

REPORT NUMBER: NCAP-MGA-20-009

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

**NISSAN MOTOR CO., LTD.
2020 Nissan Maxima S 4-Door Sedan
NHTSA No.: M20205206**

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



Test Date: December 12, 2019

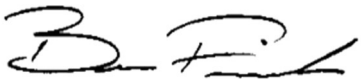
Final Report Date: March 6, 2020

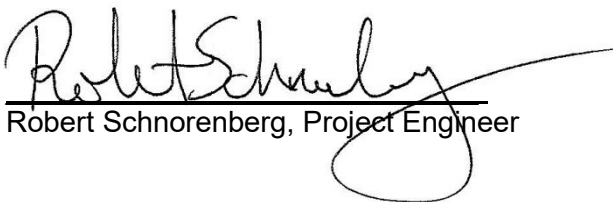
FINAL REPORT

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

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Approval Date: March 6, 2020

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

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16. Abstract A 56.3 km/h NCAP Frontal Rigid Barrier Impact Test was conducted on a 2020 Nissan Maxima S 4-Door Sedan in accordance with the specifications of the Office of Crashworthiness Standards Laboratory Procedure for NCAP Full Frontal Rigid Barrier Impact Testing. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), and 301 performance. The test was conducted at MGA Research Corporation in Burlington, Wisconsin on December 12, 2019. The impact velocity of the vehicle was 56.25 km/h and the ambient temperature at the barrier face at the time of impact was 21.4°C. The target vehicle post-test maximum crush was 529 mm located at the vehicle centerline. The test vehicle's performance was as follows: <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th rowspan="2">Units</th> <th colspan="2">Driver ATD</th> <th colspan="2">Passenger ATD</th> </tr> <tr> <th>Threshold</th> <th>Result</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₁₅)</td> <td></td> <td>700</td> <td>252</td> <td>700</td> <td>290</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>16</td> <td>52</td> <td>14</td> </tr> <tr> <td>Nij</td> <td></td> <td>1</td> <td>0.25</td> <td>1</td> <td>0.31</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4170</td> <td>1286</td> <td>2620</td> <td>551</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4000</td> <td>104</td> <td>2520</td> <td>407</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10008</td> <td>1597</td> <td>6805</td> <td>1993</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10008</td> <td>1058</td> <td>6805</td> <td>1385</td> </tr> </tbody> </table>						Measurement Description	Units	Driver ATD		Passenger ATD		Threshold	Result	Threshold	Result	Head Injury Criteria (HIC ₁₅)		700	252	700	290	Maximum Chest Compression	mm	63	16	52	14	Nij		1	0.25	1	0.31	Neck Tension	N	4170	1286	2620	551	Neck Compression	N	4000	104	2520	407	Left Femur Force	N	10008	1597	6805	1993	Right Femur Force	N	10008	1058	6805	1385
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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 693JJ919D000006. 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 Laboratory Procedure for NCAP Full Frontal Rigid Barrier Impact Testing.

SUMMARY

A load cell barrier consisting of 176 load cells was impacted by a 2020 Nissan Maxima S 4-Door Sedan at a velocity of 56.25 km/h. The test was performed at MGA Research Corporation on December 12, 2019. Pre-test and post-test photographs of the vehicle and dummies can be found in Appendix A.

Two (2) real-time cameras and sixteen (16) 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 Laboratory Procedure for NCAP Full Frontal Rigid Barrier Impact Testing.

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 installed on the driver's and passenger's lap and shoulder belts to measure dummy torso and pelvic section loading.

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

The 634 channels of data were recorded on a data acquisition system. Appendix B contains the dummy response data traces.

There was 95.4 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 529 mm located at the vehicle centerline and both the driver and passenger side doors remained closed during the impact event and were operable after the impact.

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

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

The occupant data is summarized below:

ATD position	HIC ₁₅	Nij	Neck Tension (N)	Neck Comp. (N)	3ms Chest Clip (g)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50 th)	252	0.25	1286	104	45	16	1597	1058
Passenger (5 th)	290	0.31	551	407	47	14	1993	1385

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

TEST NOTES

Camera No. 3 - Driver Close-Up video file was corrupted and could not be recovered.

Top of Engine X recorded no valid data after 30 ms.

Driver Shoulder Belt load cell was not installed.

Driver Lap Belt load cell was not installed.

Passenger Shoulder Belt load cell was not installed.

Passenger Lap Belt load cell was not installed.

Barrier C-01 Fx recorded no valid data.

Barrier C-02 Fx recorded no valid data.

Barrier C-02 My recorded no valid data.

Barrier C-02 Mz recorded no valid data.

Barrier K-15 My recorded 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: 2020 Nissan Maxima S 4-Door Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20205206
 Test Date: 12/12/2019

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	M20205206	Traction Control System (TCS)	Yes
Model Year	2019	Power Steering	Yes
Make	Nissan	Power Window Auto-Reverse	Yes
Model	Maxima S	Driver Frontal Airbag	Yes
Body Style	4-Door Sedan	Driver Curtain Airbag	Yes
VIN	1N4AA6BV9LC361538	Driver Head/Torso Airbag	No
Body Color	Carnelian Red	Driver Torso Airbag	No
Odometer (km/mi)	19 km / 12 mi	Driver Torso/Pelvis Airbag	Yes
Engine Displacement (L)	3.5 L	Driver Pelvis Airbag	No
Type/No. Cylinders	V6	Driver Knee Airbag	Yes
Engine Placement	Lateral	Front Pass. Frontal Airbag	Yes
Transmission Type	Automatic	Front Pass. Curtain Airbag	Yes
Transmission Speeds	CVT	Front Pass. Head/Torso Airbag	No
Overdrive	Yes	Front Pass. Torso Airbag	No
Final Drive	FWD	Front Pass. Torso/Pelvis Airbag	Yes
Roof Rack	No	Front Pass. Pelvis Airbag	NO
Sunroof/T-Top	No	Front Pass. Knee Airbag	Yes
Running Boards	No	Driver Pretensioner	Yes
Tilt Steering Wheel	Yes	Driver Load Limiter	Yes
Power Seats	Yes	Front Pass. Pretensioner	Yes
Anti-Lock Brakes (ABS)	Yes	Front Pass. Load Limiter	Yes
Automatic Door Locks (ADLs)	Yes	Other	N/A

Does owner's manual provide instructions to turn off automatic door locks?	No
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DATA FROM CERTIFICATION LABEL

Manufactured By	NISSAN MOTOR CO., LTD.	GVWR (kg)	2215
Date of Manufacture	08/19	GAWR Front (kg)	1145
		GAWR Rear (kg)	1000

VEHICLE SEATING AND WEIGHT CAPACITY DATA

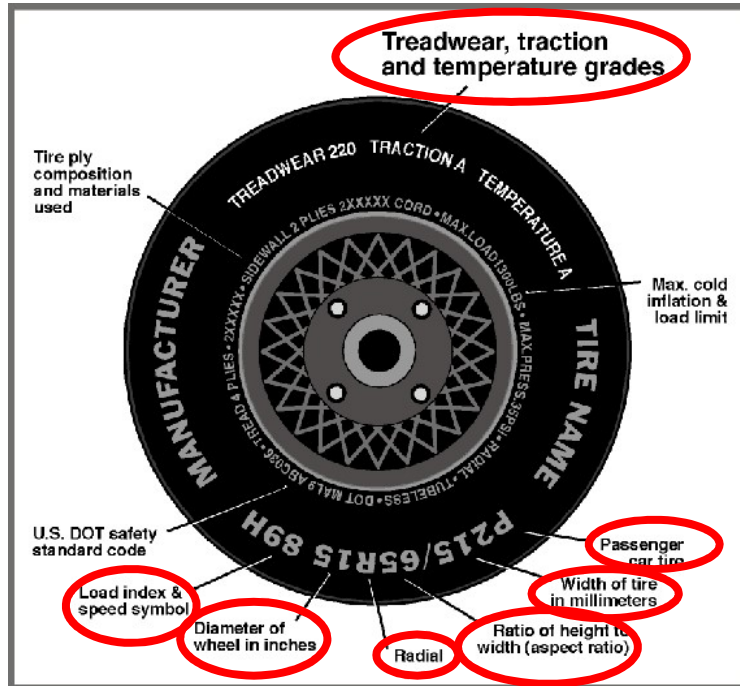
Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Contoured		
Designated Seating Capacity (DSC)	2	3		5
Capacity Weight (VCW) (kg)				408
Cargo Weight (RCLW) (kg)				68

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

Test Vehicle: 2020 Nissan Maxima S 4-Door Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20205206
 Test Date: 12/12/2019

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	230	230
Recommended Tire Size	245/45R18	245/45R18
Tire Size on Vehicle	245/48R18	245/48R18
Tire Manufacturer	Continental	Continental
Tire Model	ProContact	ProContact
Treadwear	400	400
Traction	A	A
Temperature Grade	A	A
Tire Plies Sidewall	1 Polyester	1 Polyester
Tire Plies Body	1 Polyester, 2 Steel, 1 Polyamide	1 Polyester, 2 Steel, 1 Polyamide
Load Index/Speed Symbol	96V	96V
Tire Material	Rubber	Rubber
DOT Safety Code Left	HW8V WD3E 0619	HW8V WD3E 1019
DOT Safety Code Right	HW8V WD3E 0619	HW8V WD3E 1019

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

Test Vehicle: 2020 Nissan Maxima S 4-Door Sedan
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TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	493.0	317.5		519.5	397.5	
Right	kg	503.5	303.0		524.5	377.0	
Ratio	%	61.6%	38.4%		57.4%	42.6%	
Totals	kg	996.5	620.5	1617.0	1044.0	774.5	1818.5

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1617.0
Weight of 1 P572E ATD & 1 P572O ATD	kg	141
Rated Cargo/Luggage Weight (RCLW)	kg	68
Calculated Test Vehicle Target Weight (TVTW)	kg	1826.0

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	702	713	721	713	1064
As Tested	mm	698	701	675	684	1181
Post Test	mm	774	759	688	664	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2772
Total Vehicle Length at Left Side	mm	4686
Total Vehicle Length at Centerline	mm	4904
Total Vehicle Length at Right Side	mm	4686
Weight of Ballast in Cargo Area	kg	35
Weight of Vehicle Components Removed	kg	25
Amount of Stoddard Solvent in Fuel Tank	L	63.2

List of components removed to meet test weight: None.

List of components removed for instrumentation, data box, and equipment installation: Cargo area carpet / trim, jack and tools, spare tire and cover, RR tail light, underbody plastic.

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

Test Vehicle: 2020 Nissan Maxima S 4-Door Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20205206
 Test Date: 12/12/2019

TARGET VEHICLE STRUCTURAL MEASUREMENT

	Elements	Pre-Test (mm)
1	Total Length	4904
2	Total Width	1859
3	Bumper Top Height	560
4	Bumper Bottom Height	398
5	Longitudinal Member Top Height	N/A
6	Distance between Longitudinal Members	925
7	Longitudinal Member Width	N/A
8	Engine Top Height	895
9	Engine Bottom Height	162
10	Engine and Gearbox Width	780
11	Front Bumper-Engine Distance	N/A
12	Front Shock Absorber Fixing Height	872
13	Bonnet Leading Edge Height	784
14	Front Shock Absorber Fixing Width	75
15	Front Bumper – Front Axle Distance	935
16	Front Axle – A-Pillar Distance	385
17	A-Pillar – B-Pillar Distance	1264
18	B-Pillar – Rear Axle Distance	1128
19	B-Pillar – C-Pillar Distance	682
20	Roof Sill Bottom Height	1335
21	Roof Sill Top Height	1428
22	Floor Sill Bottom Height	178
23	Floor Sill Top Height	360

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

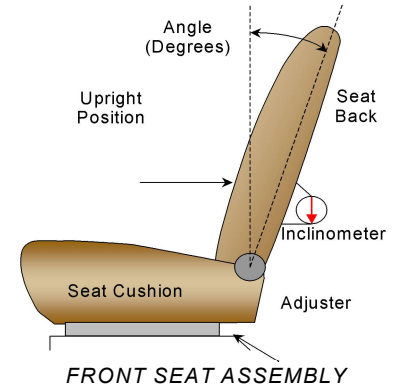
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NOMINAL DESIGN RIDING POSITION

The driver seat back is positioned as close as possible to the manufacturer's design angle. For the passenger seat back, seat back is adjusted following Appendix F, "Driver & Passenger Dummy Seating & Positioning Procedures" in the NCAP Test Procedure dated May 2018.

	Degrees
Driver Seat Back Angle	8.4° on outboard headrest post
Passenger Seat Back Angle	9.5° on outboard headrest post



SEAT FORE/AFT POSITIONS

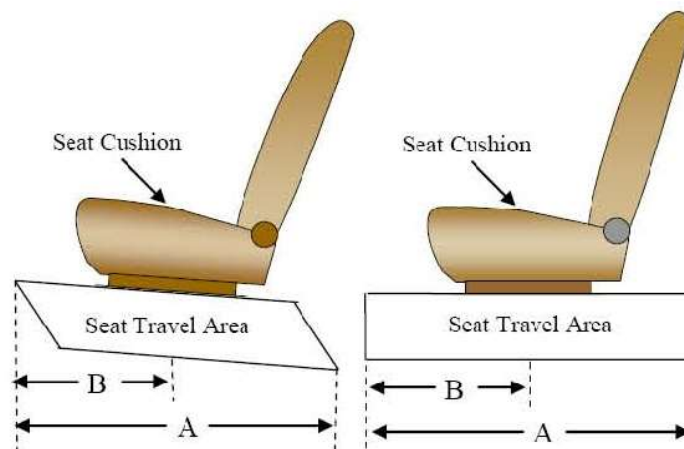
The driver and passenger seat fore/aft positions are adjusted following Appendix F, "Driver & Passenger Dummy Seating & Positioning Procedures" in the NCAP Test Procedure dated May 2018.

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	280 mm	140 mm
Passenger Seat	240 mm	0 mm

SEAT BELT UPPER ANCHORAGES

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

	Total # of Positions	Placed in Position #
Driver Seat	3 (1 st as 1)	0 (1 st as 0)
Passenger Seat	3 (1 st as 1)	0 (1 st as 0)



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

Test Vehicle: 2020 Nissan Maxima S 4-Door Sedan
 Test Program: NCAP Frontal Barrier Impact Test

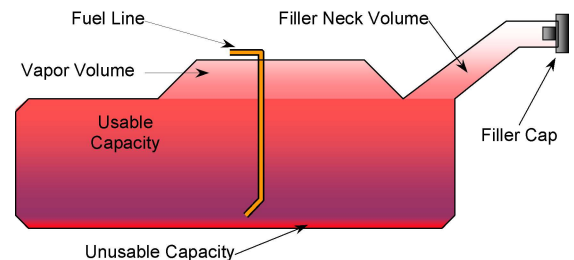
NHTSA No.: M20205206
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FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of "Standard Tank"	68.1
Usable Capacity of "Optional Tank"	
92-94% of Usable Capacity	62.7 to 64.0
Actual Amount of Solvent used	63.2
1/3 of Usable Capacity	22.7

FUEL PUMP

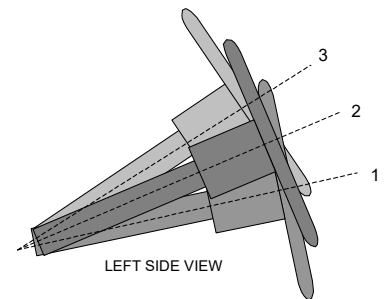
The vehicle is equipped with an electronic fuel pump. The fuel pump will run when the engine is running. The pump will also briefly run when the ignition key is turned to the "on" position. The filler neck is located on the driver's side.



VEHICLE FUEL TANK ASSEMBLY

STEERING COLUMN ADJUSTMENT

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



STEERING COLUMN ASSEMBLY

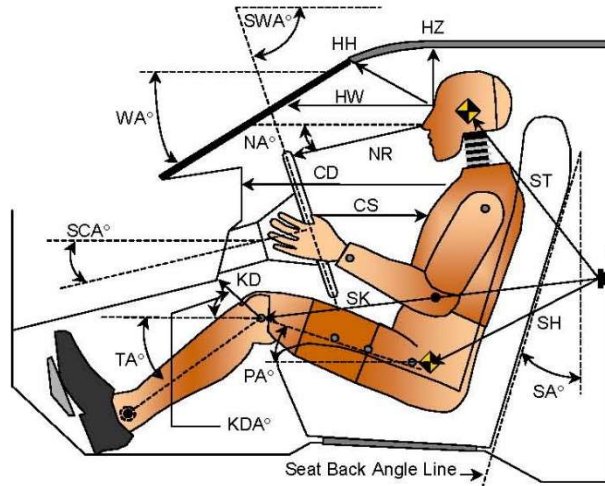
STEERING COLUMN POSITION

	Degrees	Fore/Aft Position (mm)
Lowermost Position 1	69.7	
Geometric Center Position 2	67.0	
Uppermost Position 3	64.2	
Telescoping Steering Wheel Travel		60
Test Position	67.0	30

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2020 Nissan Maxima S 4-Door Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20205206
 Test Date: 12/12/2019



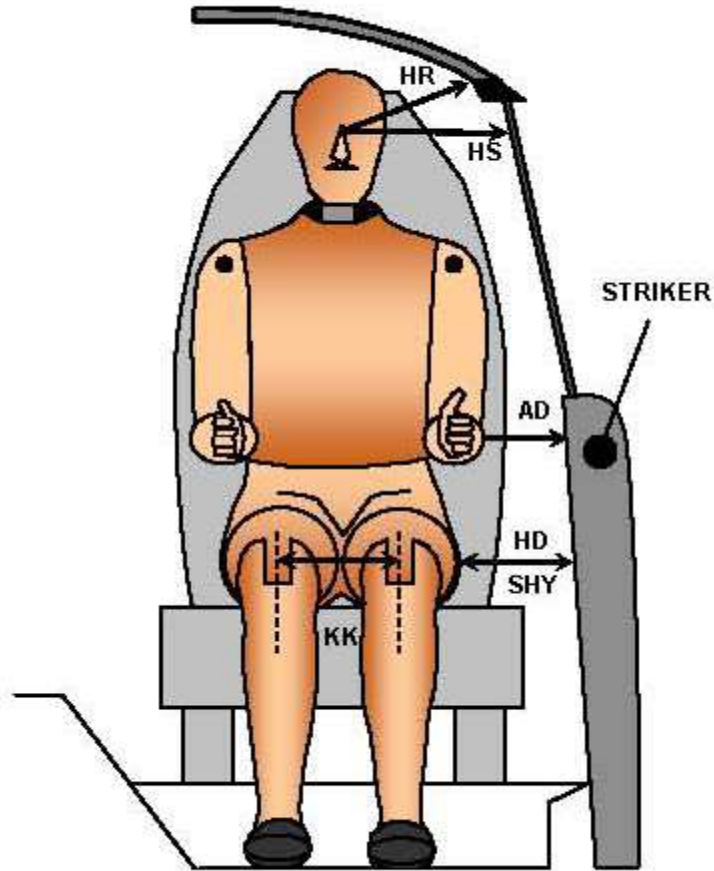
LEFT SIDE VIEW

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		21.0		
SWA°	Steering Wheel Angle		67.0		
SCA°	Steering Column Angle		23.0		
SA°	Seat Back Angle		8.4		9.5
HZ	Head to Roof (Z)	157	90	203	90
HH	Head to Header	324	23.9	311	43.1
HW	Head to Windshield	652	0	748	0
NR	Nose to Rim	359	8.3		
CD	Chest to Dash	512		429	
CS	Chest to Steering Hub	275	2.9		
RA	Rim to Abdomen	183	0		
KDL	Left Knee to Dash	178	22.0	126	34.0
KDR	Right Knee to Dash	170	23.0	140	33.4
PA°	Pelvic Angle		24.3		21.2
TA°	Tibia Angle		44.5		44.6
SK	Striker to Knee	602	88.4	657	95.1
ST	Striker to Head	537	16.3	509	26.3
SH	Striker to H-Point	162	120.4	330	104.9

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2020 Nissan Maxima S 4-Door Sedan
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NHTSA No.: M20205206
 Test Date: 12/12/2019



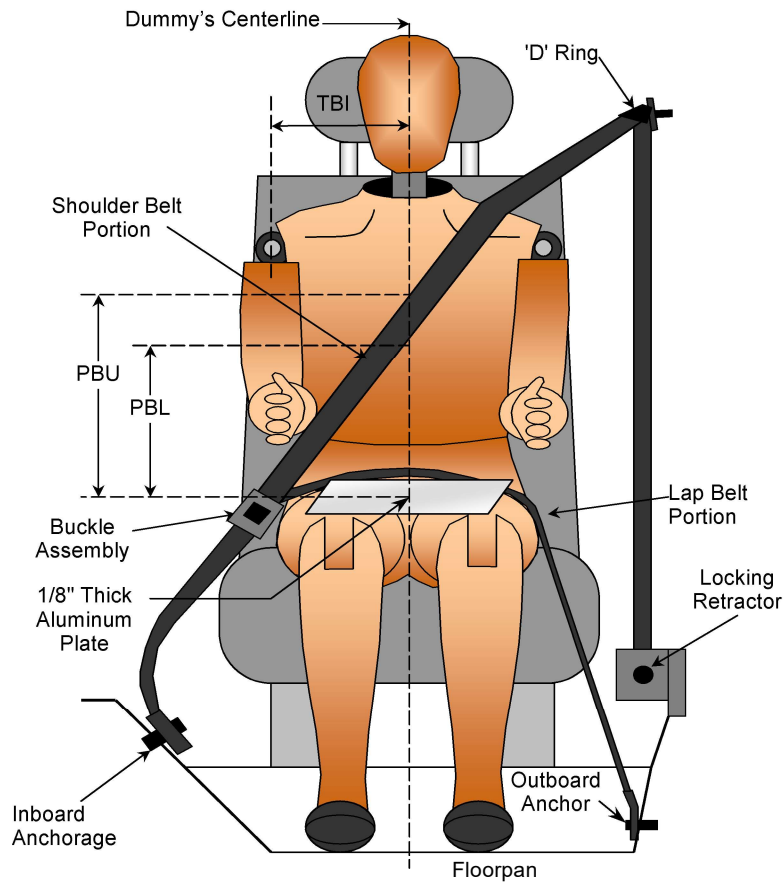
FRONT VIEW OF DUMMY

Code	Measurement Description	Driver	Passenger
		Length (mm)	
AD	Arm to Door	35	86
HD	H-Point to Door	151	184
HR	Head to Side Header	204	265
HS	Head to Side Window	328	364
KK	Knee to Knee	380	228
SHY	Striker to H-Point (Y Direction)	287	328
AA	Ankle to Ankle	385	174

DATA SHEET NO. 5 SEAT BELT POSITIONING DATA

Test Vehicle: 2020 Nissan Maxima S 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20205206
Test Date: 12/12/2019



FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	360	320
PBL - Top surface of reference to belt lower edge	mm	280	230

BELT LENGTH DATA

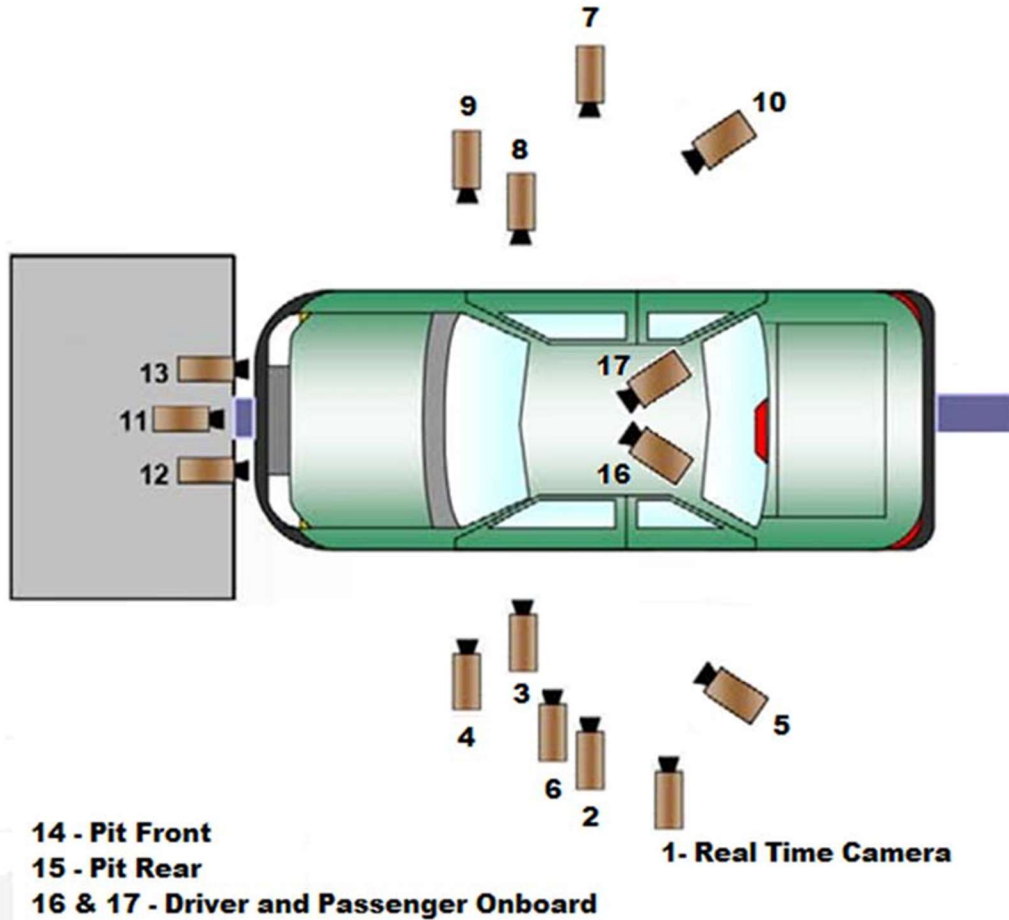
Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as measured on ATD	mm	840	880
Lap Belt Length as measured on ATD	mm	600	645
Remainder of belt on reel	mm	1160	1075
Total Belt Length for Continuous Webbing Systems	mm	3200	3200

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

Test Vehicle: 2020 Nissan Maxima S 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20205206
Test Date: 12/12/2019

CAMERA POSITIONS FOR FRONTAL IMPACTS



***Camera locations are approximate and not to scale*

DATA SHEET NO. 6 (CONTINUED)
HIGH-SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2020 Nissan Maxima S 4-Door Sedan
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CAMERA LOCATIONS

No.	Camera View	Coordinates* (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Overall					30
2	Left Overall	-2420	-6300	-1370	12	1000
3	Driver Close-Up	-1780	-6900	-1910	50	1000
4	Left Front Half	-1360	-5750	-1320	24	1000
5	Left Angle	-7250	-5750	-2020	75	1000
6	Steering Column	-1180	-5800	-1270	50	1000
7	Right Overall	-2220	-6230	-1380	12	1000
8	Passenger Close-Up	-1570	-6480	-1960	50	1000
9	Right Front Half	-1110	-5470	-1370	24	1000
10	Right Angle	-7460	-5500	-2020	75	1000
11	Windshield	80	0	-2310	11	1000
12	Driver Windshield	150	-370	-2230	25	1000
13	Passenger Windshield	150	-370	-2230	25	1000
14	Pit Front	-950	0	3340	24	1000
15	Pit Rear	-2950	0	3340	24	1000
16	Driver Onboard				12	1000
17	Passenger Onboard				12	1000
18	Real-Time Pan View					30

*COORDINATES:

+X = forward of impact plane

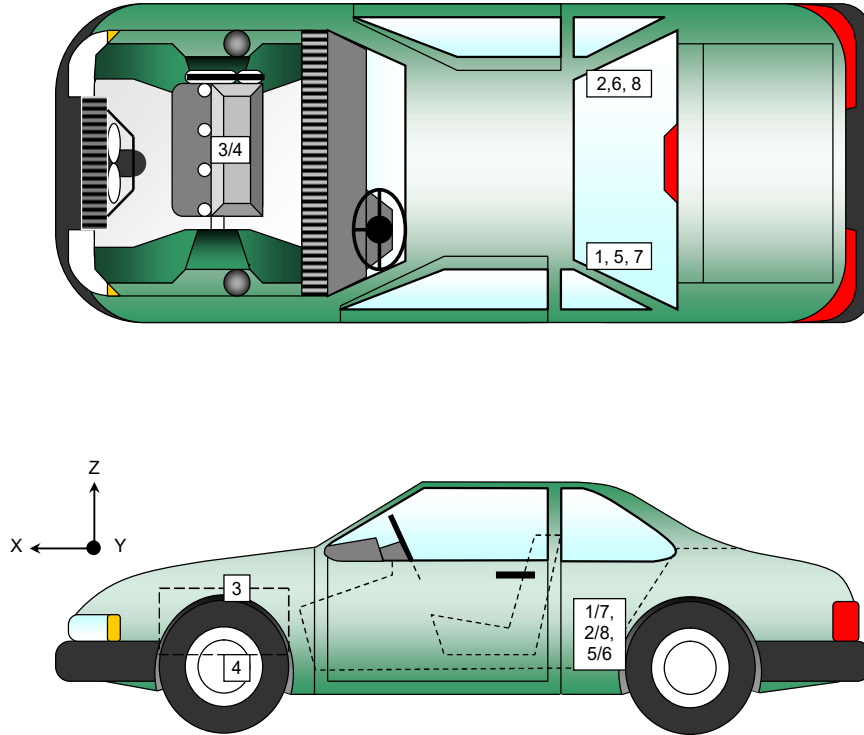
+Y = right of monorail centerline

+Z = below ground level

DATA SHEET NO. 7 VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2020 Nissan Maxima S 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20205206
Test Date: 12/12/2019



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Crossmember Accelerometer – X Direction	1962	-300	-222
2	Right Rear Crossmember Accelerometer – X Direction	1962	300	-220
3	Engine Top X	3986	75	-868
4	Engine Bottom X	4012	102	-260
5	Left Rear Crossmember Accelerometer – Z Direction	1962	-300	-222
6	Right Rear Crossmember Accelerometer – Z Direction	1962	300	-220
7	Left Rear Crossmember Accelerometer Redundant – X Direction	1962	-335	-222
8	Right Rear Crossmember Accelerometer Redundant – X Direction	1962	335	-220

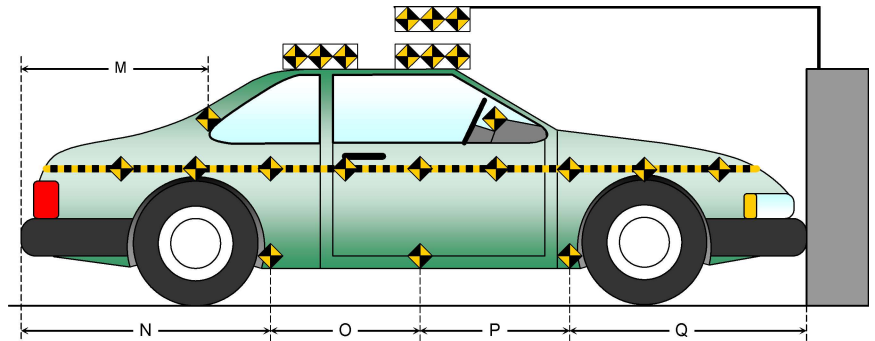
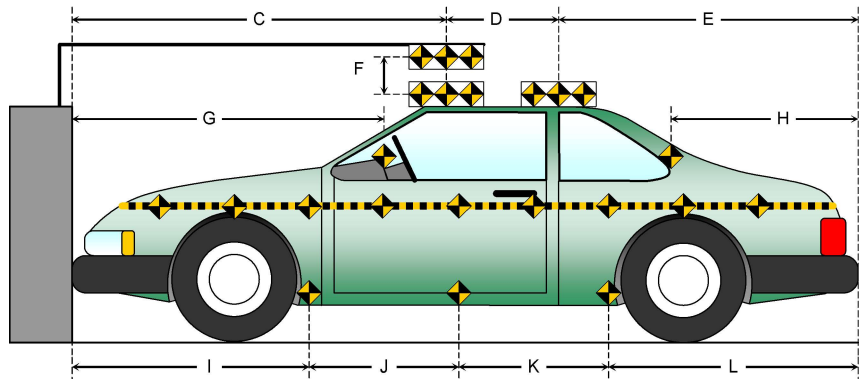
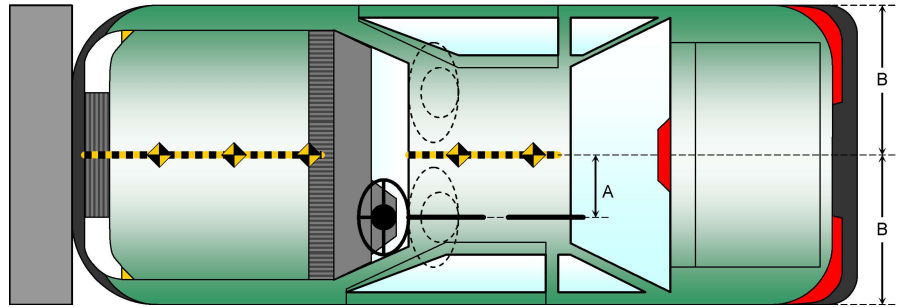
Reference Points: X - Rear Surface of Vehicle (+ forward)
Y - Vehicle Centerline (+ to right)
Z - Ground Plane (+ down)

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

Test Vehicle: 2020 Nissan Maxima S 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20205206
Test Date: 12/12/2019

Item	Value (mm)
A	370
B	930
C	2415
D	610
E	1879
F	180
G	
H	1235
I	1474
J	962
K	962
L	1506
M	1235
N	1506
O	962
P	962
Q	1474



DATA SHEET NO. 9
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2020 Nissan Maxima S 4-Door Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20205206
 Test Date: 12/12/2019

ADVANCED RESEARCH LOAD CELL BARRIER

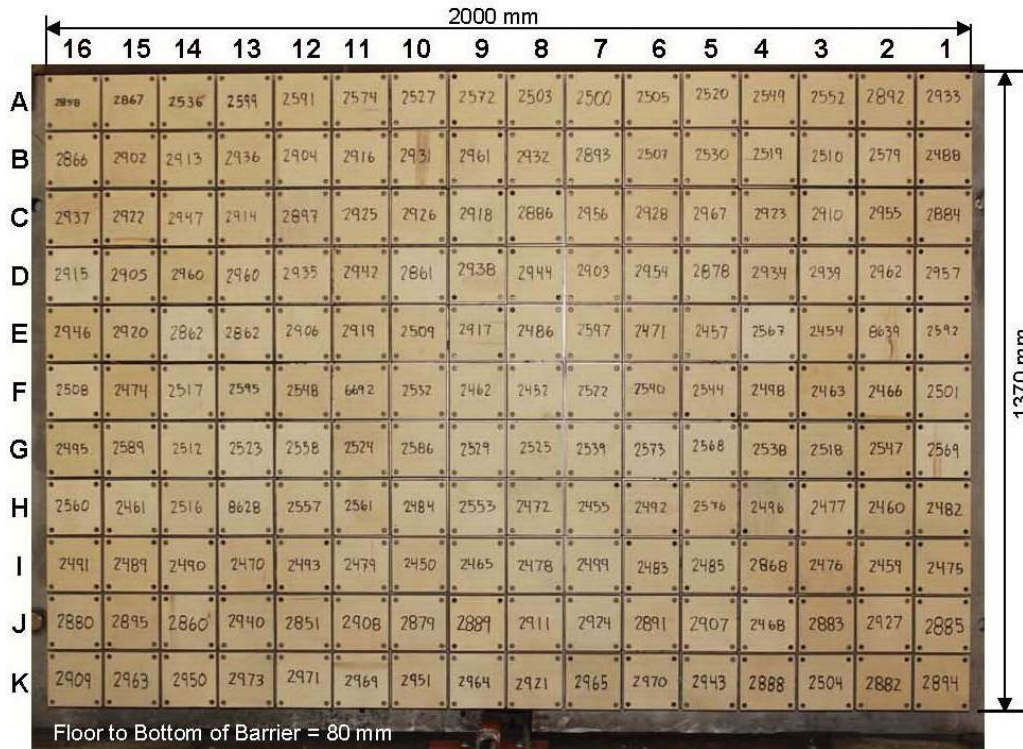


Photo for Reference Only

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: 2020 Nissan Maxima S 4-Door Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20205206
 Test Date: 12/12/2019

INSTRUMENTATION

Instrumentation	Number of Channels Collected
Driver Dummy Data Channels	49
Passenger Dummy Data Channels	49
Vehicle Structure Accelerometers	8
Barrier Channels	528
Total	634

CAMERA COVERAGE

Type of Camera	Number Used in this Test
High-Speed Vehicle Onboard	2
High-Speed Offboard	14
Real-Time	2
Total	18

DATA SHEET NO. 11
POST-TEST OBSERVATIONS

Test Vehicle: 2020 Nissan Maxima S 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20205206
Test Date: 12/12/2019

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

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

DOOR OPENING, TRUNK OPENING, AND SEAT TRACK INFORMATION

Description	Driver	Passenger
Locked/Unlocked Doors	Doors were locked	Doors were locked
Front Door Opening	Remained closed and locked; opened without tools	Remained closed and locked; opened without tools
Rear Door Opening	Remained closed and locked; opened without tools	Remained closed and locked; opened without tools
Trunk/Hatch/Tailgate Opening	Remained closed; opened without tools	
Seat Track Shift (mm)	0	0
Seat Back Movement	None	None

OTHER VEHICLE POST-TEST OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Windshield Damage	Cracked
Window Damage	None
Other Notable Effects	Doors required manual unlock from inside vehicle

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	1345
Center	mm	1270
Right Side	mm	1295
Average	mm	1303

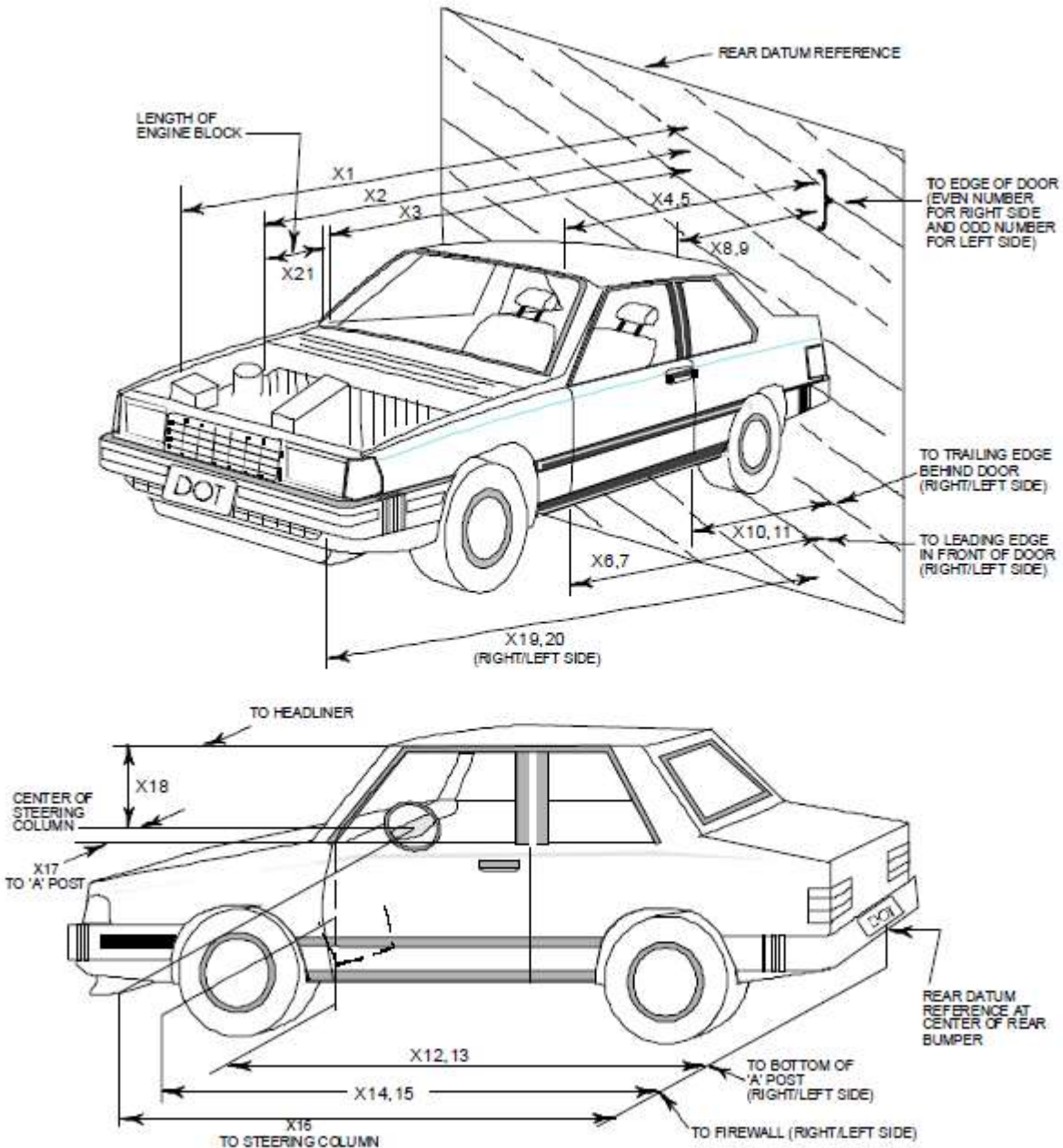
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Driver		Passenger	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	Yes	Yes	Yes
Curtain Side Airbag	Yes	No	Yes	No
Torso/Pelvis Side Airbag	Yes	No	Yes	No
Knee Airbag	Yes	Yes	Yes	Yes
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes		Yes	
Other				

DATA SHEET NO. 12
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2020 Nissan Maxima S 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20205206
Test Date: 12/12/2019



DATA SHEET NO. 12 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2020 Nissan Maxima S 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20205206
Test Date: 12/12/2019

No.	Measurement Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	4904	4375	529
2	RSOV to Front of Engine	4330	4087	243
3	RSOV to Firewall	3802	3694	108
4	RSOV to Upper Leading Edge of Right Door	3331	3316	15
5	RSOV to Upper Leading Edge of Left Door	3331	3313	18
6	RSOV to Lower Leading Edge of Right Door	3335	3324	11
7	RSOV to Lower Leading Edge of Left Door	3335	3330	5
8	RSOV to Upper Trailing Edge of Right Door	2189	2172	17
9	RSOV to Upper Trailing Edge of Left Door	2189	2173	16
10	RSOV to Lower Trailing Edge of Right Door	2200	2193	7
11	RSOV to Lower Trailing Edge of Left Door	2200	2195	5
12	RSOV to Bottom of "A" Post of Right Side	3305	3321	-16
13	RSOV to Bottom of "A" Post of Left Side	3302	3298	4
14	RSOV to Firewall, Right Side	3841	3661	180
15	RSOV to Firewall, Left Side	3831	3753	78
16	RSOV to Steering Column	2850	2854	-4
17	Center of Steering Column to "A" Post	360	393	-33
18	Center of Steering Column to Headliner	399	461	-62
19	RSOV to Right Side of Front Bumper	4686	4321	365
20	RSOV to Left Side of Front Bumper	4686	4330	356
21	Length of Engine Block	541	541	0
RD	RSOV to Right Side of Dash Panel	3125	3092	33
CD	RSOV to Center of Dash Panel	3128	3116	12
LD	RSOV to Left Side of Dash Panel	3125	3074	51

All Dimensions in mm

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2020 Nissan Maxima S 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20205206
Test Date: 12/12/2019

VEHICLE INFORMATION

VIN: 1N4AA6BV9LC361538
Vehicle Size Category: Passenger Car

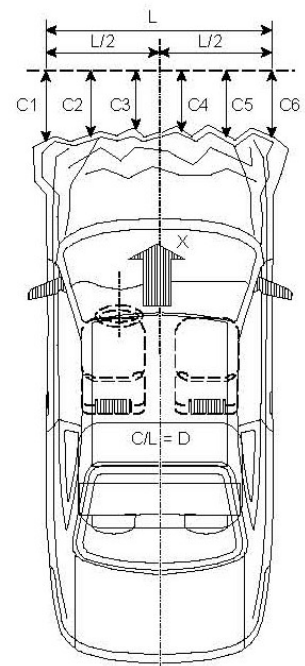
Wheelbase (mm): 2772
Test Weight (kg): 1818.5

ACCELEROMETER DATA

Accelerometer Locations: As per Data Sheet No. 7
Cal. Procedure/Interval: MGA Procedure / 6 month
Integration Algorithm: Trapezoidal
Linearity: > 99%
Impact Velocity (km/h): 56.25
Velocity Change (km/h): 66.7
Time of Separation (msec) 107

CRUSH PROFILE

Collision Deformation Classification: 12FDEW2
Midpoint of Damage: Centerline
Damage Region Length (mm): 1304
Impact Mode: Frontal



No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4686	4330	356
C2	Crush zone 2 at left side	mm	4785	4357	428
C3	Crush zone 3 at left side	mm	4850	4376	474
C4	Crush zone 4 at right side	mm	4850	4363	487
C5	Crush zone 5 at right side	mm	4785	4344	441
C6	Crush zone 6 at right side	mm	4686	4321	365
L	C1 TO C6	mm	1304	1284	20

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2020 Nissan Maxima S 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test

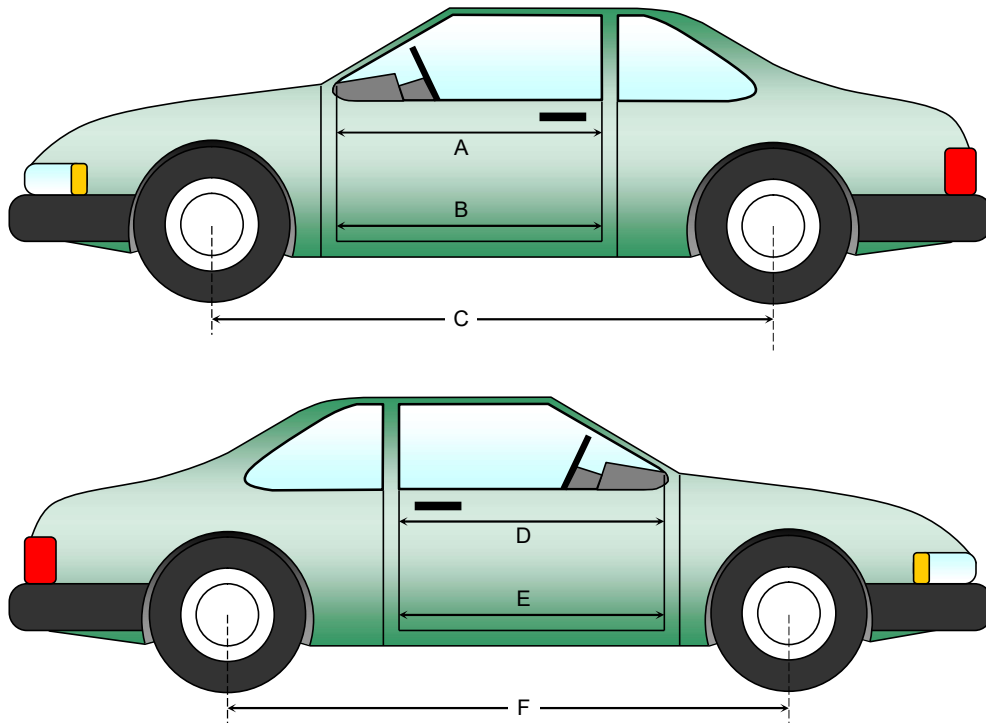
NHTSA No.: M20205206
Test Date: 12/12/2019

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1062	1062	0
B	Left Side Lower	mm	990	990	0
D	Right Side Upper	mm	1059	1059	0
E	Right Side Lower	mm	988	988	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2772	2750	22
F	Right Side Wheelbase	mm	2772	2706	66



DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

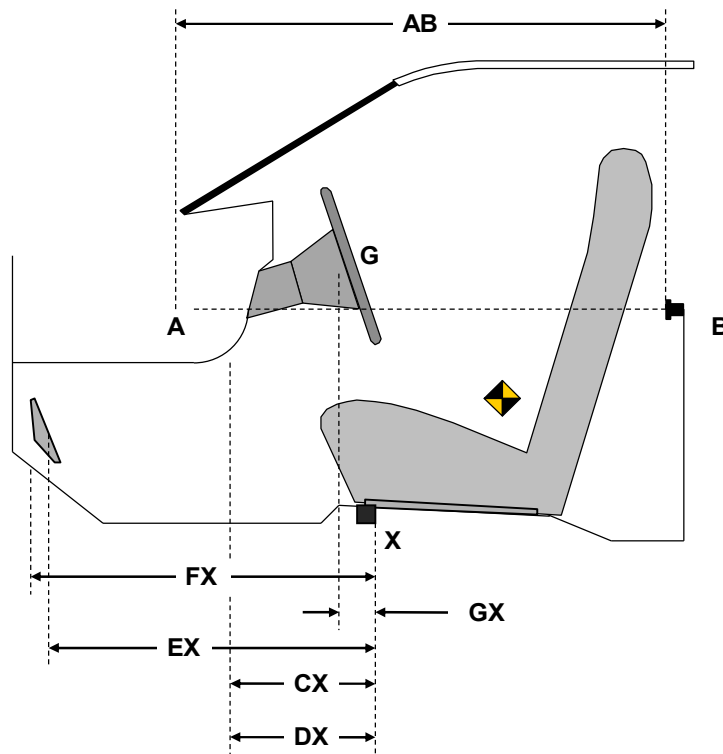
Test Vehicle: 2020 Nissan Maxima S 4-Door Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20205206
 Test Date: 12/12/2019

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	826	826	0
CX	Left Knee Bolster to X	mm	339	337	2
DX	Right Knee Bolster to X	mm	335	313	22
EX	Brake Pedal to X	mm	561	593	-32
FX	Foot Rest to X	mm	592	575	17
GX	Center of Steering Column Wheel Hub to X	mm	50	94	-44

X = Front of Seat Track (stationary)



DRIVER COMPARTMENT

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

Test Vehicle: 2020 Nissan Maxima S 4-Door Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20205206
 Test Date: 12/12/2019

WINDSHIELD MOUNTING DETAILS

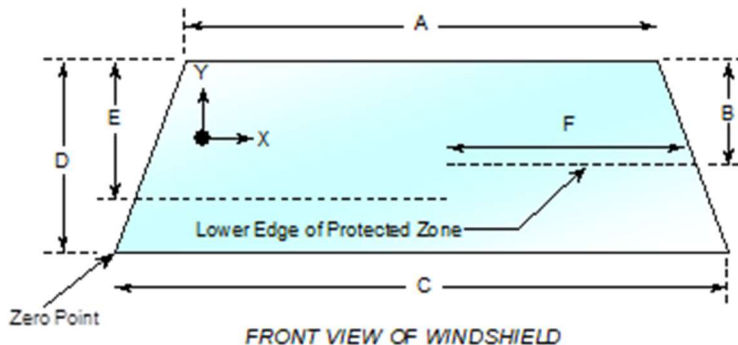
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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: 21.4°C.

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2275	2065	90.8
Right Side	2275	2275	100
Total	4550	4340	95.4



Item	Units	Value
A	mm	1258
B	mm	466
C	mm	1412
D	mm	940
E	mm	508
F	mm	499

AREA OF PROTECTED ZONE FAILURES

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. 16
FMVSS 301 BARRIER IMPACT AND STATIC ROLLOVER

Test Vehicle: 2020 Nissan Maxima S 4-Door Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20205206
 Test Date: 12/12/2019

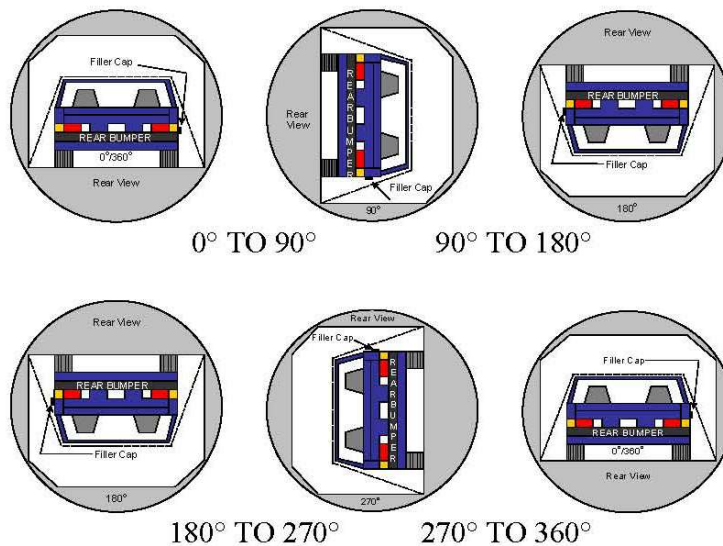
FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21.4°C

Test Time: 11:27 a.m.

- A. From impact until vehicle motion ceases: (Maximum Allowable = 1 ounce) 0.0 oz.
 B. For the 5 minute period after motion ceases: (Maximum Allowable = 5 ounces) 0.0 oz.
 C. For the following 25 minutes: (Maximum Allowable = 1 ounce / minute) None
 D. Spillage Details: None

FMVSS 301 STATIC ROLLOVER RESULTS



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°	112	300	412
90° to 180°	111	300	411
180° to 270°	107	300	407
270° to 360°	111	300	411

DATA SHEET NO. 16 (CONTINUED)
FMVSS 301 BARRIER IMPACT AND STATIC ROLLOVER

Test Vehicle: 2020 Nissan Maxima S 4-Door Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20205206
 Test Date: 12/12/2019

FMVSS 301 SPILLAGE TABLE (UNITS IN OUNCES)

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

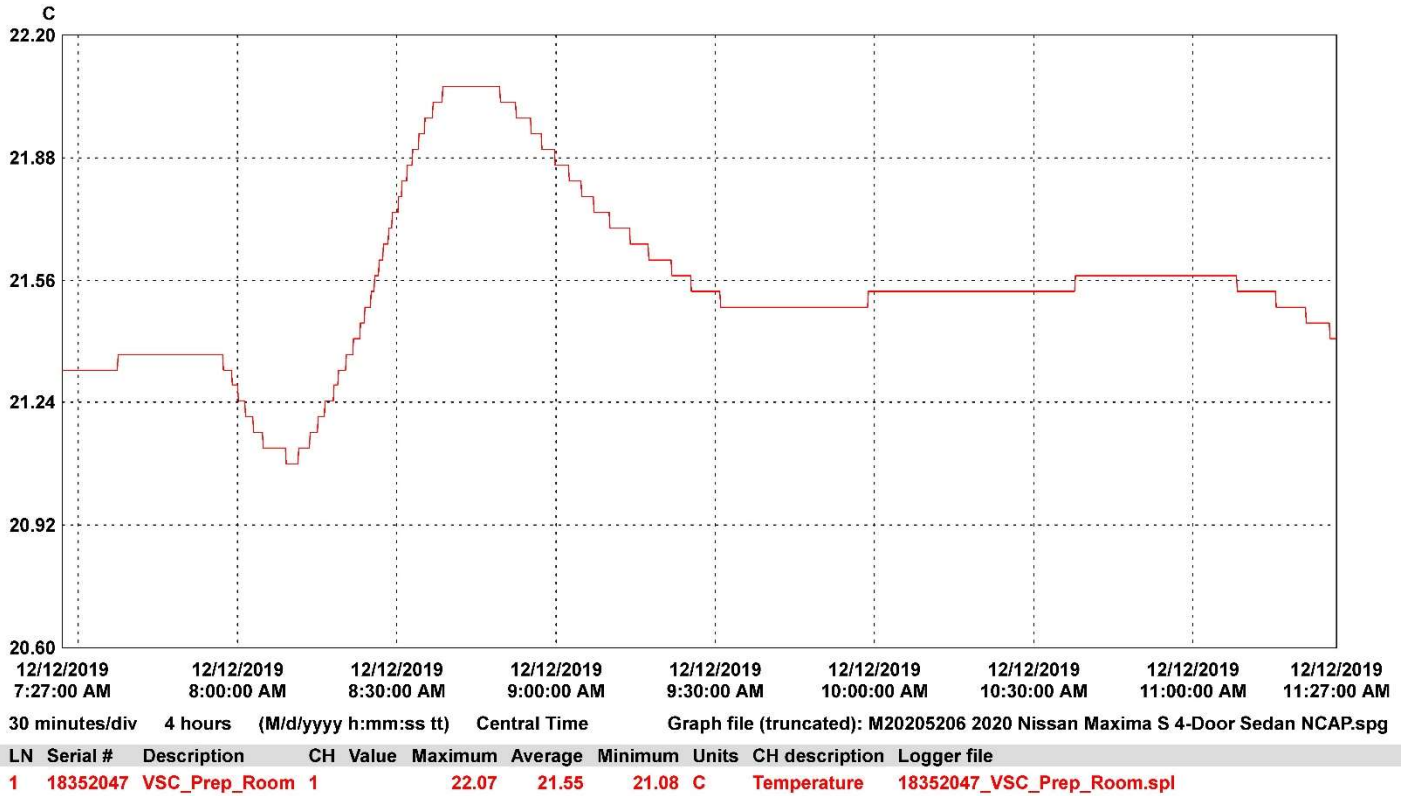
SOLVENT SPILLAGE LOCATION TABLE

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: 2020 Nissan Maxima S 4-Door Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20205206
 Test Date: 12/12/2019



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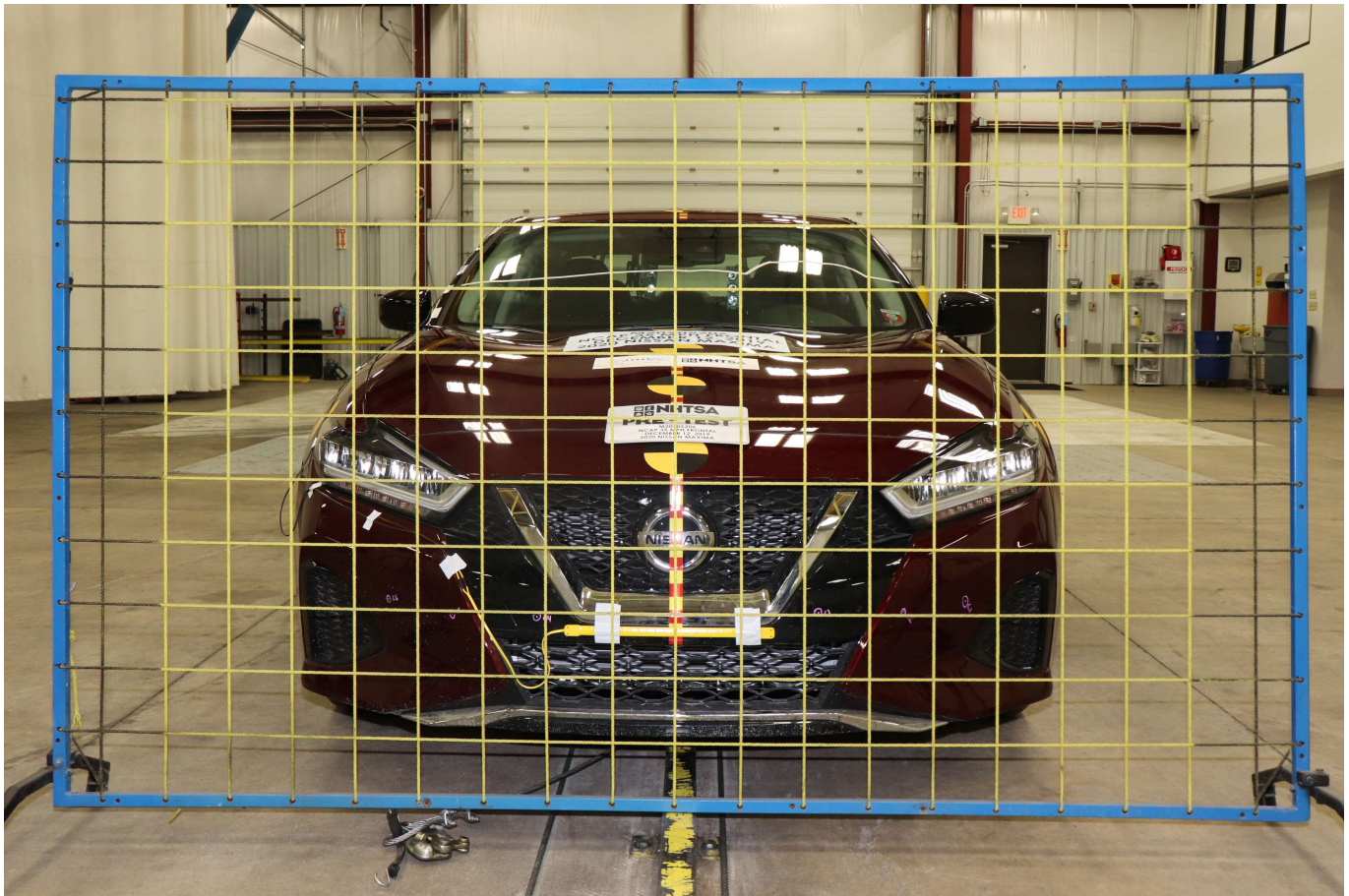


Photo No. 001 - Load Cell Location

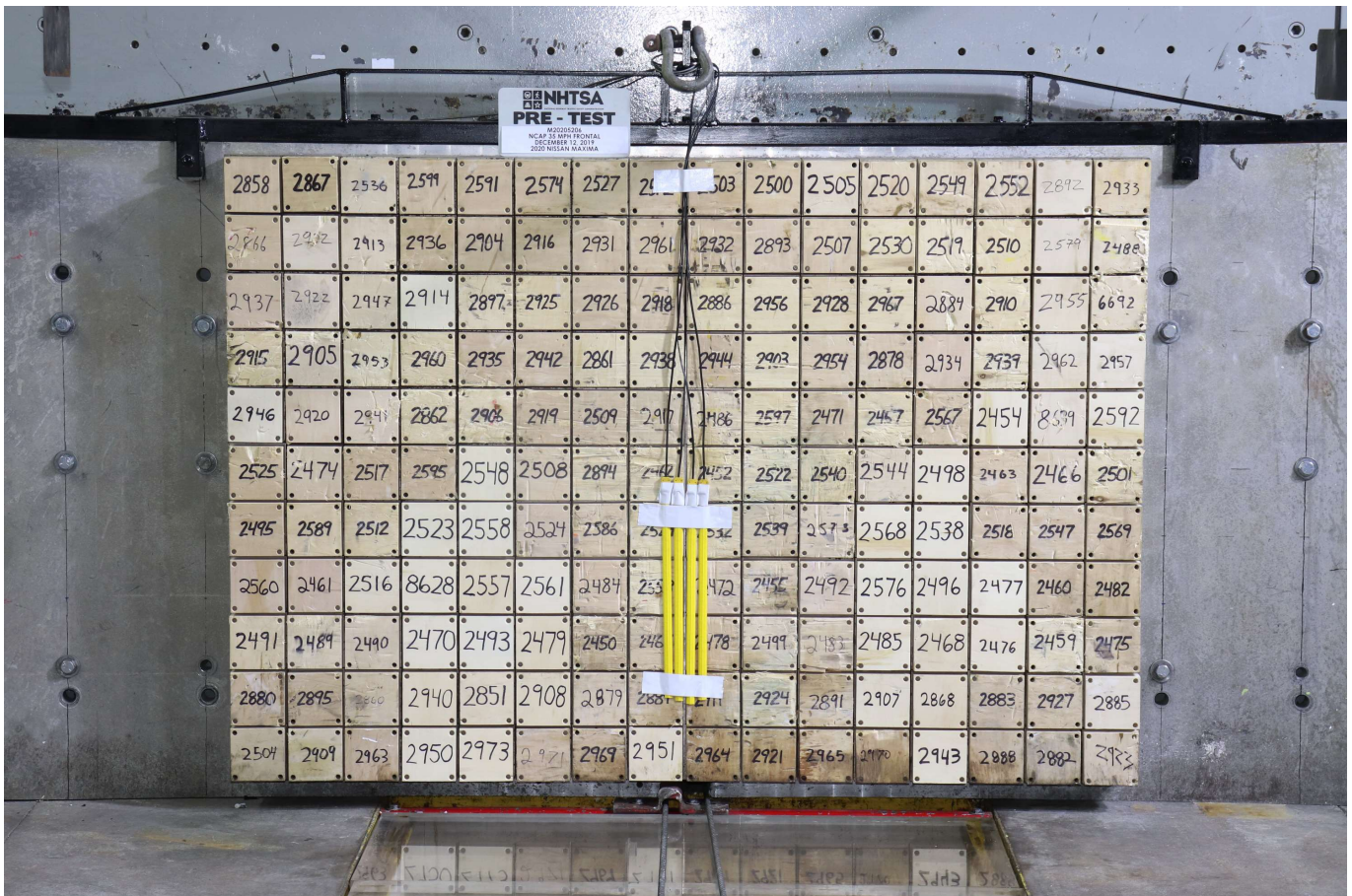


Photo No. 002 - Pre-Test Load Cell Wall

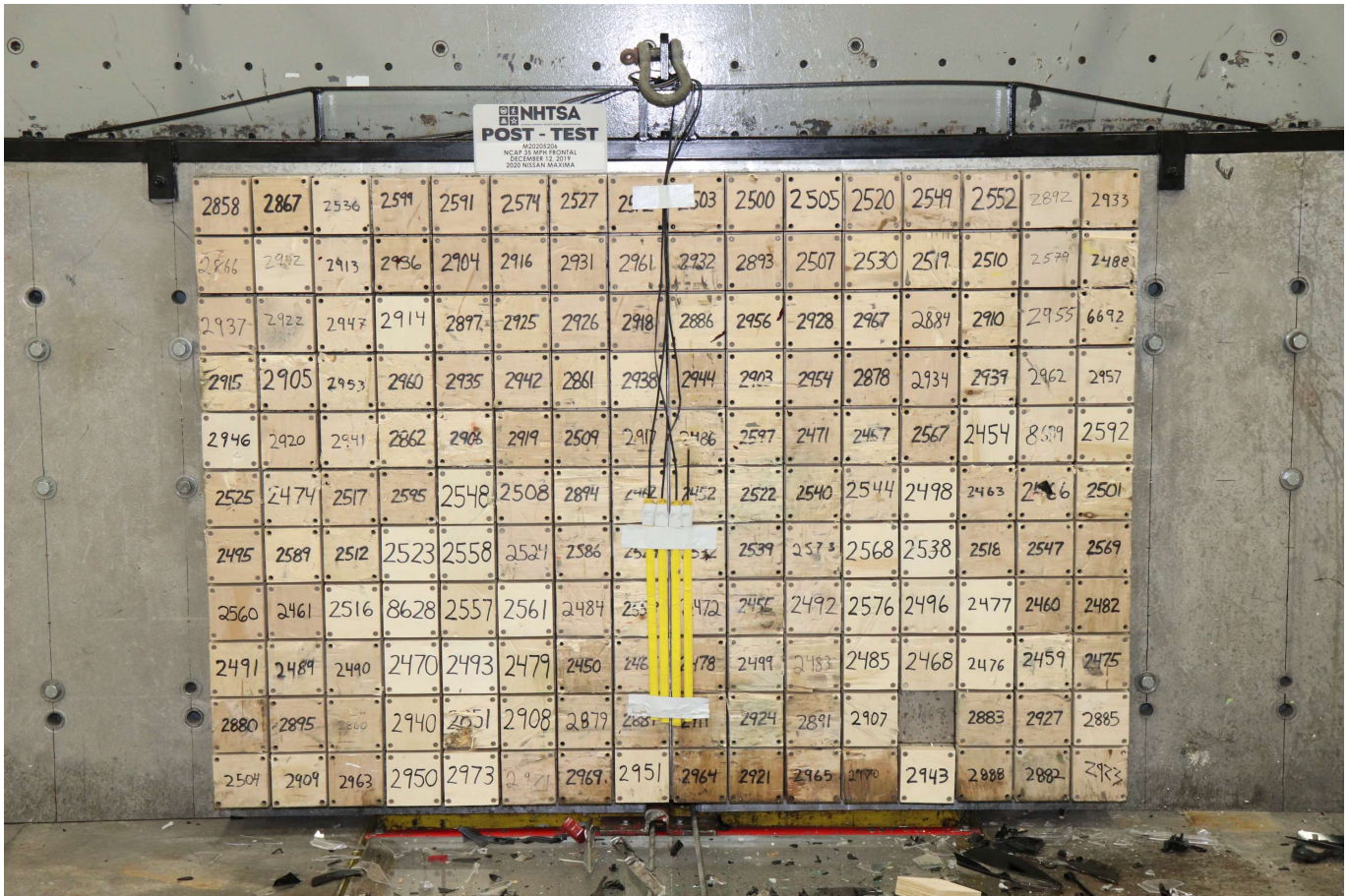


Photo No. 003 - Post-Test Load Cell Wall

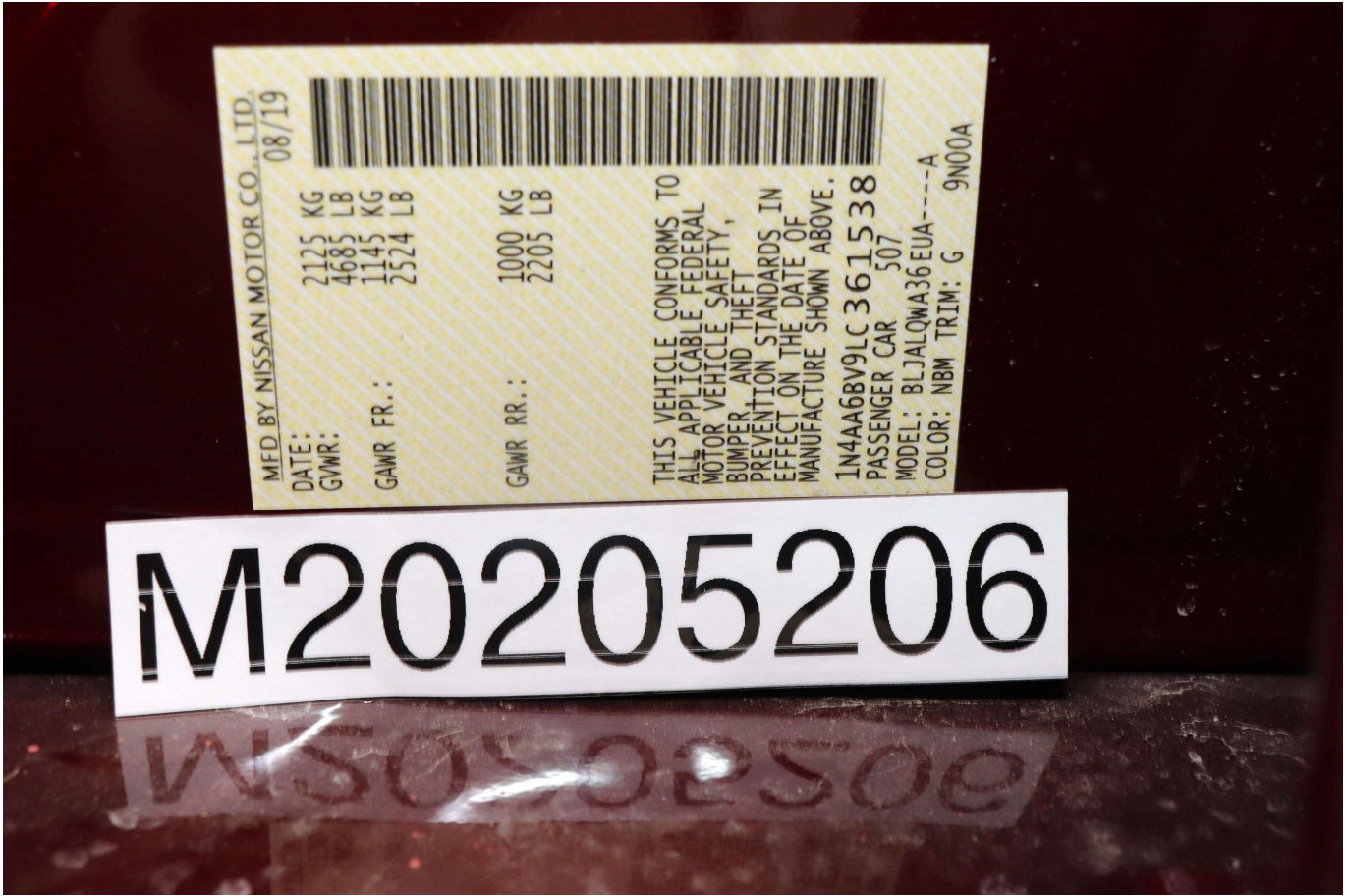


Photo No. 004 - Manufacturer Label



Photo No. 005 - Tire Placard



Photo No. 006 - 2020 Nissan Maxima S 4-Door Sedan Frontal As Delivered



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



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

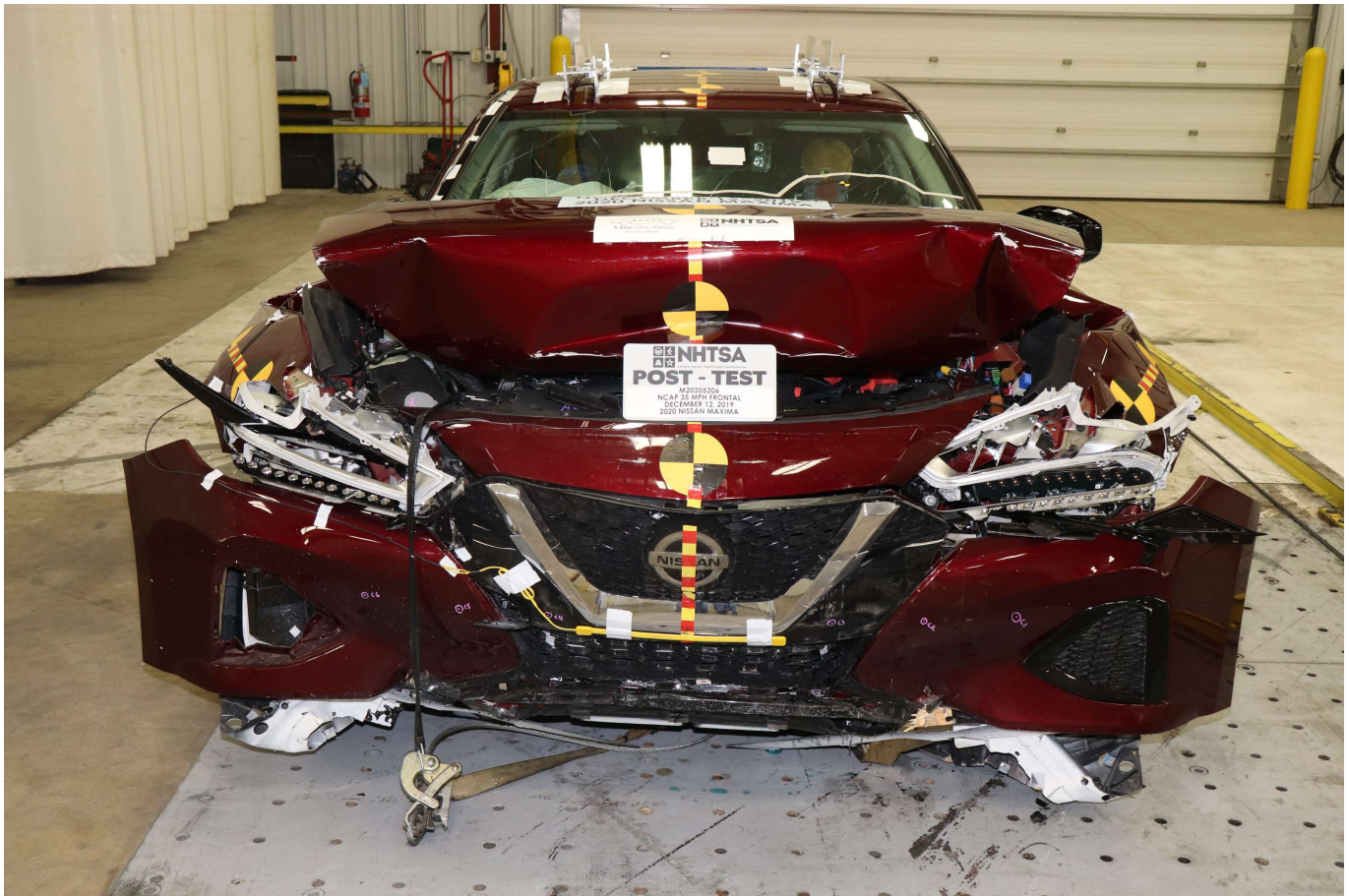


Photo No. 009 - Post-Test Front View of Test Vehicle



Photo No. 010 - Pre-Test Left View of Test Vehicle



Photo No. 011 - Post-Test Left View of Test Vehicle



Photo No. 012 - Pre-Test Right View of Test Vehicle



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



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

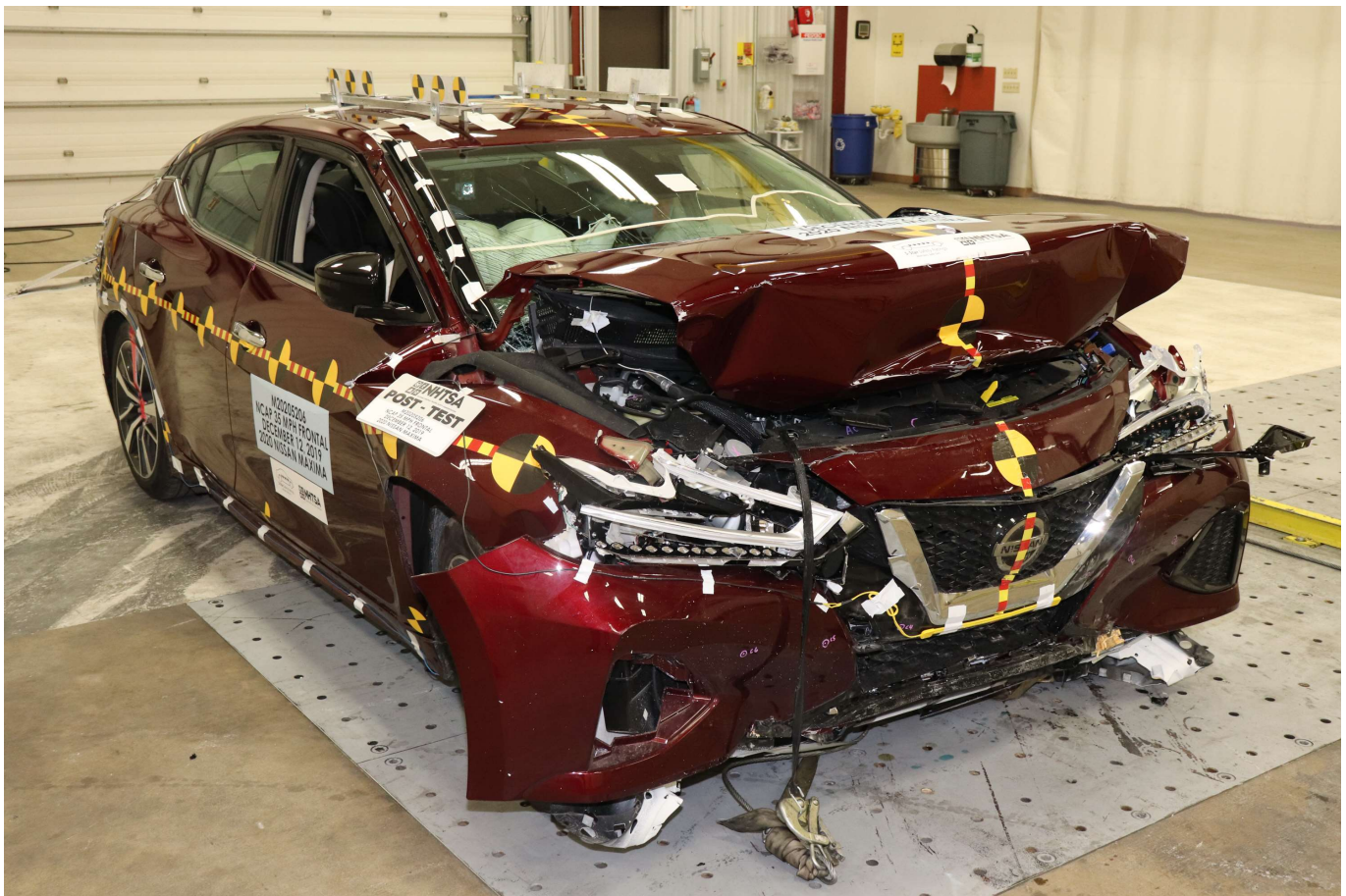


Photo No. 015 - Post-Test Right Front 3-4 View



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



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



Photo No. 018 - Pre-Test Windshield View



Photo No. 019 - Post-Test Windshield View



Photo No. 020 - Pre-Test Engine Compartment View

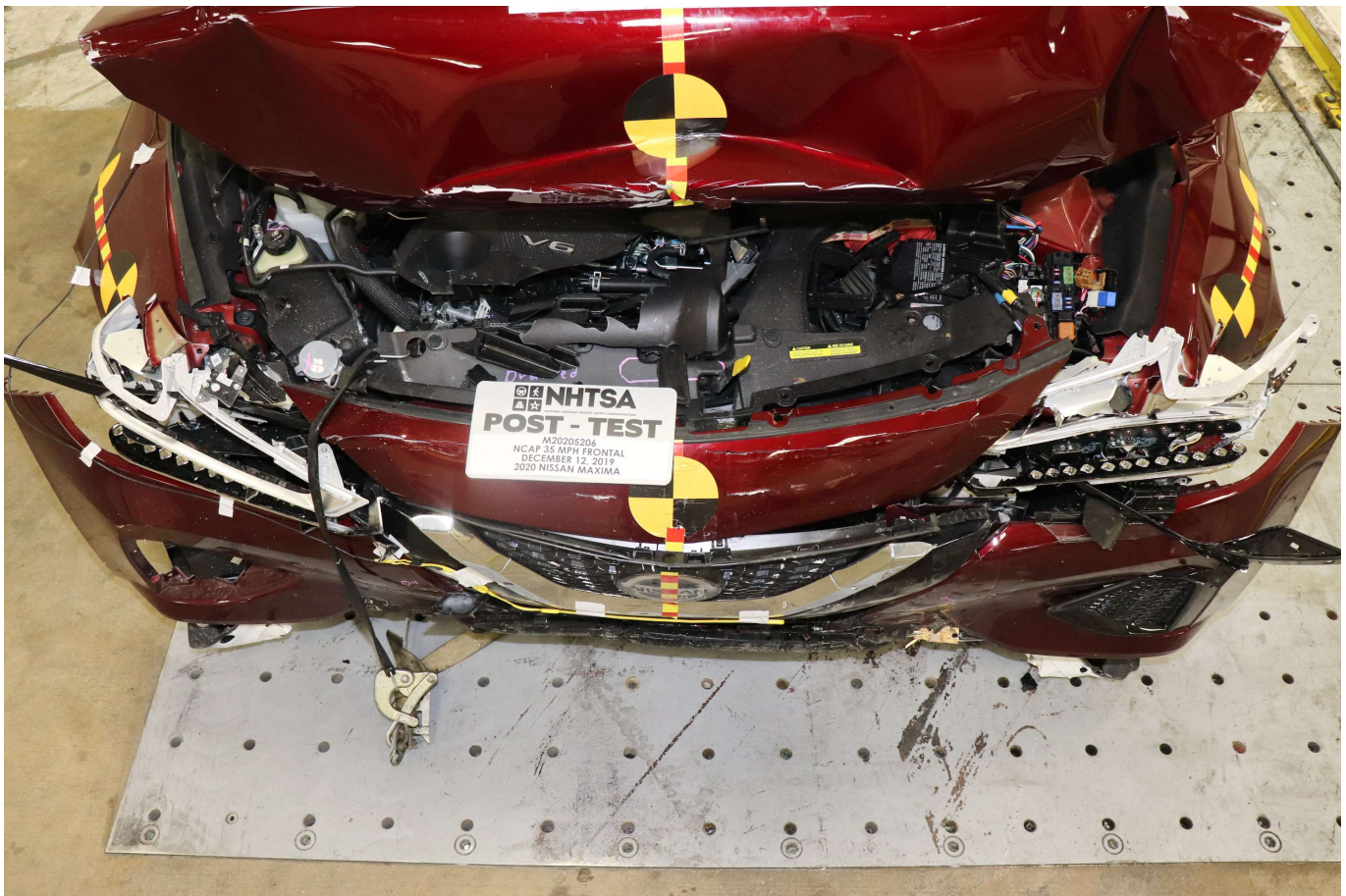


Photo No. 021 - Post-Test Engine Compartment View



Photo No. 022 - Pre-Test Fuel Filler Cap View



Photo No. 023 - Post-Test Fuel Filler Cap View

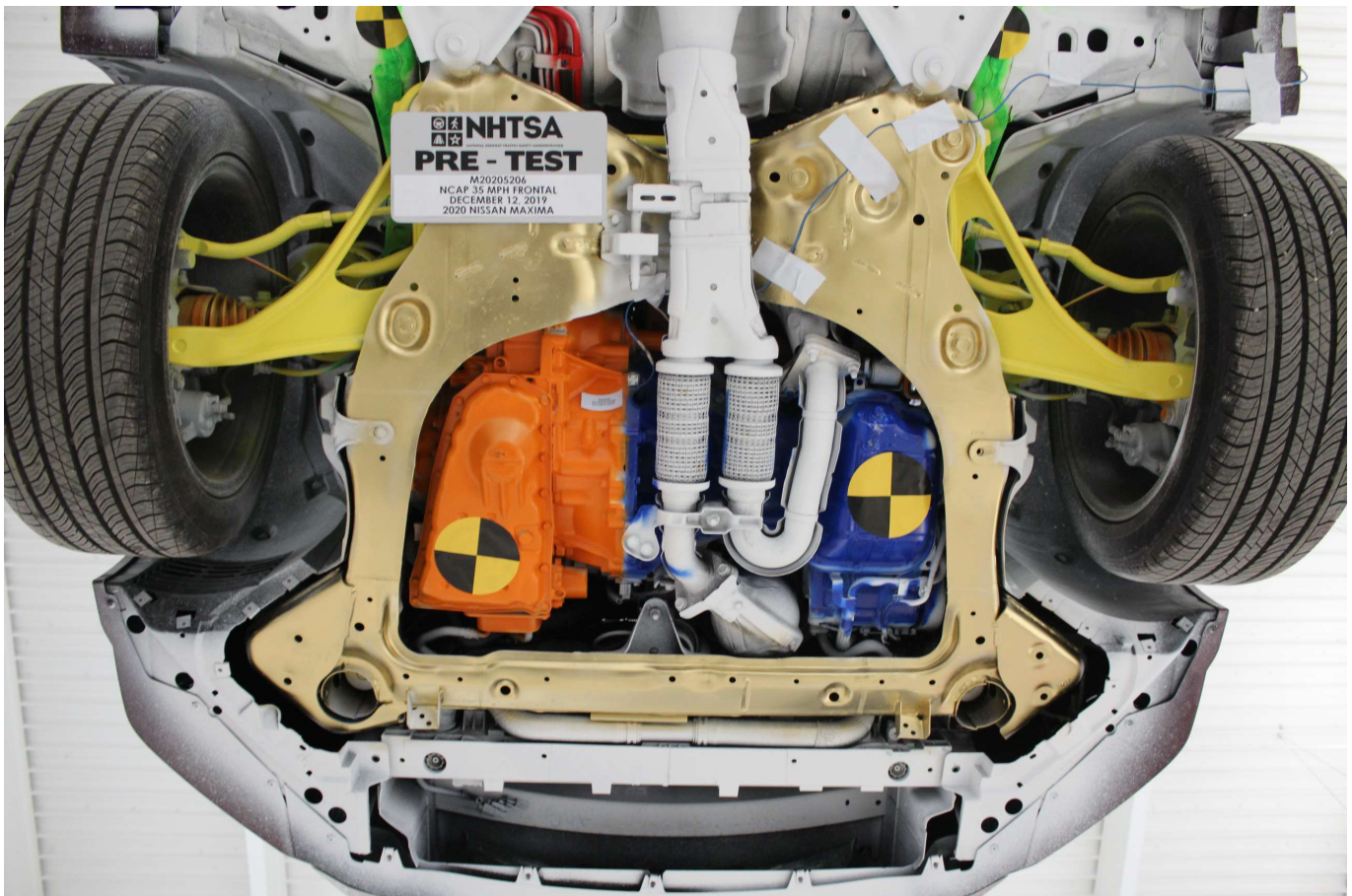


Photo No. 024 - Pre-Test Front Underbody View

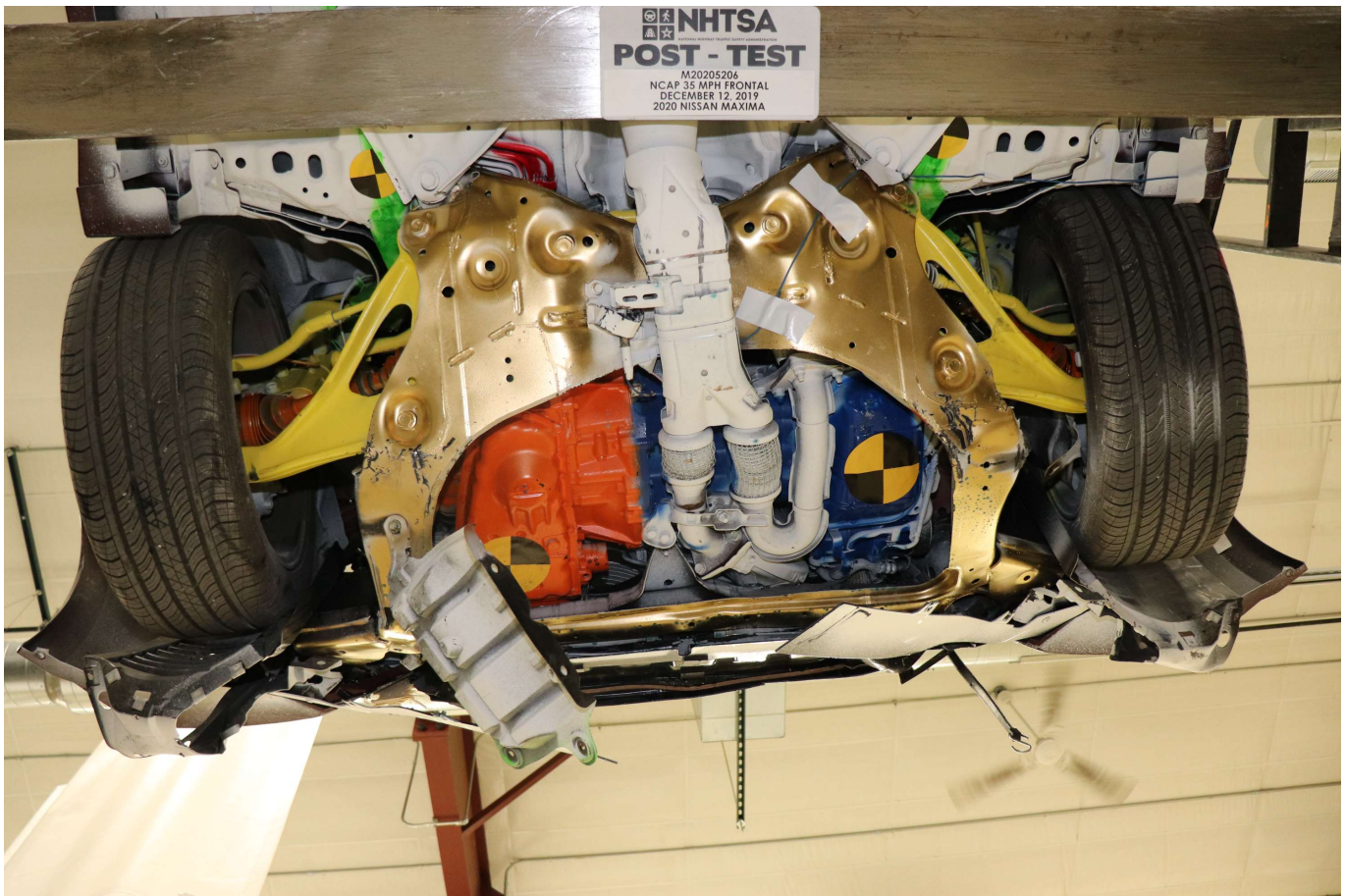


Photo No. 025 - Post-Test Front Underbody View

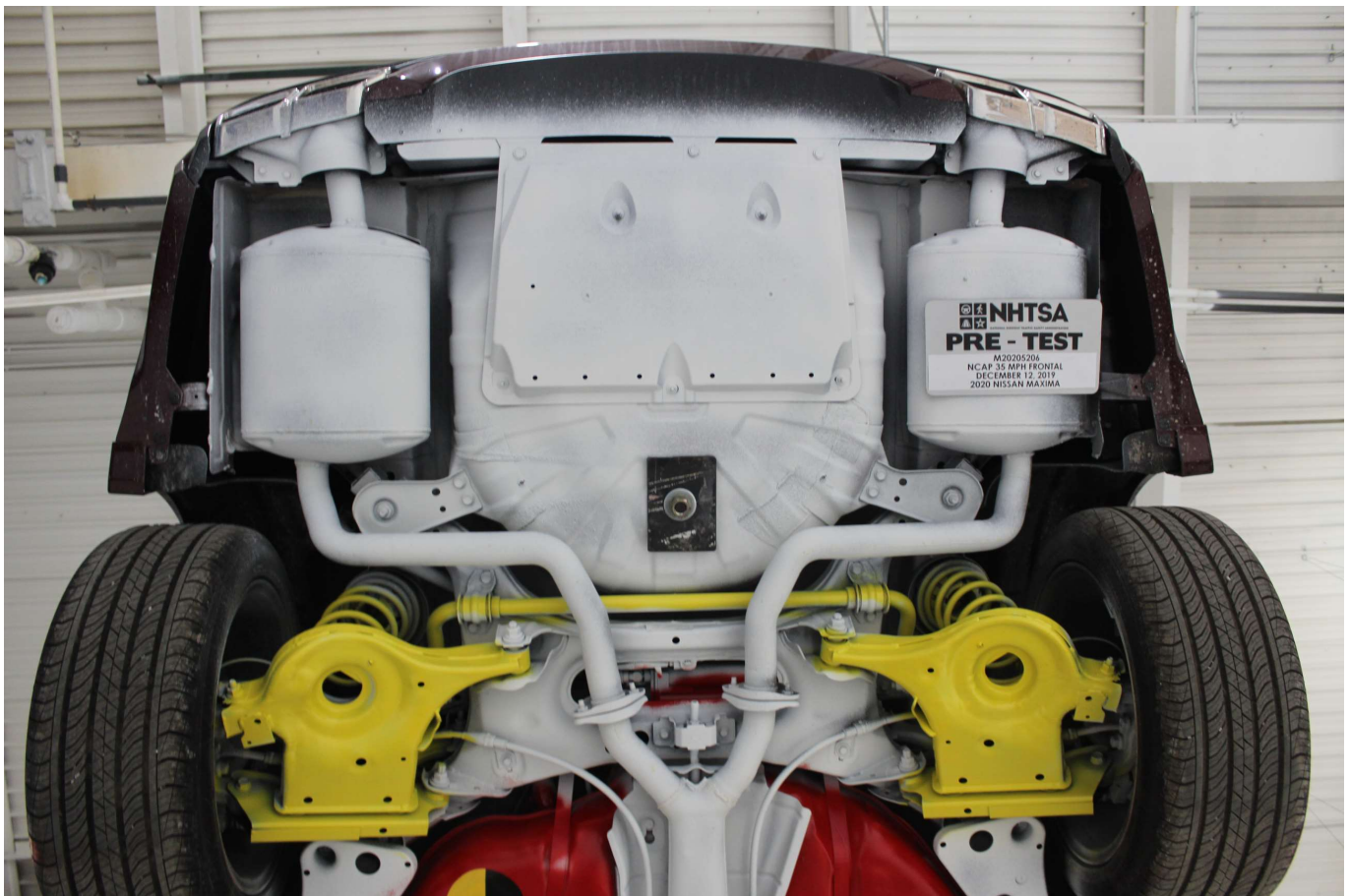


Photo No. 026 - Pre-Test Rear Underbody View

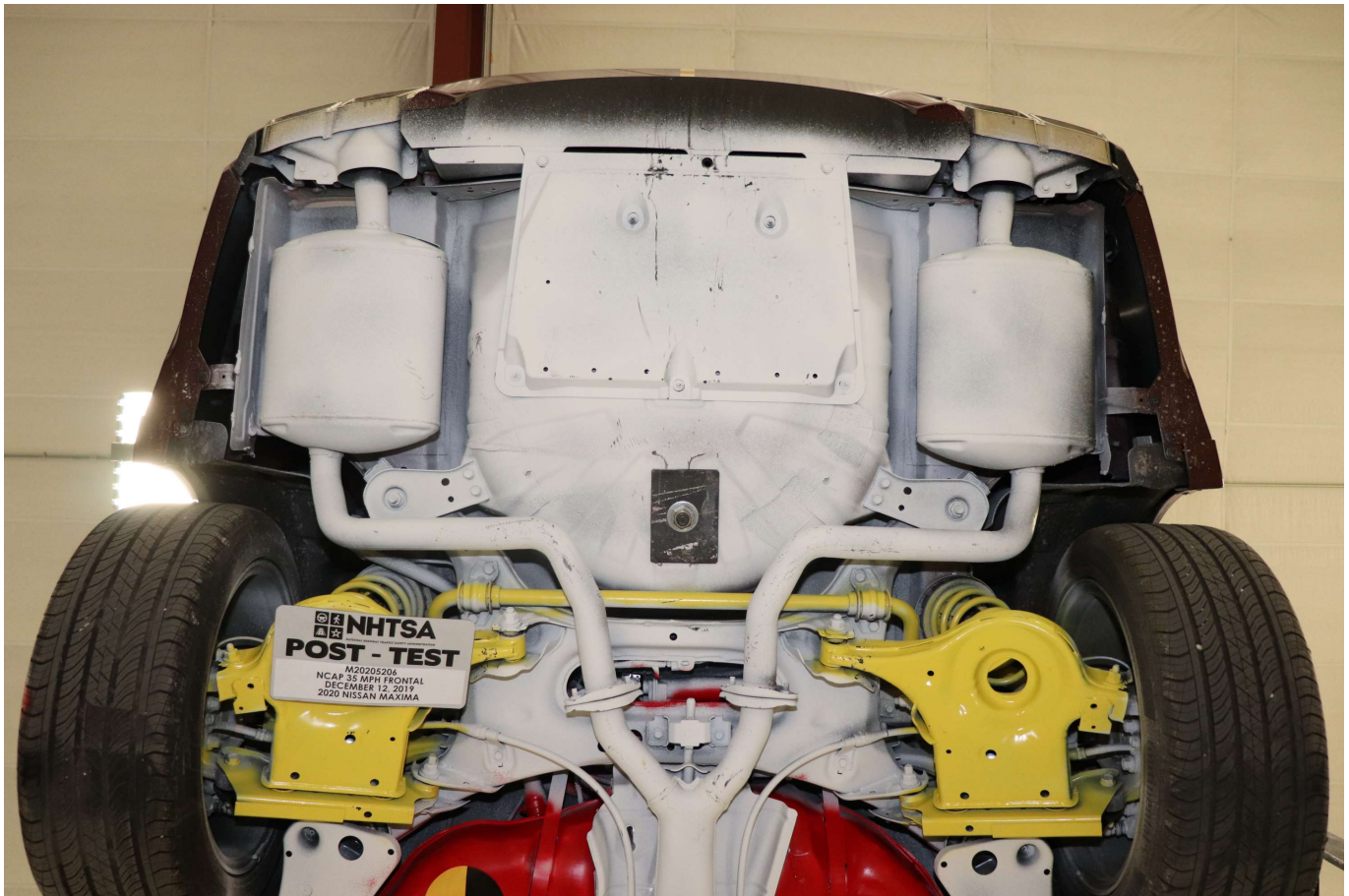


Photo No. 027 - Post-Test Rear Underbody View

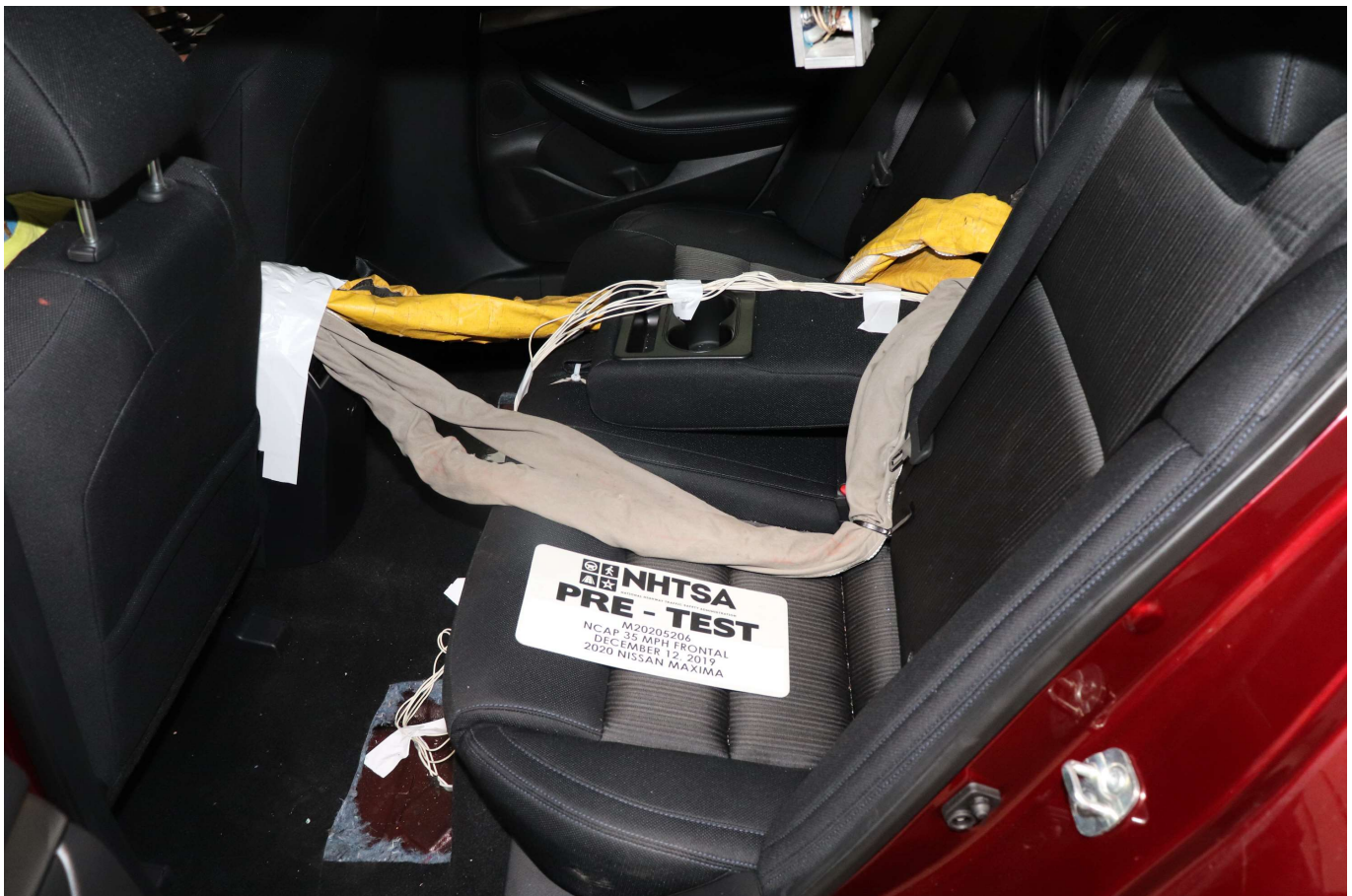


Photo No. 028 - Pre-Test Dummy Cable Routing



Photo No. 029 - Post-Test Dummy Cable Routing



Photo No. 030 - Pre-Test Driver Dummy Front View



Photo No. 031 - Post-Test Driver Dummy Front View



Photo No. 032 - Pre-Test Driver Dummy Window View



Photo No. 033 - Post-Test Driver Dummy Window View



Photo No. 034 - Pre-Test Driver Dummy and Vehicle Interior



Photo No. 035 - Post-Test Driver Dummy and Vehicle Interior



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



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

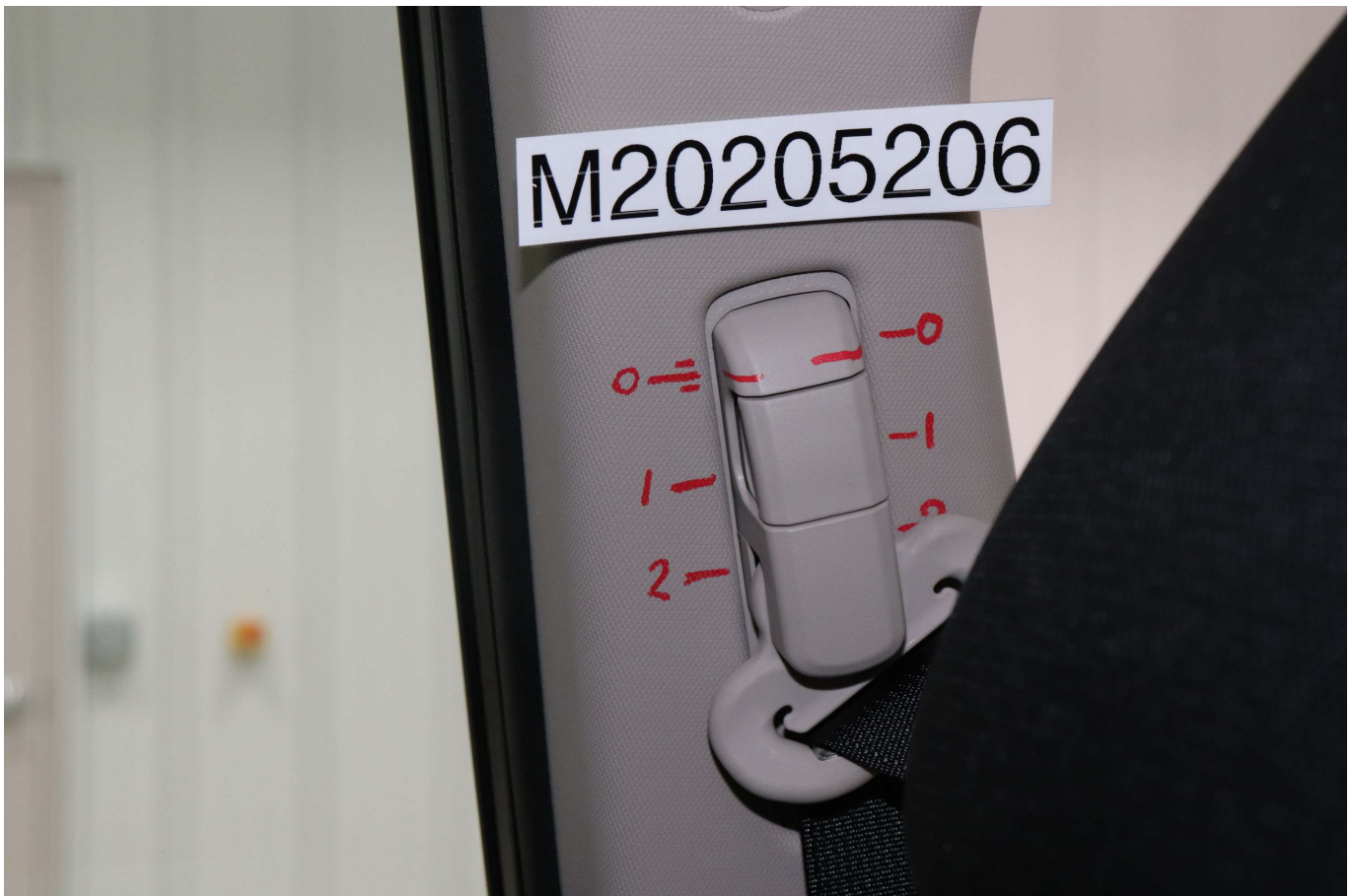


Photo No. 038 - Pre-Test View of Belt Anchorage for Driver Dummy



Photo No. 039 - Post-Test View of Belt Anchorage for Driver Dummy



Photo No. 040 - Pre-Test View of Belt Buckle and Latch Plate for Driver Dummy



Photo No. 041 - Post-Test View of Belt Buckle and Latch Plate for Driver Dummy



Photo No. 042 - Pre-Test Driver Dummy Feet



Photo No. 043 - Post-Test Driver Dummy Feet



Photo No. 044 - Pre-Test Driver Side Knee Bolster



Photo No. 047 - Post-Test Driver Side Floorpan



Photo No. 048 - Post-Test Driver Dummy Face



Photo No. 049 - Post-Test Driver Dummy Contact with Airbag



Photo No. 050 - Post-Test Driver Dummy Contact with Headrest



Photo No. 051 - Pre-Test View of the Steering Wheel



Photo No. 052 - Post-Test View of the Steering Wheel



Photo No. 053 - Pre-Test Passenger Dummy Front View



Photo No. 054 - Post-Test Passenger Dummy Front View



Photo No. 055 - Pre-Test Passenger Dummy Window View



Photo No. 056 - Post-Test Passenger Dummy Window View



Photo No. 057 - Pre-Test Passenger Dummy and Vehicle Interior



Photo No. 058 - Post-Test Passenger Dummy and Vehicle Interior



Photo No. 059 - Pre-Test Passenger Seat Fore-Aft Markings



Photo No. 060 - Post-Test Passenger Seat Fore-Aft Markings



Photo No. 061 - Pre-Test View of Belt Anchorage for Passenger Dummy



Photo No. 062 - Post-Test View of Belt Anchorage for Passenger Dummy



Photo No. 063 - Pre-Test View of Belt Buckle and Latch Plate for Passenger Dummy



Photo No. 064 - Post-Test View of Belt Buckle and Latch Plate for Passenger Dummy



Photo No. 065 - Pre-Test Passenger Dummy Feet



Photo No. 066 - Post-Test Passenger Dummy Feet



Photo No. 067 - Pre-Test Passenger Side Knee Bolster



Photo No. 068 - Post-Test Passenger Side Knee Bolster



Photo No. 069 - Pre-Test Passenger Side Floorpan



Photo No. 070 - Post-Test Passenger Side Floorpan



Photo No. 071 - Post-Test Passenger Dummy Face



Photo No. 072 - Post-Test Passenger Dummy Contact with Airbag



Photo No. 073 - Post-Test Passenger Dummy Contact with Headrest



Photo No. 074 - Ballast Installed in Vehicle

PHOTOGRAPH NOT APPLICABLE

Photo No. 075 - Post-Test Stoddard Solvent Spillage Location View



Photo No. 076 - Post-Test Speed Trap Read-Out



Photo No. 077 - Vehicle at 0 Degrees on Static Rollover Device

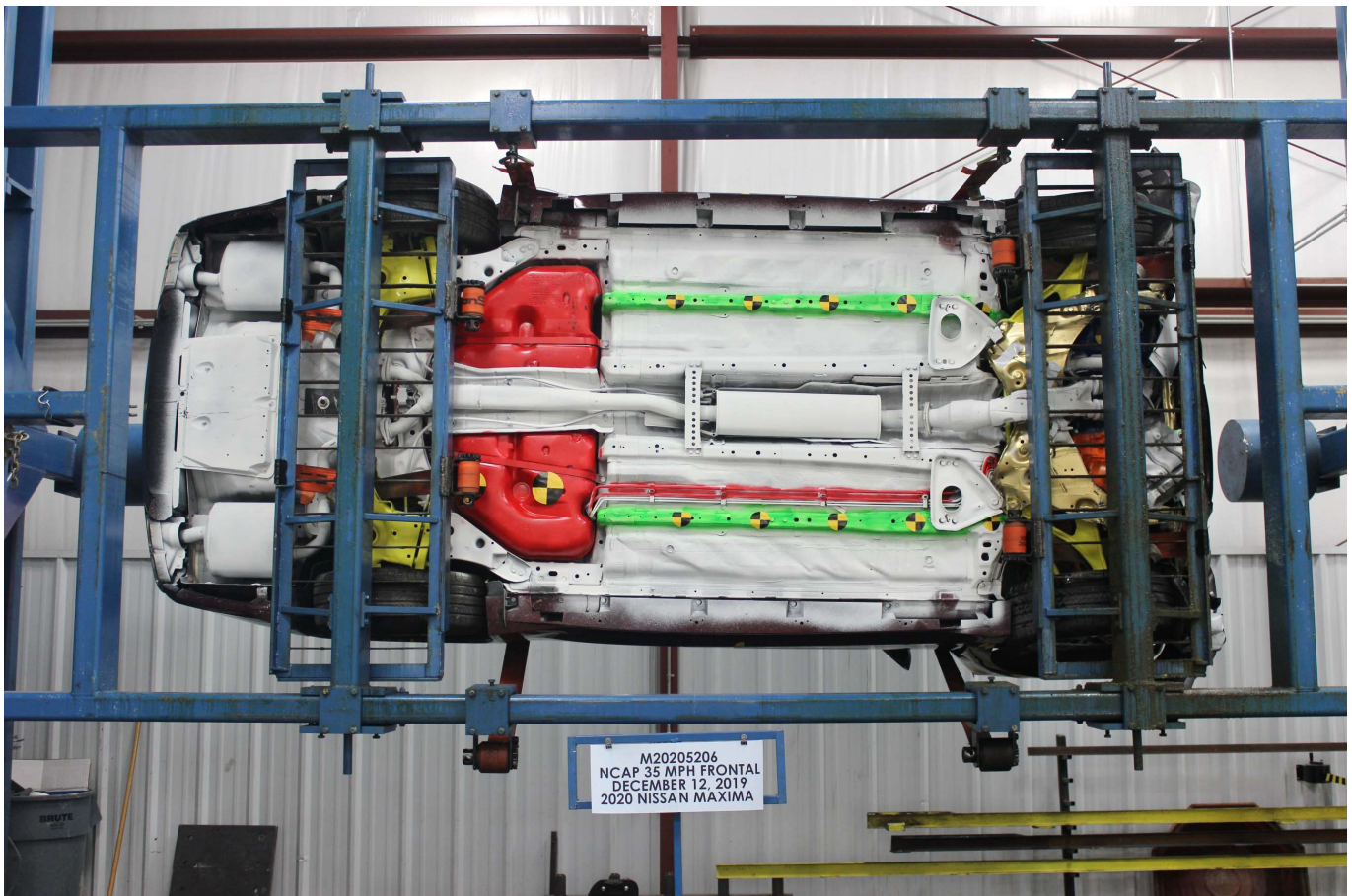


Photo No. 078 - Vehicle at 90 Degrees on Static Rollover Device



Photo No. 079 - Vehicle at 180 Degrees on Static Rollover Device



Photo No. 080 - Vehicle at 270 Degrees on Static Rollover Device



Photo No. 081 - Vehicle at 360 Degrees on Static Rollover Device



Photo No. 082 - 2020 Nissan Maxima S 4-Door Sedan Frontal Impact Event

EPA DOT

Fuel Economy MPG

MIDSIZE CARS range from 12 to 136 MPG. The best vehicle rates 136 MPGe.

You spend \$2,750 more in fuel costs over 5 years compared to the average new vehicle..

Annual fuel Cost \$2,050

Fuel Economy & Greenhouse Gas Rating (tailpipe only)

Smog Rating (tailpipe only)

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 24 MPG and costs \$7,600 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$3.25 per gallon. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

fueleconomy.gov

Calculate personalized estimates and compare vehicles

GOVERNMENT 5-STAR SAFETY RATINGS

DELIVERY

Overall Vehicle Score Not Rated

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

Frontal Crash Driver Passenger Not Rated Not Rated

Based on the risk of injury in a frontal impact. Should ONLY be compared to other vehicles of similar size and weight.

Side Crash Front seat Rear seat Not Rated Not Rated

Based on the risk of injury in a side impact.

Rollover ★★★★★

Based on the risk of rollover in a single-vehicle crash.

Star ratings range from 1 to 5 stars (★★★★★) with 5 being the highest.

Source: National Highway Traffic Safety Administration (NHTSA)
www.safercar.gov or 1-888-327-4236

This Vehicle qualifies for Nissan's Security+Plus Extended Protection Plan

The only service agreement backed by Nissan
The only service agreement backed by Nissan
Ask your dealer for details, or call 1-800-NISSAN-1 for more information

VIN: 1NA4A6BV9LC361538
EMS: 50 STATE EMISSIONS
MDL: 16010-361538 NBM-G
OPT: B-B10E10H9ZL92C03

20190904021122AS5150

Photo No. 083 - Monroney Label Photograph

APPENDIX B
DUMMY RESPONSE DATA TRACES

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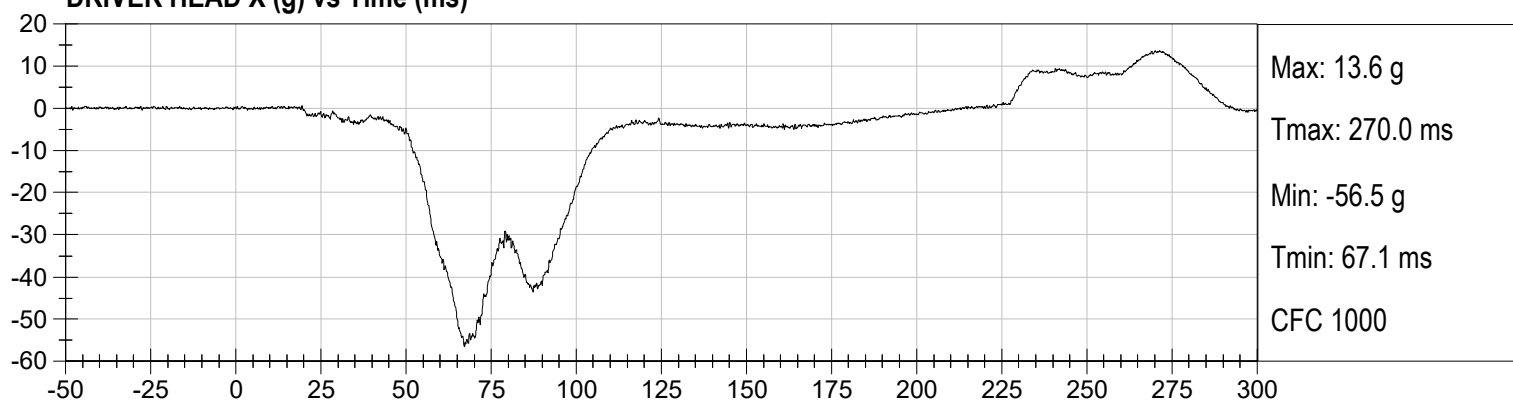
The following additional dummy and vehicle response data can be found in the R&D section of the NHTSA website at www.nhtsa.gov

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

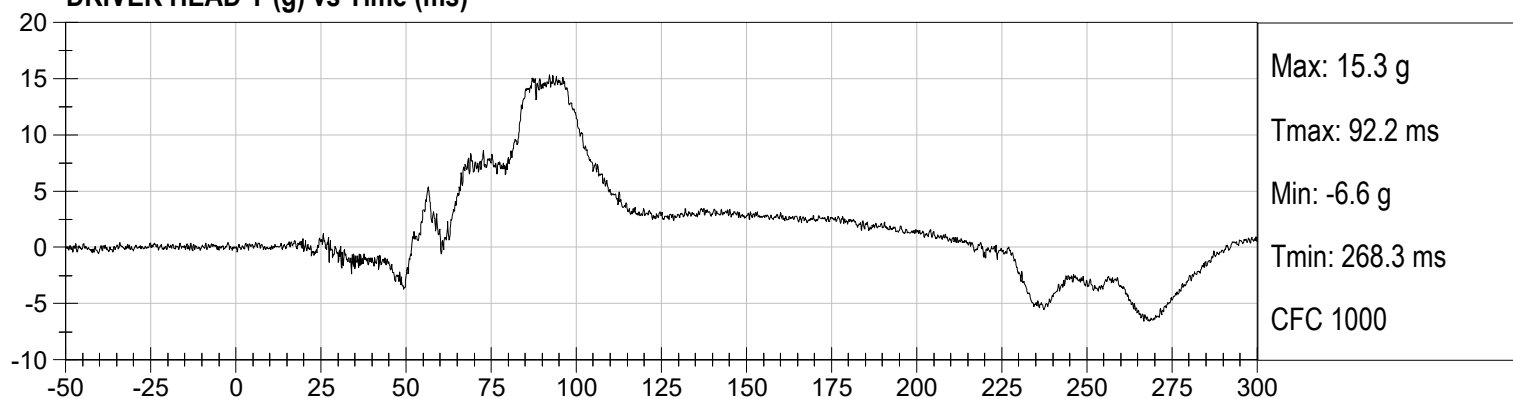
Driver Left Upper Tibia Force Z
Driver Left Lower Tibia Moment X
Driver Left Lower Tibia Moment Y
Driver Left Lower Tibia Force Z
Driver Right Upper Tibia Moment X
Driver Right Upper Tibia Moment Y
Driver Right Upper Tibia Force Z
Driver Right Lower Tibia Moment X
Driver Right Lower Tibia Moment Y
Driver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

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

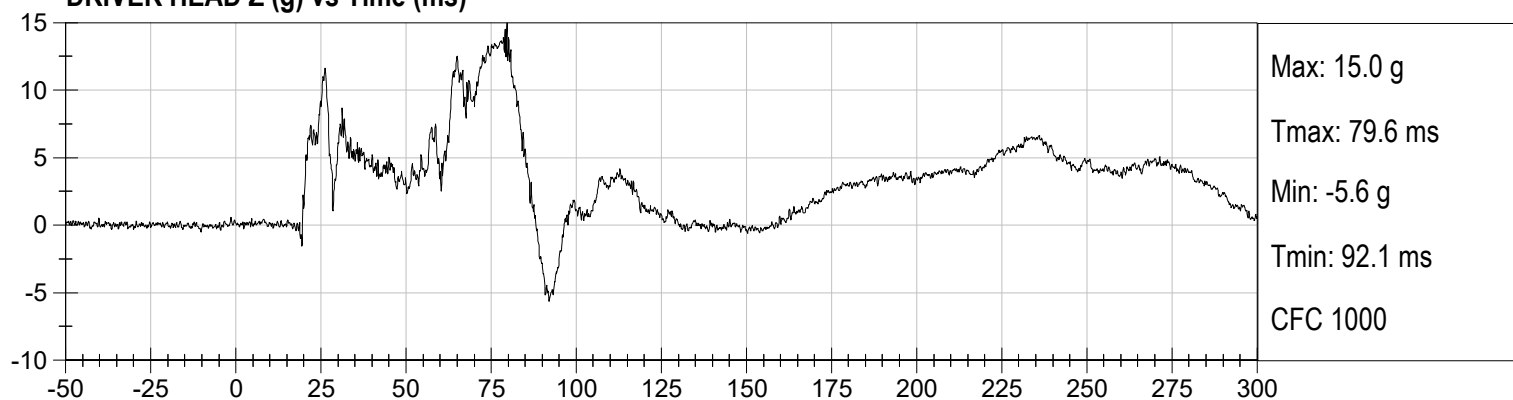
DRIVER HEAD X (g) vs Time (ms)



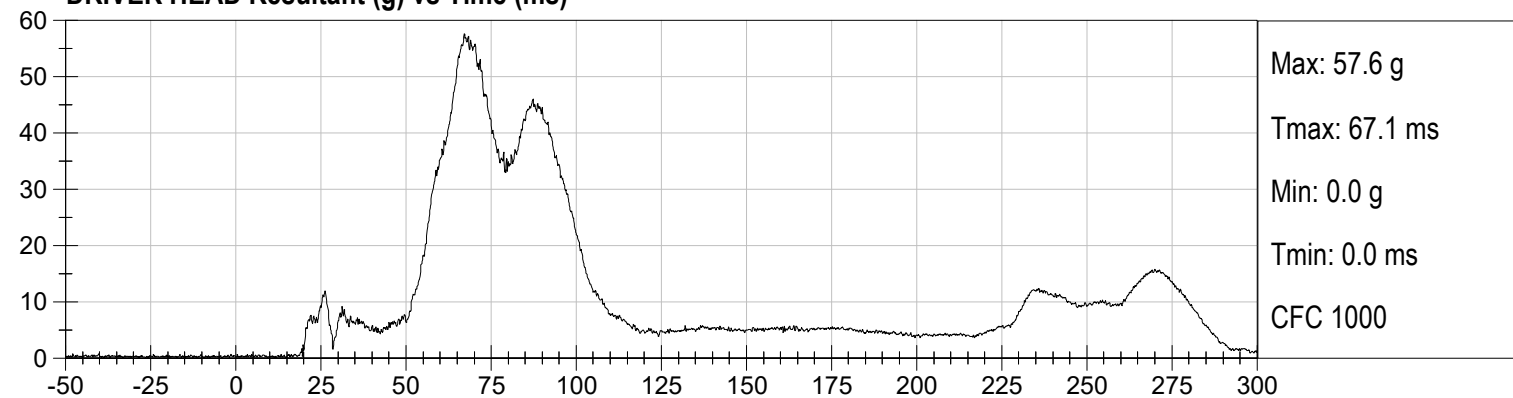
DRIVER HEAD Y (g) vs Time (ms)

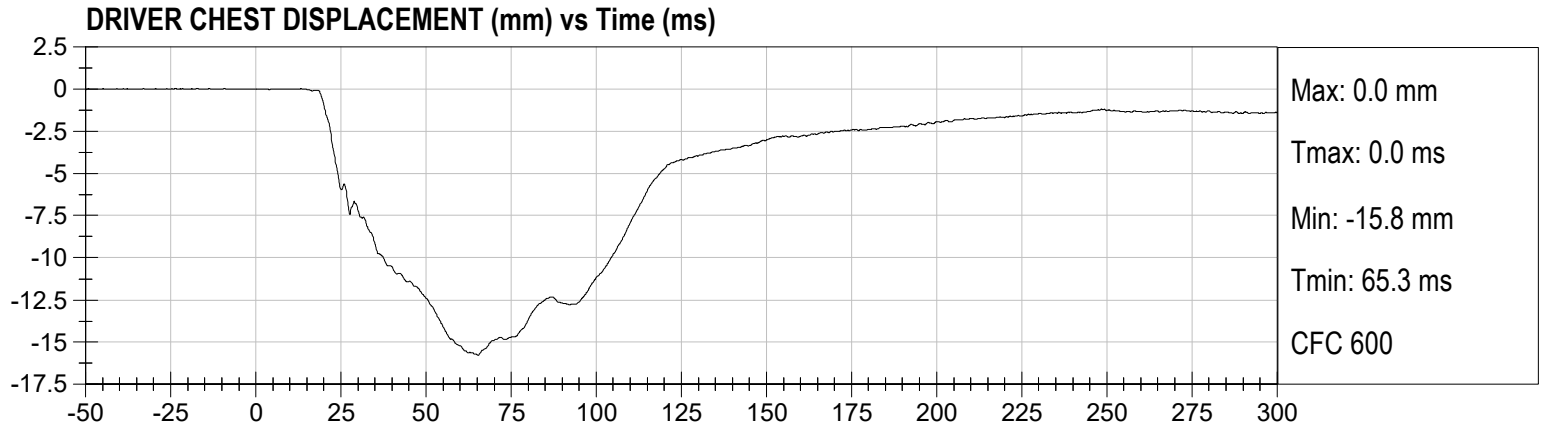


DRIVER HEAD Z (g) vs Time (ms)

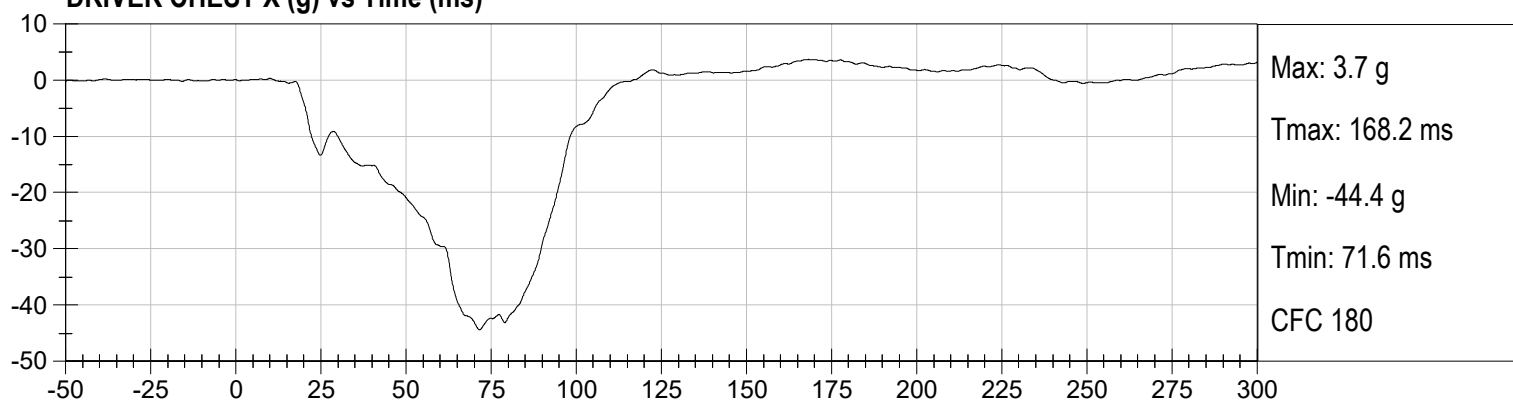


DRIVER HEAD Resultant (g) vs Time (ms)

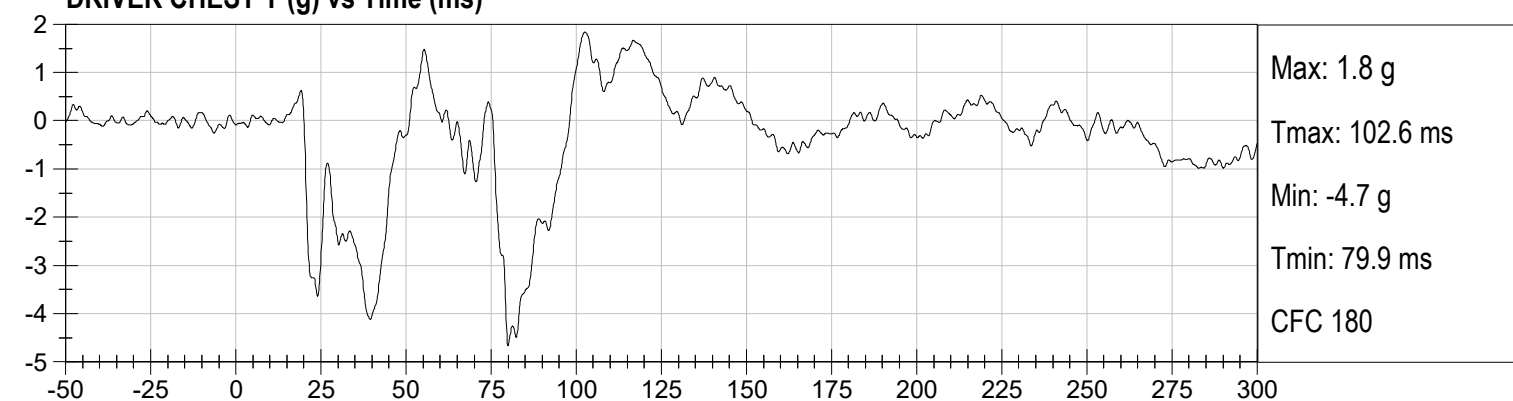




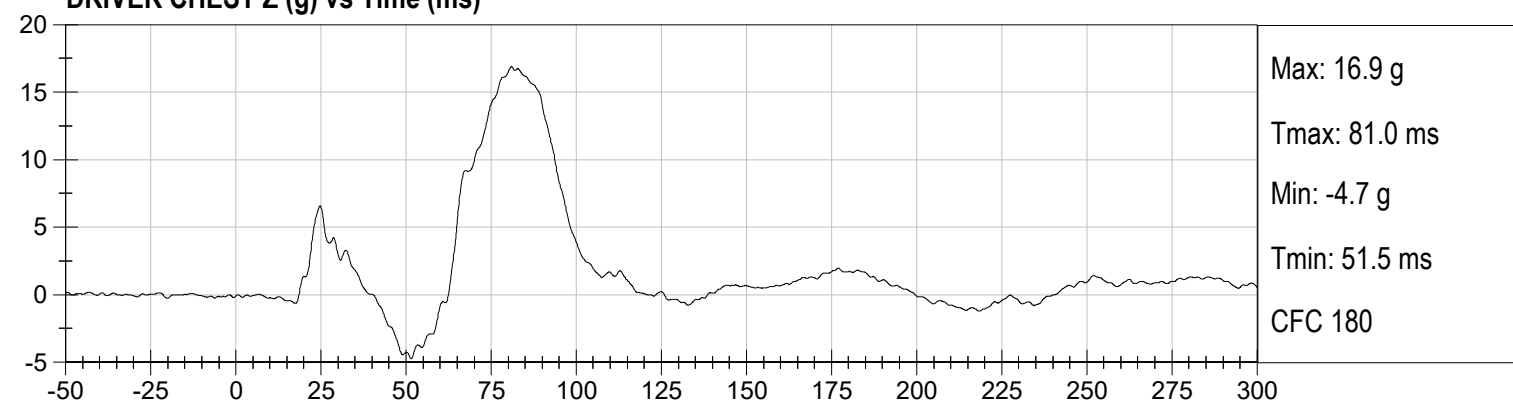
DRIVER CHEST X (g) vs Time (ms)



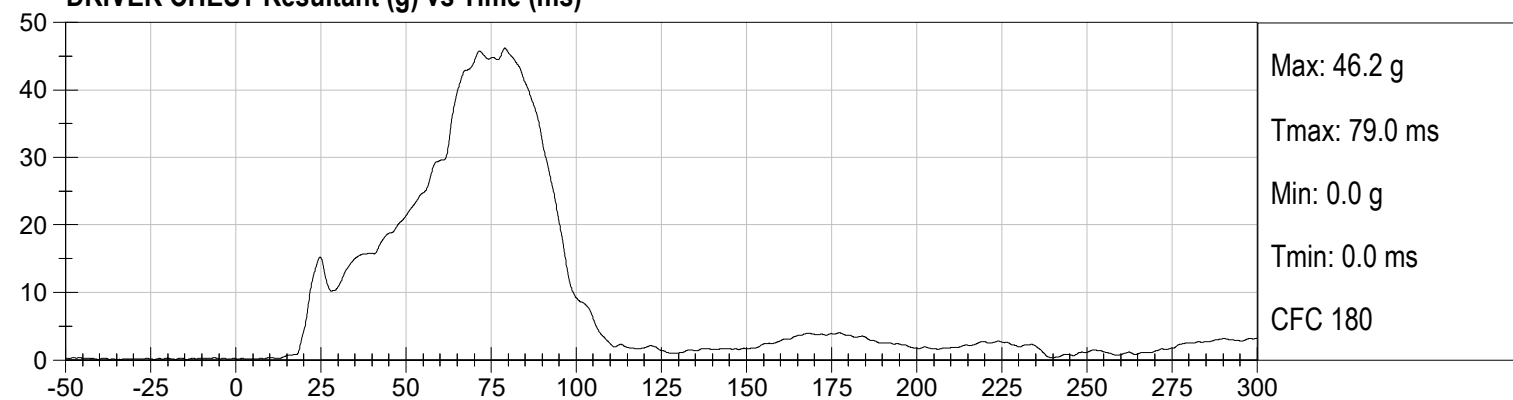
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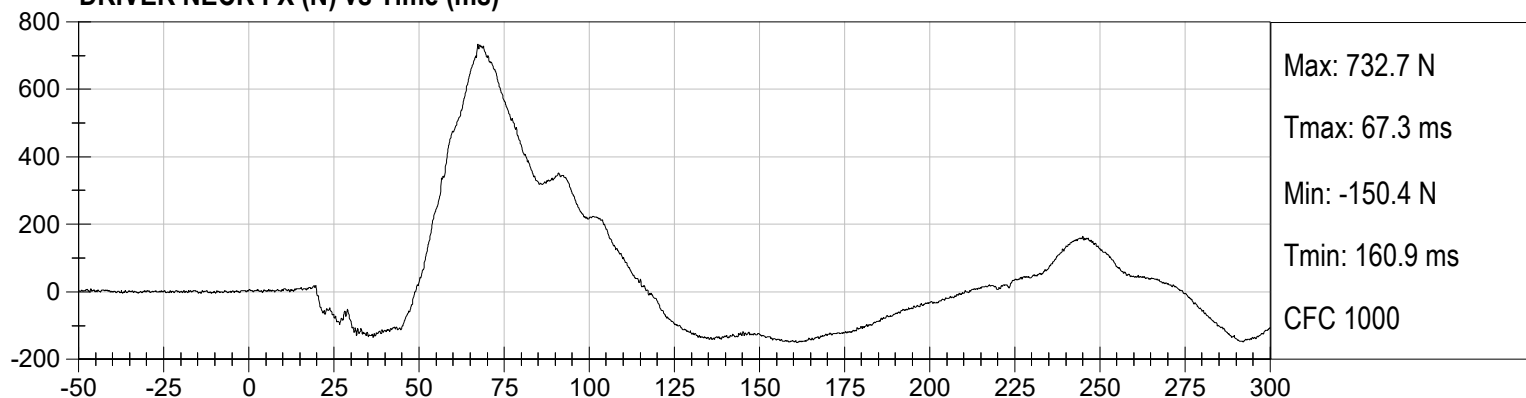
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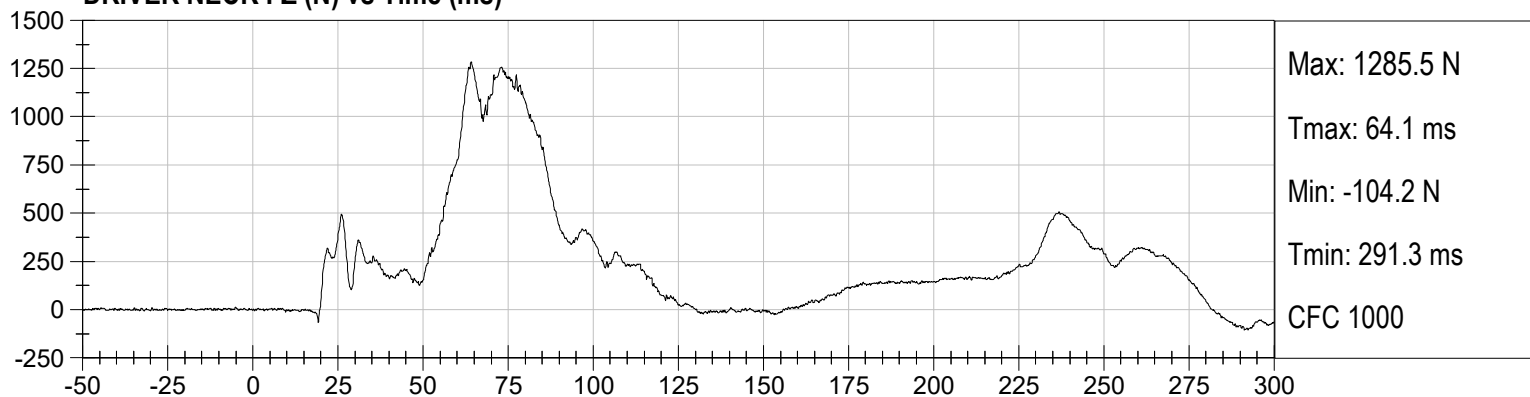
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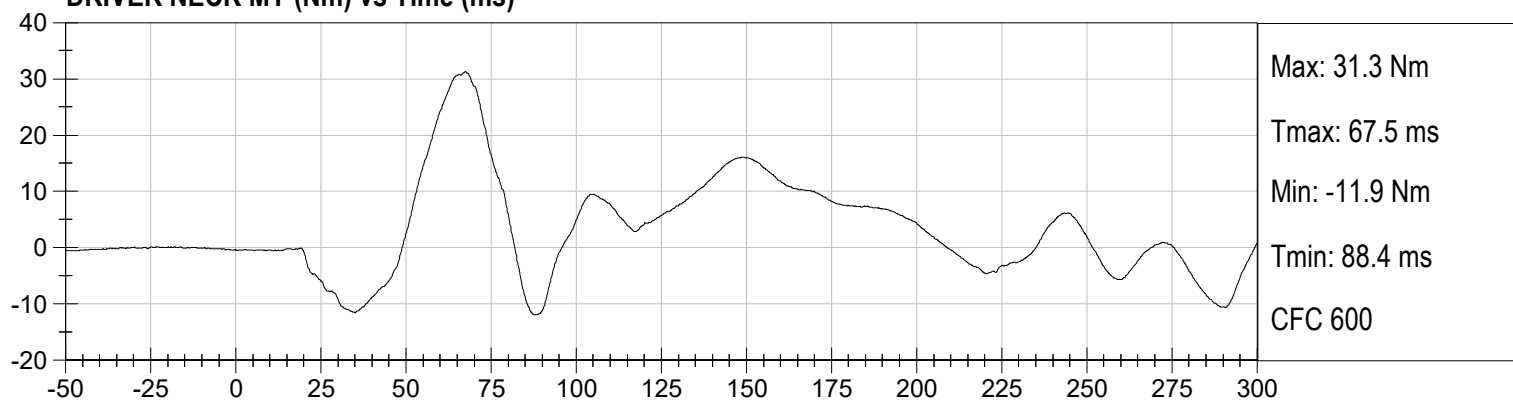
DRIVER NECK FX (N) vs Time (ms)



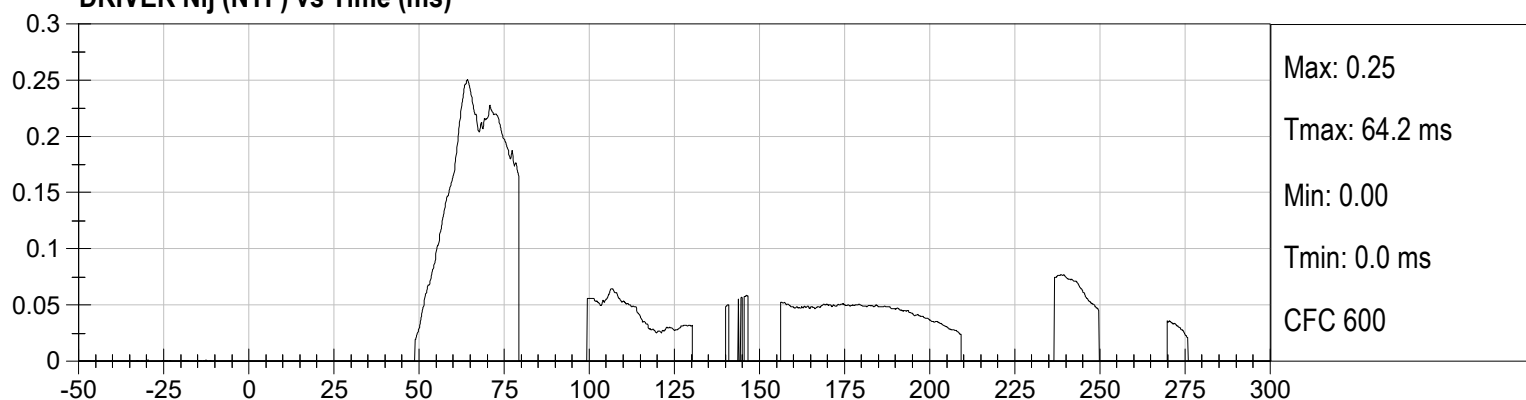
DRIVER NECK FZ (N) vs Time (ms)



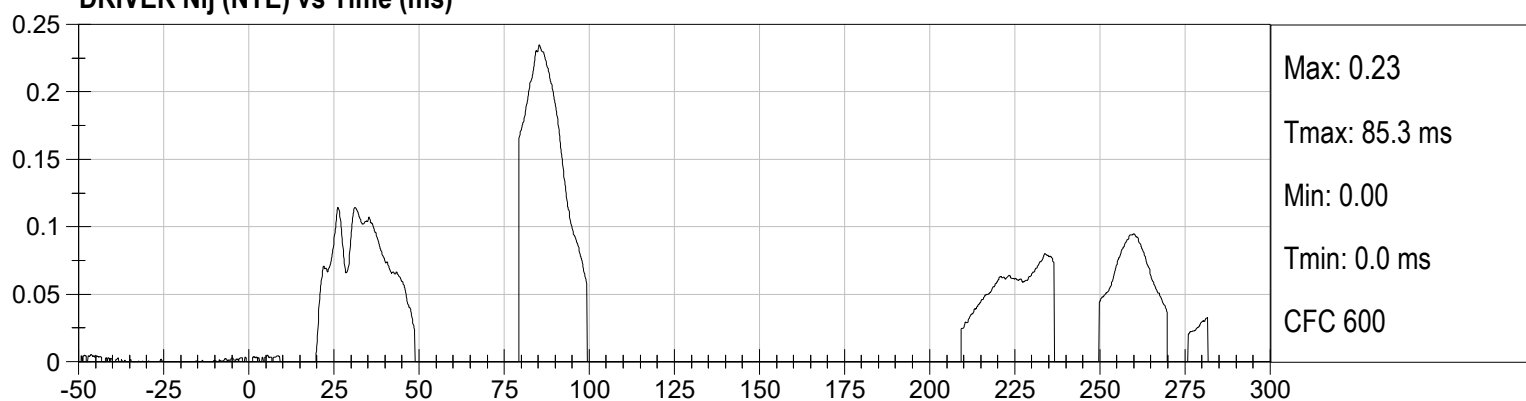
DRIVER NECK MY (Nm) vs Time (ms)



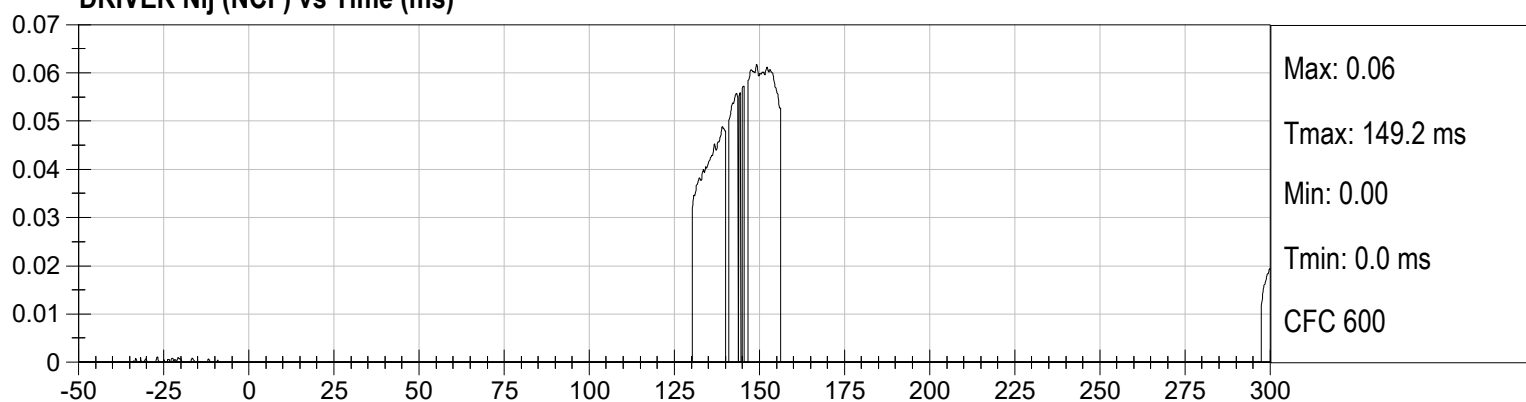
DRIVER Nij (NTF) vs Time (ms)



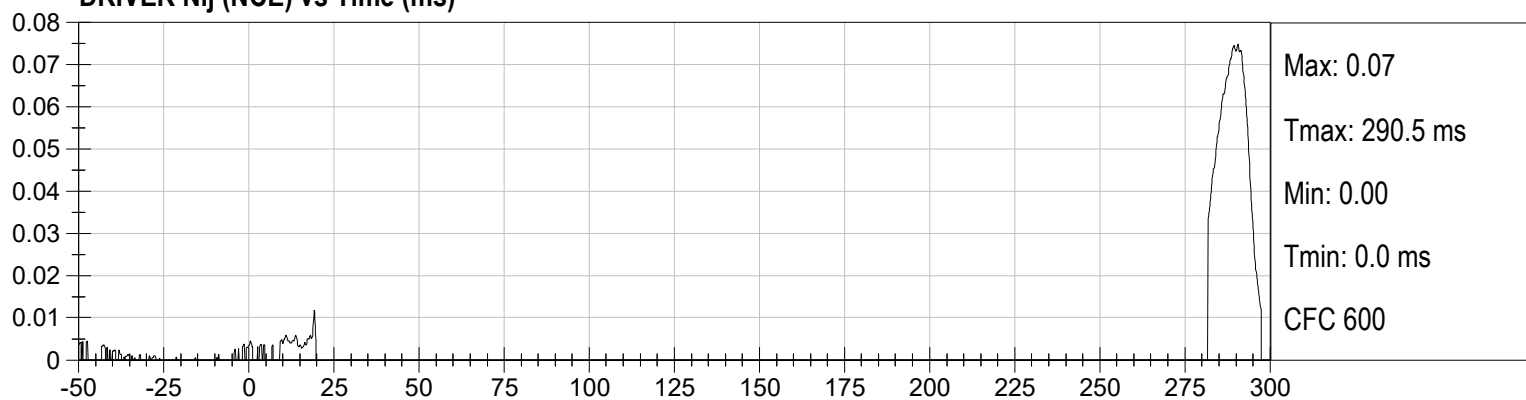
DRIVER Nij (NTE) vs Time (ms)



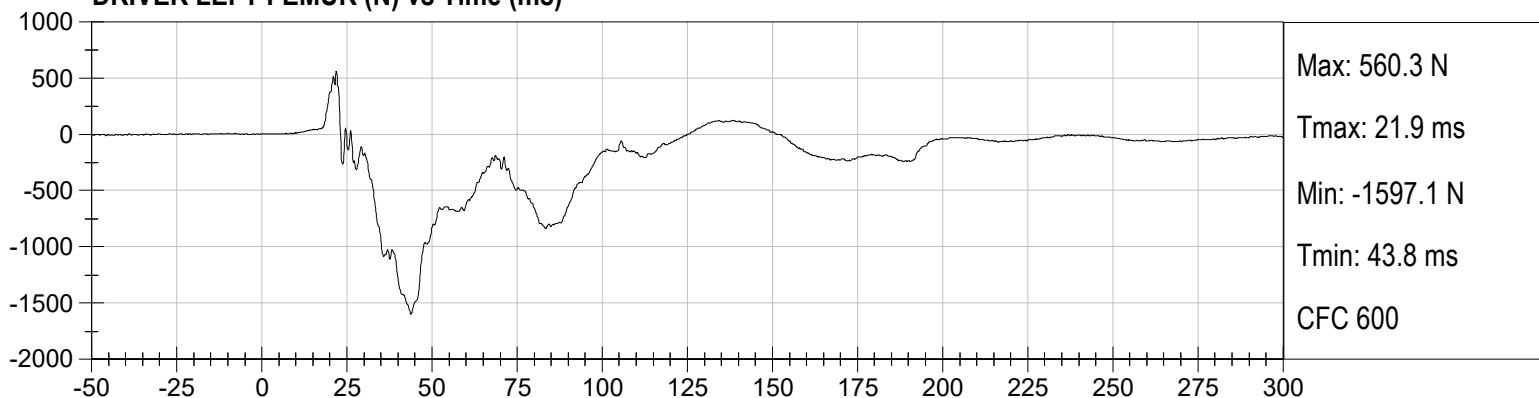
DRIVER Nij (NCF) vs Time (ms)



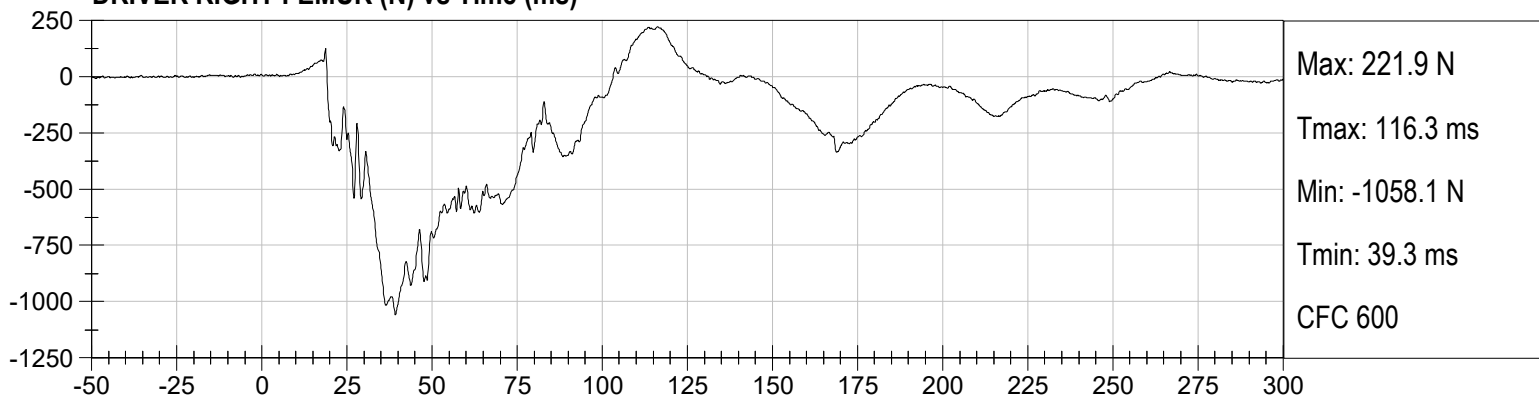
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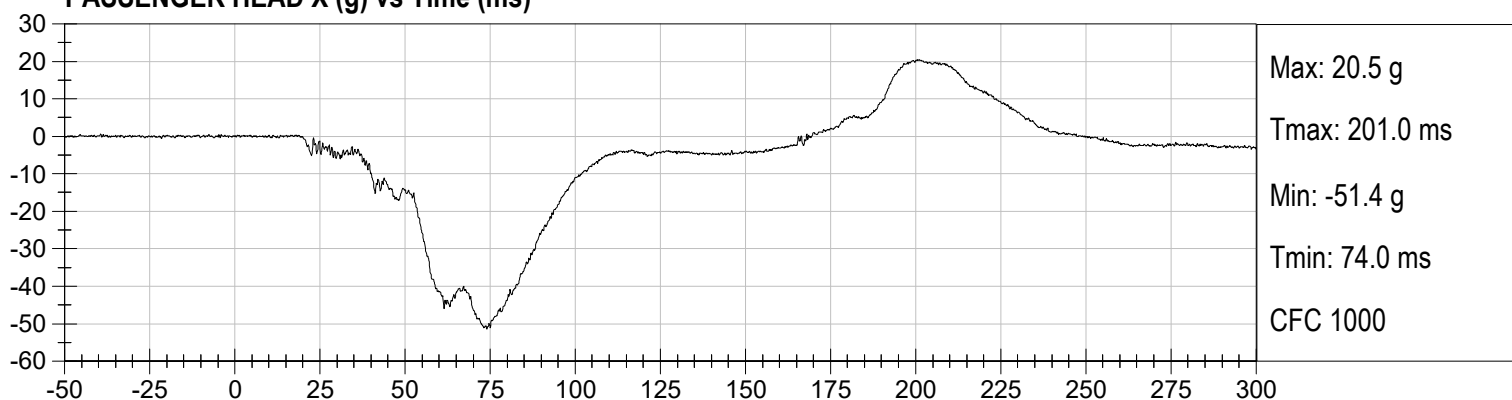
DRIVER LEFT FEMUR (N) vs Time (ms)



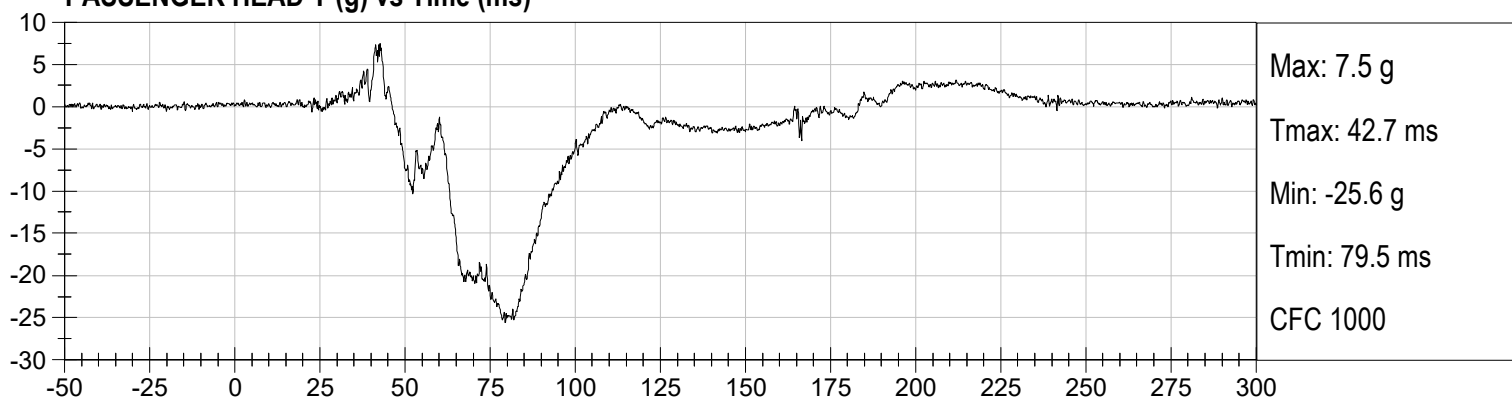
DRIVER RIGHT FEMUR (N) vs Time (ms)



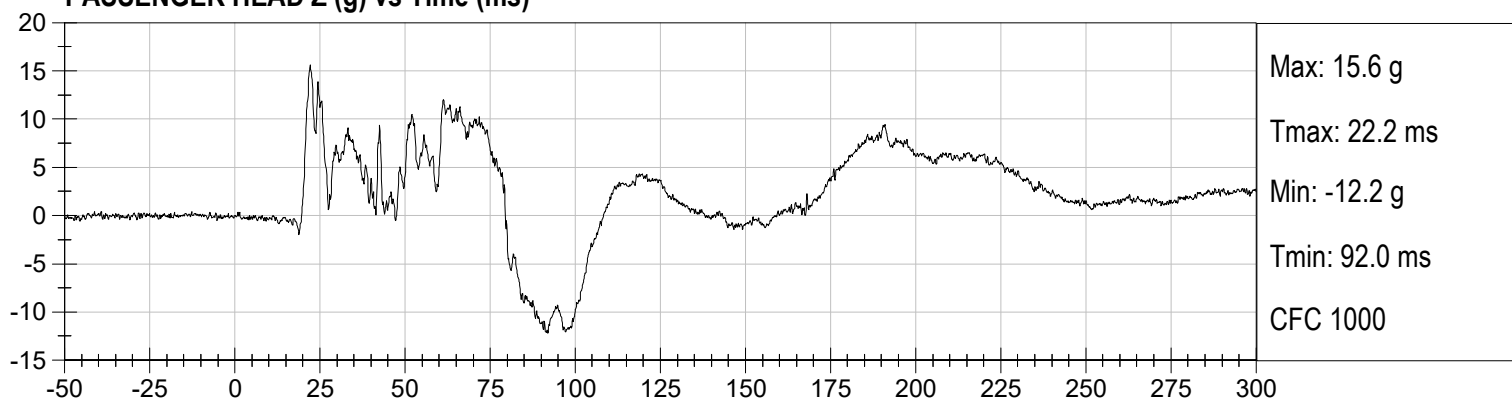
PASSENGER HEAD X (g) vs Time (ms)



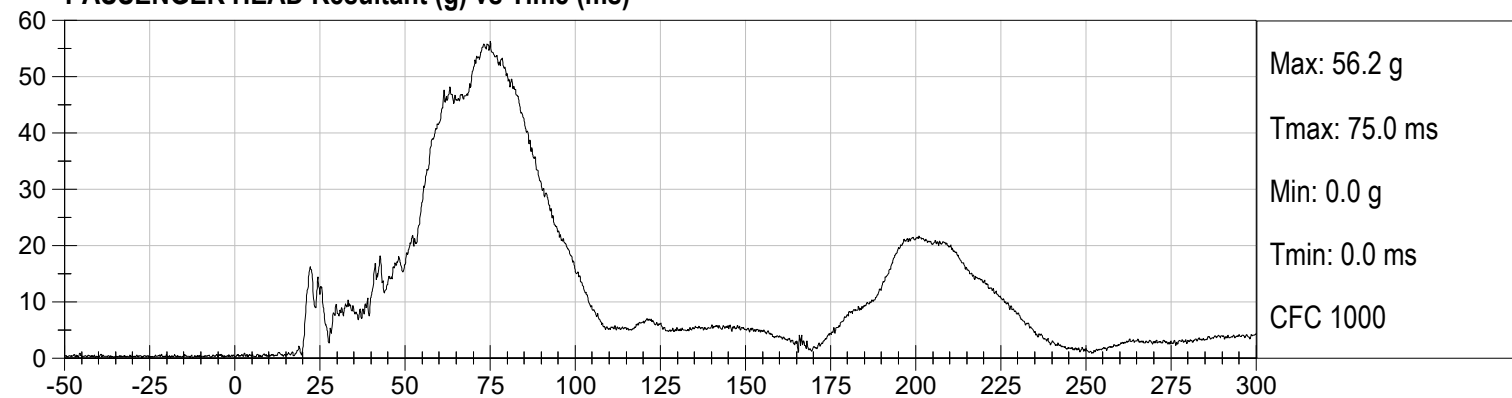
PASSENGER HEAD Y (g) vs Time (ms)

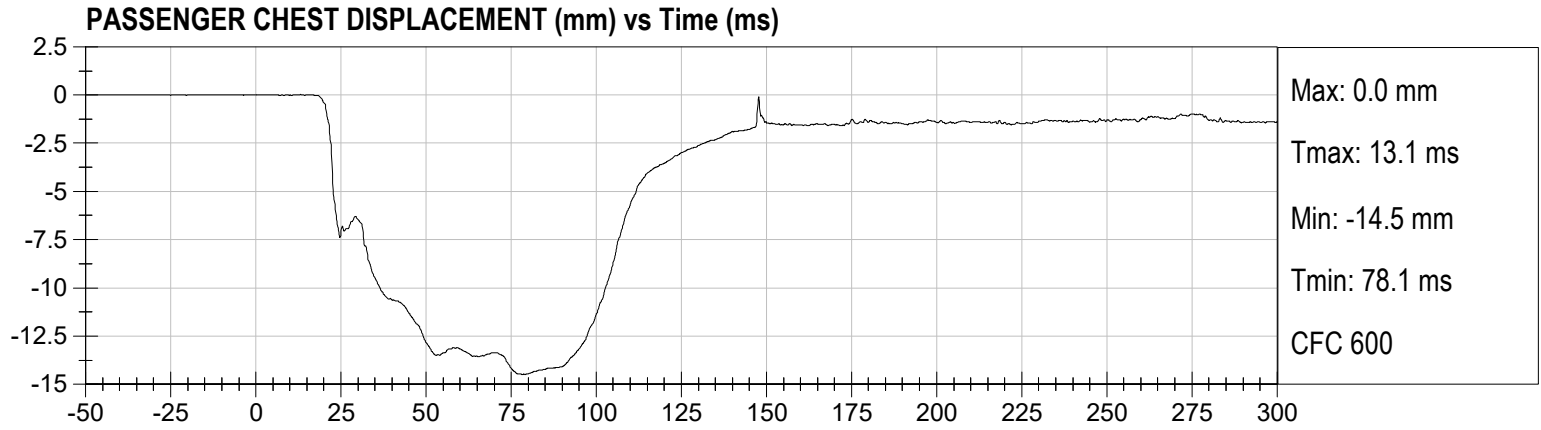


PASSENGER HEAD Z (g) vs Time (ms)

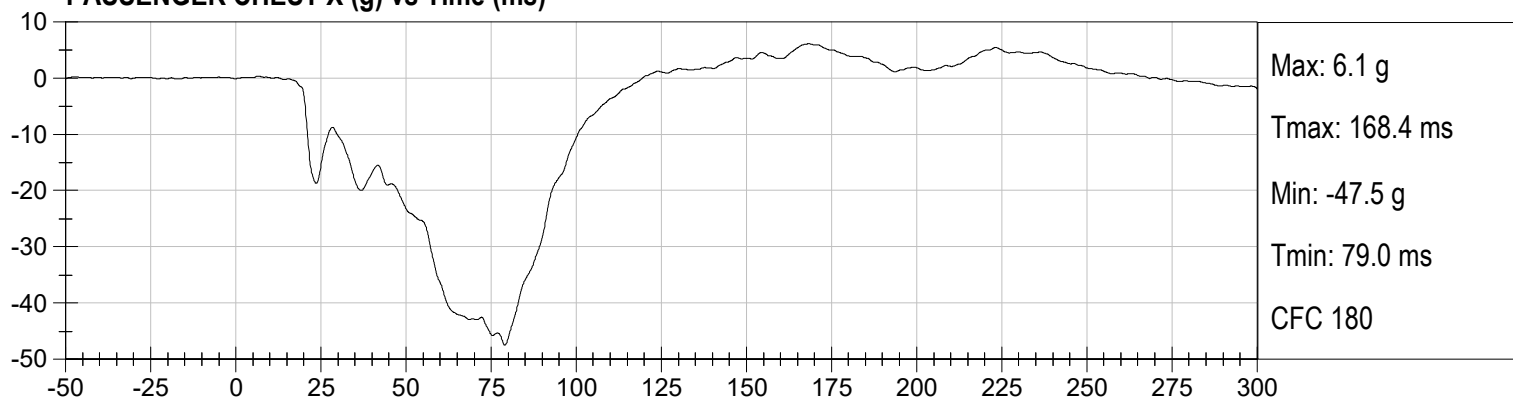


PASSENGER HEAD Resultant (g) vs Time (ms)

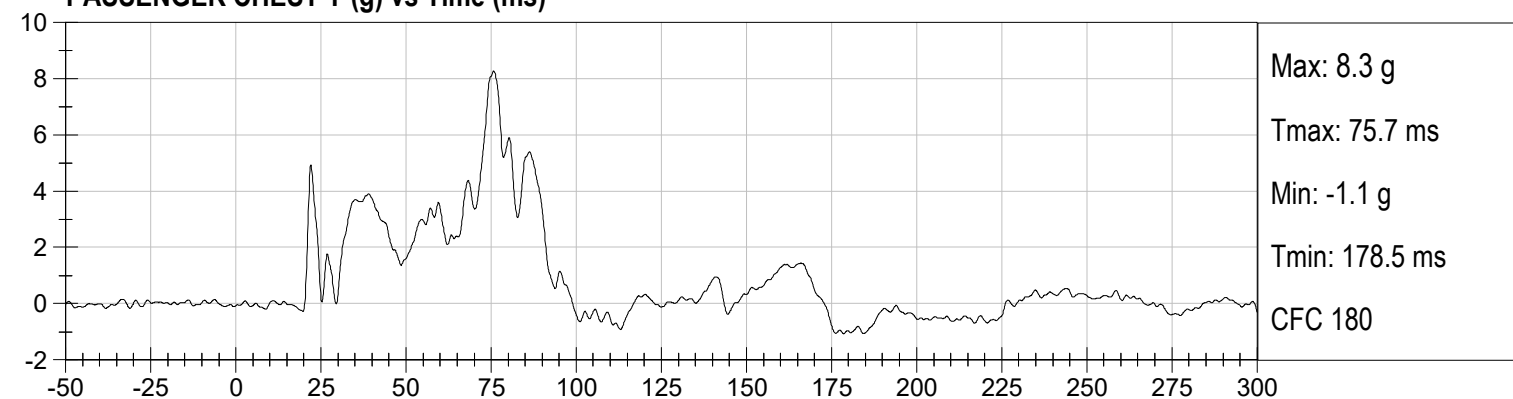




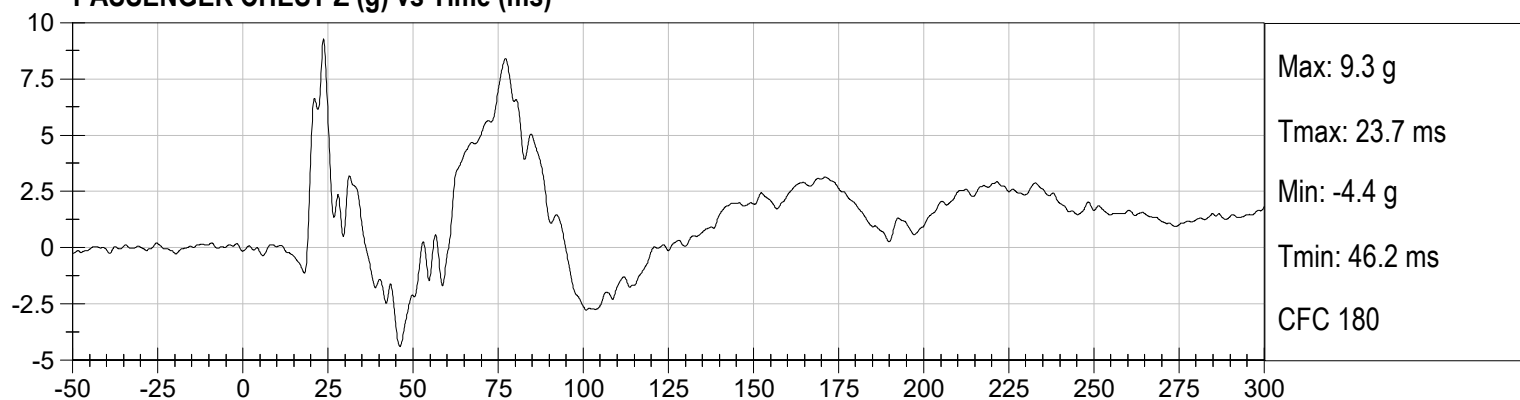
PASSENGER CHEST X (g) vs Time (ms)



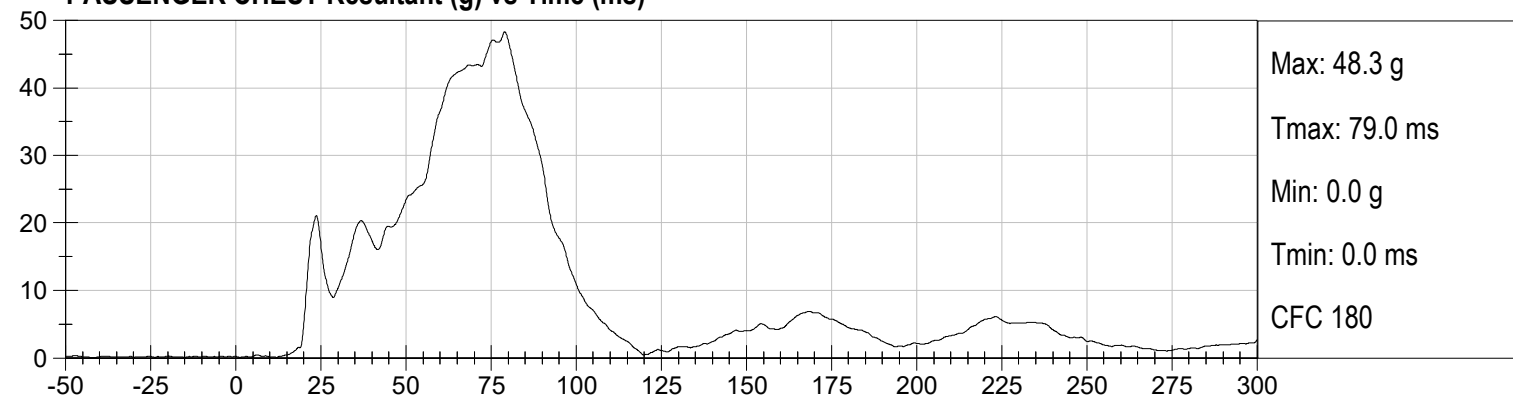
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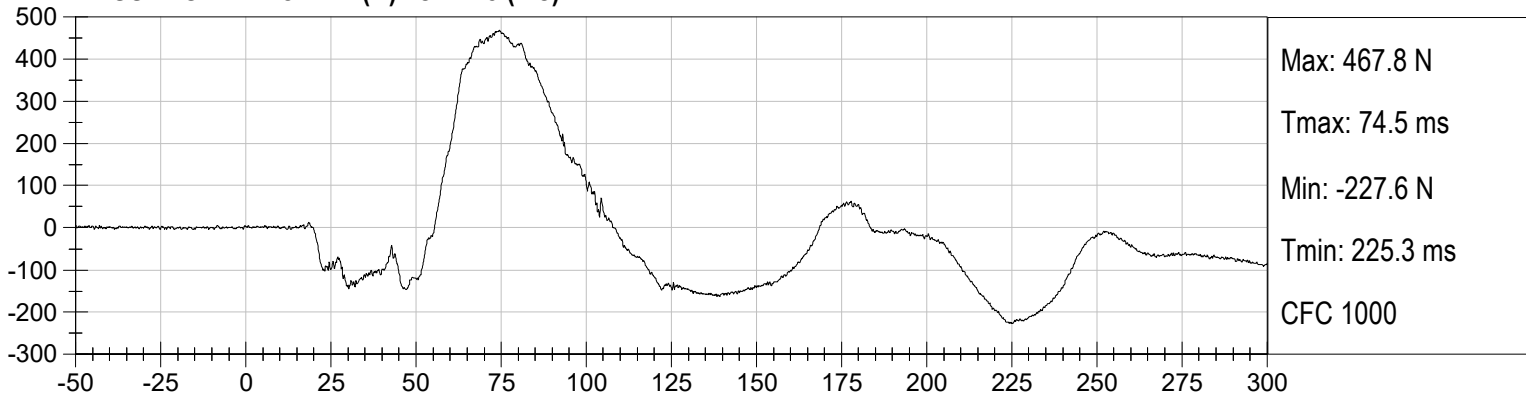
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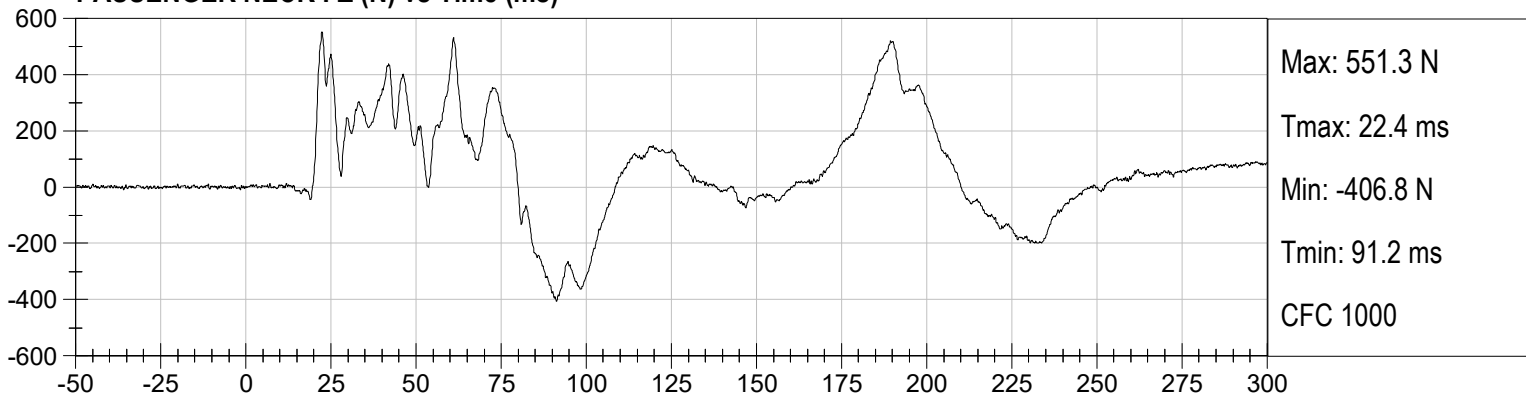
PASSENGER CHEST Resultant (g) vs Time (ms)



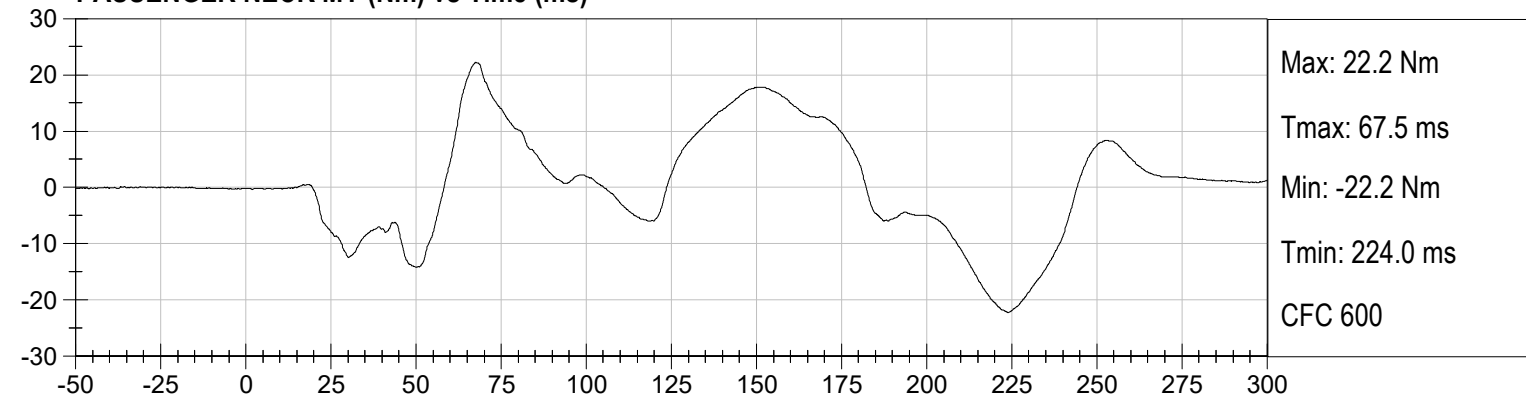
PASSENGER NECK FX (N) vs Time (ms)



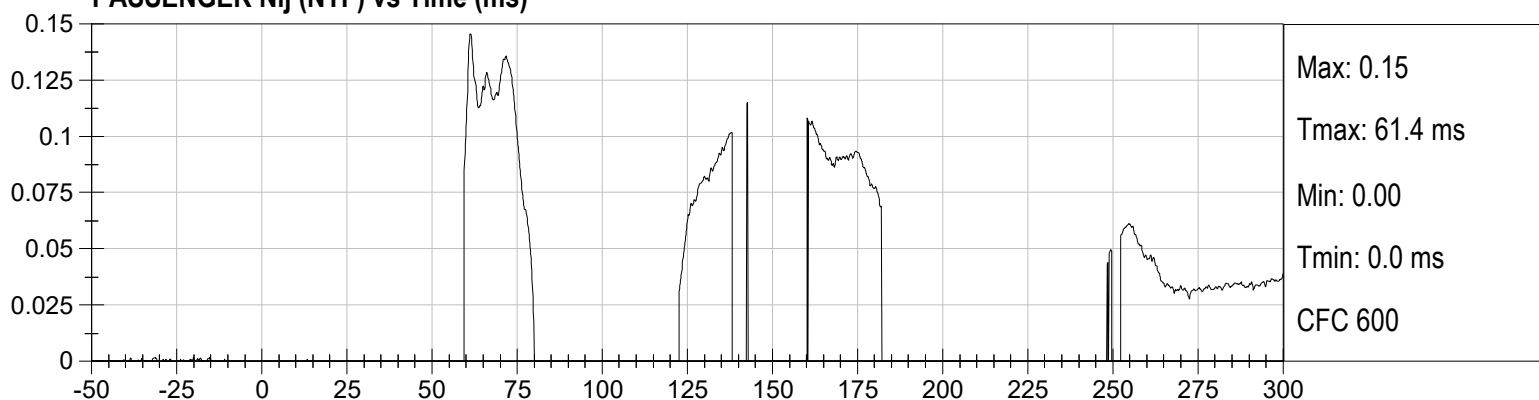
PASSENGER NECK FZ (N) vs Time (ms)



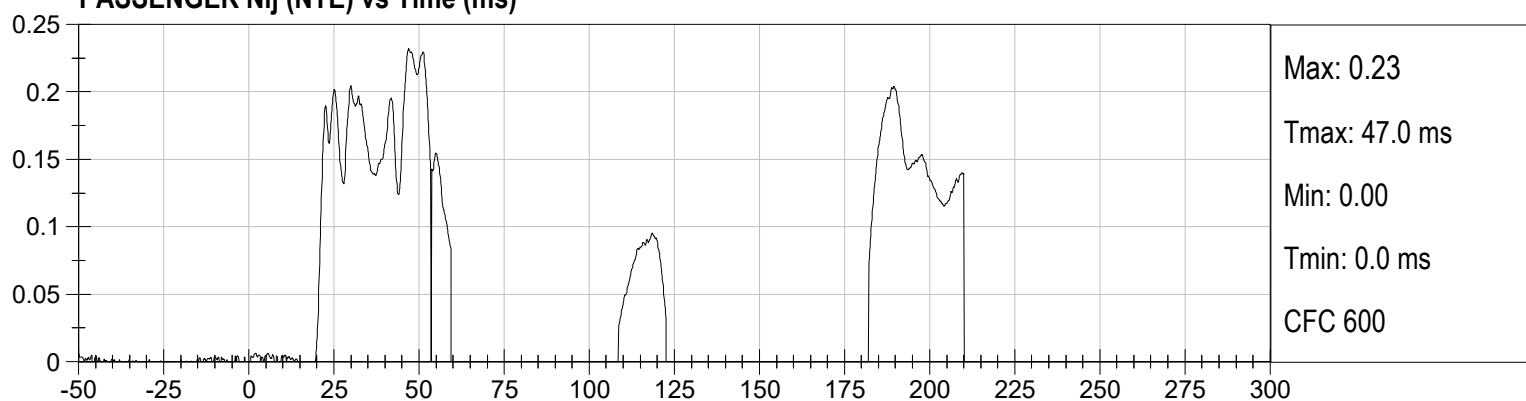
PASSENGER NECK MY (Nm) vs Time (ms)



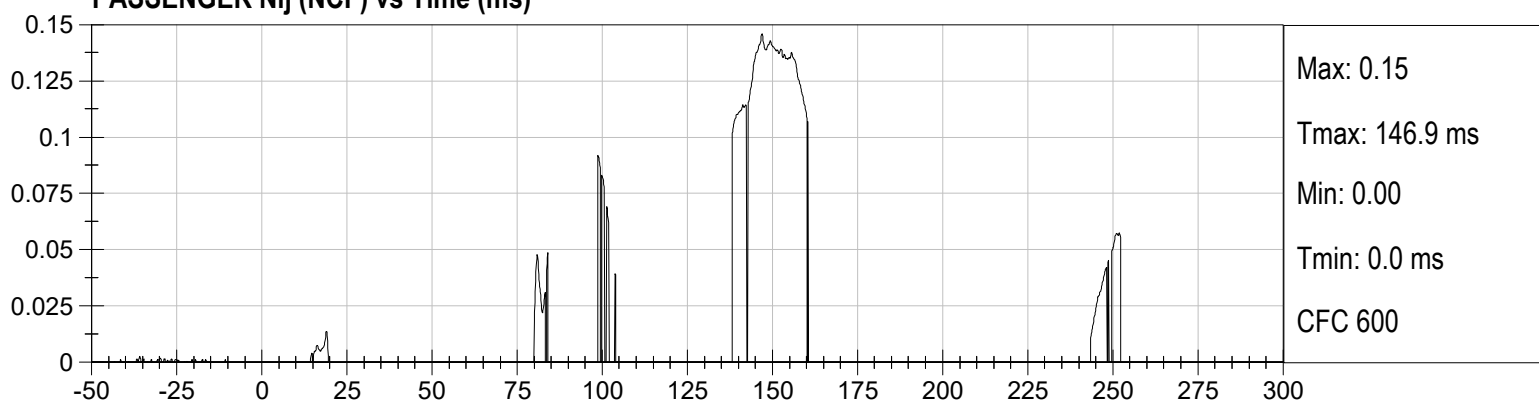
PASSENGER Nij (NTF) vs Time (ms)



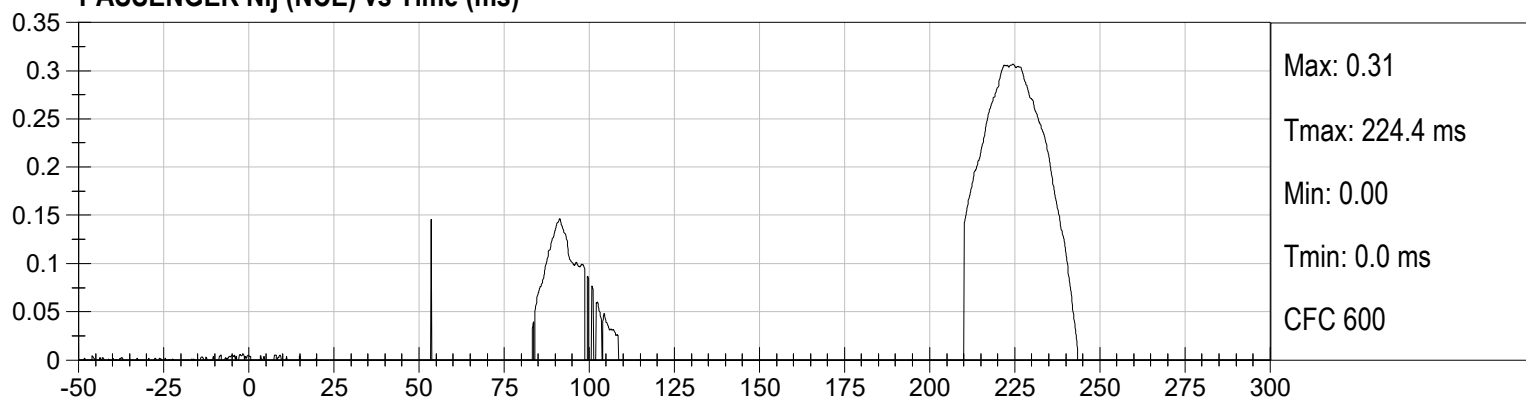
PASSENGER Nij (NTE) vs Time (ms)



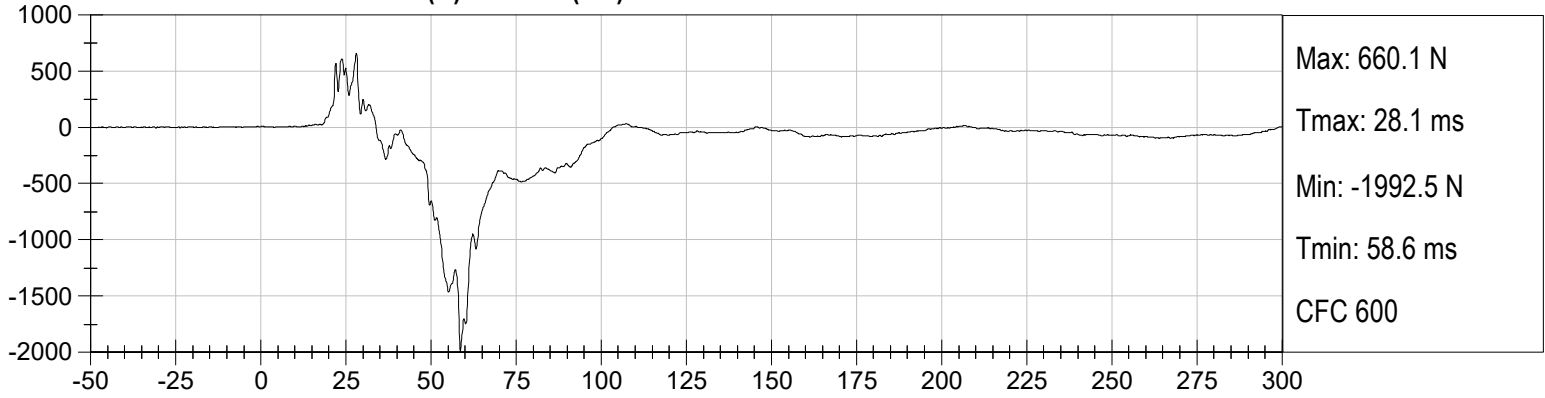
PASSENGER Nij (NCF) vs Time (ms)



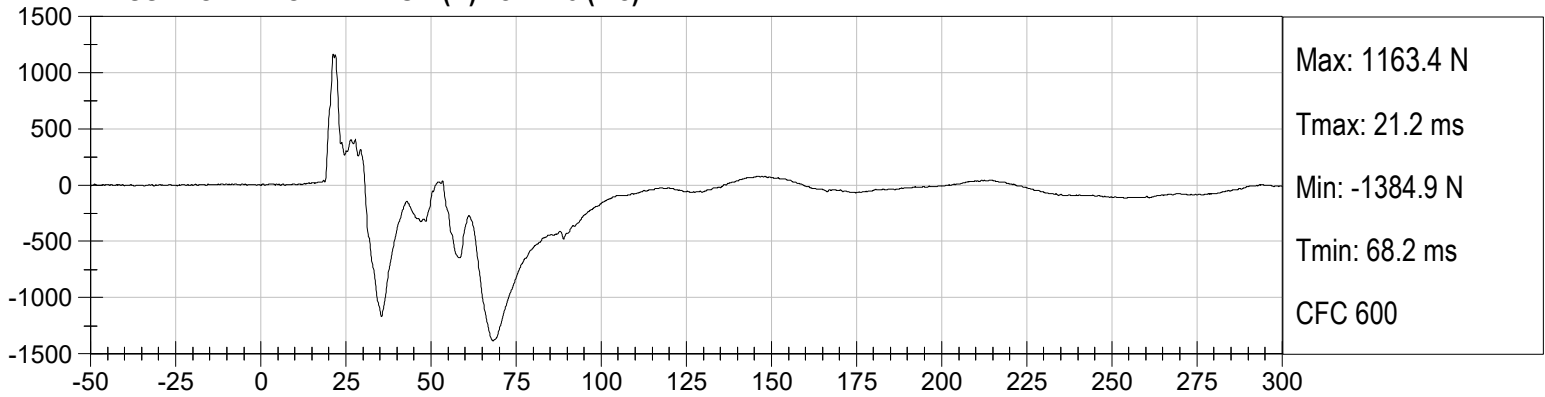
PASSENGER Nij (NCE) vs Time (ms)



PASSENGER LEFT FEMUR (N) vs Time (ms)



PASSENGER RIGHT FEMUR (N) vs Time (ms)



APPENDIX C
DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

CALIBRATION TEST RESULTS

PRE-TEST

HYBRID III 50TH PERCENTILE MALE - DRIVER ATD

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

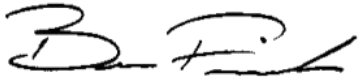
Test ID: D193831

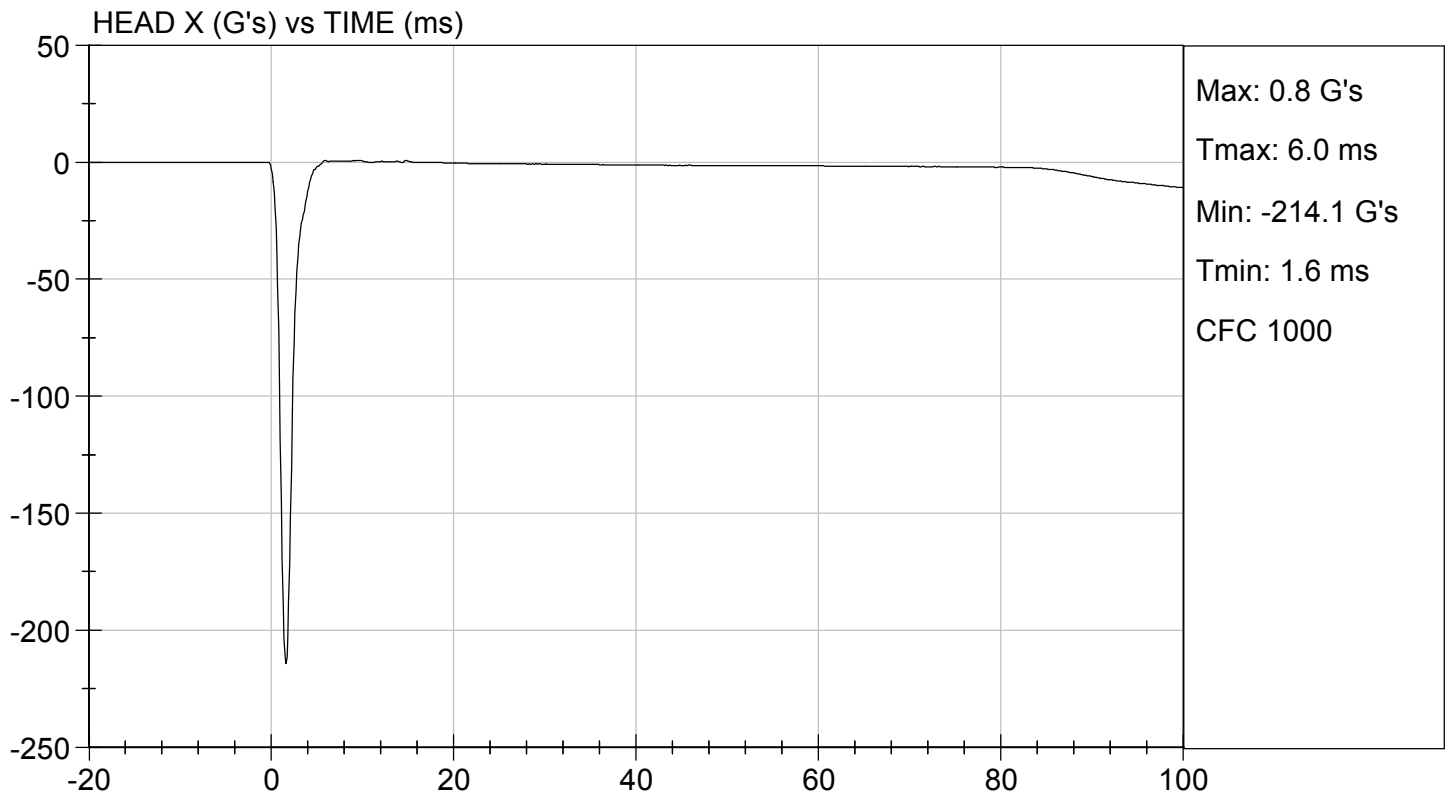
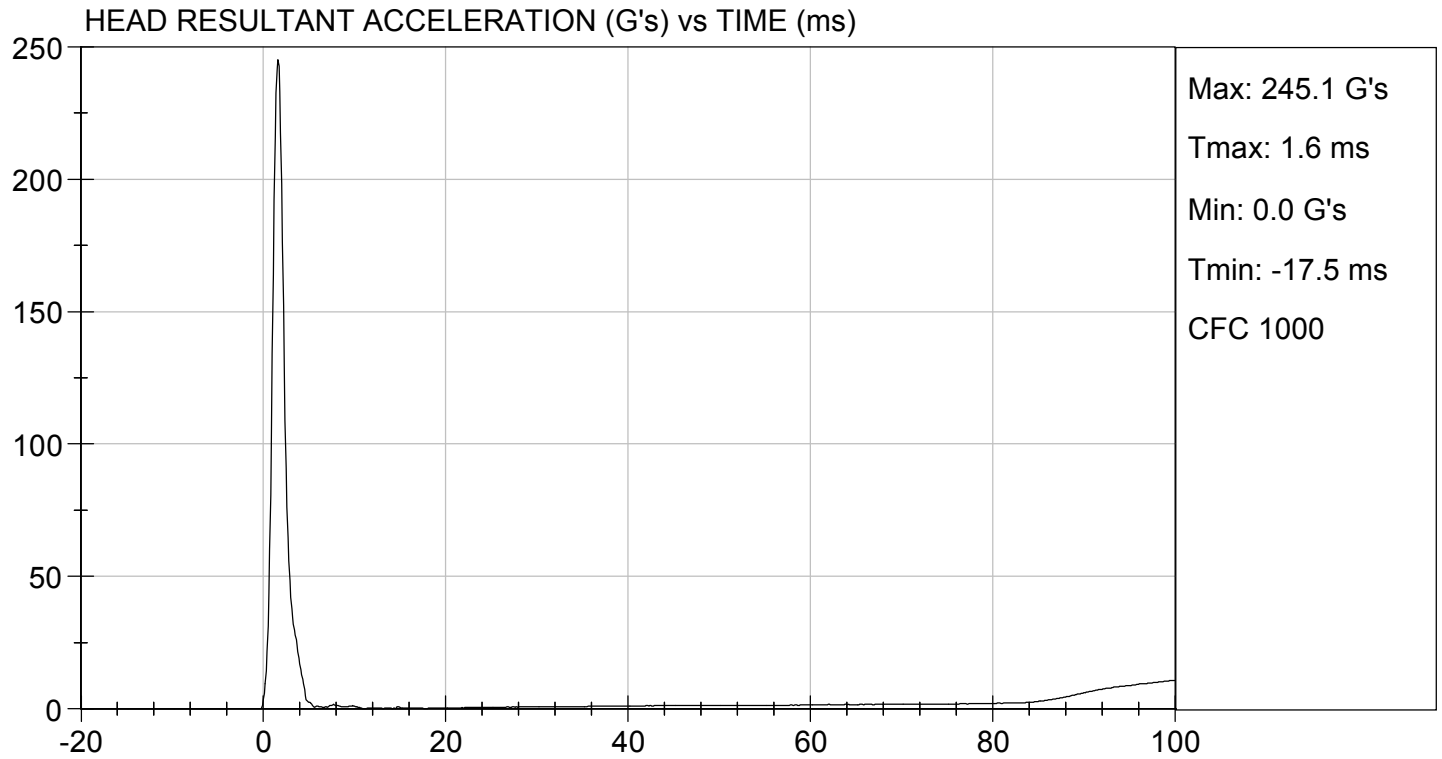
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
Peak Resultant Acceleration	G's	225 to 275	245	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	2.1	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

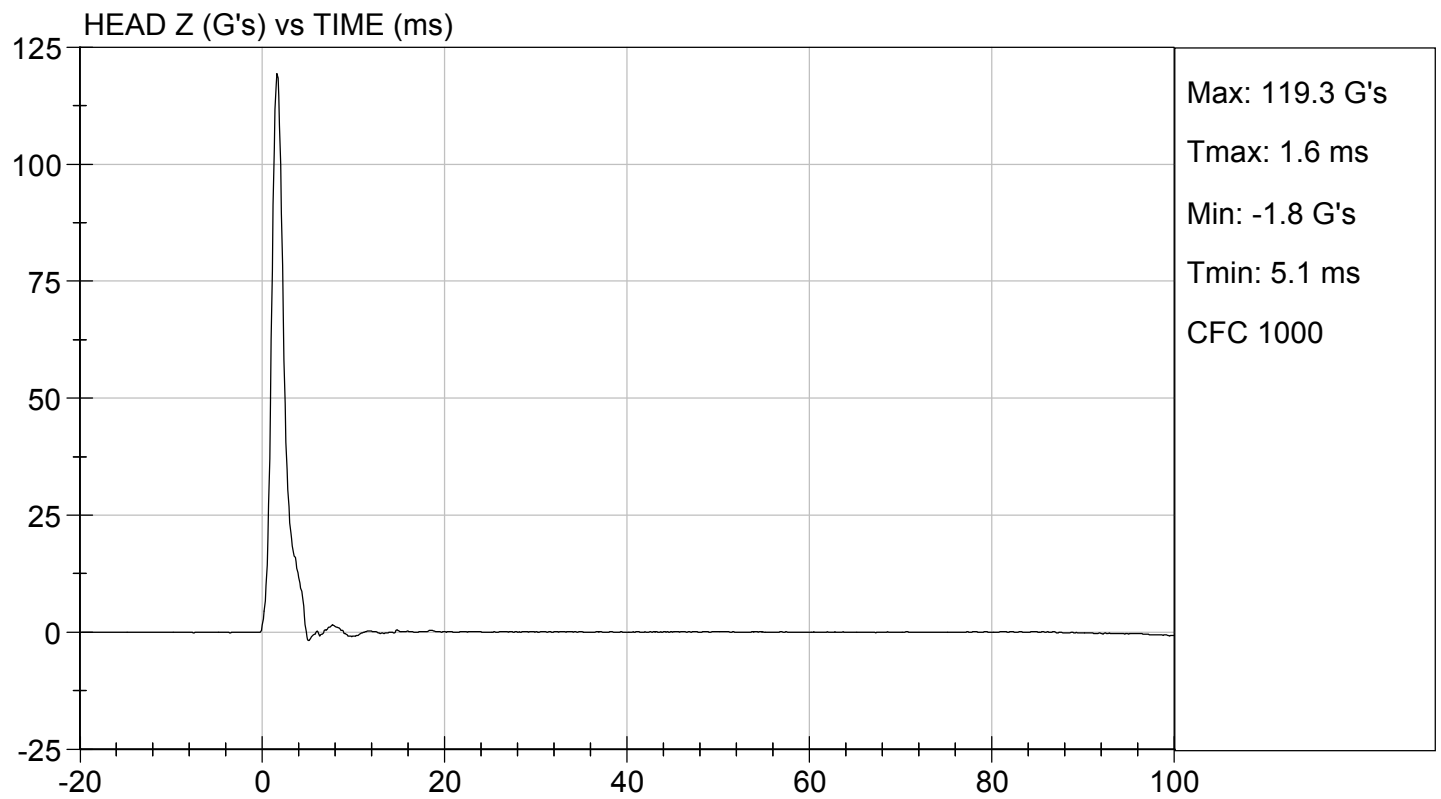
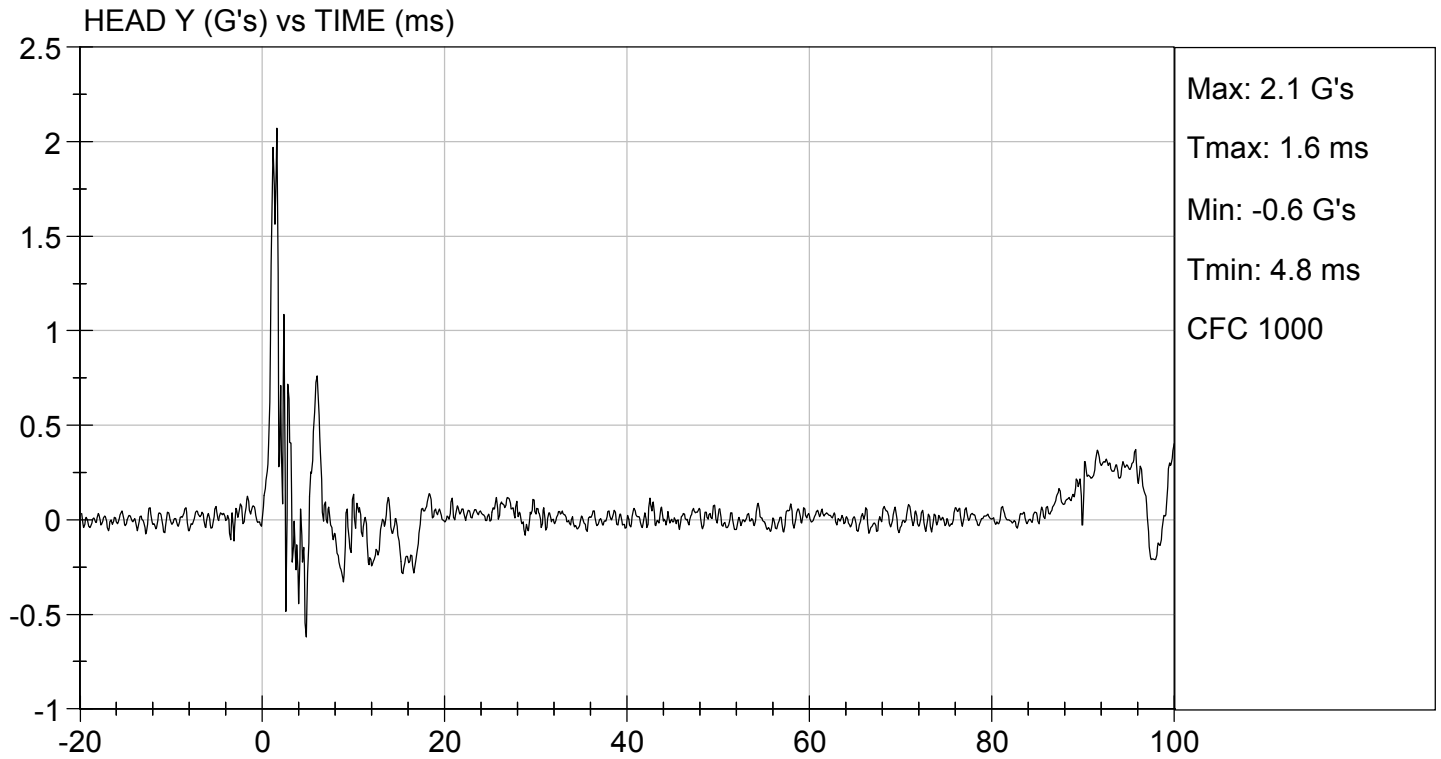

Laboratory Technician

12/06/2019

Test Date


Approved By



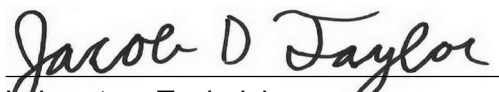


MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

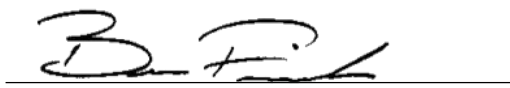
Test I.D: D193832

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	23	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.19	Pass
	20 ms	G's	17.60 to 22.60	20.44	Pass
	30 ms	G's	12.50 to 18.50	15.35	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	15.3	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	35.7	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	71.2	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	116.2	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	89.4	Pass
	Time	ms	47.0 to 58.0	48.3	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	99.3	Pass
Overall Test Results					Pass


Laboratory Technician

12/06/2019

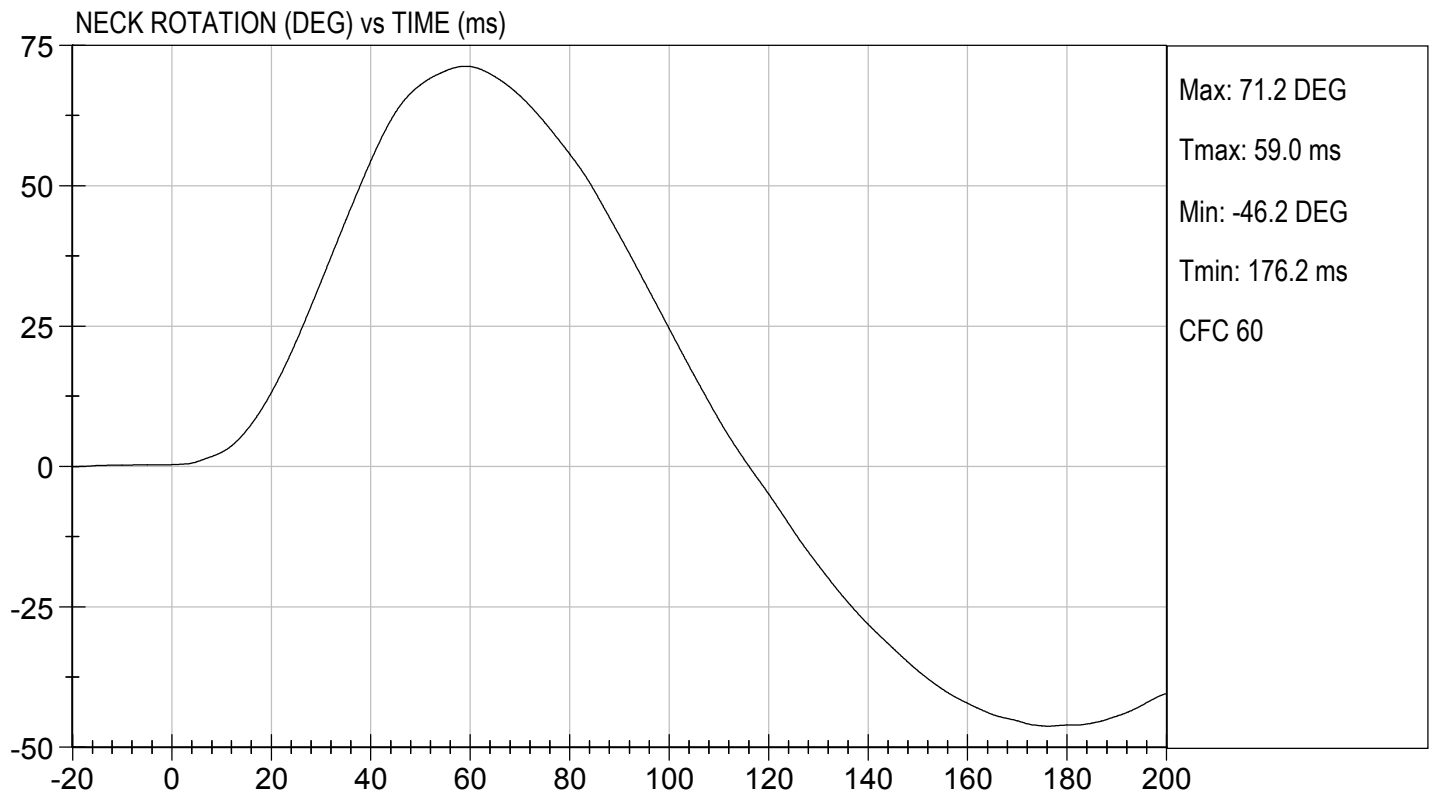
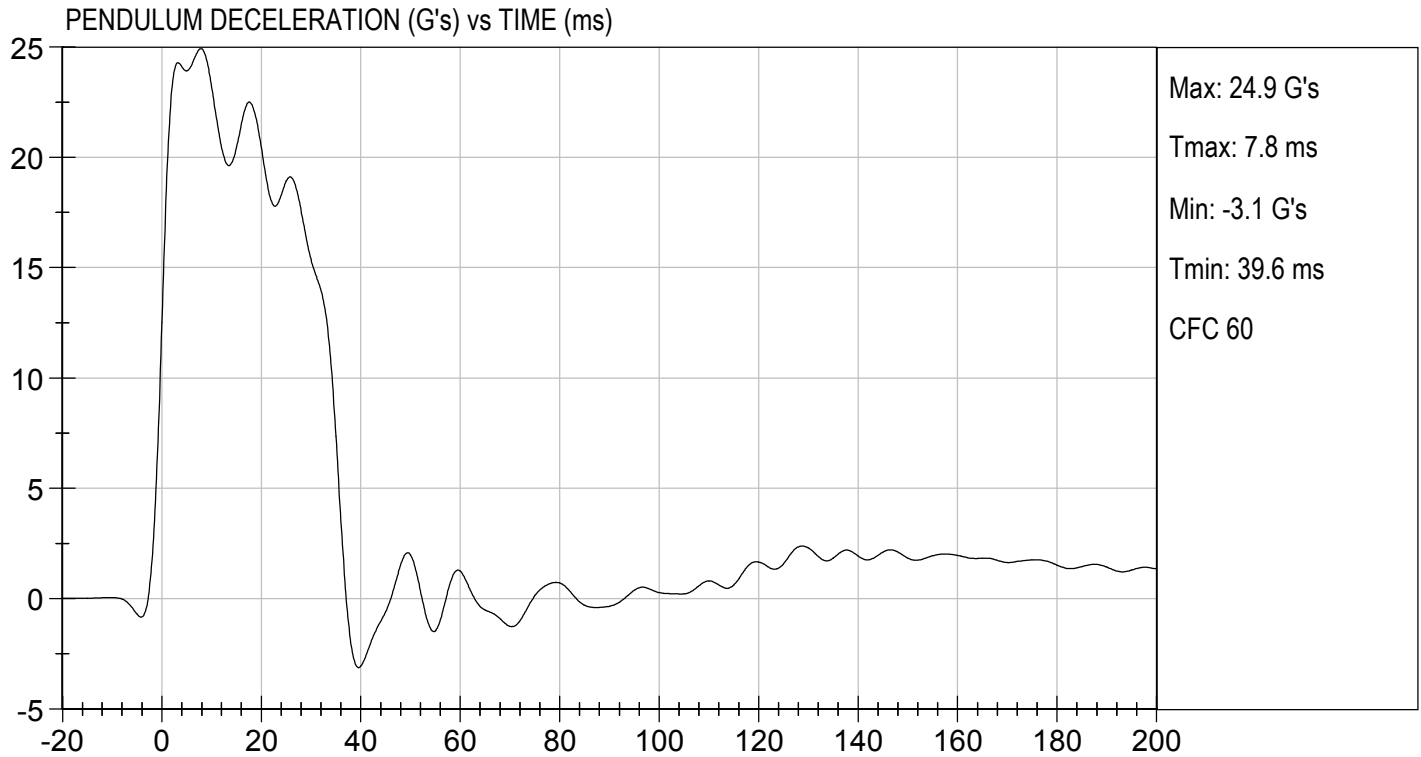
Test Date


Approved By



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

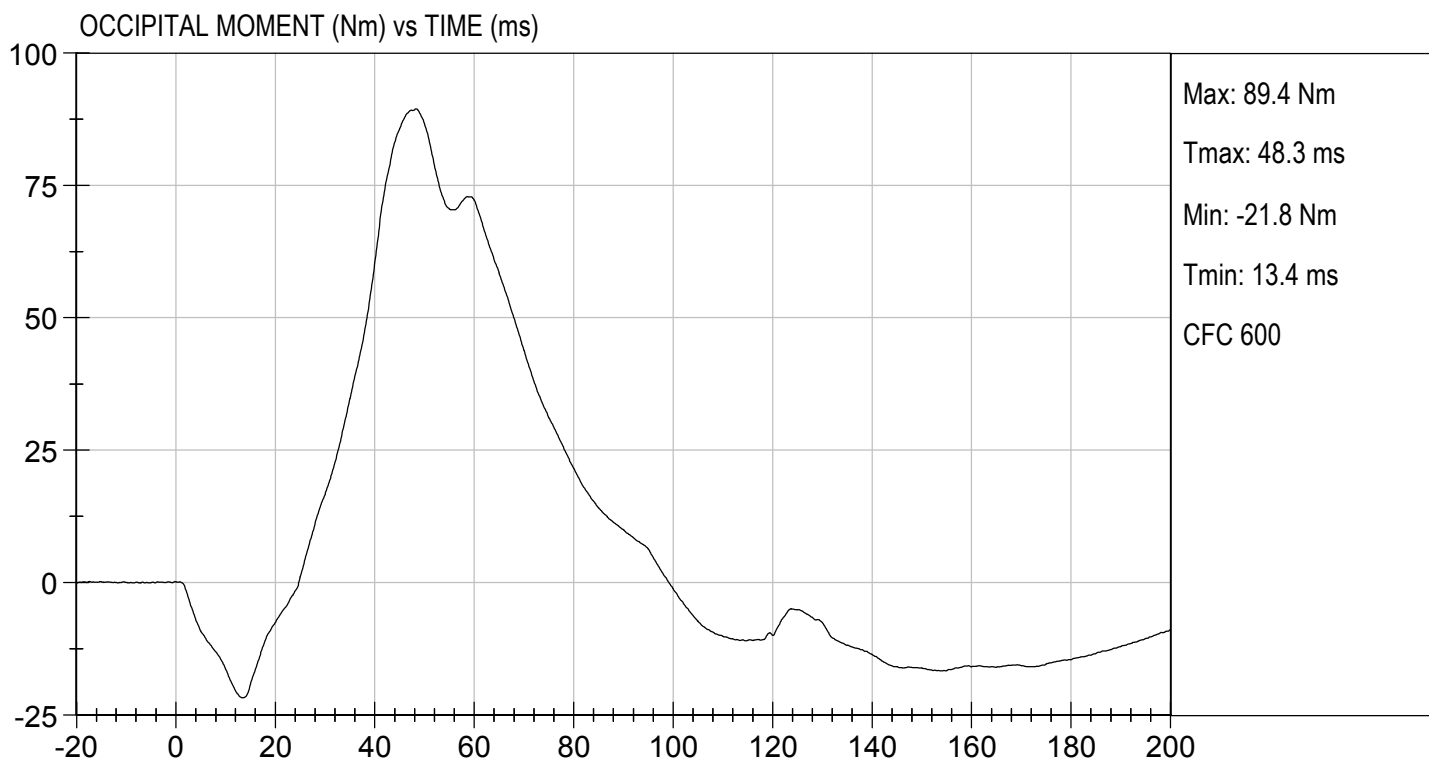
TEST DATE: 12/06/2019
TEST #: D193832





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

TEST DATE: 12/06/2019
TEST #: D193832

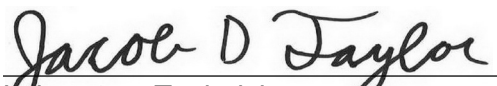


MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D: D193833

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	23	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.19	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	17.53	Pass
	20 ms	G's	14.00 to 19.00	15.82	Pass
	30 ms	G's	11.00 to 16.00	12.07	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	13.9	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	41.8	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	98.8	Pass
	Time	ms	72.0 to 82.0	77.9	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	163.8	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-57.6	Pass
	Time	ms	65.0 to 79.0	72.0	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	144.7	Pass
Overall Test Results					Pass


 Laboratory Technician

12/06/2019

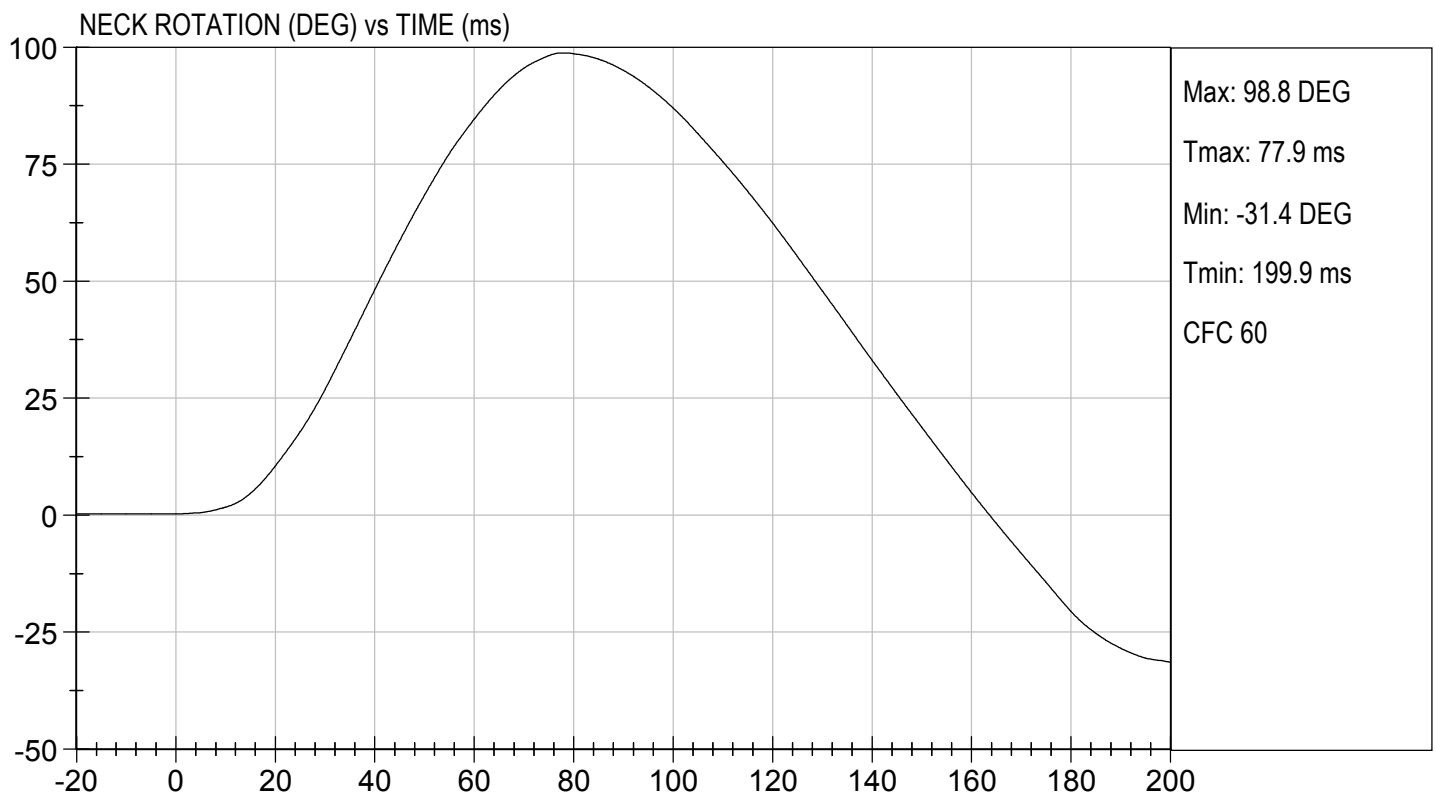
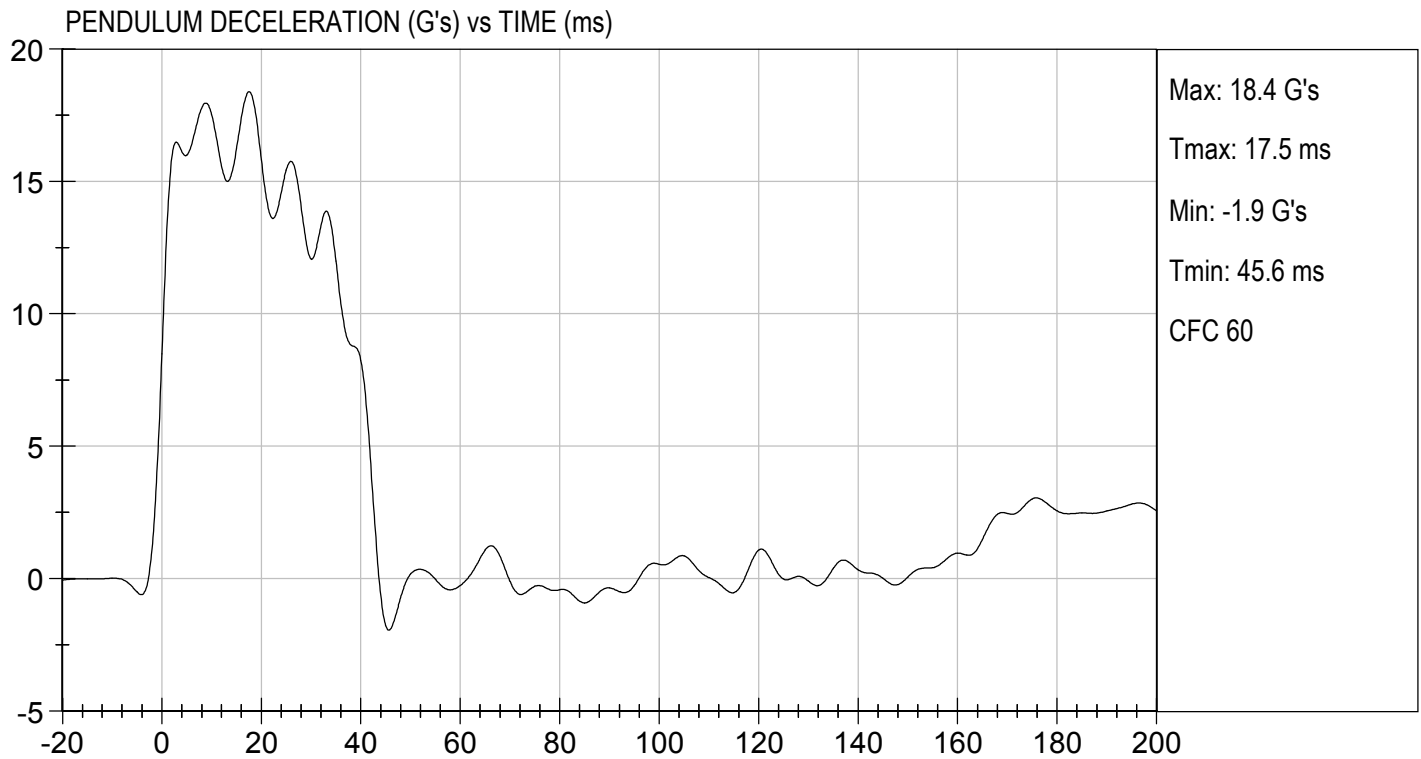
Test Date


 Approved By



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

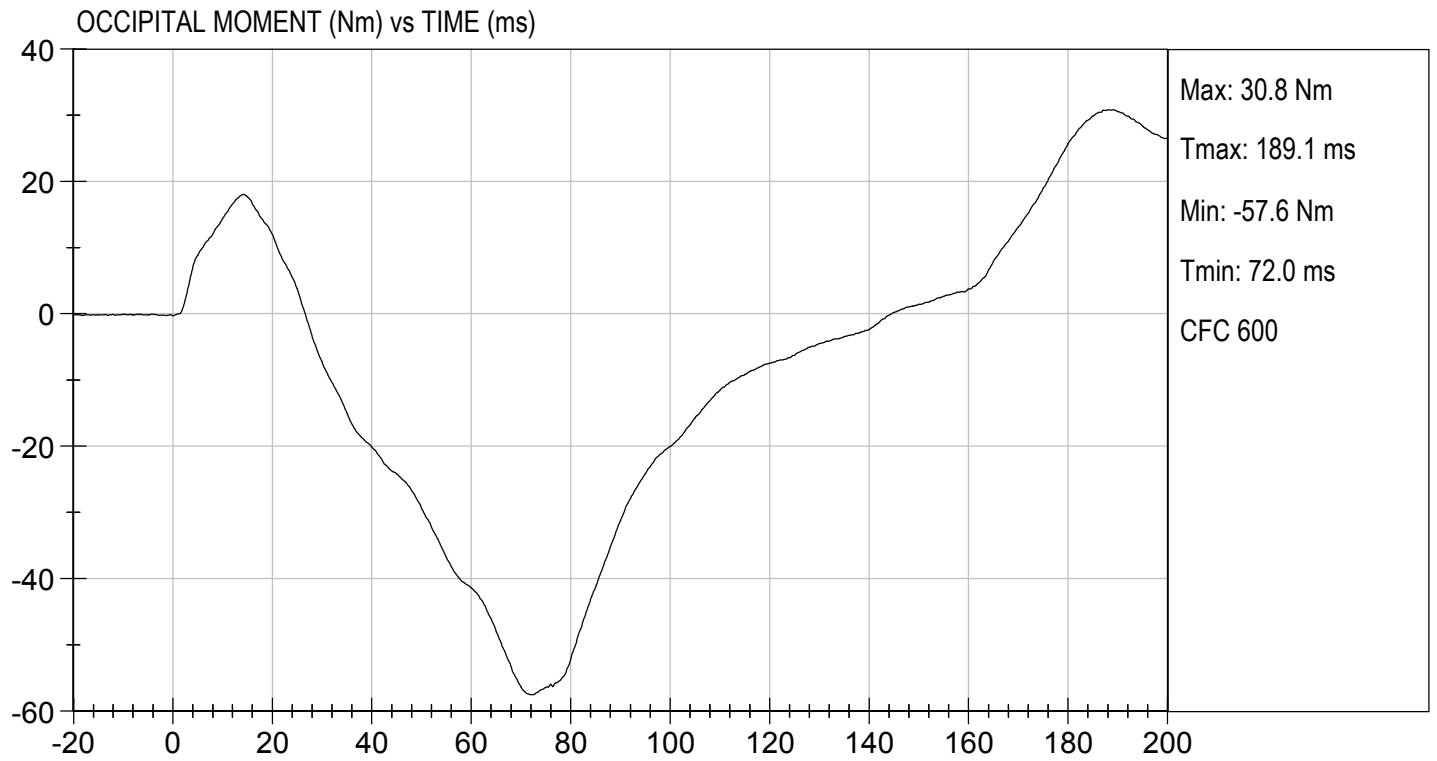
TEST DATE: 12/06/2019
TEST #: D193833





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

TEST DATE: 12/06/2019
TEST #: D193833



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

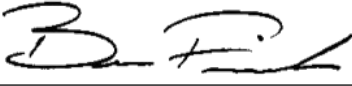
ATD Serial No: 351

Test I.D: D193834

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,581	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.73	Pass
Internal Hysteresis	%	69 to 85	72	Pass
			Overall Test Results	Pass


Laboratory Technician

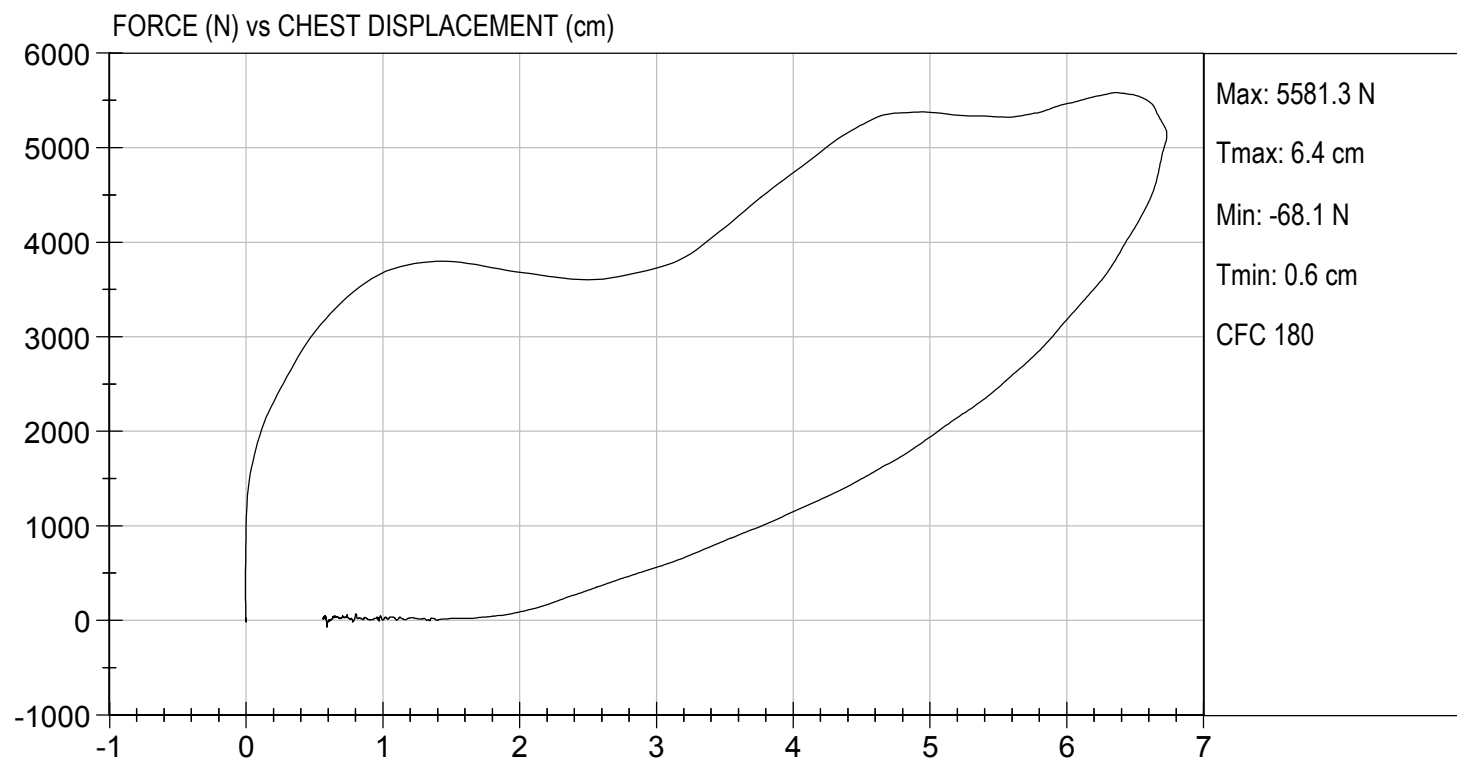
12/06/2019
Test Date


Approved By



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

TEST DATE: 12/06/2019
TEST #: D193834

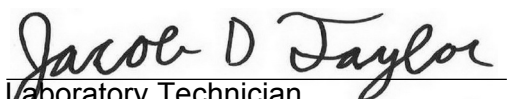


MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D: D193835

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	23	Pass
Probe Velocity	m/s	2.07 to 2.13	2.09	Pass
Peak Probe Force	N	4715 to 5782	4,905	Pass
Overall Test Results				Pass


Laboratory Technician

12/06/2019

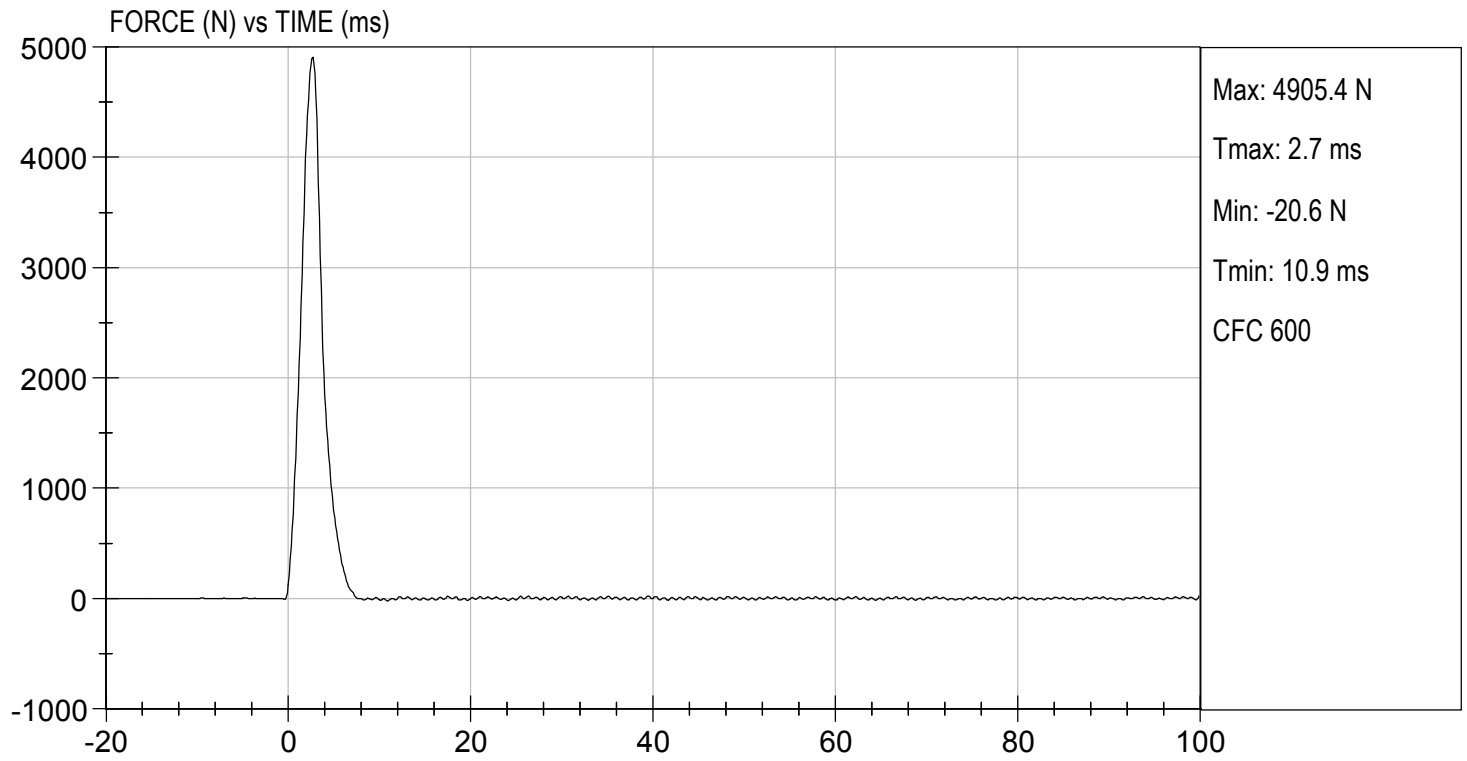
Test Date


Approved By



TEST DESC: RIGHT KNEE
VELOCITY: 6.85 ft/s, 2.09 m/s

TEST DATE: 12/06/2019
TEST #: D193835



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

ATD Serial No: 351

Test I.D: D193836

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	23	Pass
Probe Velocity	m/s	2.07 to 2.13	2.07	Pass
Peak Probe Force	N	4715 to 5782	5,105	Pass
Overall Test Results				Pass


Laboratory Technician

12/06/2019

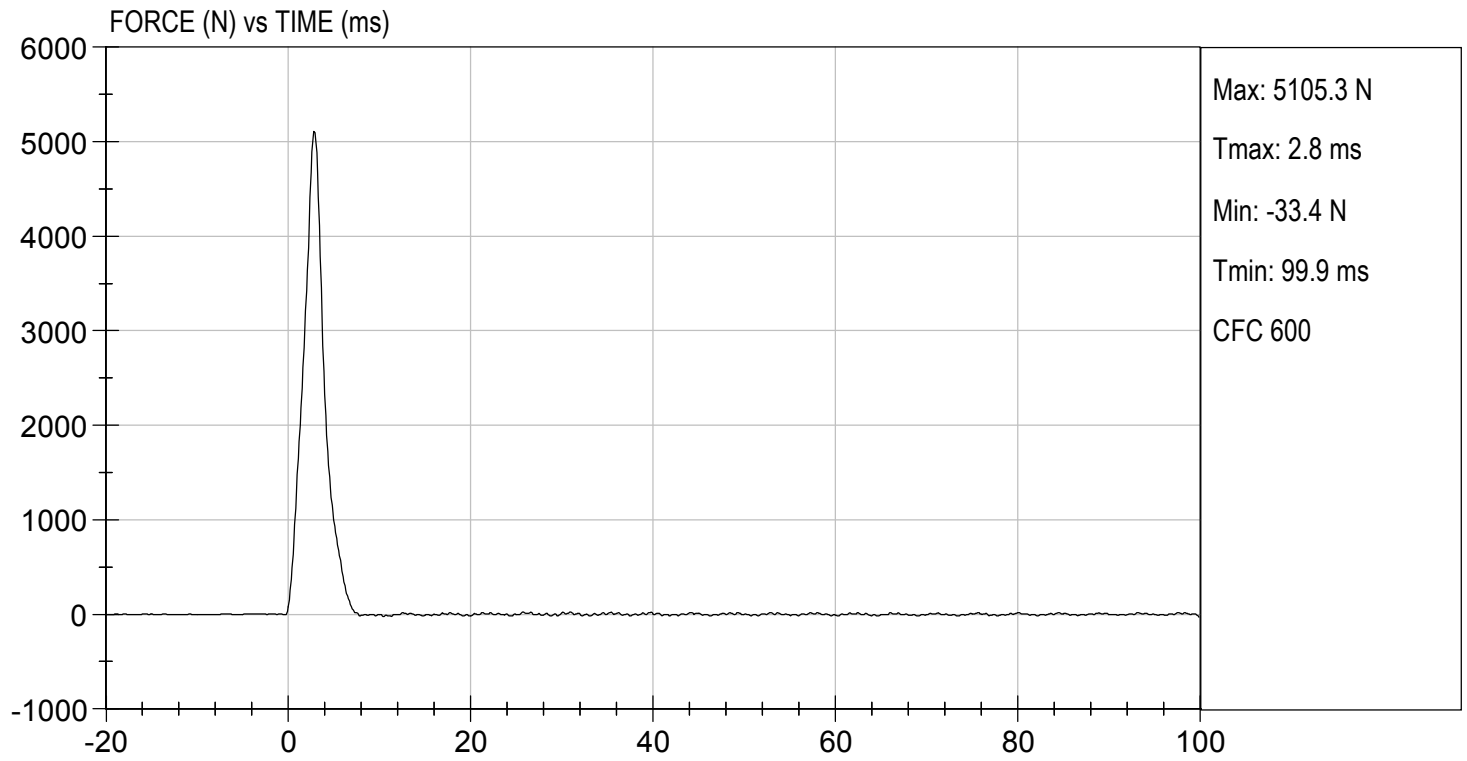
Test Date


Approved By



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

TEST DATE: 12/06/2019
TEST #: D193836

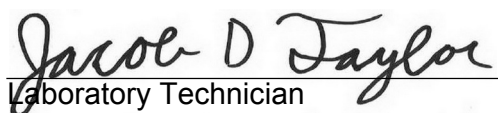


MGA RESEARCH CORPORATION
HIP-FEMUR FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

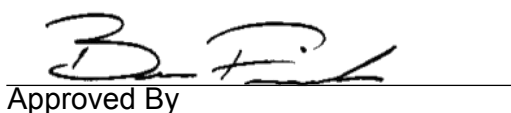
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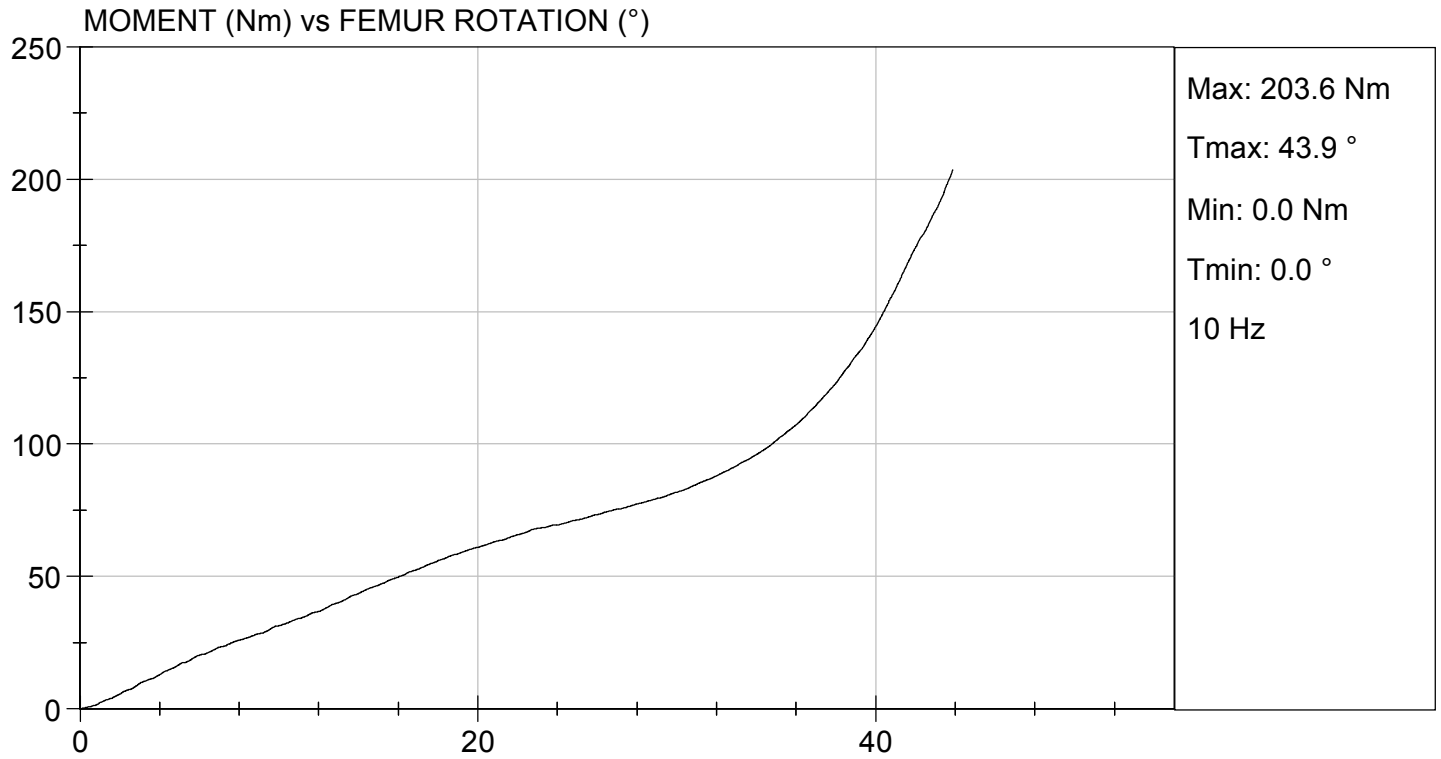
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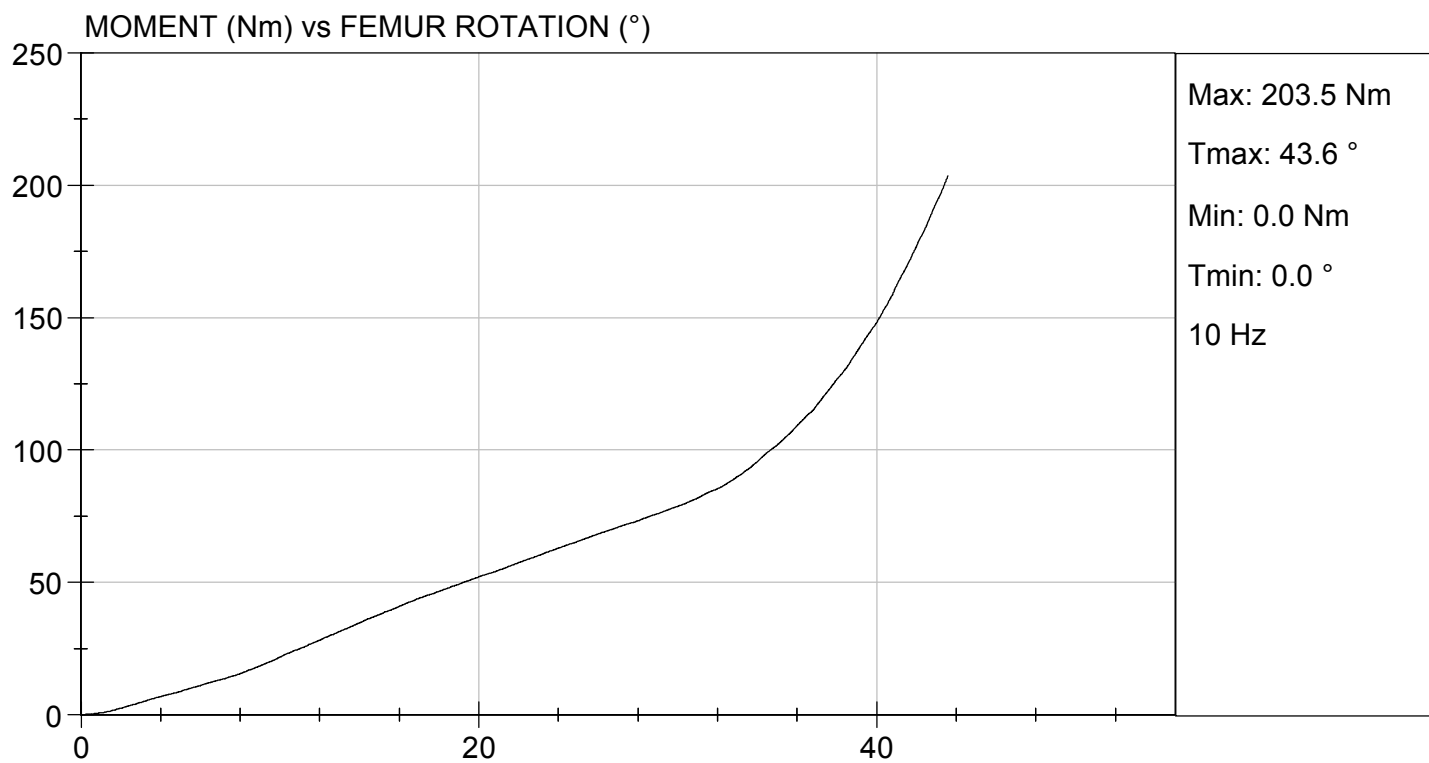
Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21	21	Pass
Laboratory Relative Humidity	%	10 to 70	29	29	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.3	6.4	Pass
30 Degrees	Nm	94.9 Nm Max	81.9	78.8	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	43.9	43.6	Pass
Overall Test Results					Pass


Laboratory Technician

12/06/2019
Test Date


Approved By





CALIBRATION TEST RESULTS

POST-TEST

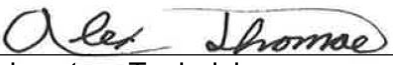
HYBRID III 50TH PERCENTILE MALE - DRIVER ATD

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

ATD Serial No: 351

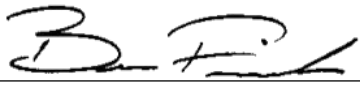
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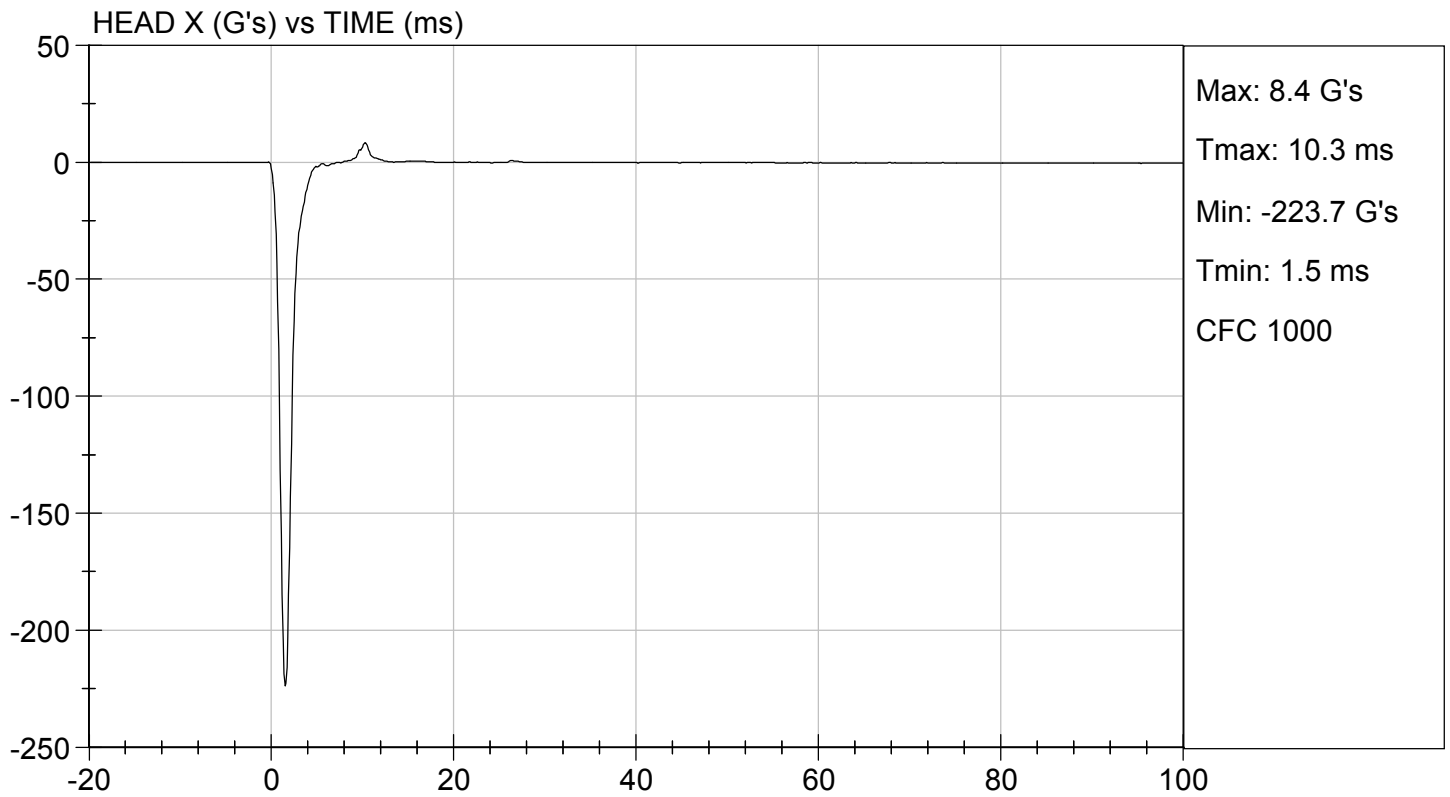
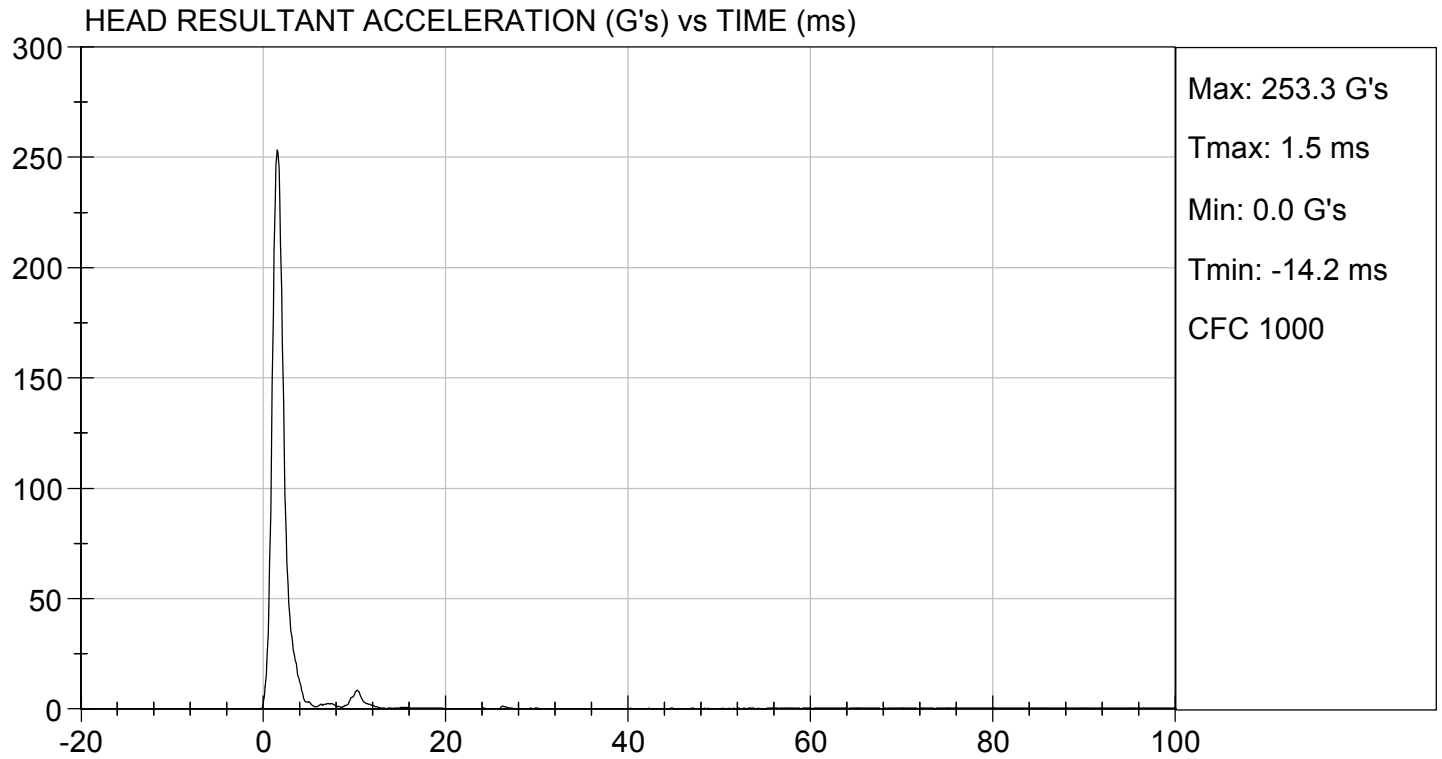
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	27	Pass
Peak Resultant Acceleration	G's	225 to 275	253	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	6.6	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

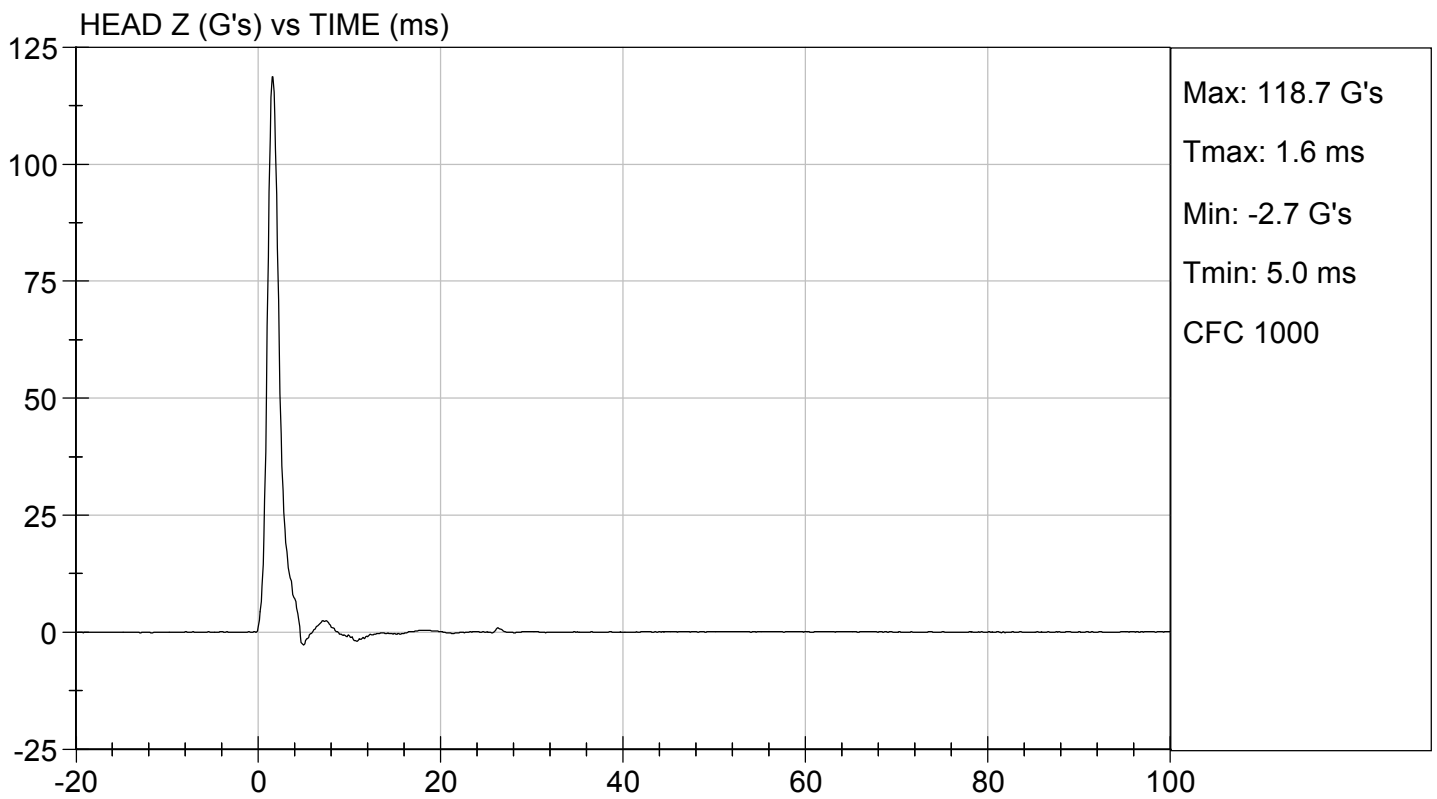
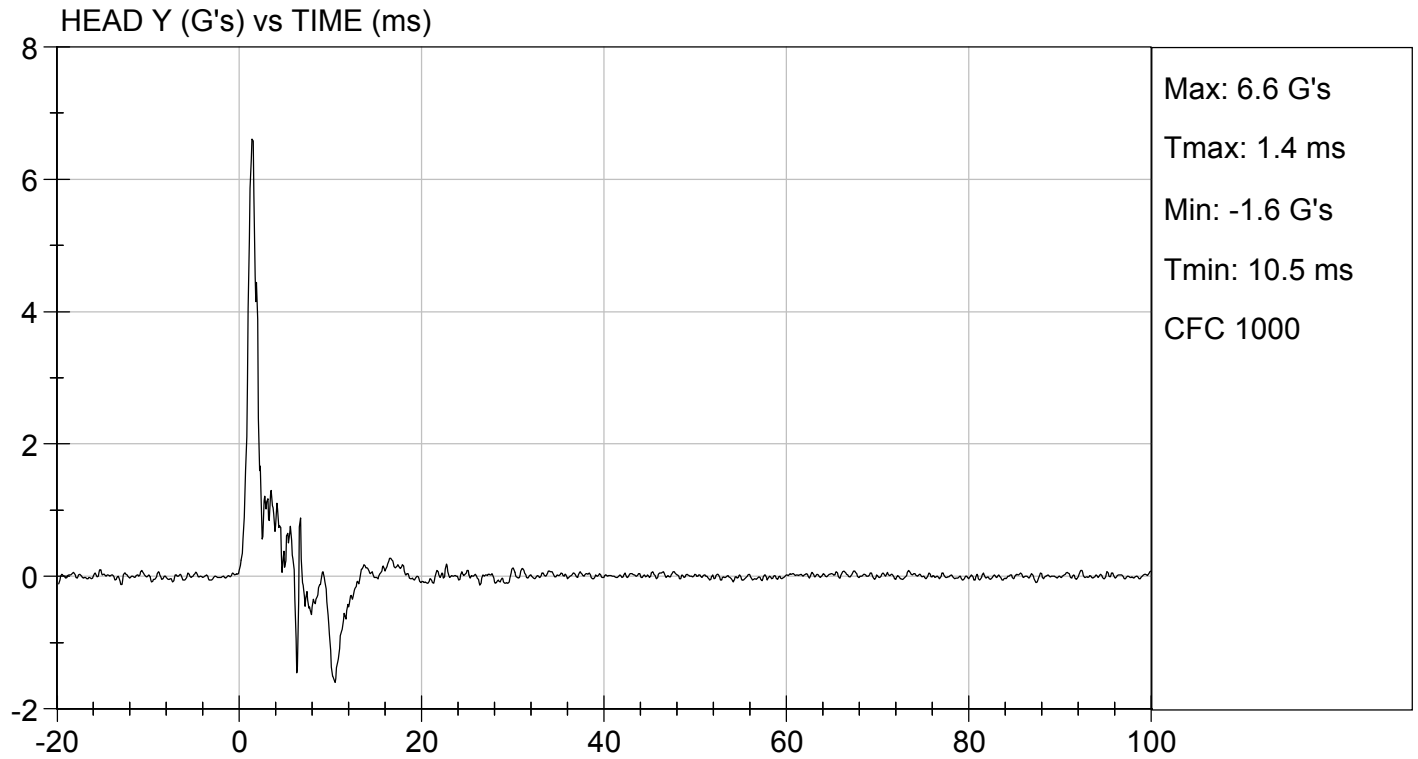

Laboratory Technician

12/13/2019

Test Date


Approved By





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

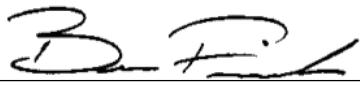
ATD Serial No: 351

Test I.D: D193882

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity		%	10 to 70	28	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.96	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	25.38	Pass
	20 ms	G's	17.60 to 22.60	19.52	Pass
	30 ms	G's	12.50 to 18.50	14.44	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	14.4	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	35.5	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	69.4	Pass
	Time	ms	57.0 to 64.0	57.5	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	114.3	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	88.6	Pass
	Time	ms	47.0 to 58.0	47.3	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	98.4	Pass
Overall Test Results					Pass


 Laboratory Technician

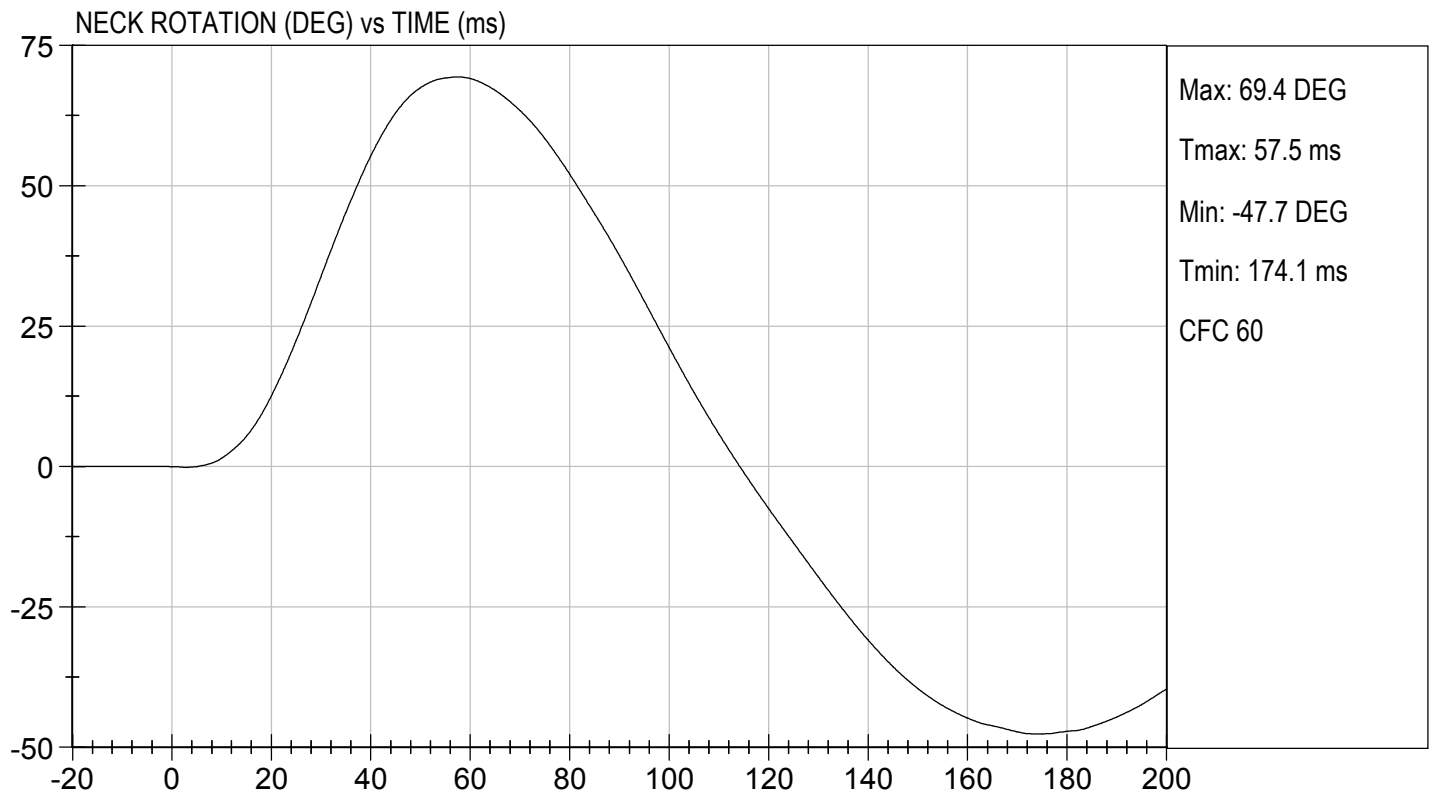
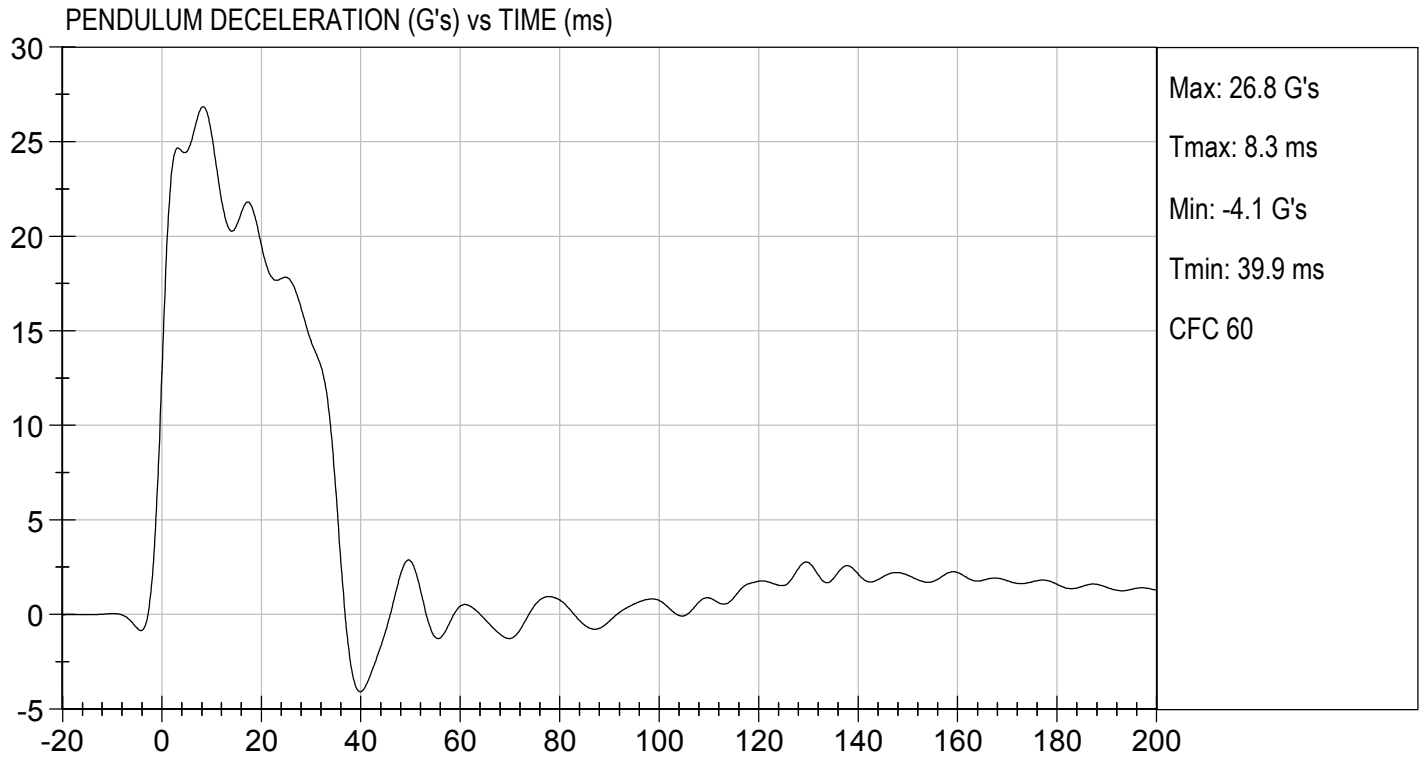
12/13/2019
 Test Date


 Approved By



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

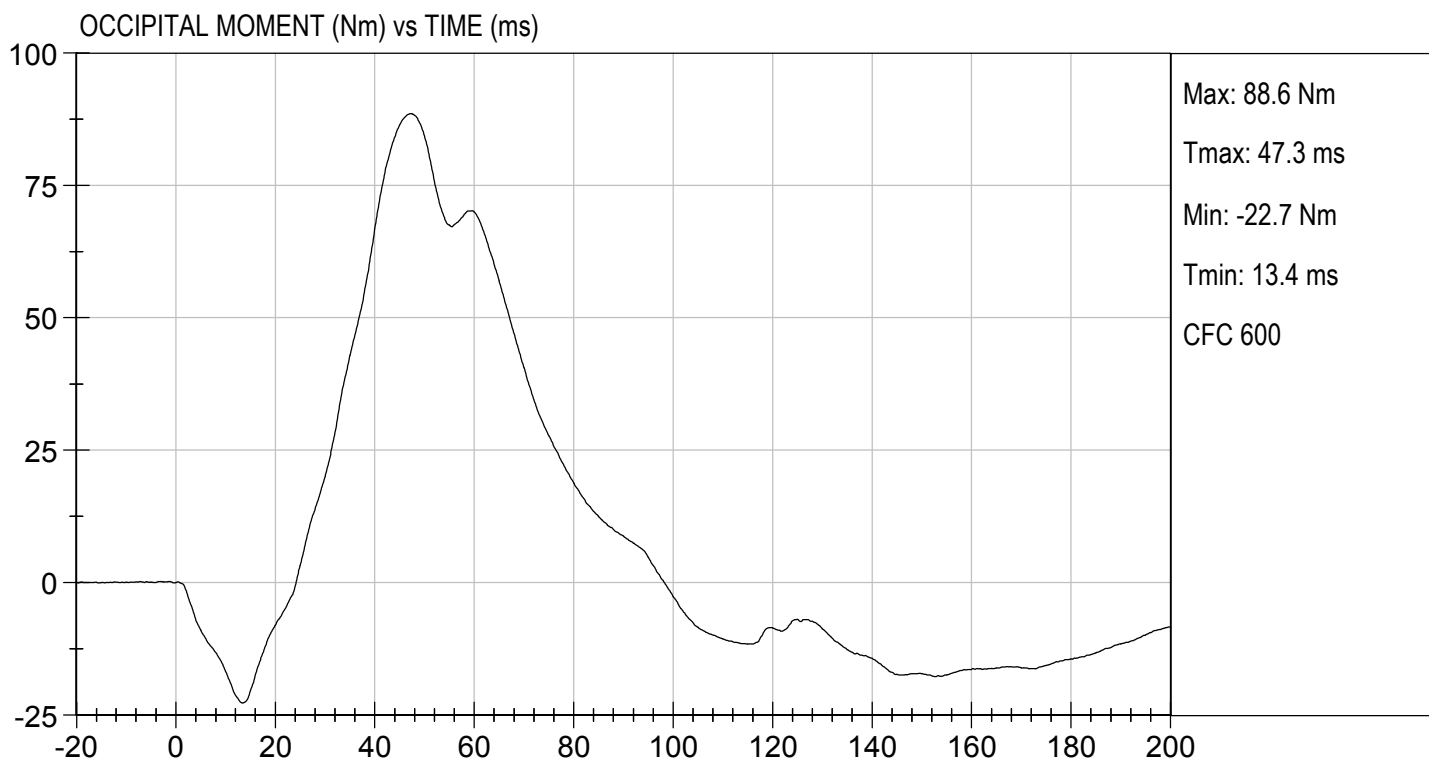
TEST DATE: 12/13/2019
TEST #: D193882





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

TEST DATE: 12/13/2019
TEST #: D193882



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

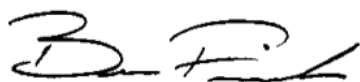
ATD Serial No: 351

Test I.D: D193883

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity		%	10 to 70	28	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.19	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	17.73	Pass
	20 ms	G's	14.00 to 19.00	16.82	Pass
	30 ms	G's	11.00 to 16.00	13.41	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	14.1	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	40.8	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	97.1	Pass
	Time	ms	72.0 to 82.0	78.8	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	161.6	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-57.1	Pass
	Time	ms	65.0 to 79.0	71.6	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	141.9	Pass
Overall Test Results					Pass


 Laboratory Technician

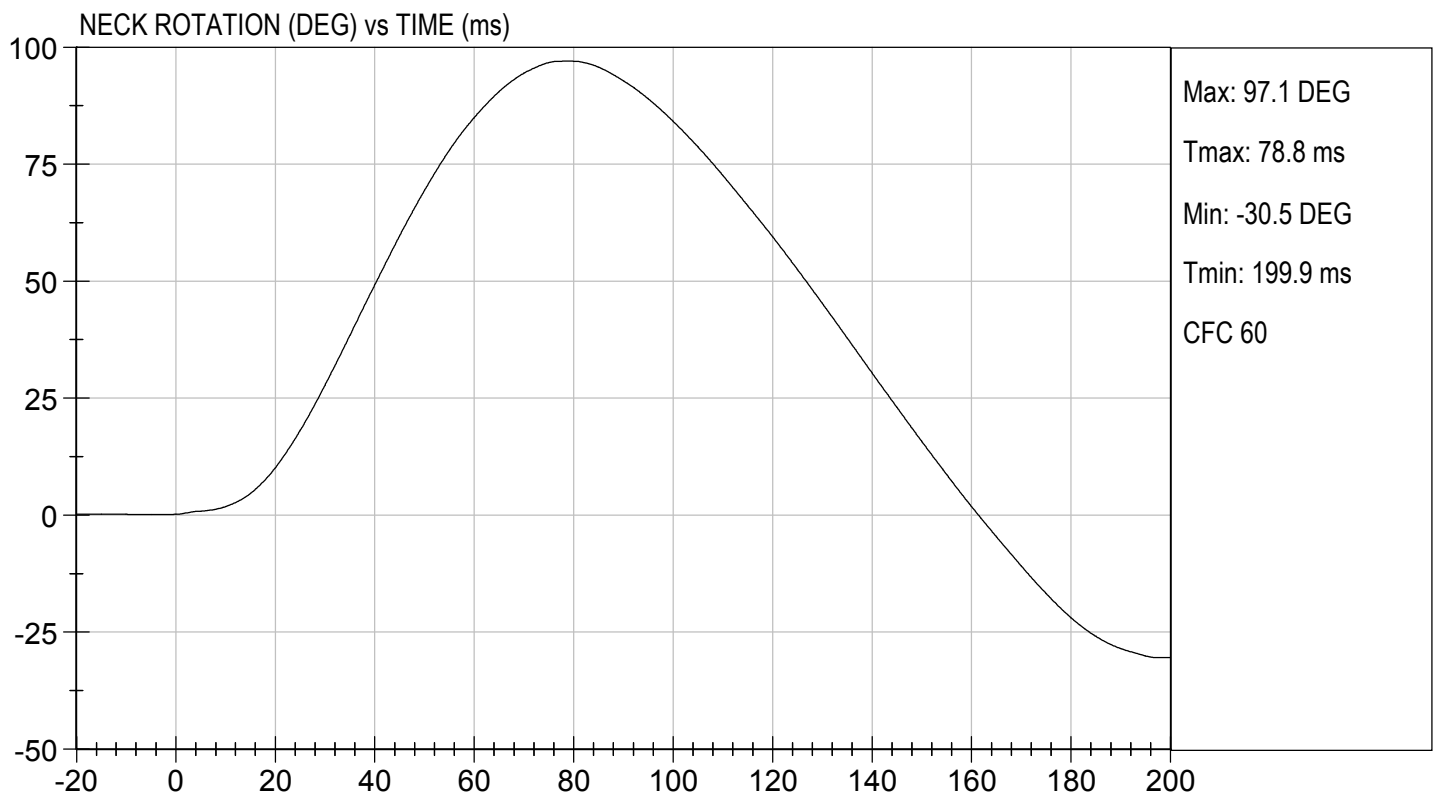
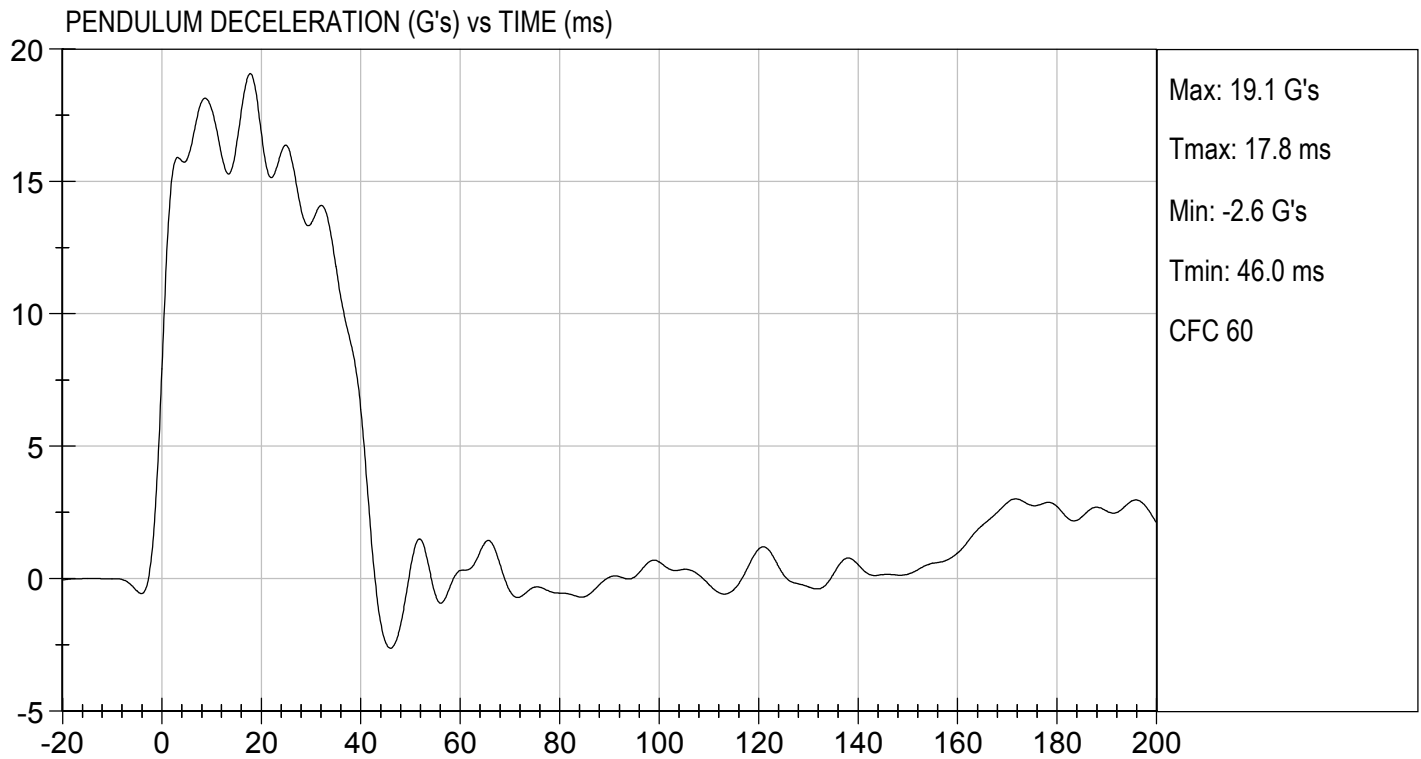
12/13/2019
 Test Date


 Approved By



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

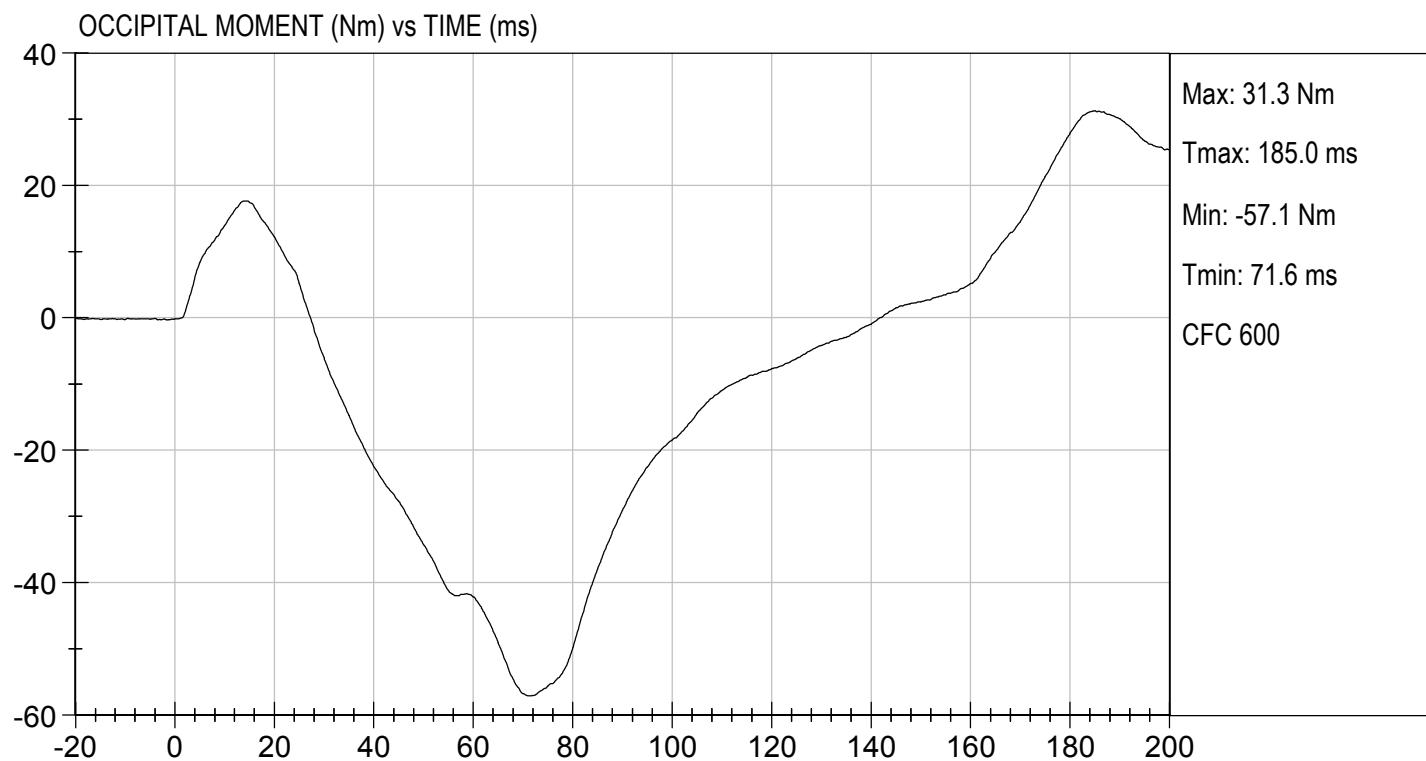
TEST DATE: 12/13/2019
TEST #: D193883





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

TEST DATE: 12/13/2019
TEST #: D193883



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

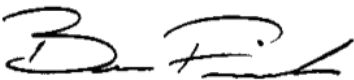
ATD Serial No: 351

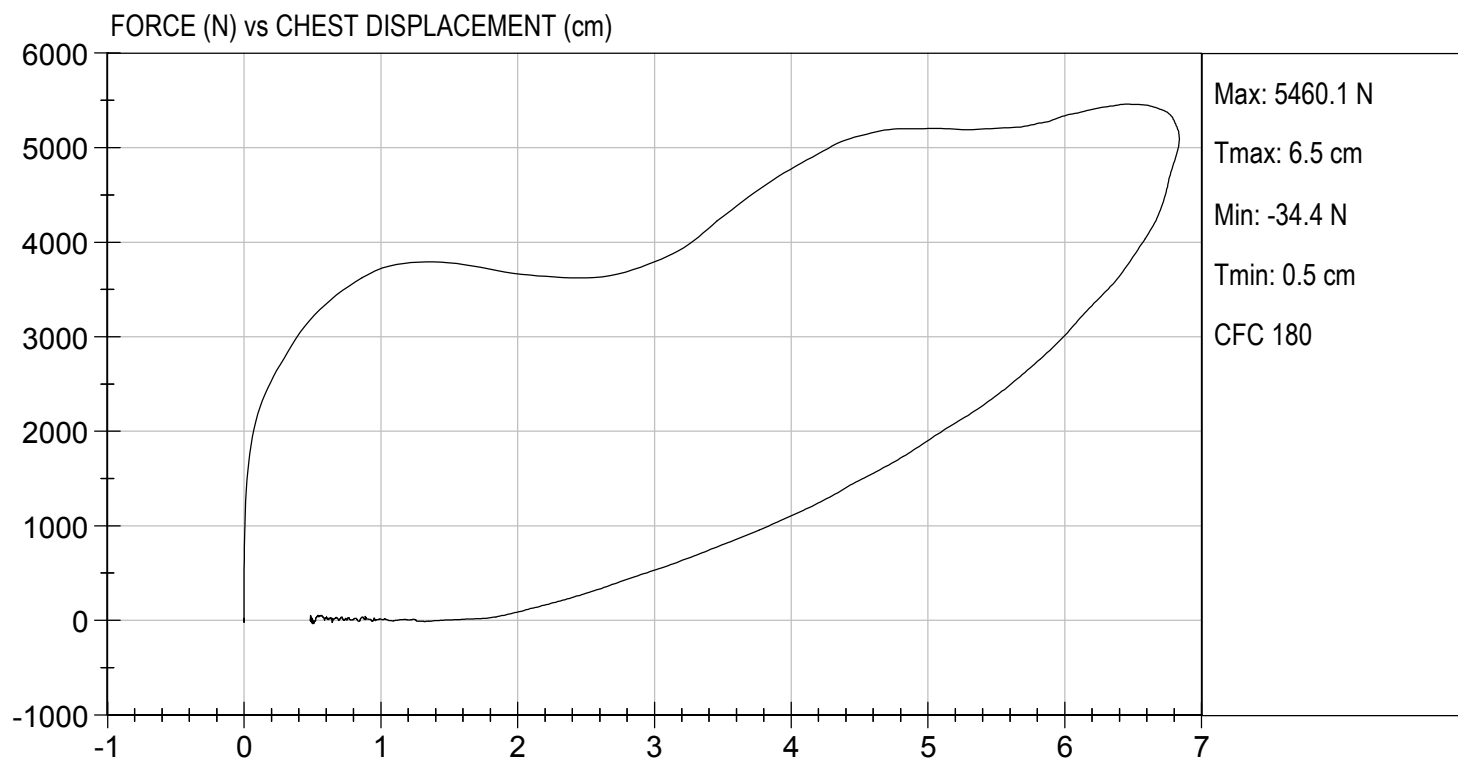
Test I.D: D193884

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Probe Velocity	m/s	6.58 to 6.82	6.68	Pass
Peak Probe Force	N	5159 to 5893	5,460	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.84	Pass
Internal Hysteresis	%	69 to 85	72	Pass
			Overall Test Results	Pass


Laboratory Technician

12/12/2019
Test Date


Approved By

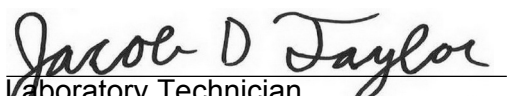


MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

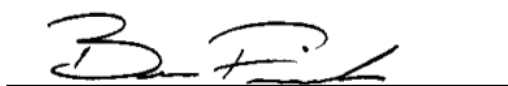
Test I.D: D193885

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Probe Velocity	m/s	2.07 to 2.13	2.09	Pass
Peak Probe Force	N	4715 to 5782	5,589	Pass
Overall Test Results				Pass


Laboratory Technician

12/13/2019

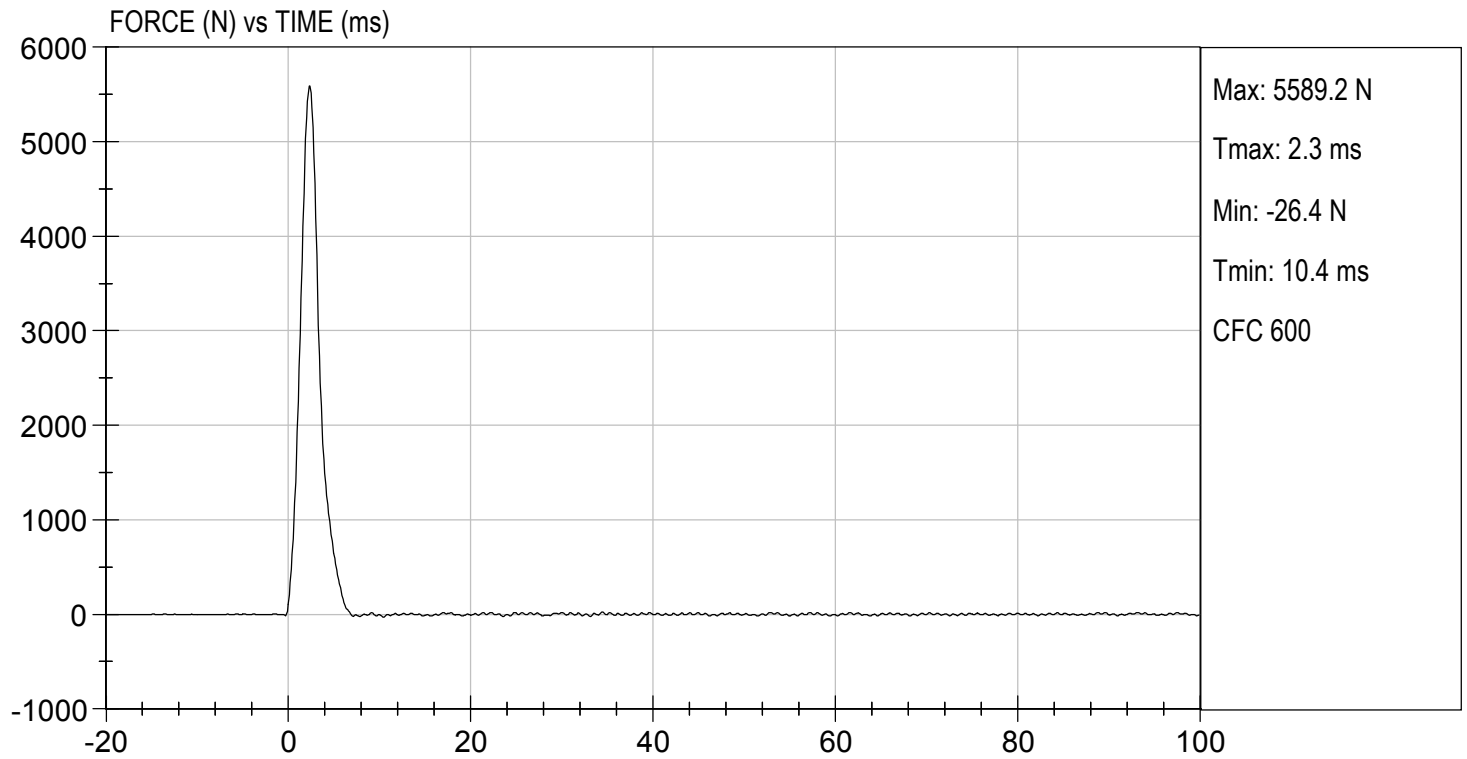
Test Date


Approved By



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

TEST DATE: 12/13/2019
TEST #: D193885



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

ATD Serial No: 351

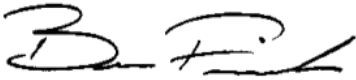
Test I.D: D193886

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Probe Velocity	m/s	2.07 to 2.13	2.11	Pass
Peak Probe Force	N	4715 to 5782	4,916	Pass
Overall Test Results				Pass


Laboratory Technician

12/13/2019

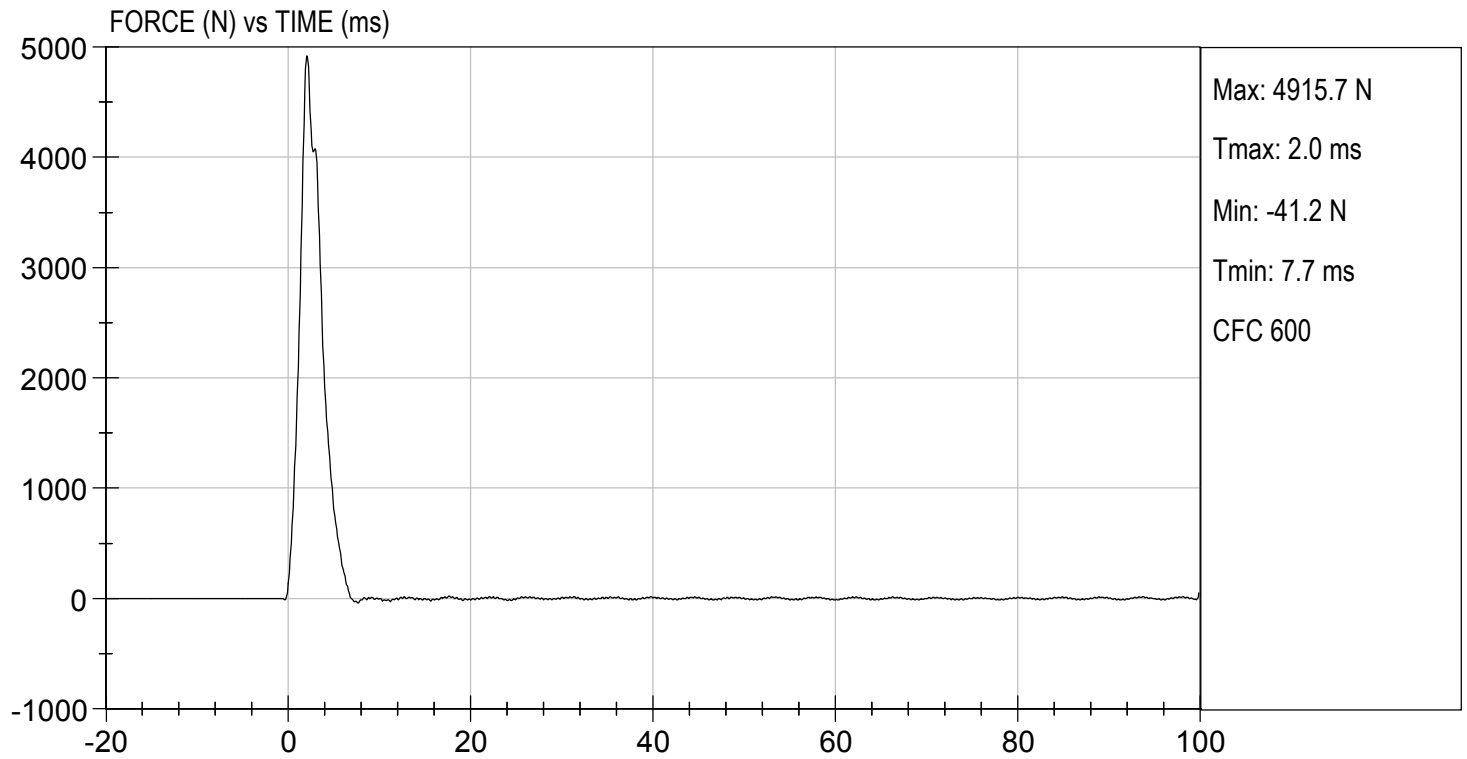
Test Date

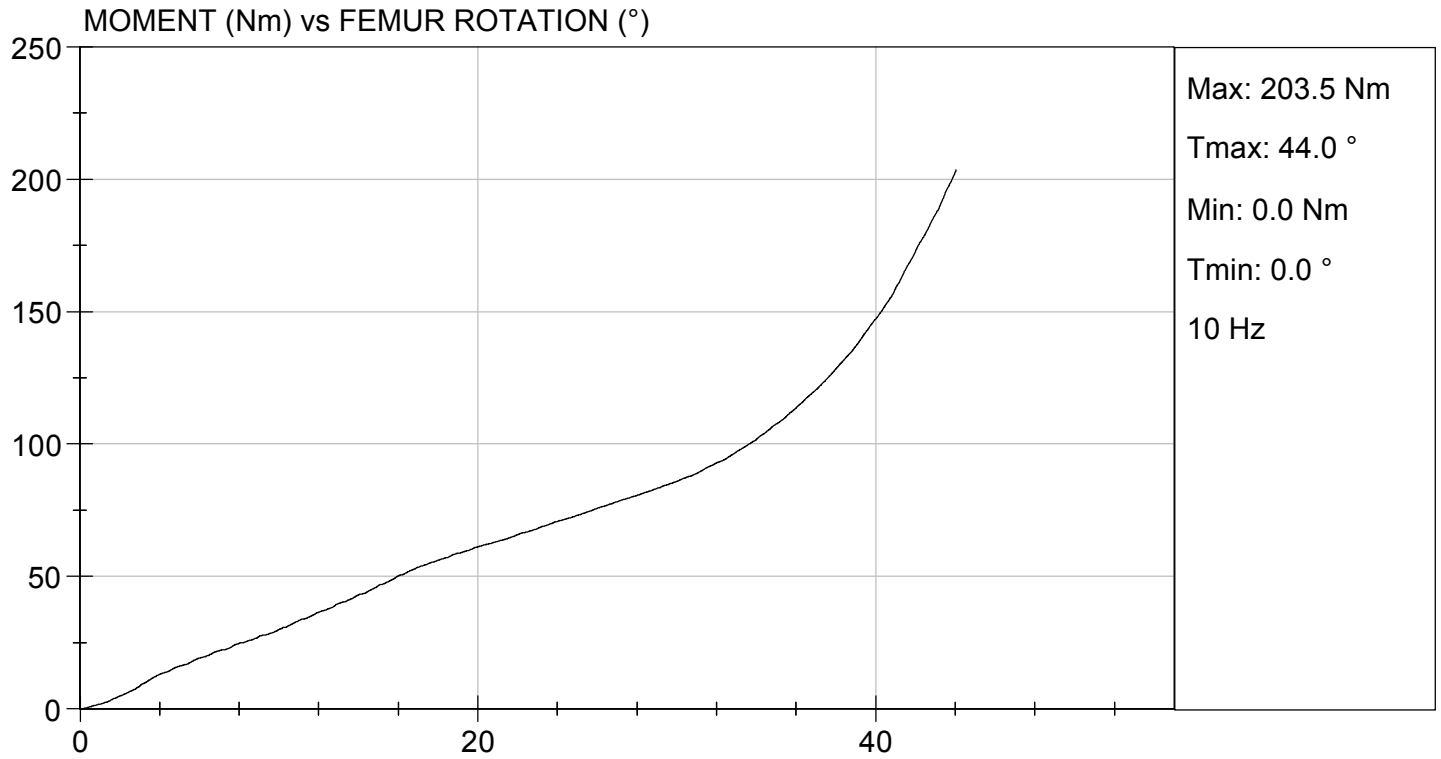

Approved By

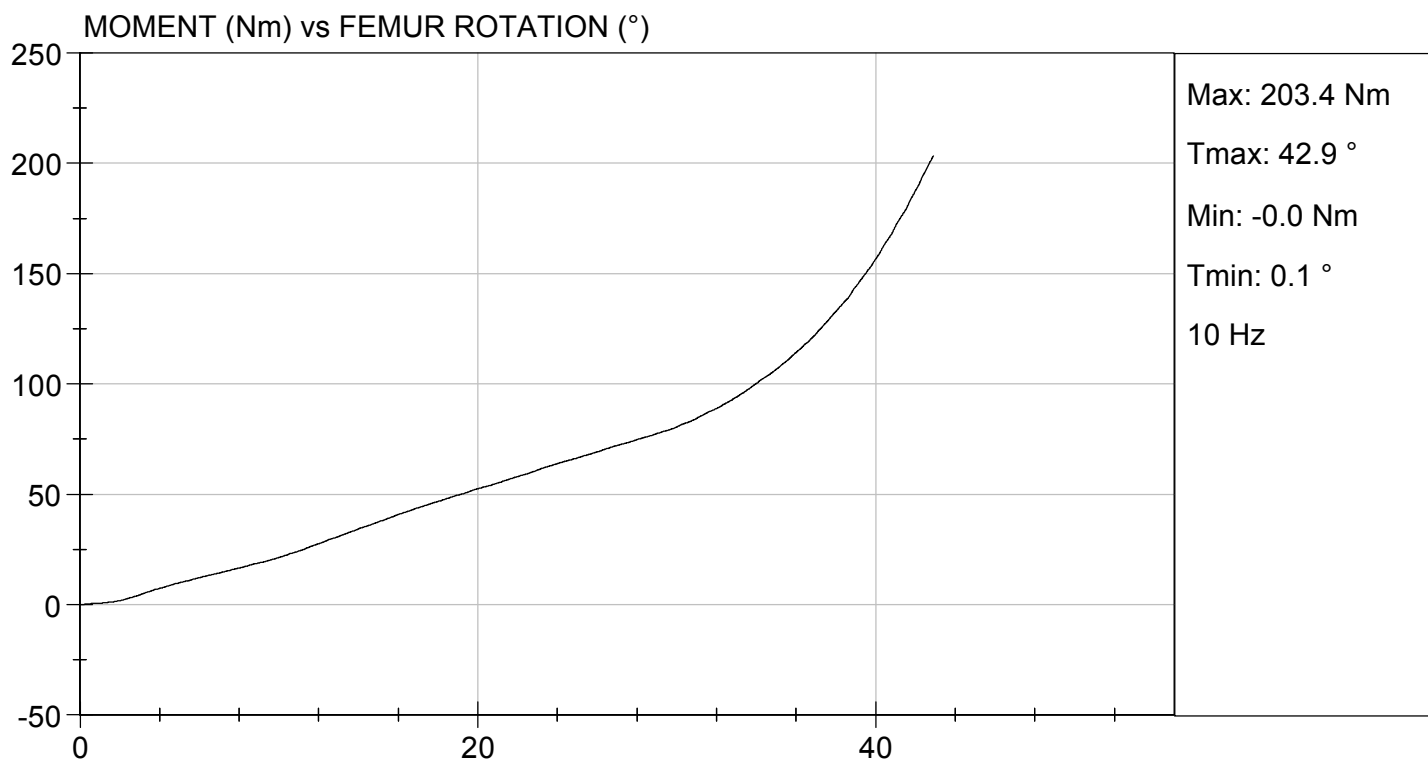


TEST DESC: LEFT KNEE
VELOCITY: 6.92 ft/s, 2.11 m/s

TEST DATE: 12/13/2019
TEST #: D193886







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

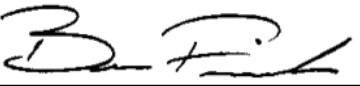
ATD Serial No: 351

Test I.D: D193880

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	20.8	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	27	27	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.3	6.4	Pass
30 Degrees	Nm	94.9 Nm Max	85.9	80.5	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	44.0	42.9	Pass
Overall Test Results					Pass


 Laboratory Technician

12/13/2019
 Test Date


 Approved By

CALIBRATION TEST RESULTS

PRE-TEST

HYBRID III 5TH PERCENTILE FEMALE - PASSENGER ATD

Hybrid III, 5th External Measurements
SN: 138

HYBRID III, PART 572, SUBPART O EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	774.7-800.1	785.1
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	456.8
C	H-POINT HEIGHT	Reference	81.3-86.3	84.0
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	146.2
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	78.0
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	127.5
G	BACK OF ELBOW TO WRIST PIVOT	back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	243.9-259.1	249.6
H	HEAD BACK TO BACKLINE	Back of Skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	45.0
I	SHOULDER TO- ELBOW LENGTH	Measure from the highest point on top of the shoulder clevis to the lowest part of the flesh on the elbow in line with the elbow pivot bolt.	276.8-297.2	280.2
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	201.9
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	520.7-546.1	526.7
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376.0	362.3
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	398.0

N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	414-439.4	430.5
HYBRID III, SUBPART O EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 304.8 ± 5.1 mm above seat surface	175.3-190.5	184.6
P	FOOT LENGTH	Tip of toe to rear of heel	218.5-233.7	221.0
Q	STANDING HEIGHT	(THEORETICAL)	1501.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	The rear surface of the buttocks to the knee pivot bolt	457.2-482.6	472.6
S	HEAD BREADTH	The widest part of the head	137.1-147.3	141.9
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	184.2
U	HIP BREADTH	The widest part of the hip	299.7-314.9	307.4
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	360.5
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	85.0
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	528.3-548.7	546.2
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	875.1
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	785.4
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	332.7-358.1	345.4
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	160.1-170.2	165.1

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

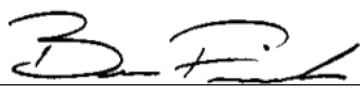
Test ID: D193811

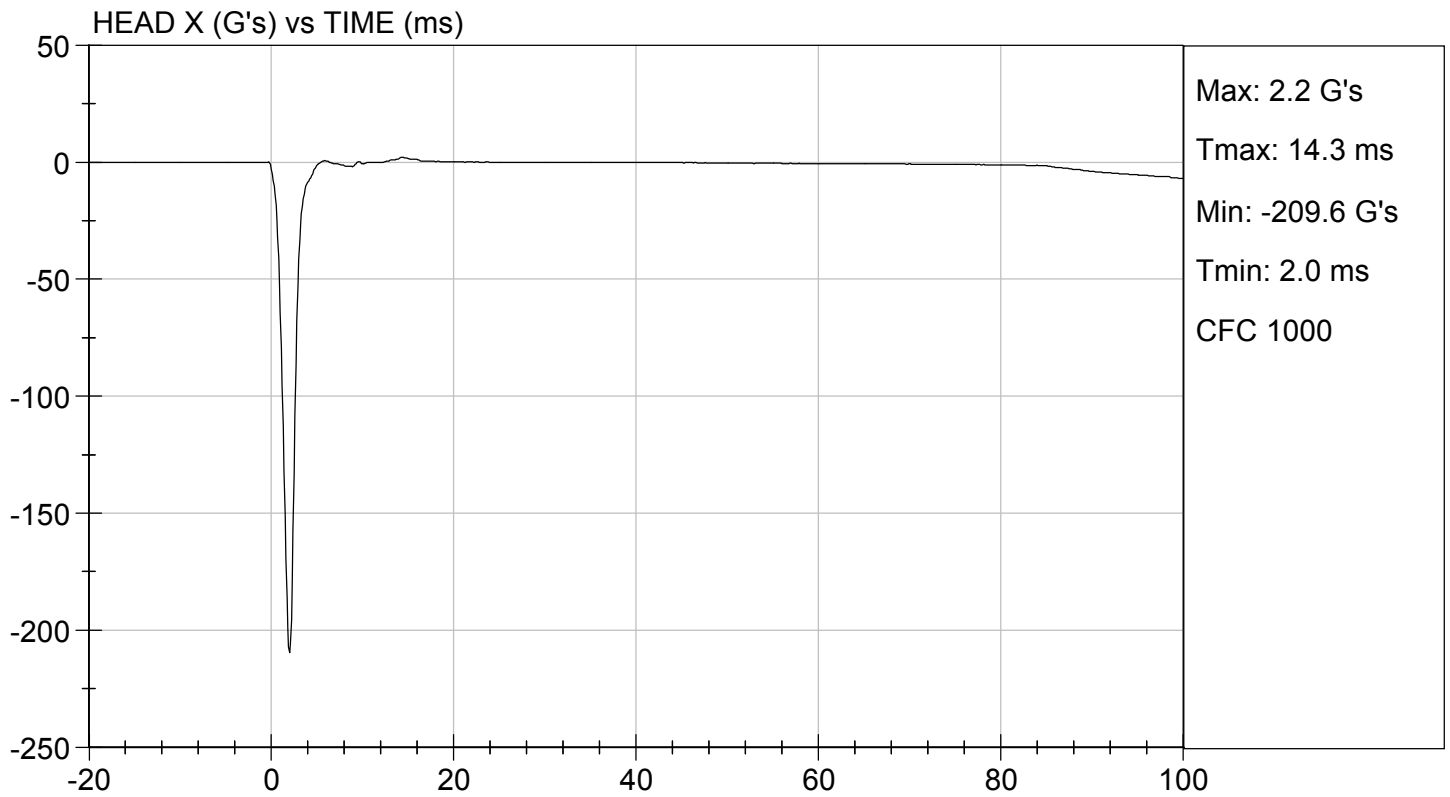
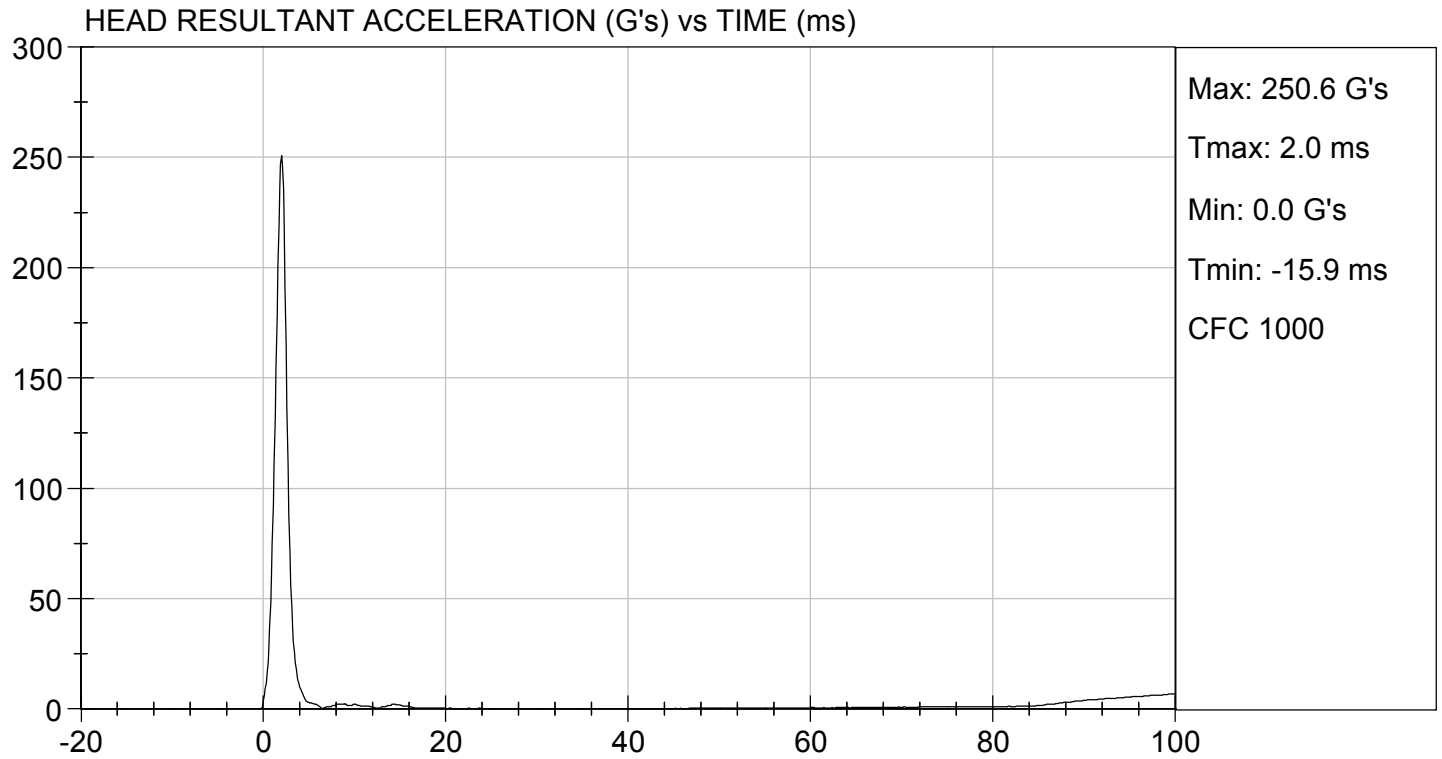
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
Peak Resultant Acceleration	G's	250 to 300	251	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-1.6	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

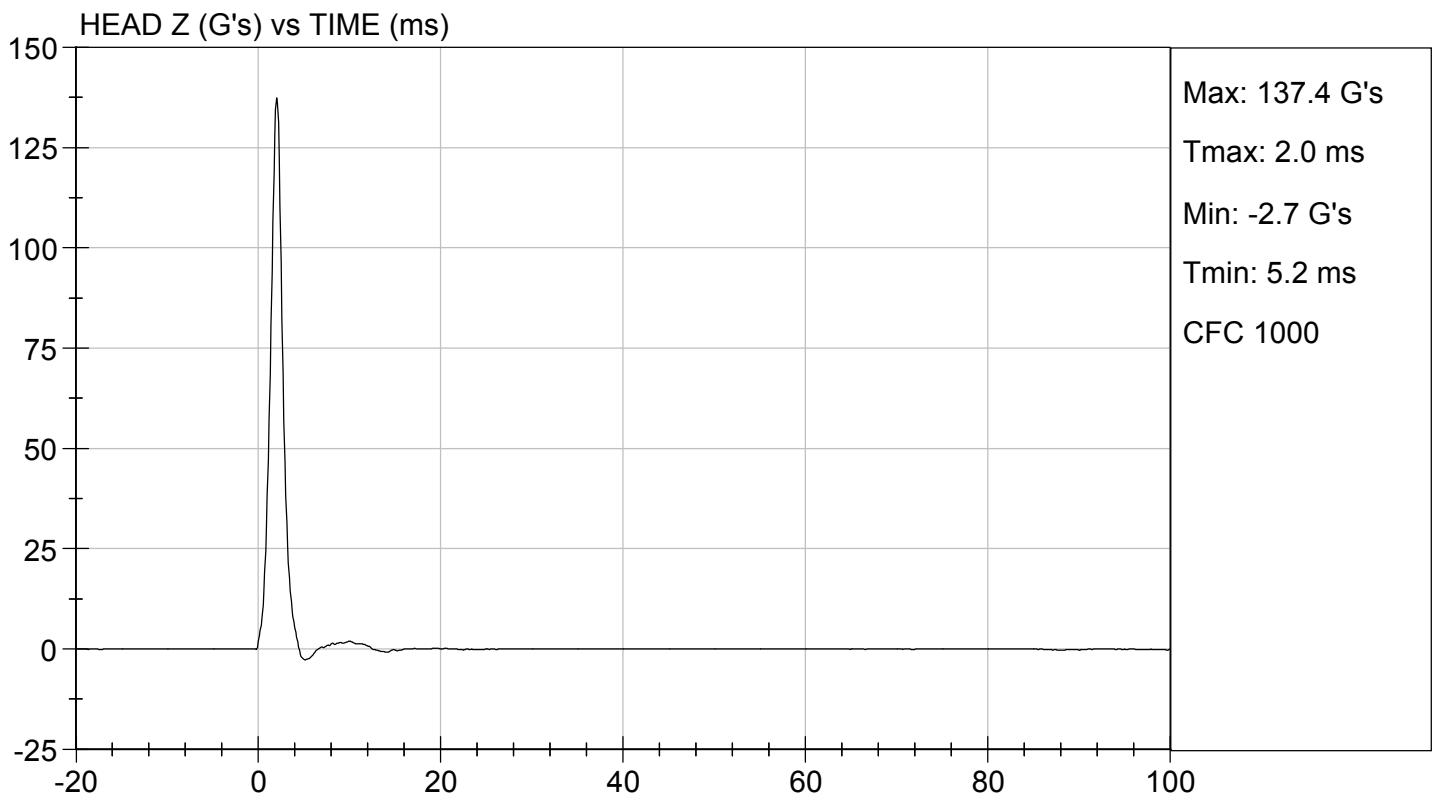
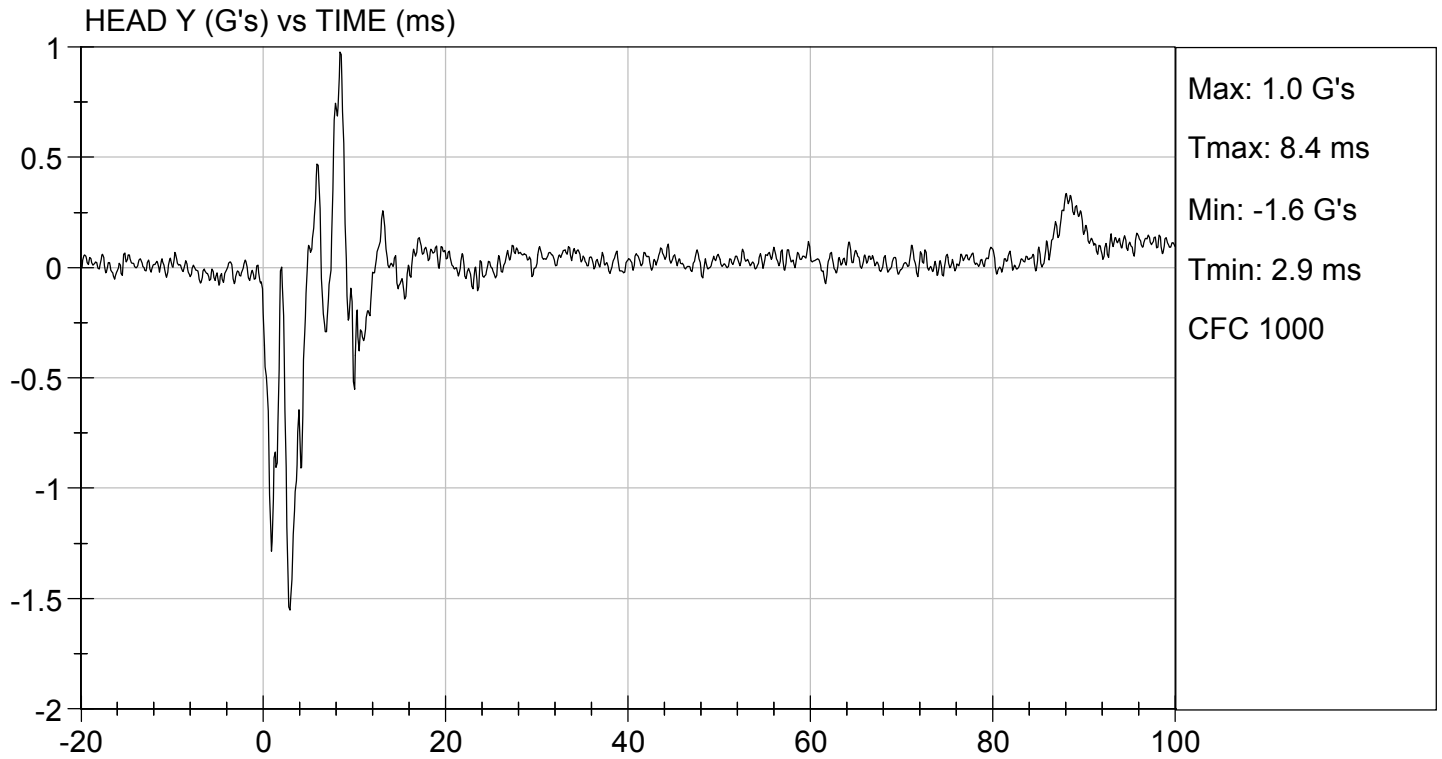

Laboratory Technician

12/06/2019

Test Date


Approved By





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D193812

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	32	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.13	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.4	Pass
	20 ms	m/s	4.0 to 5.0	4.9	Pass
	30 ms	m/s	5.8 to 7.0	6.8	Pass
D Plane Rotation	Max	deg	77 to 91	80	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	69	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	82	Pass
Overall Results					Pass

Jacob D Taylor
Laboratory Technician

12/09/2019

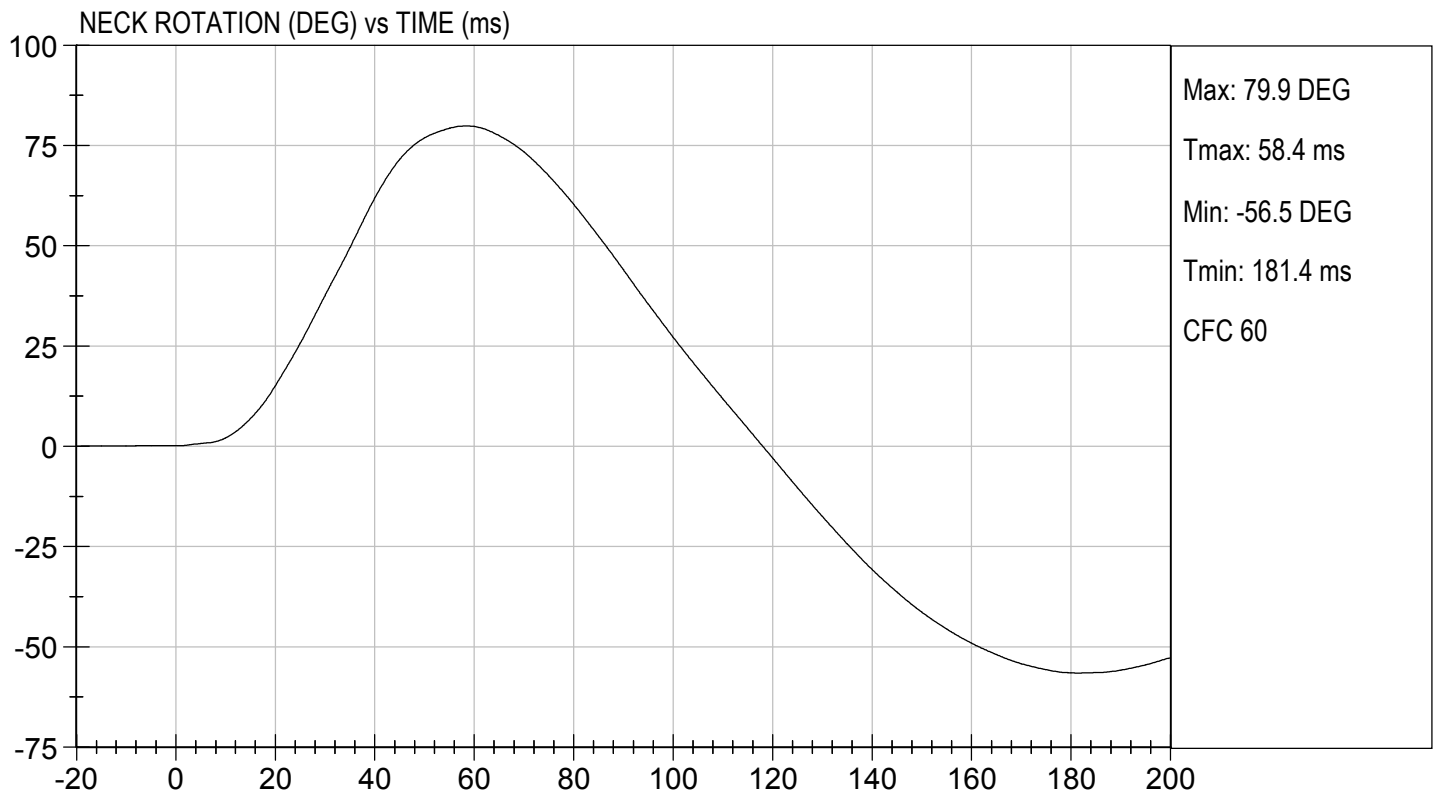
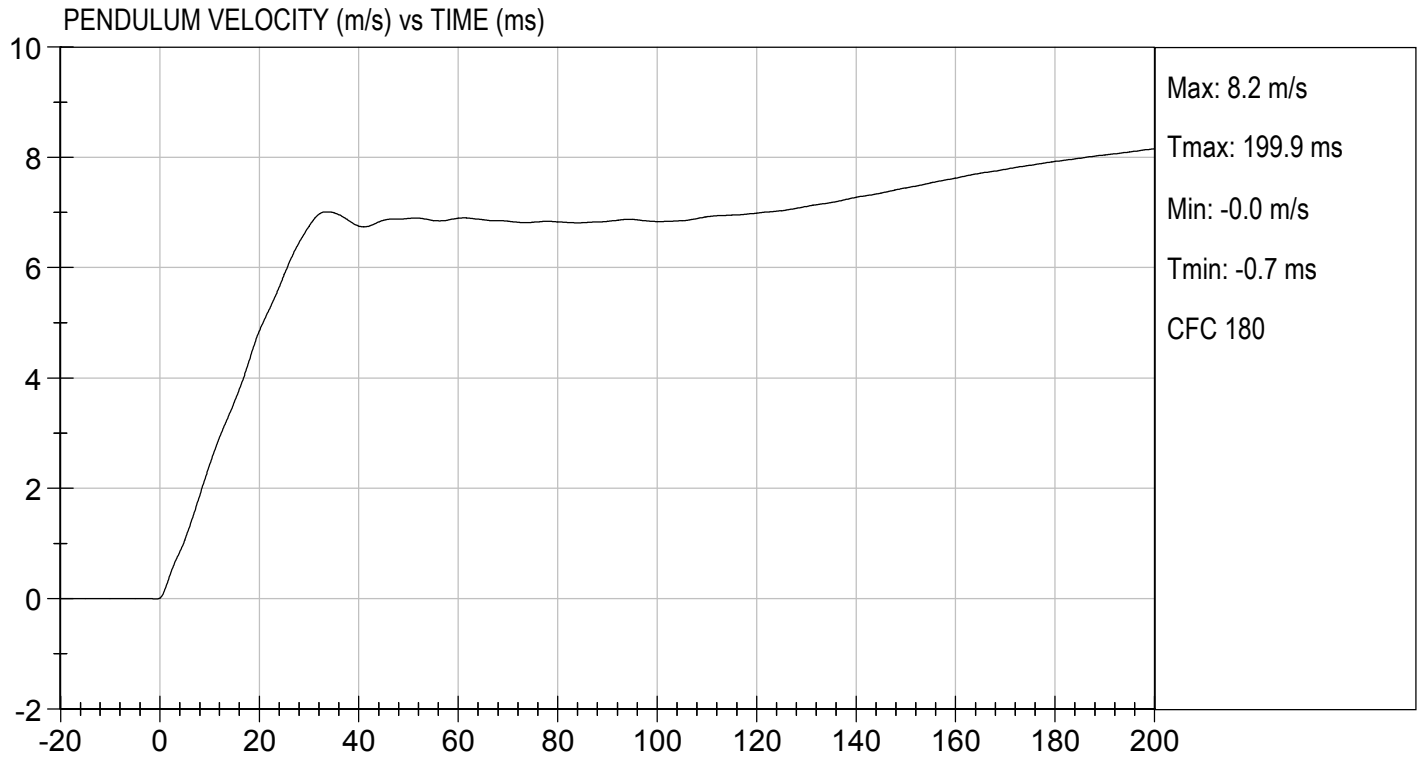
Test Date

B. Fink
Approved By



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

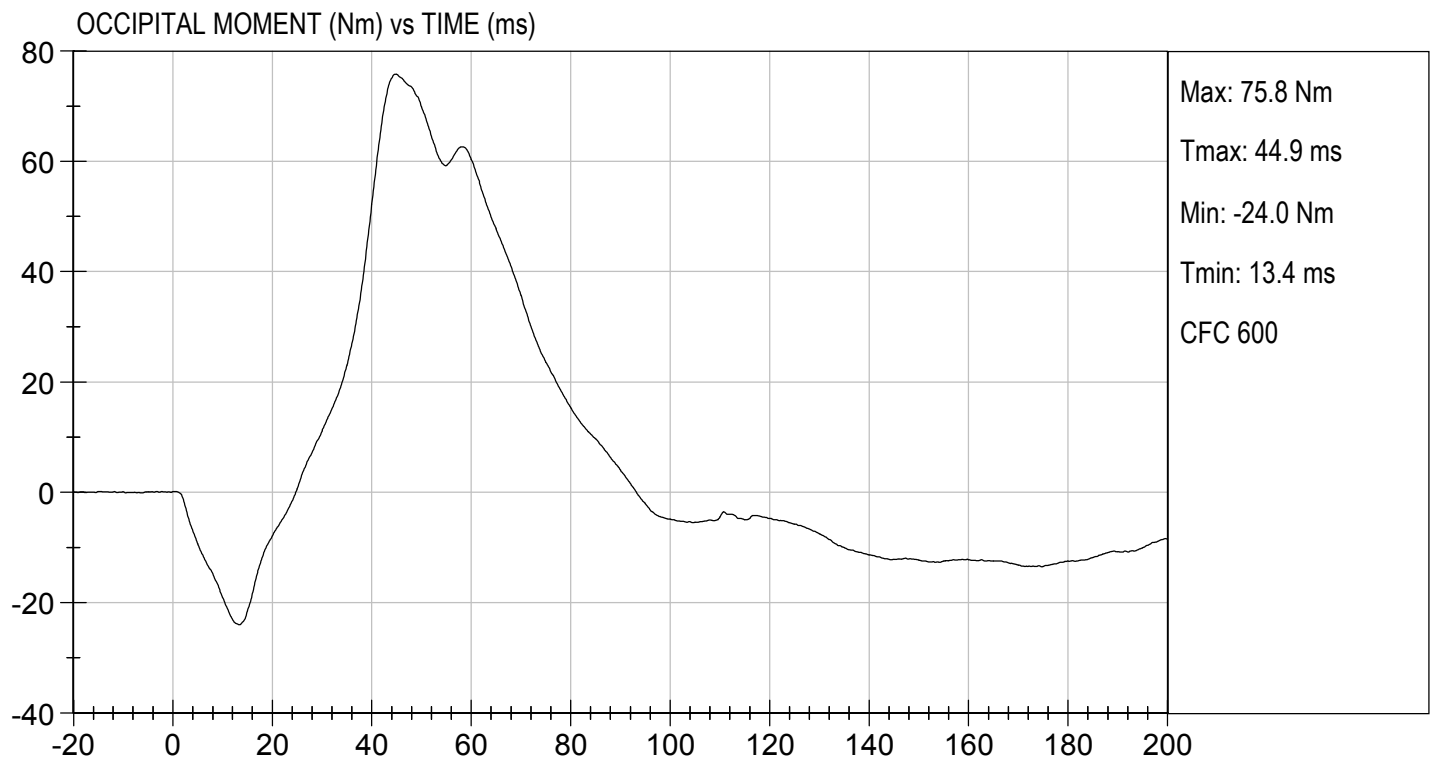
TEST DATE: 12/09/2019
TEST #: D193812





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

TEST DATE: 12/09/2019
TEST #: D193812



MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

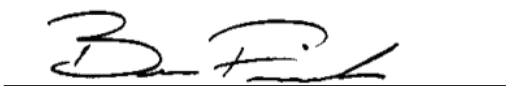
ATD Serial No: 138

Test I.D: D193813

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	32	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	-57	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	108	Pass
Overall Results					Pass


Laboratory Technician

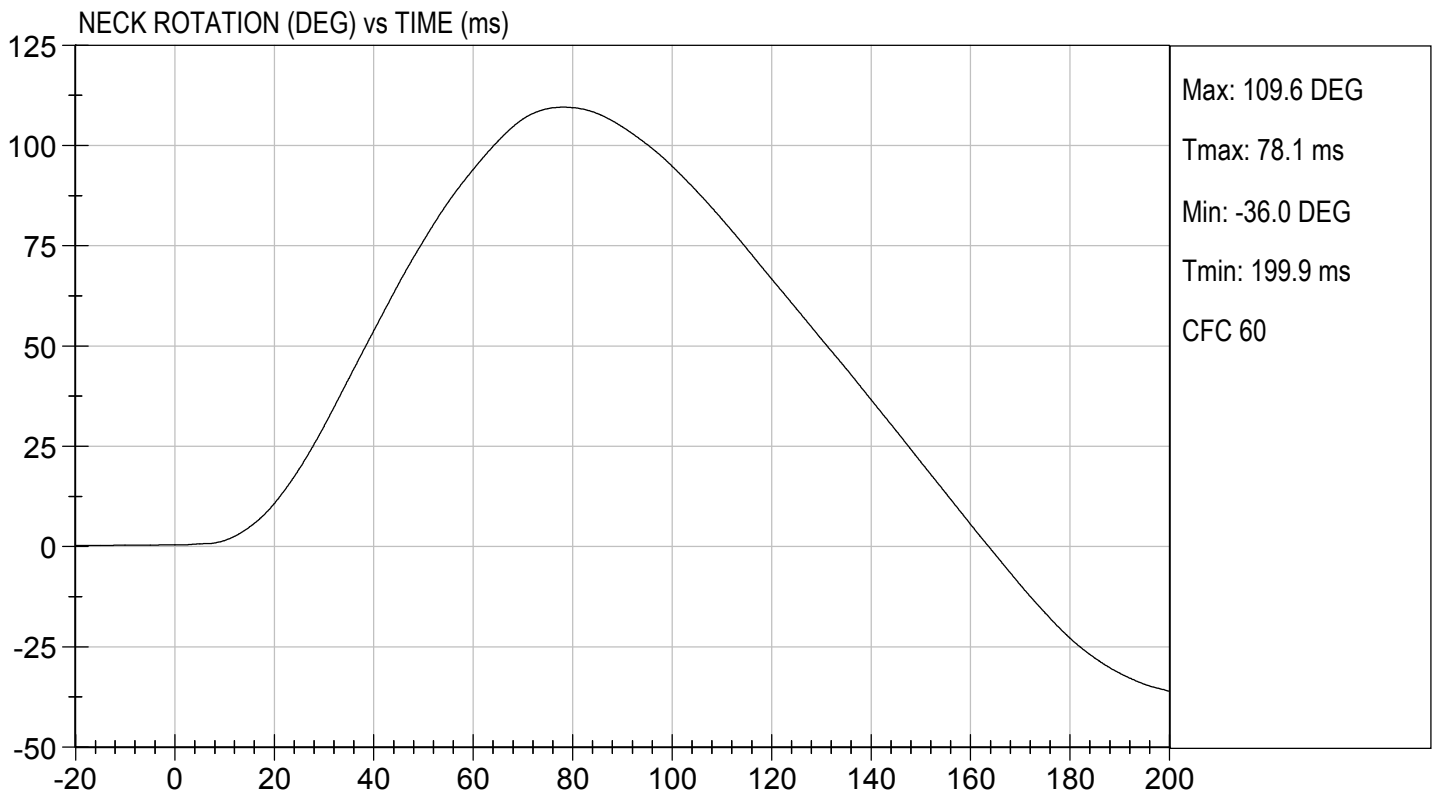
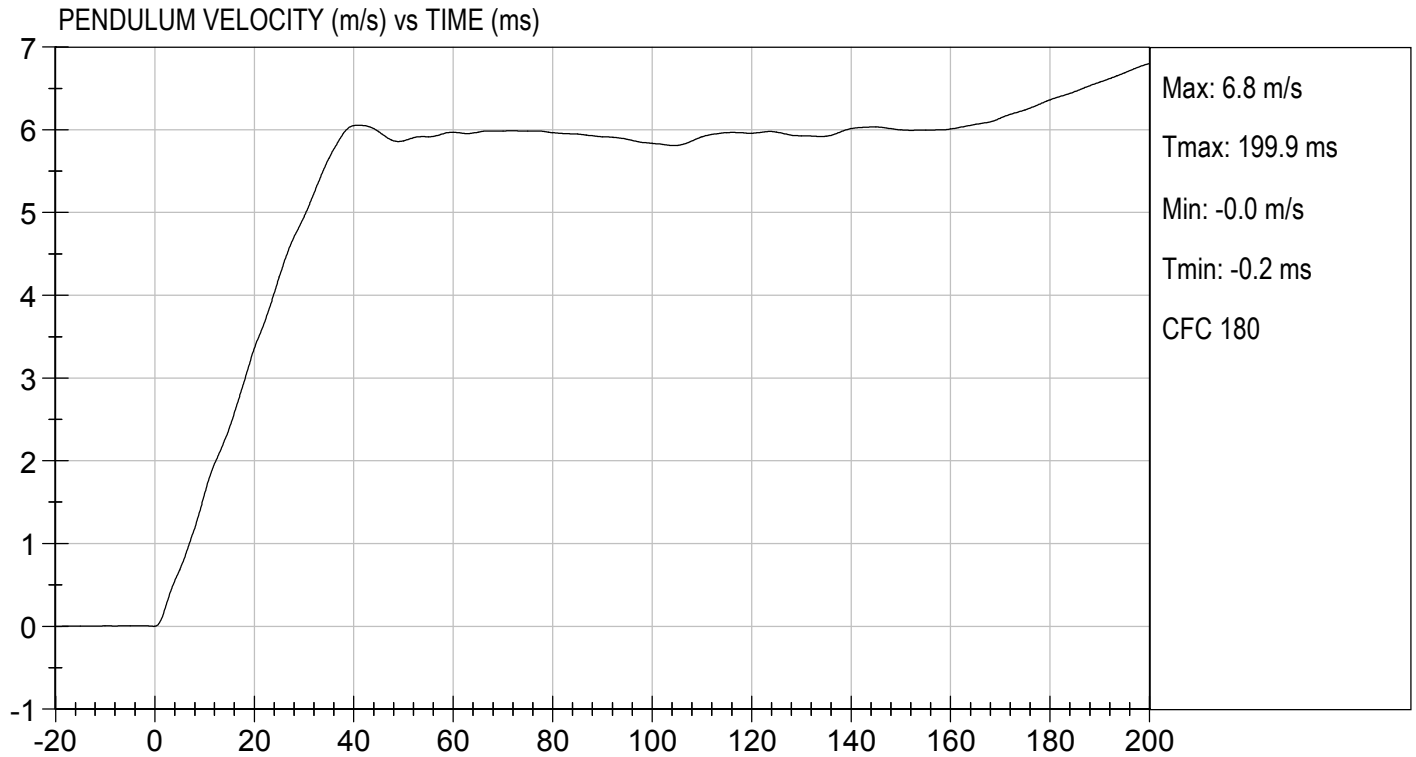
12/09/2019
Test Date


Approved By



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

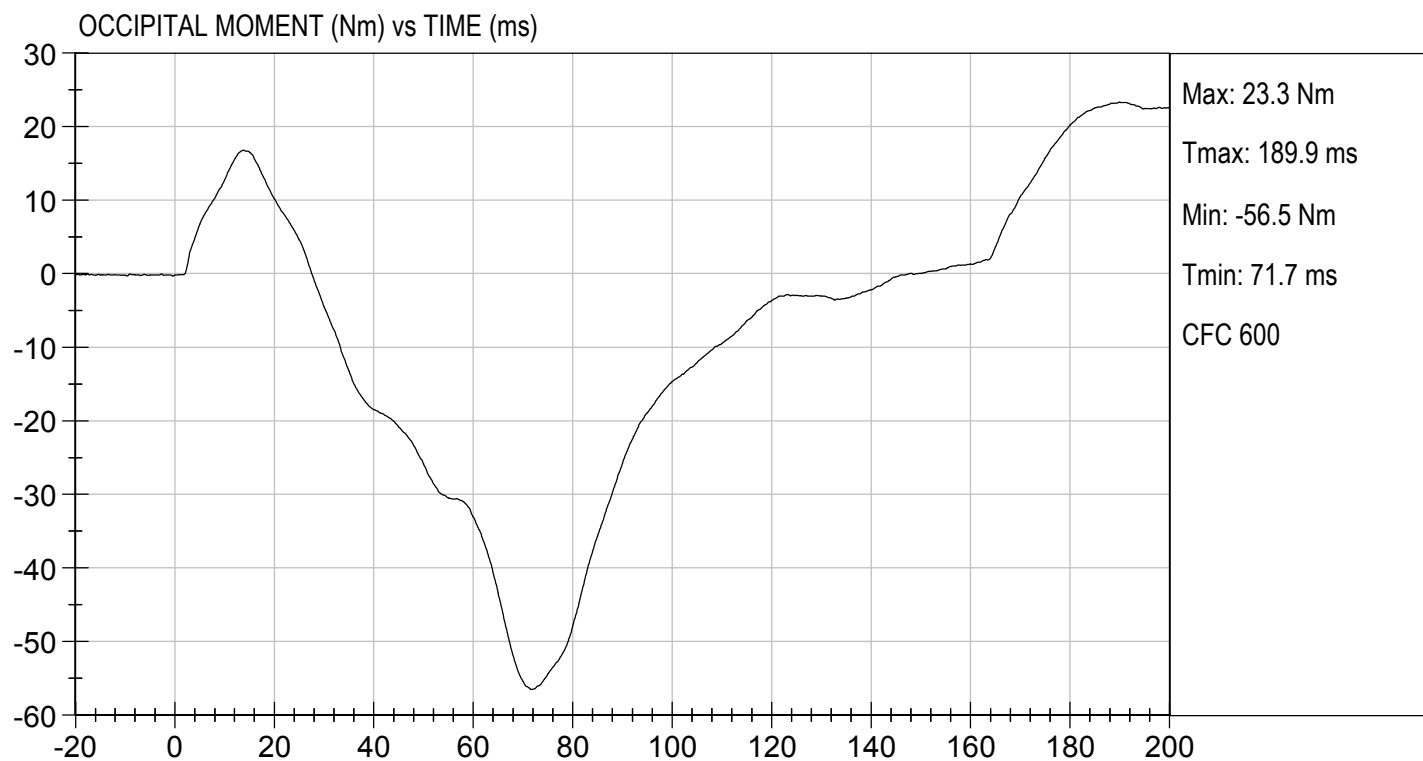
TEST DATE: 12/09/2019
TEST #: D193813





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

TEST DATE: 12/09/2019
TEST #: D193813



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

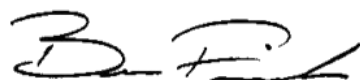
Test I.D: D193814

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.6	Pass
Relative Humidity	%	10 to 70	32	Pass
Probe Speed	m/s	6.59 to 6.83	6.68	Pass
Peak Deflection	mm	50 to 58	56	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4206	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4165	Pass
Overall Test Results				Pass


Laboratory Technician

12/09/2019

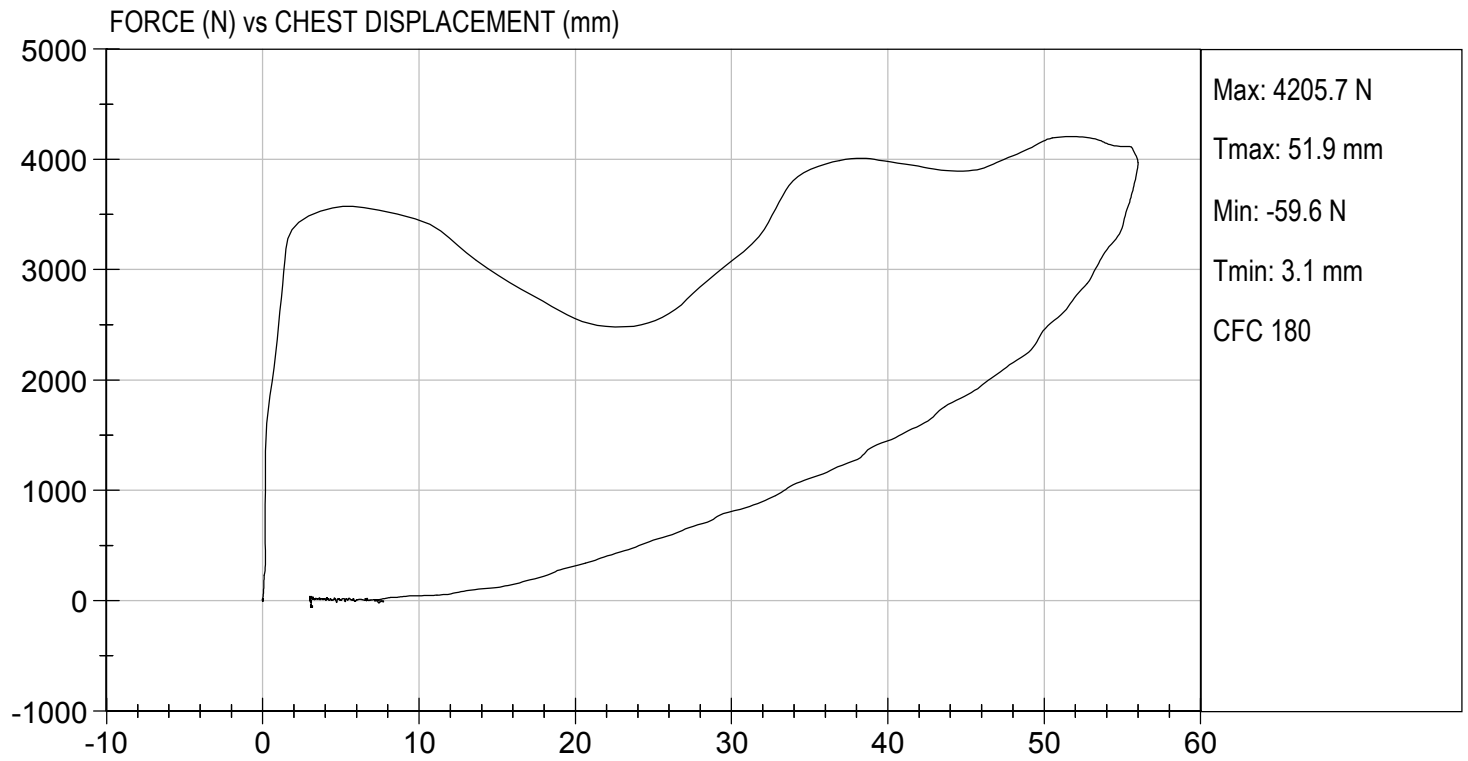
Test Date


Approved By



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

TEST DATE: 12/09/2019
TEST #: D193814



MGA RESEARCH CORPORATION

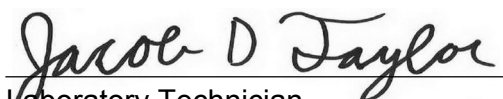
RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138

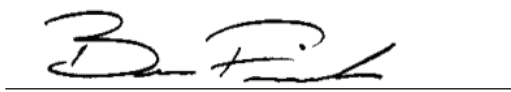
Test I.D: D193815

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	23	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3686	Pass
Overall Test Results				Pass


Laboratory Technician

12/06/2019

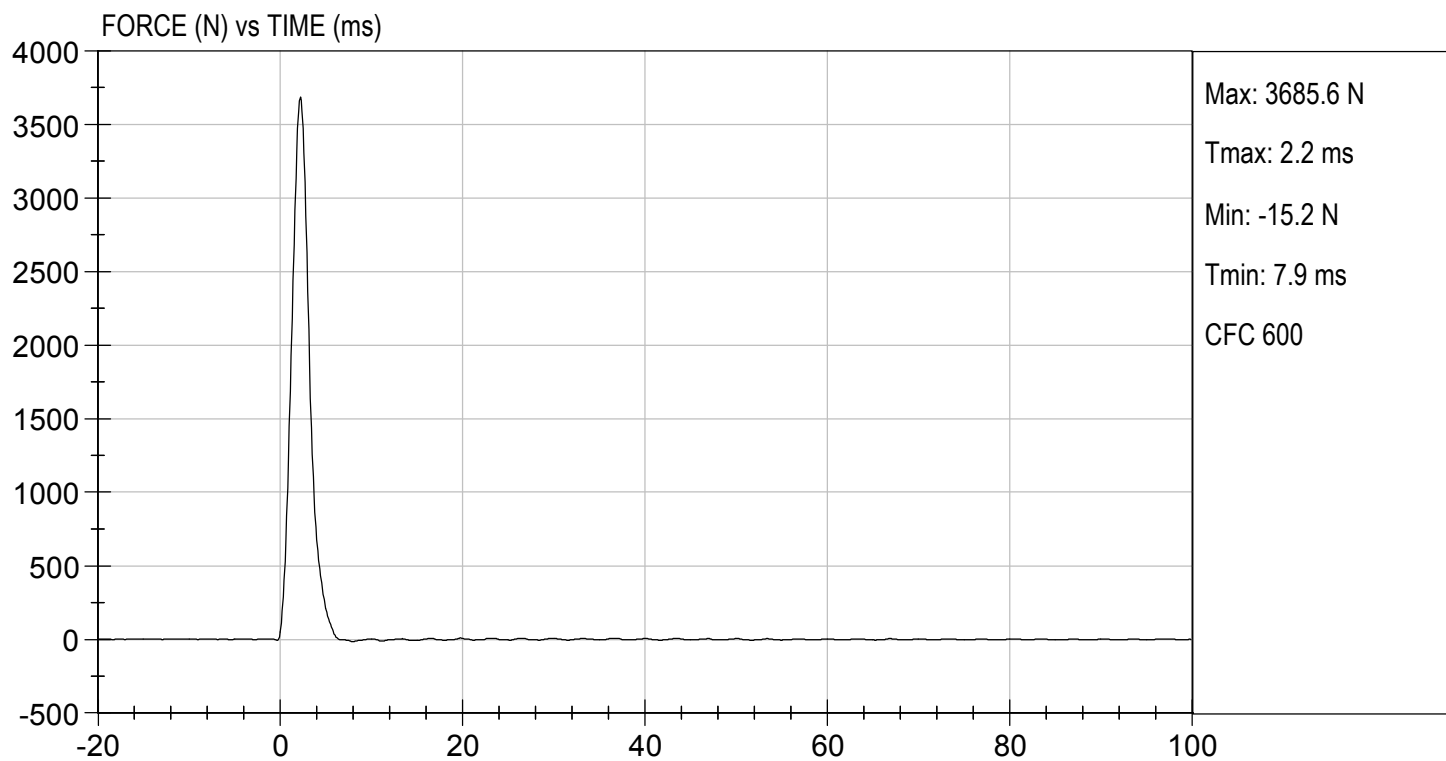
Test Date


Approved By



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

TEST DATE: 12/06/2019
TEST #: D193815



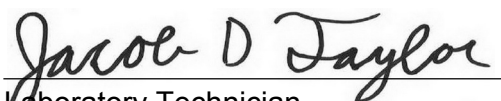
MGA RESEARCH CORPORATION

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

ATD Serial No: 138

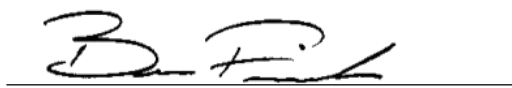
Test I.D: D193816

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	23	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3620	Pass
Overall Test Results				Pass


Laboratory Technician

12/06/2019

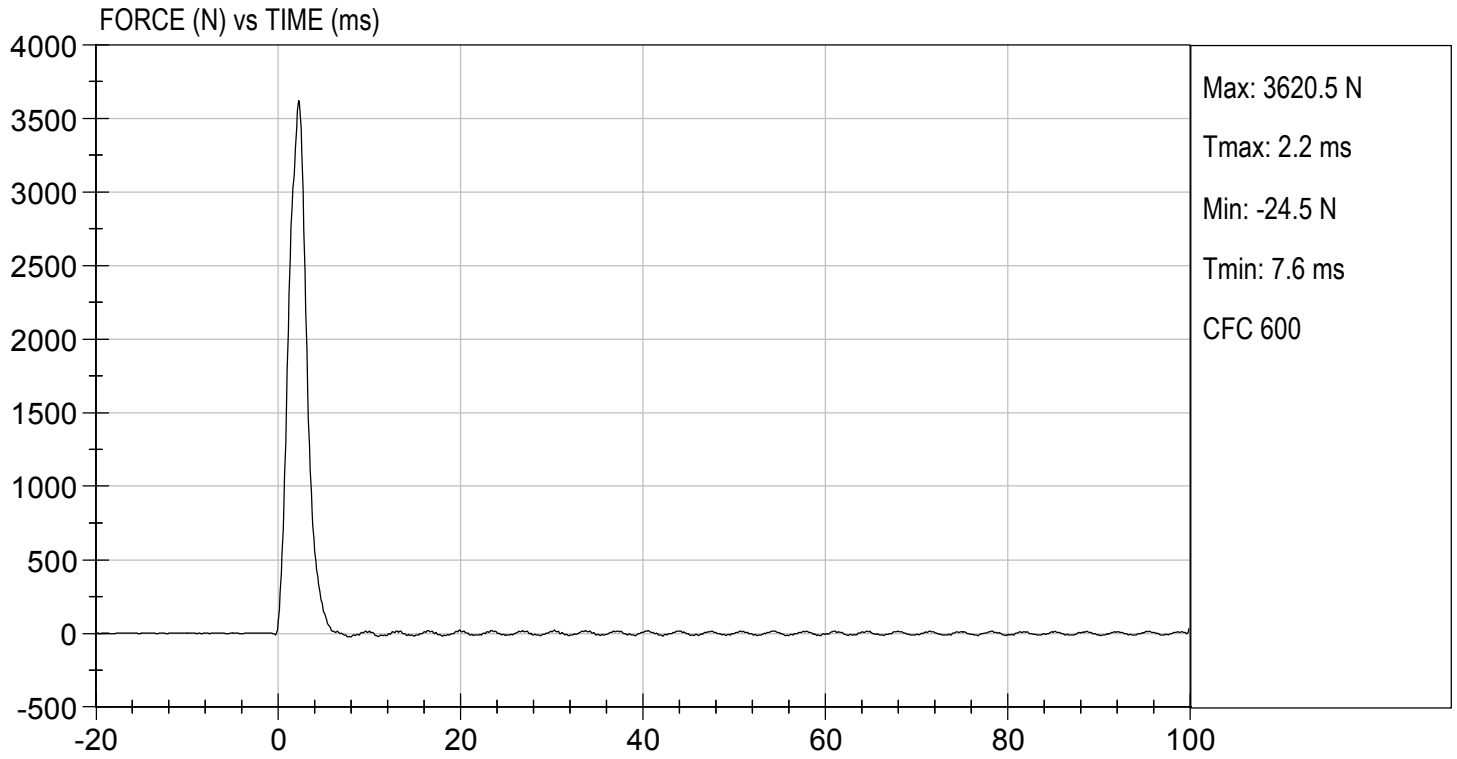
Test Date


Approved By



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

TEST DATE: 12/06/2019
TEST #: D193816



MGA RESEARCH CORPORATION

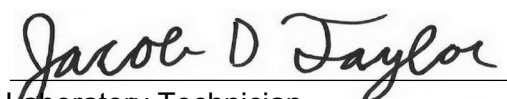
TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138

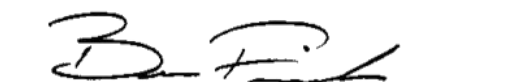
Test I.D: D193817

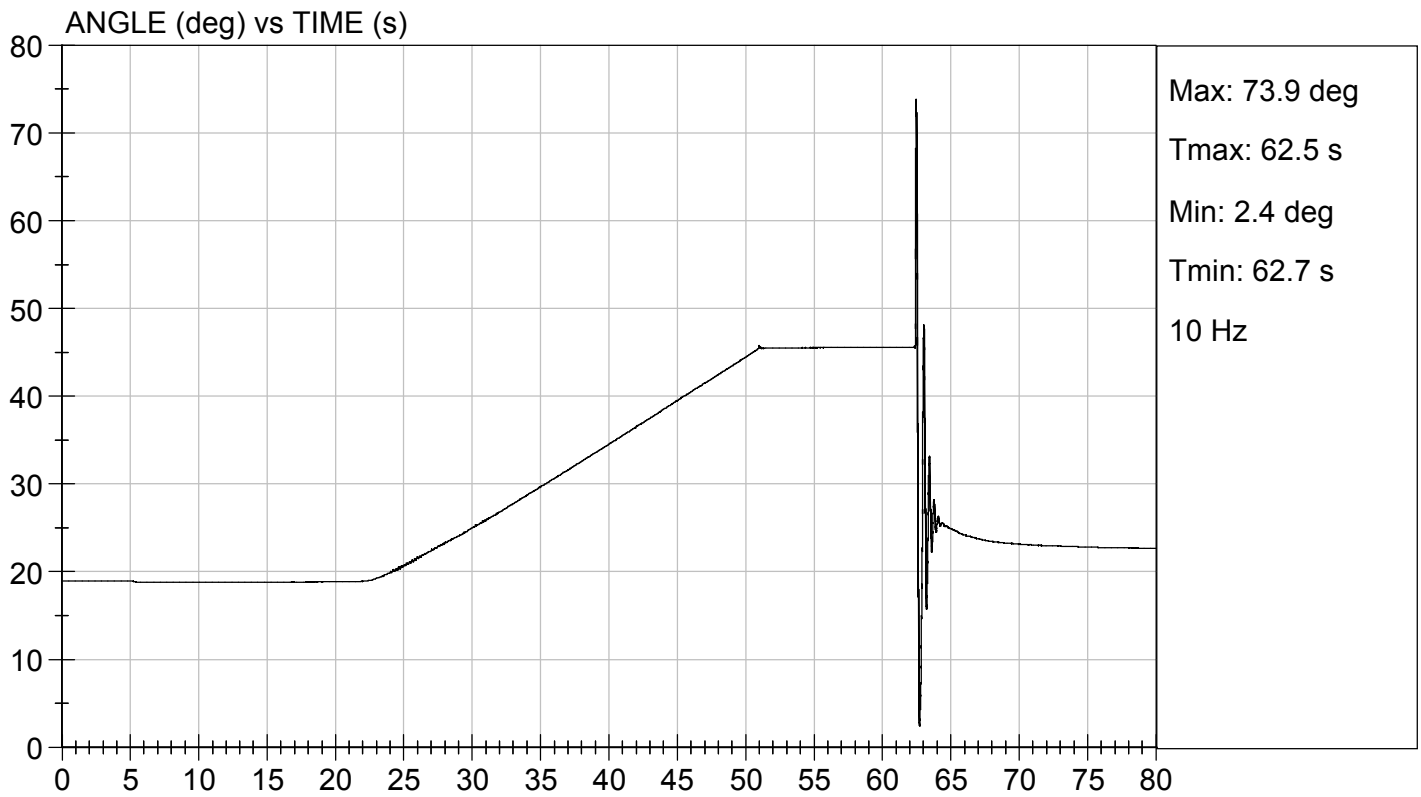
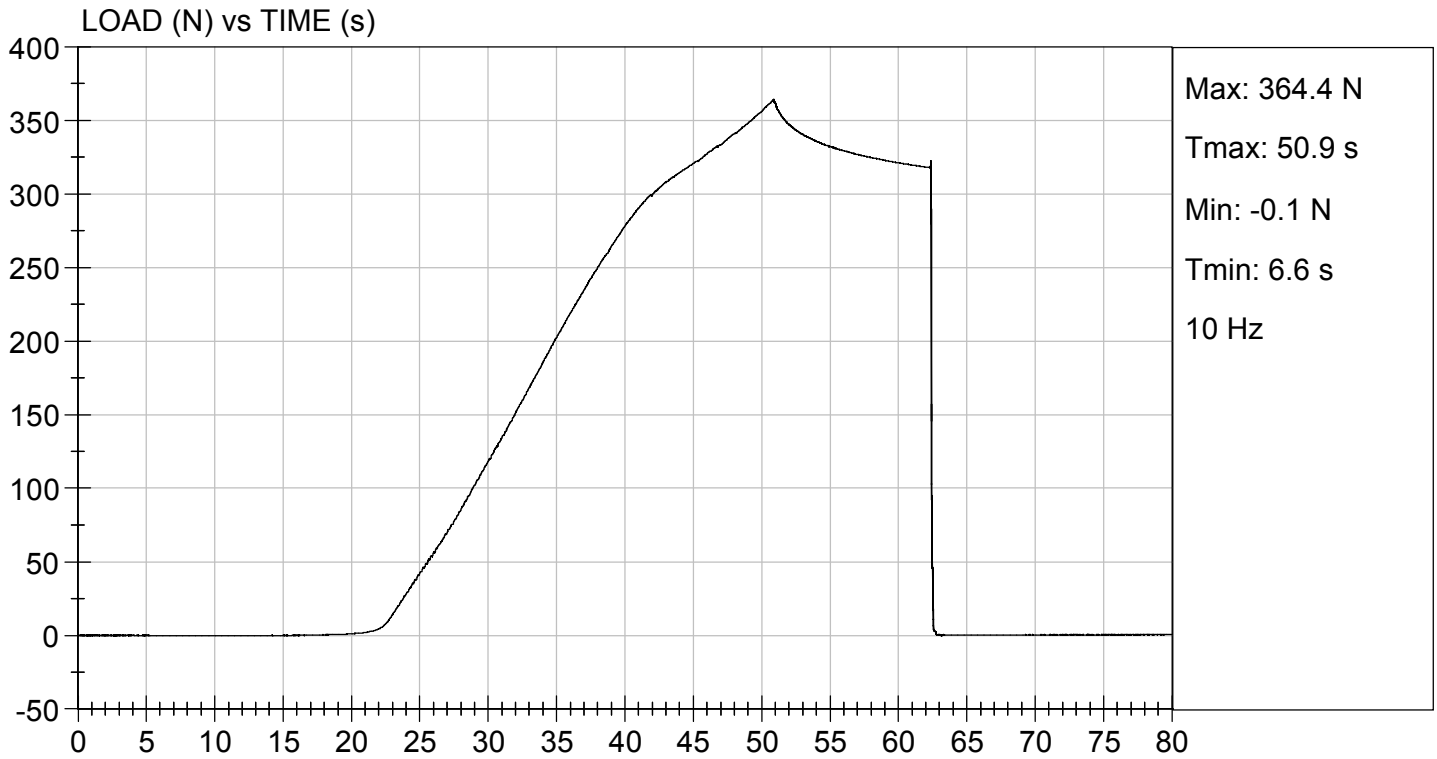
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
Initial Angle	deg	0 to 20	19	Pass
Return Angle	deg	+/- 8	3	Pass
Force at 45 deg	N	320 to 390	364	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.9	Pass
Overall Result				Pass


Laboratory Technician

12/06/2019

Test Date


Approved By



CALIBRATION TEST RESULTS

POST-TEST

HYBRID III 5TH PERCENTILE FEMALE - PASSENGER ATD

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

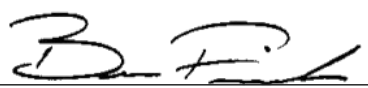
Test ID: D193811

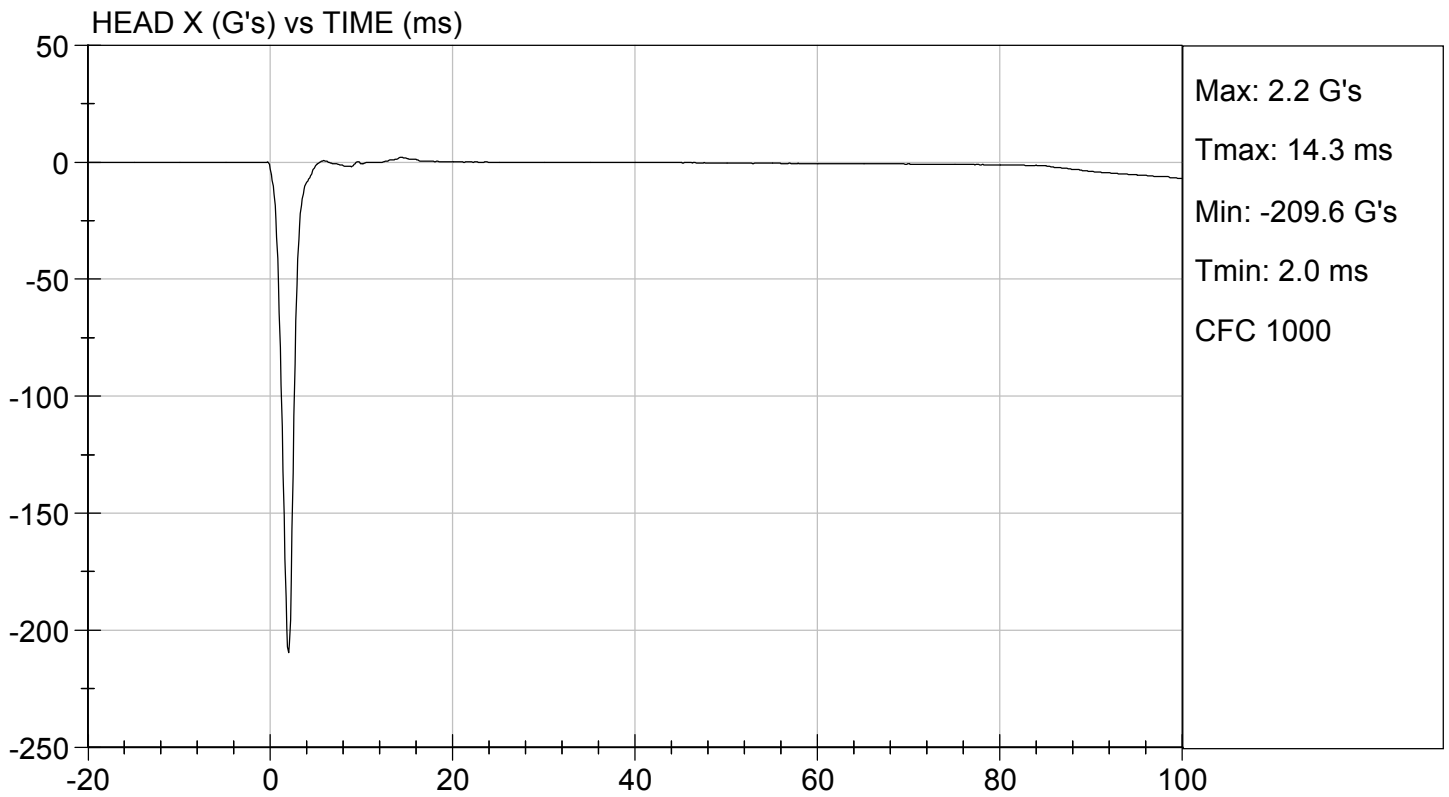
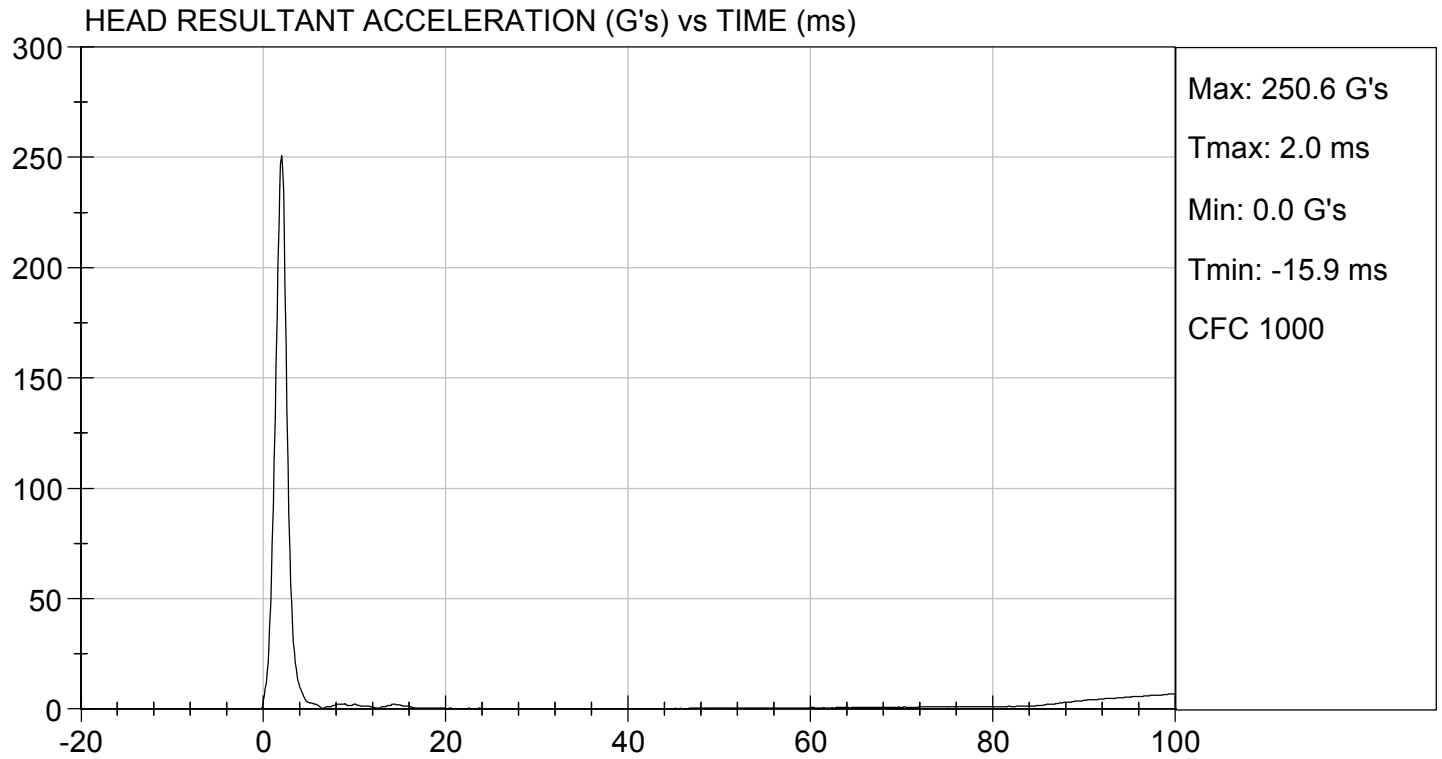
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
Peak Resultant Acceleration	G's	250 to 300	251	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-1.6	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

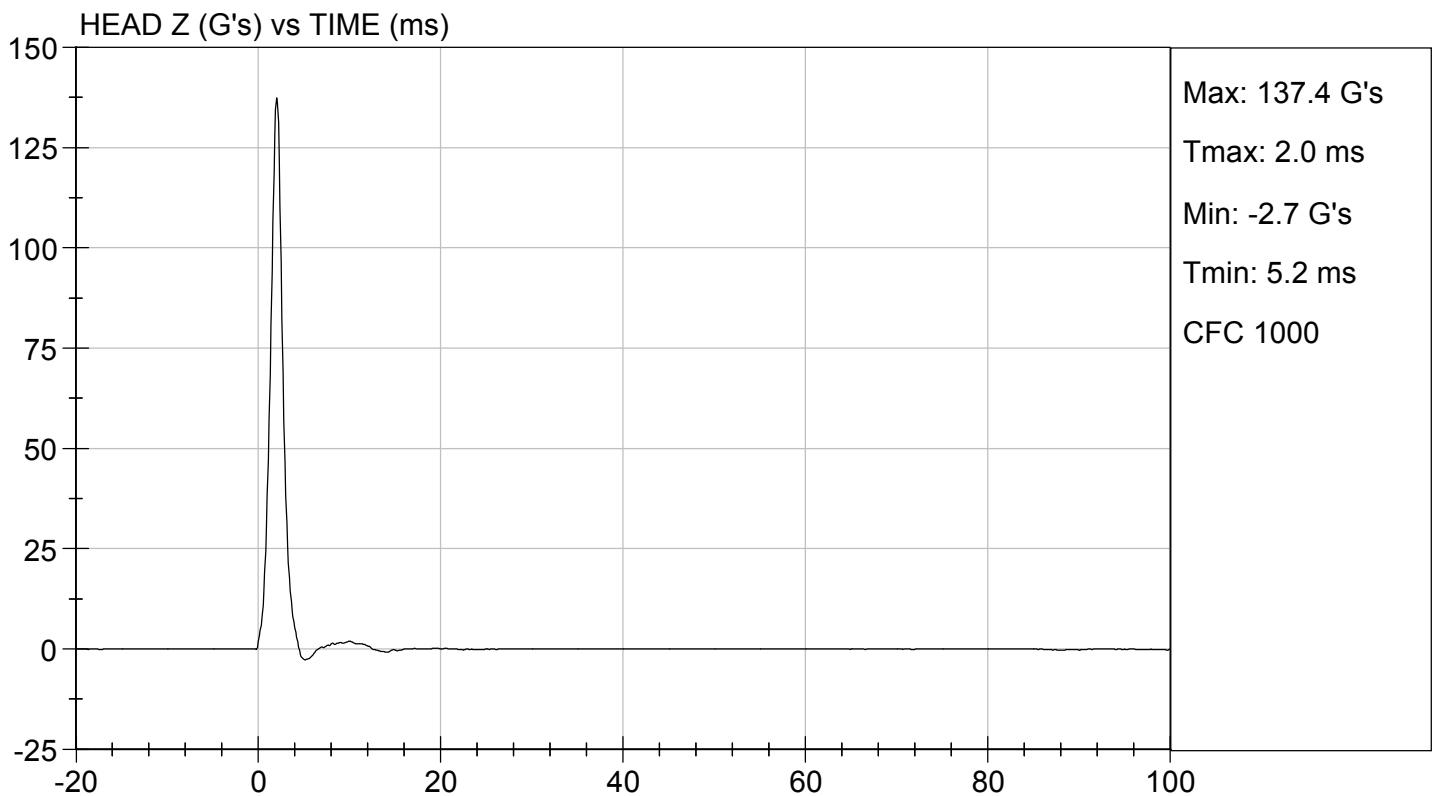
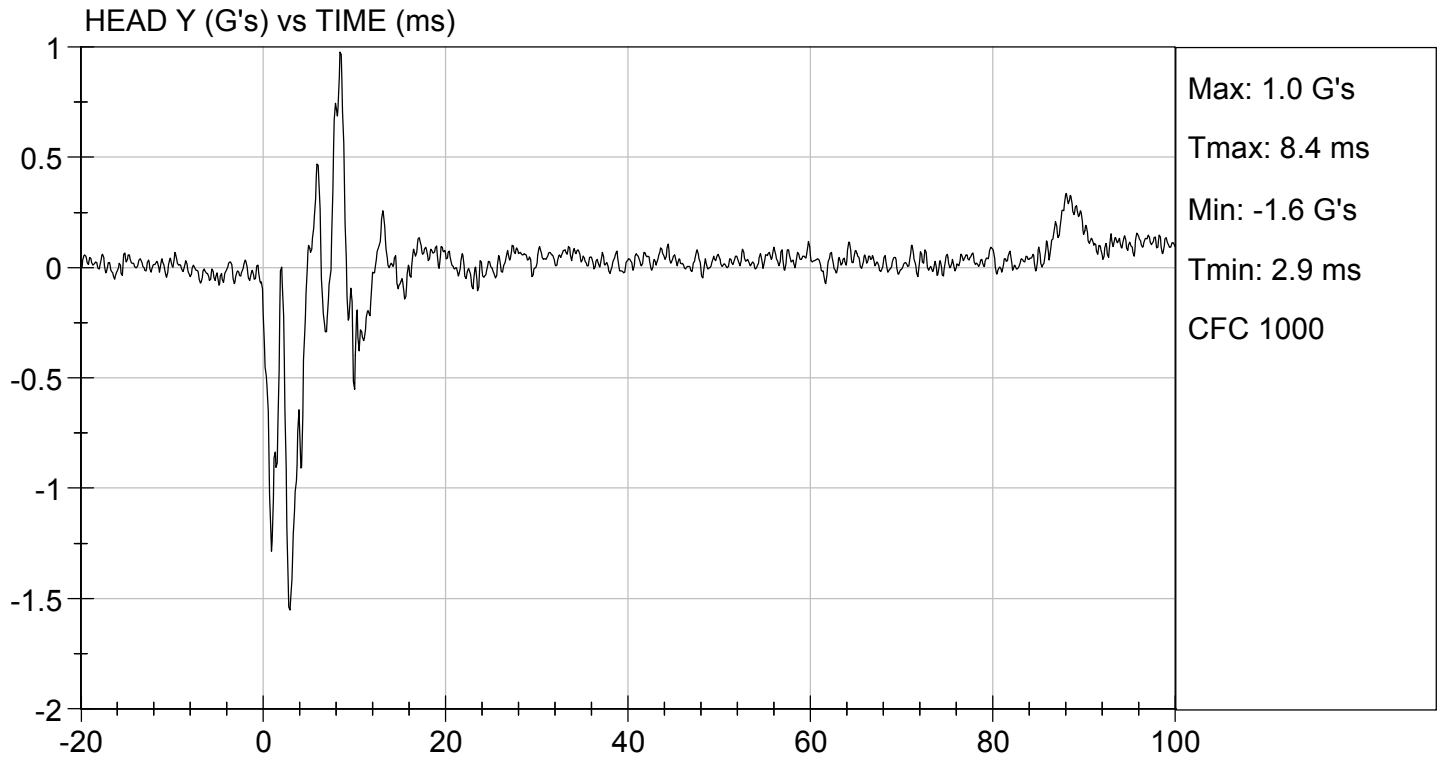

Laboratory Technician

12/06/2019

Test Date


Approved By





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D193812

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	32	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.13	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.4	Pass
	20 ms	m/s	4.0 to 5.0	4.9	Pass
	30 ms	m/s	5.8 to 7.0	6.8	Pass
D Plane Rotation	Max	deg	77 to 91	80	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	69	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	82	Pass
Overall Results					Pass

Jacob D Taylor
 Laboratory Technician

12/09/2019

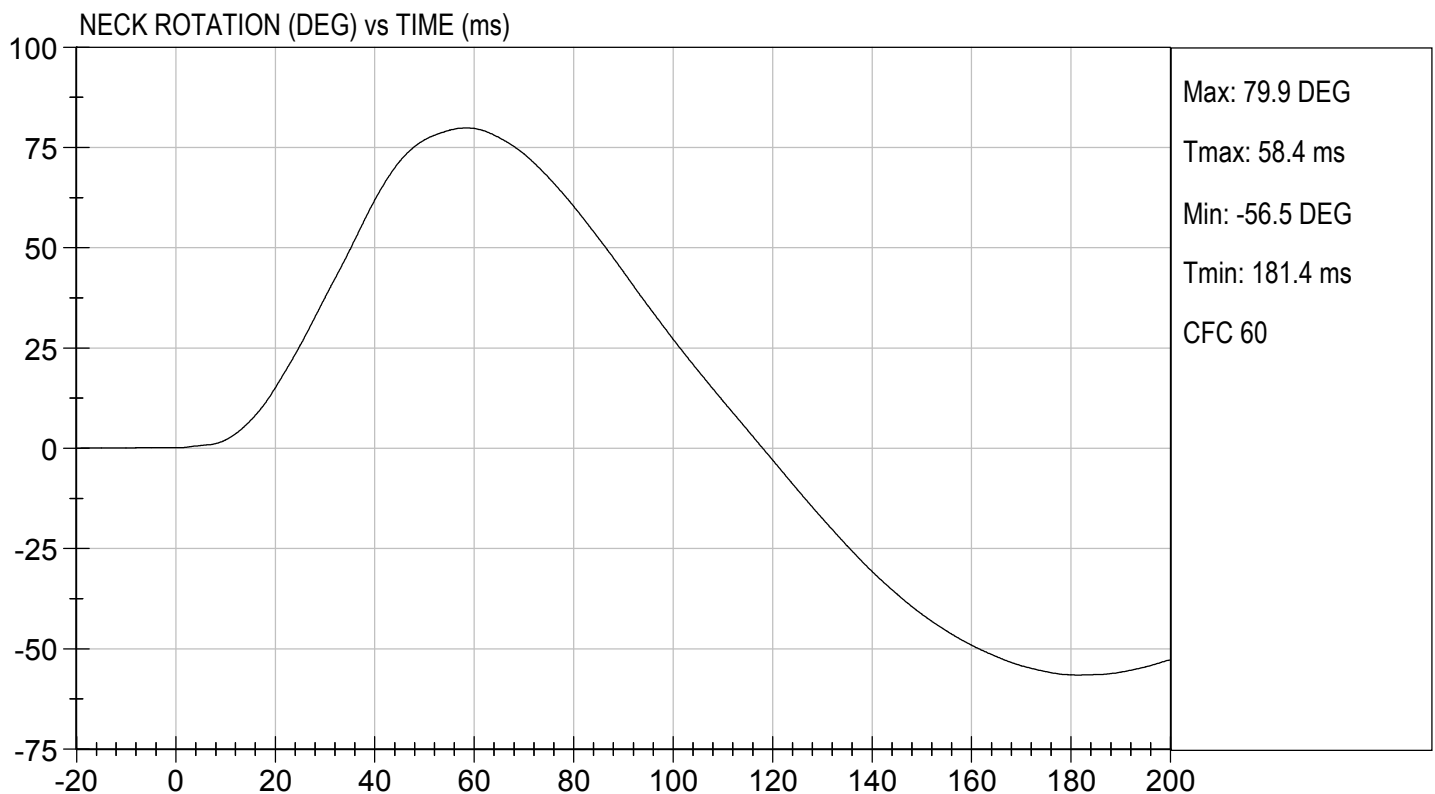
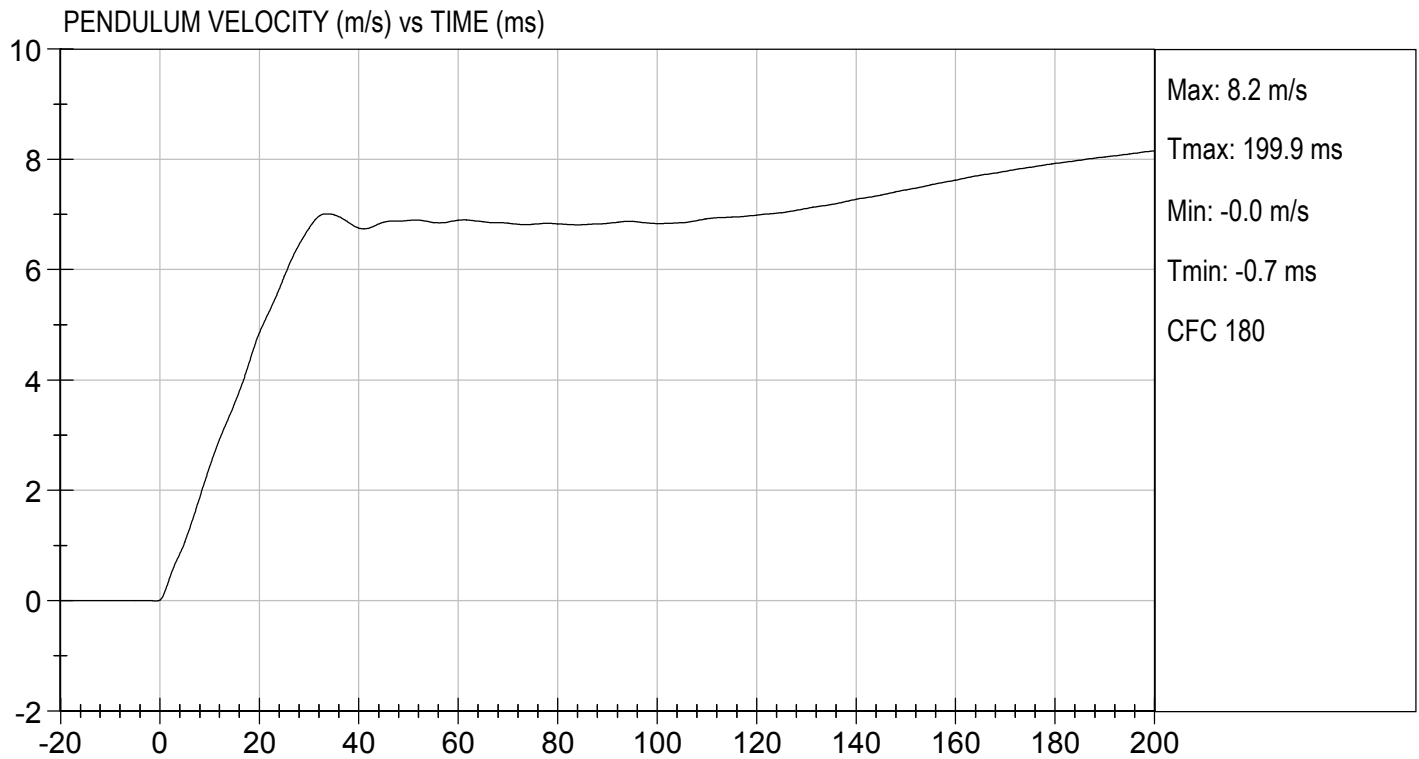
Test Date

B. F. H.
 Approved By



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

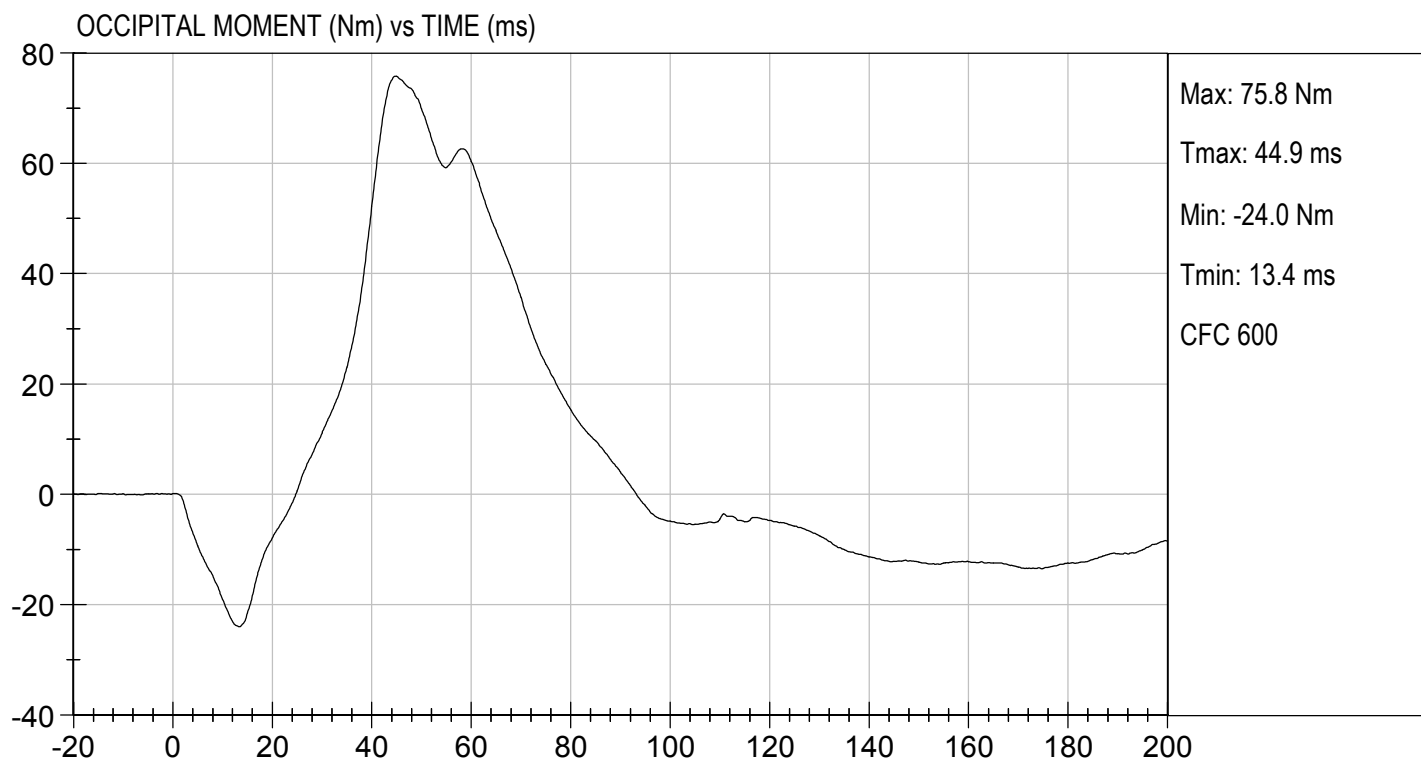
TEST DATE: 12/09/2019
TEST #: D193812





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

TEST DATE: 12/09/2019
TEST #: D193812



MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

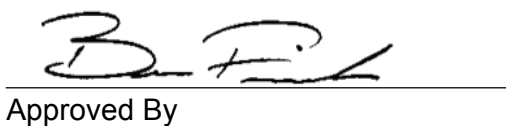
ATD Serial No: 138

Test I.D: D193813

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	32	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	-57	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	108	Pass
Overall Results					Pass


Laboratory Technician

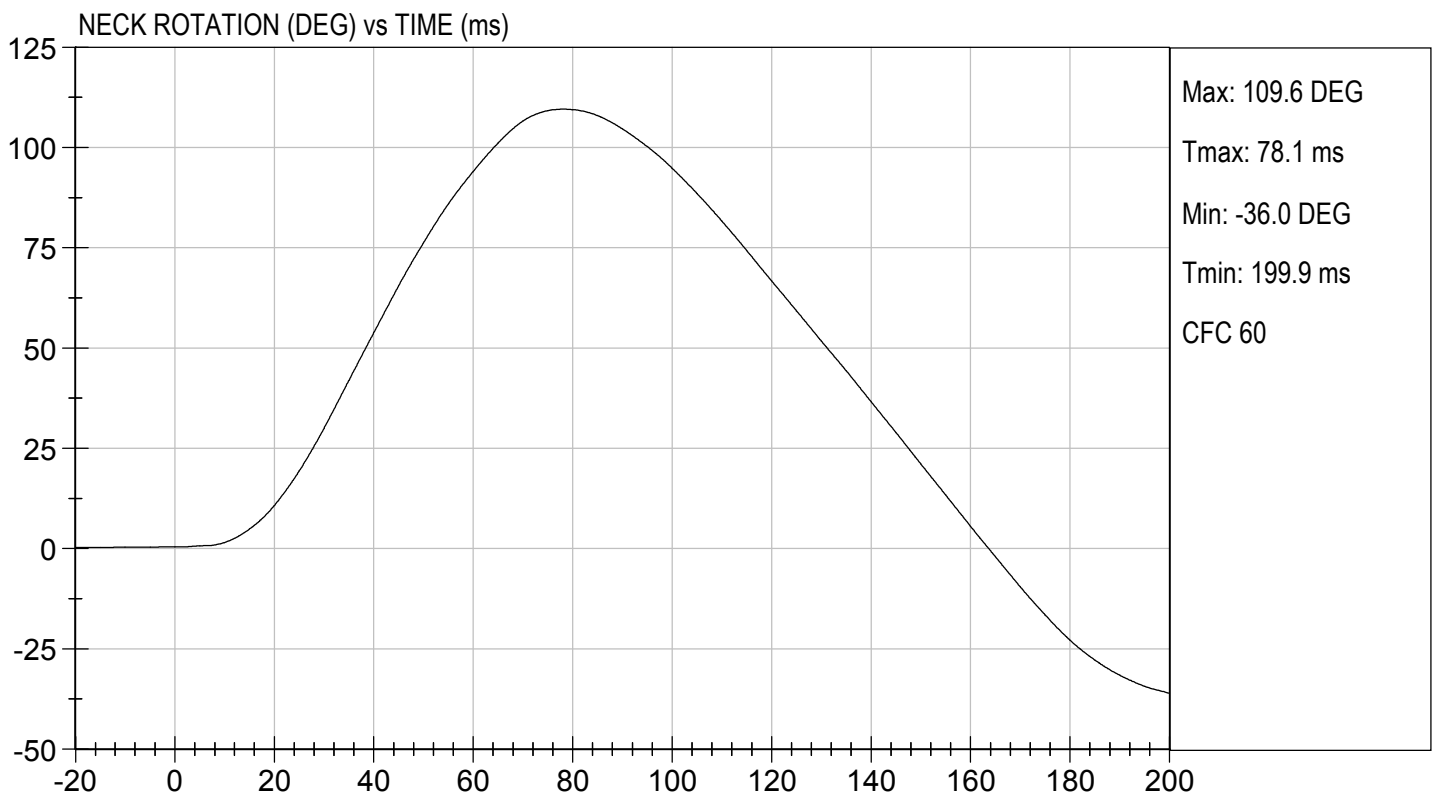
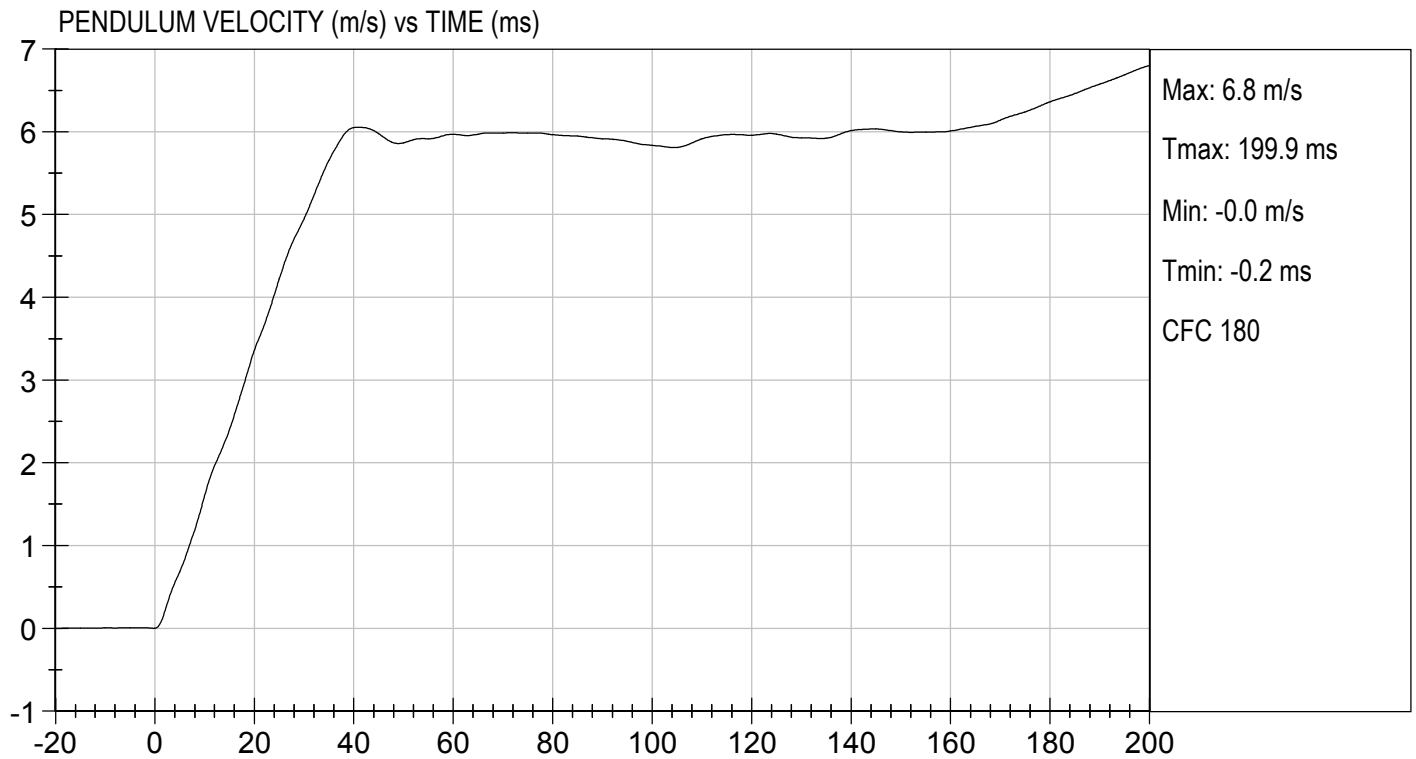
12/09/2019
Test Date


Approved By



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

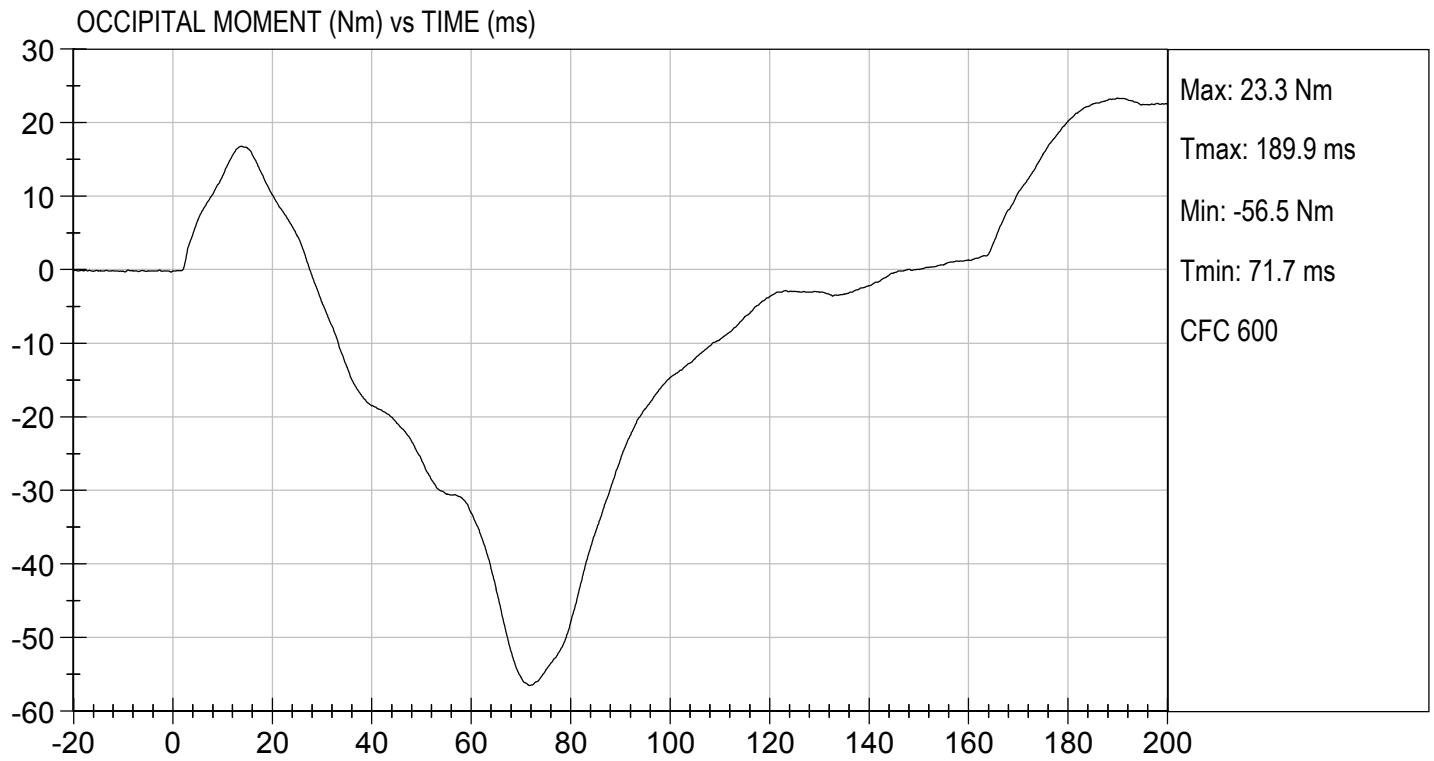
TEST DATE: 12/09/2019
TEST #: D193813





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

TEST DATE: 12/09/2019
TEST #: D193813



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

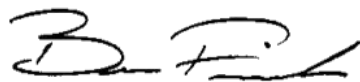
Test I.D: D193814

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.6	Pass
Relative Humidity	%	10 to 70	32	Pass
Probe Speed	m/s	6.59 to 6.83	6.68	Pass
Peak Deflection	mm	50 to 58	56	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4206	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4165	Pass
Overall Test Results				Pass


Laboratory Technician

12/09/2019

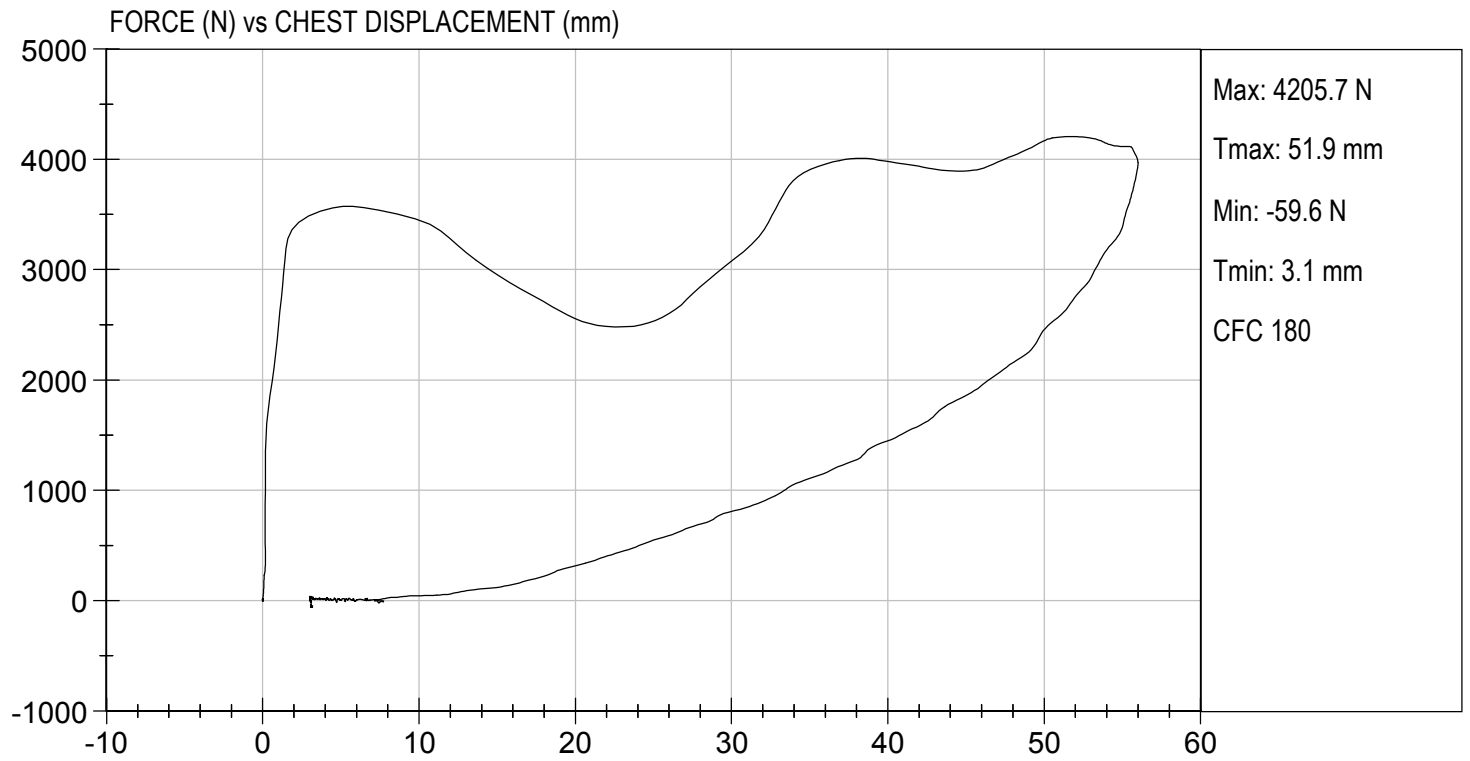
Test Date


Approved By



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

TEST DATE: 12/09/2019
TEST #: D193814



MGA RESEARCH CORPORATION

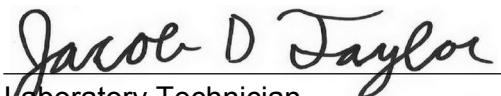
RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138

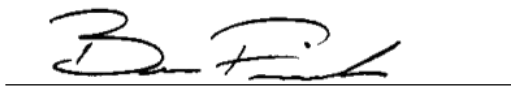
Test I.D: D193815

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	23	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3686	Pass
Overall Test Results				Pass


Laboratory Technician

12/06/2019

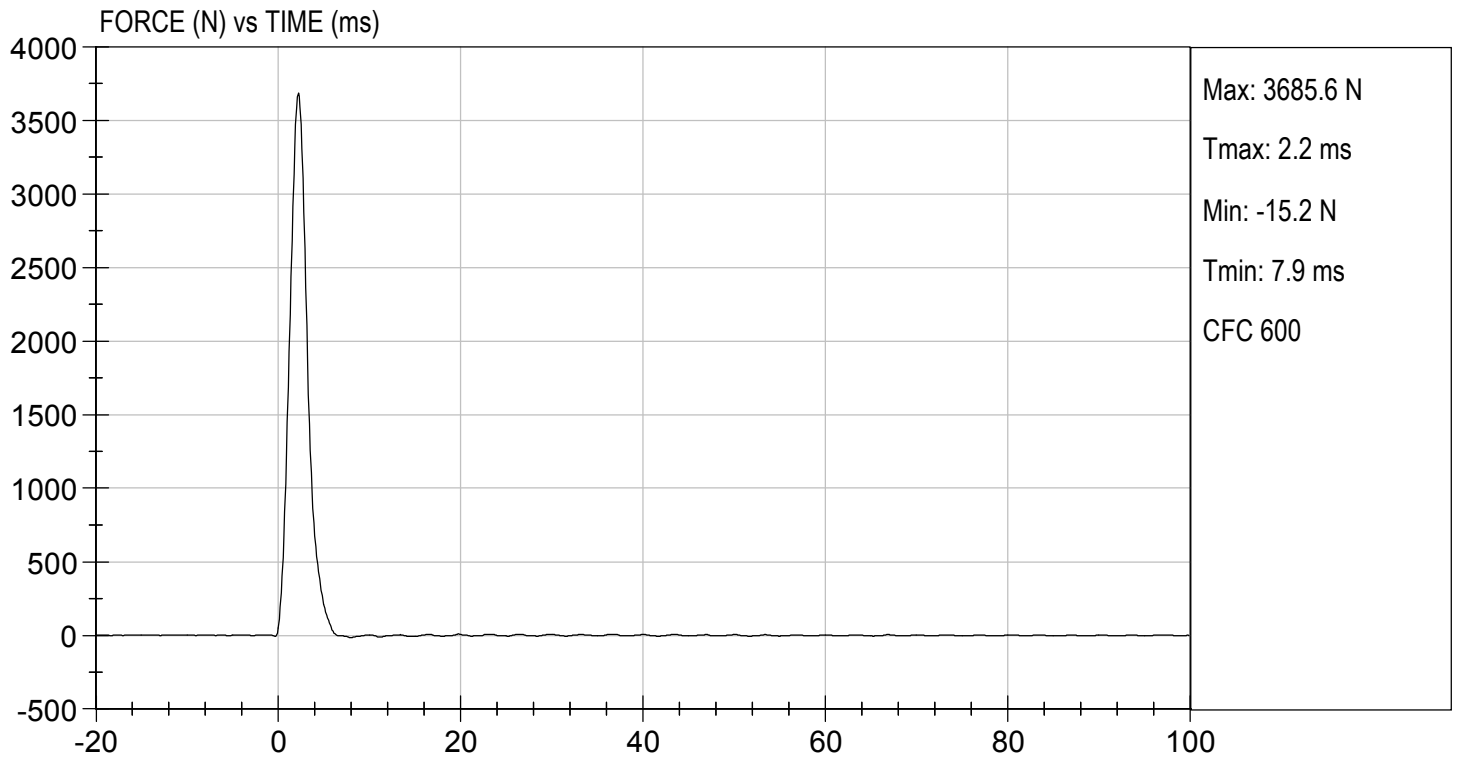
Test Date


Approved By



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

TEST DATE: 12/06/2019
TEST #: D193815



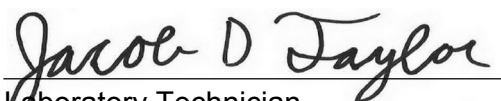
MGA RESEARCH CORPORATION

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

ATD Serial No: 138

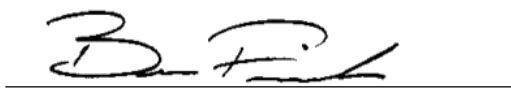
Test I.D: D193816

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	23	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3620	Pass
Overall Test Results				Pass


Laboratory Technician

12/06/2019

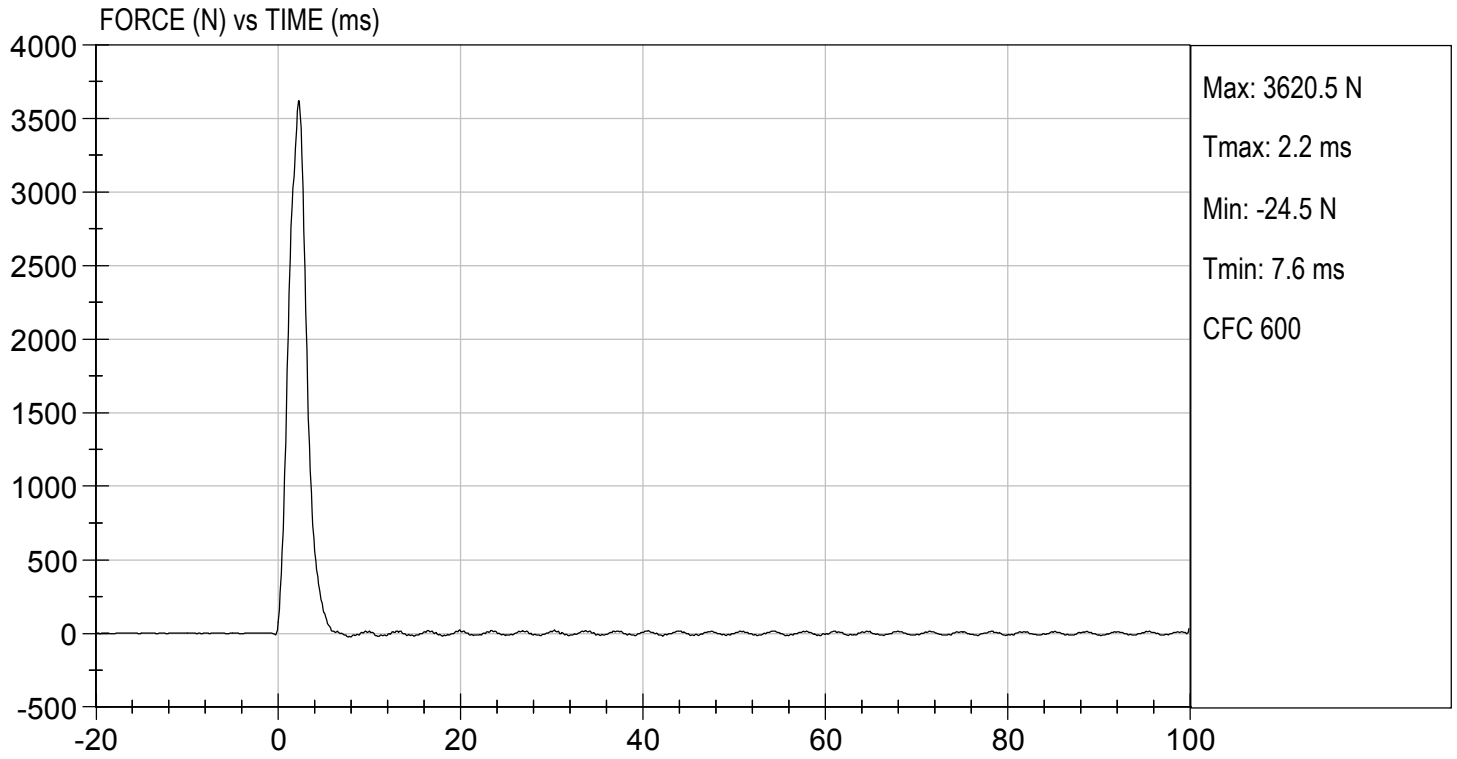
Test Date


Approved By



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

TEST DATE: 12/06/2019
TEST #: D193816



MGA RESEARCH CORPORATION

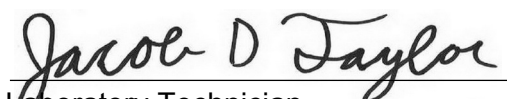
TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138

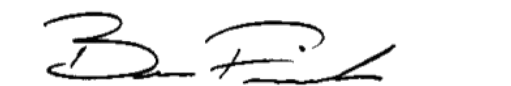
Test I.D: D193817

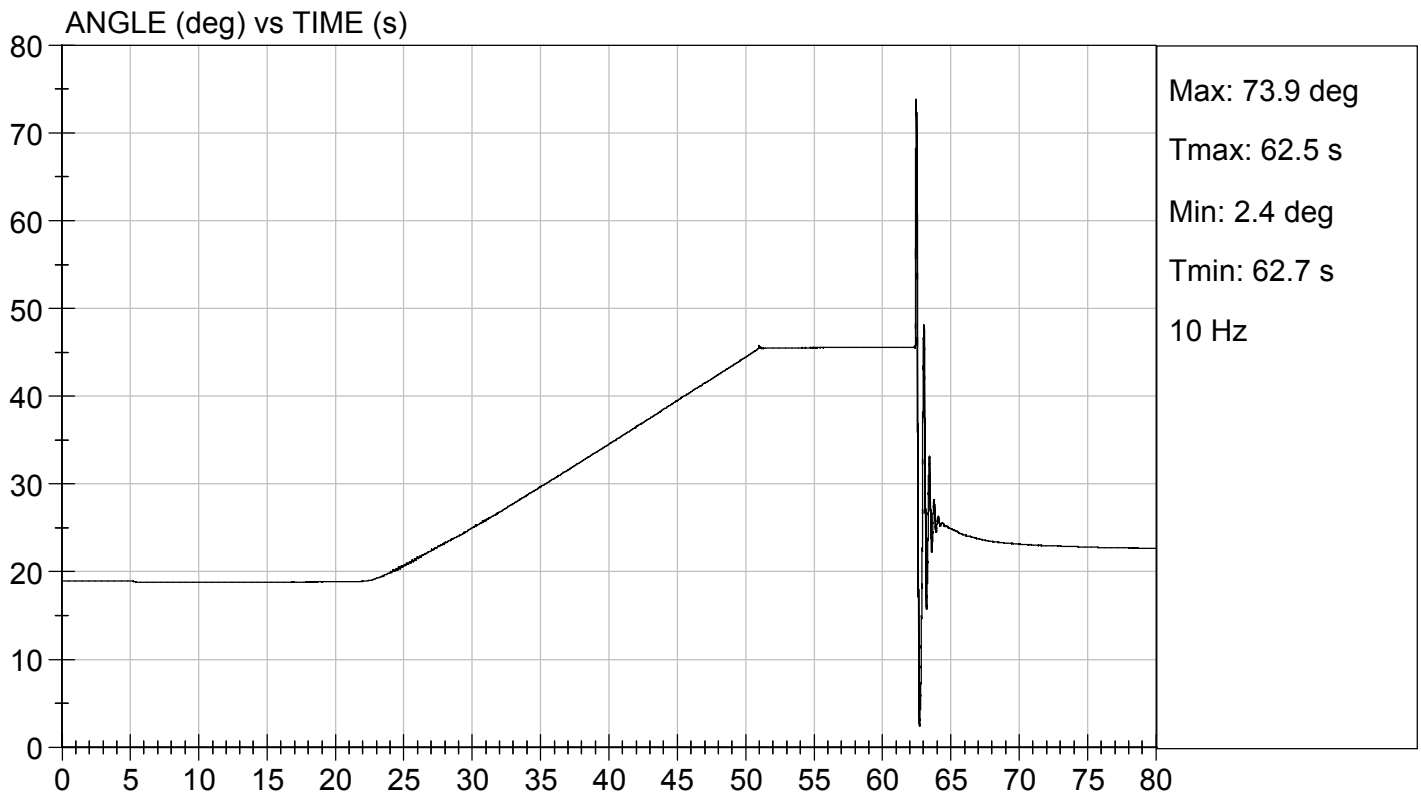
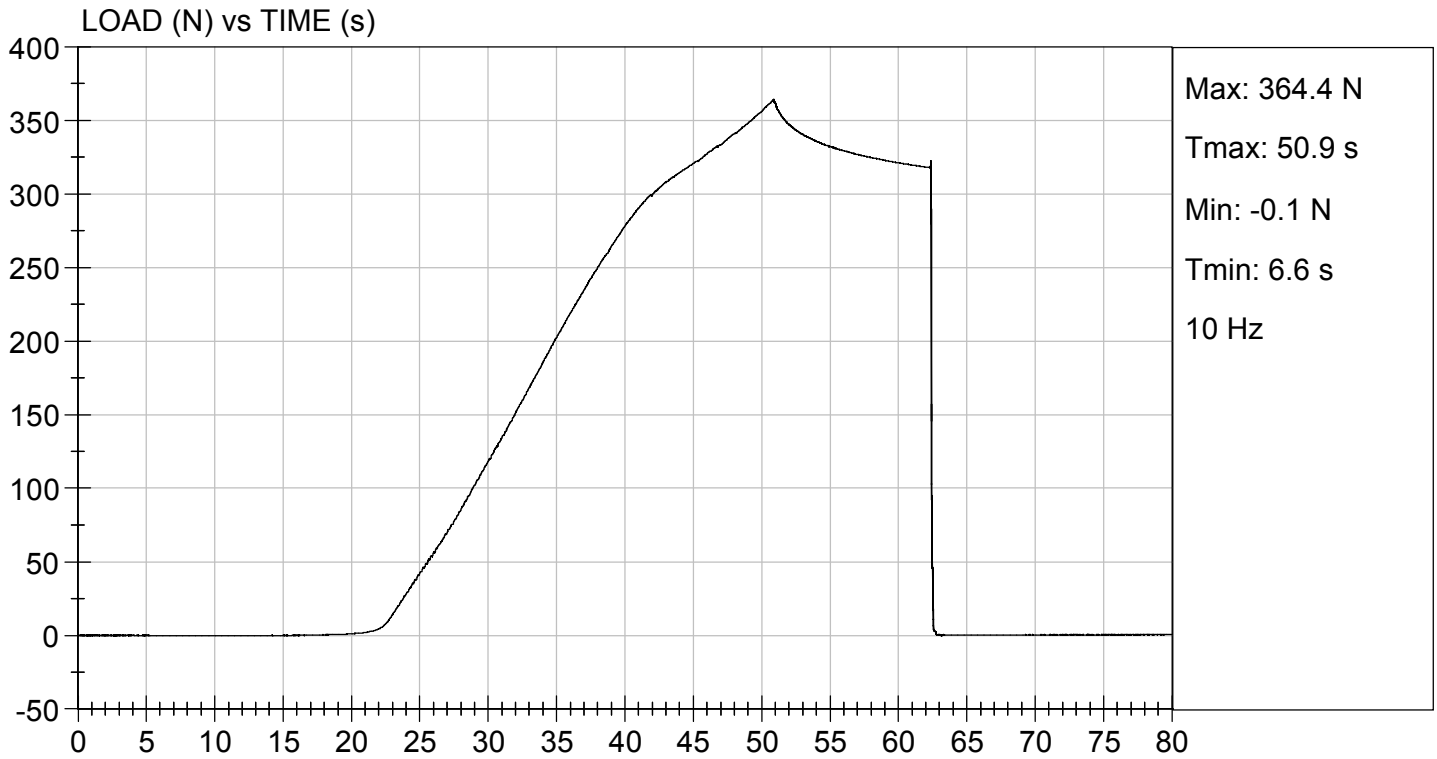
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
Initial Angle	deg	0 to 20	19	Pass
Return Angle	deg	+/- 8	3	Pass
Force at 45 deg	N	320 to 390	364	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.9	Pass
Overall Result				Pass


Laboratory Technician

12/06/2019

Test Date


Approved By



APPENDIX D
TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

TABLE 1 – DRIVER DUMMY INSTRUMENTATION

Instrument Location			Axis	Hybrid III 50 th S/N 351		
				Serial Number	Manufacturer	Calibration Date
Head Accelerometers	Primary		X	P79741	Endevco	9/12/2019
			Y	P79743	Endevco	9/12/2019
			Z	P79744	Endevco	9/12/2019
	Redundant		X	P94834	Endevco	9/12/2019
			Y	P94856	Endevco	9/12/2019
			Z	P97412	Endevco	9/12/2019
Head Angular Rate Sensors			X	ARS7325	DTS	7/8/2019
			Y	ARS7371	DTS	7/8/2019
			Z	ARS7391	DTS	7/8/2019
Upper Neck Load Cell		Fx, Fy, Fz Mx, My, Mz	NG174	FTSS	3/18/2019	
Chest Accelerometers	Primary		X	P86792	Endevco	9/13/2019
			Y	P86793	Endevco	9/13/2019
			Z	P88348	Endevco	9/13/2019
	Redundant		X	P88666	Endevco	9/13/2019
			Y	P88667	Endevco	9/13/2019
			Z	P94109	Endevco	9/13/2019
Chest Potentiometer		X	351	Servo	9/13/2019	
Pelvis Accelerometers			X	P95526	Endevco	9/12/2019
			Y	P96038	Endevco	9/12/2019
			Z	P97742	Endevco	9/12/2019
Femur Load Cells	Right	Primary	Z	FG121P	Denton	9/13/2019
		Redundant	Z	FG121R	Denton	9/13/2019
	Left	Primary	Z	FG122P	Denton	9/13/2019
		Redundant	Z	FG122R	Denton	9/13/2019
Tibia Load Cells	Right	Upper	Mx, My, Fz	TG405	Denton	3/18/2019
		Lower	Mx, My, Fz	AG368	Denton	3/18/2019
	Left	Upper	Mx, My, Fz	TG475	Denton	3/18/2019
		Lower	Mx, My, Fz	AG504	Denton	3/18/2019
Foot Accelerometers	Right	Rear	X	P94812	Endevco	9/12/2019
			Z	T16447	Endevco	9/12/2019
		Front	Z	P82120	Endevco	9/12/2019
	Left	Rear	X	T16468	Endevco	9/12/2019
			Z	T16496	Endevco	9/12/2019
		Front	Z	T16501	Endevco	9/12/2019
Seat Belt Load Cells		Lap		SBG161	FTSS	11/13/2019
		Shoulder		SBG157	FTSS	11/13/2019

TABLE 2 – FRONT PASSENGER DUMMY INSTRUMENTATION

Instrument Location			Axis	Hybrid III 5 th S/N 138		
				Serial Number	Manufacturer	Calibration Date
Head Accelerometers	Primary		X	P94799	Endevco	9/5/2019
			Y	P94800	Endevco	9/5/2019
			Z	P94801	Endevco	9/5/2019
	Redundant		X	P94802	Endevco	9/5/2019
			Y	P94803	Endevco	9/5/2019
			Z	P97377	Endevco	9/5/2019
Head Angular Rate Sensors			X	ARS7366	DTS	7/8/2019
			Y	ARS7402	DTS	7/8/2019
			Z	ARS7516	DTS	7/8/2019
Upper Neck Load Cell		Fx, Fy, Fz Mx, My, Mz	NG1915	Denton	2/22/2019	
Chest Accelerometers	Primary		X	P88719	Endevco	9/5/2019
			Y	P94785	Endevco	9/5/2019
			Z	P94793	Endevco	9/5/2019
	Redundant		X	P94794	Endevco	9/5/2019
			Y	P95322	Endevco	9/5/2019
			Z	P95370	Endevco	9/5/2019
Chest Potentiometer		X	138	Servo	9/6/2019	
Pelvis Accelerometers			X	P82646	Endevco	9/5/2019
			Y	P94798	Endevco	9/5/2019
			Z	P97705	Endevco	9/5/2019
Femur Load Cells	Right	Primary	Z	FG123P	Denton	9/6/2019
		Redundant	Z	FG123R	Denton	9/6/2019
	Left	Primary	Z	FGDS9754P	Humanetics	9/6/2019
		Redundant	Z	FGDS9754R	Humanetics	9/6/2019
Tibia Load Cells	Right	Upper	Mx, My, Fz	TGDH3308	FTSS	2/21/2019
		Lower	Mx, My, Fz	AGDI4208	FTSS	2/21/2019
	Left	Upper	Mx, My, Fz	TGDG6744	FTSS	2/21/2019
		Lower	Mx, My, Fz	AGDI4273	FTSS	2/21/2019
Foot Accelerometers	Right	Rear	X	P83167	Endevco	9/5/2019
			Z	P83168	Endevco	9/5/2019
		Front	Z	P83169	Endevco	9/5/2019
	Left	Rear	X	P94795	Endevco	9/5/2019
			Z	P94796	Endevco	9/5/2019
		Front	Z	P94797	Endevco	9/5/2019
Seat Belt Load Cells		Lap		SBG273	FTSS	11/13/2019
		Shoulder		SBG272	FTSS	11/13/2019

TABLE 3 – VEHICLE INSTRUMENTATION

Instrument Location			Axis	Serial Number	Manufacturer	Calibration Date
Crossmember / Rear Seat Accelerometers	Left	Primary	X	T21398	Endevco	7/26/2019
			Z	T18984	Endevco	8/28/2019
		Redundant	X	T18975	Endevco	8/28/2019
	Right	Primary	X	T20391	Endevco	9/13/2019
			Z	T19551	Endevco	8/28/2019
		Redundant	X	T20365	Endevco	9/13/2019
Engine Accelerometers		Top	X	T18972	Endevco	7/25/2019
		Bottom	X	PCB1240	PCB	11/18/2019