REPORT NUMBER: NCAP-MGA-2016-002

NEW CAR ASSESSMENT PROGRAM (NCAP)
Frontal Barrier Impact Test

MAZDA MOTOR CORPORATION
2016 Mazda6 I Sport 4-Dr Sedan
NHTSA No.: O20165400

MGA RESEARCH CORPORATION
5000 Warren Road
Burlington, WI 53105

Test Date: March 18, 2015

Final Report Date: April 24, 2015

FINAL REPORT

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

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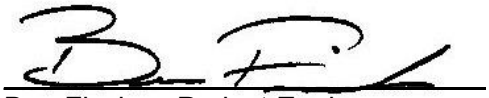
Prepared by: 
Nicholas Abels, Project Engineer

Approved by: 
Ben Fischer, Project Engineer

Approval Date: April 24, 2015

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

Technical Report Documentation Page

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15. Supplementary Notes		

16. Abstract

A 56.3 km/h NCAP Frontal Impact Test was conducted on a 2016 Mazda6 I Sport 4-Dr Sedan in accordance with the specifications of the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), and 301 performance. The test was conducted at MGA Research Corporation in Burlington, Wisconsin on March 18, 2015.

The impact velocity of the vehicle was 56.4 km/h and the ambient temperature at the barrier face at the time of impact was 21.6°C. The target vehicle post-test maximum crush was 564 located left of the vehicle's centerline. The test vehicle's performance was as follows:

Measurement Description	Units	Driver ATD		Passenger ATD	
		Threshold	Result	Threshold	Result
Head Injury Criteria (HIC_{15})	N/A	700	130	700	249
Maximum Chest	mm	63	21	52	10
Nij	N/A	1	0.23	1	0.53
Neck Tension	N	4170	1182	2620	593
Neck Compression	N	4000	106	2520	475
Left Femur Force	N	10008	191	6805	1488
Right Femur Force	N	10008	312	6805	666

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SECTION 1
PURPOSE AND SUMMARY OF TEST

PURPOSE

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

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

SUMMARY

A load cell barrier consisting of 176 load cells was impacted by a 2016 Mazda6 I Sport 4-Dr Sedan at a velocity of 56.4 km/h. The test was performed at MGA Research Corporation on March 18, 2015. Pre-test and post-test photographs of the vehicle and dummies can be found in Appendix A.

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

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

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

The driver (position 1) ATD (Serial No. 351) and the right-front passenger (position 2) ATD (Serial No. 634) were calibrated previous to this test. Certification details, along with instrumentation calibration data, are found in Appendix C of this report.

The 631 channels of data were recorded on a data acquisition system. Appendix B contains the dummy response data traces.

There was 95 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 564 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 left knee contacted steering column shroud. 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})	130	0.23	1182	106	42	21	191	312
Passenger (5^{th})	249	0.53	593	475	39	10	1488	666

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

TEST NOTES

Top of Engine X has no valid data after 50 ms.
Barrier K-16 MY has no valid data.
Barrier F-01 MZ has no valid data.
Barrier D-06 MY has no valid data.

MGA does not endorse or certify products. The manufacturer's name appears solely for identification purposes.

SECTION 2
OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2016 Mazda6 I Sport 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20165400
Test Date: 3/18/2015

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	O20165400	Traction Control System (TCS)	Yes
Model Year	2016	Power Steering	Yes
Make	Mazda	Power Window Auto-Reverse	Yes
Model	6 I Sport	Driver Frontal Airbag	Yes
Body Style	4-Dr Sedan	Driver Curtain Airbag	Yes
VIN	JM1GJ1U54G1403491	Driver Head/Torso Airbag	No
Body Color	Meteor Gray	Driver Torso Airbag	No
Odometer (km/mi)	64 / 40	Driver Torso/Pelvis Airbag	Yes
Engine Displacement (L)	2.5	Driver Pelvis Airbag	No
Type/No. Cylinders	4	Driver Knee Airbag	No
Engine Placement	Lateral	Front Pass. Frontal Airbag	Yes
Transmission Type	Automatic	Front Pass. Curtain Airbag	Yes
Transmission Speeds	6	Front Pass. Head/Torso Airbag	No
Overdrive	No	Front Pass. Torso Airbag	No
Final Drive	Front	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	Mazda Motor Corporation
Date of Manufacture	12/14

GVWR (kg)	1945
GAWR Front (kg)	1029
GAWR Rear (kg)	921

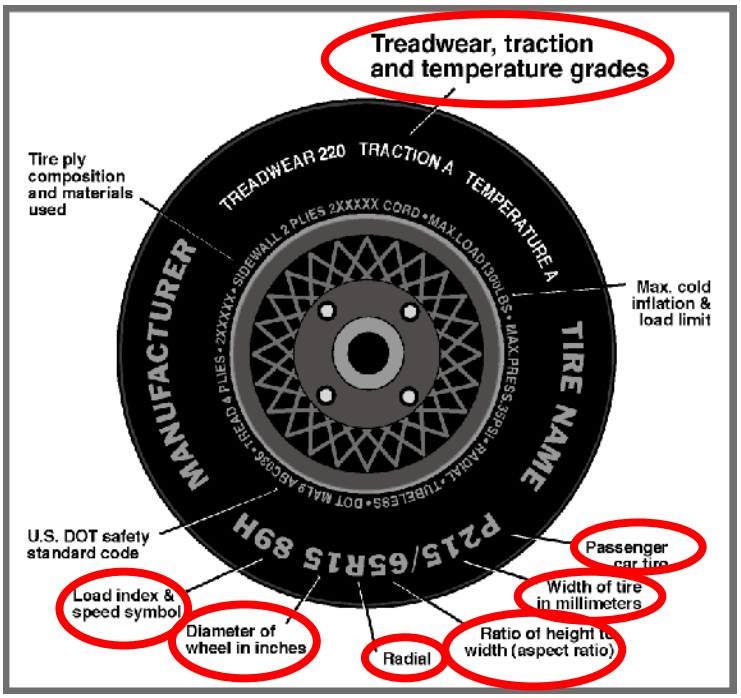
VEHICLE SEATING AND WEIGHT CAPACITY DATA

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: 2016 Mazda6 I Sport 4-Dr Sedan NHTSA No.: O20165400
Test Program: NCAP Frontal Barrier Impact Test Test Date: 3/18/2015

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	250	250
Recommended Tire Size	225/55/R17	225/55/R17
Tire Size on Vehicle	225/55/R17	225/55/R17
Tire Manufacturer	Yokohama	Yokohama
Tire Model	Advan	Advan
Treadwear	280	280
Traction	A	A
Temperature Grade	A	A
Tire Plies Sidewall	1 Polyester	1 Polyester
Tire Plies Body	2 Polyester, 2 Steel, 1 Nylon	2 Polyester, 2 Steel, 1 Nylon
Load Index/Speed Symbol	95V	95V
Tire Material	Rubber	Rubber
DOT Safety Code Left	FDVP PFW 4914	FDVP PFW 4914
DOT Safety Code Right	FDVP PFW 4914	FDVP PFW 4914

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

Test Vehicle: 2016 Mazda6 I Sport 4-Dr Sedan NHTSA No.: O20165400
Test Program: NCAP Frontal Barrier Impact Test Test Date: 3/18/2015

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	433.0	311.0		465.0	382.5	
Right	kg	429.5	292.5		446.5	351.5	
Ratio	%	58.8	41.2		55.4	44.6	
Totals	kg	862.5	603.5	1466.0	911.5	734.0	1645.5

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1466.0
Weight of 1 P572E ATD & 1 P572O ATD	kg	141
Rated Cargo/Luggage Weight (RCLW)	kg	45
Calculated Test Vehicle Target Weight (TVTW)	kg	1652.0

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	737	738	740	746	1165.8
As Tested	mm	712	720	696	705	1263.0
Post Test	mm	735	706	707	684	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2832
Total Vehicle Length at Left Side	mm	4685
Total Vehicle Length at Centerline	mm	4864
Total Vehicle Length at Right Side	mm	4685
Weight of Ballast in Cargo Area	kg	0.0
Weight of Vehicle Components Removed	kg	23.6
Amount of Stoddard Solvent in Fuel Tank	L	57.7

List of components removed to meet test weight: Rear seats.

List of components removed for instrumentation, data box, and equipment installation:
Rear floor mats, cargo divider/organizer, jack/tool kit, spare tire, right tail light, and trunk/cargo net.

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

Test Vehicle: 2016 Mazda6 I Sport 4-Dr Sedan NHTSA No.: O20165400
Test Program: NCAP Frontal Barrier Impact Test Test Date: 3/18/2015

TARGET VEHICLE STRUCTURAL MEASUREMENT

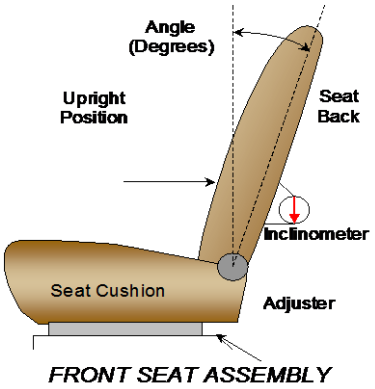
	Elements	Pre-Test (mm)
1	Total Length	4684
2	Total Width	1820
3	Bumper Top Height	555
4	Bumper Bottom Height	400
5	Longitudinal Member Top Height	520
6	Distance between Longitudinal Members	930
7	Longitudinal Member Width	65
8	Engine Top Height	819
9	Engine Bottom Height	215
10	Engine and Gearbox Width	370
11	Front Bumper-Engine Distance	450
12	Front Shock Absorber Fixing Height	916
13	Bonnet Leading Edge Height	790
14	Front Shock Absorber Fixing Width	1146
15	Front Bumper – Front Axle Distance	996
16	Front Axle – A-Pillar Distance	530
17	A-Pillar – B-Pillar Distance	1129
18	B-Pillar – Rear Axle Distance	1173
19	B-Pillar – C-Pillar Distance	1027
20	Roof Sill Bottom Height	1380
21	Roof Sill Top Height	1445
22	Floor Sill Bottom Height	215
23	Floor Sill Top Height	350

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

Test Vehicle: 2016 Mazda6 I Sport 4-Dr Sedan NHTSA No.: O20165400
Test Program: NCAP Frontal Barrier Impact Test Test Date: 3/18/2015

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	10.7° on headrest post
Passenger Seat Back Angle	5.8° on headrest post

SEAT FORE/AFT POSITIONS

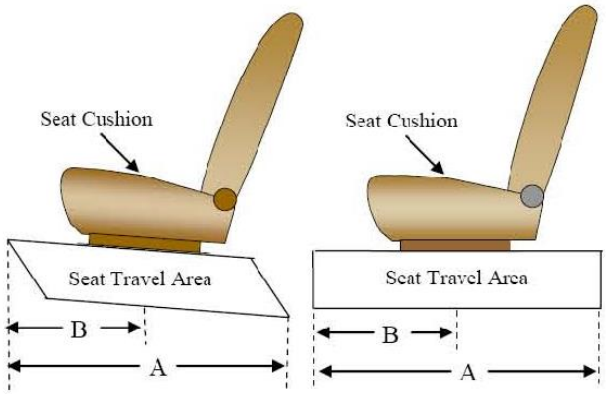
The driver and passenger seat fore/aft positions are adjusted following Appendix F, "Driver & Passenger Dummy Seating & Positioning Procedures" in the NCAP Test Procedure dated August 2013.

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	316 mm / 27 detents (1st as 1)	166 mm / 11th detent (1st as 0)
Passenger Seat	260 mm / 27 detents (1st as 1)	0 mm / 0th detent (1st 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	3 (1st as 1)	0 (1st as 0)
Passenger Seat	3 (1st as 1)	0 (1st as 0)



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

Test Vehicle: 2016 Mazda6 I Sport 4-Dr Sedan NHTSA No.: O20165400
Test Program: NCAP Frontal Barrier Impact Test Test Date: 3/18/2015

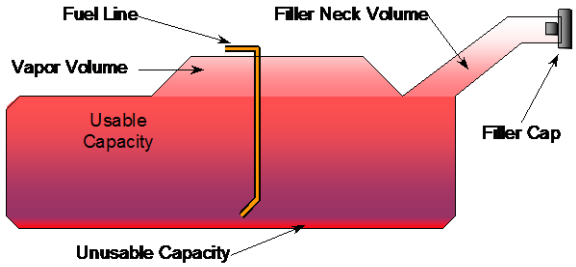
FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of "Standard Tank"	62.1
Usable Capacity of "Optional Tank"	
92-94% of Usable Capacity	57.1 to 58.3
Actual Amount of Solvent used	57.7
1/3 of Usable Capacity	20.7

FUEL PUMP

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

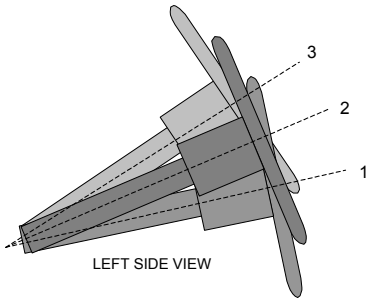
The electric fuel pump operates when starter or engine is activated.



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.



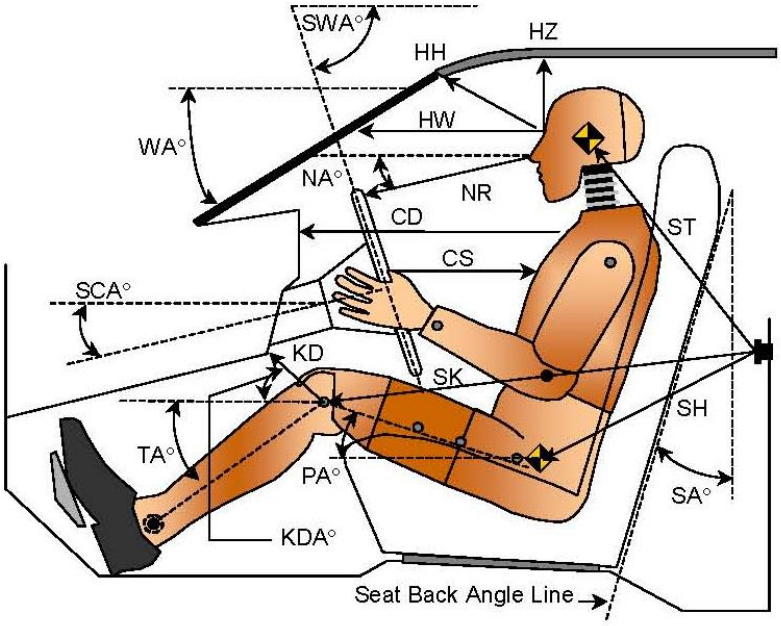
STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITION

	Degrees	Fore/Aft Position (mm)
Lowermost Position 1	70.0	176
Geometric Center Position 2	67.6	201
Uppermost Position 3	65.2	226
Telescoping Steering Wheel Travel		50
Test Position	67.6	201

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2016 Mazda6 I Sport 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20165400
Test Date: 3/18/2015

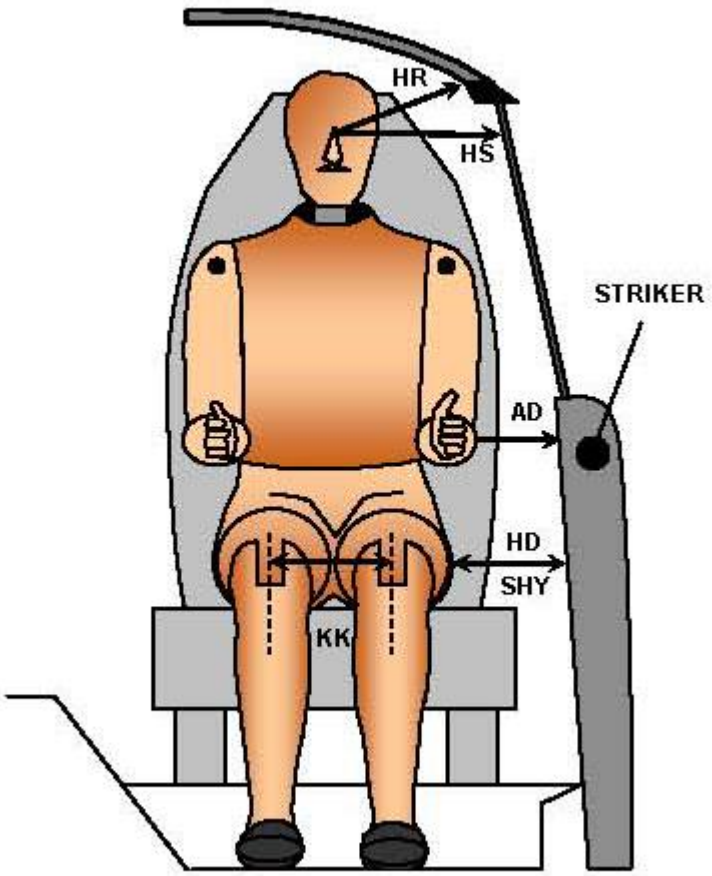


LEFT SIDE VIEW

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		21.2		
SWA°	Steering Wheel Angle		67.6		
SCA°	Steering Column Angle		22.4		
SA°	Seat Back Angle (on headrest post)		10.7		5.8
HZ	Head to Roof (Z)	189	90	183	90
HH	Head to Header	307	19.7	178	53.6
HW	Head to Windshield	614	0	584	0
NR	Nose to Rim	414	10.7		
CD	Chest to Dash	540		364	
CS	Chest to Steering Hub	321	3.8		
RA	Rim to Abdomen	208	0		
KDL	Left Knee to Dash	175	30.8	87	36.2
KDR	Right Knee to Dash	174	32.3	104	35.3
PA°	Pelvic Angle		24.3		22.1
TA°	Tibia Angle		41.9		43.6
SK	Striker to Knee	554	97.5	702	100.8
ST	Striker to Head	443	8.4	420	34.3
SH	Striker to H-Point	280	138.6	419	115.0

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2016 Mazda6 I Sport 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20165400
Test Date: 3/18/2015

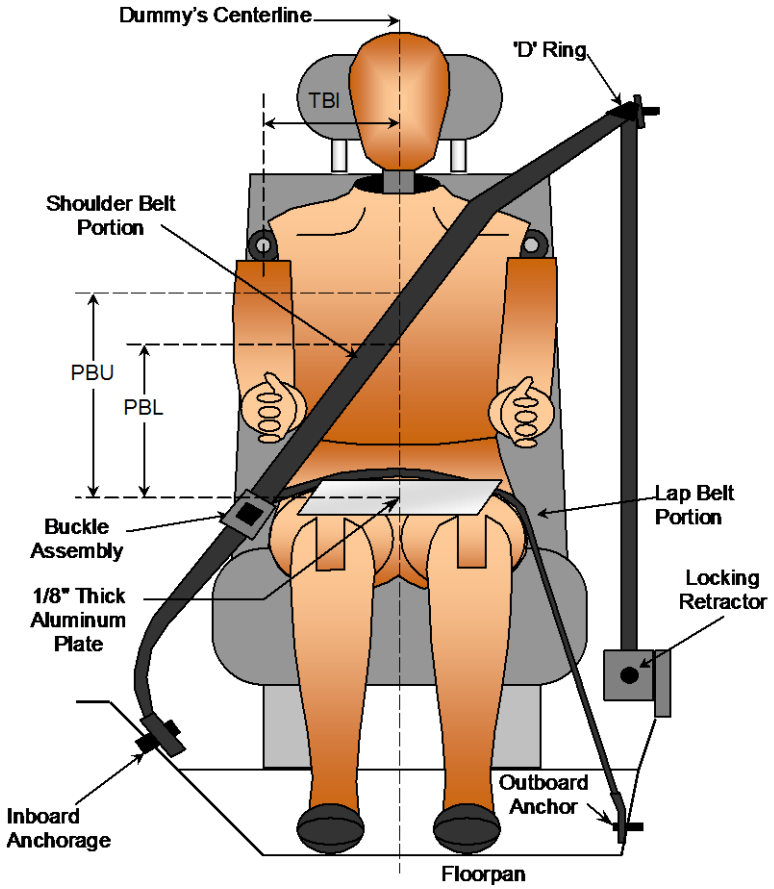


FRONT VIEW OF DUMMY

Code	Measurement Description	Driver	Passenger
		Length (mm)	
AD	Arm to Door	136	98
HD	H-Point to Door	152	235
HR	Head to Side Header	225	244
HS	Head to Side Window	336	360
KK	Knee to Knee	348	227
SHY	Striker to H-Point (Y Direction)	300	323
AA	Ankle to Ankle	332	186

DATA SHEET NO. 5
SEAT BELT POSITIONING DATA

Test Vehicle: 2016 Mazda6 I Sport 4-Dr Sedan NHTSA No.: O20165400
Test Program: NCAP Frontal Barrier Impact Test Test Date: 3/18/2015



FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	375	340
PBL - Top surface of reference to belt lower edge	mm	295	250

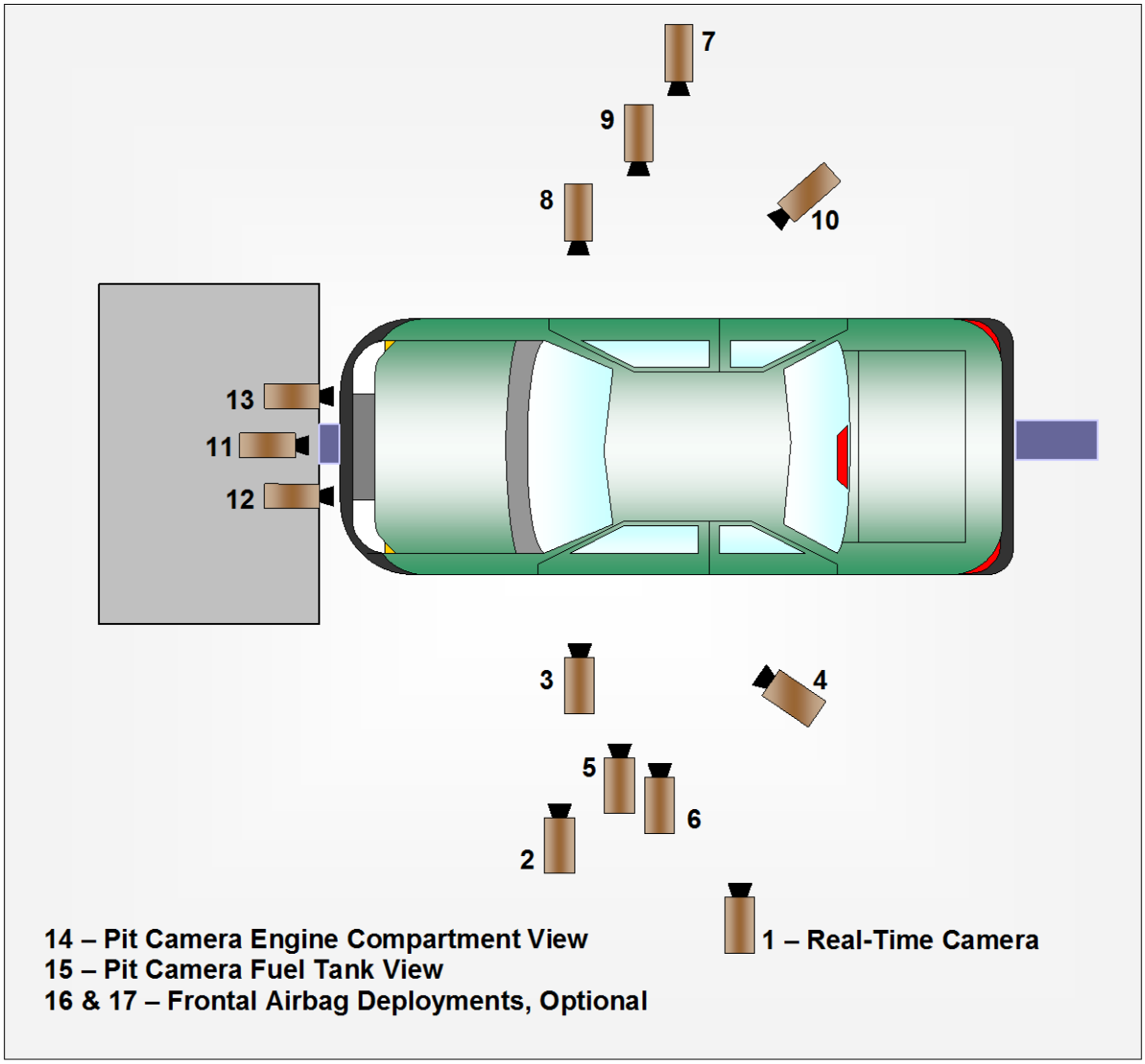
BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as measured on ATD	mm	845	940
Lap Belt Length as measured on ATD	mm	680	775
Remainder of belt on reel	mm	1005	815
Total Belt Length for Continuous Webbing Systems	mm	3230	3230

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

Test Vehicle: 2016 Mazda6 I Sport 4-Dr Sedan NHTSA No.: O20165400
Test Program: NCAP Frontal Barrier Impact Test Test Date: 3/18/2015

CAMERA POSITIONS FOR FRONTAL IMPACTS



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

Test Vehicle: 2016 Mazda6 I Sport 4-Dr Sedan NHTSA No.: O20165400
Test Program: NCAP Frontal Barrier Impact Test Test Date: 3/18/2015

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	-1840	35	1000
3	Left Front Half	-1170	-5290	-1170	24	1000
4	Left Angle	-5620	-5170	-1960	50	1000
5	Steering Column - Top					
6	Steering Column - Bottom					
7	Right Overall	-2360	6940	-1290	20	1000
8	Passenger Close-Up	-1690	6670	-1860	35	1000
9	Right Front Half	-1130	5430	-1190	24	1000
10	Right Angle	-5620	5080	-1910	50	1000
11	Windshield	430	0	-2810	20	1000
12	Driver Windshield	-30	-450	-2030	8.5	1000
13	Passenger Windshield	-30	450	-2030	8.5	1000
14	Pit Front	-1190	0	3150	24	1000
15	Pit Rear	-3190	0	3150	24	1000
16	Onboard Driver Side				12	1000
17	Onboard Passenger Side				12	1000
18	Real-Time Pan View					30

*COORDINATES:

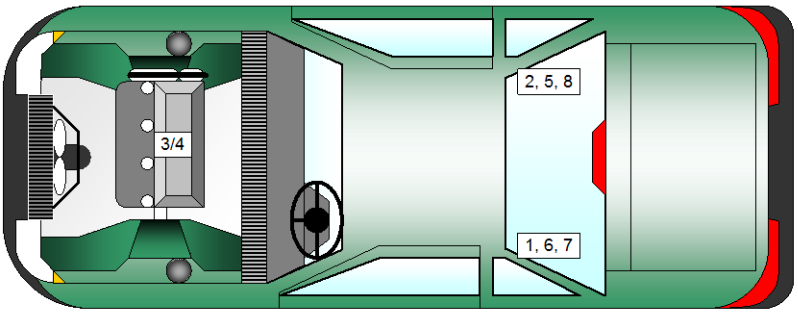
+X = forward of impact plane
+Y = right of monorail centerline
+Z = below ground level

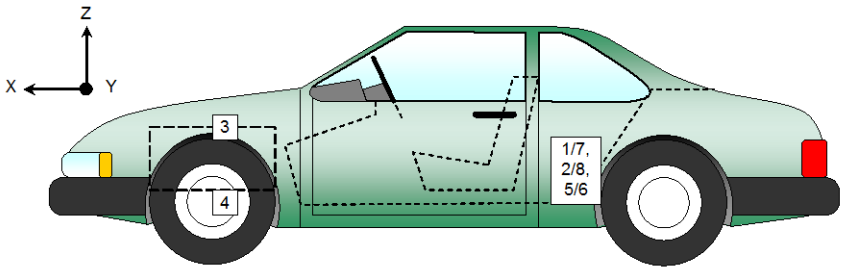
Cameras 5 & 6 were not used for this test.

DATA SHEET NO. 7
VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2016 Mazda6 I Sport 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20165400
Test Date: 3/18/2015





VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Crossmember Accelerometer – X Direction	1968	-380	-230
2	Right Rear Crossmember Accelerometer – X Direction	1968	385	-230
3	Engine Top X	4079	0	-819
4	Engine Bottom X	4018	210	-165
5	Left Rear Crossmember Accelerometer – Z Direction	1968	-410	-230
6	Right Rear Crossmember Accelerometer – Z Direction	1968	415	-230
7	Left Rear Crossmember Accelerometer Redundant – X Direction	1968	-410	-230
8	Right Rear Crossmember Accelerometer Redundant – X Direction	1968	415	-230

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

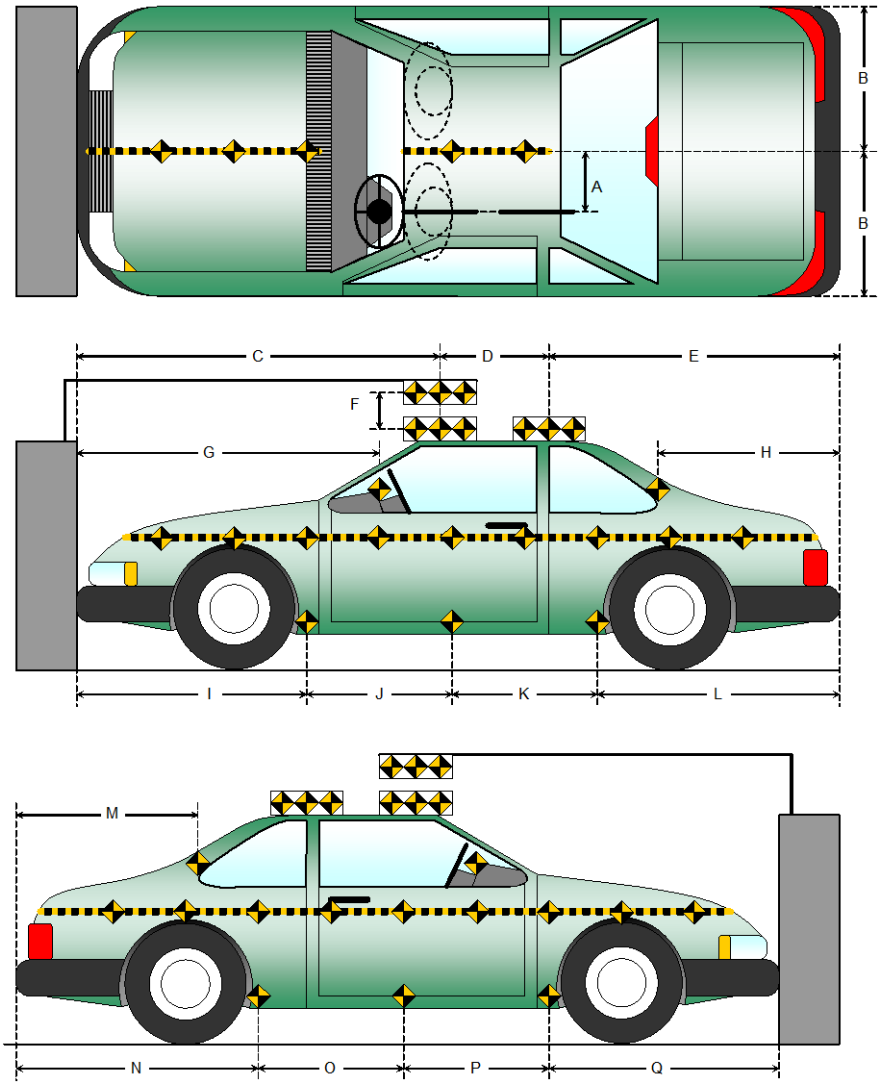
DATA SHEET NO. 8

PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2016 Mazda6 I Sport 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20165400
Test Date: 3/18/2015

Item	Value (mm)
A	368
B	910
C	2425
D	708
E	1731
F	150
G	
H	1226
I	1390
J	977
K	977
L	1520
M	1226
N	1520
O	977
P	977
Q	1390



DATA SHEET NO. 9
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2016 Mazda6 I Sport 4-Dr Sedan NHTSA No.: O20165400
Test Program: NCAP Frontal Barrier Impact Test Test Date: 3/18/2015

Advanced Research Load Cell Barrier

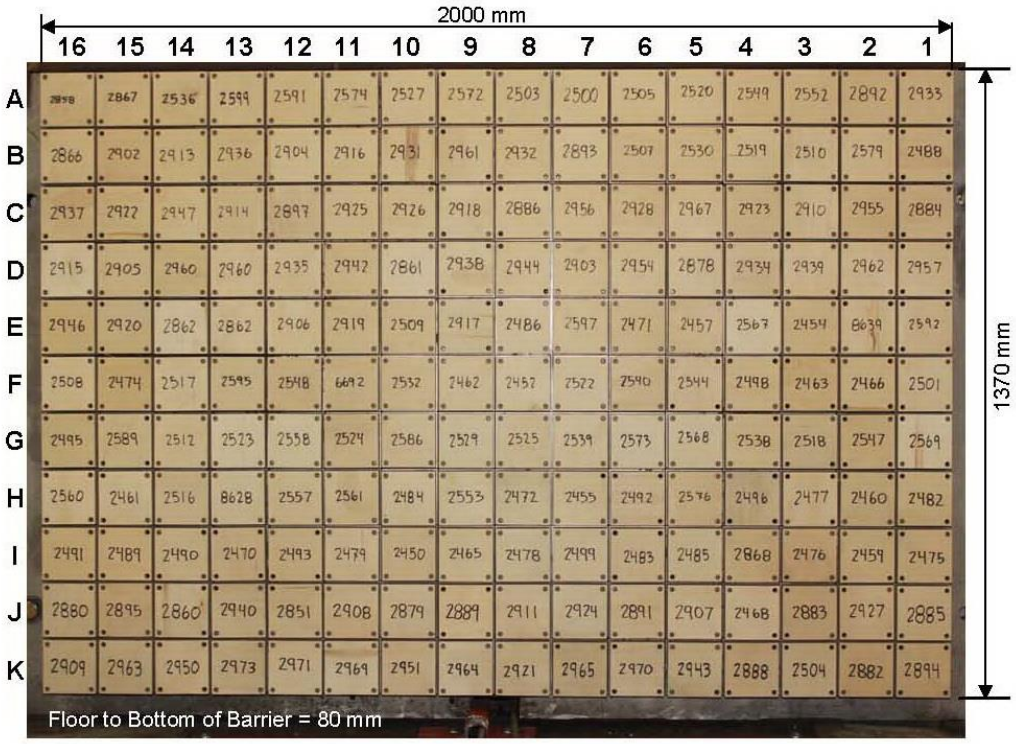


Photo for Reference Only

Centerline

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

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

DATA SHEET NO. 10
TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2016 Mazda6 I Sport 4-Dr Sedan NHTSA No.: O20165400
Test Program: NCAP Frontal Barrier Impact Test Test Date: 3/18/2015

INSTRUMENTATION

Driver Dummy Data Channels	46
Passenger Dummy Data Channels	49
Vehicle Structure Accelerometers	8
Barrier Channels	528
Total	631

CAMERA COVERAGE

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

DATA SHEET NO. 11
POST-TEST OBSERVATIONS

Test Vehicle: 2016 Mazda6 I Sport 4-Dr Sedan NHTSA No.: O20165400
Test Program: NCAP Frontal Barrier Impact Test Test Date: 3/18/2015

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 Bolster, Steering Column	Glovebox
Right Knee Contact	Knee Bolster	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	Cracked
Window Damage	None
Other Notable Effects	None

VEHICLE REBOUND FROM BARRIER

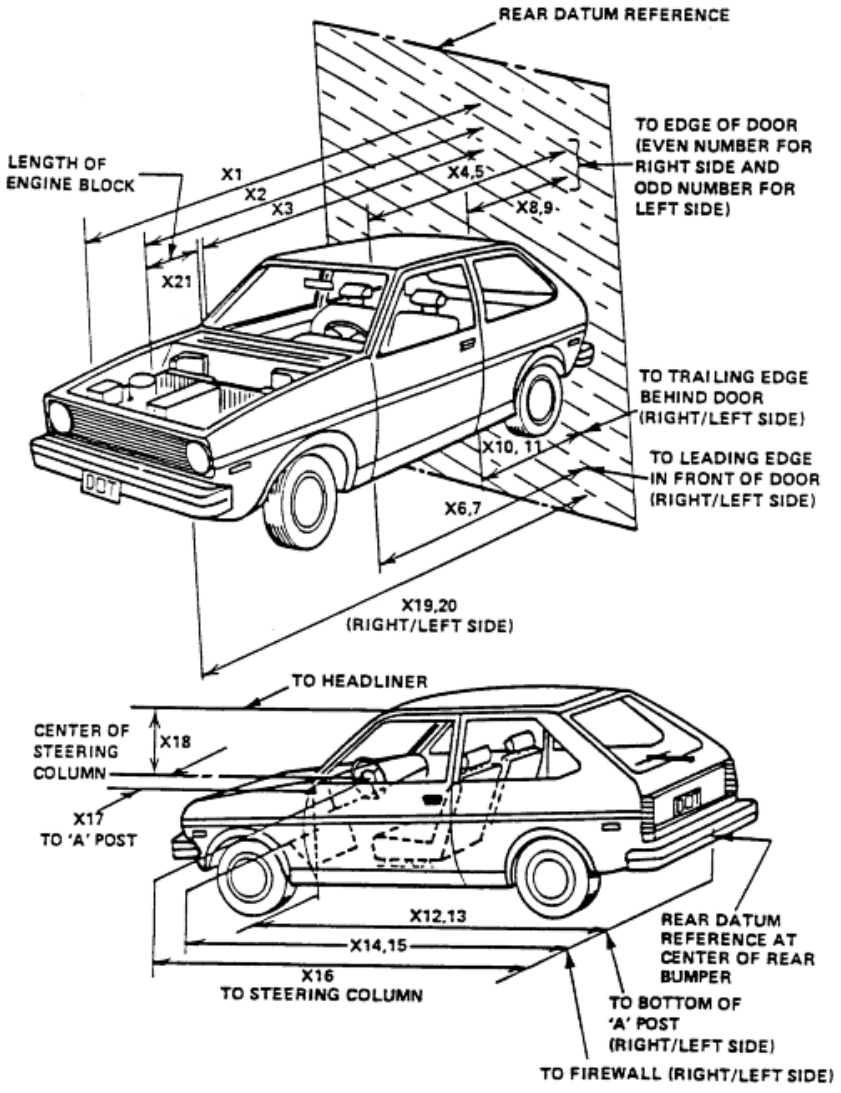
Measured Parameter	Units	Value
Left Side	mm	2590
Center	mm	2505
Right Side	mm	2465
Average	mm	2520

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	No		No	
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes		Yes	

DATA SHEET NO. 12
VEHICLE PROFILE MEASUREMENTS

Test Vehicle:	2016 Mazda6 I Sport 4-Dr Sedan	NHTSA No.:	O20165400
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	3/18/2015



DATA SHEET NO. 12 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2016 Mazda6 I Sport 4-Dr Sedan NHTSA No.: O20165400
Test Program: NCAP Frontal Barrier Impact Test Test Date: 3/18/2015

RSOV (Rear Surface of Vehicle)

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	mm	4684	4367	317
2	RSOV to Front of Engine	mm	4131	3852	279
3	RSOV to Firewall	mm	3712	3689	23
4	RSOV to Upper Leading Edge of Right Door	mm	3271	3270	1
5	RSOV to Upper Leading Edge of Left Door	mm	3271	3268	3
6	RSOV to Lower Leading Edge of Right Door	mm	3296	3295	1
7	RSOV to Lower Leading Edge of Left Door	mm	3296	3294	2
8	RSOV to Upper Trailing Edge of Right Door	mm	2209	2209	0
9	RSOV to Upper Trailing Edge of Left Door	mm	2209	2208	1
10	RSOV to Lower Trailing Edge of Right Door	mm	2233	2232	1
2	RSOV to Lower Trailing Edge of Left Door	mm	2233	2233	0
12	RSOV to Bottom of “A” Post of Right Side	mm	3338	3335	3
13	RSOV to Bottom of “A” Post of Left Side	mm	3338	3336	2
14	RSOV to Firewall, Right Side	mm	3408	3400	8
15	RSOV to Firewall, Left Side	mm	3408	3401	7
16	RSOV to Steering Column	mm	2810	2886	-76
17	Center of Steering Column to “A” Post	mm	363	363	0
18	Center of Steering Column to Headliner	mm	424	480	-56
19	RSOV to Right Side of Front Bumper	mm	4685	4268	417
20	RSOV to Left Side of Front Bumper	mm	4685	4218	467
21	Length of Engine Block	mm	360	360	0
RD	RSOV to Right Side of Dash Panel	mm	3096	3096	0
CD	RSOV to Center of Dash Panel	mm	2959	2959	0
LD	RSOV to Left Side of Dash Panel	mm	3096	3096	0

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

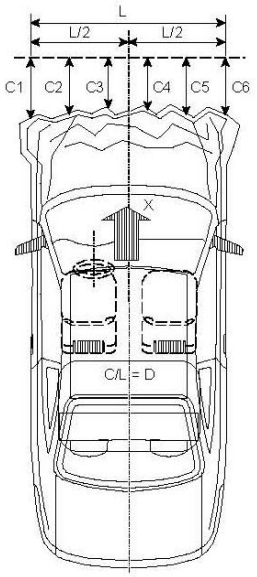
Test Vehicle: 2016 Mazda6 I Sport 4-Dr Sedan NHTSA No.: O20165400
Test Program: NCAP Frontal Barrier Impact Test Test Date: 3/18/2015

VEHICLE INFORMATION

VIN: JM1GJ1U54G1403491 Wheelbase (mm): 2832
Vehicle Size Category: Passenger Car Test Weight (kg): 1645.5

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): 66.8
Time of Separation (msec): 105.7



CRUSH PROFILE

Collision Deformation Classification: Frontal
Midpoint of Damage: Centerline
Damage Region Length (mm): 1172
Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4685	4218	467
C2	Crush zone 2 at left side	mm	4768	4246	522
C3	Crush zone 3 at left side	mm	4801	4237	564
C4	Crush zone 4 at right side	mm	4801	4322	479
C5	Crush zone 5 at right side	mm	4768	4297	471
C6	Crush zone 6 at right side	mm	4685	4268	417
L	C1 TO C6	mm	1172	1170	2

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

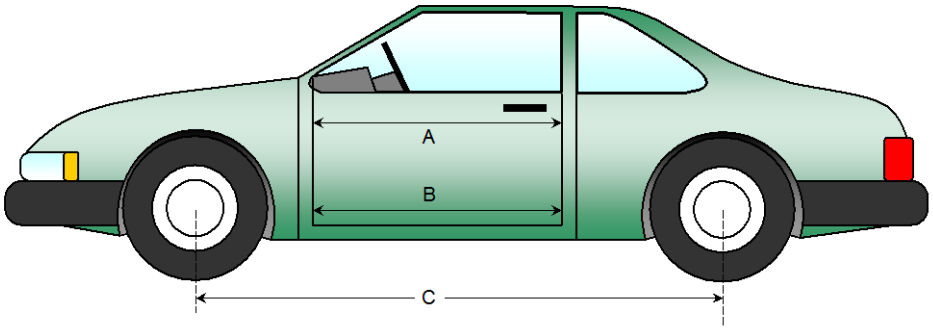
Test Vehicle: 2016 Mazda6 I Sport 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20165400
Test Date: 3/18/2015

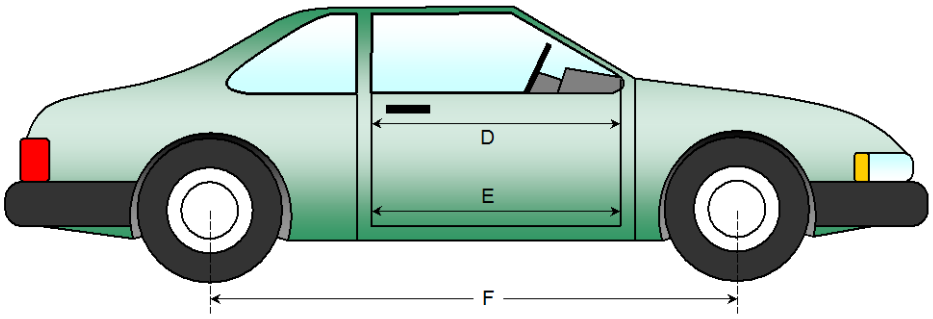
DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	994	990	4
B	Left Side Lower	mm	824	824	0
D	Right Side Upper	mm	994	990	4
E	Right Side Lower	mm	824	822	2

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2832	2752	80
F	Right Side Wheelbase	mm	2832	2746	86





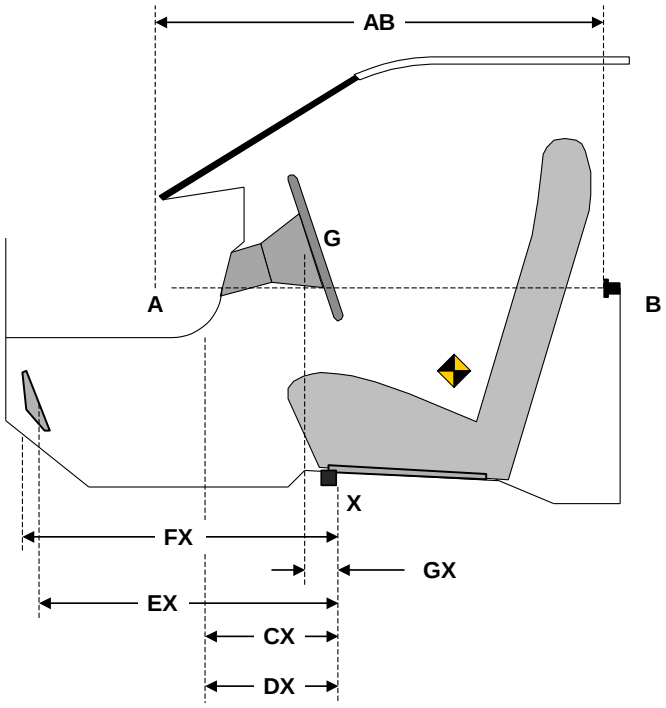
DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2016 Mazda6 I Sport 4-Dr Sedan NHTSA No.: O20165400
Test Program: NCAP Frontal Barrier Impact Test Test Date: 3/18/2015

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	720	720	0
CX	Left Knee Bolster to X	mm	220	213	7
DX	Right Knee Bolster to X	mm	210	205	5
EX	Brake Pedal to X	mm	560	455	105
FX	Foot Rest to X	mm	562	560	2
GX	Center of Steering Column Wheel Hub to X	mm	21	89	-68

X = Front of Seat Track (stationary)



DRIVER COMPARTMENT

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

Test Vehicle: 2016 Mazda6 I Sport 4-Dr Sedan NHTSA No.: O20165400
Test Program: NCAP Frontal Barrier Impact Test Test Date: 3/18/2015

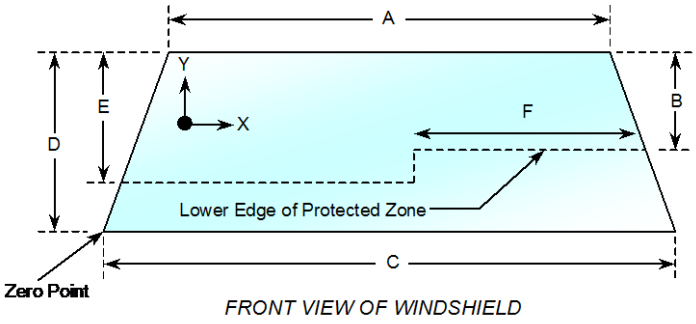
Windshield Mounting Details:
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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: 21.6° C.

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2188	2035	93
Right Side	2188	2143	98
Total	4376	4178	95



FRONT VIEW OF WINDSHIELD

Item	Units	Value
A	mm	1238
B	mm	490
C	mm	1518
D	mm	810
E	mm	520
F	mm	492

AREA OF PROTECTED ZONE FAILURES - NONE

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

X	Y

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

X	Y

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

Test Vehicle: 2016 Mazda6 I Sport 4-Dr Sedan NHTSA No.: O20165400
Test Program: NCAP Frontal Barrier Impact Test Test Date: 3/18/2015

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

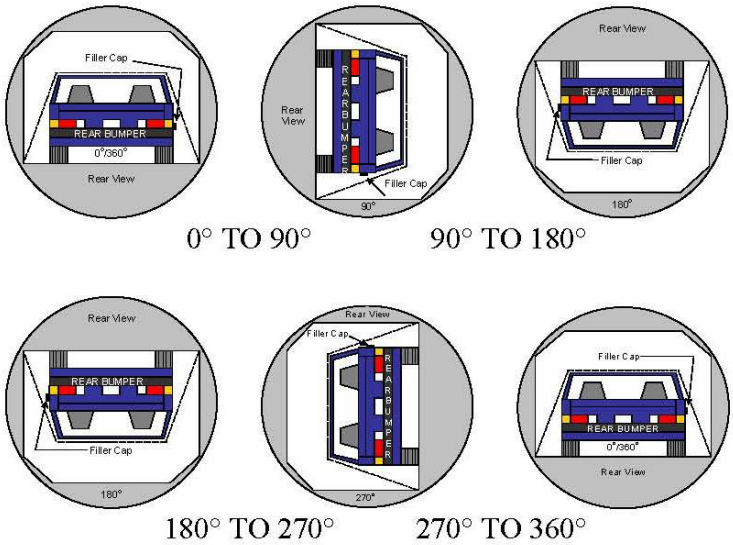
Temperature at Time of Impact: 21.6°C Test Time: 10:16 a.m.

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

DATA SHEET NO. 16
FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2016 Mazda6 I Sport 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20165400
Test Date: 3/18/2015

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°	117	300	417
90° to 180°	113	300	413
180° to 270°	107	300	407
270° to 360°	109	300	409

FMVSS 301 SPILLAGE TABLE (units in ounces)

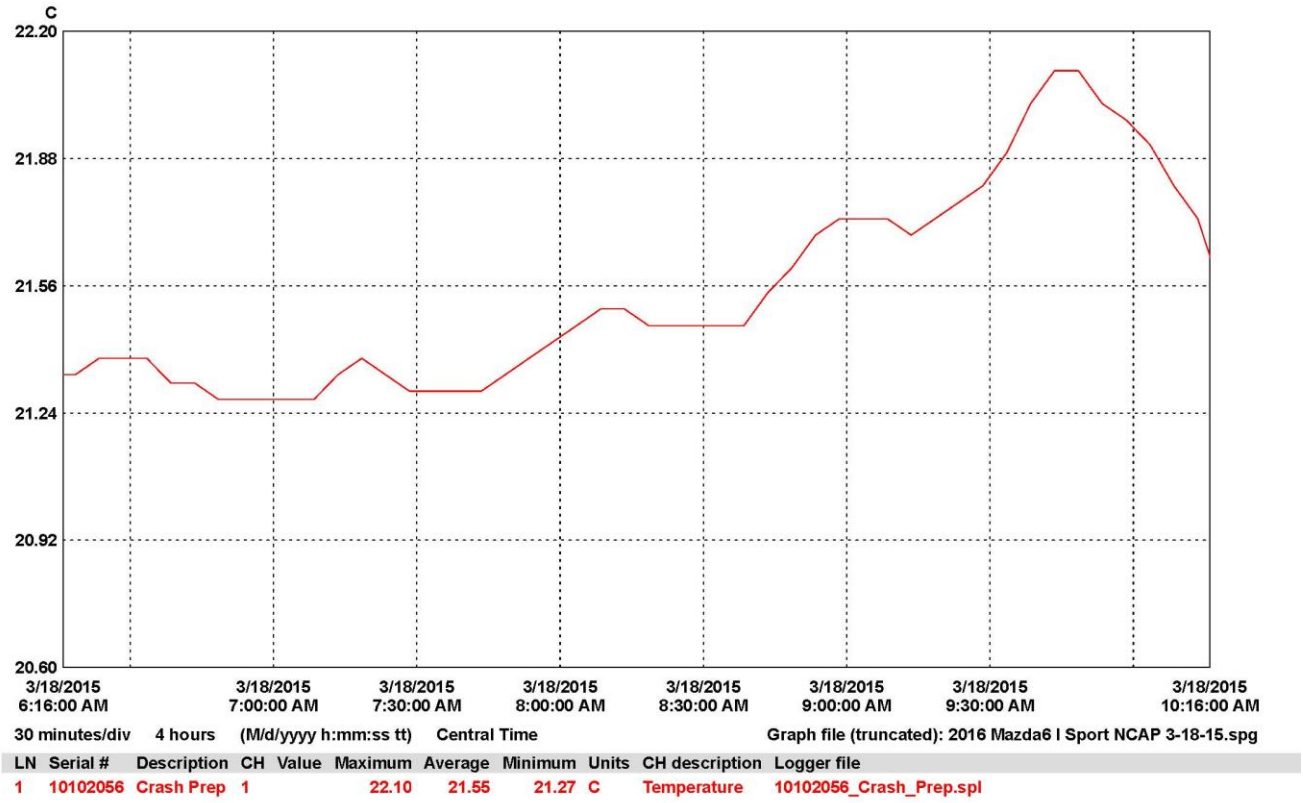
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eight Minute
0° to 90°	0	0	0	0
90° to 180°	0	0	0	0
180° to 270°	0	0	0	0
270° to 360°	0	0	0	0

SOLVENT SPILLAGE LOCATION TABLE

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

DATA SHEET NO. 17
DUMMY/VEHICLE TEMPERATURE STABILIZATION DATA

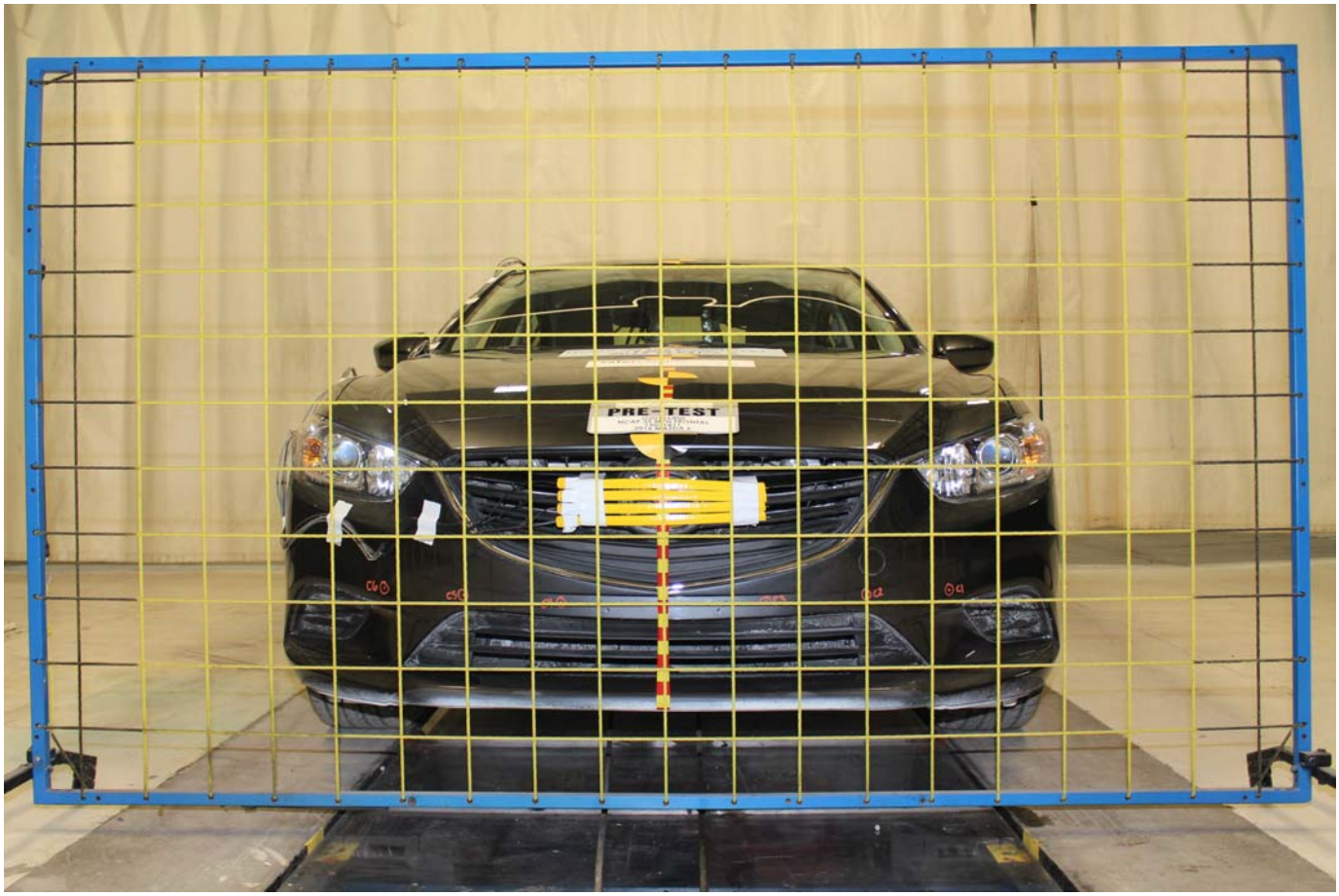
Test Vehicle: 2016 Mazda6 I Sport 4-Dr Sedan NHTSA No.: O20165400
Test Program: NCAP Frontal Barrier Impact Test Test Date: 3/18/2015



LN	Serial #	Description	CH	Value	Maximum	Average	Minimum	Units	CH description	Logger file
1	10102056	Crash Prep	1		22.10	21.55	21.27	C	Temperature	10102056_Crash_Prep.spl

APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS



No. 001 Load Cell Location

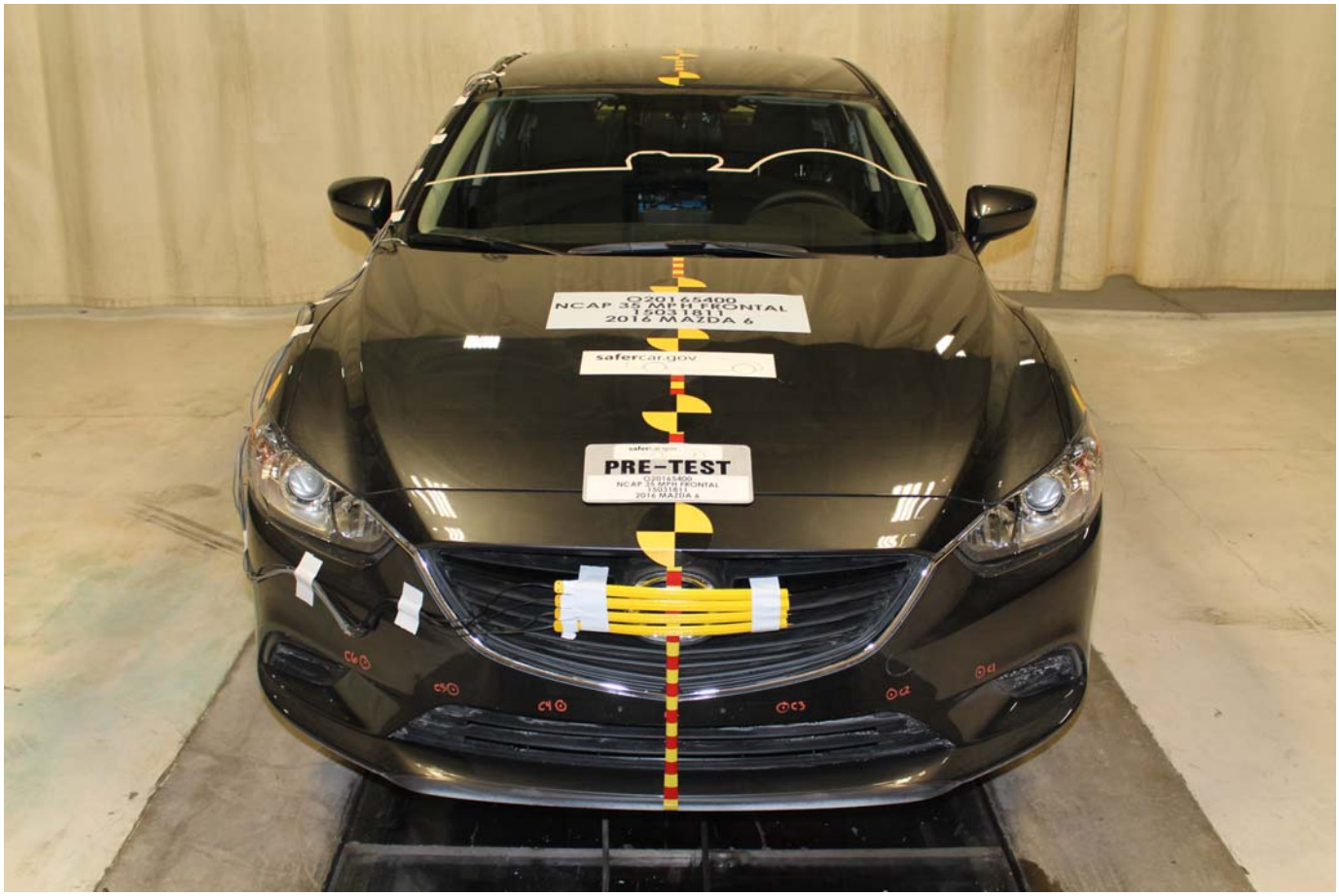
No. 002 Load Cell Wall

No. 003 Manufacturer's Label

No. 004 Tire Placard

No. 005 2016 Mazda 6 I Sport Frontal As Delivered

No. 006 Left Rear 3-4 View, As Received



No. 007 Pre-Test Front View of Test Vehicle

No. 008 Post-Test Front View of Test Vehicle

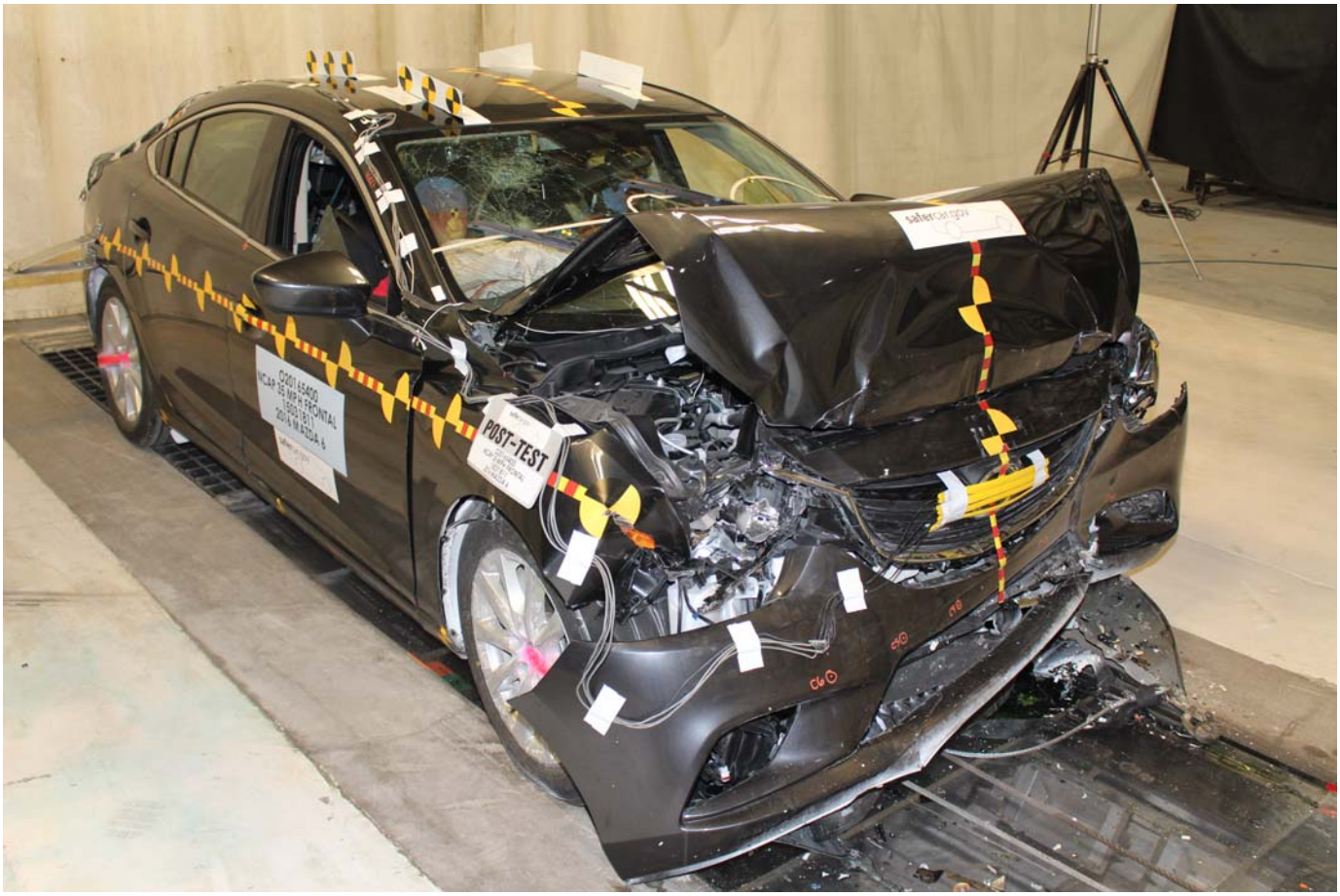
No. 009 Pre-Test Left View of Test Vehicle

No. 010 Post-Test Left View of Test Vehicle

No. 011 Pre-Test Right View of Test Vehicle

No. 012 Post-Test Right View of Test Vehicle

No. 013 Pre-Test Right Front 3-4 View



No. 014 Post-Test Right Front 3-4 View

No. 015 Pre-Test Left Rear 3-4 View

No. 016 Post-Test Left Rear 3-4 View

No. 017 Pre-Test Windshield View

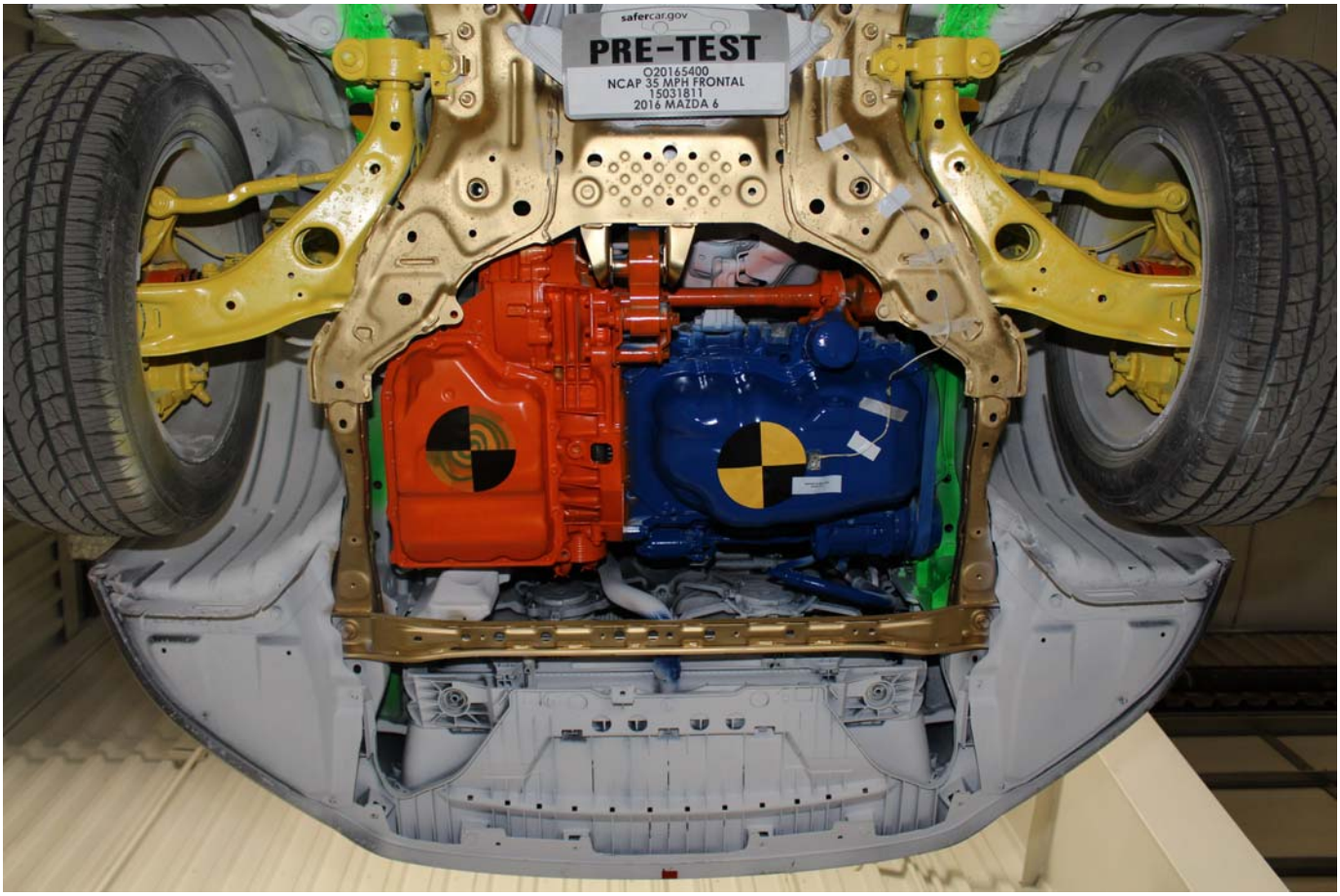
No. 018 Post-Test Windshield View

No. 019 Pre-Test Engine Compartment View

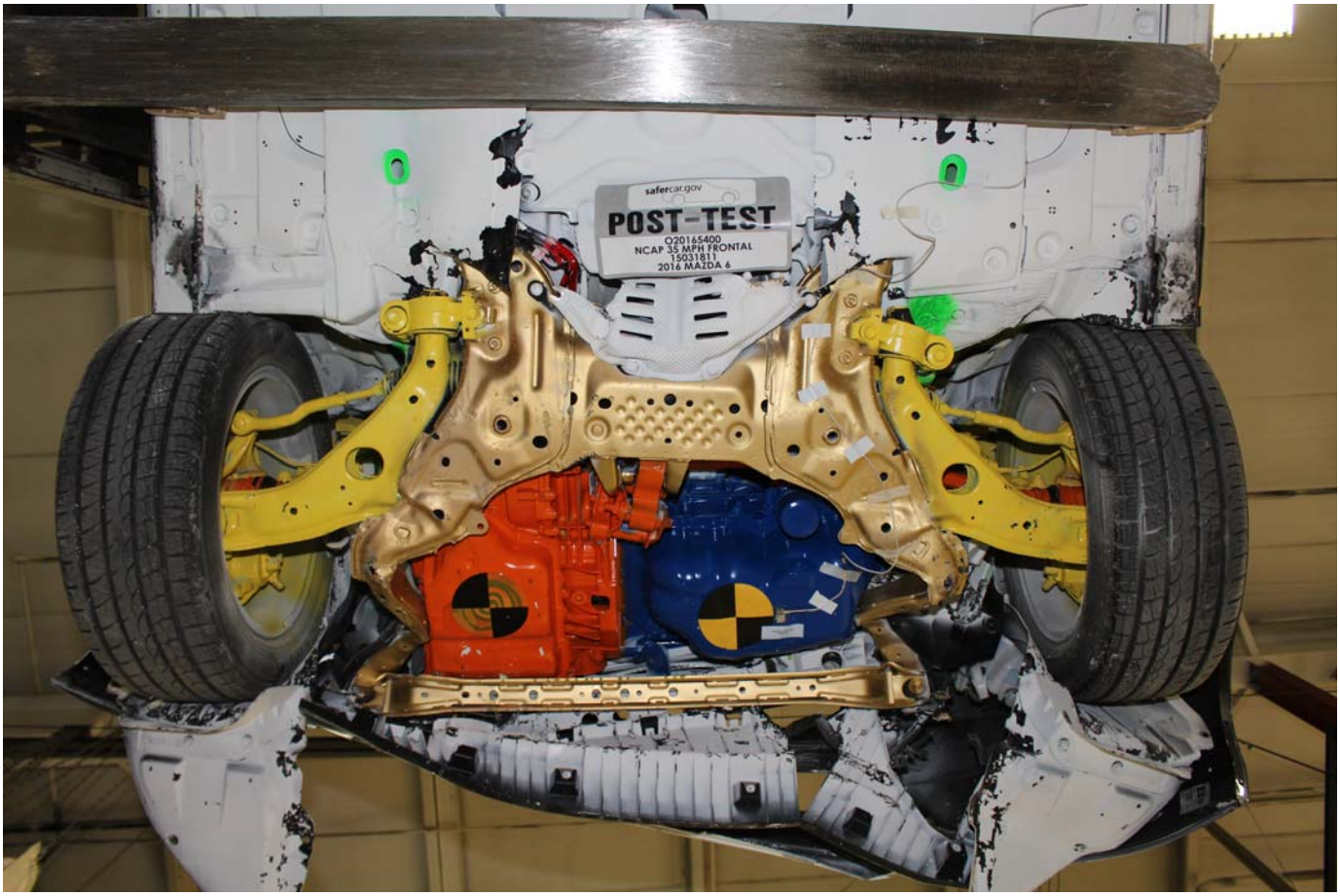
No. 020 Post-Test Engine Compartment View

No. 021 Pre-Test Fuel Filler Cap View

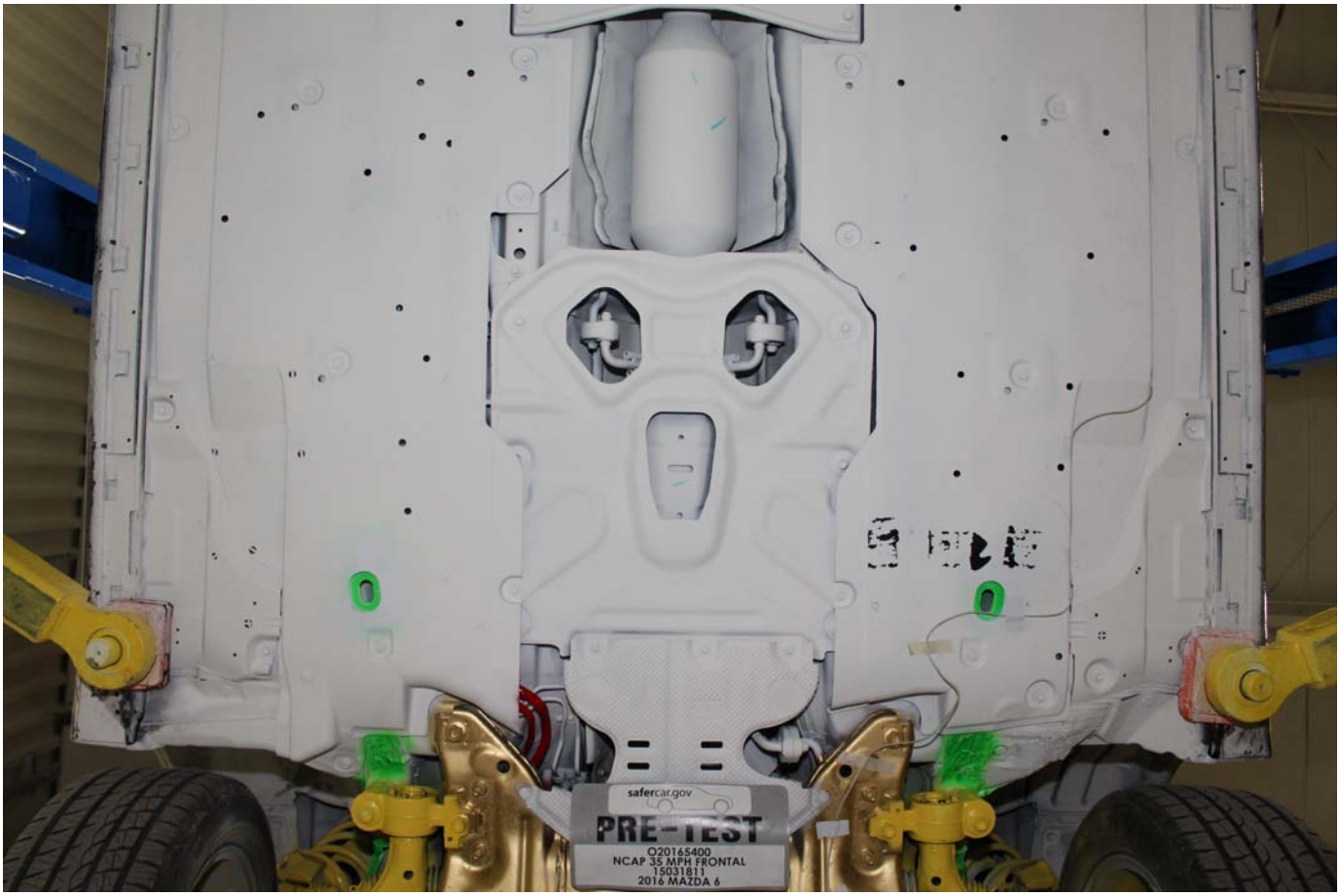
No. 022 Post-Test Fuel Filler Cap View



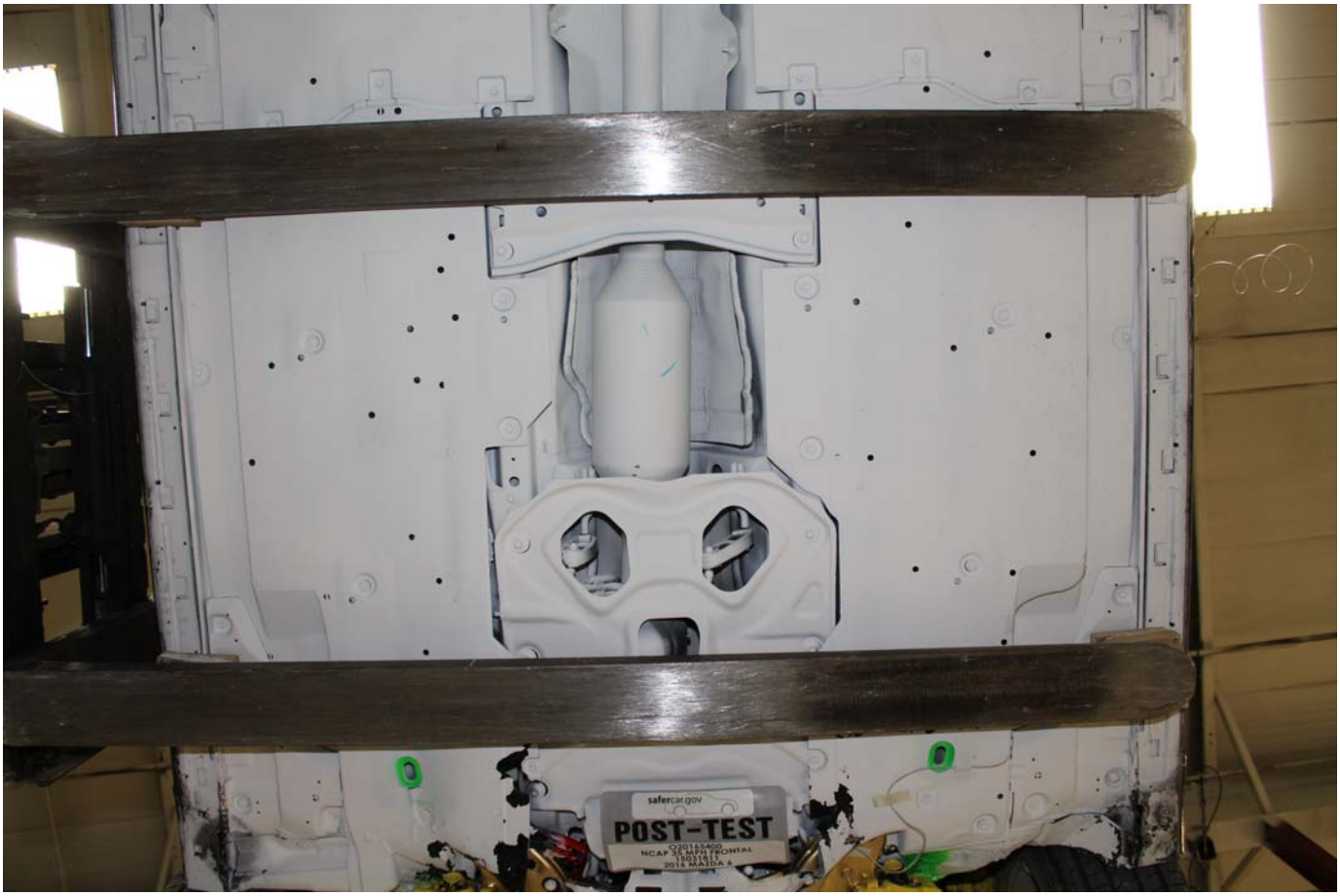
No. 023 Pre-Test Front Underbody View



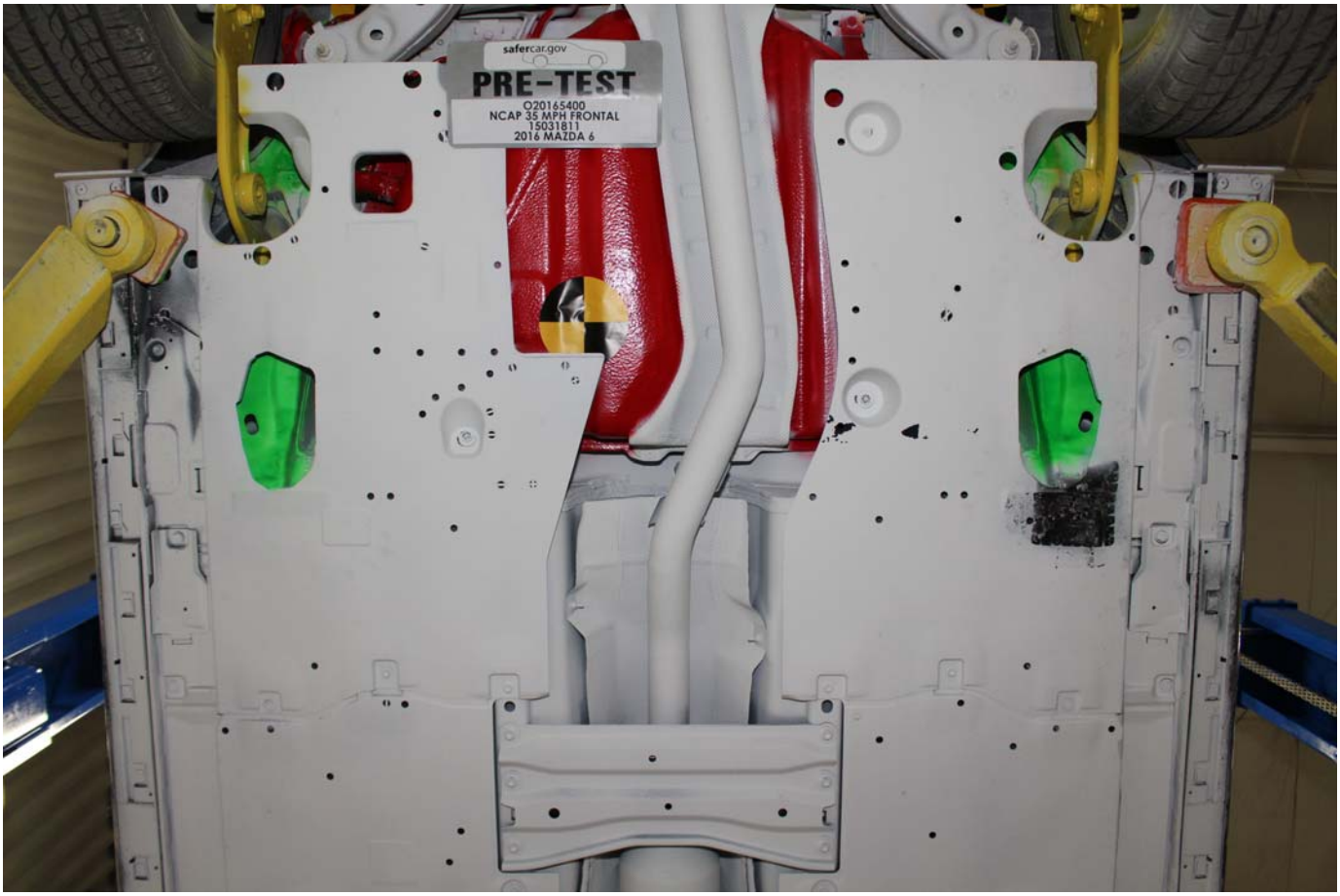
No. 024 Post-Test Front Underbody View



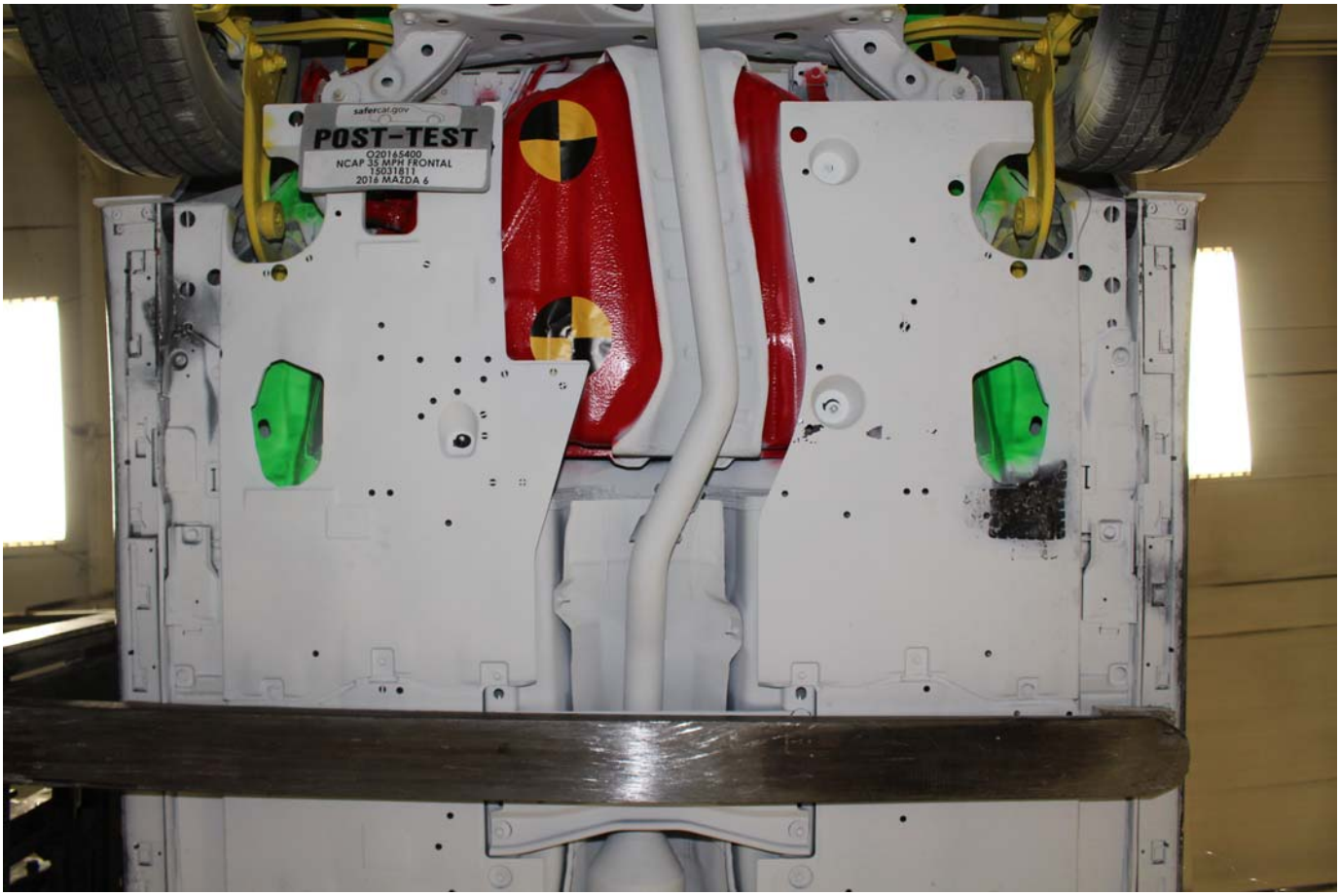
No. 025 Pre-Test Mid Front Underbody View



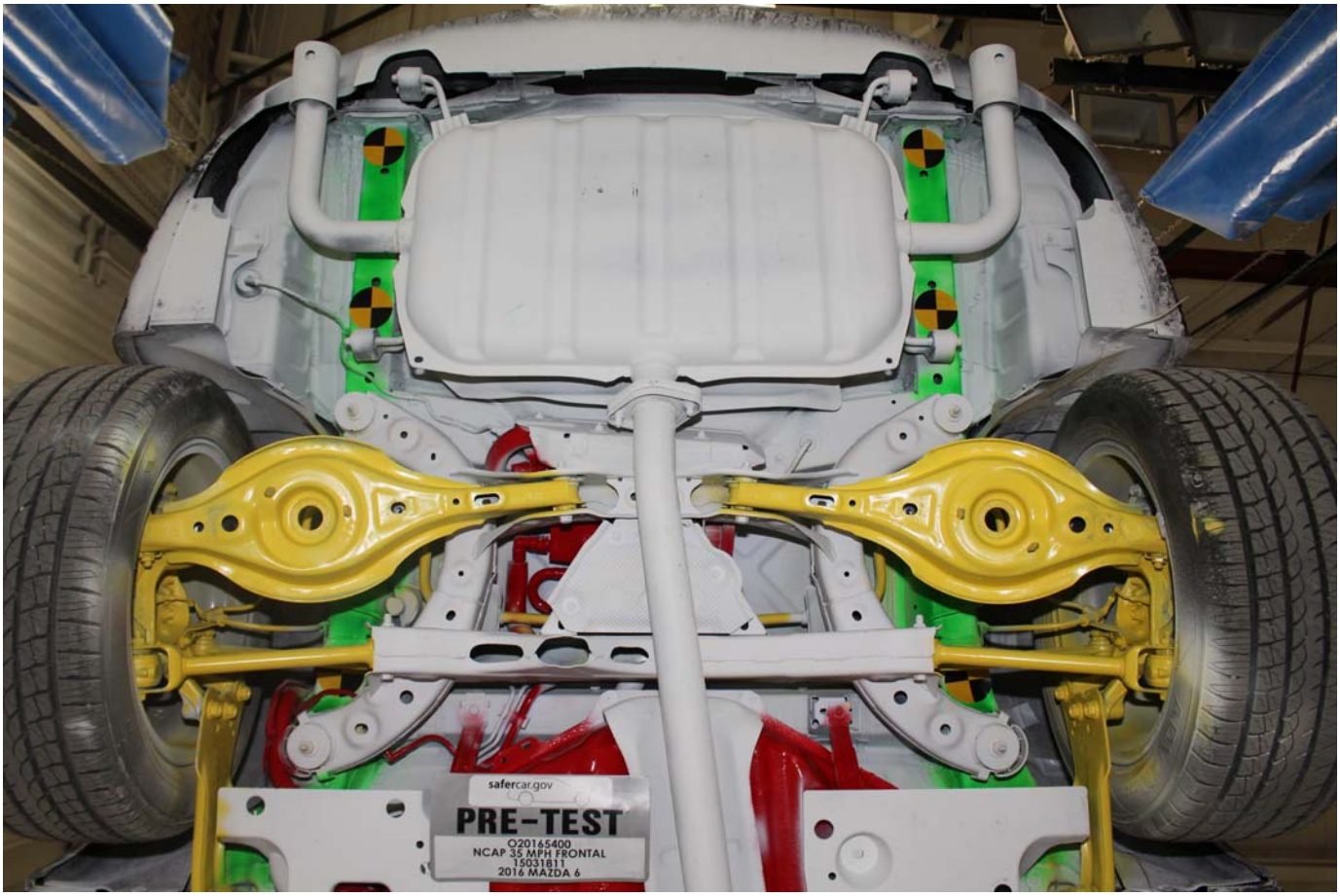
No. 026 Post-Test Mid Front Underbody View



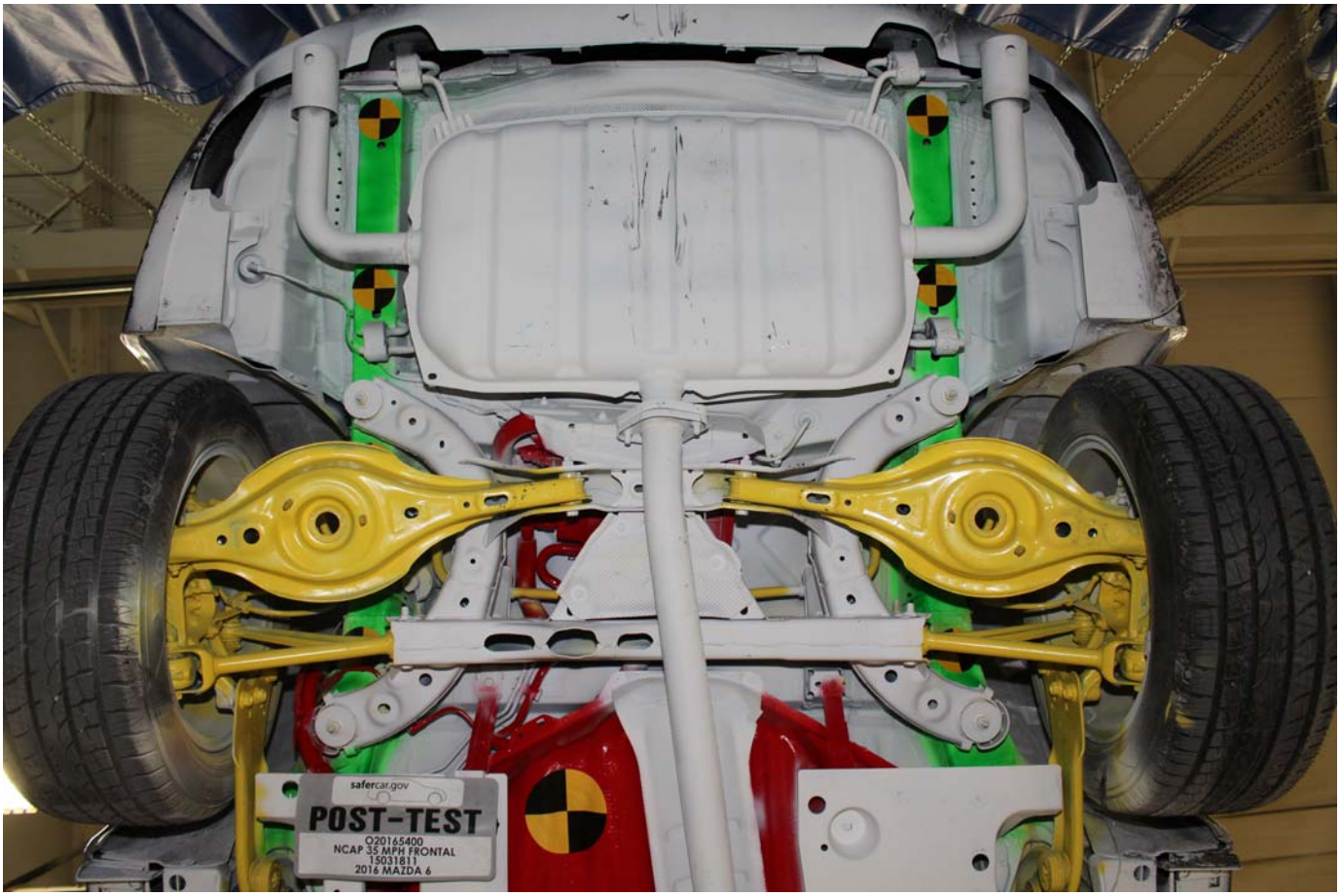
No. 027 Pre-Test Mid Rear Underbody View



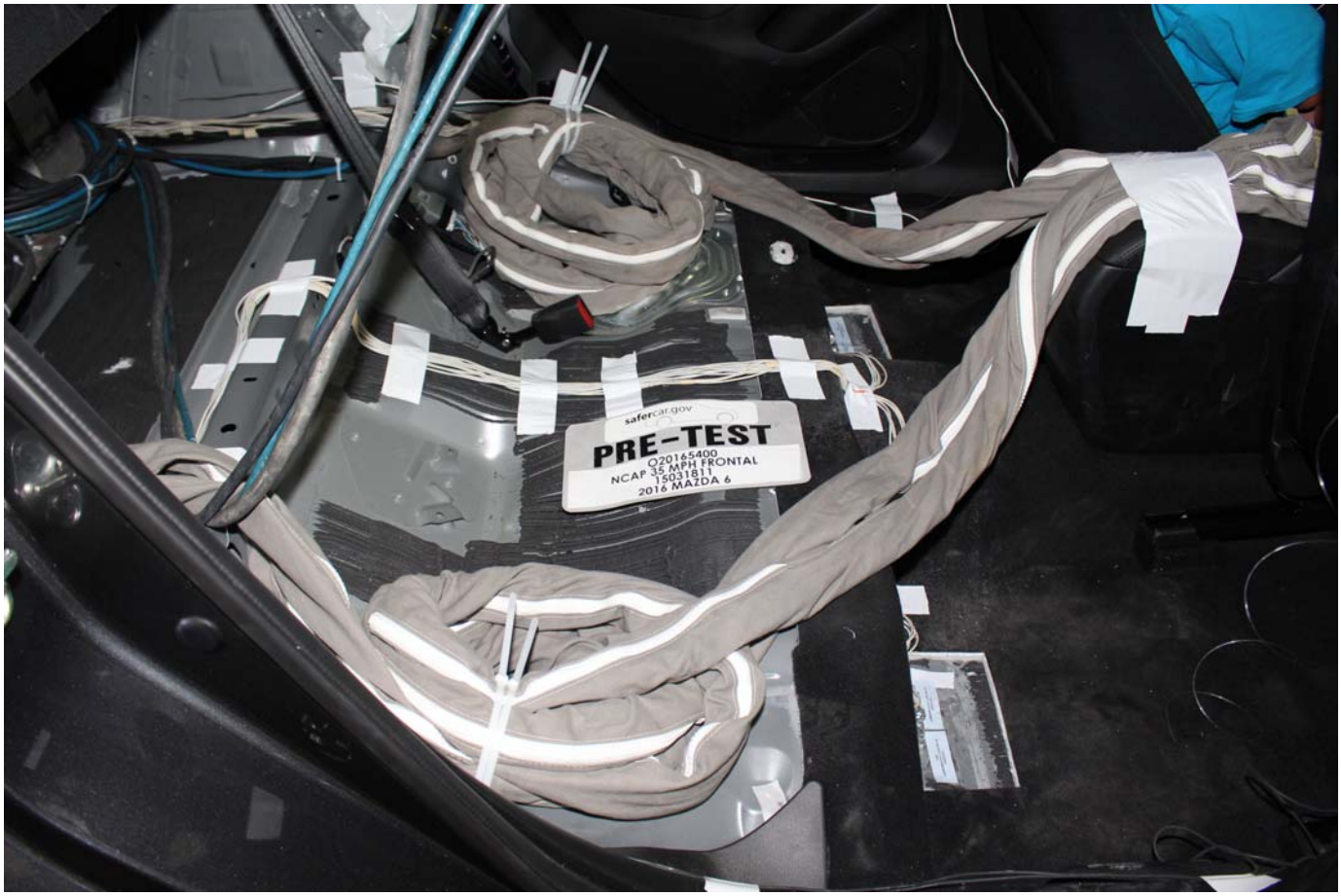
No. 028 Post-Test Mid Rear Underbody View



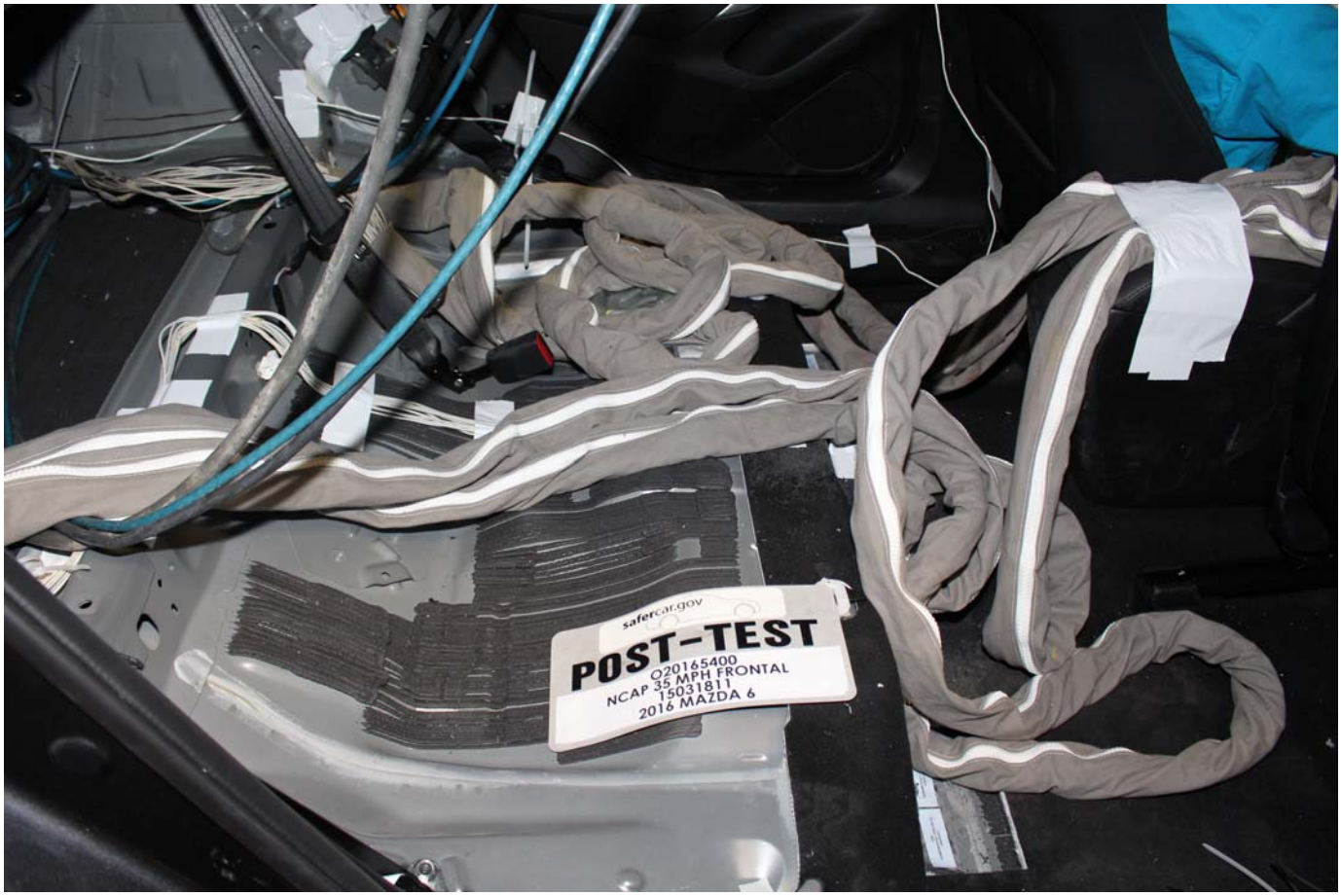
No. 029 Pre-Test Rear Underbody View



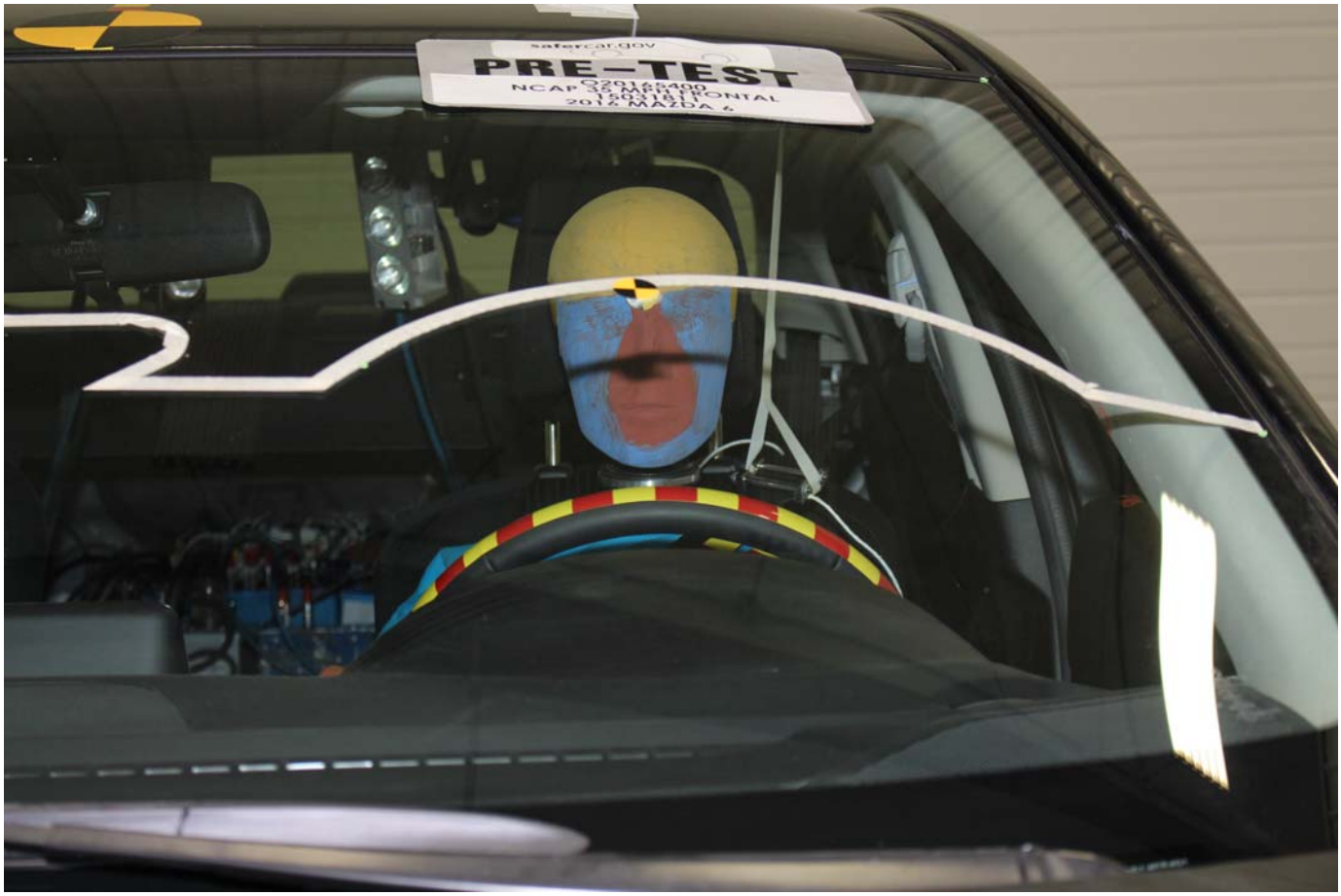
No. 030 Post-Test Rear Underbody View



No. 031 Pre-Test Dummy Cable Routing

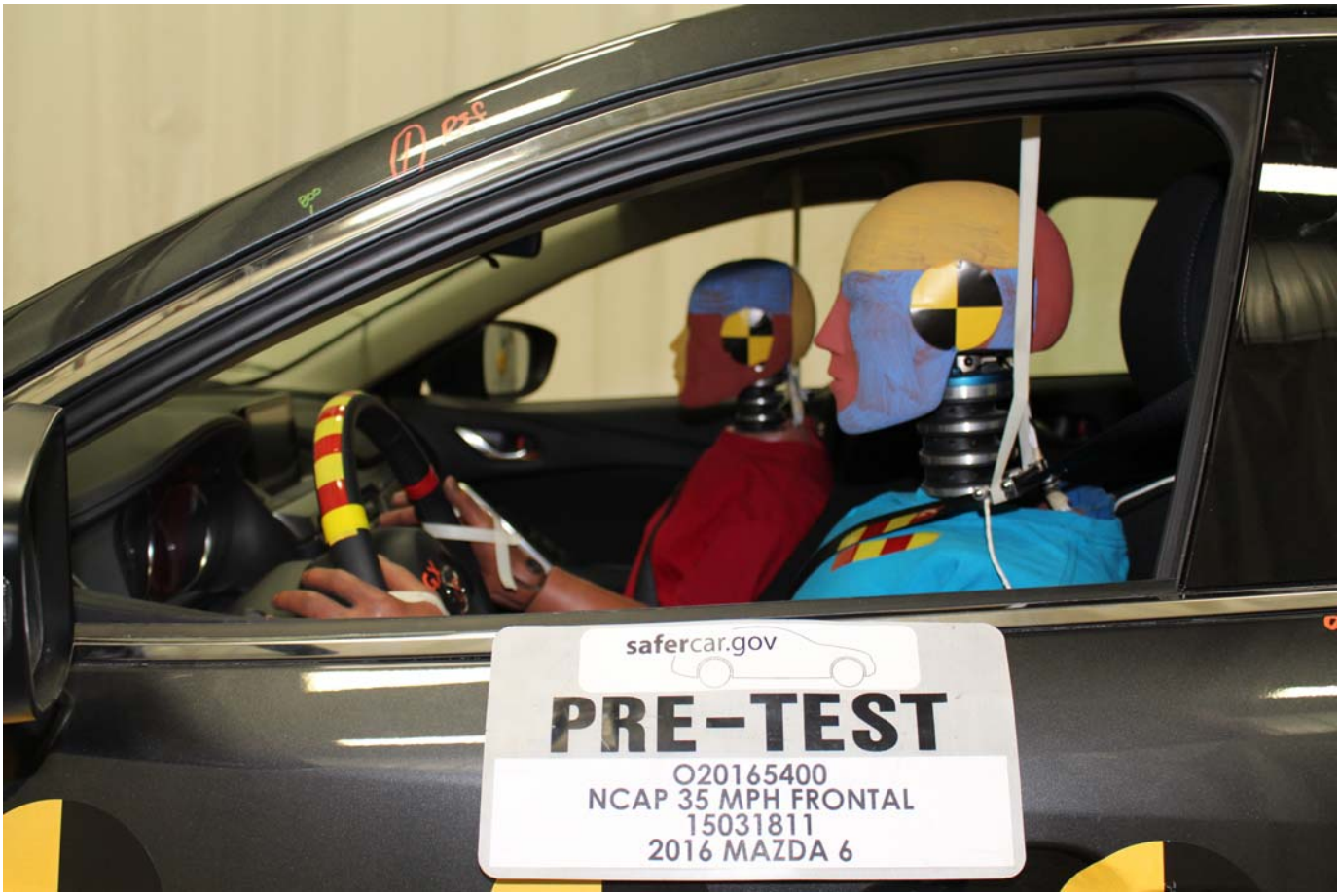


No. 032 Post-Test Dummy Cable Routing



No. 033 Pre-Test Driver Dummy Front View

No. 034 Post-Test Driver Dummy Front View

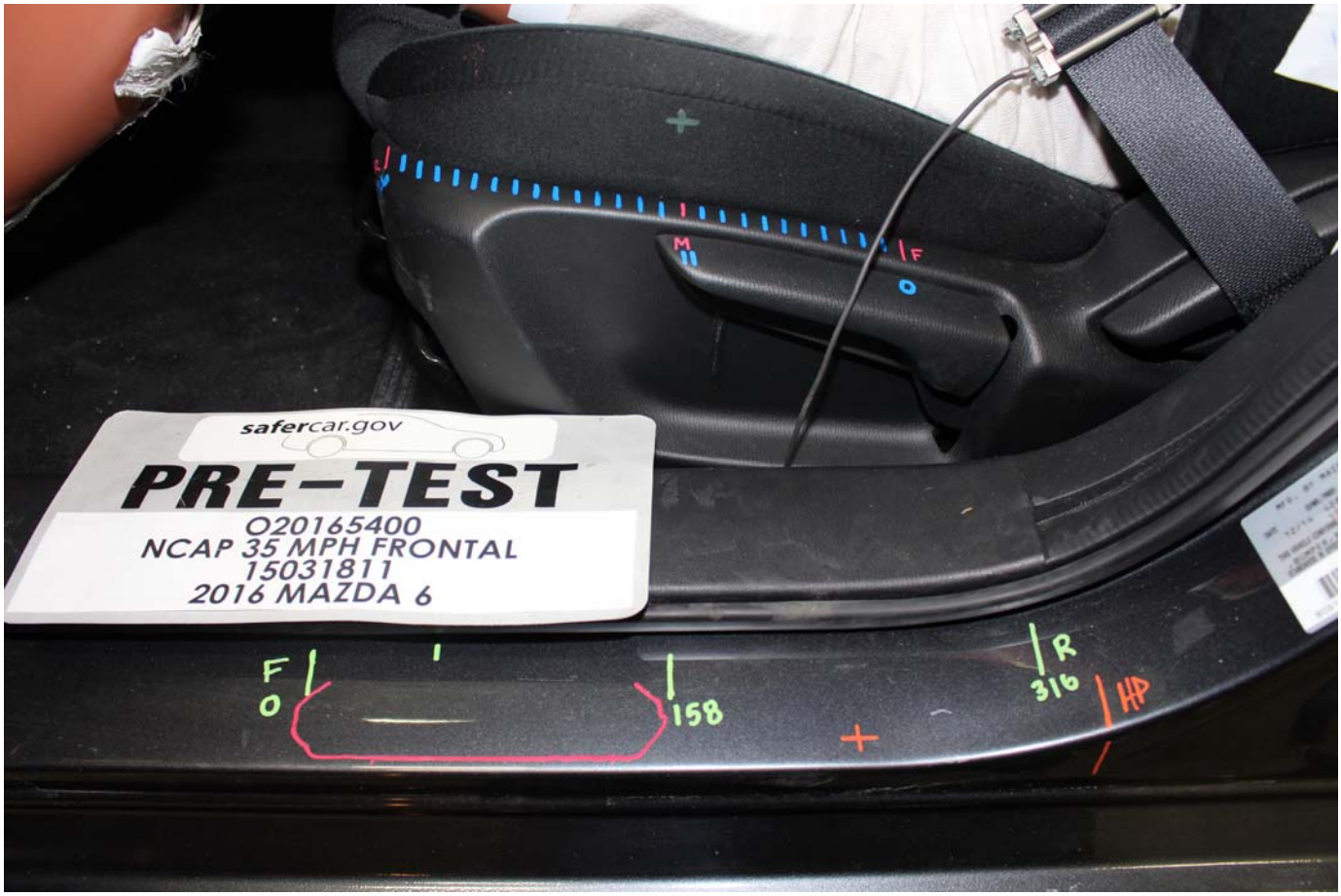


No. 035 Pre-Test Driver Dummy Window View

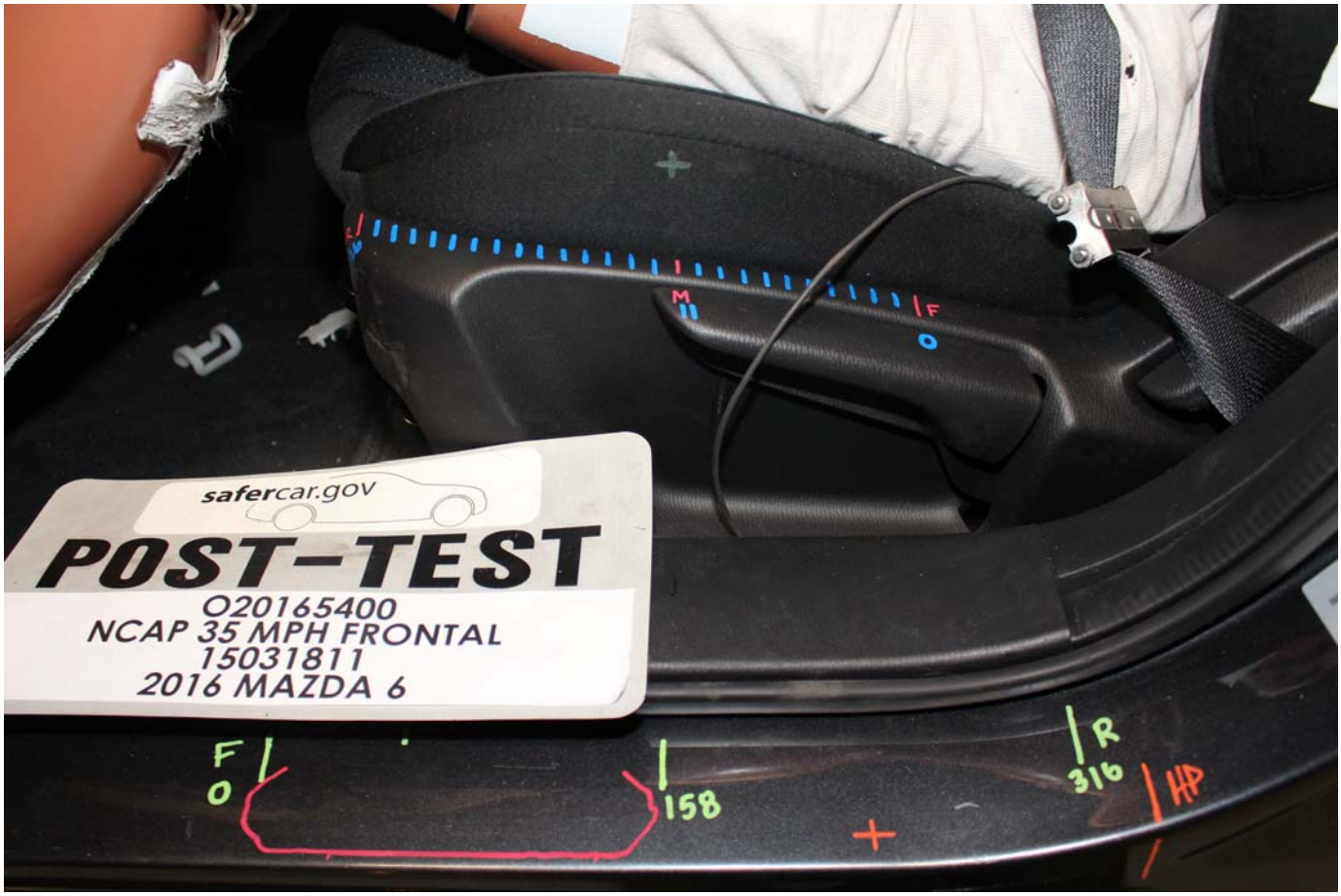
No. 036 Post-Test Driver Dummy Window View

No. 037 Pre-Test Driver Dummy and Vehicle Interior (Door Open)

No. 038 Post-Test Driver Dummy and Vehicle Interior (Door Open)



No. 039 Pre-Test Driver's Seat Fore-Aft Markings



No. 040 Post-Test Driver's Seat Fore-Aft Markings

No. 041 Pre-Test View of Belt Anchorage for Driver Dummy

No. 042 Post-Test View of Belt Anchorage for Driver Dummy

No. 043 Pre-Test Driver Dummy Feet

No. 044 Post-Test Driver Dummy Feet

No. 045 Pre-Test Driver's Side Knee Bolster (without dummy)

No. 046 Post-Test Driver's Side Knee Bolster (without dummy)

No. 047 Pre-Test Driver's Side Floorpan

No. 048 Post-Test Driver's Side Floorpan

No. 049 Post-Test Driver Dummy Face

No. 050 Post-Test Driver Dummy Contact with Airbag

No. 051 Post-Test Driver Dummy Contact with Headrest

No. 052 Post-Test Driver Dummy Contact with Knee Bolster

No. 053 Pre-Test View of the Steering Wheel

No. 054 Post-Test View of the Steering Wheel

No. 055 Pre-Test Passenger Dummy Front View

No. 056 Post-Test Passenger Dummy Front View

No. 057 Pre-Test Passenger Dummy Window View

No. 058 Post-Test Passenger Dummy Window View

No. 059 Pre-Test Passenger Dummy and Vehicle Interior (Door Open)

No. 060 Post-Test Passenger Dummy and Vehicle Interior (Door Open)

No. 061 Pre-Test Passenger's Seat Fore-Aft Markings

No. 062 Post-Test Passenger's Seat Fore-Aft Markings

No. 063 Pre-Test View of Belt Anchorage for Passenger Dummy

No. 064 Post-Test View of Belt Anchorage for Passenger Dummy

No. 065 Pre-Test Passenger Dummy Feet

No. 066 Post-Test Passenger Dummy Feet

No. 067 Pre-Test Passenger's Side Knee Bolster (without dummy)

No. 068 Post-Test Passenger's Side Knee Bolster (without dummy)

No. 069 Pre-Test Passenger's Side Floorpan

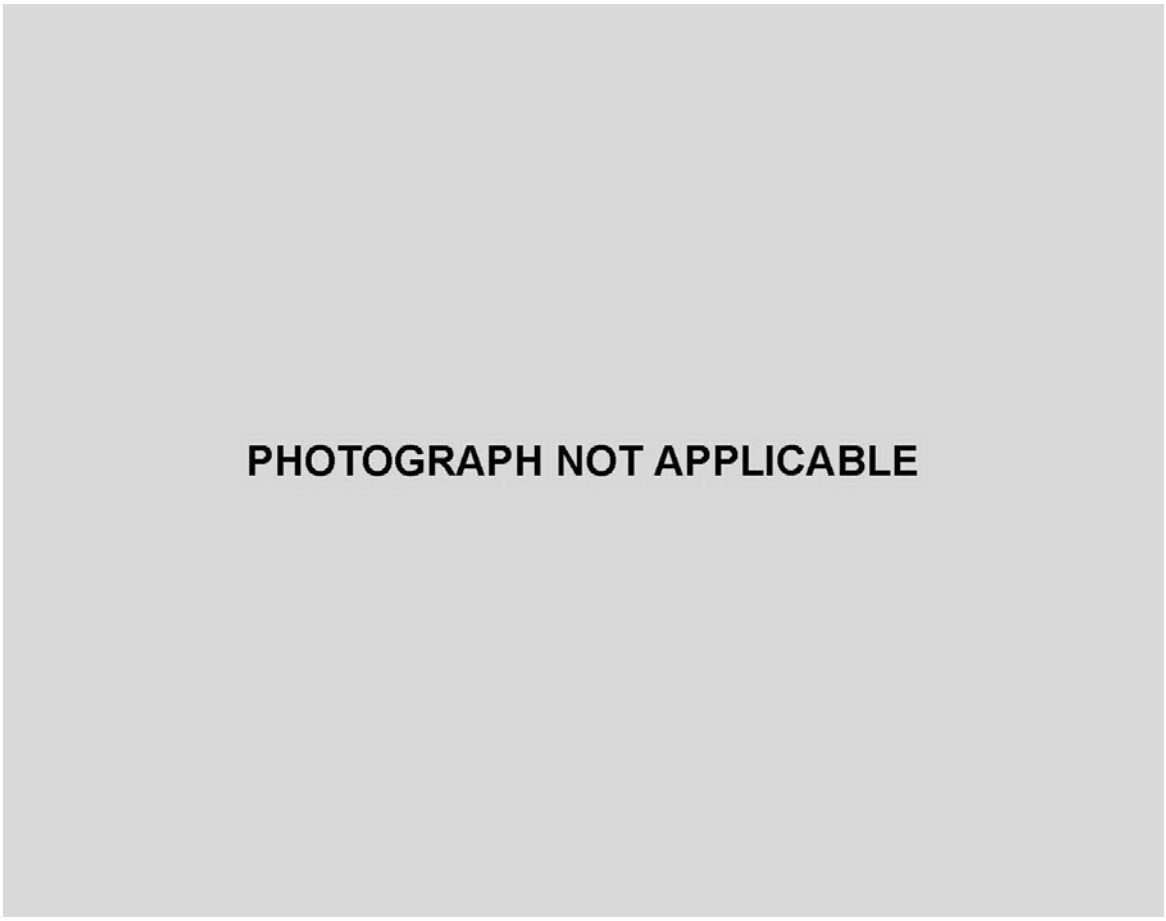
No. 070 Post-Test Passenger's Side Floorpan

No. 071 Post-Test Passenger Dummy Face

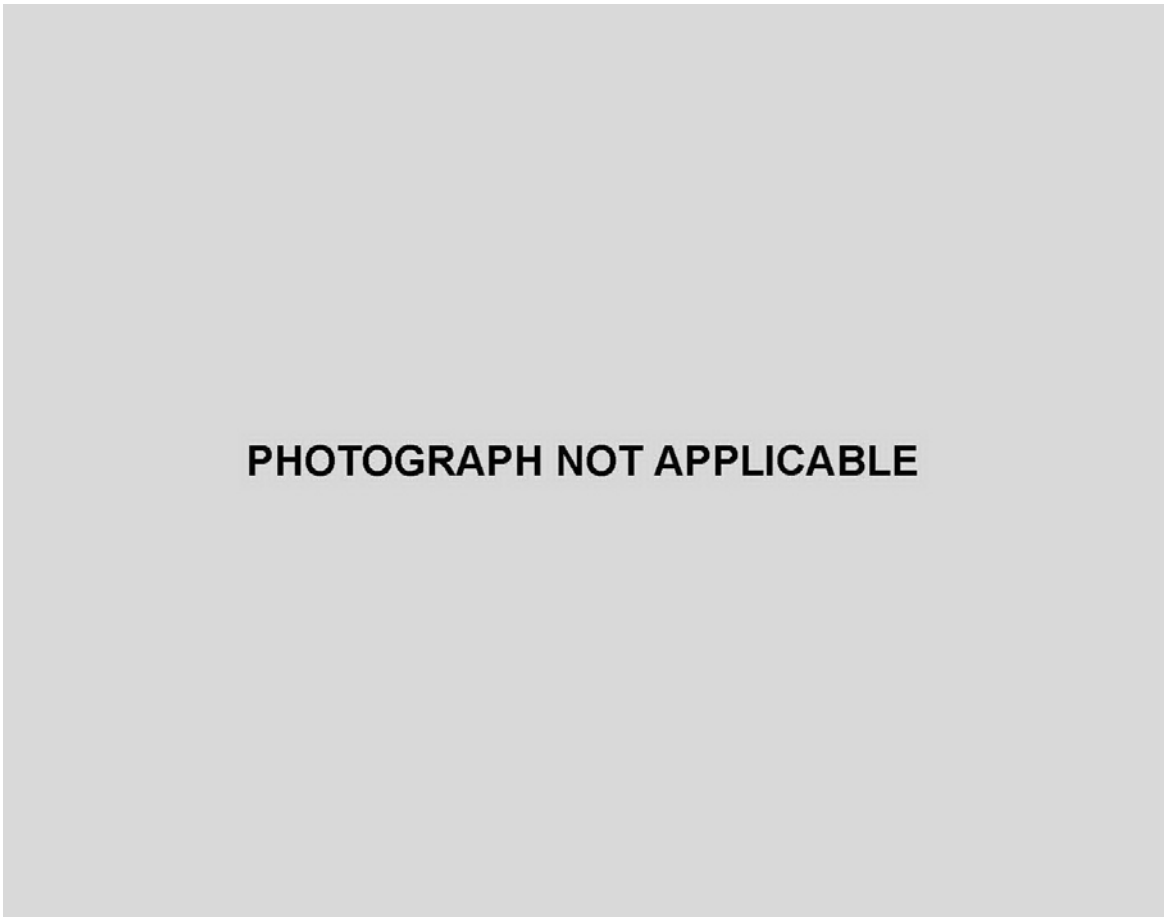
No. 072 Post-Test Passenger Dummy Contact with Airbag

No. 073 Post-Test Passenger Dummy Contact with Headrest

No. 074 Post-Test Passenger Dummy Contact with Glovebox



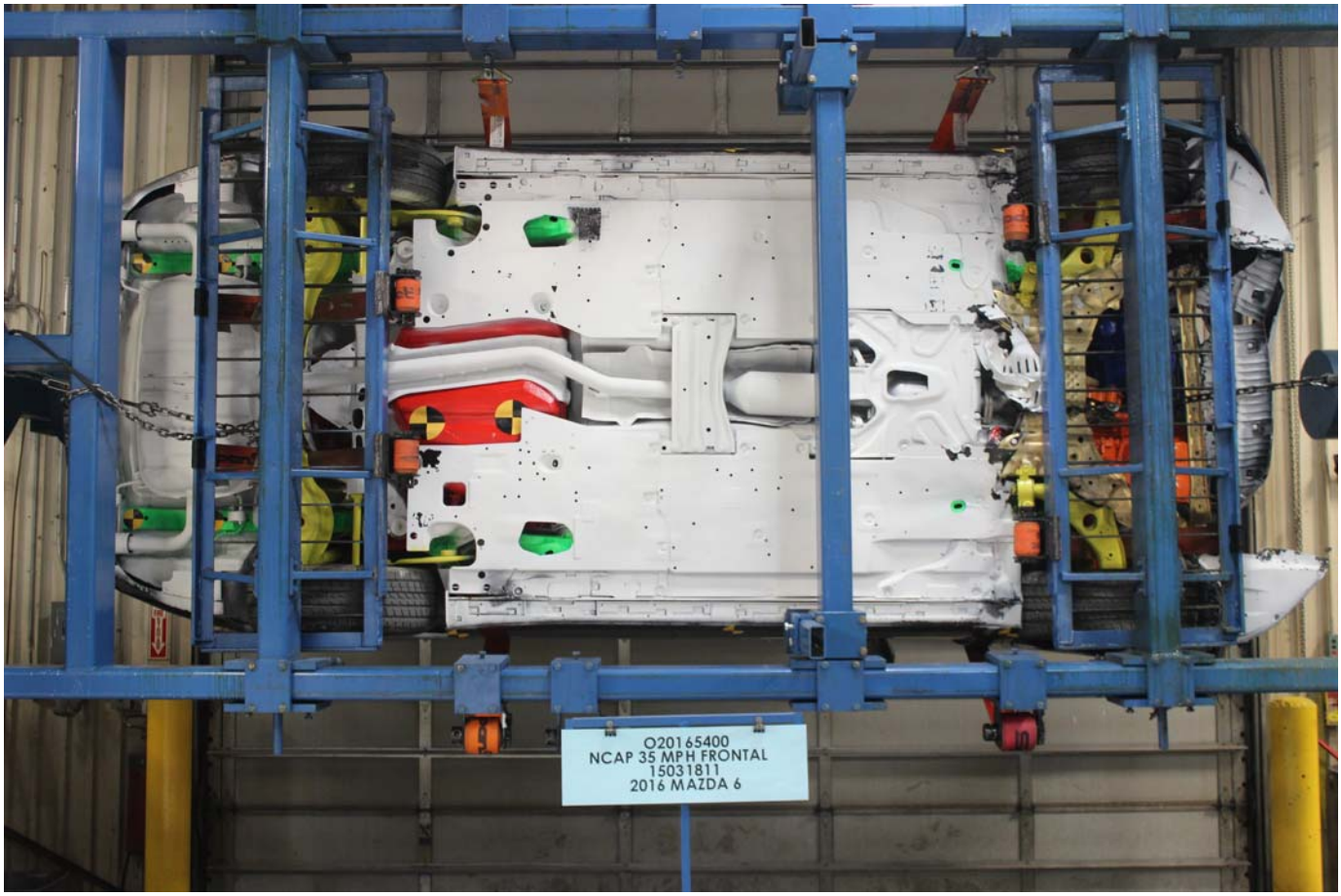
No. 075 Ballast Installed in Vehicle



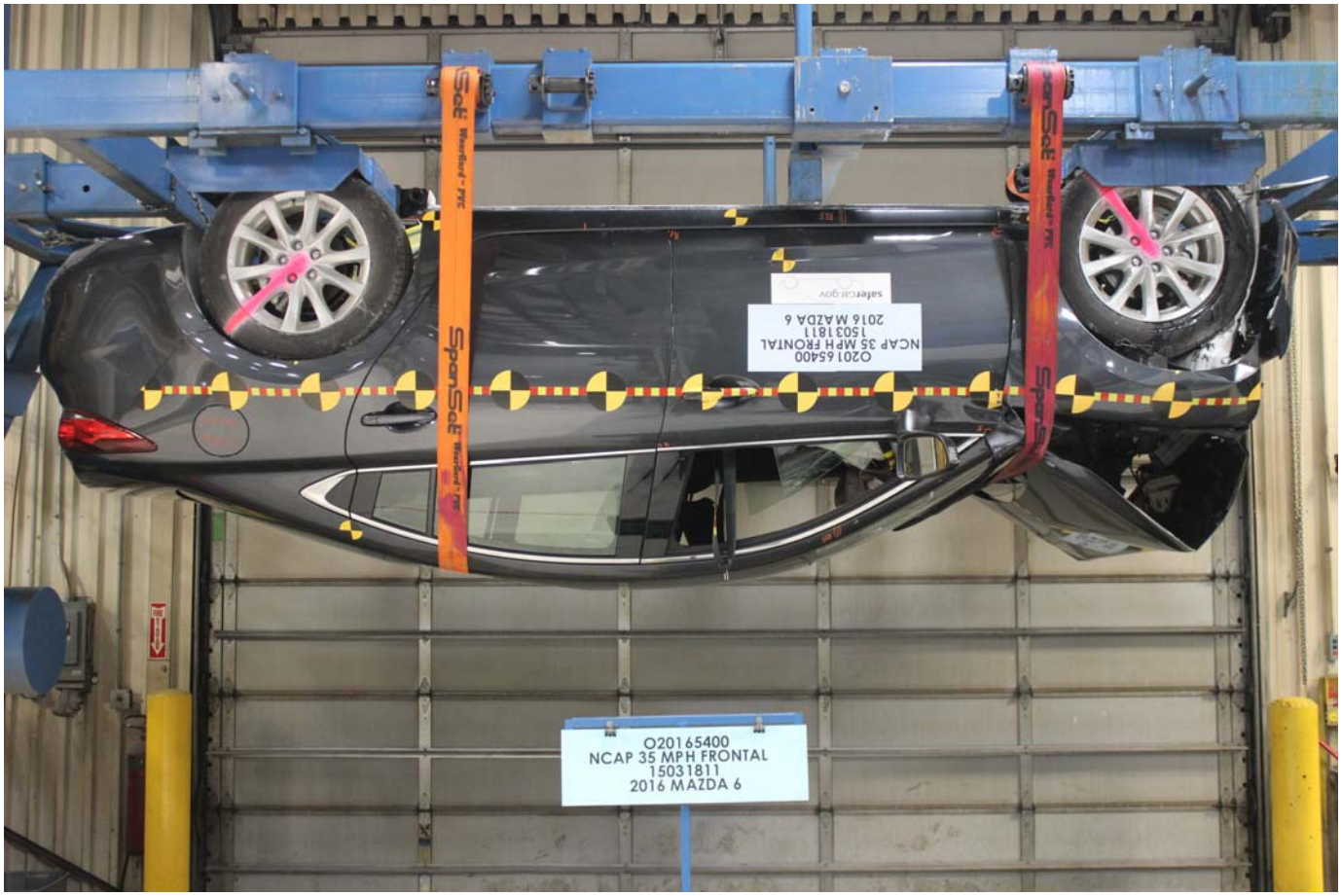
No. 076 Post-Test Stoddard Solvent Spillage Location View

No. 077 Post-Test Speed Trap Read-Out

No. 078 Vehicle at 0 Degree on Static Rollover Device

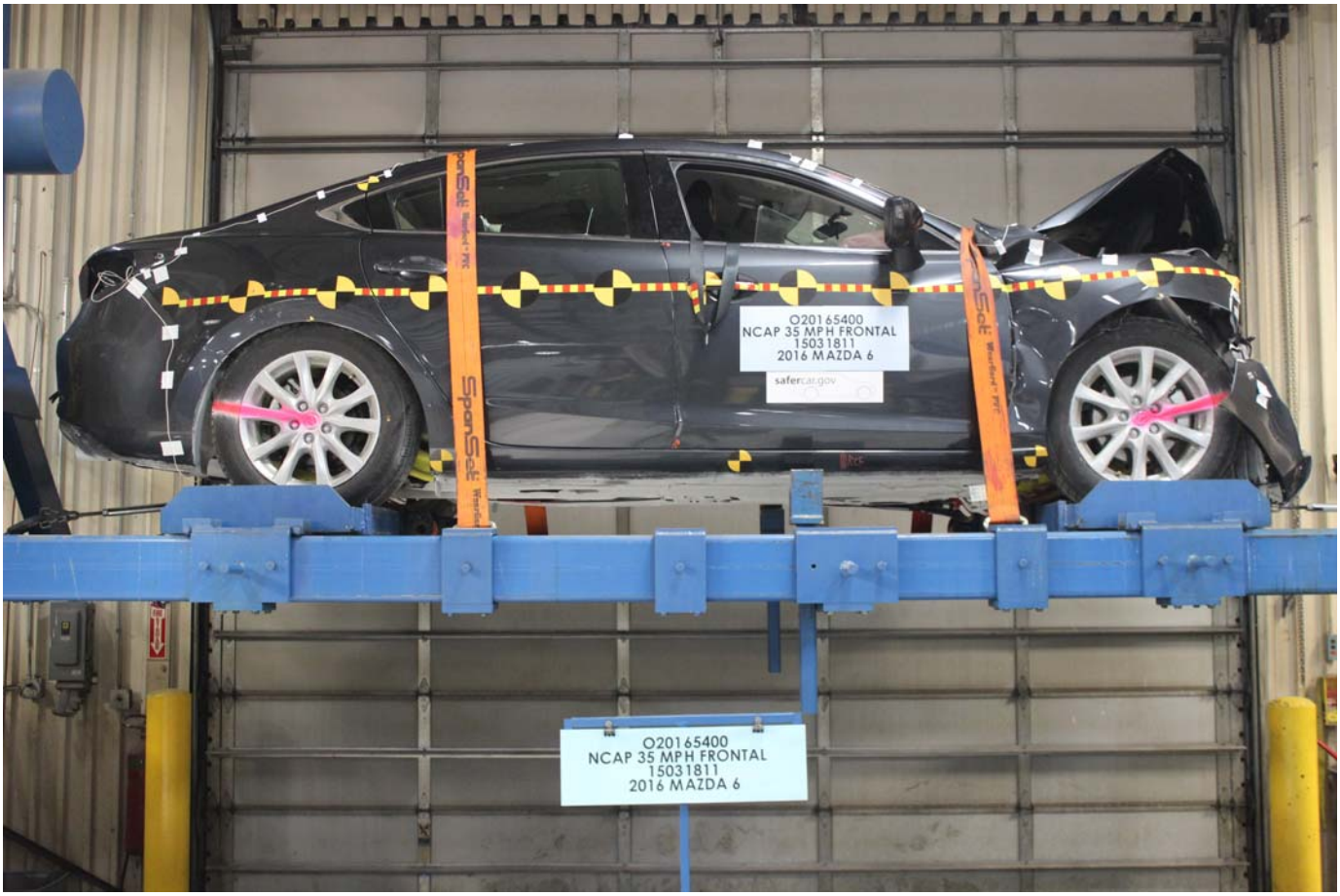


No. 079 Vehicle at 90 Degrees on Static Rollover Device



No. 080 Vehicle at 180 Degrees on Static Rollover Device

No. 081 Vehicle at 270 Degrees on Static Rollover Device



No. 082 Vehicle at 360 Degrees on Static Rollover Device

No. 083 2016 Mazda 6 I Sport Frontal Impact Event

No. 084 Monroney Label Photograph

APPENDIX B
DUMMY RESPONSE DATA TRACES

TABLE OF DATA PLOTS

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

Driver Left Lower Tibia Moment Y

Driver Left Lower Tibia Force Z

Driver Right Upper Tibia Moment X

Driver Right Upper Tibia Moment Y

Driver Right Upper Tibia Force Z

Driver Right Lower Tibia Moment X

Driver Right Lower Tibia Moment Y

Driver Right Lower Tibia Force Z

Driver Left Foot Fore Z

Driver Left Foot Aft X

Driver Left Foot Aft Z

Driver Right Foot Fore Z

Driver Right Foot Aft X

Driver Right Foot Aft Z

Driver Lap Belt Force

Driver Shoulder Belt Force

Passenger Head X Redundant

Passenger Head Y Redundant

Passenger Head Z Redundant

Passenger Head Angular Velocity X

Passenger Head Angular Velocity Y

Passenger Head Angular Velocity Z

Passenger Upper Neck Force Y

Passenger Upper Neck Moment X

Passenger Upper Neck Moment Z

Passenger Chest X Redundant

Passenger Chest Y Redundant

Passenger Chest Z Redundant

Passenger Pelvis X

Passenger Pelvis Y

Passenger Pelvis Z

Passenger Left Femur Redundant

Passenger Right Femur Redundant

Passenger Left Upper Tibia Moment X

Passenger Left Upper Tibia Moment Y

Passenger Left Upper Tibia Force Z

Passenger Left Lower Tibia Moment X

Passenger Left Lower Tibia Moment Y

Passenger Left Lower Tibia Force Z

Passenger Right Upper Tibia Moment X

Passenger Right Upper Tibia Moment Y

Passenger Right Upper Tibia Force Z

Passenger Right Lower Tibia Moment X

Passenger Right Lower Tibia Moment Y

Passenger Right Lower Tibia Force Z

Passenger Left Foot Fore Z

Passenger Left Foot Aft X

Passenger Left Foot Aft Z

Passenger Right Foot Fore Z

Passenger Right Foot Aft X

Passenger Right Foot Aft Z

Passenger Lap Belt Force

Passenger Shoulder Belt Force

Left Rear Seat Crossmember X

Right Rear Seat Crossmember X

Vehicle Engine Top X

Vehicle Engine Bottom X

Left Rear Seat Crossmember Z

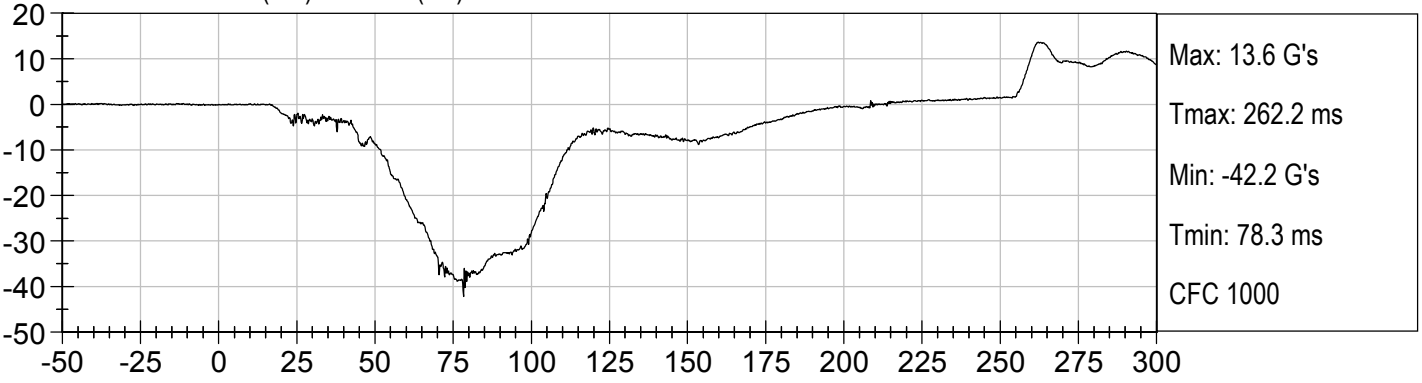
Right Rear Seat Crossmember Z

Left Rear Seat Crossmember Xr

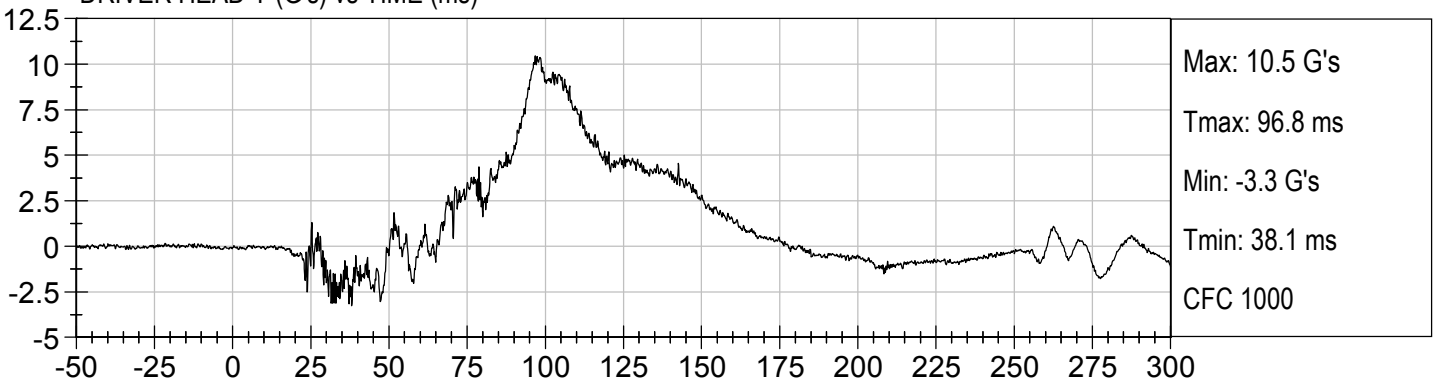
Right Rear Seat Crossmember Xr

Advanced Research Load Cell Barrier – 528 channels

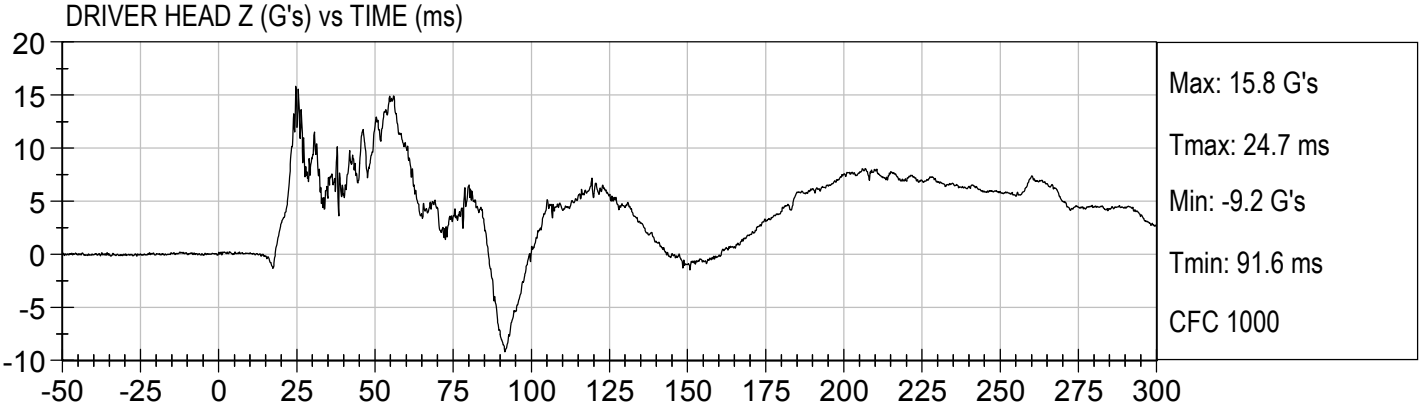
DRIVER HEAD X (G's) vs TIME (ms)



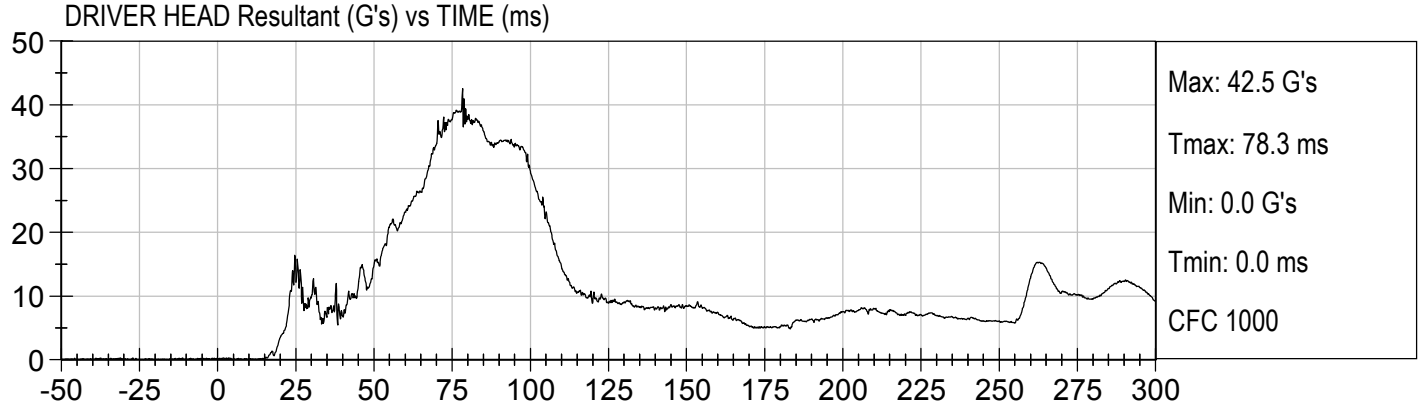
DRIVER HEAD Y (G's) vs TIME (ms)

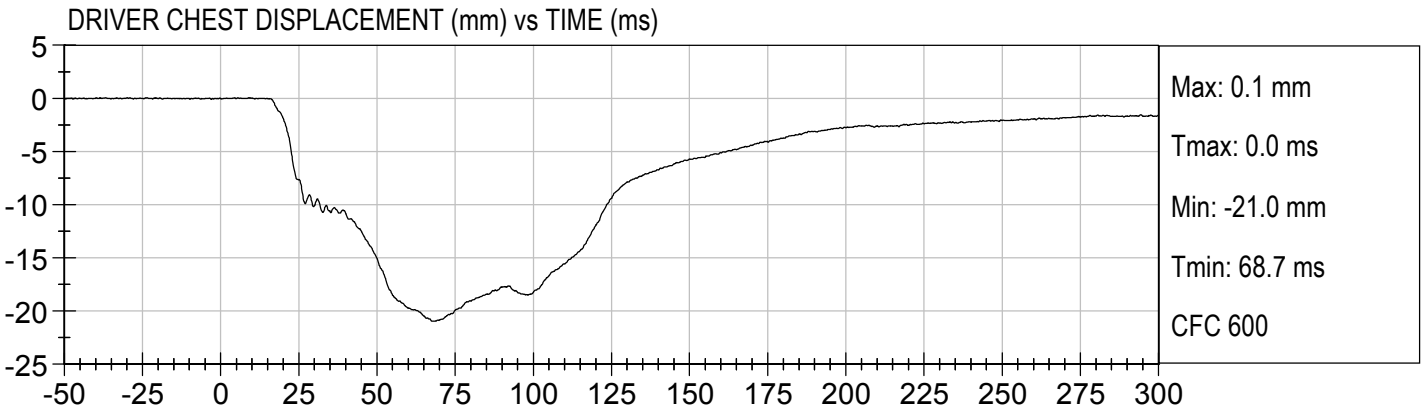


DRIVER HEAD Z (G's) vs TIME (ms)

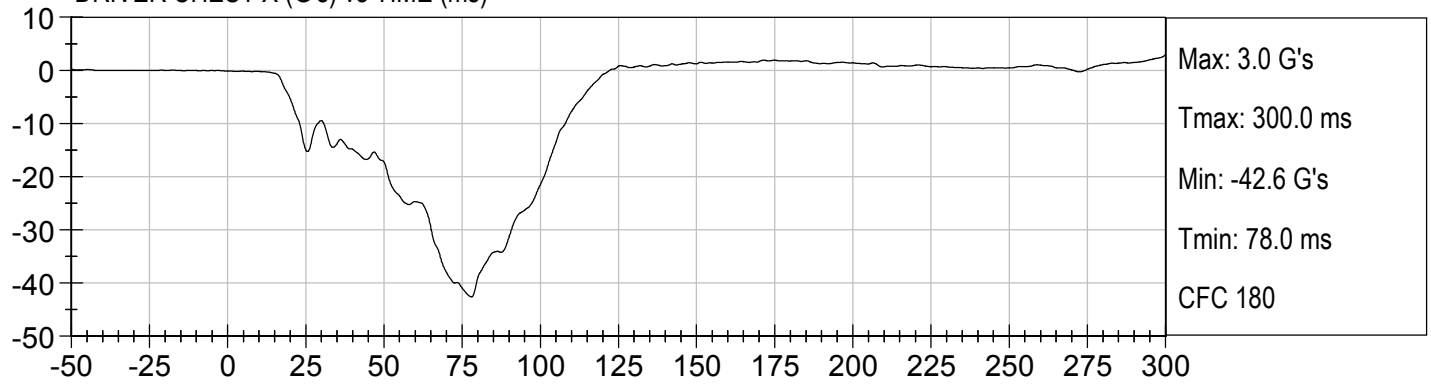


DRIVER HEAD Resultant (G's) vs TIME (ms)

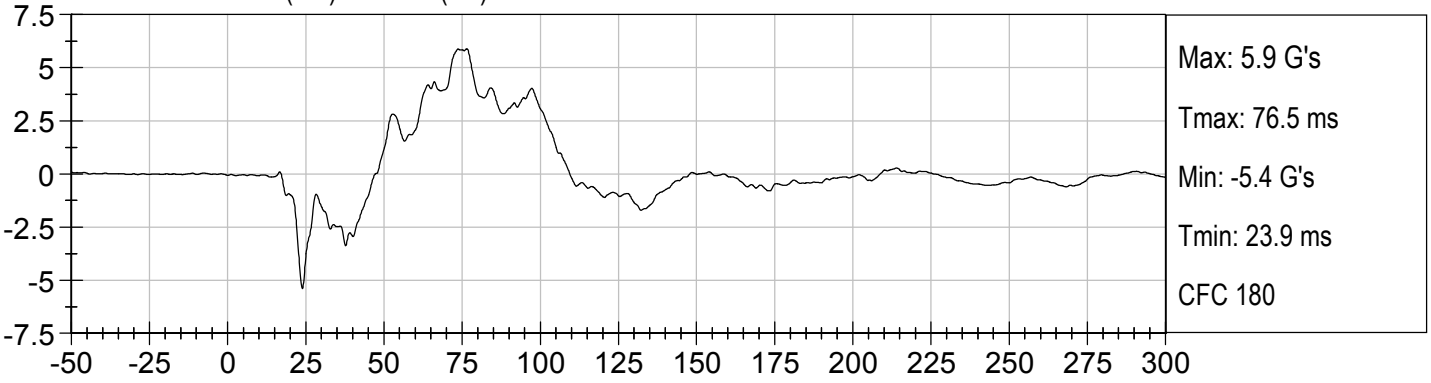



DRIVER CHEST DISPLACEMENT (mm) vs TIME (ms)
5
0
-5
-10
-15
-20
-25
-50
-25
0
25
50
75
100
125
150
175
200
225
250
275
300
Max: 0.1 mm
Tmax: 0.0 ms
Min: -21.0 mm
Tmin: 68.7 ms
CFC 600

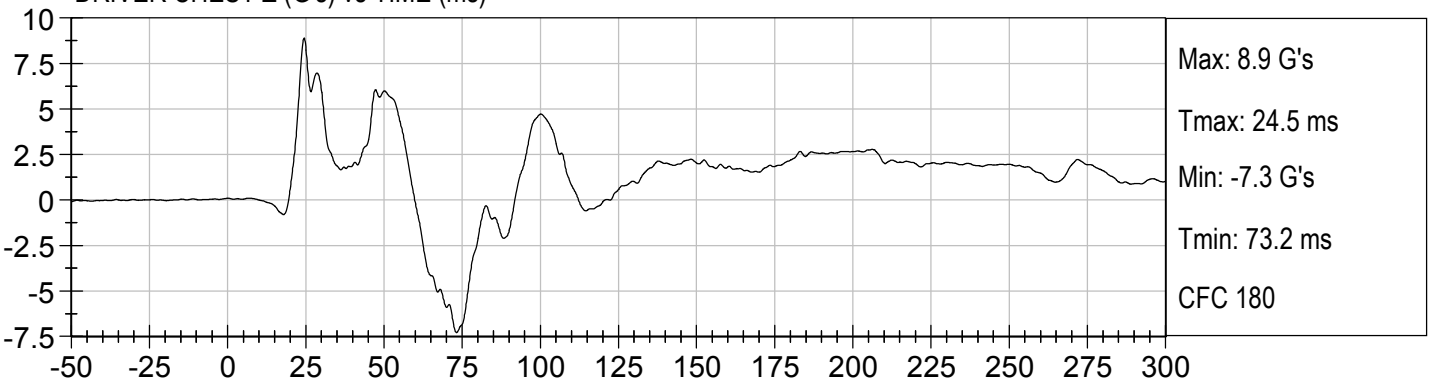
DRIVER CHEST X (G's) vs TIME (ms)



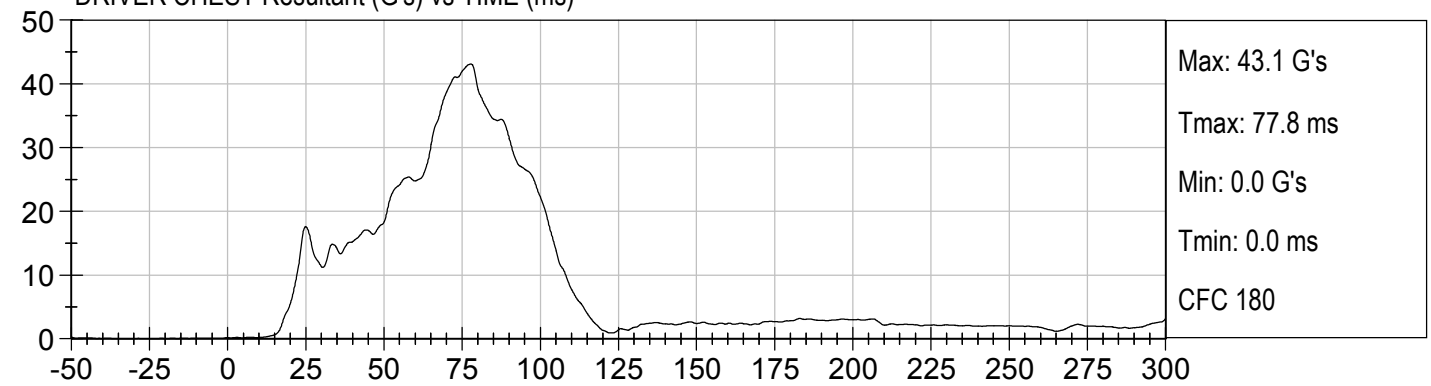
DRIVER CHEST Y (G's) vs TIME (ms)

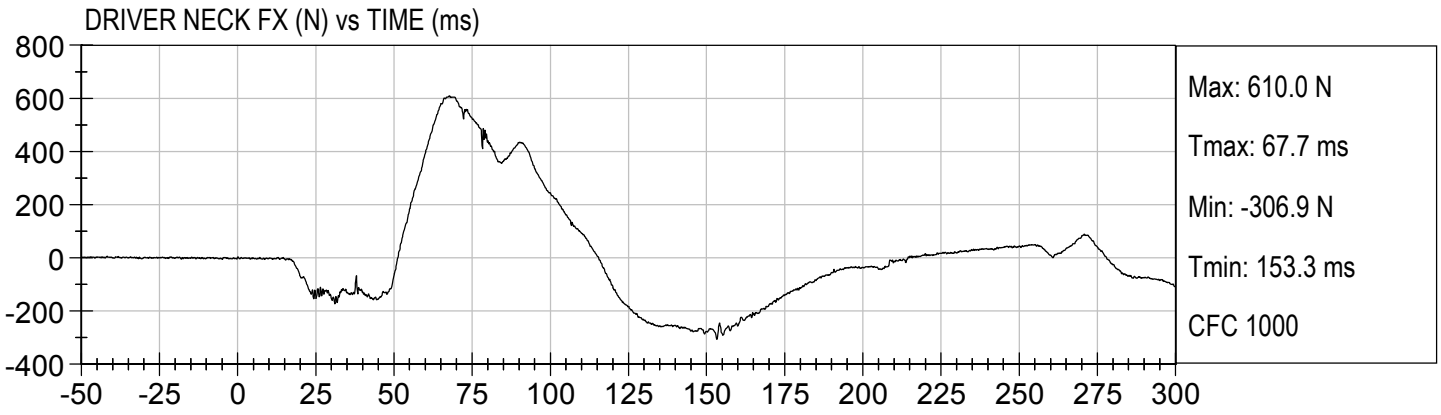


DRIVER CHEST Z (G's) vs TIME (ms)

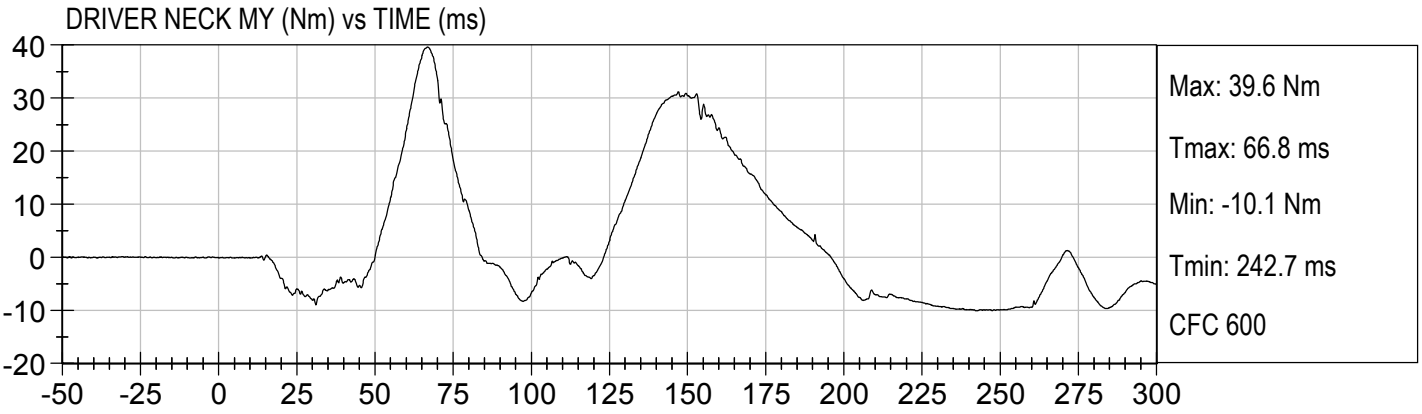


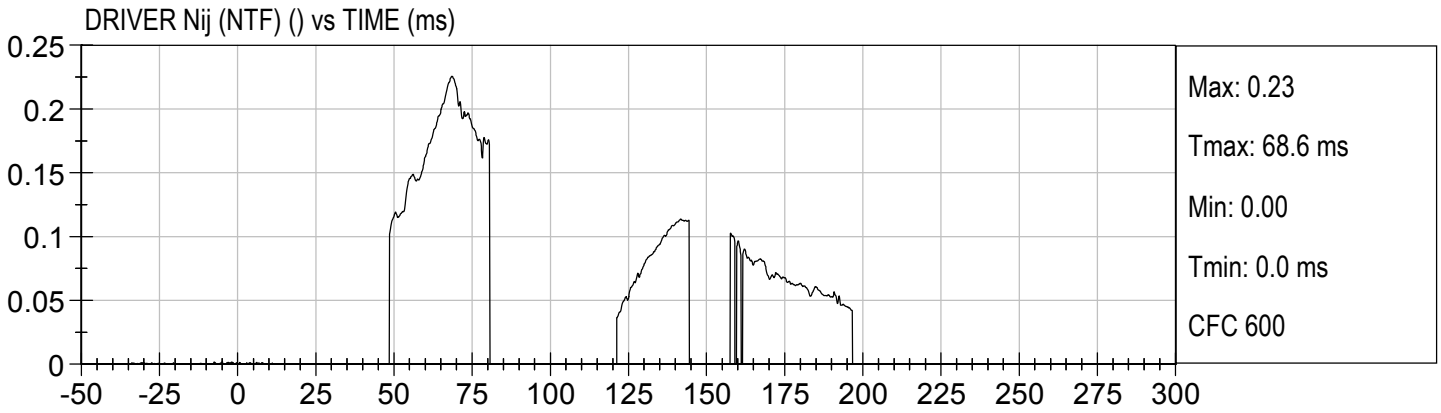
DRIVER CHEST Resultant (G's) vs TIME (ms)

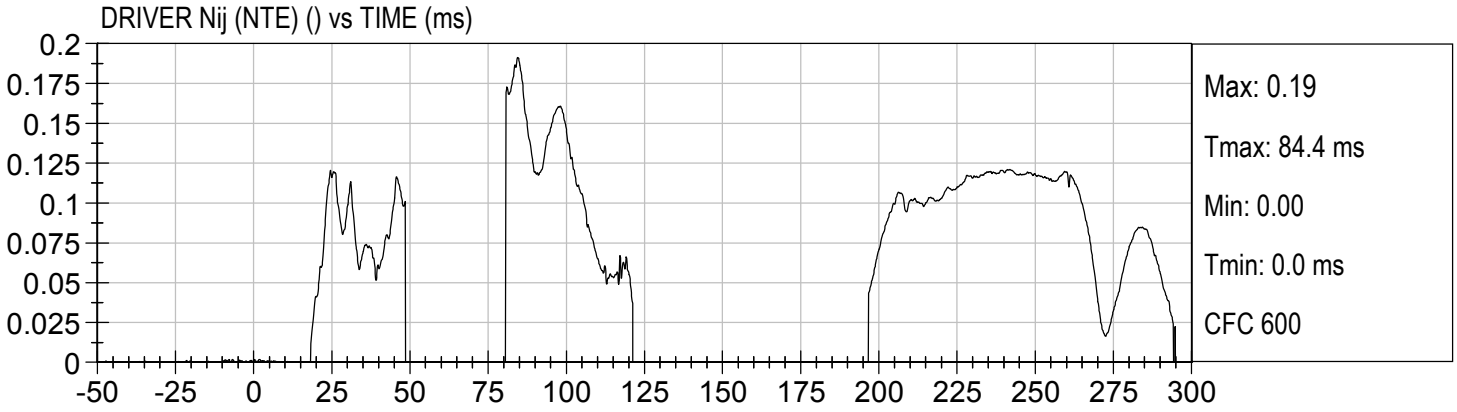


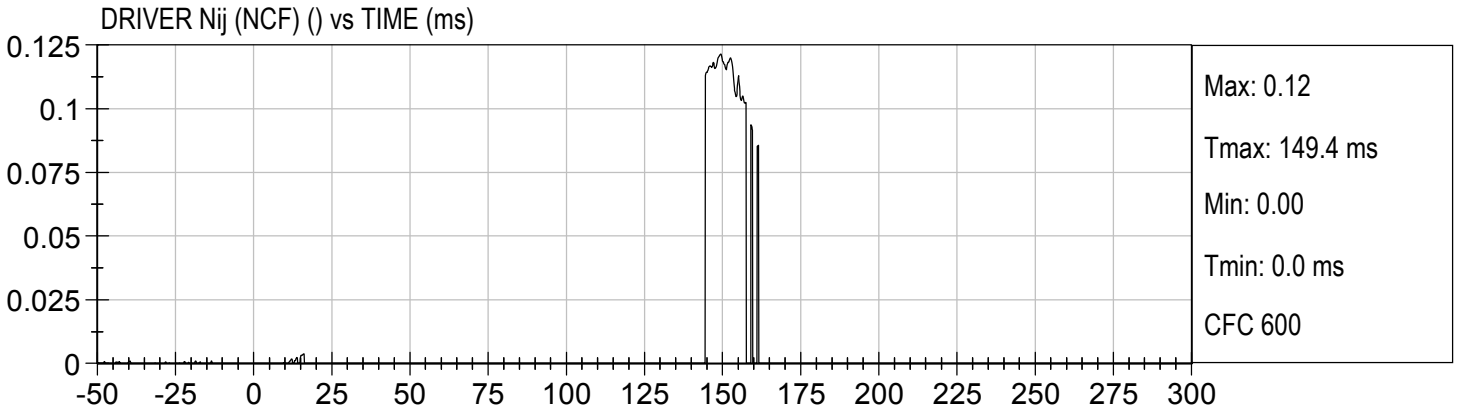

DRIVER NECK FX (N) vs TIME (ms)
800
600
400
200
0
-200
-400
-50 -25 0 25 50 75 100 125 150 175 200 225 250 275 300
Max: 610.0 N
Tmax: 67.7 ms
Min: -306.9 N
Tmin: 153.3 ms
CFC 1000

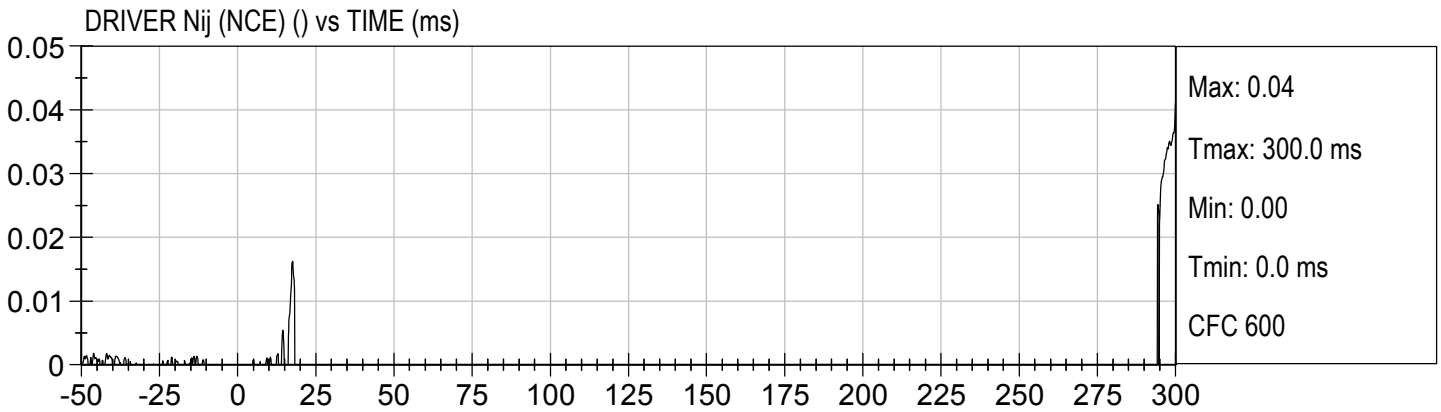

DRIVER NECK FZ (N) vs TIME (ms)
1250
1000
750
500
250
0
-250
-50 -25 0 25 50 75 100 125 150 175 200 225 250 275 300
Max: 1181.9 N
Tmax: 80.3 ms
Min: -105.8 N
Tmin: 300.0 ms
CFC 1000


DRIVER NECK MY (Nm) vs TIME (ms)
40
30
20
10
0
-10
-20
-50 -25 0 25 50 75 100 125 150 175 200 225 250 275 300
Max: 39.6 Nm
Tmax: 66.8 ms
Min: -10.1 Nm
Tmin: 242.7 ms
CFC 600

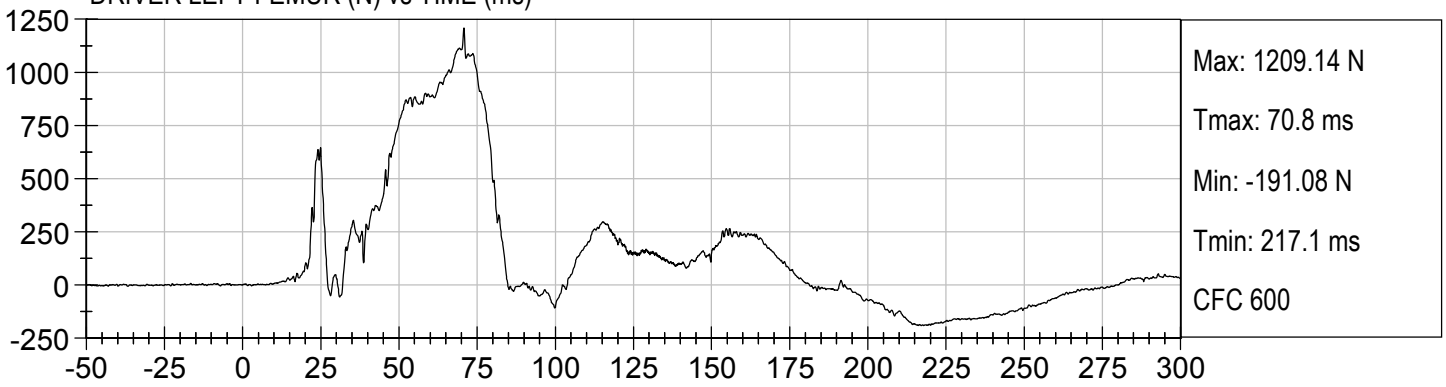

DRIVER Nij (NTF) () vs TIME (ms)
0.25
0.2
0.15
0.1
0.05
0
-50 -25 0 25 50 75 100 125 150 175 200 225 250 275 300
Max: 0.23
Tmax: 68.6 ms
Min: 0.00
Tmin: 0.0 ms
CFC 600


DRIVER Nij (NTE) () vs TIME (ms)
0.2
0.175
0.15
0.125
0.1
0.075
0.05
0.025
0
-50 -25 0 25 50 75 100 125 150 175 200 225 250 275 300
Max: 0.19
Tmax: 84.4 ms
Min: 0.00
Tmin: 0.0 ms
CFC 600

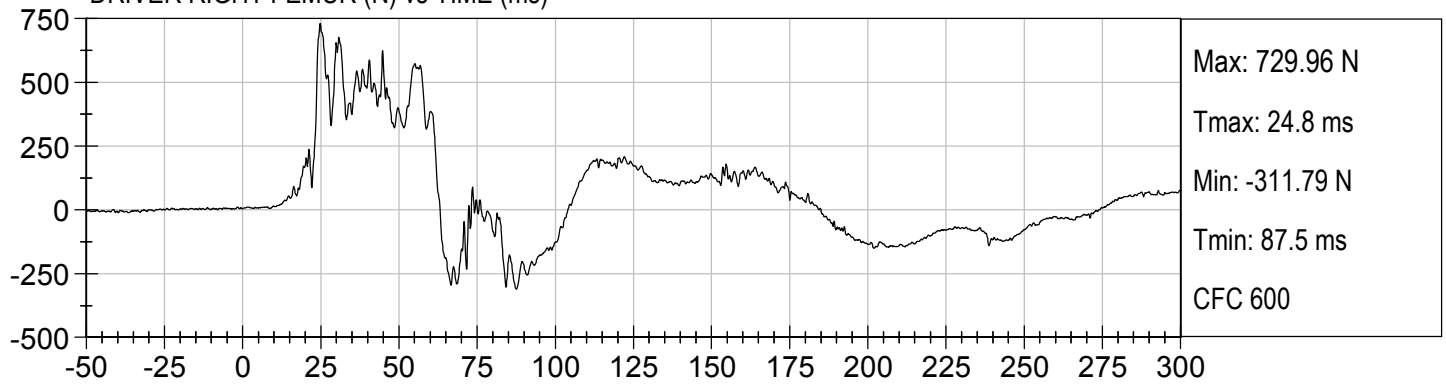

DRIVER Nij (NCF) () vs TIME (ms)
0.125
0.1
0.075
0.05
0.025
0
-50 -25 0 25 50 75 100 125 150 175 200 225 250 275 300
Max: 0.12
Tmax: 149.4 ms
Min: 0.00
Tmin: 0.0 ms
CFC 600


DRIVER Nij (NCE) () vs TIME (ms)
0.05
0.04
0.03
0.02
0.01
0
-50 -25 0 25 50 75 100 125 150 175 200 225 250 275 300
Max: 0.04
Tmax: 300.0 ms
Min: 0.00
Tmin: 0.0 ms
CFC 600

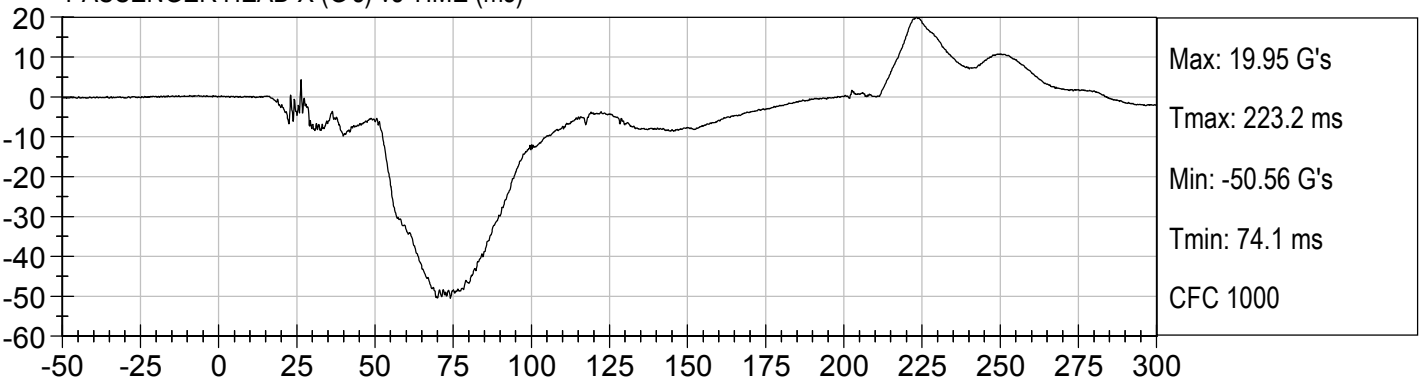
DRIVER LEFT FEMUR (N) vs TIME (ms)



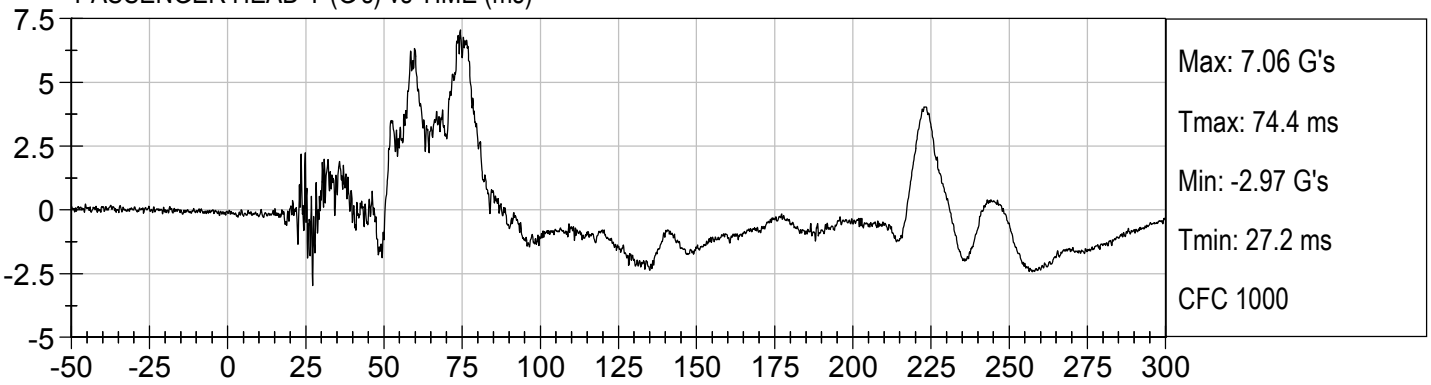
DRIVER RIGHT FEMUR (N) vs TIME (ms)



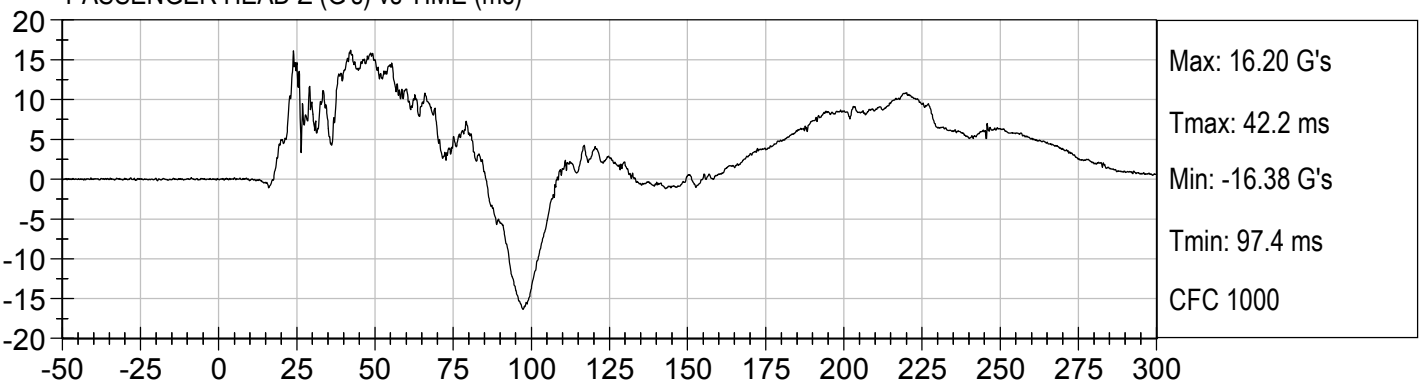
PASSENGER HEAD X (G's) vs TIME (ms)



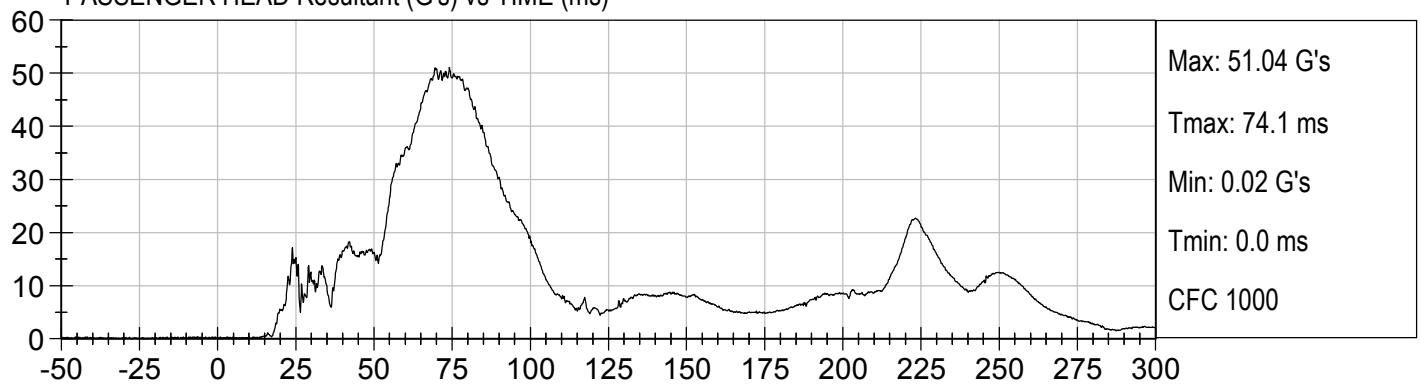
PASSENGER HEAD Y (G's) vs TIME (ms)

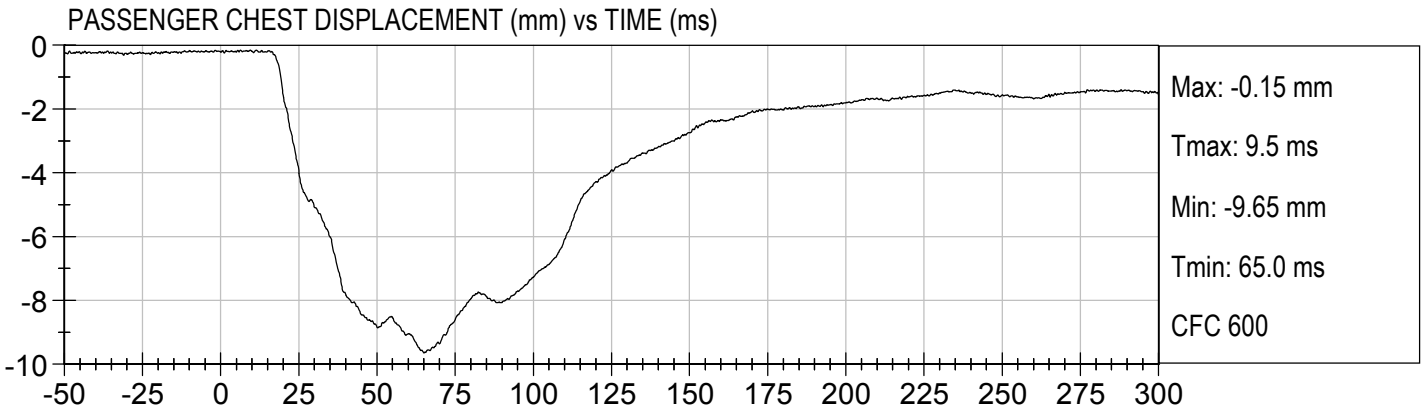


PASSENGER HEAD Z (G's) vs TIME (ms)

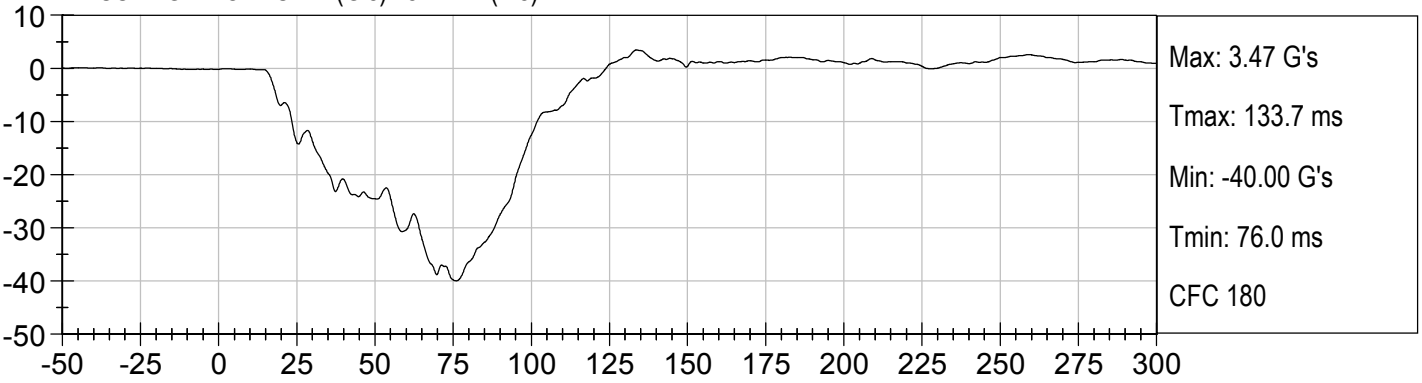


PASSENGER HEAD Resultant (G's) vs TIME (ms)

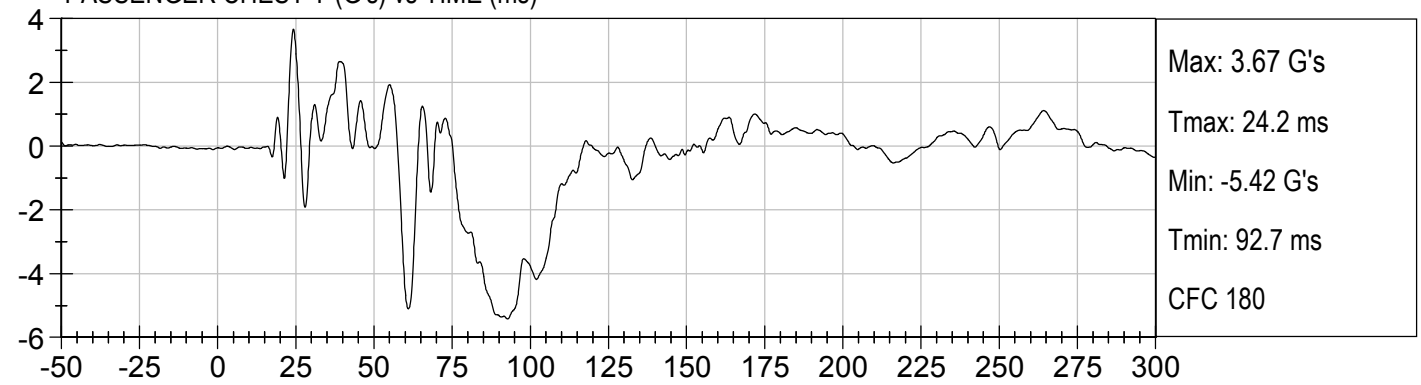



PASSENGER CHEST DISPLACEMENT (mm) vs TIME (ms)
0
-2
-4
-6
-8
-10
-50
-25
0
25
50
75
100
125
150
175
200
225
250
275
300
Max: -0.15 mm
Tmax: 9.5 ms
Min: -9.65 mm
Tmin: 65.0 ms
CFC 600

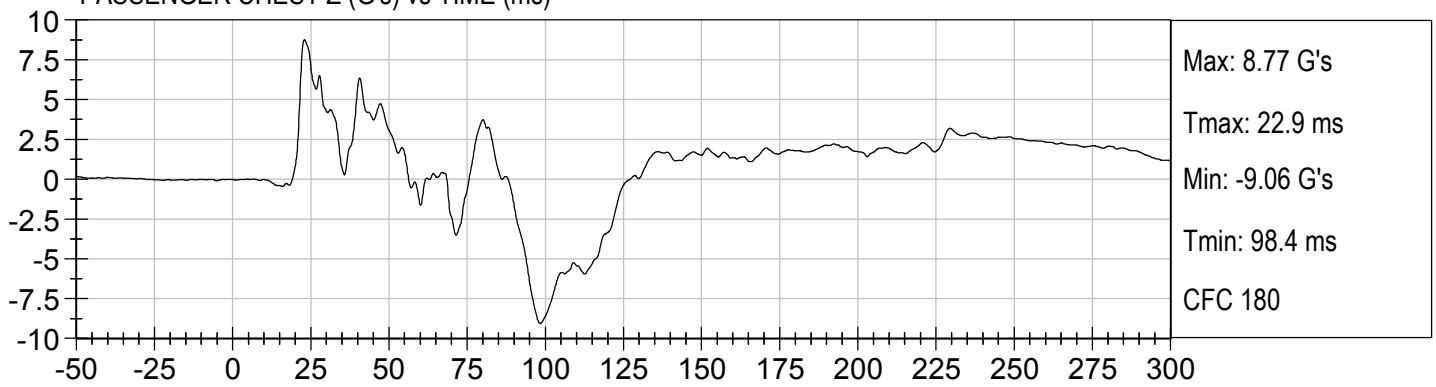
PASSENGER CHEST X (G's) vs TIME (ms)



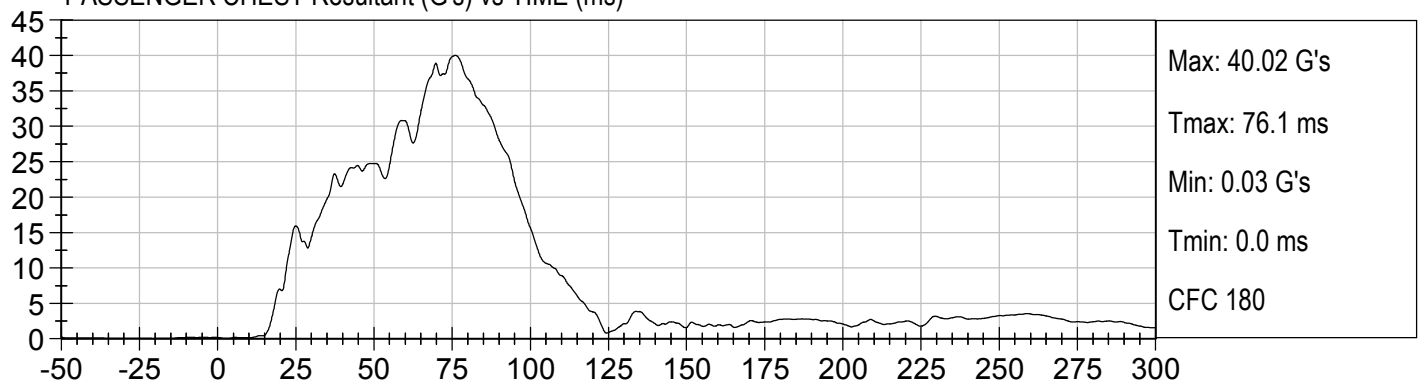
PASSENGER CHEST Y (G's) vs TIME (ms)



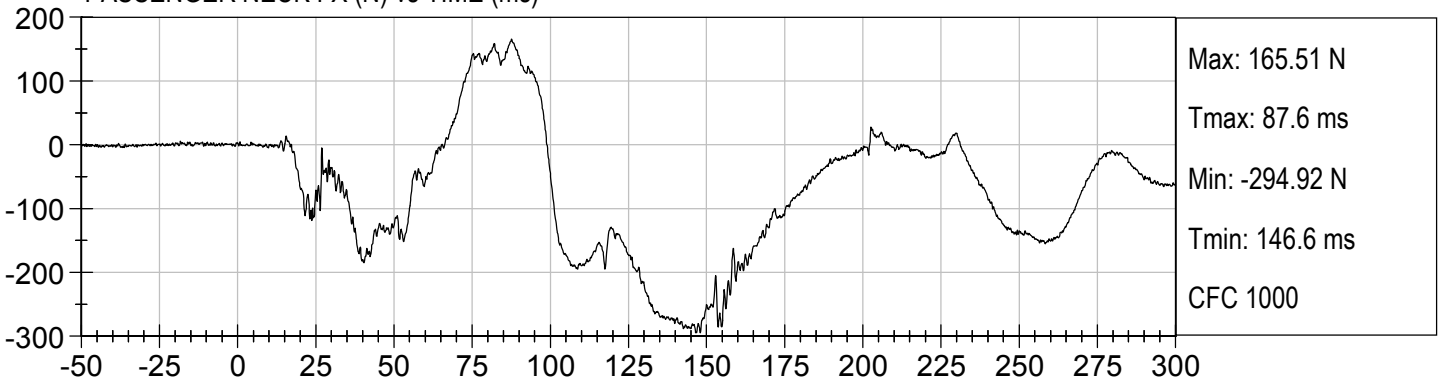
PASSENGER CHEST Z (G's) vs TIME (ms)



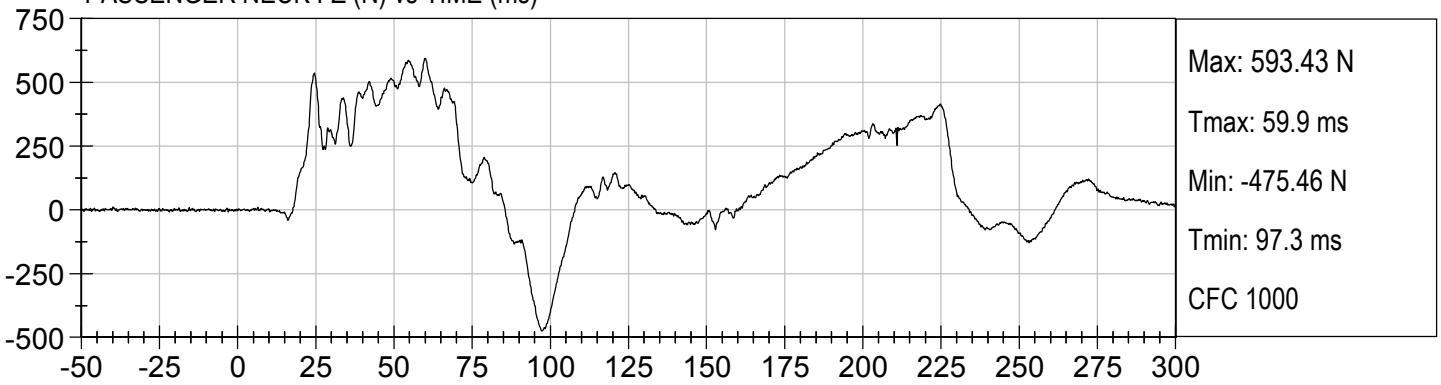
PASSENGER CHEST Resultant (G's) vs TIME (ms)



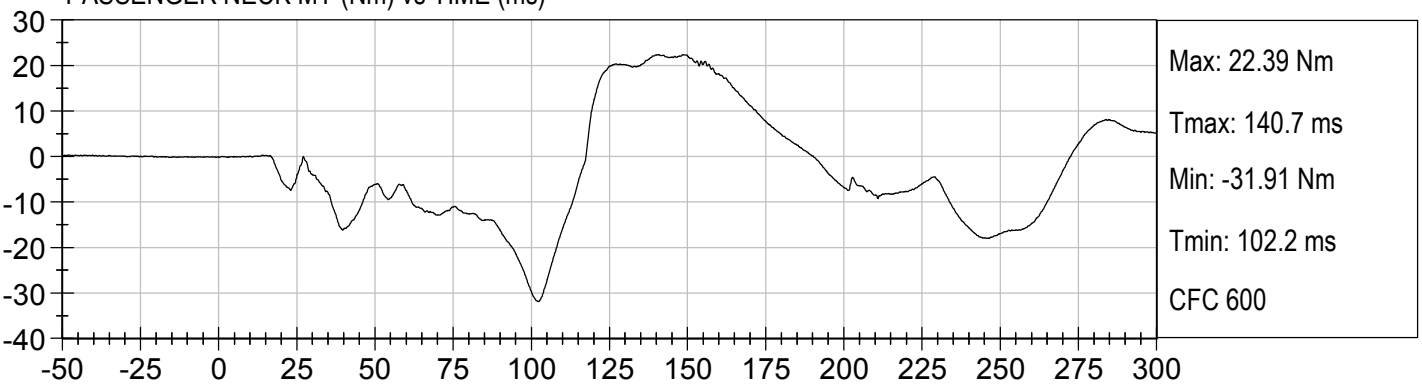
PASSENGER NECK FX (N) vs TIME (ms)



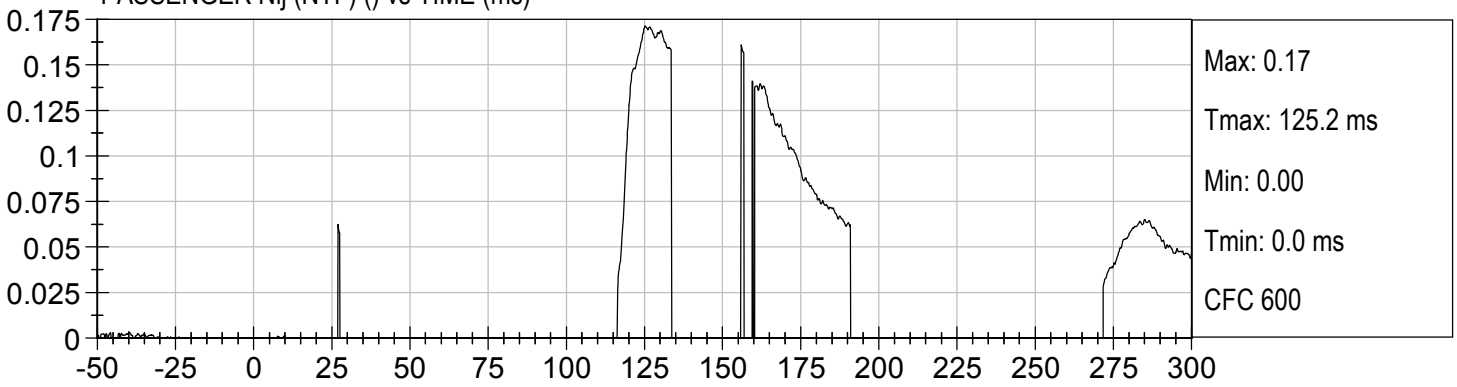
PASSENGER NECK FZ (N) vs TIME (ms)



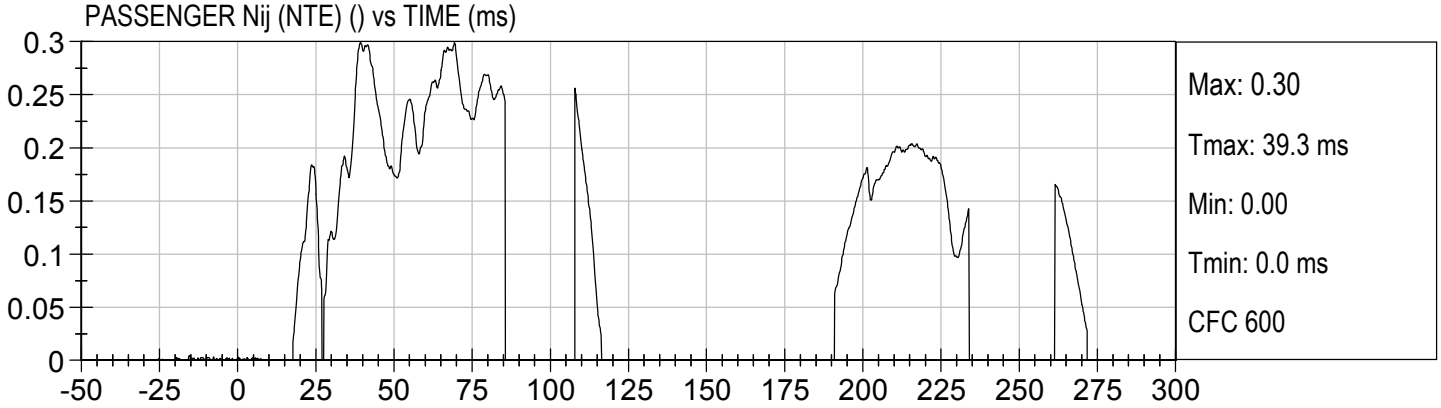
PASSENGER NECK MY (Nm) vs TIME (ms)



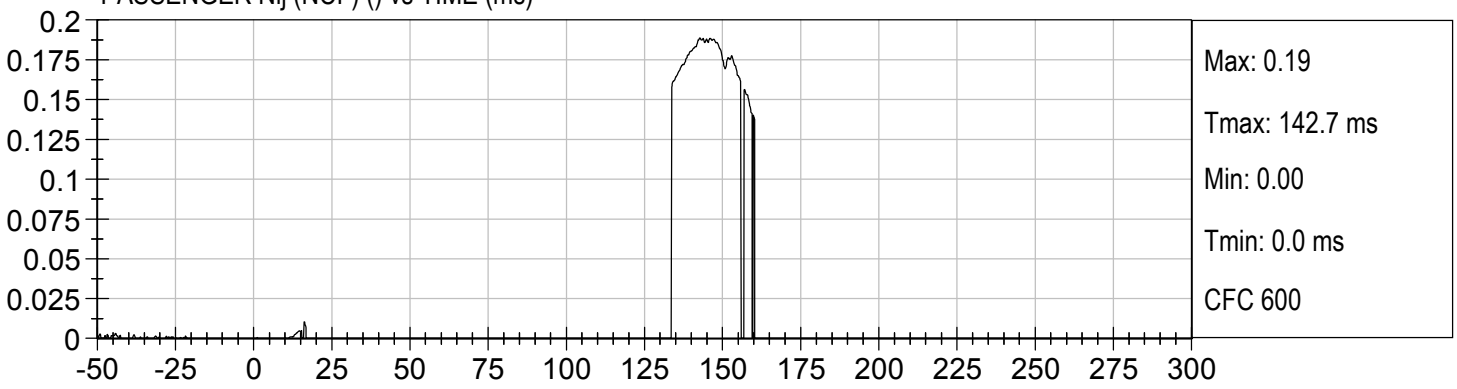
PASSENGER Nij (NTF) () vs TIME (ms)



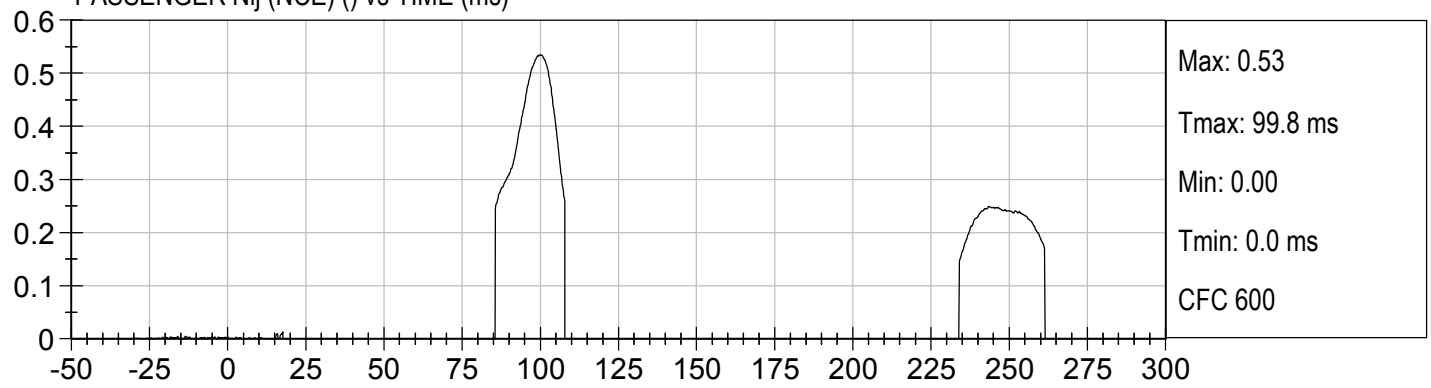
PASSENGER Nij (NTE) () vs TIME (ms)



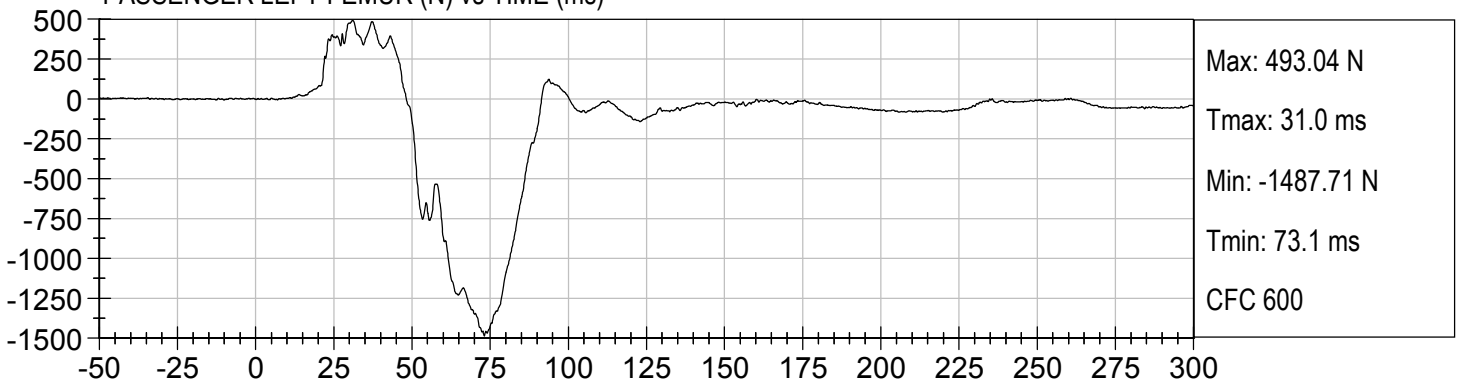
PASSENGER Nij (NCF) () vs TIME (ms)



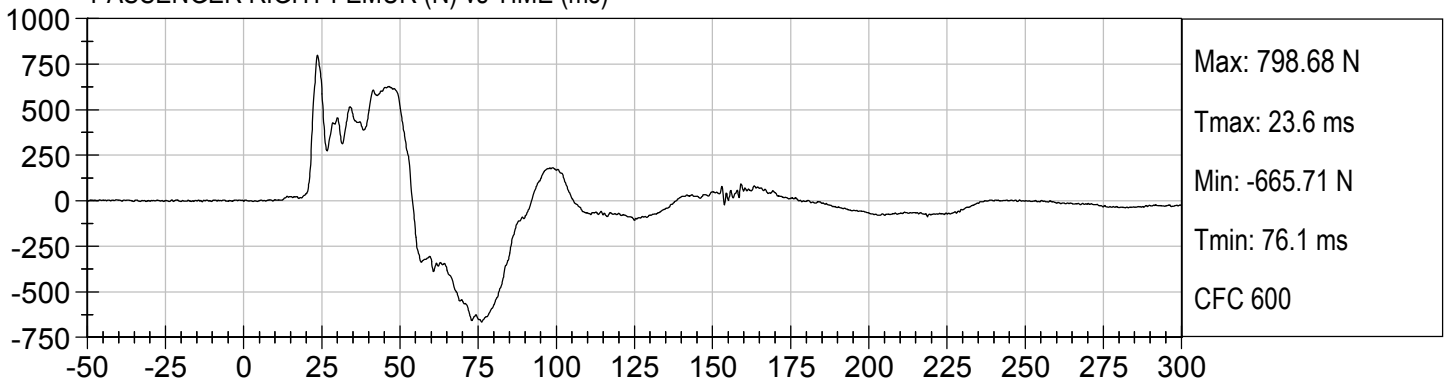
PASSENGER Nij (NCE) () vs TIME (ms)



PASSENGER LEFT FEMUR (N) vs TIME (ms)



PASSENGER RIGHT FEMUR (N) vs TIME (ms)



APPENDIX C
DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

Hybrid III, 50th External Measurements
SN: 351

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

HYBRID III, SUBPART E EXTERIOR DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS		ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 16.9-17.1 in. above seat surface	8.4-9.0	8.5
P	FOOT LENGTH	Tip of toe to rear of heel	9.9-10.5	10.3
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	16.3-17.2	16.5
W	FOOT BREADTH	The widest part of the foot	3.6-4.2	4.0
Y	CHEST CIRCUMFERENCE (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:** D15691

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	22	Pass
Peak Resultant Acceleration	G's	225 to 275	270	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-4.0	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

David Schoedel
Laboratory Technician

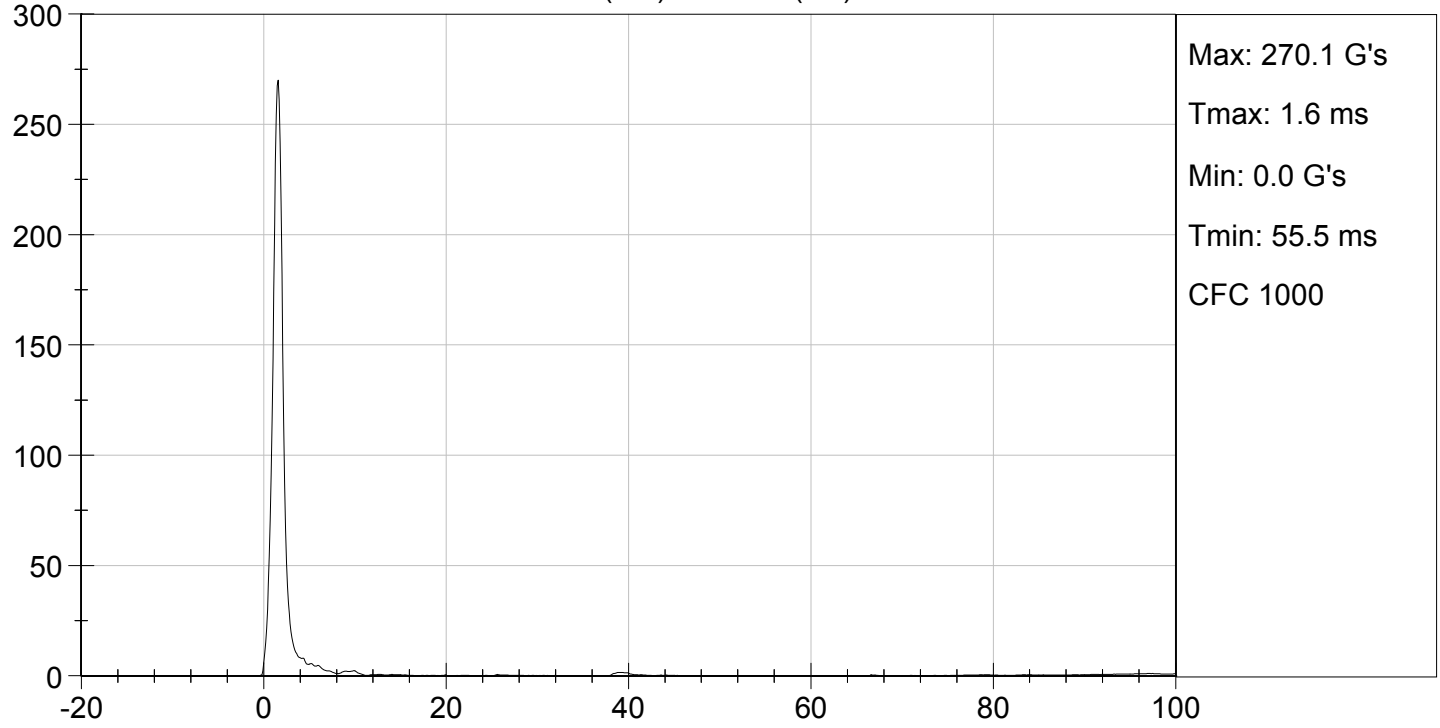
03/17/2015
Test Date

Jessica Gall
Approved By

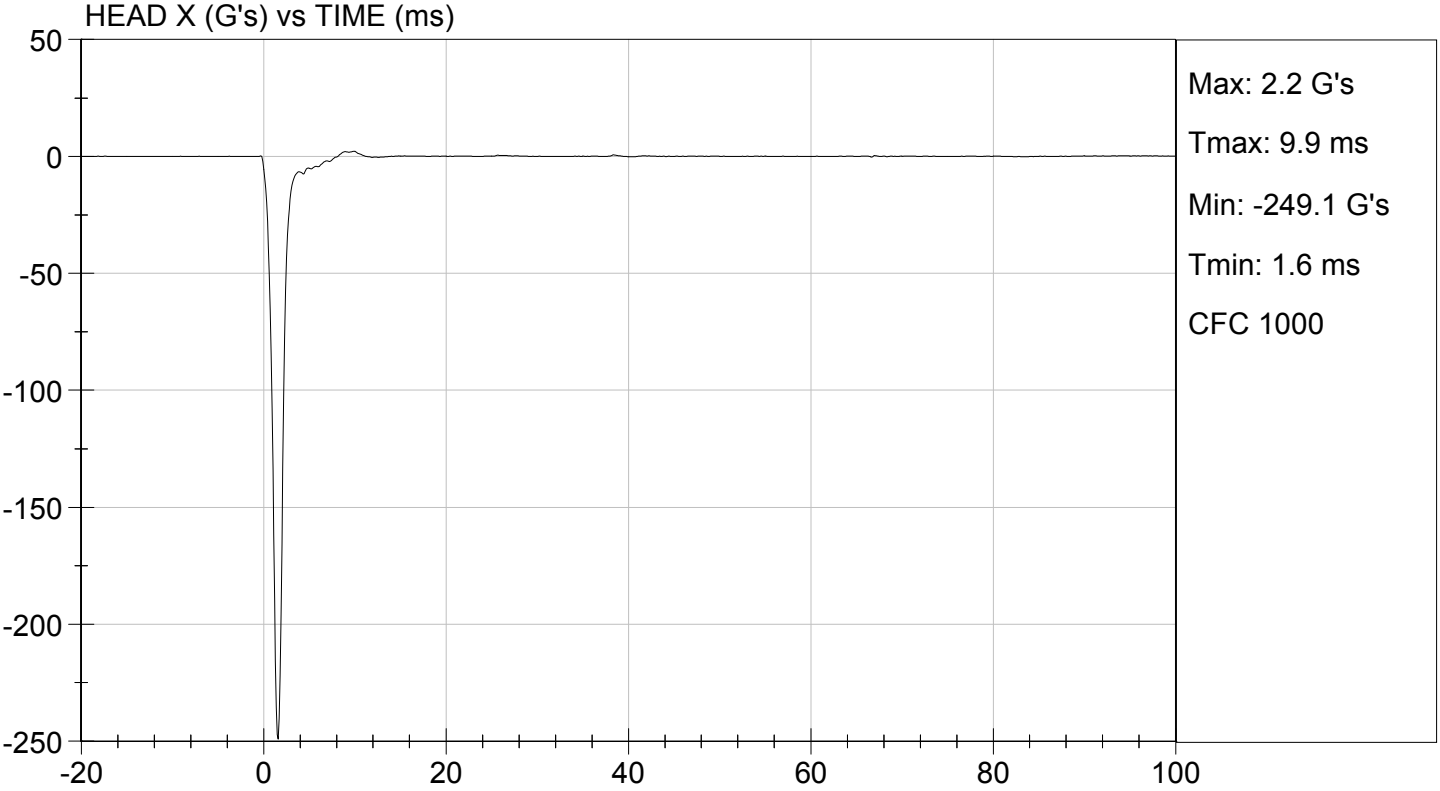
TEST DESC: HEAD DROP

TEST DATE: 03/17/2015
TEST #: D15691

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

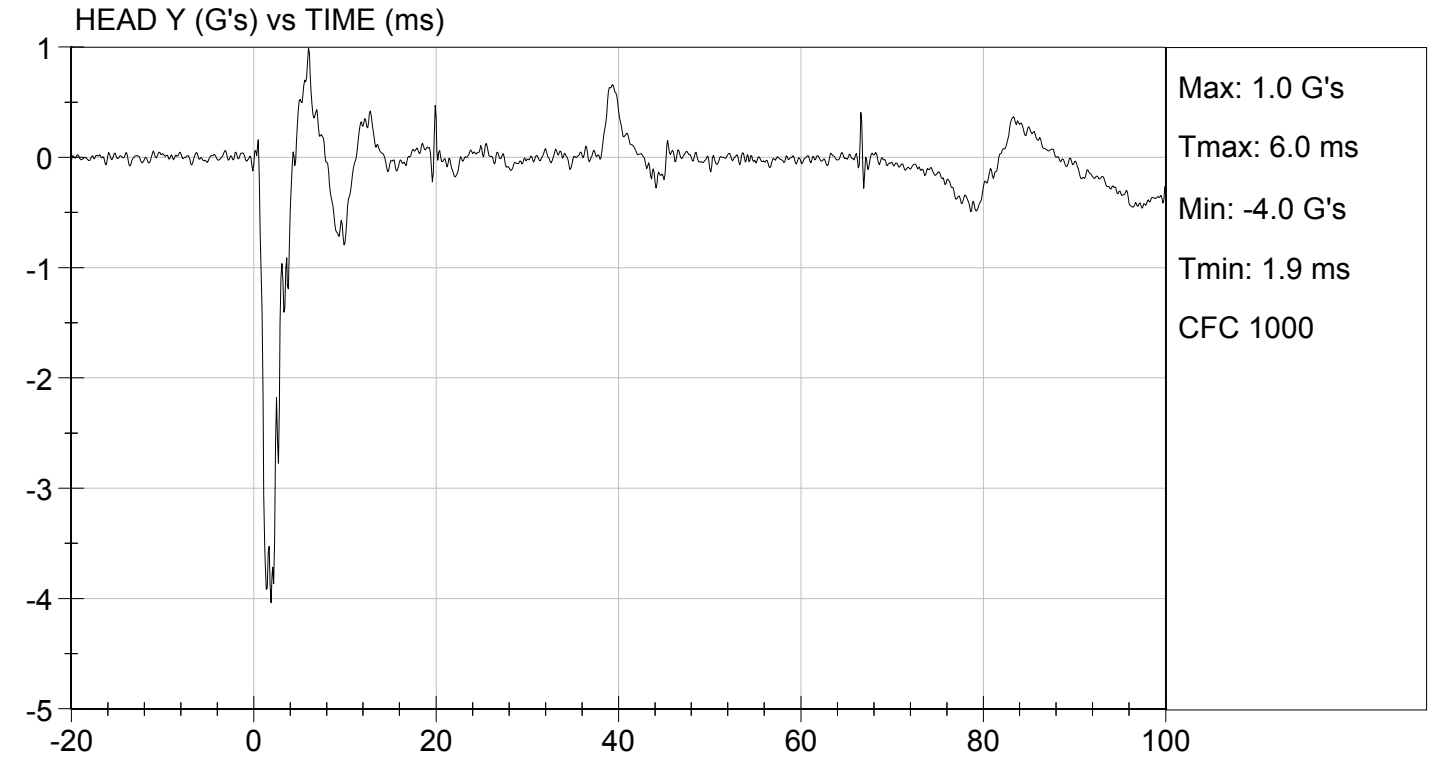


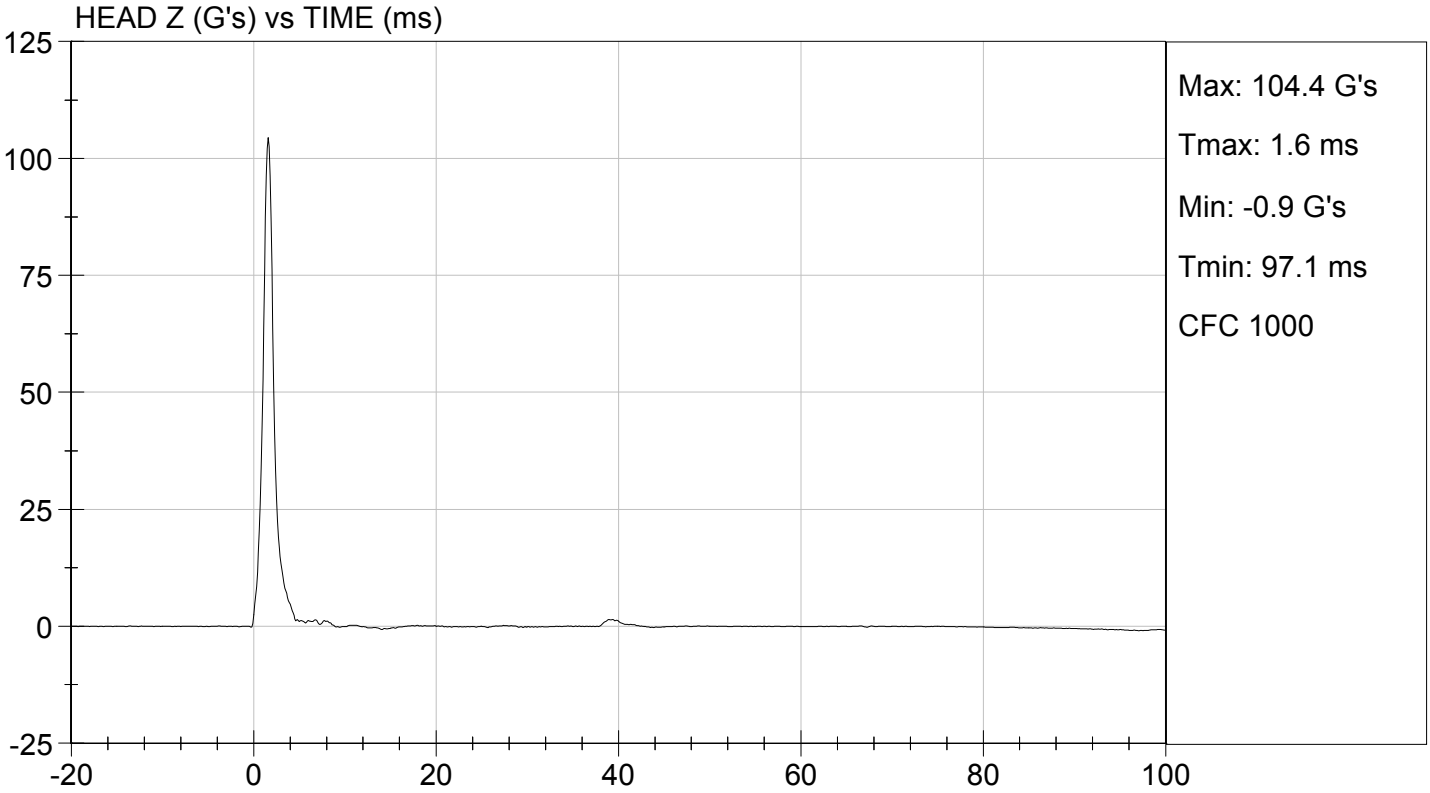
HEAD X (G's) vs TIME (ms)



TEST DESC: HEAD DROP

TEST DATE: 03/17/2015
TEST #: D15691





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D15692

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity		%	10 to 70	22	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.87	Pass
	20 ms	G's	17.60 to 22.60	19.27	Pass
	30 ms	G's	12.50 to 18.50	13.94	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	38.6	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	74.5	Pass
	Time	ms	57.0 to 64.0	60.7	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	119.7	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	88.4	Pass
	Time	ms	47.0 to 58.0	52.4	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	103.5	Pass
			Overall Test Results		Pass

David Schoedel

Laboratory Technician

03/17/2015

Test Date

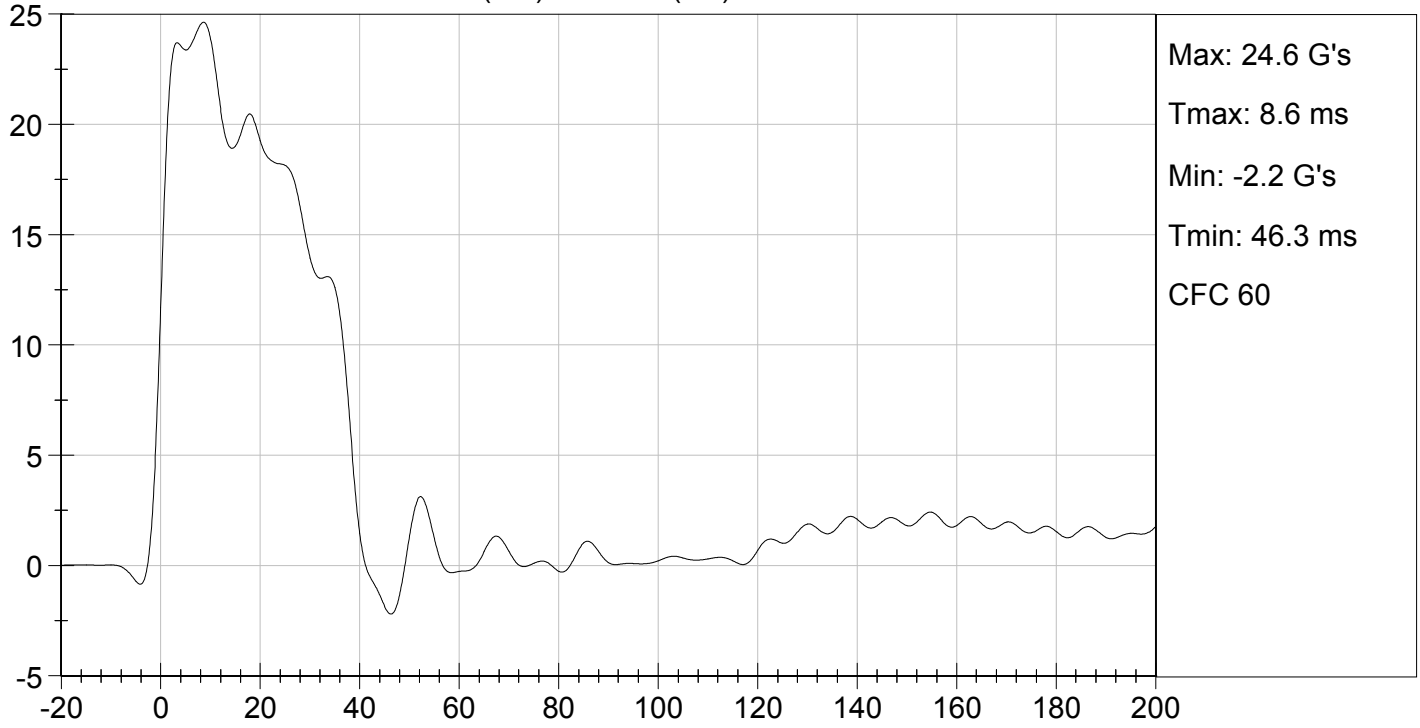
Jessica Hall

Approved By

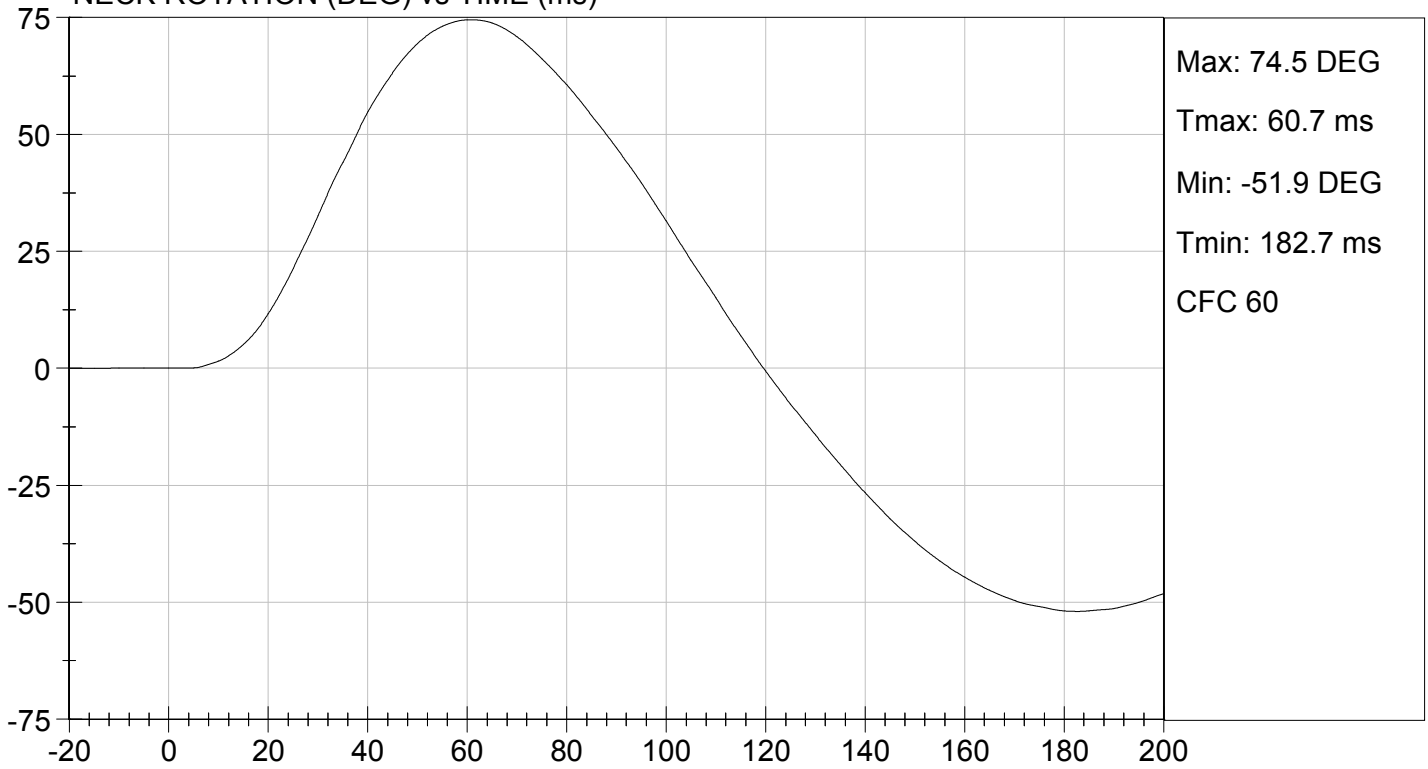
TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

TEST DATE: 03/17/2015
TEST #: D15692

PENDULUM DECELERATION (G's) vs TIME (ms)



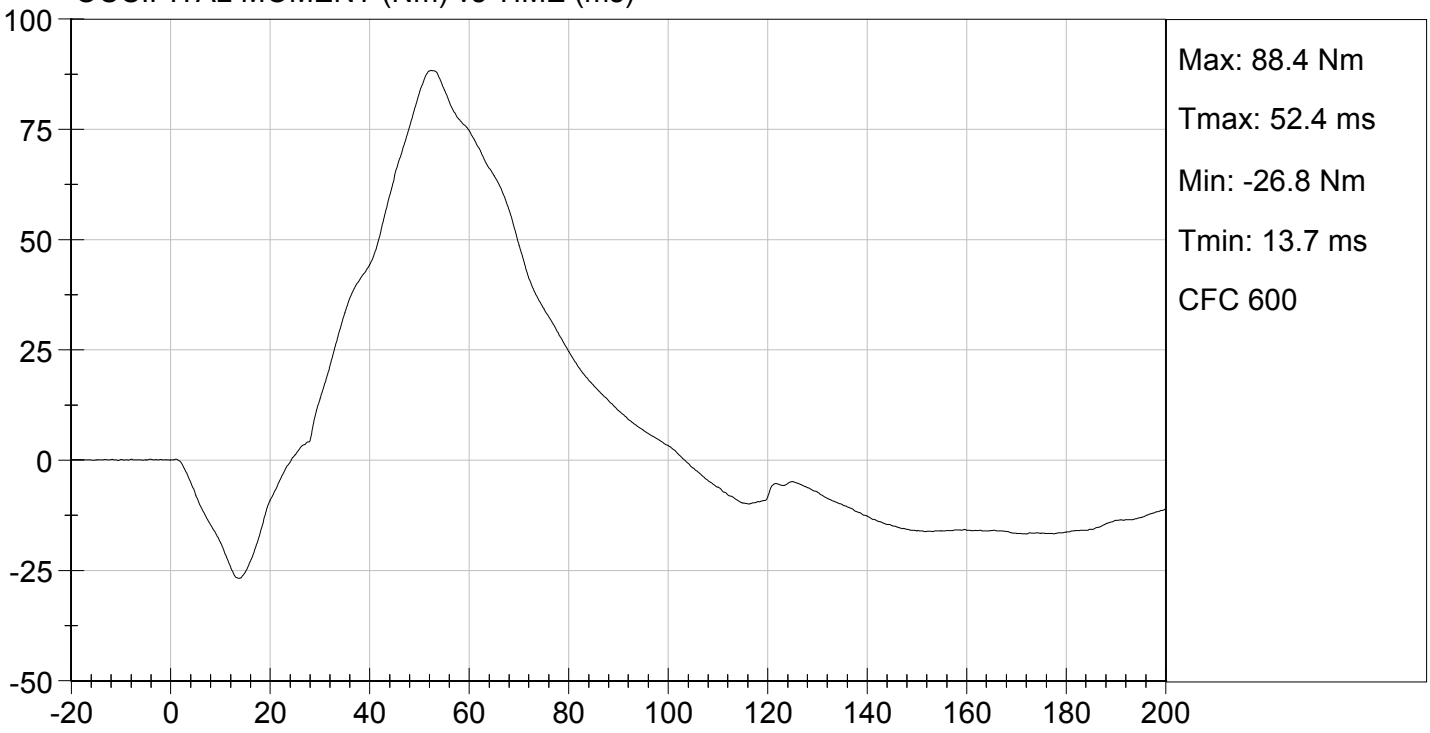
NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 03/17/2015
TEST #: D15692

OCCIPITAL MOMENT (Nm) vs TIME (ms)



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D15693

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity		%	10 to 70	22	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	20.91	Pass
	20 ms	G's	14.00 to 19.00	15.10	Pass
	30 ms	G's	11.00 to 16.00	13.70	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	13.7	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	45.6	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	100.0	Pass
	Time	ms	72.0 to 82.0	82.0	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	167.2	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-56.1	Pass
	Time	ms	65.0 to 79.0	77.3	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	145.2	Pass
			Overall Test Results		Pass

David Schoedel

Laboratory Technician

03/17/2015

Test Date

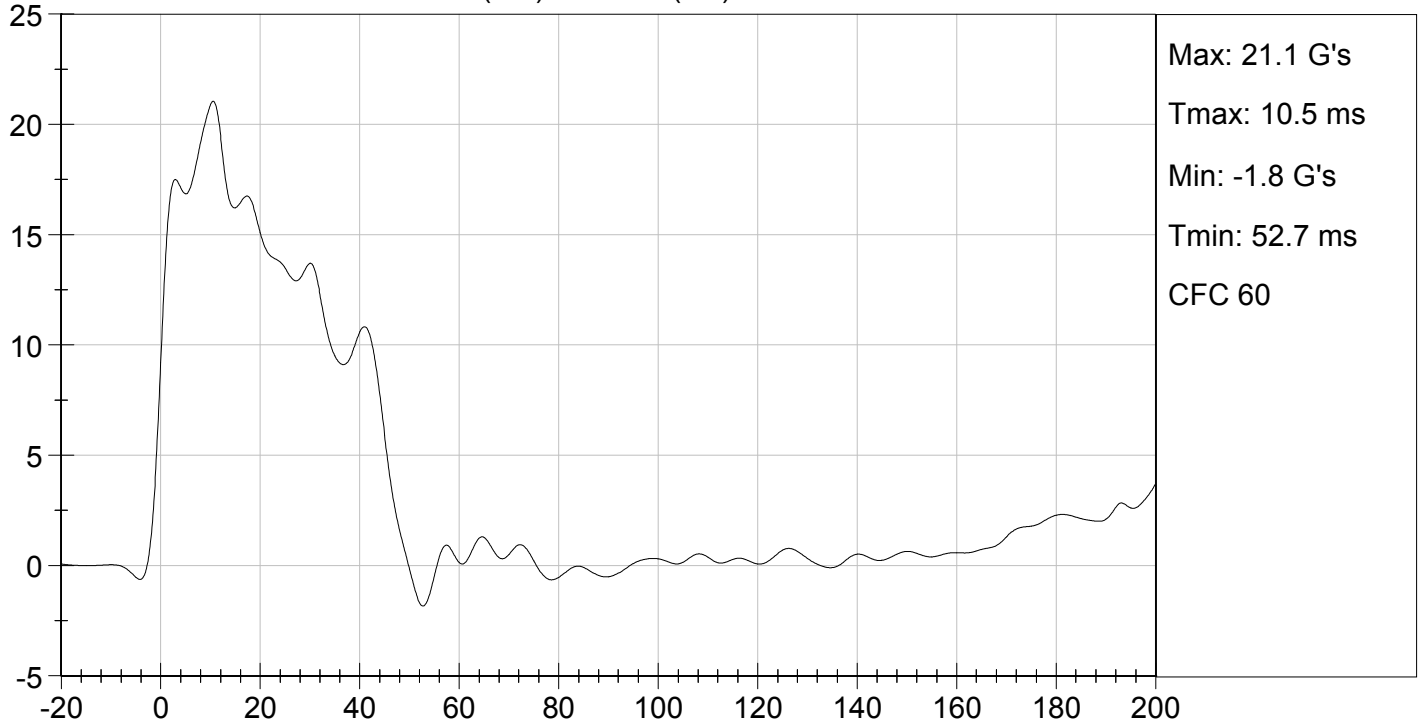
Jessica Hall

Approved By

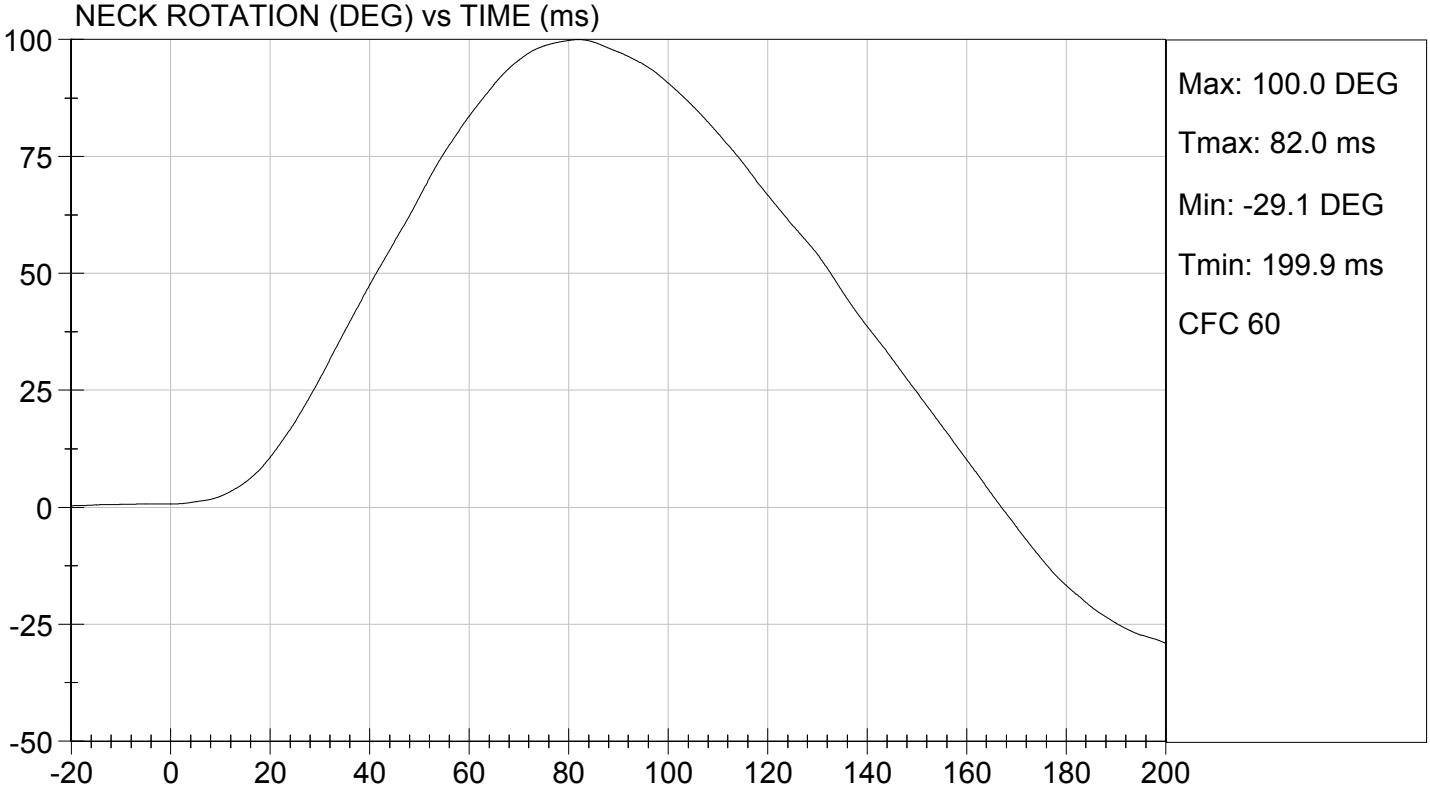
TEST DESC: NECK EXTENSION
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 03/17/2015
TEST #: D15693

PENDULUM DECELERATION (G's) vs TIME (ms)

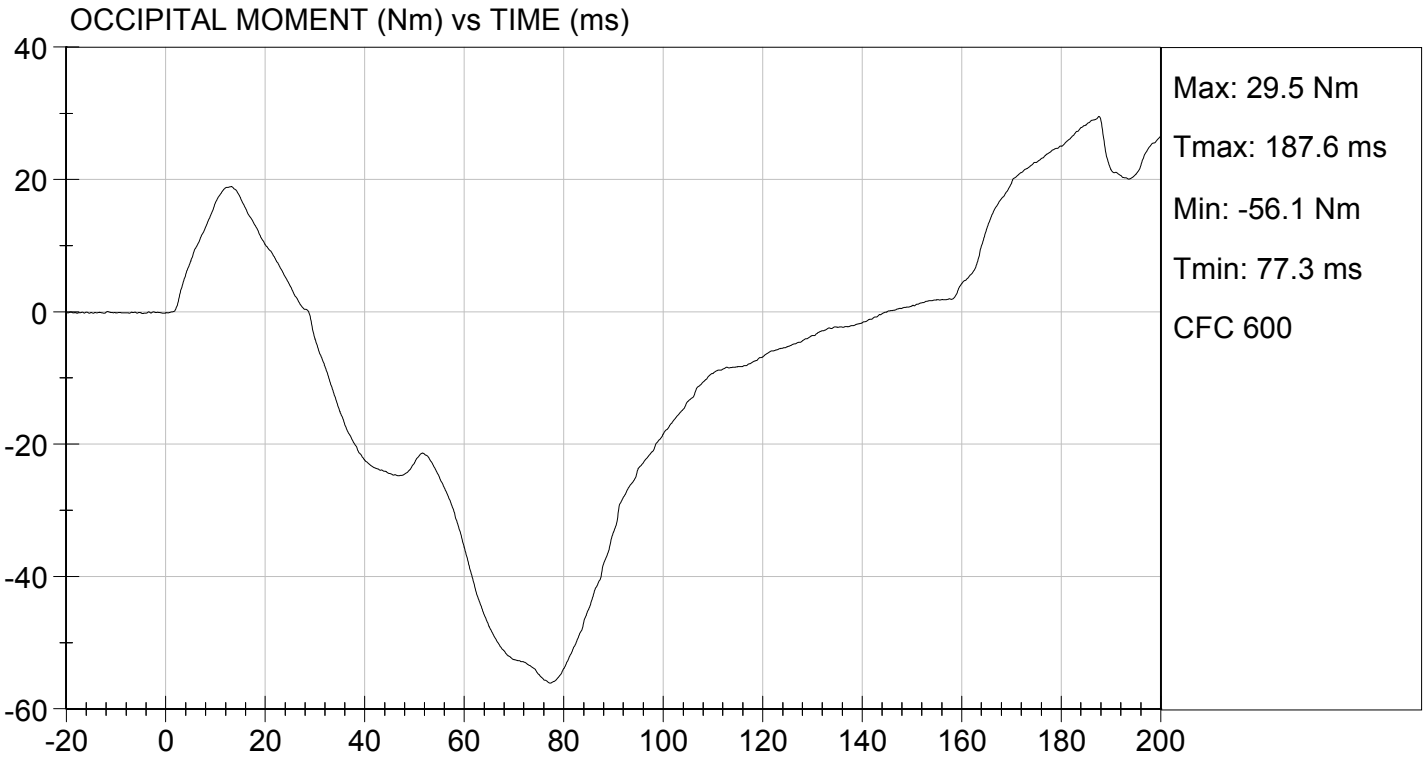


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 03/17/2015
TEST #: D15693



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D15694

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Probe Velocity	m/s	6.58 to 6.82	6.60	Pass
Peak Probe Force	N	5159 to 5893	5,282	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.76	Pass
Internal Hysteresis	%	69 to 85	69	Pass
		Overall Test Results		Pass

David Schoedel
Laboratory Technician

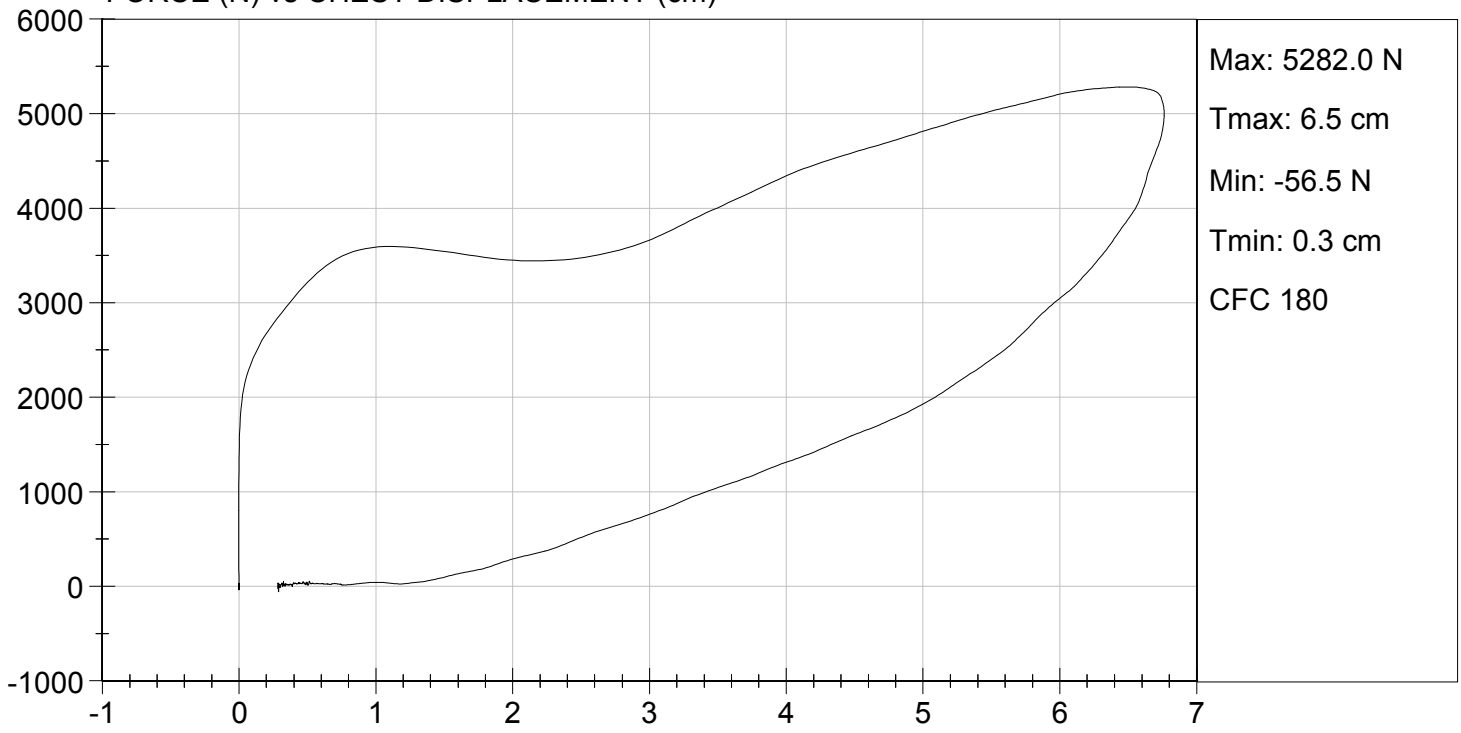
03/17/2015
Test Date

Jessica Hall
Approved By

TEST DESC: THORAX IMPACT
VELOCITY: 21.64 ft/s, 6.60 m/s

TEST DATE: 03/17/2015
TEST #: D15694

FORCE (N) vs CHEST DISPLACEMENT (cm)



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D15695

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	22	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	N	4715 to 5782	5,365	Pass
		Overall Test Results		Pass

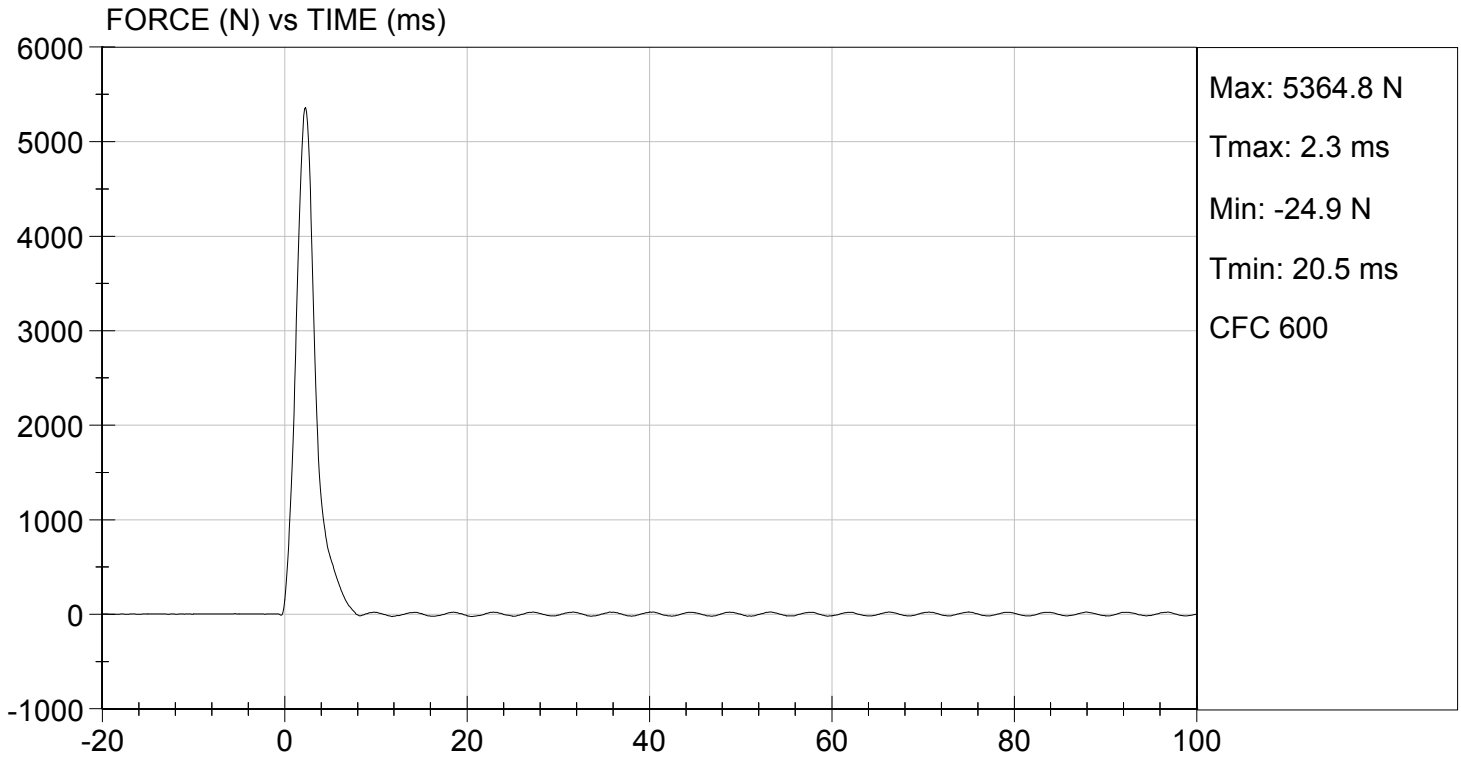
David Schoedel
Laboratory Technician

03/17/2015
Test Date

Jessica Gall
Approved By

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

TEST DATE: 03/17/2015
TEST #: D15695



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D15696

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	22	Pass
Probe Velocity	m/s	2.07 to 2.13	2.13	Pass
Peak Probe Force	N	4715 to 5782	4,759	Pass
		Overall Test Results		Pass

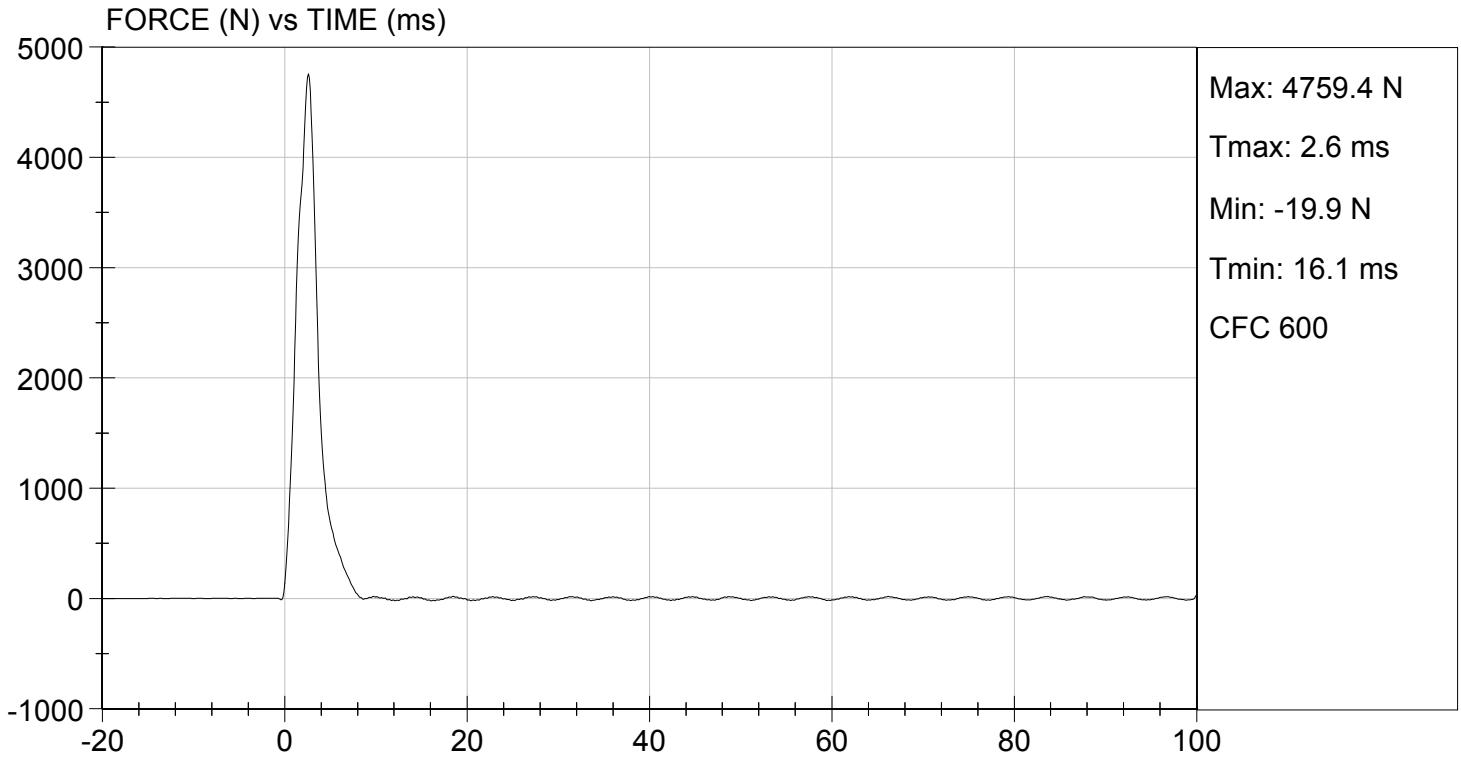
David Schoedel
Laboratory Technician

03/17/2015
Test Date

Jessica Gall
Approved By

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

TEST DATE: 03/17/2015
TEST #: D15696



MGA RESEARCH CORPORATION

HIP-FEMUR FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D15690

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	20	20	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.3	6.3	Pass
30 Degrees	Nm	94.9 Nm Max	55.6	65.0	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	49.4	47.7	Pass
		Overall Test Results			Pass

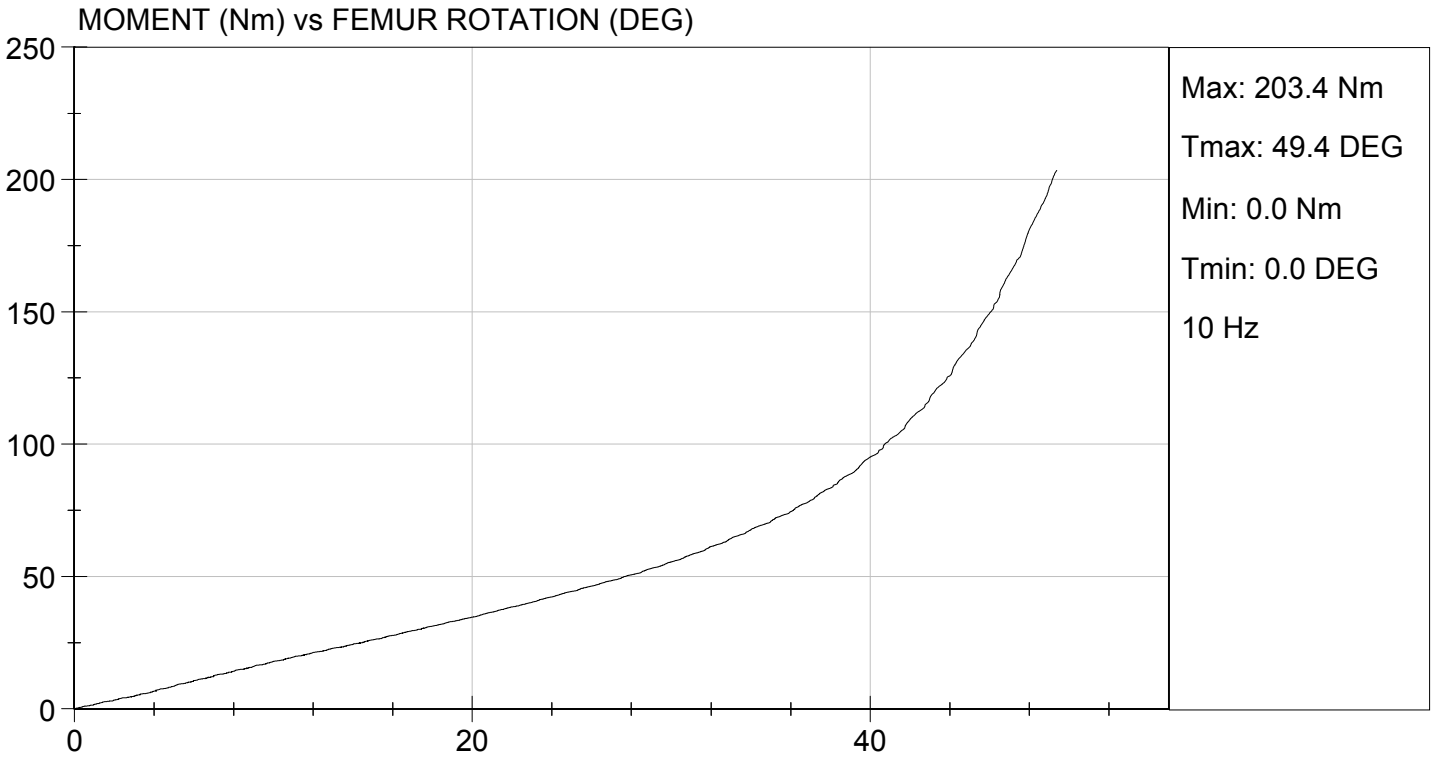
Maxime Chamberland
Laboratory Technician

03/17/2015
Test Date

Jessica Hall
Approved By

TEST DESC: RIGHT HIP FEMUR FLEXION

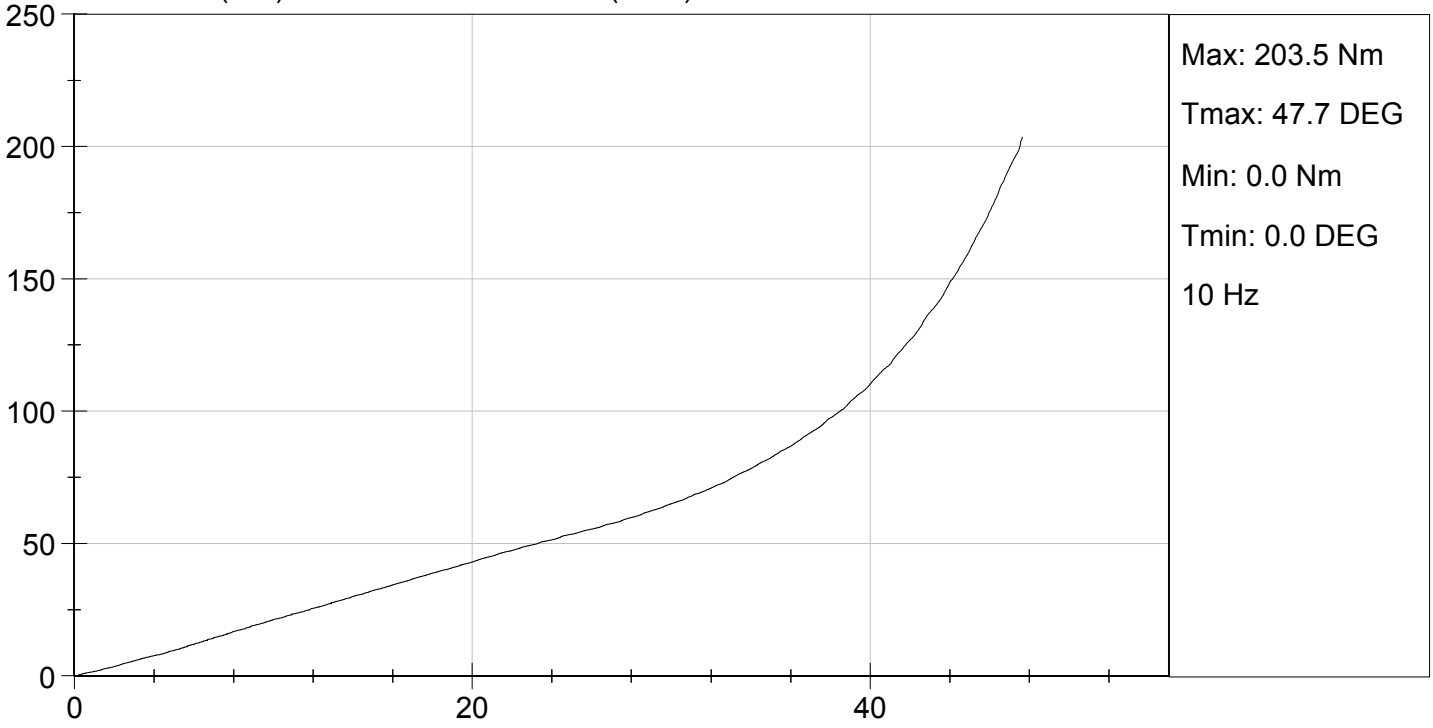
TEST DATE: 03/17/2015
TEST #: D15699



TEST DESC: LEFT HIP FEMUR FLEXION

TEST DATE: 03/17/2015
TEST #: D15690

MOMENT (Nm) vs FEMUR ROTATION (DEG)



MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test ID:** D15721

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	19	Pass
Peak Resultant Acceleration	G's	225 to 275	264	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	1.7	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

David Schoedel
Laboratory Technician

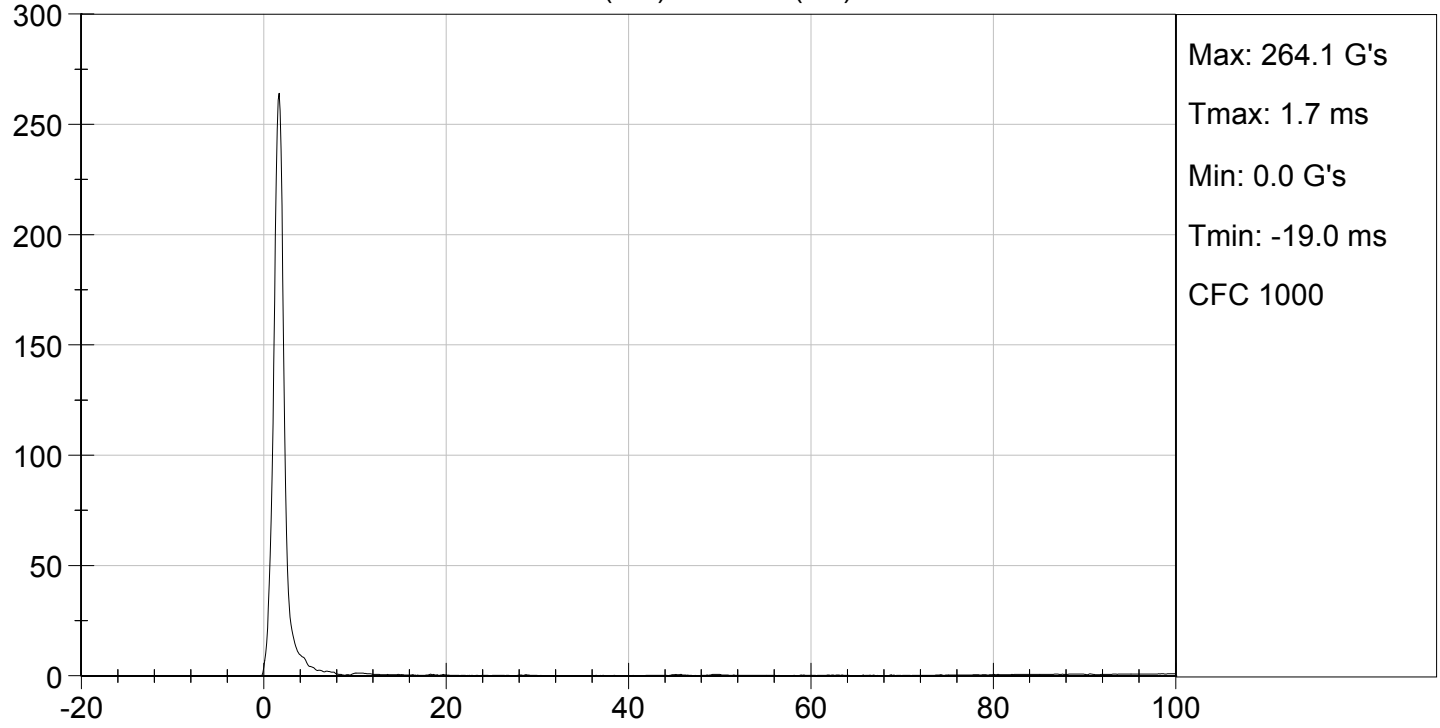
03/18/2015
Test Date

Jessica Hall
Approved By

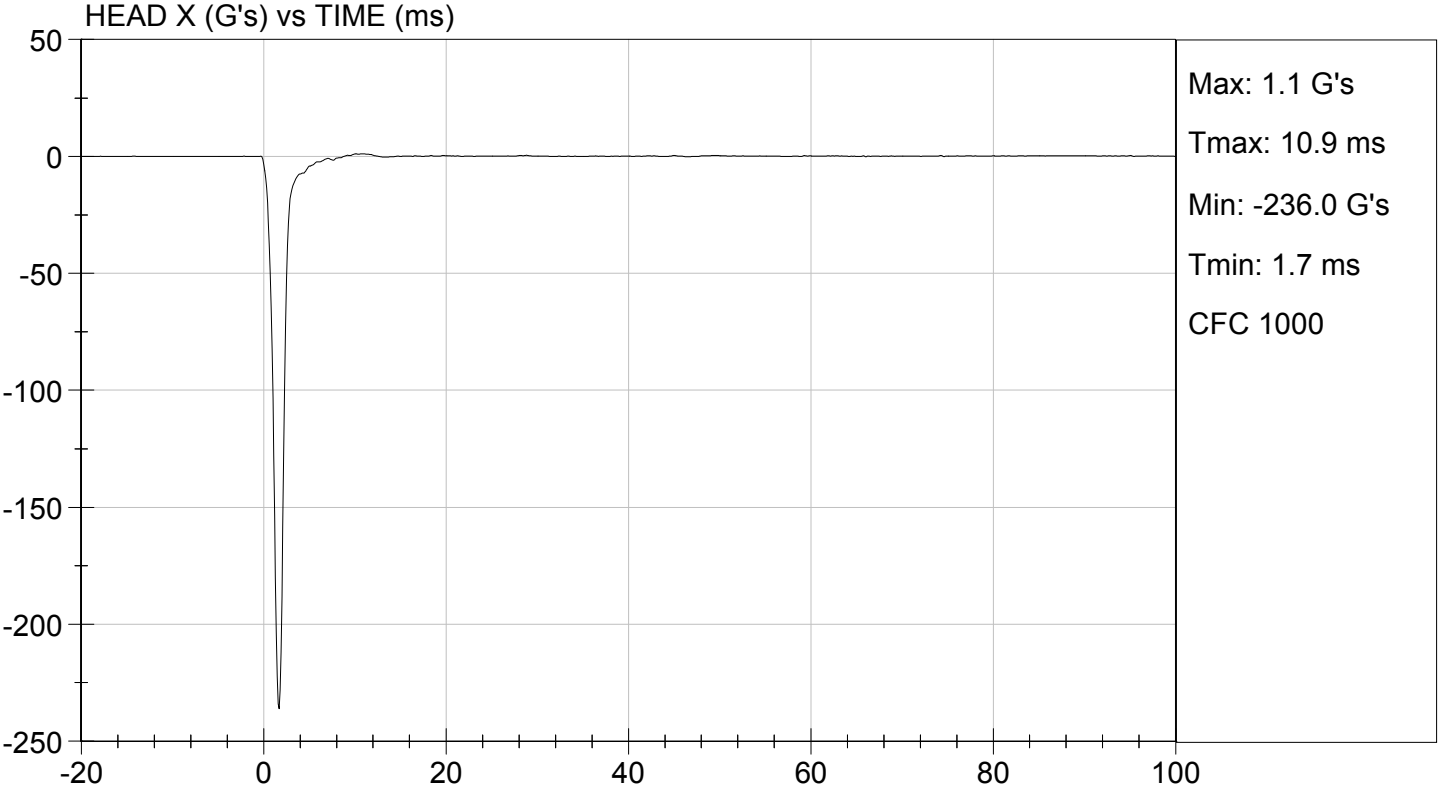
TEST DESC: HEAD DROP

TEST DATE: 03/18/2015
TEST #: D15721

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



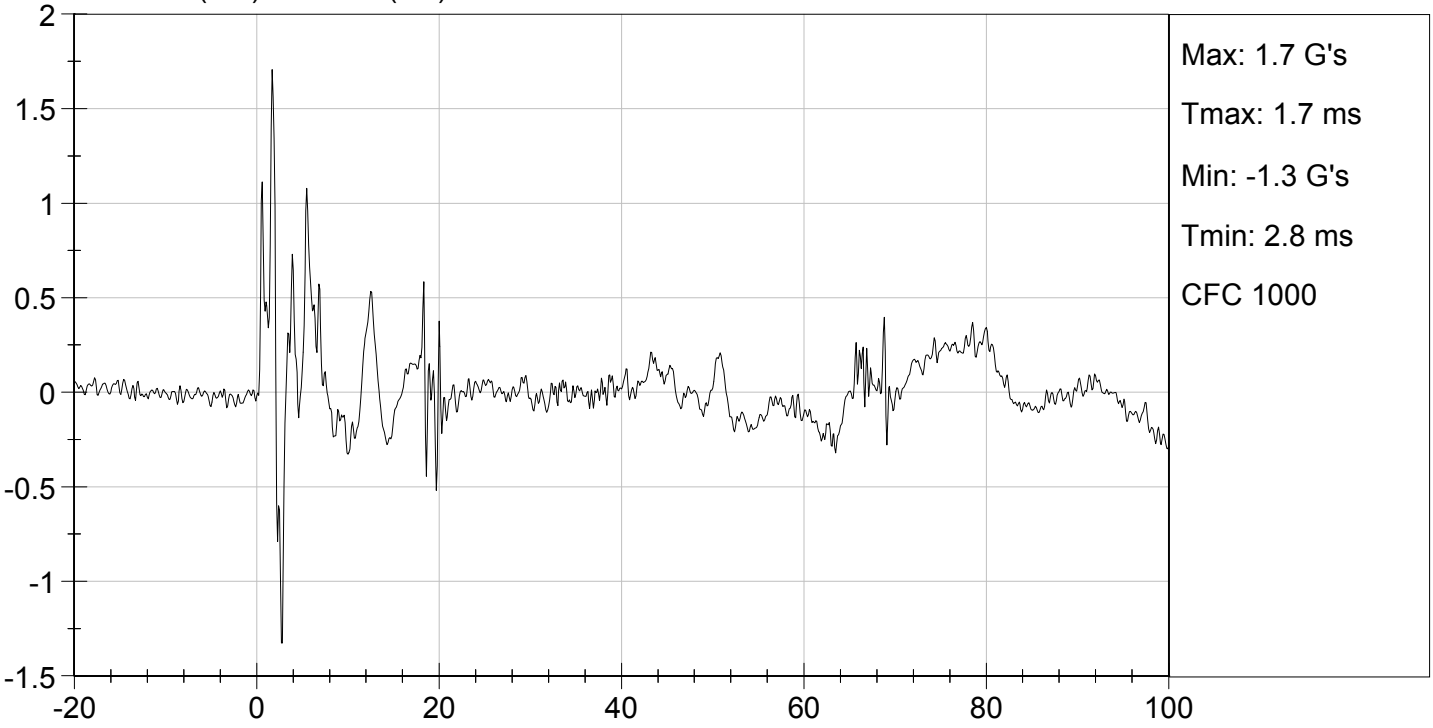
HEAD X (G's) vs TIME (ms)



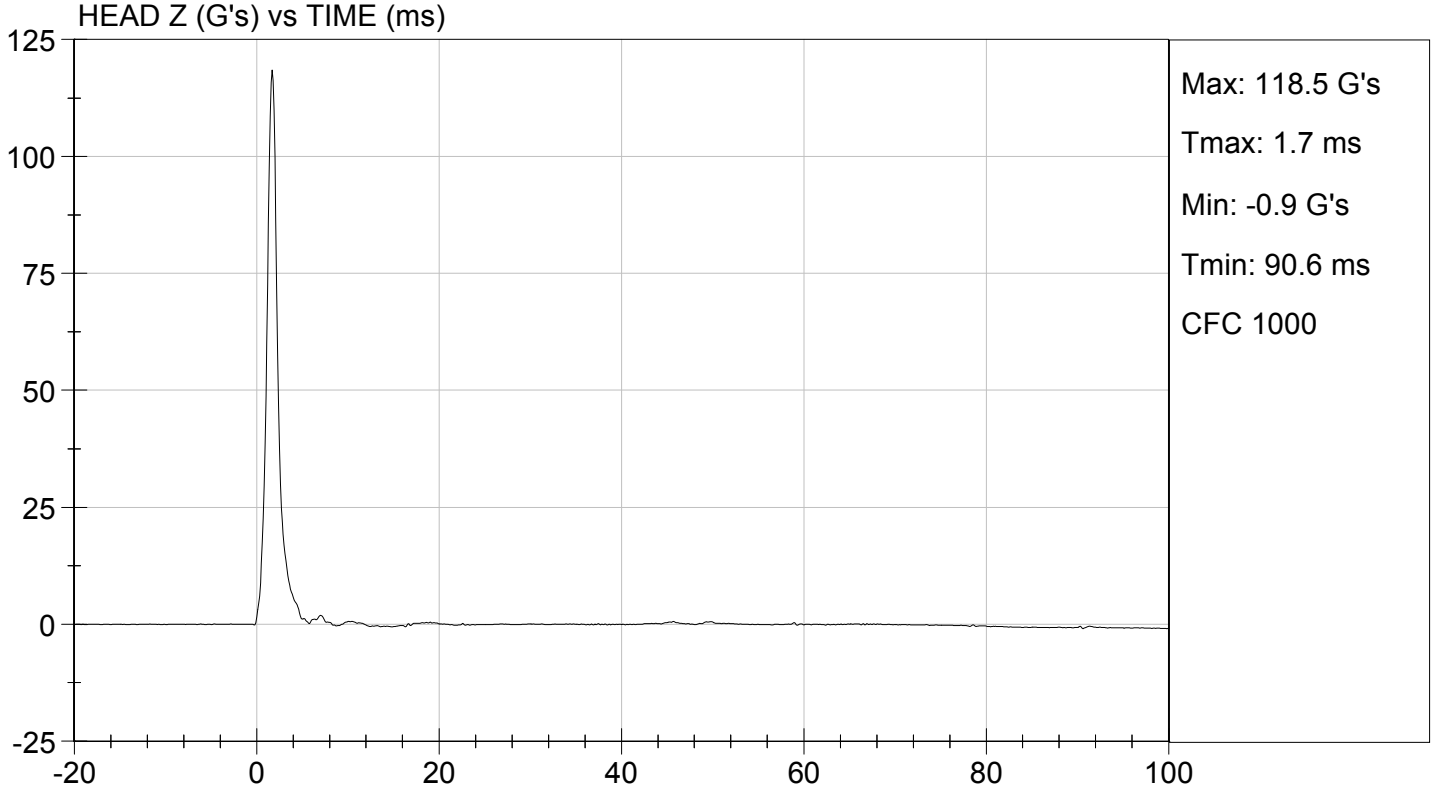
TEST DESC: HEAD DROP

TEST DATE: 03/18/2015
TEST #: D15721

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



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



MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D15722

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	19	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	22.90	Pass
	20 ms	G's	17.60 to 22.60	17.64	Pass
	30 ms	G's	12.50 to 18.50	17.19	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	18.0	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	41.4	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	74.0	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	120.2	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	88.9	Pass
	Time	ms	47.0 to 58.0	55.5	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	104.7	Pass
			Overall Test Results		Pass

David Schoedel

Laboratory Technician

03/18/2015

Test Date

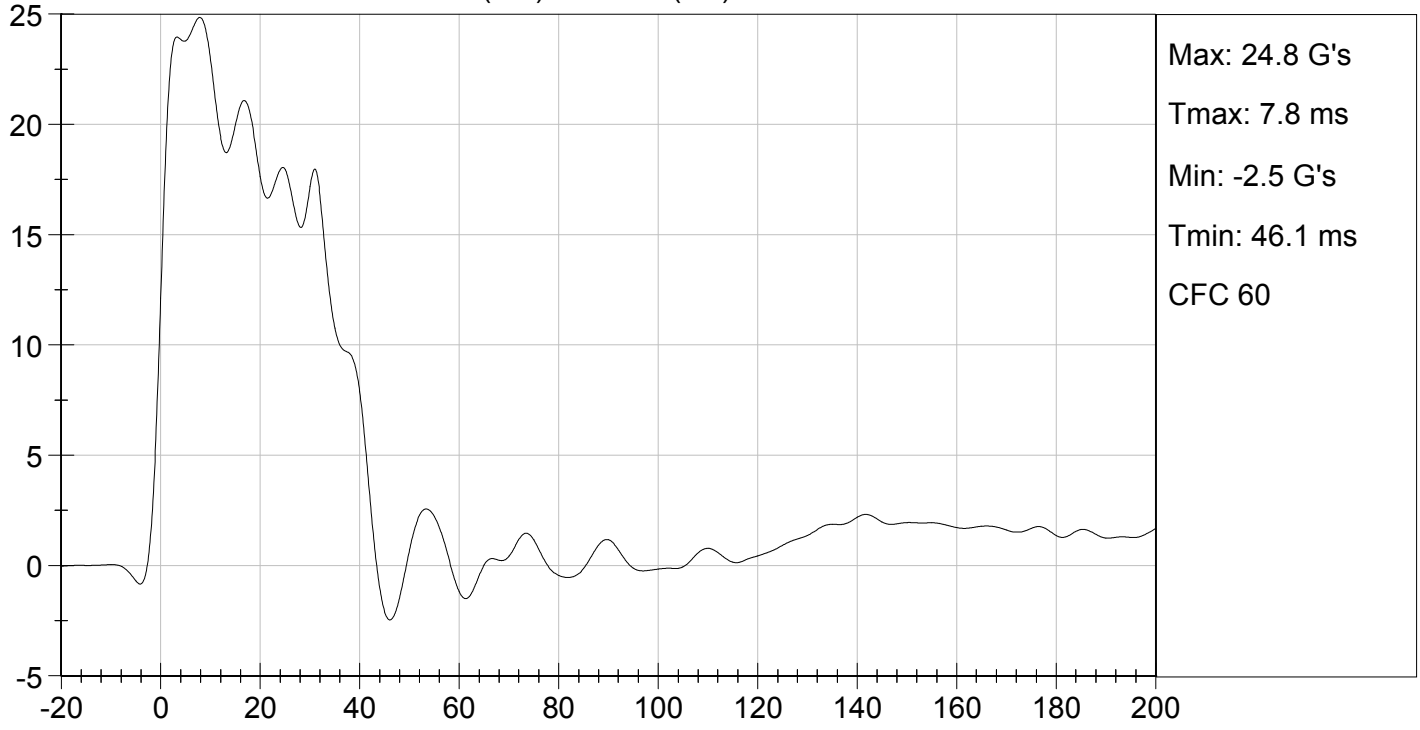
Jessica Gall

Approved By

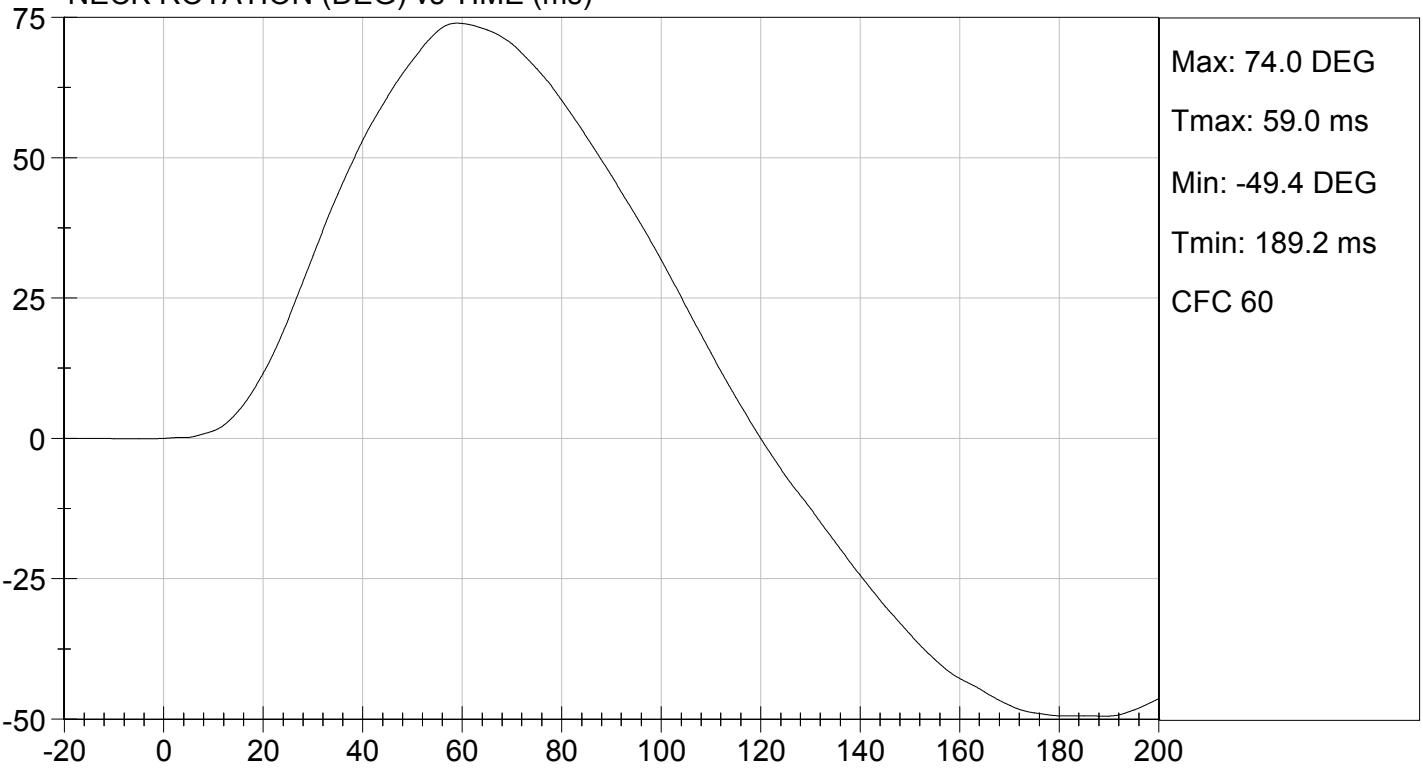
TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

TEST DATE: 03/18/2015
TEST #: D15722

PENDULUM DECELERATION (G's) vs TIME (ms)



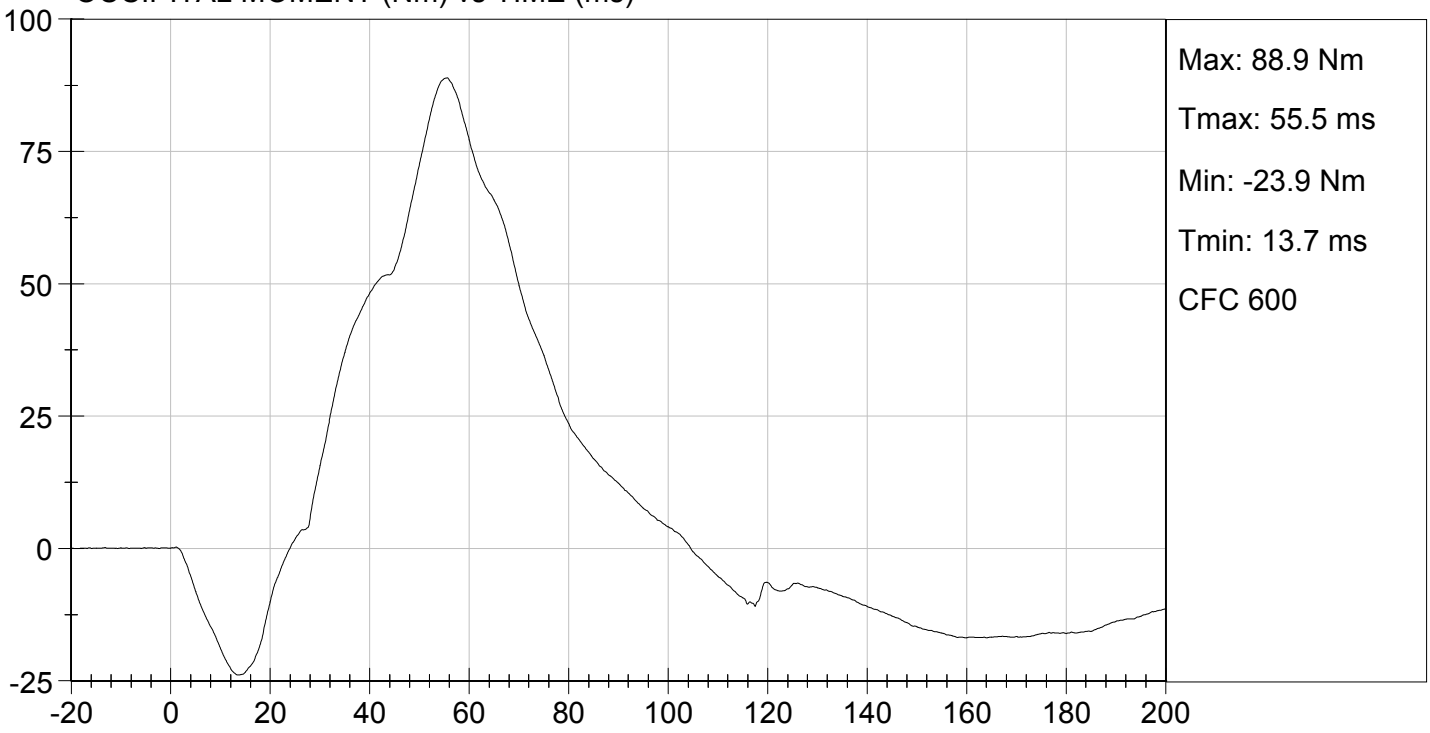
NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 03/18/2015
TEST #: D15722

OCCIPITAL MOMENT (Nm) vs TIME (ms)



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D15723

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	19	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.19	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	18.22	Pass
	20 ms	G's	14.00 to 19.00	16.35	Pass
	30 ms	G's	11.00 to 16.00	12.02	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	13.1	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	43.0	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	100.8	Pass
	Time	ms	72.0 to 82.0	80.2	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	164.2	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-60.7	Pass
	Time	ms	65.0 to 79.0	73.1	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	144.7	Pass
			Overall Test Results		Pass

David Schoedel

Laboratory Technician

03/18/2015

Test Date

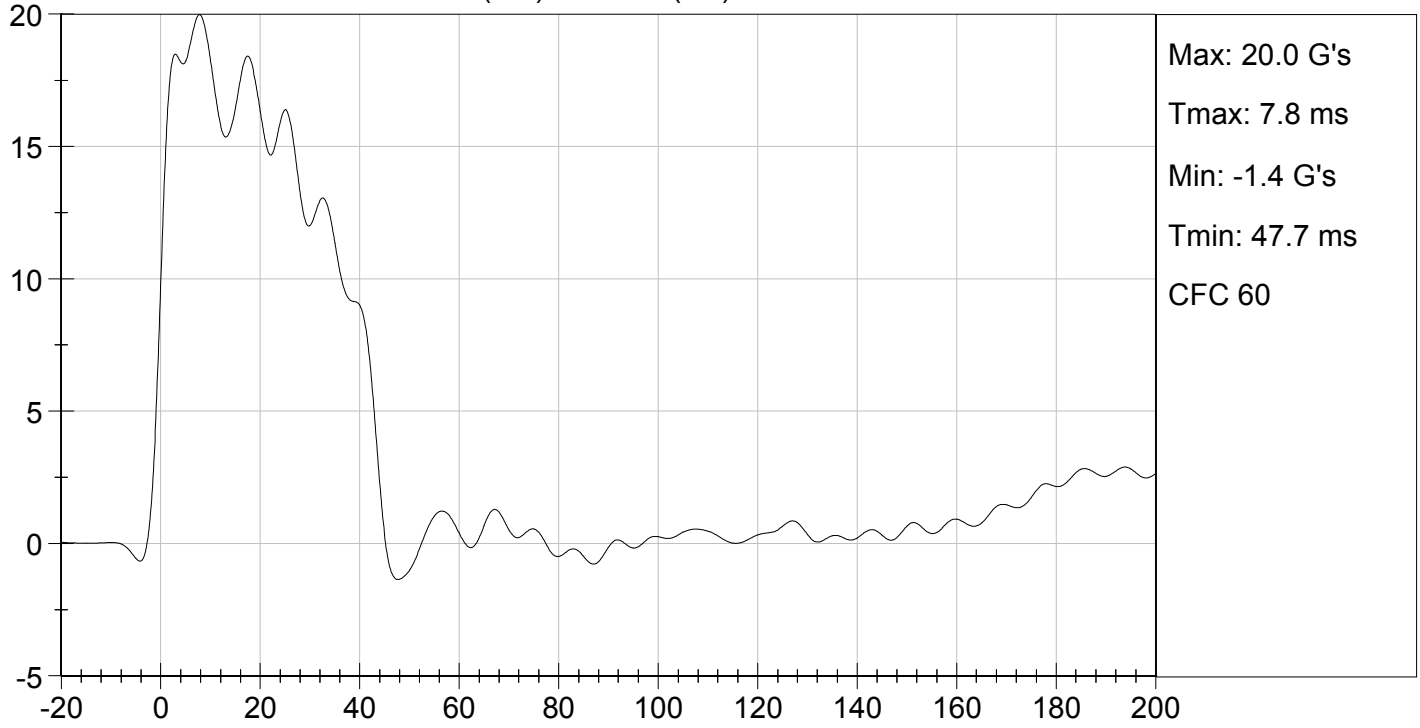
Jessica Gall

Approved By

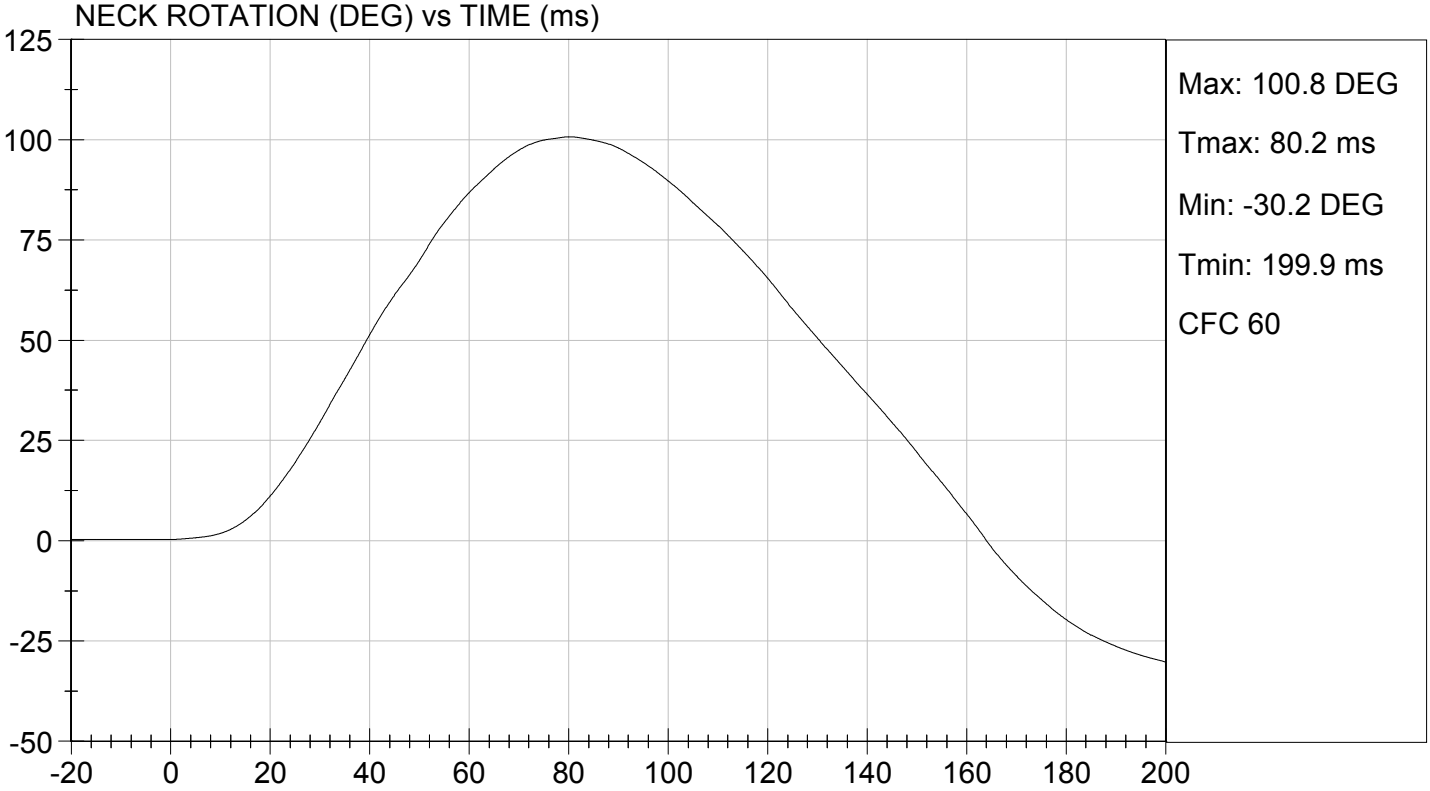
TEST DESC: NECK EXTENSION
VELOCITY: 20.30 ft/s, 6.19 m/s

TEST DATE: 03/18/2015
TEST #: D15723

PENDULUM DECELERATION (G's) vs TIME (ms)

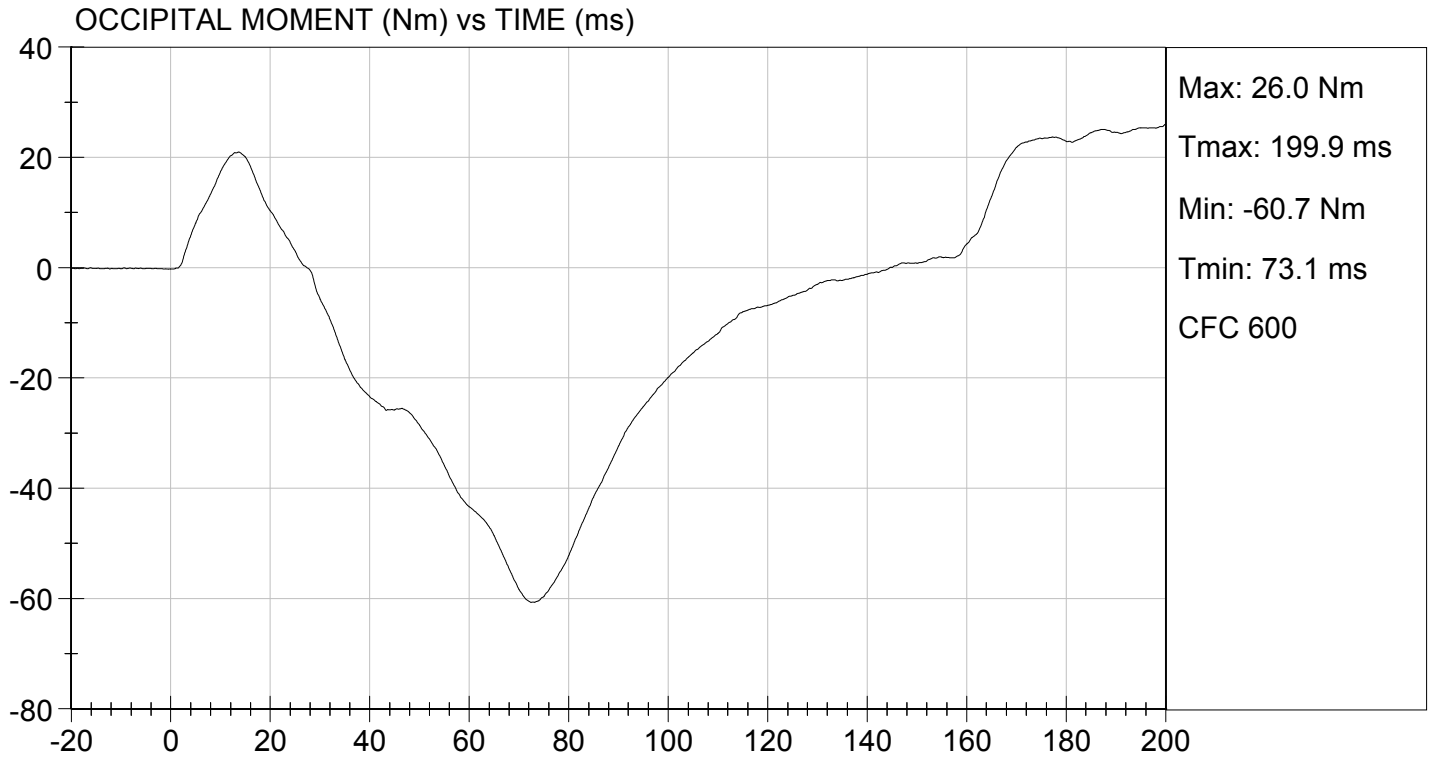


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 03/18/2015
TEST #: D15723



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D15724

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	19	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,181	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.78	Pass
Internal Hysteresis	%	69 to 85	69	Pass
		Overall Test Results		Pass

Jack Coleman
Laboratory Technician

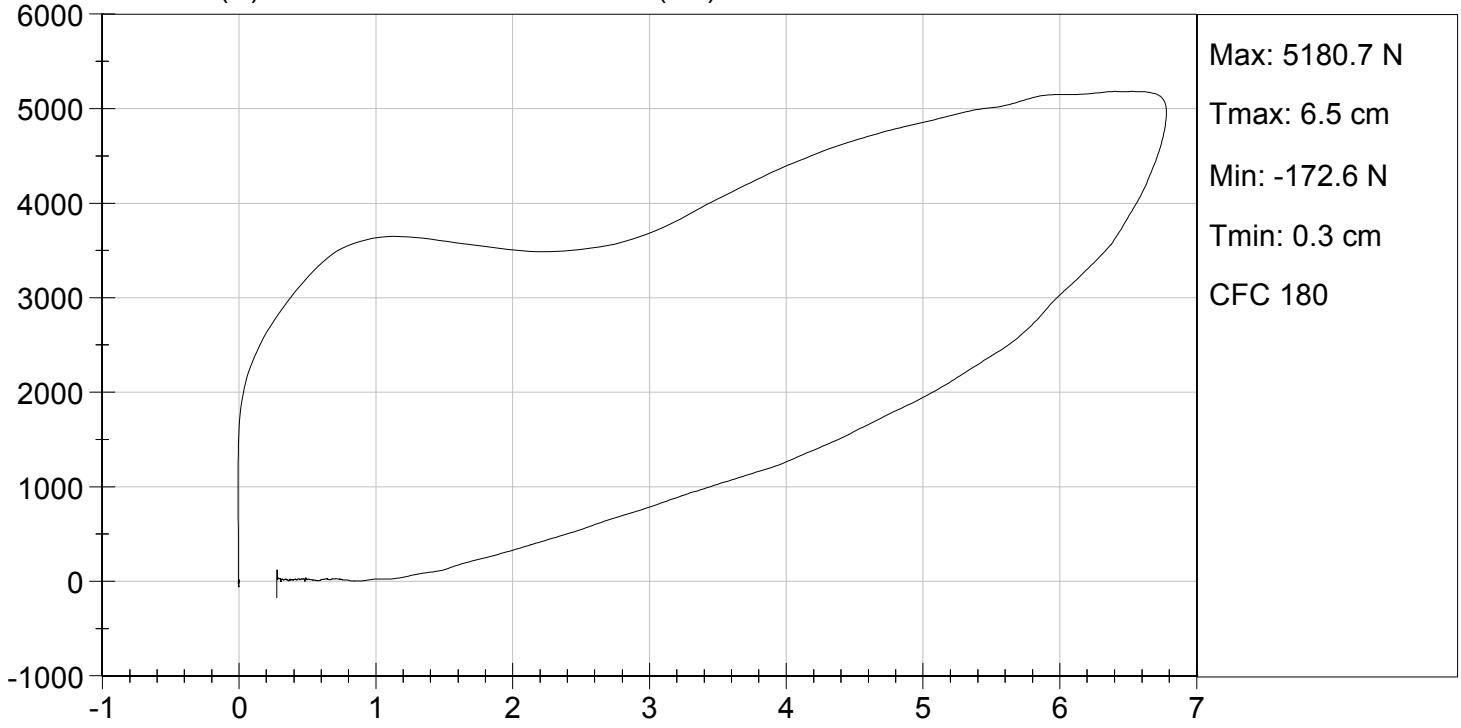
03/18/2015
Test Date

Jessica Hall
Approved By

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

TEST DATE: 03/18/2015
TEST #: D15724

FORCE (N) vs CHEST DISPLACEMENT (cm)



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D15725

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	19	Pass
Probe Velocity	m/s	2.07 to 2.13	2.13	Pass
Peak Probe Force	N	4715 to 5782	4,866	Pass
		Overall Test Results		Pass

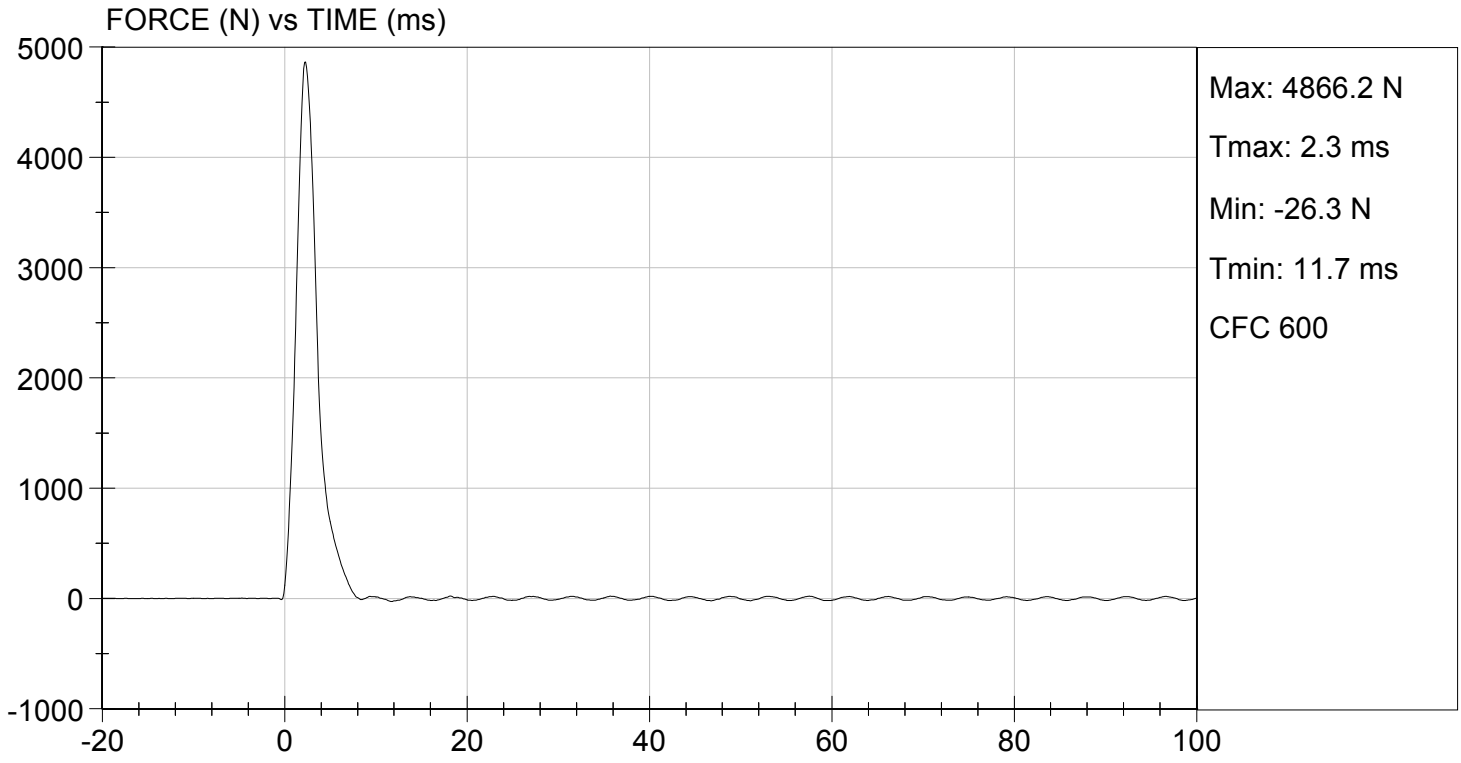
David Schoedel
Laboratory Technician

03/18/2015
Test Date

Jessica Hall
Approved By

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

TEST DATE: 03/18/2015
TEST #: D15725



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D15726

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

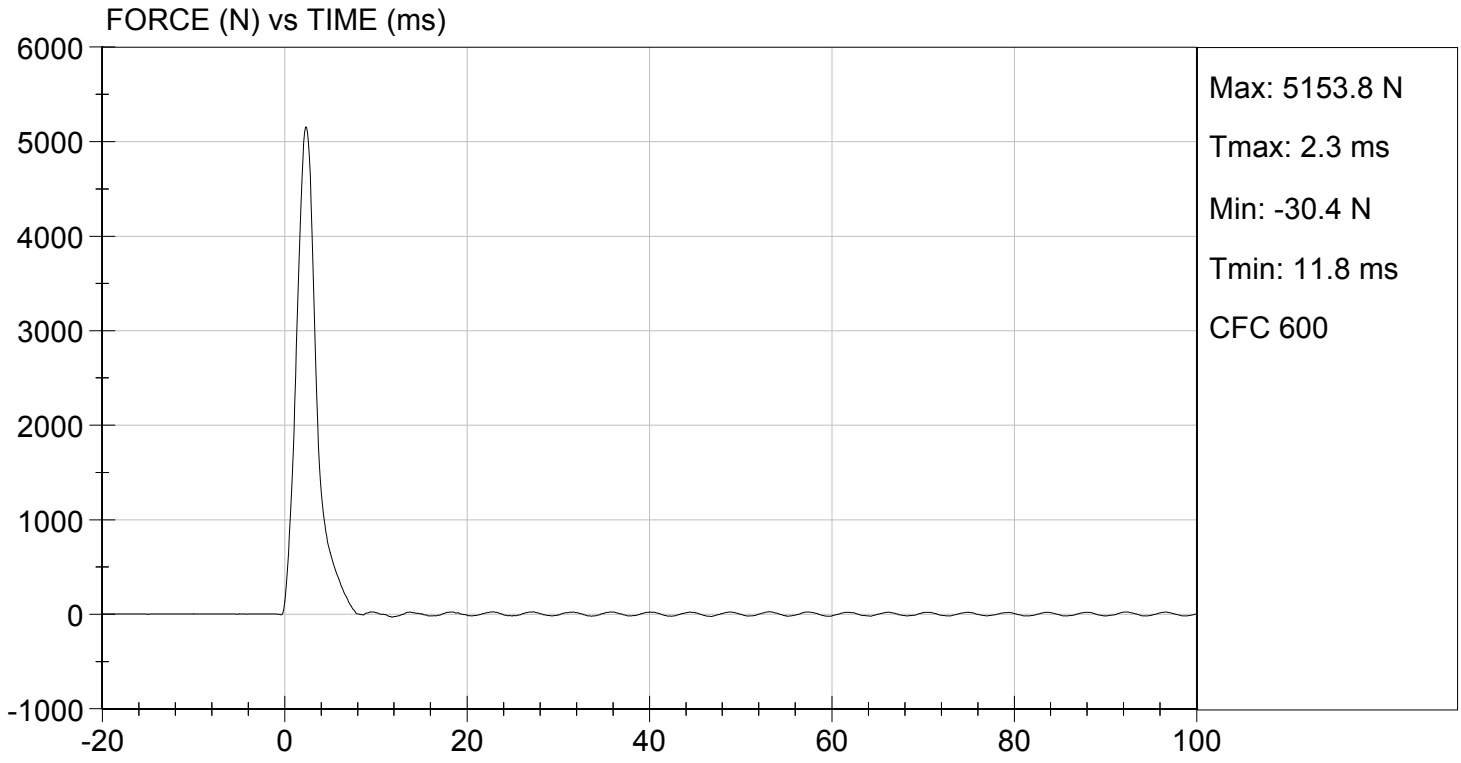
David Schoedel
Laboratory Technician

03/18/2015
Test Date

Jessica Hall
Approved By

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

TEST DATE: 03/18/2015
TEST #: D15726



MGA RESEARCH CORPORATION

HIP-FEMUR FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

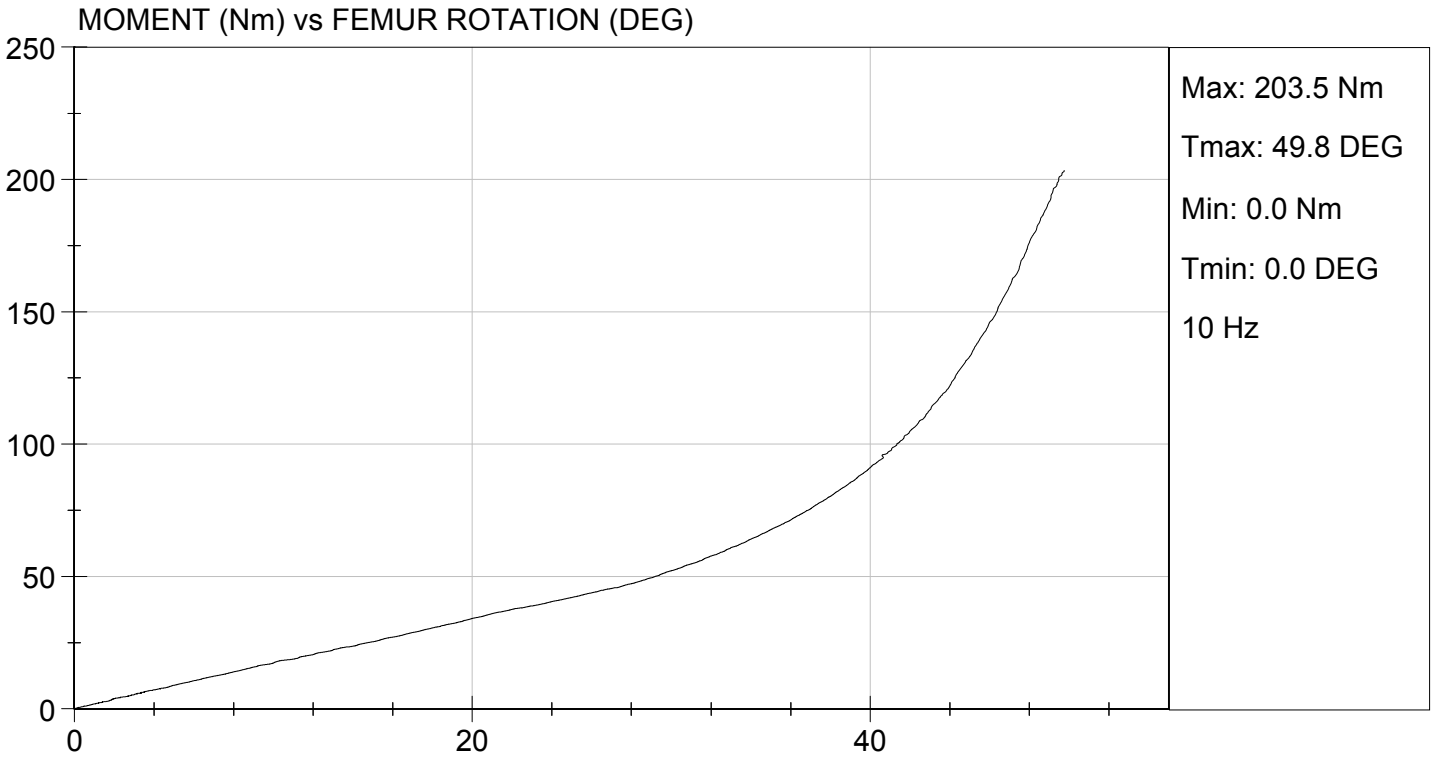
ATD Serial No: 351 **Test I.D:** D15720

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	19	19	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.3	6.3	Pass
30 Degrees	Nm	94.9 Nm Max	52.1	66.8	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	49.8	47.5	Pass
		Overall Test Results			Pass

Jack Coleman
Laboratory Technician

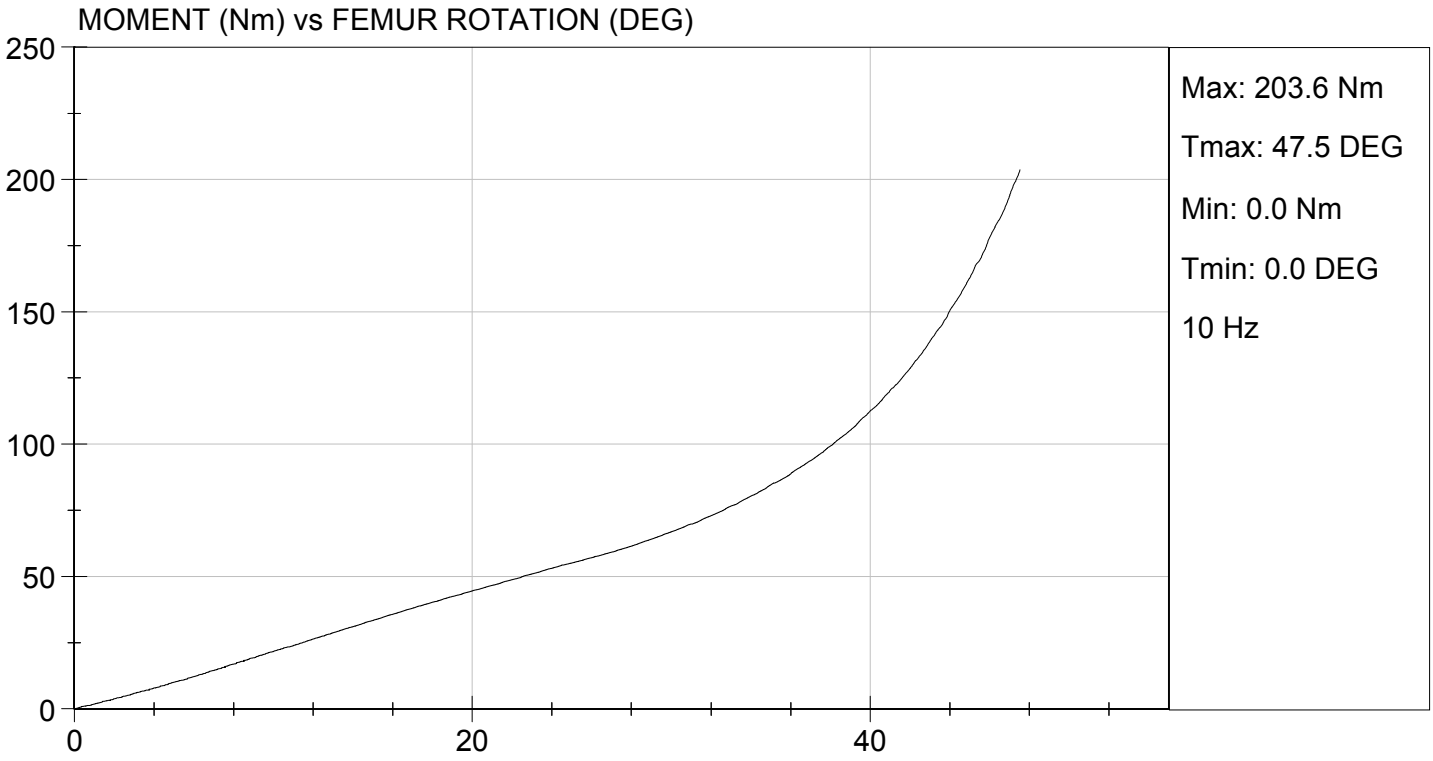
03/18/2015
Test Date

Jessica Hall
Approved By


MOMENT (Nm) vs FEMUR ROTATION (DEG)
250
200
150
100
50
0
0
20
40
Max: 203.5 Nm
Tmax: 49.8 DEG
Min: 0.0 Nm
Tmin: 0.0 DEG
10 Hz

TEST DESC: LEFT HIP FEMUR FLEXION

TEST DATE: 03/18/2015
TEST #: D15720



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:** D15701

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	22	Pass
Peak Resultant Acceleration	G's	250 to 300	267	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-7.6	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Jack Coleman
Laboratory Technician

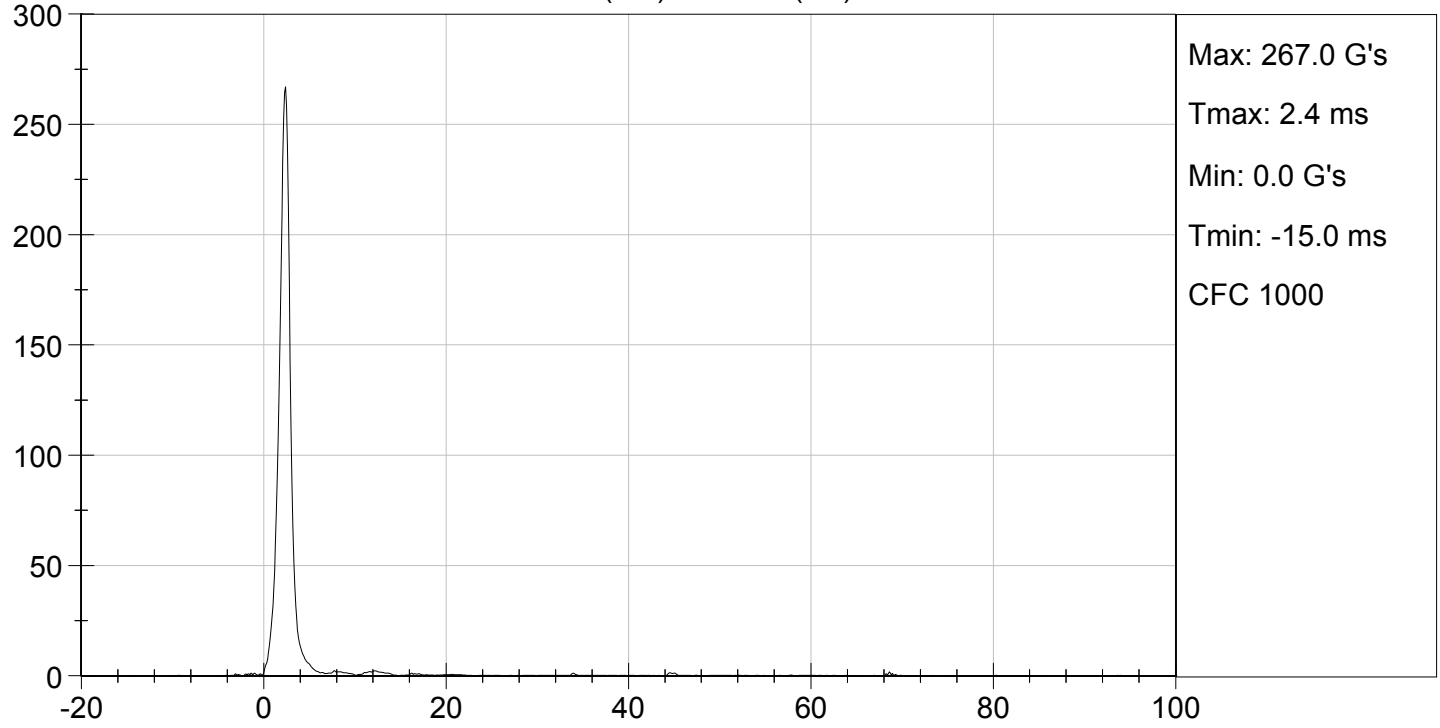
03/17/2015
Test Date

Jessica Hall
Approved By

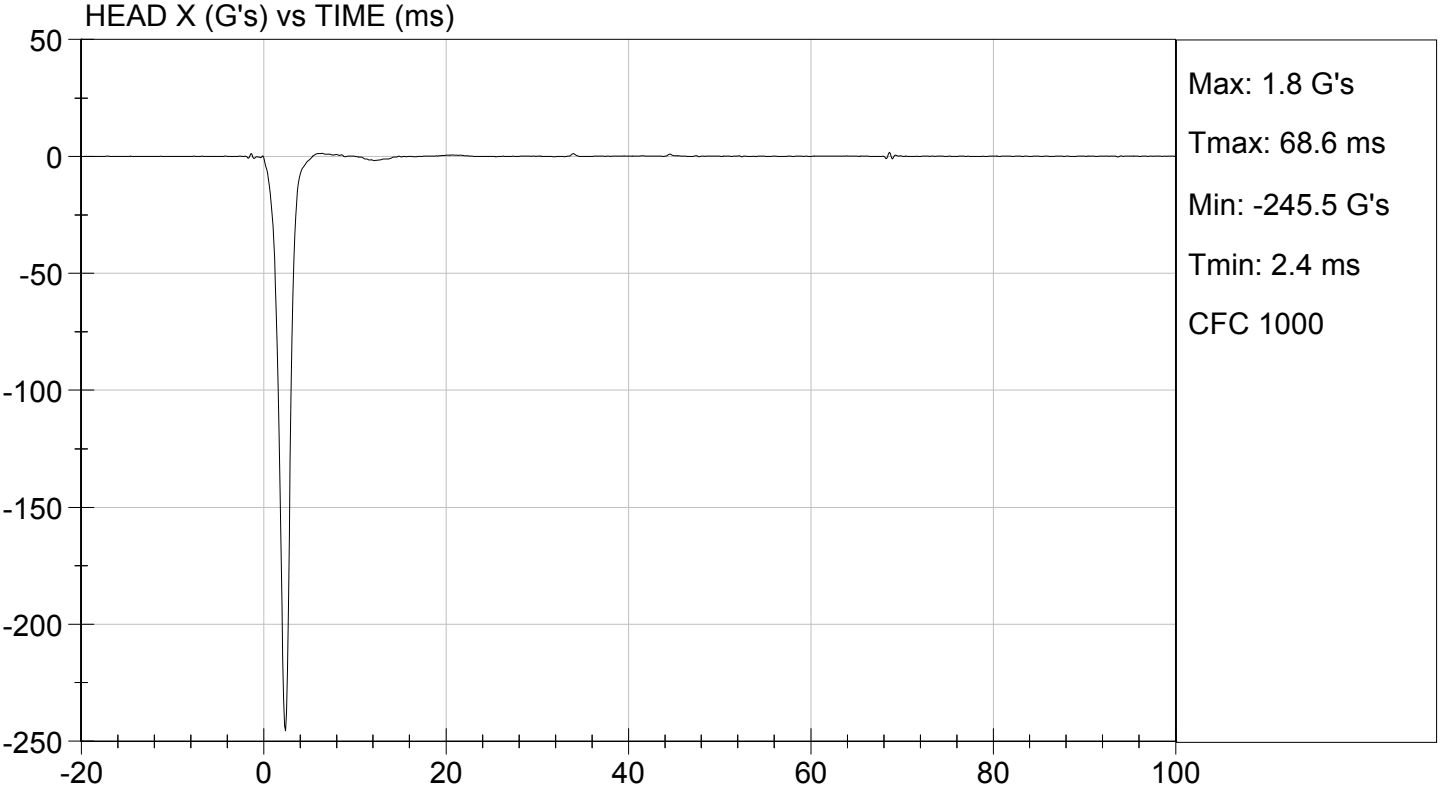
TEST DESC: HEAD DROP

TEST DATE: 03/17/2015
TEST #: D15701

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

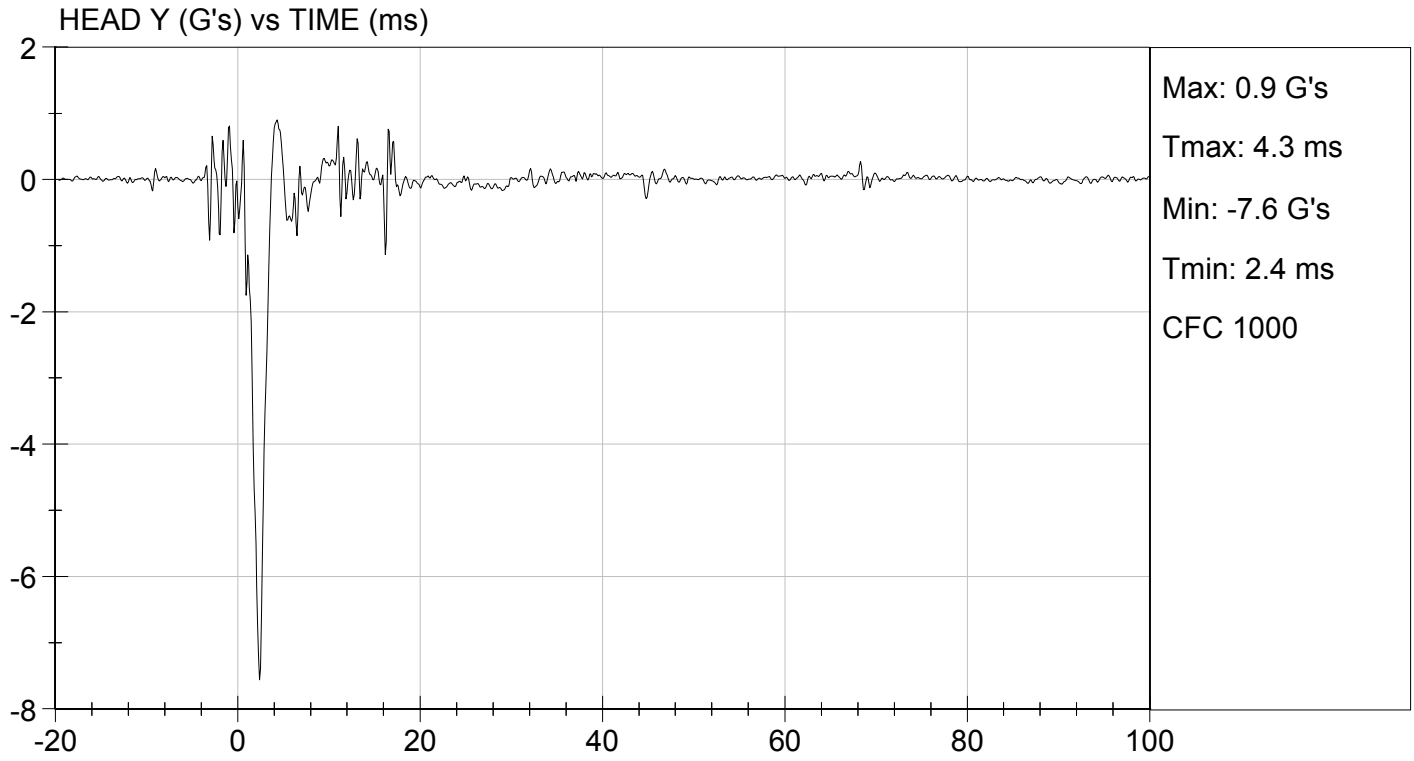


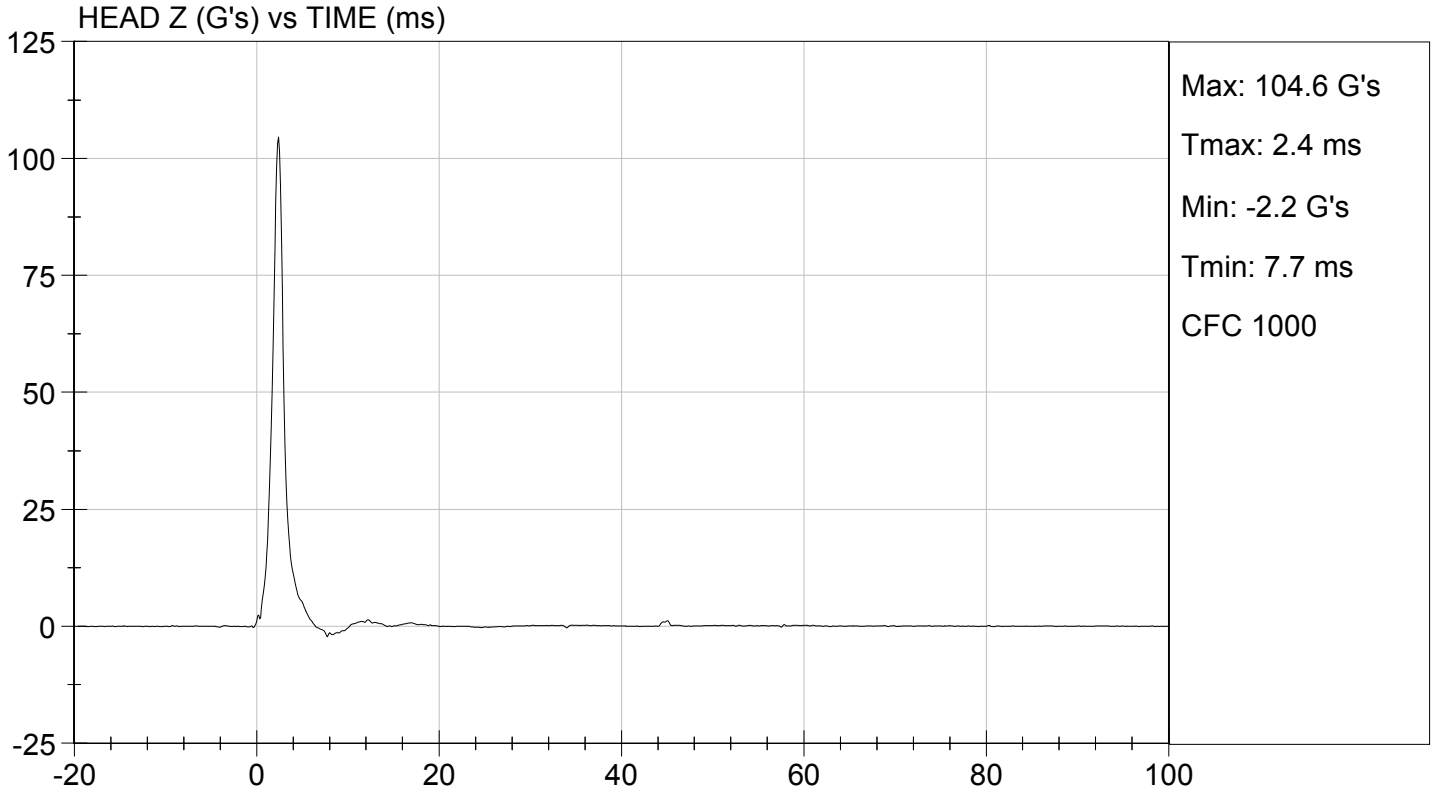
HEAD X (G's) vs TIME (ms)



TEST DESC: HEAD DROP

TEST DATE: 03/17/2015
TEST #: D15701





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D15702

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity		%	10 to 70	22	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.4	Pass
	20 ms	m/s	4.0 to 5.0	4.4	Pass
	30 ms	m/s	5.8 to 7.0	6.0	Pass
D Plane Rotation	Max	deg	77 to 91	82	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	74	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	86	Pass
			Overall Results		Pass

David Schoedel

Laboratory Technician

03/17/2015

Test Date

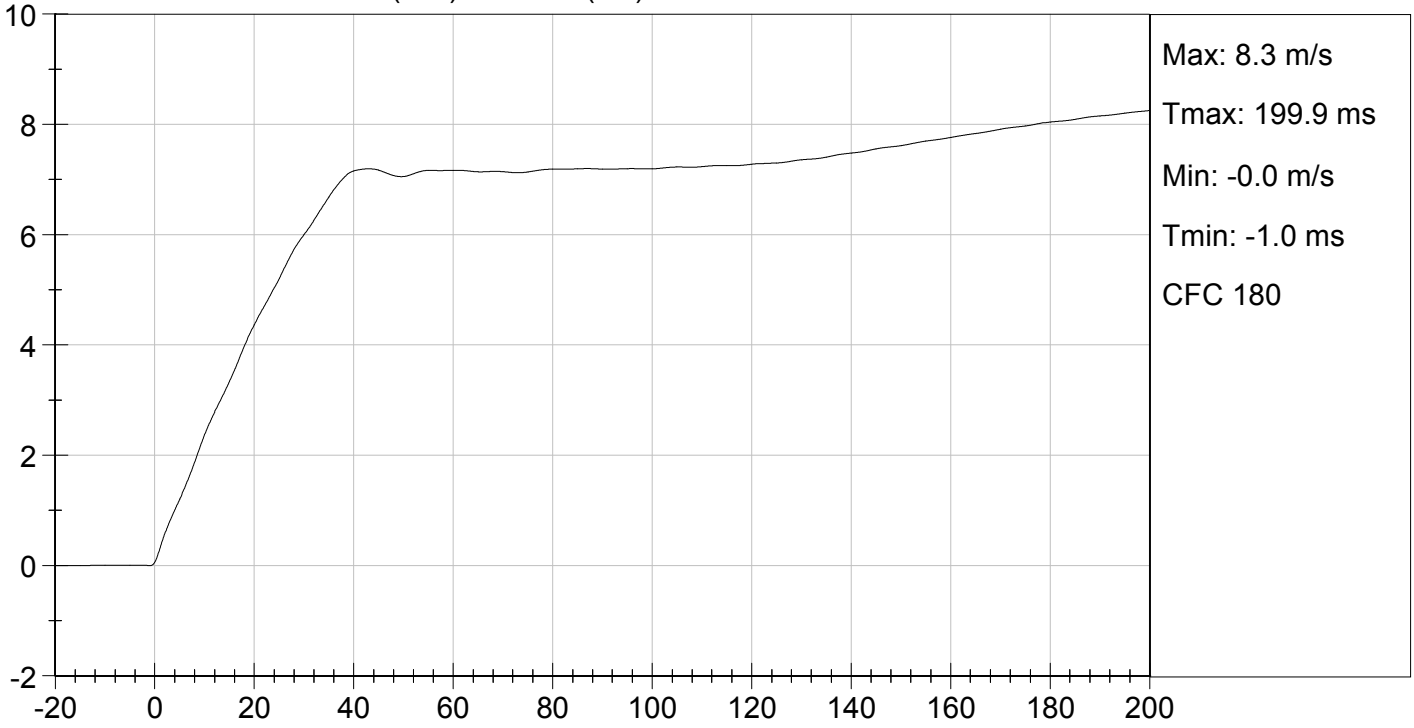
Jessica Hall

Approved By

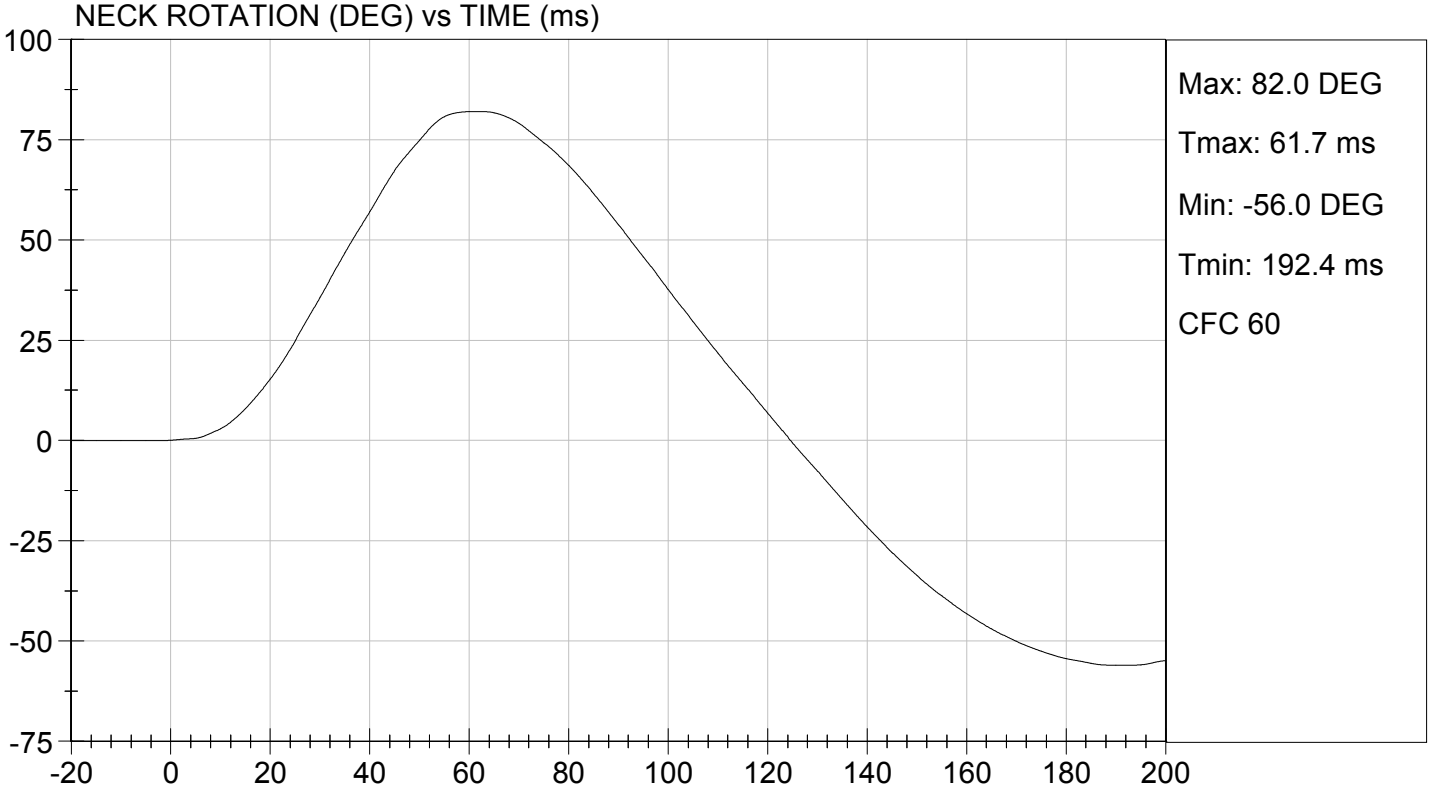
TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

TEST DATE: 03/17/2015
TEST #: D15702

PENDULUM VELOCITY (m/s) vs TIME (ms)

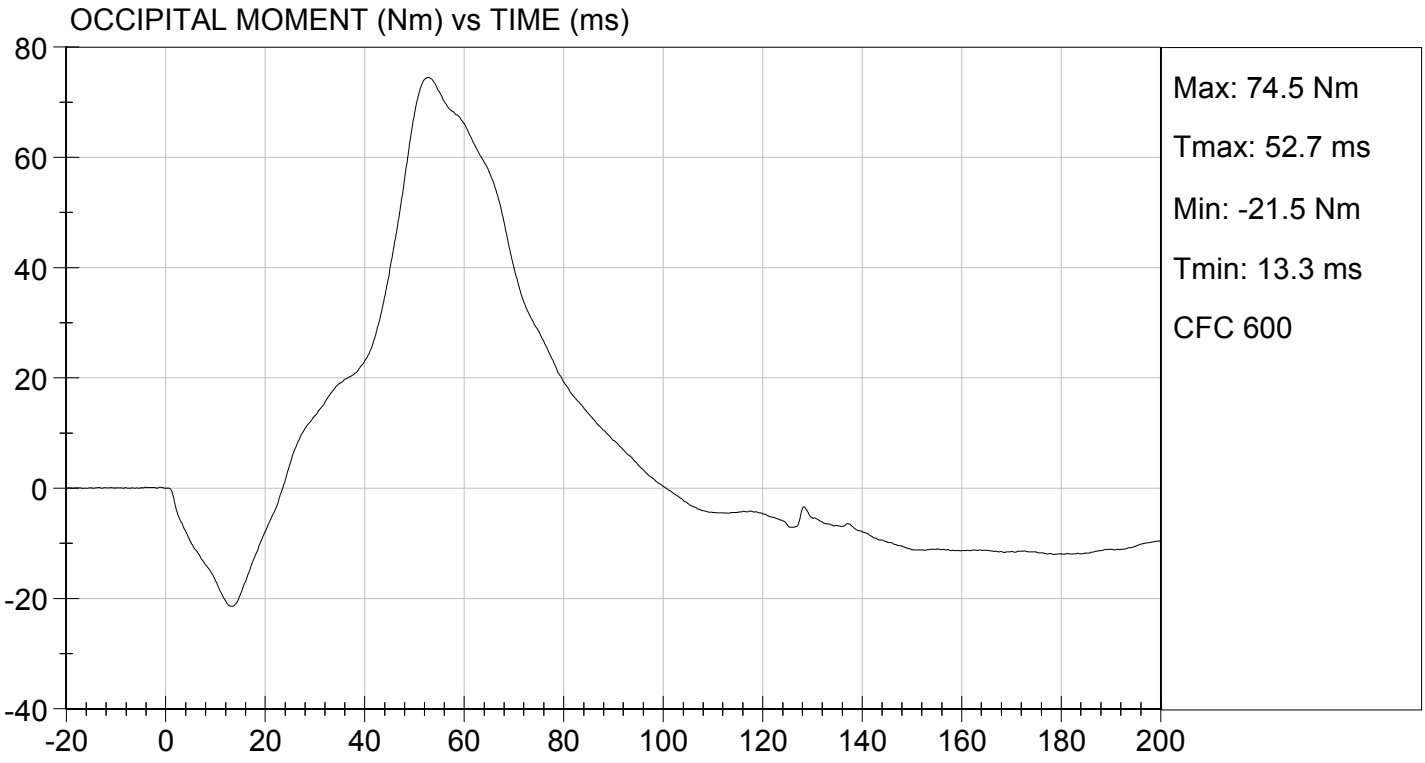


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 03/17/2015
TEST #: D15702



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D15703

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity		%	10 to 70	22	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.19	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.6	Pass
	20 ms	m/s	3.1 to 3.9	3.4	Pass
	30 ms	m/s	4.6 to 5.6	4.9	Pass
D Plane Rotation	Max	deg	99 to 114	110	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-56	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	103	Pass
			Overall Results		Pass

David Schoedel

Laboratory Technician

03/17/2015

Test Date

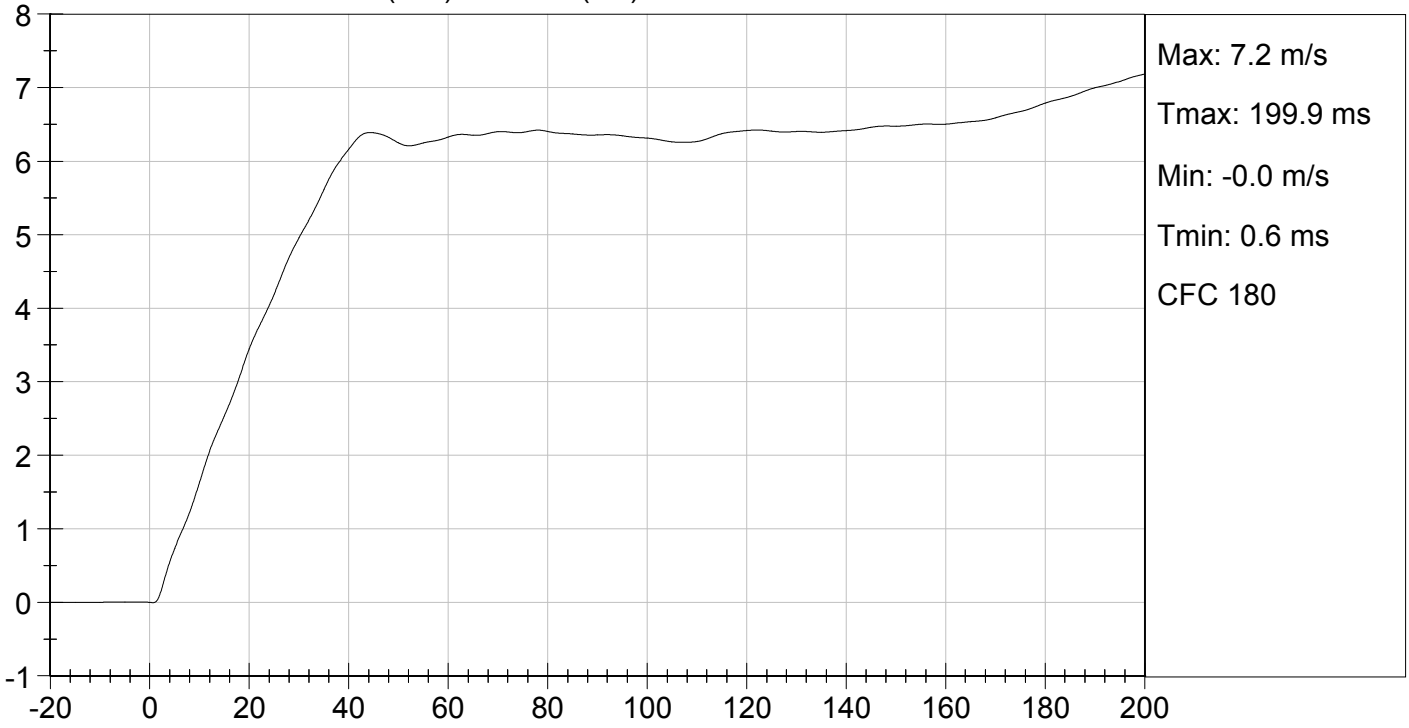
Jessica Hall

Approved By

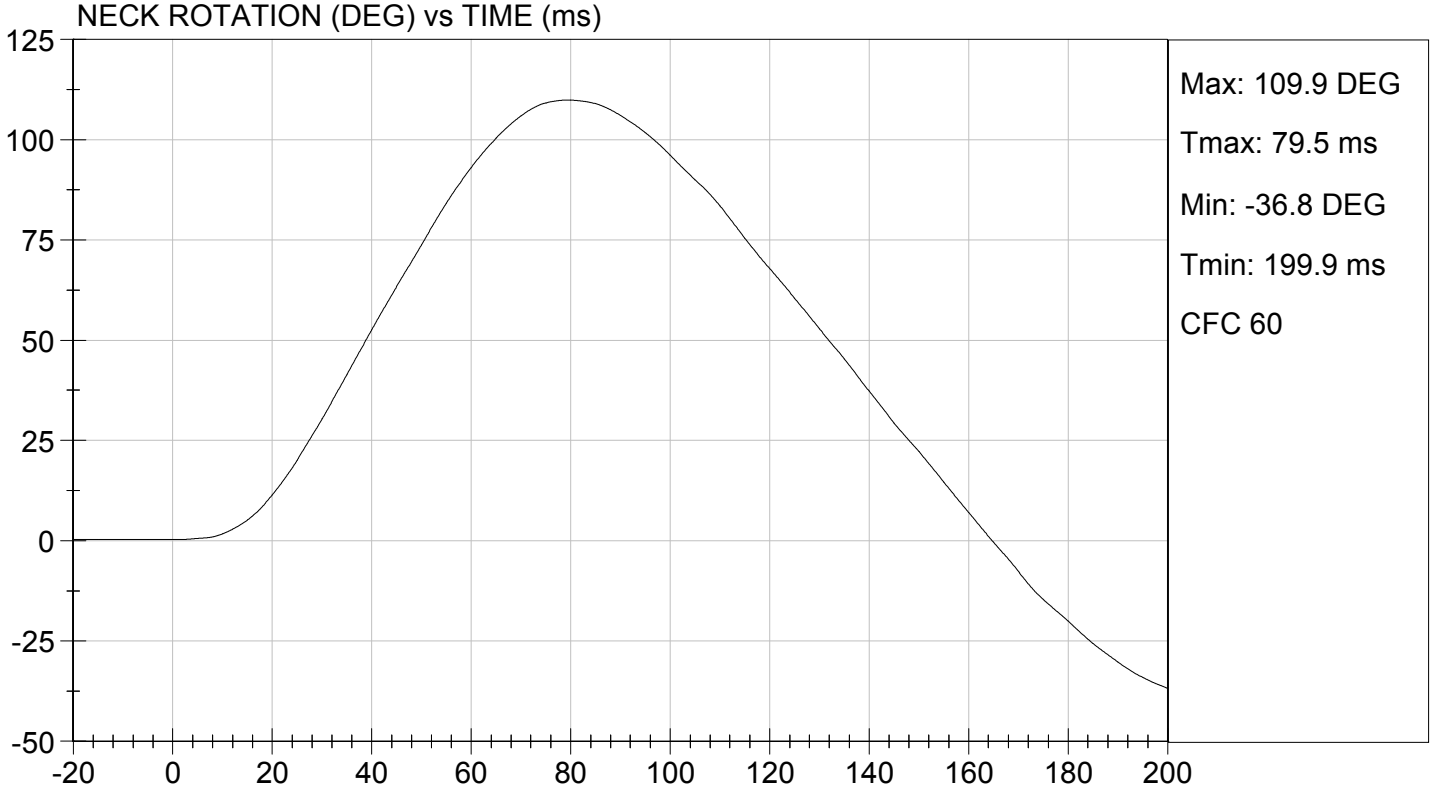
TEST DESC: NECK EXTENSION
VELOCITY: 20.30 ft/s, 6.19 m/s

TEST DATE: 03/17/2015
TEST #: D15703

PENDULUM VELOCITY (m/s) vs TIME (ms)

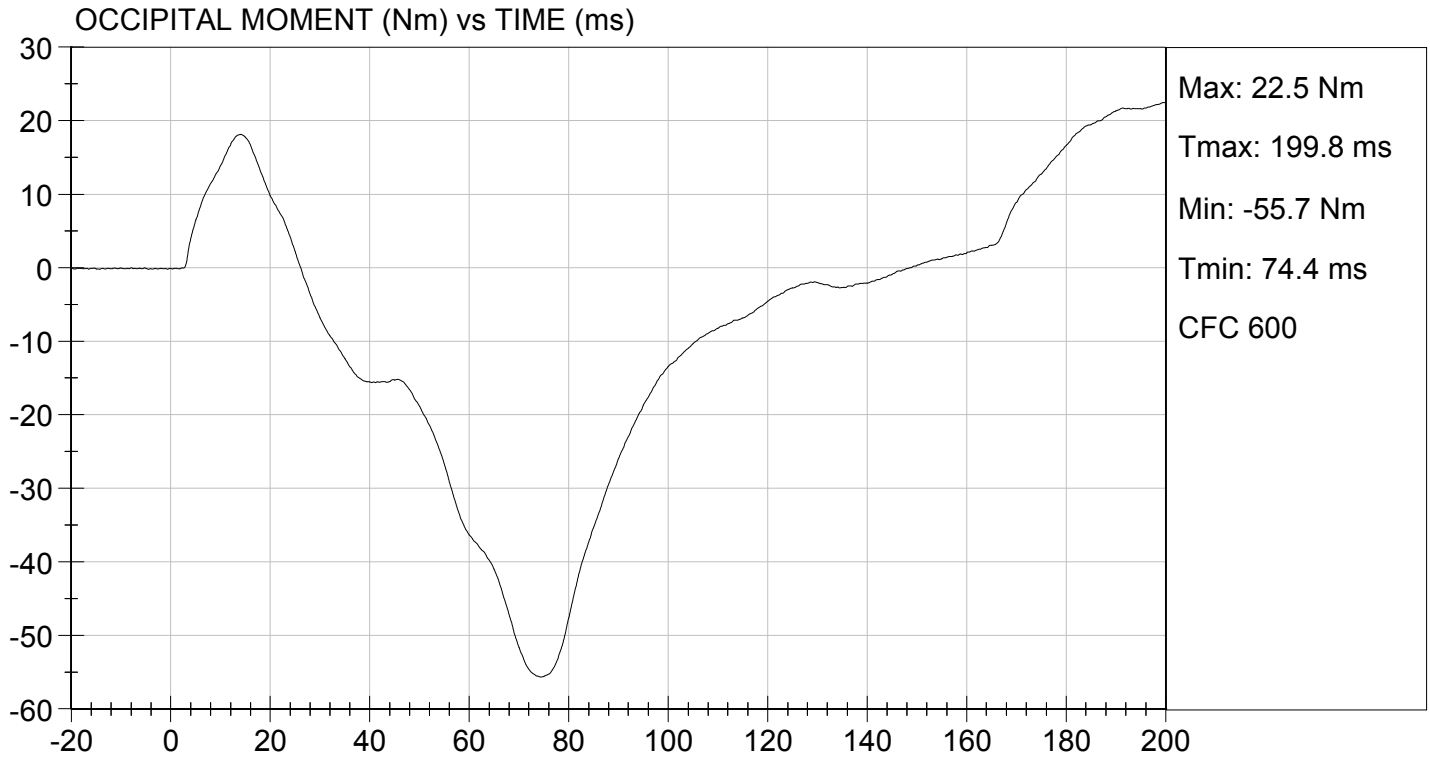


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 03/17/2015
TEST #: D15703



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D15704

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Relative Humidity	%	10 to 70	20	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	4130	Pass
Internal Hysteresis	%	69 to 85	73	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4330	Pass
		Overall Test Results		Pass

Jack Coleman
Laboratory Technician

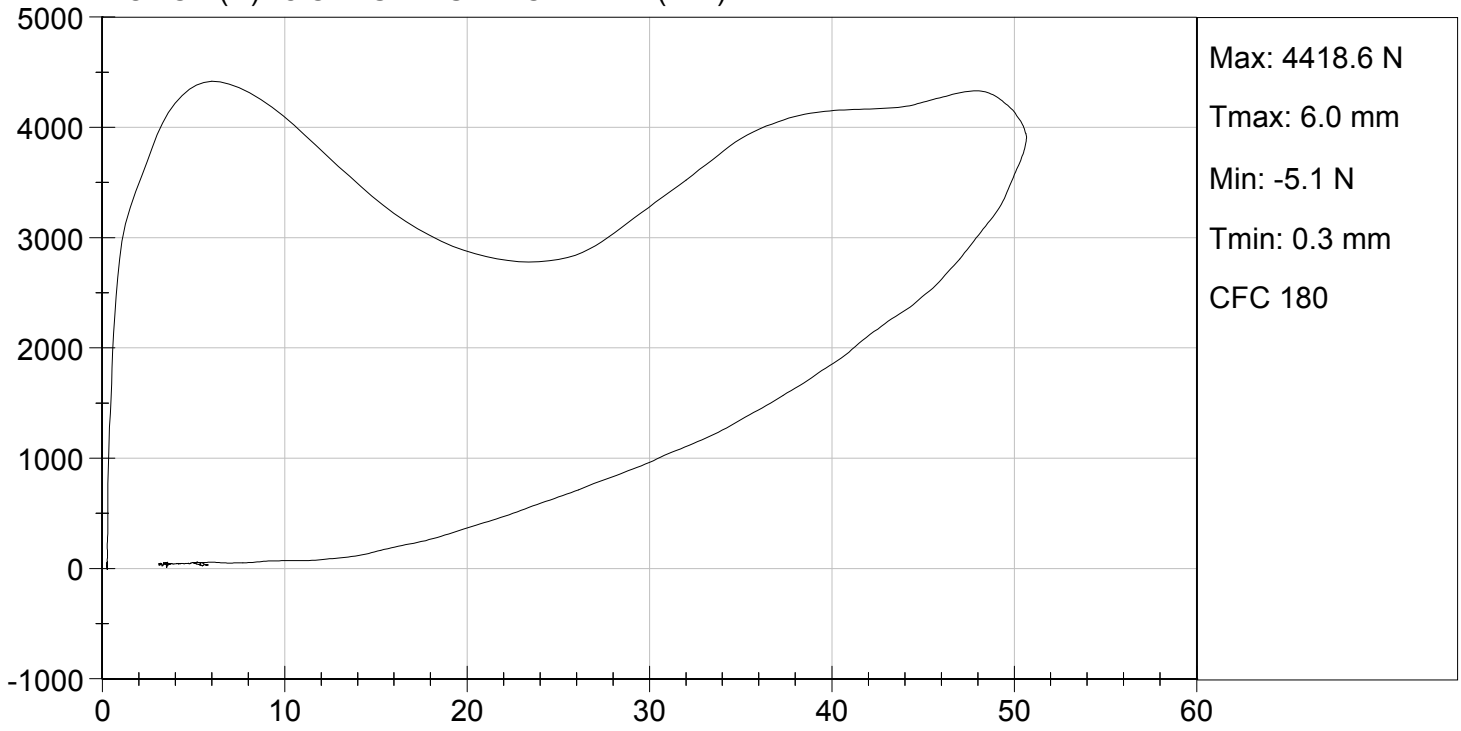
03/17/2015
Test Date

Jessica Hall
Approved By

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

TEST DATE: 03/17/2015
TEST #: D15704

FORCE (N) vs CHEST DISPLACEMENT (mm)



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D15705

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	22	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	4005	Pass
		Overall Test Results		Pass

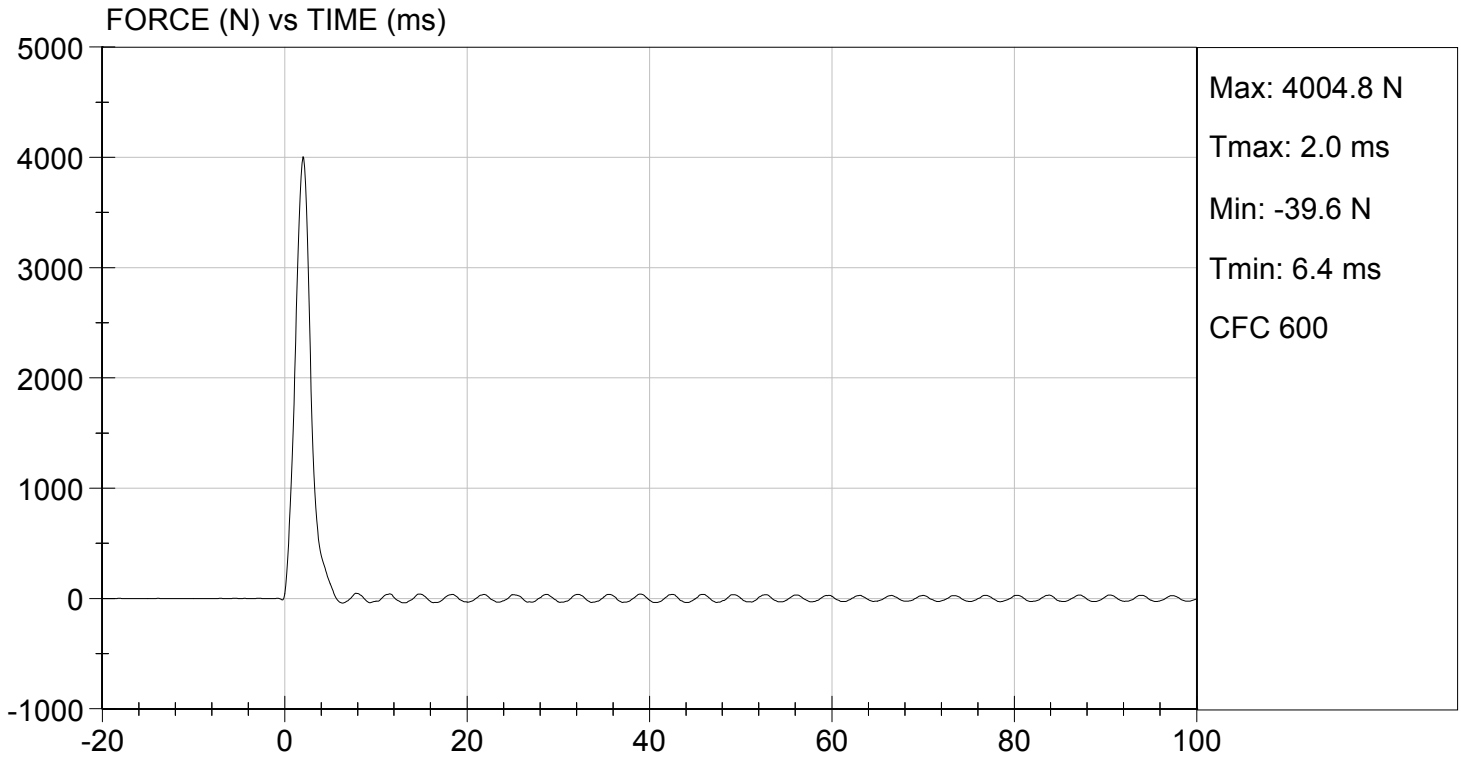
Jack Coleman
Laboratory Technician

03/17/2015
Test Date

Jessica Hall
Approved By

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

TEST DATE: 03/17/2015
TEST #: D15705



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D15706

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	22	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3741	Pass
		Overall Test Results		Pass

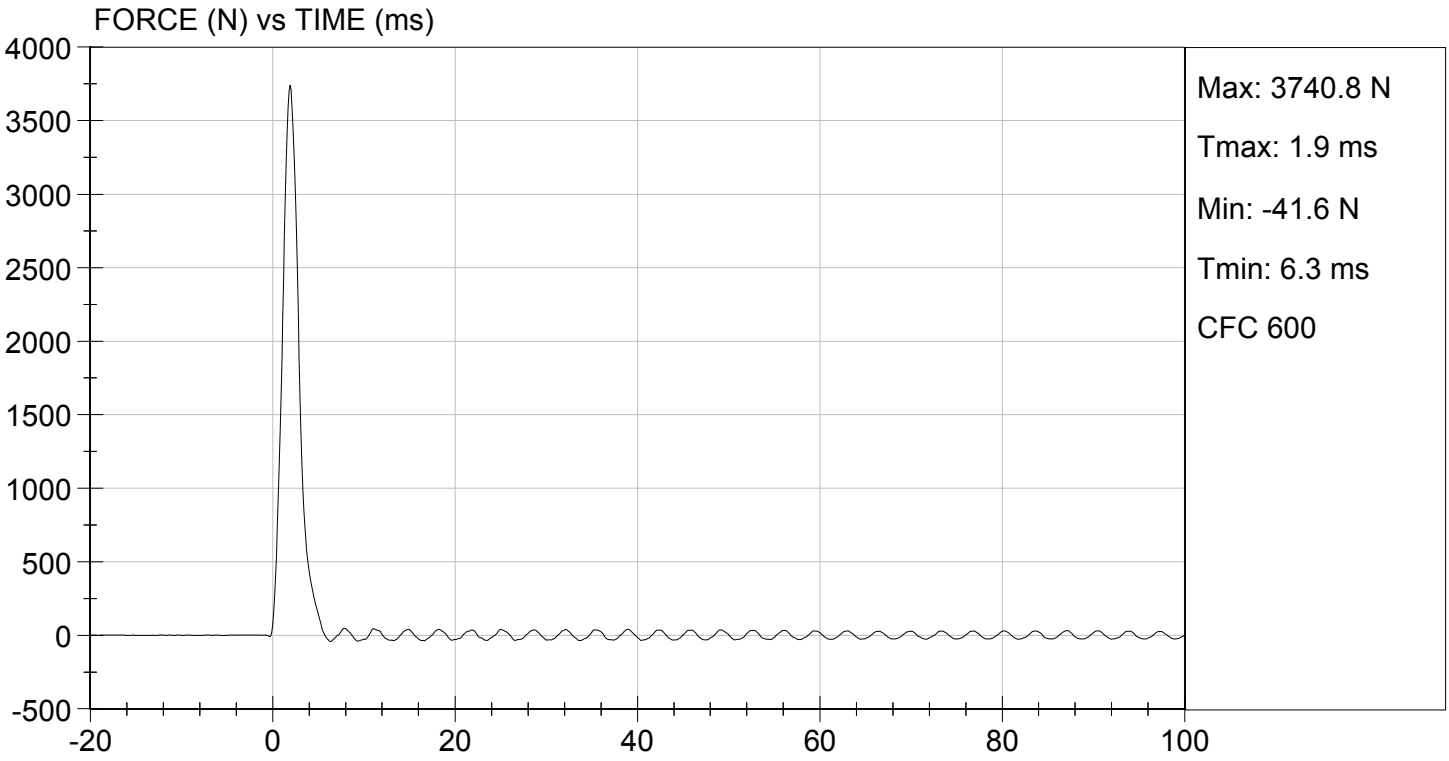
Jack Coleman
Laboratory Technician

03/17/2015
Test Date

Jessica Hall
Approved By

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

TEST DATE: 03/17/2015
TEST #: D15706



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D15707

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	22	Pass
Initial Angle	deg	0 to 20	19	Pass
Return Angle	deg	+/- 8	8	Pass
Force at 45 deg	N	320 to 390	338	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.8	Pass
		Overall Result		Pass

David Schoedel
Laboratory Technician

03/17/2015
Test Date

Jessica Gall
Approved By

MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test ID:** D15731

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	19	Pass
Peak Resultant Acceleration	G's	250 to 300	294	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	11.2	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

David Schoedel
Laboratory Technician

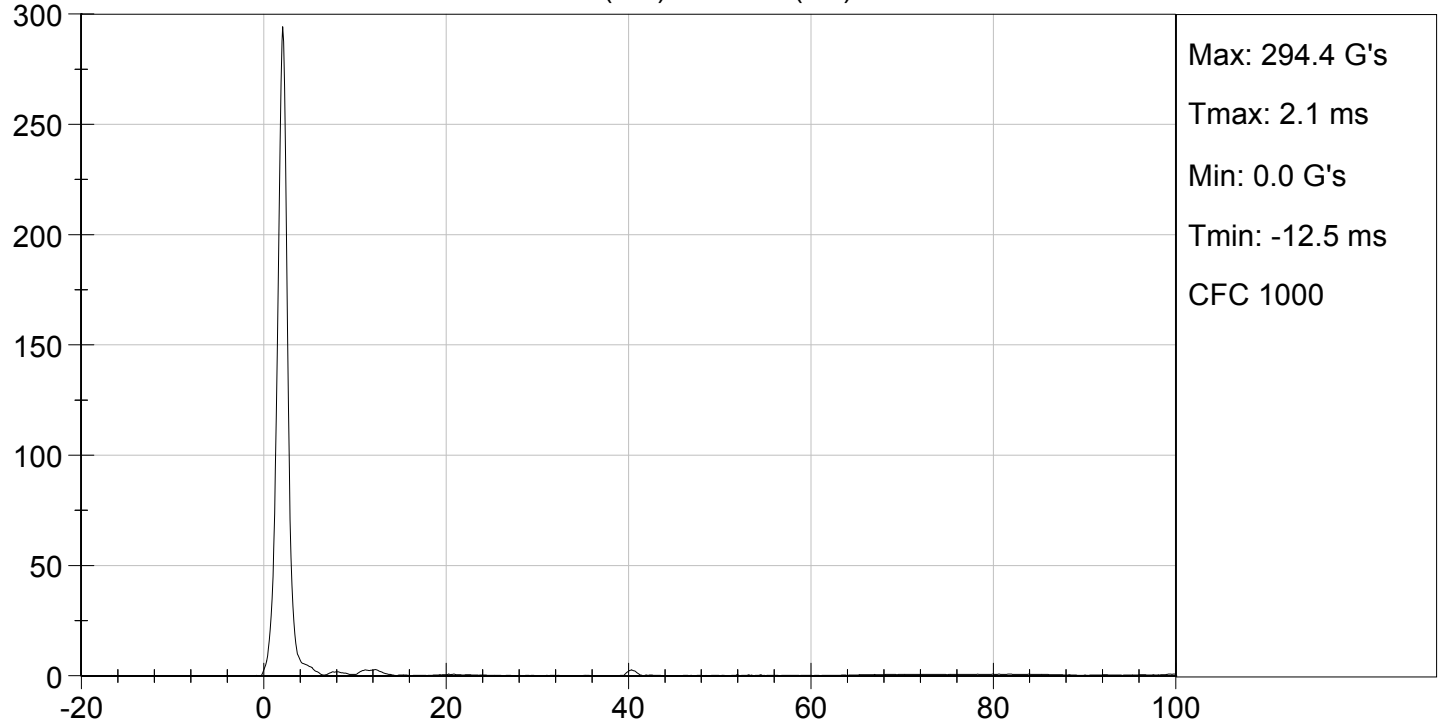
03/18/2015
Test Date

Jessica Hall
Approved By

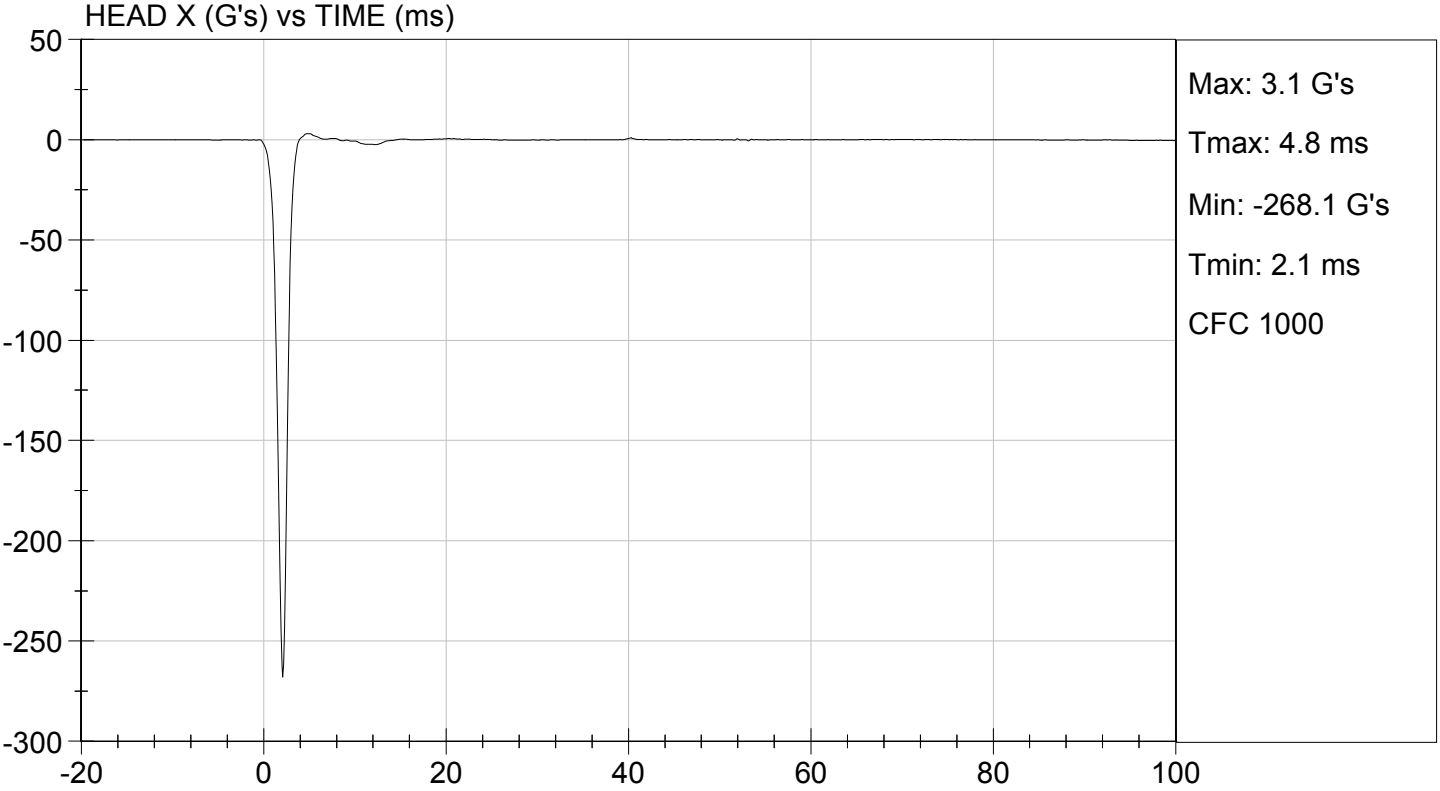
TEST DESC: HEAD DROP

TEST DATE: 03/18/2015
TEST #: D15731

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



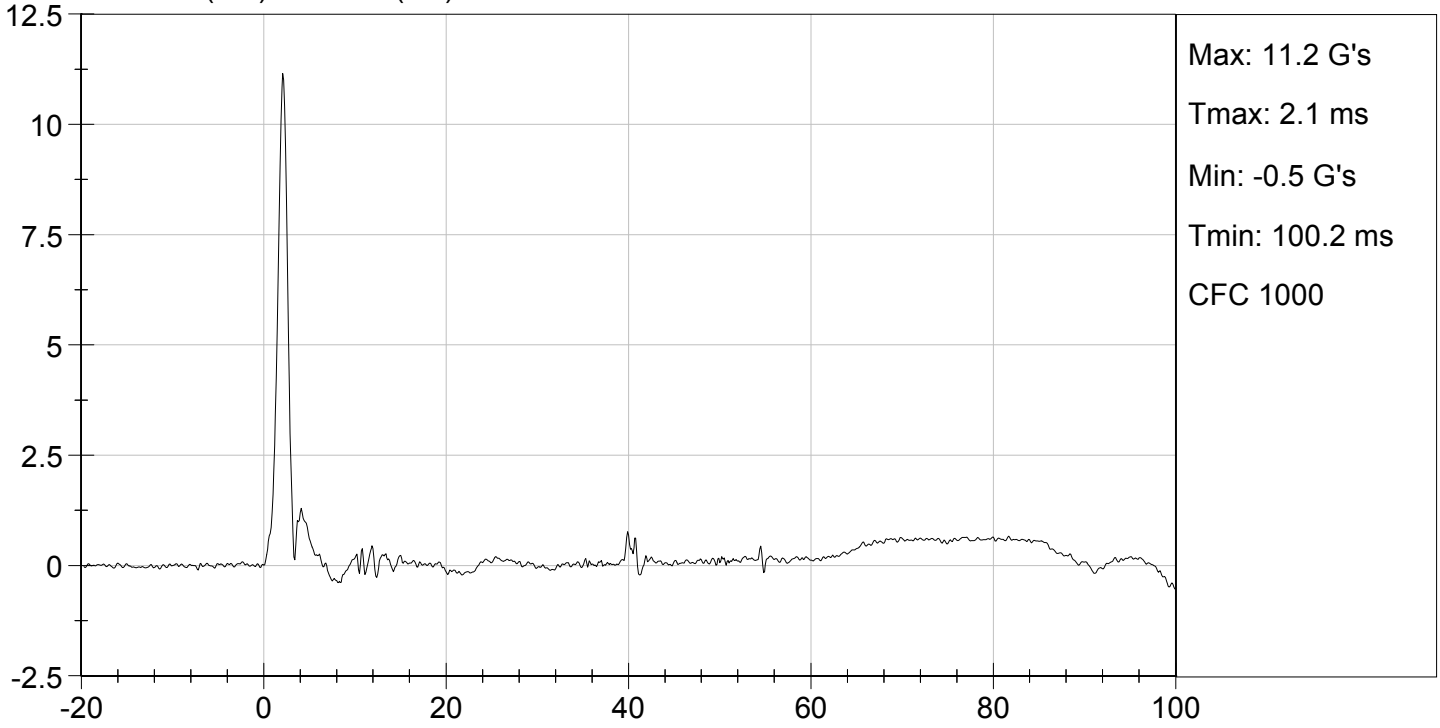
HEAD X (G's) vs TIME (ms)



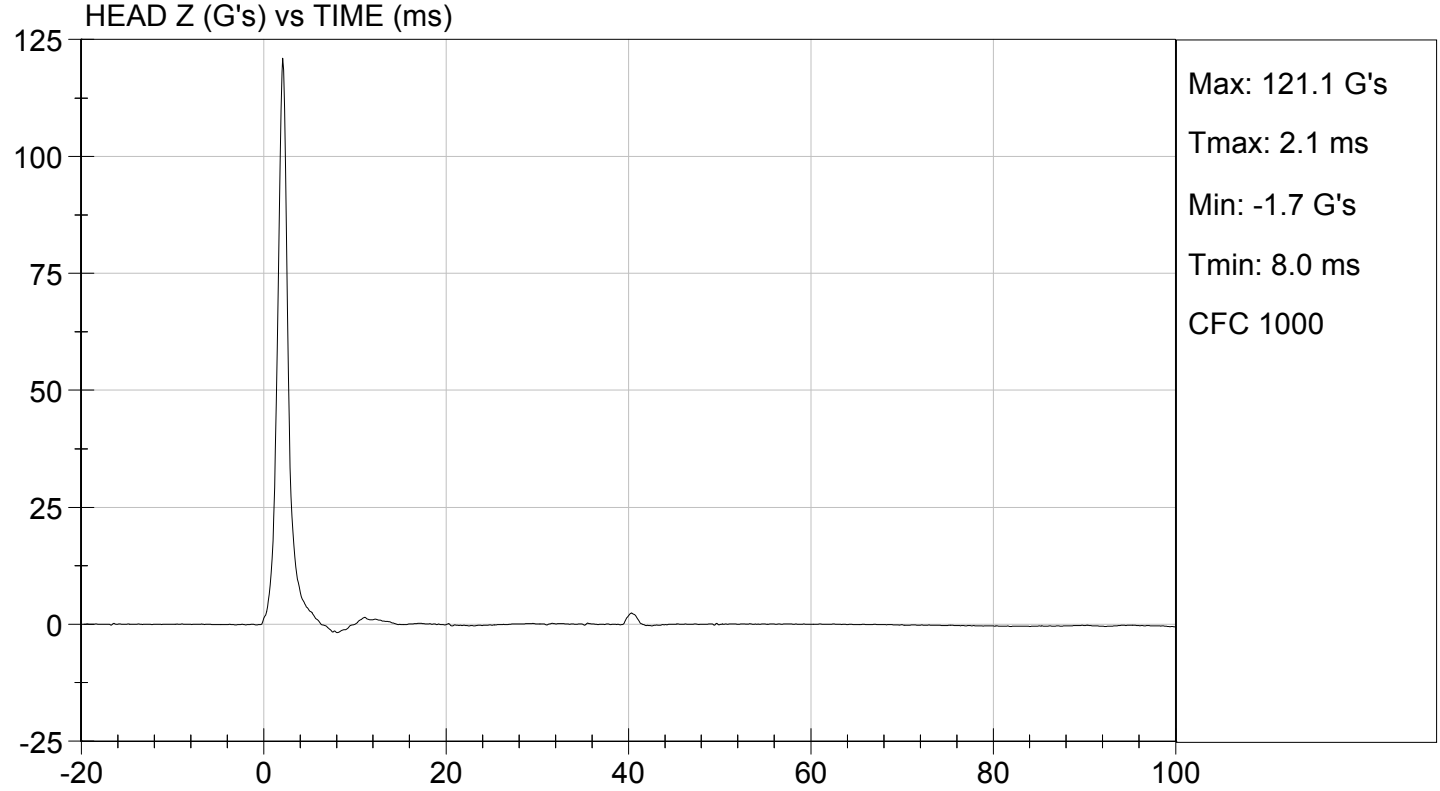
TEST DESC: HEAD DROP

TEST DATE: 03/18/2015
TEST #: D15731

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



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



MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D15732

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity		%	10 to 70	19	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.13	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.5	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	80	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	72	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	81	Pass
			Overall Results		Pass

David Schoedel

Laboratory Technician

03/18/2015

Test Date

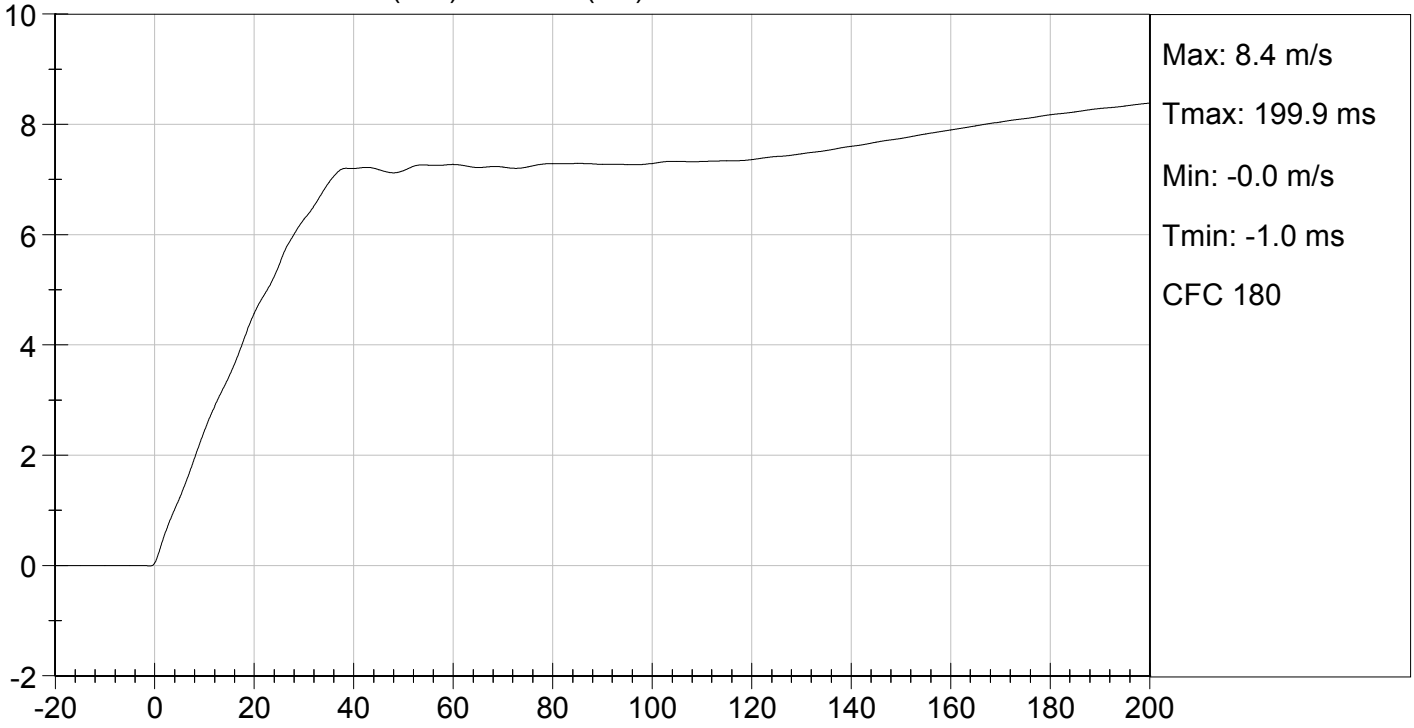
Jessica Hall

Approved By

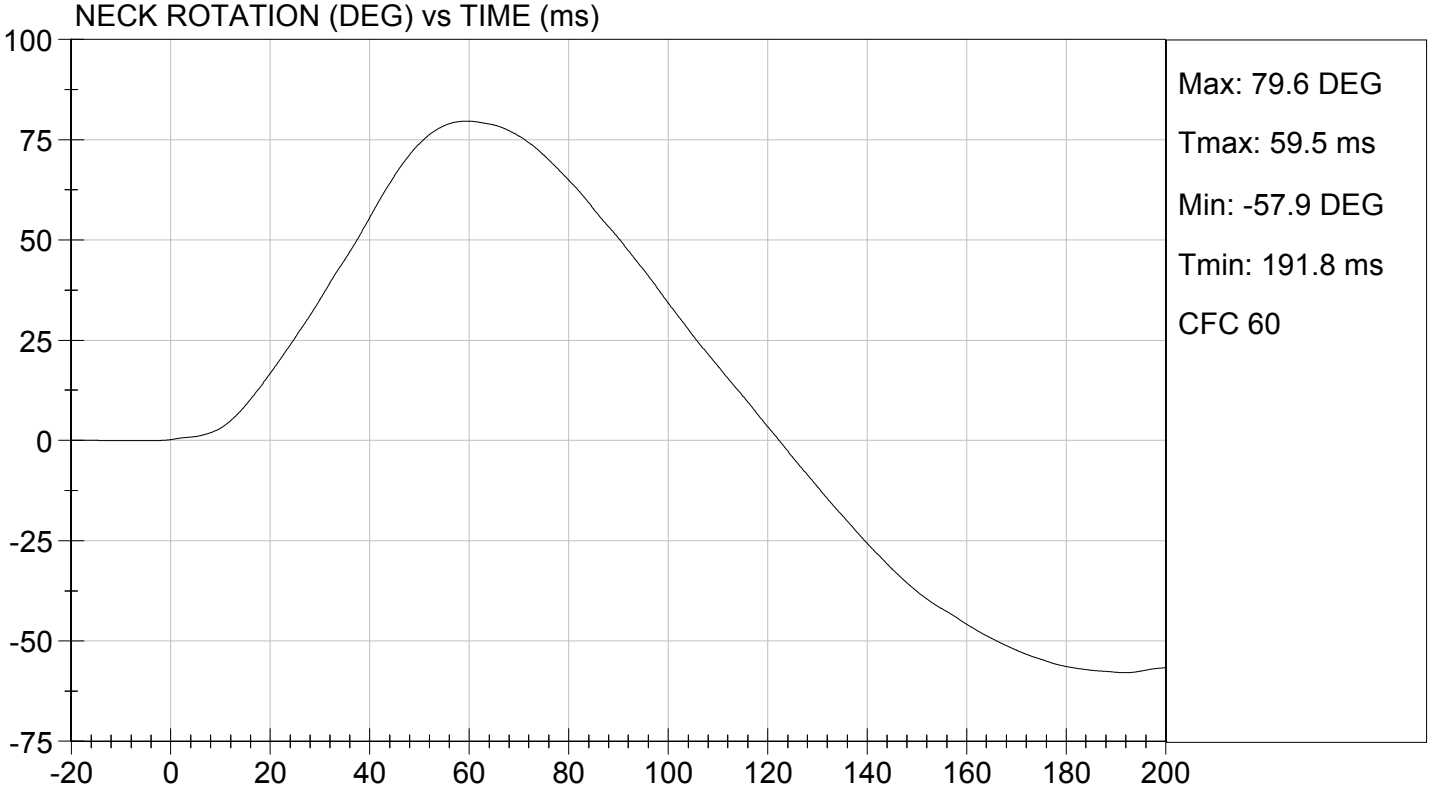
TEST DESC: NECK FLEXION
VELOCITY: 23.40 ft/s, 7.13 m/s

TEST DATE: 03/18/2015
TEST #: D15732

PENDULUM VELOCITY (m/s) vs TIME (ms)

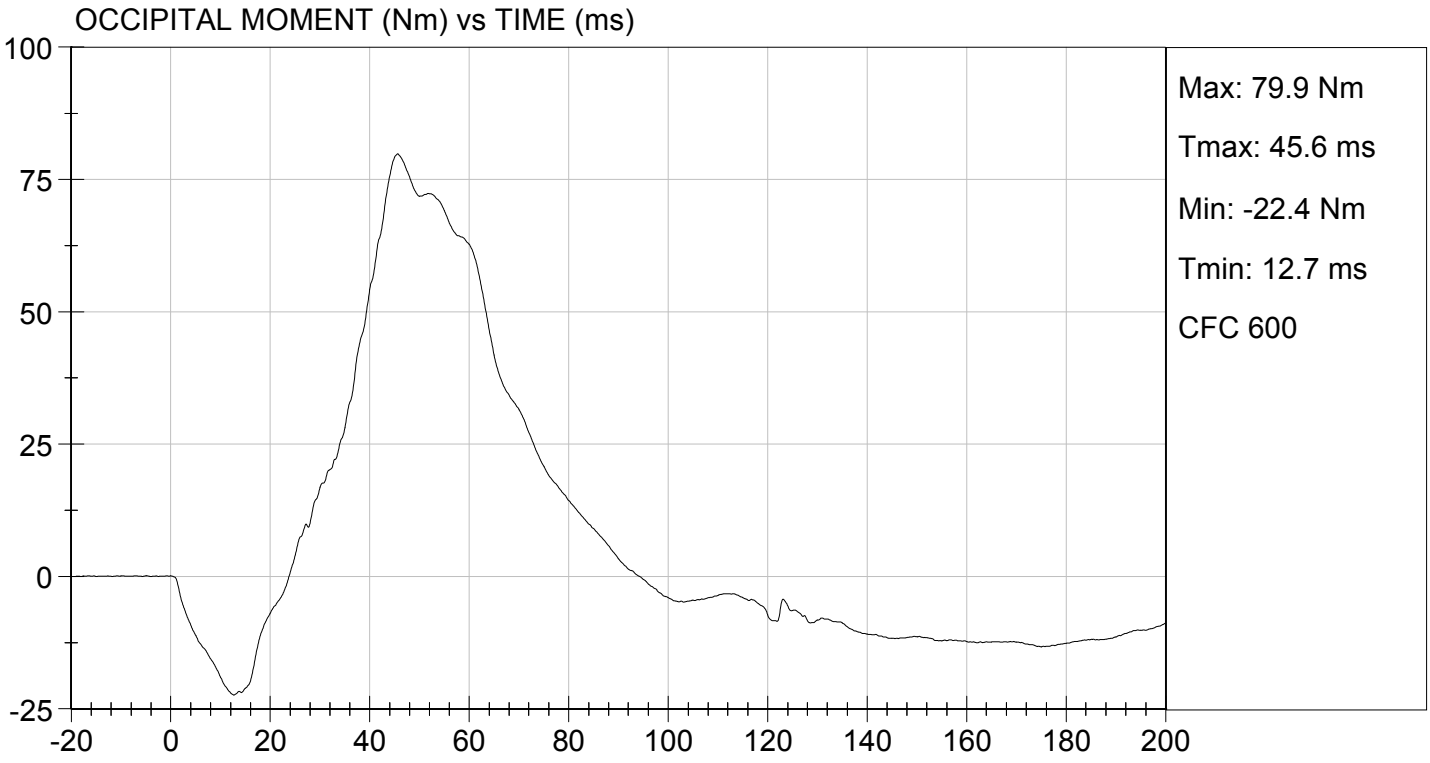


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 03/18/2015
TEST #: D15732



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D15733

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity		%	10 to 70	19	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.19	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.7	Pass
	20 ms	m/s	3.1 to 3.9	3.6	Pass
	30 ms	m/s	4.6 to 5.6	5.2	Pass
D Plane Rotation	Max	deg	99 to 114	111	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-60	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	100	Pass
			Overall Results		Pass

David Schoedel
Laboratory Technician

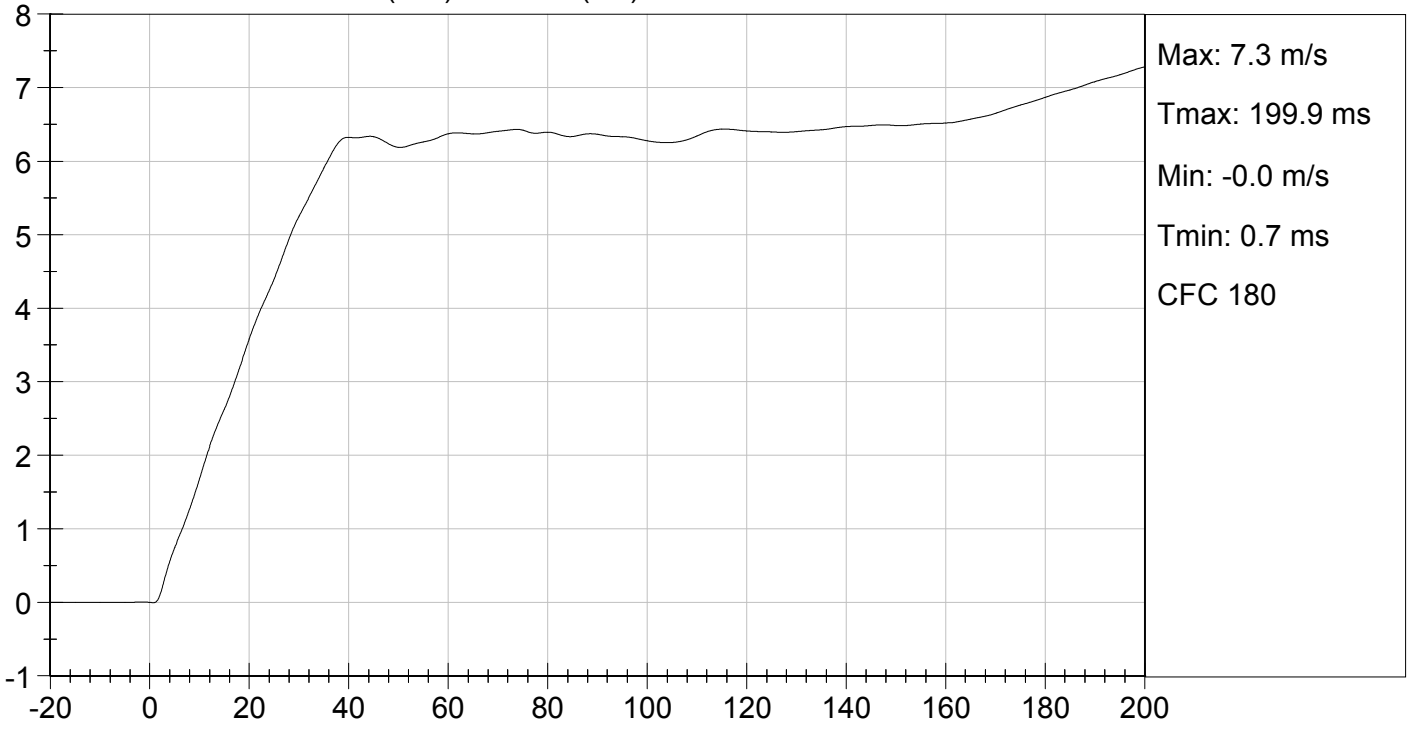
03/18/2015
Test Date

Jessica Hall
Approved By

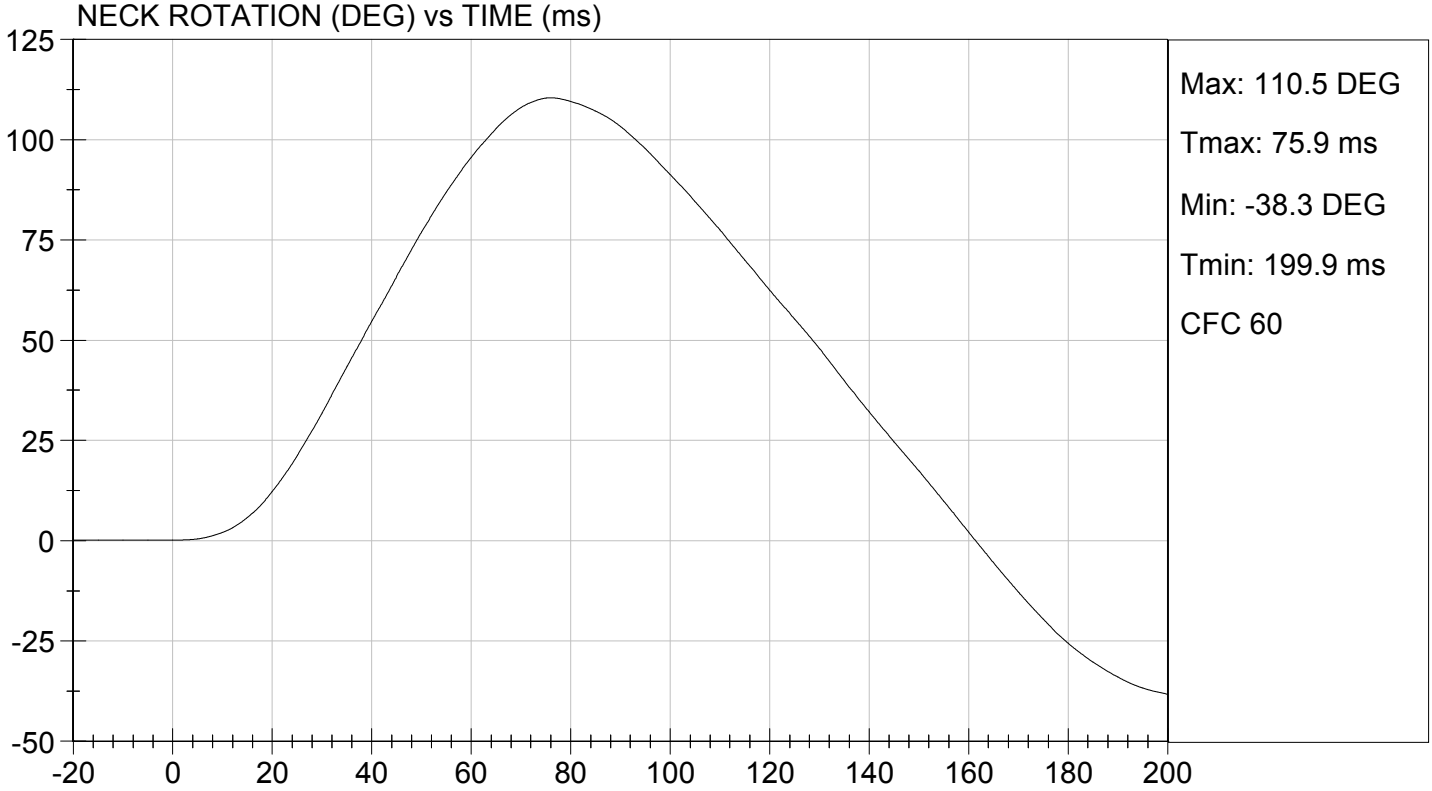
TEST DESC: NECK EXTENSION
VELOCITY: 20.30 ft/s, 6.19 m/s

TEST DATE: 03/18/2015
TEST #: D15733

PENDULUM VELOCITY (m/s) vs TIME (ms)

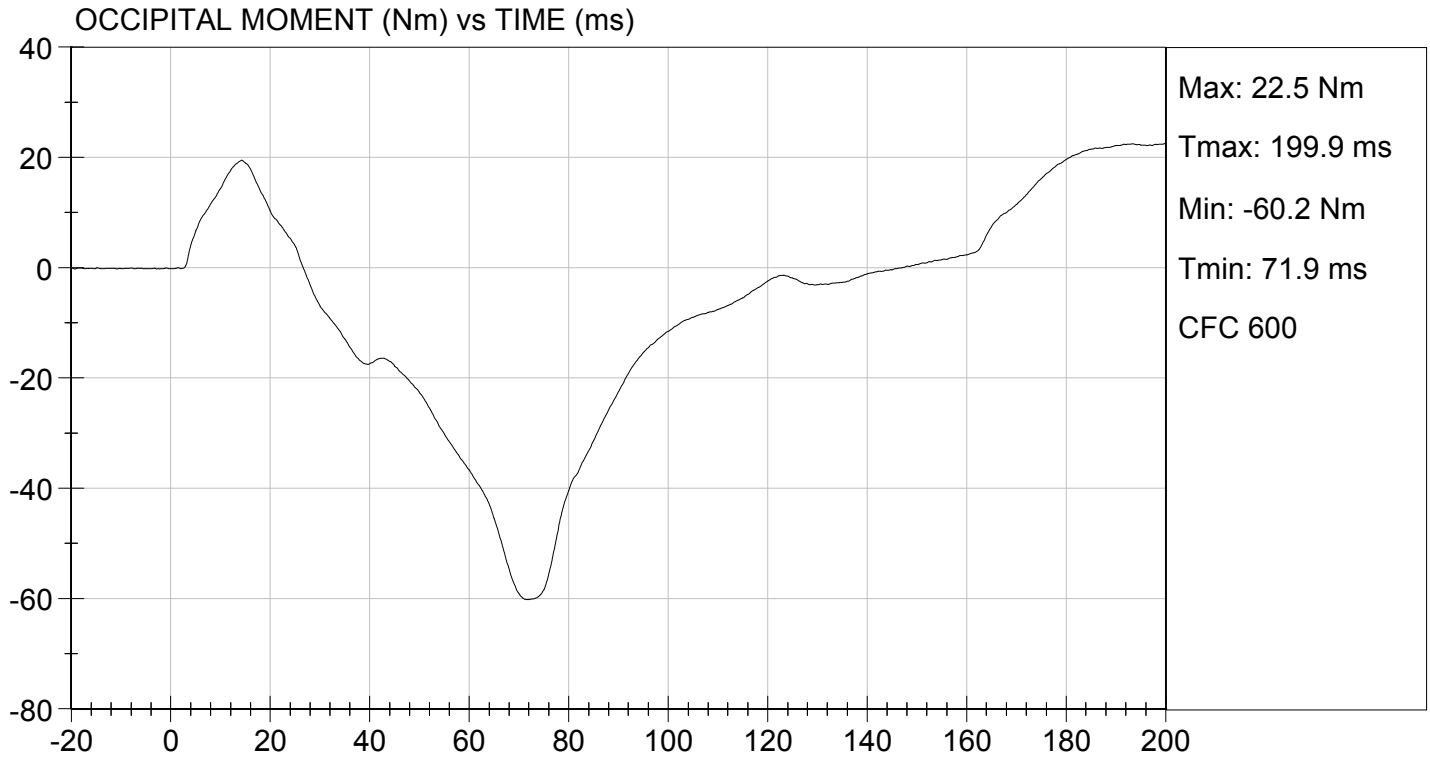


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 03/18/2015
TEST #: D15733



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D15734

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.0	Pass
Relative Humidity	%	10 to 70	21	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	4223	Pass
Internal Hysteresis	%	69 to 85	70	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4286	Pass
		Overall Test Results		Pass

Jack Coleman
Laboratory Technician

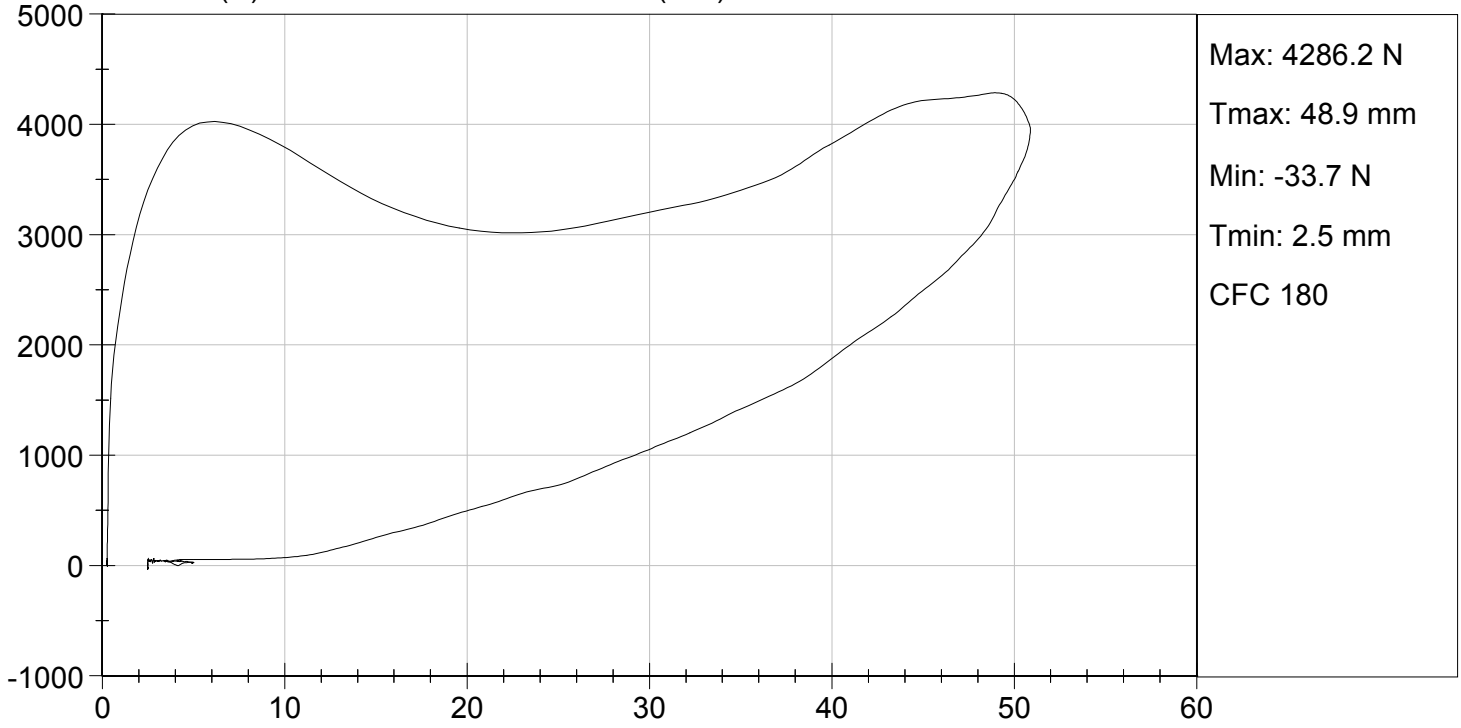
03/19/2015
Test Date

Jessica Hall
Approved By

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

TEST DATE: 03/19/2015
TEST #: D15734

FORCE (N) vs CHEST DISPLACEMENT (mm)



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D15735

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	19	Pass
Probe Speed	m/s	2.07 to 2.13	2.08	Pass
Maximum Force	N	3450 to 4060	3534	Pass
		Overall Test Results		Pass

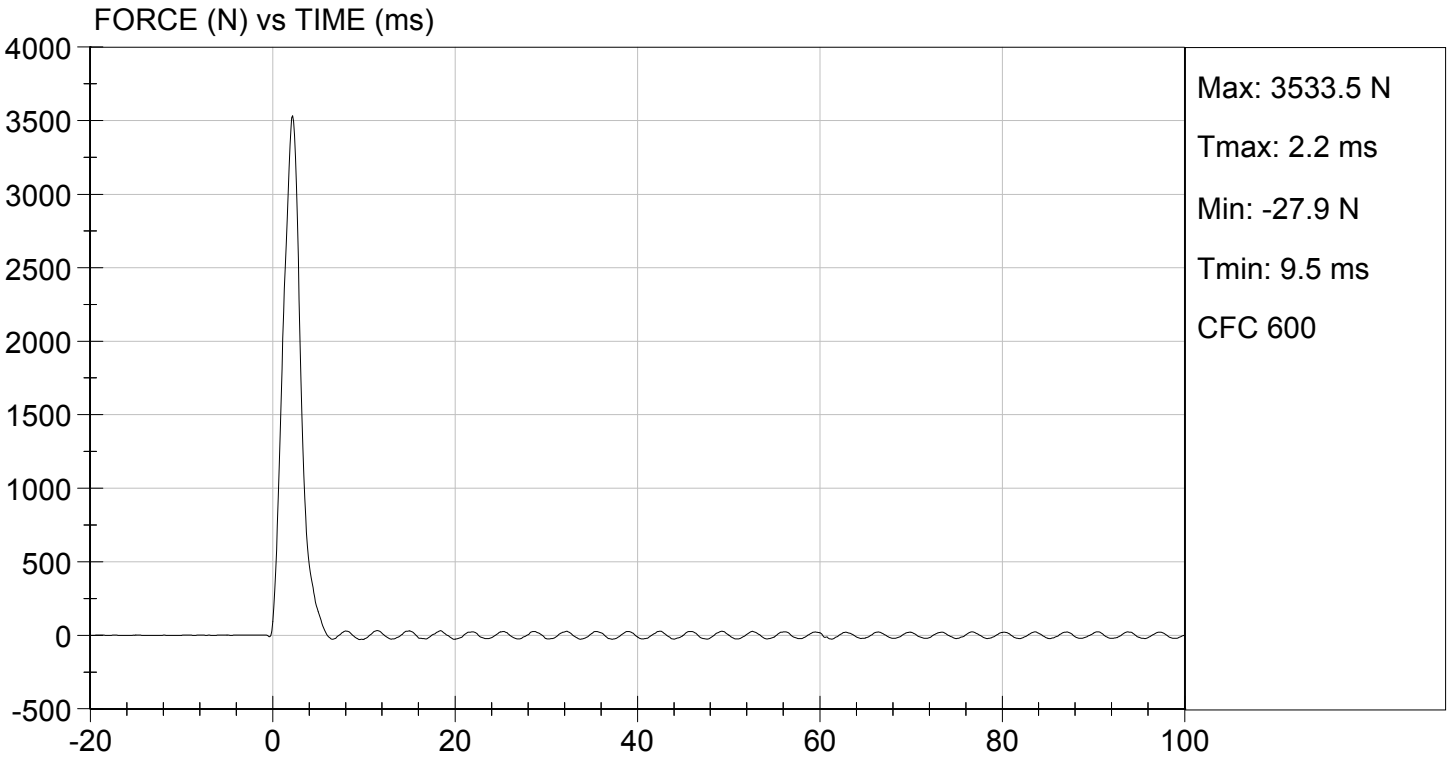
Maxime Chamberland
Laboratory Technician

03/18/2015
Test Date

Jessica Hall
Approved By

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

TEST DATE: 03/18/2015
TEST #: D15735



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D15736

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	19	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3668	Pass
		Overall Test Results		Pass

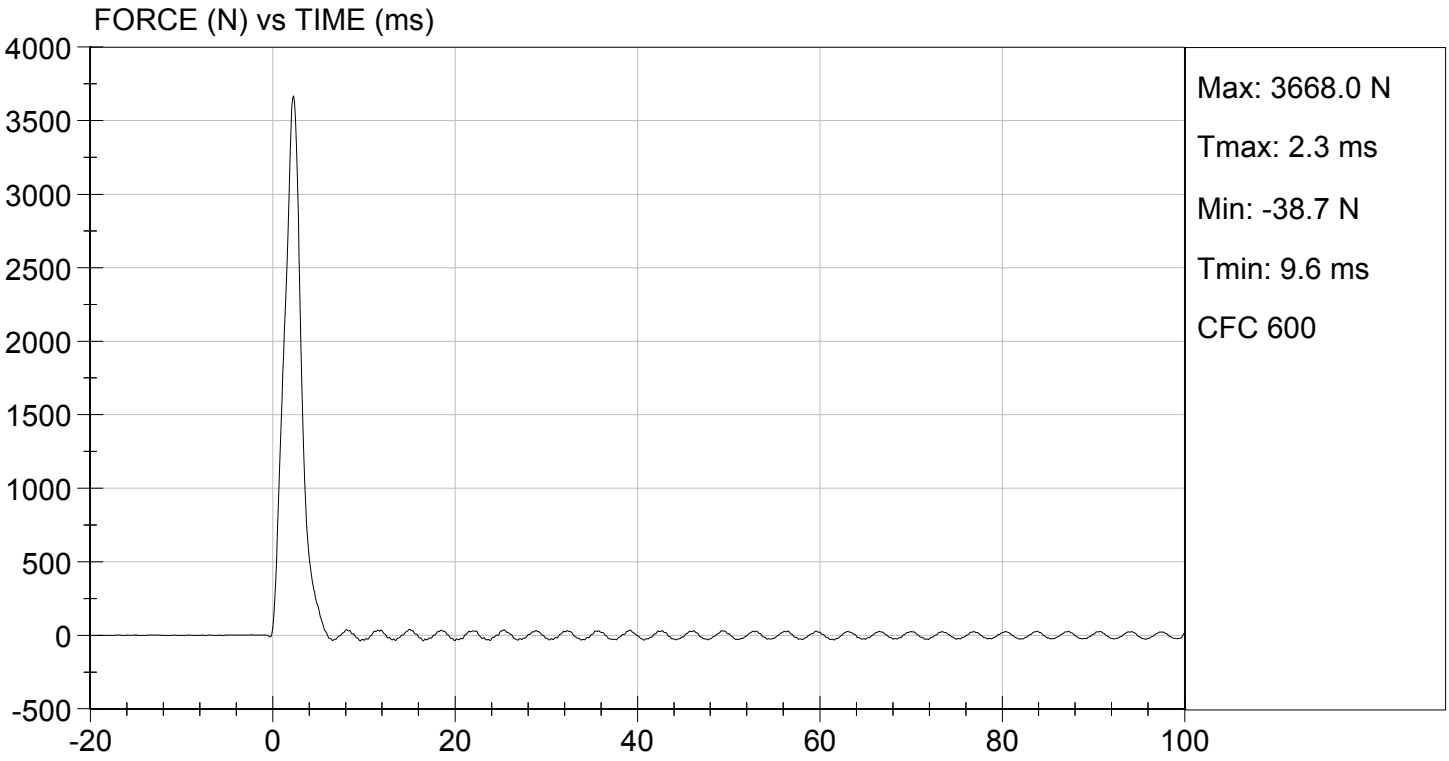
Maxime Chamberland
Laboratory Technician

03/18/2015
Test Date

Jessica Gall
Approved By

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

TEST DATE: 03/18/2015
TEST #: D15736



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D15737

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	19	Pass
Initial Angle	deg	0 to 20	18	Pass
Return Angle	deg	+/- 8	8	Pass
Force at 45 deg	N	320 to 390	324	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.9	Pass
		Overall Result		Pass

David Schoedel
Laboratory Technician

03/18/2015
Test Date

Jessica Gall
Approved By