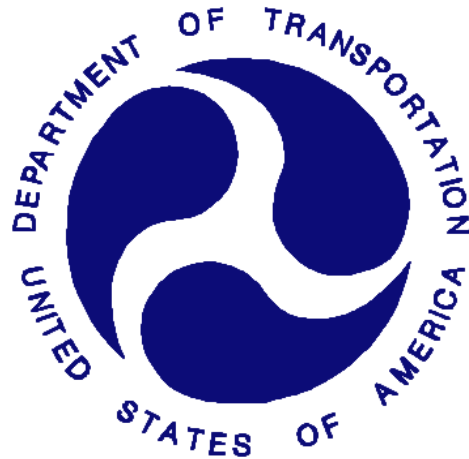


REPORT NUMBER: NCAP-MGA-2014-022

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

**CHRYSLER GROUP LLC
2014 Jeep Grand Cherokee Laredo 4X4 SUV
NHTSA No.: O20140300**

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



Test Date: November 4, 2013

Final Report Date: November 23, 2013

FINAL REPORT

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

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Prepared by: 
Donna Janovicz, Project Manager

Approved by: 
Ben Fischer, Project Engineer

Approval Date: November 23, 2013

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

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SECTION 1 PURPOSE AND SUMMARY OF TEST

PURPOSE

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

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

SUMMARY

A load cell barrier consisting of 176 load cells was impacted by a 2014 Jeep Grand Cherokee Laredo 4X4 SUV at a velocity of 56.3 km/h. The test was performed at MGA Research Corporation on November 4, 2013. Pre-test and post-test photographs of the vehicle and dummies can be found in Appendix A.

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

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

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

The driver (position 1) ATD (Serial No. 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 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 547 mm and both the driver and passenger side doors remained closed during the impact event and were operable after the impact.

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

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)	122	0.24	848	55	37	26	1643	1539
Passenger (5 th)	329	0.28	673	428	45	11	1799	867

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

TEST NOTES

Passenger Right Ankle Z has no valid data after 67ms
Load Cell K-16 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: 2014 Jeep Grand Cherokee Laredo 4X4 SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20140300
Test Date: 11/04/2013

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	O20140300	Traction Control System (TCS)	No
Model Year	2014	Power Steering	Yes
Make	Jeep	Power Window Auto-Reverse	Yes
Model	Grand Cherokee	Driver Frontal Airbag	Yes
Body Style	SUV	Driver Curtain Airbag	Yes
VIN	1C4RJFAG8EC253284	Driver Head/Torso Airbag	No
Body Color	Deep Cherry Red	Driver Torso Airbag	No
Odometer (km/mi)	116 / 72	Driver Torso/Pelvis Airbag	Yes
Engine Displacement (L)	3.6	Driver Pelvis Airbag	No
Type/No. Cylinders	6	Driver Knee Airbag	Yes
Engine Placement	Longitudinal	Front Pass. Frontal Airbag	Yes
Transmission Type	Automatic	Front Pass. Curtain Airbag	Yes
Transmission Speeds	8	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	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?	Yes
--	-----

DATA FROM CERTIFICATION LABEL

Manufactured By	Chrysler Group LLC	GVWR (kg)	2949
Date of Manufacture	7-13	GAWR Front (kg)	1452
		GAWR Rear (kg)	1679

VEHICLE SEATING AND WEIGHT CAPACITY DATA

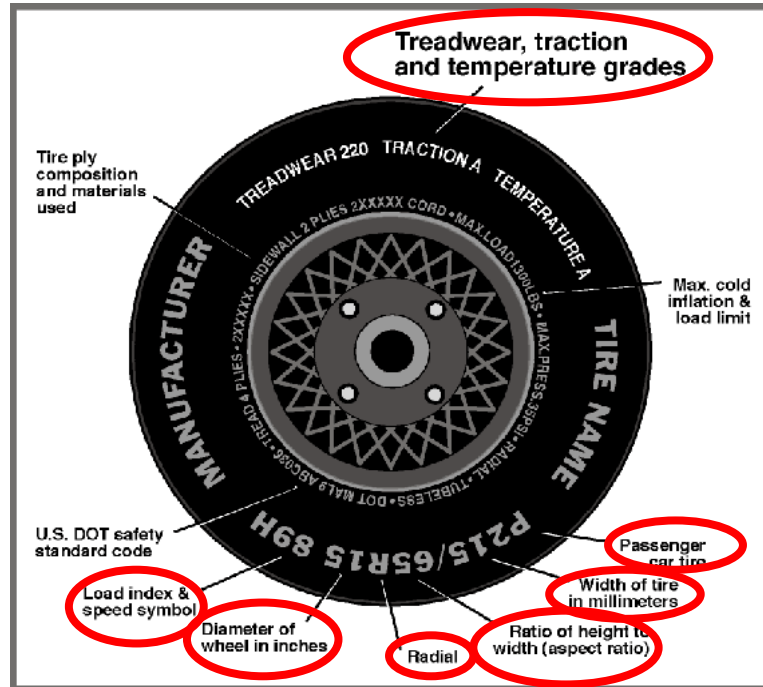
Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench		
Designated Seating Capacity (DSC)	2	3		5
Capacity Weight (VCW) (kg)				476
Cargo Weight (RCLW) (kg)				136

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

Test Vehicle: 2014 Jeep Grand Cherokee Laredo 4X4 SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20140300
Test Date: 11/04/2013

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	230	230
Recommended Tire Size	P245/70R17	P245/70R17
Tire Size on Vehicle	P245/70R17	P245/70R17
Tire Manufacturer	Goodyear	Goodyear
Tire Model	Fortera	Fortera
Treadwear	540	540
Traction	A	A
Temperature Grade	B	B
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 2 Steel	2 Polyester, 2 Steel
Load Index/Speed Symbol	108T	108T
Tire Material	Rubber	Rubber
DOT Safety Code Left	4B83 JD1R 2813	4B83 JD1R 2813
DOT Safety Code Right	4B83 JD1R 2813	4B83 JD1R 2813

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

Test Vehicle: 2014 Jeep Grand Cherokee Laredo 4X4 SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20140300
 Test Date: 11/04/2013

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	558.4	506.2		588.3	617.8	
Right	kg	552.9	509.4		568.4	622.8	
Ratio	%	52.2	47.8		48.2	51.8	
Totals	kg	1111.3	1015.6	2126.9	1156.7	1240.6	2397.3

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	2126.9
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	2403.5

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	Mm	827	822	822	830	1198
As Tested	Mm	819	815	809	812	1262
Post Test	Mm	907	880	829	800	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2920
Total Vehicle Length at Left Side	mm	4578
Total Vehicle Length at Centerline	mm	4832
Total Vehicle Length at Right Side	mm	4578
Weight of Ballast in Cargo Area	kg	145.2
Weight of Vehicle Components Removed	kg	49.9
Amount of Stoddard Solvent in Fuel Tank	L	87.1

List of components removed to meet test weight: Right taillight, jack & tools, spare tire, spare tire cover and surround, cargo area carpet, spare tire storage bins, right lower D-pillar trim, and rear floor mats.

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

Test Vehicle: 2014 Jeep Grand Cherokee Laredo 4X4 SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20140300
 Test Date: 11/04/2013

TARGET VEHICLE STRUCTURAL MEASUREMENT

	Elements	Pre-Test (mm)
1	Total Length	4832
2	Total Width	1919
3	Bumper Top Height	630
4	Bumper Bottom Height	520
5	Longitudinal Member Top Height	610
6	Distance between Longitudinal Members	802
7	Longitudinal Member Width	78
8	Engine Top Height	1107
9	Engine Bottom Height	289
10	Engine and Gearbox Width	1420
11	Front Bumper-Engine Distance	576
12	Front Shock Absorber Fixing Height	1032
13	Bonnet Leading Edge Height	1008
14	Front Shock Absorber Fixing Width	950
15	Front Bumper – Front Axle Distance	926
16	Front Axle – A-Pillar Distance	582
17	A-Pillar – B-Pillar Distance	1172
18	B-Pillar – Rear Axle Distance	1168
19	B-Pillar – C-Pillar Distance	618
20	Roof Sill Bottom Height	1606
21	Roof Sill Top Height	1714
22	Floor Sill Bottom Height	302
23	Floor Sill Top Height	528

DATA SHEET NO. 2

SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

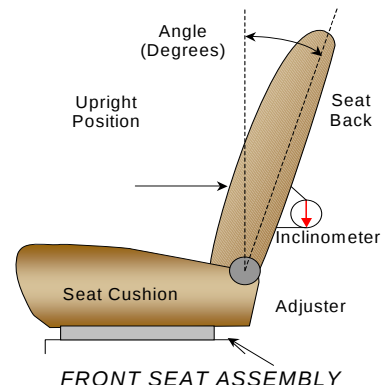
Test Vehicle: 2014 Jeep Grand Cherokee Laredo 4X4 SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20140300
 Test Date: 11/04/2013

NOMINAL DESIGN RIDING POSITION

The driver seat back is positioned as close as possible to the manufacturer's design angle. For the passenger seat back, seat back is adjusted following Appendix F, "Driver & Passenger Dummy Seating & Positioning Procedures" in the NCAP Test Procedure dated August 2013.

	Degrees
Driver Seat Back Angle	13.0° on headrest post
Passenger Seat Back Angle	12.3° on headrest post



SEAT FORE/AFT POSITIONS

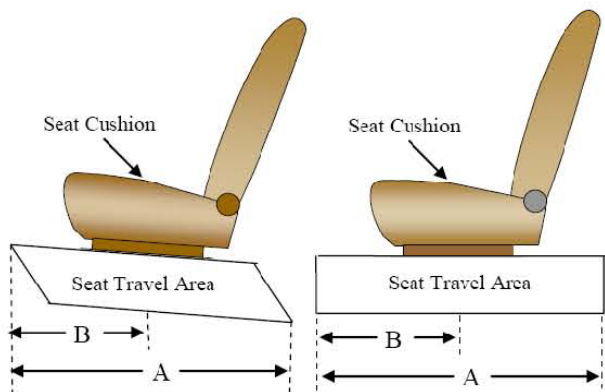
The driver and passenger seat fore/aft positions are adjusted following Appendix F, "Driver & Passenger Dummy Seating & Positioning Procedures" in the NCAP Test Procedure dated August 2013.

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	42 detents (1 st as 1)	21 st detent (foremost as 0)
Passenger Seat	35 detents (1 st as 1)	0 mm (foremost as 0)

SEAT BELT UPPER ANCHORAGES

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

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



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

Test Vehicle: 2014 Jeep Grand Cherokee Laredo 4X4 SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20140300
 Test Date: 11/04/2013

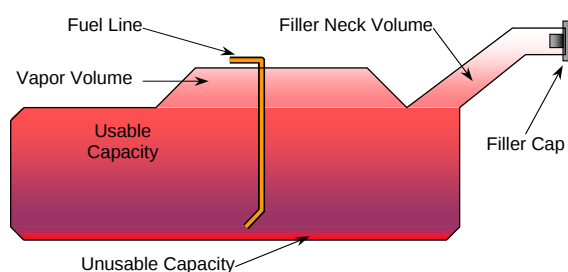
FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of "Standard Tank"	93.5
Usable Capacity of "Optional Tank"	
92-94% of Usable Capacity	86.0 to 87.9
Actual Amount of Solvent used	87.1
1/3 of Usable Capacity	31.2

FUEL PUMP

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

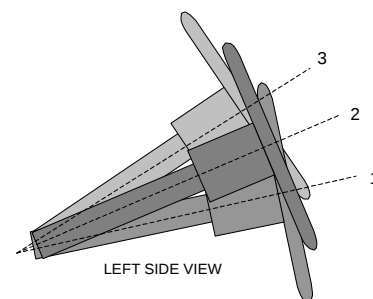
The vehicle is equipped with an electric fuel pump.
The fuel pump starts pumping fuel when the key is in the "ON" position. The fuel pipe is on the left side.



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

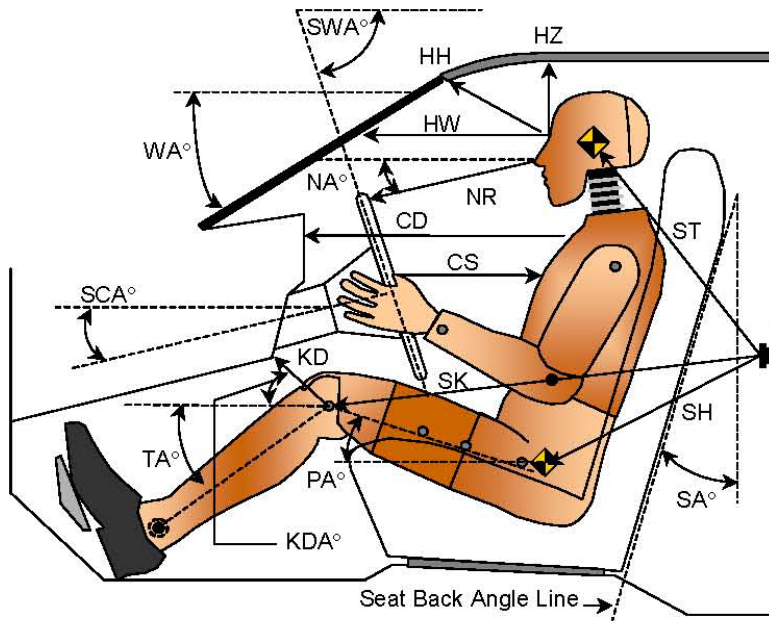
STEERING COLUMN POSITION

	Degrees	Fore/Aft Position (mm)
Lowermost Position 1	69.8	246
Geometric Center Position 2	67.5	218
Uppermost Position 3	65.2	190
Telescoping Steering Wheel Travel		56
Test Position	67.5	218

DATA SHEET NO. 3 DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2014 Jeep Grand Cherokee Laredo 4X4 SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20140300
Test Date: 11/04/2013



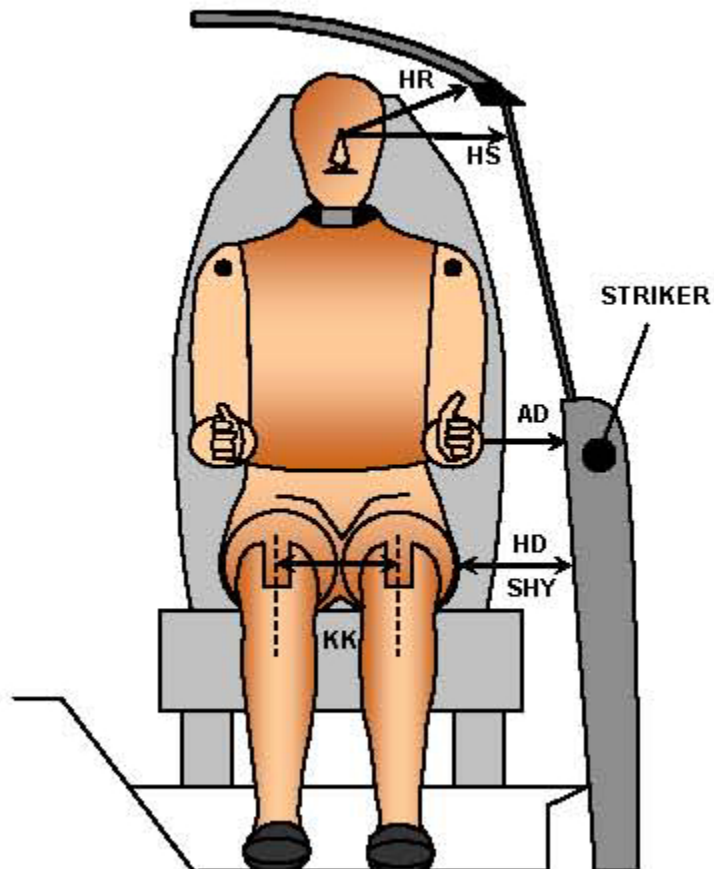
LEFT SIDE VIEW

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		25.6		
SWA°	Steering Wheel Angle		67.5		
SCA°	Steering Column Angle		22.5		
SA°	Seat Back Angle (on headrest post)		13.0		12.3
HZ	Head to Roof (Z)	204	90.0	258	90.0
HH	Head to Header	369	24.9	327	33.6
HW	Head to Windshield	621	0.0	695	0.0
NR	Nose to Rim	391	17.8		
CD	Chest to Dash	542		464	
CS	Chest to Steering Hub	317	5.6		
RA	Rim to Abdomen	200	0.0		
KDL	Left Knee to Dash	193	26.9	143	23.8
KDR	Right Knee to Dash	168	33.1	155	22.2
PA°	Pelvic Angle		22.7		18.0
TA°	Tibia Angle		50.4		55.0
SK	Striker to Knee	559	85.7	620	92.1
ST	Striker to Head	587	7.1	521	15.0
SH	Striker to H-Point	184	102.6	291	106.2

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2014 Jeep Grand Cherokee Laredo 4X4 SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20140300
 Test Date: 11/04/2013



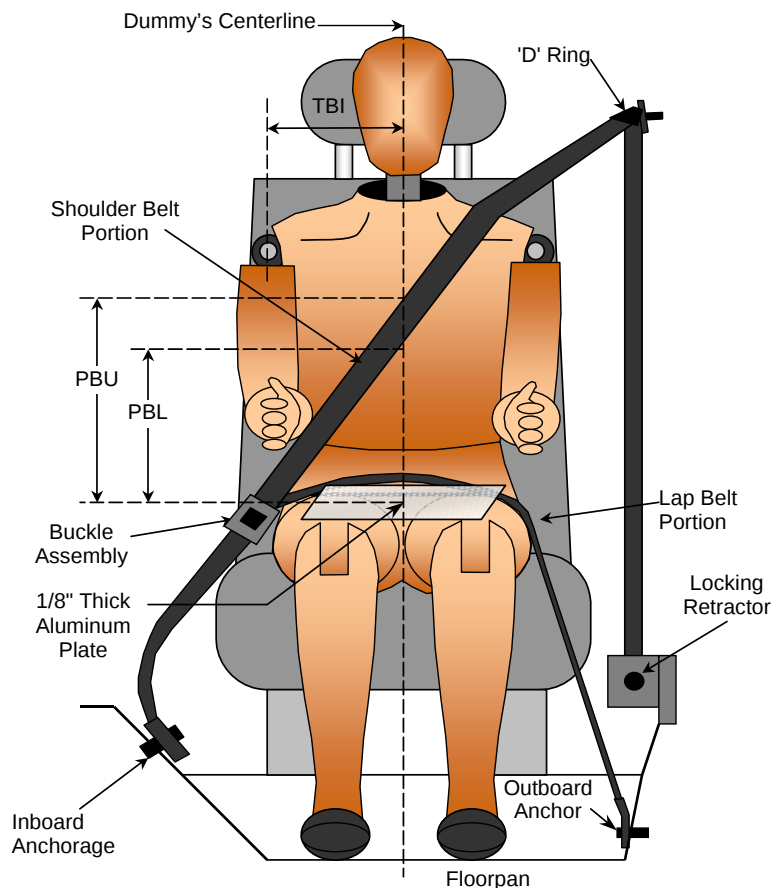
FRONT VIEW OF DUMMY

Code	Measurement Description	Driver	Passenger
		Length (mm)	
AD	Arm to Door	123	121
HD	H-Point to Door	165	207
HR	Head to Side Header	235	275
HS	Head to Side Window	340	373
KK	Knee to Knee	334	230
SHY	Striker to H-Point (Y Direction)	290	330
AA	Ankle to Ankle	311	150

DATA SHEET NO. 5 SEAT BELT POSITIONING DATA

Test Vehicle: 2014 Jeep Grand Cherokee Laredo 4X4 SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20140300
Test Date: 11/04/2013



FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	360	335
PBL - Top surface of reference to belt lower edge	mm	290	250

BELT LENGTH DATA

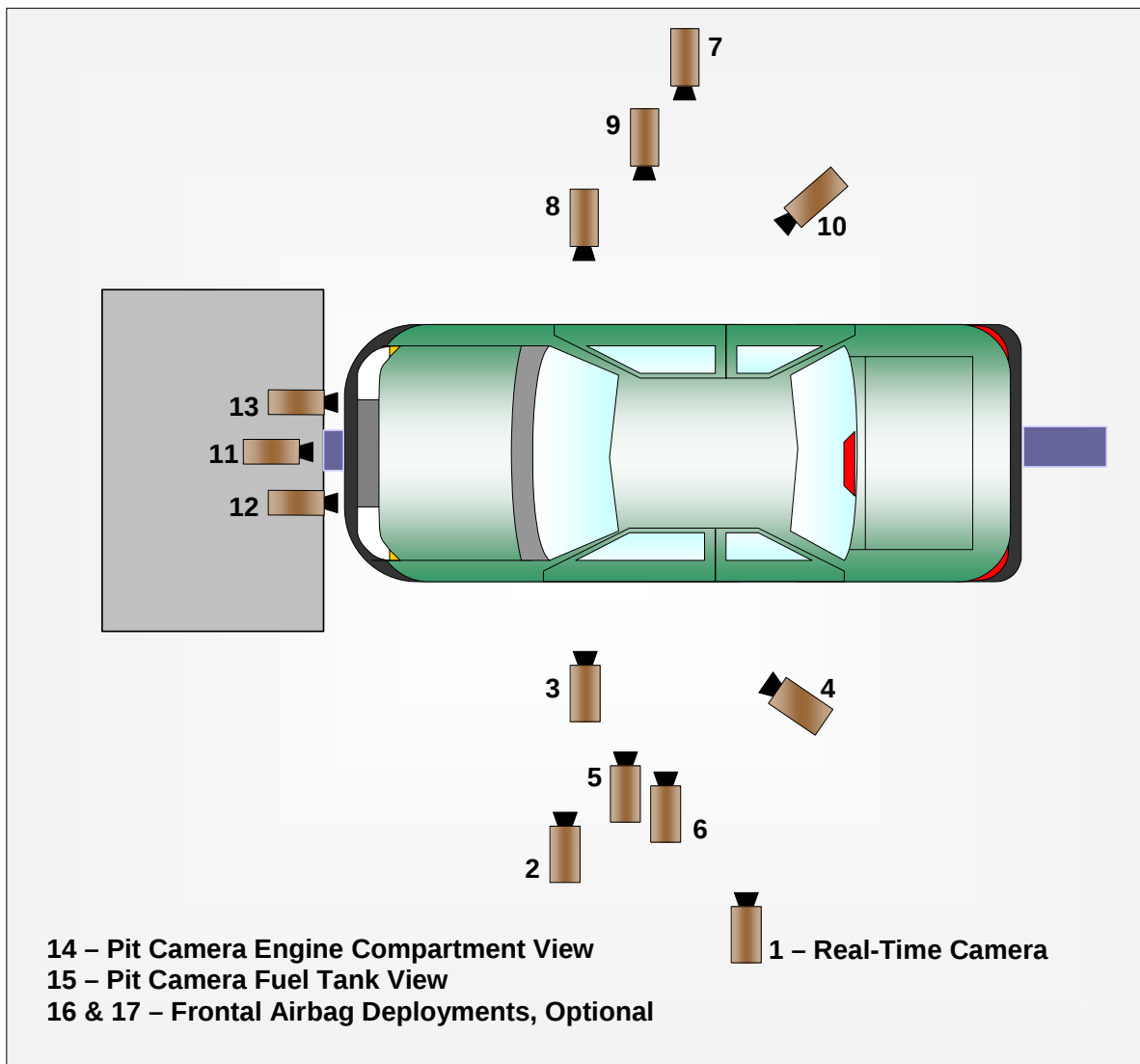
Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as measured on ATD	mm	885	900
Lap Belt Length as measured on ATD	mm	680	660
Remainder of belt on reel	mm	1735	1740
Total Belt Length for Continuous Webbing Systems	mm	3300	3300

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

Test Vehicle: 2014 Jeep Grand Cherokee Laredo 4X4 SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20140300
Test Date: 11/04/2013

CAMERA POSITIONS FOR FRONTAL IMPACTS



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

Test Vehicle: 2014 Jeep Grand Cherokee Laredo 4X4 SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20140300
 Test Date: 11/04/2013

CAMERA LOCATIONS

No.	Camera View	Coordinates (mm)			Lens (mm)	Speed (fps)
		X*	Y*	Z*		
1	Real-Time Left Overall					30
2	Driver Close-Up	1390	-6680	-1800	35	1000
3	Left Front Half	1150	-5060	-1310	24	1000
4	Left Angle	6320	-5500	-2080	50	1000
5	Steering Column - Top	650	-5280	-1210	24	1000
6	Steering Column - Bottom	620	-5260	-810	24	1000
7	Right Overall	2400	6920	-1260	20	1000
8	Passenger Close-Up	1480	6660	-1840	35	1000
9	Right Front Half	1380	5570	-1310	24	1000
10	Right Angle	6350	4810	-1930	50	1000
11	Windshield	-260	0	-2860	20	1000
12	Driver Windshield	-30	-360	-2270	8.5	1000
13	Passenger Windshield	-30	360	-2270	8.5	1000
14	Pit Front	990	0	3150	24	1000
15	Pit Rear	3060	0	3150	24	1000
16	Onboard Driver Side (optional)					
17	Onboard Passenger Side (optional)					
18	Real-Time Pan View					30

***COORDINATES:**

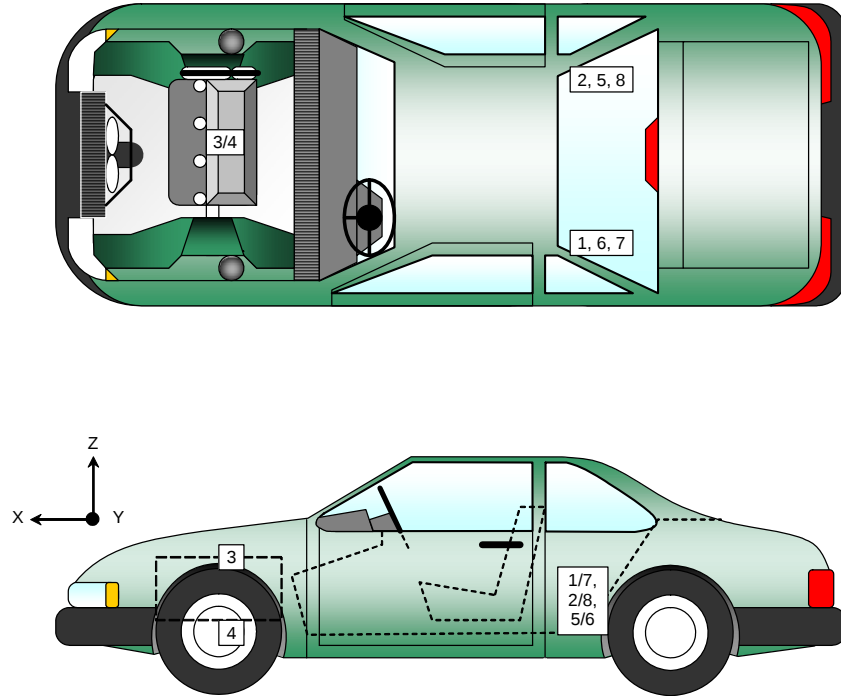
- +X = forward of impact plane
- +Y = right of monorail centerline
- +Z = below ground level

Cameras 16 & 17 were not used for this test.

DATA SHEET NO. 7 VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2014 Jeep Grand Cherokee Laredo 4X4 SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20140300
Test Date: 11/04/2013



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Crossmember Accelerometer – X Direction	1896	-398	-491
2	Right Rear Crossmember Accelerometer – X Direction	1896	-398	-489
3	Engine Top X	3904	-38	-1108
4	Engine Bottom X	3872	12	-279
5	Left Rear Crossmember Accelerometer – Z Direction	1930	400	-491
6	Right Rear Crossmember Accelerometer – Z Direction	1930	400	-489
7	Left Rear Crossmember Accelerometer Redundant – X Direction	1896	-398	-491
8	Right Rear Crossmember Accelerometer Redundant – X Direction	1896	-398	-489

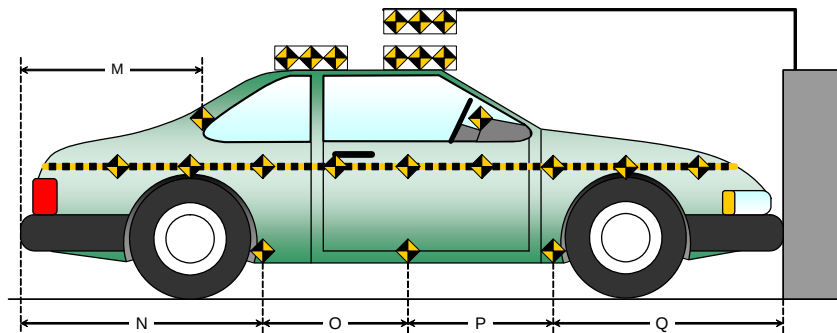
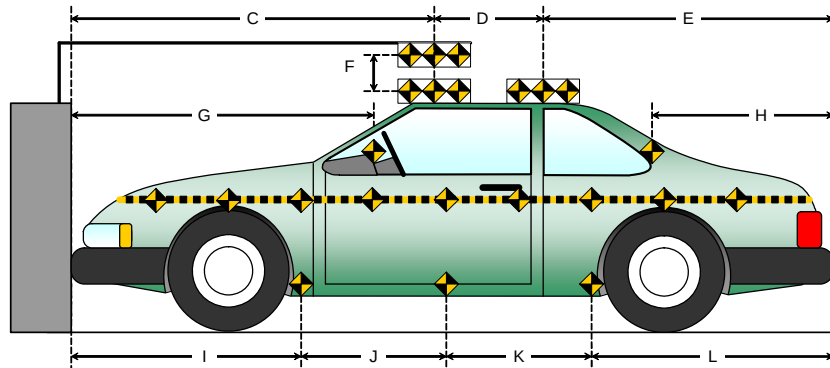
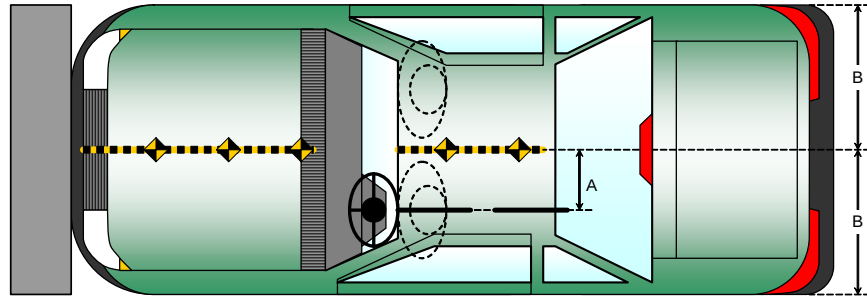
Reference Points: X - Rear Surface of Vehicle (+ forward)
Y - Vehicle Centerline (+ to right)
Z - Ground Plane (+ down)

DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2014 Jeep Grand Cherokee Laredo 4X4 SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: Q20140300
 Test Date: 11/04/2013

Item	Value (mm)
A	410
B	960
C	2455
D	670
E	1707
F	70
G	
H	1372
I	1460
J	896
K	896
L	1580
M	1372
N	1580
O	896
P	896
Q	1460



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

Test Vehicle: 2014 Jeep Grand Cherokee Laredo 4X4 SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20140300
 Test Date: 11/04/2013

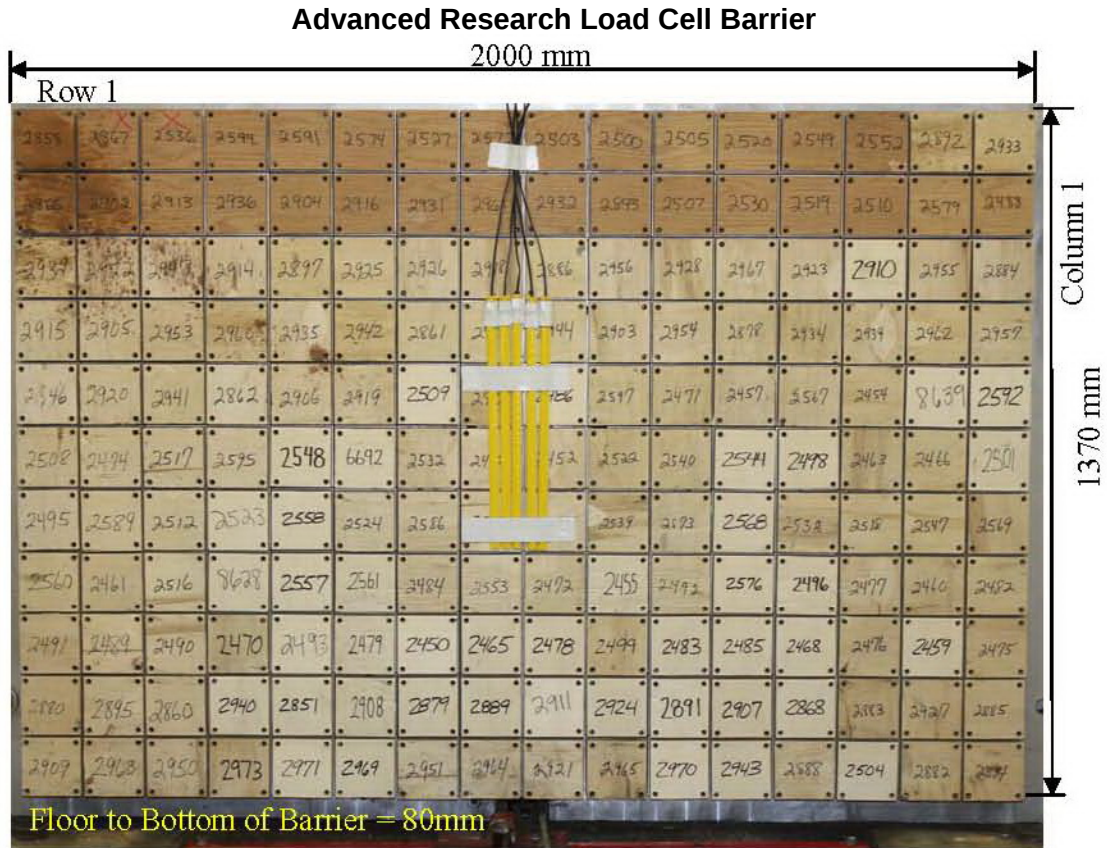


Photo for Reference Only

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

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

DATA SHEET NO. 10
TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2014 Jeep Grand Cherokee Laredo 4X4 SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20140300
Test Date: 11/04/2013

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

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

Test Vehicle: 2014 Jeep Grand Cherokee Laredo 4X4 SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20140300
Test Date: 11/04/2013

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Passenger
Dummy Type / Serial No.	HIII 50% / 351	HIII 5% / 634
Head Contact	Airbag, Headrest	Airbag, Headrest
Upper Torso Contact	Airbag	Airbag
Lower Torso Contact	None	None
Left Knee Contact	Knee Airbag	Glovebox
Right Knee Contact	Knee Airbag	Glovebox

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	546
Center	mm	496
Right Side	mm	557
Average	mm	533

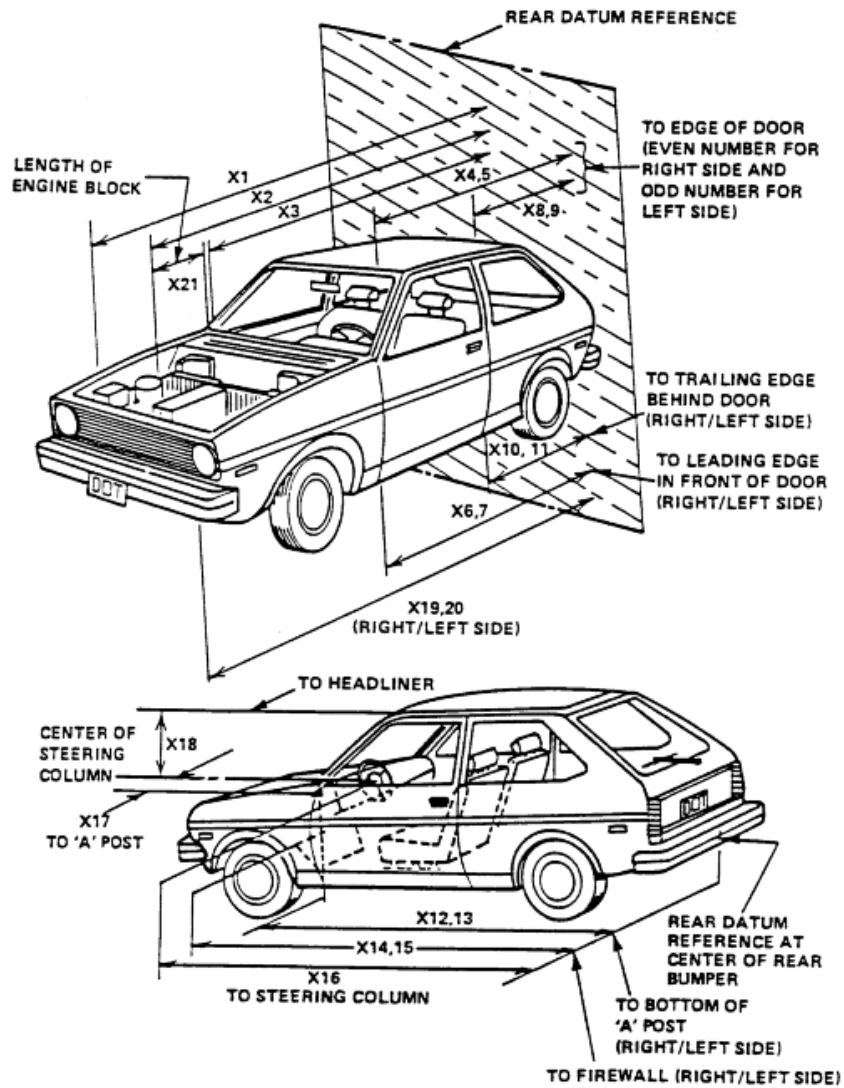
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

DATA SHEET NO. 12 VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2014 Jeep Grand Cherokee Laredo 4X4 SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20140300
Test Date: 11/04/2013



DATA SHEET NO. 12 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2014 Jeep Grand Cherokee Laredo 4X4 SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20140300
 Test Date: 11/04/2013

RSOV (Rear Surface of Vehicle)

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	mm	4832	4297	535
2	RSOV to Front of Engine	mm	4087	4053	34
3	RSOV to Firewall	mm	3624	3534	90
4	RSOV to Upper Leading Edge of Right Door	mm	3240	3240	0
5	RSOV to Upper Leading Edge of Left Door	mm	3240	3240	0
6	RSOV to Lower Leading Edge of Right Door	mm	3230	3228	2
7	RSOV to Lower Leading Edge of Left Door	mm	3230	3228	2
8	RSOV to Upper Trailing Edge of Right Door	mm	2130	2130	0
9	RSOV to Upper Trailing Edge of Left Door	mm	2130	2128	2
10	RSOV to Lower Trailing Edge of Right Door	mm	2155	2153	2
11	RSOV to Lower Trailing Edge of Left Door	mm	2155	2153	2
12	RSOV to Bottom of "A" Post of Right Side	mm	3230	3228	2
13	RSOV to Bottom of "A" Post of Left Side	mm	3228	3228	0
14	RSOV to Firewall, Right Side	mm	3442	3442	0
15	RSOV to Firewall, Left Side	mm	3440	3440	0
16	RSOV to Steering Column	mm	2725	2725	0
17	Center of Steering Column to "A" Post	mm	395	395	0
18	Center of Steering Column to Headliner	mm	400	400	0
19	RSOV to Right Side of Front Bumper	mm	4578	4220	358
20	RSOV to Left Side of Front Bumper	mm	4578	4224	354
21	Length of Engine Block	mm	480	480	0
RD	RSOV to Right Side of Dash Panel	mm	3048	3048	0
CD	RSOV to Center of Dash Panel	mm	2982	2982	0
LD	RSOV to Left Side of Dash Panel	mm	3043	3043	0

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2014 Jeep Grand Cherokee Laredo 4X4 SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20140300
Test Date: 11/04/2013

VEHICLE INFORMATION

VIN: 1C4RJFAG8EC253284 Wheelbase (mm): 2920
Vehicle Size Category: MPV Test Weight (kg): 2397.3

ACCELEROMETER DATA

Accelerometer Locations: As per measurements on Page 15

Cal. Procedure/Interval: MGA procedure / 6 month

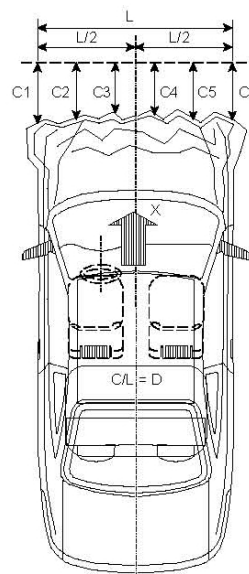
Integration Algorithm: Trapezoidal

Linearity: > 99%

Impact Velocity (km/h): 56.3

Velocity Change (km/h): 64.5

Time of Separation (msec): 122.8



CRUSH PROFILE

Collision Deformation Classification: Frontal

Midpoint of Damage: Centerline

Damage Region Length (mm): 1572

Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4578	4224	354
C2	Crush zone 2 at left side	mm	4720	4208	512
C3	Crush zone 3 at left side	mm	4771	4224	547
C4	Crush zone 4 at right side	mm	4771	4226	545
C5	Crush zone 5 at right side	mm	4720	4218	502
C6	Crush zone 6 at right side	mm	4578	4220	358
L	C1 TO C6	mm	1572	1554	18

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Jeep Grand Cherokee Laredo 4X4 SUV
Test Program: NCAP Frontal Barrier Impact Test

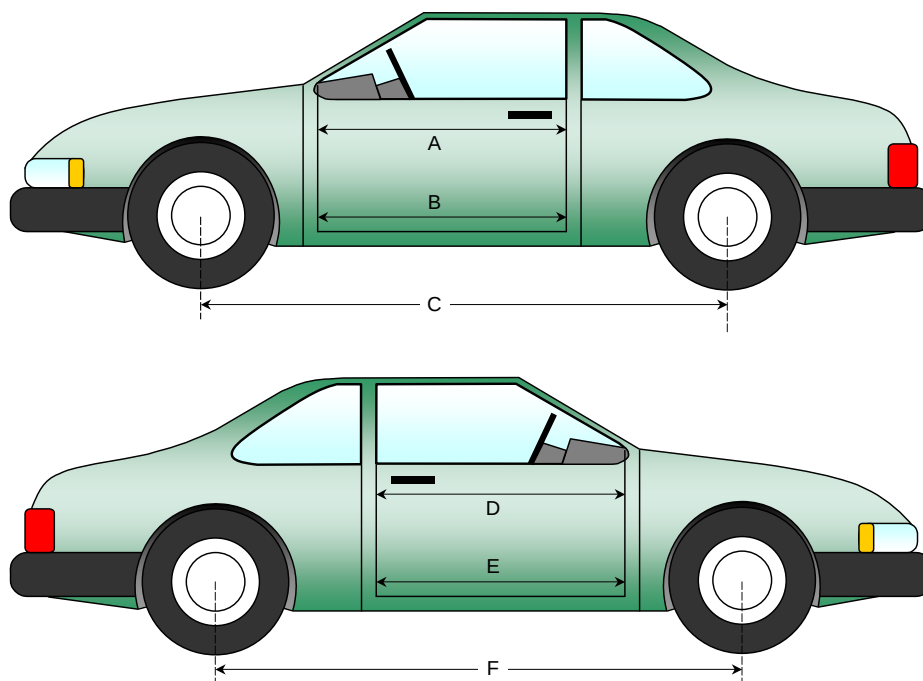
NHTSA No.: O20140300
Test Date: 11/04/2013

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	970	970	0
B	Left Side Lower	mm	870	870	0
D	Right Side Upper	mm	970	970	0
E	Right Side Lower	mm	870	870	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2920	2775	145
F	Right Side Wheelbase	mm	2920	2785	135



DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

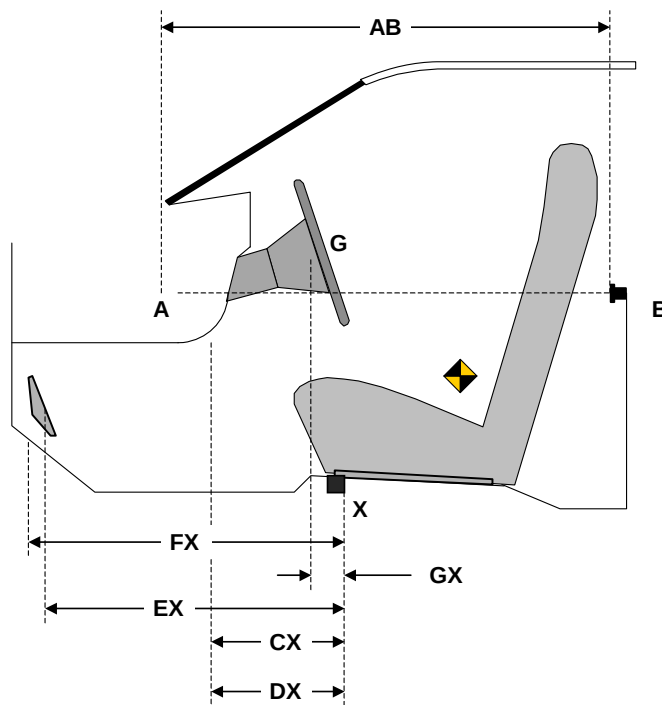
Test Vehicle: 2014 Jeep Grand Cherokee Laredo 4X4 SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20140300
 Test Date: 11/04/2013

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	770	770	0
CX	Left Knee Bolster to X	mm	217	217	0
DX	Right Knee Bolster to X	mm	201	201	0
EX	Brake Pedal to X	mm	508	508	0
FX	Foot Rest to X	mm	570	570	0
GX	Center of Steering Column Wheel Hub to X	mm	15	15	0

X = Front of Seat Track (stationary)



DRIVER COMPARTMENT

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

Test Vehicle: 2014 Jeep Grand Cherokee Laredo 4X4 SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20140300
 Test Date: 11/04/2013

Windshield Mounting Details:

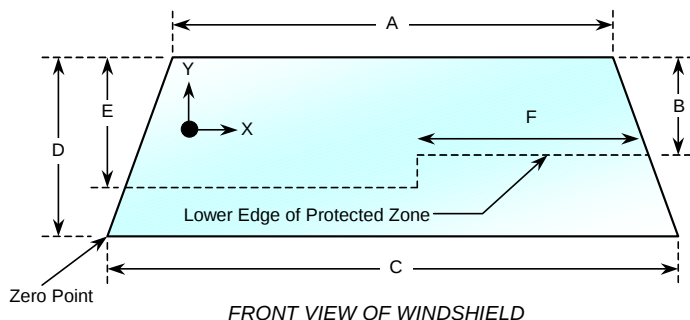
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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

Temperature of windshield molding during test: 21.1°C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2255	2255	100
Right Side	2255	2255	100
Total	4510	4510	100



Item	Units	Value
A	mm	1324
B	mm	476
C	mm	1534
D	mm	826
E	mm	505
F	mm	600

AREA OF PROTECTED ZONE FAILURES - NONE

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

X	Y

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

X	Y

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

Test Vehicle:	<u>2014 Jeep Grand Cherokee Laredo 4X4 SUV</u>	NHTSA No.:	<u>O20140300</u>
Test Program:	<u>NCAP Frontal Barrier Impact Test</u>	Test Date:	<u>11/04/2013</u>

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21.6°C Test Time: 11:38 a.m.

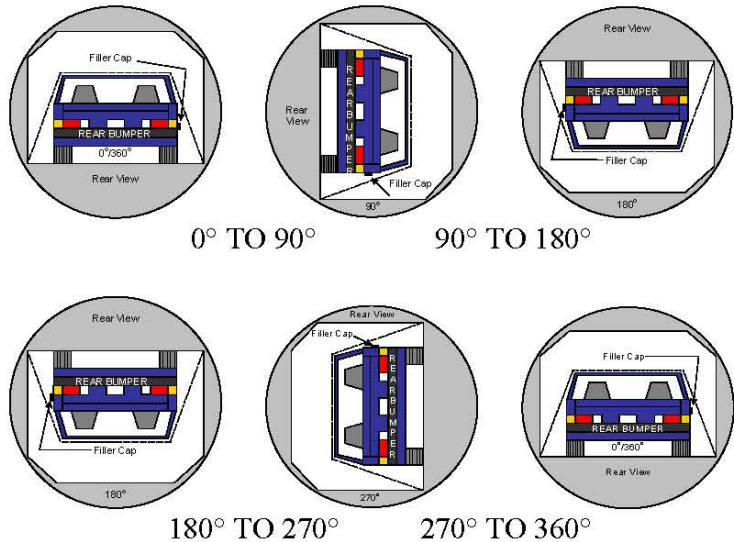
- | | |
|--|--------------|
| A. From impact until vehicle motion ceases:
(Maximum allowable = 1 oz.) | <u>0</u> oz. |
| B. For the 5 minute period after motion ceases:
(Maximum allowable = 5 oz.) | <u>0</u> oz. |
| C. For the following 25 minutes:
(Maximum allowable = 1 oz./minute) | <u>0</u> oz. |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

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

Test Vehicle: 2014 Jeep Grand Cherokee Laredo 4X4 SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20140300
 Test Date: 11/04/2013

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



SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	114	300	414
90° to 180°	111	300	411
180° to 270°	110	300	410
270° to 360°	110	300	410

FMVSS 301 SPILLAGE TABLE (units in ounces)

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

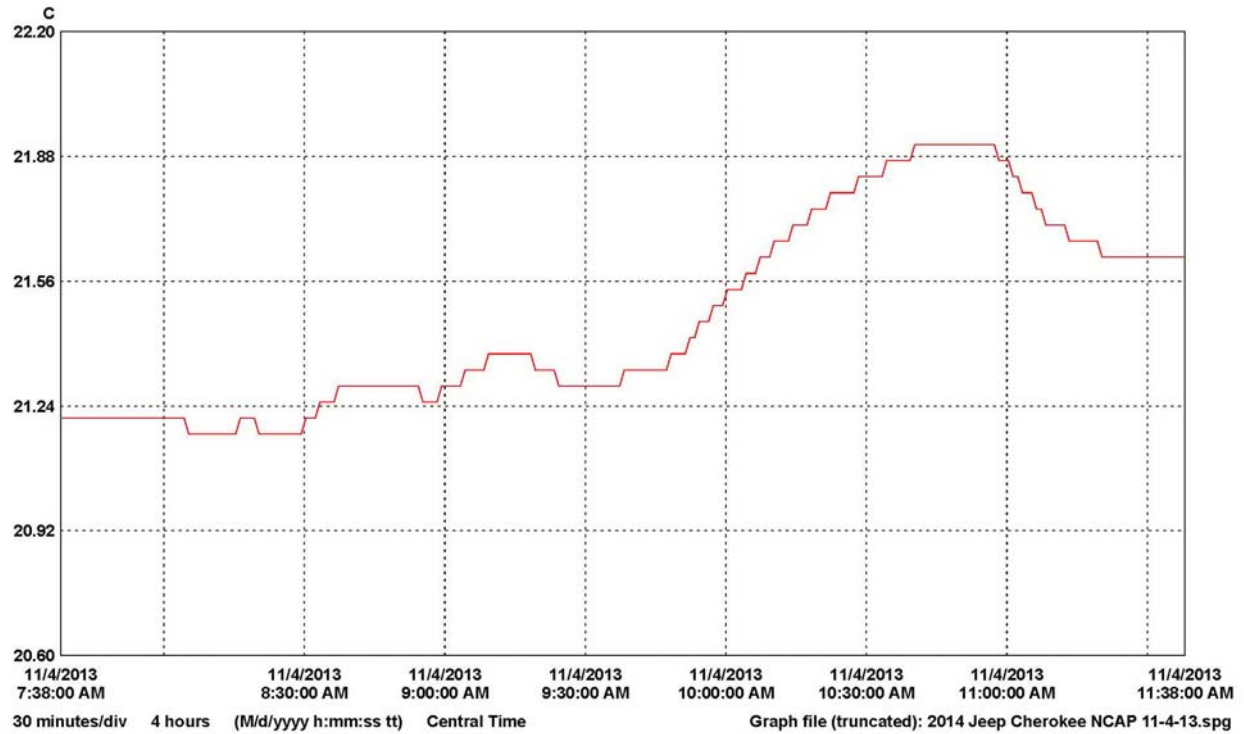
SOLVENT SPILLAGE LOCATION TABLE

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

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

Test Vehicle: 2014 Jeep Grand Cherokee Laredo 4X4 SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20140300
 Test Date: 11/04/2013



LN	Serial #	Description	CH	Value	Maximum	Average	Minimum	Units	CH description	Logger file
1	12102107	MGA_12102107	1		21.91	21.47	21.17	C	Temperature	12102107_MGA_12102107.spl

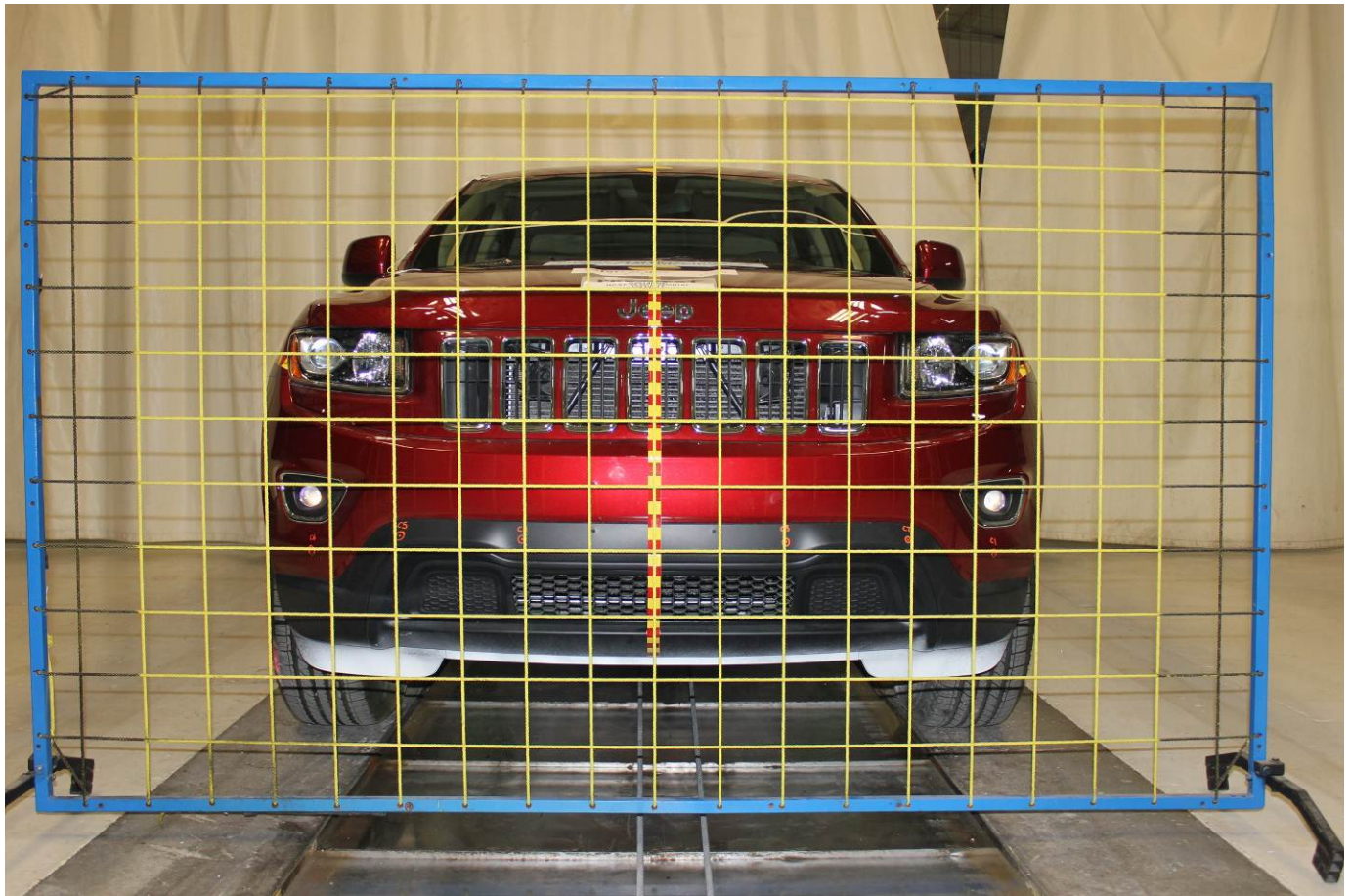
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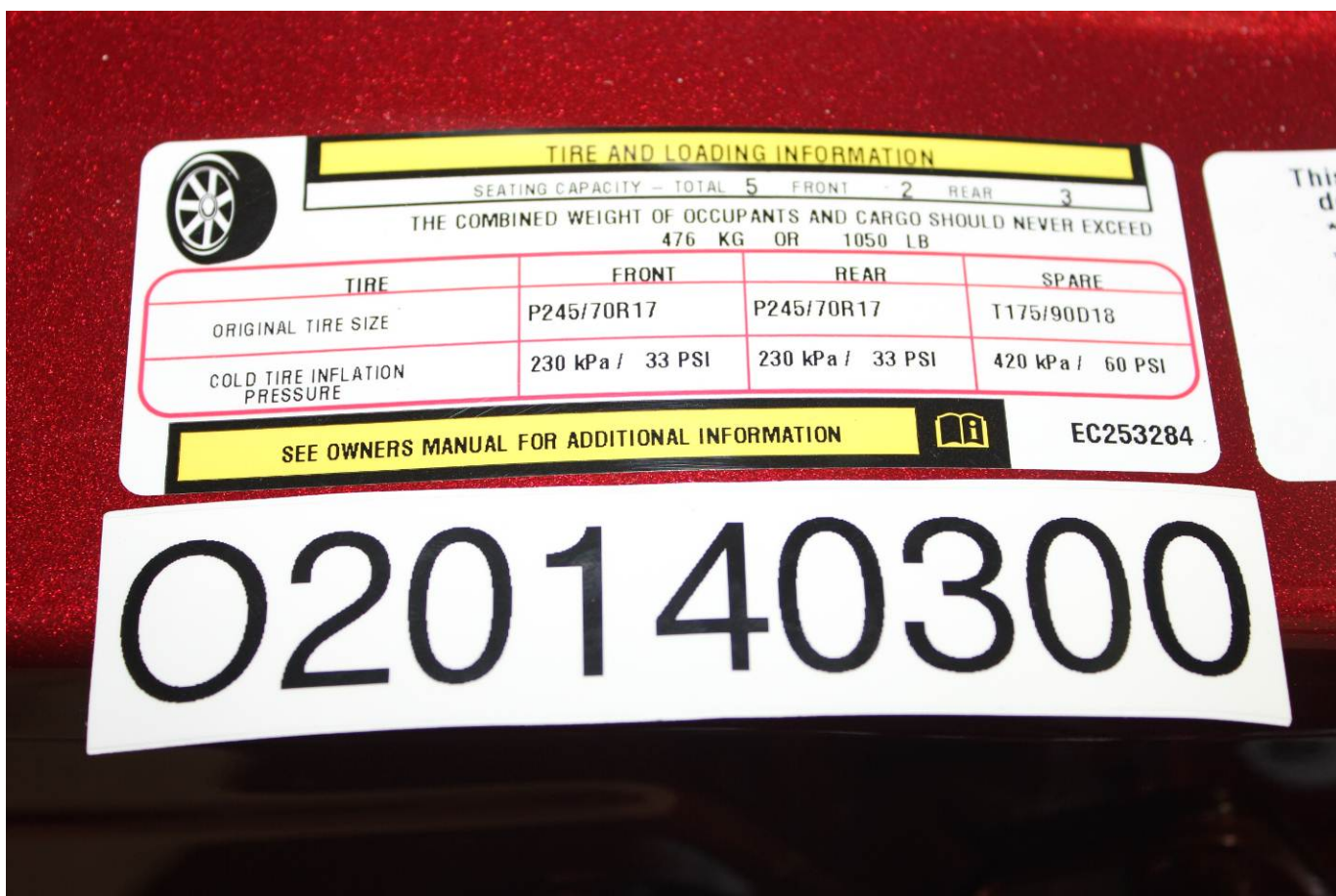
Load Cell Location



Load Cell Wall



Manufacturer's Label



Tire Placard



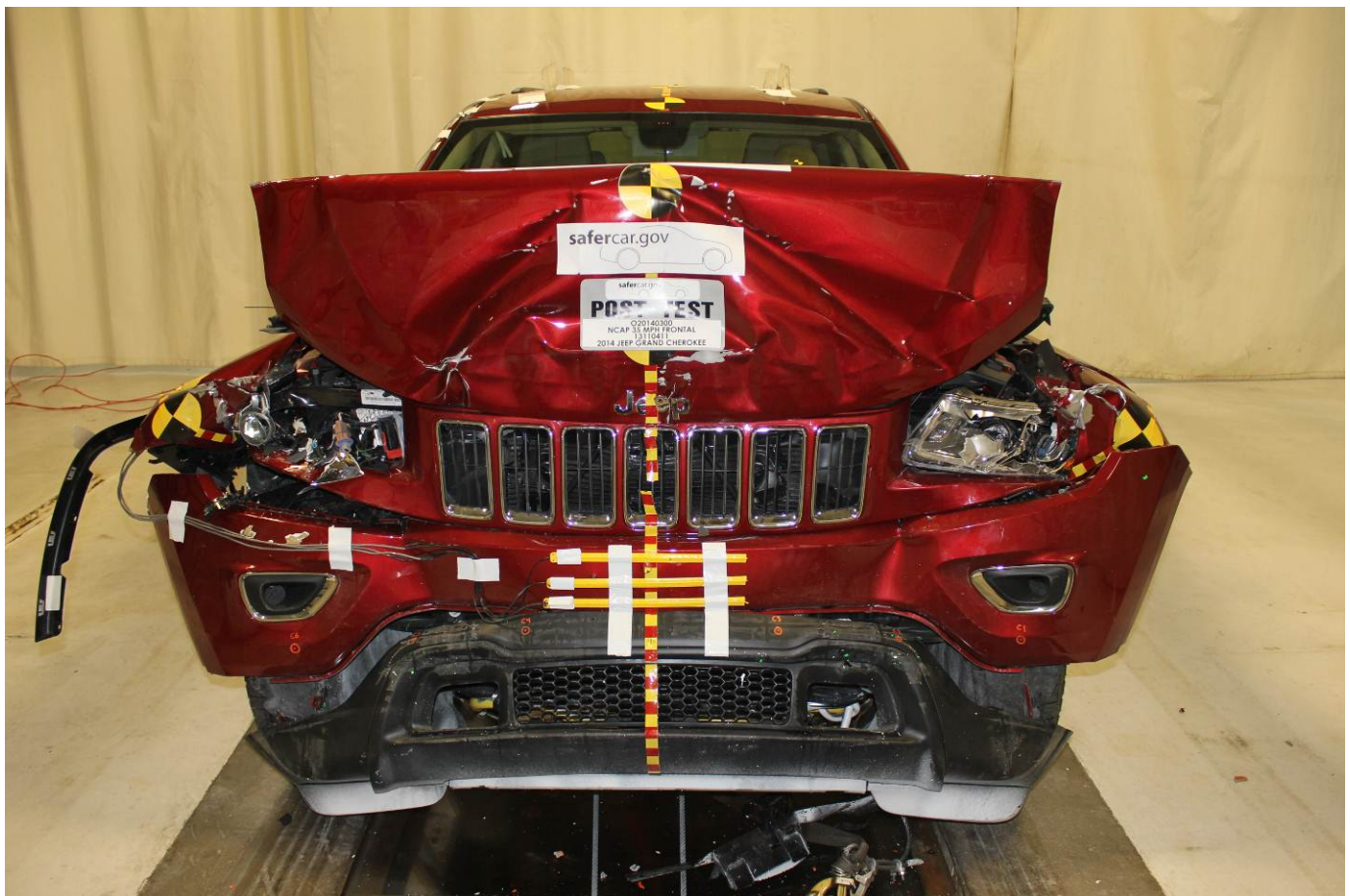
2014 Jeep Grand Cherokee Laredo Frontal As Delivered



Left Rear 3-4 View, As Received



Pre-Test Front View of Test Vehicle



Post-Test Front View of Test Vehicle



Pre-Test Left View of Test Vehicle



Post-Test Left View of Test Vehicle



Pre-Test Right View of Test Vehicle



Post-Test Right View of Test Vehicle



Pre-Test Right Front 3-4 View



Post-Test Right Front 3-4 View



Pre-Test Left Rear 3-4 View



Post-Test Left Rear 3-4 View



Pre-Test Windshield View



Post-Test Windshield View



Pre-Test Engine Compartment View



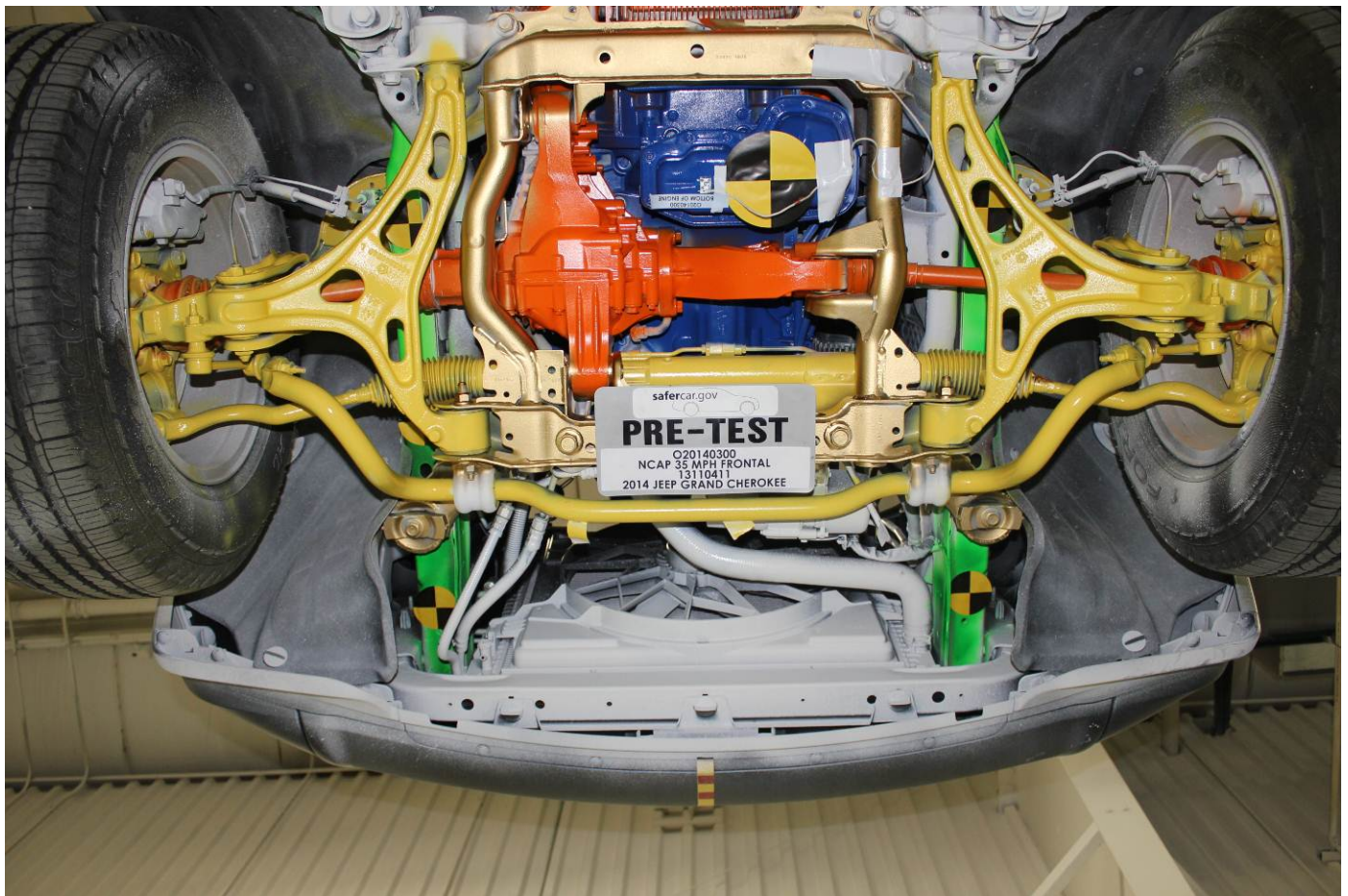
Post-Test Engine Compartment View



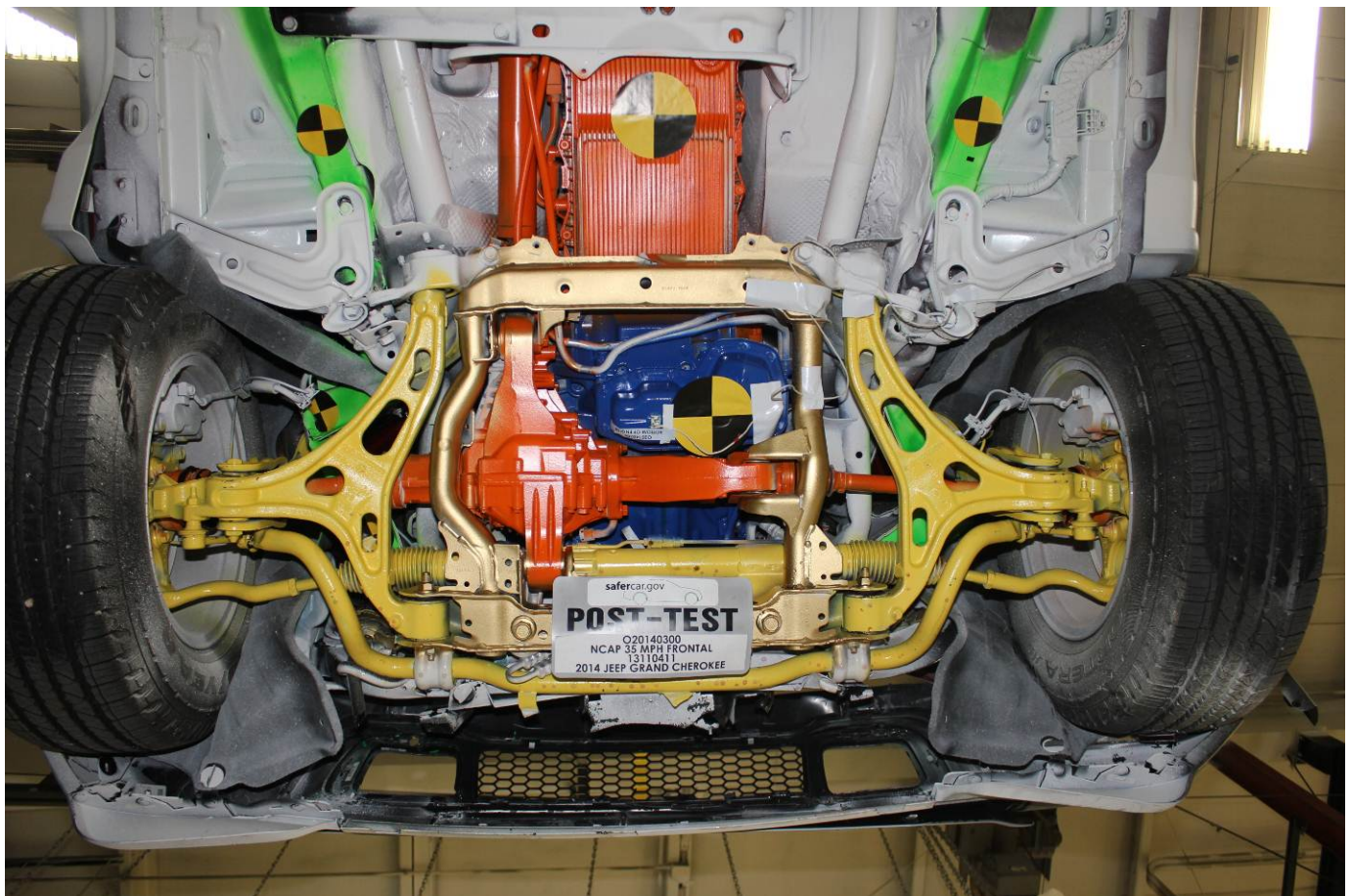
Pre-Test Fuel Filler Cap View



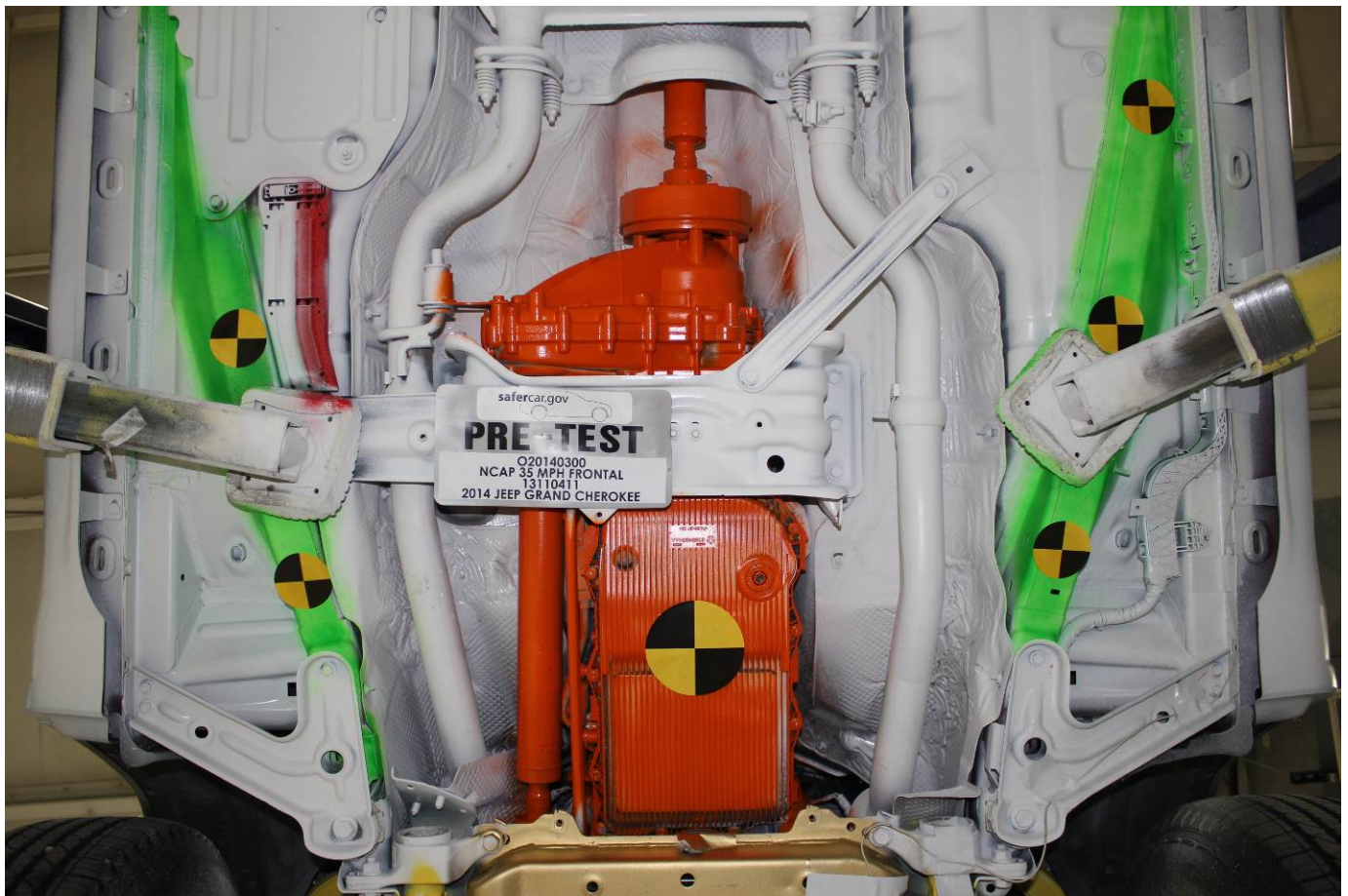
Post-Test Fuel Filler Cap View



Pre-Test Front Underbody View



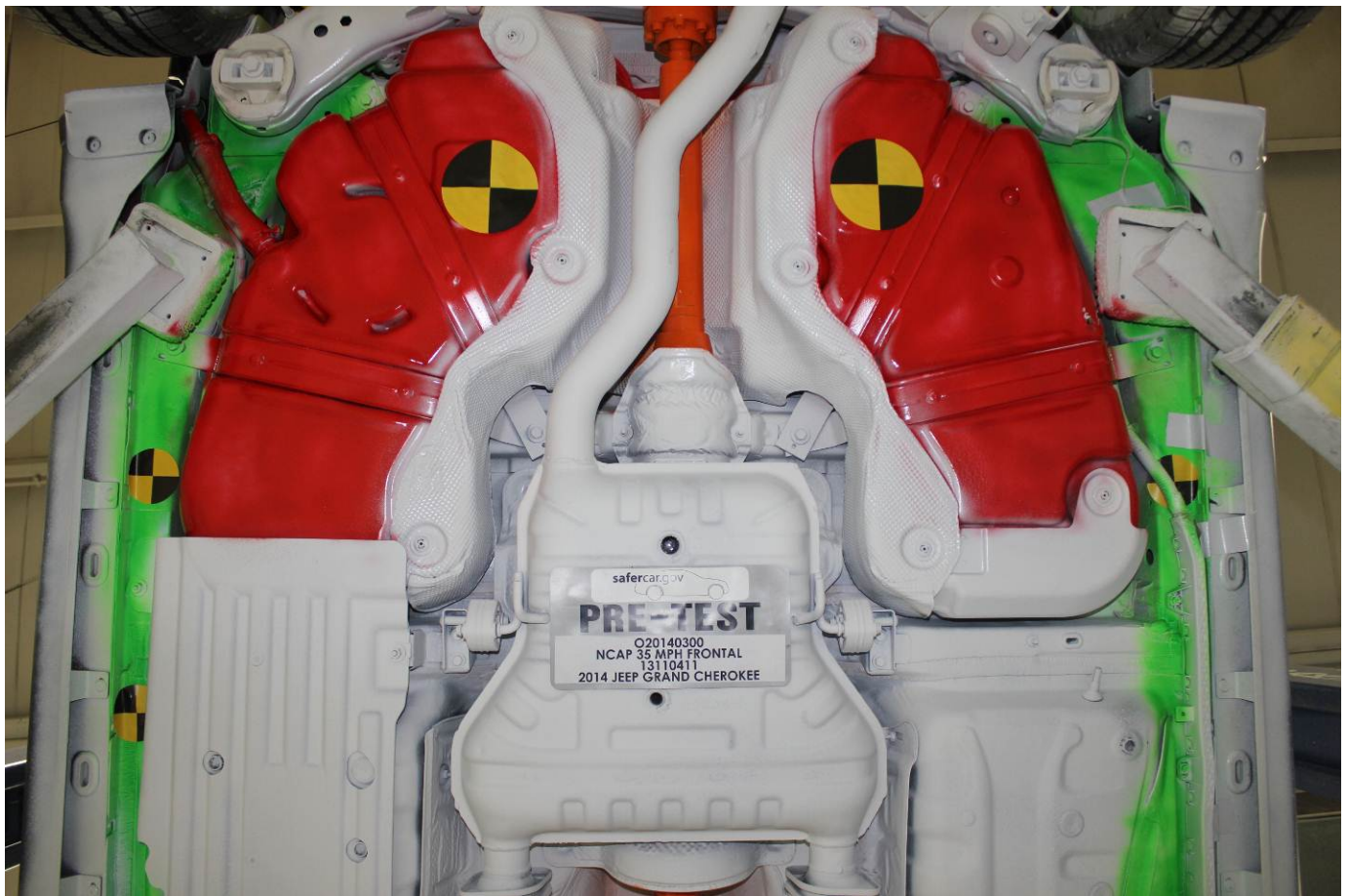
Post-Test Front Underbody View



Pre-Test Mid Front Underbody View



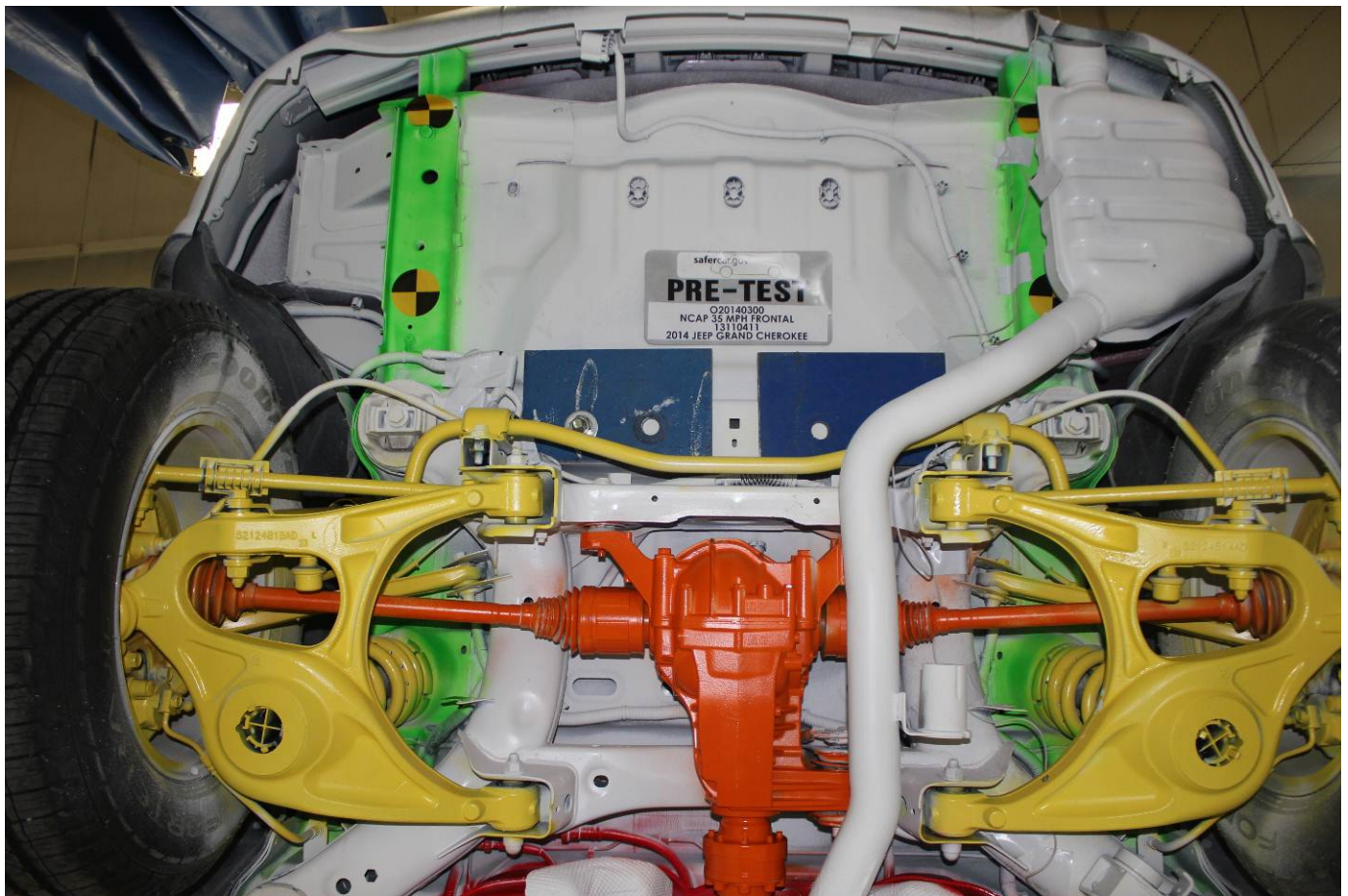
Post-Test Mid Front Underbody View



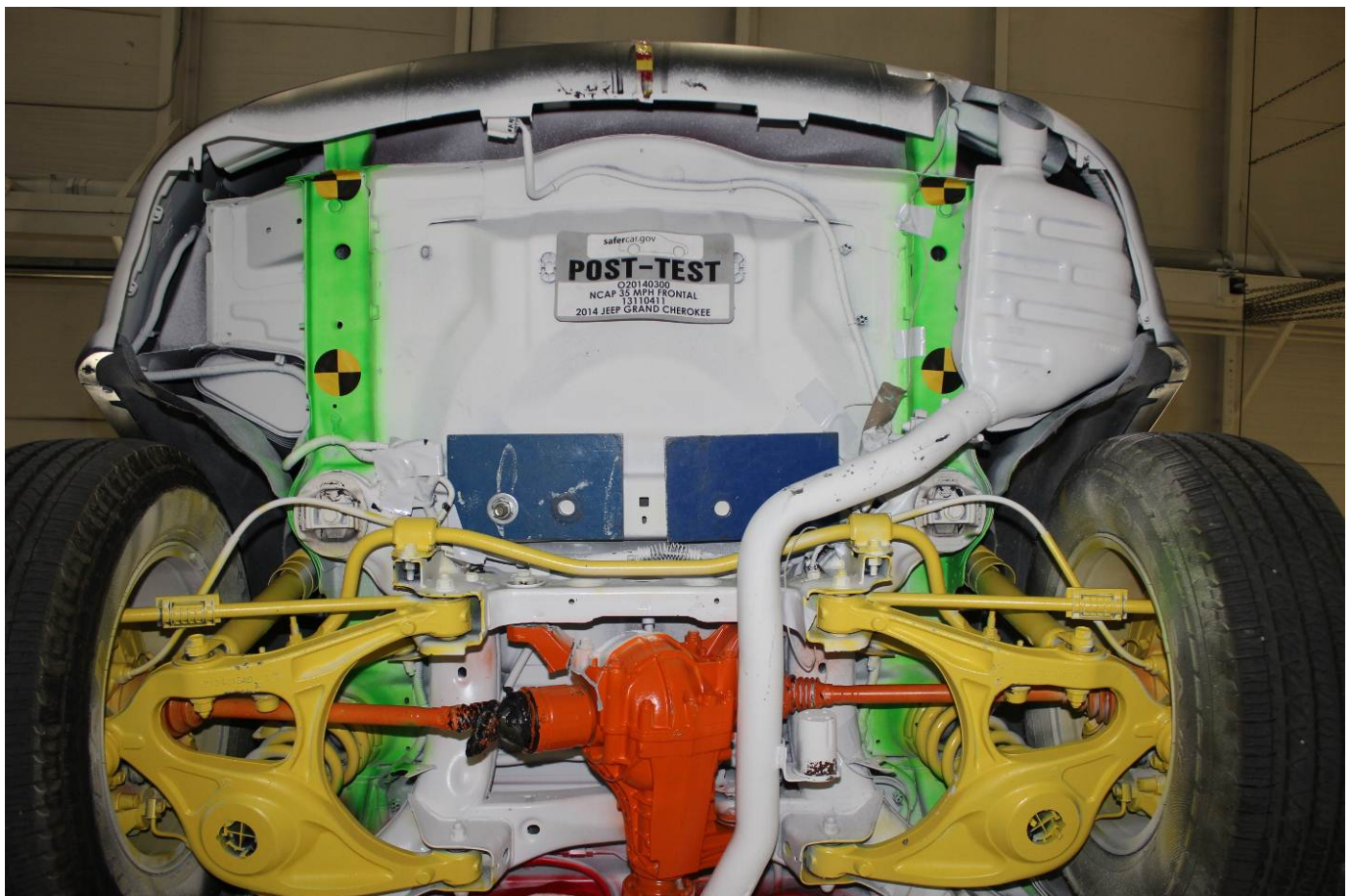
Pre-Test Mid Rear Underbody View



Post-Test Mid Rear Underbody View



Pre-Test Rear Underbody View



Post-Test Rear Underbody View



Pre-Test Dummy Cable Routing



Post-Test Dummy Cable Routing



Pre-Test Driver Dummy Front View



Post-Test Driver Dummy Front View



Pre-Test Driver Dummy Window View



Post-Test Driver Dummy Window View



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



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



Pre-Test Driver's Seat Fore-Aft Markings



Post-Test Driver's Seat Fore-Aft Markings



Pre-Test View of Belt Anchorage for Driver Dummy



Post-Test View of Belt Anchorage for Driver Dummy



Pre-Test Driver Dummy Feet



Post-Test Driver Dummy Feet



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



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



Pre-Test Driver's Side Floorpan



Post-Test Driver's Side Floorpan



Post-Test Driver Dummy Face



Post-Test Driver Dummy Contact with Airbag



Post-Test Driver Dummy Contact with Headrest



Post-Test Driver Dummy Contact with Knee Airbag



Pre-Test View of the Steering Wheel



Post-Test View of the Steering Wheel



Pre-Test Passenger Dummy Front View



Post-Test Passenger Dummy Front View



Pre-Test Passenger Dummy Window View



Post-Test Passenger Dummy Window View



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



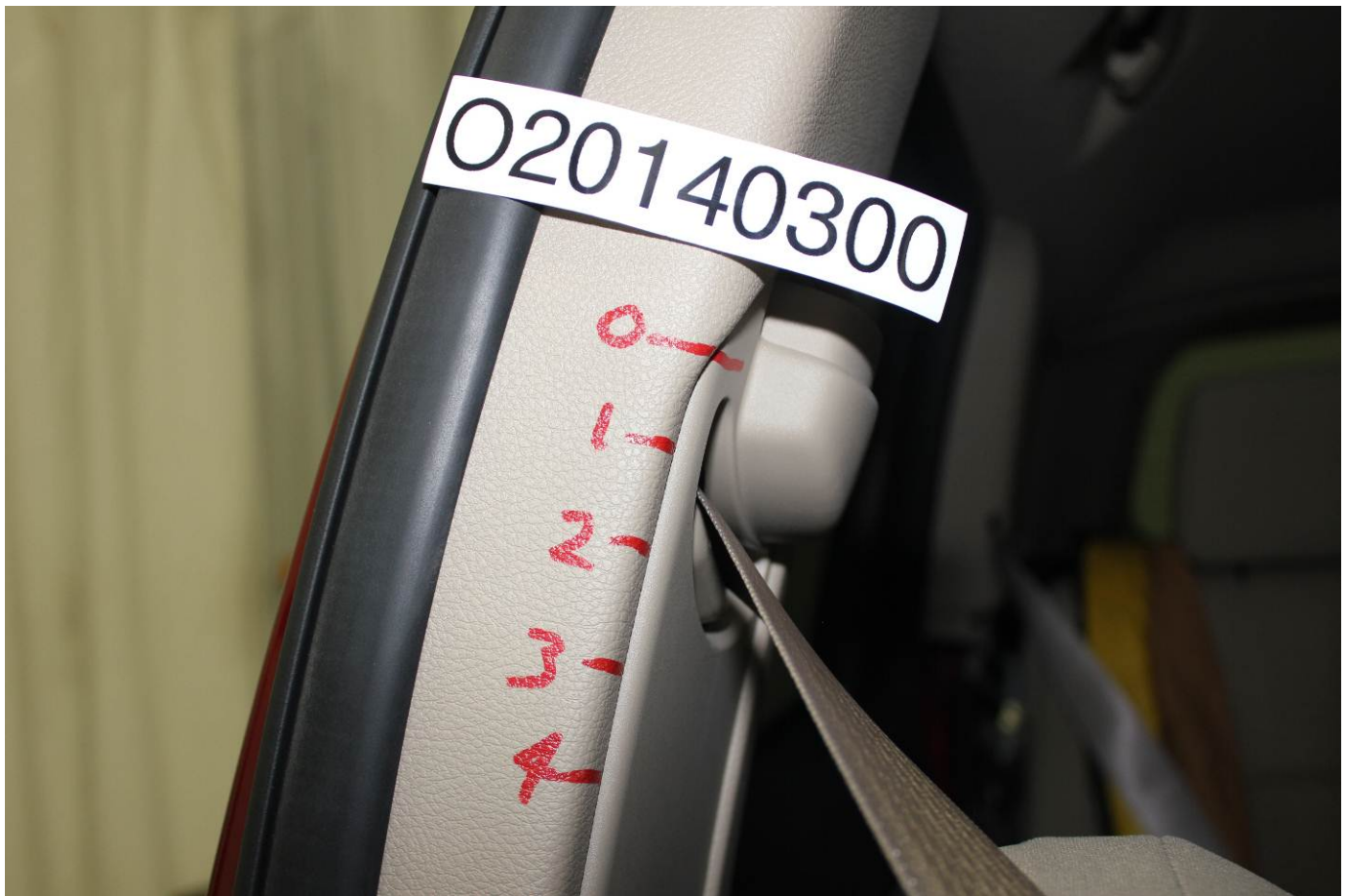
Post-Test Passenger Dummy and Vehicle Interior (Door Open)



Pre-Test Passenger's Seat Fore-Aft Markings



Post-Test Passenger's Seat Fore-Aft Markings



Pre-Test View of Belt Anchorage for Passenger Dummy



Post-Test View of Belt Anchorage for Passenger Dummy



Pre-Test Passenger Dummy Feet



Post-Test Passenger Dummy Feet



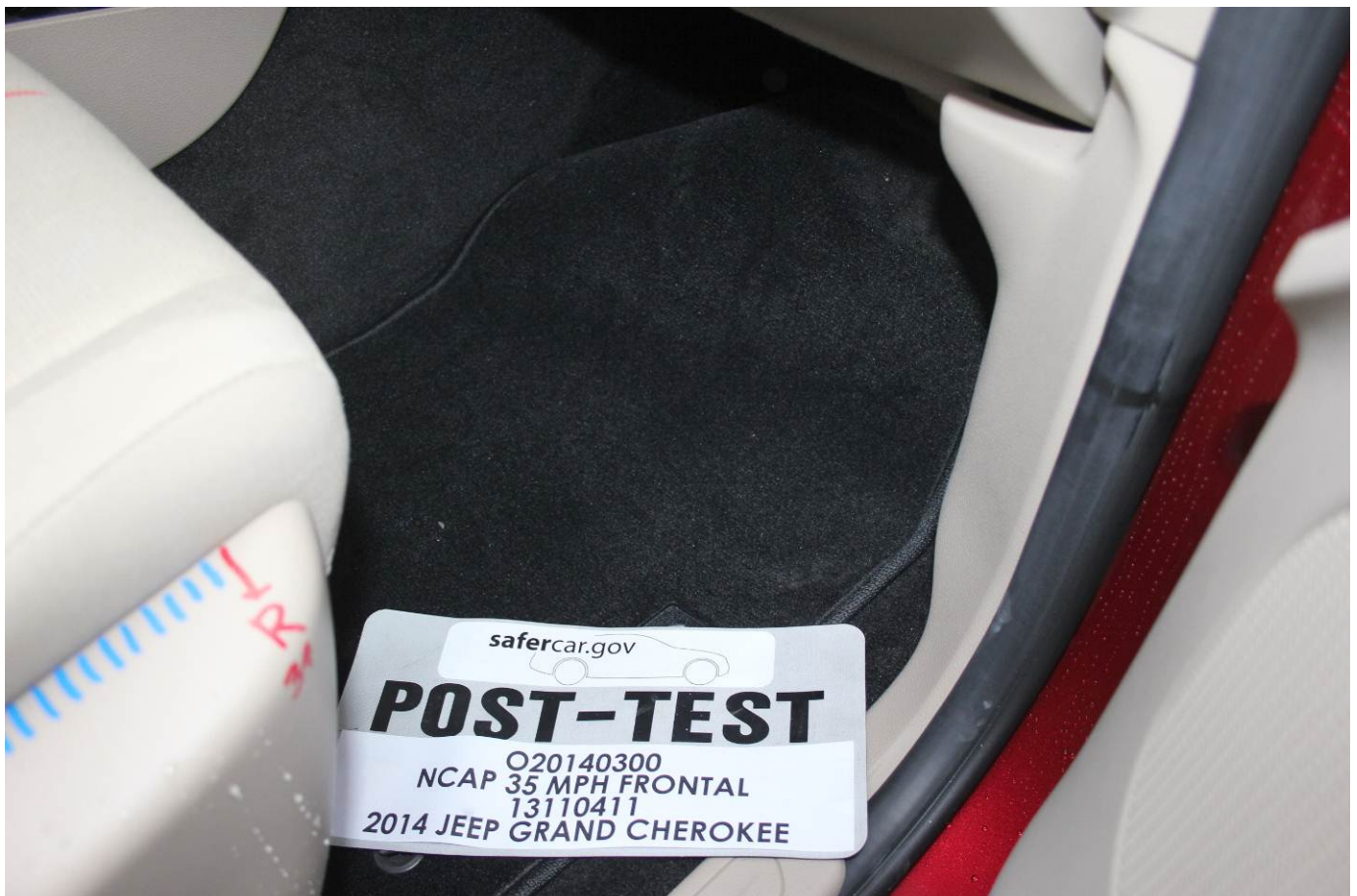
Pre-Test Passenger's Side Knee Bolster (without dummy)



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 Airbag



Post-Test Passenger Dummy Contact with Headrest



Post-Test Passenger Dummy Contact with Glovebox



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 Degree on Static Rollover Device



Vehicle at 360 Degrees on Static Rollover Device



2014 Jeep Grand Cherokee Laredo Frontal Impact Event

Jeep GRAND CHEROKEE LAREDO 4X4

For more information visit: www.jeep.com
or call 1-877-IAM-JEEP

Chrysler Group LLC

THIS VEHICLE IS MANUFACTURED TO MEET SPECIFIC UNITED STATES REQUIREMENTS. THIS VEHICLE IS NOT MANUFACTURED FOR SALE OR REGISTRATION OUTSIDE OF THE UNITED STATES.

MANUFACTURER'S SUGGESTED RETAIL PRICE OF THIS MODEL INCLUDING DEALER PREPARATION

Base Price: **\$30,795**

JEOP GRAND CHEROKEE LAREDO 4X4
Exterior Color: Deep Cherry Red Crystal Pearl Coat Exterior Paint
Interior Color: New Zealand Black and Light Frost Interior Color
Interior: Cloth Low-Back Bucket Seats
Engine: 3.6-Liter V6 24-Valve VVT Engine
Transmission: 8-Speed Automatic 845RE Transmission

STANDARD EQUIPMENT (UNLESS REPLACED BY OPTIONAL EQUIPMENT)

FUNCTIONAL/SAFETY FEATURES

Quadra-Trac I® 4WD System
Advanced Multistage Front Airbags
Supplemental Side-Curtain Front and Rear Airbags
Supplemental Front Seat-Mounted Side Airbags
Driver Inflatable Knee-Bolster Airbag
Child Seat Anchor System-LATCH Ready
Electronic Stability Control
Anti-Lock 4-Wheel Disc Brakes
Hill Start Assist
Trailer Sway Damping
Cruise Control
Keyless Enter-It-Go™
Tire Pressure Monitoring Sensor
Ready Alert Braking
Sentry Key® Theft Deterrent System
Tire Pressure Monitoring Display

INTERIOR FEATURES

Auxiliary 12-Volt Rear Power Outlet
A/C Auto Temperature Control with Dual Zone Control
7-inch Multi-View Display
Uconnect® 5.0 AM/FM/MT
Integrated Voice Command with Bluetooth®
6 Speakers
Rearview Mirror with Microphone
12-Volt Auxiliary Power Outlet
Leather-Wrapped Shift Knob
Steering Wheel Mounted Audio Controls
Steering Wheel Paddle Shift Control
Tilt / Telescope Steering Column
Leather-Wrapped Steering Wheel
Remote USB Port

Front and Rear Interior LED Lamps
EXTERIOR FEATURES
17-inch x 8.0-inch Aluminum Wheels
P245/70R17 BSW On/Off-Road Tires
Low Beam Daytime Running Headlamps
LED Tail Lamps
Premium Fog Lamps
Capless Fuel Fill
Power Heated Exterior Mirrors w/ Manual Fold-Away

OPTIONAL EQUIPMENT

Customer Preferred Package 23A
Flex Fuel Vehicle

DESTINATION CHARGE

\$995

TOTAL PRICE: * \$31,790

WARRANTY COVERAGE

5-year or 100,000-mile Powertrain Limited Warranty.
3-year or 36,000-mile Basic Limited Warranty.
5-year or 100,000-mile Roadside Assistance; certain restrictions apply.
Ask Dealer for a copy of the limited warranties or see your owner's manual for details.

**5 YEAR/100,000 MILE
POWERTRAIN WARRANTY**

Assembly Plant/Port of Entry: DETROIT, MICHIGAN, U.S.A.

VIN: 1C4RJFAG8EC-253284

LA-VIN: 5977

3714

SHIP TO: 6454 33

BINGHAMTON CHRYSLER JEEP DODGE

1275 UPPER FRONT ST

BINGHAMTON NY 13901-1012

SHIP TO: 33 6454

BINGHAMTON CHRYSLER JEEP DODGE

1275 UPPER FRONT ST

BINGHAMTON NY 13901-1012

THIS LABEL IS ADDED TO THIS VEHICLE TO COMPLY WITH FEDERAL LAW. THE LABEL CANNOT BE REMOVED OR ALTERED PRIOR TO DELIVERY TO THE ULTIMATE PURCHASER.

* EXcludes FINANCIAL, TITLE, AND LICENSE AND TITLE FEES AND DEALER SUPPLIED AND INSTALLED EQUIPMENT AND ACCESSORIES ARE NOT INCLUDED IN THIS PRICE. DISCOUNT IF ANY.

IS BASED ON PRICE OF OPTIONS IF PROVIDED SEPARATELY.

EPA DOT Fuel Economy and Environment

Flexible-Fuel Vehicle
Gasoline-Ethanol (E85)

Fuel Economy

19 MPG
combined city/hwy
Driving Range
Gasoline: 460 miles
Ethanol (E85): 370 miles

Standard SUV 4WD range from 12 to 28 MPG.
The best vehicle rates 121 MPG. Values are based on gasoline and do not reflect performance and ratings based on E85.

You spend

\$2,250
more in fuel costs
over 5 years
compared to the
average new vehicle.

**Annual fuel Cost
\$2,750**

Fuel Economy & Greenhouse Gas Rating (tailpipe only)

1 4 10 Best
This vehicle emits 458 grams CO2 per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel also creates emissions; learn more at fuelconomy.gov.

Smog Rating (tailpipe only)

1 6 10 Best
This vehicle emits 458 grams CO2 per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel also creates emissions; learn more at 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 23 MPG and cost \$11,500 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$3.50 per gallon. This is a dual fueled automobile. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

fuelconomy.gov
Calculate personalized estimates and compare vehicles



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.		
Frontal Crash	Driver Passenger	Not Rated
Based on the risk of injury in a frontal impact. Should ONLY be compared to other vehicles of similar size and weight.		
Side Crash	Front seat	★★★★★
	Rear seat	★★★★★
Based on the risk of injury in a side impact.		
Rollover		★★★★
Based on the risk of rollover in a single-vehicle crash.		

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

The safety ratings above are based on Federal Government tests of particular vehicles equipped with certain features and options. The performance of this vehicle may differ.

PARTS CONTENT INFORMATION

FOR VEHICLES IN THIS CARLINE:
U.S./CANADIAN PARTS CONTENT: 68 %
NOTE: PARTS CONTENT DOES NOT INCLUDE FINAL ASSEMBLY, DISTRIBUTION, OR OTHER NON-PARTS COSTS.
FOR THIS VEHICLE:
FINAL ASSEMBLY POINT:
DETROIT, MICHIGAN, U.S.A.
COUNTRY OF ORIGIN:
ENGINE: MEXICO
TRANSMISSION: UNITED STATES

Monroney Label

APPENDIX B
DUMMY RESPONSE DATA TRACES

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Figure No. 2.	Driver Head Y Acceleration vs. Time	B-1
Figure No. 3.	Driver Head Z Acceleration vs. Time	B-1
Figure No. 4.	Driver Head Resultant Acceleration vs. Time	B-1
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Figure No. 14.	Driver Nij (NTE) vs. Time	B-5
Figure No. 15.	Driver Nij (NCF) vs. Time	B-5
Figure No. 16.	Driver Nij (NCE) vs. Time	B-5
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Figure No. 25.	Passenger Chest Y Acceleration vs. Time	B-9
Figure No. 26.	Passenger Chest Z Acceleration vs. Time	B-9
Figure No. 27.	Passenger Chest Resultant Z Acceleration vs. Time	B-9

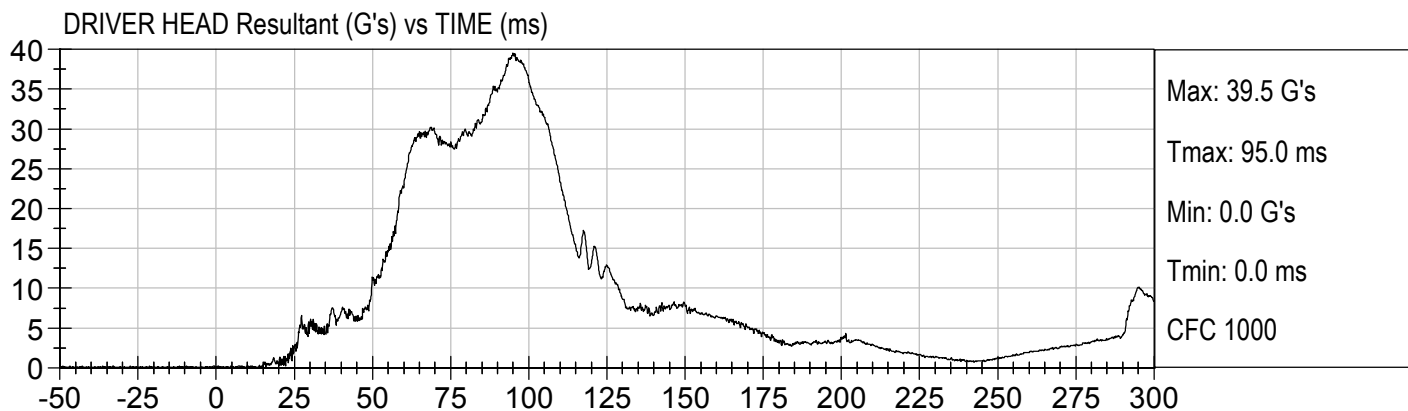
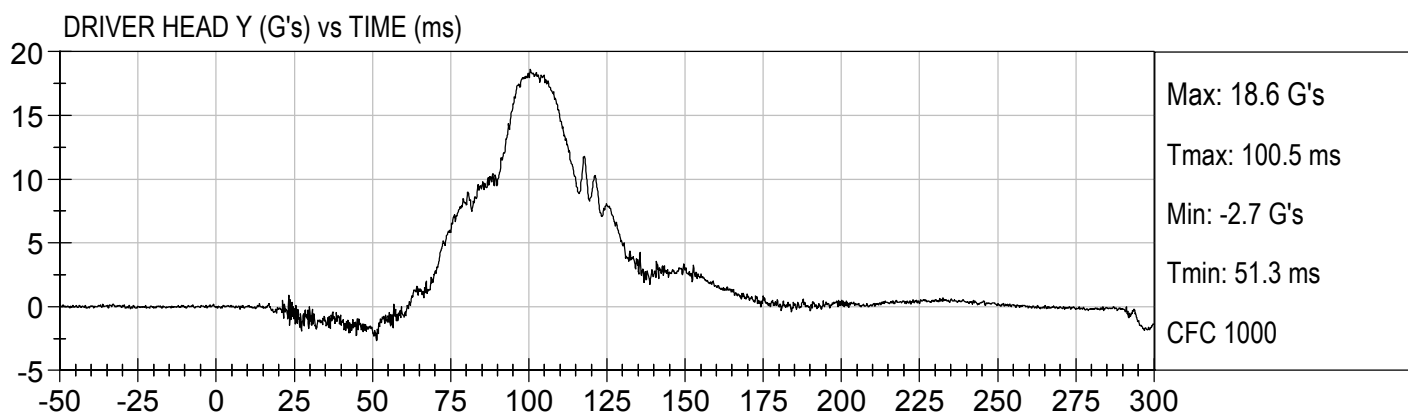
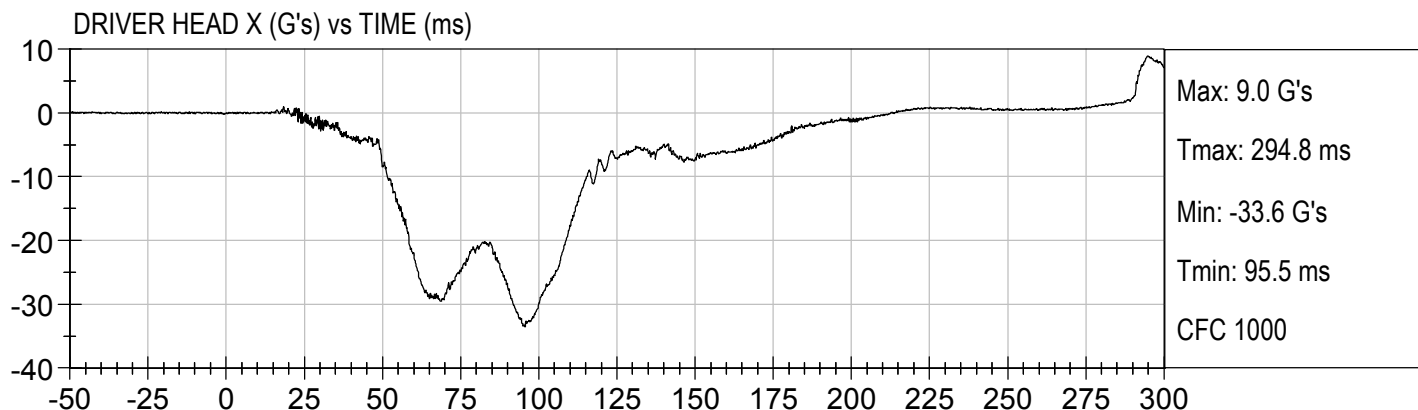
	<u>Page No.</u>
Figure No. 28. Passenger Neck Force X vs. Time	B-10
Figure No. 29. Passenger Neck Force Z vs. Time	B-10
Figure No. 30. Passenger Neck Moment Y vs. Time	B-10
Figure No. 31. Passenger Nij (NTF) vs. Time	B-11
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Figure No. 33. Passenger Nij (NCF) vs. Time	B-11
Figure No. 34. Passenger Nij (NCE) vs. Time	B-11
Figure No. 35. Passenger Left Femur Force vs. Time	B-12
Figure No. 36. Passenger Right Femur Force vs. Time	B-12

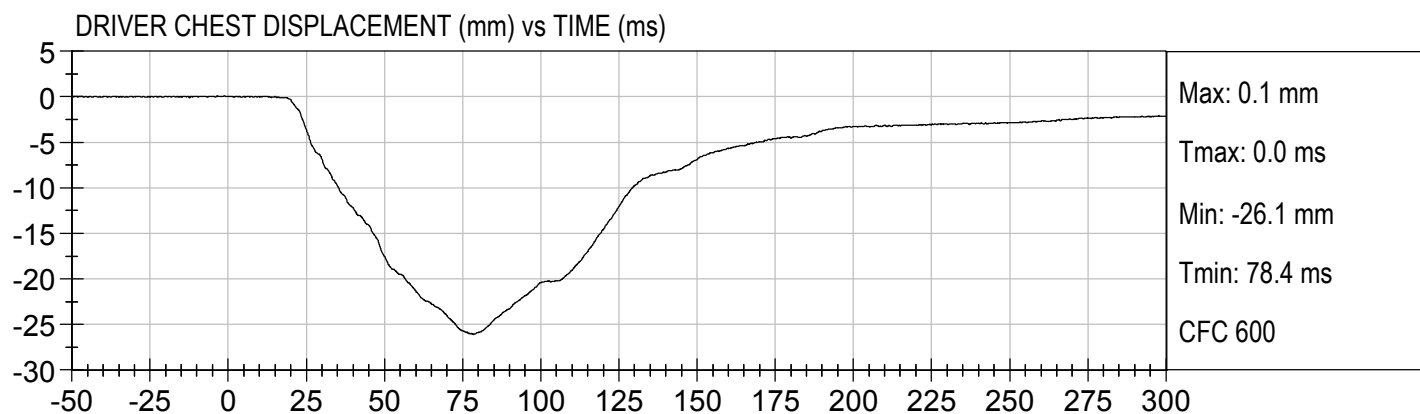
The following additional dummy and vehicle response data can be found in the R&D section of the NHTSA website at www.nhtsa.dot.gov

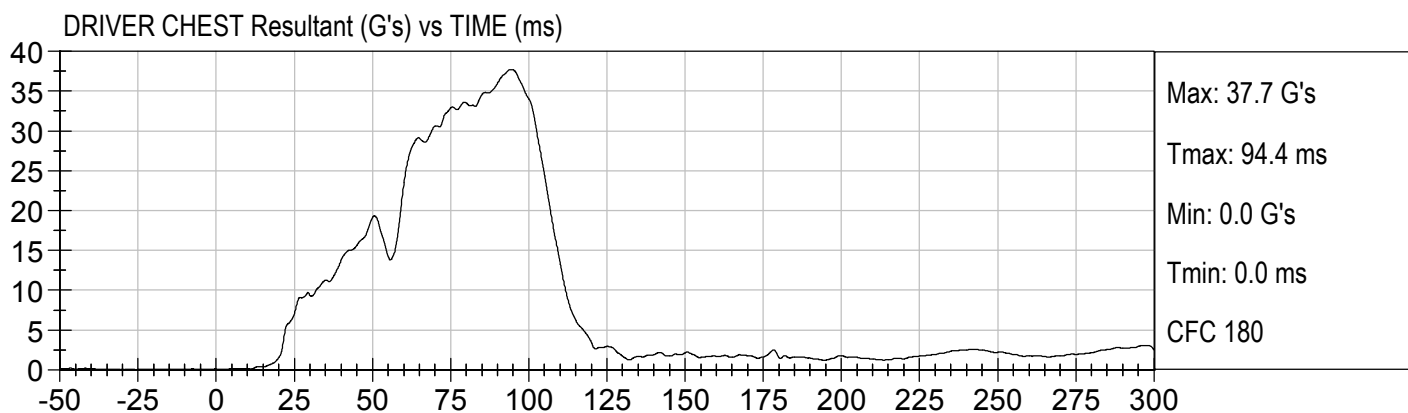
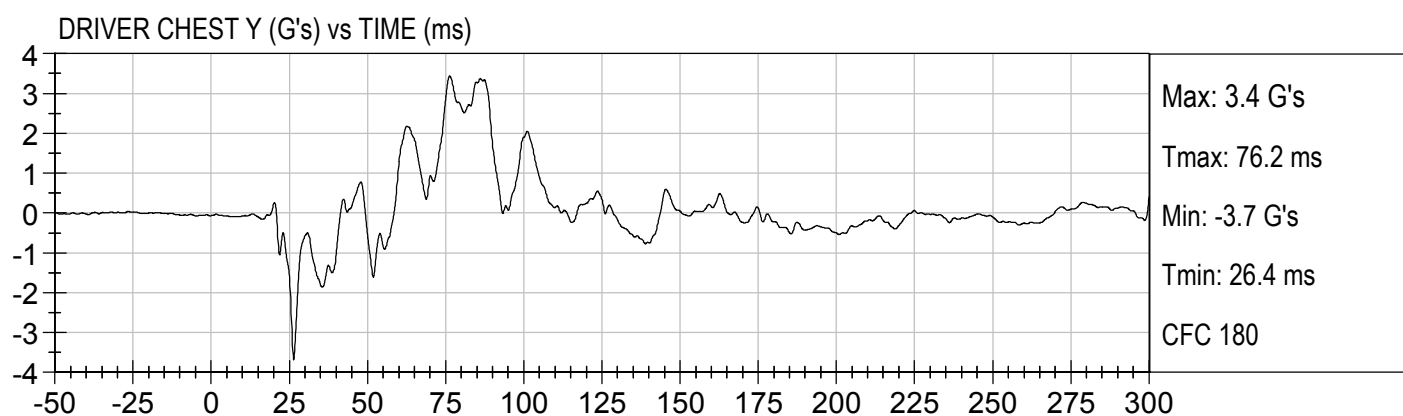
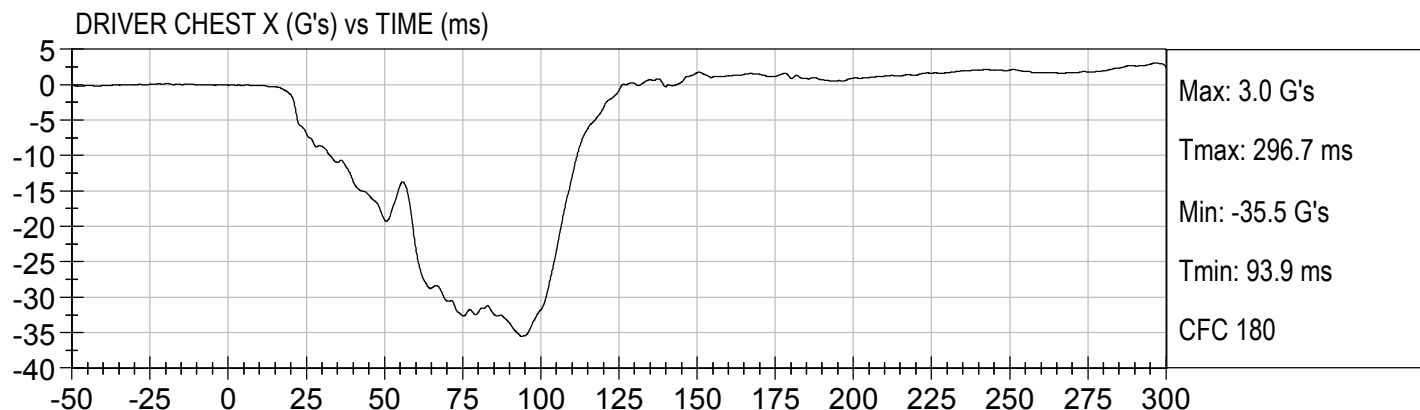
Driver Head X Redundant
 Driver Head Y Redundant
 Driver Head Z Redundant
 Driver Upper Neck Force Y
 Driver Upper Neck Moment X
 Driver Upper Neck Moment Z
 Driver Chest X Redundant
 Driver Chest Y Redundant
 Driver Chest Z Redundant
 Driver Pelvis X
 Driver Pelvis Y
 Driver Pelvis Z
 Driver Left Femur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

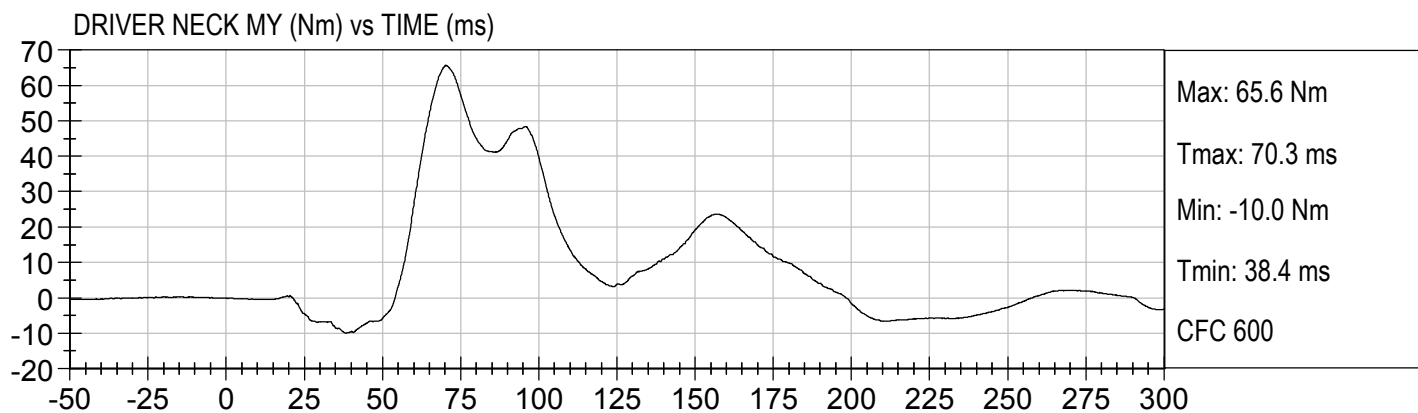
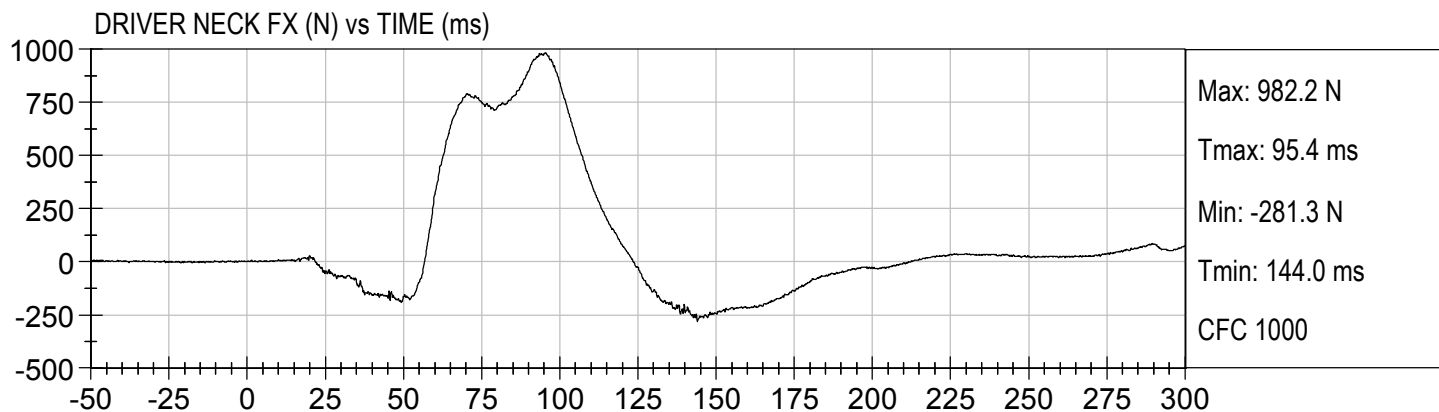
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Driver Left Lower Tibia Force Z
Driver Right Upper Tibia Moment X
Driver Right Upper Tibia Moment Y
Driver Right Upper Tibia Force Z
Driver Right Lower Tibia Moment X
Driver Right Lower Tibia Moment Y
Driver Right Lower Tibia Force Z
Driver Left Foot 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

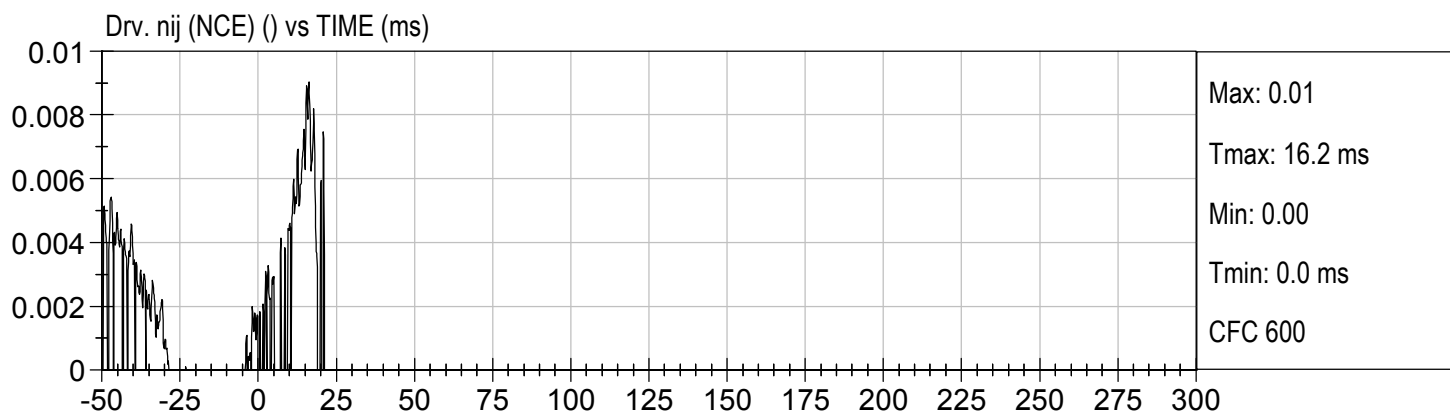
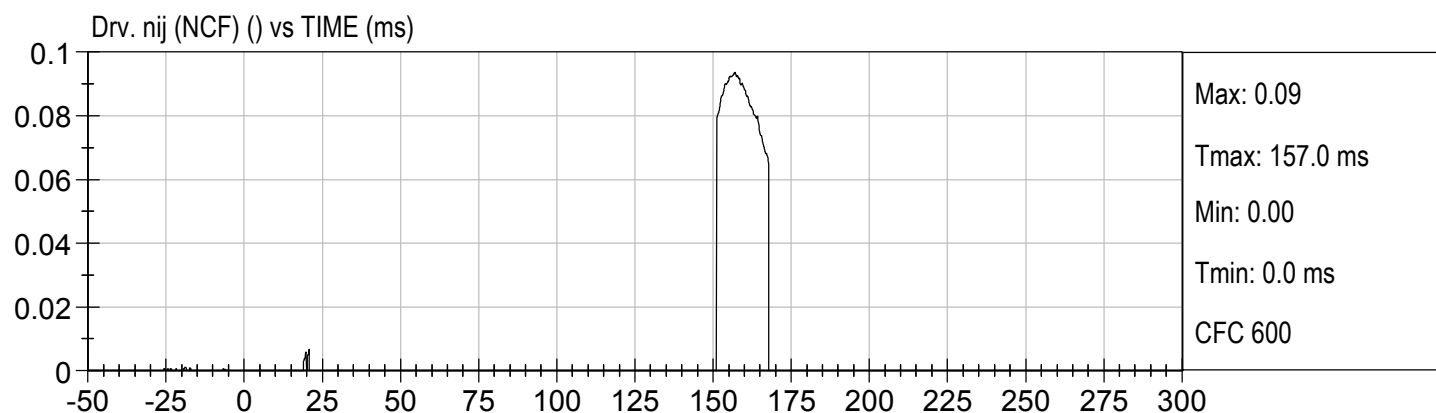
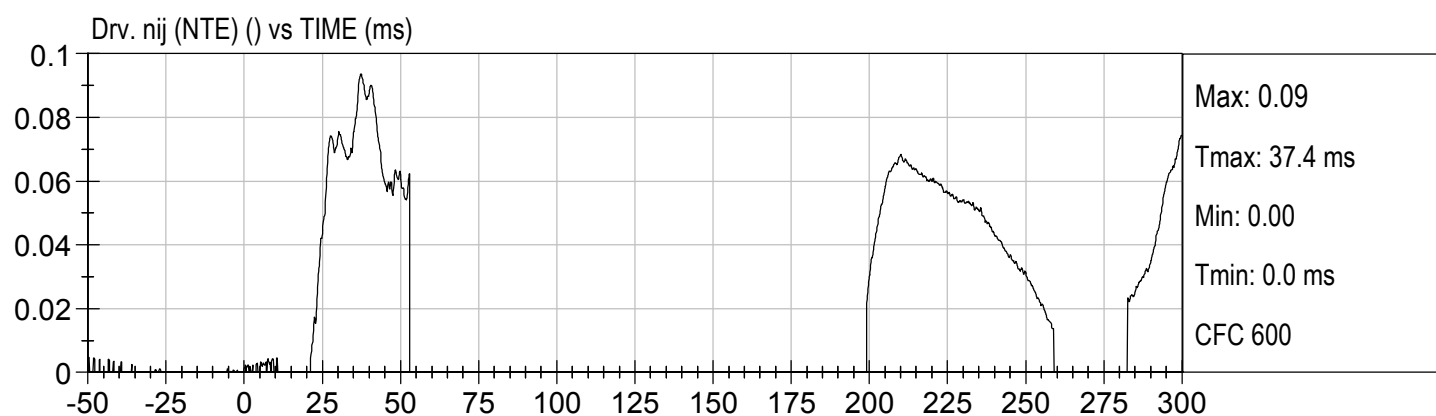
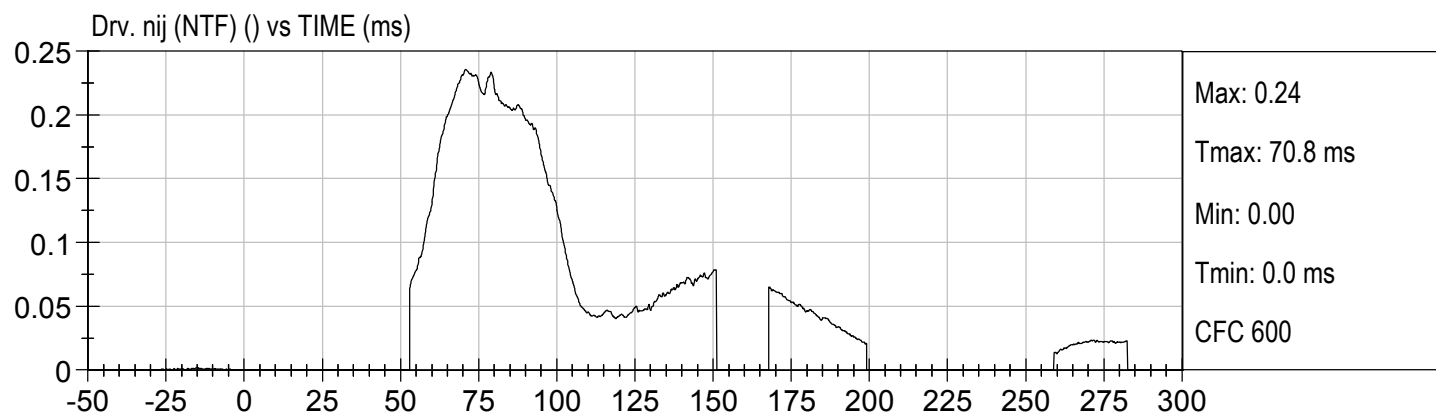
Passenger Left Upper Tibia Moment Y
Passenger Left Upper Tibia Force Z
Passenger Left Lower Tibia Moment X
Passenger Left Lower Tibia Moment Y
Passenger Left Lower Tibia Force Z
Passenger Right Upper Tibia Moment X
Passenger Right Upper Tibia Moment Y
Passenger Right Upper Tibia Force Z
Passenger Right 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

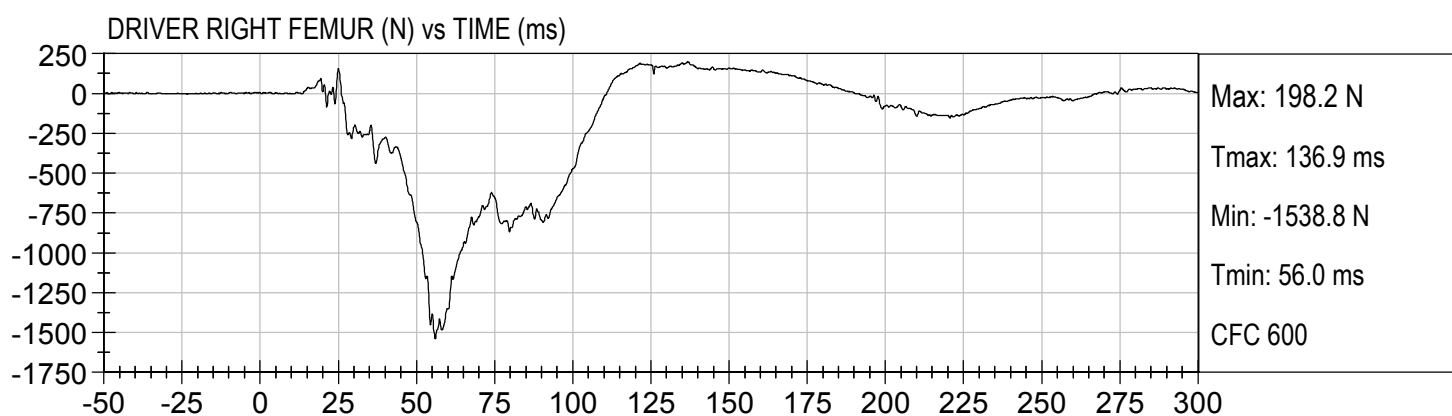
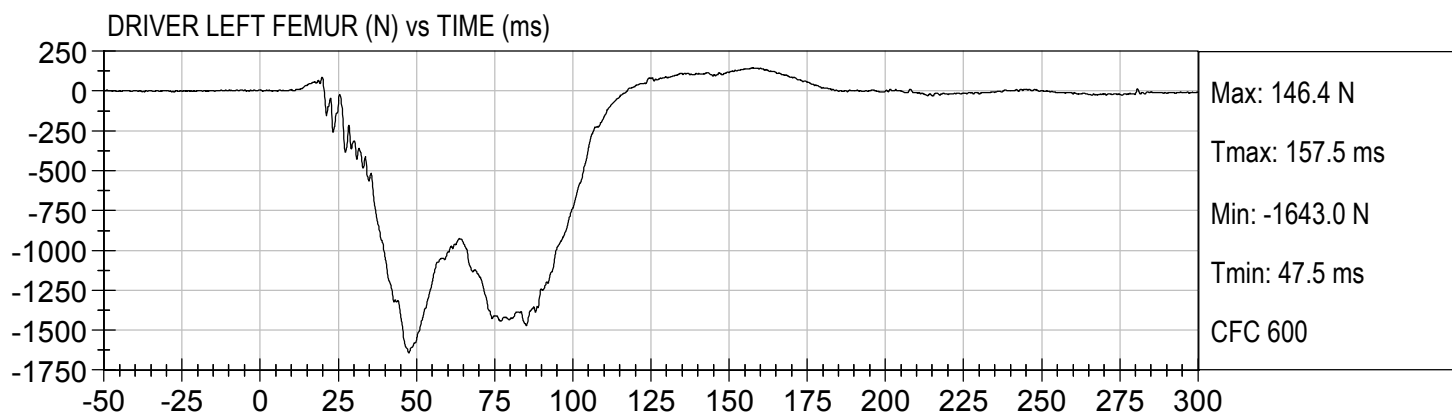


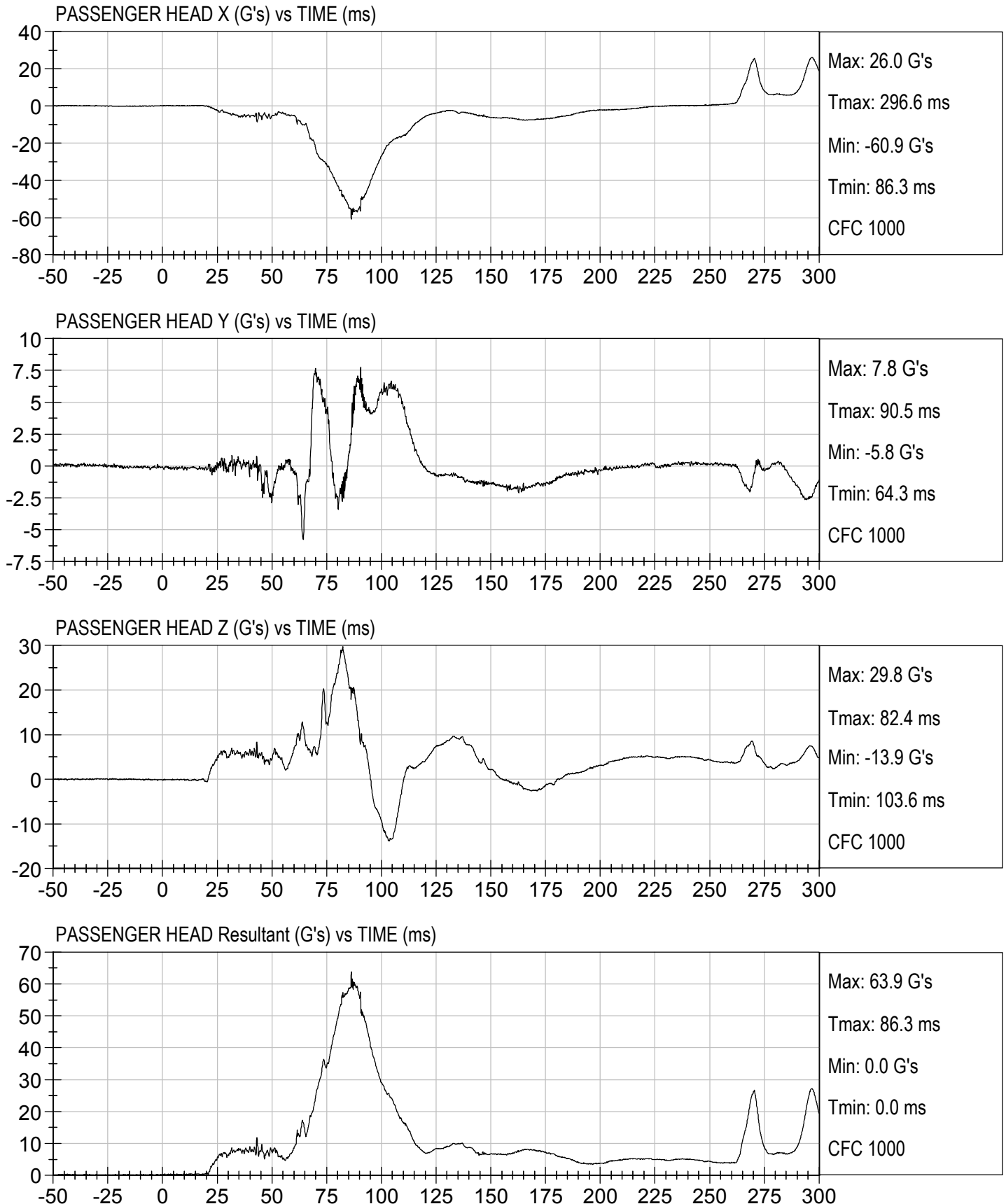


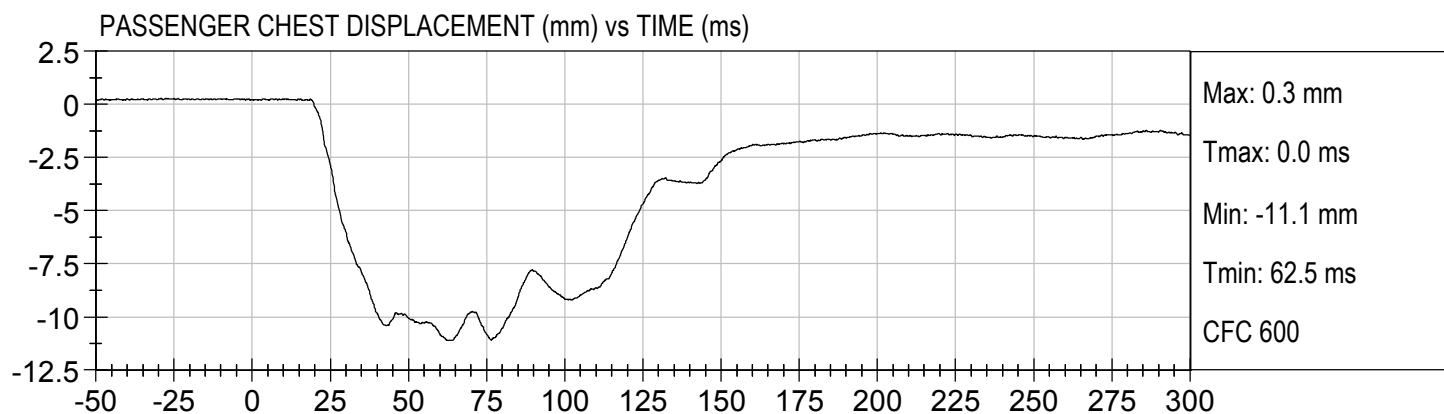


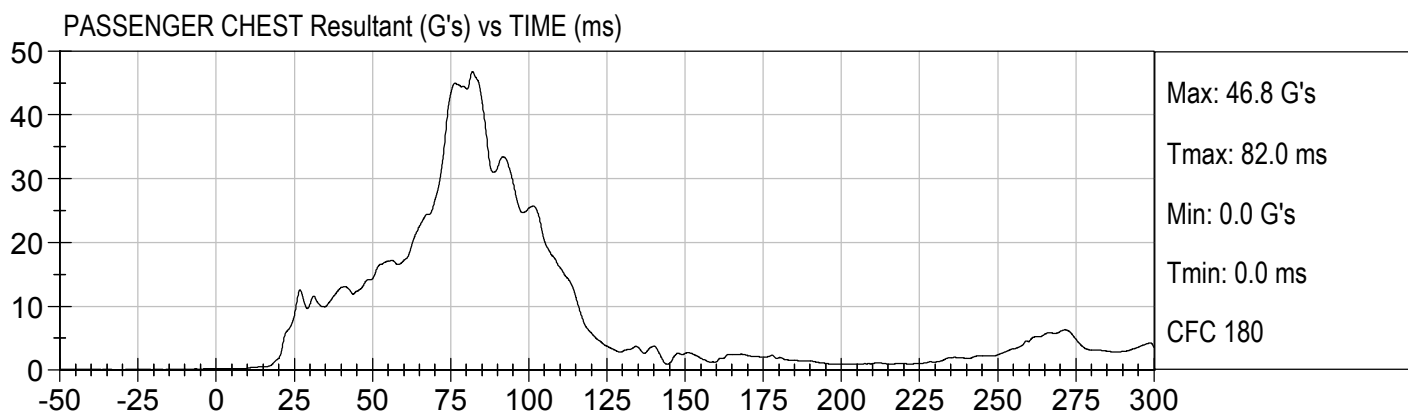
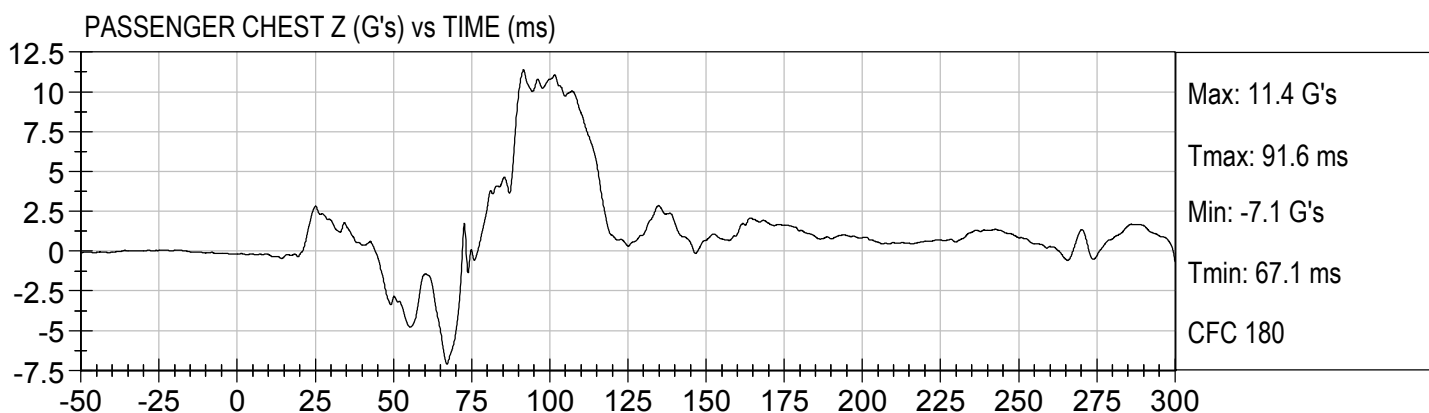
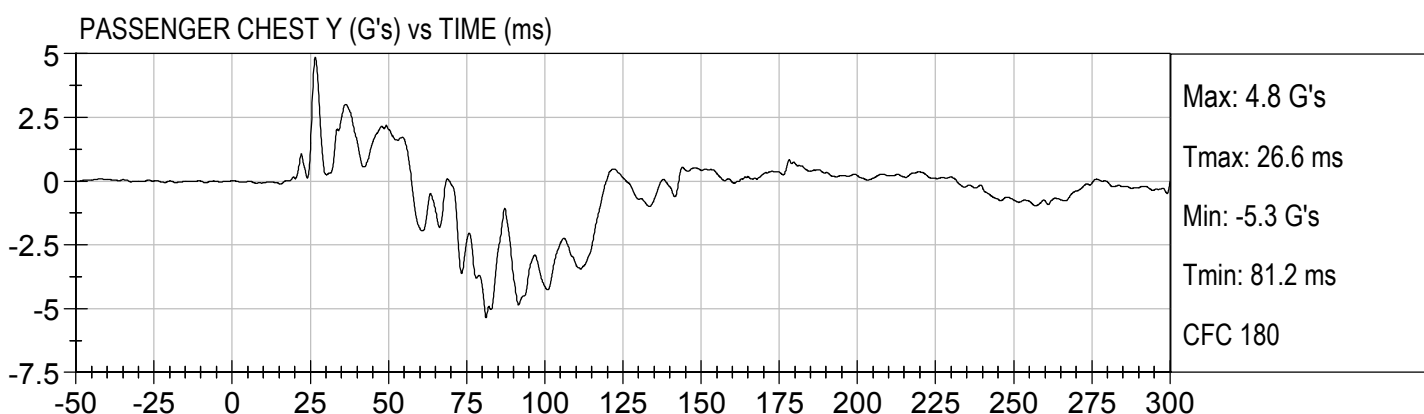
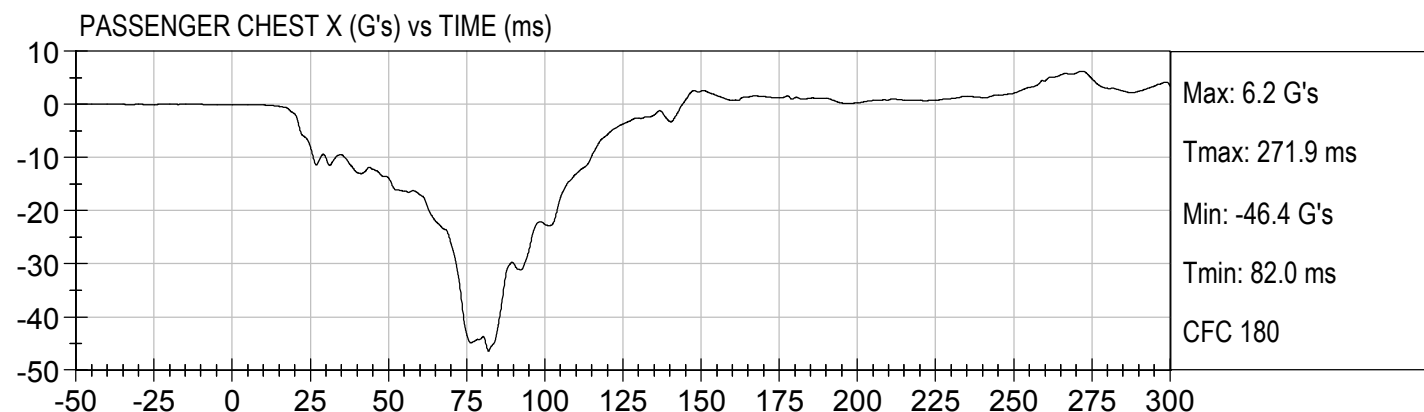


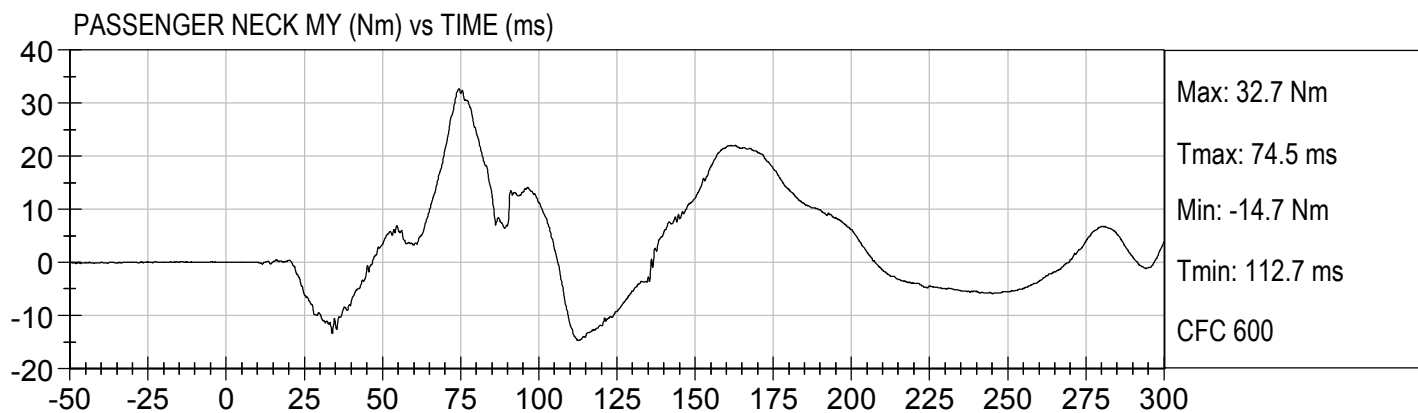
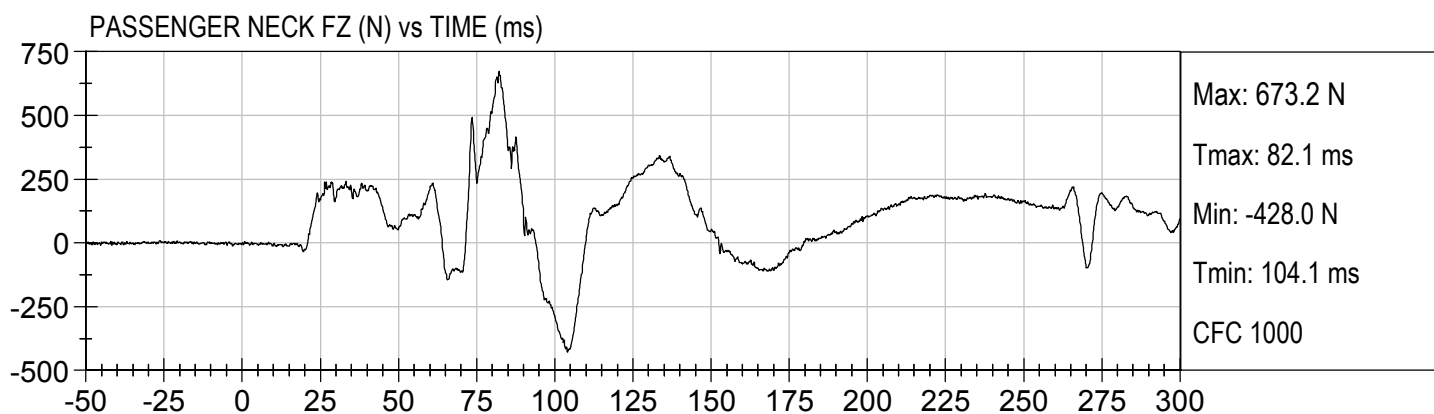
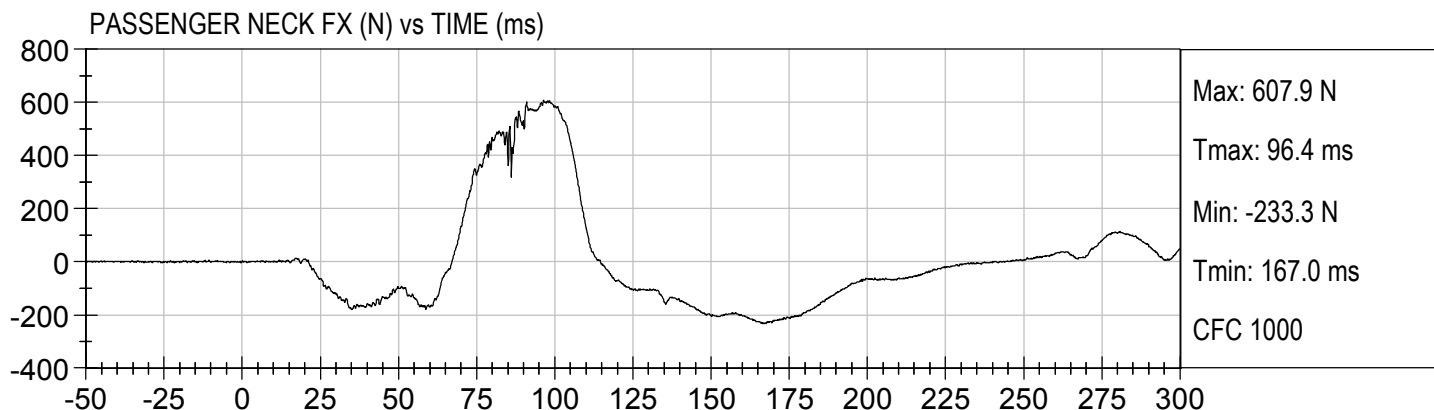


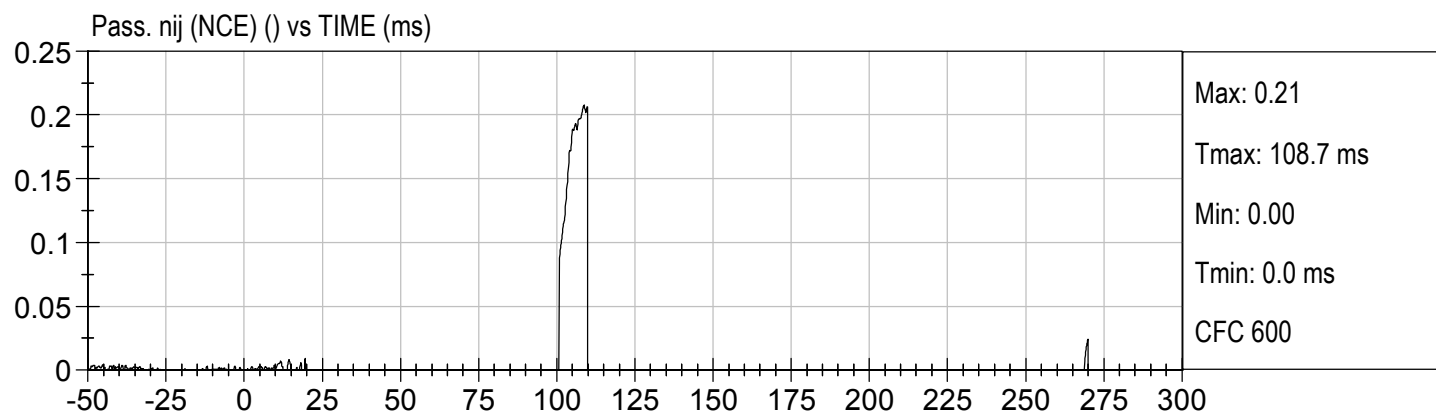
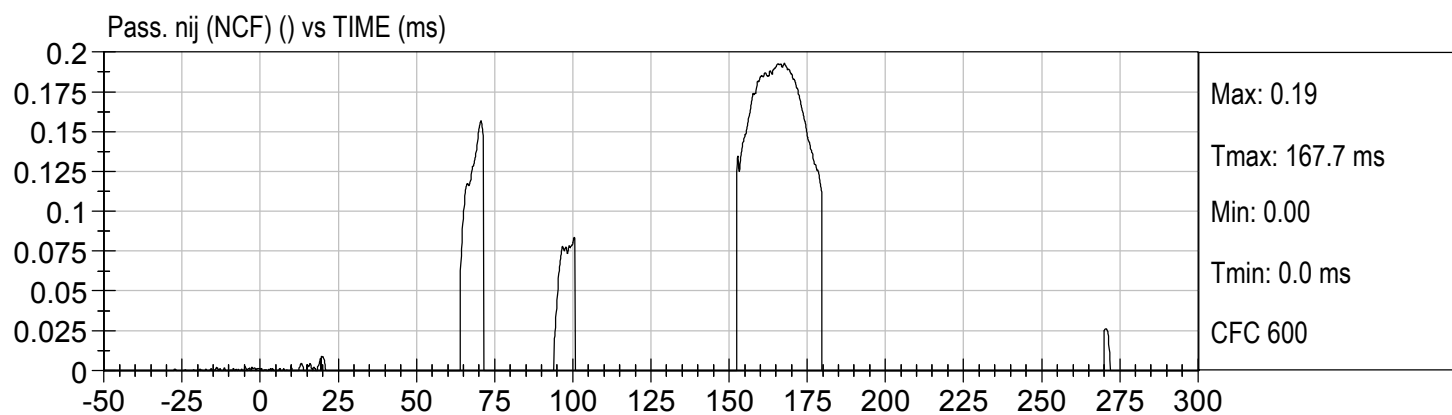
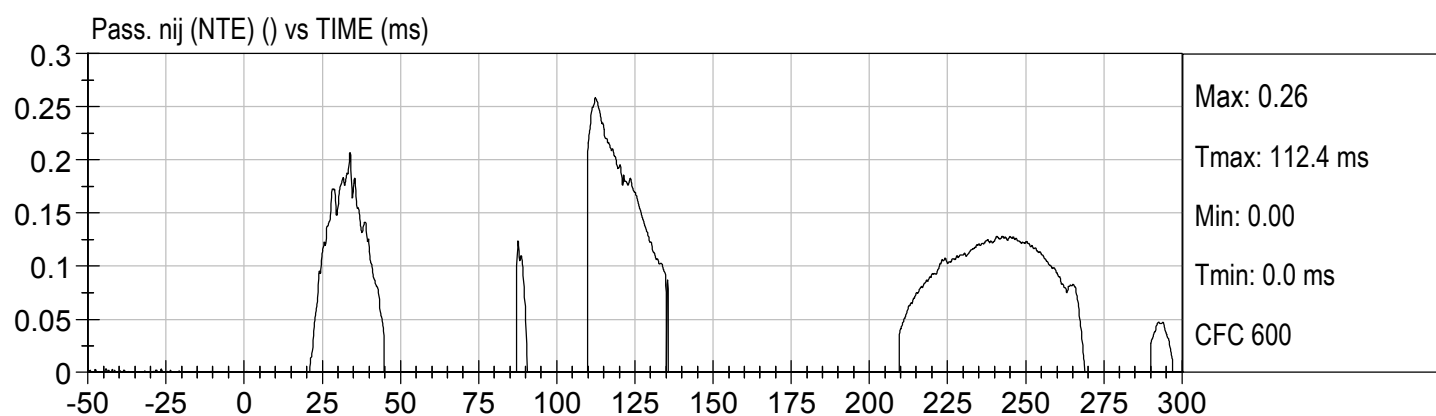
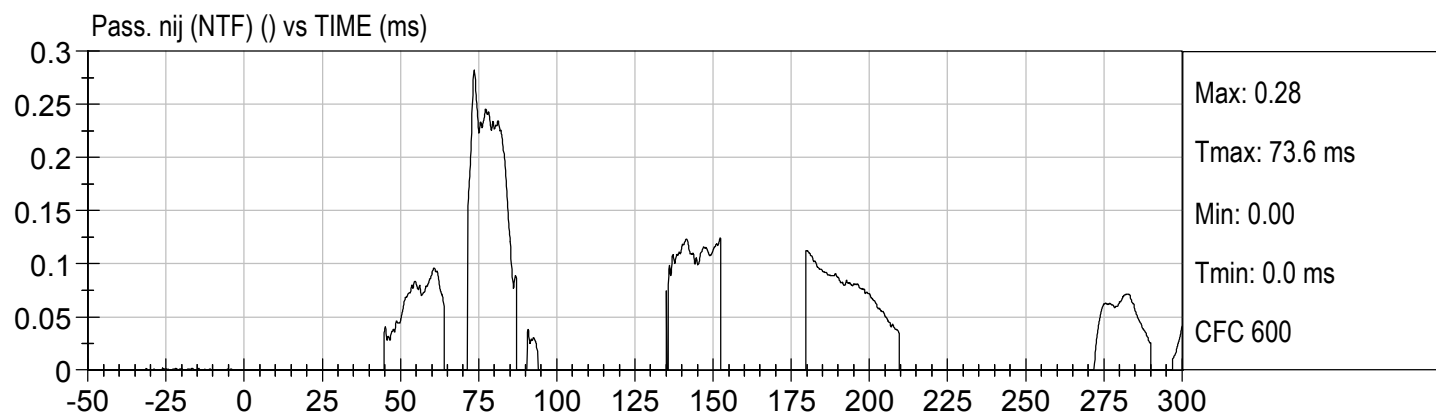


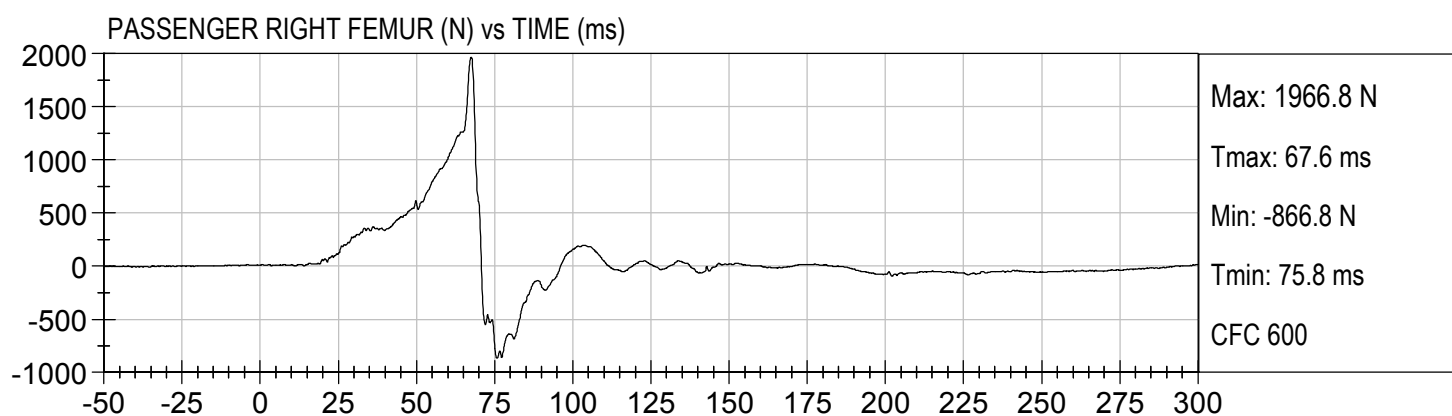
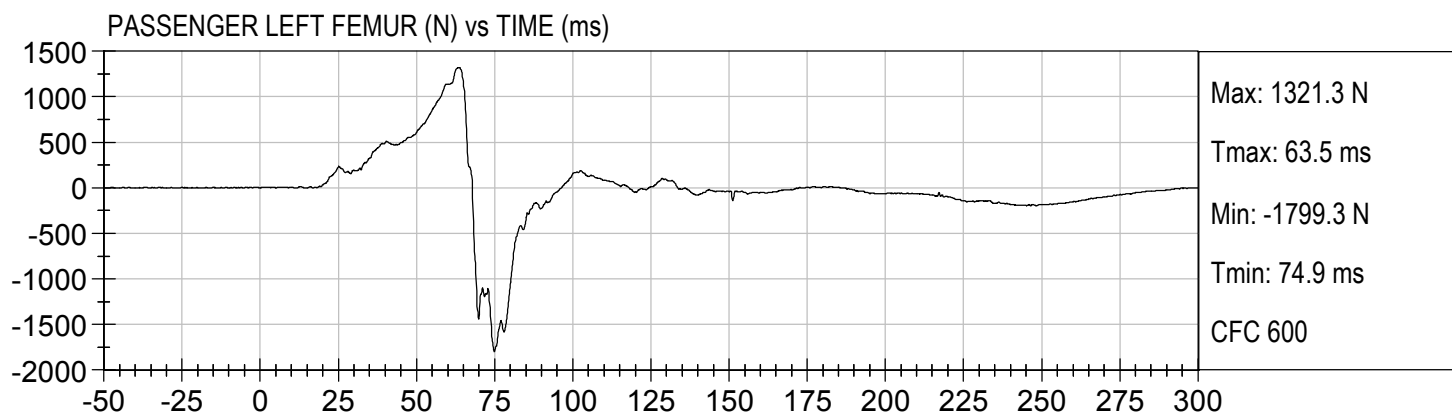












APPENDIX C
DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

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

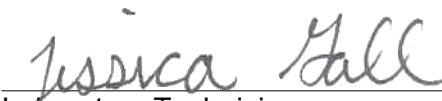
NOTE: THE H-POINT IS LOCATED 1.83 INCHES FORWARD AND 2.57 INCHES DOWN FROM THE CENTER OF THE PELVIS ANGLE REFERENCE HOLE.

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

ATD Serial No: 351

Test ID: D133341

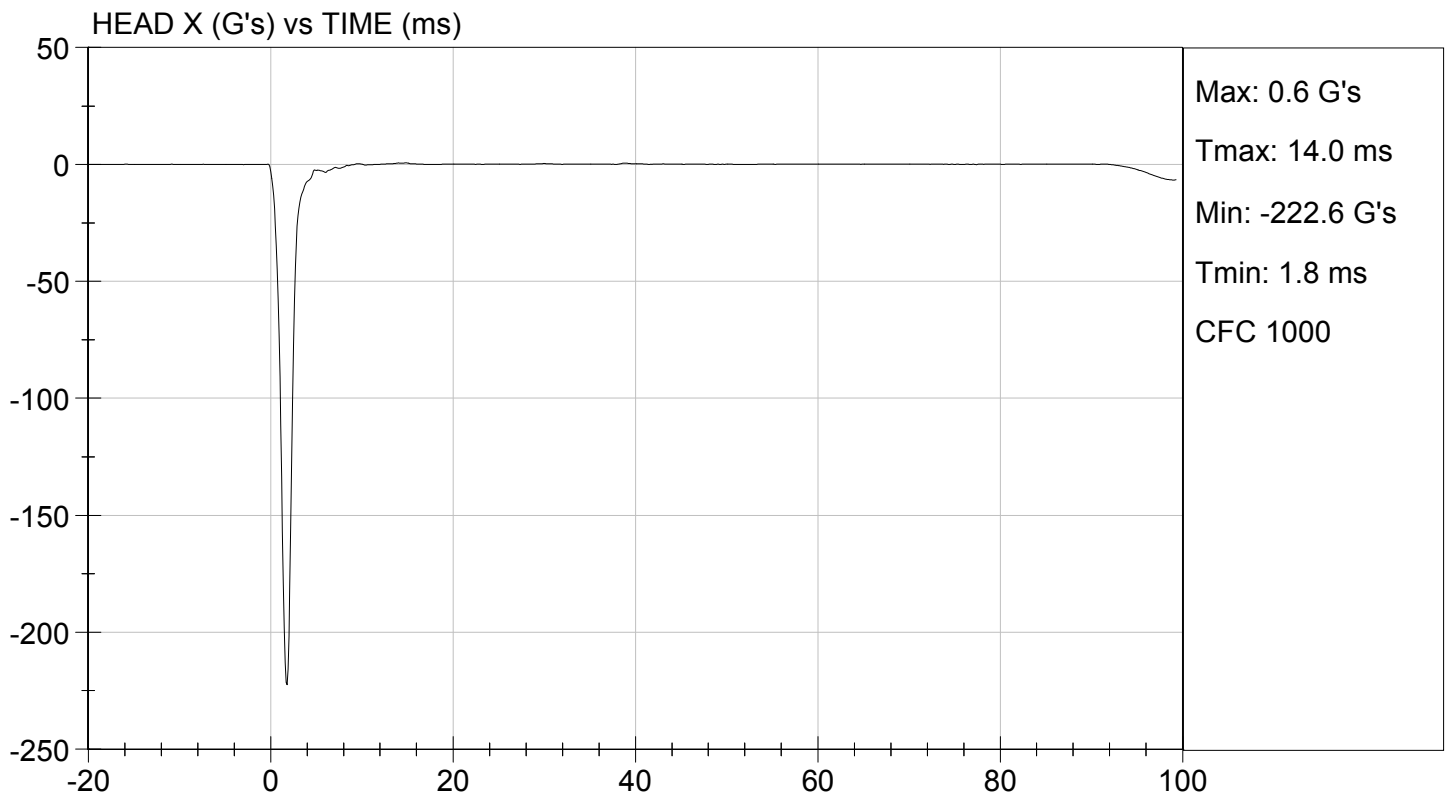
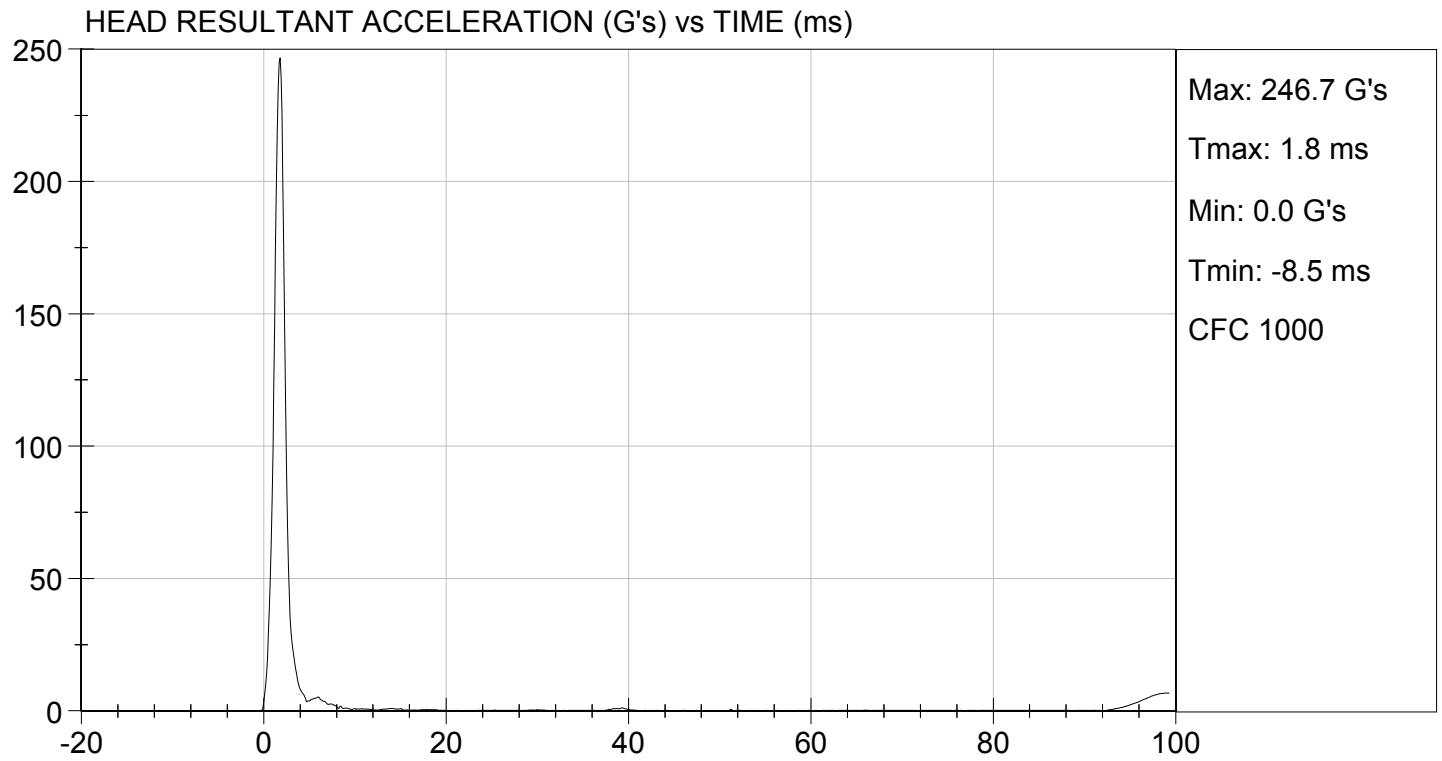
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Peak Resultant Acceleration	G's	225 to 275	247	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-9.0	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

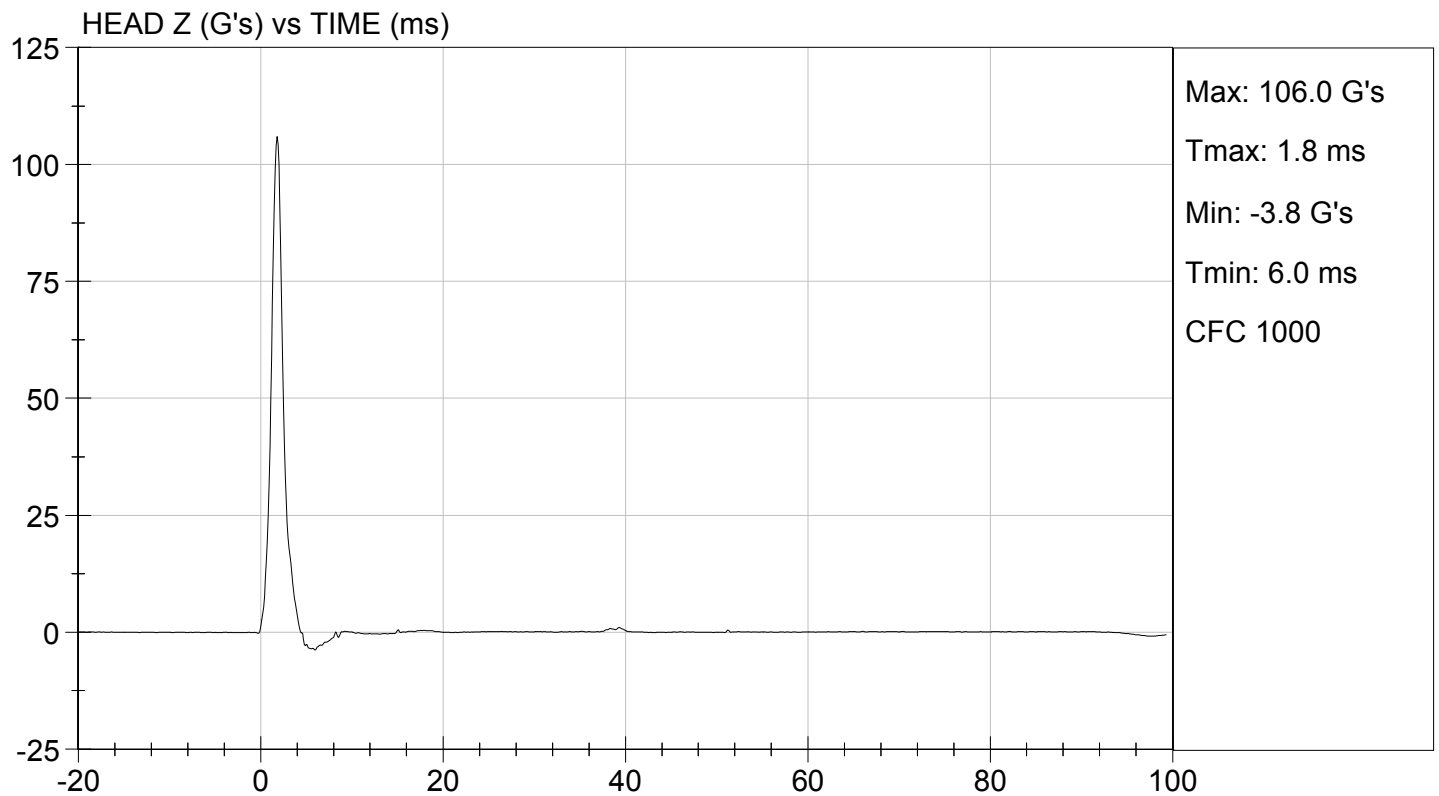
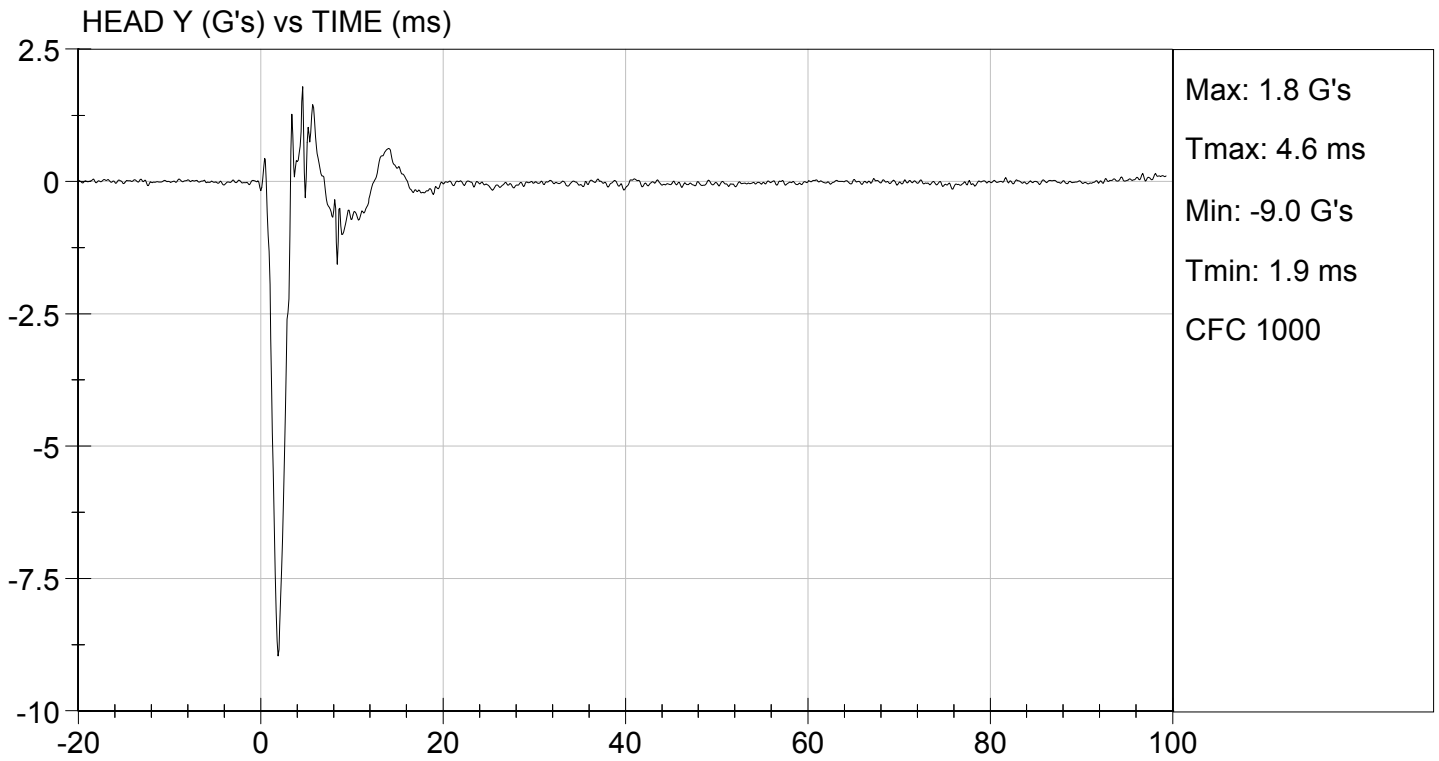

Laboratory Technician

09/30/2013

Test Date


Approved By



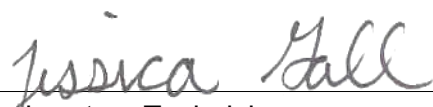


MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

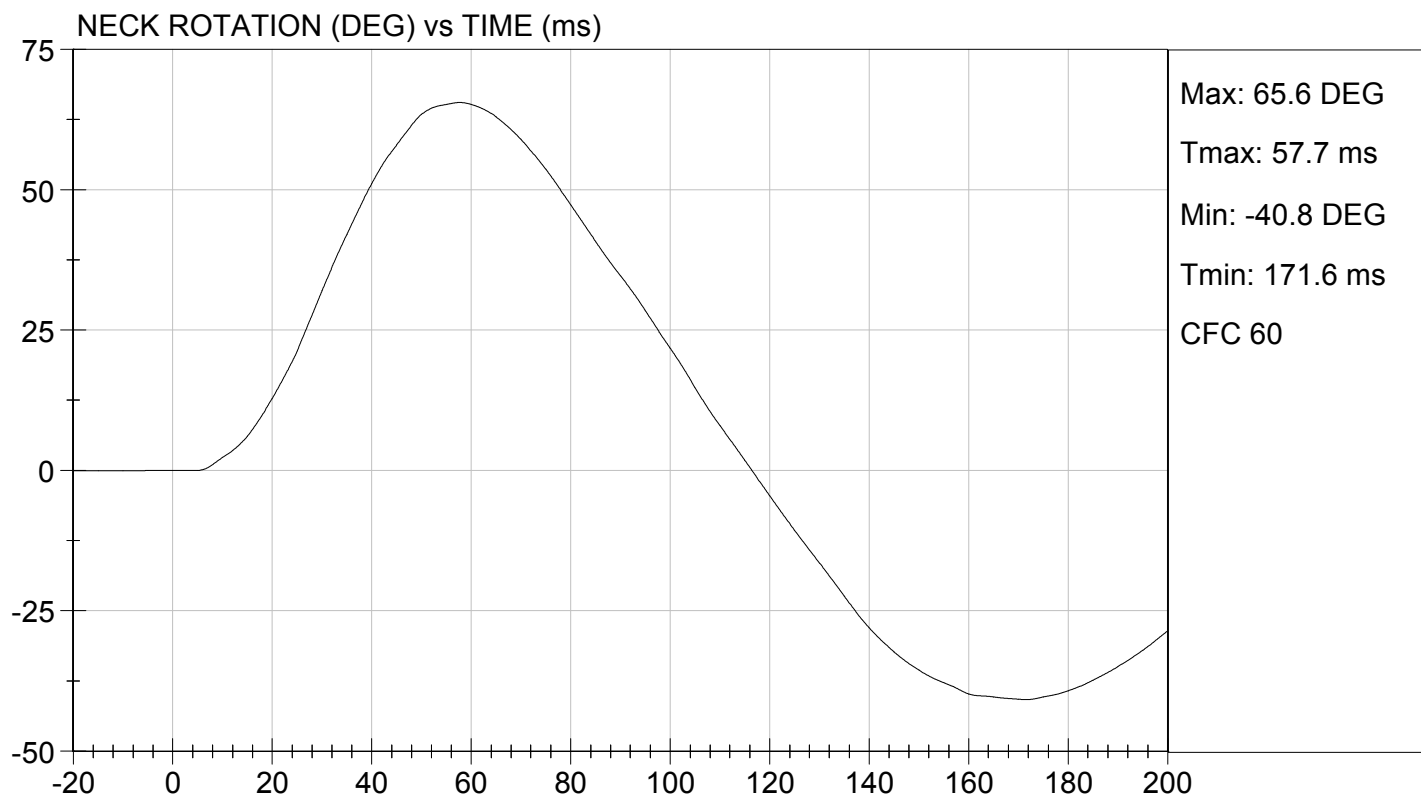
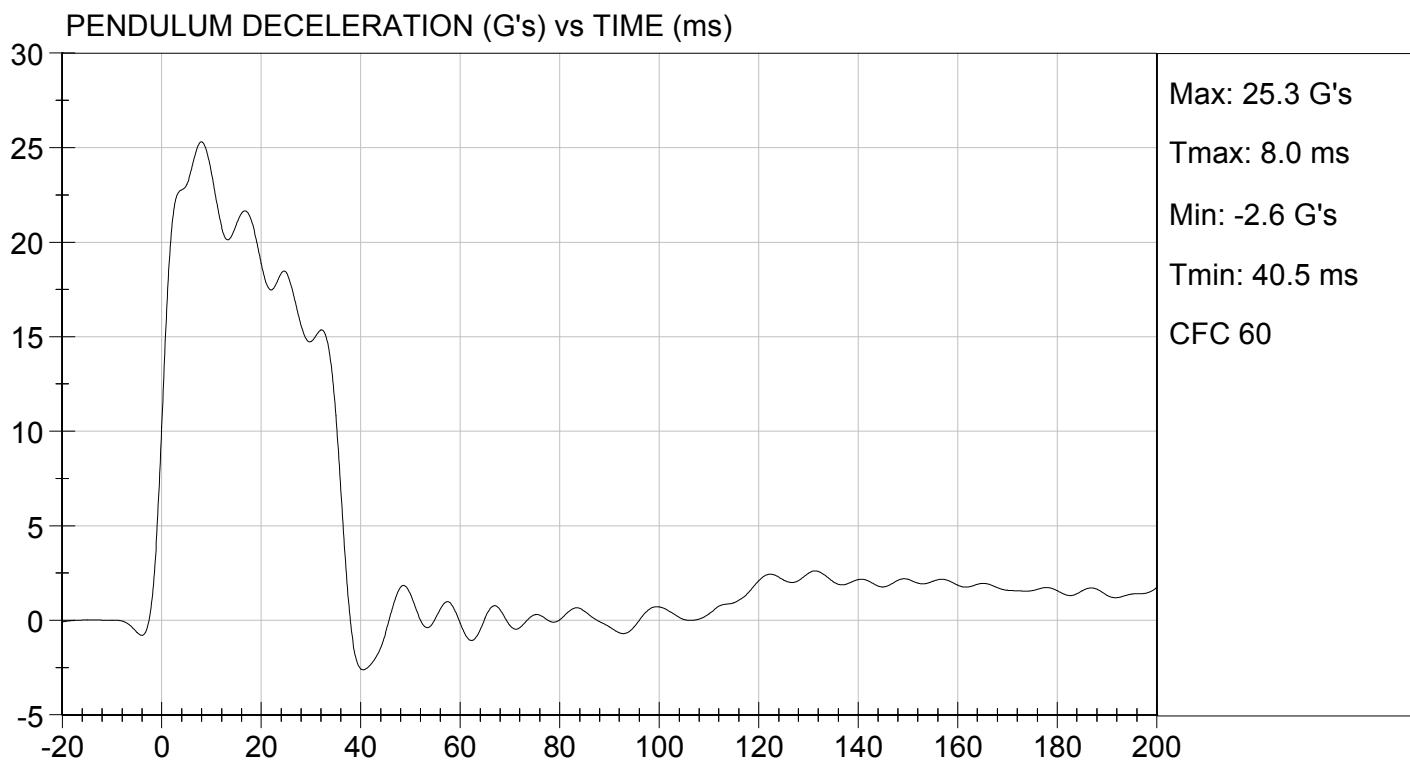
Test I.D: D133342

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	48	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.89	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.61	Pass
	20 ms	G's	17.60 to 22.60	18.88	Pass
	30 ms	G's	12.50 to 18.50	14.73	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	15.4	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	36.5	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	65.6	Pass
	Time	ms	57.0 to 64.0	57.7	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	116.6	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	89.1	Pass
	Time	ms	47.0 to 58.0	48.7	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	97.7	Pass
Overall Test Results					Pass


 Laboratory Technician

09/30/2013
 Test Date

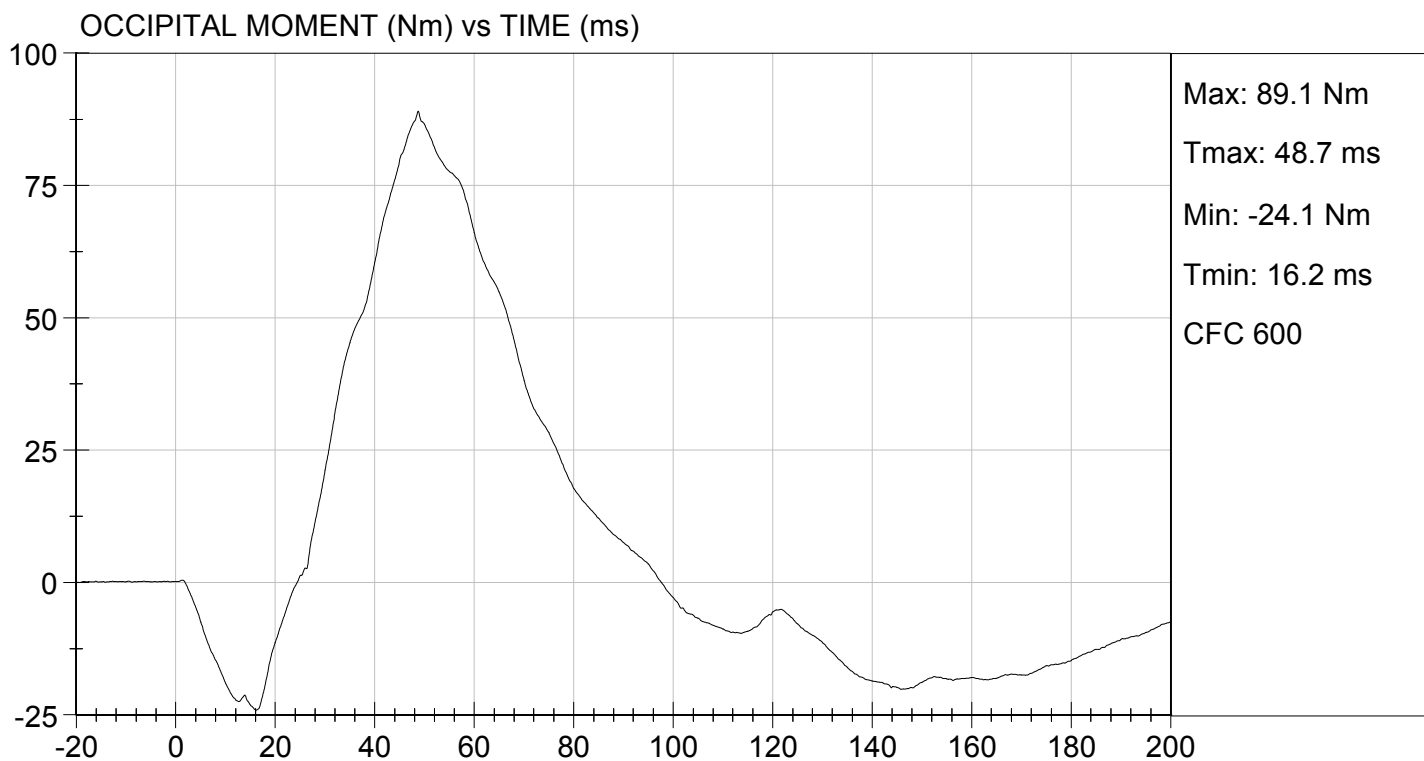

 Approved By





TEST DESC: NECK FLEXION
VELOCITY: 22.60 ft/s, 6.89 m/s

TEST DATE: 09/30/2013
TEST #: D133342



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

ATD Serial No: 351

Test I.D: D133343

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	48	Pass
Pendulum Velocity		m/s	5.95 to 6.19	5.97	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	17.86	Pass
	20 ms	G's	14.00 to 19.00	15.67	Pass
	30 ms	G's	11.00 to 16.00	13.19	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	13.6	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	40.6	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	89.3	Pass
	Time	ms	72.0 to 82.0	77.1	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	157.3	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-55.7	Pass
	Time	ms	65.0 to 79.0	70.2	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	143.2	Pass
Overall Test Results					Pass


Laboratory Technician

09/30/2013

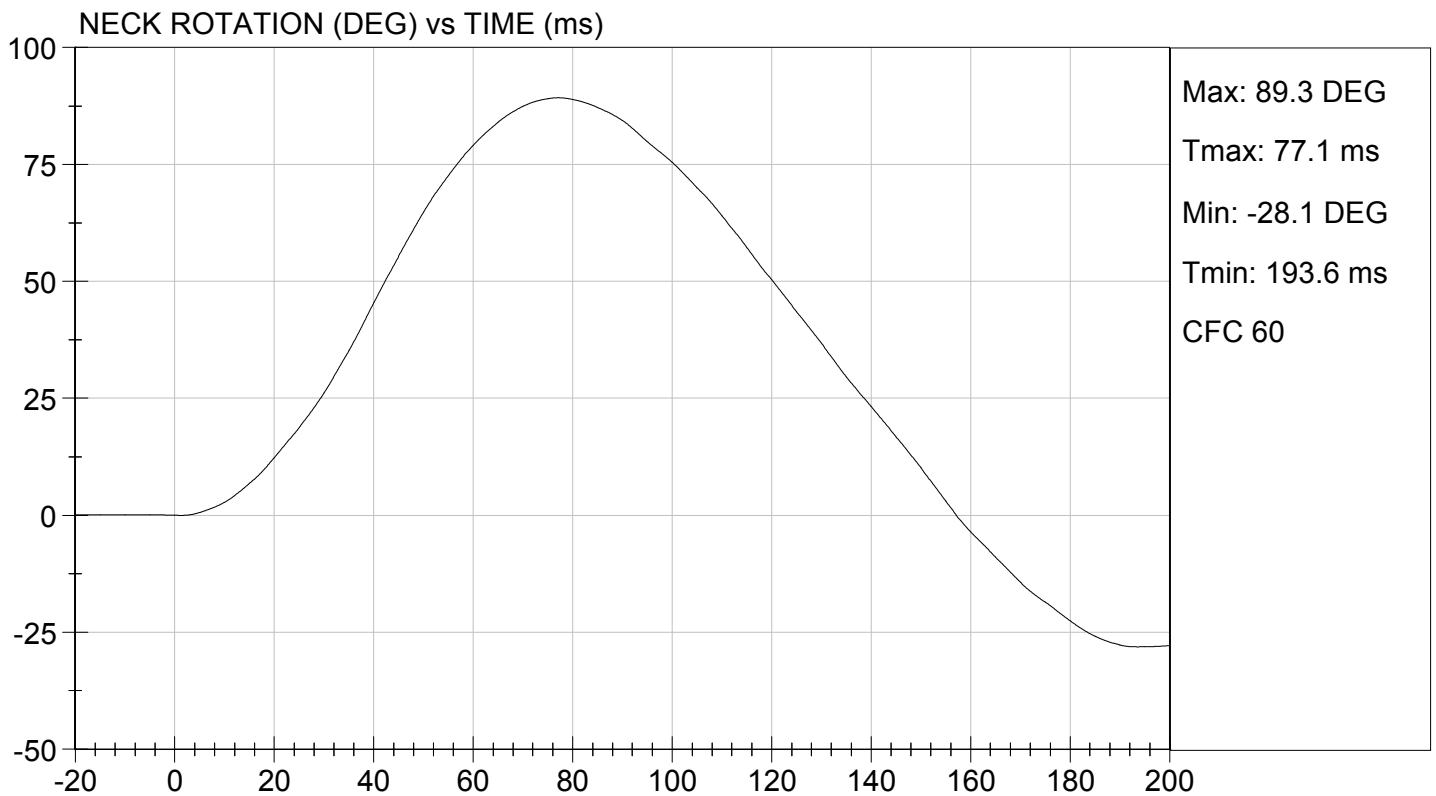
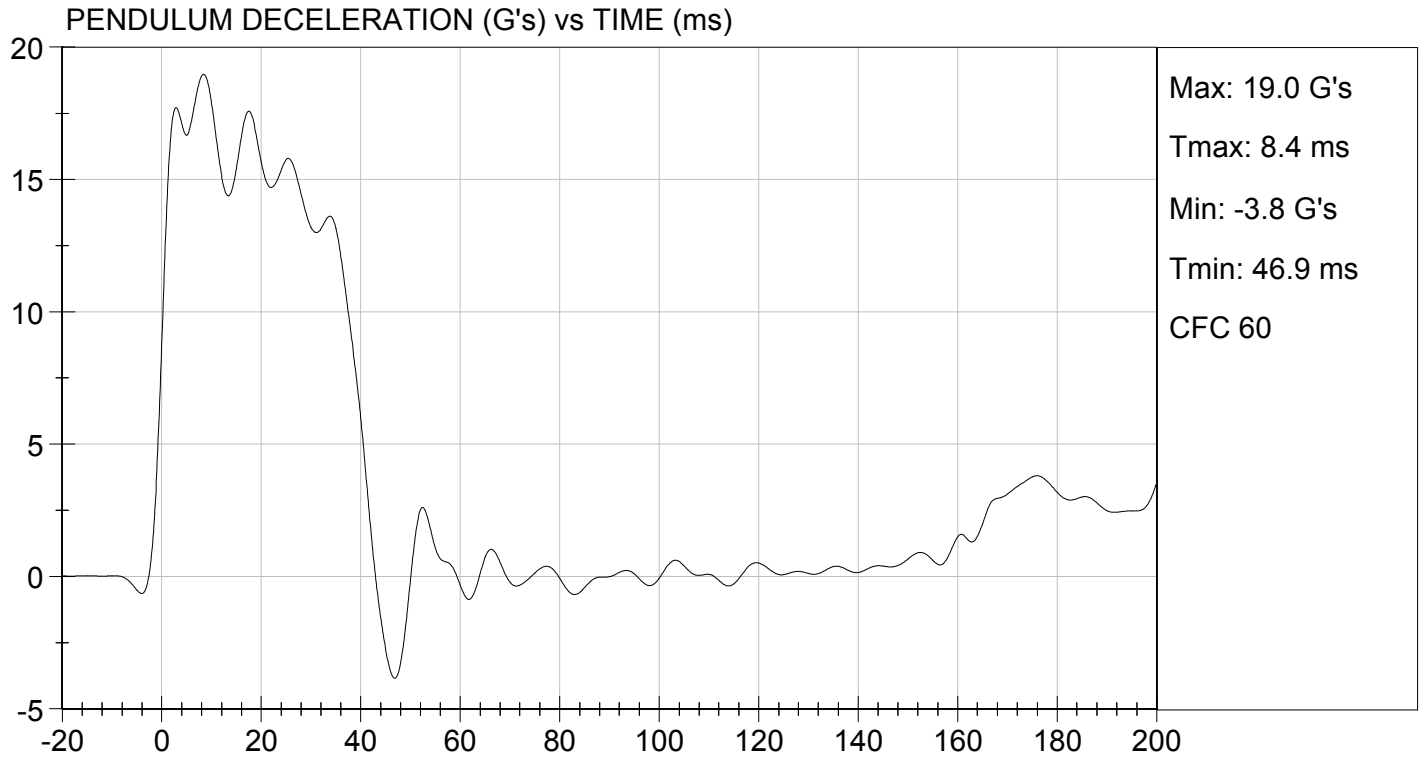
Test Date


Approved By



TEST DESC: NECK EXTENSION
VELOCITY: 19.60 ft/s, 5.97 m/s

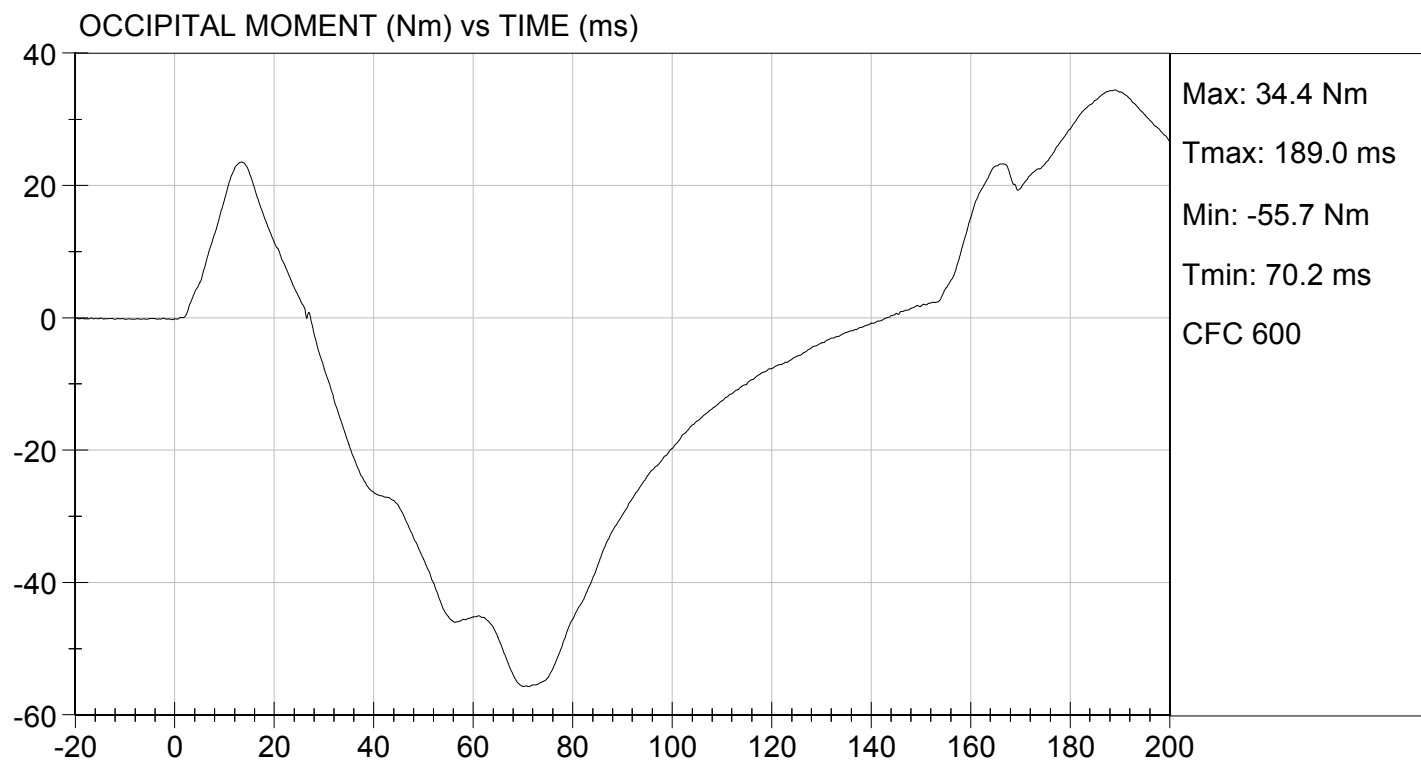
TEST DATE: 09/30/2013
TEST #: D133343





TEST DESC: NECK EXTENSION
VELOCITY: 19.60 ft/s, 5.97 m/s

TEST DATE: 09/30/2013
TEST #: D133343



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D: D133344

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	41	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,265	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.47	Pass
Internal Hysteresis	%	69 to 85	71	Pass
			Overall Test Results	Pass


Laboratory Technician

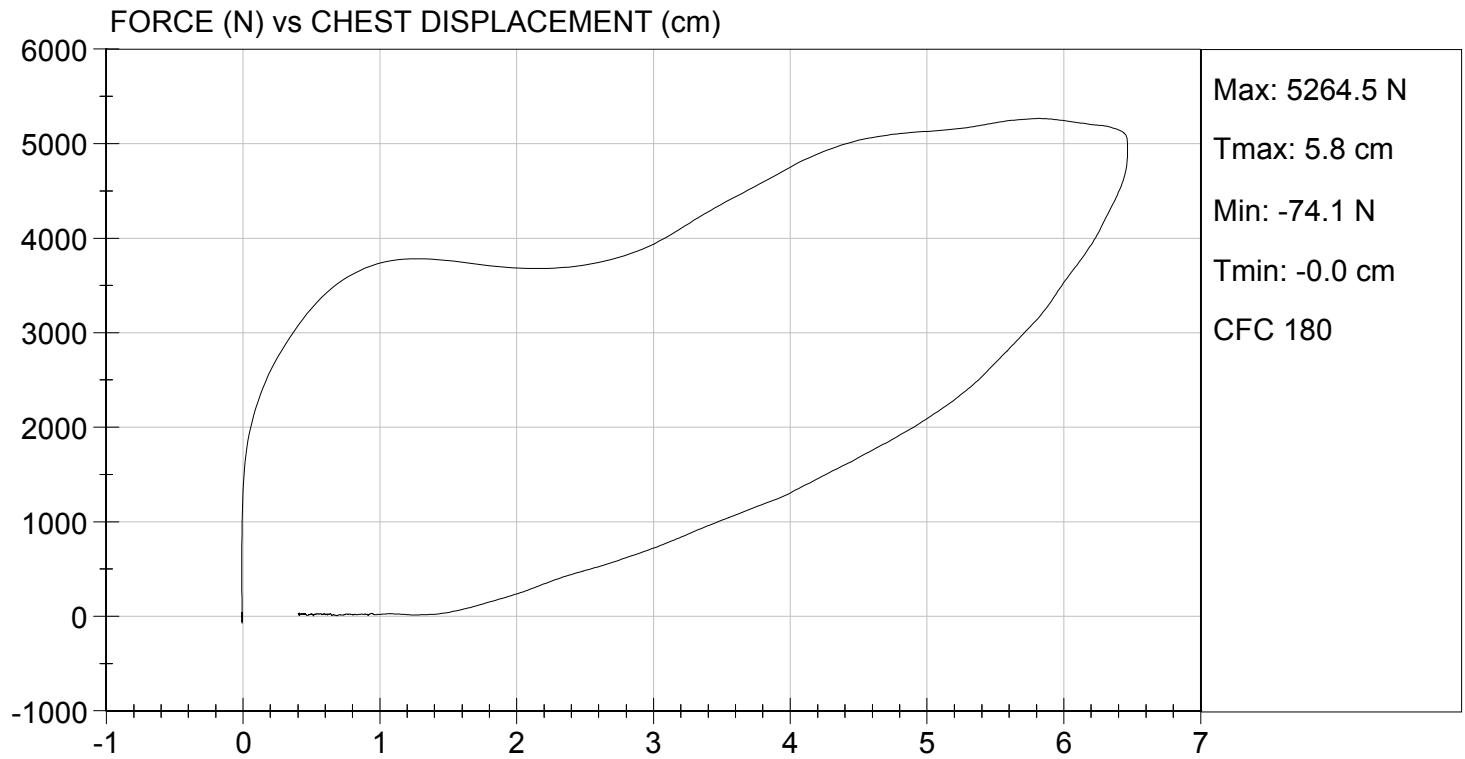
10/01/2013
Test Date


Approved By



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

TEST DATE: 10/01/2013
TEST #: D133344

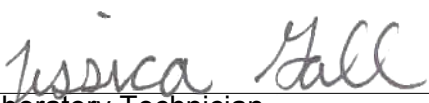


MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D: D133345

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Probe Velocity	m/s	2.07 to 2.13	2.07	Pass
Peak Probe Force	N	4715 to 5782	4,865	Pass
Overall Test Results				Pass


Laboratory Technician

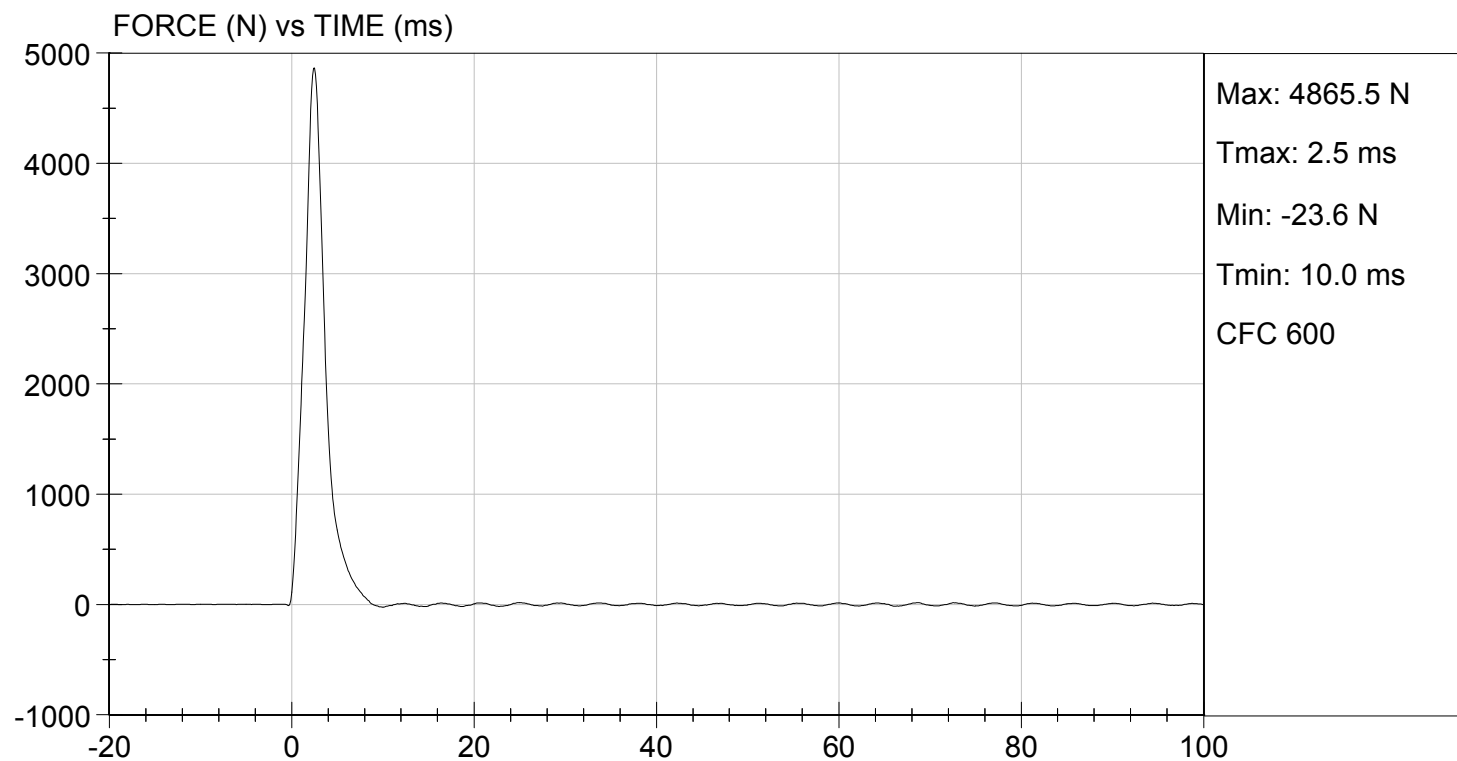
09/30/2013
Test Date


Approved By



TEST DESC: RIGHT KNEE
VELOCITY: 6.80 ft/s, 2.07 m/s

TEST DATE: 09/30/2013
TEST #: D133345

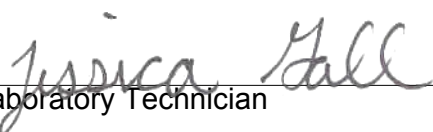


MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D: D133346

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.8	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	5,055	Pass
Overall Test Results				Pass


Laboratory Technician

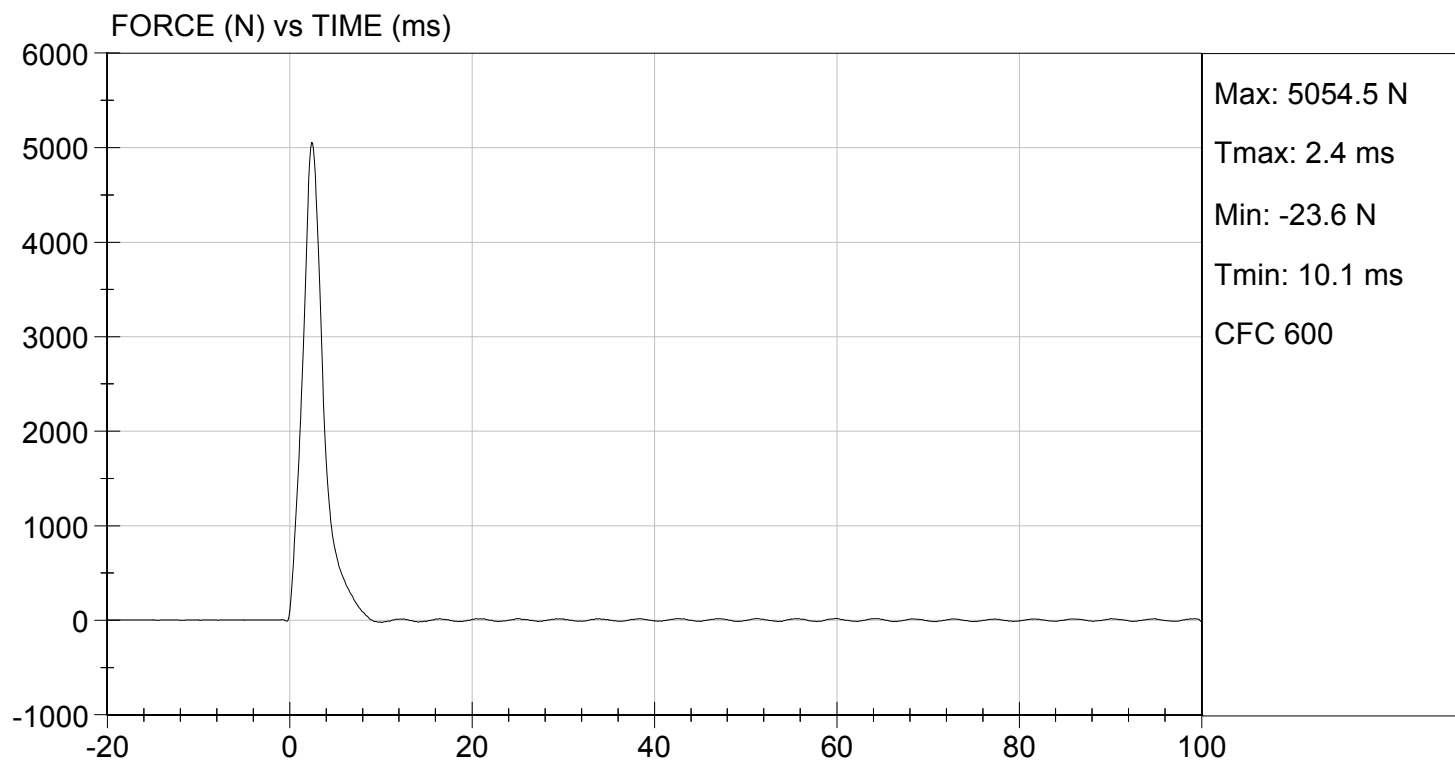
09/30/2013
Test Date


Approved By



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

TEST DATE: 09/30/2013
TEST #: D133346



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

ATD Serial No: 351

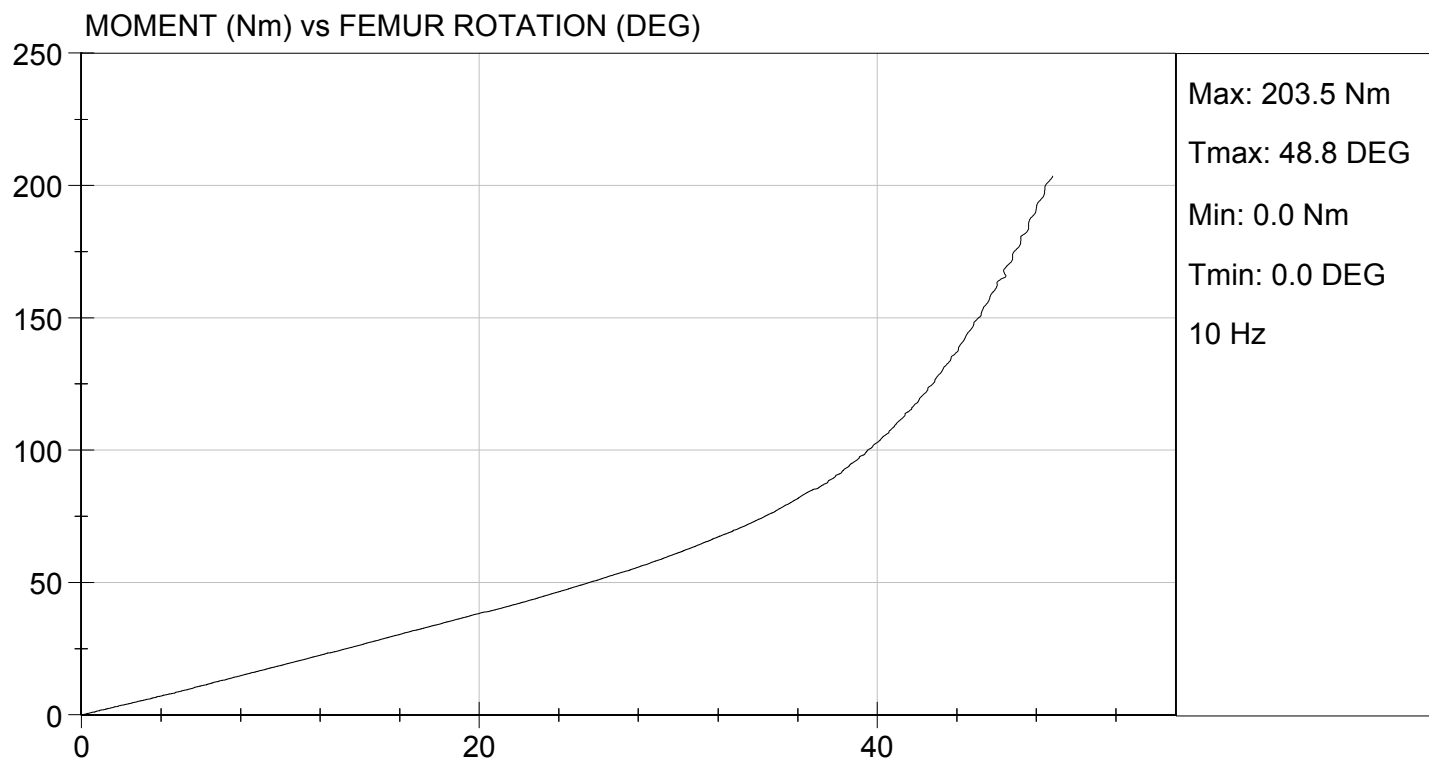
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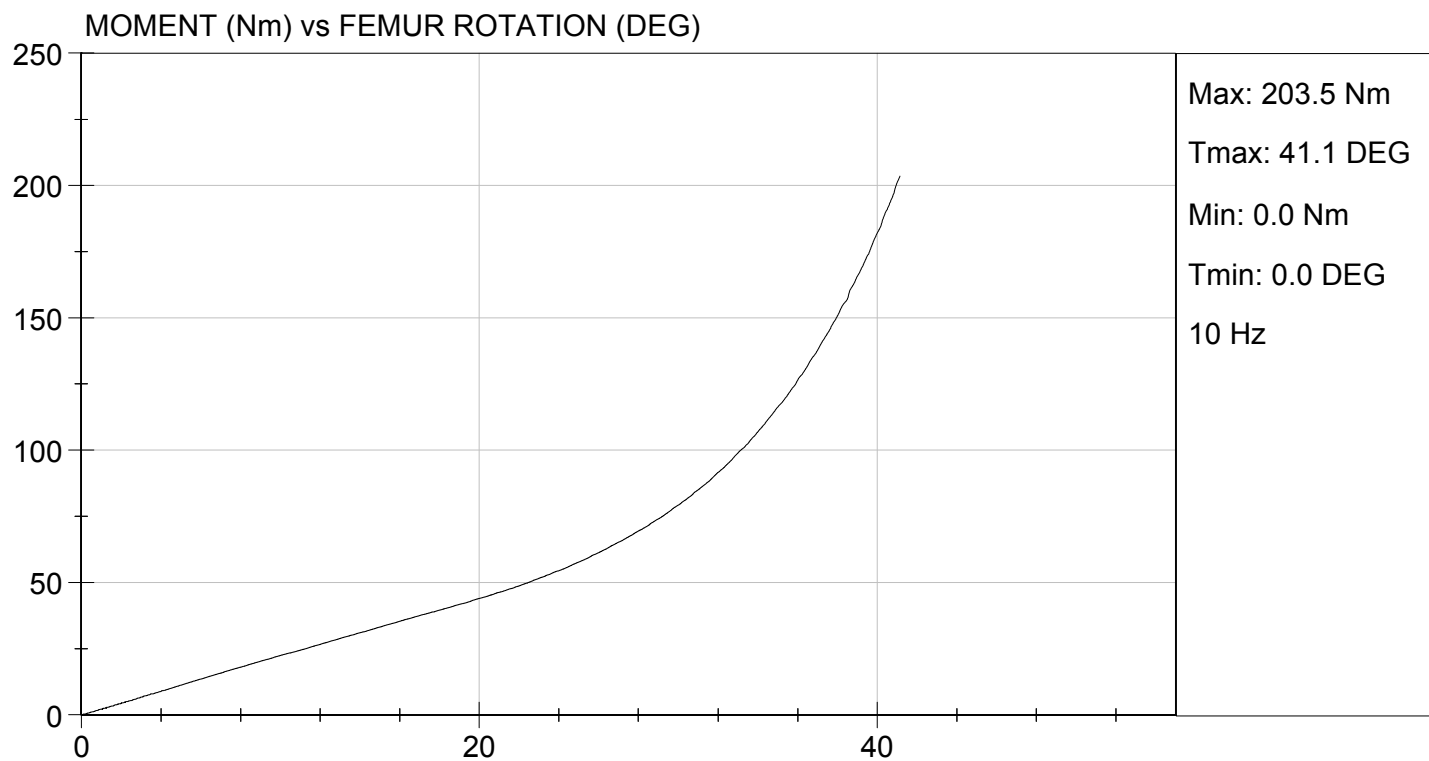
Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.7	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	46	46	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.3	6.1	Pass
30 Degrees	Nm	94.9 Nm Max	61.2	79.3	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	48.8	41.1	Pass
Overall Test Results					Pass


 Laboratory Technician

09/30/2013
 Test Date


 Approved By



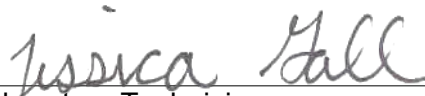


MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test ID: D133651

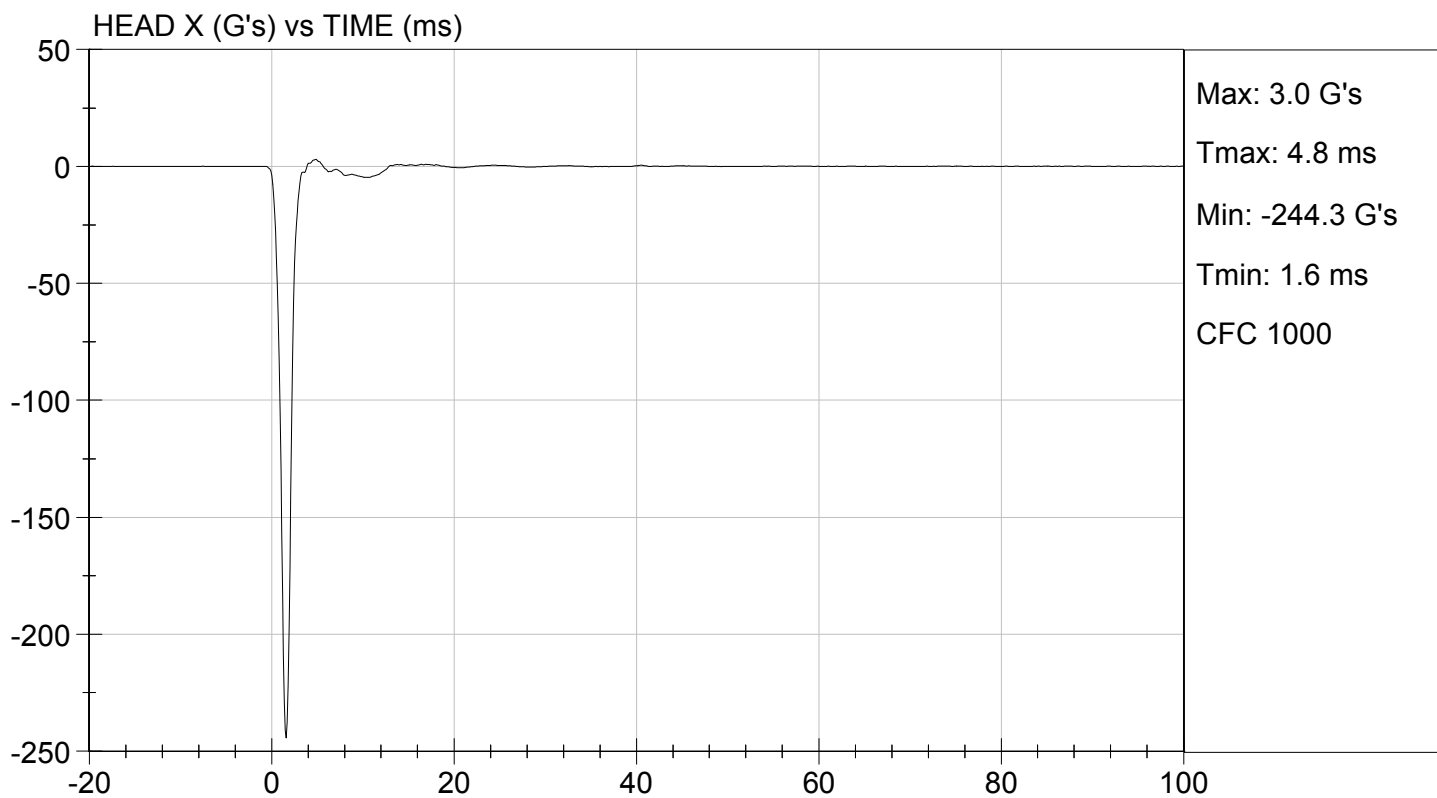
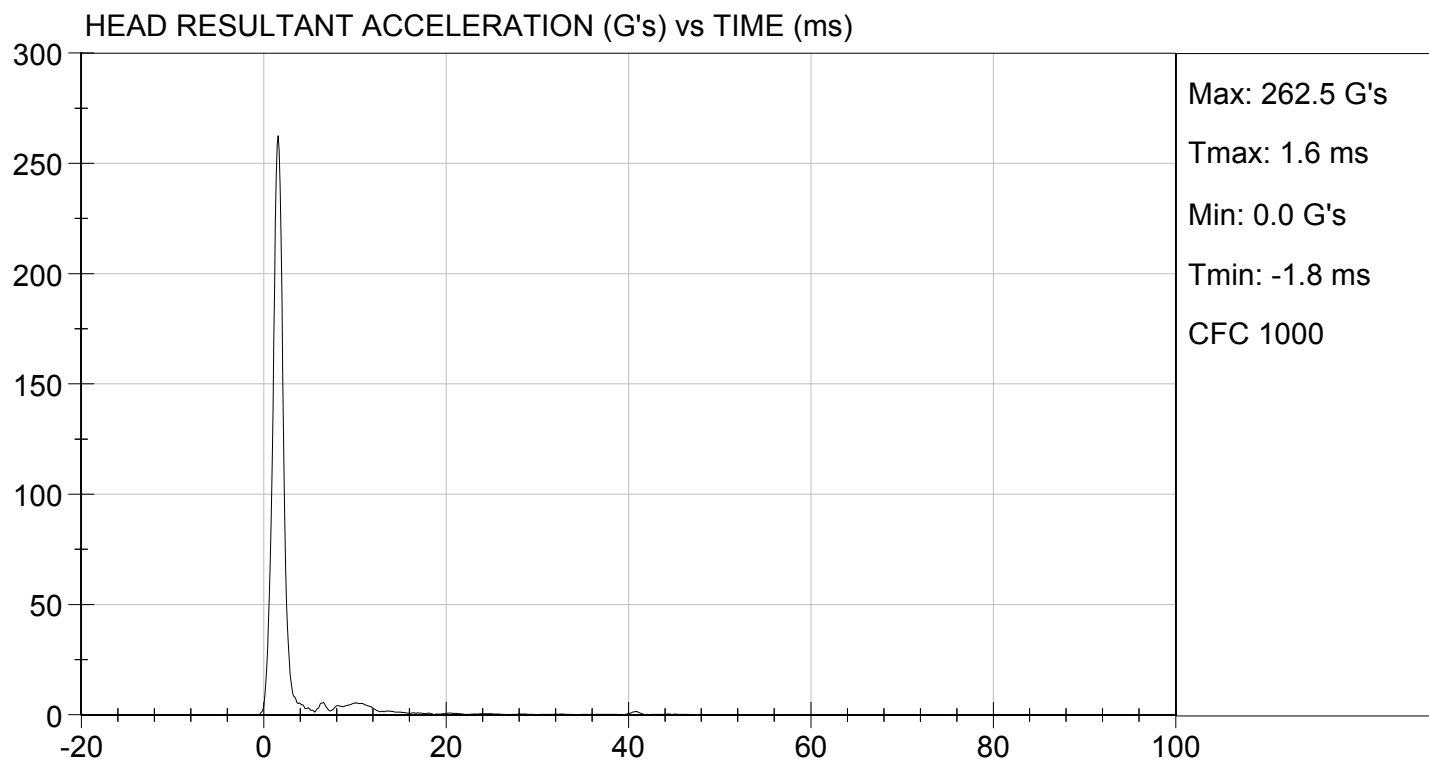
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	36	Pass
Peak Resultant Acceleration	G's	225 to 275	262	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-5.4	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

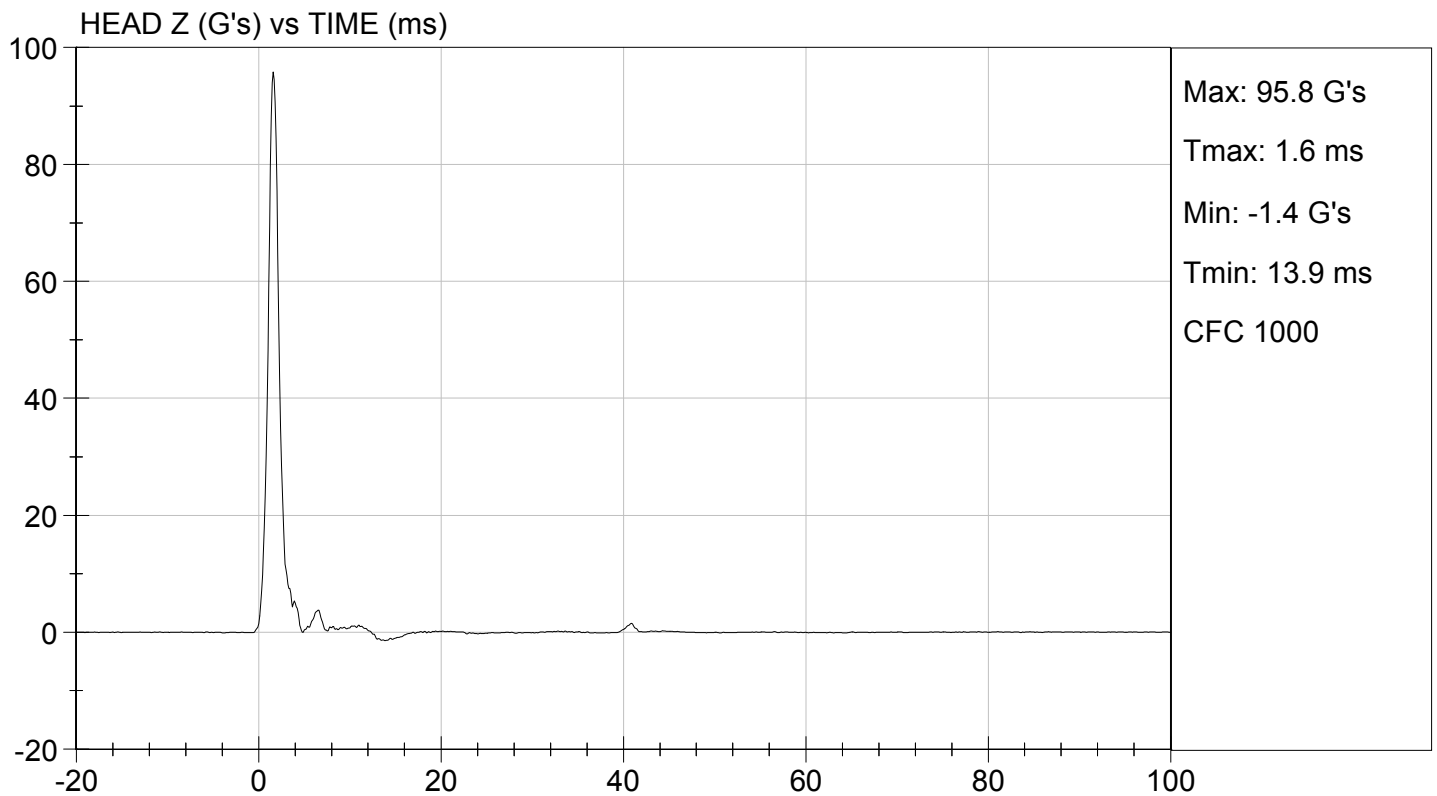
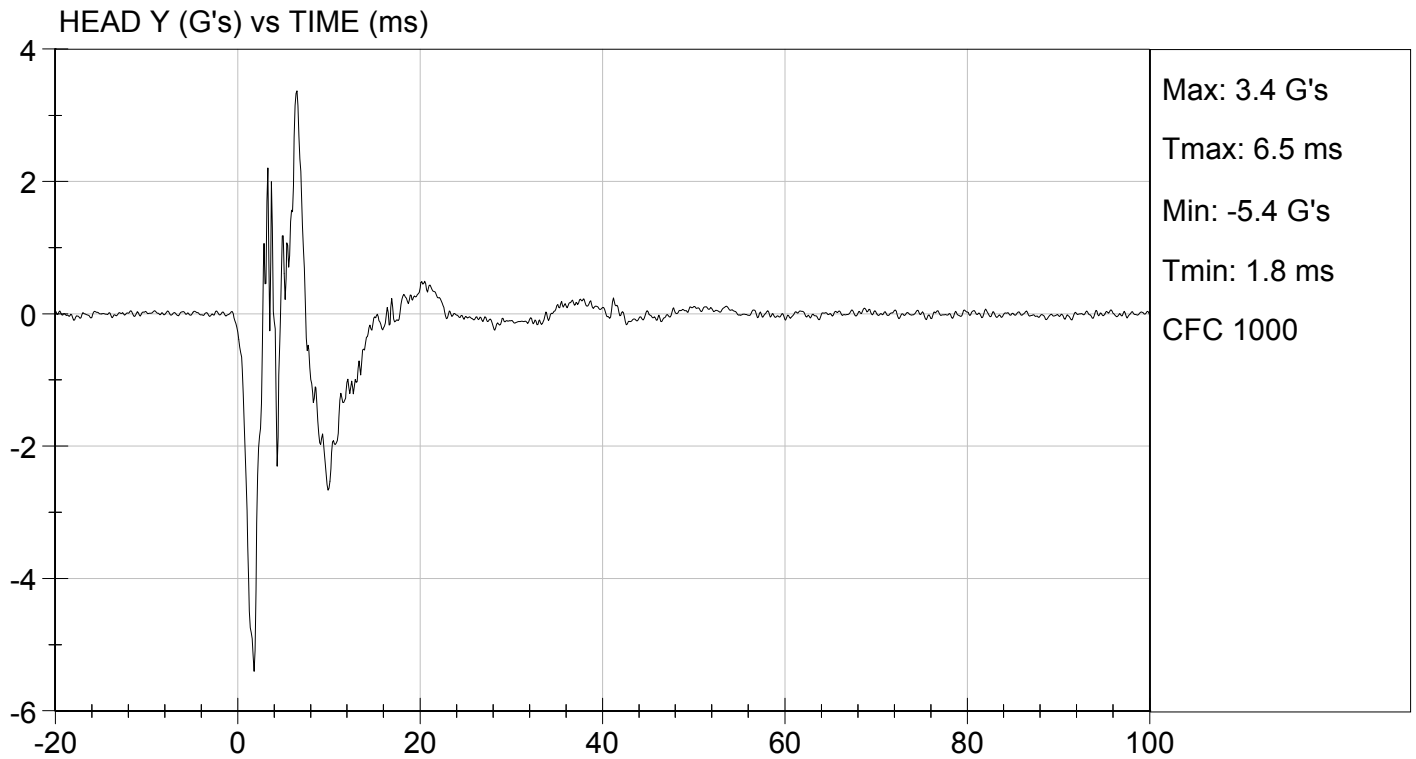

Laboratory Technician

11/05/2013

Test Date


Approved By





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

ATD Serial No: 351

Test I.D: D133652

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	35	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	22.81	Pass
	20 ms	G's	17.60 to 22.60	18.24	Pass
	30 ms	G's	12.50 to 18.50	13.63	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	13.9	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	38.5	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	66.8	Pass
	Time	ms	57.0 to 64.0	57.6	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	113.5	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	90.7	Pass
	Time	ms	47.0 to 58.0	50.6	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	98.1	Pass
Overall Test Results					Pass

Jessica Gall
Laboratory Technician

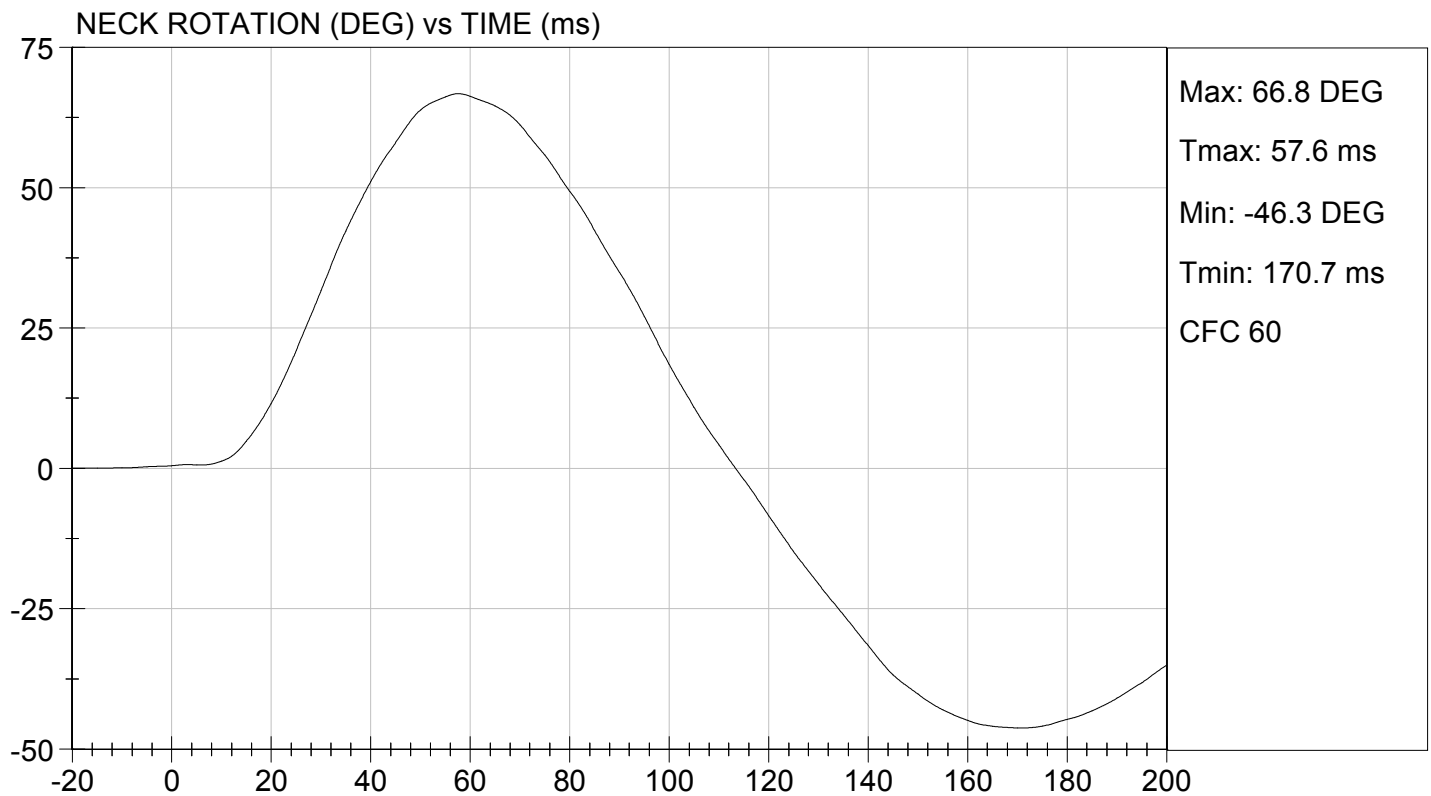
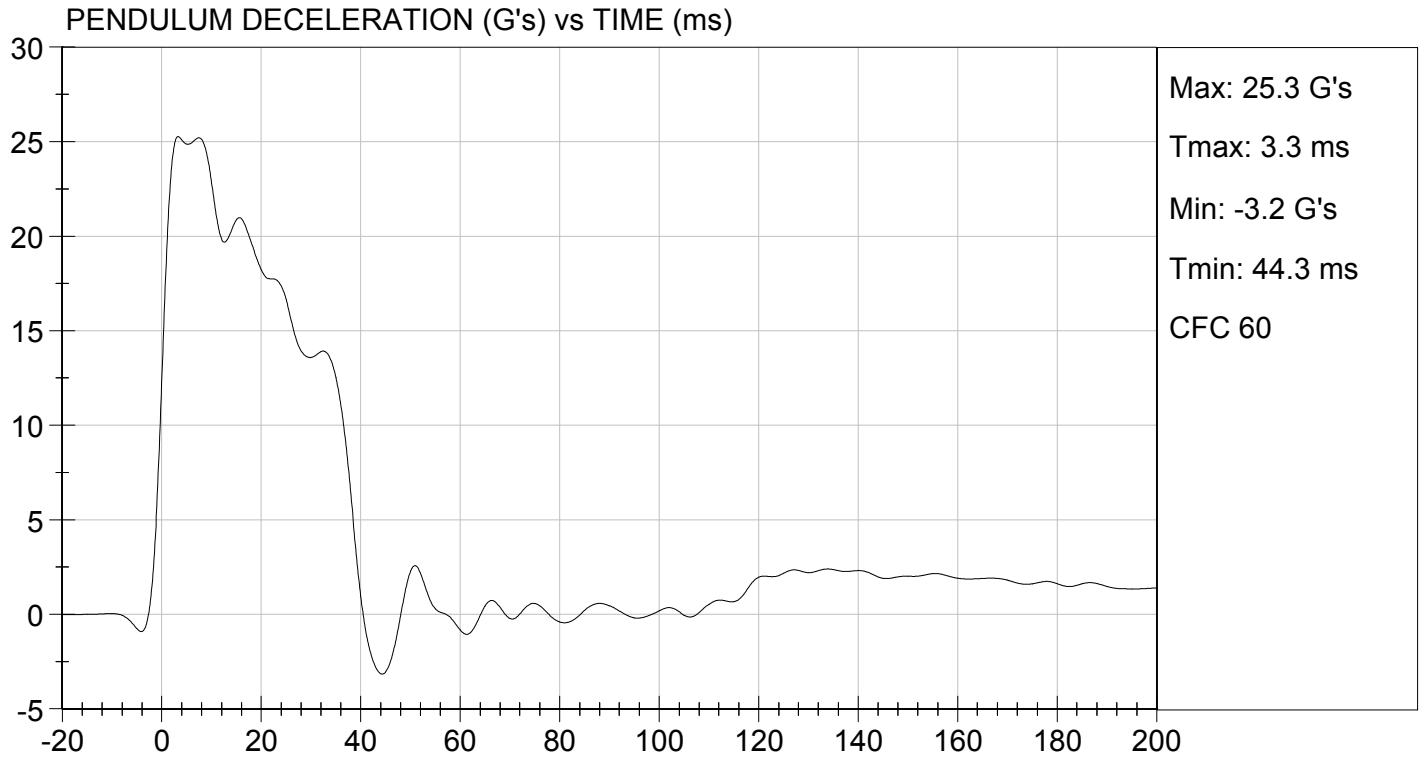
11/04/2013
Test Date

David Winkelbauer
Approved By



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

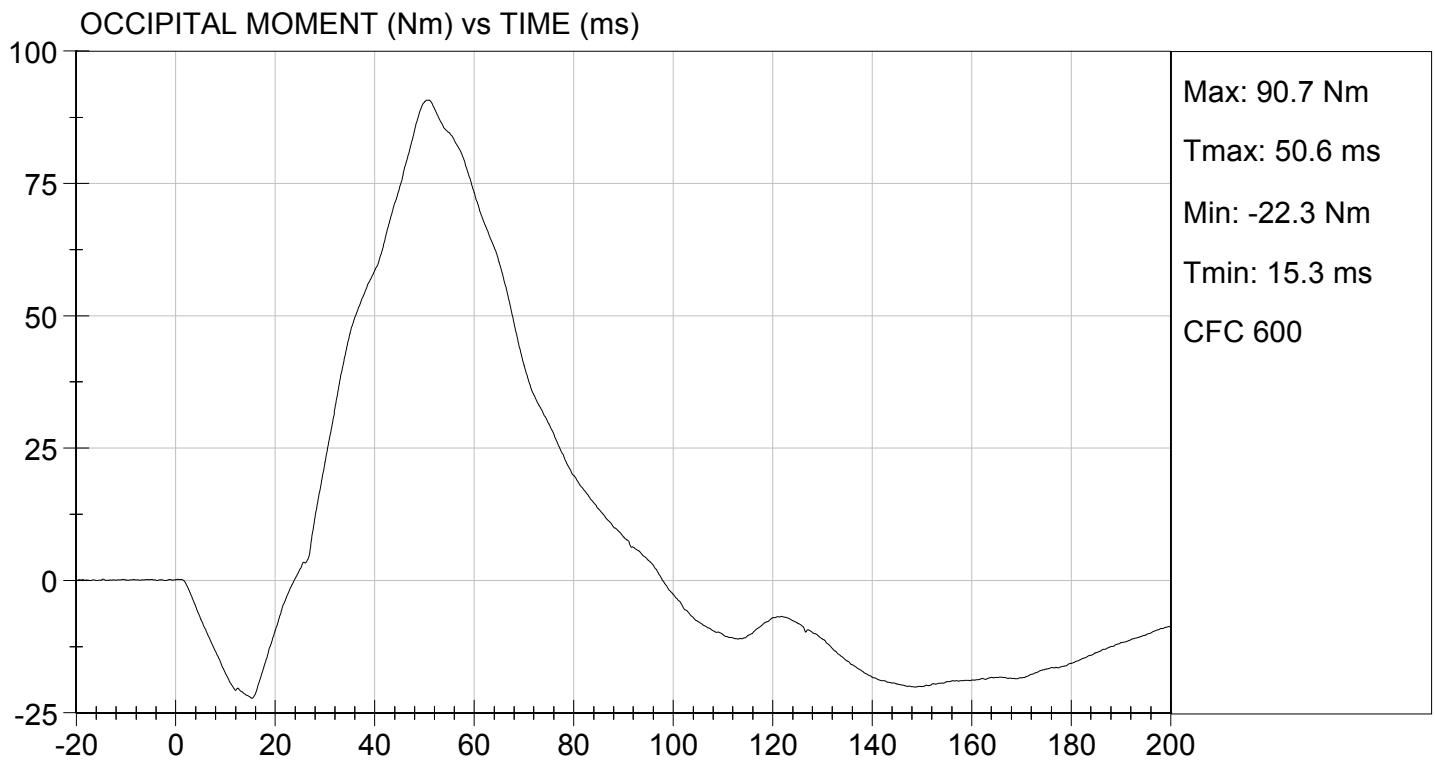
TEST DATE: 11/04/2013
TEST #: D133652





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

TEST DATE: 11/04/2013
TEST #: D133652

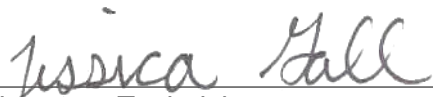


MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D: D133653

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	35	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	18.22	Pass
	20 ms	G's	14.00 to 19.00	14.79	Pass
	30 ms	G's	11.00 to 16.00	11.29	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	11.2	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	45.5	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	89.4	Pass
	Time	ms	72.0 to 82.0	78.7	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	157.3	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-54.4	Pass
	Time	ms	65.0 to 79.0	69.0	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	144.6	Pass
Overall Test Results					Pass


 Laboratory Technician

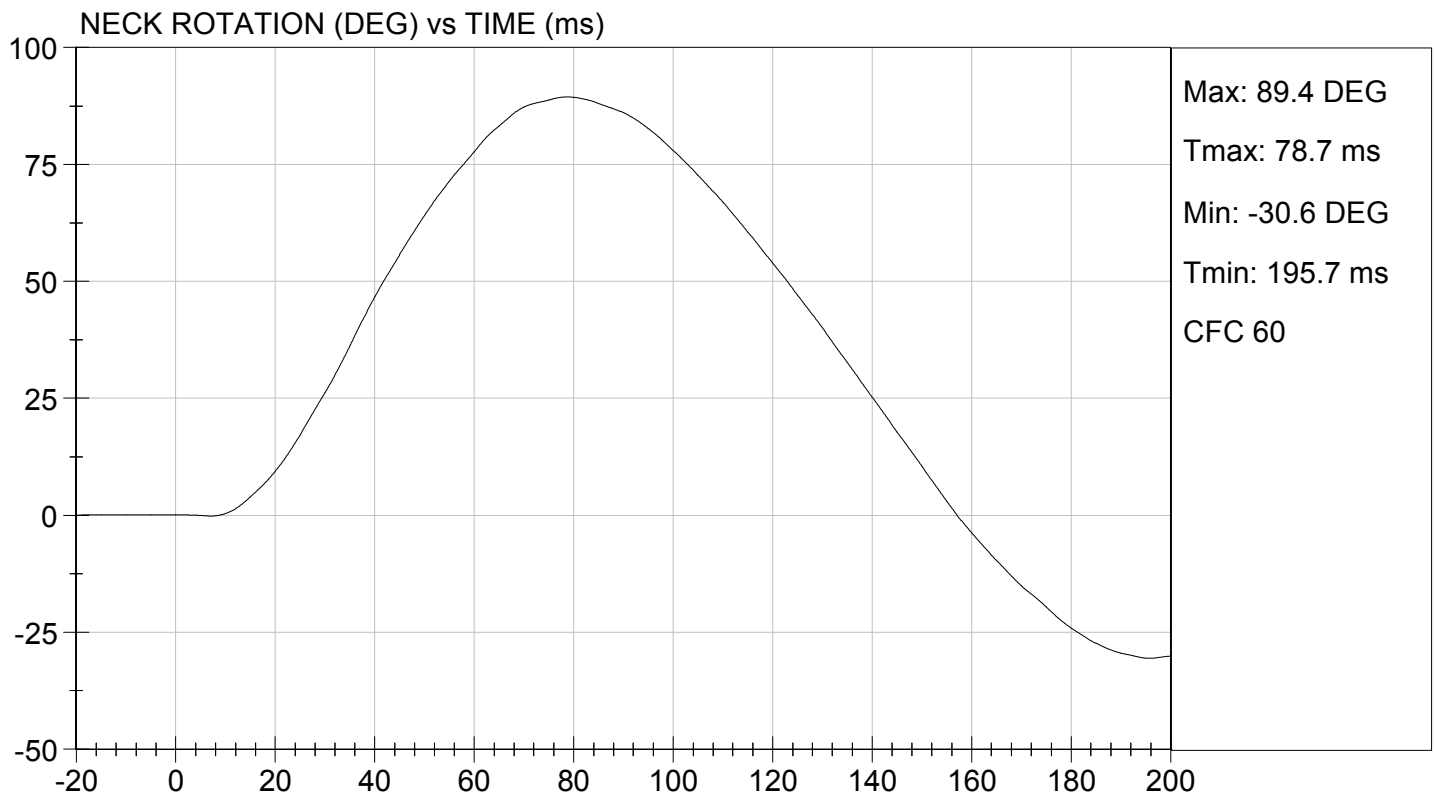
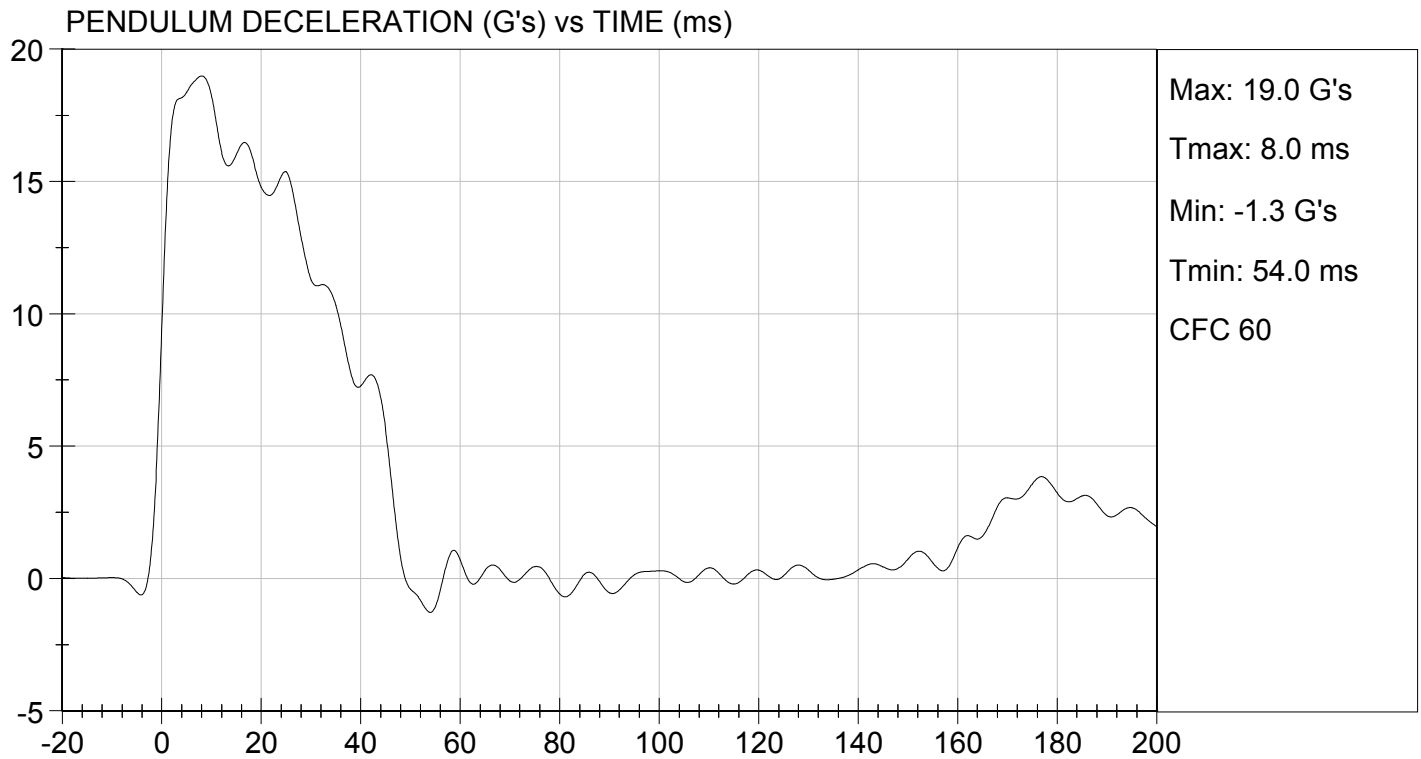
11/04/2013
 Test Date


 Approved By



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

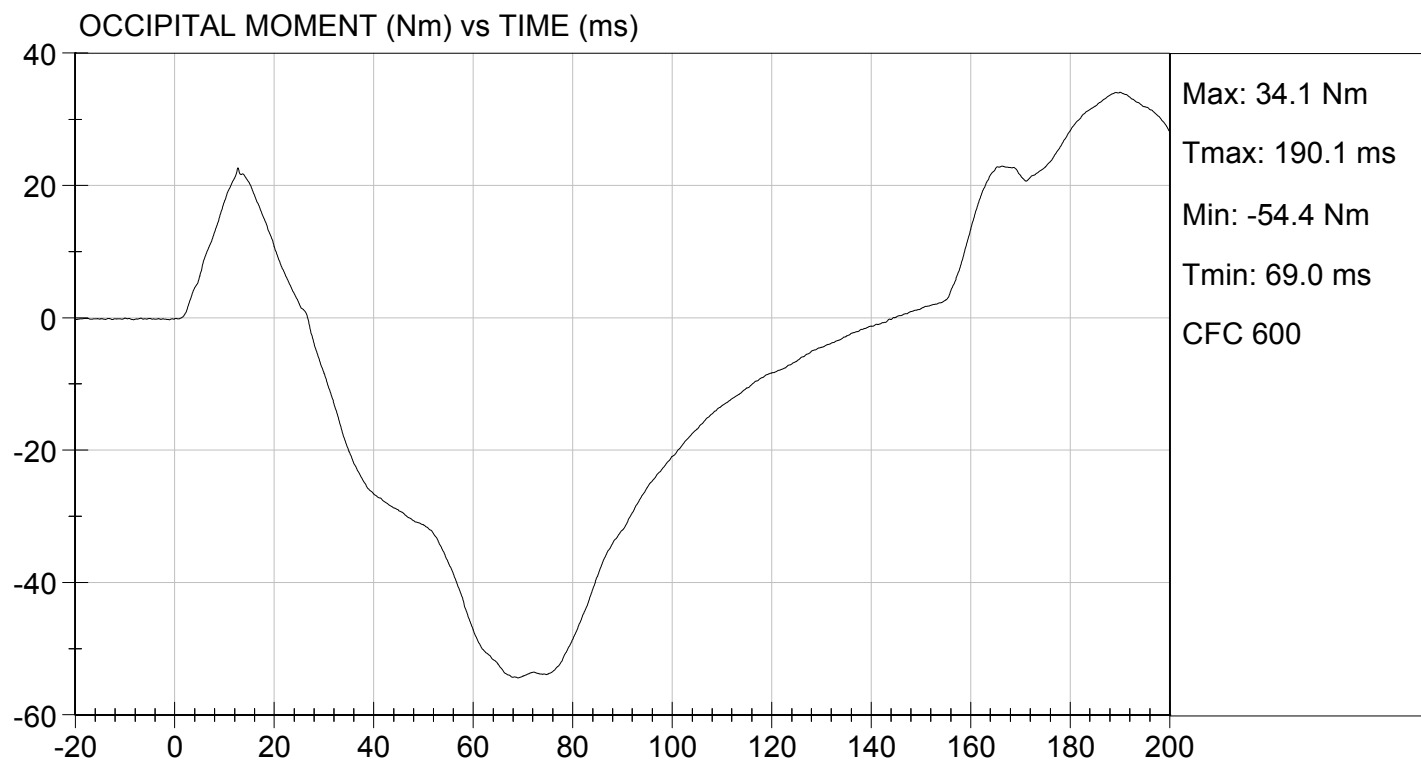
TEST DATE: 11/04/2013
TEST #: D133653





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

TEST DATE: 11/04/2013
TEST #: D133653



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D: D133654

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	39	Pass
Probe Velocity	m/s	6.58 to 6.82	6.68	Pass
Peak Probe Force	N	5159 to 5893	5,440	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.45	Pass
Internal Hysteresis	%	69 to 85	71	Pass
			Overall Test Results	Pass


Laboratory Technician

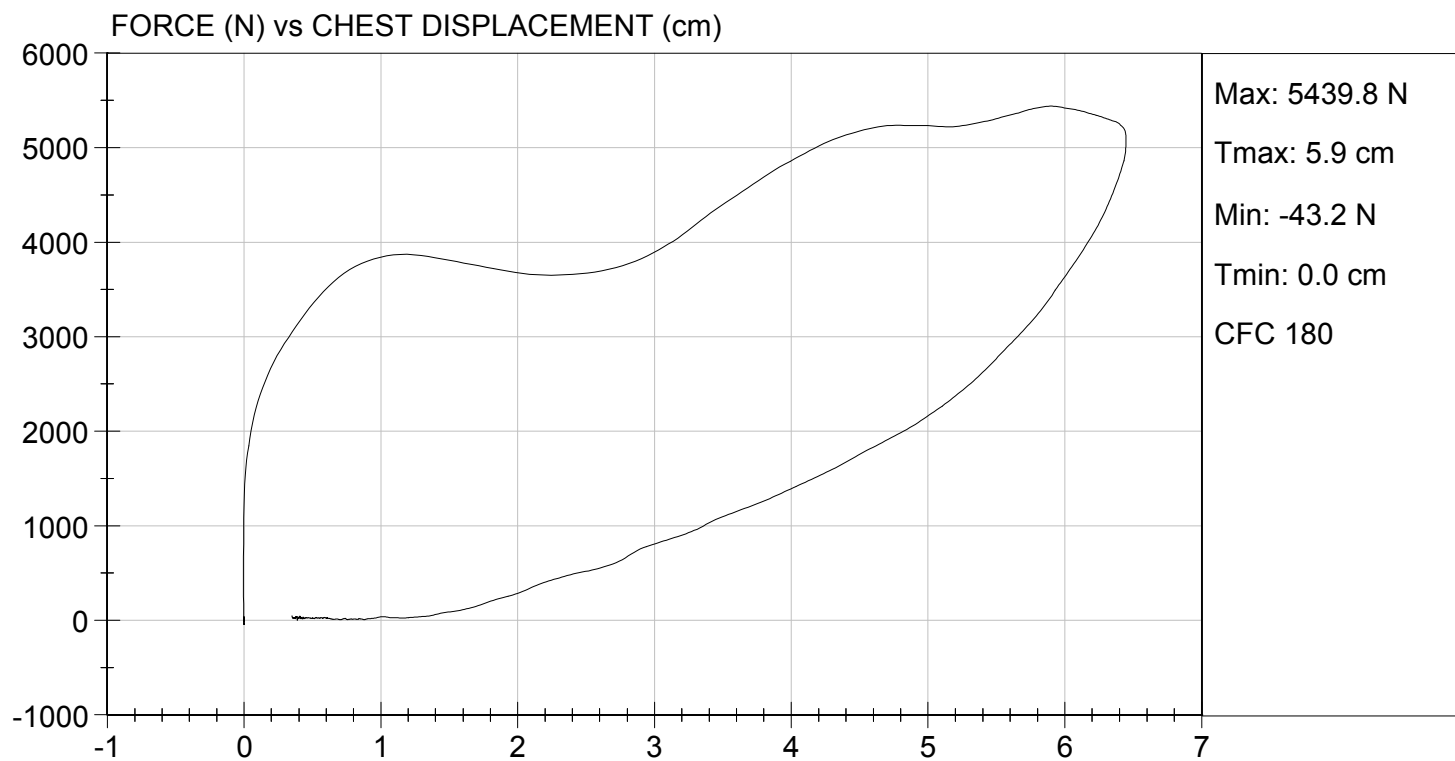
11/05/2013
Test Date


Approved By



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

TEST DATE: 11/05/2013
TEST #: D133654



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

ATD Serial No: 351

Test I.D: D133655

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	35	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	N	4715 to 5782	5,250	Pass
Overall Test Results				Pass


Laboratory Technician

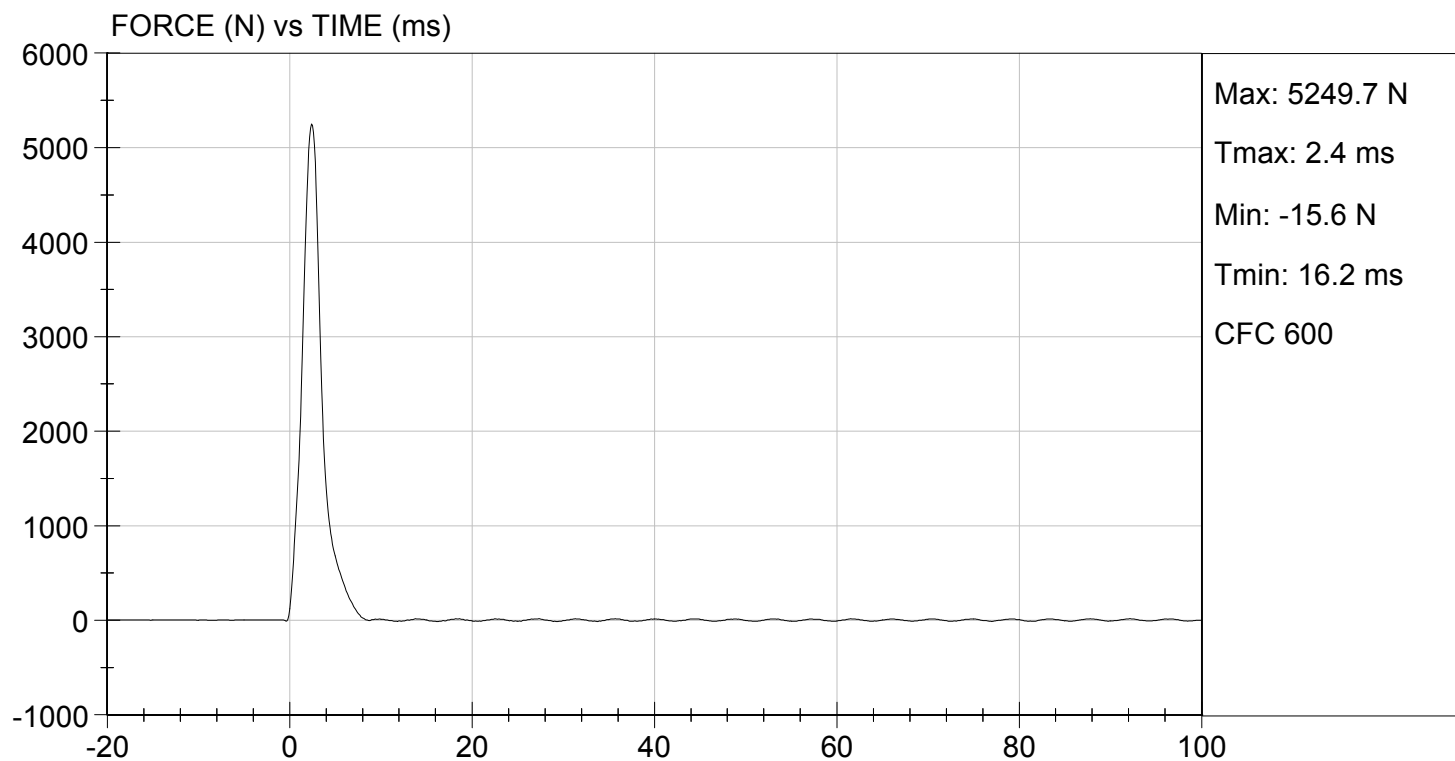
11/05/2013
Test Date


Approved By



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

TEST DATE: 11/05/2013
TEST #: D133655



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

ATD Serial No: 351

Test I.D: D133656

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	35	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	N	4715 to 5782	5,127	Pass
Overall Test Results				Pass


Laboratory Technician

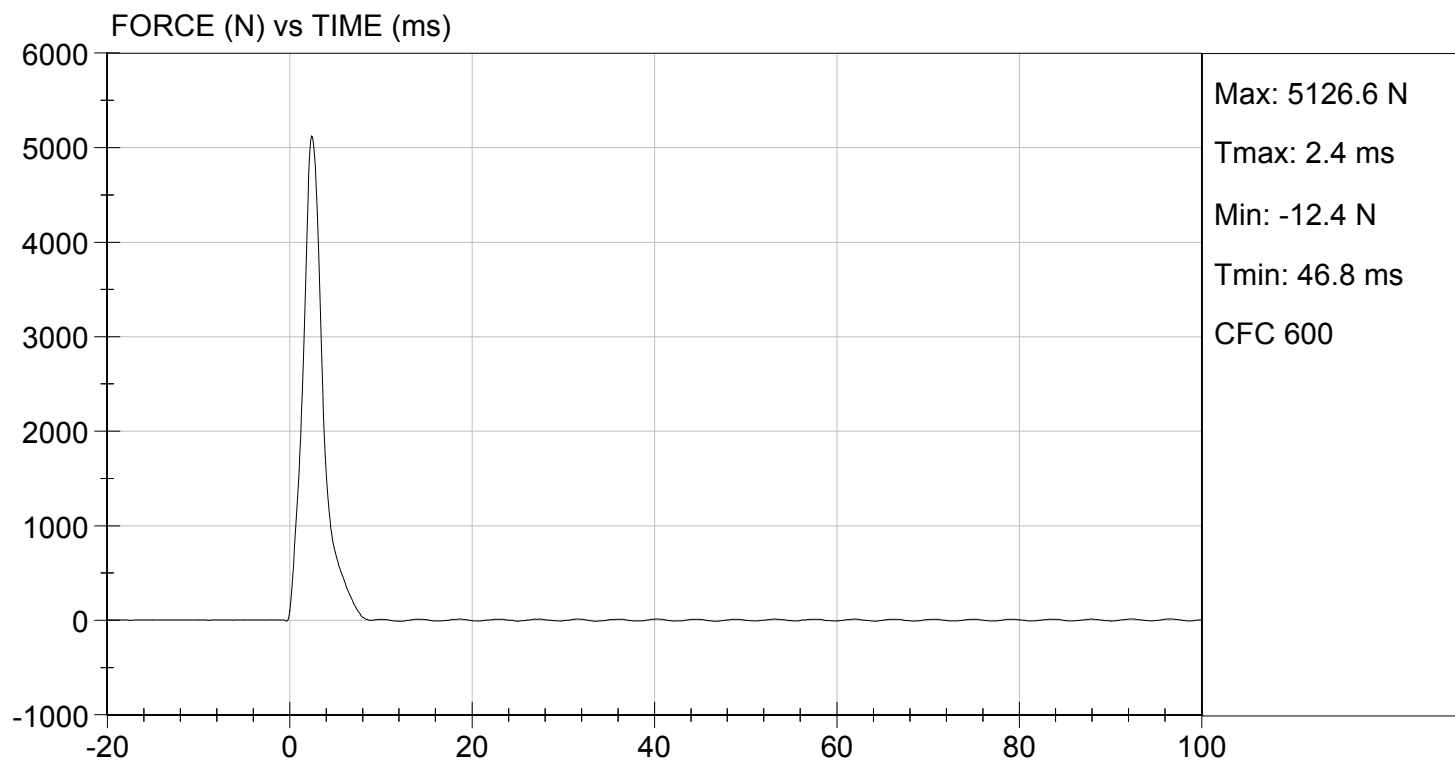
11/05/2013
Test Date


Approved By



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

TEST DATE: 11/05/2013
TEST #: D133656



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

ATD Serial No: 351

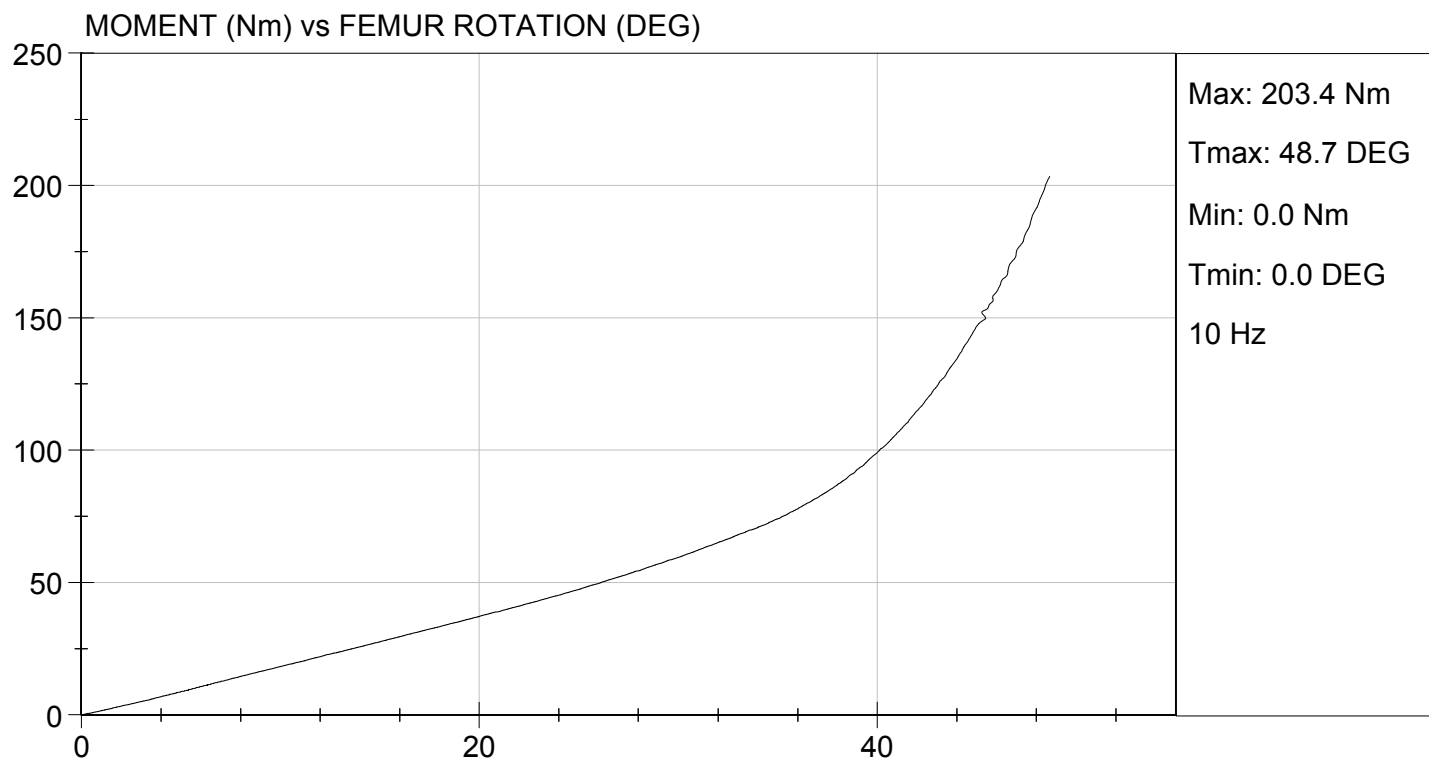
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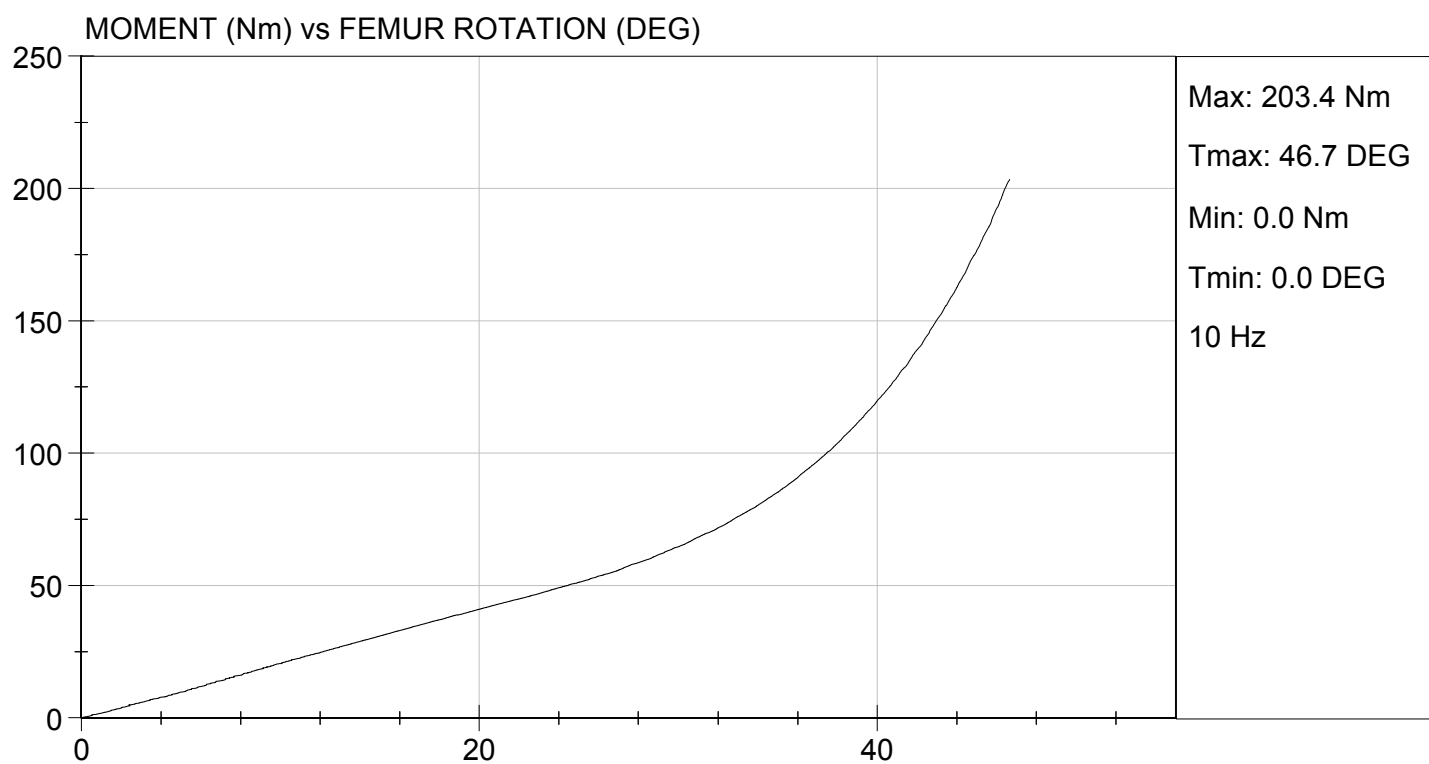
Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.3	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	33	33	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.3	6.3	Pass
30 Degrees	Nm	94.9 Nm Max	59.5	64.6	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	48.7	46.7	Pass
Overall Test Results					Pass


 Laboratory Technician

11/04/2013
 Test Date


 Approved By





Hybrid III, 5th External Measurements
SN: 634

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

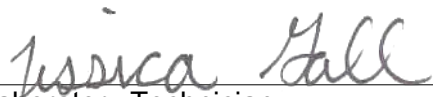
HYBRID III, SUBPART O EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 304.8 ± 5.1 mm above seat surface	175.3-190.5	181.6
P	FOOT LENGTH	Tip of toe to rear of heel	218.5-233.7	224.7
Q	STANDING HEIGHT	(THEORETICAL)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

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test ID: D133121

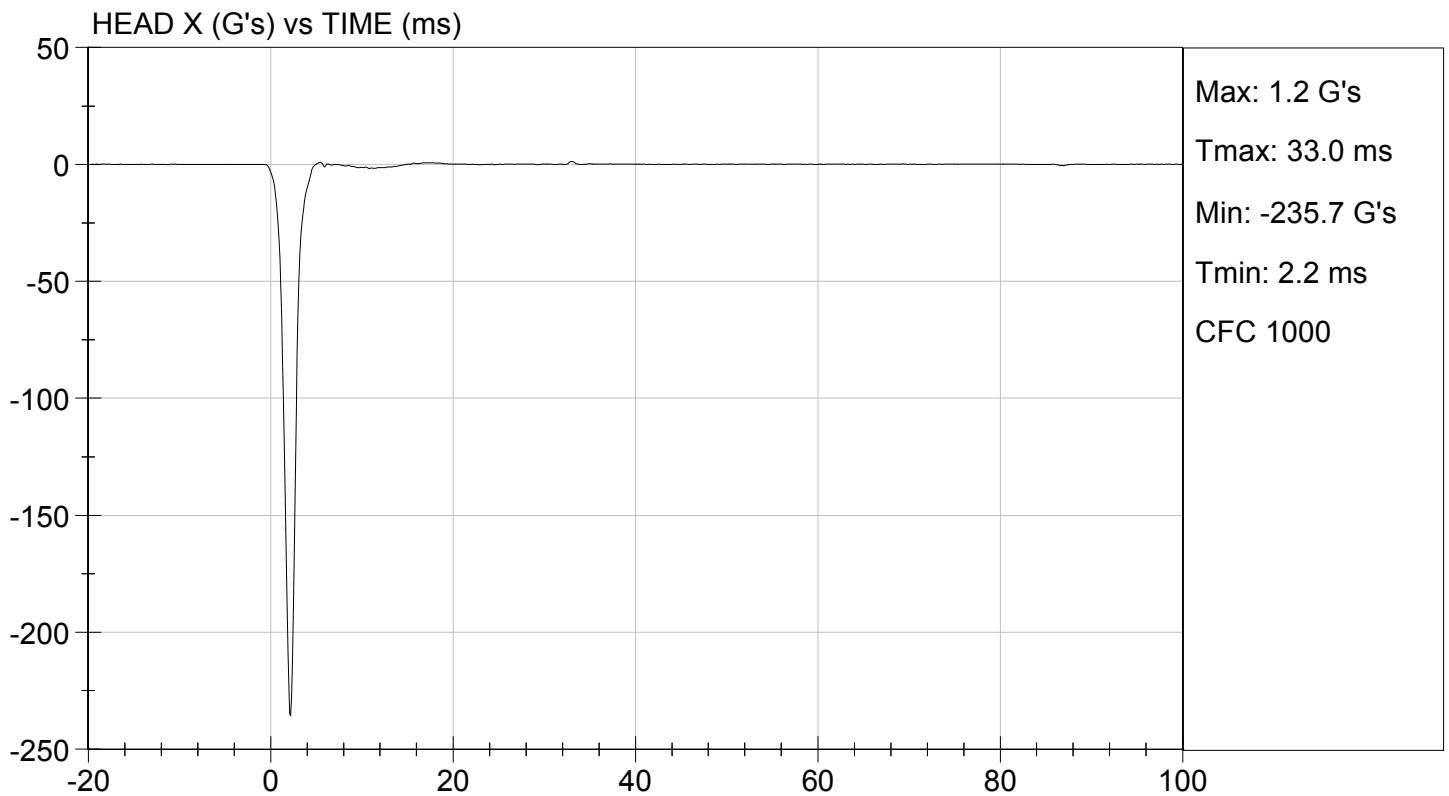
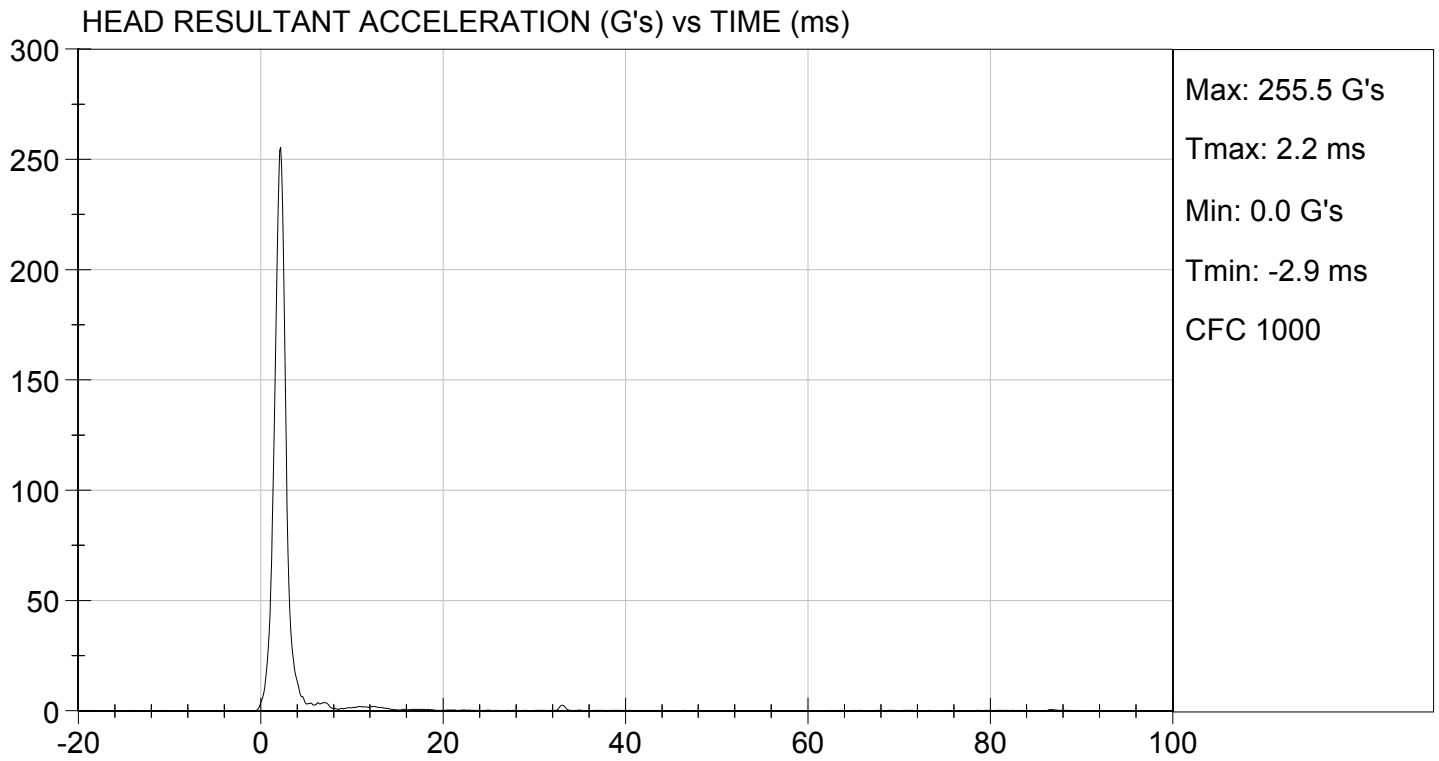
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	41	Pass
Peak Resultant Acceleration	G's	250 to 300	255	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	8.2	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

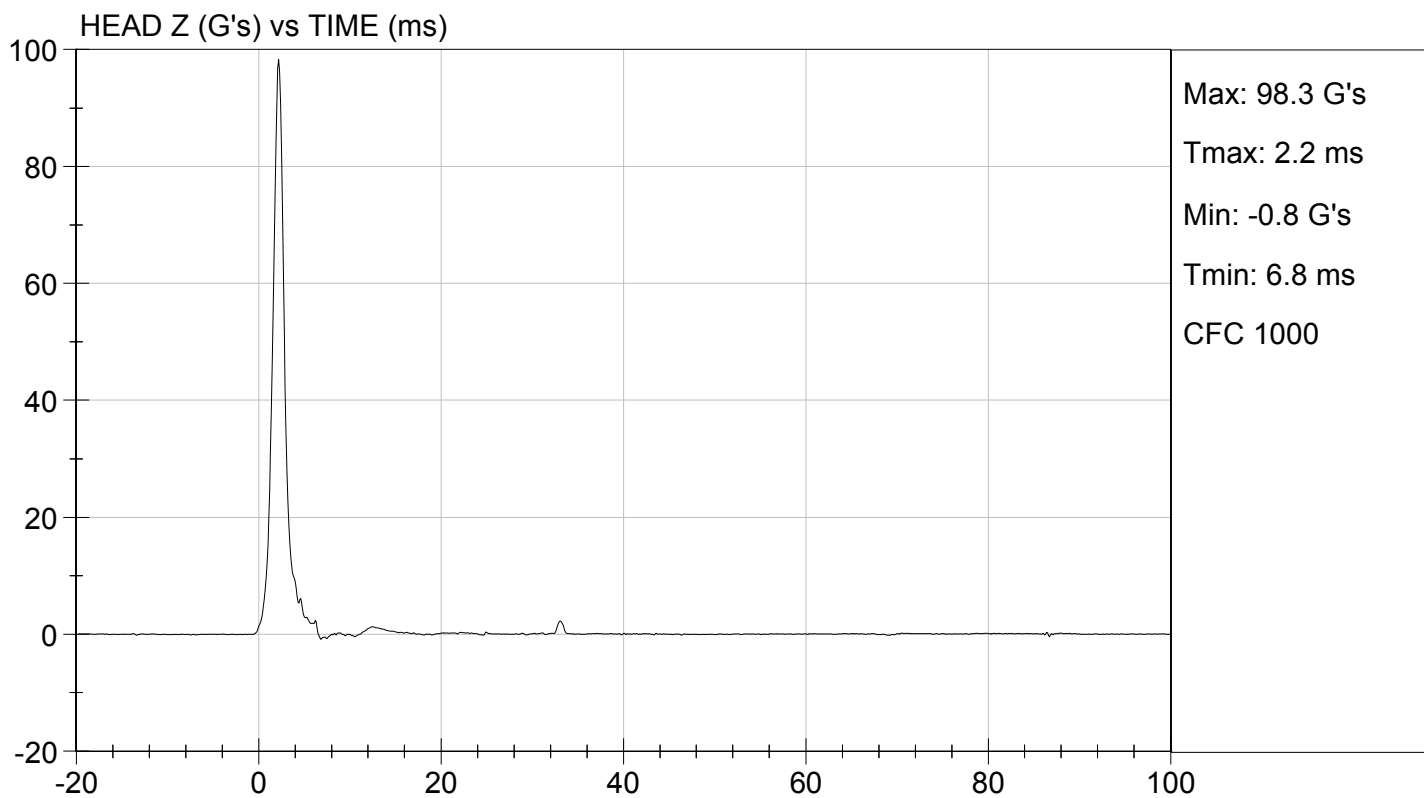
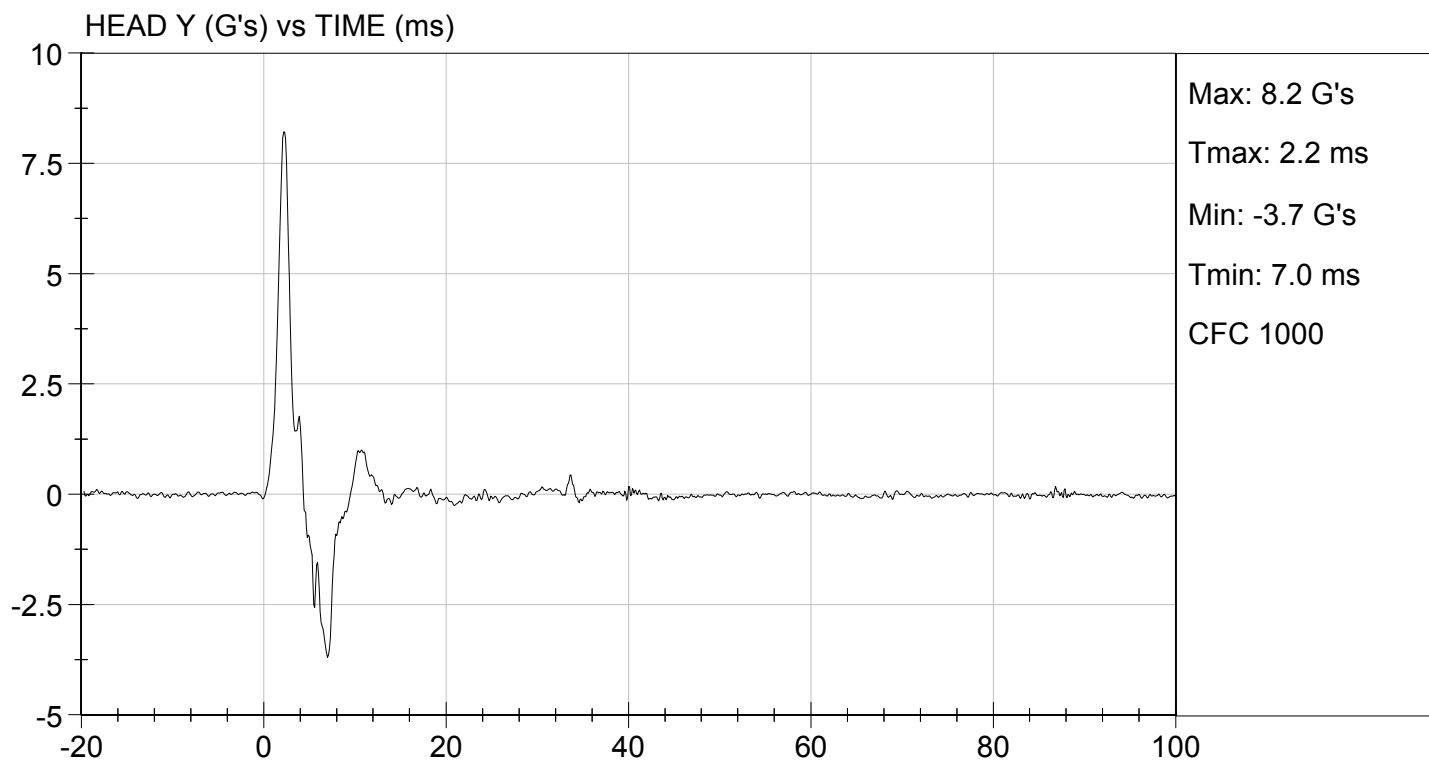

Laboratory Technician

09/13/2013

Test Date


Approved By





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D133122

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	39	Pass
Pendulum Speed		m/s	6.89 to 7.13	6.96	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.5	Pass
	20 ms	m/s	4.0 to 5.0	4.7	Pass
	30 ms	m/s	5.8 to 7.0	6.5	Pass
D Plane Rotation	Max	deg	77 to 91	89	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	73	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	89	Pass
Overall Results					Pass

Jessica Hall
 Laboratory Technician

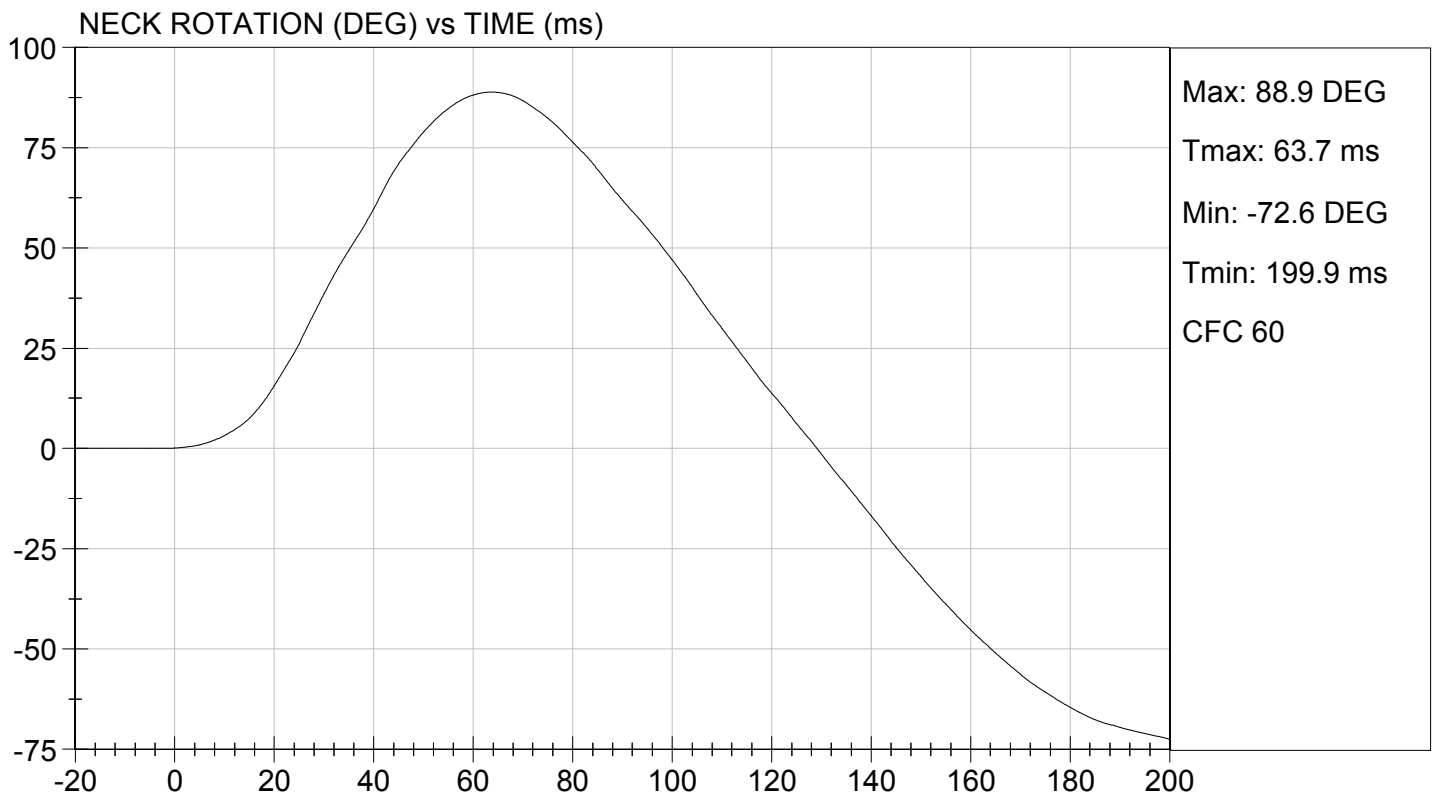
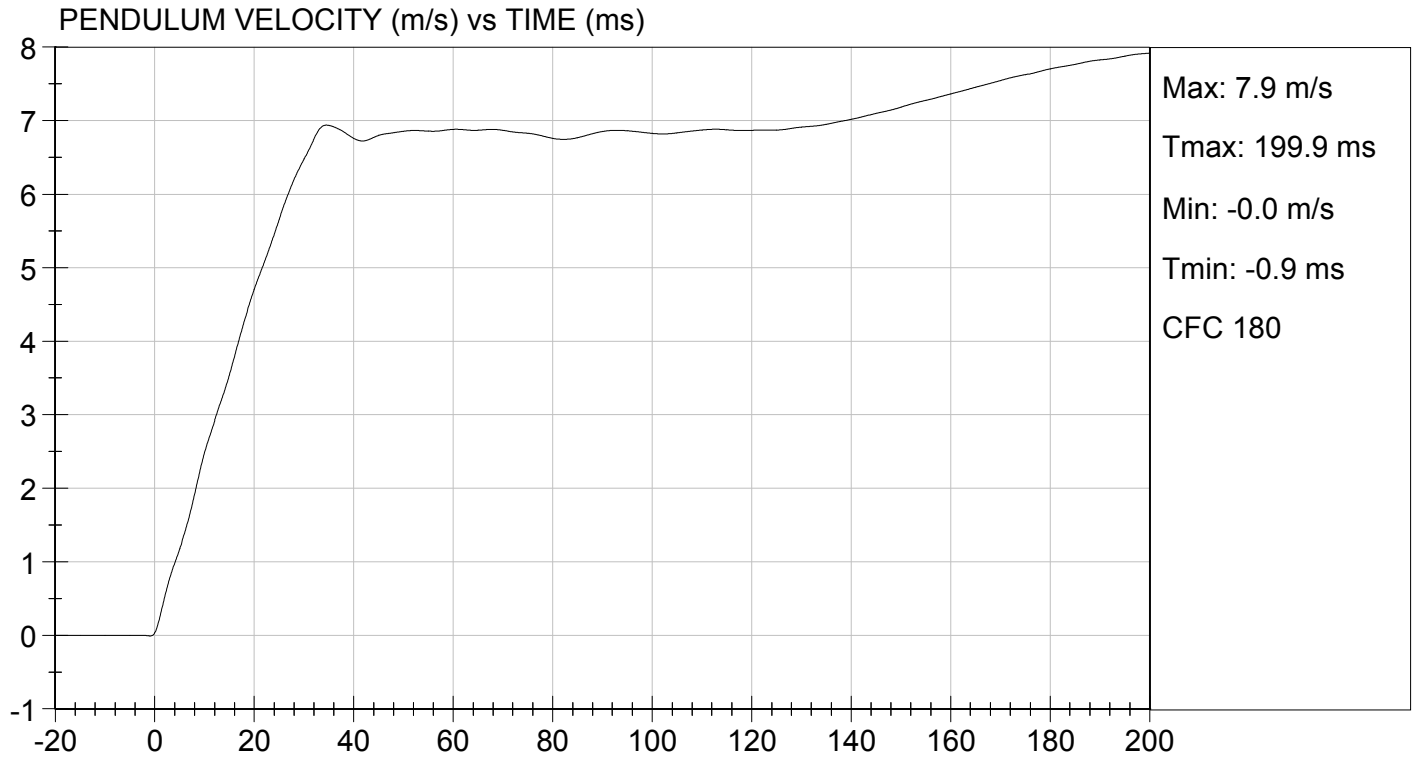
09/13/2013
 Test Date

David Winkelbauer
 Approved By



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

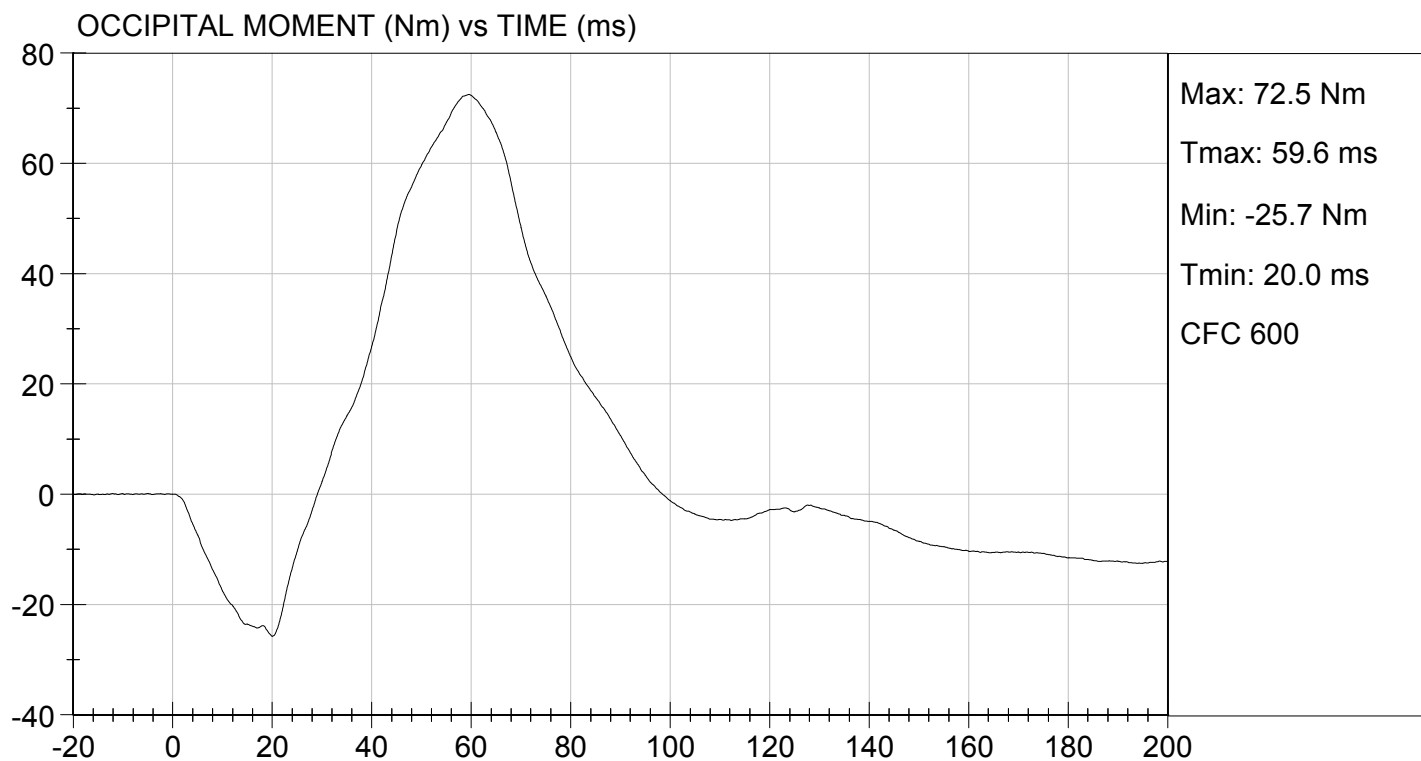
TEST DATE: 09/13/2013
TEST #: D133122





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

TEST DATE: 09/13/2013
TEST #: D133122



MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

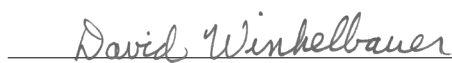
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Test I.D: D133123

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	47	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.5	Pass
	20 ms	m/s	3.1 to 3.9	3.2	Pass
	30 ms	m/s	4.6 to 5.6	4.6	Pass
D Plane Rotation	Max	deg	99 to 114	101	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-54	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	103	Pass
Overall Results					Pass


Laboratory Technician

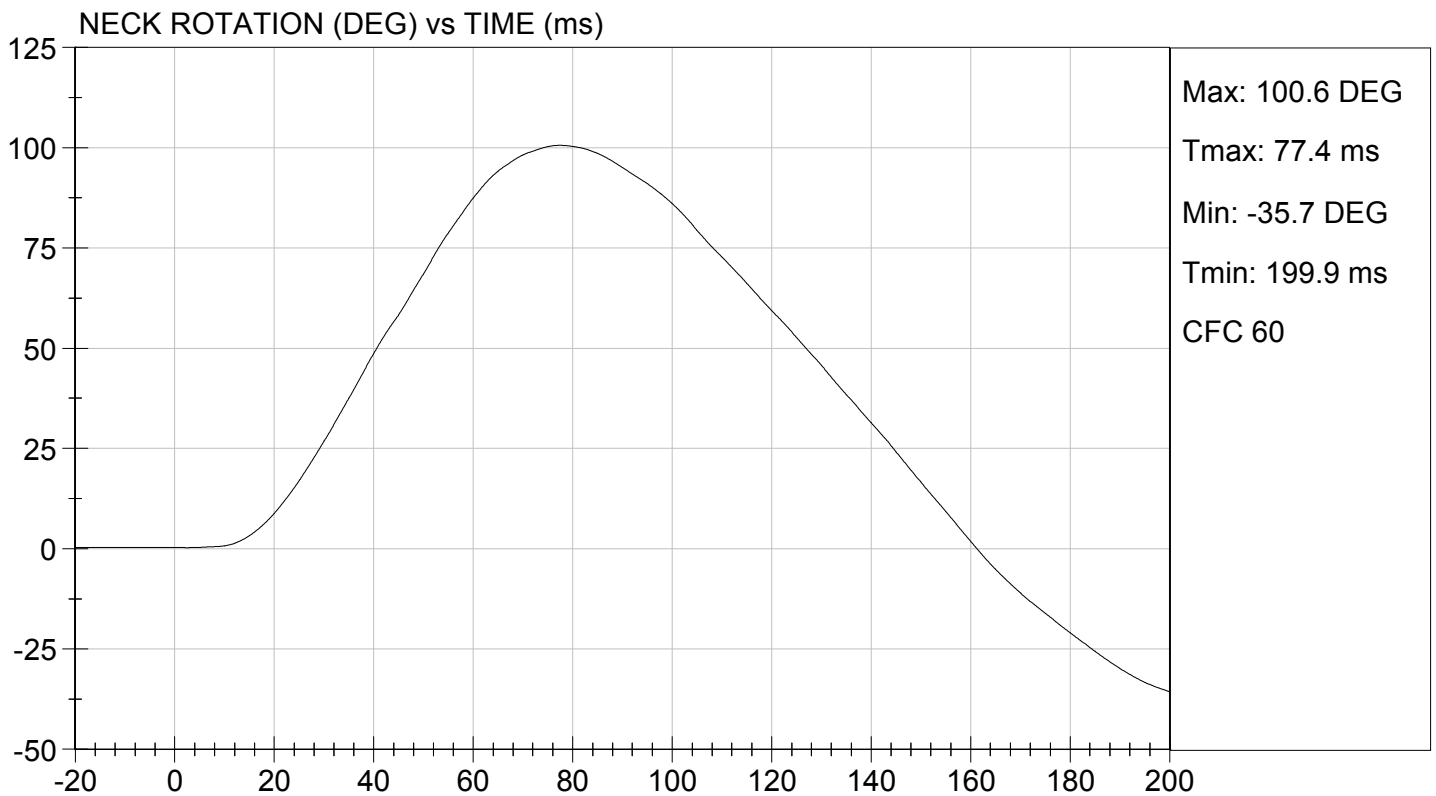
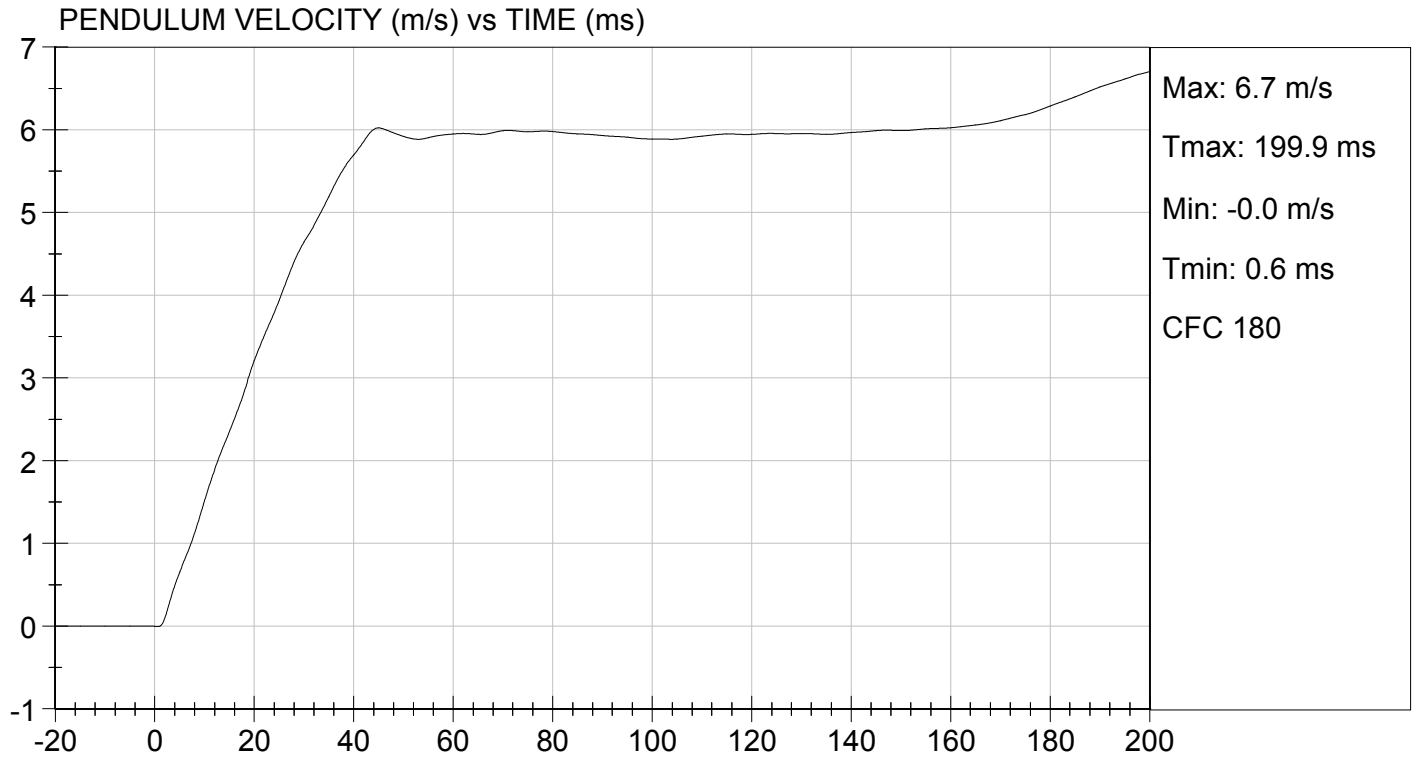
09/16/2013
Test Date


Approved By



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

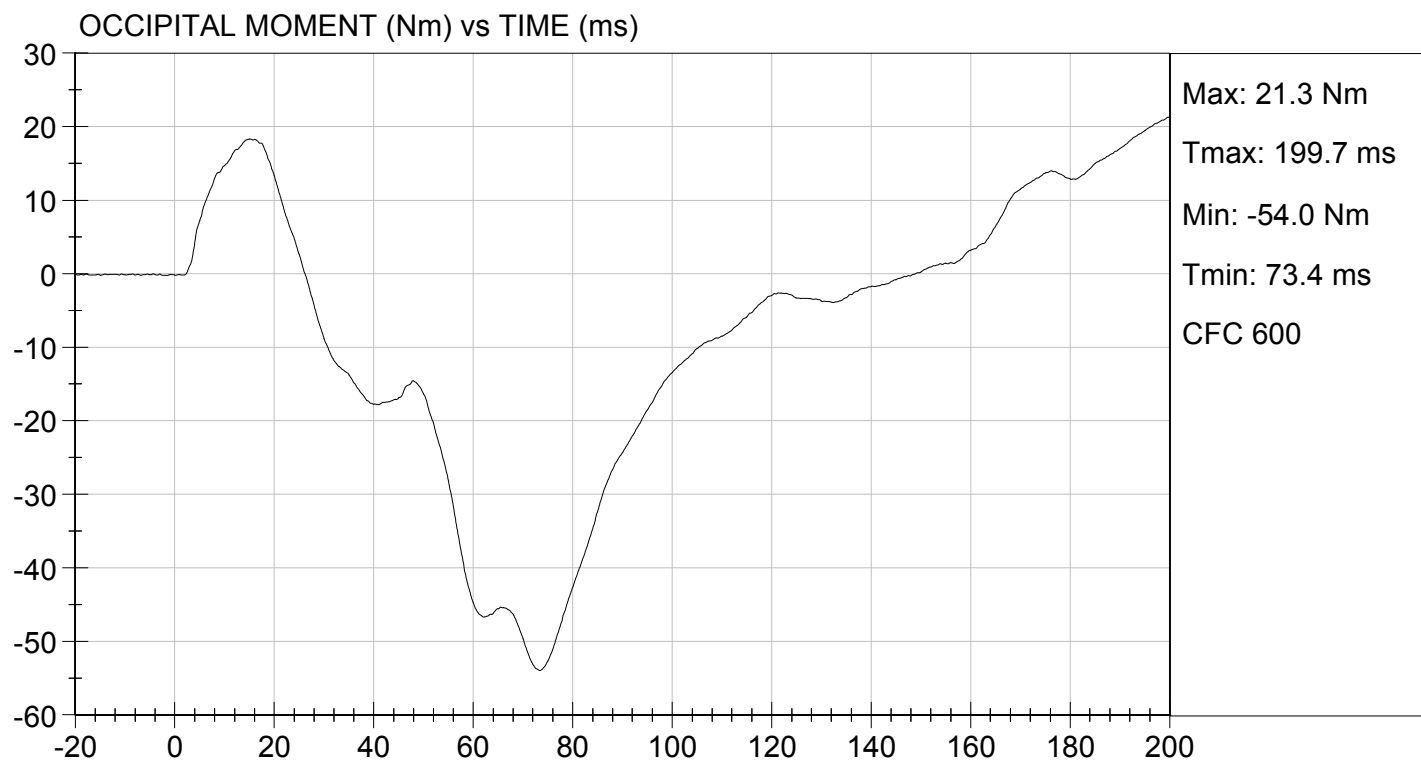
TEST DATE: 09/16/2013
TEST #: D133123





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

TEST DATE: 09/16/2013
TEST #: D133123



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D133124

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.6	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	51	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4188	Pass
Internal Hysteresis	%	69 to 85	72	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4201	Pass
Overall Test Results				Pass


Laboratory Technician

09/16/2013

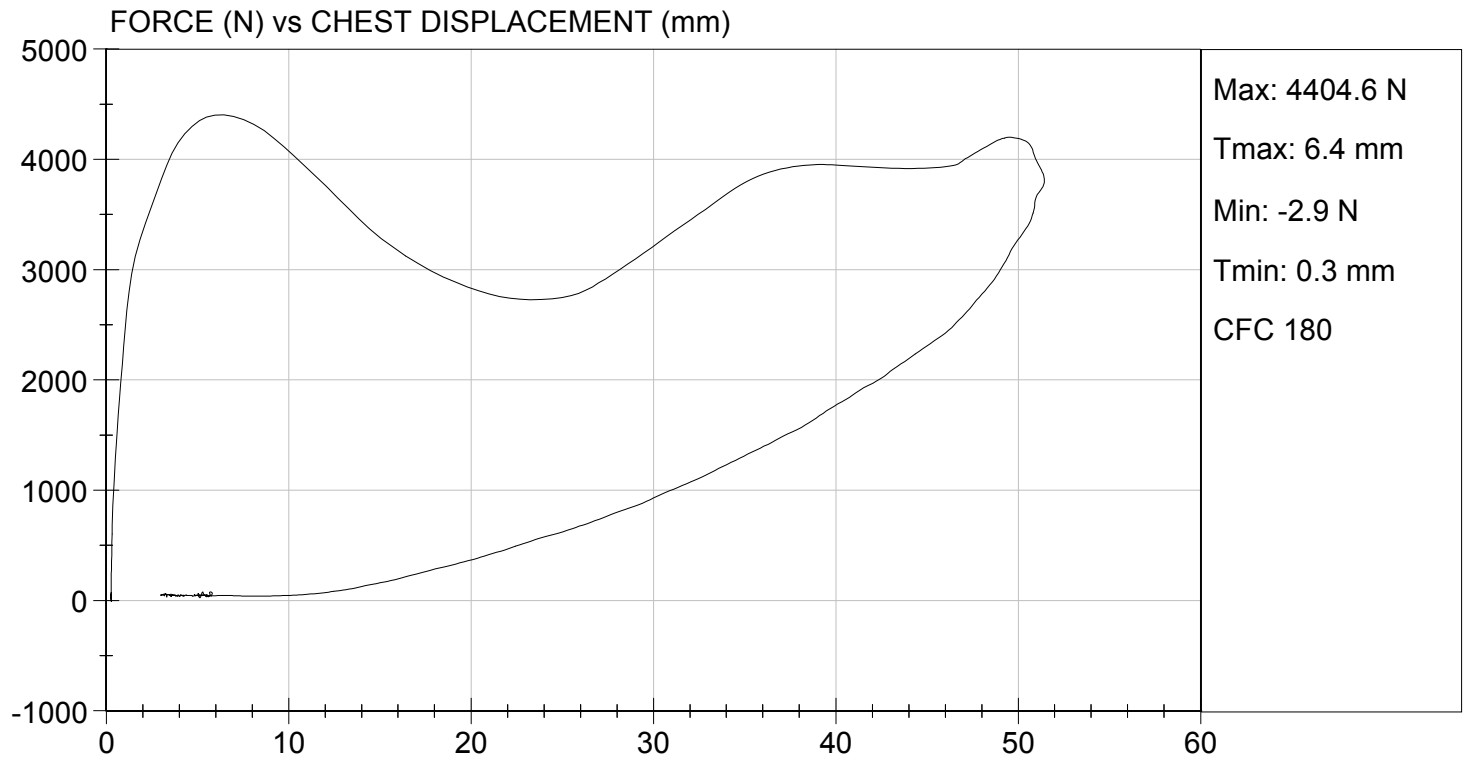
Test Date


Approved By



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

TEST DATE: 09/16/2013
TEST #: D133124



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D133125

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Probe Speed	m/s	2.07 to 2.13	2.13	Pass
Maximum Force	N	3450 to 4060	3964	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

09/16/2013

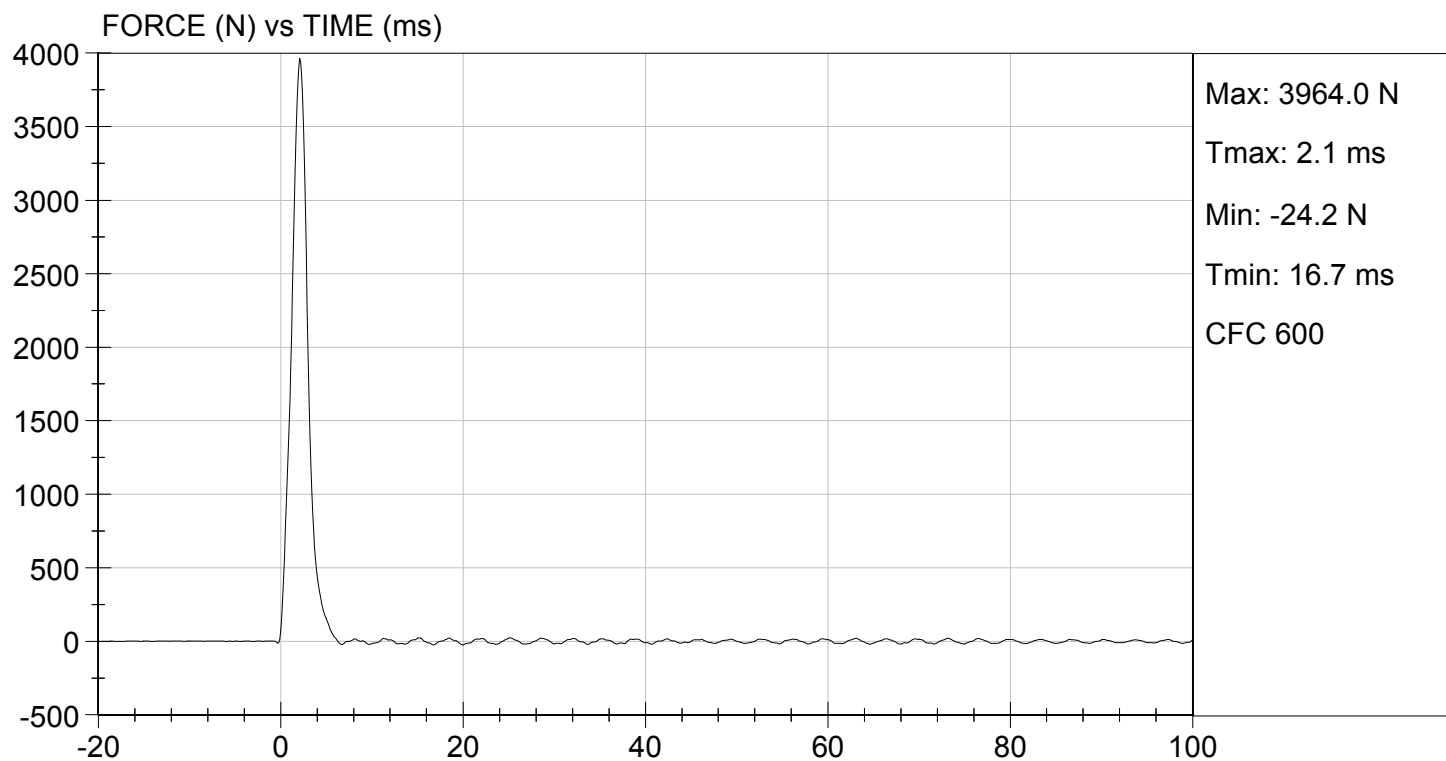
Test Date

David Winkelbauer
Approved By



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

TEST DATE: 09/16/2013
TEST #: D133125



MGA RESEARCH CORPORATION

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

ATD Serial No: 634

Test I.D: D133126

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Probe Speed	m/s	2.07 to 2.13	2.13	Pass
Maximum Force	N	3450 to 4060	3704	Pass
Overall Test Results				Pass

Jessica Gall
Laboratory Technician

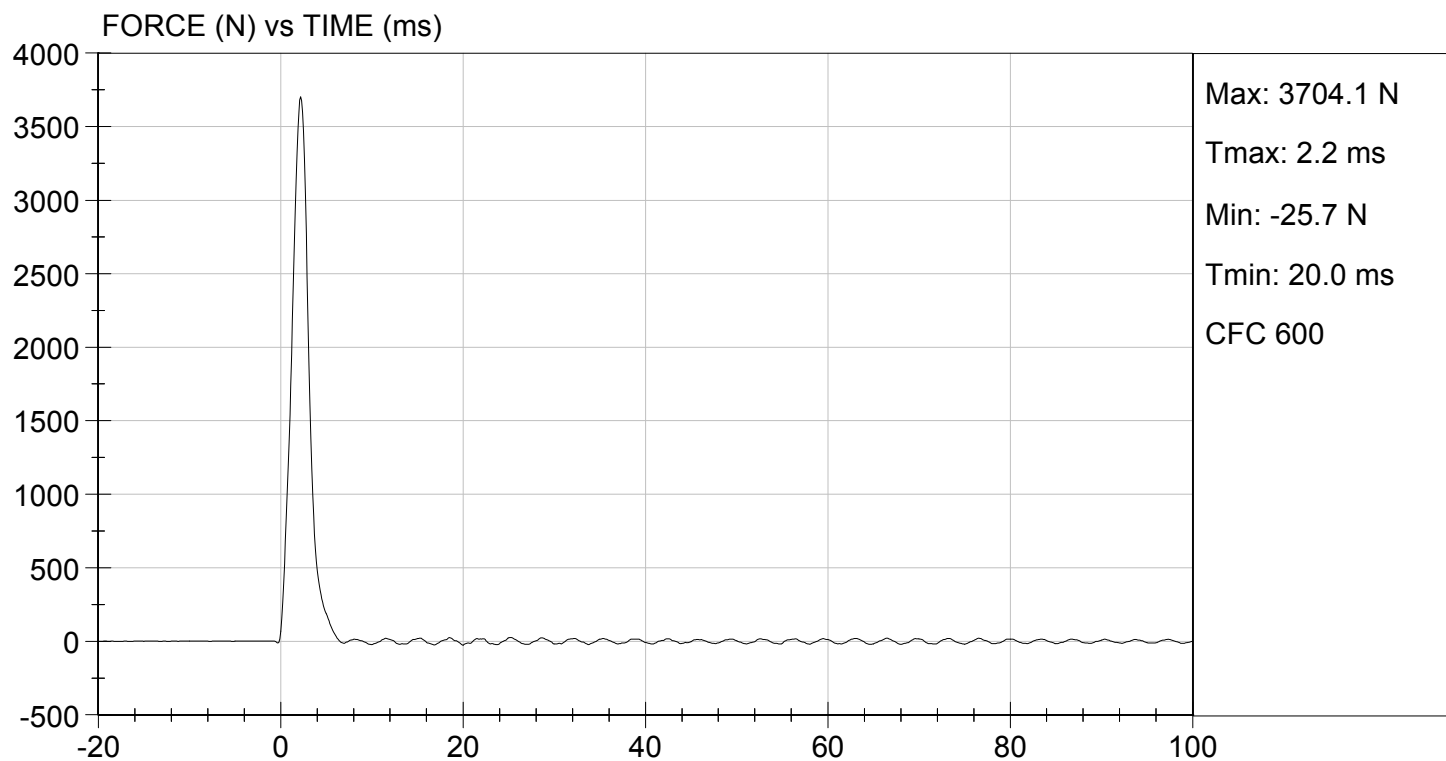
09/16/2013
Test Date

David Winkelbauer
Approved By



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

TEST DATE: 09/16/2013
TEST #: D133126



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D133127

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	48	Pass
Initial Angle	deg	0 to 20	18	Pass
Return Angle	deg	+/- 8	5	Pass
Force at 45 deg	N	320 to 390	345	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.9	Pass
Overall Result				Pass

Jessica Hall
Laboratory Technician

09/16/2013

Test Date

David Winkelbauer
Approved By

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

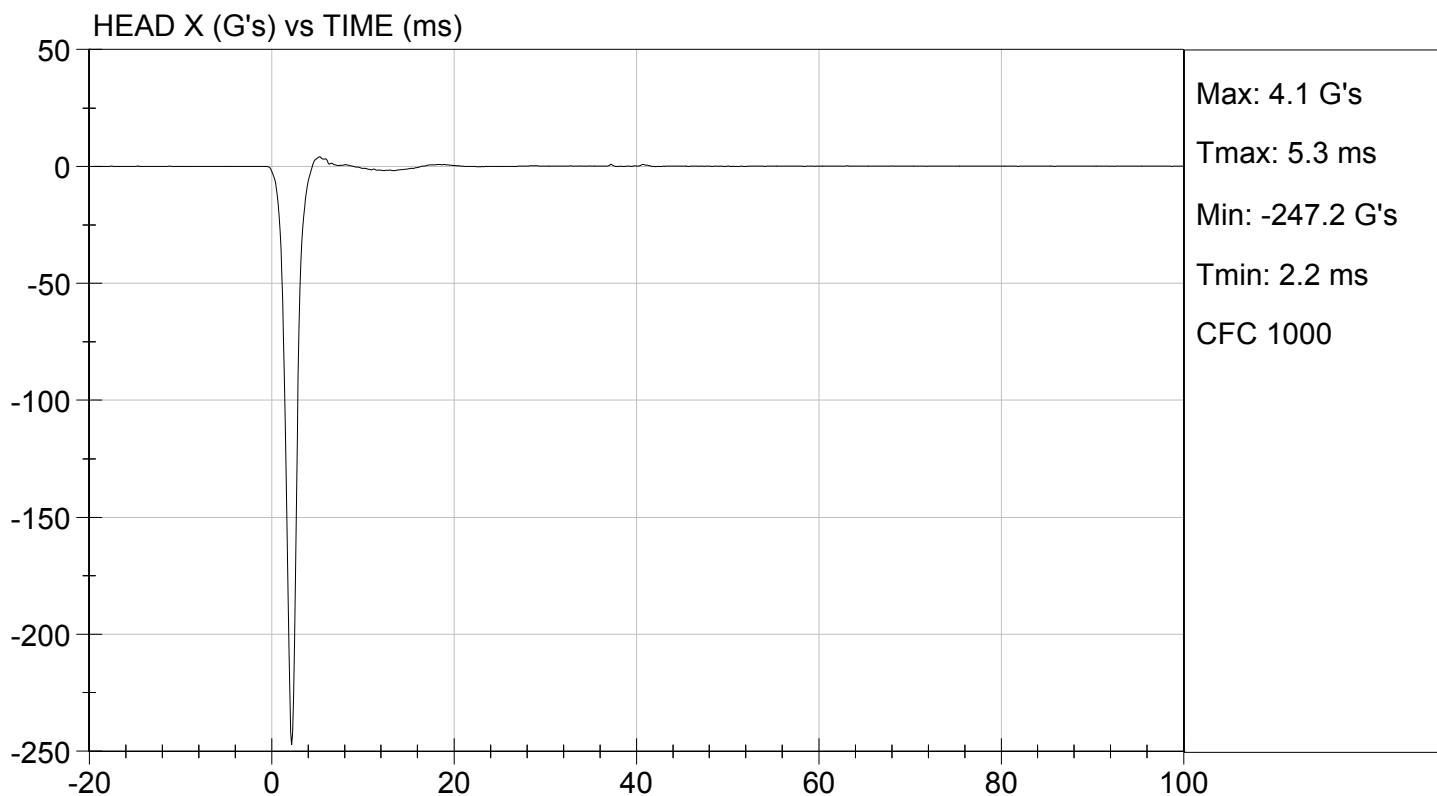
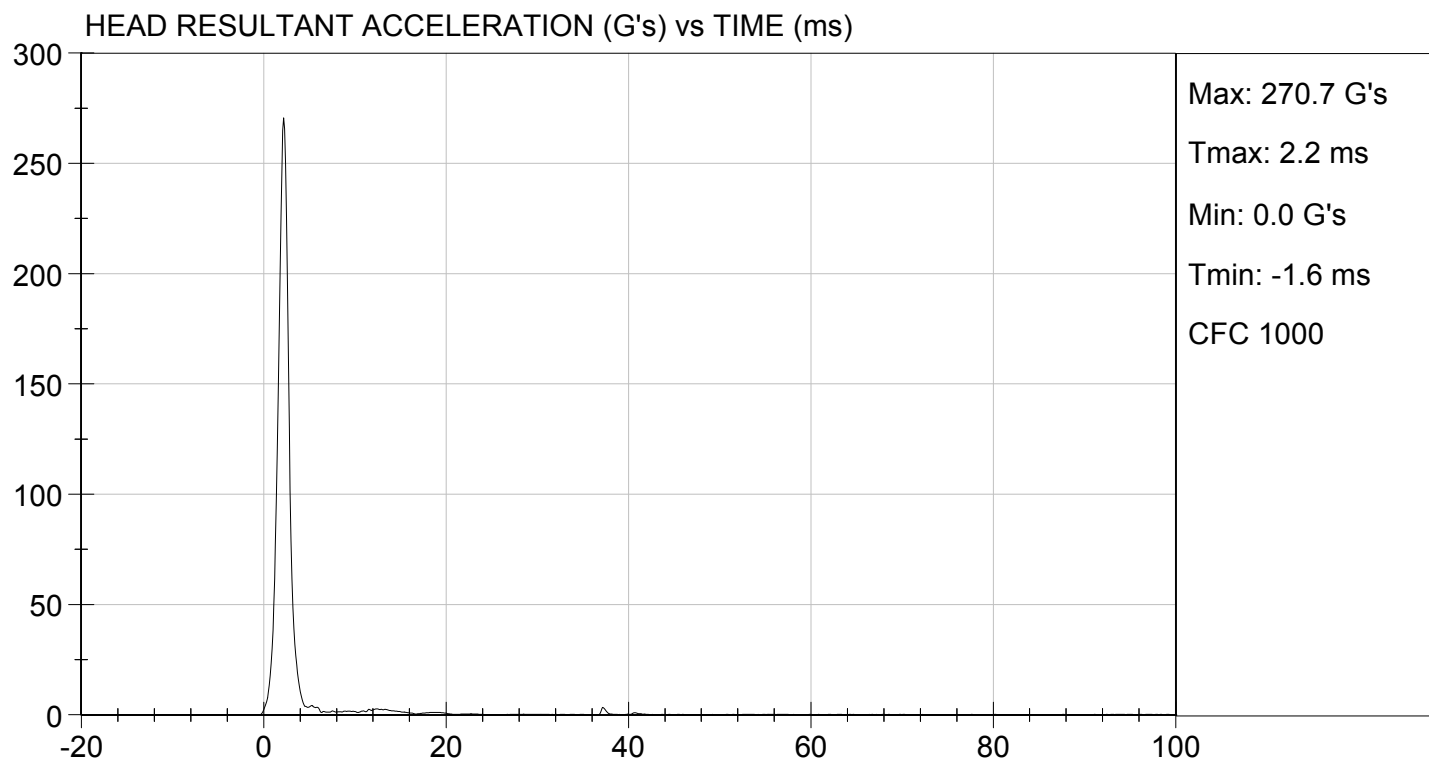
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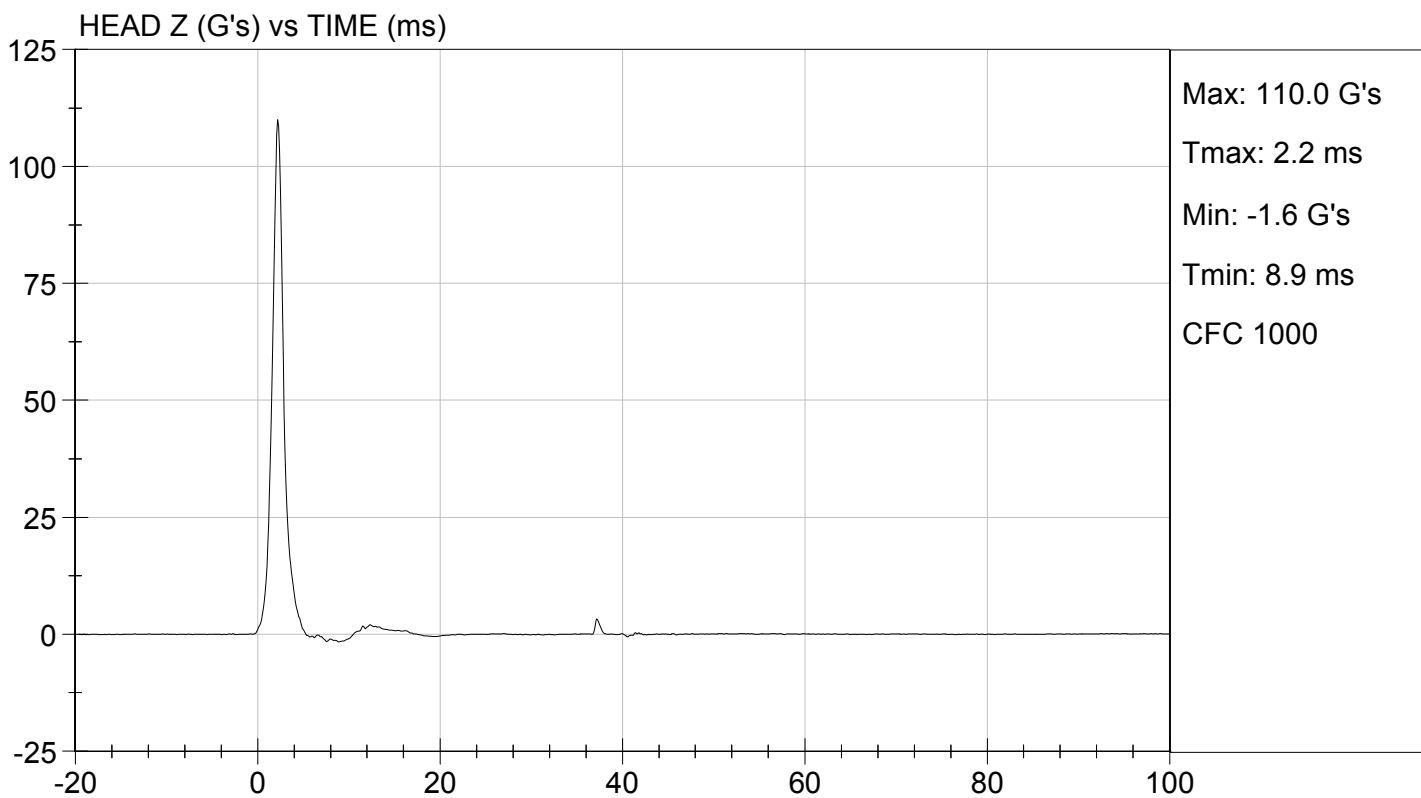
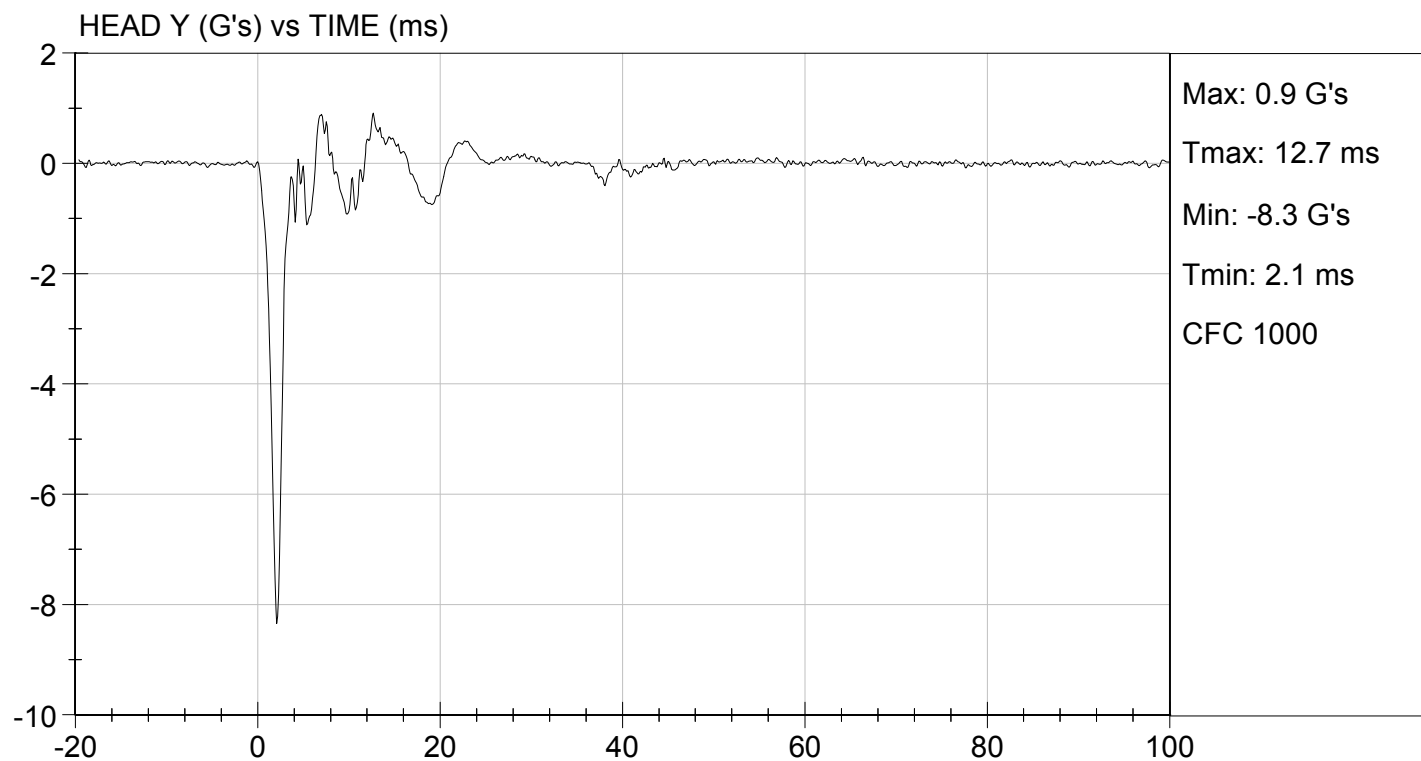
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Peak Resultant Acceleration	G's	250 to 300	271	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-8.3	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

11/05/2013
Test Date


Approved By





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D133662

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	35	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.3	Pass
	20 ms	m/s	4.0 to 5.0	4.3	Pass
	30 ms	m/s	5.8 to 7.0	5.9	Pass
D Plane Rotation	Max	deg	77 to 91	84	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	87	Pass
Overall Results					Pass

Jessica Hall
 Laboratory Technician

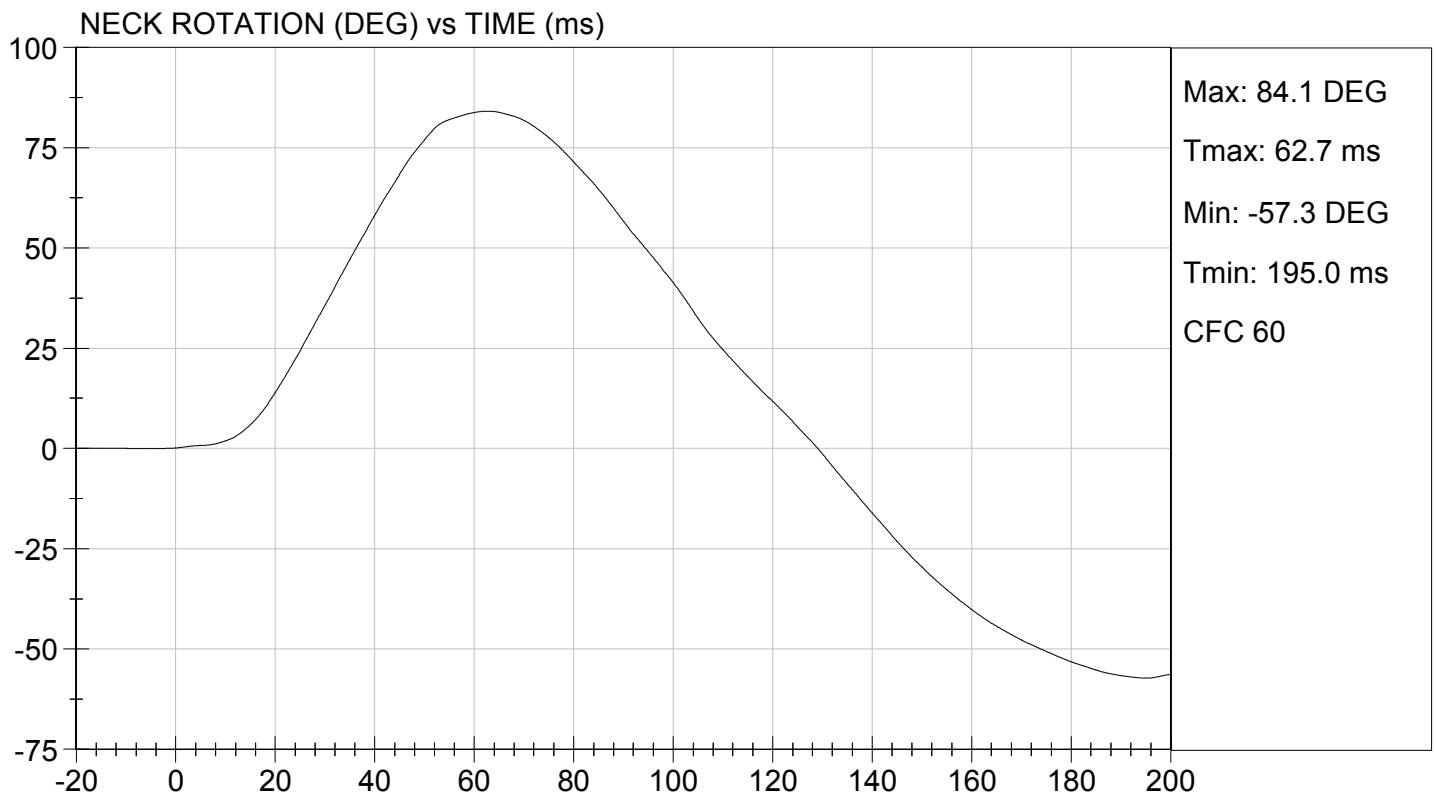
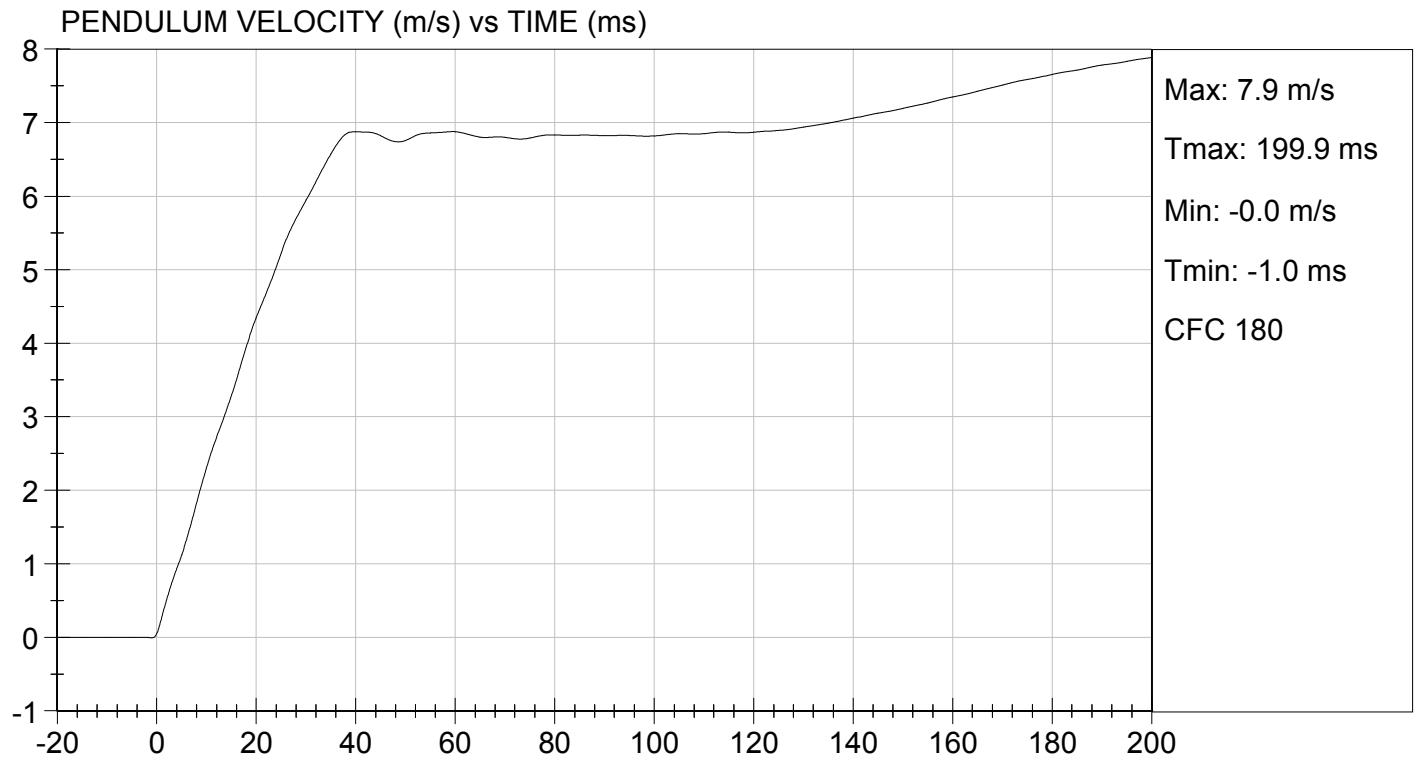
11/05/2013
 Test Date

David Winkelbauer
 Approved By



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

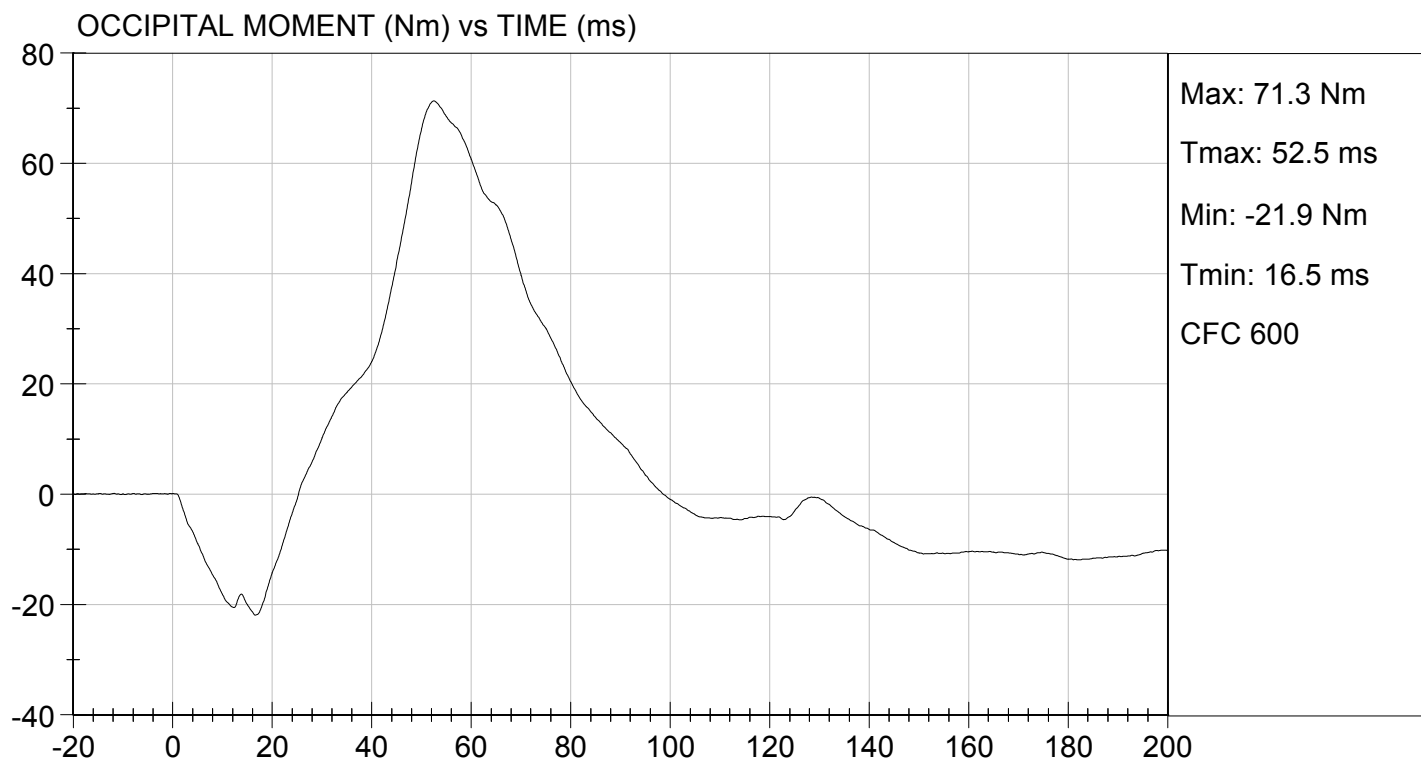
TEST DATE: 11/05/2013
TEST #: D133662





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

TEST DATE: 11/05/2013
TEST #: D133662

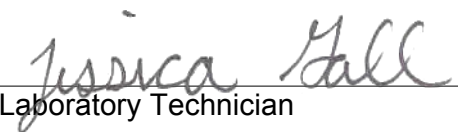


MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D133663

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	36	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.6	Pass
	20 ms	m/s	3.1 to 3.9	3.3	Pass
	30 ms	m/s	4.6 to 5.6	4.8	Pass
D Plane Rotation	Max	deg	99 to 114	104	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	100	Pass
Overall Results					Pass


Laboratory Technician

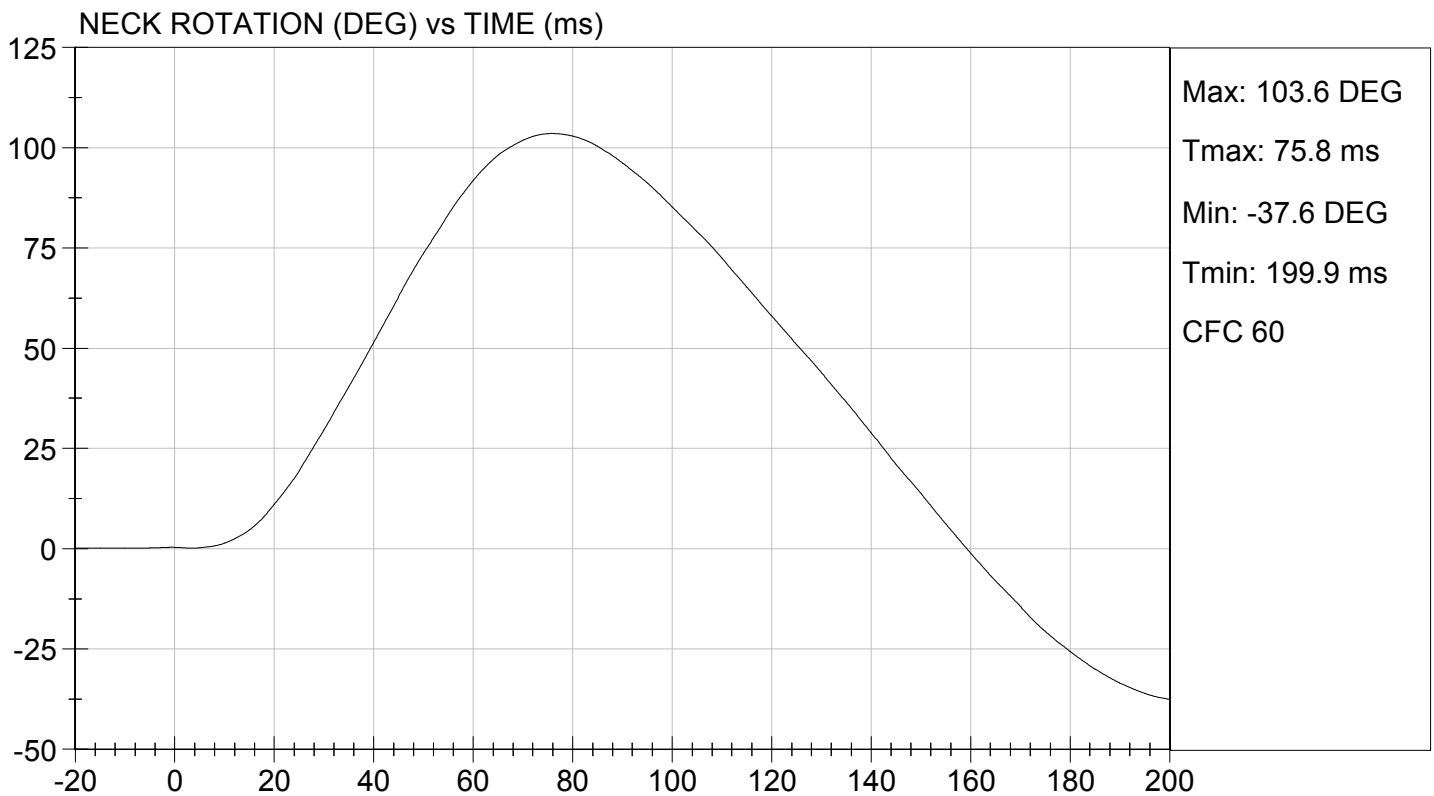
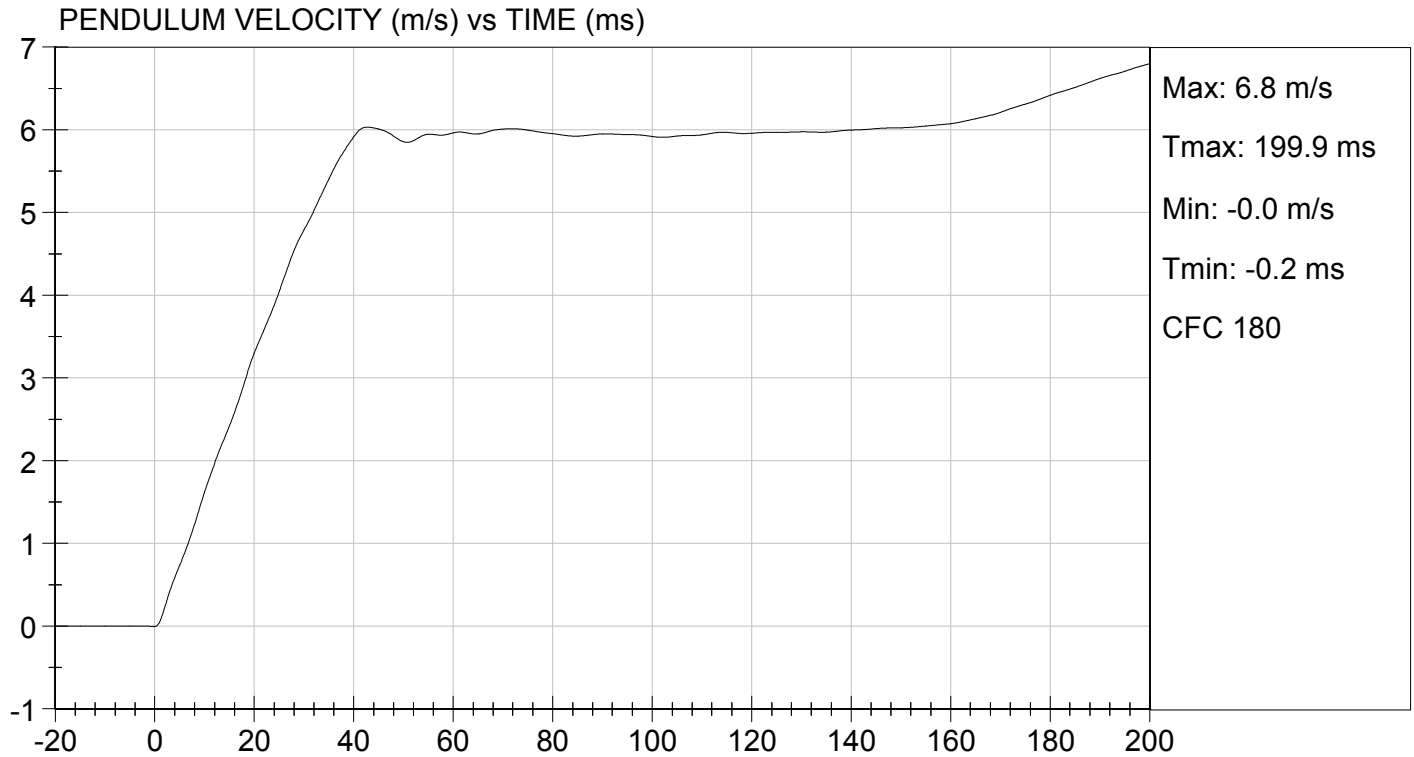
11/05/2013
Test Date


Approved By



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

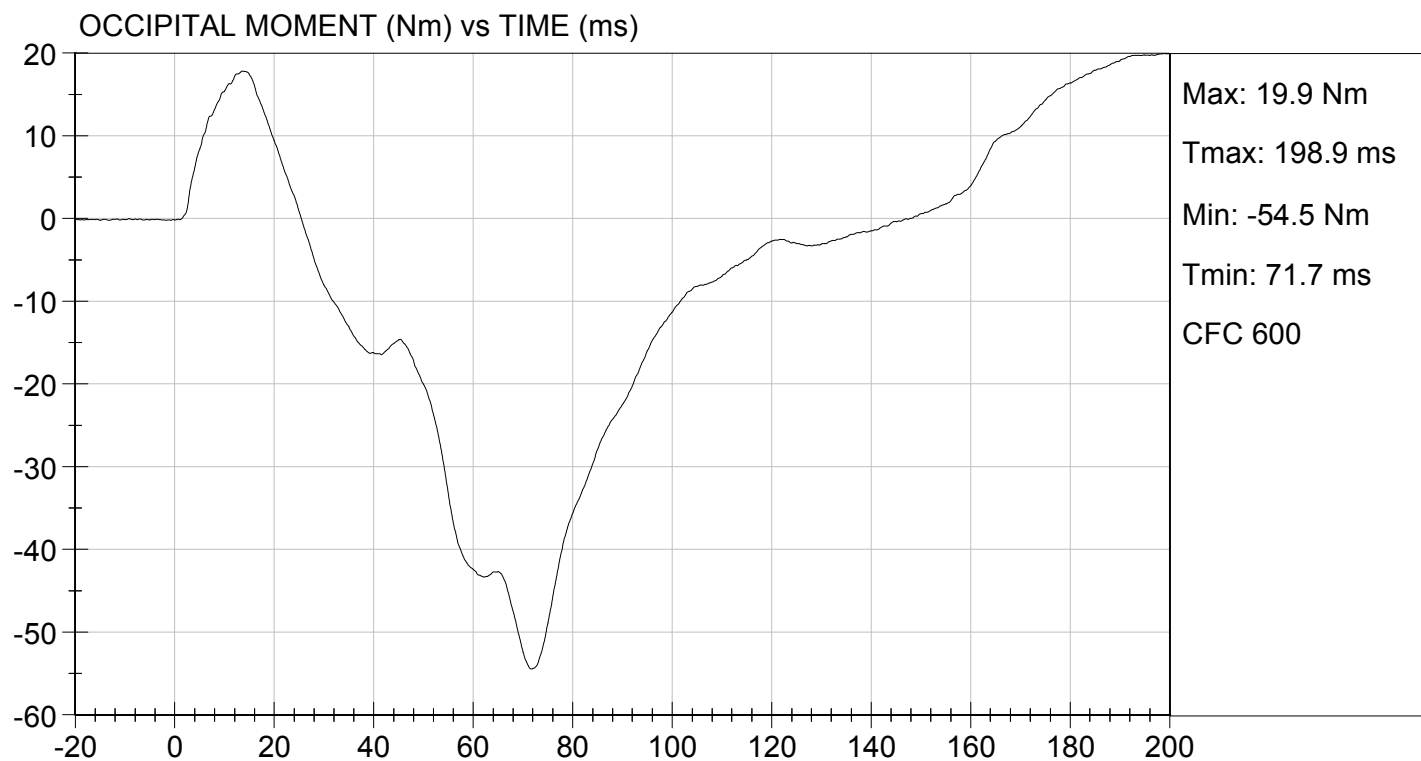
TEST DATE: 11/05/2013
TEST #: D133663





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

TEST DATE: 11/05/2013
TEST #: D133663



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D133664

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.6	Pass
Relative Humidity	%	10 to 70	39	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	51	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4239	Pass
Internal Hysteresis	%	69 to 85	73	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4282	Pass
Overall Test Results				Pass


Laboratory Technician

11/05/2013

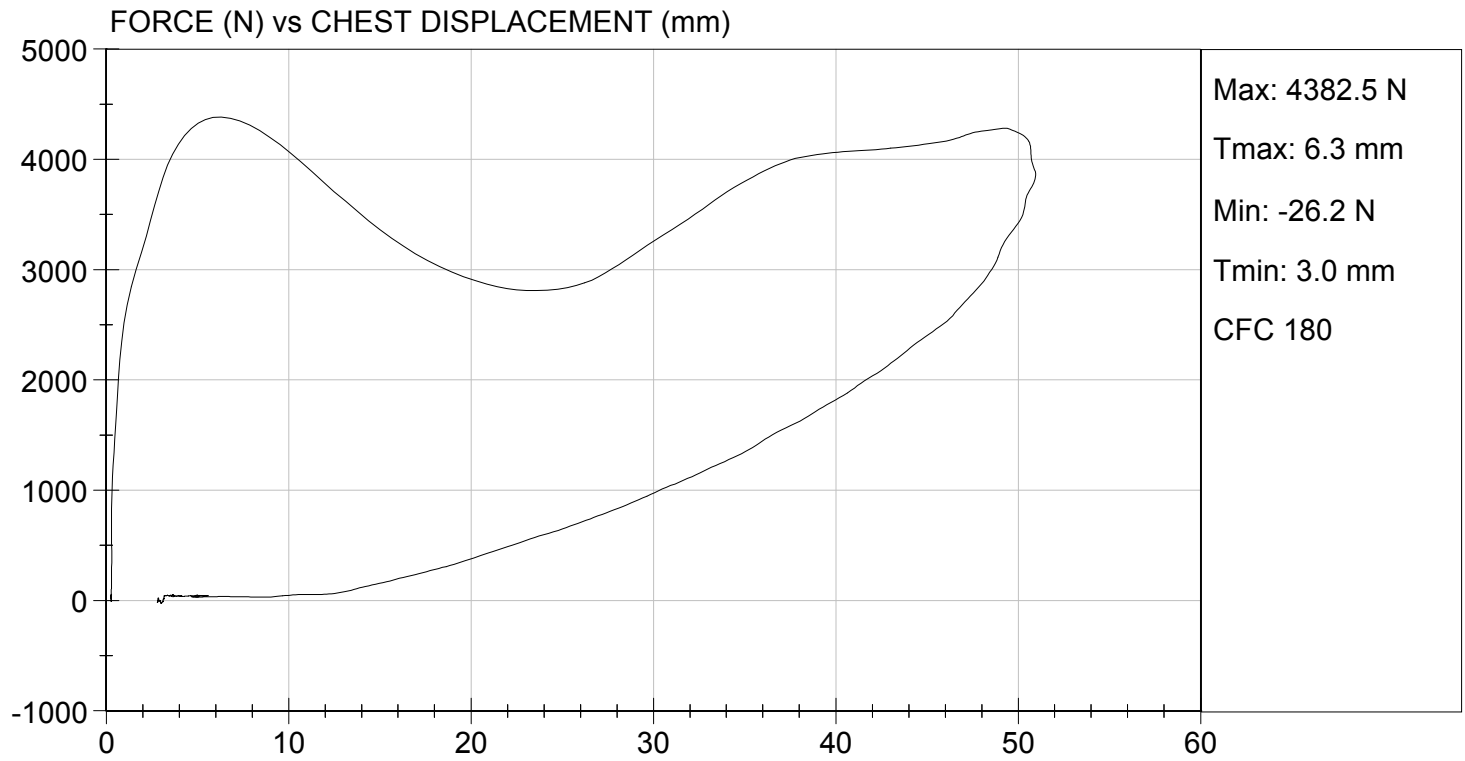
Test Date


Approved By



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

TEST DATE: 11/05/2013
TEST #: D133664



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D133665

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	40	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3786	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

11/05/2013

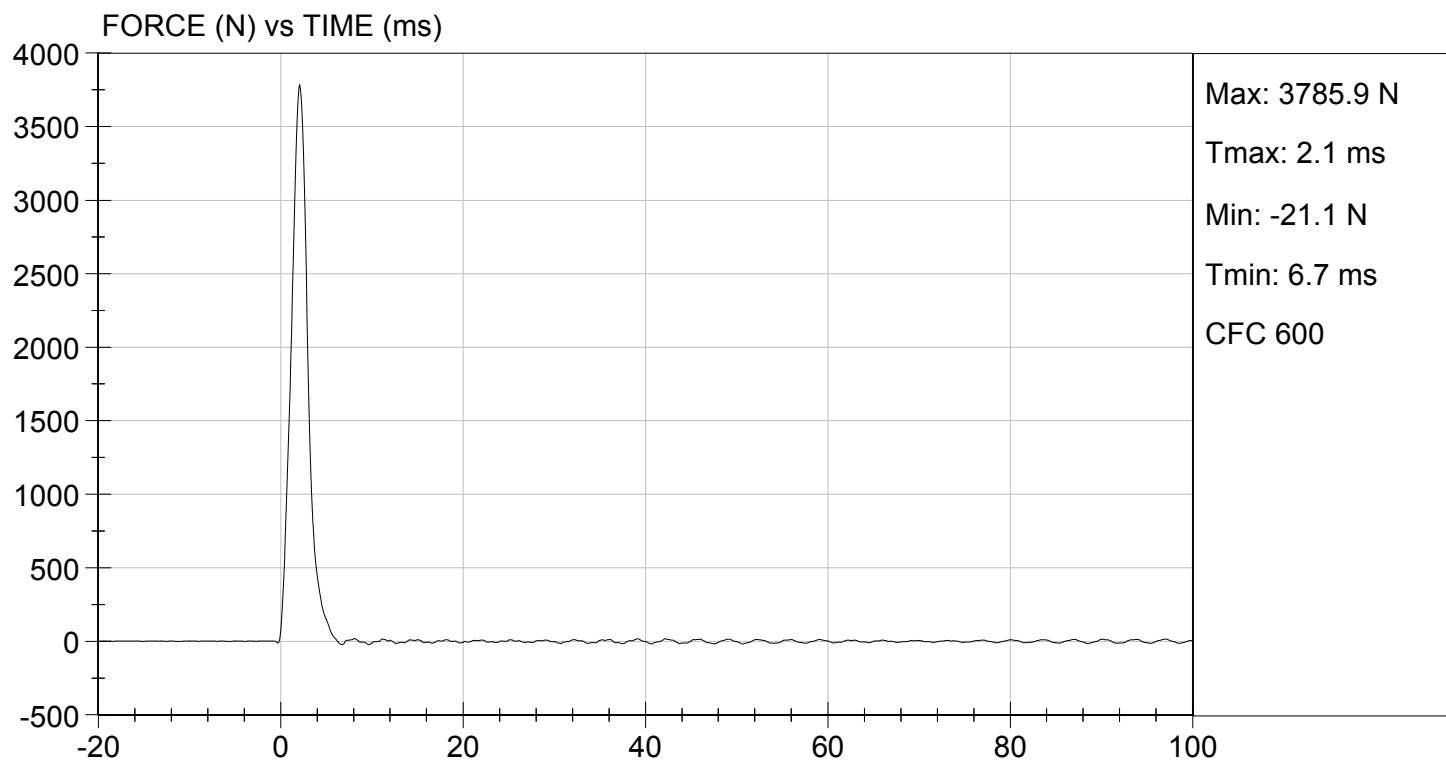
Test Date

David Winkelbauer
Approved By



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

TEST DATE: 11/05/2013
TEST #: D133665



MGA RESEARCH CORPORATION

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

ATD Serial No: 634

Test I.D: D133666

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	40	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3881	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

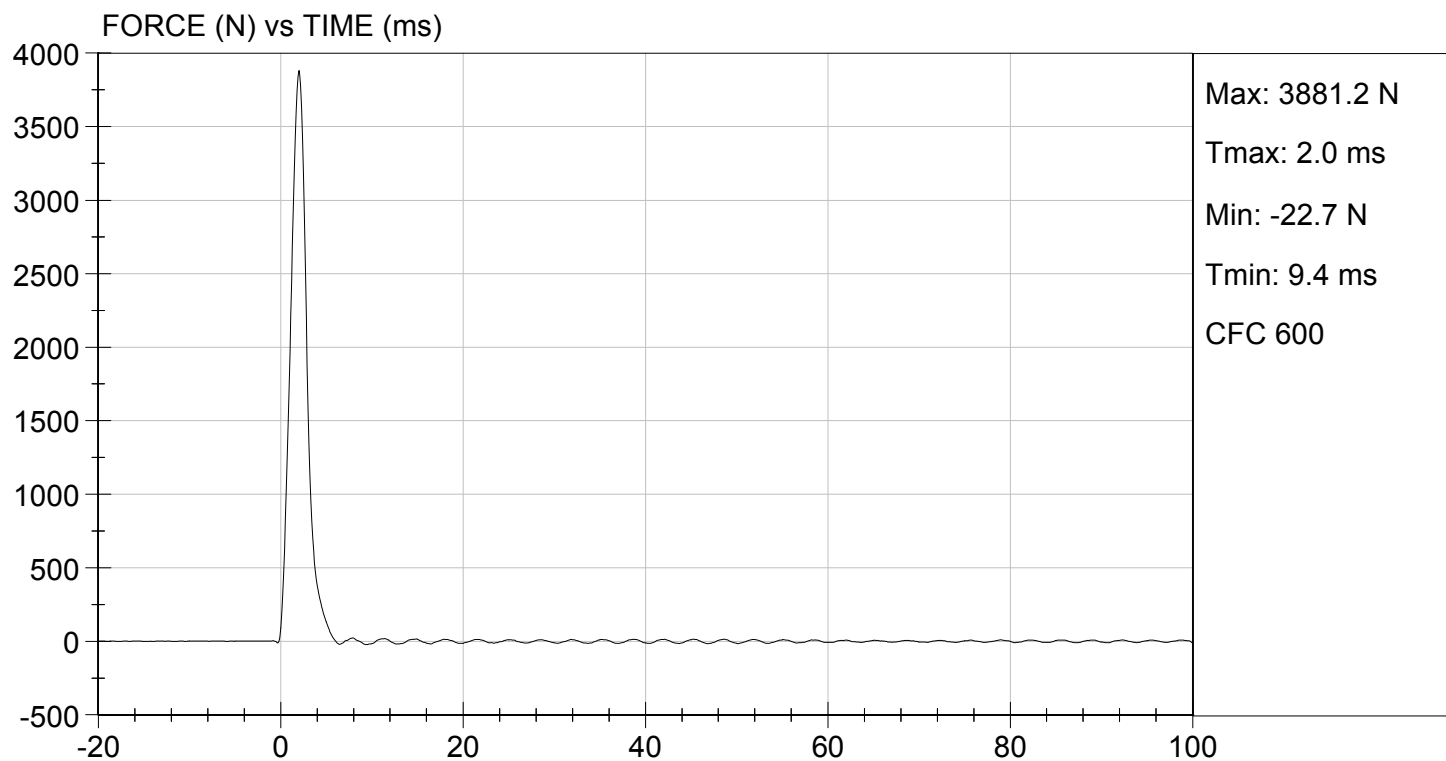
11/05/2013
Test Date

David Winkelbauer
Approved By



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

TEST DATE: 11/05/2013
TEST #: D133666



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D133667

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	39	Pass
Initial Angle	deg	0 to 20	17	Pass
Return Angle	deg	+/- 8	5	Pass
Force at 45 deg	N	320 to 390	382	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.9	Pass
Overall Result				Pass

Jessica Hall
Laboratory Technician

11/05/2013

Test Date

David Winkelbauer
Approved By