REPORT NUMBER: NCAP-MGA-21-011

NEW CAR ASSESSMENT PROGRAM (NCAP)
Frontal Barrier Impact Test

FORD MOTOR CO.
2021 Ford Transit Connect XLT Wagon LWB
NHTSA No.: M20210218

MGA RESEARCH CORPORATION
5000 Warren Road
Burlington, WI 53105

Test Date: November 19, 2020

Final Report Date: March 2, 2021

FINAL REPORT

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

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Prepared by: _____
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Approved by: _____
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Approval Date: March 2, 2021

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

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Final Report of New Car Assessment Program Frontal Impact Testing of a 2021 Ford Transit Connect XLT Wagon LWB, NHTSA No.: M20210218	March 2, 2021
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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
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15. Supplementary Notes

16. Abstract

A 56.3 km/h NCAP Frontal Rigid Barrier Impact Test was conducted on a 2021 Ford Transit Connect XLT Wagon LWB in accordance with the specifications of the Office of Crashworthiness Standards Laboratory Procedure for NCAP Full Frontal Rigid Barrier Impact Testing. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), and 301 performance. The test was conducted at MGA Research Corporation in Burlington, Wisconsin on November 19, 2020.

The impact velocity of the vehicle was 56.52 km/h and the ambient temperature at the barrier face at the time of impact was 21.3°C. The target vehicle post-test maximum crush was 542 mm located at the vehicle centerline. The test vehicle's performance was as follows:

Measurement Description	Units	Driver ATD		Passenger ATD	
		Threshold	Result	Threshold	Result
Head Injury Criteria (HIC_{15})		700	145	700	146
Maximum Chest Compression	mm	63	25	52	10
Nij		1	0.28	1	0.48
Neck Tension	N	4170	1022	2620	797
Neck Compression	N	4000	83	2520	78
Left Femur Force	N	10008	1208	6805	2835
Right Femur Force	N	10008	1308	6805	2176

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SECTION 1
PURPOSE AND SUMMARY OF TEST

PURPOSE

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

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

SUMMARY

A load cell barrier consisting of 176 load cells was impacted by a 2021 Ford Transit Connect XLT Wagon LWB at a velocity of 56.52 km/h. The test was performed at MGA Research Corporation on November 19, 2020. Pre-test and post-test photographs of the vehicle and dummies can be found in Appendix A.

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

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

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

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

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

There was 99.6 percent windshield retention and no intrusion into the protected zone of the windshield during the event. There was no Stoddard Solvent leakage after the event or during any phase of the static rollover.

The maximum static crush of the vehicle was 542 mm located at the vehicle centerline and both the driver and passenger side door(s) remained closed during the impact event and were operable after the impact.

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

The occupant data is summarized below:

ATD position	HIC_{15}	Nij	Neck Tension (N)	Neck Comp. (N)	3ms Chest Clip (g)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50^{th})	145	0.28	1022	83	38	25	1208	1308
Passenger (5^{th})	146	0.48	797	78	37	10	2835	2176

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

TEST NOTES

Passenger Right Ankle X recorded no valid data after 110 ms.
Top of Engine X recorded no valid data after 24 ms.
Bottom of Engine X recorded no valid data after 50 ms.
Right Rear Crossmember X has noise/spike at 42 ms.
Driver Shoulder Belt load cell was not installed.
Driver Lap Belt load cell was not installed.
Passenger Shoulder Belt load cell was not installed.
Passenger Lap Belt load cell was not installed.
Barrier K-15 My recorded no valid data.
Barrier K-03 Fx recorded questionable data.
Barrier J-04 My recorded no valid data.
Barrier F-16 Fx recorded questionable data.
Barrier C-02 Fx recorded no valid data.
Barrier C-02 My recorded no valid data.

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

SECTION 2
OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2021 Ford Transit Connect XLT Wagon LWB NHTSA No.: M20210218
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/19/2020

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	M20210218	Traction Control System (TCS)	Yes
Model Year	2021	Power Steering	Yes
Make	Ford	Power Window Auto-Reverse	Yes
Model	Transit Connect XLT Wagon	Driver Frontal Airbag	Yes
Body Style	Van	Driver Curtain Airbag	Yes
VIN	NM0GE9F2XM1485130	Driver Head/Torso Airbag	No
Body Color	Diffused Silver	Driver Torso Airbag	No
Odometer (km/mi)	117 mi	Driver Torso/Pelvis Airbag	Yes
Engine Displacement (L)	2.0 L	Driver Pelvis Airbag	No
Type/No. Cylinders	Inline 4	Driver Knee Airbag	Yes
Engine Placement	Lateral	Front Pass. Frontal Airbag	Yes
Transmission Type	Automatic	Front Pass. Curtain Airbag	Yes
Transmission Speeds	8	Front Pass. Head/Torso Airbag	No
Overdrive	Yes	Front Pass. Torso Airbag	No
Final Drive	FWD	Front Pass. Torso/Pelvis Airbag	Yes
Roof Rack	No	Front Pass. Pelvis Airbag	No
Sunroof/T-Top	No	Front Pass. Knee Airbag	No
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	FORD MOTOR CO.
Date of Manufacture	07/20

GVWR (kg)	2459
GAWR Front (kg)	1271
GAWR Rear (kg)	1304

VEHICLE SEATING AND WEIGHT CAPACITY DATA

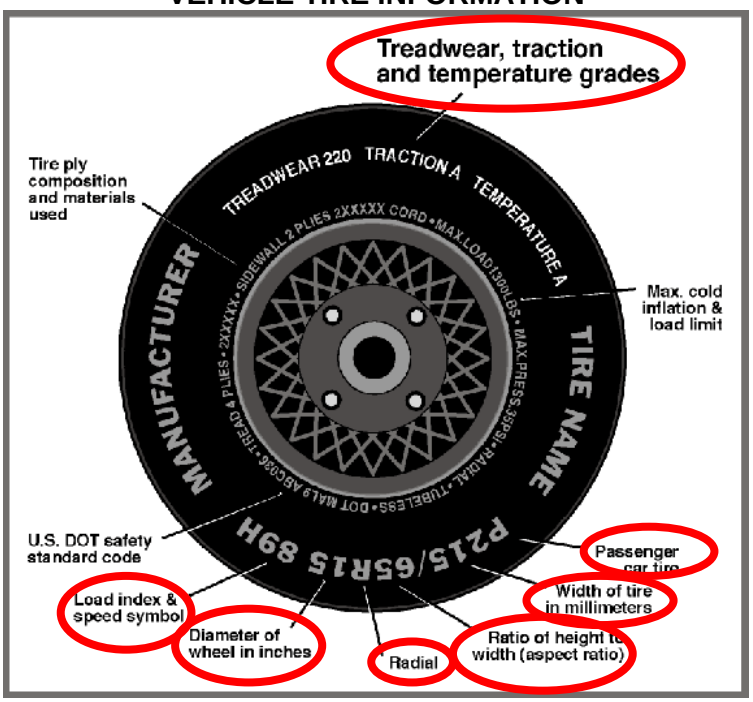
Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bucket	Split Bench	
Designated Seating Capacity (DSC)	2	2	2	6
Capacity Weight (VCW) (kg)				630
Cargo Weight (RCLW) (kg)				136

* Rated Cargo and Luggage Weight (RCLW) limited to maximum of 300 lbs (136 kg).

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

Test Vehicle: 2021 Ford Transit Connect XLT Wagon LWB
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: M20210218
Test Date: 11/19/2020

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	280	290
Recommended Tire Size	215/55R16	215/55R16
Tire Size on Vehicle	215/55R16	215/55R16
Tire Manufacturer	Continental	Continental
Tire Model	ProContact TX	ProContact TX
Treadwear	500	500
Traction	A	A
Temperature Grade	A	A
Tire Plies Sidewall	1 Rayon	1 Rayon
Tire Plies Body	1 Rayon, 2 Steel, 1 Polyamide	1 Rayon, 2 Steel, 1 Polyamide
Load Index/Speed Symbol	97H	97H
Tire Material	Rubber	Rubber
DOT Safety Code Left	6GB3 WD3V	6GB3 WD3V
DOT Safety Code Right	6GB3 WD3V	6GB3 WD3V

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

Test Vehicle: 2021 Ford Transit Connect XLT Wagon LWB NHTSA No.: M20210218
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/19/2020

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	515.5	397.5		552.5	510.0	
Right	kg	496.5	386.0		516.5	487.0	
Ratio	%	56.4%	43.6%		51.7%	48.3%	
Totals	kg	1012.0	783.5	1795.5	1069.0	997.0	2066.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1795.5
Weight of 1 P572E ATD & 1 P572O ATD	kg	141
Rated Cargo/Luggage Weight (RCLW)	kg	136
Calculated Test Vehicle Target Weight (TVTW)	kg	2072.5

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	691	699	741	744	1339
As Tested	mm	690	693	706	715	1481
Post Test	mm	705	698	717	710	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	3068
Total Vehicle Length at Left Side	mm	4651
Total Vehicle Length at Centerline	mm	4868
Total Vehicle Length at Right Side	mm	4651
Weight of Ballast in Cargo Area	kg	73
Weight of Vehicle Components Removed	kg	5
Amount of Stoddard Solvent in Fuel Tank	L	55.6

List of components removed to meet test weight: None.

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

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

Test Vehicle: 2021 Ford Transit Connect XLT Wagon LWB NHTSA No.: M20210218
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/19/2020

TARGET VEHICLE STRUCTURAL MEASUREMENT

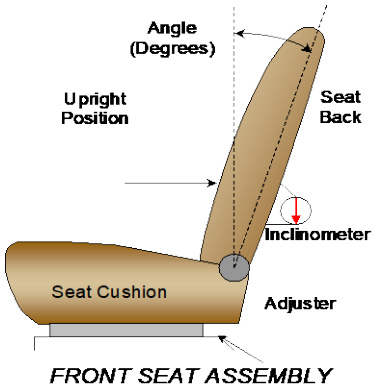
	Elements	Pre-Test (mm)
1	Total Length	4868
2	Total Width	1804
3	Bumper Top Height	555
4	Bumper Bottom Height	439
5	Longitudinal Member Top Height	N/A
6	Distance between Longitudinal Members	890
7	Longitudinal Member Width	85
8	Engine Top Height	840
9	Engine Bottom Height	211
10	Engine and Gearbox Width	880
11	Front Bumper-Engine Distance	250
12	Front Shock Absorber Fixing Height	N/A
13	Bonnet Leading Edge Height	932
14	Front Shock Absorber Fixing Width	N/A
15	Front Bumper – Front Axle Distance	660
16	Front Axle – A-Pillar Distance	409
17	A-Pillar – B-Pillar Distance	1170
18	B-Pillar – Rear Axle Distance	1506
19	B-Pillar – C-Pillar Distance	1024
20	Roof Sill Bottom Height	1560
21	Roof Sill Top Height	1730
22	Floor Sill Bottom Height	212
23	Floor Sill Top Height	356

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

Test Vehicle: 2021 Ford Transit Connect XLT Wagon LWB NHTSA No.: M20210218
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/19/2020

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	9.1° on outboard headrest post guide
Passenger Seat Back Angle	3.8° on outboard headrest post guide

SEAT FORE/AFT POSITIONS

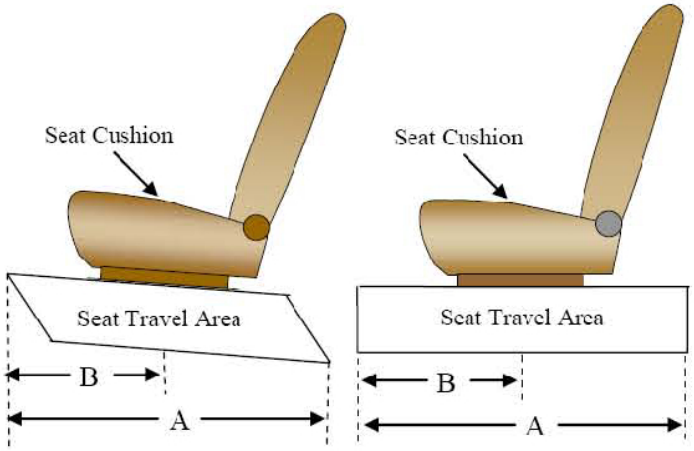
The driver and passenger seat fore/aft positions are adjusted following Appendix F, "Driver & Passenger Dummy Seating & Positioning Procedures" in the NCAP Test Procedure dated May 2018.

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	298 mm	149 mm
Passenger Seat	220 mm / 23 detents (1st as 1)	0 mm / 0th detent (1st as 0)

SEAT BELT UPPER ANCHORAGES

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

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



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

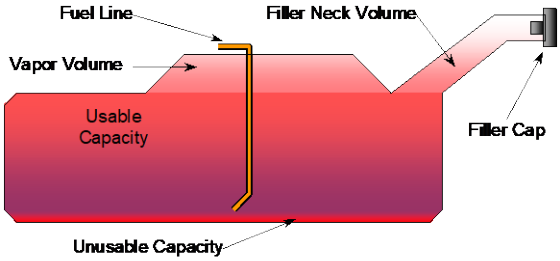
Test Vehicle: 2021 Ford Transit Connect XLT Wagon LWB NHTSA No.: M20210218
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/19/2020

FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of "Standard Tank"	60.0
Usable Capacity of "Optional Tank"	
92-94% of Usable Capacity	55.2 to 56.4
Actual Amount of Solvent used	55.6
1/3 of Usable Capacity	20.0

FUEL PUMP

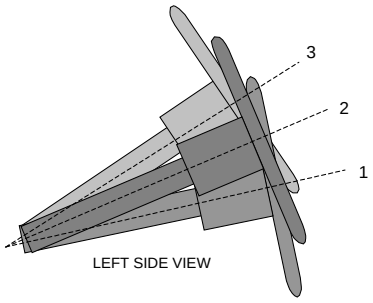
The vehicle is equipped with an electronic fuel pump. The electronic fuel pump operates for a prescribed amount of time to pressurize the fuel system following the actuation of the ignition. If no attempt has been made to start the engine, the fuel pump will shut off. The fuel pump operates continuously while the engine is running. If the engine stalls, the fuel pump is deactivated. The filler neck is located on the passenger's side.



VEHICLE FUEL TANK ASSEMBLY

STEERING COLUMN ADJUSTMENT

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



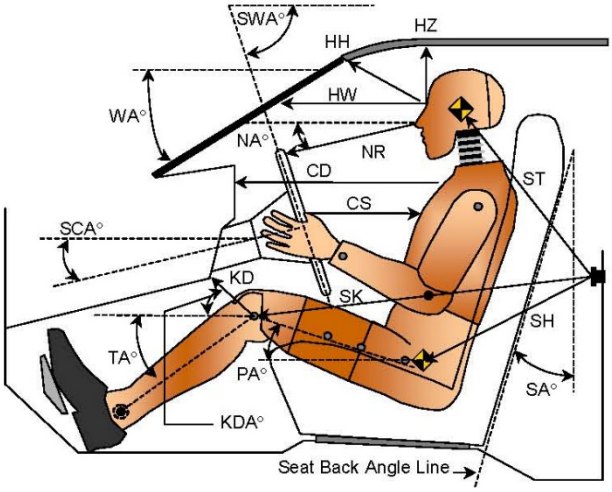
STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITION

	Degrees	Fore/Aft Position (mm)
Lowermost Position 1	65.4	
Geometric Center Position 2	62.3	
Uppermost Position 3	59.1	
Telescoping Steering Wheel Travel		50
Test Position	62.3	25

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2021 Ford Transit Connect XLT Wagon LWB
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: M20210218
Test Date: 11/19/2020

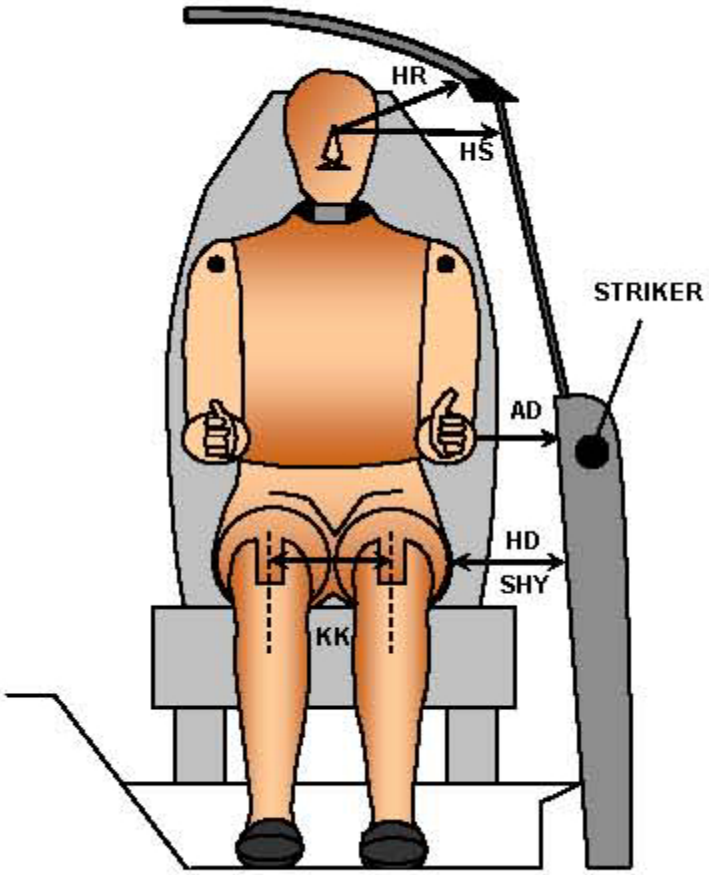


LEFT SIDE VIEW

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		30.4		
SWA°	Steering Wheel Angle		62.3		
SCA°	Steering Column Angle		27.7		
SA°	Seat Back Angle		9.1		3.8
HZ	Head to Roof (Z)	425	90	292	90
HH	Head to Header	579	36.6	507	41.0
HW	Head to Windshield	923	0	888	0
NR	Nose to Rim	408	5.2		
CD	Chest to Dash	538		396	
CS	Chest to Steering Hub	330	3.3		
RA	Rim to Abdomen	201	0		
KDL	Left Knee to Dash	159	27.5	71	35.0
KDR	Right Knee to Dash	160	32.0	90	34.1
PA°	Pelvic Angle		24.2		18.9
TA°	Tibia Angle		57.0		63.4
SK	Striker to Knee	575	94.1	674	90.4
ST	Striker to Head	561	9.3	553	19.1
SH	Striker to H-Point	236	117.4	339	10.6

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2021 Ford Transit Connect XLT Wagon LWB
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: M20210218
Test Date: 11/19/2020

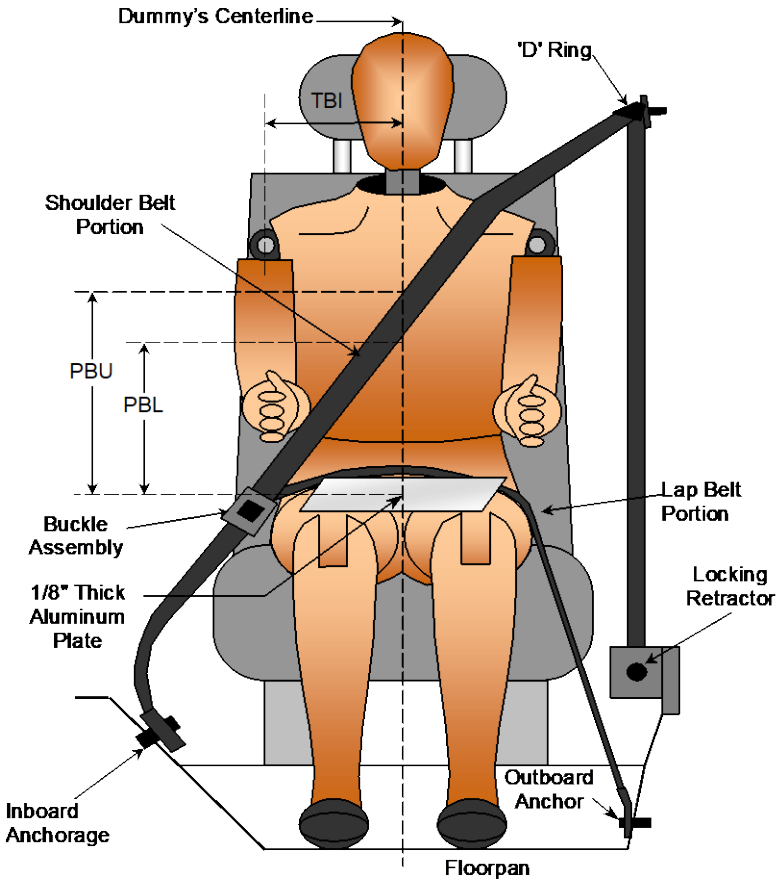


FRONT VIEW OF DUMMY

Code	Measurement Description	Driver	Passenger
		Length (mm)	
AD	Arm to Door	163	96
HD	H-Point to Door	146	158
HR	Head to Side Header	361	379
HS	Head to Side Window	431	423
KK	Knee to Knee	372	230
SHY	Striker to H-Point (Y Direction)	290	314
AA	Ankle to Ankle	358	164

DATA SHEET NO. 5
SEAT BELT POSITIONING DATA

Test Vehicle:	2021 Ford Transit Connect XLT Wagon LWB	NHTSA No.:	M20210218
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	11/19/2020



FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	355	355
PBL - Top surface of reference to belt lower edge	mm	275	265

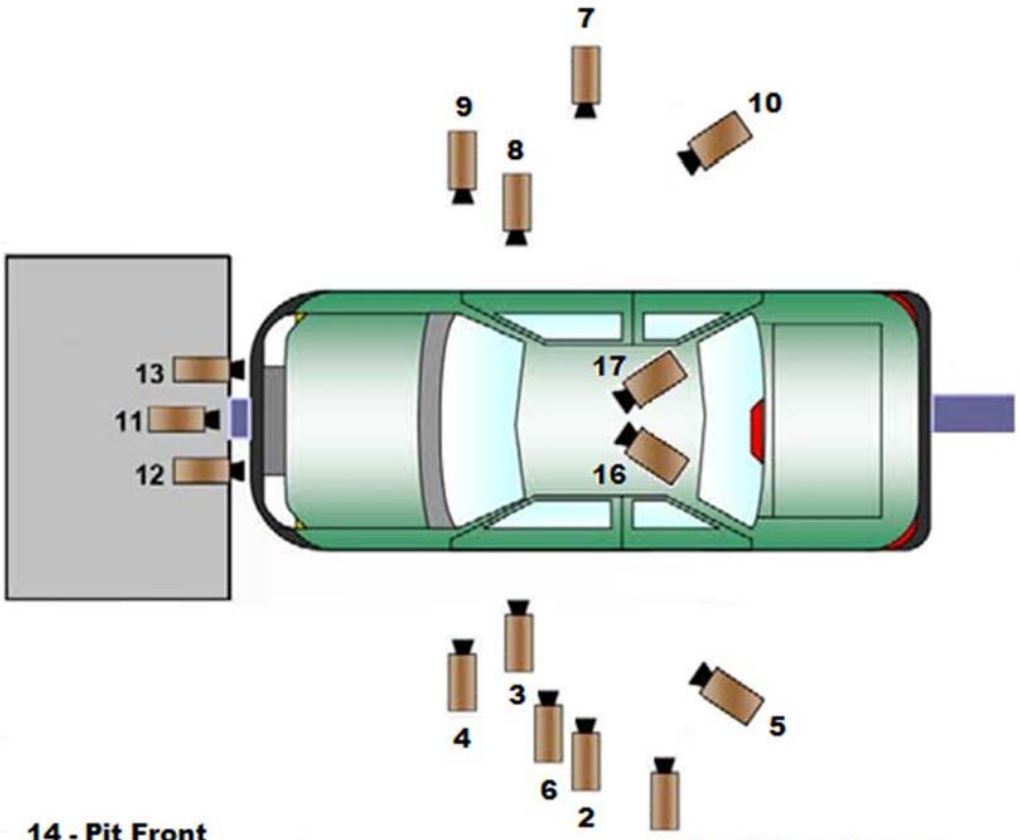
BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as measured on ATD	mm	875	940
Lap Belt Length as measured on ATD	mm	715	785
Remainder of belt on reel	mm	1040	905
Total Belt Length for Continuous Webbing Systems	mm	3290	3290

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

Test Vehicle:	2021 Ford Transit Connect XLT Wagon LWB	NHTSA No.:	M20210218
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	11/19/2020

CAMERA POSITIONS FOR FRONTAL IMPACTS



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

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

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

Test Vehicle: 2021 Ford Transit Connect XLT Wagon LWB NHTSA No.: M20210218
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/19/2020

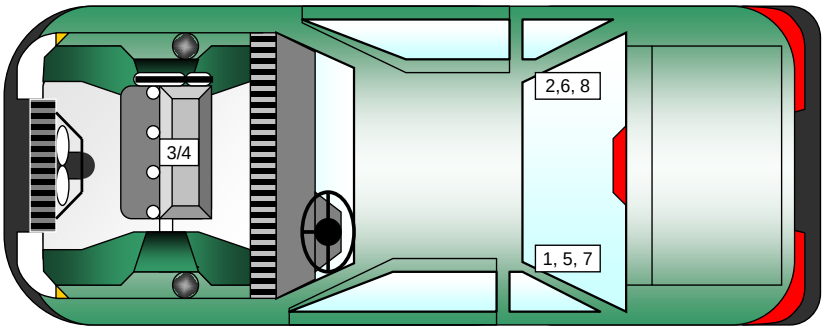
CAMERA LOCATIONS

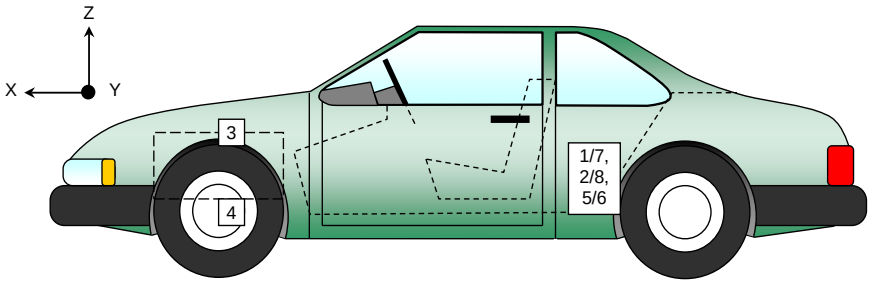
No.	Camera View	Coordinates* (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Overall					30
2	Left Overall	-2360	-5920	-1250	12	1000
3	Driver Close-Up	-1800	-6670	-1840	50	1000
4	Left Front Half	-1180	-5750	-1330	24	1000
5	Left Angle	-7290	-5820	-1840	75	1000
6	Steering Column	-750	-5480	-1250	50	1000
7	Right Overall	-2200	5750	-1300	12	1000
8	Passenger Close-Up	-1650	6730	-1810	50	1000
9	Right Front Half	-1050	5500	-1280	24	1000
10	Right Angle	-7430	5490	-1780	75	1000
11	Windshield	180	0	-2310	12	1000
12	Driver Windshield	190	-370	-2230	25	1000
13	Passenger Windshield	190	370	-2230	25	1000
14	Pit Front	-800	0	3340	24	1000
15	Pit Rear	-3220	0	3340	24	1000
16	Driver Onboard				12	1000
17	Passenger Onboard				12	1000
18	Real-Time Pan View					30

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

DATA SHEET NO. 7
VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2021 Ford Transit Connect XLT Wagon LWB
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: M20210218
Test Date: 11/19/2020





VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

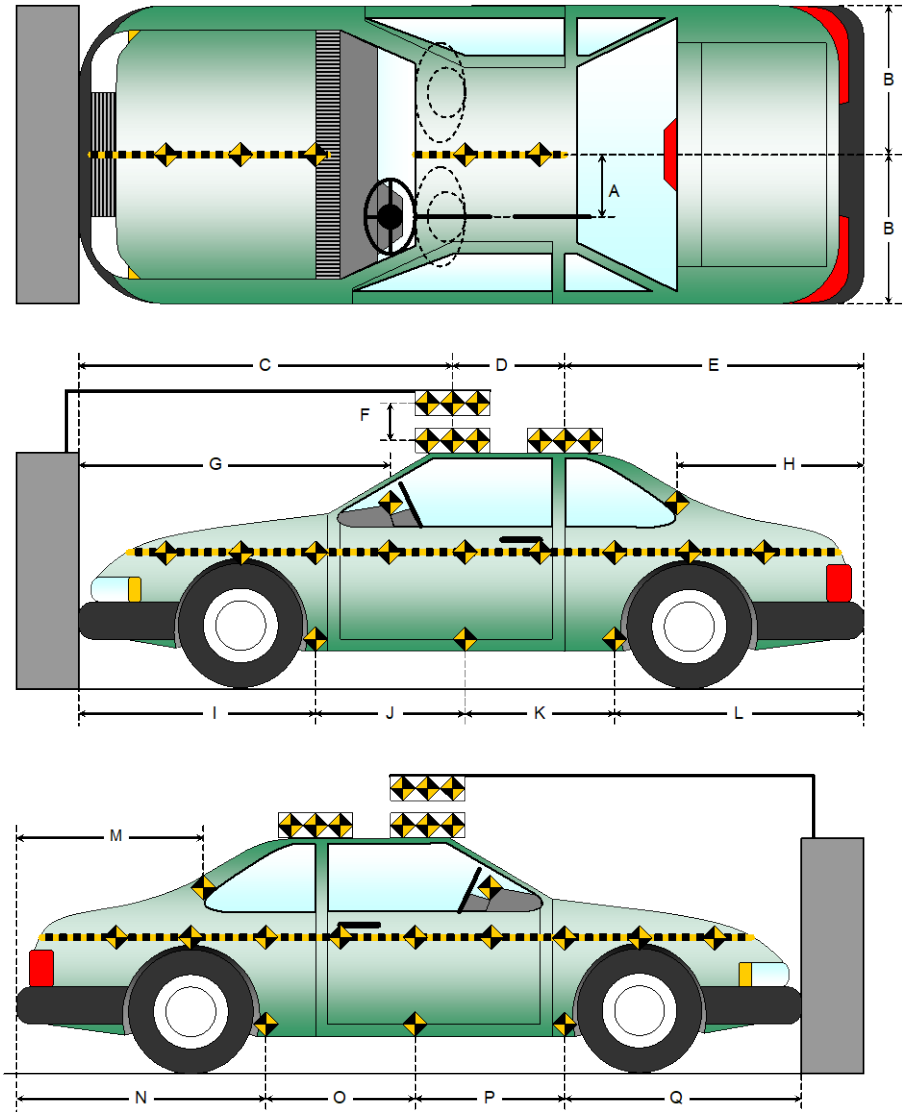
No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Crossmember Accelerometer – X Direction	2106	-425	-436
2	Right Rear Crossmember Accelerometer – X Direction	2106	425	-447
3	Engine Top X	4169	0	-837
4	Engine Bottom X	4196	0	-274
5	Left Rear Crossmember Accelerometer – Z Direction	2106	-425	-436
6	Right Rear Crossmember Accelerometer – Z Direction	2106	425	-447
7	Left Rear Crossmember Accelerometer Redundant – X Direction	2106	-380	-436
8	Right Rear Crossmember Accelerometer Redundant – X Direction	2106	380	-447

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

DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2021 Ford Transit Connect XLT Wagon LWB
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: M20210218
Test Date: 11/19/2020

Item	Value (mm)
A	350
B	902
C	2225
D	610
E	2033
F	1830
G	
H	1178
I	1339
J	1114
K	1114
L	1301
M	1178
N	1301
O	1114
P	1114
Q	1339



DATA SHEET NO. 9
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2021 Ford Transit Connect XLT Wagon LWB
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: M20210218
Test Date: 11/19/2020

ADVANCED RESEARCH LOAD CELL BARRIER

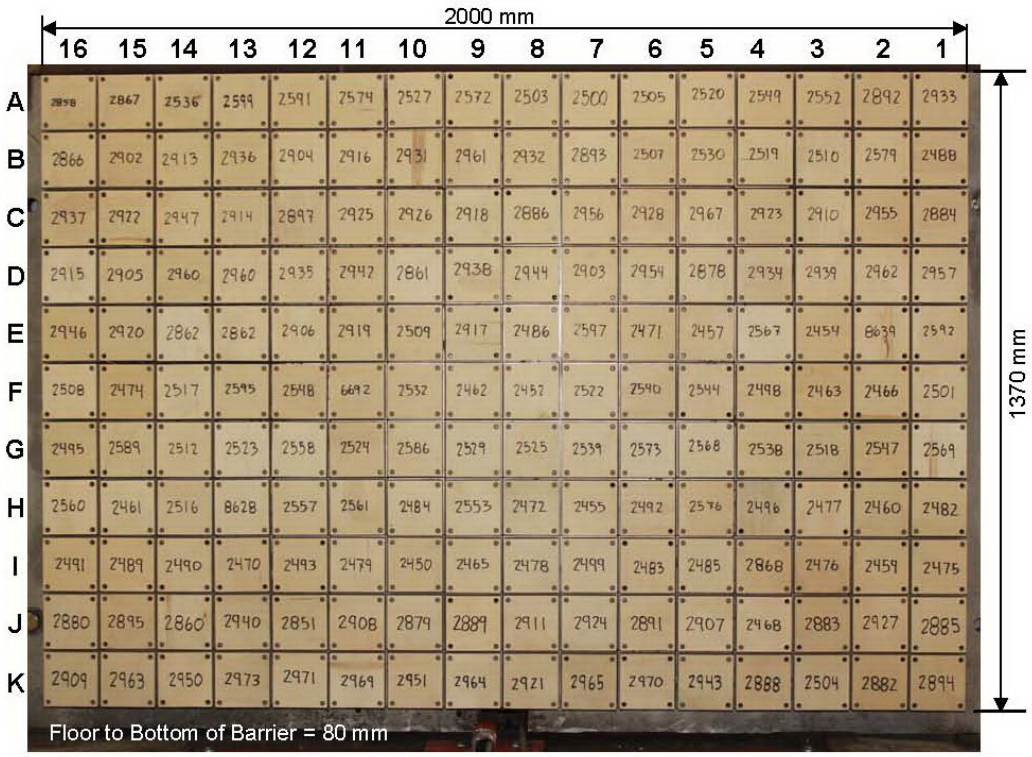


Photo for Reference Only

Centerline

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

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

DATA SHEET NO. 10
TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2021 Ford Transit Connect XLT Wagon LWB
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: M20210218
Test Date: 11/19/2020

INSTRUMENTATION

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

CAMERA COVERAGE

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

DATA SHEET NO. 11
POST-TEST OBSERVATIONS

Test Vehicle: 2021 Ford Transit Connect XLT Wagon LWB NHTSA No.: M20210218
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/19/2020

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

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

DOOR OPENING, TRUNK OPENING, AND SEAT TRACK INFORMATION

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

OTHER VEHICLE POST-TEST OBSERVATIONS

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

VEHICLE REBOUND FROM BARRIER

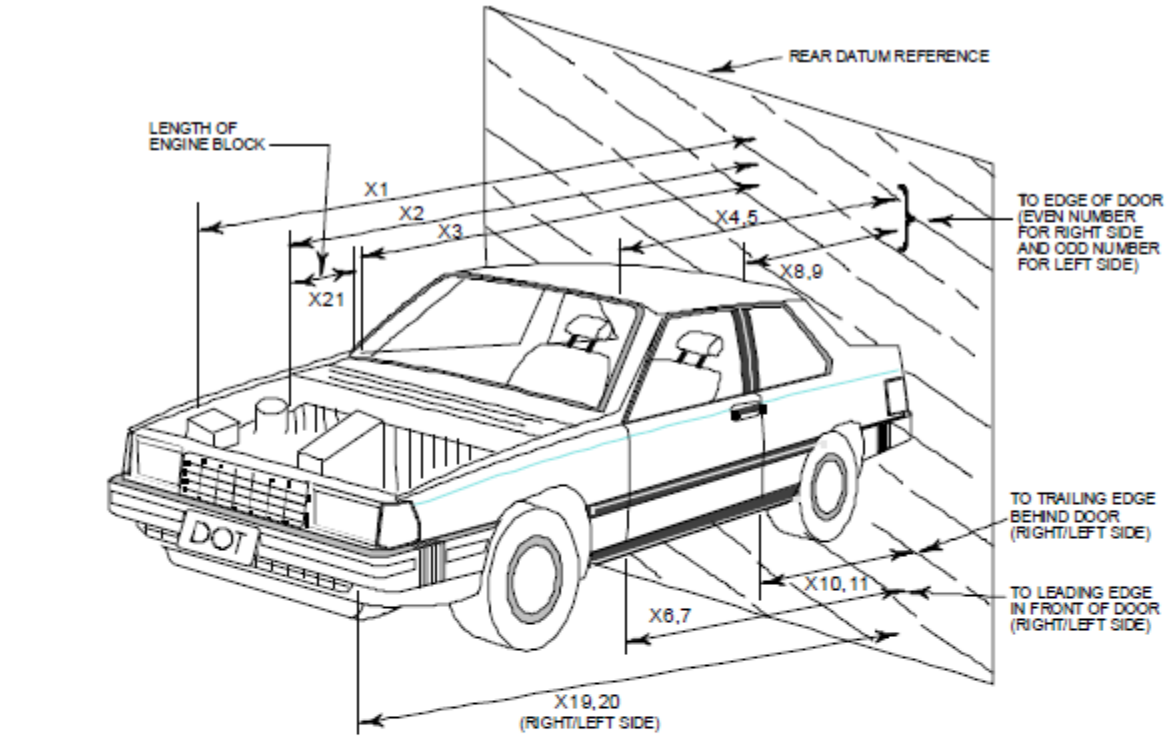
Measured Parameter	Units	Value
Left Side	mm	635
Center	mm	605
Right Side	mm	655
Average	mm	632

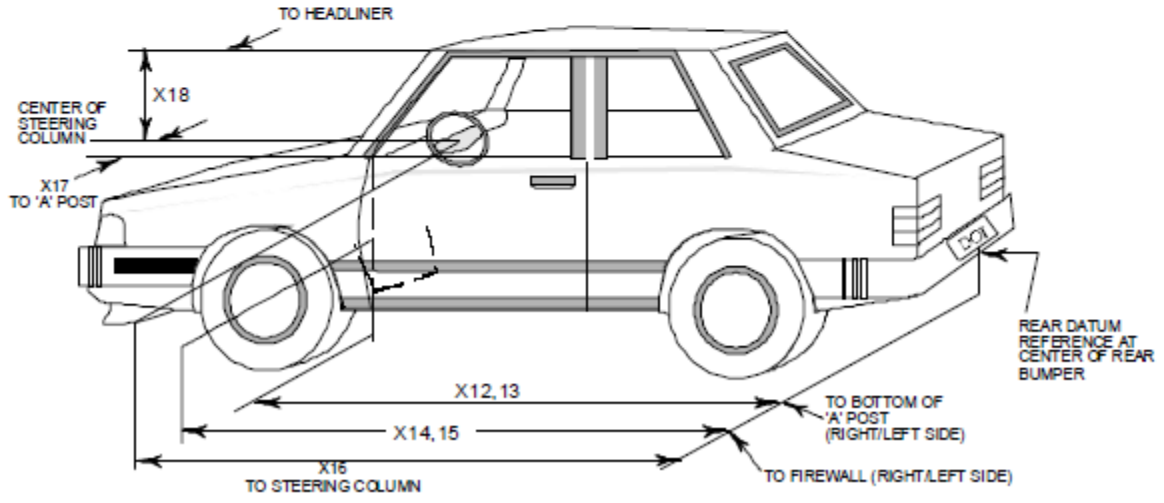
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

DATA SHEET NO. 12
VEHICLE PROFILE MEASUREMENTS

Test Vehicle:	2021 Ford Transit Connect XLT Wagon LWB	NHTSA No.:	M20210218
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	11/19/2020





DATA SHEET NO. 12 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2021 Ford Transit Connect XLT Wagon LWB NHTSA No.: M20210218
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/19/2020

No.	Measurement Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	4868	4326	542
2	RSOV to Front of Engine	4371	4121	250
3	RSOV to Firewall	4122	4109	13
4	RSOV to Upper Leading Edge of Right Door	3504	3493	11
5	RSOV to Upper Leading Edge of Left Door	3504	3495	9
6	RSOV to Lower Leading Edge of Right Door	3460	3435	25
7	RSOV to Lower Leading Edge of Left Door	3460	3441	19
8	RSOV to Upper Trailing Edge of Right Door	2391	2372	19
9	RSOV to Upper Trailing Edge of Left Door	2391	2373	18
10	RSOV to Lower Trailing Edge of Right Door	2400	2380	20
11	RSOV to Lower Trailing Edge of Left Door	2400	2382	18
12	RSOV to Bottom of “A” Post of Right Side	3475	3498	-23
13	RSOV to Bottom of “A” Post of Left Side	3475	3496	-21
14	RSOV to Firewall, Right Side	4043	3936	107
15	RSOV to Firewall, Left Side	4043	3955	88
16	RSOV to Steering Column	3038	3078	-40
17	Center of Steering Column to “A” Post	515	480	35
18	Center of Steering Column to Headliner	546	535	11
19	RSOV to Right Side of Front Bumper	4651	4276	375
20	RSOV to Left Side of Front Bumper	4651	4318	333
21	Length of Engine Block	414	414	0
RD	RSOV to Right Side of Dash Panel	3203	3179	24
CD	RSOV to Center of Dash Panel	3240	3162	78
LD	RSOV to Left Side of Dash Panel	3201	3166	35

All Dimensions in mm

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

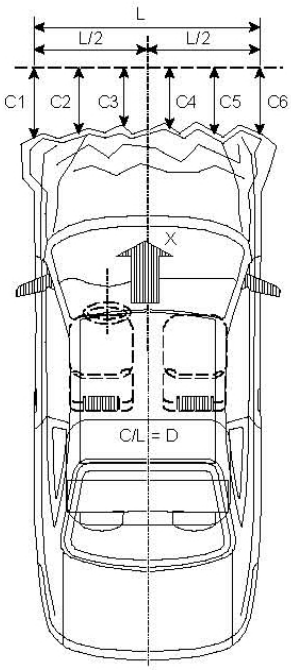
Test Vehicle: 2021 Ford Transit Connect XLT Wagon LWB
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: M20210218
Test Date: 11/19/2020

VEHICLE INFORMATION

VIN: NM0GE9F2XM1485130
Vehicle Size Category: MPV
Wheelbase (mm): 3068
Test Weight (kg): 2066.0

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): 56.52
Velocity Change (km/h): 66.2
Time of Separation (msec) 98



CRUSH PROFILE

Collision Deformation Classification: 12FDEW4
Midpoint of Damage: Centerline
Damage Region Length (mm): 1440
Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4651	4318	333
C2	Crush zone 2 at left side	mm	4790	4365	425
C3	Crush zone 3 at left side	mm	4841	4372	469
C4	Crush zone 4 at right side	mm	4841	4304	537
C5	Crush zone 5 at right side	mm	4790	4258	532
C6	Crush zone 6 at right side	mm	4651	4276	375
L	C1 TO C6	mm	1440	1420	20

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

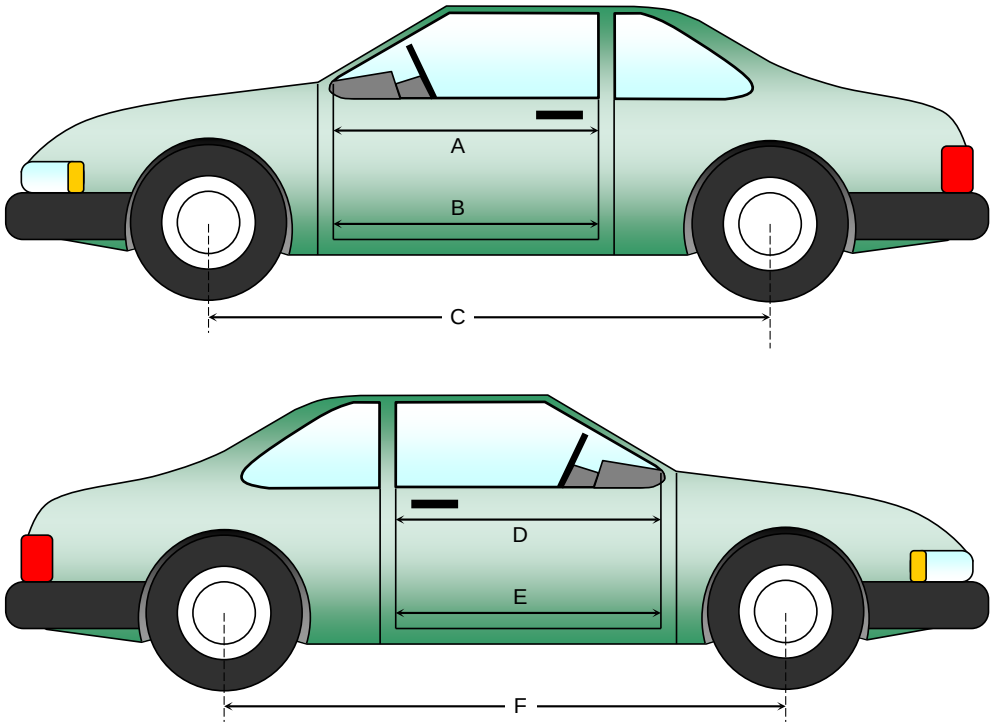
Test Vehicle: 2021 Ford Transit Connect XLT Wagon LWB
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: M20210218
Test Date: 11/19/2020

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	951	951	0
B	Left Side Lower	mm	847	847	0
D	Right Side Upper	mm	956	956	0
E	Right Side Lower	mm	844	844	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	3068	2970	98
F	Right Side Wheelbase	mm	3068	2953	115



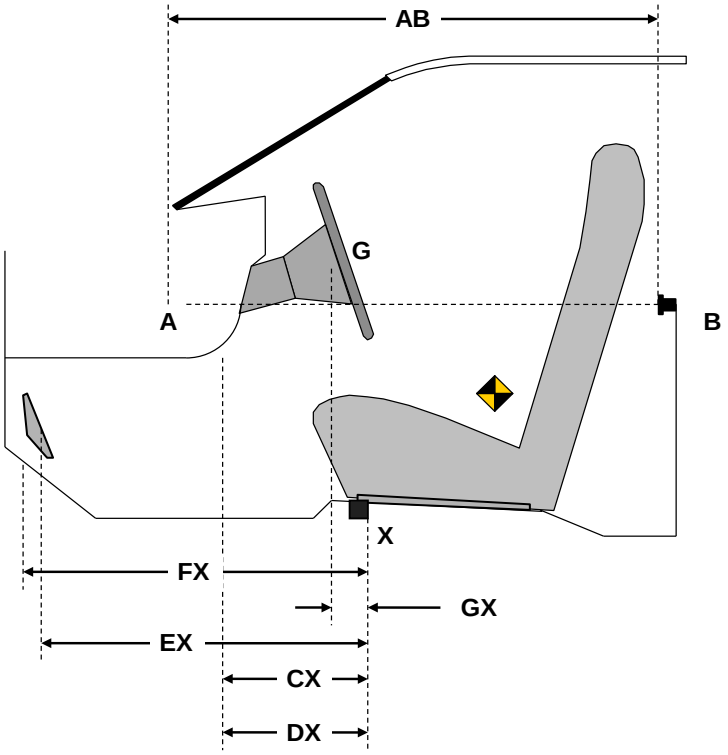
DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2021 Ford Transit Connect XLT Wagon LWB
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: M20210218
Test Date: 11/19/2020

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	890	890	0
CX	Left Knee Bolster to X	mm	342	331	11
DX	Right Knee Bolster to X	mm	358	314	44
EX	Brake Pedal to X	mm	495	514	-19
FX	Foot Rest to X	mm	545	522	23
GX	Center of Steering Column Wheel Hub to X	mm	70	136	-66

X = Front of Seat Track (stationary)



DRIVER COMPARTMENT

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

Test Vehicle: 2021 Ford Transit Connect XLT Wagon LWB NHTSA No.: M20210218
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/19/2020

WINDSHIELD MOUNTING DETAILS

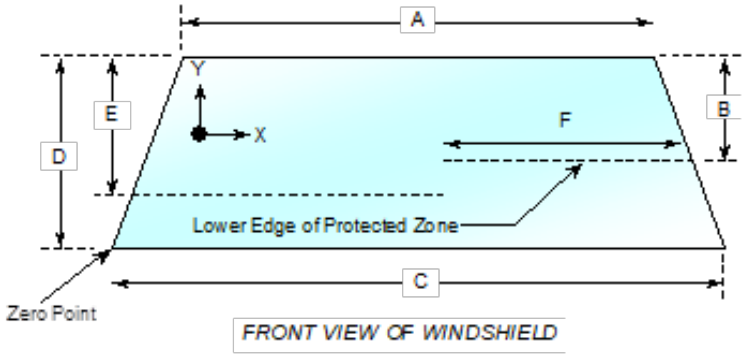
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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: 21.3°C.

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2319	2299	99.1
Right Side	2319	2319	100
Total	4638	4618	99.6



FRONT VIEW OF WINDSHIELD

Item	Units	Value
A	mm	1394
B	mm	620
C	mm	1460
D	mm	892
E	mm	641
F	mm	576

AREA OF PROTECTED ZONE FAILURES

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

X	Y

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

X	Y

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

Test Vehicle: 2021 Ford Transit Connect XLT Wagon LWB NHTSA No.: M20210218
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/19/2020

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21.3°C Test Time: 11:48 a.m.

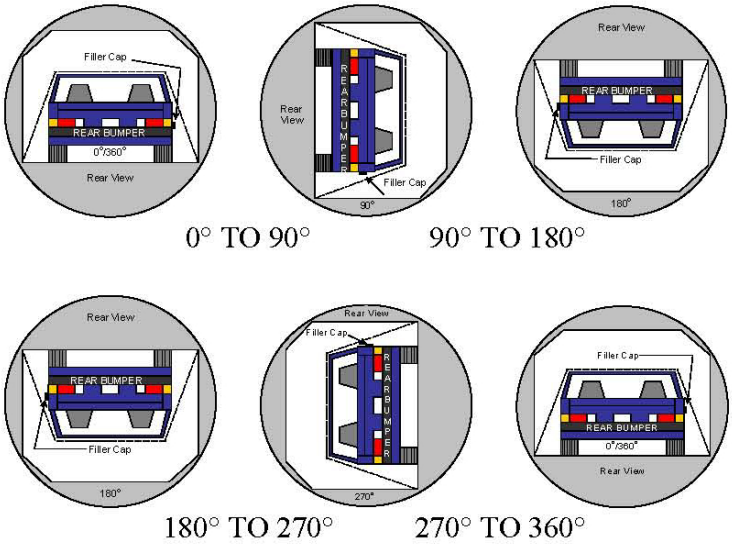
A. From impact until vehicle motion ceases: (Maximum Allowable = 1 ounce) 0.0 oz.

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

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

D. Spillage Details: None

FMVSS 301 STATIC ROLLOVER RESULTS



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

SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	112	300	412
90° to 180°	111	300	411
180° to 270°	108	300	408
270° to 360°	110	300	410

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

Test Vehicle: 2021 Ford Transit Connect XLT Wagon LWB NHTSA No.: M20210218
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/19/2020

FMVSS 301 SPILLAGE TABLE (UNITS IN OUNCES)

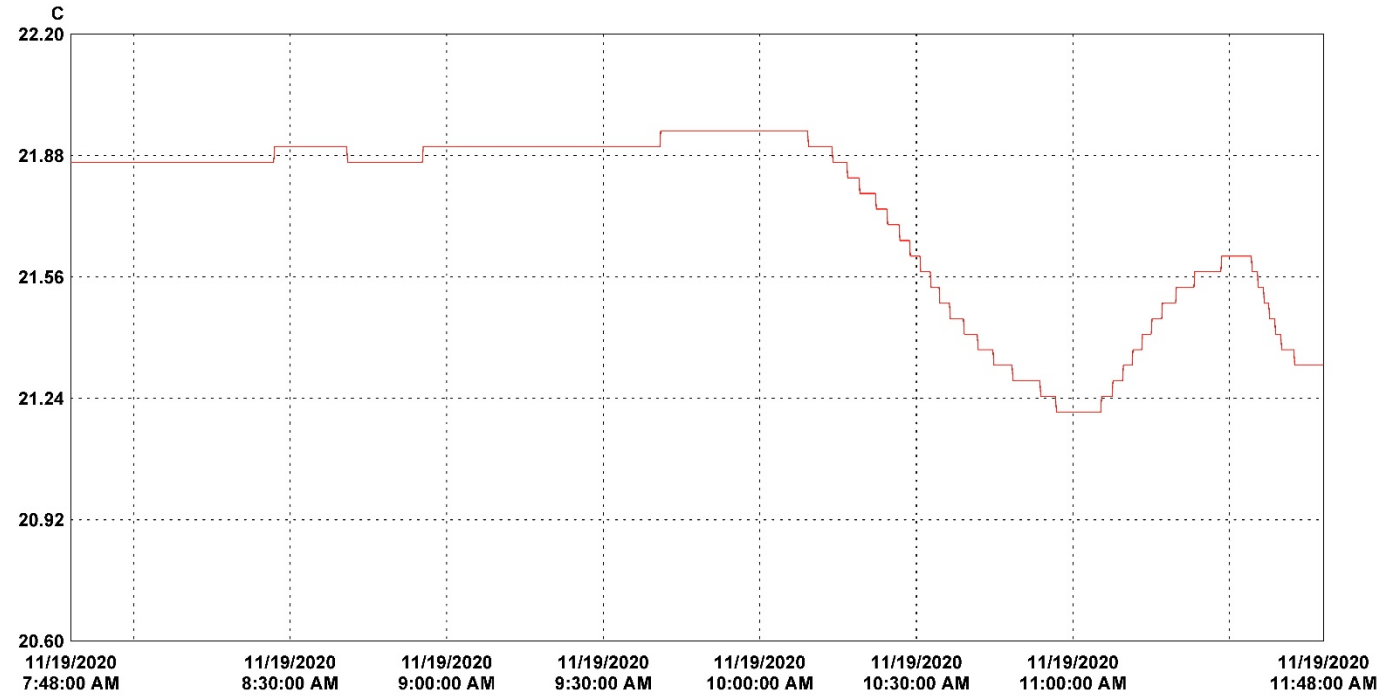
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eight Minute
0° to 90°	0	0	0	
90° to 180°	0	0	0	
180° to 270°	0	0	0	
270° to 360°	0	0	0	

SOLVENT SPILLAGE LOCATION TABLE

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

DATA SHEET NO. 17
DUMMY/VEHICLE TEMPERATURE STABILIZATION DATA

Test Vehicle: 2021 Ford Transit Connect XLT Wagon LWB
NHTSA No.: M20210218
Test Program: NCAP Frontal Barrier Impact Test
Test Date: 11/19/2020



30 minutes/div 4 hours (M/d/yyyy h:mm:ss tt) Central Time Graph file (truncated): M20210218 2021 Ford Transit Connect XLT Wagon LWB NCAP.spg

LN	Serial #	Description	CH	Value	Maximum	Average	Minimum	Units	CH description	Logger file
1	15212045	VSC_Prep_Room	1		21.94	21.73	21.20	C	Temperature	15212045_VSC_Prep_Room.spl

APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

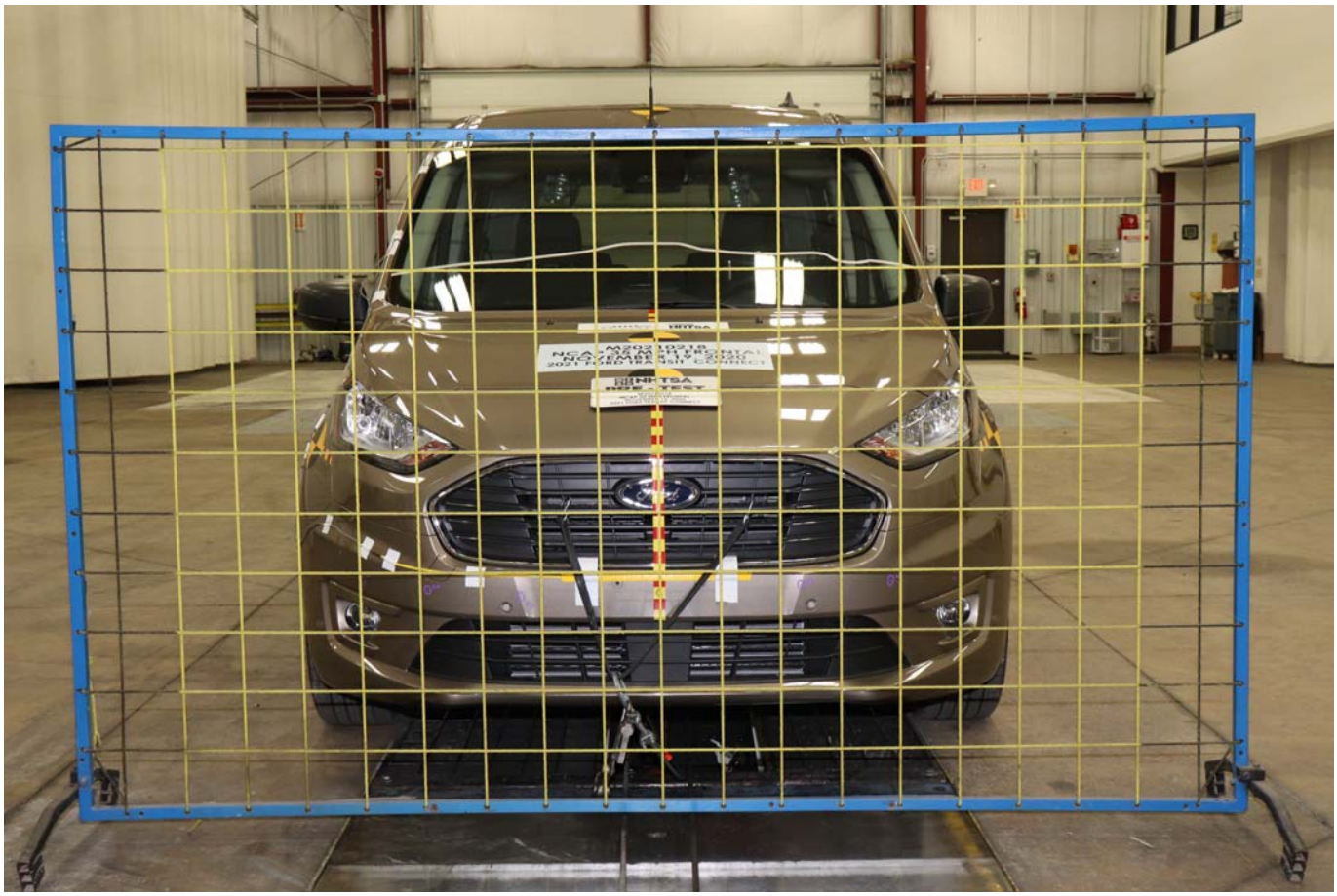


Photo No. 001 - Load Cell Location

Photo No. 002 - Pre-Test Load Cell Wall

PHOTOGRAPH NOT AVAILABLE

Photo No. 003 - Post-Test Load Cell Wall

Photo No. 004 - Manufacturer Label

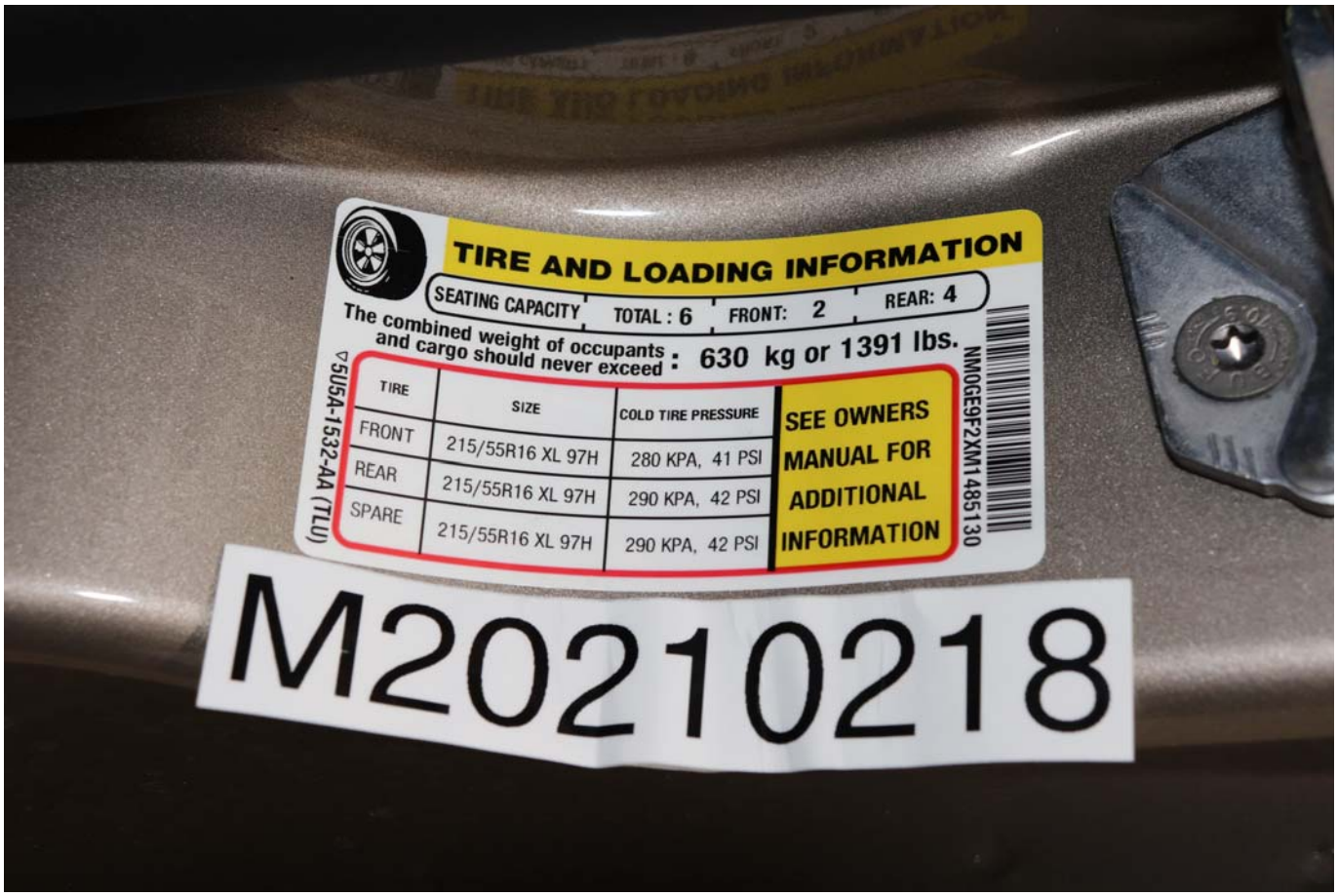


Photo No. 005 - Tire Placard


Photo No. 006 - 2021 Ford Transit Connect XLT Wagon LWB Van Frontal As Delivered

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

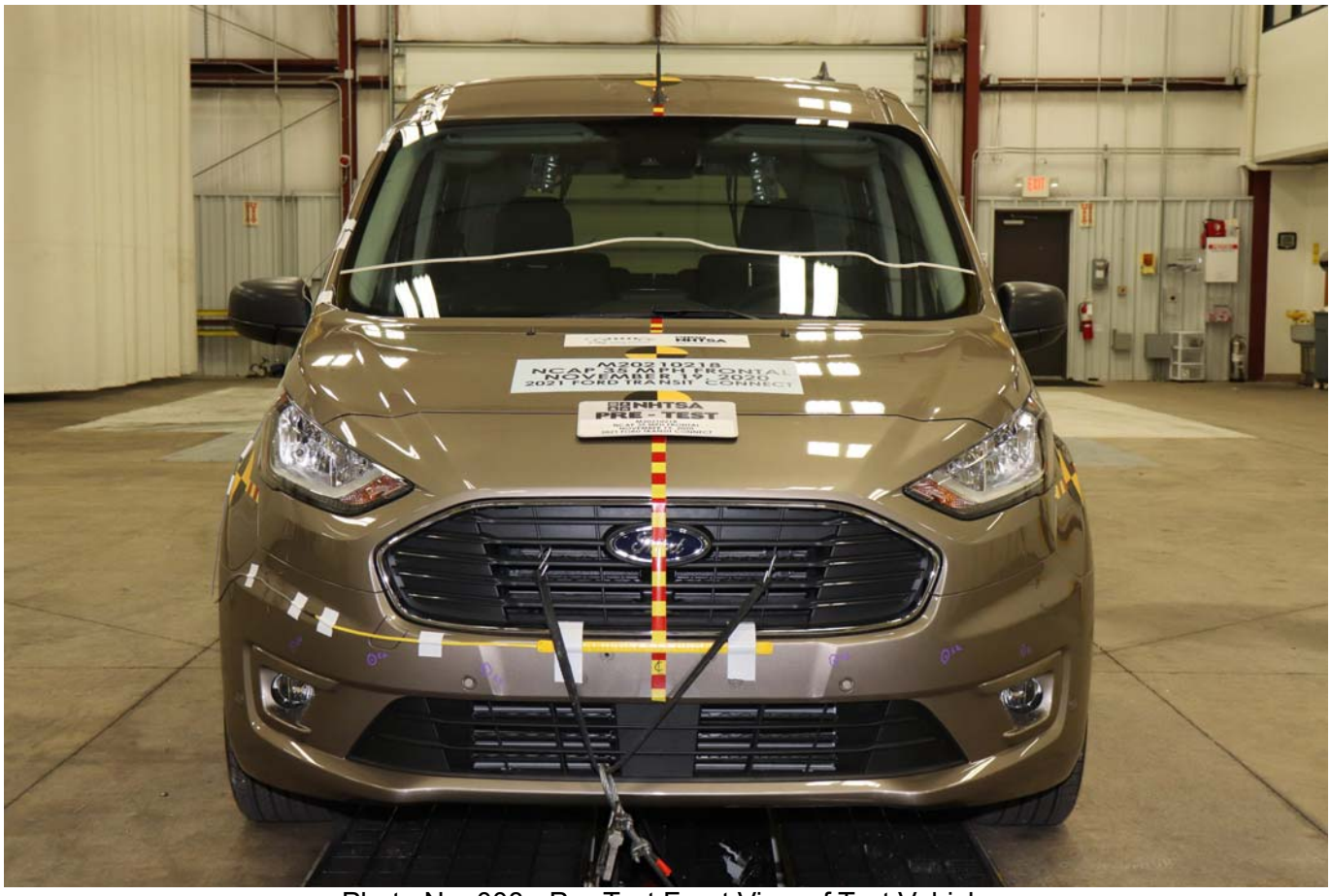


Photo No. 008 - Pre-Test Front View of Test Vehicle

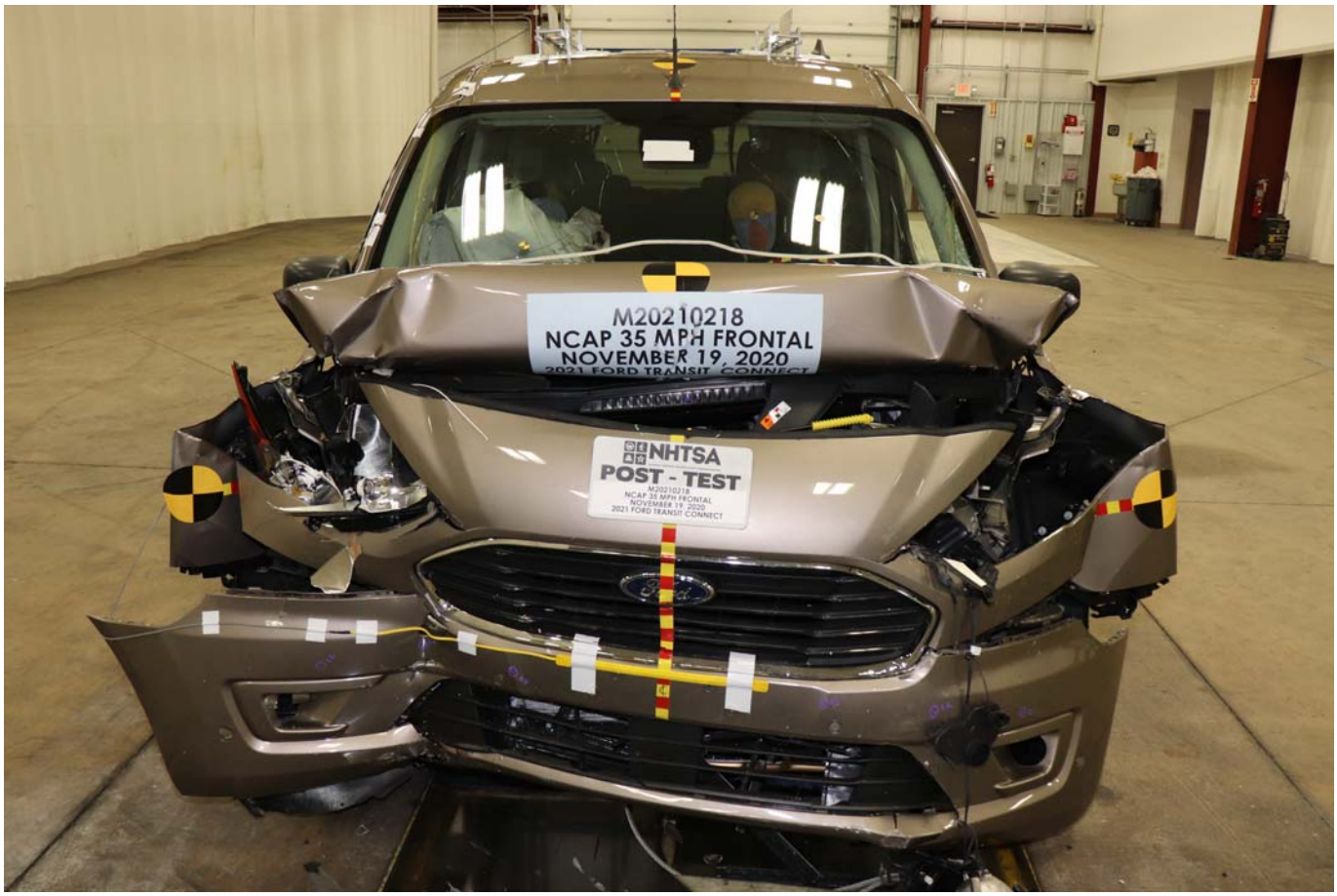


Photo No. 009 - Post-Test Front View of Test Vehicle

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

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

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

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

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

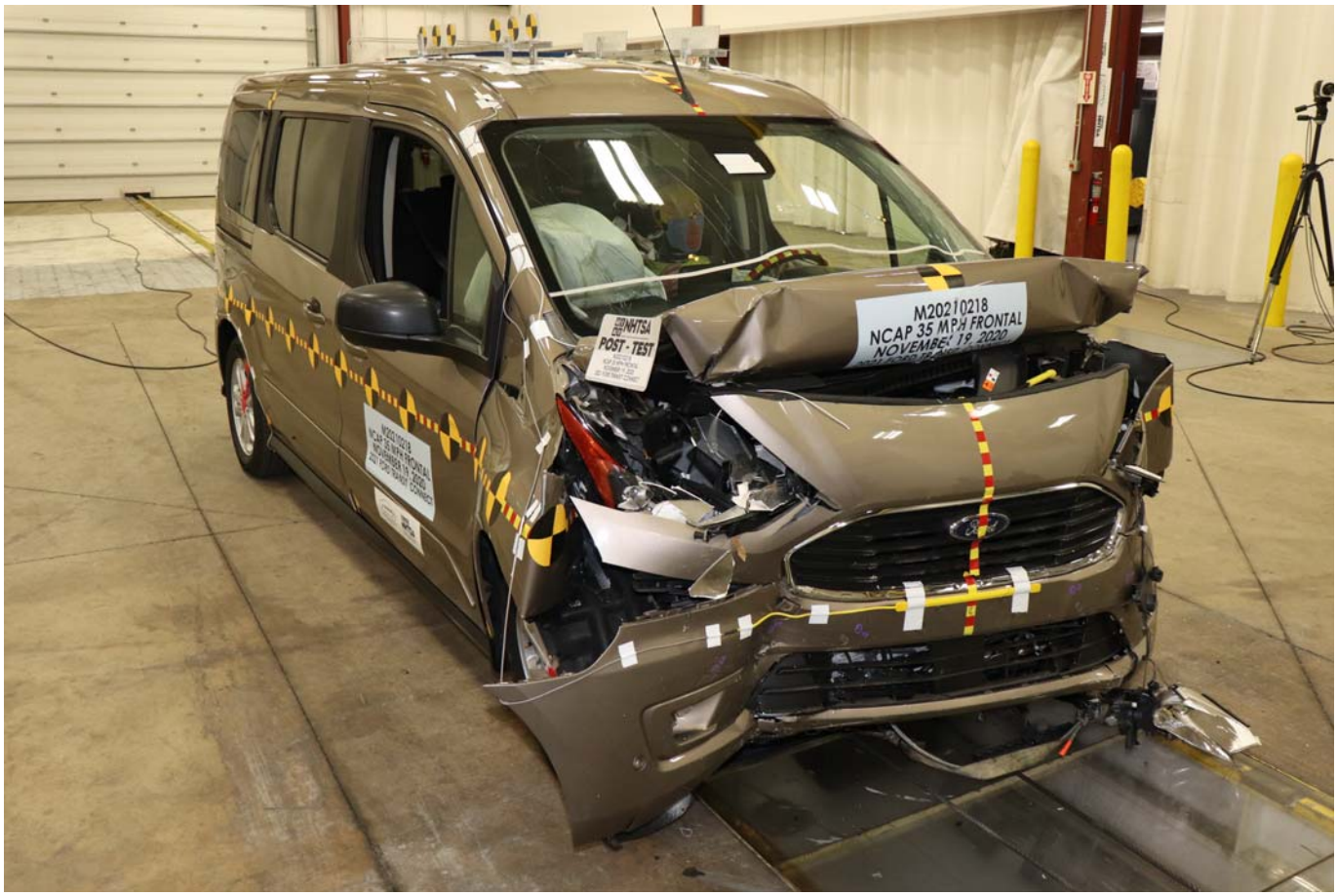


Photo No. 015 - Post-Test Right Front 3-4 View

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

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

Photo No. 018 - Pre-Test Windshield View

Photo No. 019 - Post-Test Windshield View

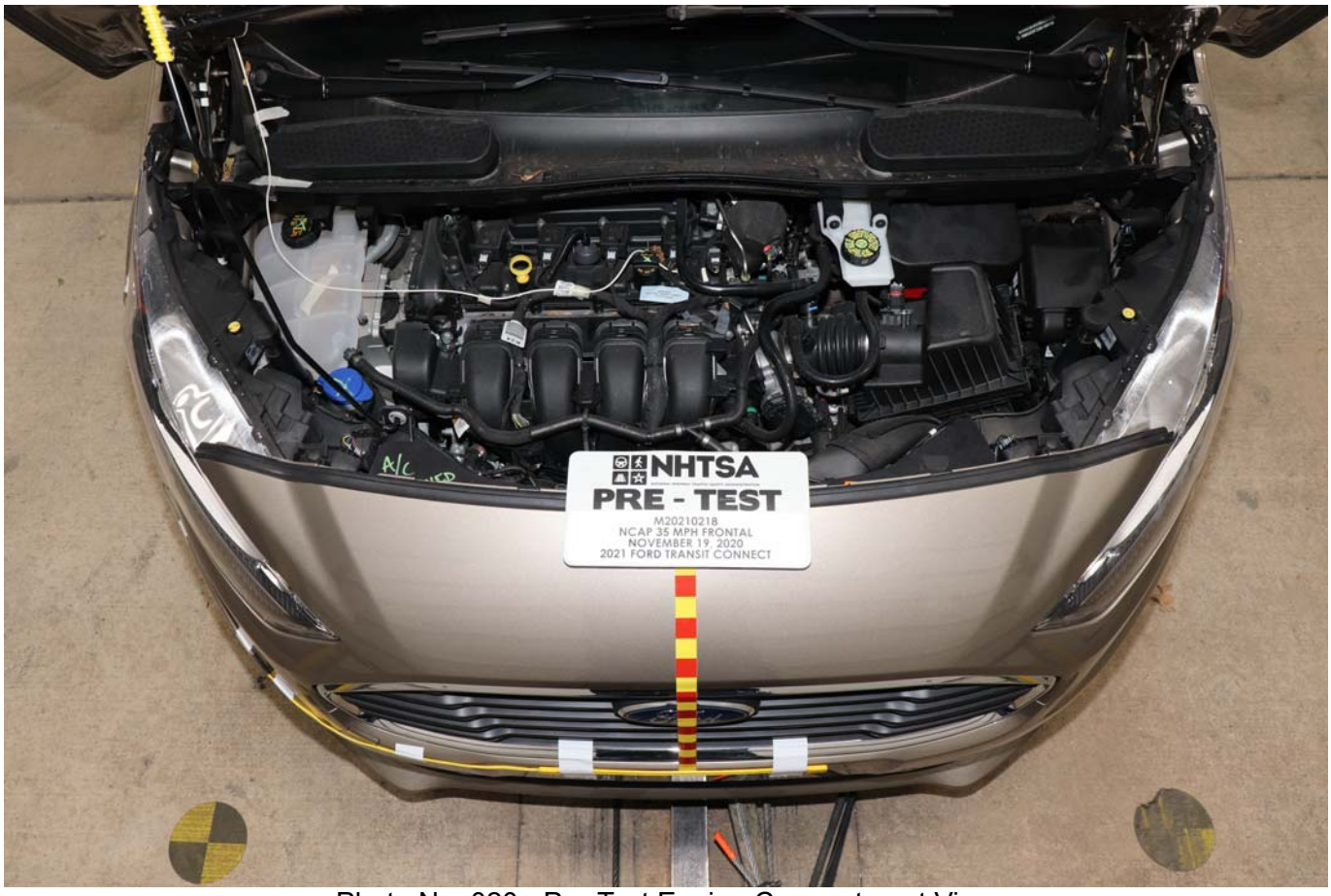


Photo No. 020 - Pre-Test Engine Compartment View

Photo No. 021 - Post-Test Engine Compartment View

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

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

Photo No. 024 - Pre-Test Front Underbody View

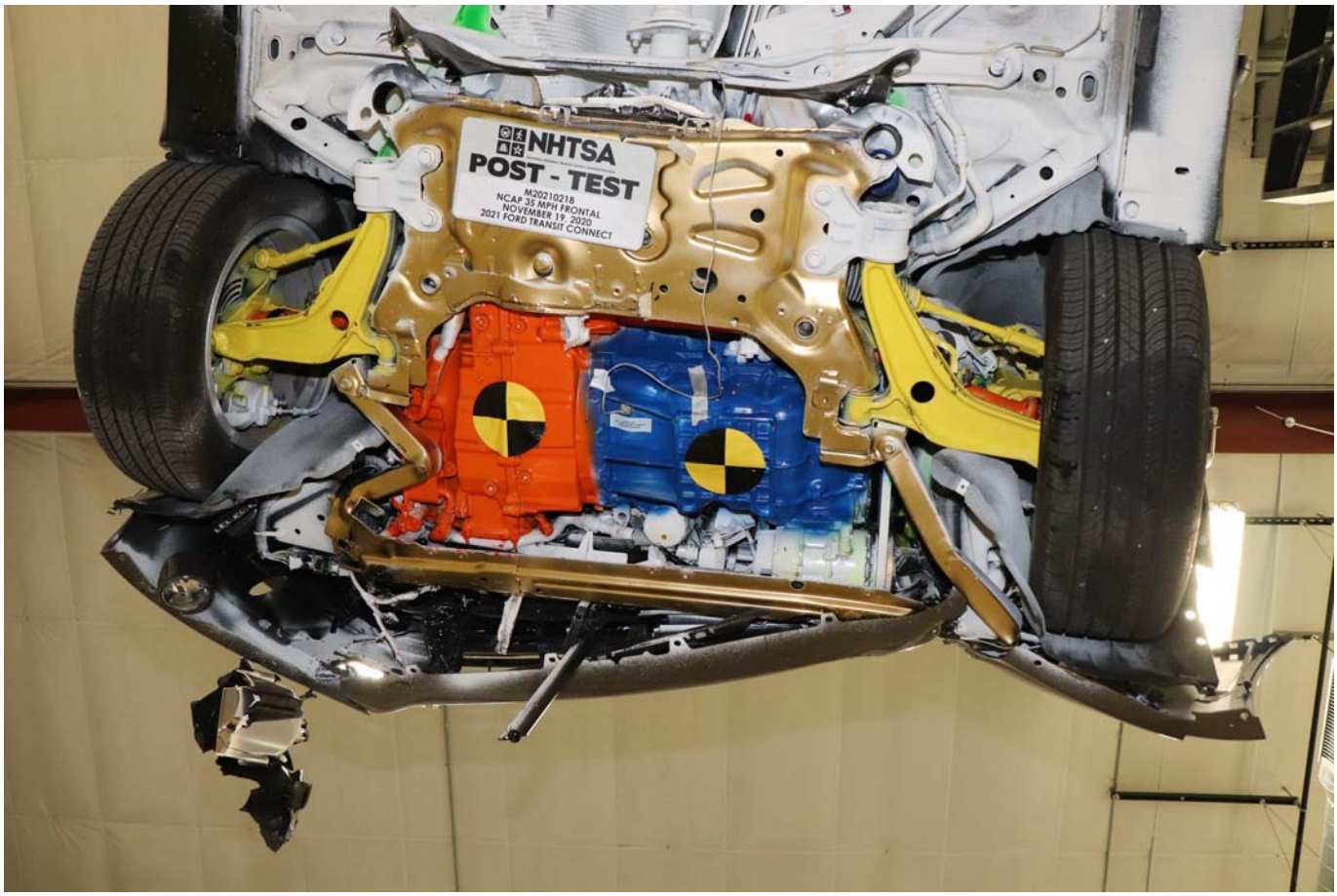


Photo No. 025 - Post-Test Front Underbody View

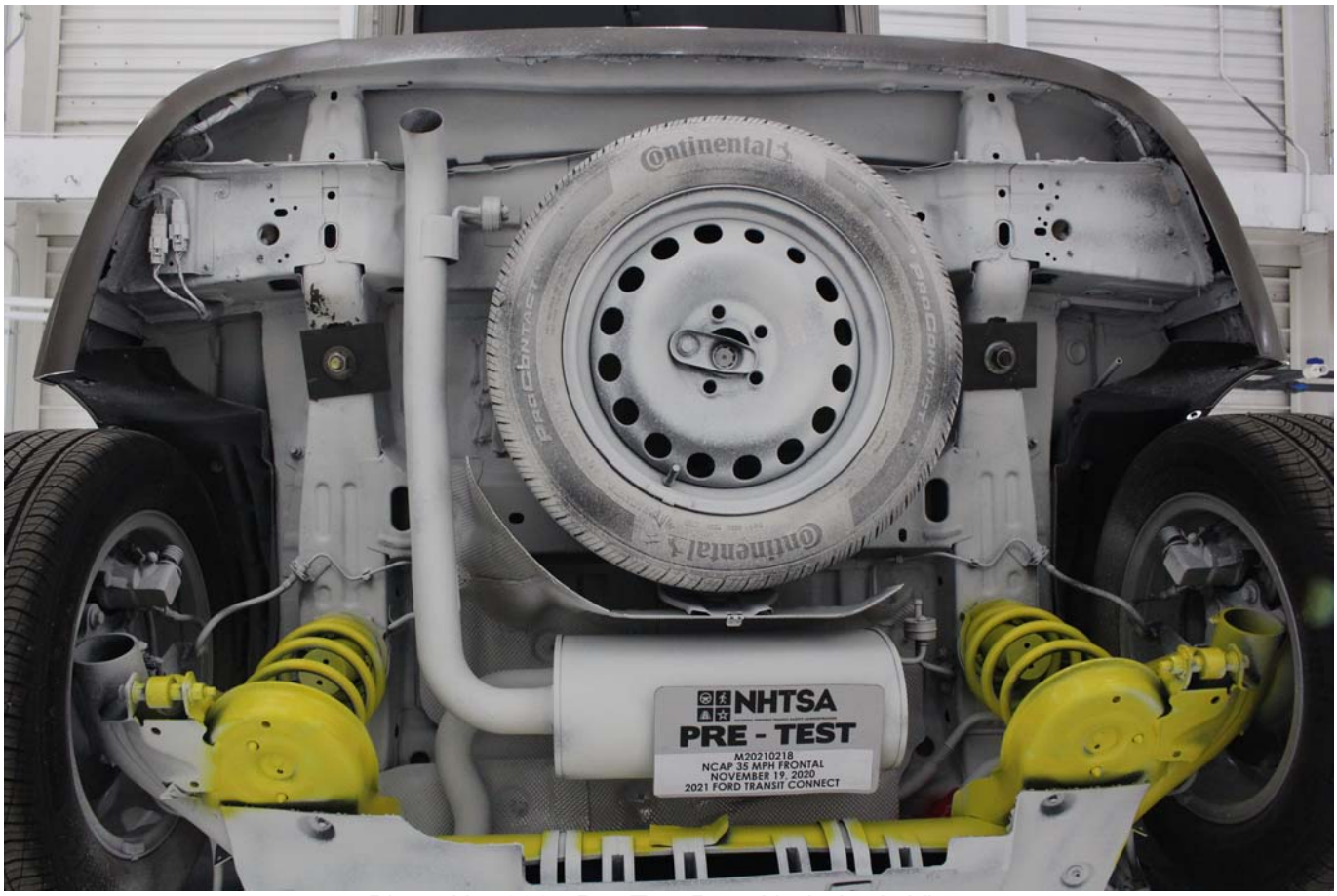


Photo No. 026 - Pre-Test Rear Underbody View

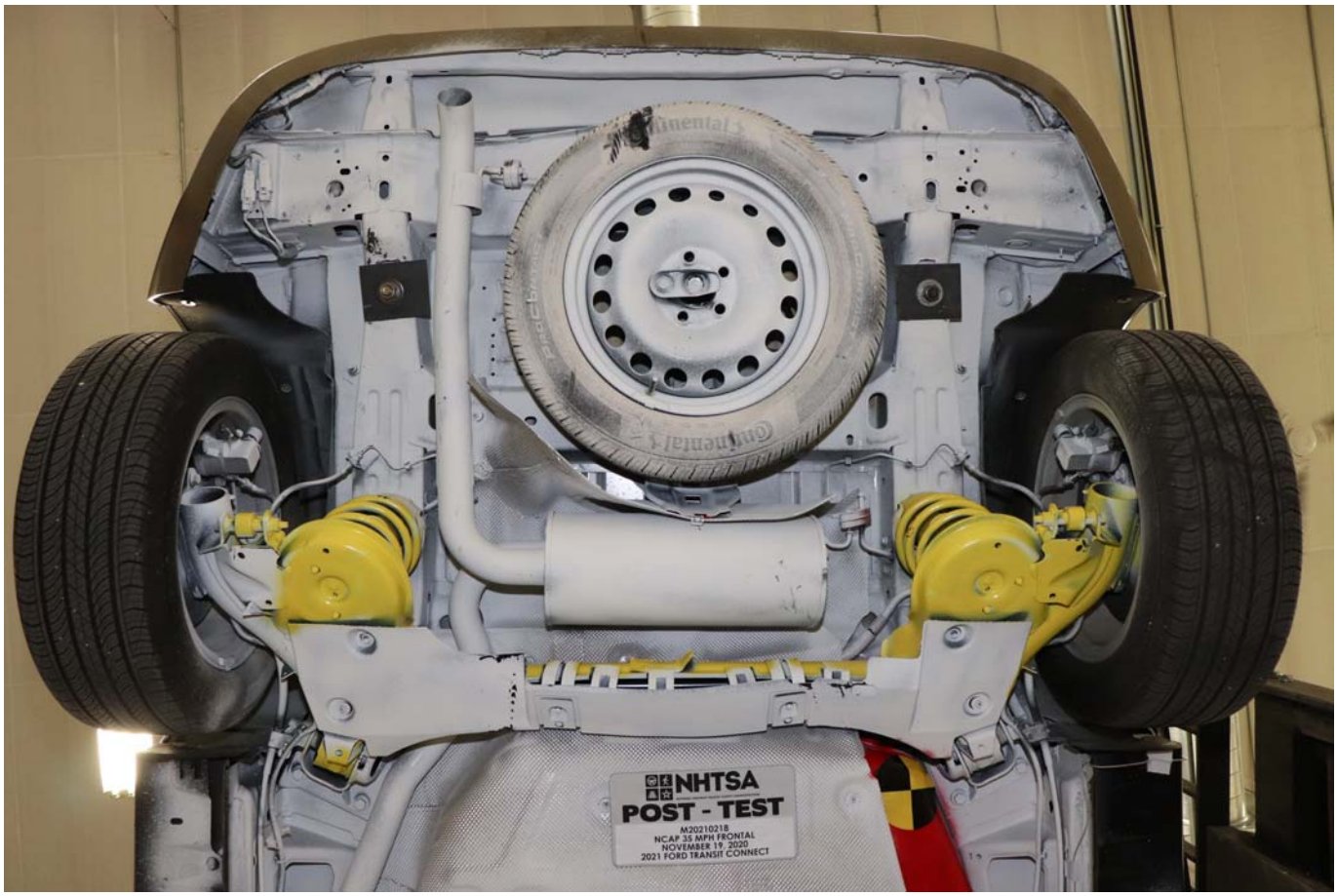


Photo No. 027 - Post-Test Rear Underbody View

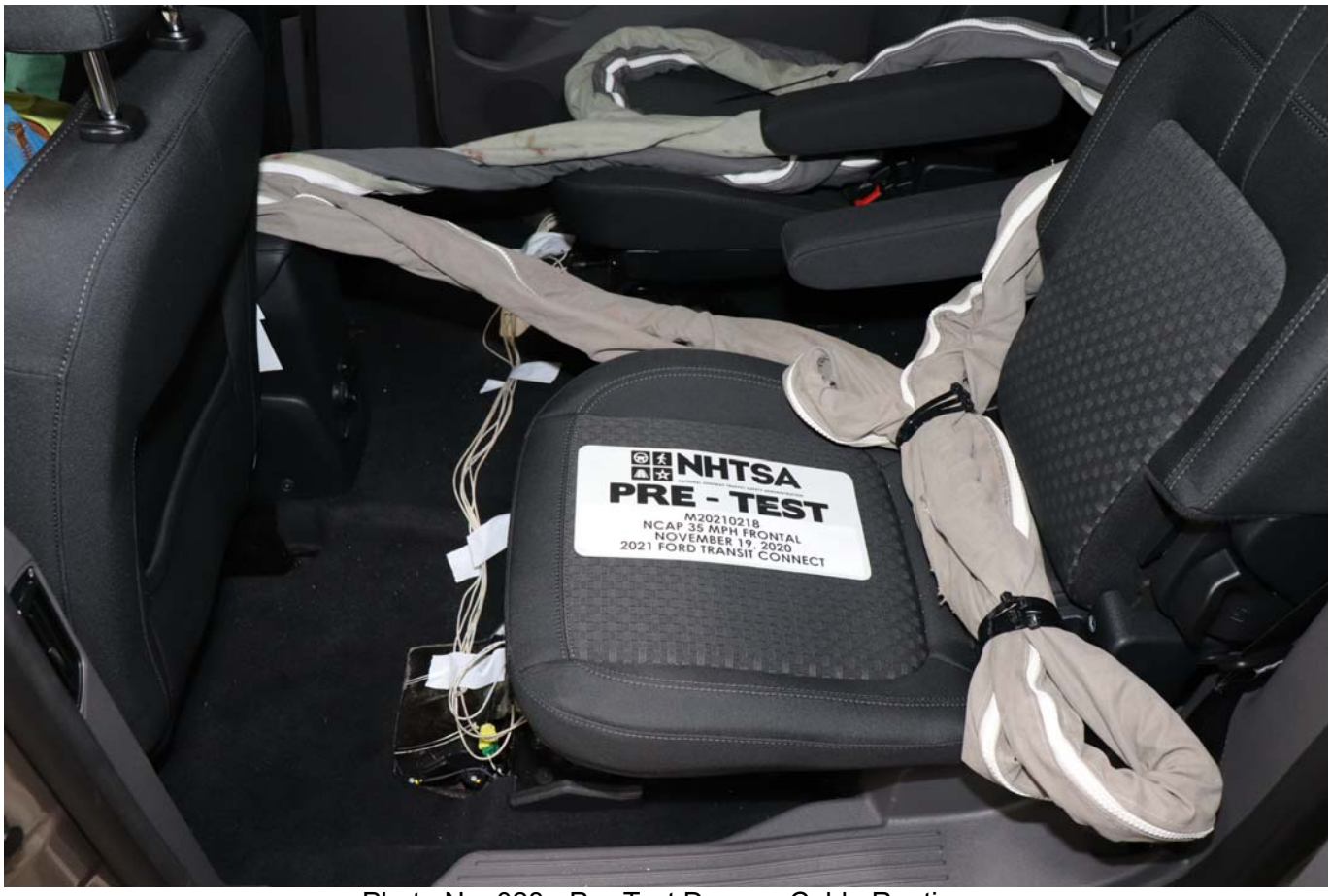


Photo No. 028 - Pre-Test Dummy Cable Routing

Photo No. 029 - Post-Test Dummy Cable Routing

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

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

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

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

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

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

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

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

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

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

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

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

Photo No. 042 - Pre-Test Driver Dummy Feet

Photo No. 043 - Post-Test Driver Dummy Feet

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

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

Photo No. 046 - Pre-Test Driver Side Floorpan

Photo No. 047 - Post-Test Driver Side Floorpan

Photo No. 048 - Post-Test Driver Dummy Face

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Photo No. 065 - Pre-Test Passenger Dummy Feet

Photo No. 066 - Post-Test Passenger Dummy Feet

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

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

Photo No. 069 - Pre-Test Passenger Side Floorpan

Photo No. 070 - Post-Test Passenger Side Floorpan

Photo No. 071 - Post-Test Passenger Dummy Face

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

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

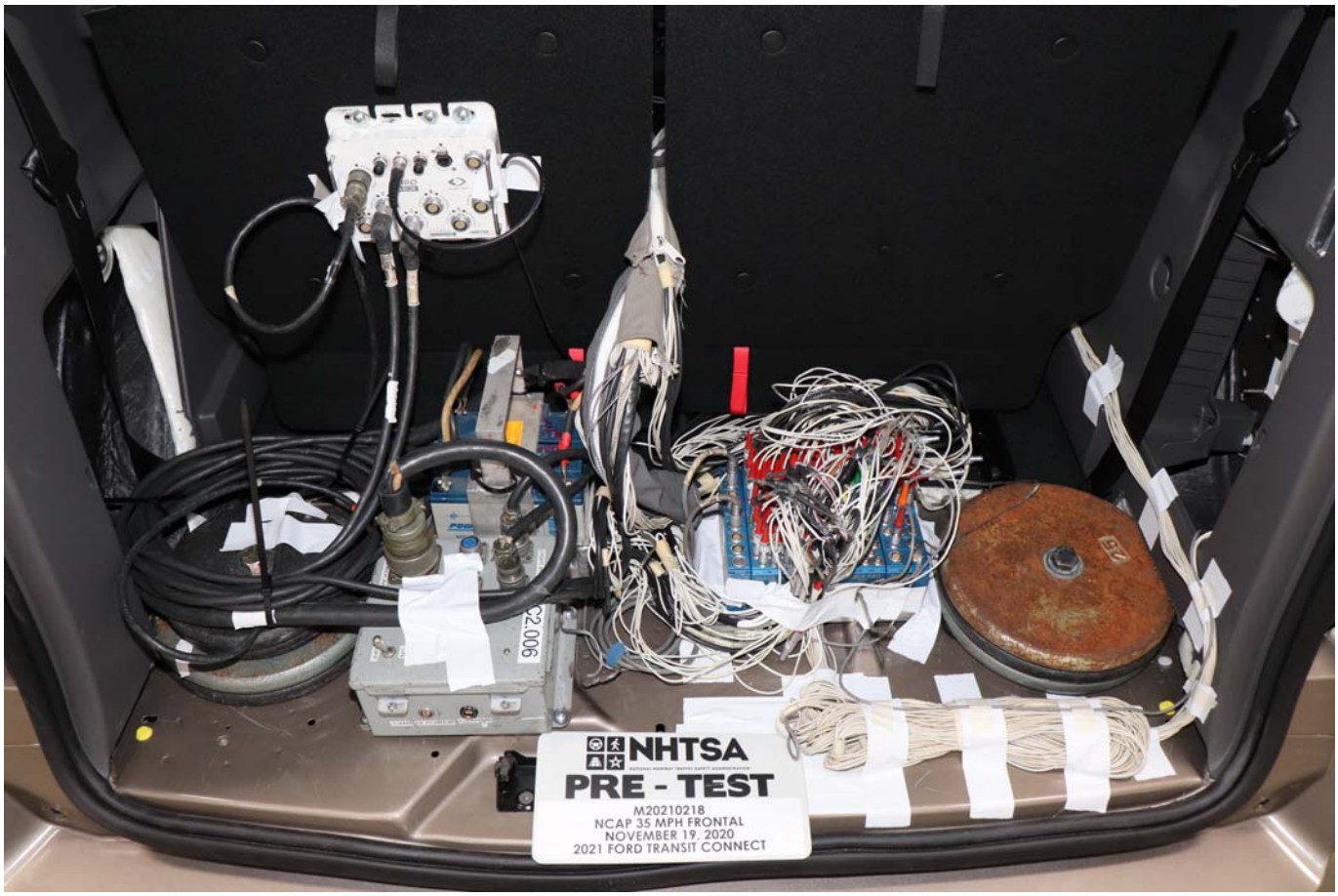


Photo No. 074 - Ballast Installed in Vehicle

PHOTOGRAPH NOT APPLICABLE

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

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

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

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

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

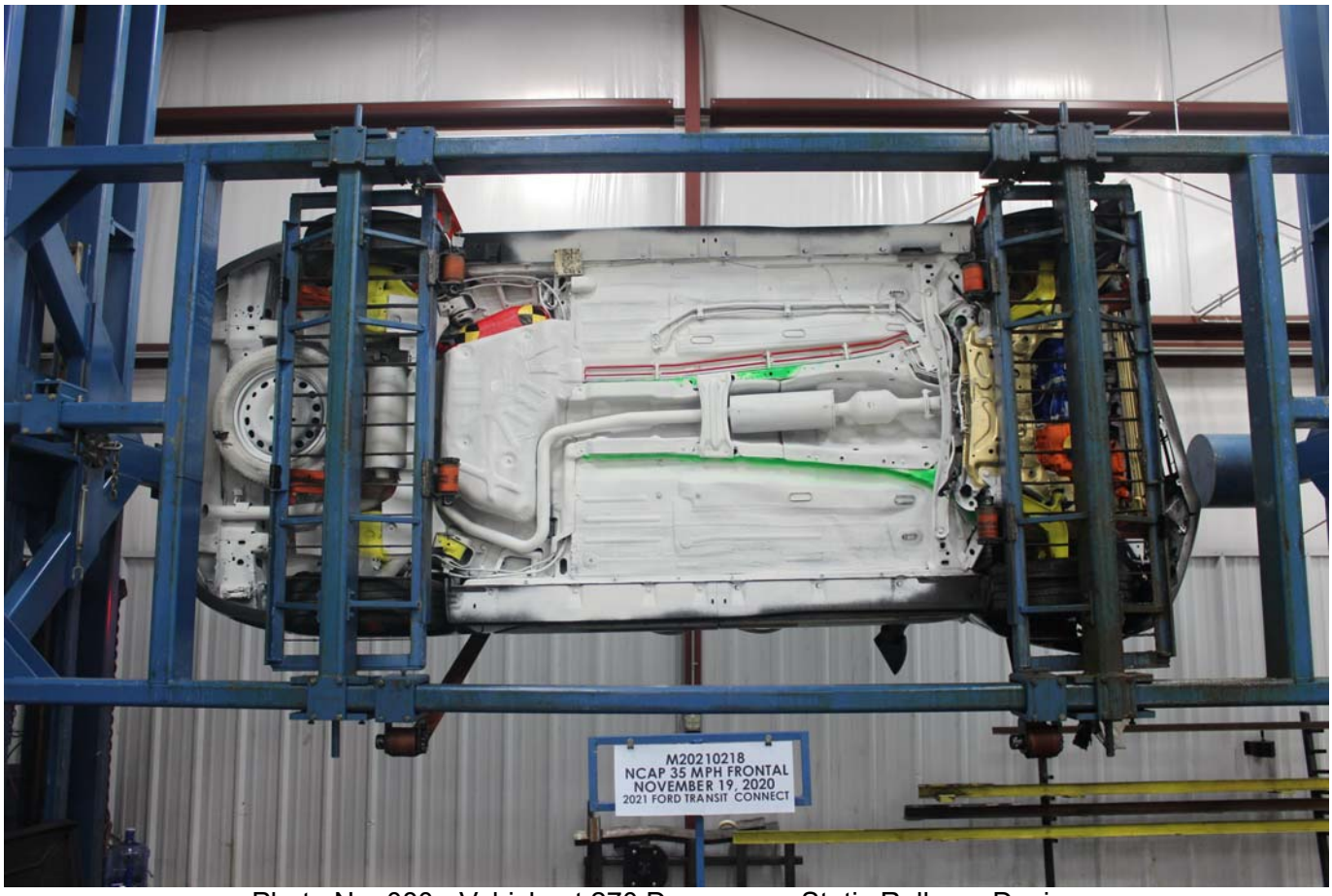
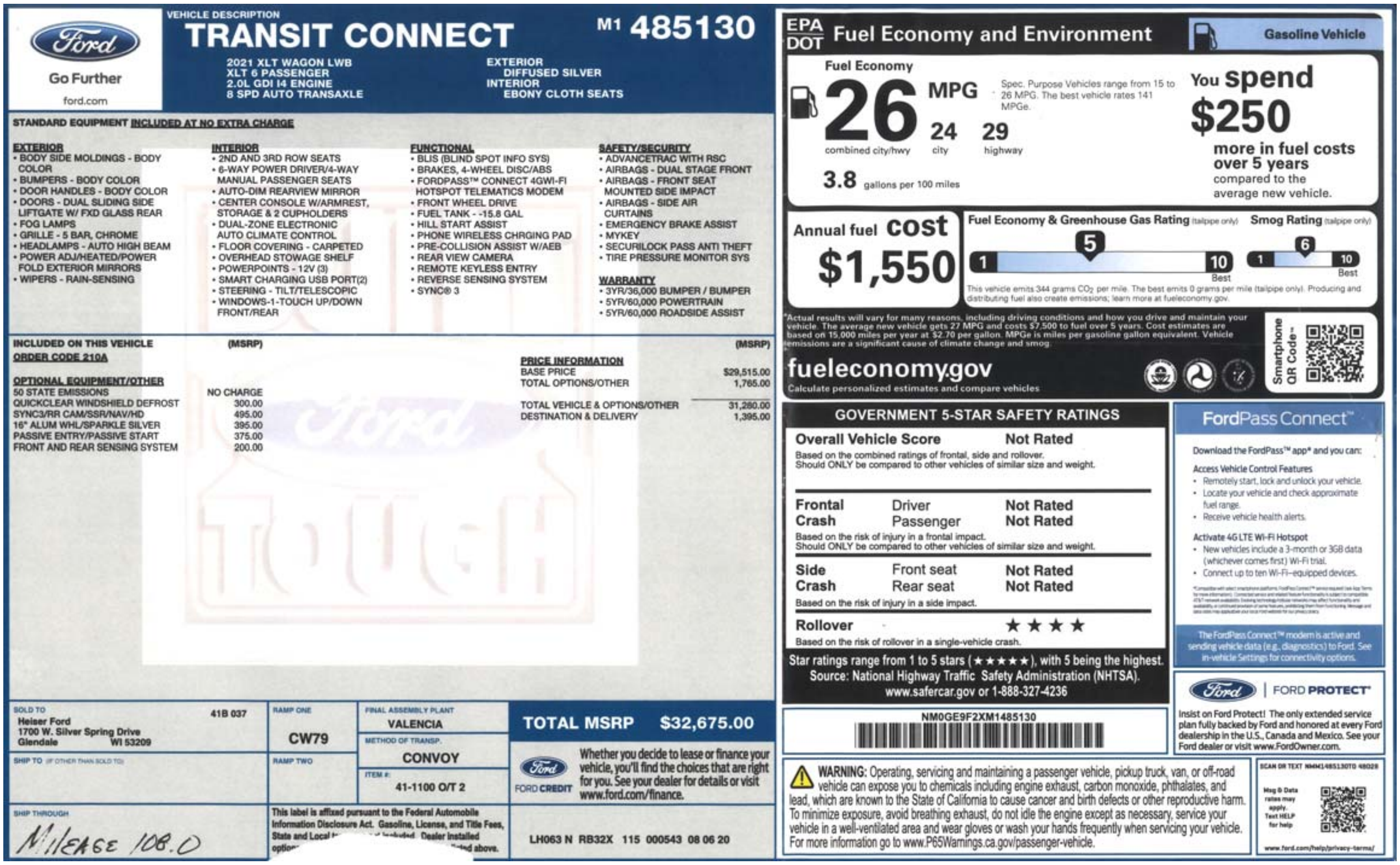


Photo No. 080 - Vehicle at 270 Degrees on Static Rollover Device

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

Photo No. 082 - 2021 Ford Transit Connect XLT Wagon LWB Van Frontal Impact Event



VEHICLE DESCRIPTION

TRANSIT CONNECT

M1 485130

Ford — Go Further — ford.com

2021 XLT WAGON LWB
XLT 6 PASSENGER
2.0L GDI I4 ENGINE
8 SPD AUTO TRANSAXLE

EXTERIOR
DIFFUSED SILVER
INTERIOR
EBONY CLOTH SEATS

STANDARD EQUIPMENT INCLUDED AT NO EXTRA CHARGE

EXTERIOR
- BODY SIDE MOLDINGS - BODY COLOR
- BUMPERS - BODY COLOR
- DOOR HANDLES - BODY COLOR
- DOORS - DUAL SLIDING SIDE LIFTGATE W/ FXD GLASS REAR
- FOG LAMPS
- GRILLE - 5 BAR, CHROME
- HEADLAMPS - AUTO HIGH BEAM
- POWER ADJ/HEATED/POWER FOLD EXTERIOR MIRRORS
- WIPERS - RAIN-SENSING

INTERIOR
- 2ND AND 3RD ROW SEATS
- 6-WAY POWER DRIVER/4-WAY MANUAL PASSENGER SEATS
- AUTO-DIM REARVIEW MIRROR
- CENTER CONSOLE W/ARMREST, STORAGE & 2 CUPHOLDERS
- DUAL-ZONE ELECTRONIC AUTO CLIMATE CONTROL
- FLOOR COVERING - CARPETED
- OVERHEAD STOWAGE SHELF
- POWERPOINTS - 12V (3)
- SMART CHARGING USB PORT(2)
- STEERING - TILT/TELESCOPIC
- WINDOWS-1-TOUCH UP/DOWN FRONT/REAR

FUNCTIONAL
- BLIS (BLIND SPOT INFO SYS)
- BRAKES, 4-WHEEL DISC/ABS
- FORDPASS™ CONNECT 4GWI-FI HOTSPOT TELEMATICS MODEM
- FRONT WHEEL DRIVE
- FUEL TANK - -15.8 GAL
- HILL START ASSIST
- PHONE WIRELESS CHRGING PAD
- PRE-COLLISION ASSIST W/AEB
- REAR VIEW CAMERA
- REMOTE KEYLESS ENTRY
- REVERSE SENSING SYSTEM
- SYNC® 3

SAFETY/SECURITY
- ADVANCETRAC WITH RSC
- AIRBAGS - DUAL STAGE FRONT
- AIRBAGS - FRONT SEAT MOUNTED SIDE IMPACT
- AIRBAGS - SIDE AIR CURTAINS
- EMERGENCY BRAKE ASSIST
- MYKEY
- SECURILOCK PASS ANTI THEFT
- TIRE PRESSURE MONITOR SYS

WARRANTY
- 3YR/36,000 BUMPER / BUMPER
- 5YR/60,000 POWERTRAIN
- 5YR/60,000 ROADSIDE ASSIST

INCLUDED ON THIS VEHICLE	(MSRP)
ORDER CODE 210A	
OPTIONAL EQUIPMENT/OTHER	
50 STATE EMISSIONS	NO CHARGE
QUICKCLEAR WINDSHIELD DEFROST	300.00
SYNC3/RR CAM/SSR/NAV/HD	495.00
16" ALUM WHL/SPARKLE SILVER	395.00
PASSIVE ENTRY/PASSIVE START	375.00
FRONT AND REAR SENSING SYSTEM	200.00

PRICE INFORMATION	(MSRP)
BASE PRICE	$29,515.00
TOTAL OPTIONS/OTHER	1,765.00
TOTAL VEHICLE & OPTIONS/OTHER	31,280.00
DESTINATION & DELIVERY	1,395.00

SOLD TO 41B 037
Heiser Ford
1700 W. Silver Spring Drive
Glendale WI 53209

SHIP TO (IF OTHER THAN SOLD TO)

SHIP THROUGH
Mileage 108.0

RAMP ONE
CW79

RAMP TWO

FINAL ASSEMBLY PLANT
VALENCIA

METHOD OF TRANSP.
CONVOY

ITEM #
41-1100 O/T 2

This label is affixed pursuant to the Federal Automobile Information Disclosure Act. Gasoline, License, and Title Fees, State and Local t[illegible] [illegible]ncluded. Dealer installed option[illegible] [illegible]ted above.

TOTAL MSRP $32,675.00

FORD CREDIT — Whether you decide to lease or finance your vehicle, you'll find the choices that are right for you. See your dealer for details or visit www.ford.com/finance.

LH063 N RB32X 115 000543 08 06 20

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

Fuel Economy

26 MPG combined city/hwy — **24** city — **29** highway

Spec. Purpose Vehicles range from 15 to 26 MPG. The best vehicle rates 141 MPGe.

3.8 gallons per 100 miles

You **spend $250** more in fuel costs over 5 years compared to the average new vehicle.

Annual fuel **cost** **$1,550**

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

Smog Rating (tailpipe only): 6 (1 – 10 Best)

This vehicle emits 344 grams CO_2 per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel also create emissions; learn more at fueleconomy.gov.

*Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 27 MPG and costs $7,500 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at $2.70 per gallon. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

fueleconomy.gov
Calculate personalized estimates and compare vehicles

Smartphone QR Code™

GOVERNMENT 5-STAR SAFETY RATINGS

Overall Vehicle Score		**Not Rated**
Based on the combined ratings of frontal, side and rollover. Should ONLY be compared to other vehicles of similar size and weight.		
Frontal Crash	Driver	**Not Rated**
	Passenger	**Not Rated**
Based on the risk of injury in a frontal impact. Should ONLY be compared to other vehicles of similar size and weight.		
Side Crash	Front seat	**Not Rated**
	Rear seat	**Not Rated**
Based on the risk of injury in a side impact.		
Rollover		★★★★
Based on the risk of rollover in a single-vehicle crash.		

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

FordPass Connect™

Download the FordPass™ app* and you can:

Access Vehicle Control Features
- Remotely start, lock and unlock your vehicle.
- Locate your vehicle and check approximate fuel range.
- Receive vehicle health alerts.

Activate 4G LTE Wi-Fi Hotspot
- New vehicles include a 3-month or 3GB data (whichever comes first) Wi-Fi trial.
- Connect up to ten Wi-Fi–equipped devices.

The FordPass Connect™ modem is active and sending vehicle data (e.g., diagnostics) to Ford. See in-vehicle Settings for connectivity options.

NM0GE9F2XM1485130

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Insist on Ford Protect! The only extended service plan fully backed by Ford and honored at every Ford dealership in the U.S., Canada and Mexico. See your Ford dealer or visit www.FordOwner.com.

WARNING: Operating, servicing and maintaining a passenger vehicle, pickup truck, van, or off-road vehicle can expose you to chemicals including engine exhaust, carbon monoxide, phthalates, and lead, which are known to the State of California to cause cancer and birth defects or other reproductive harm. To minimize exposure, avoid breathing exhaust, do not idle the engine except as necessary, service your vehicle in a well-ventilated area and wear gloves or wash your hands frequently when servicing your vehicle. For more information go to www.P65Warnings.ca.gov/passenger-vehicle.

SCAN OR TEXT NMM1485130T0 48028
Msg & Data rates may apply. Text HELP for help
www.ford.com/help/privacy-terms/

Photo No. 083 - Monroney Label Photograph

APPENDIX B
DUMMY RESPONSE DATA TRACES

TABLE OF DATA PLOTS

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

Driver Head X Redundant

Driver Head Y Redundant

Driver Head Z Redundant

Driver Head Angular Velocity X

Driver Head Angular Velocity Y

Driver Head Angular Velocity Z

Driver Upper Neck Force Y

Driver Upper Neck Moment X

Driver Upper Neck Moment Z

Driver Chest X Redundant

Driver Chest Y Redundant

Driver Chest Z Redundant

Driver Pelvis X

Driver Pelvis Y

Driver Pelvis Z

Driver Left Femur Redundant

Driver Right Femur Redundant

Driver Left Upper Tibia Moment X

Driver Left Upper Tibia Moment Y

Driver Left Upper Tibia Force Z

Driver Left Lower Tibia Moment X

Driver Left Lower Tibia Moment Y

Driver Left Lower Tibia Force Z

Driver Right Upper Tibia Moment X

Driver Right Upper Tibia Moment Y

Driver Right Upper Tibia Force Z

Driver Right Lower Tibia Moment X

Driver Right Lower Tibia Moment Y

Driver Right Lower Tibia Force Z

Driver Left Foot Fore Z

Driver Left Foot Aft X

Driver Left Foot Aft Z

Driver Right Foot Fore Z

Driver Right Foot Aft X

Driver Right Foot Aft Z

Driver Lap Belt Force

Driver Shoulder Belt Force

Passenger Head X Redundant

Passenger Head Y Redundant

Passenger Head Z Redundant

Passenger Head Angular Velocity X

Passenger Head Angular Velocity Y

Passenger Head Angular Velocity Z

Passenger Upper Neck Force Y

Passenger Upper Neck Moment X

Passenger Upper Neck Moment Z

Passenger Chest X Redundant

Passenger Chest Y Redundant

Passenger Chest Z Redundant

Passenger Pelvis X

Passenger Pelvis Y

Passenger Pelvis Z

Passenger Left Femur Redundant

Passenger Right Femur Redundant

Passenger Left Upper Tibia Moment X

Passenger Left Upper Tibia Moment Y

Passenger Left Upper Tibia Force Z

Passenger Left Lower Tibia Moment X

Passenger Left Lower Tibia Moment Y

Passenger Left Lower Tibia Force Z

Passenger Right Upper Tibia Moment X

Passenger Right Upper Tibia Moment Y

Passenger Right Upper Tibia Force Z

Passenger Right Lower Tibia Moment X

Passenger Right Lower Tibia Moment Y

Passenger Right Lower Tibia Force Z

Passenger Left Foot Fore Z

Passenger Left Foot Aft X

Passenger Left Foot Aft Z

Passenger Right Foot Fore Z

Passenger Right Foot Aft X

Passenger Right Foot Aft Z

Passenger Lap Belt Force

Passenger Shoulder Belt Force

Left Rear Seat Crossmember X

Right Rear Seat Crossmember X

Vehicle Engine Top X

Vehicle Engine Bottom X

Left Rear Seat Crossmember Z

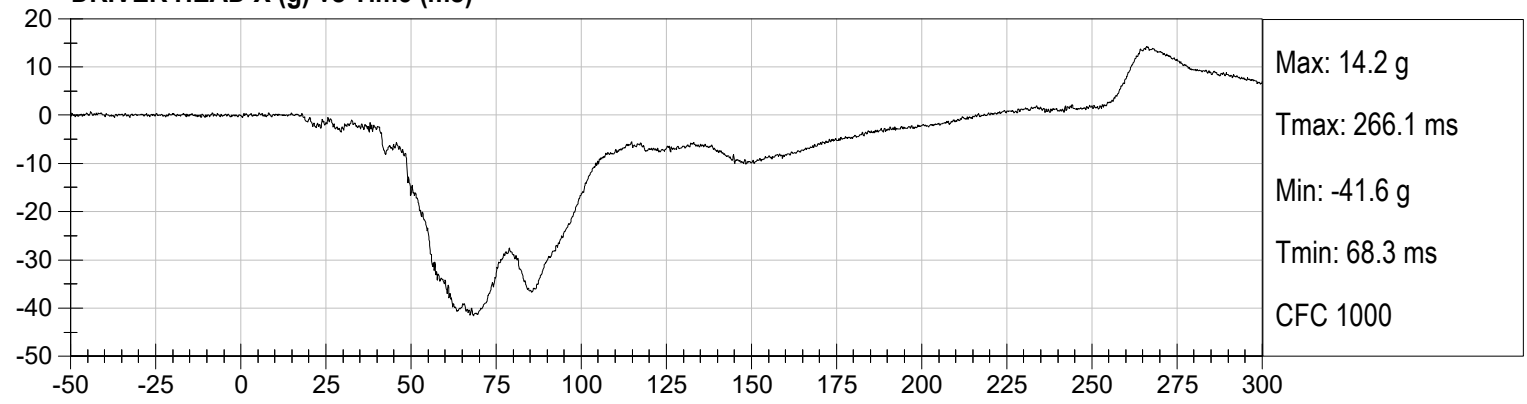
Right Rear Seat Crossmember Z

Left Rear Seat Crossmember Xr

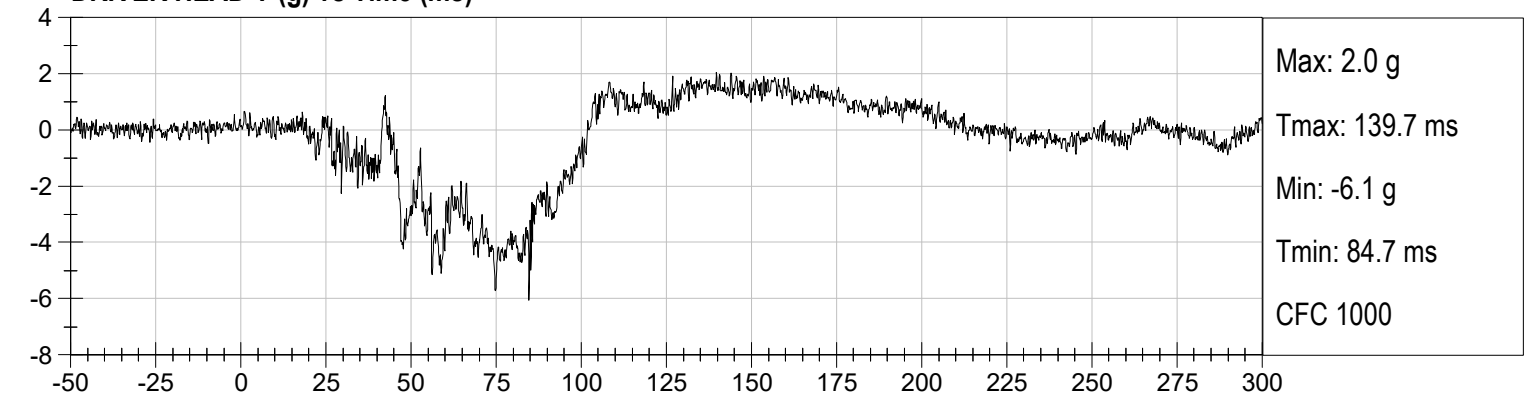
Right Rear Seat Crossmember Xr

Advanced Research Load Cell Barrier – 528 channels

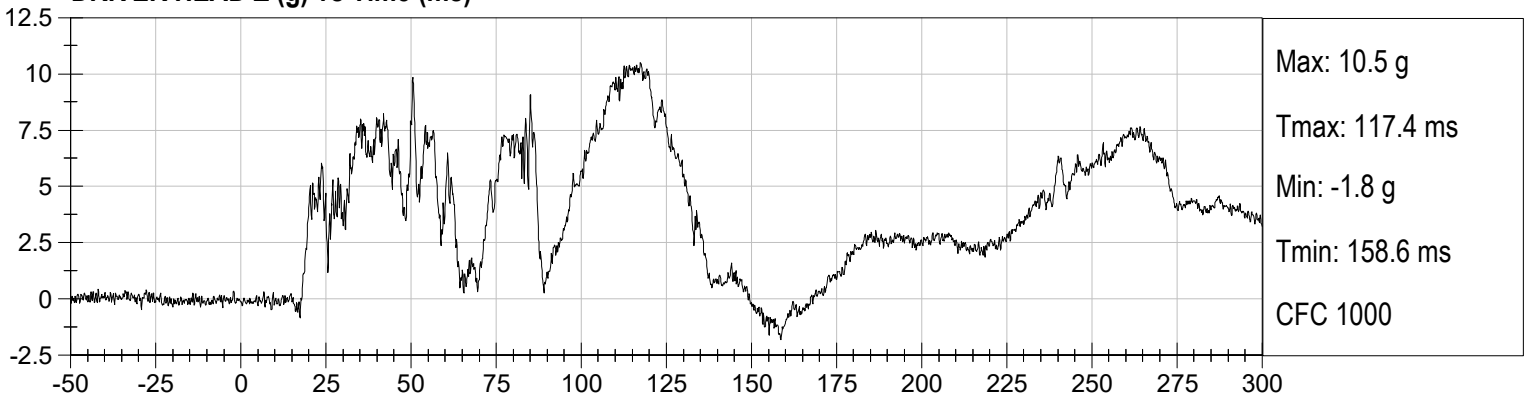
DRIVER HEAD X (g) vs Time (ms)



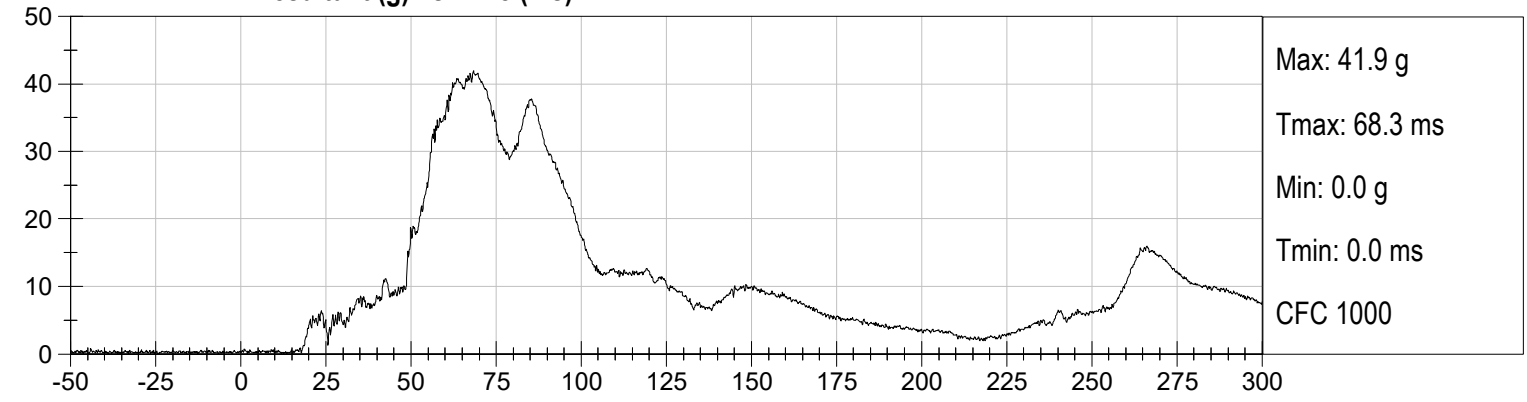
DRIVER HEAD Y (g) vs Time (ms)



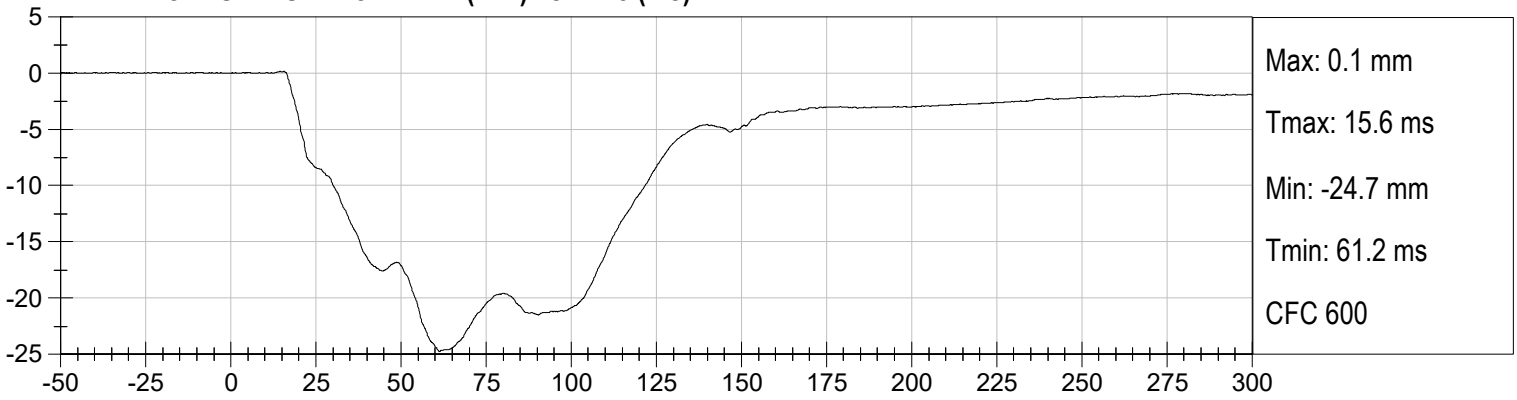
DRIVER HEAD Z (g) vs Time (ms)



DRIVER HEAD Resultant (g) vs Time (ms)



DRIVER CHEST DISPLACEMENT (mm) vs Time (ms)



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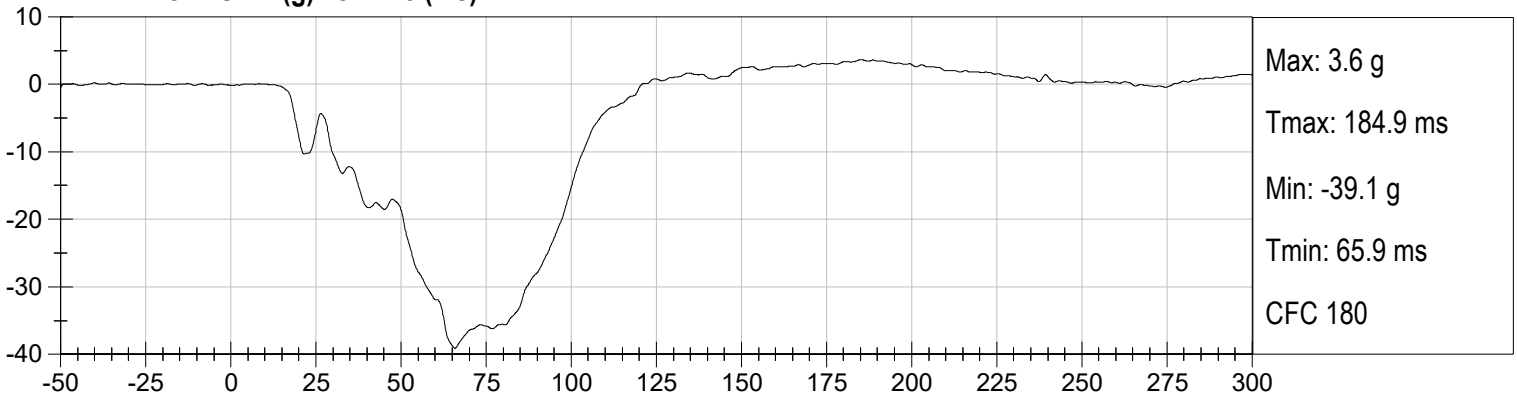

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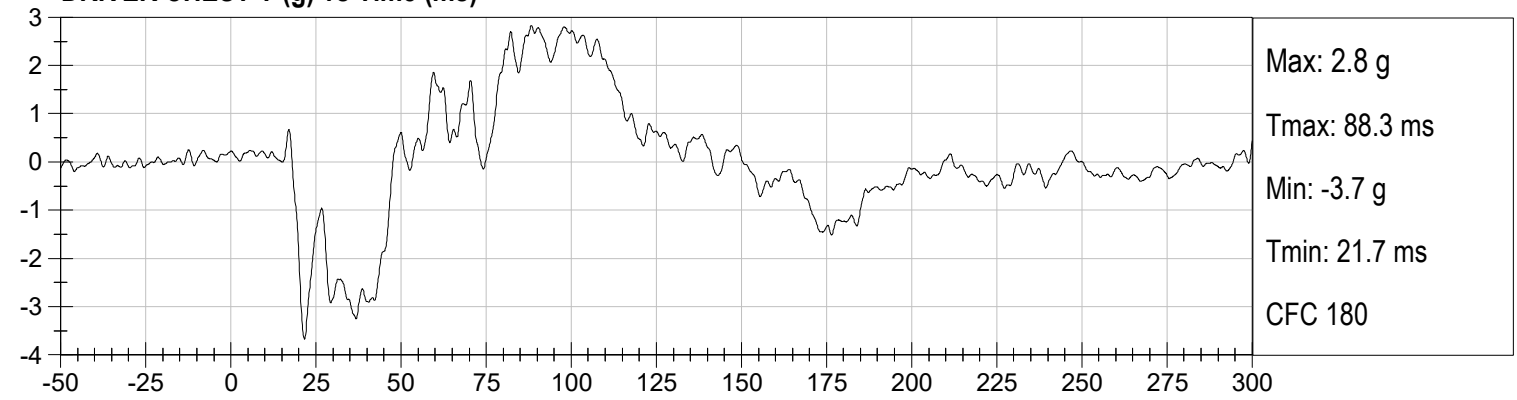

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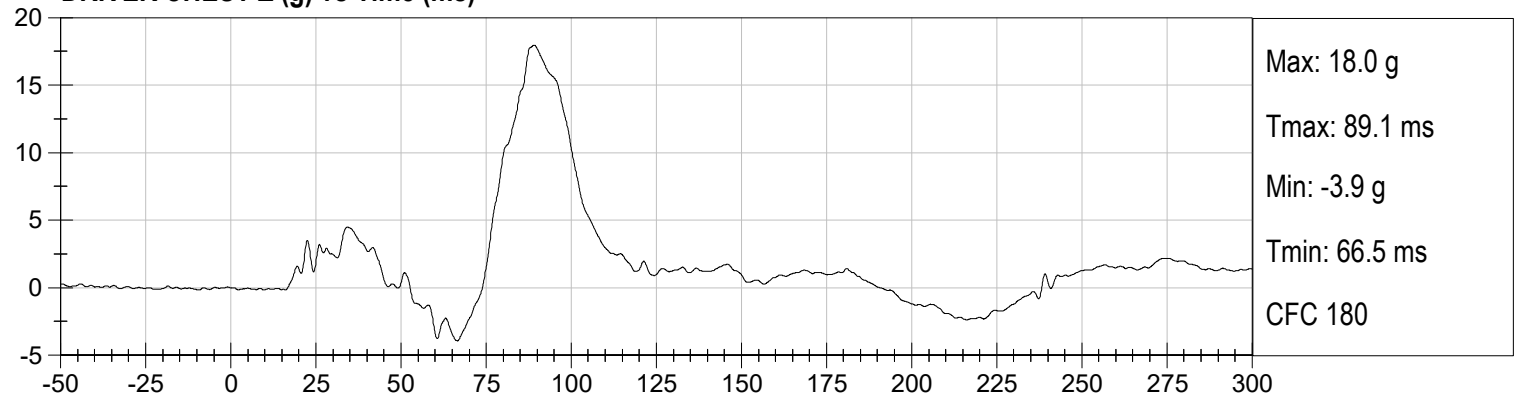

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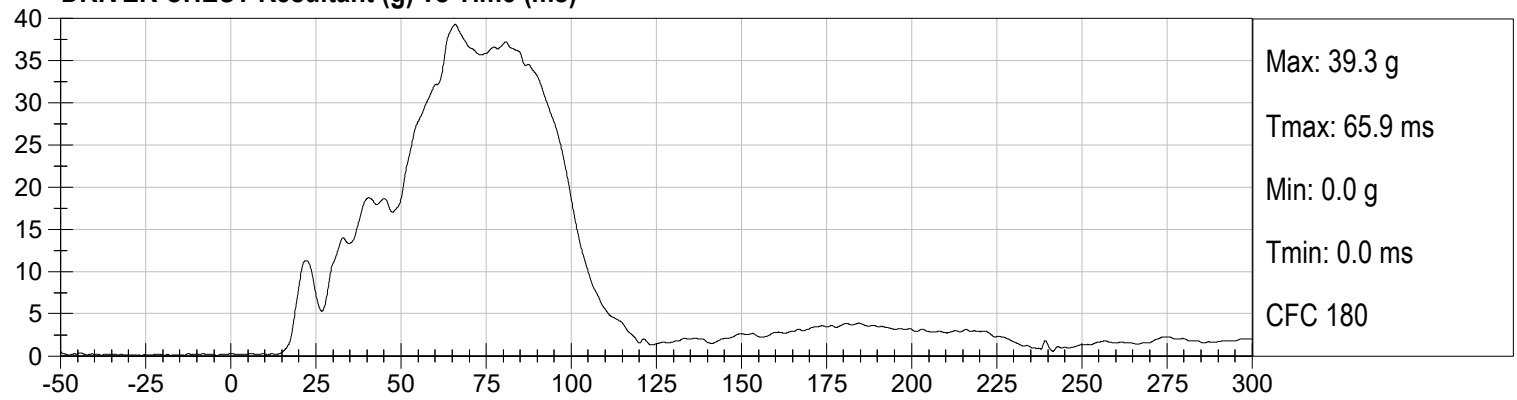
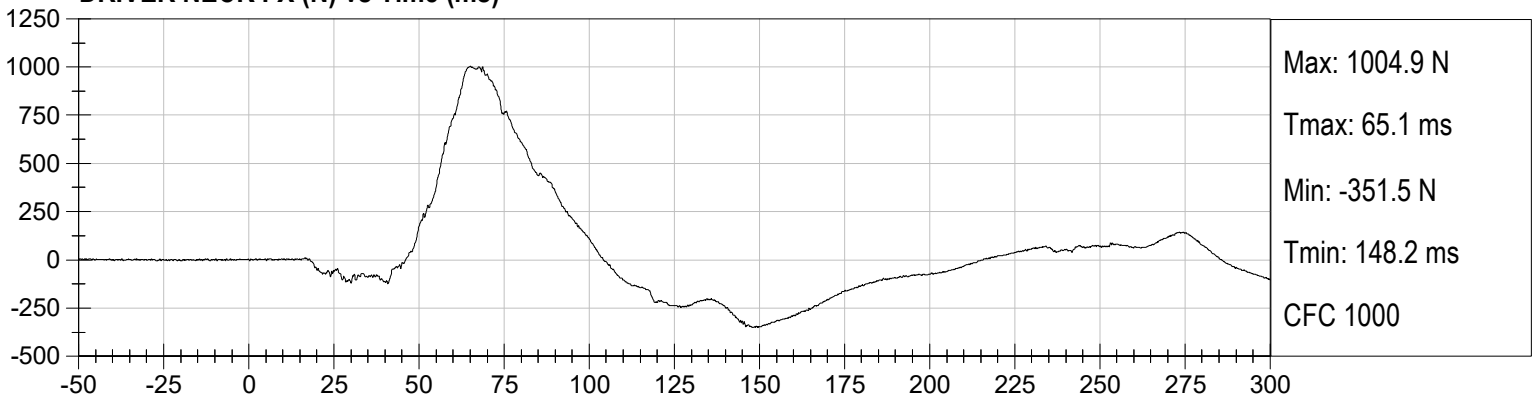
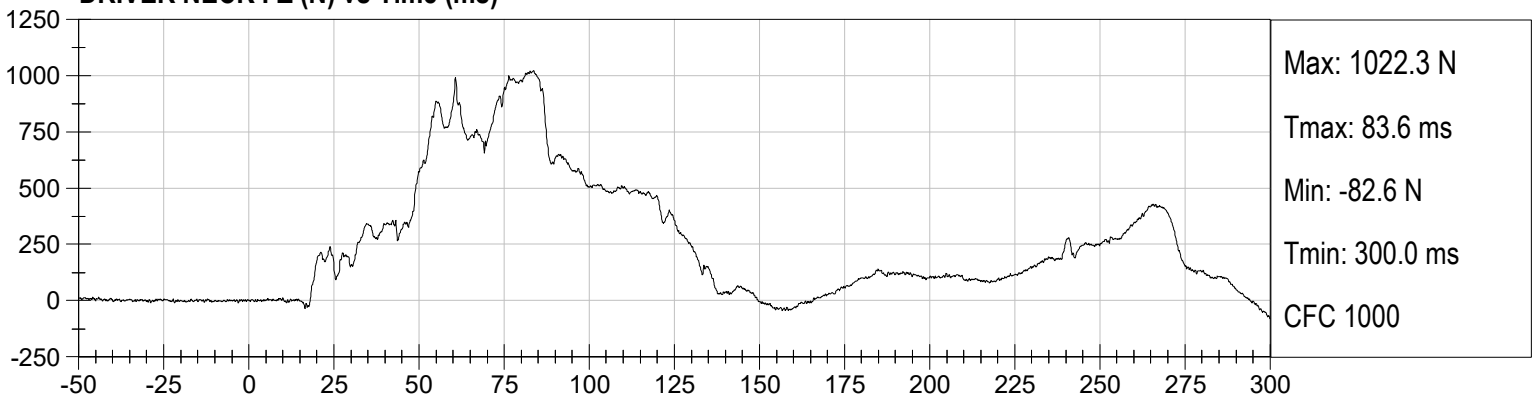


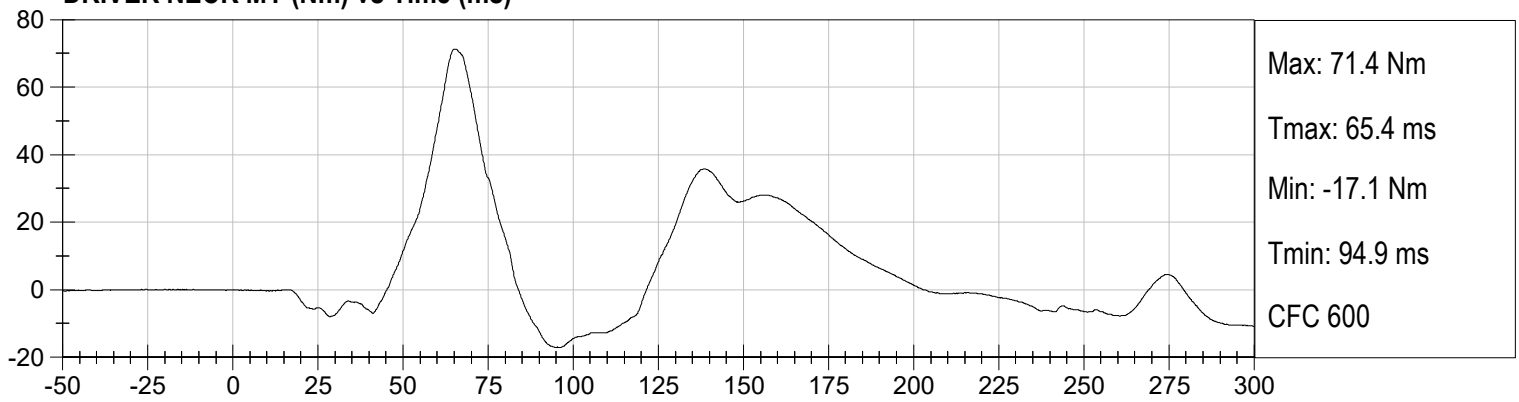
DRIVER NECK FX (N) vs Time (ms)



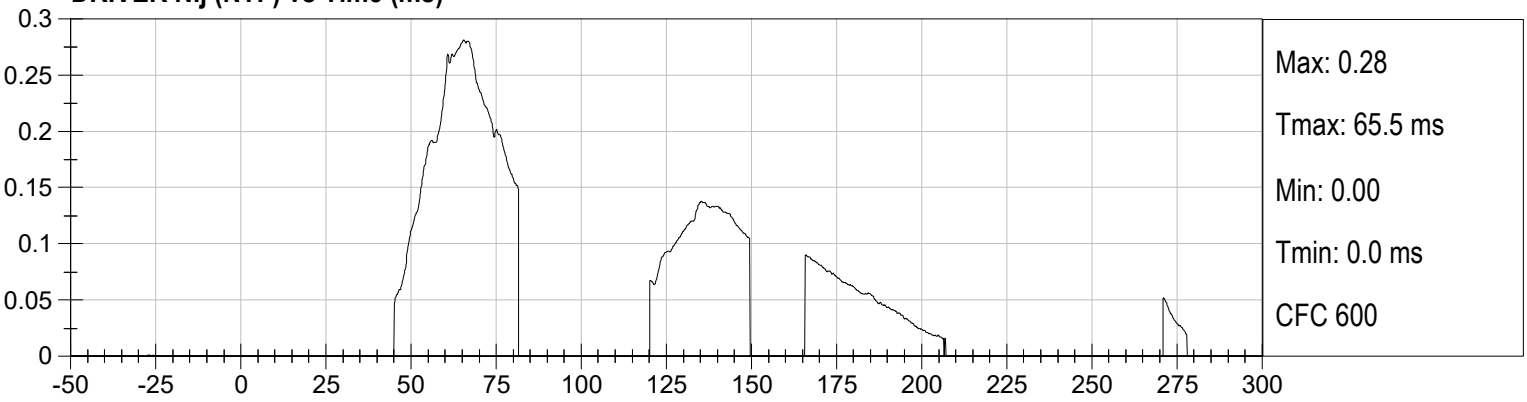
DRIVER NECK FZ (N) vs Time (ms)



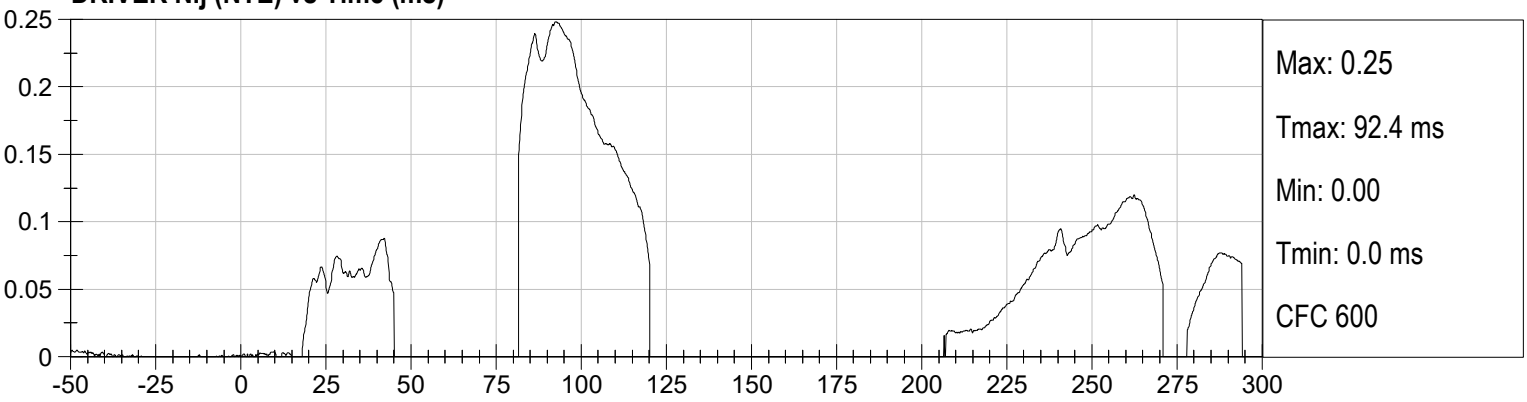
DRIVER NECK MY (Nm) vs Time (ms)



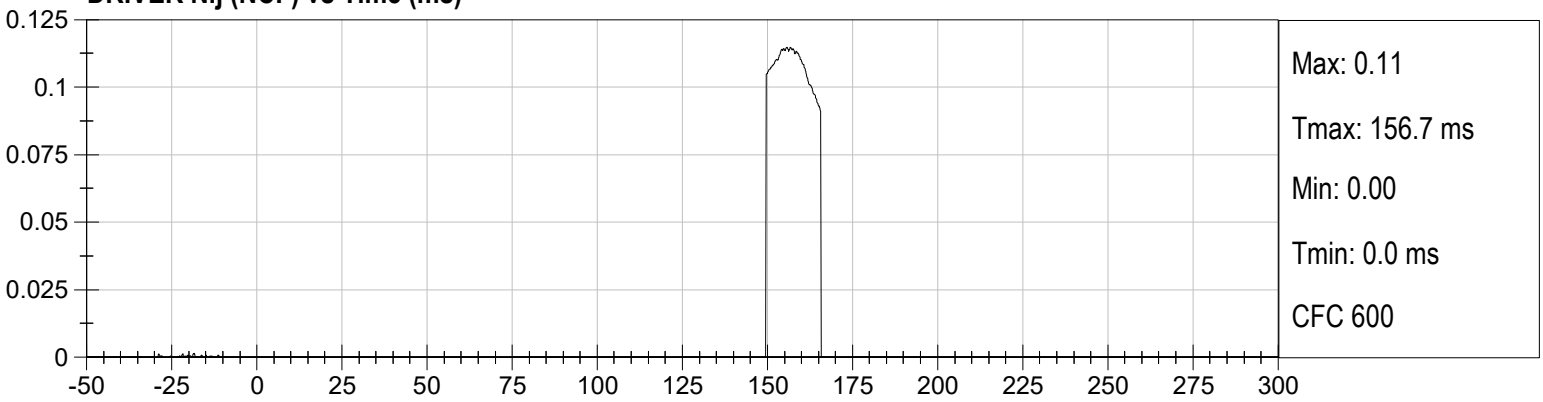
DRIVER Nij (NTF) vs Time (ms)



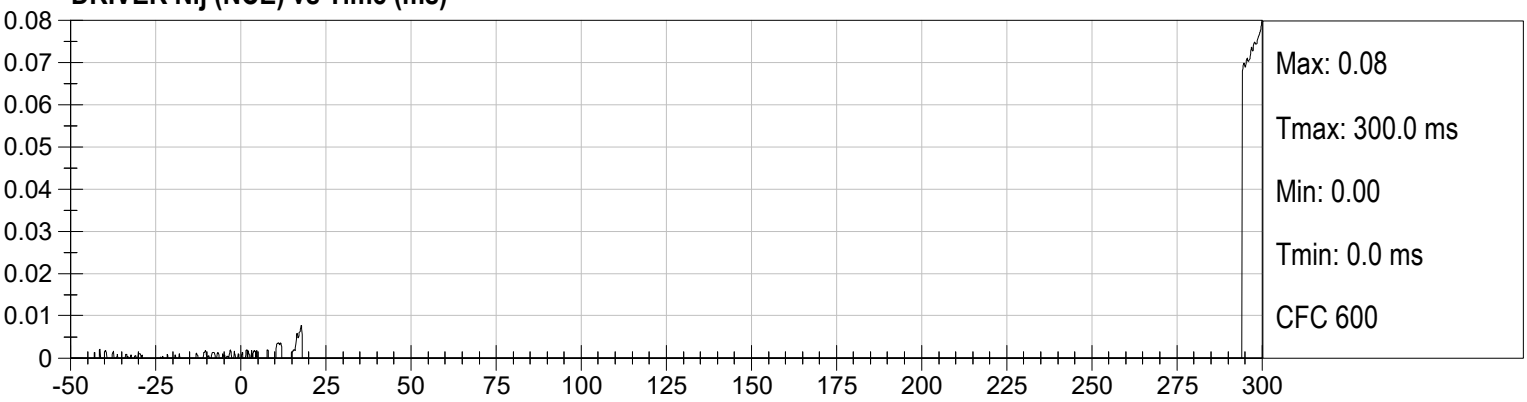
DRIVER Nij (NTE) vs Time (ms)



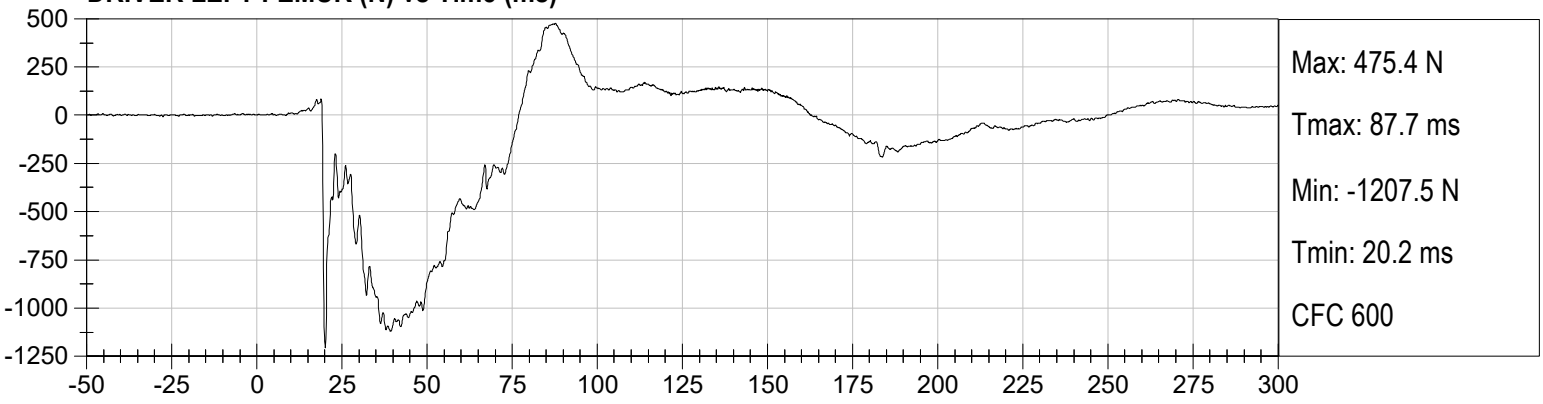
DRIVER Nij (NCF) vs Time (ms)



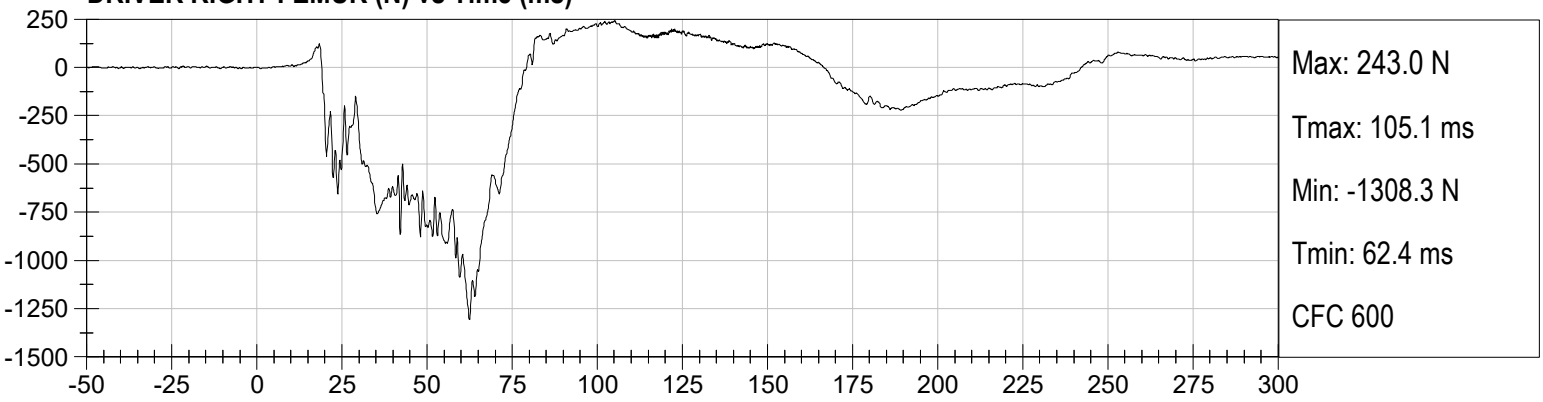
DRIVER Nij (NCE) vs Time (ms)



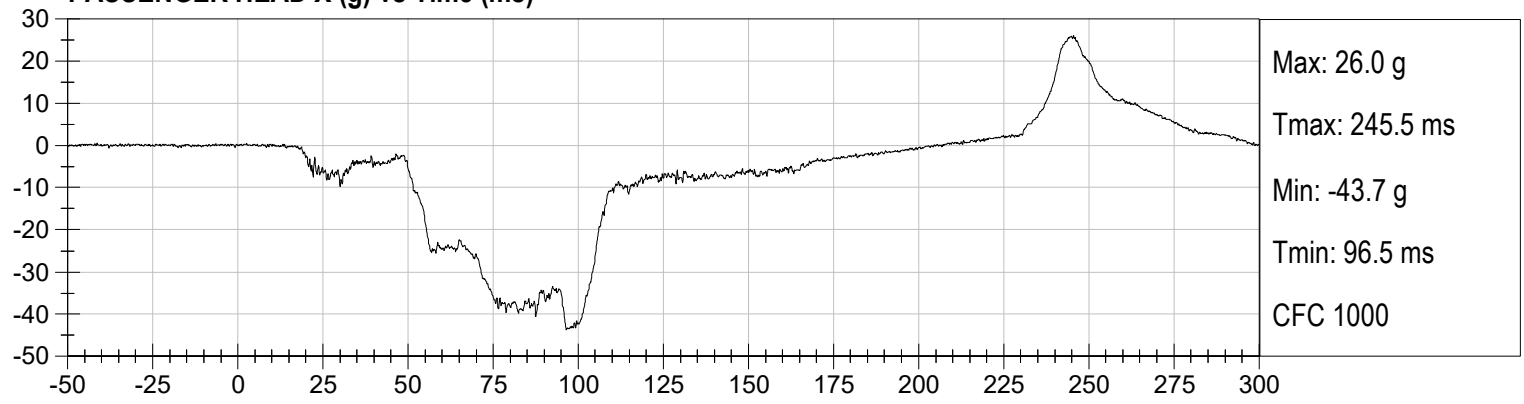
DRIVER LEFT FEMUR (N) vs Time (ms)



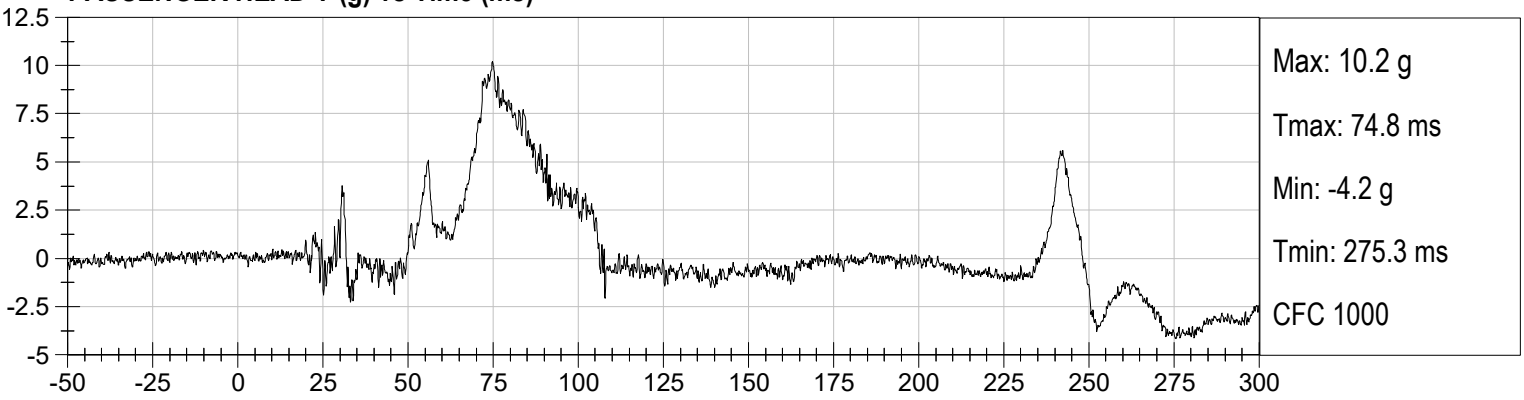
DRIVER RIGHT FEMUR (N) vs Time (ms)



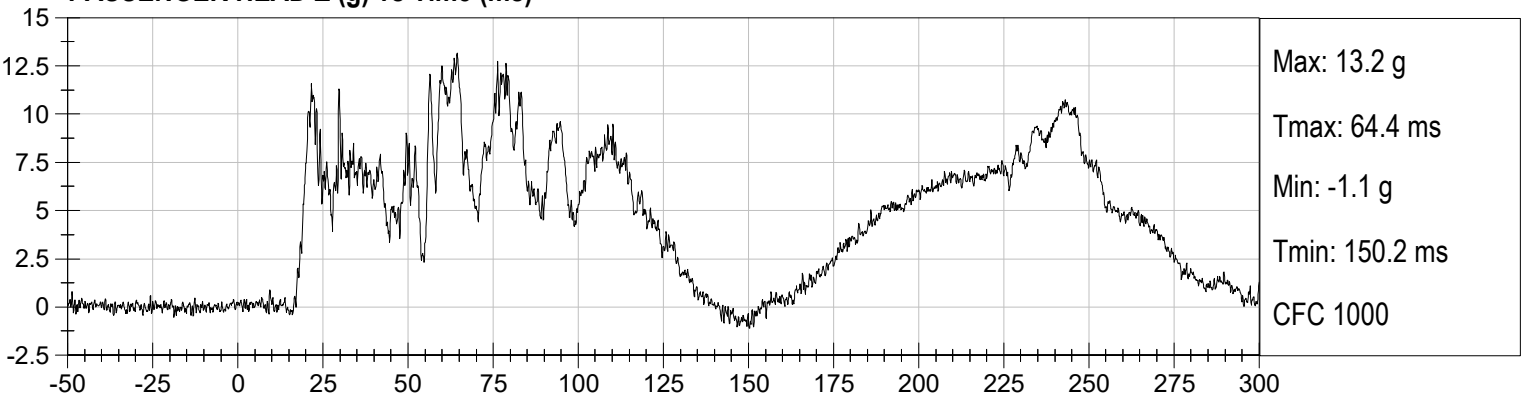
PASSENGER HEAD X (g) vs Time (ms)



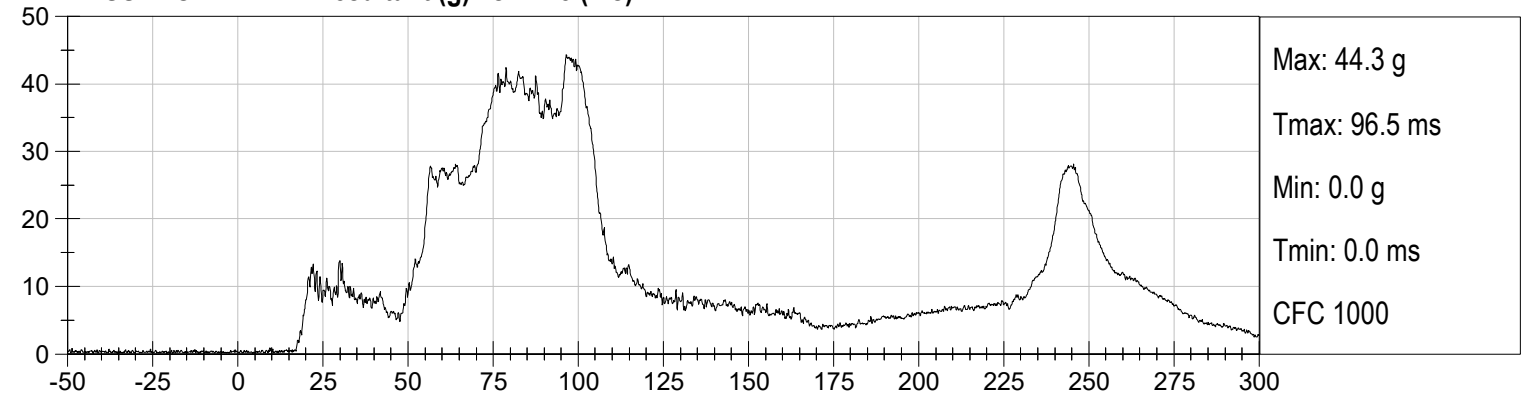
PASSENGER HEAD Y (g) vs Time (ms)



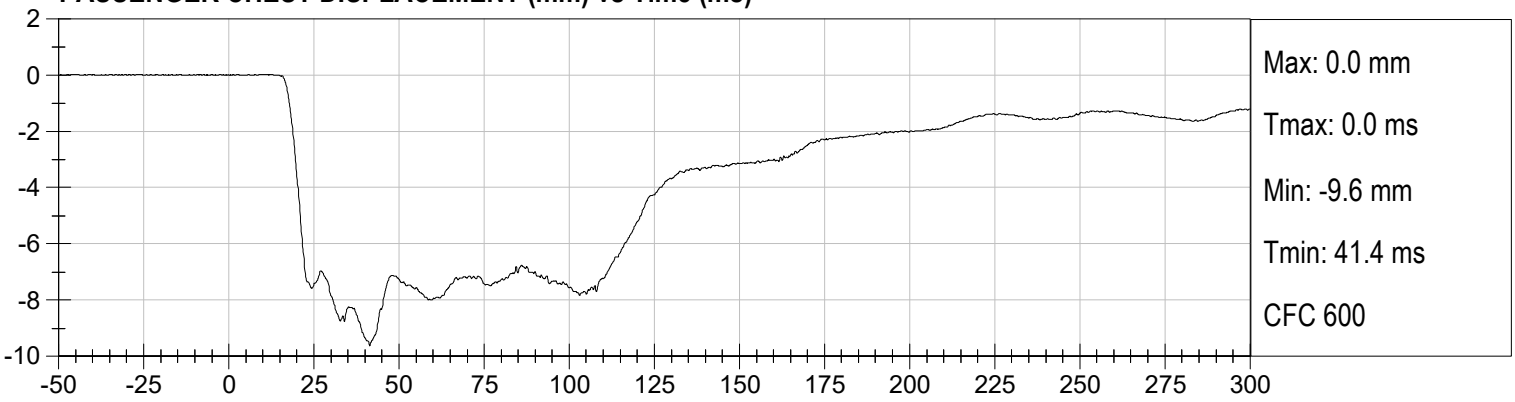
PASSENGER HEAD Z (g) vs Time (ms)



PASSENGER HEAD Resultant (g) vs Time (ms)



PASSENGER CHEST DISPLACEMENT (mm) vs Time (ms)



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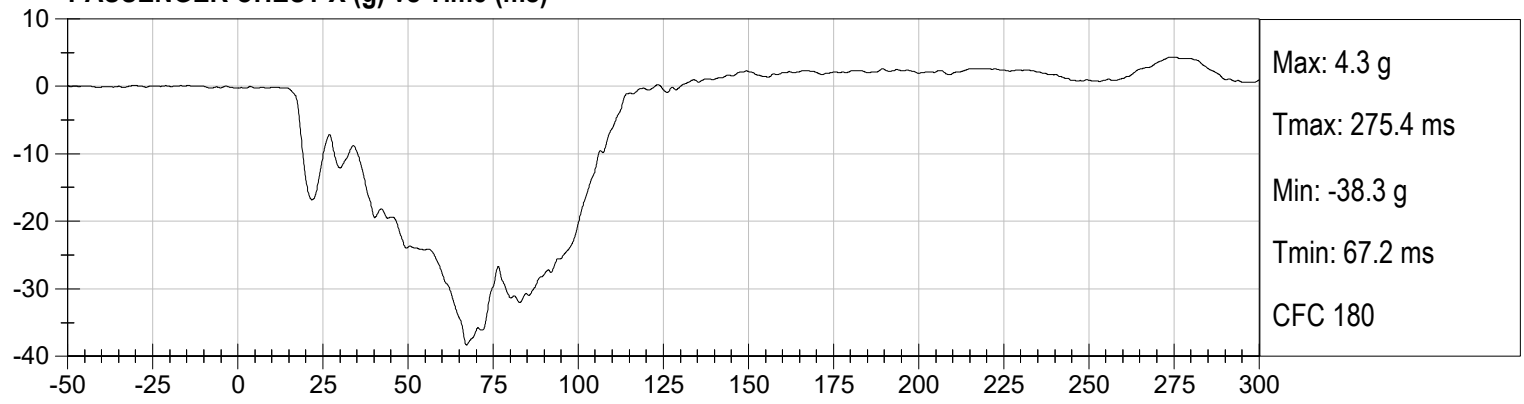

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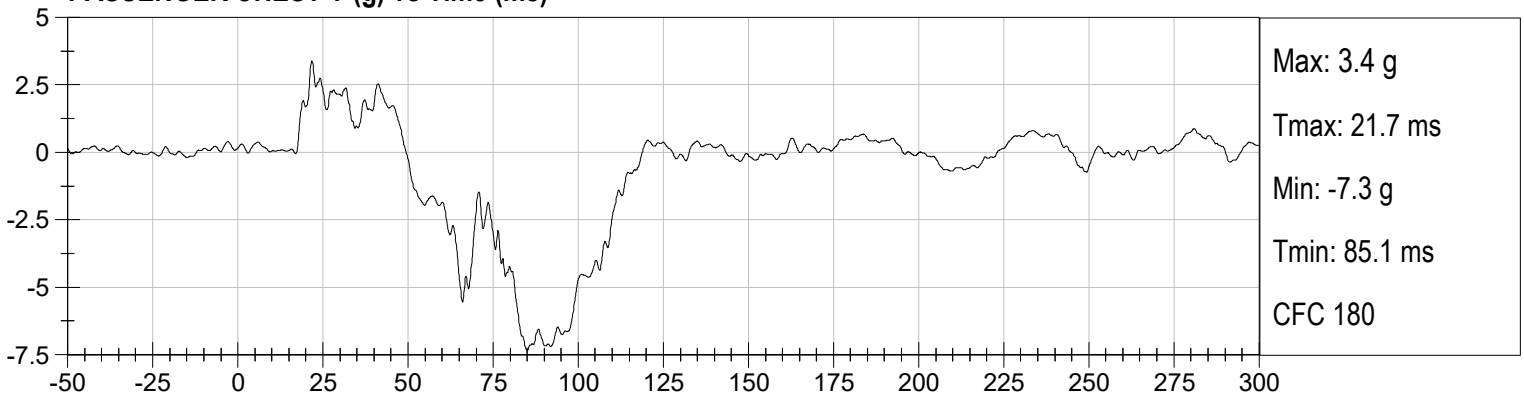

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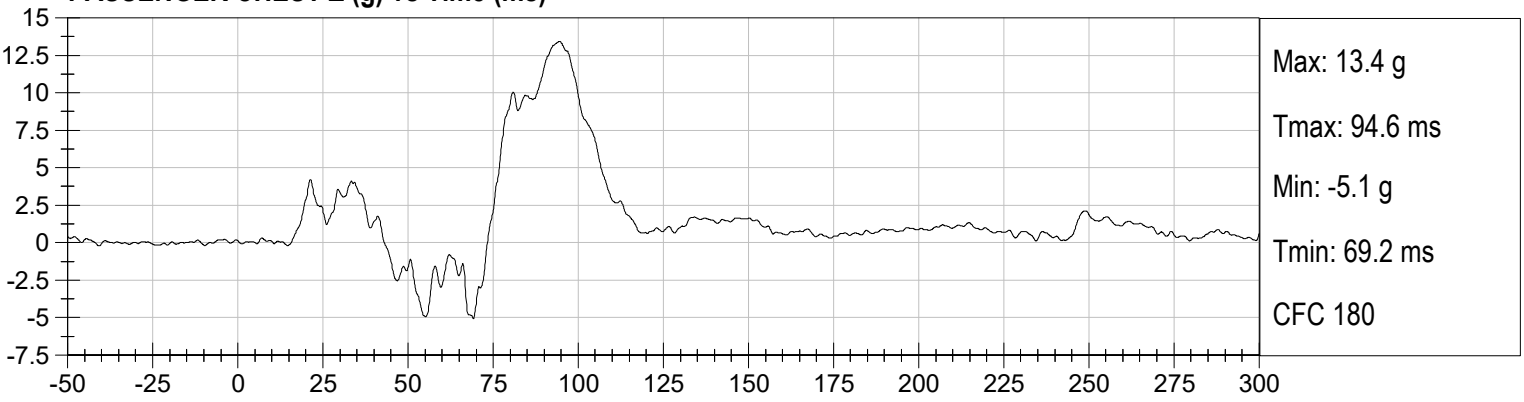
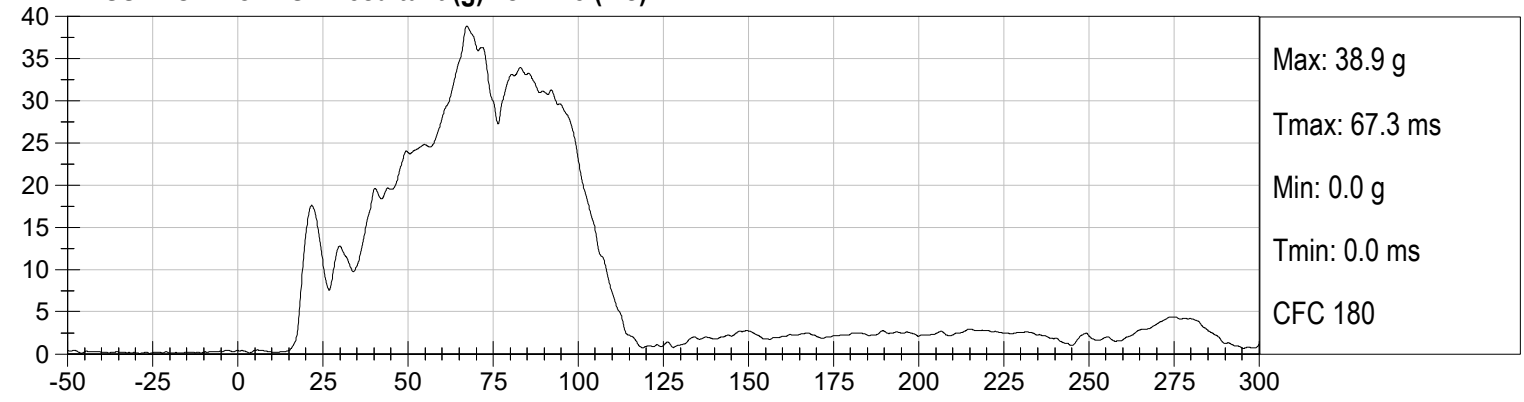
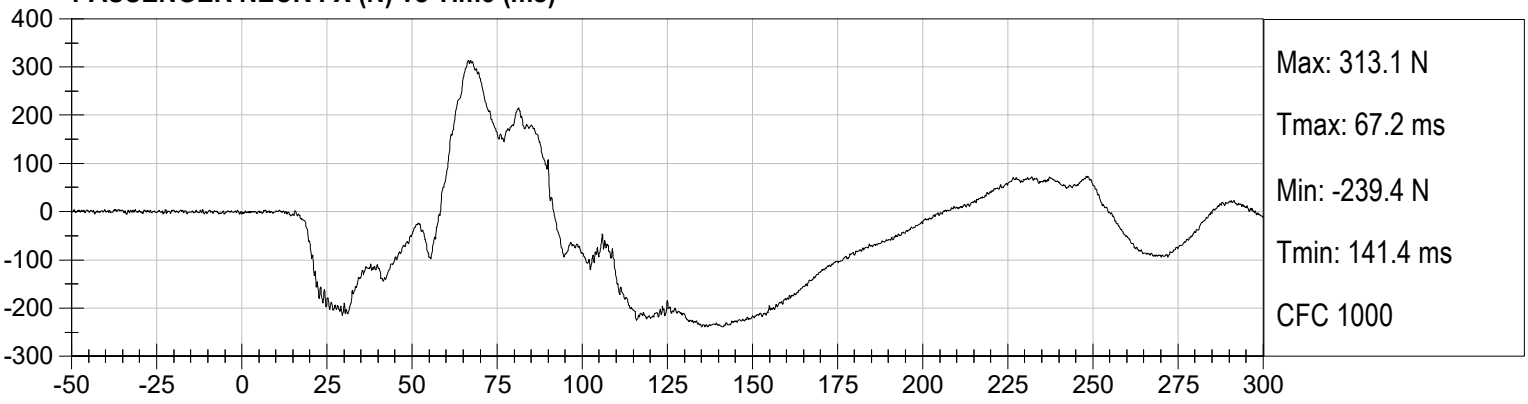


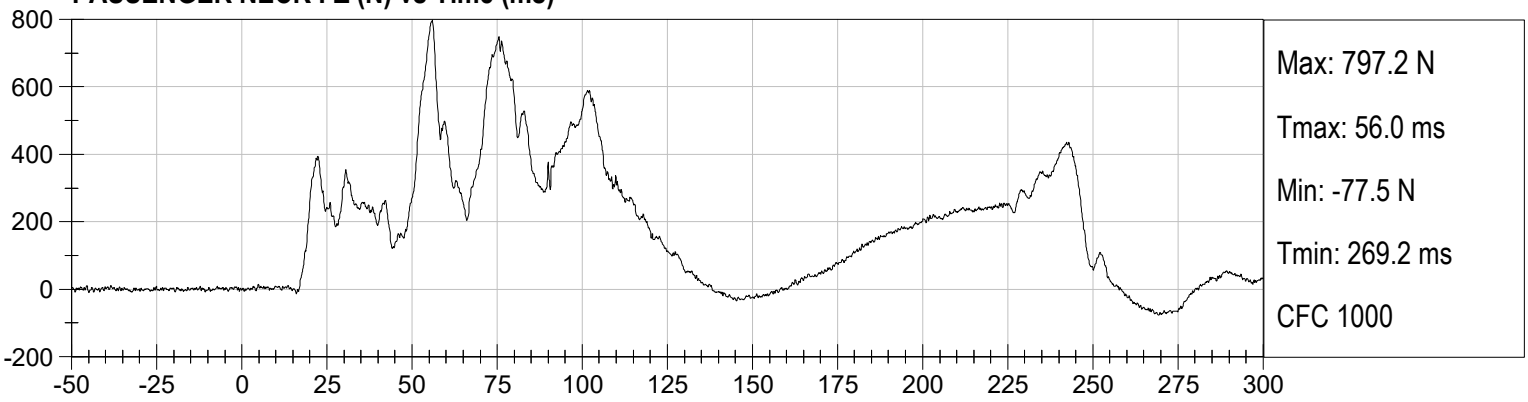
PASSENGER CHEST Resultant (g) vs Time (ms)



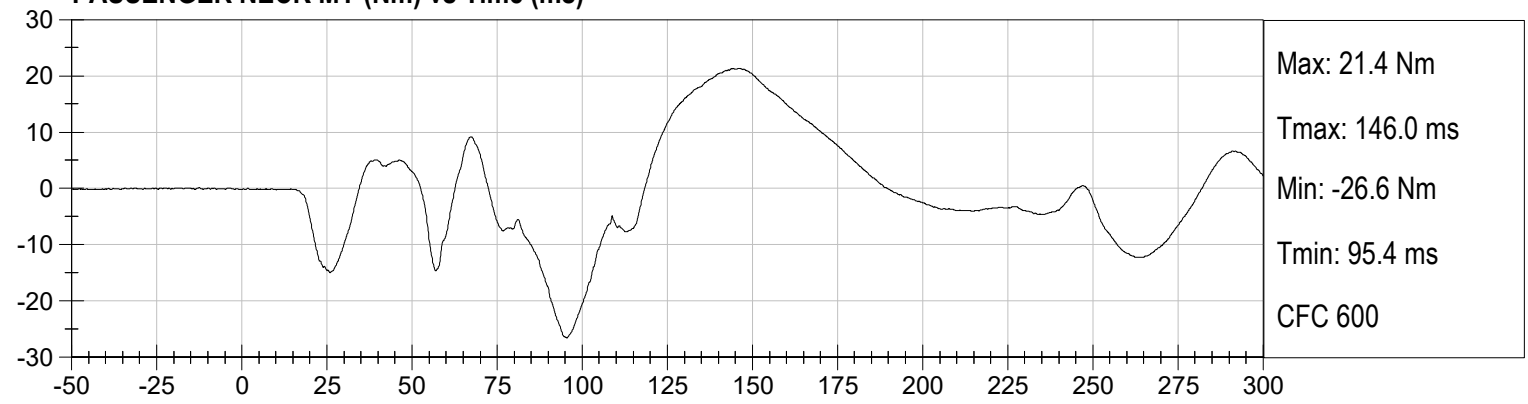
PASSENGER NECK FX (N) vs Time (ms)



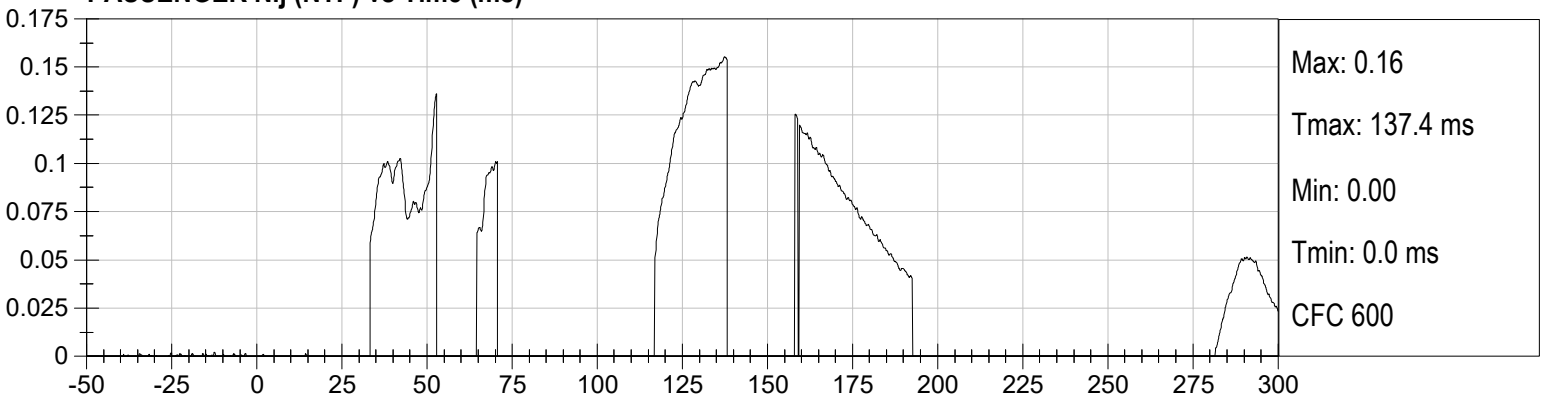
PASSENGER NECK FZ (N) vs Time (ms)



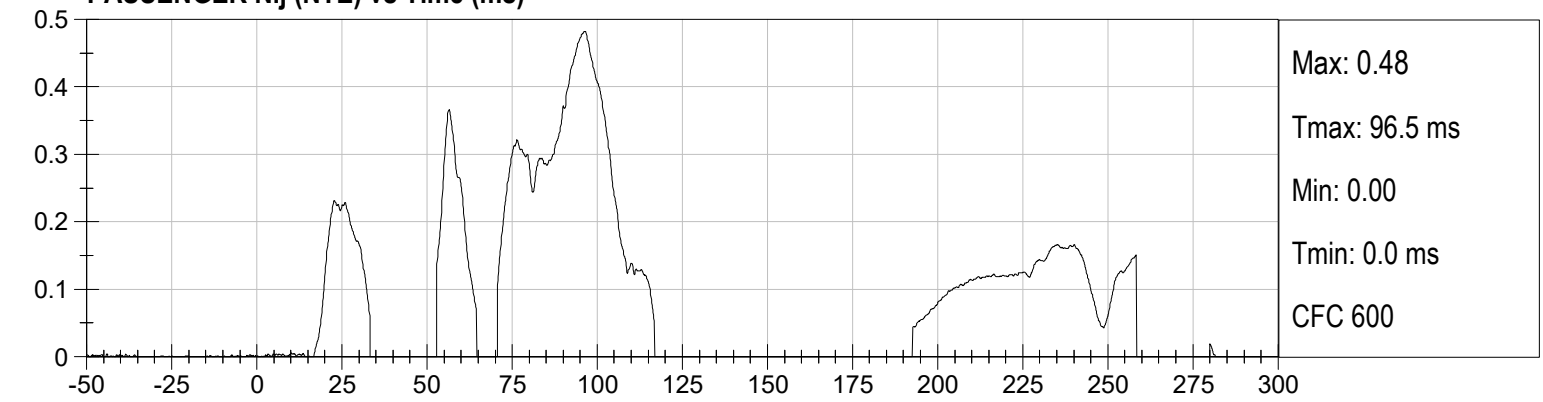
PASSENGER NECK MY (Nm) vs Time (ms)



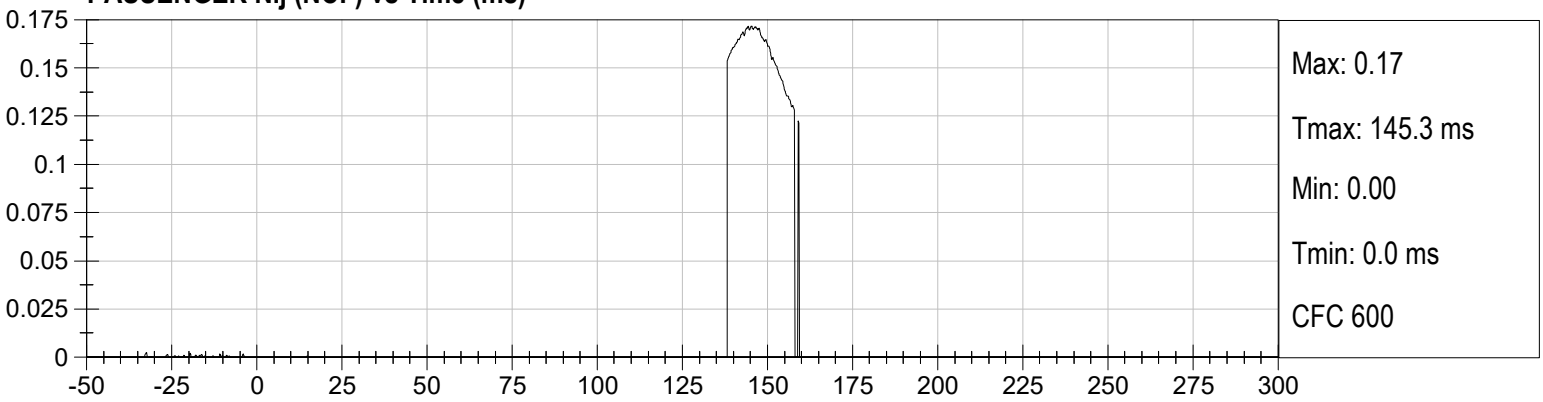
PASSENGER Nij (NTF) vs Time (ms)



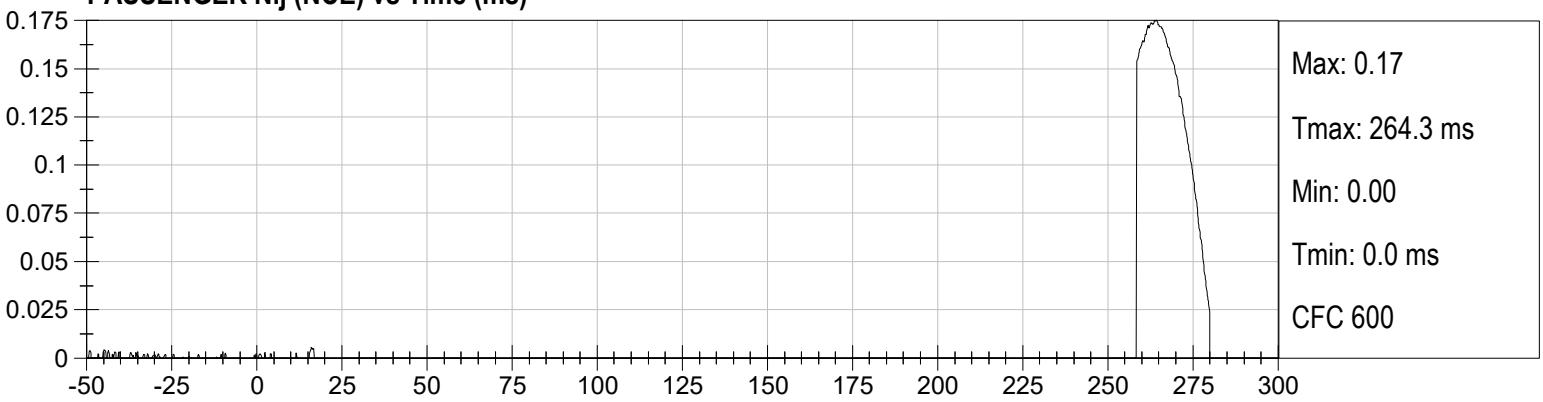
PASSENGER Nij (NTE) vs Time (ms)



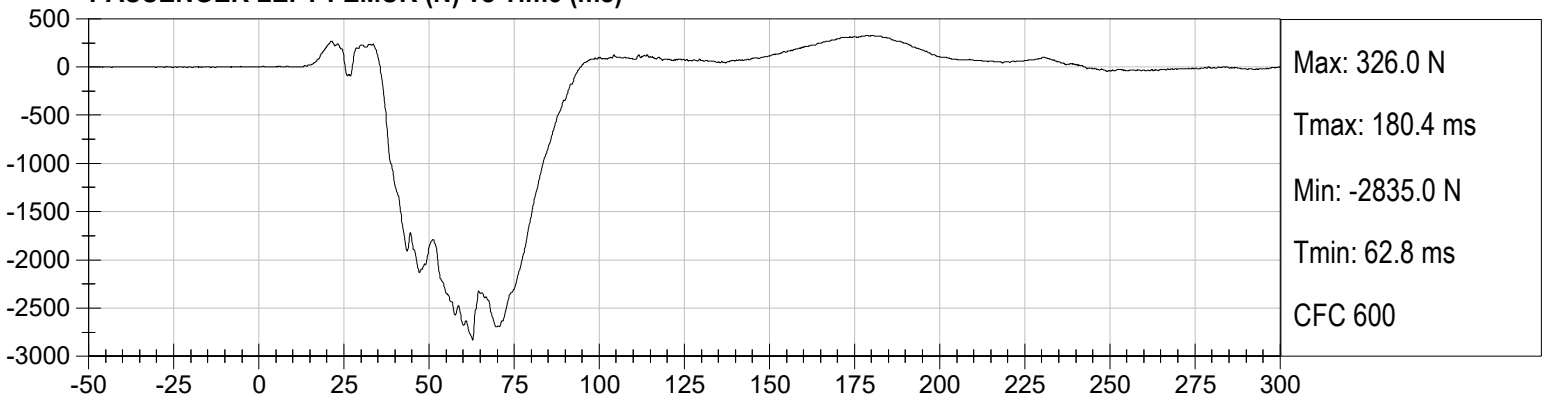
PASSENGER Nij (NCF) vs Time (ms)



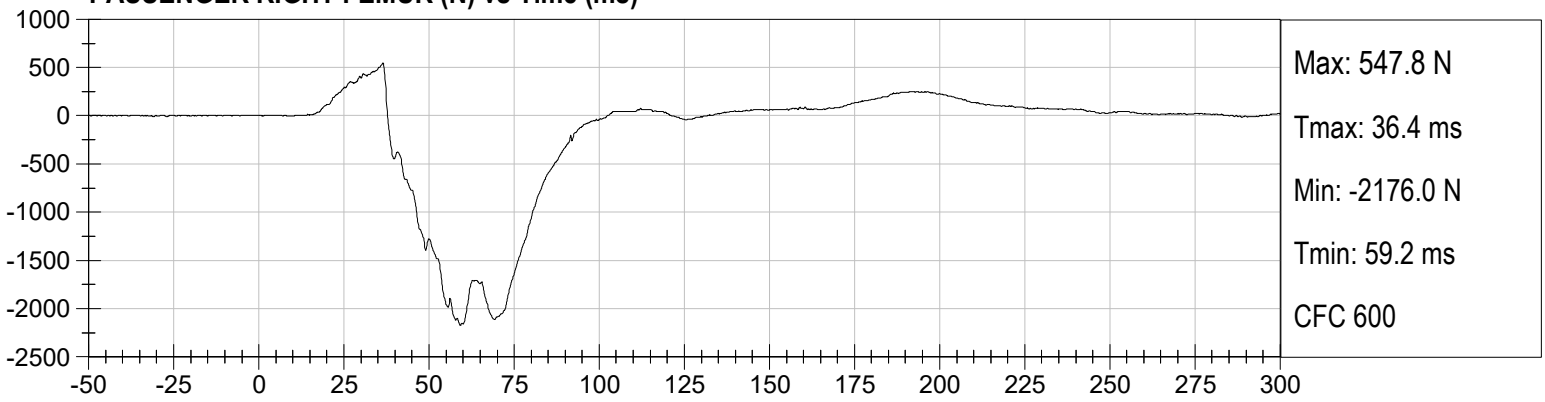
PASSENGER Nij (NCE) vs Time (ms)



PASSENGER LEFT FEMUR (N) vs Time (ms)



PASSENGER RIGHT FEMUR (N) vs Time (ms)



APPENDIX C
DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

CALIBRATION TEST RESULTS

PRE-TEST

HYBRID III 50TH PERCENTILE MALE - DRIVER ATD

Hybrid III, 50th External Measurements
SN: 351

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

HYBRID III, SUBPART E EXTERIOR DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS		ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 16.9-17.1 in. above seat surface	8.4-9.0	8.5
P	FOOT LENGTH	Tip of toe to rear of heel	9.9-10.5	10.3
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	16.3-17.2	16.5
W	FOOT BREADTH	The widest part of the foot	3.6-4.2	4.0
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 16.9-17.1 in. above seat surface	38.2-39.4	39.2
Z	WAIST CIRCUMFERENCE	Measured 8.9-9.1 in. above seat surface	32.9-34.1	33.7
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	16.9-17.1	17.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	8.9-9.1	9.0

NOTE: THE H-POINT IS LOCATED 1.83 INCHES FORWARD AND 2.57 INCHES DOWN FROM THE CENTER OF THE PELVIS ANGLE REFERENCE HOLE.

MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test ID:** D202691

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Peak Resultant Acceleration	G's	225 to 275	247	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	0.9	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Gerald Guerrero
Laboratory Technician

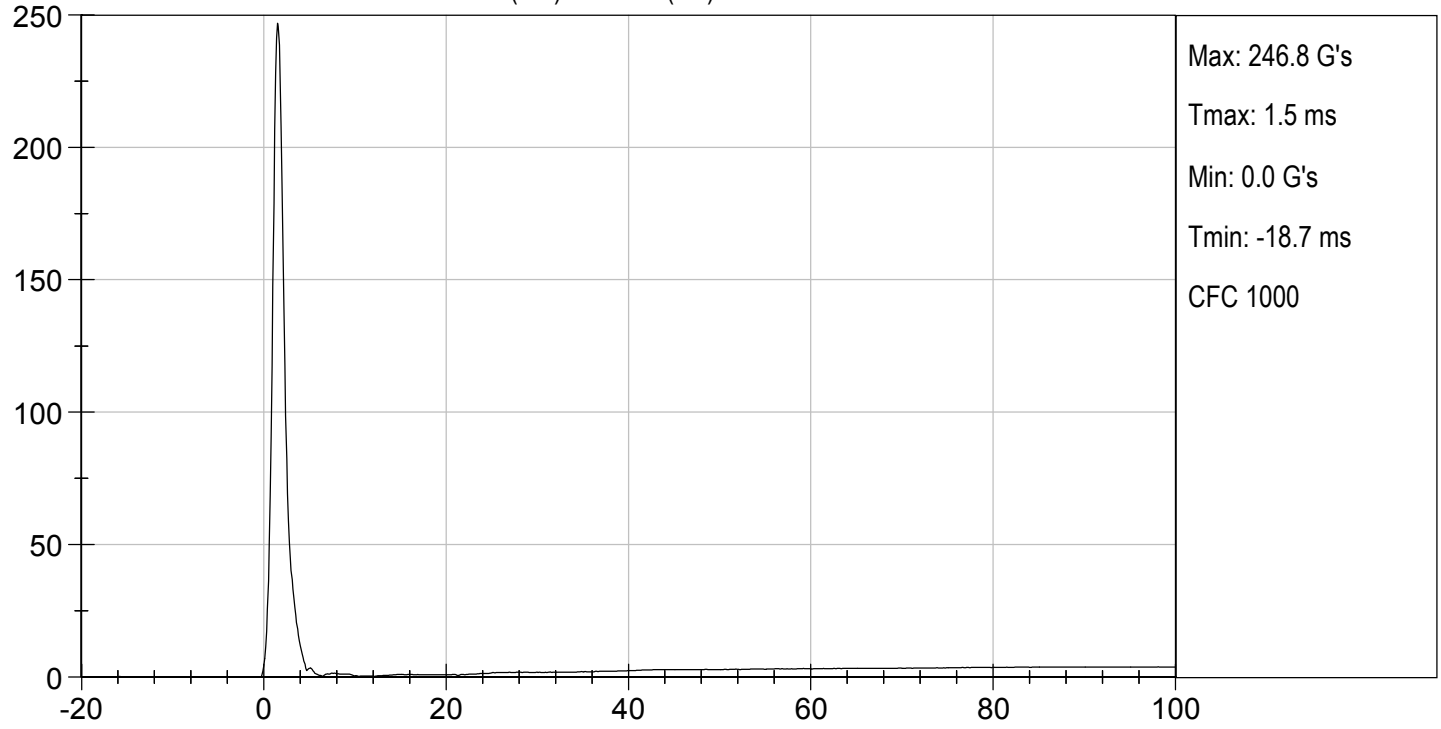
10/27/2020
Test Date

Approved By

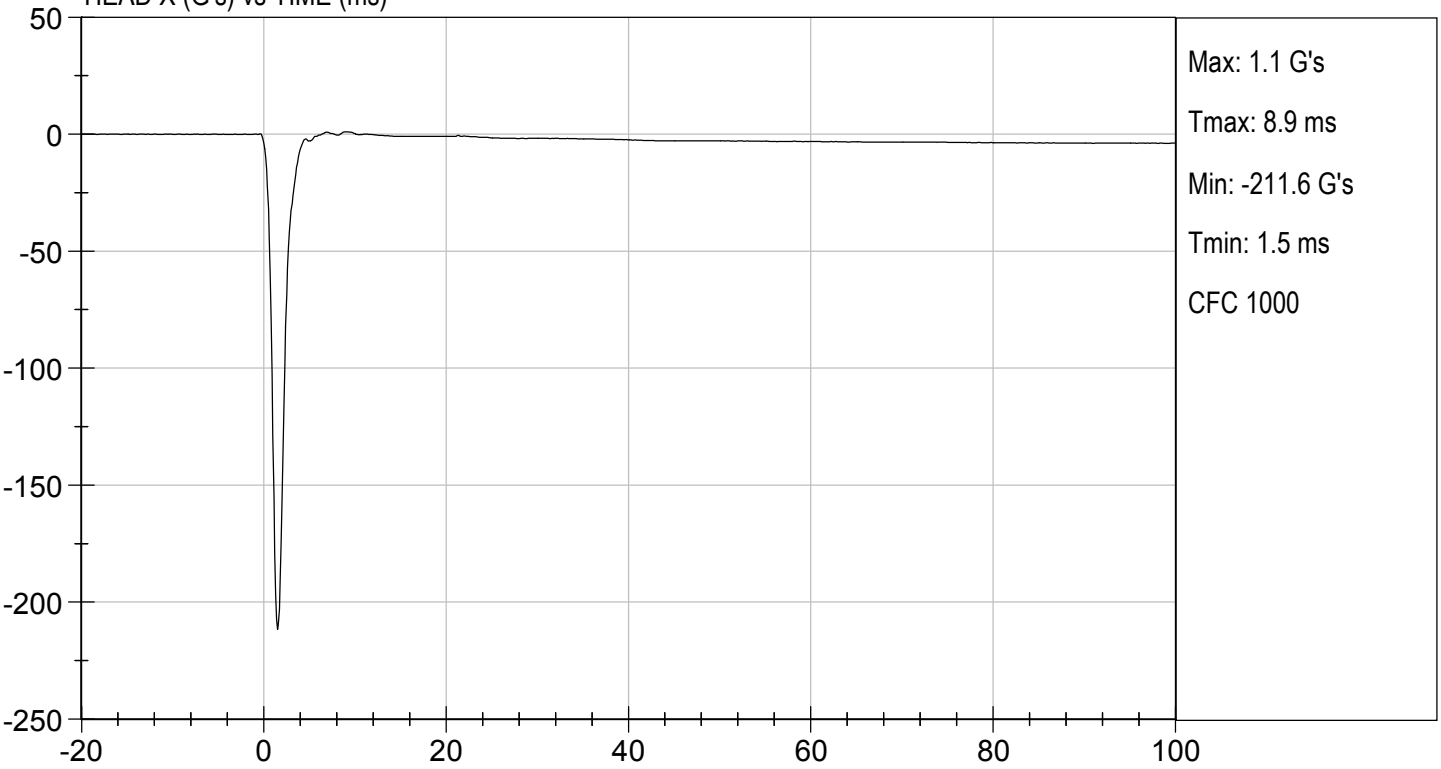
TEST DESC: HEAD DROP

TEST DATE: 10/27/2020
TEST #: D202691

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

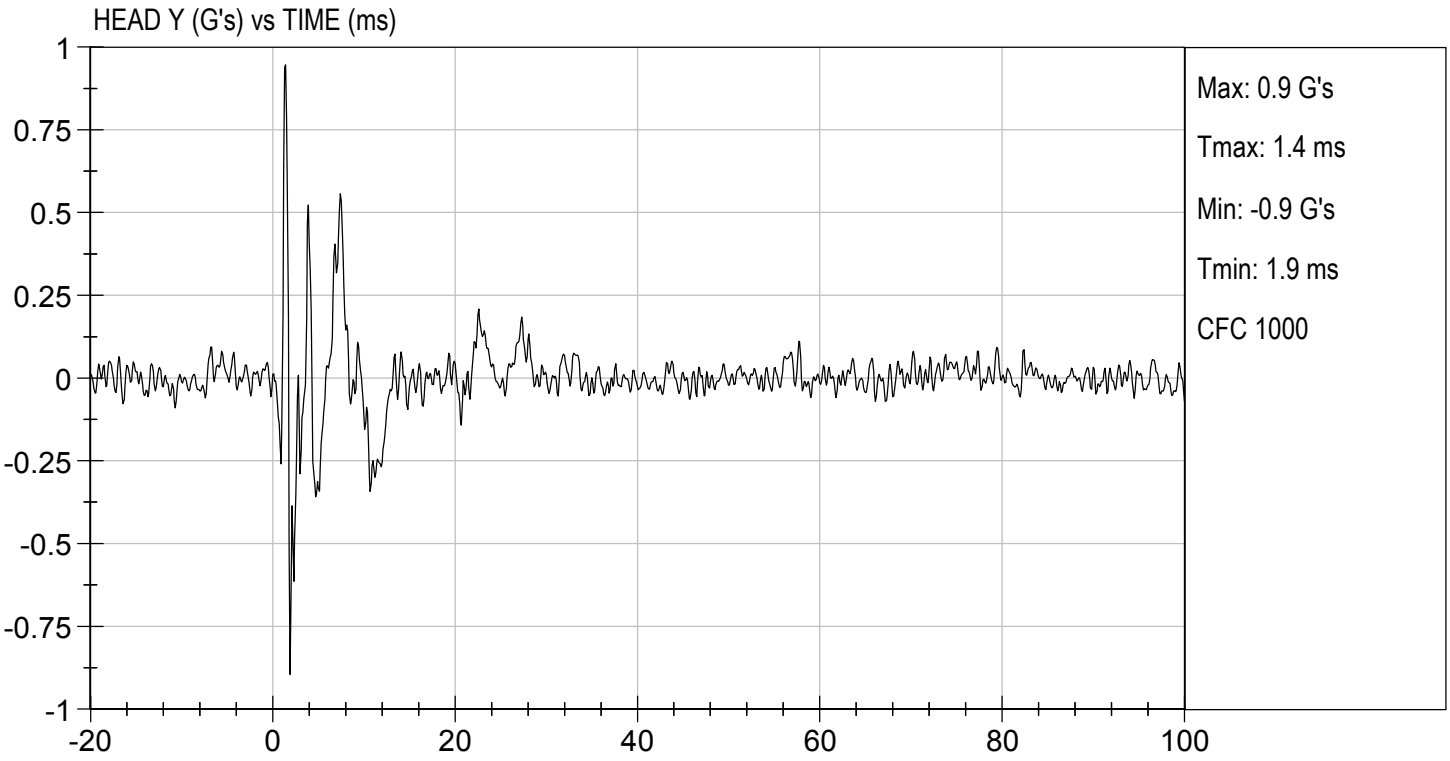


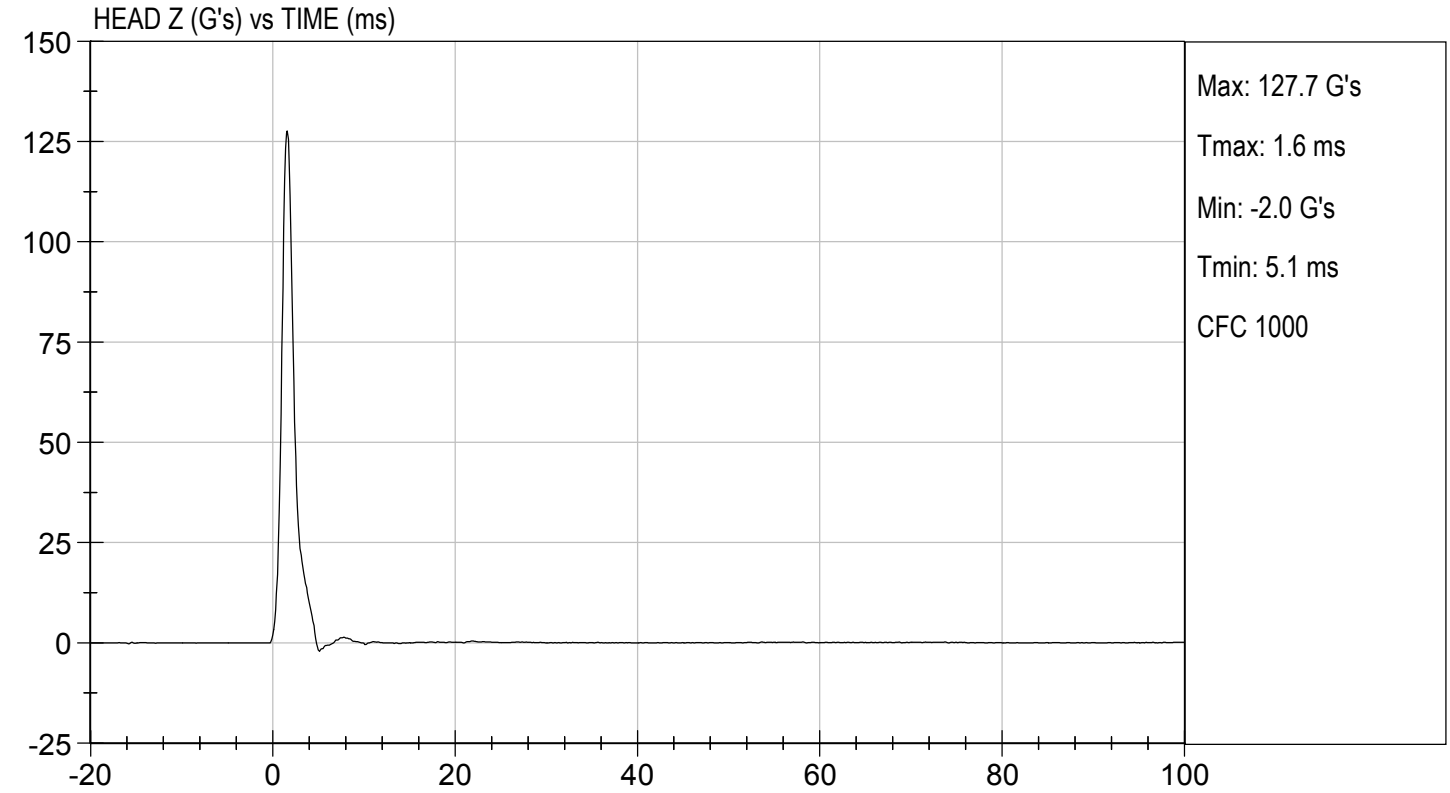
HEAD X (G's) vs TIME (ms)



TEST DESC: HEAD DROP

TEST DATE: 10/27/2020
TEST #: D202691





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D202692

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	24	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.56	Pass
	20 ms	G's	17.60 to 22.60	17.85	Pass
	30 ms	G's	12.50 to 18.50	14.15	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	14.6	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	39.7	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	68.4	Pass
	Time	ms	57.0 to 64.0	60.4	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	117.8	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	91.3	Pass
	Time	ms	47.0 to 58.0	51.2	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	99.8	Pass
			Overall Test Results		Pass

Gerald Guerrero
Laboratory Technician

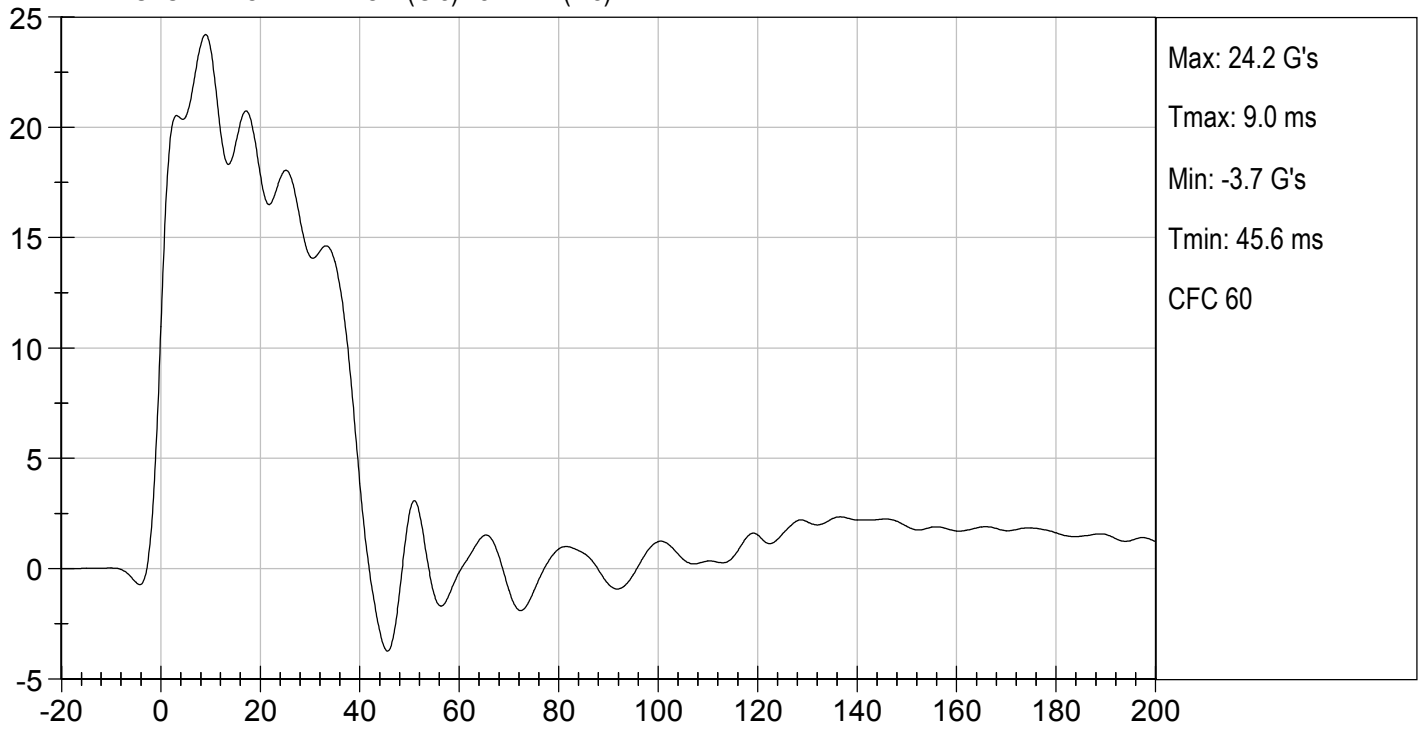
10/27/2020
Test Date

Approved By

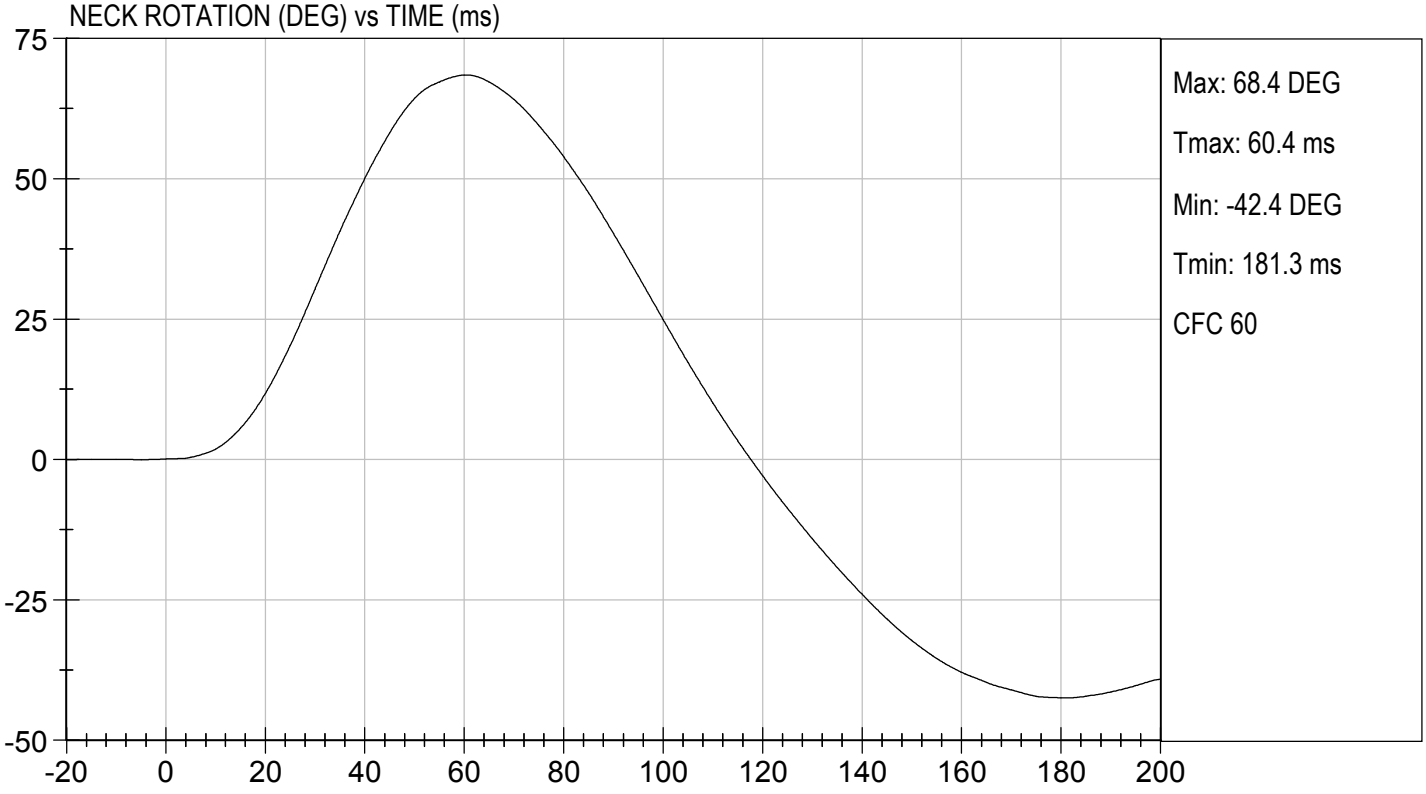
TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

TEST DATE: 10/27/2020
TEST #: D202692

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

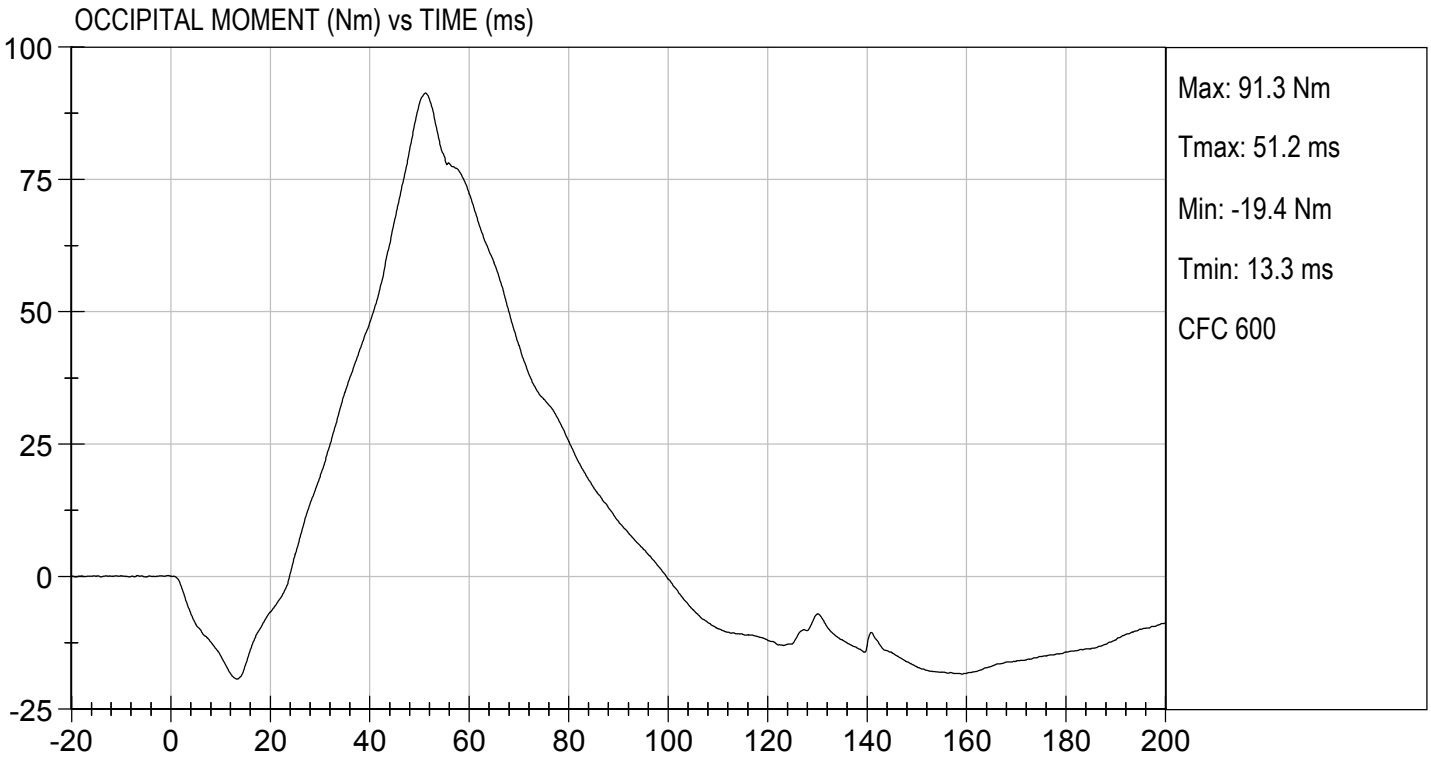


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 10/27/2020
TEST #: D202692



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D202693

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	24	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.19	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	18.05	Pass
	20 ms	G's	14.00 to 19.00	14.55	Pass
	30 ms	G's	11.00 to 16.00	12.47	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	12.5	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	43.3	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	94.2	Pass
	Time	ms	72.0 to 82.0	78.1	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	159.6	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-60.7	Pass
	Time	ms	65.0 to 79.0	72.2	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	142.5	Pass
			Overall Test Results		Pass

Gerald Guerrero
Laboratory Technician

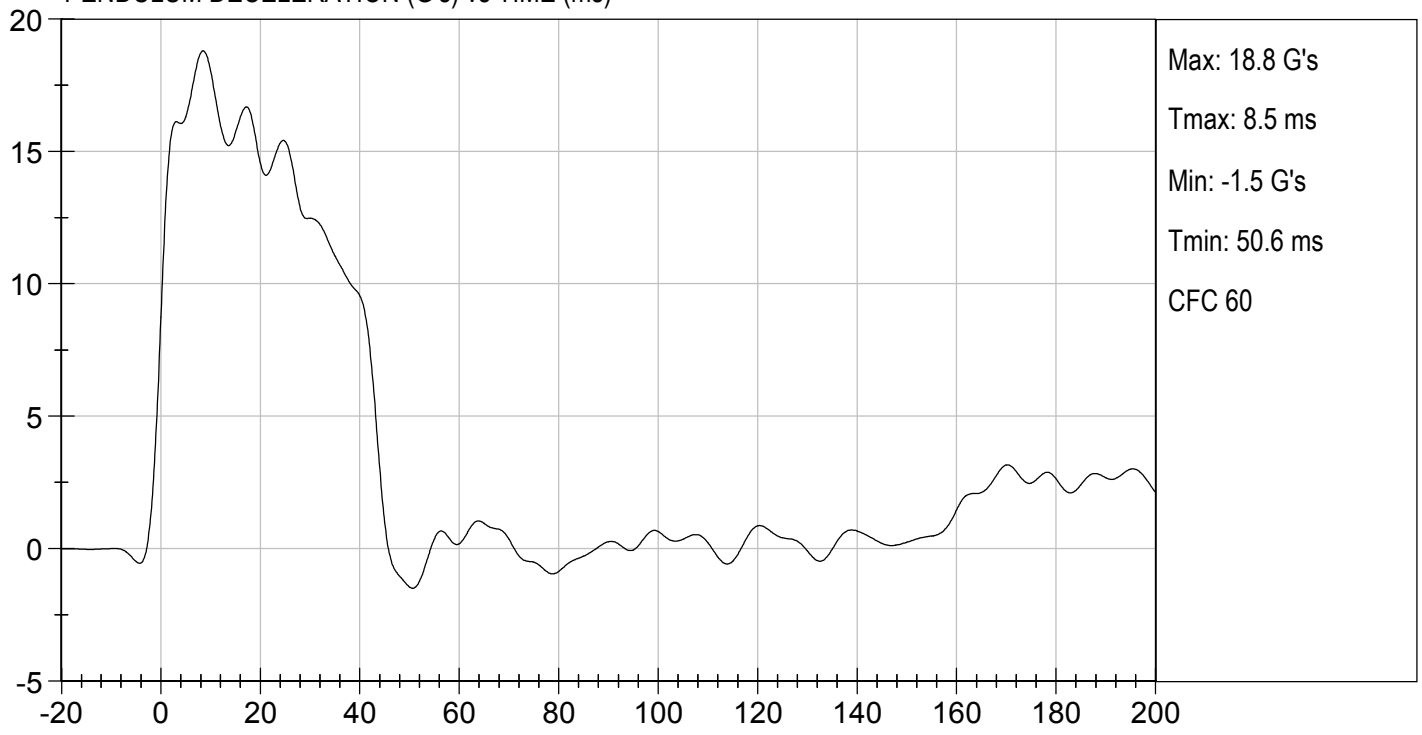
10/27/2020
Test Date

Approved By

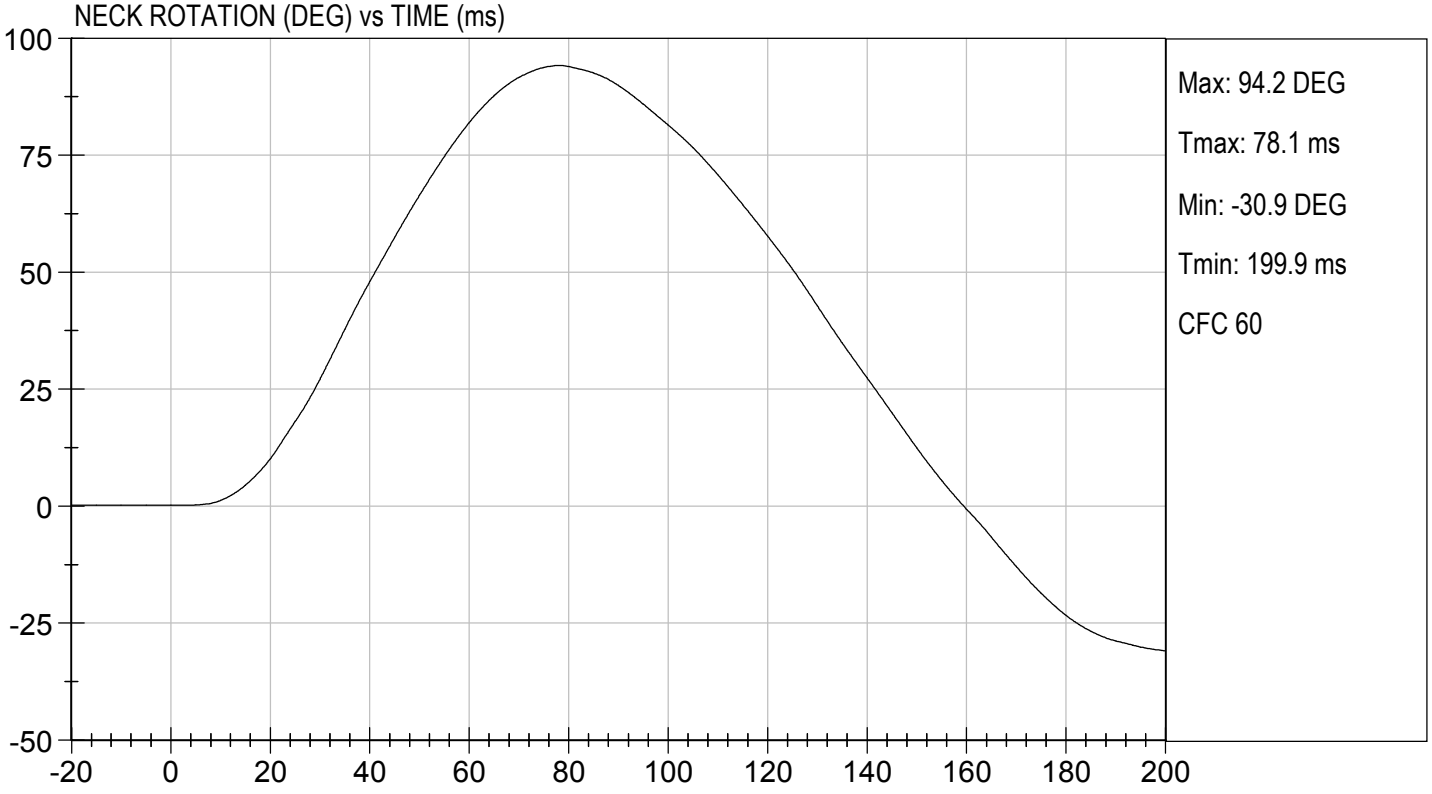
TEST DESC: NECK EXTENSION
VELOCITY: 20.30 ft/s, 6.19 m/s

TEST DATE: 10/27/2020
TEST #: D202693

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

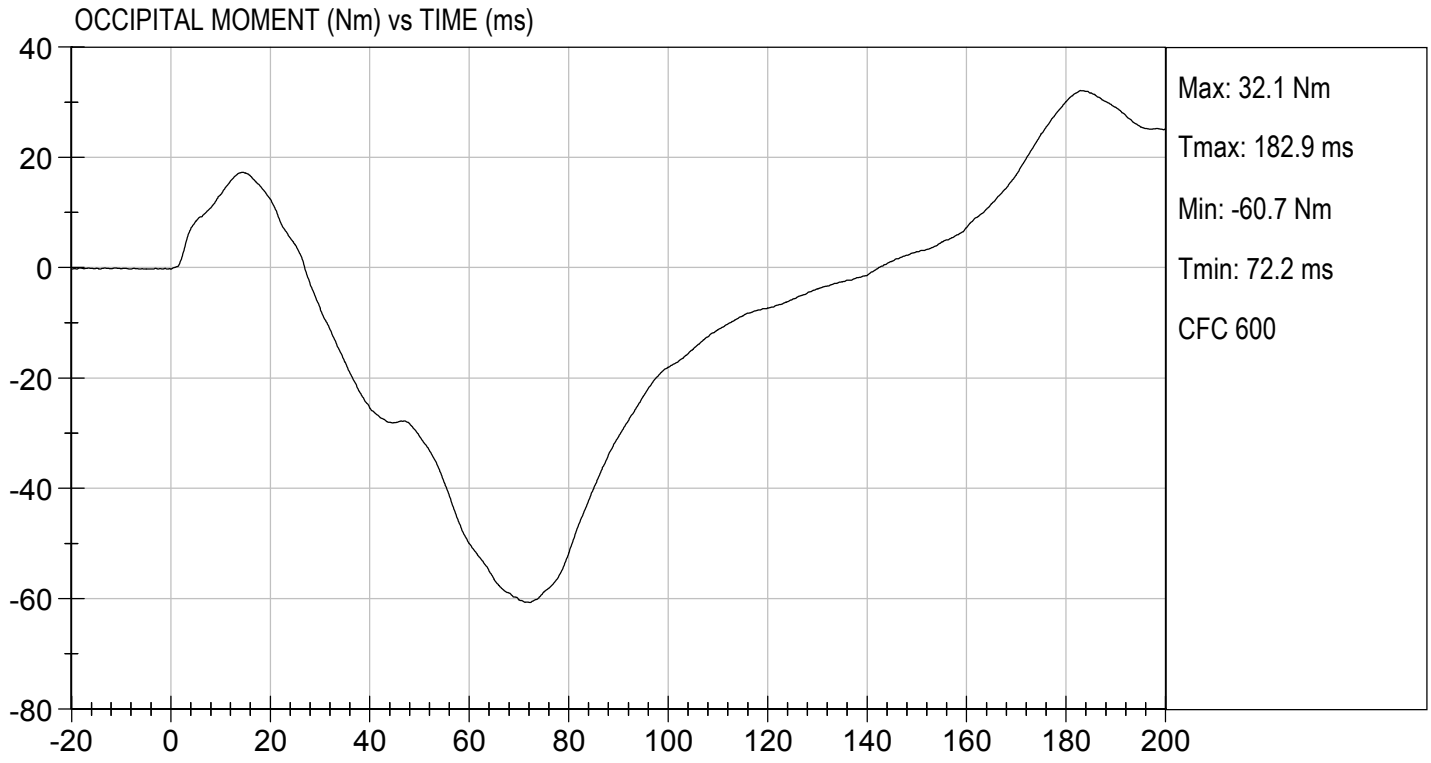


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 10/27/2020
TEST #: D202693



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D202694

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	27	Pass
Probe Velocity	m/s	6.58 to 6.82	6.68	Pass
Peak Probe Force	N	5159 to 5893	5,428	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	7.13	Pass
Internal Hysteresis	%	69 to 85	70	Pass
		Overall Test Results		Pass

Gerald Guerrero
Laboratory Technician

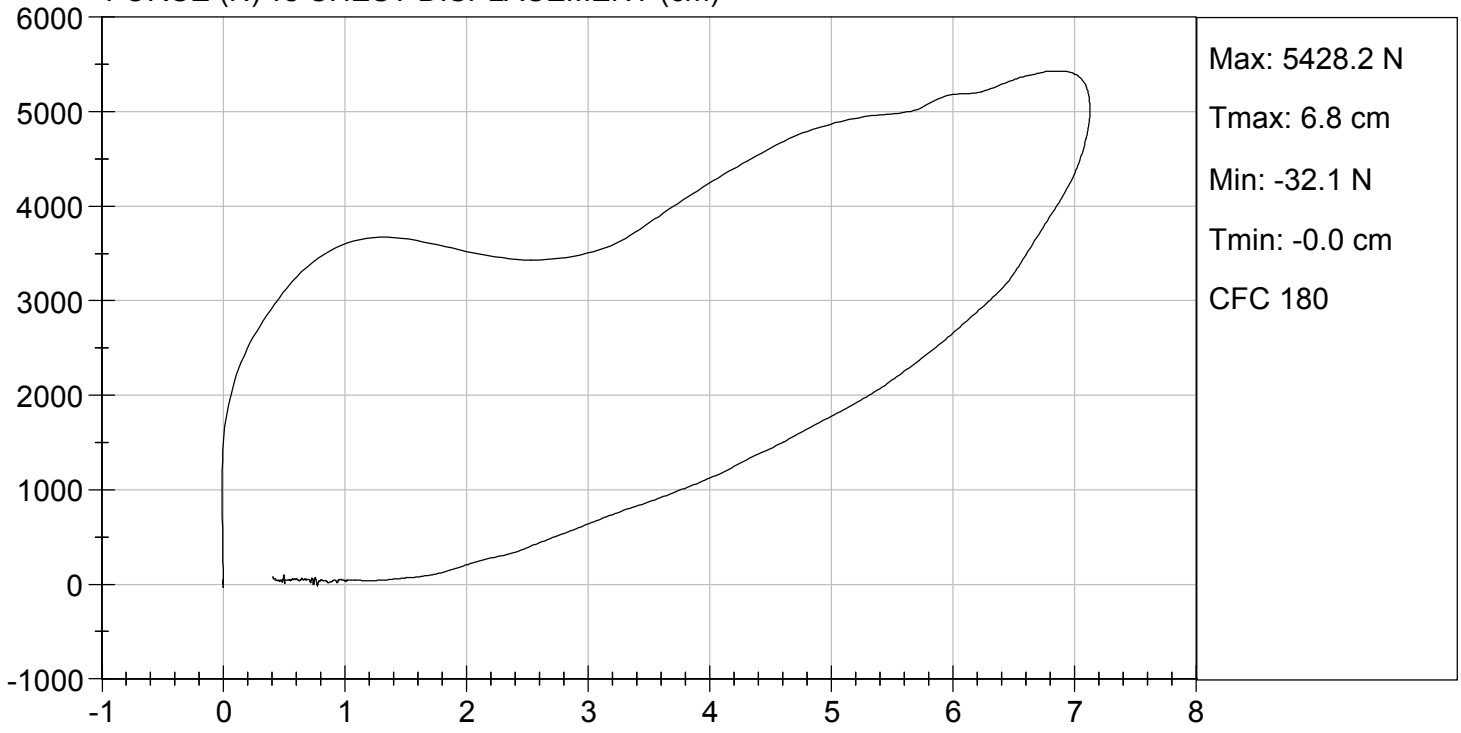
10/26/2020
Test Date

Approved By

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

TEST DATE: 10/26/2020
TEST #: D202694

FORCE (N) vs CHEST DISPLACEMENT (cm)



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D202695

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Probe Velocity	m/s	2.07 to 2.13	2.10	Pass
Peak Probe Force	N	4715 to 5782	4,737	Pass
		Overall Test Results		Pass

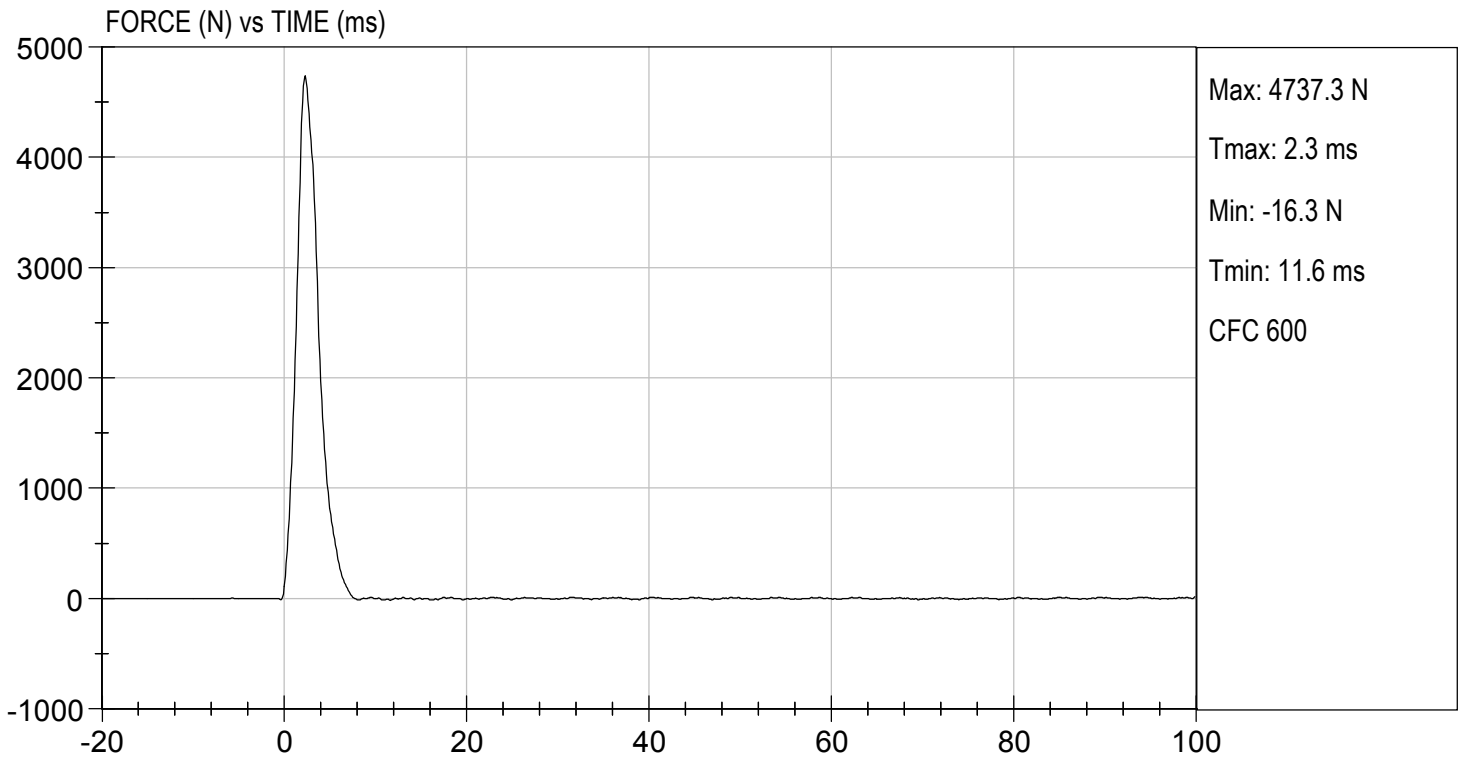
Gerald Guerrero
Laboratory Technician

10/27/2020
Test Date

Approved By

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

TEST DATE: 10/27/2020
TEST #: D202695



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D202696

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Probe Velocity	m/s	2.07 to 2.13	2.09	Pass
Peak Probe Force	N	4715 to 5782	4,749	Pass
		Overall Test Results		Pass

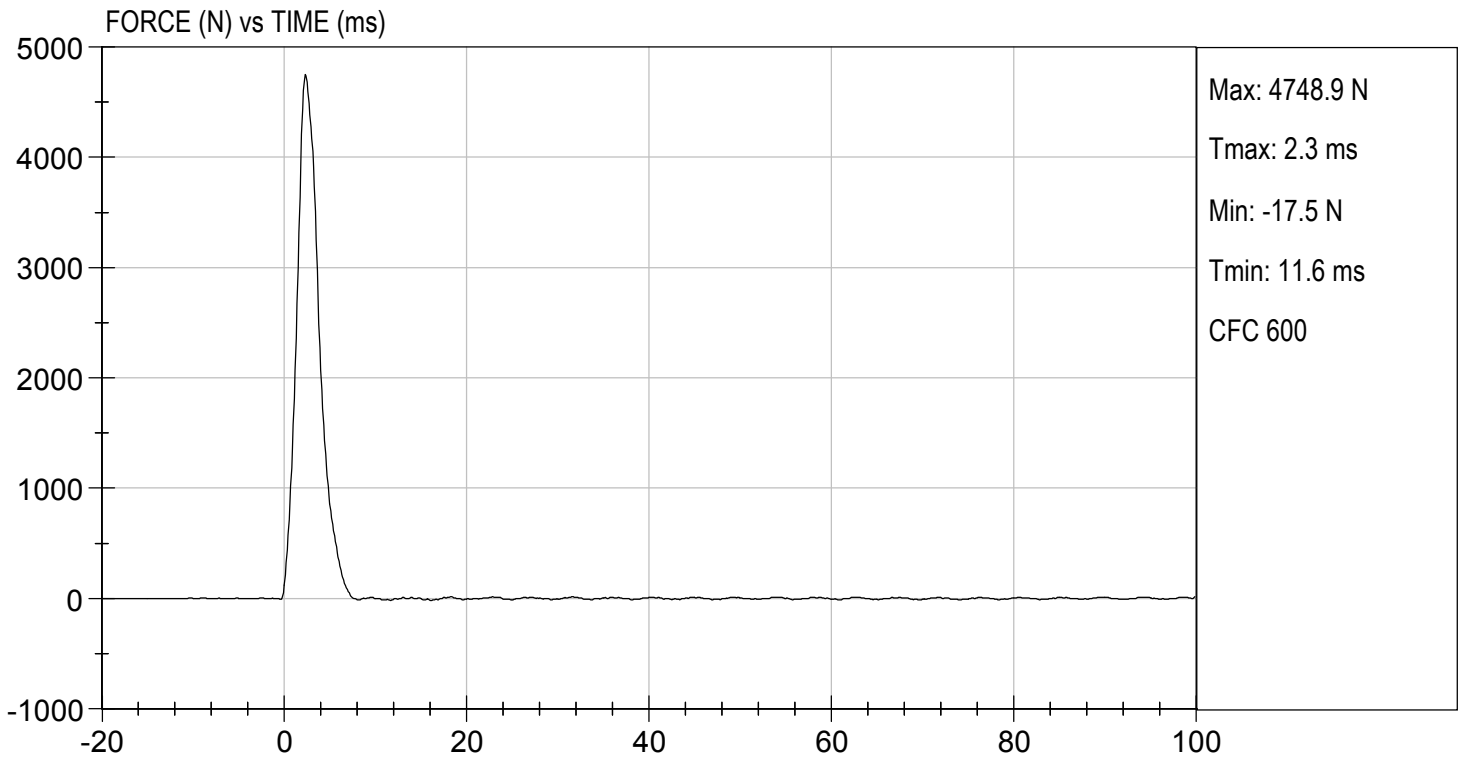
Gerald Guerrero
Laboratory Technician

10/27/2020
Test Date

Approved By

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

TEST DATE: 10/27/2020
TEST #: D202696



MGA RESEARCH CORPORATION

HIP-FEMUR FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D202690

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.2	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	23	23	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.4	6.4	Pass
30 Degrees	Nm	94.9 Nm Max	87.6	83.4	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	44.8	44.3	Pass
		Overall Test Results			Pass

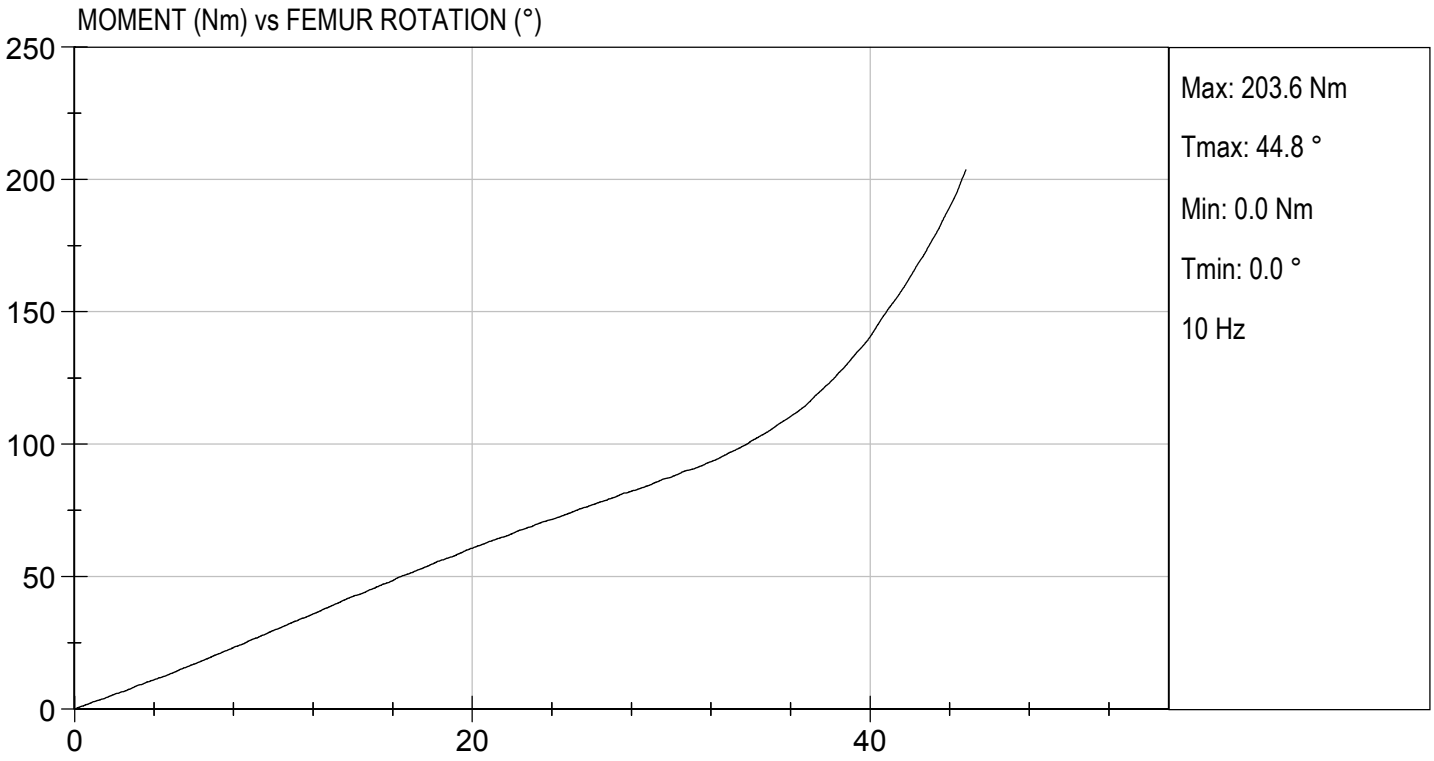
Gerald Guerrero
Laboratory Technician

10/27/2020
Test Date

Approved By

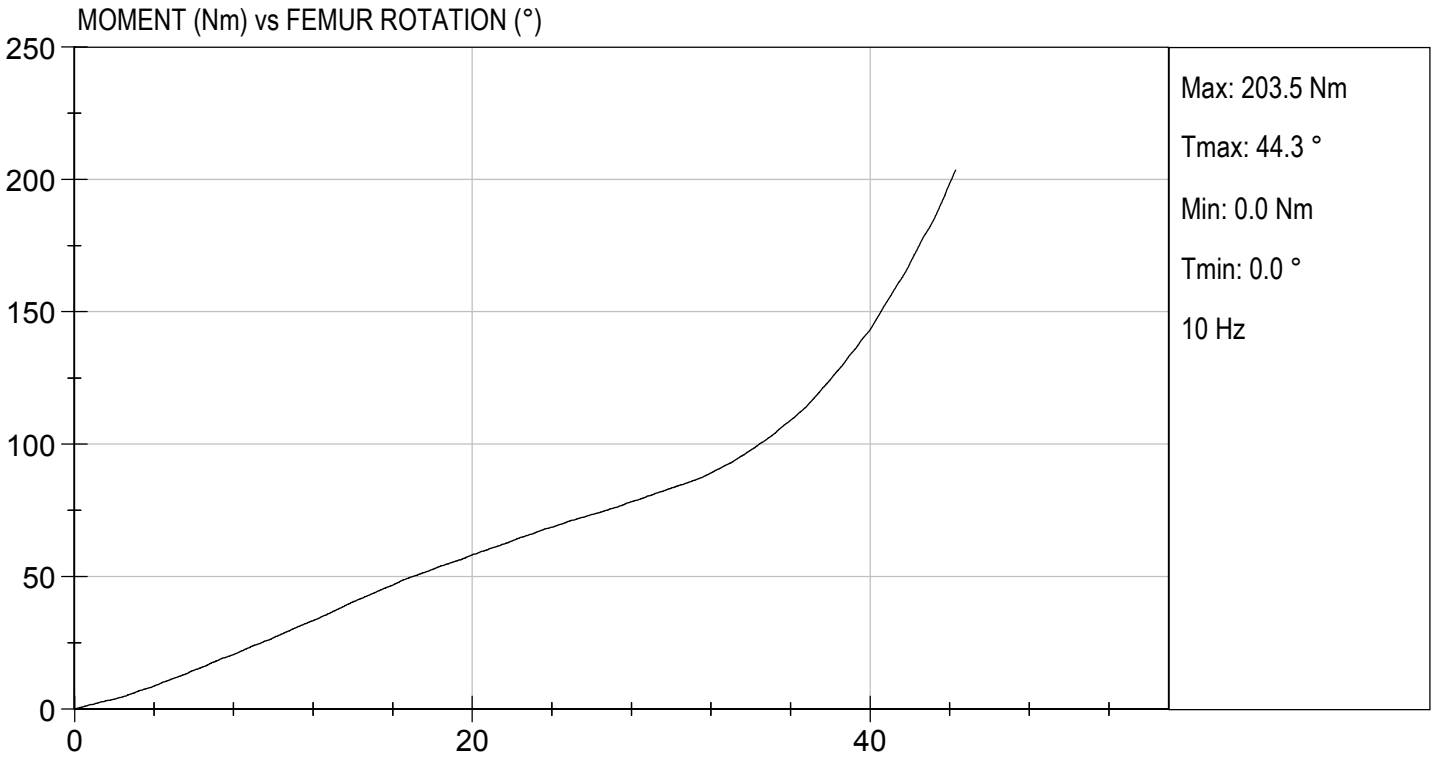
TEST DESC: RIGHT HIP FEMUR FLEXION

TEST DATE: 10/27/2020
TEST #: D202699



TEST DESC: LEFT HIP FEMUR FLEXION

TEST DATE: 10/27/2020
TEST #: D202690



CALIBRATION TEST RESULTS

POST-TEST

HYBRID III 50TH PERCENTILE MALE - DRIVER ATD

MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test ID:** D203021

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	31	Pass
Peak Resultant Acceleration	G's	225 to 275	254	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-7.1	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Alex Thomas
Laboratory Technician

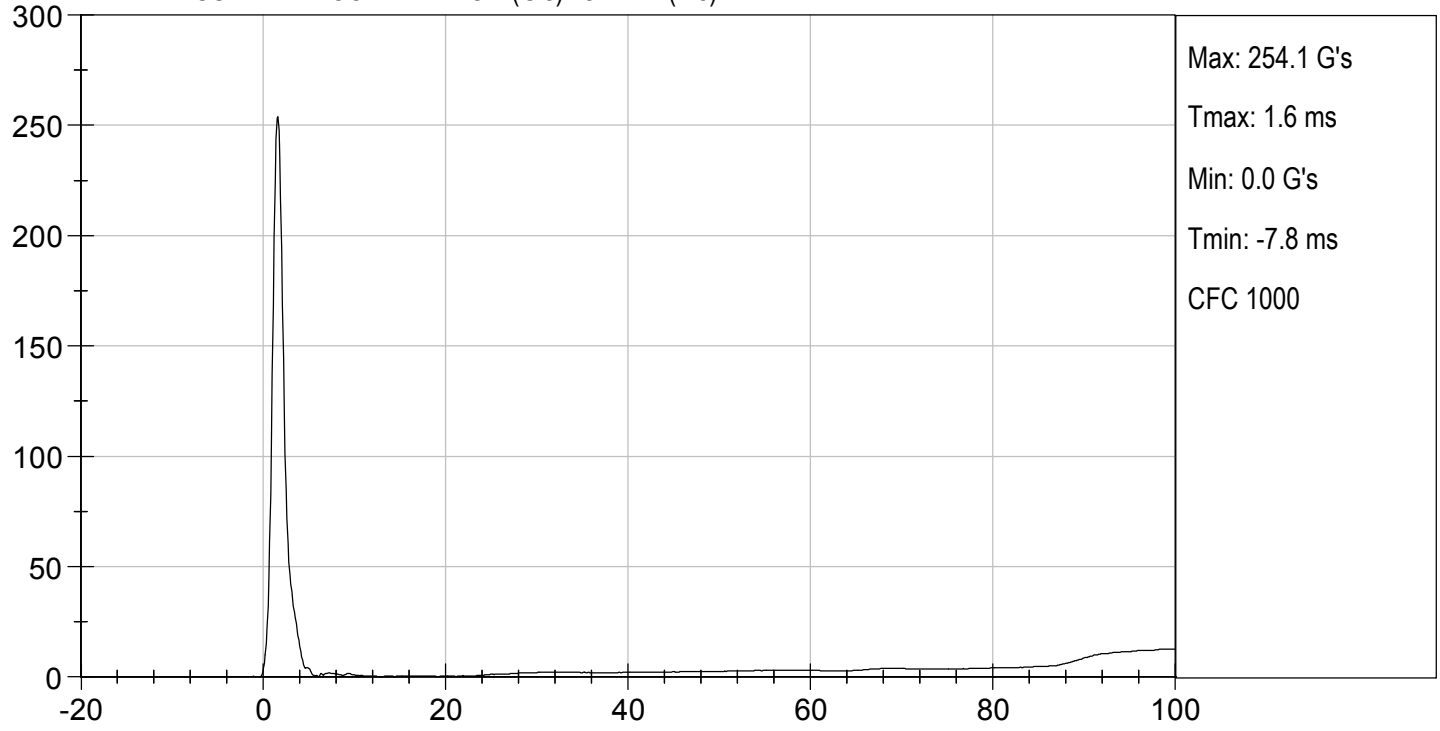
11/20/2020
Test Date

Approved By

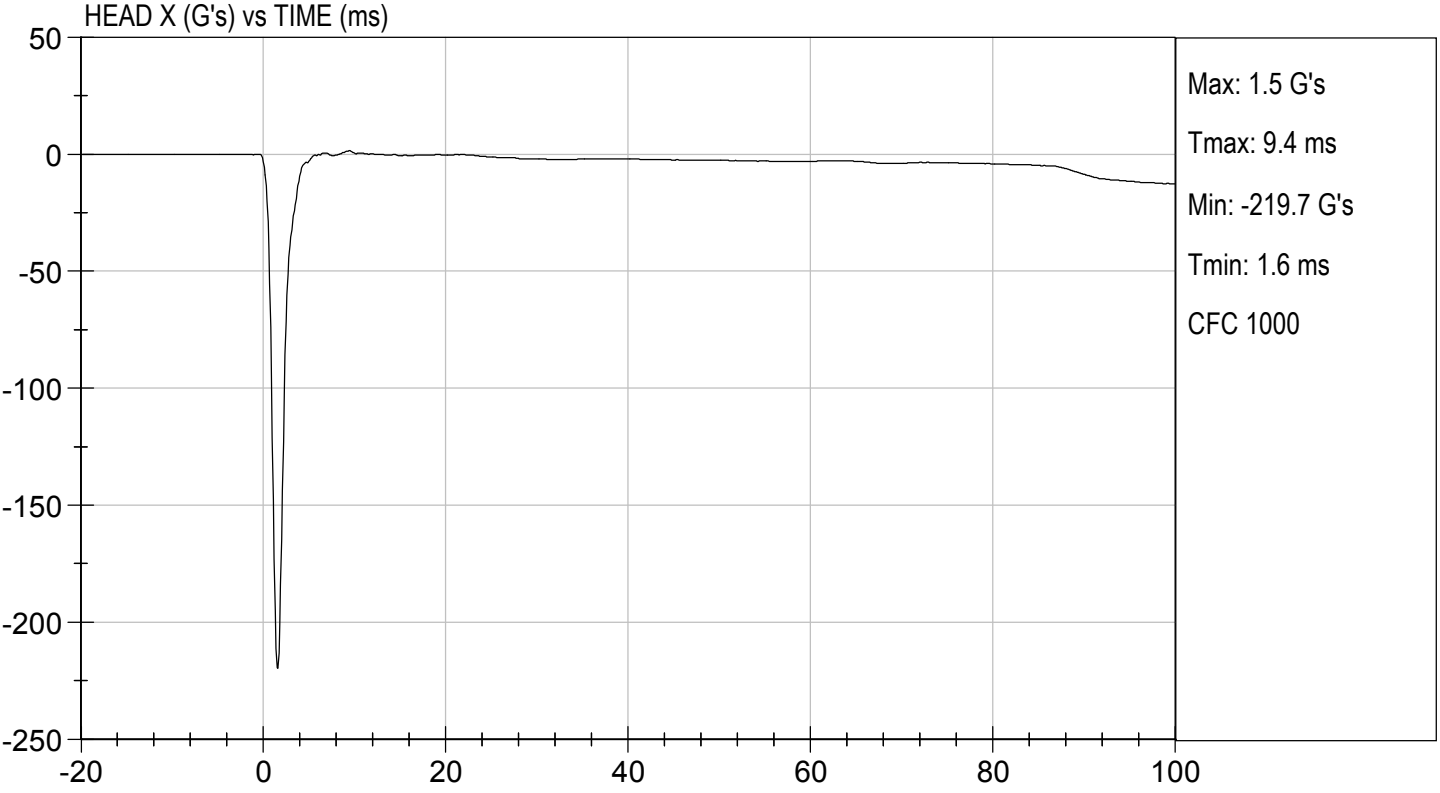
TEST DESC: HEAD DROP

TEST DATE: 11/20/2020
TEST #: D203021

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

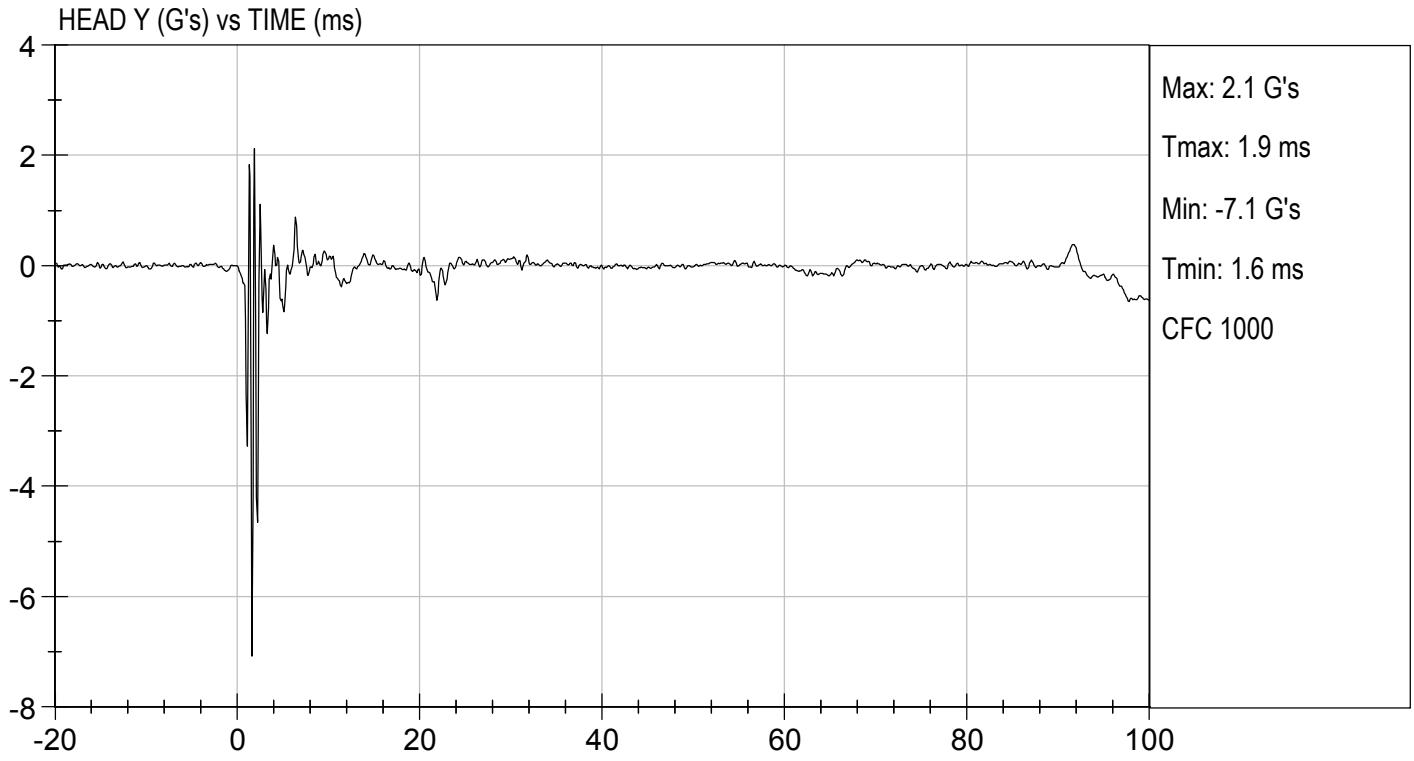


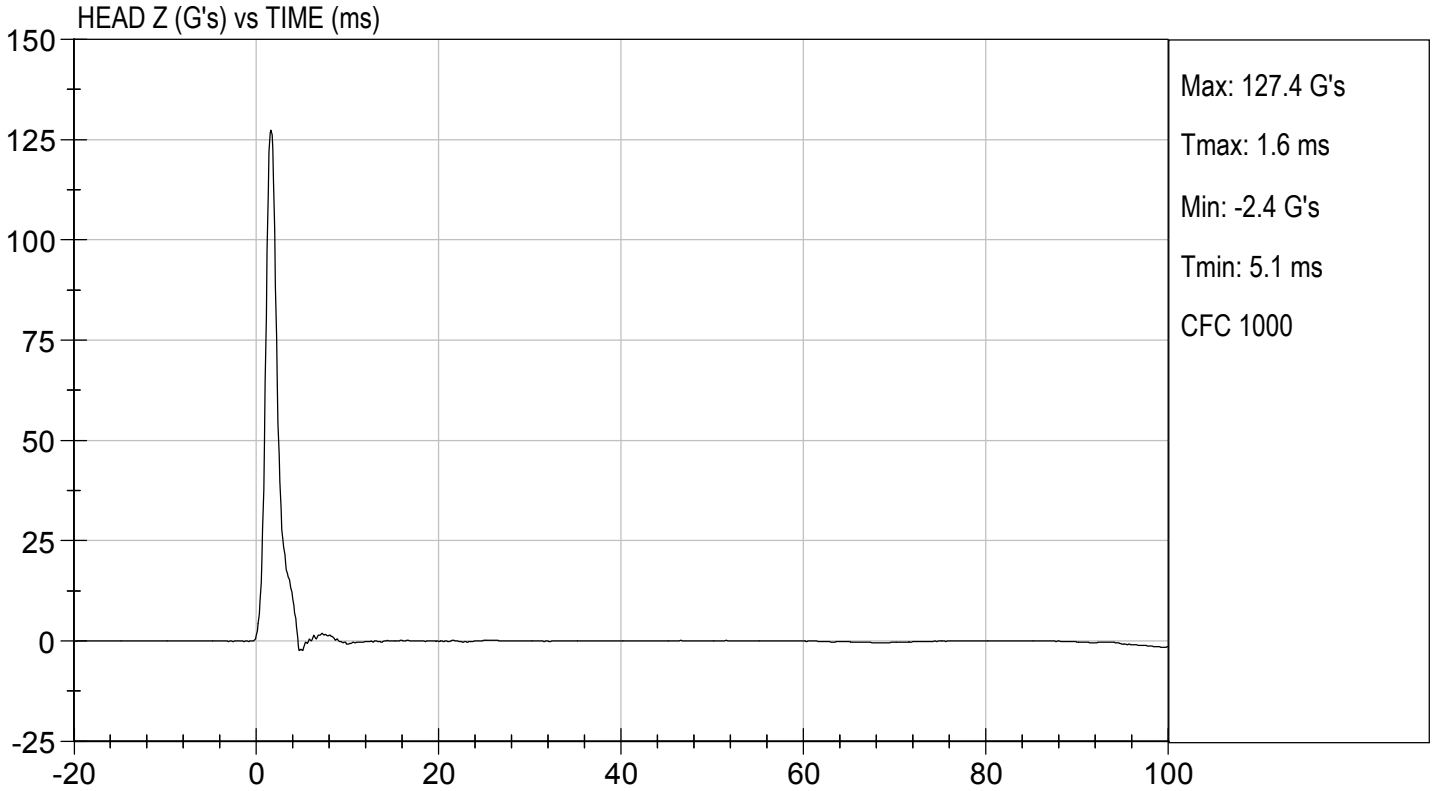
HEAD X (G's) vs TIME (ms)



TEST DESC: HEAD DROP

TEST DATE: 11/20/2020
TEST #: D203021





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D203022

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity		%	10 to 70	31	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.33	Pass
	20 ms	G's	17.60 to 22.60	19.41	Pass
	30 ms	G's	12.50 to 18.50	13.90	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	13.9	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	37.6	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	71.2	Pass
	Time	ms	57.0 to 64.0	58.4	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	116.3	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	90.9	Pass
	Time	ms	47.0 to 58.0	49.8	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	100.1	Pass
			Overall Test Results		Pass

Alex Thomas

Laboratory Technician

11/20/2020

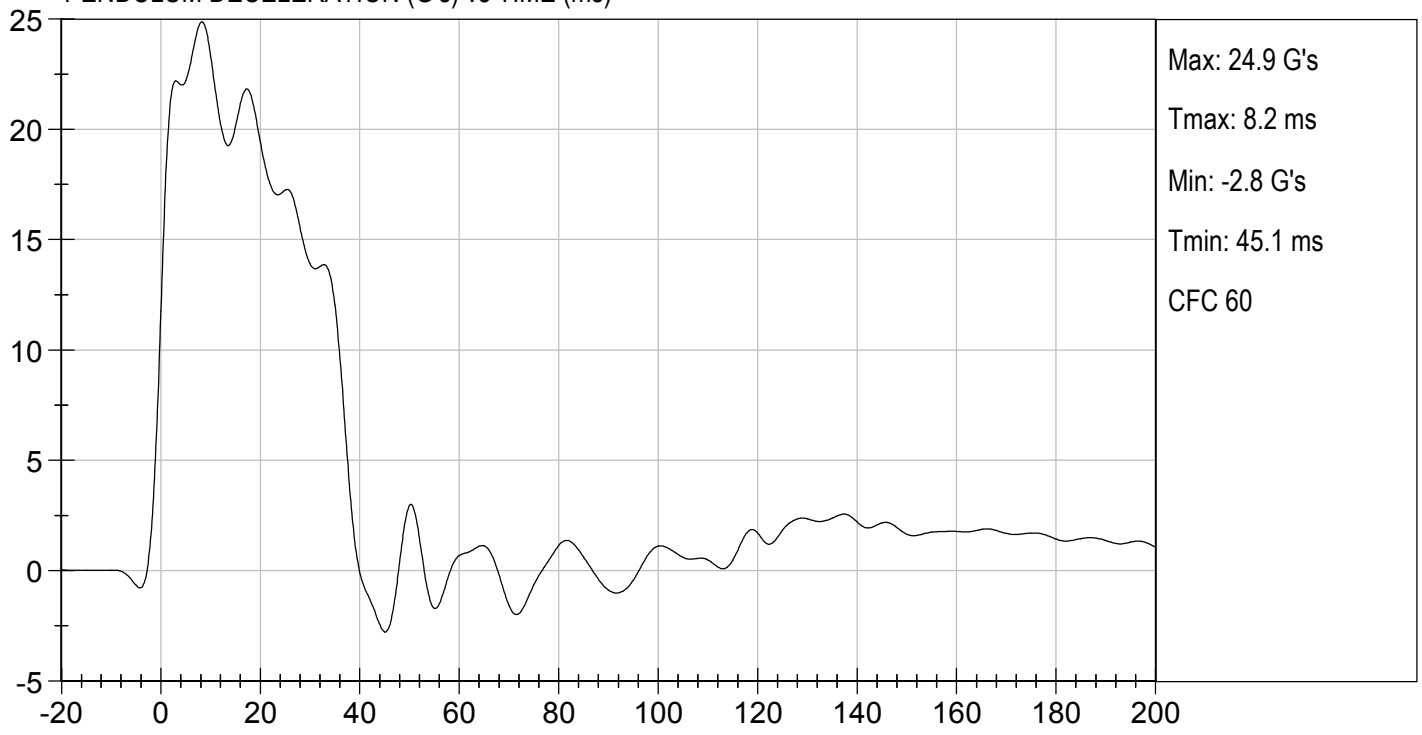
Test Date

Approved By

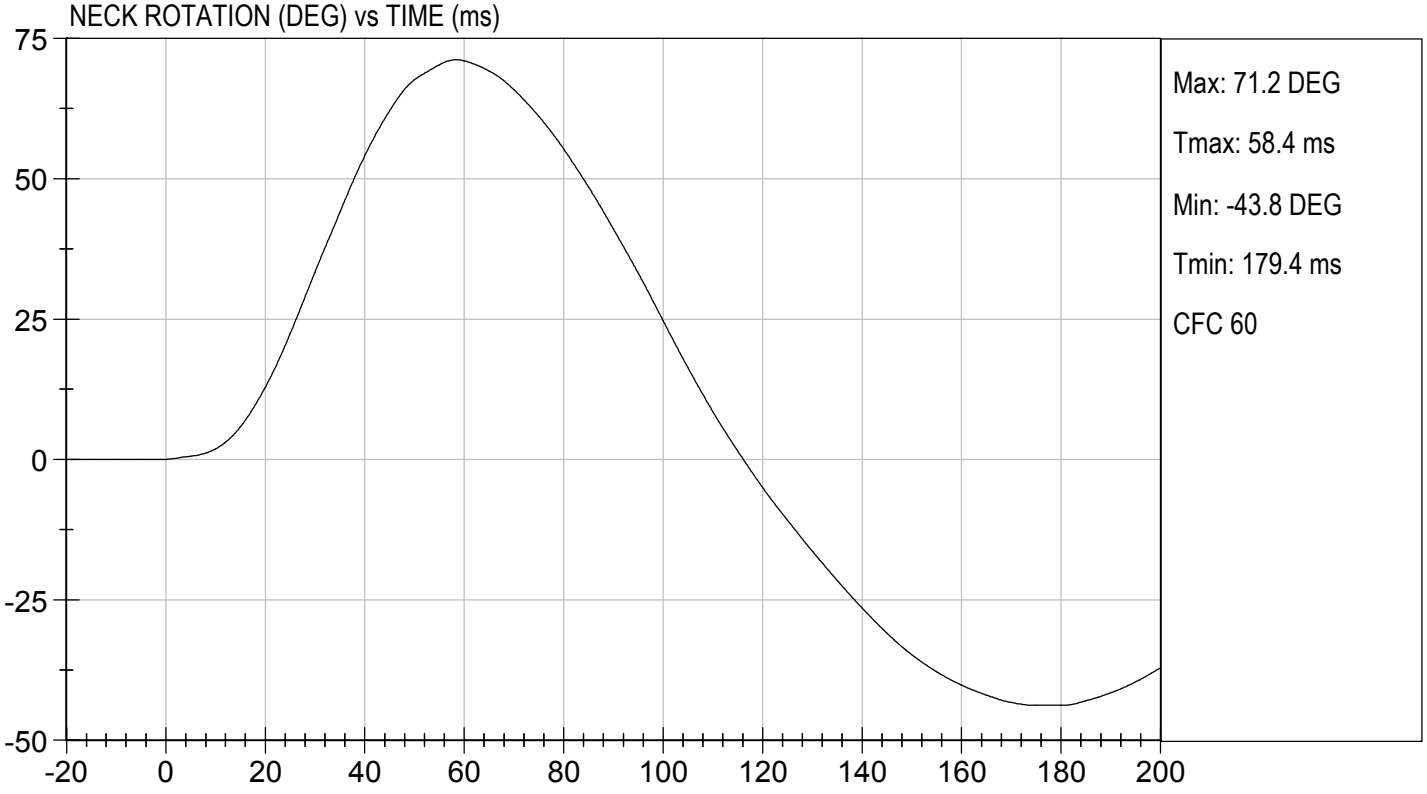
TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

TEST DATE: 11/20/2020
TEST #: D203022

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

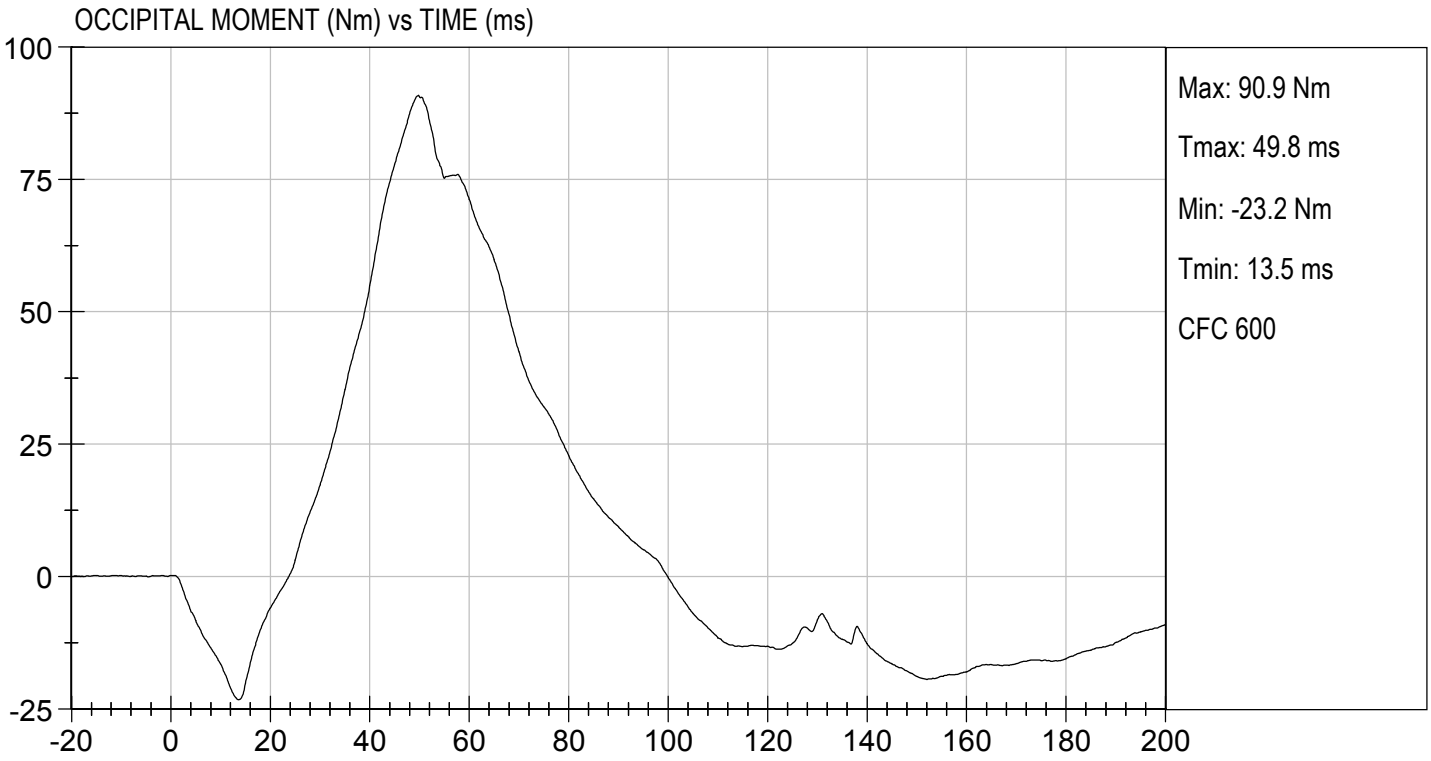


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 11/20/2020
TEST #: D203022



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D203023

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity		%	10 to 70	31	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	17.57	Pass
	20 ms	G's	14.00 to 19.00	17.17	Pass
	30 ms	G's	11.00 to 16.00	13.56	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	13.7	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	38.9	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	91.2	Pass
	Time	ms	72.0 to 82.0	75.7	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	152.5	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-64.3	Pass
	Time	ms	65.0 to 79.0	69.0	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	140.7	Pass
			Overall Test Results		Pass

Alex Thomas

Laboratory Technician

11/20/2020

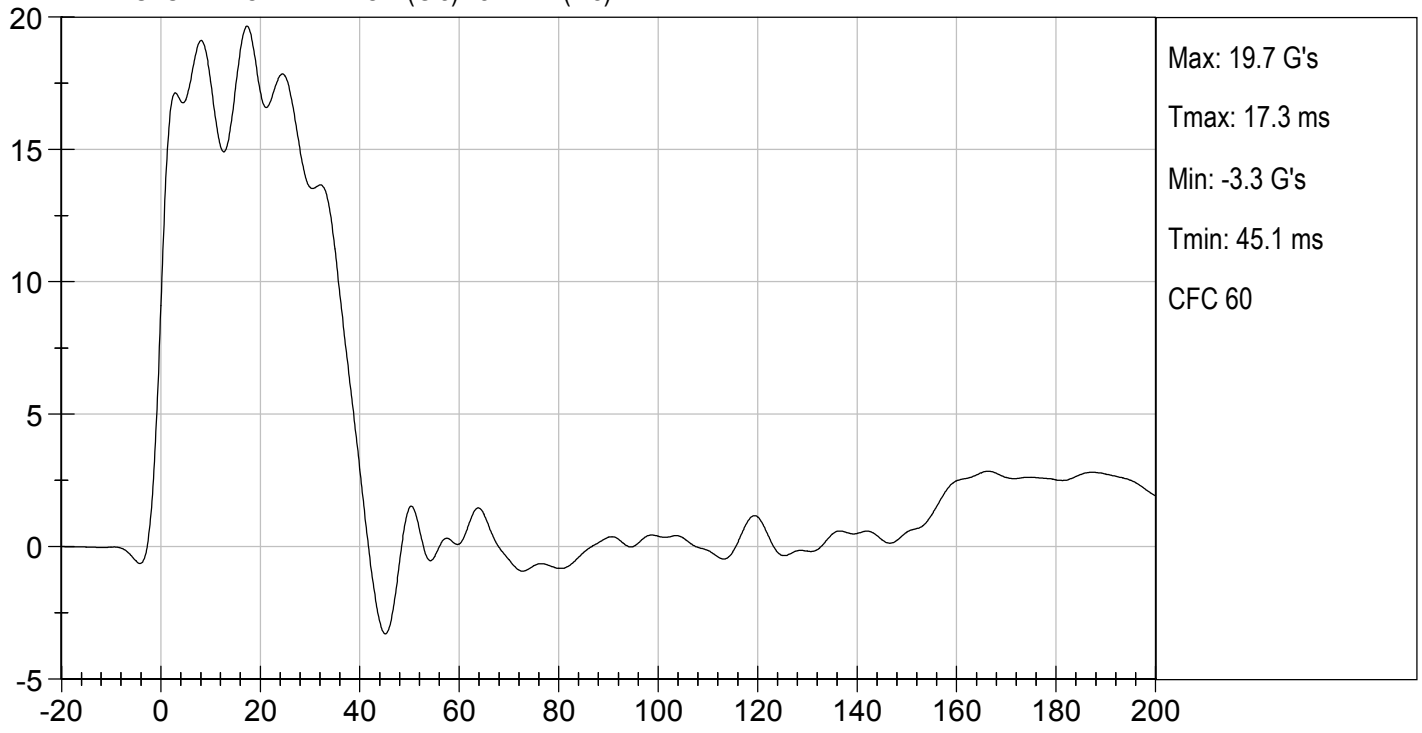
Test Date

Approved By

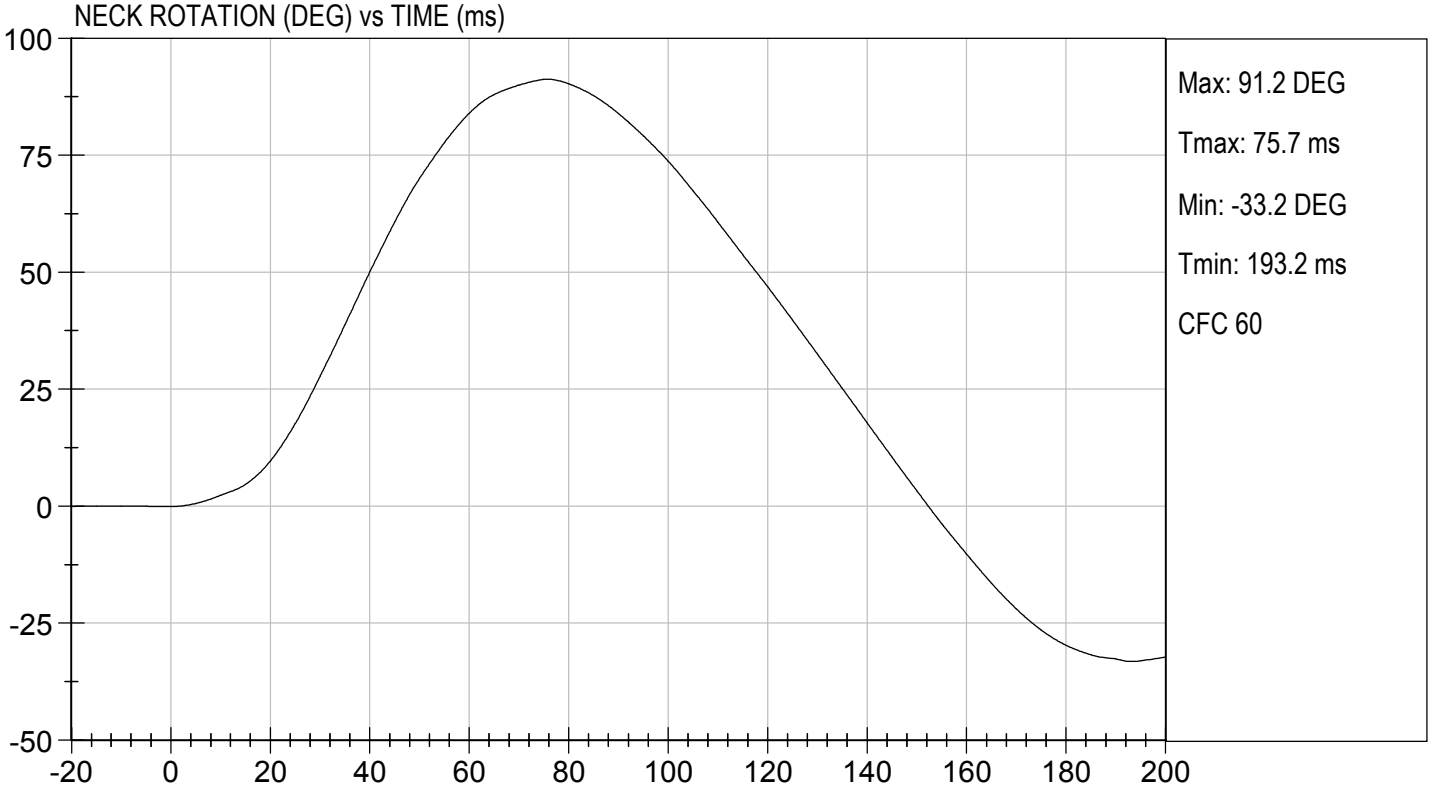
TEST DESC: NECK EXTENSION
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 11/20/2020
TEST #: D203023

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

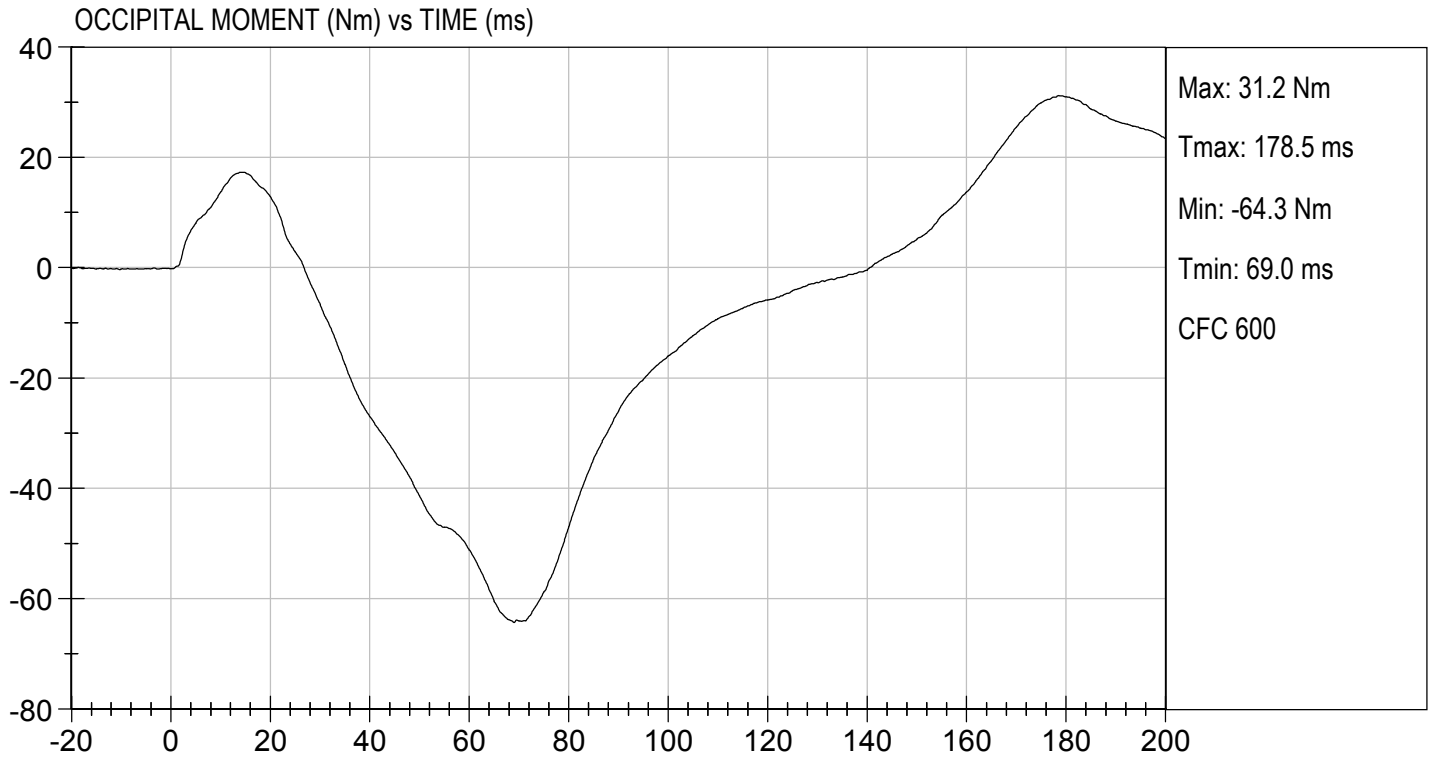


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 11/20/2020
TEST #: D203023



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D203024

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,329	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	7.18	Pass
Internal Hysteresis	%	69 to 85	69	Pass
		Overall Test Results		Pass

Laboratory Technician

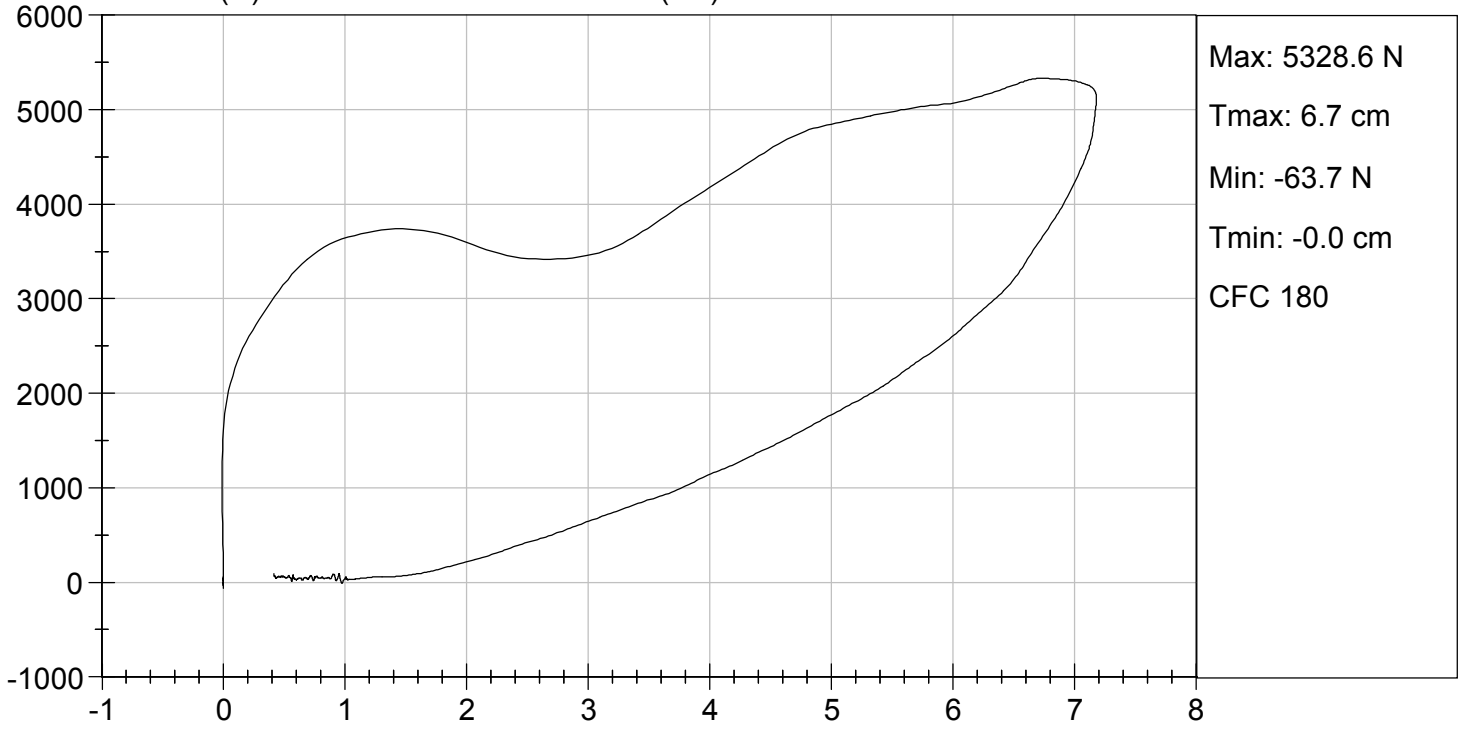
11/19/2020
Test Date

Approved By

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

TEST DATE: 11/19/2020
TEST #: D203024

FORCE (N) vs CHEST DISPLACEMENT (cm)



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D203025

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	31	Pass
Probe Velocity	m/s	2.07 to 2.13	2.10	Pass
Peak Probe Force	N	4715 to 5782	5,246	Pass
		Overall Test Results		Pass

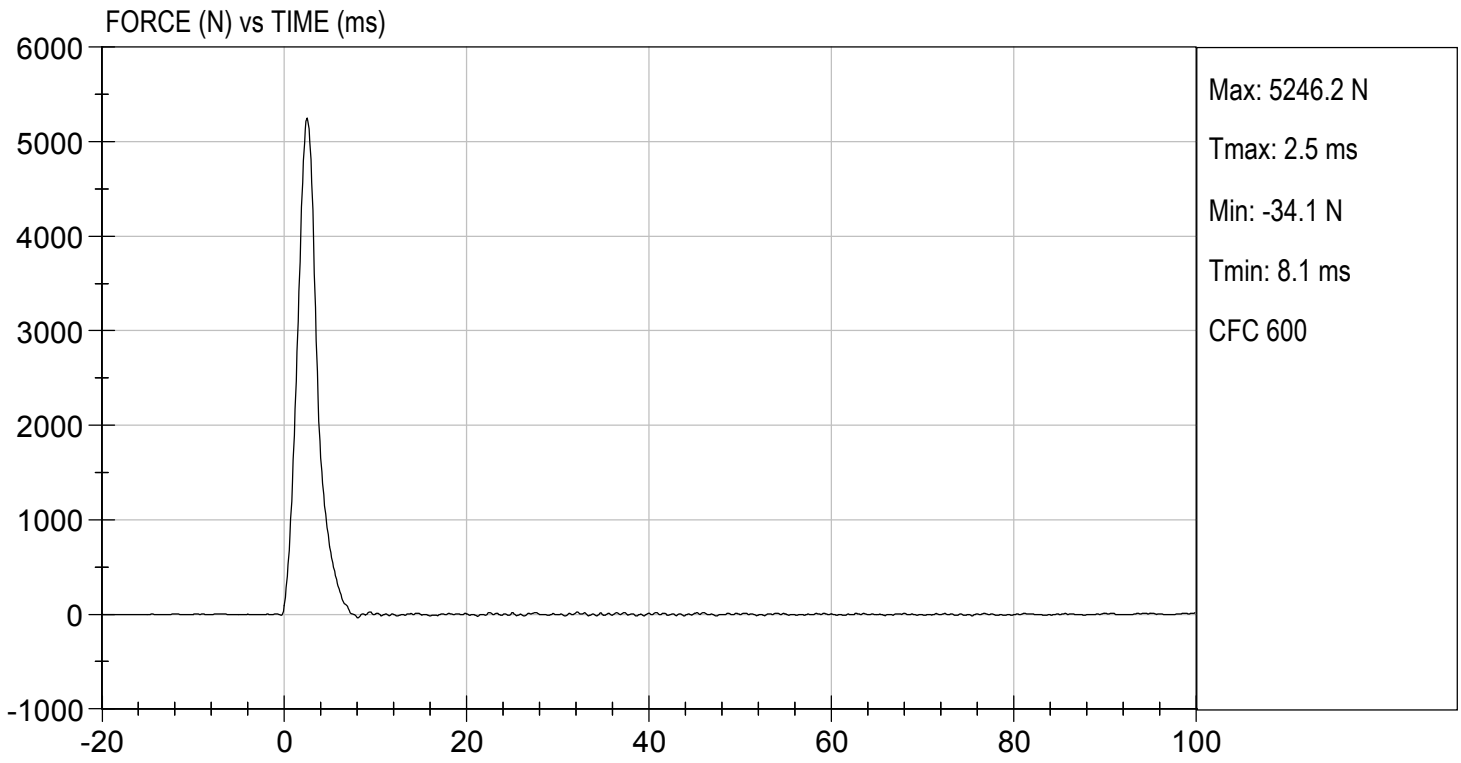
Laboratory Technician

11/23/2020
Test Date

Approved By

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

TEST DATE: 11/23/2020
TEST #: D203025



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D203026

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	31	Pass
Probe Velocity	m/s	2.07 to 2.13	2.11	Pass
Peak Probe Force	N	4715 to 5782	5,200	Pass
		Overall Test Results		Pass

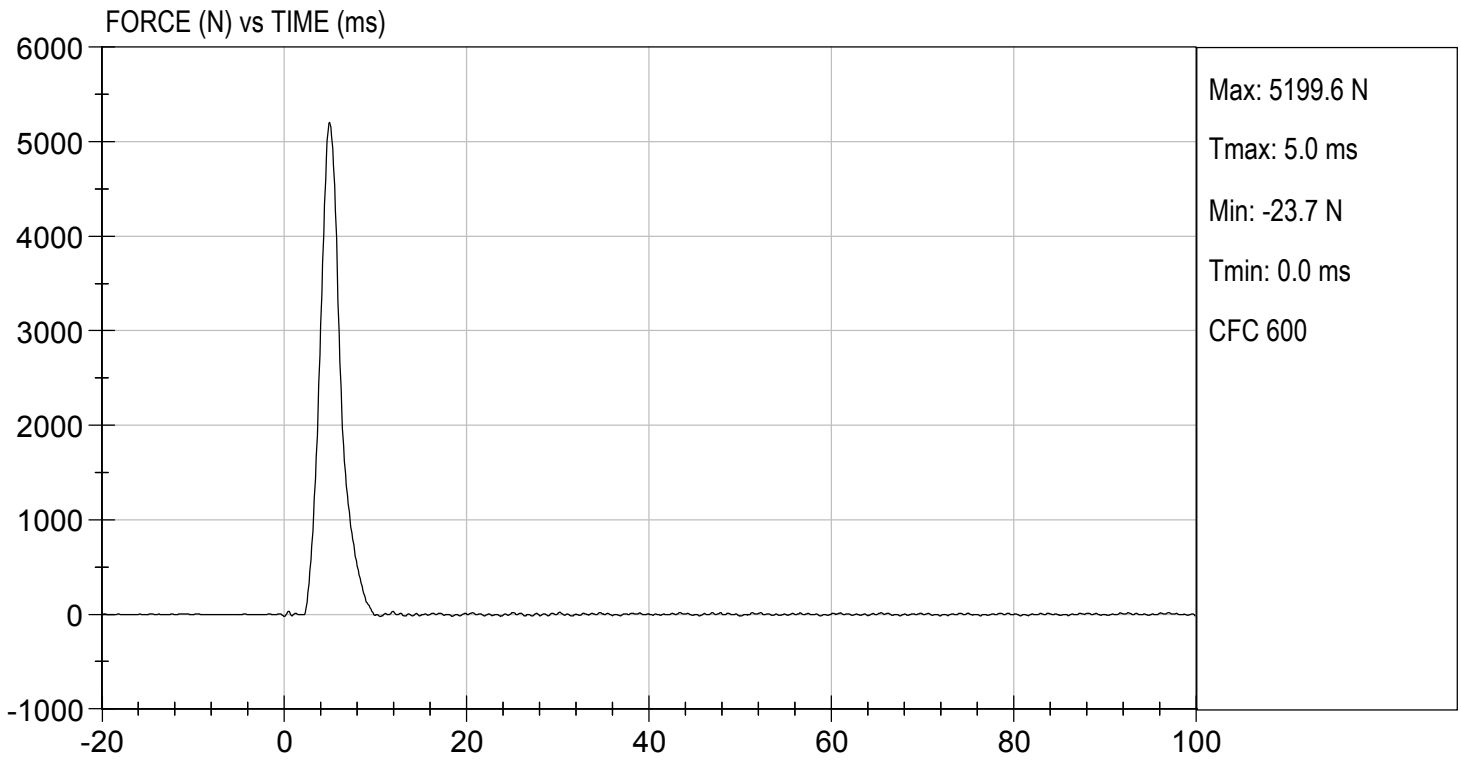
Laboratory Technician

11/23/2020
Test Date

Approved By

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

TEST DATE: 11/23/2020
TEST #: D203026



MGA RESEARCH CORPORATION

HIP-FEMUR FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D203020

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	25	25	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.4	6.4	Pass
30 Degrees	Nm	94.9 Nm Max	87.7	87.1	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	44.5	44.3	Pass
		Overall Test Results			Pass

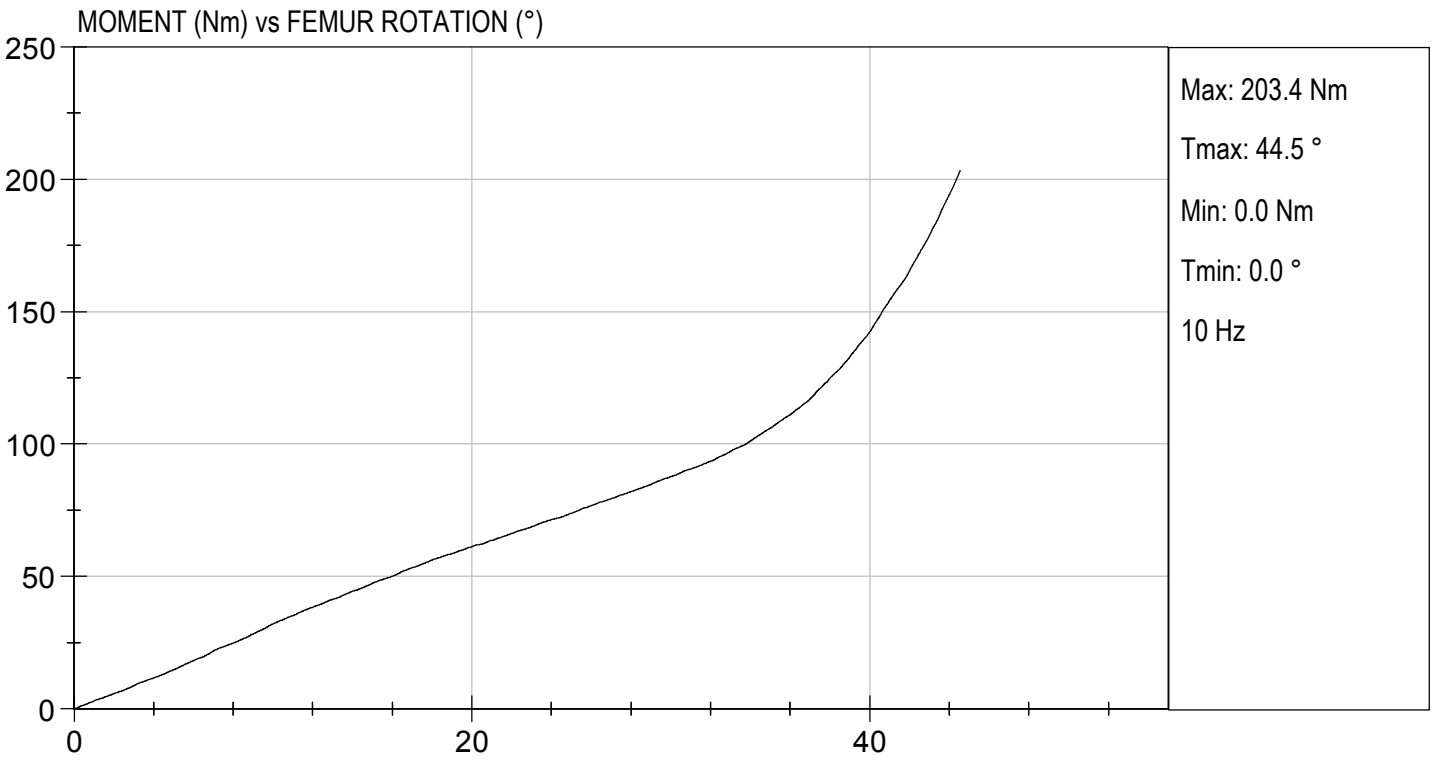
Laboratory Technician

11/23/2020
Test Date

Approved By

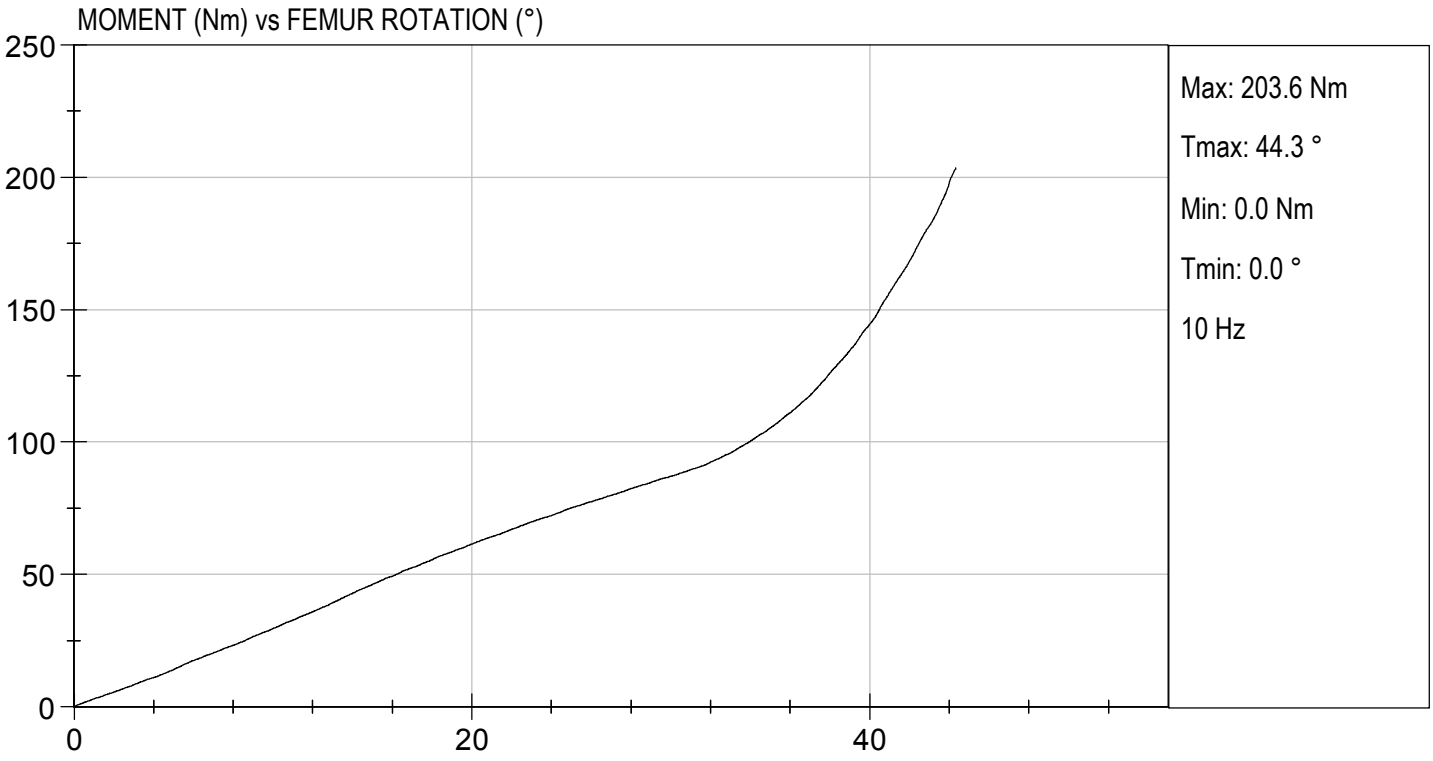
TEST DESC: RIGHT HIP FEMUR FLEXION

TEST DATE: 11/23/2020
TEST #: D203029



TEST DESC: LEFT HIP FEMUR FLEXION

TEST DATE: 11/23/2020
TEST #: D203020



CALIBRATION TEST RESULTS

PRE-TEST

HYBRID III 5TH PERCENTILE FEMALE - PASSENGER ATD

Hybrid III, 5th External Measurements
SN: DH1659

HYBRID III, PART 572, SUBPART O EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	774.7-800.1	778
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	440
C	H-POINT HEIGHT	Reference	81.3-86.3	85
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	147
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	82
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	130
G	BACK OF ELBOW TO WRIST PIVOT	back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	243.9-259.1	251
H	HEAD BACK TO BACKLINE	Back of Skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	45
I	SHOULDER TO- ELBOW LENGTH	Measure from the highest point on top of the shoulder clevis to the lowest part of the flesh on the elbow in line with the elbow pivot bolt.	276.8-297.2	285
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	189
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	520.7-546.1	543
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376	357
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	398
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. “K”.	414-439.4	435

HYBRID III, SUBPART O EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 304.8 ± 5.1 mm above seat surface	175.3-190.5	182
P	FOOT LENGTH	Tip of toe to rear of heal	218.5-233.7	221
Q	STANDING HEIGHT	(THEORETICAL)	1501.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	The rear surface of the buttocks to the knee pivot bolt	457.2-482.6	469
S	HEAD BREADTH	The widest part of the head	137.1-147.3	141
T	HEAD DEPTH	Back of the head to the forehead	177.8-188	182
U	HIP BREADTH	The widest part of the hip	299.7-314.9	306
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	357
W	FOOT BREADTH	The widest part of the foot	78.8-94	83
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. “T”	528.3-548.7	542
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	865
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	785
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	332.7-358.1	345
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	160.1-170.2	165

MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659 **Test ID:** D202701

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Peak Resultant Acceleration	G's	250 to 300	295	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-3.0	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Gerald A Guerrero
Laboratory Technician

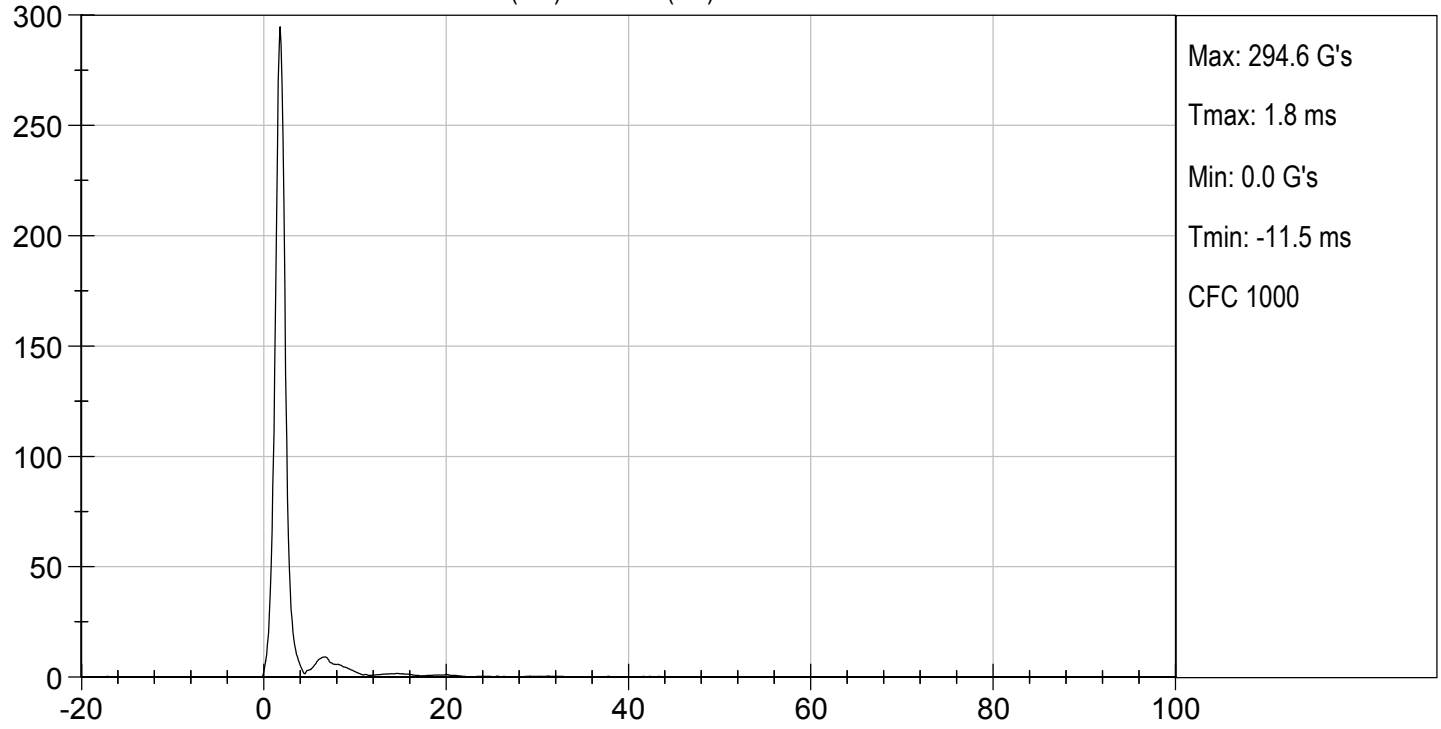
10/27/2020
Test Date

Approved By

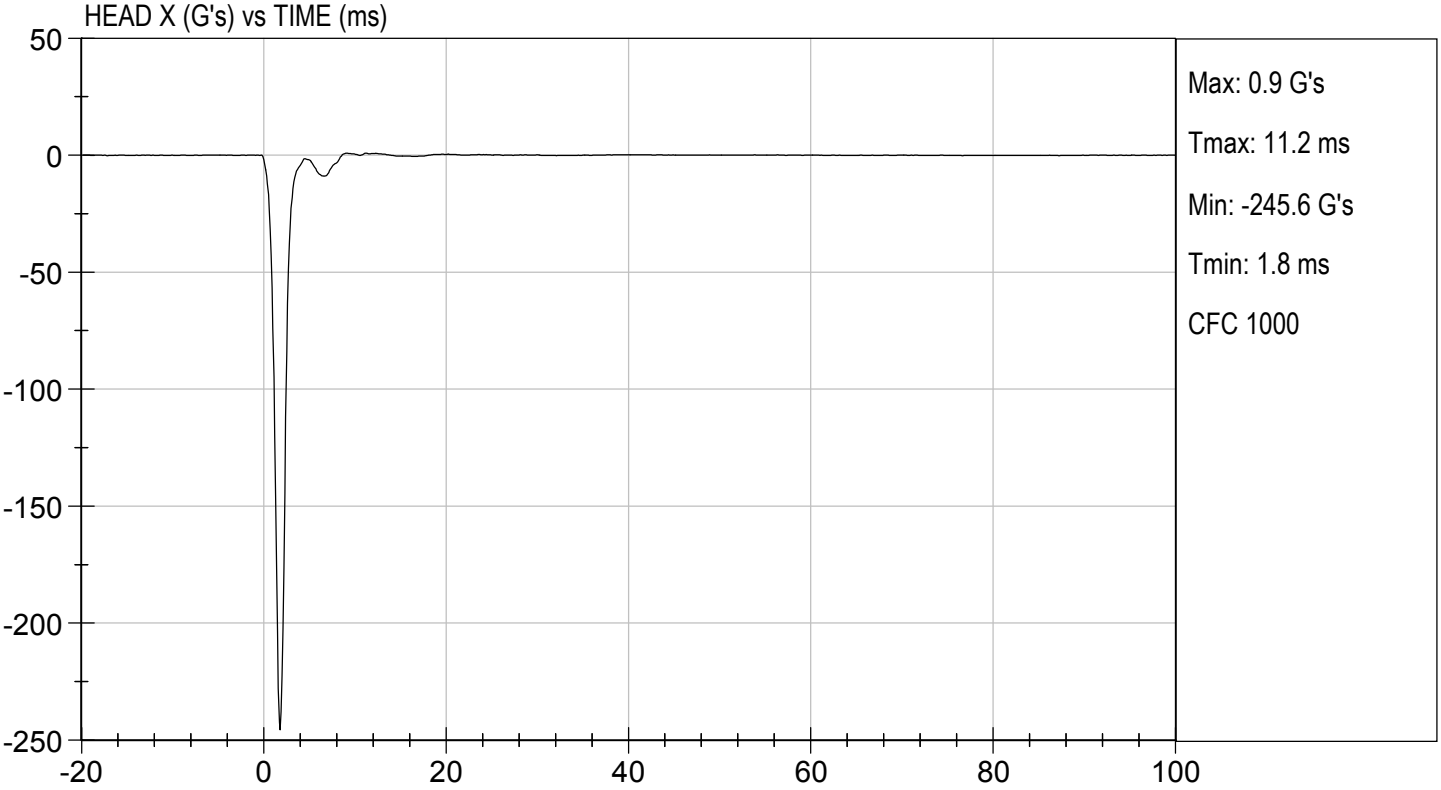
TEST DESC: HEAD DROP

TEST DATE: 10/27/2020
TEST #: D202701

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

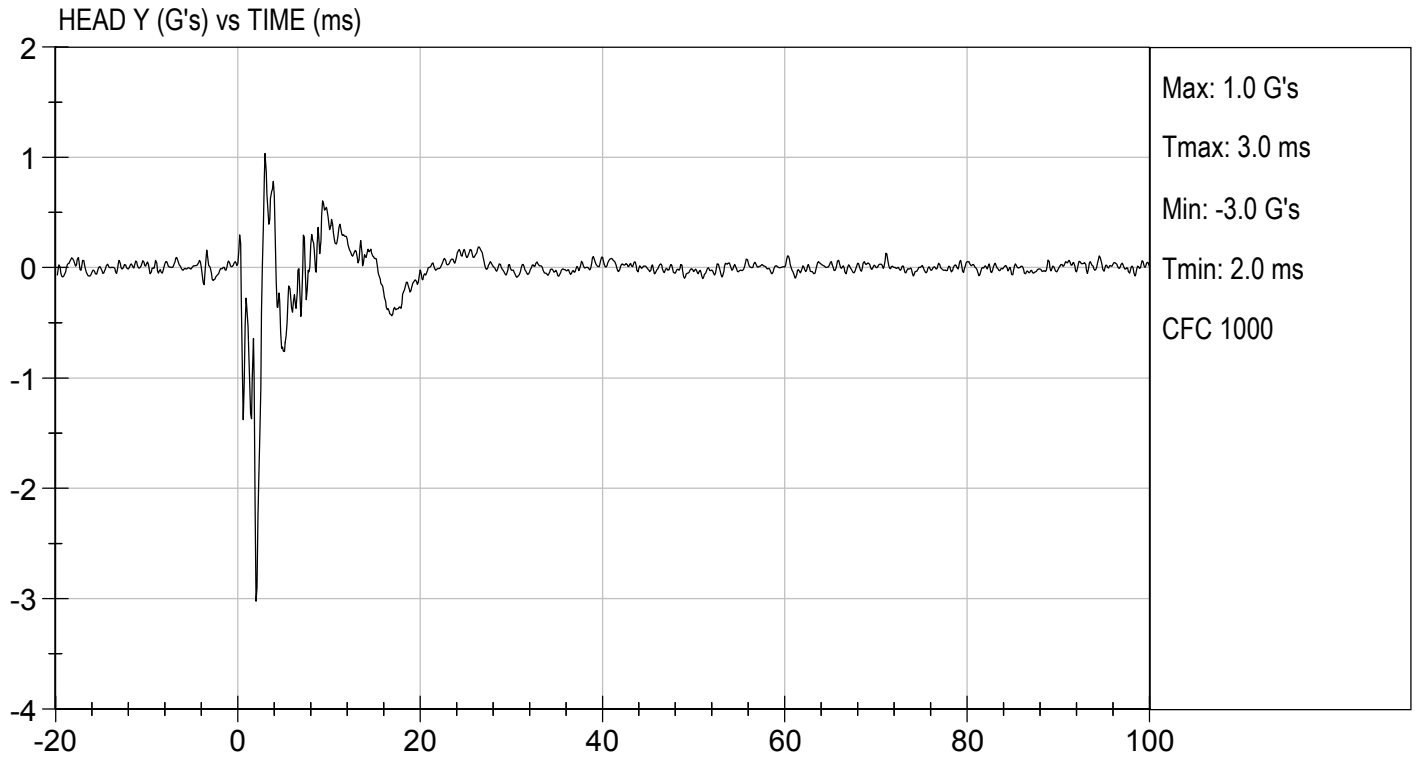


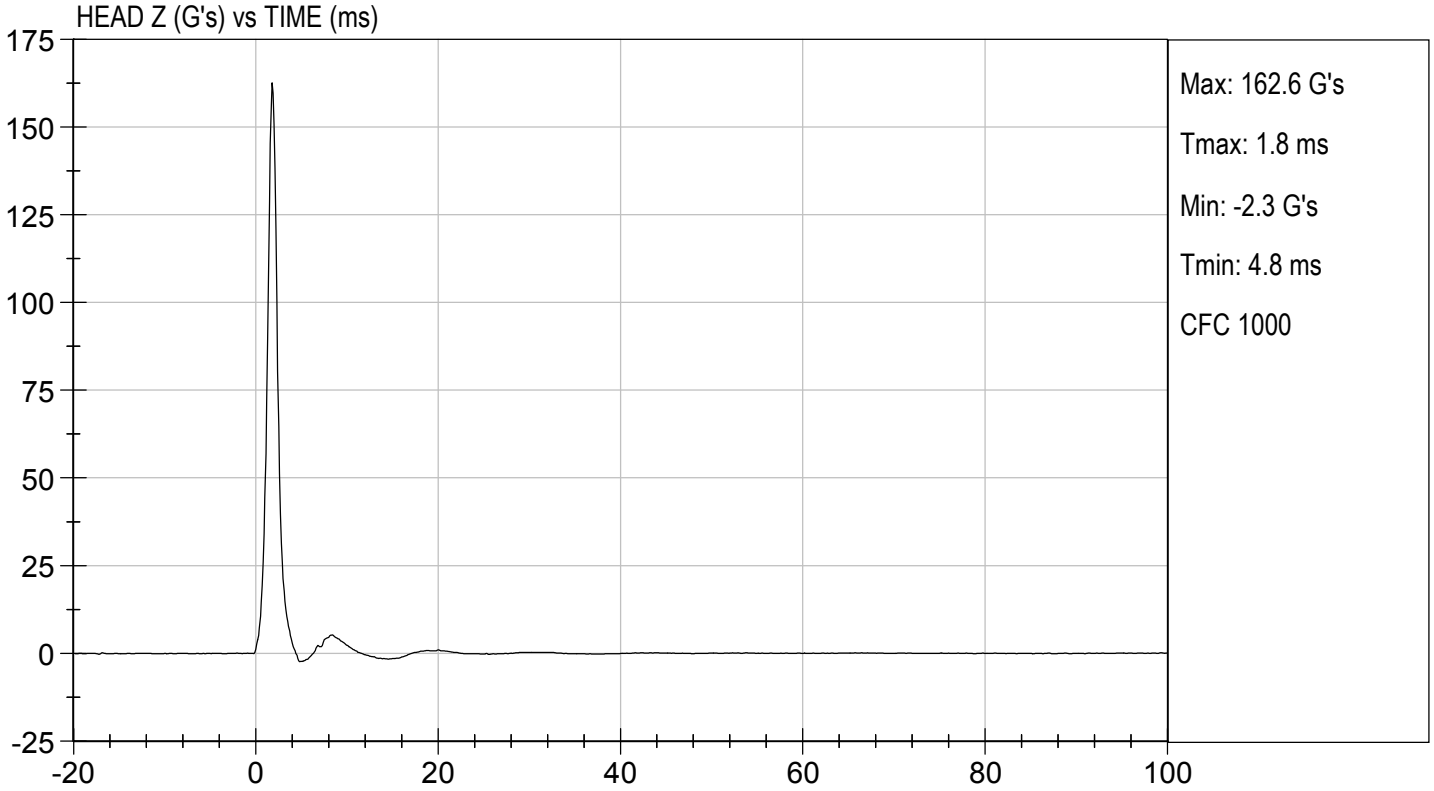
HEAD X (G's) vs TIME (ms)



TEST DESC: HEAD DROP

TEST DATE: 10/27/2020
TEST #: D202701





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659 **Test I.D:** D202702

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	24	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.13	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.2	Pass
	20 ms	m/s	4.0 to 5.0	4.5	Pass
	30 ms	m/s	5.8 to 7.0	6.3	Pass
D Plane Rotation	Max	deg	77 to 91	81	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	74	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	83	Pass
			Overall Results		Pass

Gerald Guerrero
Laboratory Technician

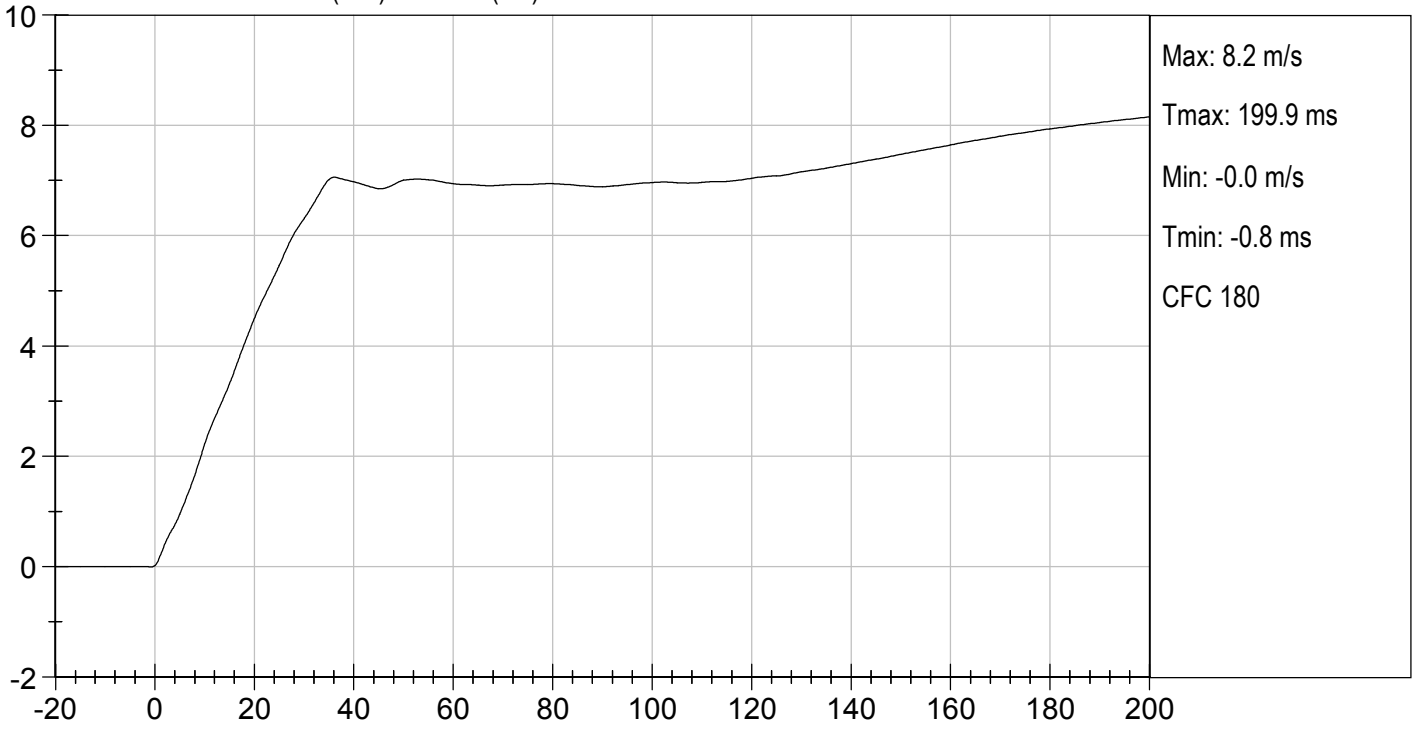
10/27/2020
Test Date

Approved By

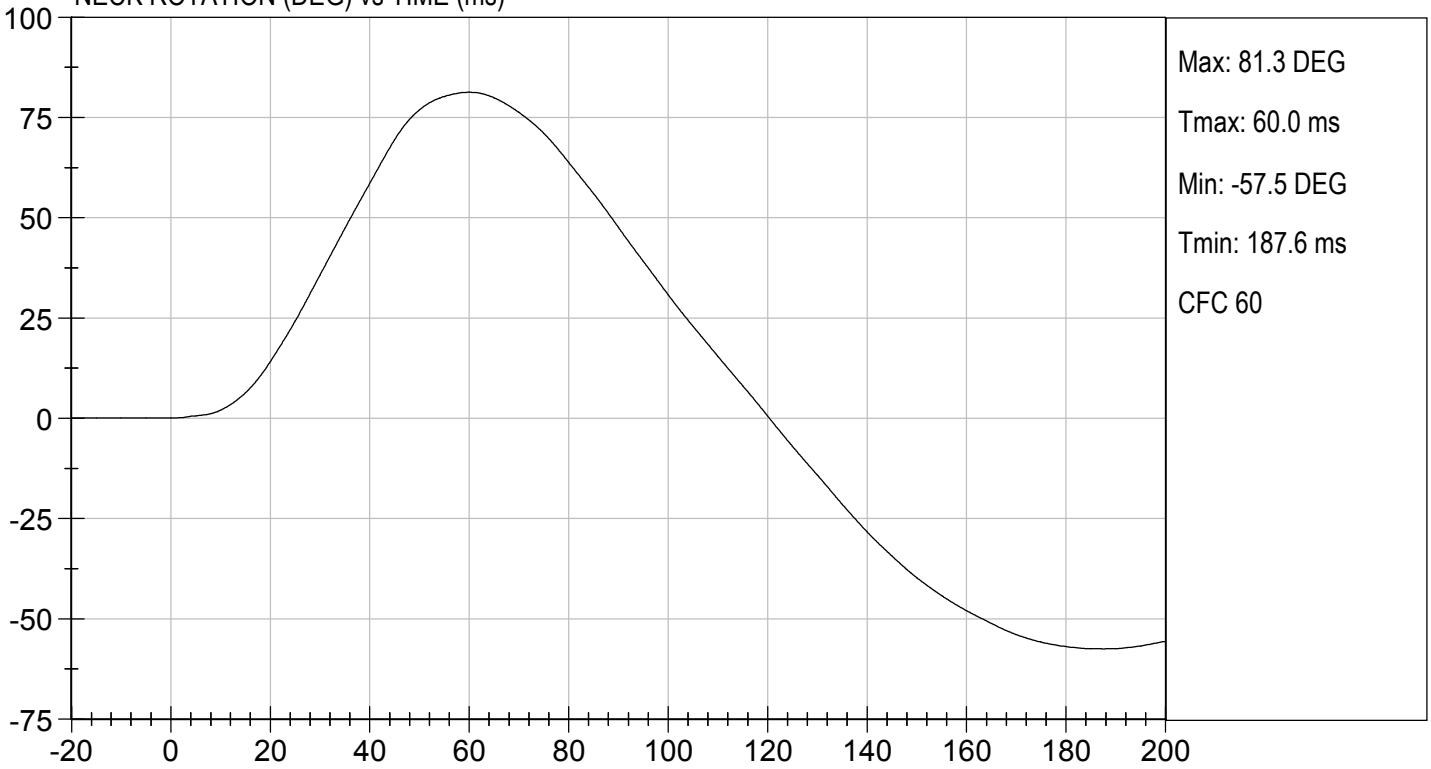
TEST DESC: NECK FLEXION
VELOCITY: 23.40 ft/s, 7.13 m/s

TEST DATE: 10/27/2020
TEST #: D202702

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



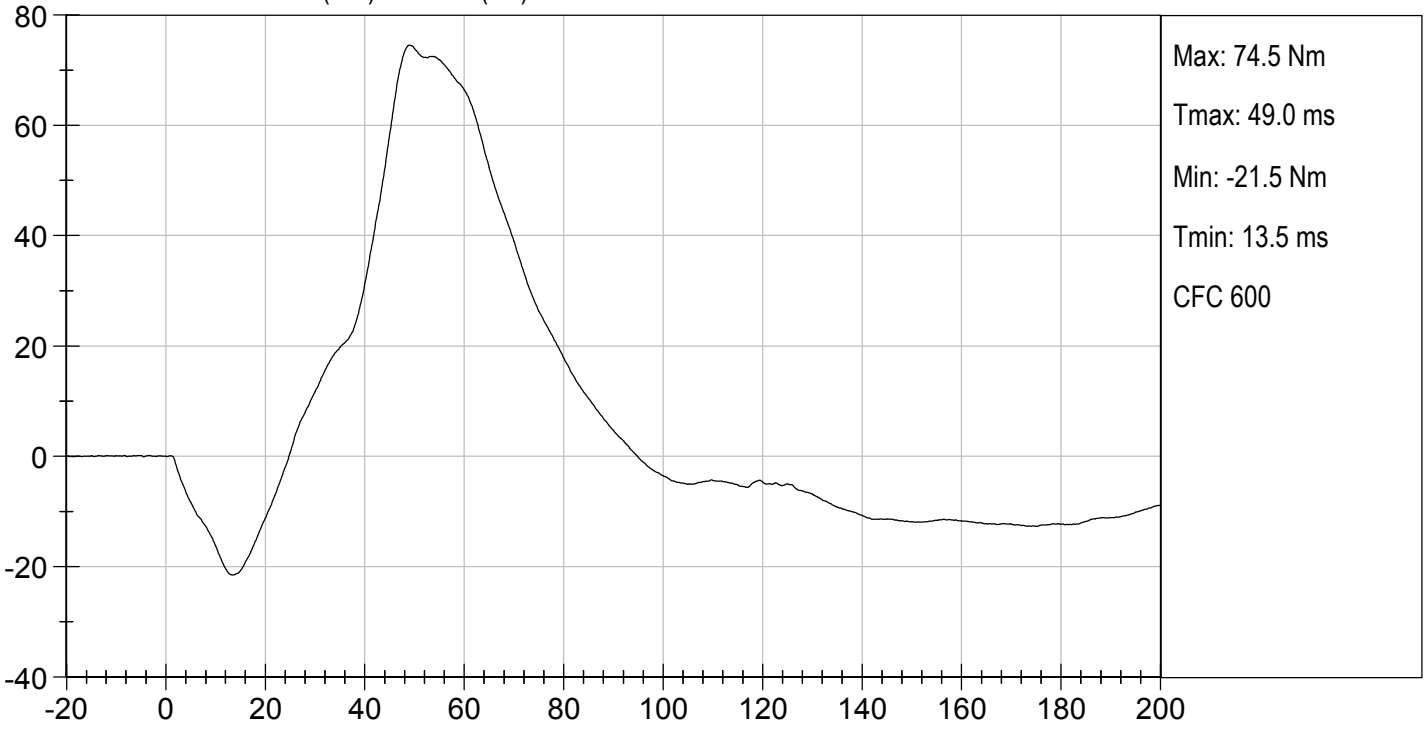
NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 10/27/2020
TEST #: D202702

OCCIPITAL MOMENT (Nm) vs TIME (ms)



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659 **Test I.D:** D202703

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity		%	10 to 70	22	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.7	Pass
	20 ms	m/s	3.1 to 3.9	3.5	Pass
	30 ms	m/s	4.6 to 5.6	5.2	Pass
D Plane Rotation	Max	deg	99 to 114	104	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-54	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	105	Pass
			Overall Results		Pass

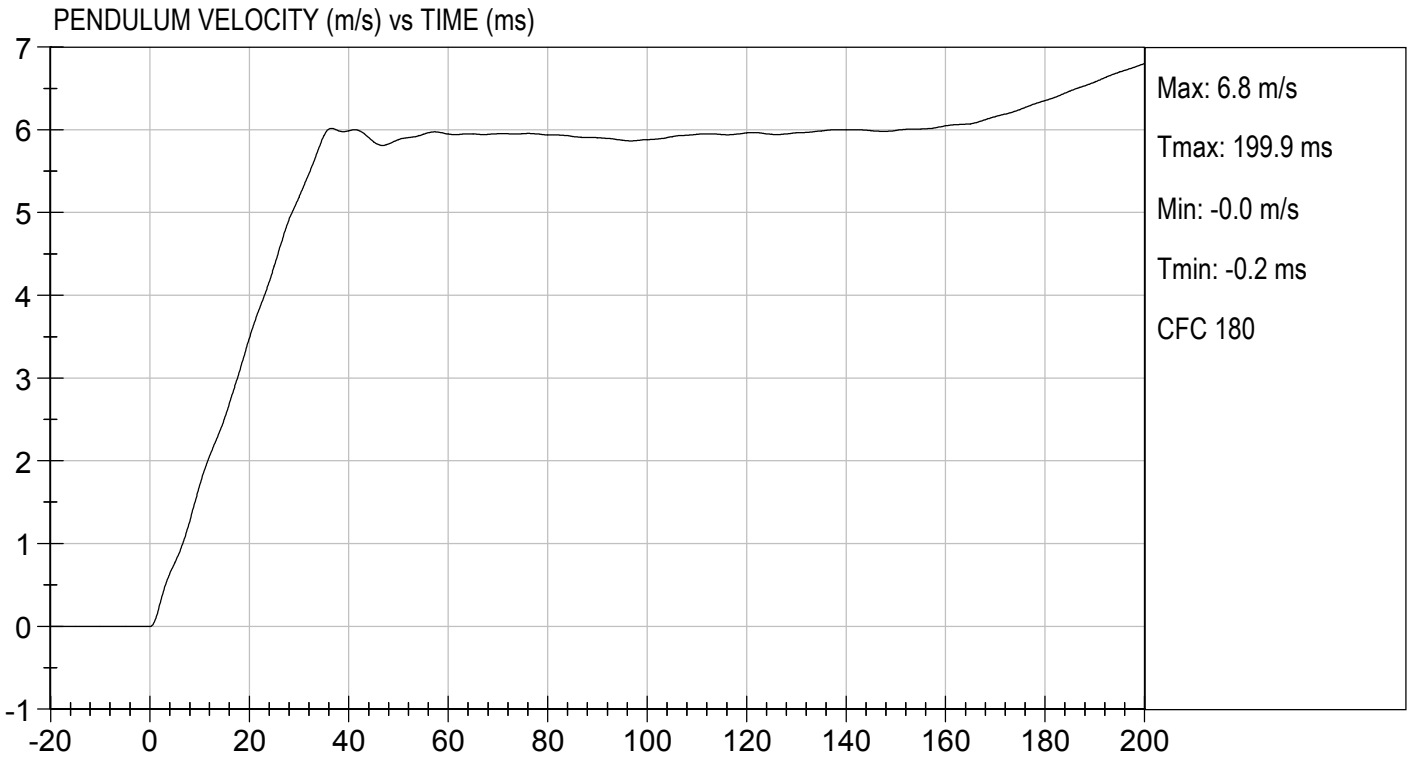
Gerald Guerrero
Laboratory Technician

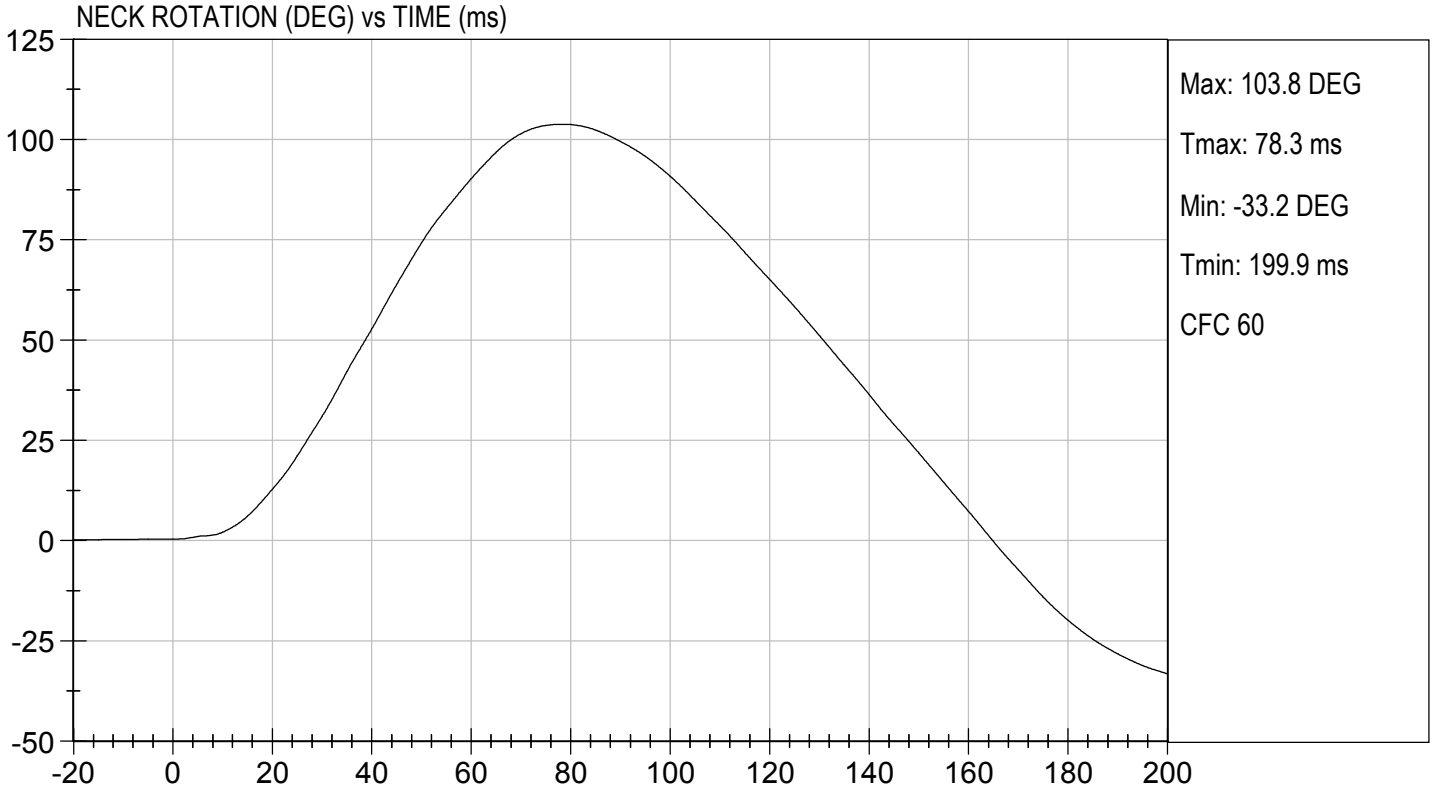
10/28/2020
Test Date

Approved By

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

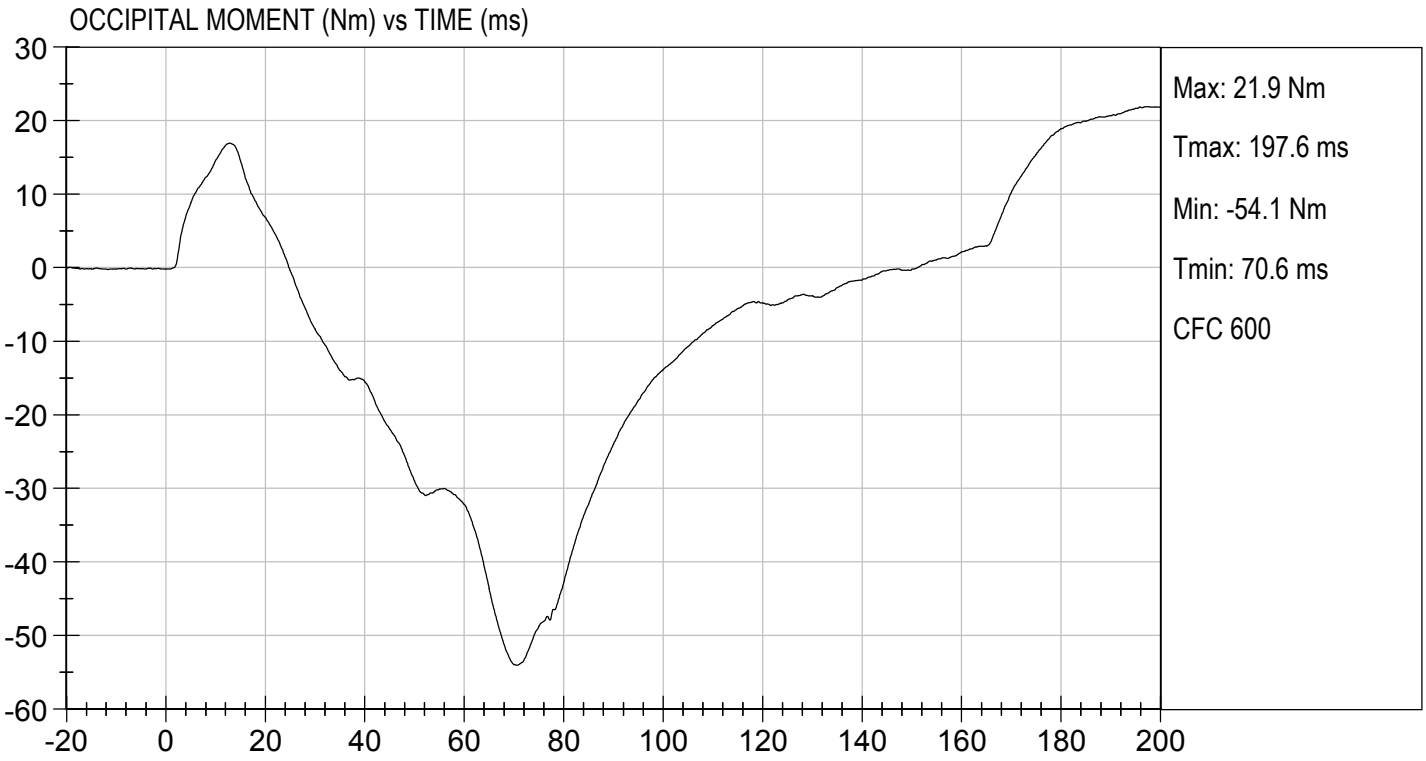
TEST DATE: 10/28/2020
TEST #: D202703





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

TEST DATE: 10/28/2020
TEST #: D202703



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659 **Test I.D:** D202704

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Relative Humidity	%	10 to 70	23	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	50	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4092	Pass
Internal Hysteresis	%	69 to 85	75	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4391	Pass
		Overall Test Results		Pass

Gerald Guerrero
Laboratory Technician

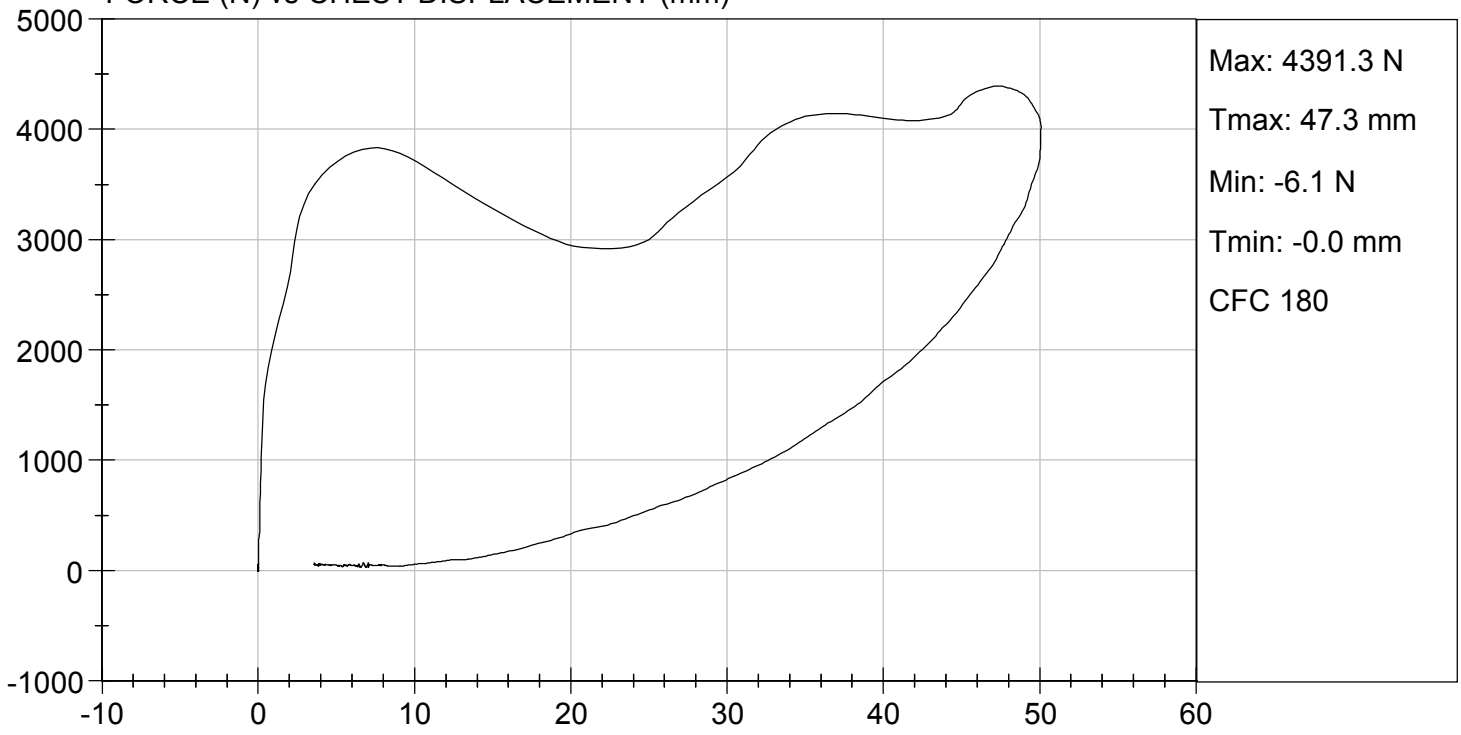
10/27/2020
Test Date

Approved By

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

TEST DATE: 10/27/2020
TEST #: D202704

FORCE (N) vs CHEST DISPLACEMENT (mm)



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659 **Test I.D:** D202705

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Probe Speed	m/s	2.07 to 2.13	2.10	Pass
Maximum Force	N	3450 to 4060	3819	Pass
		Overall Test Results		Pass

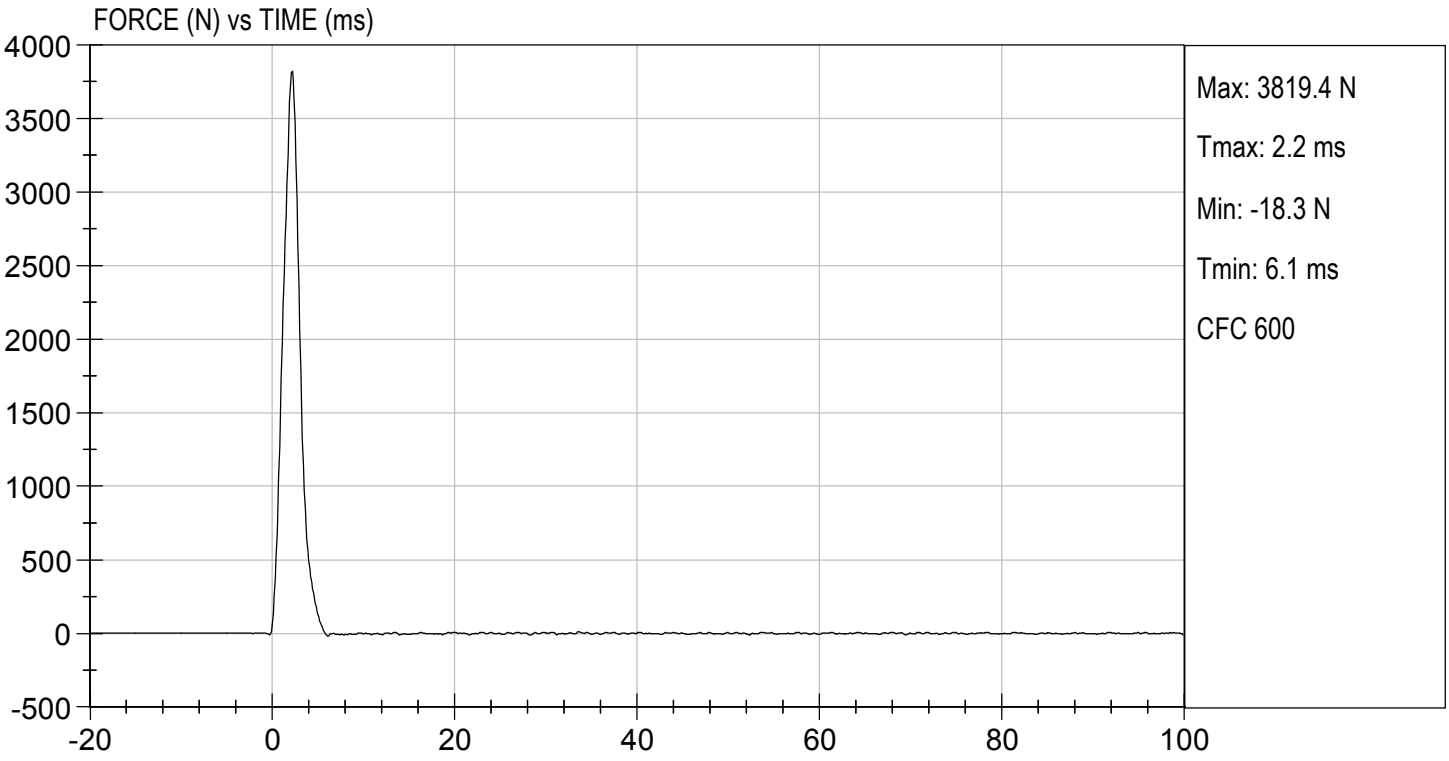
Gerald Guerrero
Laboratory Technician

10/27/2020
Test Date

Approved By

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

TEST DATE: 10/27/2020
TEST #: D202705



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659 **Test I.D:** D202706

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Probe Speed	m/s	2.07 to 2.13	2.11	Pass
Maximum Force	N	3450 to 4060	3456	Pass
		Overall Test Results		Pass

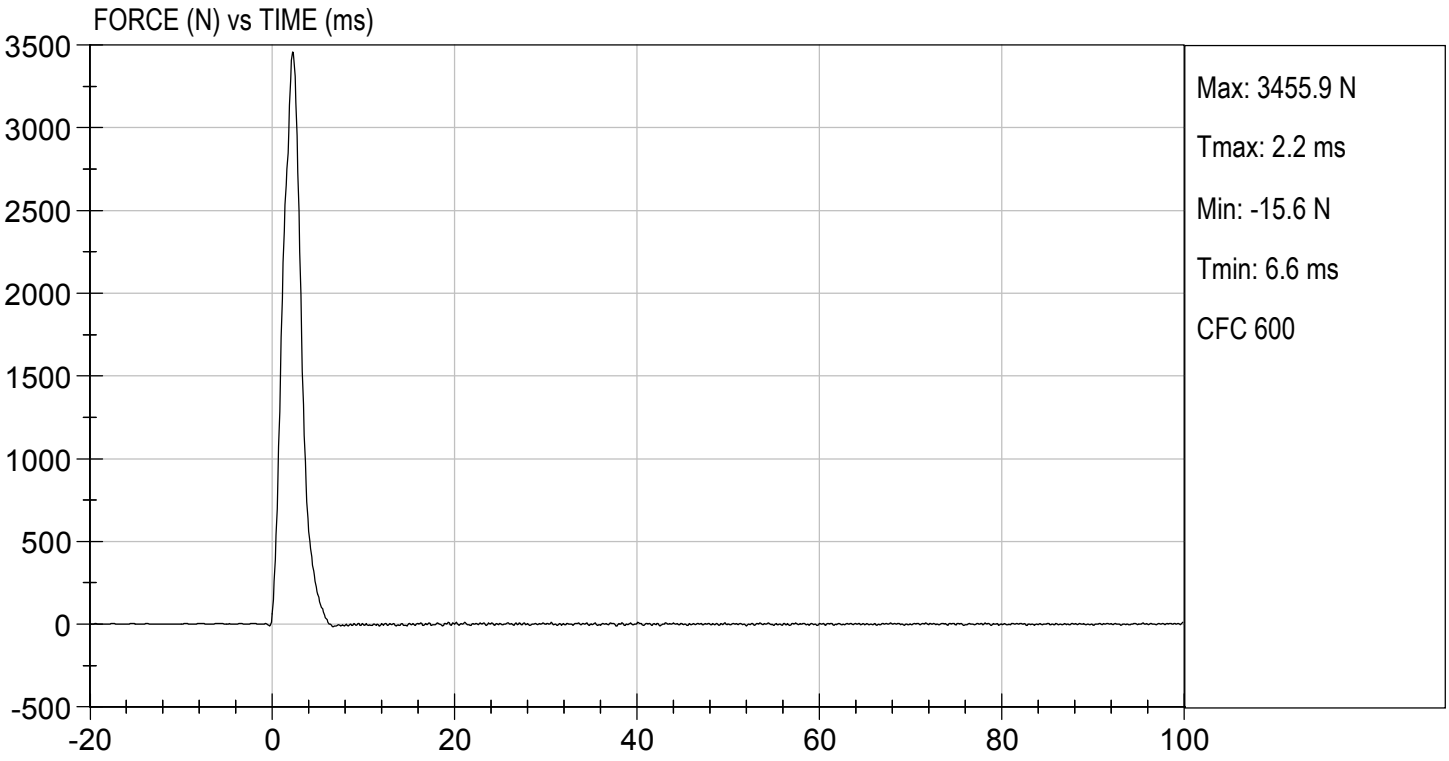
Gerald Guerrero
Laboratory Technician

10/27/2020
Test Date

Approved By

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

TEST DATE: 10/27/2020
TEST #: D202706



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659 **Test I.D:** D202707

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Initial Angle	deg	0 to 20	20	Pass
Return Angle	deg	+/- 8	3	Pass
Force at 45 deg	N	320 to 390	349	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	1.4	Pass
		Overall Result		Pass

Gerald Guerrero
Laboratory Technician

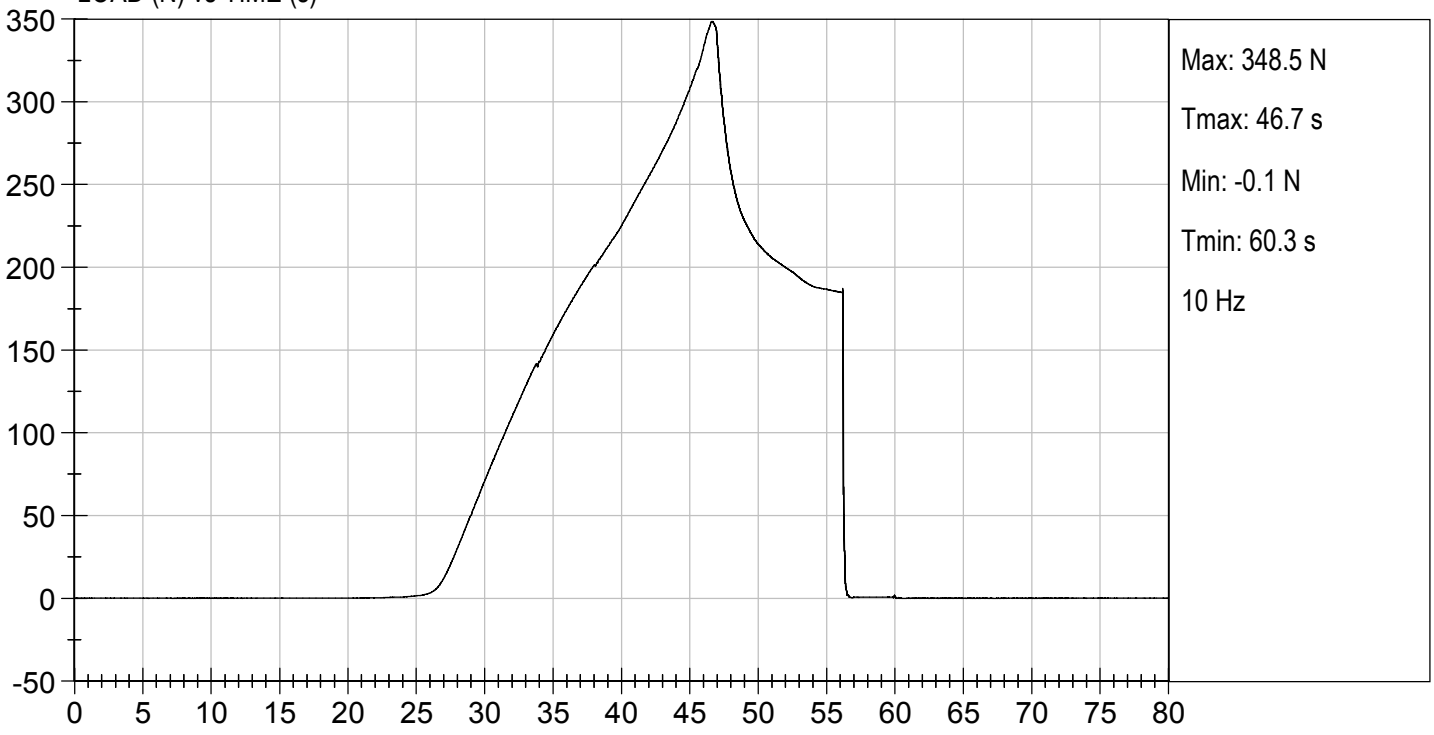
10/27/2020
Test Date

Approved By

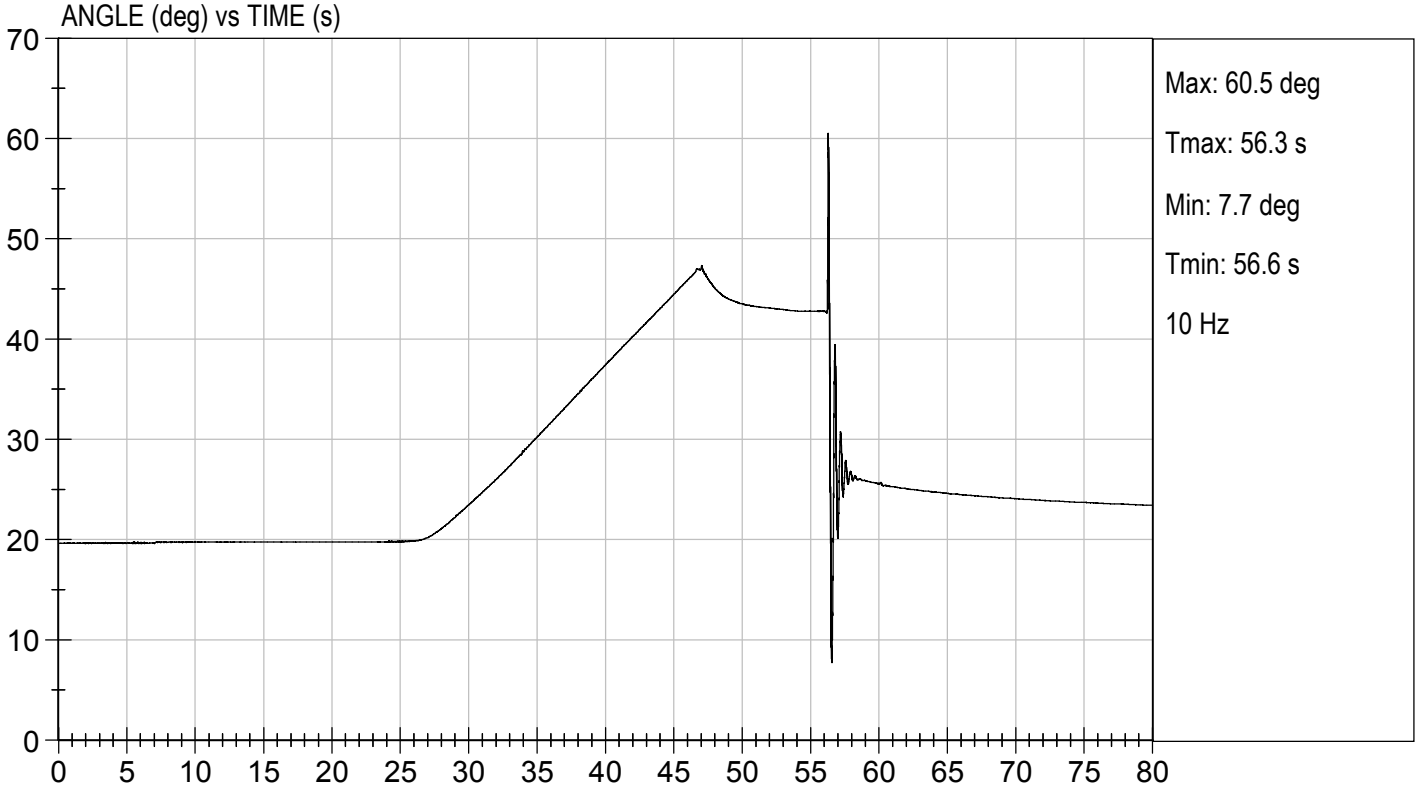
TEST DESC: LUMBAR FLEXION

TEST DATE: 10/27/2020
TEST #: D202707

LOAD (N) vs TIME (s)



ANGLE (deg) vs TIME (s)



CALIBRATION TEST RESULTS

POST-TEST

HYBRID III 5TH PERCENTILE FEMALE - PASSENGER ATD

MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659 **Test ID:** D203011

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	31	Pass
Peak Resultant Acceleration	G's	250 to 300	277	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

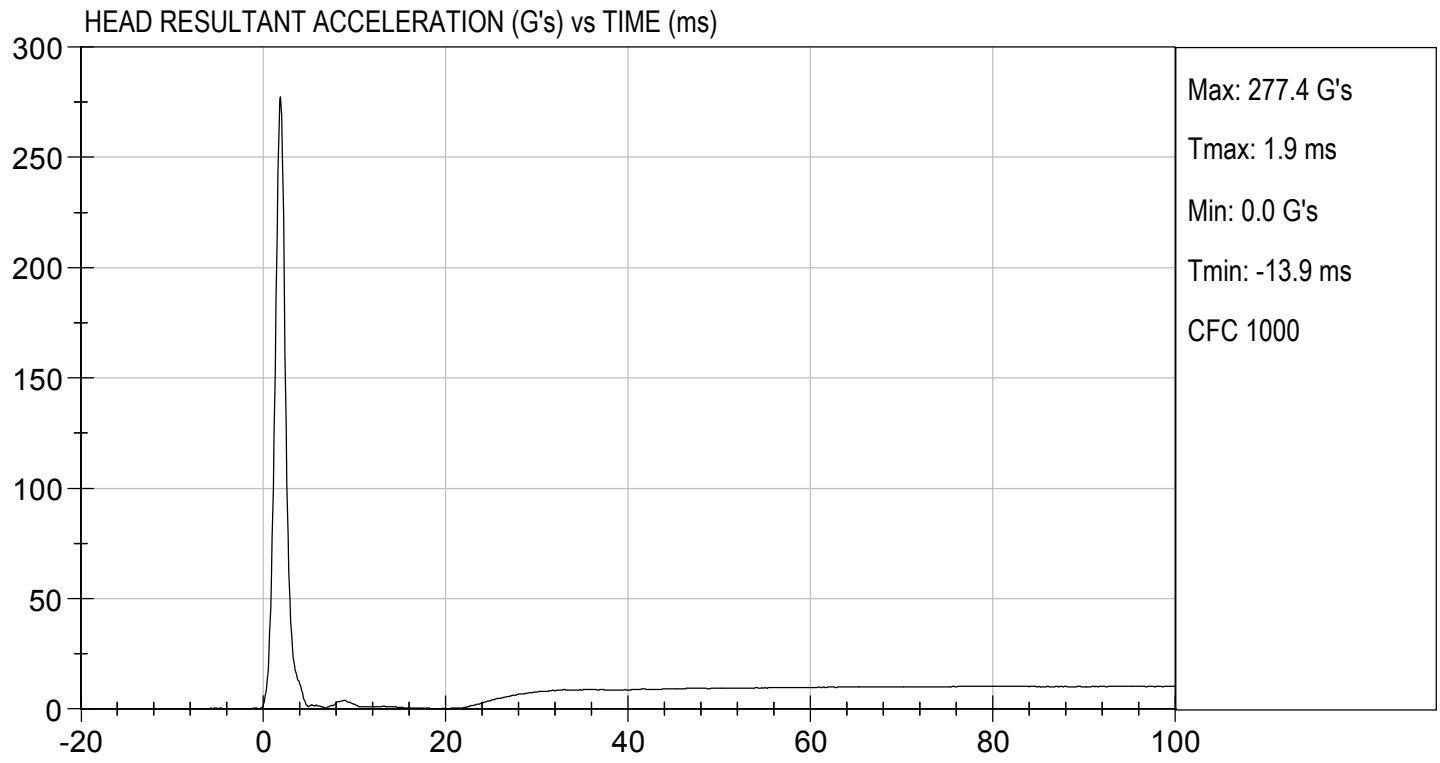
Laboratory Technician

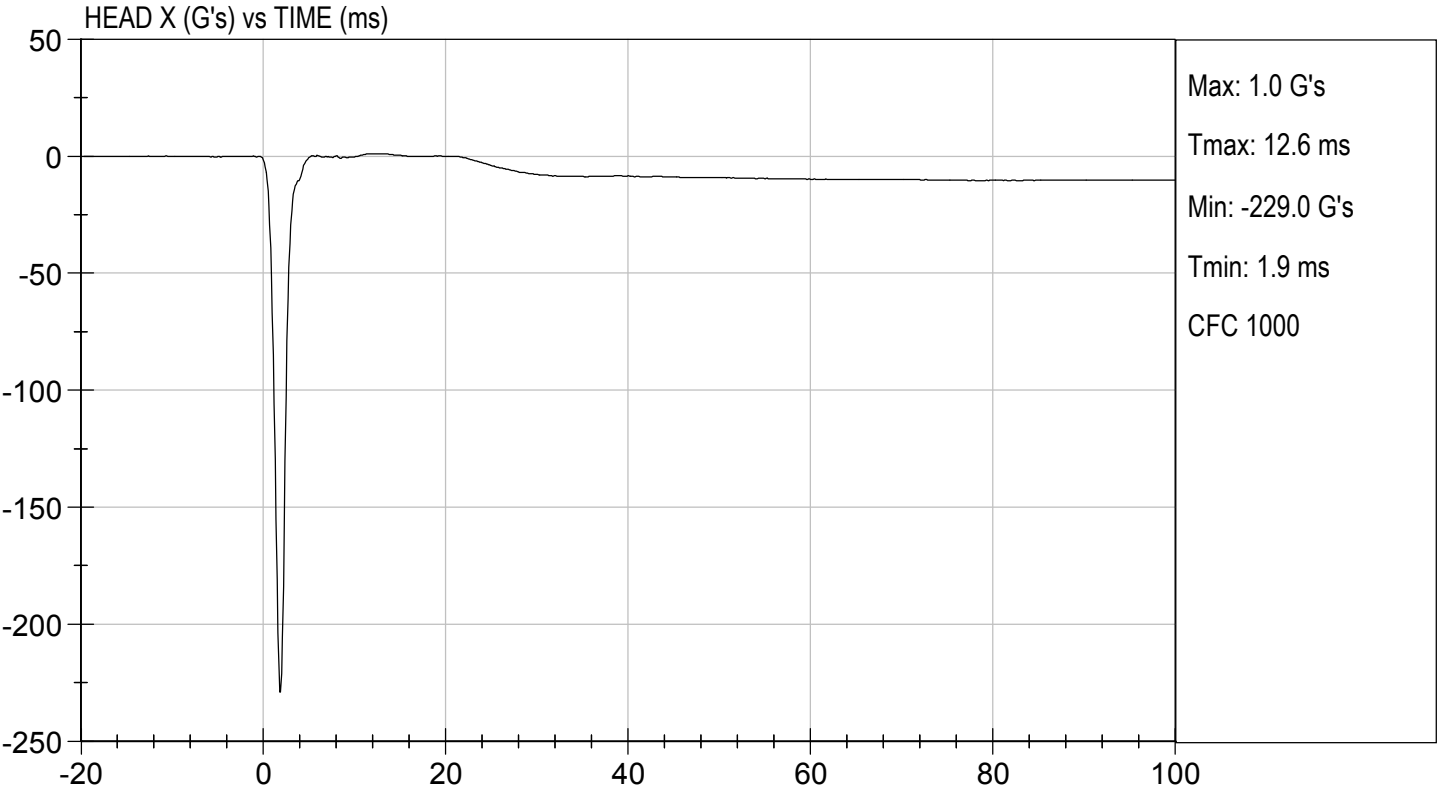
11/20/2020
Test Date

Approved By

TEST DESC: HEAD DROP

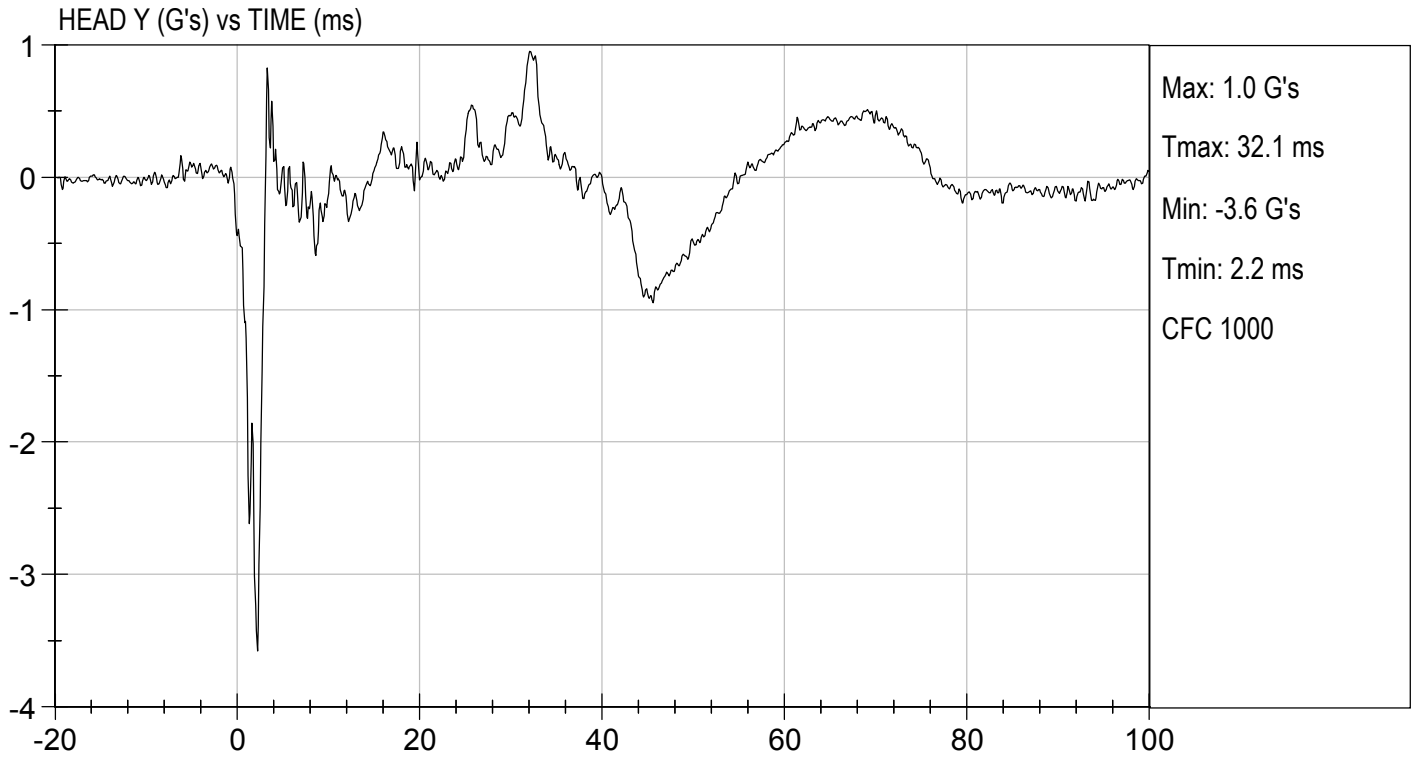
TEST DATE: 11/20/2020
TEST #: D203011

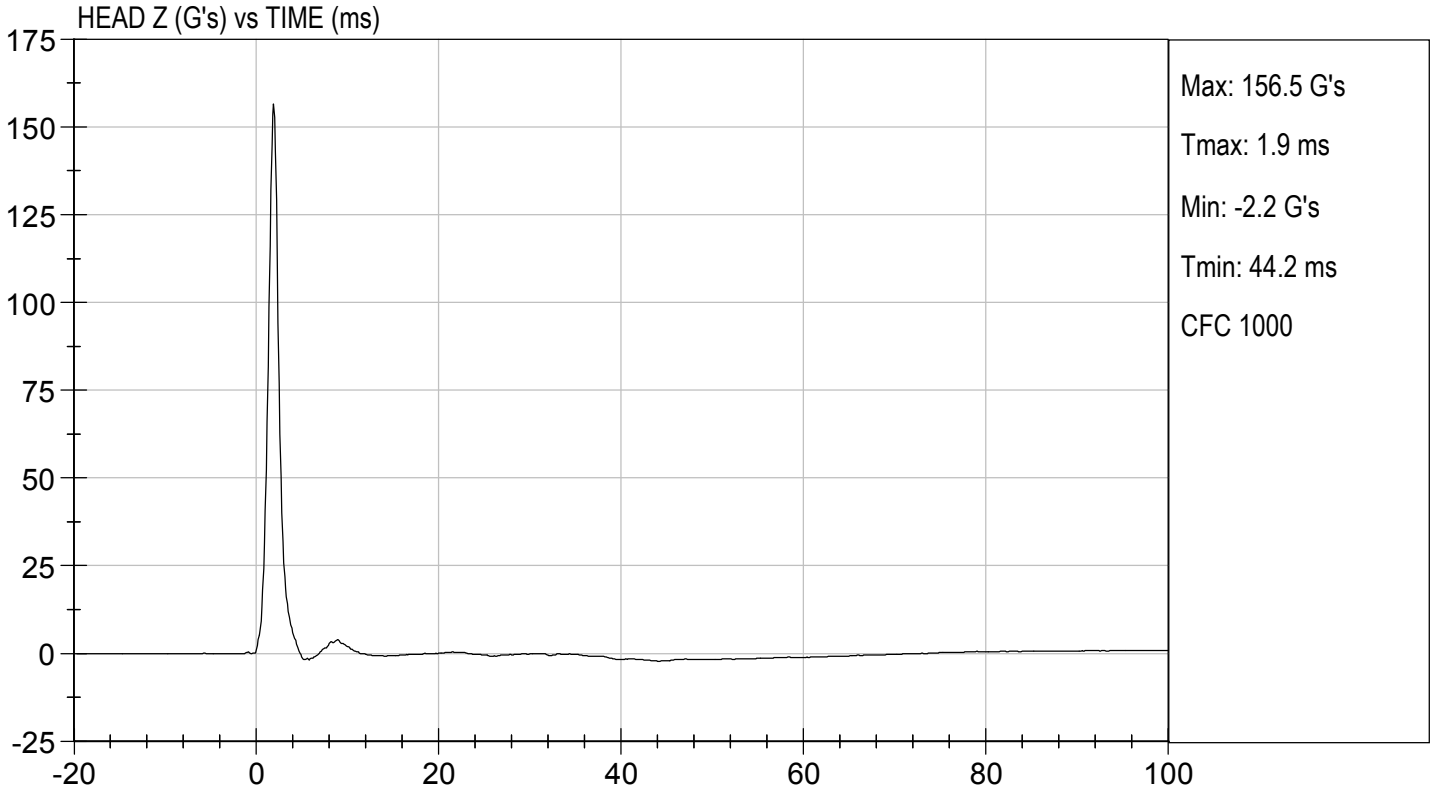




TEST DESC: HEAD DROP

TEST DATE: 11/20/2020
TEST #: D203011





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659 **Test I.D:** D203012

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity		%	10 to 70	31	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.13	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.4	Pass
	20 ms	m/s	4.0 to 5.0	4.9	Pass
	30 ms	m/s	5.8 to 7.0	7.0	Pass
D Plane Rotation	Max	deg	77 to 91	80	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	70	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	84	Pass
			Overall Results		Pass

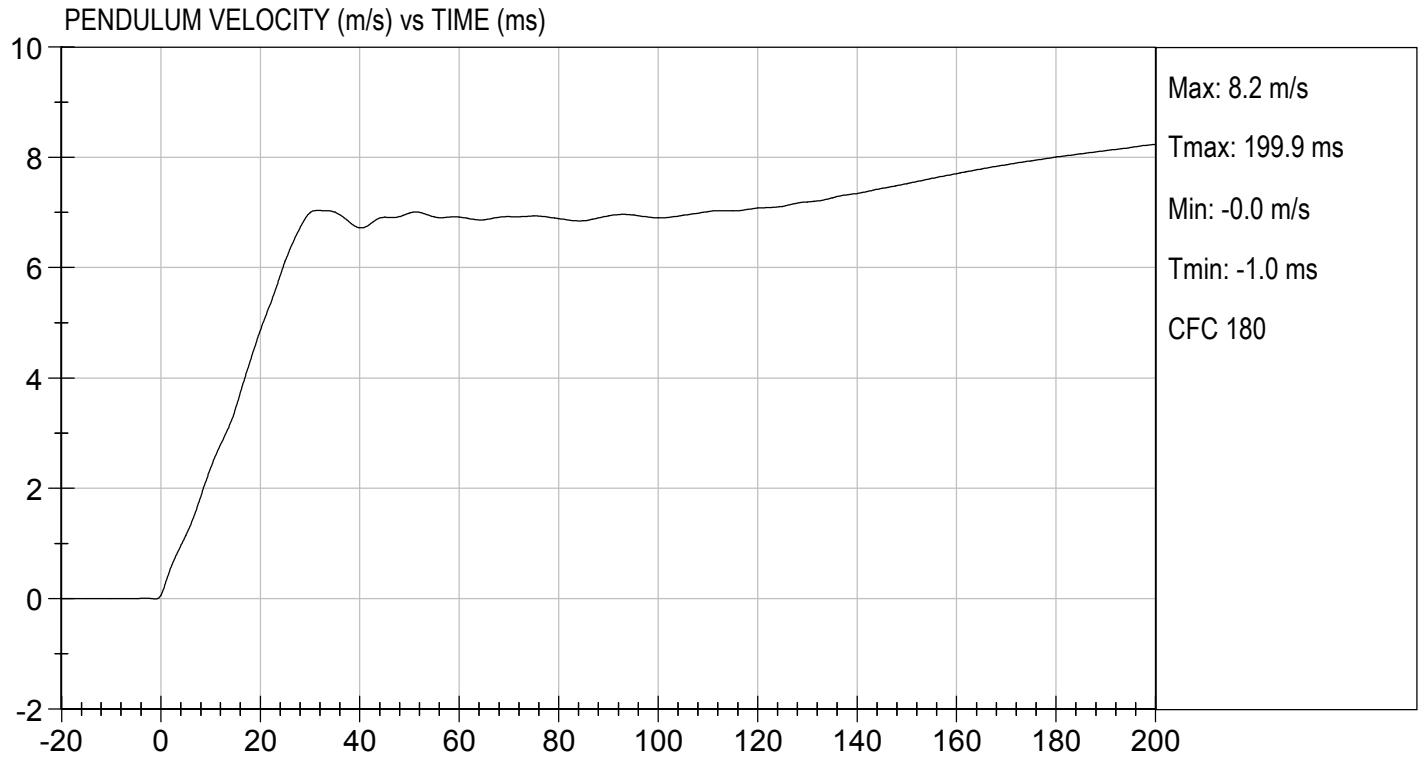
Laboratory Technician

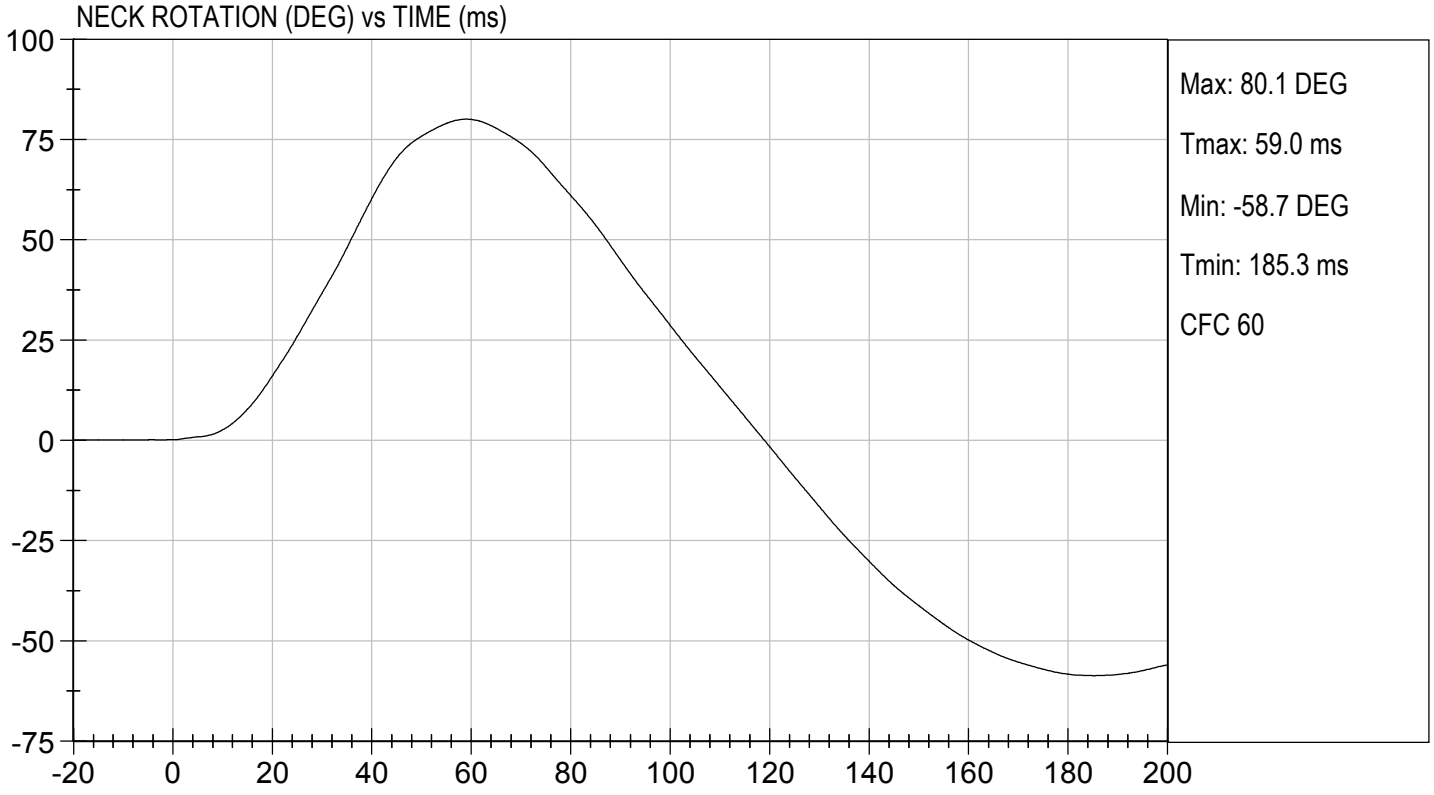
11/20/2020
Test Date

Approved By

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

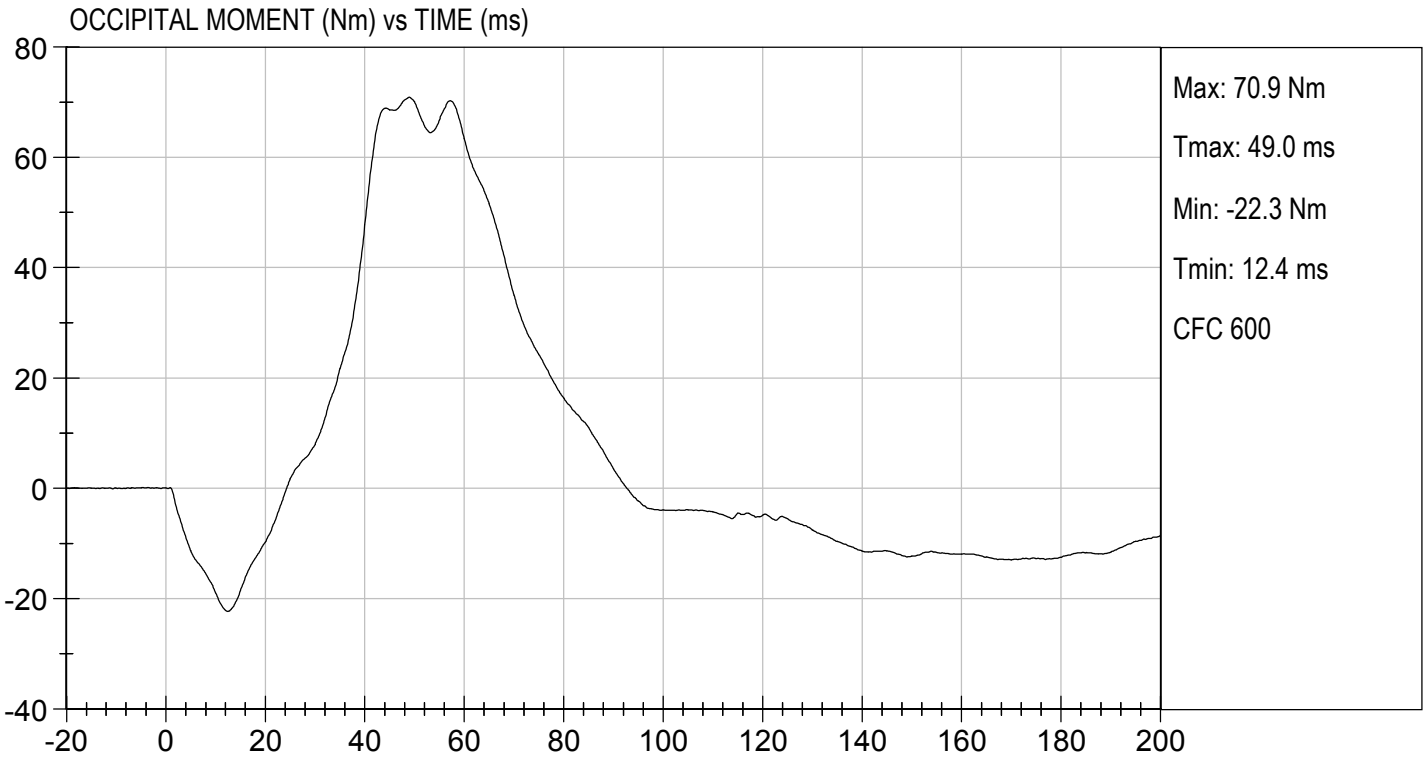
TEST DATE: 11/20/2020
TEST #: D203012





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

TEST DATE: 11/20/2020
TEST #: D203012



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659 **Test I.D:** D203013

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity		%	10 to 70	31	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.19	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.6	Pass
	20 ms	m/s	3.1 to 3.9	3.5	Pass
	30 ms	m/s	4.6 to 5.6	5	Pass
D Plane Rotation	Max	deg	99 to 114	108	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	108	Pass
			Overall Results		Pass

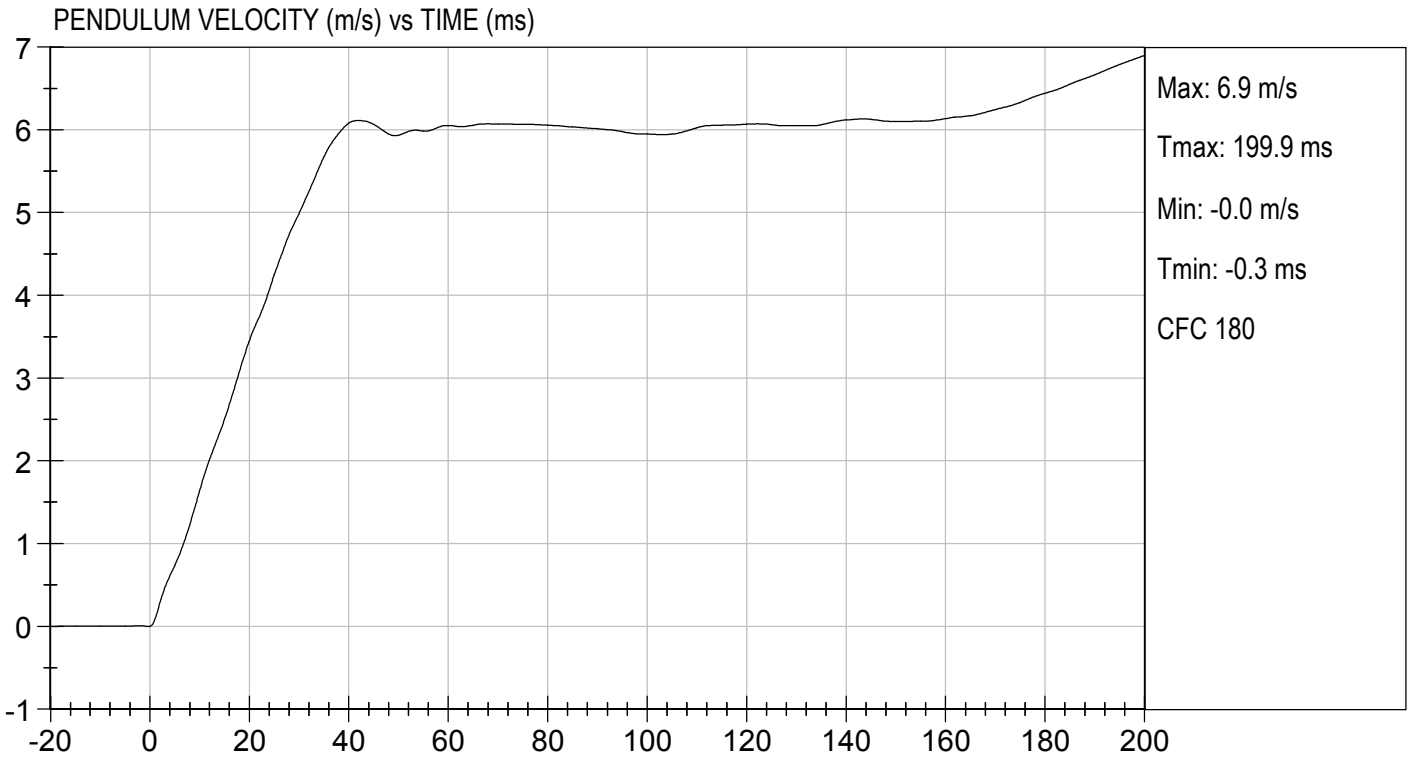
Laboratory Technician

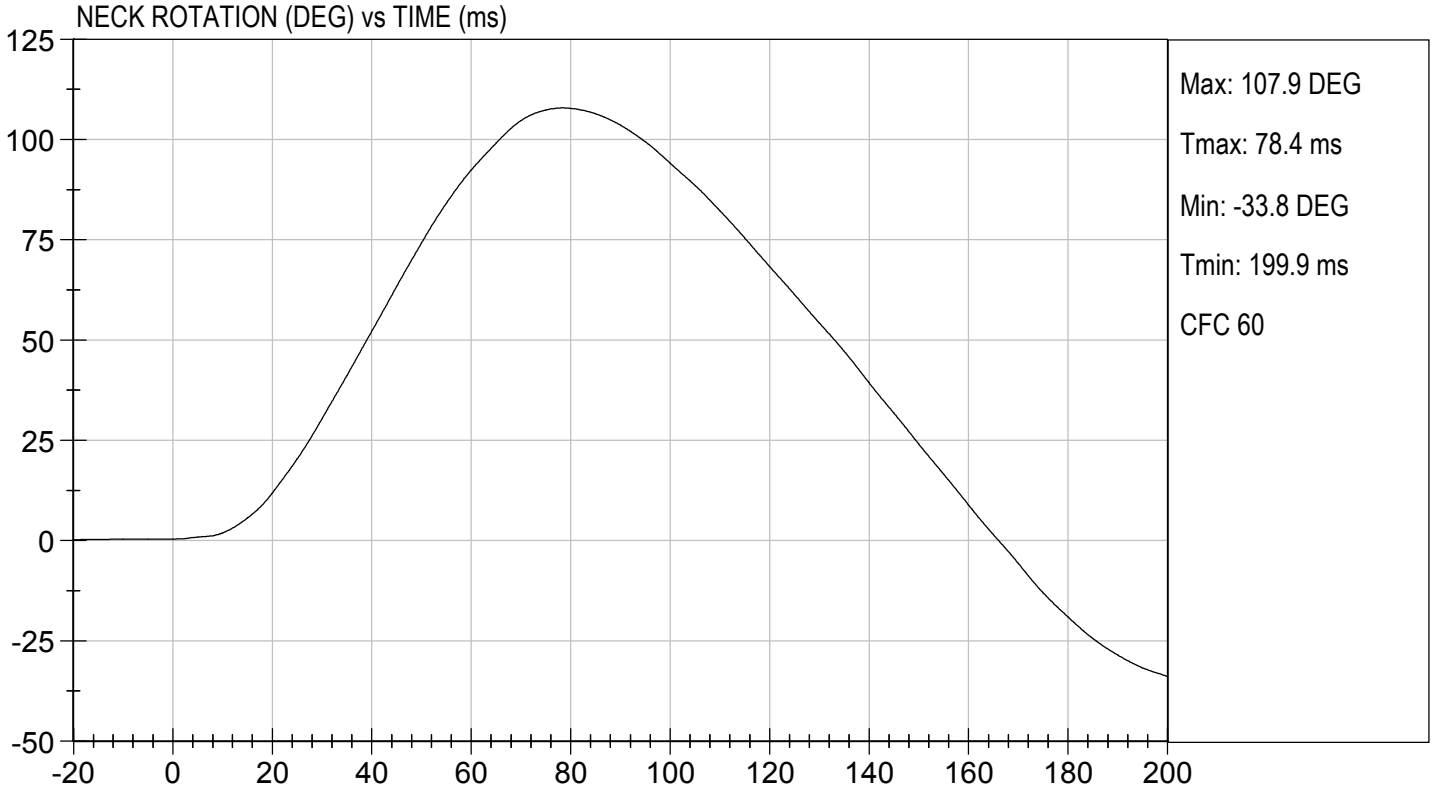
11/20/2020
Test Date

Approved By

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

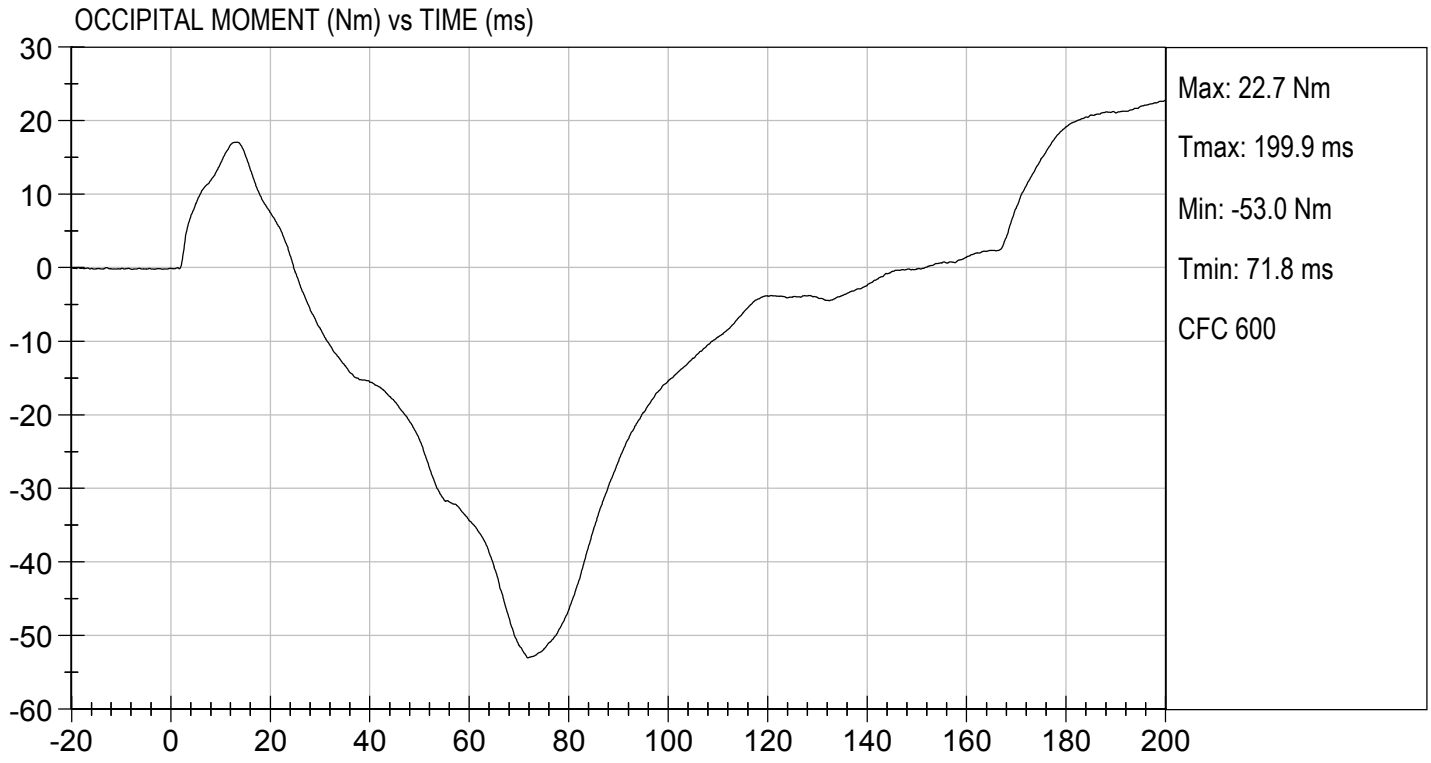
TEST DATE: 11/20/2020
TEST #: D203013





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

TEST DATE: 11/20/2020
TEST #: D203013



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659 **Test I.D:** D203014

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Relative Humidity	%	10 to 70	25	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	50	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4148	Pass
Internal Hysteresis	%	69 to 85	75	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4405	Pass
		Overall Test Results		Pass

Laboratory Technician

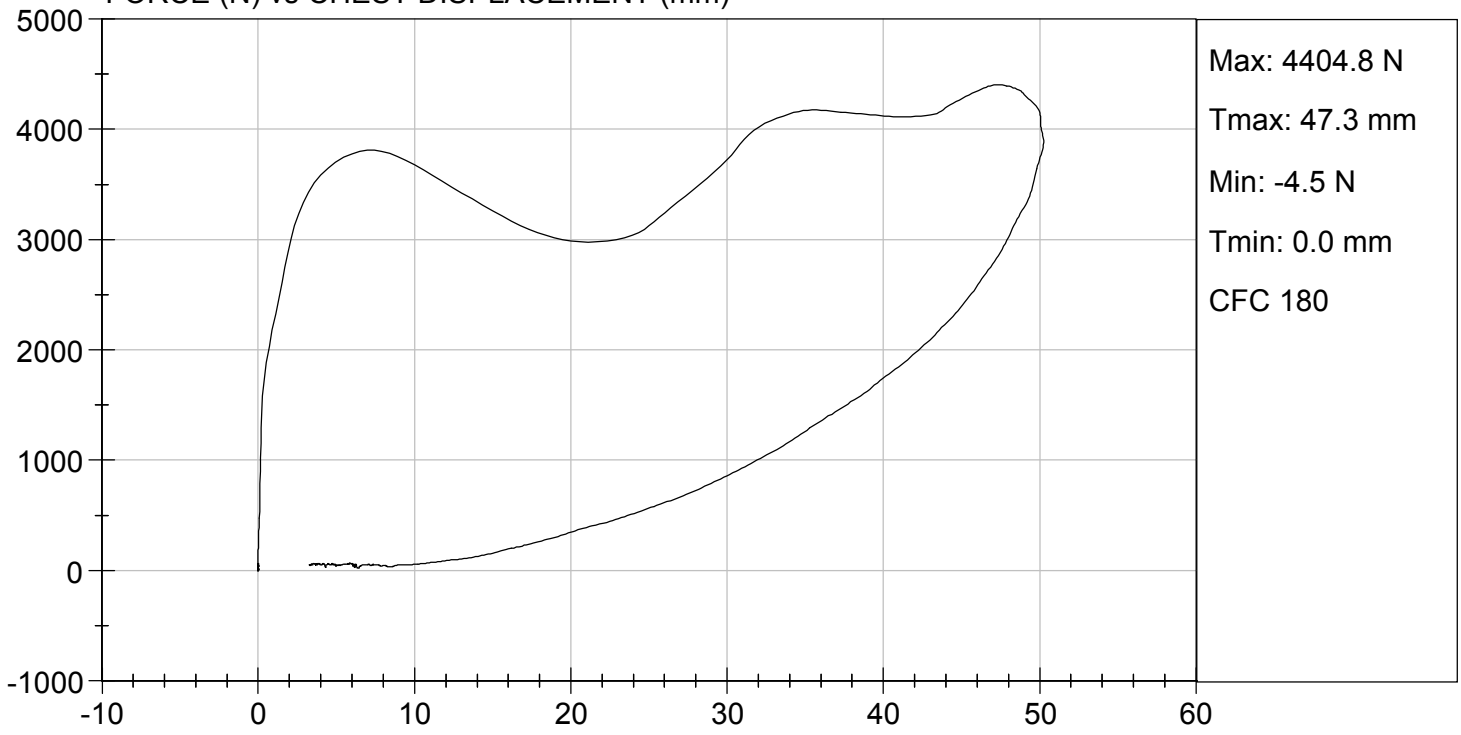
11/19/2020
Test Date

Approved By

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

TEST DATE: 11/19/2020
TEST #: D203014

FORCE (N) vs CHEST DISPLACEMENT (mm)



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659 **Test I.D:** D203015

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3810	Pass
		Overall Test Results		Pass

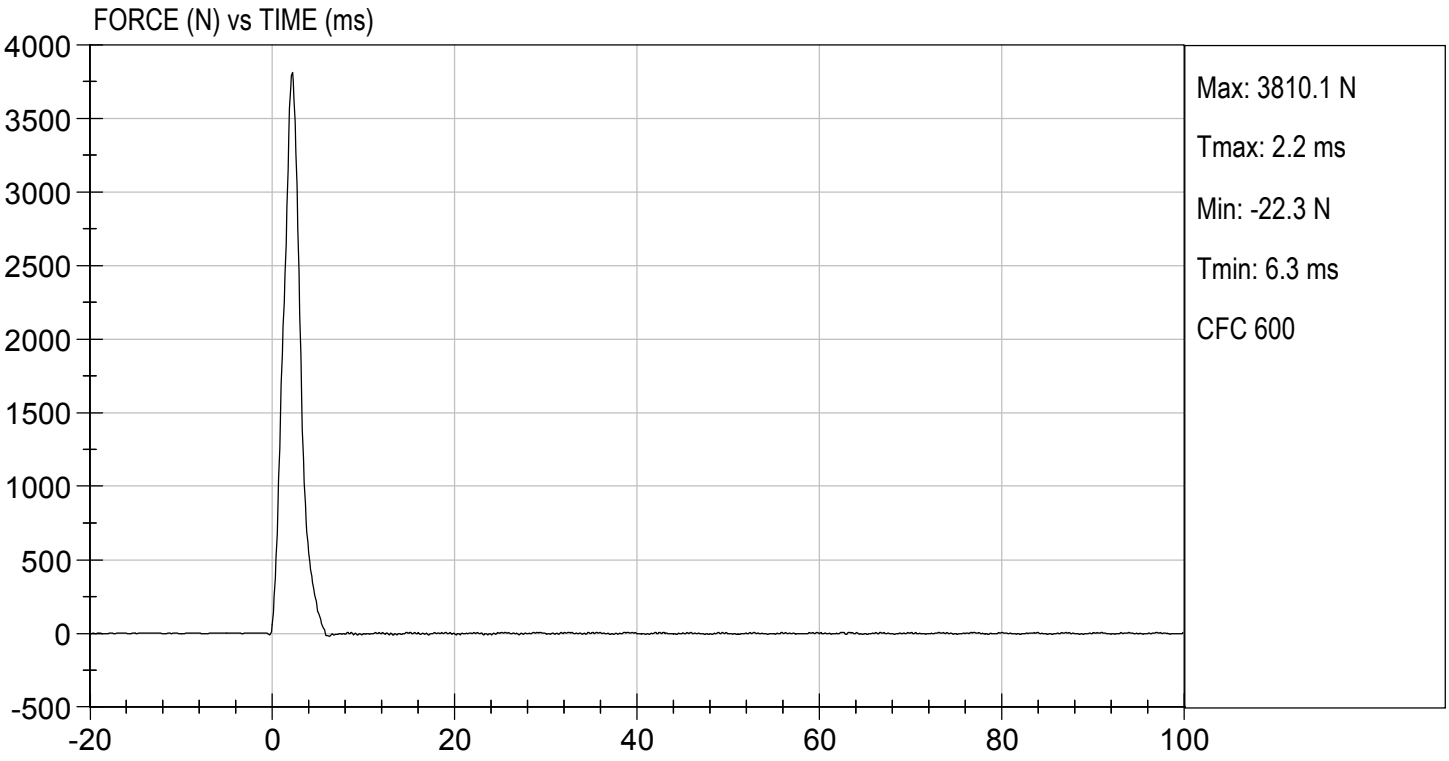
Laboratory Technician

11/23/2020
Test Date

Approved By

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

TEST DATE: 11/23/2020
TEST #: D203015



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659 **Test I.D:** D203016

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Probe Speed	m/s	2.07 to 2.13	2.11	Pass
Maximum Force	N	3450 to 4060	3473	Pass
		Overall Test Results		Pass

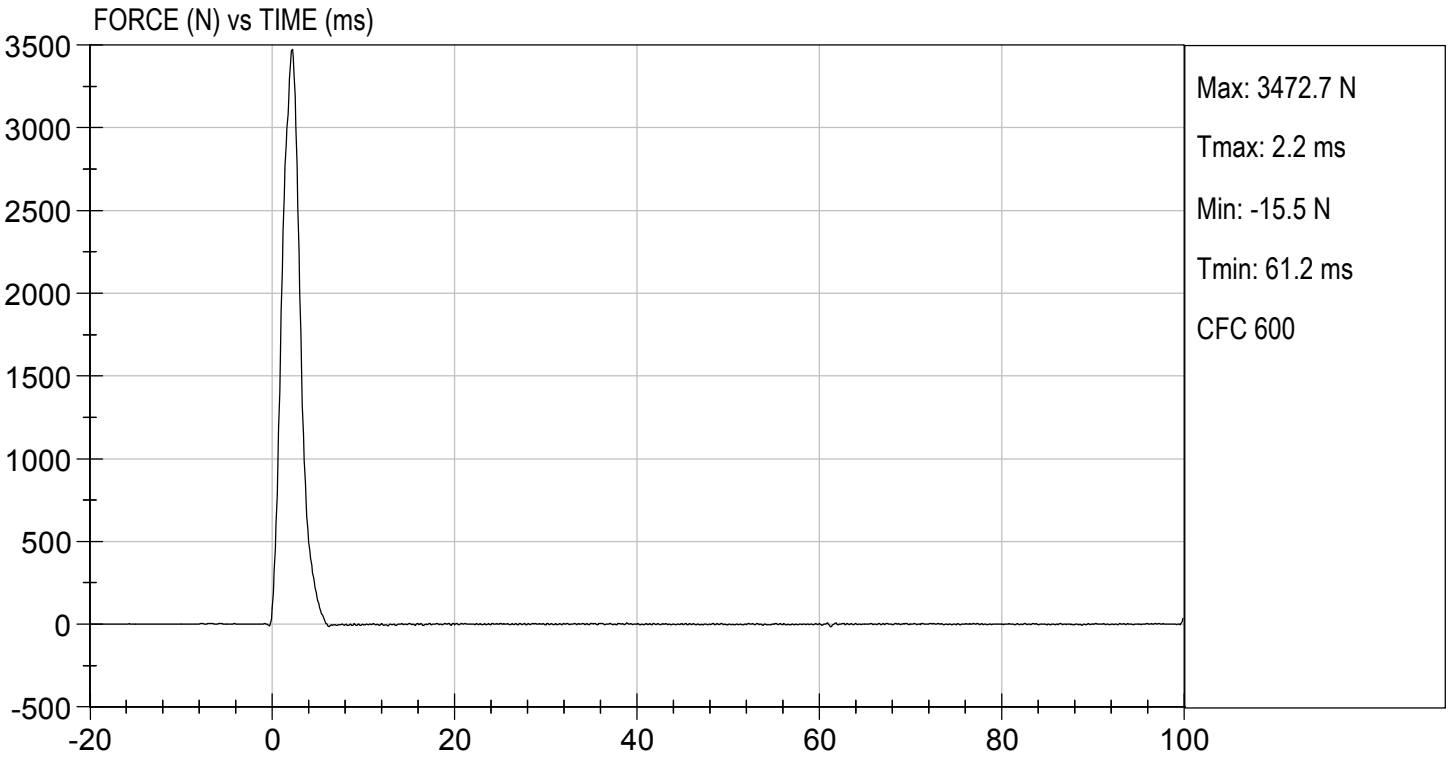
Laboratory Technician

11/23/2020
Test Date

Approved By

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

TEST DATE: 11/23/2020
TEST #: D203016



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

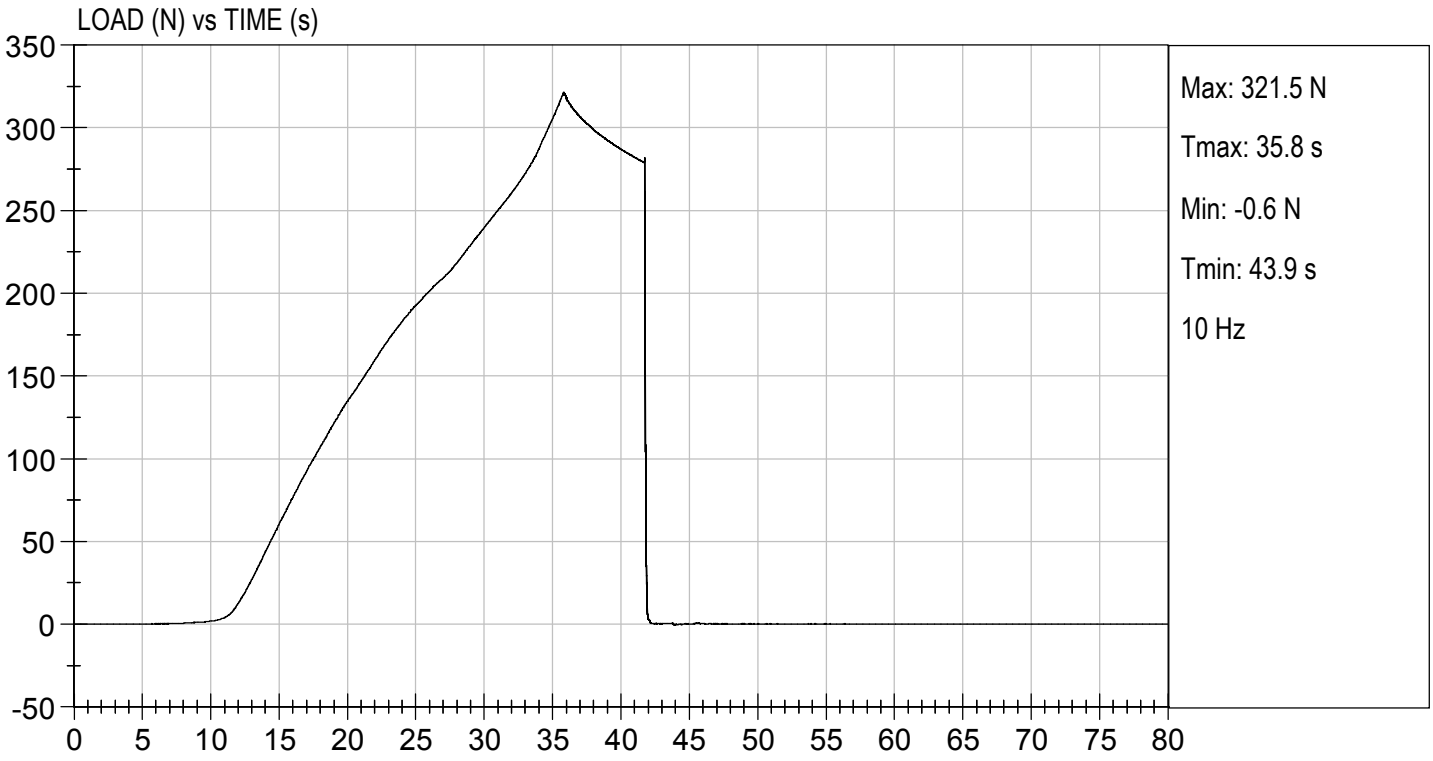
ATD Serial No: DH1659 **Test I.D:** D203017

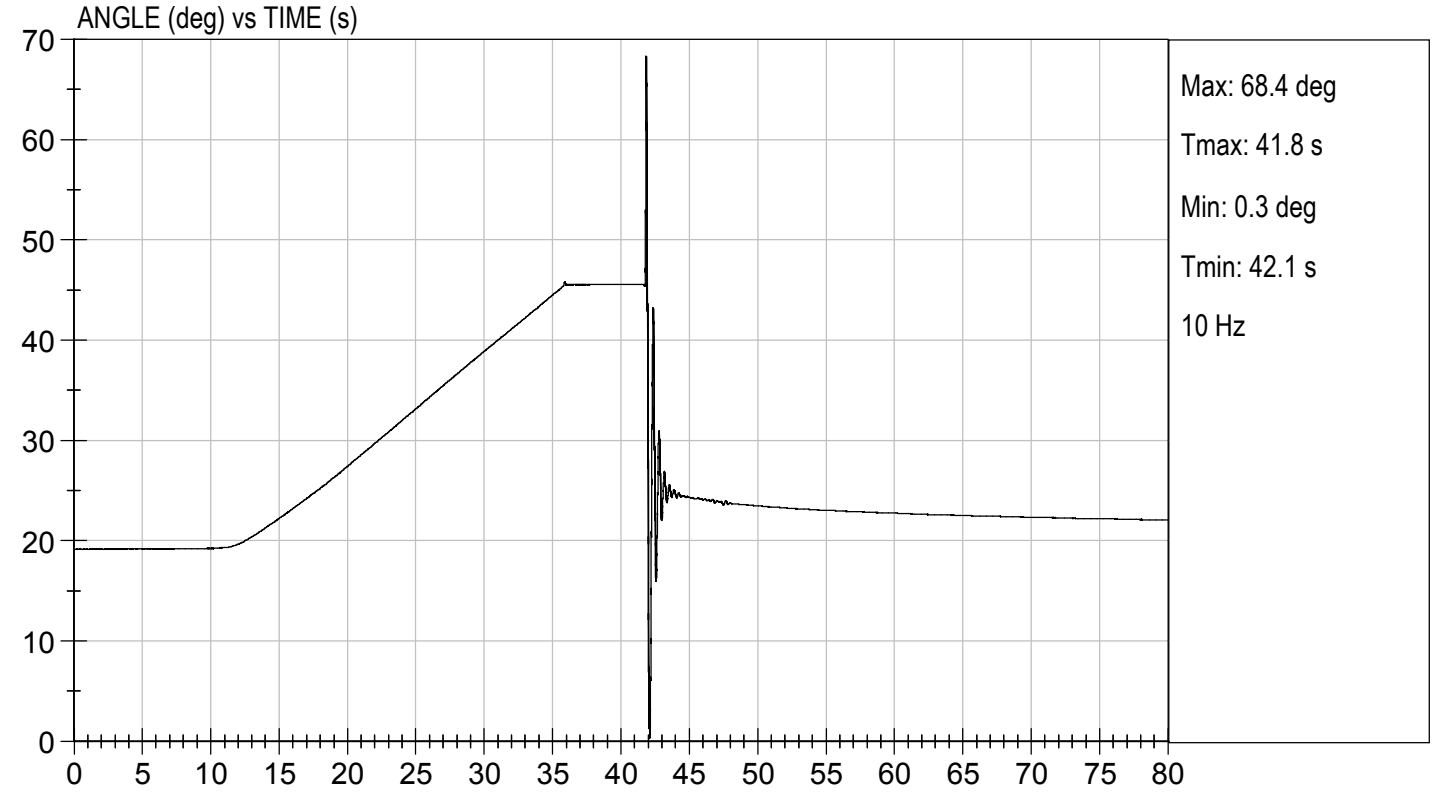
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Initial Angle	deg	0 to 20	19	Pass
Return Angle	deg	+/- 8	3	Pass
Force at 45 deg	N	320 to 390	321	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	1.1	Pass
		Overall Result		Pass

Laboratory Technician

11/23/2020
Test Date

Approved By


LOAD (N) vs TIME (s)
350
300
250
200
150
100
50
0
-50
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80
Max: 321.5 N
Tmax: 35.8 s
Min: -0.6 N
Tmin: 43.9 s
10 Hz


ANGLE (deg) vs TIME (s)
70
60
50
40
30
20
10
0
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80
Max: 68.4 deg
Tmax: 41.8 s
Min: 0.3 deg
Tmin: 42.1 s
10 Hz

APPENDIX D
TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

TABLE 1 – DRIVER DUMMY INSTRUMENTATION

Instrument Location			Axis	Hybrid III 50th S/N 351		
				Serial Number	Manufacturer	Calibration Date
Head Accelerometers		Primary	X	P79741	Endevco	09/02/2020
			Y	P79743	Endevco	09/02/2020
			Z	P79744	Endevco	09/02/2020
		Redundant	X	P94834	Endevco	09/02/2020
			Y	P94856	Endevco	09/02/2020
			Z	P97412	Endevco	09/02/2020
Head Angular Rate Sensors			X	ARS7402	DTS	08/04/2020
			Y	ARS7416	DTS	08/04/2020
			Z	ARS7366	DTS	08/04/2020
Upper Neck Load Cell			Fx, Fy, Fz Mx, My, Mz	NG1915	Denton	03/05/2020
Chest Accelerometers		Primary	X	P86792	Endevco	09/02/2020
			Y	P86793	Endevco	09/02/2020
			Z	P88348	Endevco	09/02/2020
		Redundant	X	P88666	Endevco	09/02/2020
			Y	P88667	Endevco	09/02/2020
			Z	P94109	Endevco	09/02/2020
Chest Potentiometer			X	351	Servo	09/02/2020
Pelvis Accelerometers			X	P95526	Endevco	09/01/2020
			Y	P96038	Endevco	09/01/2020
			Z	P97742	Endevco	09/01/2020
Femur Load Cells	Right	Primary	Z	FG121P	Denton	09/02/2020
		Redundant	Z	FG121R	Denton	09/02/2020
	Left	Primary	Z	FG122P	Denton	09/02/2020
		Redundant	Z	FG122R	Denton	09/02/2020
Tibia Load Cells	Right	Upper	Mx, My, Fz	TGDH3308	FTSS	03/05/2020
		Lower	Mx, My, Fz	AGDI4208	FTSS	03/05/2020
	Left	Upper	Mx, My, Fz	TGDG6744	FTSS	03/05/2020
		Lower	Mx, My, Fz	AGDI4273	FTSS	03/05/2020
Foot Accelerometers	Right	Rear	X	T22486	Endevco	10/06/2020
			Z	P97382	Endevco	10/01/2020
		Front	Z	P82120	Endevco	09/02/2020
	Left	Rear	X	T16468	Endevco	09/01/2020
			Z	T16496	Endevco	09/01/2020
		Front	Z	T16501	Endevco	09/01/2020
Seat Belt Load Cells		Lap				
		Shoulder				

TABLE 2 – FRONT PASSENGER DUMMY INSTRUMENTATION

Instrument Location			Axis	Hybrid III 5th S/N DH1659		
				Serial Number	Manufacturer	Calibration Date
Head Accelerometers		Primary	X	P82304	Endevco	08/11/2020
			Y	P88172	Endevco	08/11/2020
			Z	T16400	Endevco	08/12/2020
		Redundant	X	T16403	Endevco	08/11/2020
			Y	T16406	Endevco	08/11/2020
			Z	T16413	Endevco	08/12/2020
Head Angular Rate Sensors			X	ARS7340	DTS	08/04/2020
			Y	ARS7357	DTS	08/04/2020
			Z	ARS7442	DTS	08/04/2020
Upper Neck Load Cell			Fx, Fy, Fz Mx, My, Mz	NG2256	Denton	05/04/2020
Chest Accelerometers		Primary	X	T24796	Endevco	08/12/2020
			Y	T16416	Endevco	08/12/2020
			Z	T16420	Endevco	08/12/2020
		Redundant	X	T16423	Endevco	08/12/2020
			Y	T24766	Endevco	08/12/2020
			Z	T22499	Endevco	08/12/2020
Chest Potentiometer			X	DH1659	Servo	08/12/2020
Pelvis Accelerometers			X	T16434	Endevco	08/11/2020
			Y	T16435	Endevco	08/11/2020
			Z	T16436	Endevco	08/11/2020
Femur Load Cells	Right	Primary	Z	FG126P	Denton	08/13/2020
		Redundant	Z	FG126R	Denton	08/13/2020
	Left	Primary	Z	FG127P	Denton	08/13/2020
		Redundant	Z	FG127R	Denton	08/13/2020
Tibia Load Cells	Right	Upper	Mx, My, Fz	TG467	Denton	05/04/2020
		Lower	Mx, My, Fz	AG491	Denton	05/04/2020
	Left	Upper	Mx, My, Fz	TG478	Denton	05/04/2020
		Lower	Mx, My, Fz	AG500	Denton	05/04/2020
Foot Accelerometers	Right	Rear	X	T16437	Endevco	08/11/2020
			Z	T16438	Endevco	08/11/2020
		Front	Z	T22258	Endevco	08/11/2020
	Left	Rear	X	T16441	Endevco	08/11/2020
			Z	T16444	Endevco	08/11/2020
		Front	Z	T16445	Endevco	08/11/2020
Seat Belt Load Cells		Lap				
		Shoulder				

TABLE 3 – VEHICLE INSTRUMENTATION

Instrument Location			Axis	Serial Number	Manufacturer	Calibration Date
Crossmember / Rear Seat Accelerometers	Left	Primary	X	T22719	Endevco	09/09/2020
			Z	T22717	Endevco	09/09/2020
		Redundant	X	T22789	Endevco	09/09/2020
	Right	Primary	X	T22656	Endevco	07/01/2020
			Z	T22716	Endevco	09/04/2020
		Redundant	X	T22864	Endevco	06/30/2020
Engine Accelerometers		Top	X	A337160	MSI	11/12/2020
		Bottom	X	T21417	Endevco	06/29/2020