

REPORT NUMBER: NCAP-MGA-2013-001

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

**MAZDA MOTOR CORPORATION
2013 Mazda CX-5 Sport All Wheel Drive 5-Dr SUV
NHTSA No.: MD5400**

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



Test Date: July 5, 2012

Final Report Date: July 30, 2012

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: July 30, 2012

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

Technical Report Documentation Page

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16. Abstract A 56.3 km/h NCAP Frontal Impact Test was conducted on a 2013 Mazda CX-5 Sport All Wheel Drive 5-Dr SUV in accordance with the specifications of the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and foot well intrusion performance. The test was conducted at MGA Research Corporation in Burlington, Wisconsin, on July 5, 2012. The impact velocity was 56.4 km/h and the ambient temperature at the barrier face at the time of impact was 21.7°C. The target vehicle post-test maximum crush was 547 mm located at the vehicle's centerline. The test vehicle's performance was as follows: <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th rowspan="2">Units</th> <th colspan="2">Threshold</th> <th rowspan="2">Driver ATD</th> <th rowspan="2">Passenger ATD</th> </tr> <tr> <th>50th</th> <th>5th</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₁₅)</td> <td>N/A</td> <td>700</td> <td>700</td> <td>108</td> <td>161</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>52</td> <td>19</td> <td>10</td> </tr> <tr> <td>Nij</td> <td>N/A</td> <td>1</td> <td>1</td> <td>0.25</td> <td>0.71</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4170</td> <td>2620</td> <td>1360</td> <td>1138</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4000</td> <td>2520</td> <td>70</td> <td>362</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10008</td> <td>6805</td> <td>1008</td> <td>1115</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10008</td> <td>6805</td> <td>801</td> <td>1313</td> </tr> </tbody> </table>						Measurement Description	Units	Threshold		Driver ATD	Passenger ATD	50 th	5 th	Head Injury Criteria (HIC ₁₅)	N/A	700	700	108	161	Maximum Chest Compression	mm	63	52	19	10	Nij	N/A	1	1	0.25	0.71	Neck Tension	N	4170	2620	1360	1138	Neck Compression	N	4000	2520	70	362	Left Femur Force	N	10008	6805	1008	1115	Right Femur Force	N	10008	6805	801	1313
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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 DTNH22-06-D-00028. 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 2013 Mazda CX-5 Sport All Wheel Drive 5-Dr SUV at a velocity of 56.4 km/h. The test was performed at MGA Research Corporation on July 5, 2012. Pre-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 and passenger's lap and shoulder belts to measure dummy torso and pelvic section loading.

The driver (position 1) ATD (Serial No. 036) and the right-front passenger (position 2) ATD (Serial No. 634) were calibrated previous to this test. Certification details, along with instrumentation calibration data, are found in Appendix C of this report.

The 228 channels of data were recorded on an on-board data acquisition system. Appendix B contains the vehicle, load cell barrier, and 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 bolster and steering column. 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 glove box.

The occupant data is summarized below:

ATD position	HIC ₁₅	Nij	Neck Tension (N)	Neck Comp. (N)	3ms Chest Clip (Gs)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50 th)	108	0.25	1360	70	35	19	1008	801
Passenger (5 th)	161	0.71	1138	362	44	10	1115	1313

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

TEST NOTES

Barrier 8-2 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: 2013 Mazda CX-5 Sport All Wheel Drive 5-Dr SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5400
Test Date: 07/05/2012

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	MD5400	Traction Control System (TCS)	Yes
Model Year	2013	Auto-Leveling System	No
Make	Mazda	Automatic Door Locks (ADLs)	Yes
Model	CX-5 Sport	Power Window Auto-Reverse	Yes
Body Style	SUV	Other Optional Feature	N/A
VIN	JM3KE4BE7D0120336	Driver Front Airbag	Yes
Body Color	Sky Blue Metallic	Driver Curtain Airbag	Yes
Odometer (km/mi)	13 / 8	Driver Torso Airbag	No
Engine Displacement (L)	2.0	Driver Torso/Pelvis Airbag	Yes
Type/No. Cylinders	4	Driver Pelvis Airbag	No
Engine Placement	Lateral	Driver Knee Airbag	No
Transmission Type	Automatic	Pass. Front Airbag	Yes
Transmission Speeds	6	Pass. Curtain Airbag	Yes
Overdrive	Yes	Pass. Torso Airbag	No
Final Drive	AWD	Pass. Torso/Pelvis Airbag	Yes
Roof Rack	No	Pass. Pelvis Airbag	No
Sunroof/T-Top	No	Pass. Knee Airbag	No
Running Boards	No	Driver Seat Belt Pretensioner	Yes
Tilt Steering Wheel	Yes	Pass. Seat Belt Pretensioner	Yes
Power Seats	No	Driver Load Limiter	Yes
Anti-Lock Brakes (ABS)	Yes	Pass. Load Limiter	Yes
All-Wheel Drive (AWD)	Yes	Other Safety Restraint	N/A
Does owner's manual provide instructions to turn off automatic door locks?			Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	MAZDA MOTOR CORPORATION	GVWR (kg)	2024
Date of Manufacture	04/12	GAWR Front (kg)	1016
		GAWR Rear (kg)	1011

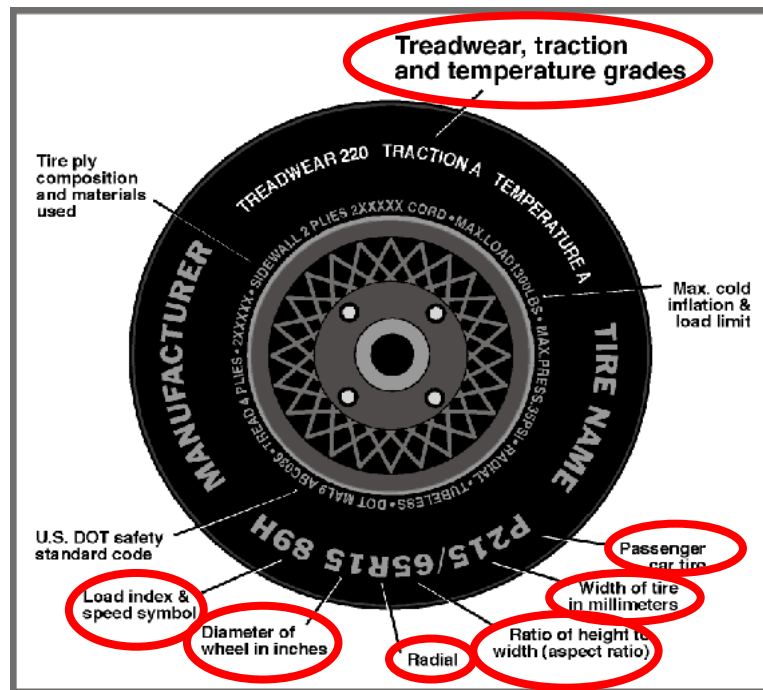
VEHICLE SEATING AND WEIGHT CAPACITY DATA

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

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

Test Vehicle: 2013 Mazda CX-5 Sport All Wheel Drive 5-Dr SUV
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TIRE PLACARD INFORMATION

Measured Parameter	Front	Rear
Recommended Cold Tire Pressure (kPa)	230	230
Recommended Tire Size	P225/65R17	P225/65R17

TIRE SIDEWALL INFORMATION

Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	300	300
Tire Size on Vehicle	P225/65R17	P225/65R17
Tire Manufacturer	Yokohama	Yokohama
Tire Model	Geolander	Geolander
Treadwear	280	280
Traction	B	B
Temperature Grade	A	A
Tire Plies Sidewall	2	2
Tire Plies Body	5	5
Load Index/Speed Symbol	100H	100H
Tire Material	Rubber	Rubber
DOT Safety Code Right	FDF5	FDF5
DOT Safety Code Left	FDF5	FDF5

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

Test Vehicle: 2013 Mazda CX-5 Sport All Wheel Drive 5-Dr SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5400
 Test Date: 07/05/2012

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	437.3	331.6		471.3	394.2	
Right	kg	425.9	324.8		453.6	379.2	
Ratio	%	56.8	43.2		54.5	45.5	
Totals	kg	863.2	656.4	1519.6	924.9	773.4	1698.3

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1519.6
Weight of 1 P572E ATD & 1 P572O ATD	kg	140.6
Rated Cargo/Luggage Weight (RCLW)	kg	45
Calculated Vehicle Target Weight (TVTW)	kg	1705.2

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	797	797	823	828	1165
As Tested	mm	785	792	798	805	1229
Post Test	mm	820	818	806	796	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2698
Total Vehicle Length at Left Side	mm	4395
Total Vehicle Length at Centerline	mm	4545
Total Vehicle Length at Right Side	mm	4395
Weight of Ballast in Cargo Area	kg	33.6
Weight of Vehicle Components Removed	kg	29.0
Amount of Stoddard Solvent in Fuel Tank	L	53.9

List of components removed to meet test weight: Right taillight, jack and tool kit, spare tire, and cargo cover.

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

Test Vehicle: 2013 Mazda CX-5 Sport All Wheel Drive 5-Dr SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5400
 Test Date: 07/05/2012

TARGET VEHICLE STRUCTURAL MEASUREMENT

	Elements	Pre-Test (mm)
1	Total Length	4545
2	Total Width	1840
3	Bumper Top Height	551
4	Bumper Bottom Height	455
5	Longitudinal Member Top Height	573
6	Distance between Longitudinal Members	918
7	Longitudinal Member Width	59
8	Engine Top Height	898
9	Engine Bottom Height	227
10	Engine and Gearbox Width	780
11	Front Bumper-Engine Distance	258
12	Front Shock Absorber Fixing Height	994
13	Bonnet Leading Edge Height	863
14	Front Shock Absorber Fixing Width	1181
15	Front Bumper – Front Axle Distance	917
16	Front Axle – A-Pillar Distance	472
17	A-Pillar – B-Pillar Distance	1099
18	B-Pillar – Rear Axle Distance	1131
19	B-Pillar – C-Pillar Distance	656
20	Roof Sill Bottom Height	1564
21	Roof Sill Top Height	1637
22	Floor Sill Bottom Height	259
23	Floor Sill Top Height	428

DATA SHEET NO. 2

SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

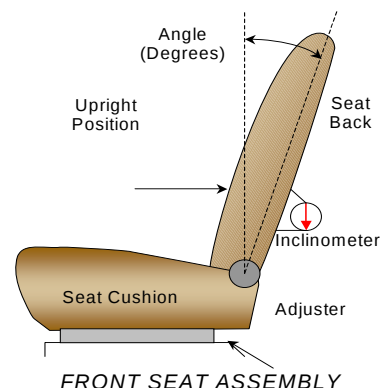
Test Vehicle: 2013 Mazda CX-5 Sport All Wheel Drive 5-Dr SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5400
 Test Date: 07/05/2012

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 May 2012.

	Degrees
Driver Seat Back Angle	6.4° on headrest post
Passenger Seat Back Angle	3.8° on headrest post



SEAT FORE/AFT POSITIONS

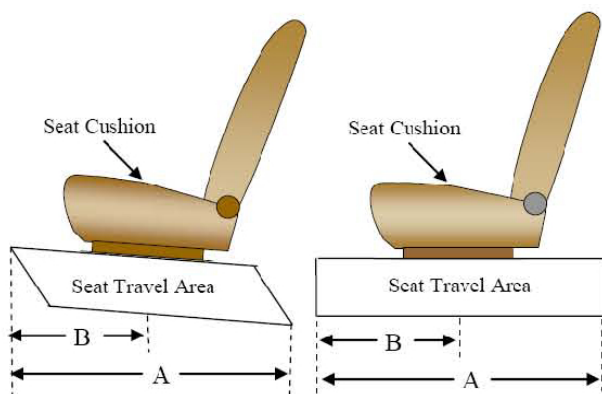
The driver and passenger seat fore/aft positions are adjusted following Appendix F, "Driver & Passenger Dummy Seating & Positioning Procedures" in the NCAP Test Procedure dated May 2012.

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	316 mm, 26 detents (1 st as 0)	10 th detent (foremost as 0)
Passenger Seat	260 mm, 26 detents (1 st as 0)	1 st detent, 10 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	4 (1 st as 1)	0 (uppermost as 0)
Passenger Seat	4 (1 st as 1)	0 (uppermost as 0)



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

Test Vehicle: 2013 Mazda CX-5 Sport All Wheel Drive 5-Dr SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5400
 Test Date: 07/05/2012

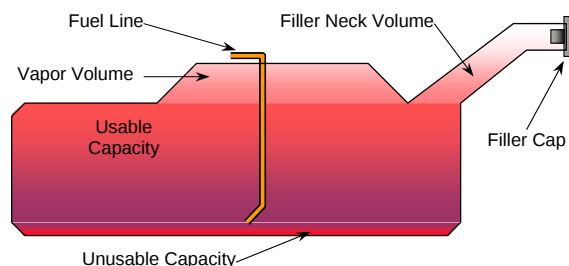
FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of "Standard Tank"	57.9
Usable Capacity of "Optional Tank"	
92-94% of Usable Capacity	53.3 to 54.4
Actual Amount of Solvent used	53.9
1/3 of Usable Capacity	19.3

FUEL PUMP

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

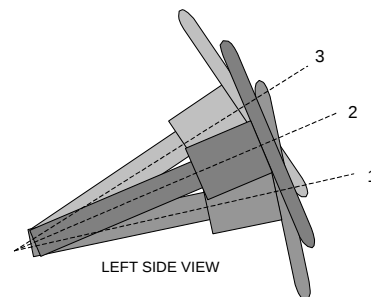
The vehicle is equipped with an electric fuel pump. The fuel pump operates when the starter or engine is activated. The fuel pipe is on the left side.



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

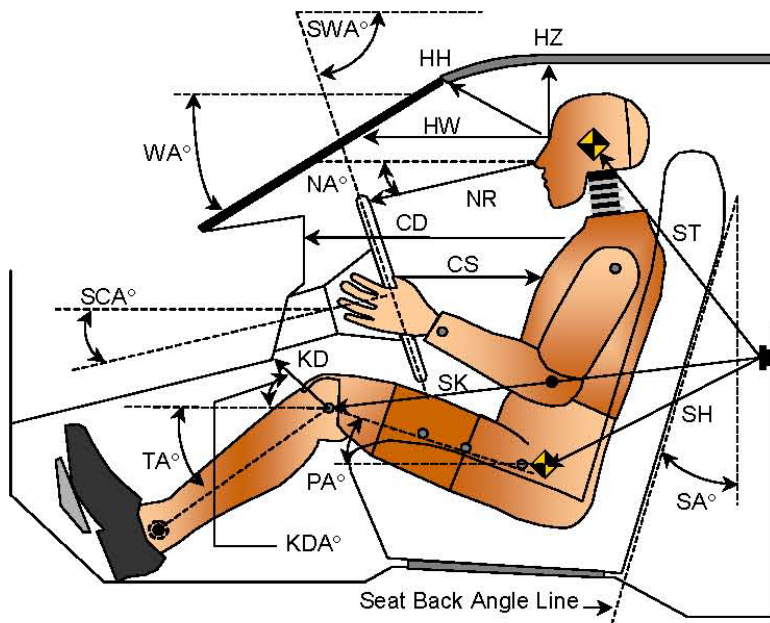
STEERING COLUMN POSITION

	Degrees	Fore/Aft Position (mm)
Lowermost Position 1	67.1	194
Geometric Center Position 2	64.7	169
Uppermost Position 3	62.3	144
Telescoping Steering Wheel Travel		50
Test Position	64.7	169

DATA SHEET NO. 3 DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2013 Mazda CX-5 Sport All Wheel Drive 5-Dr SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5400
Test Date: 07/05/2012



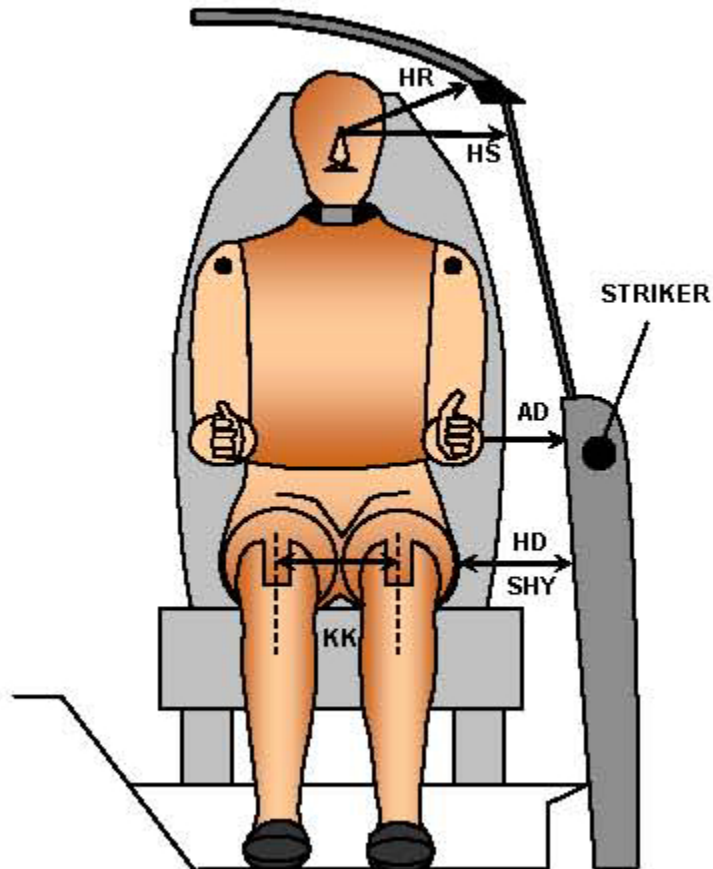
LEFT SIDE VIEW

Code	Measurement Description	Driver S/N 036		Passenger S/N 634	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		25.5		
SWA°	Steering Wheel Angle		64.7		
SCA°	Steering Column Angle		35.3		
SA°	Seat Back Angle (on headrest post)		6.4		3.8
HZ	Head to Roof (Z)	229	90	227	90
HH	Head to Header	359	30.6	285	45.7
HW	Head to Windshield	650	0	630	0
NR	Nose to Rim	376	14.3		
CD	Chest to Dash	515		351	
CS	Chest to Steering Hub	283	2.2		
RA	Rim to Abdomen	173	0		
KDL	Left Knee to Dash	126	35.0	60	34.3
KDR	Right Knee to Dash	114	29.9	76	35.4
PA°	Pelvic Angle		24.3		20.7
TA°	Tibia Angle		54.7		59.8
SK	Striker to Knee	605	99.6	710	97.0
ST	Striker to Head	483	16.2	476	27.5
SH	Striker to H-Point	283	129.0	387	107.2

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2013 Mazda CX-5 Sport All Wheel Drive 5-Dr SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5400
 Test Date: 07/05/2012



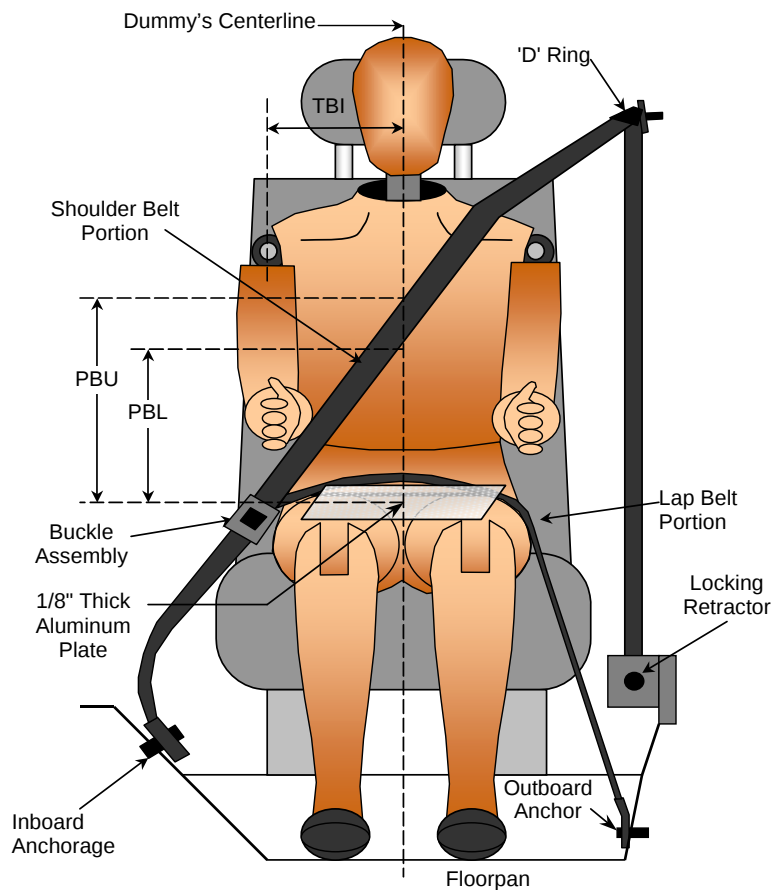
FRONT VIEW OF DUMMY

Code	Measurement Description	Driver S/N 036	Passenger S/N 634
		Length (mm)	
AD	Arm to Door	128	120
HD	H-Point to Door	169	178
HR	Head to Side Header	259	266
HS	Head to Side Window	390	364
KK	Knee to Knee	347	220
SHY	Striker to H-Point (Y Direction)	285	325
AA	Ankle to Ankle	340	170

DATA SHEET NO. 5 SEAT BELT POSITIONING DATA

Test Vehicle: 2013 Mazda CX-5 Sport All Wheel Drive 5-Dr SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5400
 Test Date: 07/05/2012



FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	375	330
PBL - Top surface of reference to belt lower edge	mm	310	245

BELT LENGTH DATA

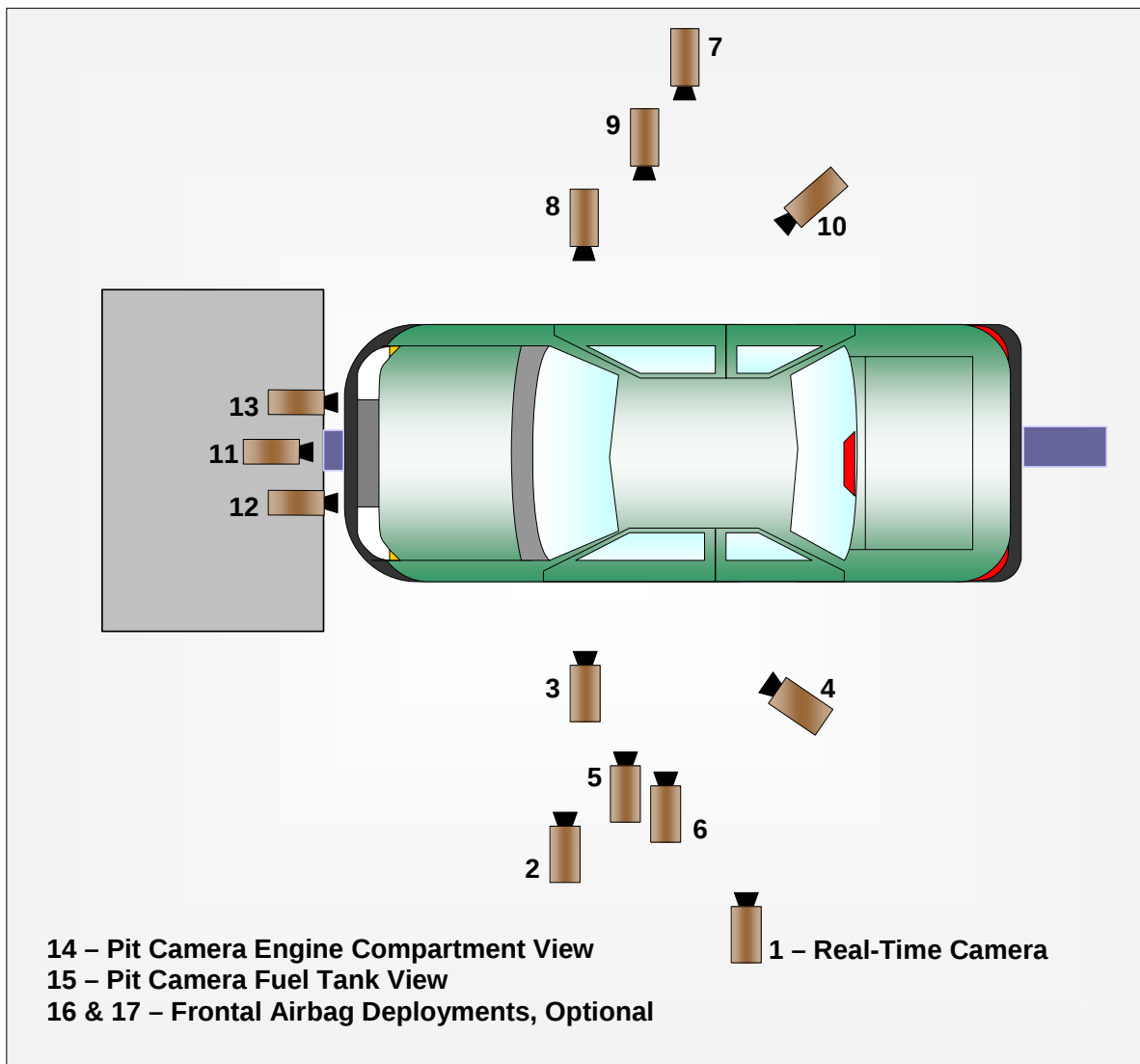
Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as measured on ATD	mm	915	990
Lap Belt Length as measured on ATD	mm	760	860
Remainder of belt on reel	mm	1605	1430
Total Belt Length for Continuous Webbing Systems	mm	3280	3280

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

Test Vehicle: 2013 Mazda CX-5 Sport All Wheel Drive 5-Dr SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5400
Test Date: 07/05/2012

CAMERA POSITIONS FOR FRONTAL IMPACTS



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

Test Vehicle: 2013 Mazda CX-5 Sport All Wheel Drive 5-Dr SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5400
 Test Date: 07/05/2012

CAMERA LOCATIONS

No.	Camera View	Coordinates (mm)			Lens (mm)	Speed (fps)
		X*	Y*	Z*		
1	Real-Time Left Overall					30
2	Driver Close-Up	1550	-6600	-1870	35	1000
3	Left Front Half	1090	-4800	-1060	24	1000
4	Left Angle	5710	-4890	-1960	50	1000
5	Steering Column - Top	530	-4950	-1240	24	1000
6	Steering Column - Bottom	510	-4900	-830	24	1000
7	Right Overall	2140	6330	-1320	20	1000
8	Passenger Close-Up	1740	6860	-1830	35	1000
9	Right Front Half	1260	5080	-1240	24	1000
10	Right Angle	5830	5010	-1950	50	1000
11	Windshield	-130	0	-2810	20	1000
12	Driver Windshield	250	-450	-2030	8.5	1000
13	Passenger Windshield	250	450	-2030	8.5	1000
14	Pit Front	1100	0	3150	24	1000
15	Pit Rear	3070	0	3150	24	1000
16	Onboard Driver Side (optional)					
17	Onboard Passenger Side (optional)					
18	Real-Time Pan View					30

***COORDINATES:**

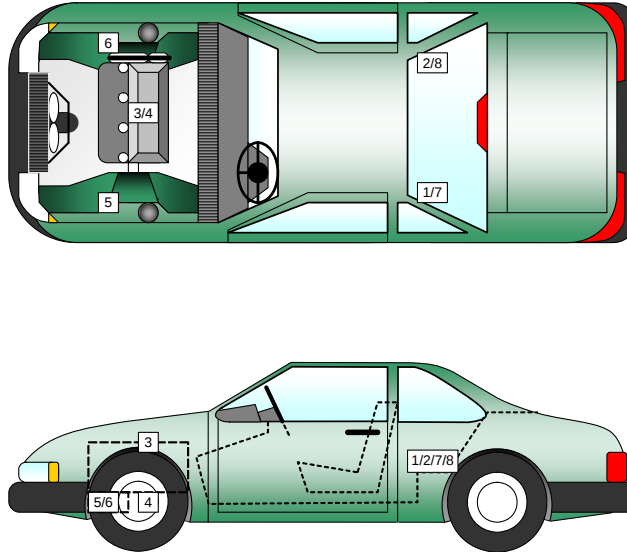
- +X = forward of impact plane
- +Y = right of monorail centerline
- +Z = below ground level

Cameras 16 & 17 were not used for this test.

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

Test Vehicle: 2013 Mazda CX-5 Sport All Wheel Drive 5-Dr SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5400
 Test Date: 07/05/2012



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Accelerometer – X Direction	1684	-400	-338
2	Right Rear Accelerometer – X Direction	1684	352	-338
3	Engine Top X	3645	0	-881
4	Engine Bottom X	3818	0	-350
5	Left Brake Caliper X	3735	-690	-280
6	Right Brake Caliper X	3735	690	-280
7	Left Rear Accelerometer Redundant – X Direction	1684	-400	-338
8	Right Rear Accelerometer Redundant – X Direction	1684	352	-338

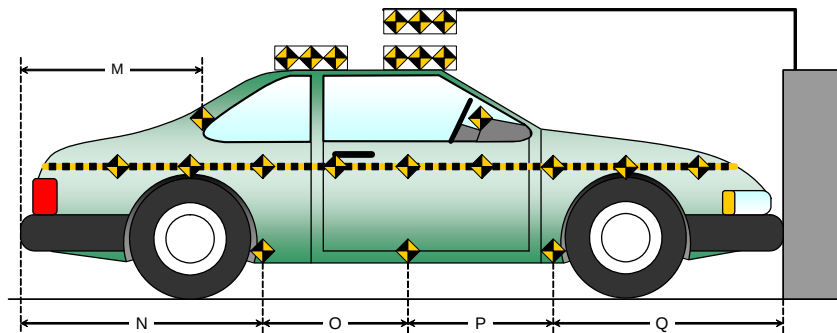
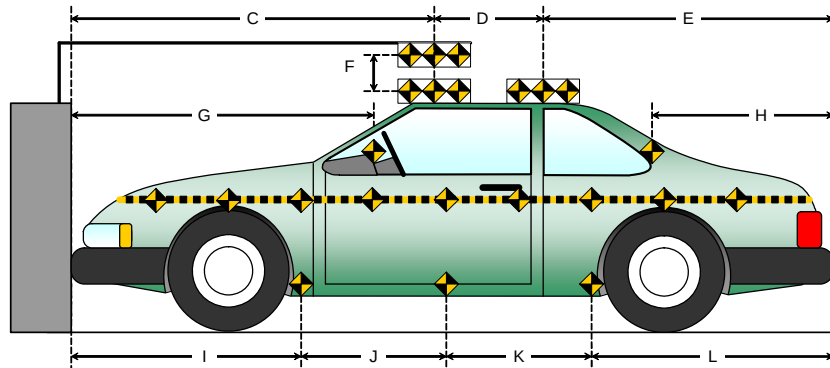
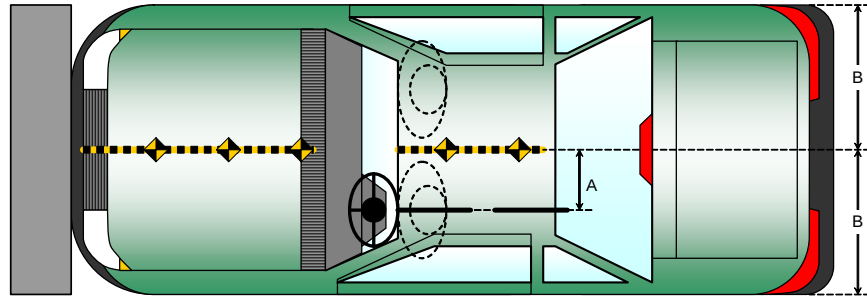
Reference Points: X - Rear Surface of Vehicle (+ forward)
 Y - Vehicle Centerline (+ to right)
 Z - Ground Plane (+ down)

DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2013 Mazda CX-5 Sport All Wheel Drive 5-Dr SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5400
 Test Date: 07/05/2012

Item	Value (mm)
A	375
B	920
C	2310
D	730
E	1505
F	178
G	
H	1181
I	1451
J	877
K	877
L	1340
M	1181
N	1340
O	877
P	877
Q	1451



DATA SHEET NO. 9
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2013 Mazda CX-5 Sport All Wheel Drive 5-Dr SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5400
 Test Date: 07/05/2012

Advanced Research Load Cell Barrier

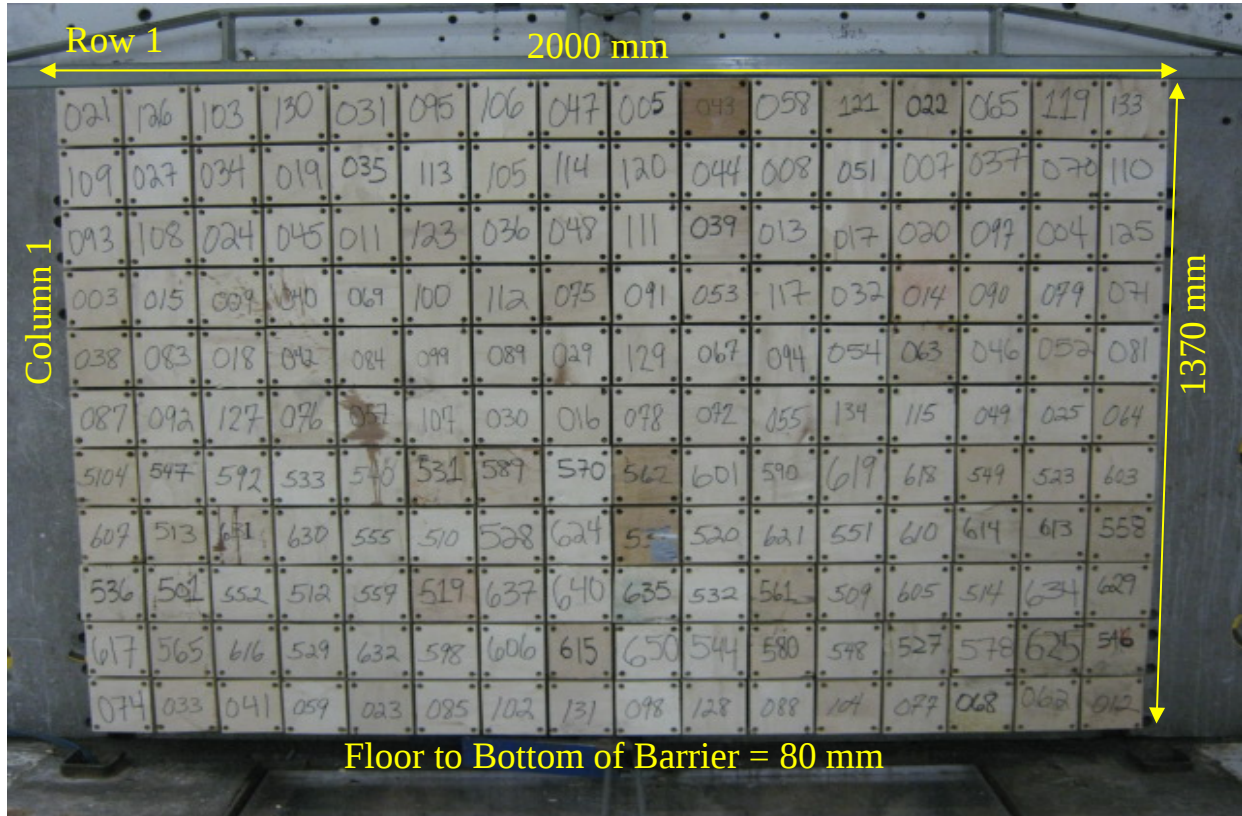


Photo for Reference Only

Centerline															
1-1	1-2	1-3	1-4	1-5	1-6	1-7	1-8	1-9	1-10	1-11	1-12	1-13	1-14	1-15	1-16
2-1	2-2	2-3	2-4	2-5	2-6	2-7	2-8	2-9	2-10	2-11	2-12	2-13	2-14	2-15	2-16
3-1	3-2	3-3	3-4	3-5	3-6	3-7	3-8	3-9	3-10	3-11	3-12	3-13	3-14	3-15	3-16
4-1	4-2	4-3	4-4	4-5	4-6	4-7	4-8	4-9	4-10	4-11	4-12	4-13	4-14	4-15	4-16
5-1	5-2	5-3	5-4	5-5	5-6	5-7	5-8	5-9	5-10	5-11	5-12	5-13	5-14	5-15	5-16
6-1	6-2	6-3	6-4	6-5	6-6	6-7	6-8	6-9	6-10	6-11	6-12	6-13	6-14	6-15	6-16
7-1	7-2	7-3	7-4	7-5	7-6	7-7	7-8	7-9	7-10	7-11	7-12	7-13	7-14	7-15	7-16
8-1	8-2	8-3	8-4	8-5	8-6	8-7	8-8	8-9	8-10	8-11	8-12	8-13	8-14	8-15	8-16
9-1	9-2	9-3	9-4	9-5	9-6	9-7	9-8	9-9	9-10	9-11	9-12	9-13	9-14	9-15	9-16
10-1	10-2	10-3	10-4	10-5	10-6	10-7	10-8	10-9	10-10	10-11	10-12	10-13	10-14	10-15	10-16
11-1	11-2	11-3	11-4	11-5	11-6	11-7	11-8	11-9	11-10	11-11	11-12	11-13	11-14	11-15	11-16

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: 2013 Mazda CX-5 Sport All Wheel Drive 5-Dr SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5400
Test Date: 07/05/2012

INSTRUMENTATION

Driver Dummy Data Channels	46
Passenger Dummy Data Channels	46
Vehicle Structure Accelerometers	8
Barrier Channels	128
Total	228

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: 2013 Mazda CX-5 Sport All Wheel Drive 5-Dr SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5400
Test Date: 07/05/2012

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

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

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	Cracked
Window Damage	None
Other Notable Effects	None

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	760
Center	mm	720
Right Side	mm	790
Average	mm	757

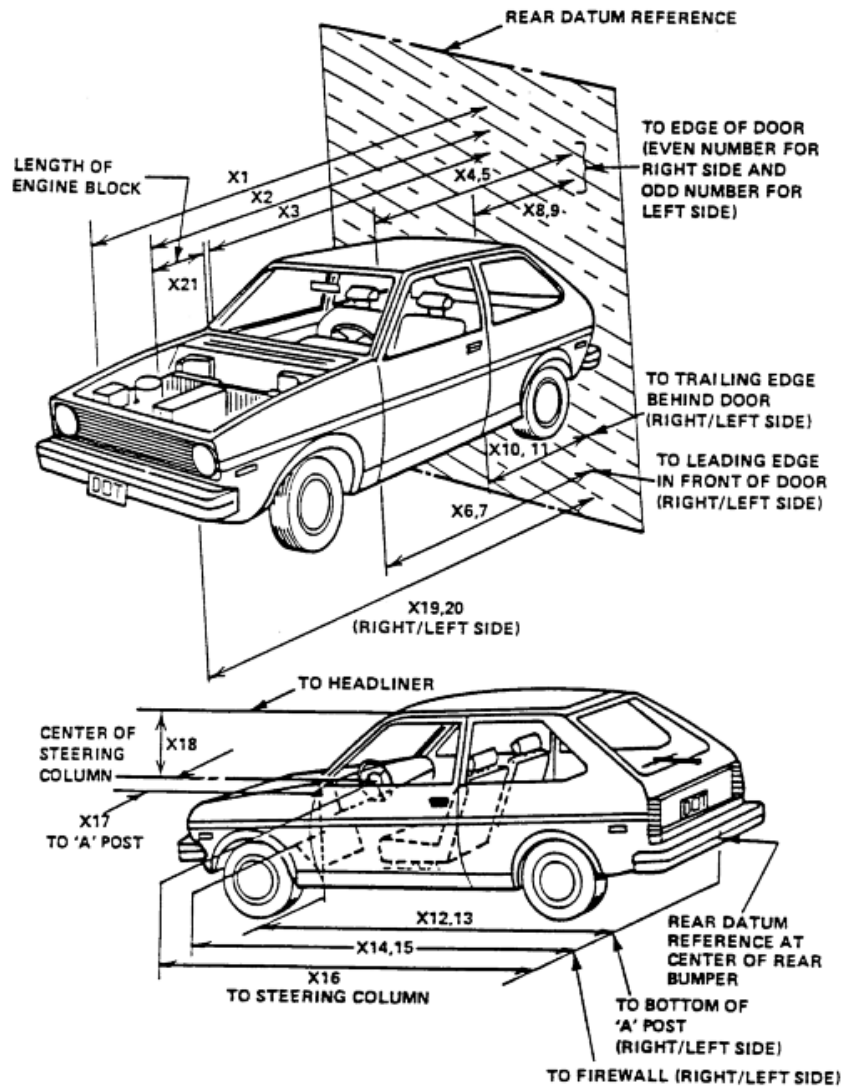
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Left Front (Driver) P1		Right Front (Passenger) P2	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	Yes	Yes	Yes
Curtain Side Airbag	Yes	No	Yes	No
Torso/Pelvis Side Airbag	Yes	No	Yes	No
Knee Airbag	No		No	
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes		Yes	
Other	No		No	

DATA SHEET NO. 12 VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2013 Mazda CX-5 Sport All Wheel Drive 5-Dr SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5400
 Test Date: 07/05/2012



DATA SHEET NO. 12 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2013 Mazda CX-5 Sport All Wheel Drive 5-Dr SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5400
 Test Date: 07/05/2012

RSOV (Rear Surface of Vehicle)

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	mm	4545	3998	547
2	RSOV to Front of Engine	mm	3865	3674	191
3	RSOV to Firewall	mm	3550	3550	0
4	RSOV to Upper Leading Edge of Right Door	mm	3024	3020	4
5	RSOV to Upper Leading Edge of Left Door	mm	3024	3024	0
6	RSOV to Lower Leading Edge of Right Door	mm	3030	3026	4
7	RSOV to Lower Leading Edge of Left Door	mm	3031	3031	0
8	RSOV to Upper Trailing Edge of Right Door	mm	1948	1946	2
9	RSOV to Upper Trailing Edge of Left Door	mm	1948	1948	0
10	RSOV to Lower Trailing Edge of Right Door	mm	1985	1980	5
11	RSOV to Lower Trailing Edge of Left Door	mm	1985	1985	0
12	RSOV to Bottom of "A" Post of Right Side	mm	3050	3050	0
13	RSOV to Bottom of "A" Post of Left Side	mm	3048	3048	0
14	RSOV to Firewall, Right Side	mm	3470	3460	10
15	RSOV to Firewall, Left Side	mm	3510	3480	30
16	RSOV to Steering Column	mm	2595	2630	-35
17	Center of Steering Column to "A" Post	mm	400	410	-10
18	Center of Steering Column to Headliner	mm	465	486	-21
19	RSOV to Right Side of Front Bumper	mm	4395	3952	443
20	RSOV to Left Side of Front Bumper	mm	4395	3970	425
21	Length of Engine Block	mm	432	432	0
RD	RSOV to Right Side of Dash Panel	mm	2800	2806	-6
CD	RSOV to Center of Dash Panel	mm	2858	2858	0
LD	RSOV to Left Side of Dash Panel	mm	2810	2817	-7

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2013 Mazda CX-5 Sport All Wheel Drive 5-Dr SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5400
Test Date: 07/05/2012

VEHICLE INFORMATION

VIN: JM3KE4BE7D0120336 Wheelbase (mm): 2698
Vehicle Size Category: MPV Test Weight (kg): 1698.3

ACCELEROMETER DATA

Accelerometer Locations: As per measurements on Page 15

Cal. Procedure/Interval: MGA procedure / 6 month

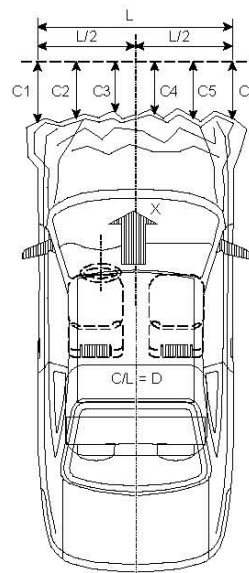
Integration Algorithm: Trapezoidal

Linearity: > 99%

Impact Velocity (km/h): 56.4

Velocity Change (km/h): 61.7

Time of Separation (msec): 107.9



CRUSH PROFILE

Collision Deformation Classification: Frontal

Midpoint of Damage: Centerline

Damage Region Length (mm): 1108

Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4395	3970	425
C2	Crush zone 2 at left side	mm	4474	3993	481
C3	Crush zone 3 at left side	mm	4490	4000	490
C4	Crush zone 4 at right side	mm	4490	3985	505
C5	Crush zone 5 at right side	mm	4474	3960	514
C6	Crush zone 6 at right side	mm	4395	3952	443
L	C1 TO C6	mm	1108	1095	13

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2013 Mazda CX-5 Sport All Wheel Drive 5-Dr SUV
Test Program: NCAP Frontal Barrier Impact Test

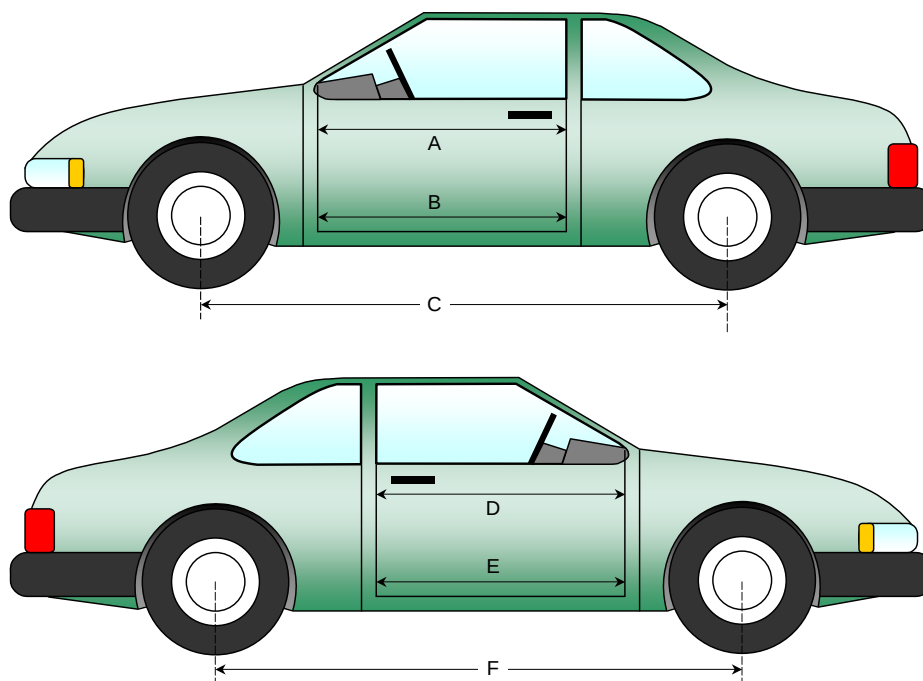
NHTSA No.: MD5400
Test Date: 07/05/2012

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	984	984	0
B	Left Side Lower	mm	899	899	0
D	Right Side Upper	mm	984	984	0
E	Right Side Lower	mm	899	899	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2698	2642	56
F	Right Side Wheelbase	mm	2698	2662	36



DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

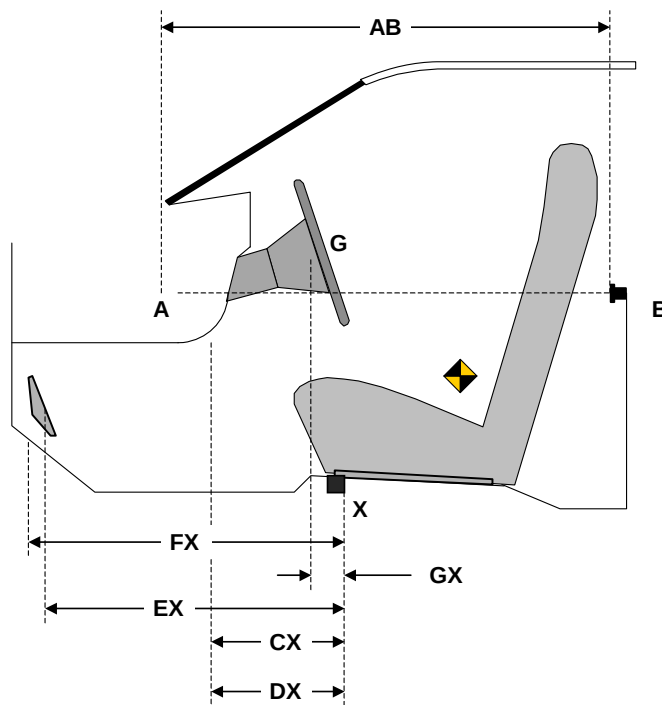
Test Vehicle: 2013 Mazda CX-5 Sport All Wheel Drive 5-Dr SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5400
 Test Date: 07/05/2012

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	812	810	2
CX	Left Knee Bolster to X	mm	289	310	-21
DX	Right Knee Bolster to X	mm	281	298	-17
EX	Brake Pedal to X	mm	520	546	-26
FX	Foot Rest to X	mm	559	572	-13
GX	Center of Steering Column Wheel Hub to X	mm	46	140	-94

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: 2013 Mazda CX-5 Sport All Wheel Drive 5-Dr SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5400
 Test Date: 07/05/2012

Windshield Mounting Details:

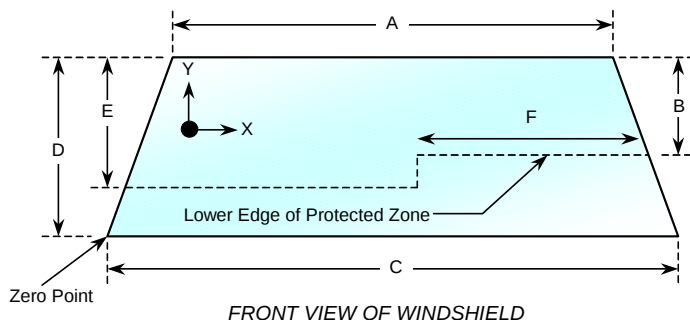
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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: 21.7°C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2245	2245	100
Right Side	2245	2245	100
Total	4490	4490	100



Item	Units	Value
A	mm	1248
B	mm	527
C	mm	1512
D	mm	865
E	mm	560
F	mm	472

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

SUMMARY OF FMVSS 212, FMVSS 219 (PARTIAL), AND 301 DATA

Test Vehicle: 2013 Mazda CX-5 Sport All Wheel Drive 5-Dr SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5400
Test Date: 07/05/2012

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21.7°C Test Time: 10:25 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

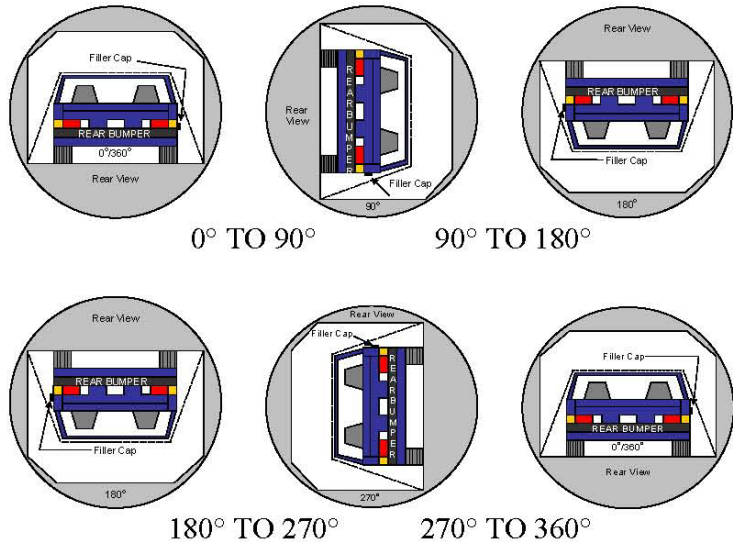
DATA SHEET NO. 16

FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2013 Mazda CX-5 Sport All Wheel Drive 5-Dr SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5400
 Test Date: 07/05/2012

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°	116	300	416
90° to 180°	112	300	412
180° to 270°	103	300	403
270° to 360°	111	300	411

FMVSS 301 SPILLAGE TABLE (units in ounces)

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

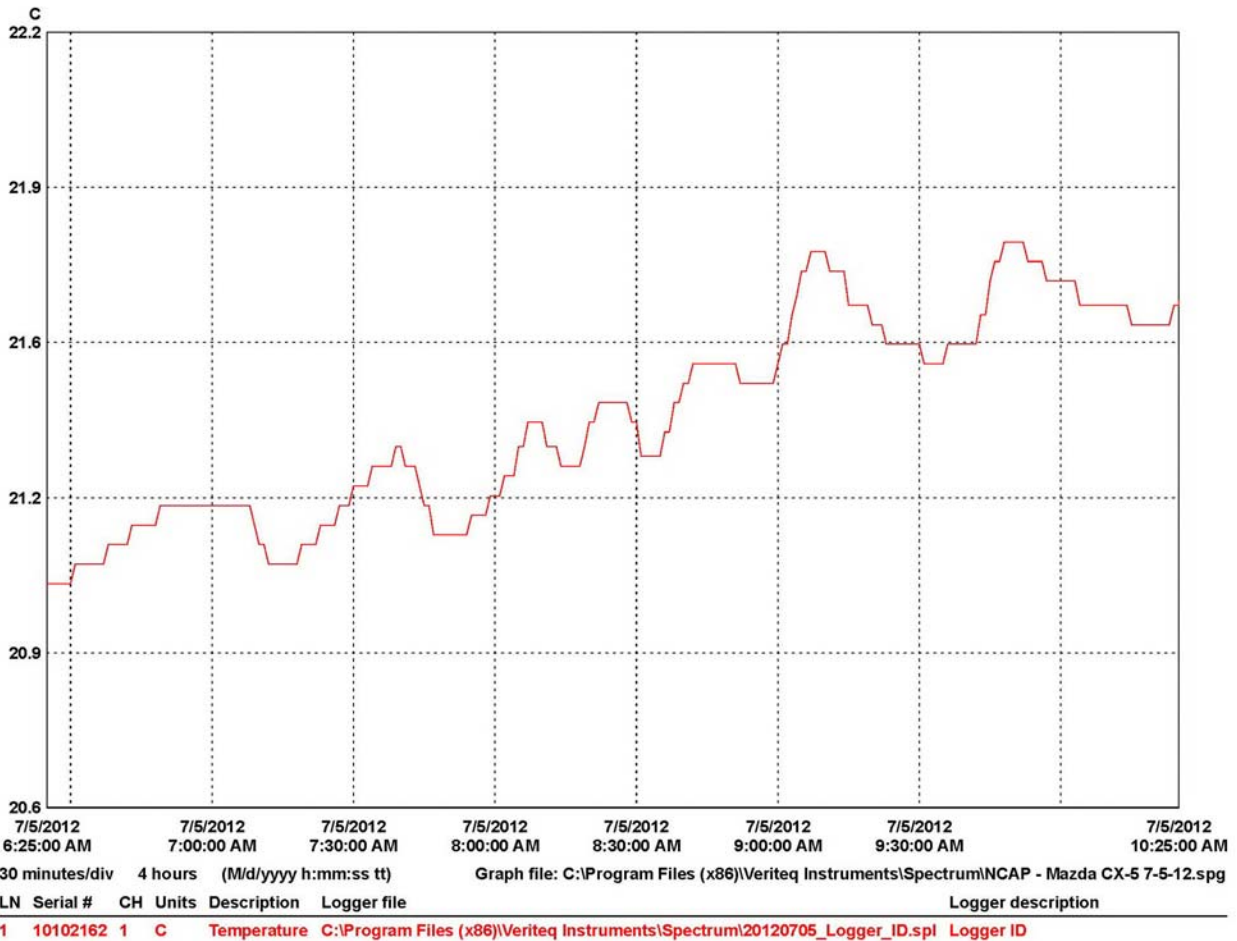
SOLVENT SPILLAGE LOCATION TABLE

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

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

Test Vehicle: 2013 Mazda CX-5 Sport All Wheel Drive 5-Dr SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5400
 Test Date: 07/05/2012



APPENDIX A
PHOTOGRAPHS

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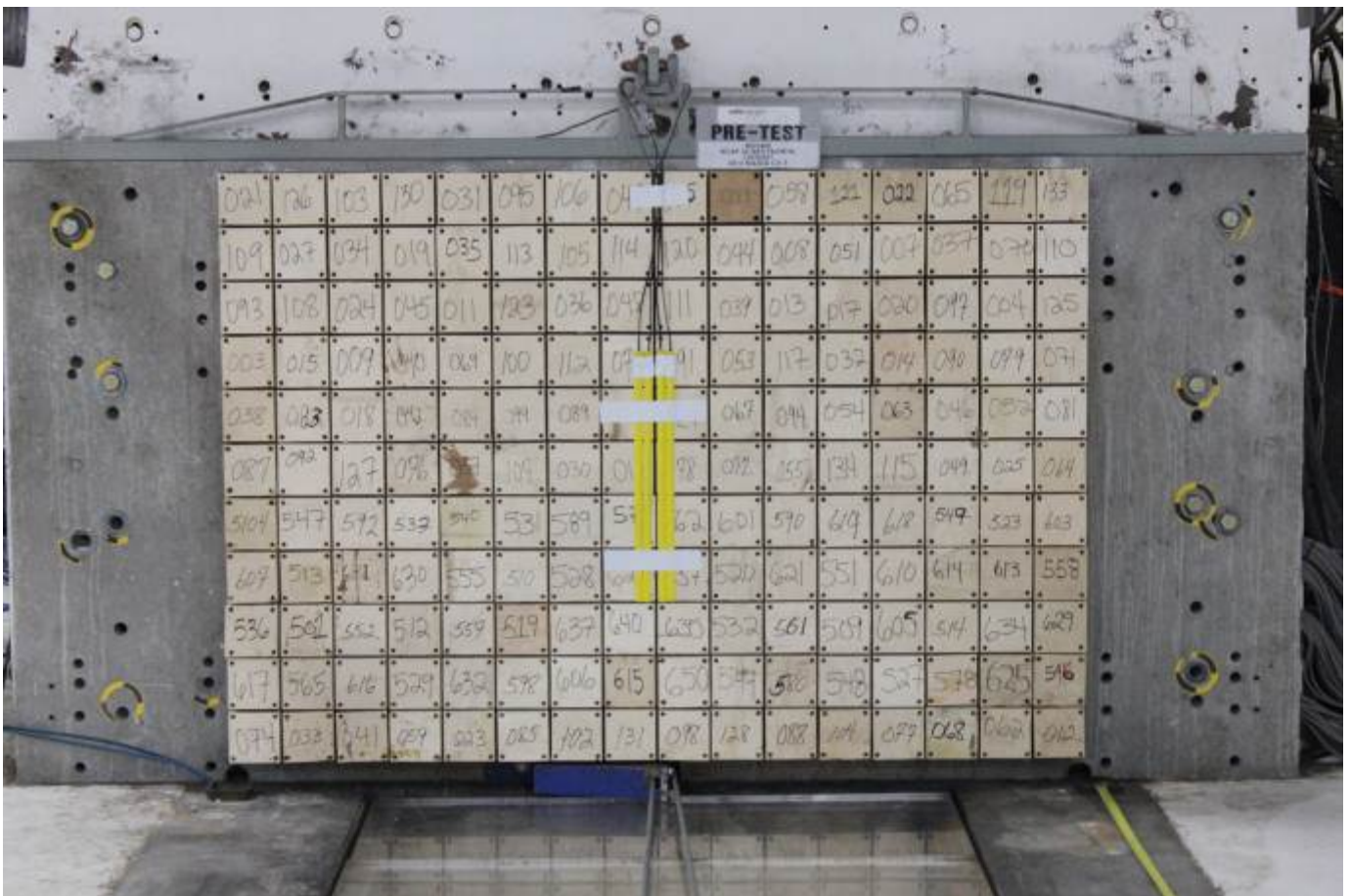
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Load Cell Location



Load Cell Wall



Manufacturer's Label



Tire Placard



2013 Mazda CX-5 Sport 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



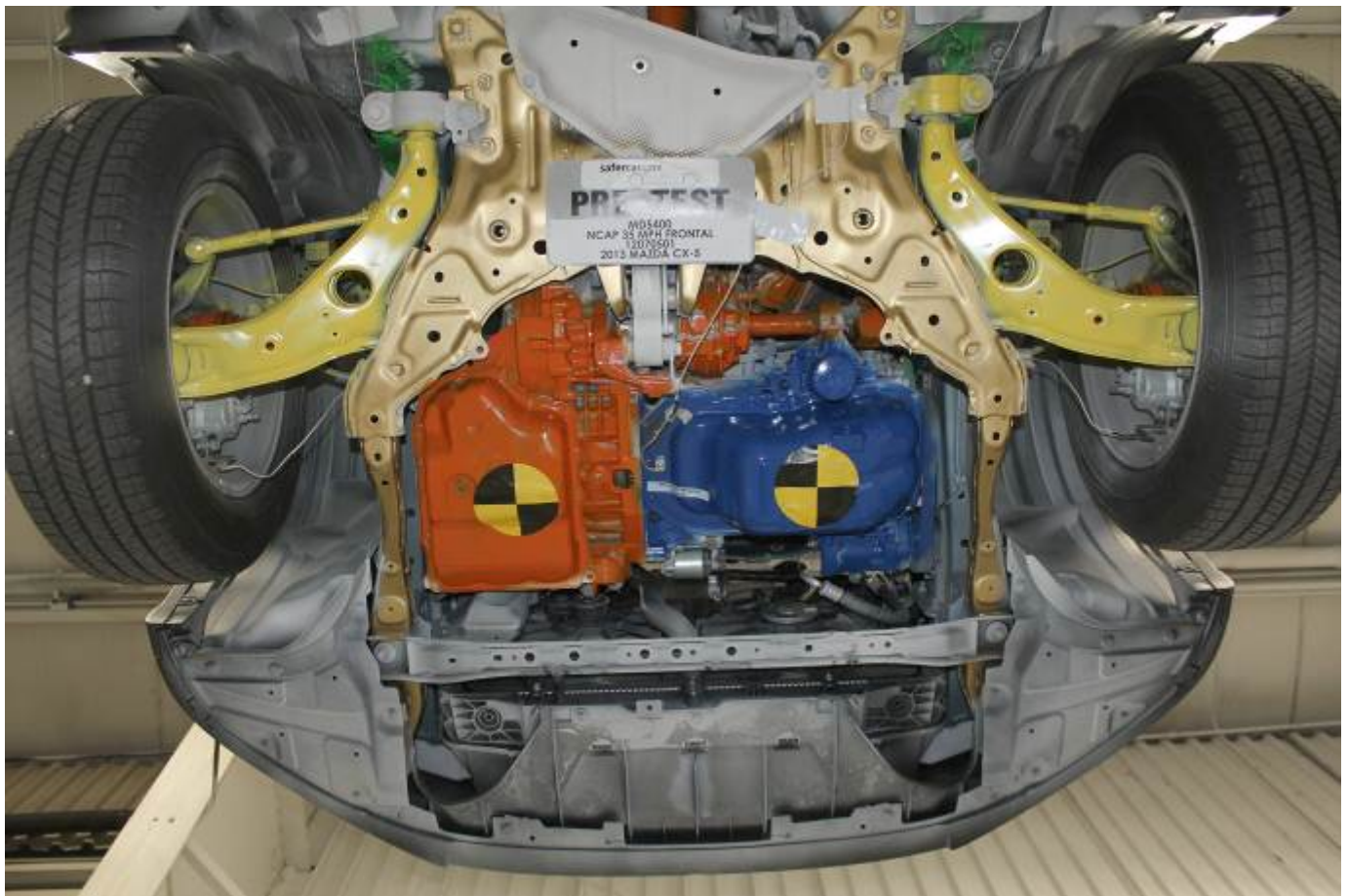
Post-Test Engine Compartment View



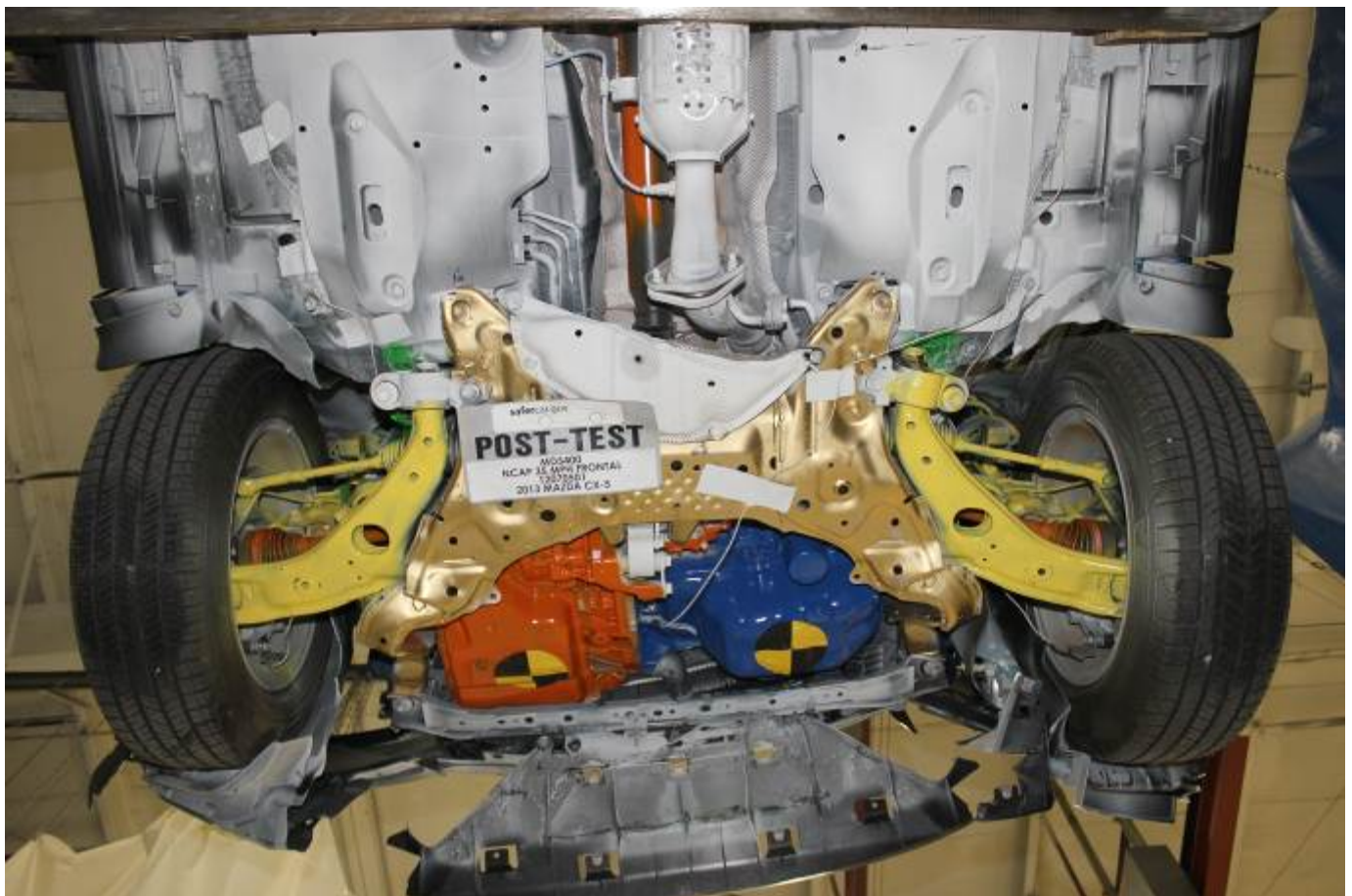
Pre-Test Fuel Filler Cap View



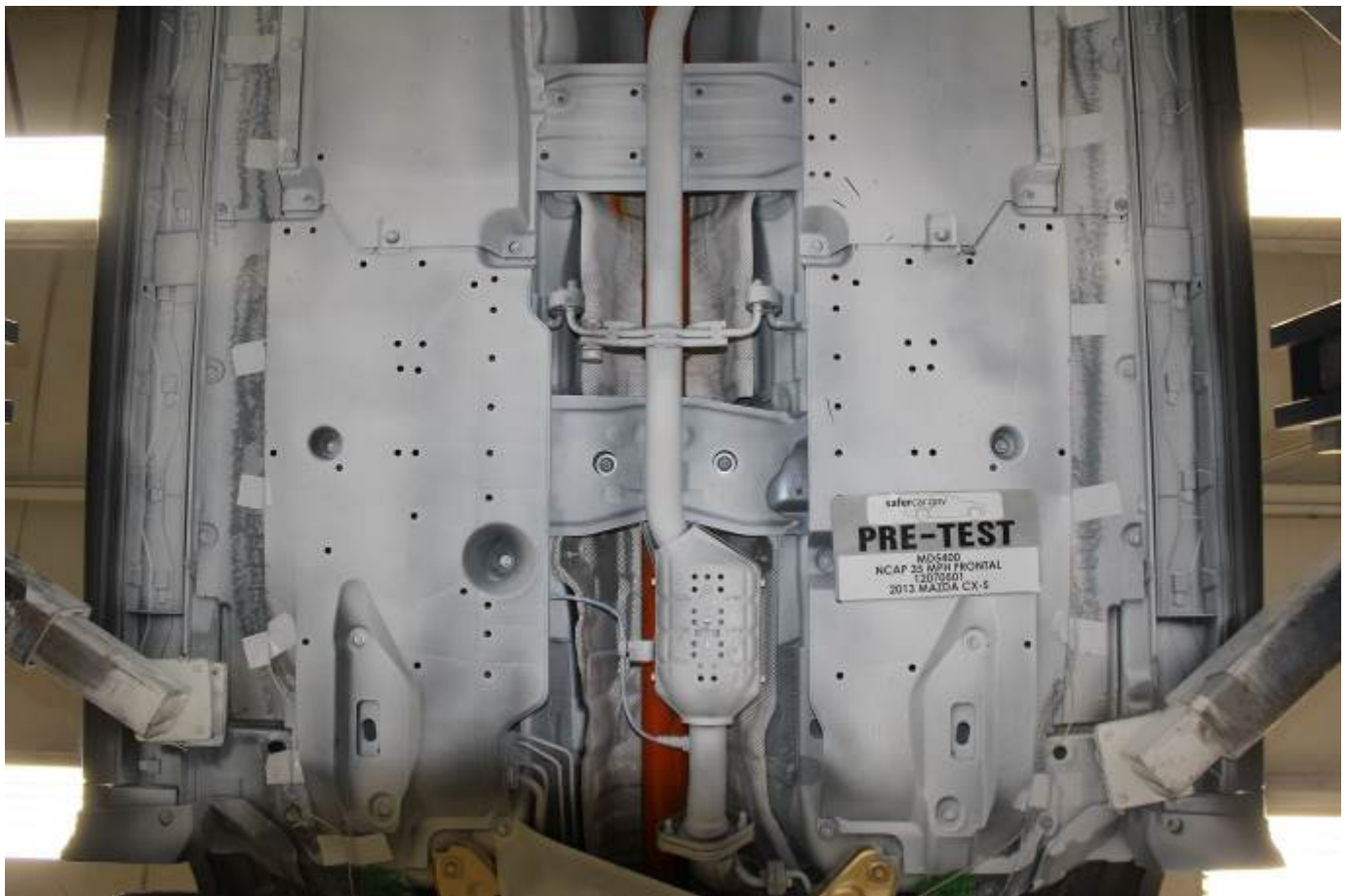
Post-Test Fuel Filler Cap View



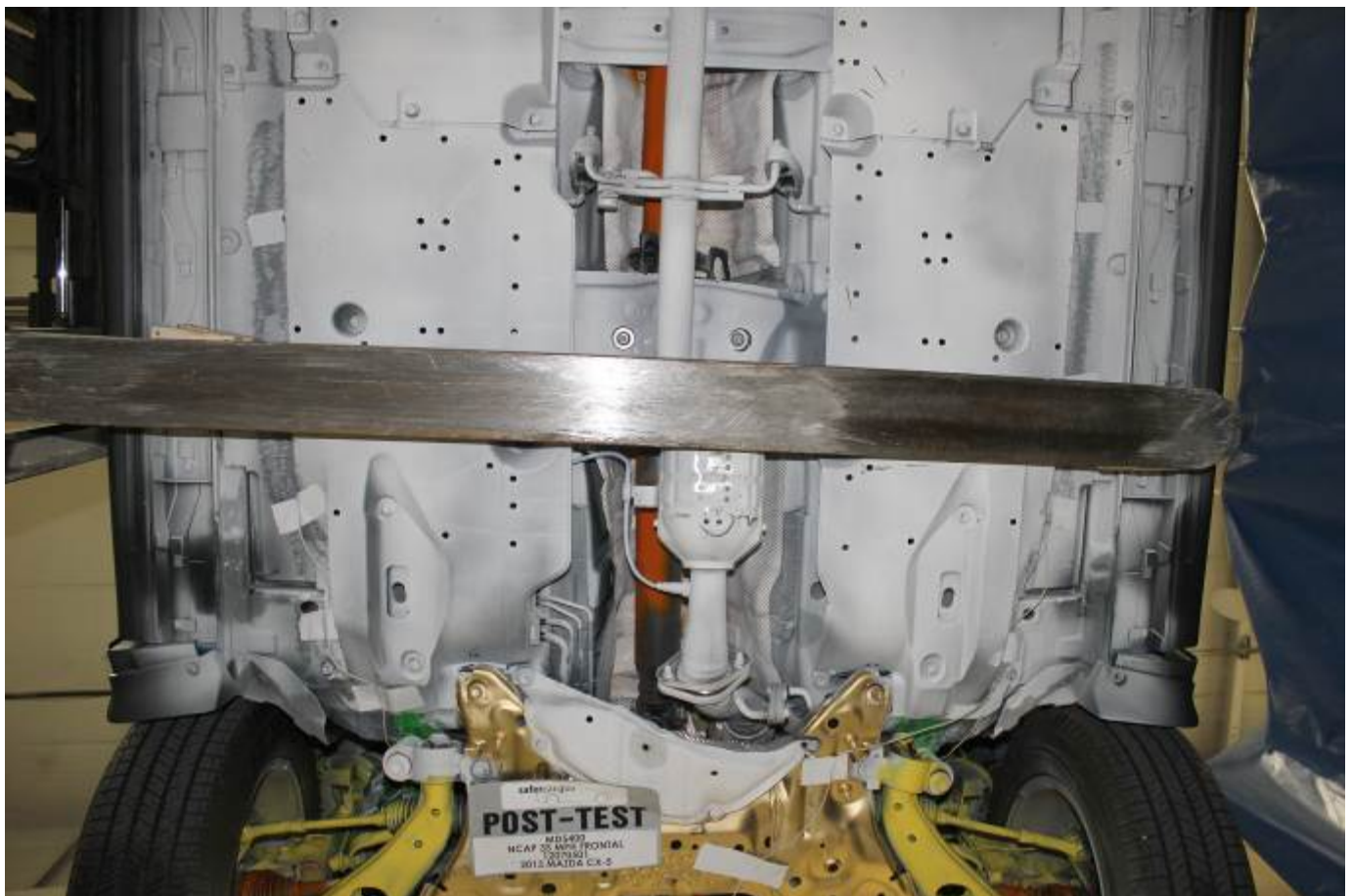
Pre-Test Front Underbody View



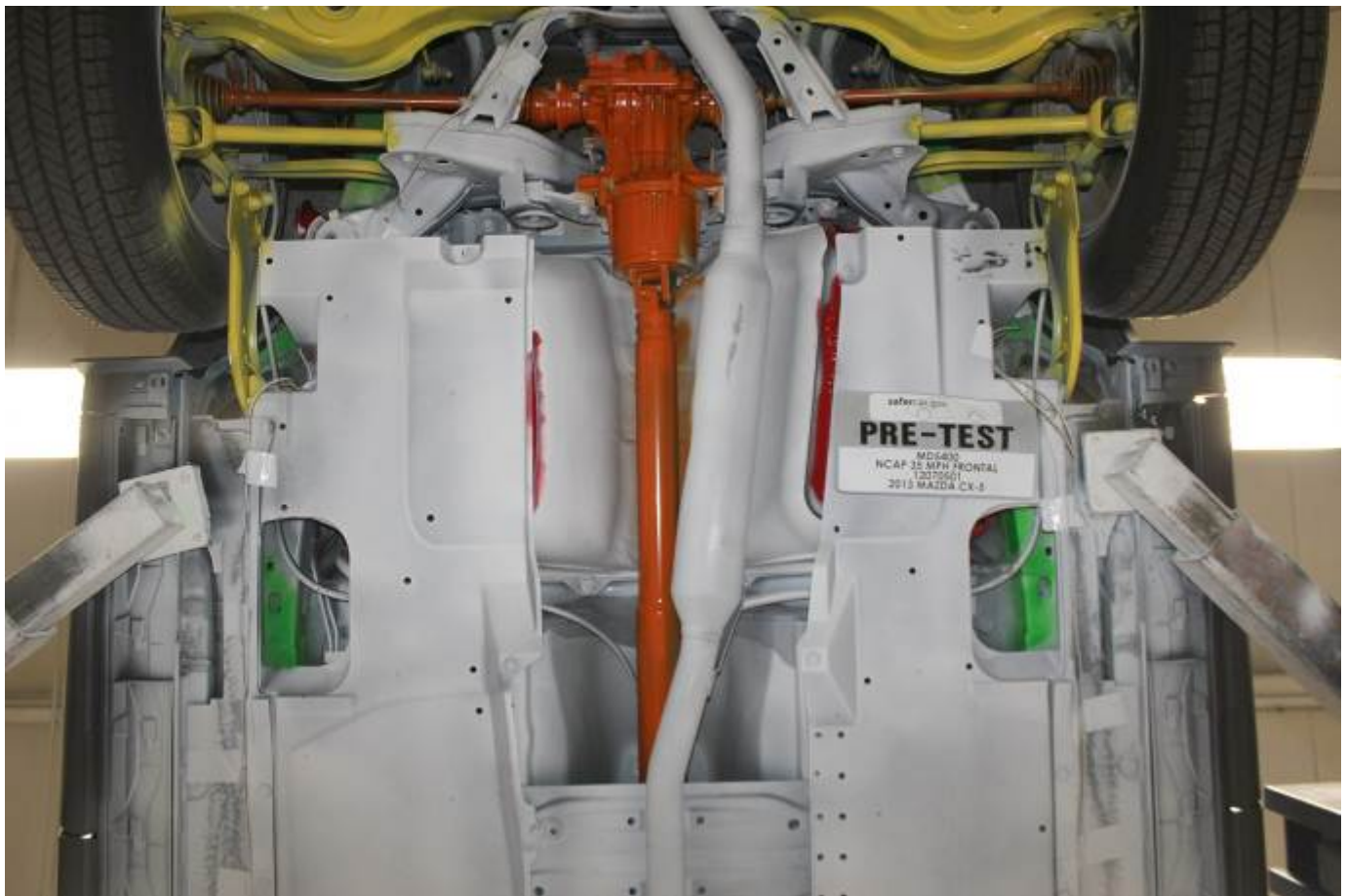
Post-Test Front Underbody View



Pre-Test Mid Front Underbody View



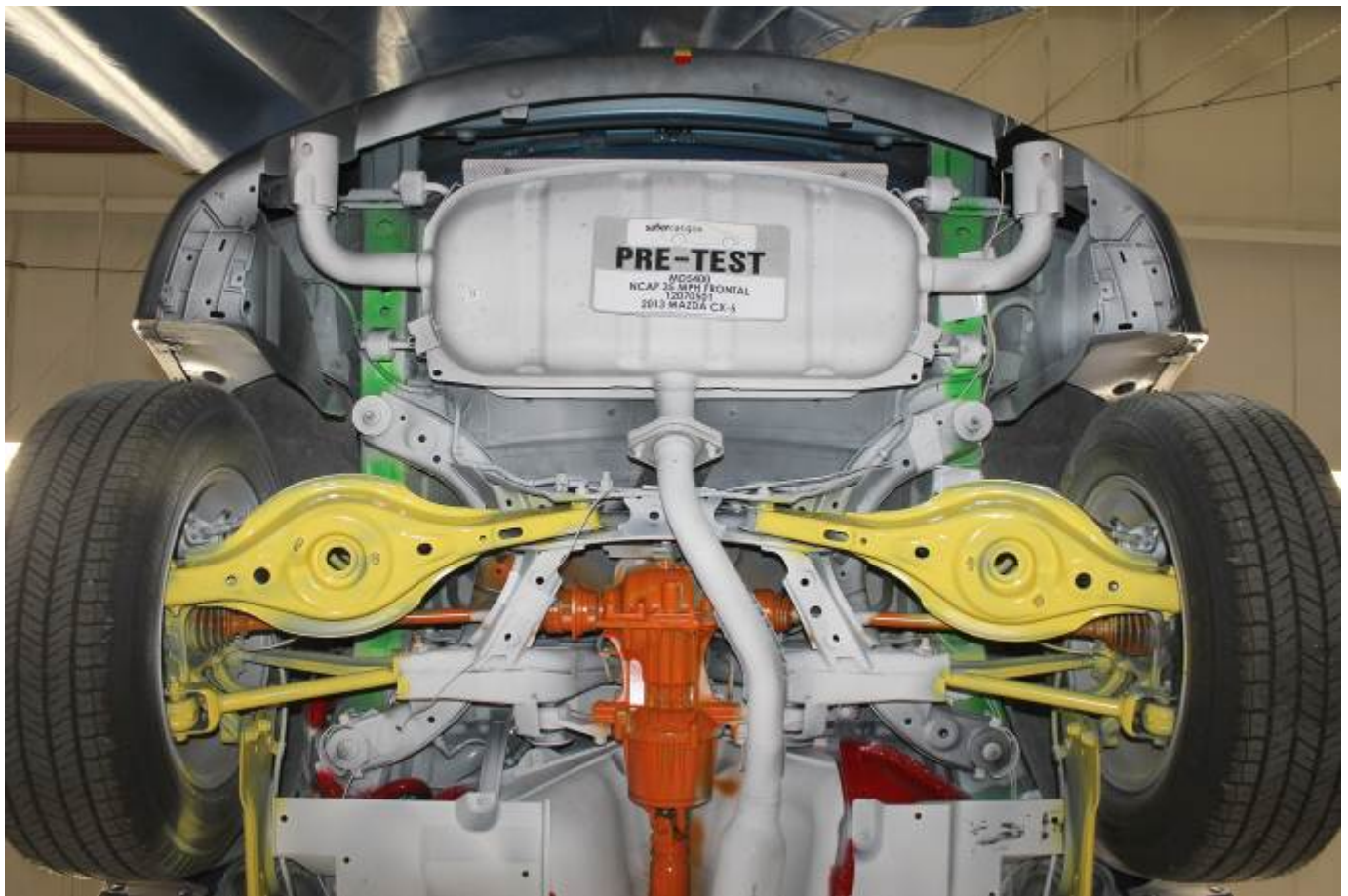
Post-Test Mid Front Underbody View



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 Bolster



Post-Test Driver Dummy Contact with Steering Column



Pre-Test View of the Steering Wheel



Post-Test View of the Steering Wheel



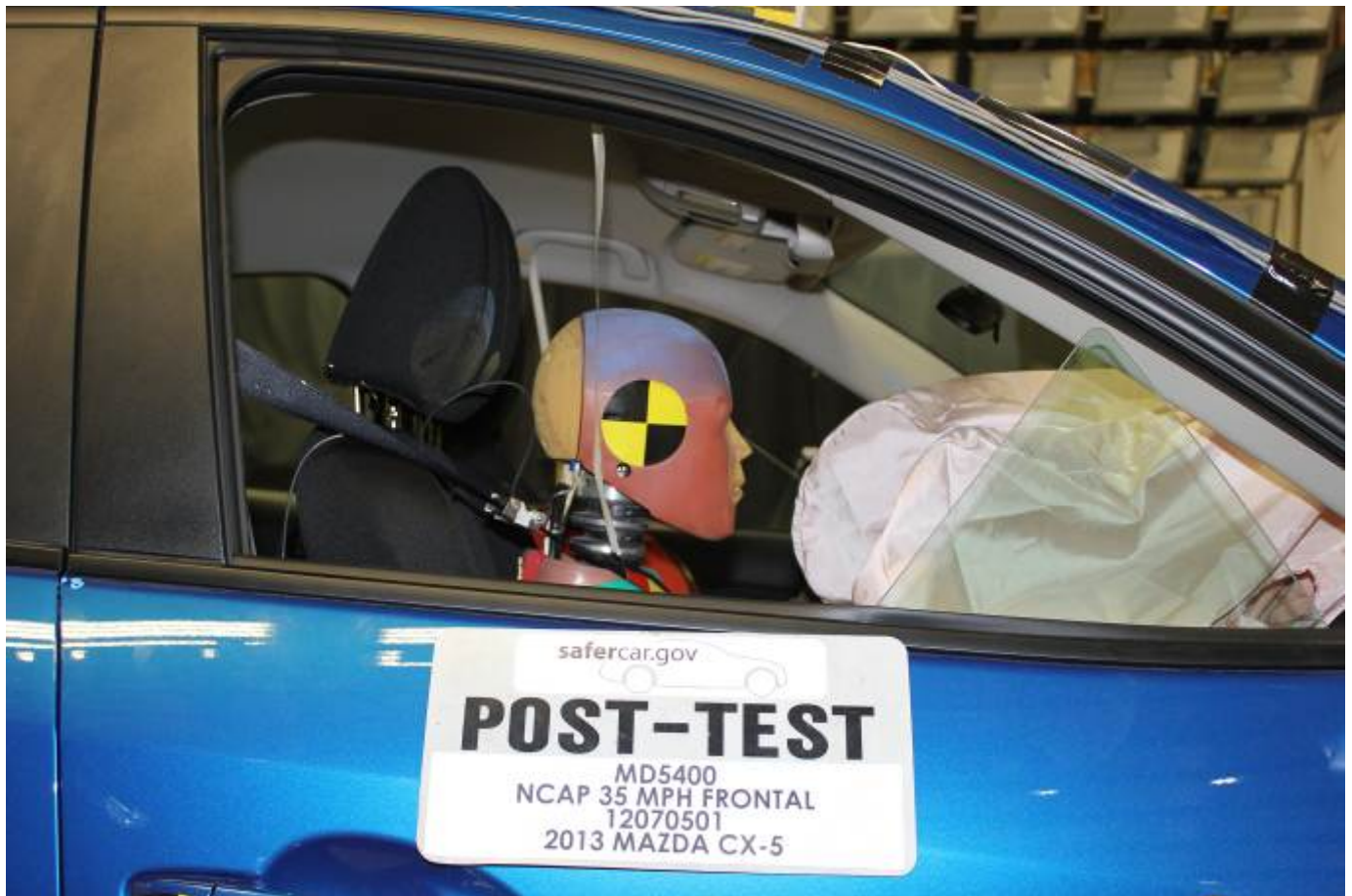
Pre-Test Passenger Dummy Front View



Post-Test Passenger Dummy Front View



Pre-Test Passenger Dummy Window View



Post-Test Passenger Dummy Window View



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



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



Pre-Test Passenger's Seat Fore-Aft Markings



Post-Test Passenger's Seat Fore-Aft Markings



Pre-Test View of Belt Anchorage for Passenger Dummy



Post-Test View of Belt Anchorage for Passenger Dummy



Pre-Test Passenger Dummy Feet



Post-Test Passenger Dummy Feet



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



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



Pre-Test Passenger's Side Floorpan



Post-Test Passenger's Side Floorpan



Post-Test Passenger Dummy Contact with Airbag



Post-Test Passenger Dummy Contact with Headrest



Post-Test Passenger Dummy Contact with Glove Box



Ballast Installed in Vehicle

PHOTOGRAPH NOT APPLICABLE

Post-Test Stoddard Solvent Spillage Location View



Post-Test Speed Trap Read-Out



Vehicle at 0° on Static Rollover Device



Vehicle at 90° on Static Rollover Device



Vehicle at 180° on Static Rollover Device



Vehicle at 270° on Static Rollover Device



Vehicle at 360° on Static Rollover Device



2013 Mazda CX-5 Sport Frontal Impact Event



Scan for Vehicle Info and offers



2013 CX-5

Model: 2013 CX-5 SPORT ALL WHEEL DRIVE
Exterior Color: SKY BLUE MC
Interior Color: BLACK

Fuel Economy and Environment

Fuel Economy

28 MPG combined city/hwy
25 city
31 highway
3.6 gallons per 100 miles

You save \$2,100 in fuel costs over 5 years compared to the average new vehicle.

Annual fuel cost \$1,900

Fuel Economy & Greenhouse Gas Rating

7 (Best)

Smog Rating

5 (Best)

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	Not Rated
	Passenger	Not Rated
Side Crash	Front seat	Not Rated
	Rear seat	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

PARTS CONTENT INFORMATION:

FOR VEHICLES IN THIS CATEGORY:
U.S./CANADIAN PARTS CONTENT: 5%
MAJOR SOURCES OF FOREIGN PARTS CONTENT: JAPAN 95%

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

FOR THIS VEHICLE:
FINAL ASSEMBLY POINT: MEXICO-EMM, JAPAN
COUNTRY OF ORIGIN: ENGINE: JAPAN
TRANSMISSION: JAPAN

STANDARD EQUIPMENT

ENGINE/MECHANICAL FEATURES

- SKYACTIV-G 2.5L ENGINE
- SKYACTIV-DRIVE 6-SPEED SPORT AT
- 135 HORSEPOWER, 155 LB-FT TORQUE
- ALL-WHEEL DRIVE

EXTERIOR FEATURES

- 17-INCH ALLOY WHEELS
- P225/65 R17 ALL-SEASON TYRES
- VARIABLE INTERMITTENT WIPERS
- FIXED-INTERMITTENT REAR WIPER
- POWER MIRROR'S TURN LAMPS

INTERIOR FEATURES

- 8-PASSENGER SEATING
- TILT & TELESCOPIC STEERING COLUMN
- STEERING WHEEL W/ AUDIO/CRUISE CONTROLS
- POWER AUTOMATIC DOOR LOCKS
- POWER WINDOWS W/ DRIVER ONE-TOUCH
- CLOTH TRIMMED SPORT SEATS
- CARPETED FLOOR MATS

SAFETY AND SECURITY FEATURES

- 30-MONTH/50,000 MILE "BUMPER-TO-BUMPER" WARRANTY
- 50-MONTH/100,000 MILE POWERTRAIN WARRANTY
- 24-HOUR ROADSIDE ASSISTANCE
- ANTI-LOCK BRAKE SYSTEM (ABS) WITH EBD & BRAKE ASSIST
- 5-PASSENGER 3-POINT SAFETY BELTS
- LATCH CHILD SAFETY SEAT ANCHORS

OPTIONAL EQUIPMENT

• BLUETOOTH AUDIO PACKAGE • BLUETOOTH • BLUETOOTH STR WHEEL SWITCH	• COLOR MONITOR • 10 RADIO (UPGRADED SYSTEM)	\$400
Total Vehicle and Options		\$23,145
Delivery, Processing and Handling Fee		\$785
Total MSRP		\$24,540

MSRP \$23,345

fuel economy.gov
Calculate personalized estimates and compare vehicles

SOLD TO: 66249
BROWN MAZDA
5825 WEST CENTRAL AVENUE
TOLEDO, OH 43015

SHIP TO: 66249 LP
BROWN MAZDA
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TOLEDO, OH 43015

JM3KE4BE7D0120336
MAZDAUSA.COM
CX5-0P-3A-4359AG-1A-1A-20130115

Monroney Label Photograph

APPENDIX B
DUMMY RESPONSE DATA TRACES

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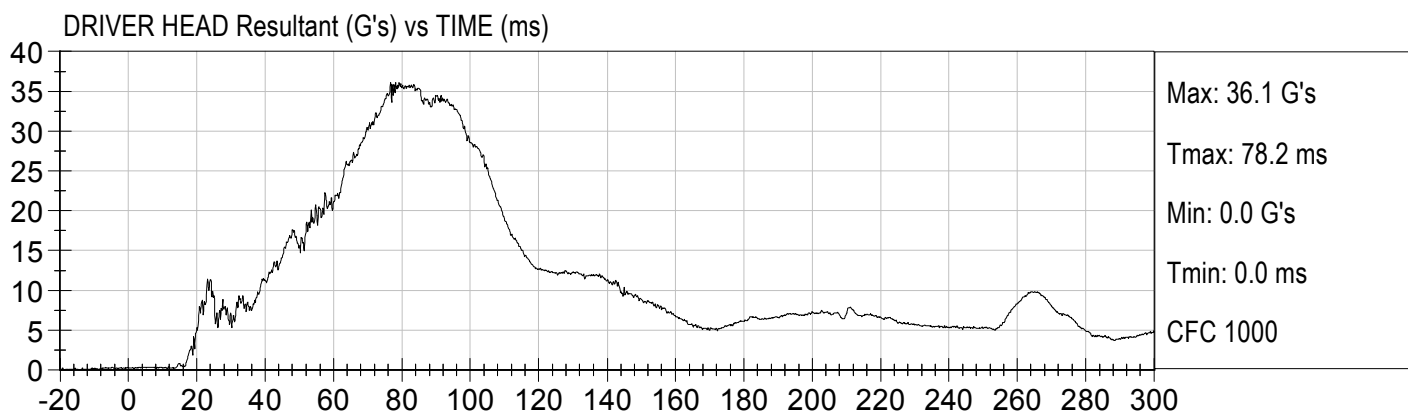
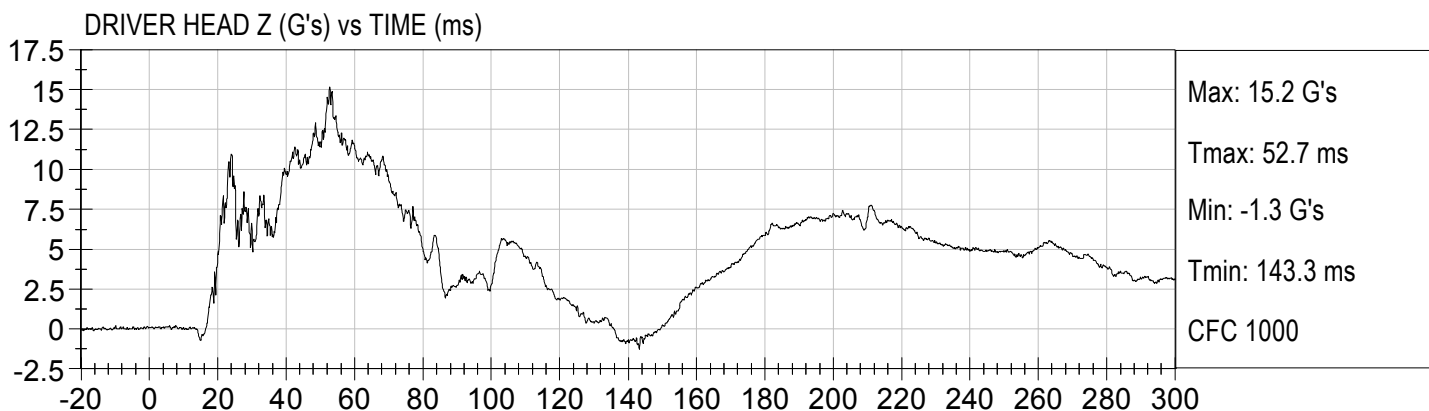
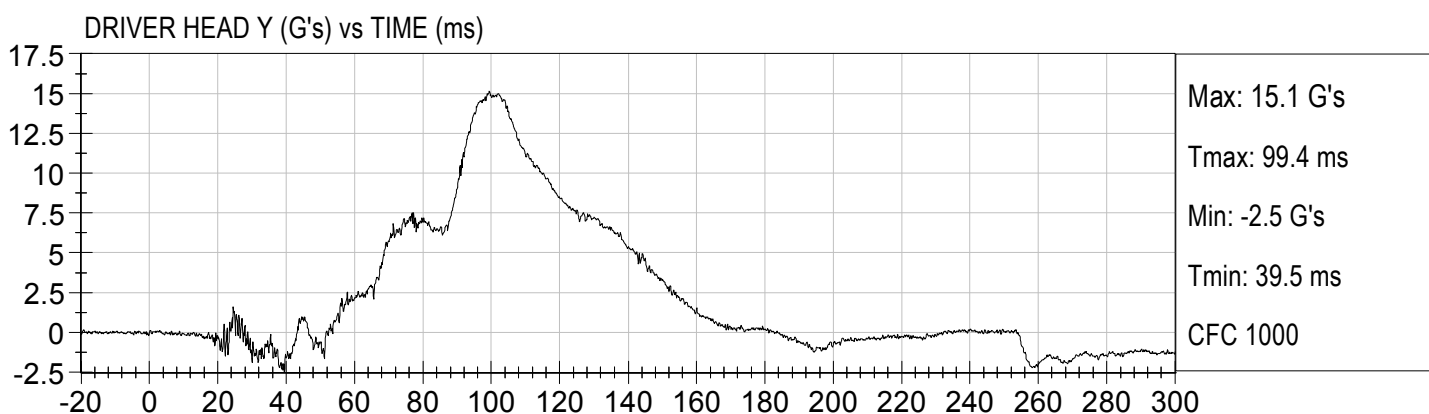
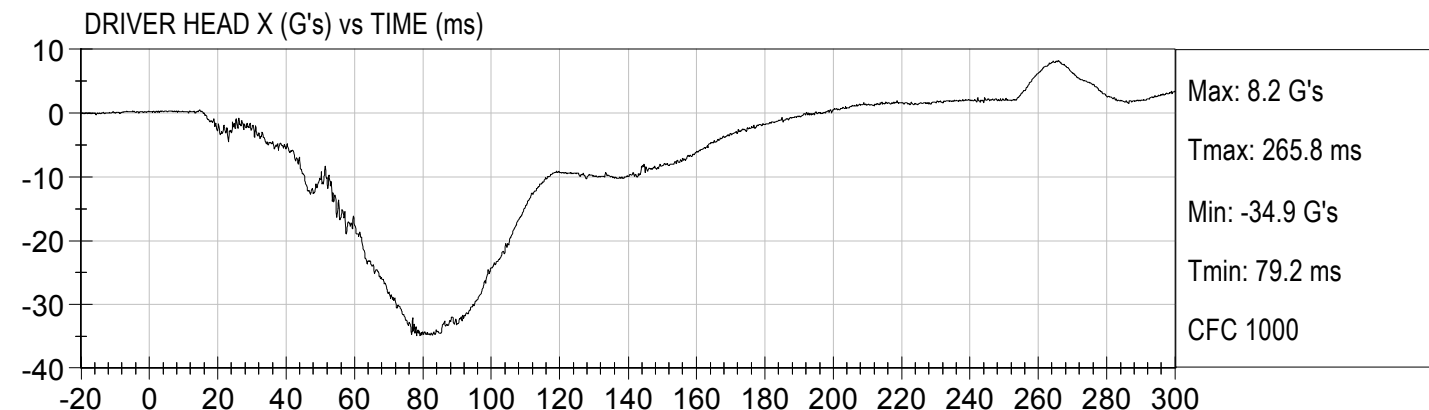
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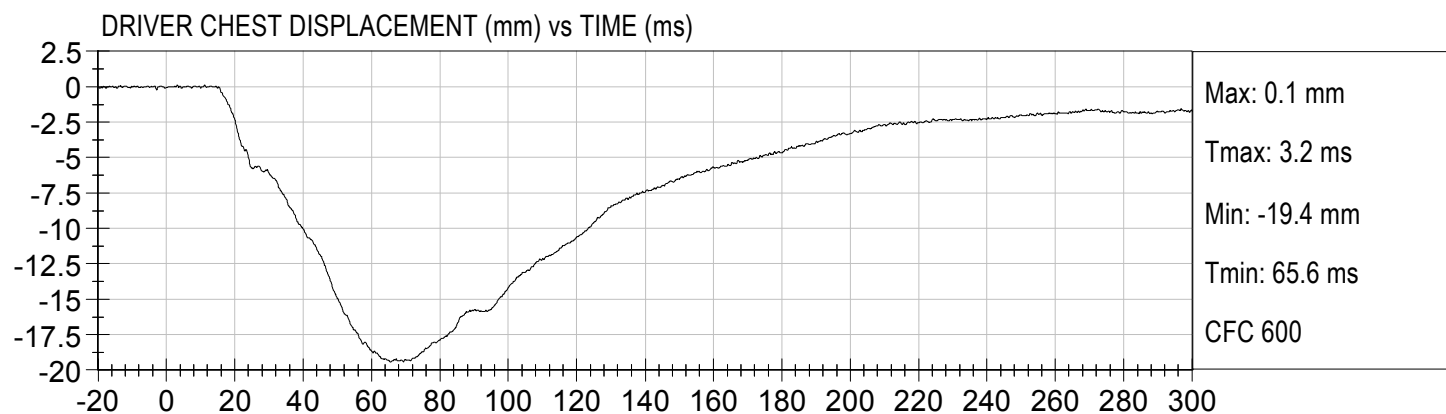
The following additional dummy and vehicle response data can be found in the R&D section of the NHTSA website at www.nhtsa.dot.gov

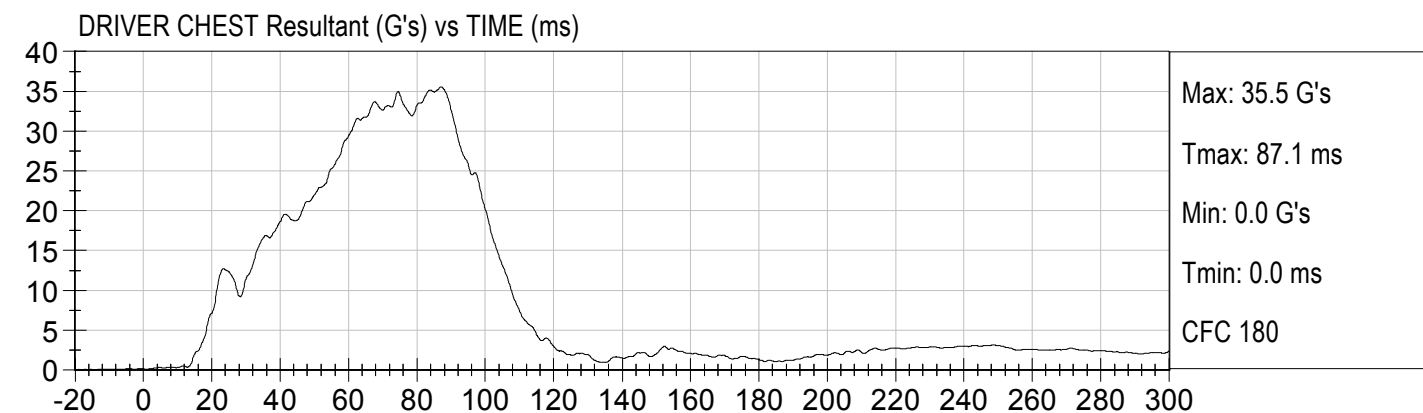
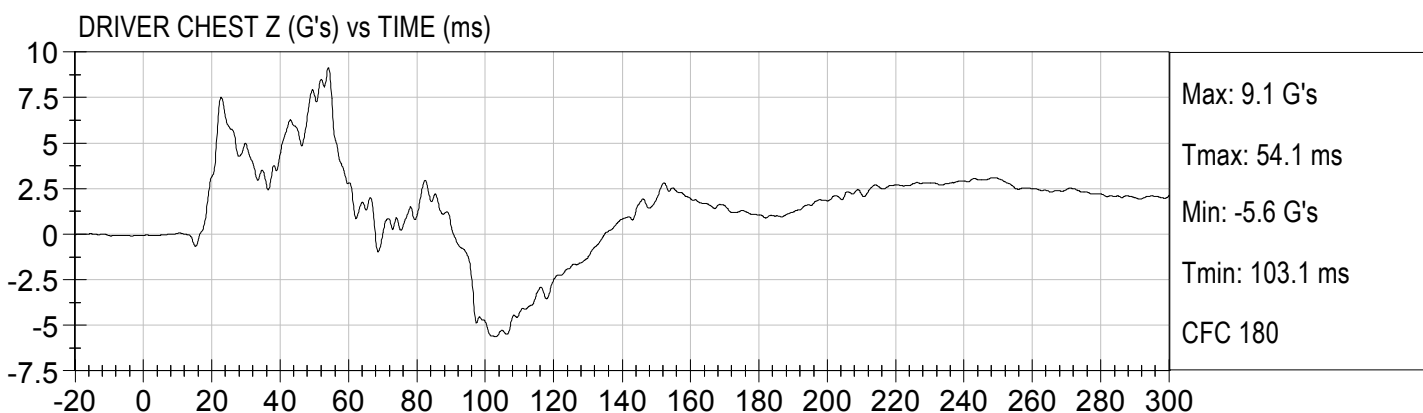
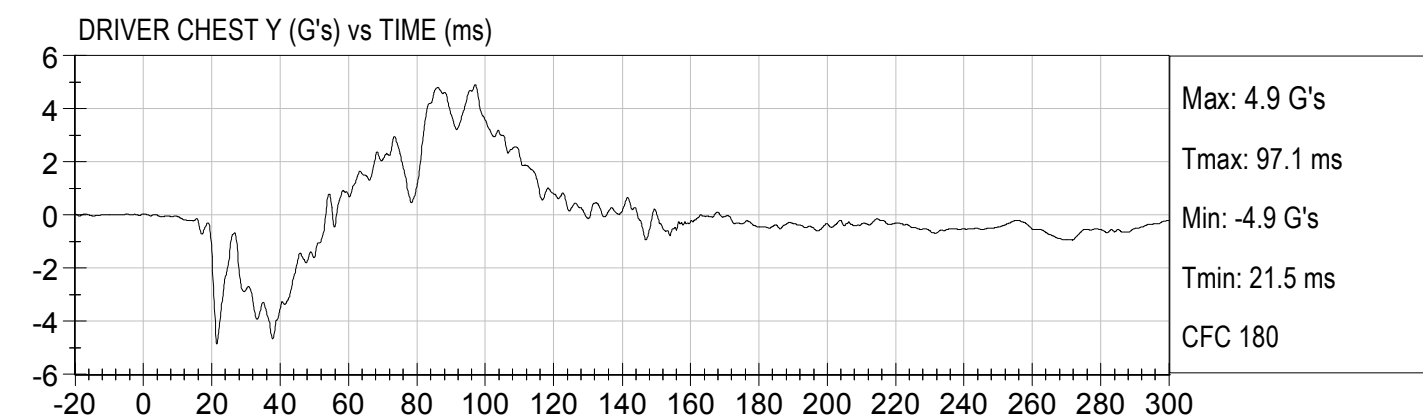
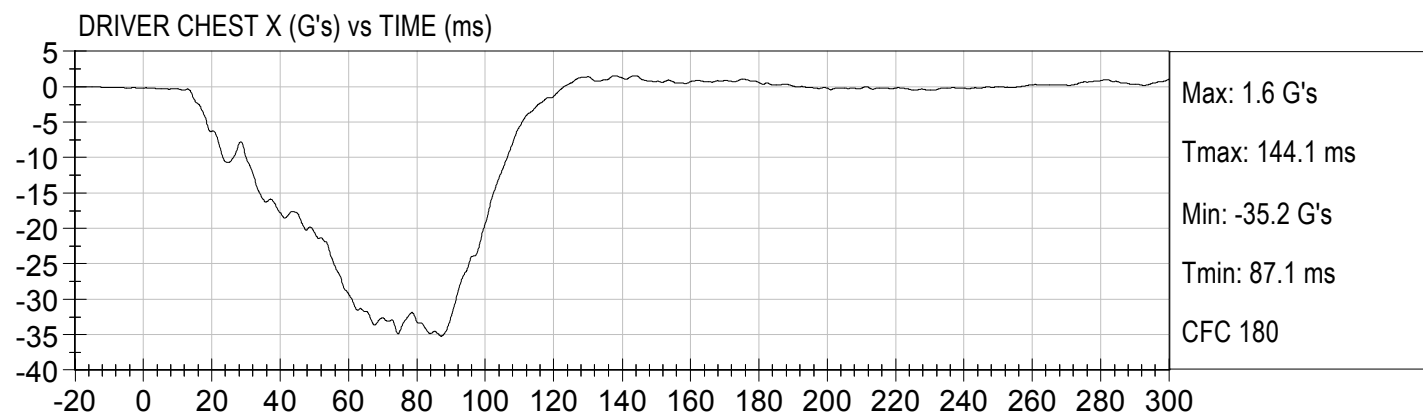
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 Driver Head Y Redundant
 Driver Head Z Redundant
 Driver Upper Neck Force Y
 Driver Upper Neck Moment X
 Driver Upper Neck Moment Z
 Driver Chest X Redundant
 Driver Chest Y Redundant
 Driver Chest Z Redundant
 Driver Pelvis X
 Driver Pelvis Y
 Driver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

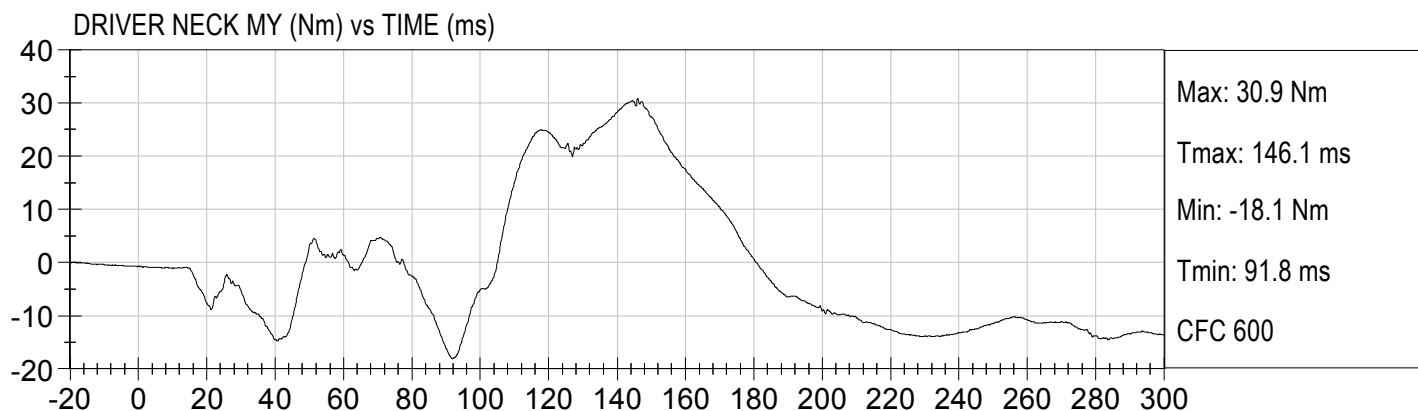
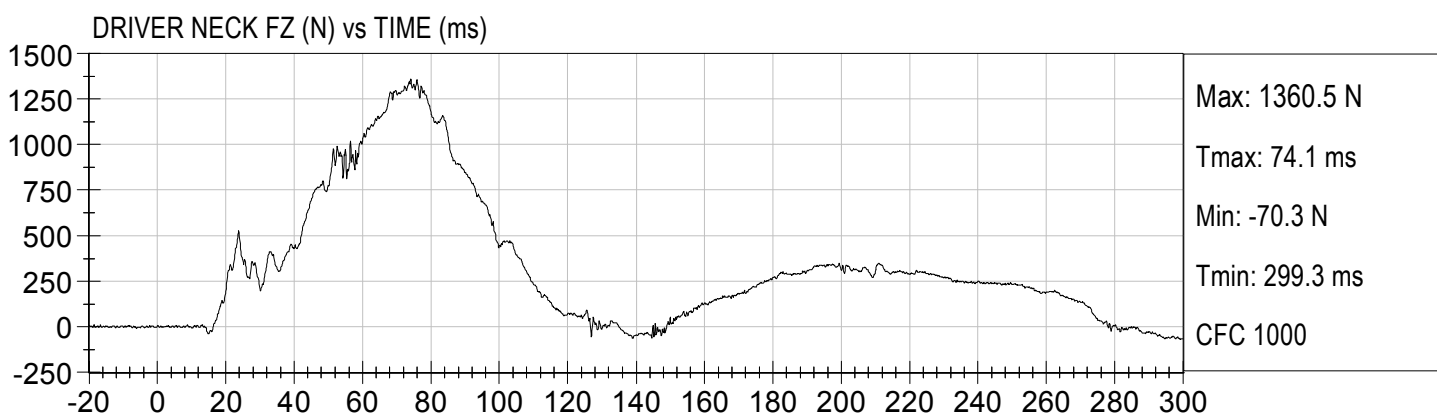
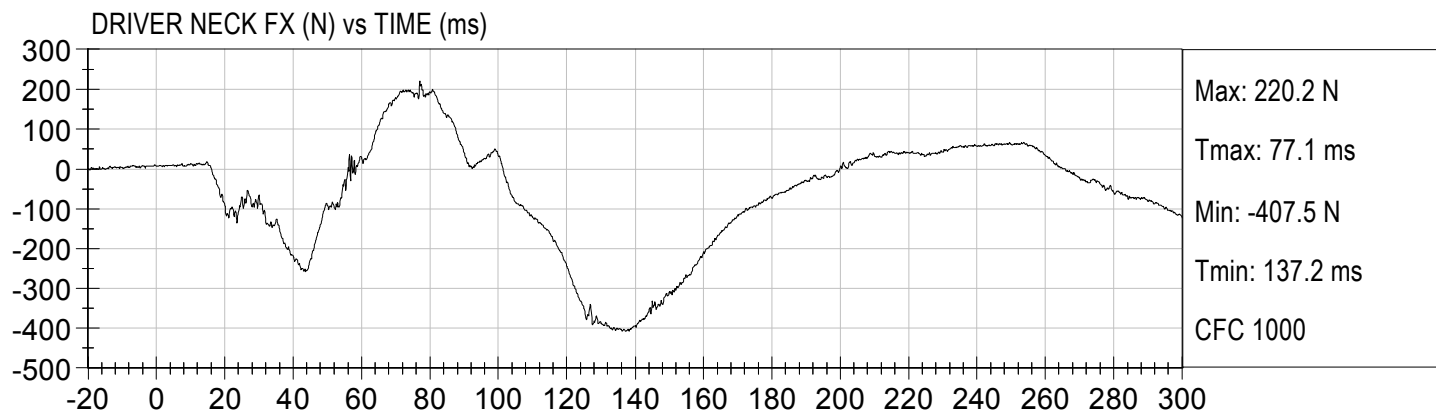
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Driver Left Lower Tibia Force Z
Driver Right Upper Tibia Moment X
Driver Right Upper Tibia Moment Y
Driver Right Upper Tibia Force Z
Driver Right Lower Tibia Moment X
Driver Right Lower Tibia Moment Y
Driver Right Lower Tibia Force Z
Driver Left Foot 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
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Passenger Pelvis Z
Passenger Left Femur Redundant
Passenger Right Femur Redundant
Passenger Left Upper Tibia Moment X

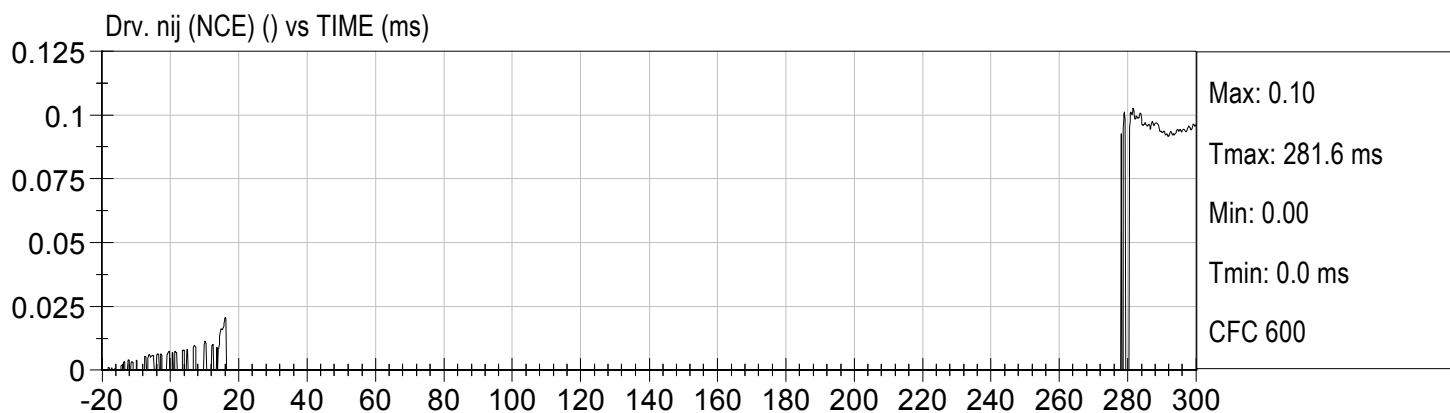
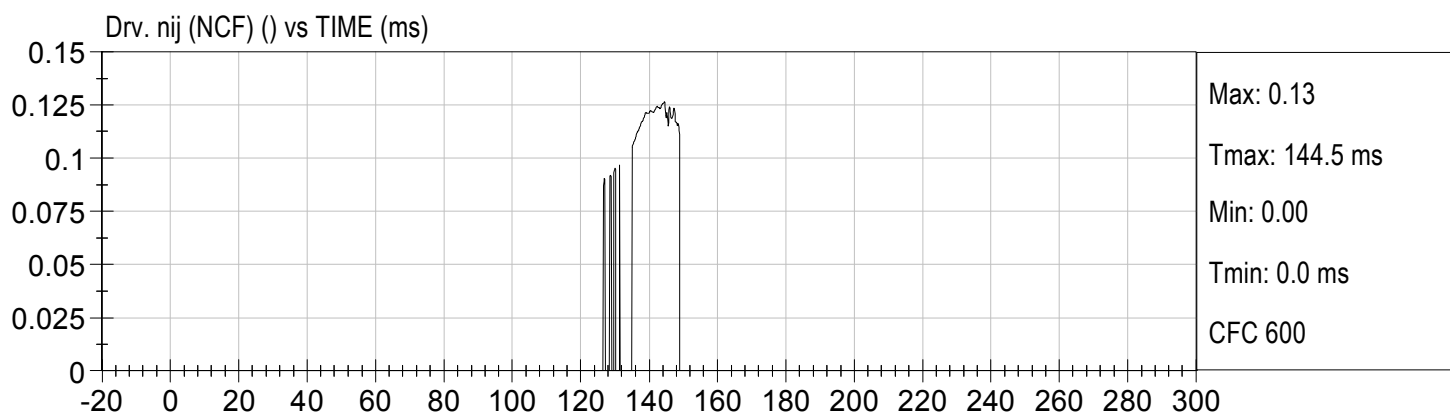
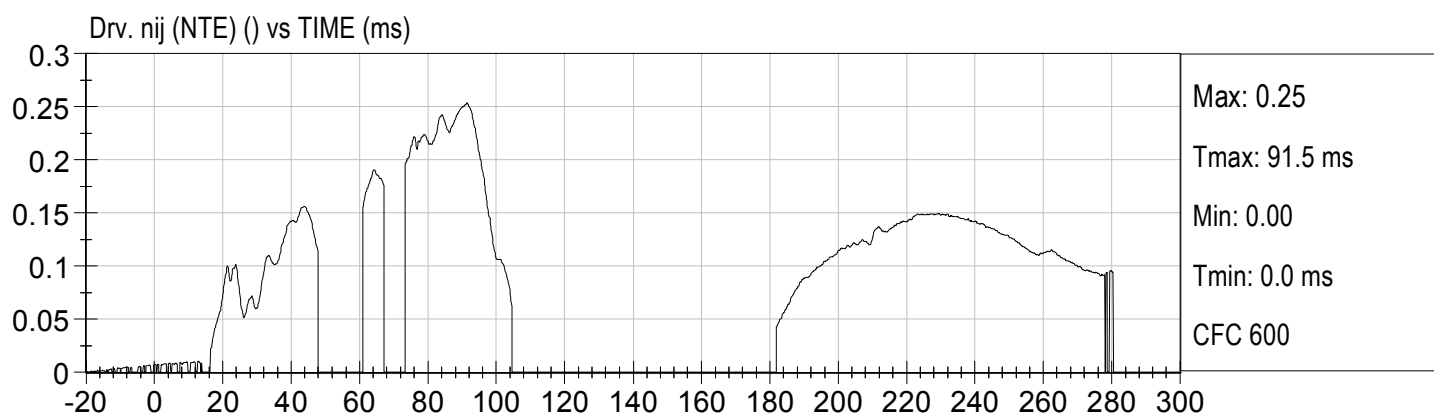
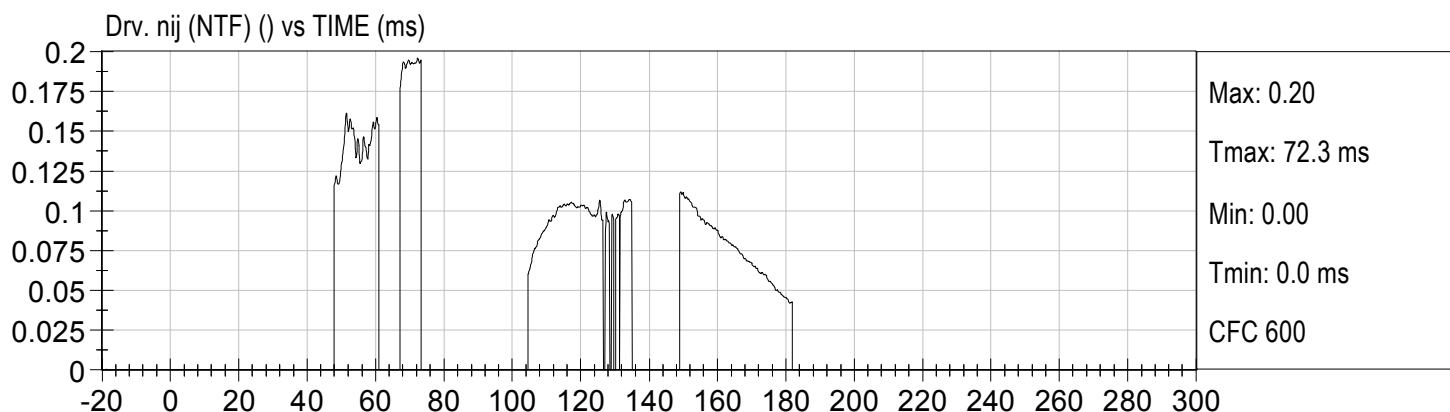
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Passenger Left Upper Tibia Force Z
Passenger Left Lower Tibia Moment X
Passenger Left Lower Tibia Moment Y
Passenger Left Lower Tibia Force Z
Passenger Right Upper Tibia Moment X
Passenger Right Upper Tibia Moment Y
Passenger Right Upper Tibia Force 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
Vehicle Left Brake Caliper X
Vehicle Right Brake Caliper X
Left Rear Seat Crossmember Xr
Right Rear Seat Crossmember Xr
Advanced Research Load Cell Barrier – 128 channels

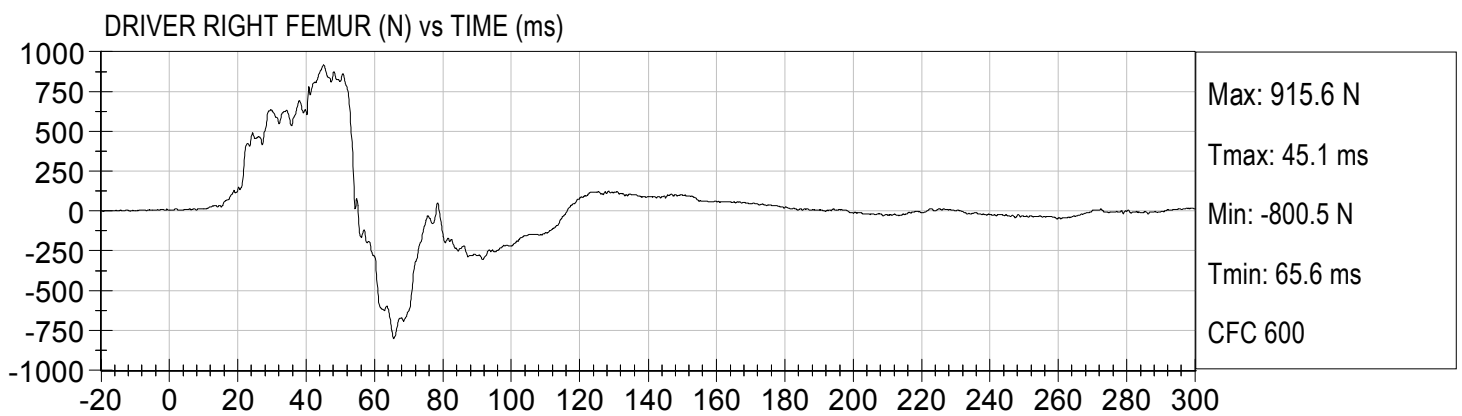
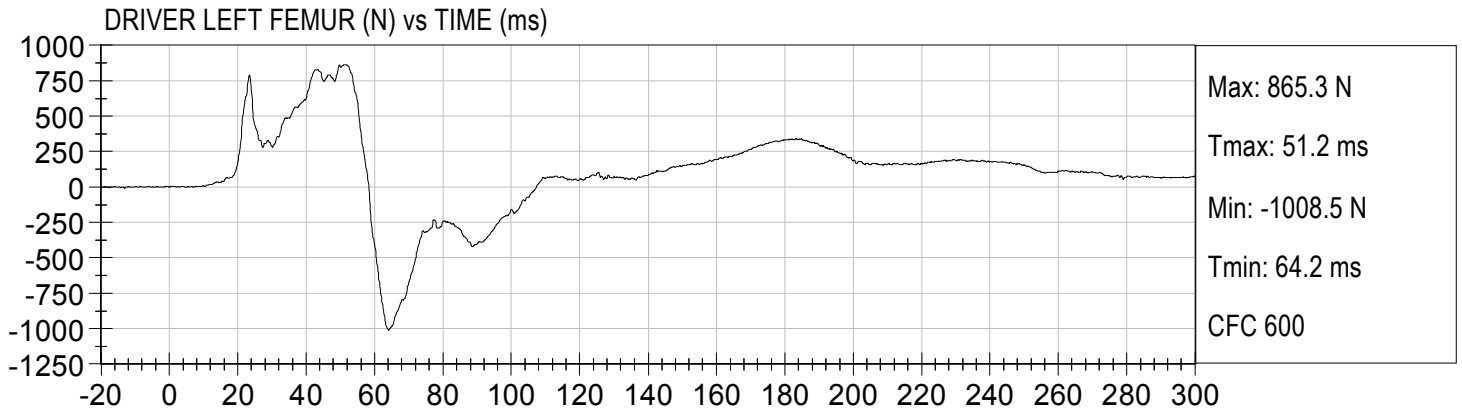


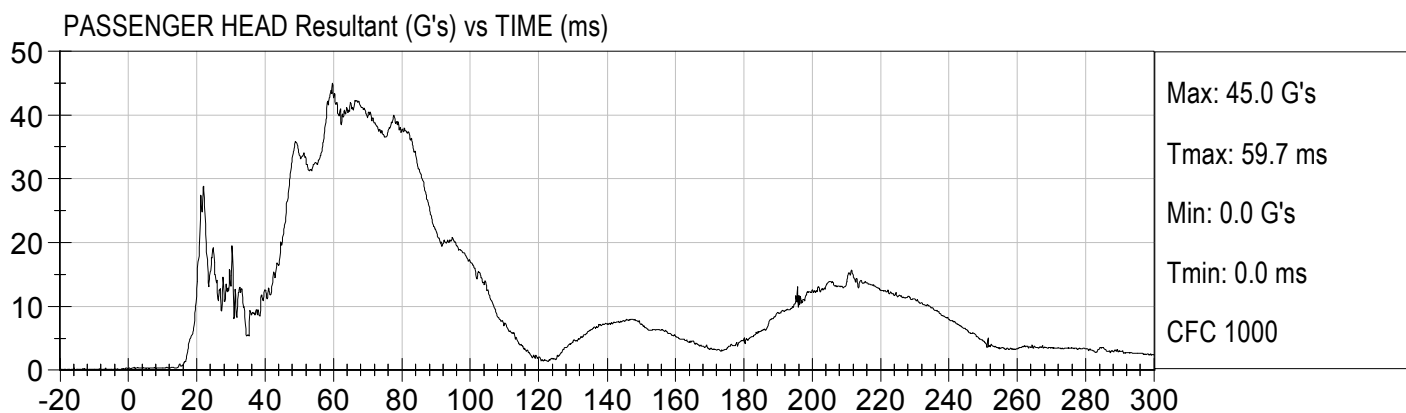
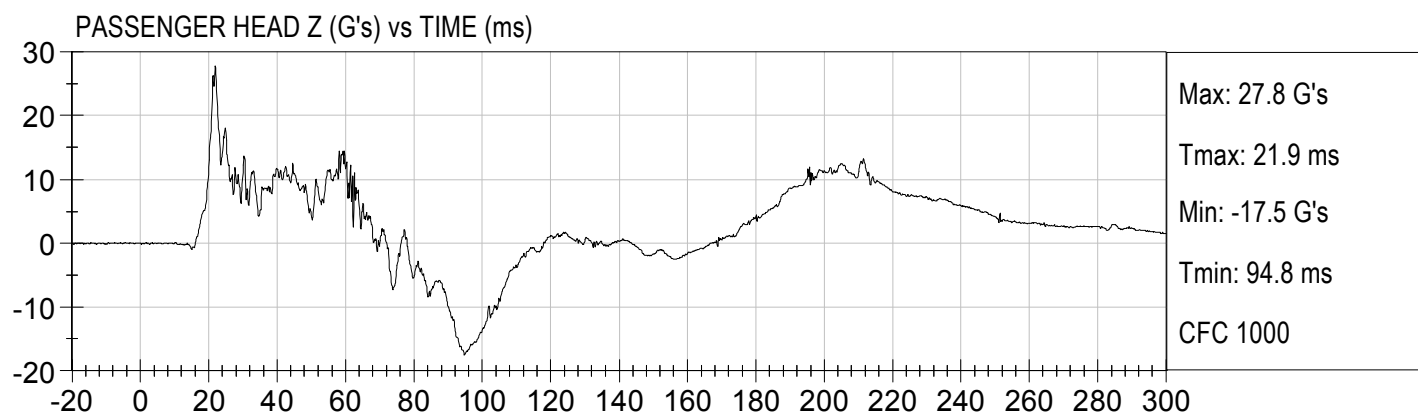
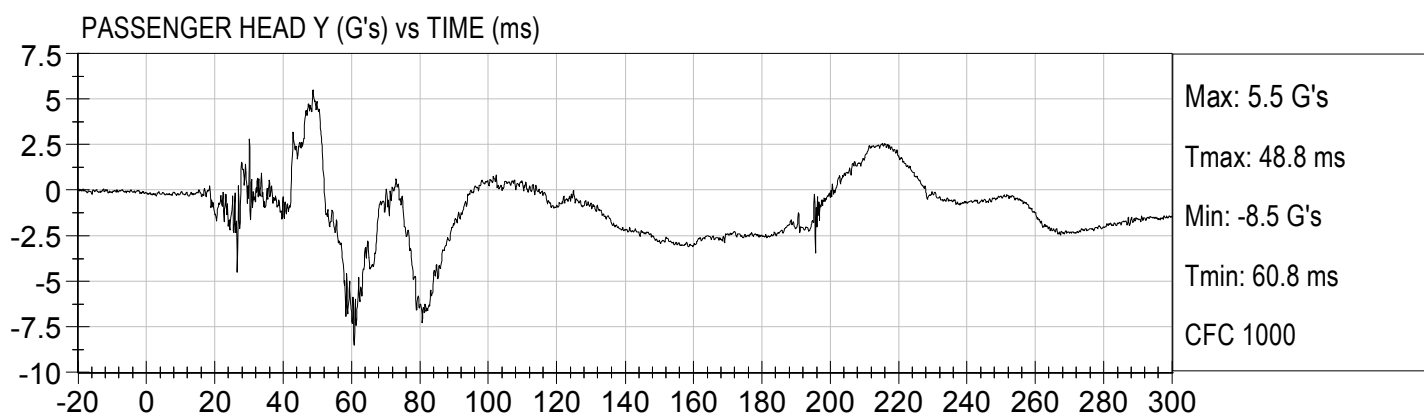
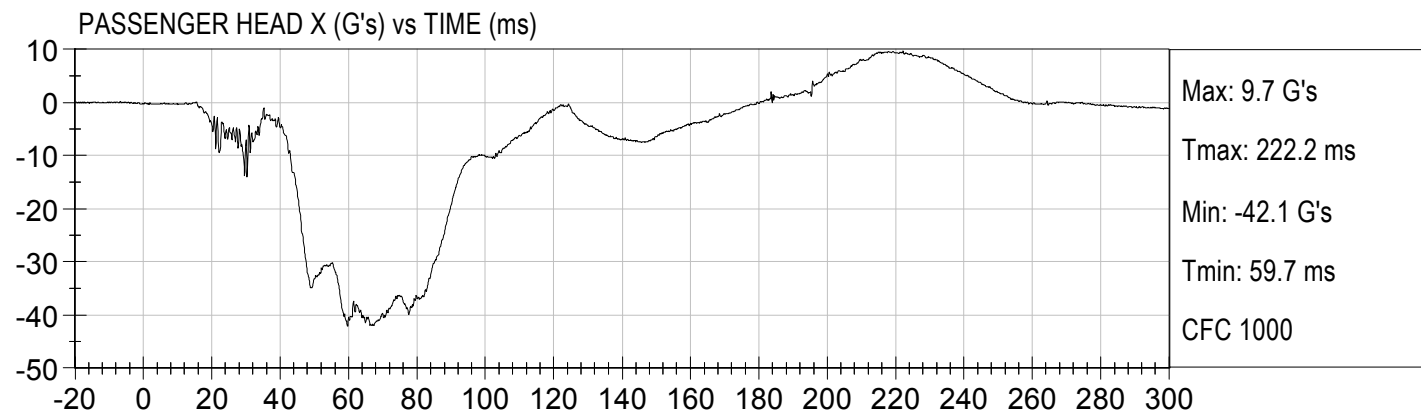


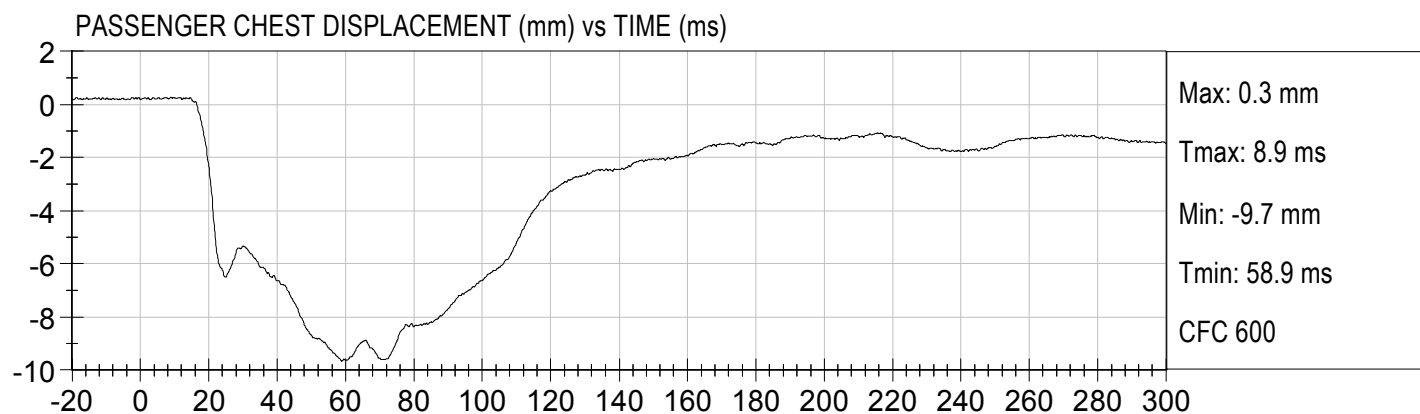


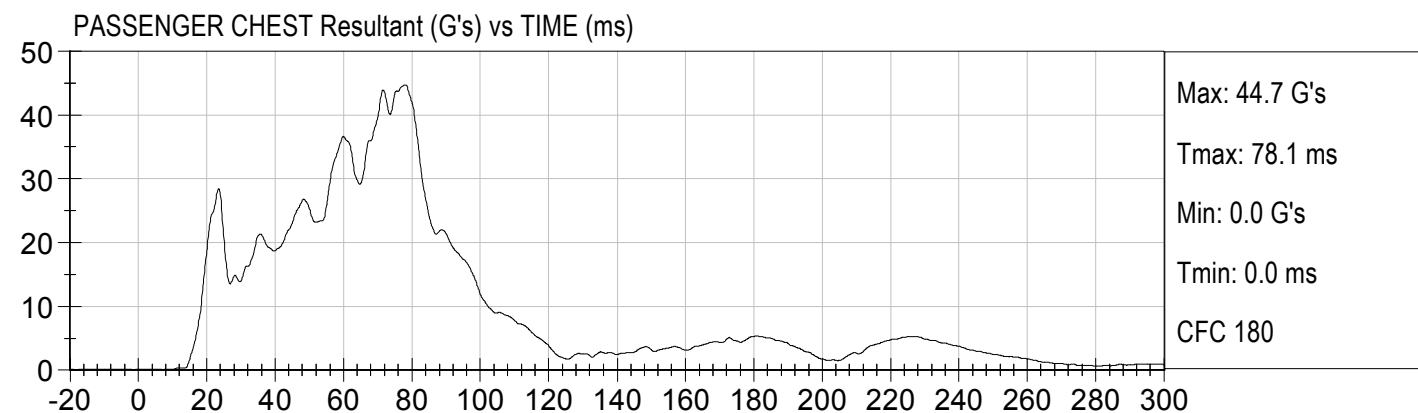
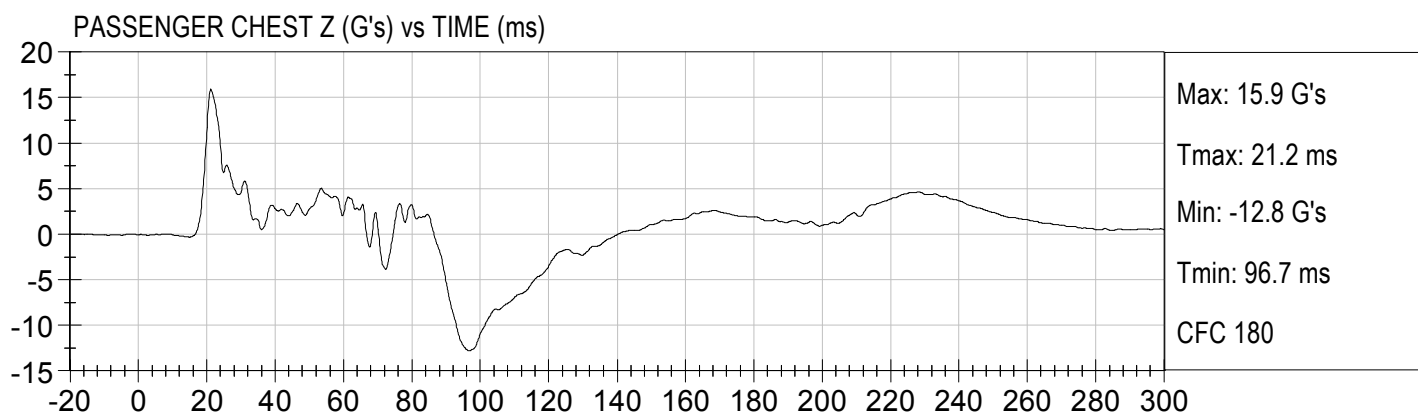
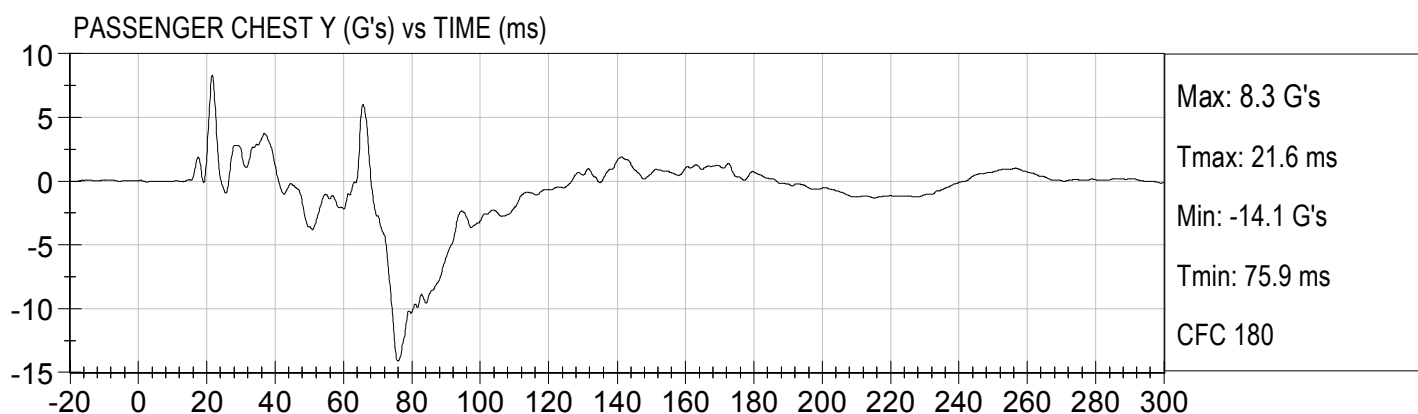
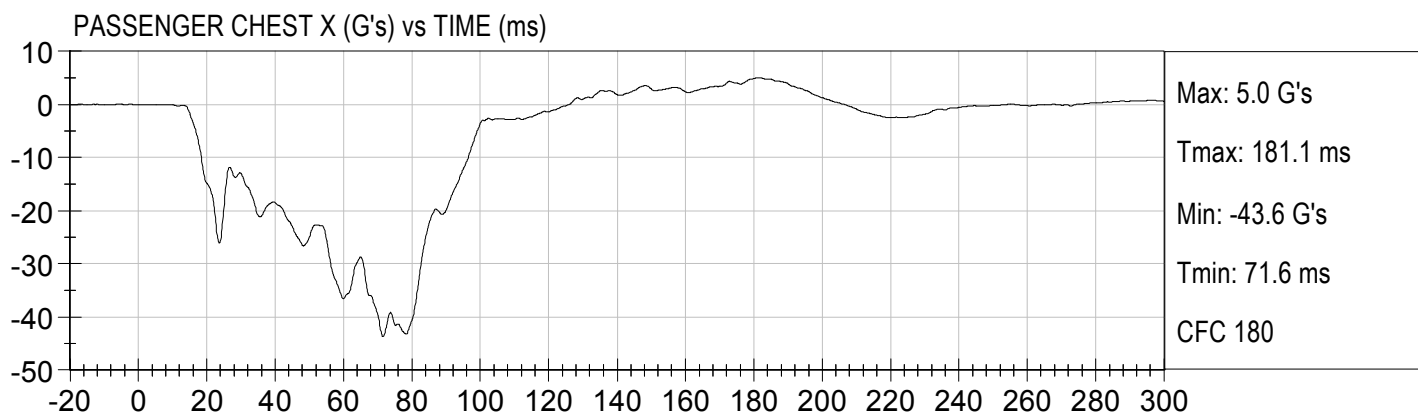


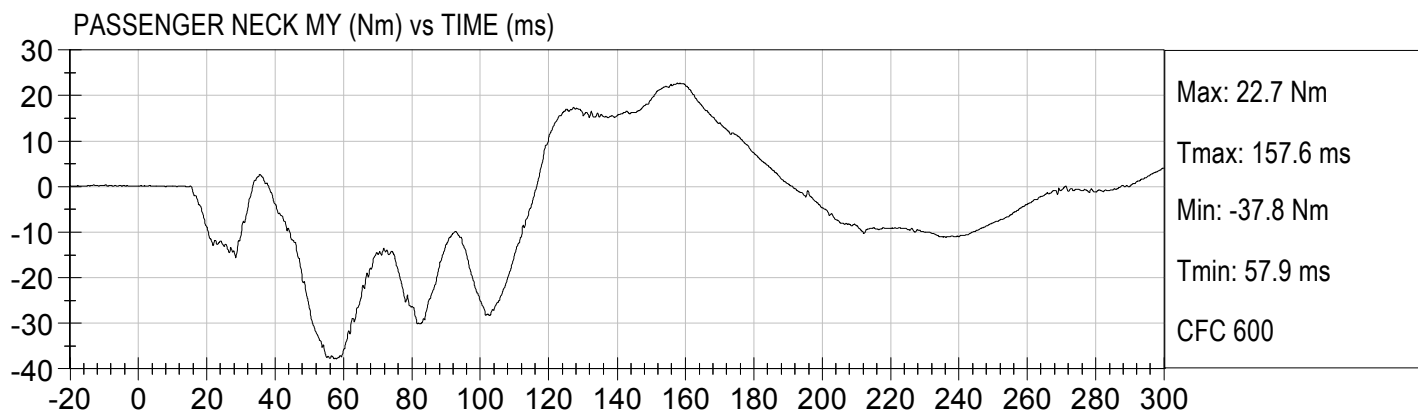
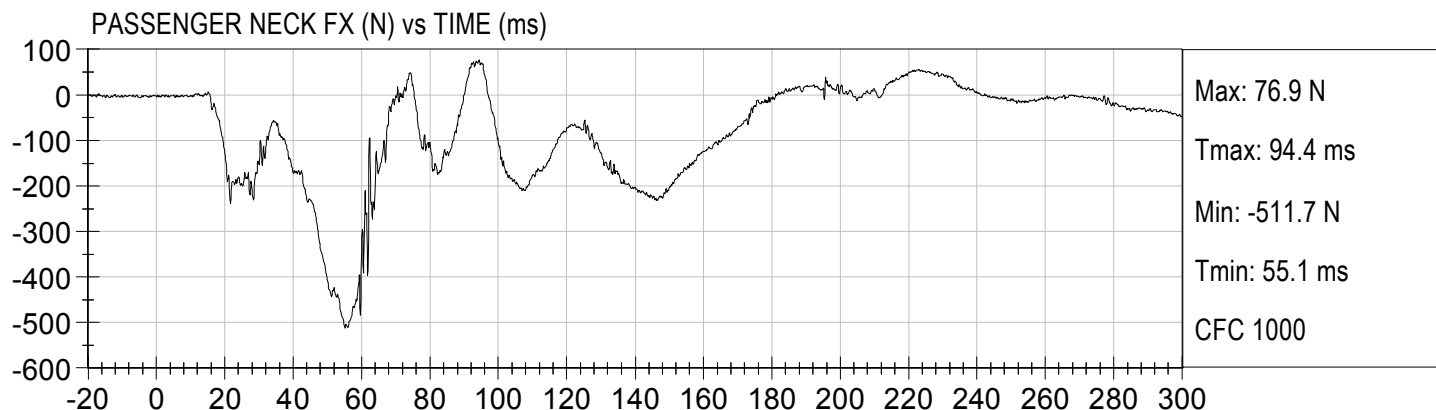


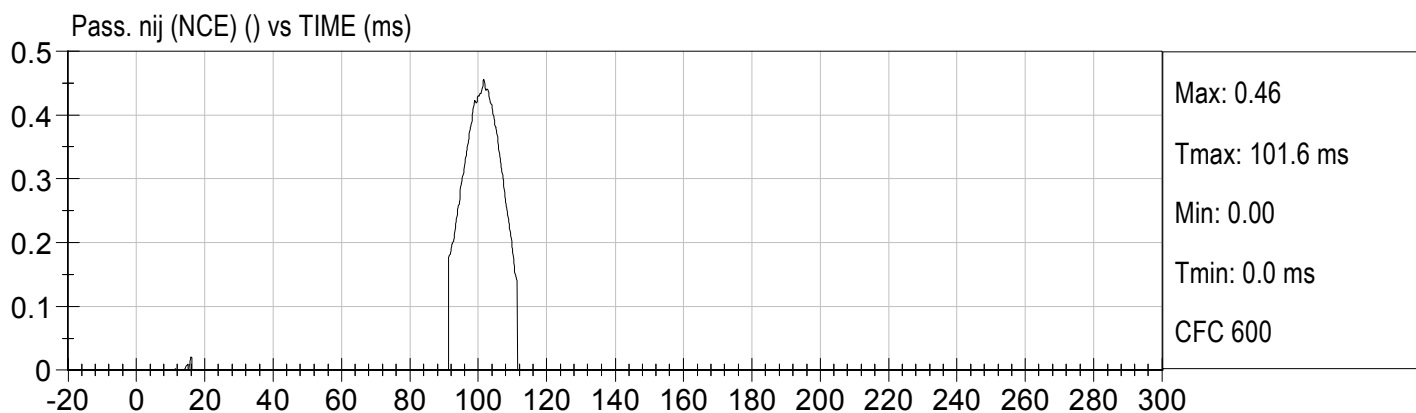
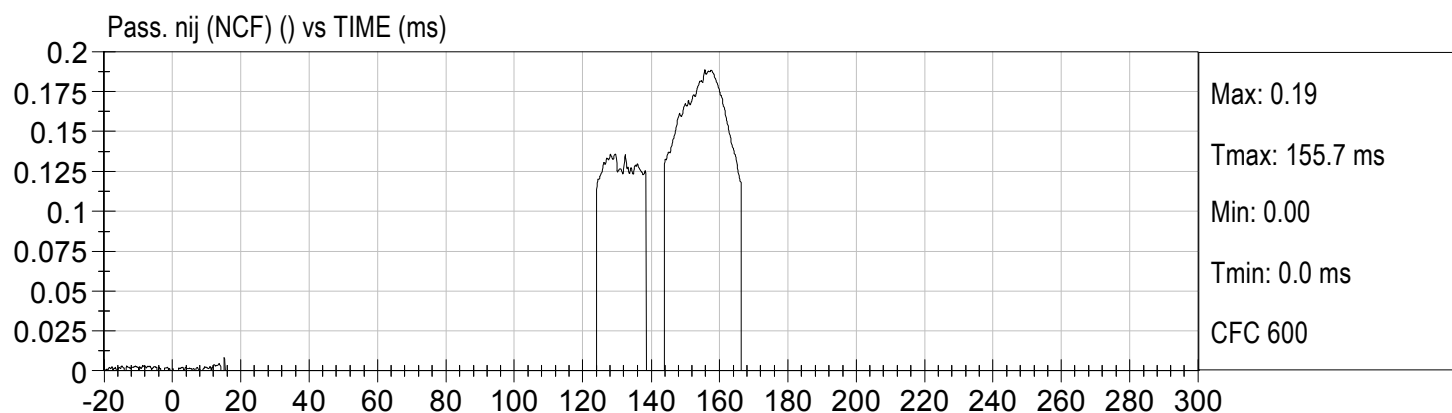
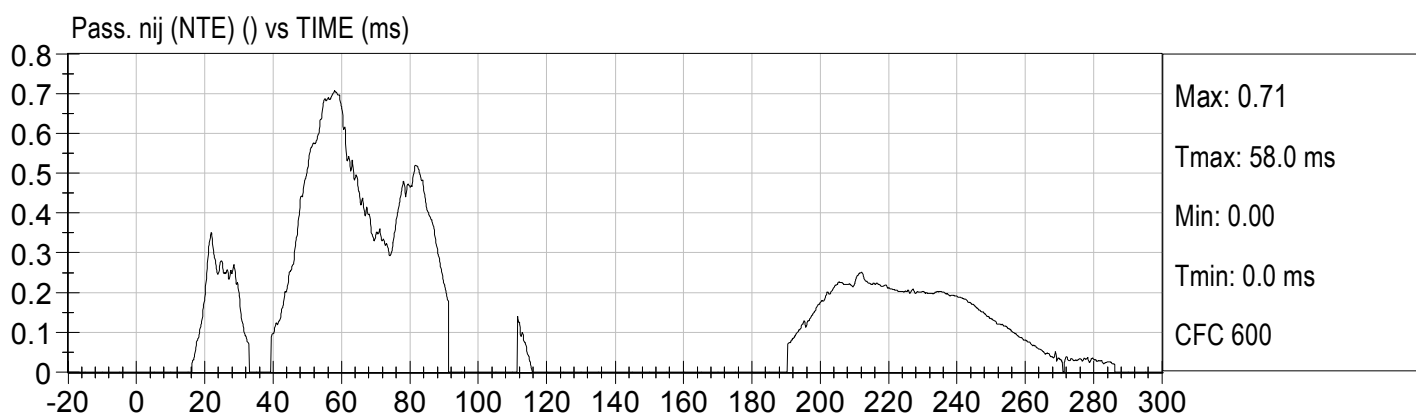
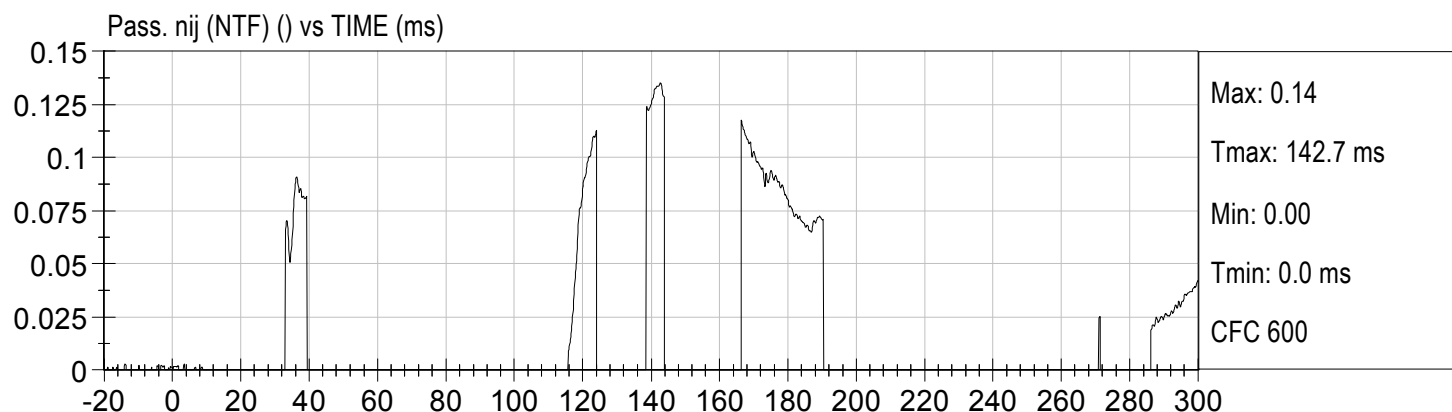


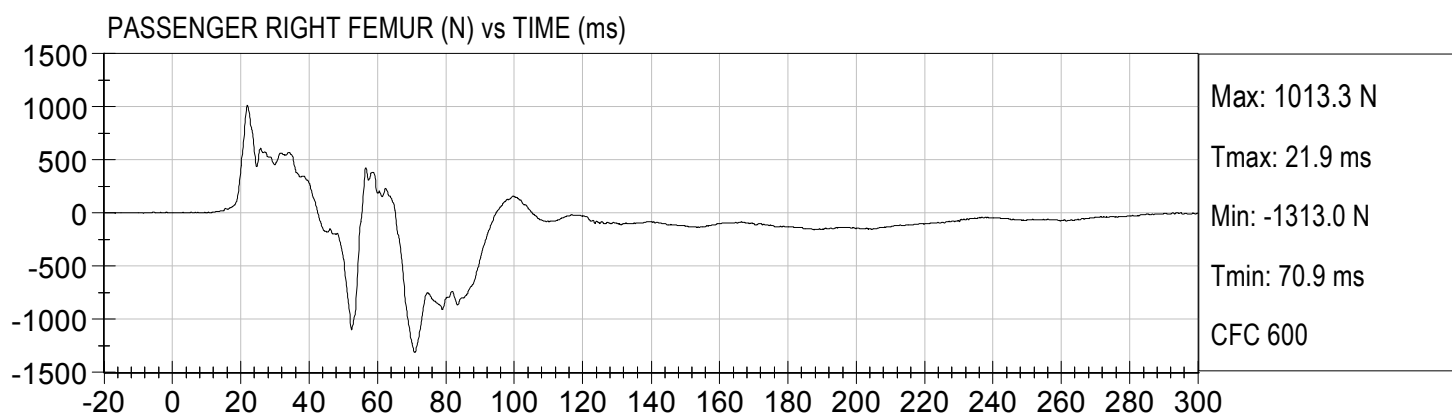
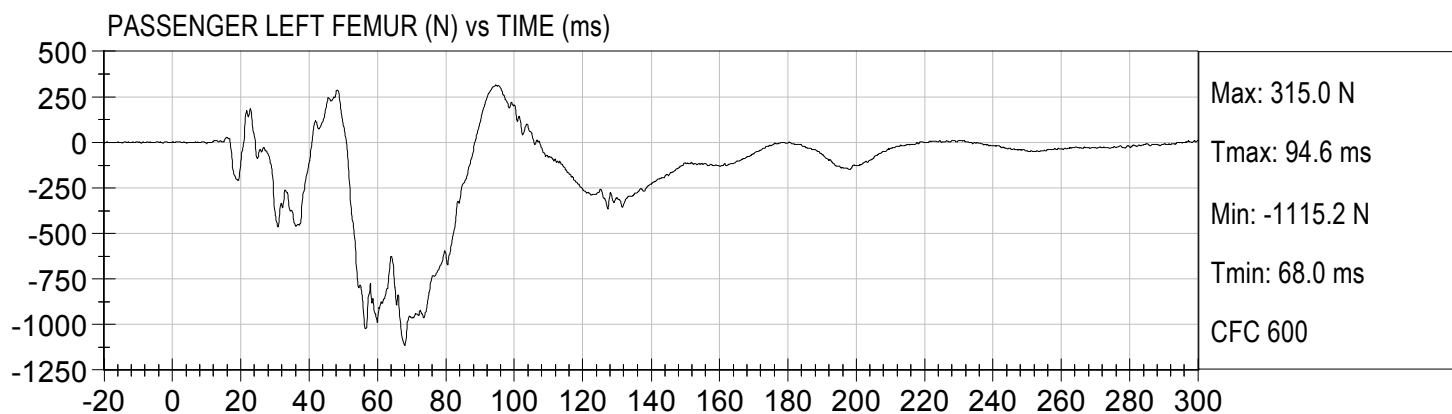












APPENDIX C

DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

Hybrid III, 50th External Measurements
SN: 036

HYBRID III, PART 572, SUBPART E EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (inches)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	34.6–35.0	34.7
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	19.9-20.5	20.0
C	H-POINT HEIGHT	Reference	3.3-3.5	3.4
D	H-POINT LOCATION FROM BACKLINE	Reference	5.3-5.5	5.4
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	3.3-3.7	3.6
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	5.5-6.1	5.8
G	BACK OF ELBOW TO WRIST PIVOT	back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	11.4-12.0	11.5
H	HEAD BACK TO BACKLINE	Back of Skull cap skin to seat rear vertical surface (Reference)	1.6-1.8	1.7
I	SHOULDER TO- ELBOW LENGTH	Measure from the highest point on top of the shoulder clevis to the lowest part of the flesh on the elbow in line with the elbow pivot bolt.	13.0-13.6	13.0
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	7.5-8.3	7.9
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	22.8-23.8	23.8
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	16.9-17.9	17.3
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	19.1-19.7	19.5
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	17.8-18.8	17.9

HYBRID III, SUBPART E EXTERIOR DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS		ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 16.9-17.1 in. above seat surface	8.4-9.0	8.8
P	FOOT LENGTH	Tip of toe to rear of heel	9.9-10.5	10.0
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	16.3-17.2	16.4
W	FOOT BREADTH	The widest part of the foot	3.6-4.2	4.1
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 16.9-17.1 in. above seat surface	38.2-39.4	38.4
Z	WAIST CIRCUMFERENCE	Measured 8.9-9.1 in. above seat surface	32.9-34.1	34.0
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	16.9-17.1	17.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	8.9-9.1	9.0

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

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

ATD Serial No: 036

Test ID: D122231

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	50	Pass
Peak Resultant Acceleration	G's	225 - 275	237	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

Jessica Hall
Laboratory Technician

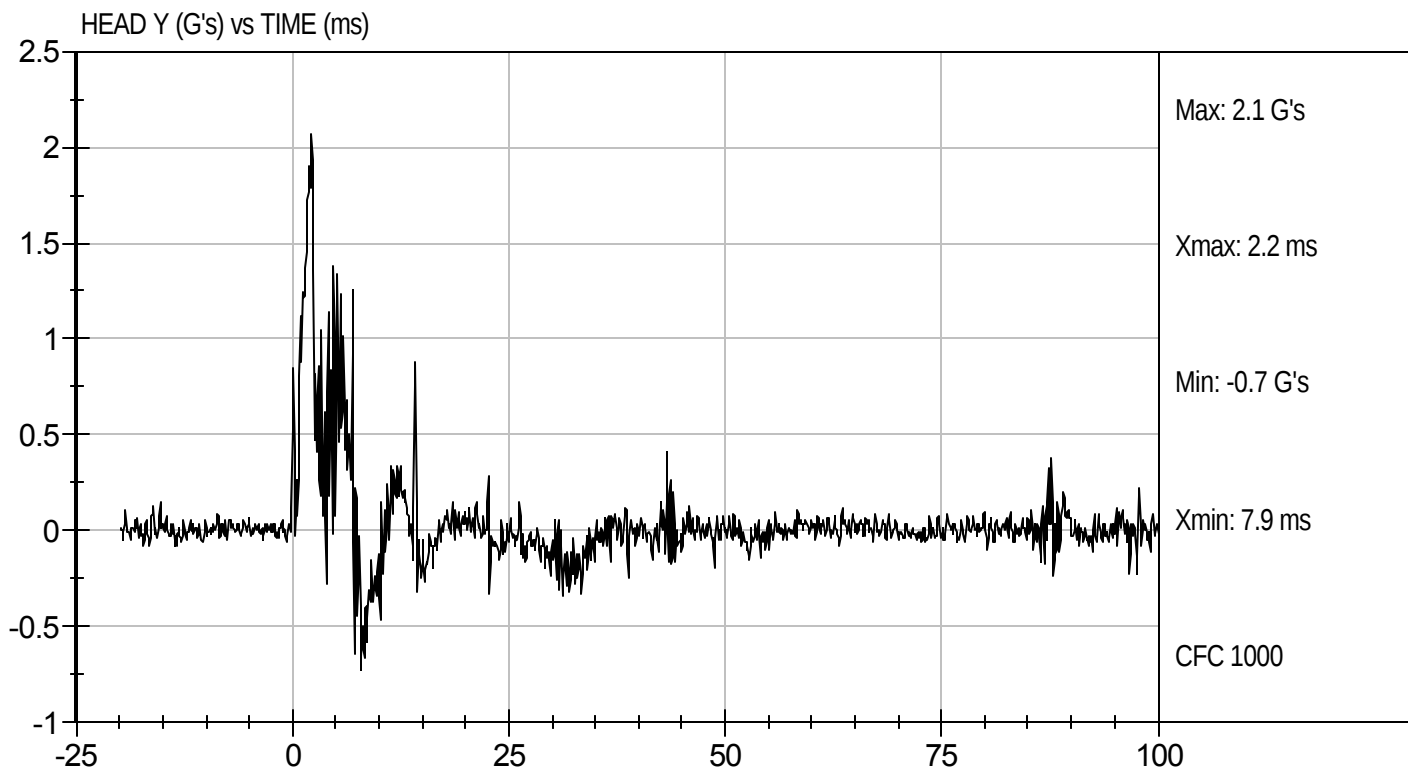
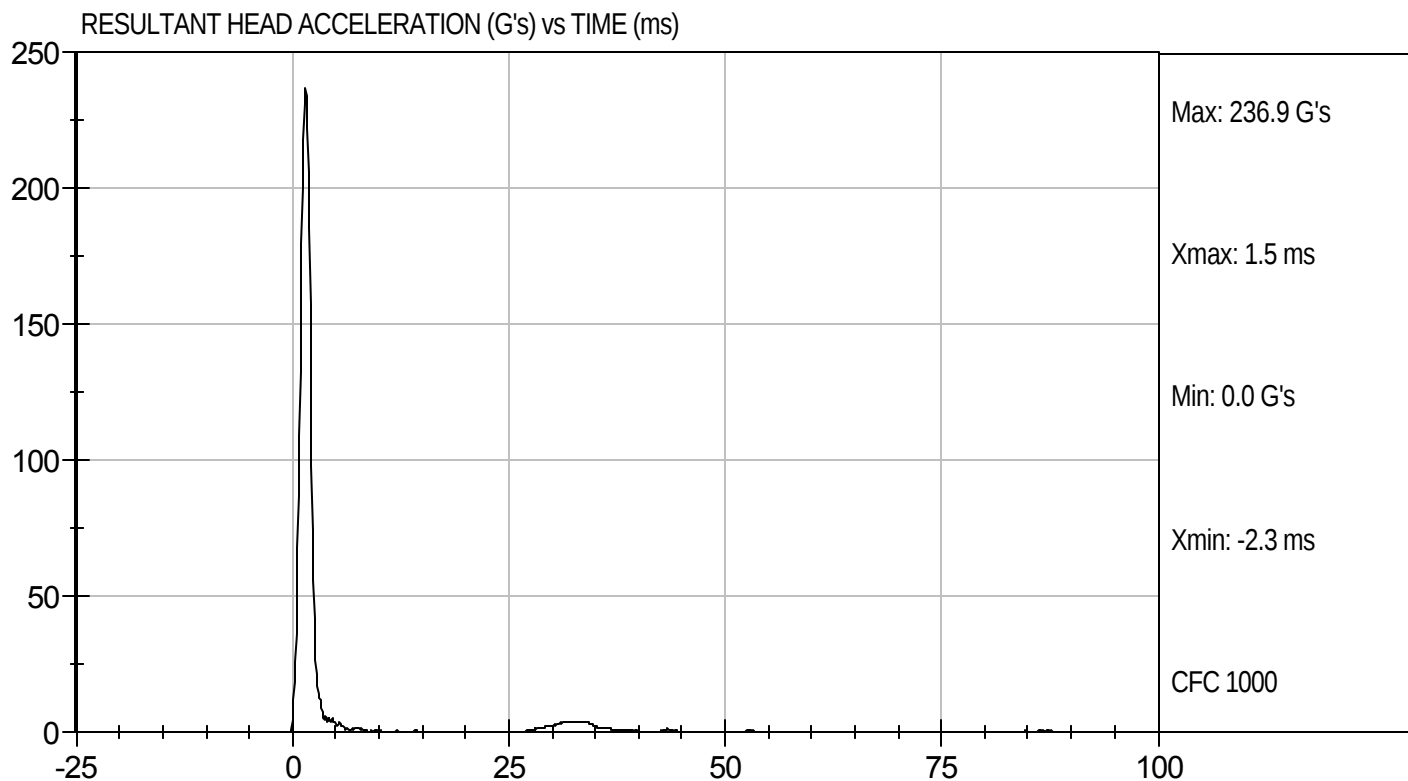
6/18/12
Test Date

David Winkelbauer
Approved By



Test Desc: Head Drop
Component ID: D122231

Test Date: 6/18/12
Velocity: 0 ft/s, 0 m/s



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

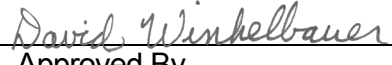
ATD Serial No: 036

Test I.D.: D122232

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.0	Pass
Laboratory Relative Humidity		%	10 to 70	51	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.27	Pass
	20 ms	G's	17.60 to 22.60	19.47	Pass
	30 ms	G's	12.50 to 18.50	14.02	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	14.0	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	35.9	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	72.9	Pass
	Time	ms	57.0 to 64.0	59.0	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	119.2	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	92.8	Pass
	Time	ms	47.0 to 58.0	48.7	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	97.6	Pass
Overall Test Results					Pass


 Laboratory Technician

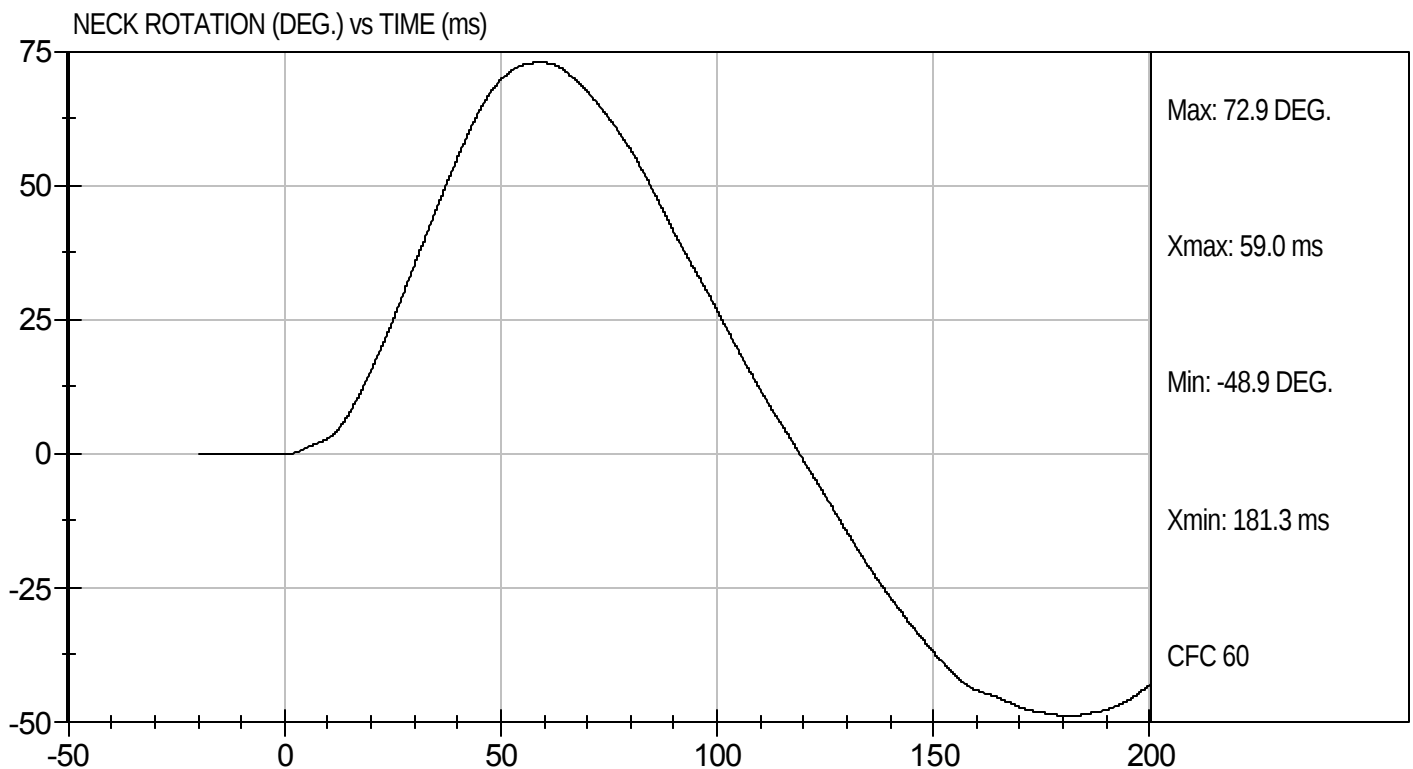
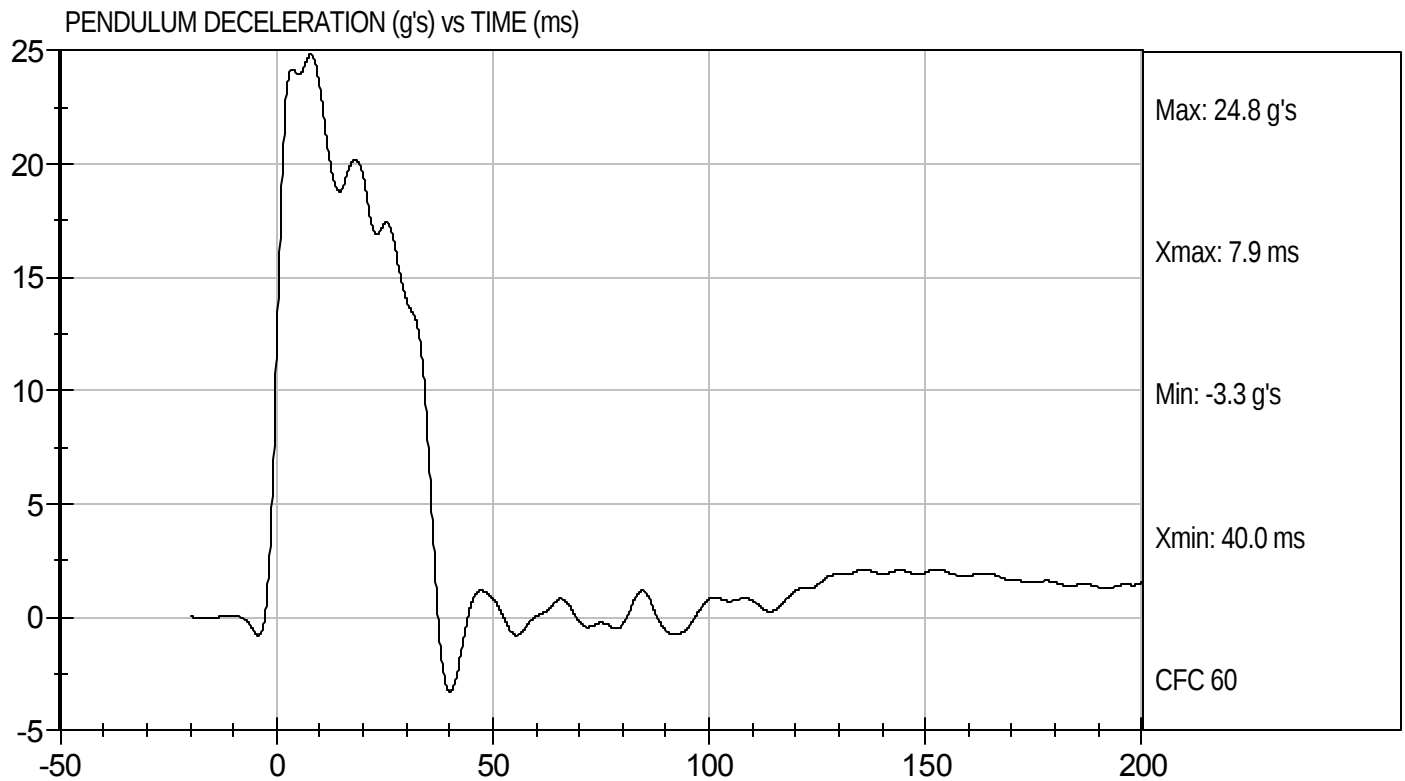
6/18/12
 Test Date


 Approved By



Test Desc: Neck Flexion
Component ID: D122232

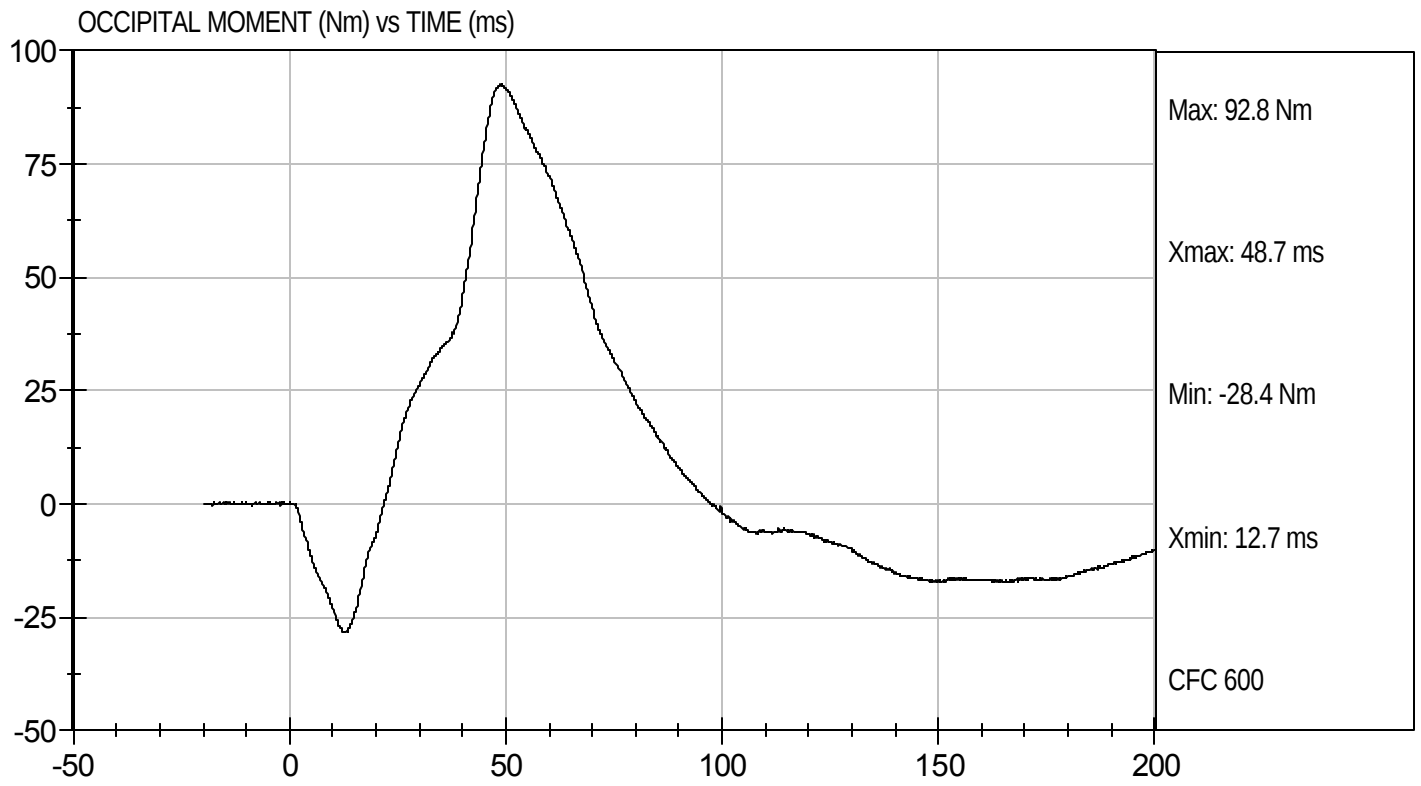
Test Date: 6/18/12
Velocity: 23.15 ft/s, 7.06 m/s





Test Desc: Neck Flexion
Component ID: D122232

Test Date: 6/18/12
Velocity: 23.15 ft/s, 7.06 m/s



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

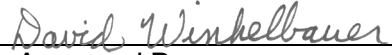
ATD Serial No: 036

Test I.D.: D122233

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.0	Pass
Laboratory Relative Humidity		%	10 to 70	51	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.05	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	17.73	Pass
	20 ms	G's	14.00 to 19.00	14.08	Pass
	30 ms	G's	11.00 to 16.00	12.47	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	43.5	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	95.0	Pass
	Time	ms	72.0 to 82.0	79.5	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	161.3	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-59.2	Pass
	Time	ms	65.0 to 79.0	73.9	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	146.0	Pass
Overall Test Results					Pass


 Laboratory Technician

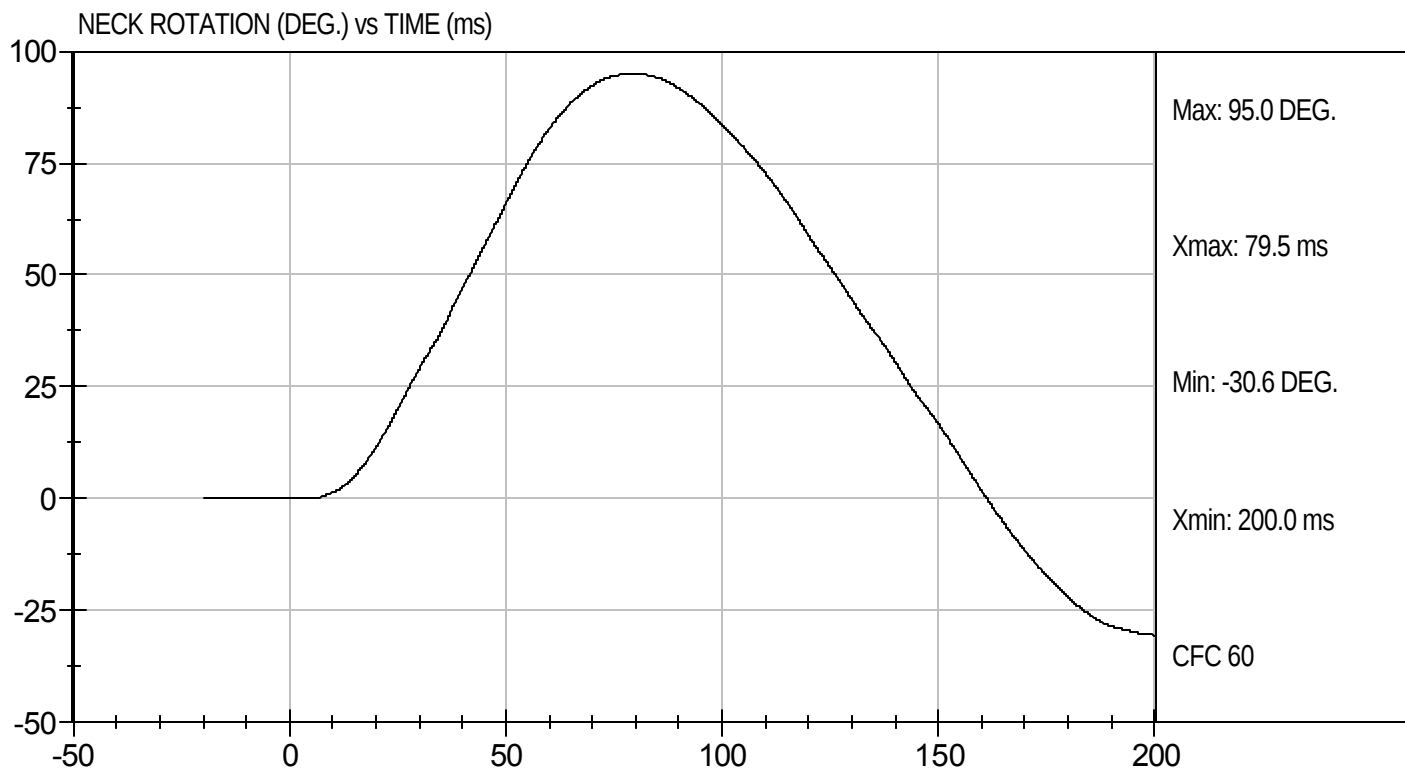
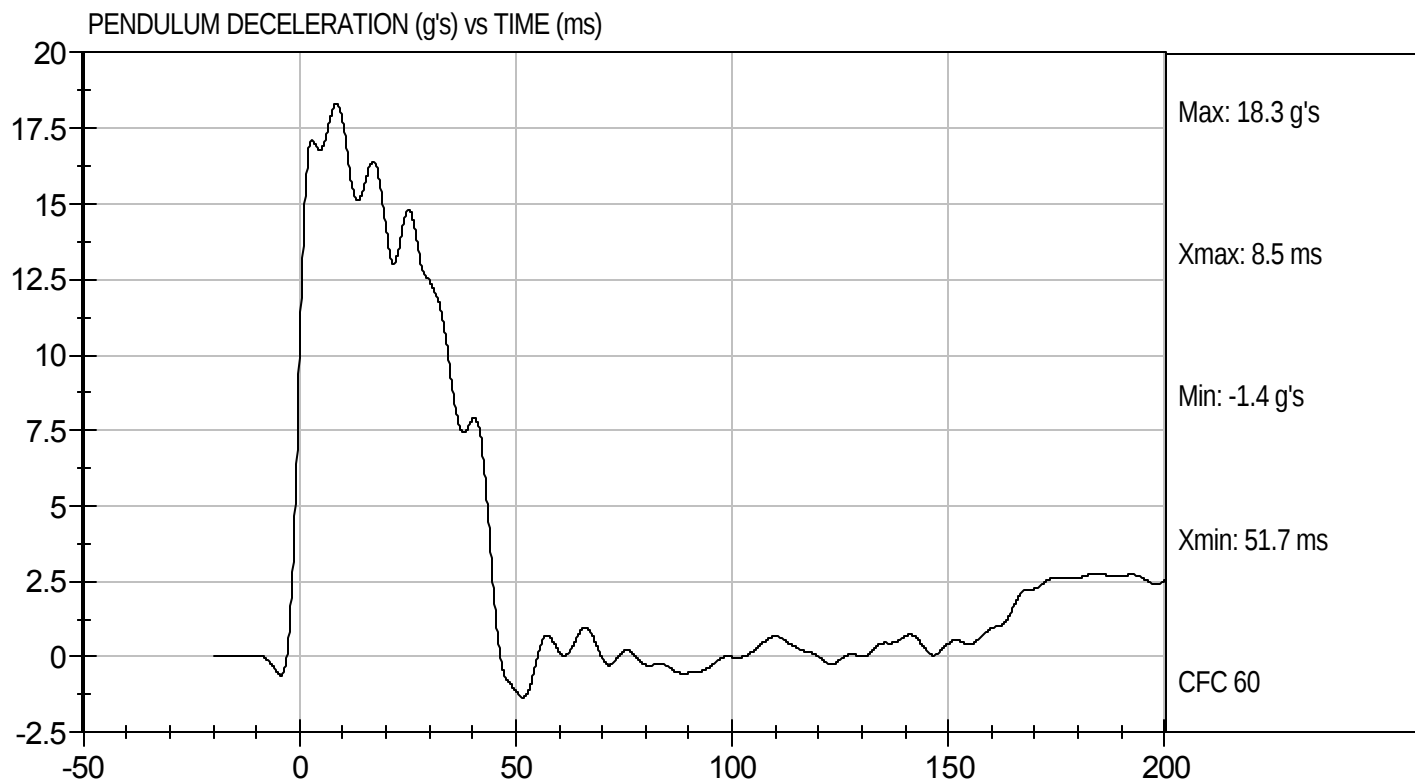
6/18/12
 Test Date


 Approved By



Test Desc: Neck Extension
Component ID: D122233

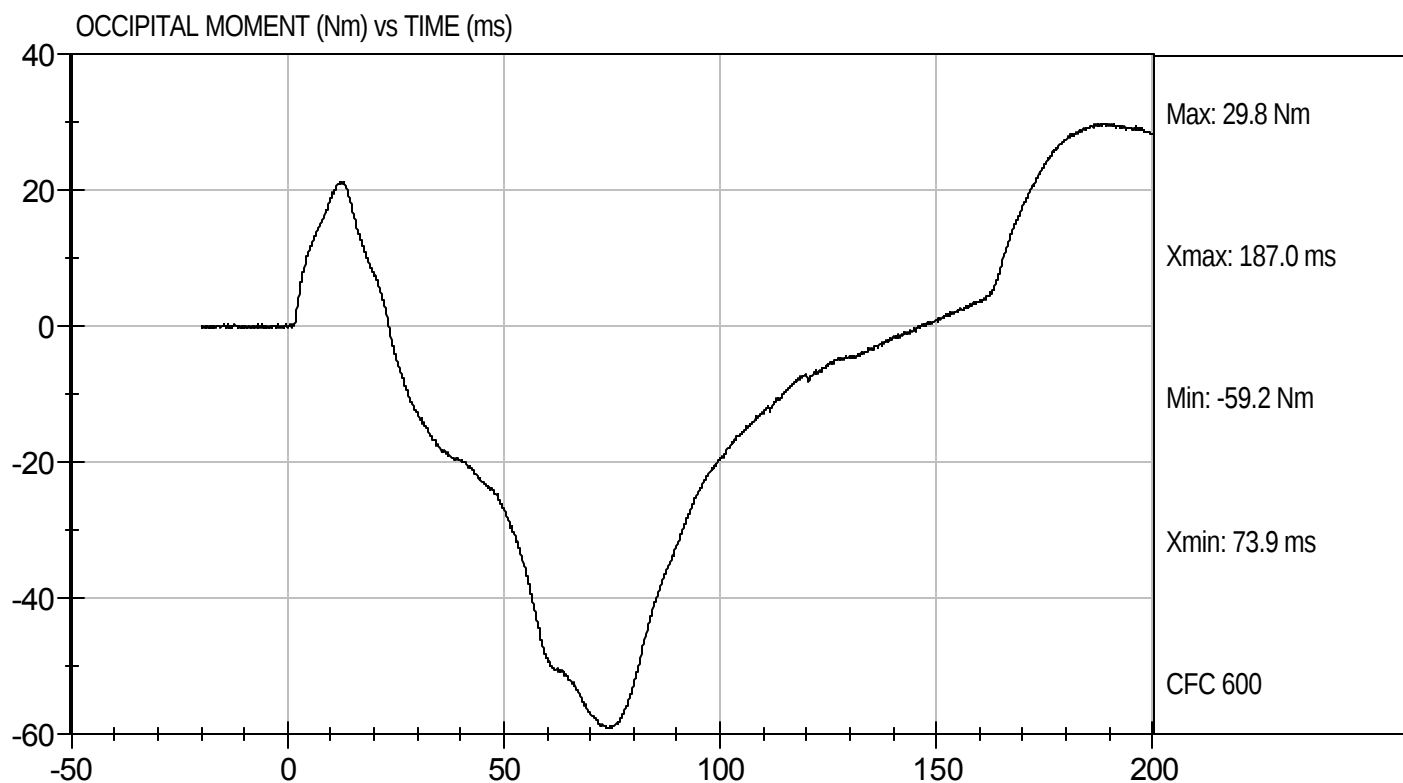
Test Date: 6/18/12
Velocity: 19.84 ft/s, 6.05 m/s





Test Desc: Neck Extension
Component ID: D122233

Test Date: 6/18/12
Velocity: 19.84 ft/s, 6.05 m/s

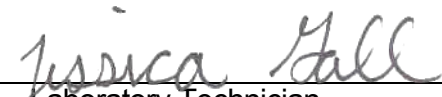


MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

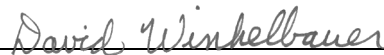
ATD Serial No: 036

Test I.D: D122234

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,738	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.82	Pass
Internal Hysteresis	%	69 to 85	70	Pass
Overall Test Results			Pass	


Laboratory Technician

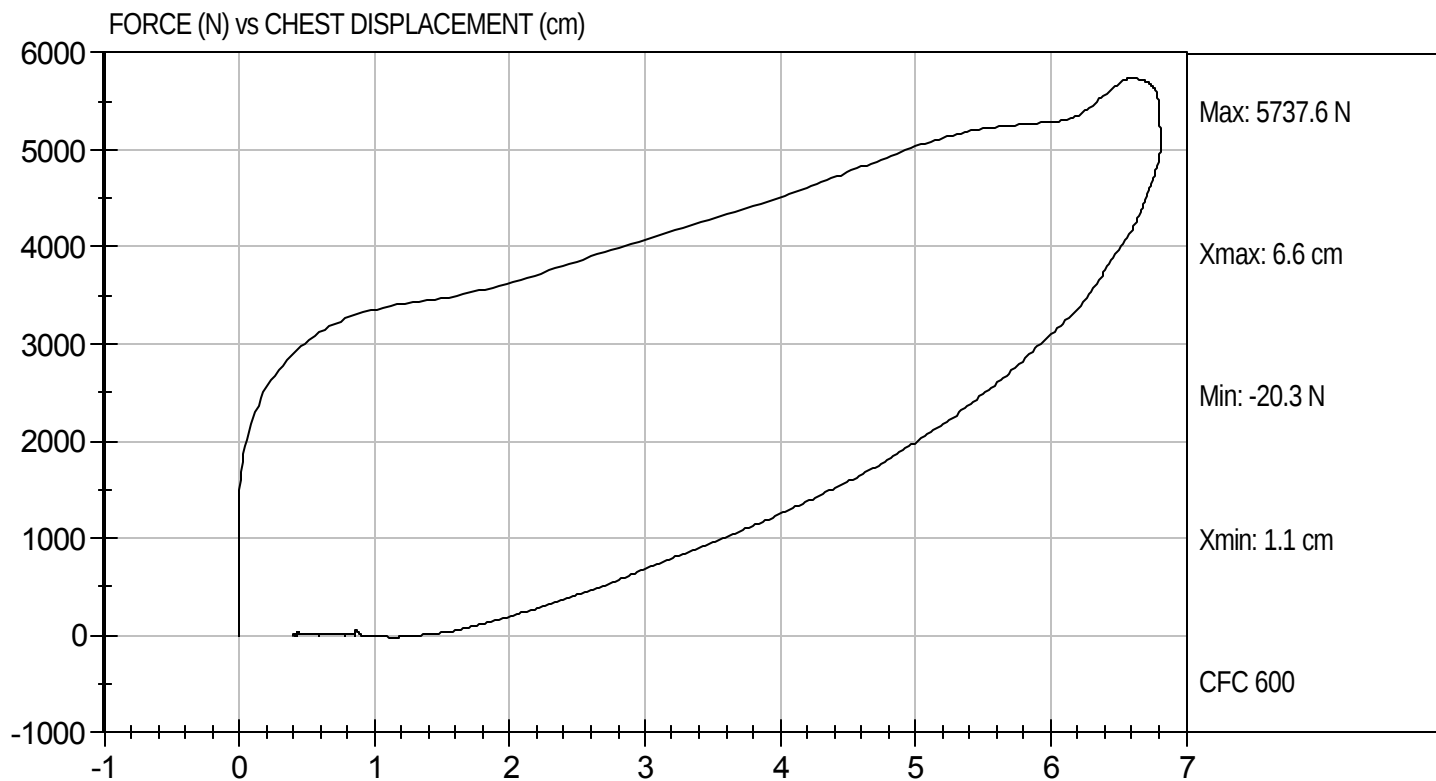
6/19/12
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D122234

Test Date: 6/19/12
Velocity: 22.22 ft/s, 6.77 m/s



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

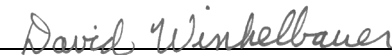
ATD Serial No: 036

Test I.D: D122235

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	49	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	Newtons	4715 to 5782	5,025	Pass
Overall Test Results				Pass


Laboratory Technician

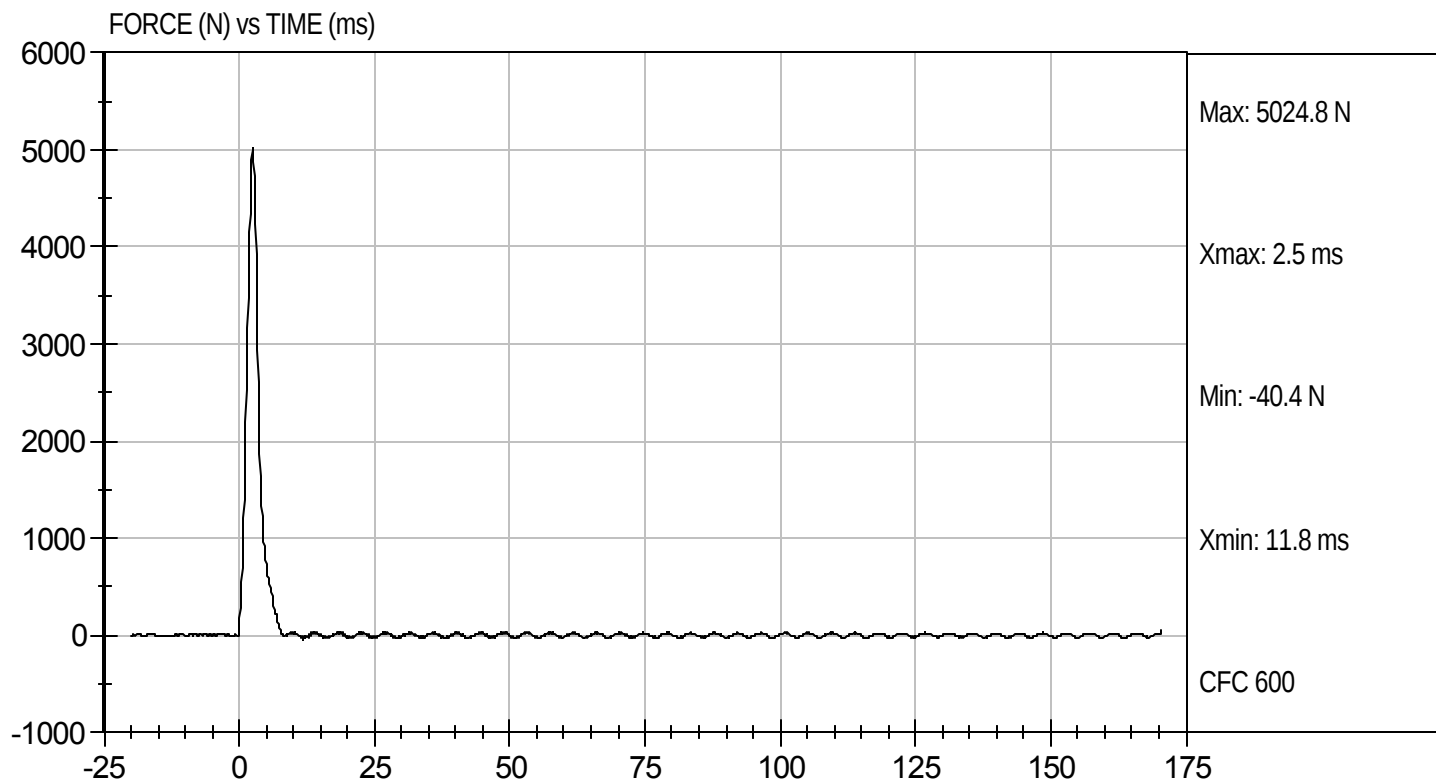
6/18/12
Test Date


Approved By



Test Desc: Right Knee
Component ID: D122235

Test Date: 6/18/12
Velocity: 6.97 ft/s, 2.12 m/s



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

ATD Serial No: 036

Test I.D: D122236

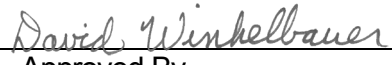
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	49	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	Newtons	4715 to 5782	4,780	Pass
Overall Test Results				Pass



Laboratory Technician

6/18/12

Test Date

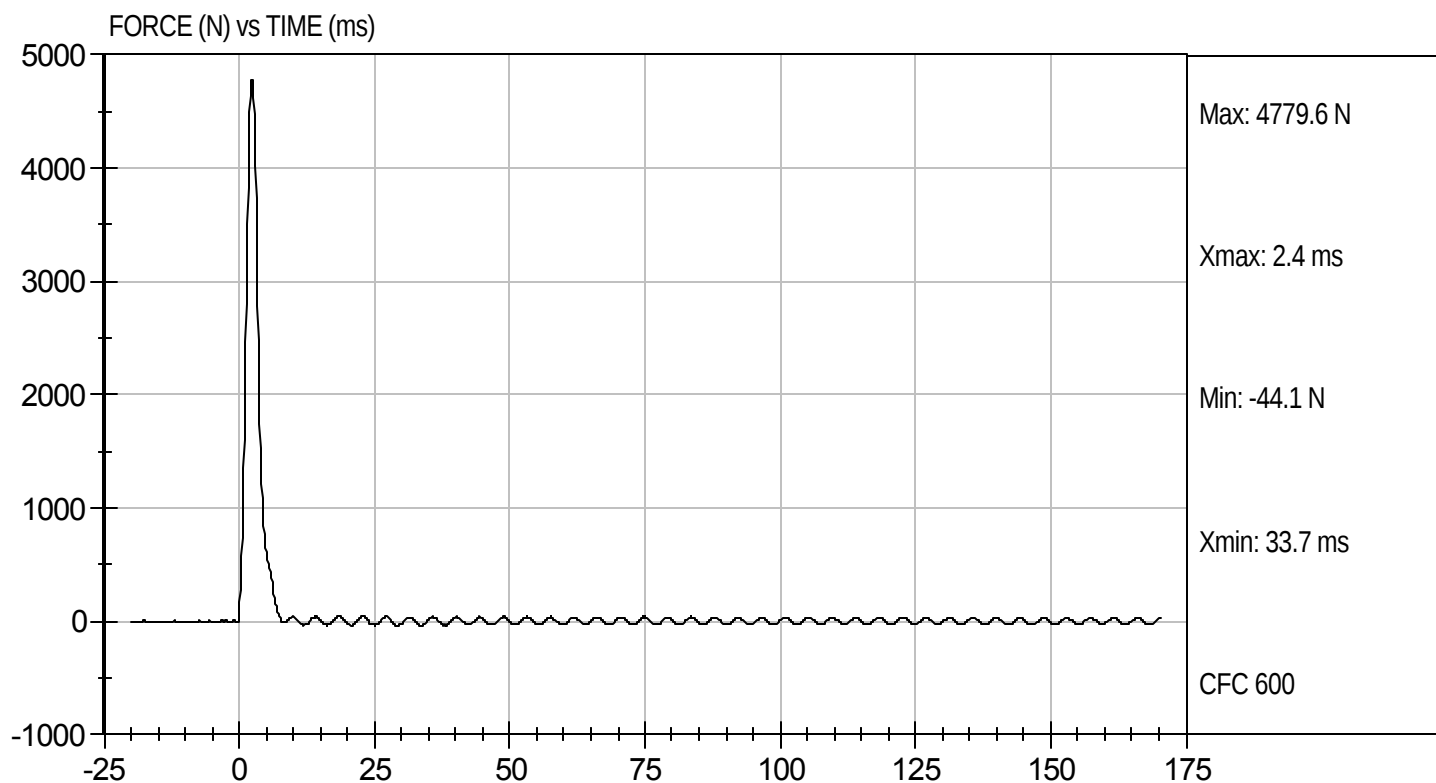


Approved By



Test Desc: Left Knee
Component ID: D122236

Test Date: 6/18/12
Velocity: 6.97 ft/s, 2.12 m/s



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

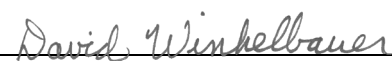
ATD Serial No: 036

Test I.D: D122230

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.0	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	51	51	Pass
Rotation Rate	deg/s	5.0 -10.0	6.2	6.2	Pass
30 Degrees	Nm	94.9 Nm Max	90.3	76.1	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 - 50.0 Degree Max Rotation	44.4	45.2	Pass
Overall Test Results					Pass


 Laboratory Technician

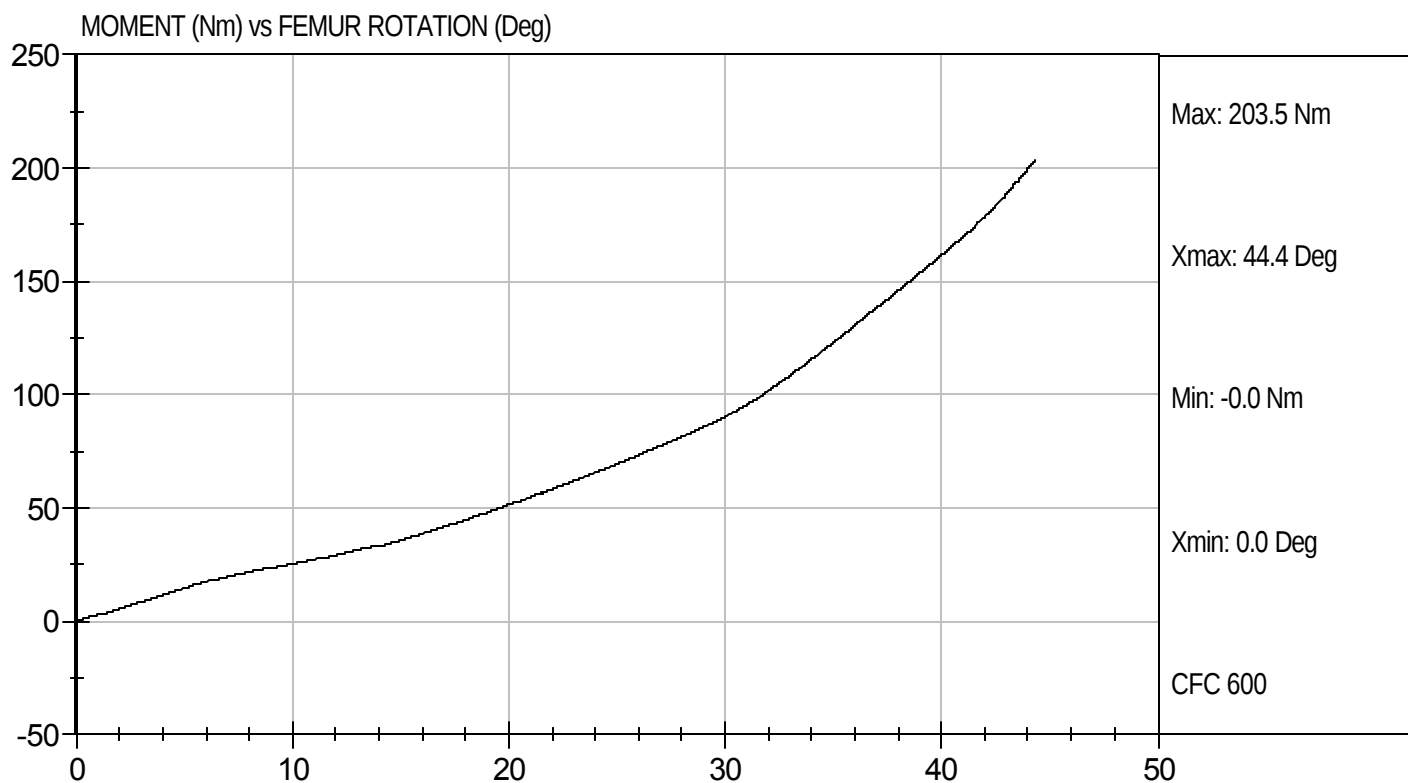
6/18/12
 Test Date


 Approved By



Test Desc: Hip Femur Flexion
Component ID: D122239

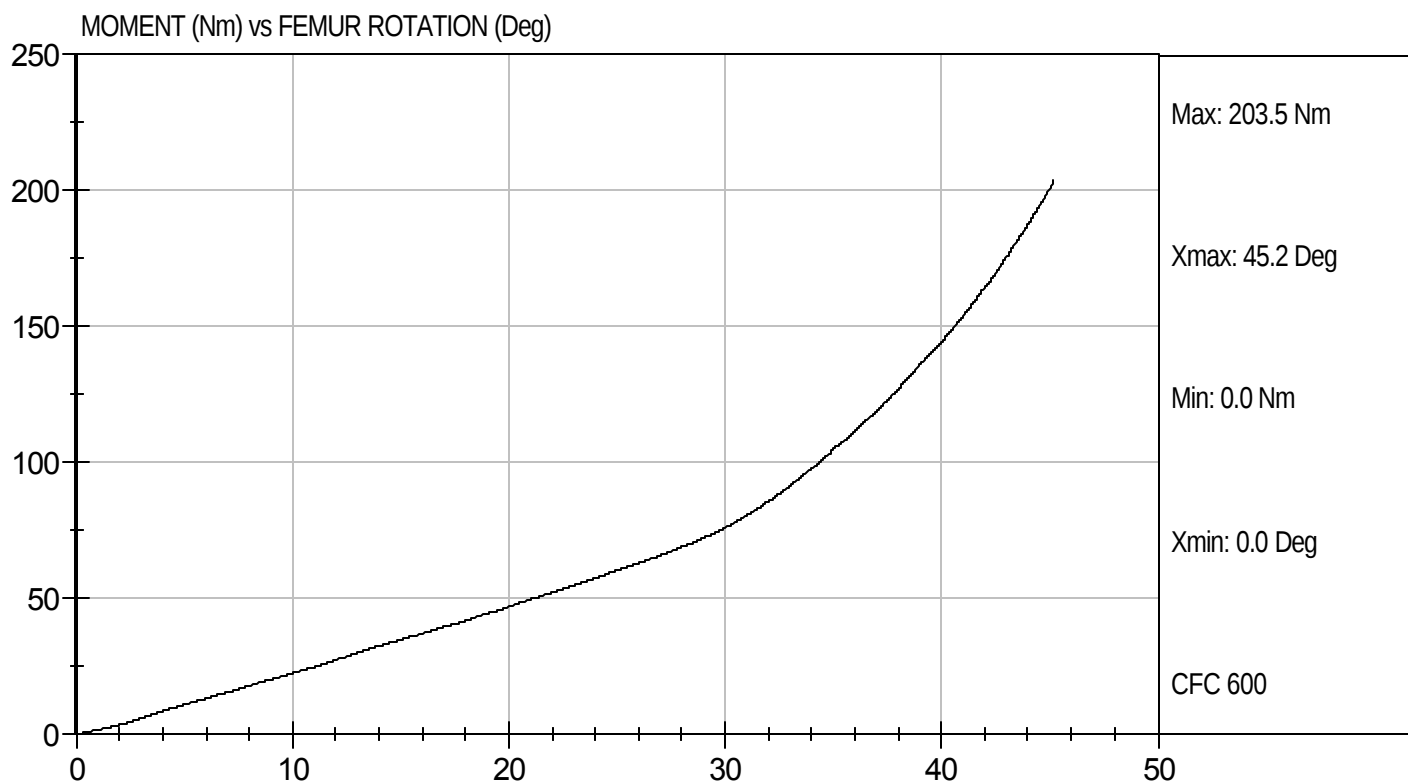
Test Date: 6/18/12
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Component ID: D122230

Test Date: 6/18/12
Velocity: 0 ft/s, 0.00 m/s



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

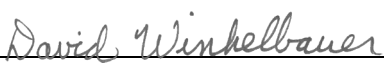
ATD Serial No: 036

Test ID: D122471

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Peak Resultant Acceleration	G's	225 - 275	237	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-7.9	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

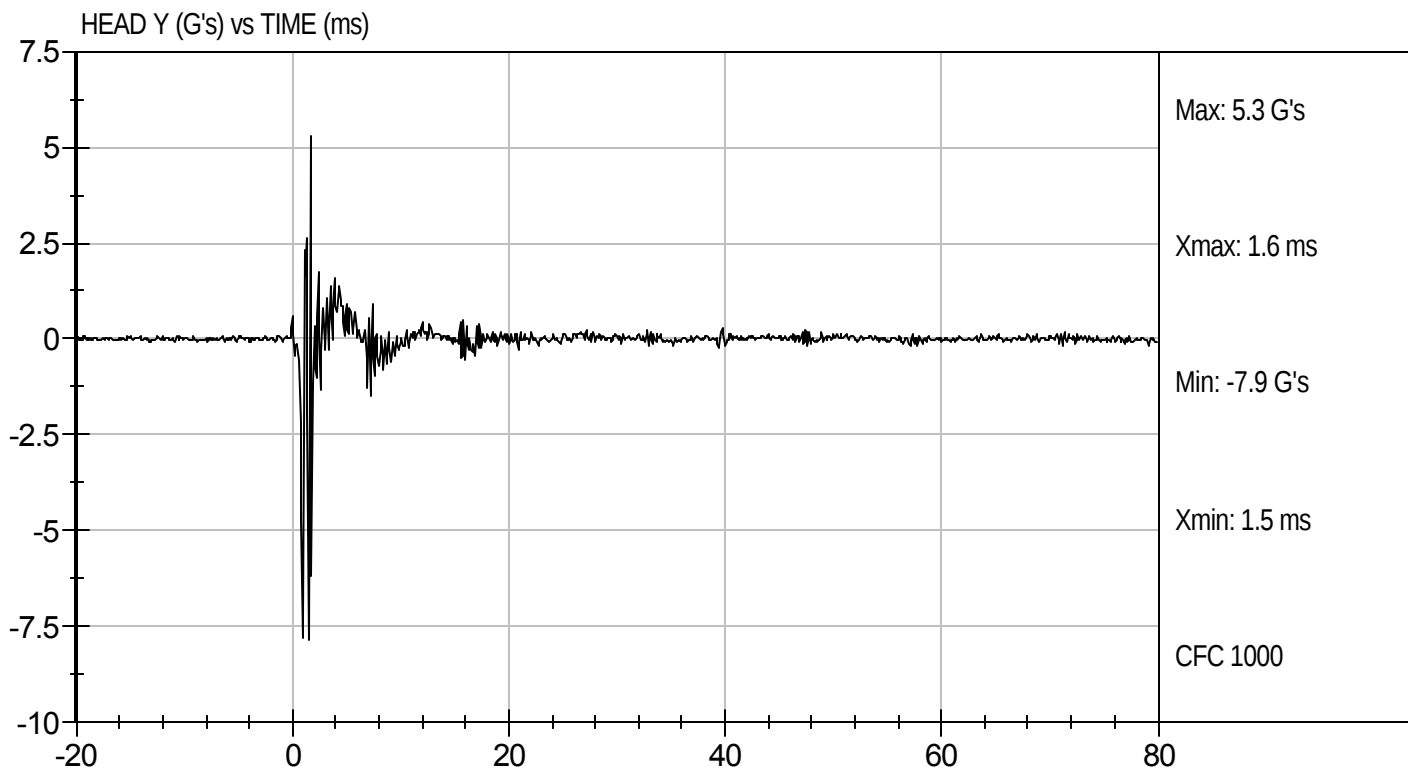
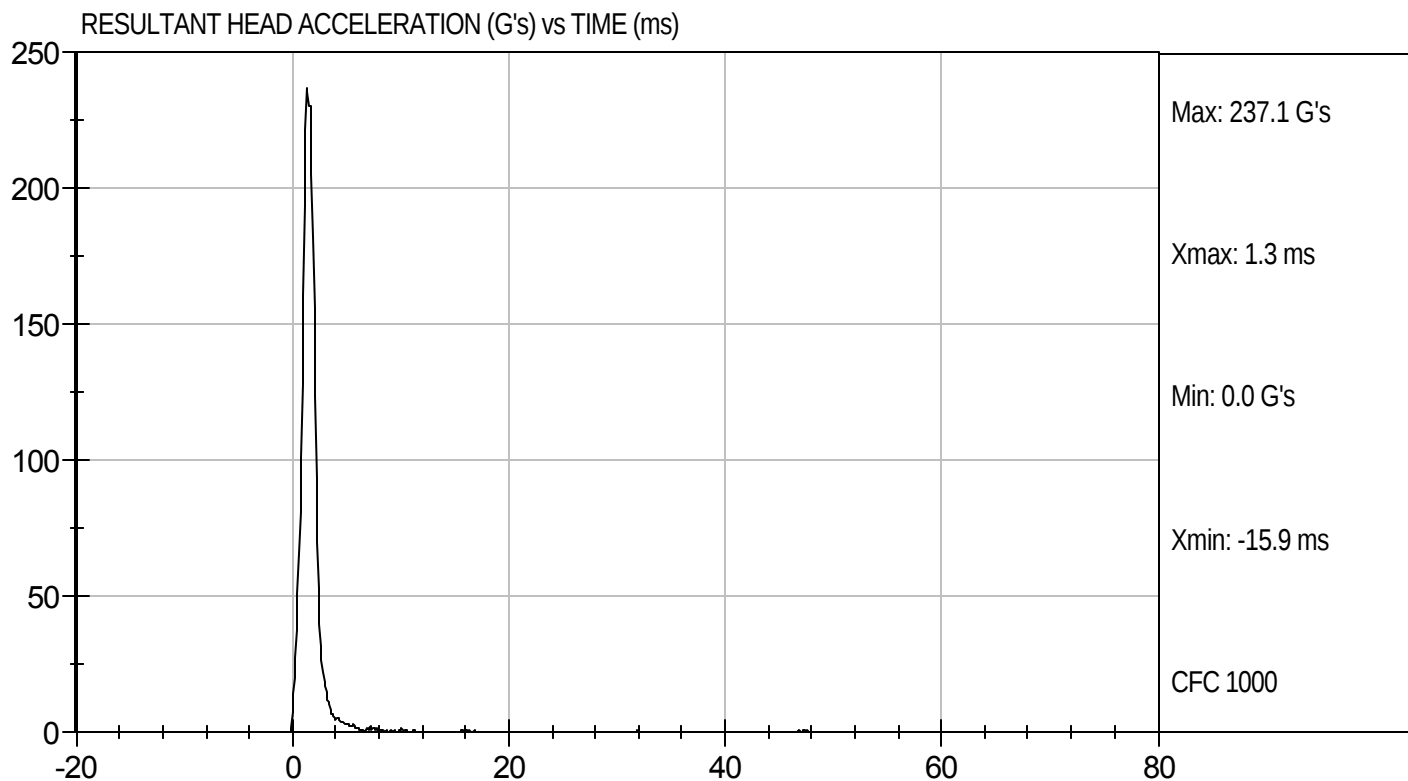
7/5/12
Test Date


Approved By



Test Desc: Head Drop
Component ID: D122471

Test Date: 7/5/12
Velocity: 0 ft/s, 0 m/s



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

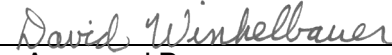
ATD Serial No: 036

Test I.D.: D122472

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	45	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	25.05	Pass
	20 ms	G's	17.60 to 22.60	20.53	Pass
	30 ms	G's	12.50 to 18.50	16.71	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	16.6	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	34.6	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	71.2	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	116.2	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	94.1	Pass
	Time	ms	47.0 to 58.0	47.5	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	98.9	Pass
Overall Test Results					Pass


 Laboratory Technician

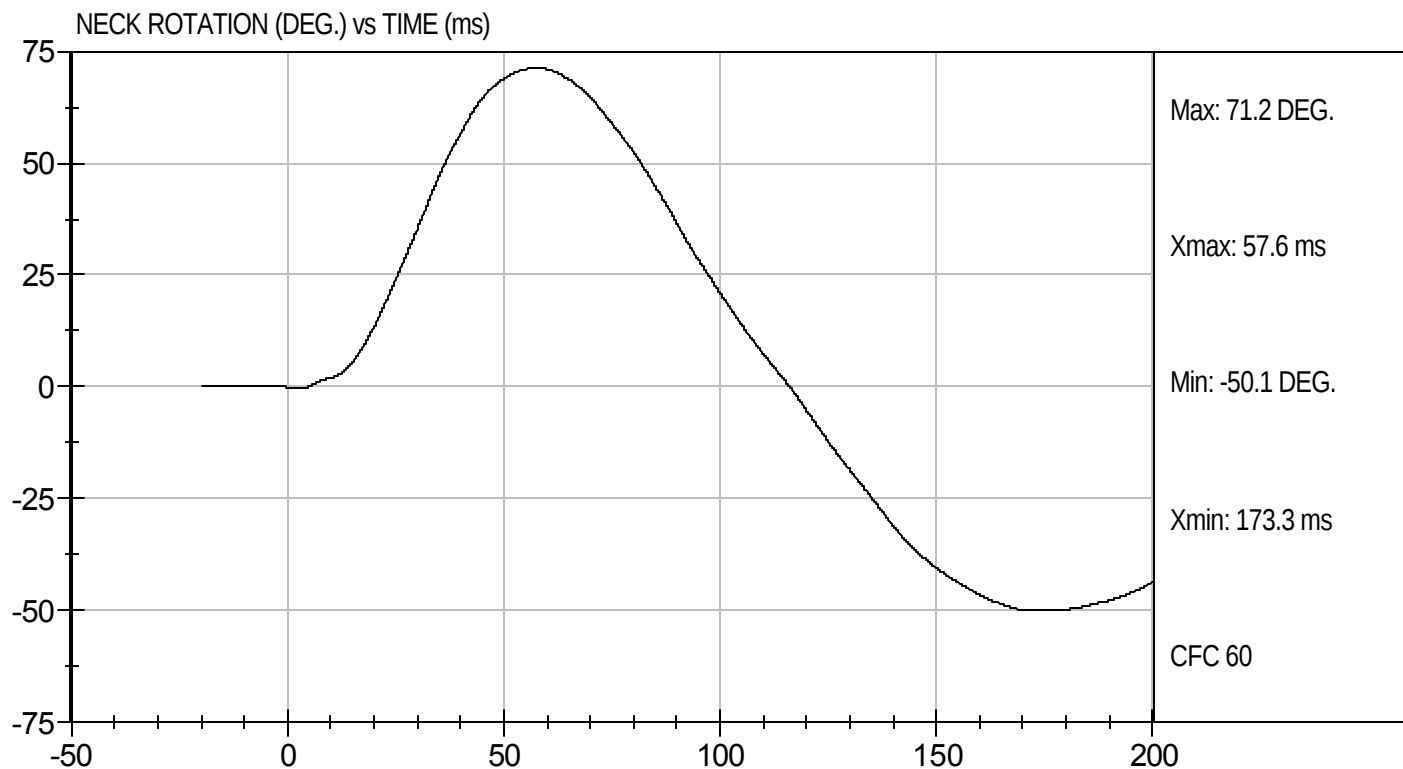
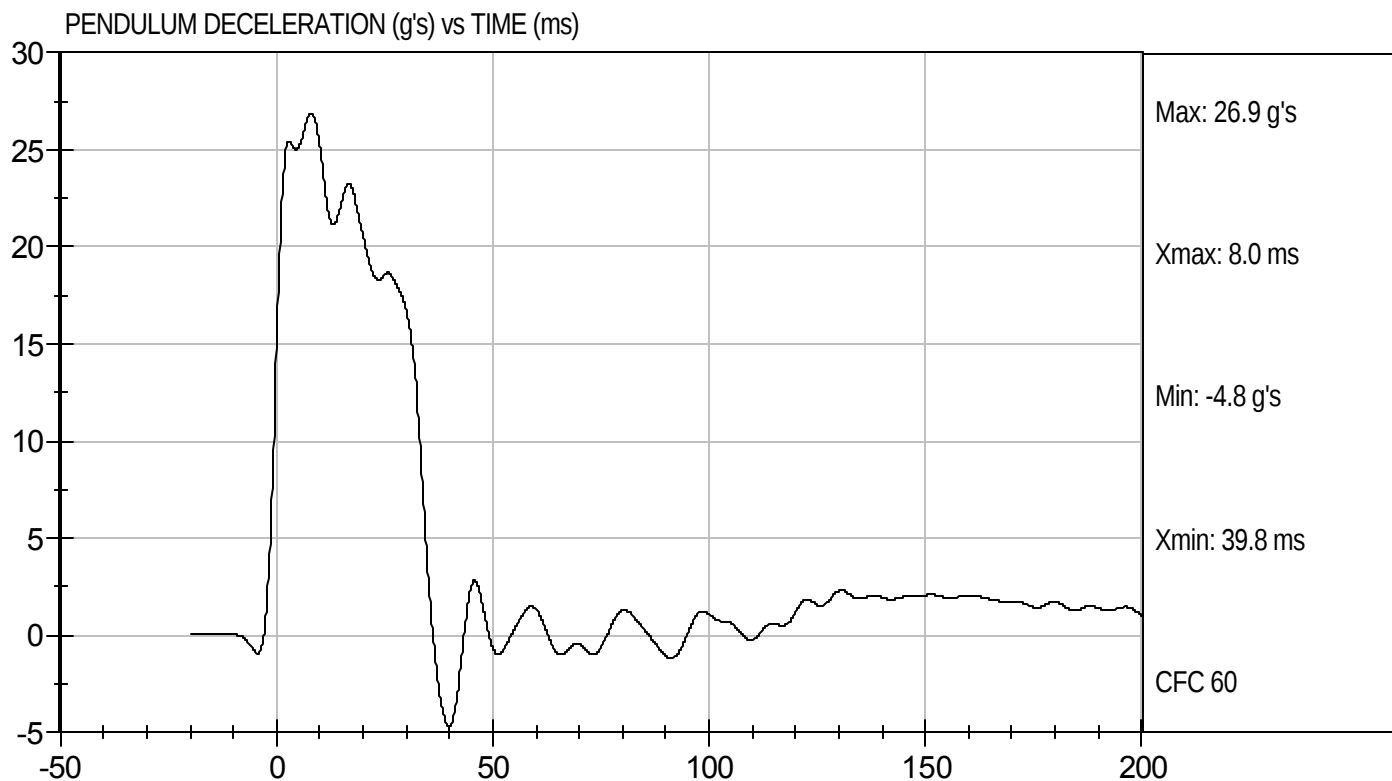
7/5/12
 Test Date


 Approved By



Test Desc: Neck Flexion
Component ID: D122472

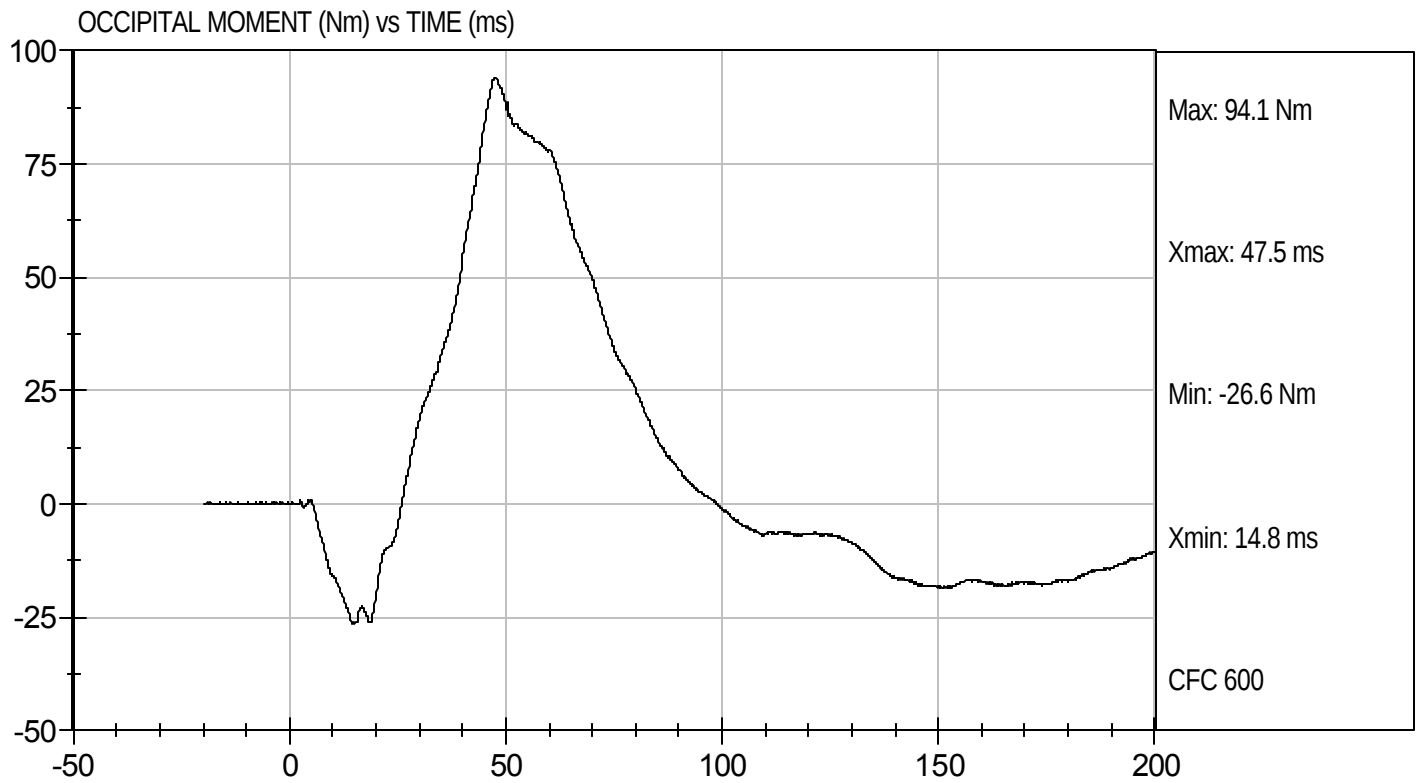
Test Date: 7/5/12
Velocity: 23.15 ft/s, 7.06 m/s





Test Desc: Neck Flexion
Component ID: D122472

Test Date: 7/5/12
Velocity: 23.15 ft/s, 7.06 m/s



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

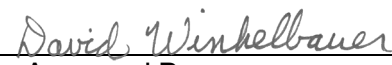
ATD Serial No: 036

Test I.D.: D122473

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	45	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	18.60	Pass
	20 ms	G's	14.00 to 19.00	18.52	Pass
	30 ms	G's	11.00 to 16.00	15.64	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	15.6	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	38.7	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	97.5	Pass
	Time	ms	72.0 to 82.0	73.1	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	155.5	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-70.1	Pass
	Time	ms	65.0 to 79.0	69.0	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	140.8	Pass
Overall Test Results					Pass


 Laboratory Technician

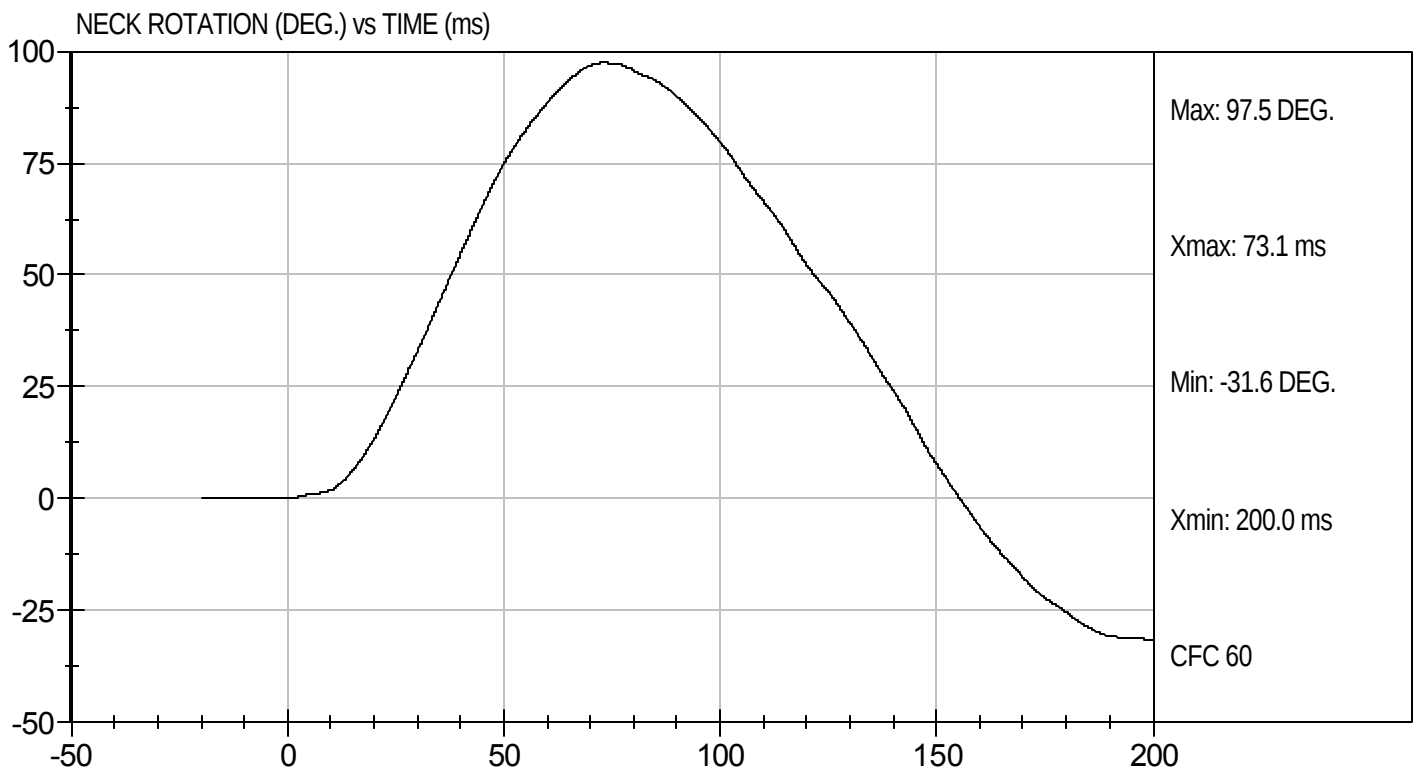
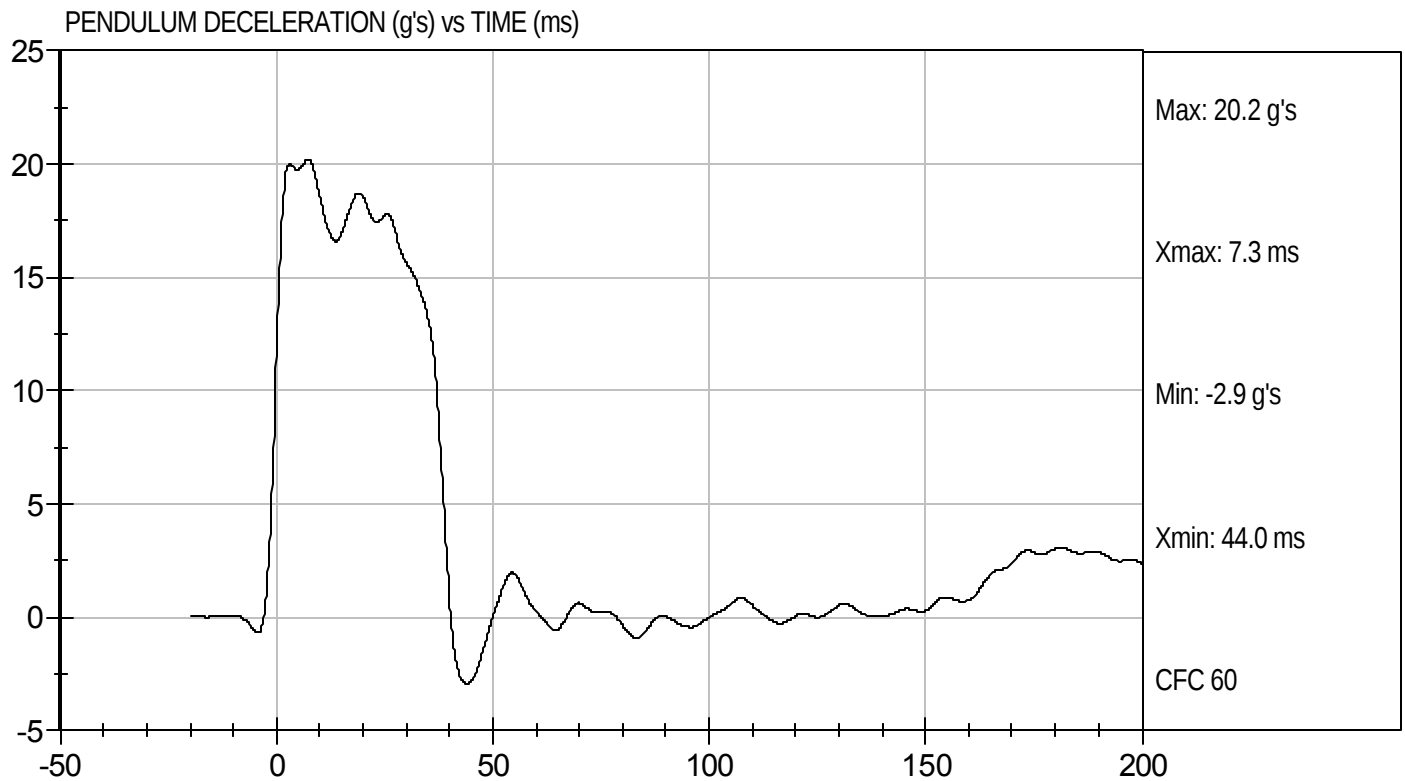
7/5/12
 Test Date


 Approved By



Test Desc: Neck Extension
Component ID: D122473

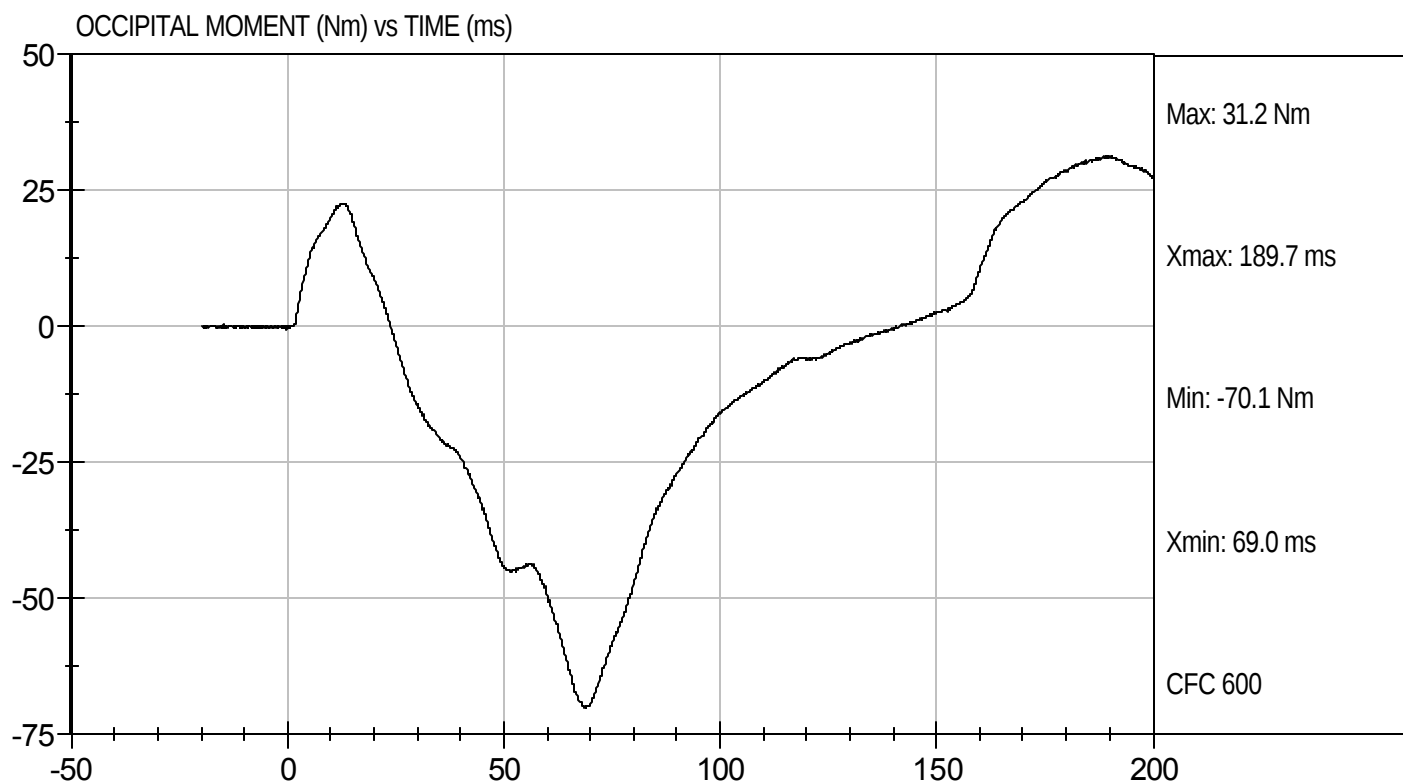
Test Date: 7/5/12
Velocity: 20.08 ft/s, 6.12 m/s





Test Desc: Neck Extension
Component ID: D122473

Test Date: 7/5/12
Velocity: 20.08 ft/s, 6.12 m/s



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

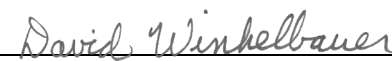
ATD Serial No: 036

Test I.D: D122474

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	46	Pass
Probe Velocity	m/s	6.58 to 6.82	6.68	Pass
Peak Probe Force	N	5159 to 5893	5,252	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	7.14	Pass
Internal Hysteresis	%	69 to 85	70	Pass
Overall Test Results			Pass	


Laboratory Technician

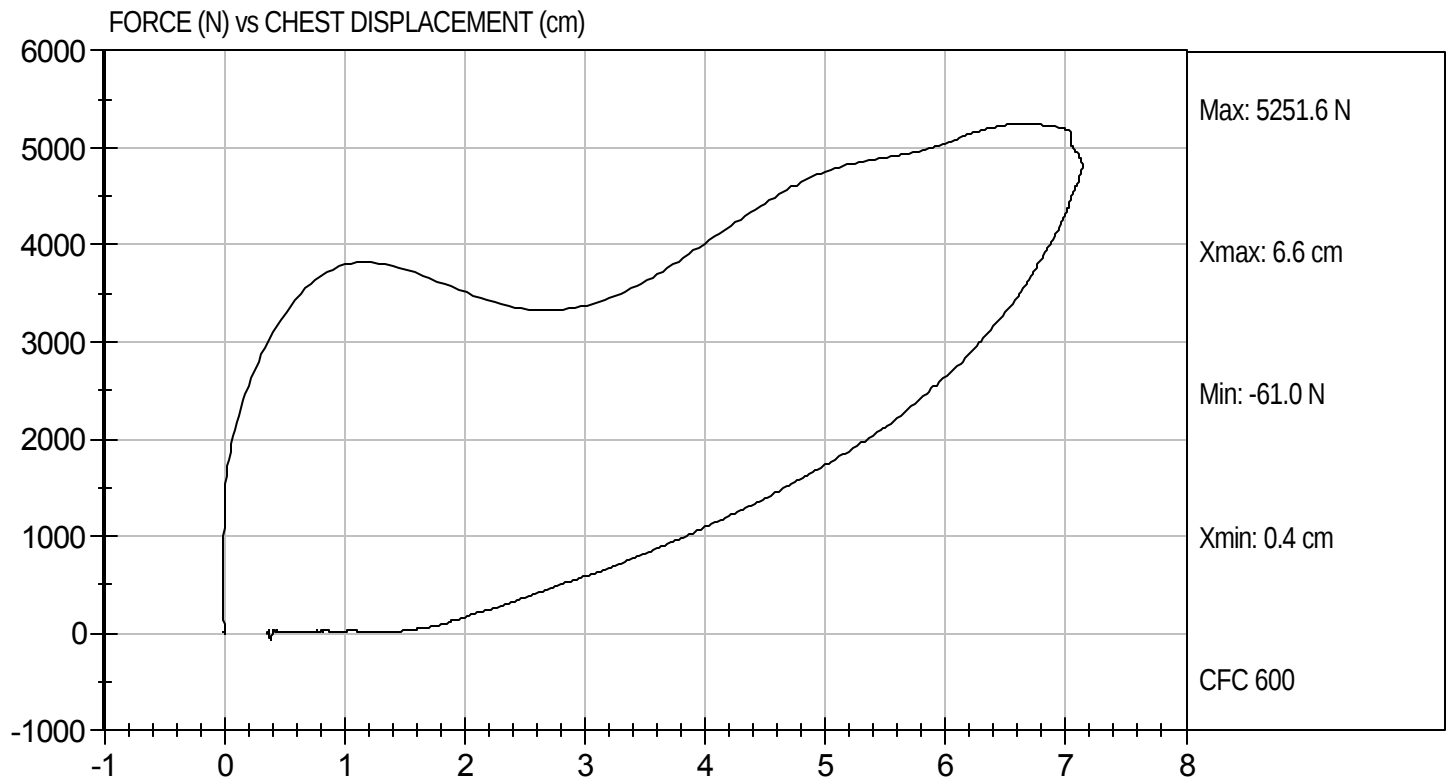
7/5/12
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D122474

Test Date: 7/5/12
Velocity: 21.9 ft/s, 6.68 m/s



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

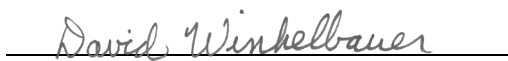
ATD Serial No: 036

Test I.D: D122475

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	45	Pass
Probe Velocity	m/s	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	5,219	Pass
Overall Test Results				Pass


Laboratory Technician

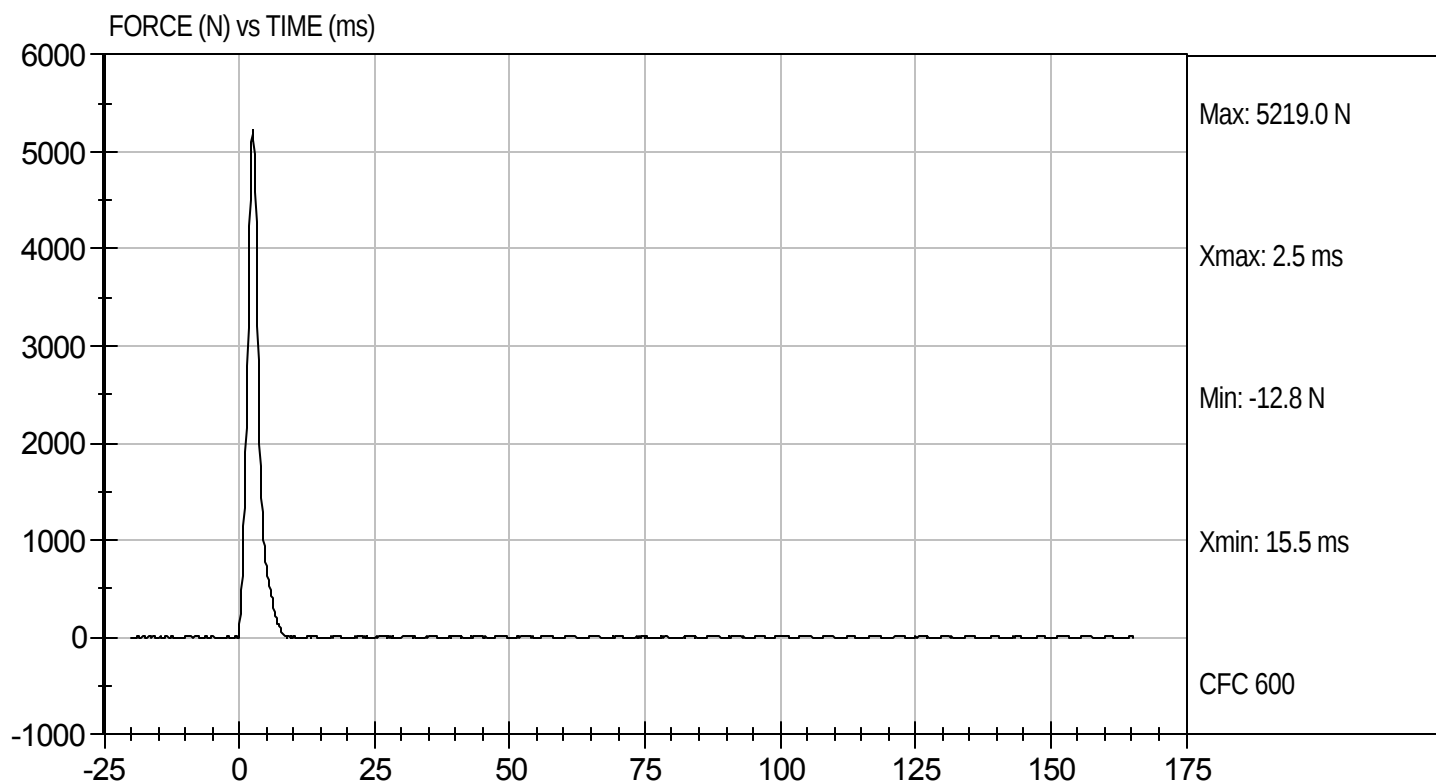
7/5/12
Test Date


Approved By



Test Desc: Right Knee
Component ID: D122475

Test Date: 7/5/12
Velocity: 6.92 ft/s, 2.11 m/s



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

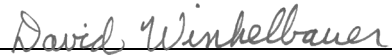
ATD Serial No: 036

Test I.D: D122476

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	45	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	Newtons	4715 to 5782	5,302	Pass
Overall Test Results				Pass


Laboratory Technician

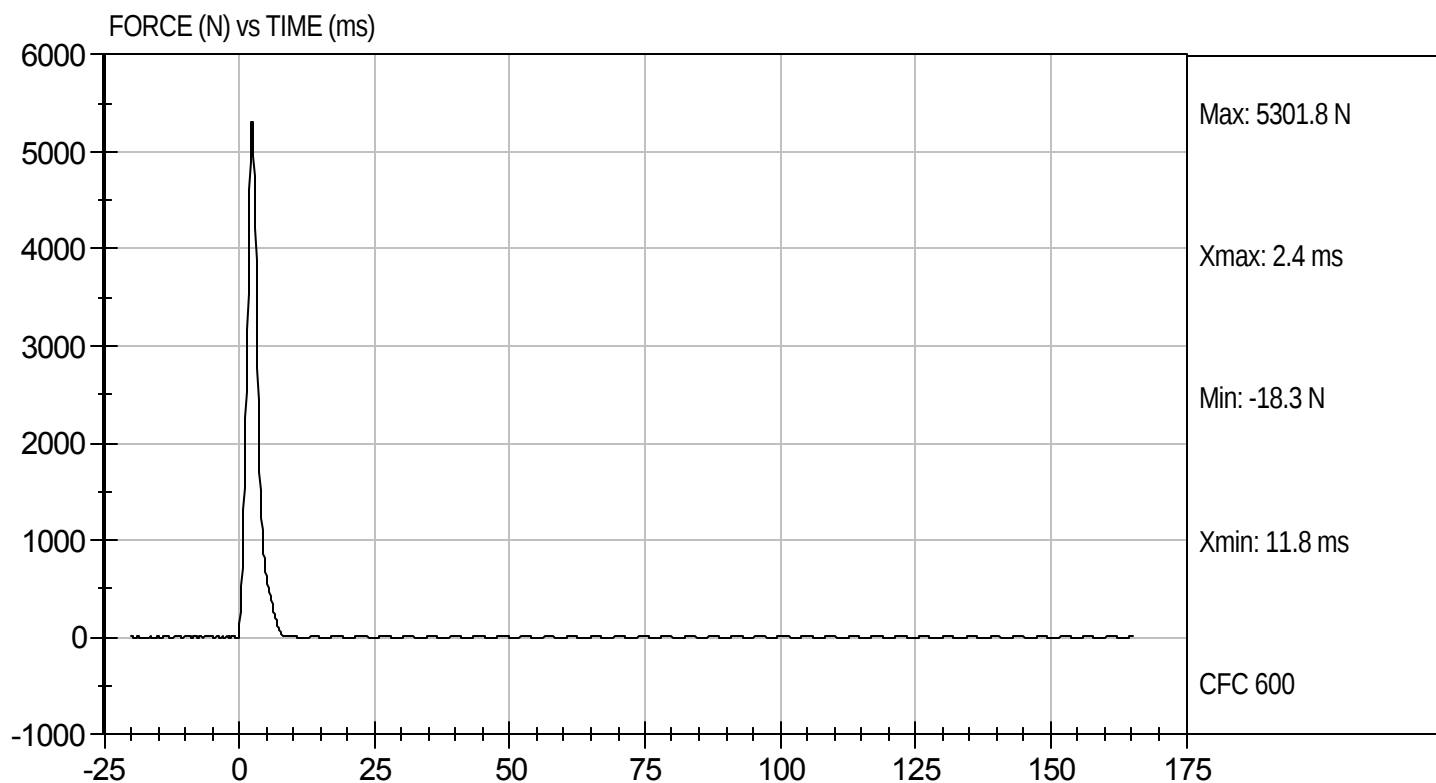
7/5/12
Test Date


Approved By



Test Desc: Left Knee
Component ID: D122476

Test Date: 7/5/12
Velocity: 6.94 ft/s, 2.12 m/s



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

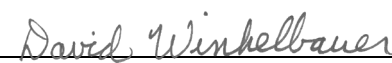
ATD Serial No: 036

Test I.D: D122470

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	22.1	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	46	46	Pass
Rotation Rate	deg/s	5.0 -10.0	6.2	6.2	Pass
30 Degrees	Nm	94.9 Nm Max	90.3	74.2	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 - 50.0 Degree Max Rotation	44.1	45.5	Pass
Overall Test Results					Pass


 Laboratory Technician

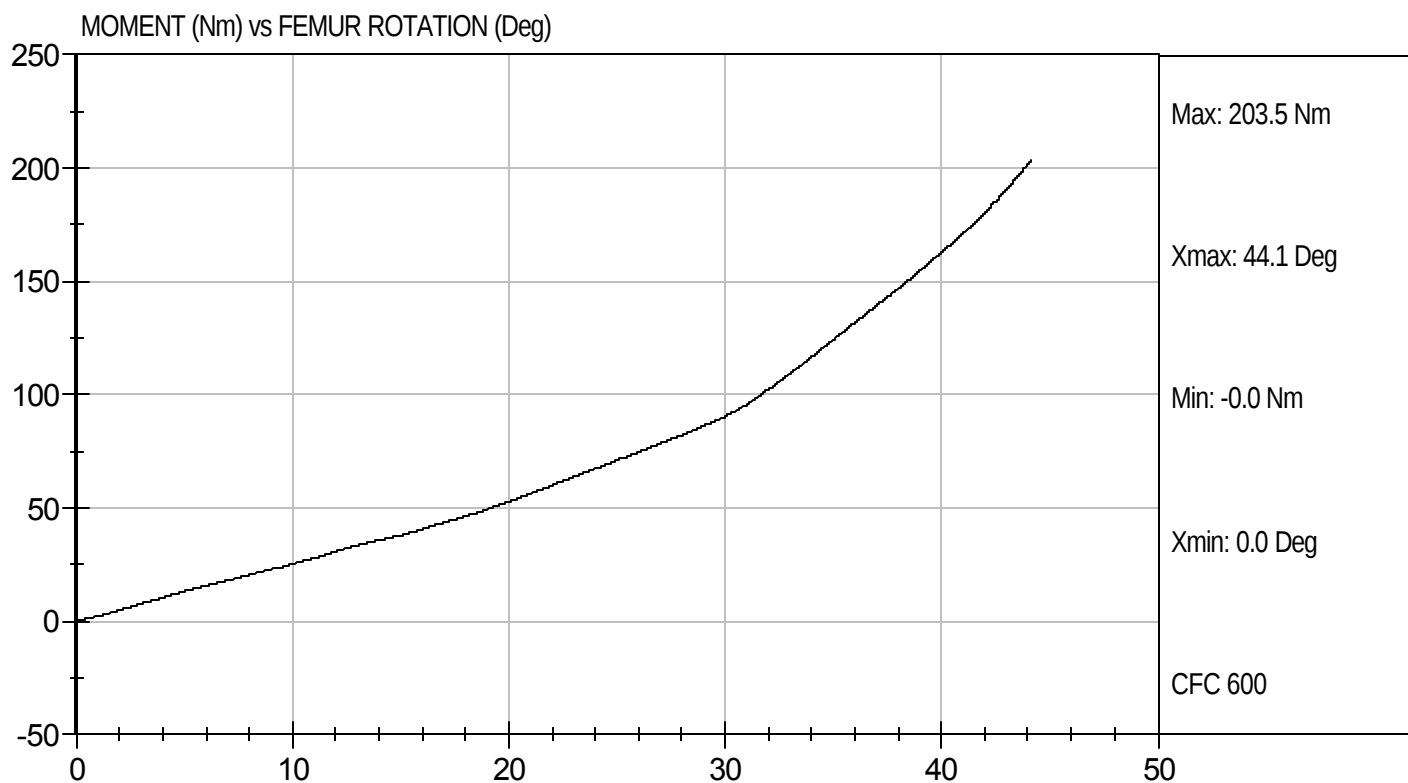
7/5/12
 Test Date


 Approved By



Test Desc: Hip Femur Flexion
Component ID: D122479

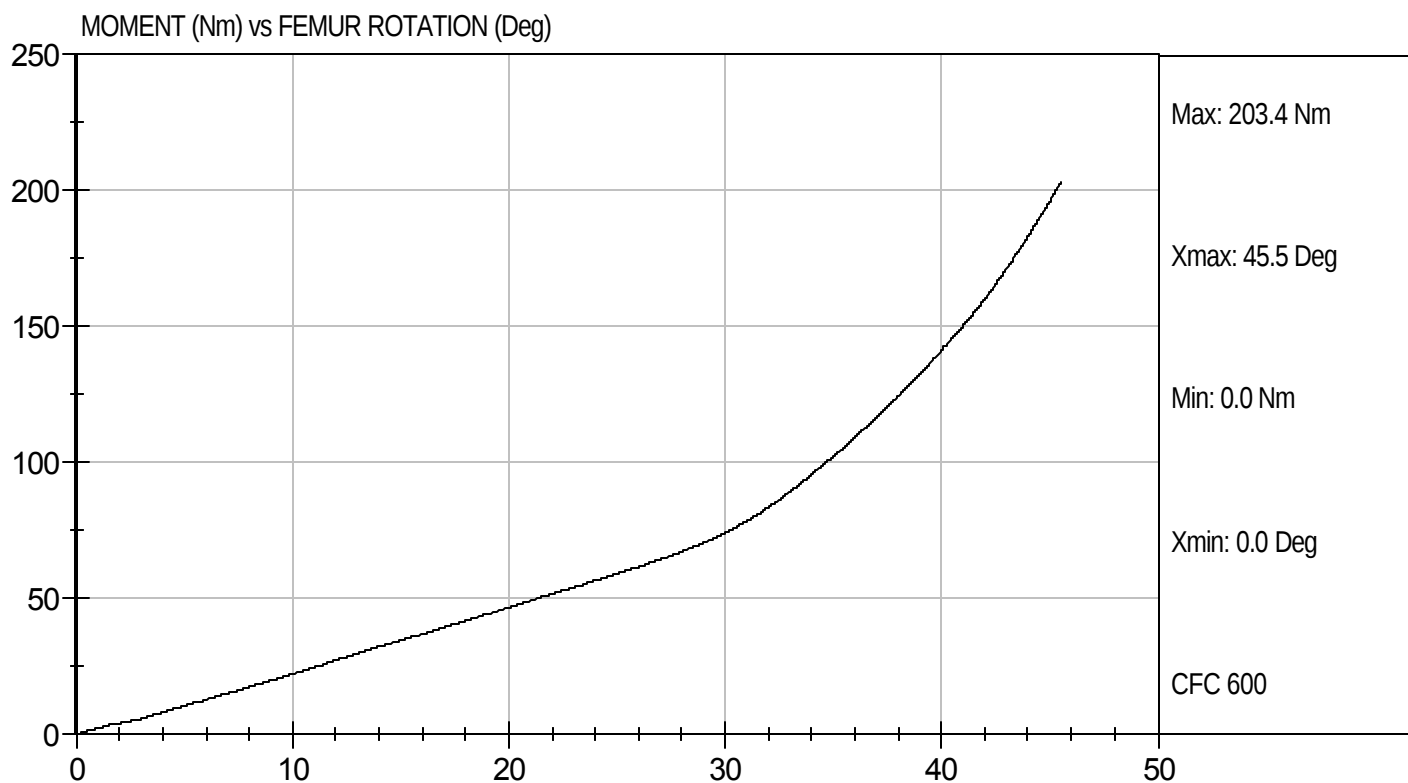
Test Date: 7/5/12
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Component ID: D122470

Test Date: 7/5/12
Velocity: 0 ft/s, 0.00 m/s



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

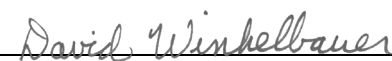
Test ID: D122031

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	40	Pass
Peak Resultant Acceleration	G's	250 to 300	272	Pass
Peak Lateral Acceleration	G's	+/- 15	3.1	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass



Laboratory Technician

5/30/12
Test Date

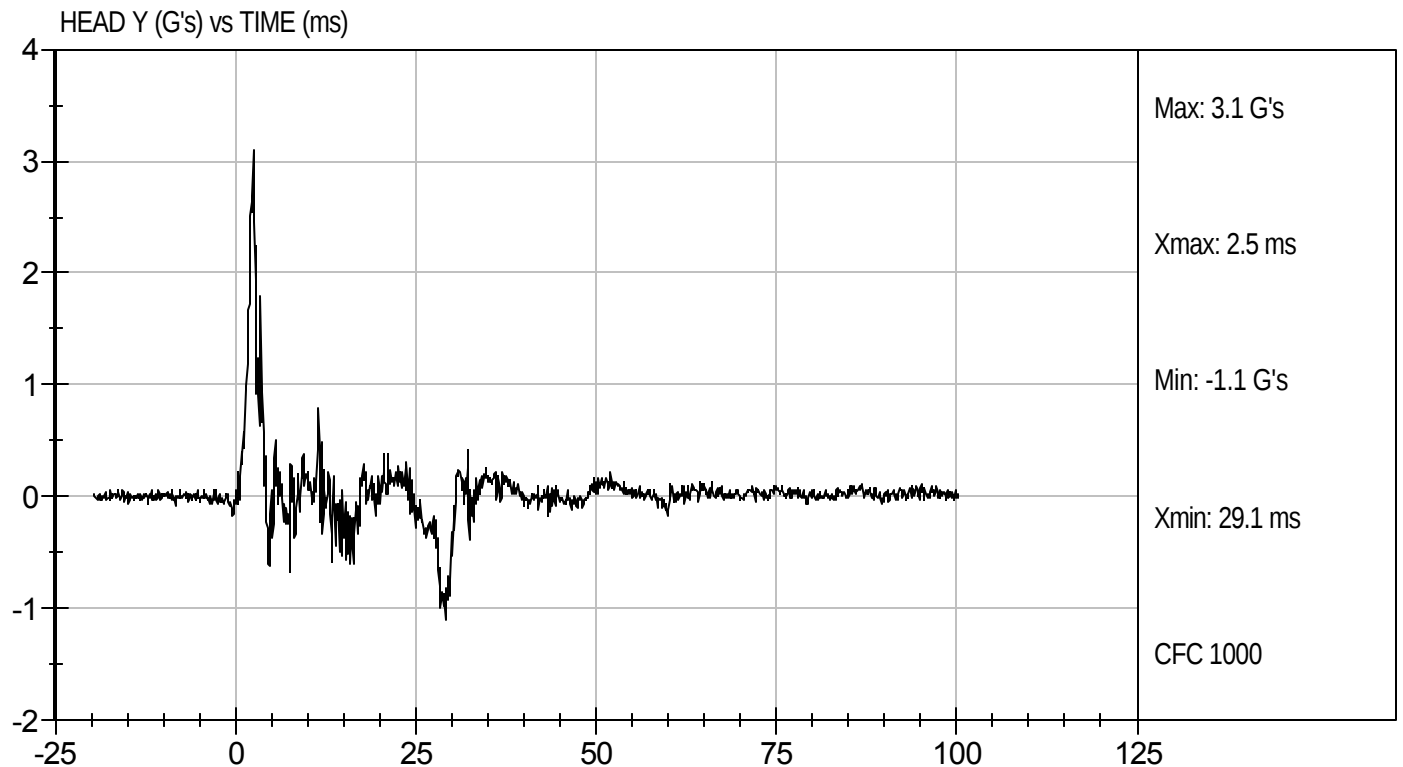
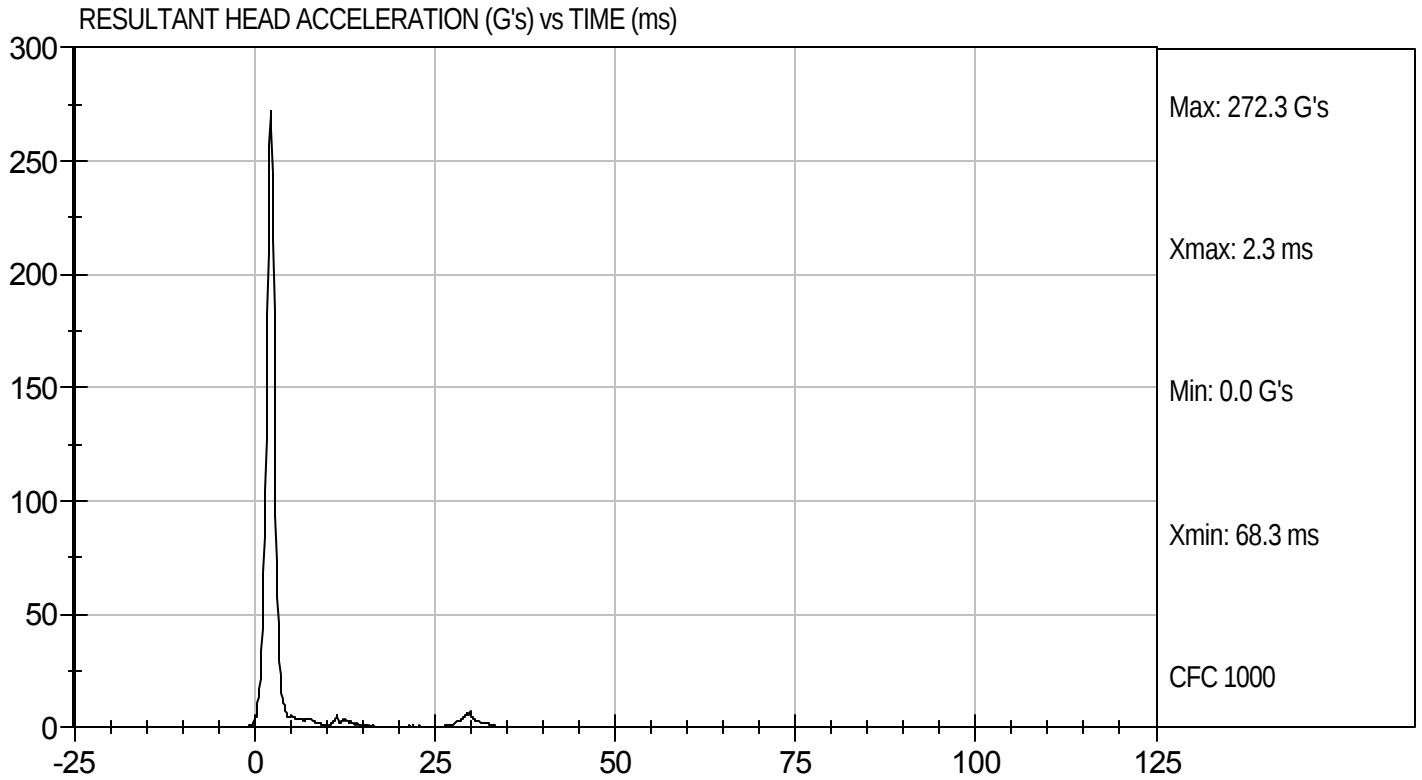


Approved By



Test Desc: Head Drop
Component ID: D122031

Test Date: 5/30/12
Velocity: 0 ft/s, 0 m/s



MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 5TH PERCENTILE

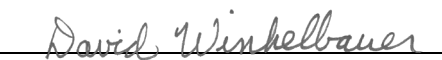
ATD Serial No: 634

Test I.D: D122032

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 Pulse	10 ms	m/s	2.1 to 2.5	2.5	Pass
	20 ms	m/s	4.0 to 5.0	4.6	Pass
	30 ms	m/s	5.8 to 7.0	6.4	Pass
D Plane Rotation	Max	deg	77 to 91	86	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	69 to 83	71	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	86	Pass
Overall Results				Pass	


 Laboratory Technician

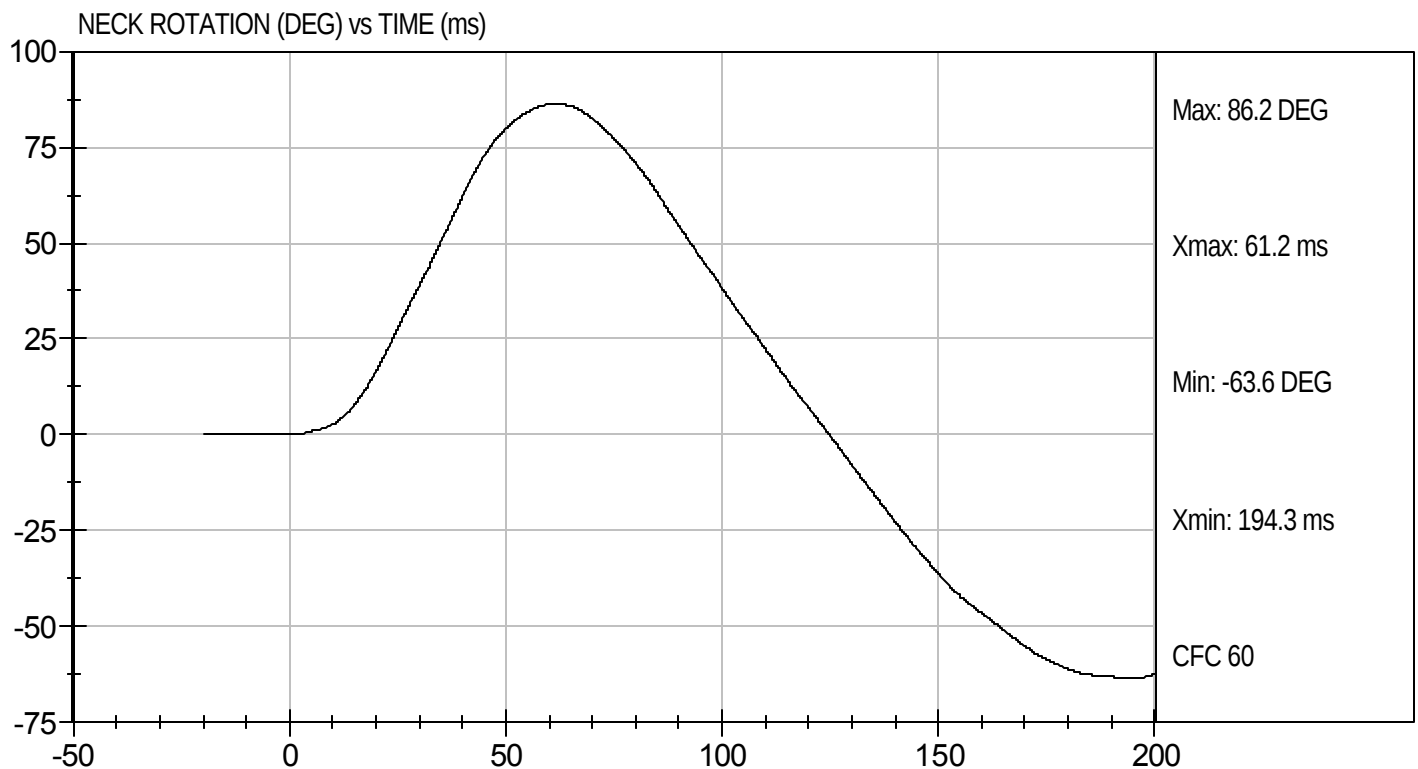
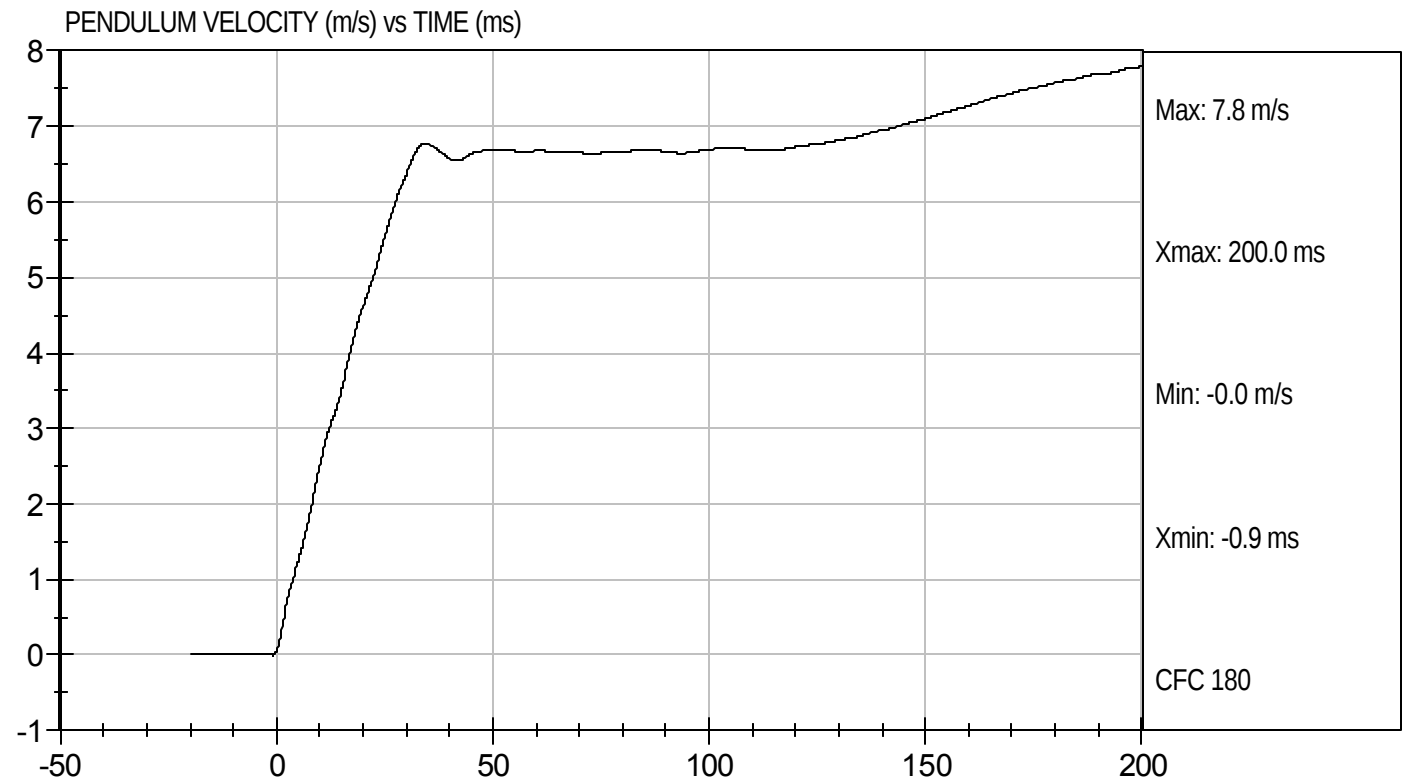
5/30/12
 Test Date


 Approved By



Test Desc: Neck Flexion
Component ID: D122032

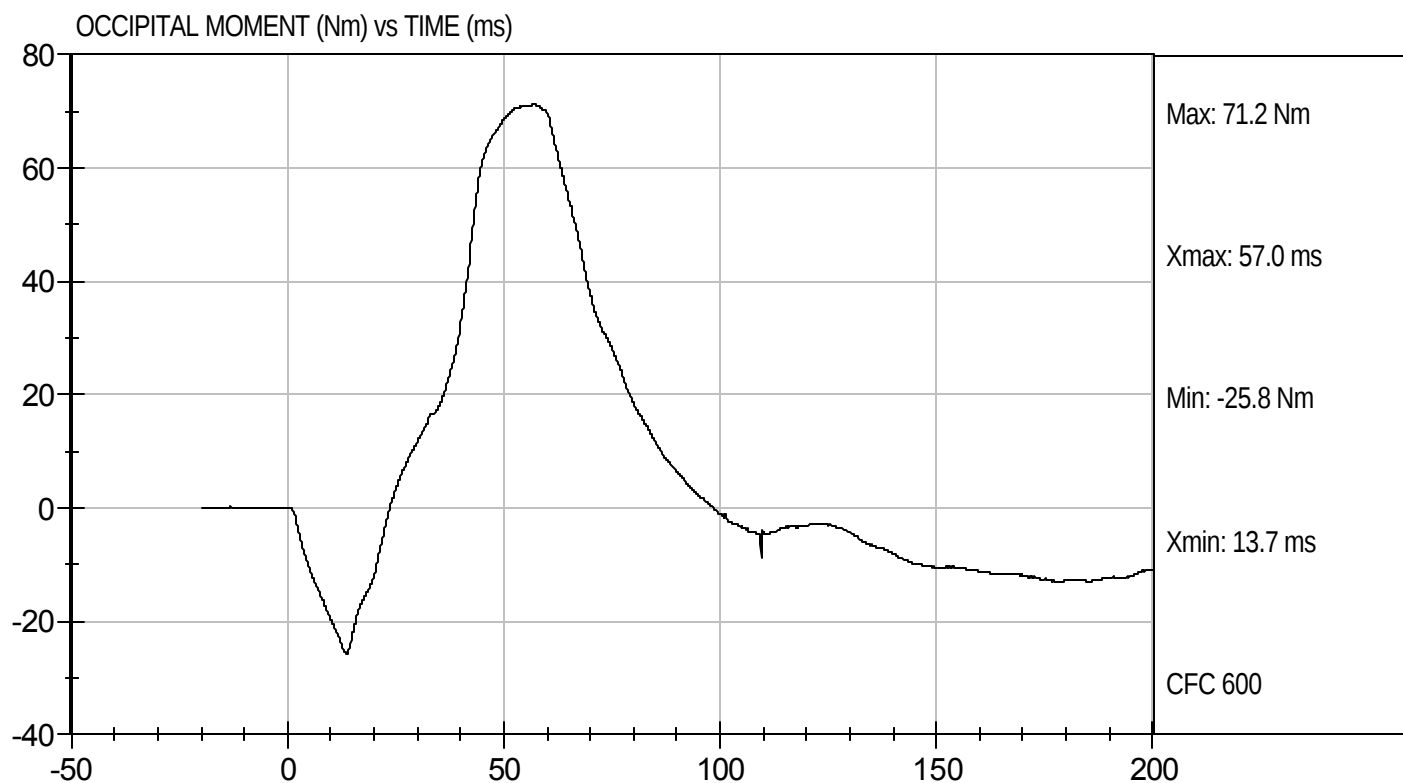
Test Date: 5/30/12
Velocity: 22.83 ft/s, 6.96 m/s





Test Desc: Neck Flexion
Component ID: D122032

Test Date: 5/30/12
Velocity: 22.83 ft/s, 6.96 m/s

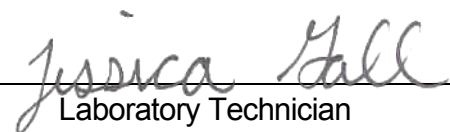


MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

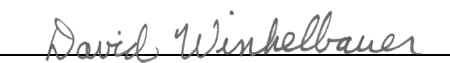
ATD Serial No: 634

Test I.D: D122033

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	39	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.19	Pass
Pendulum Pulse	10 ms	m/s	1.5 to 1.9	1.8	Pass
	20 ms	m/s	3.1 to 3.9	3.4	Pass
	30 ms	m/s	4.6 to 5.6	4.8	Pass
D Plane Rotation	Max	deg	99 to 114	105	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-55	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	101	Pass
Overall Results					Pass


Laboratory Technician

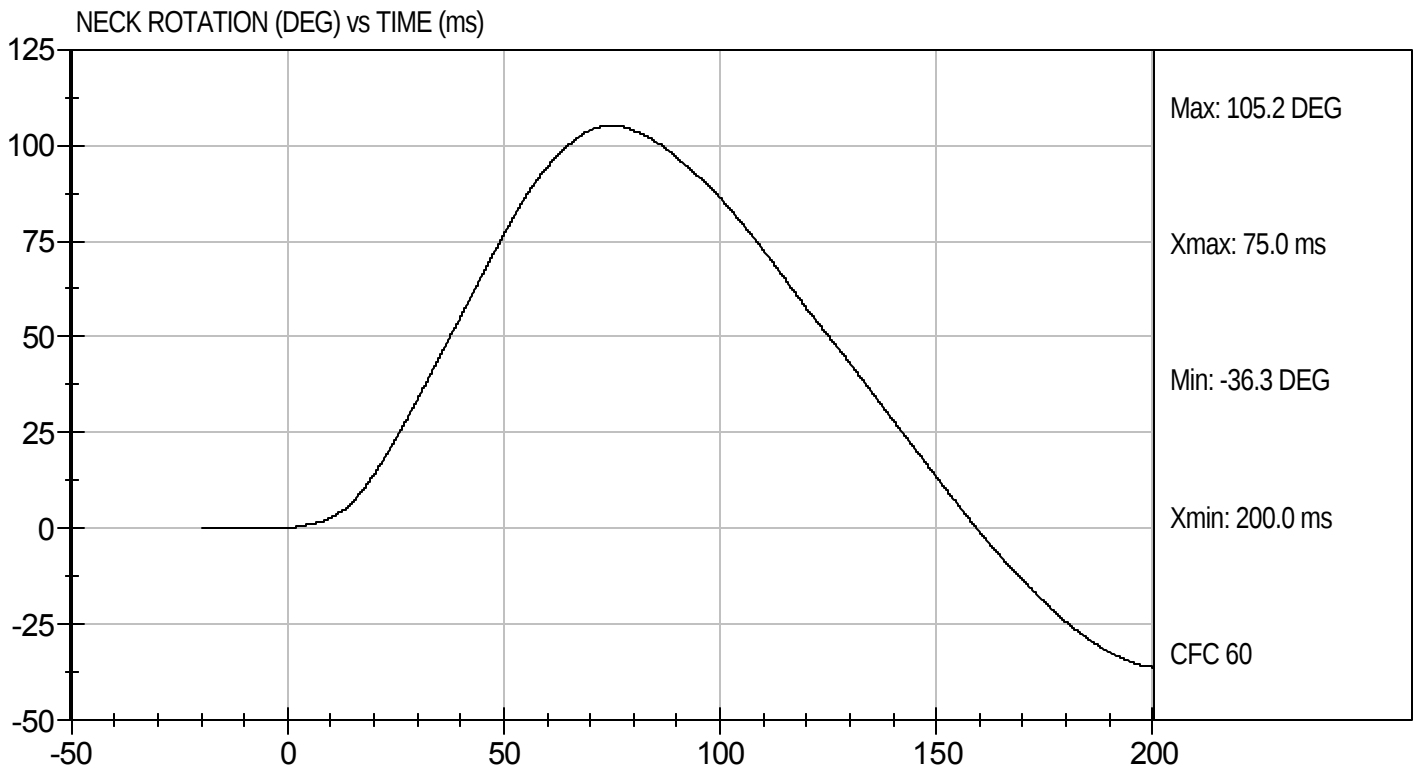
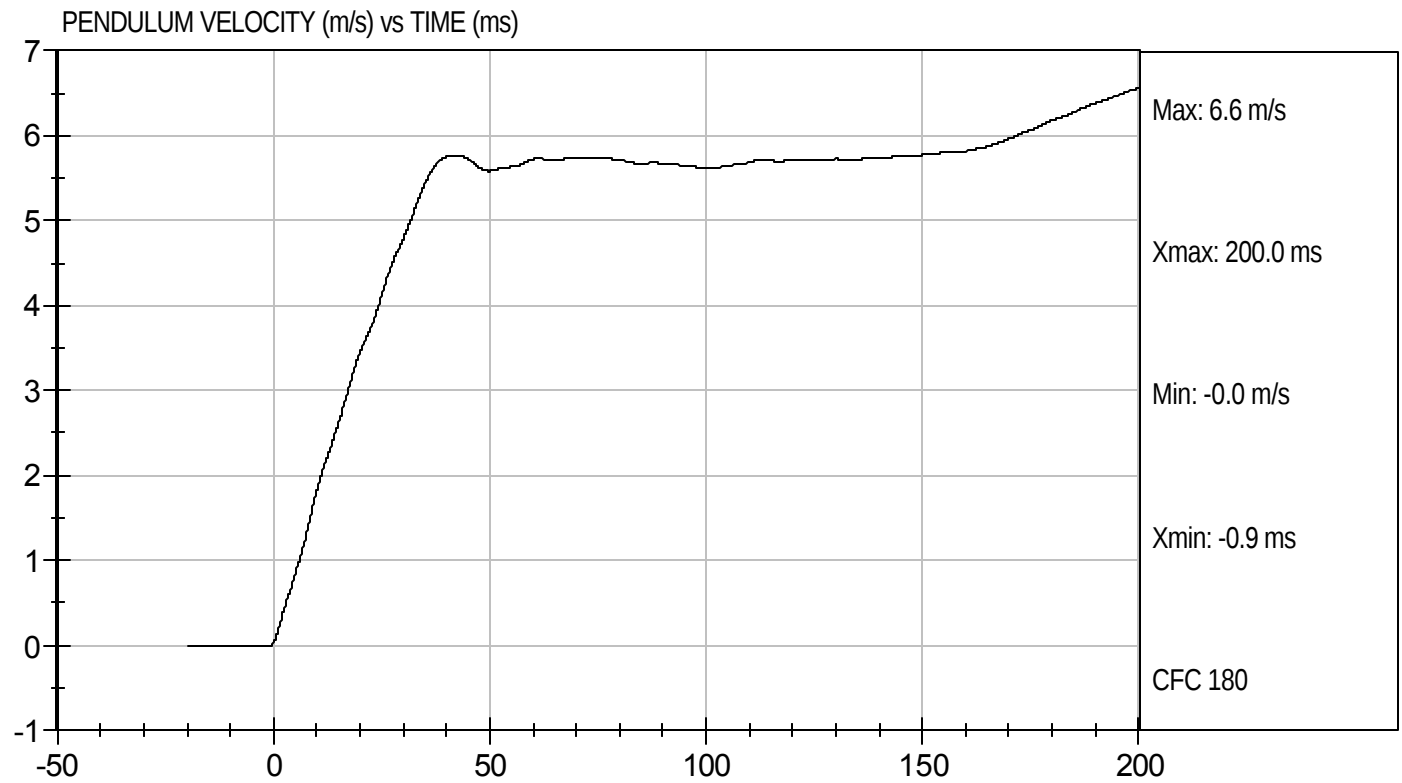
5/30/12
Test Date


Approved By



Test Desc: Neck Extension
Component ID: D122033

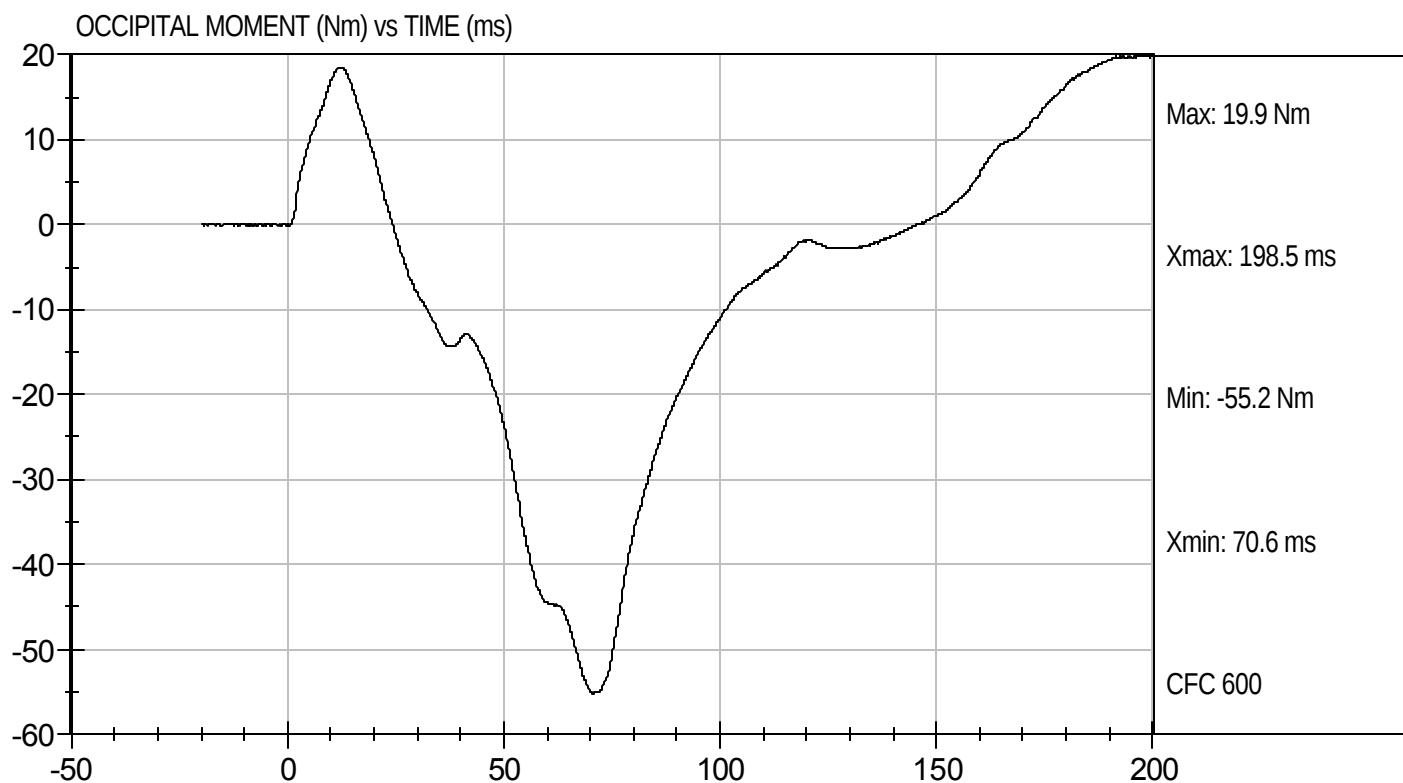
Test Date: 5/30/12
Velocity: 20.3 ft/s, 6.19 m/s





Test Desc: Neck Extension
Component ID: D122033

Test Date: 5/30/12
Velocity: 20.3 ft/s, 6.19 m/s



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

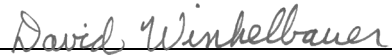
ATD Serial No: 634

Test I.D: D122034

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.1	Pass
Relative Humidity	%	10 to 70	40	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	50	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	3.90	Pass
Internal Hysteresis	%	69 to 85	74	Pass
Peak Force 18 mm - 50 mm	N	<= 4,600 N	4115	Pass
			Overall Test Results	Pass


Laboratory Technician

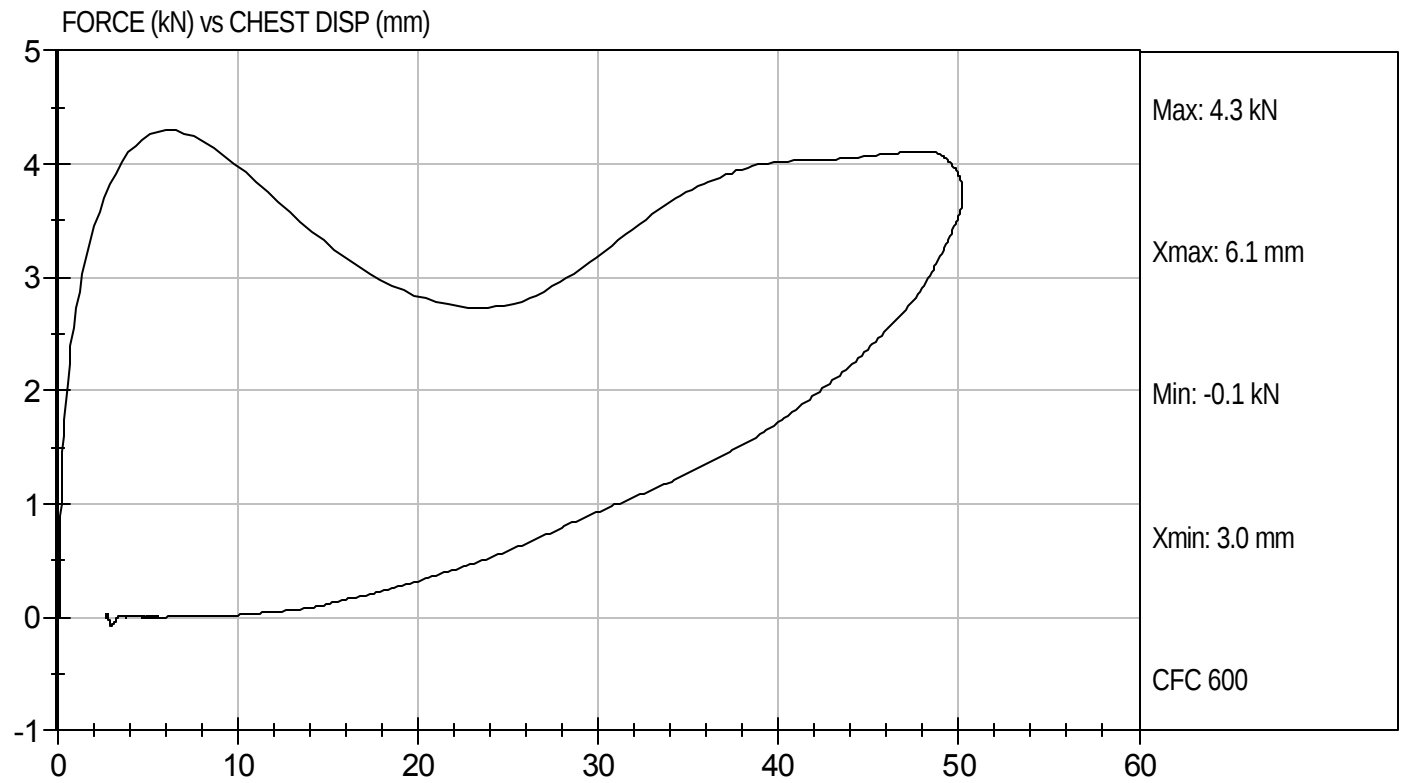
5/31/12
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D122034

Test Date: 5/31/12
Velocity: 22.22 ft/s, 6.77 m/s

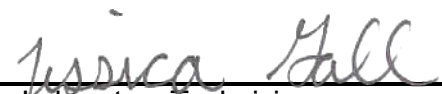


MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

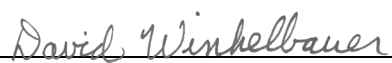
Test I.D: D122035

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	kN	3.45 to 4.06	3.76	Pass
Overall Test Results				Pass



Laboratory Technician

5/30/12
Test Date

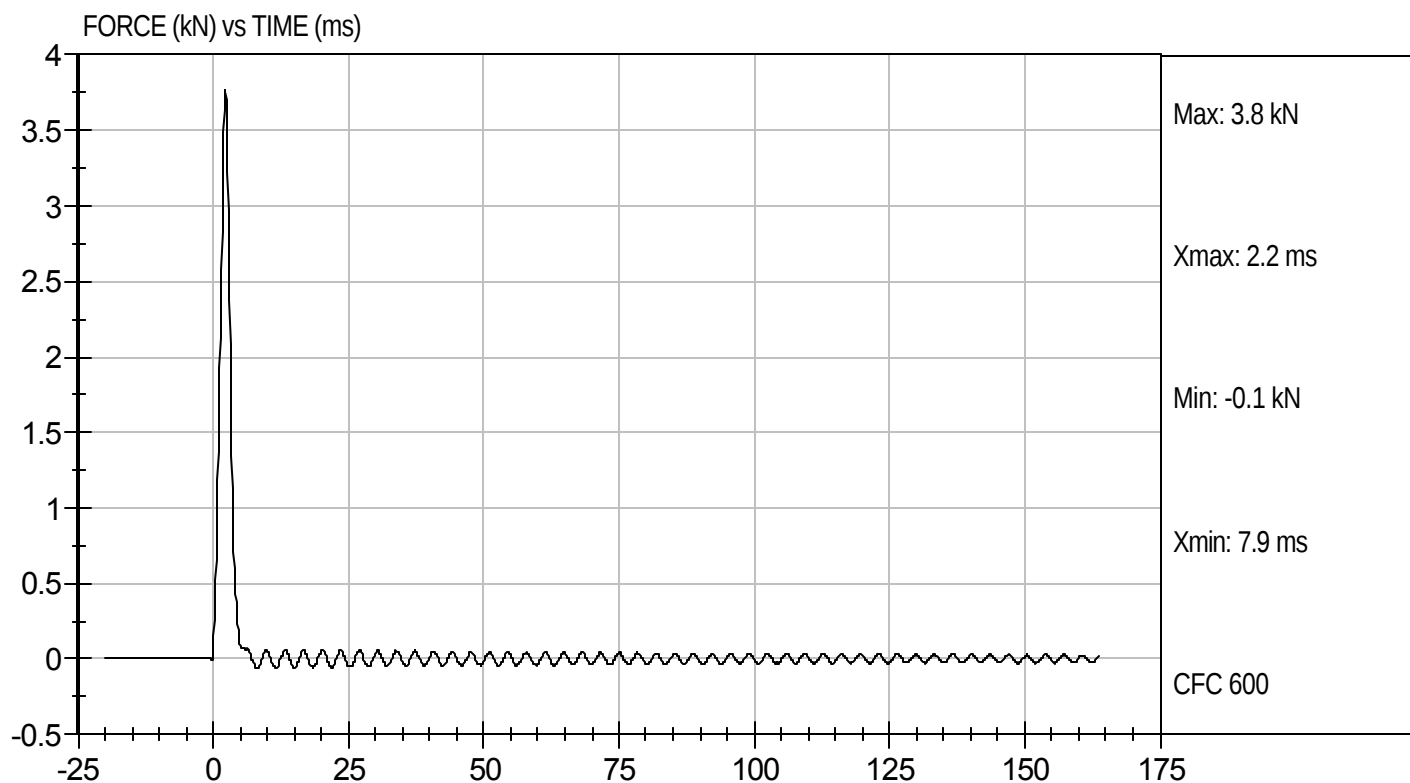


Approved By



Test Desc: Right Knee
Component ID: D122035

Test Date: 5/30/12
Velocity: 6.97 ft/s, 2.12 m/s



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

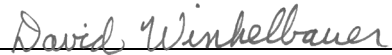
ATD Serial No: 634

Test I.D: D122036

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	kN	3.45 to 4.06	3.62	Pass
Overall Test Results				Pass


Laboratory Technician

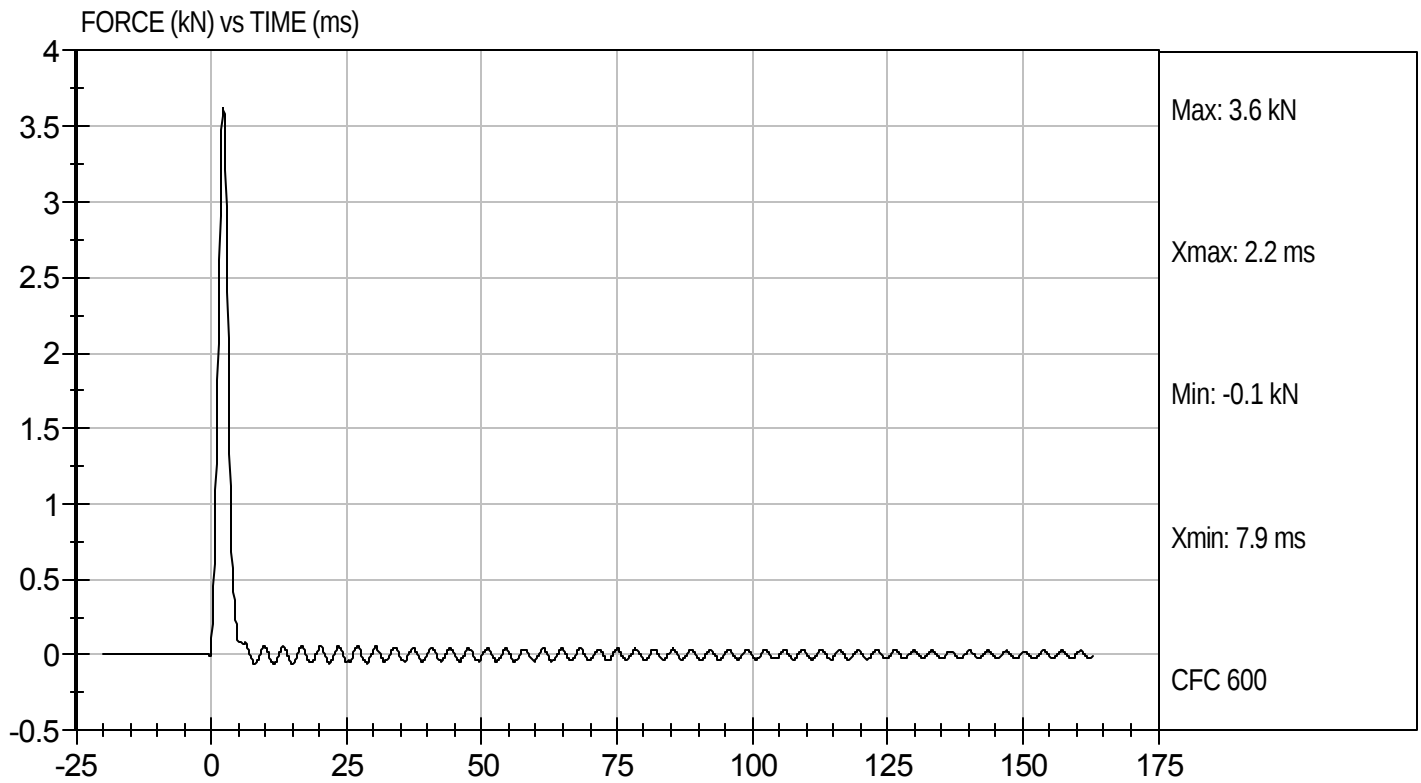
5/30/12
Test Date


Approved By



Test Desc: Left Knee
Component ID: D122036

Test Date: 5/30/12
Velocity: 6.94 ft/s, 2.12 m/s



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

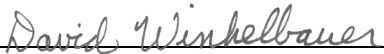
HYBRID III 5TH PERCENTILE

ATD Serial No: 634Test I.D: D122037

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	40	Pass
Initial Angle	deg	0 to 20	16	Pass
Return Angle	deg	+/- 8	6	Pass
Force at 45 deg	N	320 to 390	366	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 to 1.5	1.0	Pass
Overall Result				Pass


Laboratory Technician

5/30/12
Test Date

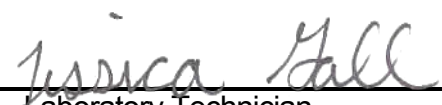

Approved By

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test ID: D122481

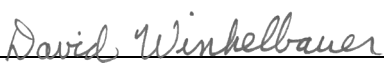
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Peak Resultant Acceleration	G's	250 to 300	278	Pass
Peak Lateral Acceleration	G's	+/- 15	-1	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass



Laboratory Technician

7/5/12

Test Date



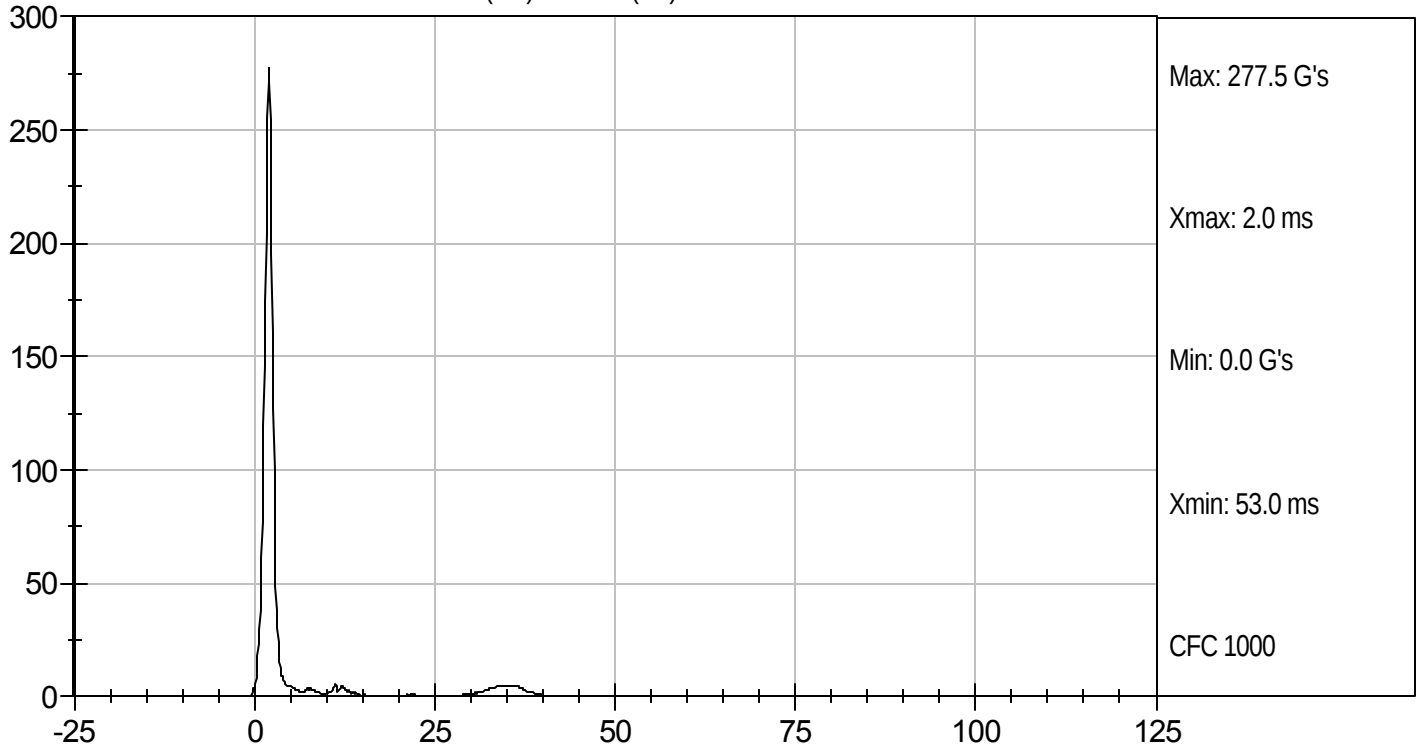
Approved By



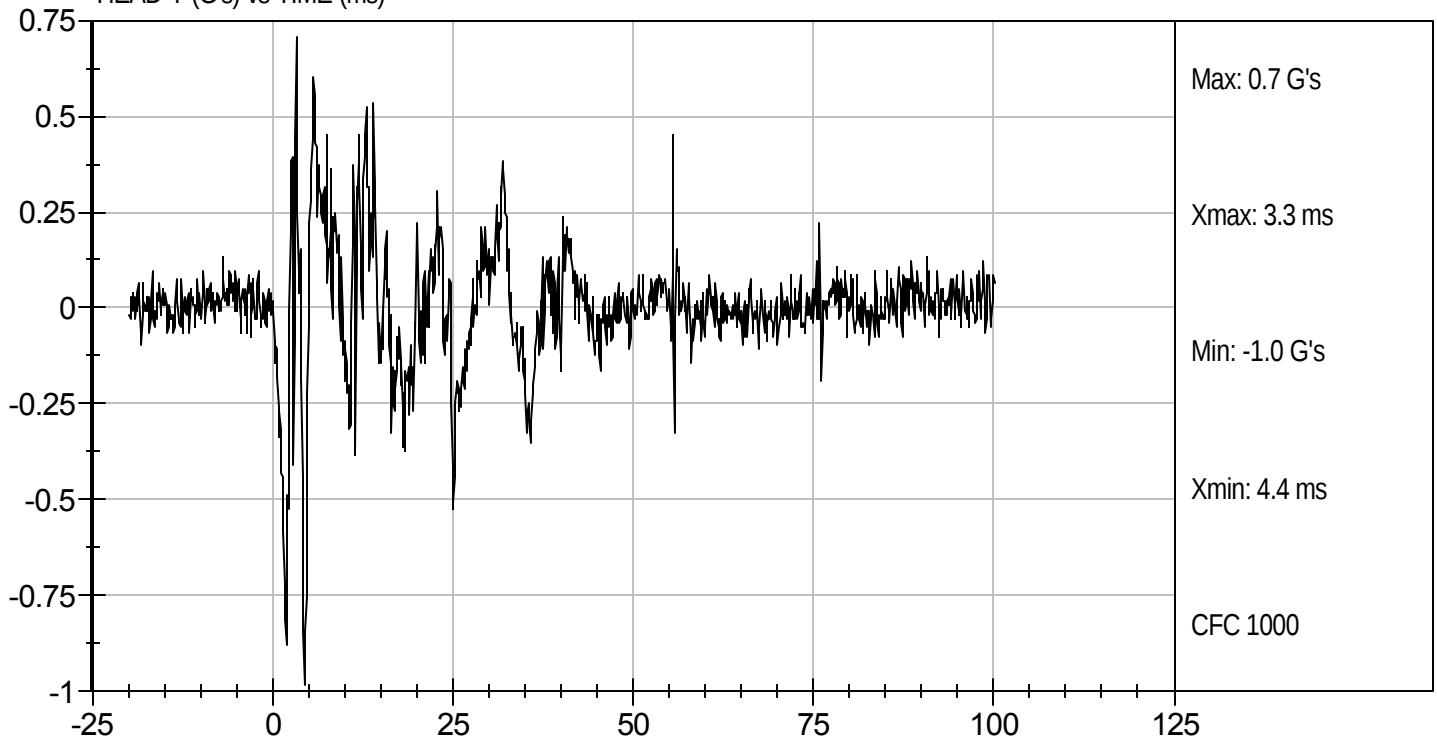
Test Desc: Head Drop
Component ID: D122481

Test Date: 7/5/12
Velocity: 0 ft/s, 0 m/s

RESULTANT HEAD ACCELERATION (G's) vs TIME (ms)



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



MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 5TH PERCENTILE

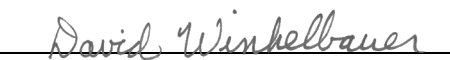
ATD Serial No: 634

Test I.D: D122482

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	47	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Pulse	10 ms	m/s	2.1 to 2.5	2.4	Pass
	20 ms	m/s	4.0 to 5.0	4.6	Pass
	30 ms	m/s	5.8 to 7.0	6.3	Pass
D Plane Rotation	Max	deg	77 to 91	89	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	69 to 83	70	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	86	Pass
Overall Results					Pass


Laboratory Technician

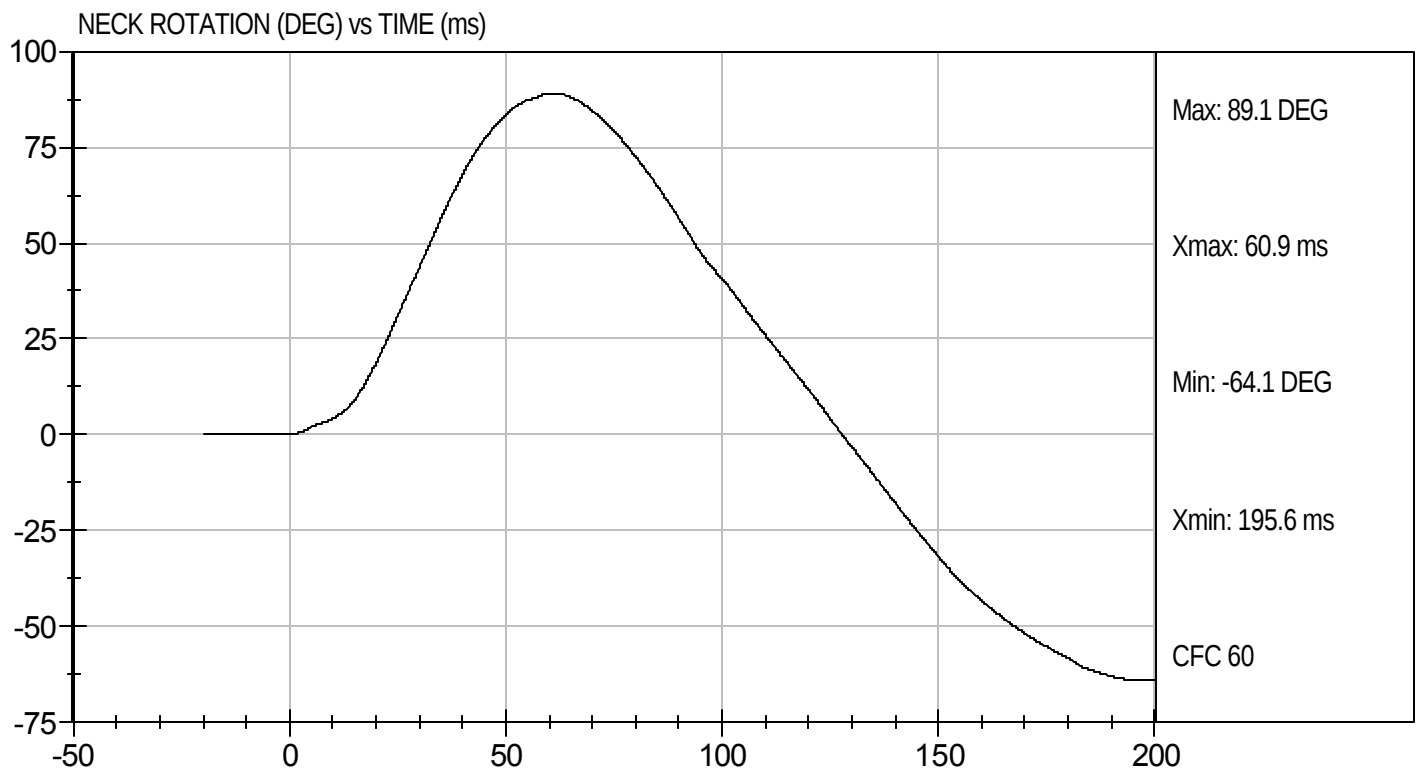
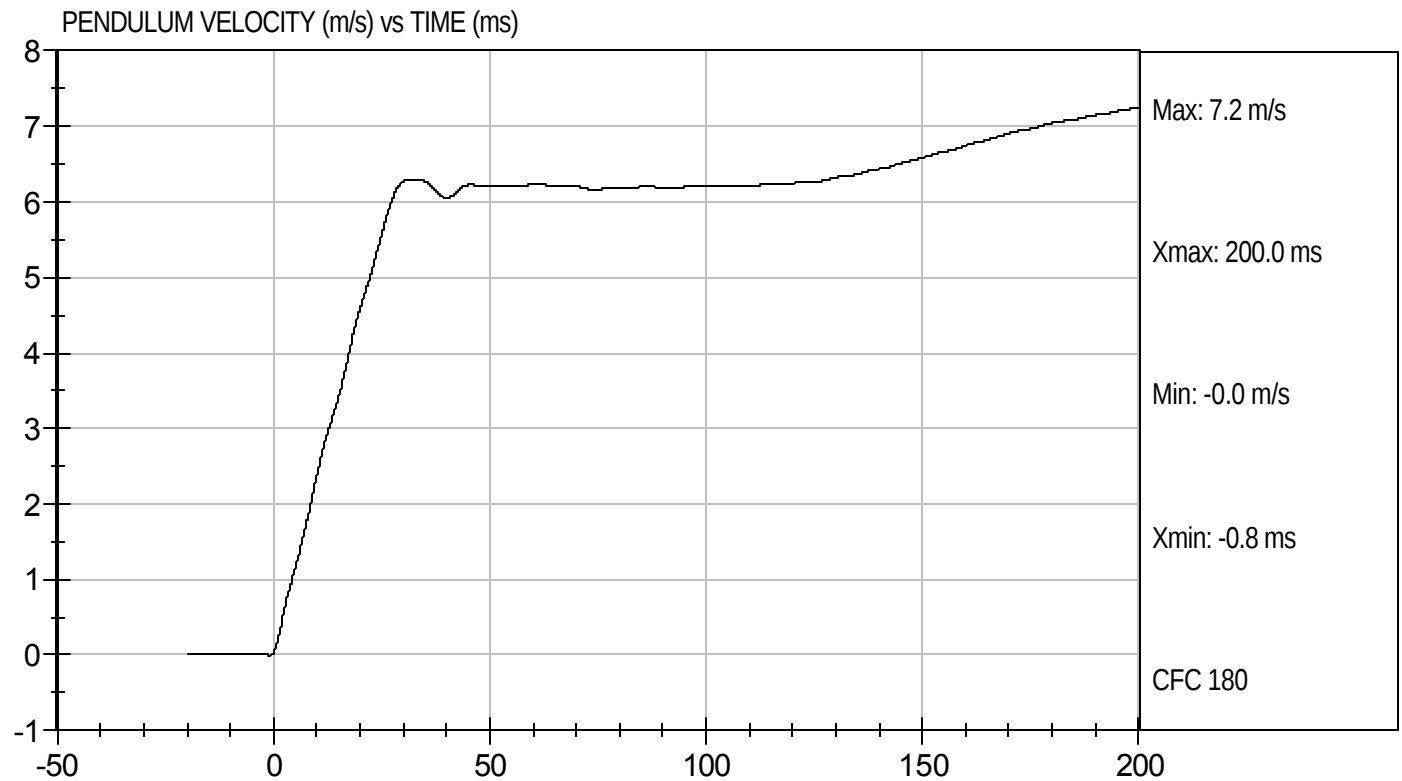
7/5/12
Test Date


Approved By



Test Desc: Neck Flexion
Component ID: D122482

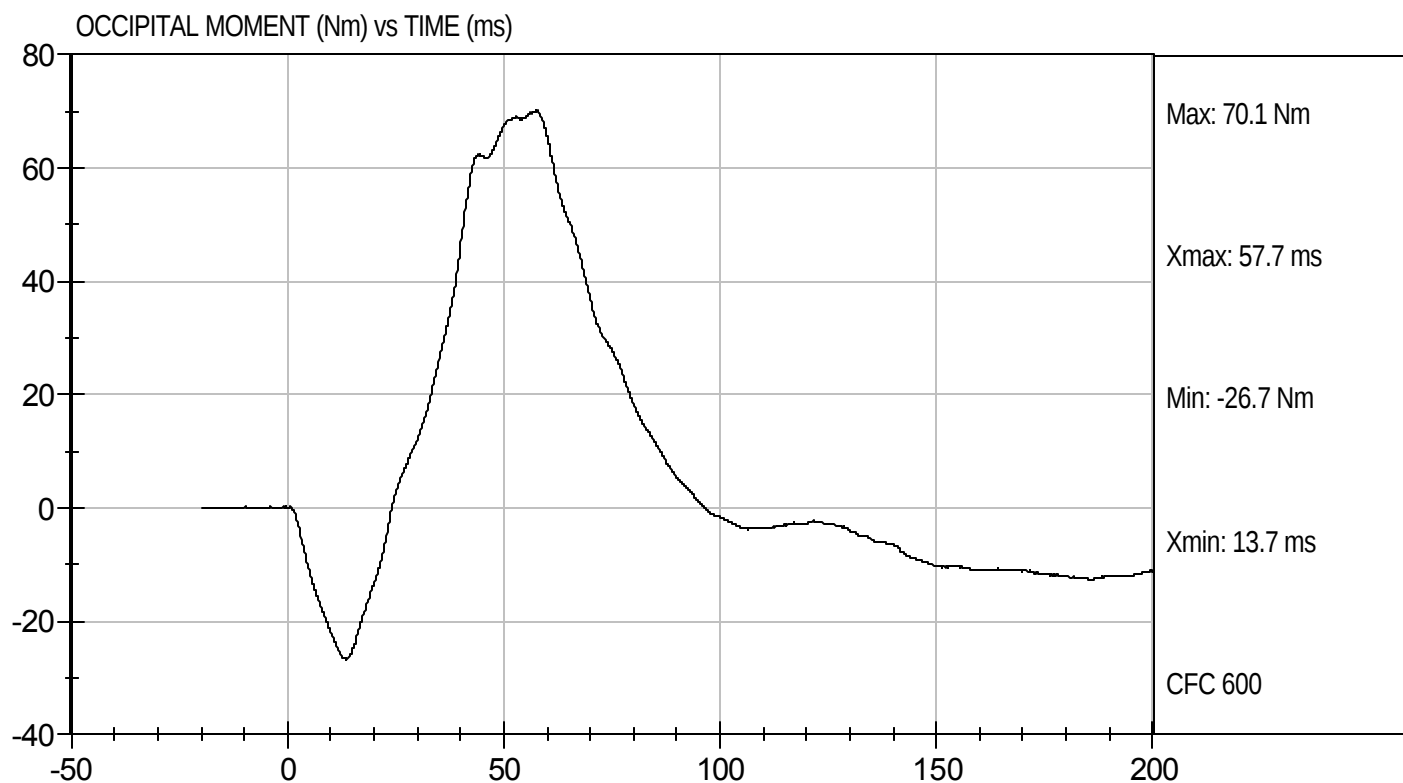
Test Date: 7/5/12
Velocity: 23.15 ft/s, 7.06 m/s





Test Desc: Neck Flexion
Component ID: D122482

Test Date: 7/5/12
Velocity: 23.15 ft/s, 7.06 m/s



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634Test I.D: D122483

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	47	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Pulse	10 ms	m/s	1.5 to 1.9	1.9	Pass
	20 ms	m/s	3.1 to 3.9	3.7	Pass
	30 ms	m/s	4.6 to 5.6	5.2	Pass
D Plane Rotation	Max	deg	99 to 114	108	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-58	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	95	Pass
Overall Results					Pass


 Laboratory Technician

7/5/12

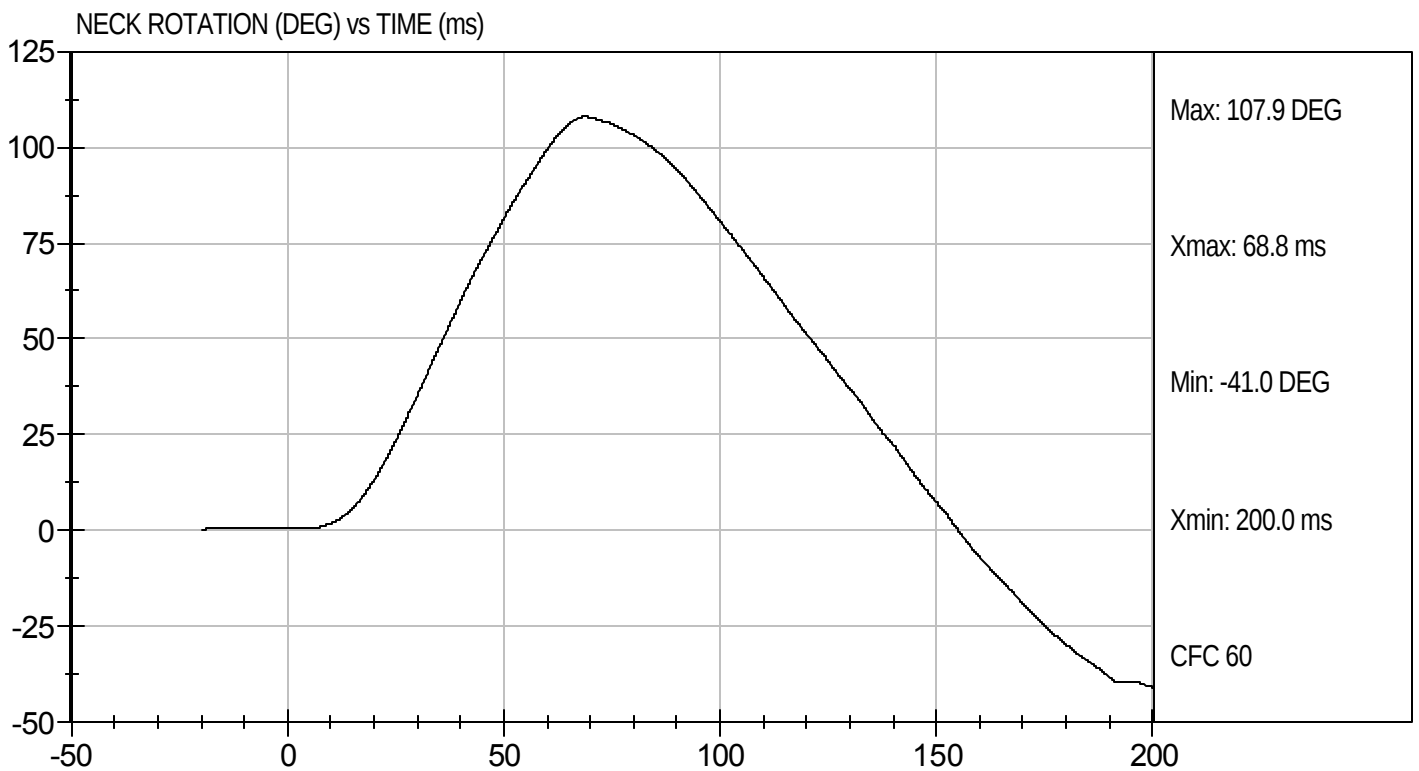
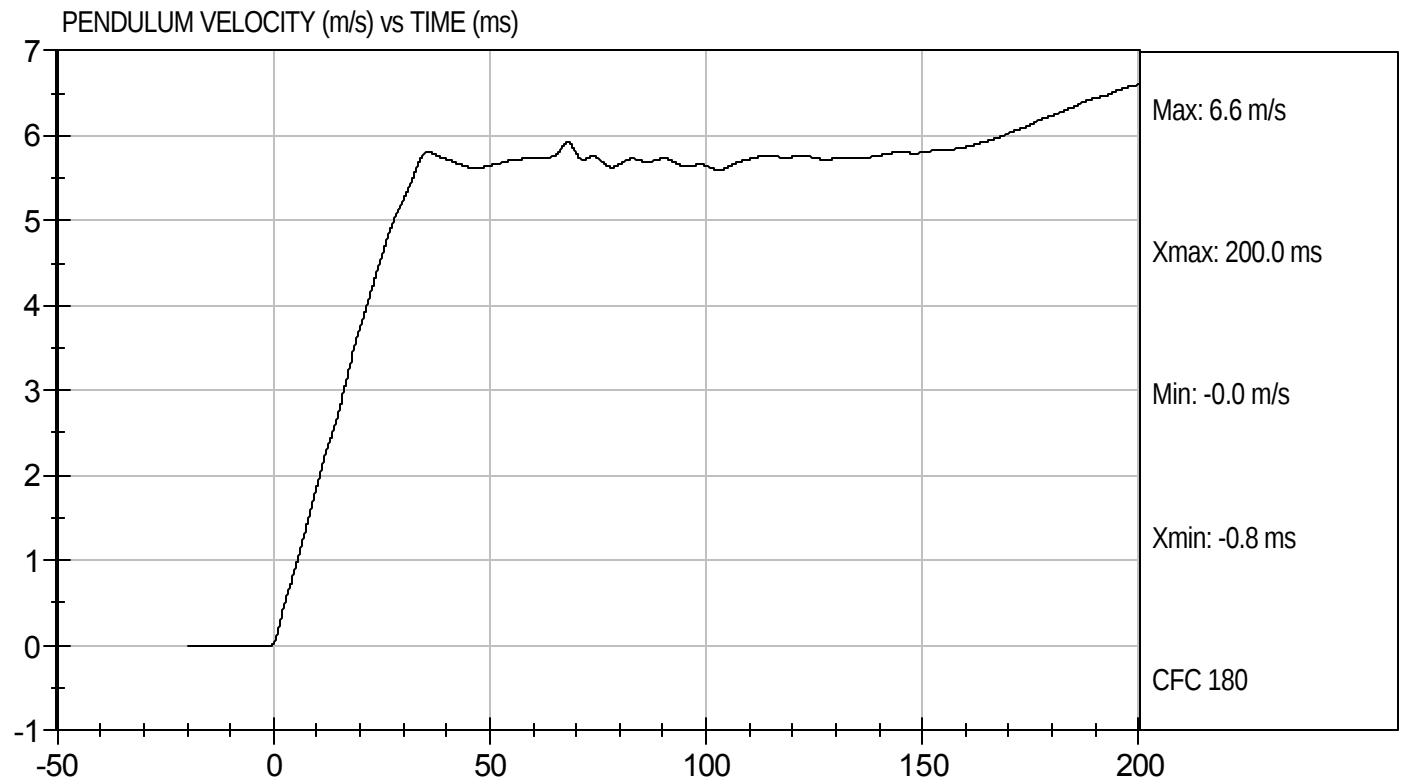
Test Date


 Approved By



Test Desc: Neck Extension
Component ID: D122483

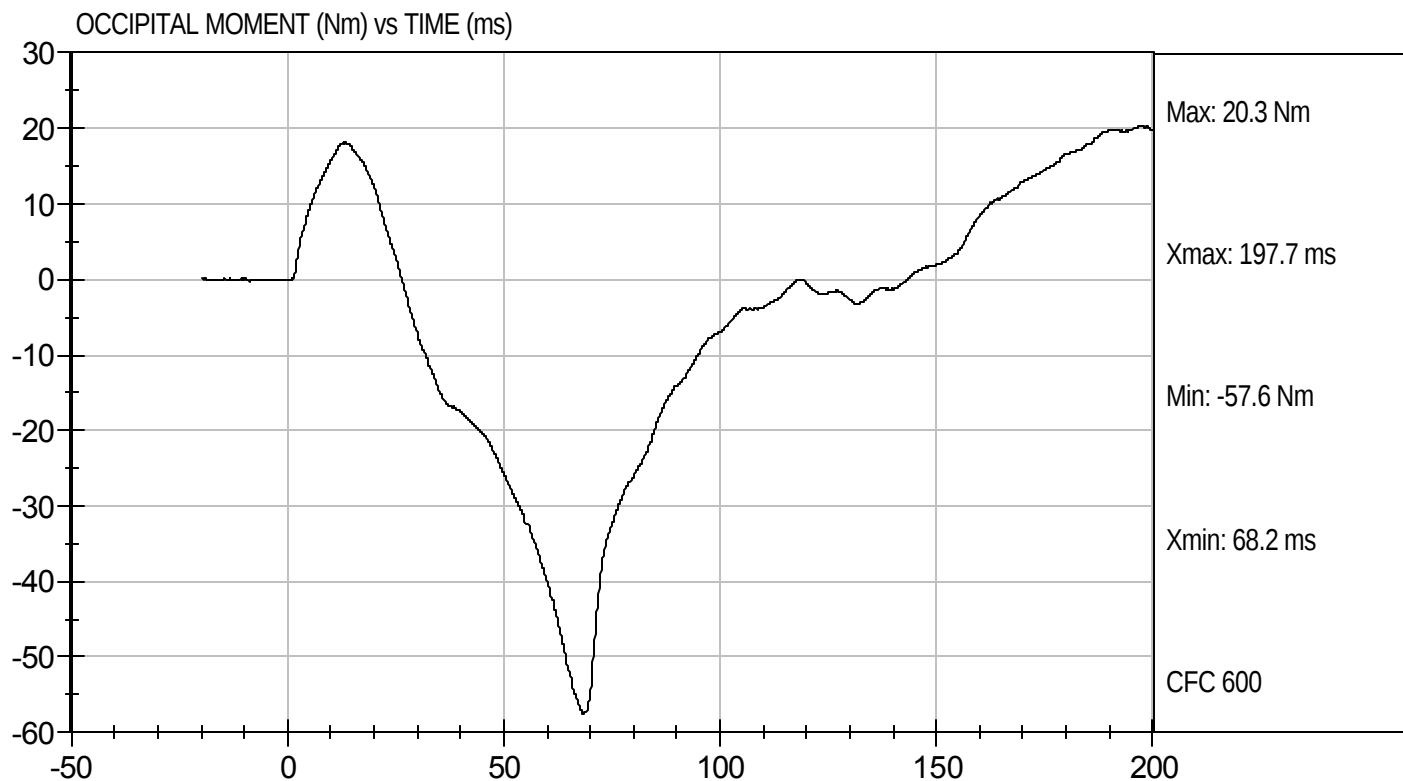
Test Date: 7/5/12
Velocity: 20.08 ft/s, 6.12 m/s





Test Desc: Neck Extension
Component ID: D122483

Test Date: 7/5/12
Velocity: 20.08 ft/s, 6.12 m/s



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D122484

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	22.0	Pass
Relative Humidity	%	10 to 70	46	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	52	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	4.15	Pass
Internal Hysteresis	%	69 to 85	74	Pass
Peak Force 18 mm - 50 mm	N	<= 4,600 N	4131	Pass
			Overall Test Results	Pass


Laboratory Technician

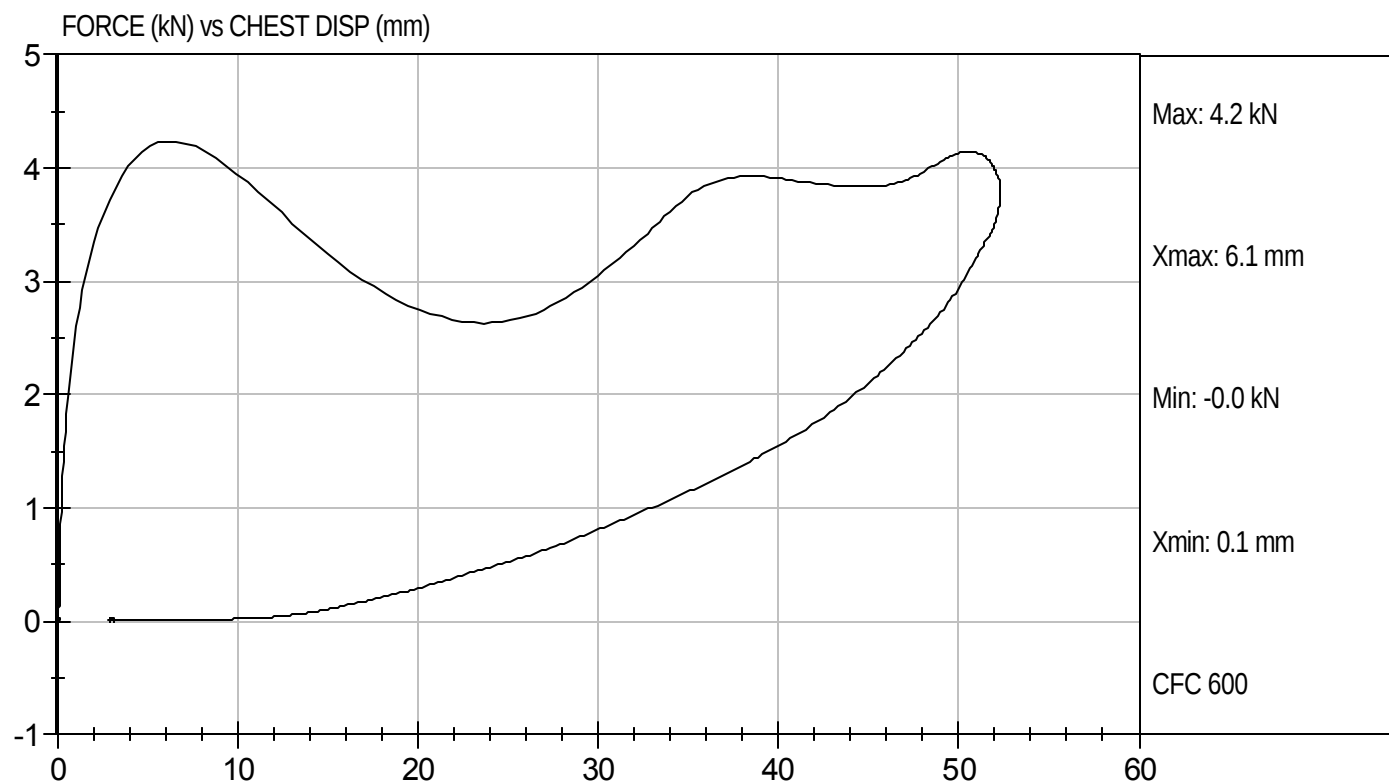
7/5/12
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D122484

Test Date: 7/5/12
Velocity: 22.22 ft/s, 6.77 m/s



MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D122485

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	45	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	kN	3.45 to 4.06	3.67	Pass
Overall Test Results				Pass


Laboratory Technician

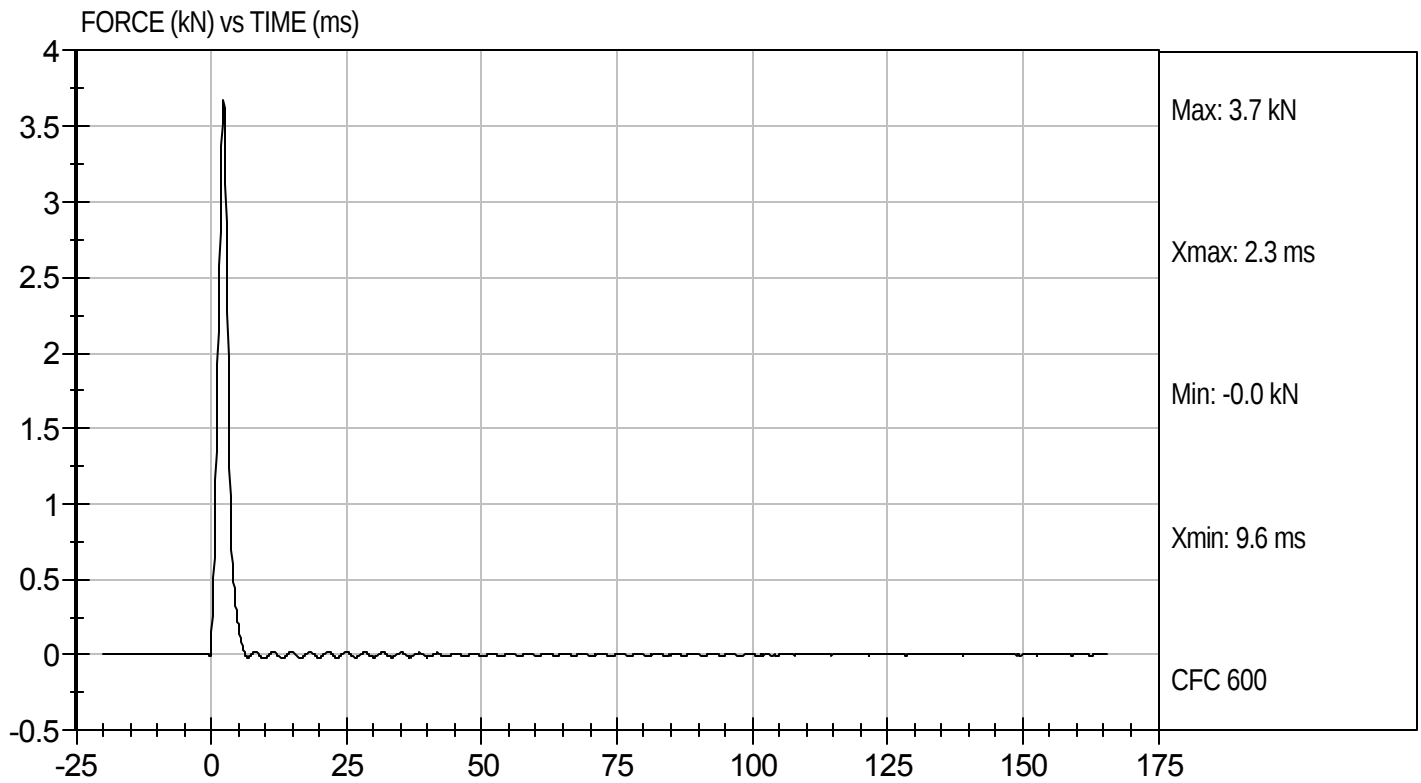
7/5/12
Test Date


Approved By



Test Desc: Right Knee
Component ID: D122485

Test Date: 7/5/12
Velocity: 6.94 ft/s, 2.12 m/s



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D122486

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	45	Pass
Probe Speed	m/s	2.07 to 2.13	2.11	Pass
Maximum Force	kN	3.45 to 4.06	3.80	Pass
Overall Test Results				Pass


Laboratory Technician

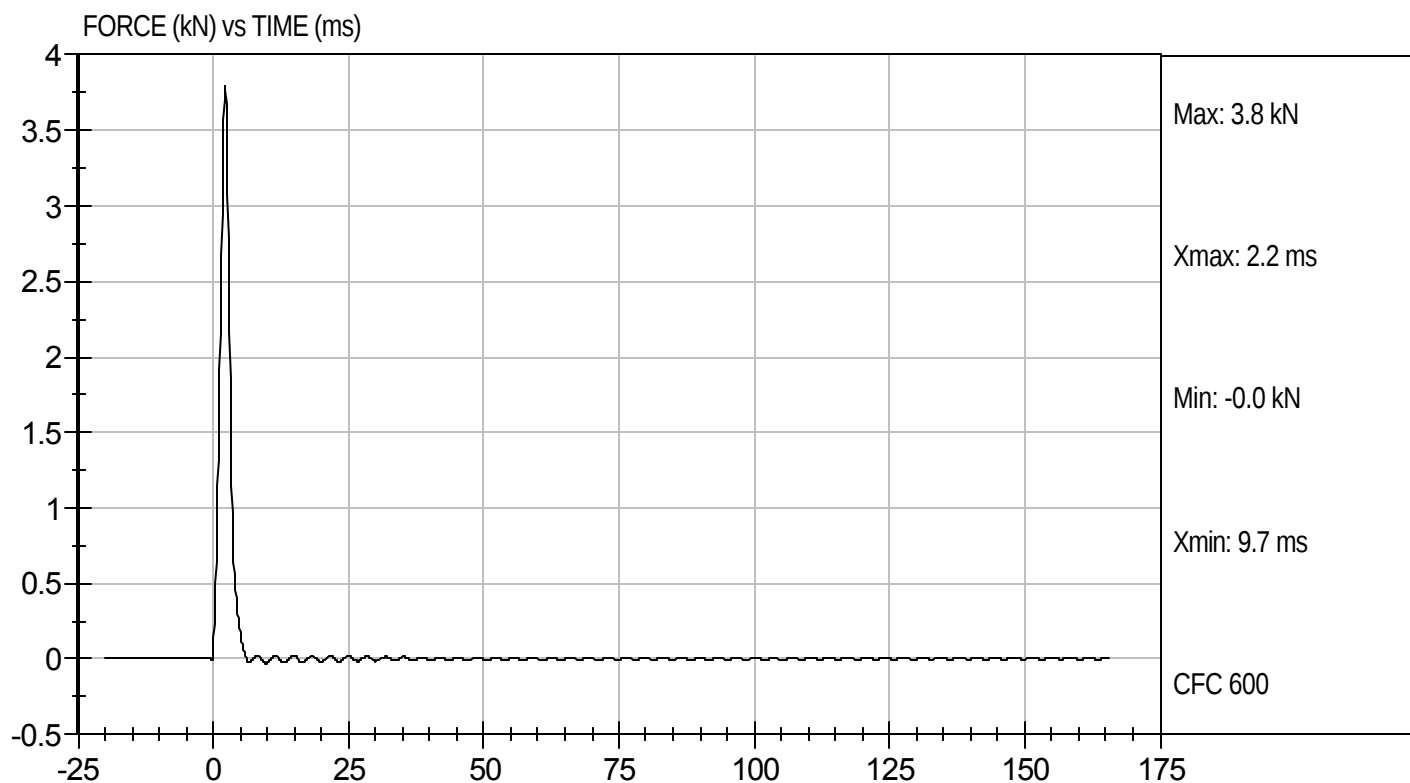
7/5/12
Test Date


Approved By



Test Desc: Left Knee
Component ID: D122486

Test Date: 7/5/12
Velocity: 6.92 ft/s, 2.11 m/s



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

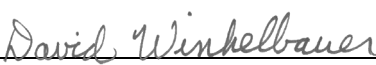
ATD Serial No: 634

Test I.D: D122487

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	46	Pass
Initial Angle	deg	0 to 20	18	Pass
Return Angle	deg	+/- 8	5	Pass
Force at 45 deg	N	320 to 390	368	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 to 1.5	1.0	Pass
Overall Result				Pass


Laboratory Technician

7/5/12
Test Date


Approved By