REPORT NUMBER: NCAP-MGA-2019-047

NEW CAR ASSESSMENT PROGRAM (NCAP)
Frontal Barrier Impact Test

FCA US LLC
2019 Dodge Durango SXT AWD 5-Door SUV
NHTSA No.: M20190318

MGA RESEARCH CORPORATION
5000 Warren Road
Burlington, WI 53105

Test Date: June 7, 2019

Final Report Date: August 28, 2019

FINAL REPORT

U.S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Office of Crashworthiness Standards
Mail Code: NRM-110
1200 New Jersey Ave, SE
Room W43-410
Washington, DC 20590

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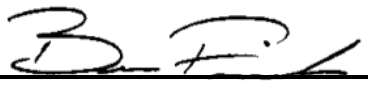
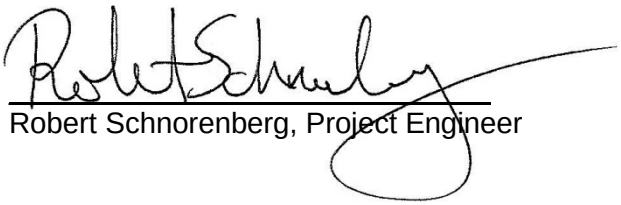
Prepared by: 
Ben Fischer, Project Engineer

Approved by: 
Robert Schnorenberg, Project Engineer

Approval Date: August 28, 2019

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

Technical Report Documentation Page

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16. Abstract

A 56.3 km/h NCAP Frontal Impact Test was conducted on a 2019 Dodge Durango SXT AWD 5-Door SUV in accordance with the specifications of the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), and 301 performance. The test was conducted at MGA Research Corporation in Burlington, Wisconsin on June 7, 2019.

The impact velocity of the vehicle was 56.30 km/h and the ambient temperature at the barrier face at the time of impact was 21.6°C. The target vehicle post-test maximum crush was 504 mm located at the vehicle centerline. The test vehicle's performance was as follows:

Measurement Description	Units	Driver ATD		Passenger ATD	
		Threshold	Result	Threshold	Result
Head Injury Criteria (HIC_{15})	N/A	700	74	700	295
Maximum Chest	mm	63	38	52	21
Nij	N/A	1	0.34	1	0.26
Neck Tension	N	4170	1049	2620	693
Neck Compression	N	4000	51	2520	383
Left Femur Force	N	10008	1510	6805	1349
Right Femur Force	N	10008	1619	6805	144

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SECTION 1
PURPOSE AND SUMMARY OF TEST

PURPOSE

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

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

SUMMARY

A load cell barrier consisting of 176 load cells was impacted by a 2019 Dodge Durango SXT AWD 5-Door SUV at a velocity of 56.30 km/h. The test was performed at MGA Research Corporation on June 7, 2019. Pre-test and post-test photographs of the vehicle and dummies can be found in Appendix A.

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

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

Both ATDs were fully instrumented with head, chest and pelvis tri-axial accelerometers, chest displacement potentiometers, upper neck transducers, right/left femur load cells, and lower leg instrumentation.

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

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

There was 100 percent windshield retention and no intrusion into the protected zone of the windshield during the event. There was no Stoddard Solvent leakage after the event or during any phase of the static rollover.

The maximum static crush of the vehicle was 504 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 glove box.

The occupant data is summarized below:

ATD position	HIC_{15}	Nij	Neck Tension (N)	Neck Comp. (N)	3ms Chest Clip (Gs)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50^{th})	74	0.34	1049	51	40	38	1510	1619
Passenger (5^{th})	295	0.26	693	383	46	21	1349	144

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

TEST NOTES

None.

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: 2019 Dodge Durango SXT AWD 5-Door SUV NHTSA No.: M20190318
Test Program: NCAP Frontal Barrier Impact Test Test Date: 6/7/2019

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	M20190318	Traction Control System (TCS)	Yes
Model Year	2019	Power Steering	Yes
Make	Dodge	Power Window Auto-Reverse	Yes
Model	Durango SXT AWD	Driver Frontal Airbag	Yes
Body Style	5-Door SUV	Driver Curtain Airbag	Yes
VIN	1C4RDJAG0KC644662	Driver Head/Torso Airbag	No
Body Color	Granite	Driver Torso Airbag	No
Odometer (km/mi)	179 km / 111 mi	Driver Torso/Pelvis Airbag	Yes
Engine Displacement (L)	3.6 L	Driver Pelvis Airbag	No
Type/No. Cylinders	V6	Driver Knee Airbag	Yes
Engine Placement	Longitudinal	Front Pass. Frontal Airbag	Yes
Transmission Type	Automatic	Front Pass. Curtain Airbag	Yes
Transmission Speeds	8	Front Pass. Head/Torso Airbag	No
Overdrive	Yes	Front Pass. Torso Airbag	No
Final Drive	AWD	Front Pass. Torso/Pelvis Airbag	Yes
Roof Rack	No	Front Pass. Pelvis Airbag	No
Sunroof/T-Top	No	Front Pass. Knee Airbag	No
Running Boards	No	Driver Pretensioner	Yes
Tilt Steering Wheel	Yes	Driver Load Limiter	Yes
Power Seats	No	Front Pass. Pretensioner	Yes
Anti-Lock Brakes (ABS)	Yes	Front Pass. Load Limiter	Yes
Automatic Door Locks (ADLs)	Yes	Other	N/A

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

DATA FROM CERTIFICATION LABEL

Manufactured By	FCA US LLC
Date of Manufacture	12/18

GVWR (kg)	2949
GAWR Front (kg)	1452
GAWR Rear (kg)	1770

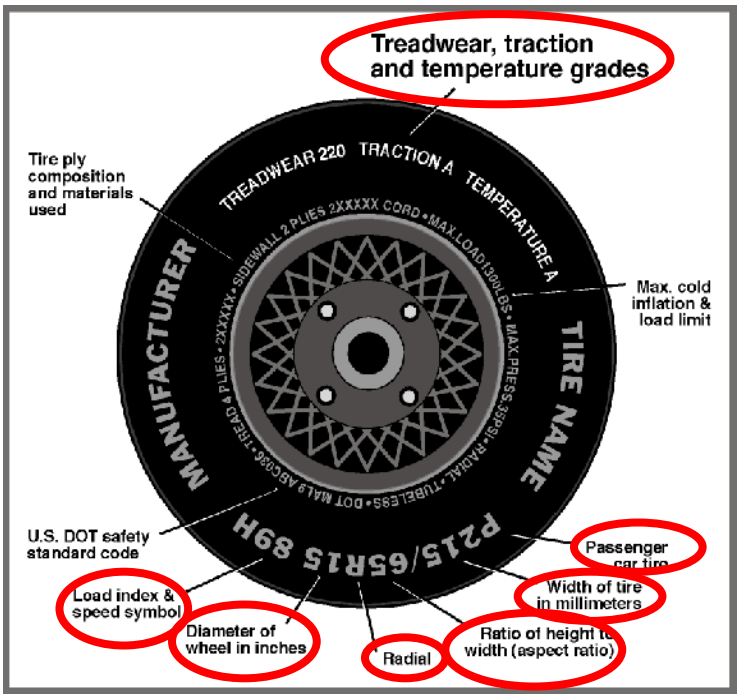
VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Contoured	Split Bench	
Designated Seating Capacity (DSC)	2	3	2	7
Capacity Weight (VCW) (kg)				544
Cargo Weight (RCLW) (kg)				68

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

Test Vehicle: 2019 Dodge Durango SXT AWD 5-Door SUV NHTSA No.: M20190318
Test Program: NCAP Frontal Barrier Impact Test Test Date: 6/7/2019

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	250	250
Recommended Tire Size	265/60R18	265/60R18
Tire Size on Vehicle	265/60R18	265/60R18
Tire Manufacturer	Michelin	Michelin
Tire Model	Premier LTX	Premier LTX
Treadwear	620	620
Traction	A	A
Temperature Grade	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 1 Polyamide, 2 Steel	2 Polyester, 1 Polyamide, 2 Steel
Load Index/Speed Symbol	110T	110T
Tire Material	Rubber	Rubber
DOT Safety Code Left	AP5E OTEX 4318	AP5E OTEX 4318
DOT Safety Code Right	AP5E OTEX 4318	AP5E OTEX 4318

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

Test Vehicle: 2019 Dodge Durango SXT AWD 5-Door SUV NHTSA No.: M20190318
Test Program: NCAP Frontal Barrier Impact Test Test Date: 6/7/2019

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	566.5	536.0		594.5	615.5	
Right	kg	548.0	569.5		568.0	643.0	
Ratio	%	50.2%	49.8%		48.0%	52.0%	
Totals	kg	1114.5	1105.5	2220.0	1162.5	1258.5	2421.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	2220.0
Weight of 1 P572E ATD & 1 P572O ATD	kg	141
Rated Cargo/Luggage Weight (RCLW)	kg	68
Calculated Test Vehicle Target Weight (TVTW)	kg	2429.0

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	853	853	873	877	1519
As Tested	mm	842	841	853	860	1585
Post Test	mm	868	890	859	866	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	3050
Total Vehicle Length at Left Side	mm	4898
Total Vehicle Length at Centerline	mm	5085
Total Vehicle Length at Right Side	mm	4898
Weight of Ballast in Cargo Area	kg	12
Weight of Vehicle Components Removed	kg	20
Amount of Stoddard Solvent in Fuel Tank	L	86.7

List of components removed to meet test weight: None.

List of components removed for instrumentation, data box, and equipment installation: Cargo area carpet / trim / cover, LR/RR floor mat, jack and tools, RR tail light, LF/RF underbody plastic.

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

Test Vehicle: 2019 Dodge Durango SXT AWD 5-Door SUV NHTSA No.: M20190318
Test Program: NCAP Frontal Barrier Impact Test Test Date: 6/7/2019

TARGET VEHICLE STRUCTURAL MEASUREMENT

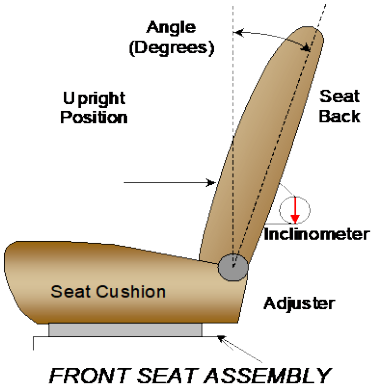
	Elements	Pre-Test (mm)
1	Total Length	5085
2	Total Width	1915
3	Bumper Top Height	680
4	Bumper Bottom Height	530
5	Longitudinal Member Top Height	610
6	Distance between Longitudinal Members	795
7	Longitudinal Member Width	76
8	Engine Top Height	1100
9	Engine Bottom Height	280
10	Engine and Gearbox Width	700
11	Front Bumper-Engine Distance	465
12	Front Shock Absorber Fixing Height	953
13	Bonnet Leading Edge Height	1015
14	Front Shock Absorber Fixing Width	90
15	Front Bumper – Front Axle Distance	865
16	Front Axle – A-Pillar Distance	555
17	A-Pillar – B-Pillar Distance	1190
18	B-Pillar – Rear Axle Distance	1312
19	B-Pillar – C-Pillar Distance	761
20	Roof Sill Bottom Height	1650
21	Roof Sill Top Height	1705
22	Floor Sill Bottom Height	385
23	Floor Sill Top Height	470

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

Test Vehicle: 2019 Dodge Durango SXT AWD 5-Door SUV NHTSA No.: M20190318
Test Program: NCAP Frontal Barrier Impact Test Test Date: 6/7/2019

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 October 2015.



	Degrees
Driver Seat Back Angle	14.0° on outboard headrest post
Passenger Seat Back Angle	9.2° on outboard headrest post

SEAT FORE/AFT POSITIONS

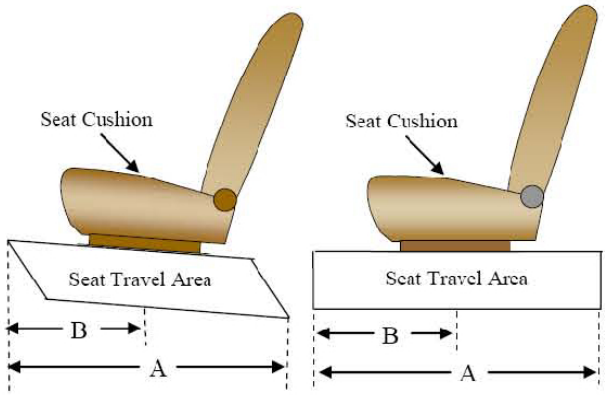
The driver and passenger seat fore/aft positions are adjusted following Appendix F, "Driver & Passenger Dummy Seating & Positioning Procedures" in the NCAP Test Procedure dated October 2015.

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	280 mm / 42 detents (1st as 1)	143 mm / 21st detent (1st as 0)
Passenger Seat	233 mm / 35 detents (1st as 1)	0 mm / 0th detent (1st as 0)

SEAT BELT UPPER ANCHORAGES

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

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



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

Test Vehicle: 2019 Dodge Durango SXT AWD 5-Door SUV NHTSA No.: M20190318
Test Program: NCAP Frontal Barrier Impact Test Test Date: 6/7/2019

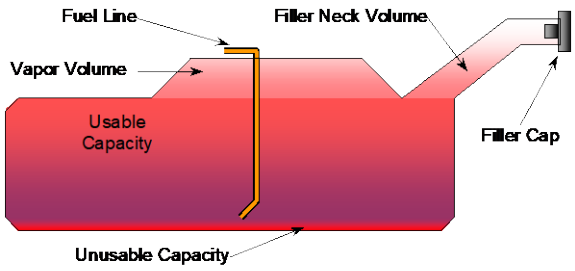
FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of "Standard Tank"	93.5
Usable Capacity of "Optional Tank"	
92-94% of Usable Capacity	86.0 to 87.9
Actual Amount of Solvent used	86.7
1/3 of Usable Capacity	31.2

FUEL PUMP

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

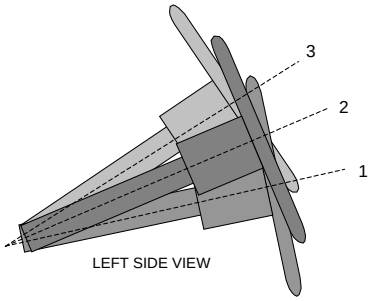
The vehicle is equipped with an electronic fuel pump. The fuel pump starts pumping fuel when the key is "ON" position. The filler neck is located on the driver's side.



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.



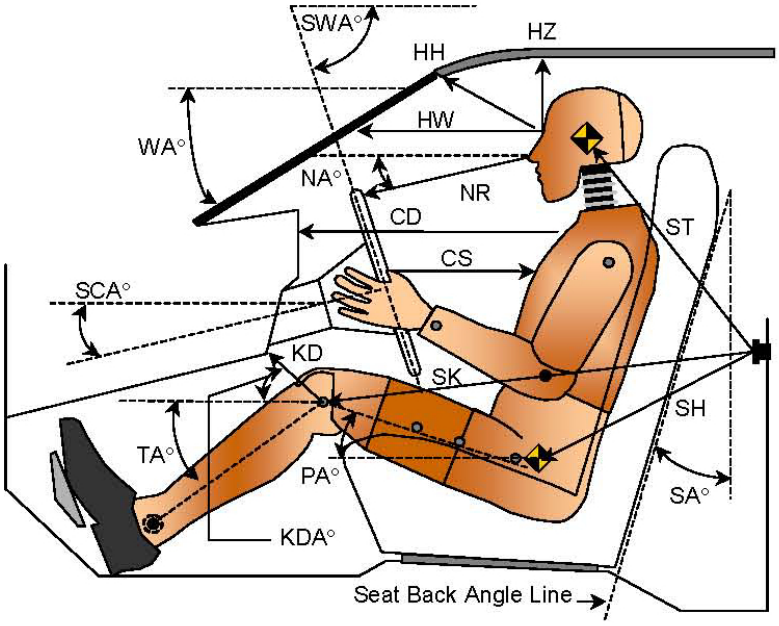
STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITION

	Degrees	Fore/Aft Position (mm)
Lowermost Position 1	70.4	246
Geometric Center Position 2	68.1	218
Uppermost Position 3	65.8	190
Telescoping Steering Wheel Travel		56
Test Position	68.1	218

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2019 Dodge Durango SXT AWD 5-Door SUV NHTSA No.: M20190318
Test Program: NCAP Frontal Barrier Impact Test Test Date: 6/7/2019

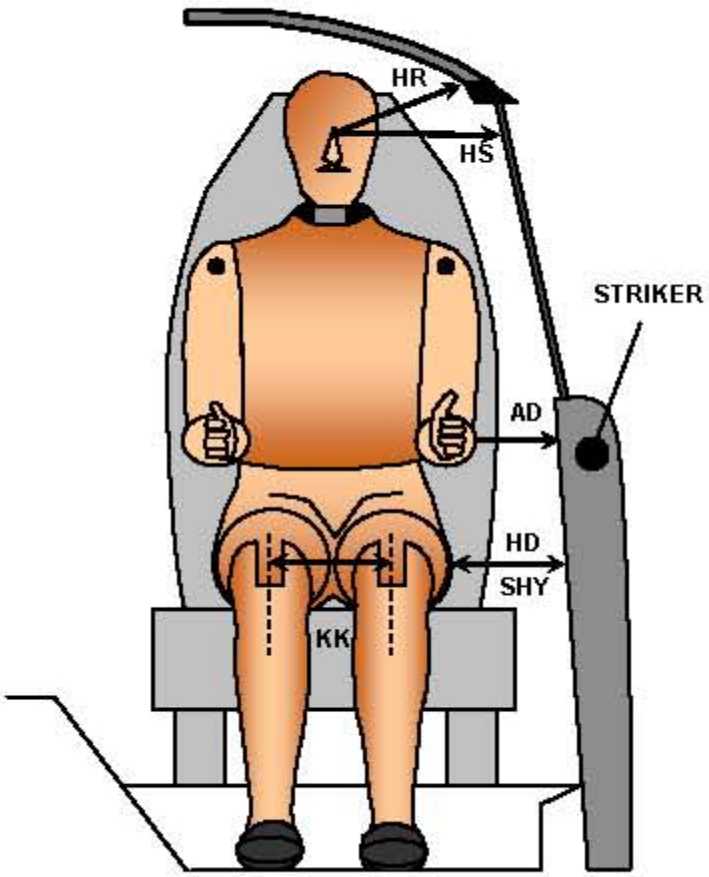


LEFT SIDE VIEW

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		26.1		
SWA°	Steering Wheel Angle		68.1		
SCA°	Steering Column Angle		21.9		
SA°	Seat Back Angle		14.0		9.2
HZ	Head to Roof (Z)	201	90	232	90
HH	Head to Header	406	20.1	359	39.1
HW	Head to Windshield	662	0	699	0
NR	Nose to Rim	392	2.0		
CD	Chest to Dash	556		429	
CS	Chest to Steering Hub	321	1.1		
RA	Rim to Abdomen	209	0		
KDL	Left Knee to Dash	207	25.6	132	36.9
KDR	Right Knee to Dash	185	36.3	139	35.3
PA°	Pelvic Angle		24.6		22.0
TA°	Tibia Angle		46.4		63.2
SK	Striker to Knee	562	90.4	646	91.0
ST	Striker to Head	586	8.5	534	20.8
SH	Striker to H-Point	193	112.9	329	107.2

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2019 Dodge Durango SXT AWD 5-Door SUV NHTSA No.: M20190318
Test Program: NCAP Frontal Barrier Impact Test Test Date: 6/7/2019

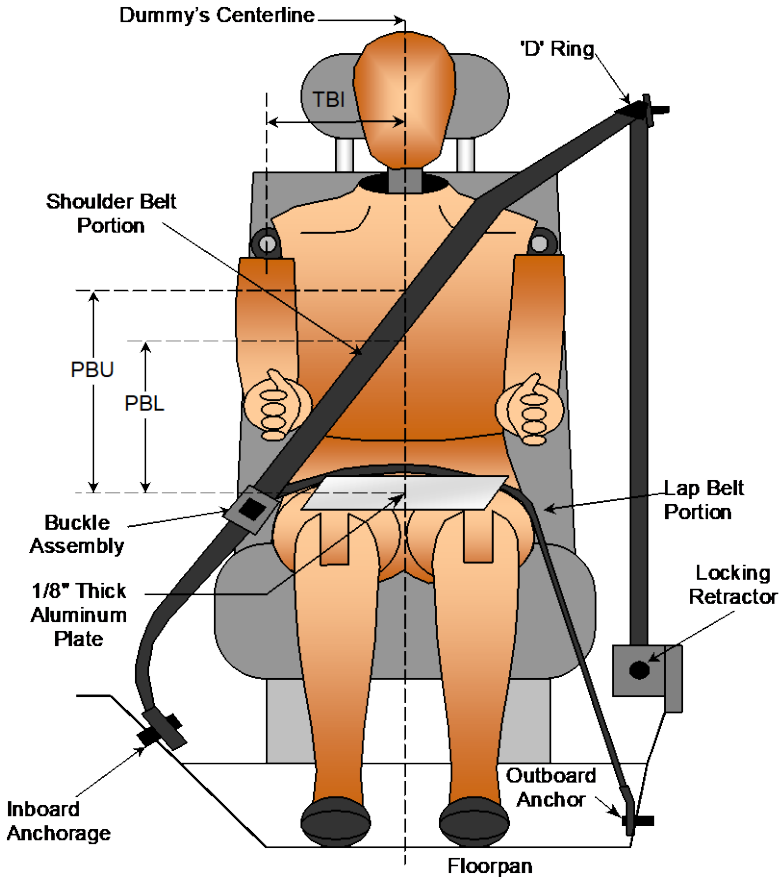


FRONT VIEW OF DUMMY

Code	Measurement Description	Driver	Passenger
		Length (mm)	
AD	Arm to Door	148	109
HD	H-Point to Door	157	195
HR	Head to Side Header	221	284
HS	Head to Side Window	360	383
KK	Knee to Knee	329	228
SHY	Striker to H-Point (Y Direction)	291	326
AA	Ankle to Ankle	307	161

DATA SHEET NO. 5
SEAT BELT POSITIONING DATA

Test Vehicle: 2019 Dodge Durango SXT AWD 5-Door SUV NHTSA No.: M20190318
Test Program: NCAP Frontal Barrier Impact Test Test Date: 6/7/2019



FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	345	305
PBL - Top surface of reference to belt lower edge	mm	270	230

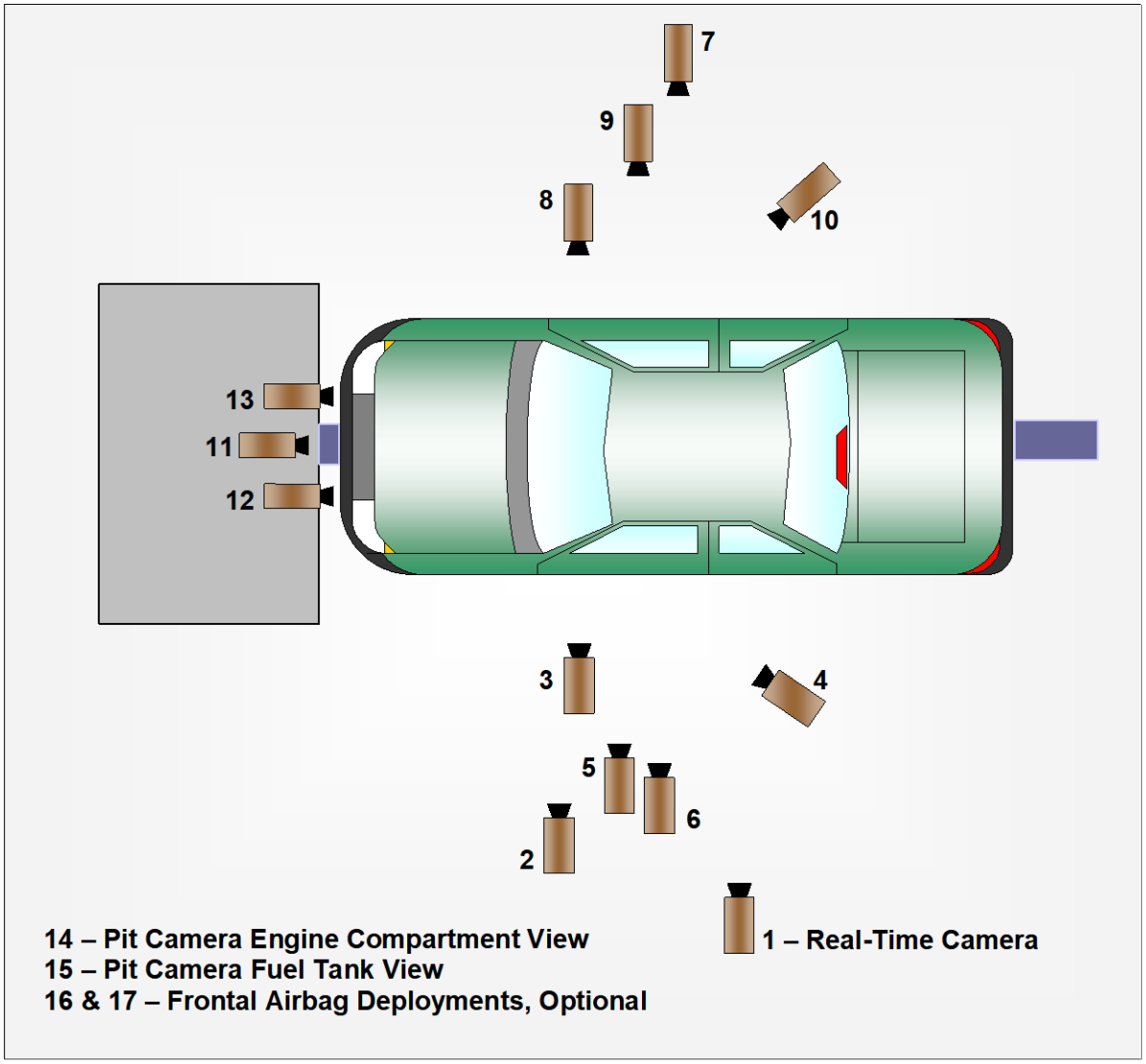
BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as measured on ATD	mm	900	905
Lap Belt Length as measured on ATD	mm	570	520
Remainder of belt on reel	mm	920	965
Total Belt Length for Continuous Webbing Systems	mm	2990	2990

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

Test Vehicle:	2019 Dodge Durango SXT AWD 5-Door SUV	NHTSA No.:	M20190318
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	6/7/2019

CAMERA POSITIONS FOR FRONTAL IMPACTS



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

Test Vehicle: 2019 Dodge Durango SXT AWD 5-Door SUV NHTSA No.: M20190318
Test Program: NCAP Frontal Barrier Impact Test Test Date: 6/7/2019

CAMERA LOCATIONS

No.	Camera View	Coordinates (mm)			Lens (mm)	Speed (fps)
		X*	Y*	Z*		
1	Real-Time Left Overall					30
2	Driver Close-Up	-1390	-6880	-2040	50	1000
3	Left Front Half	-1140	-5380	-1290	24	1000
4	Left Angle	-7070	-5940	-2010	75	1000
5	Steering Column - Top					
6	Steering Column - Bottom					
7	Right Overall	-2000	5570	-1290	16	1000
8	Passenger Close-Up	-1540	6790	-2060	50	1000
9	Right Front Half	-1050	5300	-1490	24	1000
10	Right Angle	-6980	5640	-2050	75	1000
11	Windshield	100	0	-2310	11	1000
12	Driver Windshield	210	-370	-2230	25	1000
13	Passenger Windshield	210	370	-2230	25	1000
14	Pit Front	-970	0	3340	24	1000
15	Pit Rear	-2810	0	3340	24	1000
16	Onboard Driver Side				12	1000
17	Onboard Passenger Side				12	1000
18	Real-Time Pan View					30

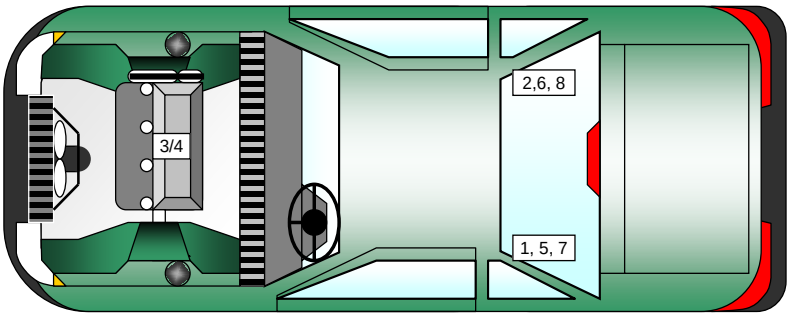
*COORDINATES:

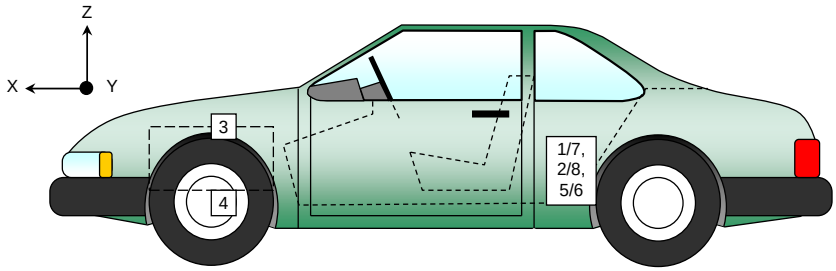
+X = forward of impact plane
+Y = right of monorail centerline
+Z = below ground level

Cameras 5 & 6 were not used for this test.

DATA SHEET NO. 7
VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2019 Dodge Durango SXT AWD 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: M20190318
Test Date: 6/7/2019





VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Crossmember Accelerometer – X Direction	2169	-418	-483
2	Right Rear Crossmember Accelerometer – X Direction	2169	418	-484
3	Engine Top X	4196	84	-1101
4	Engine Bottom X	4096	135	-275
5	Left Rear Crossmember Accelerometer – Z Direction	2169	-418	-483
6	Right Rear Crossmember Accelerometer – Z Direction	2169	418	-484
7	Left Rear Crossmember Accelerometer Redundant – X Direction	2169	-457	-483
8	Right Rear Crossmember Accelerometer Redundant – X Direction	2169	457	-484

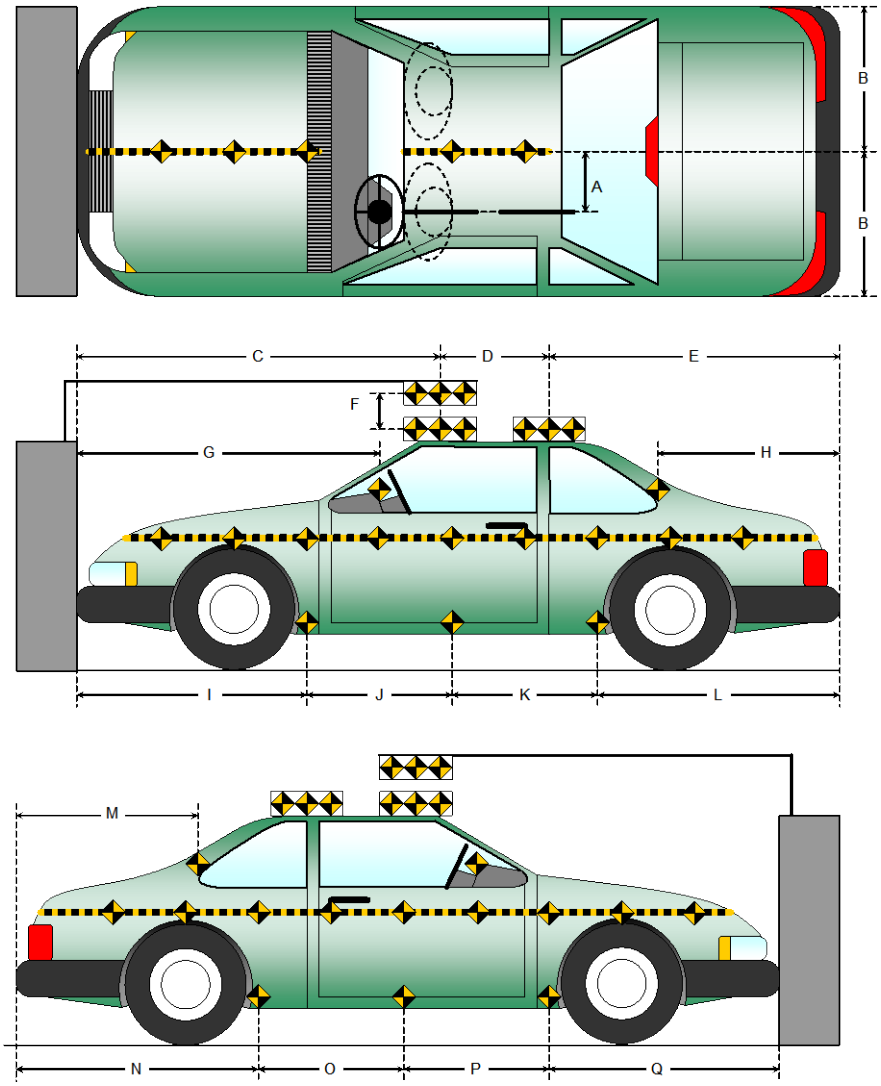
Reference Points: X - Rear Surface of Vehicle (+ forward)
Y - Vehicle Centerline (+ to right)
Z - Ground Plane (+ down)

DATA SHEET NO. 8

PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2019 Dodge Durango SXT AWD 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: M20190318
Test Date: 6/7/2019

Item	Value (mm)
A	396
B	958
C	2460
D	610
E	2015
F	90
G	
H	1584
I	1433
J	970
K	970
L	1712
M	1584
N	1712
O	970
P	970
Q	1433



DATA SHEET NO. 9
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2019 Dodge Durango SXT AWD 5-Door SUV NHTSA No.: M20190318
Test Program: NCAP Frontal Barrier Impact Test Test Date: 6/7/2019

Advanced Research Load Cell Barrier

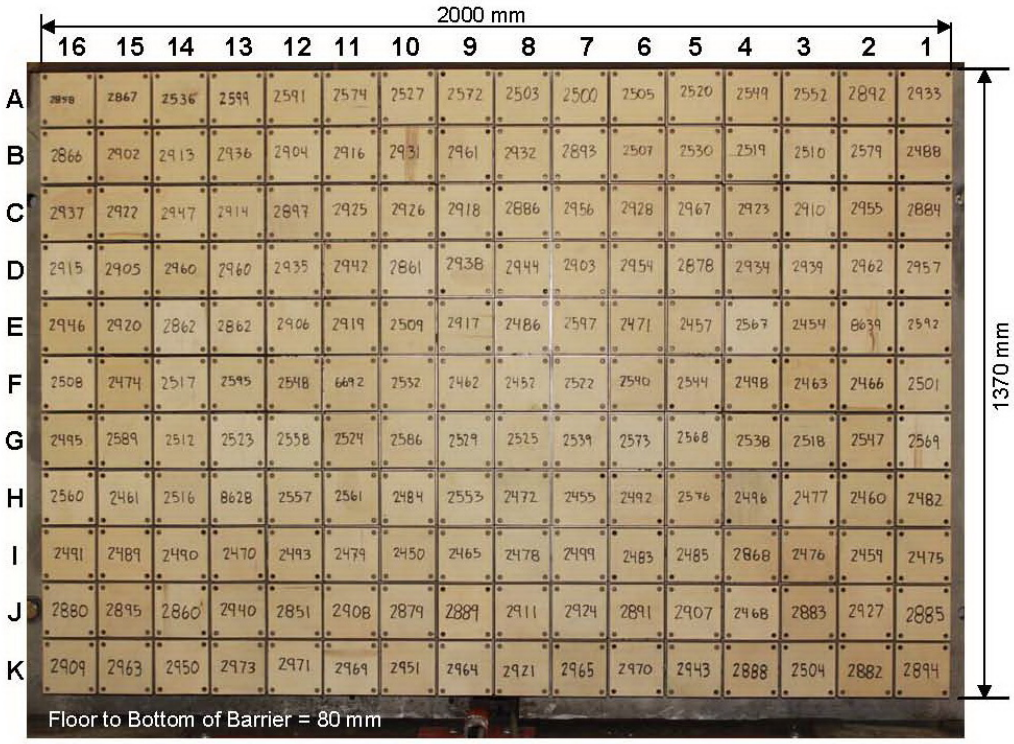


Photo for Reference Only

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: 2019 Dodge Durango SXT AWD 5-Door SUV NHTSA No.: M20190318
Test Program: NCAP Frontal Barrier Impact Test Test Date: 6/7/2019

INSTRUMENTATION

Driver Dummy Data Channels	49
Passenger Dummy Data Channels	49
Vehicle Structure Accelerometers	8
Barrier Channels	0
Total	106

CAMERA COVERAGE

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

DATA SHEET NO. 11
POST-TEST OBSERVATIONS

Test Vehicle: 2019 Dodge Durango SXT AWD 5-Door SUV NHTSA No.: M20190318
Test Program: NCAP Frontal Barrier Impact Test Test Date: 6/7/2019

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

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

DOOR OPENING AND SEAT TRACK INFORMATION

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

POST TEST STRUCTURAL OBSERVATIONS

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

VEHICLE REBOUND FROM BARRIER

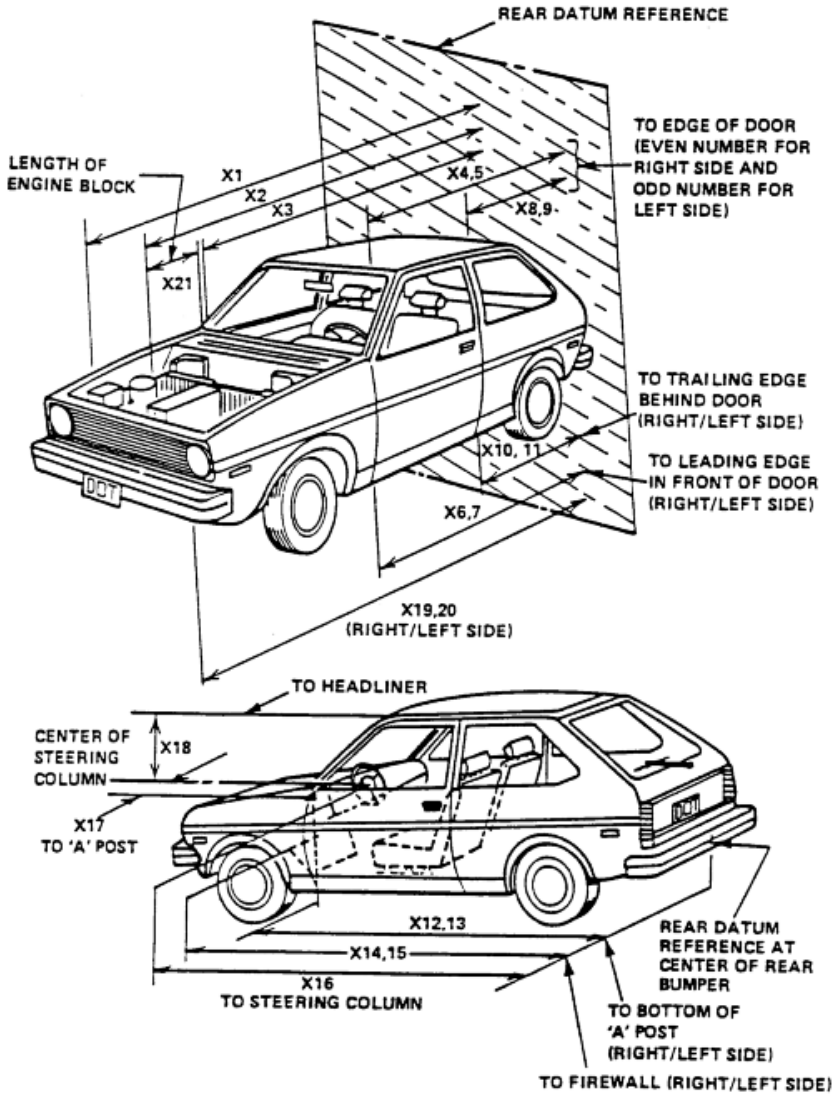
Measured Parameter	Units	Value
Left Side	mm	880
Center	mm	775
Right Side	mm	885
Average	mm	847

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

DATA SHEET NO. 12
VEHICLE PROFILE MEASUREMENTS

Test Vehicle:	2019 Dodge Durango SXT AWD 5-Door SUV	NHTSA No.:	M20190318
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	6/7/2019



DATA SHEET NO. 12 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2019 Dodge Durango SXT AWD 5-Door SUV NHTSA No.: M20190318
Test Program: NCAP Frontal Barrier Impact Test Test Date: 6/7/2019

RSOV (Rear Surface of Vehicle)

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	mm	5085	4581	504
2	RSOV to Front of Engine	mm	4396	4285	111
3	RSOV to Firewall	mm	3980	3913	67
4	RSOV to Upper Leading Edge of Right Door	mm	3552	3559	-7
5	RSOV to Upper Leading Edge of Left Door	mm	3552	3547	5
6	RSOV to Lower Leading Edge of Right Door	mm	3514	3508	6
7	RSOV to Lower Leading Edge of Left Door	mm	3514	3490	24
8	RSOV to Upper Trailing Edge of Right Door	mm	2456	2438	18
9	RSOV to Upper Trailing Edge of Left Door	mm	2456	2427	29
10	RSOV to Lower Trailing Edge of Right Door	mm	2449	2452	-3
11	RSOV to Lower Trailing Edge of Left Door	mm	2449	2434	15
12	RSOV to Bottom of “A” Post of Right Side	mm	3485	3516	-31
13	RSOV to Bottom of “A” Post of Left Side	mm	3485	3501	-16
14	RSOV to Firewall, Right Side	mm	3730	3722	8
15	RSOV to Firewall, Left Side	mm	3730	3712	18
16	RSOV to Steering Column	mm	3062	3073	-11
17	Center of Steering Column to “A” Post	mm	395	418	-23
18	Center of Steering Column to Headliner	mm	406	463	-57
19	RSOV to Right Side of Front Bumper	mm	4898	4482	416
20	RSOV to Left Side of Front Bumper	mm	4898	4483	415
21	Length of Engine Block	mm	492	492	0
RD	RSOV to Right Side of Dash Panel	mm	3310	3321	-11
CD	RSOV to Center of Dash Panel	mm	3260	3219	41
LD	RSOV to Left Side of Dash Panel	mm	3308	3319	-11

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

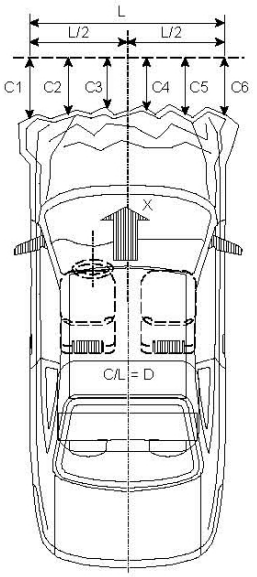
Test Vehicle: 2019 Dodge Durango SXT AWD 5-Door SUV NHTSA No.: M20190318
Test Program: NCAP Frontal Barrier Impact Test Test Date: 6/7/2019

VEHICLE INFORMATION

VIN: 1C4RDJAG0KC644662 Wheelbase (mm): 3050
Vehicle Size Category: MPV Test Weight (kg): 2421.0

ACCELEROMETER DATA

Accelerometer Locations: As per measurements on Page 15
Cal. Procedure/Interval: MGA procedure / 6 month
Integration Algorithm: Trapezoidal
Linearity: > 99%
Impact Velocity (km/h): 56.30
Velocity Change (km/h): 65.6
Time of Separation (msec): 95



CRUSH PROFILE

Collision Deformation Classification: 12FDEW2
Midpoint of Damage: Centerline
Damage Region Length (mm): 1540
Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4898	4483	415
C2	Crush zone 2 at left side	mm	5002	4518	484
C3	Crush zone 3 at left side	mm	5050	4569	481
C4	Crush zone 4 at right side	mm	5050	4553	497
C5	Crush zone 5 at right side	mm	5002	4524	478
C6	Crush zone 6 at right side	mm	4898	4482	416
L	C1 TO C6	mm	1540	1537	3

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

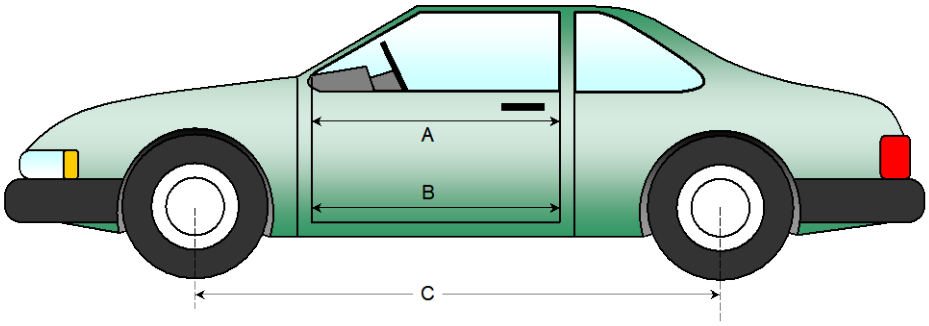
Test Vehicle: 2019 Dodge Durango SXT AWD 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: M20190318
Test Date: 6/7/2019

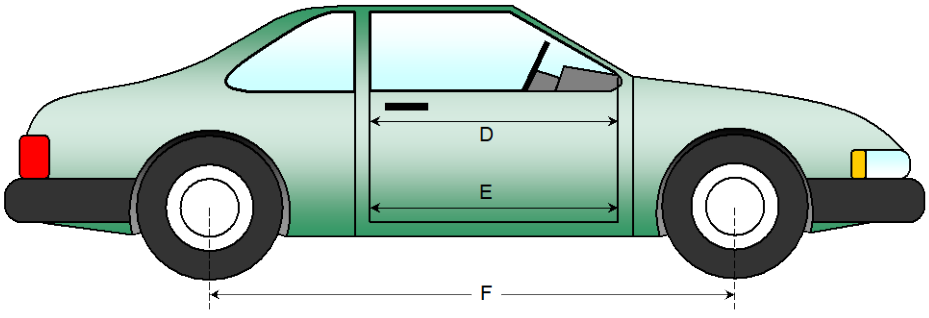
DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	962	962	0
B	Left Side Lower	mm	854	854	0
D	Right Side Upper	mm	962	962	0
E	Right Side Lower	mm	854	854	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	3050	2897	153
F	Right Side Wheelbase	mm	3050	2905	145





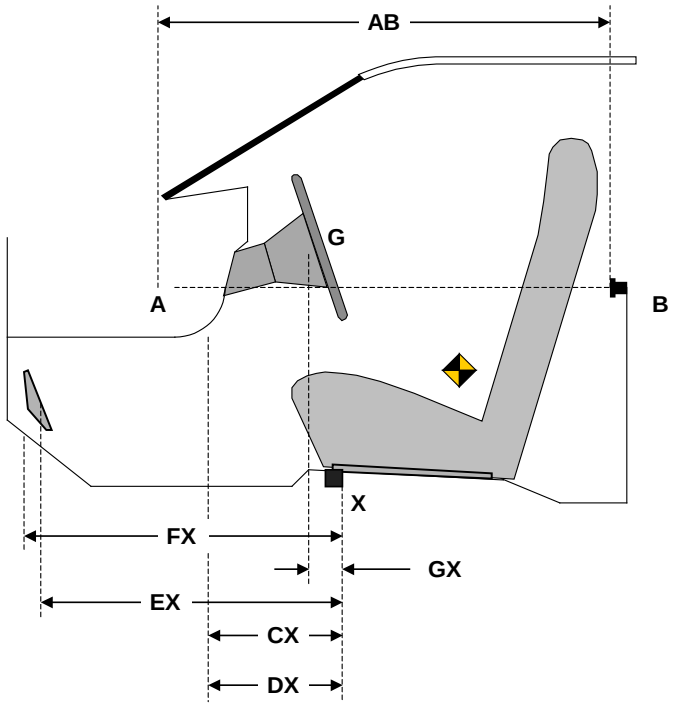
DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2019 Dodge Durango SXT AWD 5-Door SUV NHTSA No.: M20190318
Test Program: NCAP Frontal Barrier Impact Test Test Date: 6/7/2019

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	770	770	0
CX	Left Knee Bolster to X	mm	226	225	1
DX	Right Knee Bolster to X	mm	203	204	-1
EX	Brake Pedal to X	mm	508	489	19
FX	Foot Rest to X	mm	546	541	5
GX	Center of Steering Column Wheel Hub to X	mm	0	73	-73

X = Front of Seat Track (stationary)



DRIVER COMPARTMENT

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

Test Vehicle: 2019 Dodge Durango SXT AWD 5-Door SUV NHTSA No.: M20190318
Test Program: NCAP Frontal Barrier Impact Test Test Date: 6/7/2019

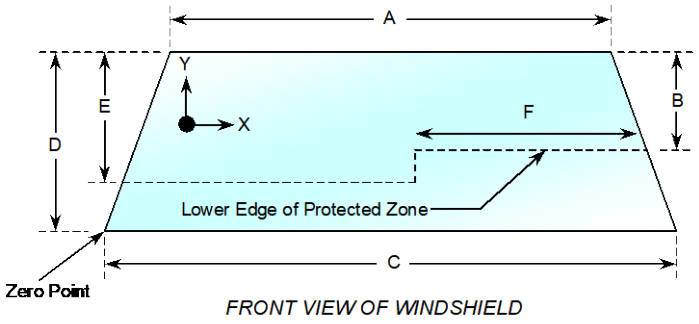
Windshield Mounting Details:
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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: 21.6°C.

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2242	2242	100
Right Side	2242	2242	100
Total	4484	4484	100



FRONT VIEW OF WINDSHIELD

Item	Units	Value
A	mm	1322
B	mm	474
C	mm	1522
D	mm	820
E	mm	510
F	mm	528

AREA OF PROTECTED ZONE FAILURES - NONE

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

X	Y

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

X	Y

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

Test Vehicle:	2019 Dodge Durango SXT AWD 5-Door SUV	NHTSA No.:	M20190318
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	6/7/2019

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

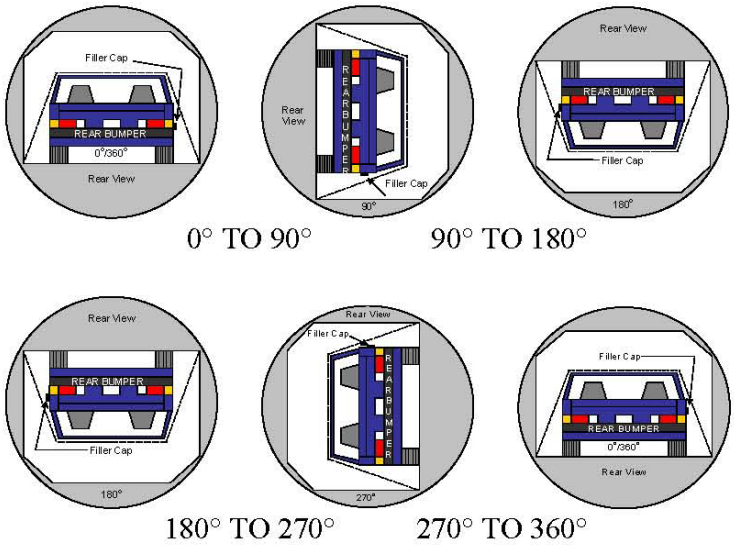
Temperature at Time of Impact: 21.6°C Test Time: 9:55 a.m.

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

DATA SHEET NO. 16
FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2019 Dodge Durango SXT AWD 5-Door SUV NHTSA No.: M20190318
Test Program: NCAP Frontal Barrier Impact Test Test Date: 6/7/2019

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°	110	300	410
90° to 180°	111	300	411
180° to 270°	108	300	408
270° to 360°	112	300	412

FMVSS 301 SPILLAGE TABLE (units in ounces)

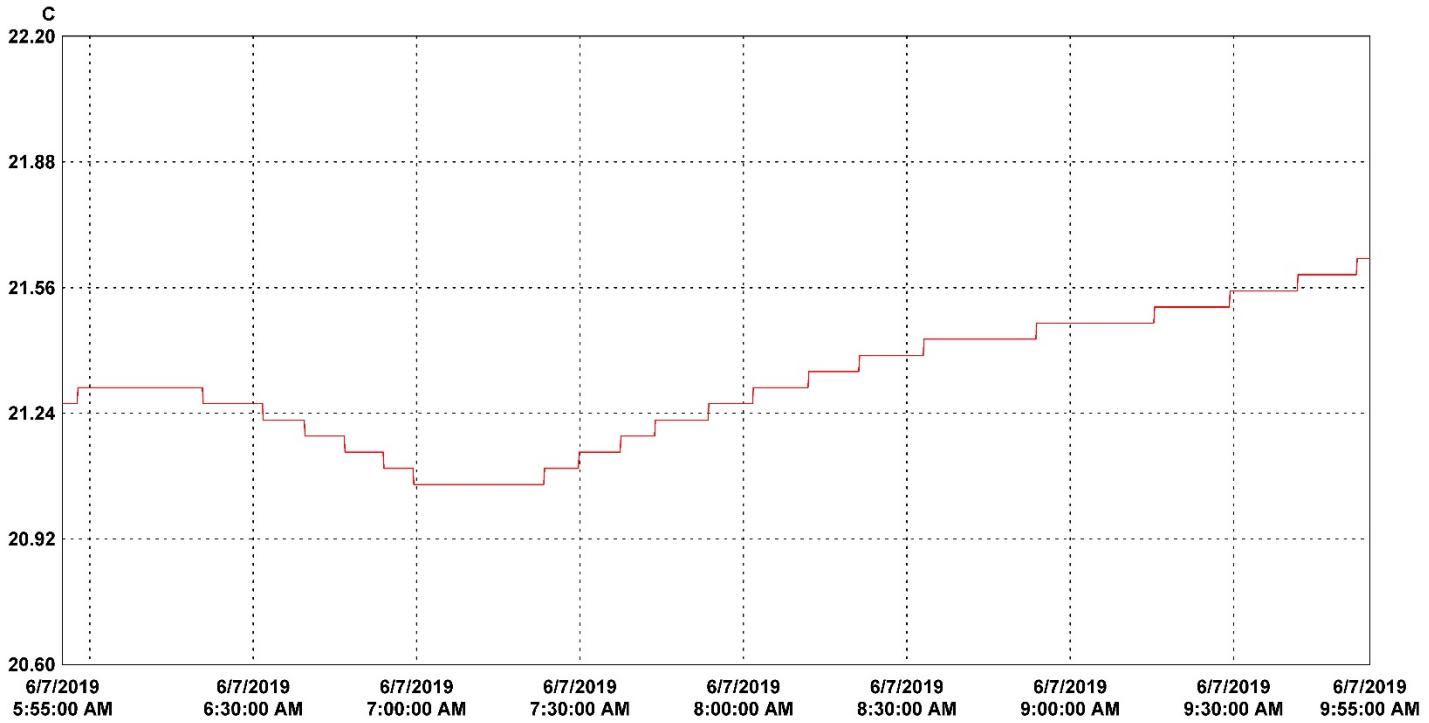
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eight Minute
0° to 90°	0	0	0	0
90° to 180°	0	0	0	0
180° to 270°	0	0	0	0
270° to 360°	0	0	0	0

SOLVENT SPILLAGE LOCATION TABLE

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

DATA SHEET NO. 17
DUMMY/VEHICLE TEMPERATURE STABILIZATION DATA

Test Vehicle: 2019 Dodge Durango SXT AWD 5-Door SUV NHTSA No.: M20190318
Test Program: NCAP Frontal Barrier Impact Test Test Date: 6/7/2019



LN	Serial #	Description	CH	Value	Maximum	Average	Minimum	Units	CH description	Logger file
1	18352047	VSC_Prep_Room	1		21.63	21.32	21.06	C	Temperature	18352047_VSC_Prep_Room.spl

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PHOTOGRAPHS

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PHOTOGRAPH NOT APPLICABLE

Photo No. 001 - Load Cell Location

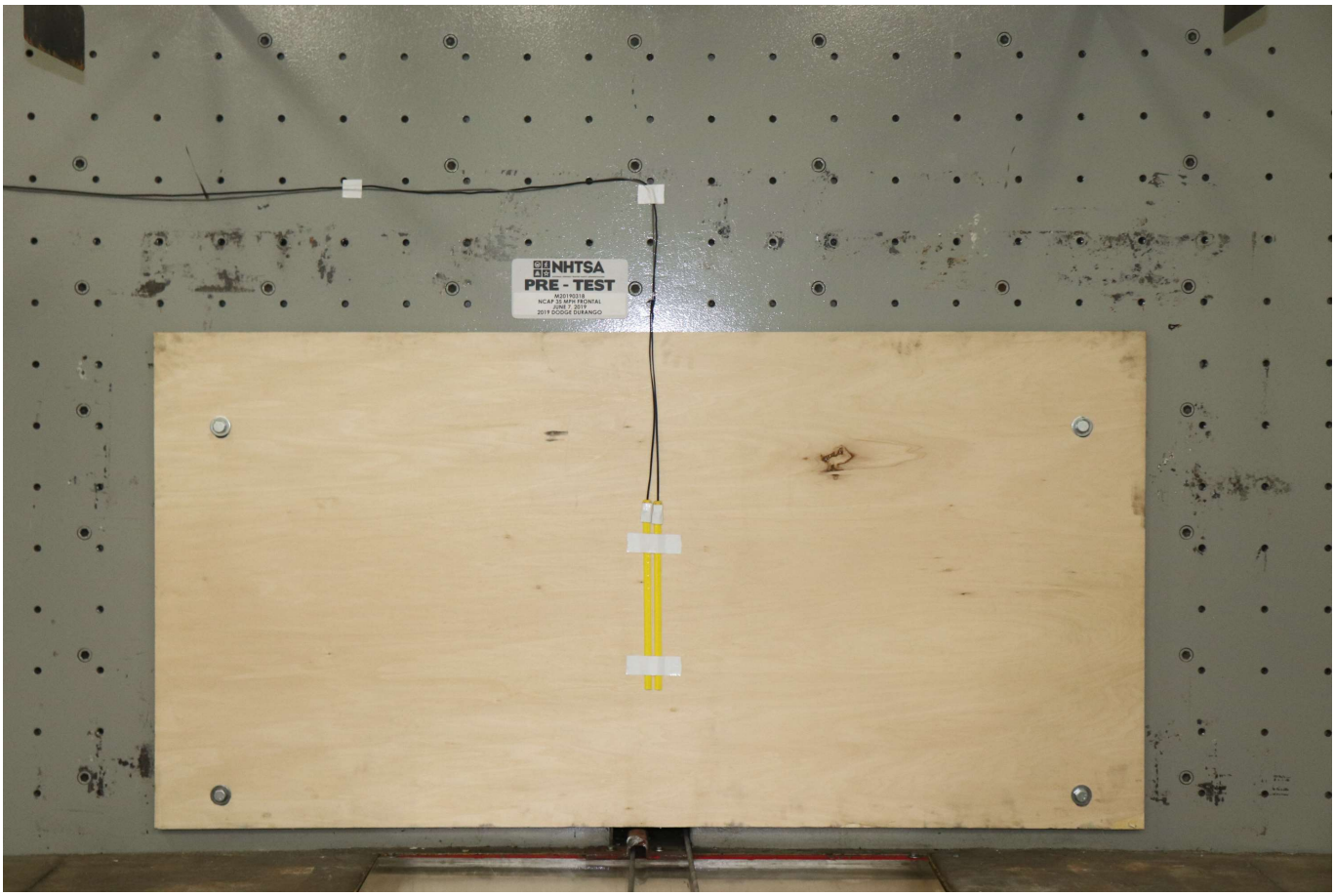

Photo No. 002 - Pre-Test Load Cell Wall

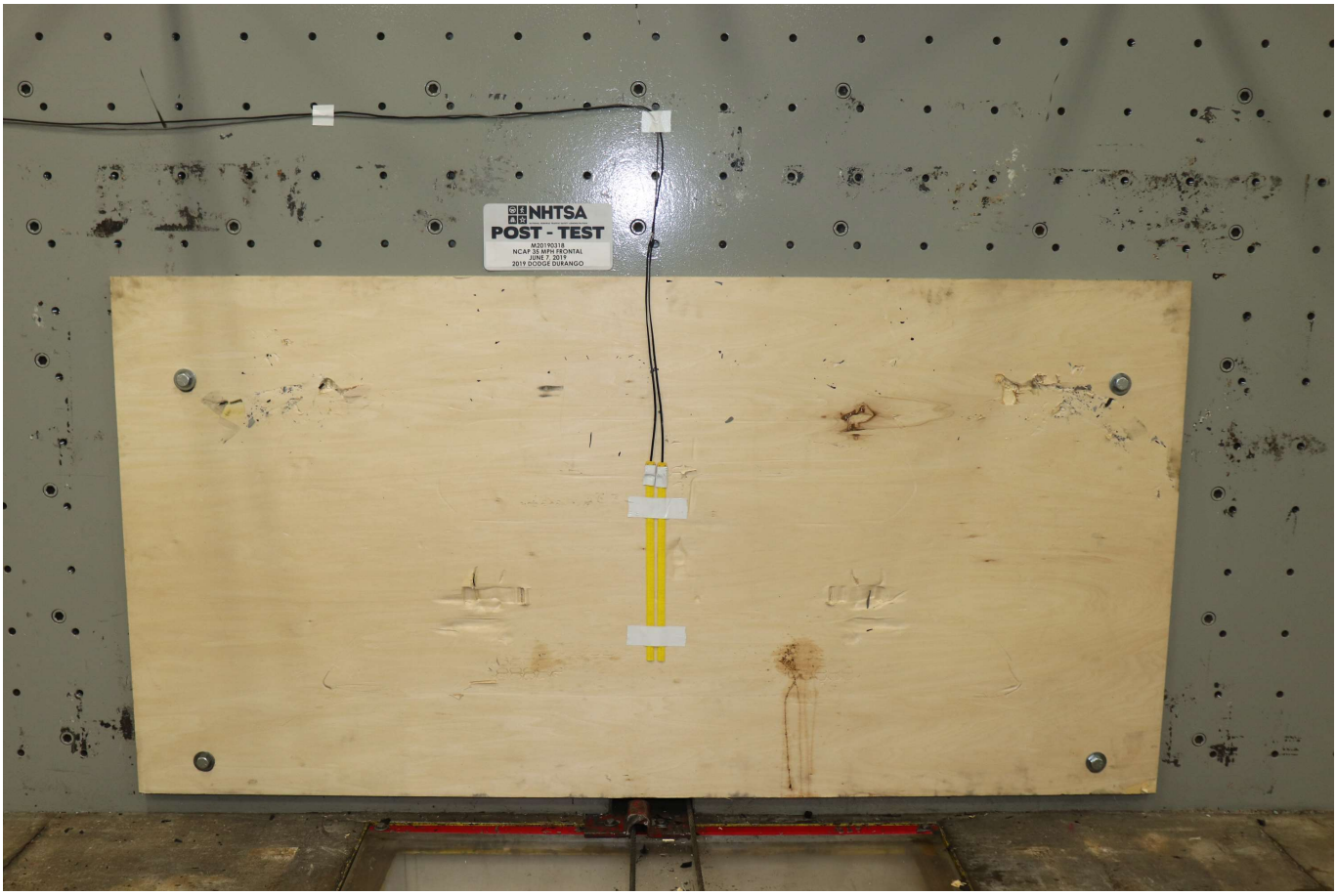

Photo No. 003 - Post-Test Load Cell Wall

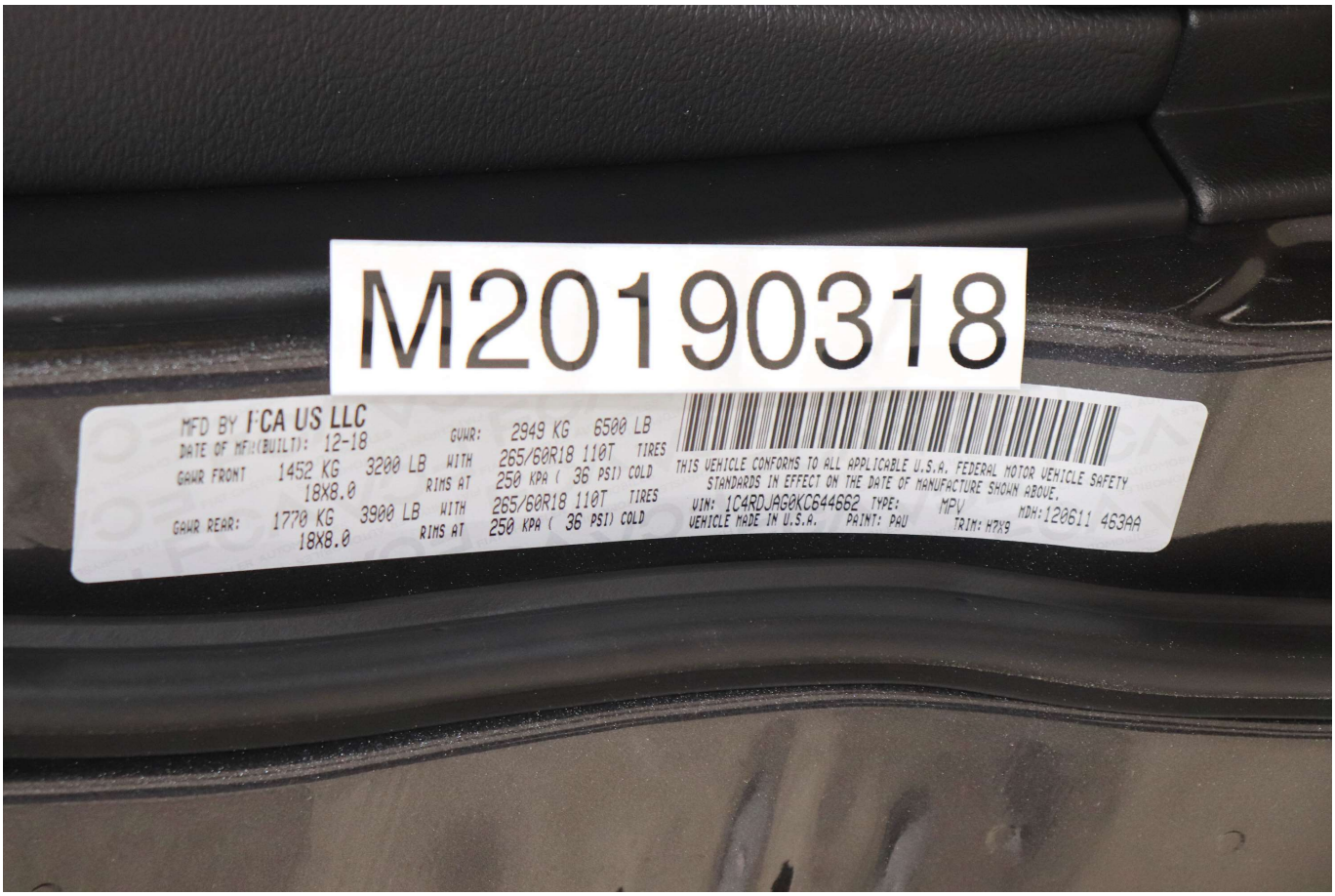

Photo No. 004 - Manufacturer Label

Photo No. 005 - Tire Placard

Photo No. 006 - 2019 Dodge Durango SXT AWD 5-Door SUV Frontal As Delivered

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

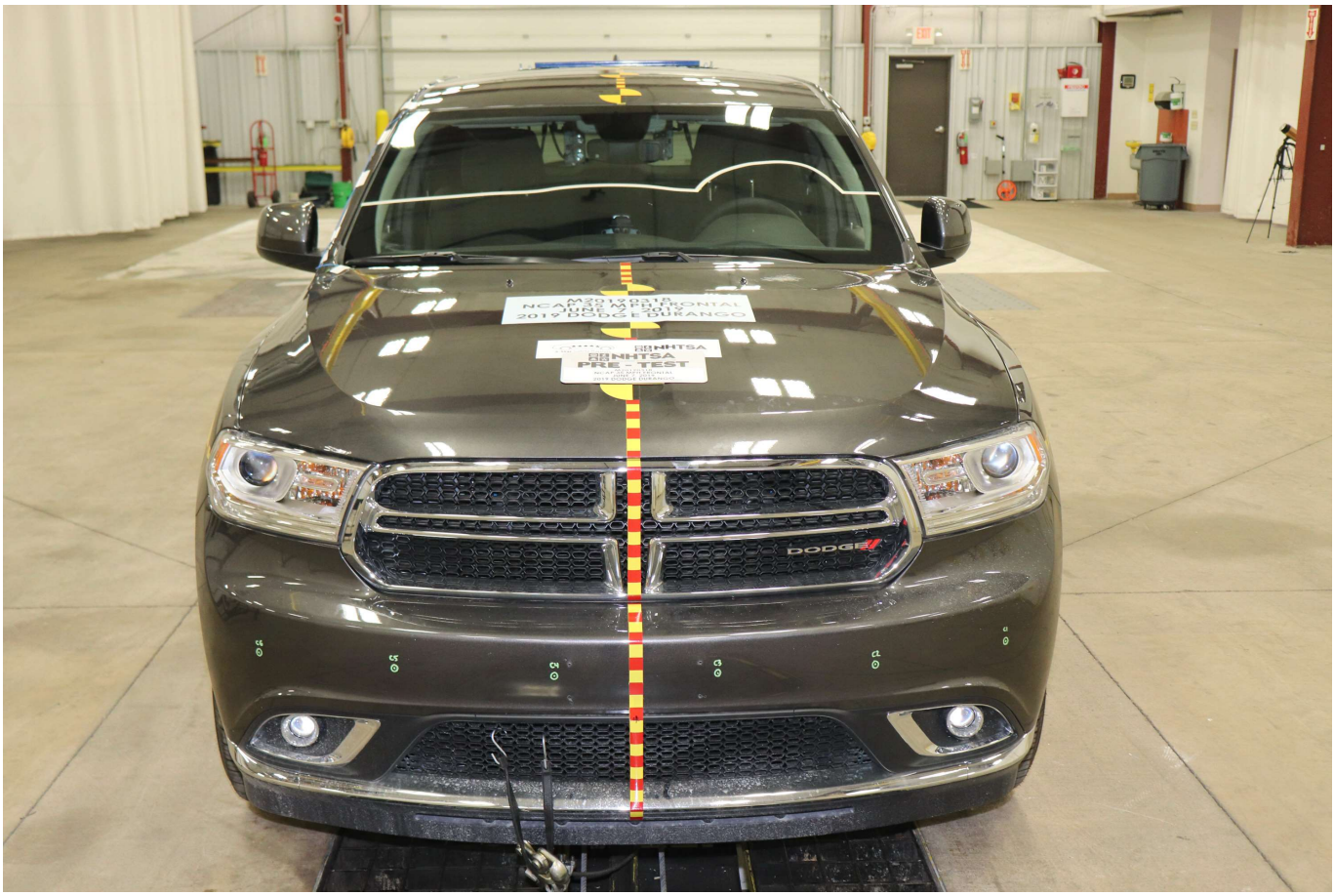

Photo No. 008 - Pre-Test Front View of Test Vehicle

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

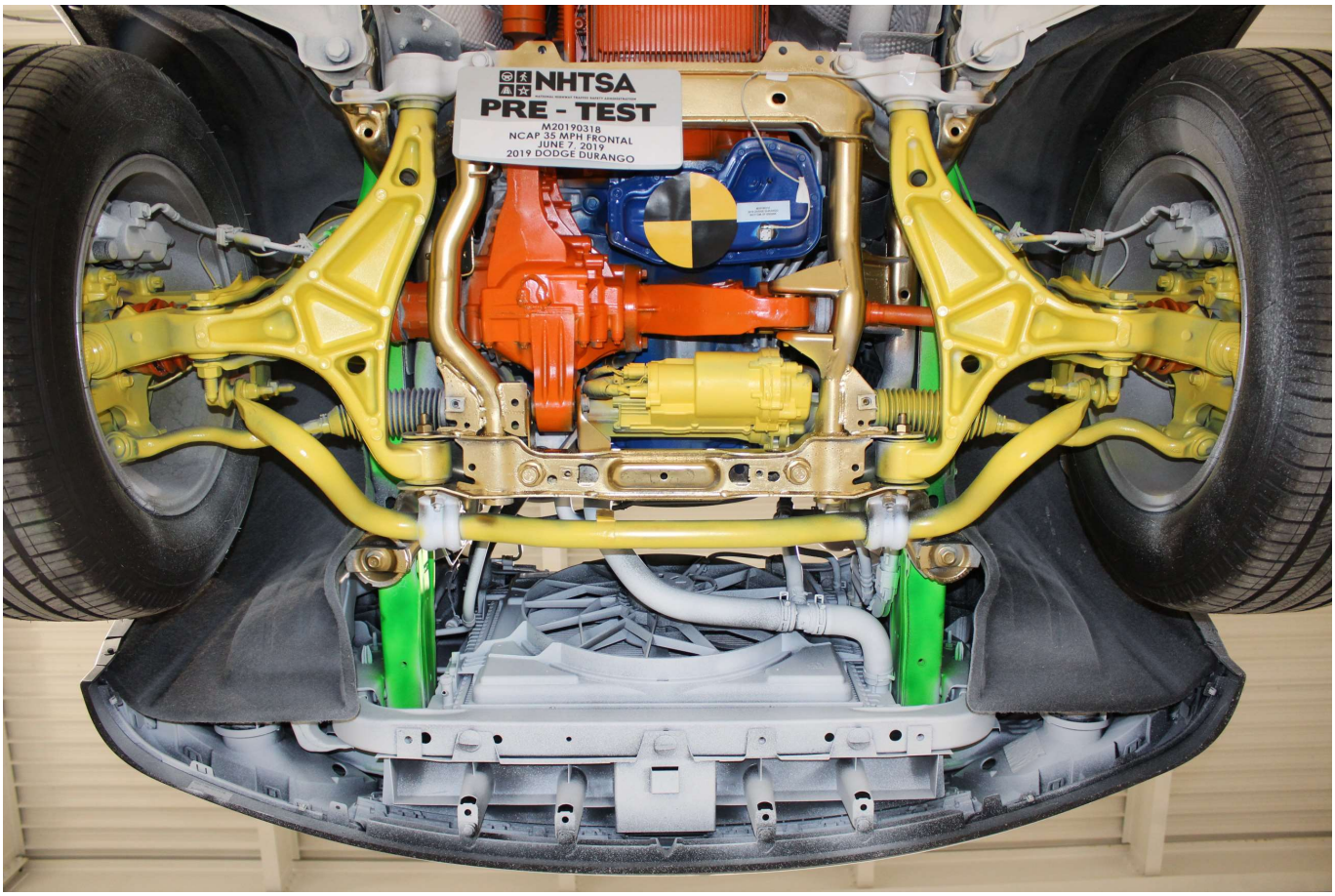

Photo No. 024 - Pre-Test Front Underbody View

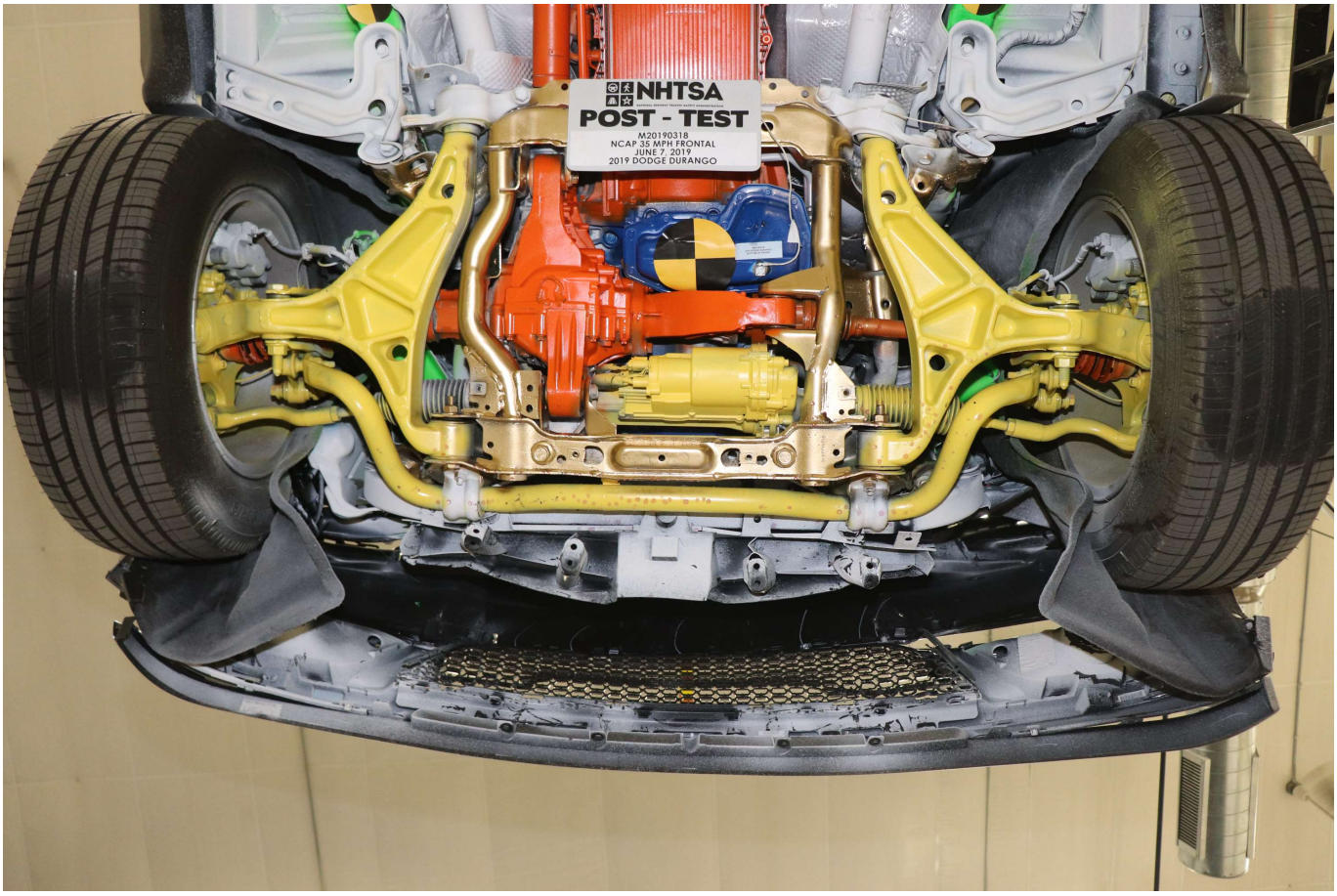

Photo No. 025 - Post-Test Front Underbody View

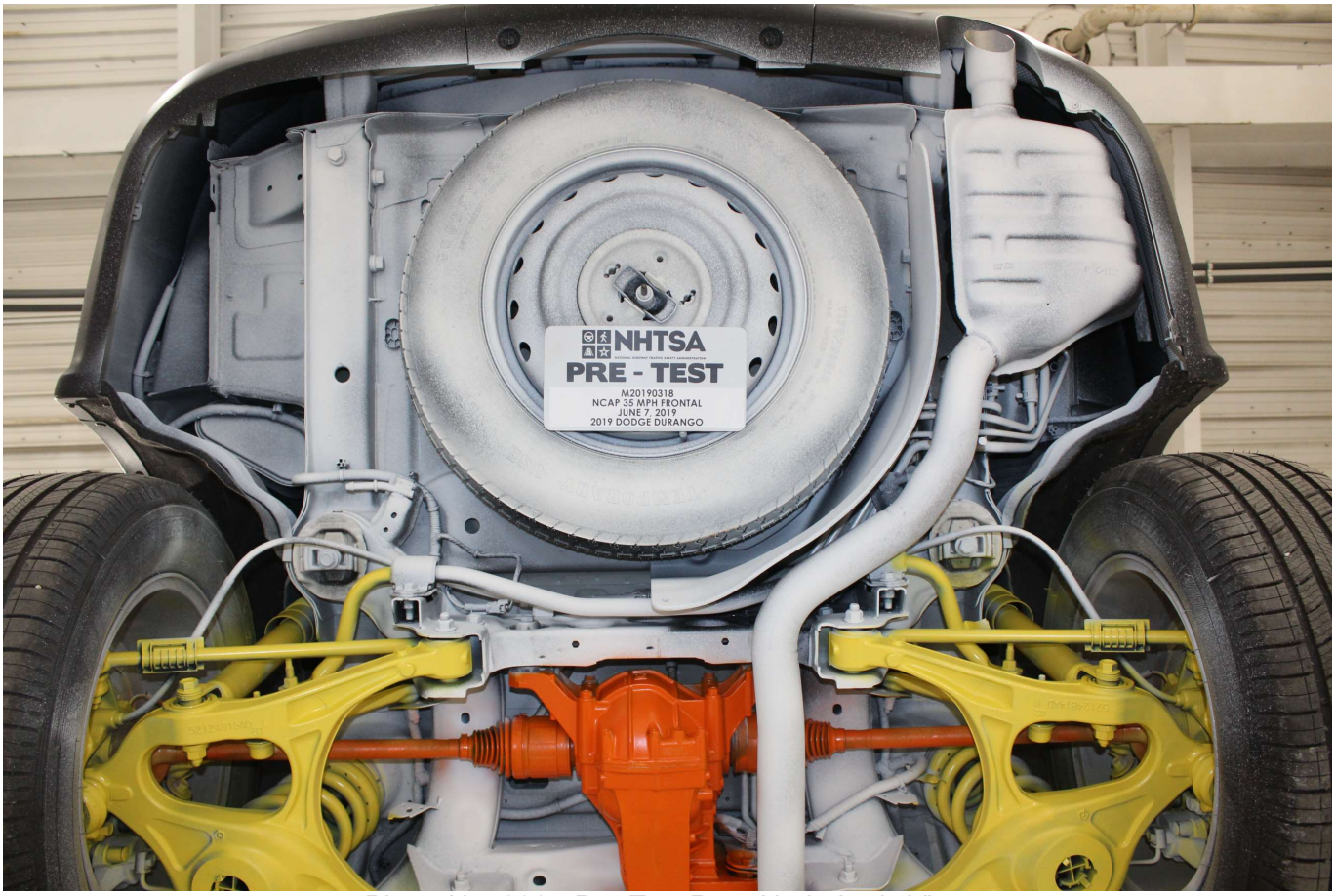

Photo No. 026 - Pre-Test Rear Underbody View

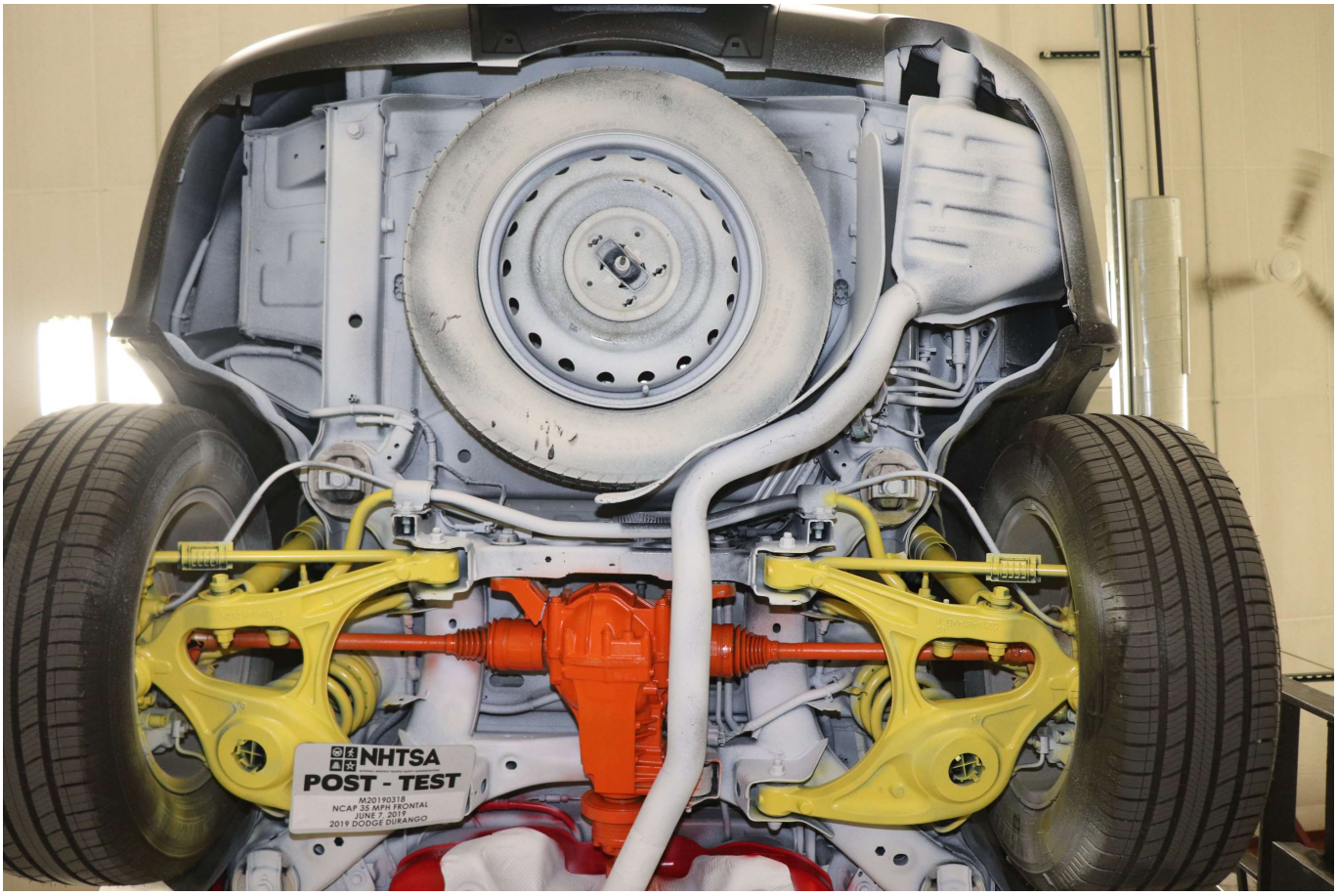

Photo No. 027 - Post-Test Rear Underbody View

Photo No. 028 - Pre-Test Dummy Cable Routing

Photo No. 029 - Post-Test Dummy Cable Routing

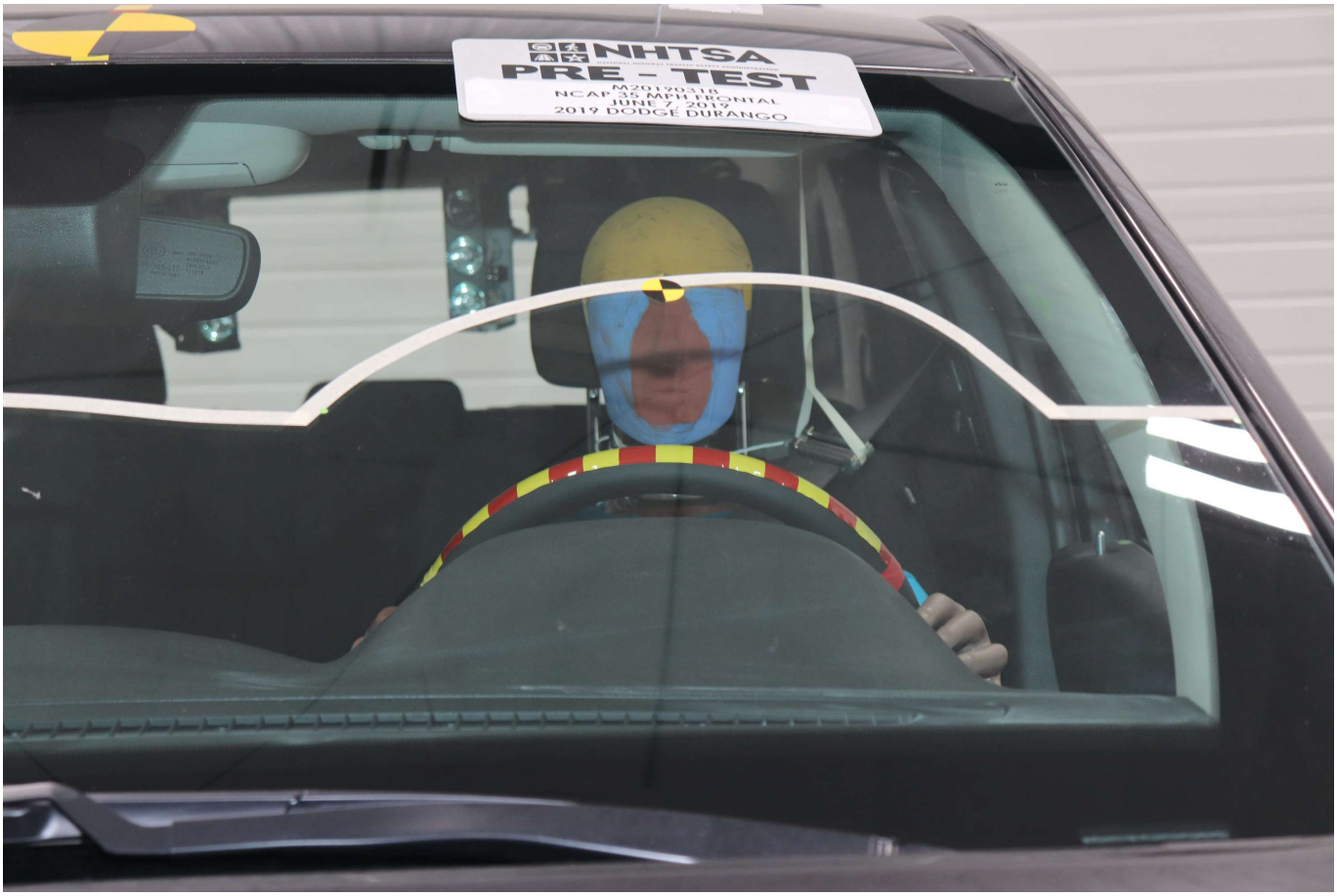

Photo No. 030 - Pre-Test Driver Dummy Front View

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 Driver Dummy Feet

Photo No. 041 - Post-Test Driver Dummy Feet

Photo No. 042 - Pre-Test Driver Side Knee Bolster

Photo No. 043 - Post-Test Driver Side Knee Bolster

Photo No. 044 - Pre-Test Driver Side Floorpan

Photo No. 045 - Post-Test Driver Side Floorpan

Photo No. 046 - Post-Test Driver Dummy Face

Photo No. 047 - Post-Test Driver Dummy Contact with Airbag

Photo No. 048 - Post-Test Driver Dummy Contact with Headrest

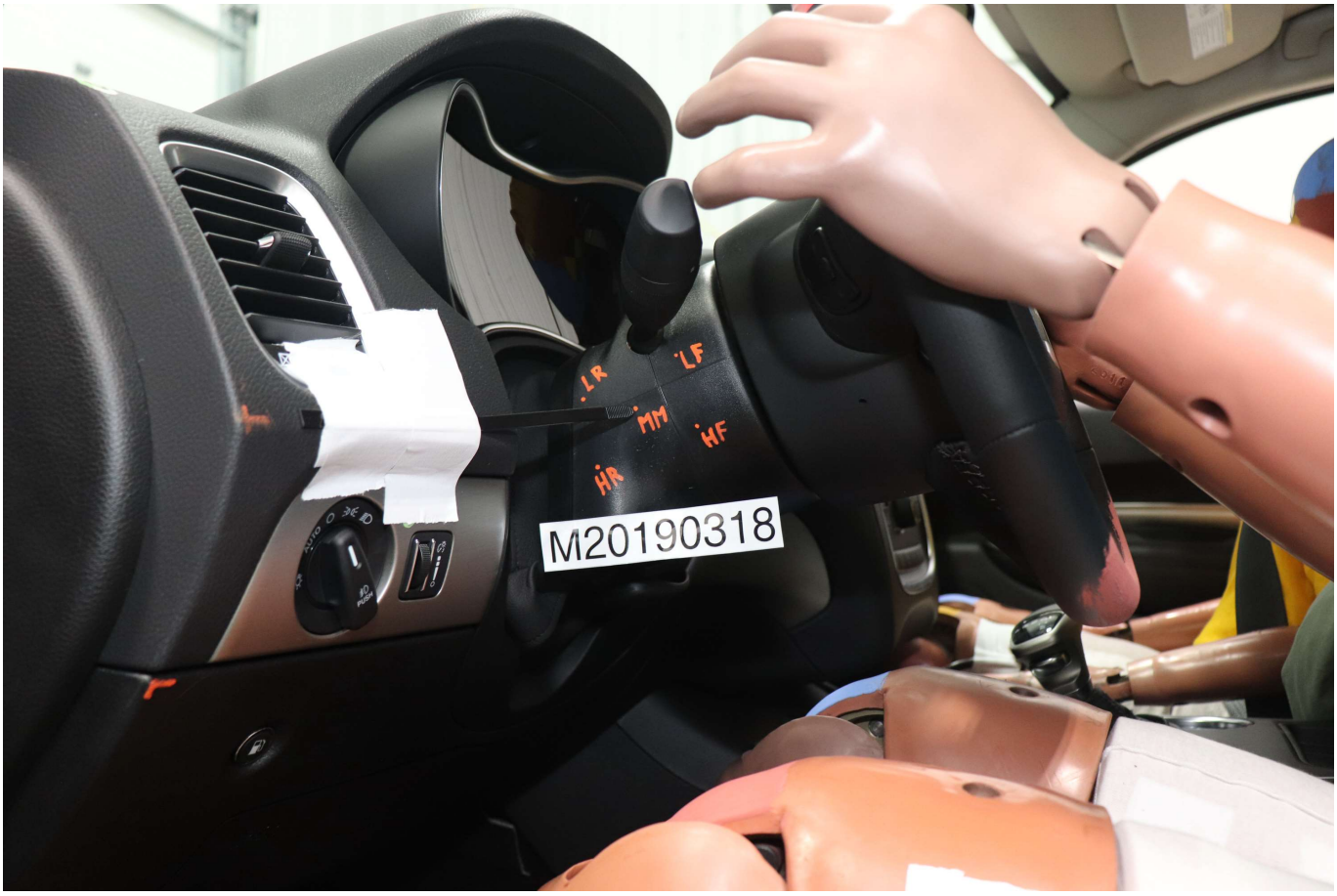

Photo No. 049 - Pre-Test View of the Steering Wheel

Photo No. 050 - Post-Test View of the Steering Wheel

Photo No. 051 - Pre-Test Passenger Dummy Front View

Photo No. 052 - Post-Test Passenger Dummy Front View

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

Photo No. 055 - Pre-Test Passenger Dummy and Vehicle Interior

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Photo No. 060 - Post-Test View of Belt Anchorage for Passenger Dummy

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Photo No. 063 - Pre-Test Passenger Side Knee Bolster

Photo No. 064 - Post-Test Passenger Side Knee Bolster

Photo No. 065 - Pre-Test Passenger Side Floorpan

Photo No. 066 - Post-Test Passenger Side Floorpan

Photo No. 067 - Post-Test Passenger Dummy Face

Photo No. 068 - Post-Test Passenger Dummy Contact with Airbag

Photo No. 069 - Post-Test Passenger Dummy Contact with Headrest

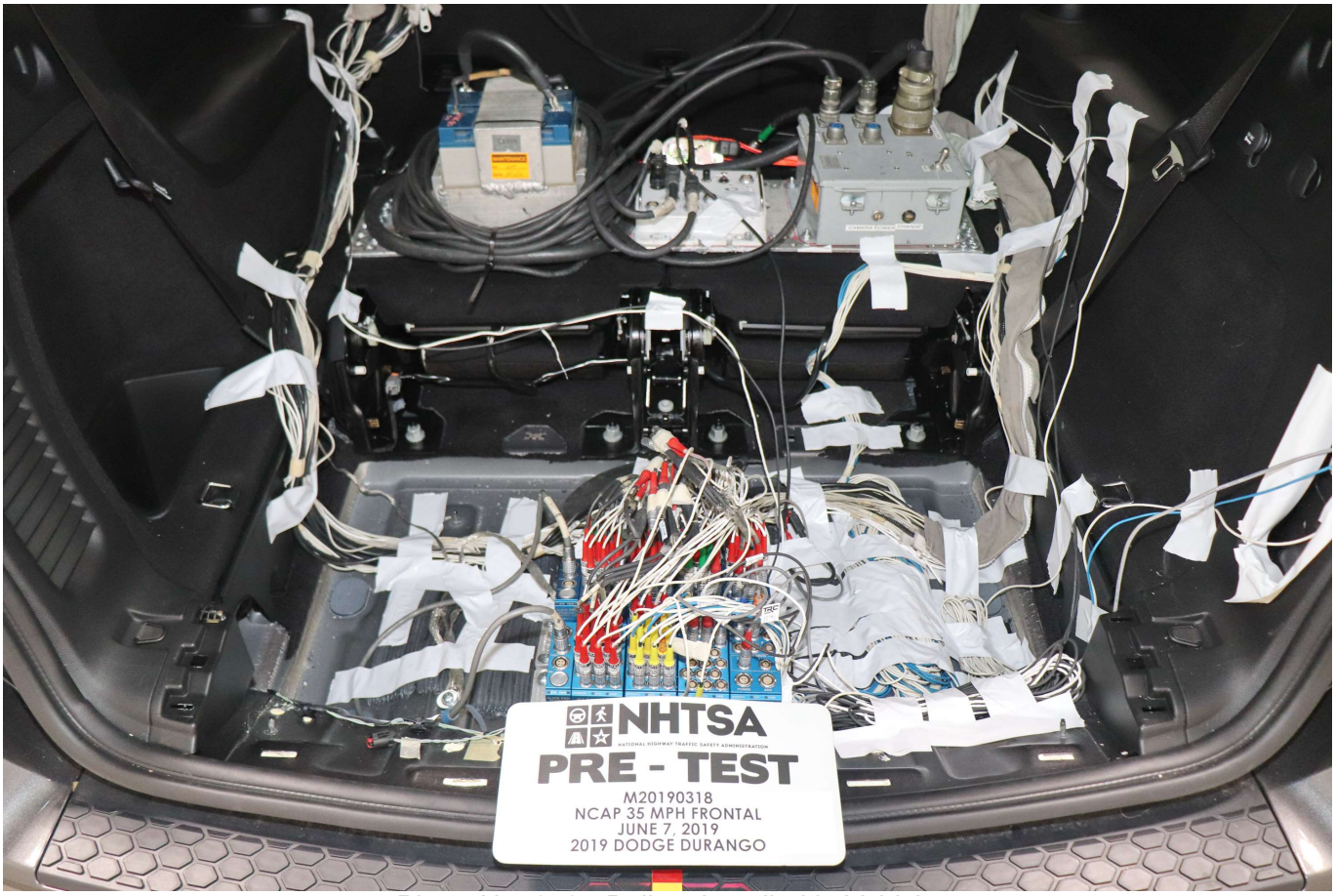


Photo No. 070 - Ballast Installed in Vehicle

PHOTOGRAPH NOT APPLICABLE

Photo No. 071 - Post-Test Stoddard Solvent Spillage Location View

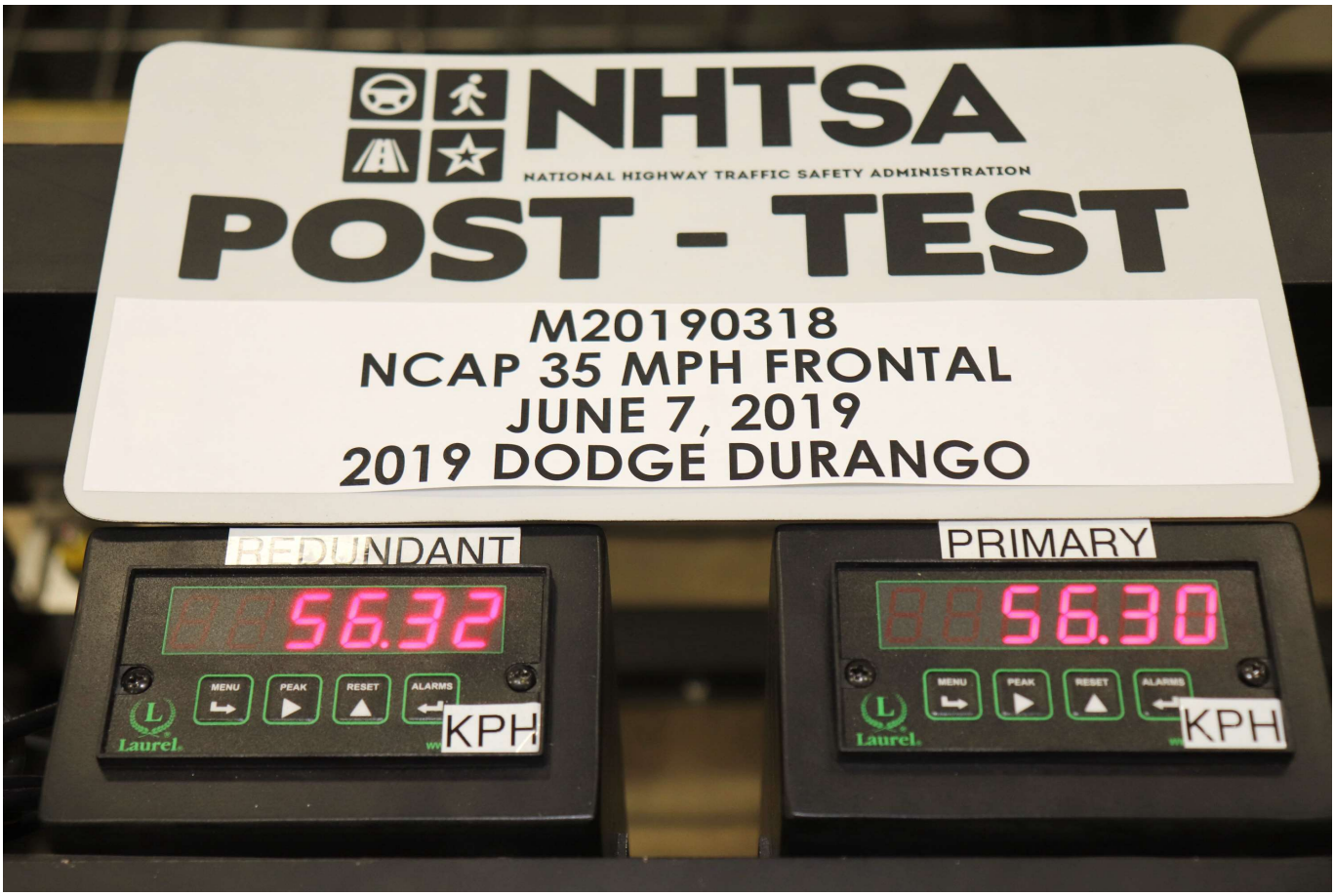


Photo No. 072 - Post-Test Speed Trap Read-Out

Photo No. 073 - Vehicle at 0 Degree on Static Rollover Device

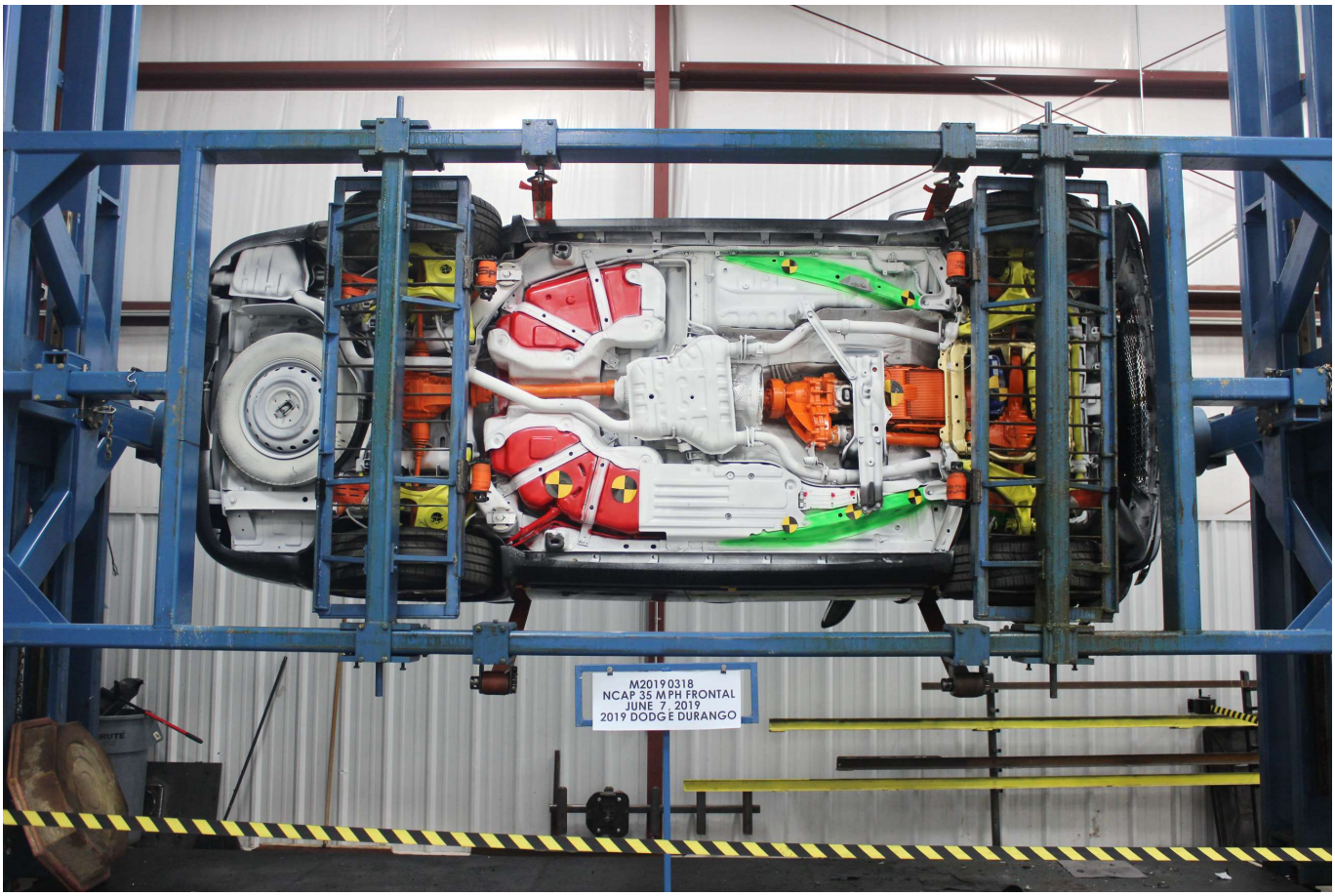


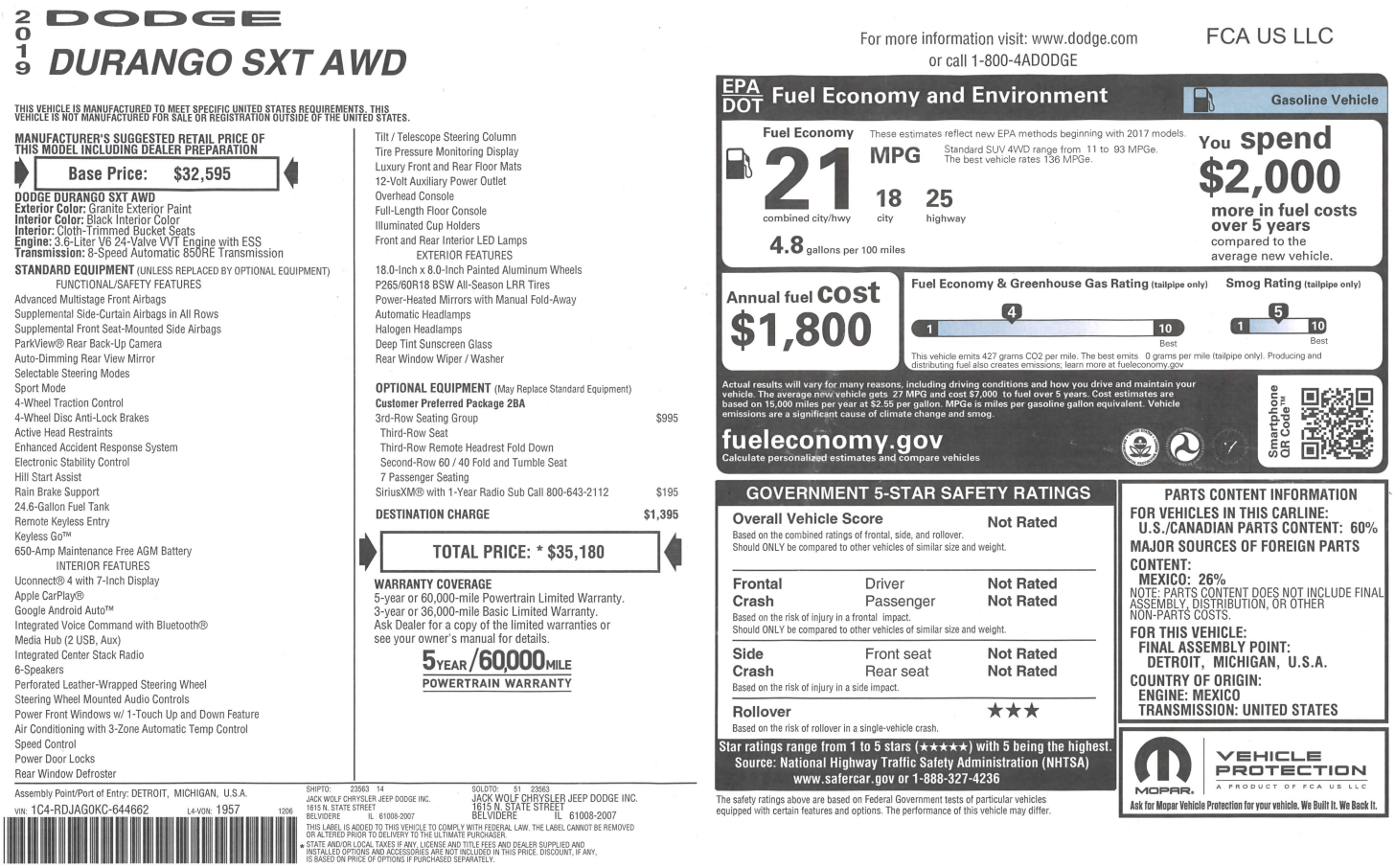
Photo No. 074 - Vehicle at 90 Degrees on Static Rollover Device

Photo No. 075 - Vehicle at 180 Degrees on Static Rollover Device

Photo No. 076 - Vehicle at 270 Degrees on Static Rollover Device

Photo No. 077 - Vehicle at 360 Degrees on Static Rollover Device

Photo No. 078 - 2019 Dodge Durango SXT AWD 5-Door SUV Frontal Impact Event



2019 DODGE DURANGO SXT AWD

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

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

Base Price: $32,595

DODGE DURANGO SXT AWD
Exterior Color: Granite Exterior Paint
Interior Color: Black Interior Color
Interior: Cloth-Trimmed Bucket Seats
Engine: 3.6-Liter V6 24-Valve VVT Engine with ESS
Transmission: 8-Speed Automatic 850RE Transmission

STANDARD EQUIPMENT (UNLESS REPLACED BY OPTIONAL EQUIPMENT)

FUNCTIONAL/SAFETY FEATURES
Advanced Multistage Front Airbags
Supplemental Side-Curtain Airbags in All Rows
Supplemental Front Seat-Mounted Side Airbags
ParkView® Rear Back-Up Camera
Auto-Dimming Rear View Mirror
Selectable Steering Modes
Sport Mode
4-Wheel Traction Control
4-Wheel Disc Anti-Lock Brakes
Active Head Restraints
Enhanced Accident Response System
Electronic Stability Control
Hill Start Assist
Rain Brake Support
24.6-Gallon Fuel Tank
Remote Keyless Entry
Keyless Go™
650-Amp Maintenance Free AGM Battery

INTERIOR FEATURES
Uconnect® 4 with 7-Inch Display
Apple CarPlay®
Google Android Auto™
Integrated Voice Command with Bluetooth®
Media Hub (2 USB, Aux)
Integrated Center Stack Radio
6-Speakers
Perforated Leather-Wrapped Steering Wheel
Steering Wheel Mounted Audio Controls
Power Front Windows w/ 1-Touch Up and Down Feature
Air Conditioning with 3-Zone Automatic Temp Control
Speed Control
Power Door Locks
Rear Window Defroster
Tilt / Telescope Steering Column
Tire Pressure Monitoring Display
Luxury Front and Rear Floor Mats
12-Volt Auxiliary Power Outlet
Overhead Console
Full-Length Floor Console
Illuminated Cup Holders
Front and Rear Interior LED Lamps

EXTERIOR FEATURES
18.0-Inch x 8.0-Inch Painted Aluminum Wheels
P265/60R18 BSW All-Season LRR Tires
Power-Heated Mirrors with Manual Fold-Away
Automatic Headlamps
Halogen Headlamps
Deep Tint Sunscreen Glass
Rear Window Wiper / Washer

OPTIONAL EQUIPMENT (May Replace Standard Equipment)
Customer Preferred Package 2BA
3rd-Row Seating Group $995
Third-Row Seat
Third-Row Remote Headrest Fold Down
Second-Row 60 / 40 Fold and Tumble Seat
7 Passenger Seating
SiriusXM® with 1-Year Radio Sub Call 800-643-2112 $195

DESTINATION CHARGE $1,395

TOTAL PRICE: * $35,180

WARRANTY COVERAGE
5-year or 60,000-mile Powertrain Limited Warranty.
3-year or 36,000-mile Basic Limited Warranty.
Ask Dealer for a copy of the limited warranties or see your owner's manual for details.

5 YEAR / 60,000 MILE POWERTRAIN WARRANTY

Assembly Point/Port of Entry: DETROIT, MICHIGAN, U.S.A.
VIN: 1C4-RDJAG0KC-644662 L4-VON: 1957 1206

SHIPTO: 23563 14
JACK WOLF CHRYSLER JEEP DODGE INC.
1615 N. STATE STREET
BELVIDERE IL 61008-2007

SOLDTO: 61 23563
JACK WOLF CHRYSLER JEEP DODGE INC.
1615 N. STATE STREET
BELVIDERE IL 61008-2007

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

* STATE AND/OR LOCAL TAXES IF ANY, LICENSE AND TITLE FEES AND DEALER SUPPLIED AND INSTALLED OPTIONS AND ACCESSORIES ARE NOT INCLUDED IN THIS PRICE. DISCOUNT, IF ANY, IS BASED ON PRICE OF OPTIONS IF PURCHASED SEPARATELY.

For more information visit: www.dodge.com
or call 1-800-4ADODGE

FCA US LLC

EPA DOT Fuel Economy and Environment — Gasoline Vehicle

Fuel Economy: 21 MPG combined city/hwy (18 city, 25 highway)
These estimates reflect new EPA methods beginning with 2017 models.
Standard SUV 4WD range from 11 to 93 MPGe.
The best vehicle rates 136 MPGe.
4.8 gallons per 100 miles

You spend $2,000 more in fuel costs over 5 years compared to the average new vehicle.

Annual fuel cost $1,800

Fuel Economy & Greenhouse Gas Rating (tailpipe only): 4 (1 – 10, Best)
Smog Rating (tailpipe only): 5 (1 – 10, Best)

This vehicle emits 427 grams CO2 per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel also creates emissions; learn more at fueleconomy.gov

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 27 MPG and cost $7,000 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at $2.55 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

Smartphone QR Code™

GOVERNMENT 5-STAR SAFETY RATINGS

Overall Vehicle Score: Not Rated
Based on the combined ratings of frontal, side, and rollover.
Should ONLY be compared to other vehicles of similar size and weight.

Frontal Crash — Driver: Not Rated; Passenger: Not Rated
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: Not Rated; Rear seat: 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

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

PARTS CONTENT INFORMATION
FOR VEHICLES IN THIS CARLINE:
U.S./CANADIAN PARTS CONTENT: 60%
MAJOR SOURCES OF FOREIGN PARTS CONTENT:
MEXICO: 26%
NOTE: PARTS CONTENT DOES NOT INCLUDE FINAL ASSEMBLY, DISTRIBUTION, OR OTHER NON-PARTS COSTS.
FOR THIS VEHICLE:
FINAL ASSEMBLY POINT:
DETROIT, MICHIGAN, U.S.A.
COUNTRY OF ORIGIN:
ENGINE: MEXICO
TRANSMISSION: UNITED STATES

MOPAR. VEHICLE PROTECTION
A PRODUCT OF FCA US LLC
Ask for Mopar Vehicle Protection for your vehicle. We Built It. We Back It.

Photo No. 079 - 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

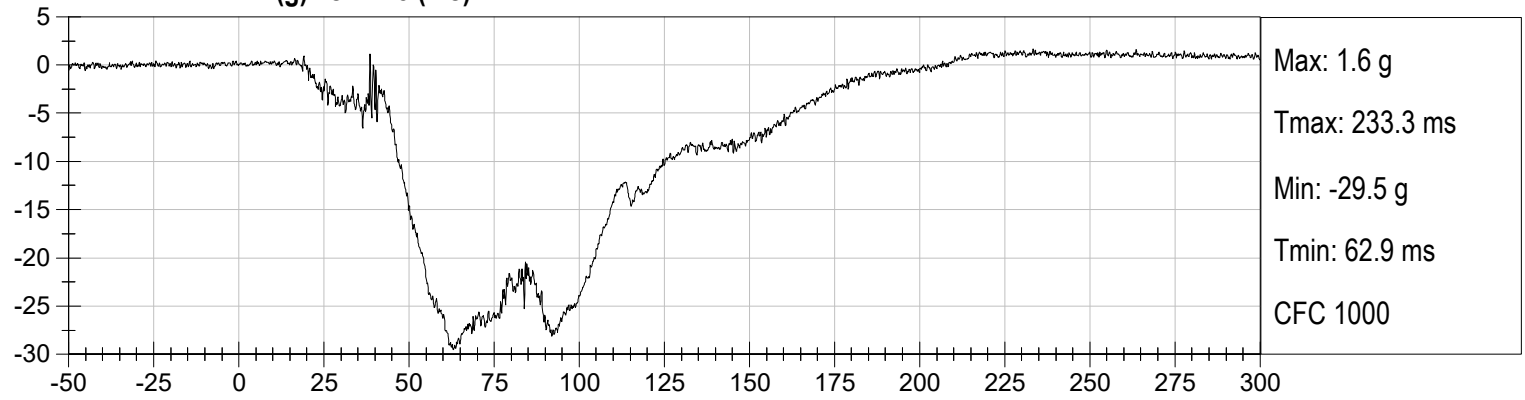
Right Rear Seat Crossmember Z

Left Rear Seat Crossmember Xr

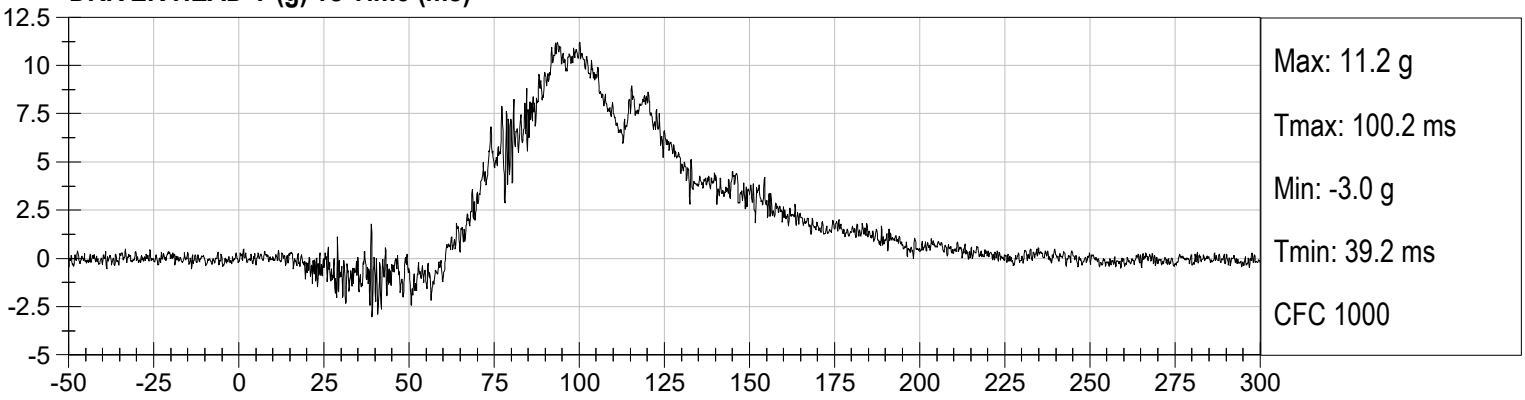
Right Rear Seat Crossmember Xr

Advanced Research Load Cell Barrier – 528 channels

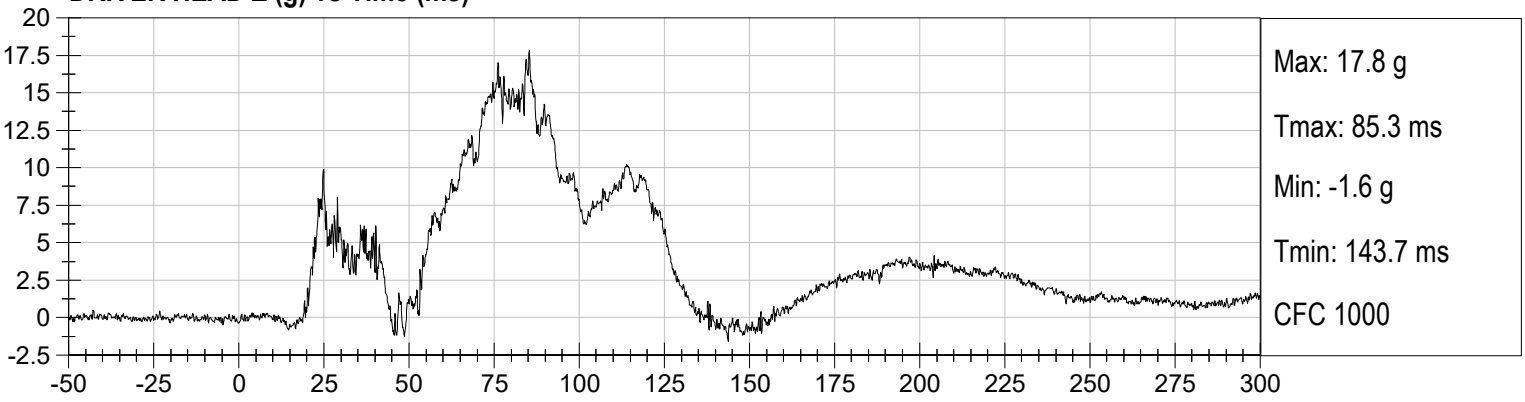
DRIVER HEAD X (g) vs Time (ms)



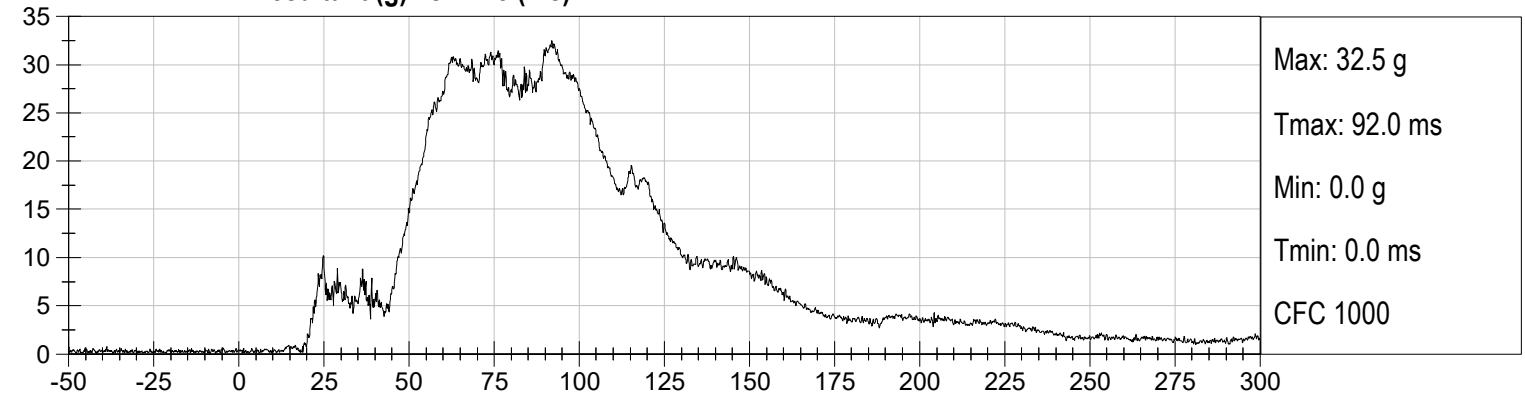
DRIVER HEAD Y (g) vs Time (ms)



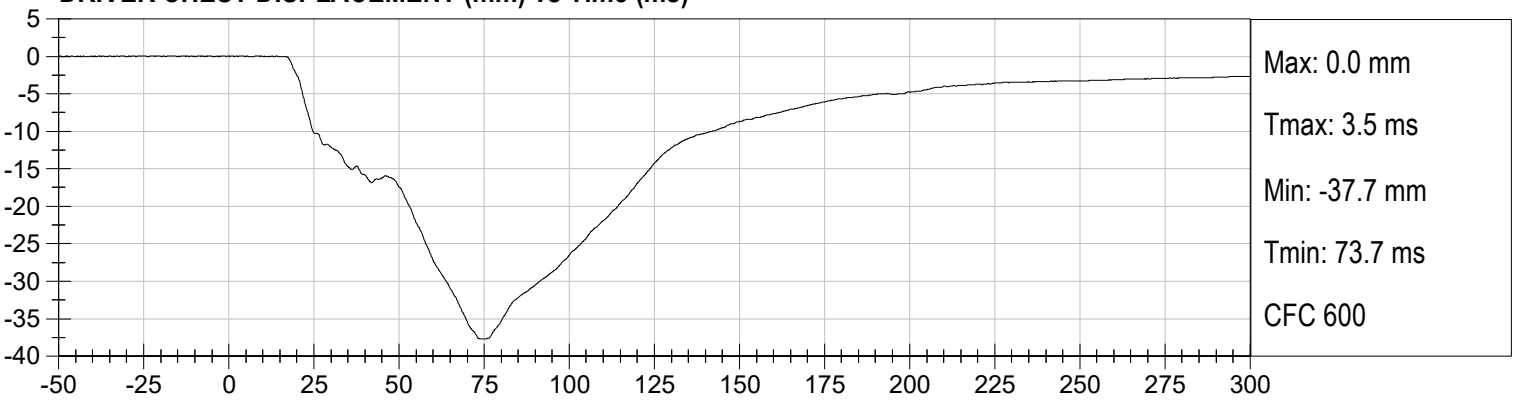
DRIVER HEAD Z (g) vs Time (ms)



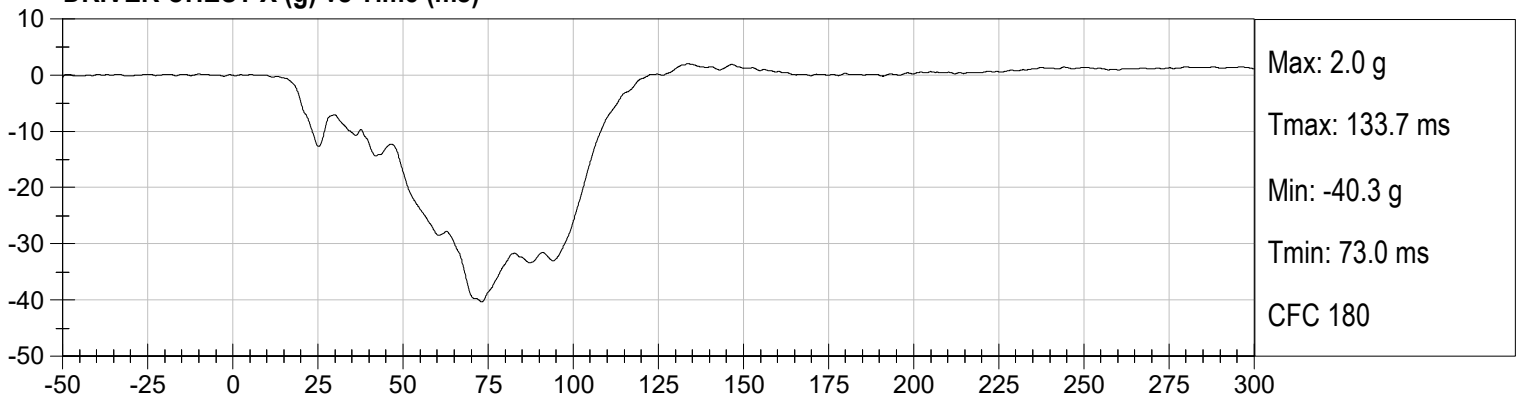
DRIVER HEAD Resultant (g) vs Time (ms)



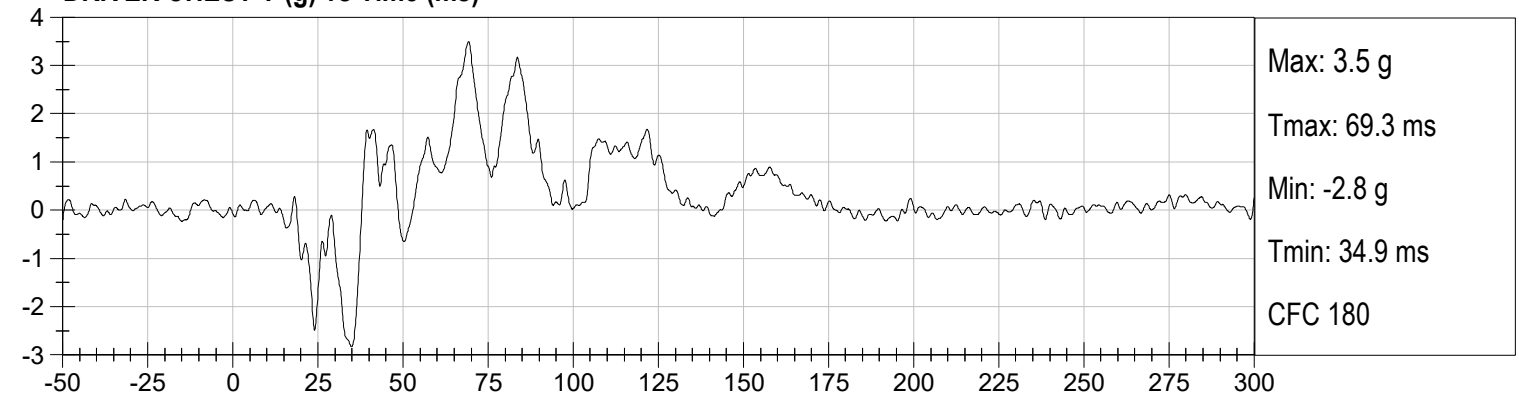
DRIVER CHEST DISPLACEMENT (mm) vs Time (ms)



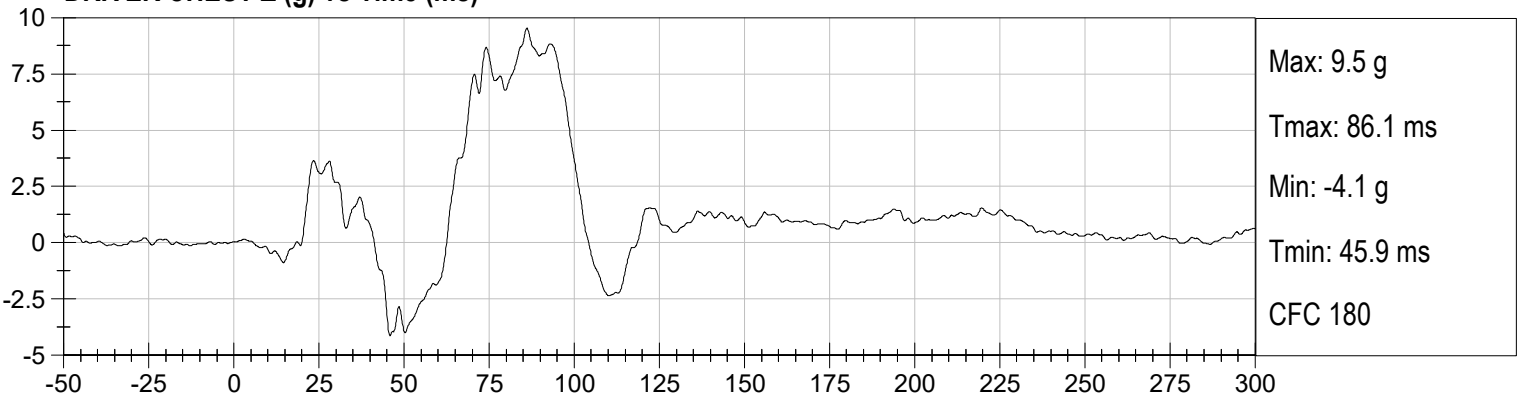
DRIVER CHEST X (g) vs Time (ms)



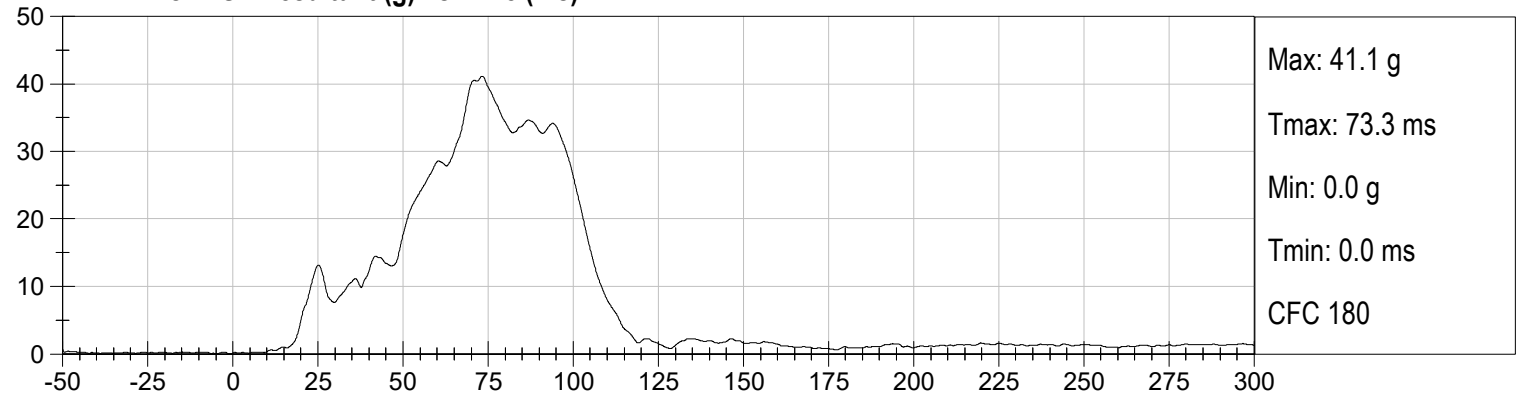
DRIVER CHEST Y (g) vs Time (ms)



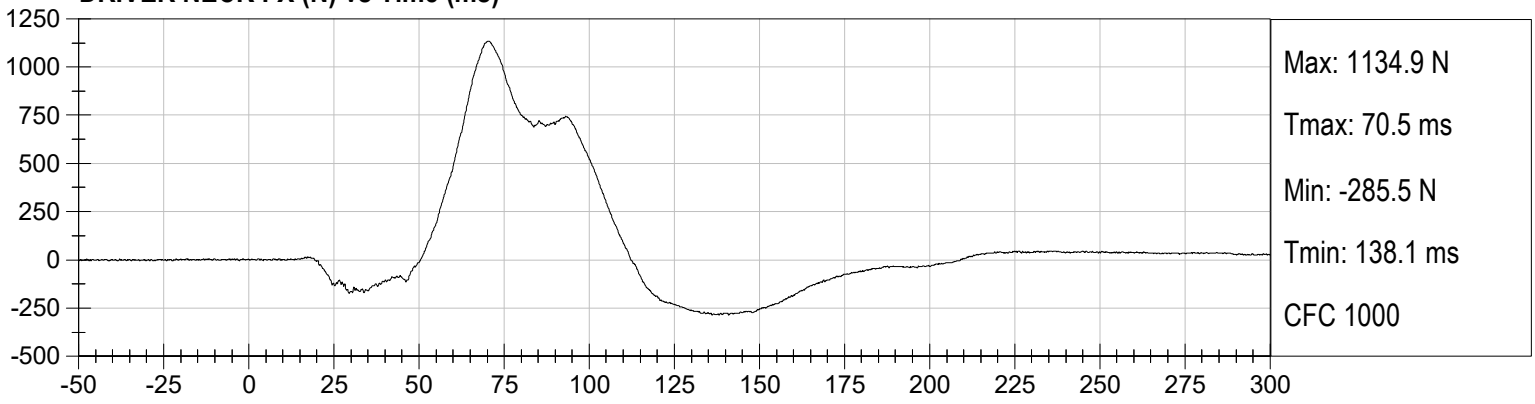
DRIVER CHEST Z (g) vs Time (ms)



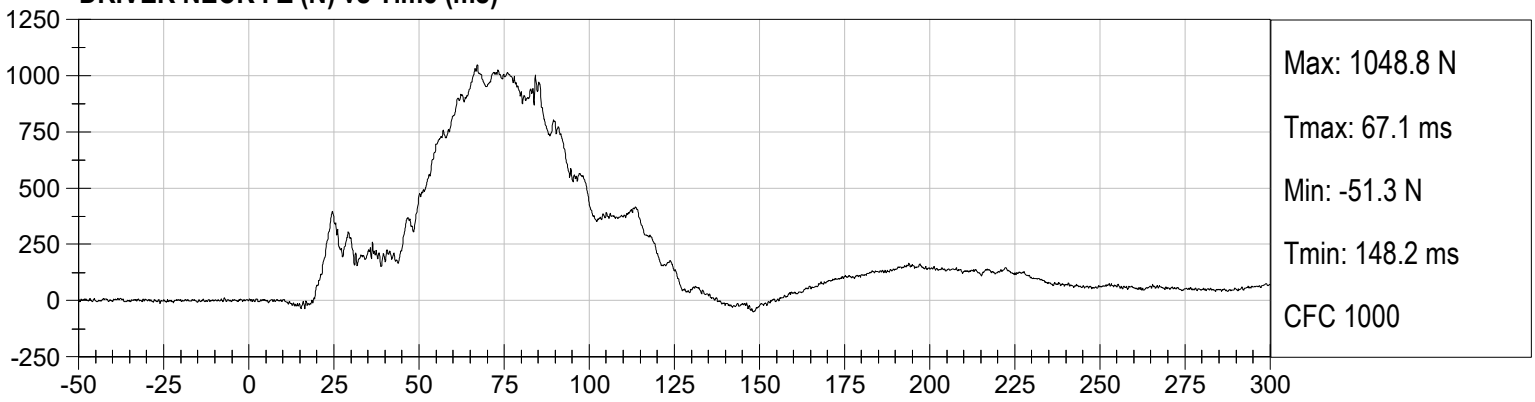
DRIVER CHEST Resultant (g) vs Time (ms)



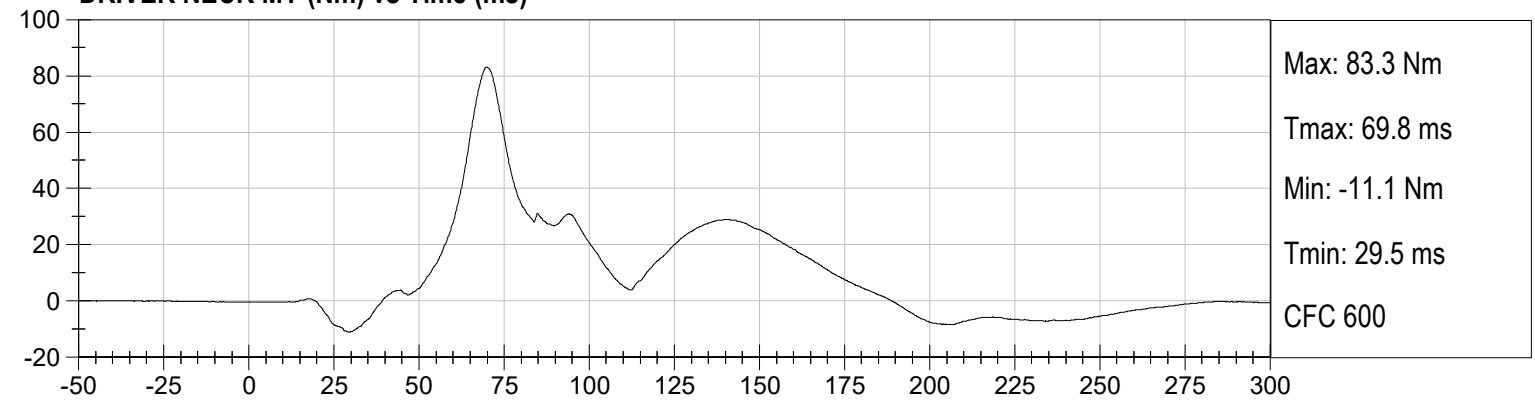
DRIVER NECK FX (N) vs Time (ms)



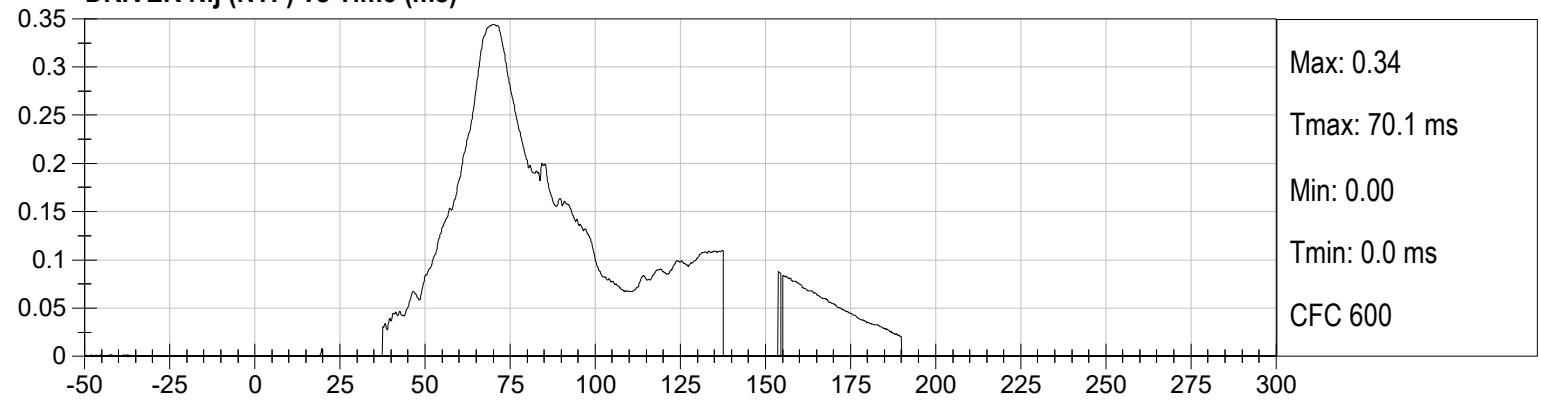
DRIVER NECK FZ (N) vs Time (ms)



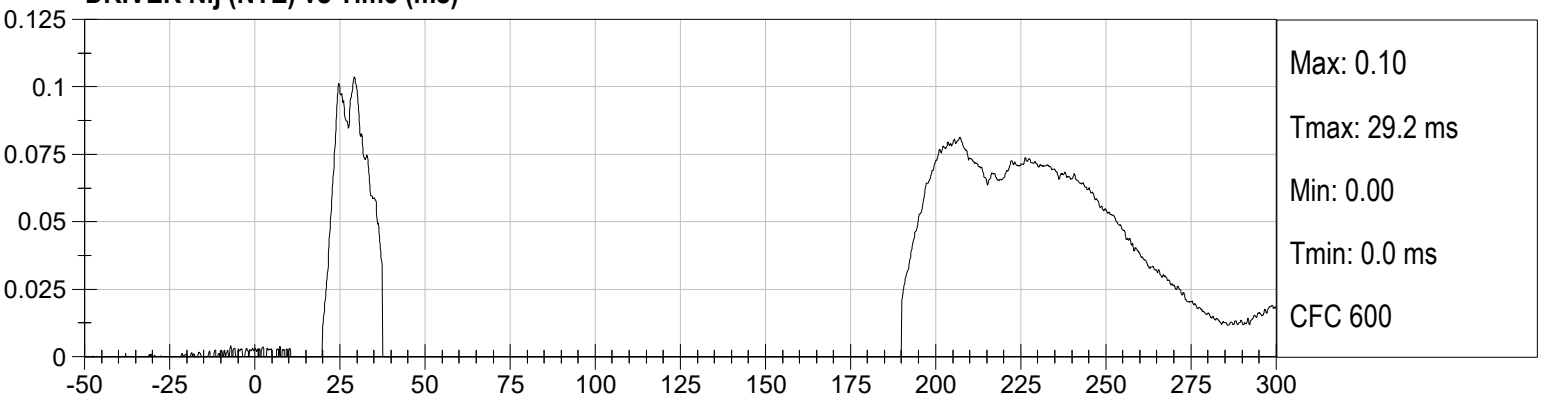
DRIVER NECK MY (Nm) vs Time (ms)



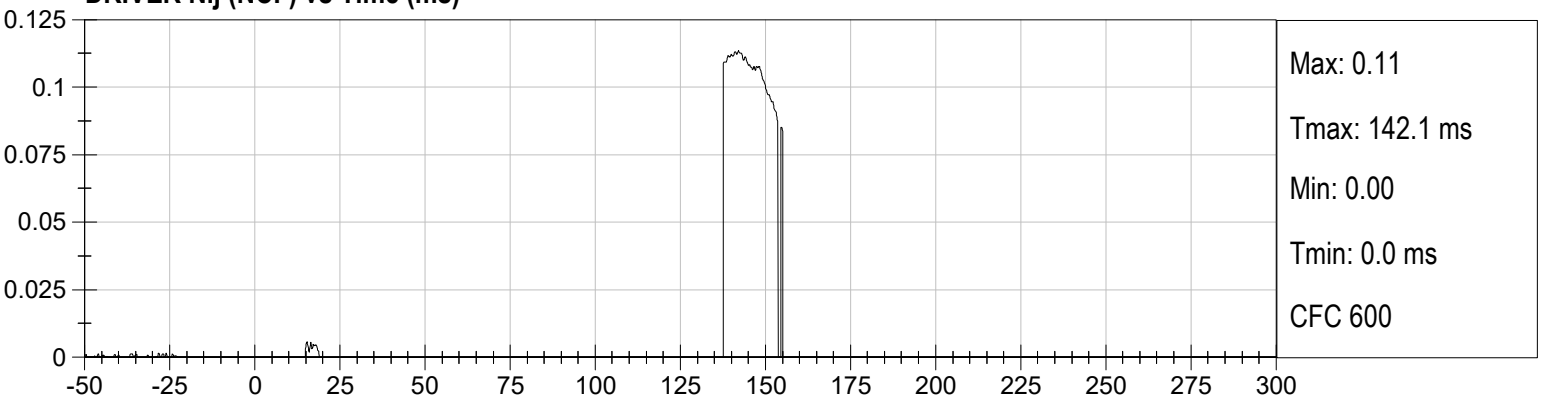
DRIVER Nij (NTF) vs Time (ms)



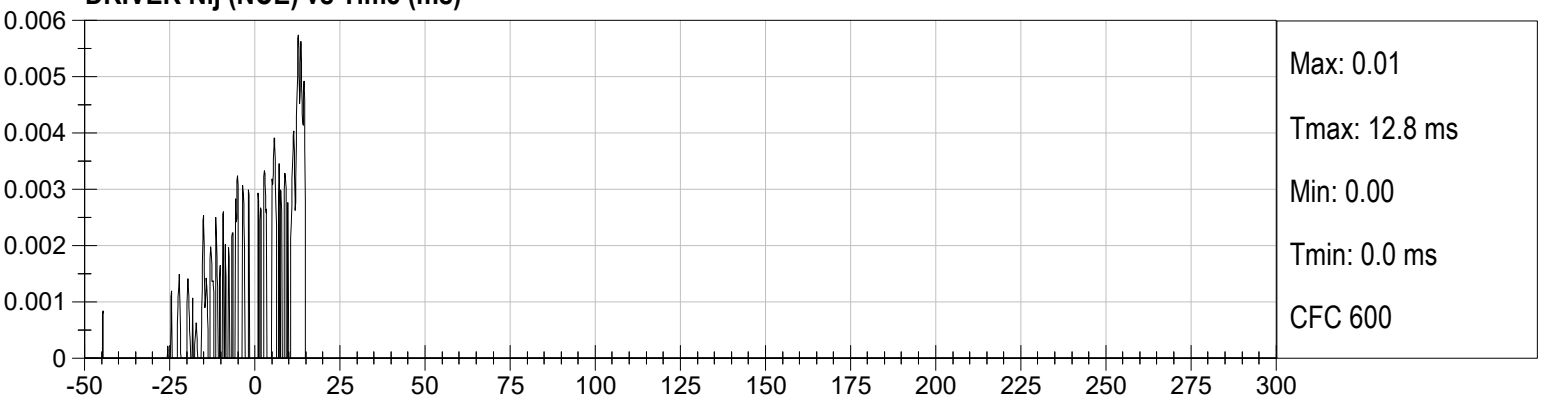
DRIVER Nij (NTE) vs Time (ms)



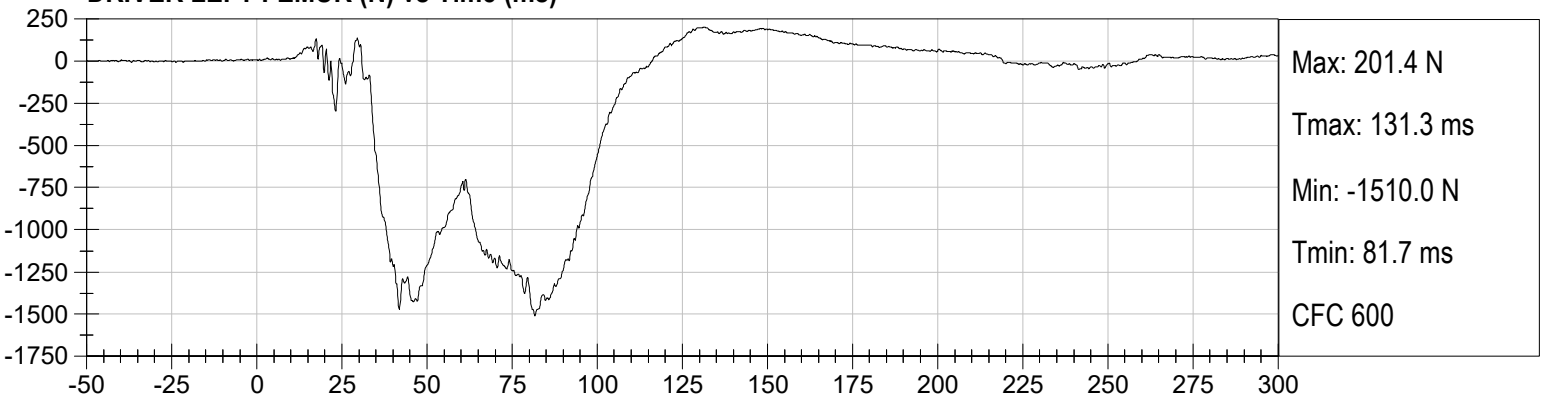
DRIVER Nij (NCF) vs Time (ms)



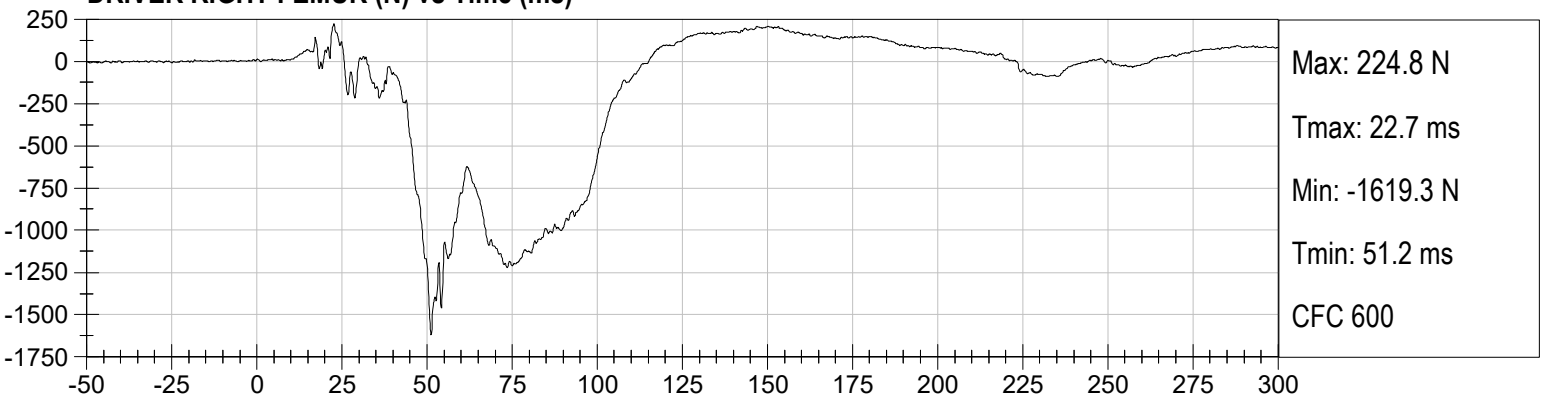
DRIVER Nij (NCE) vs Time (ms)



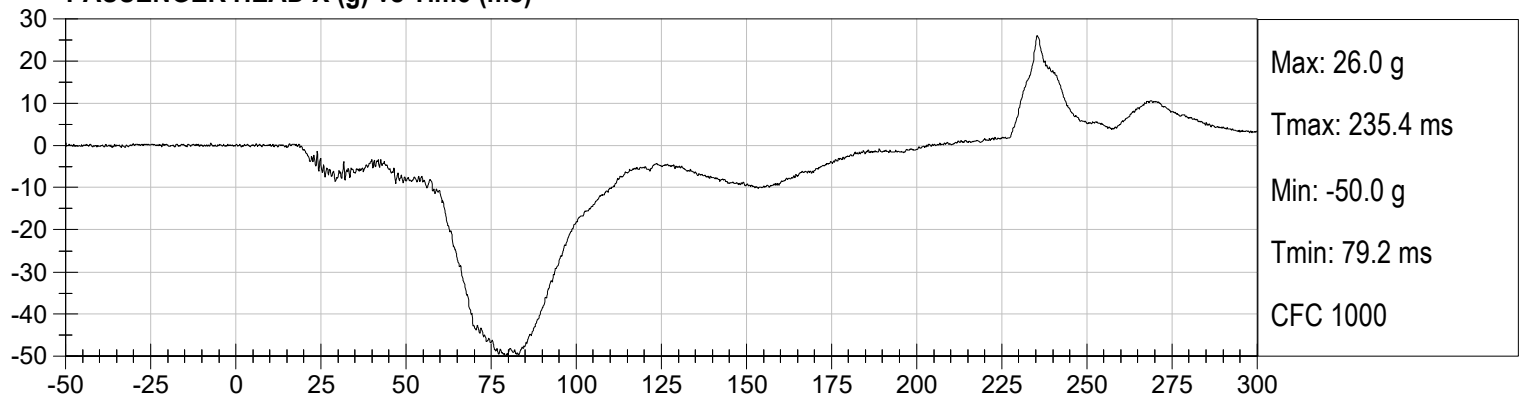
DRIVER LEFT FEMUR (N) vs Time (ms)



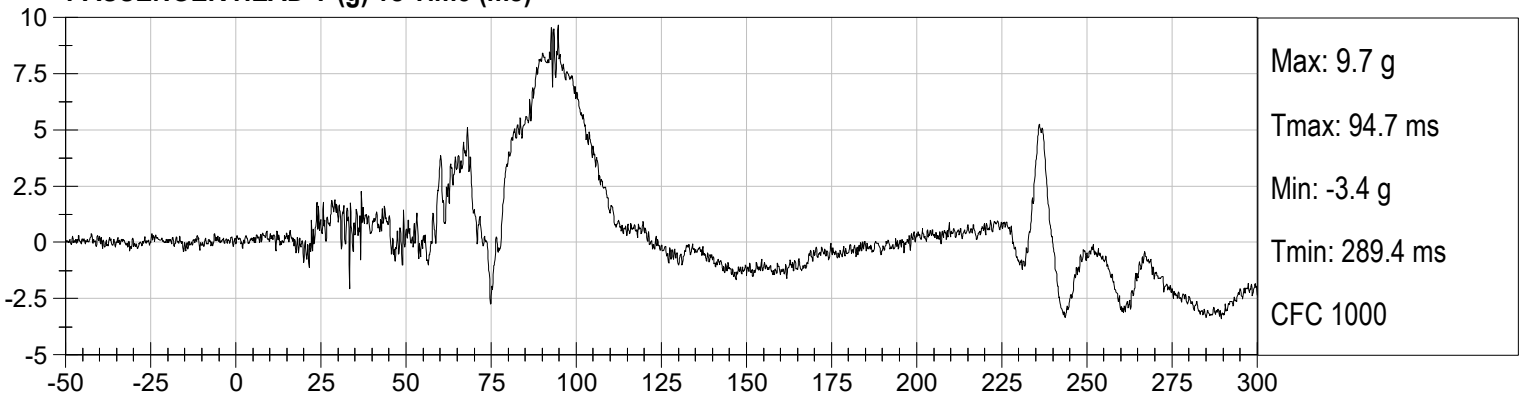
DRIVER RIGHT FEMUR (N) vs Time (ms)



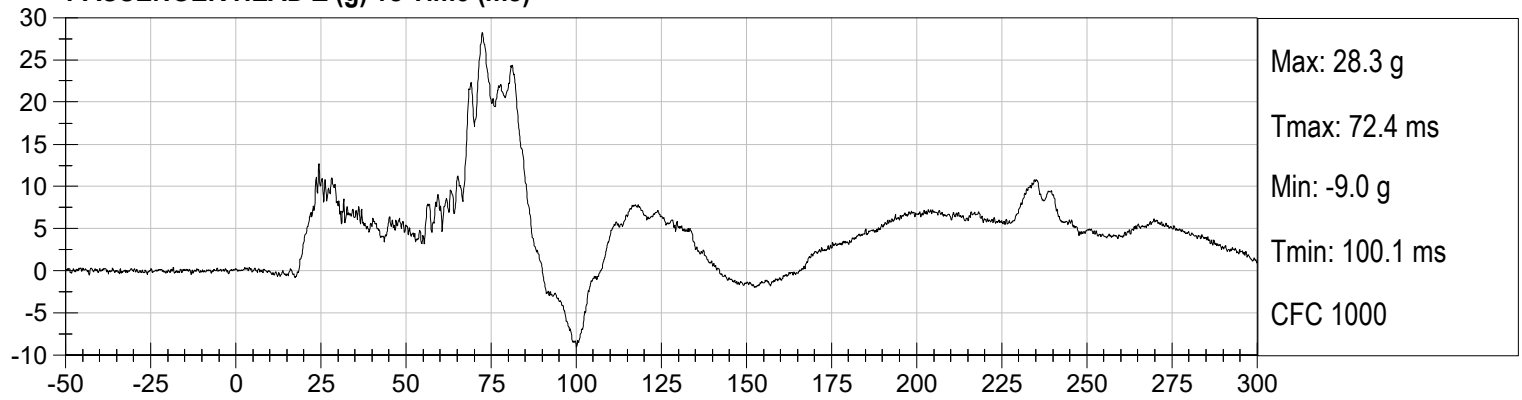
PASSENGER HEAD X (g) vs Time (ms)



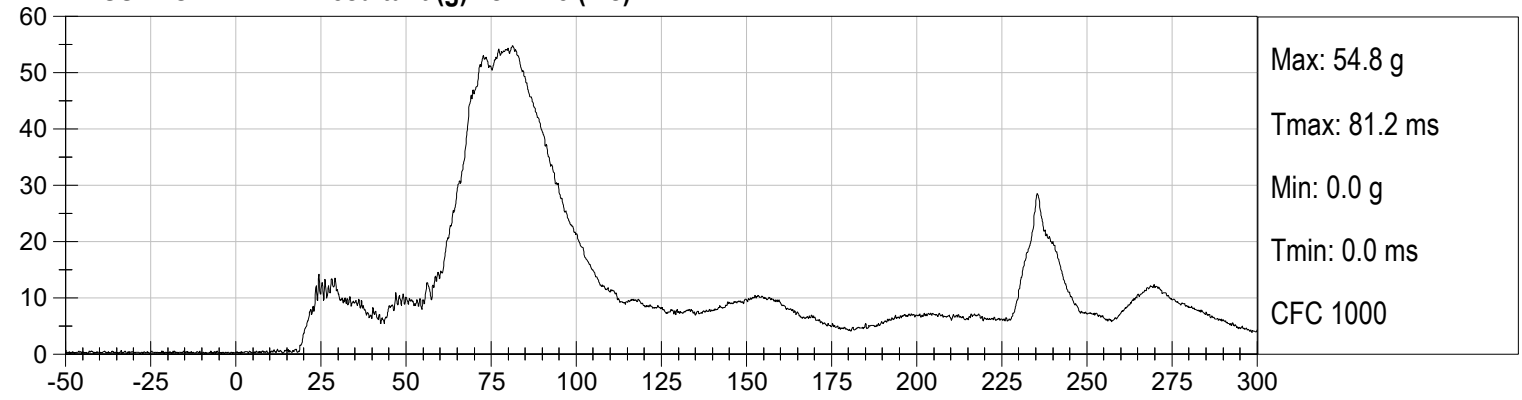
PASSENGER HEAD Y (g) vs Time (ms)



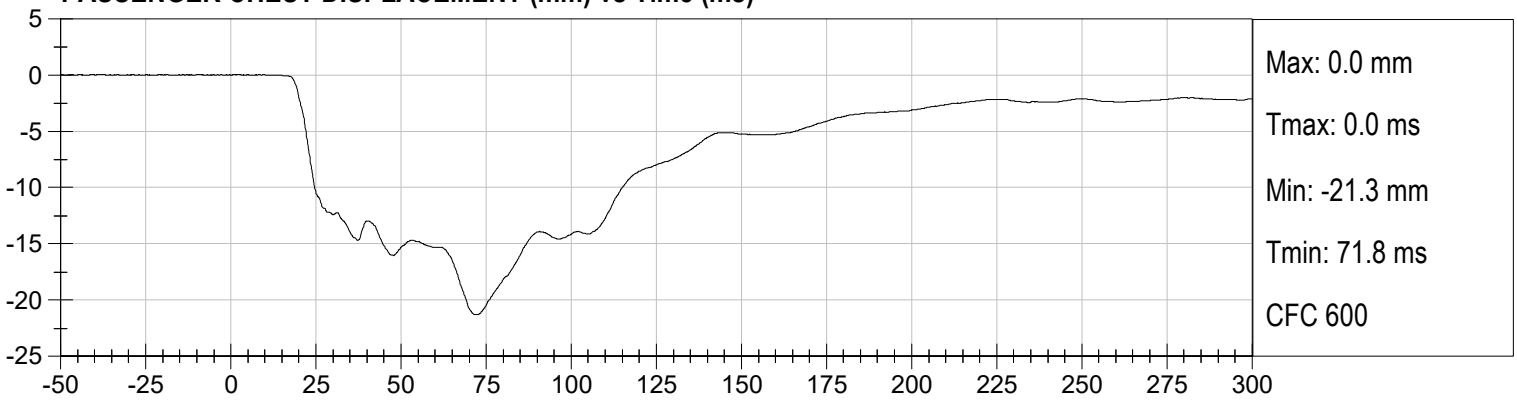
PASSENGER HEAD Z (g) vs Time (ms)



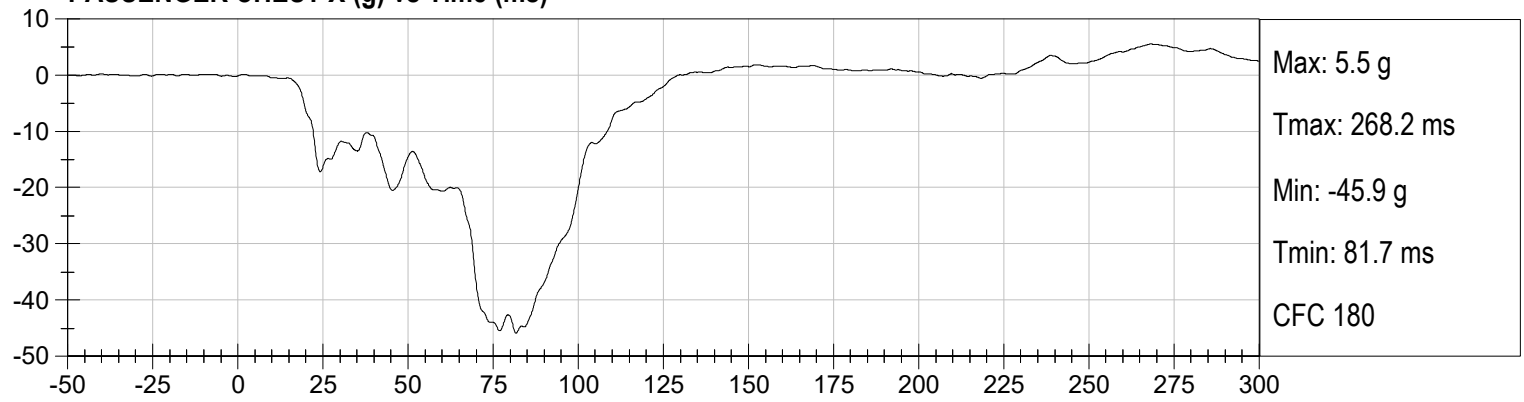
PASSENGER HEAD Resultant (g) vs Time (ms)



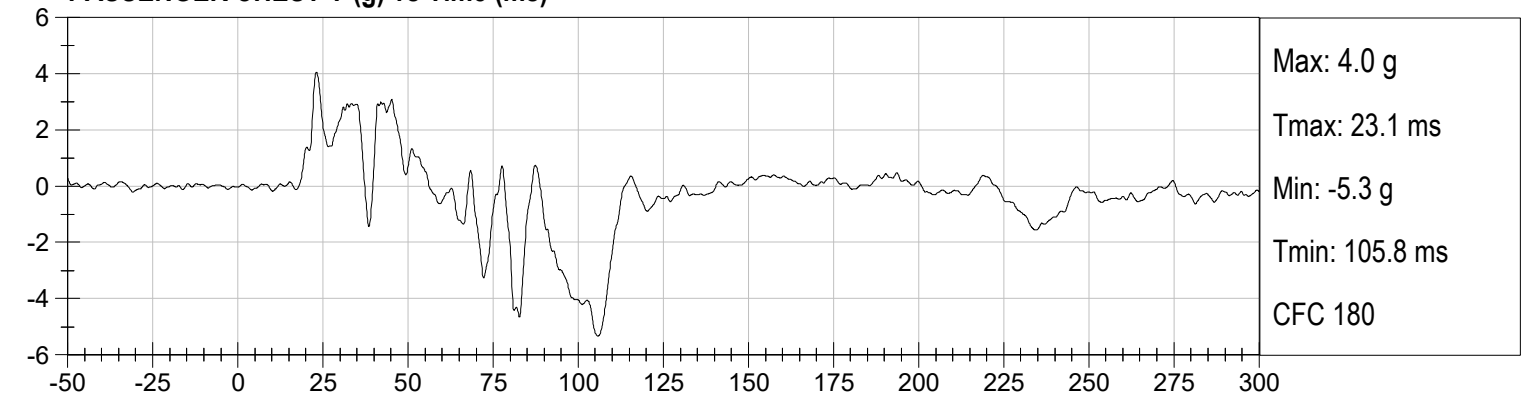
PASSENGER CHEST DISPLACEMENT (mm) vs Time (ms)



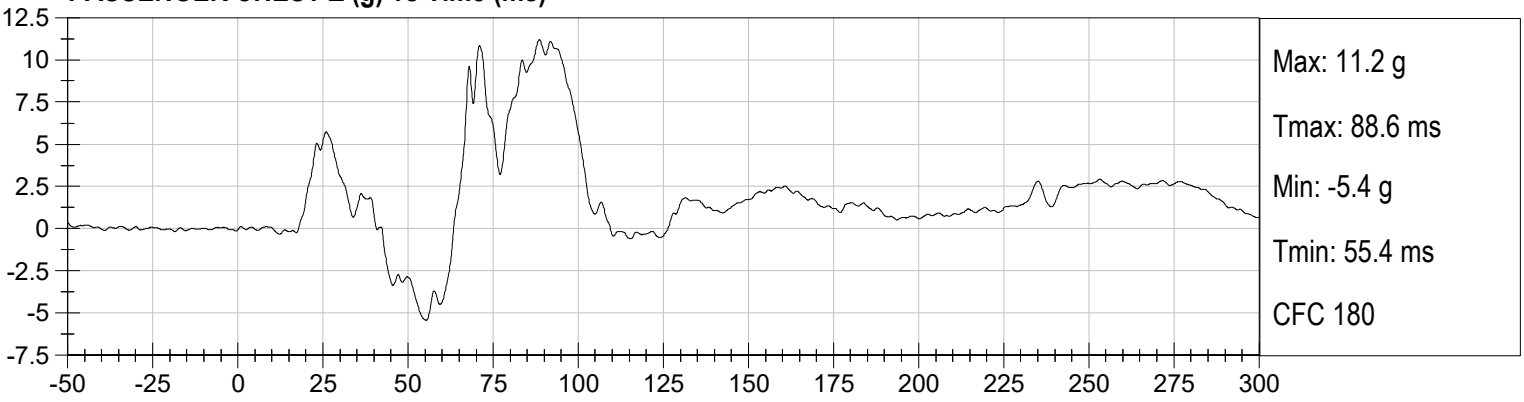
PASSENGER CHEST X (g) vs Time (ms)



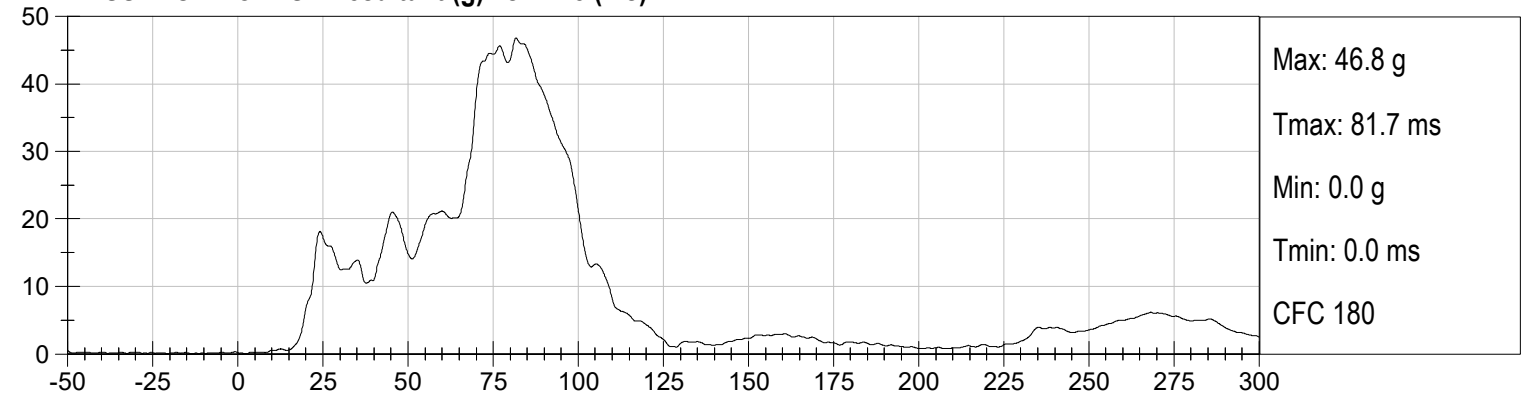
PASSENGER CHEST Y (g) vs Time (ms)



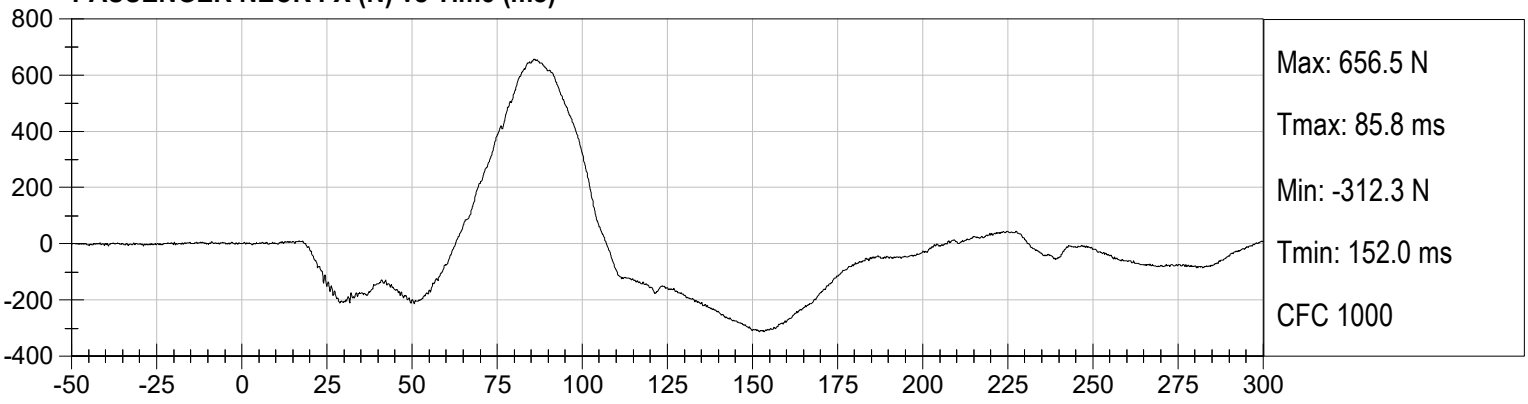
PASSENGER CHEST Z (g) vs Time (ms)



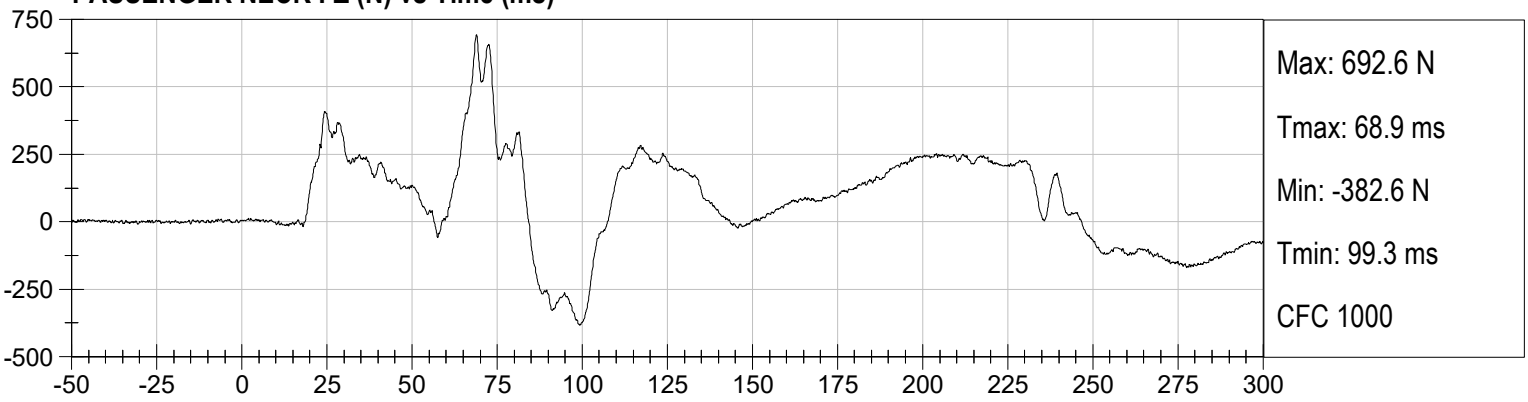
PASSENGER CHEST Resultant (g) vs Time (ms)



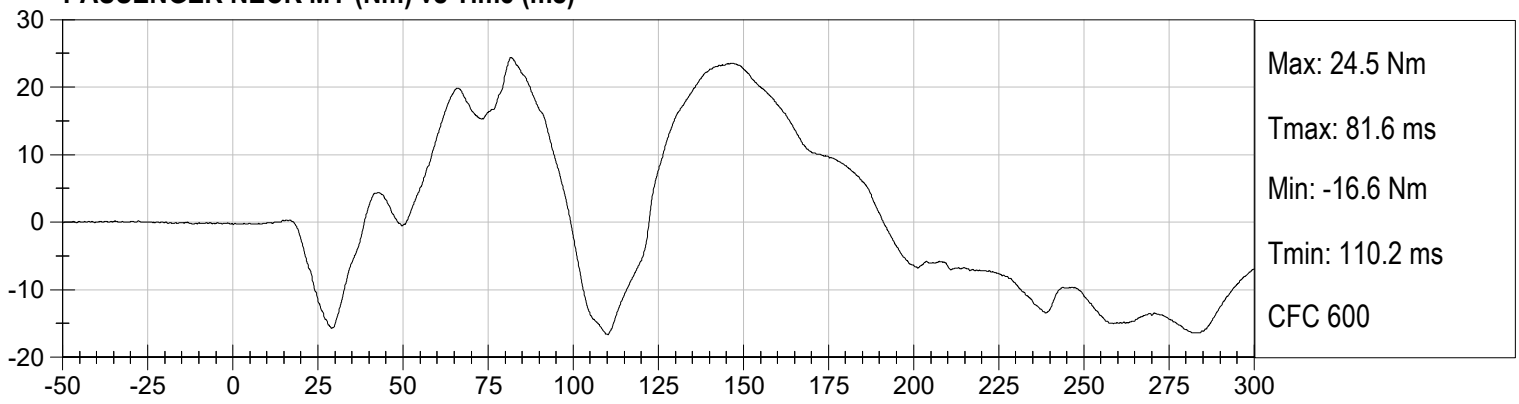
PASSENGER NECK FX (N) vs Time (ms)



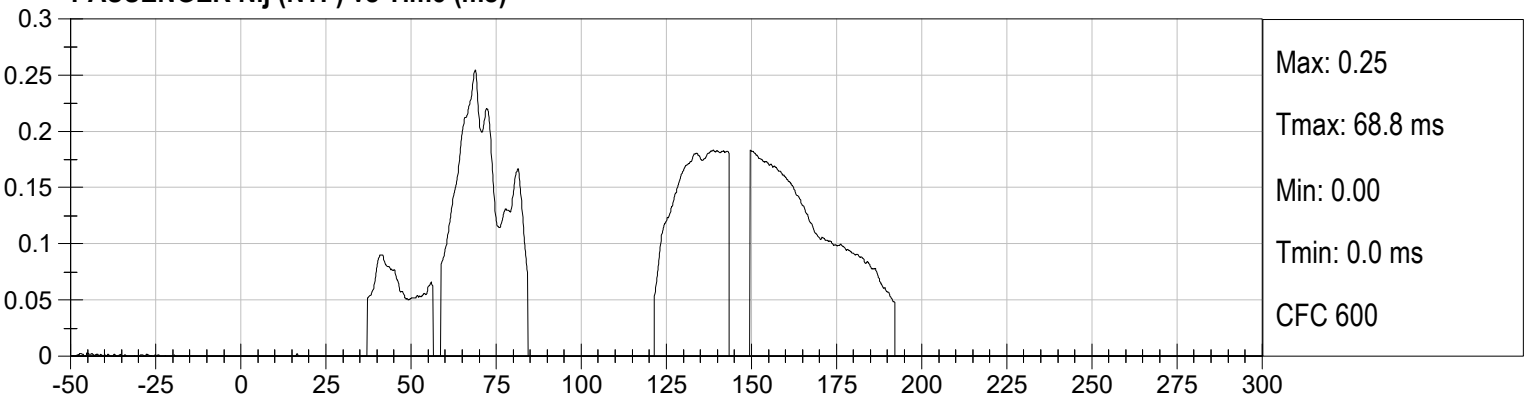
PASSENGER NECK FZ (N) vs Time (ms)



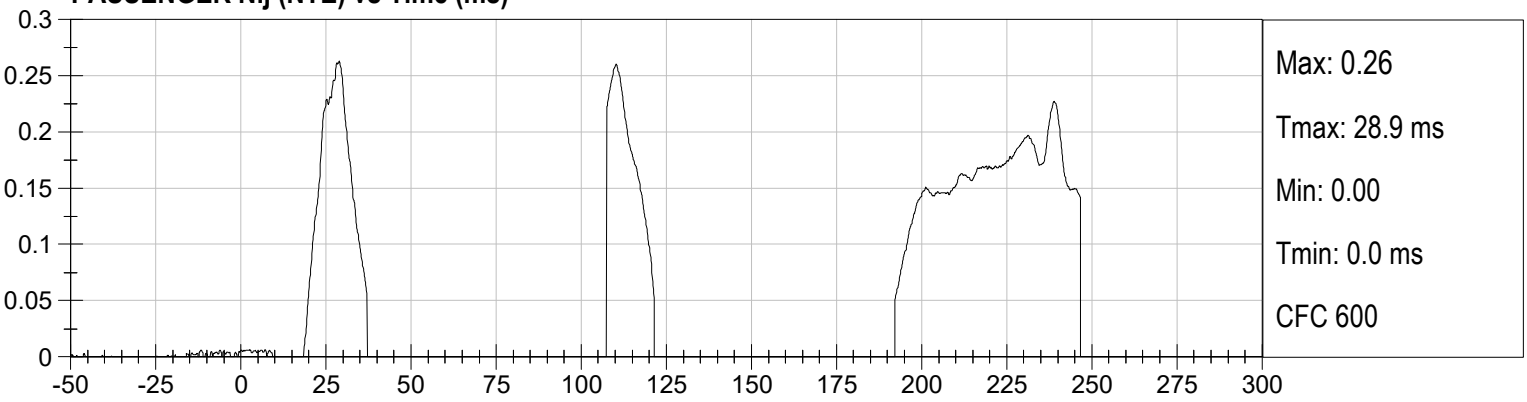
PASSENGER NECK MY (Nm) vs Time (ms)



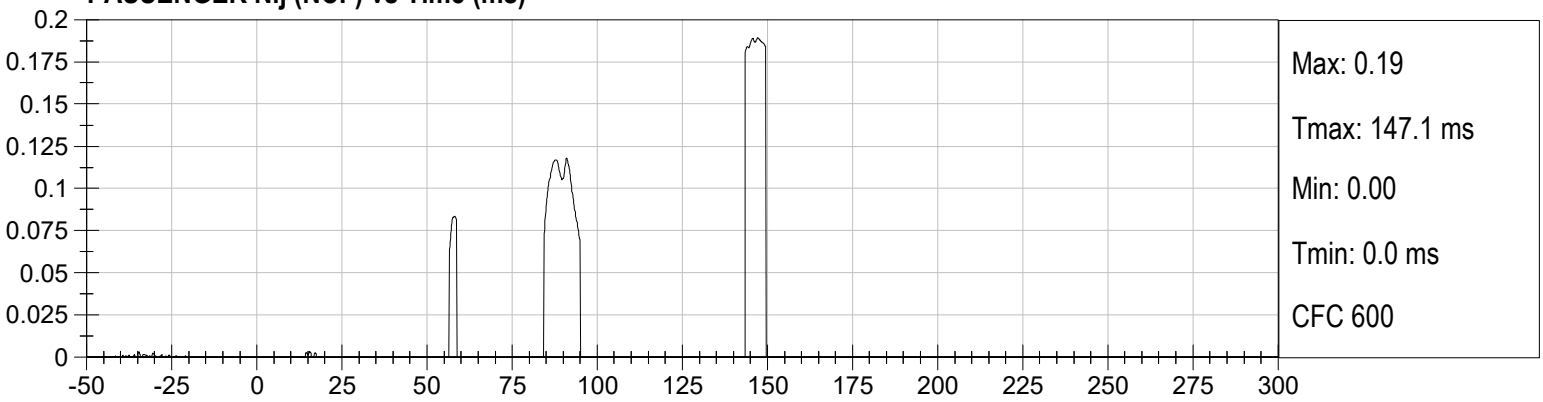
PASSENGER Nij (NTF) vs Time (ms)



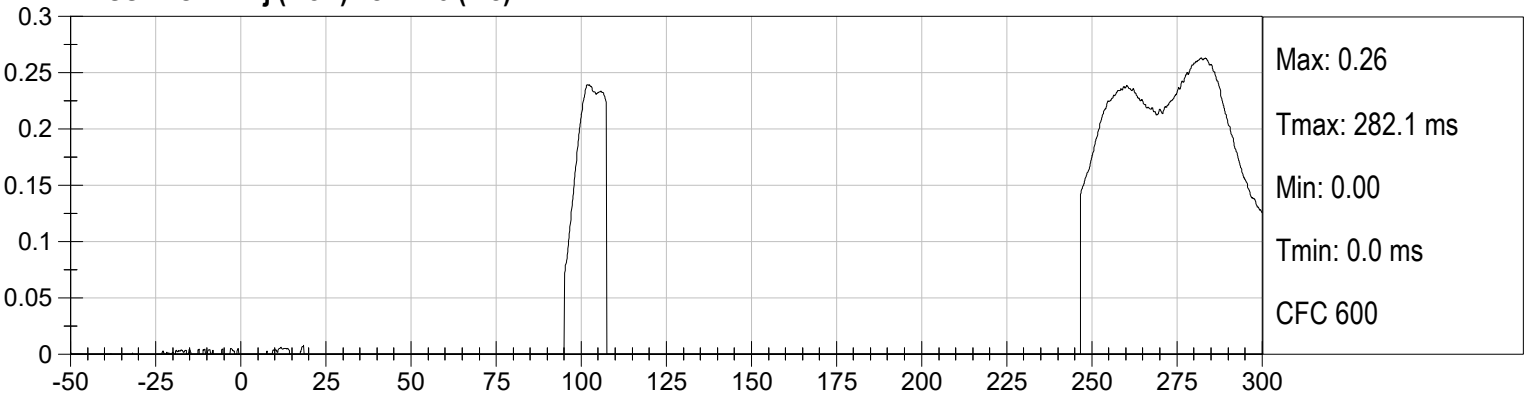
PASSENGER Nij (NTE) vs Time (ms)



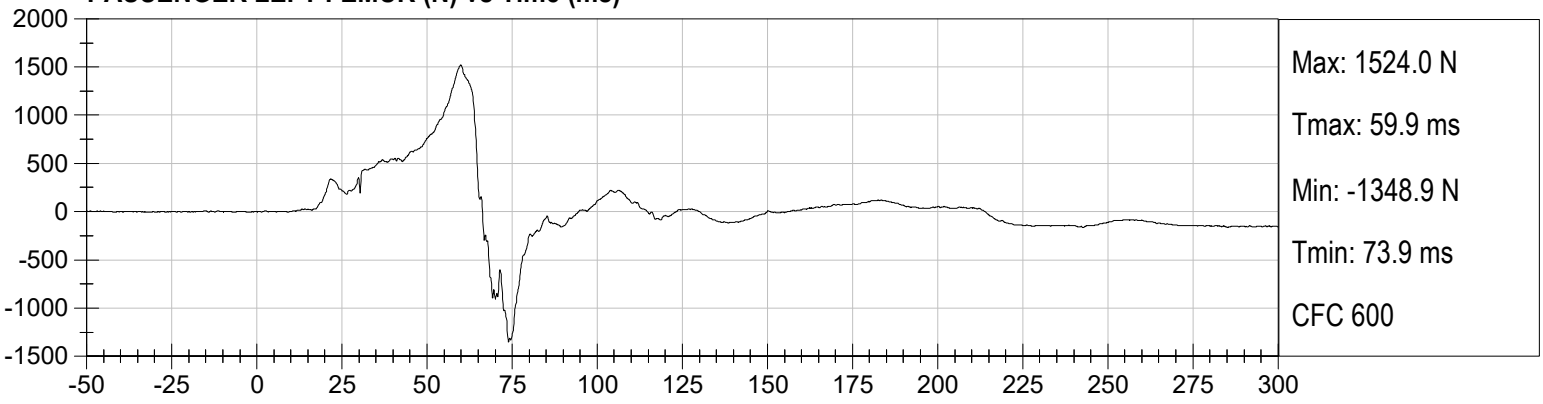
PASSENGER Nij (NCF) vs Time (ms)



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

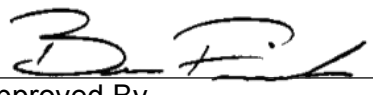
ATD Serial No: 351 **Test ID:** D191711

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	52	Pass
Peak Resultant Acceleration	G's	225 to 275	232	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-6.8	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Laboratory Technician

05/31/2019

Test Date

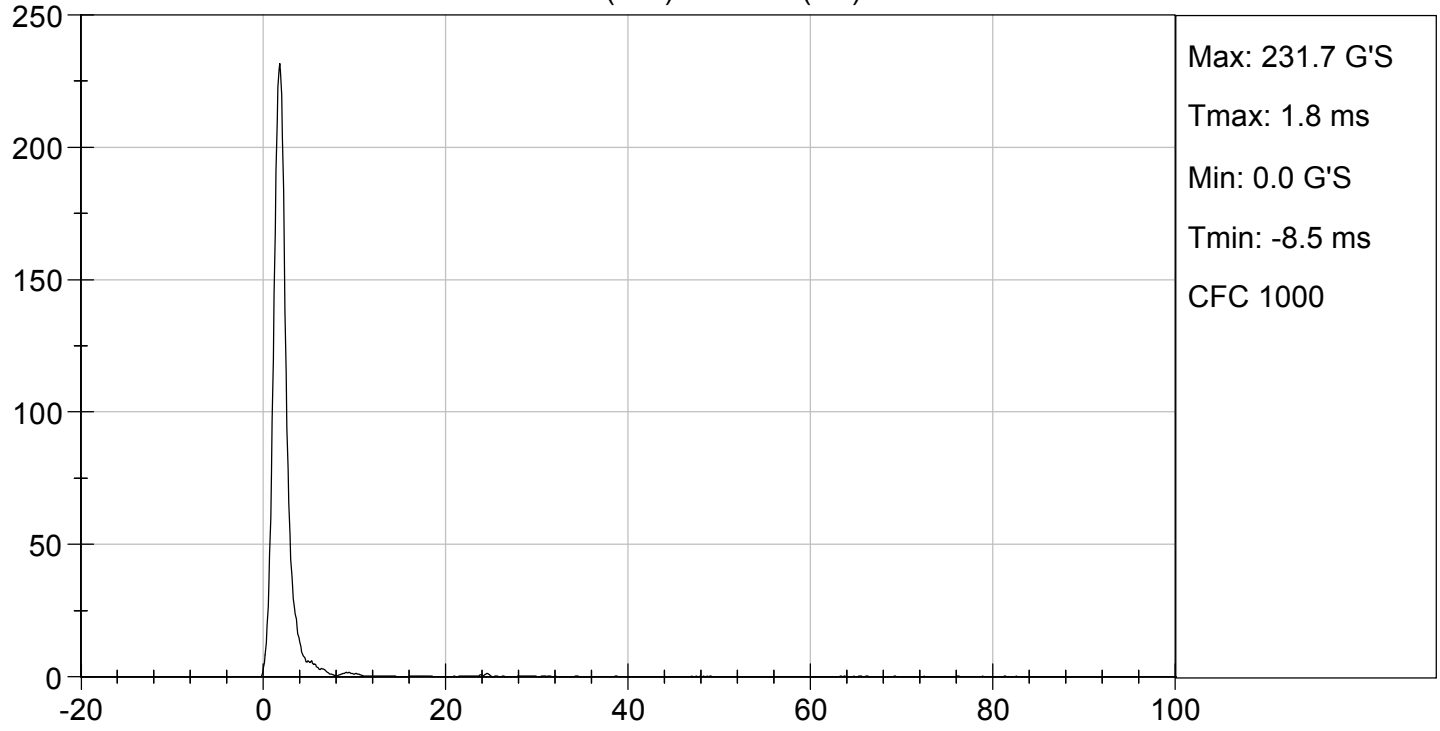


Approved By

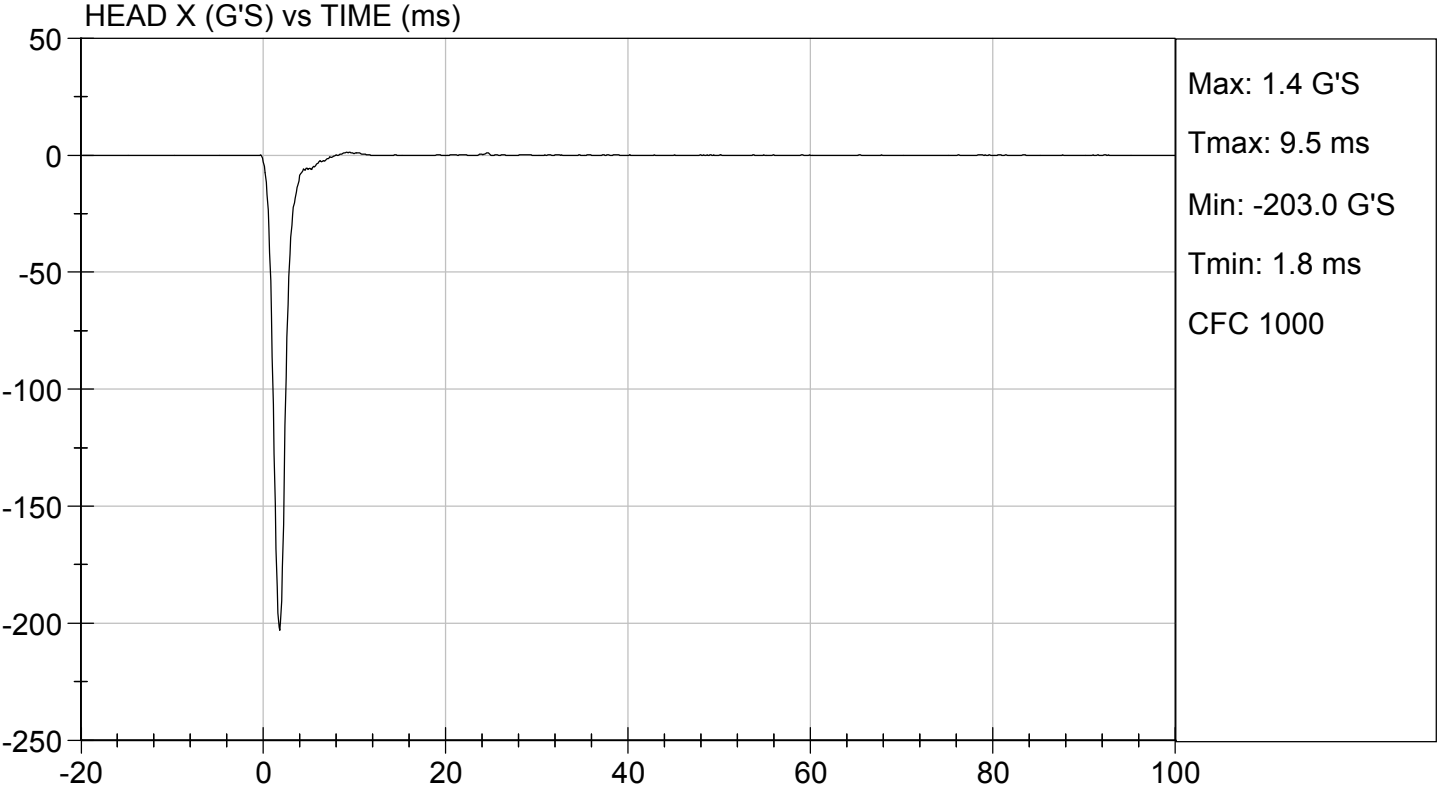
TEST DESC: HEAD DROP

TEST DATE: 05/31/2019
TEST #: D191711

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

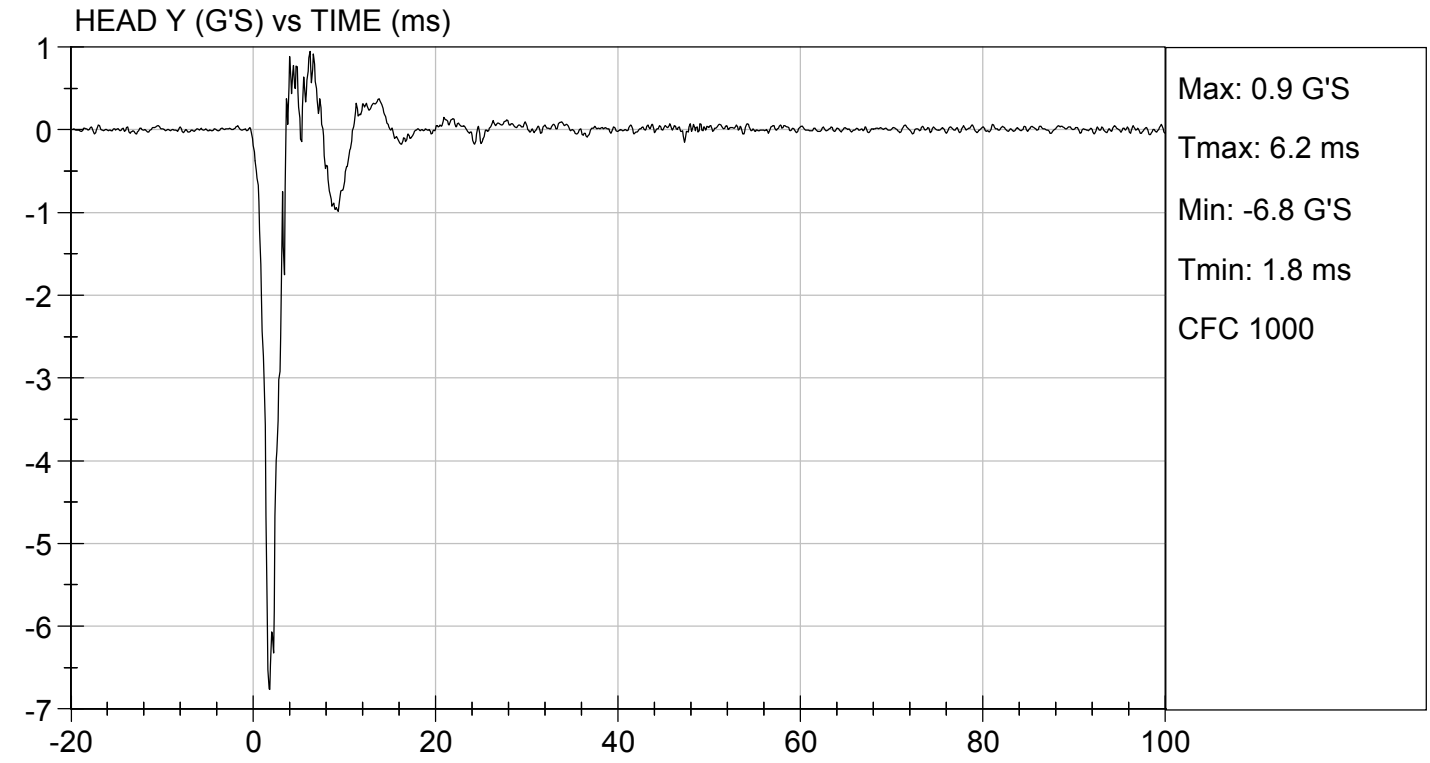


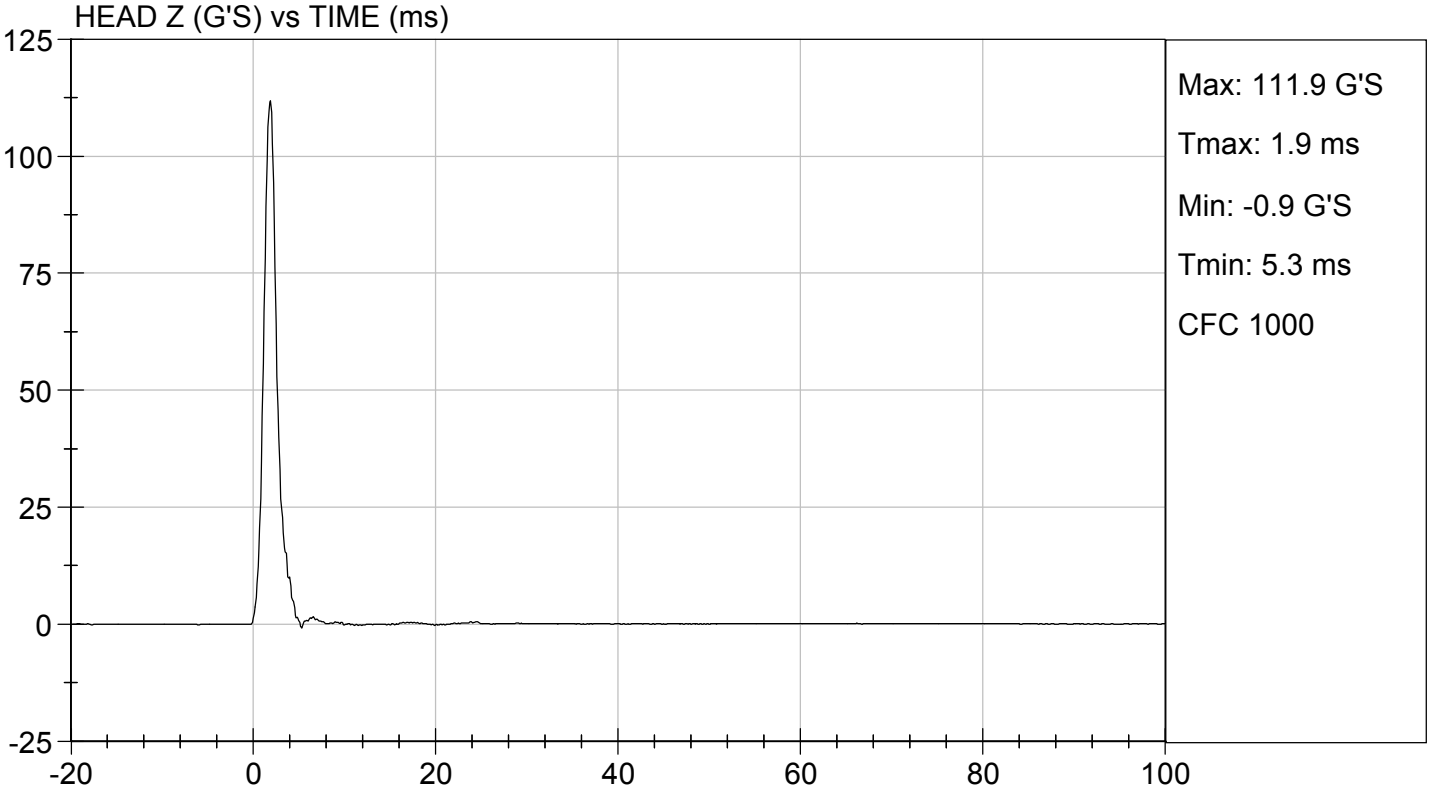
HEAD X (G'S) vs TIME (ms)



TEST DESC: HEAD DROP

TEST DATE: 05/31/2019
TEST #: D191711





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

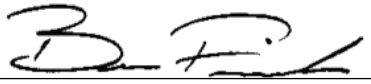
ATD Serial No: 351 **Test I.D:** D191712

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	52	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	22.88	Pass
	20 ms	G's	17.60 to 22.60	20.53	Pass
	30 ms	G's	12.50 to 18.50	16.60	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	16.5	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	35.4	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	71.9	Pass
	Time	ms	57.0 to 64.0	58.6	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	116.6	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	96.0	Pass
	Time	ms	47.0 to 58.0	47.2	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	99.7	Pass
			Overall Test Results		Pass

Laboratory Technician

05/31/2019

Test Date

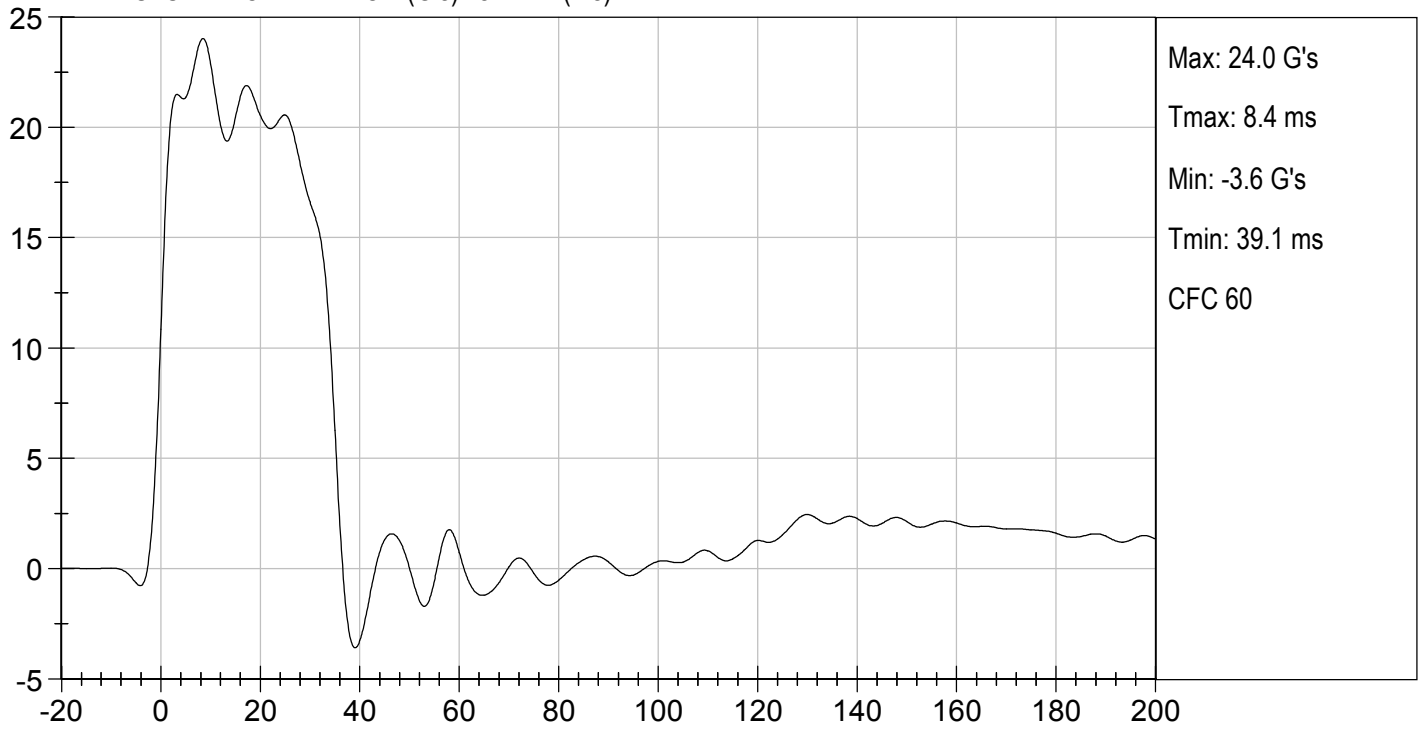


Approved By

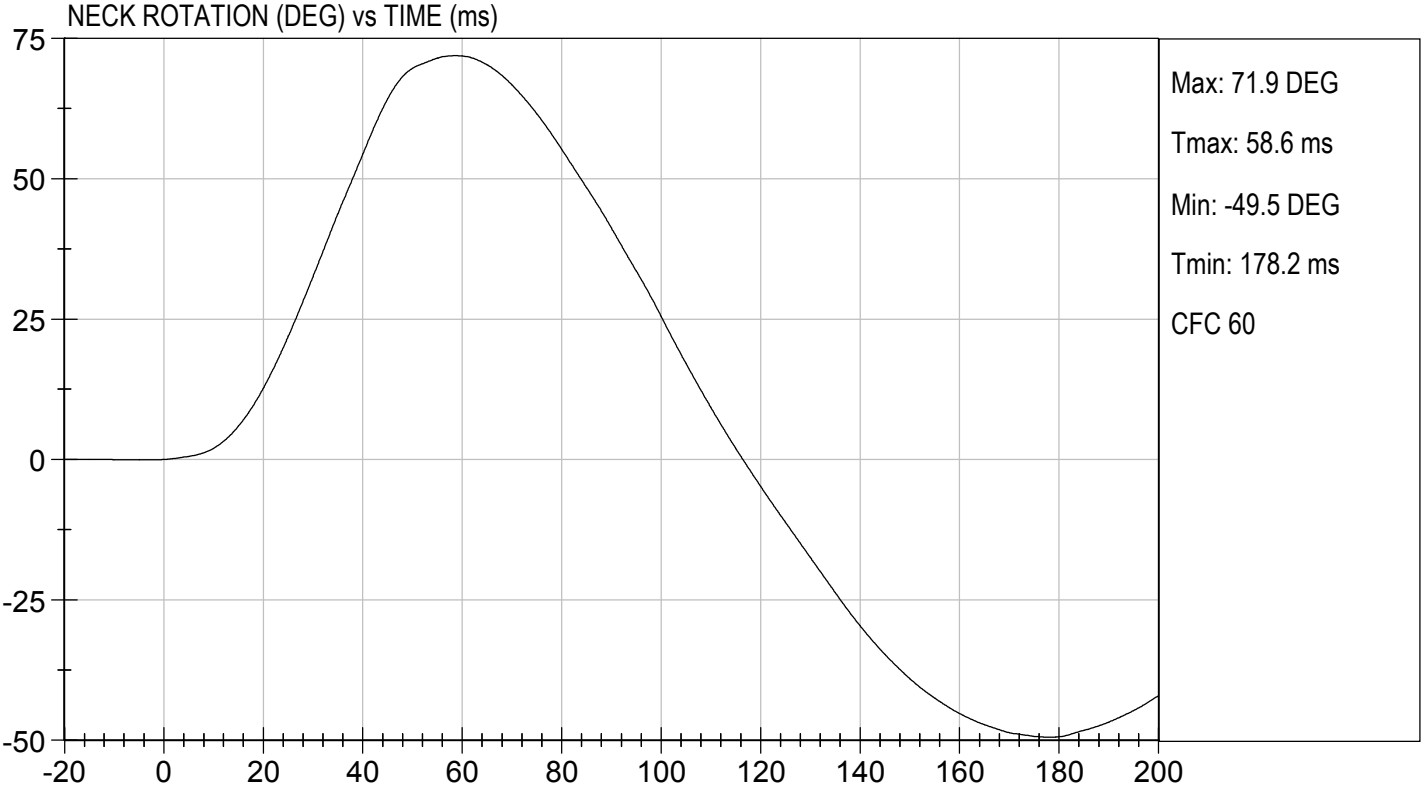
TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

TEST DATE: 05/31/2019
TEST #: D191712

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

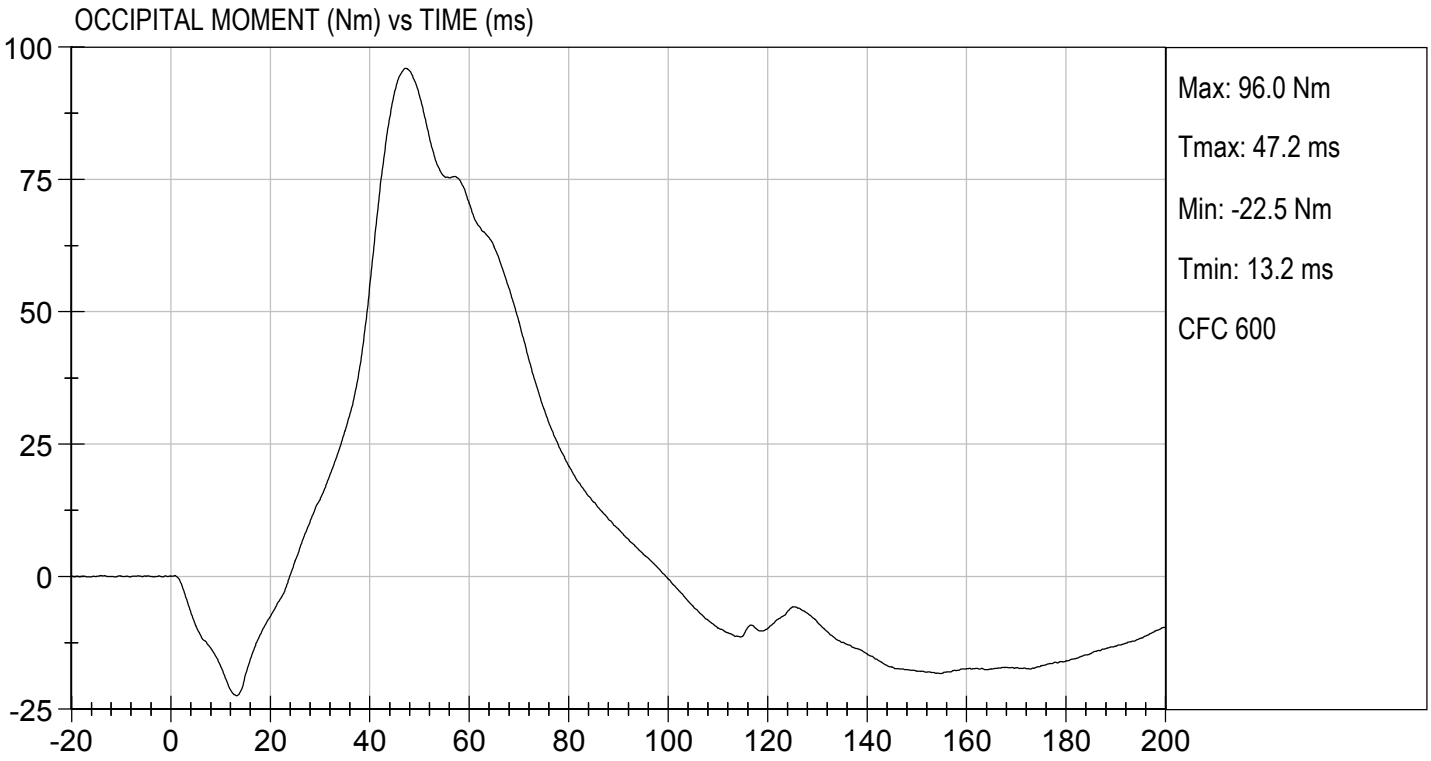


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 05/31/2019
TEST #: D191712



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D191713

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	52	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.05	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	18.56	Pass
	20 ms	G's	14.00 to 19.00	15.15	Pass
	30 ms	G's	11.00 to 16.00	12.56	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	14.4	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	39.8	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	94.9	Pass
	Time	ms	72.0 to 82.0	77.7	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	159.1	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-59.7	Pass
	Time	ms	65.0 to 79.0	70.6	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	140.1	Pass
			Overall Test Results		Pass

Laboratory Technician

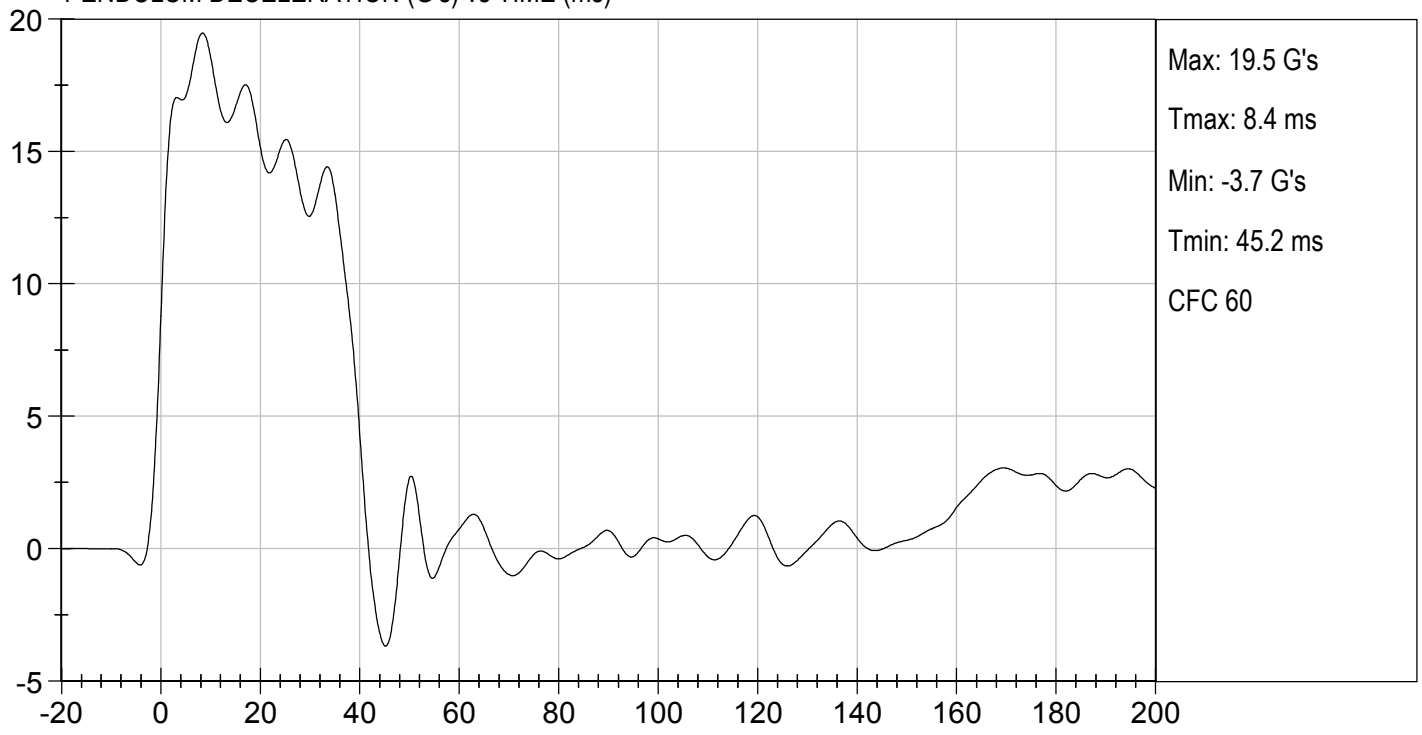
05/31/2019
Test Date

Approved By

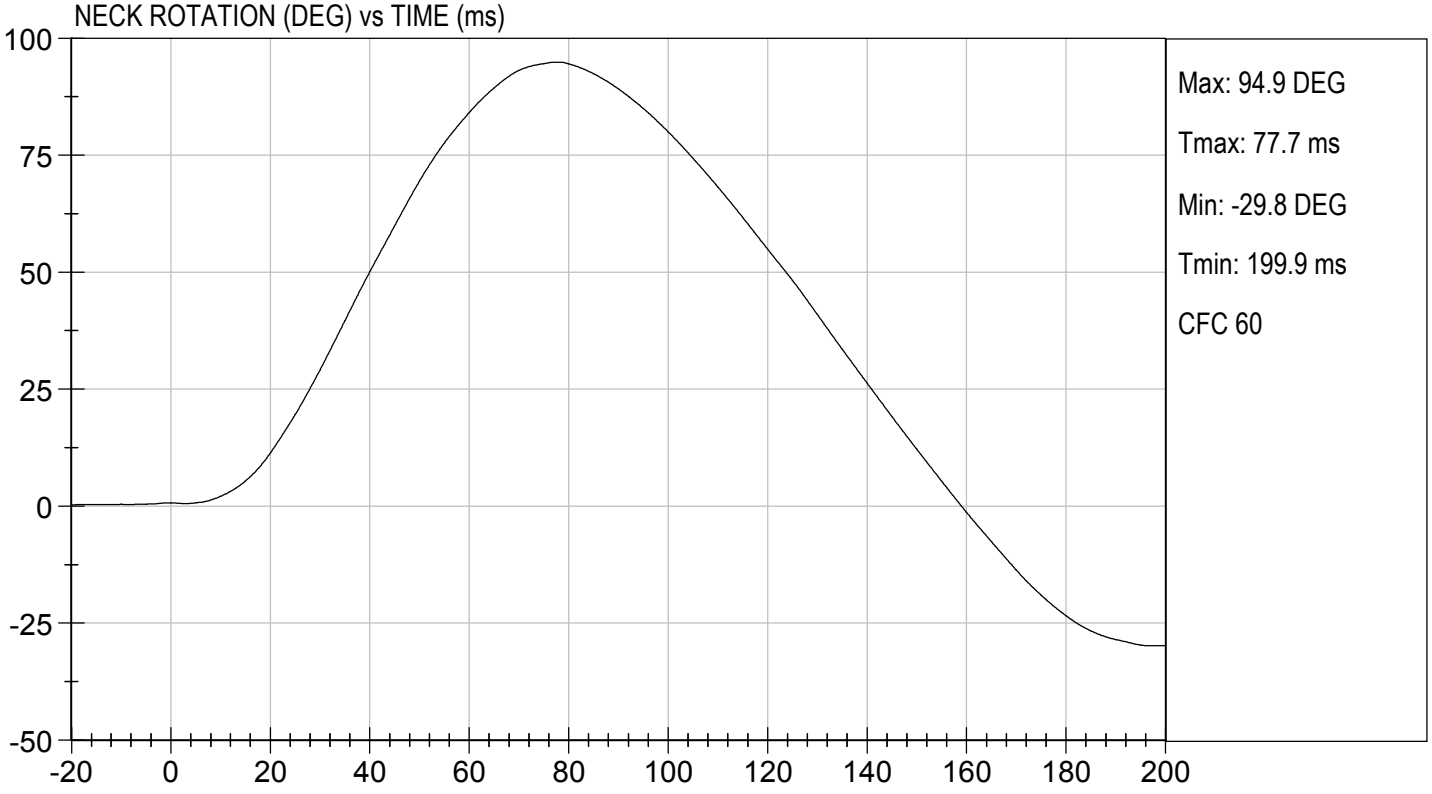
TEST DESC: NECK EXTENSION
VELOCITY: 19.84 ft/s, 6.05 m/s

TEST DATE: 05/31/2019
TEST #: D191713

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

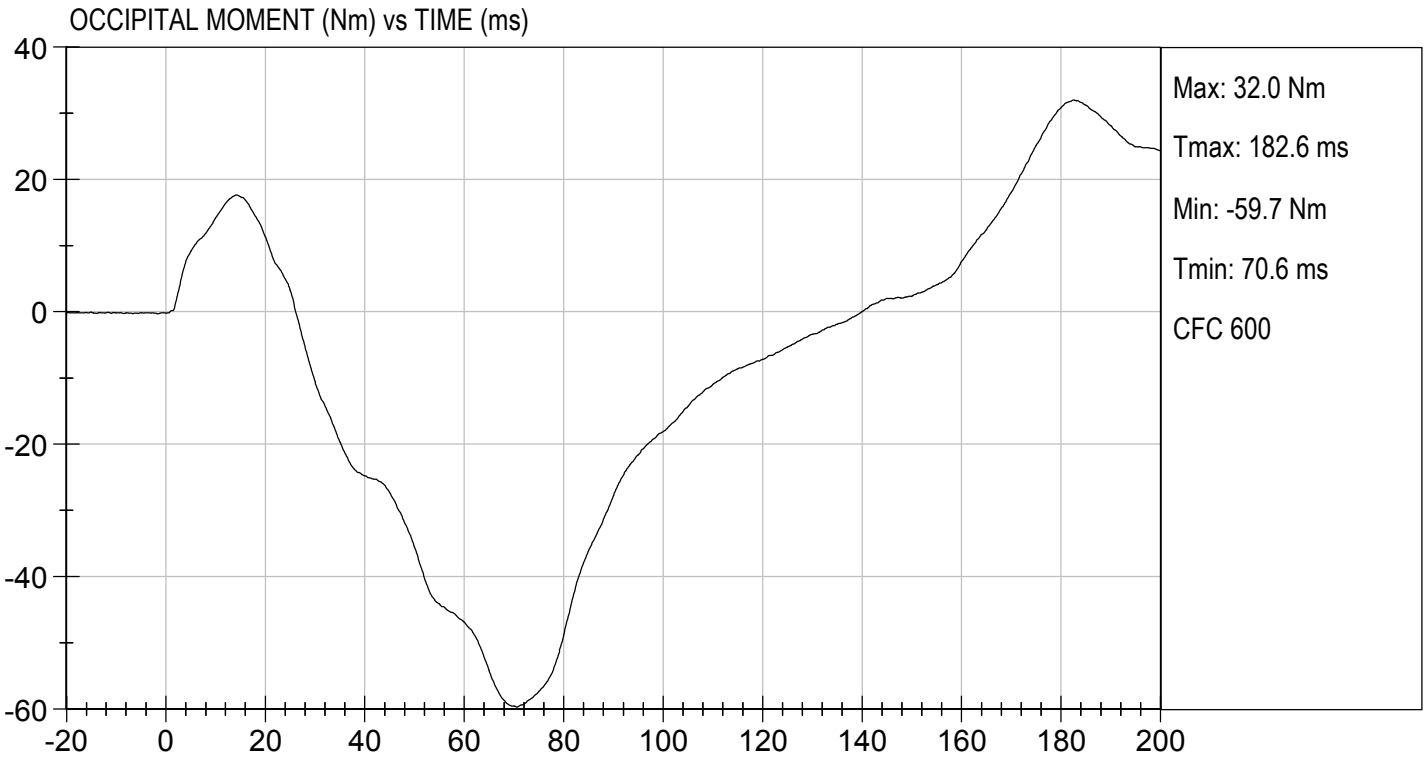


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 05/31/2019
TEST #: D191713



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** 191714

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	51	Pass
Probe Velocity	m/s	6.58 to 6.82	6.60	Pass
Peak Probe Force	N	5159 to 5893	5,568	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.77	Pass
Internal Hysteresis	%	69 to 85	71	Pass
		Overall Test Results		Pass

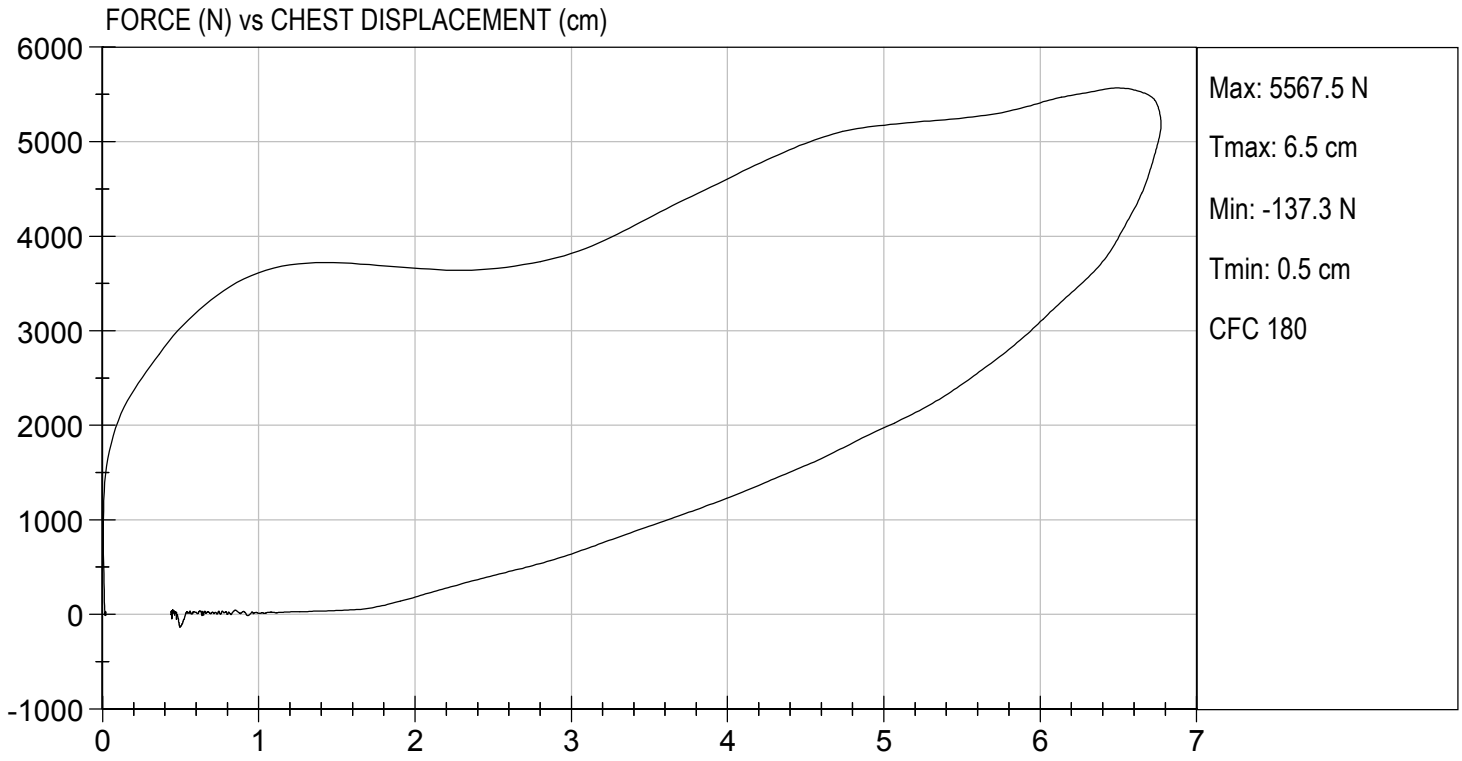
Jacob D Taylor
Laboratory Technician

06/03/2019
Test Date

Approved By

TEST DESC: THORAX IMPACT
VELOCITY: 21.65 ft/s, 6.60 m/s

TEST DATE: 06/03/2019
TEST #: 191714



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D191715

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	52	Pass
Probe Velocity	m/s	2.07 to 2.13	2.10	Pass
Peak Probe Force	N	4715 to 5782	4,726	Pass
		Overall Test Results		Pass

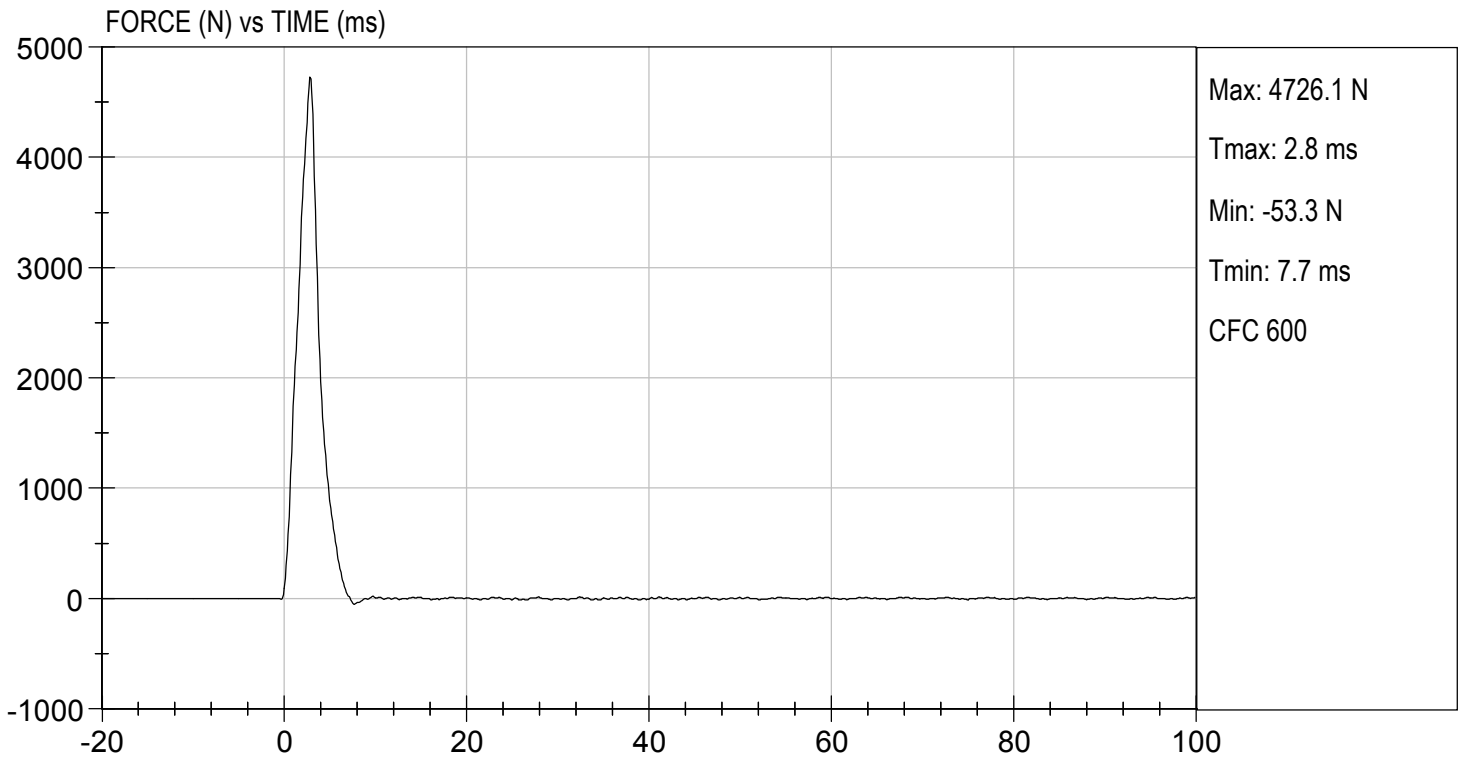
Danielle Redinbaugh
Laboratory Technician

05/31/2019
Test Date

Approved By

TEST DESC: RIGHT KNEE
VELOCITY: 6.89 ft/s, 2.10 m/s

TEST DATE: 05/31/2019
TEST #: D191715



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D191716

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	52	Pass
Probe Velocity	m/s	2.07 to 2.13	2.11	Pass
Peak Probe Force	N	4715 to 5782	5,259	Pass
		Overall Test Results		Pass

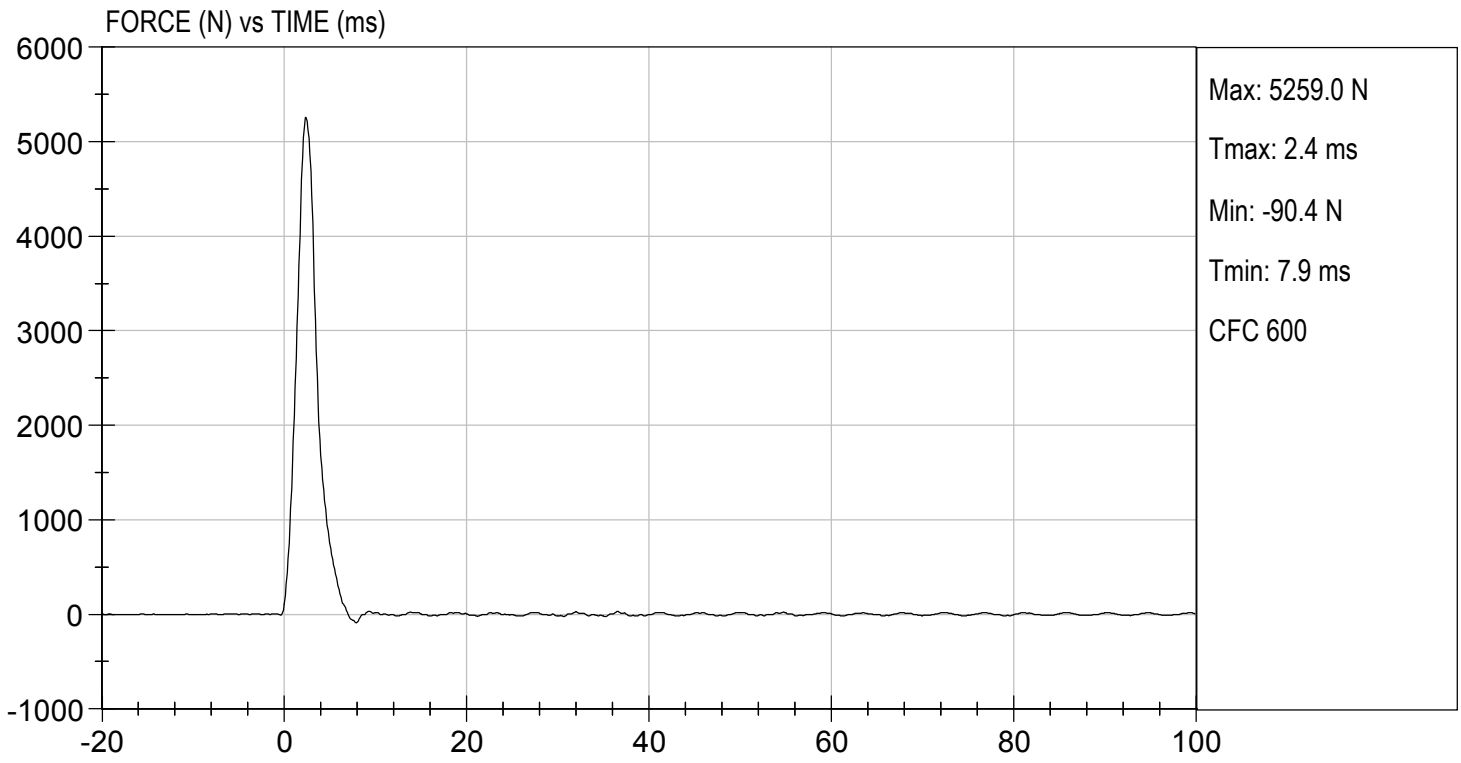
Danielle Redinbaugh
Laboratory Technician

05/31/2019
Test Date

Approved By

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

TEST DATE: 05/31/2019
TEST #: D191716



MGA RESEARCH CORPORATION

HIP-FEMUR FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D191710

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	52	52	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.5	6.5	Pass
30 Degrees	Nm	94.9 Nm Max	79.2	85.7	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	47.5	44.2	Pass
		Overall Test Results			Pass

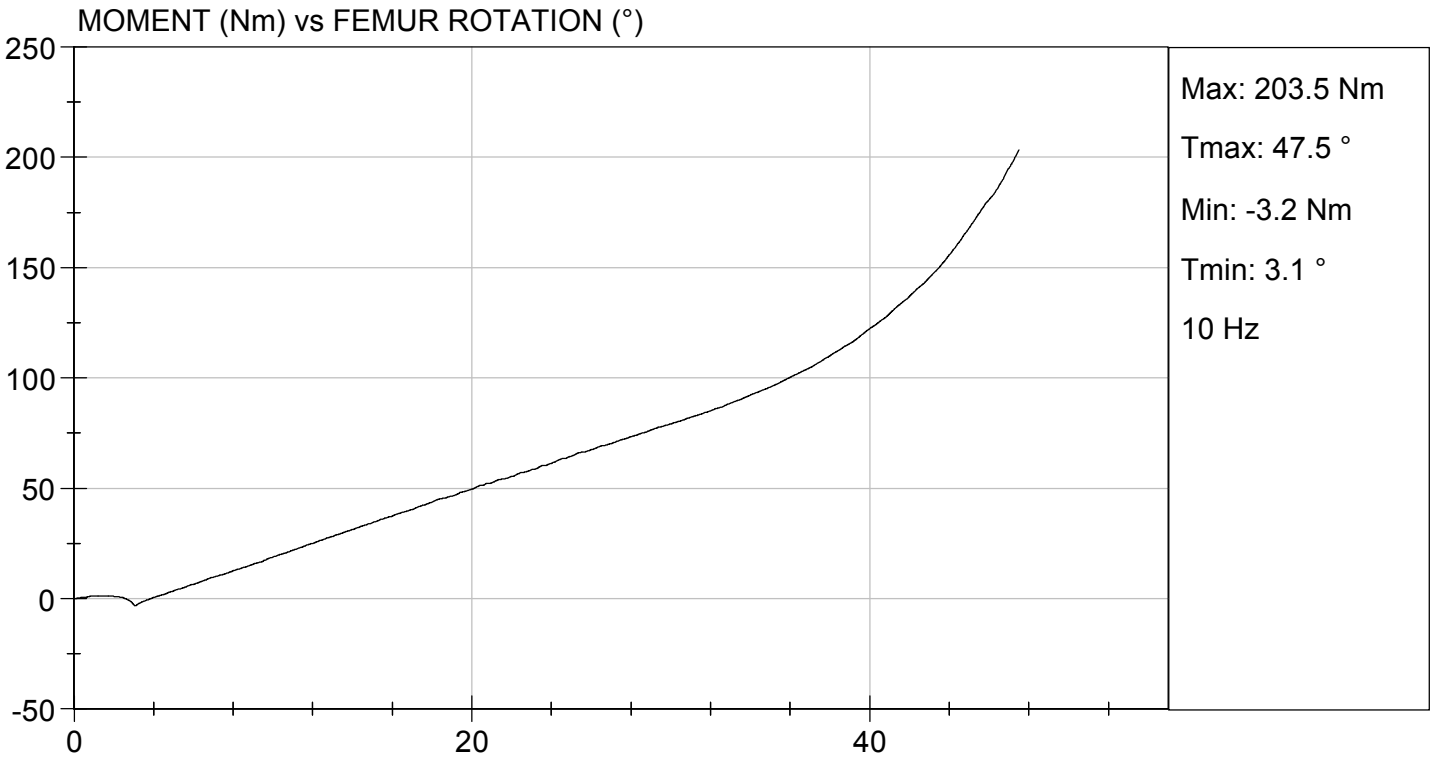
Laboratory Technician

05/31/2019
Test Date

Approved By

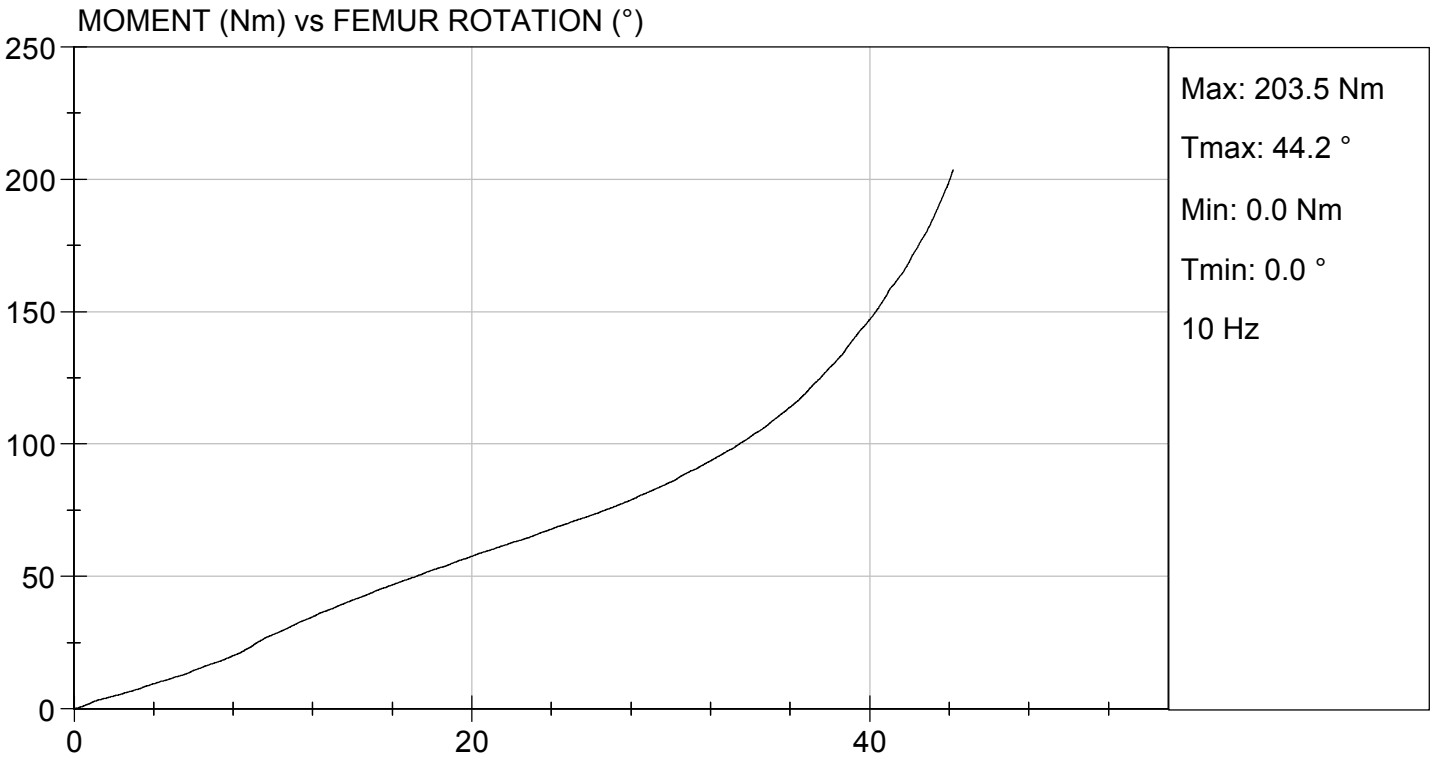
TEST DESC: RIGHT HIP FEMUR FLEXION

TEST DATE: 05/31/2019
TEST #: D191719



TEST DESC: LEFT HIP FEMUR FLEXION

TEST DATE: 05/31/2019
TEST #: D191710



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 **Test ID:** D191821

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Peak Resultant Acceleration	G's	225 to 275	254	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-1.8	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Danielle Redinbaugh
Laboratory Technician

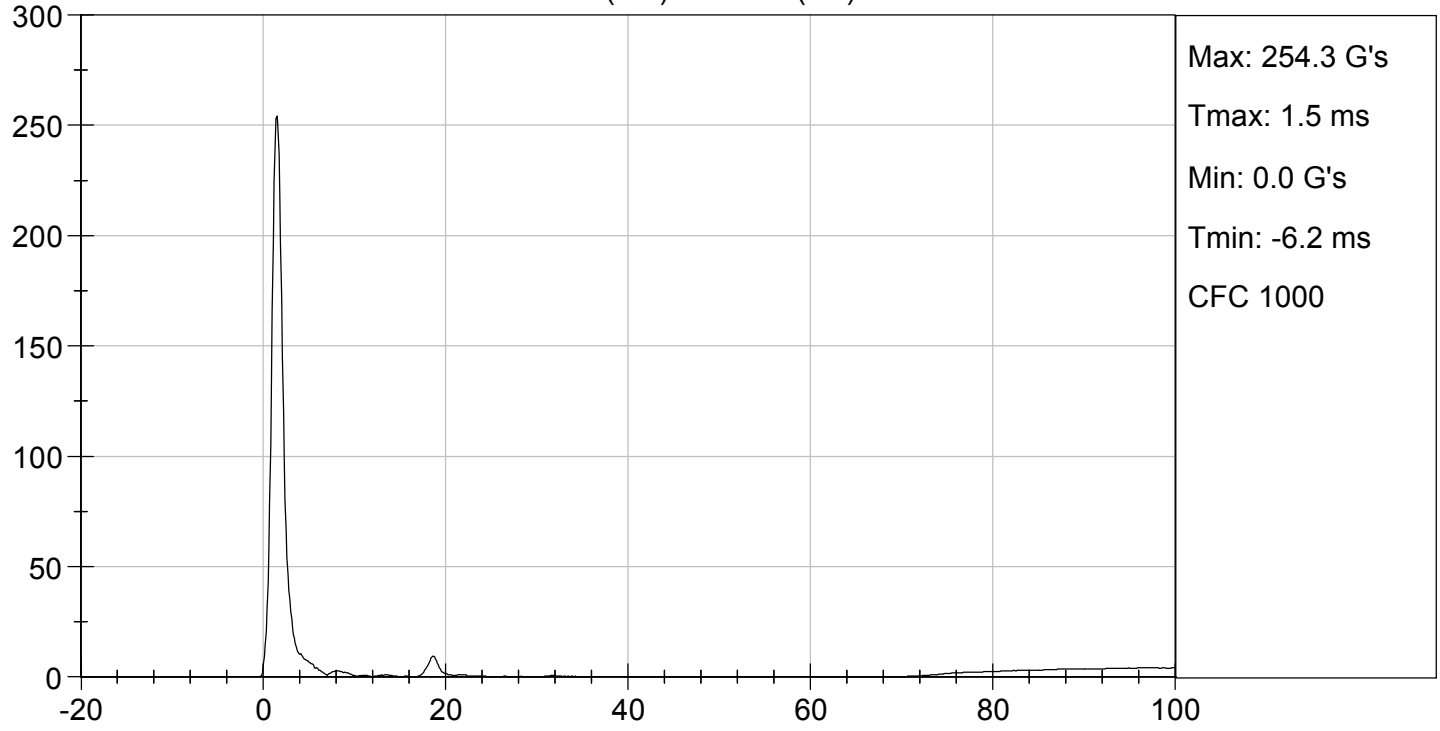
06/10/2019
Test Date

Approved By

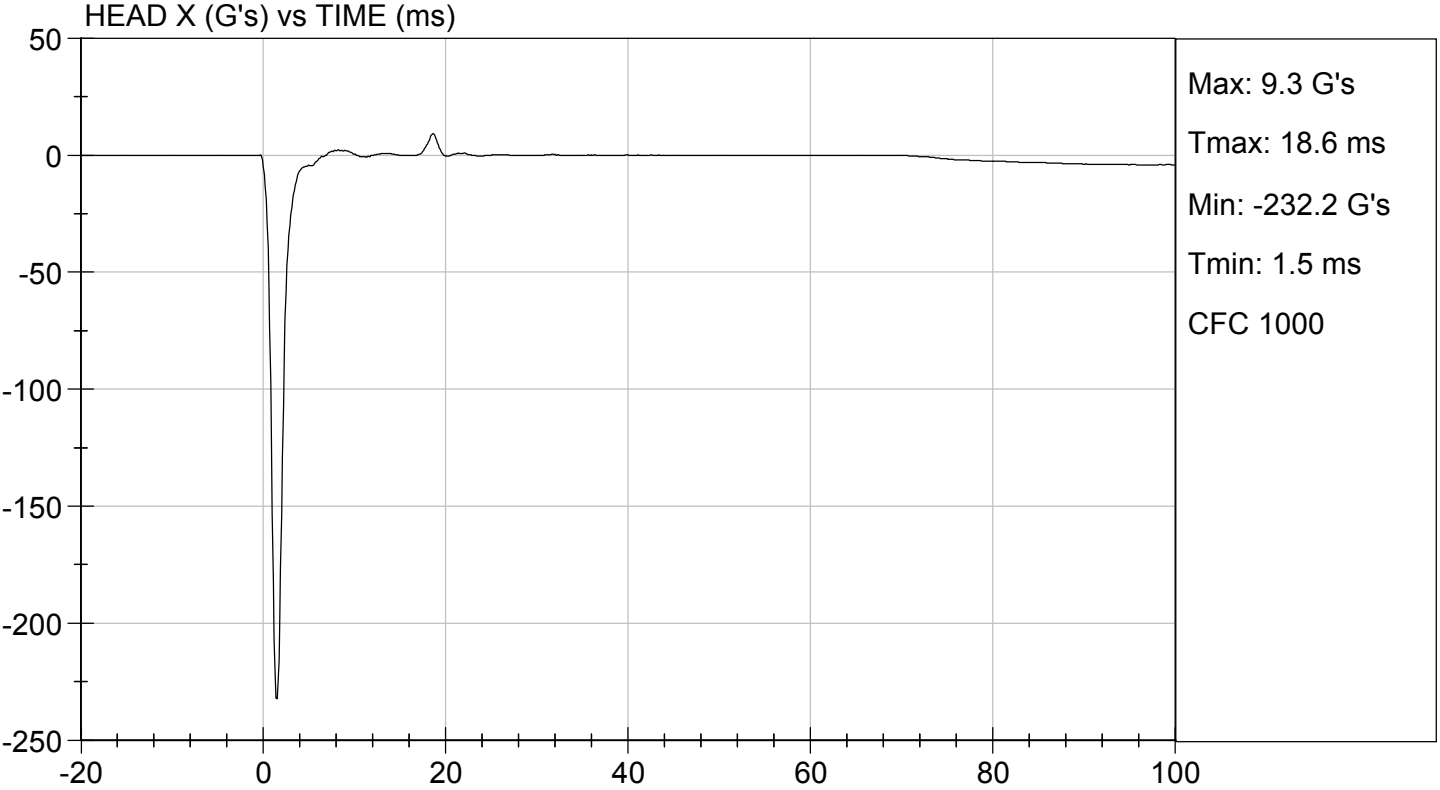
TEST DESC: HEAD DROP

TEST DATE: 06/10/2019
TEST #: D191821

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

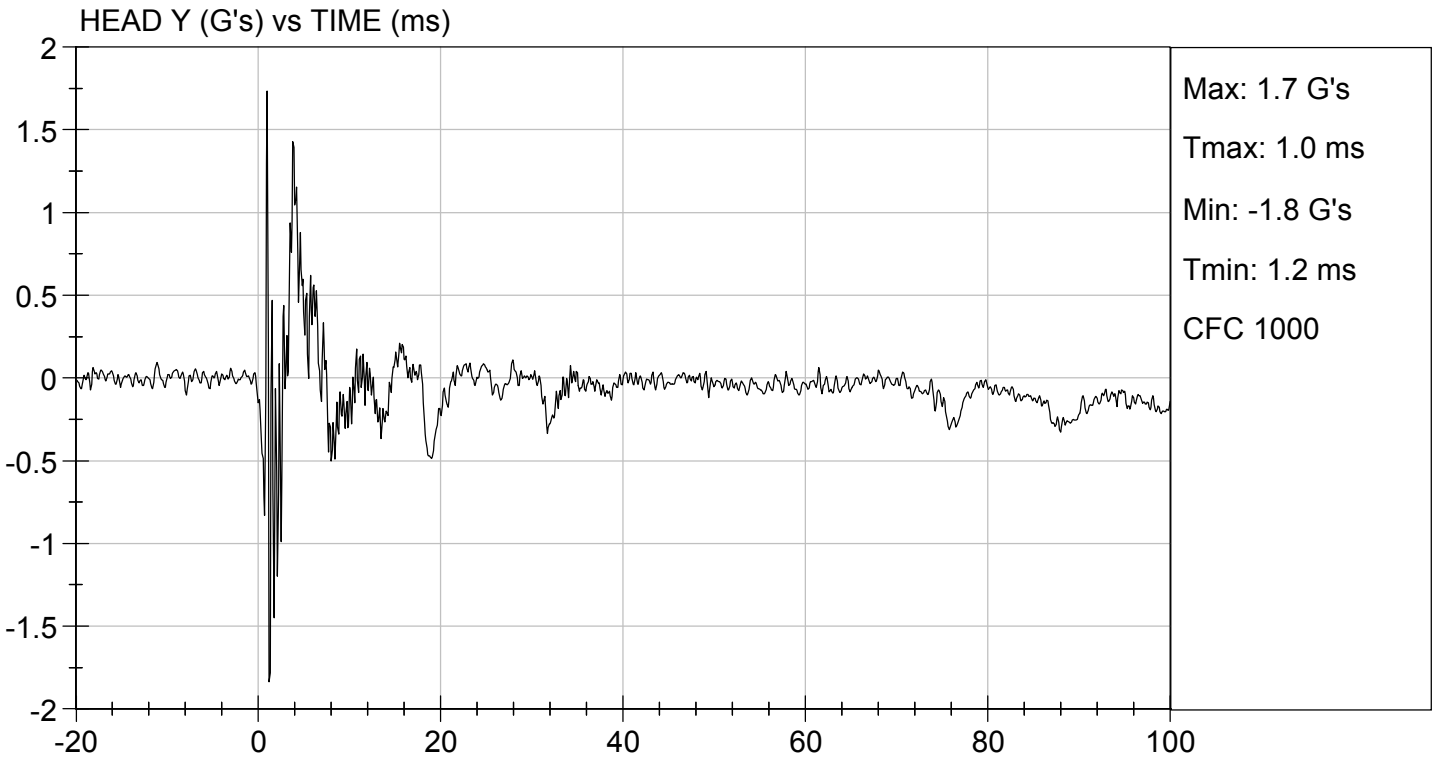


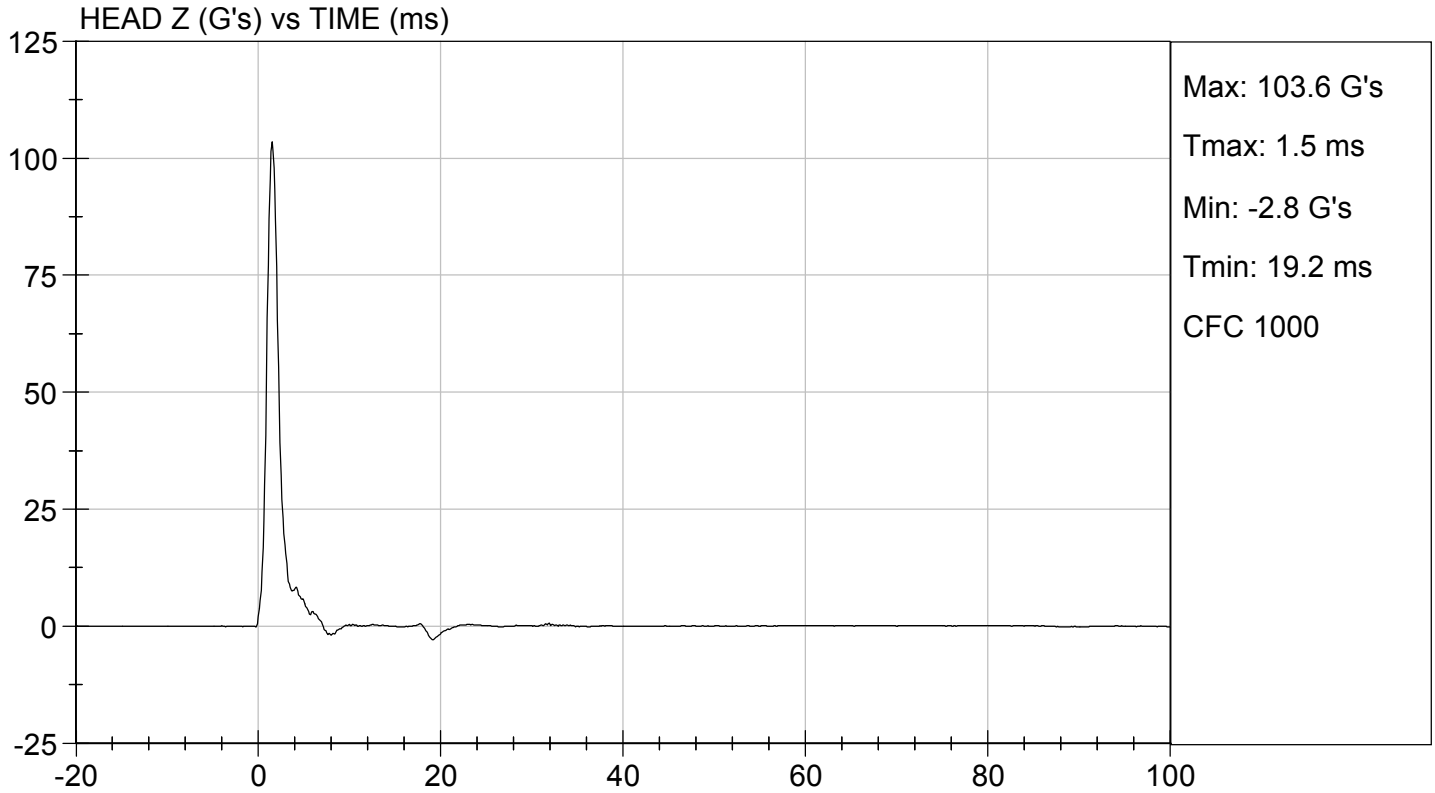
HEAD X (G's) vs TIME (ms)



TEST DESC: HEAD DROP

TEST DATE: 06/10/2019
TEST #: D191821





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D191822

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity		%	10 to 70	47	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.96	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	22.78	Pass
	20 ms	G's	17.60 to 22.60	19.95	Pass
	30 ms	G's	12.50 to 18.50	15.37	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	15.6	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	37.3	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	70.8	Pass
	Time	ms	57.0 to 64.0	58.7	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	117.4	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	89.3	Pass
	Time	ms	47.0 to 58.0	49.7	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	99.9	Pass
			Overall Test Results		Pass

Danielle Redinbaugh
Laboratory Technician

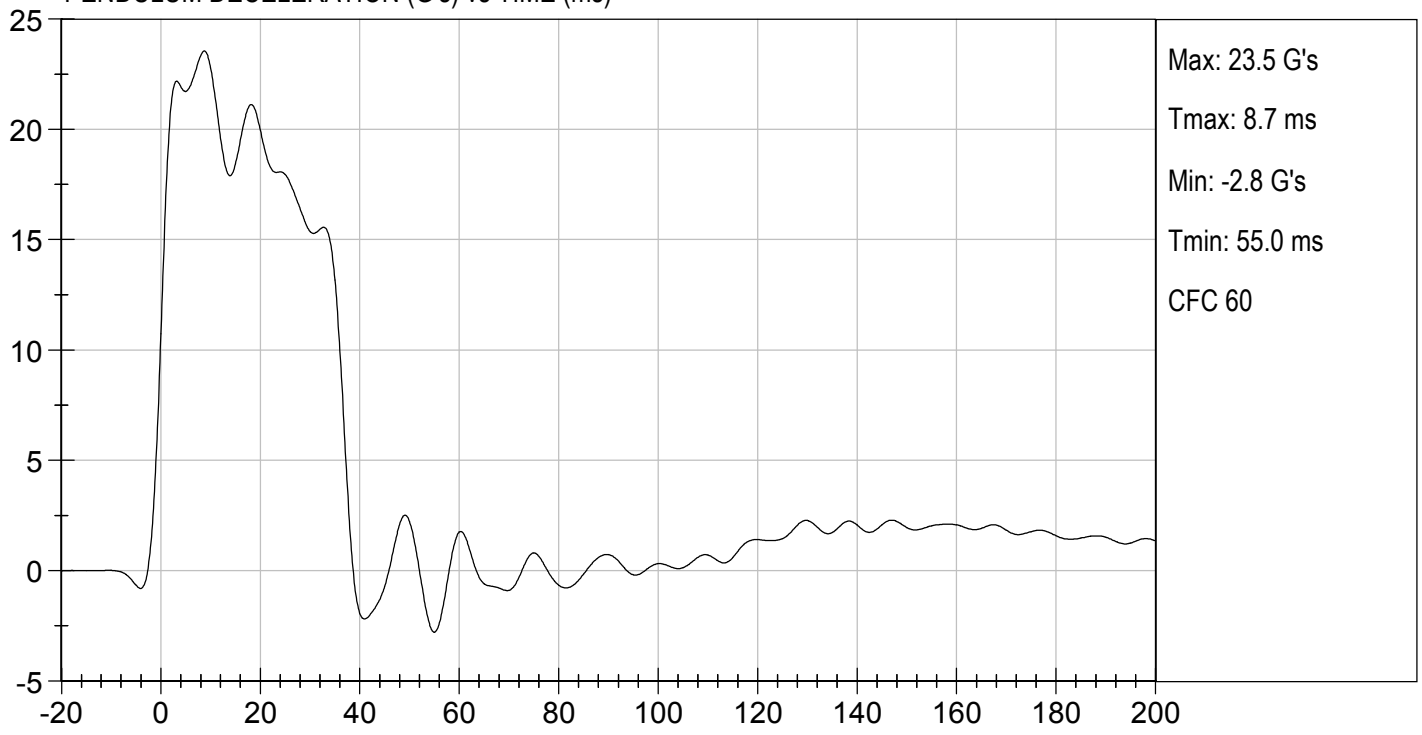
06/10/2019
Test Date

Approved By

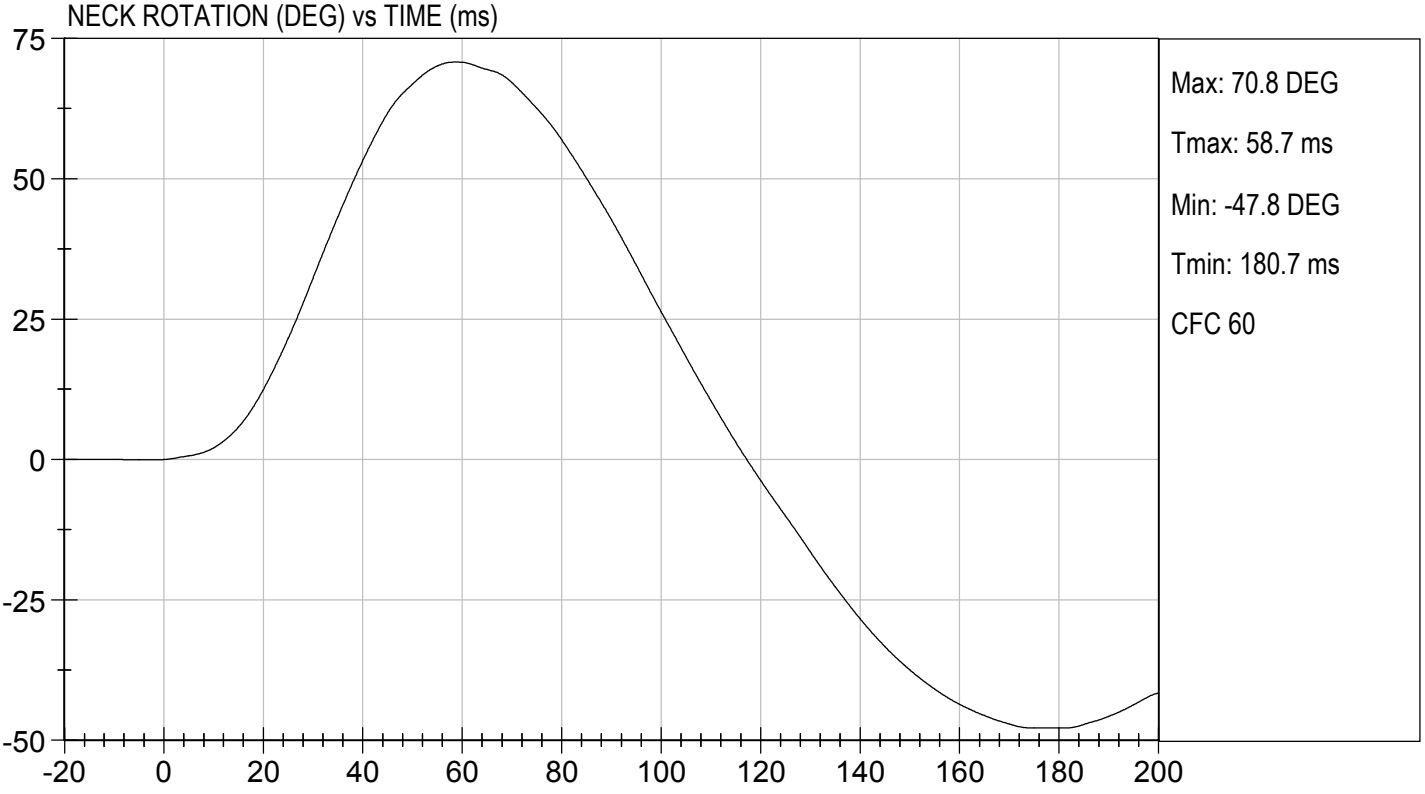
TEST DESC: NECK FLEXION
VELOCITY: 22.83 ft/s, 6.96 m/s

TEST DATE: 06/10/2019
TEST #: D191822

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

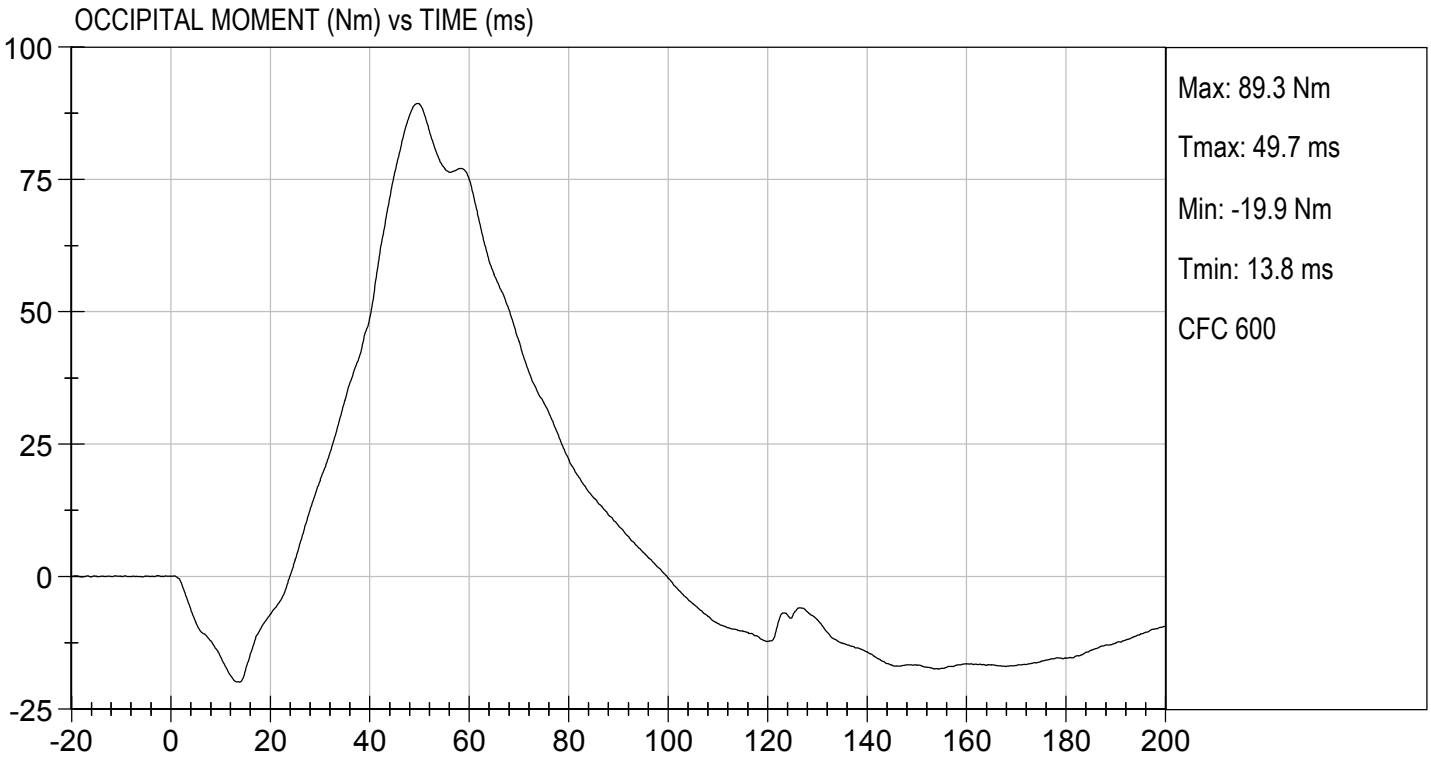


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 06/10/2019
TEST #: D191822



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D191823

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity		%	10 to 70	47	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.05	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	17.59	Pass
	20 ms	G's	14.00 to 19.00	14.82	Pass
	30 ms	G's	11.00 to 16.00	13.21	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	14.3	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	40.7	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	95.4	Pass
	Time	ms	72.0 to 82.0	76.8	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	157.1	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-61.3	Pass
	Time	ms	65.0 to 79.0	69.8	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	139.8	Pass
			Overall Test Results		Pass

Danielle Redenbaugh

Laboratory Technician

06/10/2019

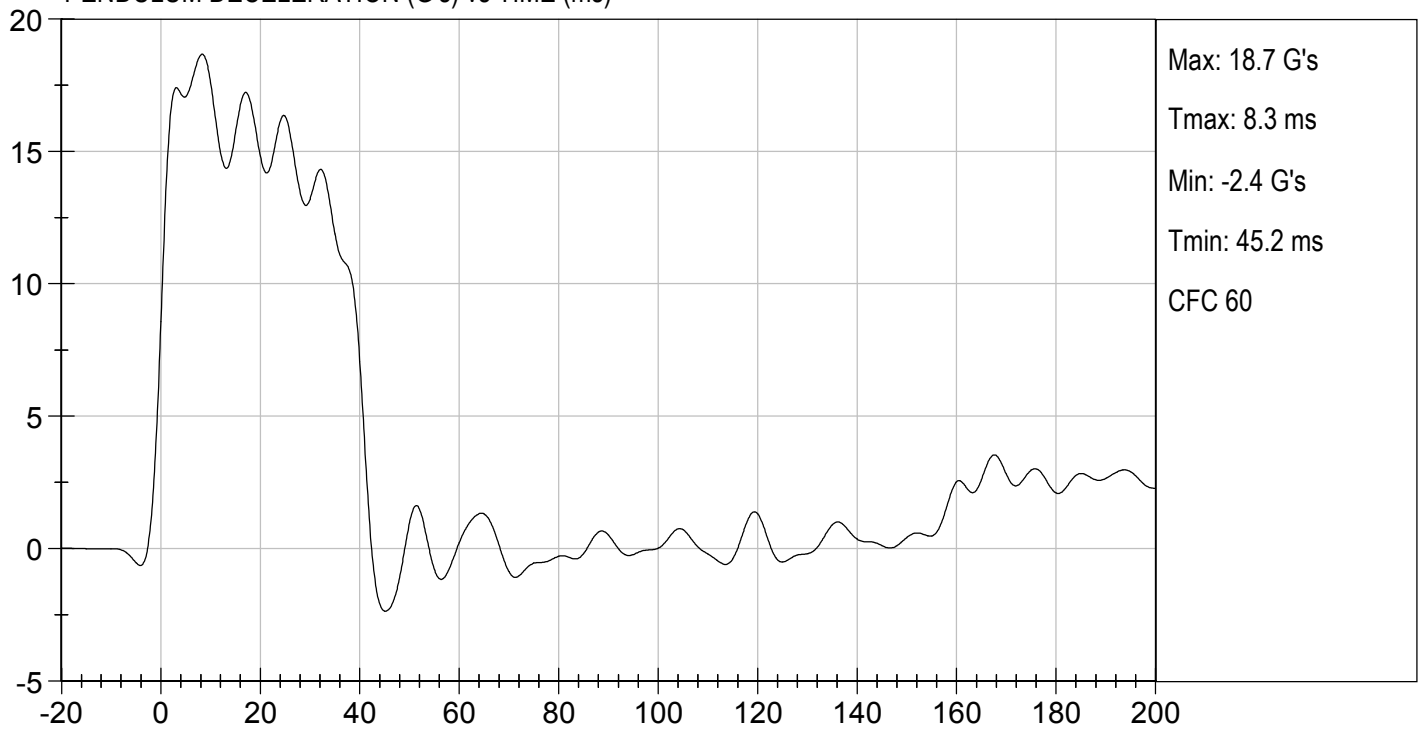
Test Date

Approved By

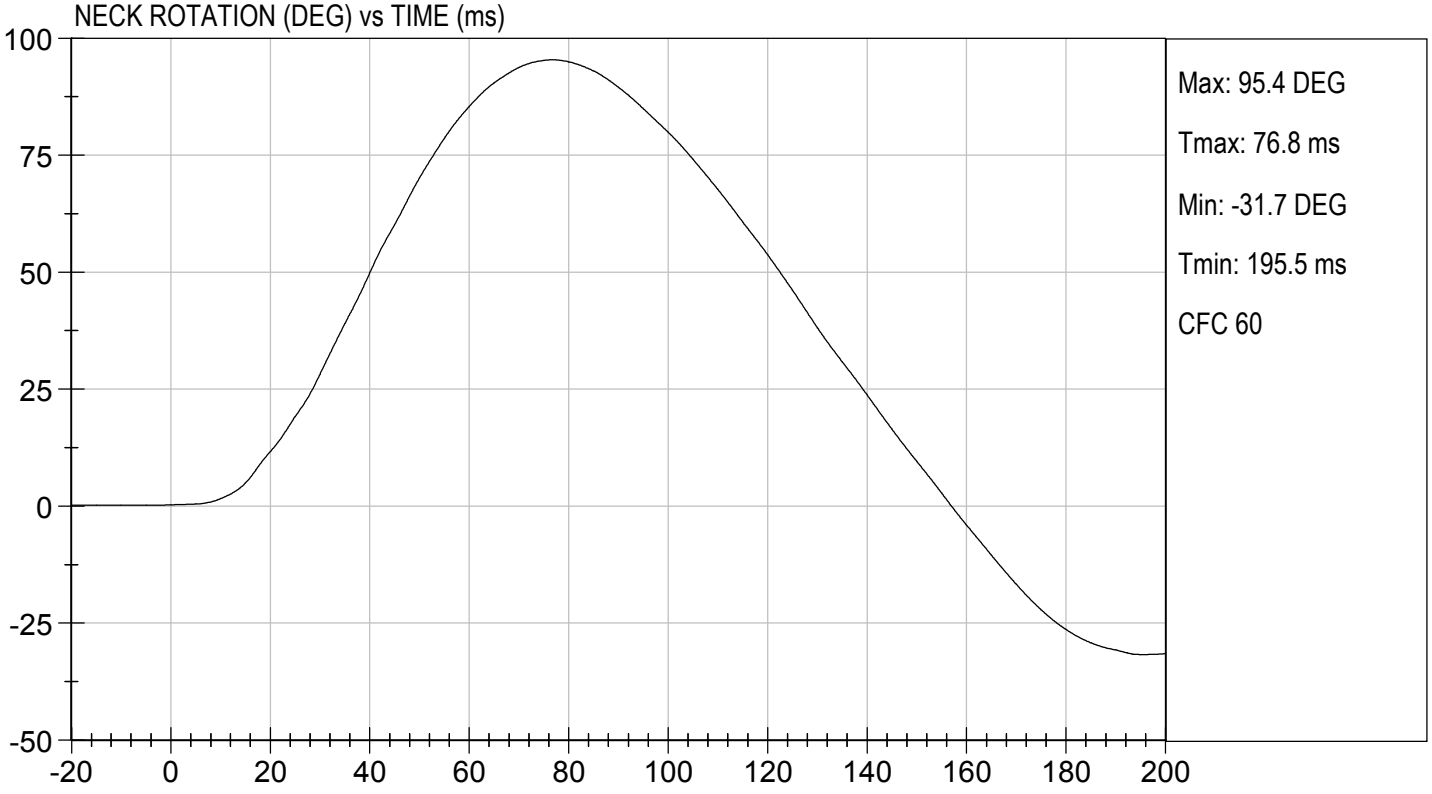
TEST DESC: NECK EXTENSION
VELOCITY: 19.84 ft/s, 6.05 m/s

TEST DATE: 06/10/2019
TEST #: D191823

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

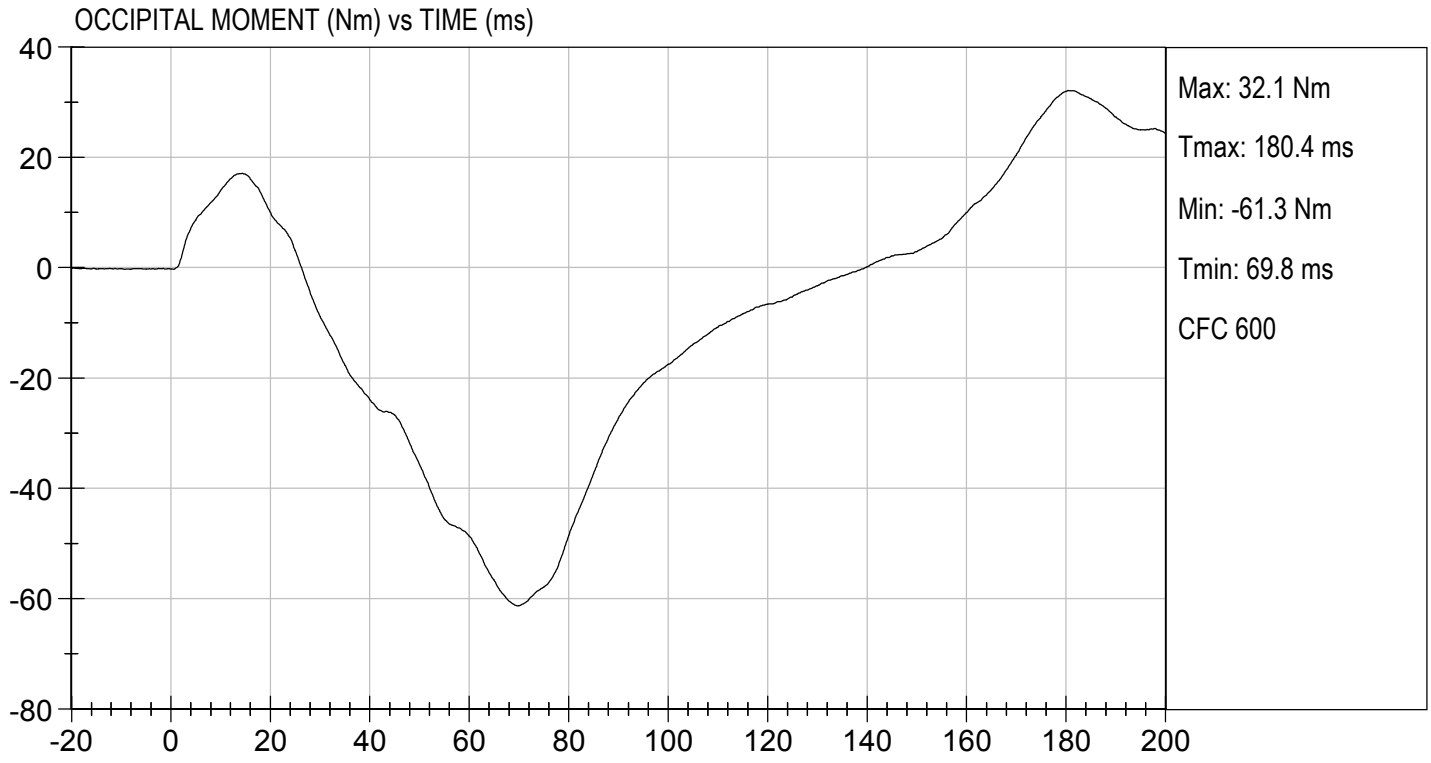


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 06/10/2019
TEST #: D191823



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D191824

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Probe Velocity	m/s	6.58 to 6.82	6.60	Pass
Peak Probe Force	N	5159 to 5893	5,362	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	7.16	Pass
Internal Hysteresis	%	69 to 85	69	Pass
		Overall Test Results		Pass

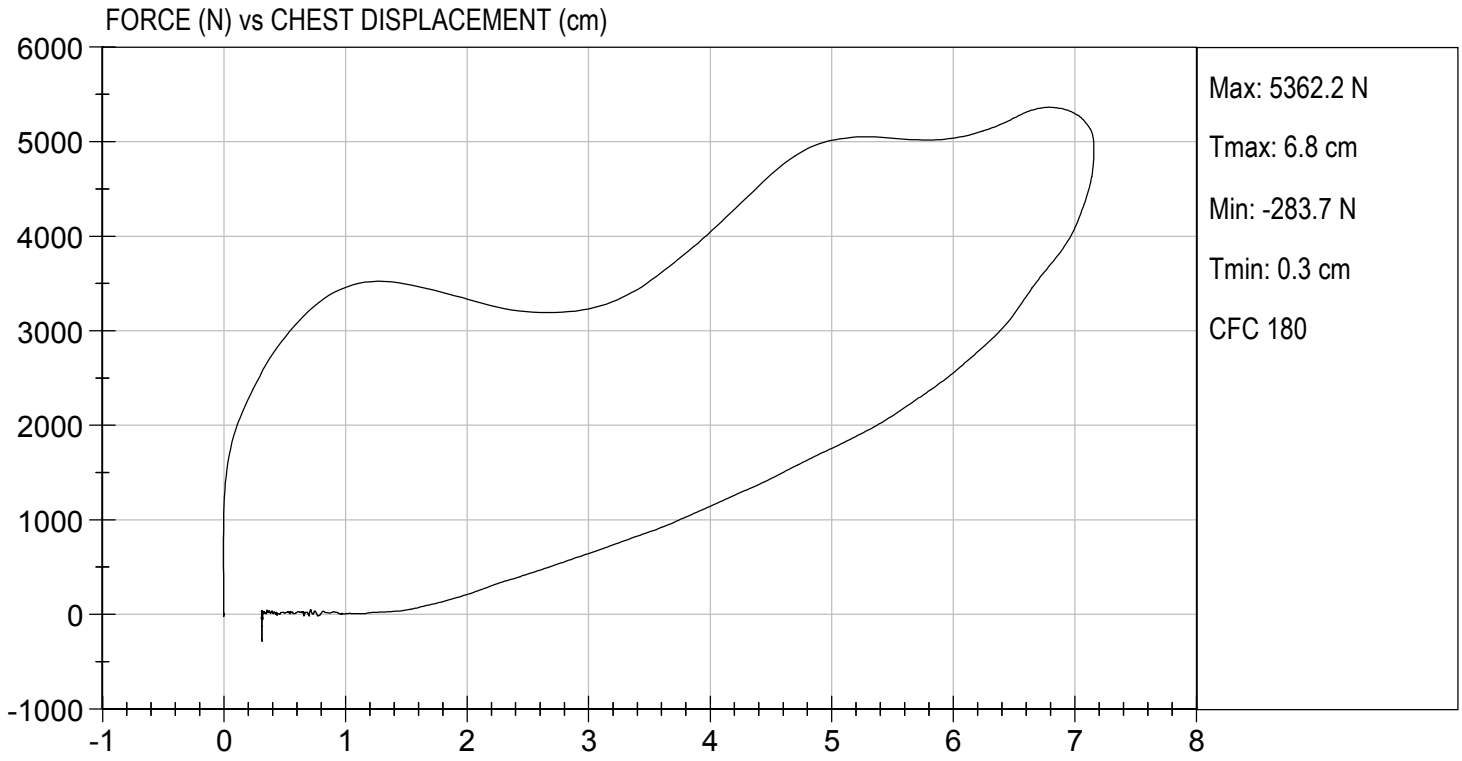
Danielle Redinbaugh
Laboratory Technician

06/07/2019
Test Date

Approved By

TEST DESC: THORAX IMPACT
VELOCITY: 21.65 ft/s, 6.60 m/s

TEST DATE: 06/07/2019
TEST #: D191824



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D191825

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Probe Velocity	m/s	2.07 to 2.13	2.07	Pass
Peak Probe Force	N	4715 to 5782	5,281	Pass
		Overall Test Results		Pass

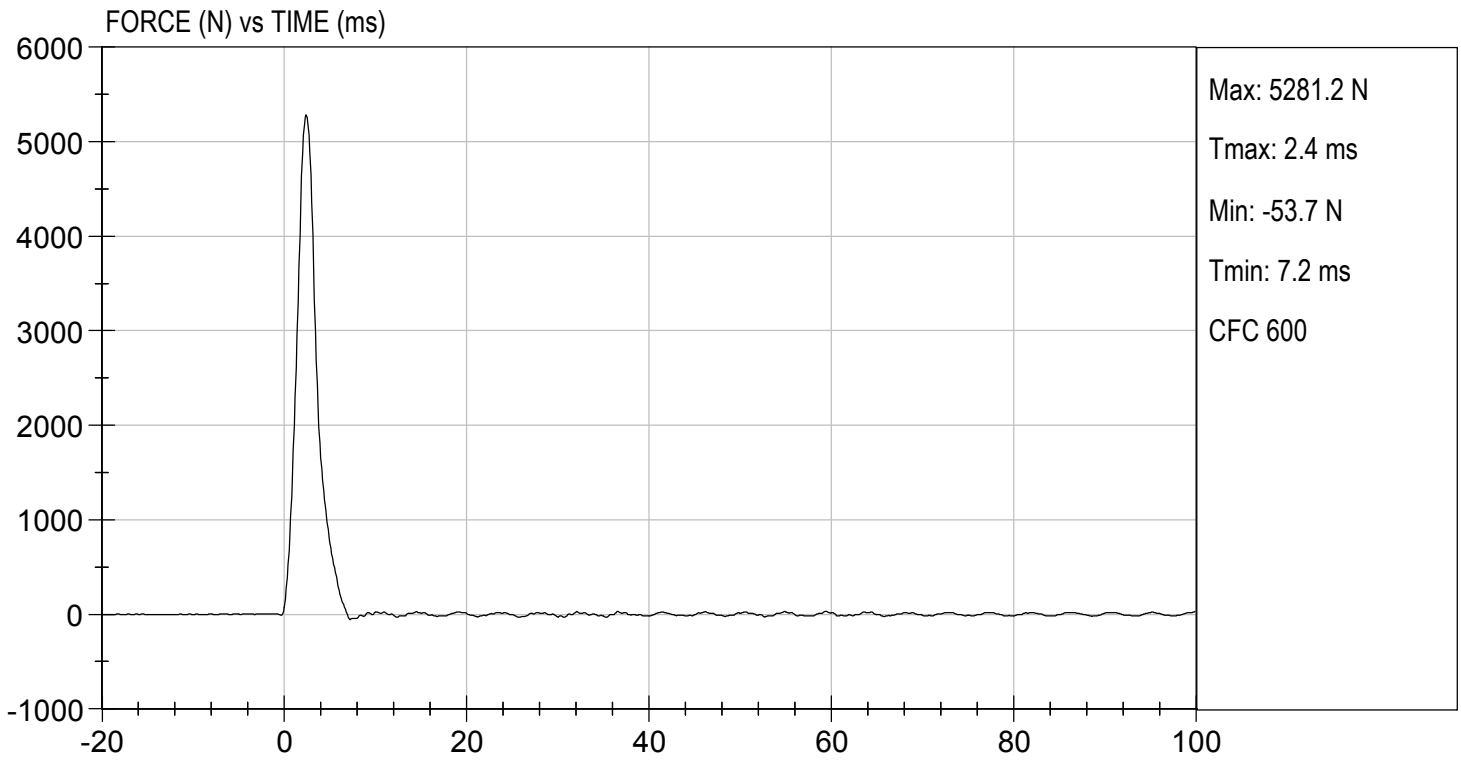
Jacob D Taylor
Laboratory Technician

06/07/2019
Test Date

Approved By

TEST DESC: RIGHT KNEE
VELOCITY: 6.78 ft/s, 2.07 m/s

TEST DATE: 06/07/2019
TEST #: D191825



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D191826

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Probe Velocity	m/s	2.07 to 2.13	2.07	Pass
Peak Probe Force	N	4715 to 5782	4,904	Pass
		Overall Test Results		Pass

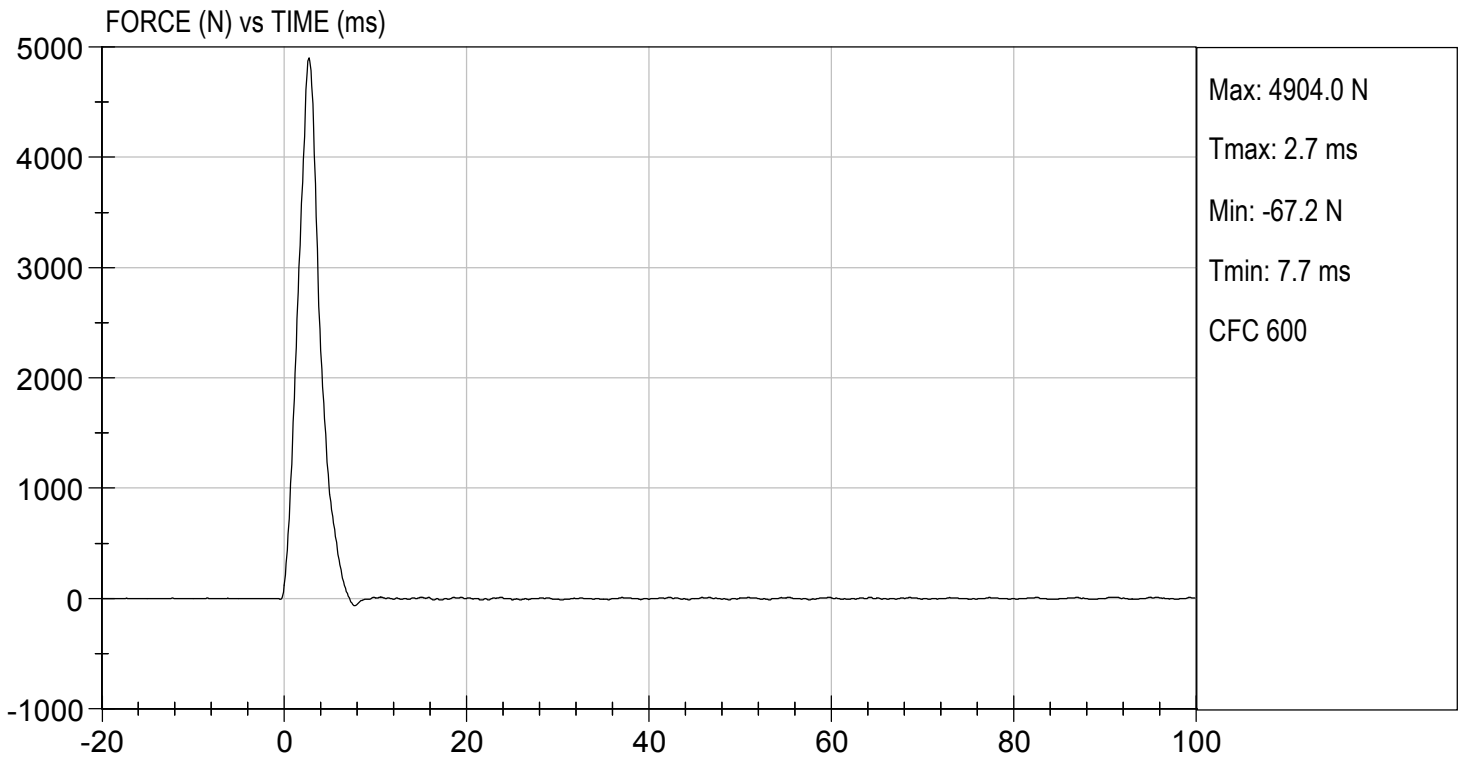
Jacob D Taylor
Laboratory Technician

06/07/2019
Test Date

Approved By

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

TEST DATE: 06/07/2019
TEST #: D191826



MGA RESEARCH CORPORATION

HIP-FEMUR FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D191820

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.5	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	47	47	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.5	6.5	Pass
30 Degrees	Nm	94.9 Nm Max	89.0	83.9	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	47.0	44.8	Pass
		Overall Test Results			Pass

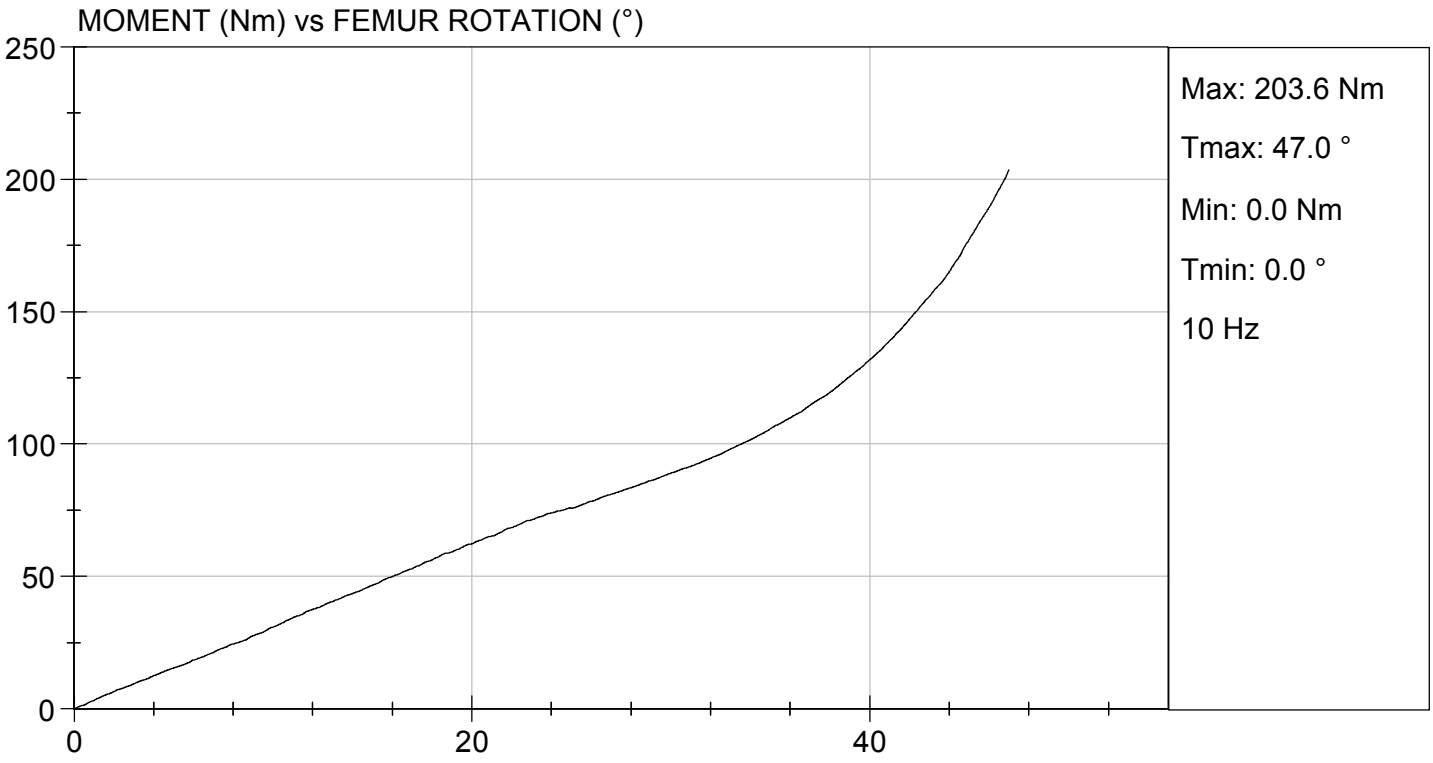
Danielle Redinbaugh
Laboratory Technician

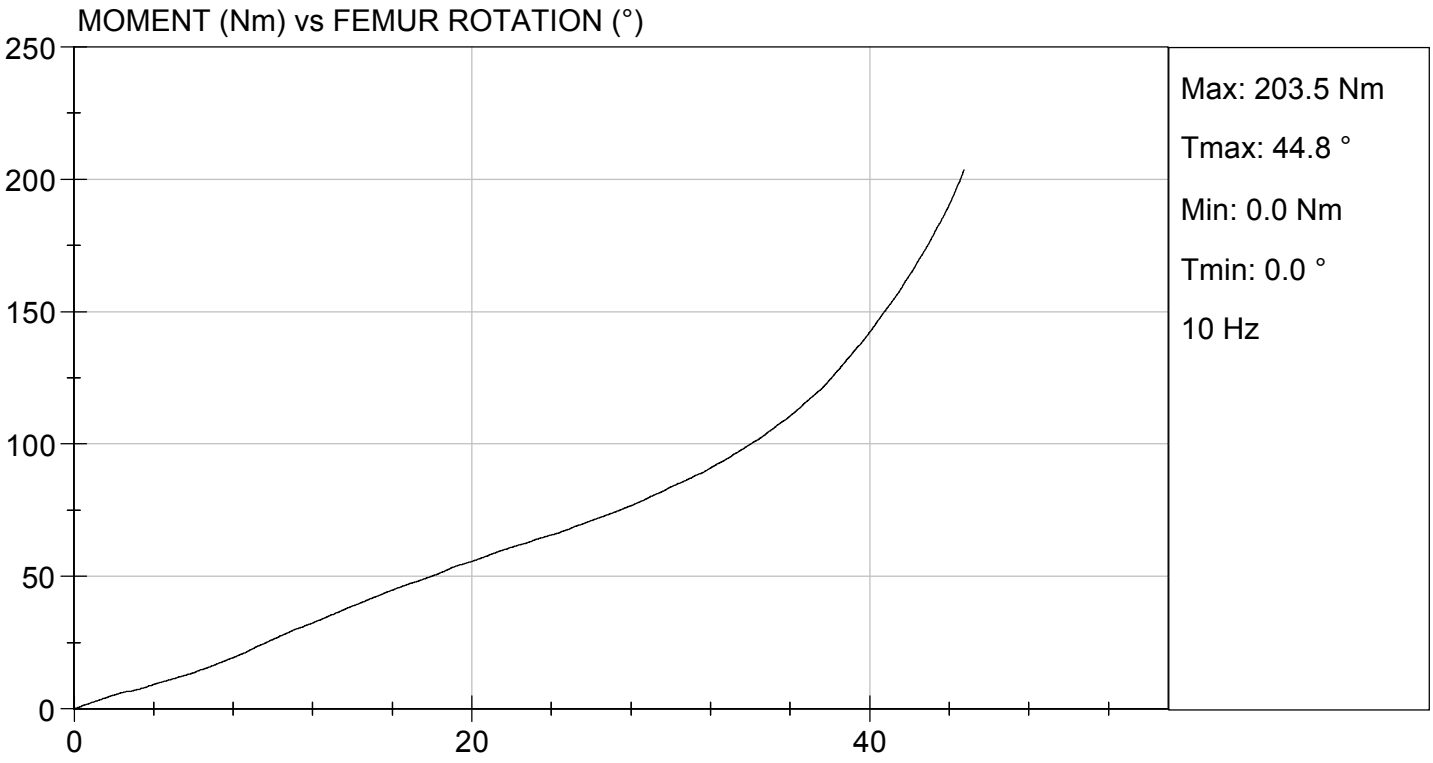
06/10/2019
Test Date

Approved By

TEST DESC: RIGHT HIP FEMUR FLEXION

TEST DATE: 06/10/2019
TEST #: D191829




MOMENT (Nm) vs FEMUR ROTATION (°)
250
200
150
100
50
0
0
20
40
Max: 203.5 Nm
Tmax: 44.8 °
Min: 0.0 Nm
Tmin: 0.0 °
10 Hz

CALIBRATION TEST RESULTS

PRE-TEST

HYBRID III 5TH PERCENTILE FEMALE - PASSENGER ATD

Hybrid III, 5th External Measurements
SN: 634

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

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

MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test ID:** D191551

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Peak Resultant Acceleration	G's	250 to 300	288	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-4.0	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Jacob D Taylor

Laboratory Technician

05/09/2019

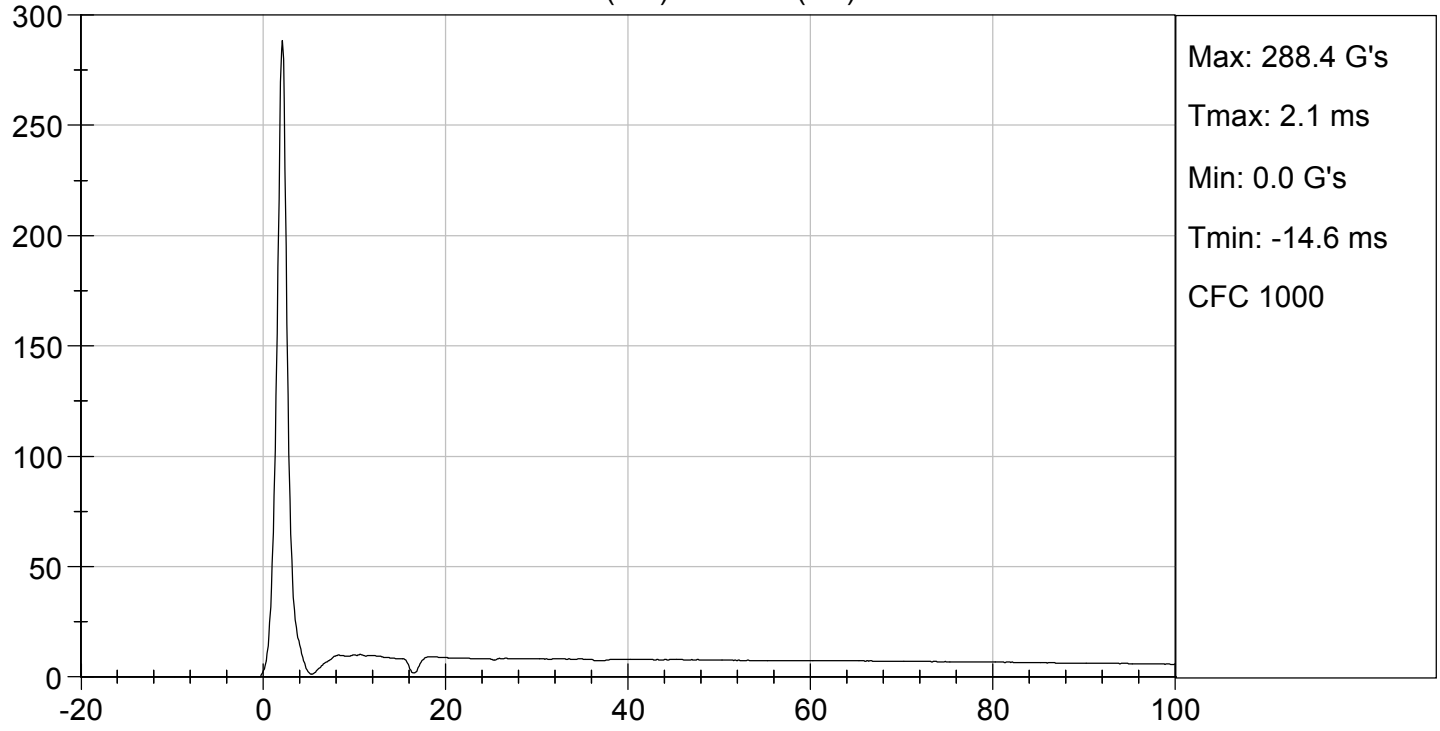
Test Date

Approved By

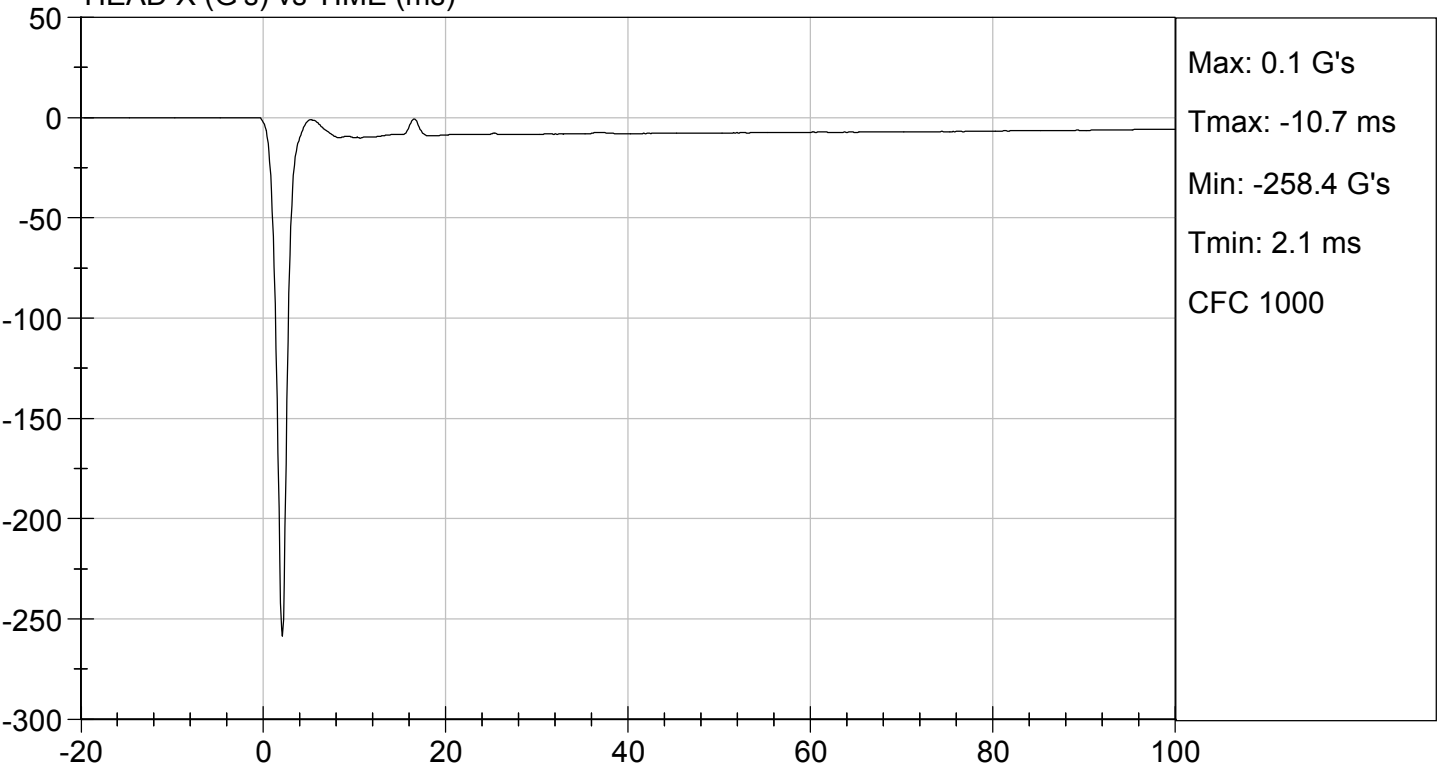
TEST DESC: HEAD DROP

TEST DATE: 05/09/2019
TEST #: D191551

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

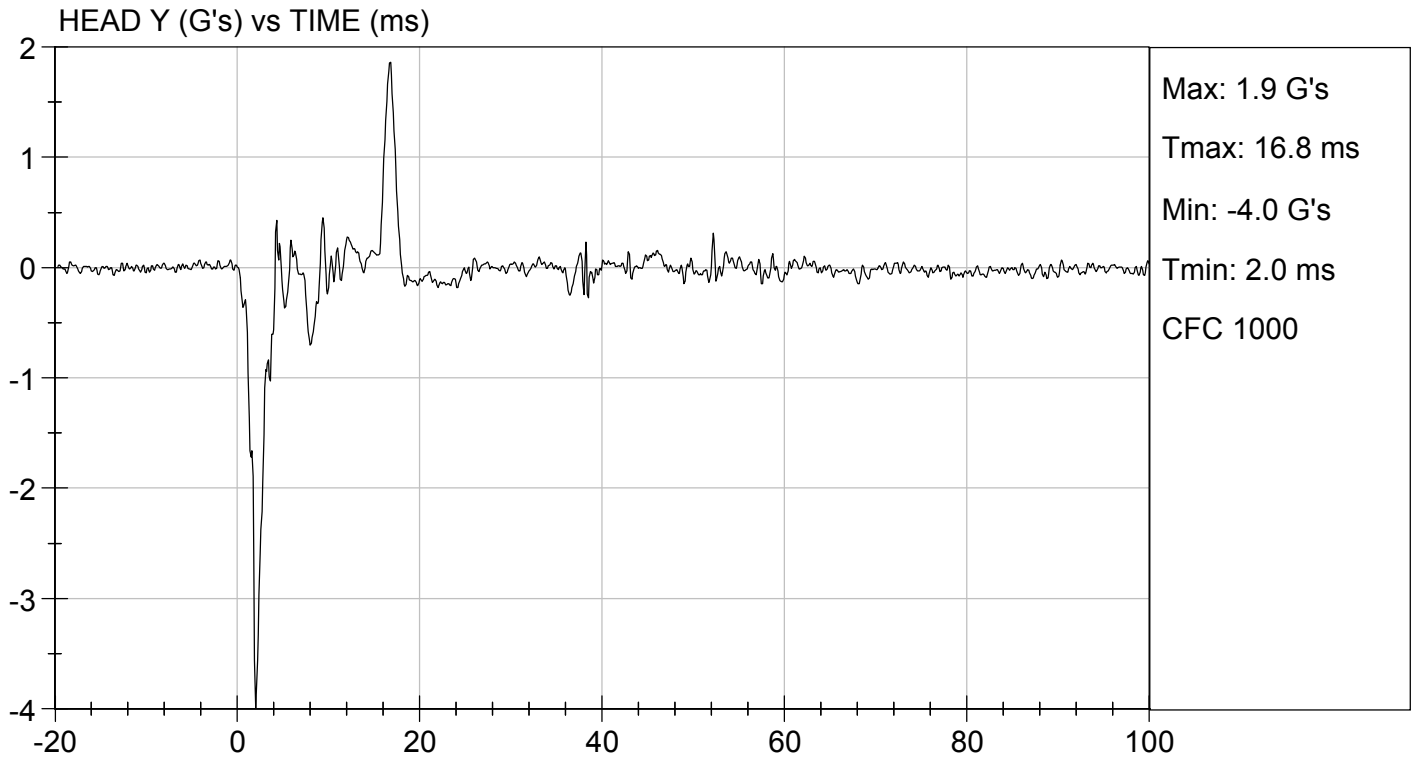


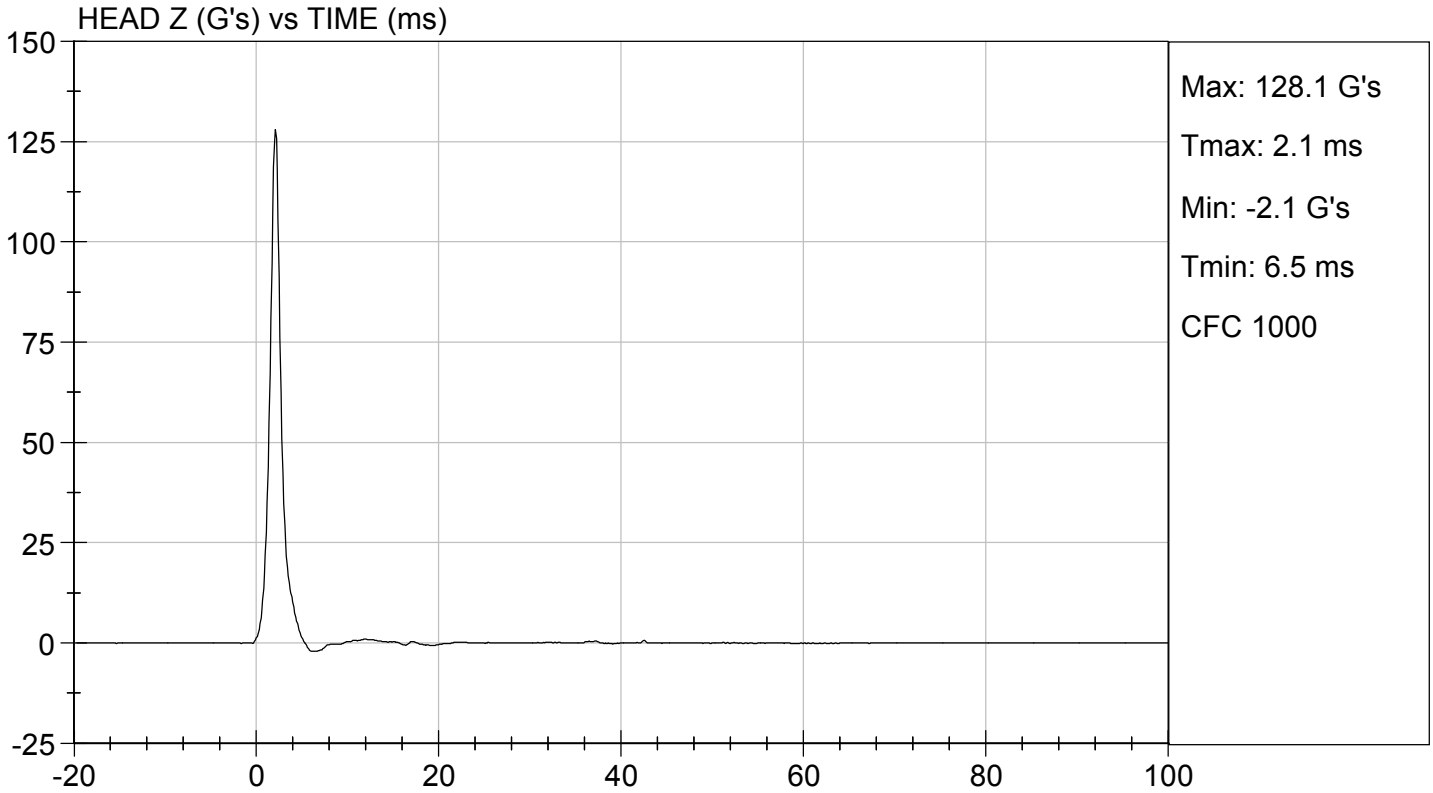
HEAD X (G's) vs TIME (ms)



TEST DESC: HEAD DROP

TEST DATE: 05/09/2019
TEST #: D191551





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D191552

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.13	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.1	Pass
	20 ms	m/s	4.0 to 5.0	4.5	Pass
	30 ms	m/s	5.8 to 7.0	6.4	Pass
D Plane Rotation	Max	deg	77 to 91	87	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	76	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	89	Pass
			Overall Results		Pass

Jacob D Taylor

Laboratory Technician

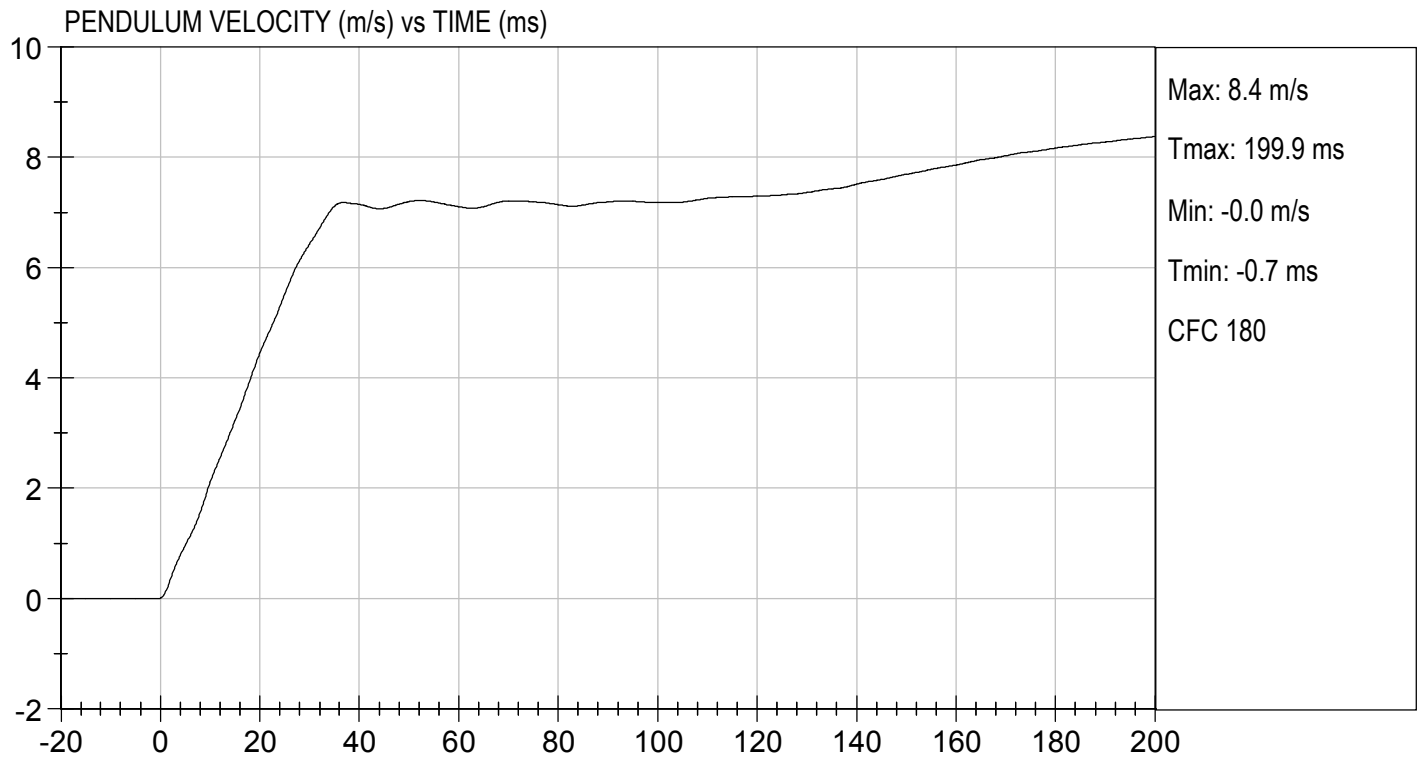
05/09/2019

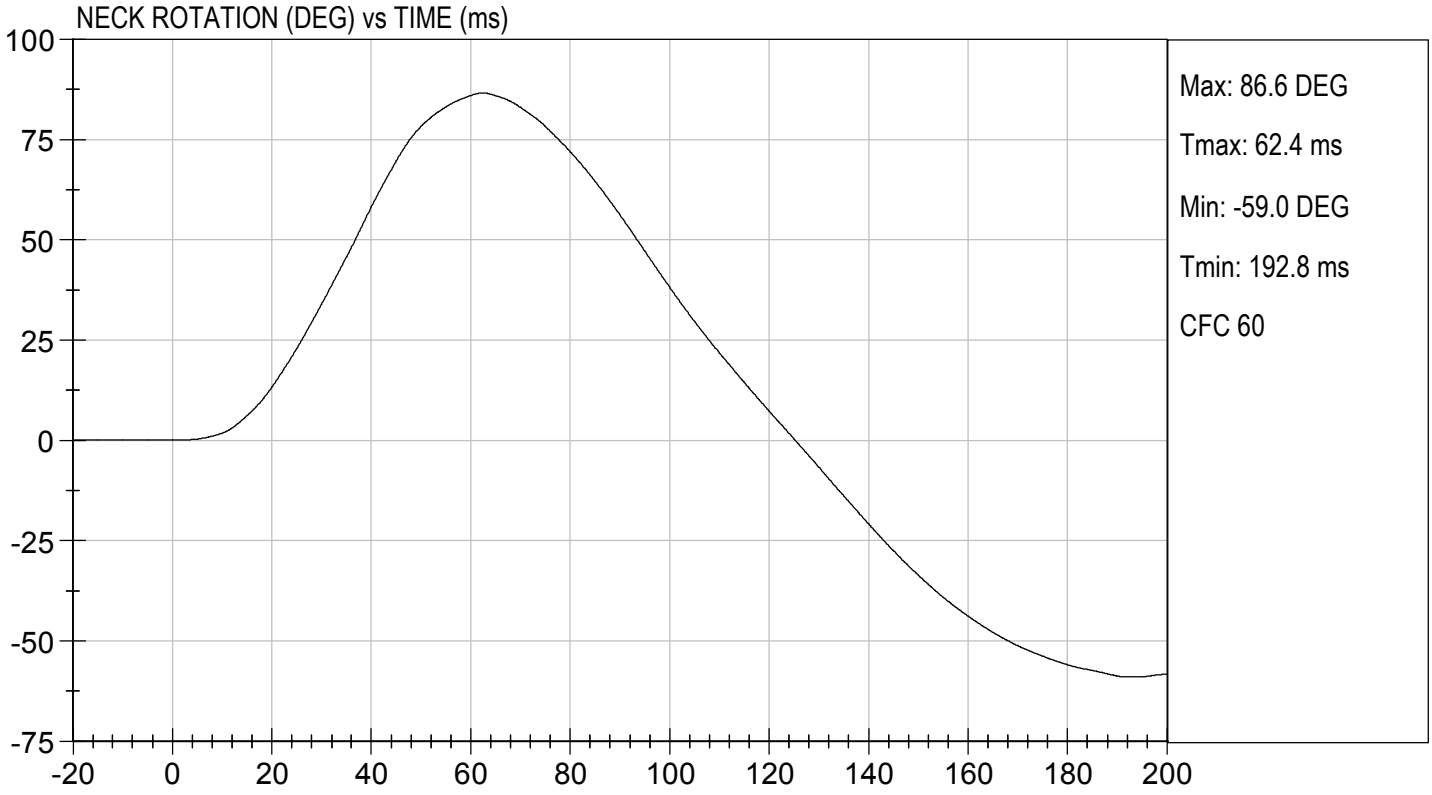
Test Date

Approved By

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

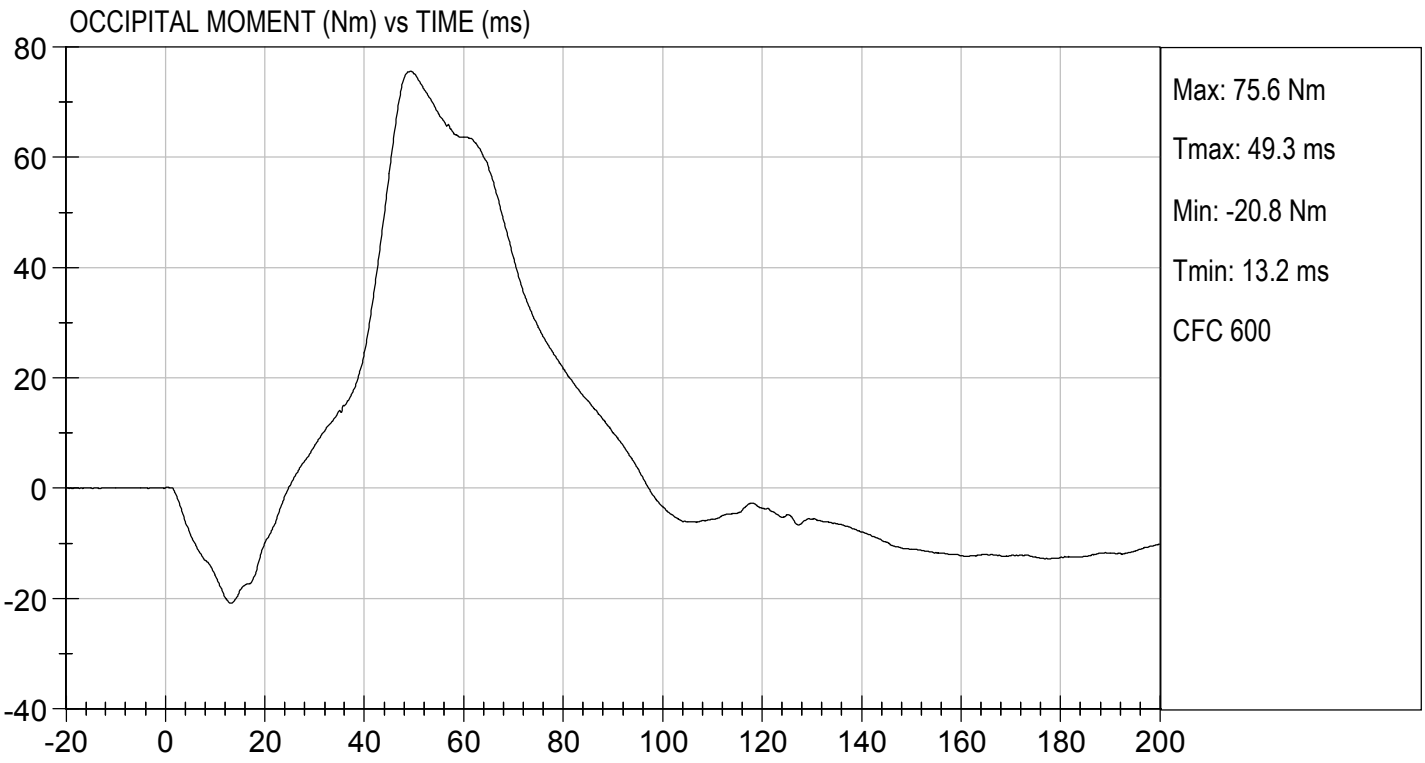
TEST DATE: 05/09/2019
TEST #: D191552





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

TEST DATE: 05/09/2019
TEST #: D191552



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D191553

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity		%	10 to 70	46	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.8	Pass
	20 ms	m/s	3.1 to 3.9	3.6	Pass
	30 ms	m/s	4.6 to 5.6	5.2	Pass
D Plane Rotation	Max	deg	99 to 114	111	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-55	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	106	Pass
			Overall Results		Pass

Jacob D Taylor

Laboratory Technician

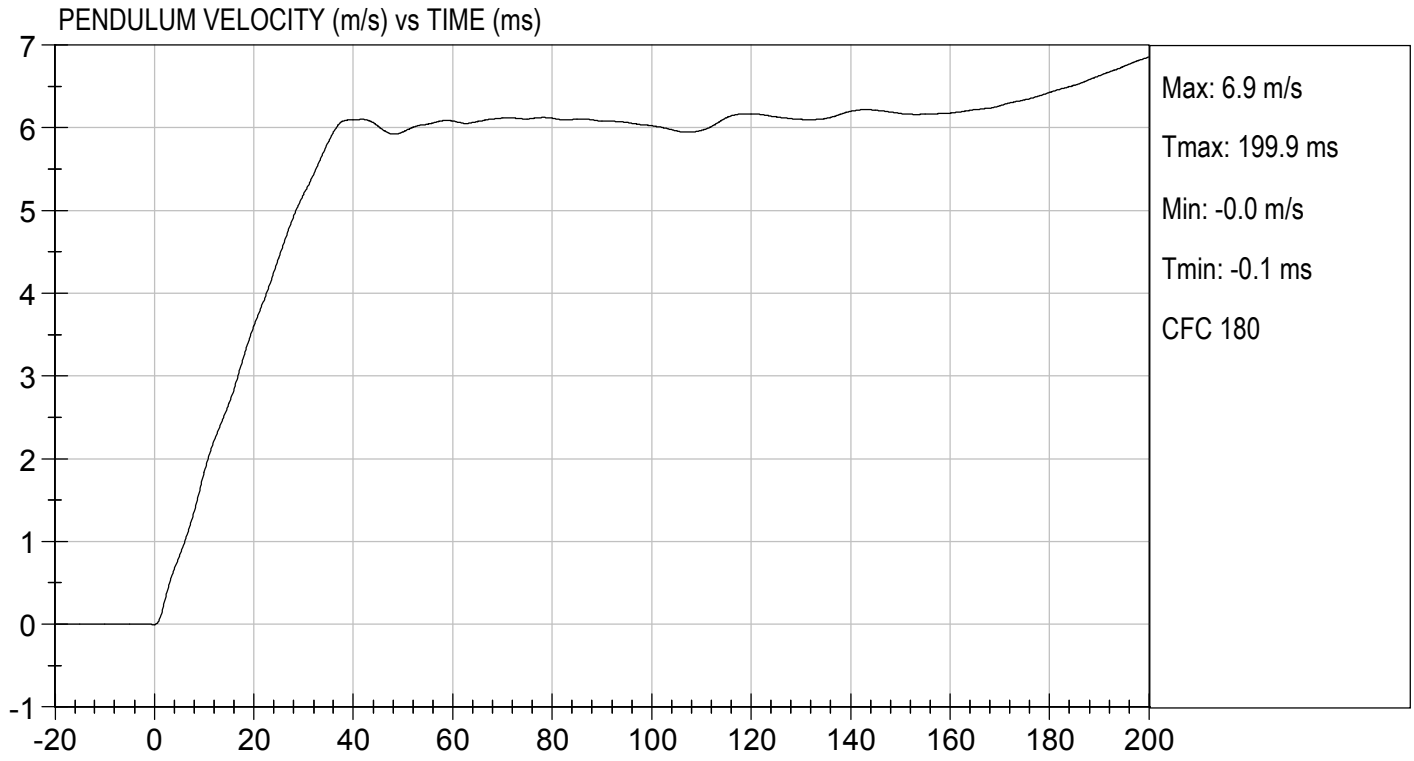
05/09/2019

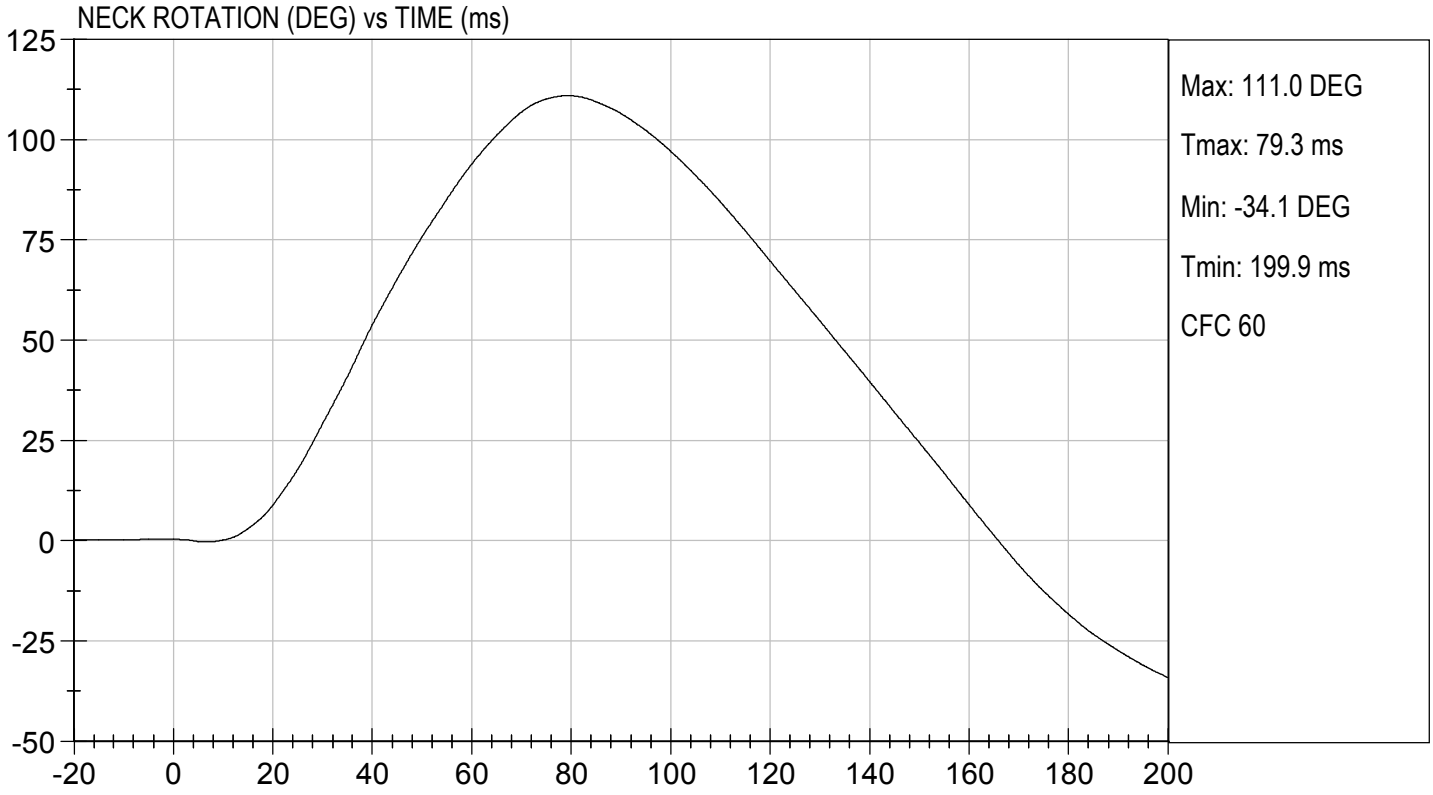
Test Date

Approved By

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

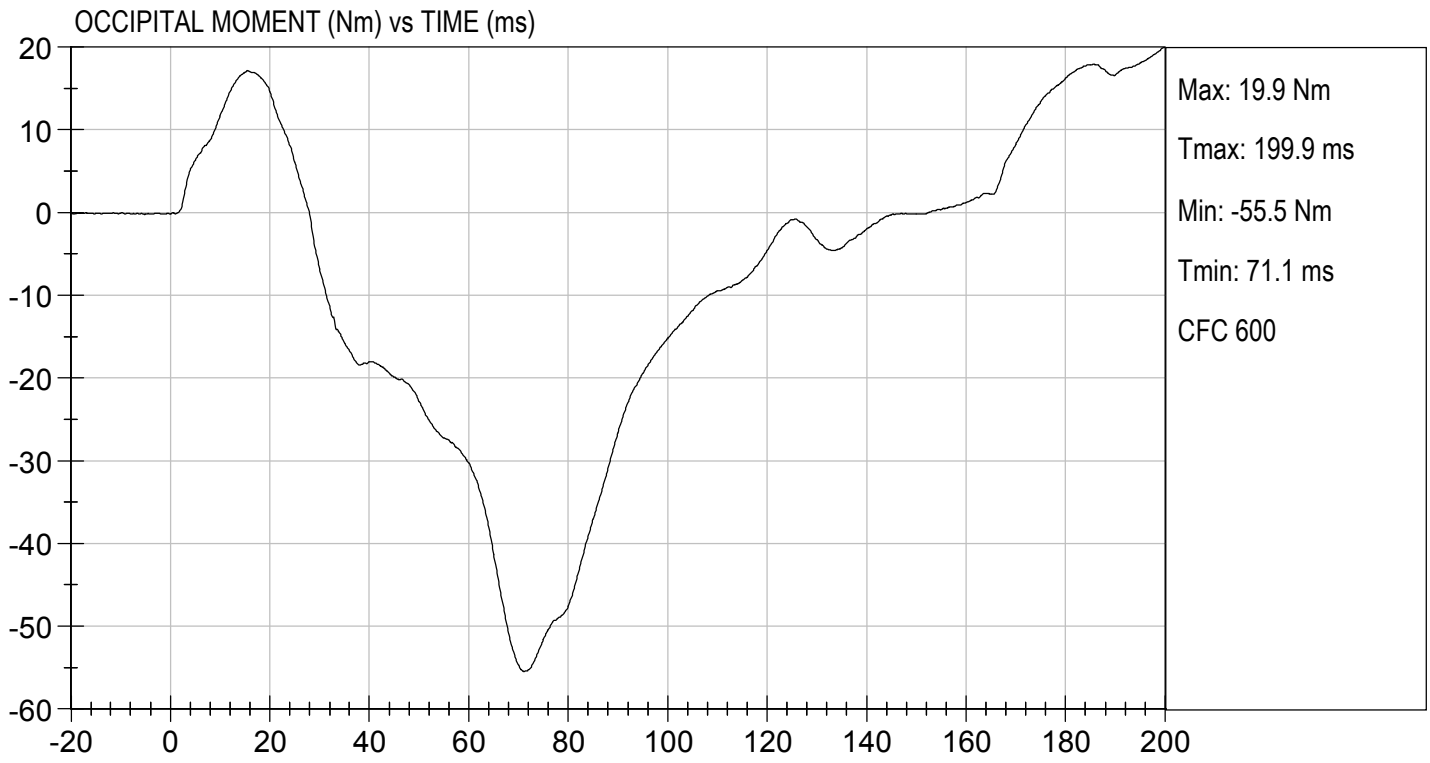
TEST DATE: 05/09/2019
TEST #: D191553





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

TEST DATE: 05/09/2019
TEST #: D191553



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D191554

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Relative Humidity	%	10 to 70	34	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	50	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4346	Pass
Internal Hysteresis	%	69 to 85	72	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4520	Pass
		Overall Test Results		Pass

Jacob D Taylor

Laboratory Technician

05/08/2019

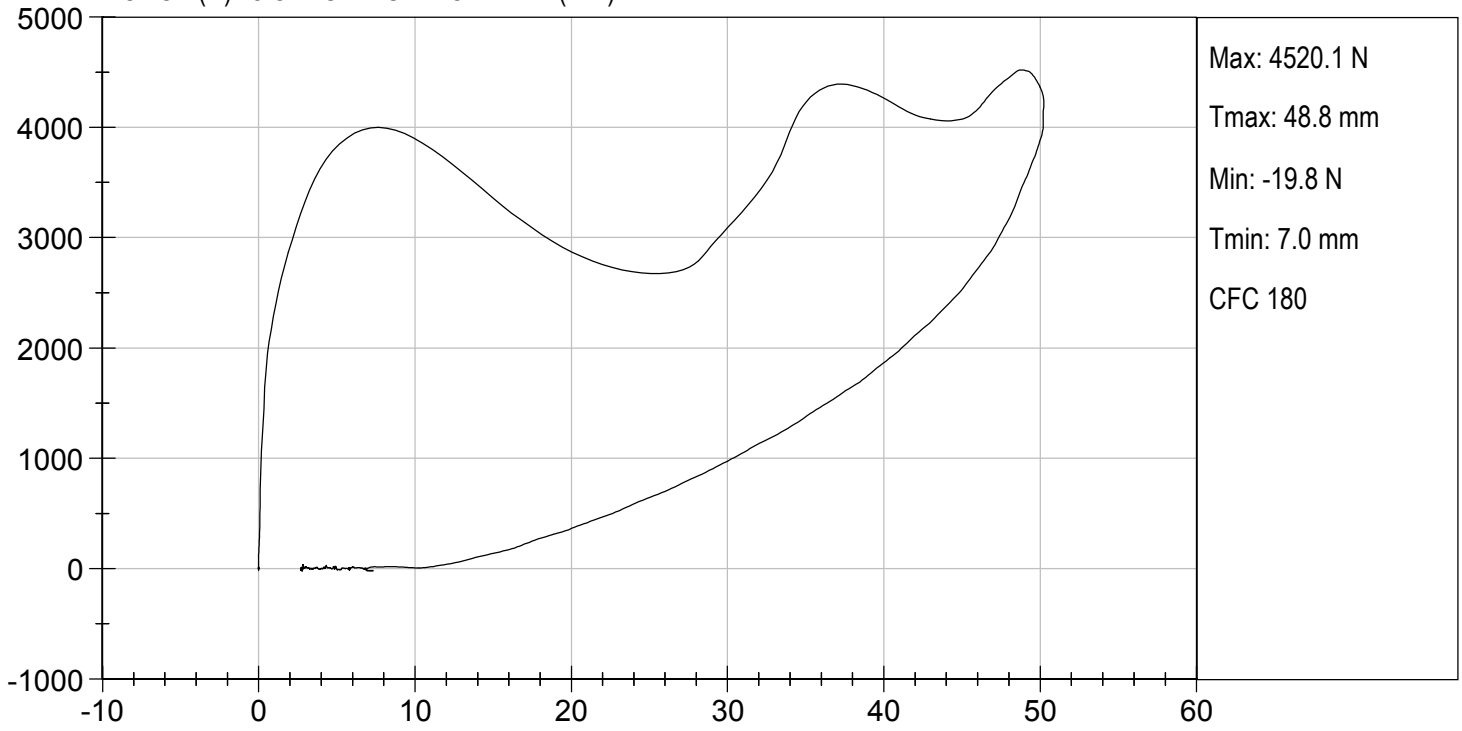
Test Date

Approved By

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

TEST DATE: 05/08/2019
TEST #: D191554

FORCE (N) vs CHEST DISPLACEMENT (mm)



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D191555

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Speed	m/s	2.07 to 2.13	2.07	Pass
Maximum Force	N	3450 to 4060	3918	Pass
		Overall Test Results		Pass

Jacob D Taylor

Laboratory Technician

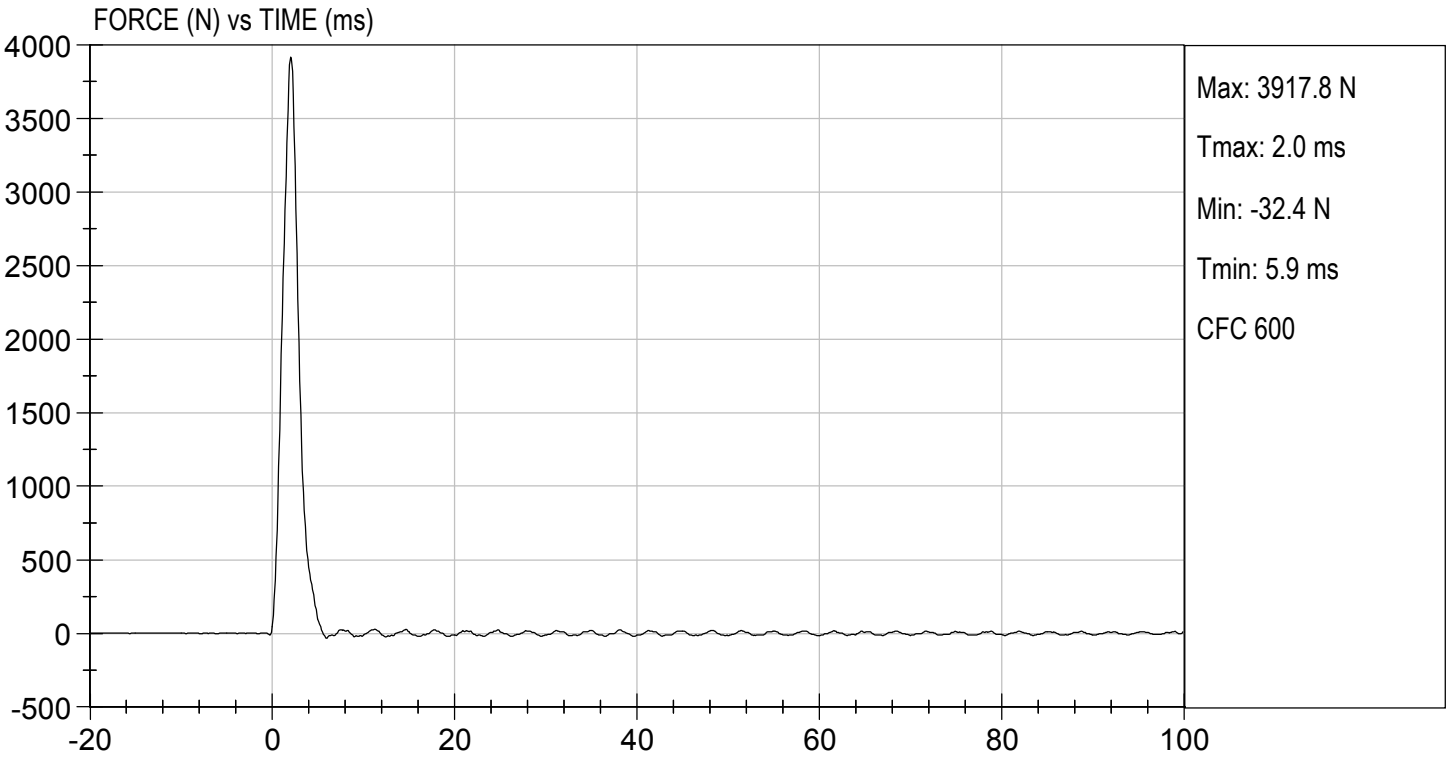
05/08/2019

Test Date

Approved By

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

TEST DATE: 05/08/2019
TEST #: D191555



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D191556

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Speed	m/s	2.07 to 2.13	2.07	Pass
Maximum Force	N	3450 to 4060	3719	Pass
		Overall Test Results		Pass

Jacob D Taylor

Laboratory Technician

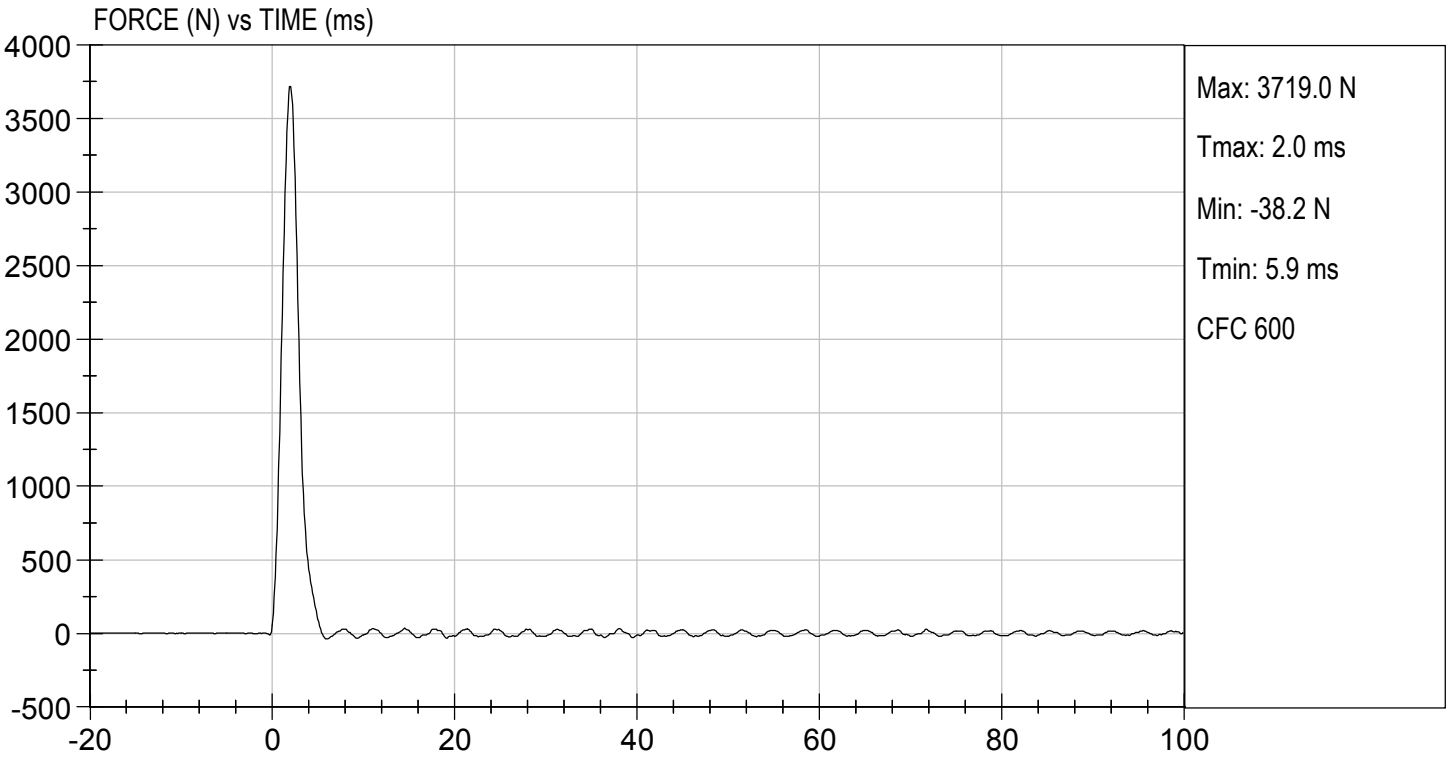
05/08/2019

Test Date

Approved By

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

TEST DATE: 05/08/2019
TEST #: D191556



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D191557

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	34	Pass
Initial Angle	deg	0 to 20	19	Pass
Return Angle	deg	+/- 8	3	Pass
Force at 45 deg	N	320 to 390	346	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.7	Pass
		Overall Result		Pass

Jacob D Taylor

Laboratory Technician

05/08/2019

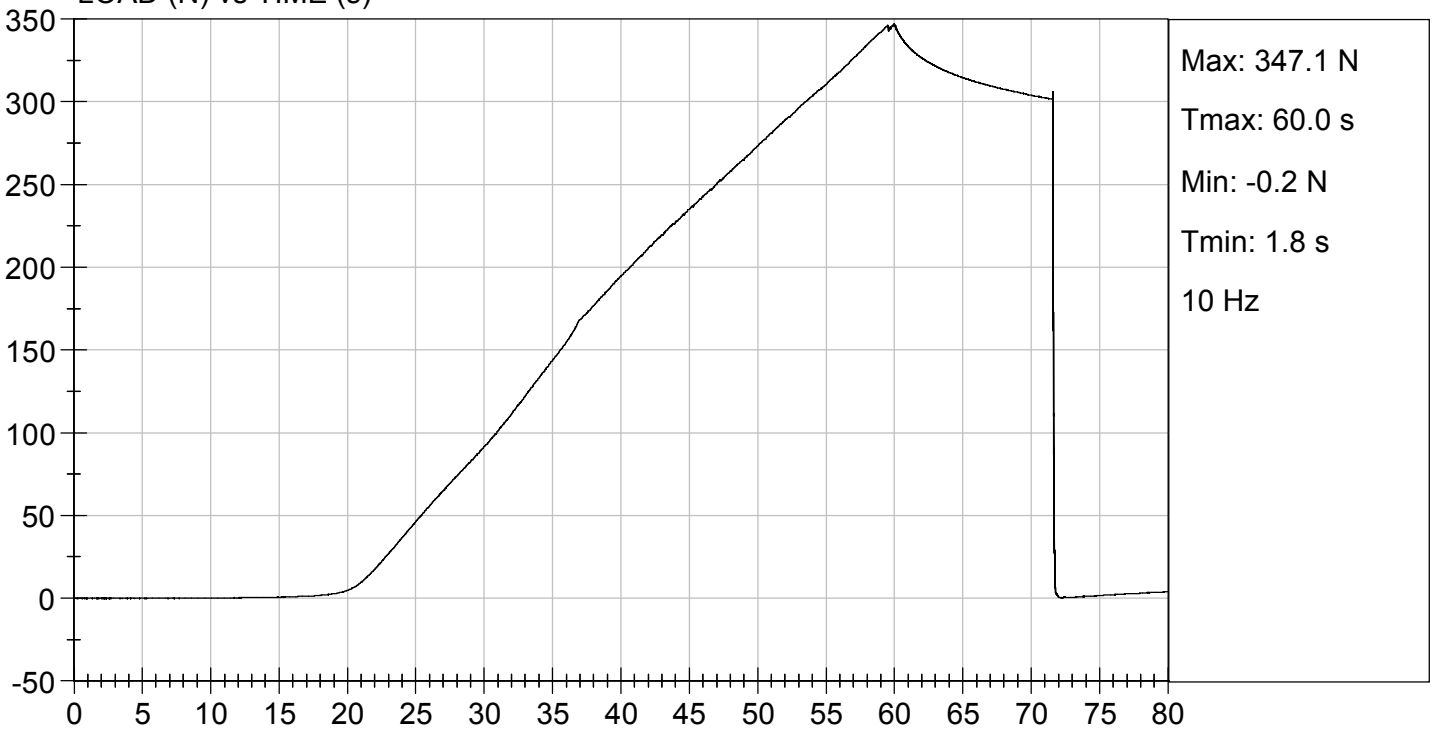
Test Date

Approved By

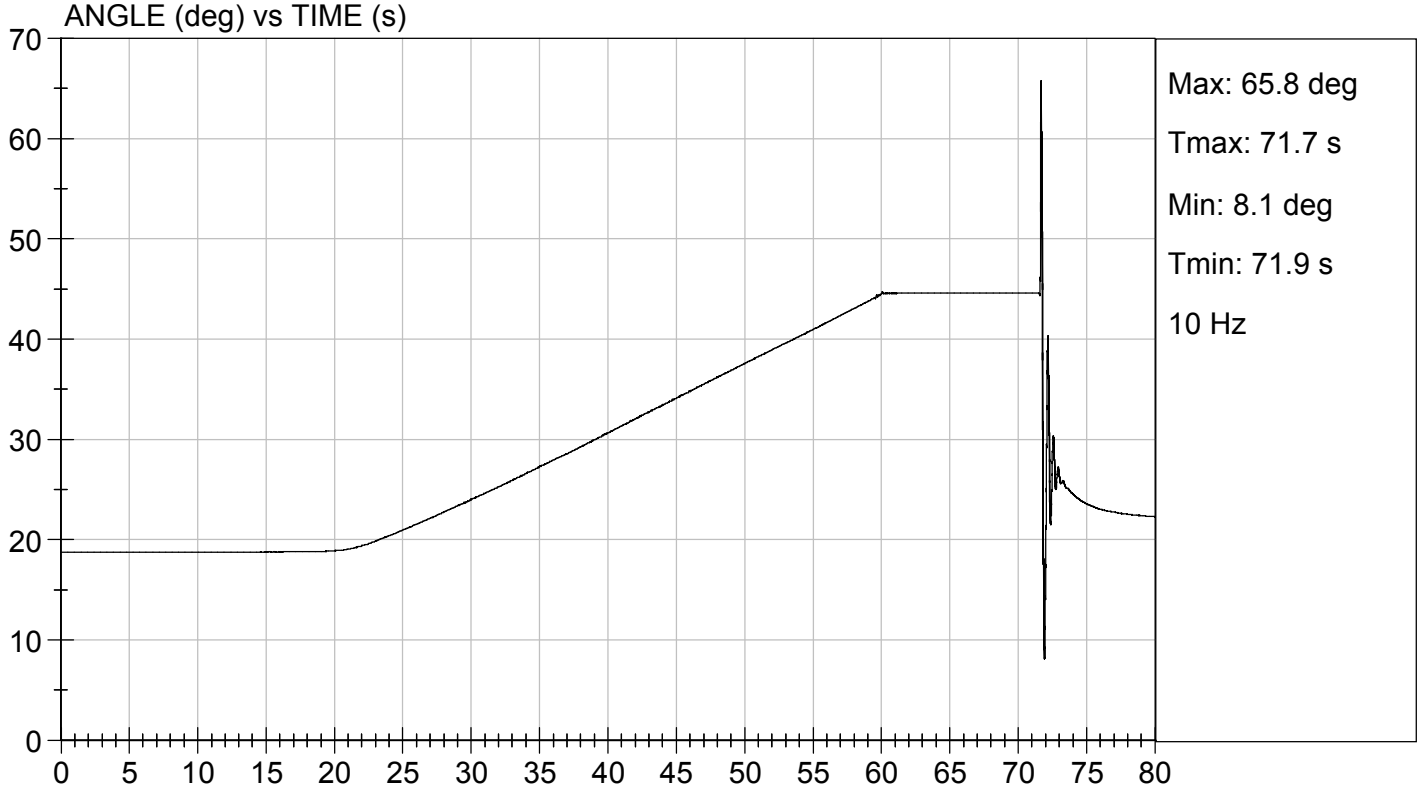
TEST DESC: LUMBAR FLEXION

TEST DATE: 05/08/2019
TEST #: D191557

LOAD (N) vs TIME (s)



ANGLE (deg) vs TIME (s)



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: 634 **Test ID:** D191831

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Peak Resultant Acceleration	G's	250 to 300	287	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

Jacob D Taylor
Laboratory Technician

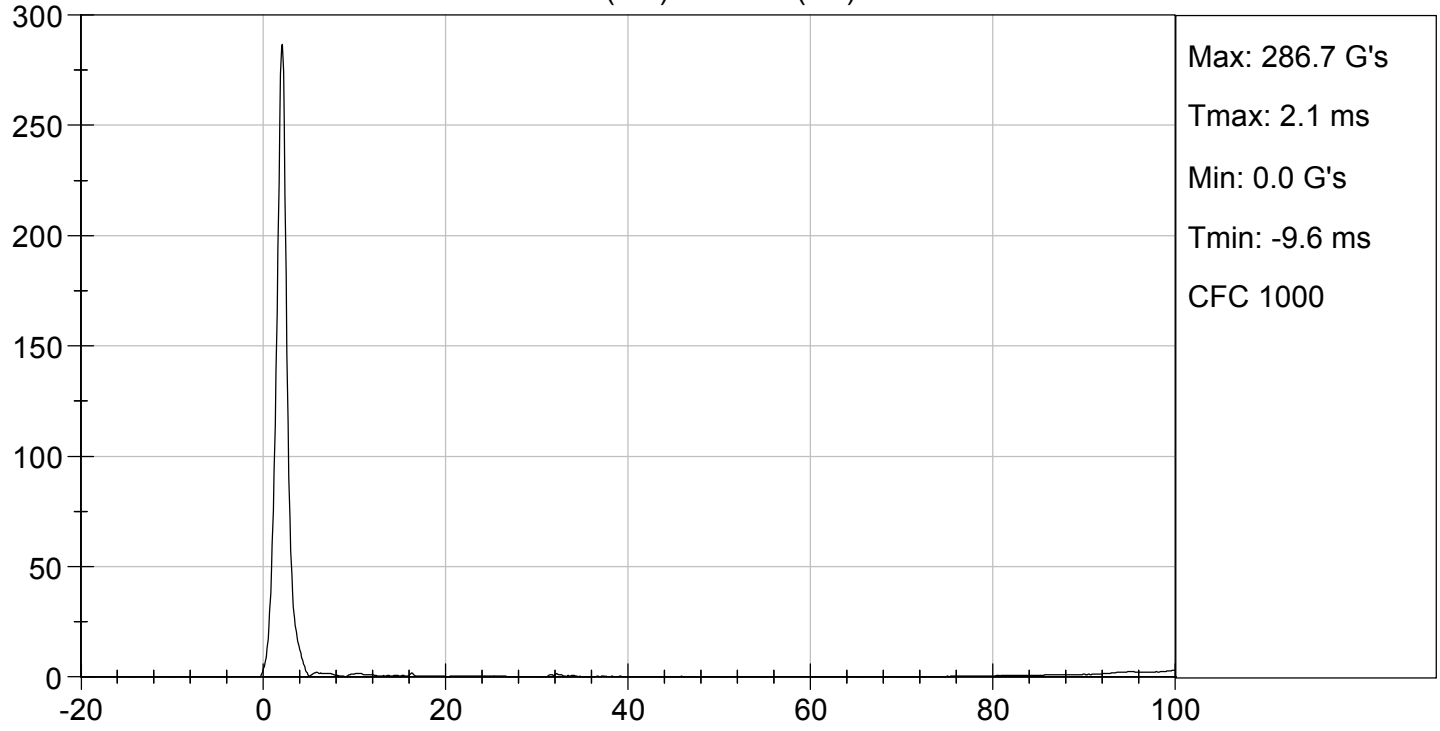
06/10/2019
Test Date

Approved By

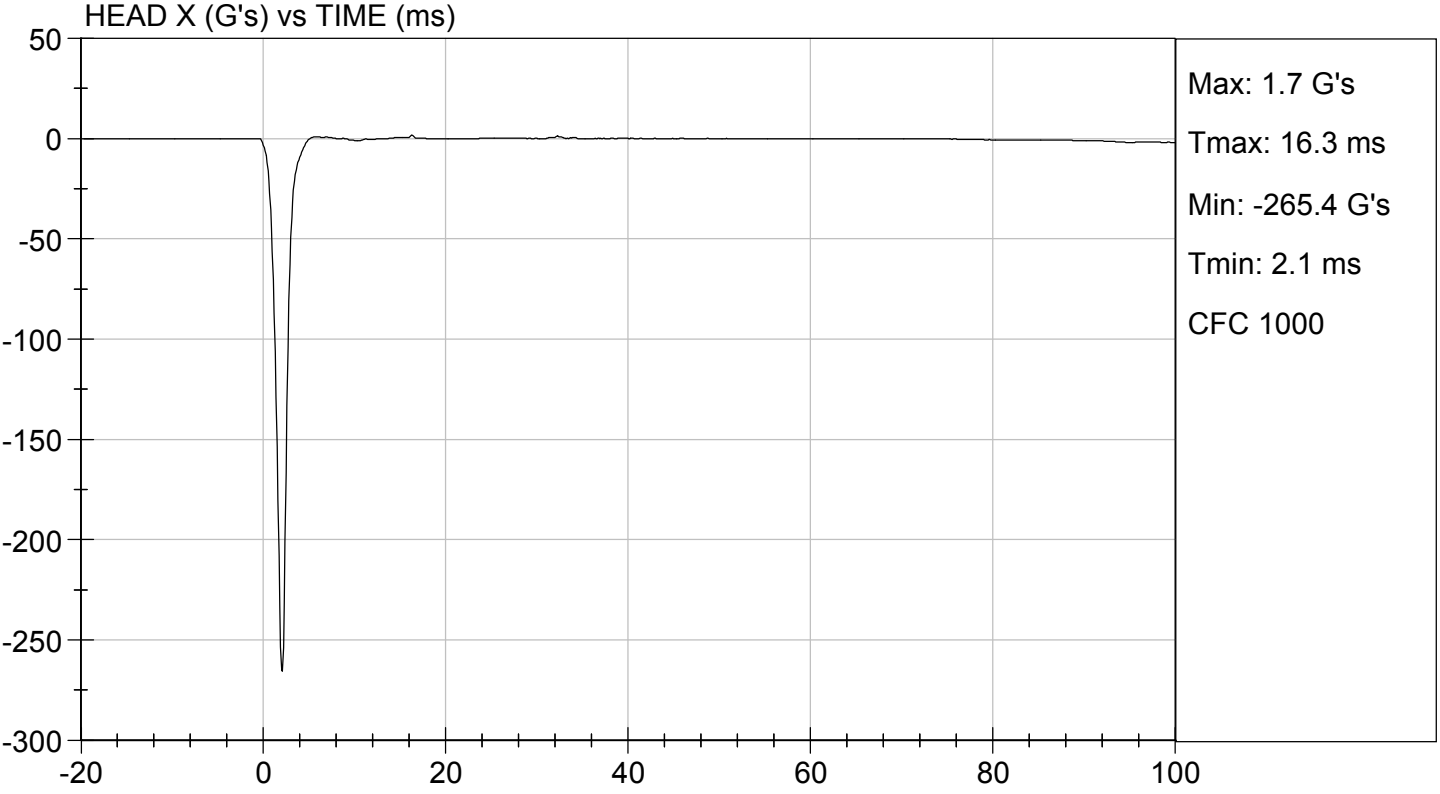
TEST DESC: HEAD DROP

TEST DATE: 06/10/2019
TEST #: D191831

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

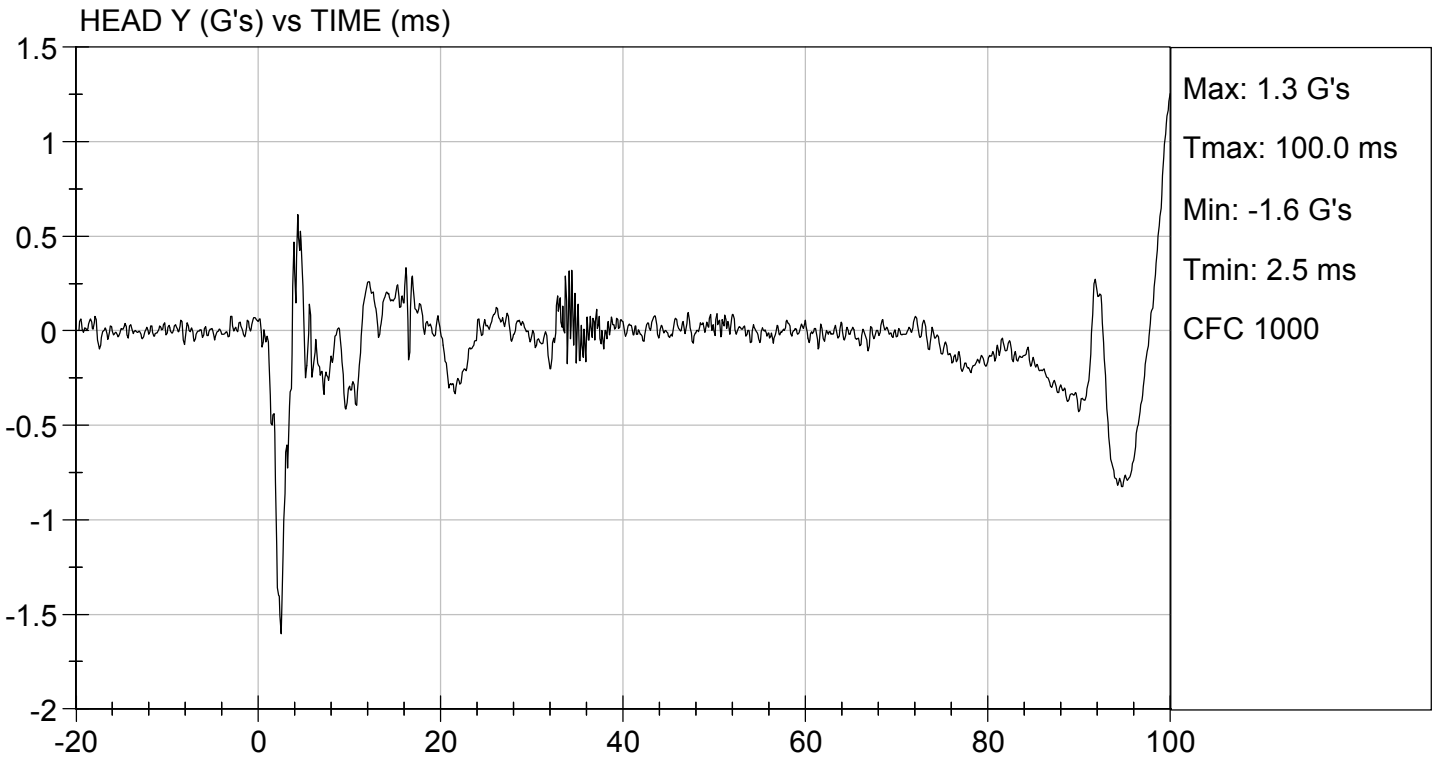


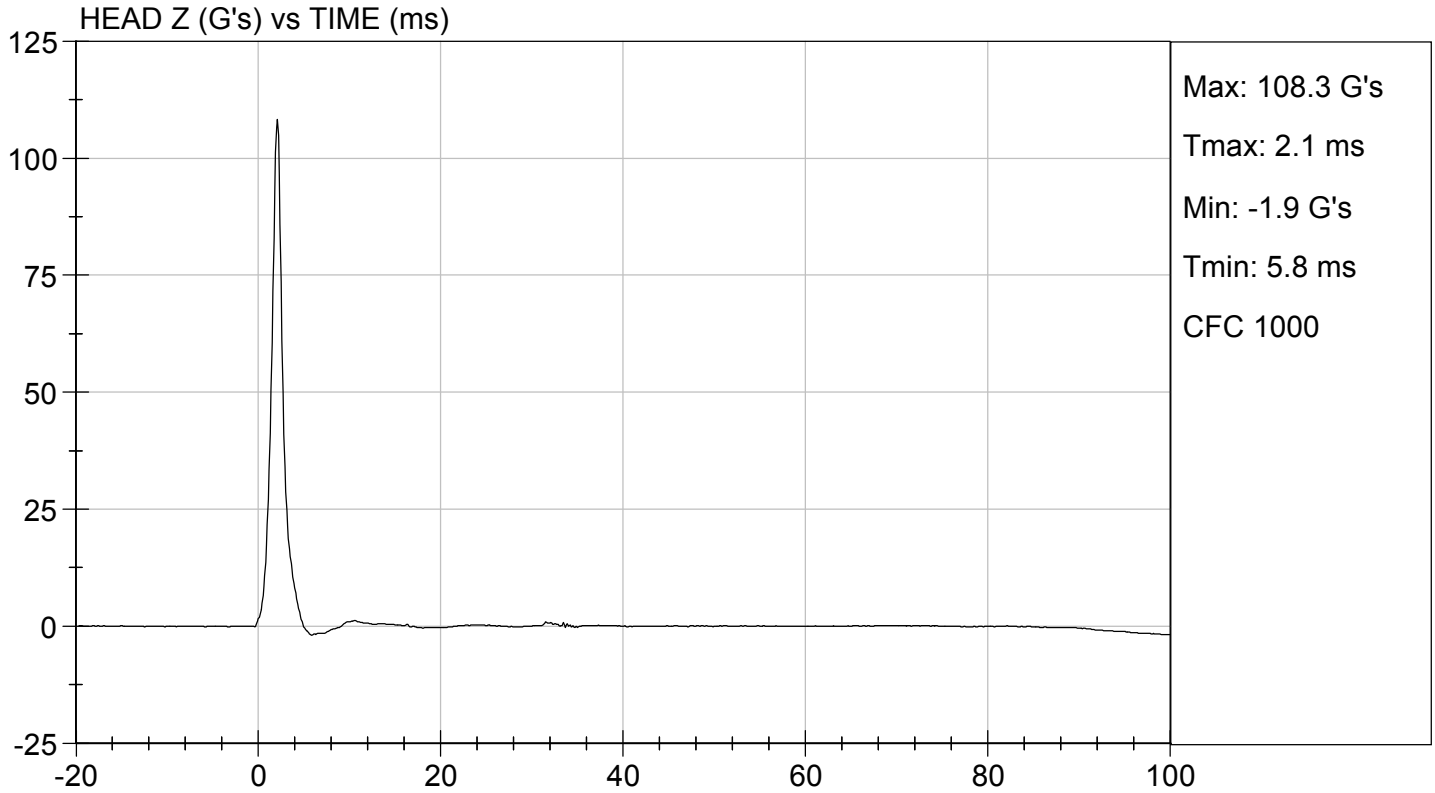
HEAD X (G's) vs TIME (ms)



TEST DESC: HEAD DROP

TEST DATE: 06/10/2019
TEST #: D191831





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D191832

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity		%	10 to 70	47	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.13	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.3	Pass
	20 ms	m/s	4.0 to 5.0	4.9	Pass
	30 ms	m/s	5.8 to 7.0	6.9	Pass
D Plane Rotation	Max	deg	77 to 91	81	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

06/10/2019

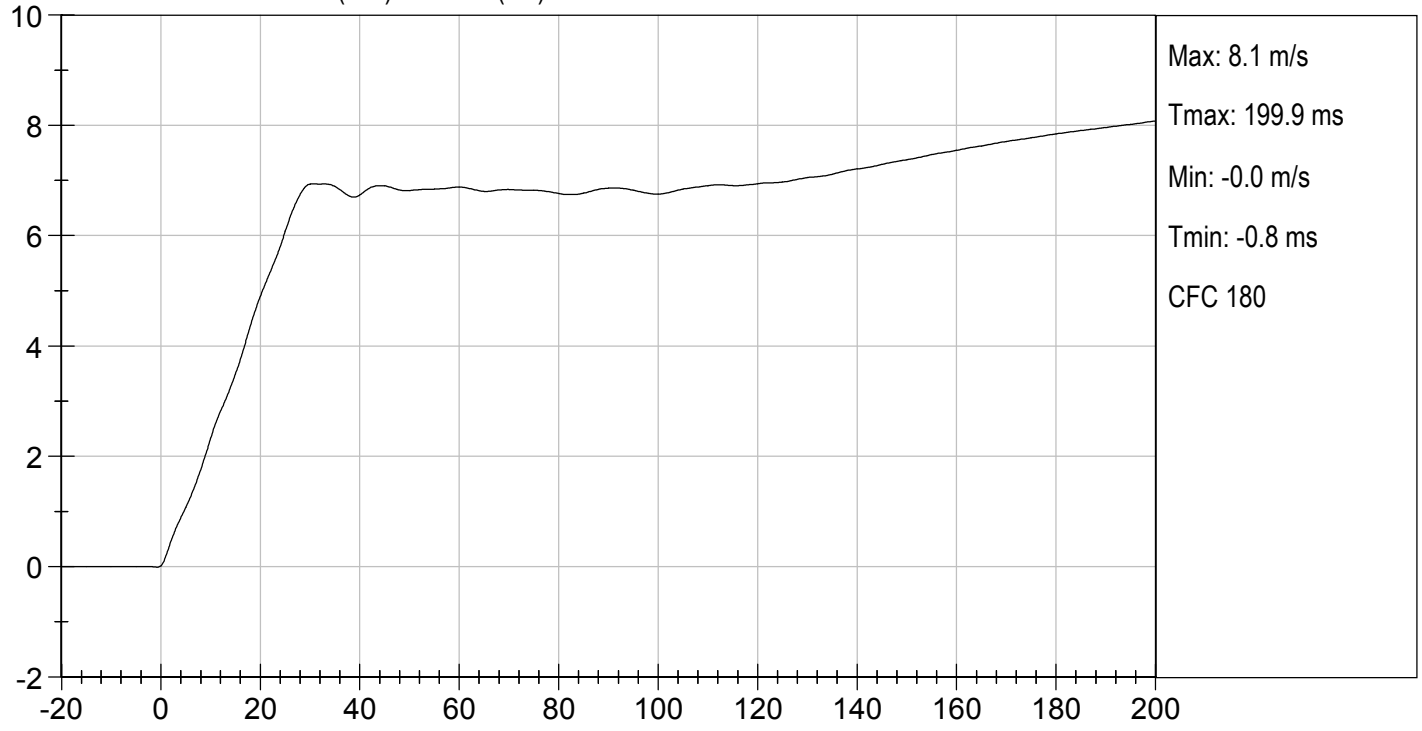
Test Date

Approved By

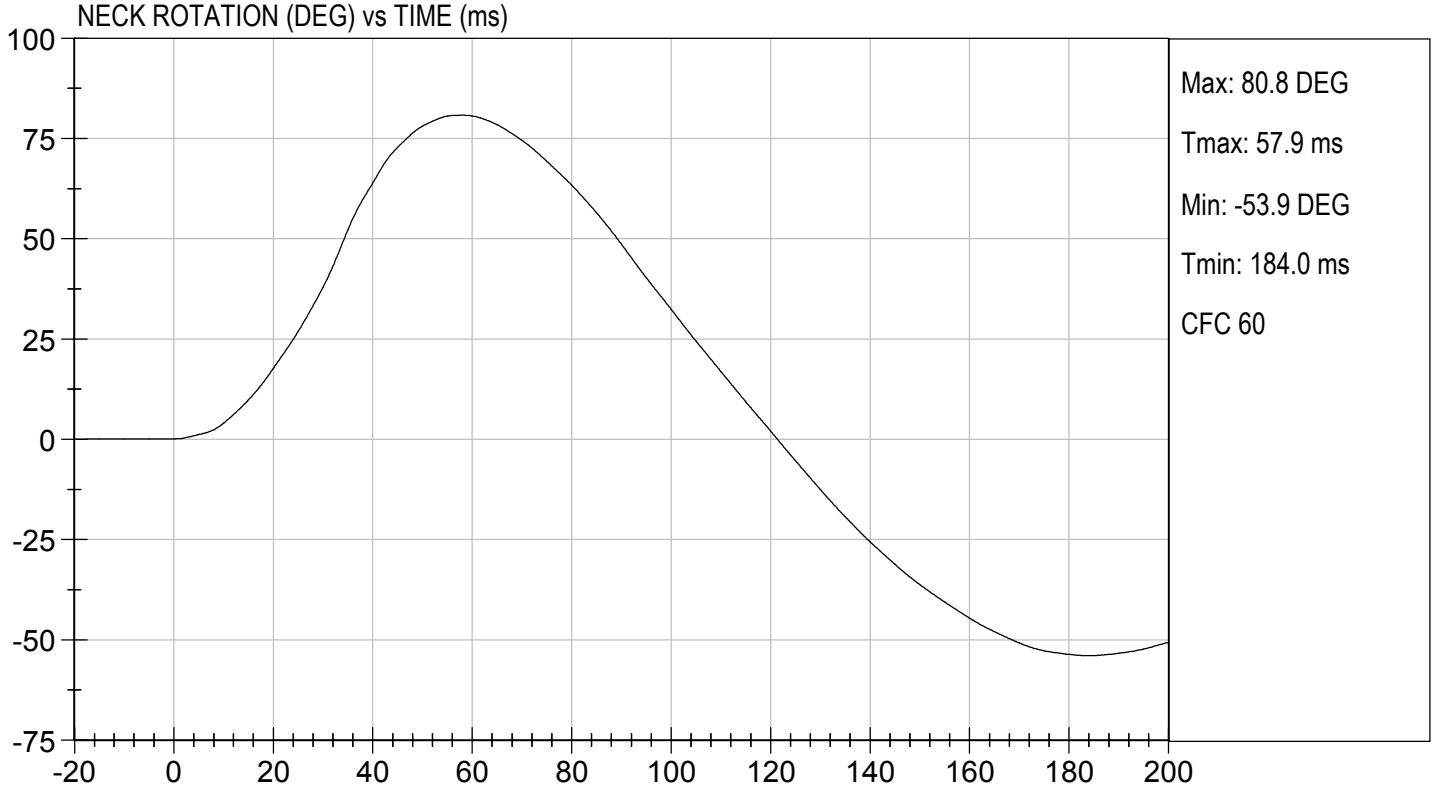
TEST DESC: NECK FLEXION
VELOCITY: 23.40 ft/s, 7.13 m/s

TEST DATE: 06/10/2019
TEST #: D191832

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

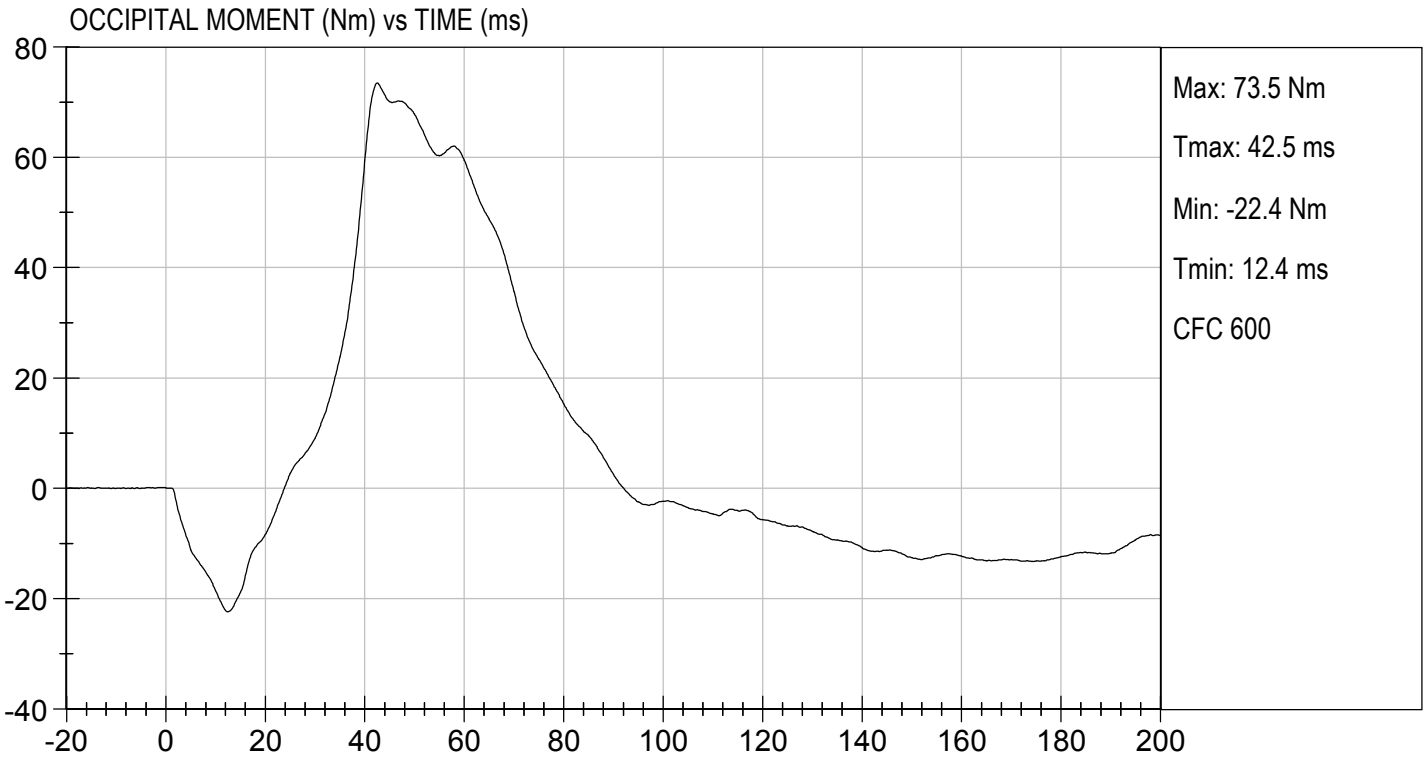


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 06/10/2019
TEST #: D191832



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D191833

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity		%	10 to 70	47	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.19	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.8	Pass
	20 ms	m/s	3.1 to 3.9	3.9	Pass
	30 ms	m/s	4.6 to 5.6	5.5	Pass
D Plane Rotation	Max	deg	99 to 114	107	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-56	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	105	Pass
			Overall Results		Pass

Jacob D Taylor

Laboratory Technician

06/11/2019

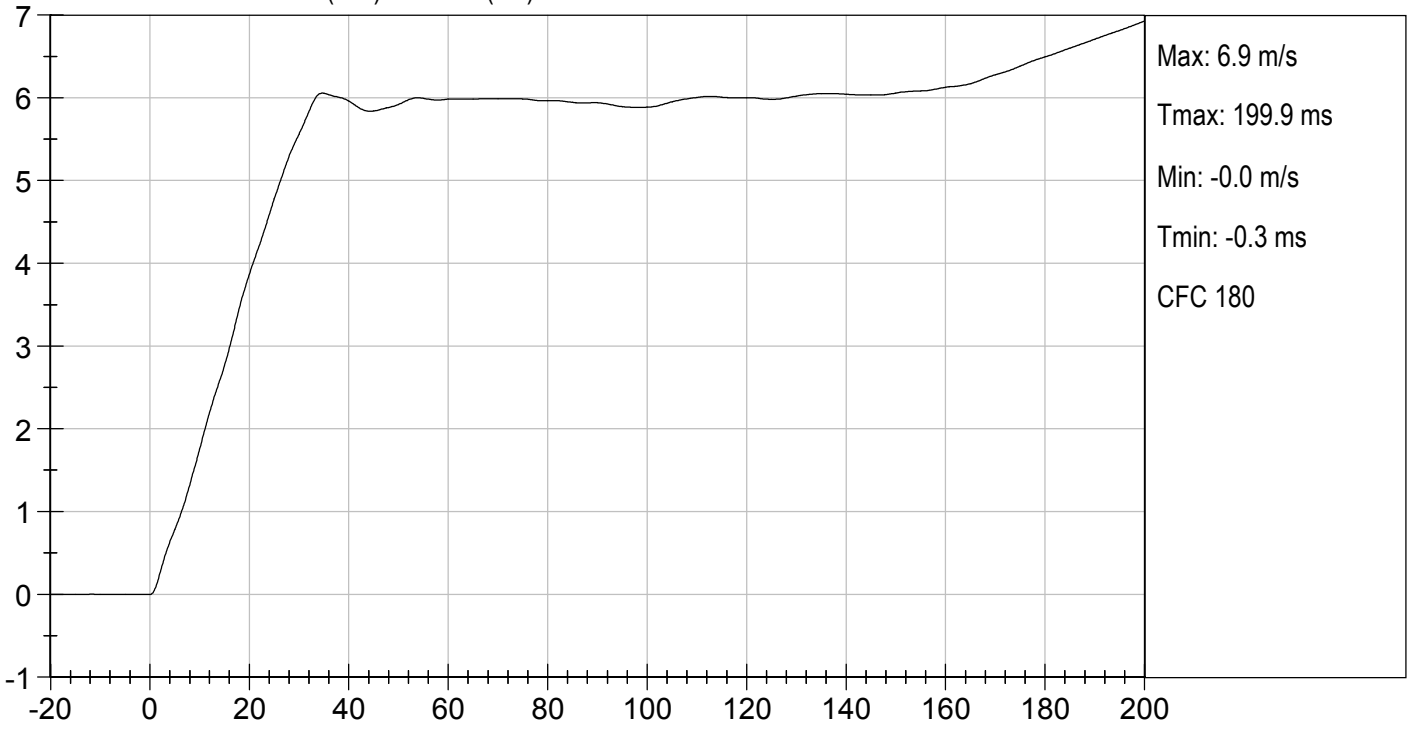
Test Date

Approved By

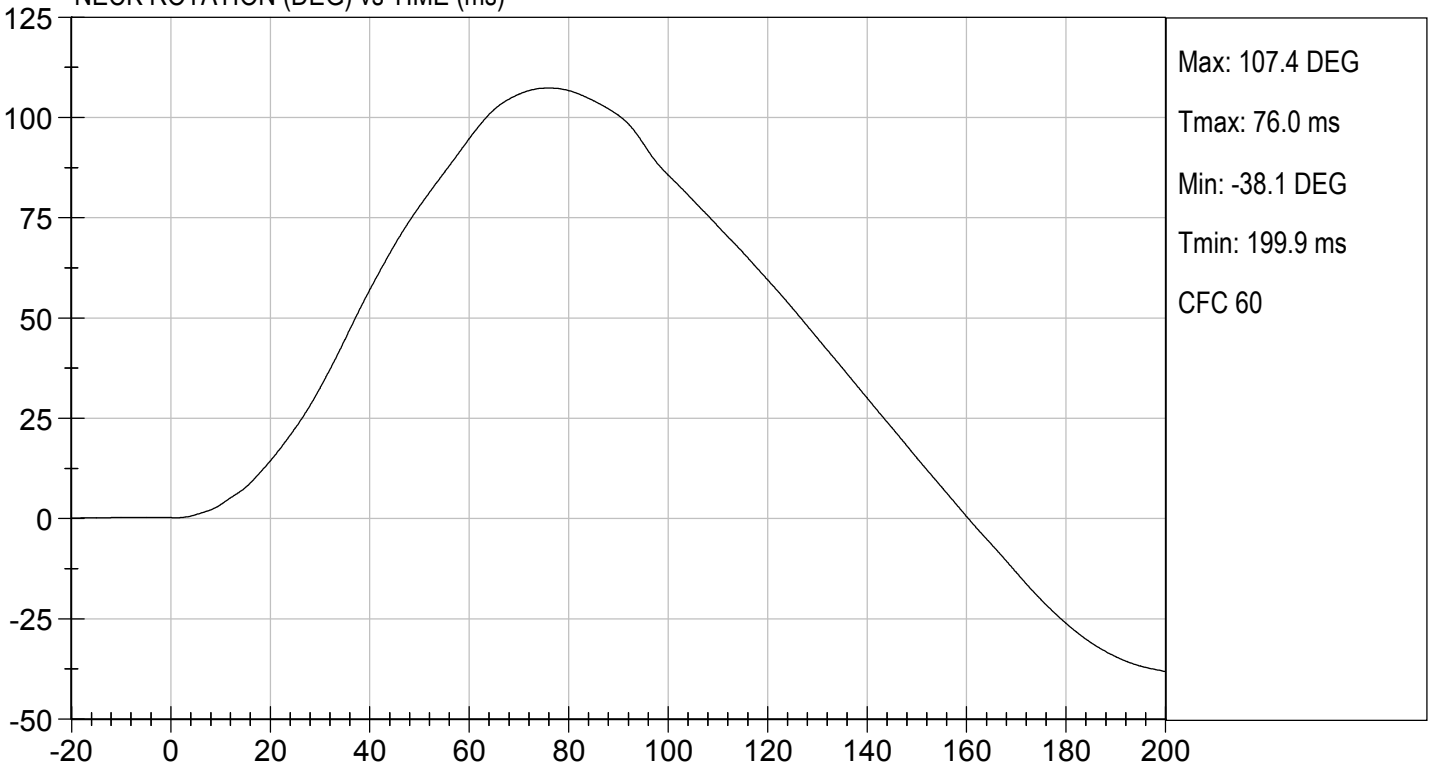
TEST DESC: NECK EXTENSION
VELOCITY: 20.30 ft/s, 6.19 m/s

TEST DATE: 06/11/2019
TEST #: D191833

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

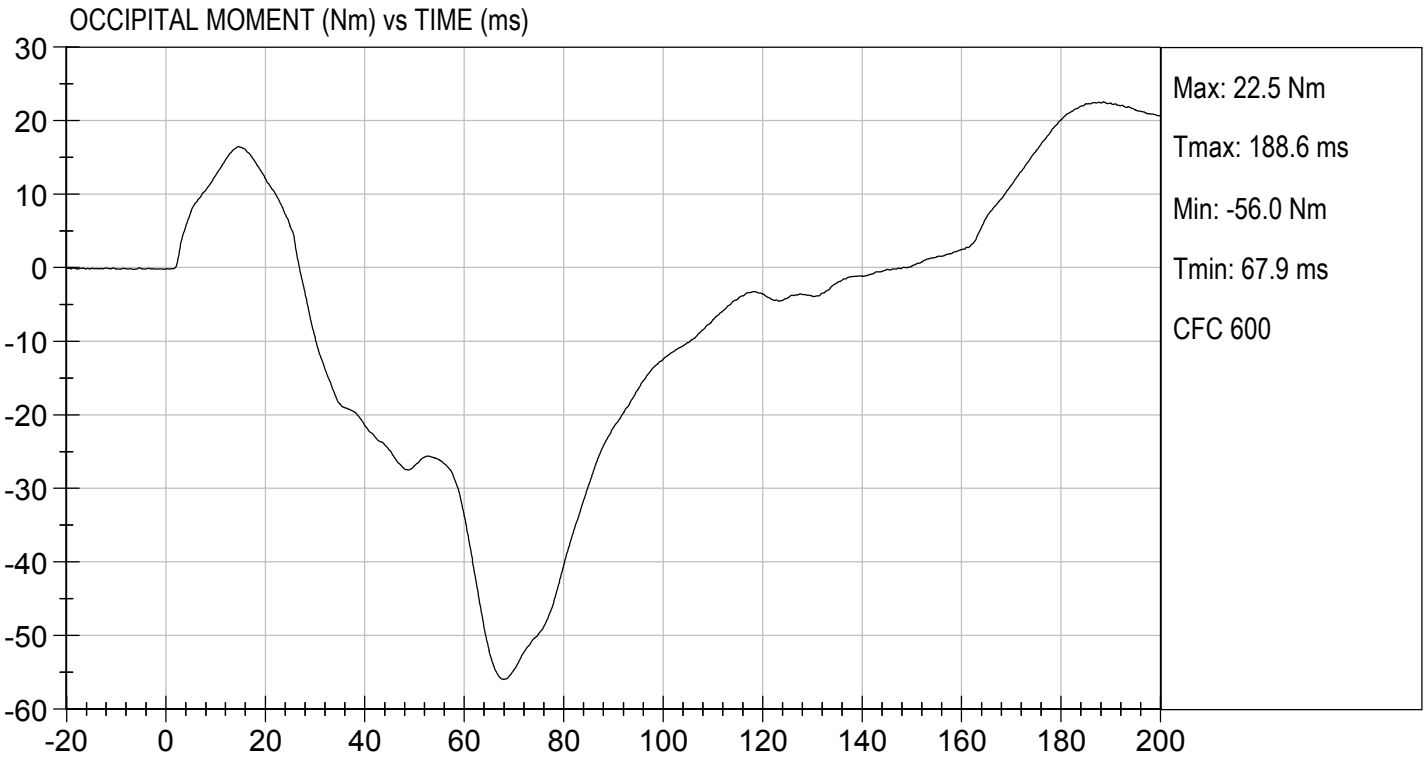


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 06/11/2019
TEST #: D191833



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D191834

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Relative Humidity	%	10 to 70	42	Pass
Probe Speed	m/s	6.59 to 6.83	6.60	Pass
Peak Deflection	mm	50 to 58	53	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4387	Pass
Internal Hysteresis	%	69 to 85	70	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4258	Pass
		Overall Test Results		Pass

Jacob D Taylor
Laboratory Technician

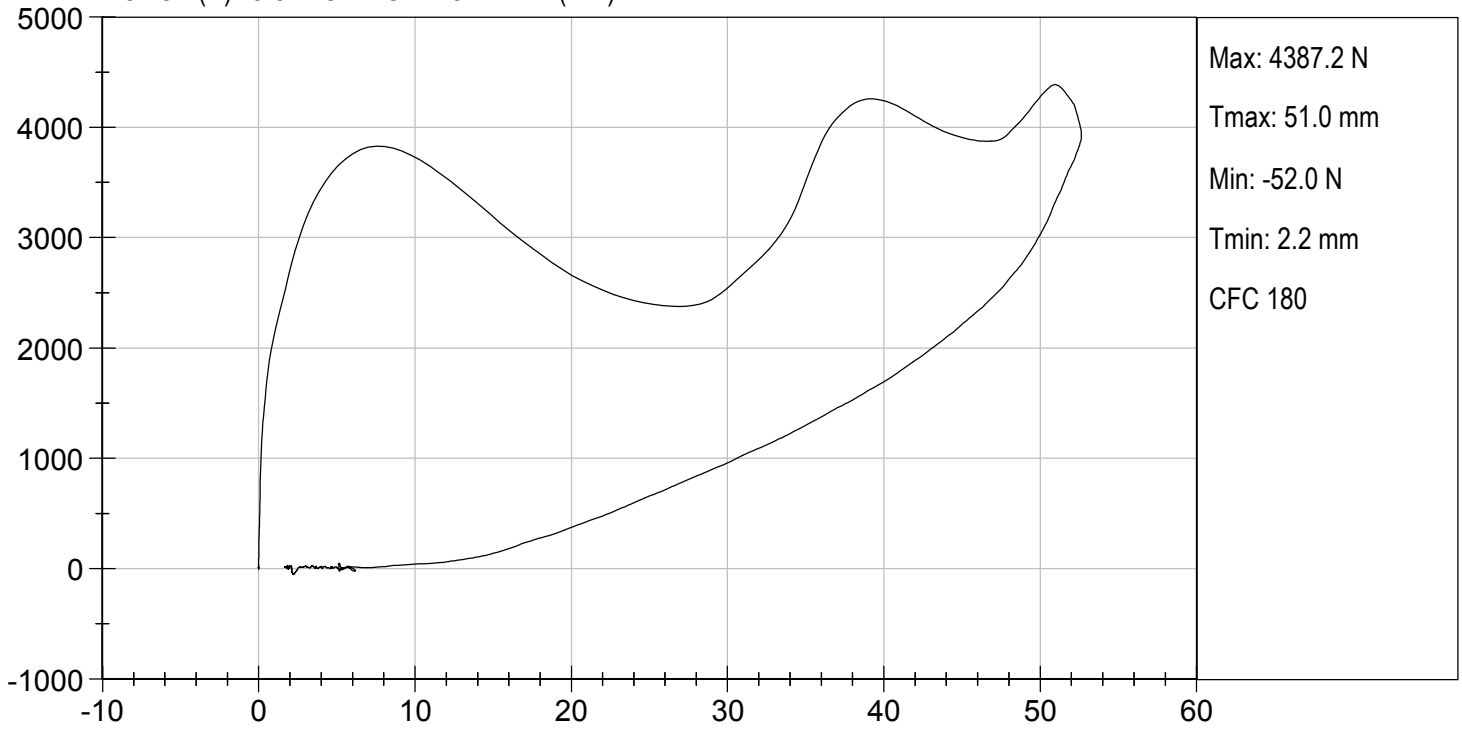
06/11/2019
Test Date

Approved By

TEST DESC: THORAX IMPACT
VELOCITY: 21.65 ft/s, 6.60 m/s

TEST DATE: 06/11/2019
TEST #: D191834

FORCE (N) vs CHEST DISPLACEMENT (mm)



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D191835

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Probe Speed	m/s	2.07 to 2.13	2.08	Pass
Maximum Force	N	3450 to 4060	4003	Pass
		Overall Test Results		Pass

Jacob D Taylor

Laboratory Technician

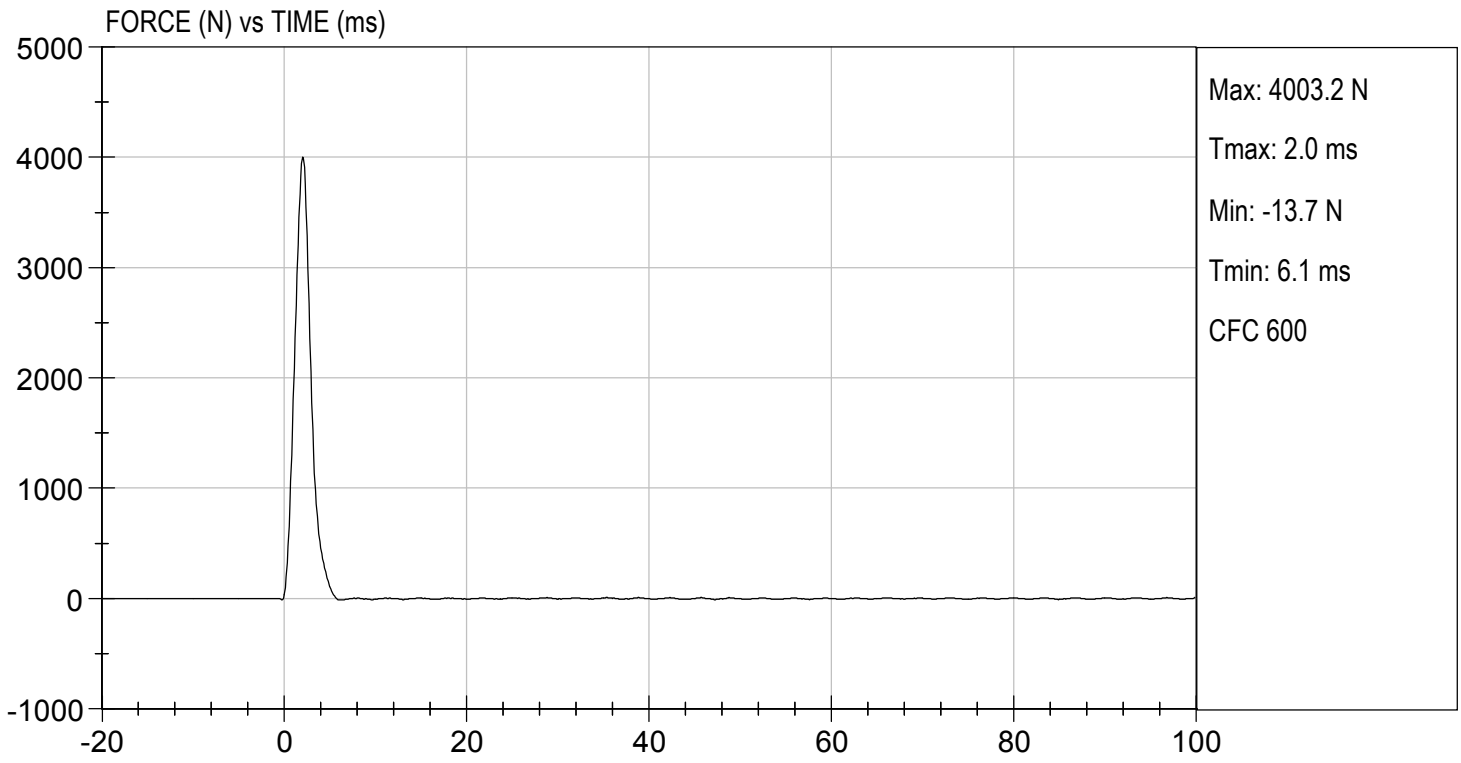
06/11/2019

Test Date

Approved By

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

TEST DATE: 06/11/2019
TEST #: D191835



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D191836

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Probe Speed	m/s	2.07 to 2.13	2.13	Pass
Maximum Force	N	3450 to 4060	3516	Pass
		Overall Test Results		Pass

Jacob D Taylor

Laboratory Technician

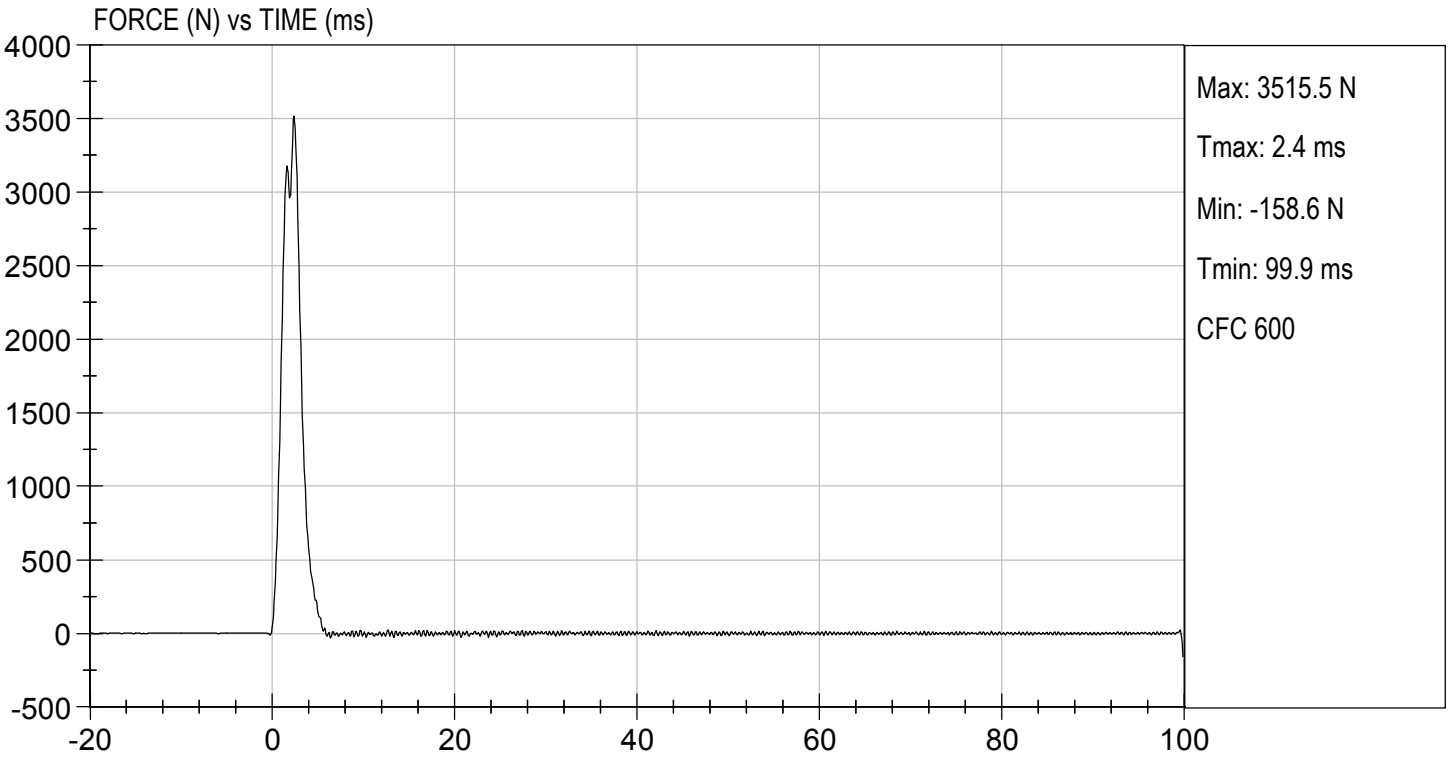
06/11/2019

Test Date

Approved By

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

TEST DATE: 06/11/2019
TEST #: D191836



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D191837

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	22	Pass
Laboratory Relative Humidity	%	10 to 70	42	Pass
Initial Angle	deg	0 to 20	19	Pass
Return Angle	deg	+/- 8	2	Pass
Force at 45 deg	N	320 to 390	383	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.9	Pass
		Overall Result		Pass

Jacob D Taylor

Laboratory Technician

06/12/2019

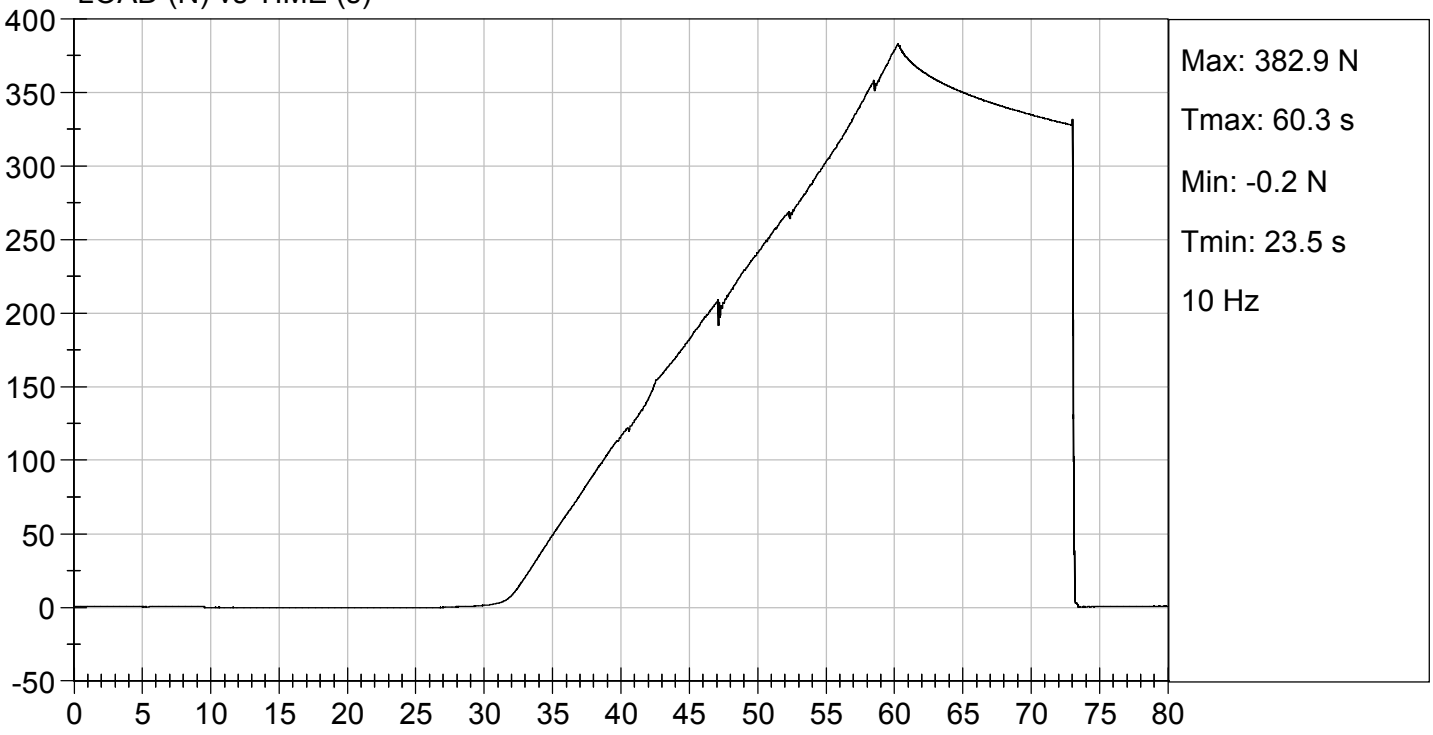
Test Date

Approved By

TEST DESC: LUMBAR FLEXION

TEST DATE: 06/12/2019
TEST #: D191837

LOAD (N) vs TIME (s)



ANGLE (deg) vs TIME (s)