REPORT NUMBER: NCAP-MGA-21-032

NEW CAR ASSESSMENT PROGRAM (NCAP)
Frontal Barrier Impact Test

NISSAN MOTOR CO., LTD.
2021 Nissan Rogue S AWD 5-Door SUV
NHTSA No.: O20215200

MGA RESEARCH CORPORATION
5000 Warren Road
Burlington, WI 53105

Test Date: March 24, 2021

Final Report Date: July 20, 2021

FINAL REPORT

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

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Approval Date: July 20, 2021

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

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16. Abstract

A 56.3 km/h NCAP Frontal Rigid Barrier Impact Test was conducted on a 2021 Nissan Rogue S AWD 5-Door SUV in accordance with the specifications of the Office of Crashworthiness Standards Laboratory Procedure for NCAP Full Frontal Rigid Barrier Impact Testing. The test was conducted at MGA Research Corporation in Burlington, Wisconsin on March 24, 2021.

The impact velocity of the vehicle was 56.22 km/h and the ambient temperature at the barrier face at the time of impact was 21.9°C. The target vehicle post-test maximum crush was 485 mm located to the right of 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})		700	225	700	424
Maximum Chest Compression	mm	63	25	52	16
Nij		1	0.33	1	0.47
Neck Tension	N	4170	1536	2620	1010
Neck Compression	N	4000	177	2520	338
Left Femur Force	N	10008	1122	6805	1920
Right Femur Force	N	10008	1037	6805	2092

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SECTION 1
PURPOSE AND SUMMARY OF TEST

PURPOSE

This 56.3 km/h frontal barrier impact test is part of the Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under contract number 693JJ919D000006. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for consumer information purposes.

The 56.3 km/h frontal barrier impact was conducted in accordance with the Office of Crashworthiness Standards Laboratory Procedure for NCAP Full Frontal Rigid Barrier Impact Testing.

SUMMARY

A load cell barrier consisting of 176 load cells was impacted by a 2021 Nissan Rogue S AWD 5-Door SUV at a velocity of 56.22 km/h. The test was performed at MGA Research Corporation on March 24, 2021. Pre-test and post-test photographs of the vehicle and dummies can be found in Appendix A.

Two (2) real-time cameras and sixteen (16) high-speed cameras were used to document the frontal barrier impact event. Camera locations and other pertinent camera information can be found in this report.

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

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

The driver (position 1) ATD (Serial No. 351) and the right-front passenger (position 2) ATD (Serial No. DH1659) were qualified previous to this test. Certification details, along with instrumentation calibration data, are found in Appendix C of this report.

The 630 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 485 mm located to the right of the vehicle centerline and both the driver and passenger side doors remained closed during the impact event and were operable after the impact.

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

The occupant data is summarized below:

ATD position	HIC_{15}	Nij	Neck Tension (N)	Neck Comp. (N)	3ms Chest Clip (g)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50^{th})	225	0.33	1536	177	44.2	25	1122	1037
Passenger (5^{th})	424	0.47	1010	338	50.9	16	1920	2092

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

TEST NOTES

Driver Head Xr recorded noise from 38-50 ms.
Driver Head Yr recorded noise from 38-50 ms.
Driver Head Zr recorded noise from 38-50 ms.
Driver Left Femur Force recorded a noise spike at 39 ms.
Driver Right Femur Force recorded a noise spike at 39 ms.
Passenger Head X recorded noise from 38-47 ms.
Passenger Head Y recorded noise from 38-47 ms.
Passenger Head Z recorded noise from 38-47 ms.
Driver Shoulder Belt load cell was not installed.
Driver Lap Belt load cell was not installed.
Passenger Shoulder Belt load cell was not installed.
Passenger Lap Belt load cell was not installed.

Barrier C-01 Fx recorded questionable data.
Barrier C-02 Fx recorded questionable data.
Barrier C-02 My recorded questionable data.
Barrier D-14 Fx recorded questionable data.
Barrier F-16 Fx recorded no valid data.
Barrier I-05 My recorded no valid data.
Barrier K-15 My recorded no valid data.

Low-level cyclical noise observed throughout many of the data channels.

SECTION 2
OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2021 Nissan Rogue S AWD 5-Door SUV NHTSA No.: O20215200
Test Program: NCAP Frontal Barrier Impact Test Test Date: 3/24/2021

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	O20215200	Traction Control System (TCS)	Yes
Model Year	2021	Power Steering	Yes
Make	Nissan	Power Window Auto-Reverse	Yes
Model	Rogue S AWD	Driver Frontal Airbag	Yes
Body Style	5-Door SUV	Driver Curtain Airbag	Yes
VIN	5N1AT3AB9MC698167	Driver Head/Torso Airbag	No
Body Color	Gun Metallic	Driver Torso Airbag	No
Odometer (km/mi)	183 km / 114 mi	Driver Torso/Pelvis Airbag	Yes
Engine Displacement (L)	2.5 L	Driver Pelvis Airbag	No
Type/No. Cylinders	Inline 4	Driver Knee Airbag	Yes
Engine Placement	Lateral	Front Pass. Frontal Airbag	Yes
Transmission Type	Automatic	Front Pass. Curtain Airbag	Yes
Transmission Speeds	CVT	Front Pass. Head/Torso Airbag	No
Overdrive	Yes	Front Pass. Torso Airbag	No
Final Drive	AWD	Front Pass. Torso/Pelvis Airbag	Yes
Roof Rack	No	Front Pass. Pelvis Airbag	No
Sunroof/T-Top	No	Front Pass. Knee Airbag	Yes
Running Boards	No	Driver Pretensioner	Yes
Tilt Steering Wheel	Yes	Driver Load Limiter	Yes
Power Seats	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	NISSAN MOTOR CO., LTD.
Date of Manufacture	11/20

GVWR (kg)	4619
GAWR Front (kg)	1090
GAWR Rear (kg)	1055

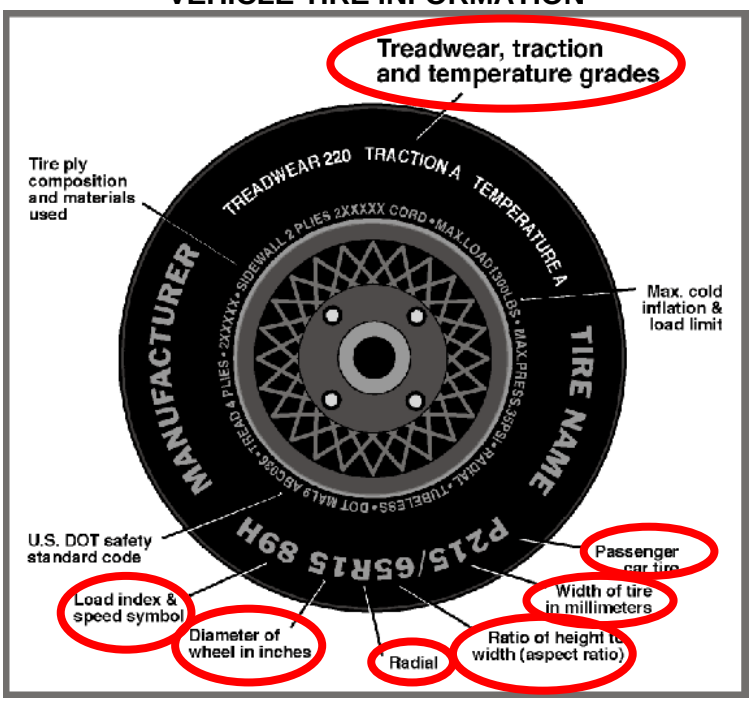
VEHICLE SEATING AND WEIGHT CAPACITY DATA

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

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

Test Vehicle: 2021 Nissan Rogue S AWD 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20215200
Test Date: 3/24/2021

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	250	230
Recommended Tire Size	235/65R17	235/65R17
Tire Size on Vehicle	235/65R17	235/65R17
Tire Manufacturer	Continental	Continental
Tire Model	CrossContact RX	CrossContact RX
Treadwear	480	480
Traction	A	A
Temperature Grade	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	1 Polyester, 2 Steel, 1 Polyamide	1 Polyester, 2 Steel, 1 Polyamide
Load Index/Speed Symbol	104H	104H
Tire Material	Rubber	Rubber
DOT Safety Code Left	VY81 D943 4620	VY81 D943 4620
DOT Safety Code Right	VY81 D943 4620	VY81 D943 4620

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

Test Vehicle: 2021 Nissan Rogue S AWD 5-Door SUV NHTSA No.: O20215200
Test Program: NCAP Frontal Barrier Impact Test Test Date: 3/24/2021

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	478.0	335.5		514.5	410.5	
Right	kg	458.0	329.5		481.5	396.0	
Ratio	%	58.5%	41.5%		55.3%	44.7%	
Totals	kg	936.0	665.0	1601.0	996.0	806.5	1802.5

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1601.0
Weight of 1 P572E ATD & 1 P572O ATD	kg	141
Rated Cargo/Luggage Weight (RCLW)	kg	68
Calculated Test Vehicle Target Weight (TVTW)	kg	1810.0

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	825	835	836	836	1124
As Tested	mm	821	823	808	818	1210
Post Test	mm	788	768	838	825	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2705
Total Vehicle Length at Left Side	mm	4501
Total Vehicle Length at Centerline	mm	4657
Total Vehicle Length at Right Side	mm	4501
Weight of Ballast in Cargo Area	kg	24
Weight of Vehicle Components Removed	kg	22
Amount of Stoddard Solvent in Fuel Tank	L	54.1

List of components removed to meet test weight: None.

List of components removed for instrumentation, data box, and equipment installation: Cargo area carpet/trim/divider, jack and tools, spare tire, RR taillight.

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

Test Vehicle: 2021 Nissan Rogue S AWD 5-Door SUV NHTSA No.: O20215200
Test Program: NCAP Frontal Barrier Impact Test Test Date: 3/24/2021

TARGET VEHICLE STRUCTURAL MEASUREMENT

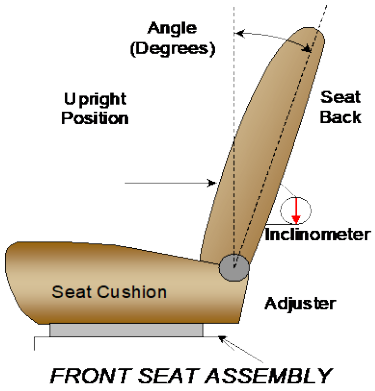
	Elements	Pre-Test (mm)
1	Total Length	4657
2	Total Width	1874
3	Bumper Top Height	628
4	Bumper Bottom Height	524
5	Longitudinal Member Top Height	303
6	Distance between Longitudinal Members	968
7	Longitudinal Member Width	63
8	Engine Top Height	1301
9	Engine Bottom Height	282
10	Engine and Gearbox Width	791
11	Front Bumper-Engine Distance	412
12	Front Shock Absorber Fixing Height	982
13	Bonnet Leading Edge Height	959
14	Front Shock Absorber Fixing Width	1200
15	Front Bumper – Front Axle Distance	802
16	Front Axle – A-Pillar Distance	501
17	A-Pillar – B-Pillar Distance	1082
18	B-Pillar – Rear Axle Distance	1145
19	B-Pillar – C-Pillar Distance	891
20	Roof Sill Bottom Height	1578
21	Roof Sill Top Height	1642
22	Floor Sill Bottom Height	292
23	Floor Sill Top Height	449

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

Test Vehicle: 2021 Nissan Rogue S AWD 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20215200
Test Date: 3/24/2021

NOMINAL DESIGN RIDING POSITION

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



	Degrees
Driver Seat Back Angle	6.6° on outboard headrest post
Passenger Seat Back Angle	3.7° on outboard headrest post

SEAT FORE/AFT POSITIONS

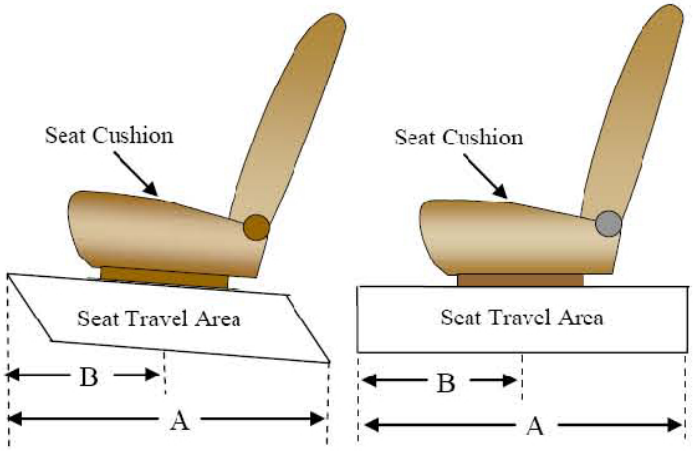
The driver and passenger seat fore/aft positions are adjusted following Appendix F, "Driver & Passenger Dummy Seating & Positioning Procedures" in the NCAP Test Procedure dated May 2018.

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	317 mm / 27 detents (1st as 1)	158 mm / 10th detent (1st as 0)
Passenger Seat	260 mm / 27 detents (1st as 1)	0 mm / 0th detent (1st as 0)

SEAT BELT UPPER ANCHORAGES

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

	Total # of Positions	Placed in Position #
Driver Seat	4 (1st as 1)	0 (1st as 0)
Passenger Seat	4 (1st as 1)	0 (1st as 0)



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

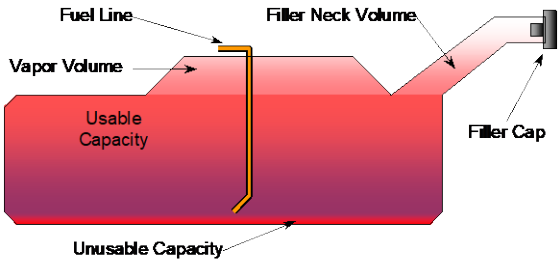
Test Vehicle: 2021 Nissan Rogue S AWD 5-Door SUV NHTSA No.: O20215200
Test Program: NCAP Frontal Barrier Impact Test Test Date: 3/24/2021

FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of "Standard Tank"	58.3
Usable Capacity of "Optional Tank"	
92-94% of Usable Capacity	53.6 to 54.8
Actual Amount of Solvent used	54.1
1/3 of Usable Capacity	19.4

FUEL PUMP

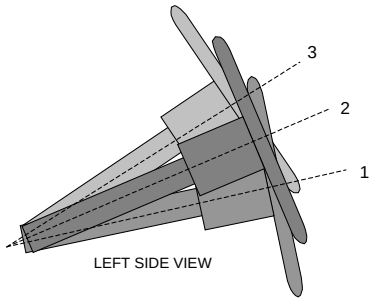
The vehicle is equipped with an electronic fuel pump. The fuel pump will run when the engine is running. The filler neck is located on the passenger's side.



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.



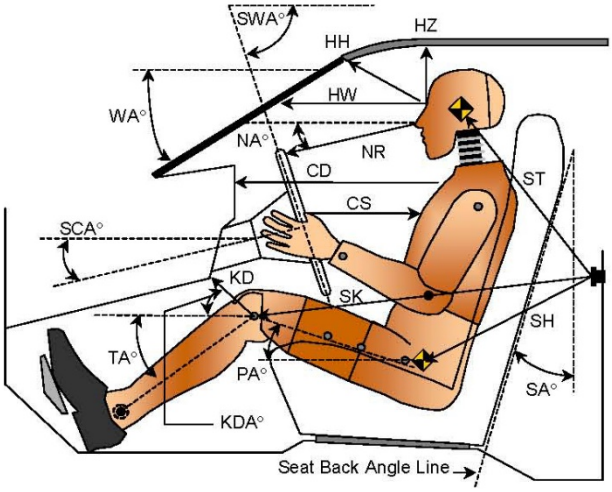
STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITION

	Degrees	Fore/Aft Position (mm)
Lowermost Position 1	66.0	
Geometric Center Position 2	63.4	
Uppermost Position 3	60.8	
Telescoping Steering Wheel Travel		59
Test Position	63.4	30

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2021 Nissan Rogue S AWD 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20215200
Test Date: 3/24/2021

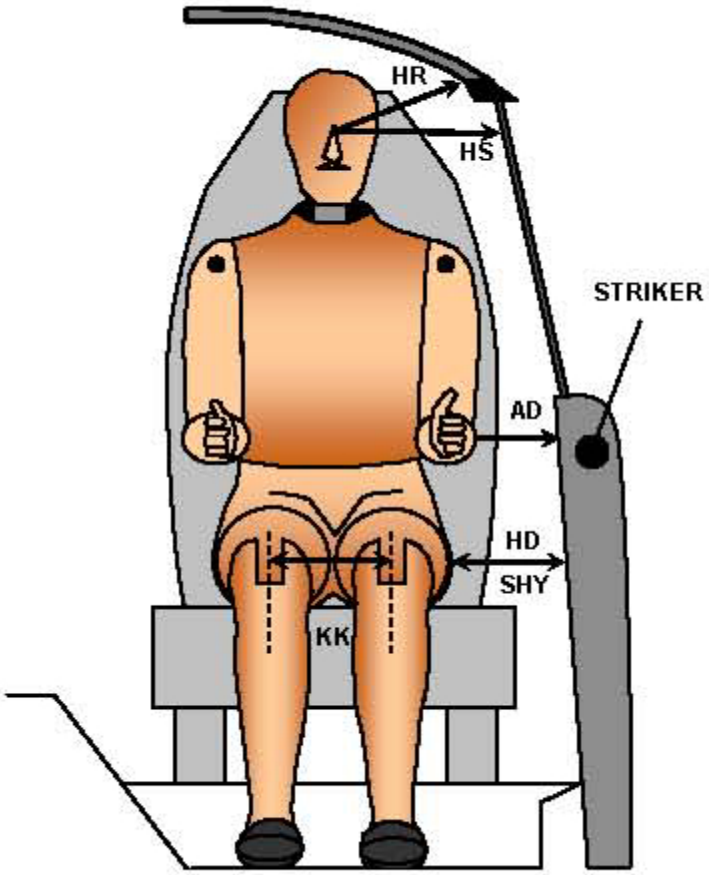


LEFT SIDE VIEW

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		24.9		
SWA°	Steering Wheel Angle		63.4		
SCA°	Steering Column Angle		26.6		
SA°	Seat Back Angle		6.6		3.7
HZ	Head to Roof (Z)	225	90	224	90
HH	Head to Header	340	32.3	282	50.2
HW	Head to Windshield	684	0	643	0
NR	Nose to Rim	395	11.7		
CD	Chest to Dash	527		371	
CS	Chest to Steering Hub	308	6.3		
RA	Rim to Abdomen	191	0		
KDL	Left Knee to Dash	156	29.2	68	41.5
KDR	Right Knee to Dash	145	32.2	87	35.0
PA°	Pelvic Angle		24.8		18.2
TA°	Tibia Angle		51.4		52.8
SK	Striker to Knee	614	92.6	723	94.5
ST	Striker to Head	502	15.5	532	28.4
SH	Striker to H-Point	289	120.0	405	106.5

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2021 Nissan Rogue S AWD 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20215200
Test Date: 3/24/2021

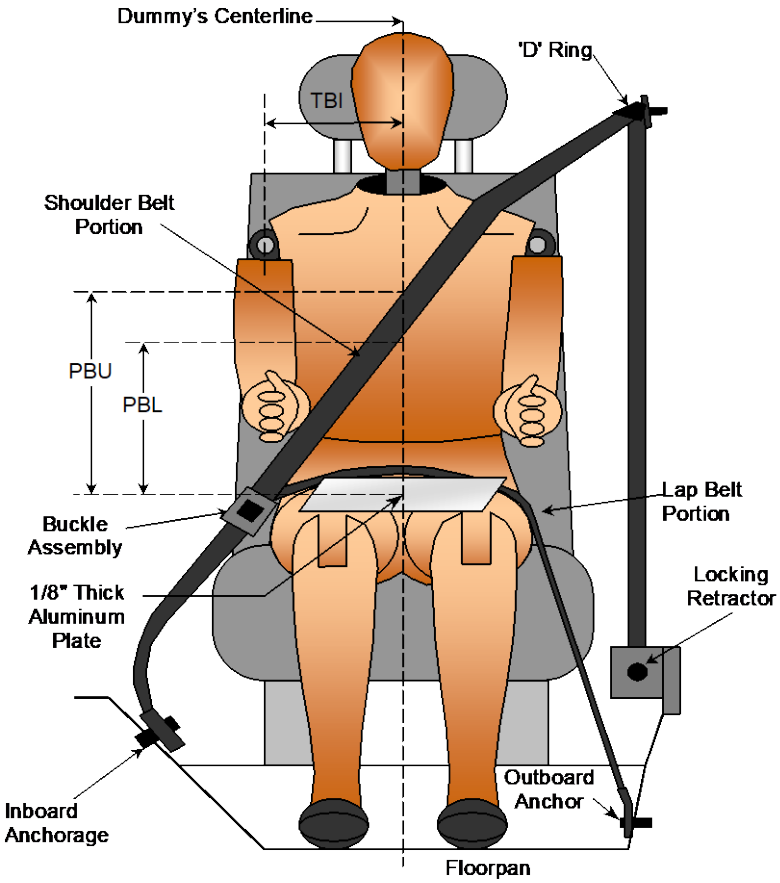


FRONT VIEW OF DUMMY

Code	Measurement Description	Driver	Passenger
		Length (mm)	
AD	Arm to Door	120	56
HD	H-Point to Door	145	191
HR	Head to Side Header	242	257
HS	Head to Side Window	336	355
KK	Knee to Knee	352	230
SHY	Striker to H-Point (Y Direction)	288	291
AA	Ankle to Ankle	343	162

DATA SHEET NO. 5
SEAT BELT POSITIONING DATA

Test Vehicle:	2021 Nissan Rogue S AWD 5-Door SUV	NHTSA No.:	O20215200
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	3/24/2021



FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	355	315
PBL - Top surface of reference to belt lower edge	mm	260	220

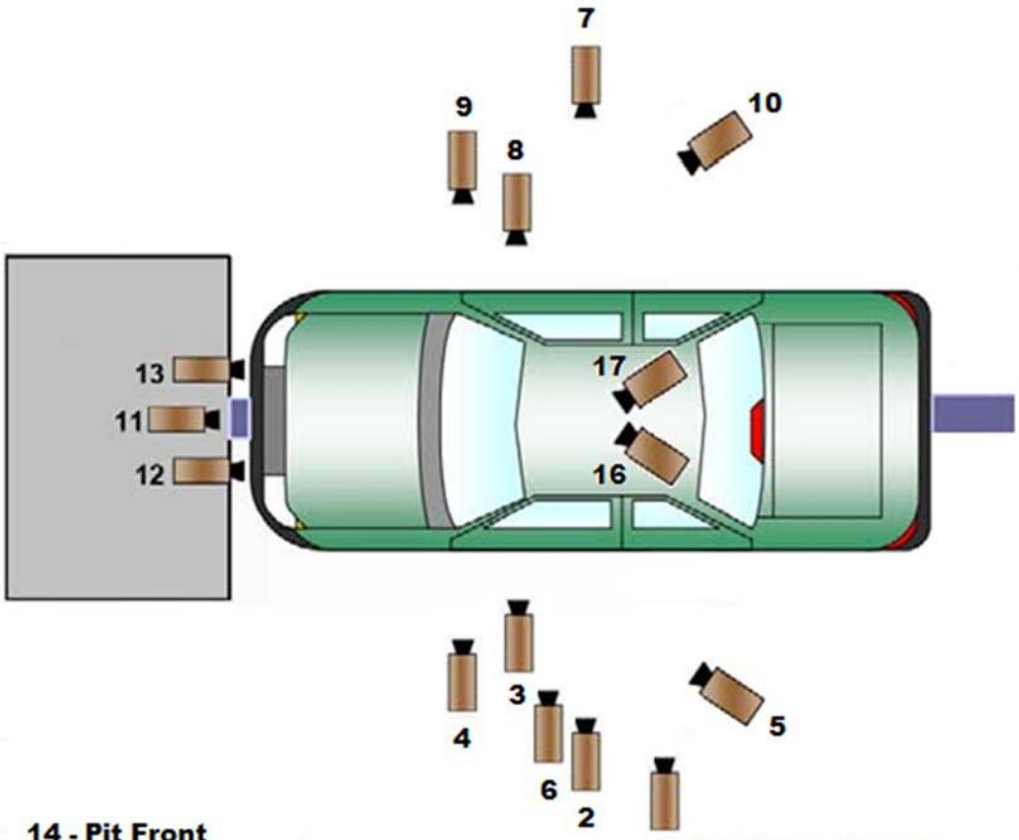
BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as measured on ATD	mm	890	970
Lap Belt Length as measured on ATD	mm	650	790
Remainder of belt on reel	mm	860	640
Total Belt Length for Continuous Webbing Systems	mm	3000	3000

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

Test Vehicle:	2021 Nissan Rogue S AWD 5-Door SUV	NHTSA No.:	O20215200
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	3/24/2021

CAMERA POSITIONS FOR FRONTAL IMPACTS



14 - Pit Front
15 - Pit Rear
16 & 17 - Driver and Passenger Onboard

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

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

Test Vehicle: 2021 Nissan Rogue S AWD 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20215200
Test Date: 3/24/2021

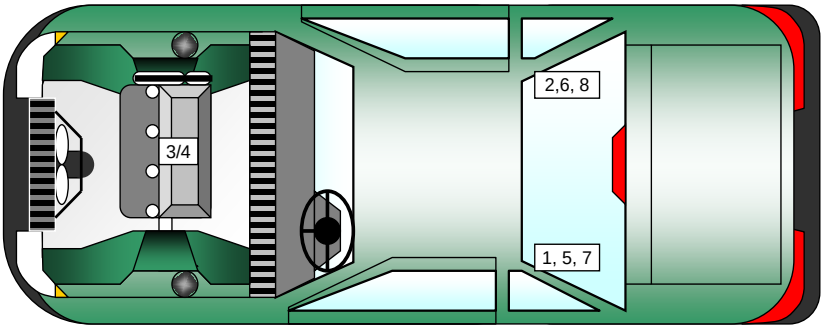
CAMERA LOCATIONS

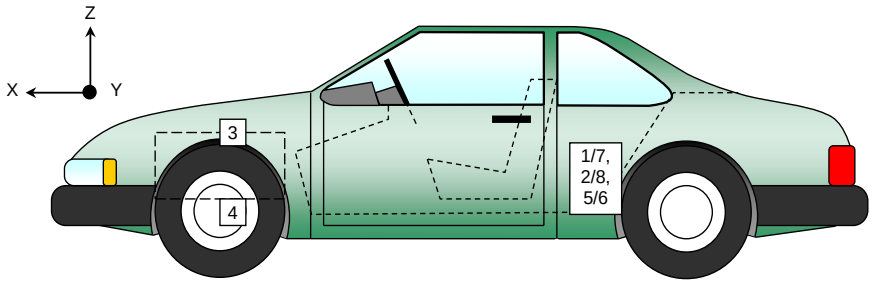
No.	Camera View	Coordinates* (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Overall					30
2	Left Overall	-2380	-5900	-1310	12	1000
3	Driver Close-Up	-1800	-6830	-1760	50	1000
4	Left Front Half	-1410	-5800	-1290	24	1000
5	Left Angle	-7300	-5810	-1800	75	1000
6	Steering Column	-1100	-5560	-1260	50	1000
7	Right Overall	-2200	5990	-1450	12	1000
8	Passenger Close-Up	-1680	6780	-1830	50	1000
9	Right Front Half	-1290	5840	-1260	24	1000
10	Right Angle	-7400	5440	-1800	75	1000
11	Windshield	180	0	-2310	12	1000
12	Driver Windshield	190	-370	-2230	25	1000
13	Passenger Windshield	190	370	-2230	25	1000
14	Pit Front	-840	0	3340	24	1000
15	Pit Rear	-2810	0	3340	24	1000
16	Driver Onboard				12	1000
17	Passenger Onboard				12	1000
18	Real-Time Pan View					30

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

DATA SHEET NO. 7
VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2021 Nissan Rogue S AWD 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20215200
Test Date: 3/24/2021





VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Crossmember Accelerometer – X Direction	1818	-400	-406
2	Right Rear Crossmember Accelerometer – X Direction	1818	395	-406
3	Engine Top X	3902	30	-1301
4	Engine Bottom X	3898	190	-202
5	Left Rear Crossmember Accelerometer – Z Direction	1818	-400	-406
6	Right Rear Crossmember Accelerometer – Z Direction	1818	395	-406
7	Left Rear Crossmember Accelerometer Redundant – X Direction	1818	-355	-406
8	Right Rear Crossmember Accelerometer Redundant – X Direction	1818	370	-406

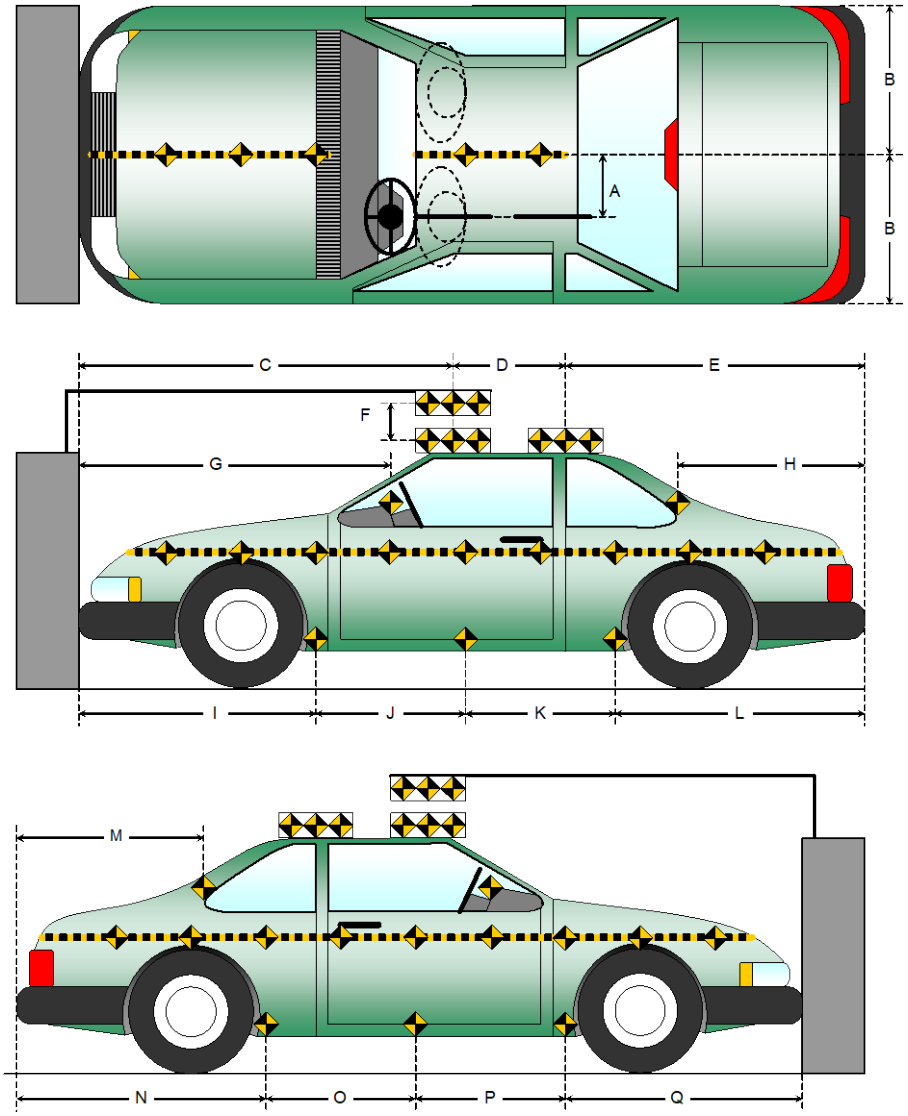
Reference Points: X - Rear Surface of Vehicle (+ forward)
Y - Vehicle Centerline (+ to right)
Z - Ground Plane (+ down)

DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2021 Nissan Rogue S AWD 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20215200
Test Date: 3/24/2021

Item	Value (mm)
A	380
B	937
C	2300
D	610
E	1747
F	220
G	
H	851
I	1446
J	839
K	839
L	1533
M	851
N	1533
O	839
P	839
Q	1446



DATA SHEET NO. 9
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2021 Nissan Rogue S AWD 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20215200
Test Date: 3/24/2021

ADVANCED RESEARCH LOAD CELL BARRIER

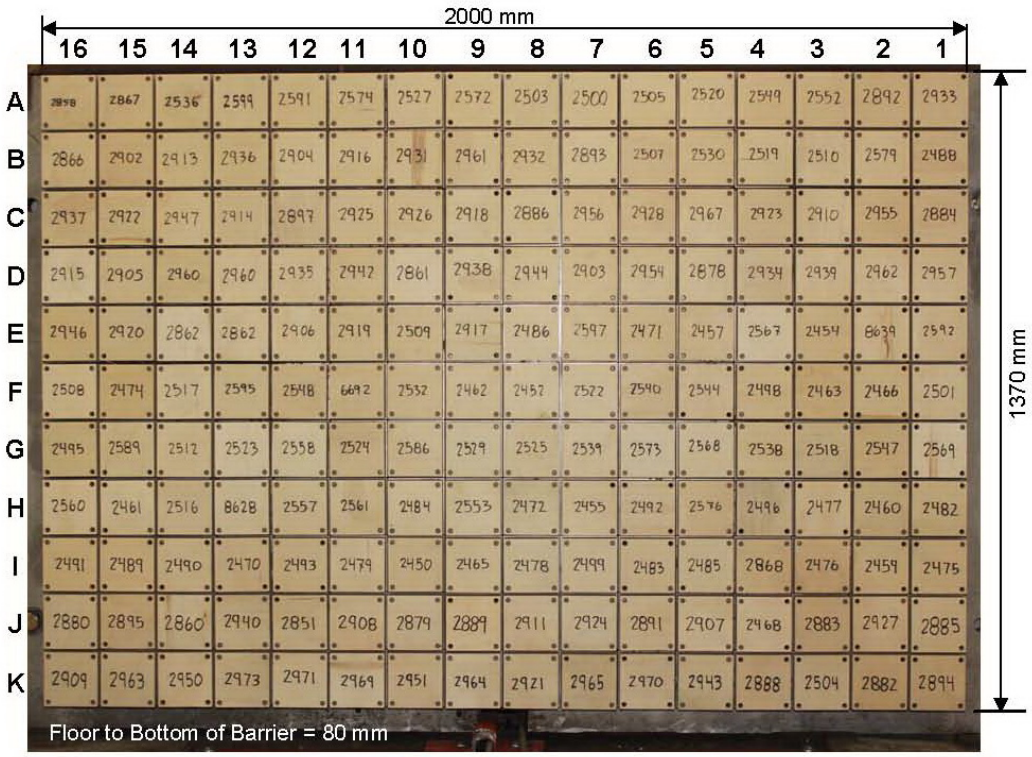


Photo for Reference Only

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: 2021 Nissan Rogue S AWD 5-Door SUV NHTSA No.: O20215200
Test Program: NCAP Frontal Barrier Impact Test Test Date: 3/24/2021

INSTRUMENTATION

Instrumentation	Number of Channels Collected
Driver Dummy Data Channels	47
Passenger Dummy Data Channels	47
Vehicle Structure Accelerometers	8
Barrier Channels	528
Total	630

CAMERA COVERAGE

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

DATA SHEET NO. 11
POST-TEST OBSERVATIONS

Test Vehicle: 2021 Nissan Rogue S AWD 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20215200
Test Date: 3/24/2021

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Passenger
Dummy Type / Serial No.	HIII 50% / 351	HIII 5% / DH1659
Head Contact	Frontal Airbag, Headrest	Frontal Airbag, Headrest
Upper Torso Contact	Frontal Airbag	Frontal Airbag
Lower Torso Contact	None	None
Left Knee Contact	Knee Airbag	Knee Airbag
Right Knee Contact	Knee Airbag	Knee Airbag

DOOR OPENING, TRUNK OPENING, AND SEAT TRACK INFORMATION

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

OTHER VEHICLE POST-TEST OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Windshield Damage	Cracked by passenger airbag and hood
Window Damage	None
Other Notable Effects	None

VEHICLE REBOUND FROM BARRIER

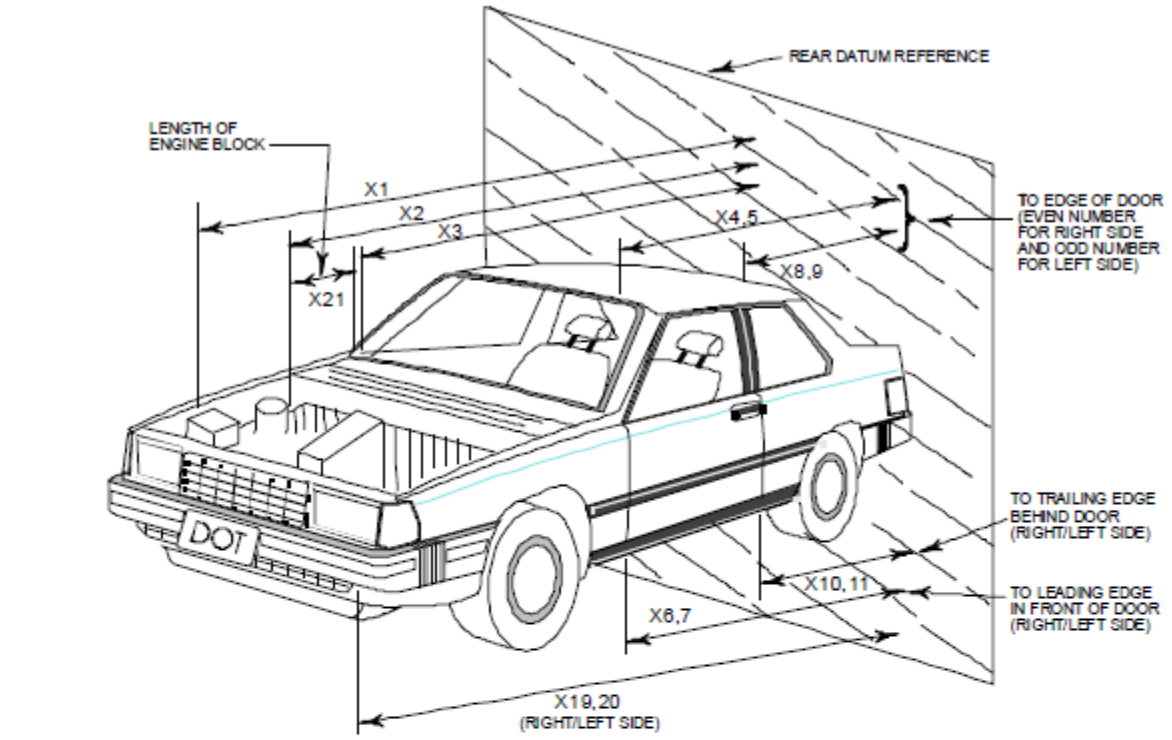
Measured Parameter	Units	Value
Left Side	mm	2840
Center	mm	2975
Right Side	mm	3055
Average	mm	2957

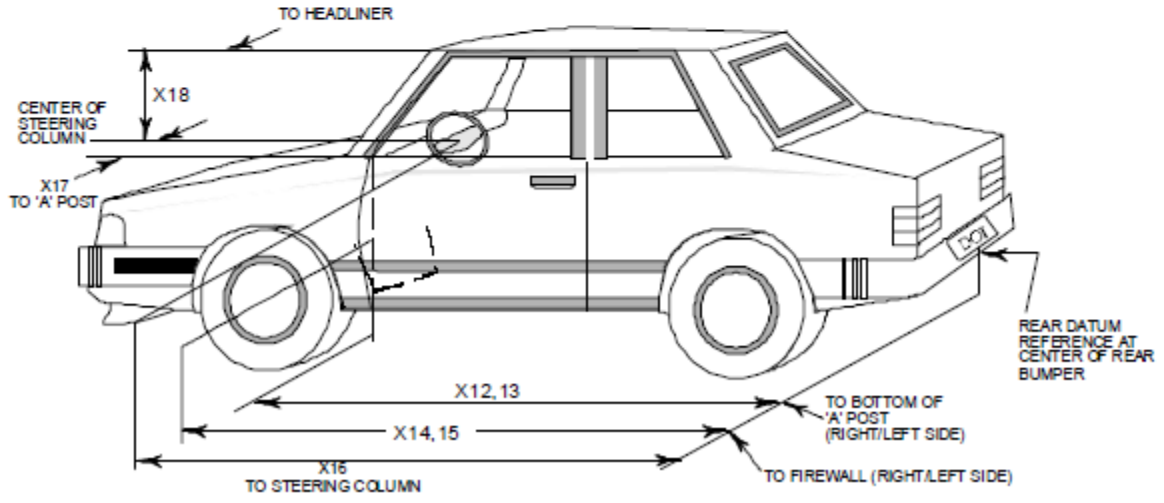
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

DATA SHEET NO. 12
VEHICLE PROFILE MEASUREMENTS

Test Vehicle:	2021 Nissan Rogue S AWD 5-Door SUV	NHTSA No.:	O20215200
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	3/24/2021





DATA SHEET NO. 12 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2021 Nissan Rogue S AWD 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20215200
Test Date: 3/24/2021

No.	Measurement Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	4657	4225	432
2	RSOV to Front of Engine	4019	3768	251
3	RSOV to Firewall	3640	3606	34
4	RSOV to Upper Leading Edge of Right Door	3148	3165	-17
5	RSOV to Upper Leading Edge of Left Door	3164	3163	1
6	RSOV to Lower Leading Edge of Right Door	3168	3167	1
7	RSOV to Lower Leading Edge of Left Door	3178	3155	23
8	RSOV to Upper Trailing Edge of Right Door	2093	2093	0
9	RSOV to Upper Trailing Edge of Left Door	2099	2090	9
10	RSOV to Lower Trailing Edge of Right Door	2132	2113	19
11	RSOV to Lower Trailing Edge of Left Door	2125	2100	25
12	RSOV to Bottom of “A” Post of Right Side	3158	3156	2
13	RSOV to Bottom of “A” Post of Left Side	3162	3161	1
14	RSOV to Firewall, Right Side	3585	3590	-5
15	RSOV to Firewall, Left Side	3561	3558	3
16	RSOV to Steering Column	2689	2813	-124
17	Center of Steering Column to “A” Post	421	453	-32
18	Center of Steering Column to Headliner	472	475	-3
19	RSOV to Right Side of Front Bumper	4501	4122	379
20	RSOV to Left Side of Front Bumper	4501	4159	342
21	Length of Engine Block	442	442	0
RD	RSOV to Right Side of Dash Panel	3218	3216	2
CD	RSOV to Center of Dash Panel	3132	3082	50
LD	RSOV to Left Side of Dash Panel	3233	3235	-2

All Dimensions in mm

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

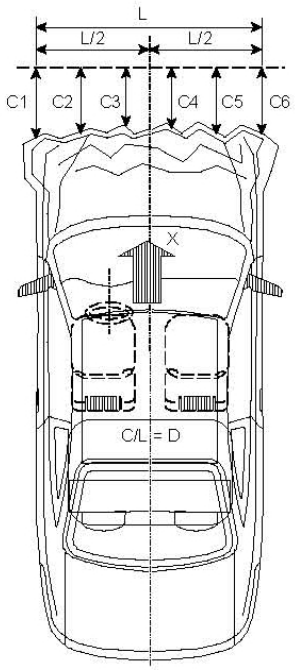
Test Vehicle: 2021 Nissan Rogue S AWD 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20215200
Test Date: 3/24/2021

VEHICLE INFORMATION

VIN:	5N1AT3AB9MC698167	Wheelbase (mm):	2705
Vehicle Size Category:	MPV	Test Weight (kg):	1802.5

ACCELEROMETER DATA

Accelerometer Locations:	As per Data Sheet No. 7
Cal. Procedure/Interval:	MGA Procedure / 6 month
Integration Algorithm:	Trapezoidal
Linearity:	> 99%
Impact Velocity (km/h):	56.22
Velocity Change (km/h):	64.6
Time of Separation (msec)	96



CRUSH PROFILE

Collision Deformation Classification:	12FDEW3
Midpoint of Damage:	Centerline
Damage Region Length (mm):	1386
Impact Mode:	Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4501	4159	342
C2	Crush zone 2 at left side	mm	4620	4180	440
C3	Crush zone 3 at left side	mm	4655	4178	477
C4	Crush zone 4 at right side	mm	4655	4172	483
C5	Crush zone 5 at right side	mm	4620	4135	485
C6	Crush zone 6 at right side	mm	4501	4122	379
L	C1 TO C6	mm	1386	1368	18

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

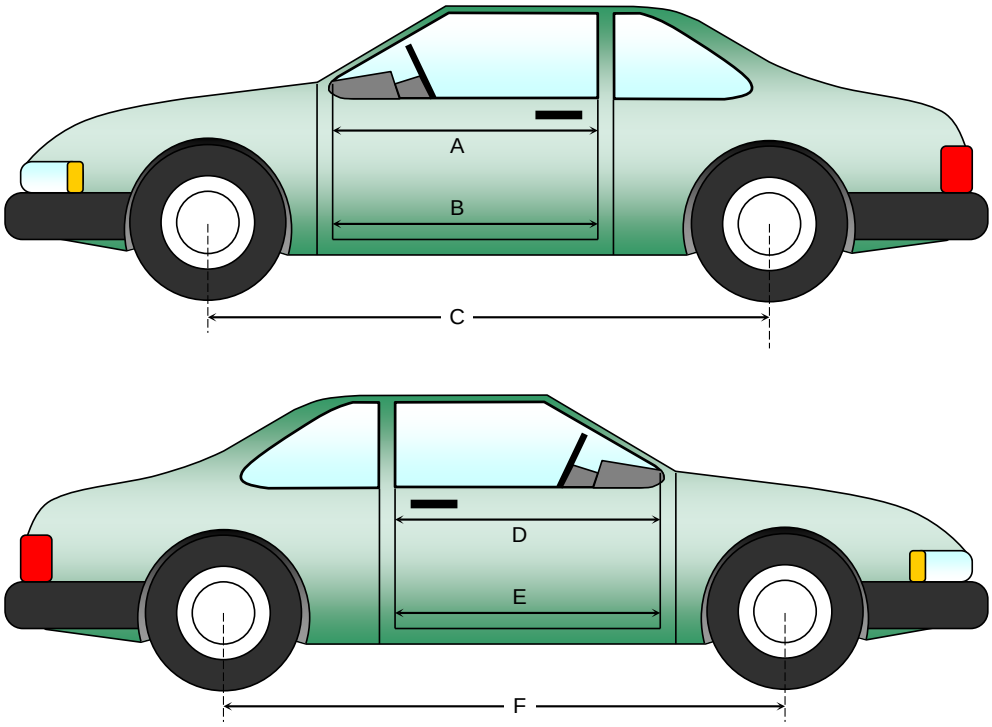
Test Vehicle: 2021 Nissan Rogue S AWD 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20215200
Test Date: 3/24/2021

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1009	1009	0
B	Left Side Lower	mm	906	906	0
D	Right Side Upper	mm	1017	1017	0
E	Right Side Lower	mm	921	921	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2705	2682	23
F	Right Side Wheelbase	mm	2705	2685	20



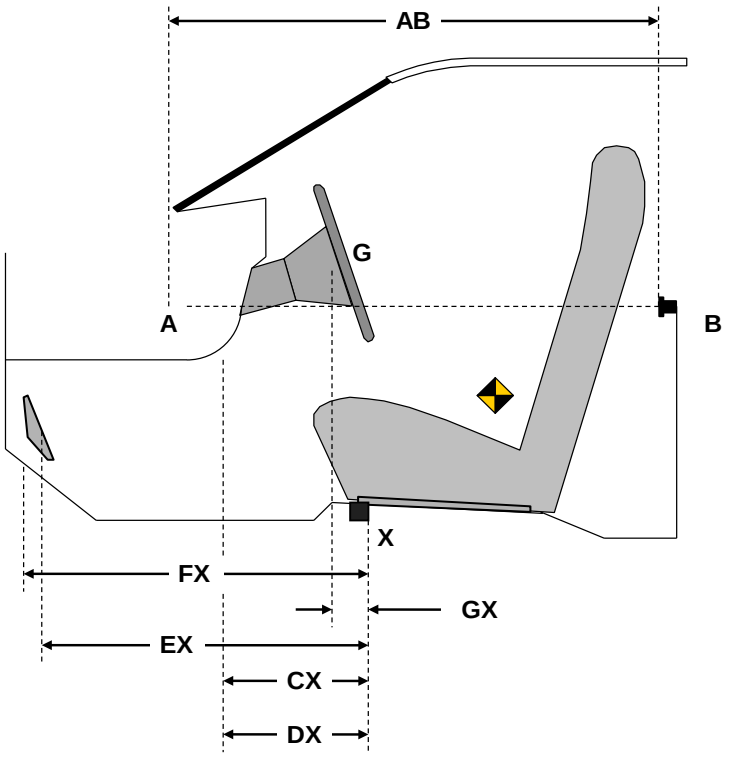
DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2021 Nissan Rogue S AWD 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20215200
Test Date: 3/24/2021

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	837	837	0
CX	Left Knee Bolster to X	mm	309	328	-19
DX	Right Knee Bolster to X	mm	315	335	-20
EX	Brake Pedal to X	mm	556	546	10
FX	Foot Rest to X	mm	560	555	5
GX	Center of Steering Column Wheel Hub to X	mm	92	132	-40

X = Front of Seat Track (stationary)



DRIVER COMPARTMENT

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

Test Vehicle: 2021 Nissan Rogue S AWD 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20215200
Test Date: 3/24/2021

WINDSHIELD MOUNTING DETAILS

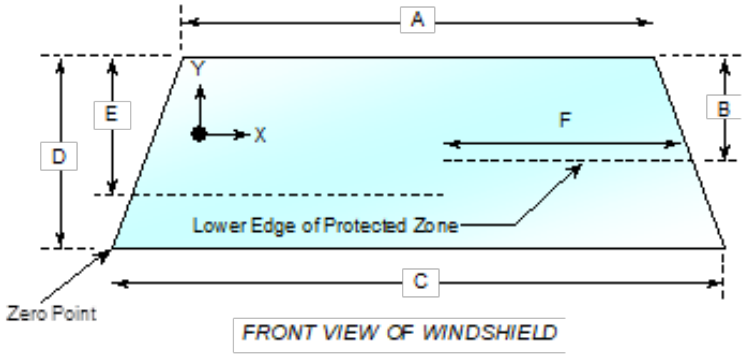
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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: 21.9°C.

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2272	2272	100
Right Side	2272	2272	100
Total	4544	4544	100



FRONT VIEW OF WINDSHIELD

Item	Units	Value
A	mm	1224
B	mm	520
C	mm	1430
D	mm	945
E	mm	582
F	mm	541

AREA OF PROTECTED ZONE FAILURES

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

X	Y

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

X	Y

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

Test Vehicle: 2021 Nissan Rogue S AWD 5-Door SUV NHTSA No.: O20215200
Test Program: NCAP Frontal Barrier Impact Test Test Date: 3/24/2021

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21.9°C Test Time: 12:12 p.m.

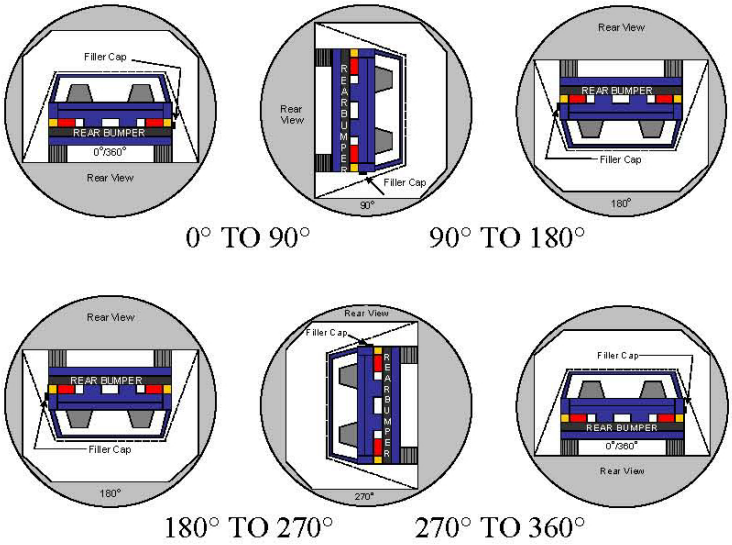
A. From impact until vehicle motion ceases: (Maximum Allowable = 1 ounce) 0.0 oz.

B. For the 5 minute period after motion ceases: (Maximum Allowable = 5 ounces) 0.0 oz.

C. For the following 25 minutes: (Maximum Allowable = 1 ounce / minute) None

D. Spillage Details: None

FMVSS 301 STATIC ROLLOVER RESULTS



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

SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	113	300	413
90° to 180°	111	300	411
180° to 270°	107	300	407
270° to 360°	110	300	410

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

Test Vehicle: 2021 Nissan Rogue S AWD 5-Door SUV NHTSA No.: O20215200
Test Program: NCAP Frontal Barrier Impact Test Test Date: 3/24/2021

FMVSS 301 SPILLAGE TABLE (UNITS IN OUNCES)

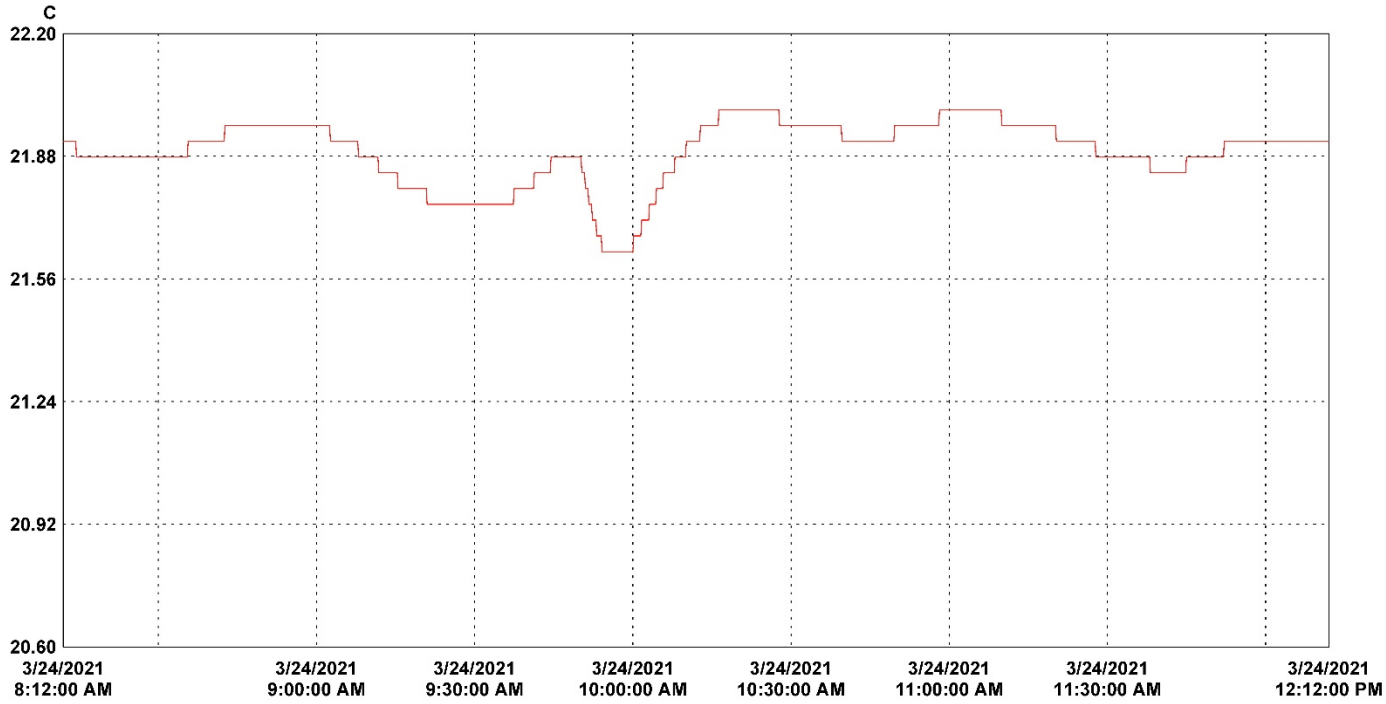
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eight Minute
0° to 90°	0	0	0	
90° to 180°	0	0	0	
180° to 270°	0	0	0	
270° to 360°	0	0	0	

SOLVENT SPILLAGE LOCATION TABLE

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

DATA SHEET NO. 17
DUMMY/VEHICLE TEMPERATURE STABILIZATION DATA

Test Vehicle: 2021 Nissan Rogue S AWD 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20215200
Test Date: 3/24/2021



30 minutes/div 4 hours (M/d/yyyy h:mm:ss tt) Central Time Graph file (truncated): O20215200 2021 Nissan Rogue S AWD 5-Door SUV NCAP.spg

LN	Serial #	Description	CH	Value	Maximum	Average	Minimum	Units	CH description	Logger file
1	18352041	VSC_Prep_Room	1		22.00	21.89	21.63	C	Temperature	18352041_VSC_Prep_Room.spl

APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

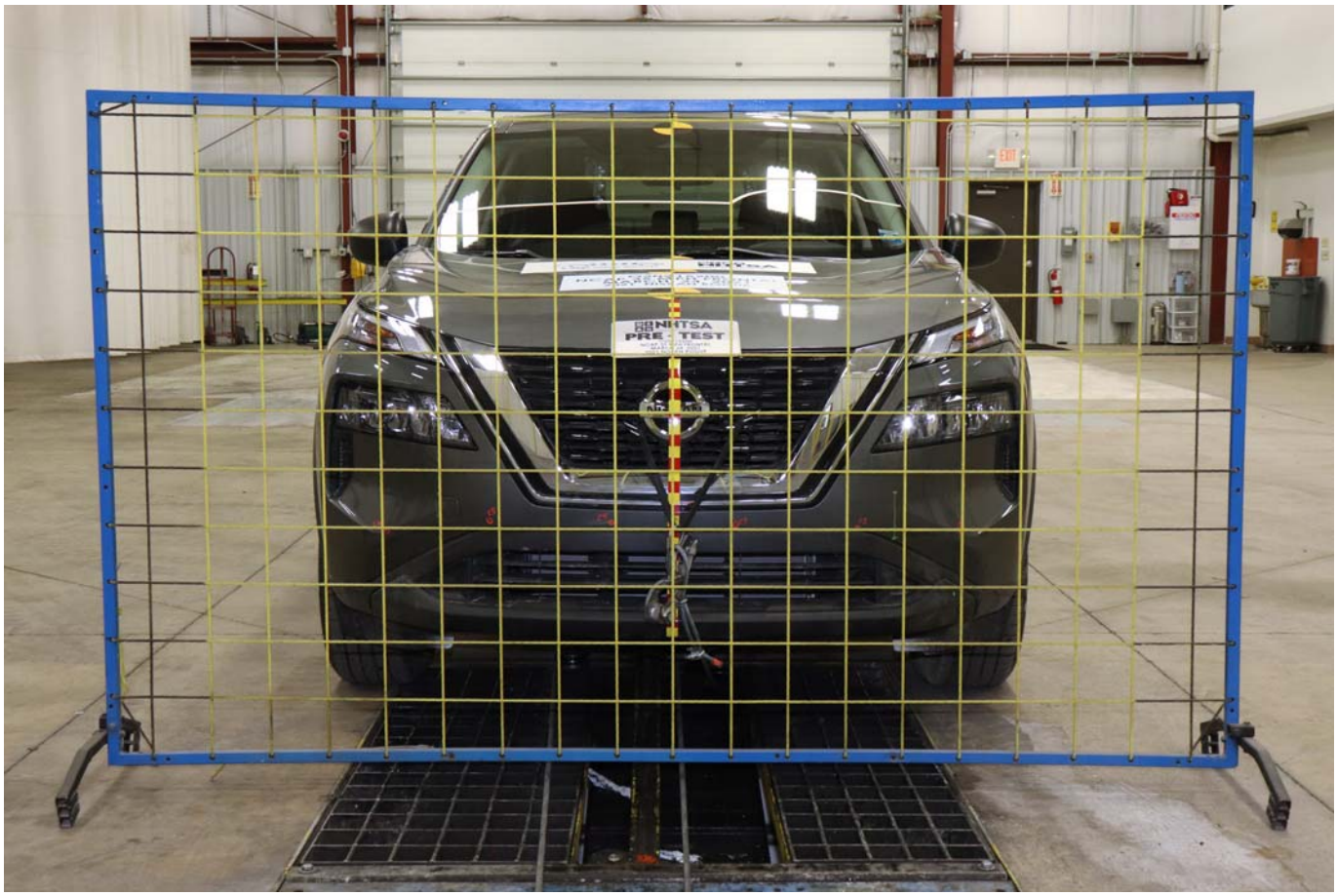


Photo No. 001 - Load Cell Location

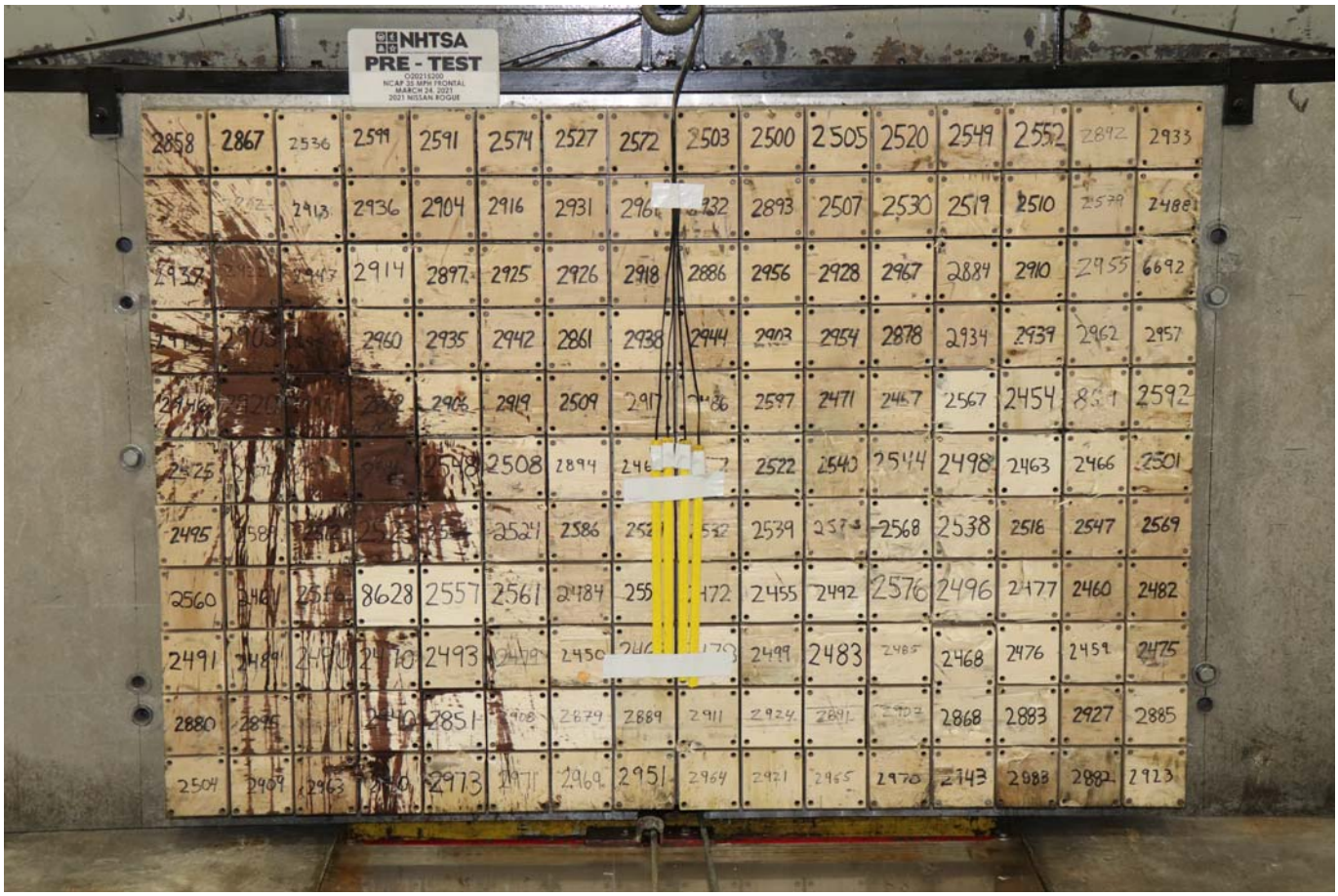


Photo No. 002 - Pre-Test Load Cell Wall

Photo No. 003 - Post-Test Load Cell Wall

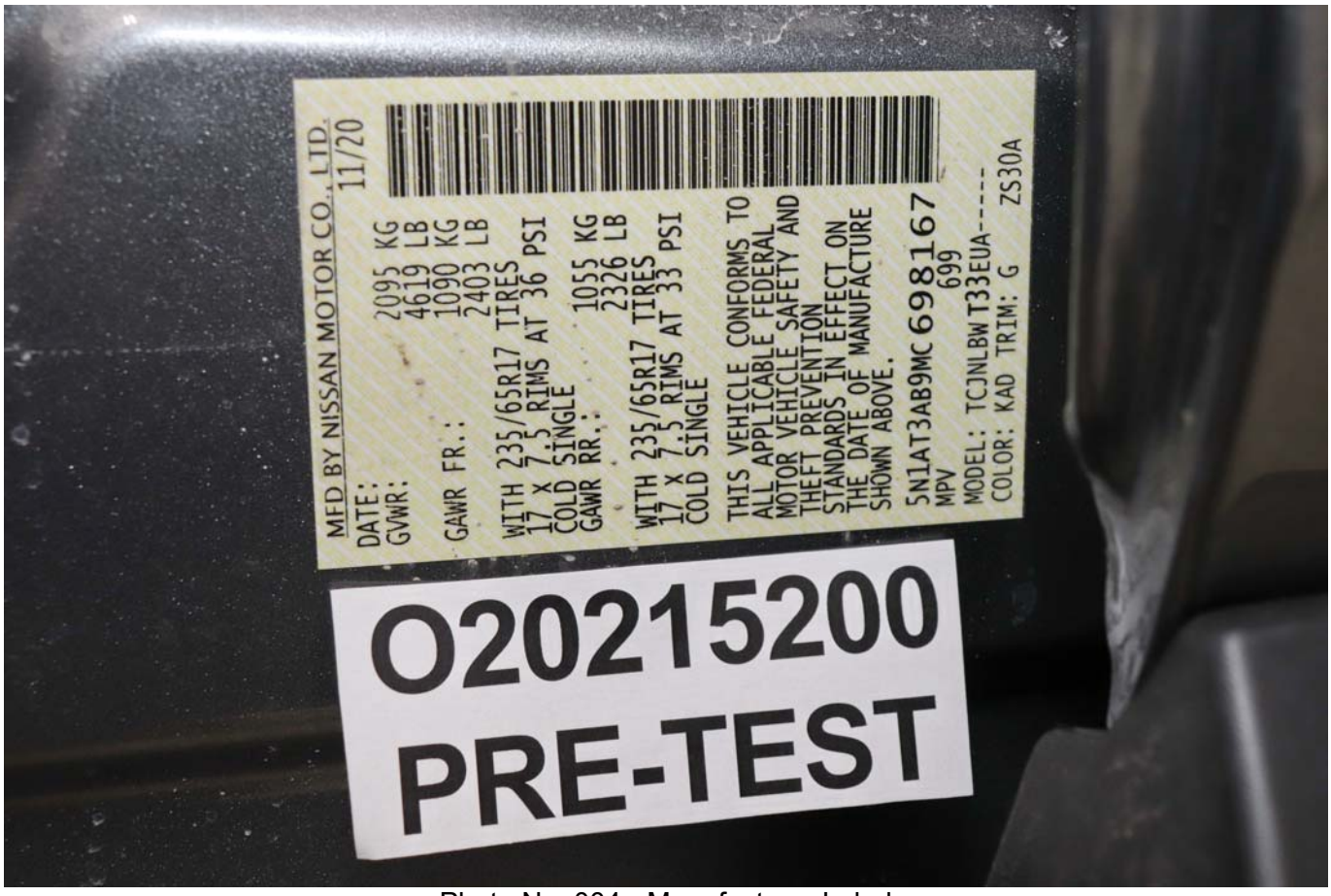


Photo No. 004 - Manufacturer Label

Photo No. 005 - Tire Placard

Photo No. 006 - 2021 Nissan Rogue S AWD 5-Door SUV Frontal As Delivered

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

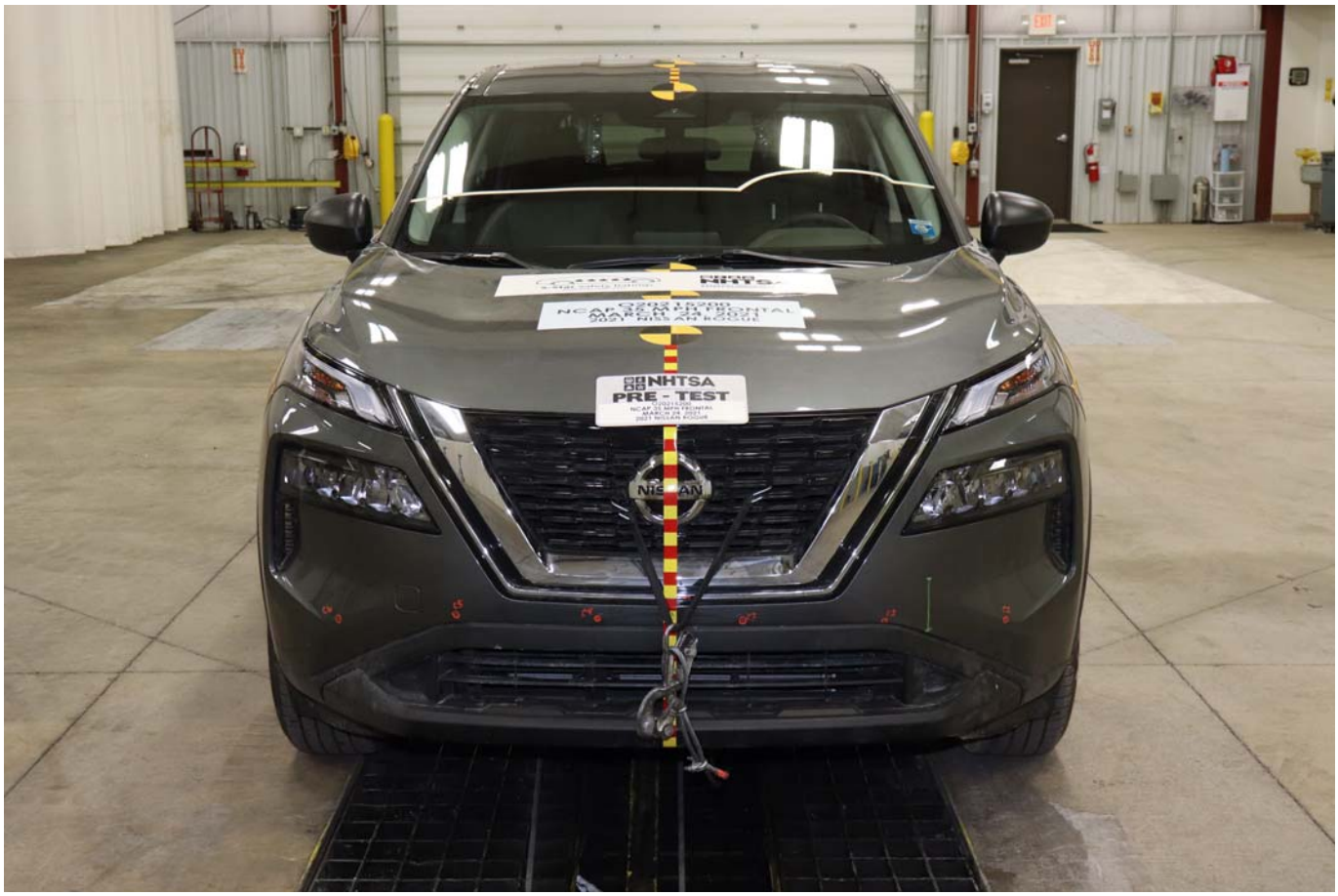


Photo No. 008 - Pre-Test Front View of Test Vehicle

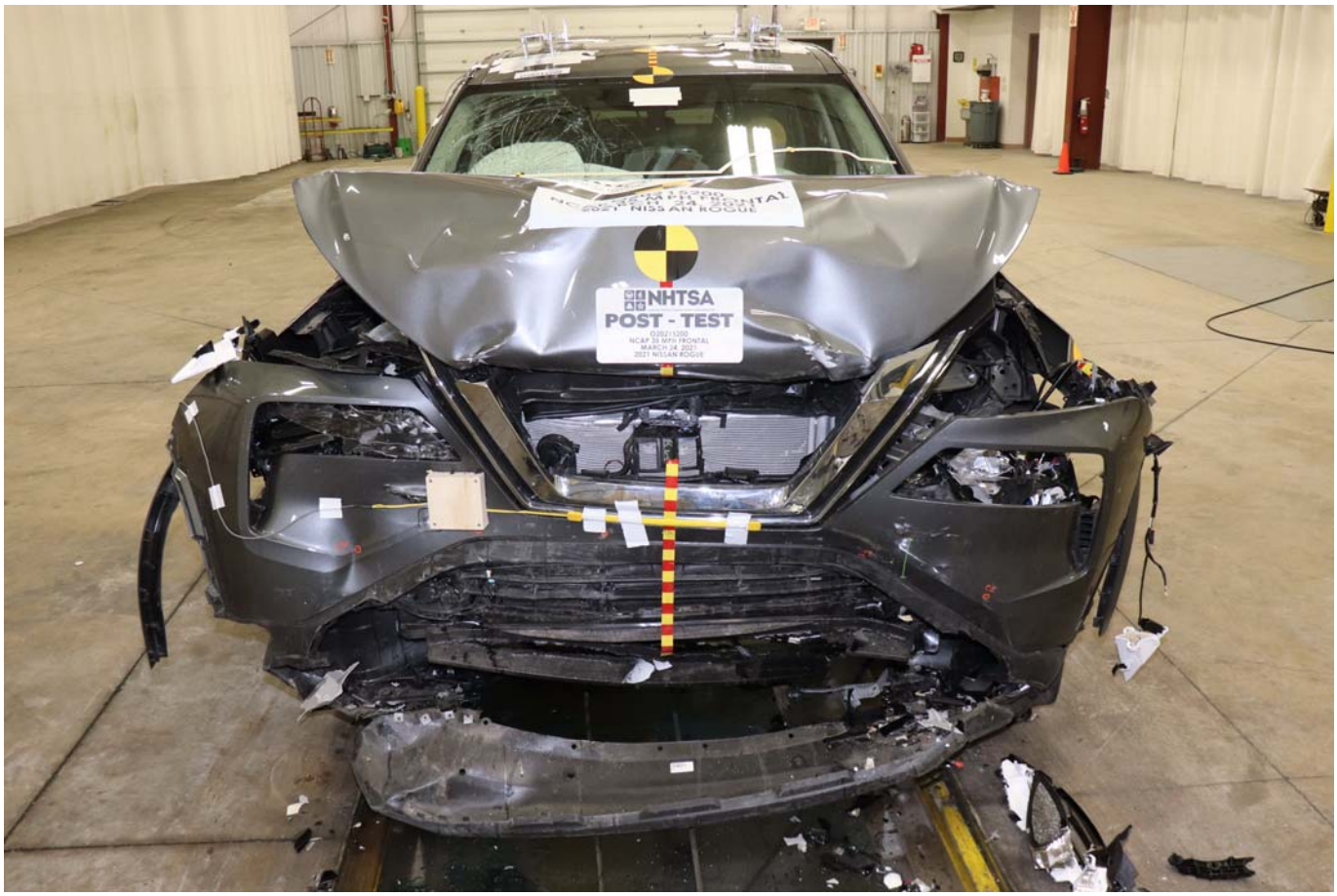


Photo No. 009 - Post-Test Front View of Test Vehicle

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

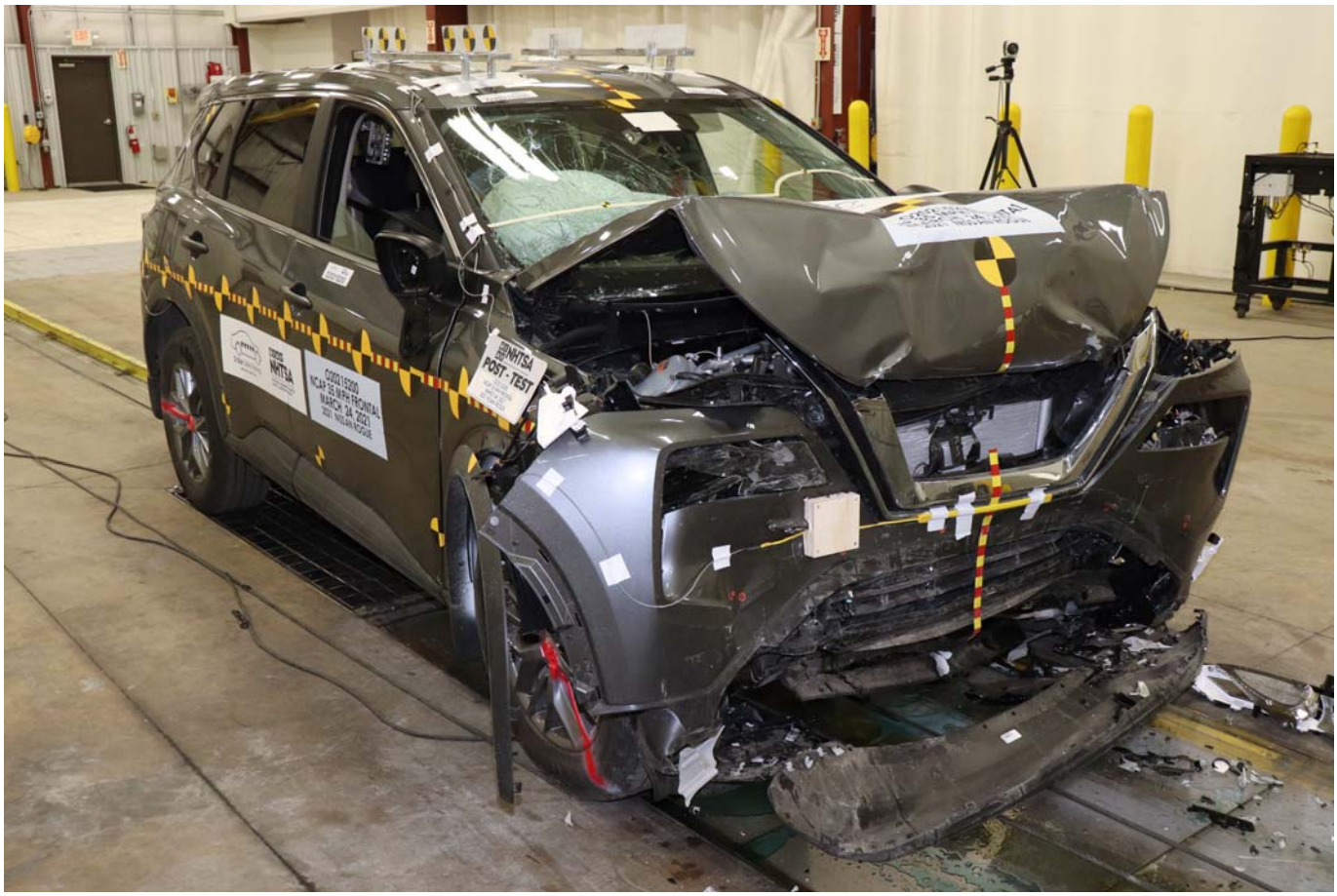


Photo No. 015 - Post-Test Right Front 3-4 View

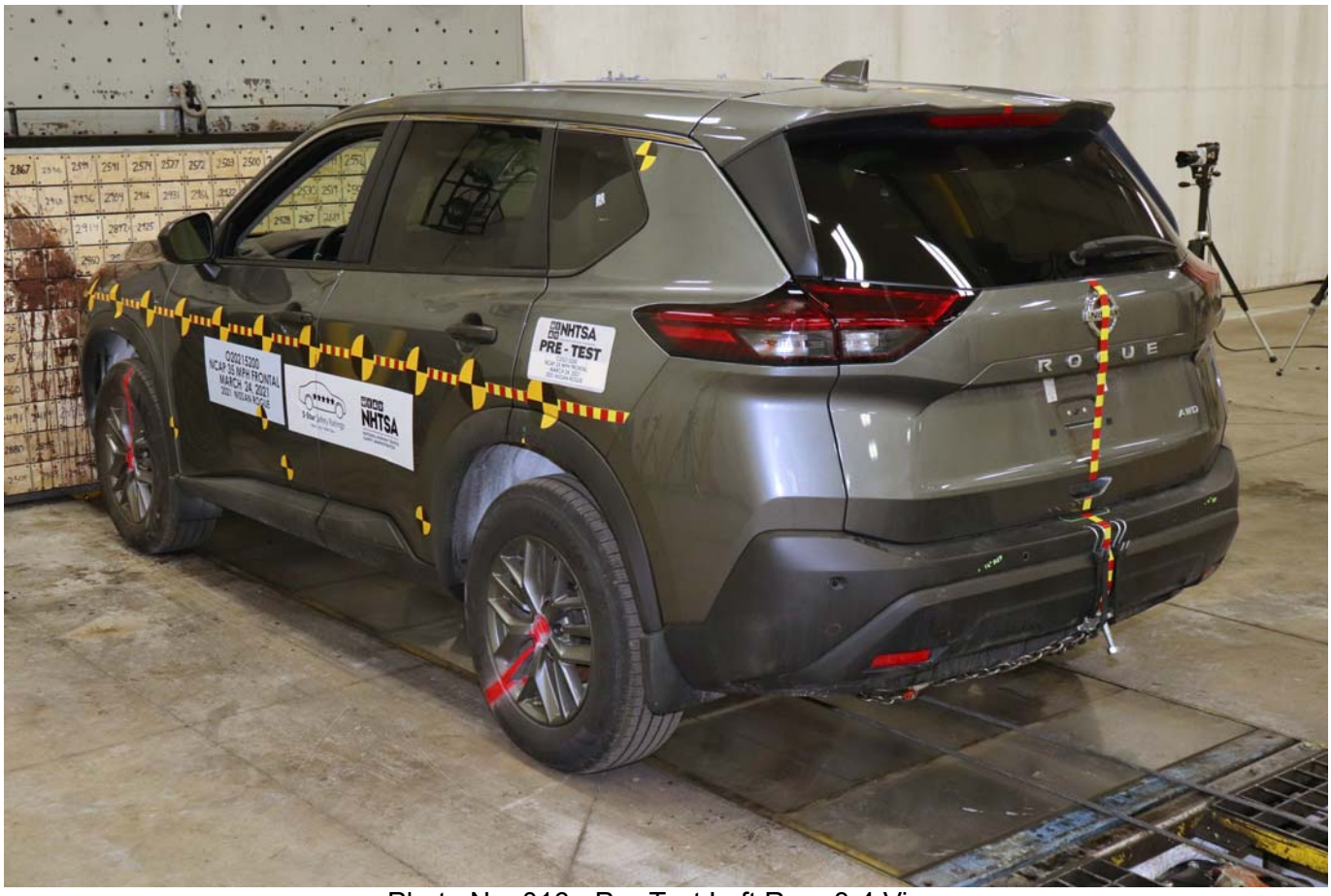


Photo No. 016 - Pre-Test Left Rear 3-4 View

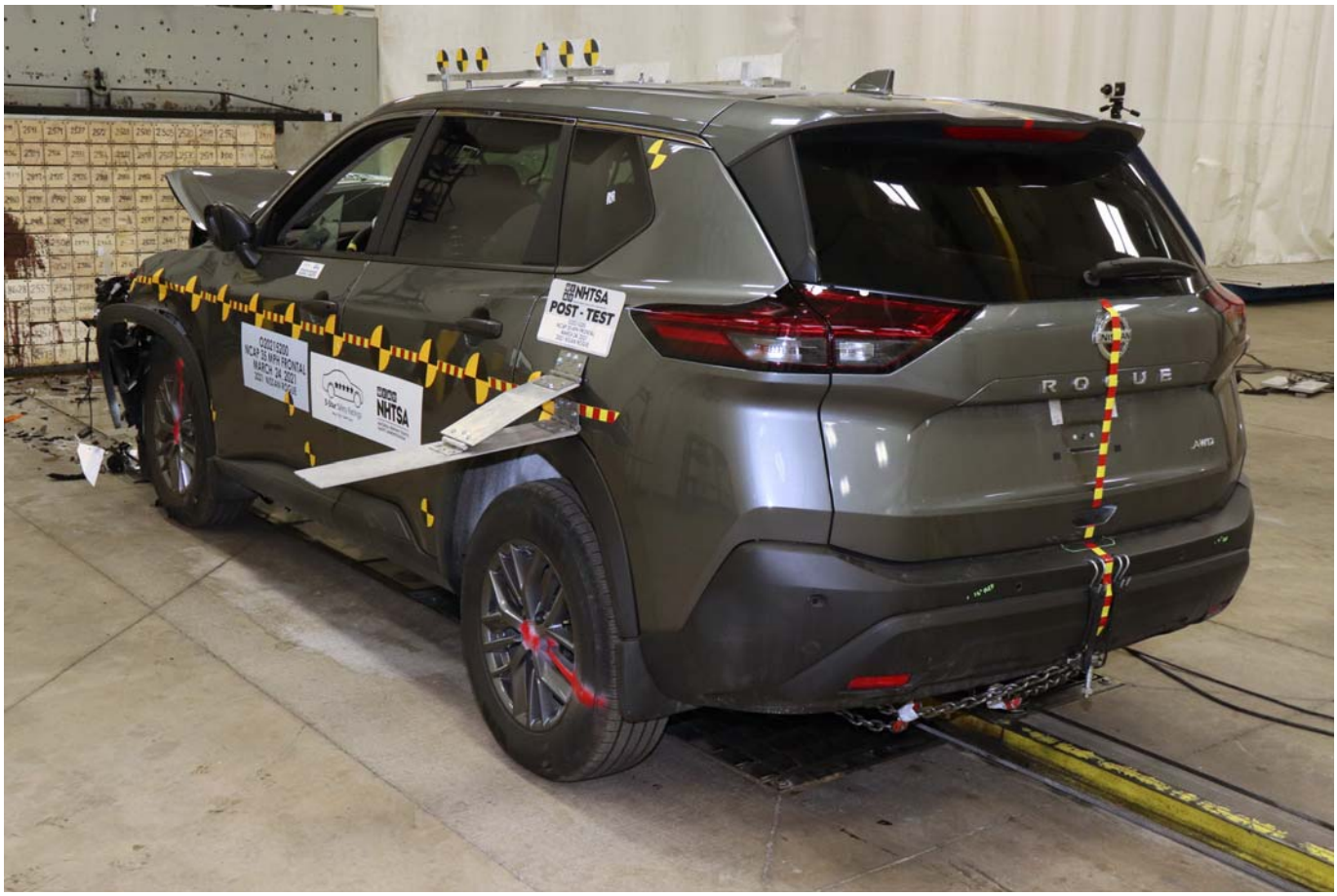


Photo No. 017 - Post-Test Left Rear 3-4 View

Photo No. 018 - Pre-Test Windshield View

Photo No. 019 - Post-Test Windshield View

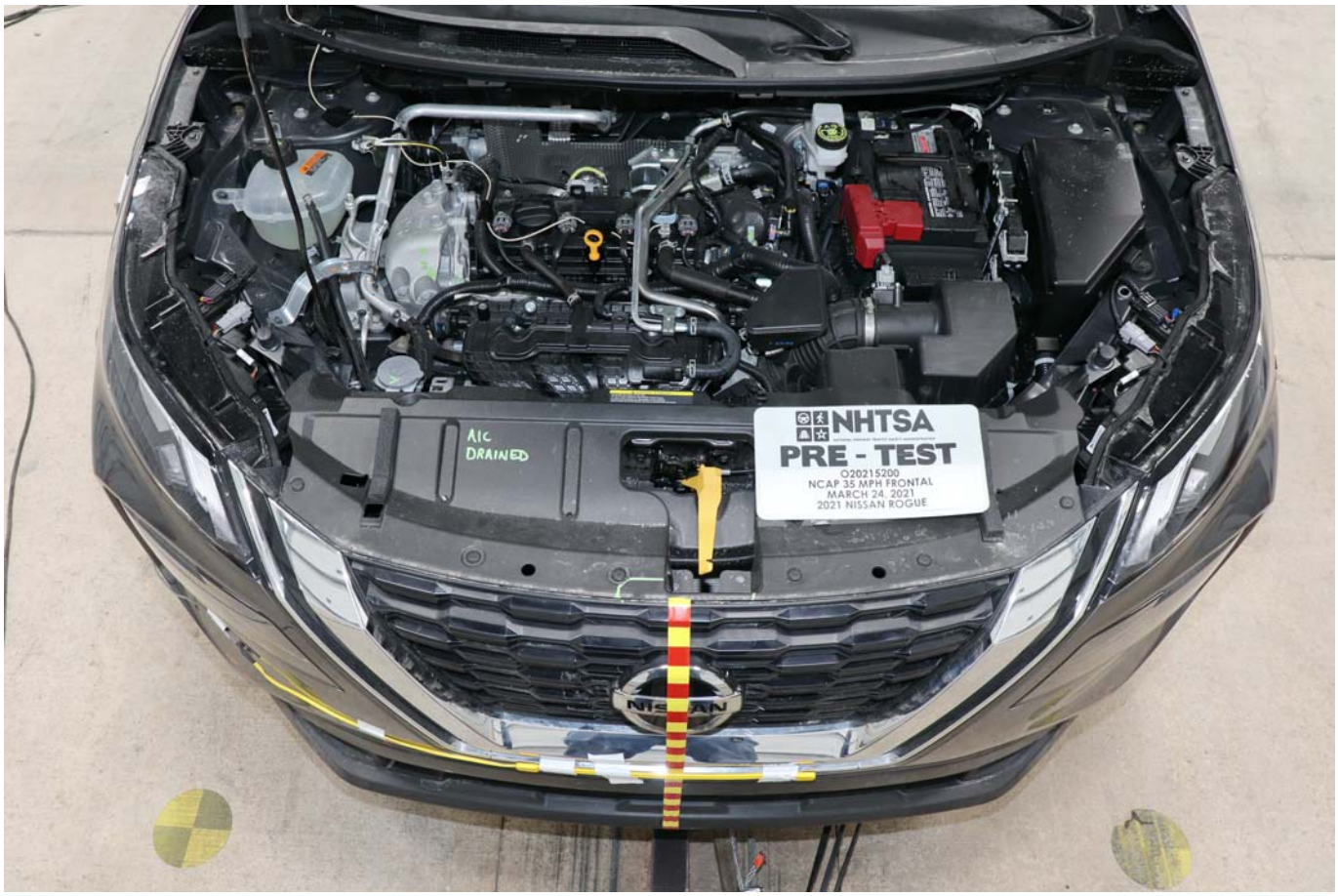


Photo No. 020 - Pre-Test Engine Compartment View

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

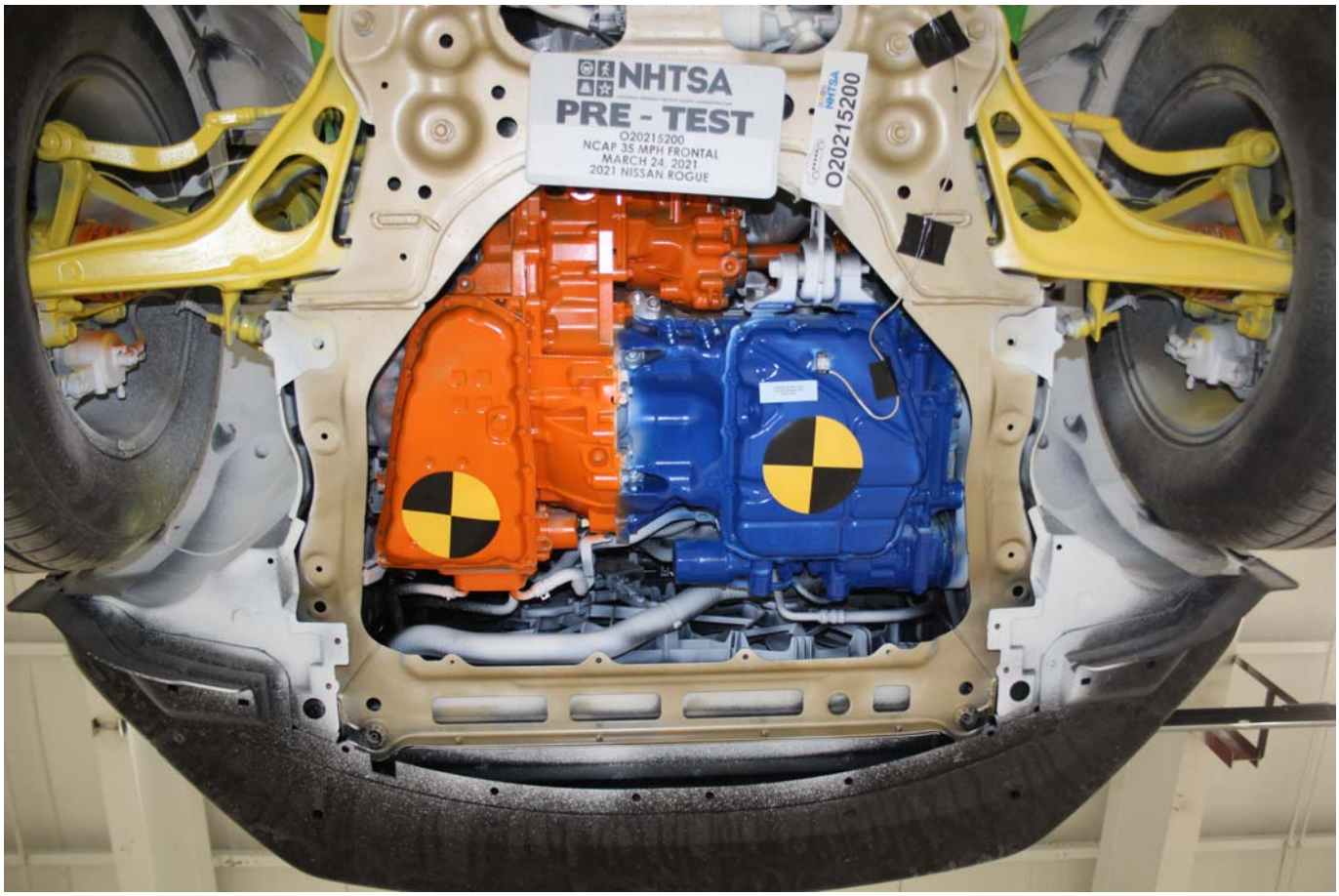


Photo No. 024 - Pre-Test Front Underbody View

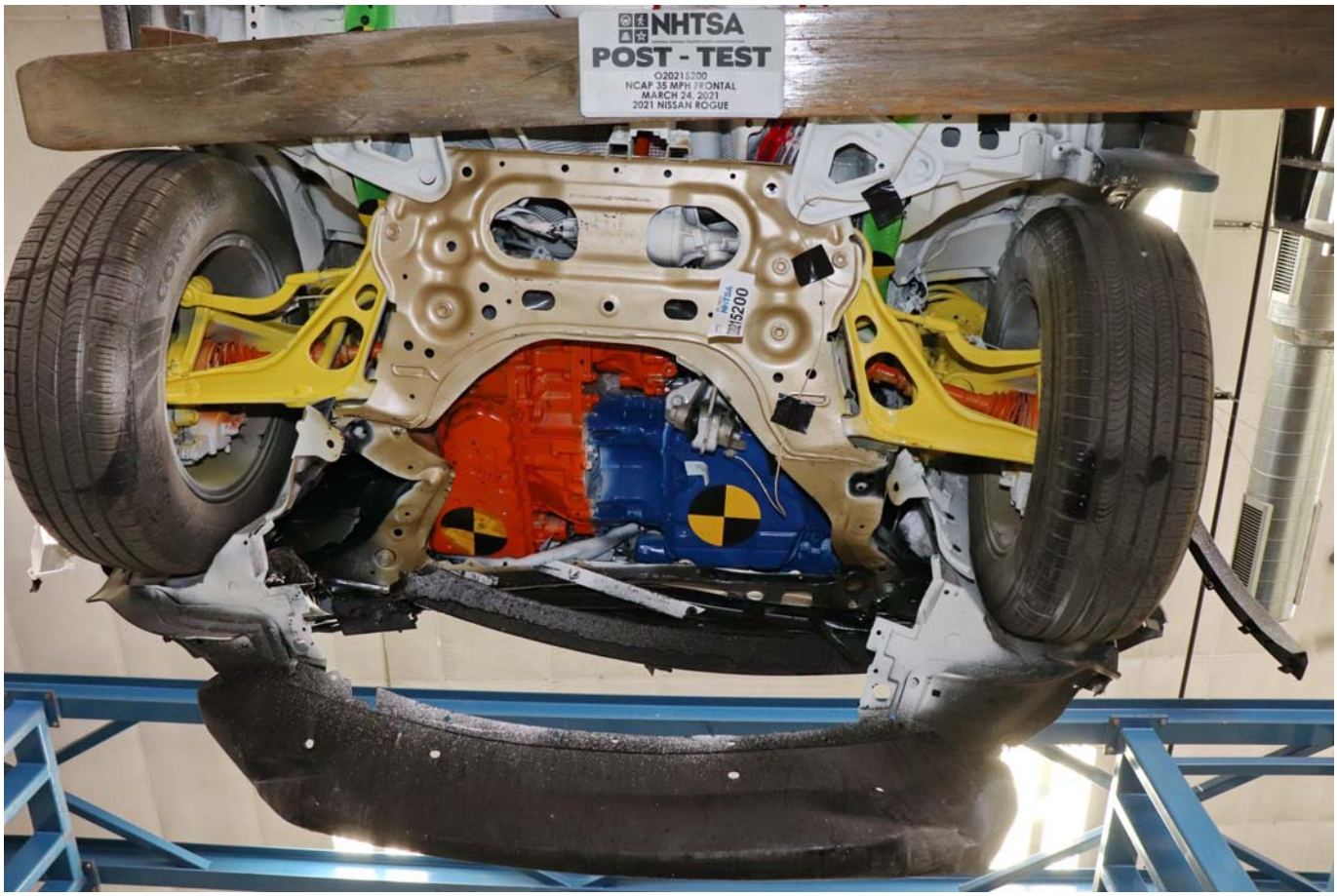


Photo No. 025 - Post-Test Front Underbody View

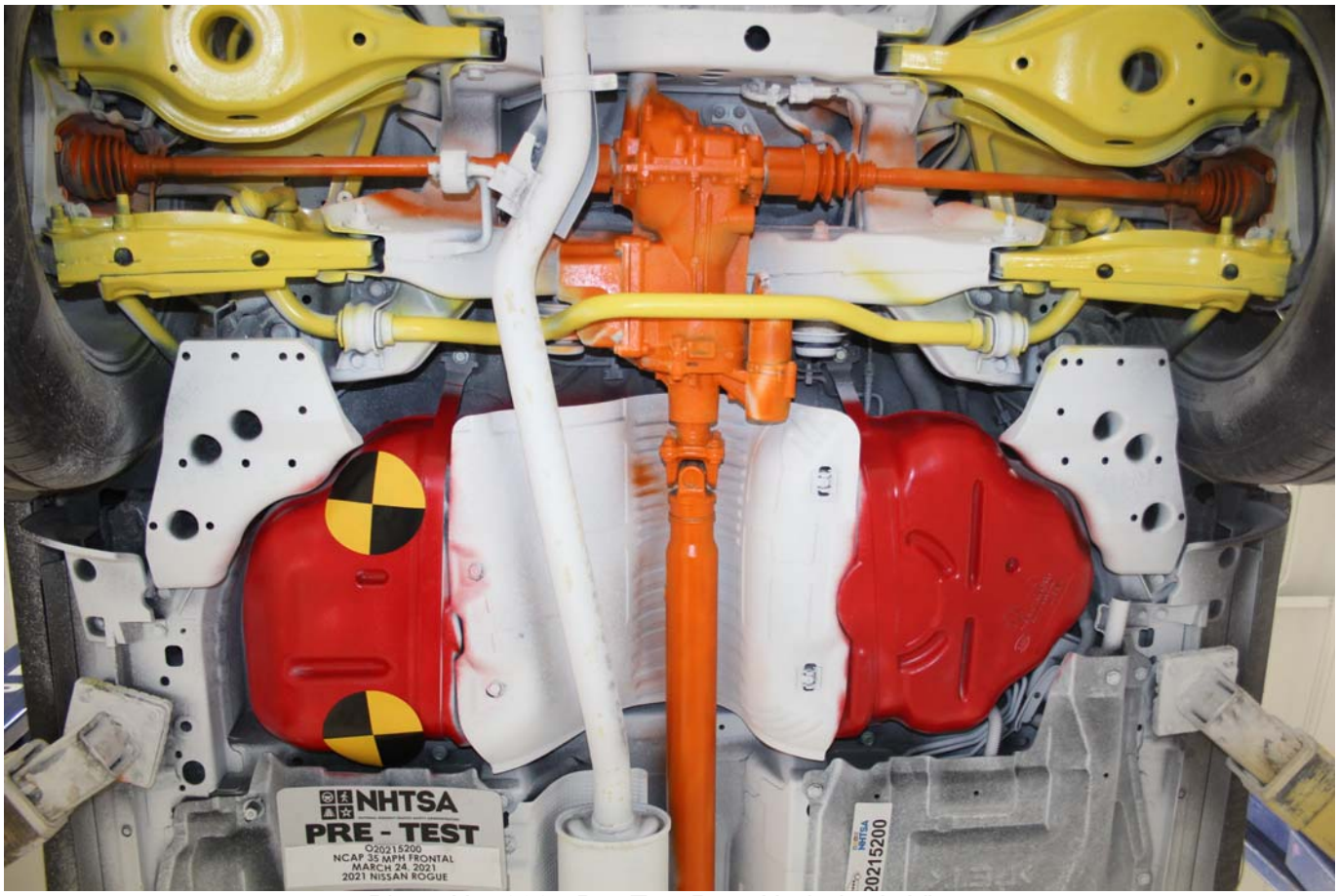


Photo No. 026 - Pre-Test Rear Underbody View

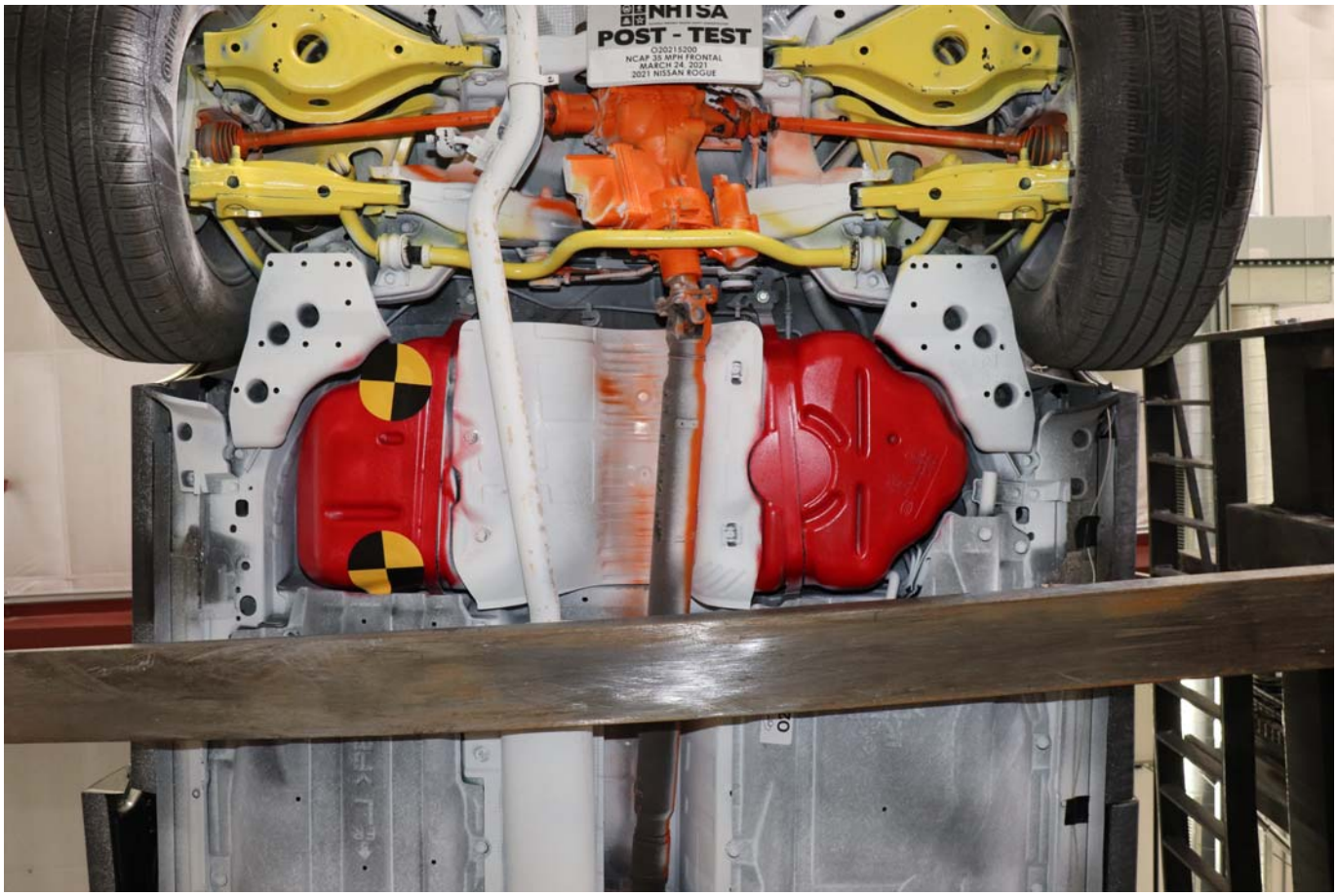


Photo No. 027 - Post-Test Rear Underbody View

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

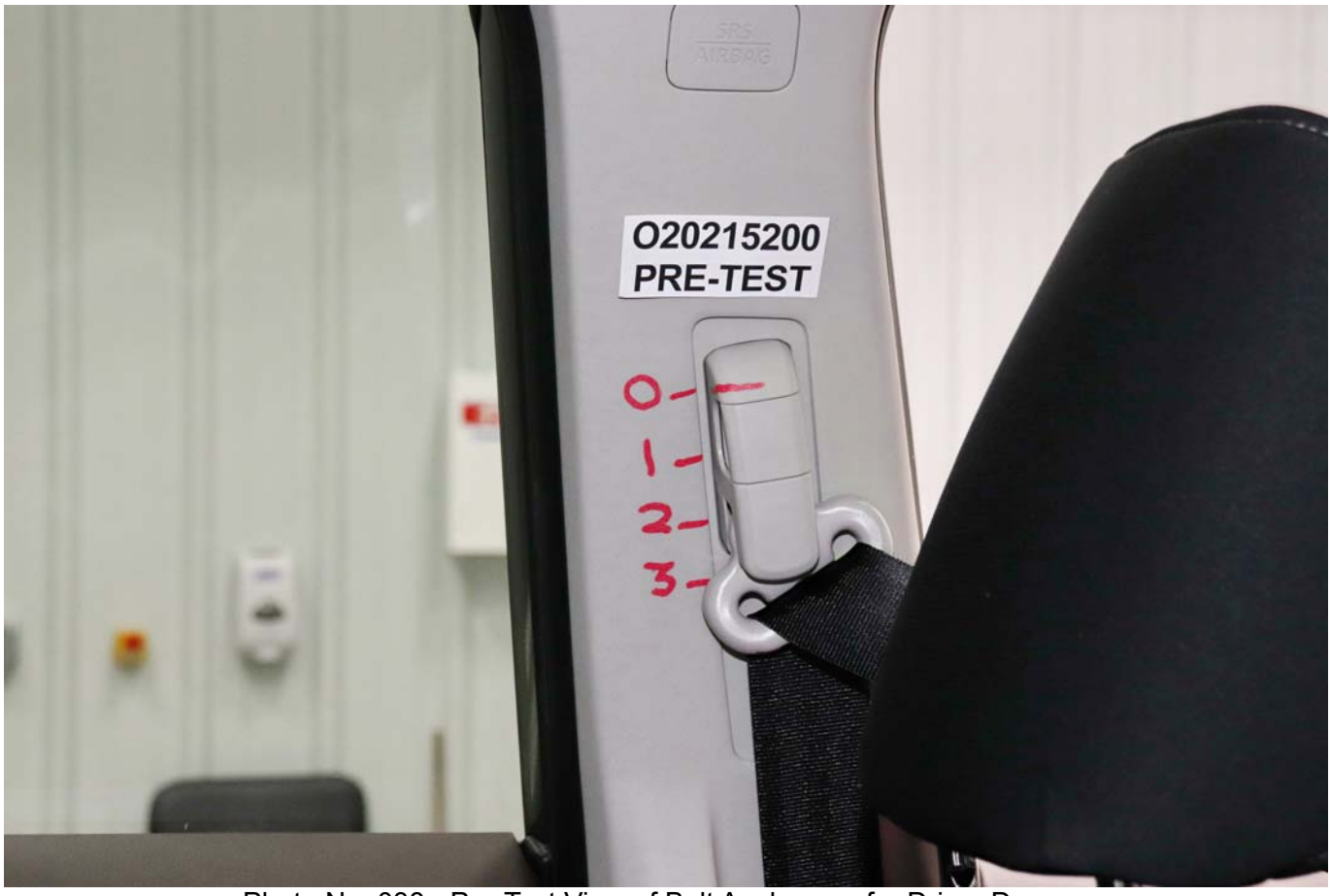


Photo No. 038 - Pre-Test View of Belt Anchorage for Driver Dummy

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

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

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

Photo No. 042 - Pre-Test Driver Dummy Feet

Photo No. 043 - Post-Test Driver Dummy Feet

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

Photo No. 045 - Post-Test Driver Side Knee Bolster

Photo No. 046 - Pre-Test Driver Side Floorpan

Photo No. 047 - Post-Test Driver Side Floorpan

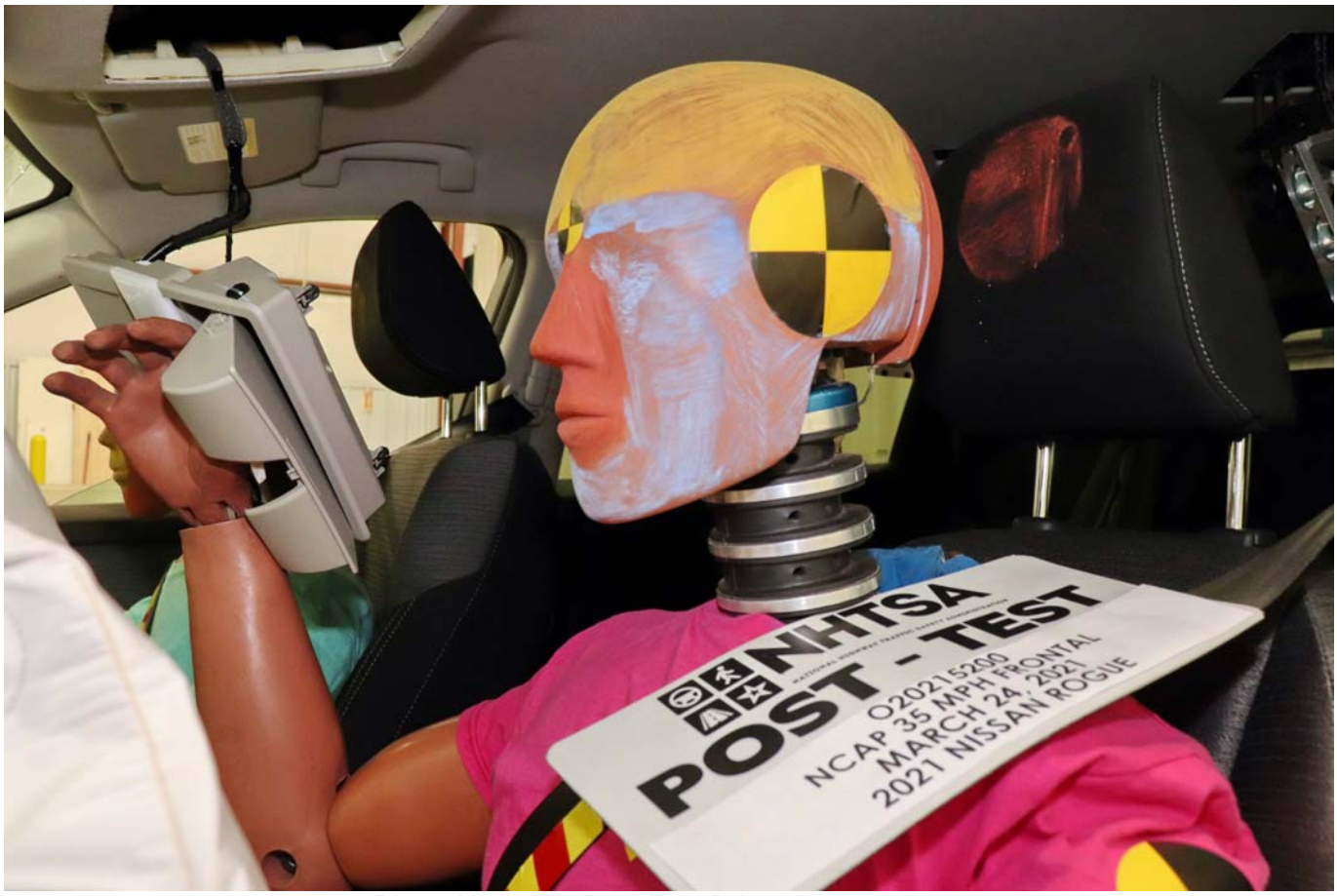


Photo No. 048 - Post-Test Driver Dummy Face

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Photo No. 065 - Pre-Test Passenger Dummy Feet

Photo No. 066 - Post-Test Passenger Dummy Feet

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

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

Photo No. 069 - Pre-Test Passenger Side Floorpan

Photo No. 070 - Post-Test Passenger Side Floorpan

Photo No. 071 - Post-Test Passenger Dummy Face

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

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

Photo No. 074 - Ballast Installed in Vehicle

PHOTOGRAPH NOT APPLICABLE

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

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

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

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

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

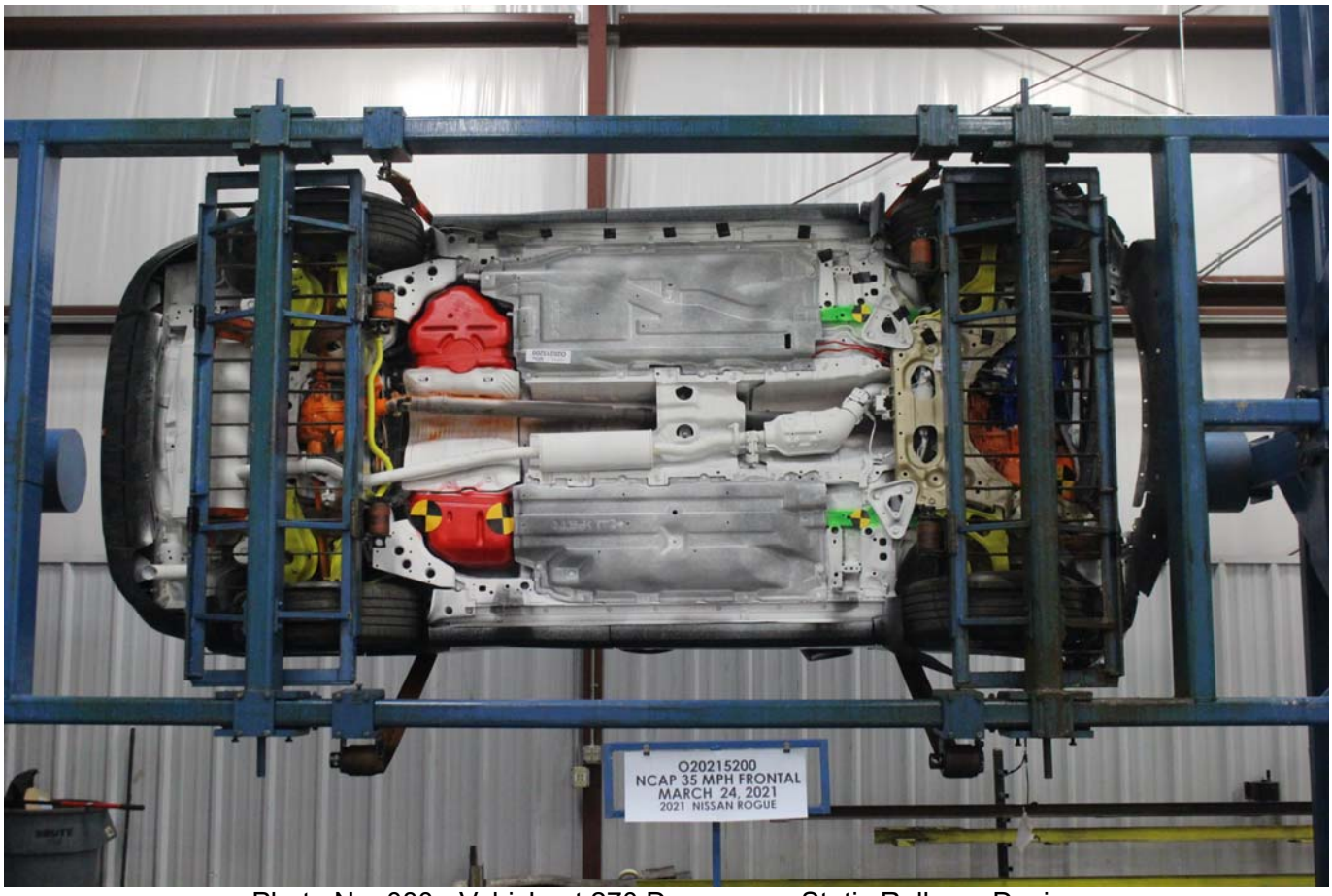


Photo No. 080 - Vehicle at 270 Degrees on Static Rollover Device

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

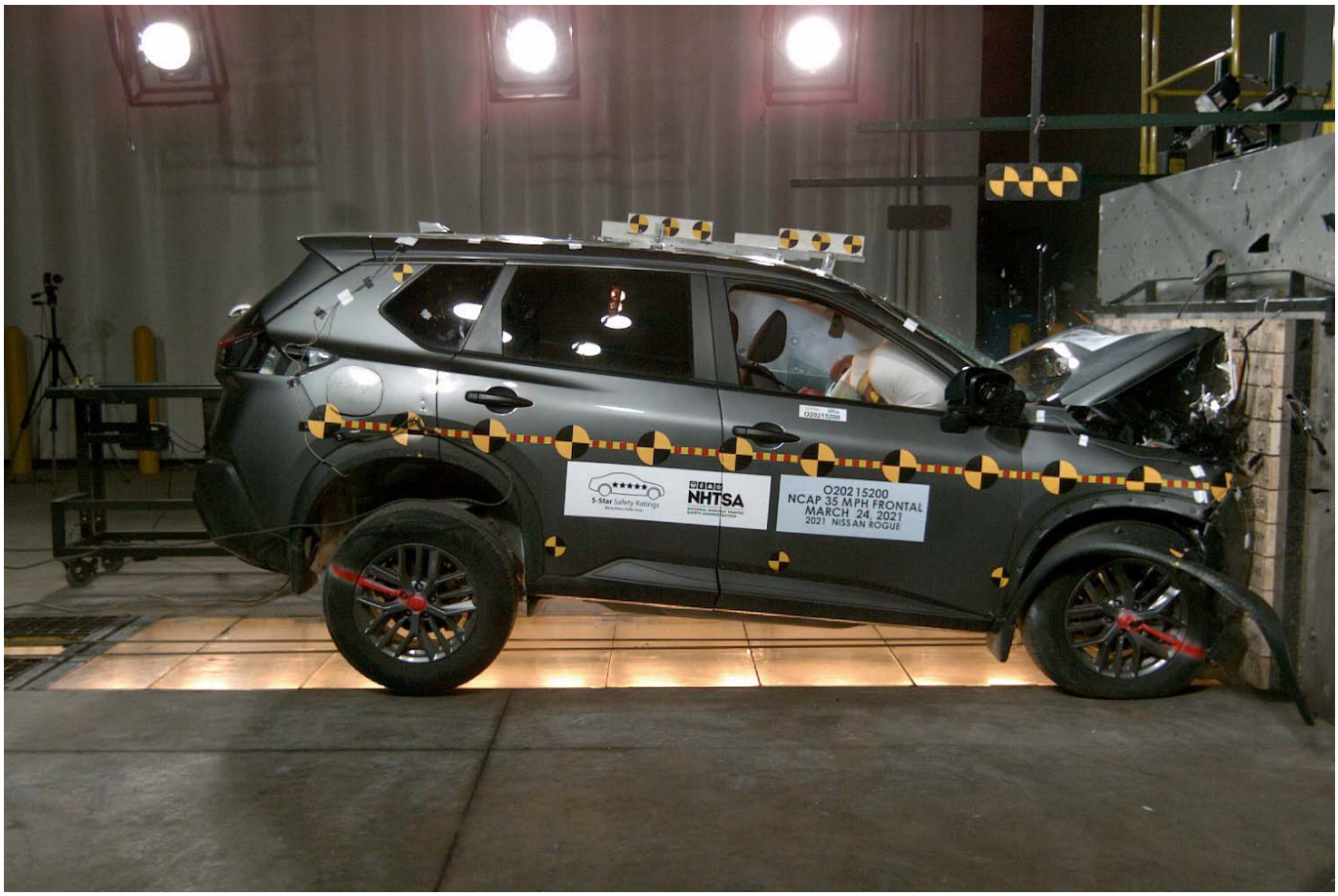
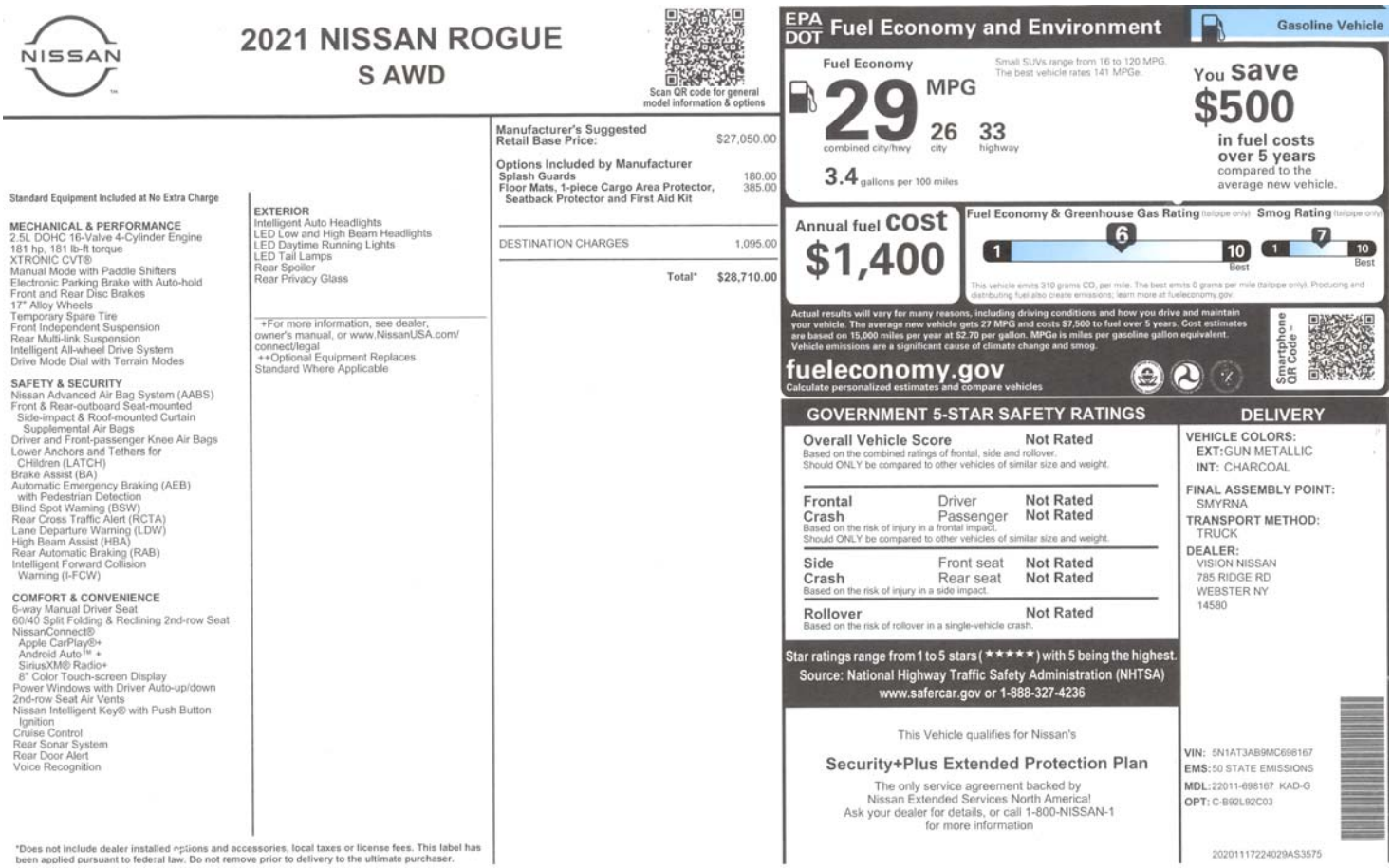


Photo No. 082 - 2021 Nissan Rogue S AWD 5-Door SUV Frontal Impact Event



2021 NISSAN ROGUE
S AWD

Scan QR code for general model information & options

Standard Equipment Included at No Extra Charge

MECHANICAL & PERFORMANCE
2.5L DOHC 16-Valve 4-Cylinder Engine
181 hp, 181 lb-ft torque
XTRONIC CVT®
Manual Mode with Paddle Shifters
Electronic Parking Brake with Auto-hold
Front and Rear Disc Brakes
17" Alloy Wheels
Temporary Spare Tire
Front Independent Suspension
Rear Multi-link Suspension
Intelligent All-wheel Drive System
Drive Mode Dial with Terrain Modes

SAFETY & SECURITY
Nissan Advanced Air Bag System (AABS)
Front & Rear-outboard Seat-mounted Side-impact & Roof-mounted Curtain Supplemental Air Bags
Driver and Front-passenger Knee Air Bags
Lower Anchors and Tethers for CHildren (LATCH)
Brake Assist (BA)
Automatic Emergency Braking (AEB) with Pedestrian Detection
Blind Spot Warning (BSW)
Rear Cross Traffic Alert (RCTA)
Lane Departure Warning (LDW)
High Beam Assist (HBA)
Rear Automatic Braking (RAB)
Intelligent Forward Collision Warning (I-FCW)

COMFORT & CONVENIENCE
6-way Manual Driver Seat
60/40 Split Folding & Reclining 2nd-row Seat
NissanConnect®
Apple CarPlay®+
Android Auto™ +
SiriusXM® Radio+
8" Color Touch-screen Display
Power Windows with Driver Auto-up/down
2nd-row Seat Air Vents
Nissan Intelligent Key® with Push Button Ignition
Cruise Control
Rear Sonar System
Rear Door Alert
Voice Recognition

EXTERIOR
Intelligent Auto Headlights
LED Low and High Beam Headlights
LED Daytime Running Lights
LED Tail Lamps
Rear Spoiler
Rear Privacy Glass

+For more information, see dealer, owner's manual, or www.NissanUSA.com/connect/legal
++Optional Equipment Replaces Standard Where Applicable

Manufacturer's Suggested Retail Base Price:	$27,050.00
Options Included by Manufacturer	
Splash Guards	180.00
Floor Mats, 1-piece Cargo Area Protector, Seatback Protector and First Aid Kit	385.00
DESTINATION CHARGES	1,095.00
Total*	**$28,710.00**

*Does not include dealer installed options and accessories, local taxes or license fees. This label has been applied pursuant to federal law. Do not remove prior to delivery to the ultimate purchaser.

EPA DOT Fuel Economy and Environment

Gasoline Vehicle

Fuel Economy
29 MPG
combined city/hwy
26 city
33 highway
3.4 gallons per 100 miles

Small SUVs range from 16 to 120 MPG. The best vehicle rates 141 MPGe.

You save **$500** in fuel costs over 5 years compared to the average new vehicle.

Annual fuel cost $1,400

Fuel Economy & Greenhouse Gas Rating (tailpipe only) 6 (1 – 10 Best)
Smog Rating (tailpipe only) 7 (1 – 10 Best)

This vehicle emits 310 grams CO2 per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel also create 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 costs $7,500 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at $2.70 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 — Not Rated
Based on the risk of rollover in a single-vehicle crash.

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

This Vehicle qualifies for Nissan's

Security+Plus Extended Protection Plan

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

DELIVERY

VEHICLE COLORS:
EXT: GUN METALLIC
INT: CHARCOAL

FINAL ASSEMBLY POINT:
SMYRNA

TRANSPORT METHOD:
TRUCK

DEALER:
VISION NISSAN
785 RIDGE RD
WEBSTER NY
14580

VIN: 5N1AT3AB9MC698167
EMS: 50 STATE EMISSIONS
MDL: 22011-698167 KAD-G
OPT: C-B92L92C03

20201117224029AS3575

Photo No. 083 - Monroney Label Photograph

APPENDIX B
DUMMY RESPONSE DATA TRACES

TABLE OF DATA PLOTS

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

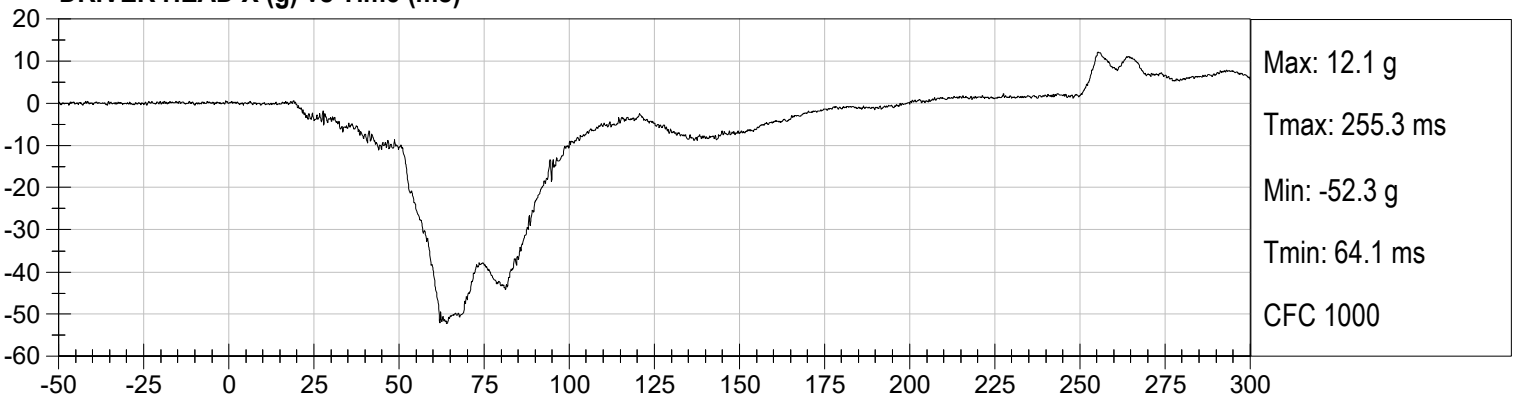
Right Rear Seat Crossmember Z

Left Rear Seat Crossmember Xr

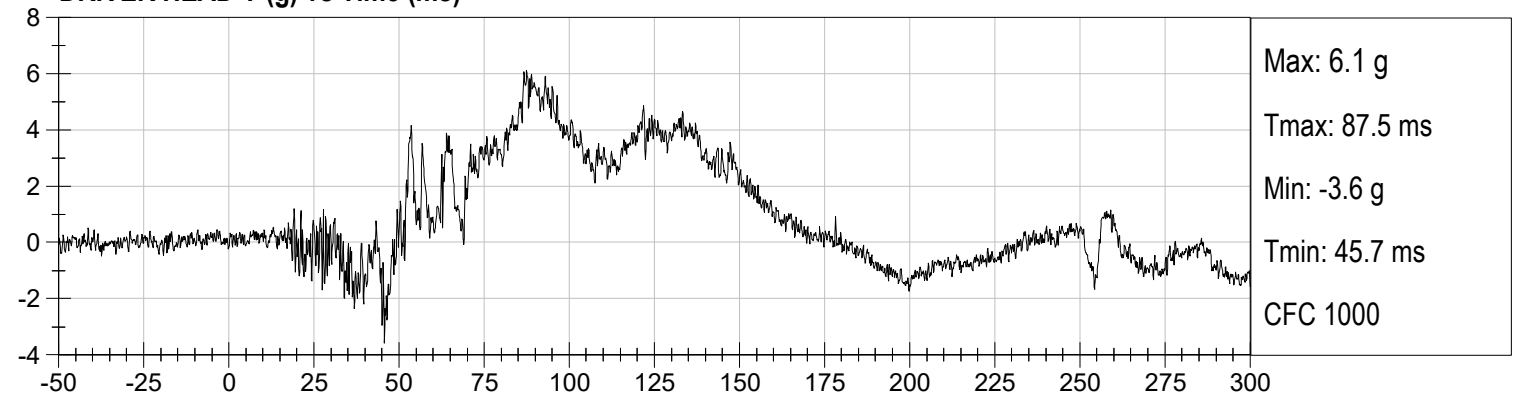
Right Rear Seat Crossmember Xr

Advanced Research Load Cell Barrier – 528 channels

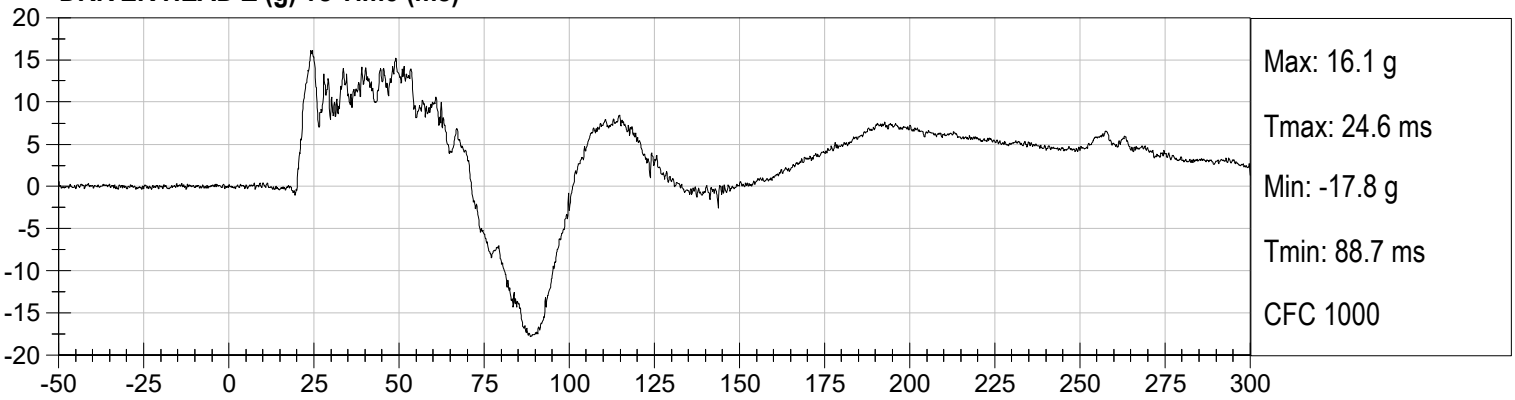
DRIVER HEAD X (g) vs Time (ms)



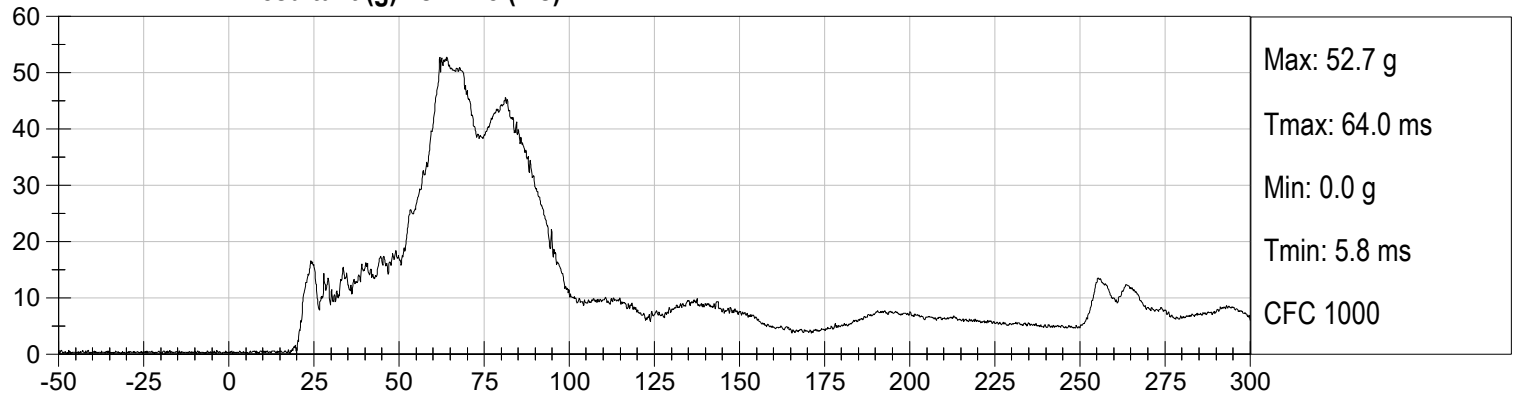
DRIVER HEAD Y (g) vs Time (ms)



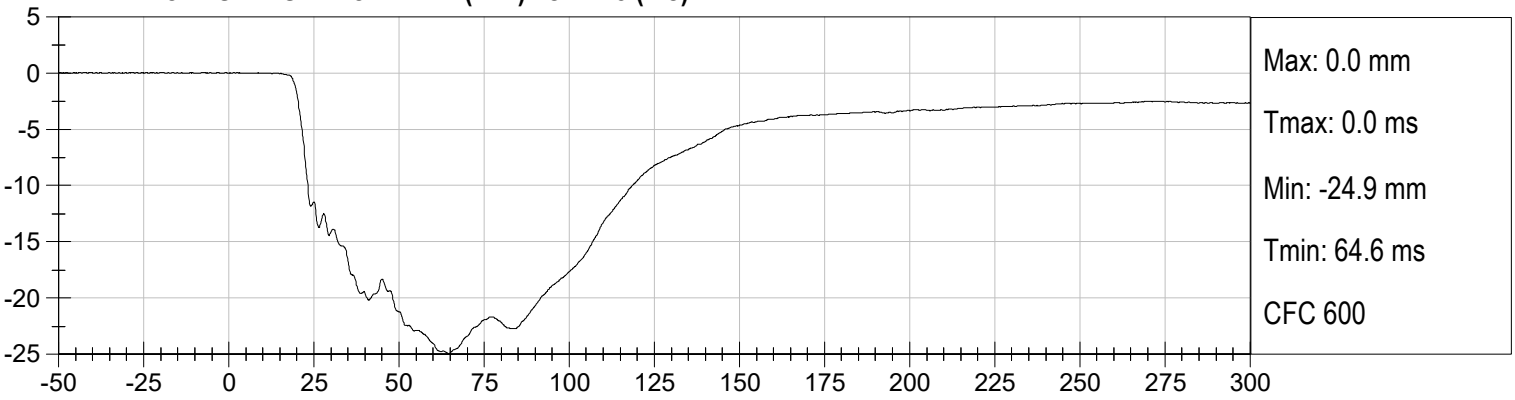
DRIVER HEAD Z (g) vs Time (ms)



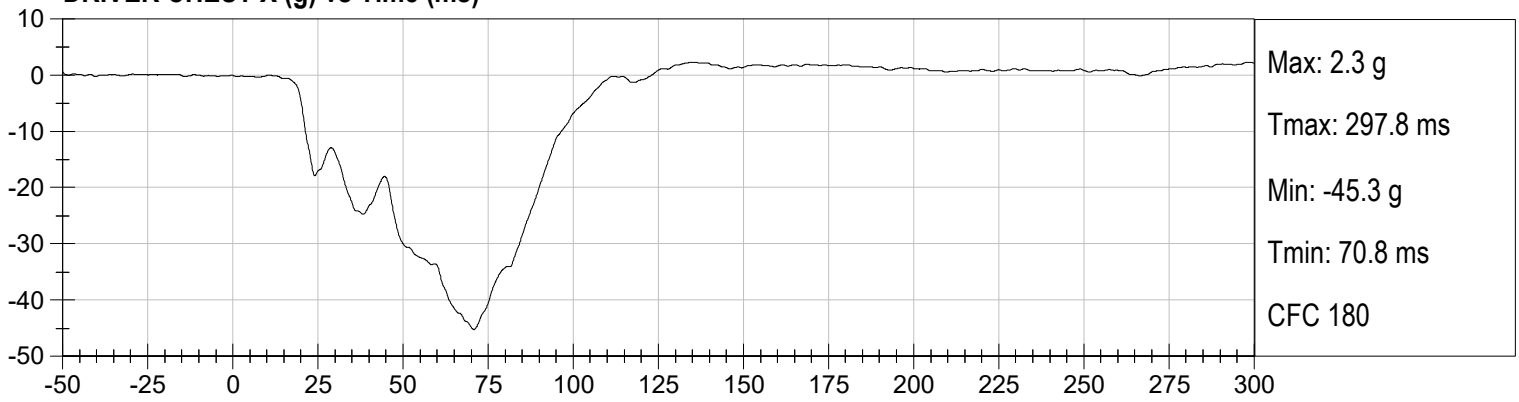
DRIVER HEAD Resultant (g) vs Time (ms)



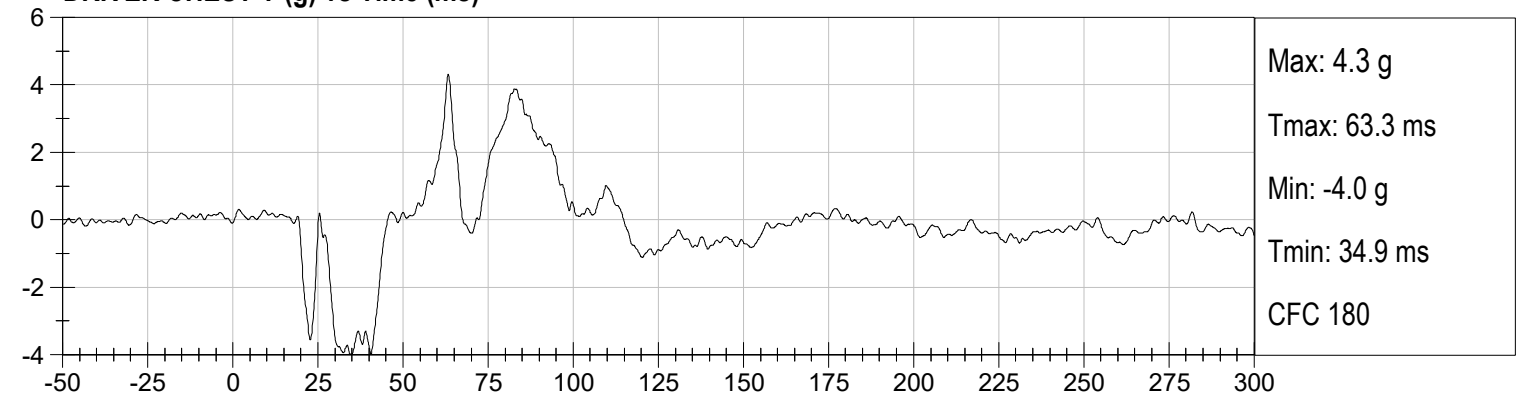
DRIVER CHEST DISPLACEMENT (mm) vs Time (ms)



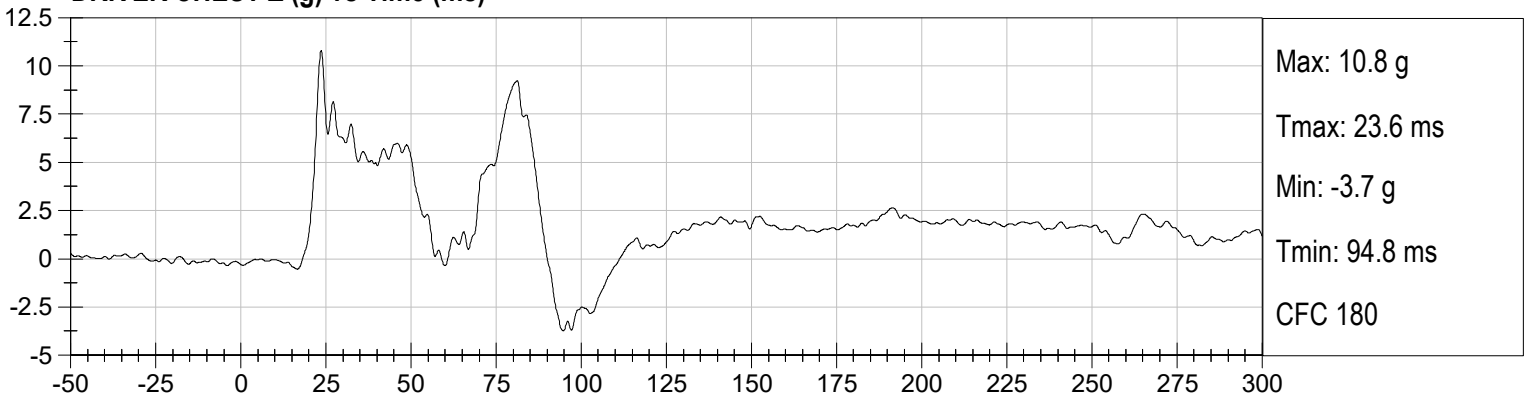
DRIVER CHEST X (g) vs Time (ms)



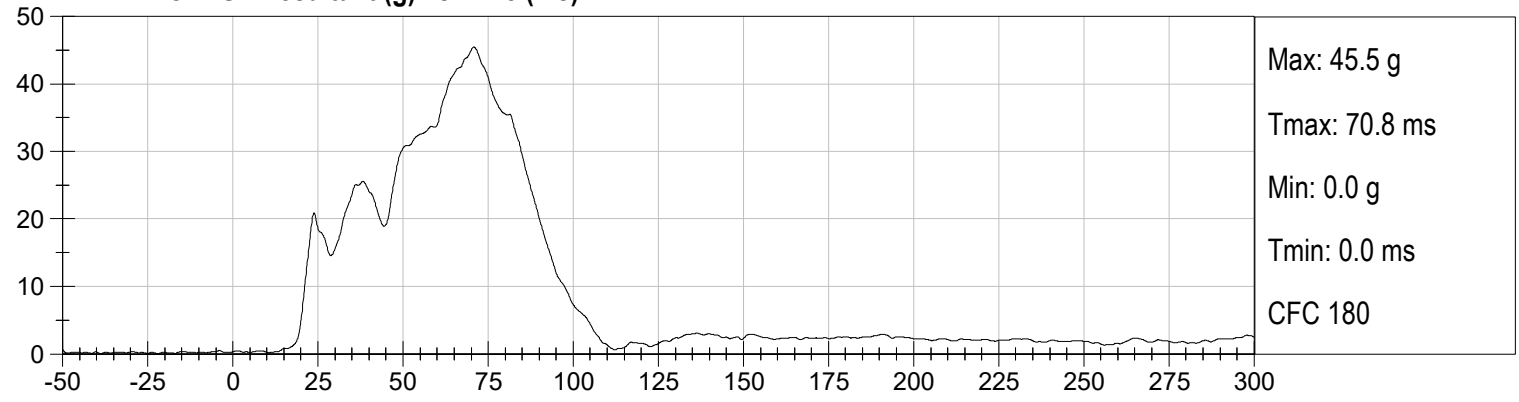
DRIVER CHEST Y (g) vs Time (ms)



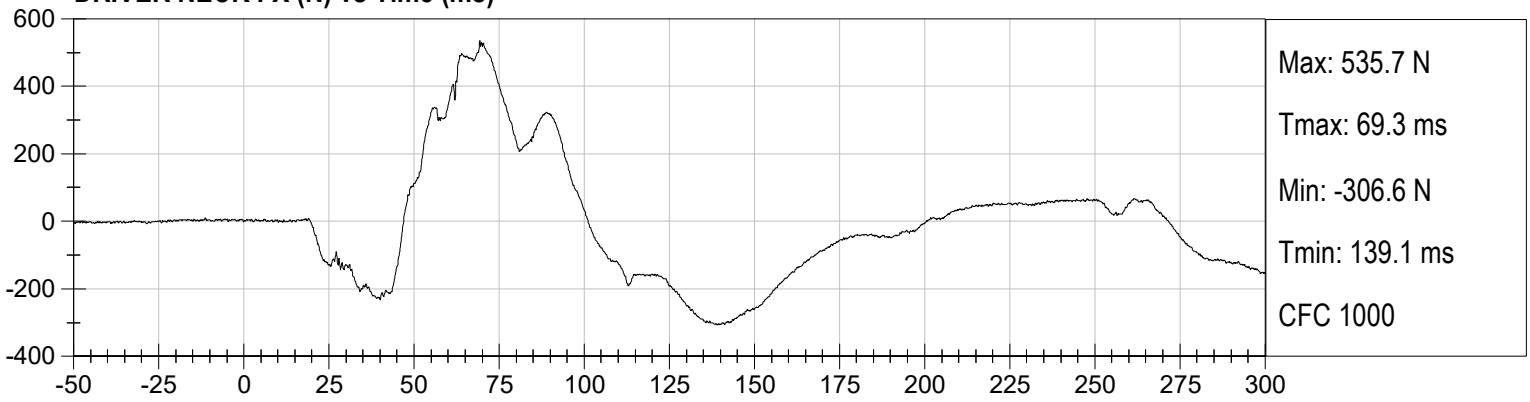
DRIVER CHEST Z (g) vs Time (ms)



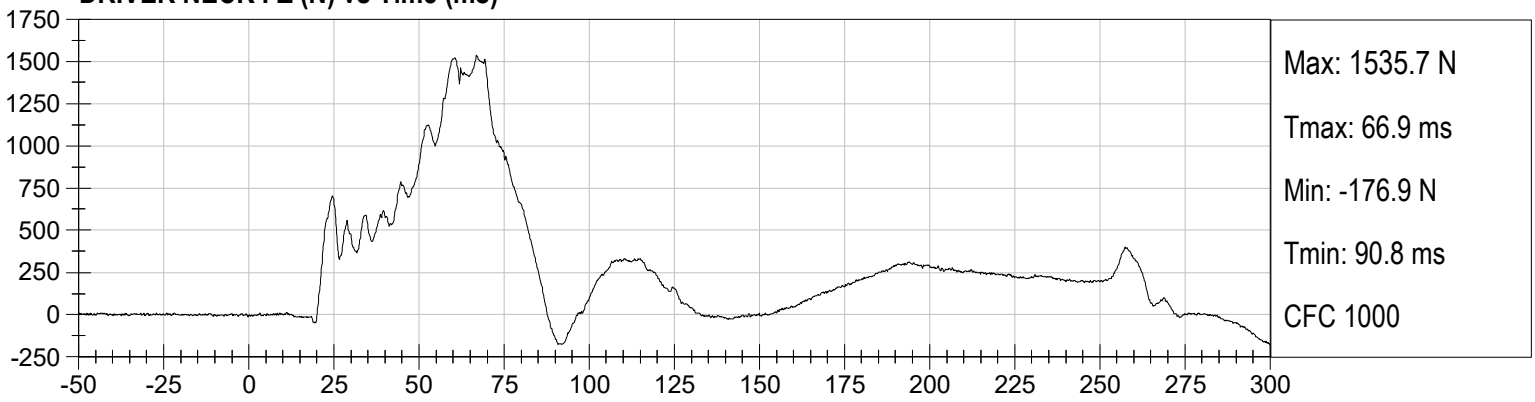
DRIVER CHEST Resultant (g) vs Time (ms)



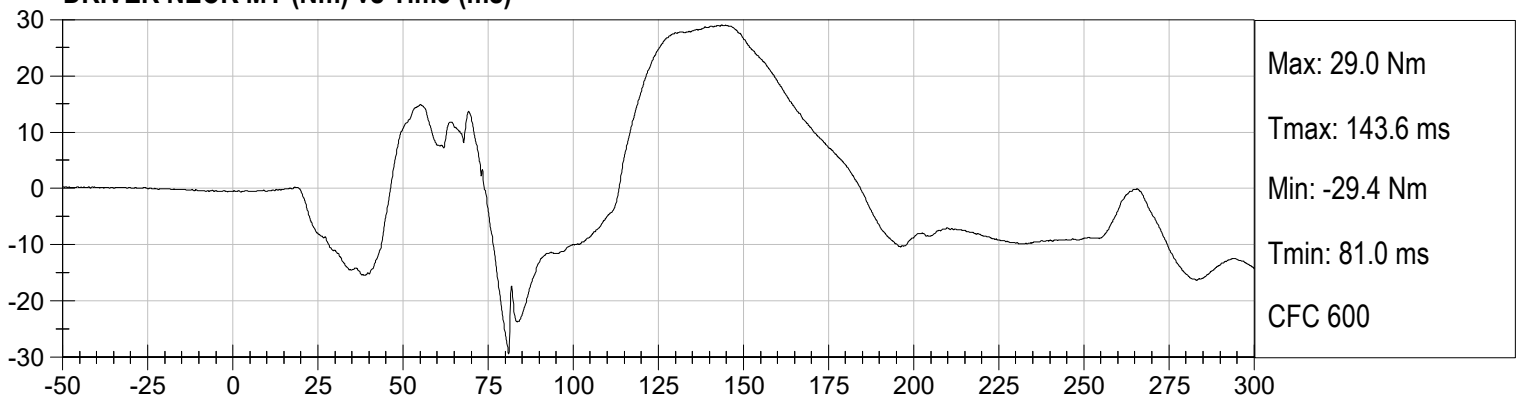
DRIVER NECK FX (N) vs Time (ms)



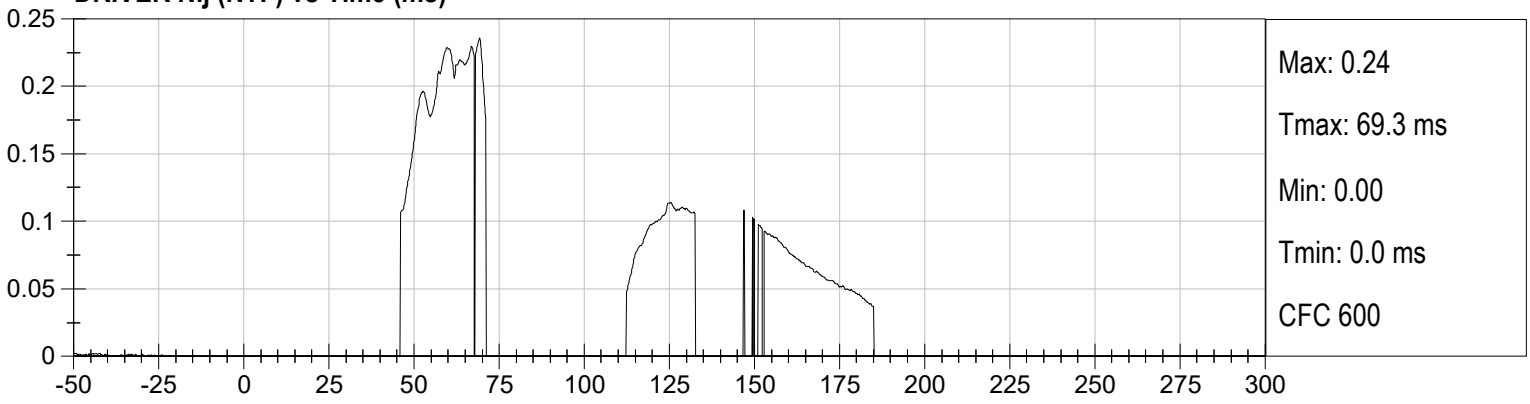
DRIVER NECK FZ (N) vs Time (ms)



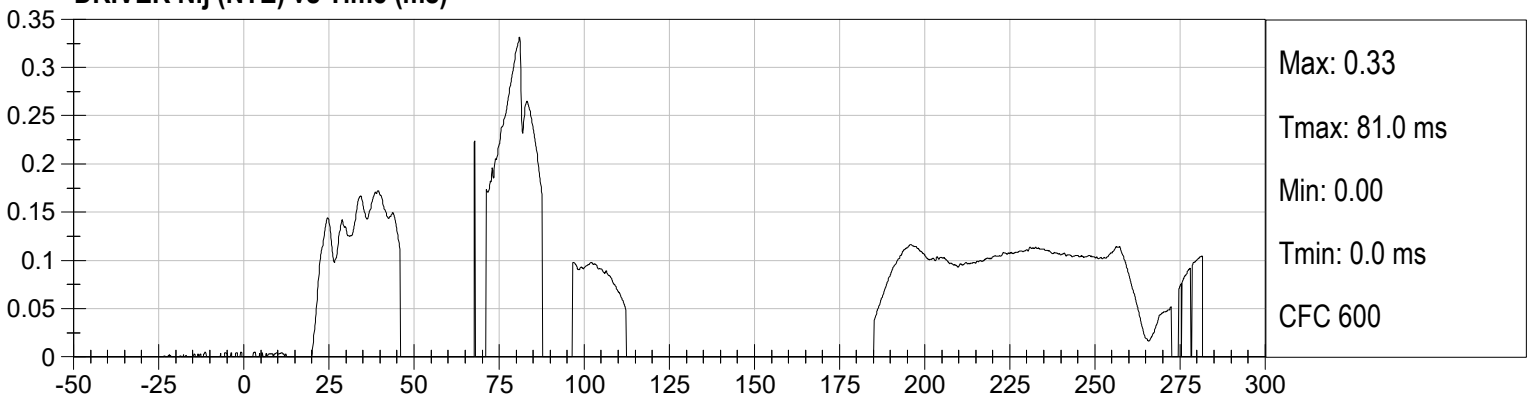
DRIVER NECK MY (Nm) vs Time (ms)



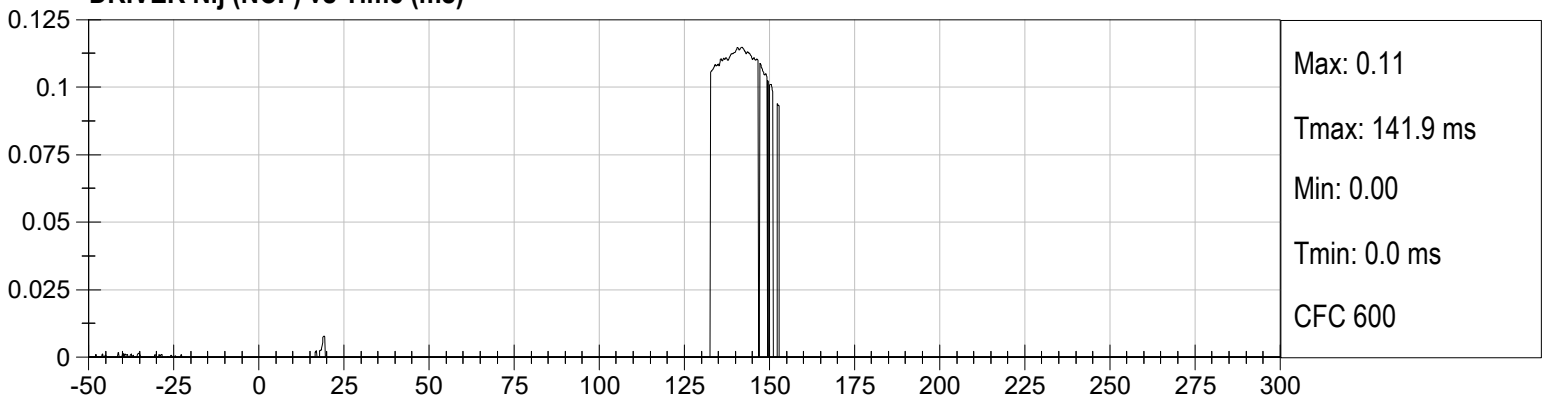
DRIVER Nij (NTF) vs Time (ms)



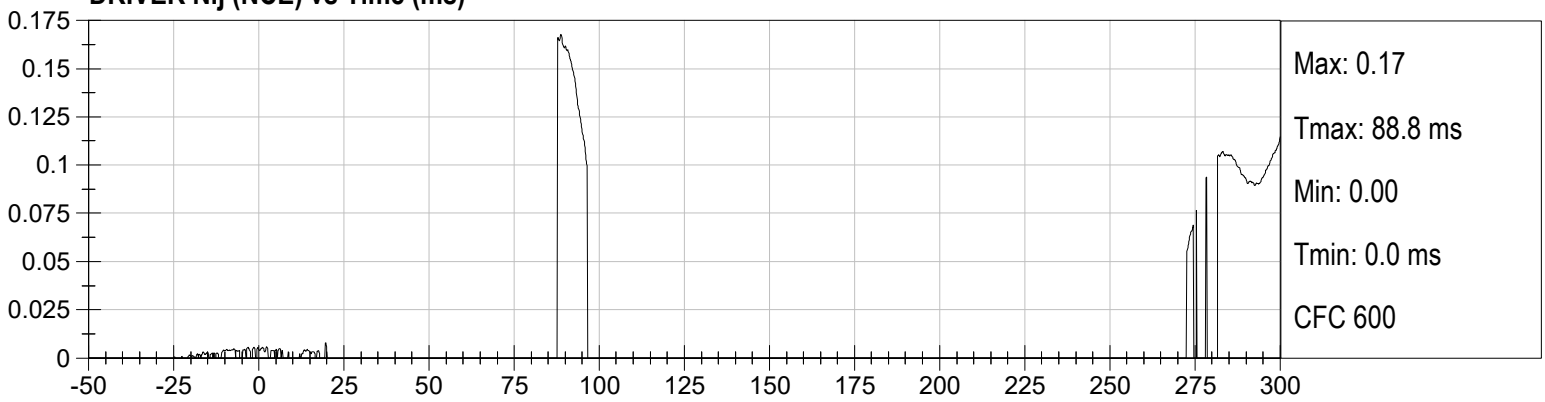
DRIVER Nij (NTE) vs Time (ms)



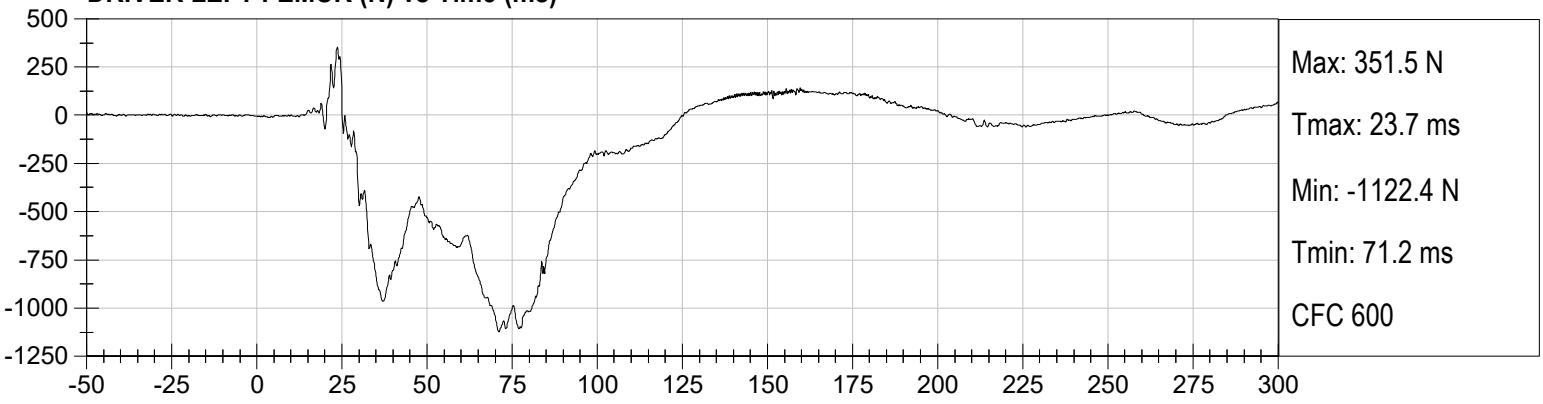
DRIVER Nij (NCF) vs Time (ms)



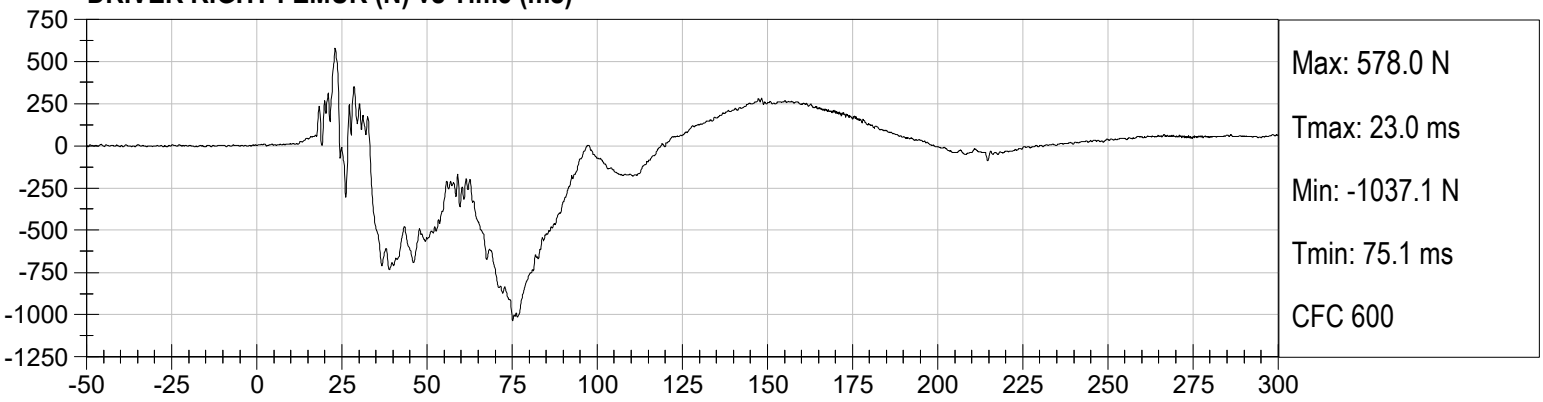
DRIVER Nij (NCE) vs Time (ms)



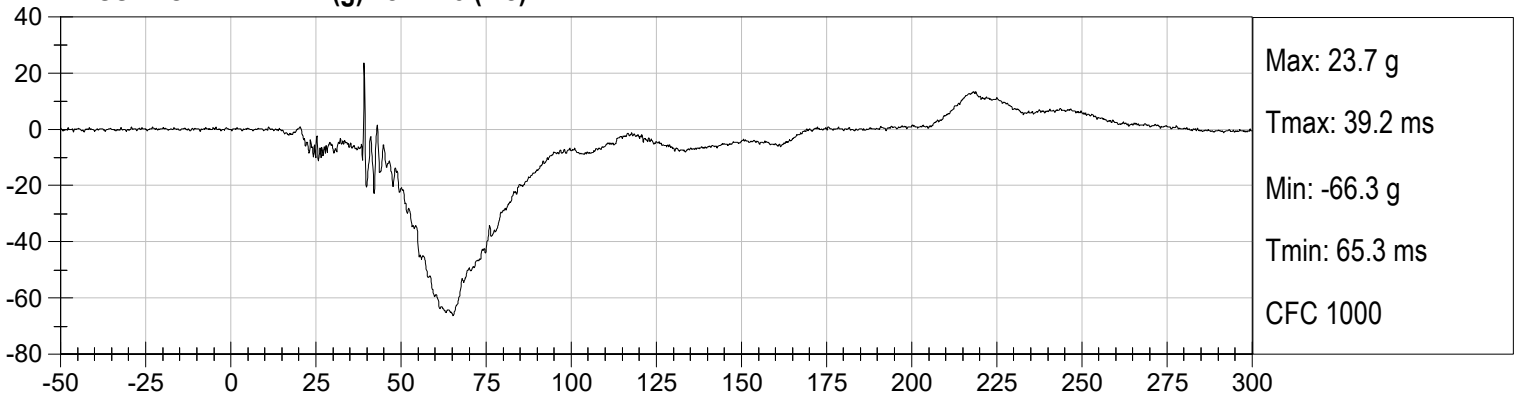
DRIVER LEFT FEMUR (N) vs Time (ms)



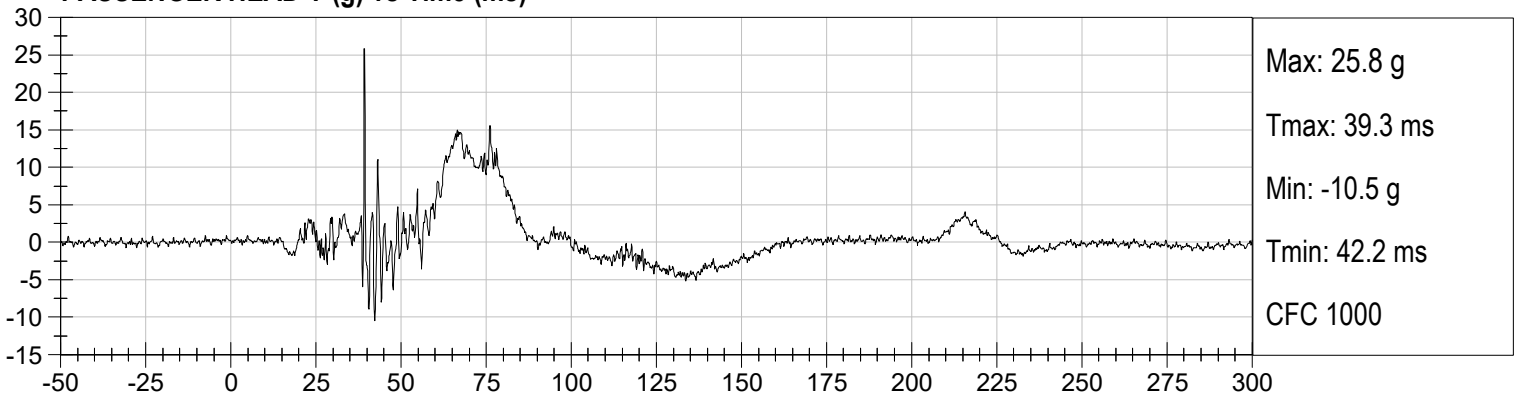
DRIVER RIGHT FEMUR (N) vs Time (ms)



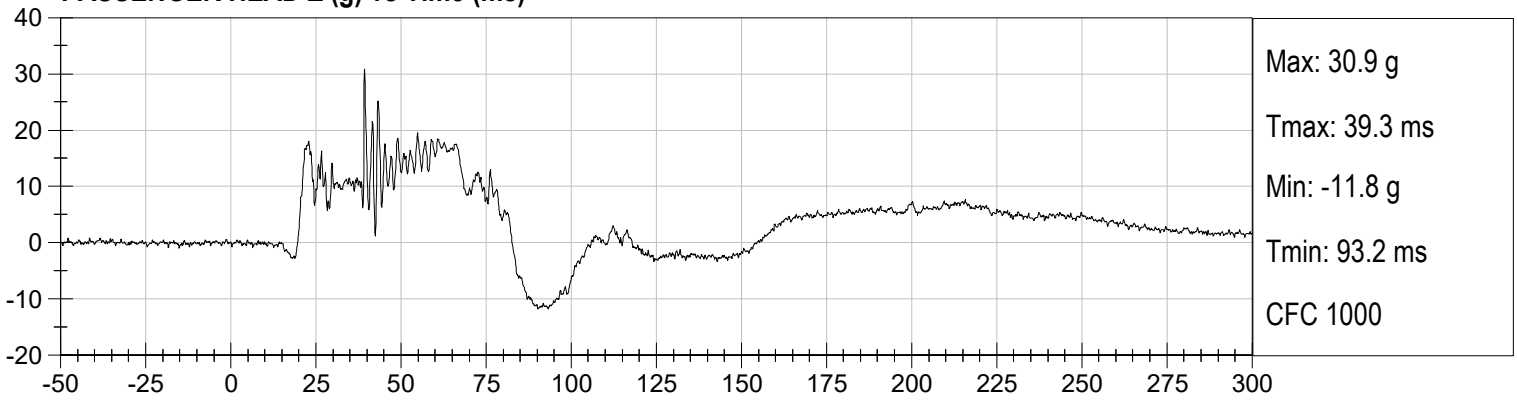
PASSENGER HEAD X (g) vs Time (ms)



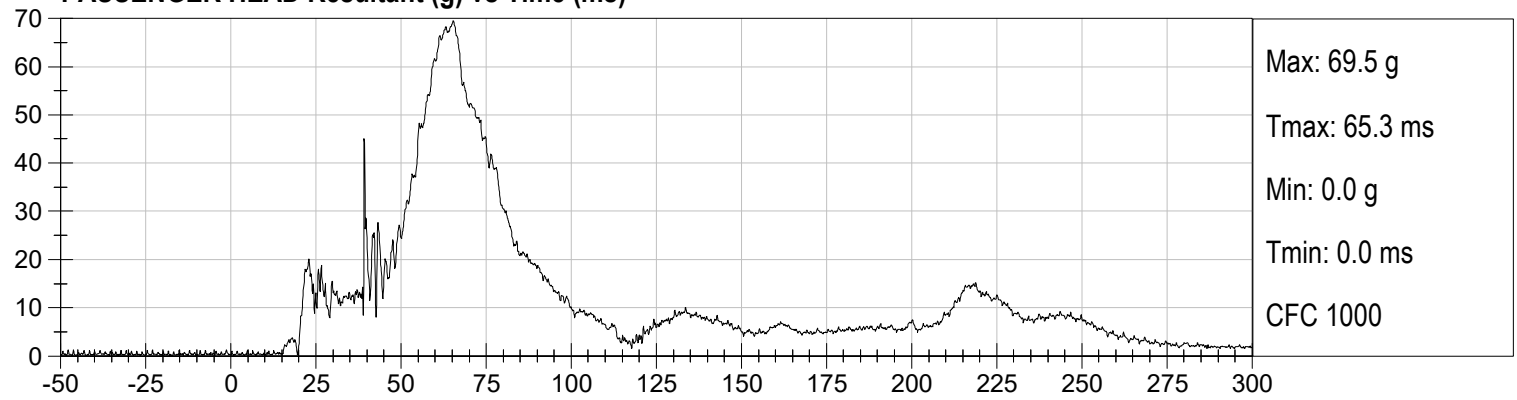
PASSENGER HEAD Y (g) vs Time (ms)



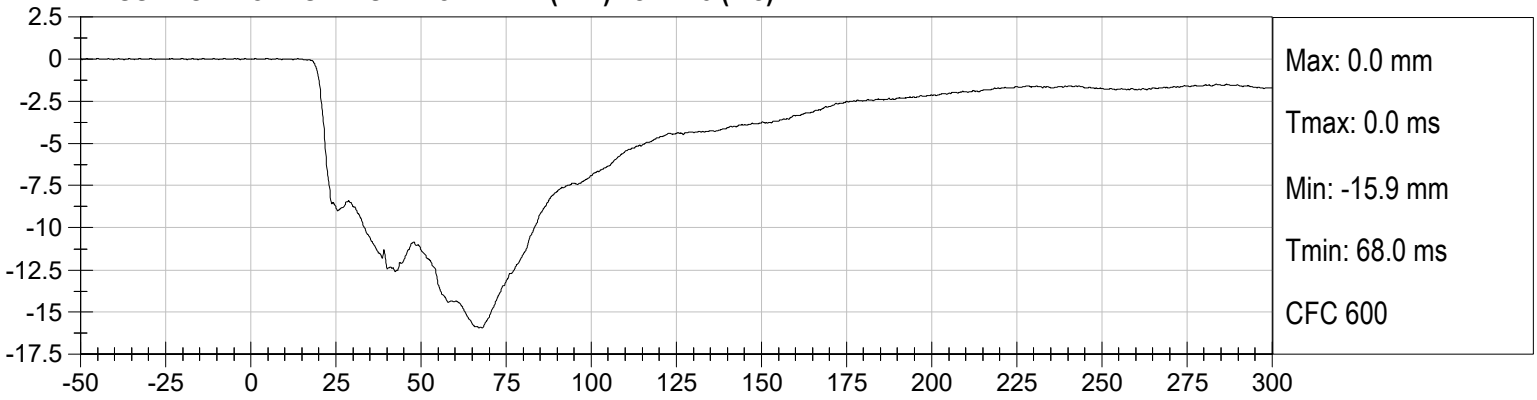
PASSENGER HEAD Z (g) vs Time (ms)



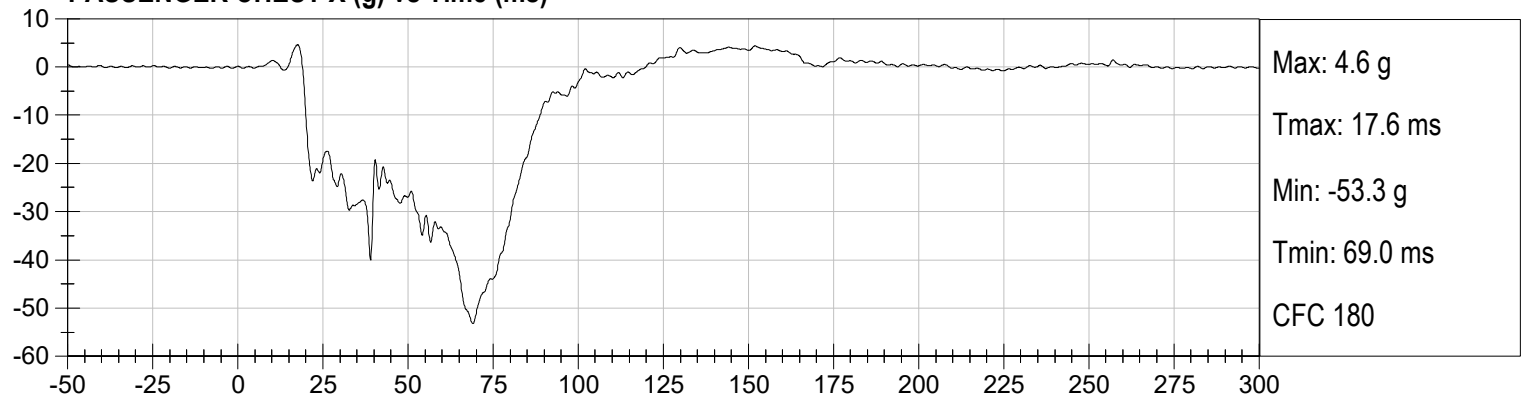
PASSENGER HEAD Resultant (g) vs Time (ms)



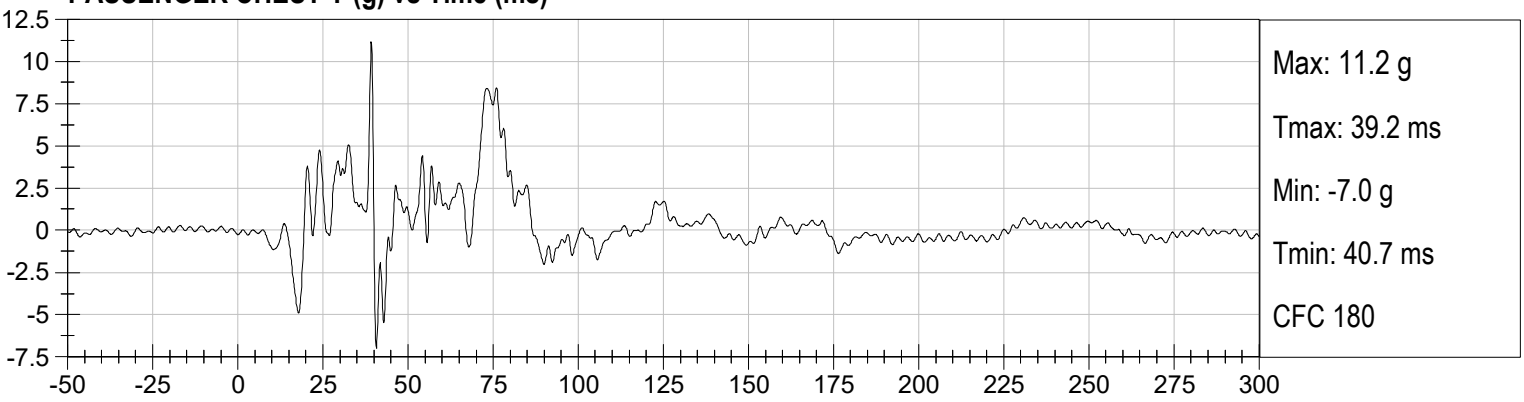
PASSENGER CHEST DISPLACEMENT (mm) vs Time (ms)



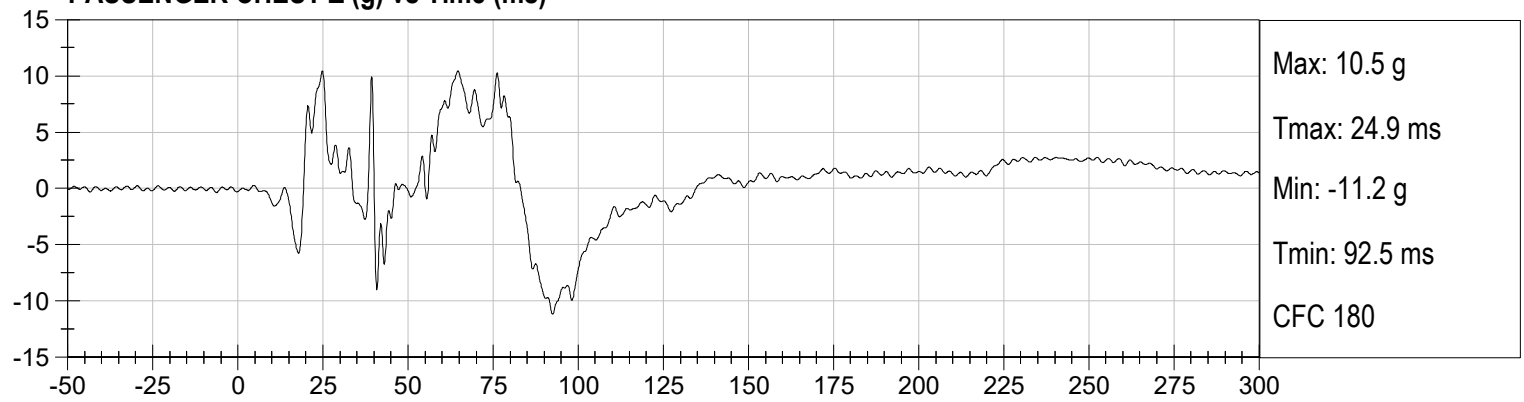
PASSENGER CHEST X (g) vs Time (ms)



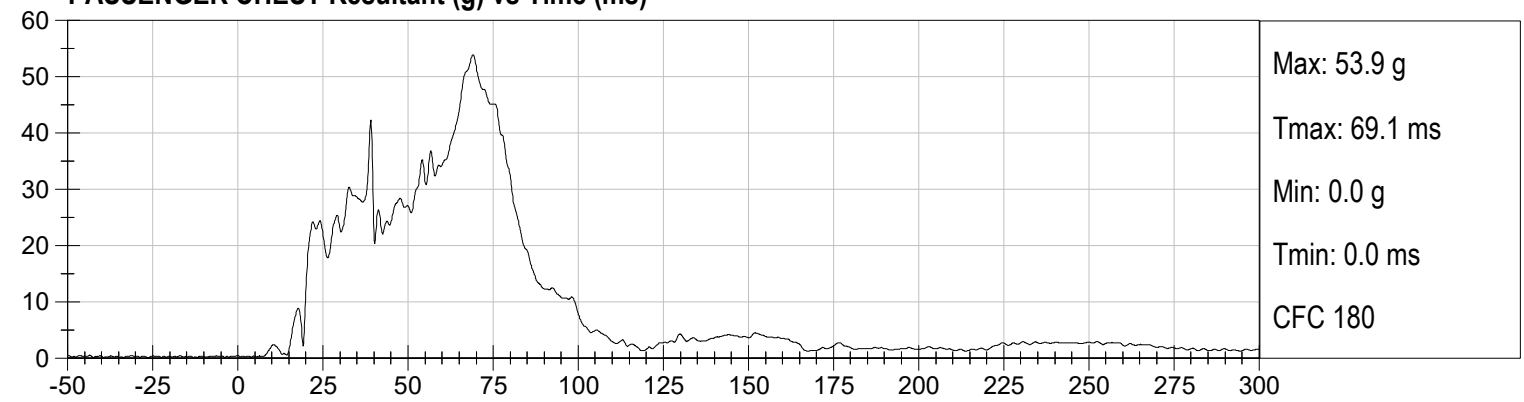
PASSENGER CHEST Y (g) vs Time (ms)



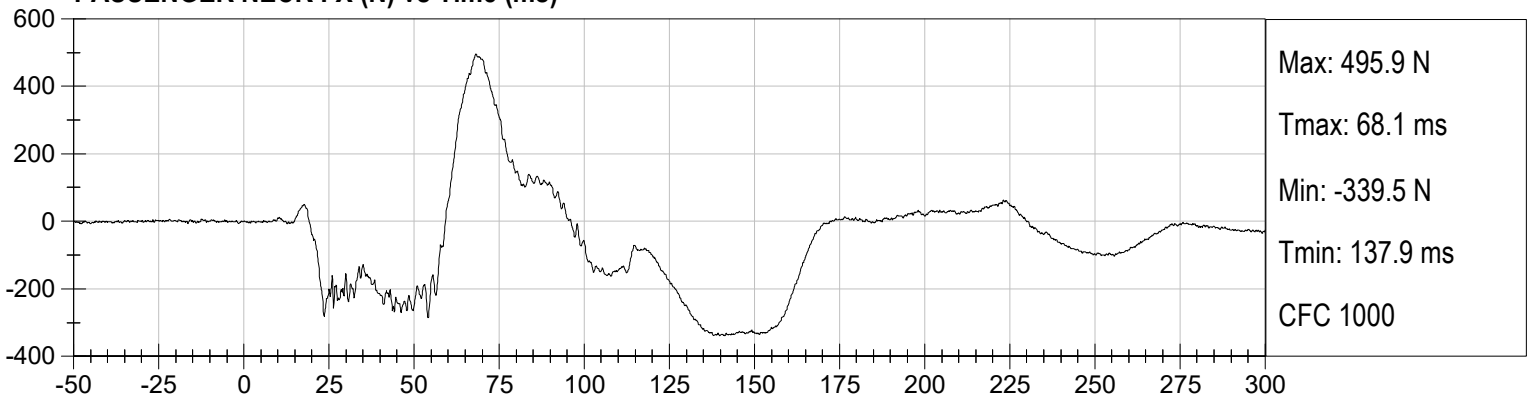
PASSENGER CHEST Z (g) vs Time (ms)



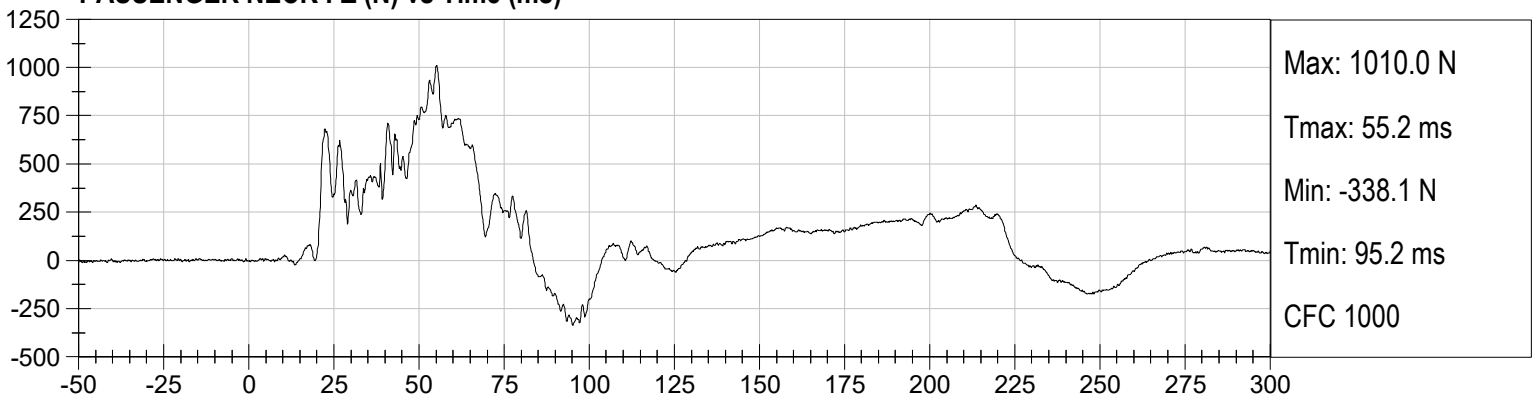
PASSENGER CHEST Resultant (g) vs Time (ms)



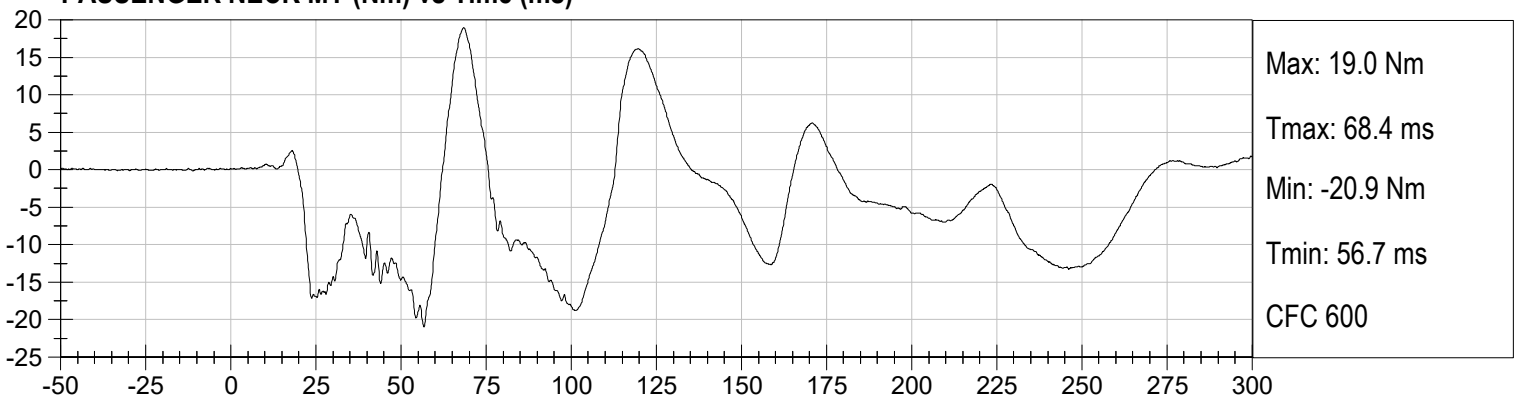
PASSENGER NECK FX (N) vs Time (ms)



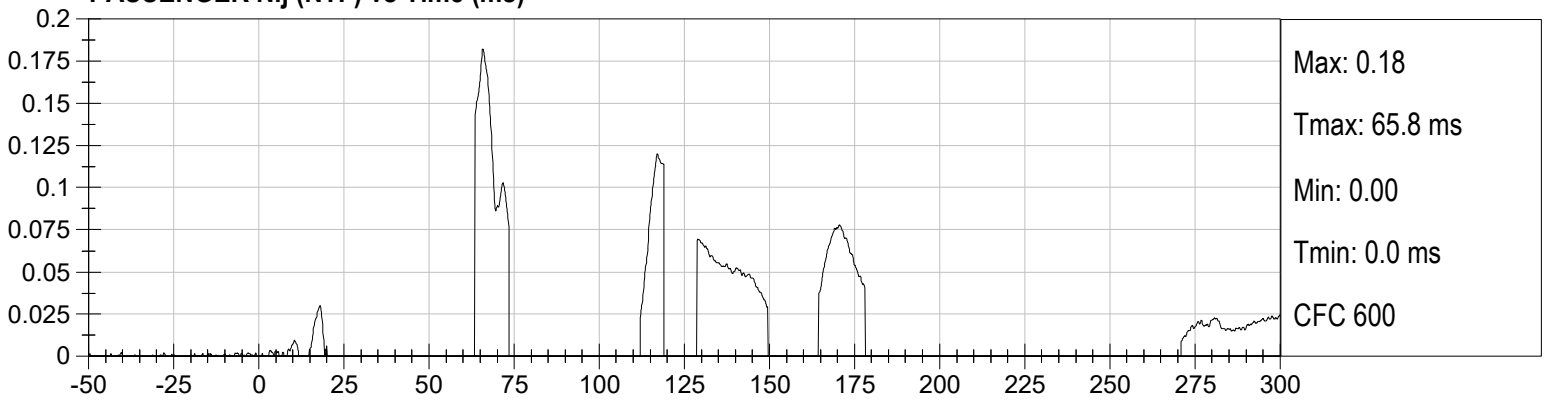
PASSENGER NECK FZ (N) vs Time (ms)



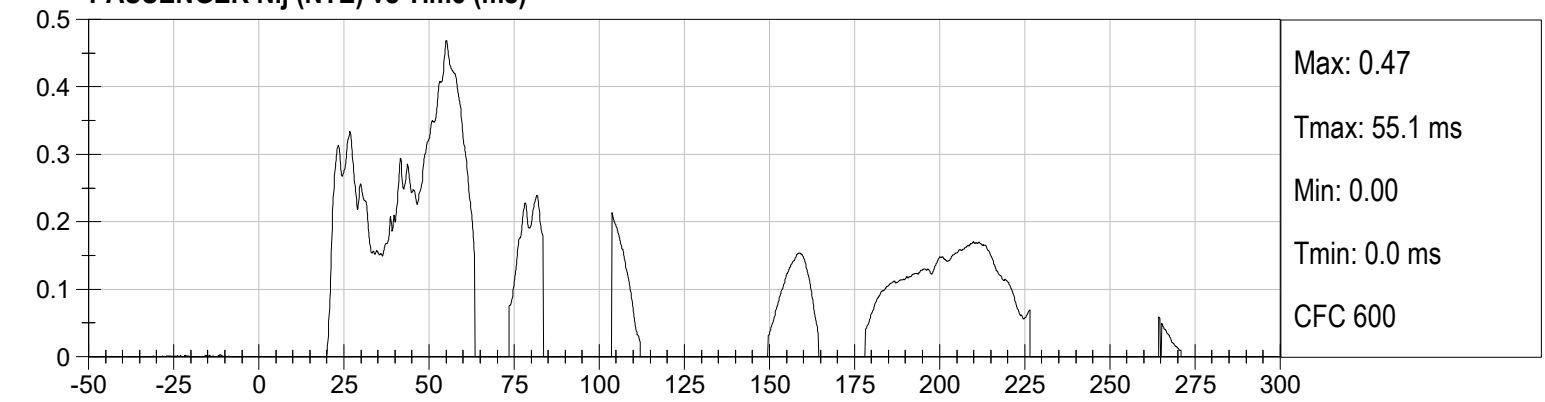
PASSENGER NECK MY (Nm) vs Time (ms)



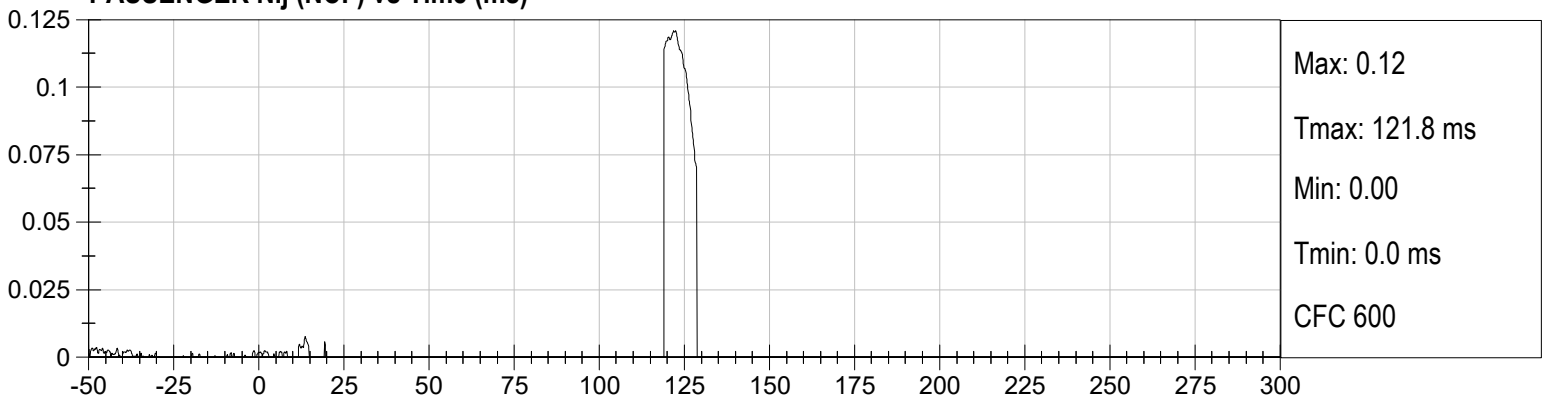
PASSENGER Nij (NTF) vs Time (ms)



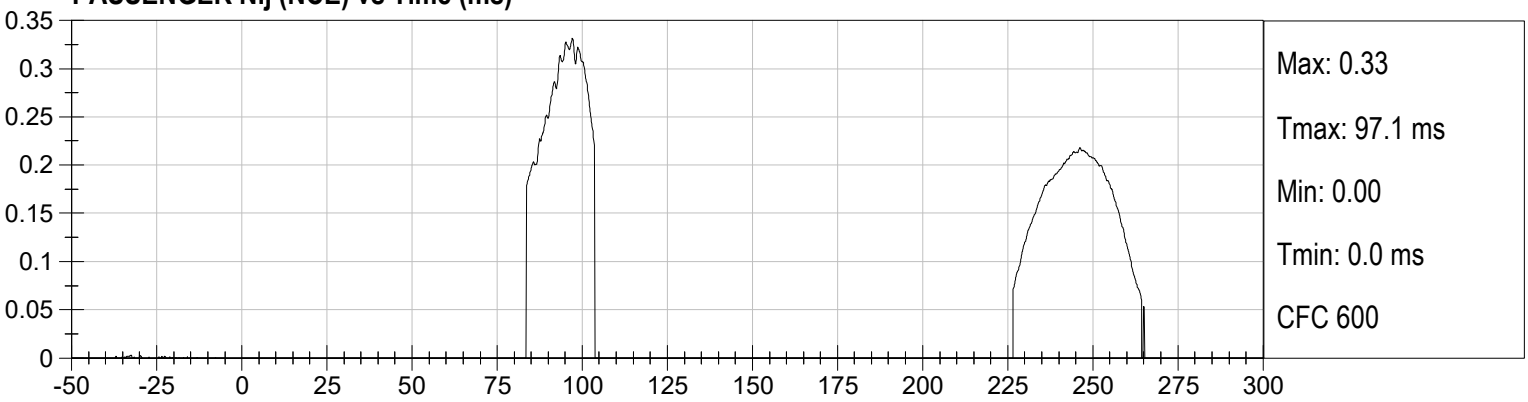
PASSENGER Nij (NTE) vs Time (ms)



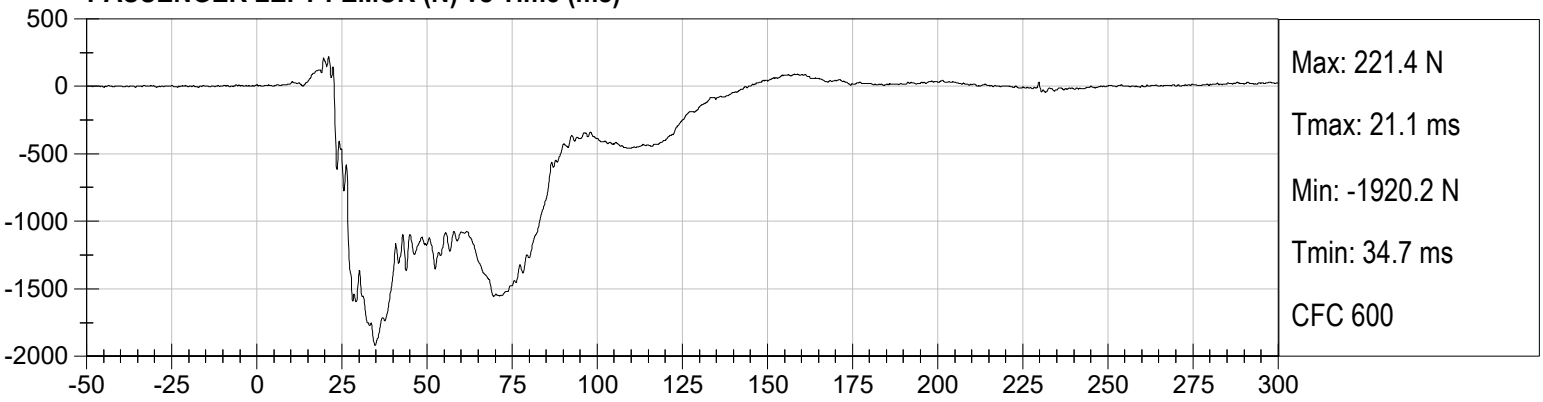
PASSENGER Nij (NCF) vs Time (ms)



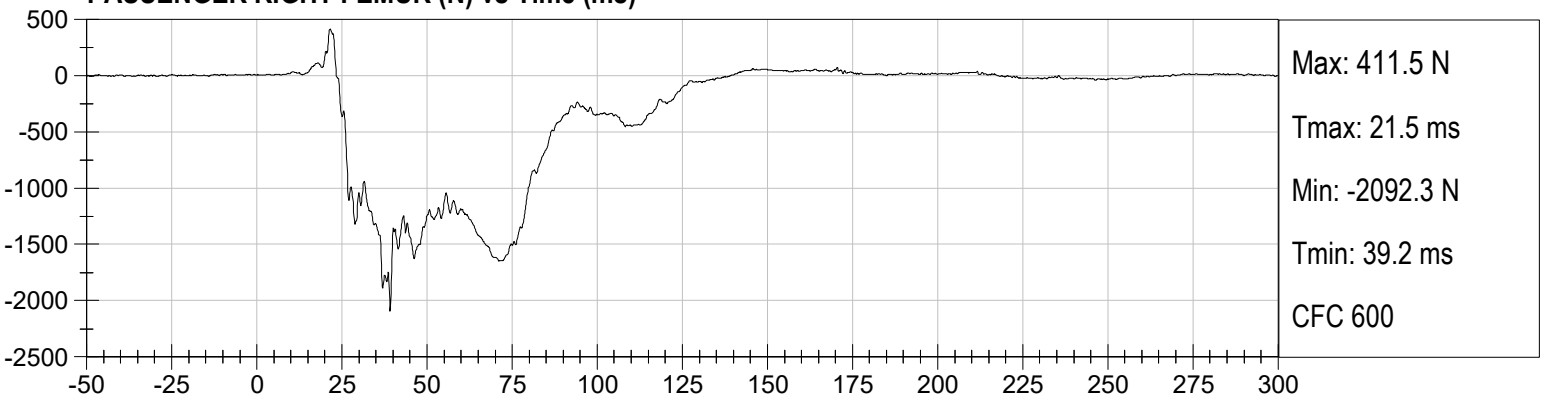
PASSENGER Nij (NCE) vs Time (ms)



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:** D210941

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	26.3	Pass
Peak Resultant Acceleration	G's	225 to 275	258	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-5.0	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Laboratory Technician

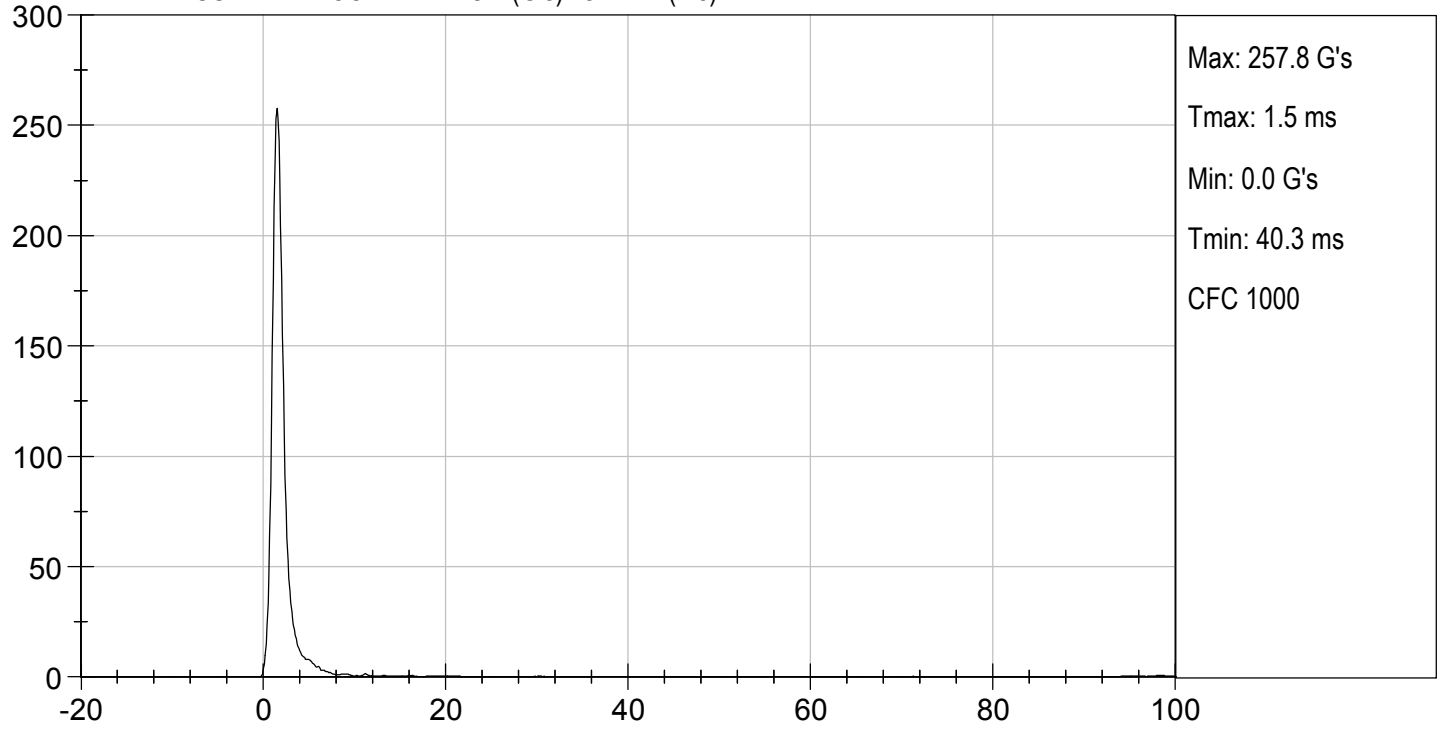
03/18/2021
Test Date

Approved By

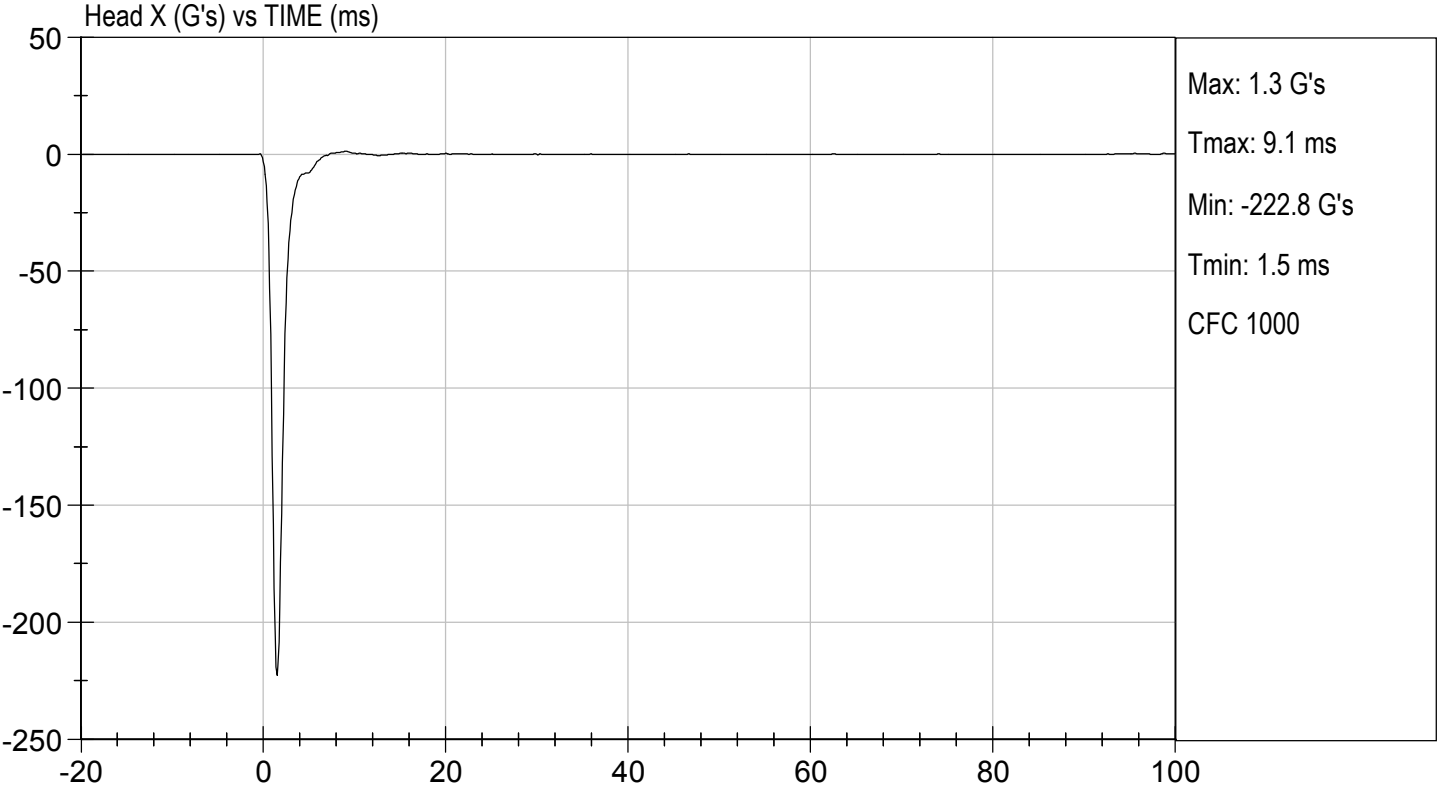
TEST DESC: HEAD DROP

TEST DATE: 03/18/2021
TEST #: D210941

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

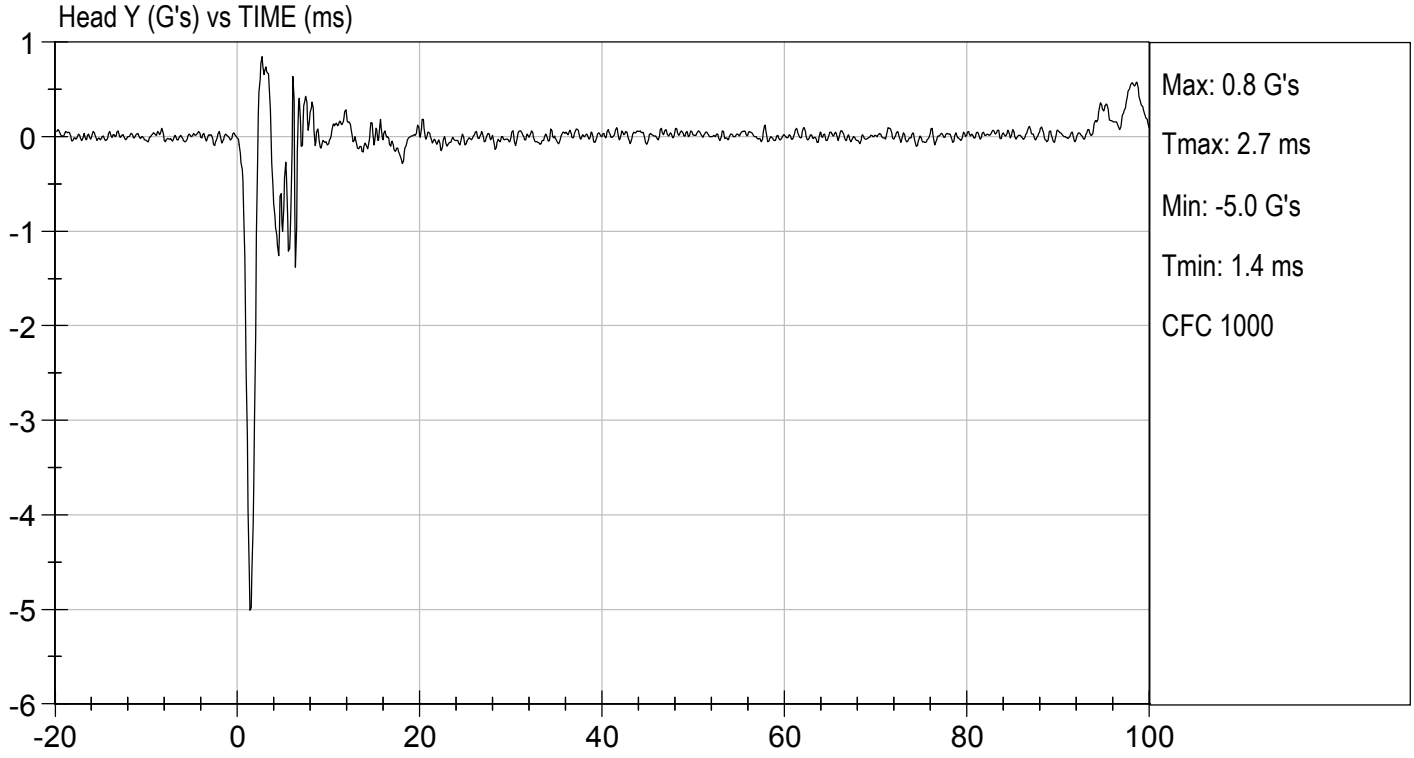


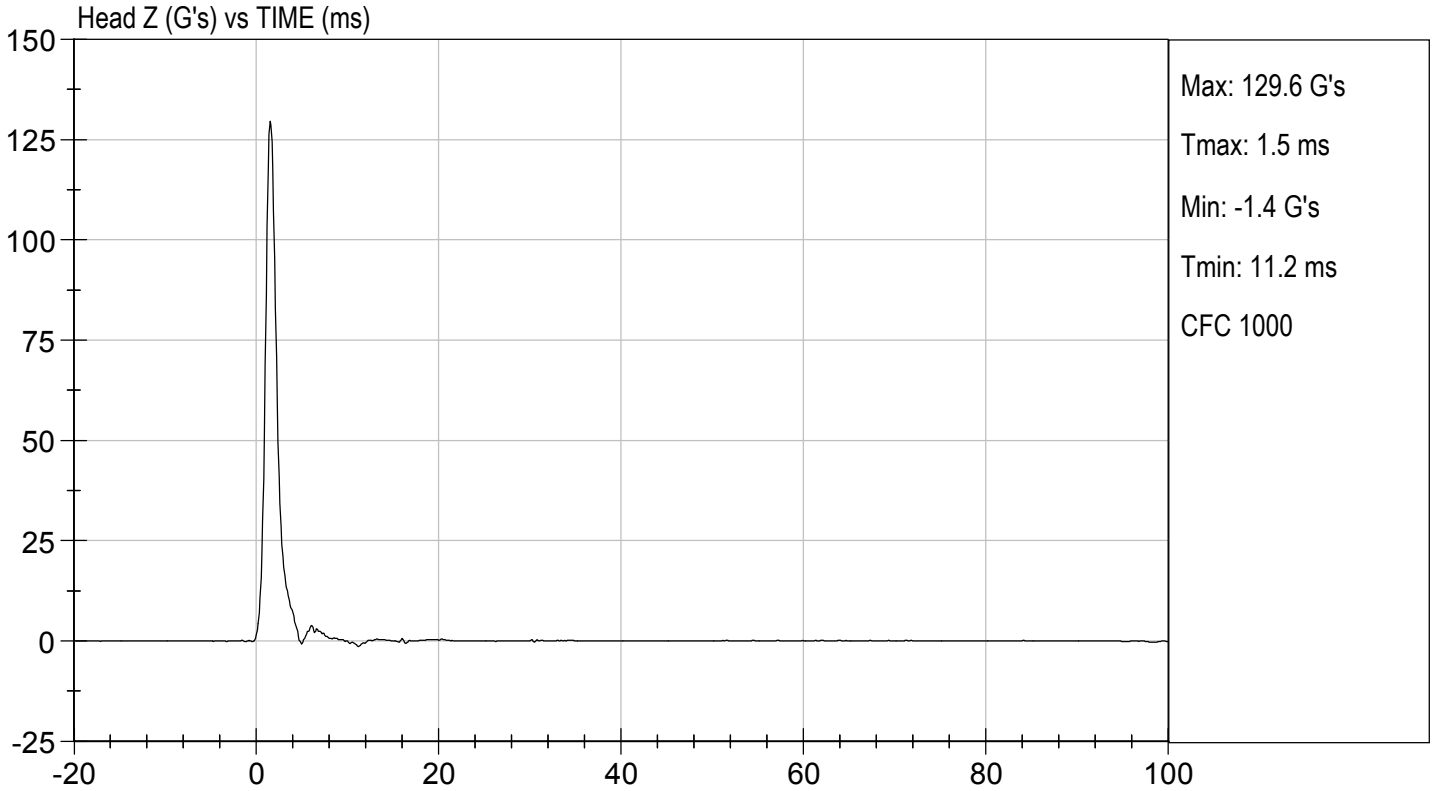
Head X (G's) vs TIME (ms)



TEST DESC: HEAD DROP

TEST DATE: 03/18/2021
TEST #: D210941





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D210942

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	27	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.96	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	22.68	Pass
	20 ms	G's	17.60 to 22.60	19.76	Pass
	30 ms	G's	12.50 to 18.50	14.79	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	14.8	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	37.7	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	68.8	Pass
	Time	ms	57.0 to 64.0	62.4	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	117.9	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	89.9	Pass
	Time	ms	47.0 to 58.0	49.7	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	101.7	Pass
			Overall Test Results		Pass

Laboratory Technician

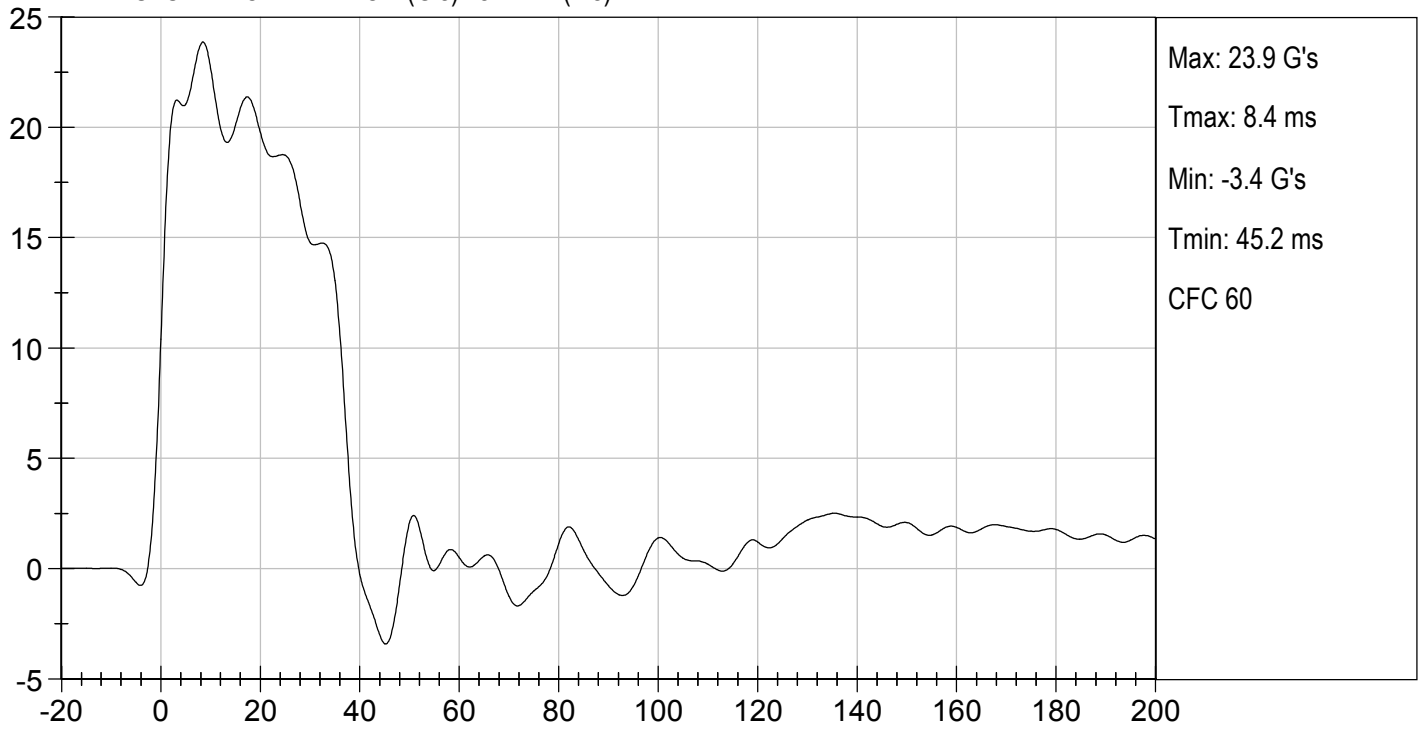
03/18/2021
Test Date

Approved By

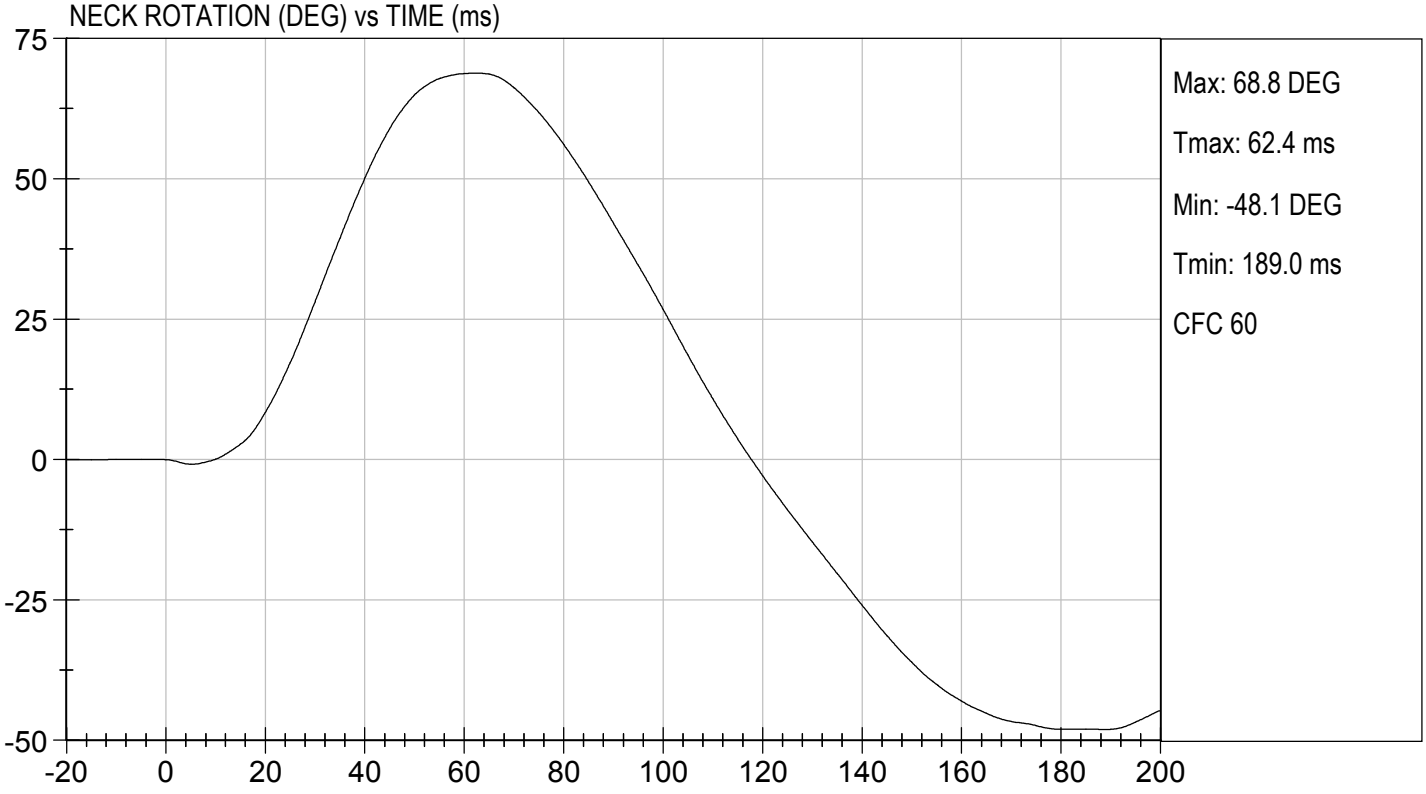
TEST DESC: NECK FLEXION
VELOCITY: 22.83 ft/s, 6.96 m/s

TEST DATE: 03/18/2021
TEST #: D210942

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

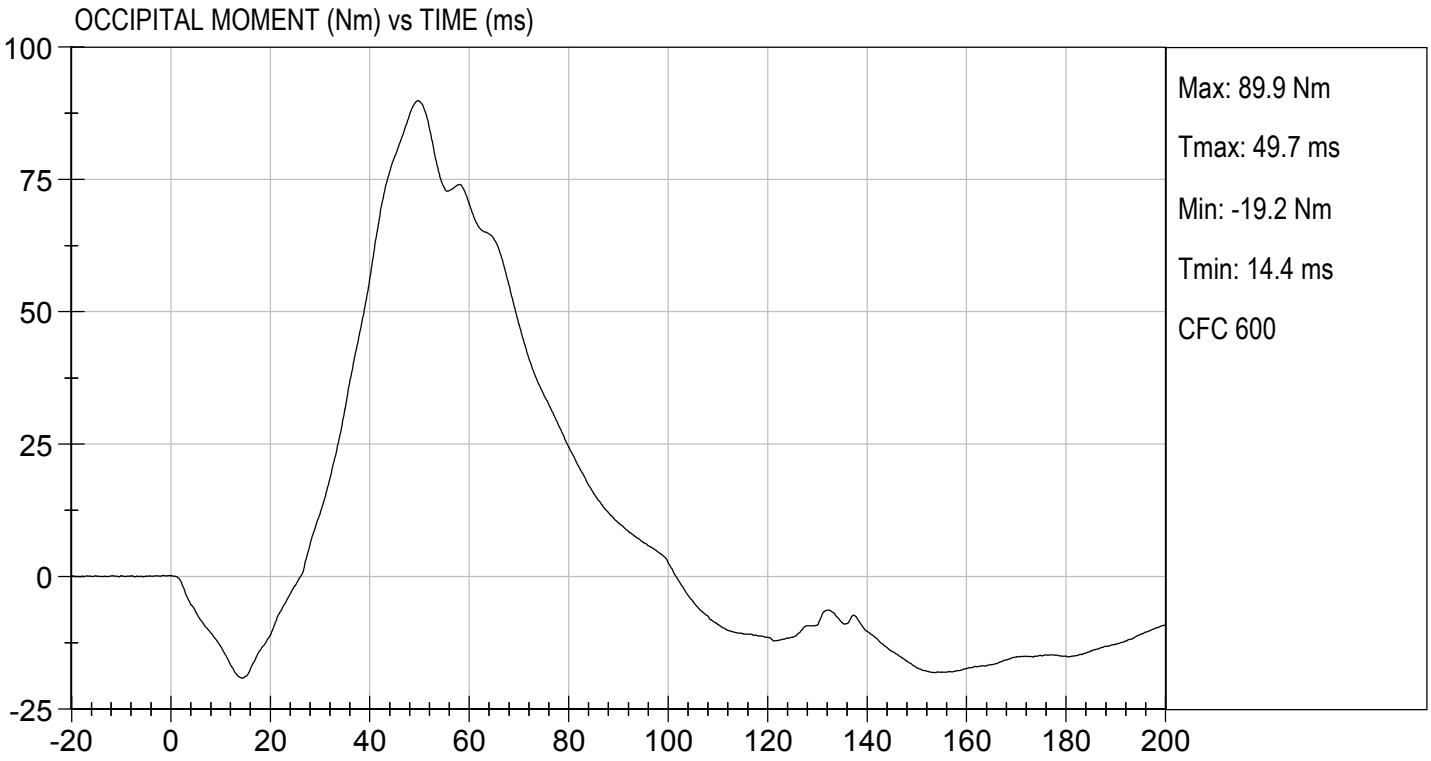


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 03/18/2021
TEST #: D210942



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D210943

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	27	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	17.90	Pass
	20 ms	G's	14.00 to 19.00	14.84	Pass
	30 ms	G's	11.00 to 16.00	13.07	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	13.5	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	41.9	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	98.2	Pass
	Time	ms	72.0 to 82.0	81.9	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	163.3	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-61.3	Pass
	Time	ms	65.0 to 79.0	72.3	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	144.9	Pass
			Overall Test Results		Pass

Laboratory Technician

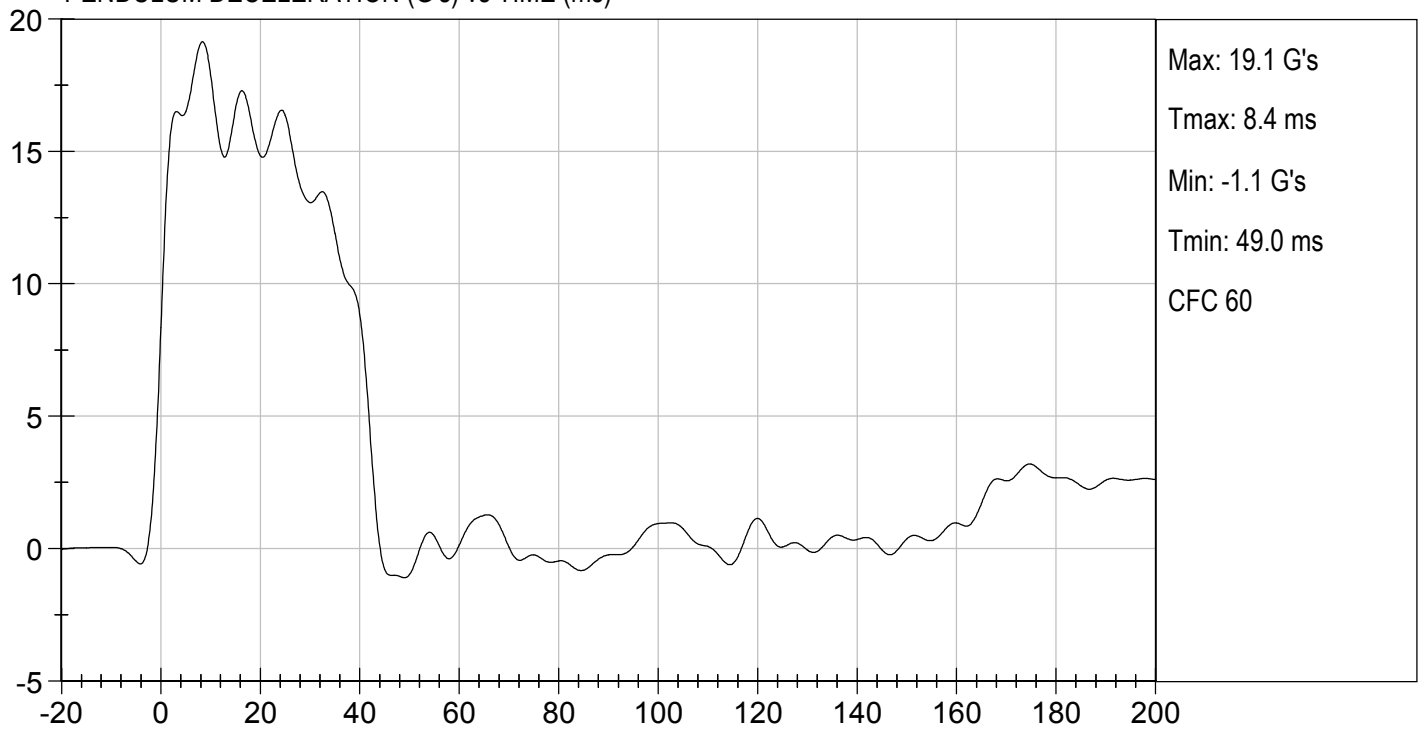
03/18/2021
Test Date

Approved By

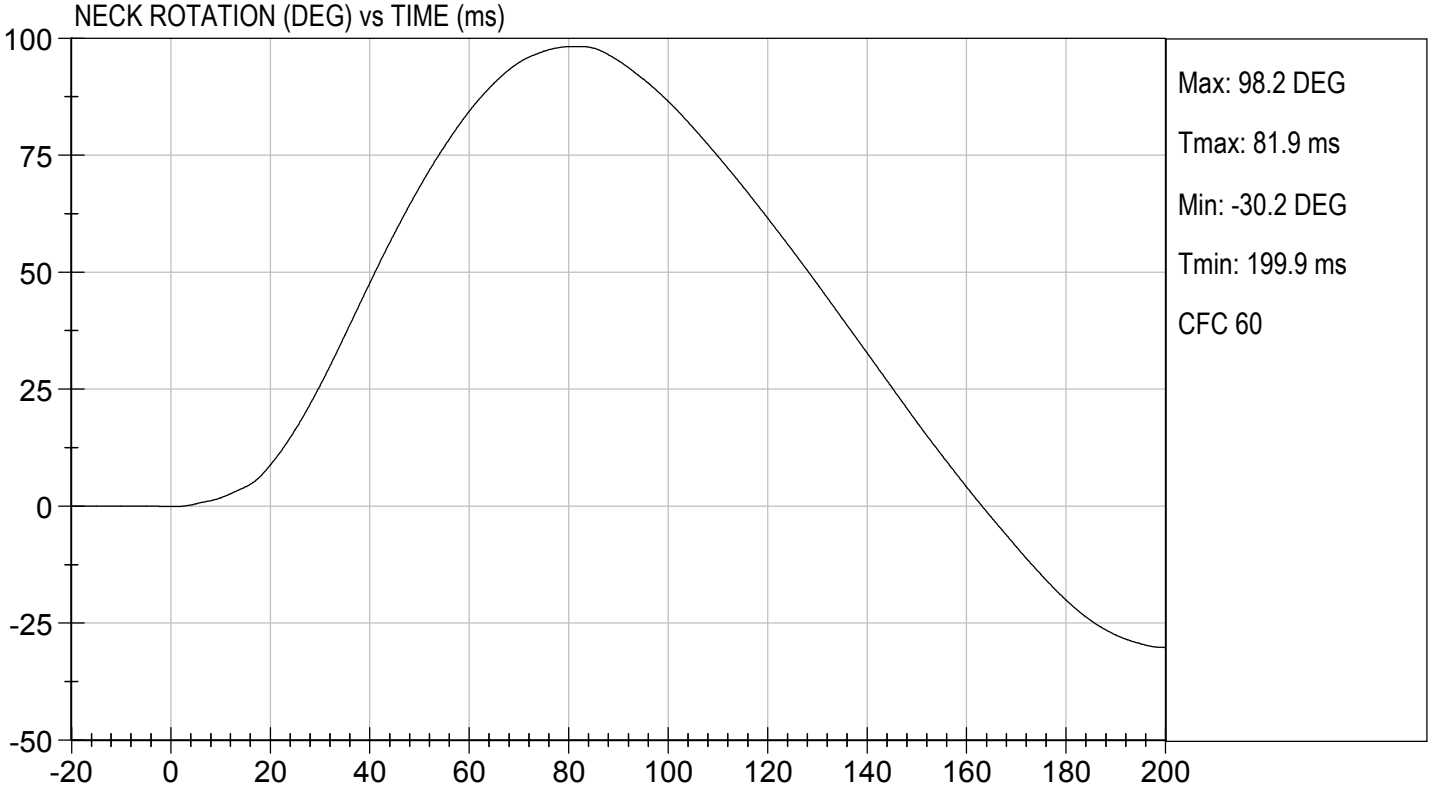
TEST DESC: NECK EXTENSION
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 03/18/2021
TEST #: D210943

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

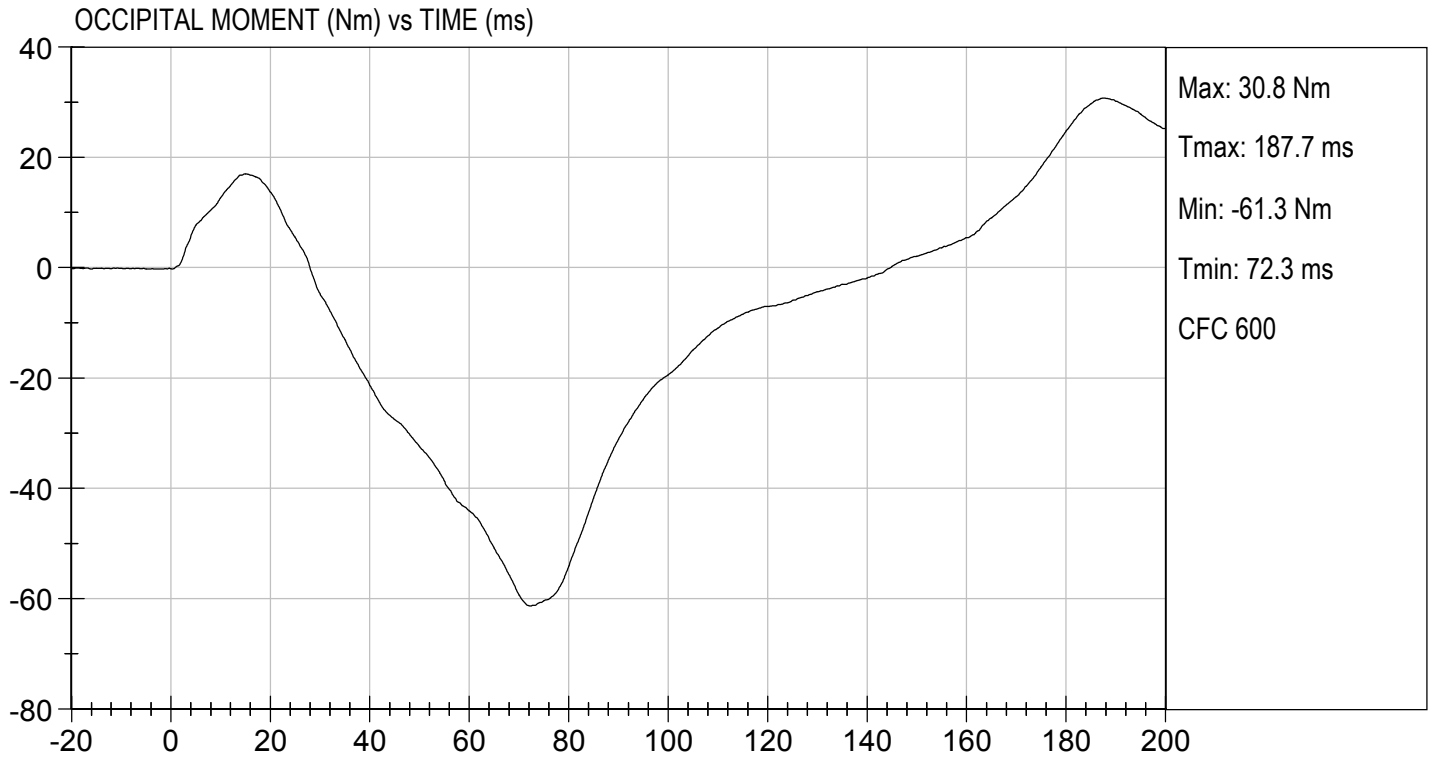


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 03/18/2021
TEST #: D210943



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D210944

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	21	Pass
Probe Velocity	m/s	6.58 to 6.82	6.68	Pass
Peak Probe Force	N	5159 to 5893	5,306	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.90	Pass
Internal Hysteresis	%	69 to 85	71	Pass
		Overall Test Results		Pass

Laboratory Technician

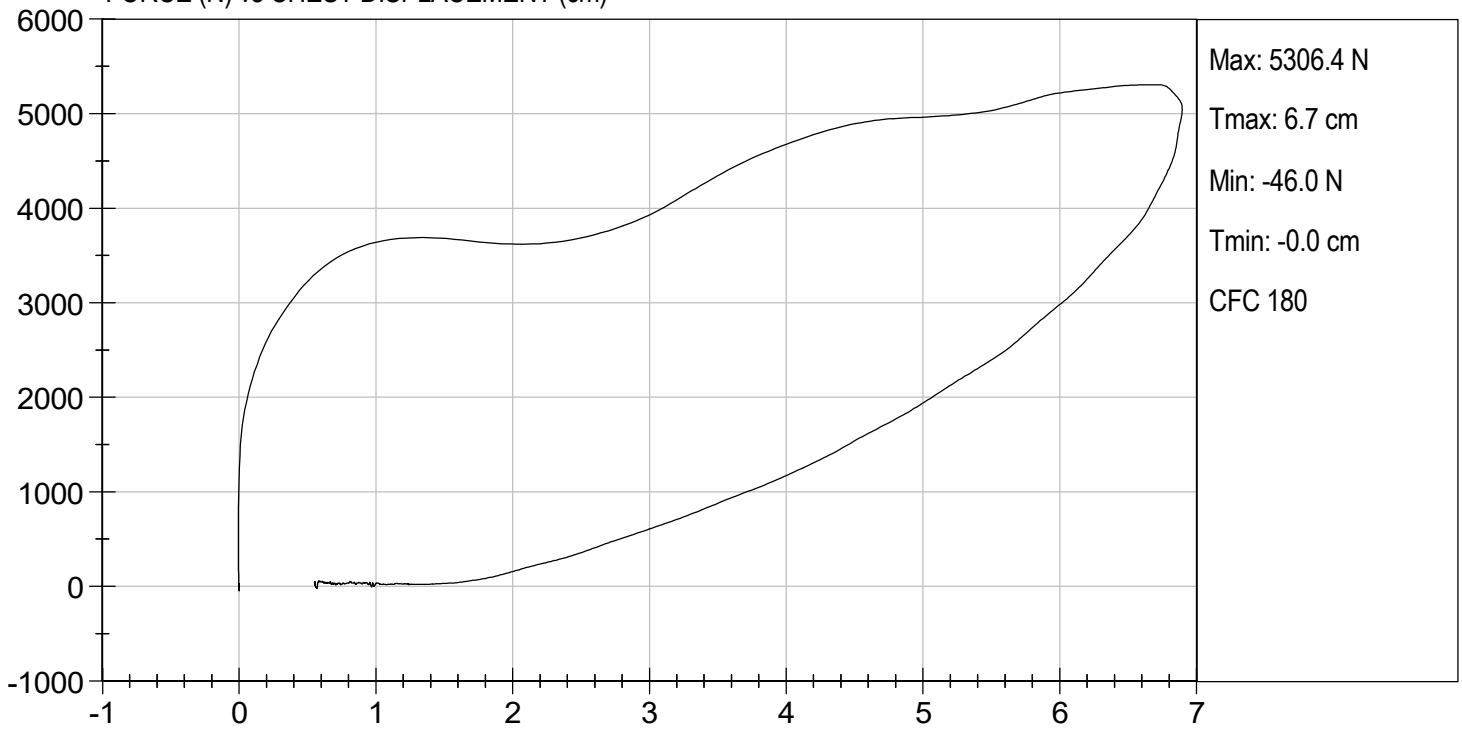
03/19/2021
Test Date

Approved By

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

TEST DATE: 03/19/2021
TEST #: D210944

FORCE (N) vs CHEST DISPLACEMENT (cm)



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D210945

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	26	Pass
Probe Velocity	m/s	2.07 to 2.13	2.08	Pass
Peak Probe Force	N	4715 to 5782	5,416	Pass
		Overall Test Results		Pass

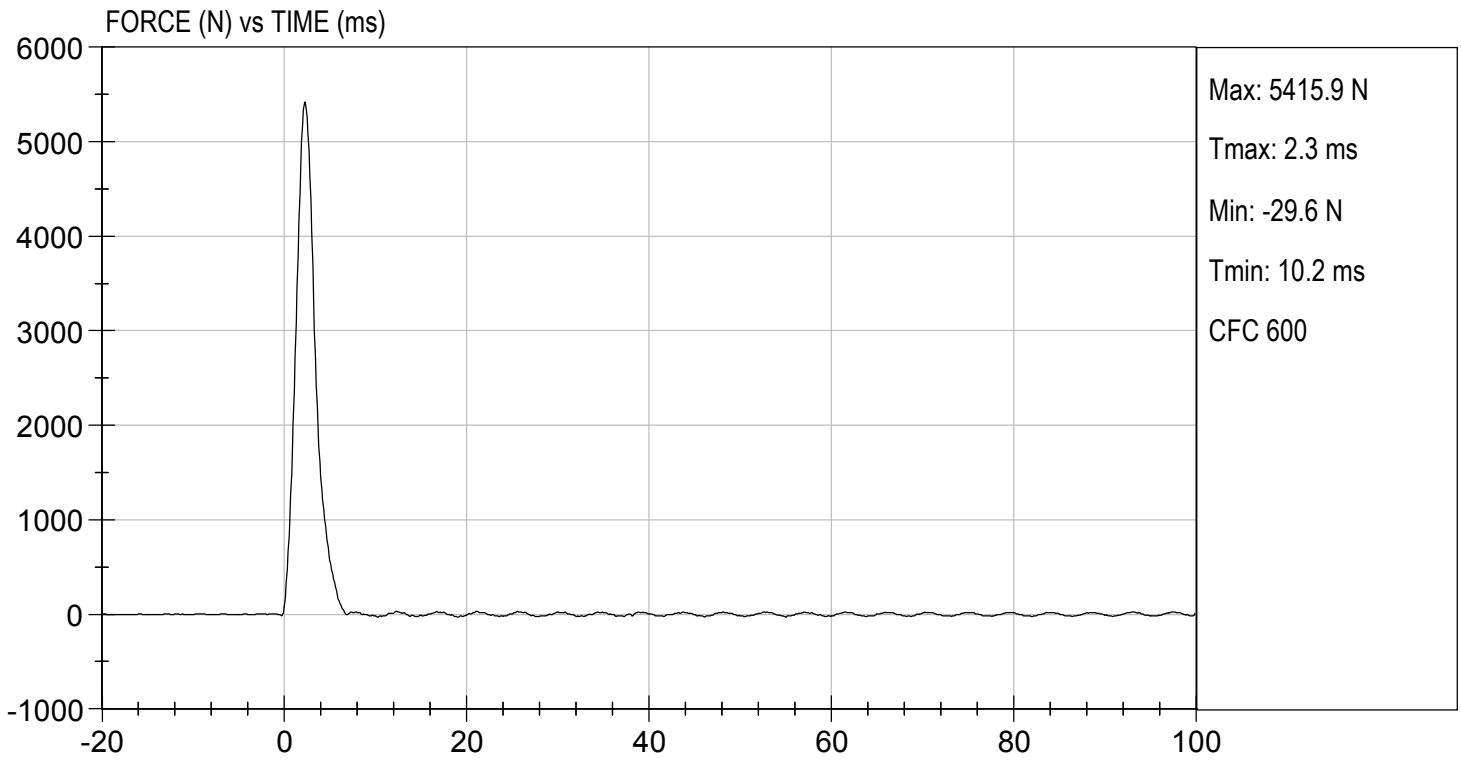
Laboratory Technician

03/18/2021
Test Date

Approved By

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

TEST DATE: 03/18/2021
TEST #: D210945



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D210946

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	26	Pass
Probe Velocity	m/s	2.07 to 2.13	2.09	Pass
Peak Probe Force	N	4715 to 5782	4,838	Pass
		Overall Test Results		Pass

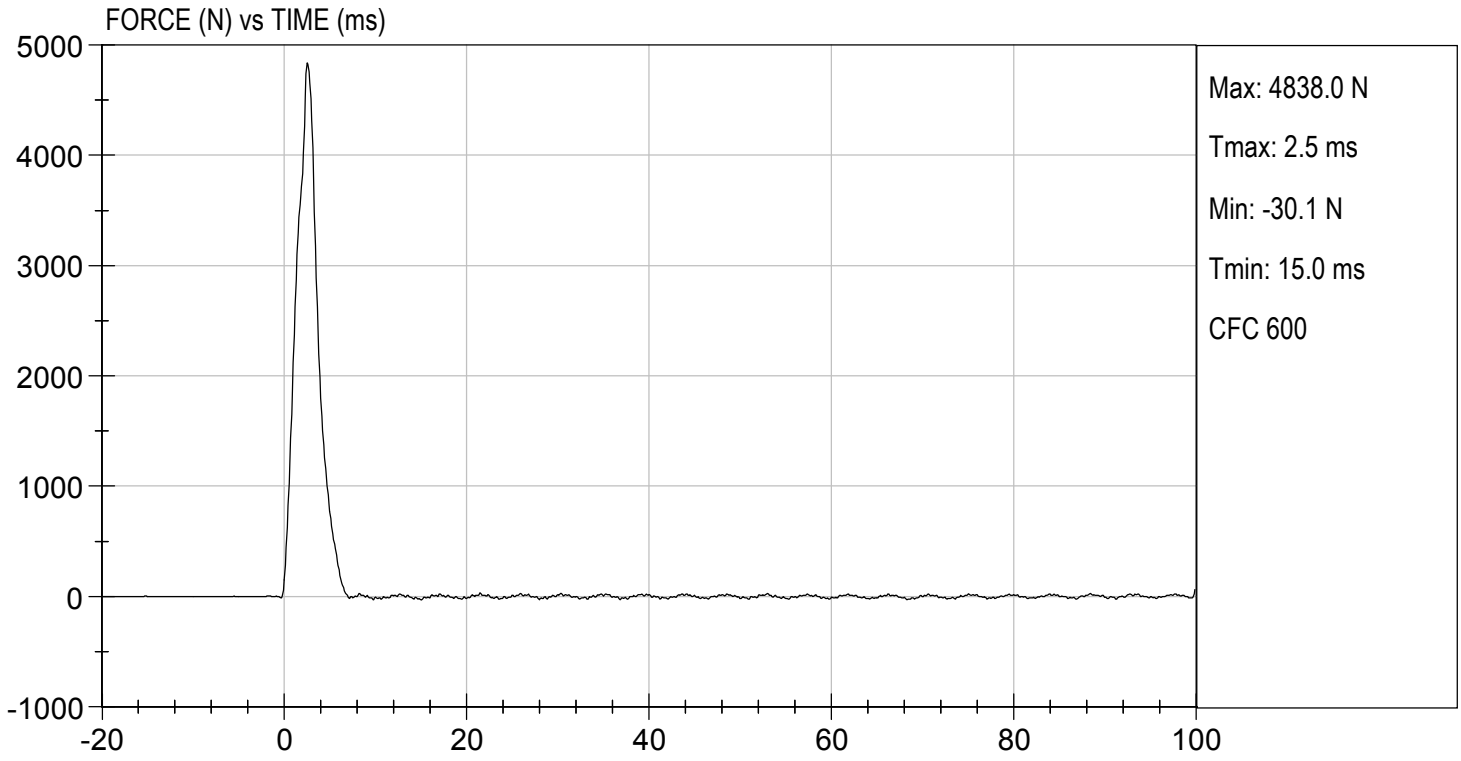
Laboratory Technician

03/18/2021
Test Date

Approved By

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

TEST DATE: 03/18/2021
TEST #: D210946



MGA RESEARCH CORPORATION

HIP-FEMUR FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D210940

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.2	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	26.3	26.3	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.4	6.4	Pass
30 Degrees	Nm	94.9 Nm Max	89.6	91.4	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	43.7	44.4	Pass
		Overall Test Results			Pass

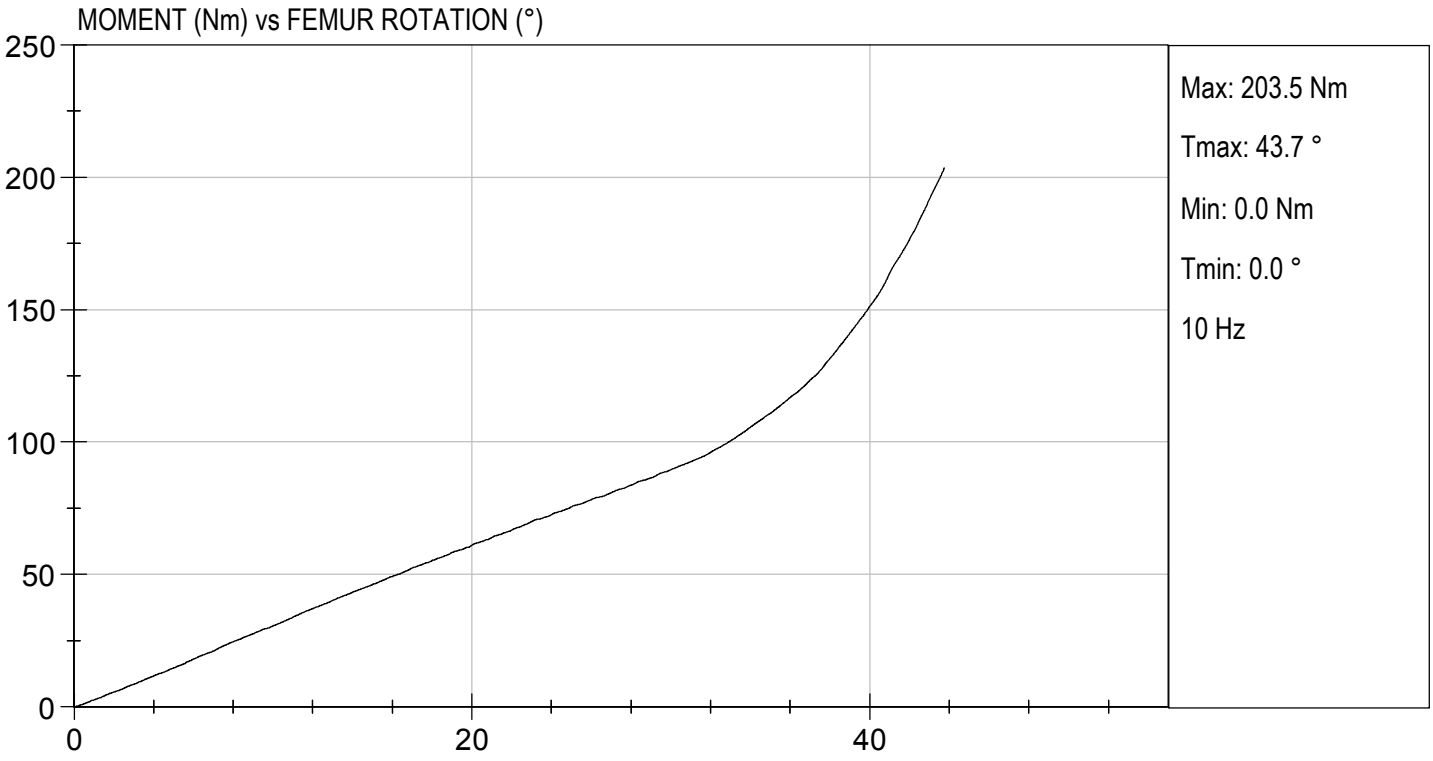
Laboratory Technician

03/18/2021
Test Date

Approved By

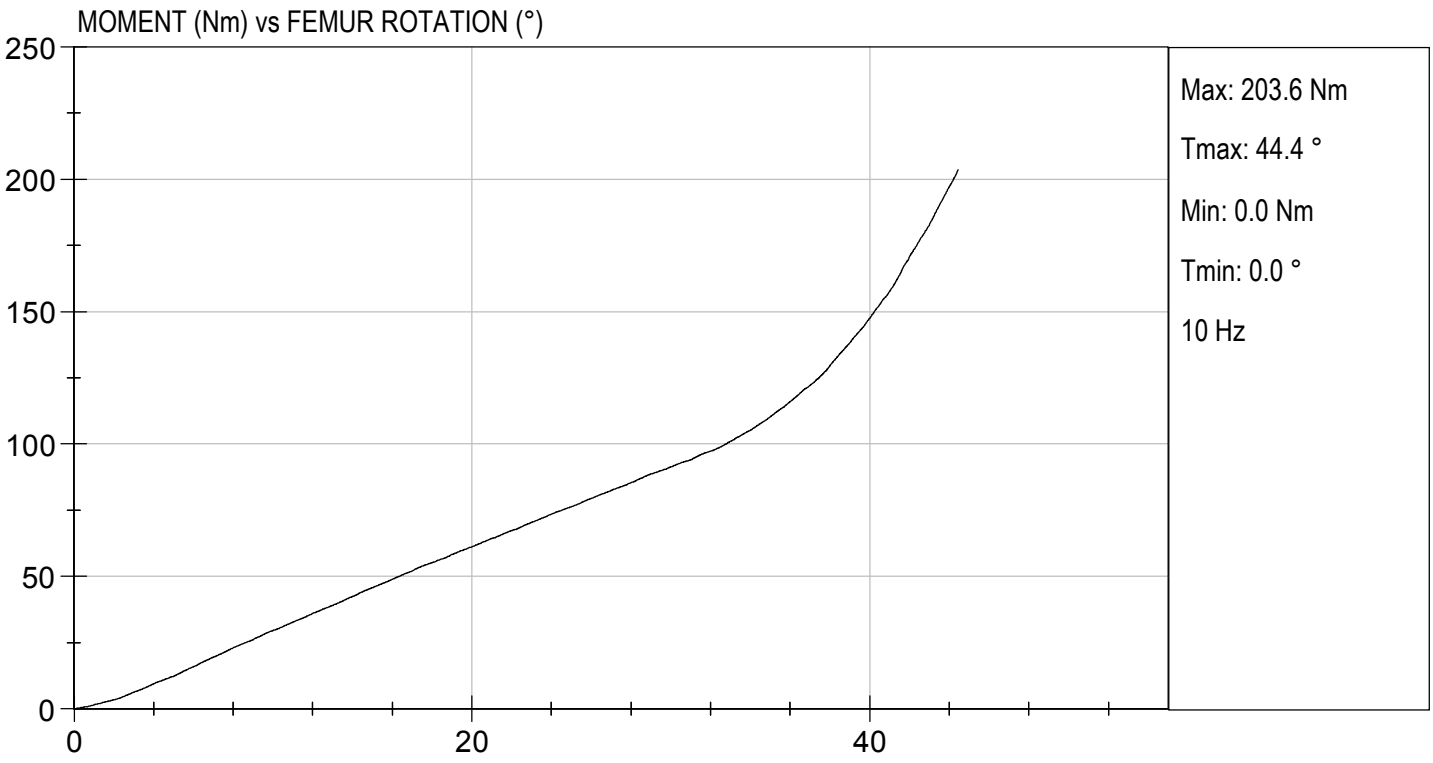
TEST DESC: RIGHT HIP FEMUR FLEXION

TEST DATE: 03/18/2021
TEST #: D210949



TEST DESC: LEFT HIP FEMUR FLEXION

TEST DATE: 03/18/2021
TEST #: D210940



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:** D211051

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	36	Pass
Peak Resultant Acceleration	G's	225 to 275	253	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-3.1	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Laboratory Technician

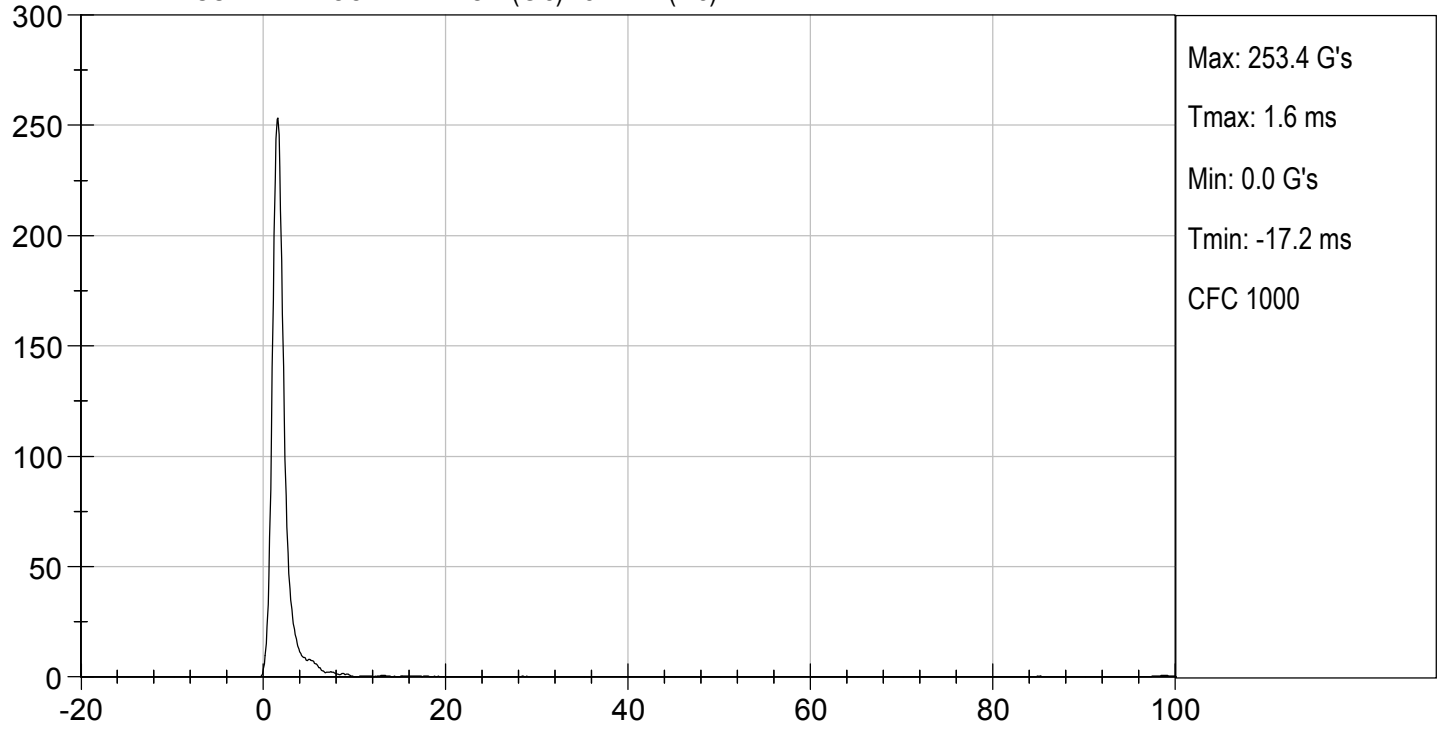
03/25/2021
Test Date

Approved By

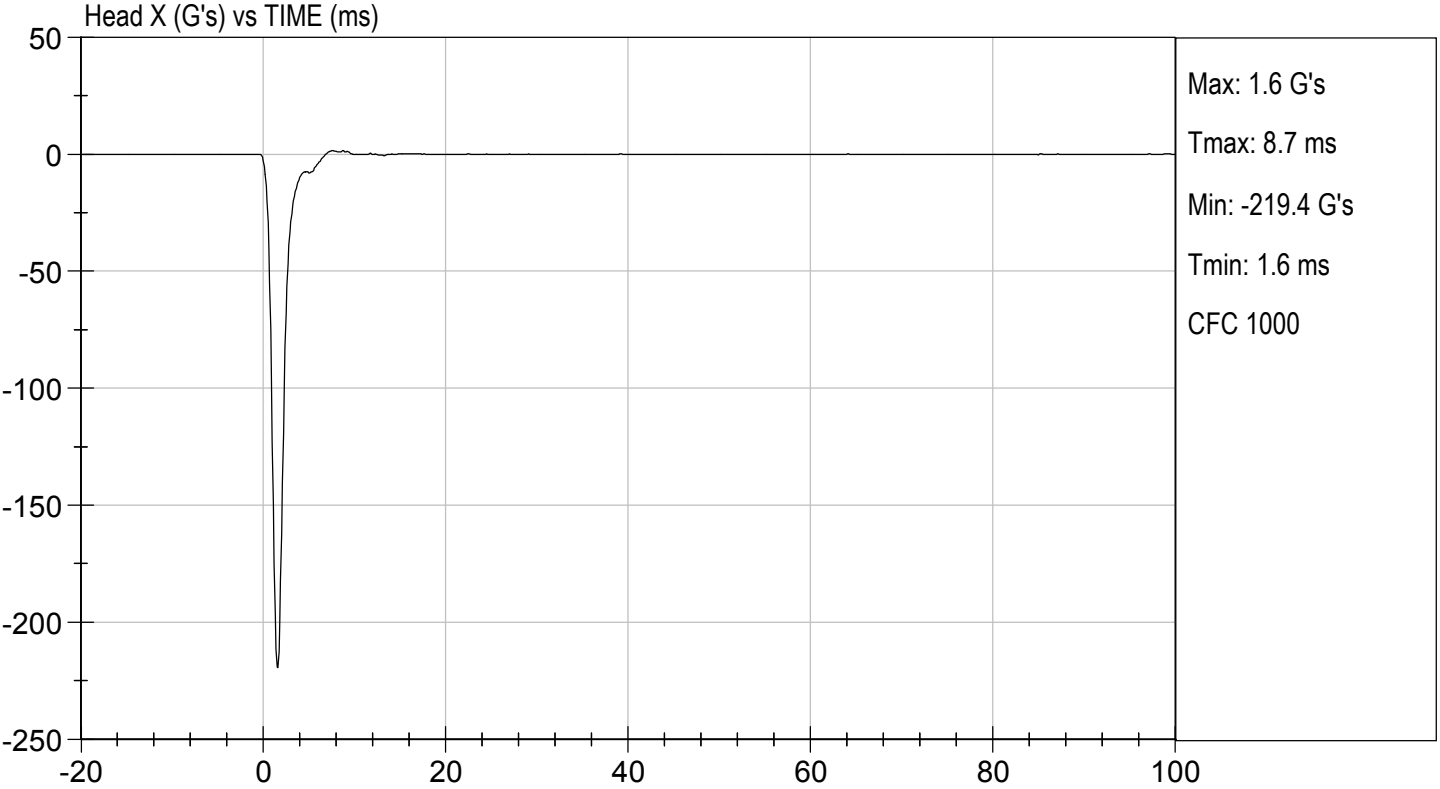
TEST DESC: HEAD DROP

TEST DATE: 03/25/2021
TEST #: D211051

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

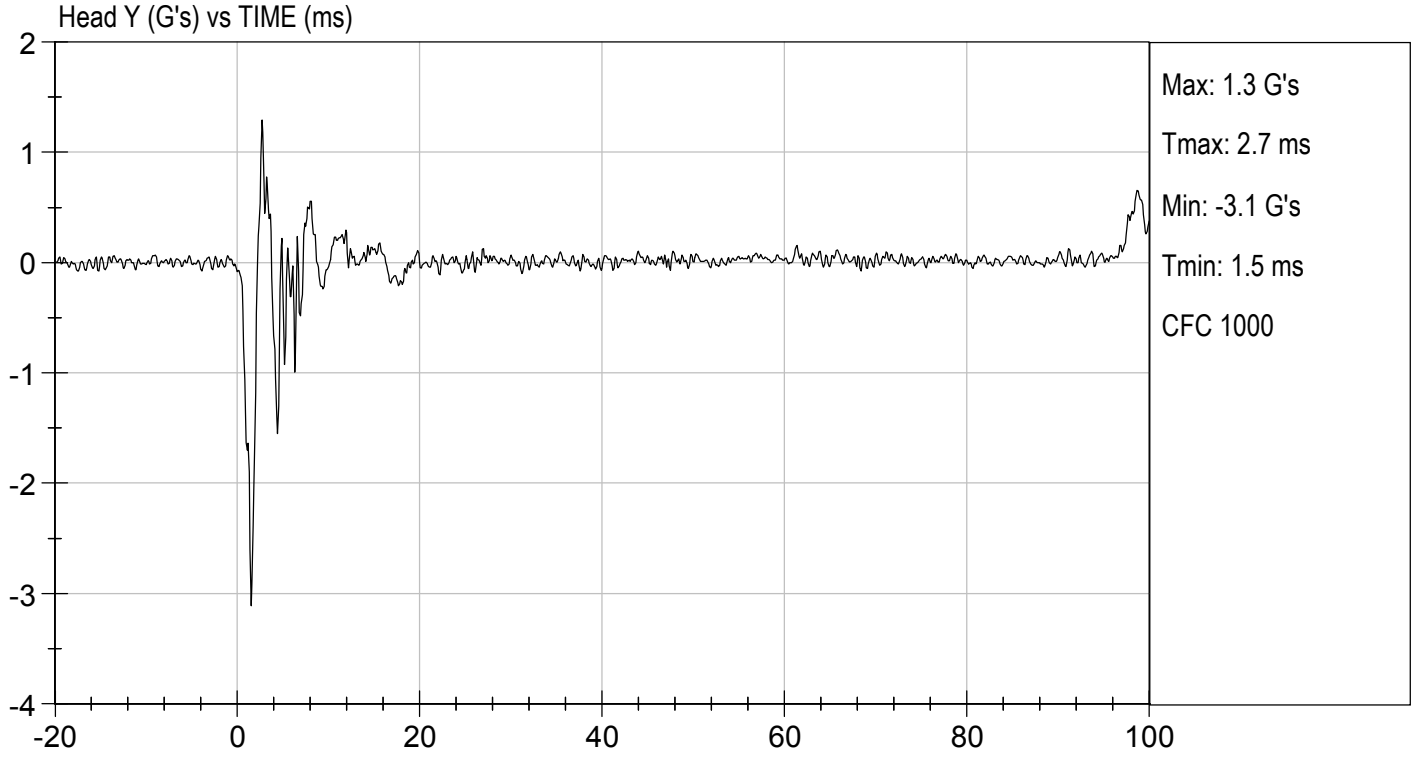


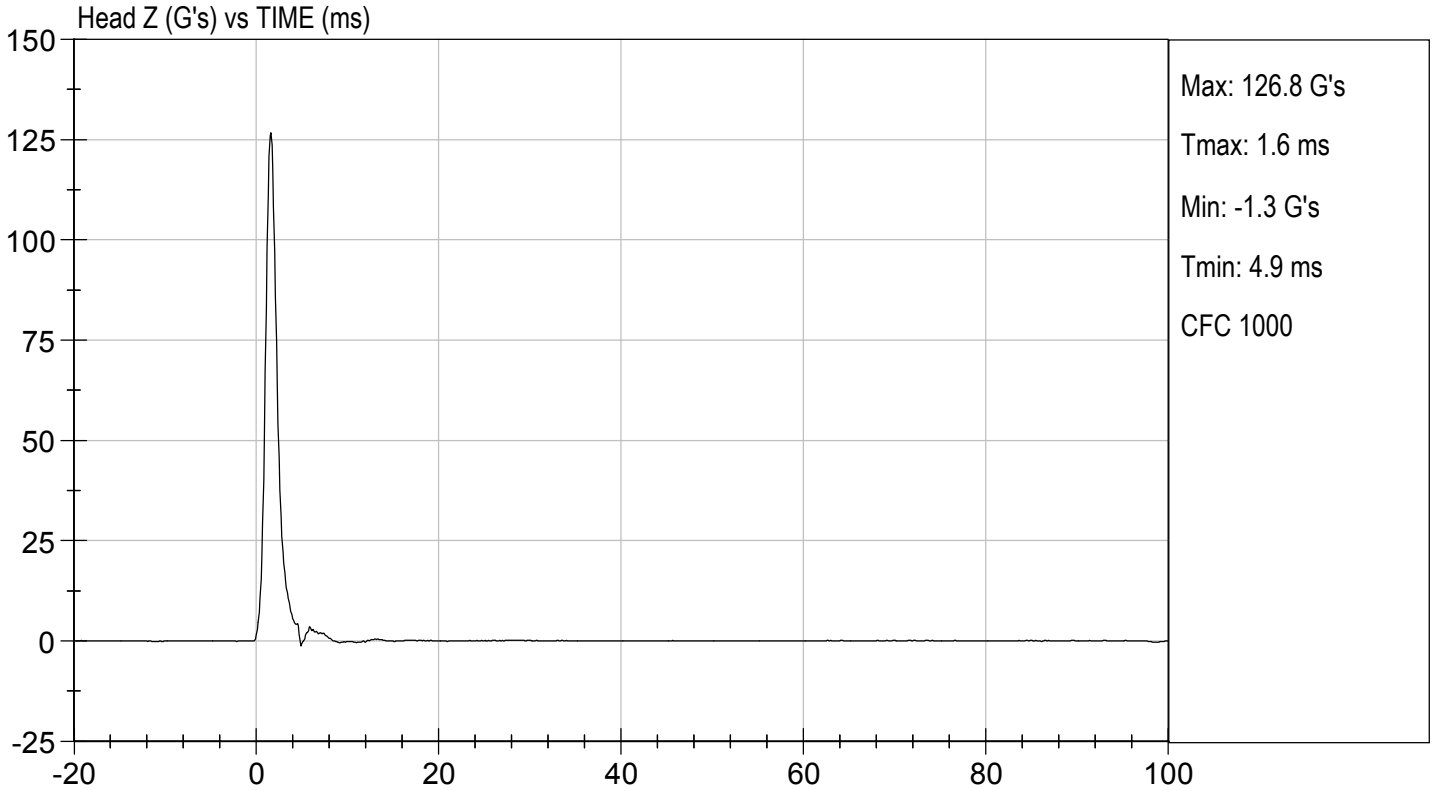
Head X (G's) vs TIME (ms)



TEST DESC: HEAD DROP

TEST DATE: 03/25/2021
TEST #: D211051





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D211052

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity		%	10 to 70	36	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.56	Pass
	20 ms	G's	17.60 to 22.60	20.51	Pass
	30 ms	G's	12.50 to 18.50	16.78	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	16.7	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	35.8	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	70.1	Pass
	Time	ms	57.0 to 64.0	59.4	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	119.1	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	92.8	Pass
	Time	ms	47.0 to 58.0	47.2	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	98.7	Pass
			Overall Test Results		Pass

Laboratory Technician

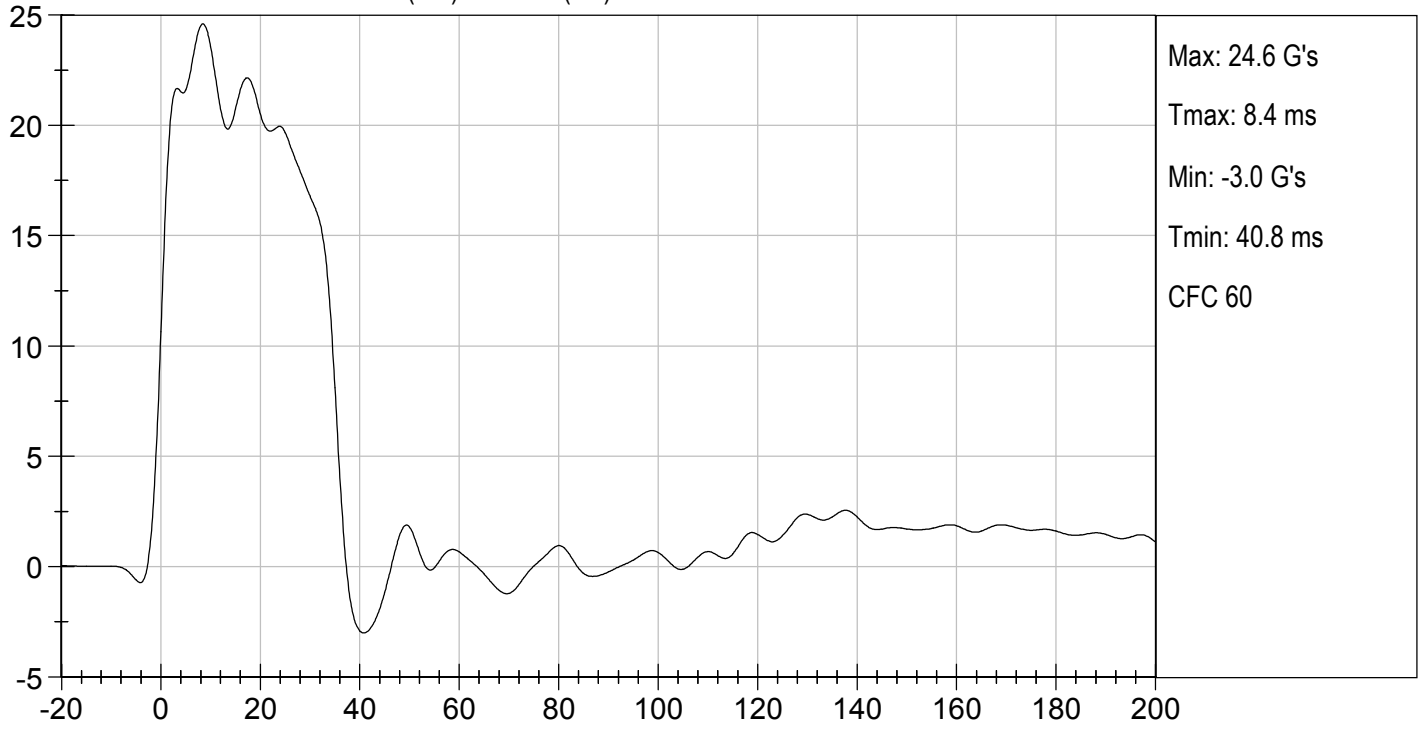
03/25/2021
Test Date

Approved By

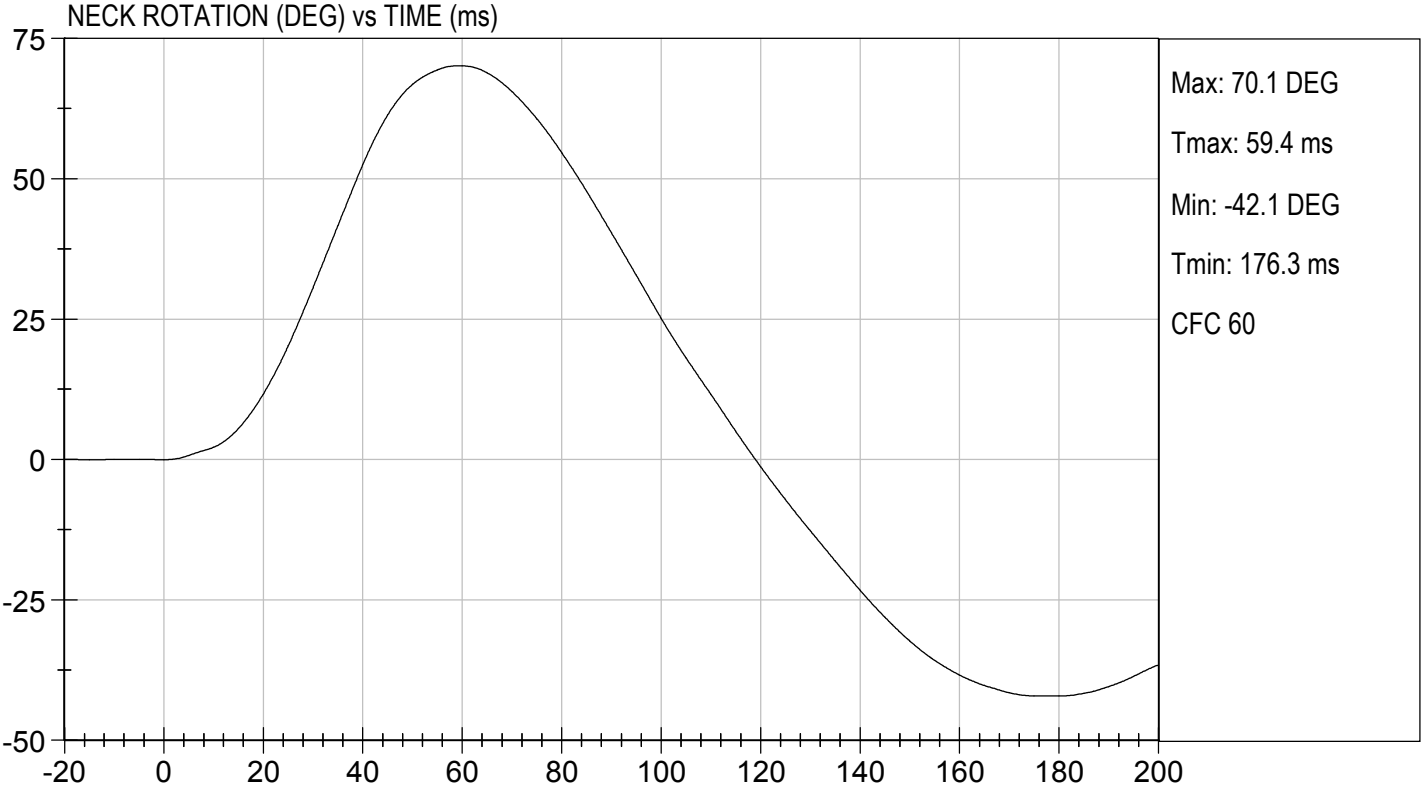
TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

TEST DATE: 03/25/2021
TEST #: D211052

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

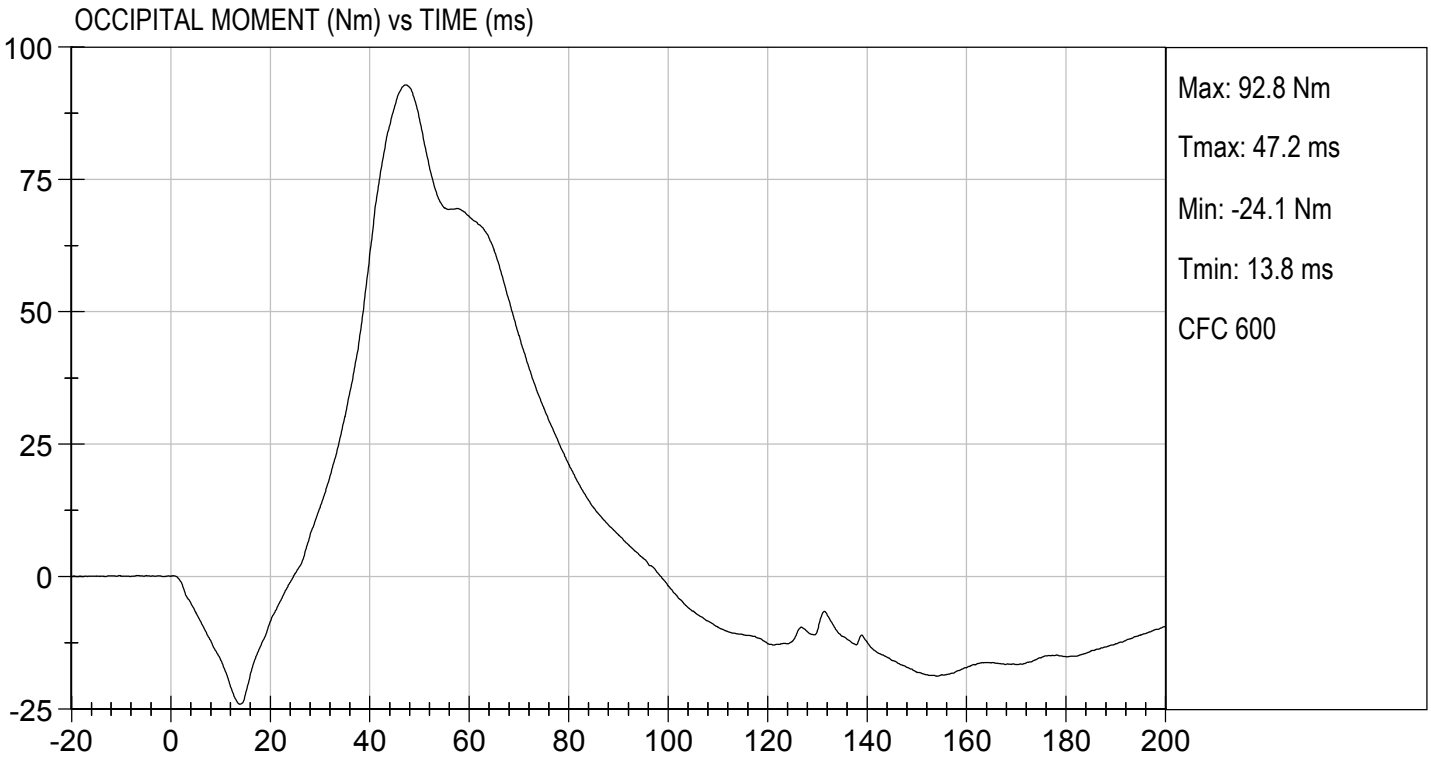


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 03/25/2021
TEST #: D211052



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D211053

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity		%	10 to 70	36	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	18.87	Pass
	20 ms	G's	14.00 to 19.00	16.16	Pass
	30 ms	G's	11.00 to 16.00	14.25	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	14.9	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	39.1	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	94.2	Pass
	Time	ms	72.0 to 82.0	78.5	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	162.9	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-65.5	Pass
	Time	ms	65.0 to 79.0	72.7	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	147.4	Pass
			Overall Test Results		Pass

Laboratory Technician

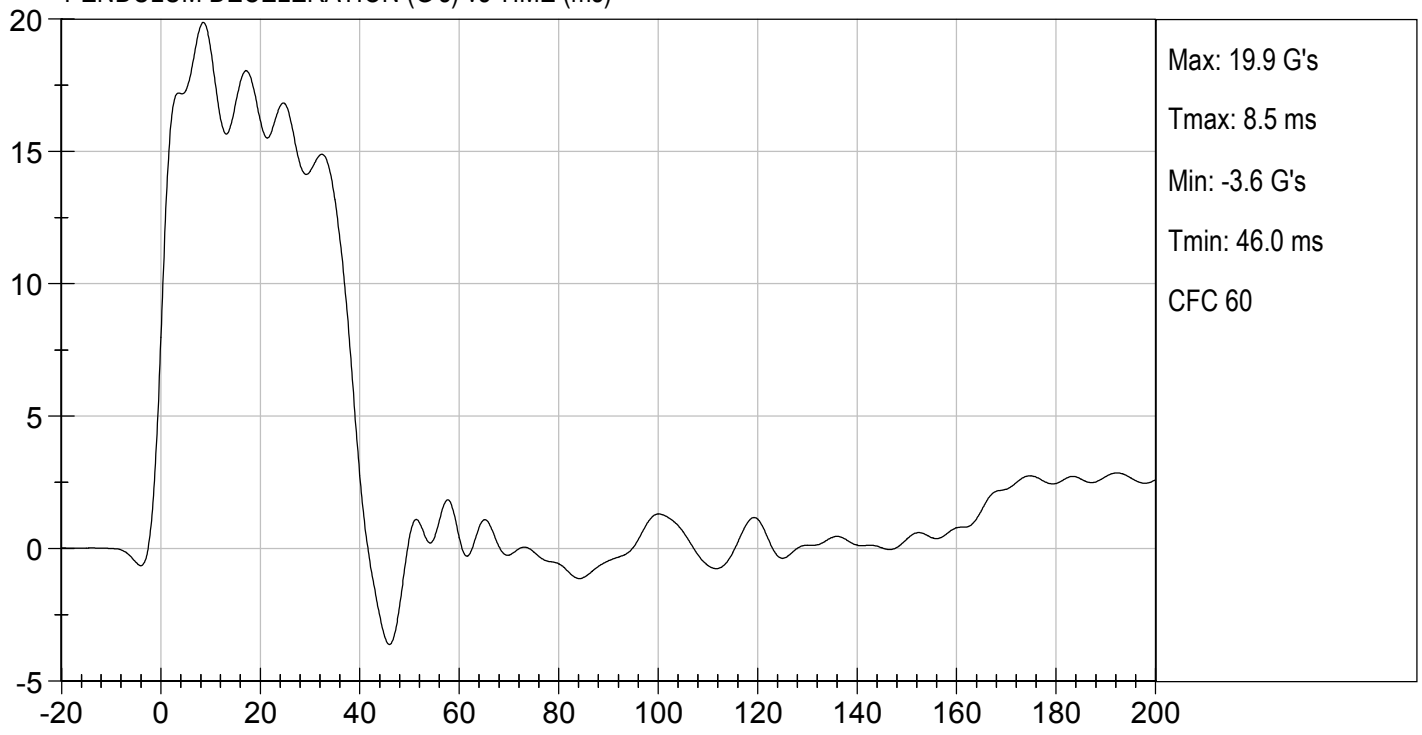
03/25/2021
Test Date

Approved By

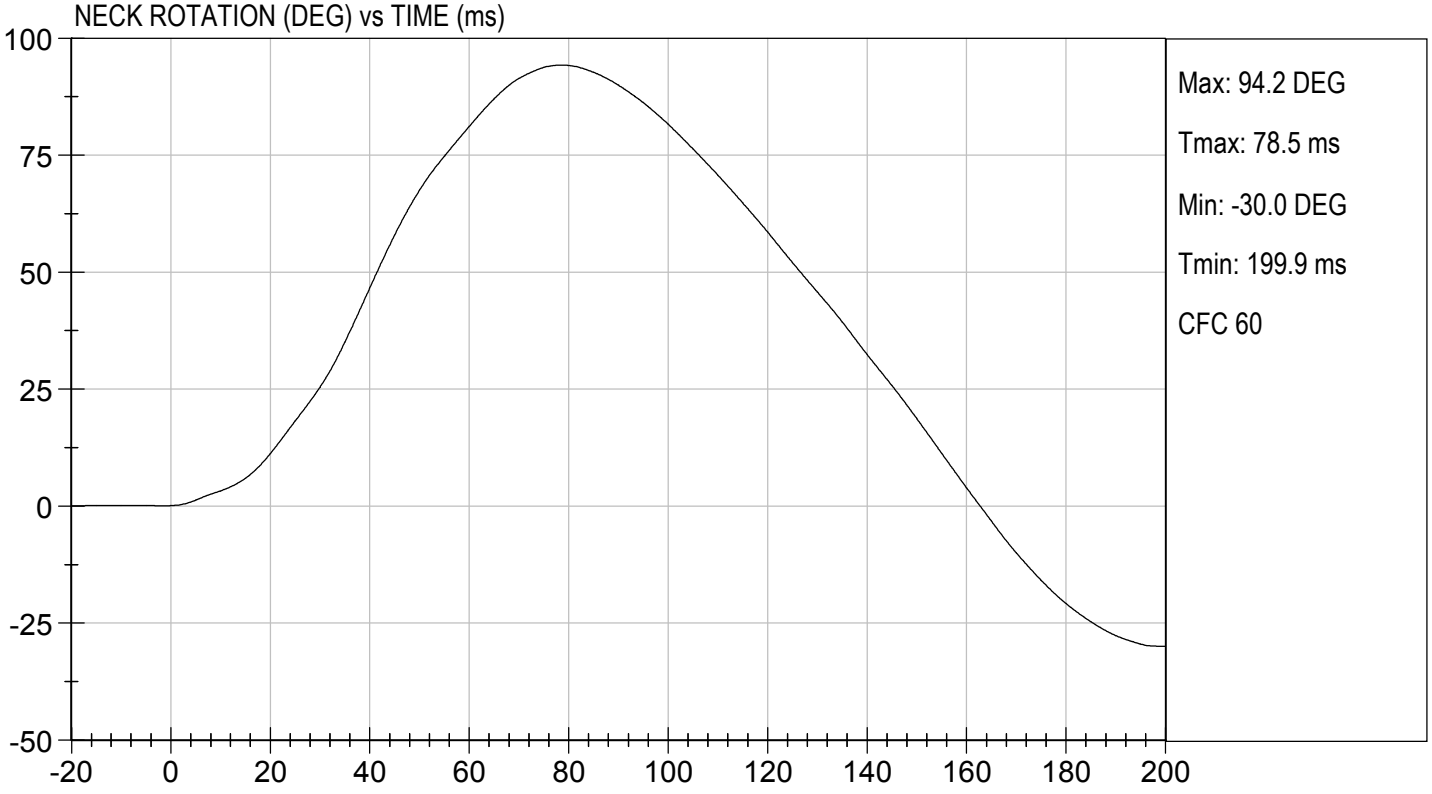
TEST DESC: NECK EXTENSION
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 03/25/2021
TEST #: D211053

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

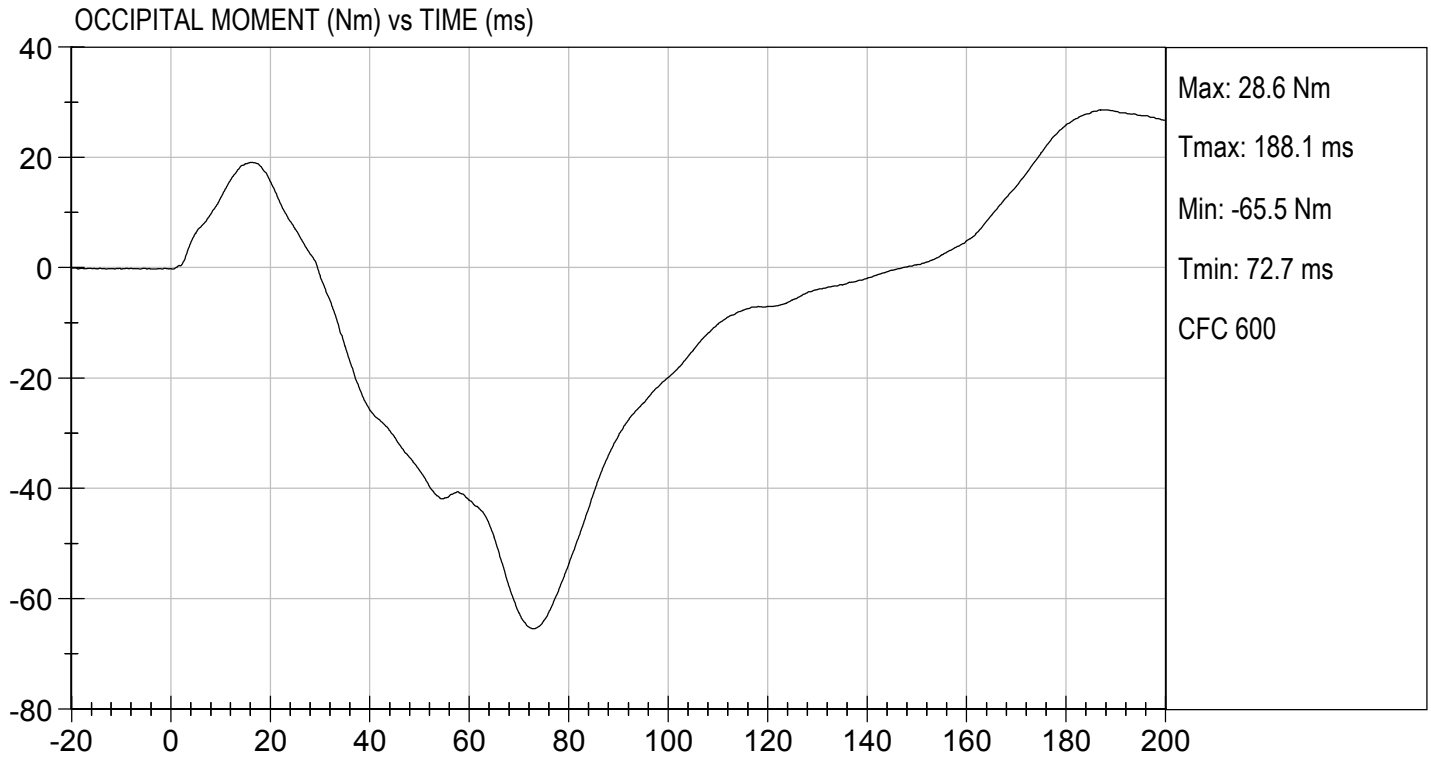


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 03/25/2021
TEST #: D211053



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D211054

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	30	Pass
Probe Velocity	m/s	6.58 to 6.82	6.60	Pass
Peak Probe Force	N	5159 to 5893	5,356	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	7.00	Pass
Internal Hysteresis	%	69 to 85	71	Pass
		Overall Test Results		Pass

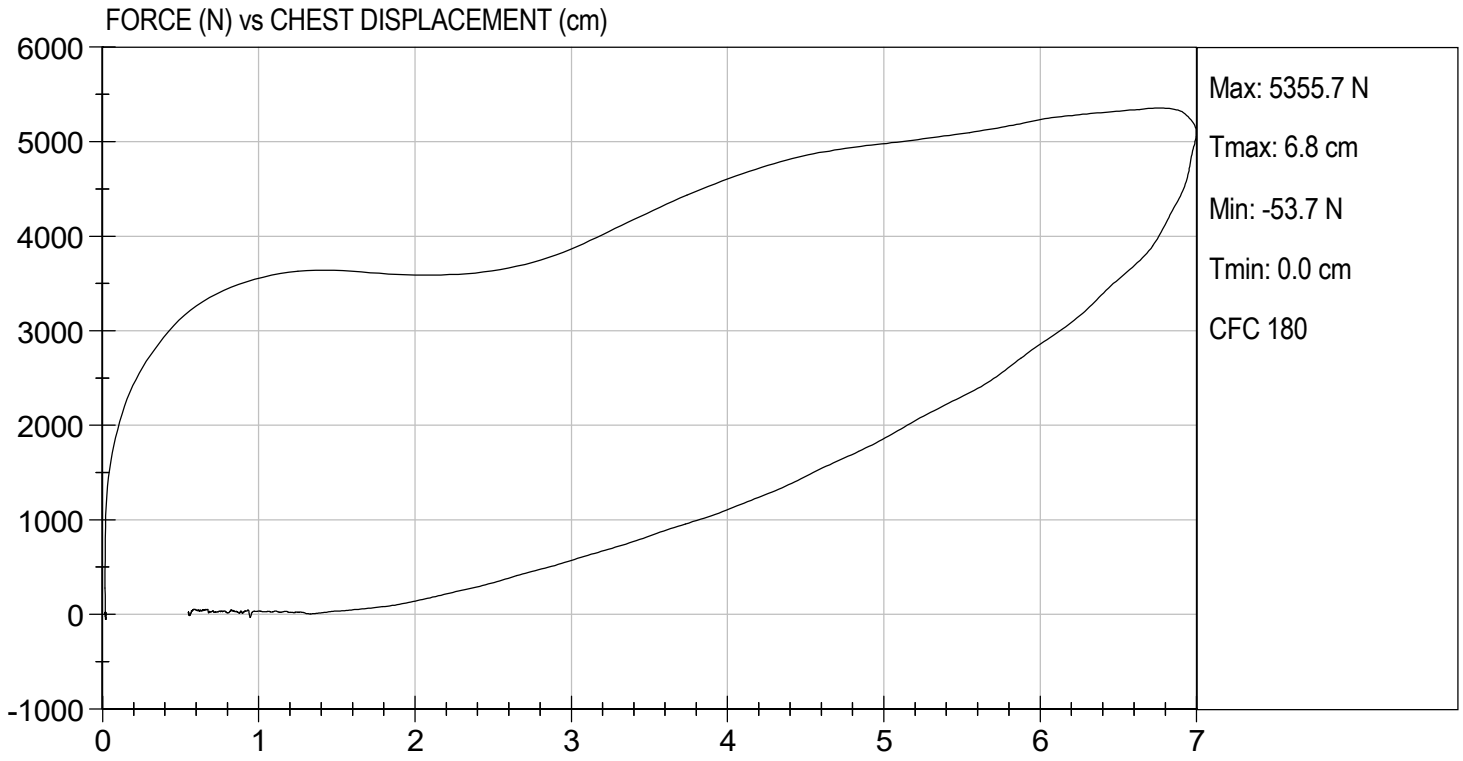
Laboratory Technician

03/26/2021
Test Date

Approved By

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

TEST DATE: 03/26/2021
TEST #: D211054



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D211055

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	N	4715 to 5782	4,851	Pass
		Overall Test Results		Pass

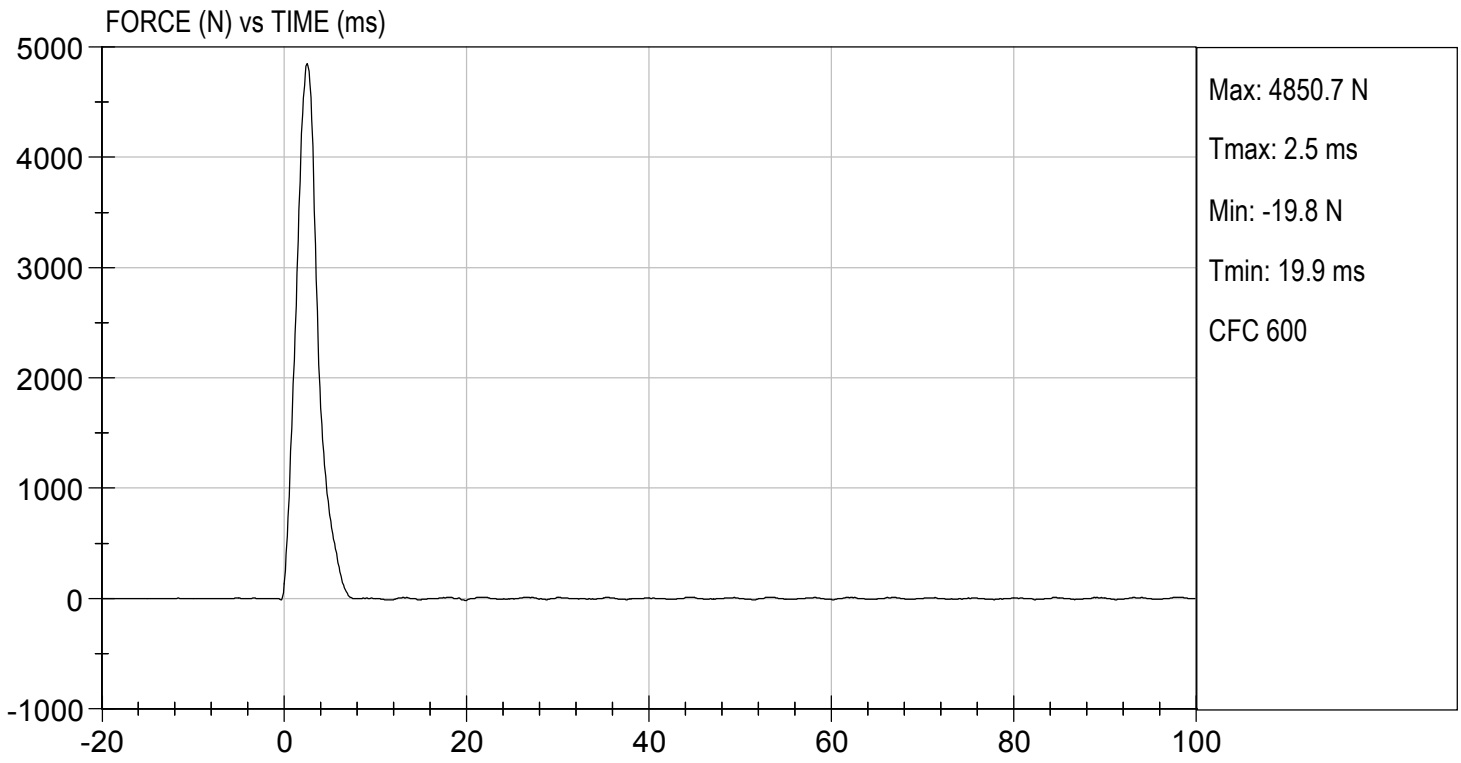
Laboratory Technician

3/26/2021
Test Date

Approved By

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

TEST DATE: 3/26/2021
TEST #: D211055



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D211056

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21	Pass
Laboratory Relative Humidity	%	10 to 70	29.8	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	N	4715 to 5782	4,987	Pass
		Overall Test Results		Pass

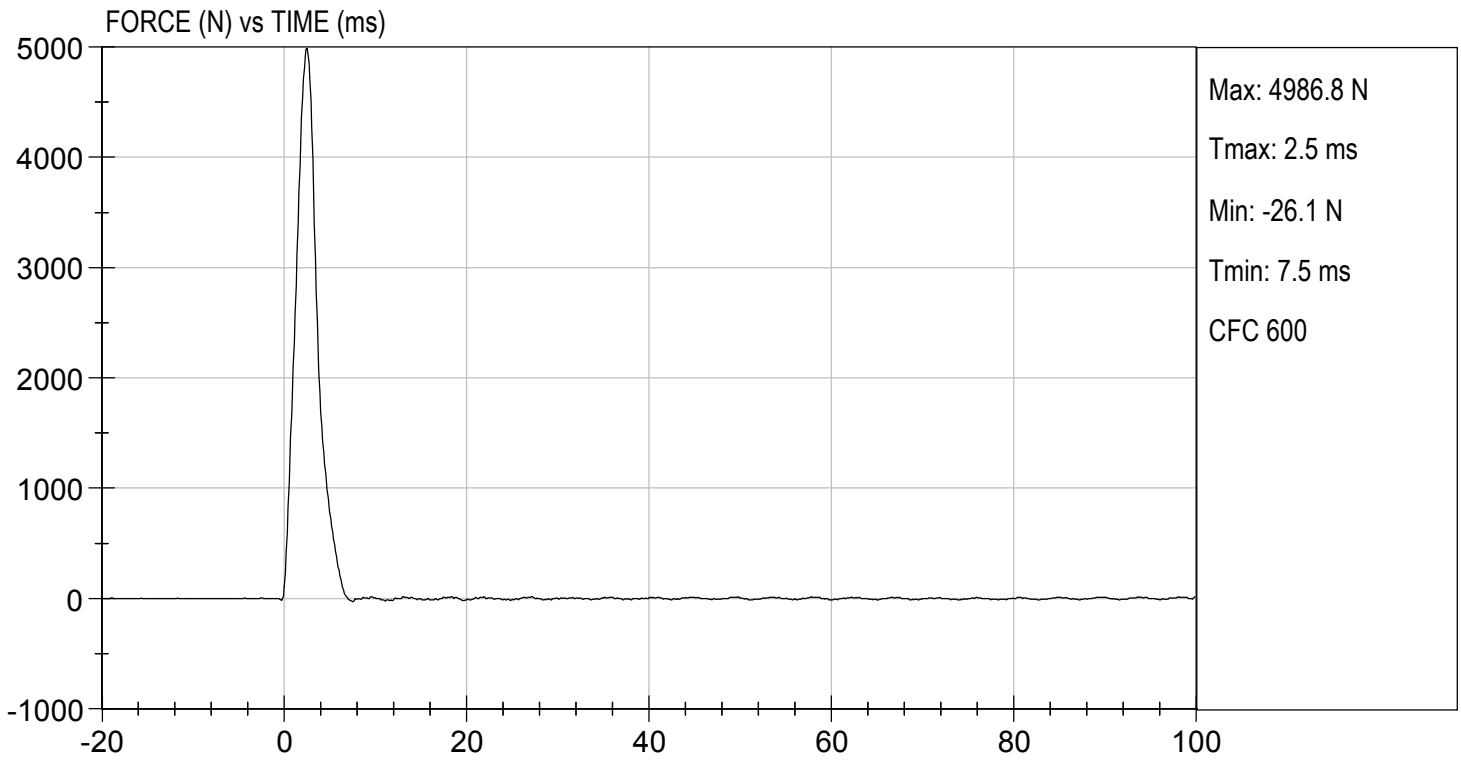
Laboratory Technician

03/26/2021
Test Date

Approved By

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

TEST DATE: 03/26/2021
TEST #: D211056



MGA RESEARCH CORPORATION

HIP-FEMUR FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D211050

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.7	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	36.5	36.5	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.4	6.4	Pass
30 Degrees	Nm	94.9 Nm Max	85.0	88.2	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	44.5	44.0	Pass
		Overall Test Results			Pass

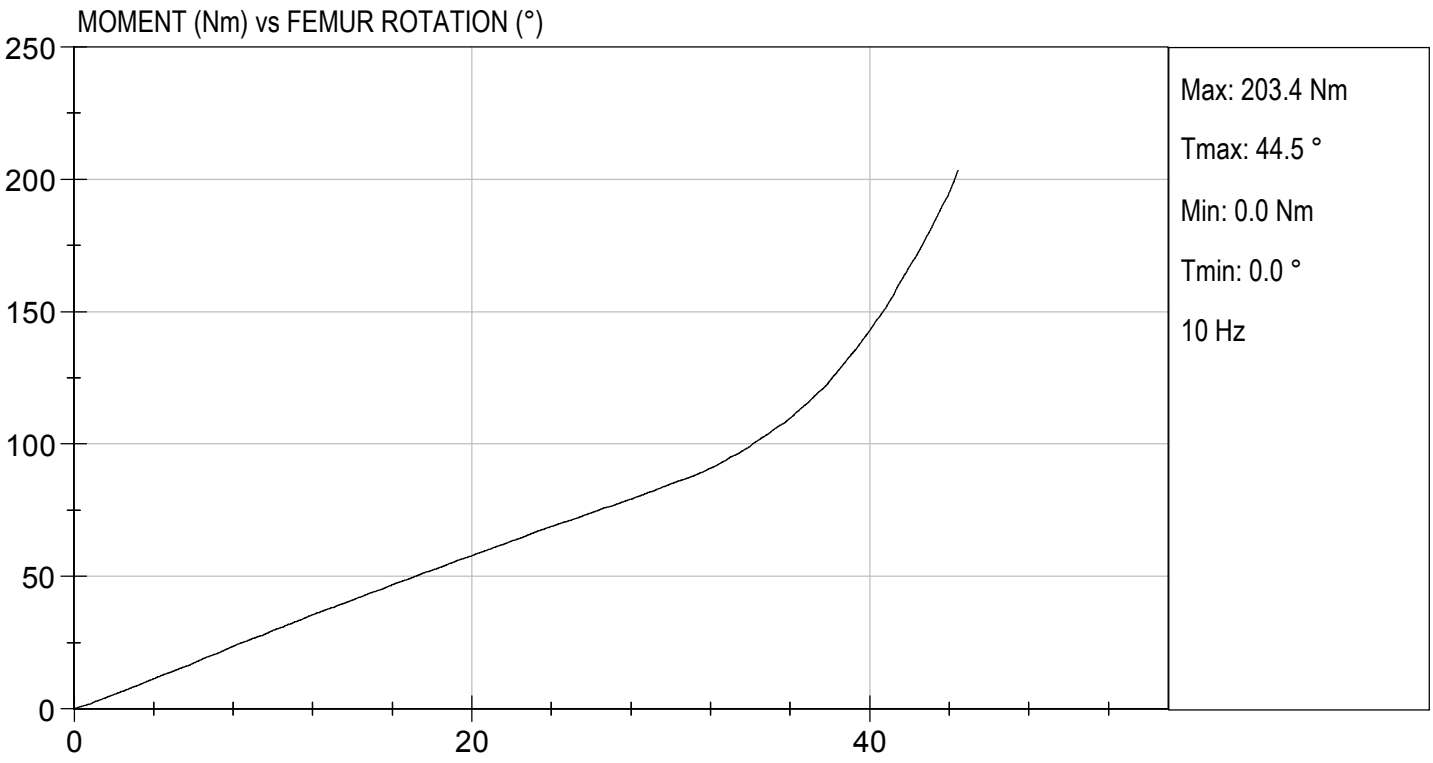
Laboratory Technician

04/07/2021
Test Date

Approved By

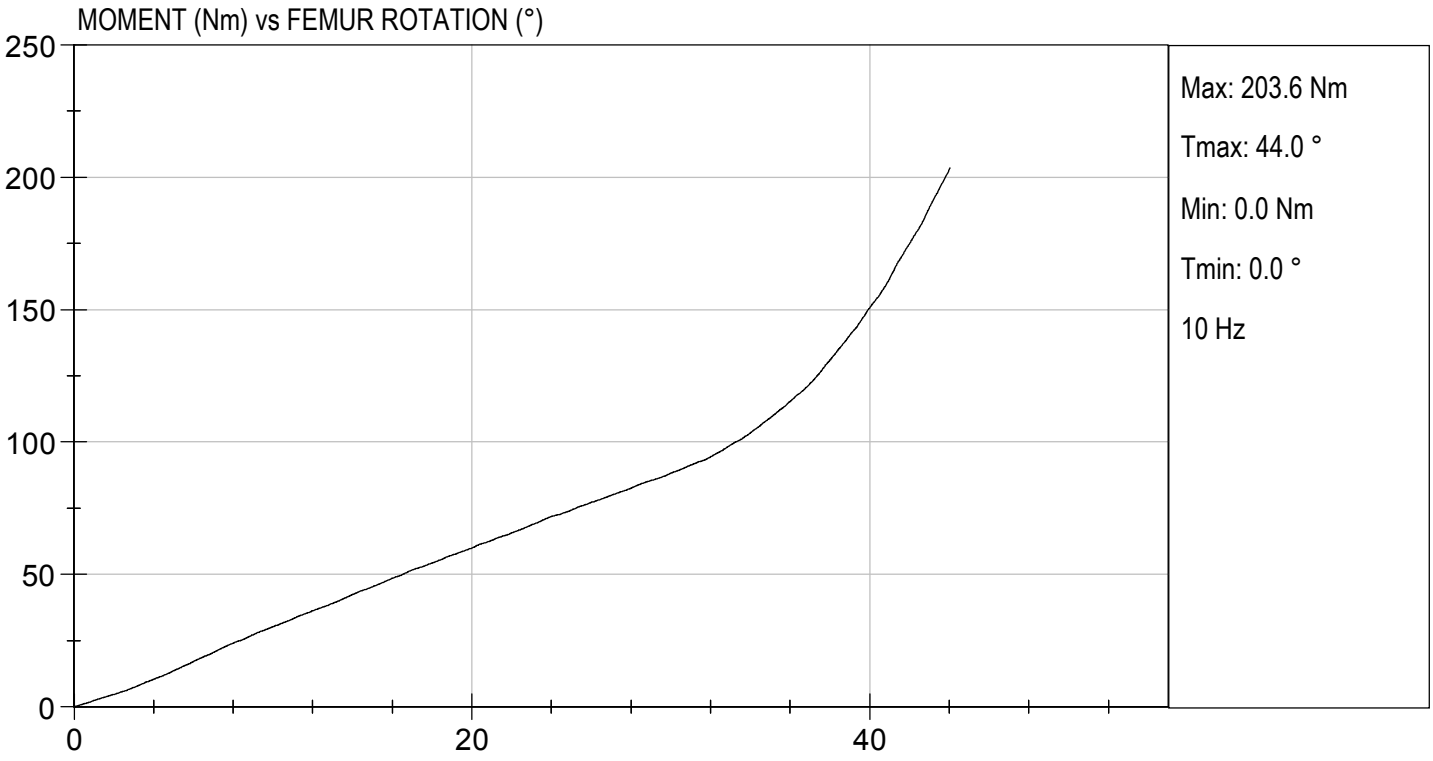
TEST DESC: RIGHT HIP FEMUR FLEXION

TEST DATE: 03/25/2021
TEST #: D211059



TEST DESC: LEFT HIP FEMUR FLEXION

TEST DATE: 04/07/2021
TEST #: D211050



CALIBRATION TEST RESULTS

PRE-TEST

HYBRID III 5TH PERCENTILE FEMALE - PASSENGER ATD

Hybrid III, 5th External Measurements
SN: DH1659

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	778
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	440
C	H-POINT HEIGHT	Reference	81.3-86.3	85
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	147
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	82
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	130
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	251
H	HEAD BACK TO BACKLINE	Back of Skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	45
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	285
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	189
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	543
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376	357
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	398
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	435

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	182
P	FOOT LENGTH	Tip of toe to rear of heal	218.5-233.7	221
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	469
S	HEAD BREADTH	The widest part of the head	137.1-147.3	141
T	HEAD DEPTH	Back of the head to the forehead	177.8-188	182
U	HIP BREADTH	The widest part of the hip	299.7-314.9	306
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	357
W	FOOT BREADTH	The widest part of the foot	78.8-94	83
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. “T”	528.3-548.7	542
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	865
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	785
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	332.7-358.1	345
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	160.1-170.2	165

MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659 **Test ID:** D210951

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	26.3	Pass
Peak Resultant Acceleration	G's	250 to 300	292	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-3.3	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Laboratory Technician

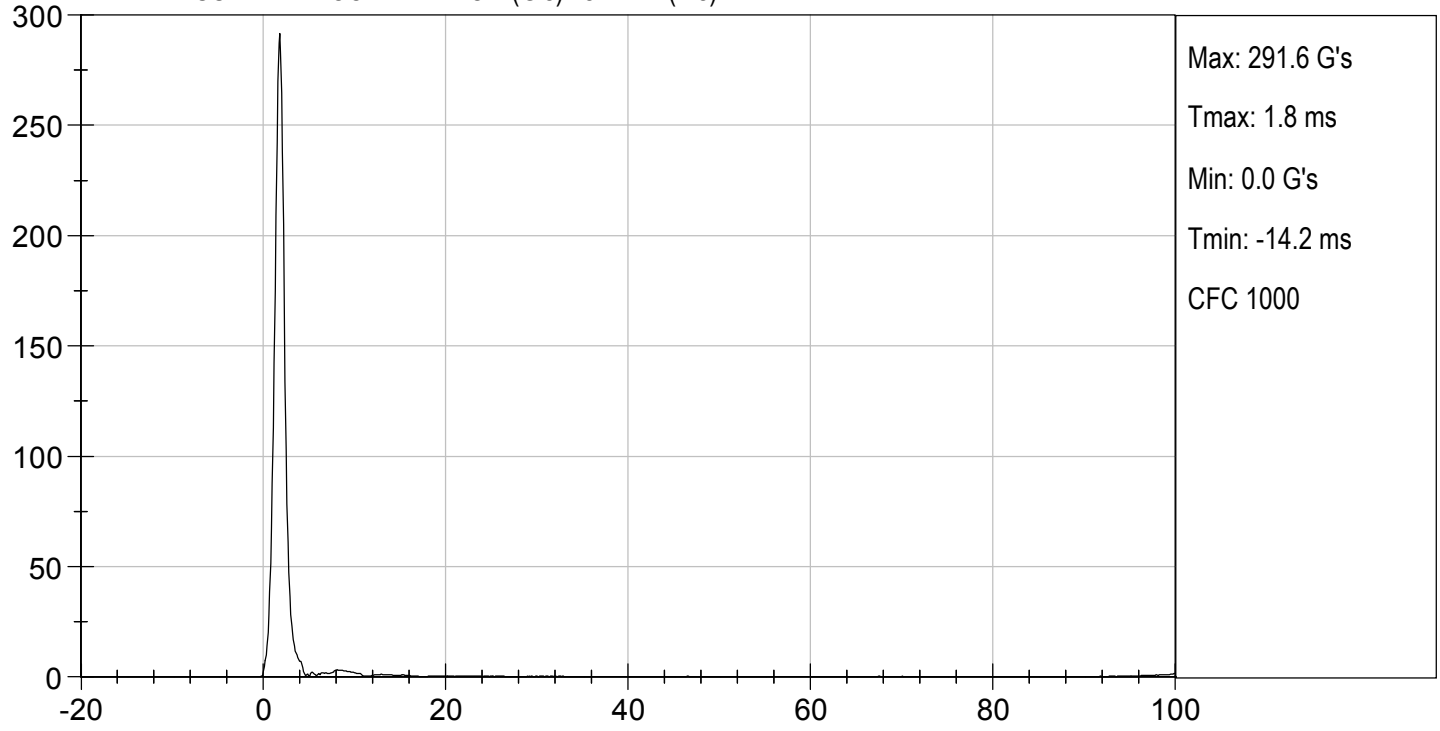
03/18/2021
Test Date

Approved By

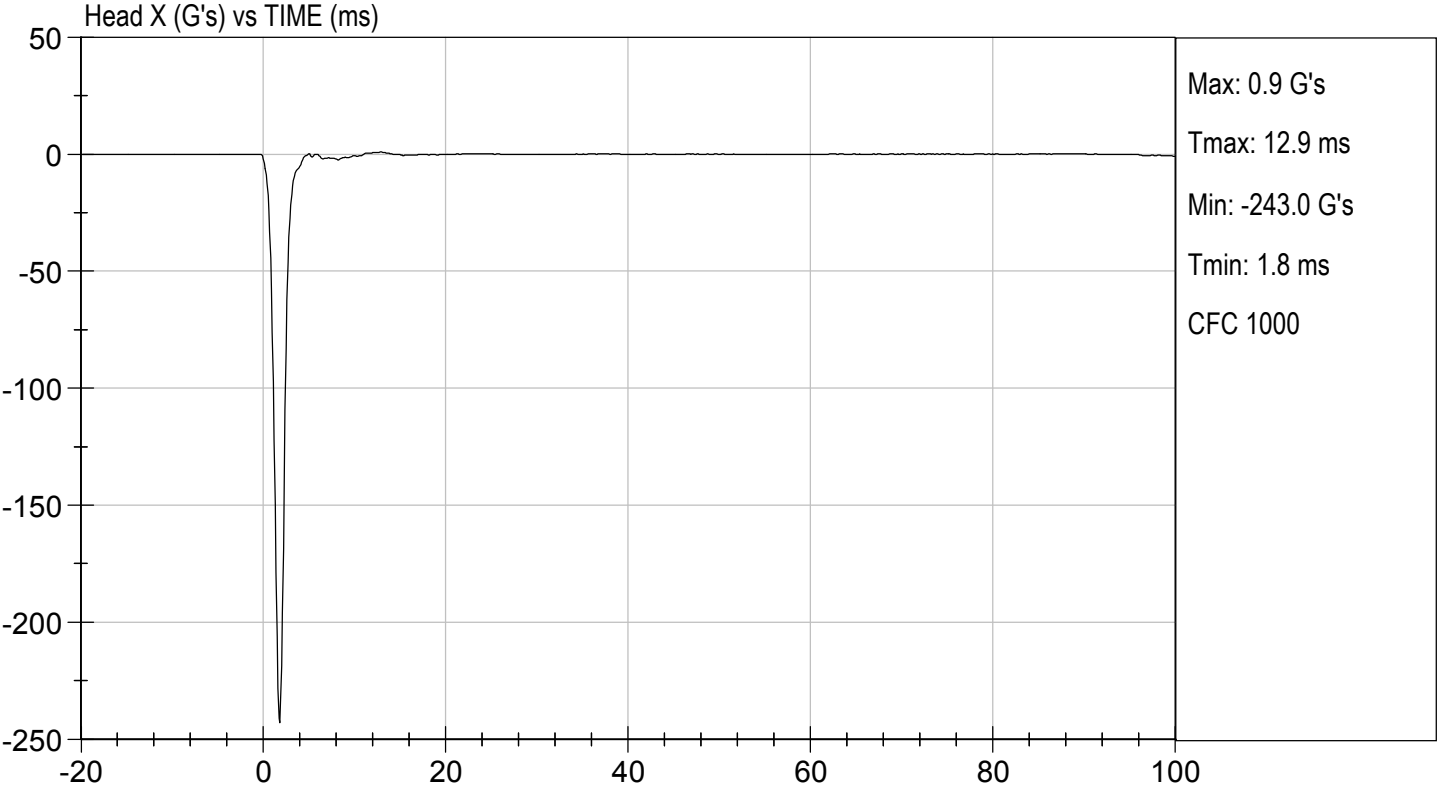
TEST DESC: HEAD DROP

TEST DATE: 03/18/2021
TEST #: D210951

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

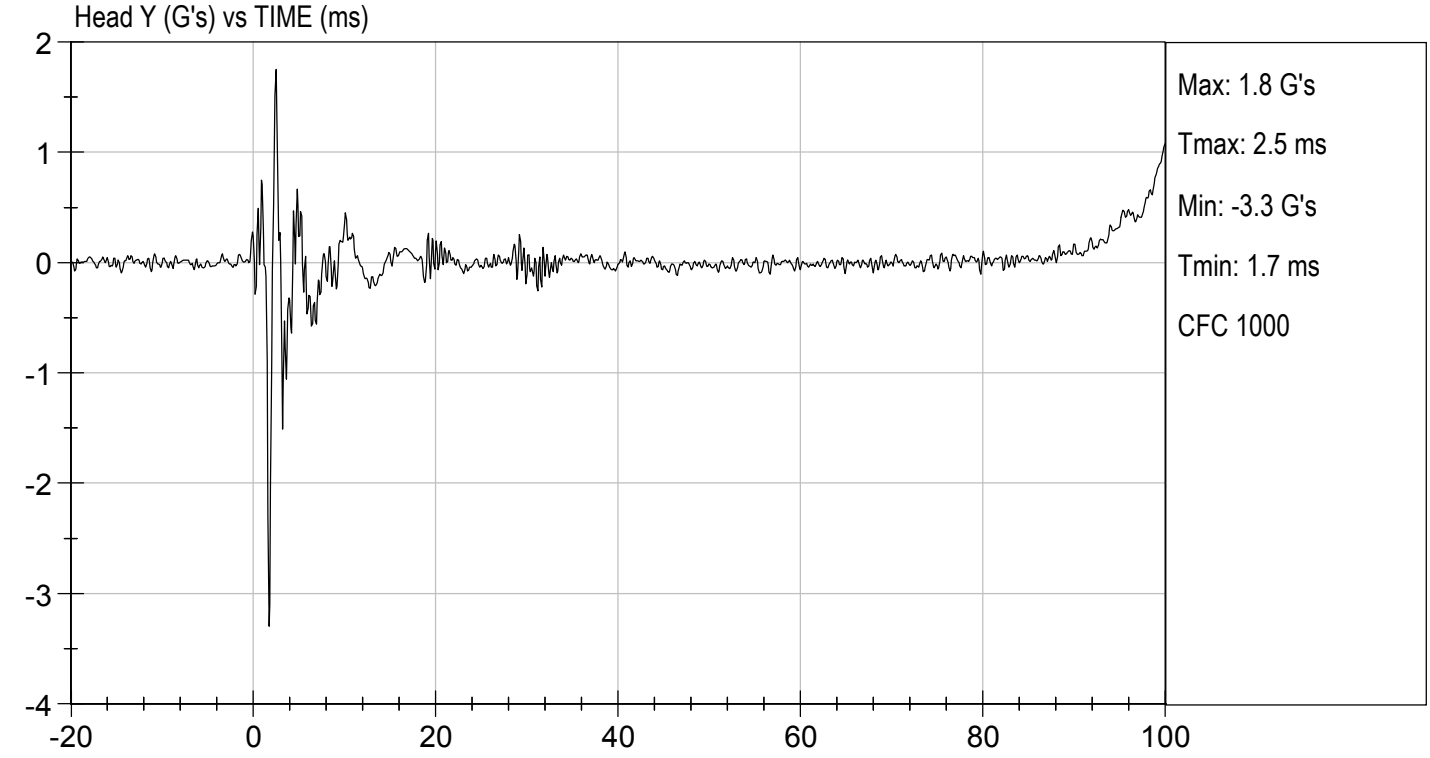


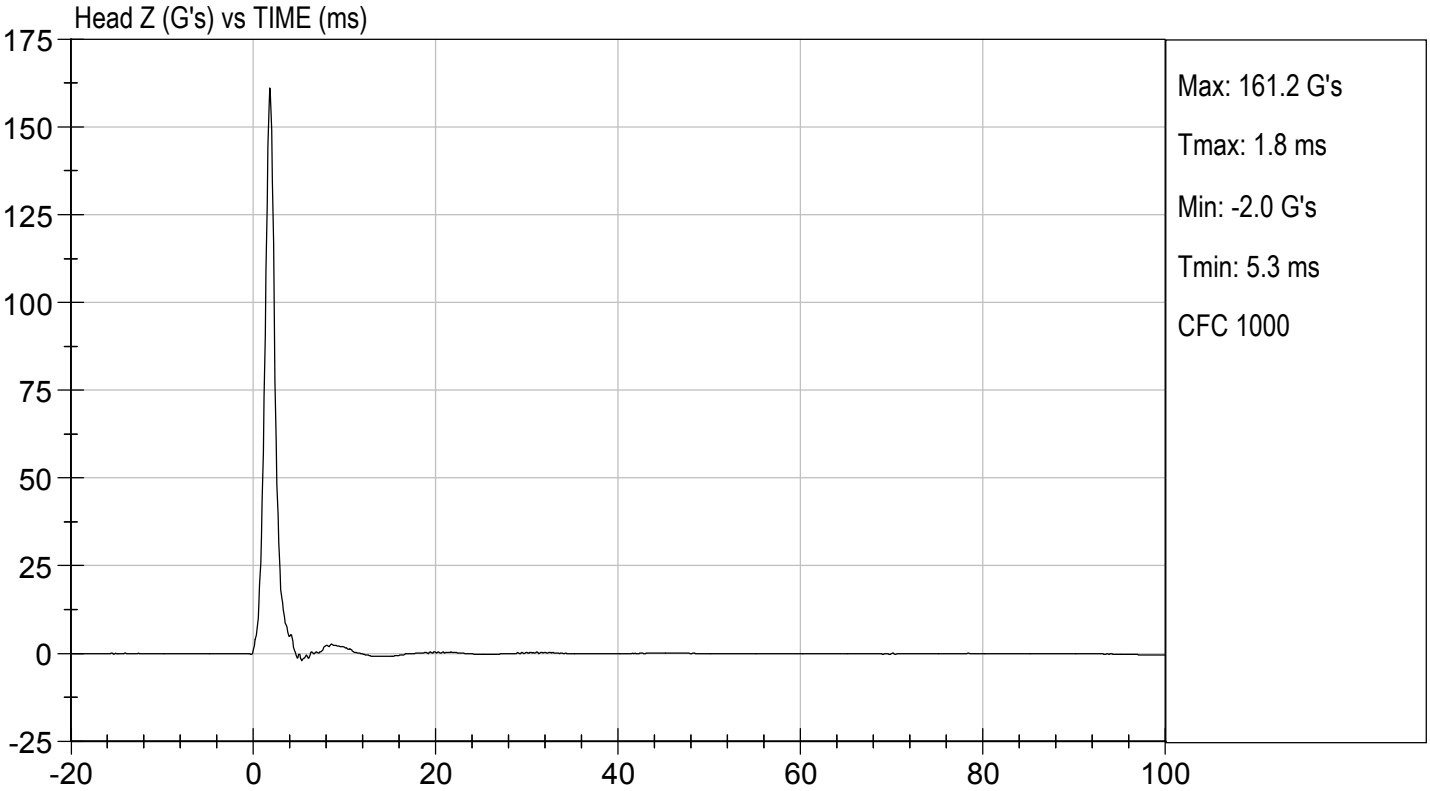
Head X (G's) vs TIME (ms)



TEST DESC: HEAD DROP

TEST DATE: 03/18/2021
TEST #: D210951





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659 **Test I.D:** D210952

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	21.2	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.3	Pass
	20 ms	m/s	4.0 to 5.0	4.7	Pass
	30 ms	m/s	5.8 to 7.0	7.0	Pass
D Plane Rotation	Max	deg	77 to 91	82	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	71	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	84	Pass
			Overall Results		Pass

Laboratory Technician

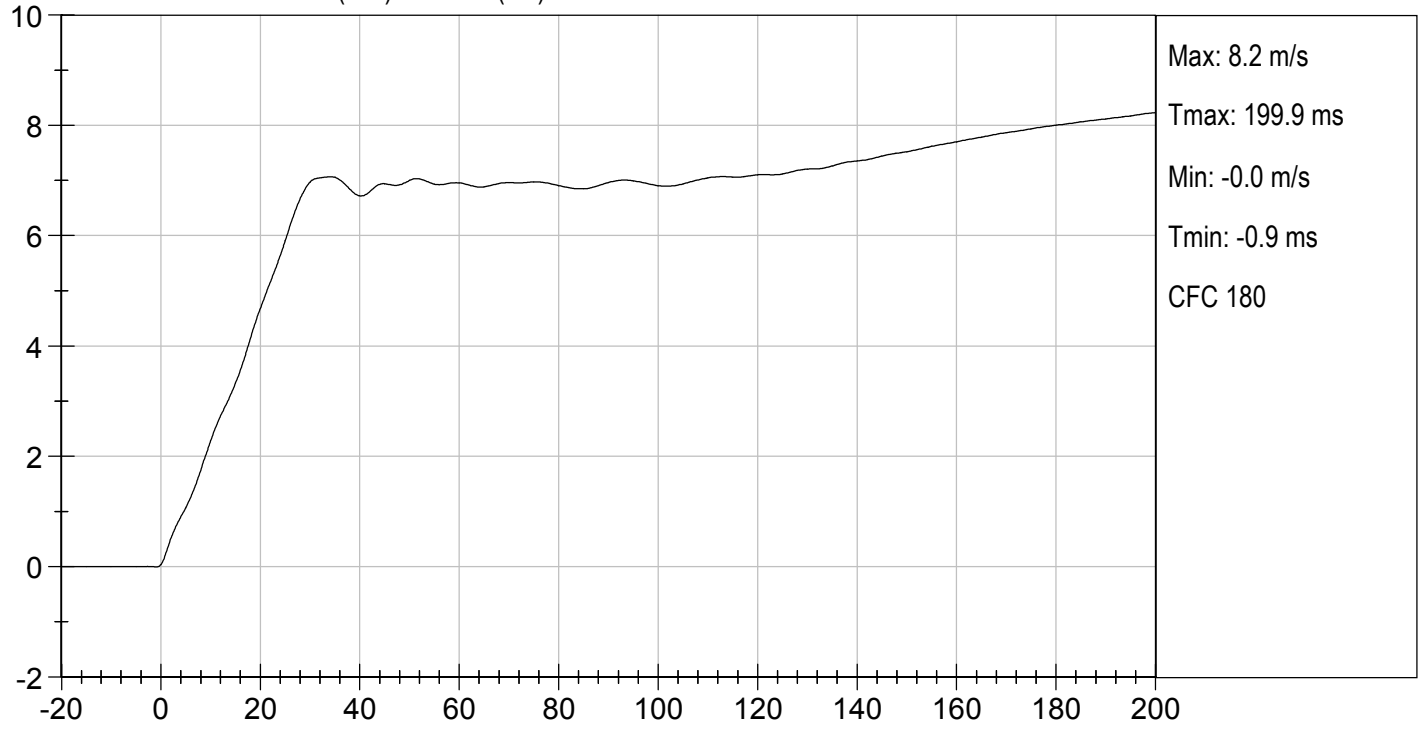
03/19/2021
Test Date

Approved By

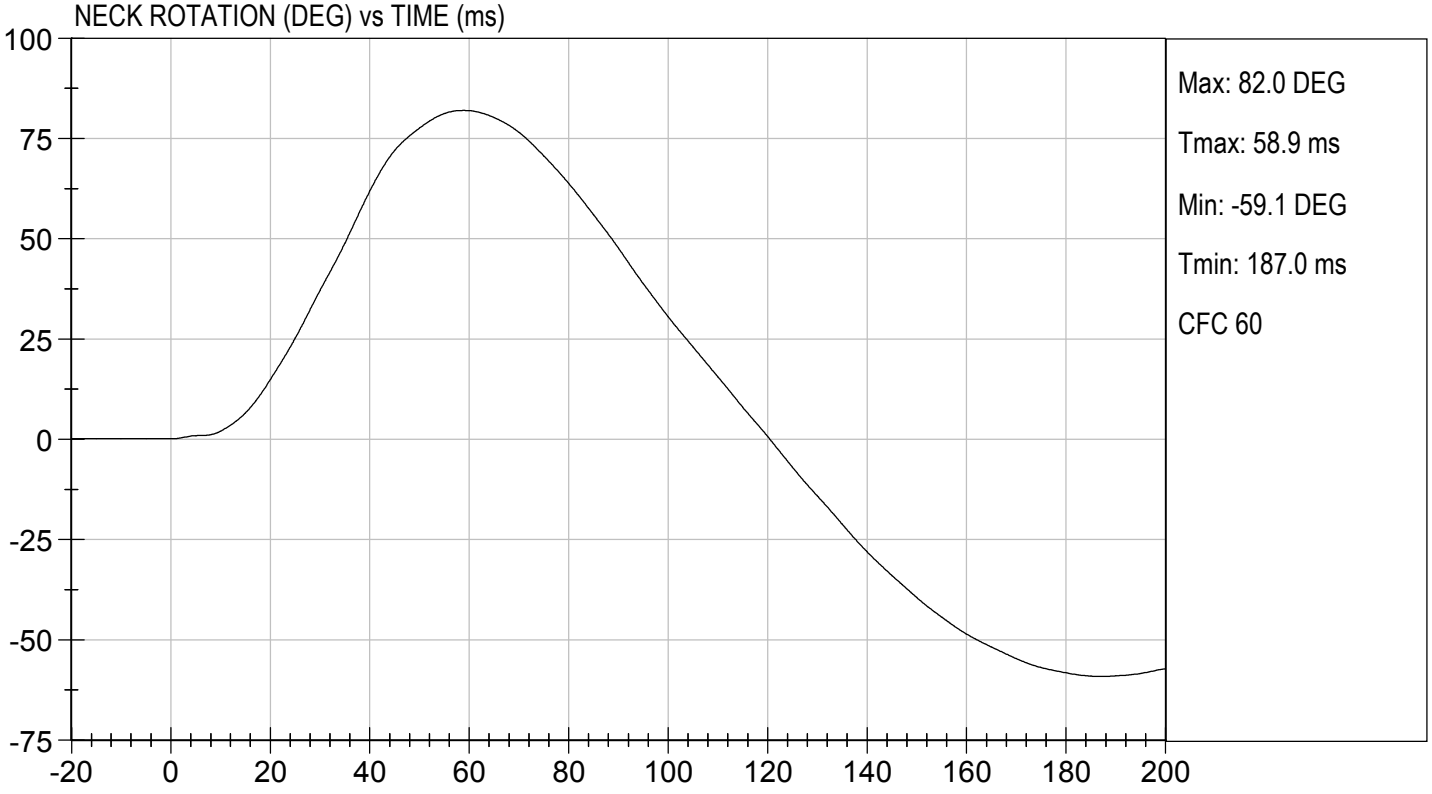
TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

TEST DATE: 03/19/2021
TEST #: D210952

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

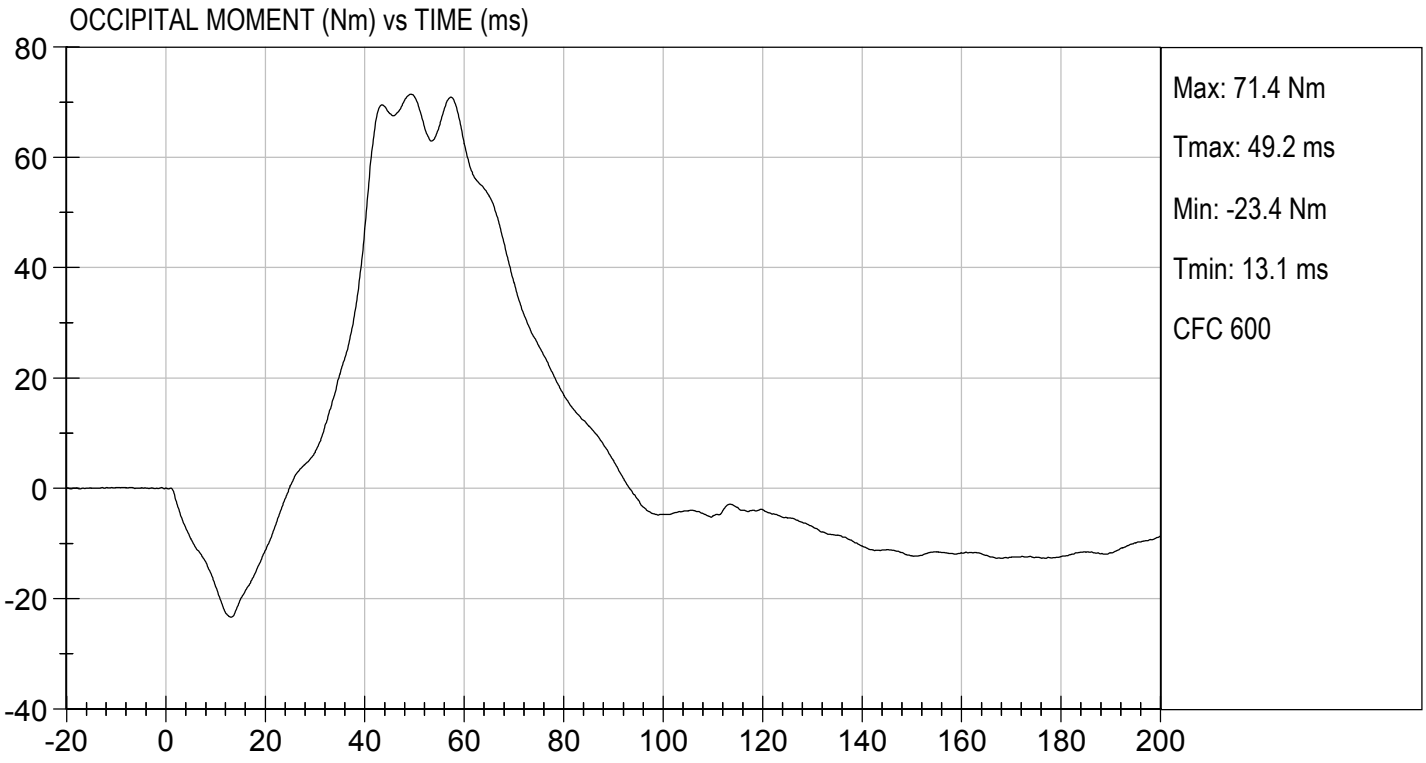


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 03/19/2021
TEST #: D210952



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659 **Test I.D:** D210953

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	21.2	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.7	Pass
	20 ms	m/s	3.1 to 3.9	3.5	Pass
	30 ms	m/s	4.6 to 5.6	5.2	Pass
D Plane Rotation	Max	deg	99 to 114	108	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-55	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	105	Pass
			Overall Results		Pass

Laboratory Technician

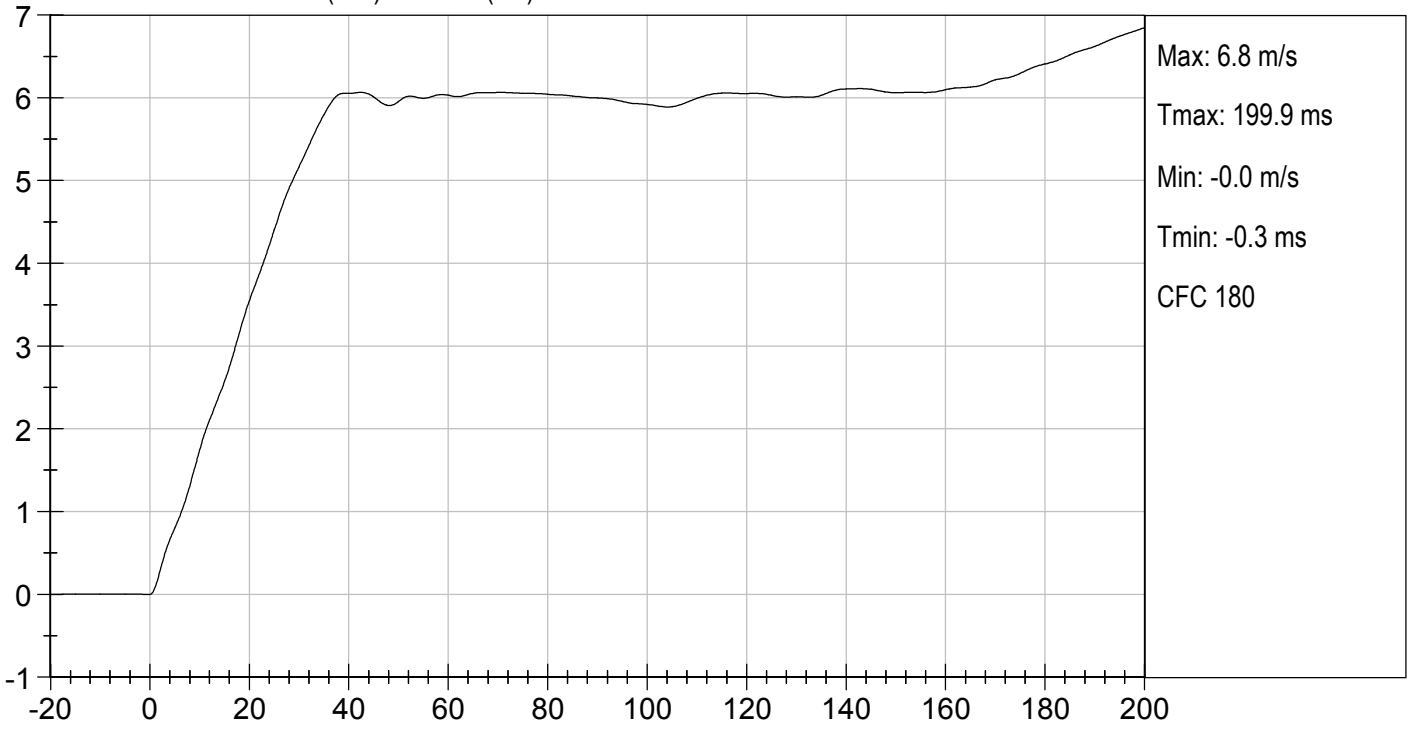
03/19/2021
Test Date

Approved By

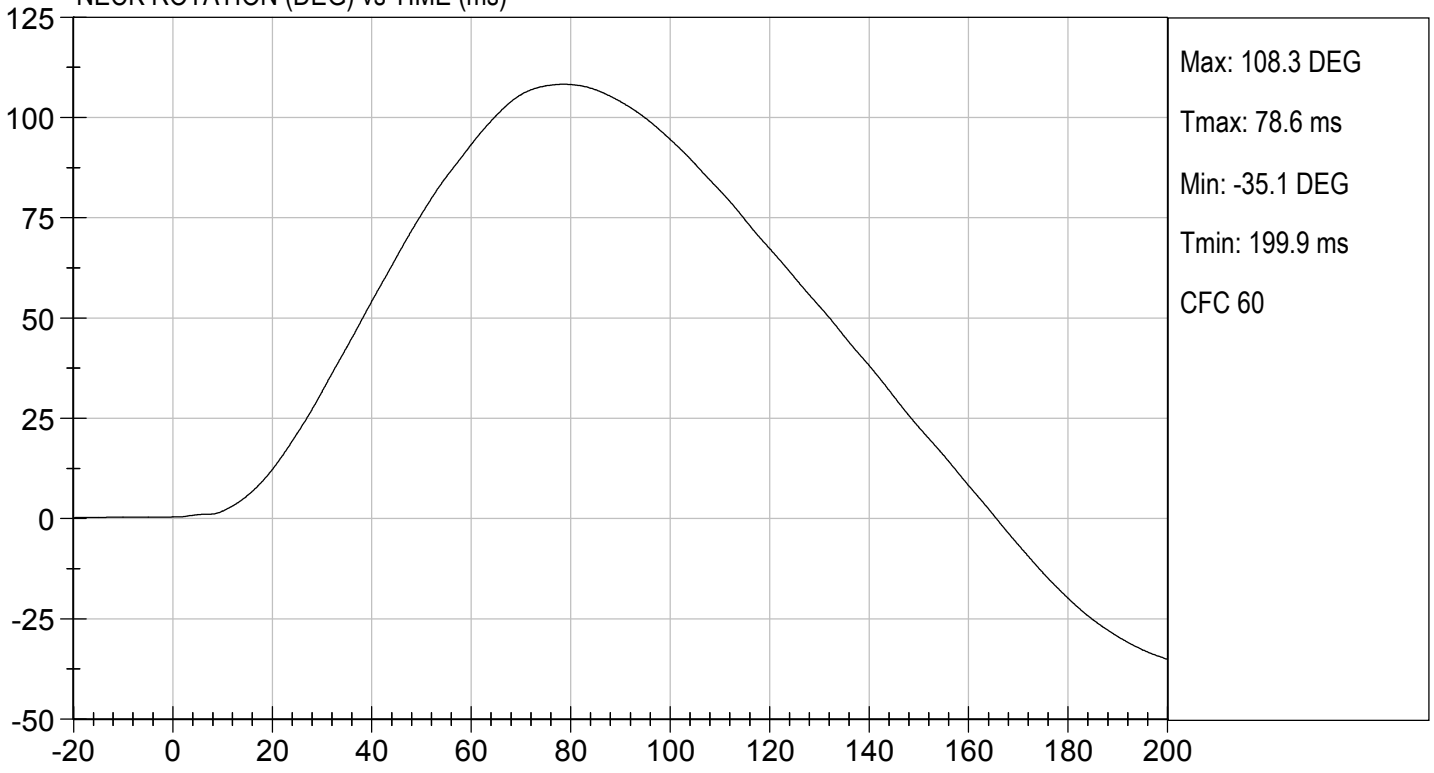
TEST DESC: NECK EXTENSION
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 03/19/2021
TEST #: D210953

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

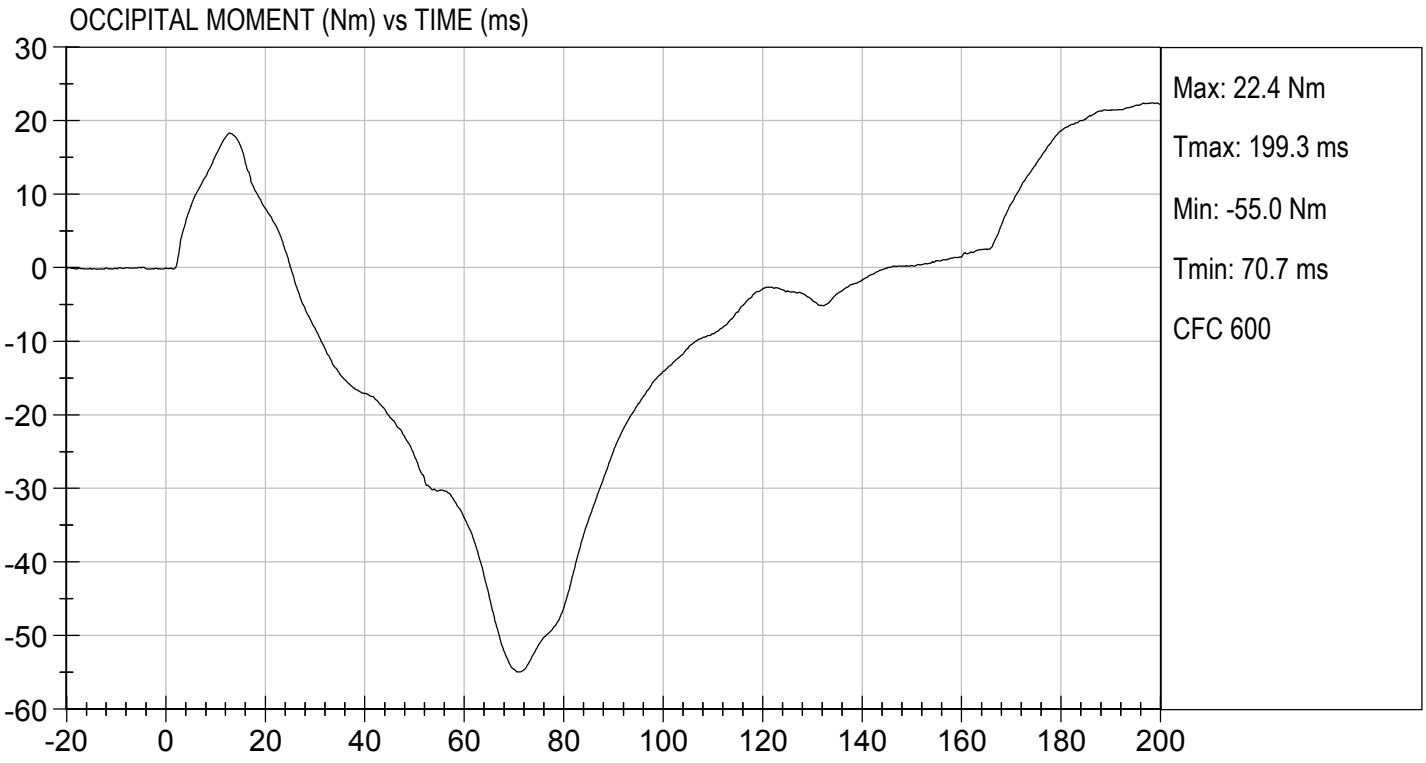


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 03/19/2021
TEST #: D210953



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659 **Test I.D:** D210954

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Relative Humidity	%	10 to 70	21	Pass
Probe Speed	m/s	6.59 to 6.83	6.68	Pass
Peak Deflection	mm	50 to 58	51	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4377	Pass
Internal Hysteresis	%	69 to 85	73	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4385	Pass
		Overall Test Results		Pass

Laboratory Technician

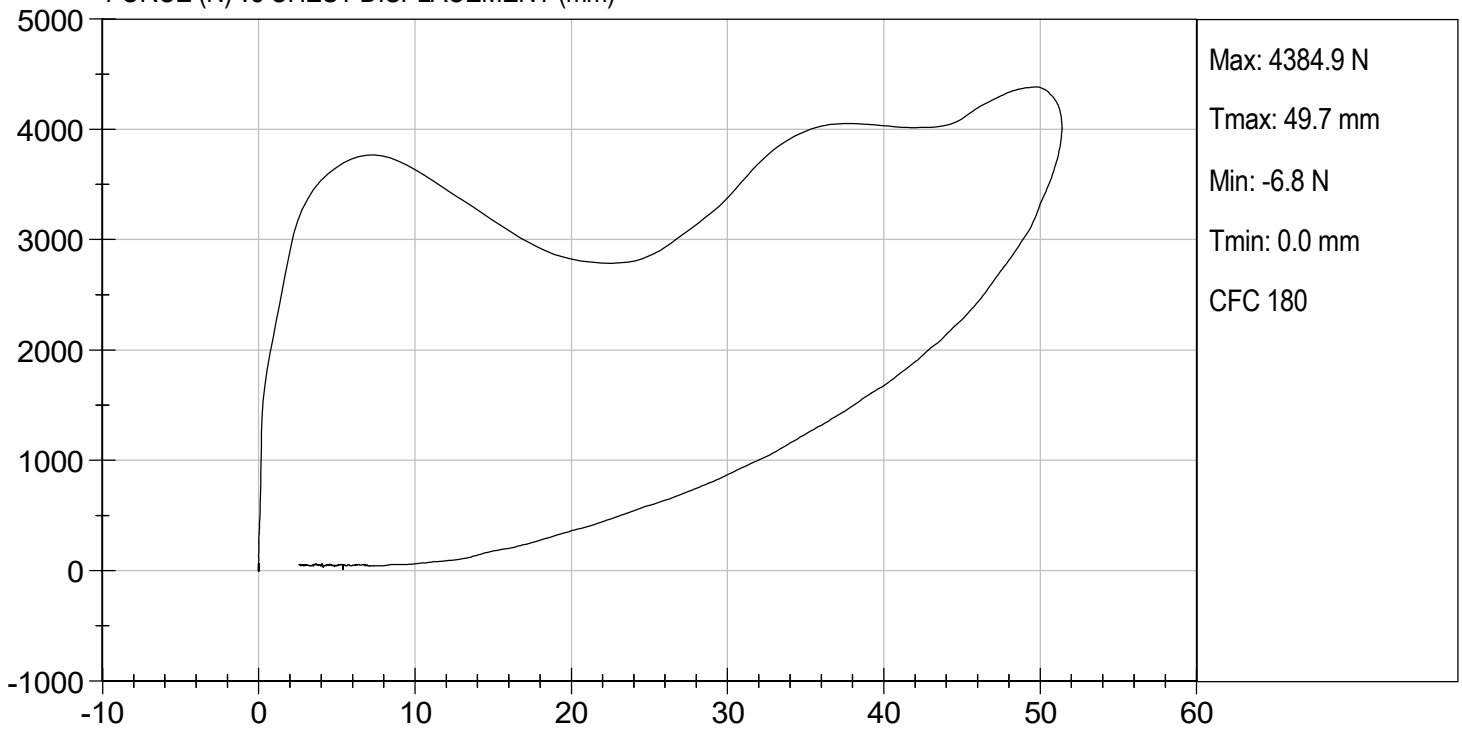
03/19/2021
Test Date

Approved By

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

TEST DATE: 03/19/2021
TEST #: D210954

FORCE (N) vs CHEST DISPLACEMENT (mm)



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659 **Test I.D:** D210955

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	26	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3566	Pass
		Overall Test Results		Pass

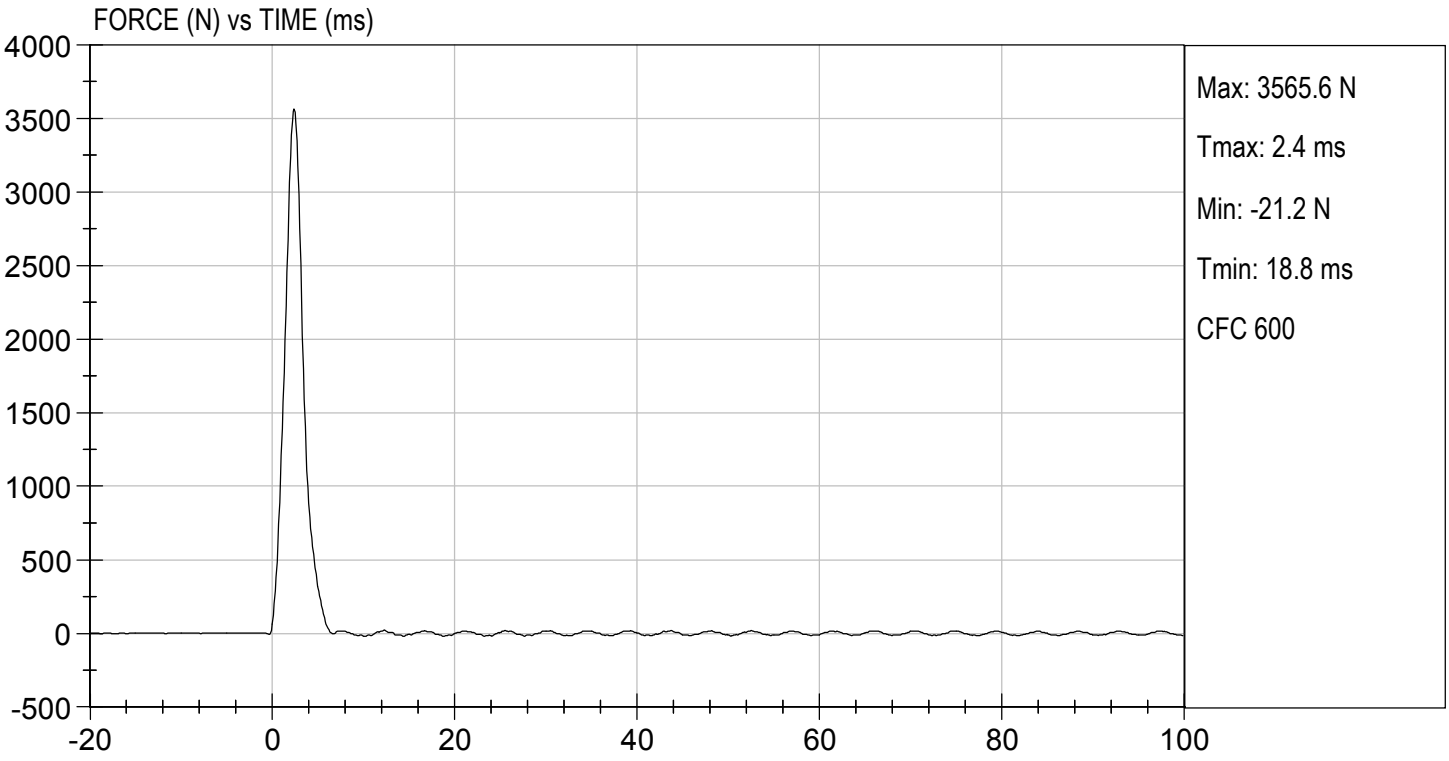
Laboratory Technician

03/18/2021
Test Date

Approved By

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

TEST DATE: 03/18/2021
TEST #: D210955



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659 **Test I.D:** D210956

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	26	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	4013	Pass
		Overall Test Results		Pass

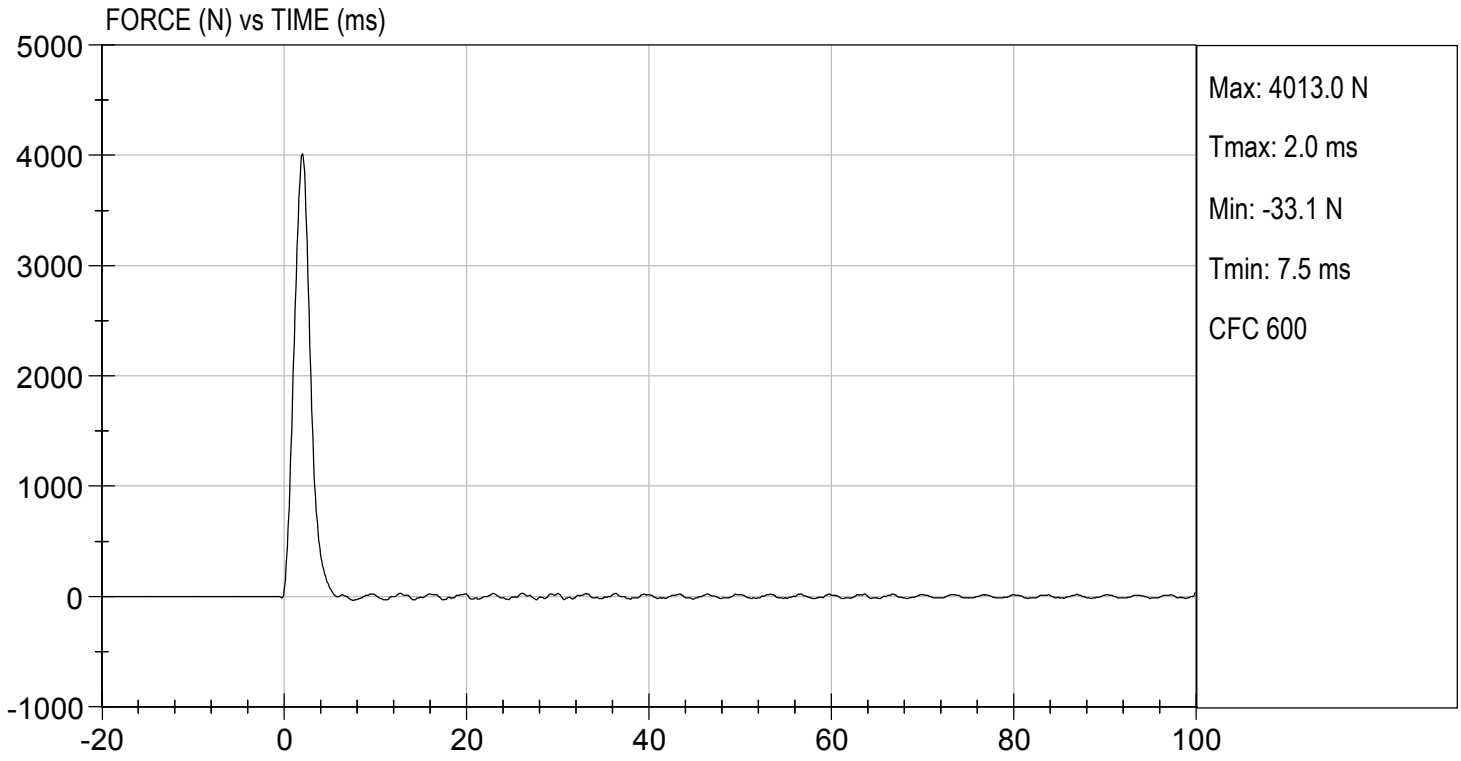
Laboratory Technician

03/18/2021
Test Date

Approved By

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

TEST DATE: 03/18/2021
TEST #: D210956



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659 **Test I.D:** D210957

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	26.3	Pass
Initial Angle	deg	0 to 20	19	Pass
Return Angle	deg	+/- 8	2	Pass
Force at 45 deg	N	320 to 390	363	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.7	Pass
		Overall Result		Pass

Laboratory Technician

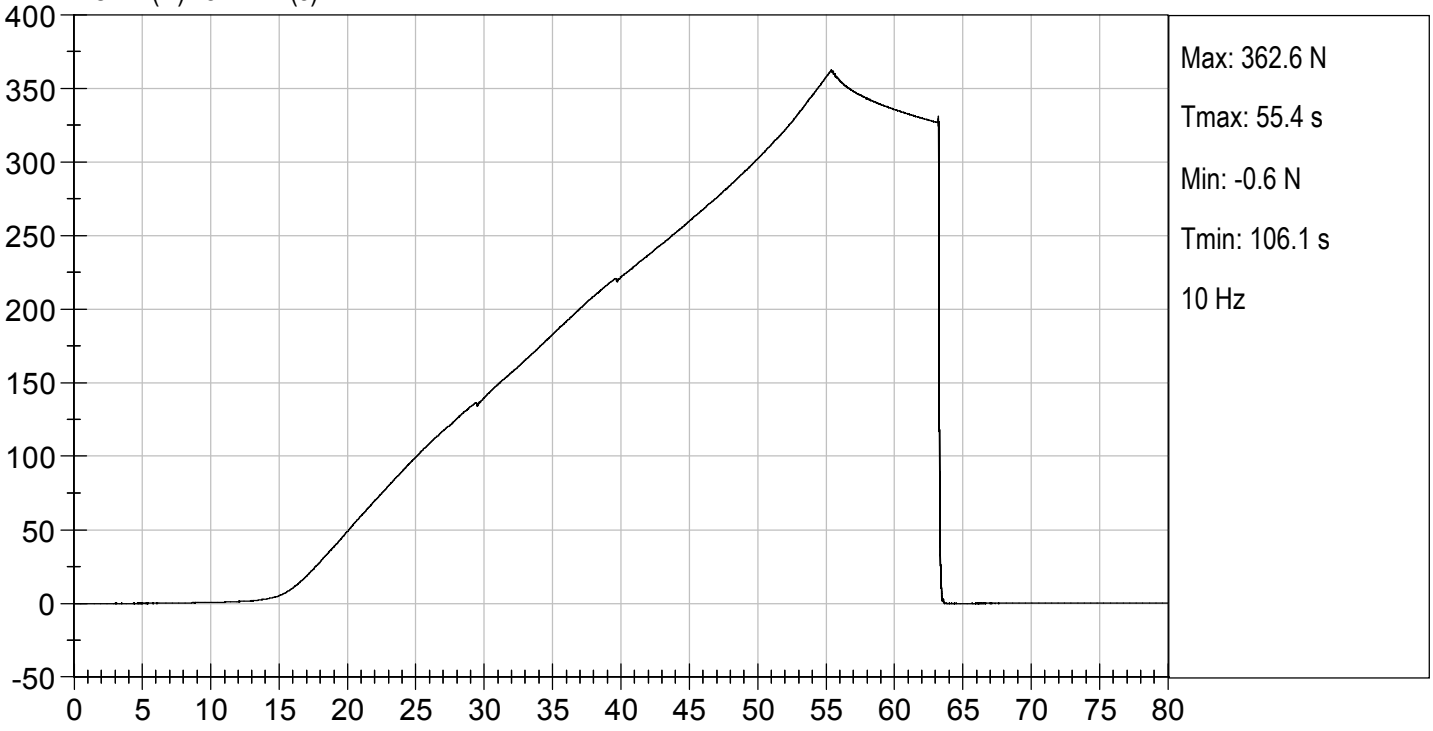
03/18/2021
Test Date

Approved By

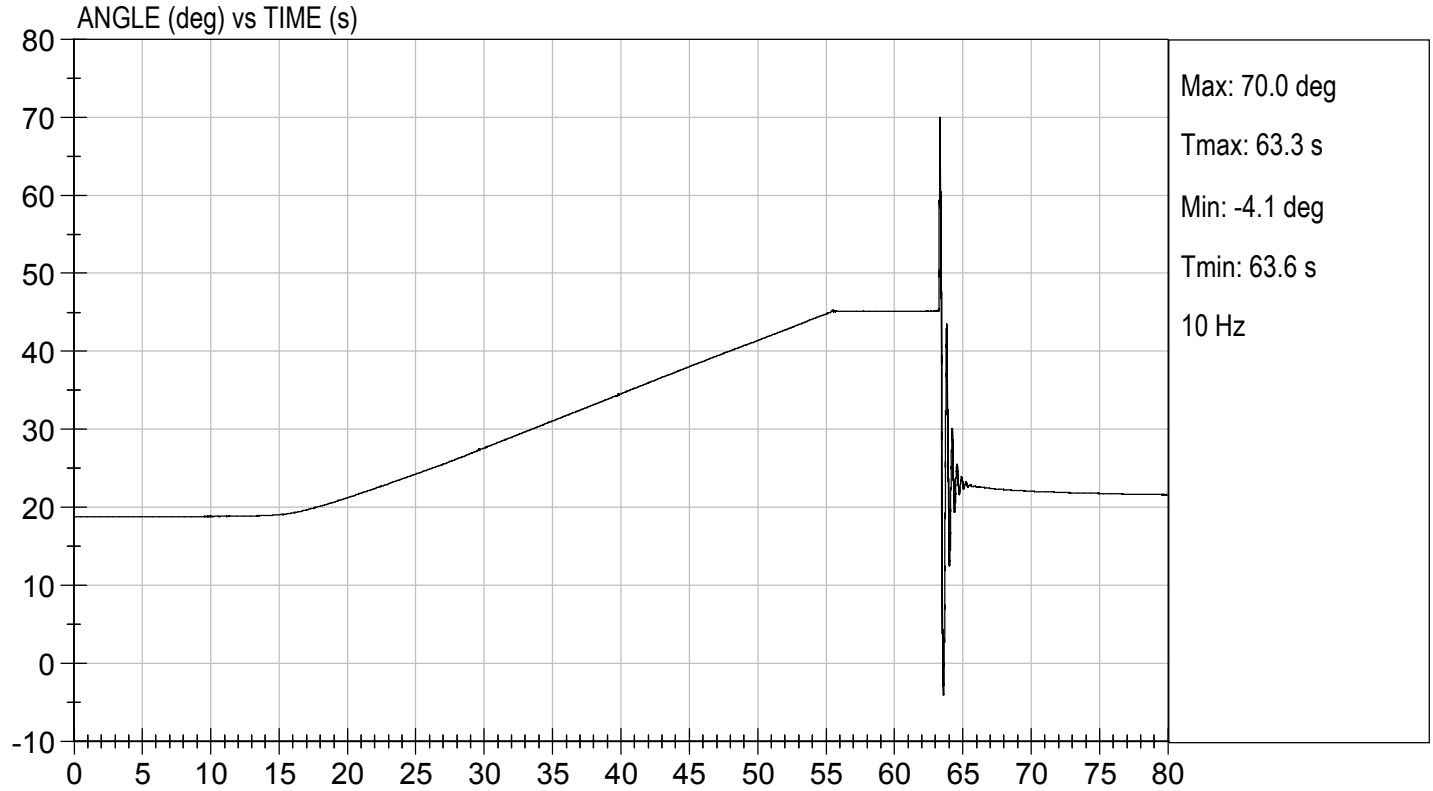
TEST DESC: LUMBAR FLEXION

TEST DATE: 03/18/2021
TEST #: D210957

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: DH1659 **Test ID:** D211031

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	36	Pass
Peak Resultant Acceleration	G's	250 to 300	289	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-4.3	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Gerald Guerrero
Laboratory Technician

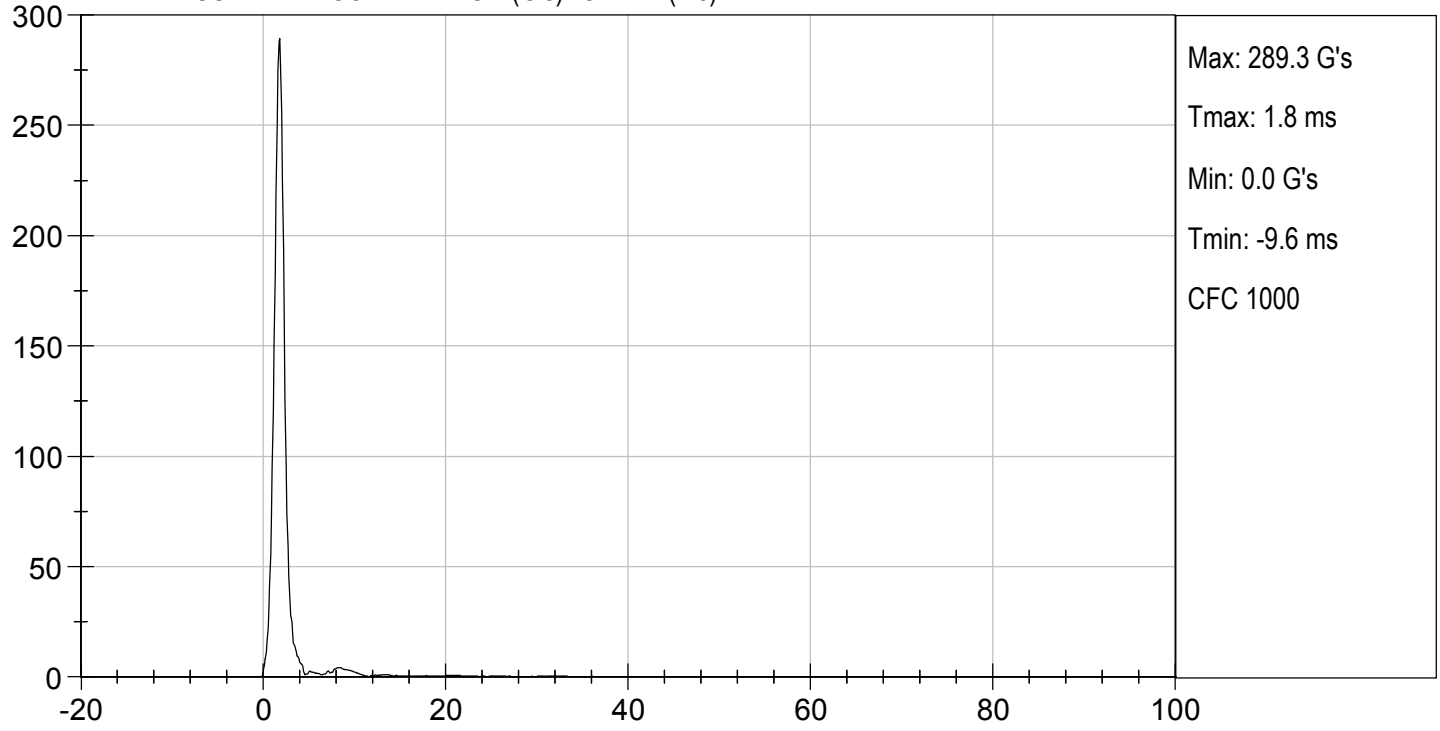
03/25/2021
Test Date

Approved By

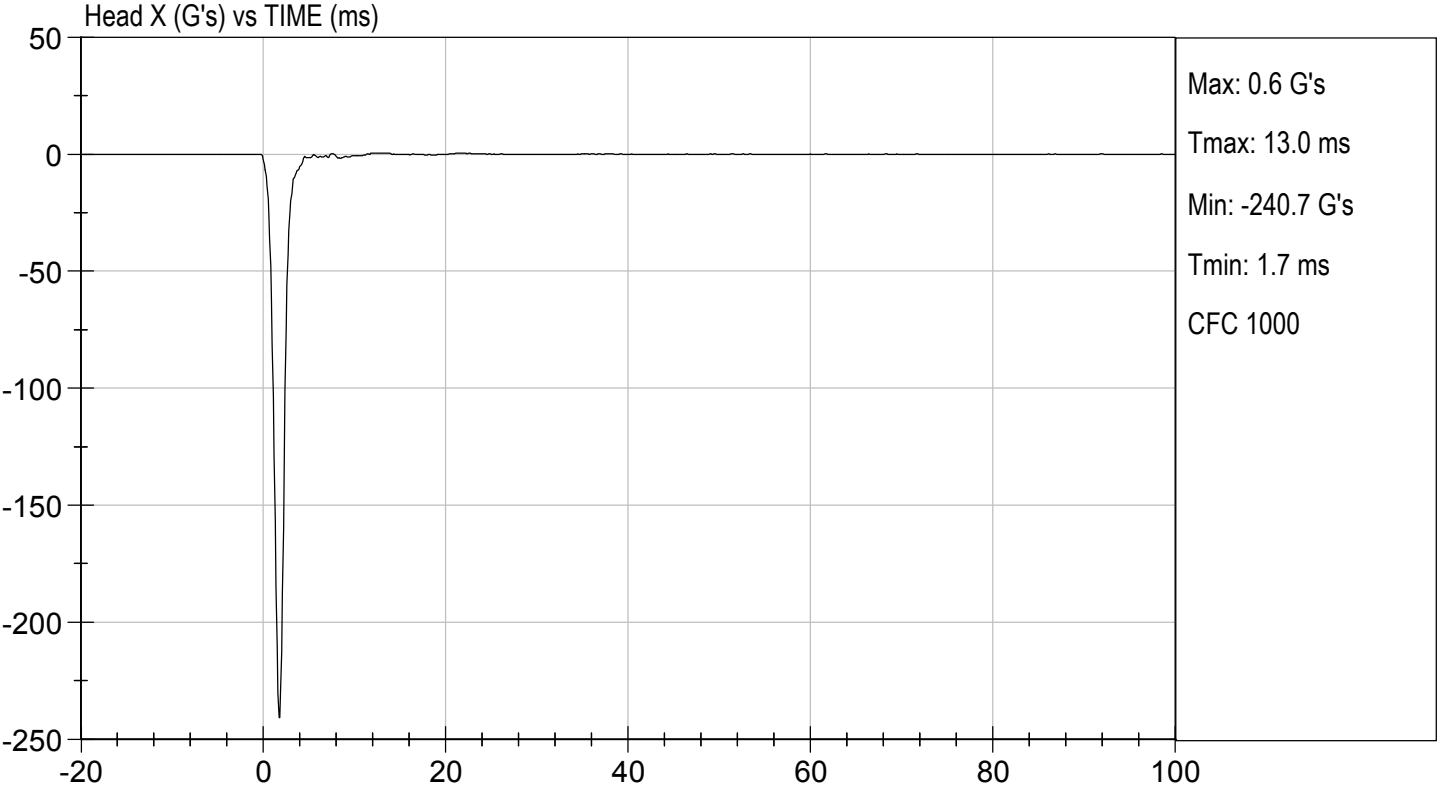
TEST DESC: HEAD DROP

TEST DATE: 03/25/2021
TEST #: D211031

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

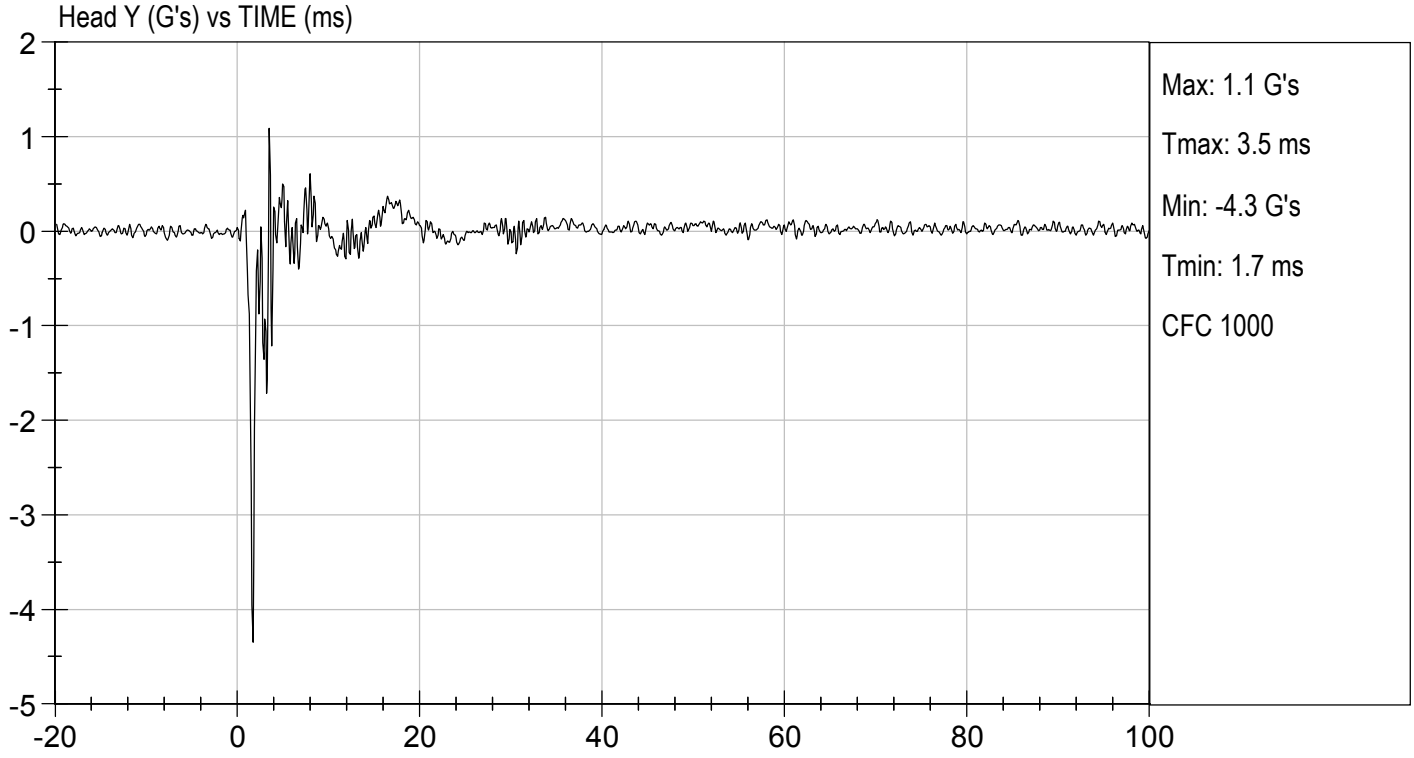


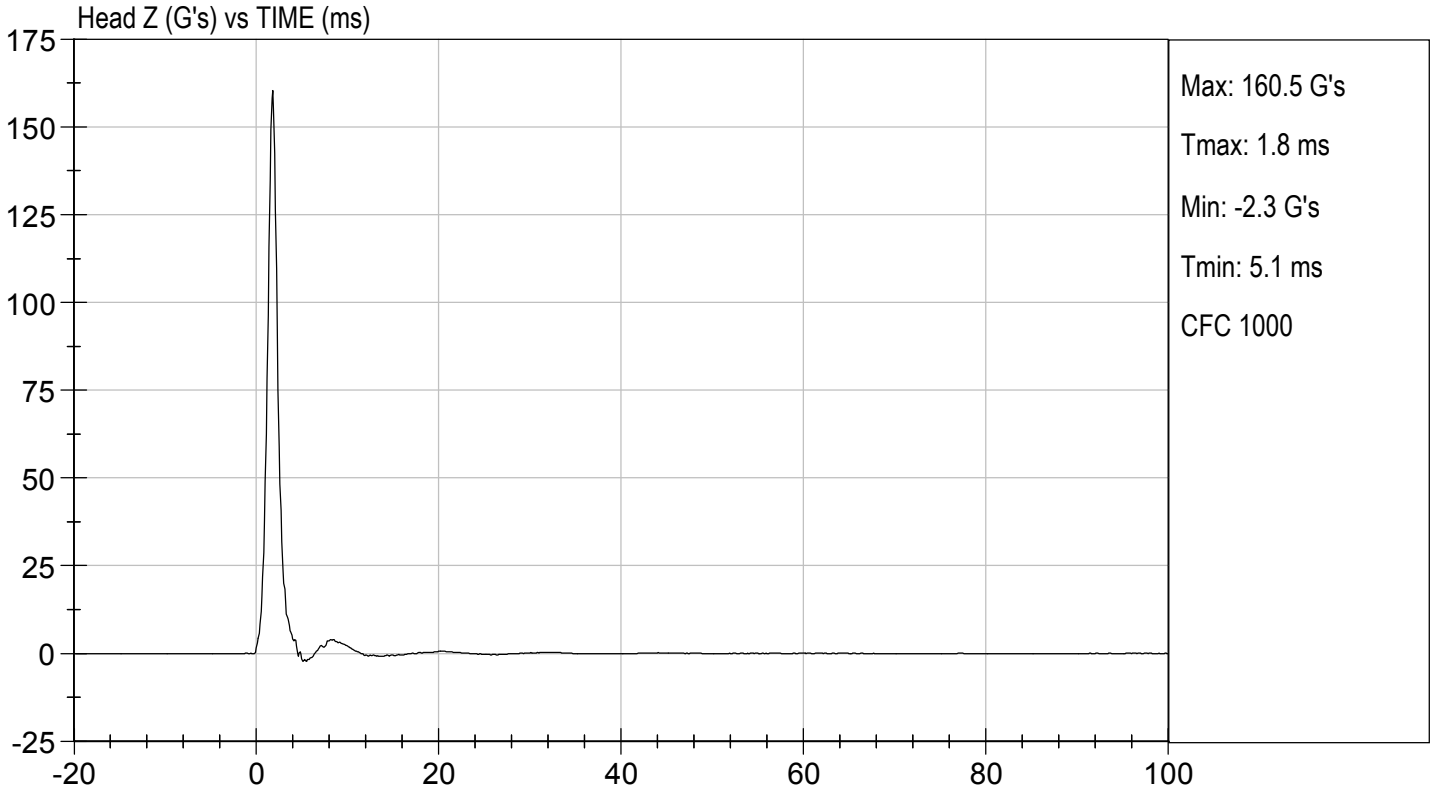
Head X (G's) vs TIME (ms)



TEST DESC: HEAD DROP

TEST DATE: 03/25/2021
TEST #: D211031





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659 **Test I.D:** D211032

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity		%	10 to 70	36	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.05	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.2	Pass
	20 ms	m/s	4.0 to 5.0	4.5	Pass
	30 ms	m/s	5.8 to 7.0	6.6	Pass
D Plane Rotation	Max	deg	77 to 91	80	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	69	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	85	Pass
			Overall Results		Pass

Gerald Guerrero

Laboratory Technician

03/25/2021

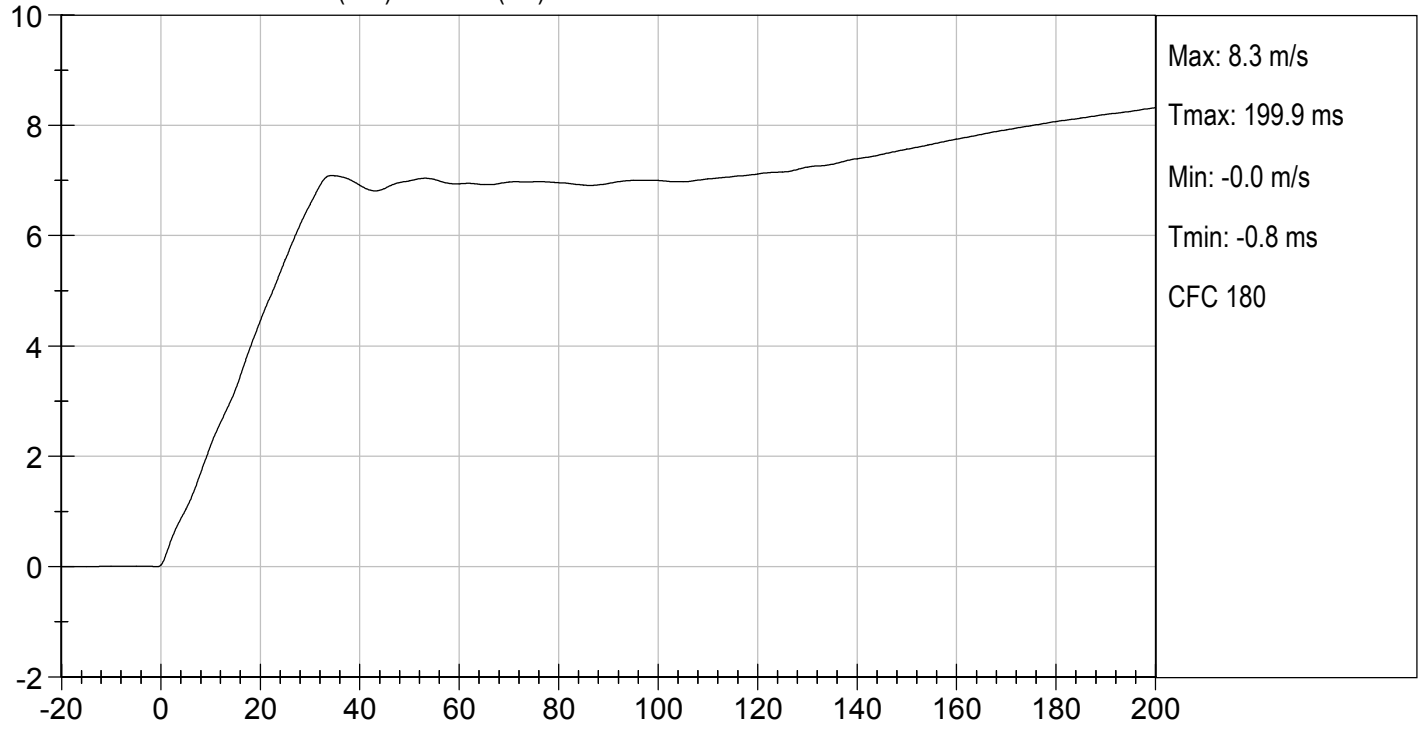
Test Date

Approved By

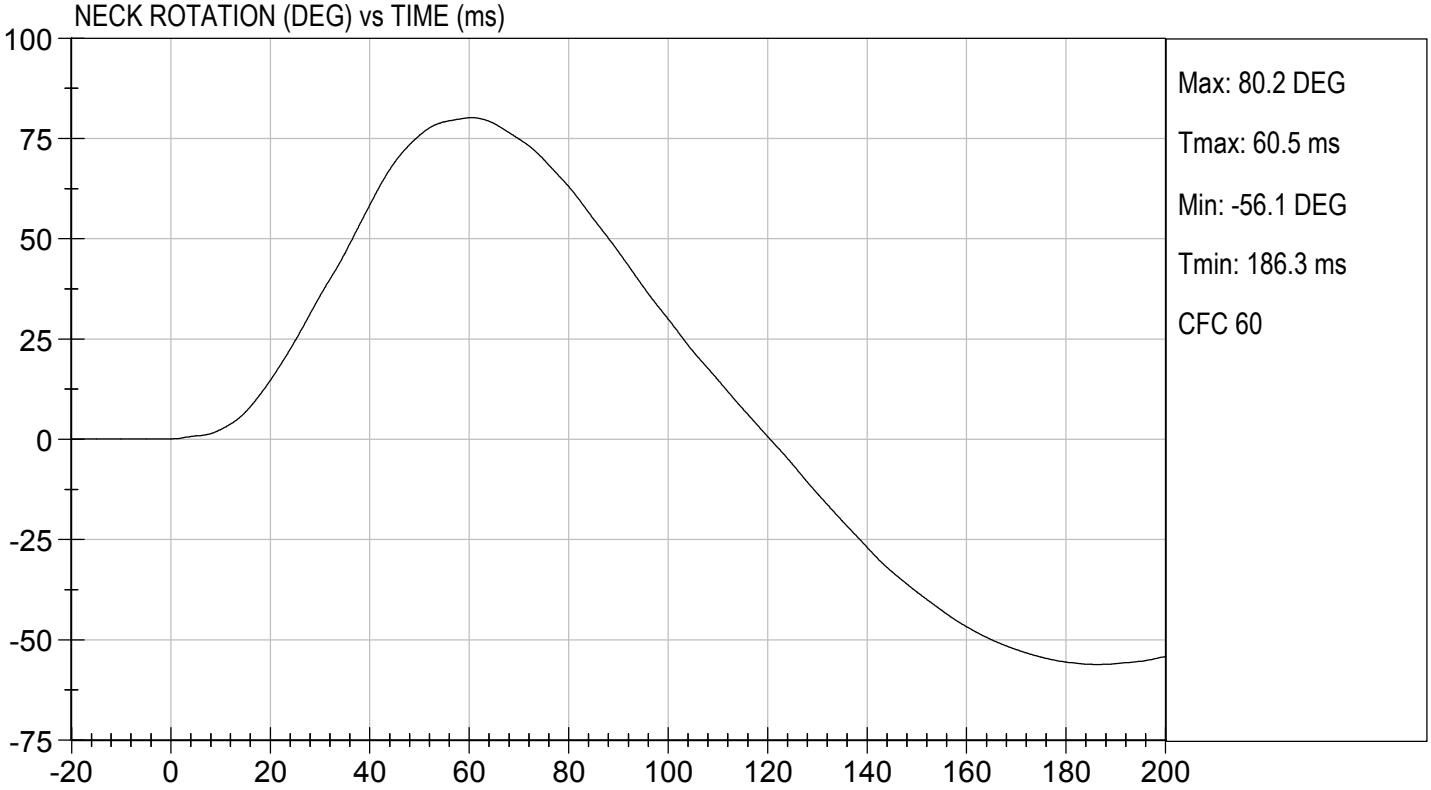
TEST DESC: NECK FLEXION
VELOCITY: 23.14 ft/s, 7.05 m/s

TEST DATE: 03/25/2021
TEST #: D211032

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

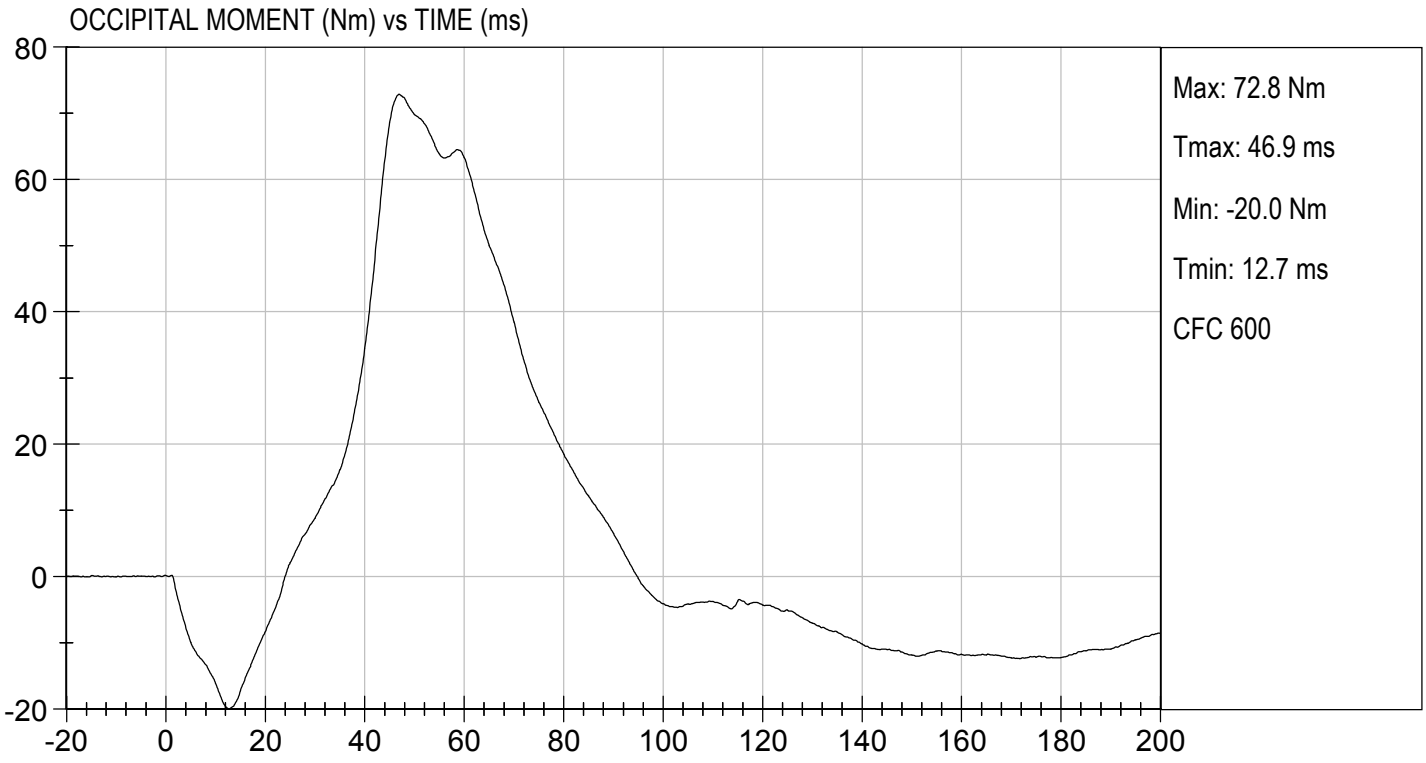


NECK ROTATION (DEG) vs TIME (ms)



TEST DESC: NECK FLEXION
VELOCITY: 23.14 ft/s, 7.05 m/s

TEST DATE: 03/25/2021
TEST #: D211032



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659 **Test I.D:** D211033

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity		%	10 to 70	36	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.19	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.8	Pass
	20 ms	m/s	3.1 to 3.9	3.7	Pass
	30 ms	m/s	4.6 to 5.6	5.4	Pass
D Plane Rotation	Max	deg	99 to 114	109	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-58	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	105	Pass
			Overall Results		Pass

Gerald Guerrero
Laboratory Technician

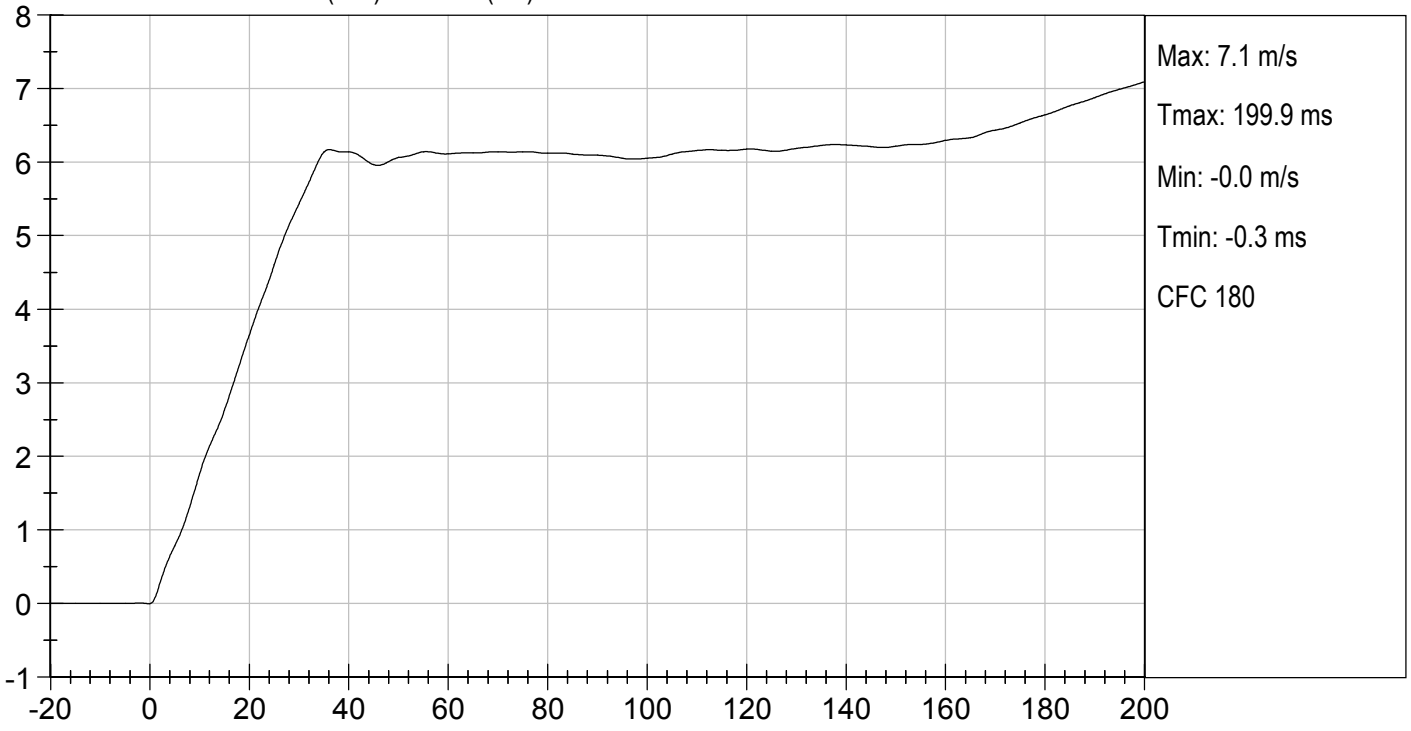
03/25/2021
Test Date

Approved By

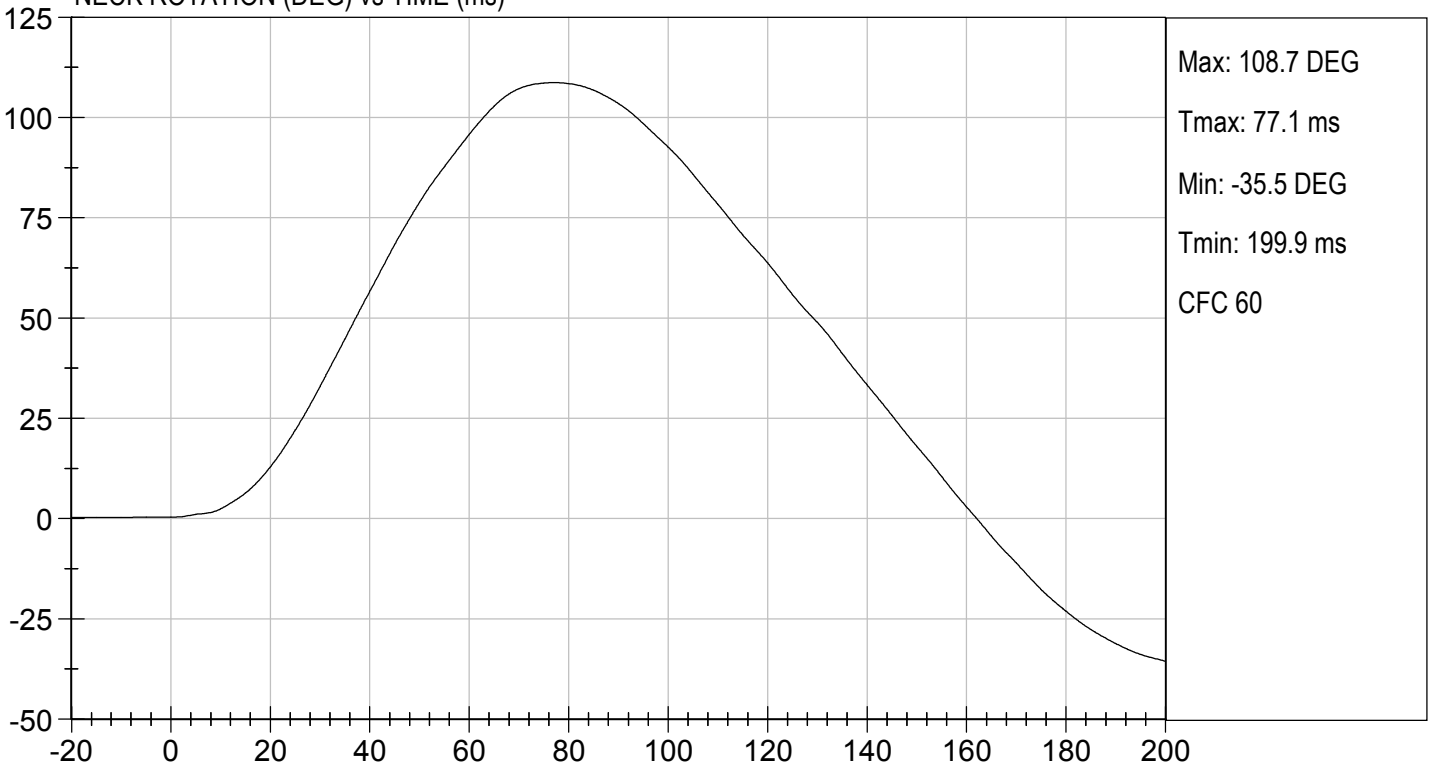
TEST DESC: NECK EXTENSION
VELOCITY: 20.32 ft/s, 6.19 m/s

TEST DATE: 03/25/2021
TEST #: D211033

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

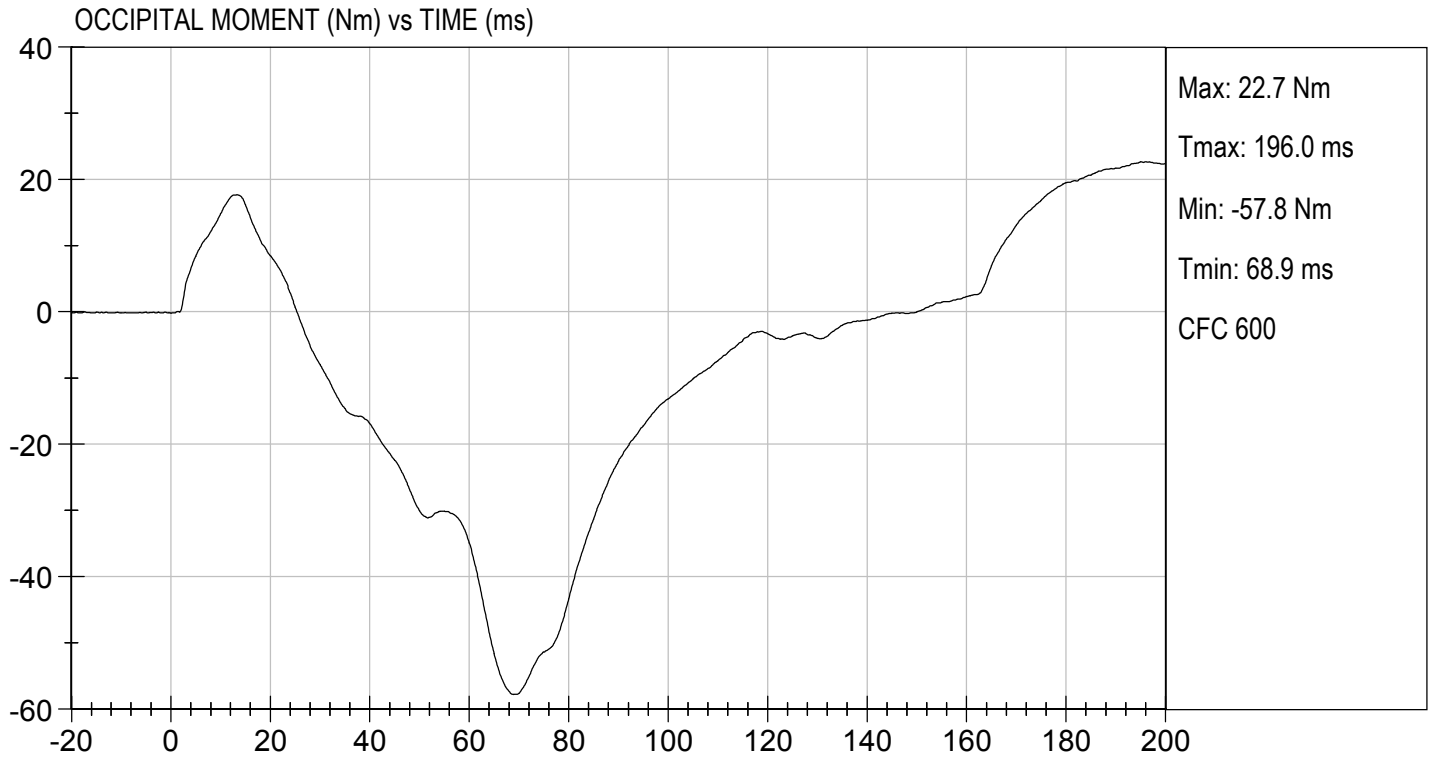


NECK ROTATION (DEG) vs TIME (ms)



TEST DESC: NECK EXTENSION
VELOCITY: 20.32 ft/s, 6.19 m/s

TEST DATE: 03/25/2021
TEST #: D211033



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659 **Test I.D:** D211034

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.6	Pass
Relative Humidity	%	10 to 70	30	Pass
Probe Speed	m/s	6.59 to 6.83	6.68	Pass
Peak Deflection	mm	50 to 58	52	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4356	Pass
Internal Hysteresis	%	69 to 85	73	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4385	Pass
		Overall Test Results		Pass

Gerald Guerrero
Laboratory Technician

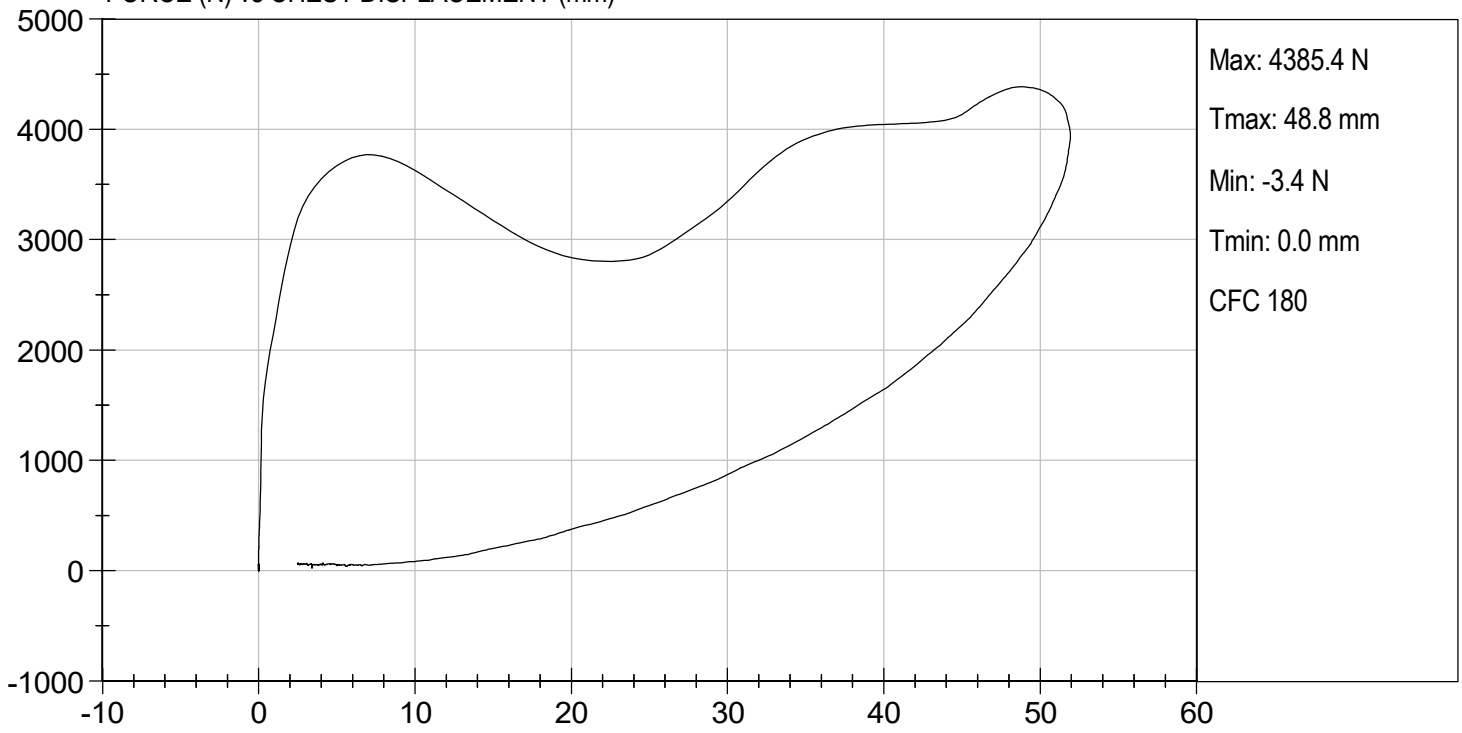
03/26/2021
Test Date

Approved By

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

TEST DATE: 03/26/2021
TEST #: D211034

FORCE (N) vs CHEST DISPLACEMENT (mm)



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659 **Test I.D:** D211035

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	42	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3809	Pass
		Overall Test Results		Pass

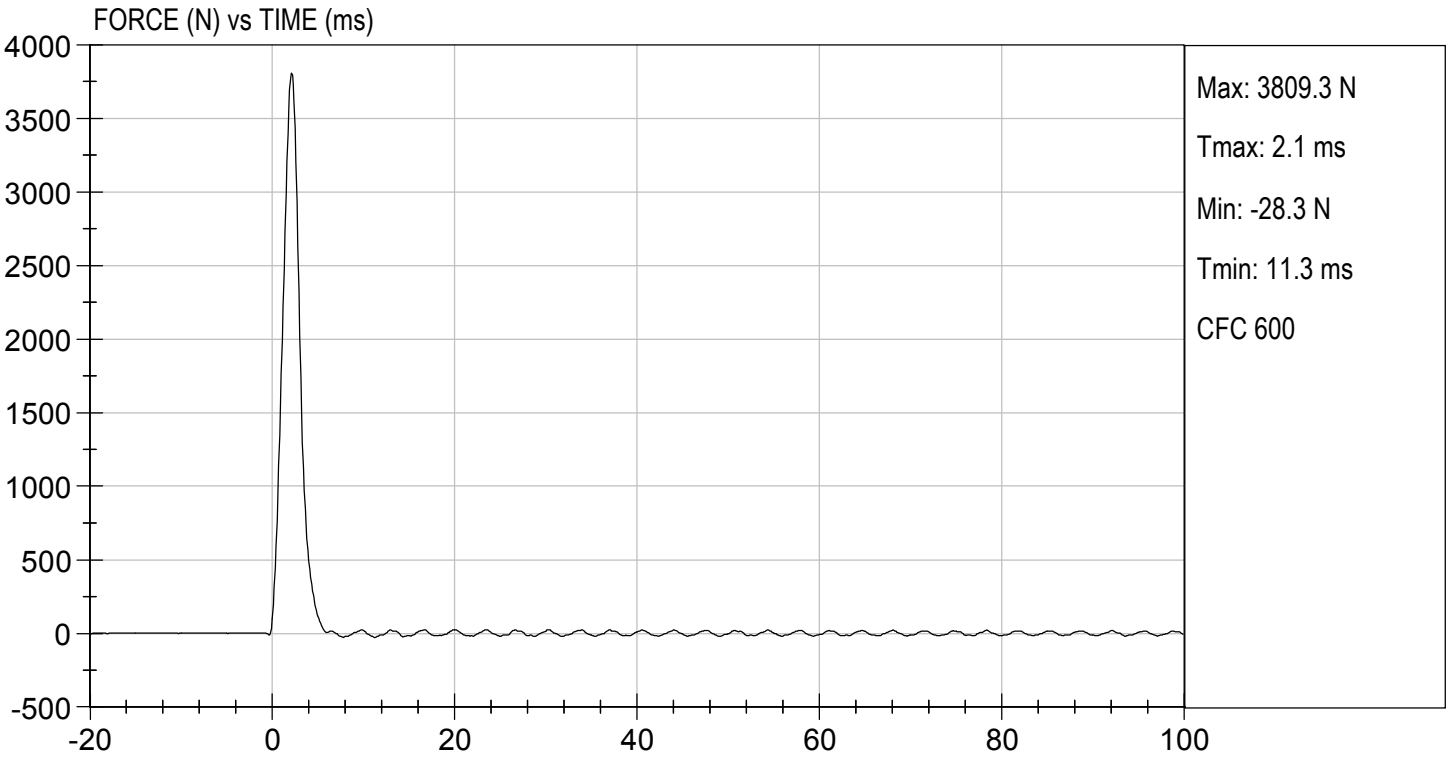
Gerald Guerrero
Laboratory Technician

03/24/2021
Test Date

Approved By

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

TEST DATE: 03/24/2021
TEST #: D211035



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659 **Test I.D:** D211036

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	42	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3584	Pass
		Overall Test Results		Pass

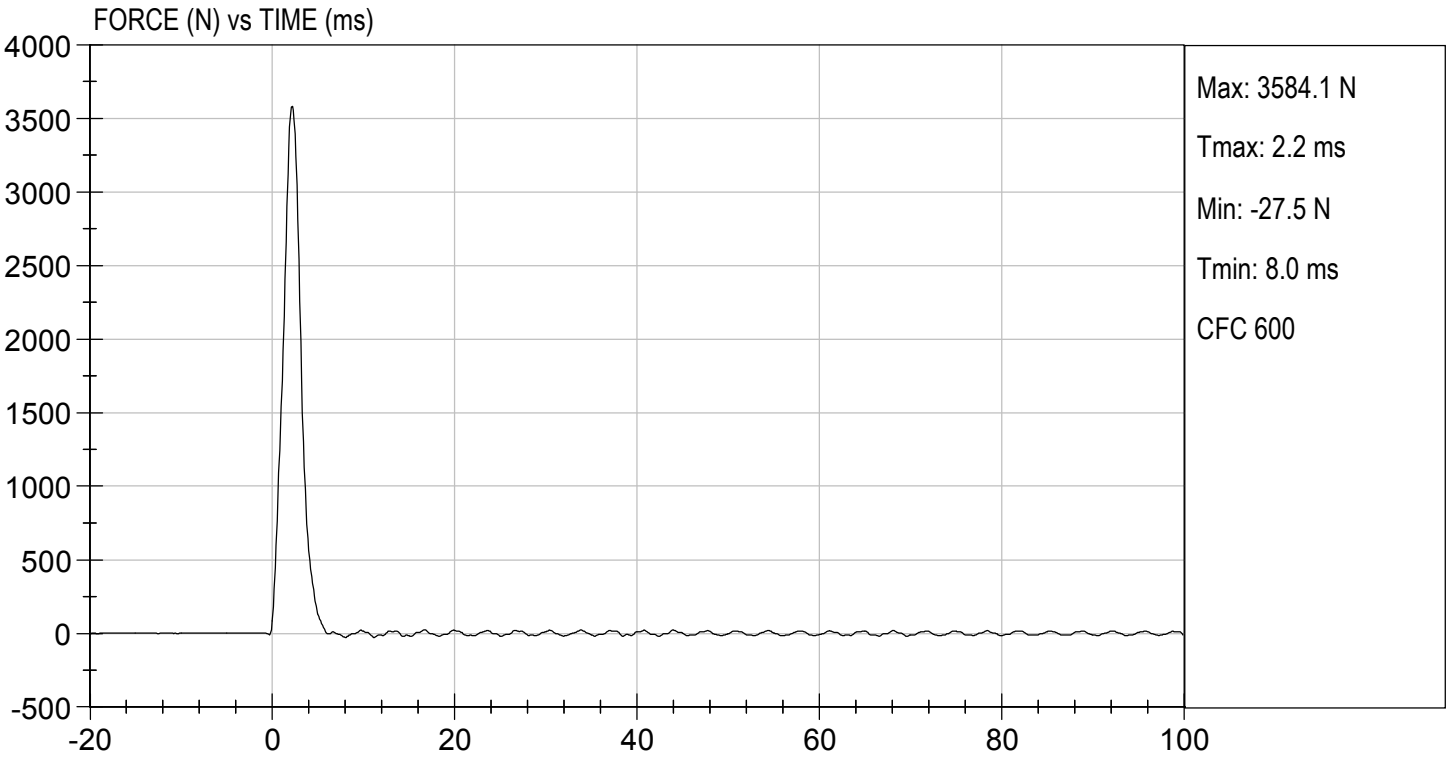
Gerald Guerrero
Laboratory Technician

03/24/2021
Test Date

Approved By

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

TEST DATE: 03/24/2021
TEST #: D211036



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

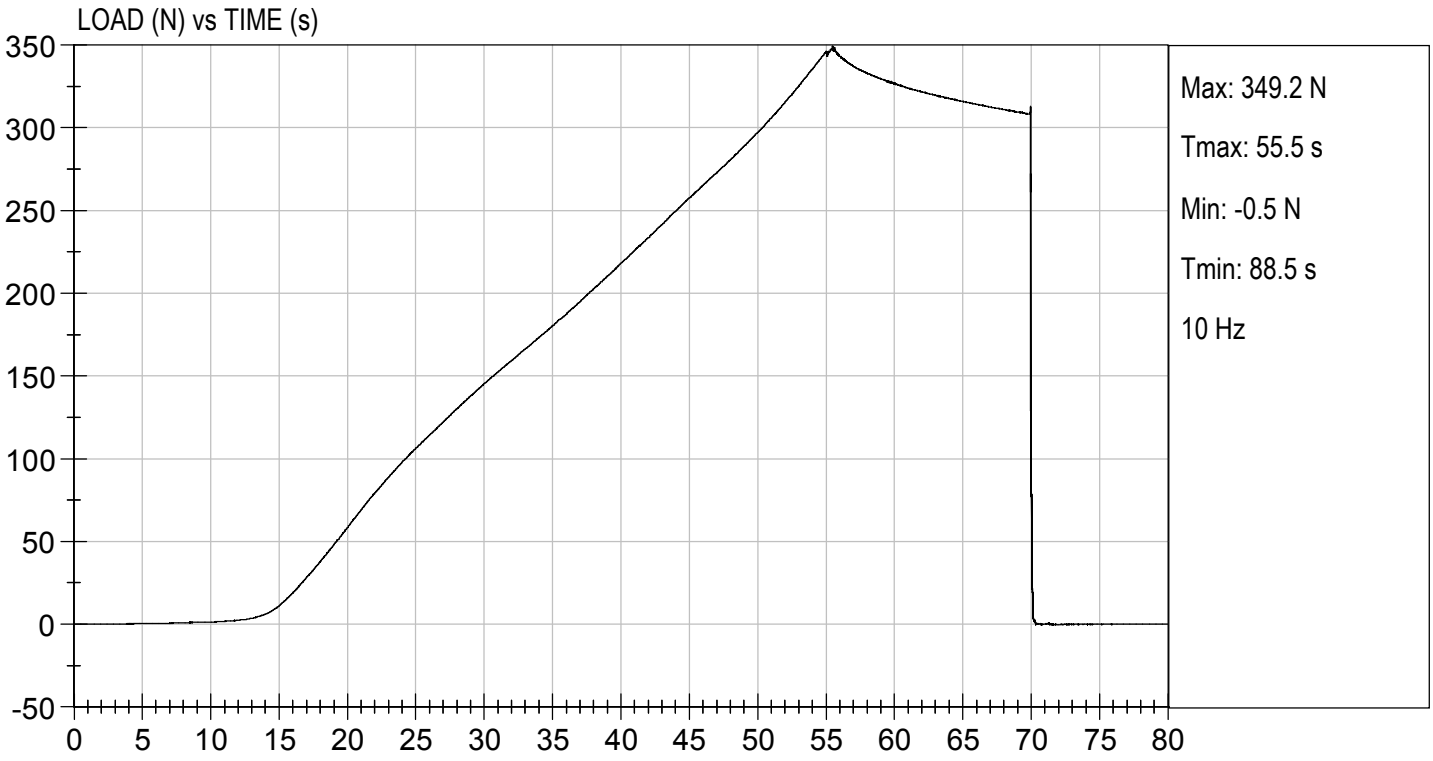
ATD Serial No: DH1659 **Test I.D:** D211037

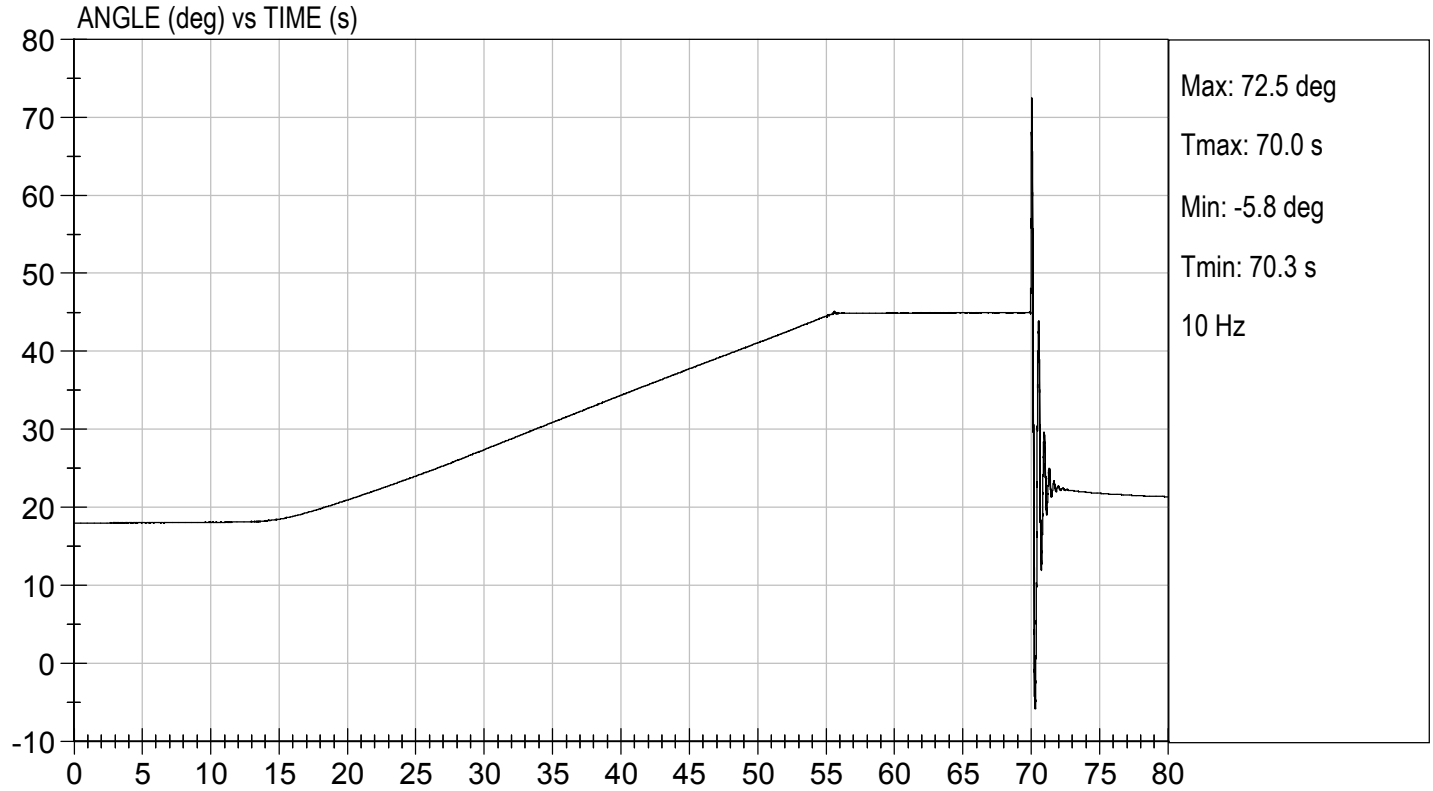
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	36	Pass
Initial Angle	deg	0 to 20	18	Pass
Return Angle	deg	+/- 8	3	Pass
Force at 45 deg	N	320 to 390	349	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.7	Pass
		Overall Result		Pass

Gerald Guerrero
Laboratory Technician

03/25/2021
Test Date

Approved By


LOAD (N) vs TIME (s)
350
300
250
200
150
100
50
0
-50
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80
Max: 349.2 N
Tmax: 55.5 s
Min: -0.5 N
Tmin: 88.5 s
10 Hz


ANGLE (deg) vs TIME (s)
80
70
60
50
40
30
20
10
0
-10
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80
Max: 72.5 deg
Tmax: 70.0 s
Min: -5.8 deg
Tmin: 70.3 s
10 Hz

APPENDIX D
TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

TABLE 1 – DRIVER DUMMY INSTRUMENTATION

Instrument Location			Axis	Hybrid III 50th S/N 351		
				Serial Number	Manufacturer	Calibration Date
Head Accelerometers		Primary	X	P79741	Endevco	03/01/2021
			Y	P79743	Endevco	03/01/2021
			Z	P79744	Endevco	03/01/2021
		Redundant	X	P94834	Endevco	03/01/2021
			Y	P94856	Endevco	03/01/2021
			Z	P97412	Endevco	03/01/2021
Head Angular Rate Sensors			X	ARS7402	DTS	08/04/2020
			Y	ARS7416	DTS	08/04/2020
			Z	ARS7366	DTS	08/04/2020
Upper Neck Load Cell			Fx, Fy, Fz Mx, My, Mz	NG2203	Denton	02/10/2021
Chest Accelerometers		Primary	X	P86792	Endevco	03/01/2021
			Y	P86793	Endevco	03/01/2021
			Z	P88348	Endevco	03/01/2021
		Redundant	X	P88666	Endevco	03/01/2021
			Y	P88667	Endevco	03/01/2021
			Z	P94109	Endevco	03/01/2021
Chest Potentiometer			X	351	Servo	03/02/2021
Pelvis Accelerometers			X	P95526	Endevco	03/01/2021
			Y	P96038	Endevco	03/01/2021
			Z	P97742	Endevco	03/01/2021
Femur Load Cells	Right	Primary	Z	FG121	Denton	03/02/2021
		Redundant	Z	FG121	Denton	03/02/2021
	Left	Primary	Z	FG122	Denton	03/02/2021
		Redundant	Z	FG122	Denton	03/02/2021
Tibia Load Cells	Right	Upper	Mx, My, Fz	TG408	Denton	02/09/2021
		Lower	Mx, My, Fz	AG116	Denton	02/09/2021
	Left	Upper	Mx, My, Fz	TG480	Denton	02/09/2021
		Lower	Mx, My, Fz	AG502	Denton	02/09/2021
Foot Accelerometers	Right	Rear	X	t22486	Endevco	03/01/2021
			Z	P97382	Endevco	03/01/2021
		Front	Z	P82120	Endevco	03/01/2021
	Left	Rear	X	T16468	Endevco	03/01/2021
			Z	T16496	Endevco	03/01/2021
		Front	Z	T16501	Endevco	03/01/2021
Seat Belt Load Cells		Lap				
		Shoulder				

TABLE 2 – FRONT PASSENGER DUMMY INSTRUMENTATION

Instrument Location			Axis	Hybrid III 5th S/N DH1659		
				Serial Number	Manufacturer	Calibration Date
Head Accelerometers		Primary	X	P97377	Endevco	02/10/2021
			Y	P94800	Endevco	02/10/2021
			Z	P94802	Endevco	02/10/2021
		Redundant	X	P94799	Endevco	02/10/2021
			Y	P94801	Endevco	02/10/2021
			Z	P94803	Endevco	02/10/2021
Head Angular Rate Sensors			X	ARS7340	DTS	08/04/2020
			Y	ARS7357	DTS	08/04/2020
			Z	ARS7442	DTS	08/04/2020
Upper Neck Load Cell			Fx, Fy, Fz Mx, My, Mz	NG2256	Denton	05/04/2020
Chest Accelerometers		Primary	X	P94793	Endevco	02/10/2021
			Y	P95322	Endevco	02/10/2021
			Z	P88719	Endevco	02/10/2021
		Redundant	X	P94794	Endevco	02/10/2021
			Y	P95370	Endevco	02/10/2021
			Z	P94785	Endevco	02/10/2021
Chest Potentiometer			X	DH1659	Servo	02/10/2021
Pelvis Accelerometers			X	P94798	Endevco	02/10/2021
			Y	P97705	Endevco	02/10/2021
			Z	P82646	Endevco	02/10/2021
Femur Load Cells	Right	Primary	Z	FG126	Denton	02/10/2021
		Redundant	Z	FG126	Denton	02/10/2021
	Left	Primary	Z	FG127	Denton	02/10/2021
		Redundant	Z	FG127	Denton	02/10/2021
Tibia Load Cells	Right	Upper	Mx, My, Fz	TG467	Denton	05/04/2020
		Lower	Mx, My, Fz	AG491	Denton	05/04/2020
	Left	Upper	Mx, My, Fz	TG478	Denton	05/04/2020
		Lower	Mx, My, Fz	AG500	Denton	05/04/2020
Foot Accelerometers	Right	Rear	X	P94795	Endevco	02/10/2021
			Z	P94796	Endevco	02/10/2021
		Front	Z	P94797	Endevco	02/10/2021
	Left	Rear	X	P83167	Endevco	02/10/2021
			Z	P83168	Endevco	02/10/2021
		Front	Z	P83169	Endevco	02/10/2021
Seat Belt Load Cells		Lap				
		Shoulder				

TABLE 3 – VEHICLE INSTRUMENTATION

Instrument Location			Axis	Serial Number	Manufacturer	Calibration Date
Crossmember / Rear Seat Accelerometers	Left	Primary	X	A340698	MSI	12/18/2020
			Z	A340783	MSI	12/18/2020
		Redundant	X	A360982	MSI	12/18/2020
	Right	Primary	X	A370393	MSI	03/11/2021
			Z	A370262	MSI	03/08/2021
		Redundant	X	A370381	MSI	03/11/2021
Engine Accelerometers		Top	X	A337171	MSI	11/12/2020
		Bottom	X	A360966	MSI	12/14/2020