REPORT NUMBER: NCAP-MGA-23-058

NEW CAR ASSESSMENT PROGRAM (NCAP)
Frontal Barrier Impact Test

LUCID USA, INC.
2023 Lucid Air 4-Door Sedan
NHTSA No.: O20234600

MGA RESEARCH CORPORATION
5000 Warren Road
Burlington, WI 53105

Test Date: March 4, 2024

Final Report Date: October 18, 2024

FINAL REPORT

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

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Approval Date: October 18, 2024

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

TECHNICAL REPORT DOCUMENTATION PAGE

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4. Title and Subtitle	5. Report Date
Final Report of New Car Assessment Program Frontal Impact Testing and FMVSS No. 305 Indicant Testing of a 2023 Lucid Air 4-Door Sedan, NHTSA No.: O20234600	October 18, 2024
	6. Performing Organization Code MGA
7. Author(s) Ben Fischer, Program Manager	**8. Performing Organization Report No.** NCAP-MGA-23-058
9. Performing Organization Name and Address MGA Research Corporation 5000 Warren Road Burlington, WI 53105	**10. Work Unit No.**
	11. Contract or Grant No. 693JJ919D000006
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Crashworthiness Standards (NRM-110) 1200 New Jersey Ave, SE Washington, D.C. 20590	**13. Type of Report and Period Covered** Final Test Report March 4, 2024 to October 18, 2024
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15. Supplementary Notes

16. Abstract

A 56.3 km/h NCAP Frontal Rigid Barrier Impact Test was conducted on a 2023 Lucid Air 4-Door Sedan 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 4, 2024.

The impact velocity of the vehicle was 55.91 km/h and the ambient temperature at the barrier face at the time of impact was 21.5°C. The target vehicle post-test maximum crush was 550 mm located to the left 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	200.127	700	209.387
Maximum Chest Compression	mm	63	22.866	52	13.187
Nij		1	0.225	1	0.320
Neck Tension	N	4170	1298.914	2620	830.968
Neck Compression	N	4000	80.257	2520	253.274
Left Femur Force	N	10008	2414.994	6805	2927.068
Right Femur Force	N	10008	2403.021	6805	1976.751

17. Key Words	18. Distribution Statement
56.3 km/h (35 mph) Full Frontal Rigid Barrier Impact Test New Car Assessment Program (NCAP)	Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services Division 1200 New Jersey Ave, SE Washington, DC 20590

19. Security Classification of Report	20. Security Classification of Page	21. No. of Pages	22. Price
Unclassified	Unclassified	209	

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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 2023 Lucid Air 4-Door Sedan at a velocity of 55.91 km/h. The test was performed at MGA Research Corporation on March 4, 2024. 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. 064) and the right-front passenger (position 2) ATD (Serial No. 142) were qualified previous to this test. Certification details, along with instrumentation calibration data, are found in Appendix C of this report.

The 282 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 or battery electrolyte leakage and no loss of high-voltage battery isolation after the event or during any phase of the static rollover.

The maximum static crush of the vehicle was 549 mm located to the left 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})	200.127	0.225	1298.914	80.257	37.683	22.866	2414.994	2403.021
Passenger (5^{th})	209.387	0.320	830.968	253.274	36.283	13.187	2927.068	1976.751

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

TEST NOTES

Passenger Pelvis Z recorded no valid data.
Passenger Right Ankle X recorded no valid data after 111 ms.

SECTION 2
OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2023 Lucid Air 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20234600
Test Date: 3/4/2024

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	O20234600	Traction Control System (TCS)	Yes
Model Year	2023	Power Steering	Yes
Make	Lucid	Power Window Auto-Reverse	Yes
Model	Air	Driver Frontal Airbag	Yes
Body Style	4-Door Sedan	Driver Curtain Airbag	Yes
VIN	50EA1GBA0PA002038	Driver Head/Torso Airbag	No
Body Color	Quantum Gray	Driver Torso Airbag	No
Odometer (km/mi)	64 km / 40 mi	Driver Torso/Pelvis Airbag	Yes
Engine Displacement (L)		Driver Pelvis Airbag	No
Type/No. Cylinders	Electric	Driver Knee Airbag	Yes
Engine Placement	Lateral	Front Pass. Frontal Airbag	Yes
Transmission Type	Automatic	Front Pass. Curtain Airbag	Yes
Transmission Speeds		Front Pass. Head/Torso Airbag	No
Overdrive		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	Yes	Front Pass. Knee Airbag	Yes
Running Boards	No	Driver Pretensioner	Yes
Tilt Steering Wheel	Yes	Driver Load Limiter	Yes
Power Seats	Yes	Front Pass. Pretensioner	Yes
Anti-Lock Brakes (ABS)	Yes	Front Pass. Load Limiter	Yes
Automatic Door Locks (ADLs)	Yes	Other	N/A

Does owner's manual provide instructions to turn off automatic door locks?	No

DATA FROM CERTIFICATION LABEL

Manufactured By	LUCID USA, INC.
Date of Manufacture	10/22

GVWR (kg)	2850
GAWR Front (kg)	1430
GAWR Rear (kg)	1450

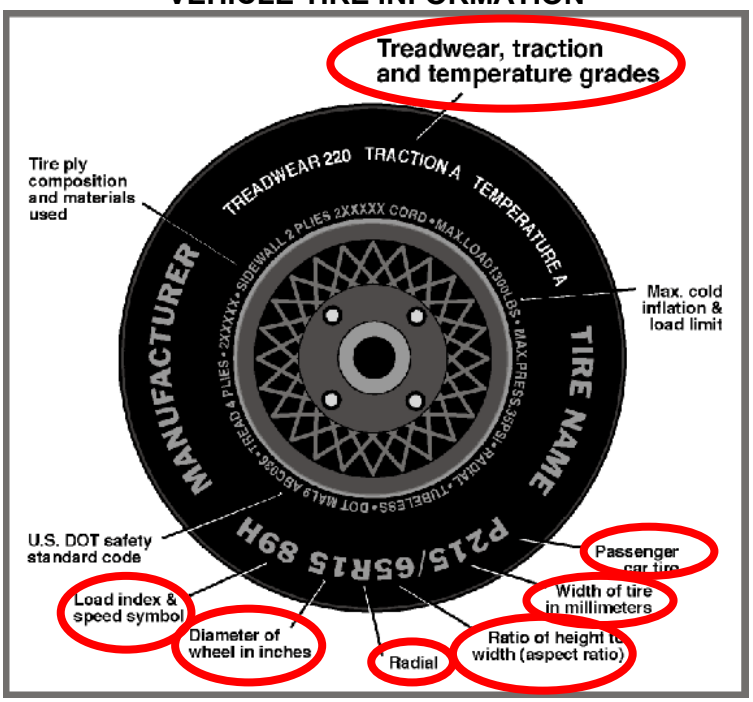
VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Contoured		
Designated Seating Capacity (DSC)	2	3		5
Capacity Weight (VCW) (kg)				400
Cargo Weight (RCLW) (kg)				60

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

Test Vehicle: 2023 Lucid Air 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20234600
Test Date: 3/4/2024

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	290	290
Recommended Tire Size	245/35R21	265/35R21
Tire Size on Vehicle	245/35R21	265/35R21
Tire Manufacturer	Pirelli	Pirelli
Tire Model	P Zero	P Zero
Treadwear	280	280
Traction	AA	AA
Temperature Grade	A	A
Tire Plies Sidewall	2 Rayon	2 Rayon
Tire Plies Body	2 Rayon, 2 Steel, 1 Polyamide	2 Rayon, 2 Steel, Polyamide
Load Index/Speed Symbol	99Y	103Y
Tire Material	Rubber	Rubber
DOT Safety Code Left	1VN CY794M 0222	1VN CW793M 3922
DOT Safety Code Right	1VN CY794M 0222	1VN CW793M 3922

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

Test Vehicle: 2023 Lucid Air 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20234600
Test Date: 3/4/2024

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	573.0	613.5		619.0	667.5	
Right	kg	625.0	572.5		658.0	631.5	
Ratio	%	50.3%	49.7%		49.6%	50.4%	
Totals	kg	1198.0	1186.0	2384.0	1277.0	1299.0	2576.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	2384.0
Weight of 1 P572E ATD & 1 P572O ATD	kg	141
Rated Cargo/Luggage Weight (RCLW)	kg	60
Calculated Test Vehicle Target Weight (TVTW)	kg	2585.0

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	773	766	759	759	1471
As Tested	mm	750	746	748	748	1491
Post Test	mm	N/A	N/A	744	748	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2956
Total Vehicle Length at Left Side	mm	4818
Total Vehicle Length at Centerline	mm	4976
Total Vehicle Length at Right Side	mm	4809
Weight of Ballast in Cargo Area	kg	0
Weight of Vehicle Components Removed	kg	25
Amount of Stoddard Solvent in Fuel Tank	L	

List of components removed to meet test weight: RR door trim panel, LR/RR headrest, rear underbody plastic.

List of components removed for instrumentation, data box, and equipment installation: Cargo area carpet/trim/divider, jack and tools, EV charging cable.

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

Test Vehicle: 2023 Lucid Air 4-Door Sedan NHTSA No.: O20234600
Test Program: NCAP Frontal Barrier Impact Test Test Date: 3/4/2024

TARGET VEHICLE STRUCTURAL MEASUREMENT

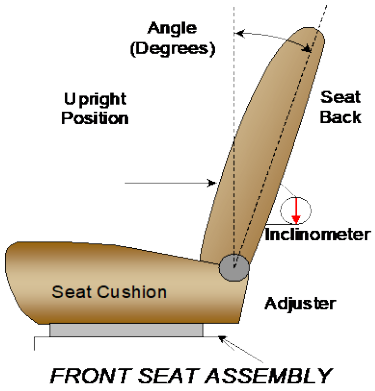
	Elements	Pre-Test (mm)
1	Total Length	4976
2	Total Width	1885
3	Bumper Top Height	536
4	Bumper Bottom Height	386
5	Longitudinal Member Top Height	508
6	Distance between Longitudinal Members	977
7	Longitudinal Member Width	66
8	Engine Top Height	558
9	Engine Bottom Height	265
10	Engine and Gearbox Width	326
11	Front Bumper-Engine Distance	819
12	Front Shock Absorber Fixing Height	837
13	Bonnet Leading Edge Height	673
14	Front Shock Absorber Fixing Width	1007
15	Front Bumper – Front Axle Distance	908
16	Front Axle – A-Pillar Distance	604
17	A-Pillar – B-Pillar Distance	1105
18	B-Pillar – Rear Axle Distance	1247
19	B-Pillar – C-Pillar Distance	1258
20	Roof Sill Bottom Height	1223
21	Roof Sill Top Height	1260
22	Floor Sill Bottom Height	135
23	Floor Sill Top Height	351

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

Test Vehicle: 2023 Lucid Air 4-Door Sedan NHTSA No.: O20234600
Test Program: NCAP Frontal Barrier Impact Test Test Date: 3/4/2024

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	1.7° on outboard headrest post guide
Passenger Seat Back Angle	5.6° on outboard headrest post guide

SEAT FORE/AFT POSITIONS

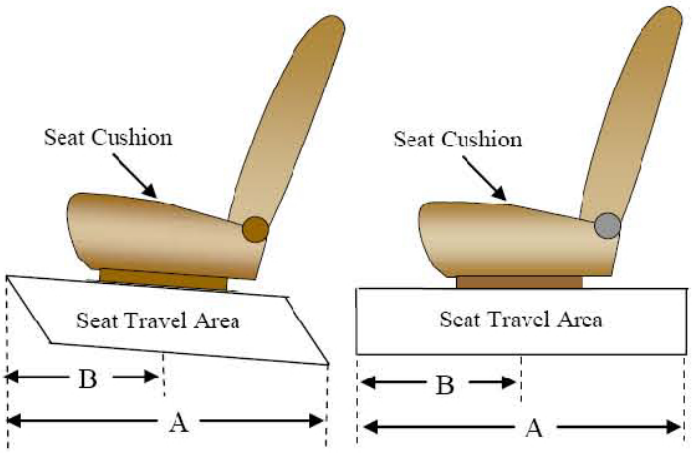
The driver and passenger seat fore/aft positions are adjusted following Appendix F, "Driver & Passenger Dummy Seating & Positioning Procedures" in the NCAP Test Procedure dated May 2018.

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	343 mm	172 mm
Passenger Seat	283 mm	0 mm

SEAT BELT UPPER ANCHORAGES

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

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



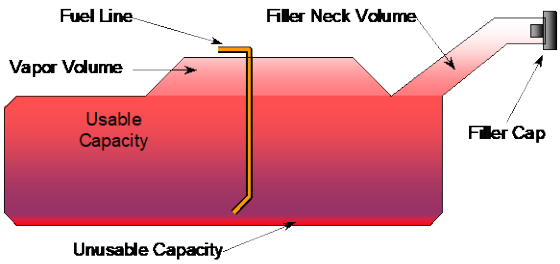
DATA SHEET NO. 2 (CONTINUED)
SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2023 Lucid Air 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20234600
Test Date: 3/4/2024

FUEL TANK CAPACITY DATA

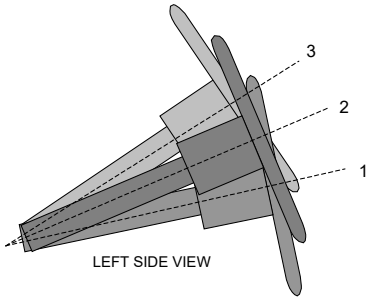
	Liters
Usable Capacity of "Standard Tank"	
Usable Capacity of "Optional Tank"	
92-94% of Usable Capacity	
Actual Amount of Solvent used	
1/3 of Usable Capacity	

FUEL PUMP
Electric vehicle.



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.



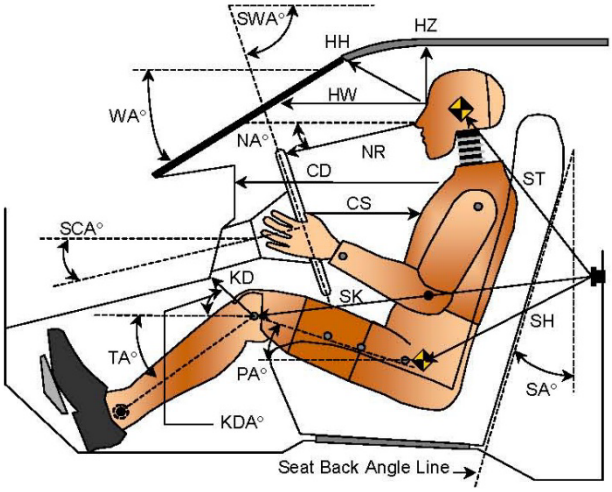
STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITION

	Degrees	Fore/Aft Position (mm)
Lowermost Position 1	72.2	
Geometric Center Position 2	69.8	
Uppermost Position 3	67.3	
Telescoping Steering Wheel Travel		48
Test Position	69.8	24

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2023 Lucid Air 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20234600
Test Date: 3/4/2024

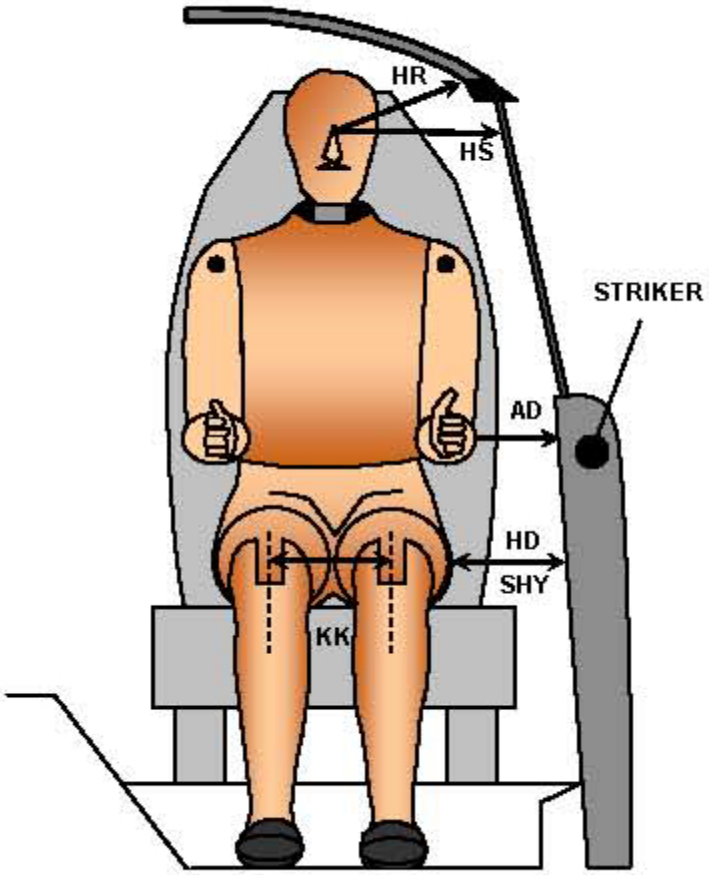


LEFT SIDE VIEW

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		23.5		
SWA°	Steering Wheel Angle		69.8		
SCA°	Steering Column Angle		20.2		
SA°	Seat Back Angle		1.7		5.6
HZ	Head to Roof (Z)	184	90	207	90
HH	Head to Header	283	18.5	213	53.9
HW	Head to Windshield	636	0	665	0
NR	Nose to Rim	404	8.0		
CD	Chest to Dash	608		392	
CS	Chest to Steering Hub	328	2.4		
RA	Rim to Abdomen	220	0		
KDL	Left Knee to Dash	200	29.3	126	50.7
KDR	Right Knee to Dash	193	37.6	127	44.0
PA°	Pelvic Angle		24.0		21.8
TA°	Tibia Angle		38.4		47.0
SK	Striker to Knee	581	98.3	684	97.8
ST	Striker to Head	448	9.3	419	31.0
SH	Striker to H-Point	304	137.3	409	119.9

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2023 Lucid Air 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20234600
Test Date: 3/4/2024

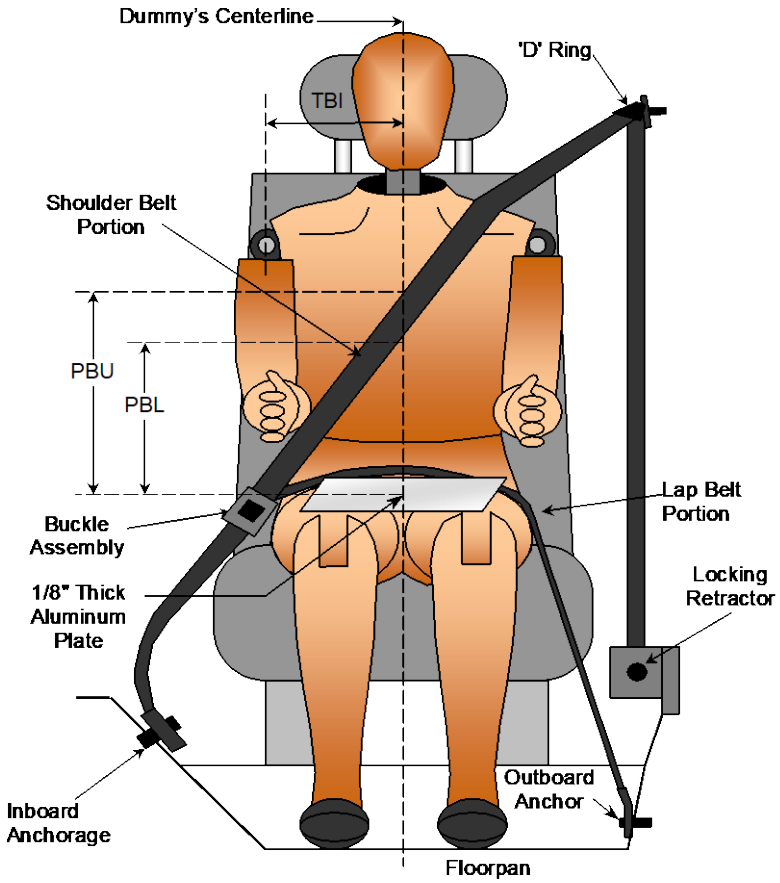


FRONT VIEW OF DUMMY

Code	Measurement Description	Driver	Passenger
		Length (mm)	
AD	Arm to Door	135	81
HD	H-Point to Door	136	157
HR	Head to Side Header	187	266
HS	Head to Side Window	338	360
KK	Knee to Knee	355	233
SHY	Striker to H-Point (Y Direction)	239	267
AA	Ankle to Ankle	347	190

DATA SHEET NO. 5
SEAT BELT POSITIONING DATA

Test Vehicle:	2023 Lucid Air 4-Door Sedan	NHTSA No.:	O20234600
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	3/4/2024



FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	360	300
PBL - Top surface of reference to belt lower edge	mm	280	220

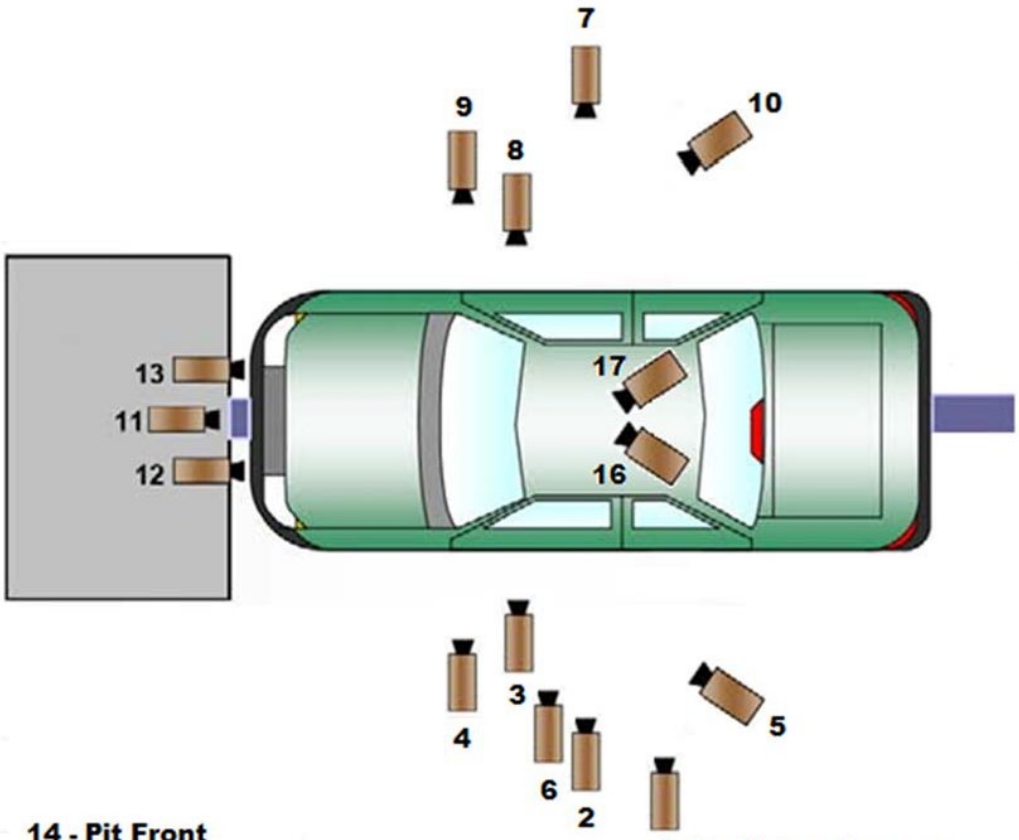
BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as measured on ATD	mm	910	960
Lap Belt Length as measured on ATD	mm	465	435
Remainder of belt on reel	mm	640	620
Total Belt Length for Continuous Webbing Systems	mm	2290	2290

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

Test Vehicle:	2023 Lucid Air 4-Door Sedan	NHTSA No.:	O20234600
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	3/4/2024

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: 2023 Lucid Air 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20234600
Test Date: 3/4/2024

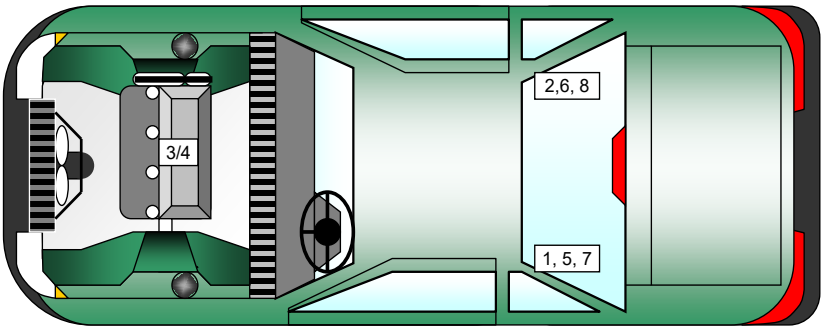
CAMERA LOCATIONS

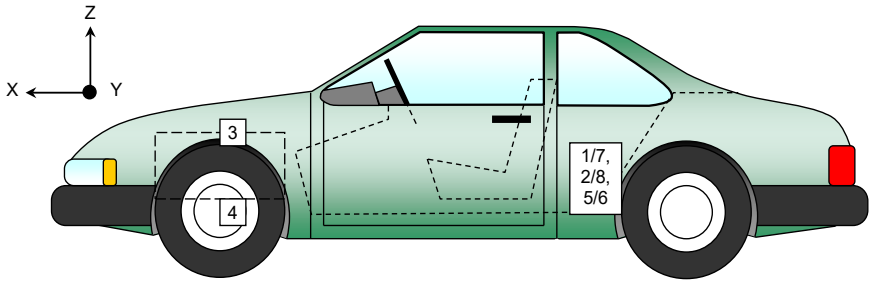
No.	Camera View	Coordinates* (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Overall					30
2	Left Overall	-2330	-5790	-1390	12	1000
3	Driver Close-Up	-1750	-6860	-2040	50	1000
4	Left Front Half	-1310	-5570	-1450	24	1000
5	Left Angle	-7300	-5720	-2320	75	1000
6	Steering Column	-1080	-5530	-1230	50	1000
7	Right Overall	-2150	5970	-1450	12	1000
8	Passenger Close-Up	-1810	6620	-2020	50	1000
9	Right Front Half	-1210	5400	-1440	24	1000
10	Right Angle	-7370	5480	-2270	75	1000
11	Windshield	150	0	-2310	12	1000
12	Driver Windshield	200	-370	-2230	25	1000
13	Passenger Windshield	200	370	-2230	25	1000
14	Pit Front	-770	0	3340	24	1000
15	Pit Rear	-2860	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: 2023 Lucid Air 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20234600
Test Date: 3/4/2024





VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Crossmember Accelerometer – X Direction	1958	-358	-267
2	Right Rear Crossmember Accelerometer – X Direction	1959	361	-271
3	Engine Top X	4074	18	-574
4	Engine Bottom X	4139	8	-304
5	Left Rear Crossmember Accelerometer – Z Direction	1958	-358	-267
6	Right Rear Crossmember Accelerometer – Z Direction	1959	361	-271
7	Left Rear Crossmember Accelerometer Redundant – X Direction	1958	-358	-267
8	Right Rear Crossmember Accelerometer Redundant – X Direction	1959	361	-271

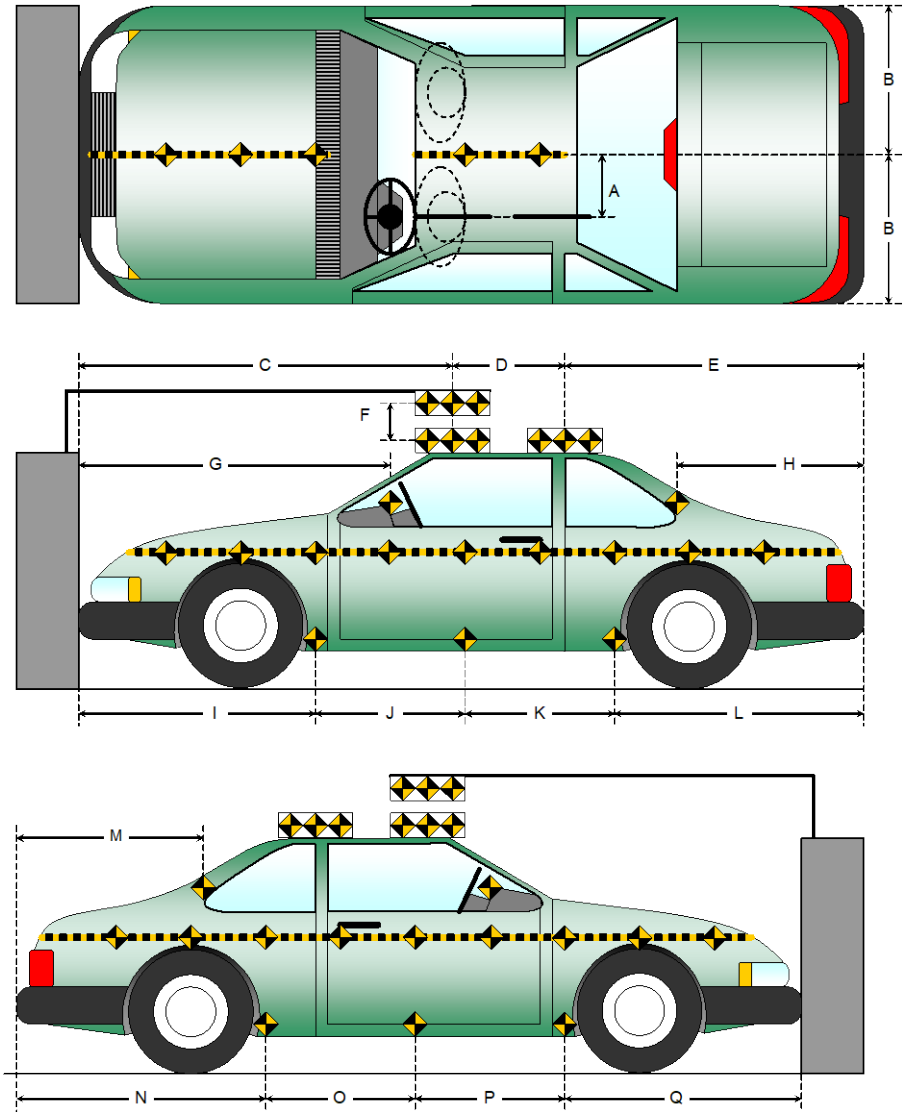
Reference Points: X - Rear Surface of Vehicle (+ forward)
Y - Vehicle Centerline (+ to right)
Z - Ground Plane (+ down)

DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2023 Lucid Air 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20234600
Test Date: 3/4/2024

Item	Value (mm)
A	390
B	942
C	2416
D	608
E	1952
F	252
G	
H	1103
I	1390
J	1031
K	1035
L	1520
M	1181
N	1521
O	1027
P	1037
Q	1391



DATA SHEET NO. 9
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2023 Lucid Air 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20234600
Test Date: 3/4/2024

ADVANCED RESEARCH LOAD CELL BARRIER

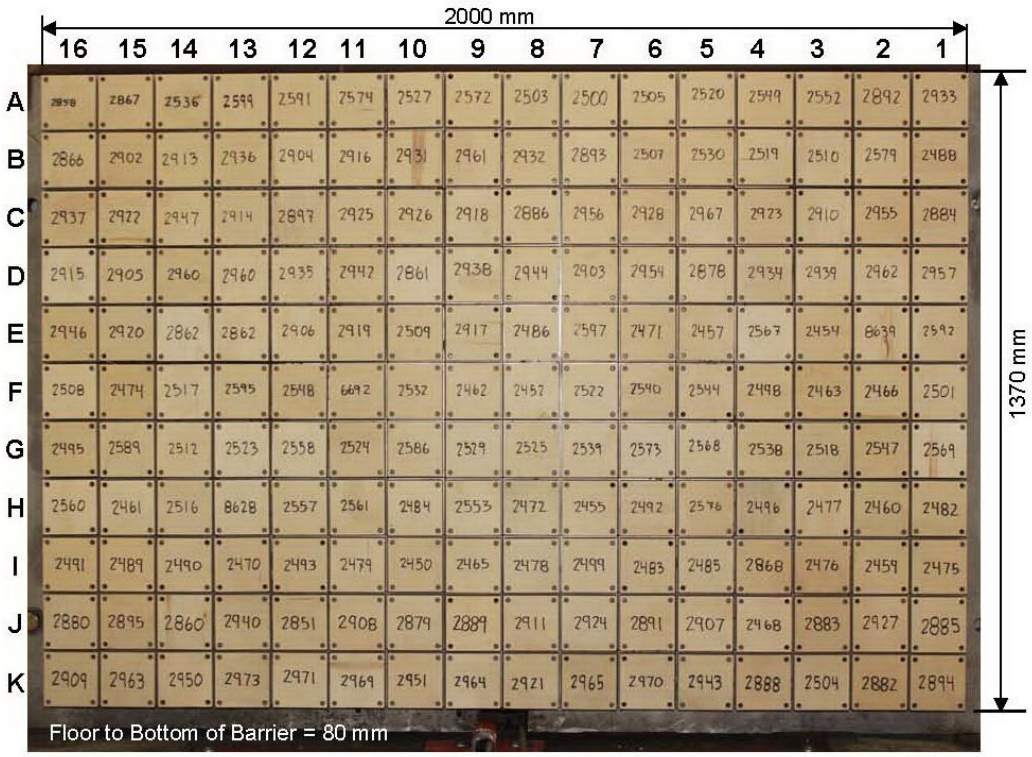


Photo for Reference Only

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: 2023 Lucid Air 4-Door Sedan NHTSA No.: O20234600
Test Program: NCAP Frontal Barrier Impact Test Test Date: 3/4/2024

INSTRUMENTATION

Instrumentation	Number of Channels Collected
Driver Dummy Data Channels	49
Passenger Dummy Data Channels	49
Vehicle Structure Accelerometers	8
Barrier Channels	176
Total	282

CAMERA COVERAGE

Type of Camera	Number Used in this Test
High-Speed Vehicle Onboard	2
High-Speed Offboard	15
Real-Time	2
Total	19

DATA SHEET NO. 11
POST-TEST OBSERVATIONS

Test Vehicle: 2023 Lucid Air 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20234600
Test Date: 3/4/2024

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Passenger
Dummy Type / Serial No.	HIII 50% / 064	HIII 5% / 142
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	None
Window Damage	None
Other Notable Effects	Front film pit glass broken

VEHICLE REBOUND FROM BARRIER

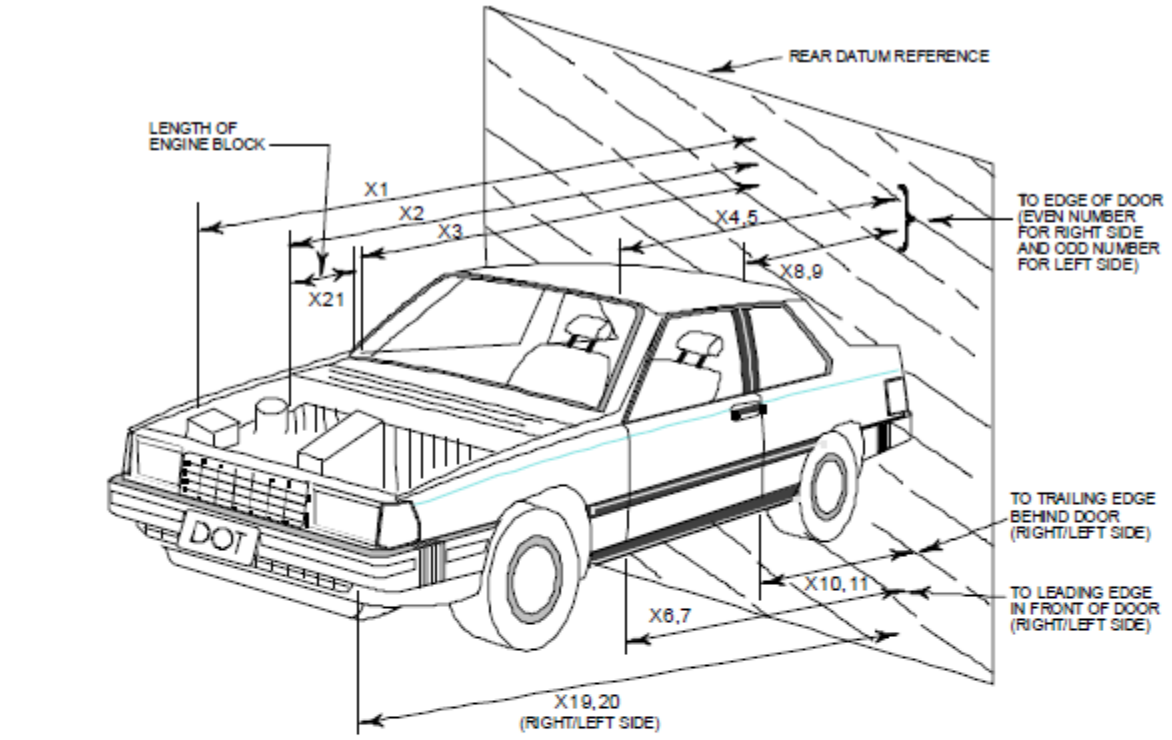
Measured Parameter	Units	Value
Left Side	mm	750
Center	mm	825
Right Side	mm	805
Average	mm	793

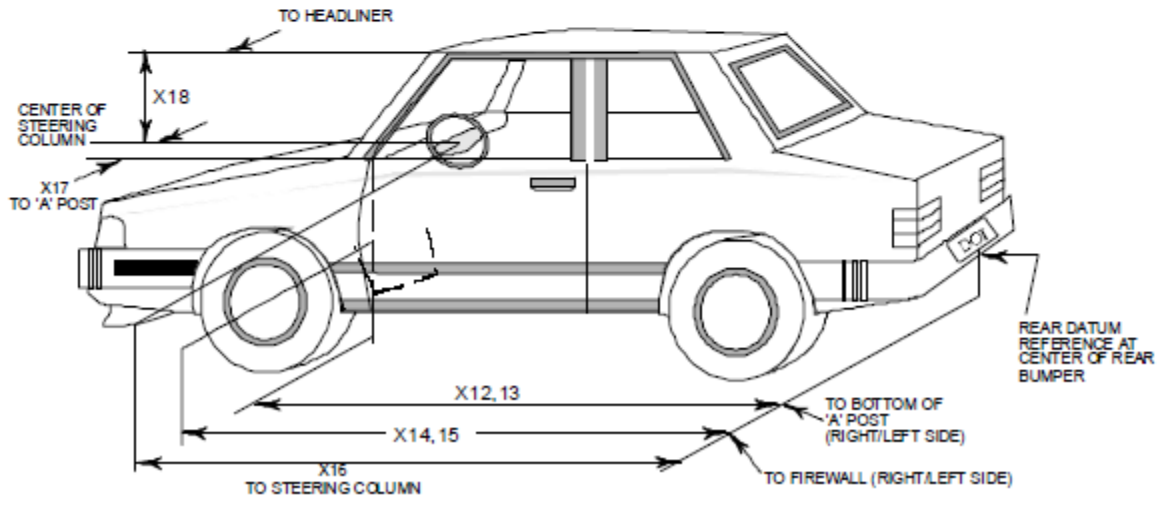
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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:	2023 Lucid Air 4-Door Sedan	NHTSA No.:	O20234600
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	3/4/2024





DATA SHEET NO. 12 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2023 Lucid Air 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20234600
Test Date: 3/4/2024

No.	Measurement Description	Pre-Test	Post-Test	Change
1	Total Length of Vehicle at Centerline	4976	4435	-541
2	RSOV to Front of Engine	4300	4114	-186
3	RSOV to Firewall	4199	4196	-3
4	RSOV to Upper Leading Edge of Right Door	3487	3488	1
5	RSOV to Upper Leading Edge of Left Door	3488	3490	2
6	RSOV to Lower Leading Edge of Right Door	3513	3513	0
7	RSOV to Lower Leading Edge of Left Door	3513	3514	1
8	RSOV to Upper Trailing Edge of Right Door	2309	2310	1
9	RSOV to Upper Trailing Edge of Left Door	2310	2312	2
10	RSOV to Lower Trailing Edge of Right Door	2387	2388	1
11	RSOV to Lower Trailing Edge of Left Door	2388	2390	2
12	RSOV to Bottom of “A” Post of Right Side	3584	3585	1
13	RSOV to Bottom of “A” Post of Left Side	3586	3586	0
14	RSOV to Firewall, Right Side	3717	3738	21
15	RSOV to Firewall, Left Side	3711	3710	-1
16	RSOV to Steering Column	2981	3078	97
17	Center of Steering Column to “A” Post	327	328	1
18	Center of Steering Column to Headliner	370	412	42
19	RSOV to Right Side of Front Bumper	4809	4466	-343
20	RSOV to Left Side of Front Bumper	4818	4449	-369
21	Length of Engine Block	192	192	0
RD	RSOV to Right Side of Dash Panel	3189	3191	2
CD	RSOV to Center of Dash Panel	3433	3432	-1
LD	RSOV to Left Side of Dash Panel	3190	3192	2

All dimensions in mm

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

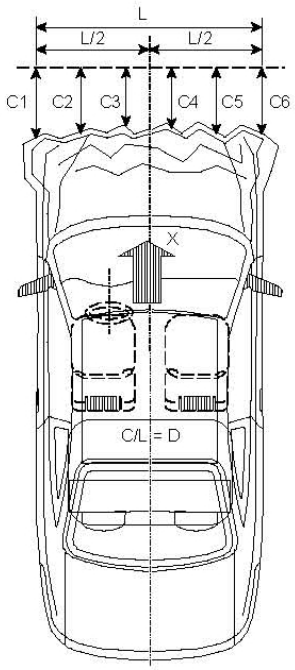
Test Vehicle: 2023 Lucid Air 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20234600
Test Date: 3/4/2024

VEHICLE INFORMATION

VIN:	50EA1GBA0PA002038	Wheelbase (mm):	2956
Vehicle Size Category:	Passenger Car	Test Weight (kg):	2576.0

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):	55.91
Velocity Change (km/h):	62.5
Time of Separation (msec)	98



CRUSH PROFILE

Collision Deformation Classification:	12FDEW4
Midpoint of Damage:	Centerline
Damage Region Length (mm):	1275
Impact Mode:	Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Exterior Crush
C1	Crush zone 1 at left side	mm	4818	4449	369
C2	Crush zone 2 at left side	mm	4932	4412	520
C3	Crush zone 3 at left side	mm	4969	4420	549
C4	Crush zone 4 at right side	mm	4969	4425	544
C5	Crush zone 5 at right side	mm	4929	4412	517
C6	Crush zone 6 at right side	mm	4809	4466	343
L	C1 TO C6	mm	1275	1321	-46

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

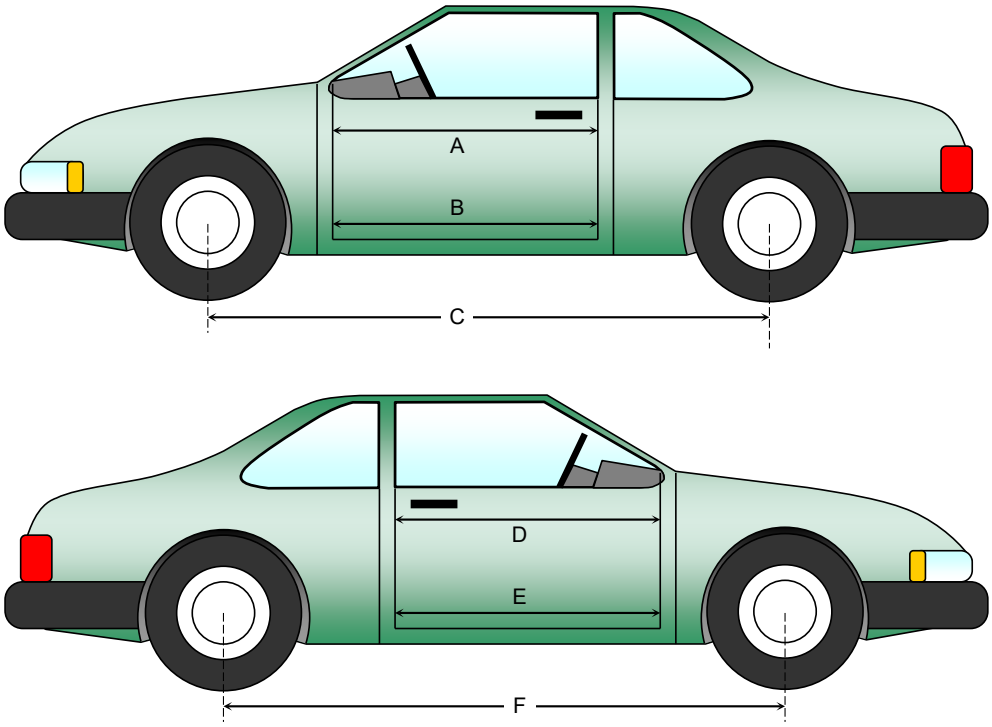
Test Vehicle: 2023 Lucid Air 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20234600
Test Date: 3/4/2024

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Change
A	Left Side Upper	mm	993	993	0
B	Left Side Lower	mm	932	932	0
D	Right Side Upper	mm	995	994	-1
E	Right Side Lower	mm	935	936	1

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Change
C	Left Side Wheelbase	mm	2956	2891	-65
F	Right Side Wheelbase	mm	2957	2883	-74



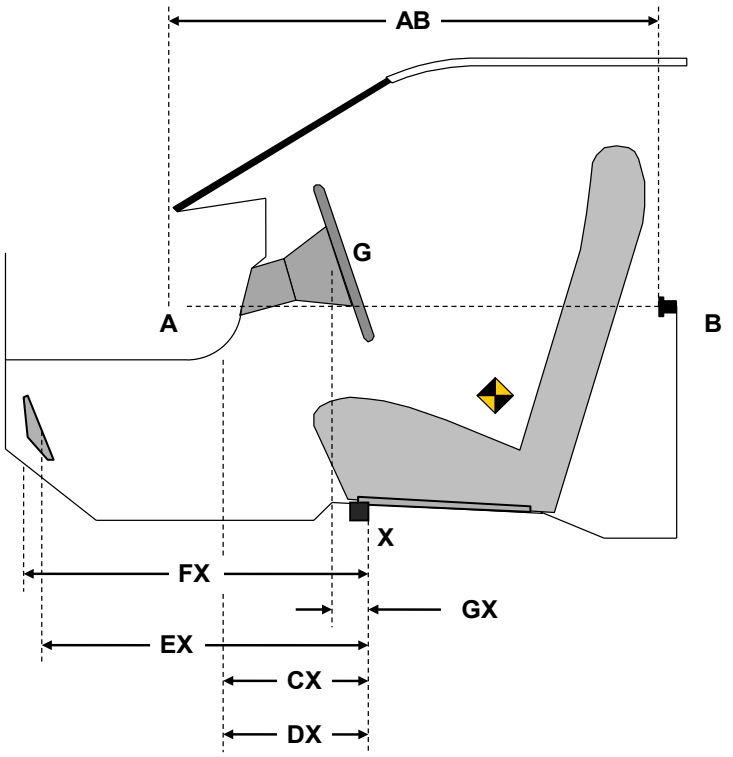
DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2023 Lucid Air 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20234600
Test Date: 3/4/2024

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Change
AB	Door Opening (Inside Window Jam)	mm	782	783	1
CX	Left Knee Bolster to X	mm	330	327	-3
DX	Right Knee Bolster to X	mm	324	320	-4
EX	Brake Pedal to X	mm	597	588	-9
FX	Foot Rest to X	mm	628	623	-5
GX	Center of Steering Column Wheel Hub to X	mm	63	156	93

X = Front of Seat Track (stationary)



DRIVER COMPARTMENT

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

Test Vehicle: 2023 Lucid Air 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20234600
Test Date: 3/4/2024

WINDSHIELD MOUNTING DETAILS

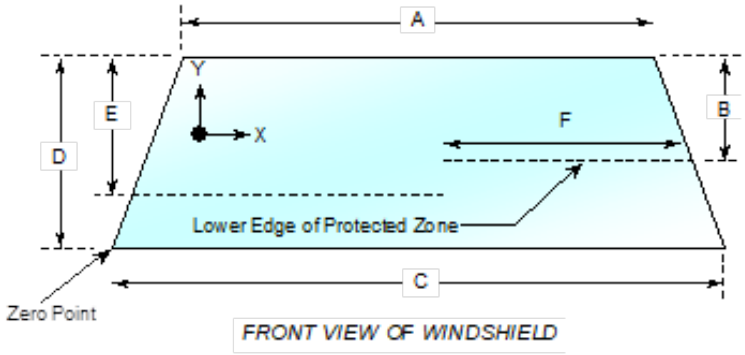
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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: 21.5°C.

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2954	2954	100
Right Side	2954	2954	100
Total	5908	5908	100



FRONT VIEW OF WINDSHIELD

Item	Units	Value
A	mm	1212
B	mm	1042
C	mm	1688
D	mm	1504
E	mm	1240
F	mm	542

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: 2023 Lucid Air 4-Door Sedan NHTSA No.: O20234600
Test Program: NCAP Frontal Barrier Impact Test Test Date: 3/4/2024

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: N/A Test Time: N/A

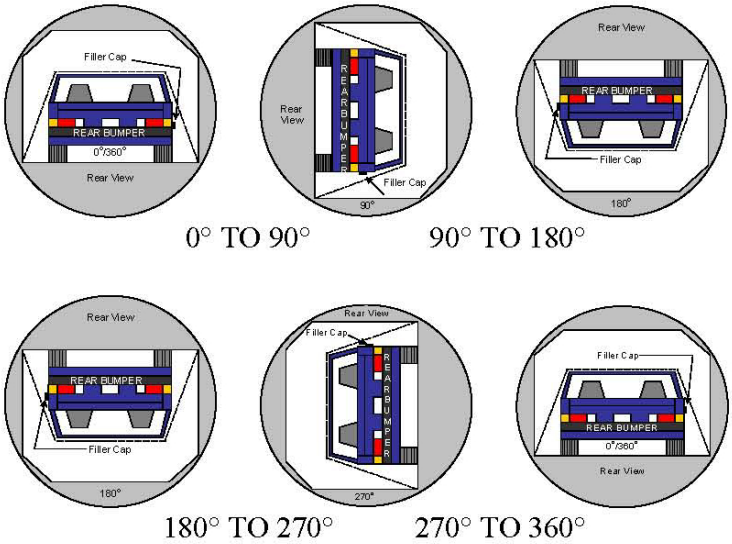
A. From impact until vehicle motion ceases: (Maximum Allowable = 1 ounce) N/A oz.

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

C. For the following 25 minutes: (Maximum Allowable = 1 ounce / minute) N/A

D. Spillage Details: N/A

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°			
90° to 180°			
180° to 270°			
270° to 360°			

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

Test Vehicle: 2023 Lucid Air 4-Door Sedan NHTSA No.: O20234600
Test Program: NCAP Frontal Barrier Impact Test Test Date: 3/4/2024

FMVSS 301 SPILLAGE TABLE (UNITS IN OUNCES)

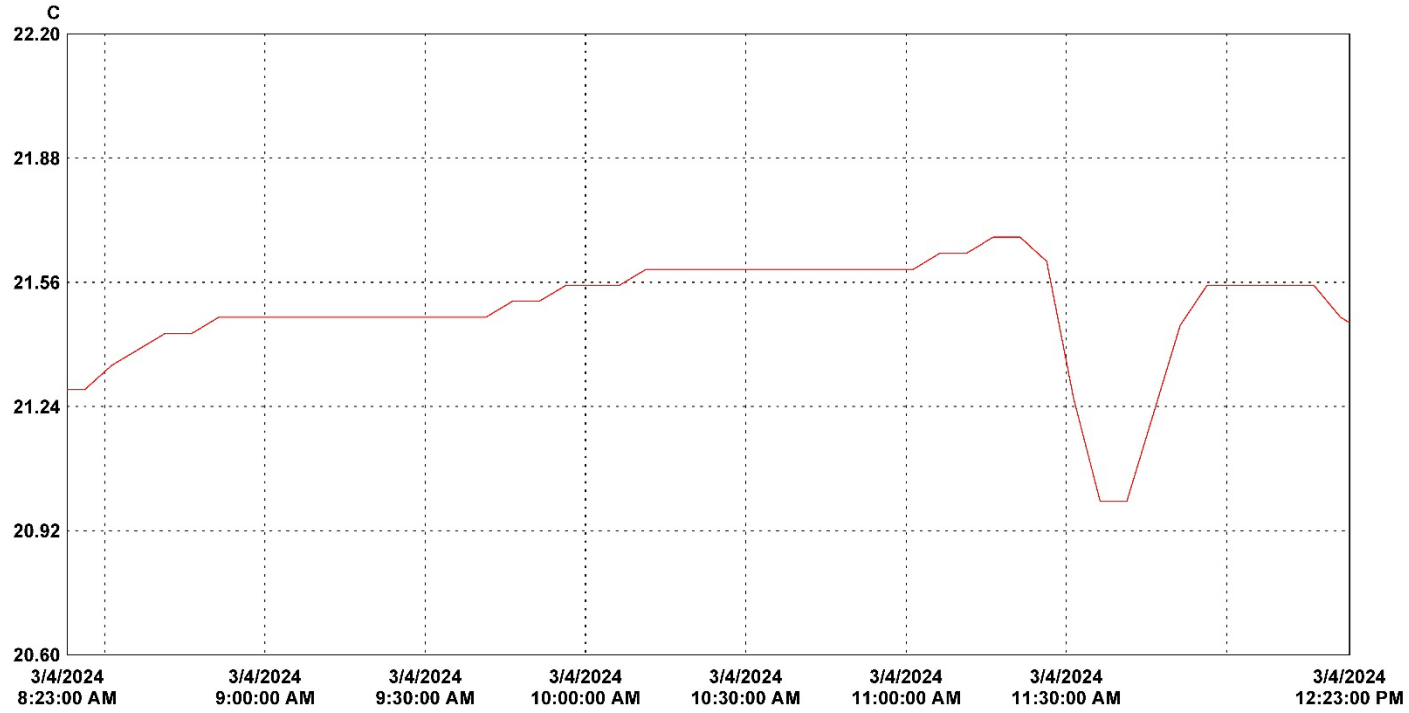
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eight Minute
0° to 90°				
90° to 180°				
180° to 270°				
270° to 360°				

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: 2023 Lucid Air 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20234600
Test Date: 3/4/2024



30 minutes/div 4 hours (M/d/yyyy h:mm:ss tt) Central Time Graph file (truncated): O20234600 2023 Lucid Air 4-Dr Sedan Frontal NCAP.spg

LN	Serial #	Description	CH	Value	Maximum	Average	Minimum	Units	CH description	Logger file
1	21282027	VSC_Prep_Room	1		21.68	21.49	21.00	C	Temperature	21282027_VSC_Prep_Room (Mar 2024).spl

DATA SHEET NO. 305-1
GENERAL TEST AND VEHICLE PARAMETER DATA
FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle: 2023 Lucid Air 4-Door Sedan NHTSA No.: O20234600
Test Program: NCAP Frontal Barrier Impact Test Test Date: 3/4/2024

ELECTRIC VEHICLE PROPULSION SYSTEM

	Units	Observations and Conclusions
Type of Electric Vehicle		Electric
Propulsion Battery Type		Lithium-ion
Nominal Voltage	V	792
Physical Location of Automatic Propulsion Battery Disconnect		Inside the battery pack (battery disconnect unit)
Auxiliary Battery Type		N/A

PROPULSION BATTERY SYSTEM DATA

	Units		Observations and Conclusions
Electrolyte Fluid Type			Carbonates
Electrolyte Fluid Specific Gravity			1.254
Electrolyte Fluid Kinematic Viscosity			N/A
Electrolyte Fluid Color			Transparent
Propulsion Battery Coolant Type, Color, Specific Gravity (if applicable)			Glycolated water (orange)
Location of Battery Modules			Inside Passenger Compartment
		X	Outside Passenger Compartment
			The high-voltage battery is located on the underside of the vehicle.

PROPULSION BATTERY STATE OF CHARGE

For all battery types:	
Voltage range corresponding to **useable energy** of the battery:	
Minimum State of Charge	
Maximum State of Charge	924
95% of Maximum State of Charge	878
Test Voltage - No less than 95% of maximum State of Charge	913
For batteries that are rechargeable ONLY by an energy source on the vehicle:	
Voltage range corresponding to **useable energy** of the battery:	
Minimum State of Charge	
Maximum State of Charge	
Test Voltage – Maximum practicable State of Charge within Normal Operating Range	

DATA SHEET NO. 305-2
PRE-IMPACT DATA
FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle: 2023 Lucid Air 4-Door Sedan NHTSA No.: O20234600
Test Program: NCAP Frontal Barrier Impact Test Test Date: 3/4/2024

VEHICLE CHASSIS GROUND POINT(S) LOCATION(S)

Details of Vehicle Chassis Ground Point(s) & Location(s)	Vehicle underbody

PROPULSION BATTERY SYSTEM

Details of Electric Energy Storage/Conversion System Test Points	Connected at + and – terminal ends of propulsion system
Additional Comments	None

DATA SHEET NO. 305-3
PRE-IMPACT ELECTRICAL ISOLATION MEASUREMENTS AND CALCULATIONS
FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle: 2023 Lucid Air 4-Door Sedan NHTSA No.: O20234600
Test Program: NCAP Frontal Barrier Impact Test Test Date: 3/4/2024

VOLTMETER INFORMATION

	Units	Observations and Conclusions
Make		Fluke
Model		177
Serial Number		62100018
Internal Impedance Value	MΩ	> 10 MΩ < 100 pF
Resolution	V	0.001
Last Calibration Date		7/14/2023

PROPULSION BATTERY VOLTAGE

Measurement shall be made with Energy Storage/Conversion System connected to the vehicle propulsion system, and the vehicle in the "ready-to-drive" (propulsion system energized) position.

NOTE: If voltage measurement is not at the voltage or within the normal operating voltage range specified by the manufacturer, the battery must be charged.

Vb	V	913

ELECTRIC ISOLATION MEASUREMENTS
PROPULSION BATTERY TO VEHICLE CHASSIS

Vehicle chassis point(s) determined and supplied to contractor by COTR.

V1	V	492.4
V2	V	330.0

PROPULSION BATTERY TO VEHICLE CHASSIS ACROSS RESISTOR

The known resistance Ro (in ohms) should be approximately 500 times the normal operating voltage of the vehicle (in volts) per SAE J1766.

Ro	Ω	542,700

V1' Pre-Impact	V	63.7
V2' Pre-Impact	V	58.1

DATA SHEET NO. 305-3 (CONTINUED)
PRE-IMPACT ELECTRICAL ISOLATION MEASUREMENTS AND CALCULATIONS
FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle:	2023 Lucid Air 4-Door Sedan	NHTSA No.:	O20234600
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	3/4/2024

ELECTRICAL ISOLATION CALCULATIONS

NOTE: If measured voltage is zero and results in a division by zero, record “Zero Volts”.
This “zero voltage” condition is considered as being compliant.

Ri1 = Ro (1 + V2/V1) [(V1-V1’)/V1’]		
Ri1 Pre-Impact	Ω	6,100,128
Ri2 = Ro (1 + V1/V2) [(V2-V2’)/V2’]		
Ri2 Pre-Impact	Ω	6,329,393
Ri = The lesser of Ri1 and Ri2		
Ri Pre-Impact	Ω	6,100,128
Ri / Vb = Electrical Isolation Value / Nominal Battery Voltage		
Ri / Vb Pre-Impact	Ω	6,681

NOTE: The minimum Electrical Isolation Value is 500 Ω/V.

	Yes	No (Fail)
Is the measured Electrical Isolation Value ≥ 500 Ω/V?	X	
Additional Comments	None	

DATA SHEET NO. 305-4
POST-IMPACT DATA
FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle: 2023 Lucid Air 4-Door Sedan NHTSA No.: O20234600
Test Program: NCAP Frontal Barrier Impact Test Test Date: 3/4/2024

VOLTMETER INFORMATION

	Units	Observations and Conclusions
Make		Fluke
Model		177
Serial Number		62100018
Internal Impedance Value	MΩ	> 10 MΩ < 100 pF
Resolution	V	0.001
Last Calibration Date		7/14/2023

ELECTRICAL ISOLATION MEASUREMENTS

Vb Post-Impact	V	69.1

V1 Post-Impact	V	24.7	Impact Time	1	Minutes	29	Seconds
V2 Post-Impact	V	26.2		1	Minutes	33	Seconds
V1' Post-Impact	V	3.0		1	Minutes	45	Seconds
V2' Post-Impact	V	3.0		1	Minutes	40	Seconds

Ro	Ω	542,700

DATA SHEET NO. 305-4 (CONTINUED)
POST-IMPACT DATA
FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle:	2023 Lucid Air 4-Door Sedan	NHTSA No.:	O20234600
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	3/4/2024

ELECTRICAL ISOLATION CALCULATIONS

NOTE: If measured voltage is zero and results in a division by zero, record "Zero Volts". This "zero voltage" condition is considered as being compliant.

Ri1 = Ro (1 + V2/V1) [(V1-V1')/V1']							
Ri1 Post-Impact	Ω	8,089,453	Impact Time	1	Minutes	45	Seconds
Ri2 = Ro (1 + V1/V2) [(V2-V2')/V2']							
Ri2 Post-Impact	Ω	8,153,481	Impact Time	1	Minutes	40	Seconds
Ri = The lesser of Ri1 and Ri2							
Ri Post-Impact	Ω	8,089,453	Impact Time	1	Minutes	45	Seconds
Ri / Vb = Electrical Isolation Value / Nominal Battery Voltage							
Ri / Vb Post-Impact	Ω	117,069	Impact Time	1	Minutes	45	Seconds

NOTE: The minimum Electrical Isolation Value is 500 Ω/V.

	Yes	No (Fail)
Is the measured Electrical Isolation Value ≥ 500 Ω/V?	X	
Additional Comments	None	

DATA SHEET NO. 305-4 (CONTINUED)
POST-IMPACT DATA
FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle: 2023 Lucid Air 4-Door Sedan NHTSA No.: O20234600
Test Program: NCAP Frontal Barrier Impact Test Test Date: 3/4/2024

PROPULSION BATTERY SYSTEM COMPONENTS

Describe any Propulsion Battery Module movement within the passenger compartment [Supply photographs as appropriate]:
Not Applicable

	Yes (Fail)	No
Has the Propulsion Battery Module moved within the passenger compartment?		X

Describe intrusion of an outside Propulsion Battery Component into the passenger compartment [Supply photographs as appropriate]:
No Intrusion

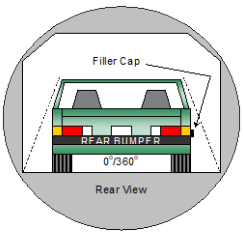
	Yes (Fail)	No
Has an outside Propulsion Battery Component intruded into the passenger compartment?		X

	Yes (Fail)	No
Is the Propulsion Battery Electrolyte Spillage visible in the passenger compartment?		X

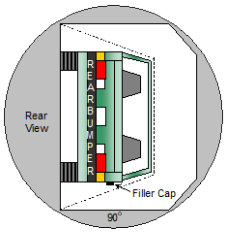
DATA SHEET NO. 305-5
STATIC ROLLOVER TEST DATA
FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle: 2023 Lucid Air 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20234600
Test Date: 3/4/2024

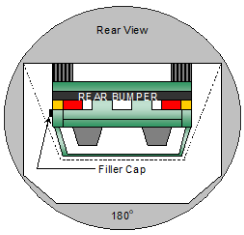
PROPULSION BATTERY SYSTEM COMPONENTS



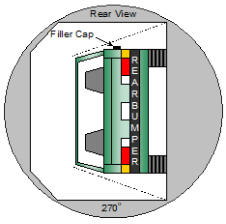
0°/360°



90°



180°



270°

PROPULSION BATTERY ELECTROLYTE COLLECTION TIME PERIOD

Test Phase	Rotation Time (spec. 1-3 min)				FMVSS 301 Hold Time		Total Time				Next Whole Minute Interval	
0° - 90°	1	min	52	sec	5	min	6	min	52	sec	7	min
90° - 180°	1	min	52	sec	5	min	6	min	52	sec	7	min
180° - 270°	1	min	48	sec	5	min	6	min	48	sec	7	min
270° - 360°	1	min	50	sec	5	min	6	min	50	sec	7	min

TEST VEHICLE PROPULSION BATTERY ELECTROLYTE SPILLAGE

NOTE: The maximum allowable Propulsion Battery Electrolyte Spillage is 5.0 Liters.

Test Phase	Propulsion Battery Electrolyte Spillage (L)	Spillage Location
0° to 90°	0	Not Applicable
90° to 180°	0	Not Applicable
180° to 270°	0	Not Applicable
270° to 360°	0	Not Applicable
Total Spillage	0	

	Yes (Fail)	No
Is the total Propulsion Battery Electrolyte Spillage greater than 5.0 Liters?		X
Is the Propulsion Battery Electrolyte Spillage visible in the passenger compartment?		X

DATA SHEET NO. 305-5 (CONTINUED)
STATIC ROLLOVER TEST DATA
FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle: 2023 Lucid Air 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20234600
Test Date: 3/4/2024

VOLTMETER INFORMATION

	Units	Observations and Conclusions
Make		Fluke
Model		177
Serial Number		62100018
Internal Impedance Value	MΩ	> 10 MΩ < 100 pF
Resolution	V	0.001
Last Calibration Date		7/14/2023

ELECTRICAL ISOLATION MEASUREMENTS

Vb Post-Impact	V	0.0
Ro	Ω	542,700

Record V1, V2, V1', V2' voltage measurements at the start of each successive increment of 90°, 180°, 270°, and 360° of the static rollover test.

	Voltage	Units	Test Phase	Time			
V1	0.0	V	0°		min		sec
	0.0		90°	2		54	
	0.0		180°	2		55	
	0.0		270°	2		45	
	0.0		360°	2		58	
V2	0.0	V	0°		min		sec
	0.0		90°	2		59	
	0.0		180°	2		59	
	0.0		270°	2		50	
	0.0		360°	3		1	
V1'	0.0	V	0°		min		sec
	0.0		90°	3		13	
	0.0		180°	3		14	
	0.0		270°	3		3	
	0.0		360°	3		15	
V2'	0.0	V	0°		min		sec
	0.0		90°	3		6	
	0.0		180°	3		6	
	0.0		270°	2		56	
	0.0		360°	3		7	

DATA SHEET NO. 305-5 (CONTINUED)
STATIC ROLLOVER TEST DATA
FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle: 2023 Lucid Air 4-Door Sedan NHTSA No.: O20234600
Test Program: NCAP Frontal Barrier Impact Test Test Date: 3/4/2024

ELECTRICAL ISOLATION CALCULATIONS

NOTE: If measured voltage is zero and results in a division by zero, record "Zero Volts". This "zero voltage" condition is considered as being compliant.

	Voltage	Units	Test Phase	Time			
Ri1 = Ro (1 + V2/V1) [(V1-V1')/V1']							
Ri1	Zero Volts	Ω	0°		min		sec
	Zero Volts		90°	3		13	
	Zero Volts		180°	3		14	
	Zero Volts		270°	3		3	
	Zero Volts		360°	3		15	
Ri2 = Ro (1 + V1/V2) [(V2-V2')/V2']							
Ri2	Zero Volts	Ω	0°		min		sec
	Zero Volts		90°	3		6	
	Zero Volts		180°	3		6	
	Zero Volts		270°	2		56	
	Zero Volts		360°	3		7	
Ri = The lesser of Ri1 and Ri2							
Ri	Zero Volts	Ω	0°		min		sec
	Zero Volts		90°	3		6	
	Zero Volts		180°	3		6	
	Zero Volts		270°	2		56	
	Zero Volts		360°	3		7	
Ri / Vb = Electrical Isolation Value / Nominal Battery Voltage							
Ri / Vb	Zero Volts	Ω/V	0°		min		sec
	Zero Volts		90°	3		6	
	Zero Volts		180°	3		6	
	Zero Volts		270°	2		56	
	Zero Volts		360°	3		7	

NOTE: The minimum Electrical Isolation Value is 500 Ω/V.

	Yes	No (Fail)
Is the measured Electrical Isolation Value ≥ 500 Ω/V?	X	
Additional Comments	None	

APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

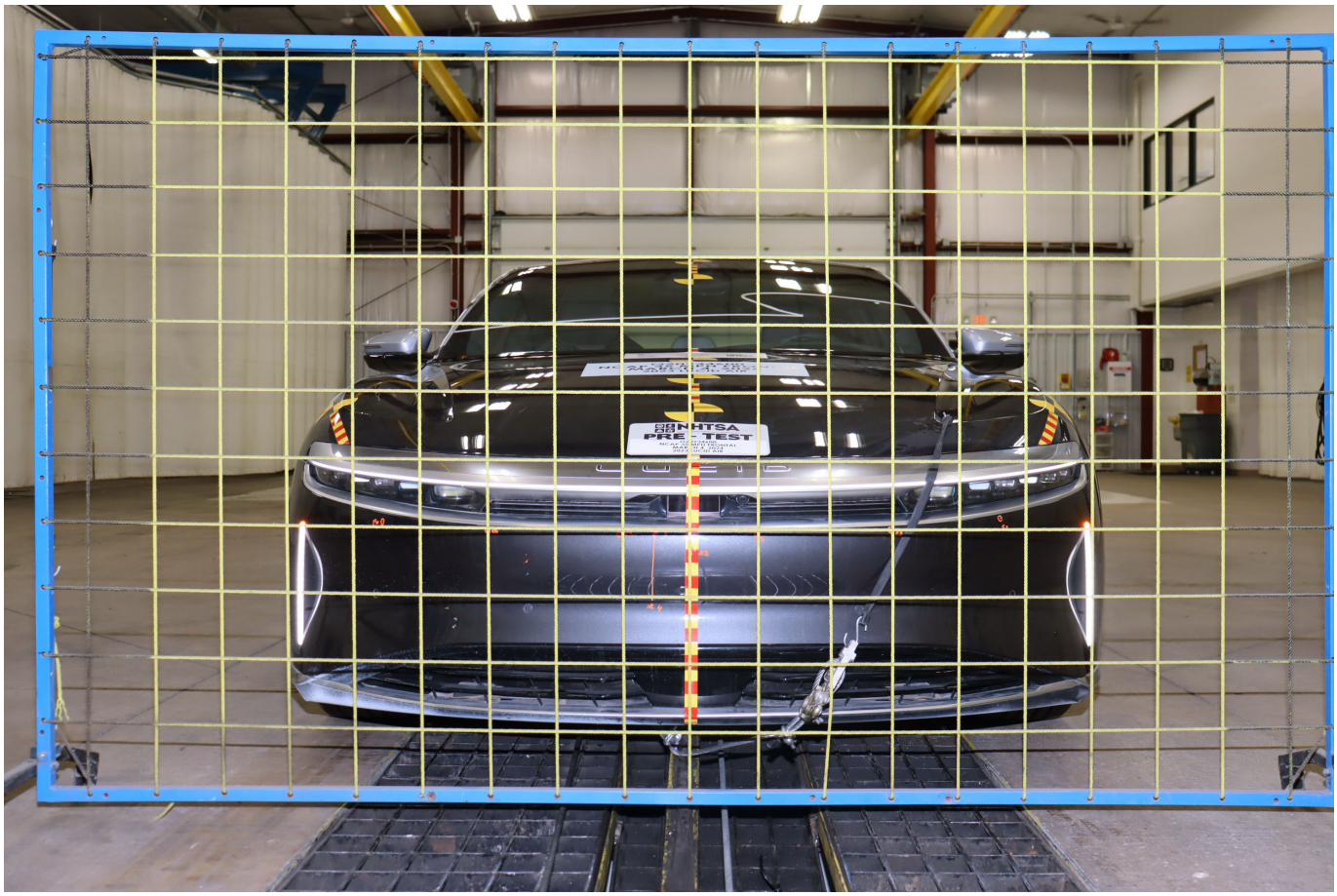


Photo No. 001 - Load Cell Location

Photo No. 002 - Pre-Test Load Cell Wall

Photo No. 003 - Post-Test Load Cell Wall

Photo No. 004 - Manufacturer's Label

Photo No. 005 - Tire Placard

Photo No. 006 - 2023 Lucid Air 4-Door Sedan Frontal As Delivered

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

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

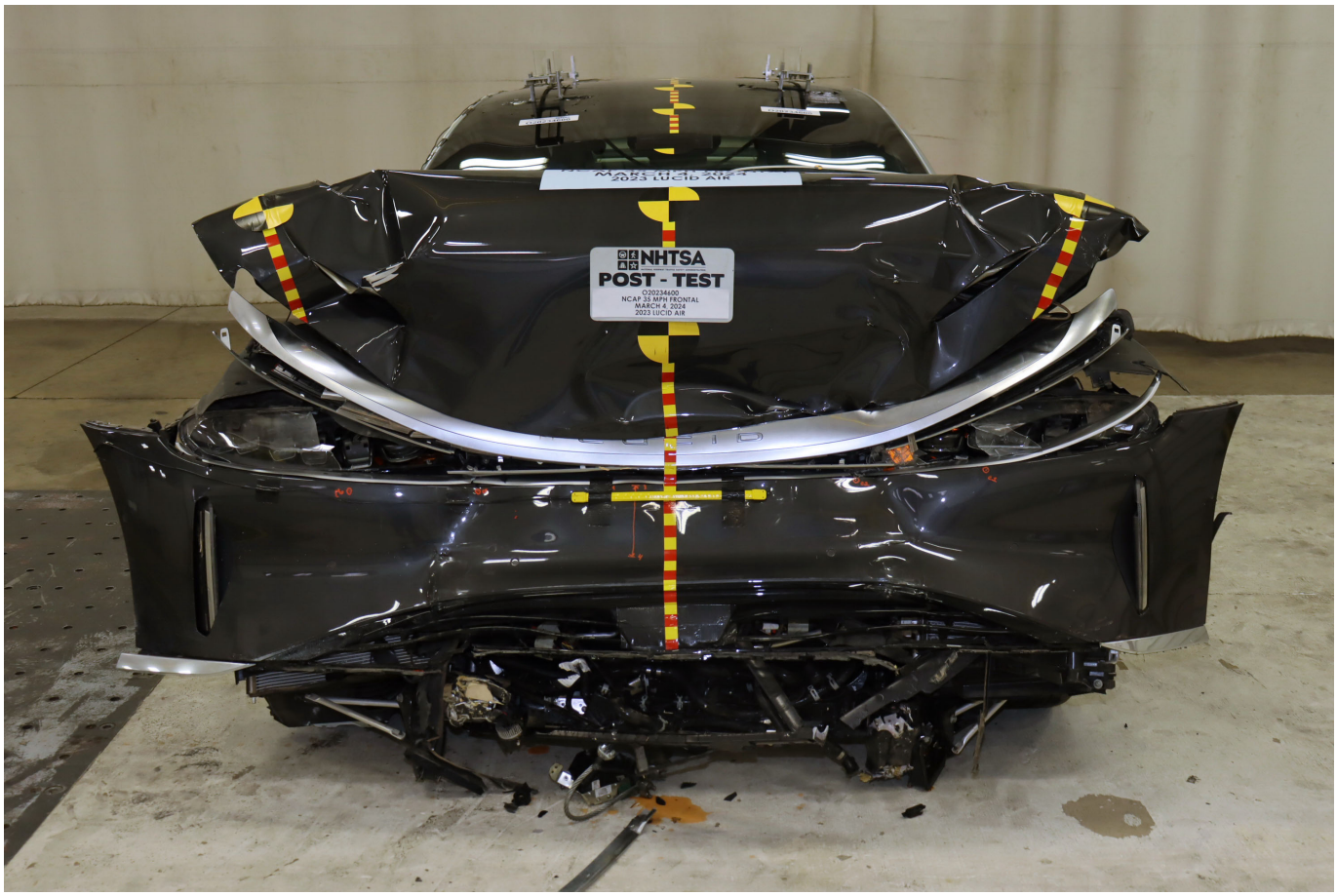


Photo No. 009 - Post-Test Front View of Test Vehicle

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

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

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

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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

PHOTOGRAPH NOT AVAILABLE

Photo No. 021 - Post-Test Engine Compartment View

PHOTOGRAPH NOT APPLICABLE

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

PHOTOGRAPH NOT APPLICABLE

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

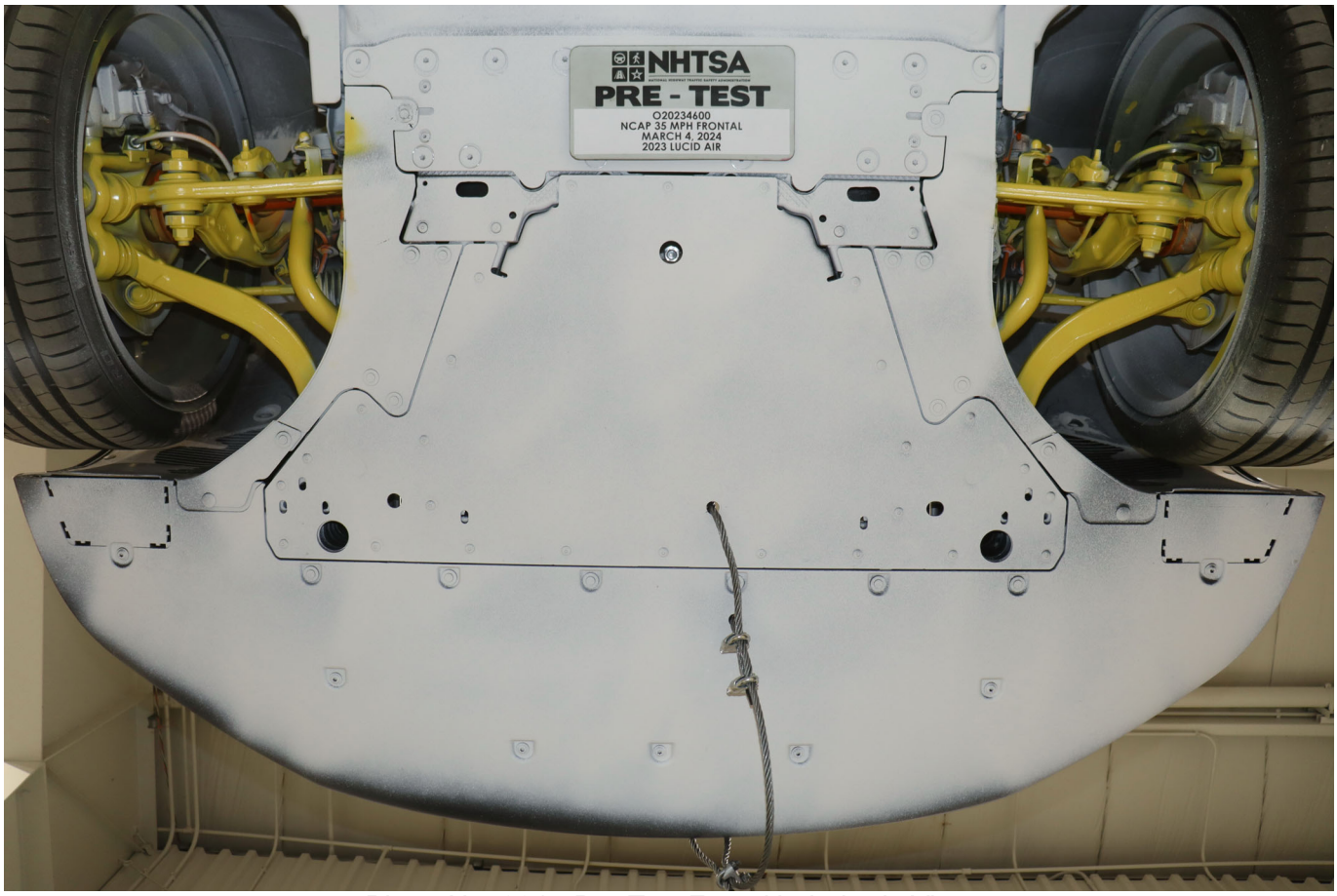

Photo No. 024 - Pre-Test Front Underbody View

Photo No. 025 - Post-Test Front Underbody View

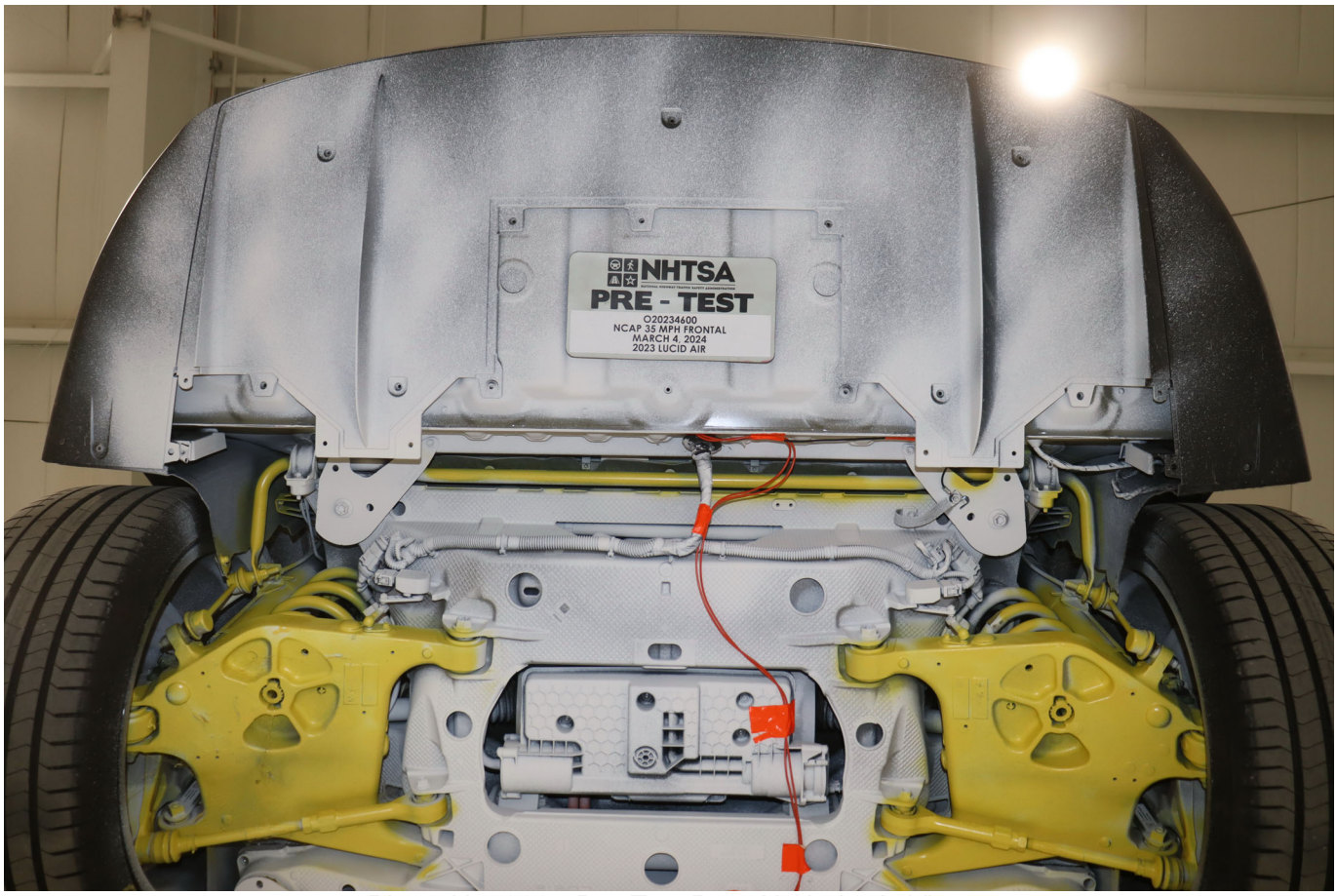

Photo No. 026 - Pre-Test Rear Underbody View

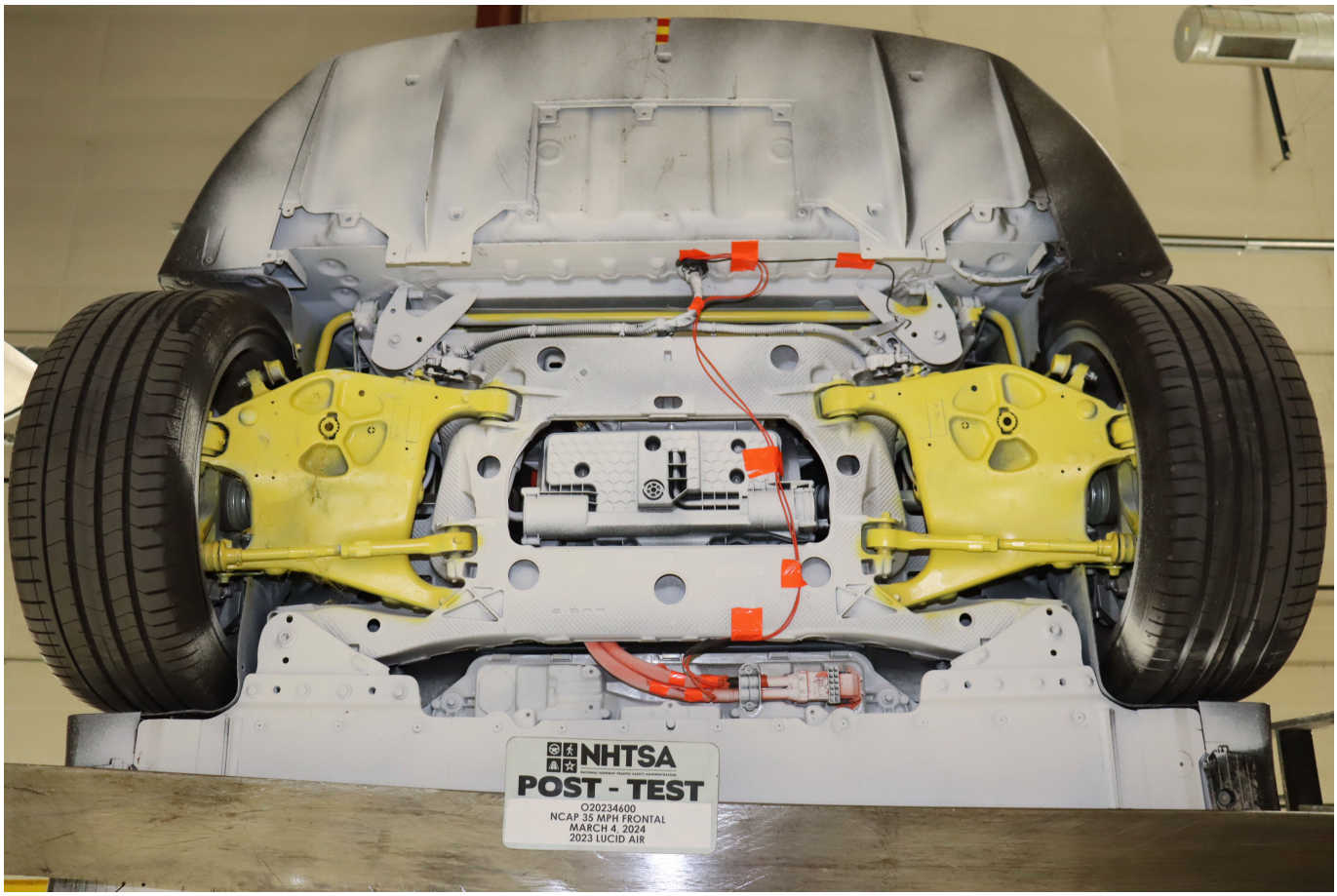

Photo No. 027 - Post-Test Rear Underbody View

Photo No. 028 - Pre-Test Dummy Cable Routing

Photo No. 029 - Post-Test Dummy Cable Routing

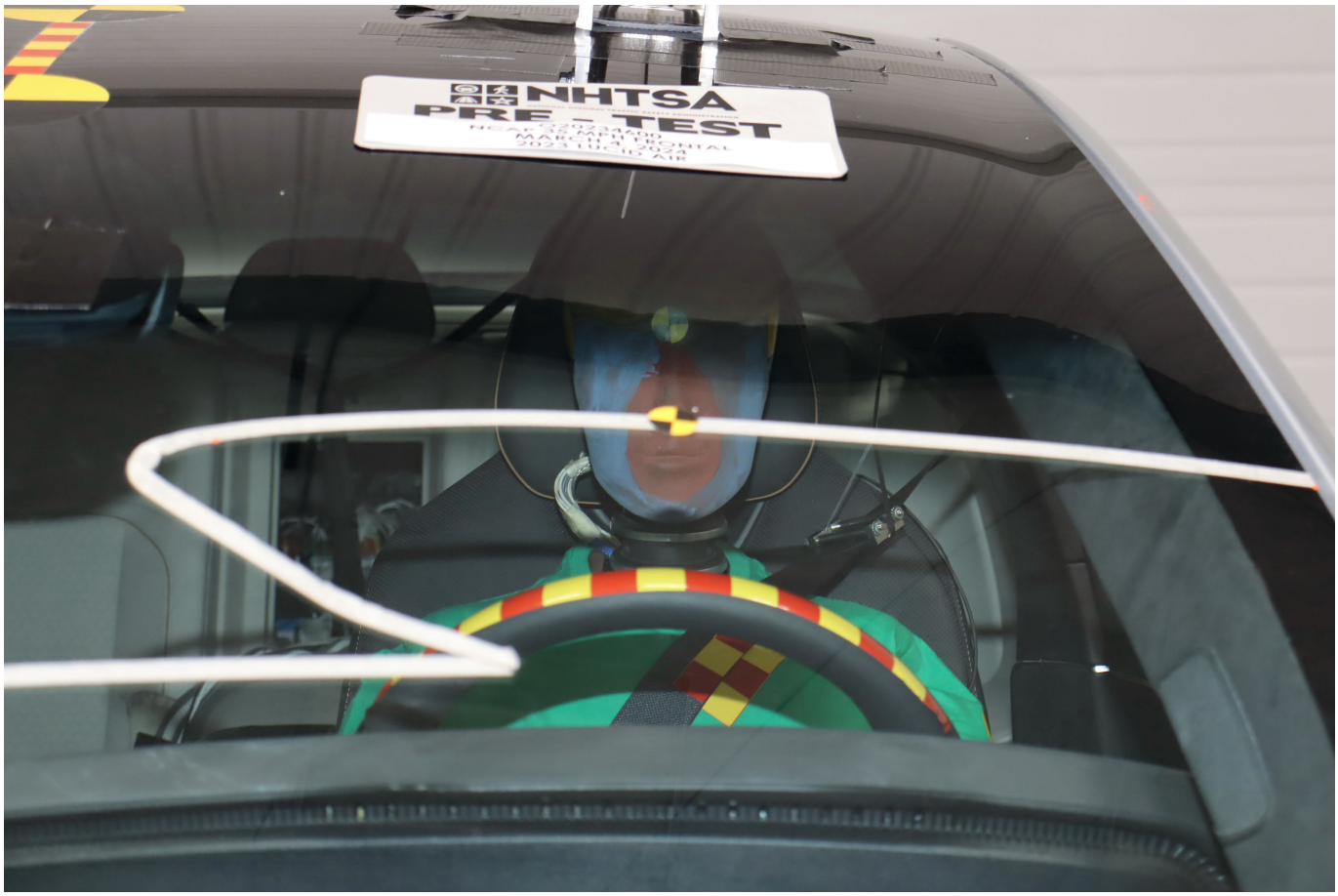

Photo No. 030 - Pre-Test Driver Dummy Front View

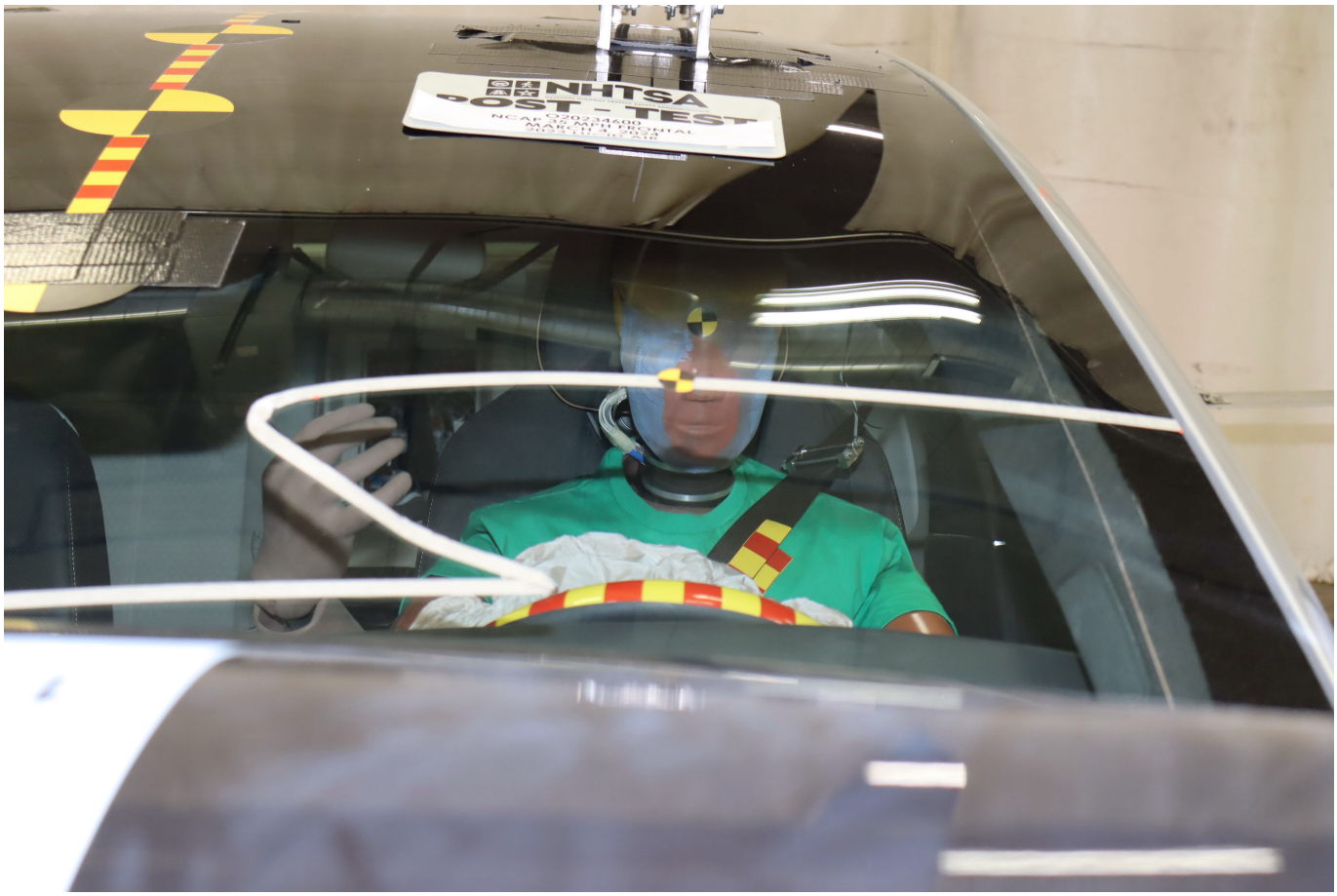

Photo No. 031 - Post-Test Driver Dummy Front View

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 View

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

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

Photo No. 037 - Post-Test Driver's 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's Side Knee Bolster

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

Photo No. 046 - Pre-Test Driver's Side Floorpan

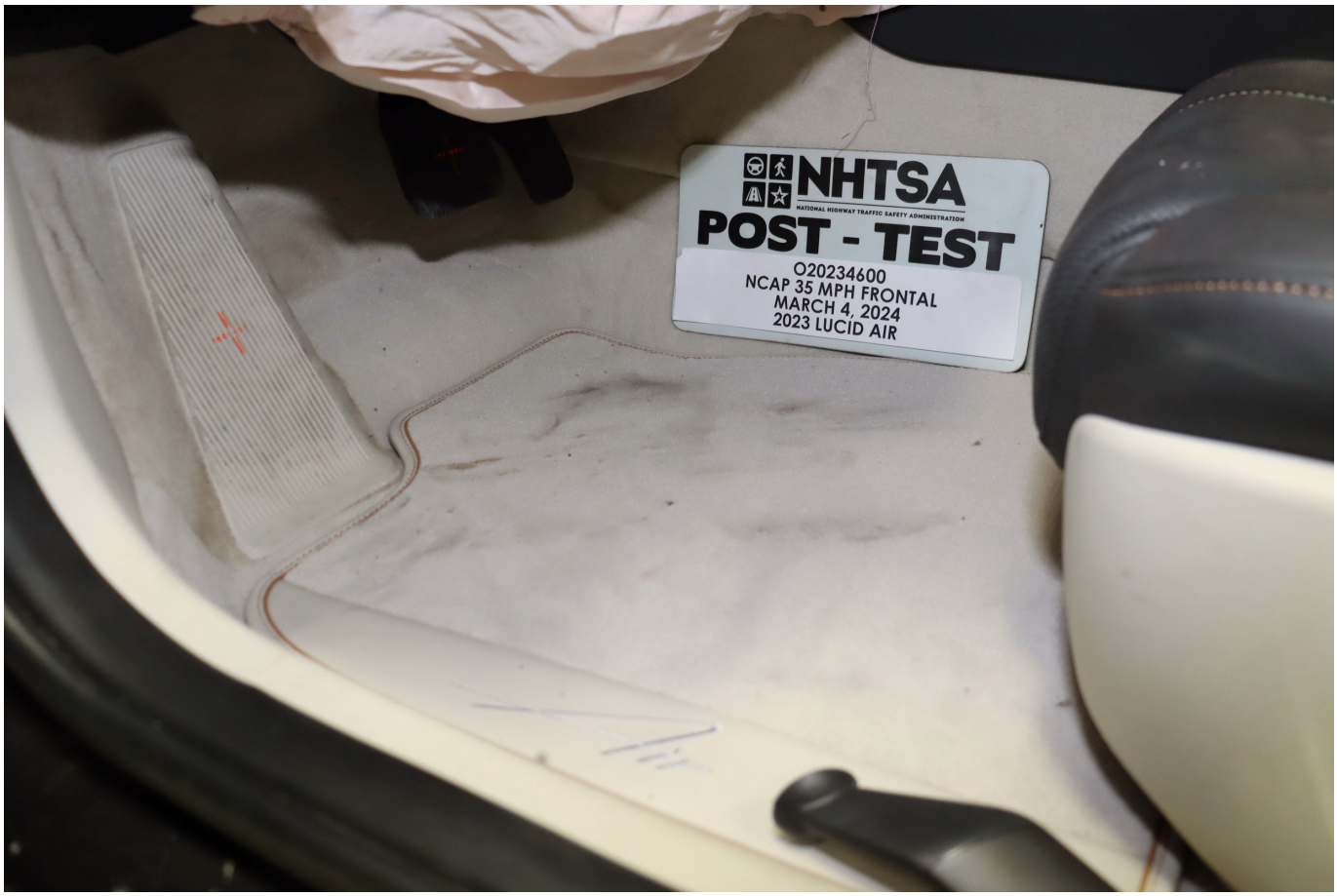

Photo No. 047 - Post-Test Driver's Side Floorpan

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

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

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

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

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

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

Photo No. 060 - Post-Test Passenger's 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

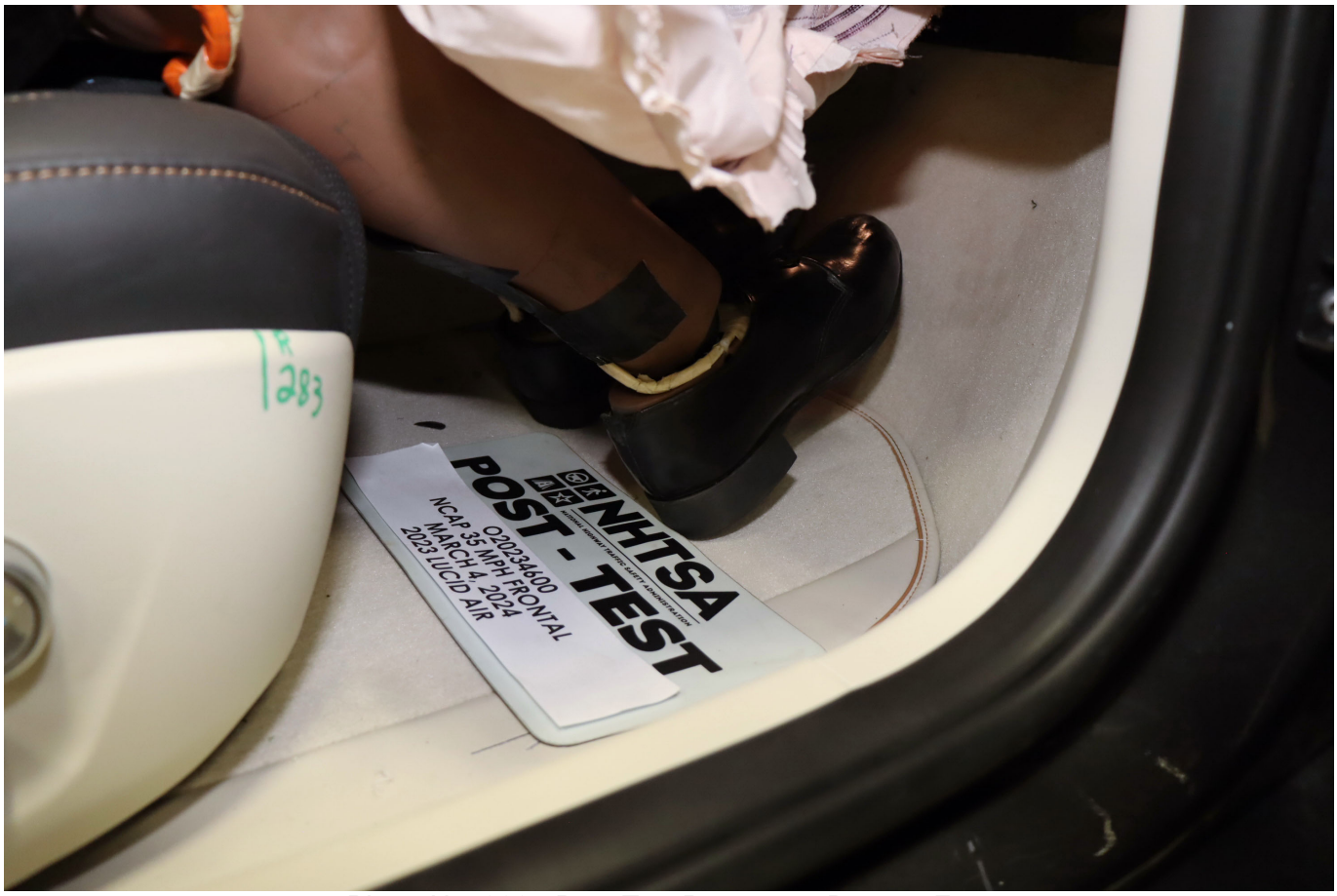


Photo No. 066 - Post-Test Passenger Dummy Feet

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

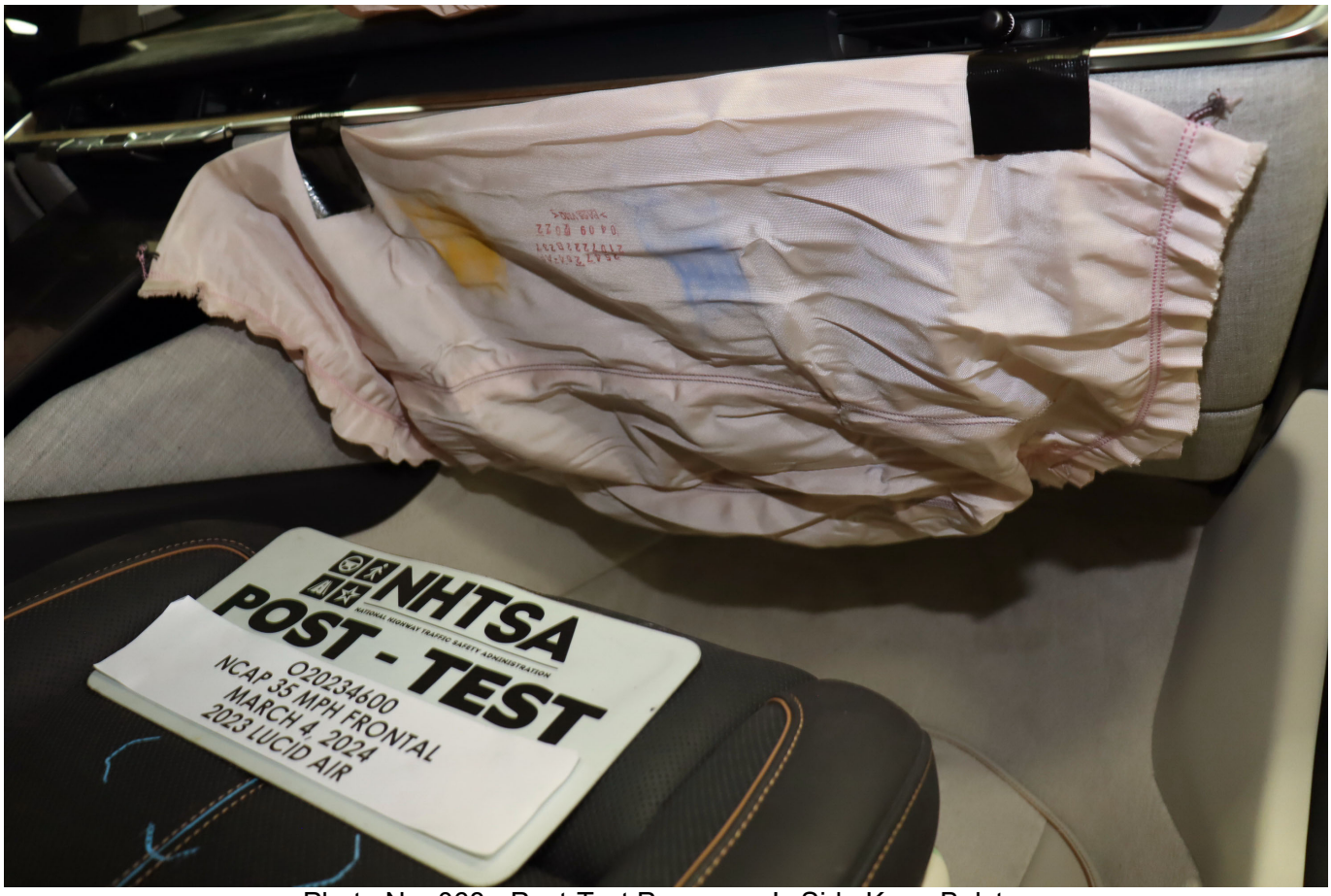


Photo No. 068 - Post-Test Passenger's Side Knee Bolster

Photo No. 069 - Pre-Test Passenger's Side Floorpan

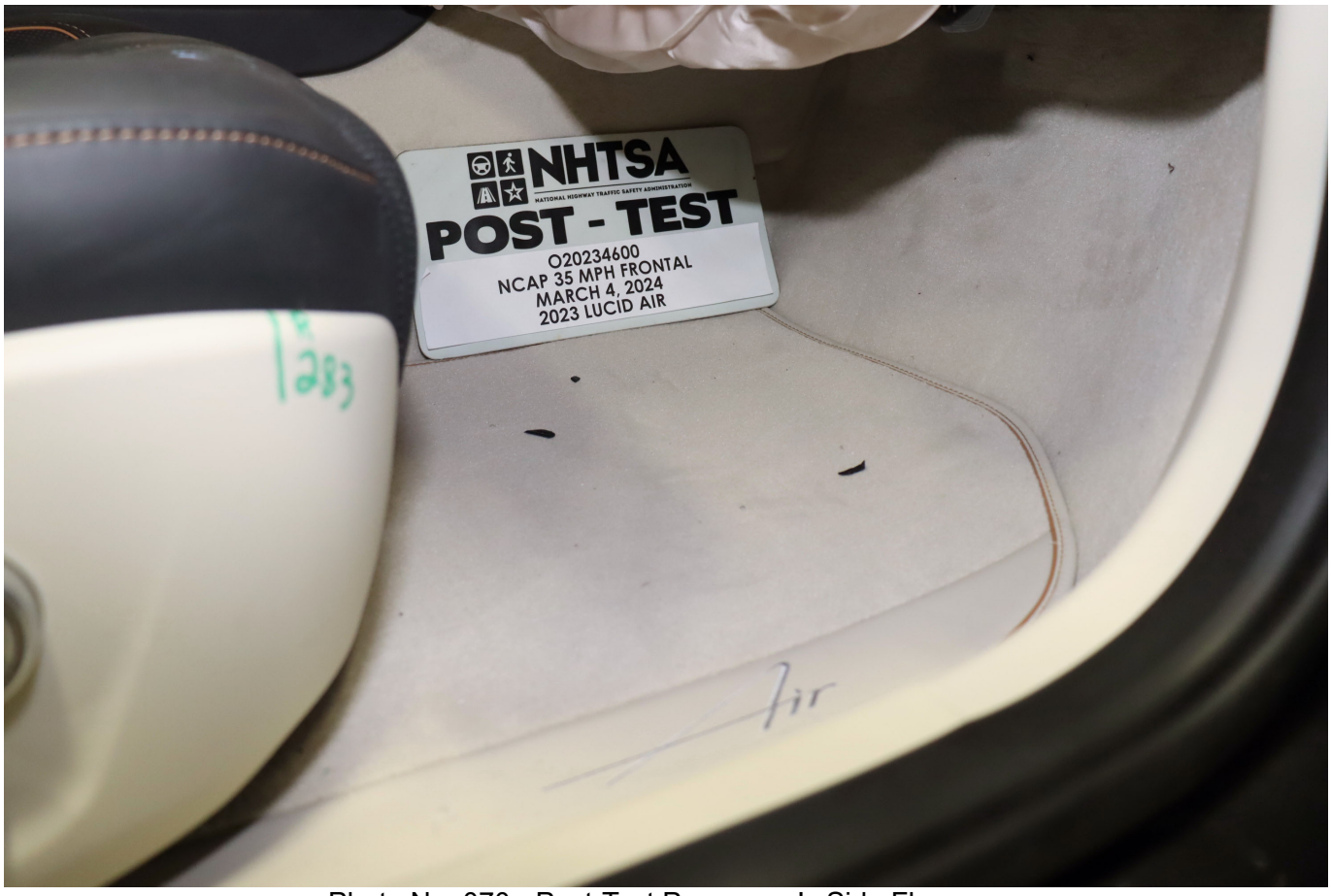


Photo No. 070 - Post-Test Passenger's Side Floorpan

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

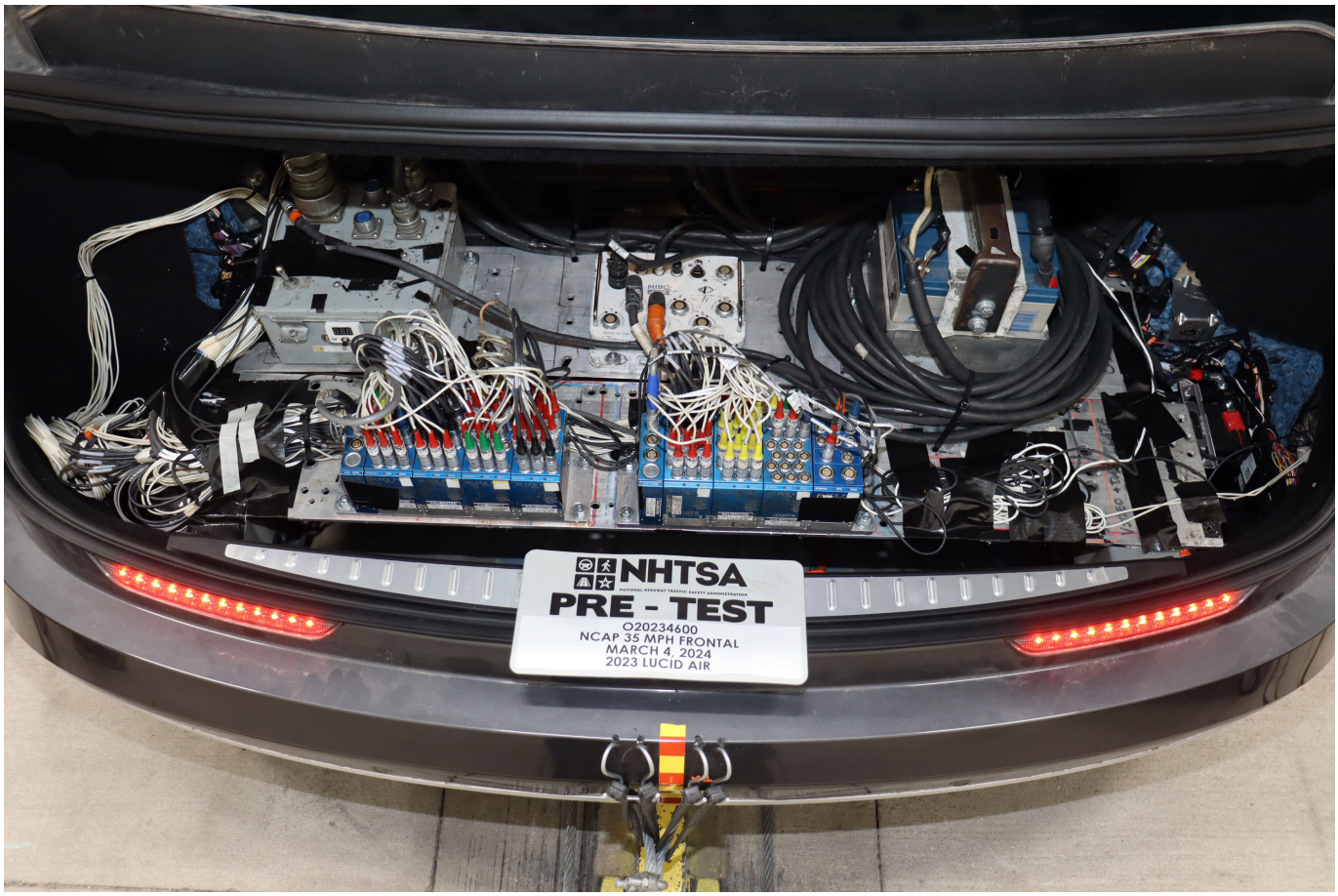


Photo No. 074 - Photograph of Ballast Installed in Vehicle

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 - 2023 Lucid Air 4-Door Sedan Frontal Impact Event

LUCID

2023 LUCID AIR SEDAN

VIN : 50EA1GBA0PA002038
MODEL : Air Grand Touring Standard
INTERIOR : Grand Touring Luxe-Santa Cruz
EXTERIOR : Quantum Gray

STANDARD EQUIPMENT INCLUDED AT NO EXTRA CHARGE

EXTERIOR
21" Aero Blade Wheels
Glass Canopy Roof with Heat & Sunlight Blocking Technology
Platinum Polish Canopy Roof Trim
Heated Precision Wipers
Power Trunk & Frunk Open/Close Soft-Close Doors
Auto-Dimming, Power Folding, & Heated Exterior Mirrors
Intelligent Micro Lens Array LED Headlights including:
- Adaptive Front Lighting System
- Automatic Headlights with Daytime LED Signature
Speedform LED Taillight
32 Multimodel DreamDrive™ Sensors
Power Charge Port Door
Rear Fog Lamp
Powered Illuminated Door Handles

INTERIOR
34" Glass Cockpit Display Screen
Retractable Pilot Panel Screen
Nappa Full-Grain & Premium Natural Grain Leather
Interior Wood Accents
20-Way Power Front Ventilated & Heated Seats with Massage
Heated Steering Wheel
5-Zone Heated Rear Seats
Lucid UX with Navigation
Surreal Sound™ System with 21 Speakers
AM/FM HD Radio
Smartphone Wireless Charging
Bluetooth® Wireless Technology
4-Zone Automatic Climate Control
Power Rear & Rear Side Window Sunshades
60/40 Folding Rear Seatback with Pass-Through

FUNCTIONAL
819 Horsepower
Dual Motor, All-Wheel Drive
4 Year/50,000 Mile New Vehicle Limited Warranty
4 Year/50,000 Mile 24-Hour Roadside Assistance Program
8 Year/100,000 Mile Battery Limited Warranty (to 70% Capacity)
Selectable Drive Modes
Adaptive Dampers
900V+ Charging System
Wunderbox™ Onboard Boost Charger
Lucid Mobile Charging Cable including:
- NEMA 5-15 & 14-50 Charging Adapters
5 Personalized Driver Profiles
Over-the-Air Software Update Capability

SAFETY/SECURITY
DreamDrive™ Pro including:
- Future-Ready Hardware for Semi-Autonomous Driving
- Blind Spot Monitoring with Blind Spot Display
- Automatic Park In & Out
- Park Distance Warning
- Surround View Monitoring
- Driver Monitoring System with:
- Distracted Driver Alert & Drowsy Driver Alert
Advanced Airbag Deployment System with 8 Airbags
Rear Outboard Seat ISOFIX & Top Tether System

OPTIONAL EQUIPMENT/OTHER
Quantum Gray
Grand Touring Luxe-Santa Cruz
Air Grand Touring

BASE PRICE	$154,000
DESTINATION CHARGES	$1,650
TOTAL MSRP	$155,650

DELIVERED TO	FINAL ASSEMBLY POINT	DELIVERY METHOD
Lucid Group USA, Inc. 3020 N. Scottsdale Road Scottsdale, AZ 85251	317 S. THORNTON ROAD CASA GRANDE, AZ 85193	TRUCK

EPA DOT **Fuel Economy and Environment** — Electric Vehicle

Fuel Economy **121** MPGe — The best vehicle rates 142 MPGe

Combined City/Hwy	City	Highway	kW-hrs per 100 miles
121	121	122	28

Driving Range
When fully charged, vehicle can travel about... 0 100 200 300 400 **469** miles

Charge Time: **13hours** (240V)

You save $3,750 in fuel costs over 5 Years compared to the average new vehicle.

Annual Fuel Cost **$550**

Fuel Economy & Greenhouse Rating (tailpipe only) 1 10 10 Best
Smog Rating (tailpipe only) 1 10 10 Best

This vehicle emits 0 grams CO_2 per mile. The best emits 0 grams per mile (tailpipe only). Does not include emissions from generating electricity; 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 $6,500 to fuel over 5 Years. Cost estimates are based on 15,000 miles per year at $0.13 per kW-hr. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

fueleconomy.gov
Calculate personalised estimates and compare vehicles

Smartphone QR Code™

PARTS CONTENT INFORMATION

FOR VEHICLES IN THIS CAR LINE

US/CANADIAN PARTS CONTENT: 46%

NOTE: Parts content does not include final assembly, distribution or other non-parts costs

FOR THIS VEHICLE:

FINAL ASSEMBLY POINT: CASA GRANDE, AZ

COUNTRY OF ORIGIN:

MOTOR ASSEMBLY: USA

GEARBOX / TRANSMISSION: USA

GOVERNMENT 5-STAR SAFETY RATINGS

Overall vehicle score TO BE RATED
Based on the combined ratings of frontal, side and rollover should only be compared to other vehicles of similar size and weight.

Frontal Crash Driver Passenger TO BE 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 TO BE RATED; Rear seat TO BE RATED
Based on the risk of injury in a side impact.

Rollover TO BE RATED
Based on the risk of rollover in a single-vehicle.

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

Photo No. 083 - Monroney Label Photograph

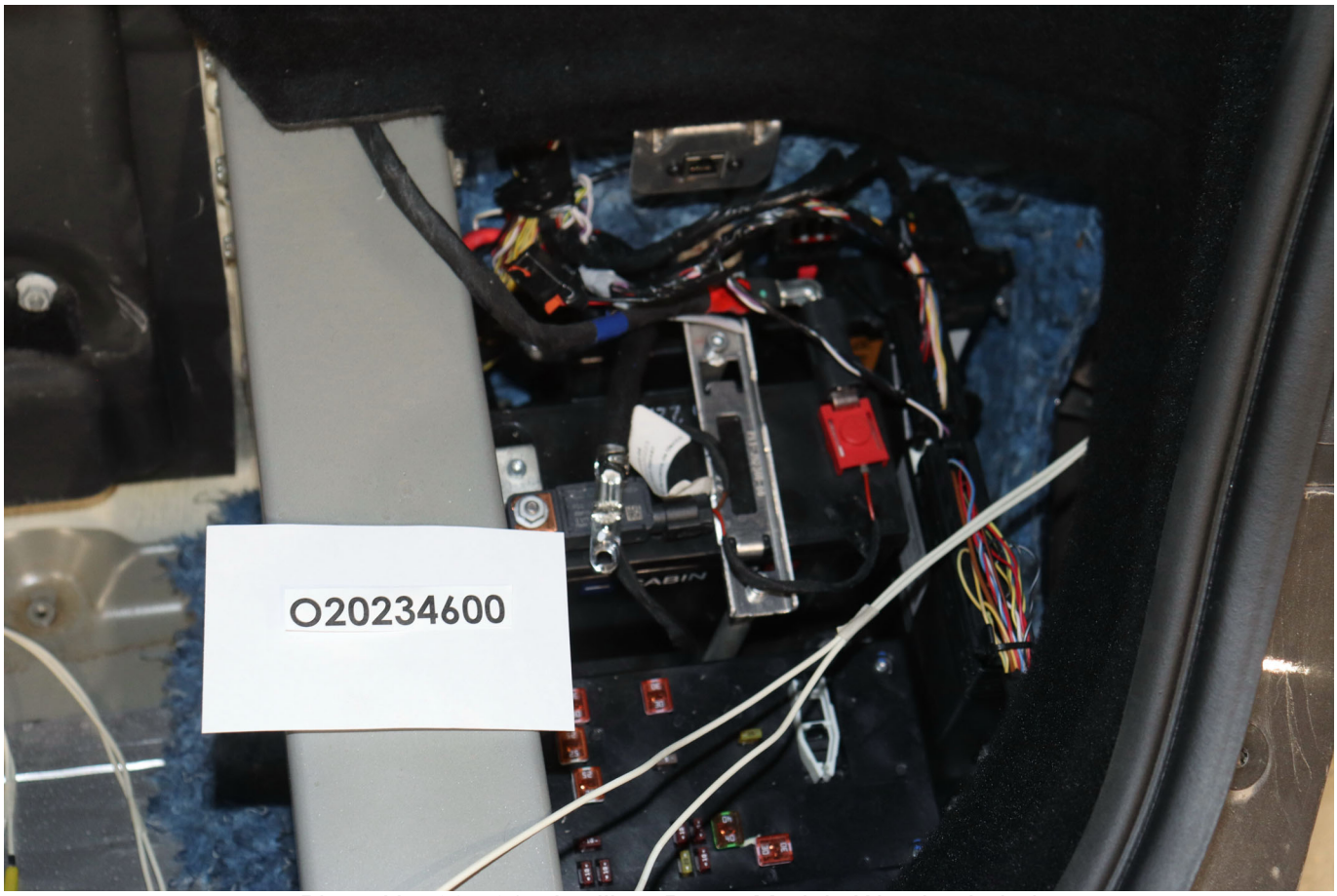


Photo No. 305-01 - Auxiliary Power Module Warning Label

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-02 - Power Inverter Warning Label

Photo No. 305-03 - First Responder Warning Label

Photo No. 305-04 - First Responder Warning Location

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-05 - Other Vehicle Label(s) Related to Electrical Propulsion System

Photo No. 305-06 - Manual High Voltage Service Disconnect in Place

Photo No. 305-07 - Manual High Voltage Service Disconnect Removed

Photo No. 305-08 - Manual High Voltage Service Disconnect Removed

Photo No. 305-09 - Pre-Impact View of Propulsion Battery

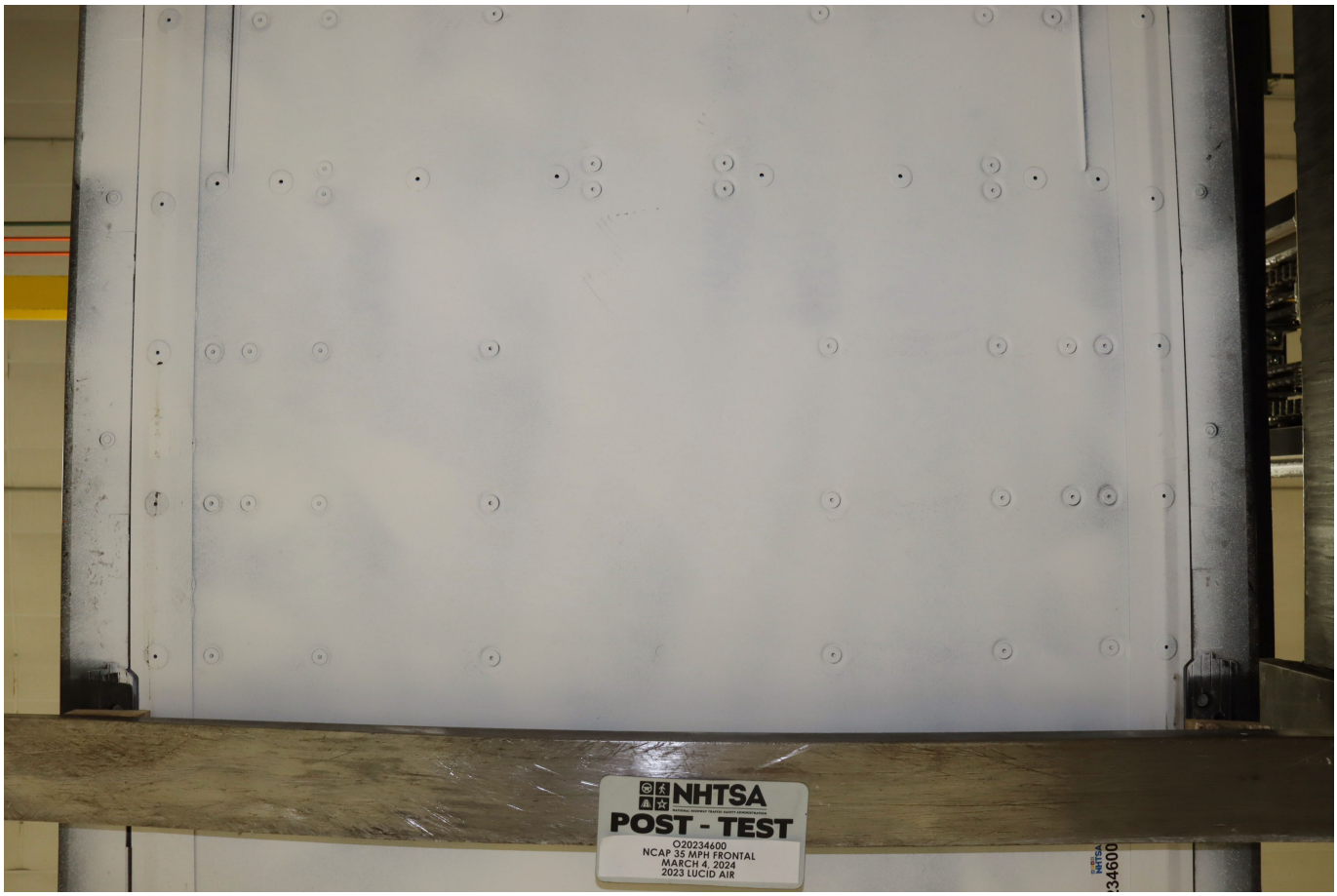


Photo No. 305-10 - Post-Impact Front View of Propulsion Battery

Photo No. 305-11 - Post-Impact Rear View of Propulsion Battery

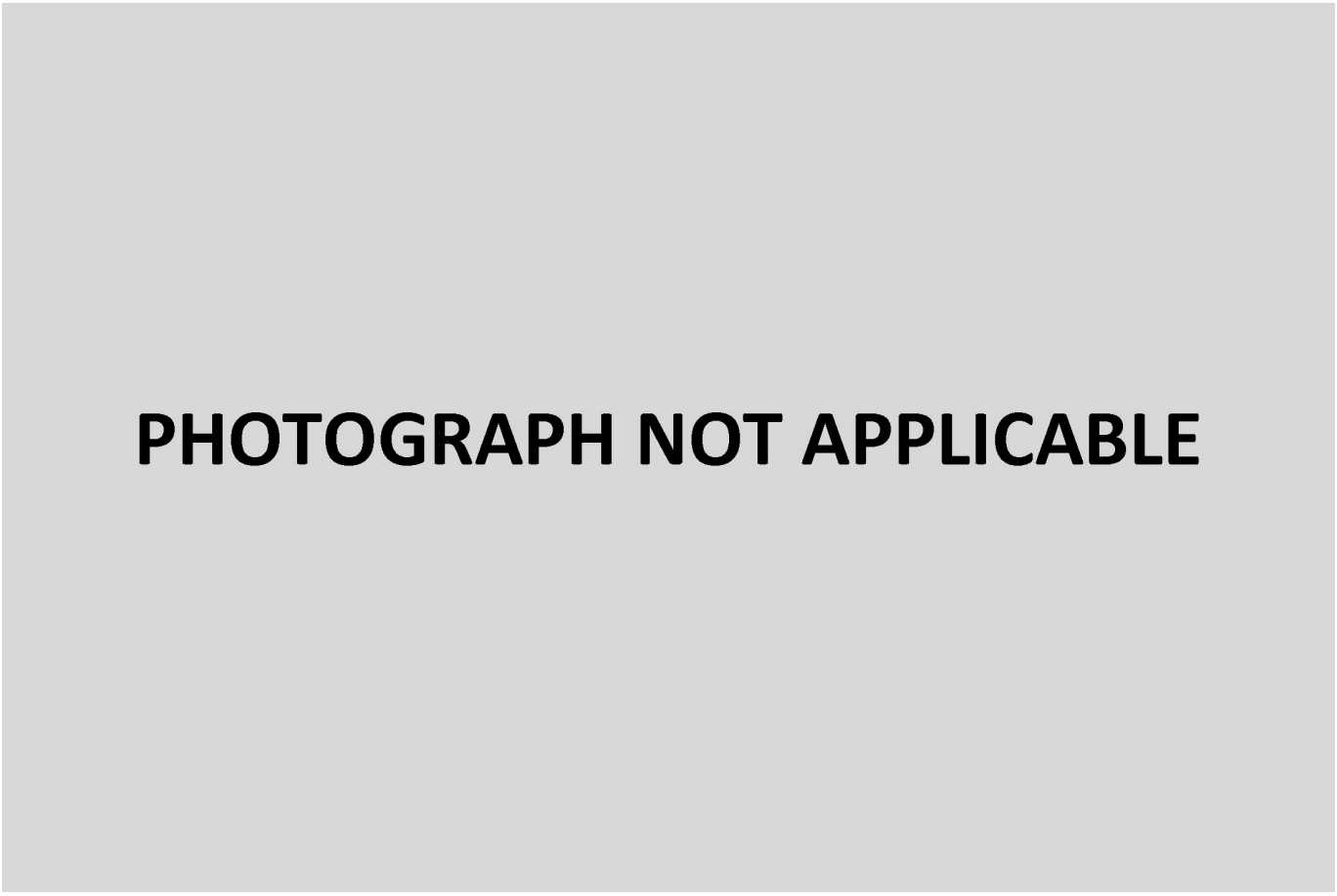


Photo No. 305-12 - Pre-Impact View of Battery Box(s) or Container(s) Which Holds Individual Battery Modules

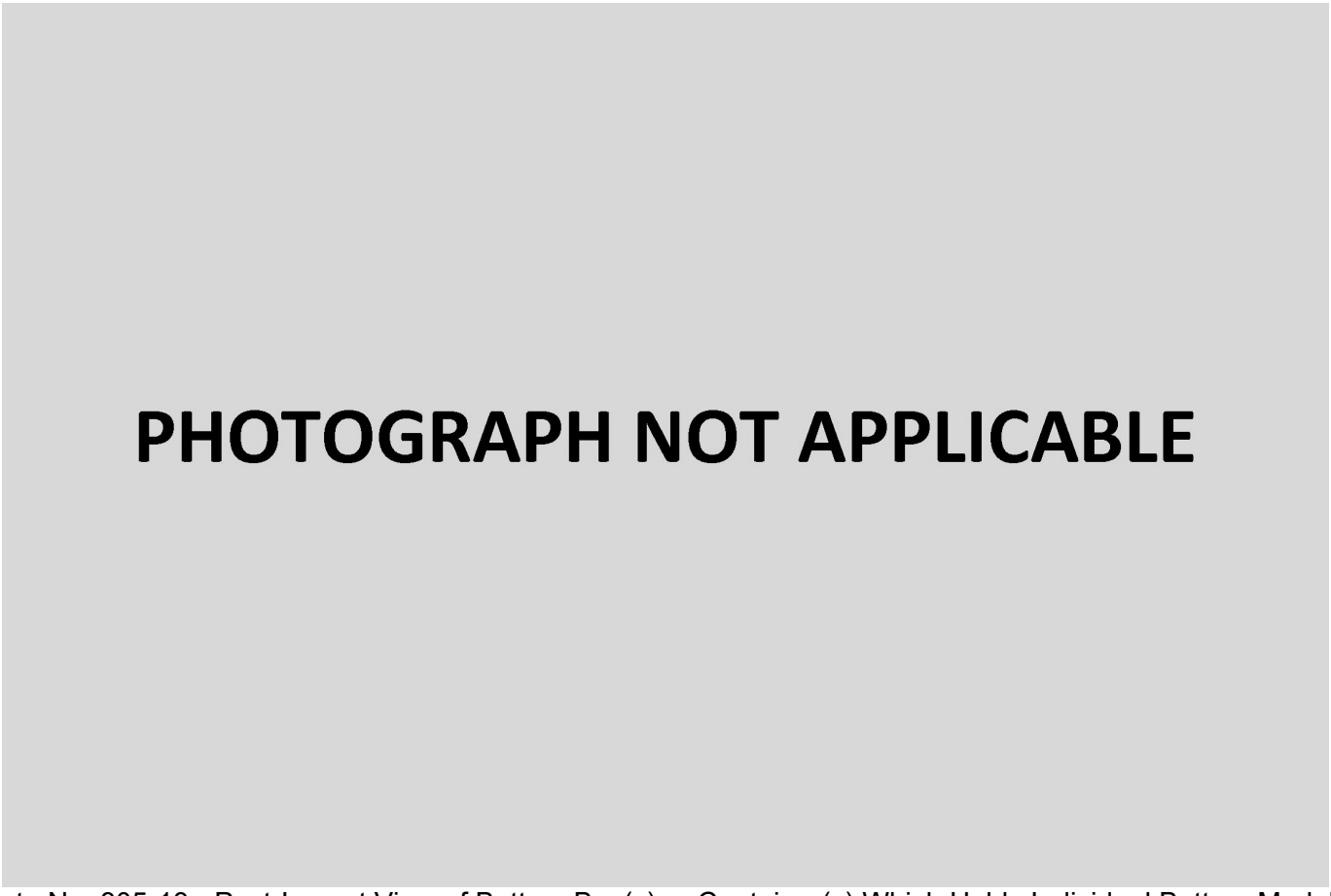


Photo No. 305-13 - Post-Impact View of Battery Box(s) or Container(s) Which Holds Individual Battery Modules

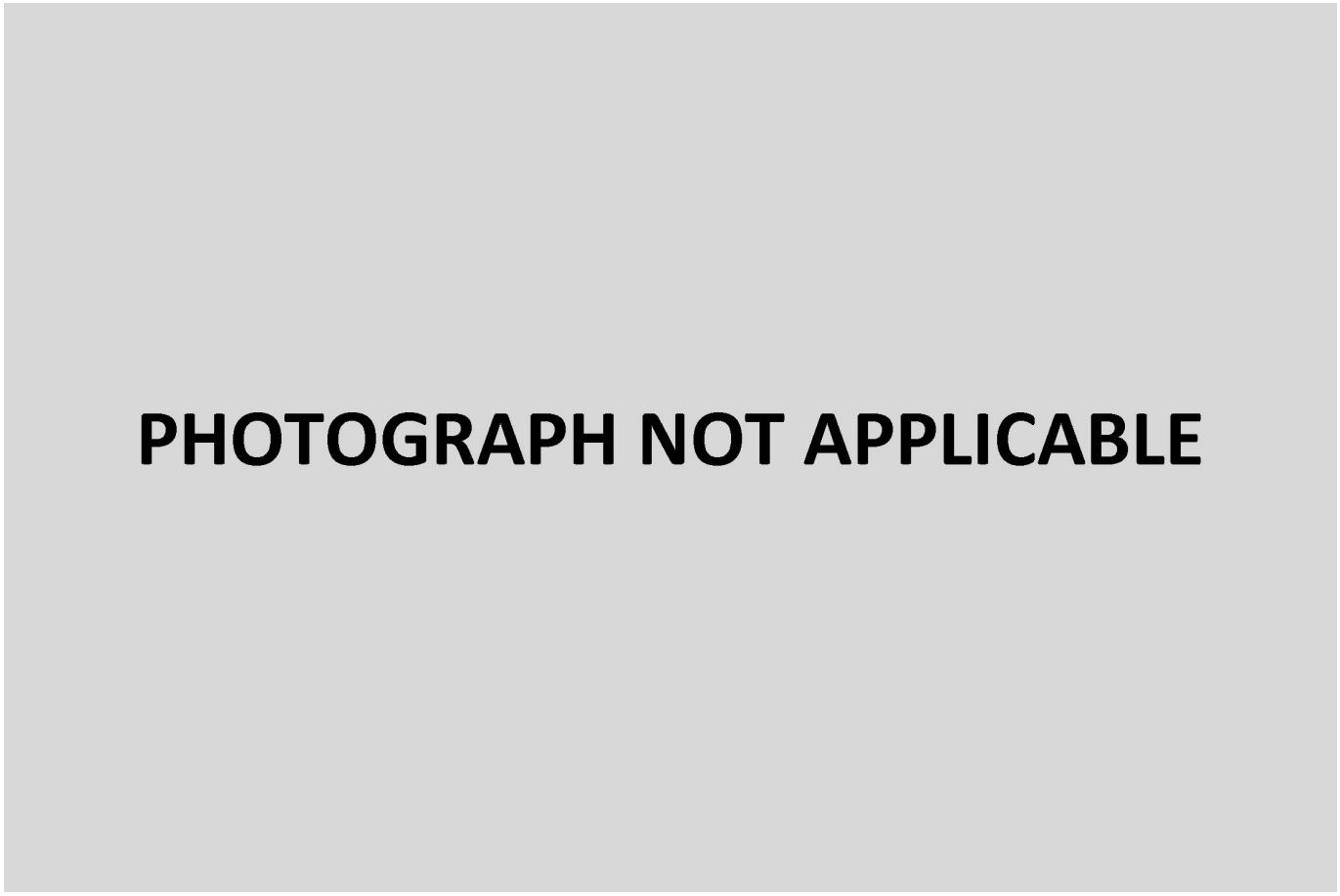


Photo No. 305-14 - Pre-Impact View of Propulsion Battery Module(s)

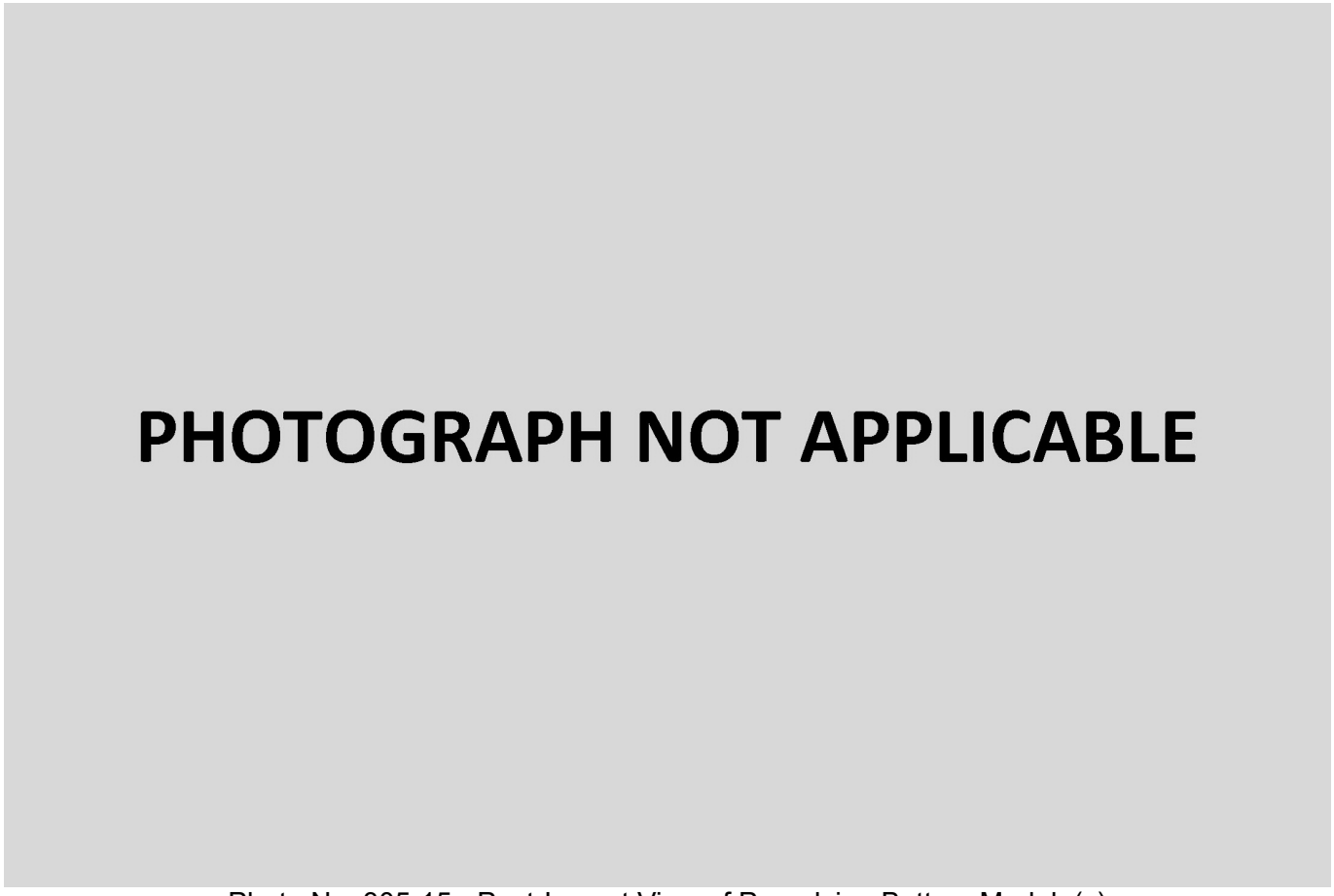


Photo No. 305-15 - Post-Impact View of Propulsion Battery Module(s)

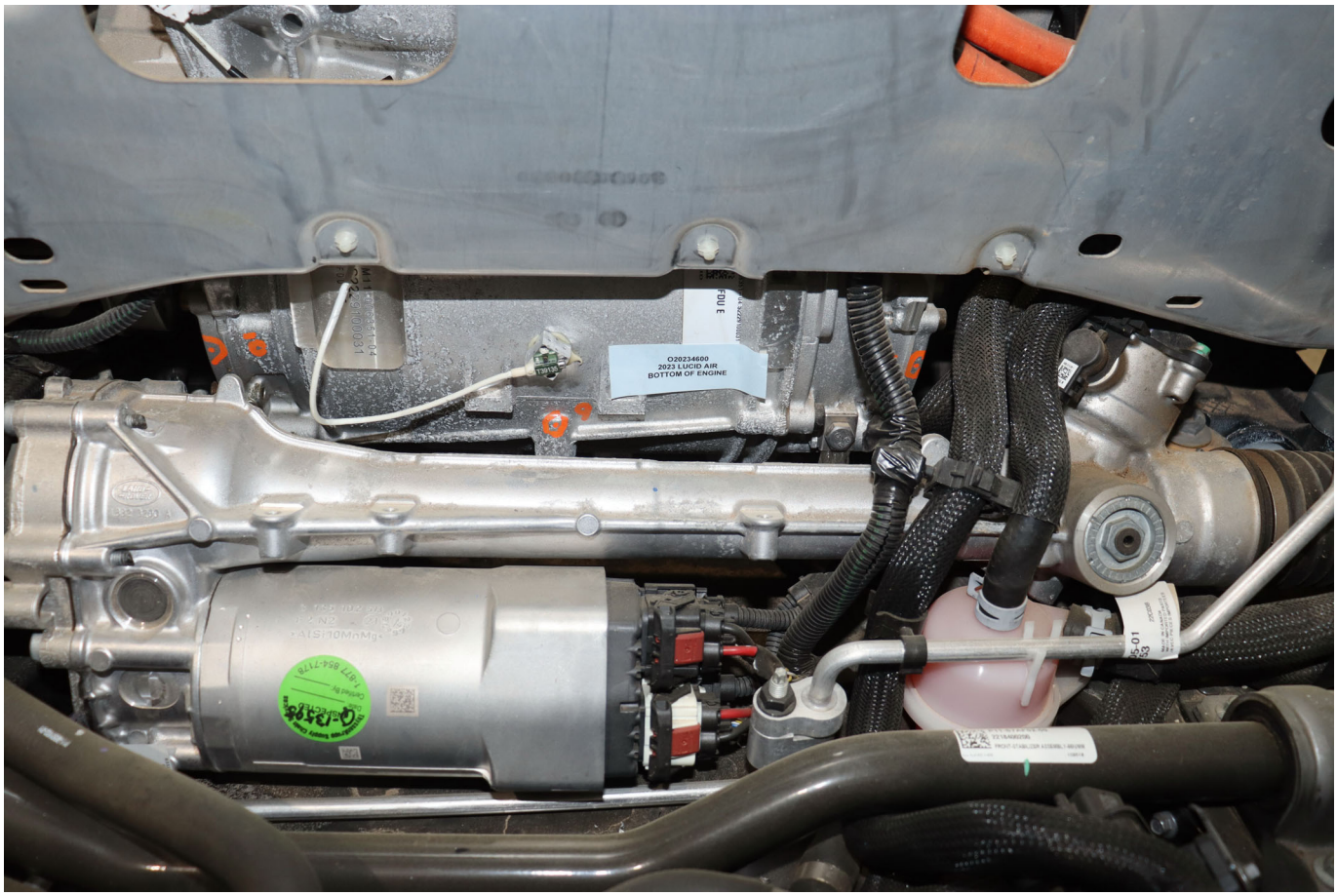


Photo No. 305-16 - Pre-Impact View of Electric Propulsion Drive

PHOTOGRAPH NOT AVAILABLE

Photo No. 305-17 - Post-Impact View of Electric Propulsion Drive

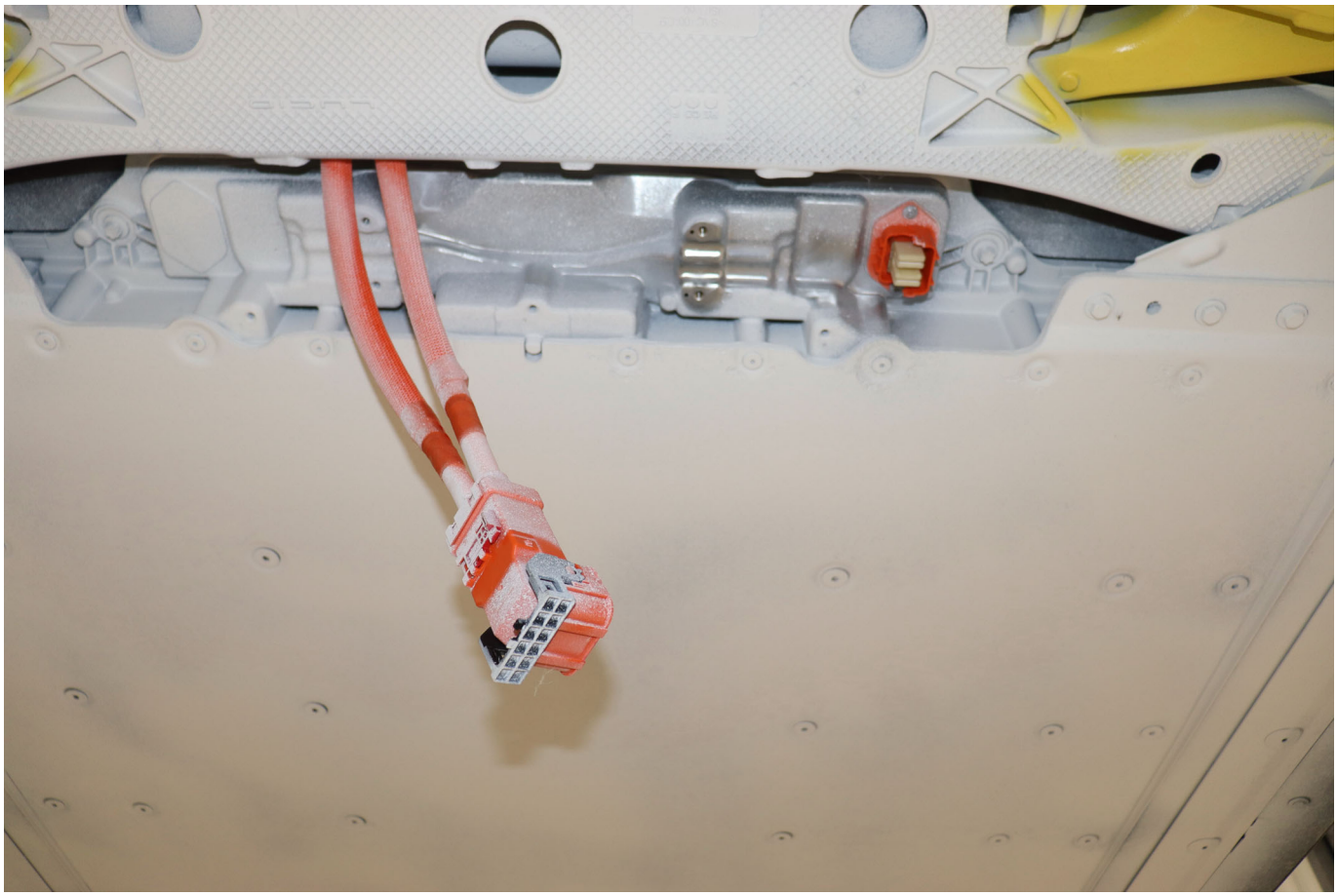


Photo No. 305-18 - Pre-Impact View of High Voltage Interconnect(s)

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-19 - Pre-Impact View Propulsion Battery Venting System(s)

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-20 - Pre-Impact View of Other Visible Electric Propulsion Components

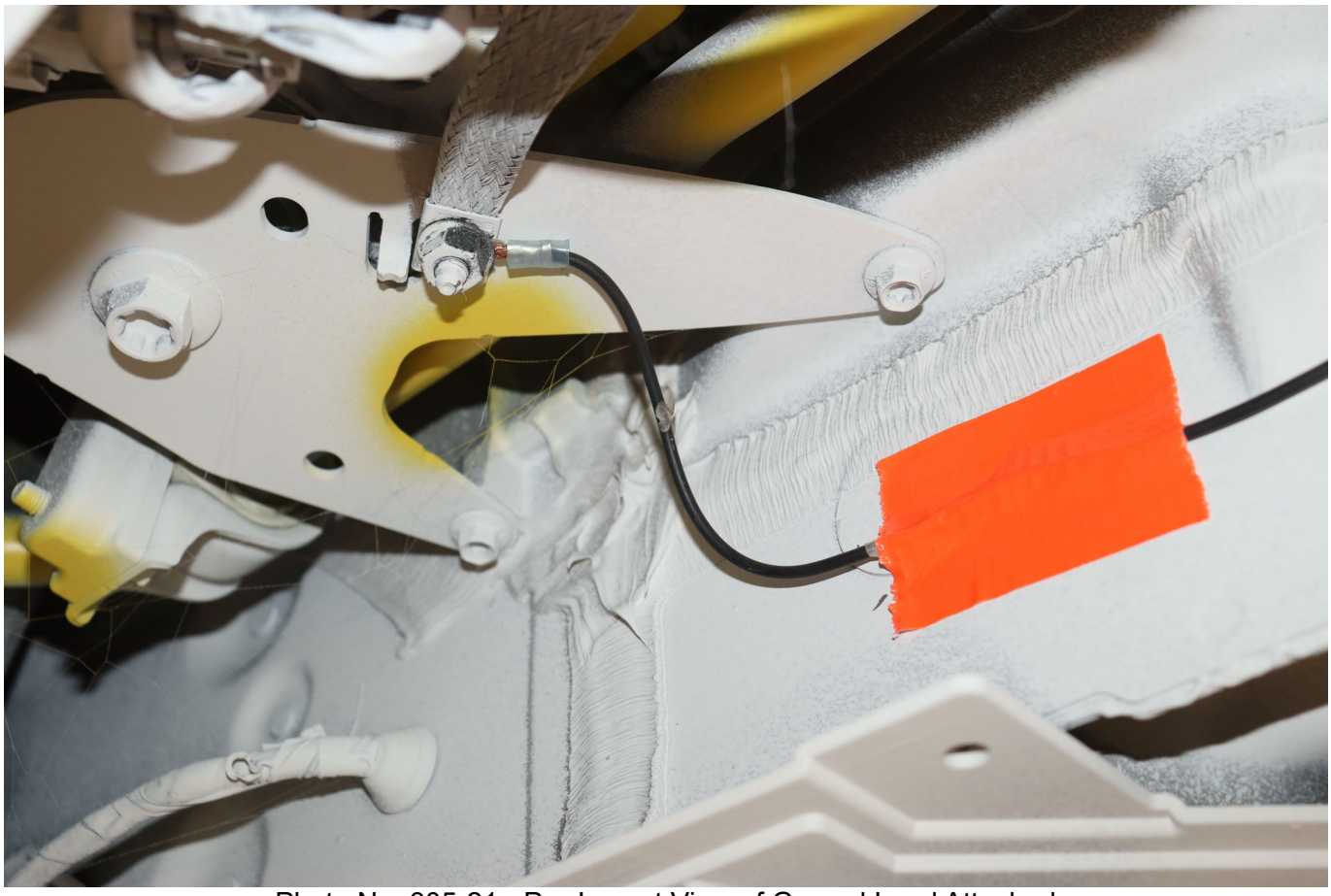


Photo No. 305-21 - Pre-Impact View of Ground Lead Attached

Photo No. 305-22 - Pre-Impact View of High Voltage Leads Attached

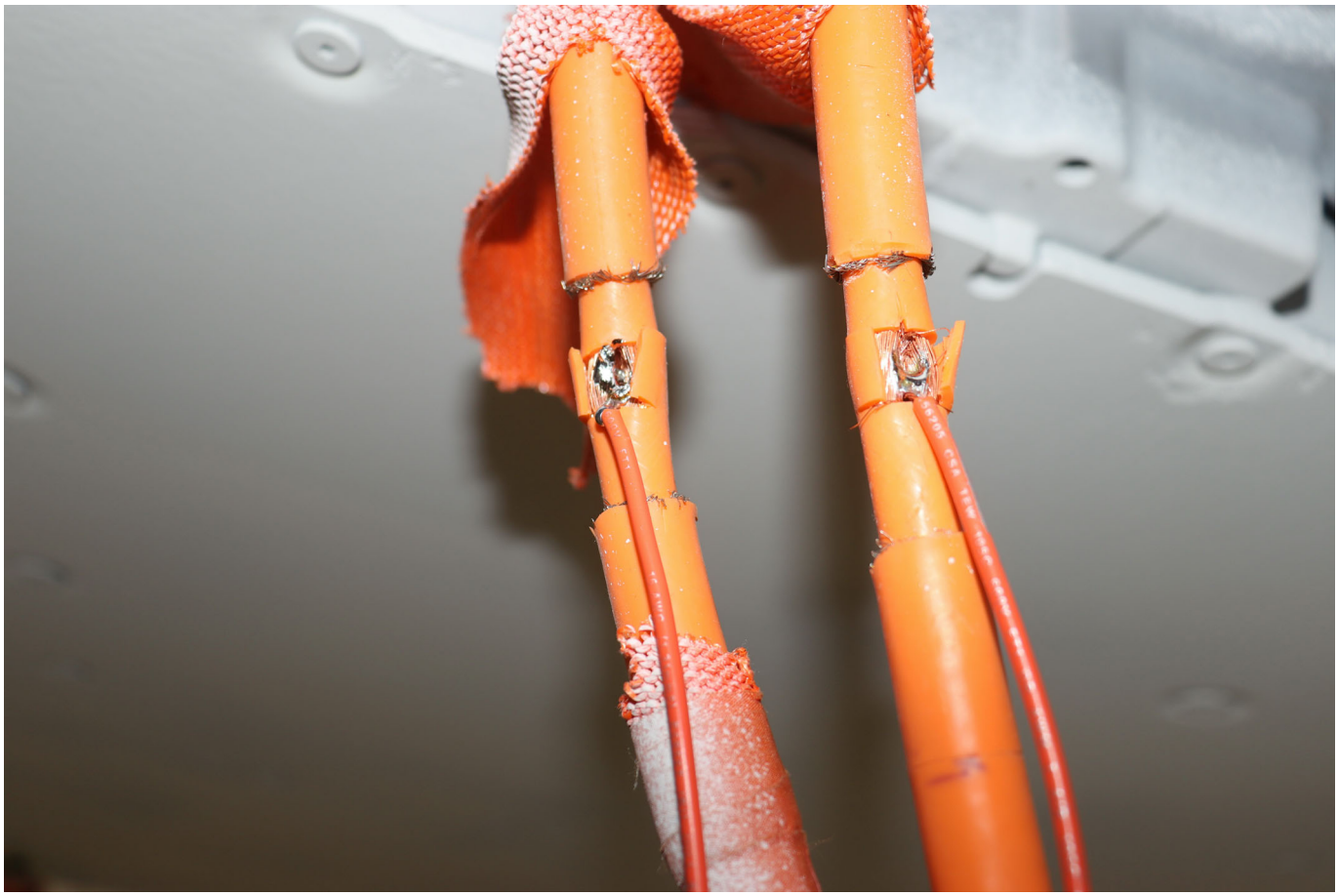


Photo No. 305-23 - Pre-Impact Close-Up View of High Voltage Leads Attached

Photo No. 305-24 - Pre-Impact View of Installed Test Interface Port

Photo No. 305-25 - Post-Impact View of Installed Test Interface Port

PHOTOGRAPH NOT AVAILABLE

Photo No. 305-26 - Pre-Impact View of Other Test Devices

Photo No. 305-27 - Post-Impact View of Other Test Devices

Photo No. 305-28 - FMVSS No. 305 Static Rollover at 90 Degrees

Photo No. 305-29 - FMVSS No. 305 Static Rollover at 180 Degrees

Photo No. 305-30 - FMVSS No. 305 Static Rollover at 270 Degrees

Photo No. 305-31 - FMVSS No. 305 Static Rollover at 360 Degrees

Photo No. 305-32 - Pre-Impact View of the Vehicle Passenger Compartment Adjacent to Propulsion Battery

Photo No. 305-33 - Post-Impact View of the Vehicle Passenger Compartment Adjacent to Propulsion Battery

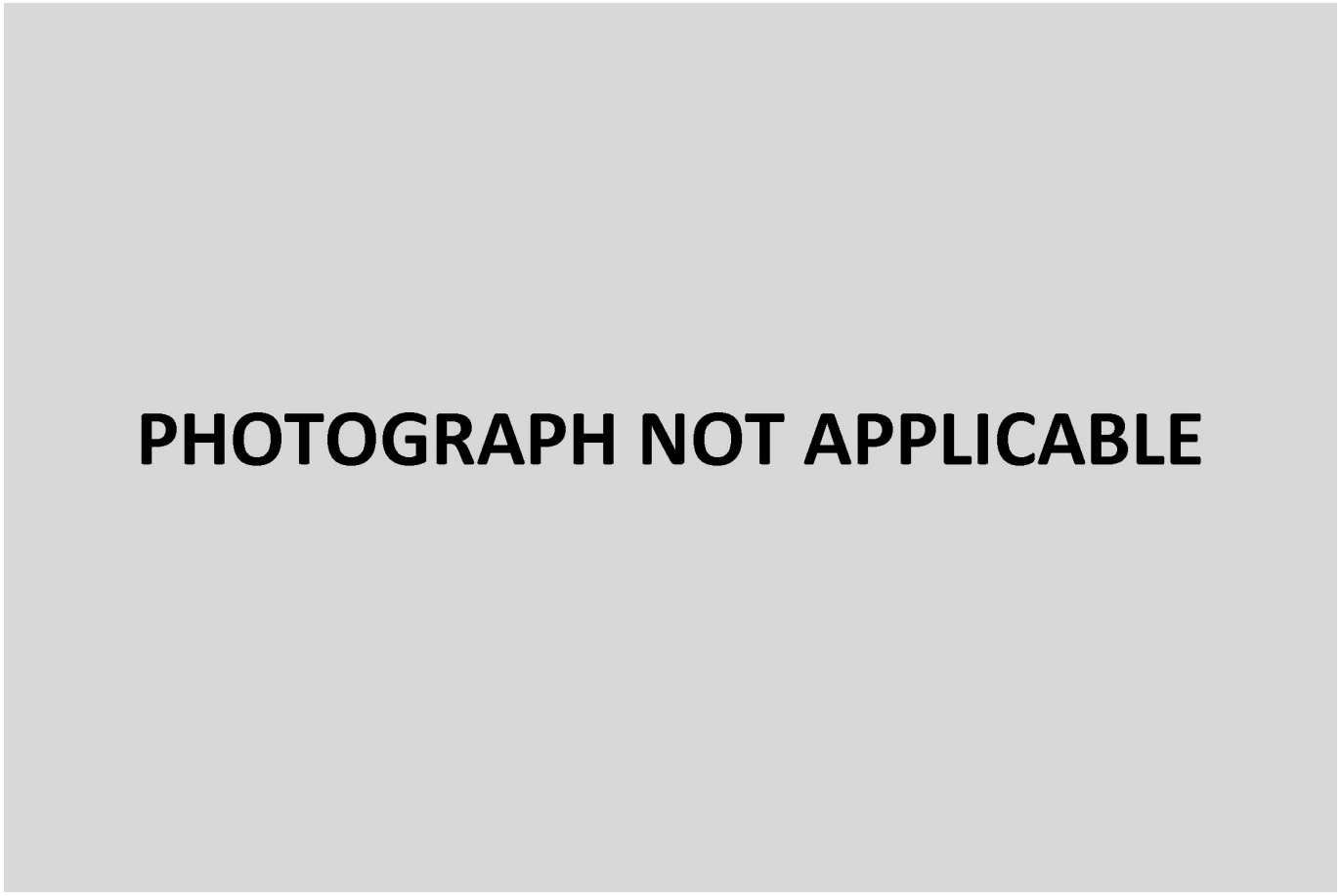


Photo No. 305-34 - Post-Impact Propulsion Battery System Mounting and-or Intrusion Failure(s)

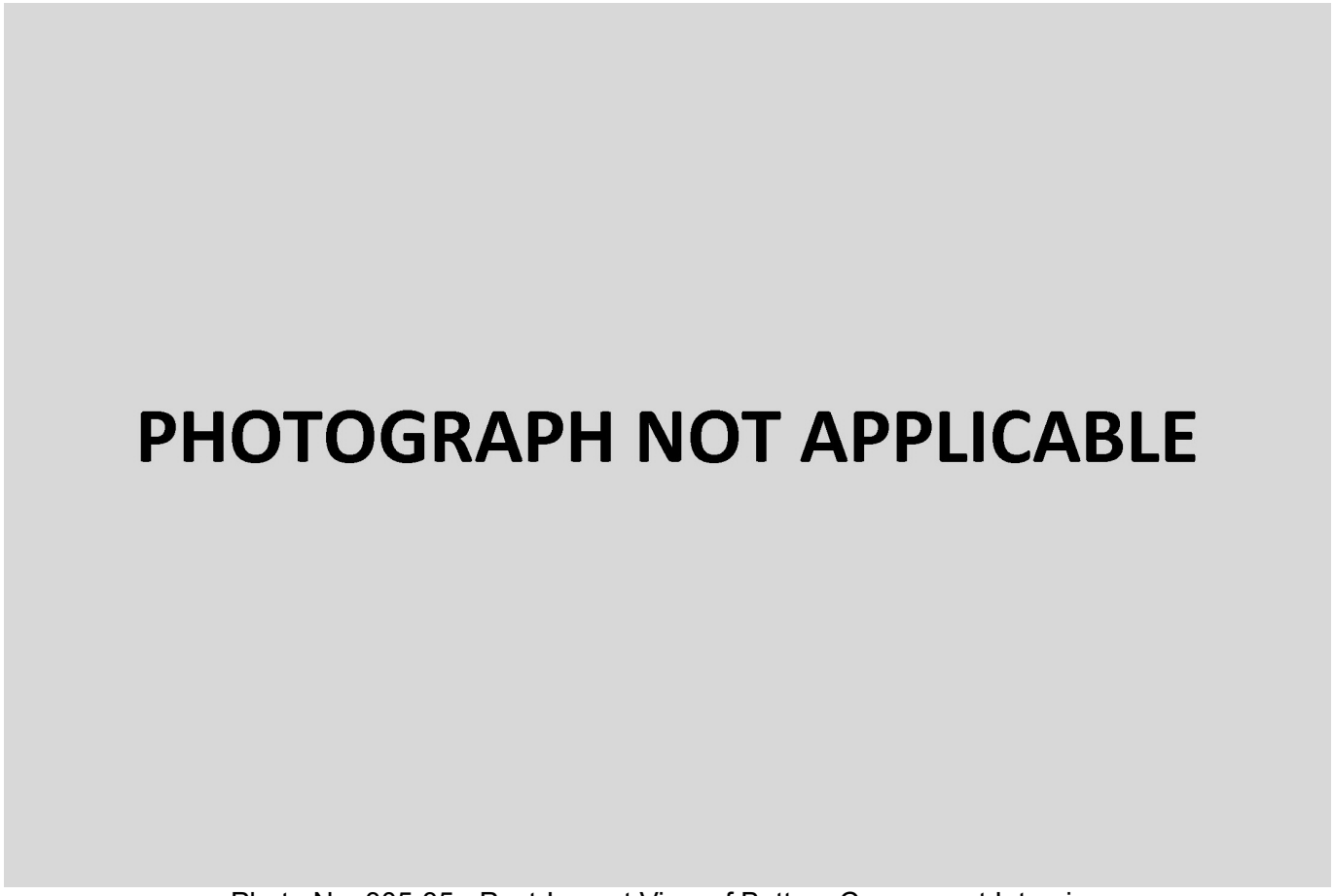


Photo No. 305-35 - Post-Impact View of Battery Component Intrusion

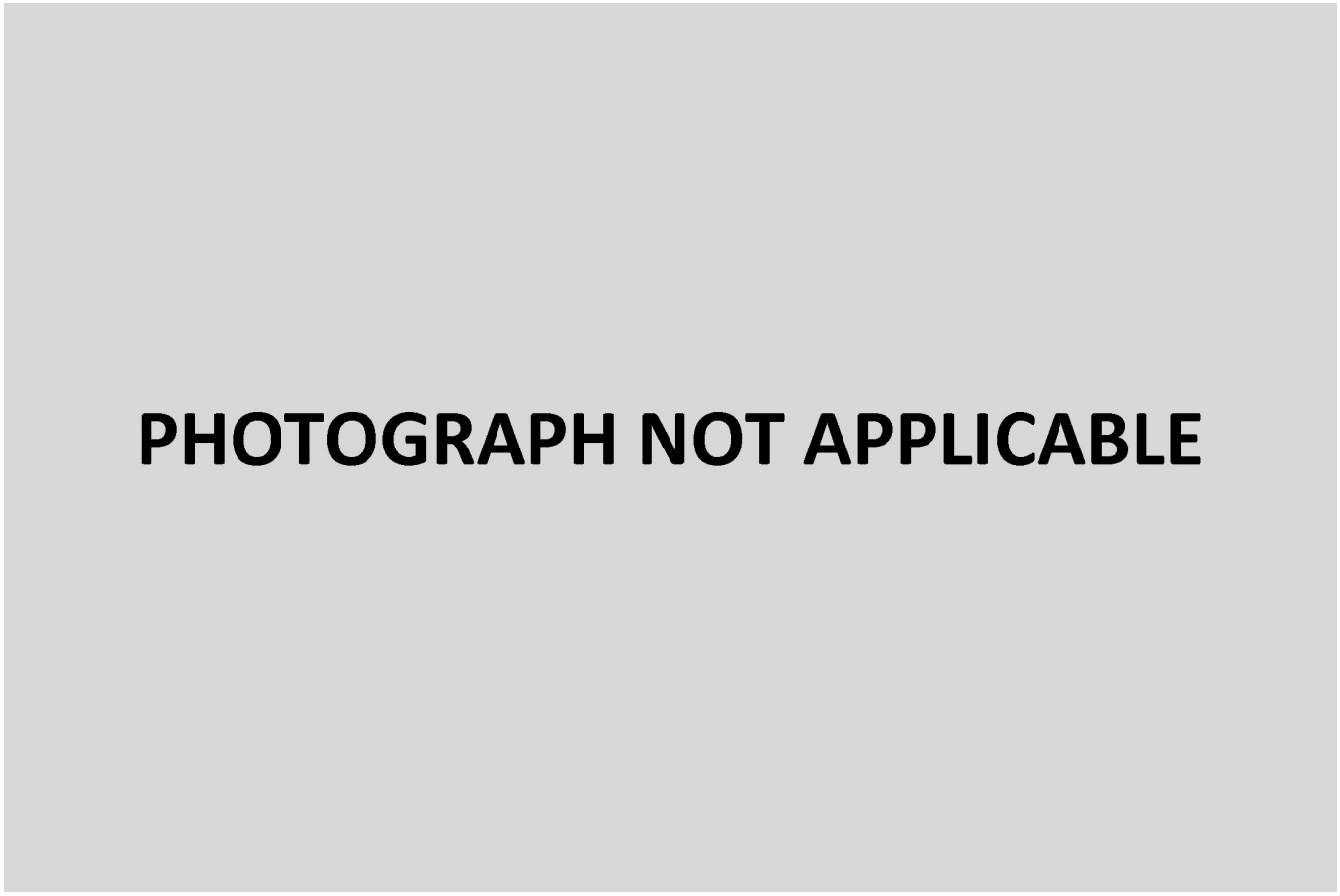


Photo No. 305-36 - Post-Impact View of Battery Module Movement or Retention Loss

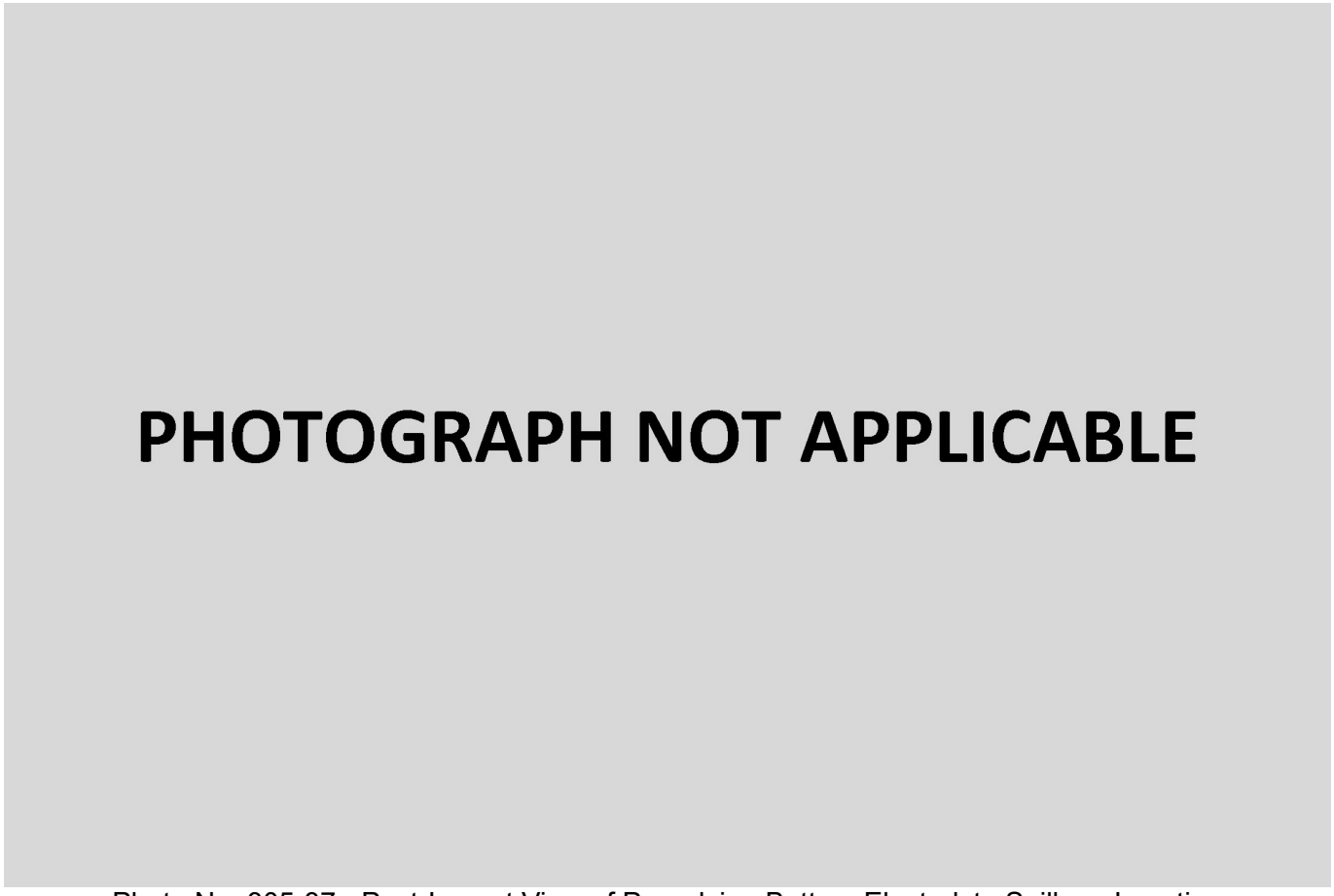


Photo No. 305-37 - Post-Impact View of Propulsion Battery Electrolyte Spillage Location

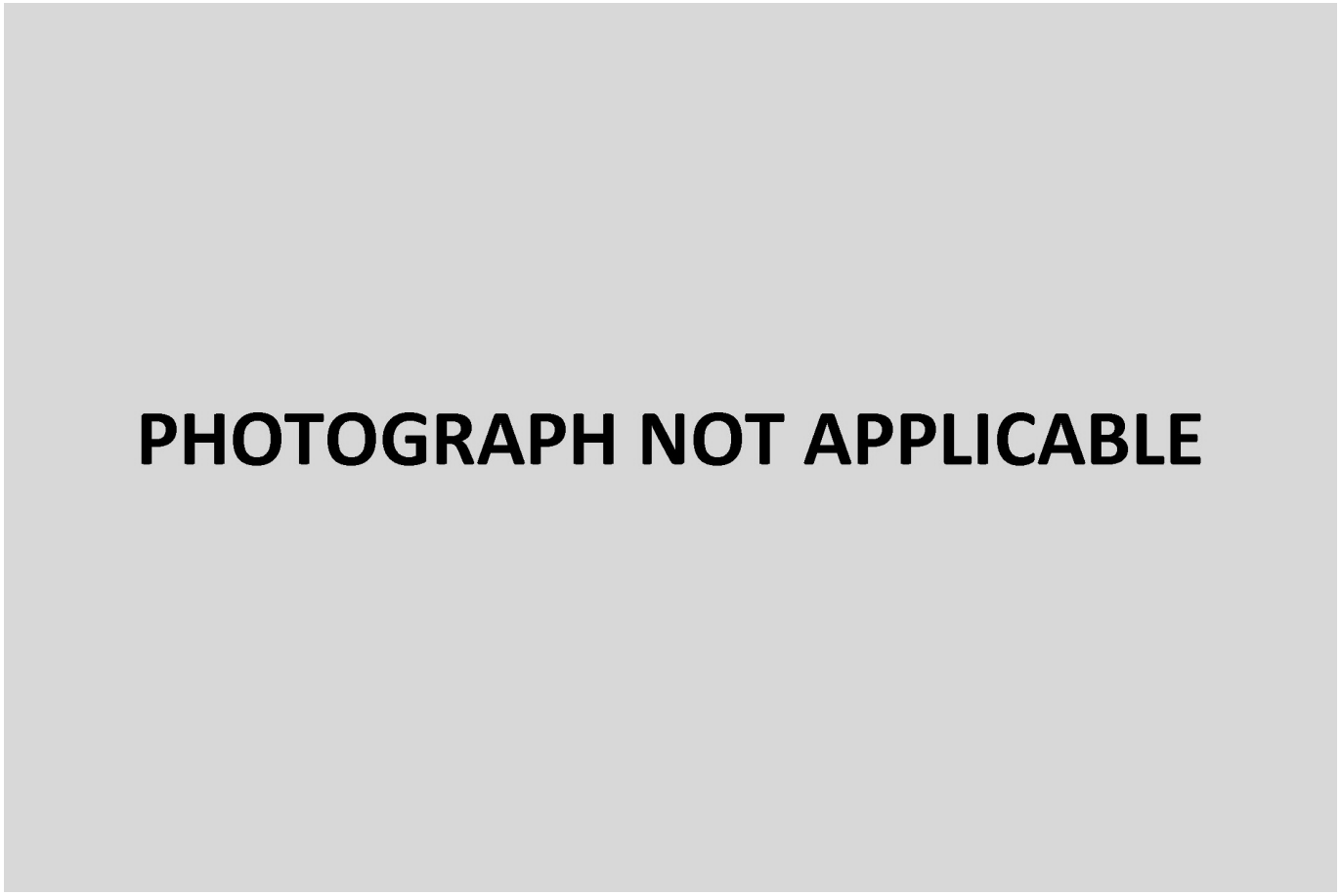


Photo No. 305-38 - Post-Test View of Propulsion Battery Electrolyte Spillage Location

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

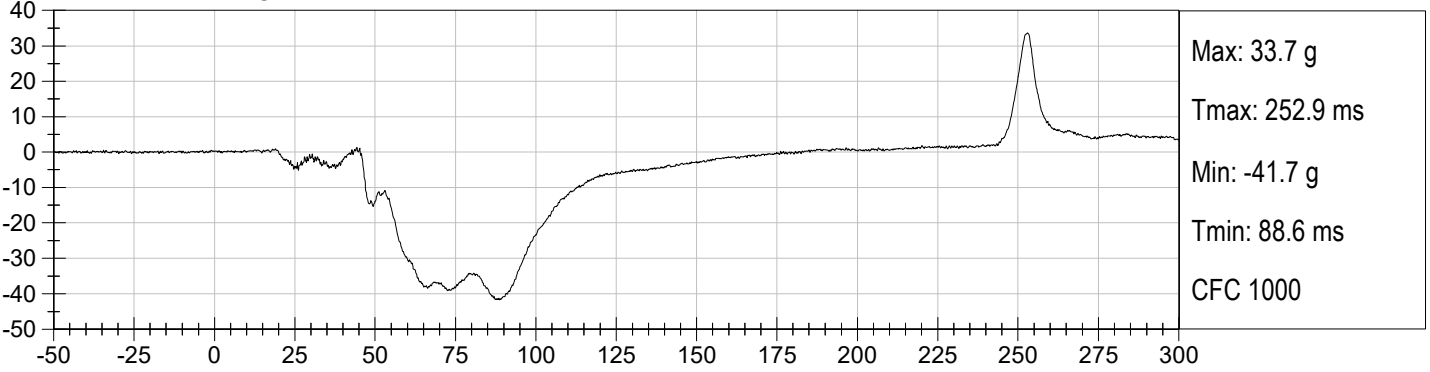
Right Rear Seat Crossmember Z

Left Rear Seat Crossmember Xr

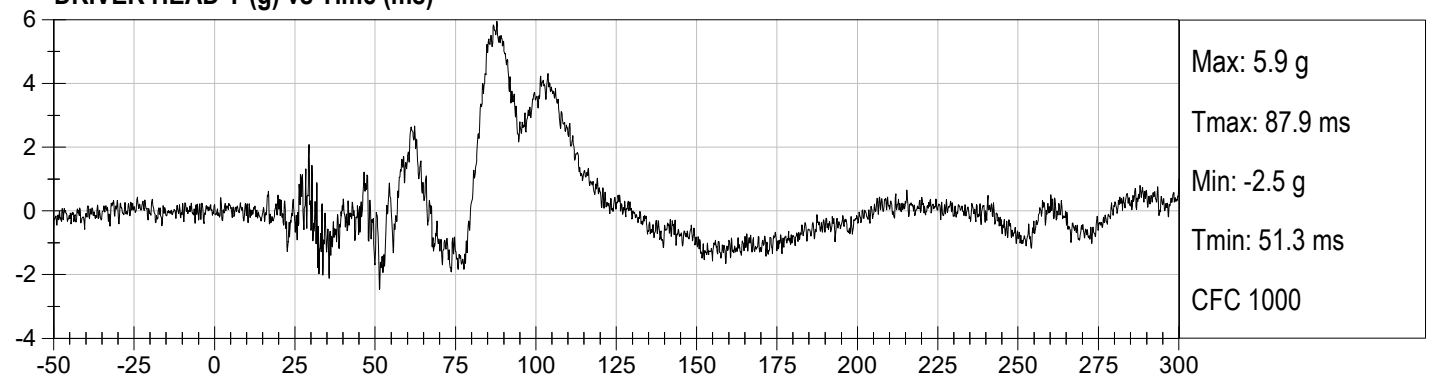
Right Rear Seat Crossmember Xr

Advanced Research Load Cell Barrier – 528 channels

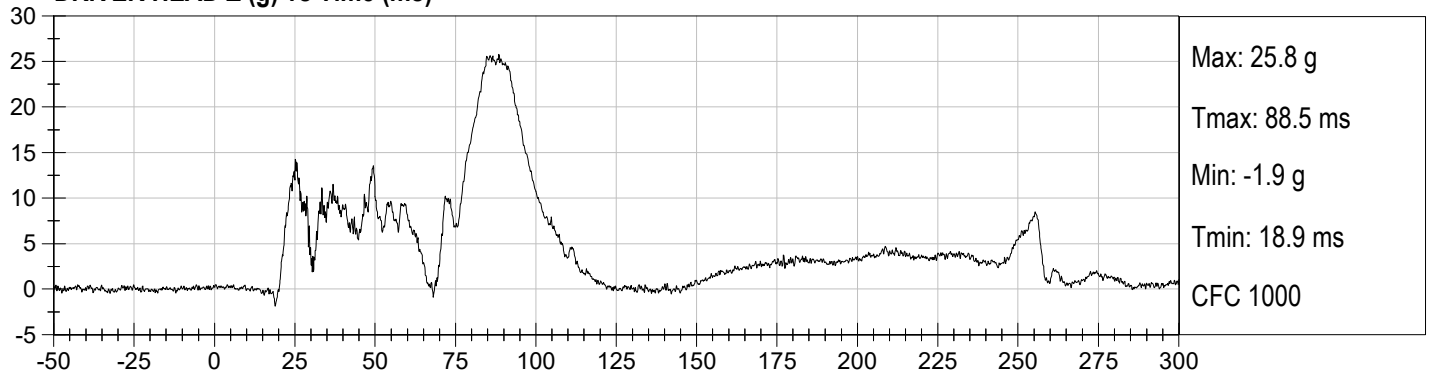
DRIVER HEAD X (g) vs Time (ms)



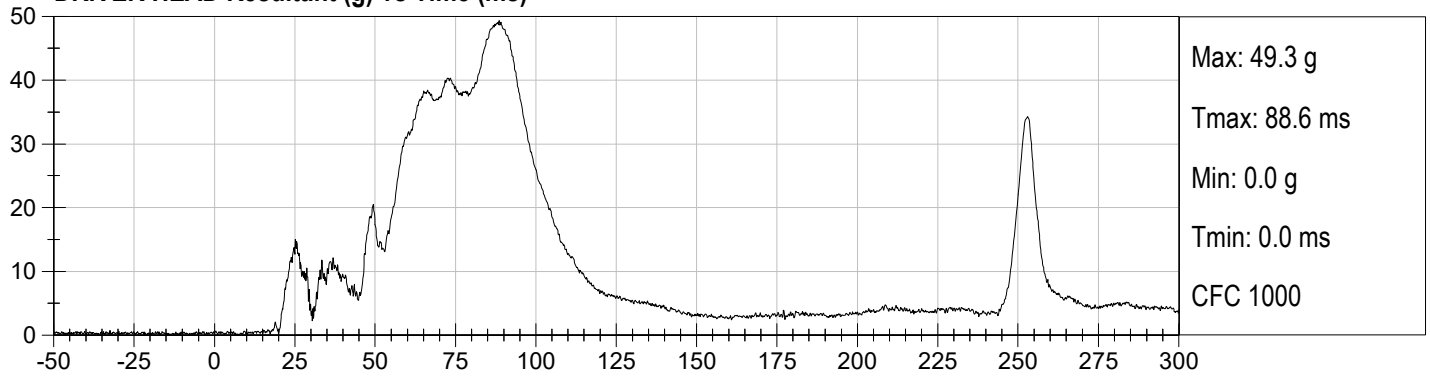
DRIVER HEAD Y (g) vs Time (ms)



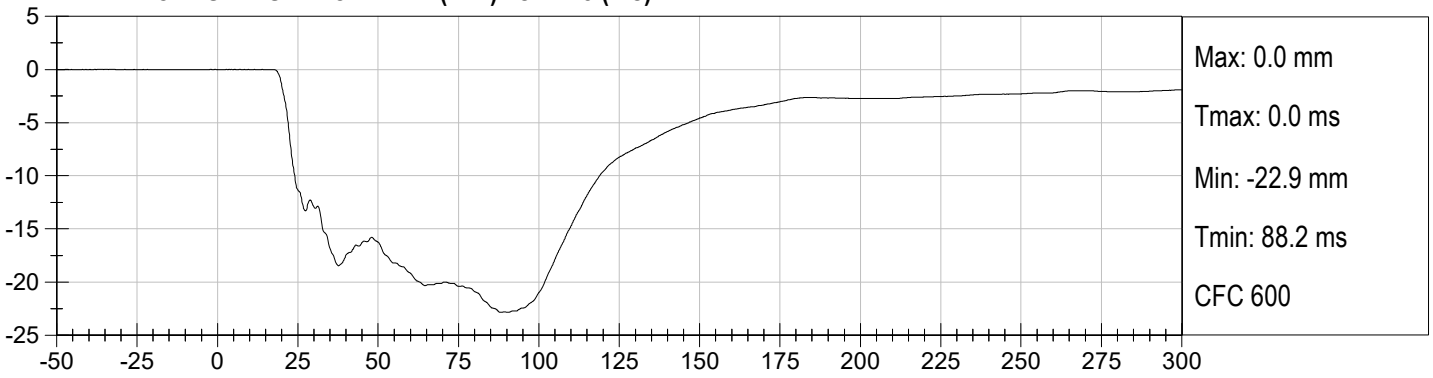
DRIVER HEAD Z (g) vs Time (ms)



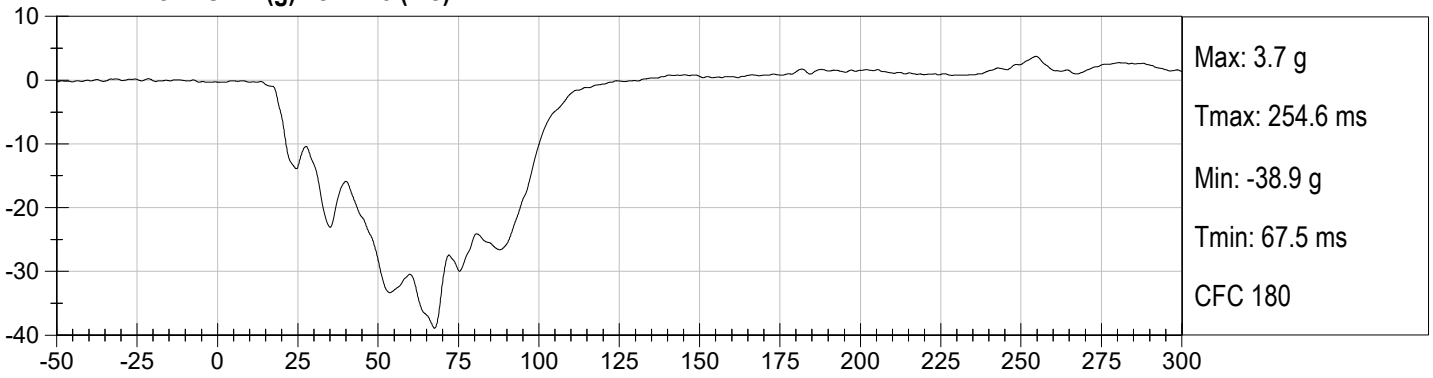
DRIVER HEAD Resultant (g) vs Time (ms)



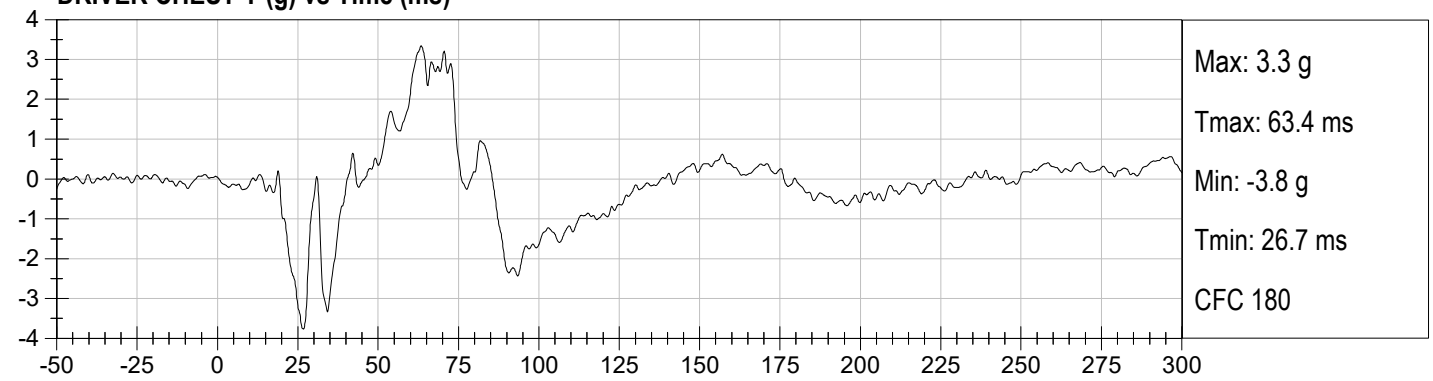
DRIVER CHEST DISPLACEMENT (mm) vs Time (ms)



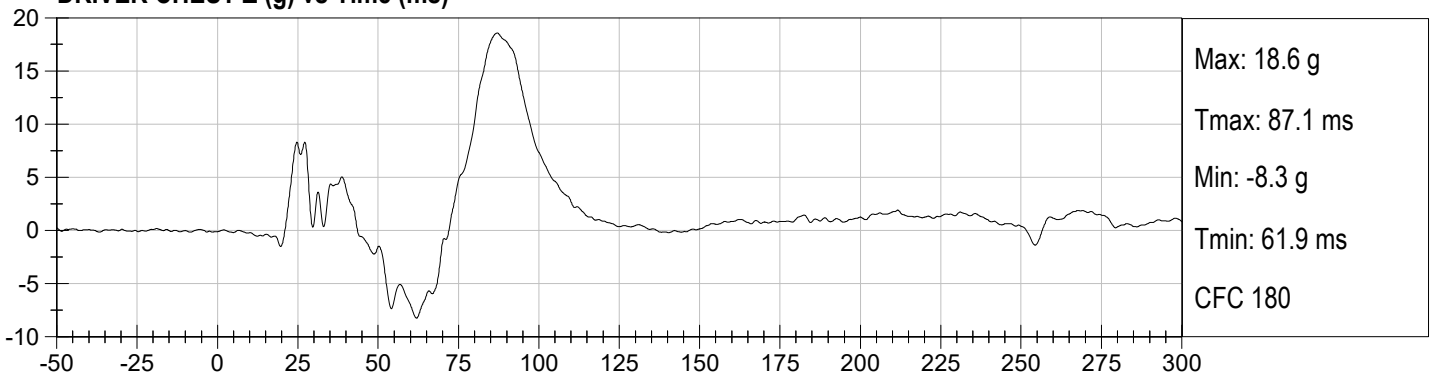
DRIVER CHEST X (g) vs Time (ms)



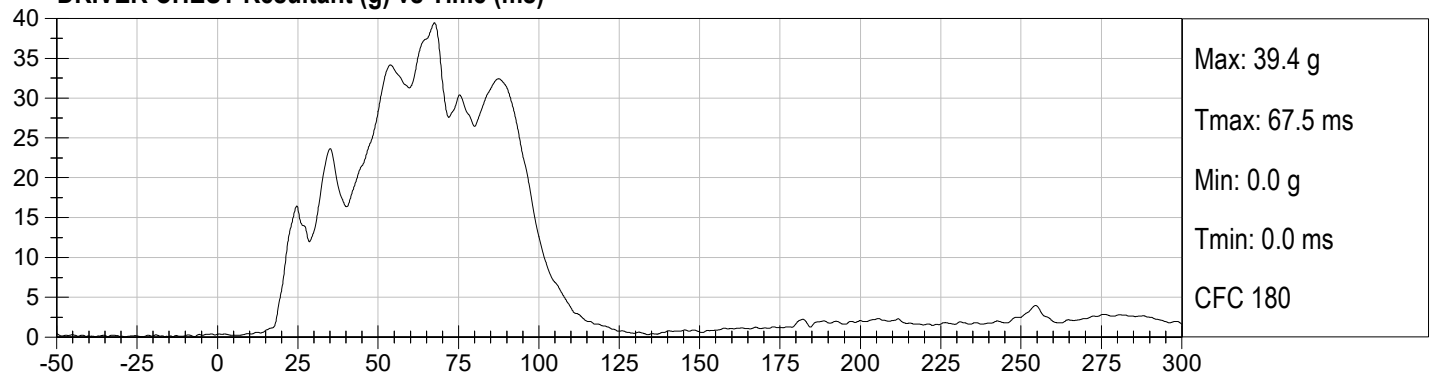
DRIVER CHEST Y (g) vs Time (ms)



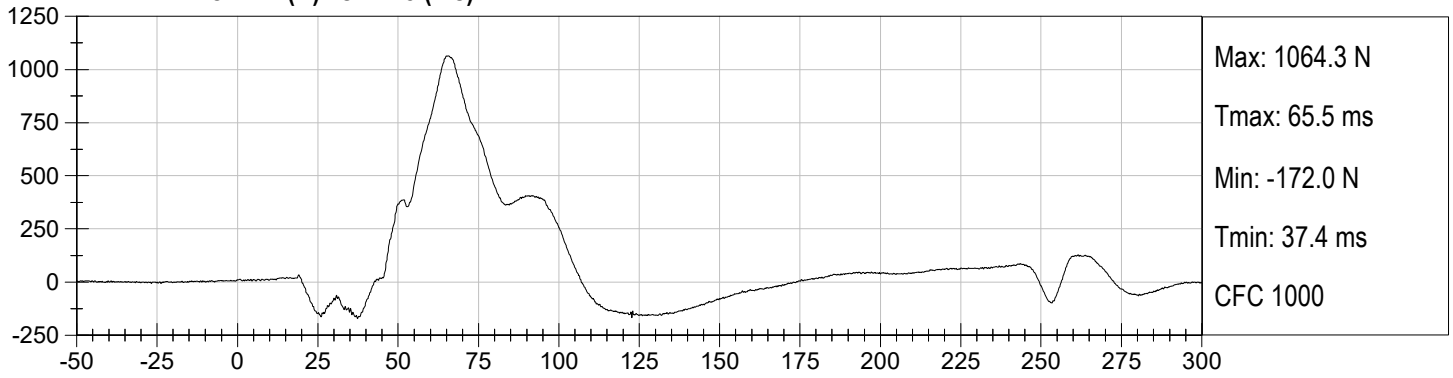
DRIVER CHEST Z (g) vs Time (ms)



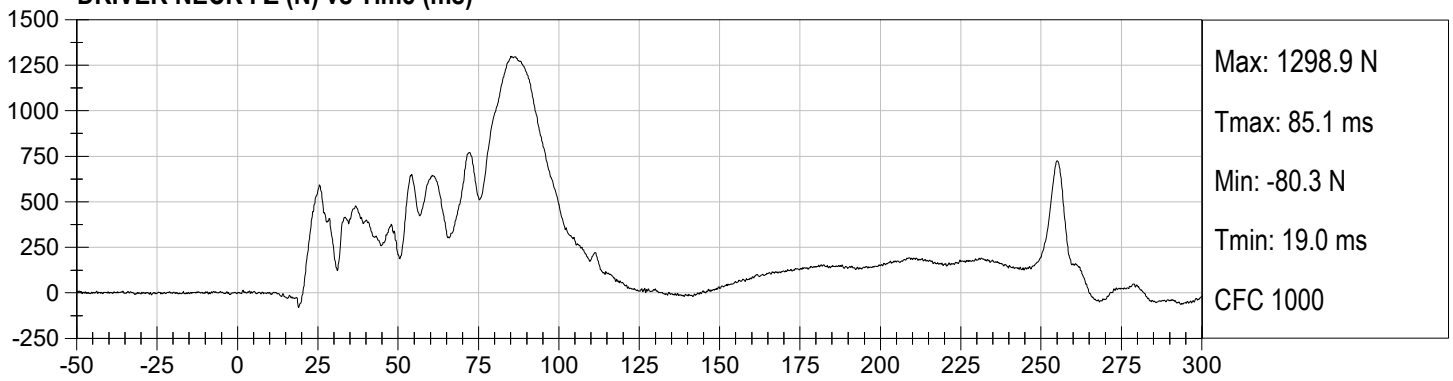
DRIVER CHEST Resultant (g) vs Time (ms)



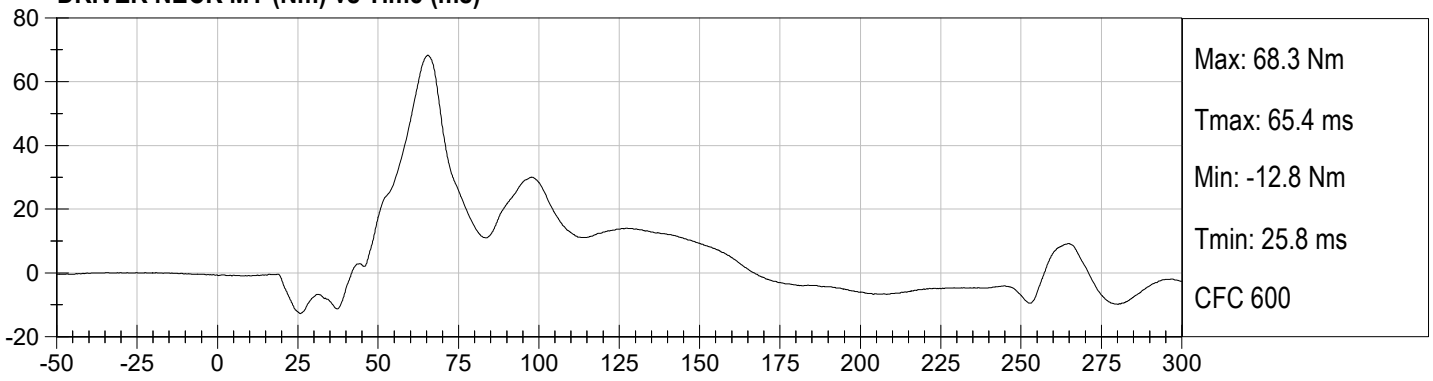
DRIVER NECK FX (N) vs Time (ms)



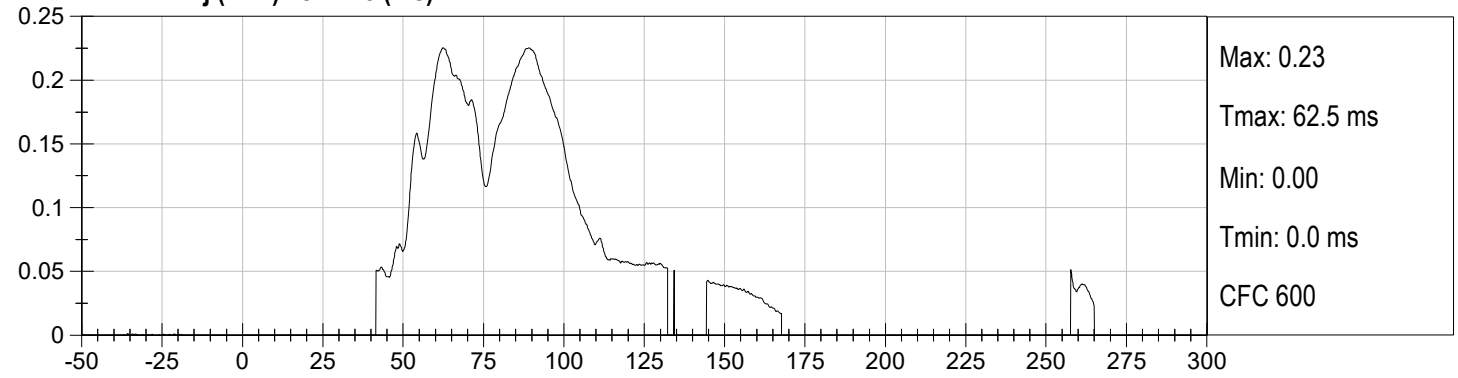
DRIVER NECK FZ (N) vs Time (ms)



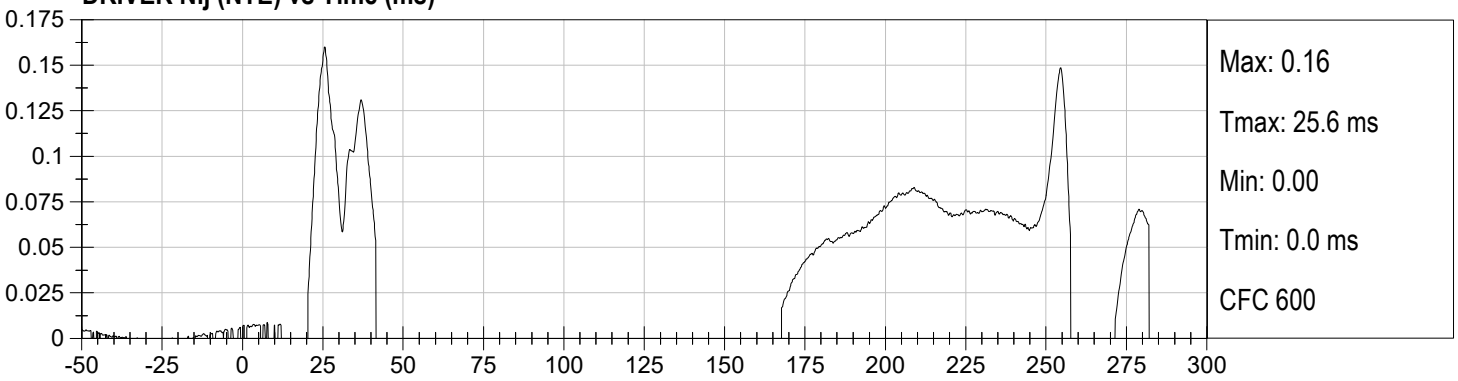
DRIVER NECK MY (Nm) vs Time (ms)



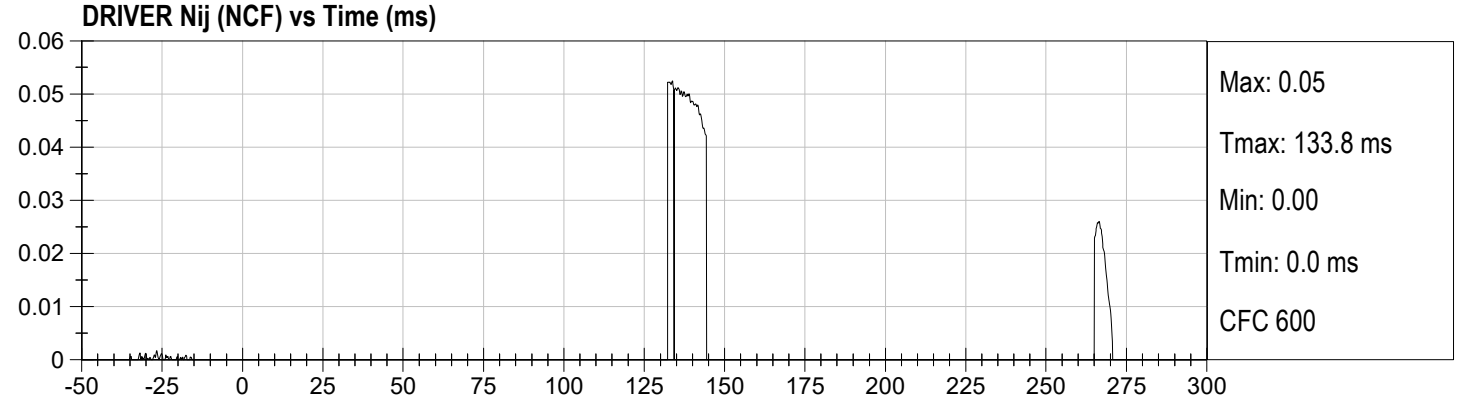
DRIVER Nij (NTF) vs Time (ms)



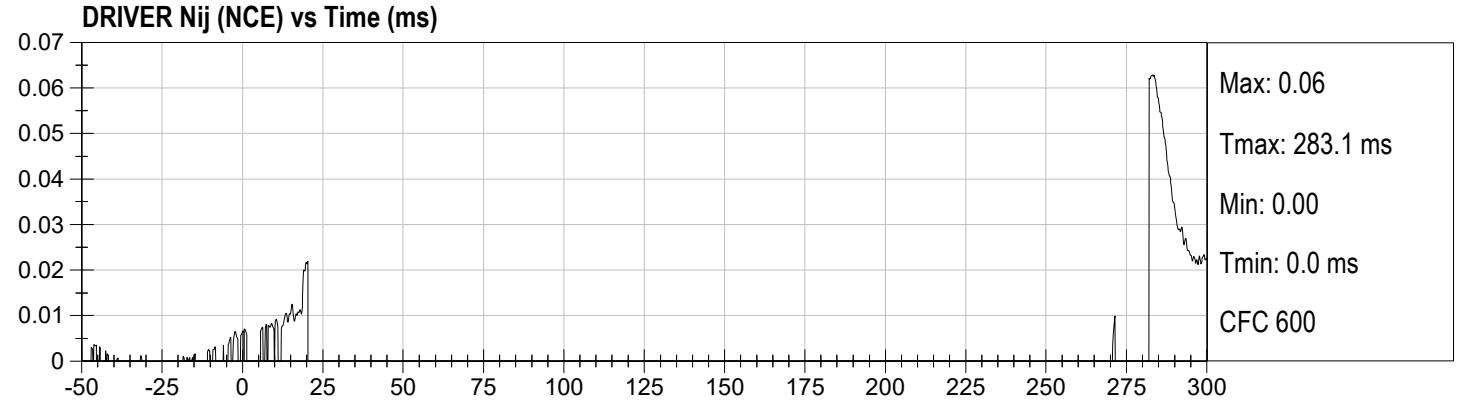
DRIVER Nij (NTE) vs Time (ms)



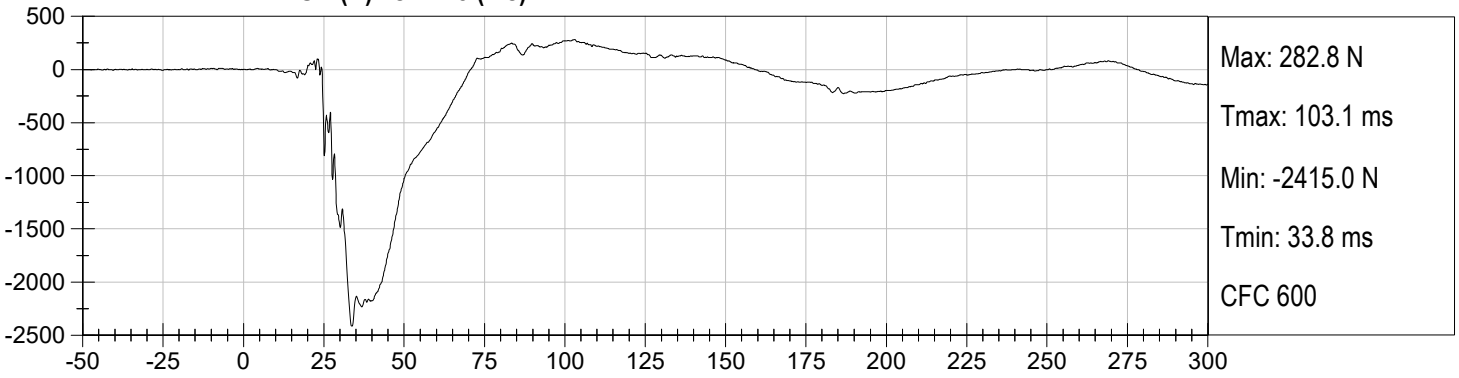
DRIVER Nij (NCF) vs Time (ms)



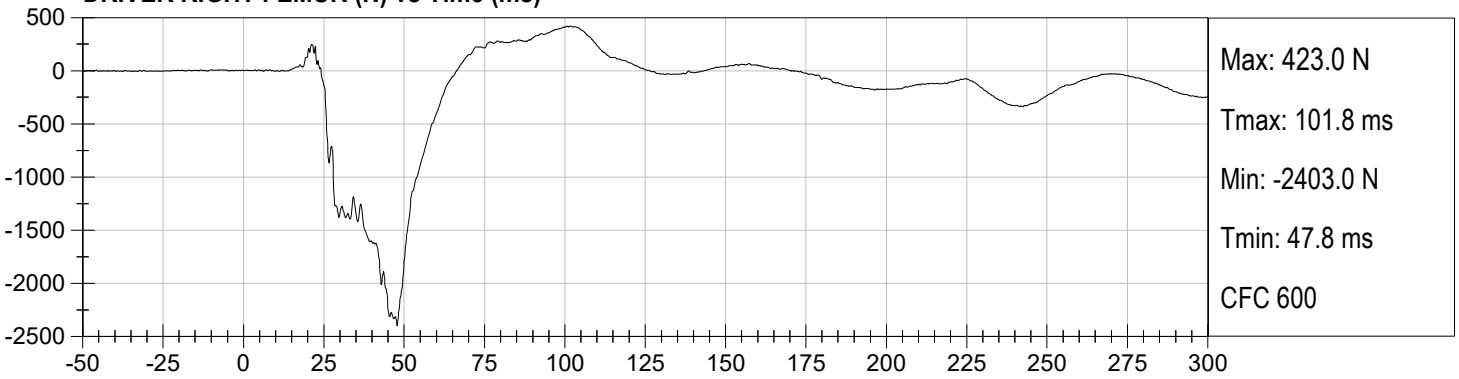
DRIVER Nij (NCE) vs Time (ms)



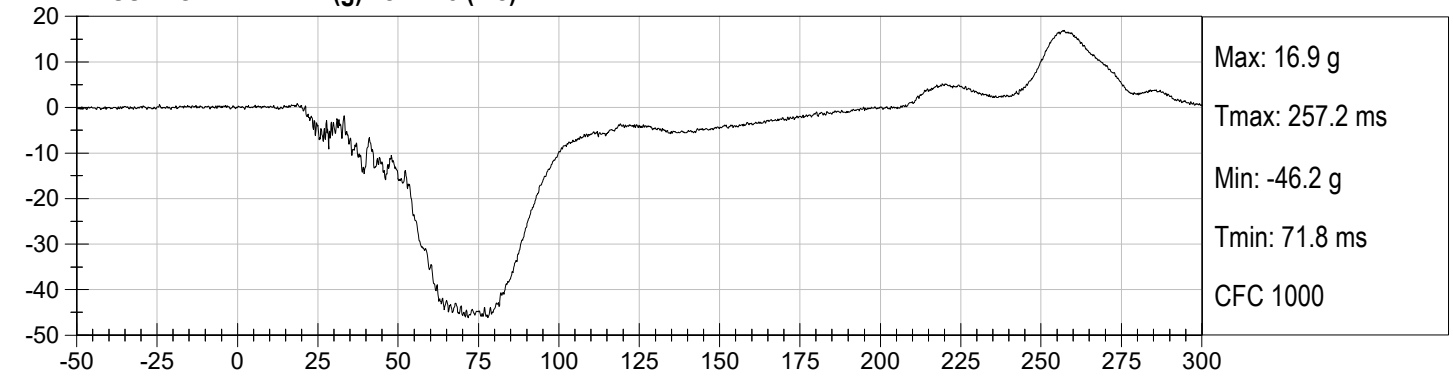
DRIVER LEFT FEMUR (N) vs Time (ms)



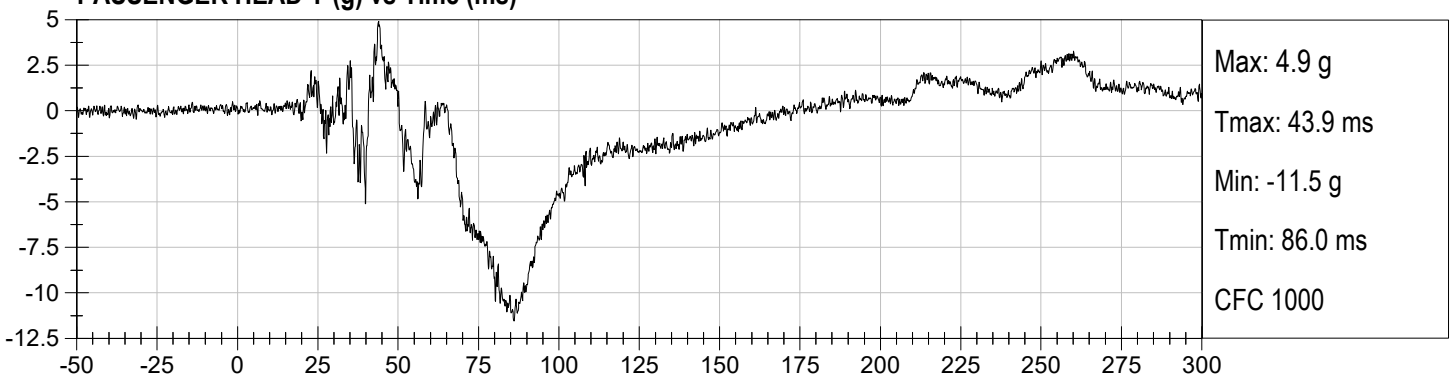
DRIVER RIGHT FEMUR (N) vs Time (ms)



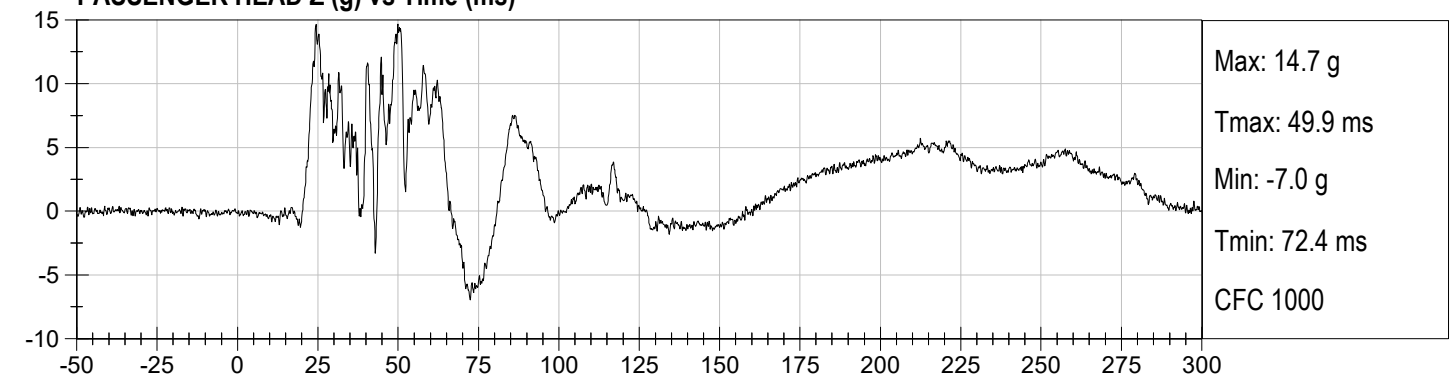
PASSENGER HEAD X (g) vs Time (ms)



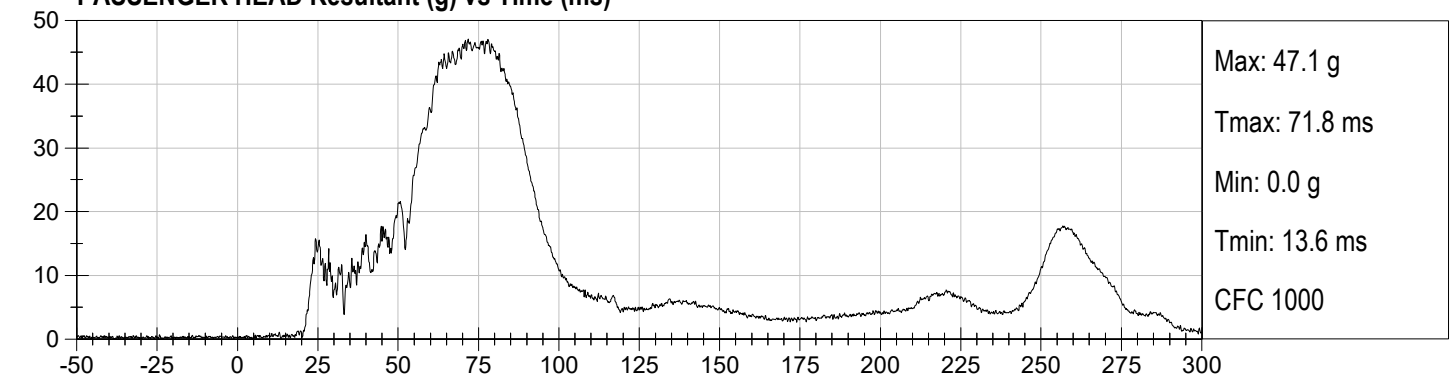
PASSENGER HEAD Y (g) vs Time (ms)



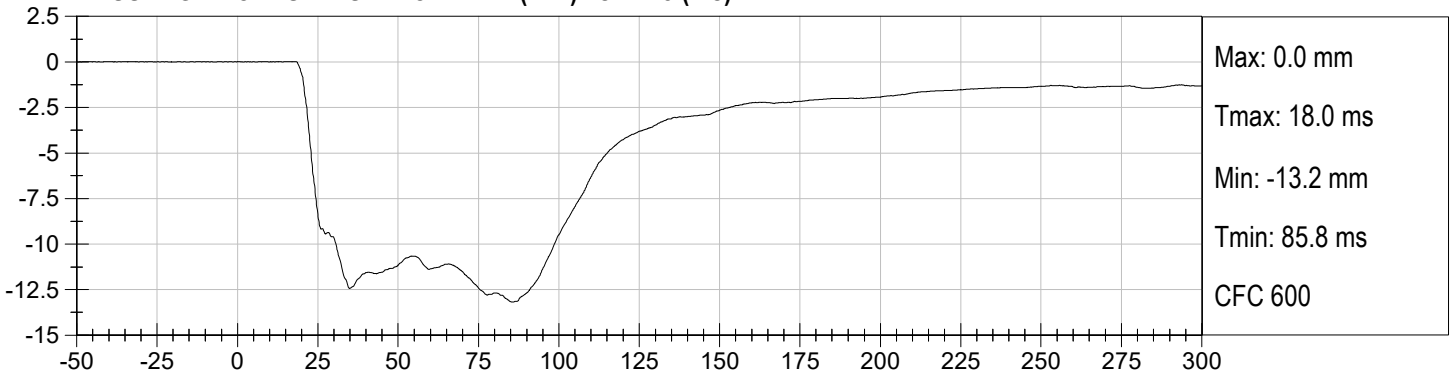
PASSENGER HEAD Z (g) vs Time (ms)



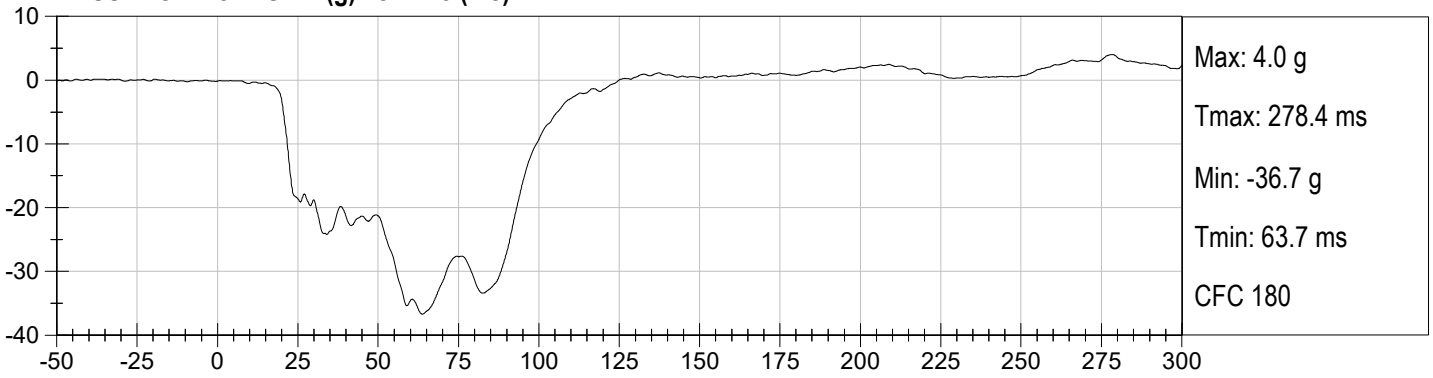
PASSENGER HEAD Resultant (g) vs Time (ms)



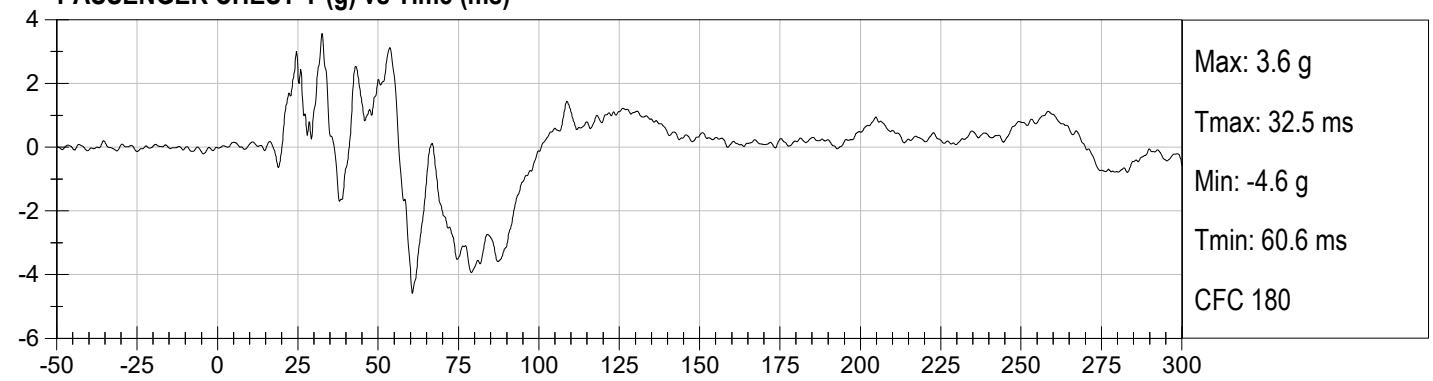
PASSENGER CHEST DISPLACEMENT (mm) vs Time (ms)



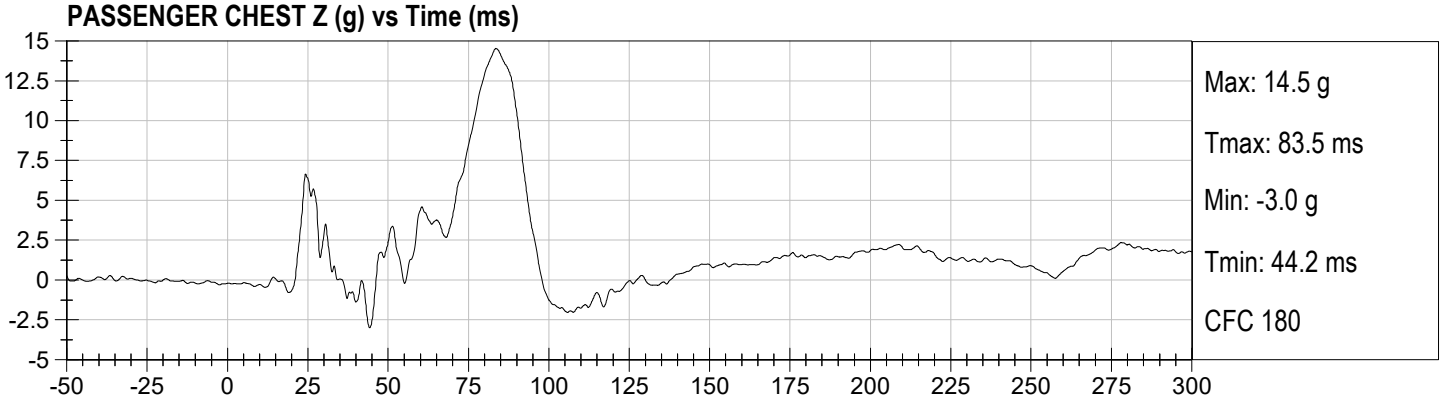
PASSENGER CHEST X (g) vs Time (ms)



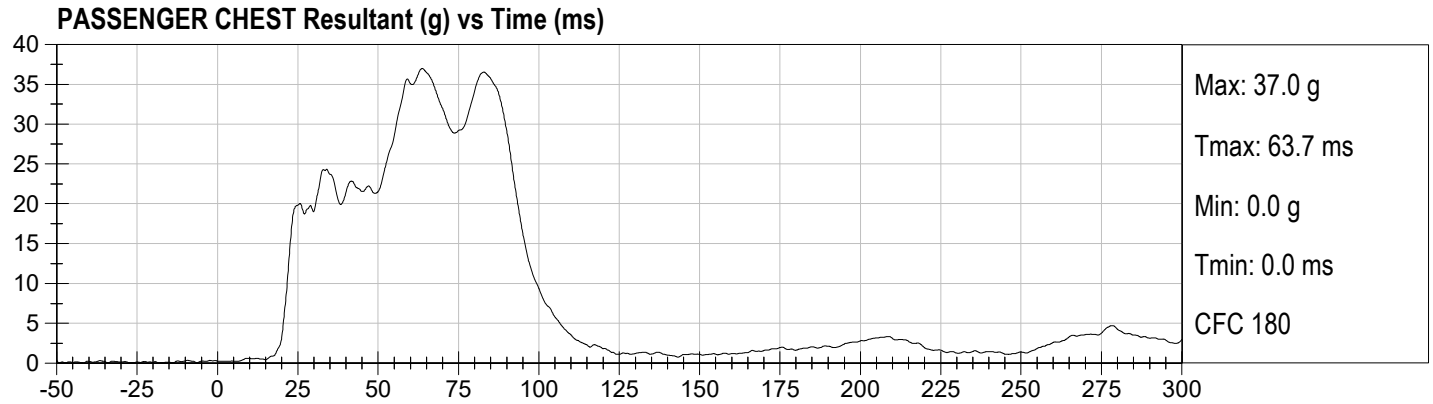
PASSENGER CHEST Y (g) vs Time (ms)



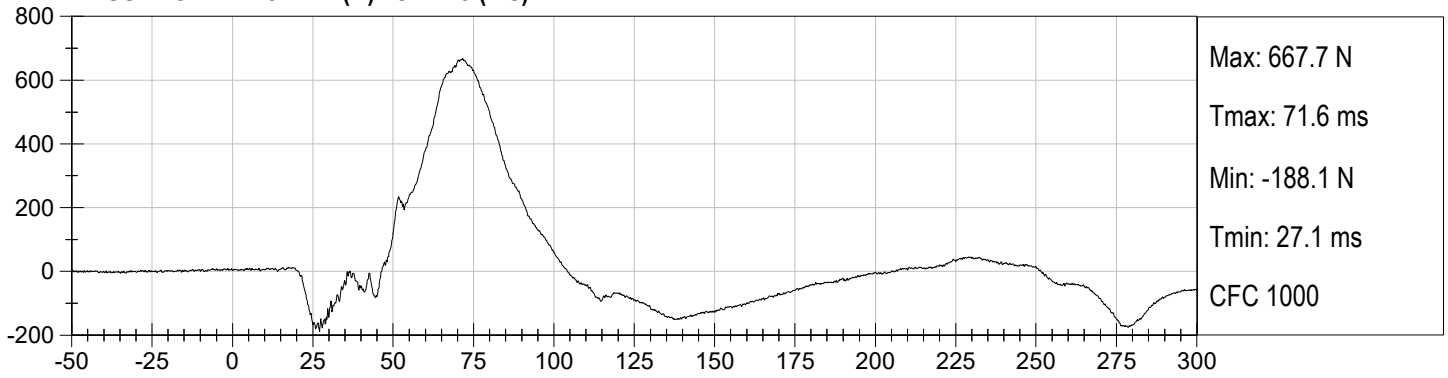
PASSENGER CHEST Z (g) vs Time (ms)



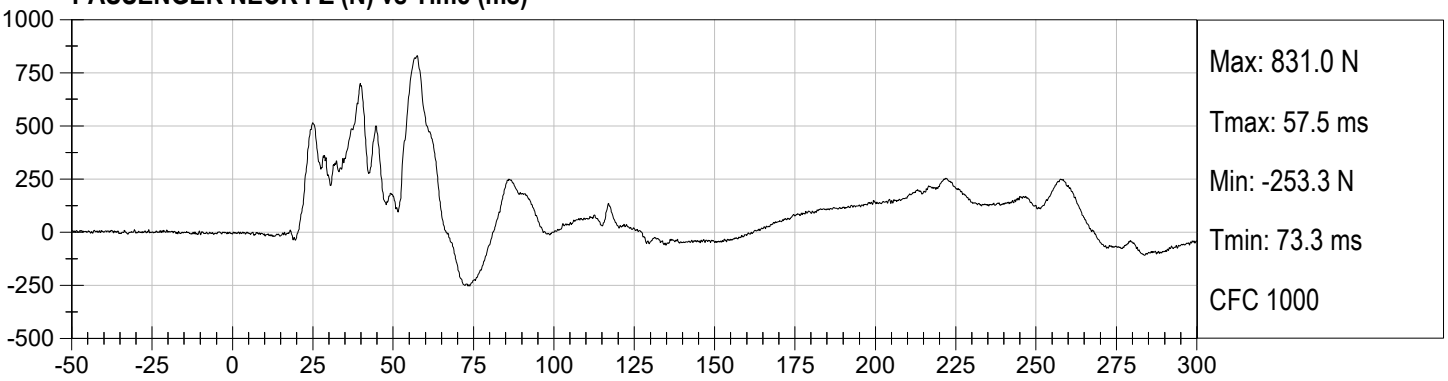
PASSENGER CHEST Resultant (g) vs Time (ms)



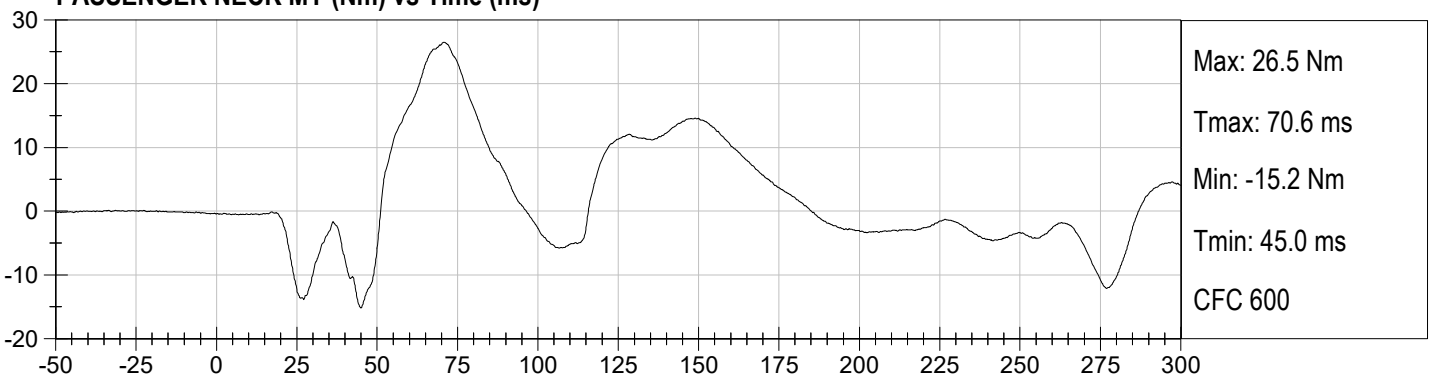
PASSENGER NECK FX (N) vs Time (ms)



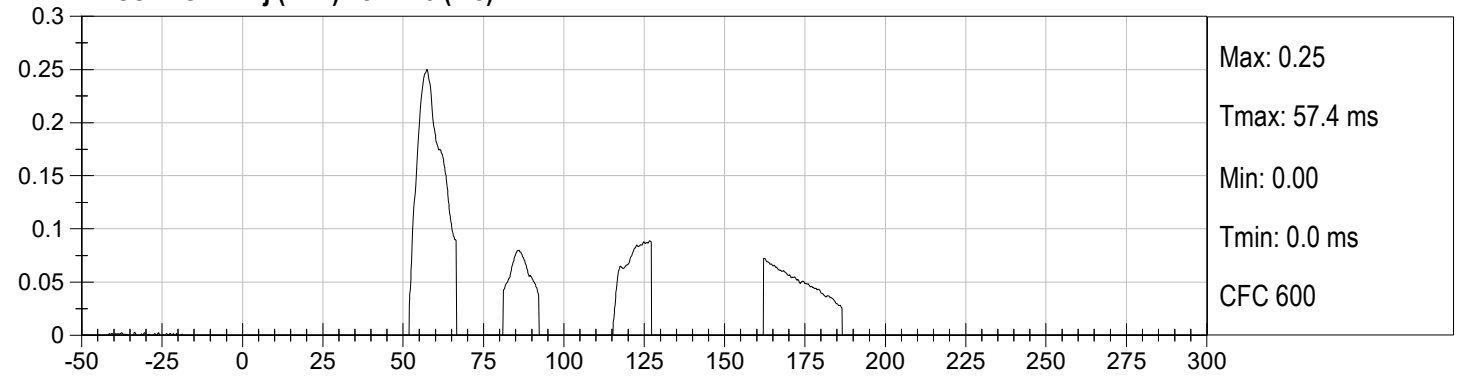
PASSENGER NECK FZ (N) vs Time (ms)



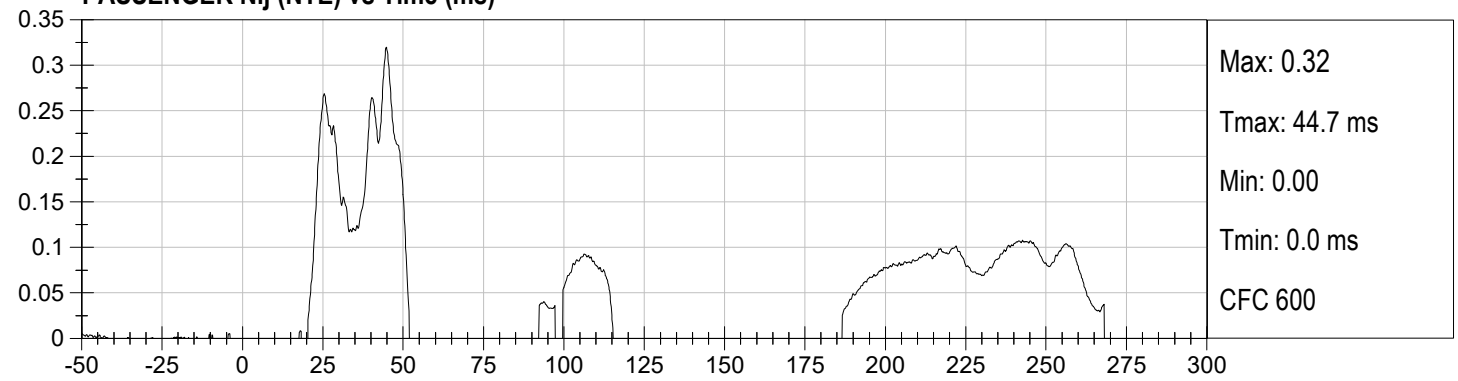
PASSENGER NECK MY (Nm) vs Time (ms)



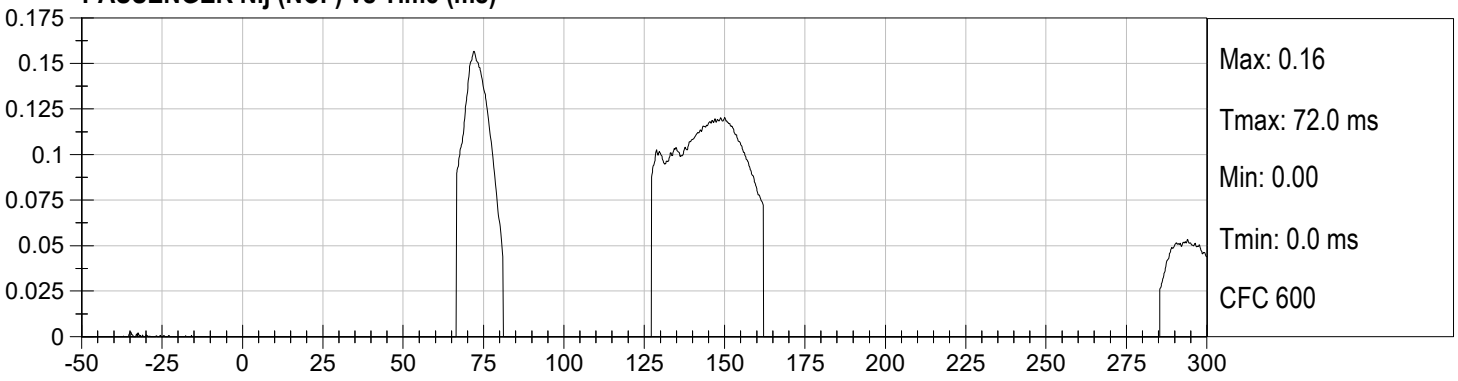
PASSENGER Nij (NTF) vs Time (ms)



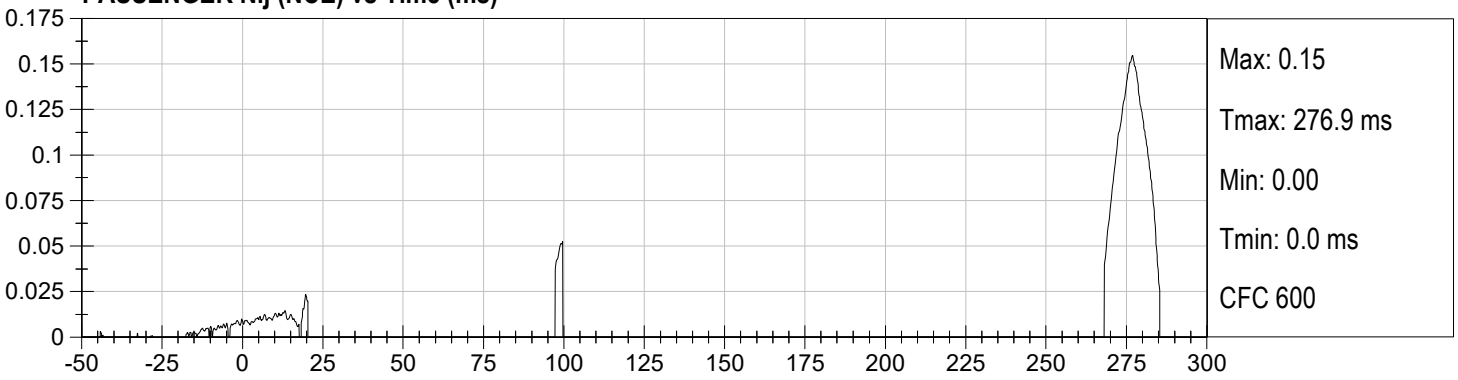
PASSENGER Nij (NTE) vs Time (ms)



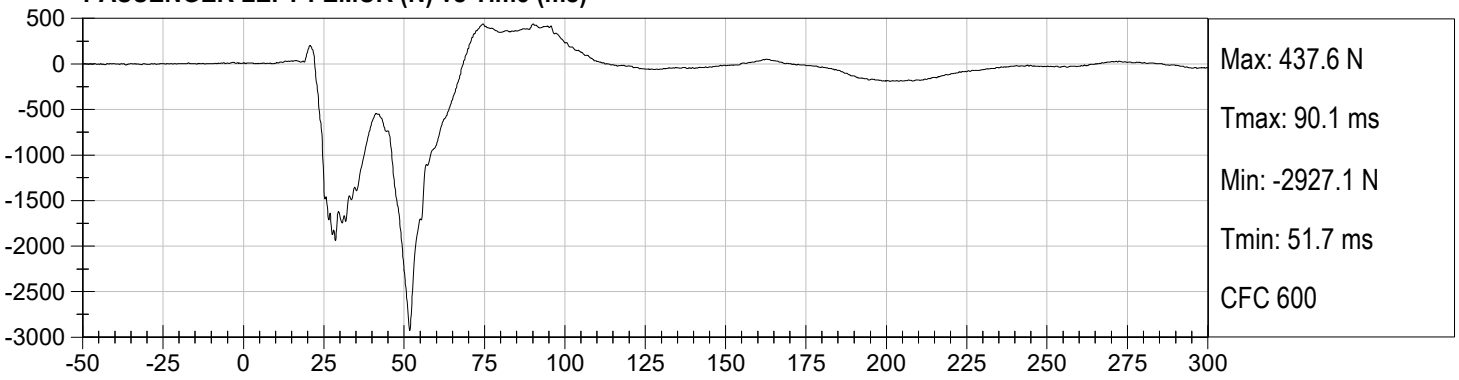
PASSENGER Nij (NCF) vs Time (ms)



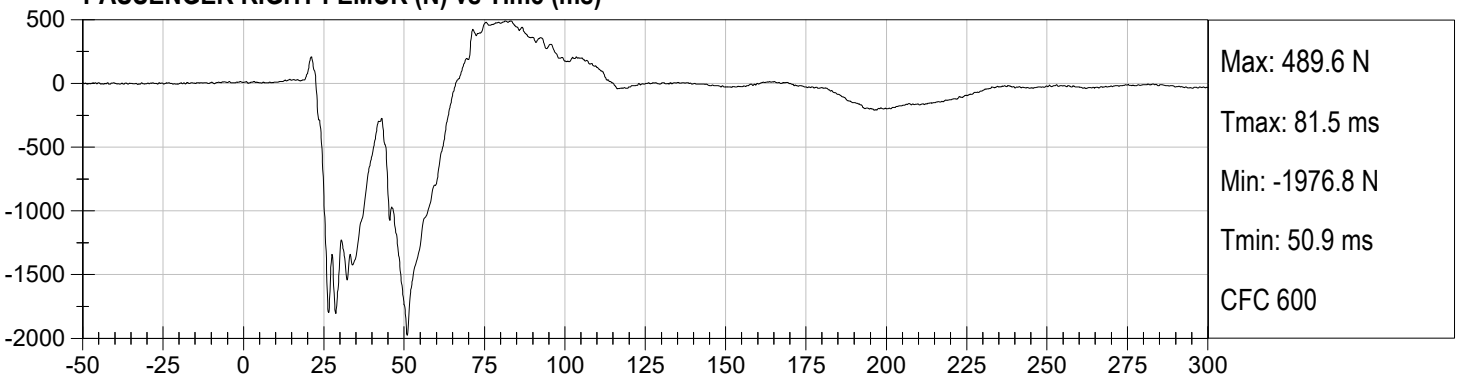
PASSENGER Nij (NCE) vs Time (ms)



PASSENGER LEFT FEMUR (N) vs Time (ms)



PASSENGER RIGHT FEMUR (N) vs Time (ms)



APPENDIX C
DUMMY QUALIFICATION AND PERFORMANCE VERIFICATION

QUALIFICATION TEST RESULTS

PRE-TEST

HYBRID III 50TH PERCENTILE MALE - DRIVER ATD

Hybrid III 50th, External Measurements
SN: 064

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	34.71
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	19.9-20.5	20.31
C	H-POINT HEIGHT	Reference	3.3-3.5	3.38
D	H-POINT LOCATION FROM BACKLINE	Reference	5.3-5.5	5.40
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	3.3-3.7	3.46
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	5.5-6.1	6.09
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	11.48
H	HEAD BACK TO BACKLINE	Back of Skull cap skin to seat rear vertical surface (Reference)	1.6-1.8	1.75
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	13.08
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	7.5-8.3	8.13
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	23.49
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	16.9-17.9	17.01
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	19.1-19.7	19.22
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	18.20

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	8.43
P	FOOT LENGTH	Tip of toe to rear of heel	9.9-10.5	10.33
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	16.3-17.2	16.65
W	FOOT BREADTH	The widest part of the foot	3.6-4.2	3.94
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 16.9-17.1 in. above seat surface	38.2-39.4	39.25
Z	WAIST CIRCUMFERENCE	Measured 8.9-9.1 in. above seat surface	32.9-34.1	33.89
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	16.9-17.1	17.00
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	8.9-9.1	9.00

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

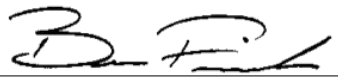
ATD Serial No: 064 **Test ID:** D240541

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	18	Pass
Peak Resultant Acceleration	G's	225 to 275	231	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

02/29/2024

Test Date

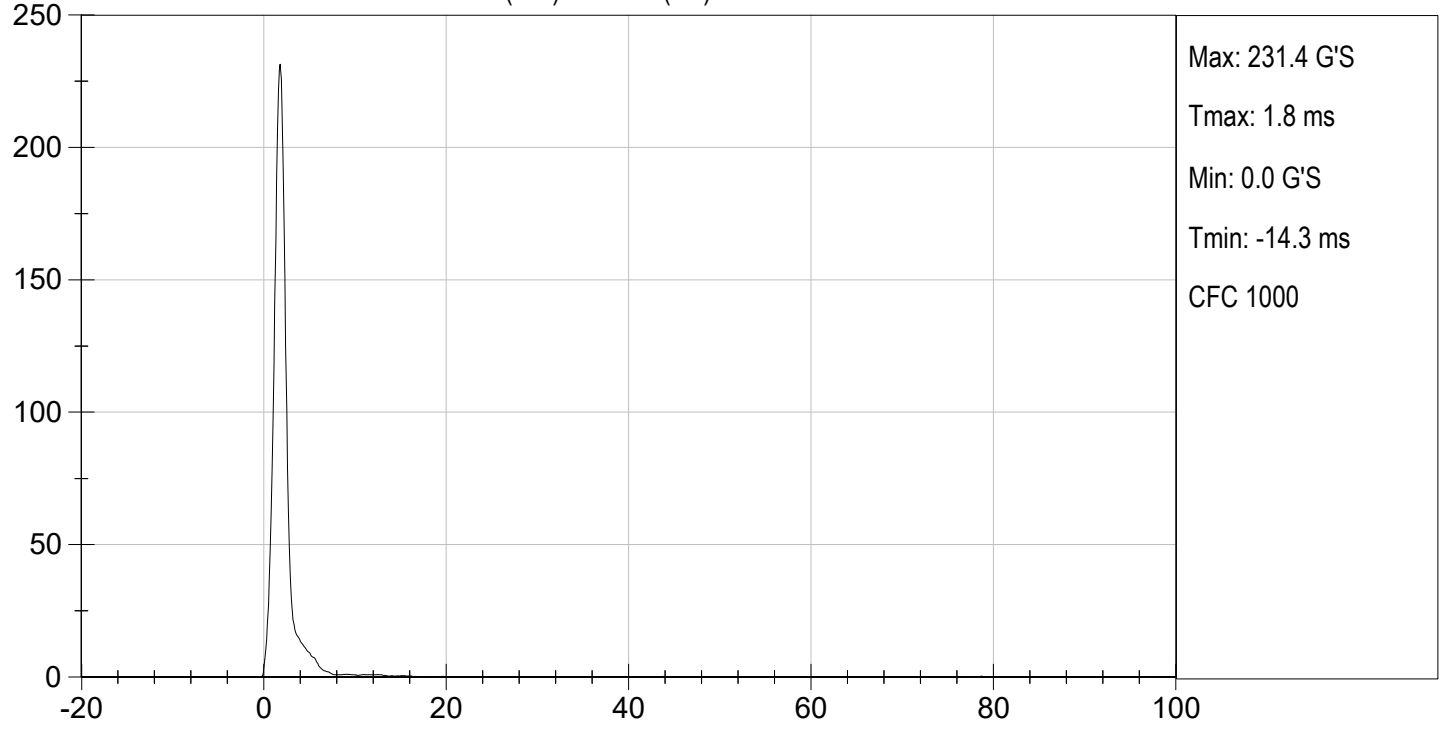


Approved By

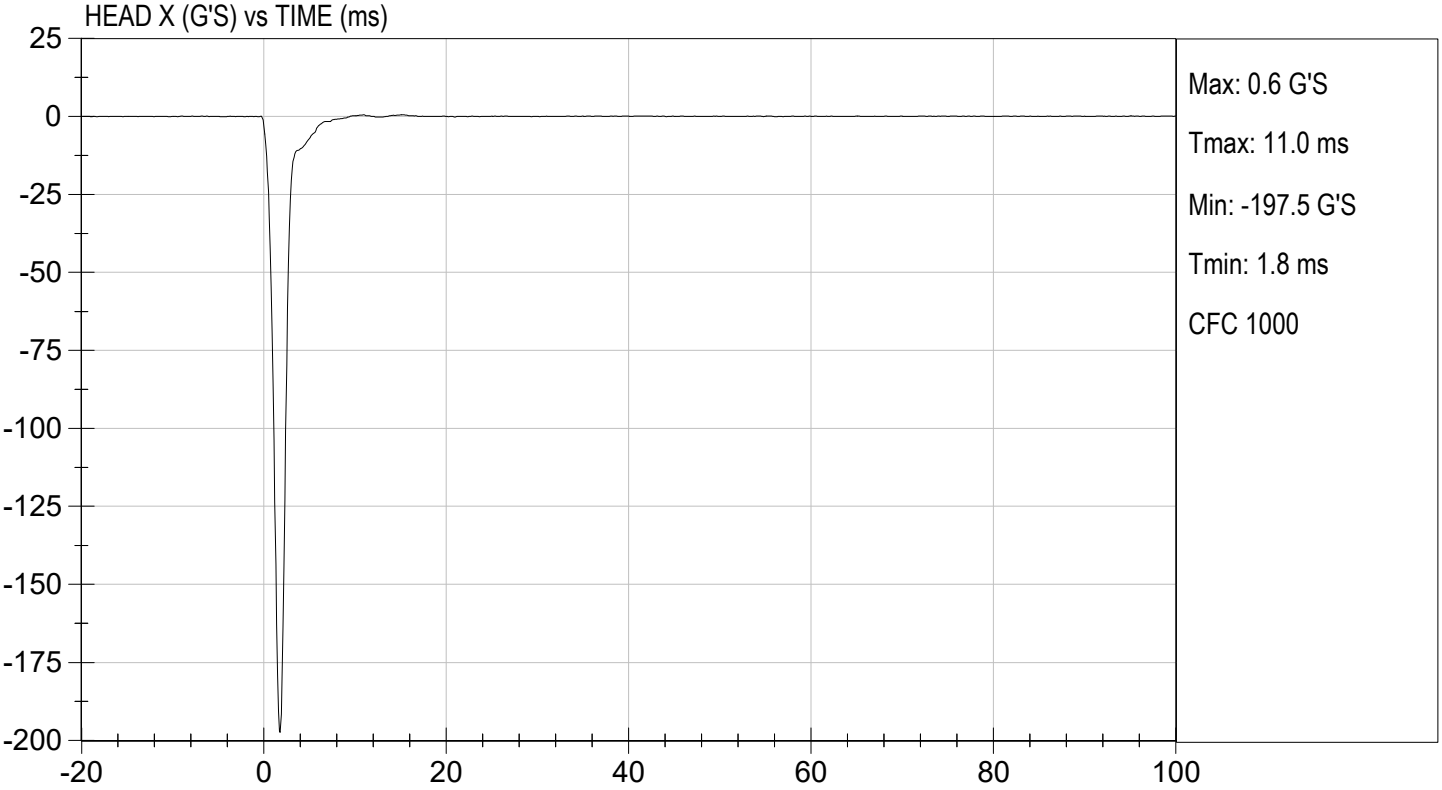
TEST DESC: HEAD DROP

TEST DATE: 02/29/2024
TEST #: D240541

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

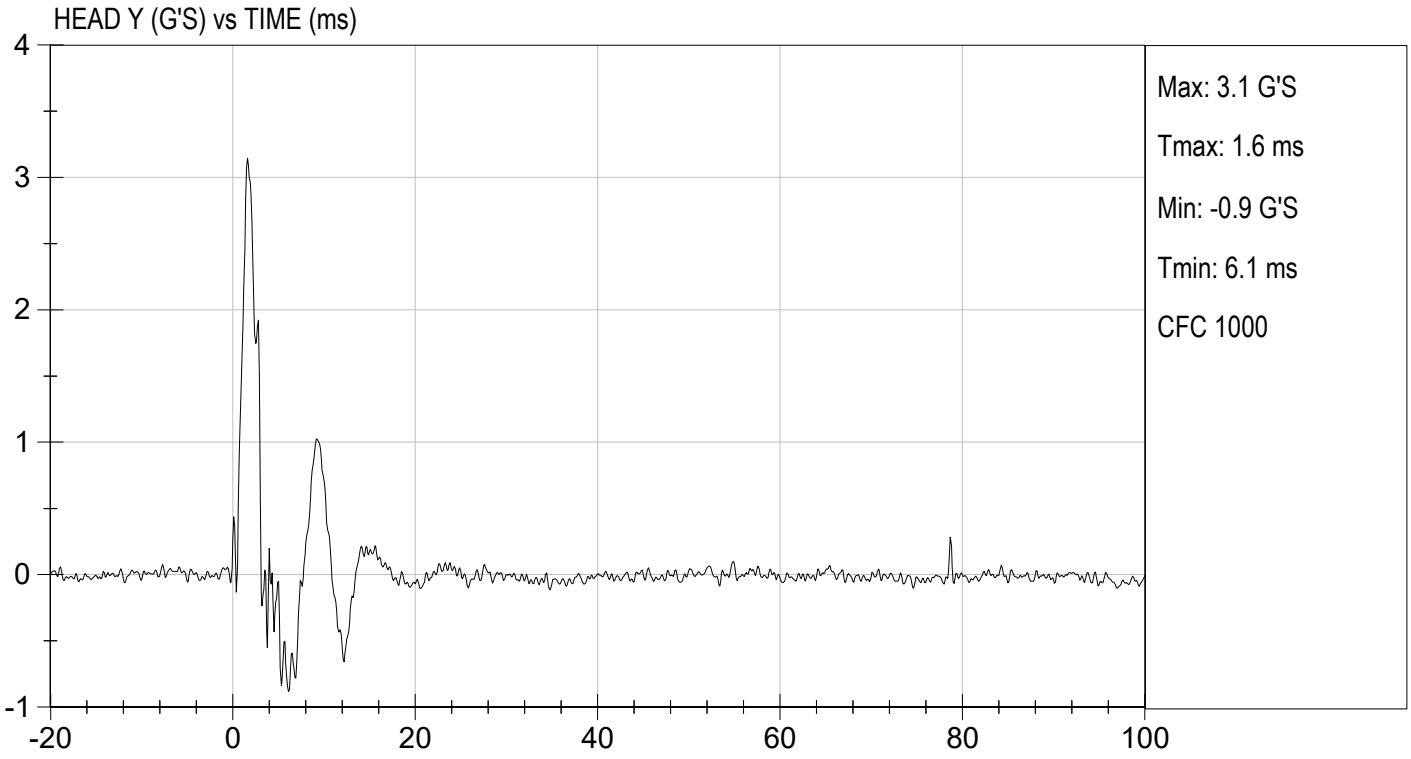


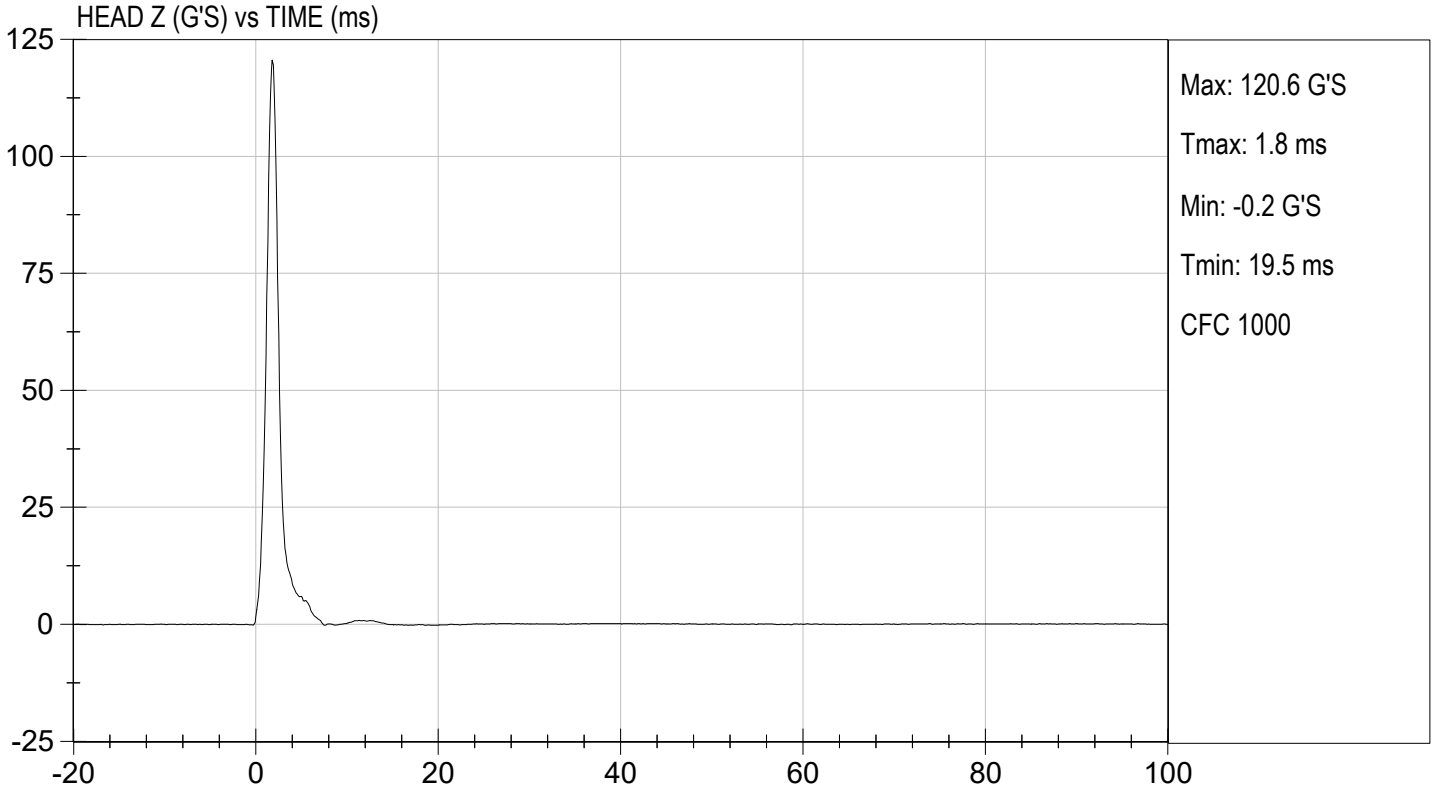
HEAD X (G'S) vs TIME (ms)



TEST DESC: HEAD DROP

TEST DATE: 02/29/2024
TEST #: D240541





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 064 **Test I.D:** D240542

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity		%	10 to 70	24	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.96	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.26	Pass
	20 ms	G's	17.60 to 22.60	20.61	Pass
	30 ms	G's	12.50 to 18.50	15.82	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	15.8	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	38.1	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	72.3	Pass
	Time	ms	57.0 to 64.0	60.1	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	116.5	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	99.6	Pass
	Time	ms	47.0 to 58.0	50.2	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	97.5	Pass
			Overall Test Results		Pass

Laboratory Technician

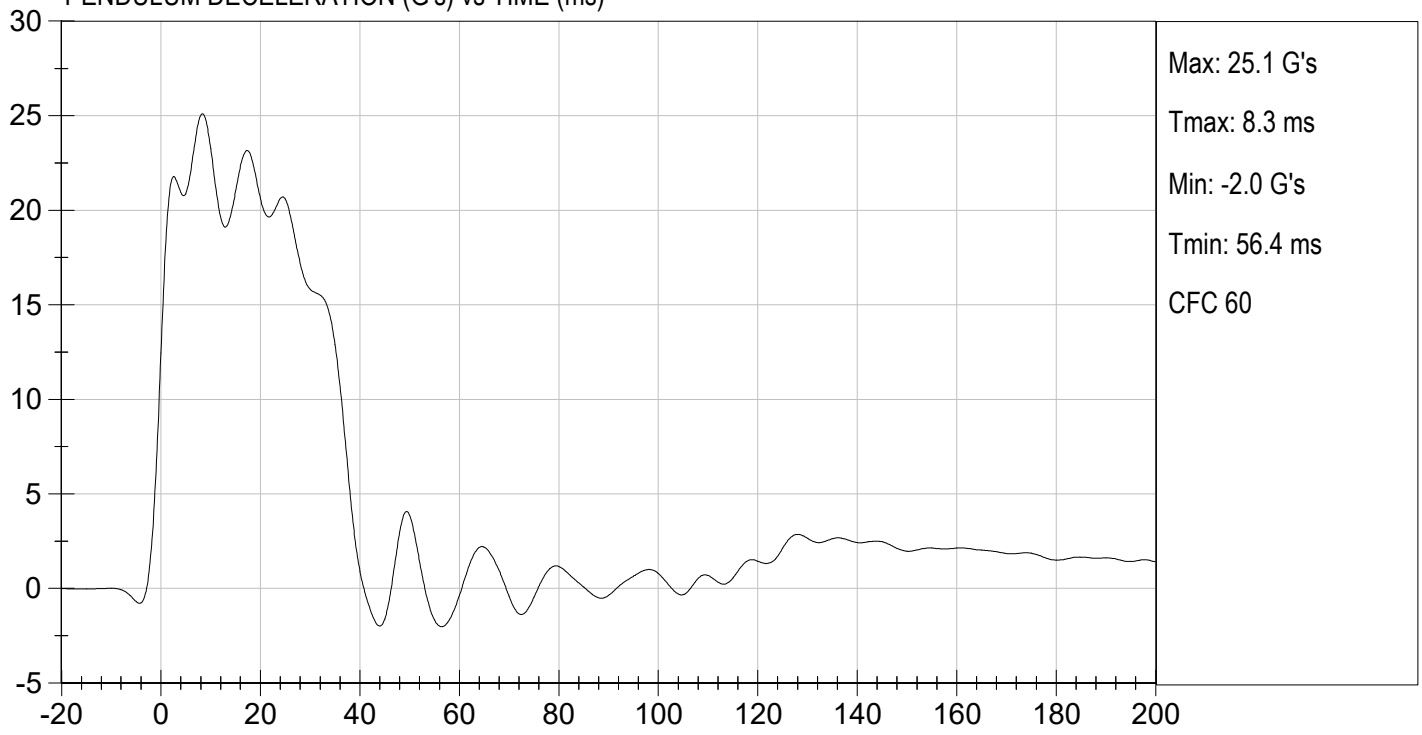
02/28/2024
Test Date

Approved By

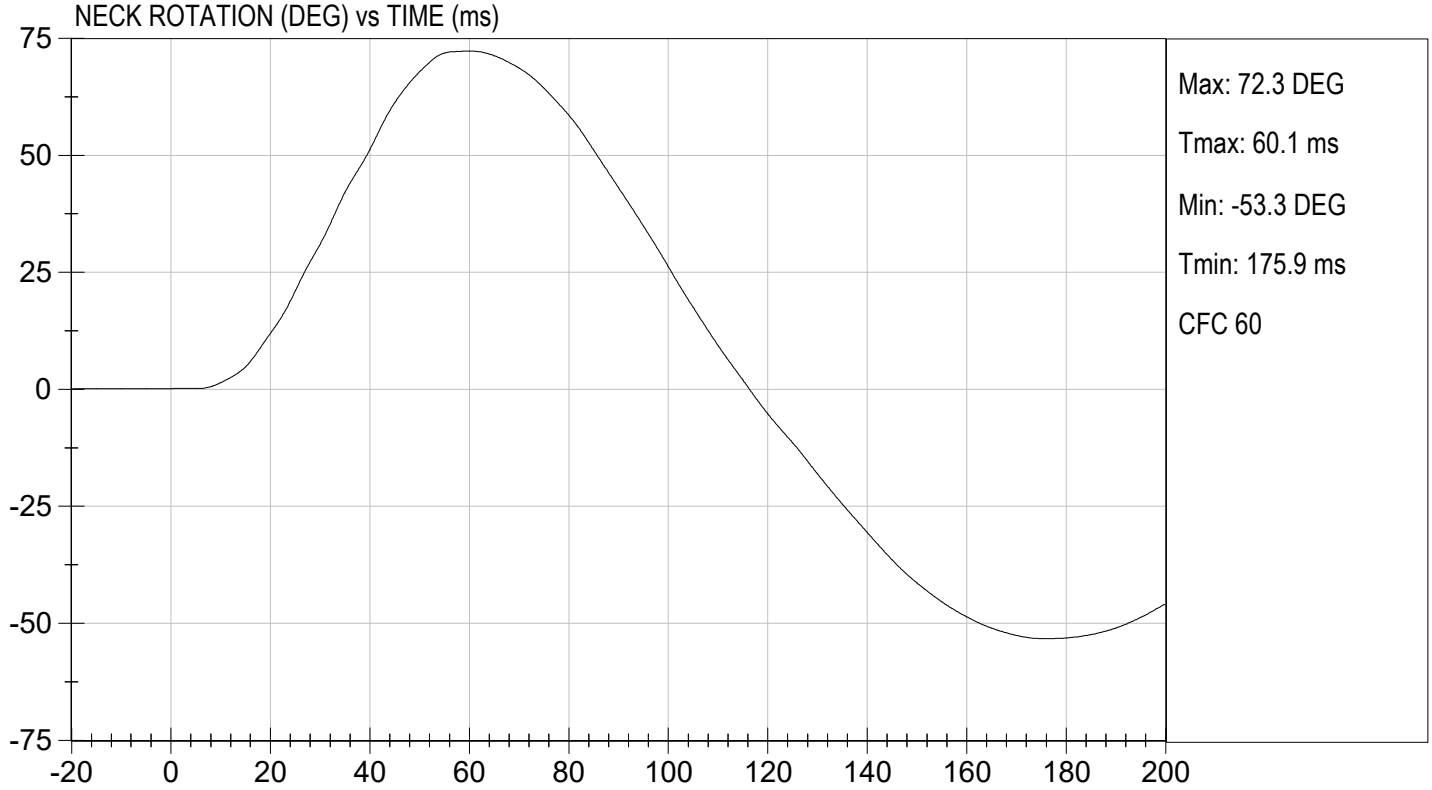
TEST DESC: NECK FLEXION
VELOCITY: 22.83 ft/s, 6.96 m/s

TEST DATE: 02/28/2024
TEST #: D240542

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

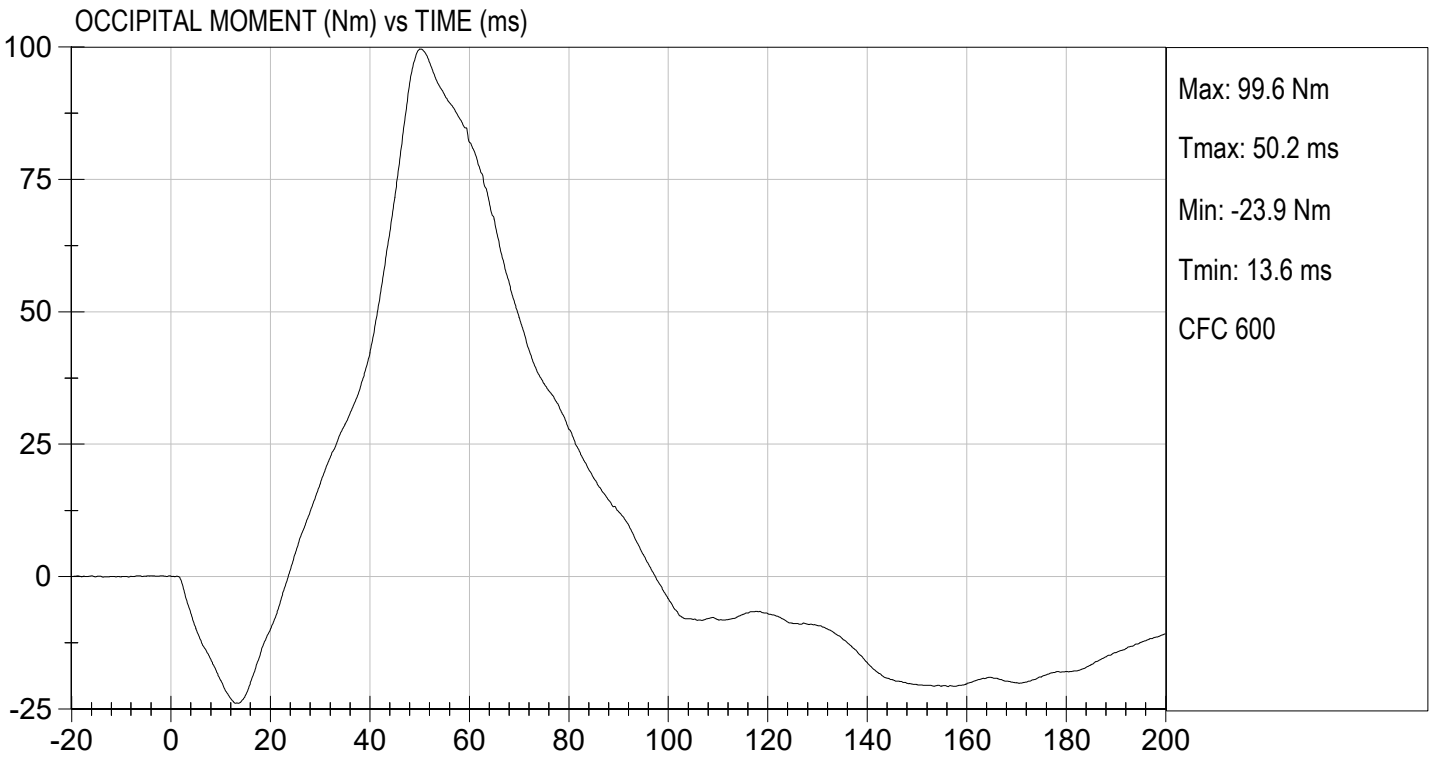


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 02/28/2024
TEST #: D240542



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 064 **Test I.D:** D240543

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity		%	10 to 70	24	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.05	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	19.51	Pass
	20 ms	G's	14.00 to 19.00	16.51	Pass
	30 ms	G's	11.00 to 16.00	14.94	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	15.4	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	38.0	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	99.7	Pass
	Time	ms	72.0 to 82.0	75.5	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	156.4	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-63.5	Pass
	Time	ms	65.0 to 79.0	72.0	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	142.1	Pass
			Overall Test Results		Pass

Laboratory Technician

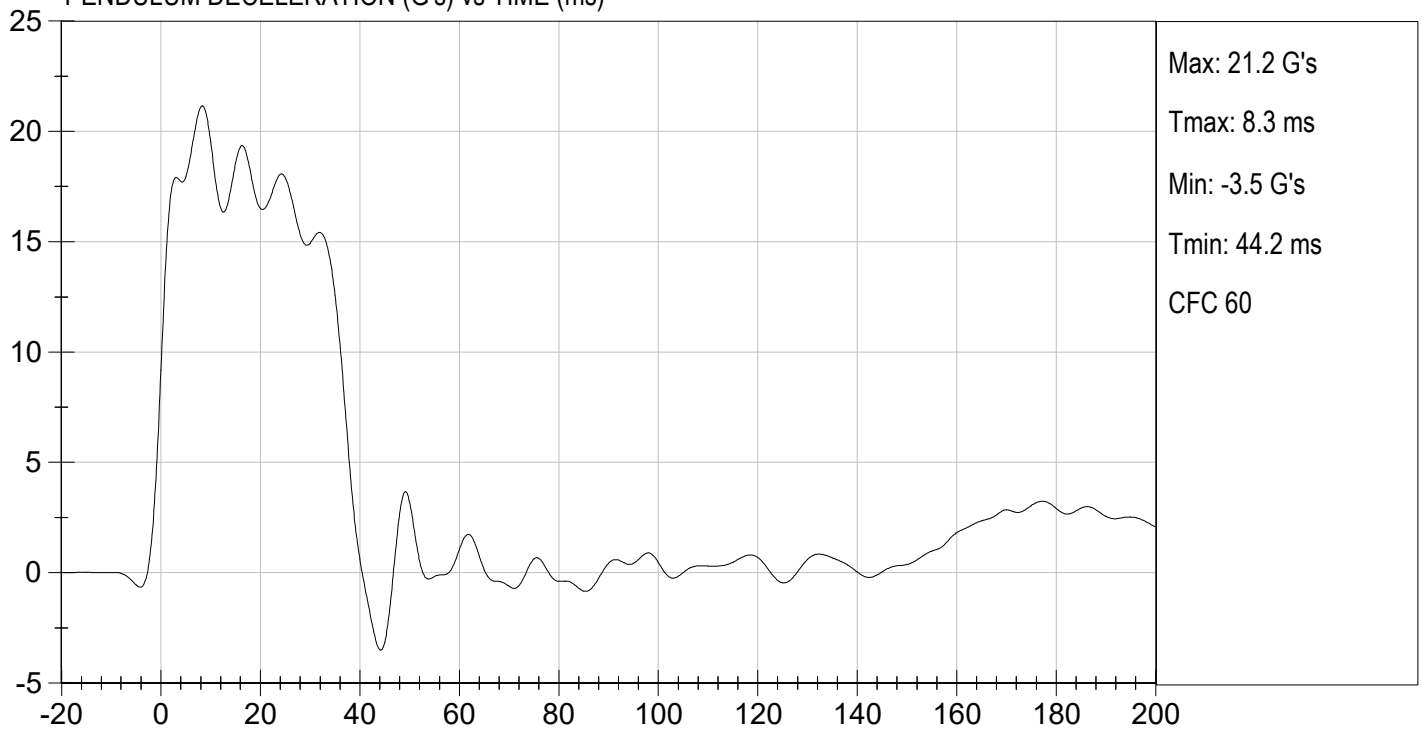
02/28/2024
Test Date

Approved By

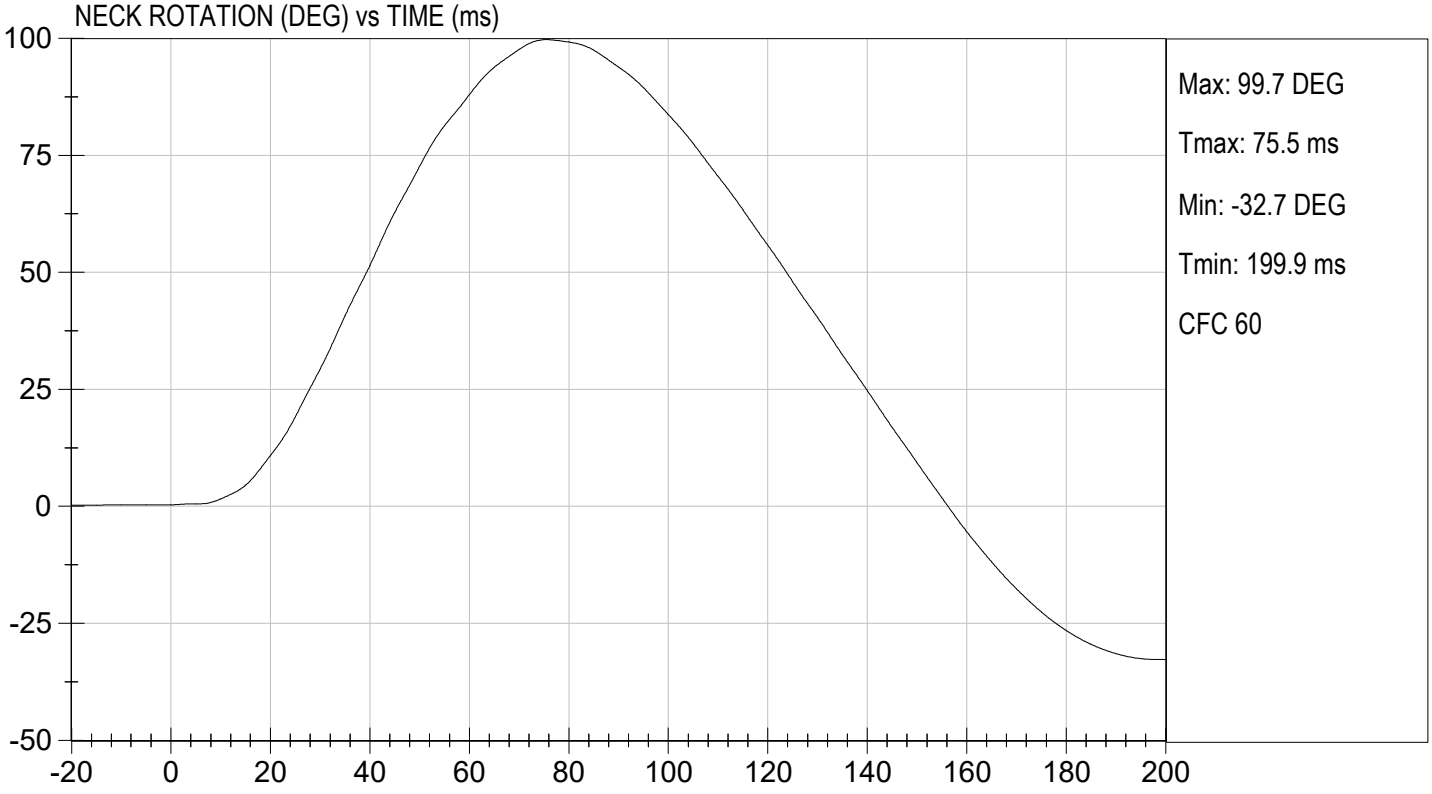
TEST DESC: NECK EXTENSION
VELOCITY: 19.84 ft/s, 6.05 m/s

TEST DATE: 02/28/2024
TEST #: D240543

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

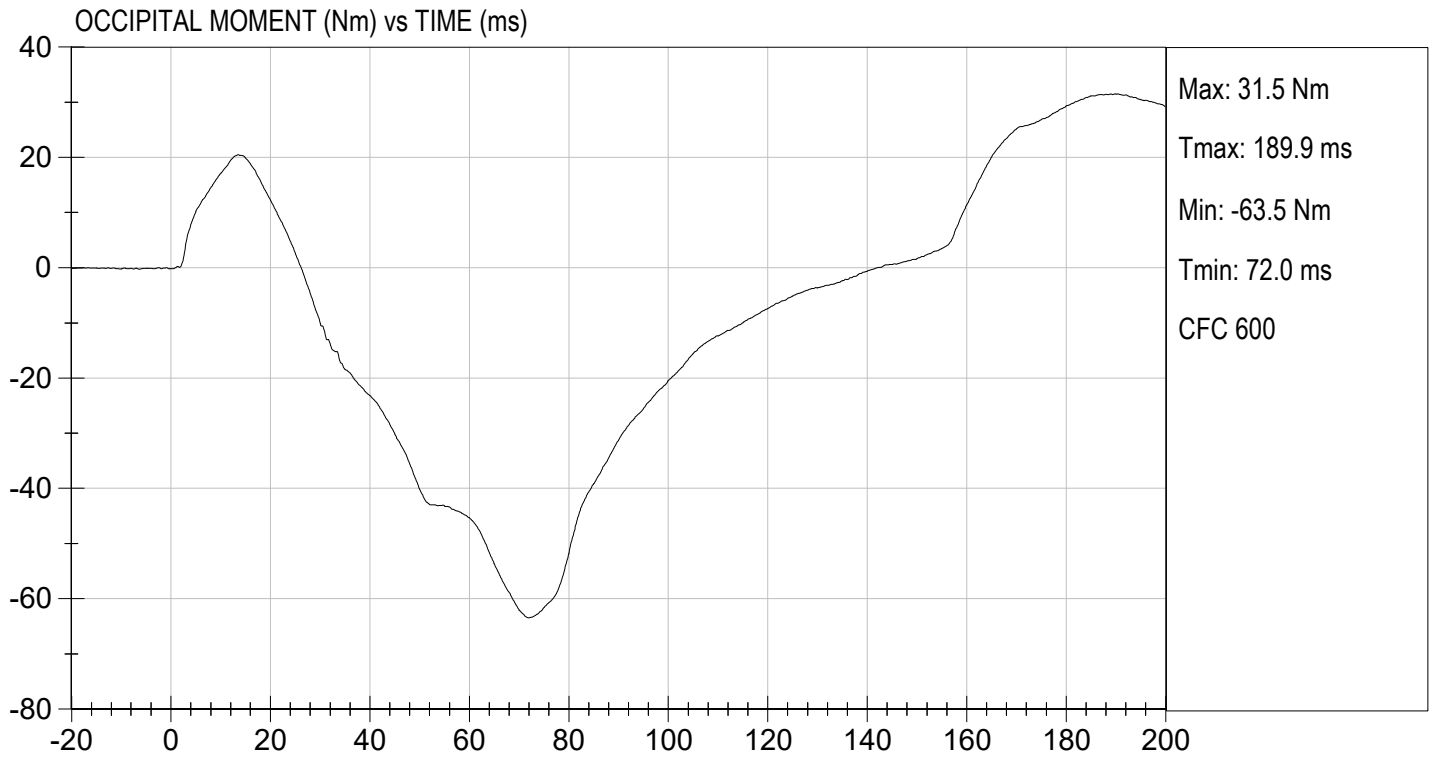


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 02/28/2024
TEST #: D240543



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 064 **Test I.D:** D240544

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	19	Pass
Probe Velocity	m/s	6.58 to 6.82	6.68	Pass
Peak Probe Force	N	5159 to 5893	5,372	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.89	Pass
Internal Hysteresis	%	69 to 85	72	Pass
		Overall Test Results		Pass

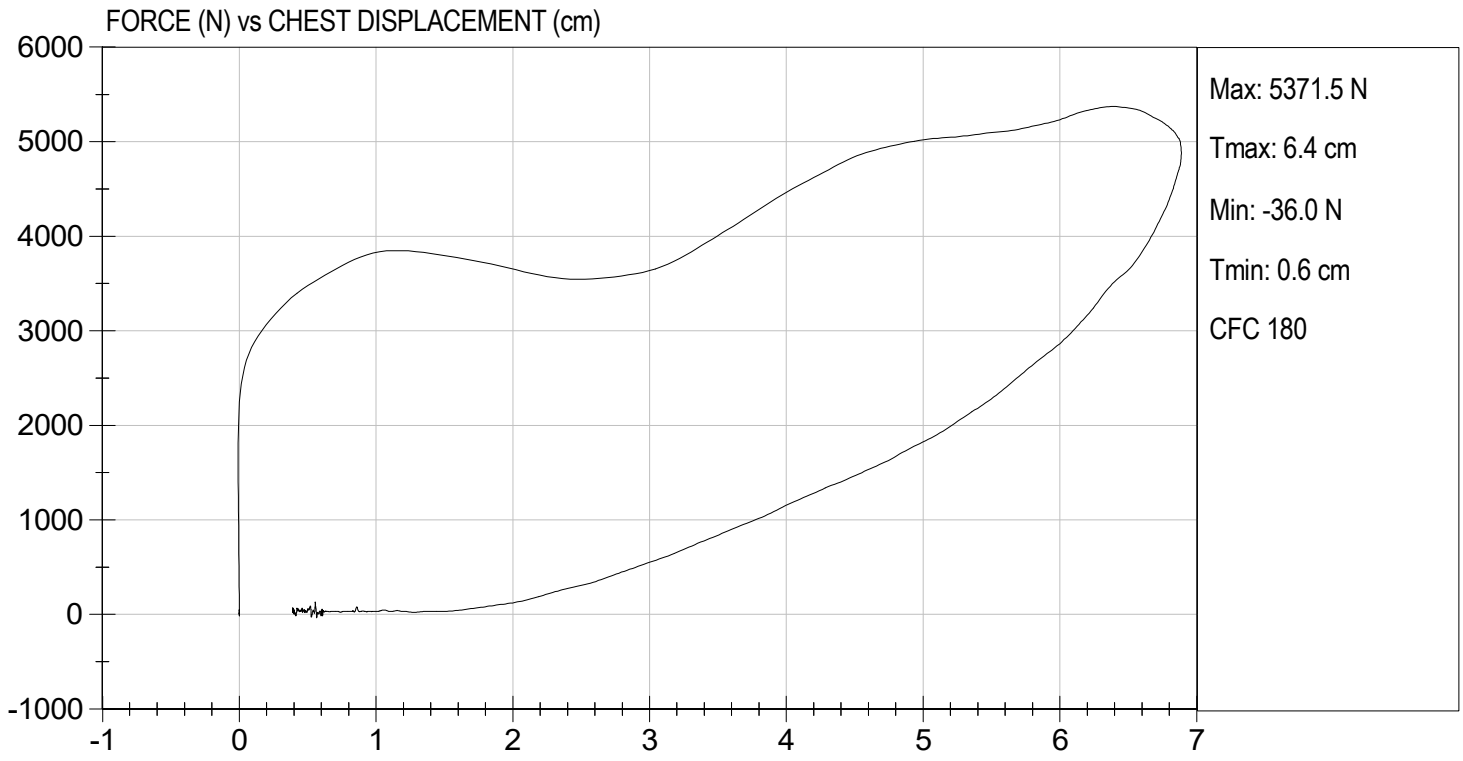
Laboratory Technician

02/29/2024
Test Date

Approved By

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

TEST DATE: 02/29/2024
TEST #: D240544



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 064 **Test I.D:** D240545

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	N	4715 to 5782	5,117	Pass
		Overall Test Results		Pass

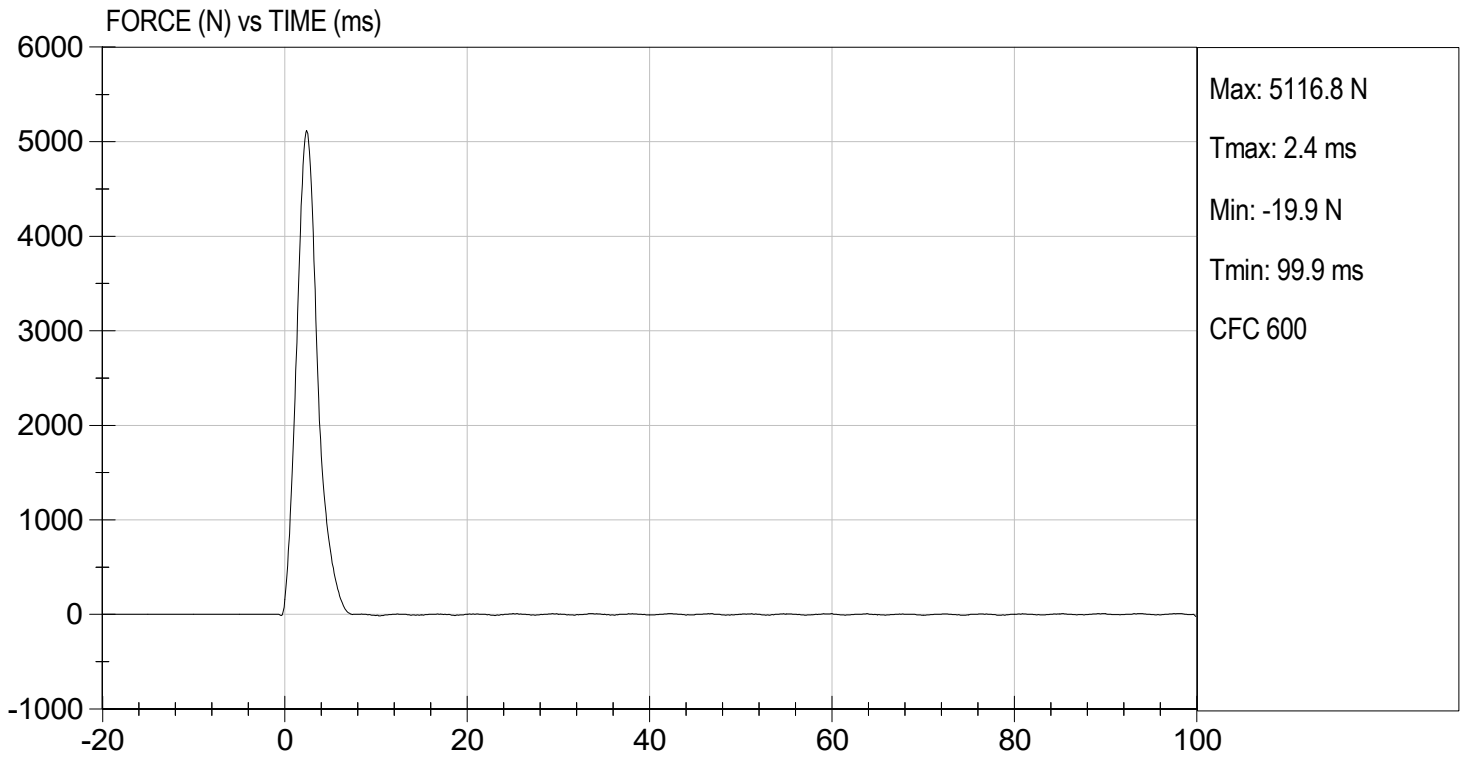
Laboratory Technician

02/28/2024
Test Date

Approved By

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

TEST DATE: 02/28/2024
TEST #: D240545



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 064 **Test I.D:** D240546

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	N	4715 to 5782	4,919	Pass
		Overall Test Results		Pass

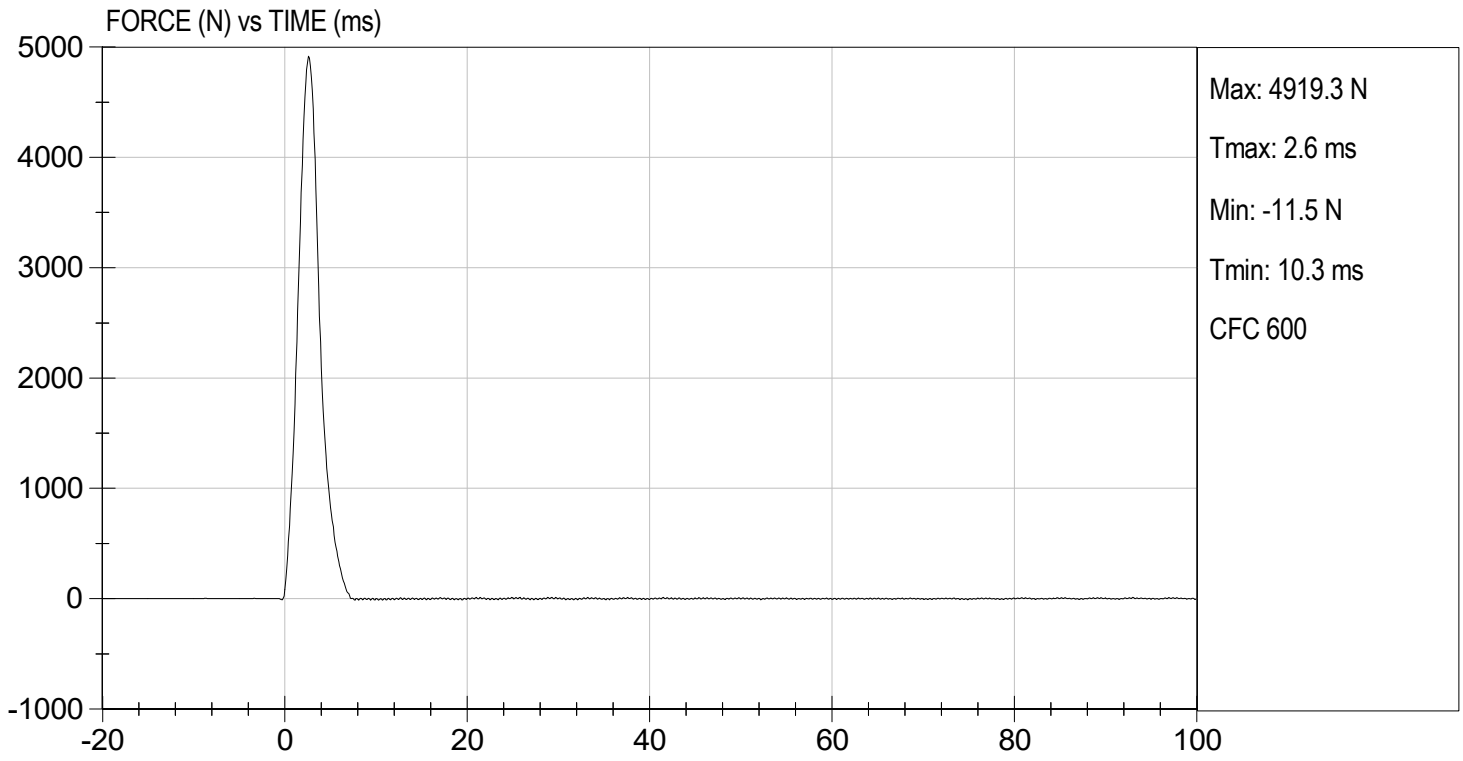
Laboratory Technician

02/28/2024
Test Date

Approved By

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

TEST DATE: 02/28/2024
TEST #: D240546



MGA RESEARCH CORPORATION

HIP-FEMUR FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 064 **Test I.D:** D240540

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.3	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	24	24	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.3	6.3	Pass
30 Degrees	Nm	94.9 Nm Max	89.1	89.6	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	44.4	43.5	Pass
		Overall Test Results			Pass

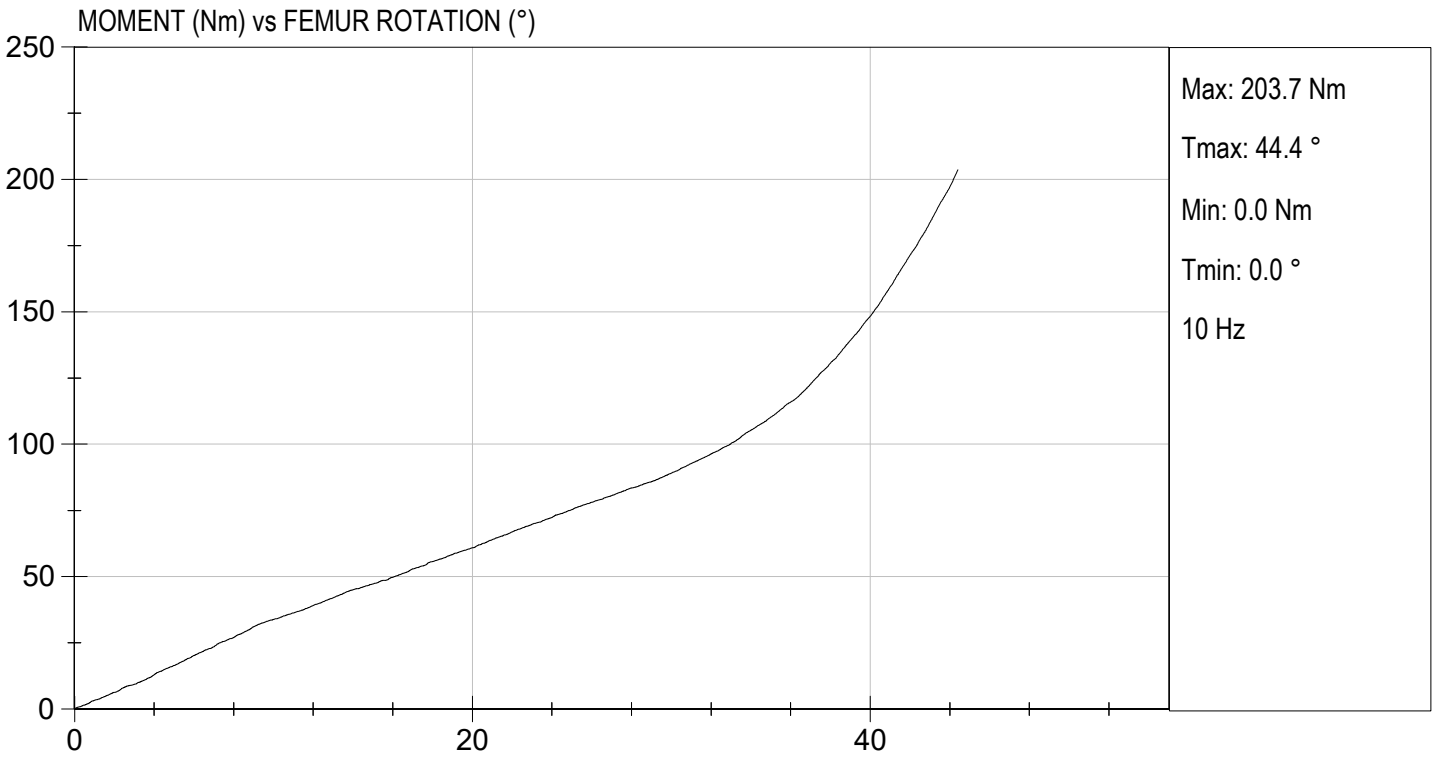
Laboratory Technician

02/28/2024
Test Date

Approved By

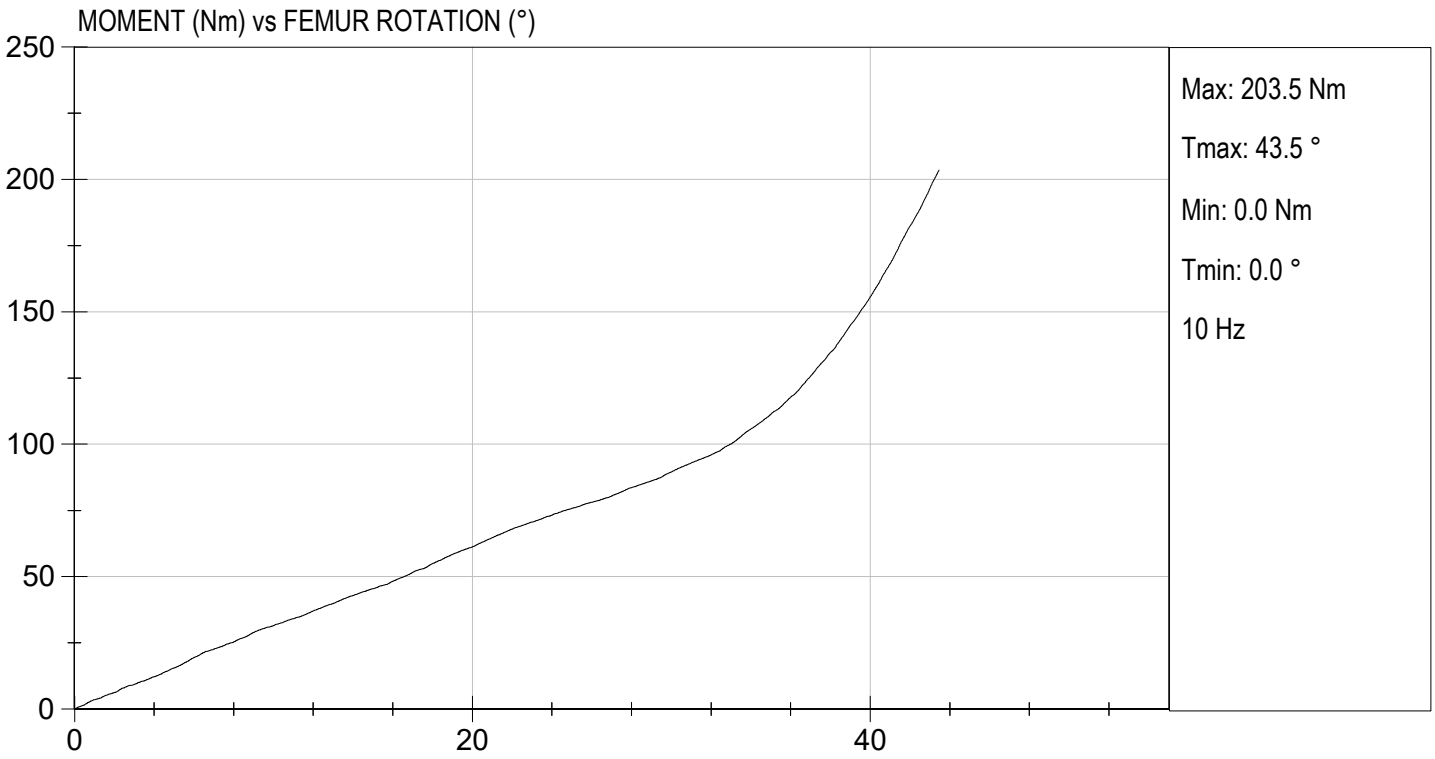
TEST DESC: RIGHT HIP FEMUR FLEXION

TEST DATE: 02/28/2024
TEST #: D240549



TEST DESC: LEFT HIP FEMUR FLEXION

TEST DATE: 02/28/2024
TEST #: D240540



QUALIFICATION 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: 064 **Test ID:** D240601

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	36	Pass
Peak Resultant Acceleration	G's	225 to 275	240	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	3.6	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Laboratory Technician

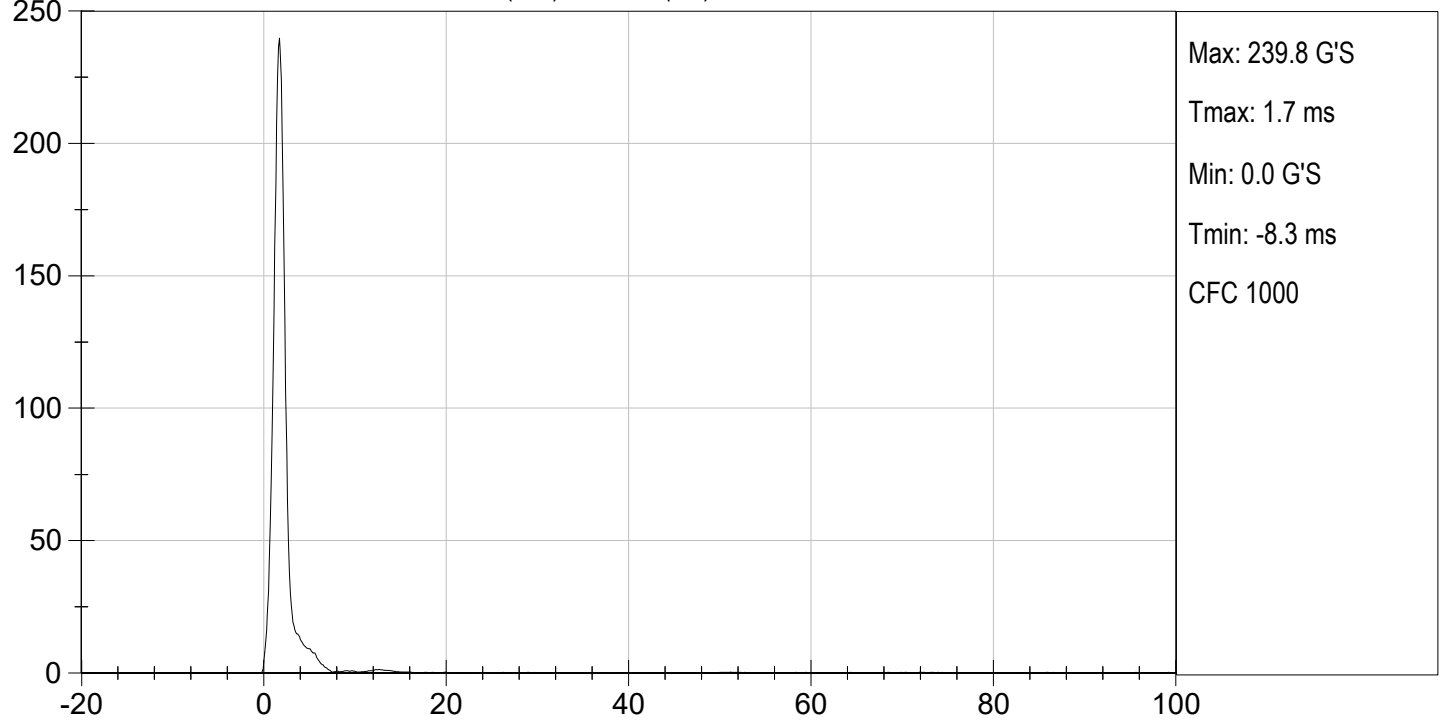
03/05/2024
Test Date

Approved By

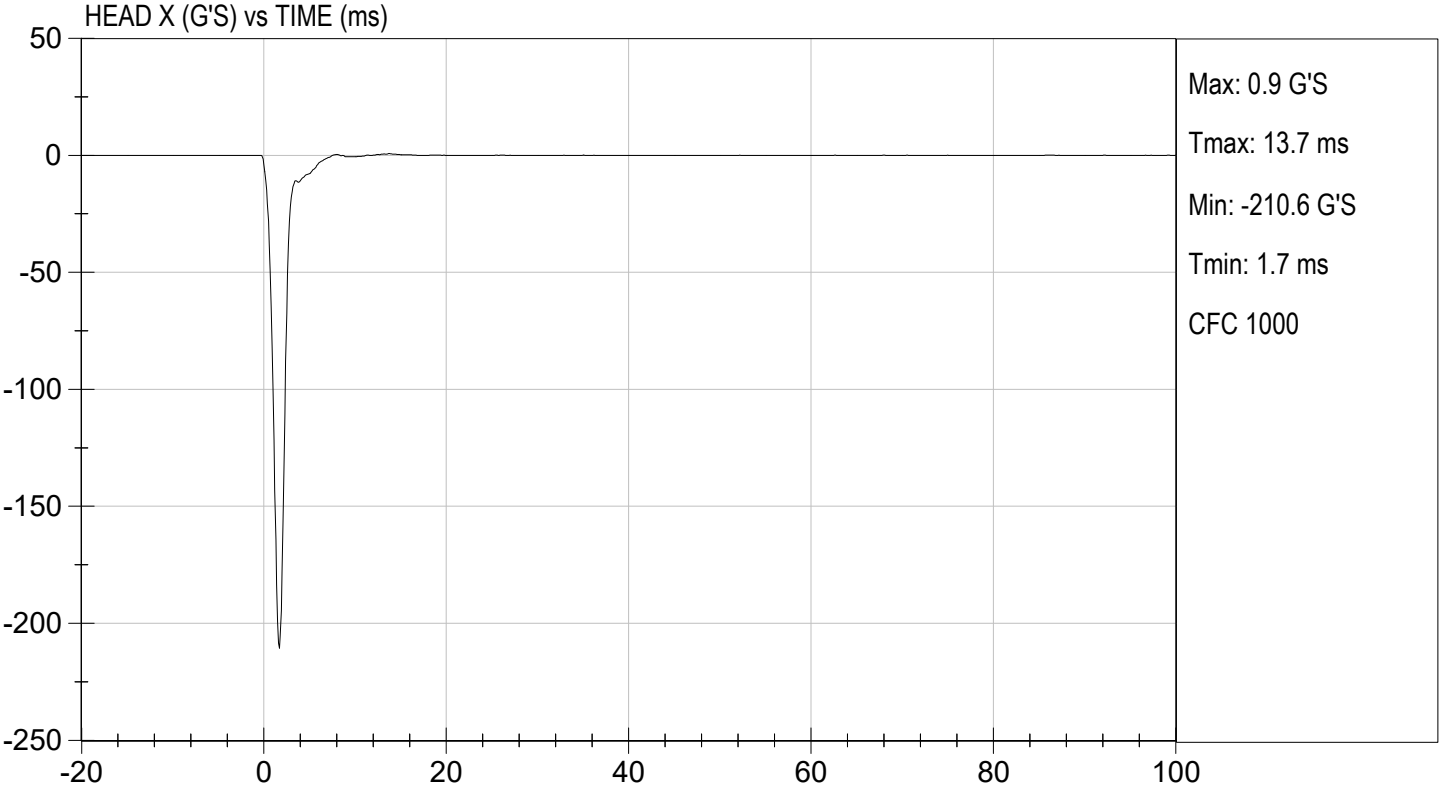
TEST DESC: HEAD DROP

TEST DATE: 03/05/2024
TEST #: D240601

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

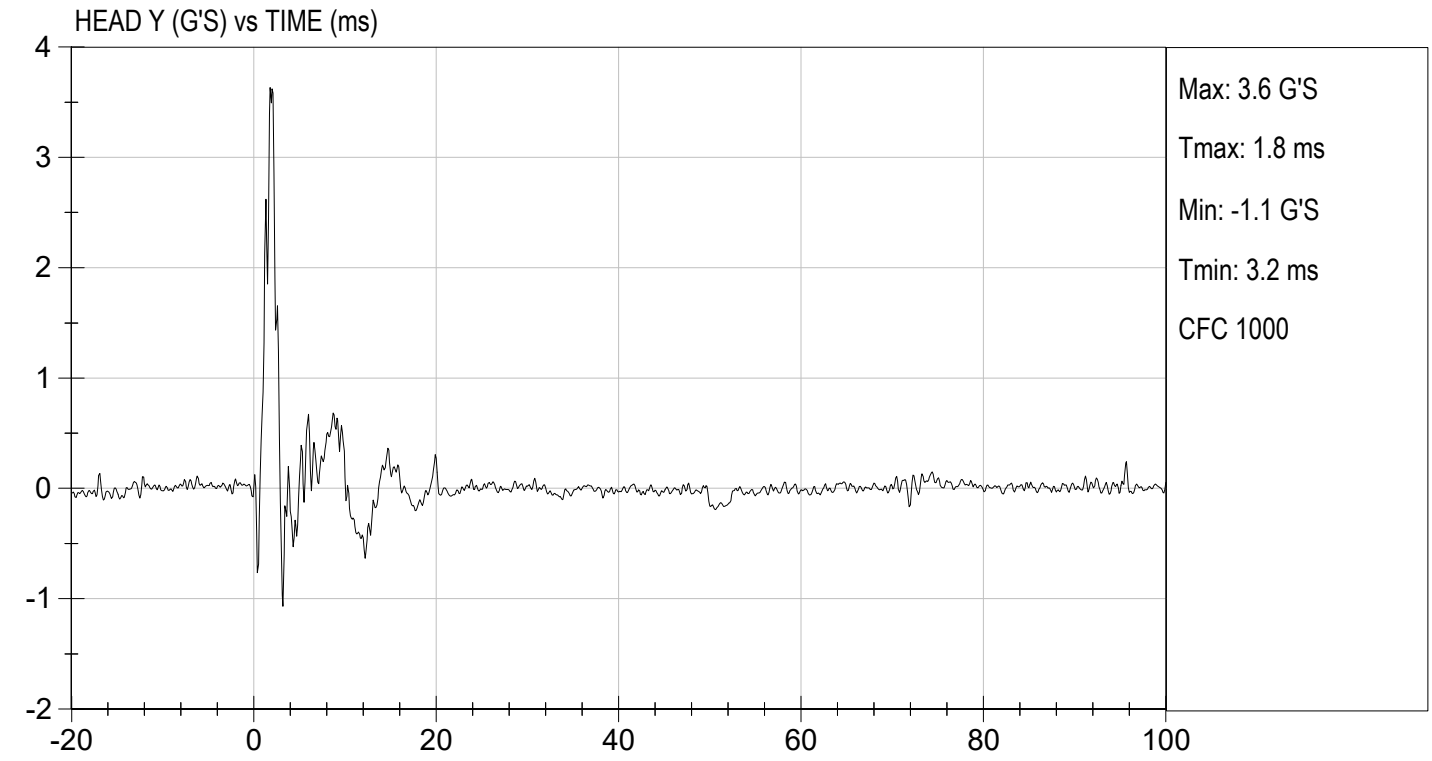


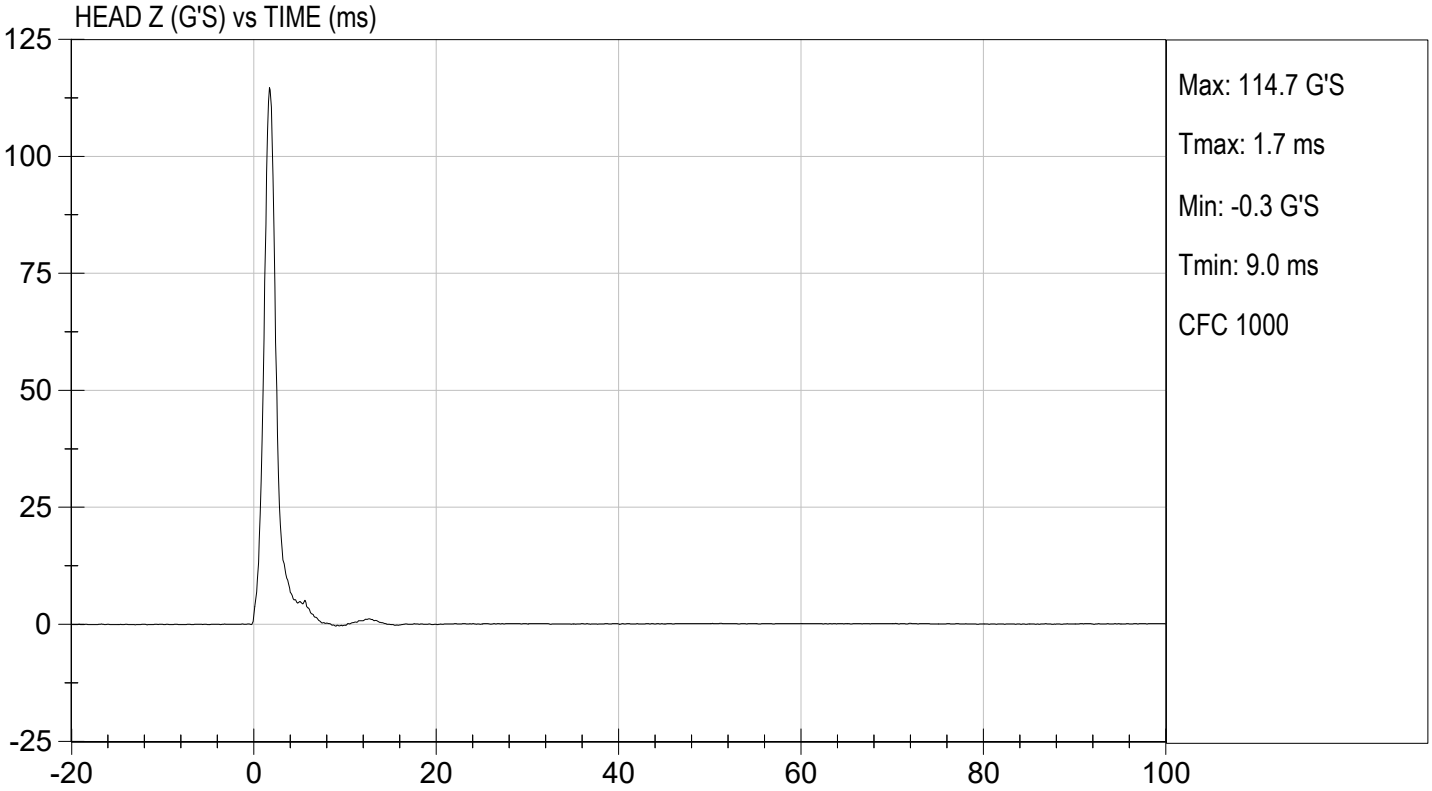
HEAD X (G'S) vs TIME (ms)



TEST DESC: HEAD DROP

TEST DATE: 03/05/2024
TEST #: D240601





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 064 **Test I.D:** D240602

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	36	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.96	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.93	Pass
	20 ms	G's	17.60 to 22.60	18.88	Pass
	30 ms	G's	12.50 to 18.50	16.82	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	16.8	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	38.6	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	71.5	Pass
	Time	ms	57.0 to 64.0	59.6	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	114.1	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	97.9	Pass
	Time	ms	47.0 to 58.0	51.0	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	97.8	Pass
			Overall Test Results		Pass

Laboratory Technician

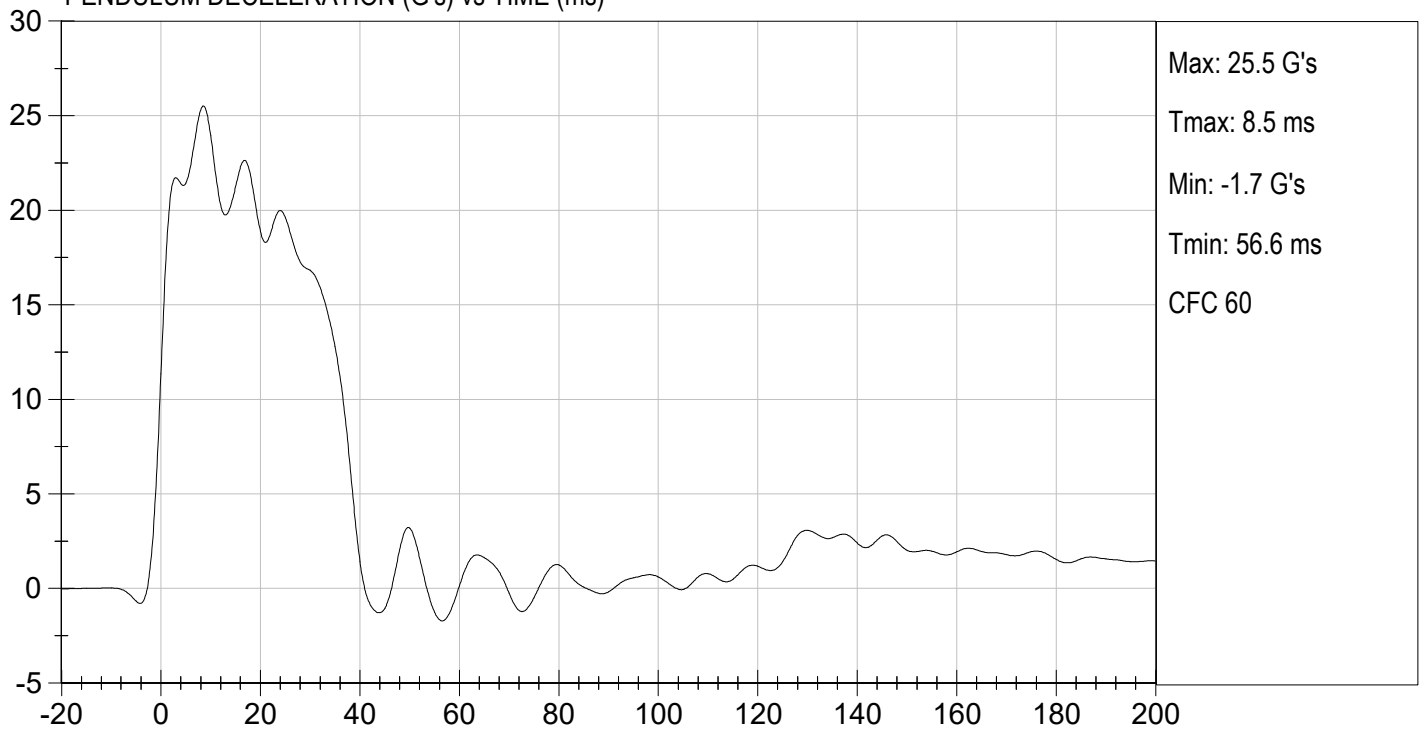
03/05/2024
Test Date

Approved By

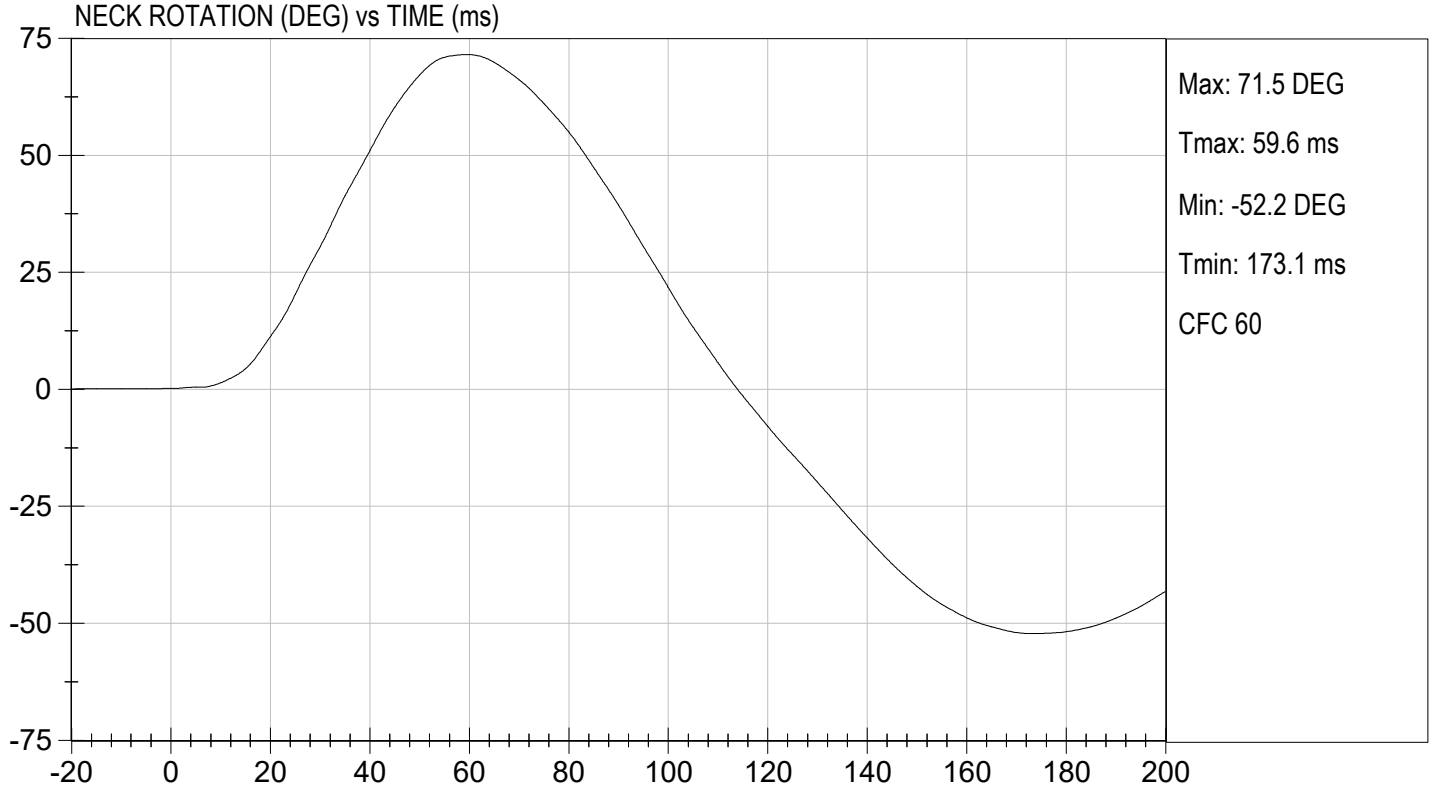
TEST DESC: NECK FLEXION
VELOCITY: 22.83 ft/s, 6.96 m/s

TEST DATE: 03/05/2024
TEST #: D240602

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

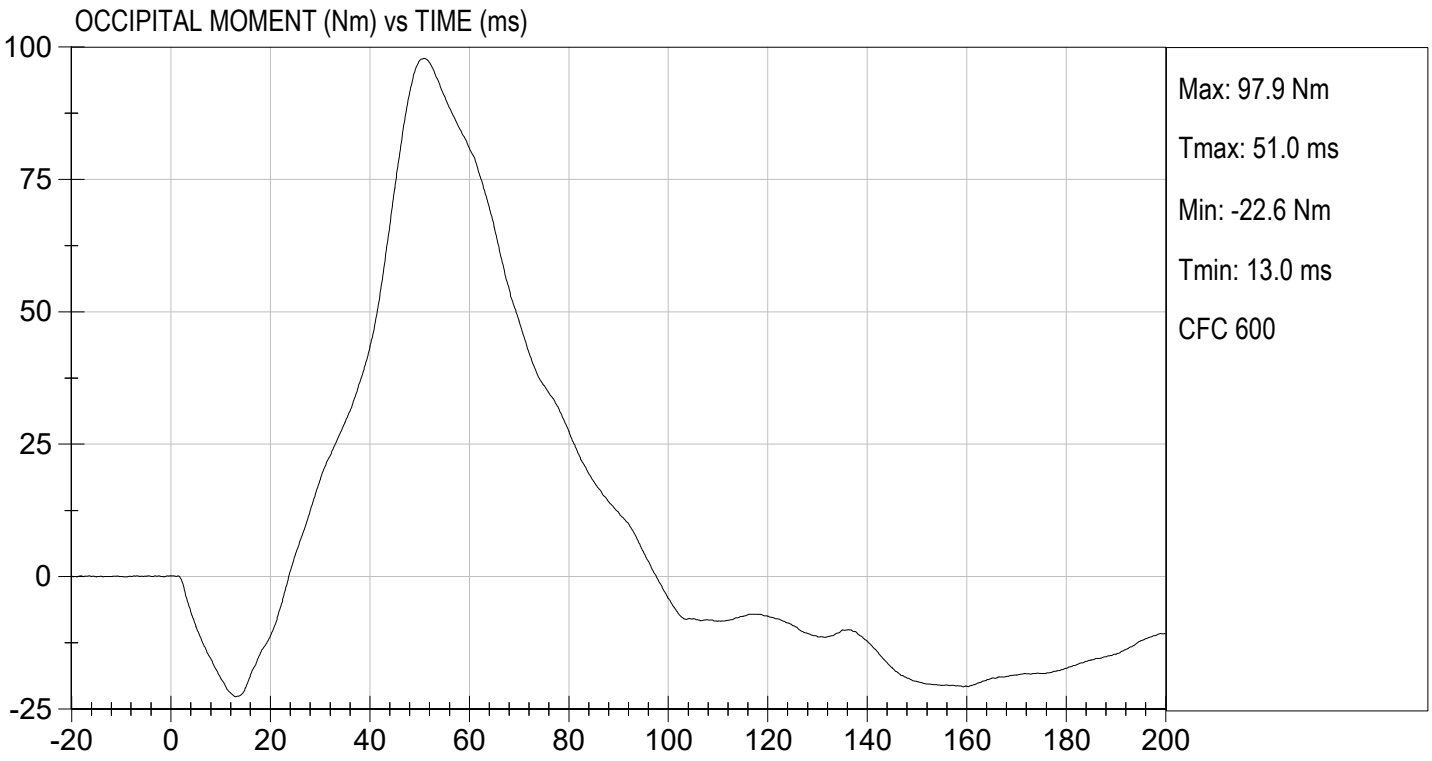


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 03/05/2024
TEST #: D240602



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 064 **Test I.D:** D240603

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity		%	10 to 70	36	Pass
Pendulum Velocity		m/s	5.95 to 6.19	5.98	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	19.43	Pass
	20 ms	G's	14.00 to 19.00	16.67	Pass
	30 ms	G's	11.00 to 16.00	13.79	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	14.0	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	40.1	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	99.0	Pass
	Time	ms	72.0 to 82.0	77.9	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	157.8	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-60.4	Pass
	Time	ms	65.0 to 79.0	73.7	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	143.0	Pass
			Overall Test Results		Pass

Laboratory Technician

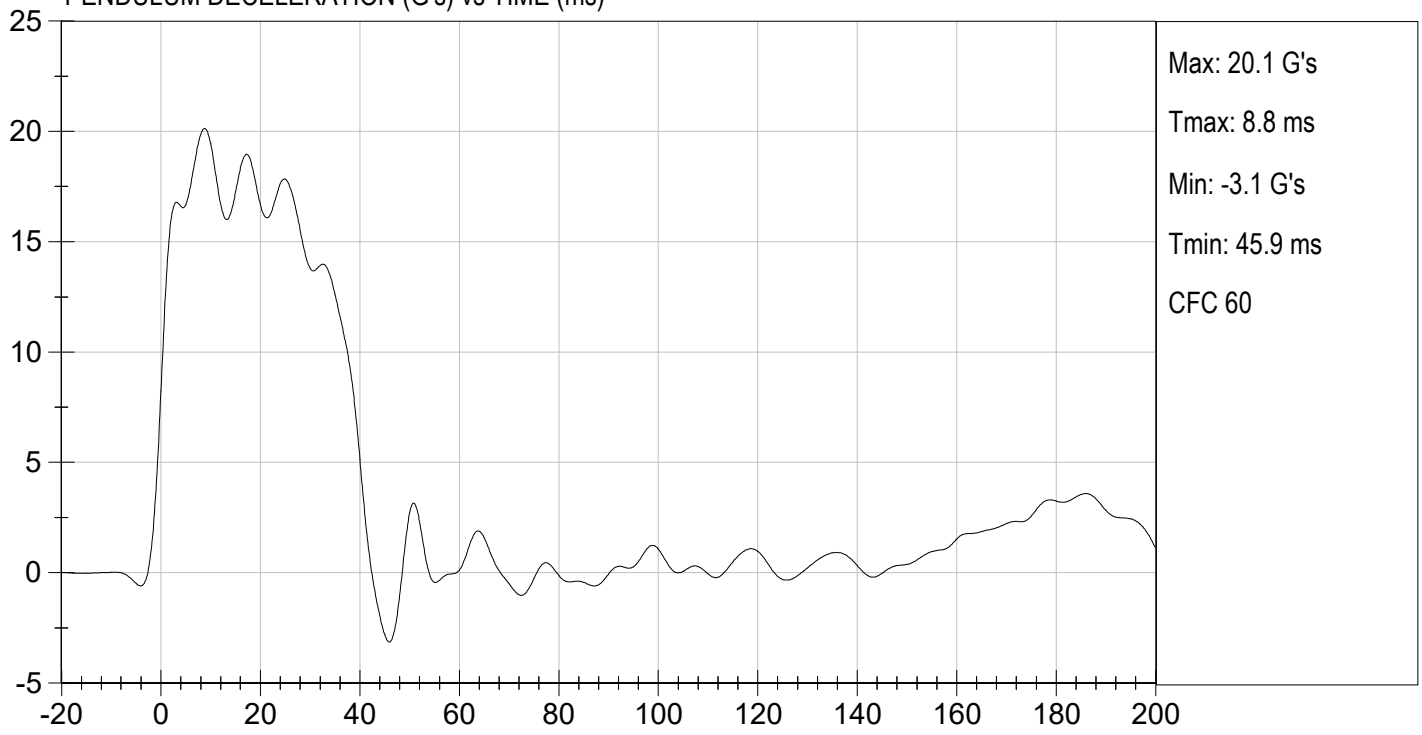
03/05/2024
Test Date

Approved By

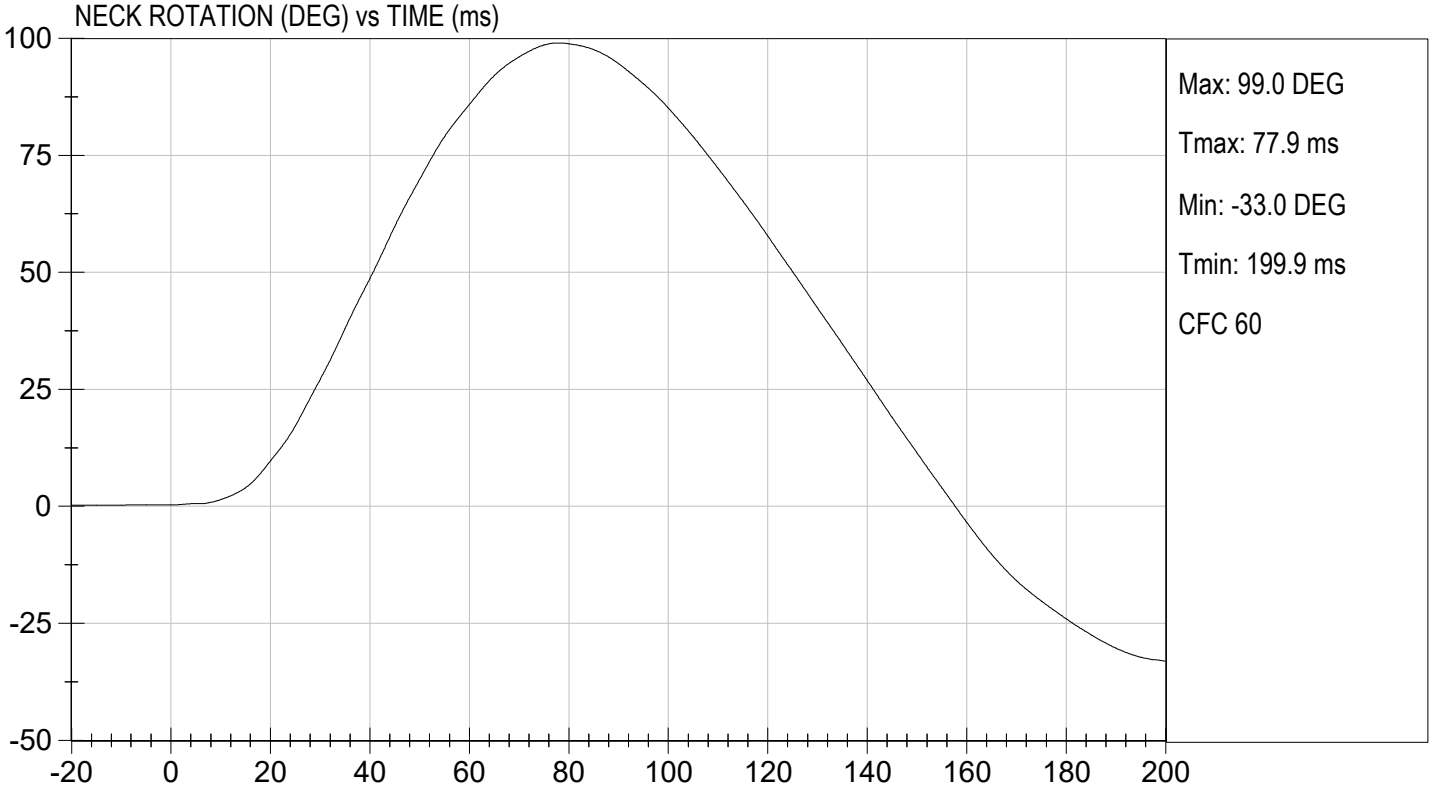
TEST DESC: NECK EXTENSION
VELOCITY: 19.61 ft/s, 5.98 m/s

TEST DATE: 03/05/2024
TEST #: D240603

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

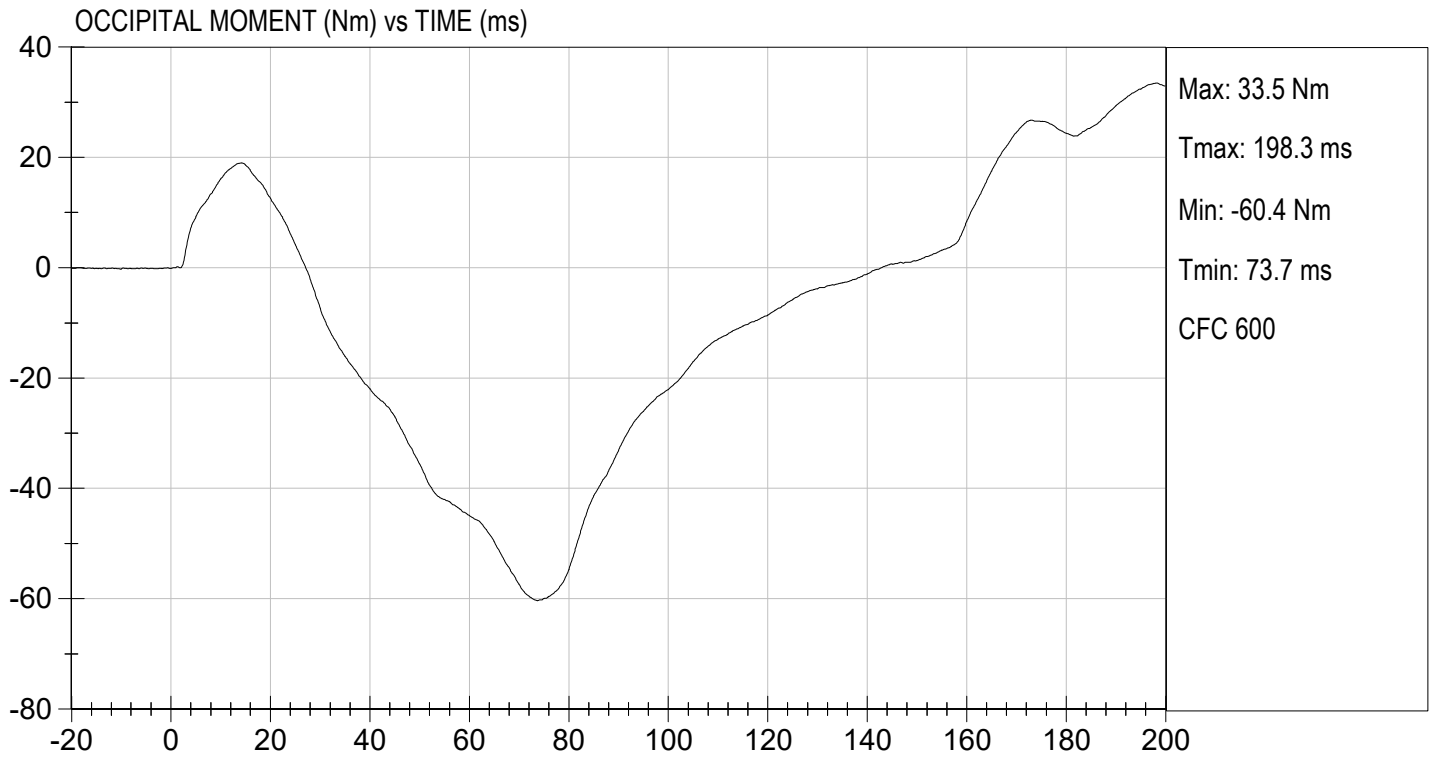


NECK ROTATION (DEG) vs TIME (ms)



TEST DESC: NECK EXTENSION
VELOCITY: 19.61 ft/s, 5.98 m/s

TEST DATE: 03/05/2024
TEST #: D240603



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 064 **Test I.D:** D240604

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	37	Pass
Probe Velocity	m/s	6.58 to 6.82	6.68	Pass
Peak Probe Force	N	5159 to 5893	5,375	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.89	Pass
Internal Hysteresis	%	69 to 85	72	Pass
		Overall Test Results		Pass

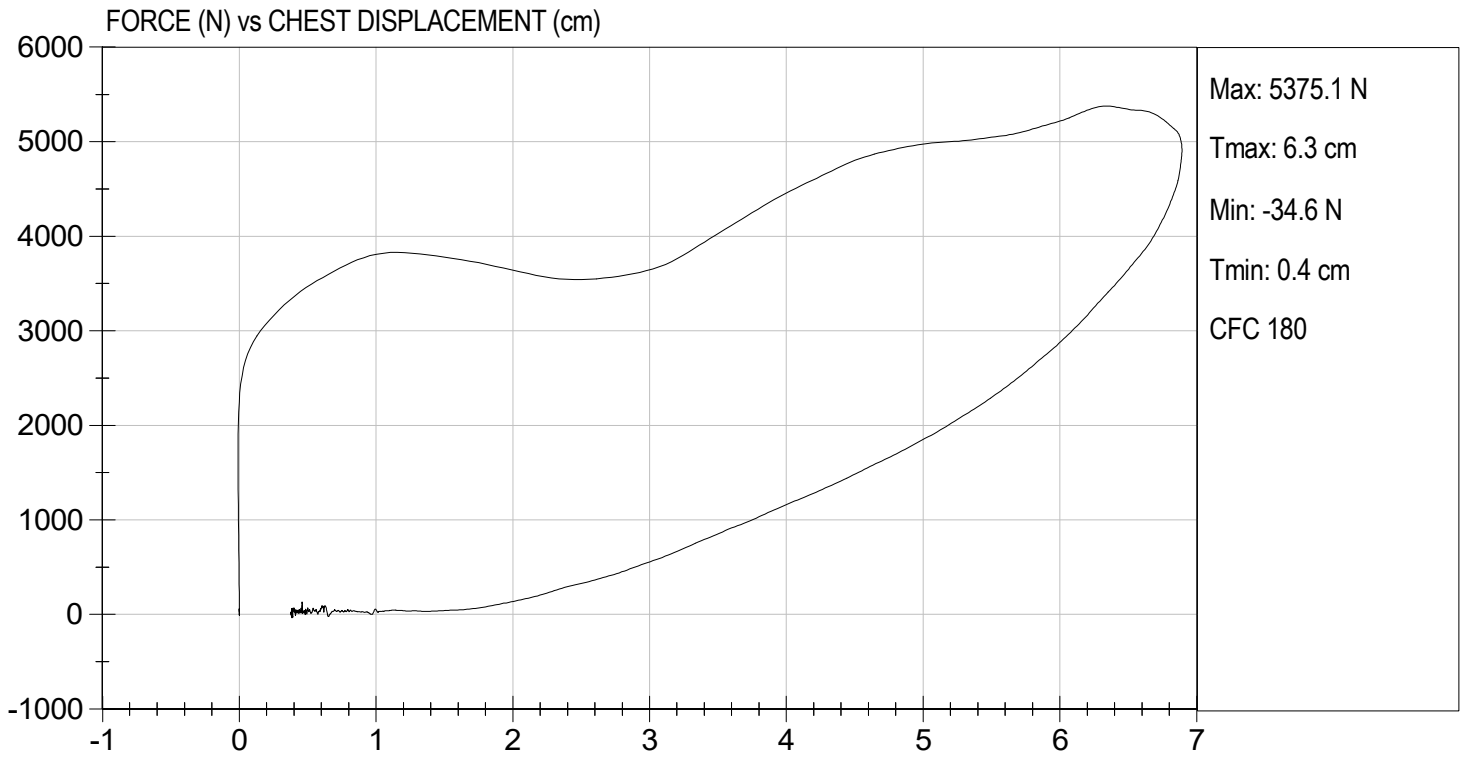
Laboratory Technician

03/05/2024
Test Date

Approved By

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

TEST DATE: 03/05/2024
TEST #: D240604



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 064 **Test I.D:** D240605

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	36	Pass
Probe Velocity	m/s	2.07 to 2.13	2.10	Pass
Peak Probe Force	N	4715 to 5782	5,056	Pass
		Overall Test Results		Pass

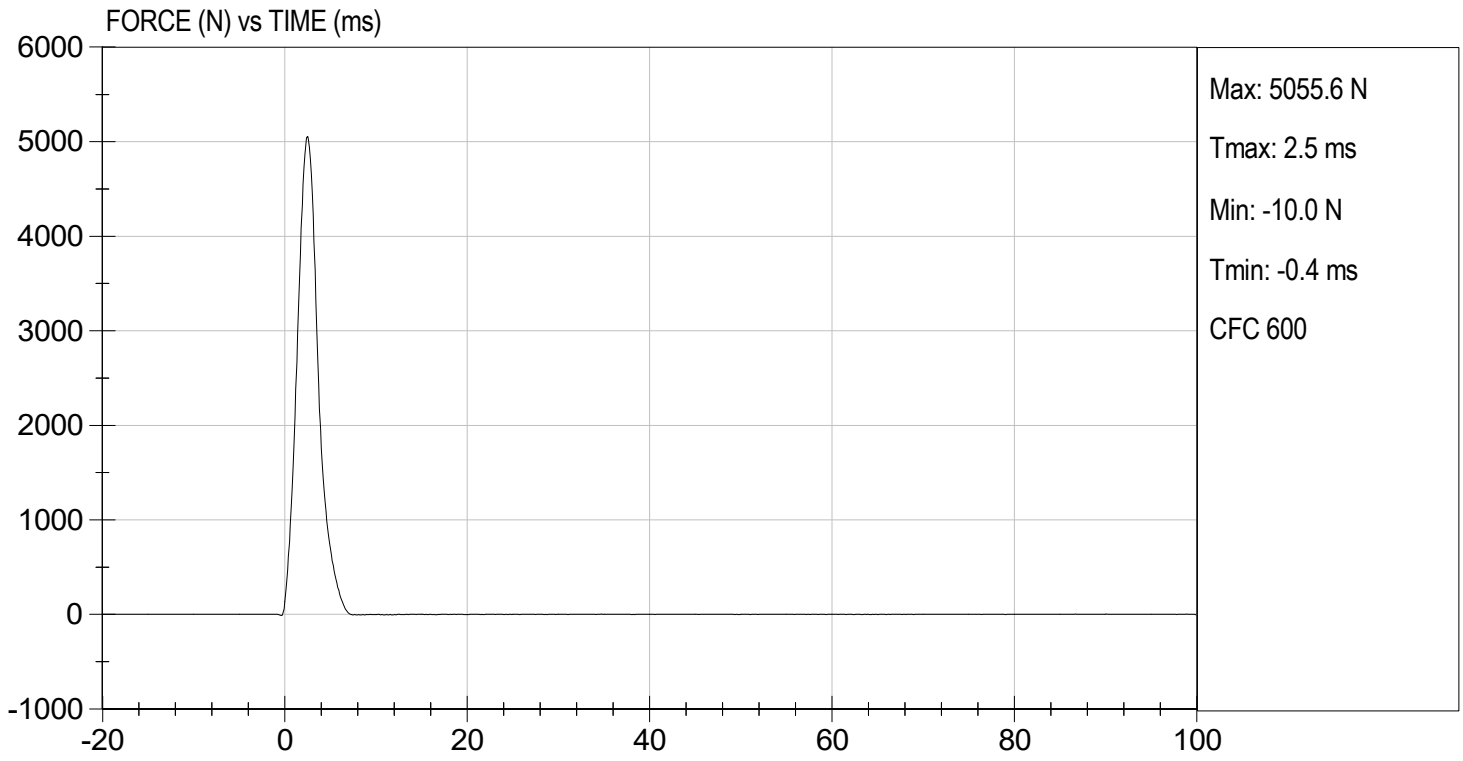
Laboratory Technician

03/05/2024
Test Date

Approved By

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

TEST DATE: 03/05/2024
TEST #: D240605



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 064 **Test I.D:** D240606

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	36	Pass
Probe Velocity	m/s	2.07 to 2.13	2.10	Pass
Peak Probe Force	N	4715 to 5782	4,891	Pass
		Overall Test Results		Pass

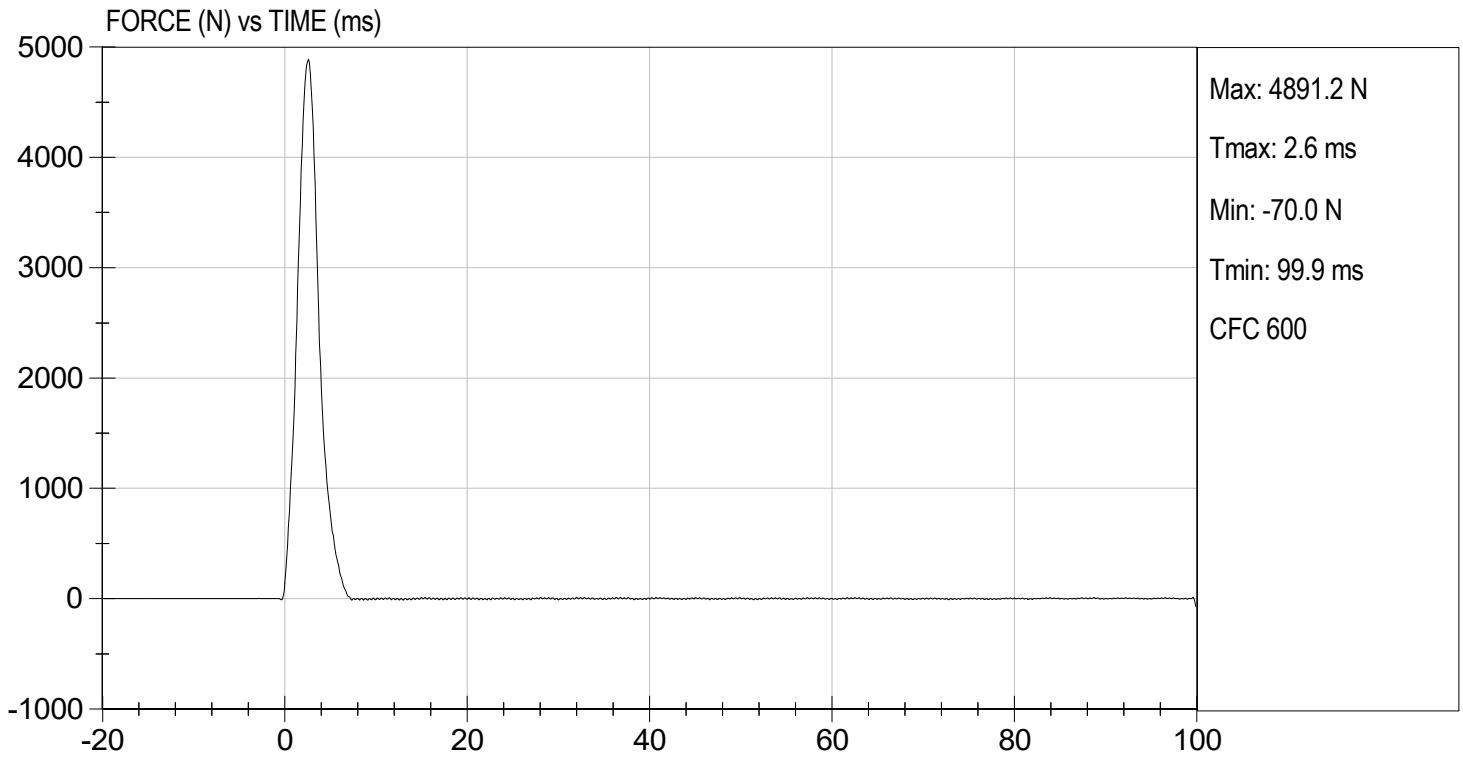
Laboratory Technician

03/05/2024
Test Date

Approved By

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

TEST DATE: 03/05/2024
TEST #: D240606



MGA RESEARCH CORPORATION

HIP-FEMUR FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

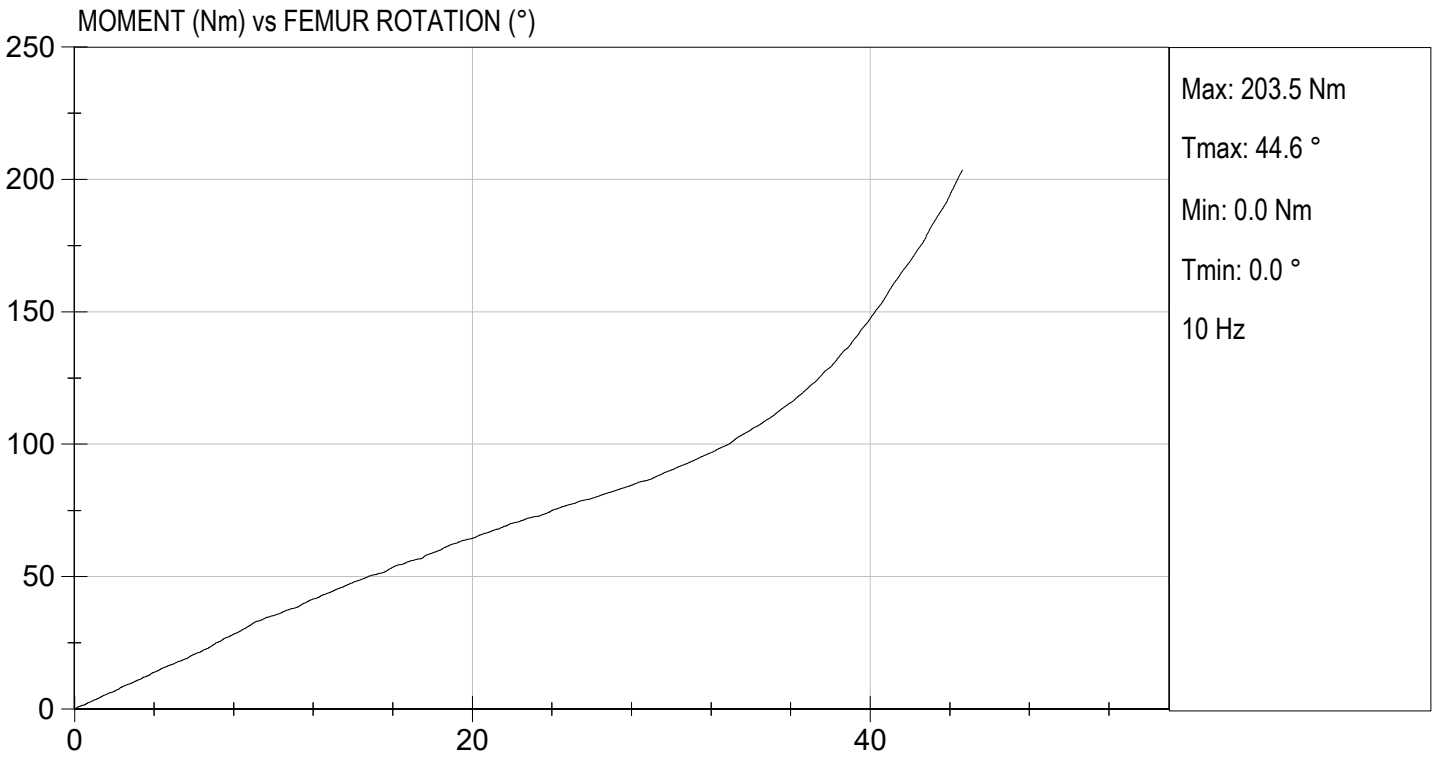
ATD Serial No: 064 **Test I.D:** D240600

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.4	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	36	36	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.3	6.3	Pass
30 Degrees	Nm	94.9 Nm Max	90.3	90.1	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	44.6	43.8	Pass
		Overall Test Results			Pass

Laboratory Technician

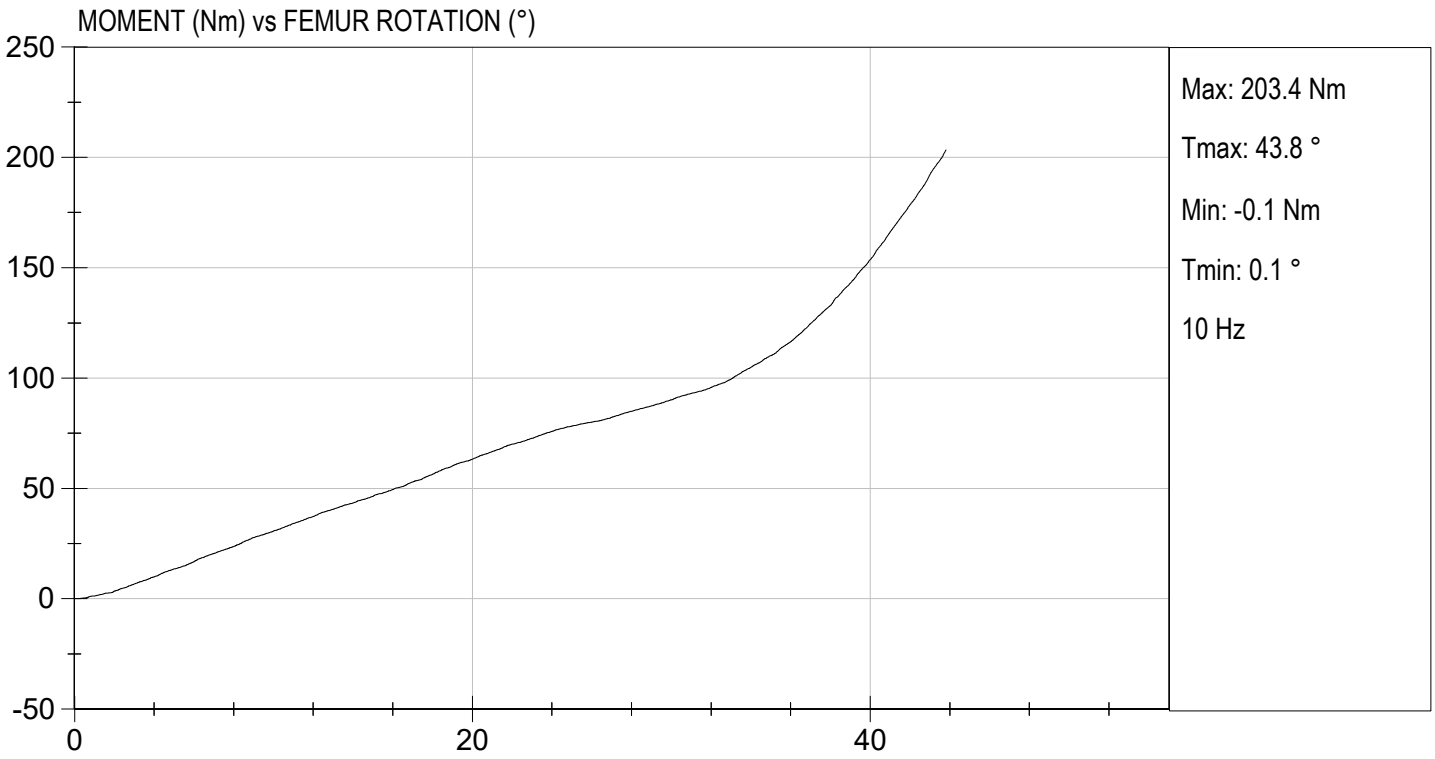
03/05/2024
Test Date

Approved By


MOMENT (Nm) vs FEMUR ROTATION (°)
250
200
150
100
50
0
0
20
40
Max: 203.5 Nm
Tmax: 44.6 °
Min: 0.0 Nm
Tmin: 0.0 °
10 Hz

TEST DESC: LEFT HIP FEMUR FLEXION

TEST DATE: 03/05/2024
TEST #: D240600



QUALIFICATION TEST RESULTS

PRE-TEST

HYBRID III 5TH PERCENTILE FEMALE - PASSENGER ATD

Hybrid III, 5th External Measurements
SN: 142

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	775.0
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	438.2
C	H-POINT HEIGHT	Reference	81.3-86.3	81.8
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	148.3
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	83.0
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	124.4
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	245.2
H	HEAD BACK TO BACKLINE	Back of Skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	43.4
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	281.1
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	197.2
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	537.2
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376	358.8
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	403.1
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	435.2

HYBRID III, SUBPART O EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 304.8 ± 5.1 mm above seat surface	175.3-190.5	181.2
P	FOOT LENGTH	Tip of toe to rear of heal	218.5-233.7	227.3
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	475.0
S	HEAD BREADTH	The widest part of the head	137.1-147.3	138.6
T	HEAD DEPTH	Back of the head to the forehead	177.8-188	181.0
U	HIP BREADTH	The widest part of the hip	299.7-314.9	308.4
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	362.1
W	FOOT BREADTH	The widest part of the foot	78.8-94	82.8
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. “T”	528.3-548.7	545.2
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	870.7
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	779.9
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	332.7-358.1	350.1
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	160.1-170.2	170.0

MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 142 **Test ID:** D240251

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
Peak Resultant Acceleration	G's	250 to 300	287	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-3.2	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Laboratory Technician

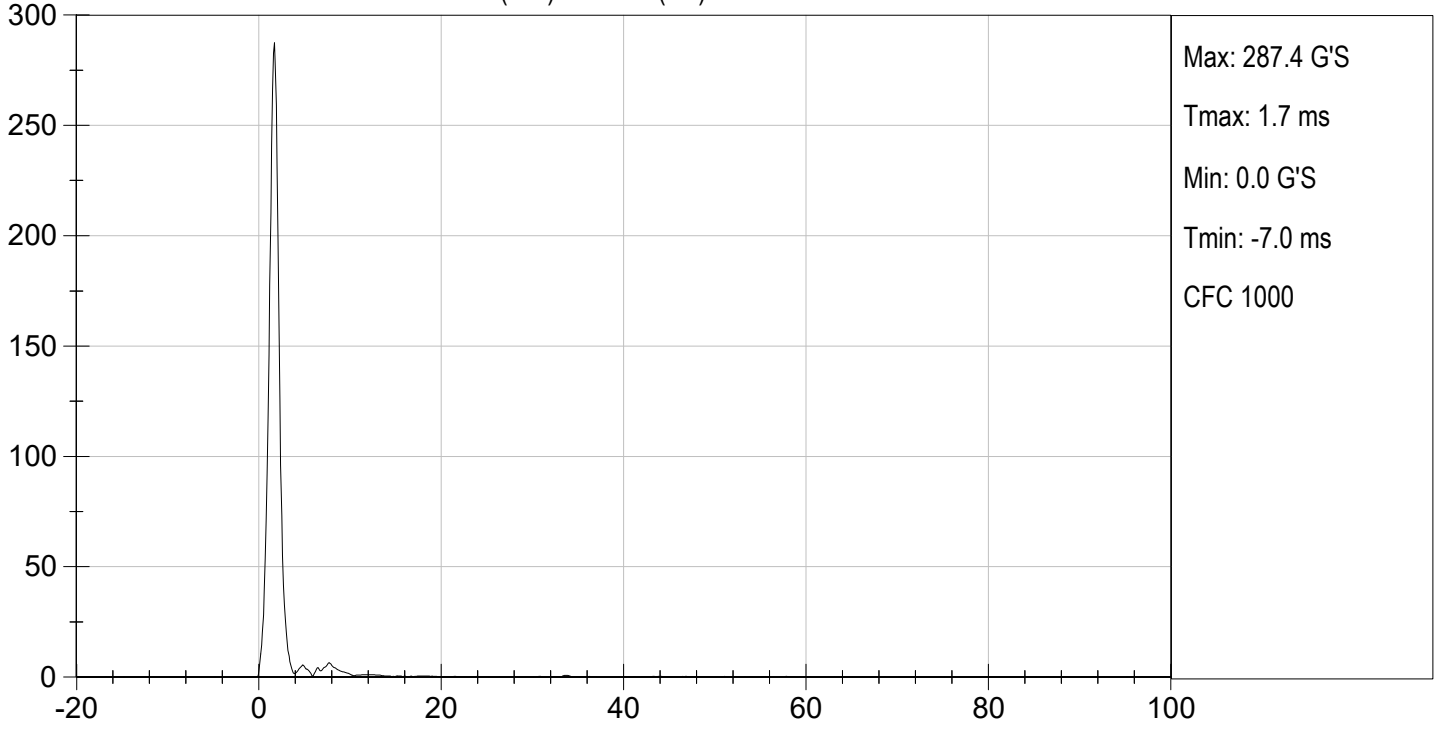
01/23/2024
Test Date

Approved By

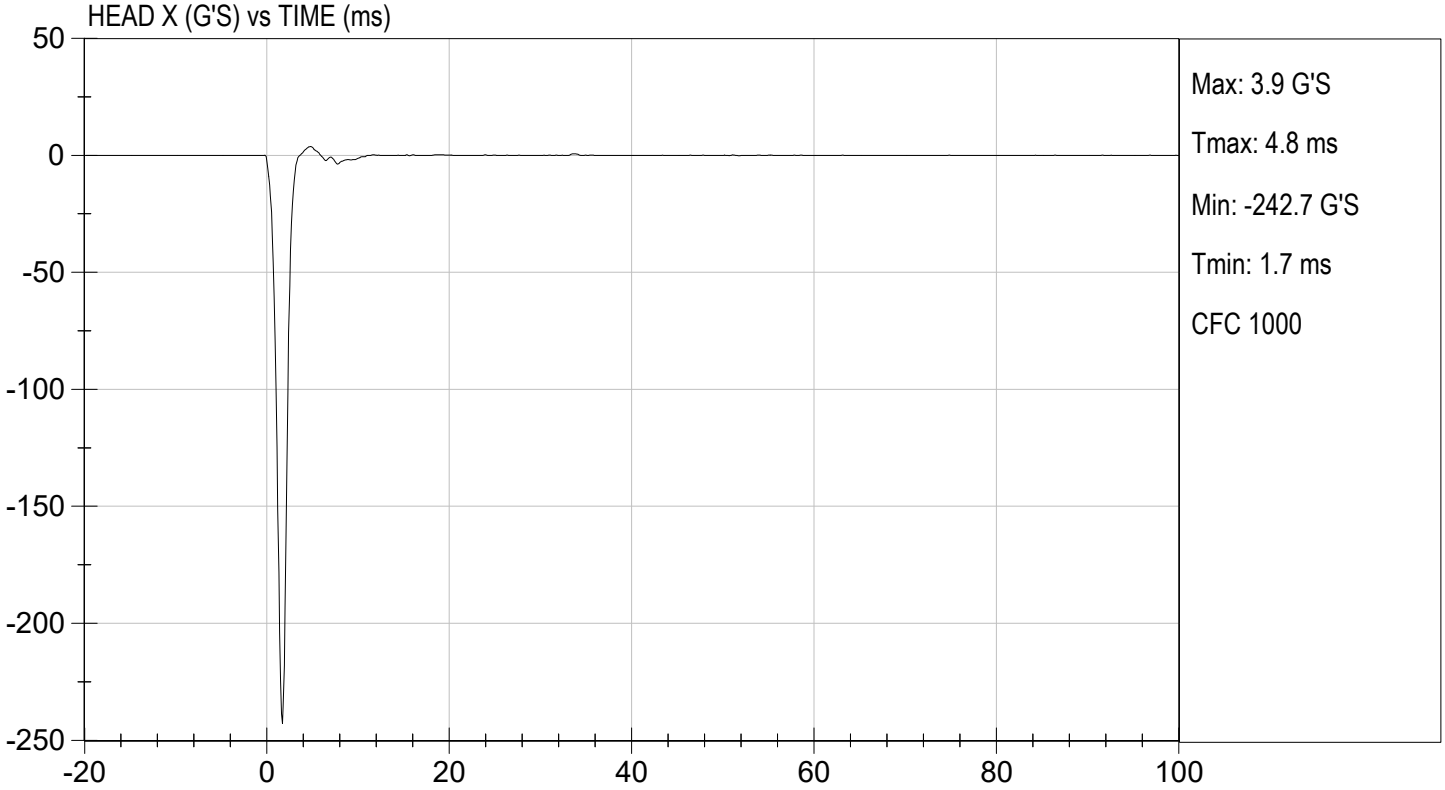
TEST DESC: HEAD DROP

TEST DATE: 01/23/2024
TEST #: D240251

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

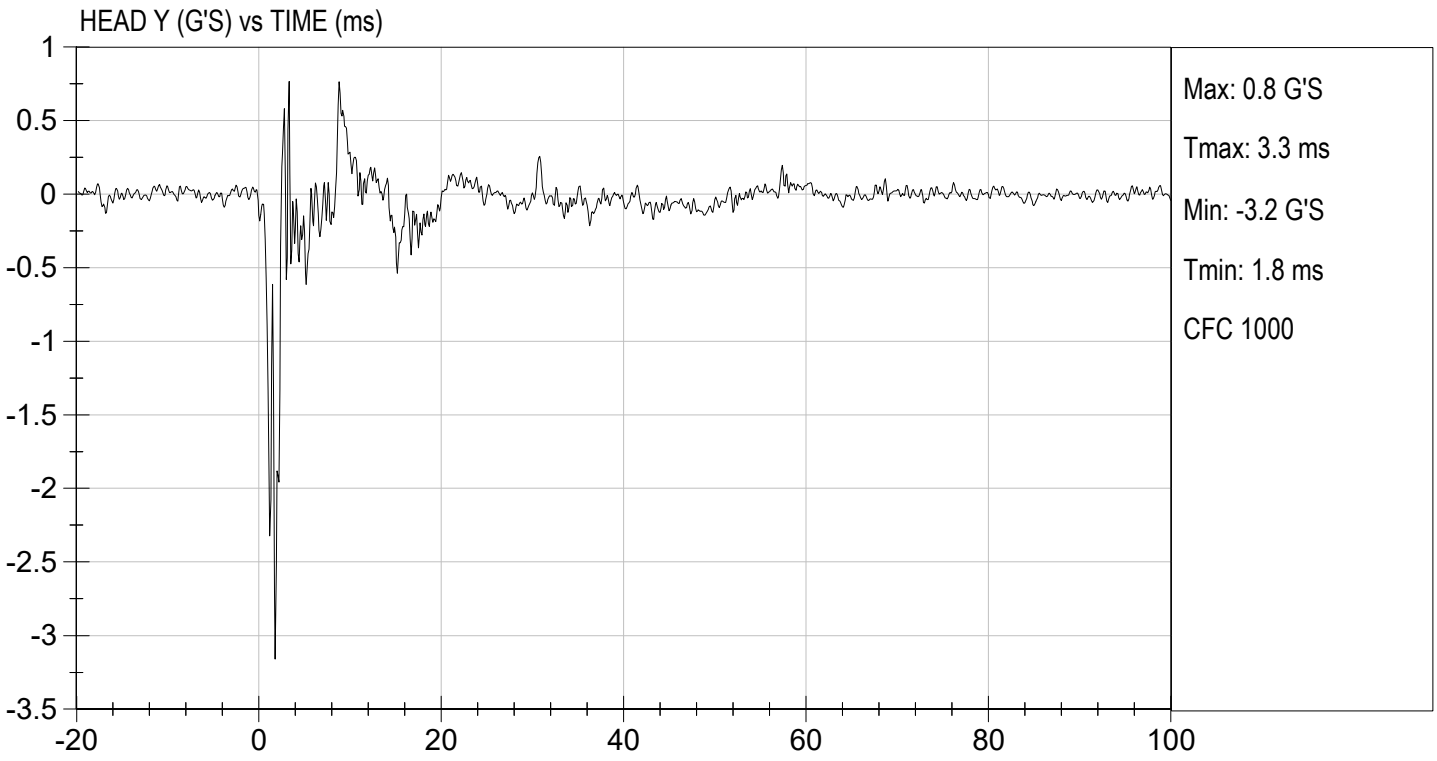


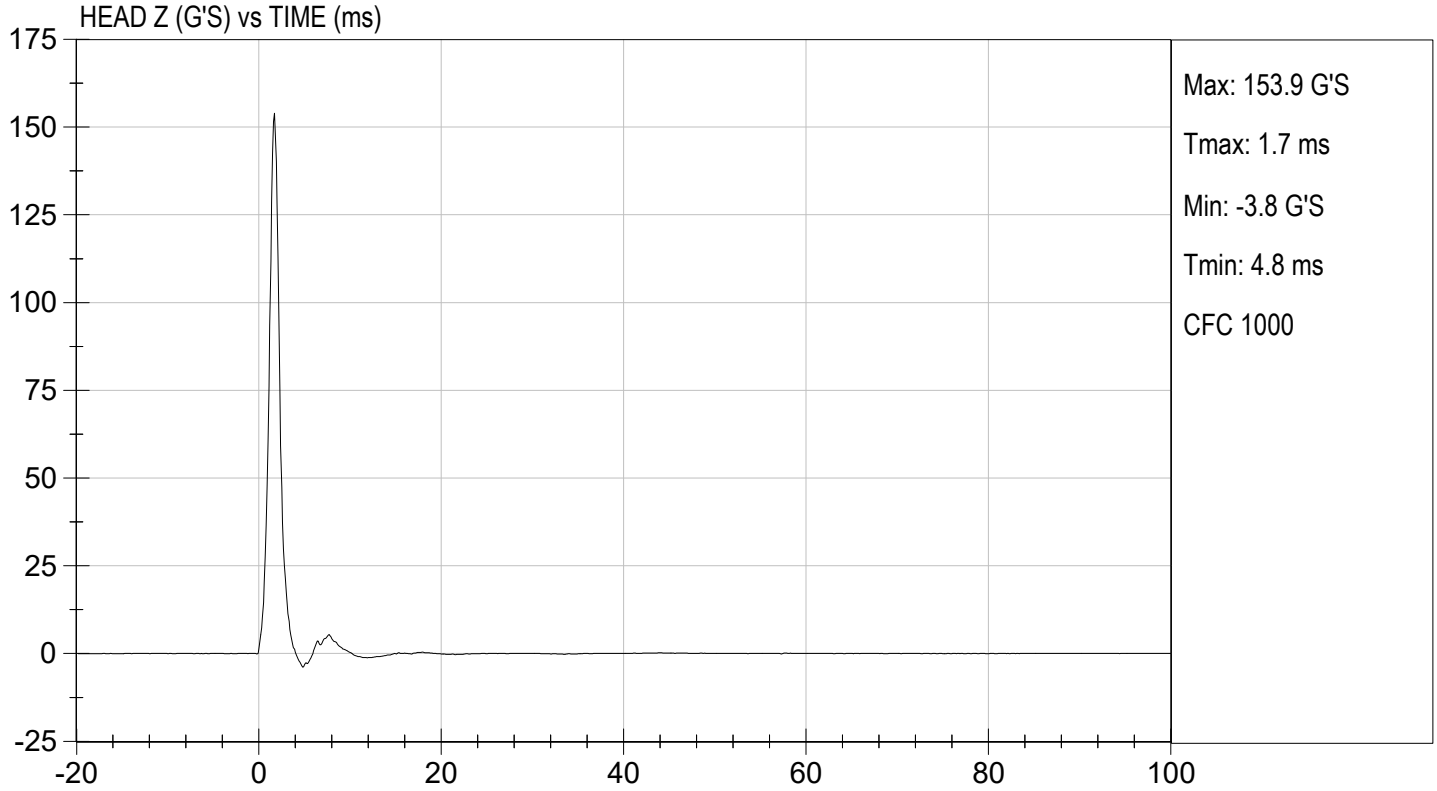
HEAD X (G'S) vs TIME (ms)



TEST DESC: HEAD DROP

TEST DATE: 01/23/2024
TEST #: D240251





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 142 **Test I.D:** D24AB2

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity		%	10 to 70	28	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.2	Pass
	20 ms	m/s	4.0 to 5.0	4.4	Pass
	30 ms	m/s	5.8 to 7.0	6.5	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	85	Pass
			Overall Results		Pass

Laboratory Technician

02/12/2024

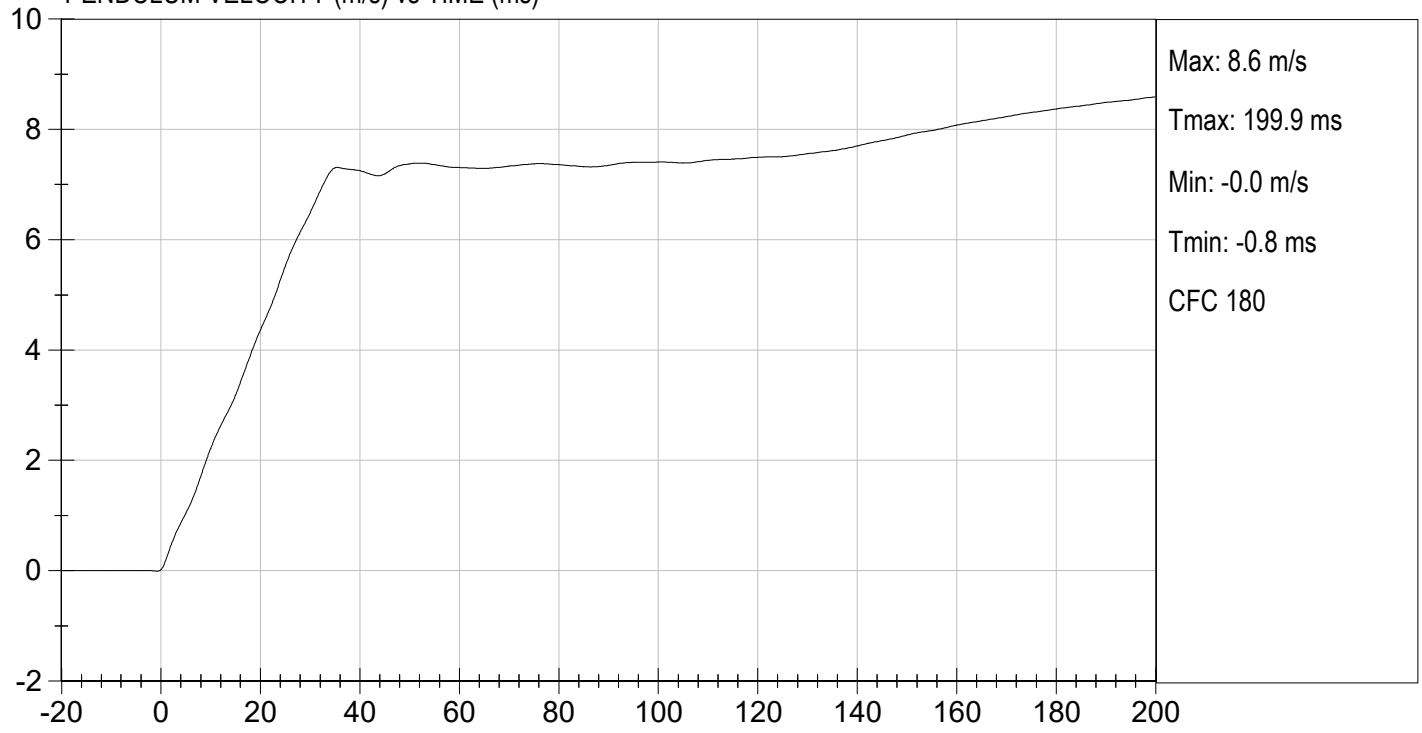
Test Date

Approved By

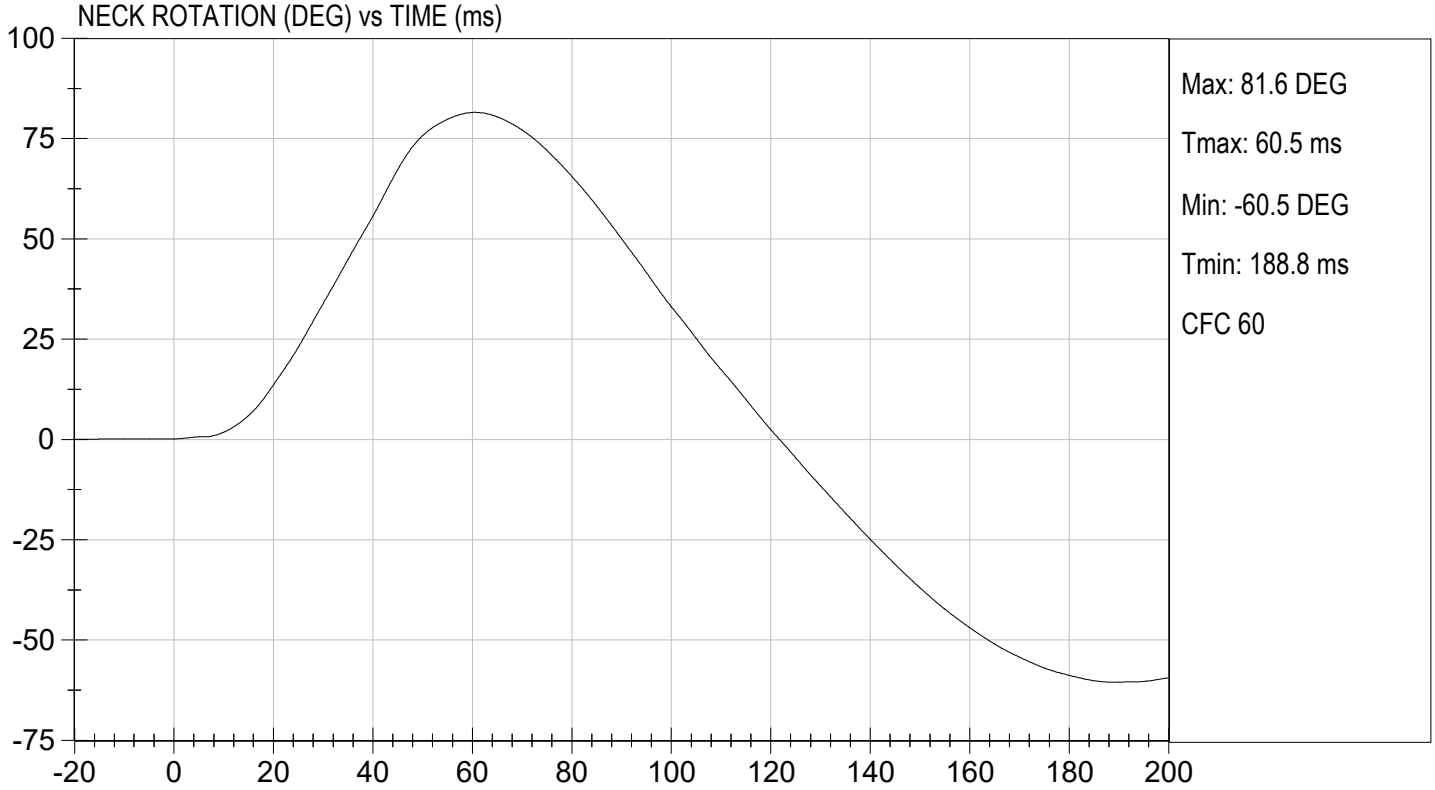
TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

TEST DATE: 02/12/2024
TEST #: D24AB2

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

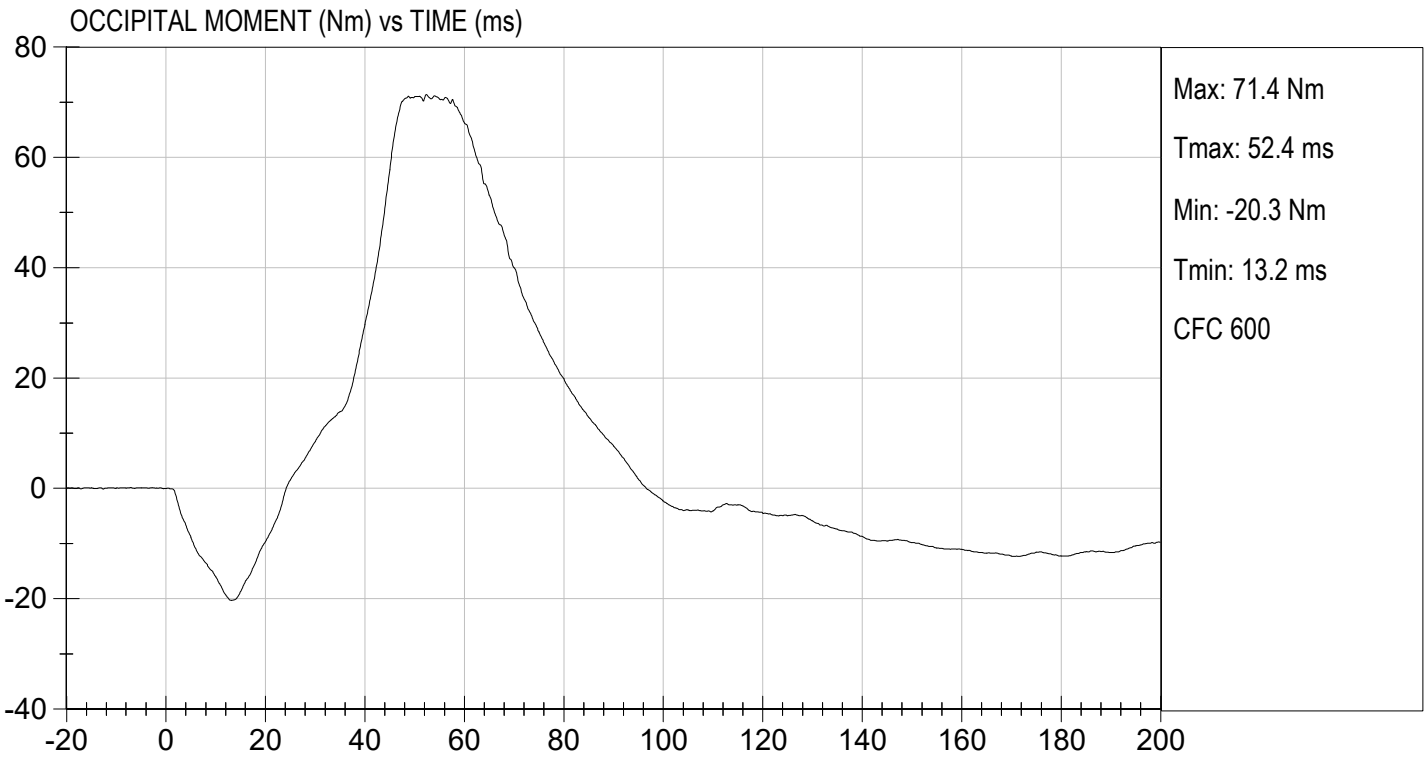


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 02/12/2024
TEST #: D24AB2



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 142 **Test I.D:** D24AB3

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	28	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.05	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.9	Pass
	20 ms	m/s	3.1 to 3.9	3.7	Pass
	30 ms	m/s	4.6 to 5.6	5.3	Pass
D Plane Rotation	Max	deg	99 to 114	112	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

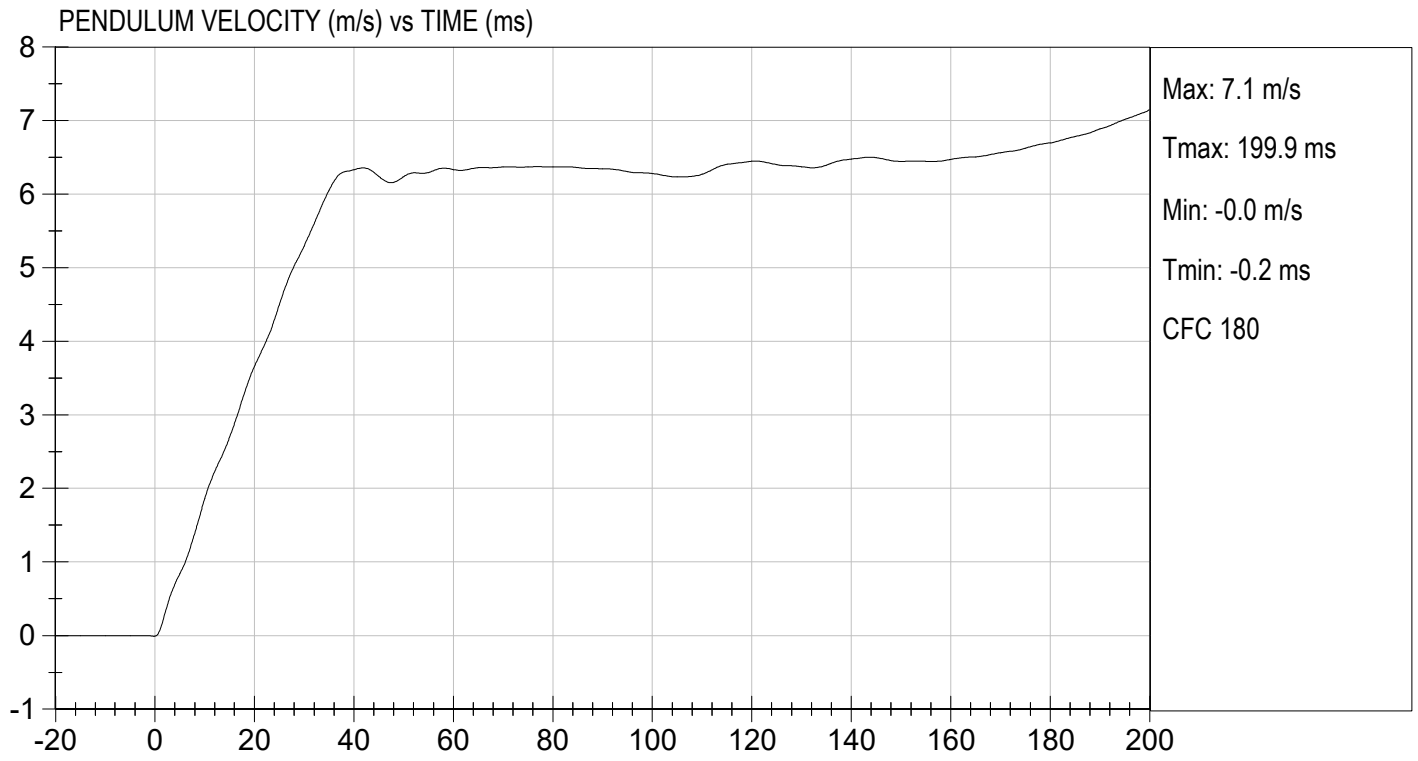
Laboratory Technician

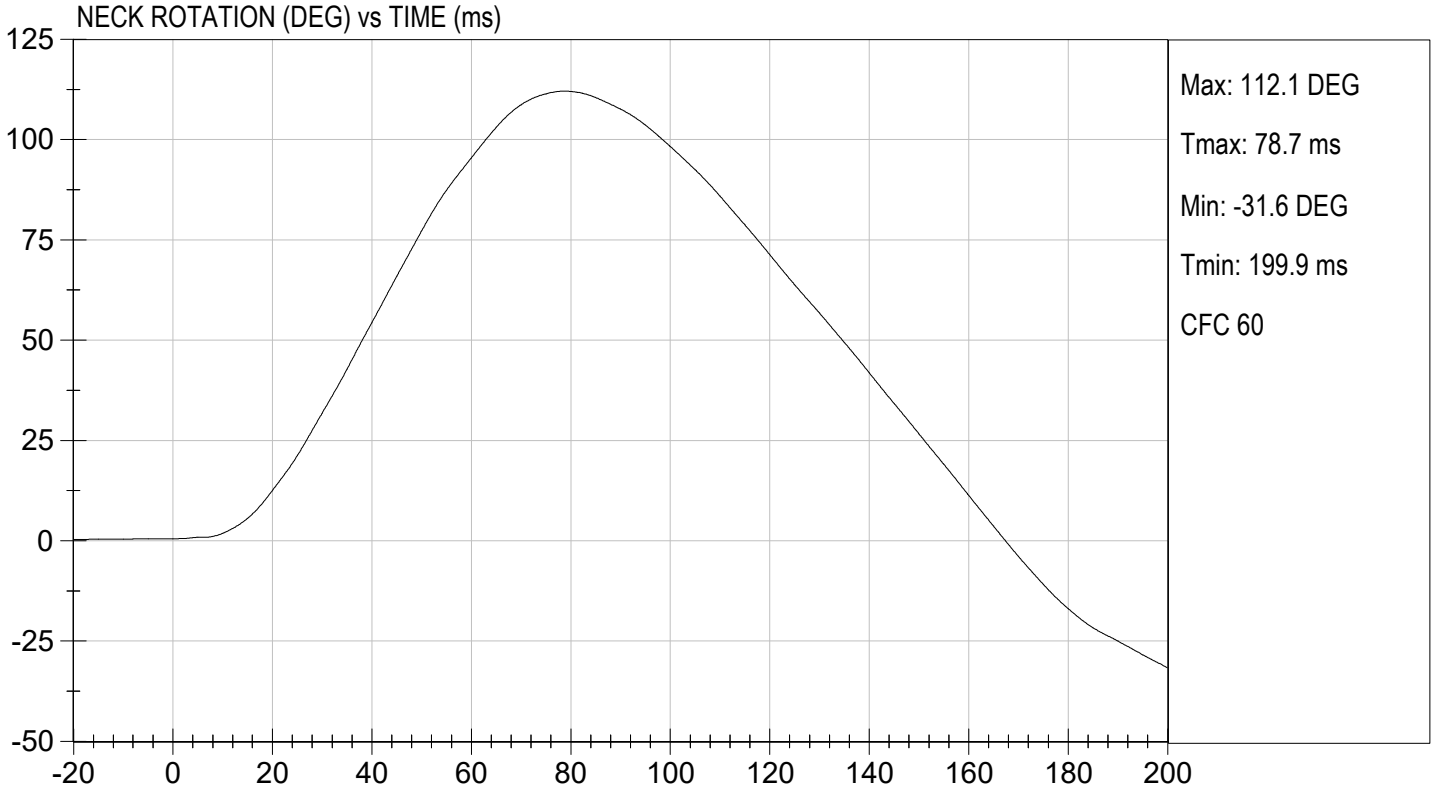
02/12/2024
Test Date

Approved By

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

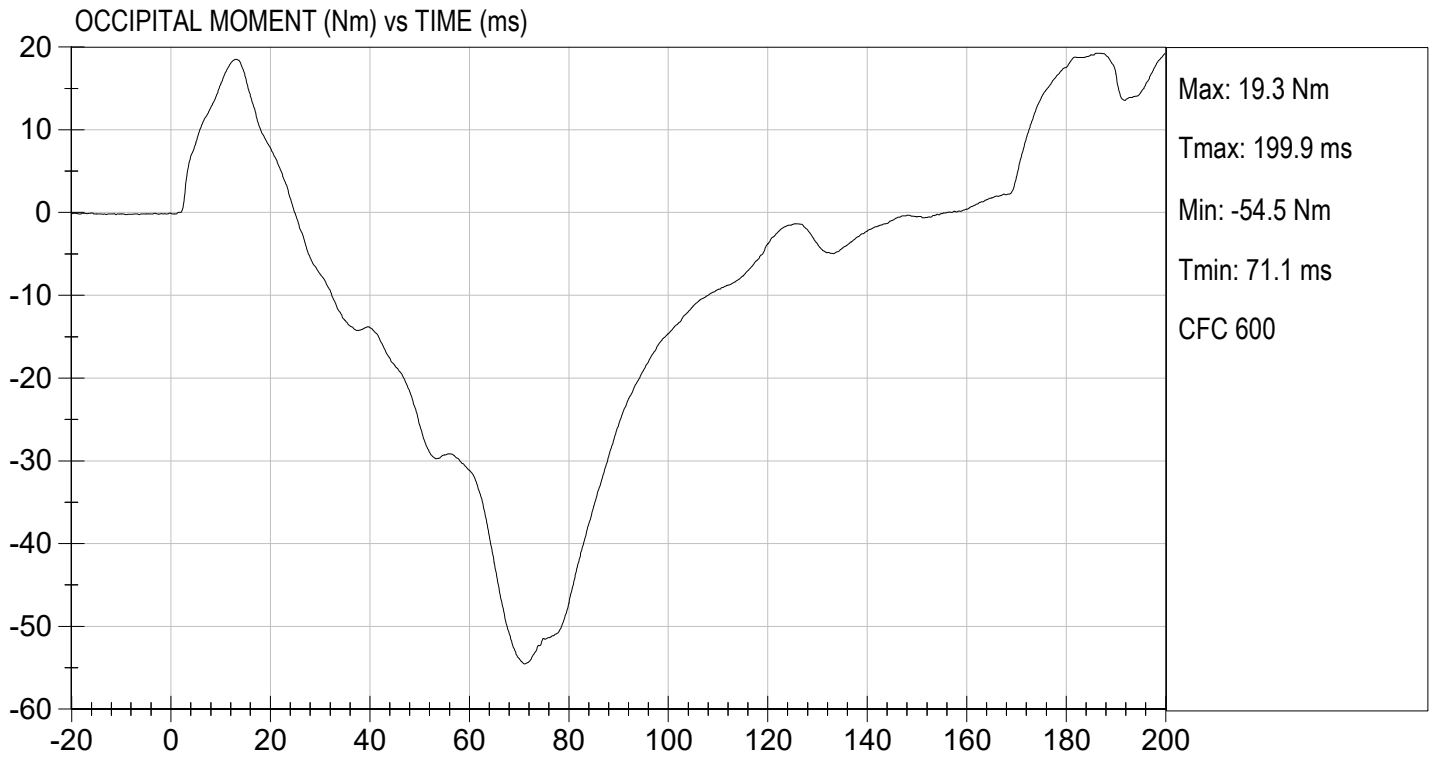
TEST DATE: 02/12/2024
TEST #: D24AB3





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

TEST DATE: 02/12/2024
TEST #: D24AB3



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 5TH PERCENTILE

ATD Serial No: 142 **Test I.D:** D240254

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Relative Humidity	%	10 to 70	25	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	4358	Pass
Internal Hysteresis	%	69 to 85	75	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4392	Pass
		Overall Test Results		Pass

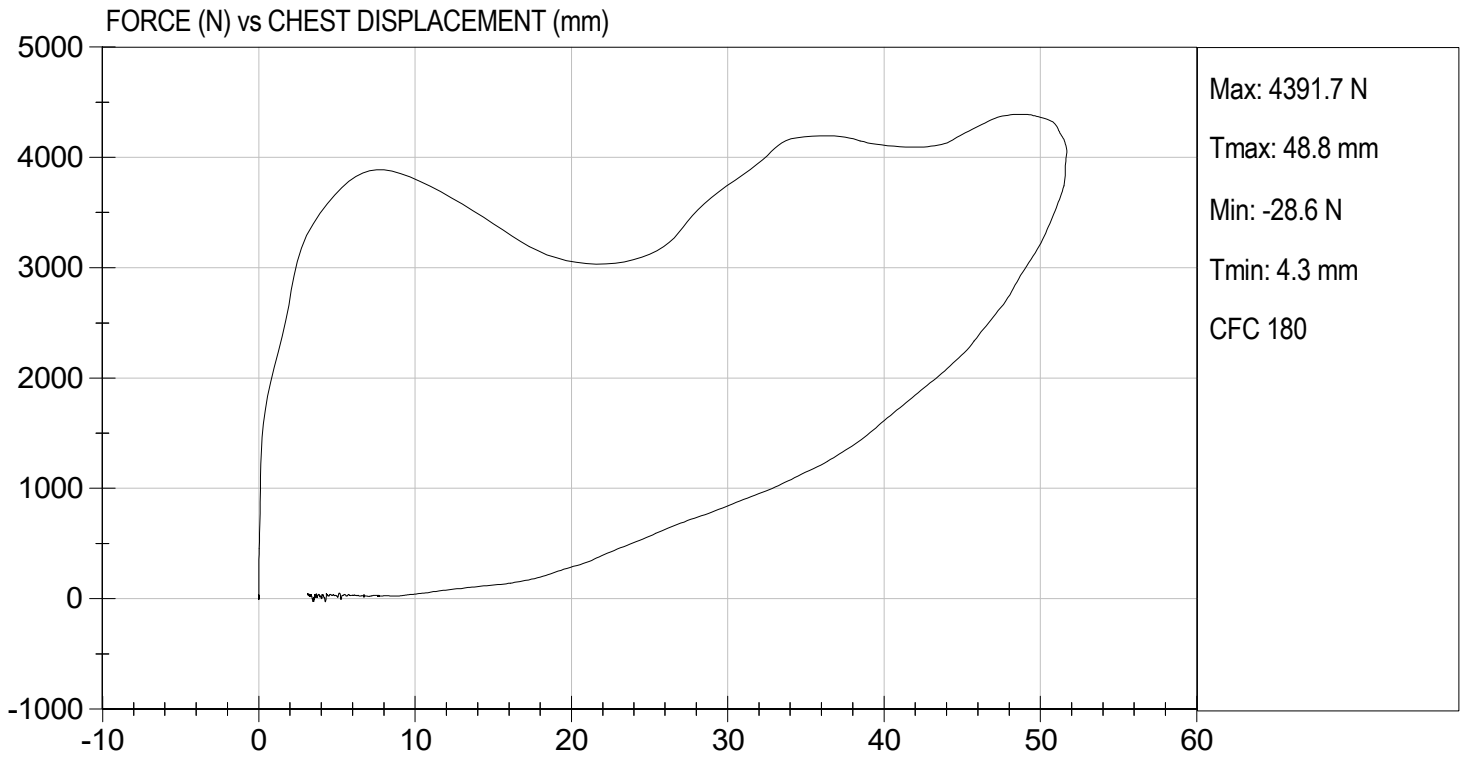
Laboratory Technician

01/23/2024
Test Date

Approved By

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

TEST DATE: 01/23/2024
TEST #: D240254



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 142 **Test I.D:** D240255

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Probe Speed	m/s	2.07 to 2.13	2.10	Pass
Maximum Force	N	3450 to 4060	3777	Pass
		Overall Test Results		Pass

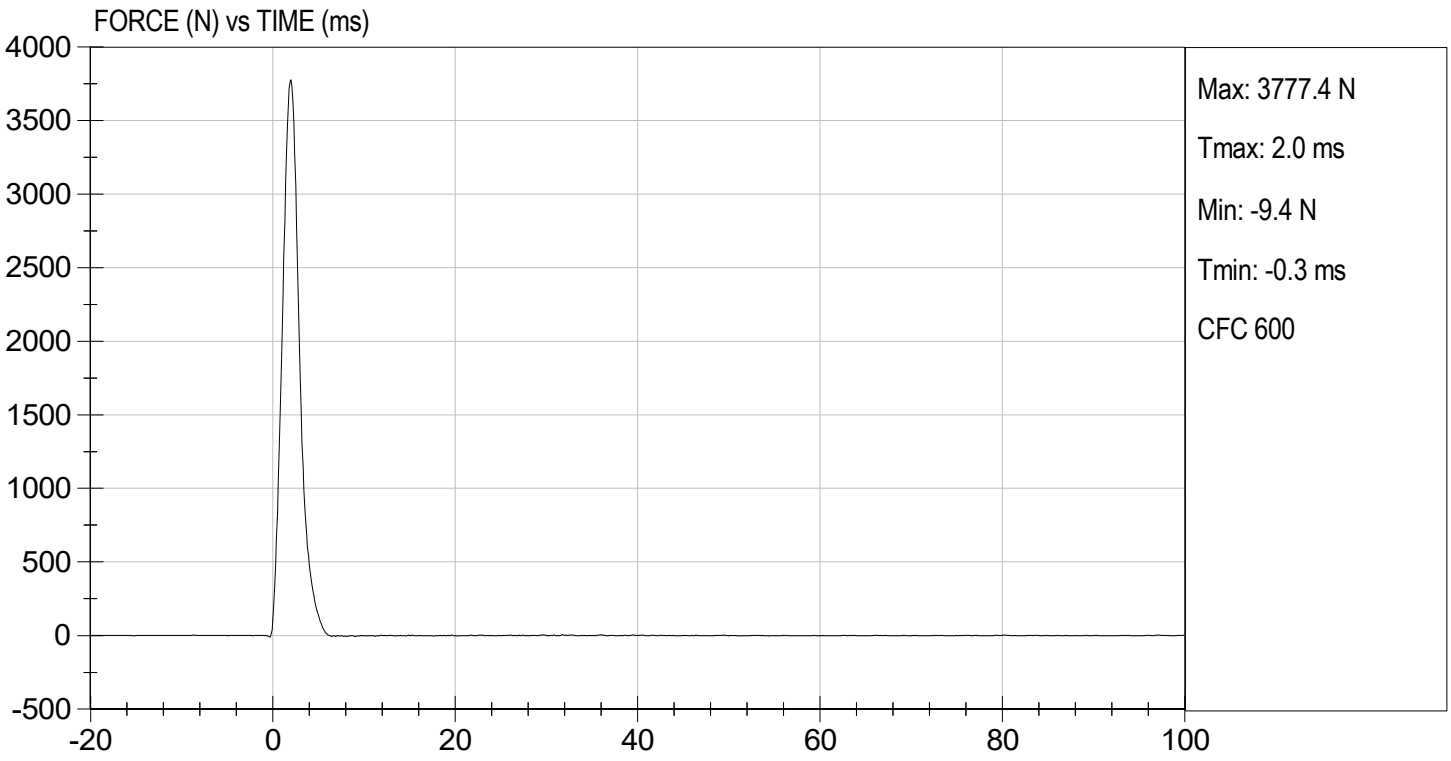
Laboratory Technician

01/23/2024
Test Date

Approved By

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

TEST DATE: 01/23/2024
TEST #: D240255



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 142 **Test I.D:** D240256

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Probe Speed	m/s	2.07 to 2.13	2.08	Pass
Maximum Force	N	3450 to 4060	3815	Pass
		Overall Test Results		Pass

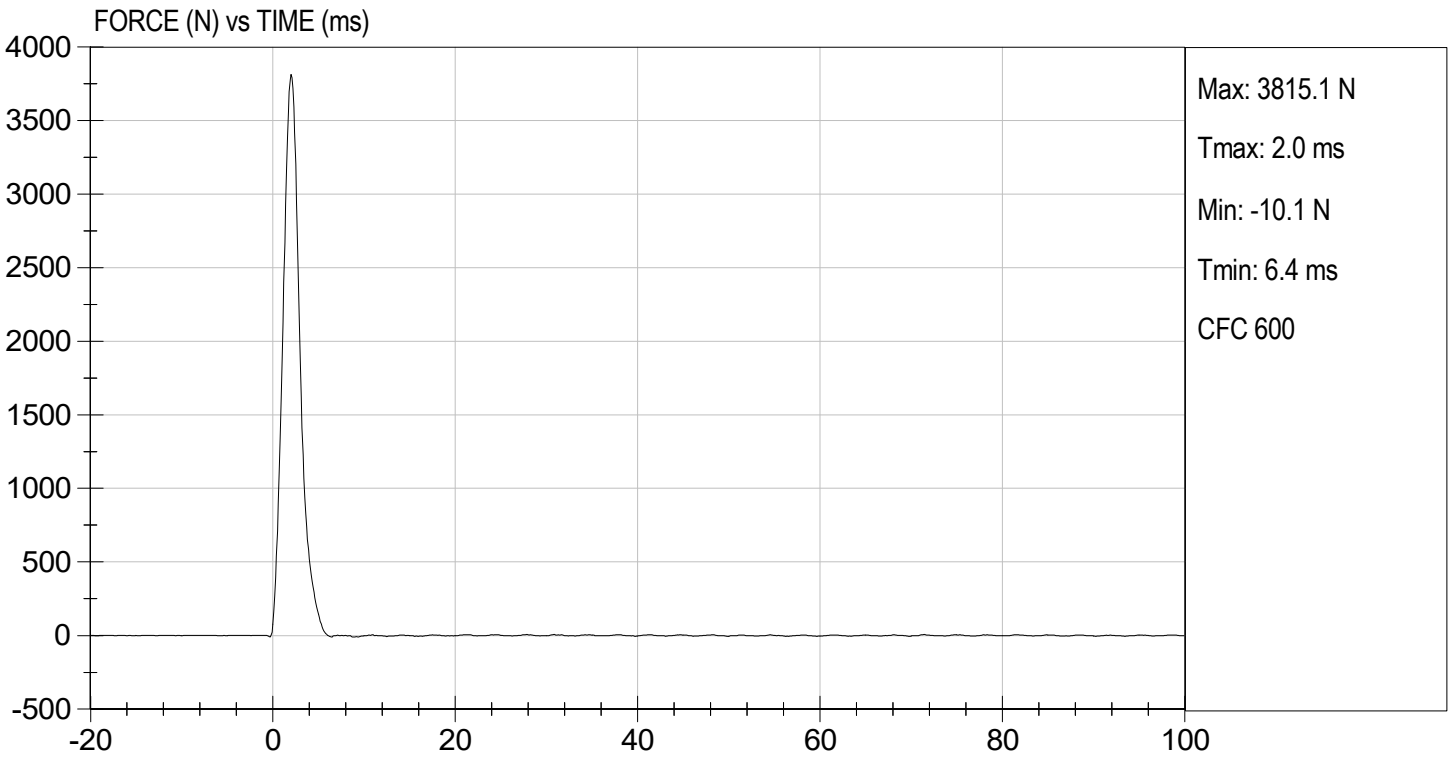
Laboratory Technician

01/23/2024
Test Date

Approved By

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

TEST DATE: 01/23/2024
TEST #: D240256



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 142 **Test I.D:** D240257

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	27	Pass
Initial Angle	deg	0 to 20	17	Pass
Return Angle	deg	+/- 8	4	Pass
Force at 45 deg	N	320 to 390	345	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.9	Pass
		Overall Result		Pass

Laboratory Technician

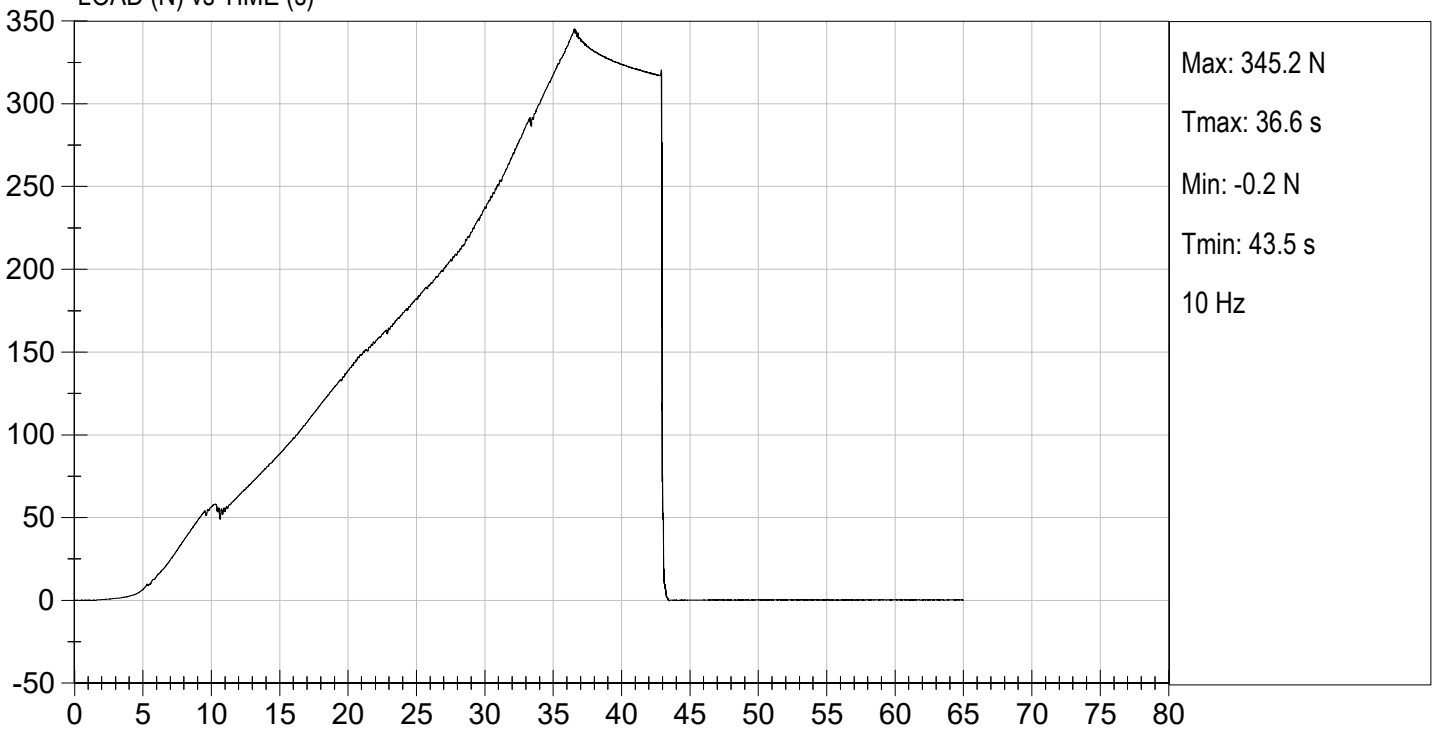
01/23/2024
Test Date

Approved By

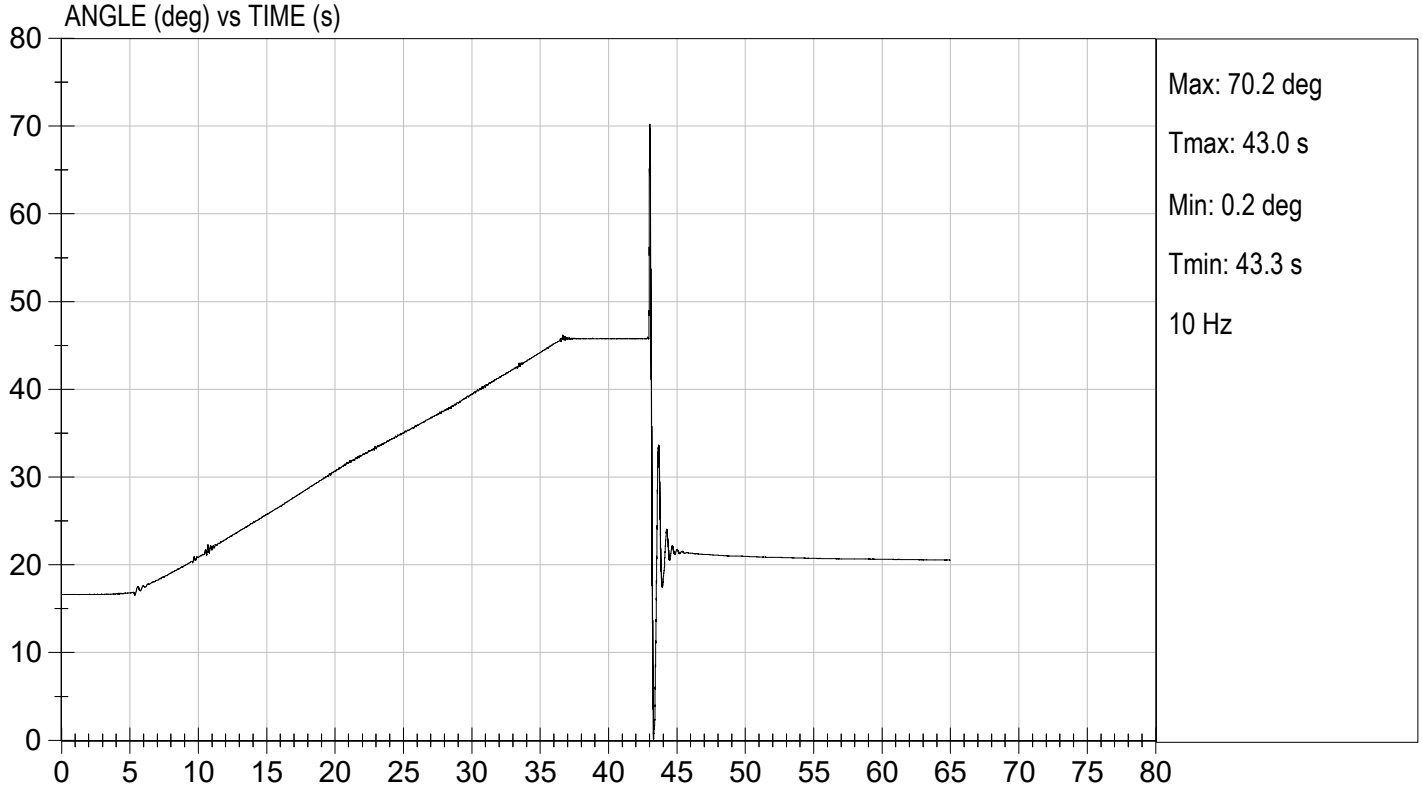
TEST DESC: LUMBAR FLEXION

TEST DATE: 01/23/2024
TEST #: D240257

LOAD (N) vs TIME (s)



ANGLE (deg) vs TIME (s)



QUALIFICATION TEST RESULTS

POST-TEST

HYBRID III 5TH PERCENTILE FEMALE - PASSENGER ATD

MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 142 **Test ID:** D240591

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	37	Pass
Peak Resultant Acceleration	G's	250 to 300	253	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	4.1	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Laboratory Technician

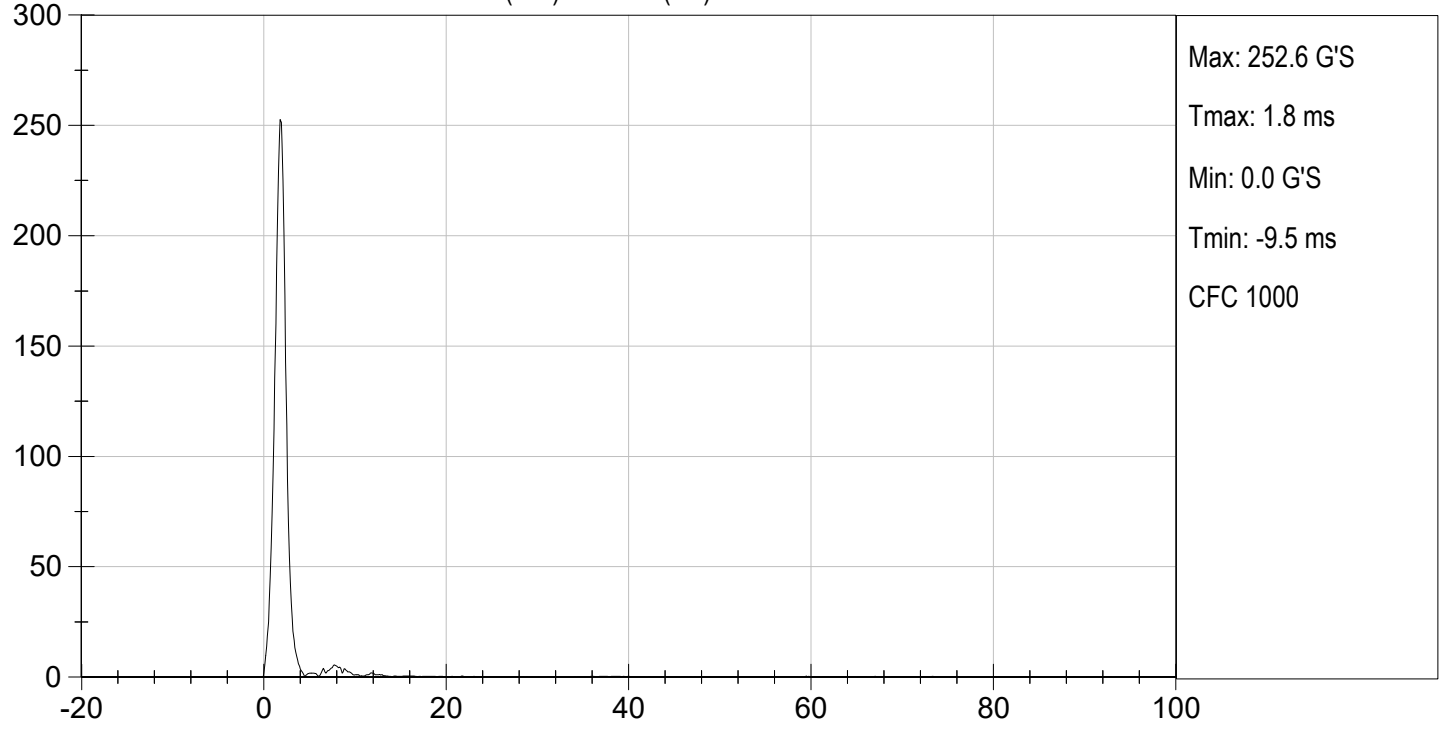
03/05/2024
Test Date

Approved By

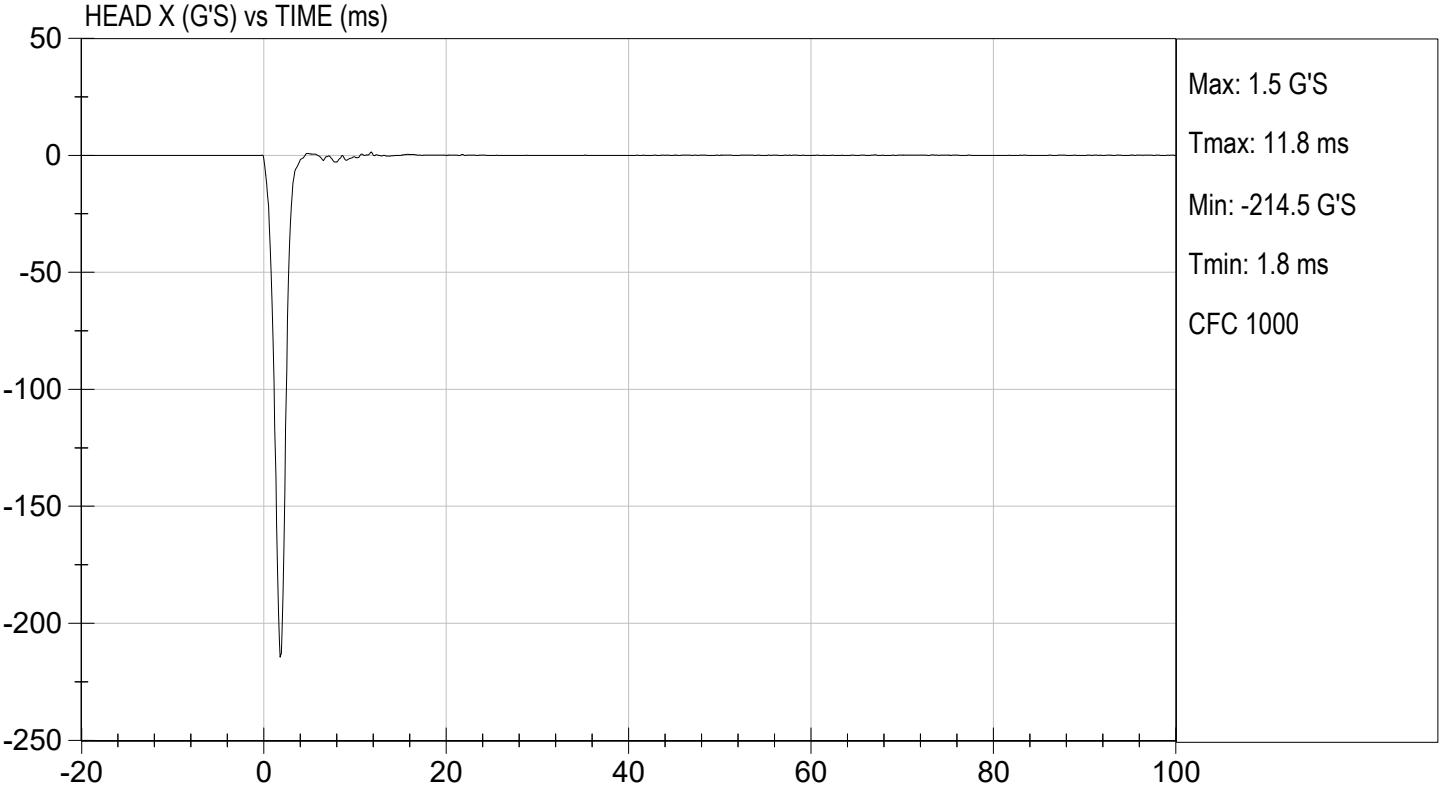
TEST DESC: HEAD DROP

TEST DATE: 03/05/2024
TEST #: D240591

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

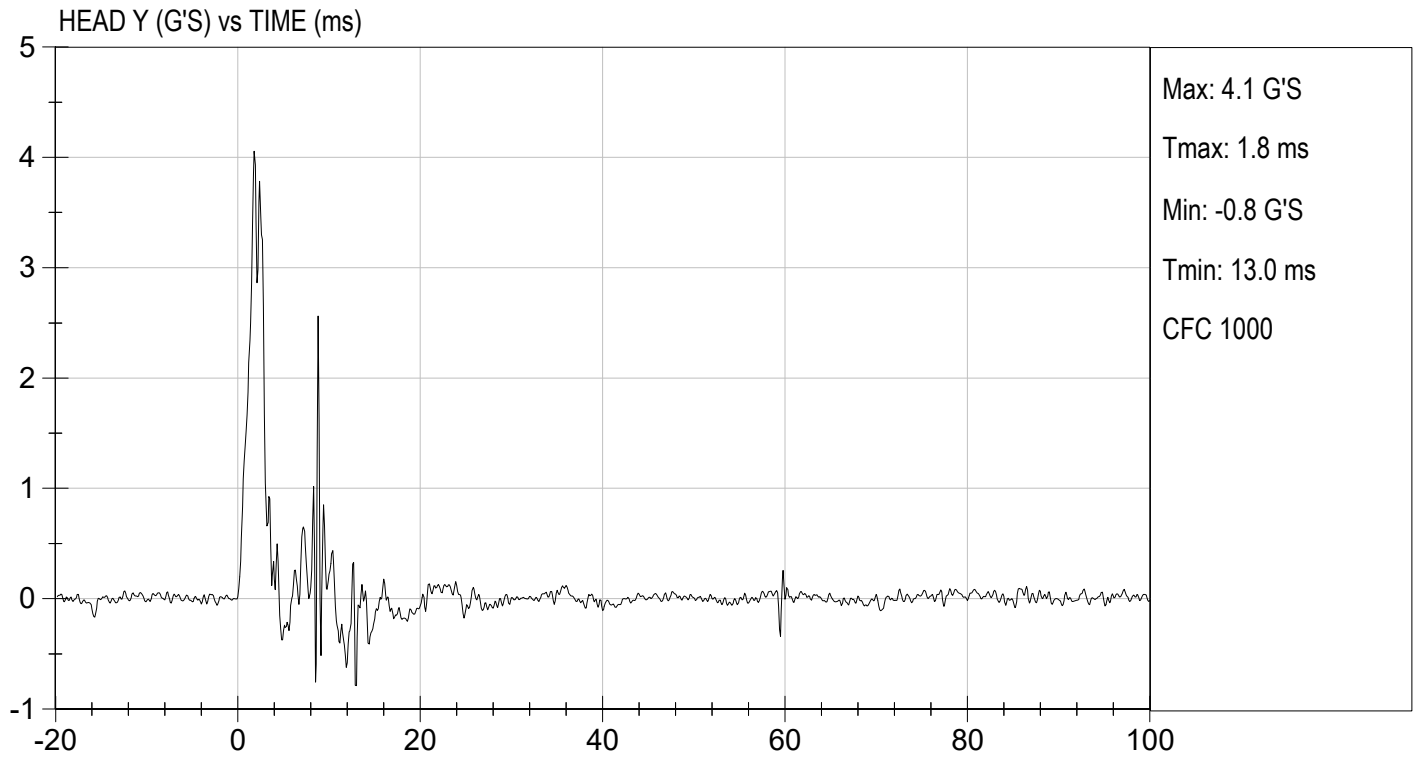


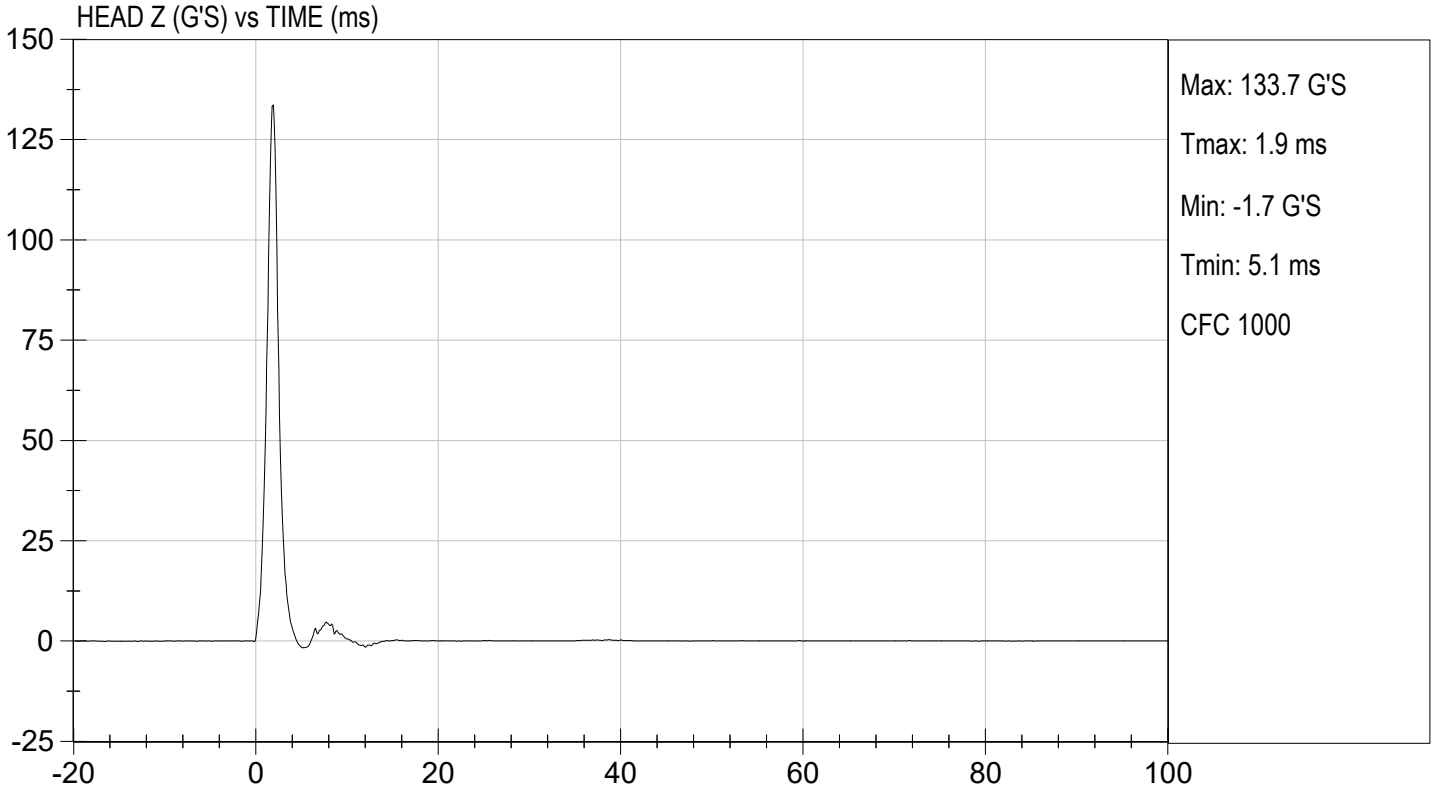
HEAD X (G'S) vs TIME (ms)



TEST DESC: HEAD DROP

TEST DATE: 03/05/2024
TEST #: D240591





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 142 **Test I.D:** D240592

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	37	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.4	Pass
	20 ms	m/s	4.0 to 5.0	4.6	Pass
	30 ms	m/s	5.8 to 7.0	6.8	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

03/05/2024

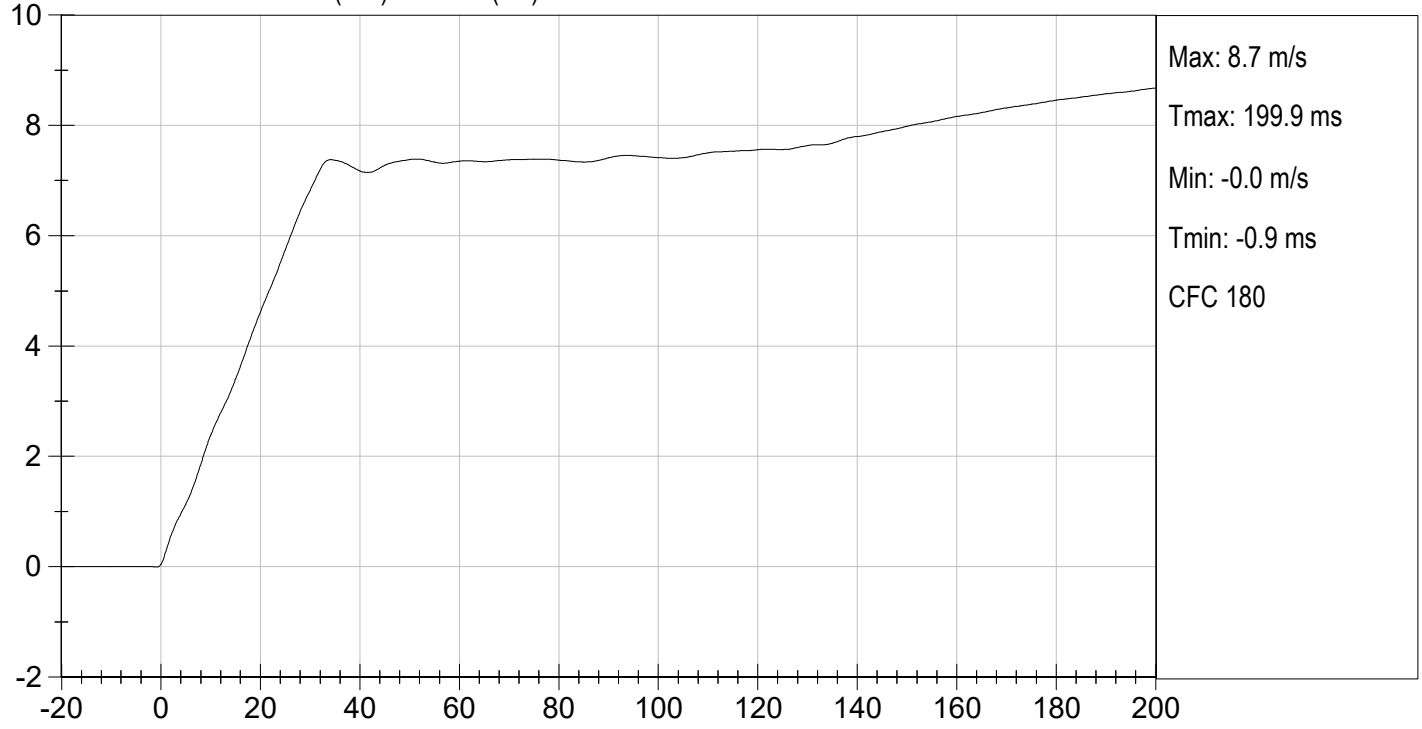
Test Date

Approved By

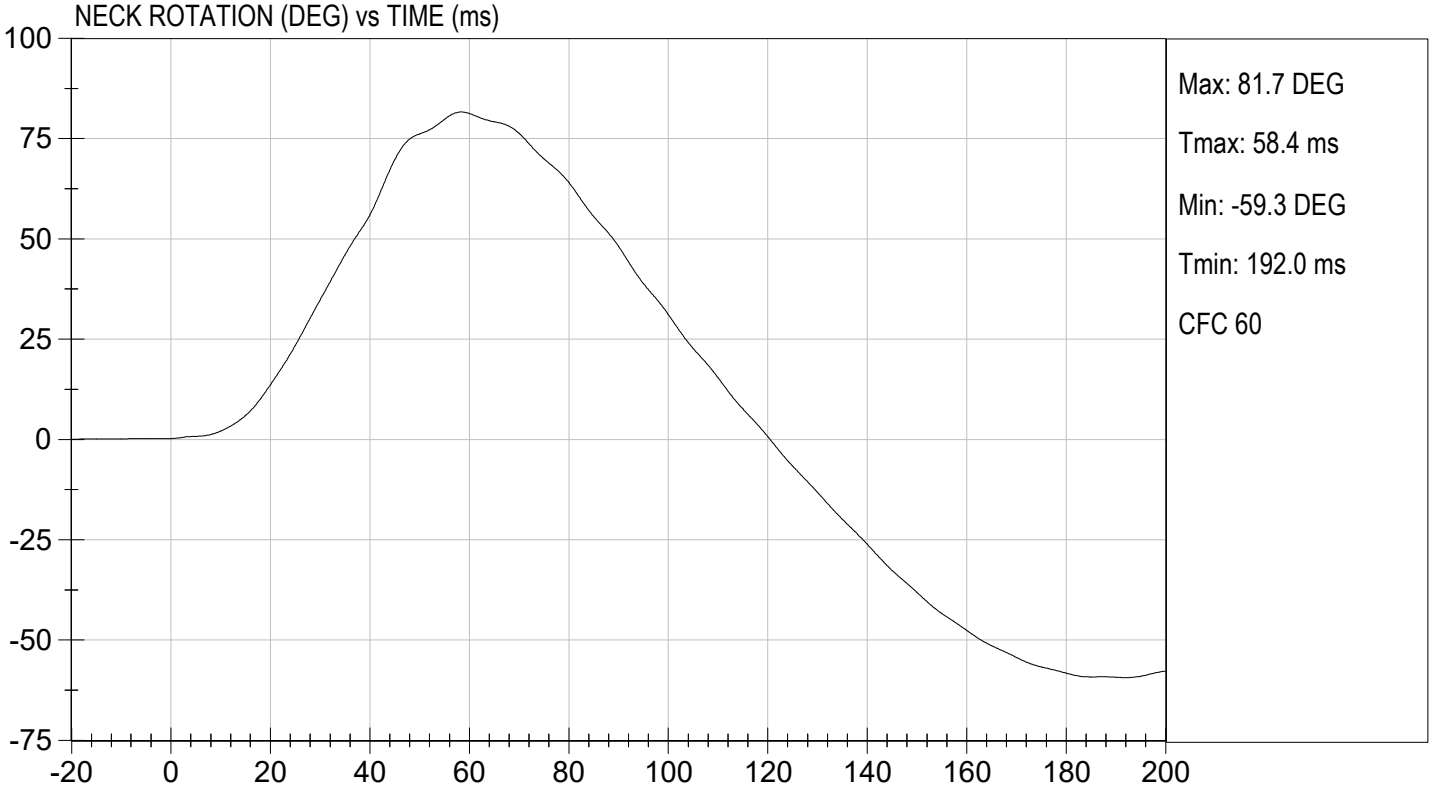
TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

TEST DATE: 03/05/2024
TEST #: D240592

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

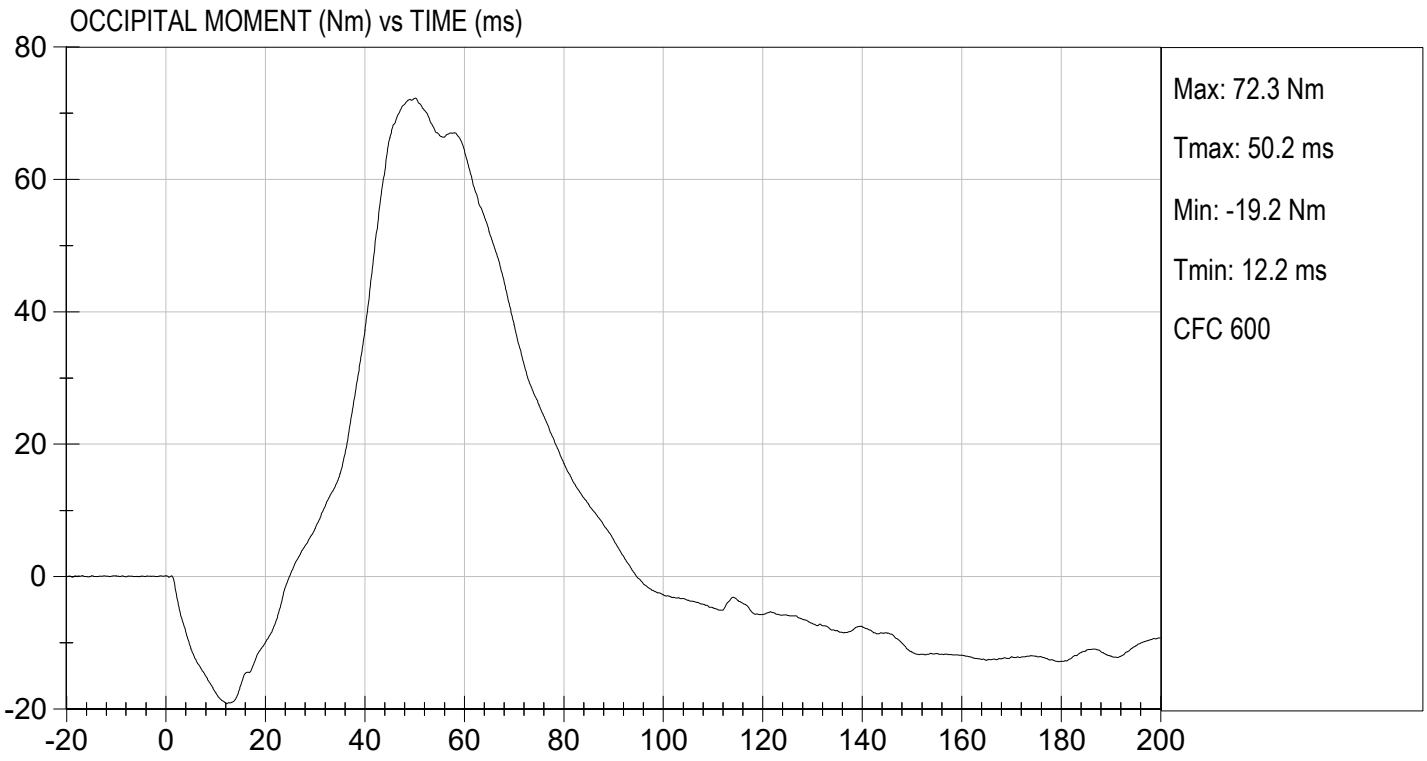


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 03/05/2024
TEST #: D240592



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 142 **Test I.D:** D240593

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	37	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.8	Pass
	20 ms	m/s	3.1 to 3.9	3.6	Pass
	30 ms	m/s	4.6 to 5.6	5.1	Pass
D Plane Rotation	Max	deg	99 to 114	112	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-53	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	105	Pass
			Overall Results		Pass

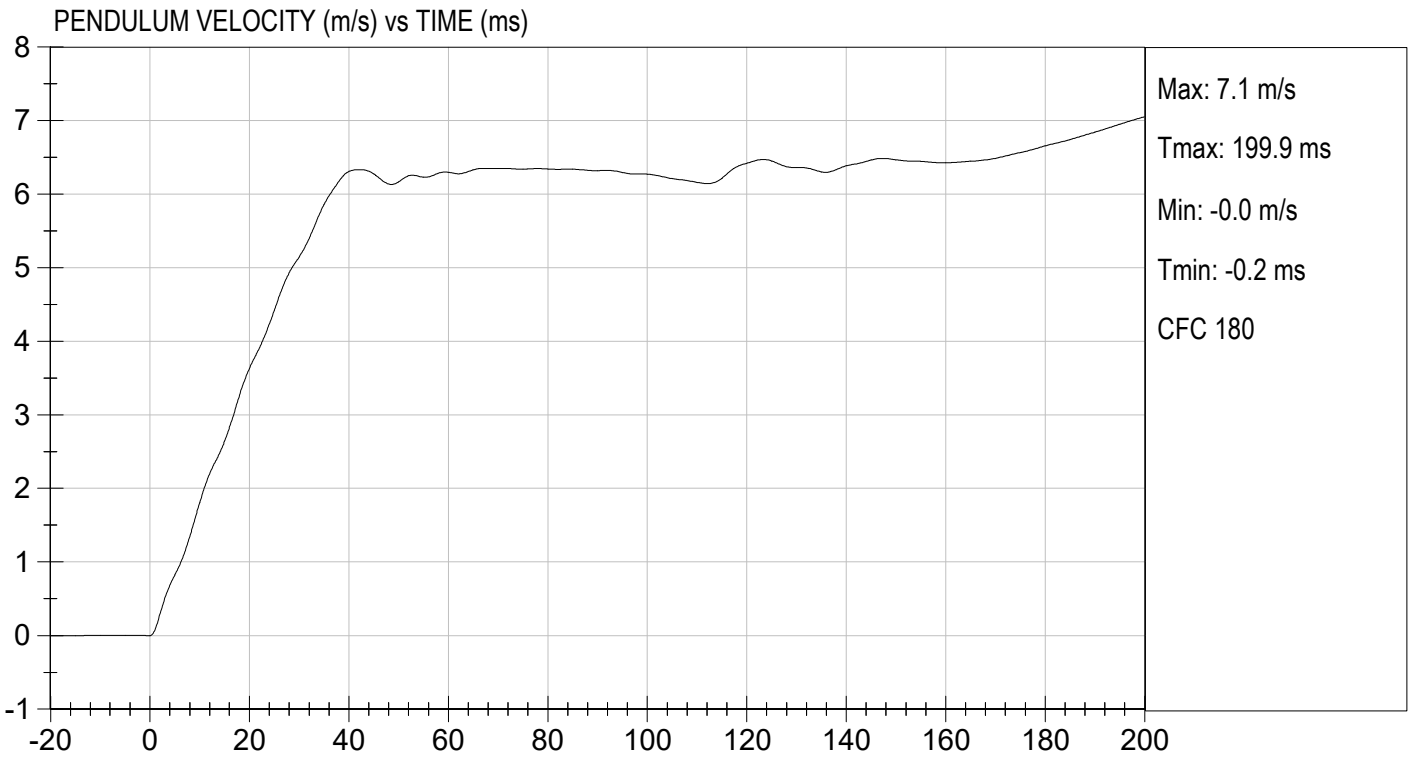
Laboratory Technician

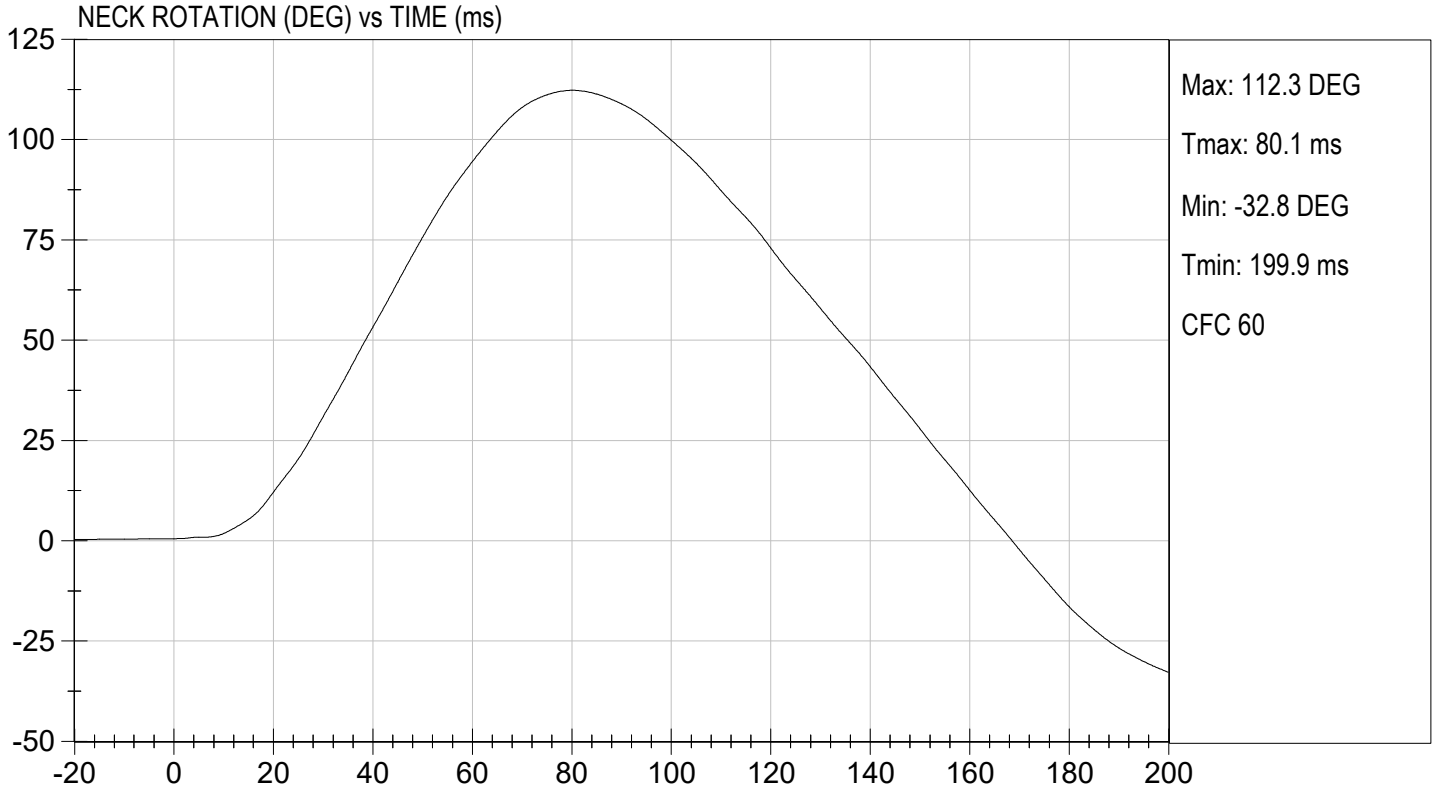
03/05/2024
Test Date

Approved By

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

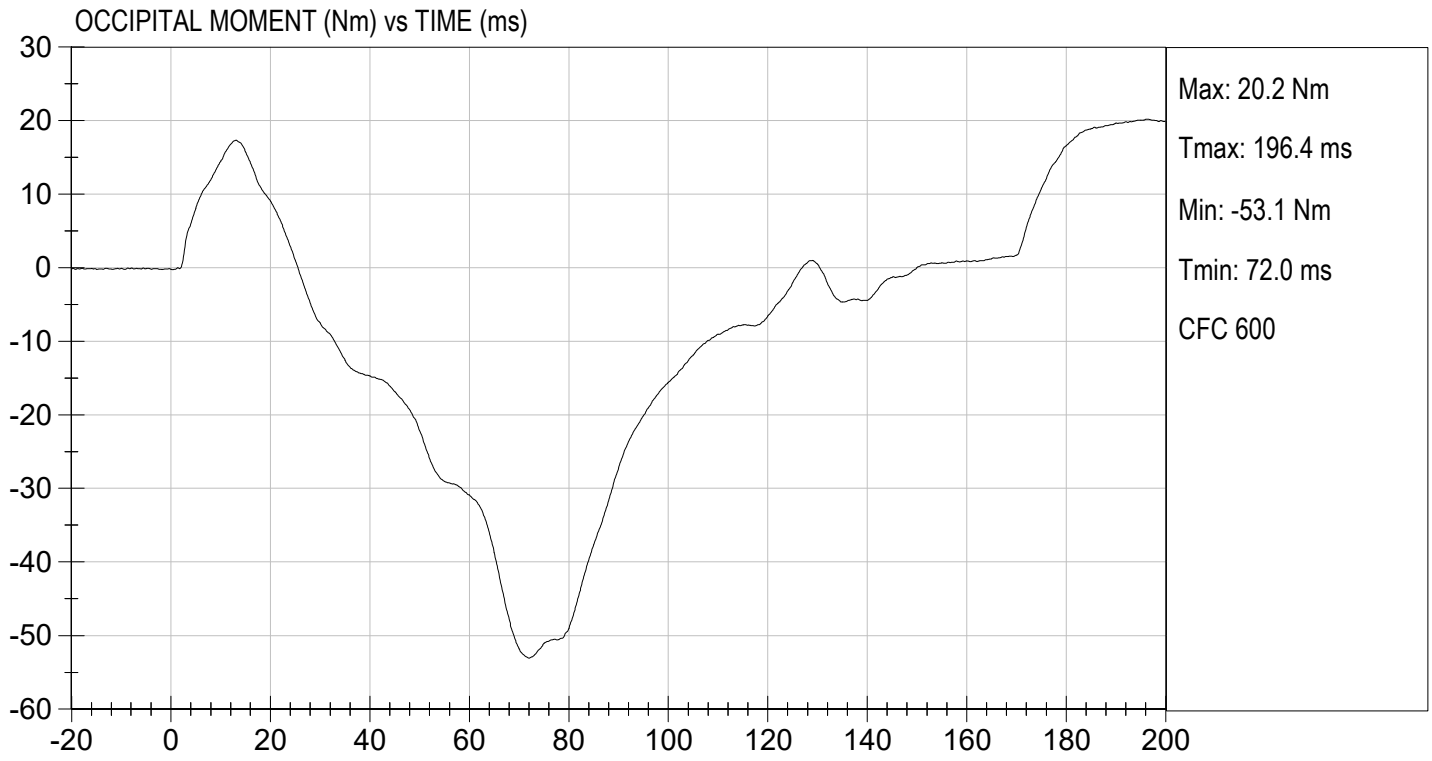
TEST DATE: 03/05/2024
TEST #: D240593





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

TEST DATE: 03/05/2024
TEST #: D240593



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 5TH PERCENTILE

ATD Serial No: 142 **Test I.D:** D240594

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Relative Humidity	%	10 to 70	37	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	4169	Pass
Internal Hysteresis	%	69 to 85	75	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4369	Pass
		Overall Test Results		Pass

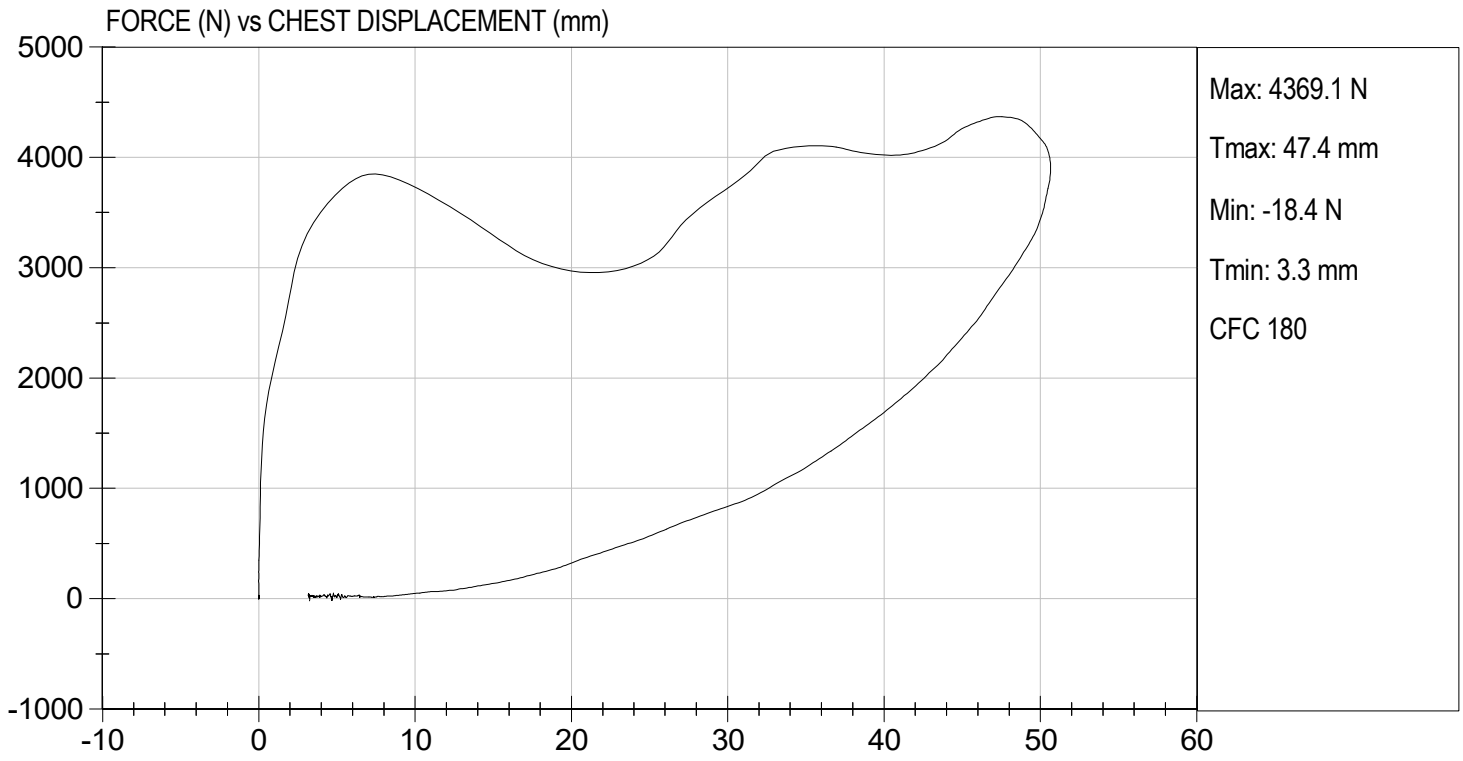
Laboratory Technician

03/05/2024
Test Date

Approved By

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

TEST DATE: 03/05/2024
TEST #: D240594



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 142 **Test I.D:** D240595

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	36	Pass
Probe Speed	m/s	2.07 to 2.13	2.11	Pass
Maximum Force	N	3450 to 4060	3892	Pass
		Overall Test Results		Pass

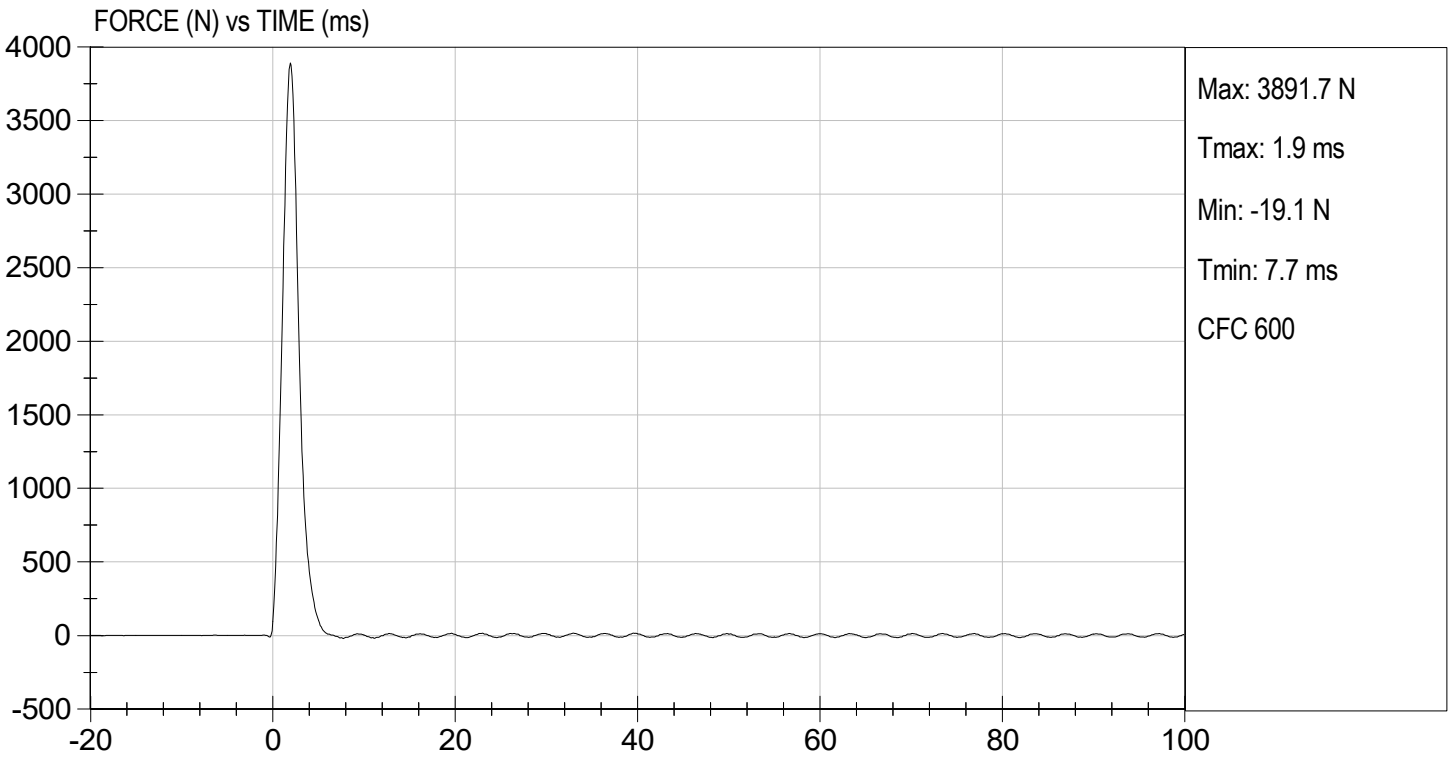
Laboratory Technician

03/05/2024
Test Date

Approved By

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

TEST DATE: 03/05/2024
TEST #: D240595



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 142 **Test I.D:** D240596

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	36	Pass
Probe Speed	m/s	2.07 to 2.13	2.11	Pass
Maximum Force	N	3450 to 4060	3829	Pass
		Overall Test Results		Pass

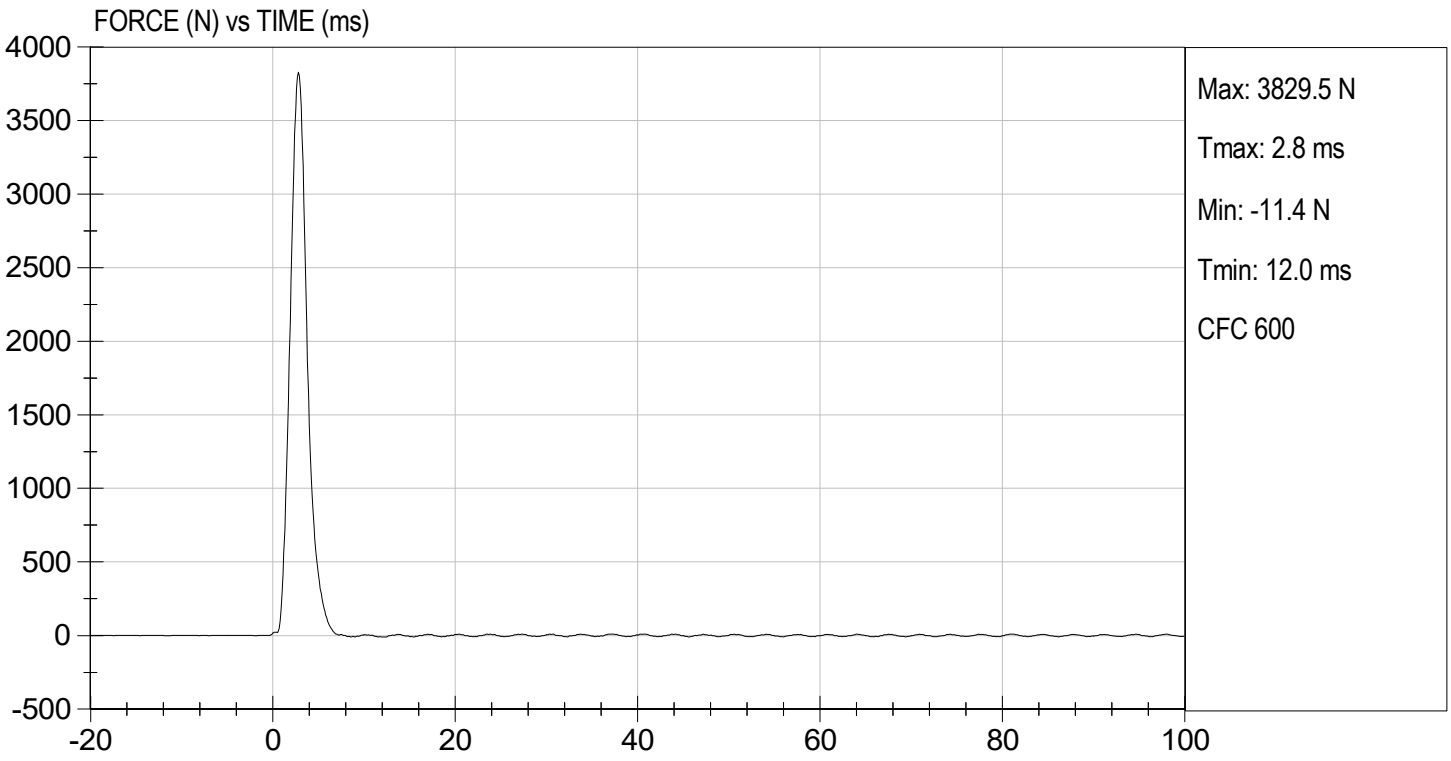
Laboratory Technician

03/05/2024
Test Date

Approved By

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

TEST DATE: 03/05/2024
TEST #: D240596



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 142 **Test I.D:** D240597

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	38	Pass
Initial Angle	deg	0 to 20	16	Pass
Return Angle	deg	+/- 8	3	Pass
Force at 45 deg	N	320 to 390	368	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.9	Pass
		Overall Result		Pass

Laboratory Technician

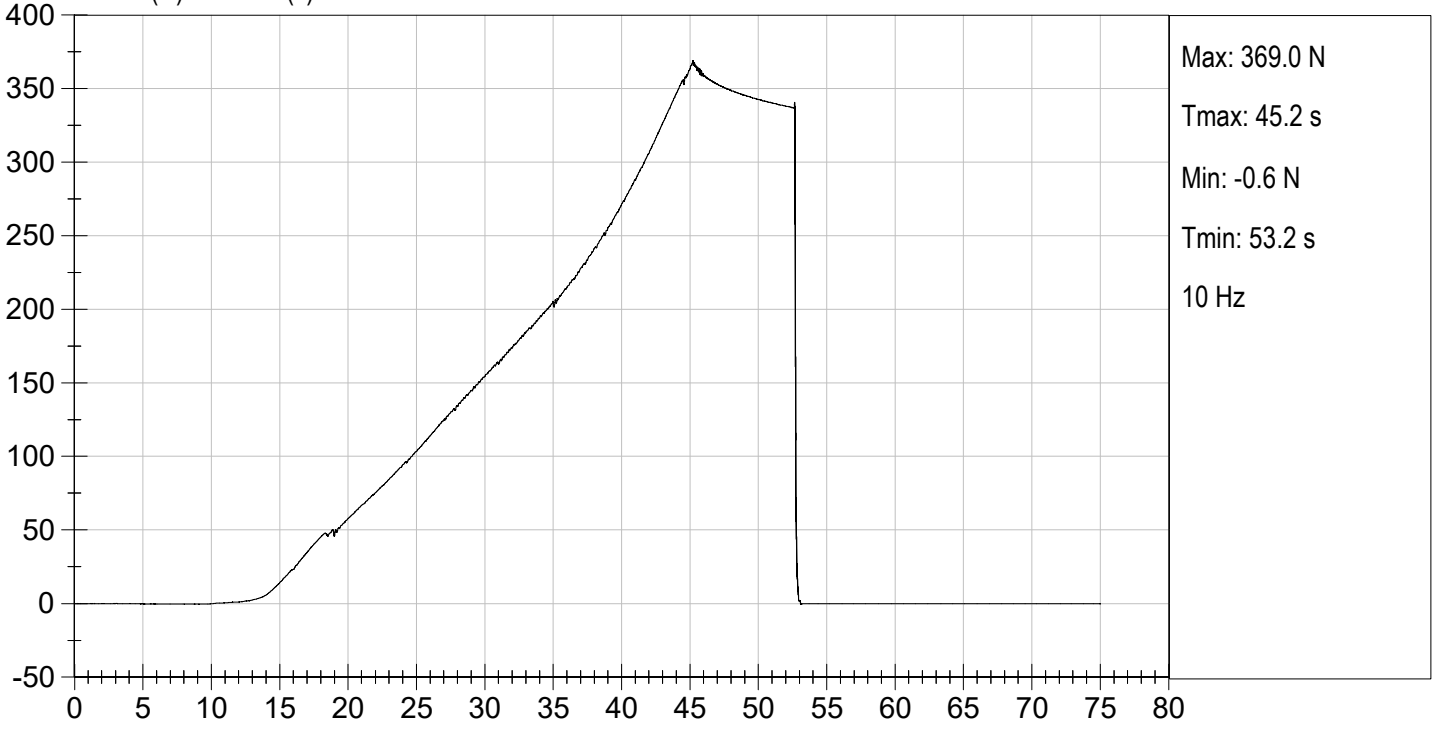
03/05/2024
Test Date

Approved By

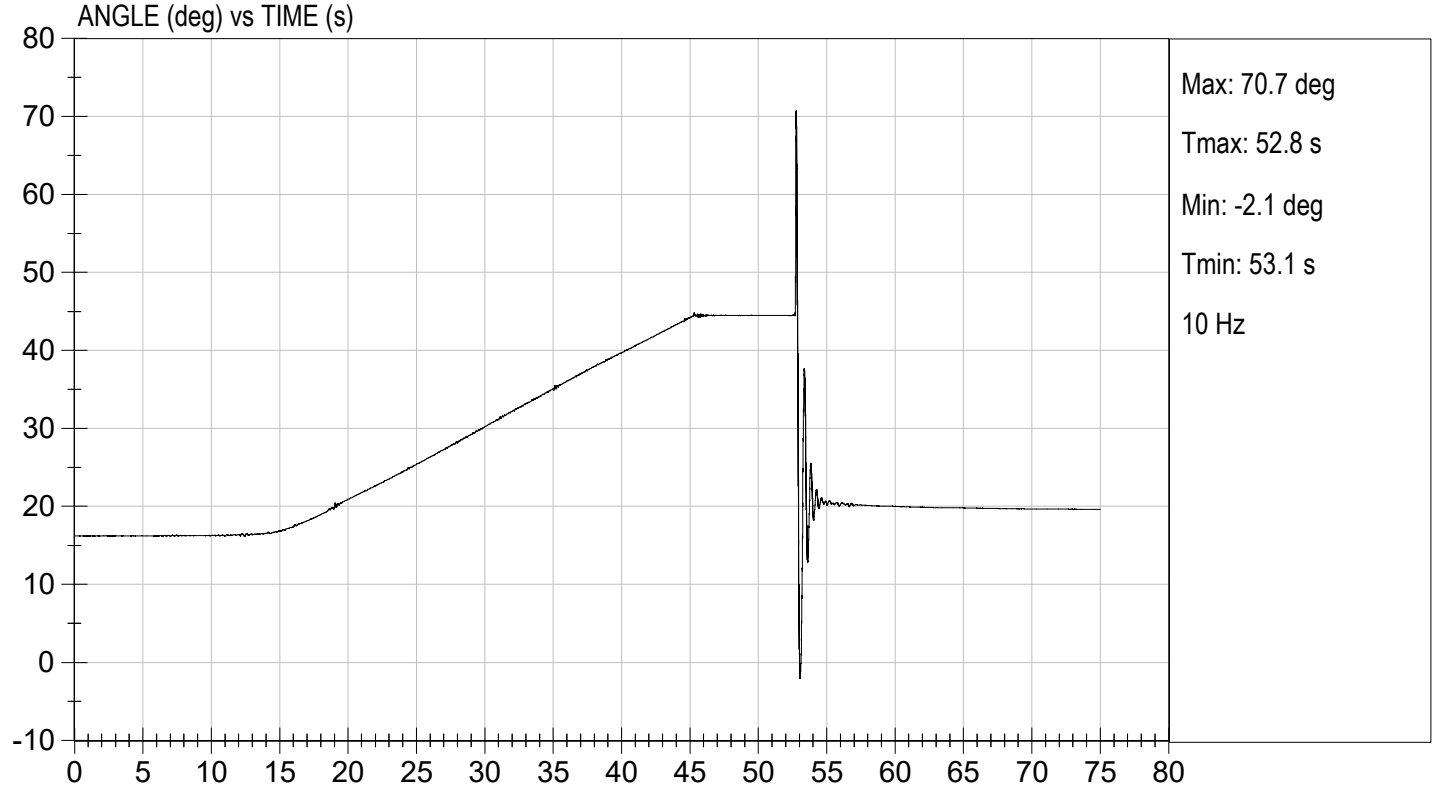
TEST DESC: LUMBAR FLEXION

TEST DATE: 03/05/2024
TEST #: D240597

LOAD (N) vs TIME (s)



ANGLE (deg) vs TIME (s)



APPENDIX D
TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION

TABLE 1 – DRIVER DUMMY INSTRUMENTATION

Instrument Location			Axis	Hybrid III 50th S/N 064		
				Serial Number	Manufacturer	Calibration Date
Head Accelerometers		Primary	X	T30960	Endevco	11/27/2023
			Y	P79743	Endevco	11/22/2023
			Z	P79741	Endevco	11/22/2023
		Redundant	X	P79744	Endevco	11/22/2023
			Y	P94834	Endevco	11/22/2023
			Z	P94856	Endevco	11/22/2023
Head Angular Rate Sensors			X	ARS7502	DTS	04/07/2023
			Y	ARS7524	DTS	04/07/2023
			Z	ARS7547	DTS	04/07/2023
Upper Neck Load Cell			Fx, Fy, Fz Mx, My, Mz	NG1911	Denton	06/23/2023
Chest Accelerometers		Primary	X	P86793	Endevco	11/27/2023
			Y	P88348	Endevco	11/27/2023
			Z	P86792	Endevco	11/27/2023
		Redundant	X	P88667	Endevco	11/27/2023
			Y	P94109	Endevco	11/27/2023
			Z	P88666	Endevco	11/27/2023
Chest Potentiometer			X	064	Humanetics	02/16/2024
Pelvis Accelerometers			X	P97742	Endevco	11/22/2023
			Y	P96038	Endevco	11/22/2023
			Z	P95526	Endevco	11/22/2023
Femur Load Cells	Right	Primary	Z	FG121P	Denton	11/22/2023
		Redundant	Z	FG121R	Denton	11/22/2023
	Left	Primary	Z	FG122P	Denton	11/22/2023
		Redundant	Z	FG122R	Denton	11/22/2023
Tibia Load Cells	Right	Upper	Mx, My, Fz	TG408	Denton	11/28/2023
		Lower	Mx, My, Fz	AG116	Denton	11/28/2023
	Left	Upper	Mx, My, Fz	TG480	Denton	11/28/2023
		Lower	Mx, My, Fz	AG502	Denton	11/28/2023
Foot Accelerometers	Right	Rear	X	T22486	Endevco	11/22/2023
			Z	P97382	Endevco	11/22/2023
		Front	Z	P82120	Endevco	11/22/2023
	Left	Rear	X	T16468	Endevco	11/22/2023
			Z	T32154	Endevco	11/22/2023
		Front	Z	T32190	Endevco	11/22/2023
Seat Belt Load Cells		Lap		SBG161	FTSS	08/22/2023
		Shoulder		SBG157	FTSS	08/22/2023

TABLE 2 – FRONT PASSENGER DUMMY INSTRUMENTATION

Instrument Location			Axis	Hybrid III 5th S/N 142		
				Serial Number	Manufacturer	Calibration Date
Head Accelerometers		Primary	X	P94799	Endevco	10/27/2023
			Y	P94800	Endevco	10/27/2023
			Z	P94801	Endevco	10/27/2023
		Redundant	X	P94802	Endevco	10/27/2023
			Y	P94803	Endevco	10/27/2023
			Z	P97377	Endevco	10/27/2023
Head Angular Rate Sensors			X	ARS7413	DTS	04/07/2023
			Y	ARS7421	DTS	04/07/2023
			Z	ARS7423	DTS	04/07/2023
Upper Neck Load Cell			Fx, Fy, Fz Mx, My, Mz	NG2203	Denton	01/22/2024
Chest Accelerometers		Primary	X	P88719	Endevco	10/27/2023
			Y	P94785	Endevco	10/27/2023
			Z	P94793	Endevco	10/27/2023
		Redundant	X	P95322	Endevco	10/27/2023
			Y	P95370	Endevco	10/27/2023
			Z	T30901	Endevco	10/27/2023
Chest Potentiometer			X	142	Humanetics	10/27/2023
Pelvis Accelerometers			X	P94798	Endevco	10/30/2023
			Y	P82646	Endevco	10/27/2023
			Z	P97705	Endevco	10/27/2023
Femur Load Cells	Right	Primary	Z	FG126P	Denton	10/27/2023
		Redundant	Z	FG126R	Denton	10/27/2023
	Left	Primary	Z	FG127P	Denton	10/27/2023
		Redundant	Z	FG127R	Denton	10/27/2023
Tibia Load Cells	Right	Upper	Mx, My, Fz	TG467	Denton	01/22/2024
		Lower	Mx, My, Fz	AG500	Denton	01/22/2024
	Left	Upper	Mx, My, Fz	TG478	Denton	01/22/2024
		Lower	Mx, My, Fz	AG491	Denton	01/22/2024
Foot Accelerometers	Right	Rear	X	P94795	Endevco	10/27/2023
			Z	P94796	Endevco	10/27/2023
		Front	Z	P94797	Endevco	10/30/2023
	Left	Rear	X	P83167	Endevco	10/30/2023
			Z	P83168	Endevco	10/27/2023
		Front	Z	P83169	Endevco	10/30/2023
Seat Belt Load Cells		Lap		SBG273	FTSS	08/22/2023
		Shoulder		SBG272	FTSS	08/22/2023

TABLE 3 – VEHICLE INSTRUMENTATION

Instrument Location			Axis	Serial Number	Manufacturer	Calibration Date
Crossmember / Rear Seat Accelerometers	Left	Primary	X	T32743	Endevco	09/13/2023
			Z	T33138	Endevco	01/09/2024
		Redundant	X	T39329	Endevco	11/06/2023
	Right	Primary	X	T39234	Endevco	10/31/2023
			Z	T39230	Endevco	10/31/2023
		Redundant	X	T39269	Endevco	11/07/2023
Engine Accelerometers		Top	X	T39076	Endevco	10/30/2023
		Bottom	X	T39135	Endevco	10/30/2023