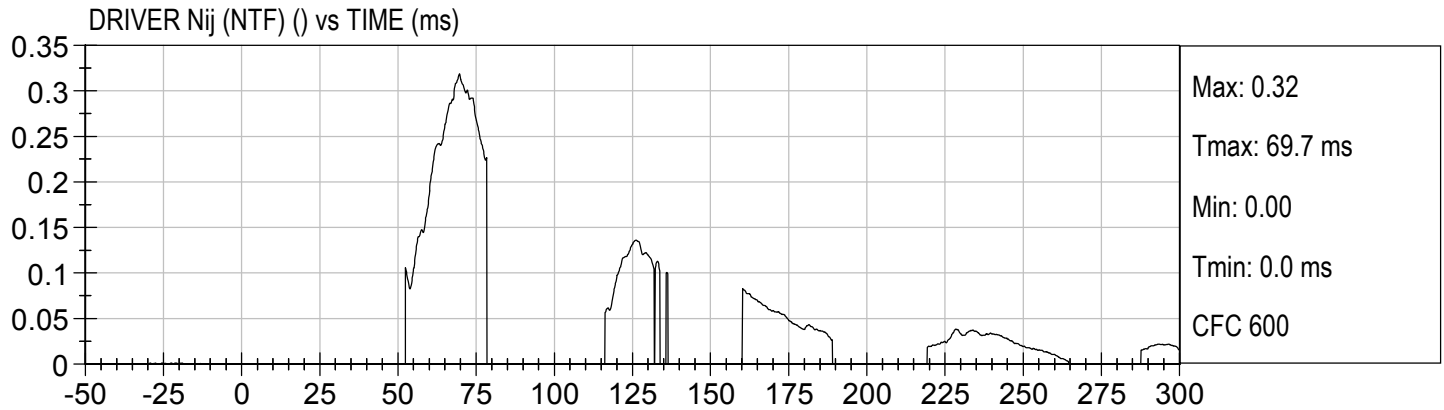
Passenger Left Upper Tibia Moment Y
Passenger Left Upper Tibia Force Z
Passenger Left Lower Tibia Moment X
Passenger Left Lower Tibia Moment Y
Passenger Left Lower Tibia Force Z
Passenger Right Upper Tibia Moment X
Passenger Right Upper Tibia Moment Y
Passenger Right Upper Tibia Force Z
Passenger Right Lower Tibia Moment X
Passenger Right Lower Tibia Moment Y
Passenger Right Lower Tibia Force Z
Passenger Left Foot Fore Z
Passenger Left Foot Aft X
Passenger Left Foot Aft Z
Passenger Right Foot Fore Z
Passenger Right Foot Aft X
Passenger Right Foot Aft Z
Passenger Lap Belt Force
Passenger Shoulder Belt Force
Left Rear Seat Crossmember X
Right Rear Seat Crossmember X
Vehicle Engine Top X
Vehicle Engine Bottom X
Left Rear Seat Crossmember Z
Right Rear Seat Crossmember Z
Left Rear Seat Crossmember Xr
Right Rear Seat Crossmember Xr
Advanced Research Load Cell Barrier – 528 channels

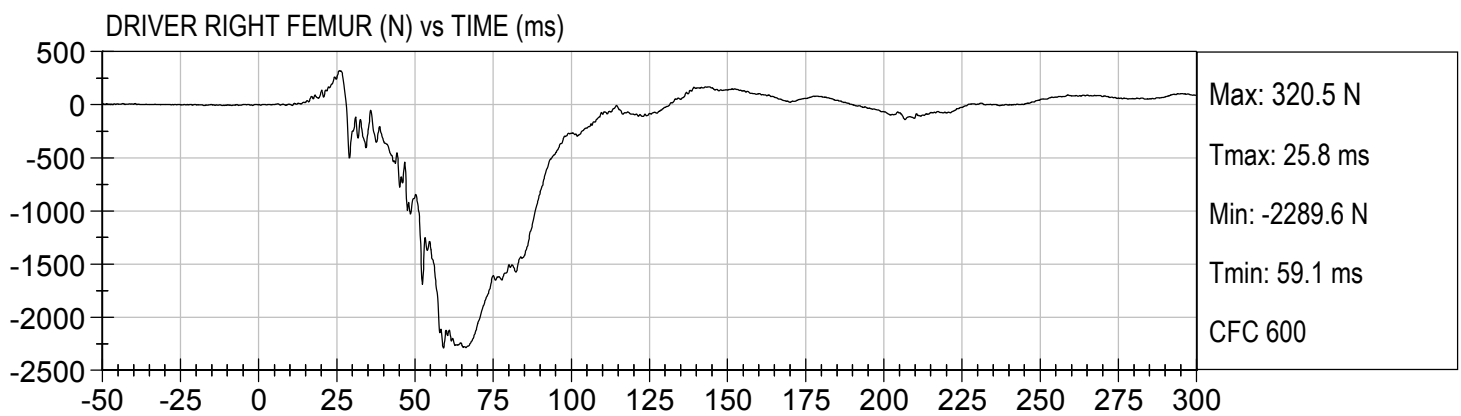
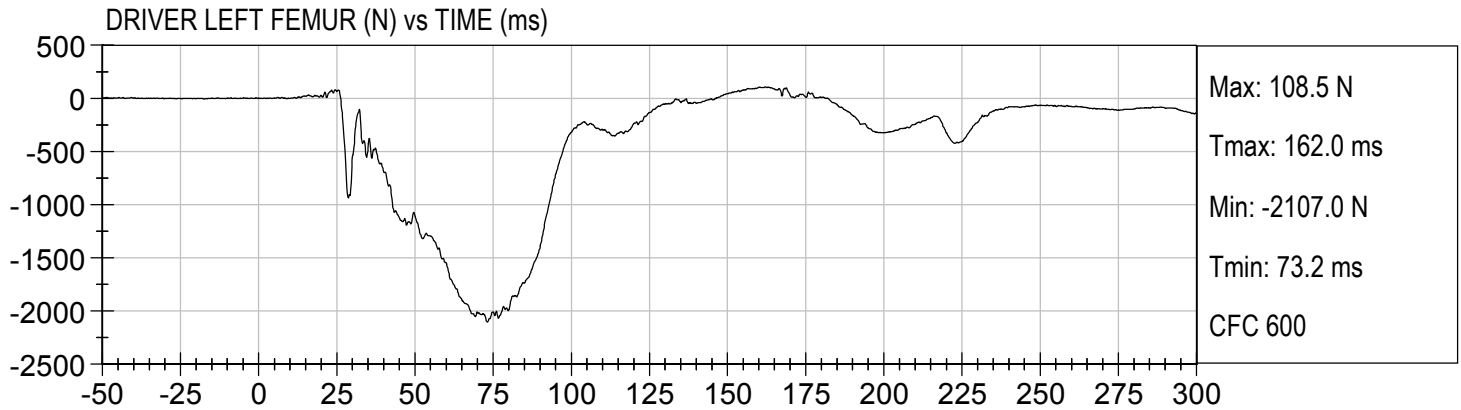


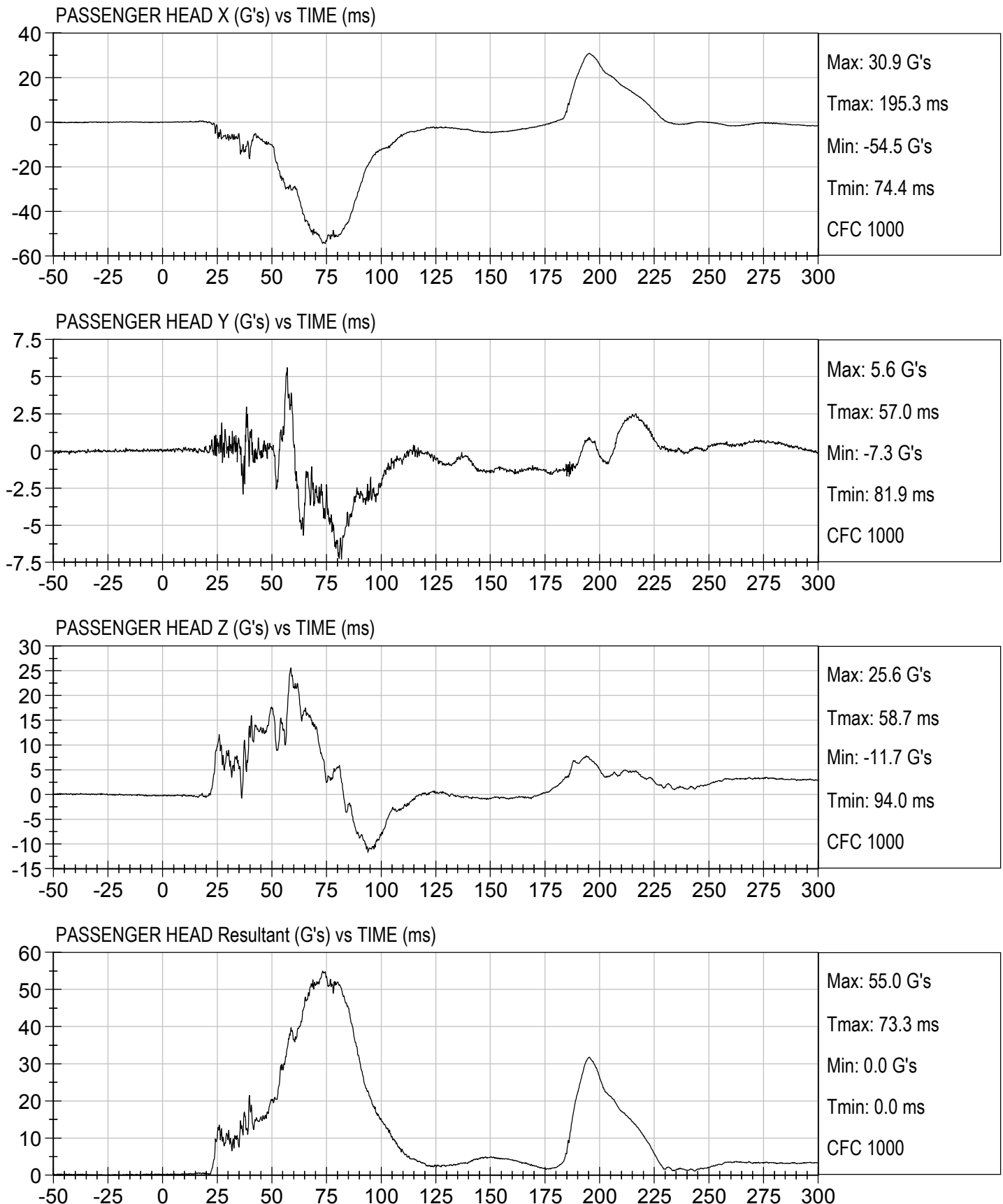


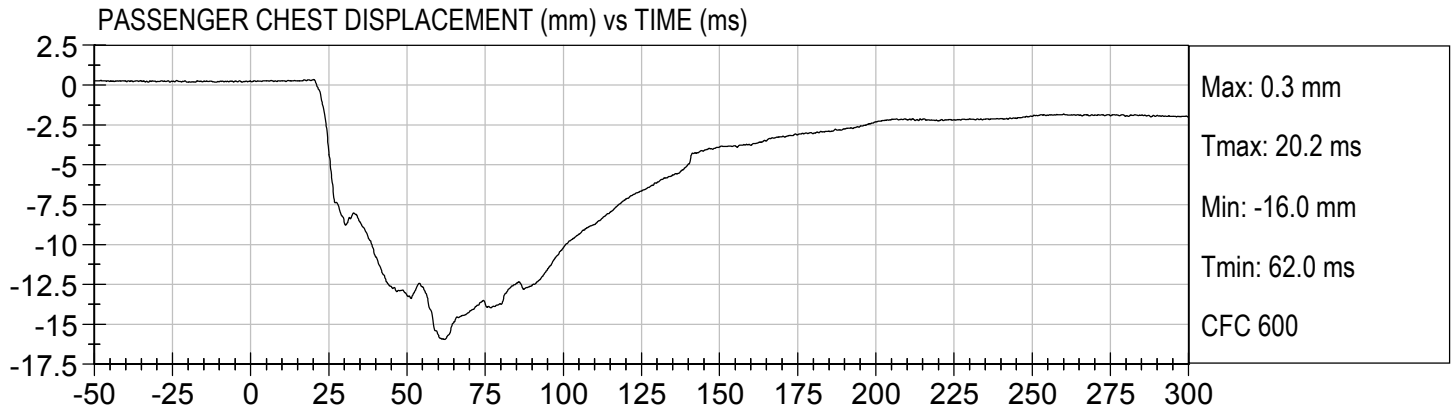


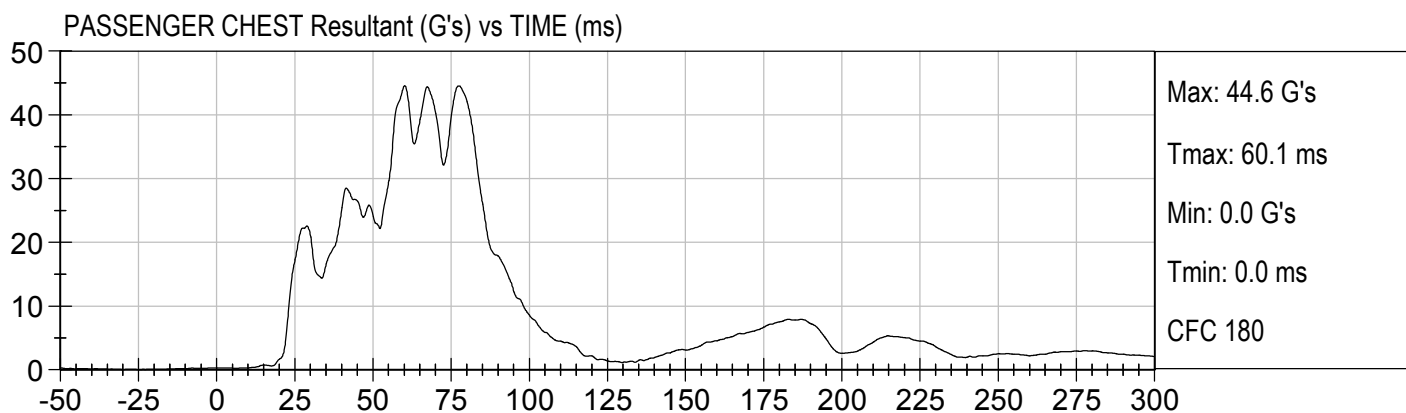
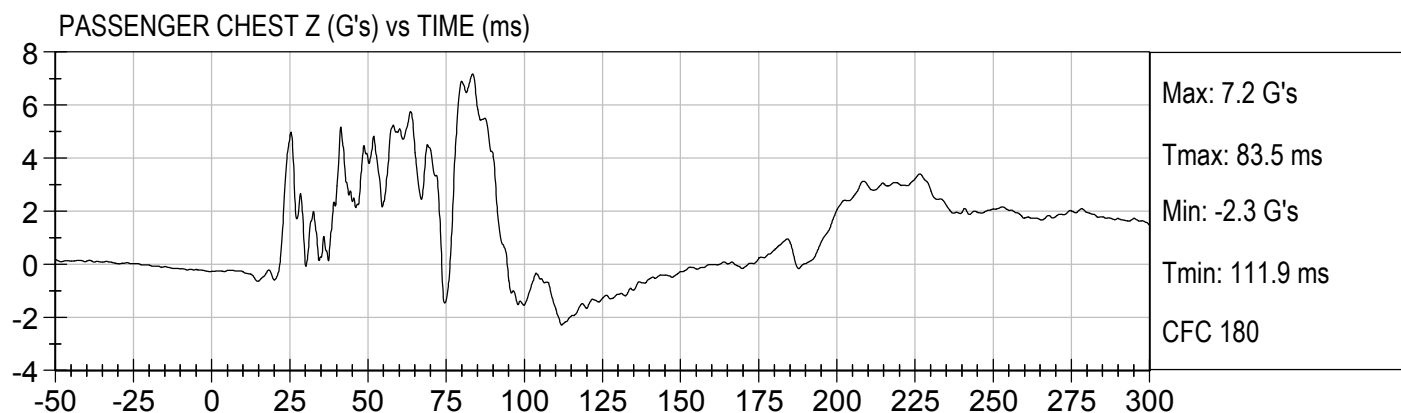
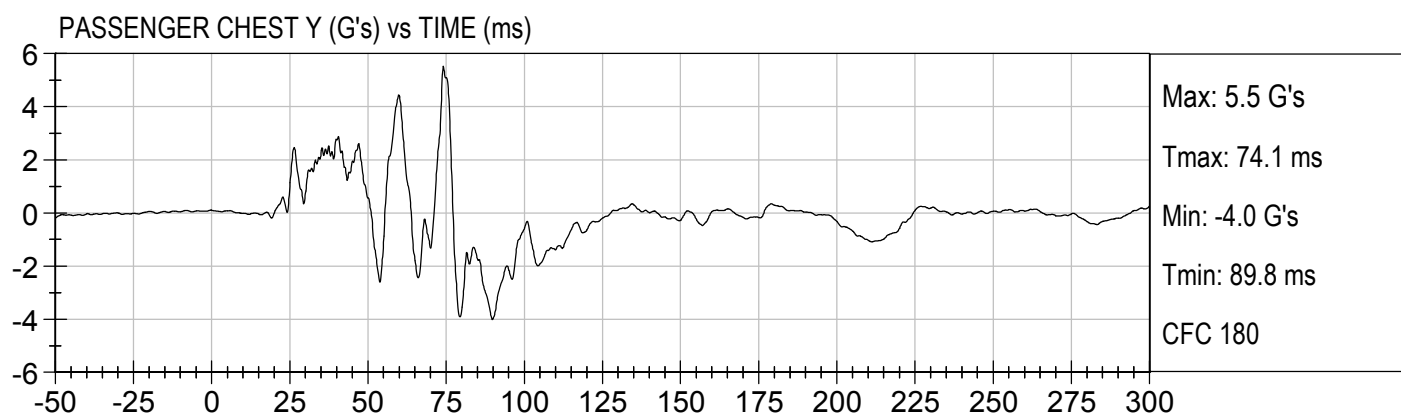
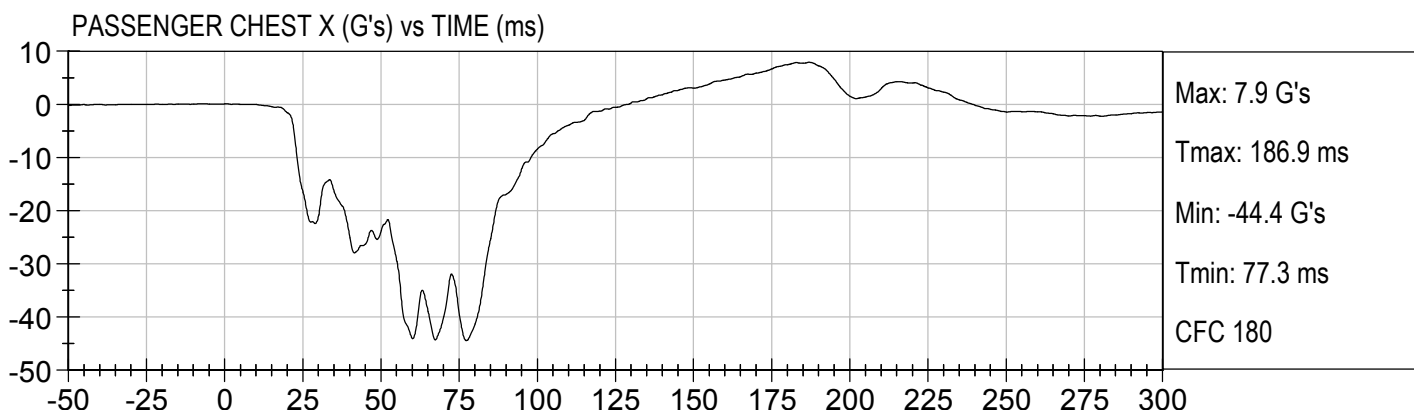


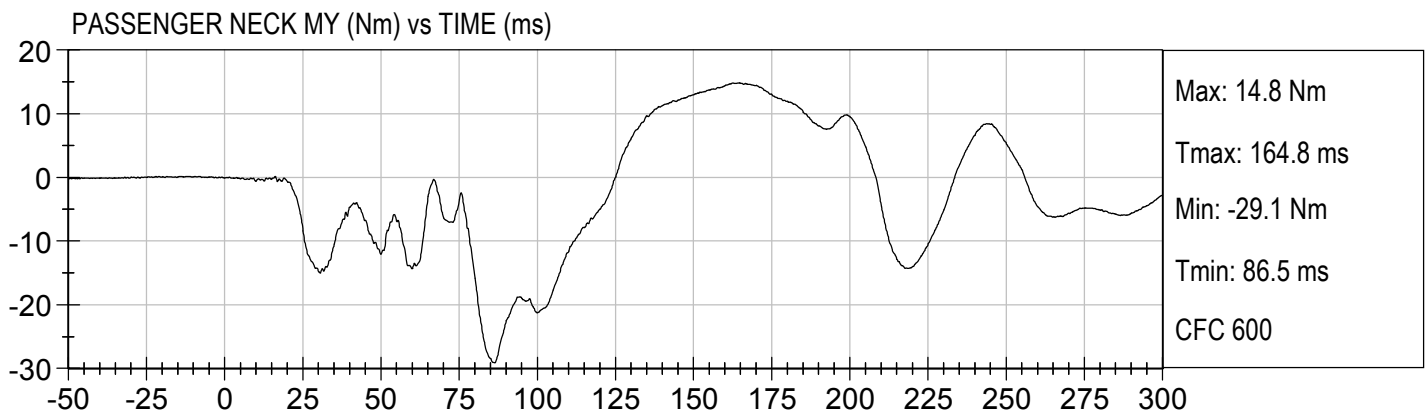
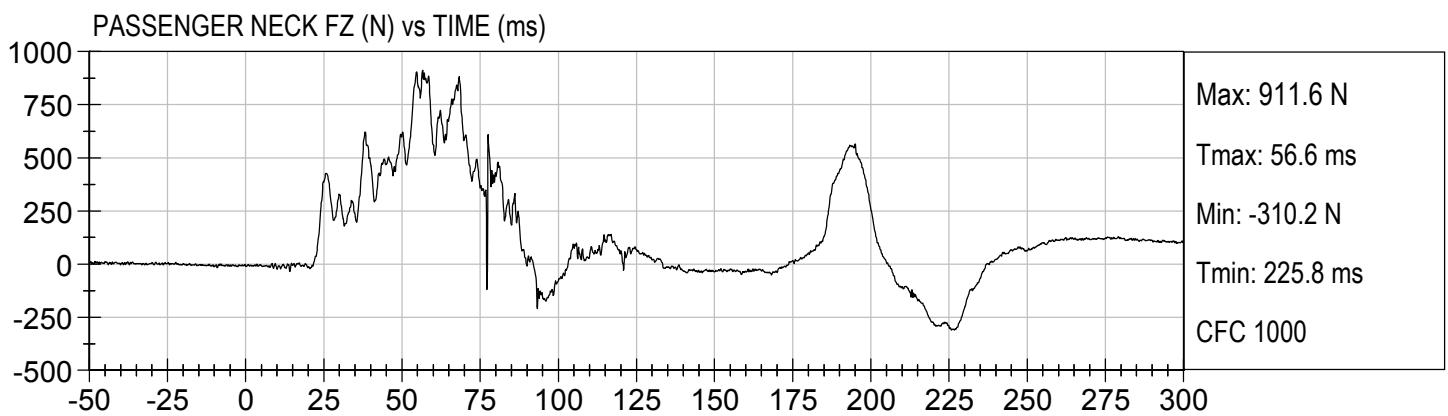
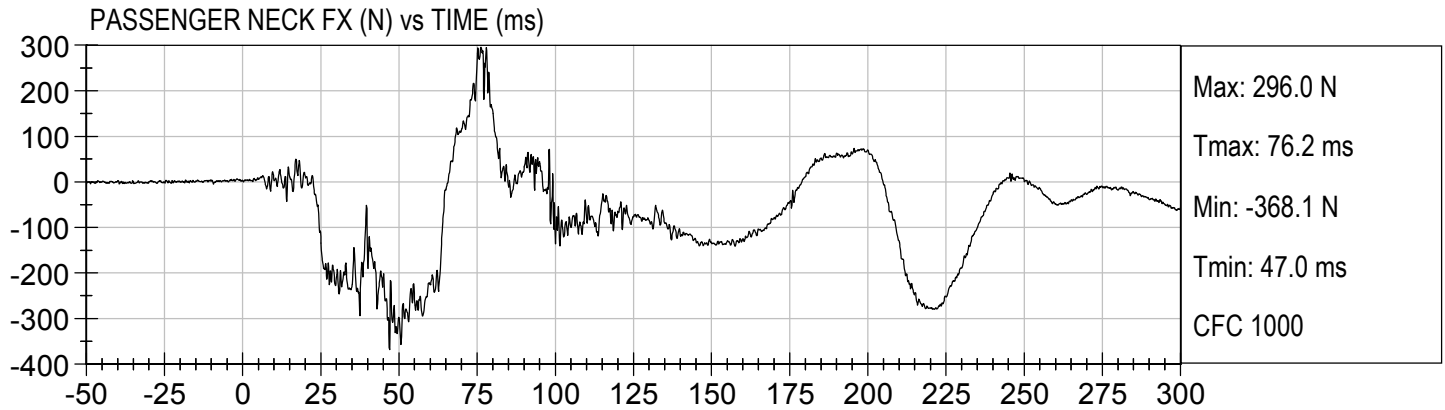


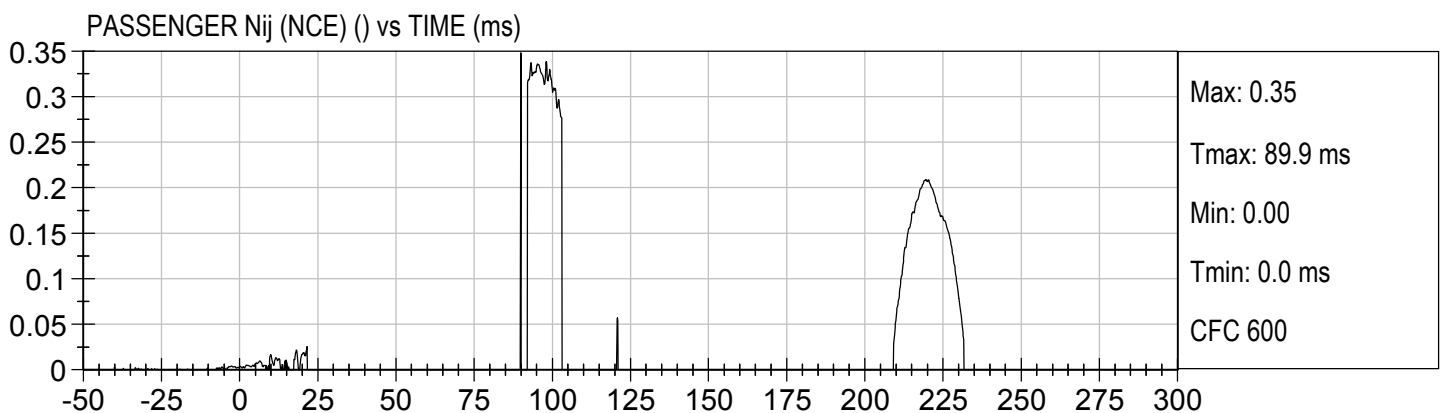
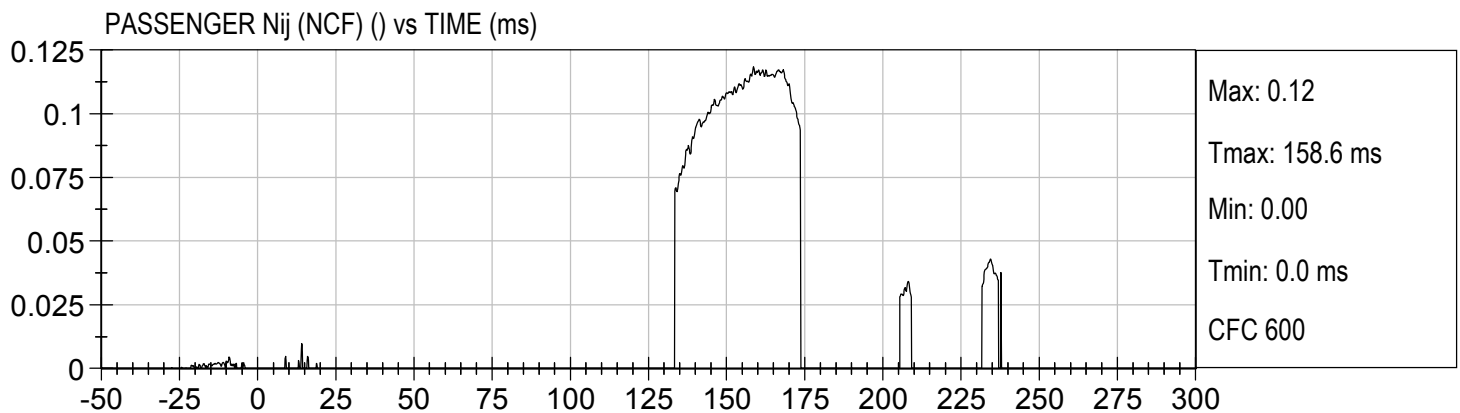
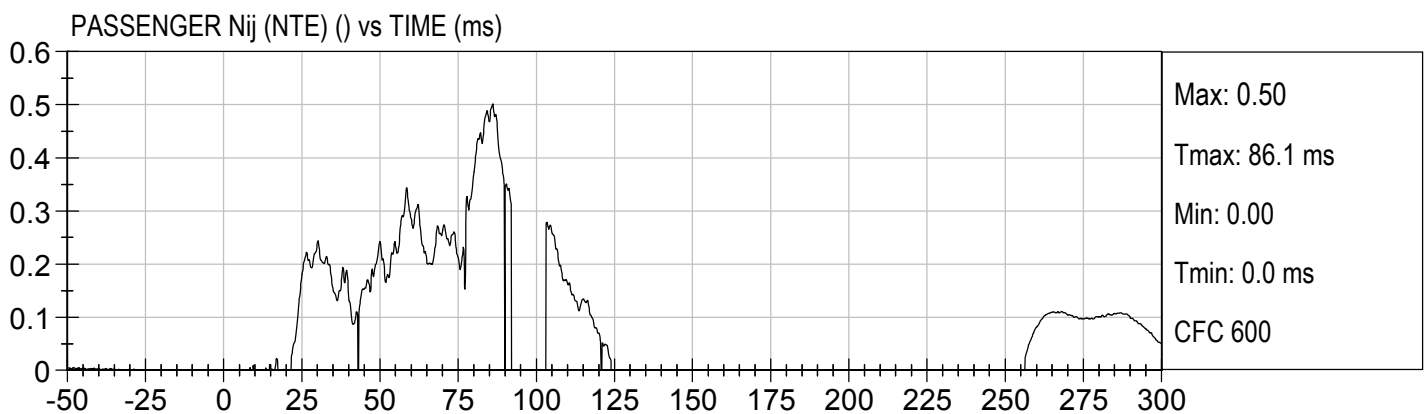
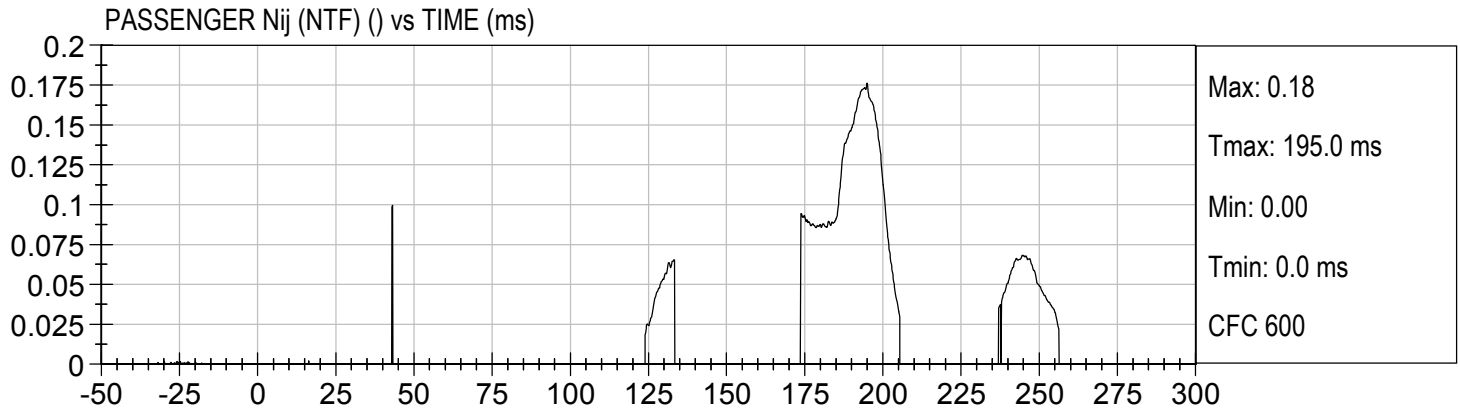


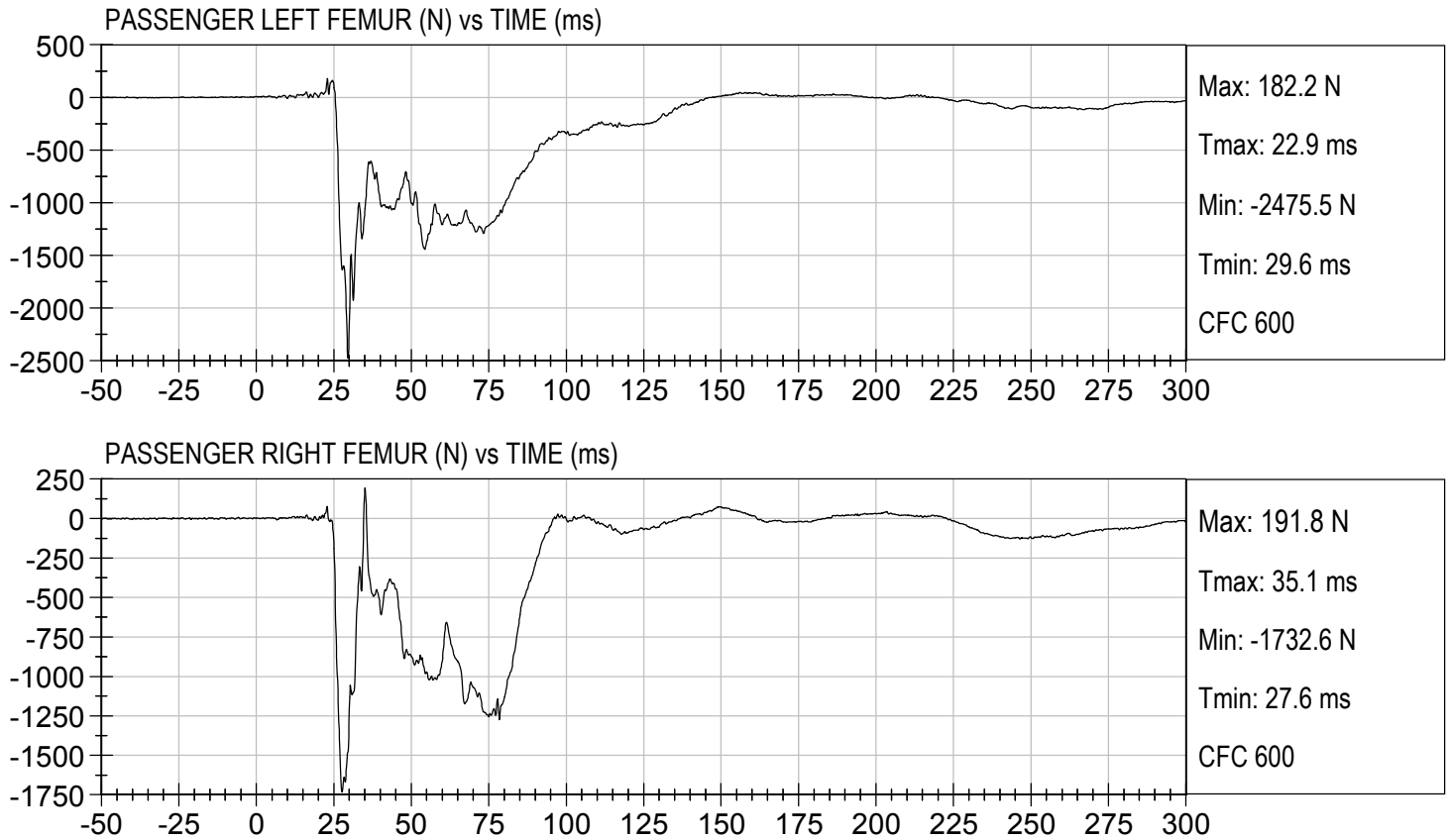












APPENDIX C
DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

Hybrid III, 50th External Measurements
SN: 351

HYBRID III, PART 572, SUBPART E EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (inches)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	34.6–35.0	34.8
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	19.9-20.5	20.0
C	H-POINT HEIGHT	Reference	3.3-3.5	3.4
D	H-POINT LOCATION FROM BACKLINE	Reference	5.3-5.5	5.5
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	3.3-3.7	3.5
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	5.5-6.1	6.0
G	BACK OF ELBOW TO WRIST PIVOT	back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	11.4-12.0	11.8
H	HEAD BACK TO BACKLINE	Back of Skull cap skin to seat rear vertical surface (Reference)	1.6-1.8	1.7
I	SHOULDER TO- ELBOW LENGTH	Measure from the highest point on top of the shoulder clevis to the lowest part of the flesh on the elbow in line with the elbow pivot bolt.	13.0-13.6	13.3
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	7.5-8.3	7.8
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	22.8-23.8	23.8
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	16.9-17.9	17.0
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	19.1-19.7	19.5
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	17.8-18.8	18.8

HYBRID III, SUBPART E EXTERIOR DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS		ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 16.9-17.1 in. above seat surface	8.4-9.0	8.5
P	FOOT LENGTH	Tip of toe to rear of heel	9.9-10.5	10.3
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	16.3-17.2	16.5
W	FOOT BREADTH	The widest part of the foot	3.6-4.2	4.0
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 16.9-17.1 in. above seat surface	38.2-39.4	39.2
Z	WAIST CIRCUMFERENCE	Measured 8.9-9.1 in. above seat surface	32.9-34.1	33.7
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	16.9-17.1	17.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	8.9-9.1	9.0

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

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

ATD Serial No: 351

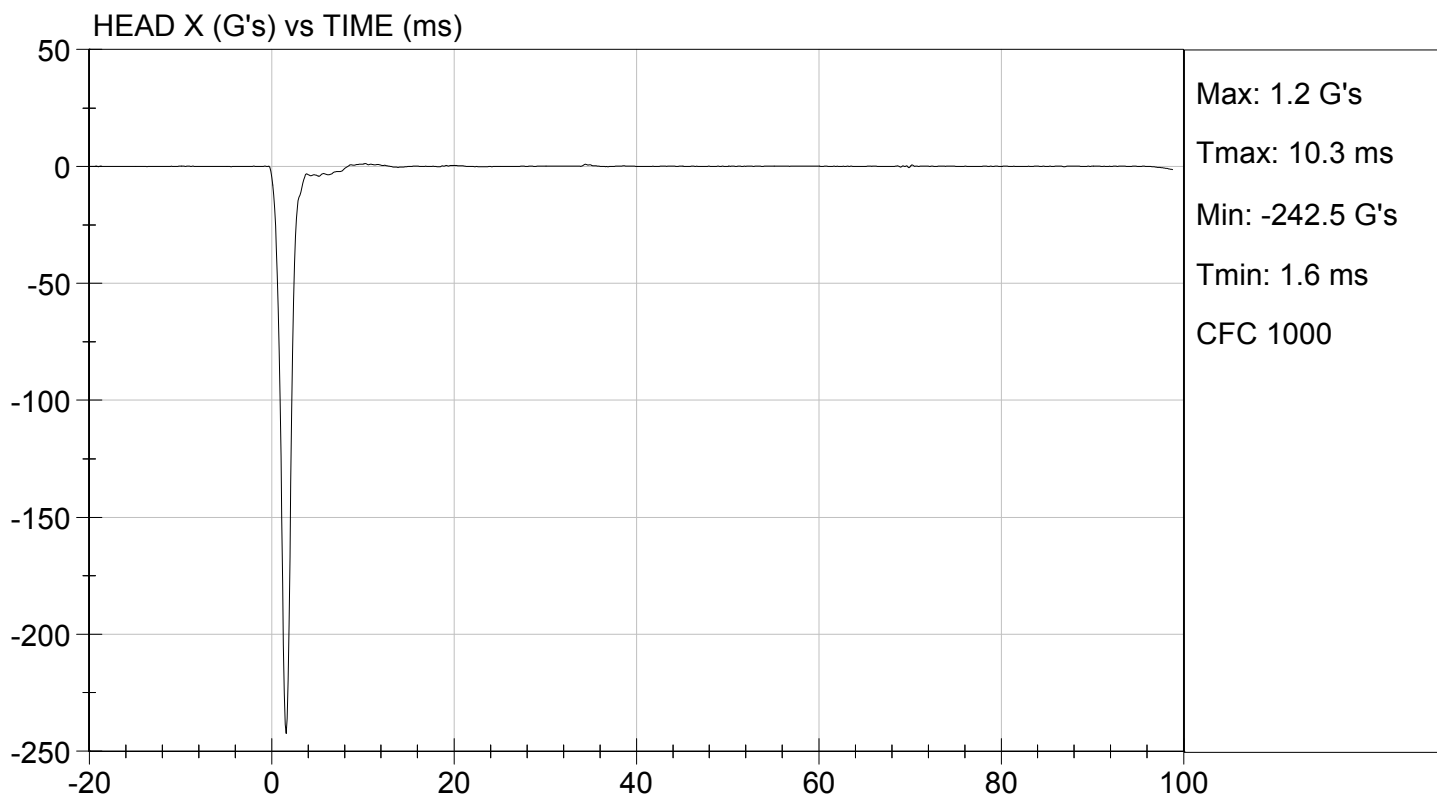
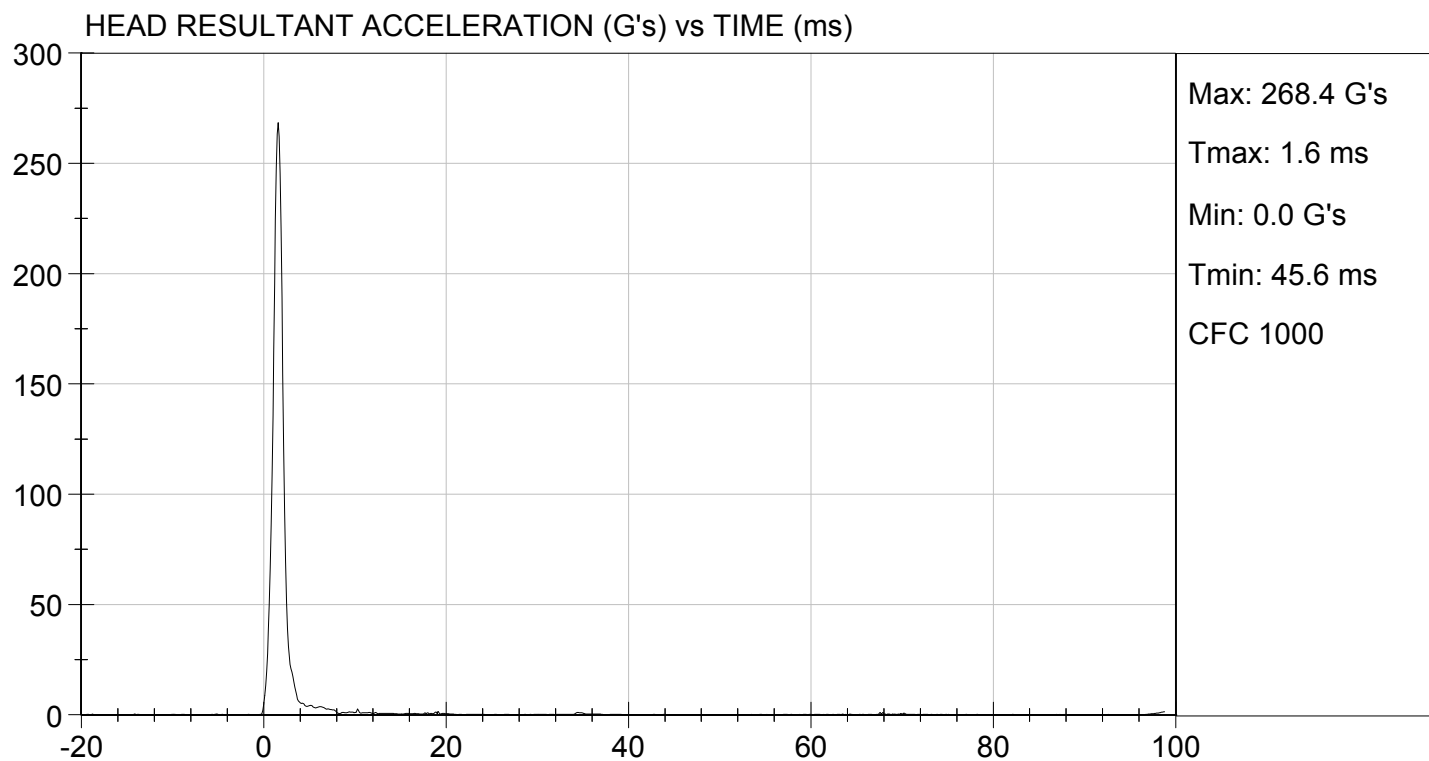
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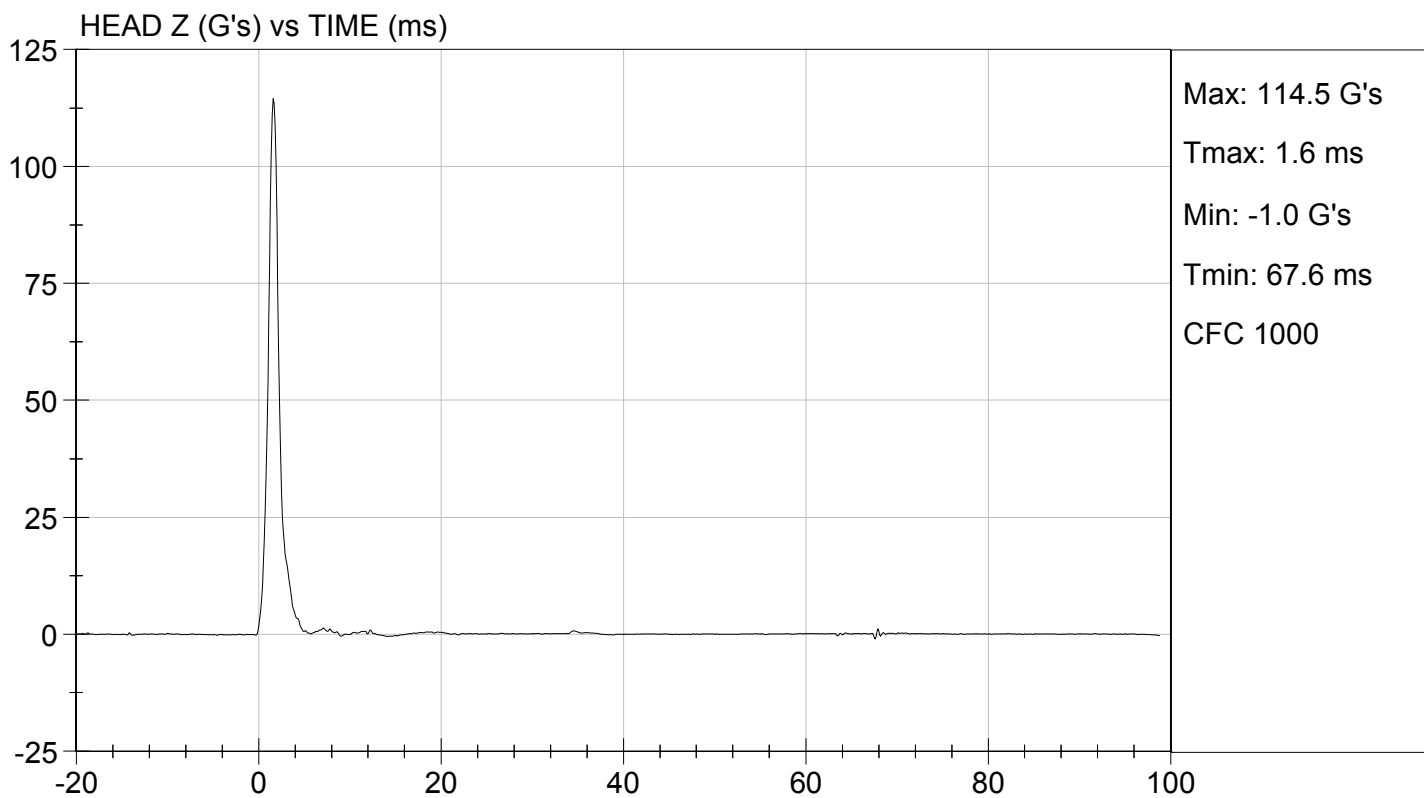
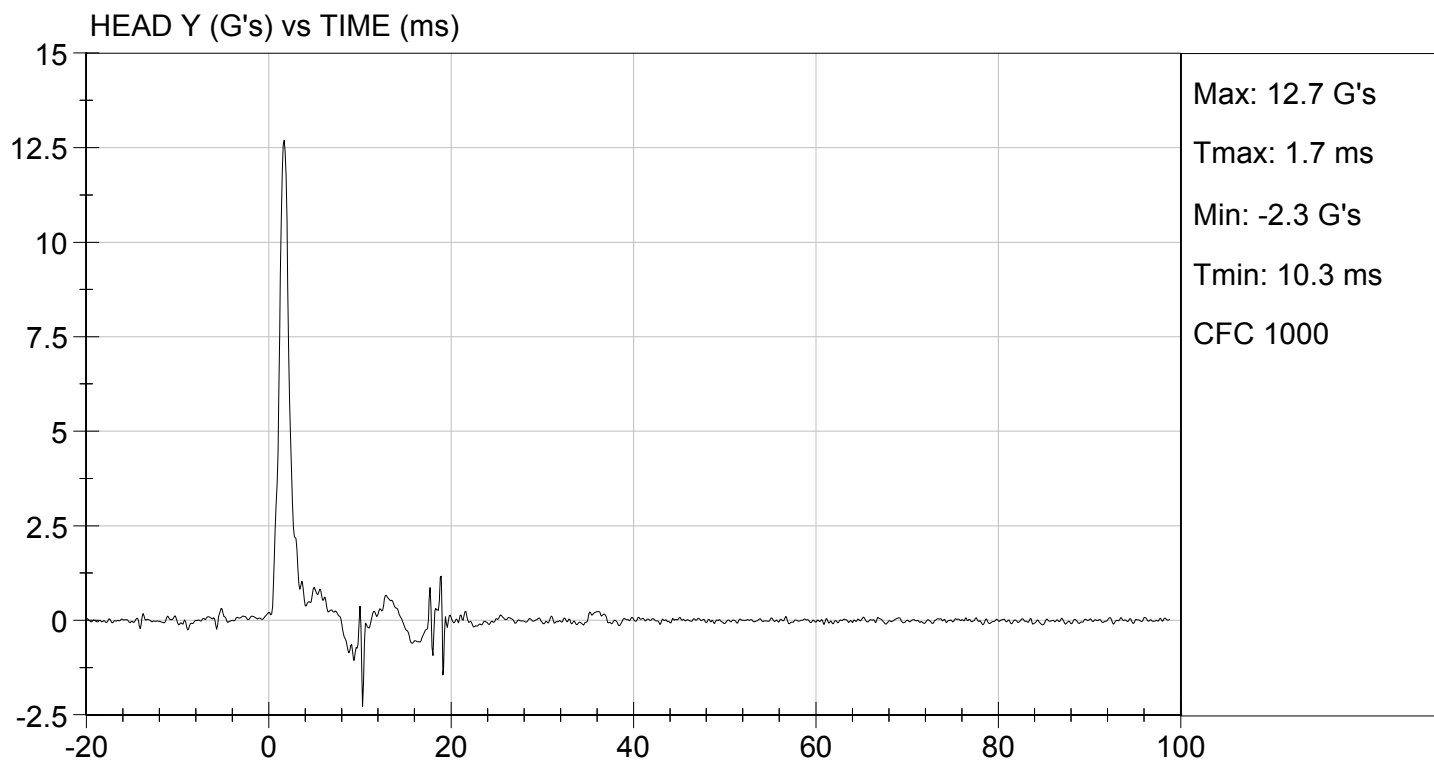
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	16	Pass
Peak Resultant Acceleration	G's	225 to 275	268	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	12.7	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

Maxime Chamberland
Laboratory Technician

12/01/2014
Test Date

Jessica Hall
Approved By





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

ATD Serial No: 351

Test I.D: D144232

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity		%	10 to 70	16	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.96	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	24.51	Pass
	20 ms	G's	17.60 to 22.60	18.87	Pass
	30 ms	G's	12.50 to 18.50	12.79	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	13.0	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	35.8	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	68.0	Pass
	Time	ms	57.0 to 64.0	57.1	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	113.6	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	88.8	Pass
	Time	ms	47.0 to 58.0	52.2	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	103.2	Pass
Overall Test Results					Pass

Maxime Chamberland
Laboratory Technician

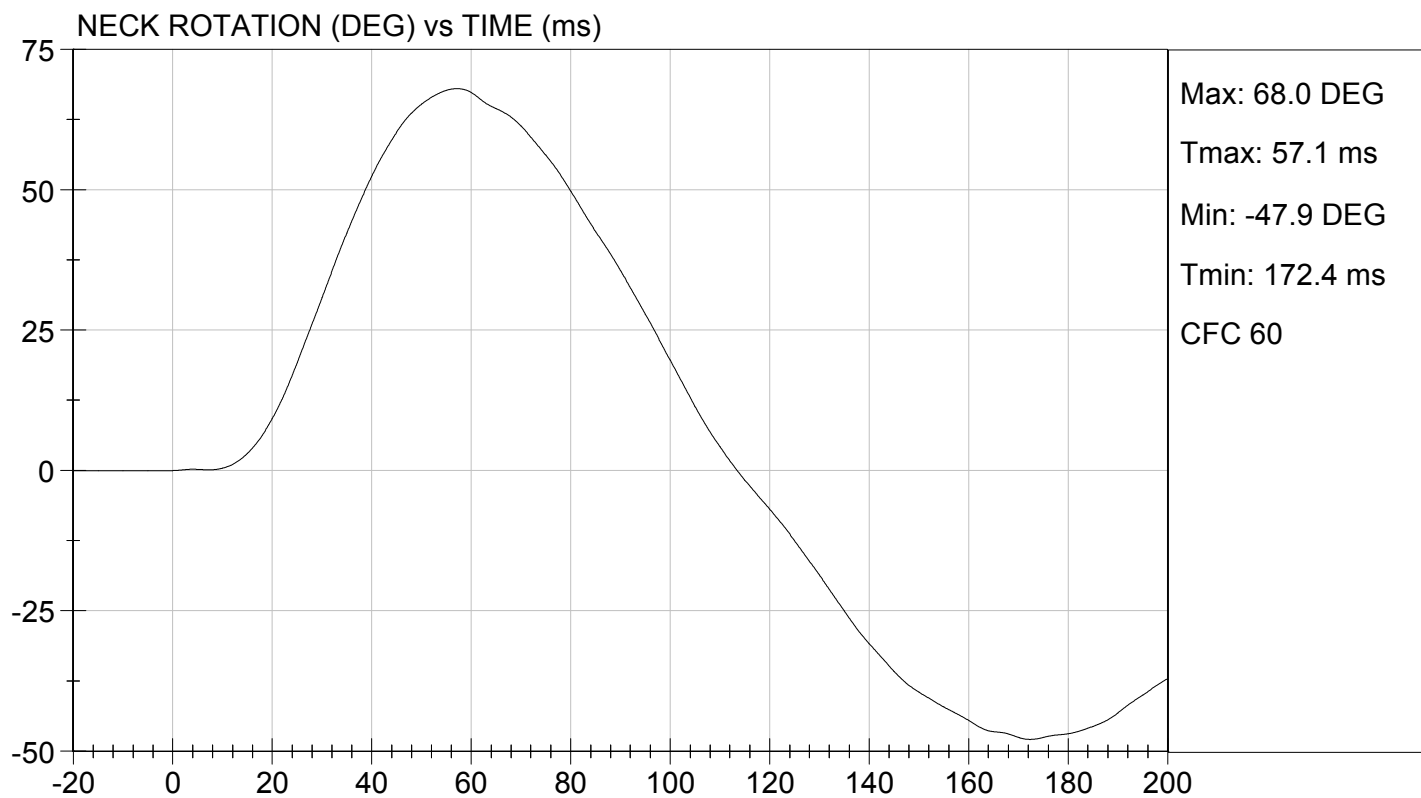
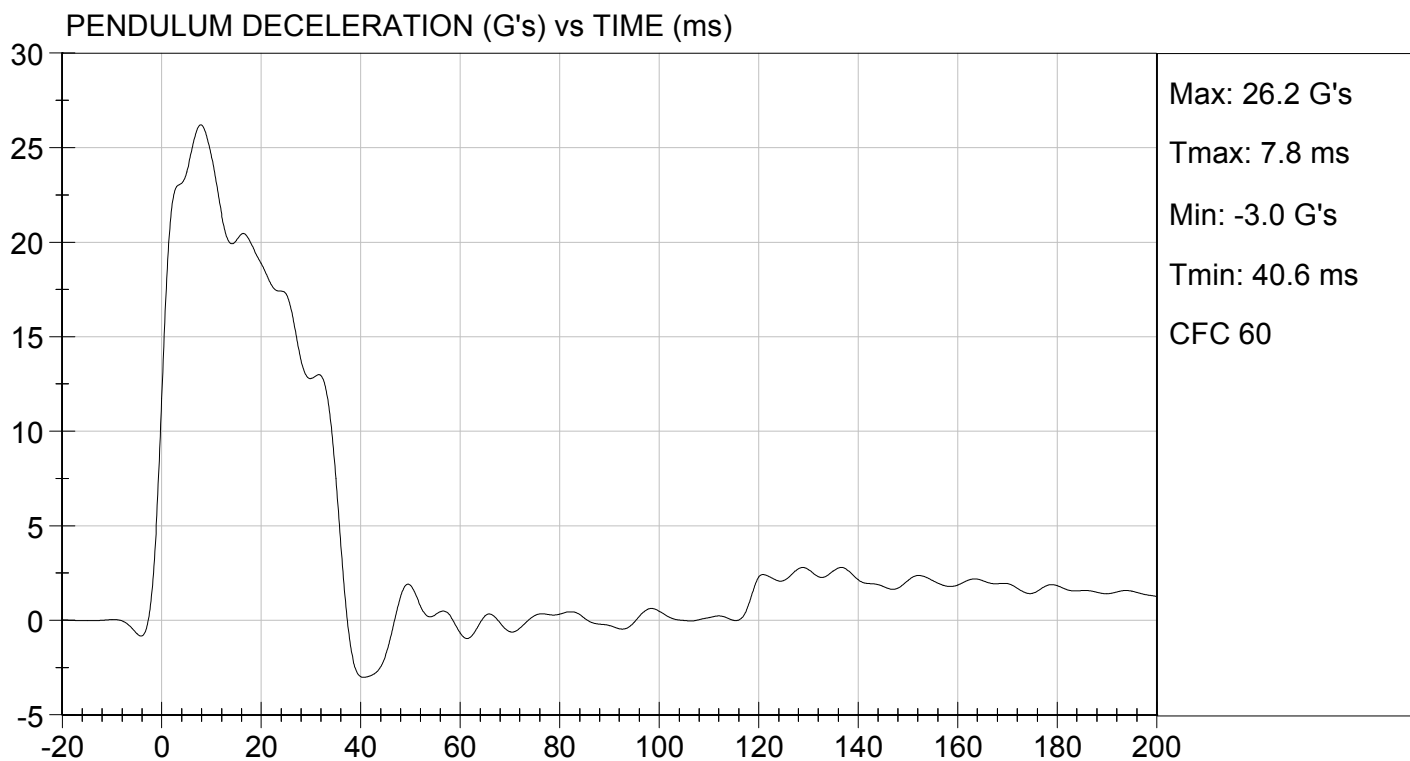
12/01/2014
Test Date

Jessica Hall
Approved By



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

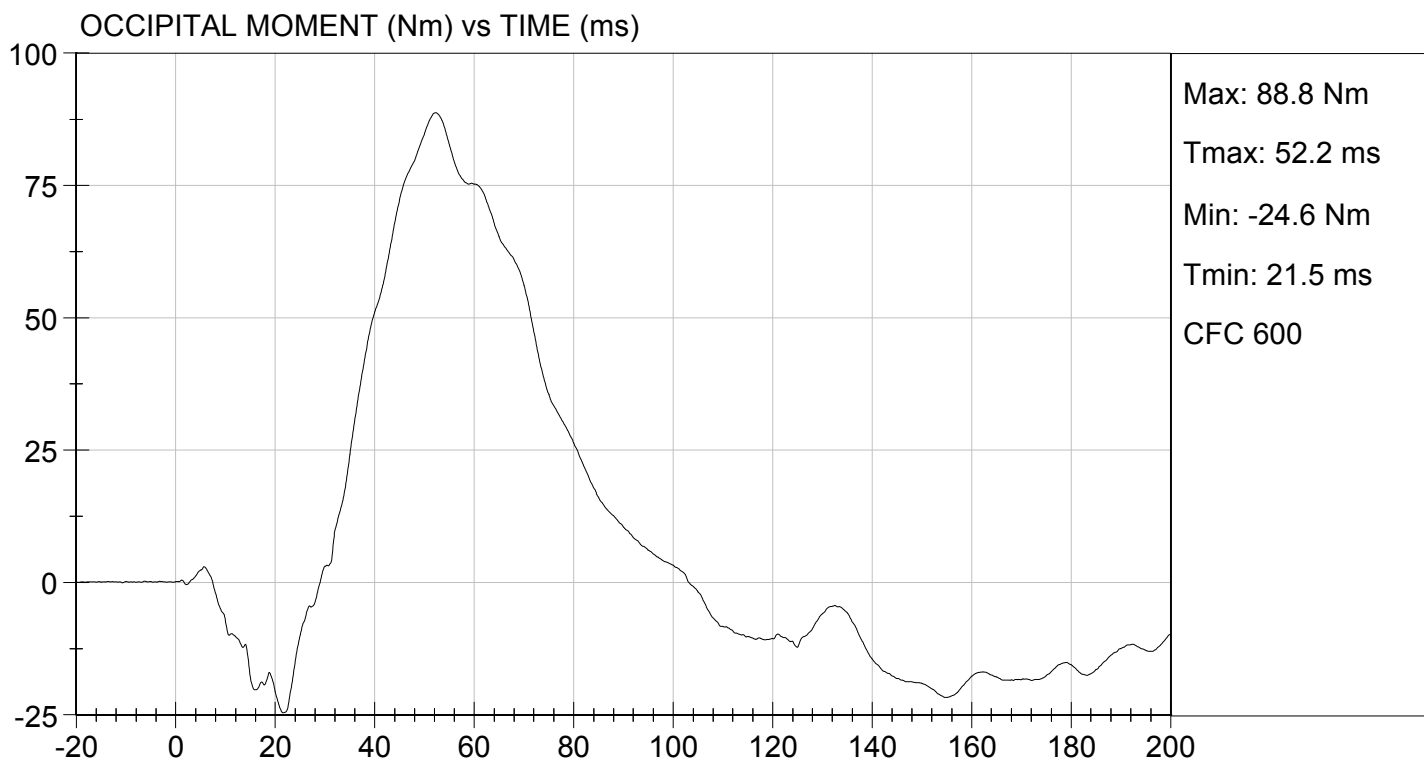
TEST DATE: 12/01/2014
TEST #: D144232





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

TEST DATE: 12/01/2014
TEST #: D144232



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

ATD Serial No: 351

Test I.D: D144233

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity		%	10 to 70	16	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	18.37	Pass
	20 ms	G's	14.00 to 19.00	16.21	Pass
	30 ms	G's	11.00 to 16.00	12.59	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	12.5	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	44.6	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	90.5	Pass
	Time	ms	72.0 to 82.0	78.9	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	157.1	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-54.2	Pass
	Time	ms	65.0 to 79.0	73.3	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	144.6	Pass
Overall Test Results					Pass

Maxime Chamberland
Laboratory Technician

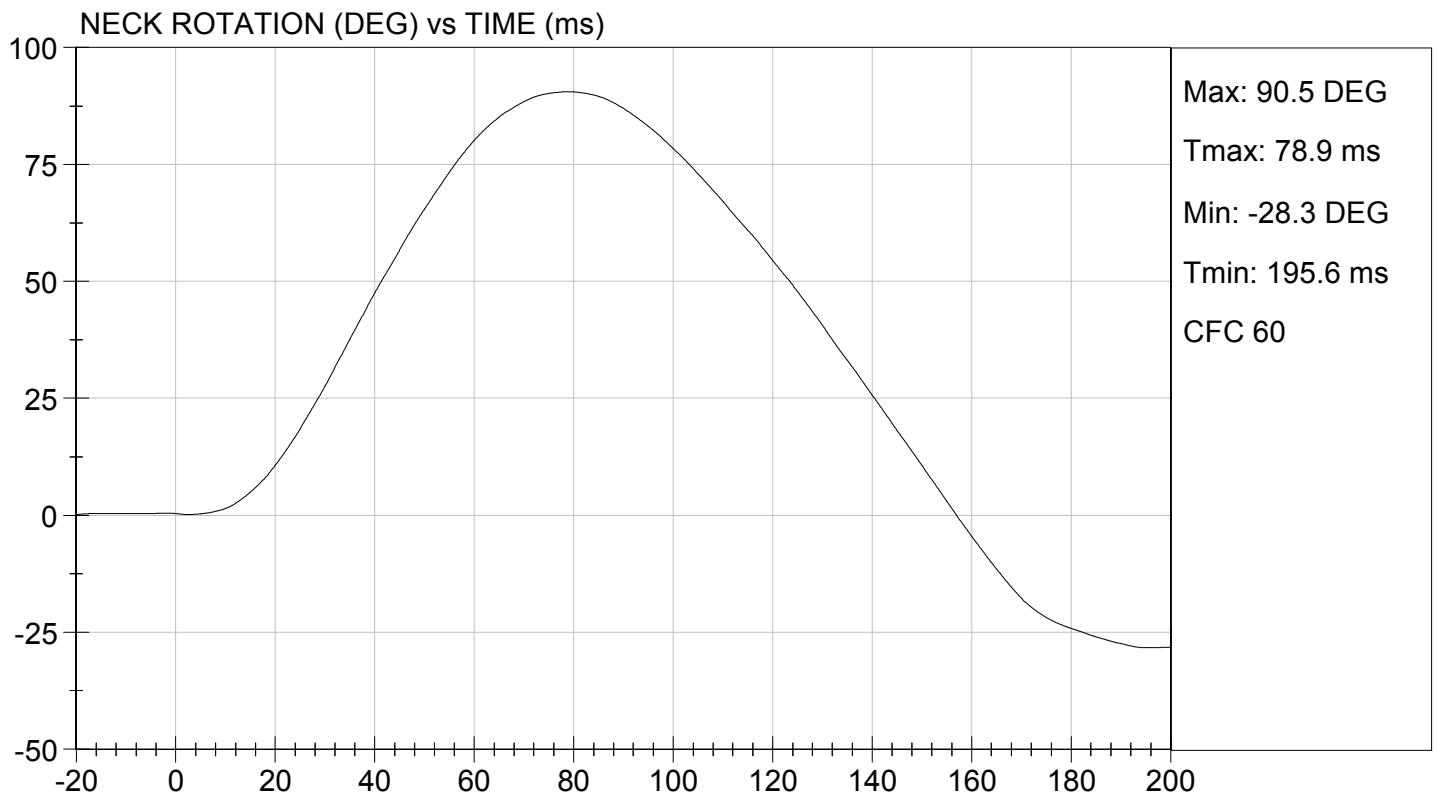
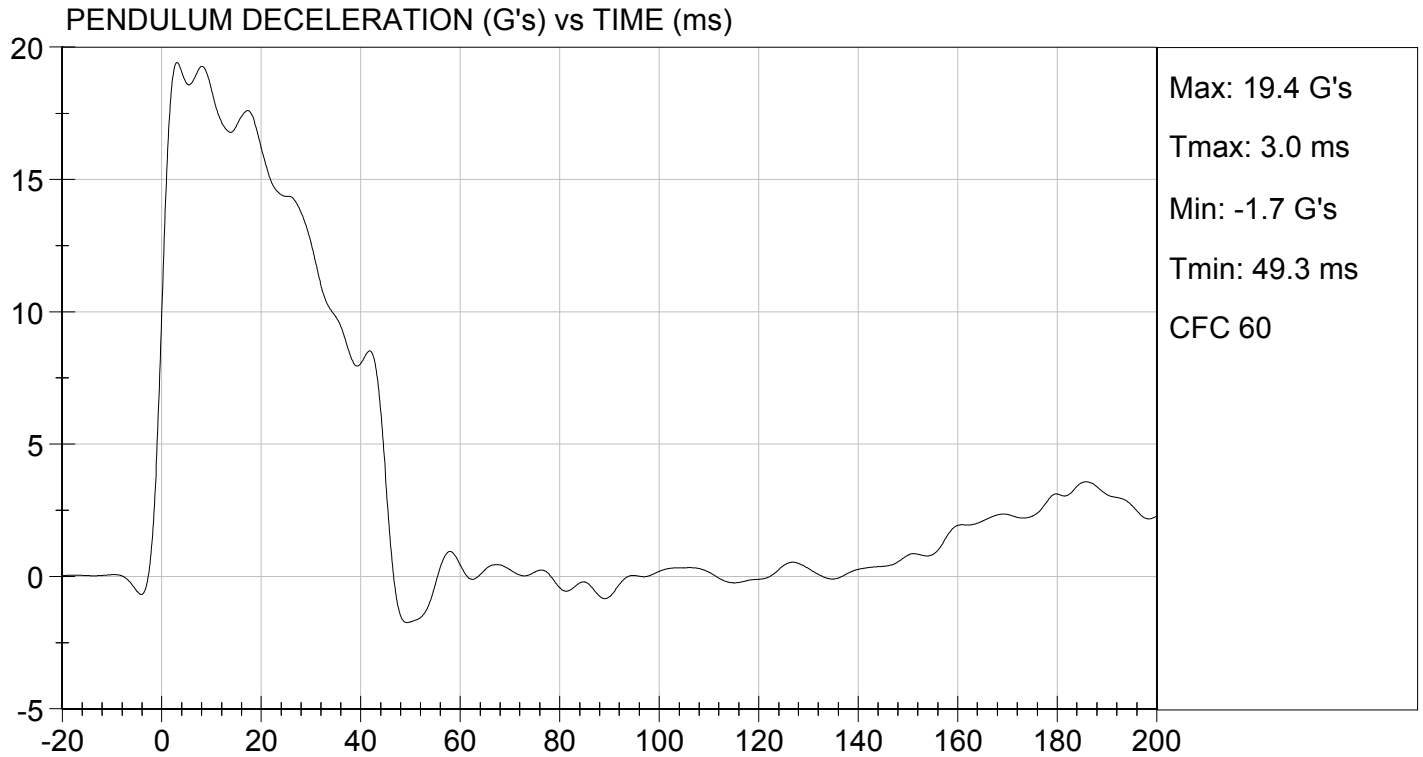
12/01/2014
Test Date

Jessica Hall
Approved By



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

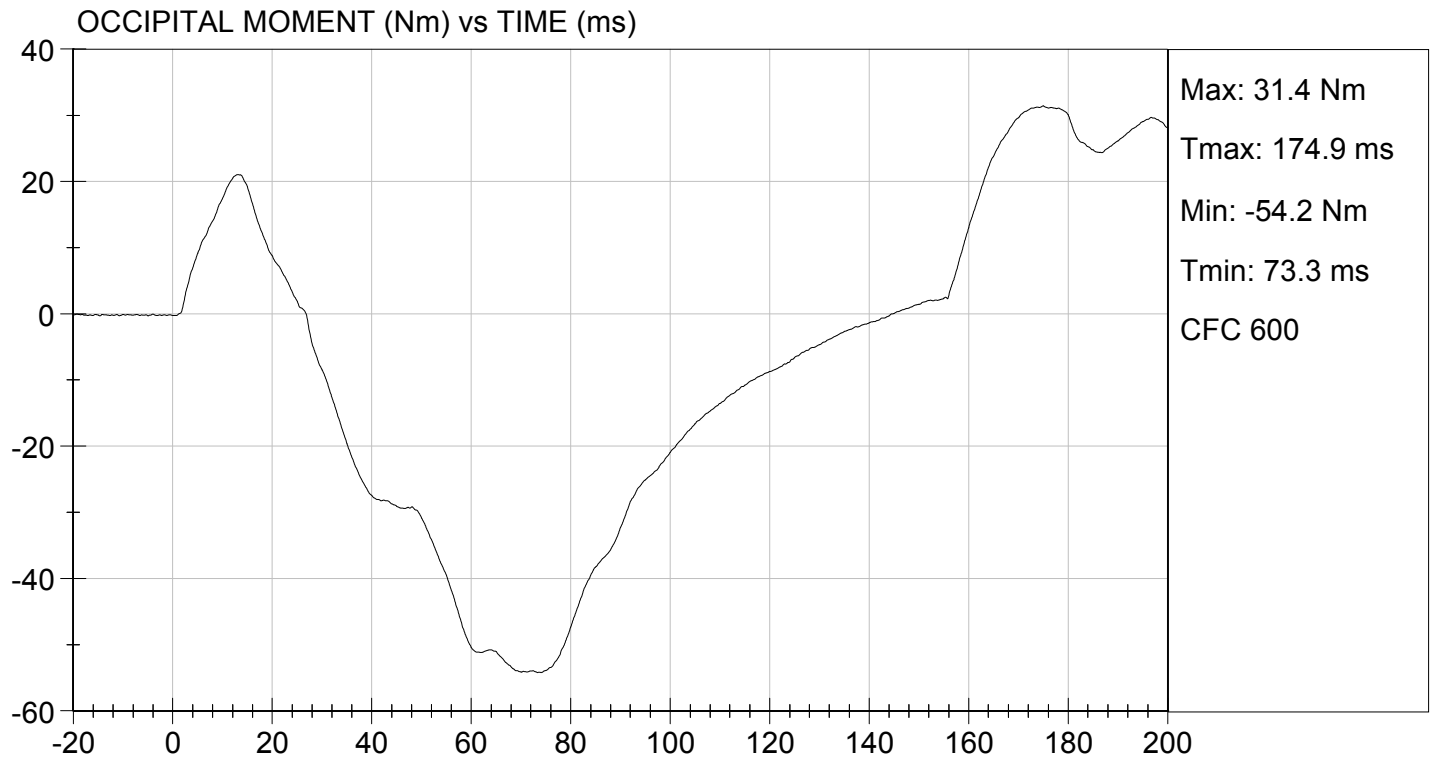
TEST DATE: 12/01/2014
TEST #: D144233





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

TEST DATE: 12/01/2014
TEST #: D144233



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D: D144234

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	17	Pass
Probe Velocity	m/s	6.58 to 6.82	6.68	Pass
Peak Probe Force	N	5159 to 5893	5,272	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.52	Pass
Internal Hysteresis	%	69 to 85	69	Pass
			Overall Test Results	Pass

Maxime Chamberland
Laboratory Technician

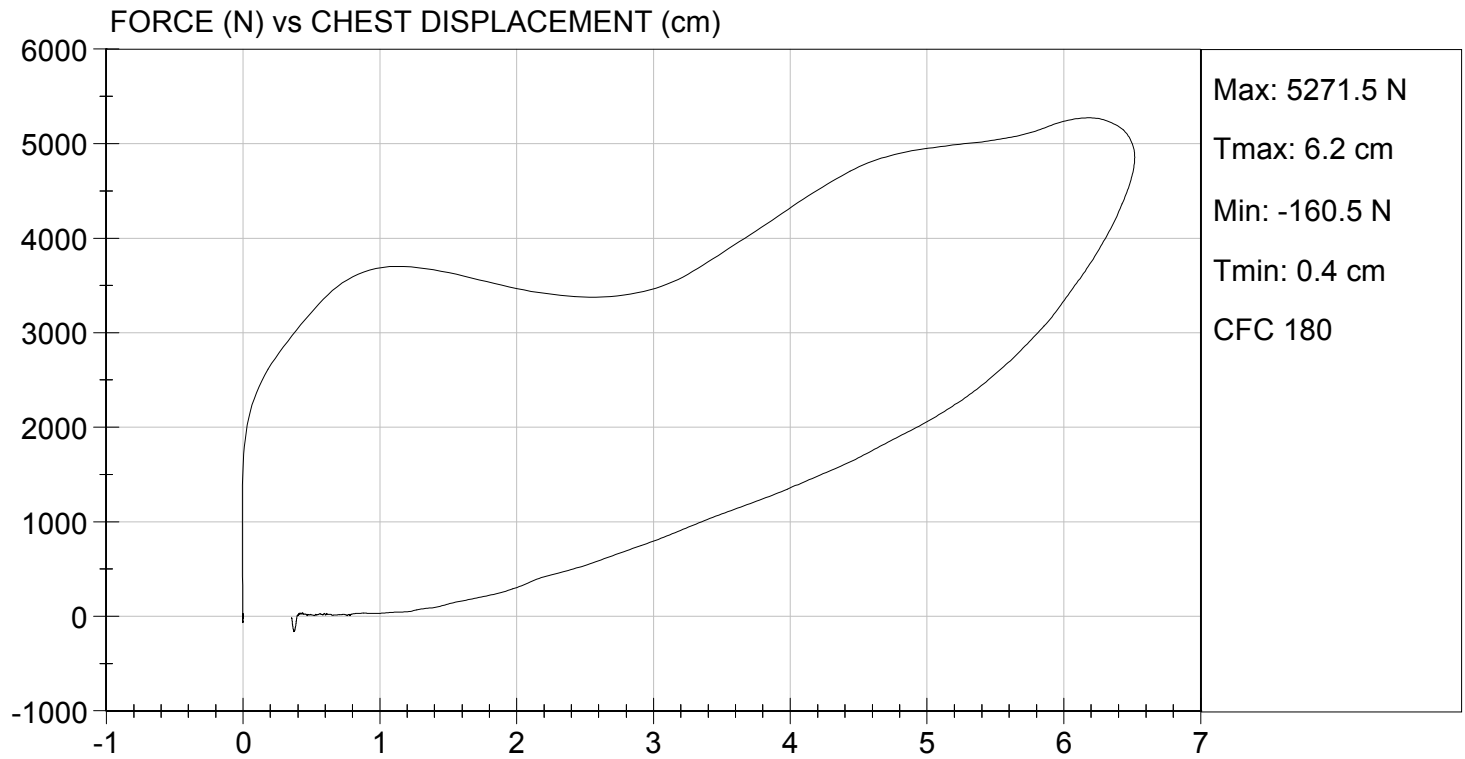
12/02/2014
Test Date

Jessica Hall
Approved By



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

TEST DATE: 12/02/2014
TEST #: D144234



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

ATD Serial No: 351

Test I.D: D144235

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	16	Pass
Probe Velocity	m/s	2.07 to 2.13	2.09	Pass
Peak Probe Force	N	4715 to 5782	4,742	Pass
Overall Test Results				Pass


Laboratory Technician

12/01/2014

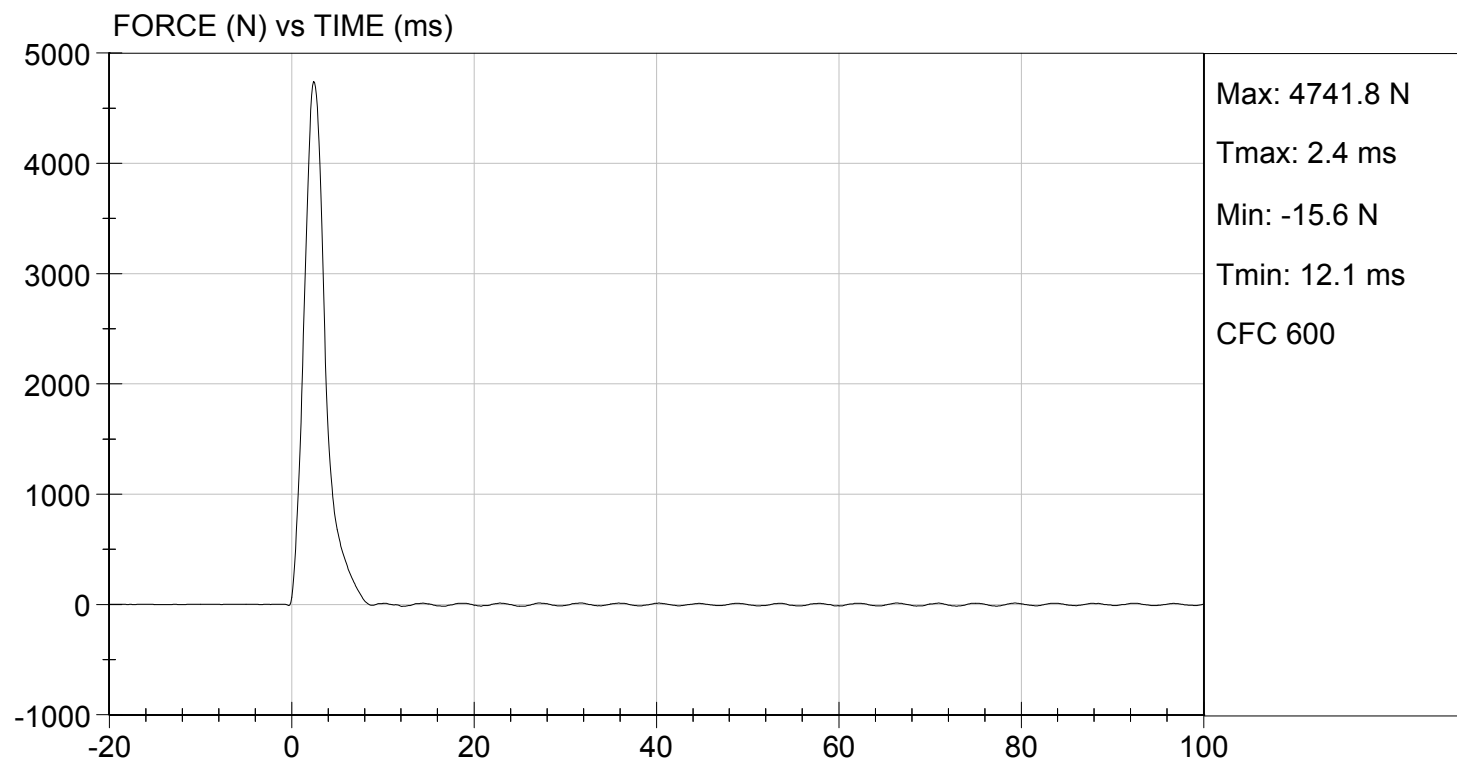
Test Date


Approved By



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

TEST DATE: 12/01/2014
TEST #: D144235



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

ATD Serial No: 351

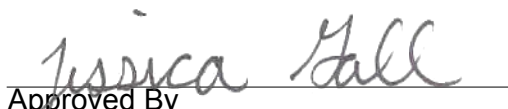
Test I.D: D144236

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	16	Pass
Probe Velocity	m/s	2.07 to 2.13	2.13	Pass
Peak Probe Force	N	4715 to 5782	5,129	Pass
Overall Test Results				Pass


Laboratory Technician

12/01/2014

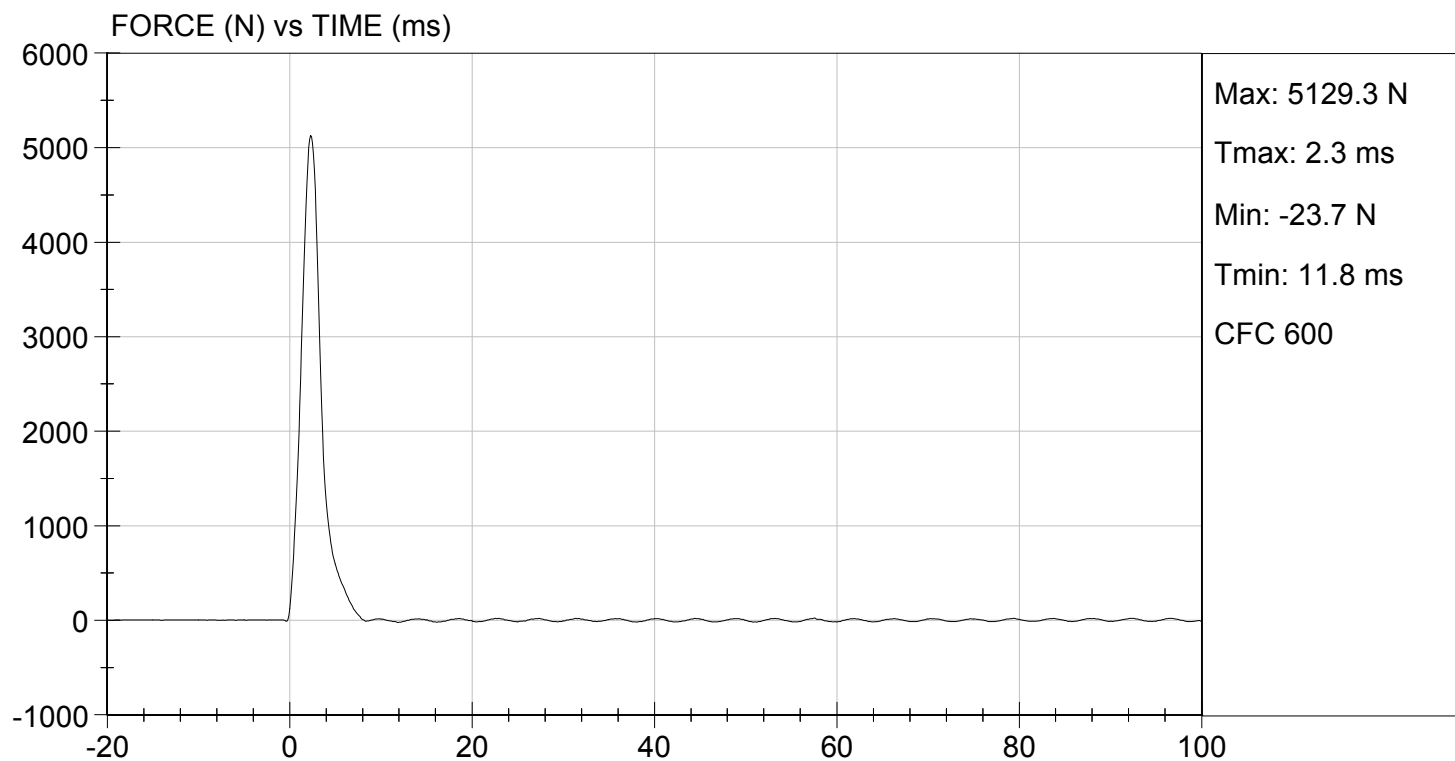
Test Date


Approved By



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

TEST DATE: 12/01/2014
TEST #: D144236



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

ATD Serial No: 351

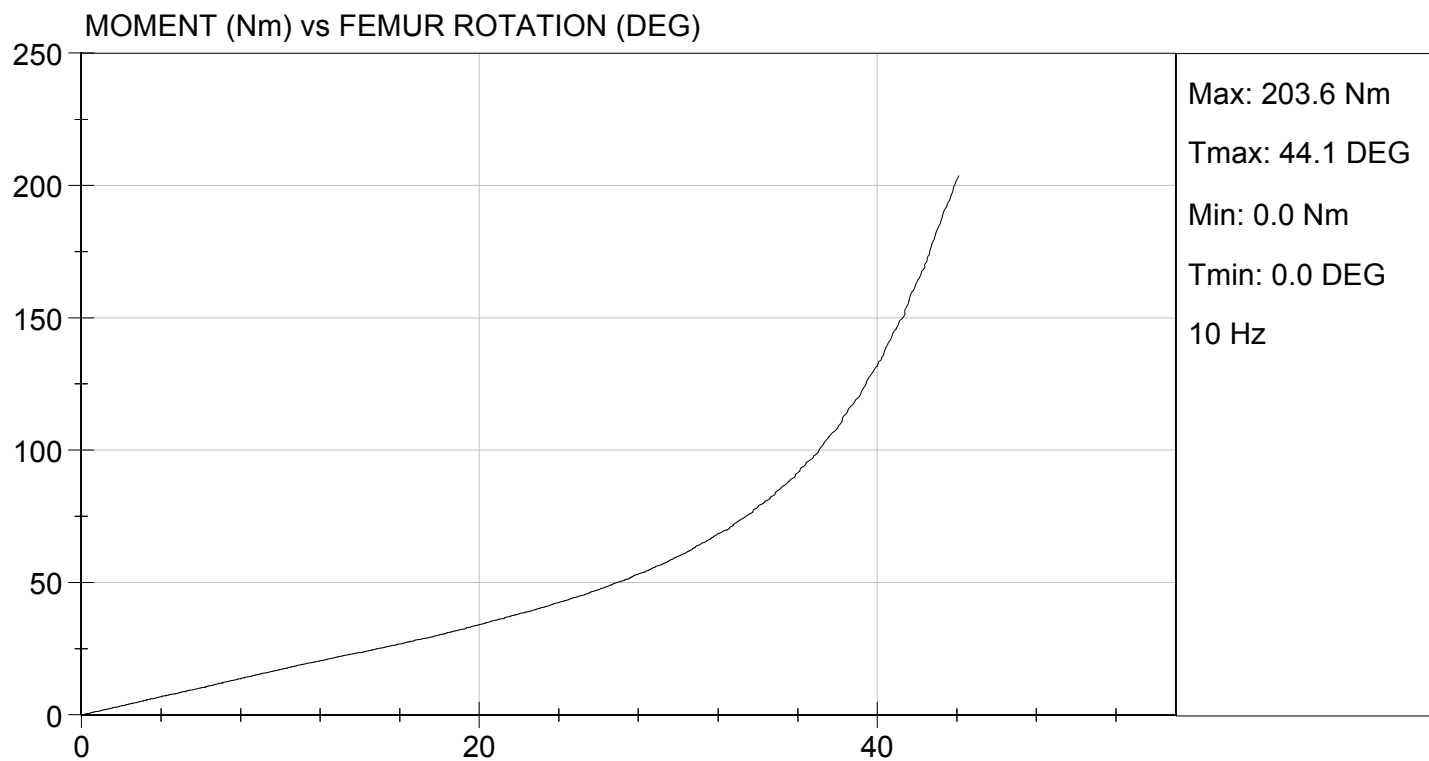
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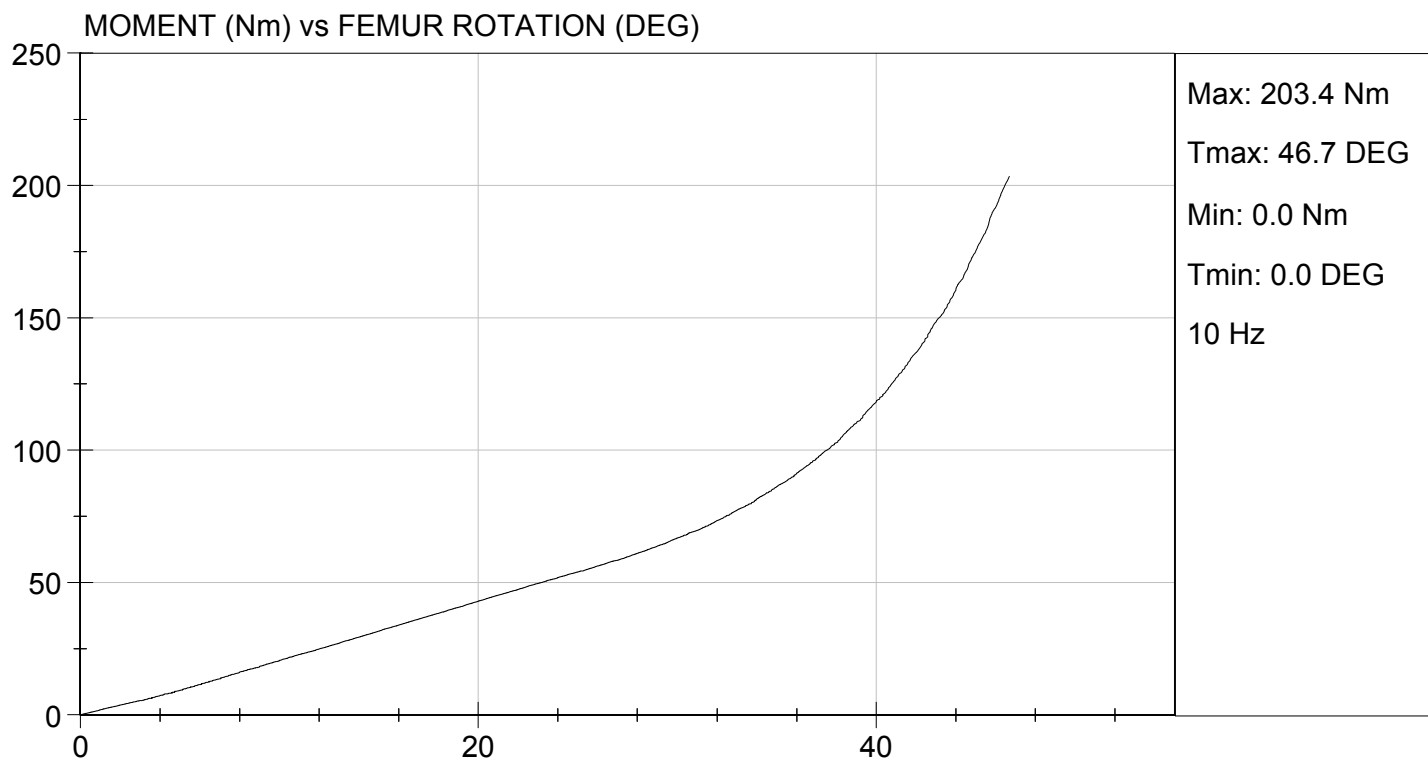
Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.8	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	18	18	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.1	6.3	Pass
30 Degrees	Nm	94.9 Nm Max	60.0	66.7	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	44.1	46.7	Pass
Overall Test Results					Pass

Maxime Chamberland
Laboratory Technician

12/01/2014
Test Date

Jessica Hall
Approved By



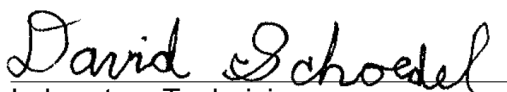


MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

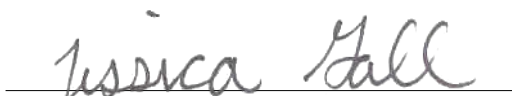
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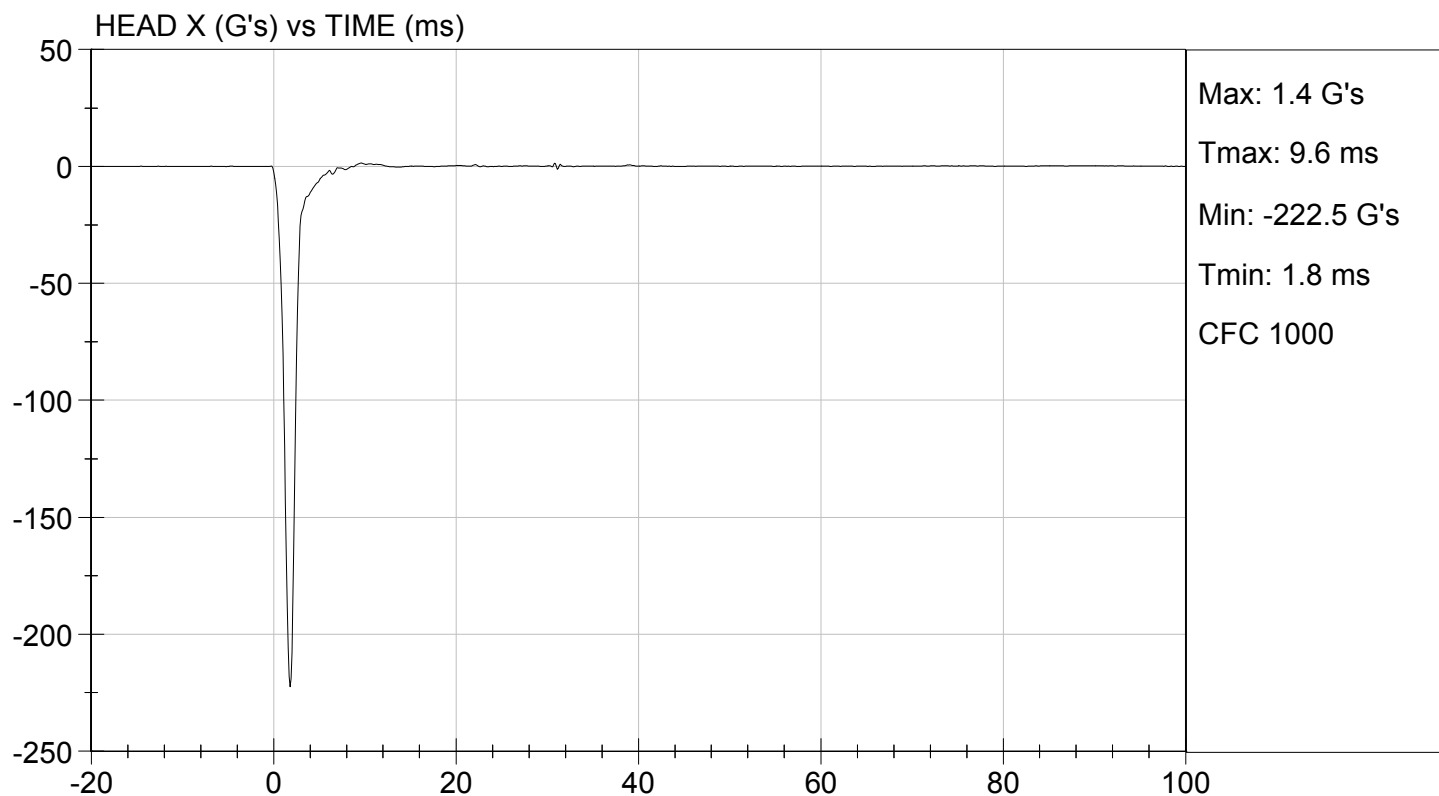
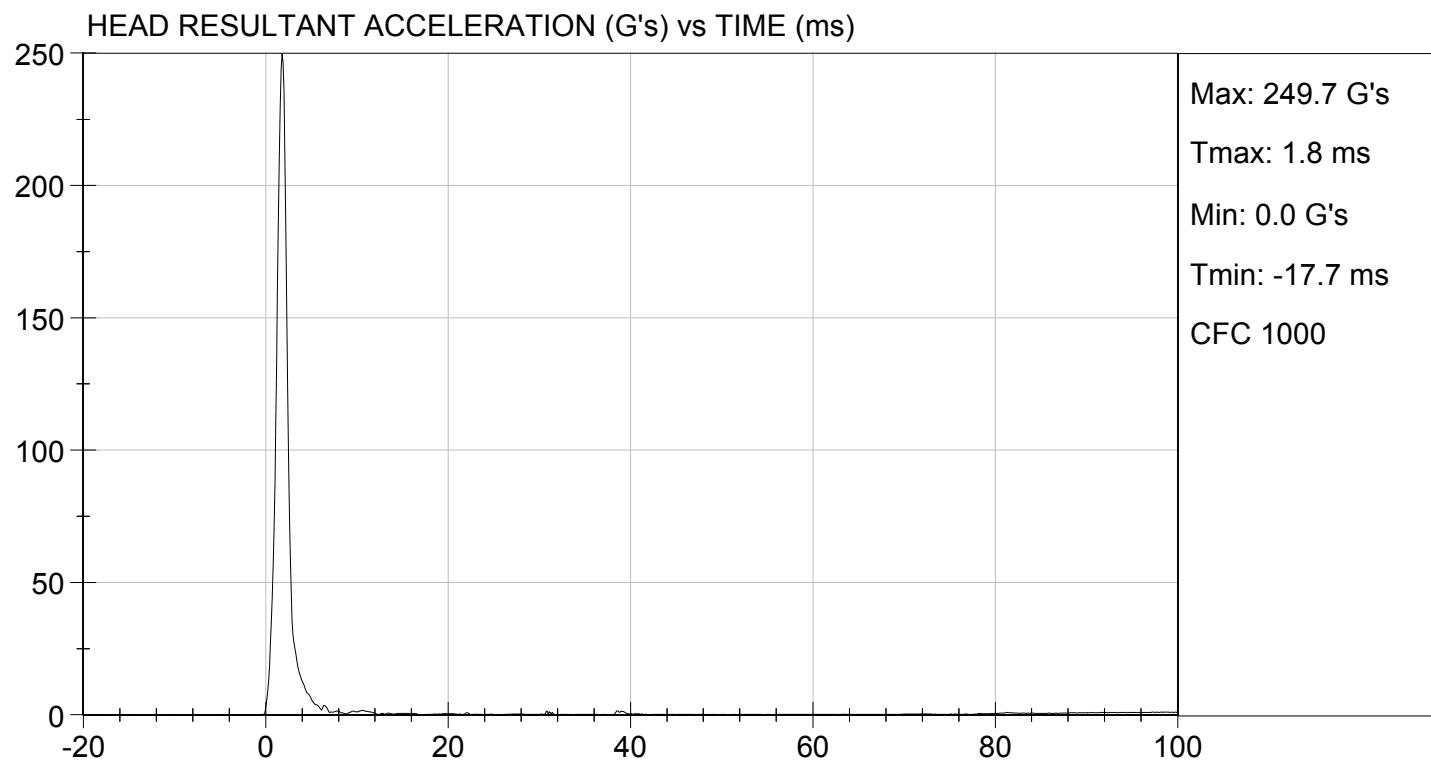
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	18	Pass
Peak Resultant Acceleration	G's	225 to 275	250	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-4.7	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

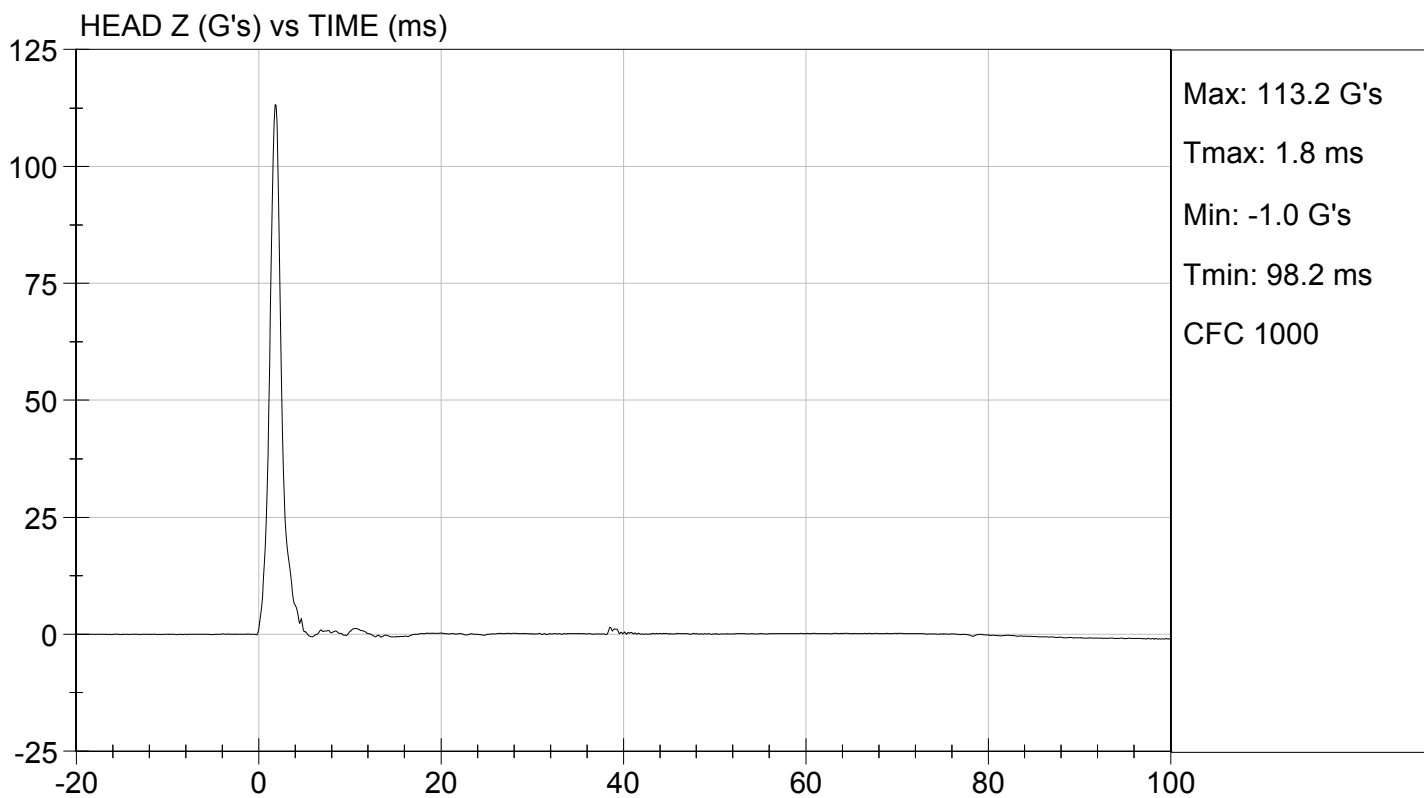
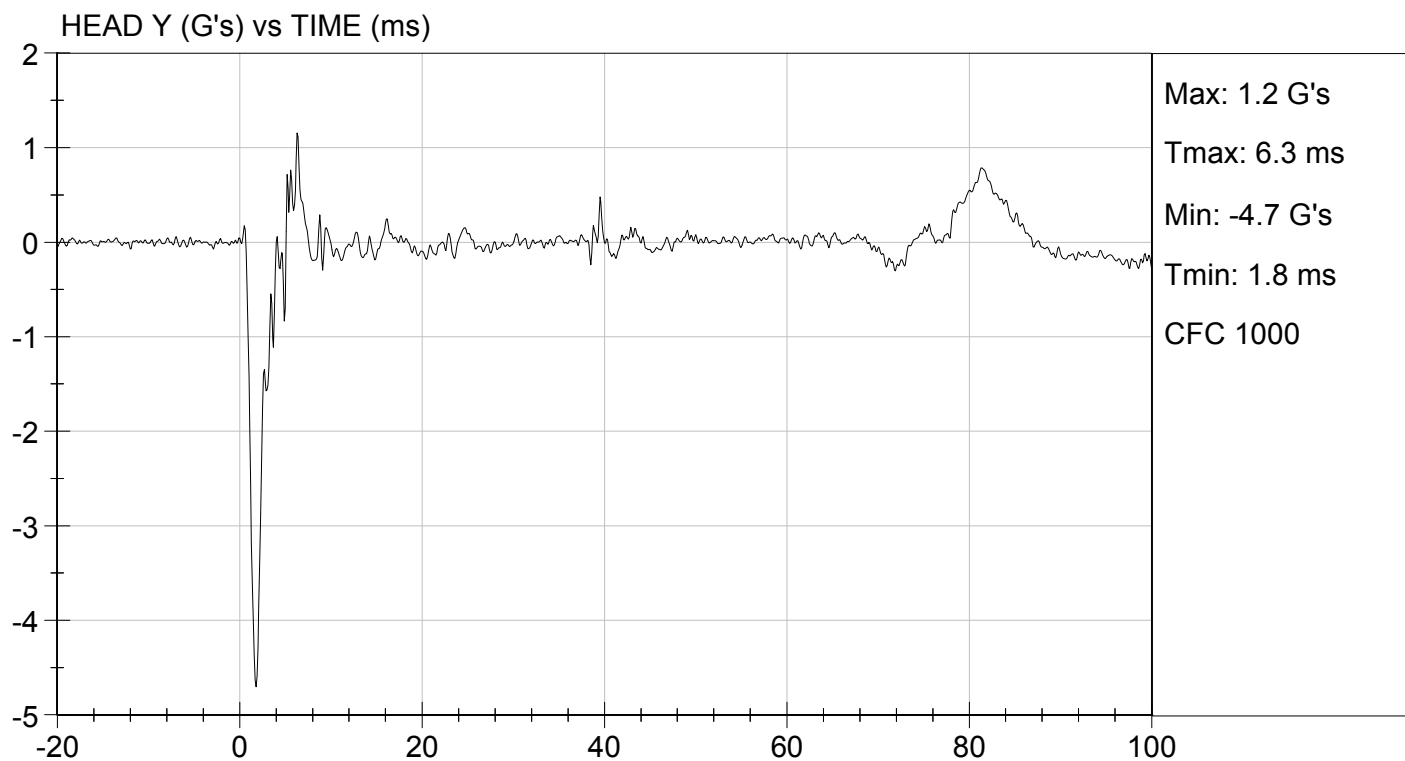

Laboratory Technician

12/08/2014

Test Date


Approved By





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

ATD Serial No: 351

Test I.D: D144312

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	18	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.13	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	24.67	Pass
	20 ms	G's	17.60 to 22.60	19.94	Pass
	30 ms	G's	12.50 to 18.50	13.96	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	14.6	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	41.6	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	66.4	Pass
	Time	ms	57.0 to 64.0	58.6	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	114.1	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	95.7	Pass
	Time	ms	47.0 to 58.0	53.5	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	101.6	Pass
Overall Test Results					Pass

David Schoedel
Laboratory Technician

12/08/2014

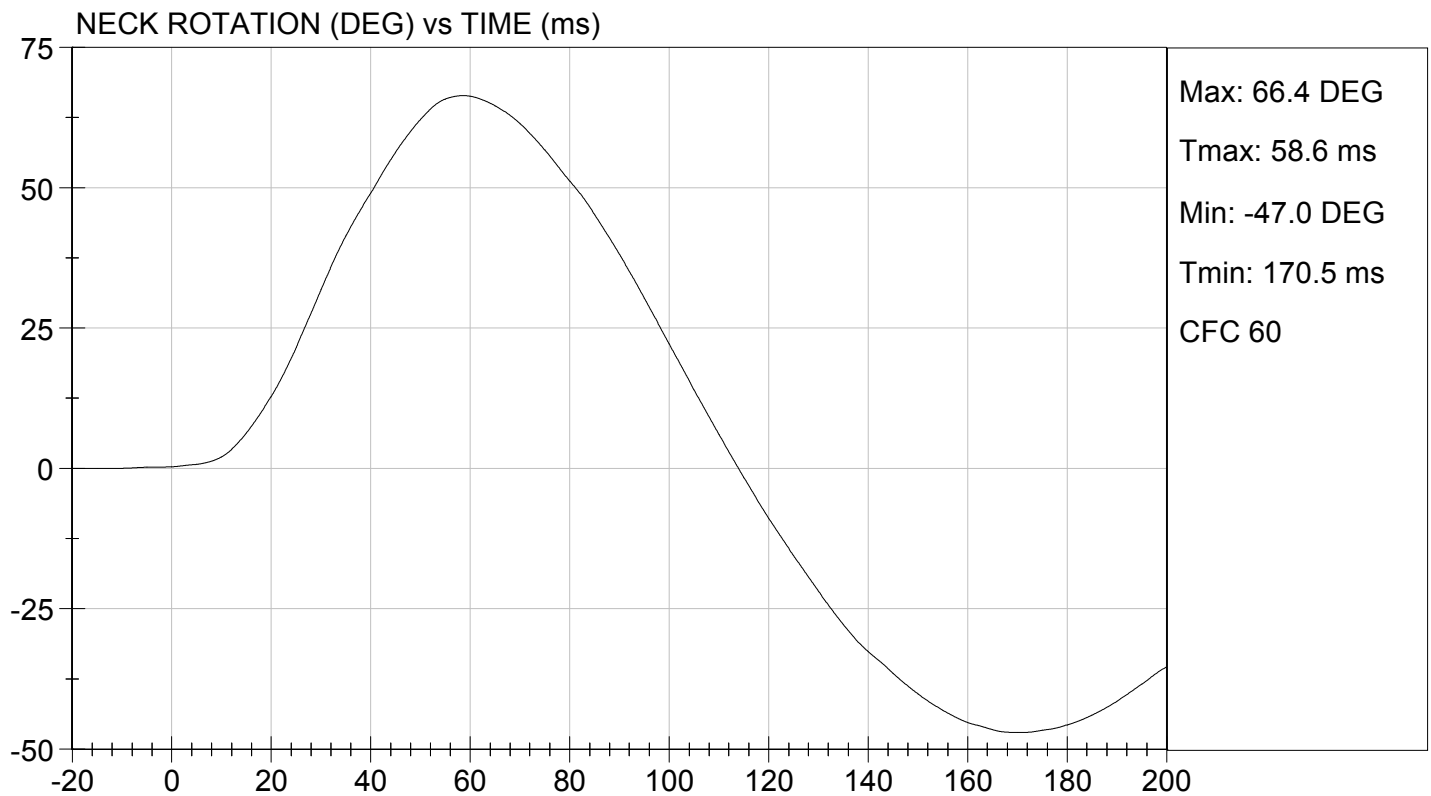
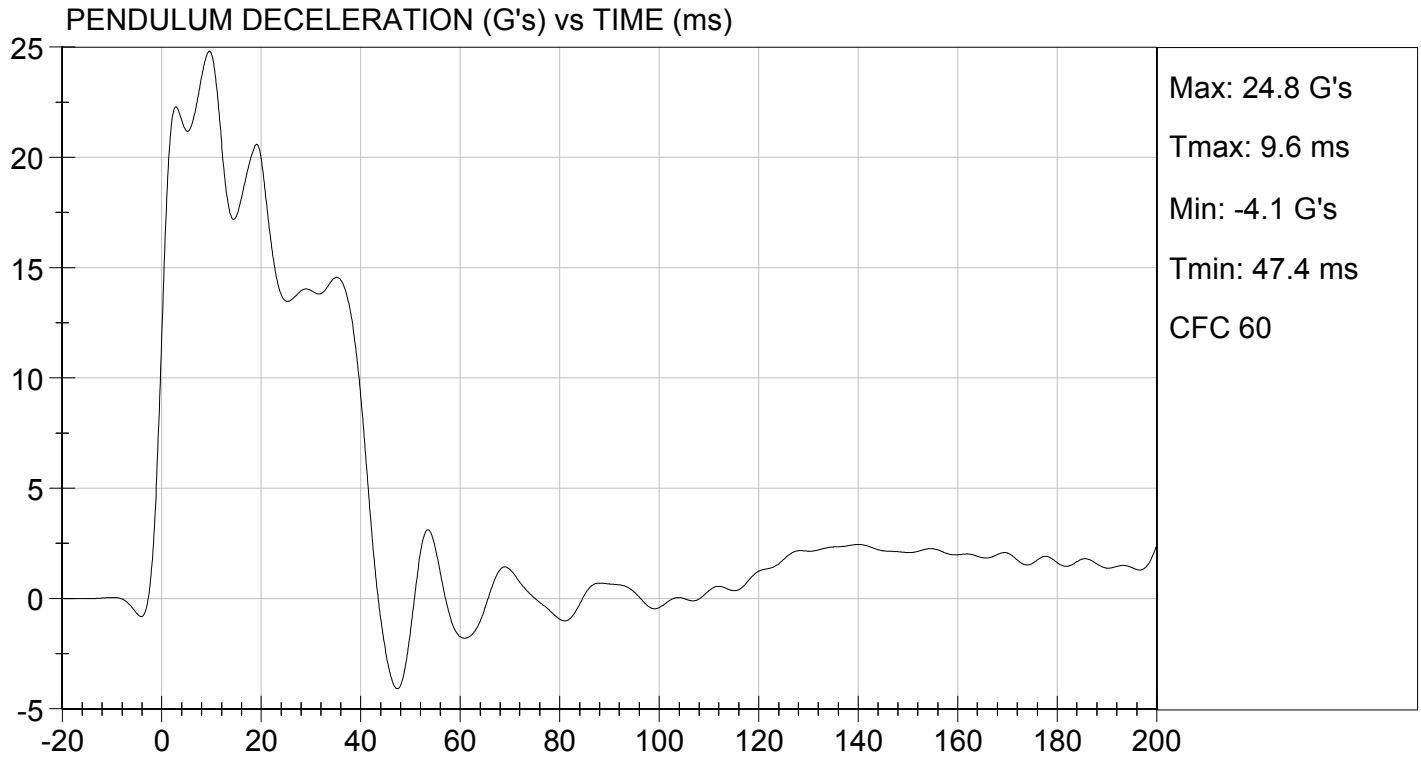
Test Date

Jessica Hall
Approved By



TEST DESC: NECK FLEXION
VELOCITY: 23.40 ft/s, 7.13 m/s

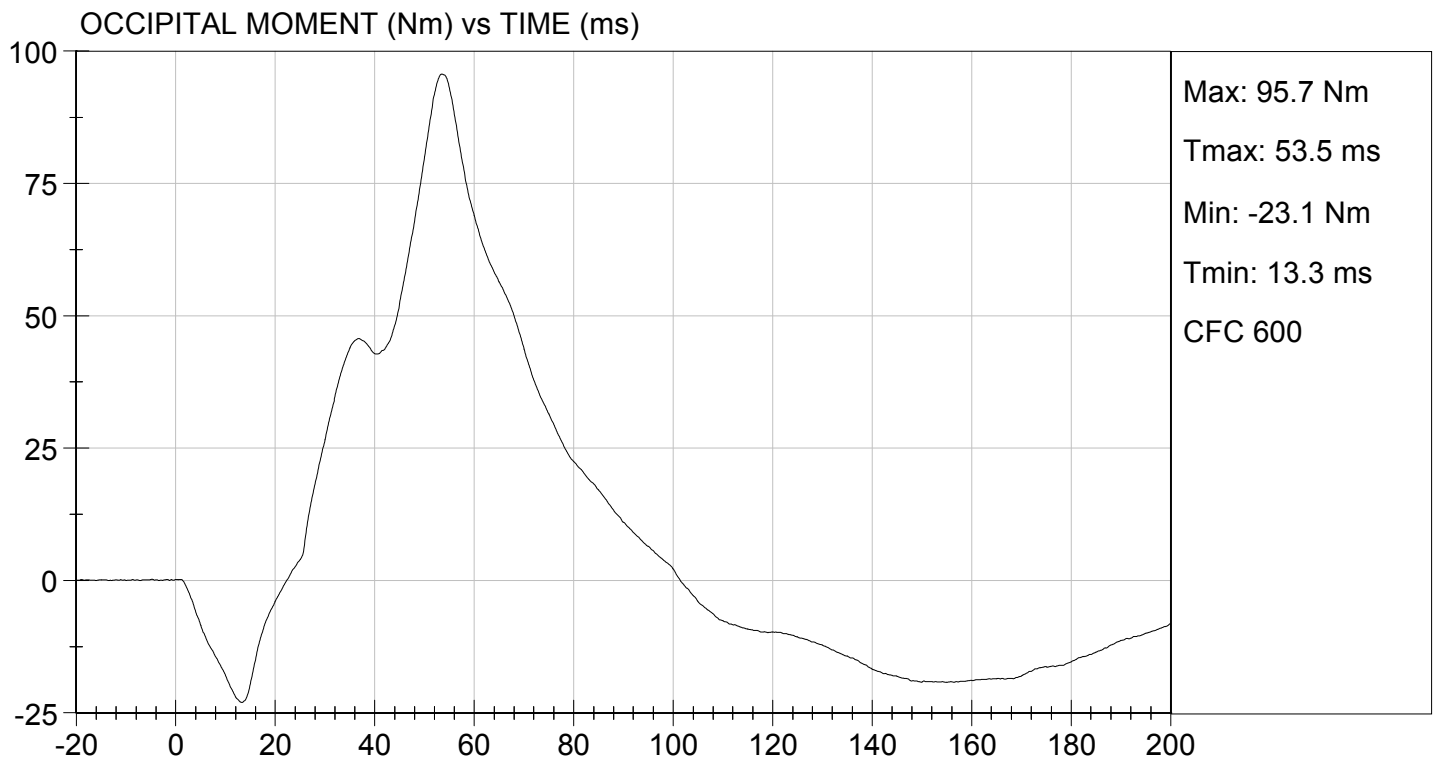
TEST DATE: 12/08/2014
TEST #: D144312





TEST DESC: NECK FLEXION
VELOCITY: 23.40 ft/s, 7.13 m/s

TEST DATE: 12/08/2014
TEST #: D144312



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

ATD Serial No: 351

Test I.D: D144313

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	18	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.19	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	19.90	Pass
	20 ms	G's	14.00 to 19.00	18.62	Pass
	30 ms	G's	11.00 to 16.00	13.38	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	13.2	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	40.7	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	94.9	Pass
	Time	ms	72.0 to 82.0	74.6	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	152.7	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-56.8	Pass
	Time	ms	65.0 to 79.0	68.8	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	142.6	Pass
Overall Test Results					Pass

David Schoedel
Laboratory Technician

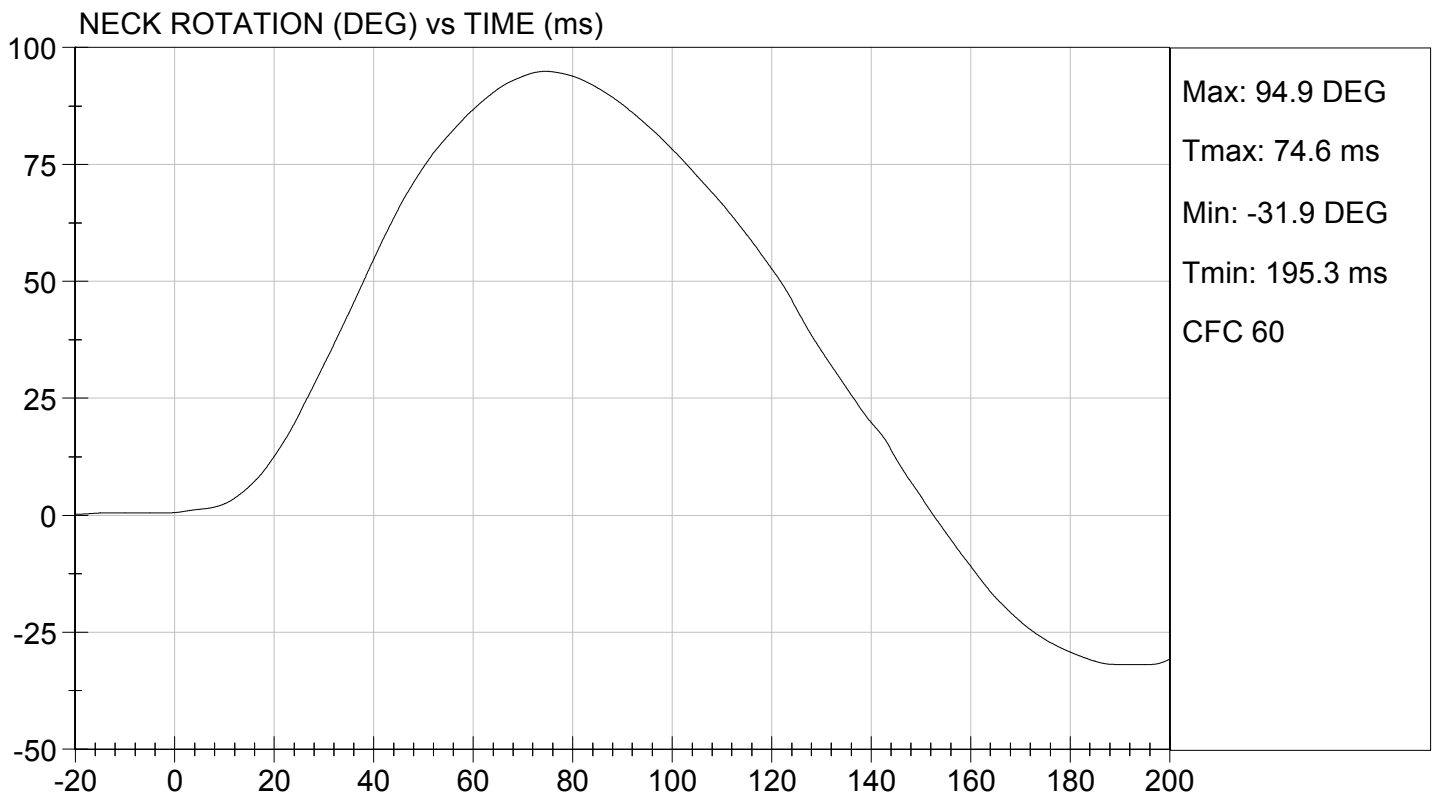
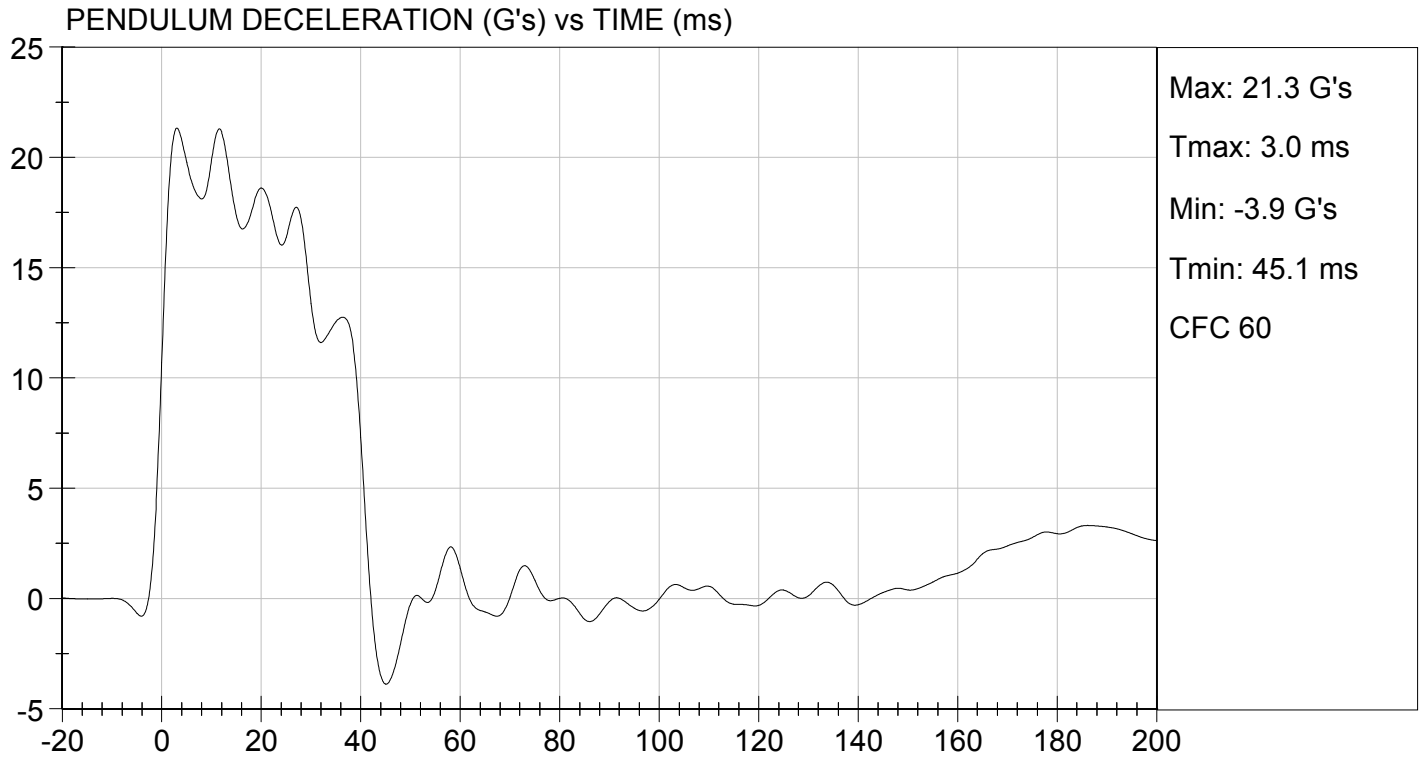
12/08/2014
Test Date

Jessica Hall
Approved By



TEST DESC: NECK EXTENSION
VELOCITY: 20.30 ft/s, 6.19 m/s

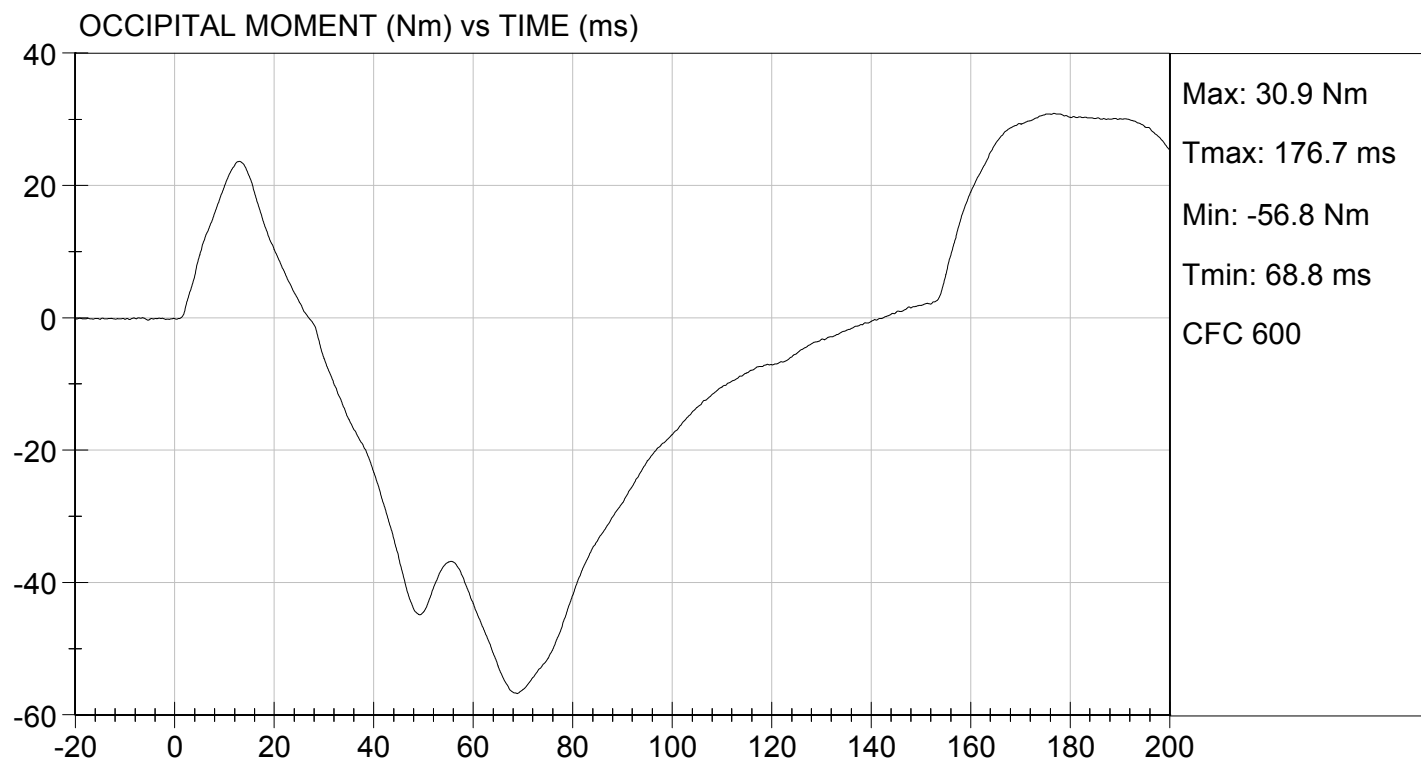
TEST DATE: 12/08/2014
TEST #: D144313





TEST DESC: NECK EXTENSION
VELOCITY: 20.30 ft/s, 6.19 m/s

TEST DATE: 12/08/2014
TEST #: D144313



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D: D144314

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	6.58 to 6.82	6.68	Pass
Peak Probe Force	N	5159 to 5893	5,323	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.45	Pass
Internal Hysteresis	%	69 to 85	69	Pass
Overall Test Results			Pass	

Maxime Chamberland
Laboratory Technician

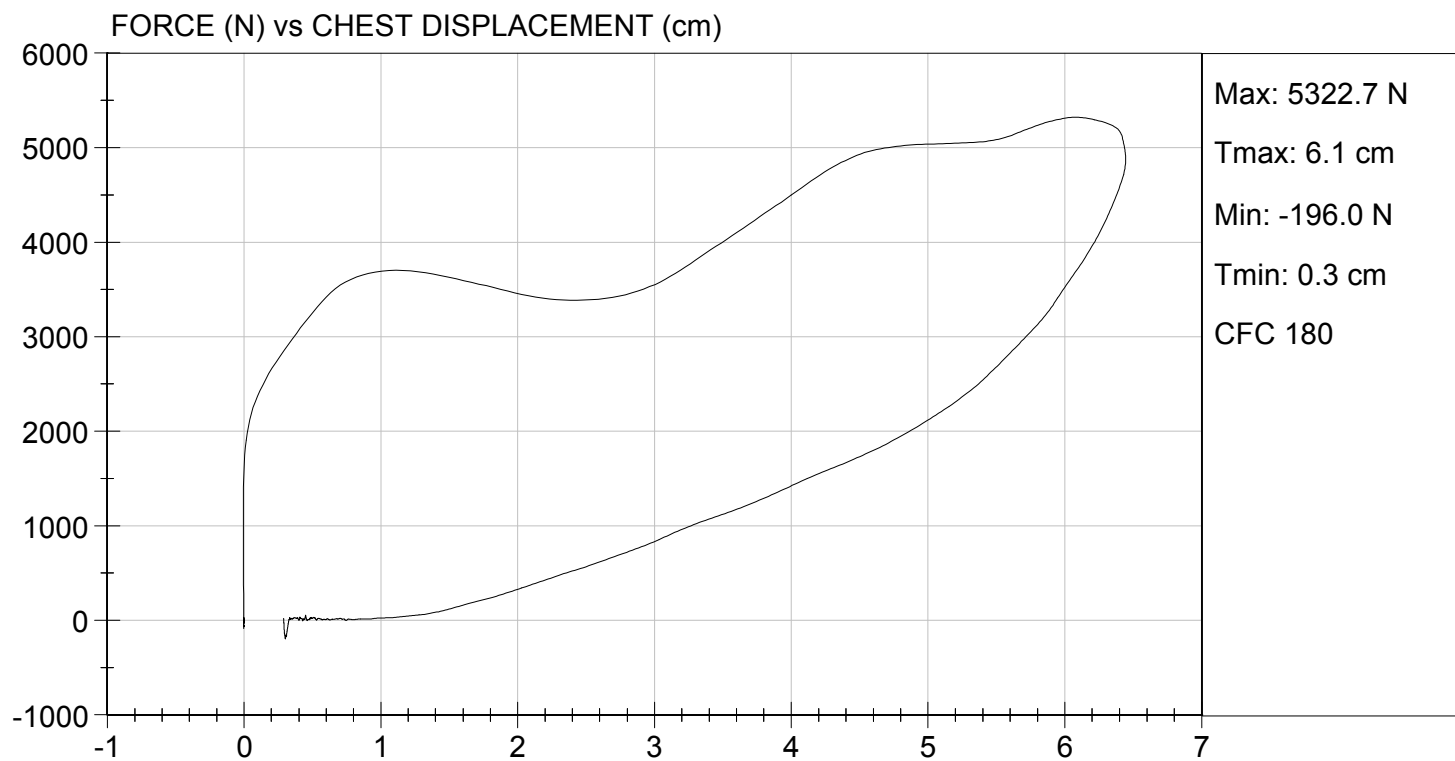
12/08/2014
Test Date

Jessica Hall
Approved By



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

TEST DATE: 12/08/2014
TEST #: D144314



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

ATD Serial No: 351

Test I.D: D144315

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	18	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	N	4715 to 5782	4,715	Pass
Overall Test Results				Pass


Laboratory Technician

12/08/2014

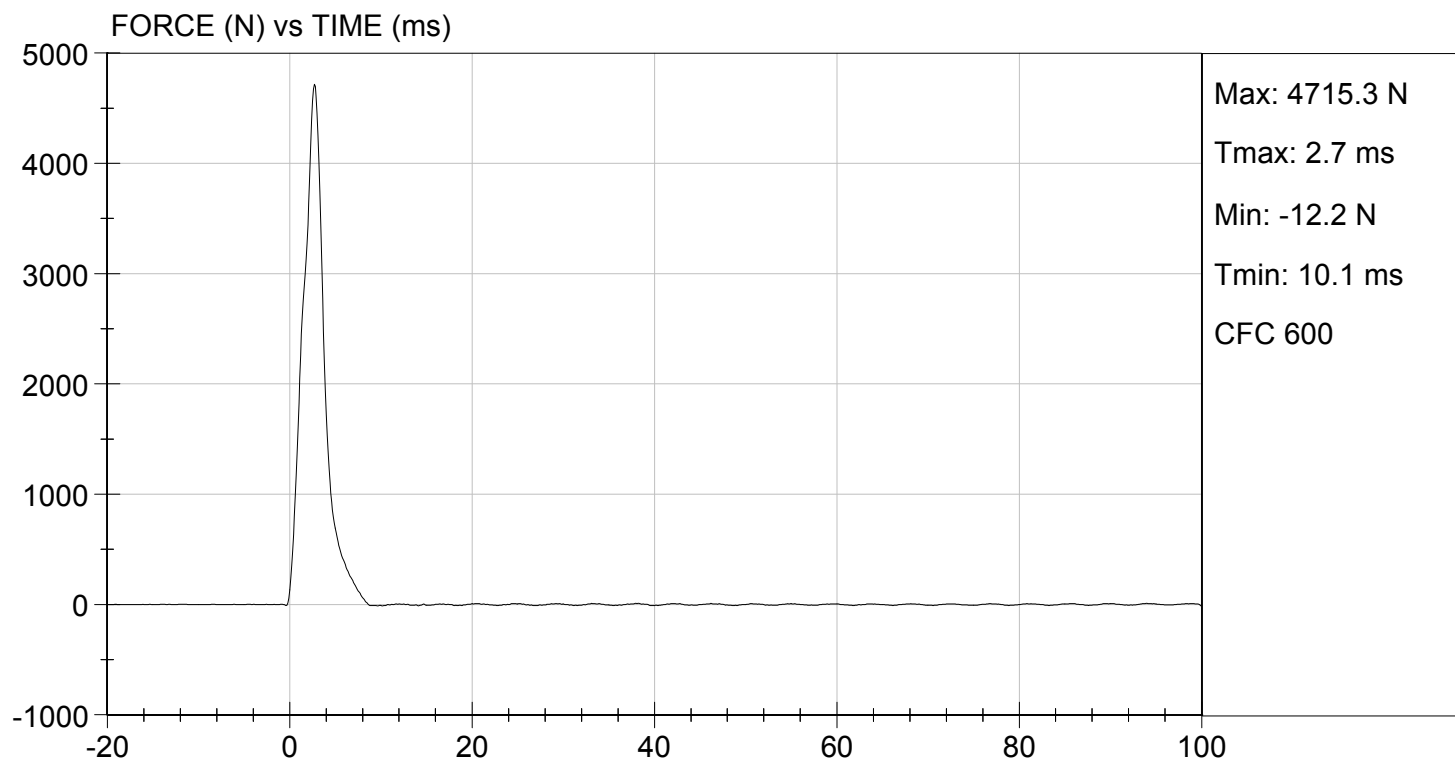
Test Date


Approved By



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

TEST DATE: 12/08/2014
TEST #: D144315



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

ATD Serial No: 351

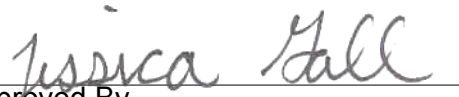
Test I.D: D144316

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	18	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	N	4715 to 5782	4,939	Pass
Overall Test Results				Pass


Laboratory Technician

12/08/2014

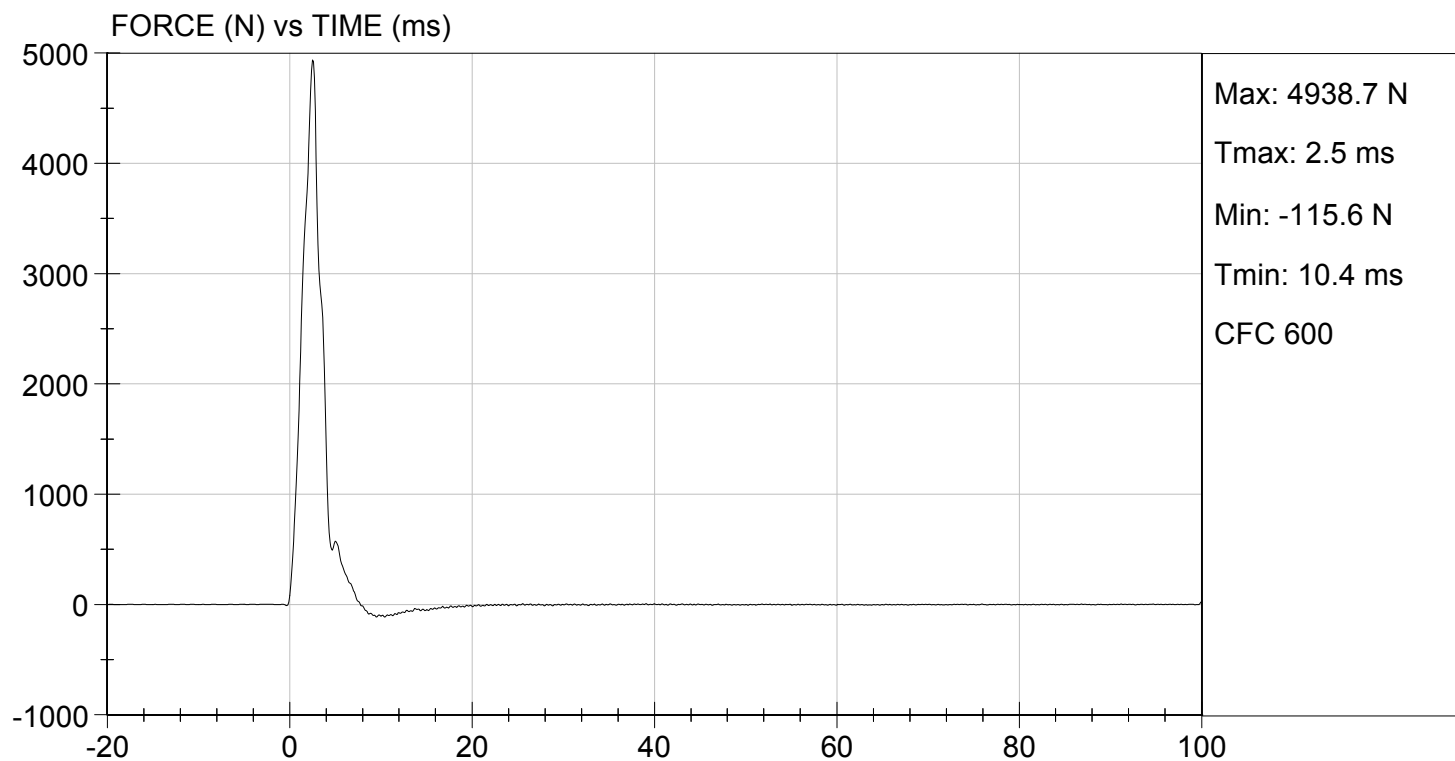
Test Date


Approved By



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

TEST DATE: 12/08/2014
TEST #: D144316



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

ATD Serial No: 351

Test I.D: D144310

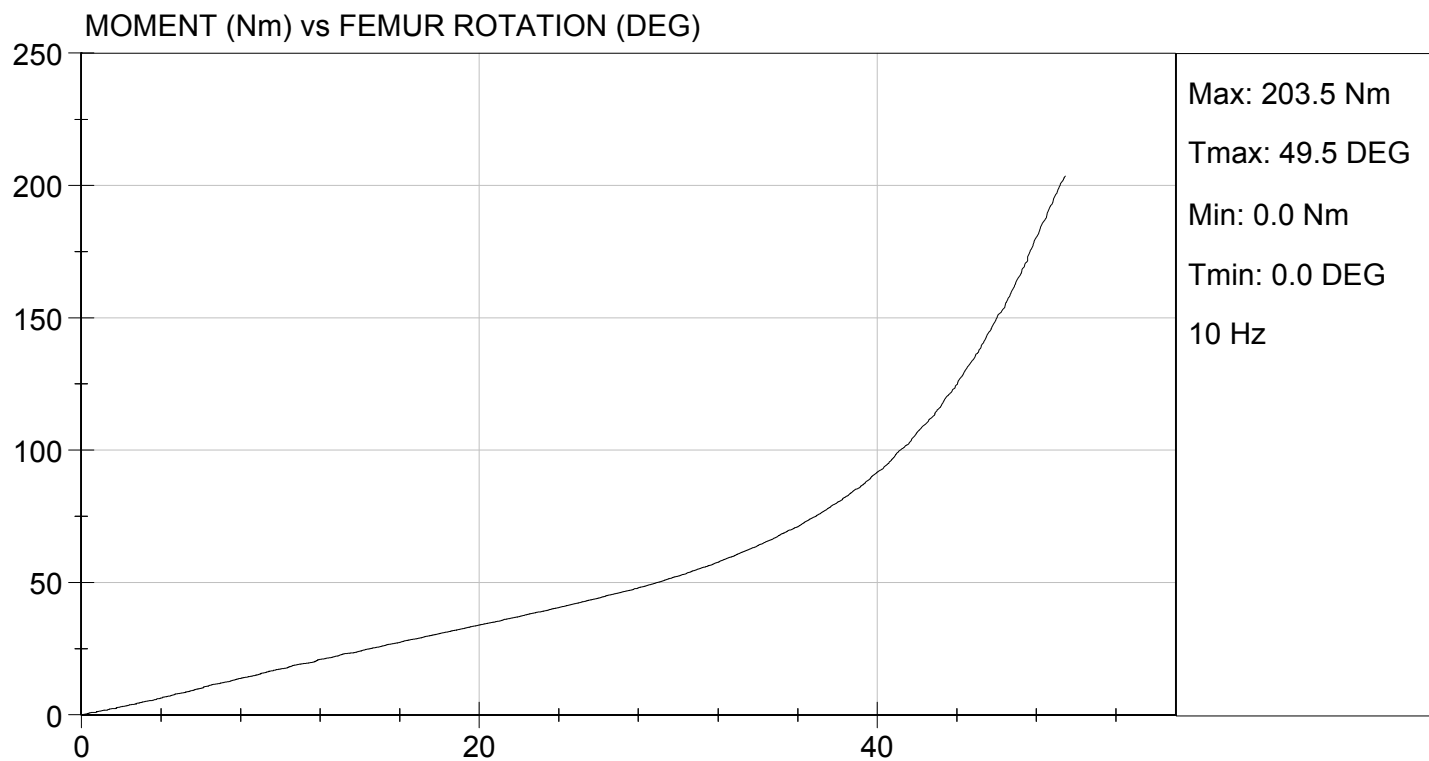
Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.9	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	28	28	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.3	6.3	Pass
30 Degrees	Nm	94.9 Nm Max	52.4	65.4	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	49.5	47.0	Pass
Overall Test Results					Pass

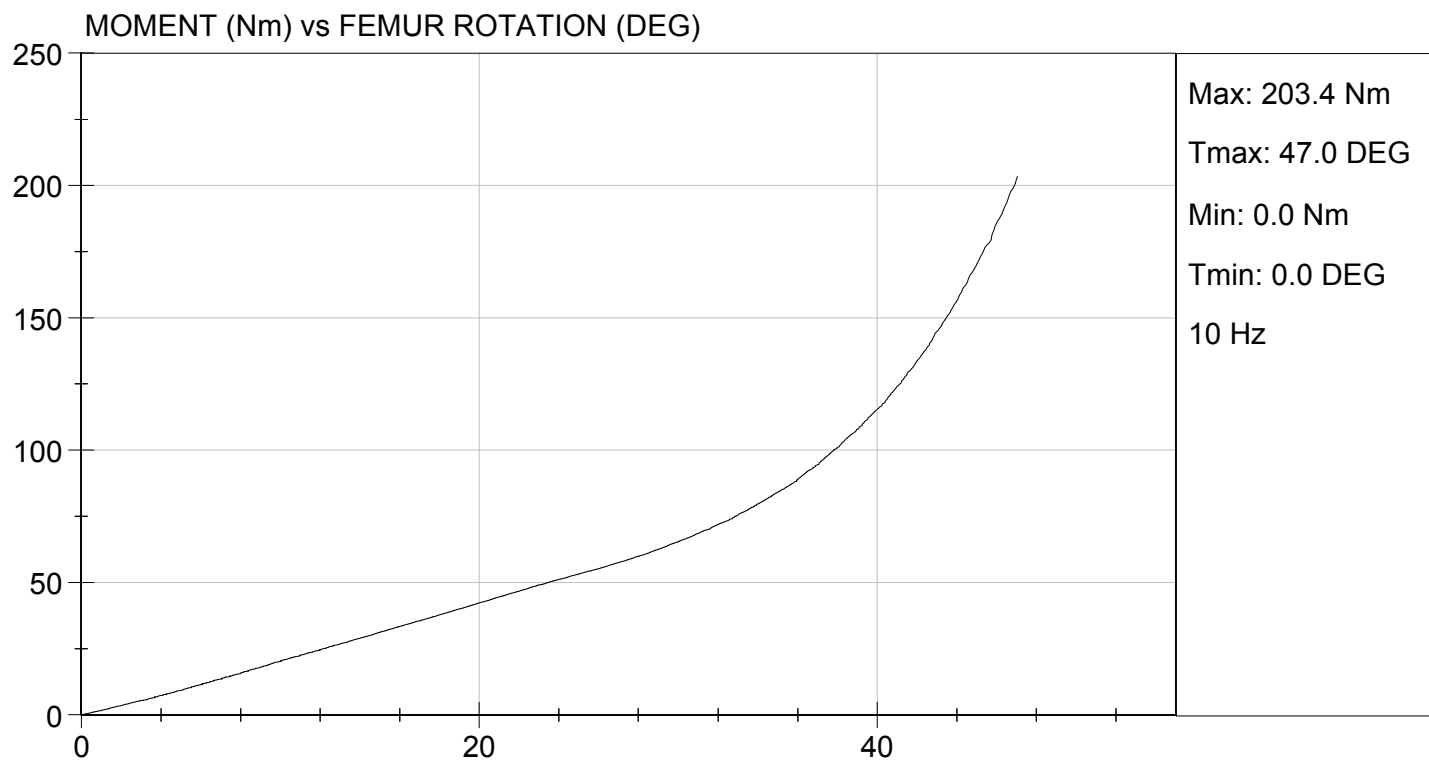

 Laboratory Technician

12/08/2014

Test Date


 Approved By





Hybrid III, 5th External Measurements
SN: 138

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	785.1
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	456.8
C	H-POINT HEIGHT	Reference	81.3-86.3	84.0
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	146.2
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	78.0
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	127.5
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	249.6
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	280.2
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	201.9
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	526.7
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376.0	362.3
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	398.0

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	430.5
HYBRID III, SUBPART O EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 304.8 ± 5.1 mm above seat surface	175.3-190.5	184.6
P	FOOT LENGTH	Tip of toe to rear of heel	218.5-233.7	221.0
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	472.6
S	HEAD BREADTH	The widest part of the head	137.1-147.3	141.9
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	184.2
U	HIP BREADTH	The widest part of the hip	299.7-314.9	307.4
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	360.5
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	85.0
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	528.3-548.7	546.2
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	875.1
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	785.4
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: 138

Test ID: D144171

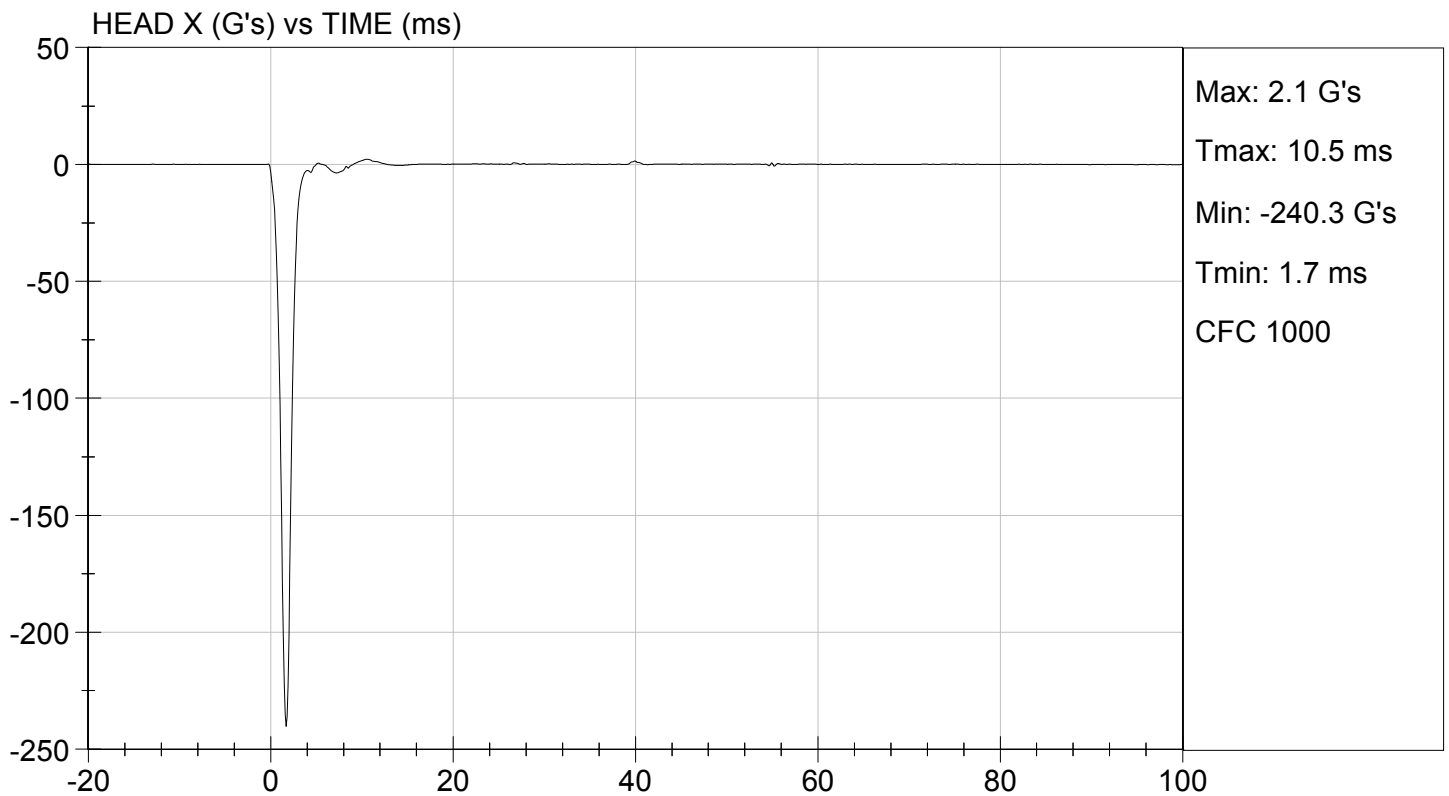
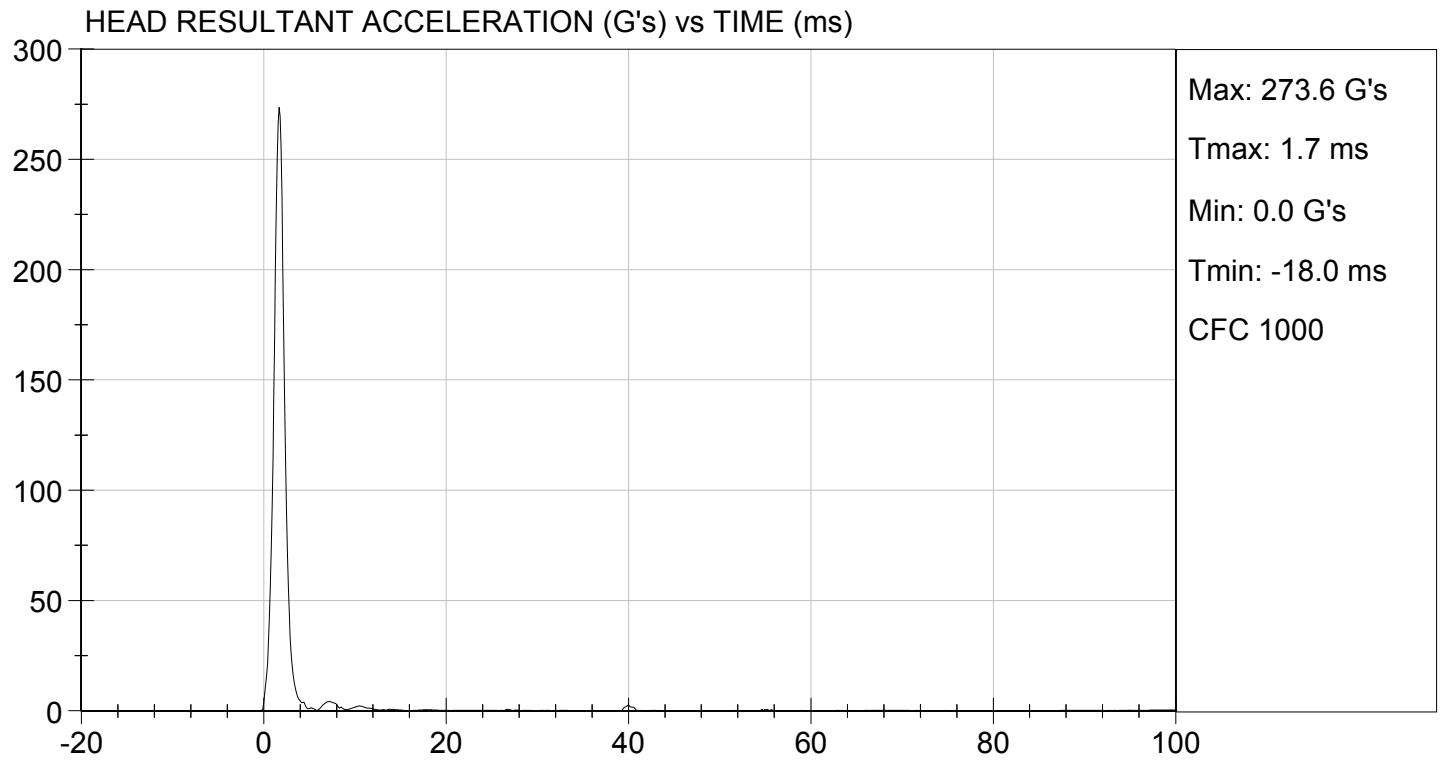
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	36	Pass
Peak Resultant Acceleration	G's	250 to 300	274	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-2.1	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

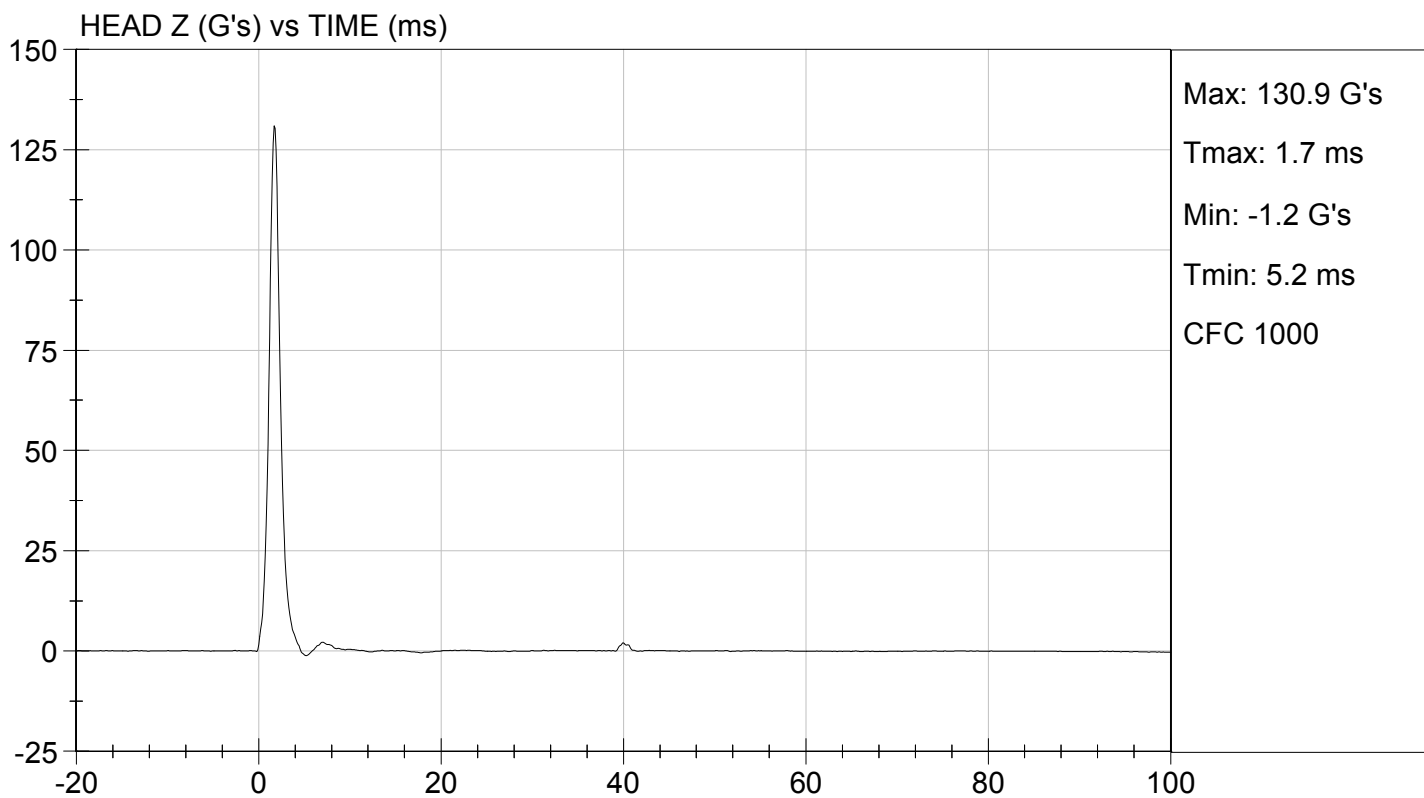
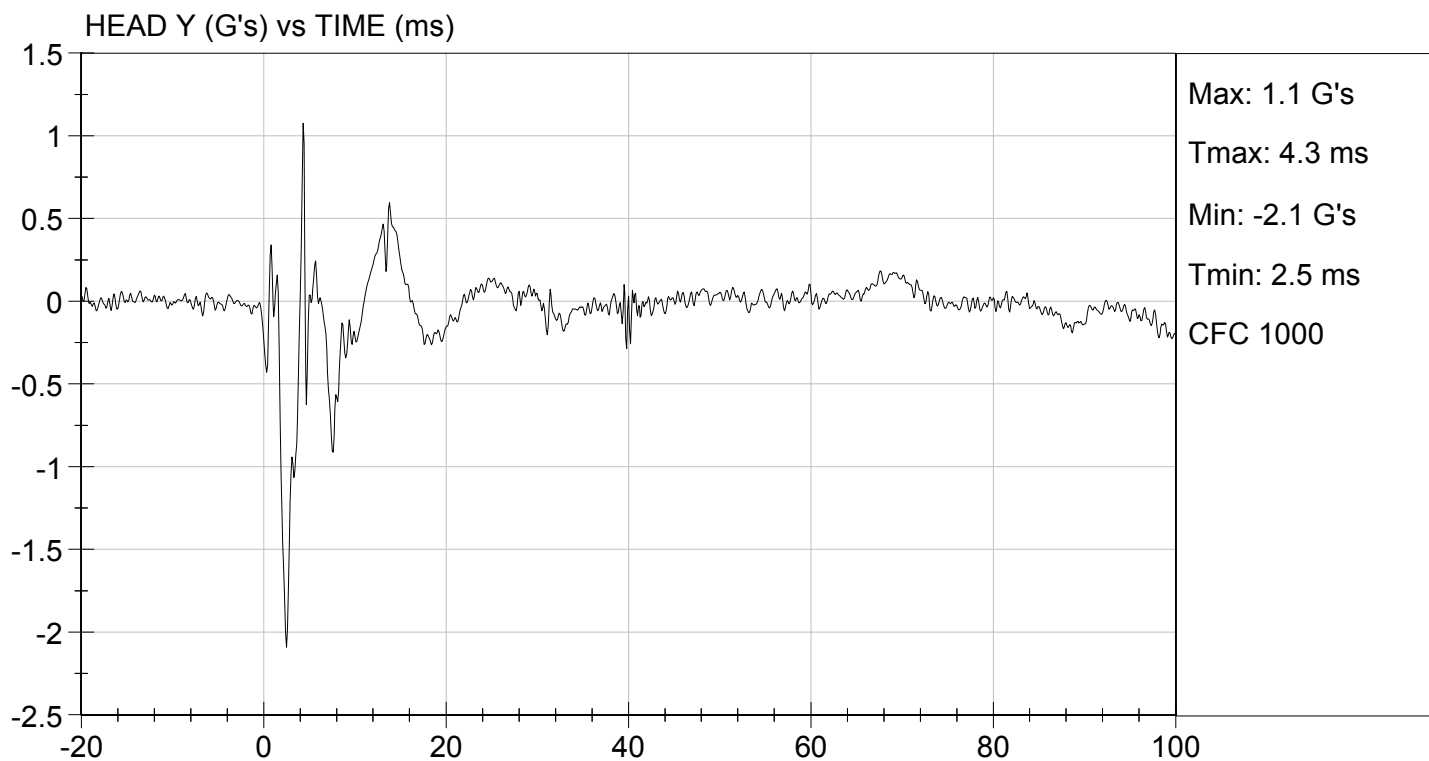

Laboratory Technician

11/24/2014

Test Date


Approved By





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D144172

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity		%	10 to 70	35	Pass
Pendulum Speed		m/s	6.89 to 7.13	6.96	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.4	Pass
	20 ms	m/s	4.0 to 5.0	4.5	Pass
	30 ms	m/s	5.8 to 7.0	6.1	Pass
D Plane Rotation	Max	deg	77 to 91	81	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	71	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	86	Pass
Overall Results					Pass

Jack Coleman
Laboratory Technician

11/24/2014

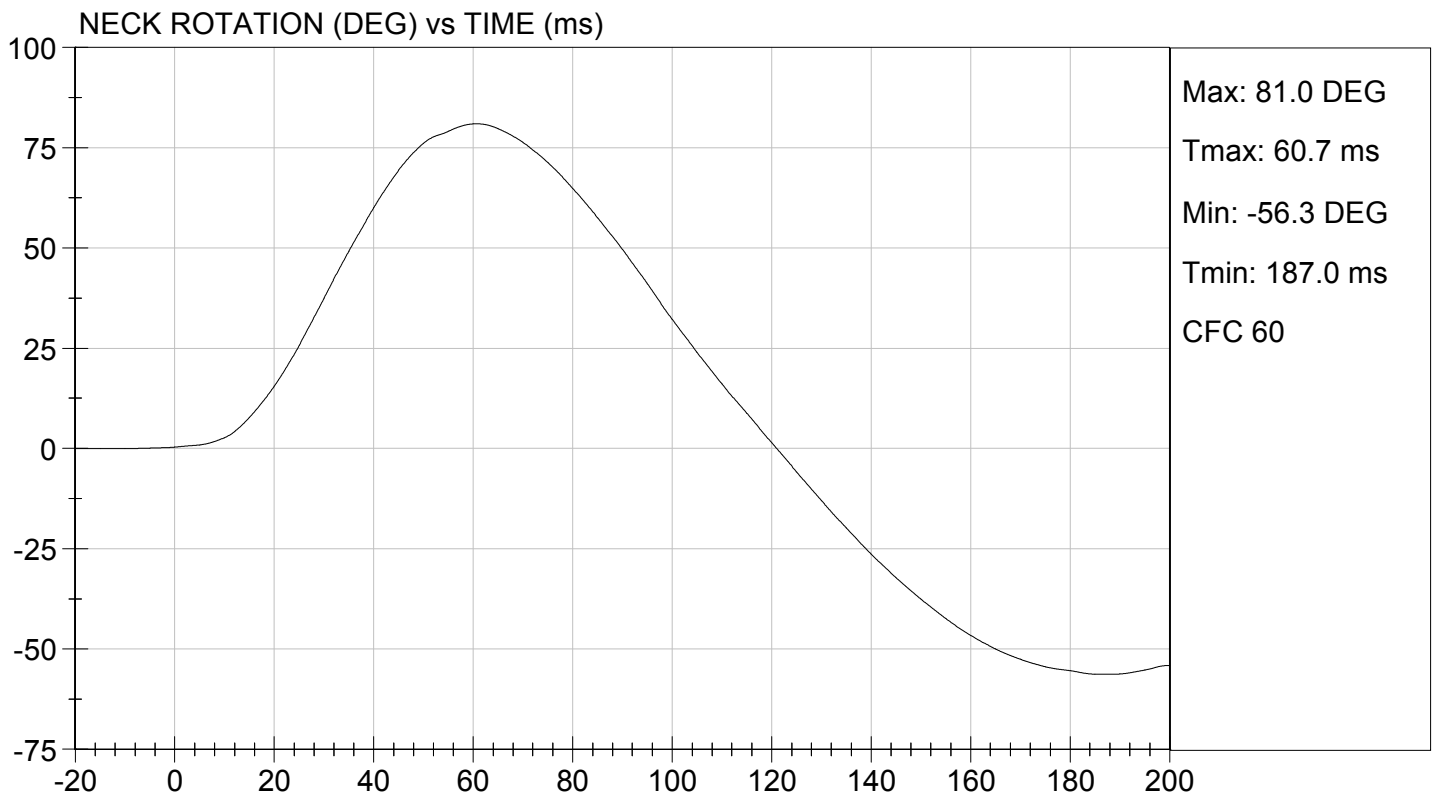
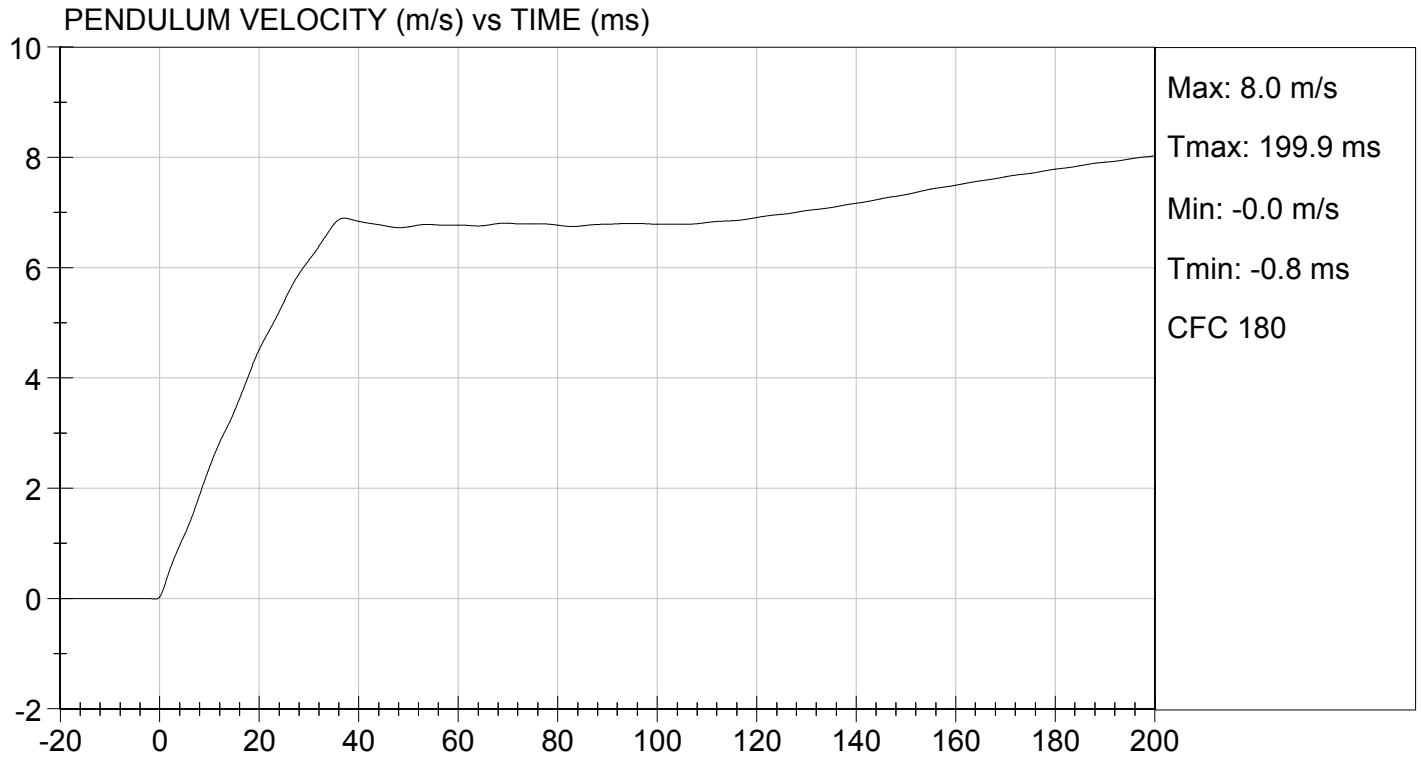
Test Date

Jessica Hall
Approved By



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

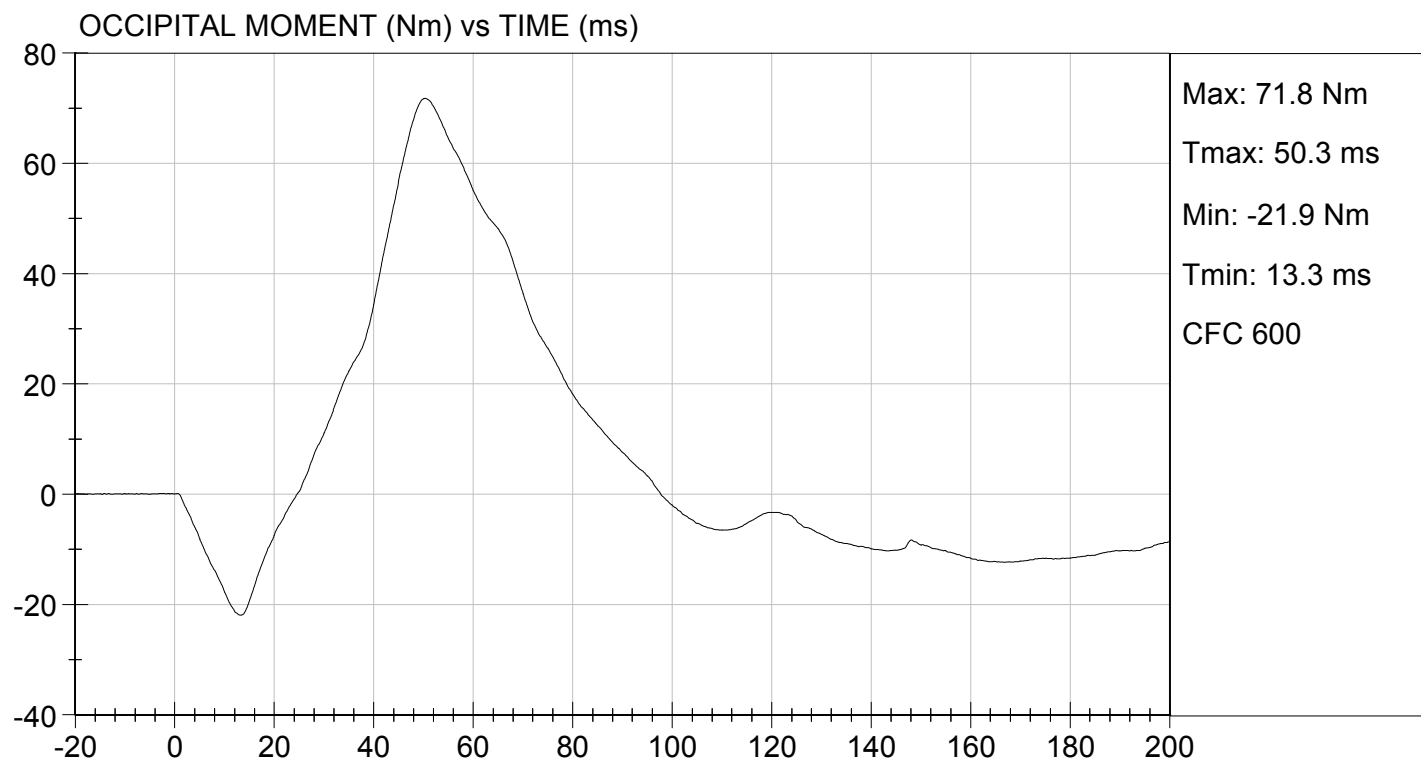
TEST DATE: 11/24/2014
TEST #: D144172





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

TEST DATE: 11/24/2014
TEST #: D144172



MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

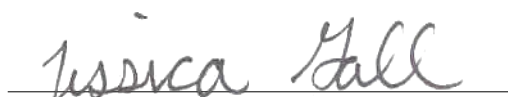
ATD Serial No: 138

Test I.D: D144173

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity		%	10 to 70	35	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.05	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.6	Pass
	20 ms	m/s	3.1 to 3.9	3.4	Pass
	30 ms	m/s	4.6 to 5.6	4.9	Pass
D Plane Rotation	Max	deg	99 to 114	108	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-56	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	104	Pass
Overall Results					Pass


Laboratory Technician

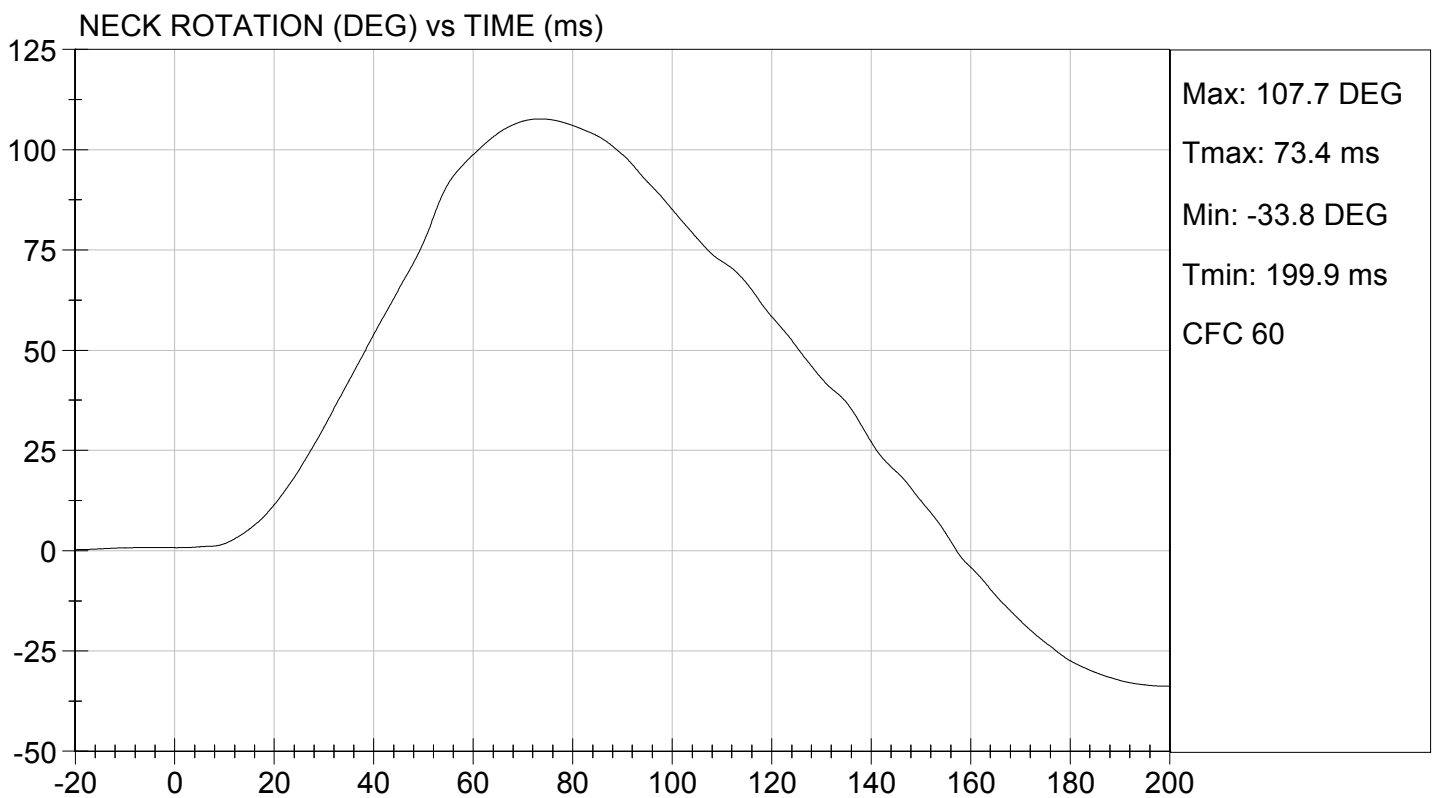
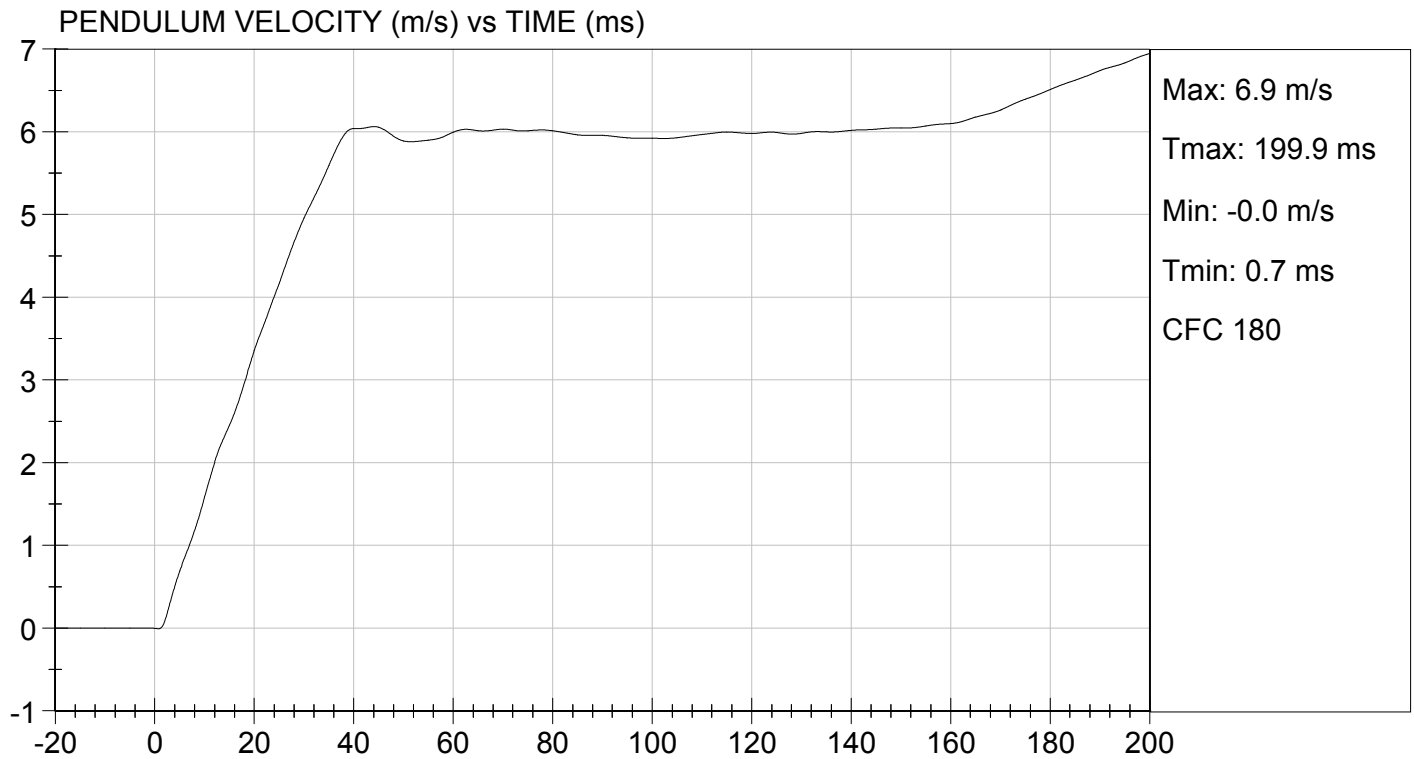
11/25/2014
Test Date


Approved By



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

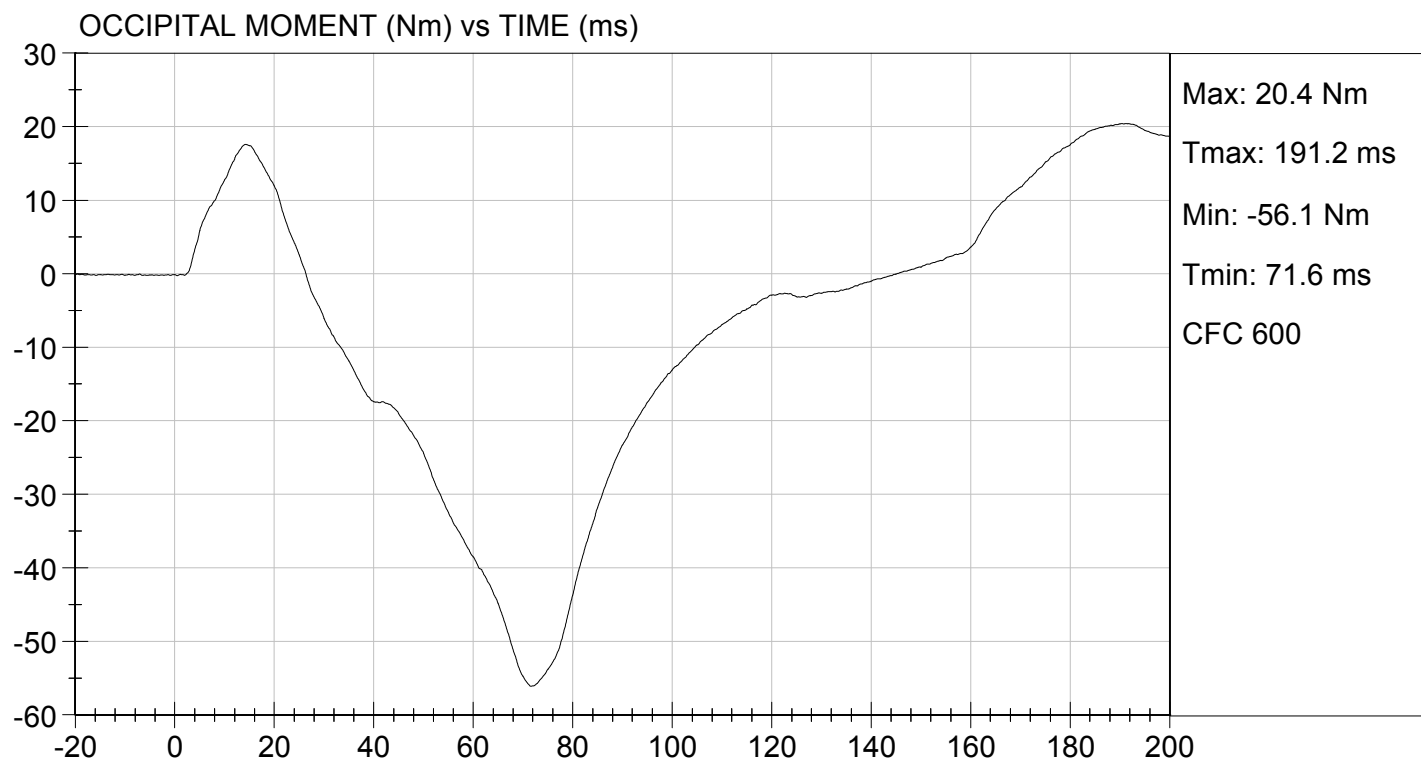
TEST DATE: 11/25/2014
TEST #: D144173





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

TEST DATE: 11/25/2014
TEST #: D144173



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D144174

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Relative Humidity	%	10 to 70	24	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	51	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4163	Pass
Internal Hysteresis	%	69 to 85	72	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4200	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

11/25/2014

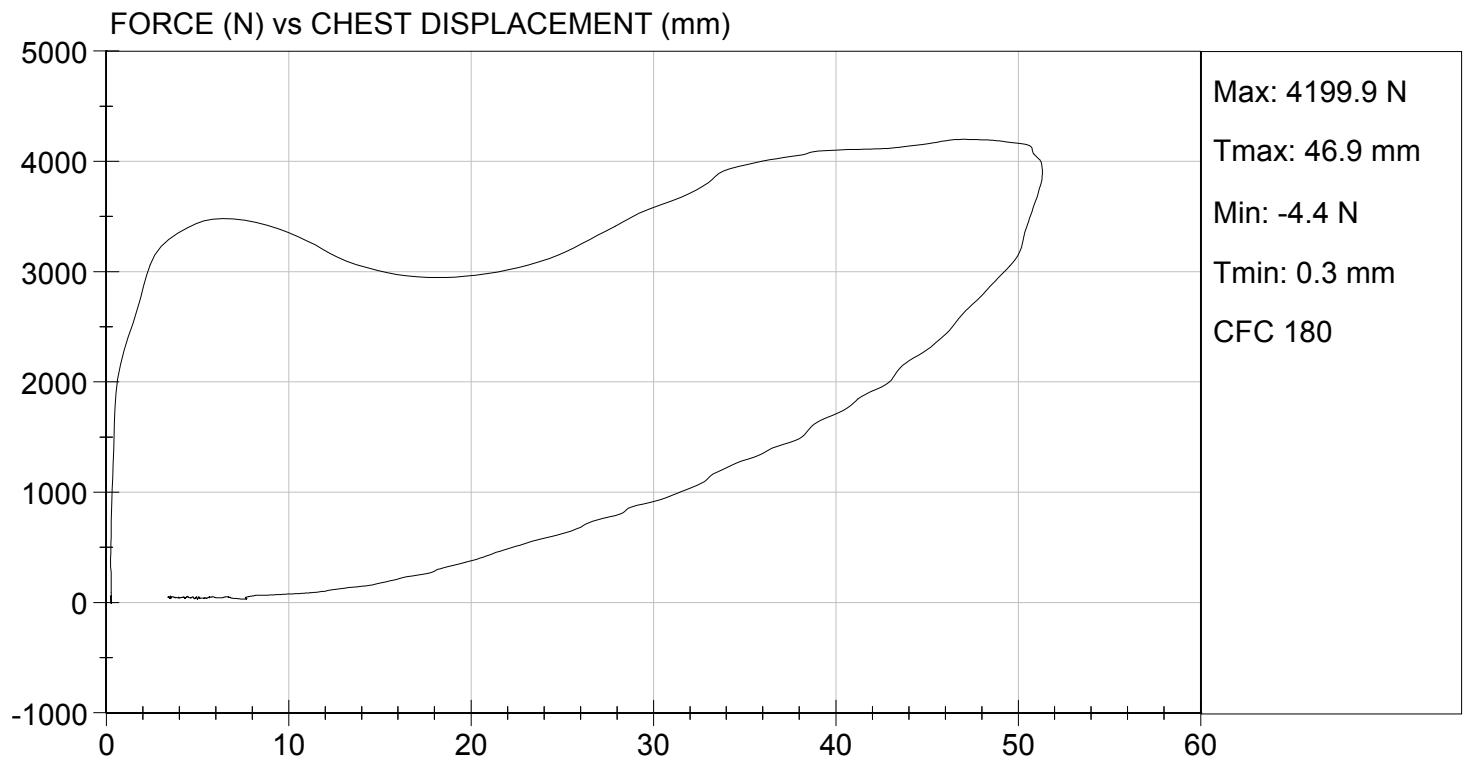
Test Date

Jessica Hall
Approved By



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

TEST DATE: 11/25/2014
TEST #: D144174



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D144175

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Probe Speed	m/s	2.07 to 2.13	2.13	Pass
Maximum Force	N	3450 to 4060	3513	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

11/25/2014

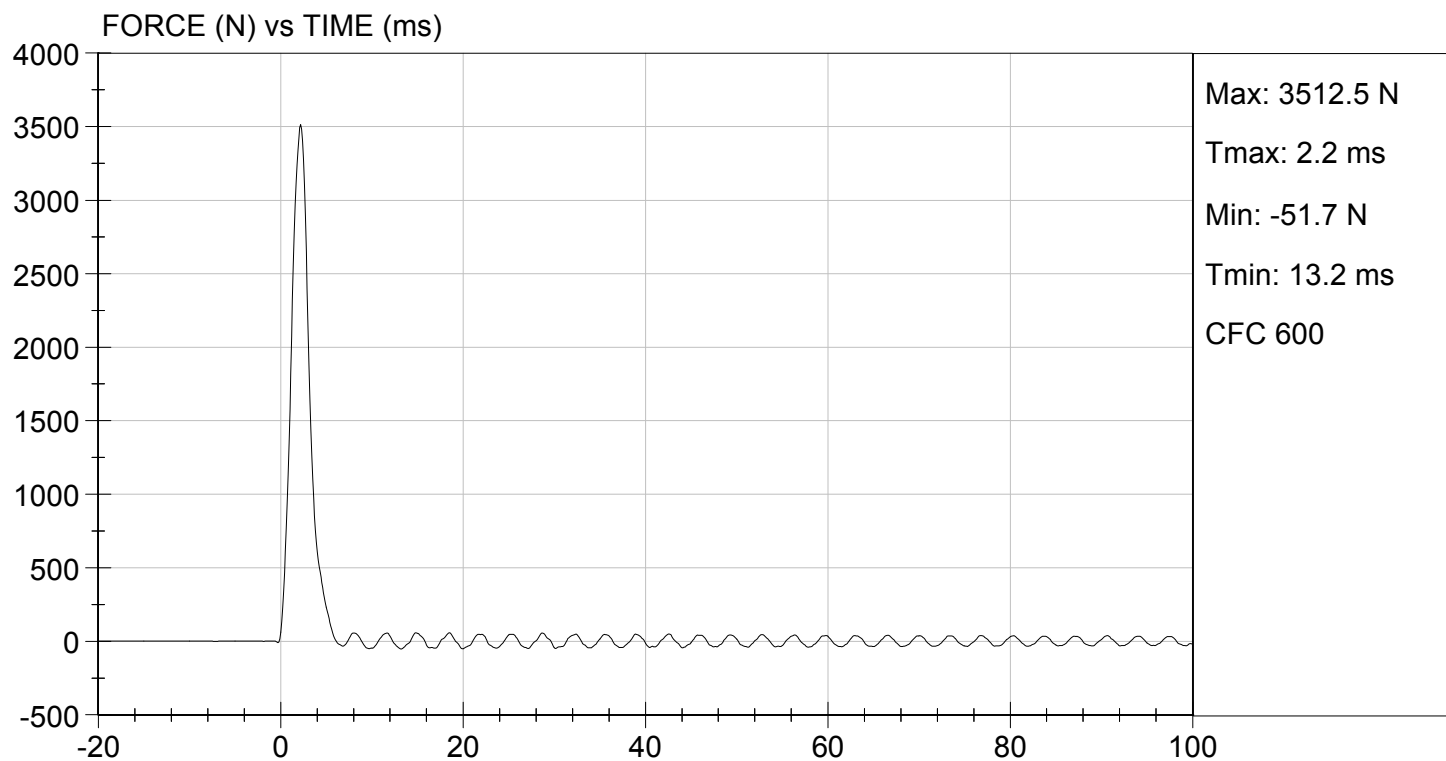
Test Date

Jessica Hall
Approved By



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

TEST DATE: 11/25/2014
TEST #: D144175



MGA RESEARCH CORPORATION

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

ATD Serial No: 138

Test I.D: D144176

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Probe Speed	m/s	2.07 to 2.13	2.13	Pass
Maximum Force	N	3450 to 4060	3588	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

11/25/2014

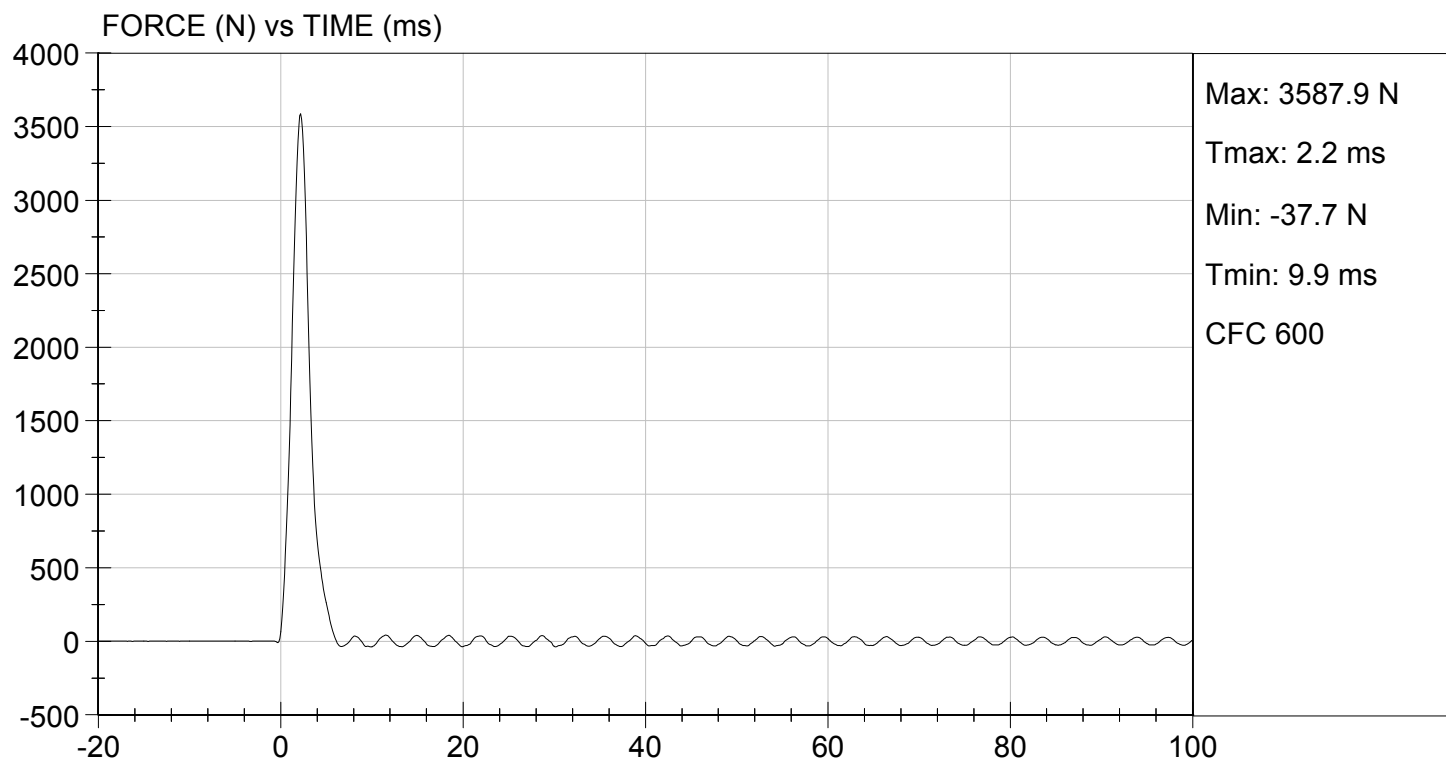
Test Date

Jessica Hall
Approved By



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

TEST DATE: 11/25/2014
TEST #: D144176



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138

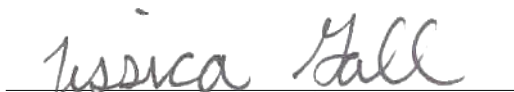
Test I.D: D144177

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Initial Angle	deg	0 to 20	20	Pass
Return Angle	deg	+/- 8	5	Pass
Force at 45 deg	N	320 to 390	389	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.6	Pass
Overall Result				Pass


Laboratory Technician

11/25/2014

Test Date


Approved By

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test ID: D144321

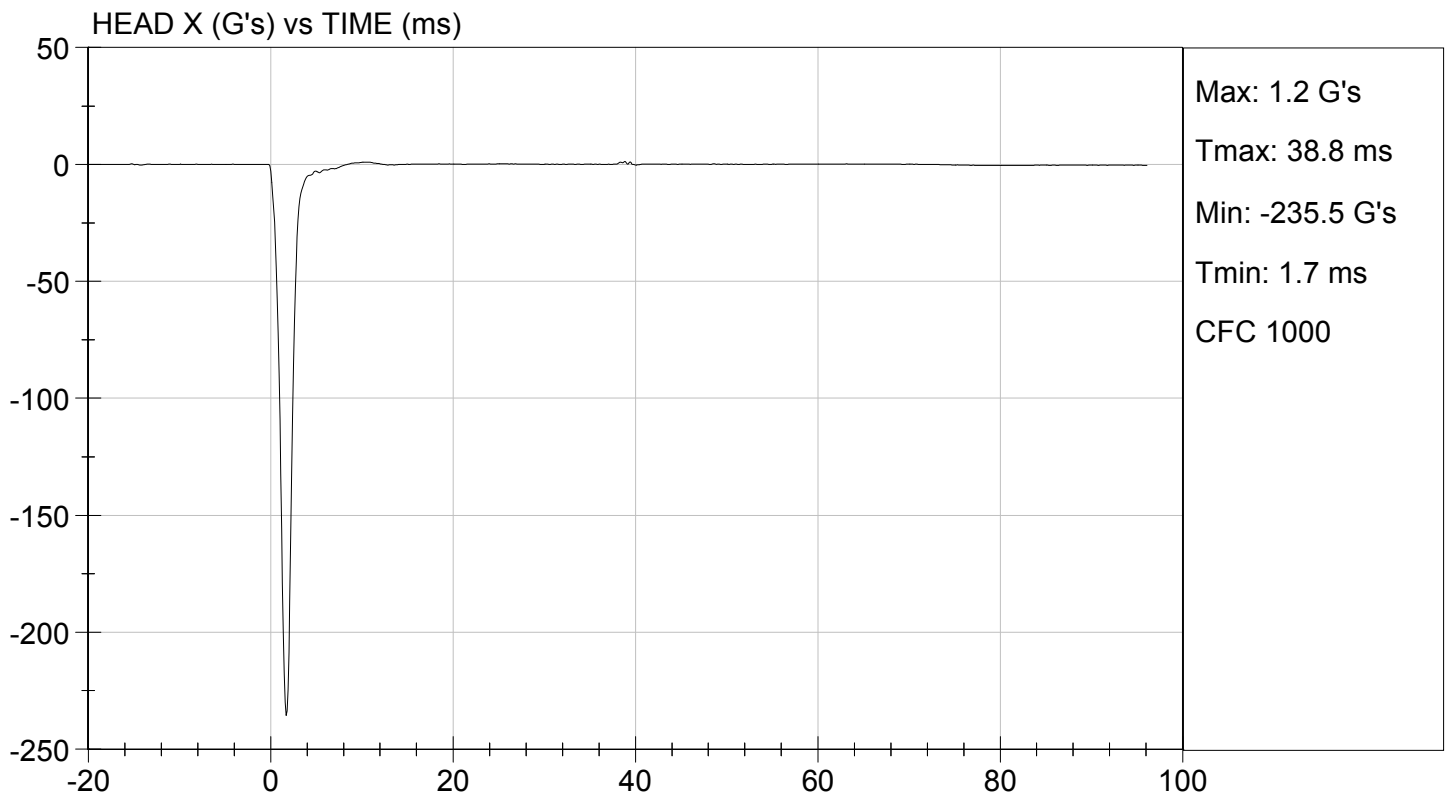
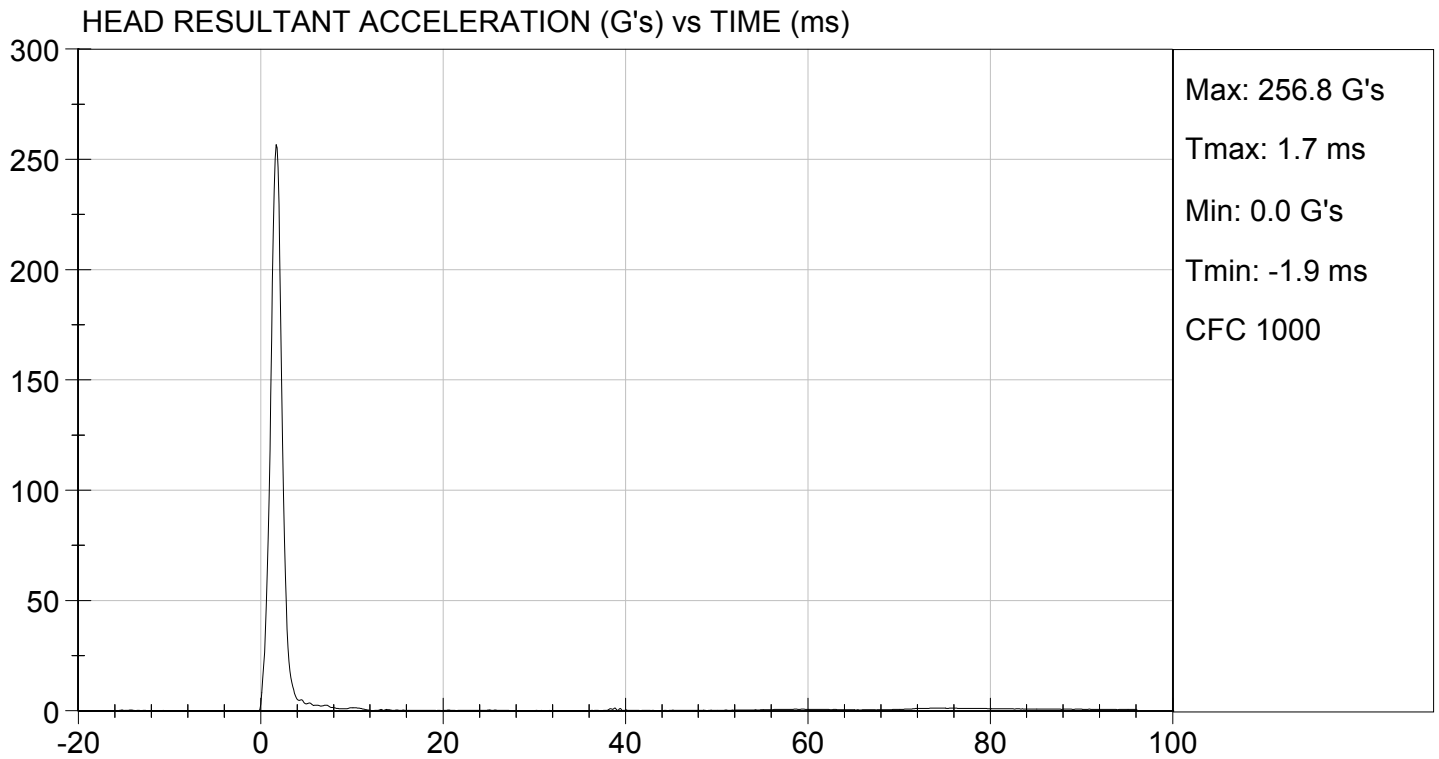
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	18	Pass
Peak Resultant Acceleration	G's	250 to 300	257	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-6.8	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

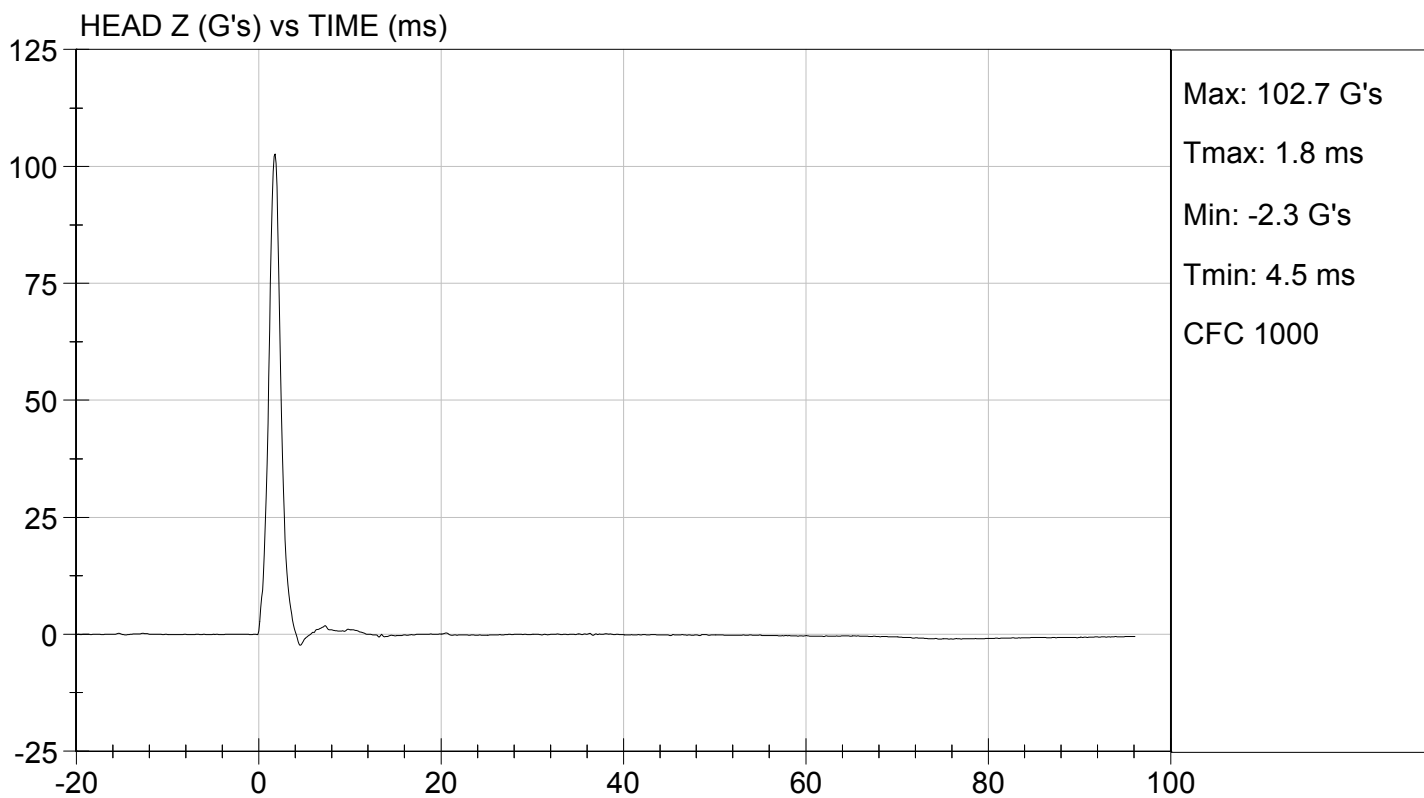
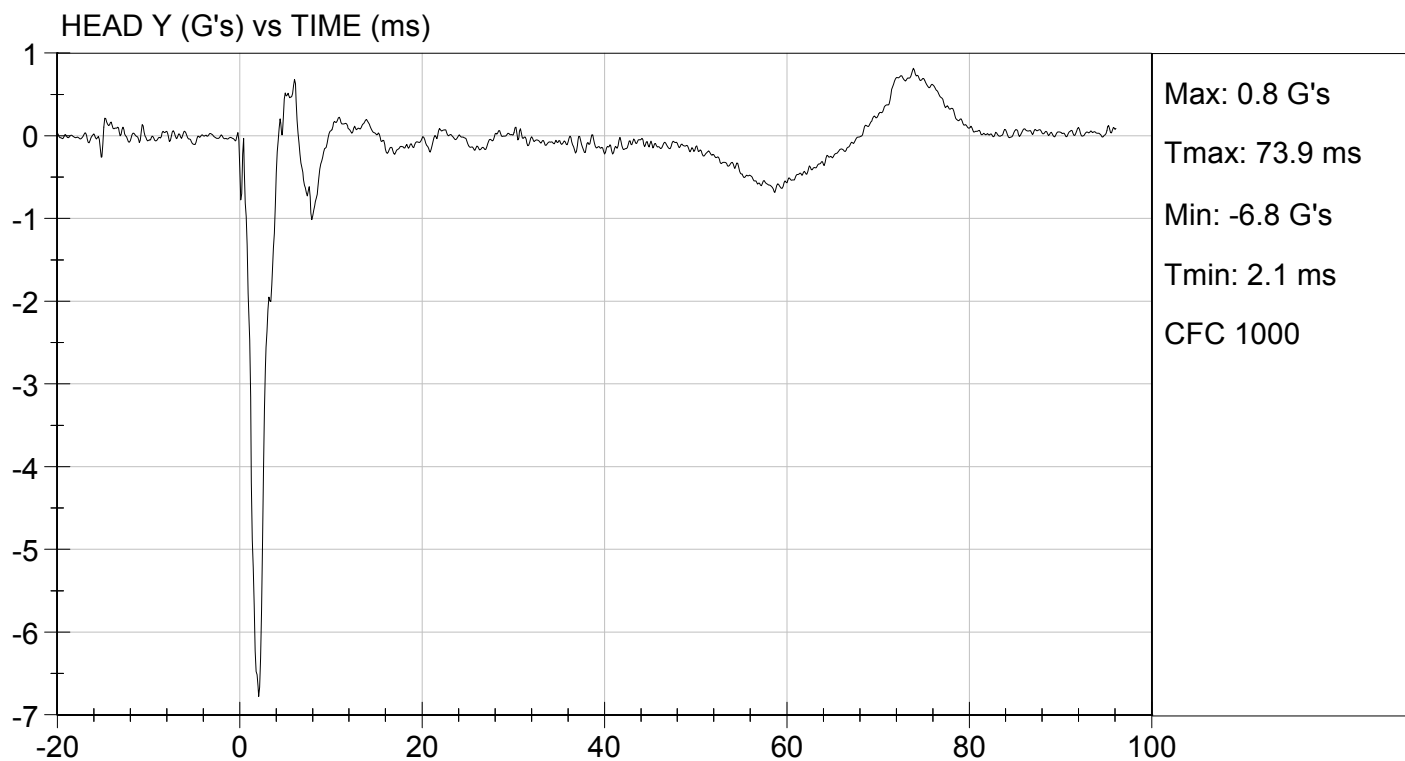
David Schoedel
Laboratory Technician

12/08/2014

Test Date

Jessica Hall
Approved By





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D144322

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	18	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.13	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.4	Pass
	20 ms	m/s	4.0 to 5.0	4.5	Pass
	30 ms	m/s	5.8 to 7.0	6.3	Pass
D Plane Rotation	Max	deg	77 to 91	83	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	72	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	83	Pass
Overall Results					Pass

David Schoedel
Laboratory Technician

12/08/2014

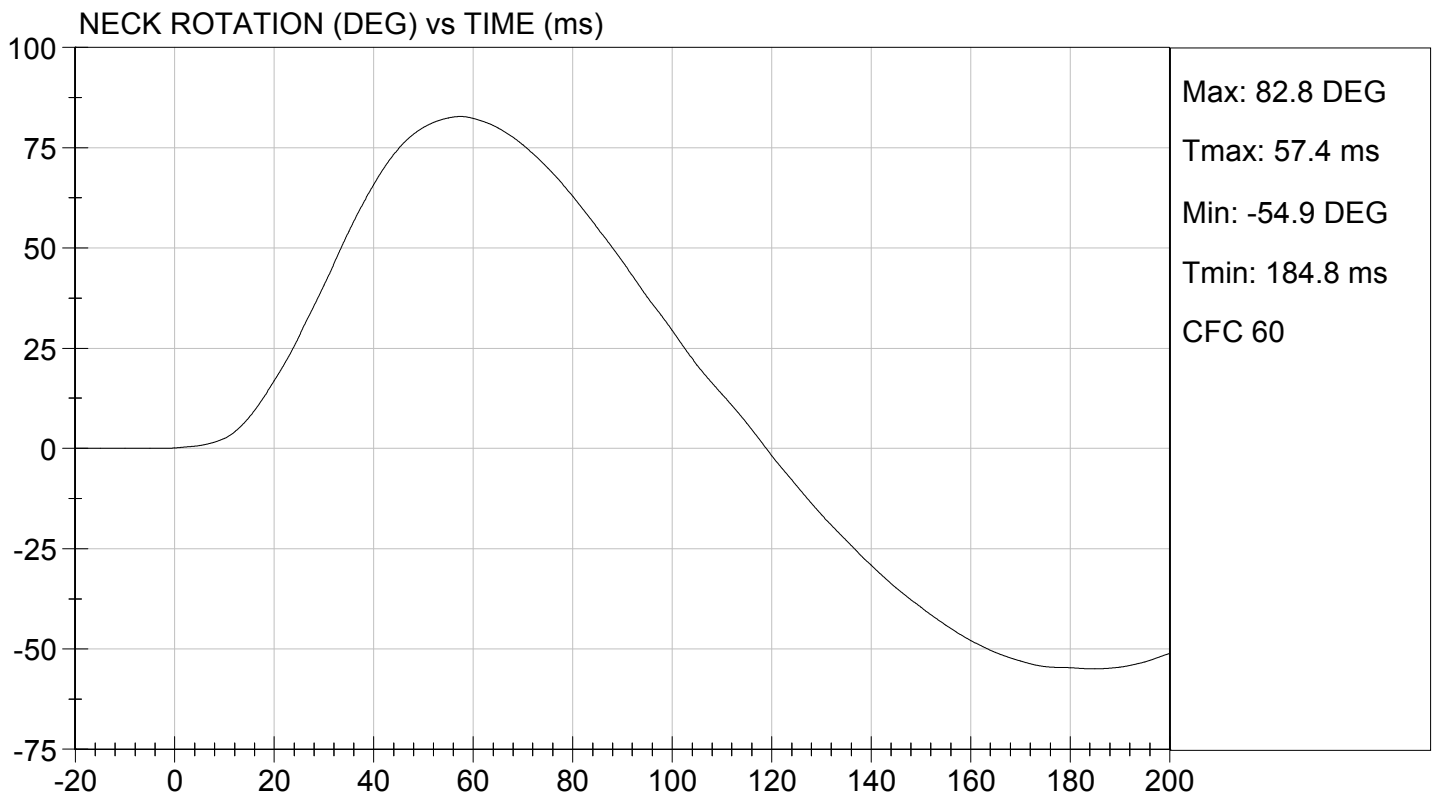
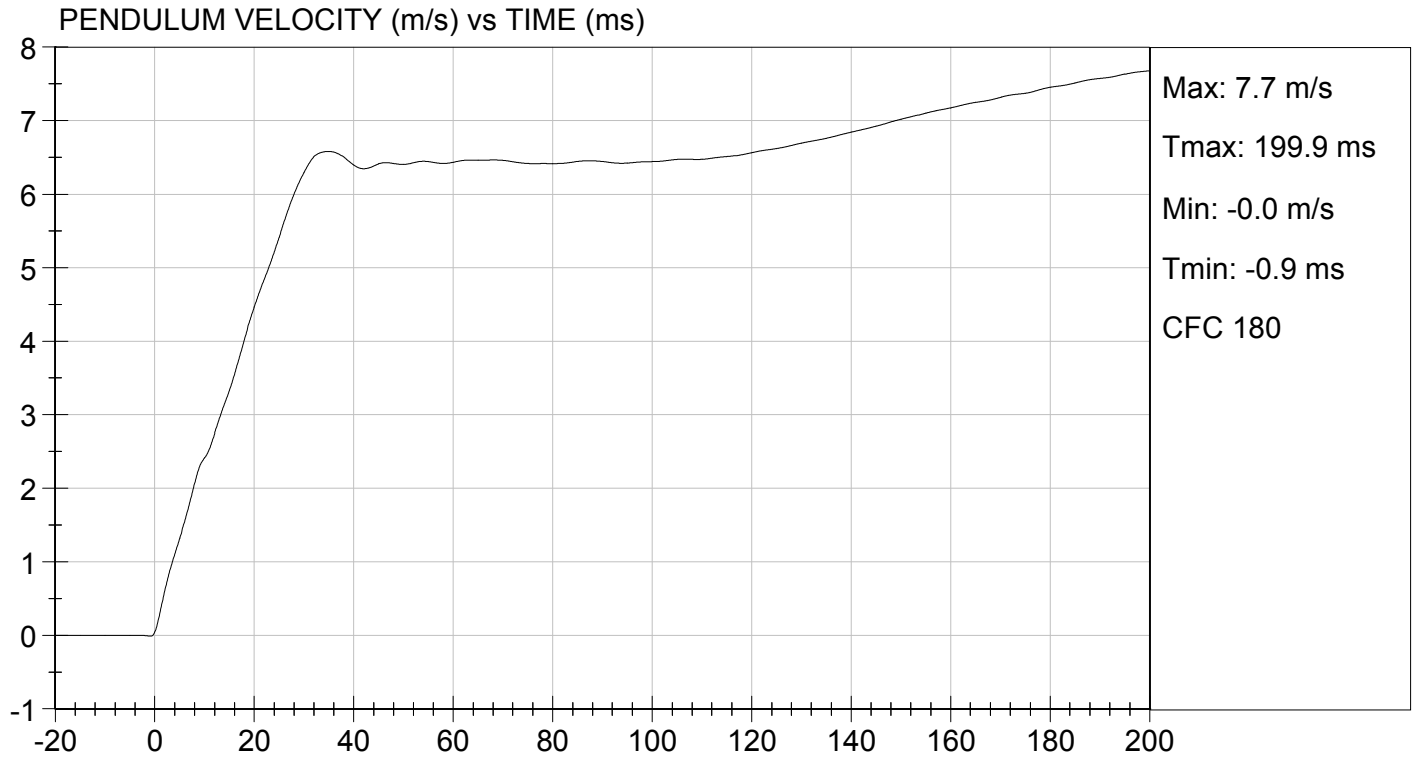
Test Date

Jessica Hall
Approved By



TEST DESC: NECK FLEXION
VELOCITY: 23.40 ft/s, 7.13 m/s

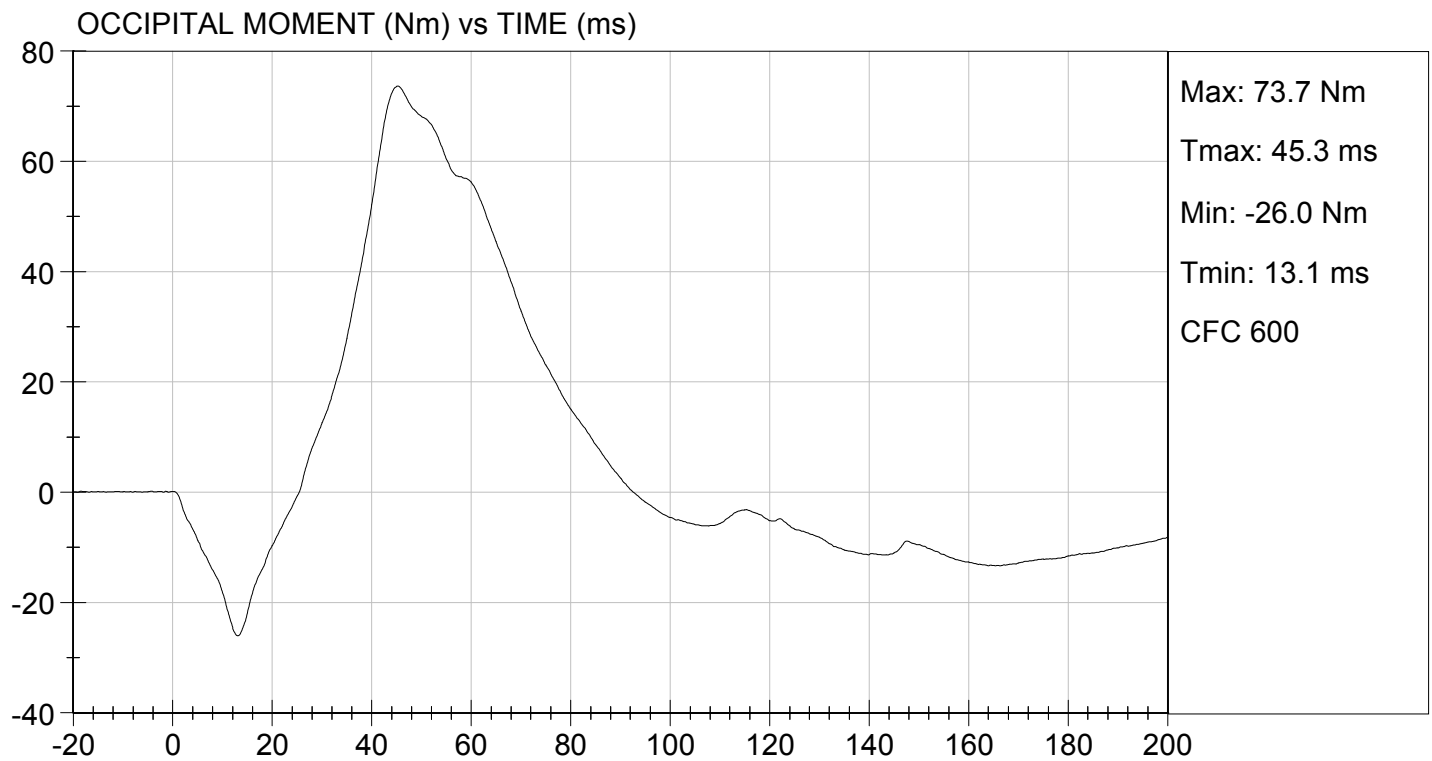
TEST DATE: 12/08/2014
TEST #: D144322





TEST DESC: NECK FLEXION
VELOCITY: 23.40 ft/s, 7.13 m/s

TEST DATE: 12/08/2014
TEST #: D144322



MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D144323

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	18	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.19	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.9	Pass
	20 ms	m/s	3.1 to 3.9	3.8	Pass
	30 ms	m/s	4.6 to 5.6	5.4	Pass
D Plane Rotation	Max	deg	99 to 114	106	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-55	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	101	Pass
Overall Results					Pass

David Schoedel
Laboratory Technician

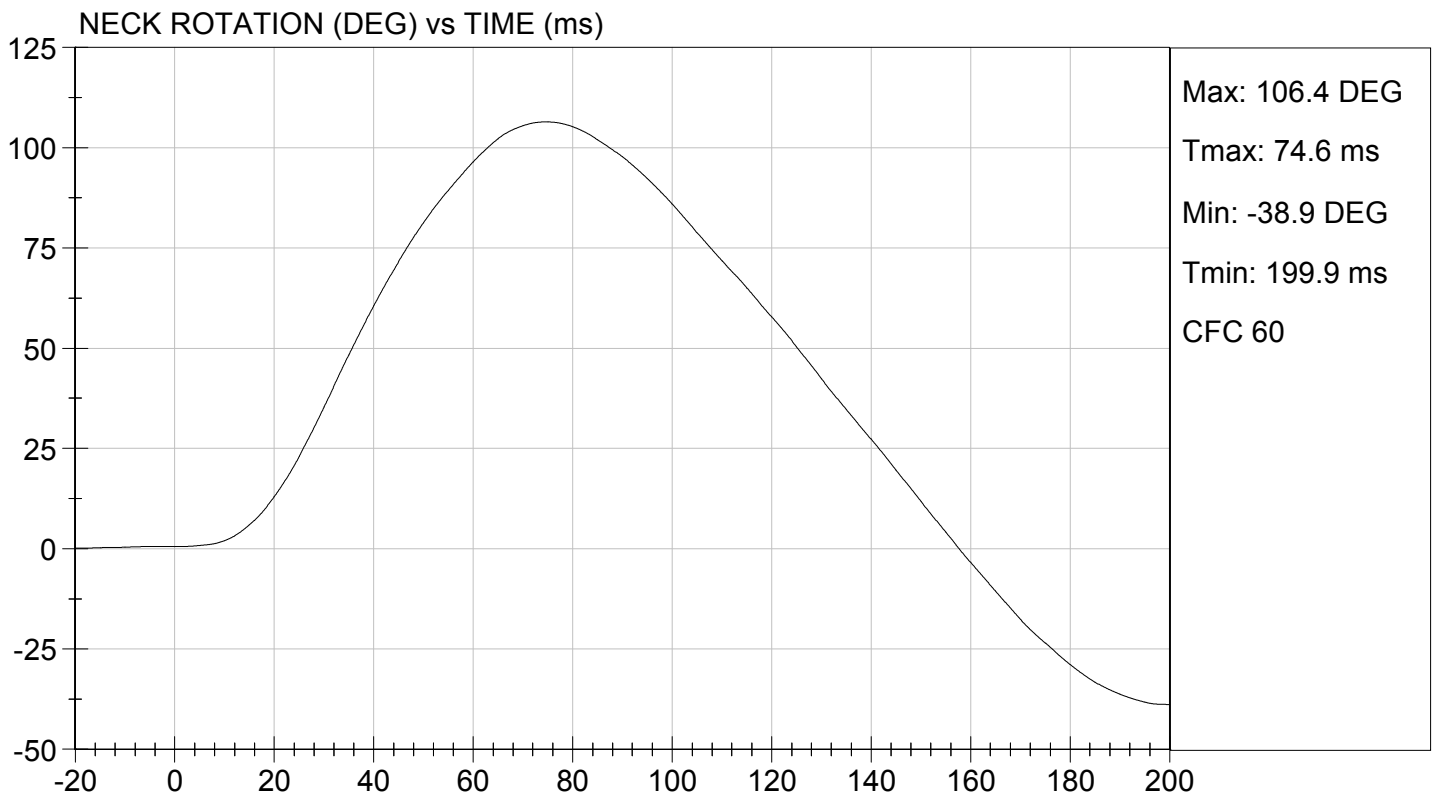
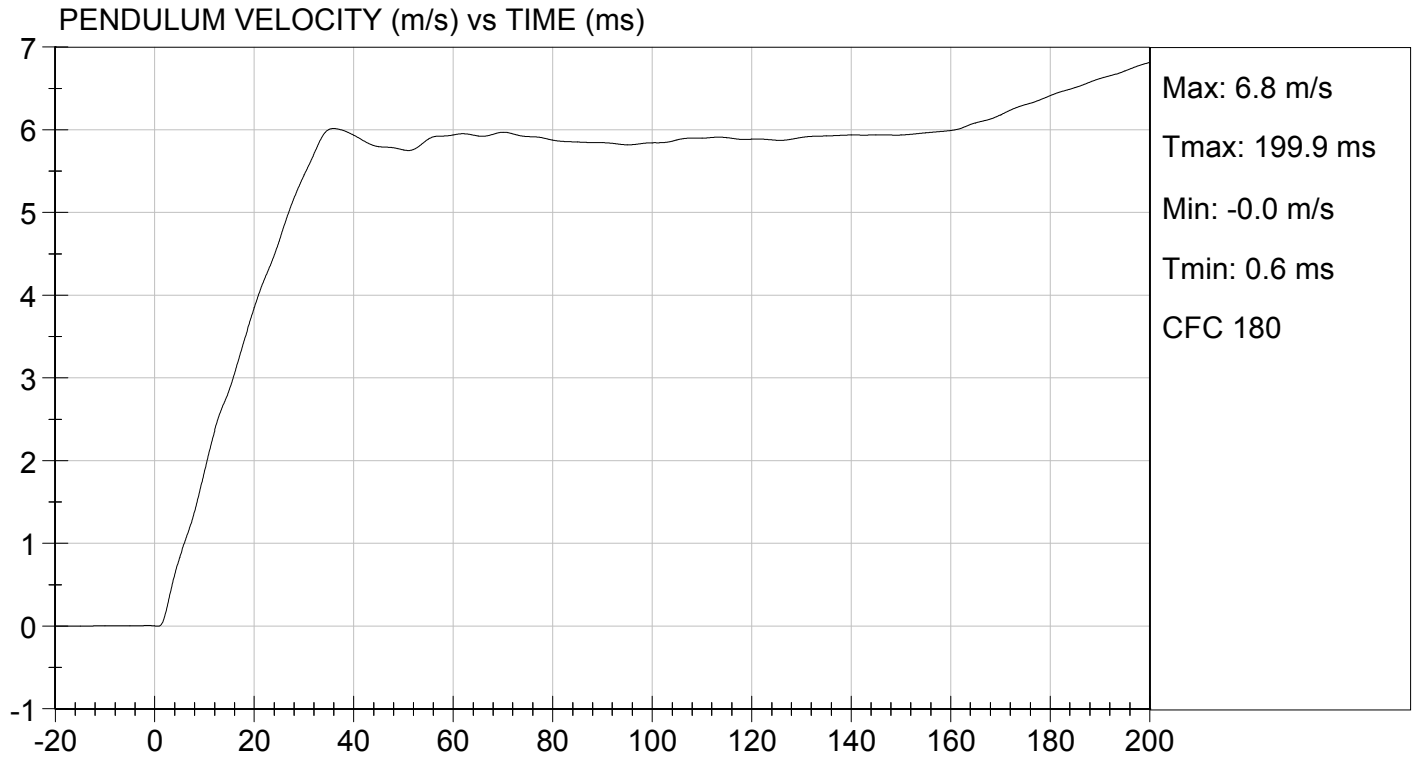
12/08/2014
Test Date

Jessica Hall
Approved By



TEST DESC: NECK EXTENSION
VELOCITY: 20.30 ft/s, 6.19 m/s

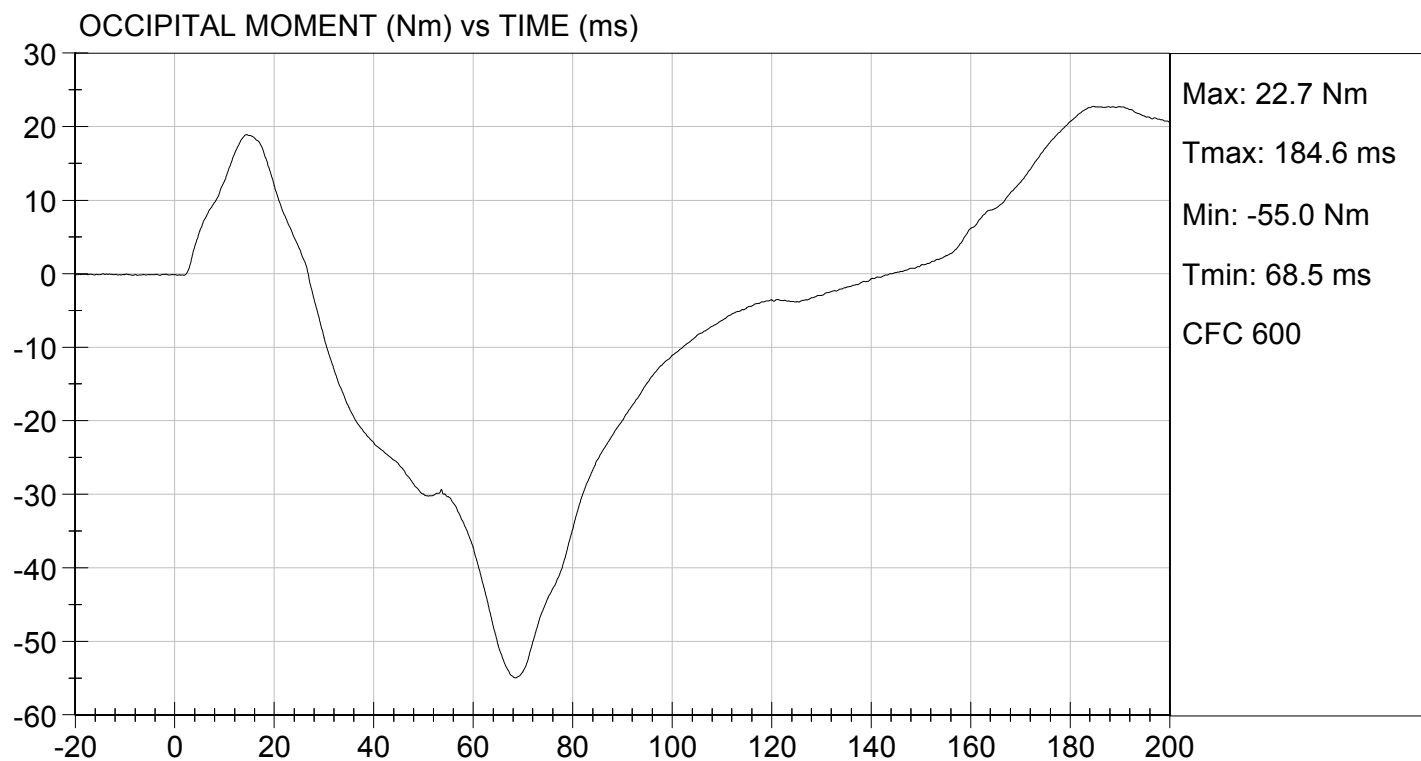
TEST DATE: 12/08/2014
TEST #: D144323





TEST DESC: NECK EXTENSION
VELOCITY: 20.30 ft/s, 6.19 m/s

TEST DATE: 12/08/2014
TEST #: D144323



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D144324

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Relative Humidity	%	10 to 70	27	Pass
Probe Speed	m/s	6.59 to 6.83	6.68	Pass
Peak Deflection	mm	50 to 58	52	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4129	Pass
Internal Hysteresis	%	69 to 85	73	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4159	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

12/09/2014

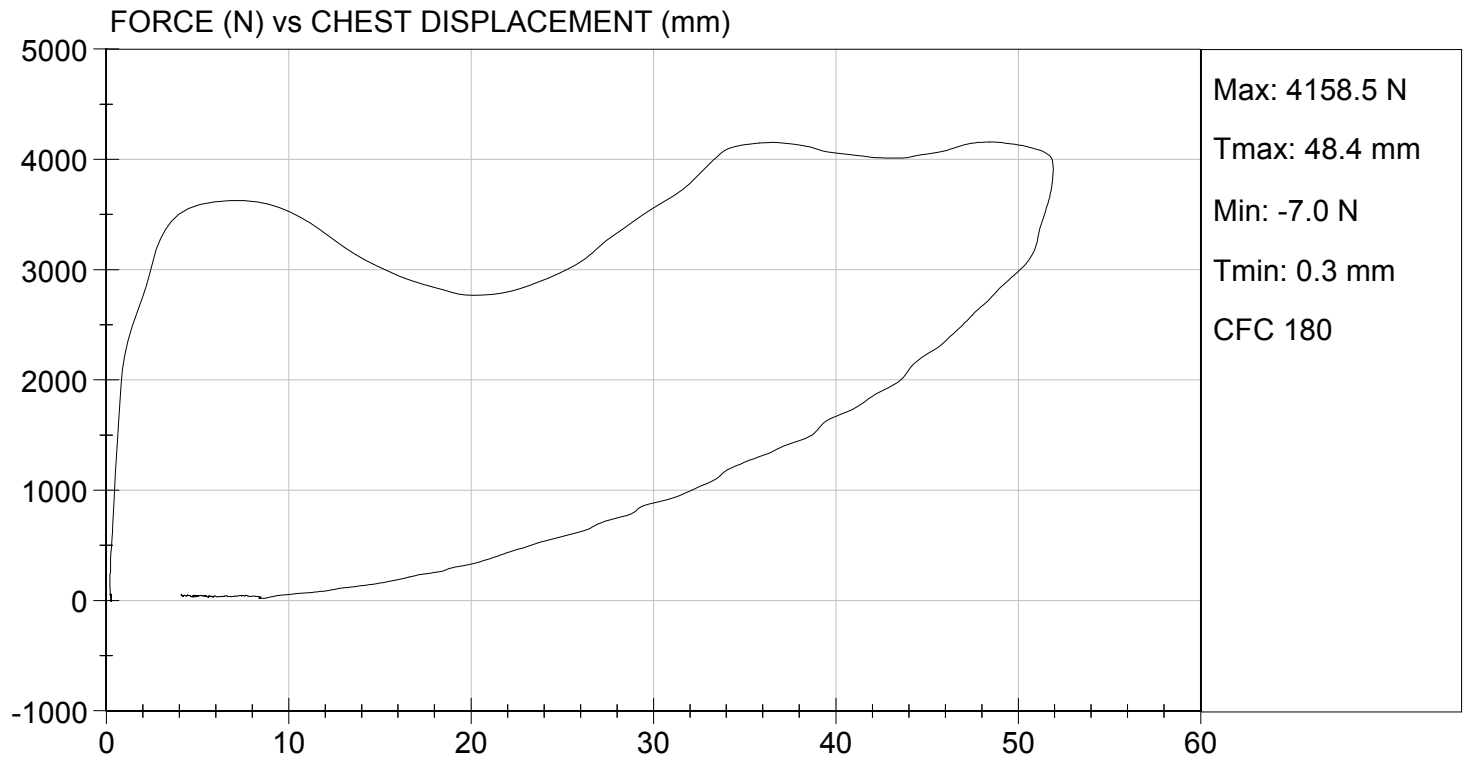
Test Date

Jessica Hall
Approved By



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

TEST DATE: 12/09/2014
TEST #: D144324



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D144325

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	30	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3531	Pass
Overall Test Results				Pass

Maxime Chamberland

Laboratory Technician

12/09/2014

Test Date

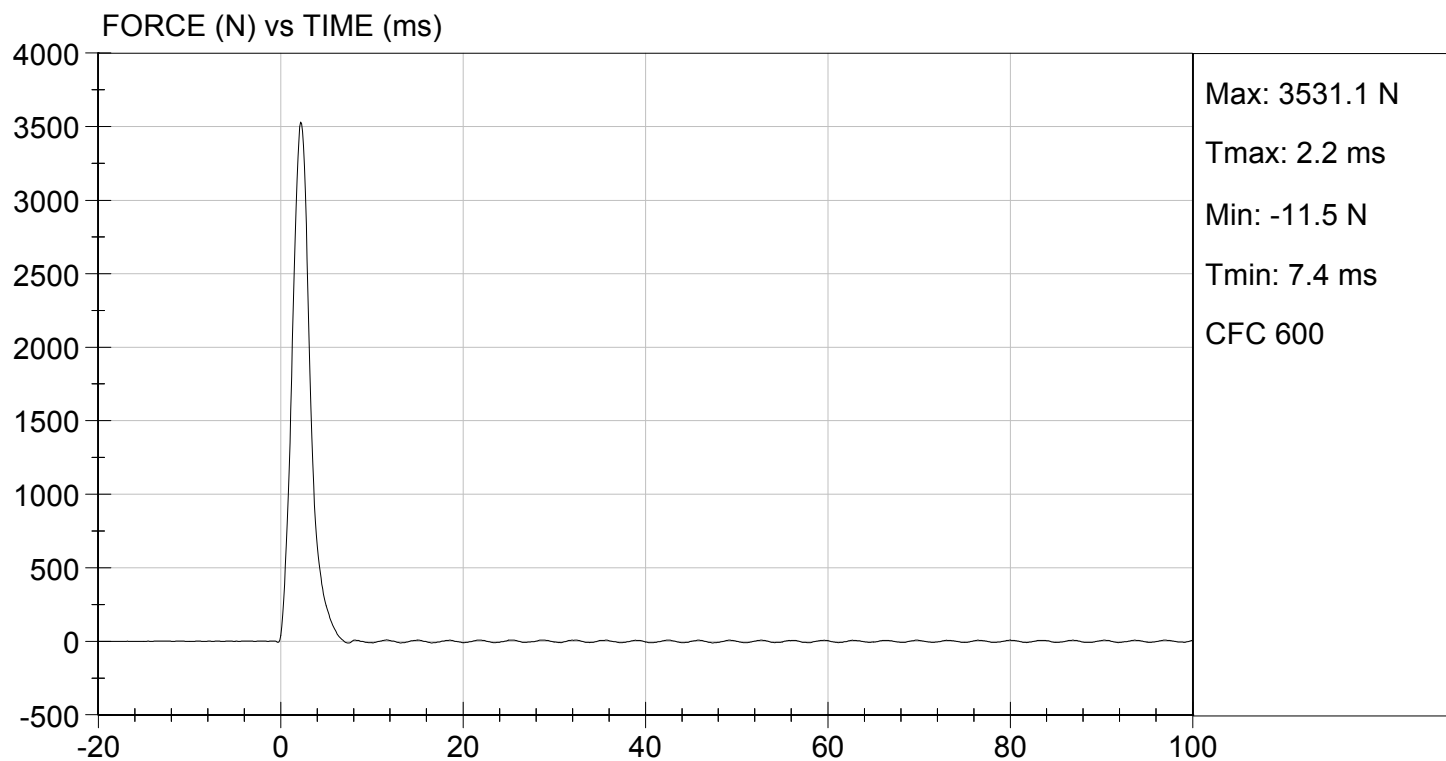
Jessica Hall

Approved By



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

TEST DATE: 12/09/2014
TEST #: D144325



MGA RESEARCH CORPORATION

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

ATD Serial No: 138

Test I.D: D144326

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	30	Pass
Probe Speed	m/s	2.07 to 2.13	2.13	Pass
Maximum Force	N	3450 to 4060	3530	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

12/09/2014

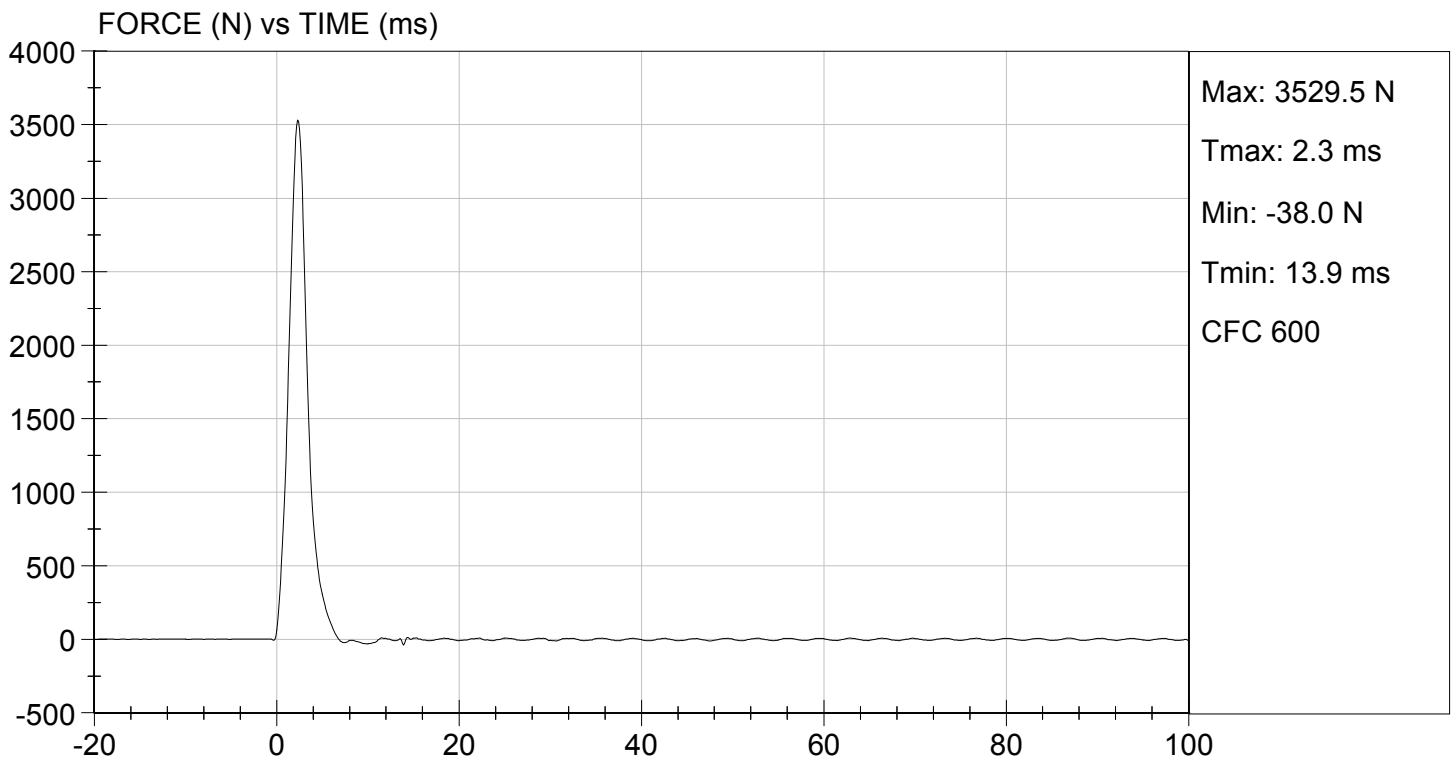
Test Date

Jessica Hall
Approved By



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

TEST DATE: 12/09/2014
TEST #: D144326



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D144327

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Initial Angle	deg	0 to 20	20	Pass
Return Angle	deg	+/- 8	5	Pass
Force at 45 deg	N	320 to 390	346	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.6	Pass
Overall Result				Pass

David Schoedel
Laboratory Technician

12/09/2014

Test Date

Jessica Hall
Approved By