REPORT NUMBER: NCAP-CAL-20-017

NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST

FCA US LLC
2020 Chrysler Pacifica Hybrid
Five Door Minivan

NHTSA No: M20200316

PREPARED BY:
CALSPAN CORPORATION
P.O. BOX 400
BUFFALO, NEW YORK 104625

November 11, 2020

FINAL REPORT

PREPARED FOR:
U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
1200 NEW JERSEY AVE SE, ROOM W43-410
WASHINGTON, D.C. 20590

This final test report was prepared for the U.S. Department of Transportation, National Highway Traffic Administration, in response to Contract Number 693JJ919D000005.

Prepared by: Matthew Pronko Date: November 11, 2020
Matthew Pronko, Test Engineer

Approved by: Vanessa Hansen Date: November 11, 2020
Vanessa Hansen, Operations Manager

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

TECHNICAL REPORT DOCUMENTATION PAGE

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9. Performing Organization Name and Address Calspan Corporation Transportation Test Operations P.O. Box 400 Buffalo, New York 104625		***10. Work Unit No.*** ***11. Contract or Grant No.*** 693JJ919D000005
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Crashworthiness Standards 1200 New Jersey Ave., SE, Room W43-410 Washington, D.C. 20590		***13. Type of Report and Period Covered:*** Final Test Report September 8, 2020 - November 11, 2020 ***14. Sponsoring Agency Code*** NRM-110
15. Supplementary Notes		

16. Abstract

A 56.30 km/h (35 mph), NCAP frontal rigid barrier impact test was conducted on a 2020 Chrysler Pacifica Hybrid Minivan 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 related to FMVSS Nos. 208, 212, 219 (partial), 301, and 305 performance. The test was conducted at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on September 8, 2020.

The impact velocity of the vehicle was 56.36 km/h, and the ambient temperature at the barrier face at the time of impact was 21°C. The target vehicle post-test maximum crush was 414 mm at the vehicles centerline. The test vehicle's occupant performance data is as follows:

Measurement Description	Units	Driver ATD (Serial No. 142)		Passenger ATD (Serial No. 288)	
		Threshold	Result	Threshold	Result
Head Injury Criteria (HIC_{15})		700	184.905	700	328.617
Maximum Chest Compression	mm	63	-27.327	52	-15.879
Nij		1	0.324	1	0.408
Neck Tension	N	4,170	1128.909	2,620	590.360
Neck Compression	N	4,000	-147.926	2,520	-261.246
Left Femur Force	N	10,008	-689.215	6,805	-1632.541
Right Femur Force	N	10,008	-1329.070	6,805	-894.760

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

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Form DOT F1700.7 (8-69)

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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 No. 693JJ919D000005. 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 test 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 128 load cells was impacted by a 2020 Chrysler Pacifica Hybrid Minivan at a velocity of 56.36 km/h. The test was performed at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on September 8, 2020. Pre- and post-test photographs of the vehicle and dummies to document the test can be found in Appendix A. One real-time camera and 16 high-speed cameras were used to document the frontal barrier impact event. Camera locations and other pertinent camera information can be found in Data Sheet 6 of 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 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, 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. 142) and the right-front passenger (position 2) ATD (Serial No. 288) were qualified prior to this test. Certification details, along with instrumentation calibration data, can be found in Appendix C of this report.

The 486 channels of data were recorded on an on-board data acquisition system. Appendix B contains the vehicle, load cell barrier and dummy response data traces.

There was 100 percent windshield retention and no intrusion into the protected zone of the windshield during the event. There was a total of 0.0 grams of Stoddard or electrolyte solvent leakage after the event or during any phase of the static rollover. The maximum static crush of the vehicle was 414 mm and both driver and passenger side doors remained closed during the impact event and were operable after the impact.

The driver's visible contact points were as follows: The driver's head contacted the frontal airbag and then the head restraint. The upper torso contacted the frontal airbag. Both knees contacted the knee air bag.

The passenger's visible contact points were as follows: The passenger's head contacted the frontal airbag and then the head restraint. The upper torso contacted the frontal airbag. Both knees contacted the knee airbag

The occupant data is summarized below.

ATD Position	HIC_{15}	Nij	Neck Tension (N)	Neck Comp. (N)	3ms Chest Clip (Gs)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50^{th})	184.905	0.324	1128.909	-147.926	47.226	-27.327	-689.215	-1329.070
Passenger (5^{th})	328.617	0.408	590.360	-261.246	39.239	-15.879	-1632.541	-894.760

GENERAL COMMENTS:

1. P1 (Driver) serial number - 142
2. P2 (Passenger) serial number - 288

Data Anomalies:

- Driver Shoulder Force,Channel Failed
- Passenger Pelvic Z Acceleration, Questionable spikes at 65 & 75 ms

SECTION 2

OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

This section contains information reporting for the following Data Sheets:

Data Sheet No. 1 – General Test and Vehicle Parameter Data

Data Sheet No. 2 – Seat Adjustment, Fuel System, and Steering Wheel Data

Data Sheet No. 3 – Dummy Longitudinal Clearance Dimensions

Data Sheet No. 4 – Dummy Lateral Clearance Dimensions

Data Sheet No. 5 – Seat Belt Positioning Data

Data Sheet No. 6 – High-Speed Camera Locations and Data

Data Sheet No. 7 – Vehicle Accelerometer Locations

Data Sheet No. 8 – Photographic Reference Target Locations

Data Sheet No. 9 – Load Cell Locations on Fixed Barrier

Data Sheet No. 10 – Test Vehicle Summary of Results

Data Sheet No. 11 – Post-Test Observations

Data Sheet No. 12 – Vehicle Profile Measurements

Data Sheet No. 13 – Accident Investigation Division Data

Data Sheet No. 14 – Vehicle Intrusion Measurements

Data Sheet No. 15 – Summary of Indicant FMVSS No. 212 and FMVSS No. 219 (Partial)

Data Sheet No. 16 – FMVSS 301 Barrier Impact and Static Rollover Results

Data Sheet No. 17 – Dummy/Vehicle Temperature Stabilization Chart

Data Sheet No. 305-1 – General Test and Parameter Data for Indicant FMVSS No. 305 Testing

Data Sheet No. 305-2 – Pre-Impact Data for Indicant FMVSS No. 305 Testing

Data Sheet No. 305-3 – Pre-Impact Electrical Isolation Measurements and Calculations for Indicant FMVSS No. 305 Testing

Data Sheet No. 305-4 – Post-Impact Data for Indicant FMVSS No. 305 Testing

Data Sheet No. 305-5 –Static Rollover Test Data for Indicant FMVSS No. 305 Testing

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2020 Chrysler Pacifica Hybrid Minivan
NHTSA No.: M20200316
Test Program: NCAP Frontal Barrier Impact Test
Test Date: 9/8/2020

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	M20200316
Model Year	2020
Make	Chrysler
Model	Pacifica Hybrid
Body Style	Minivan
VIN	2C4RC1L70LR242553
Body Color	Gray
Odometer Reading (km /mi)	152 mi
Engine Displacement (L)	3.6
Type / No. Cylinders	V6
Engine Placement	Transverse
Transmission Type	Automatic
Transmission Speeds	EVT
Overdrive	Yes
Final Drive	Front Wheel Drive
Roof Rack	No
Sunroof / T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	Yes
Anti-Lock Brakes (ABS)	Yes
Automatic Door Locks (ADLs)	Yes

Traction Control System (TCS)	Yes
Power Steering	Yes
Power Window Auto-Reverse	No
Driver Frontal Airbag	Yes
Driver Curtain Airbag	Yes
Driver Head/Torso Airbag	No
Driver Torso Airbag	No
Driver Torso/Pelvis Airbag	Yes
Driver Pelvis Airbag	No
Driver Knee Airbag	Yes
Front Pass. Frontal Airbag	Yes
Front Pass. Curtain Airbag	Yes
Front Pass. Head/Torso Airbag	No
Front Pass. Torso Airbag	No
Front Pass. Torso/Pelvis Airbag	Yes
Front Pass. Pelvis Airbag	No
Front Pass. Knee Airbag	Yes
Driver Pretensioner	Yes
Driver Load Limiter	Yes
Front Pass. Pretensioner	Yes
Front Pass. Load Limiter	Yes
Other –	-

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

DATA FROM CERTIFICATION LABEL

Manufactured By	FCA US LLC
Date of Manufacture	8-20

GVWR (kg)	2858
GAWR Front (kg)	1452
GAWR Rear (kg)	1452

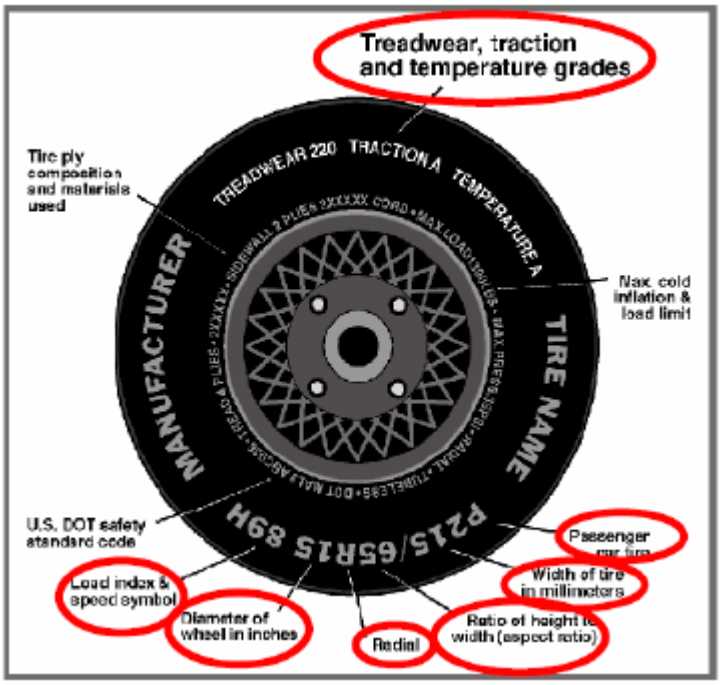
VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench	Bench	
Number of Occupants	2	2	3	7
Capacity Wt. (VCW) (kg)				498
Cargo Wt. (RCLW) (kg)				21.72

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

Test Vehicle:	2020 Chrysler Pacifica Hybrid Minivan	NHTSA No.:	M20200316
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	9/8/2020

Collect items circled in red, tire manufacturer, and tire name.



VEHICLE TIRE INFORMATION

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	250	250
Recommended Tire Size	235/65R17	235/65R17
Tire Size on Vehicle	235/65R17	235/65R17
Tire Manufacturer	Yokohama	Yokohama
Tire Model	Avid	Avid
Treadwear	460	460
Traction	B	B
Temperature Grades	B	B
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 2 Steel, 1 Nylon	2 Polyester, 2 Steel, 1 Nylon
Load Index / Speed Symbol	104T	104T
Tire Material	Rubber	Rubber
DOT Safety Code Left	4UL8-PKX4819	4UL8-PKX4819
DOT Safety Code Right	4UL8-PKX4819	4UL8-PKX4819

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

Test Vehicle: 2020 Chrysler Pacifica Hybrid Minivan NHTSA No.: M20200316
Test Program: NCAP Frontal Barrier Impact Test Test Date: 9/8/2020

TEST VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	630	534		681	569	
Right	kg	644	469		670	513	
Ratio	%	56.0	44.0		56.0	44.0	
Totals	kg	1274	1003	2277	1351	1082	2433

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	2277	(A)
Weight of 1 P572E ATD & 1 P572O ATD	kg	142	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	21.72	(C)
Calculated Vehicle Target Weight (TVTW)	kg	2440.72	(A+B+C)

TEST VEHICLE ATTITUDES AND CG

Condition	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	806	809	811	814	1362
As Tested	mm	796	800	798	801	1375
Post-Test	mm	812	817	806	807	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	3091
Total Vehicle Length at Left Side	mm	5085
Total Vehicle Length at Centerline	mm	5175
Total Vehicle Length at Right Side	mm	5085
Weight of Ballast in Cargo Area	kg	0
Weight of Vehicle Components Removed	kg	63
Amount of Stoddard Solvent in Fuel Tank	L	57.7

LIST OF COMPONENTS REMOVED TO MEET TEST WEIGHT:

Trunk carpeting and third row seats

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

Test Vehicle: 2020 Chrysler Pacifica Hybrid Minivan NHTSA No.: M20200316
Test Program: NCAP Frontal Barrier Impact Test Test Date: 9/8/2020

TARGET VEHICLE STRUCTURAL MEASUREMENT

No.	Description	Pre-Test
1	Total Length	5175
2	Total Width	2024
3*	Bumper Top Height	690
4*	Bumper Bottom Height	429
5*	Longitudinal Member Top Height	575
6	Distance Between Longitudinal Members	1230
7	Longitudinal Member Width	124
8*	Engine Top Height	951
9*	Engine Bottom Height	198
10	Engine and Gearbox Width	813
11	Front Bumper-Engine Distance	484
12*	Front Shock Absorber Fixing Height	991
13*	Bonnet Leading Edge Height	856
14	Front Shock Absorber Fixing Width	1354
15	Front Bumper – Front Axle Distance	961
16	Front Axle – A Pillar Distance	510
17	A-Pillar – B-Pillar Distance	1063
18	B-Pillar – Rear Axle Distance	1517
19	B-Pillar – C-Pillar Distance	1173
20*	Roof Sill Bottom Height	1567
21*	Roof Sill Top Height	1665
22*	Floor Sill Bottom Height	400
23*	Floor Sill Top Height	397

*Height Measurements are taken from the ground
Note: All measurements are in millimeters

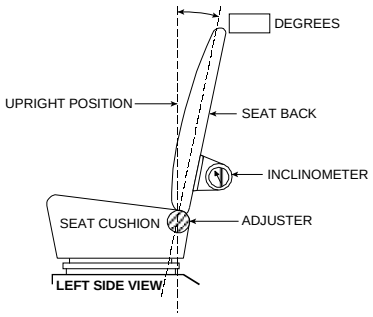
DATA SHEET NO. 2
SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle:	2020 Chrysler Pacifica Hybrid Minivan	NHTSA No.:	M20200316
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	9/8/2020

NOMINAL DESIGN RIDING POSITION

The driver's seat back was set to the manufacturer's designated angle. The passenger's seat back was positioned in a similar manner as the driver's seat back. Seat back angles are measured at the headrest post bezel using a digital inclinometer.

Seating Position	Degrees
Driver Seat Back Angle	0.1
Passenger Seat Back Angle	3.6



FRONT SEAT ASSEMBLY

SEAT FORE / AFT POSITIONS

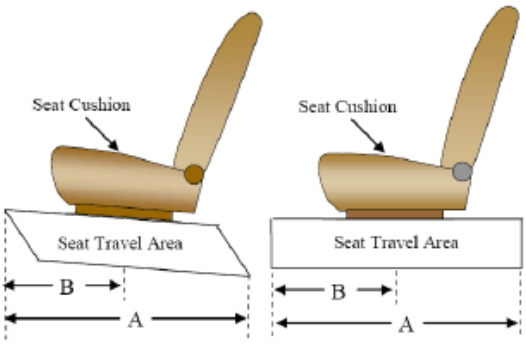
The driver's seat was positioned at the mid-point of fore/aft travel at its lowest position. The passenger's seat was positioned at the most forward position of fore/aft travel. Zero is defined as the forward most position.

Seating Position	Total Fore / Aft Travel	Placed in Position #
Driver Seat	292	146
Passenger Seat	220 (0-32)	0

SEAT BELT UPPER ANCHORAGE

The driver's seat belt anchorage was positioned according to the manufacturer's designated positioning for a 50th percentile adult male ATD. The passenger's seat belt anchorage was positioned according to the manufacturer's designated positioning for a 5th percentile adult female ATD. For this test zero is defined as the uppermost position.

Seating Position	Total # of Positions	Placed in Position #
Driver Seat	5 (0-4)	0
Passenger Seat	5 (0-4)	0



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

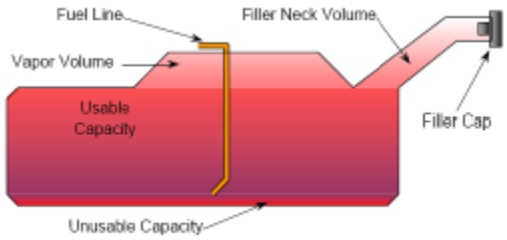
Test Vehicle: 2020 Chrysler Pacifica Hybrid Minivan
NHTSA No.: M20200316
Test Program: NCAP Frontal Barrier Impact Test
Test Date: 9/8/2020

FUEL TANK CAPACITY

Description	Liters
Usable Capacity of "Standard Tank"	62.1
Usable Capacity of "Optional Tank"	N/A
92%-94% of Usable Capacity	57.1 – 58.4
Actual Amount of Solvent Used	57.7
1/3 of Usable Capacity	20.7

FUEL PUMP

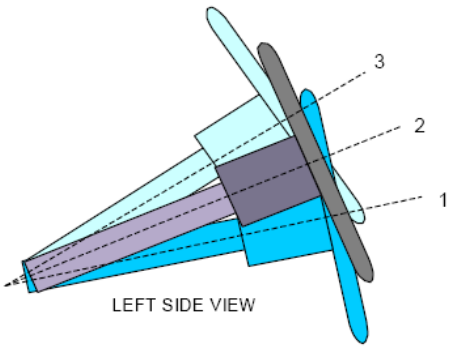
The vehicle is equipped with an electric fuel pump. The fuel filler neck is on the left side of the vehicle. The pump creates positive pressure in the fuel lines, pushing the gasoline to the engine. See form 1 for more information.



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. For angular measurements, a digital inclinometer was used to measure a plate which was placed across the steering wheel rim. A tape measure was used to measure the telescoping steering wheel travel.



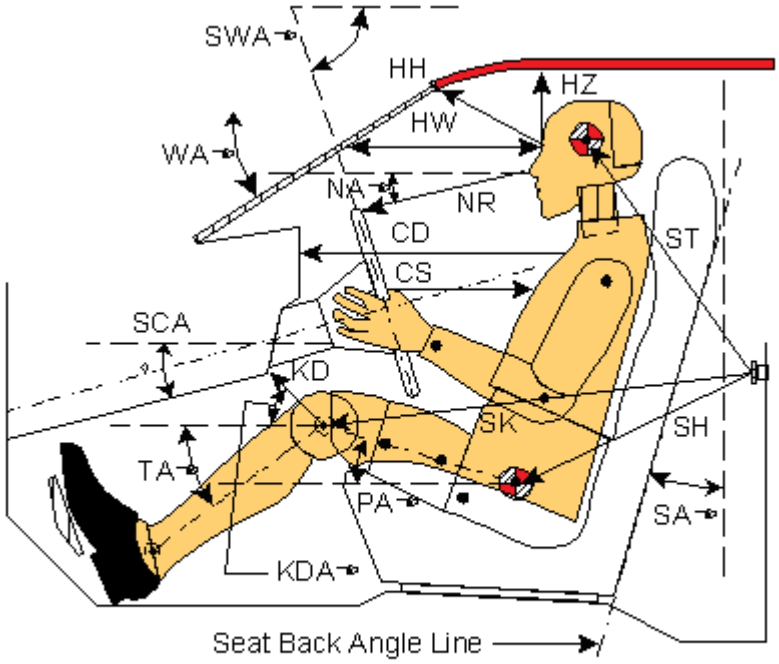
STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITIONS

Description	Degrees	Fore / Aft Position (mm)
Lowermost position No. 1	18.5	
Geometric center position No. 2	21.1	
Uppermost position No. 3	23.5	
Telescoping Steering Wheel Travel		65
Test Position	21.1	33

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2020 Chrysler Pacifica Hybrid Minivan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: M20200316
Test Date: 9/8/2020



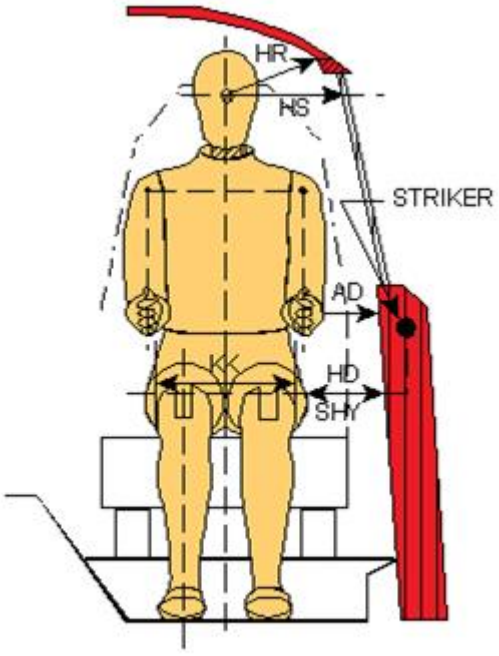
Left Side View

Code	Measurement Description	Driver (SN: 142)		Passenger (SN: 288)	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		26.7		
SWA°	Steering Wheel Angle		21.7		
SCA°	Steering Column Angle		68.3		
SA°	Seat Back Angle (on headrest post)		0.8		3.6
HZ	Head to Roof (Z)	240	90	281	90
HH	Head to Header	384	30.2	377	46.2
HW	Head to Windshield	738	0	754	0
NR	Nose to Rim / Dash	404	4.8	458	22.8
CD	Chest to Dash	556		393	
CS	Chest to Steering Hub	323	0		
RA	Rim to Abdomen	211	0		
KDL	Left Knee to Dash	197	33.0	153	29.3
KDR	Right Knee to Dash	202	32.1	151	35.8
PA°	Pelvic Angle		23.7		19.4
TA°	Tibia Angle		32.8		48.3
SK	Striker to Knee	605	1.9	718	1.0
ST	Striker to Head	575	75.5	531	64.9
SH	Striker to H-Point	247	32.2	418	-16.0

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2020 Chrysler Pacifica Hybrid Minivan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20200316
Test Date: 9/8/2020

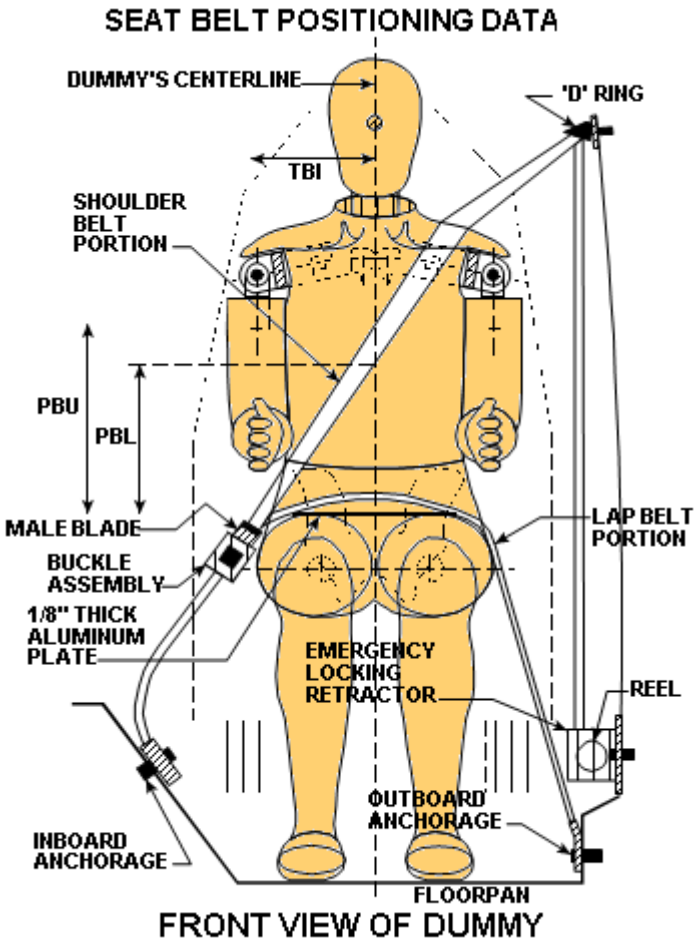


Front View

Code	Description	Driver (mm)	Passenger (mm)
AD	Arm to Door	160	108
HD	H-Point to Door	157	190
HR	Head to Side Header	267	293
HS	Head to Side Window	394	410
KK	Knee to Knee	345	210
SHY	Striker to H-Point (Y Direction)	280	310
AA	Ankle to Ankle	355	160

DATA SHEET NO. 5
SEAT BELT POSITIONING DATA

Test Vehicle:	2020 Chrysler Pacifica Hybrid Minivan	NHTSA No.:	M20200316
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	9/8/2020



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU — Top surface of reference to belt upper edge	mm	365	285
PBL — Top surface of reference to belt lower edge	mm	290	210

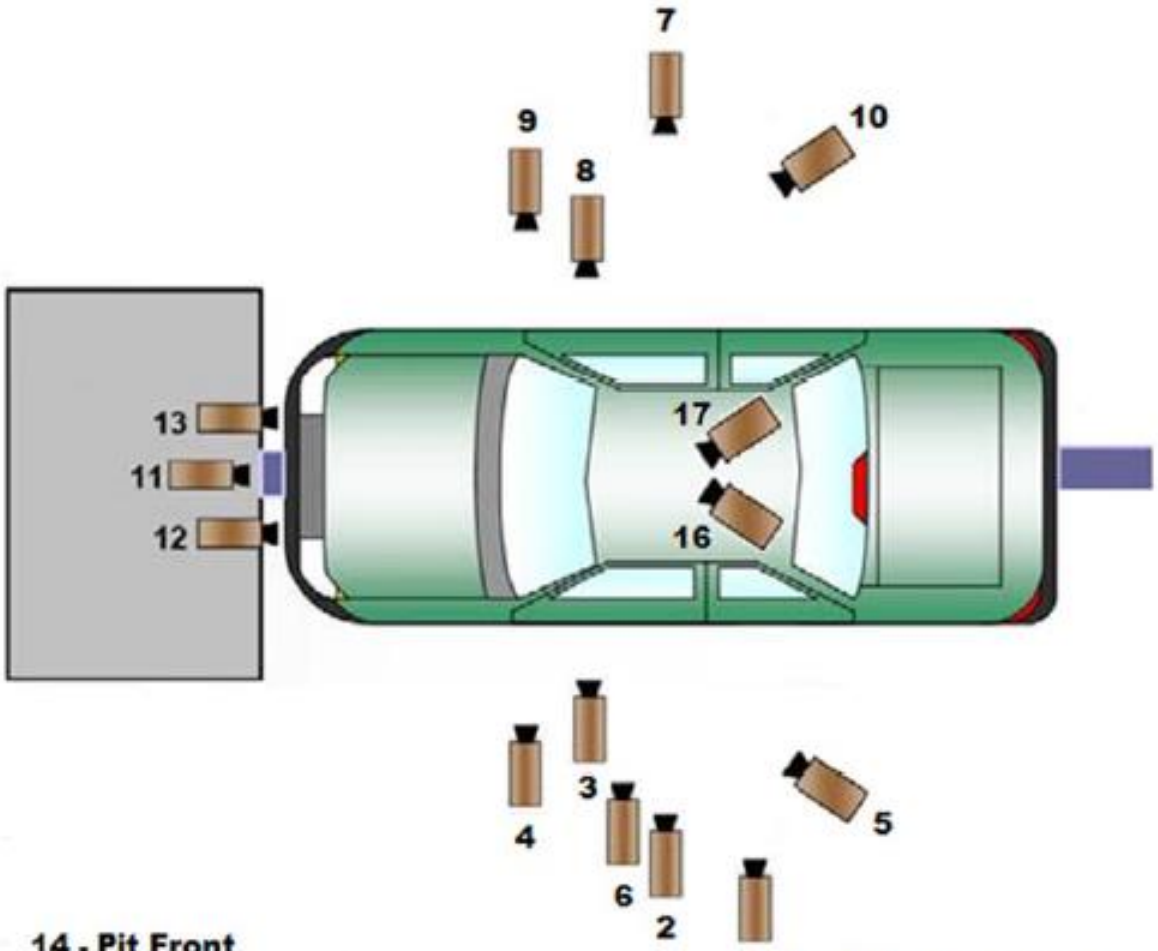
BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	870	940
Lap Belt Length as measured on ATD	mm	695	815
Remainder of belt on reel	mm	835	645
Total belt length for continuous webbing systems	mm	2400	2400

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

Test Vehicle:	2020 Chrysler Pacifica Hybrid Minivan	NHTSA No.:	M20200316
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	9/8/2020

CAMERA POSITIONS FOR FRONTAL IMPACTS



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

Test Vehicle: 2020 Chrysler Pacifica Hybrid Minivan NHTSA No.: M20200316
Test Program: NCAP Frontal Barrier Impact Test Test Date: 9/8/2020

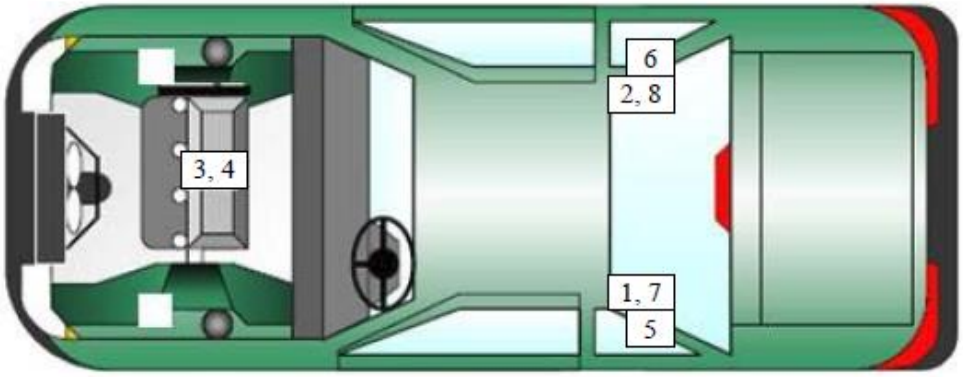
CAMERA LOCATIONS

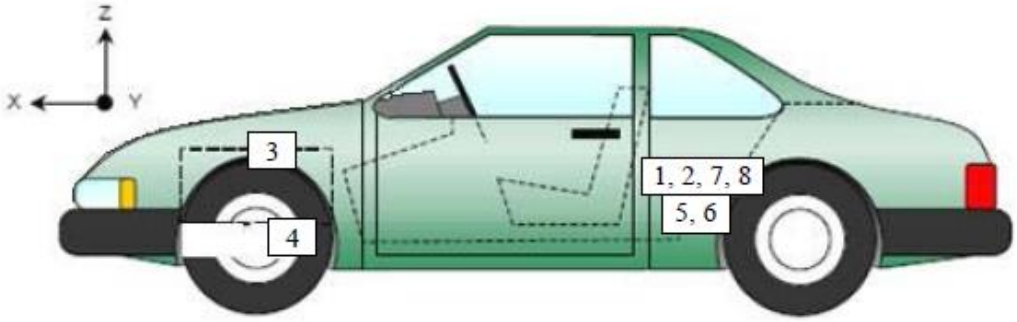
No.	Camera View	Location (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Overall	-	-	-		60
2	Left Overall	-2151	-7723	-1386	24	1000
3	Driver Close-Up	-1257	-6719	-1541	50	1000
4	Left Front Half	-997	-6328	-1297	28	1000
5	Left Angle	-4189	-5032	-2325	50	1000
6	Steering Column	-1369	-7032	-2208	50	1000
7	Right Overall	-2320	7860	-1449	24	1000
8	Passenger Close-Up	-1475	6755	-1442	50	1000
9	Right Front Half	-1049	6127	-1301	28	1000
10	Right Angle	-4425	4842	-2501	50	1000
11	Windshield	1124	0	-3475	12.5	1000
12	Driver Windshield	813	-348	-2331	25	1000
13	Passenger Windshield	813	361	-2331	25	1000
14	Pit Front	-1059	0	2443	12.5	1000
15	Pit Rear	-2934	0	2286	12.5	1000
16	Onboard Driver Airbag (Optional)				8	1000
17	Onboard Passenger Airbag (Optional)				8	1000

** COORDINATES:* *+X = forward of impact plane*
+Y = right of monorail center
+Z = into ground

DATA SHEET NO. 7
VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2020 Chrysler Pacifica Hybrid Minivan NHTSA No.: M20200316
Test Program: NCAP Frontal Barrier Impact Test Test Date: 9/8/2020





VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Accelerometer – X Direction	2310	-368	66
2	Right Rear Accelerometer – X Direction	2323	381	69
3	Engine Top X	4597	142	-401
4	Engine Bottom X	4486	204	341
5	Left Rear Accelerometer – Z Direction	2310	-368	66
6	Right Rear Accelerometer – Z Direction	2323	381	69
7	Left Rear Accelerometer – X Direction Redundant	2310	-375	66
8	Right Rear Accelerometer – X Direction Redundant	2323	373	70

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

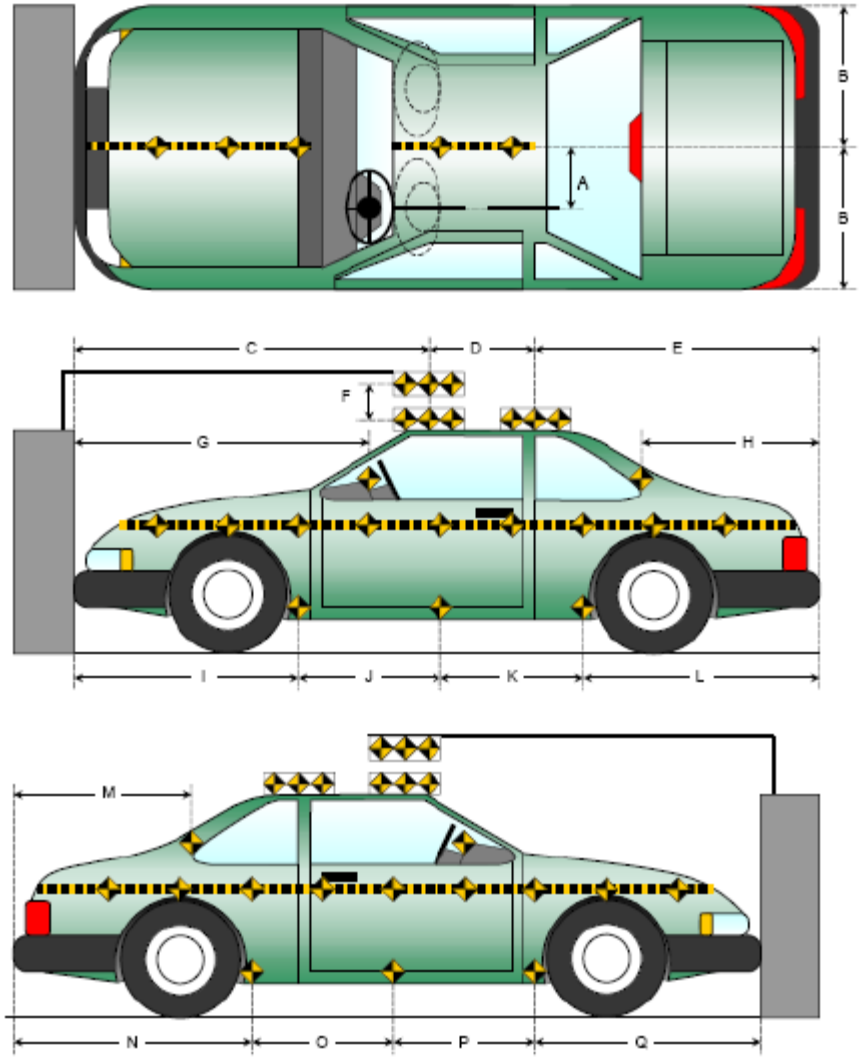
DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2020 Chrysler Pacifica Hybrid Minivan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20200316
Test Date: 9/8/2020

Item	Value
A	409
B	1012
C	2794
D	750
E	1631
F	215
G	1697
H	1477
I	1439
J	1042
K	1044
L	1650
M	1479
N	1654
O	1042
P	1043
Q	1436

All units in millimeters



DATA SHEET NO. 9
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle:	2020 Chrysler Pacifica Hybrid Minivan	NHTSA No.:	M20200316
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	9/8/2020

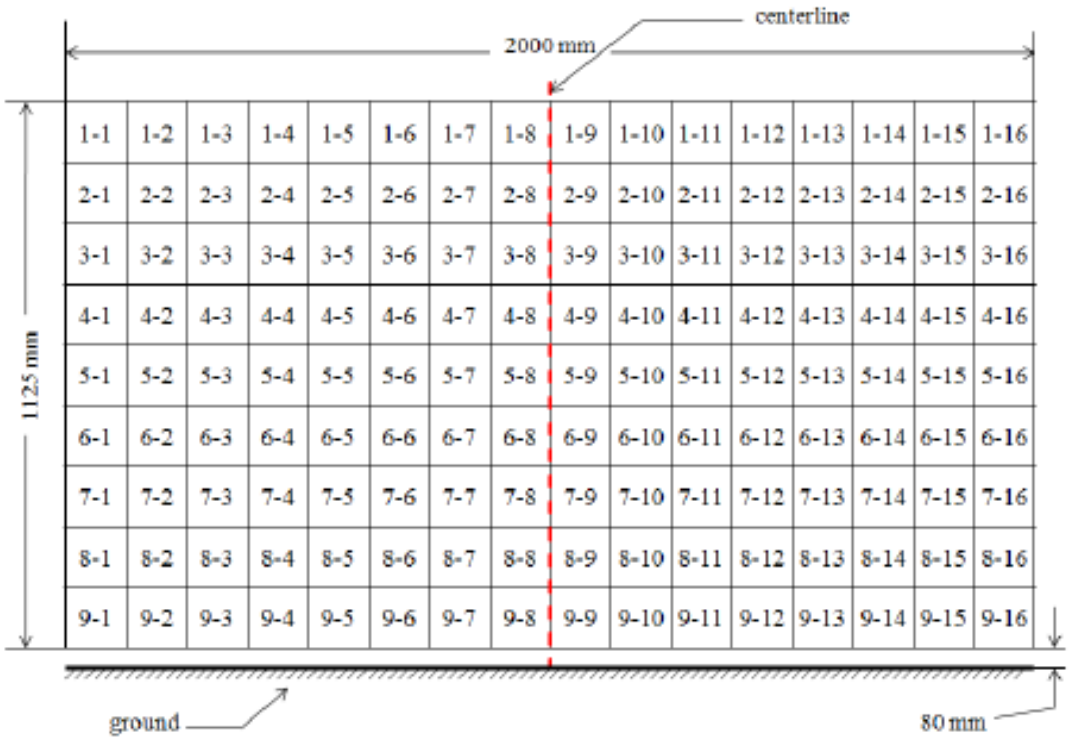


Figure 1 - Load Cell Locations on a 128-Load Cell Barrier with Plywood Height Extension*
Please note above diagram is not actual representation of load cell barrier used.

DATA SHEET NO. 10
TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2020 Chrysler Pacifica Hybrid Minivan NHTSA No.: M20200316
Test Program: NCAP Frontal Barrier Impact Test Test Date: 9/8/2020

INSTRUMENTATION

Instrumentation	Number of Channels Collected
Driver Dummy Accelerometers	47
Passenger Dummy Accelerometers	47
Vehicle Structure Accelerometers	8
Load Cell Barrier	384
Total	486

CAMERA COVERAGE

Type of Camera	Number Used in this Test
High-Speed Vehicle Onboard	2
High-Speed Offboard	14
Real-Time Panning	1
Total	17

DATA SHEET NO. 11
POST-TEST OBSERVATIONS

Test Vehicle: 2020 Chrysler Pacifica Hybrid Minivan NHTSA No.: M20200316
Test Program: NCAP Frontal Barrier Impact Test Test Date: 9/8/2020

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Passenger
Dummy Type / Serial No.	P572E 50th Male / 142	P5720 5th Female / 288
Head Contact	Frontal Airbag & Headrest	Frontal Airbag & Headrest
Upper Torso Contact	Frontal Airbag	Frontal Airbag
Lower Torso Contact	None	None
Left Knee Contact	Knee Airbag	Knee Airbag
Right Knee Contact	Knee Airbag	Knee Airbag

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Passenger	Other
Locked / Unlocked Doors	Unlocked	Unlocked	
Front Door Opening	Closed & Operational	Closed & Operational	
Rear Door Opening	Closed & Operational	Closed & Operational	
Trunk/Hatch/Tailgate Opening			Closed & Operational
Seat Track Shift (mm)	0	0	
Seat Back Movement from Initial Position	No	No	

POST-TEST STRUCTURAL OBSERVATIONS

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

VEHICLE REBOUND FROM BARRIER

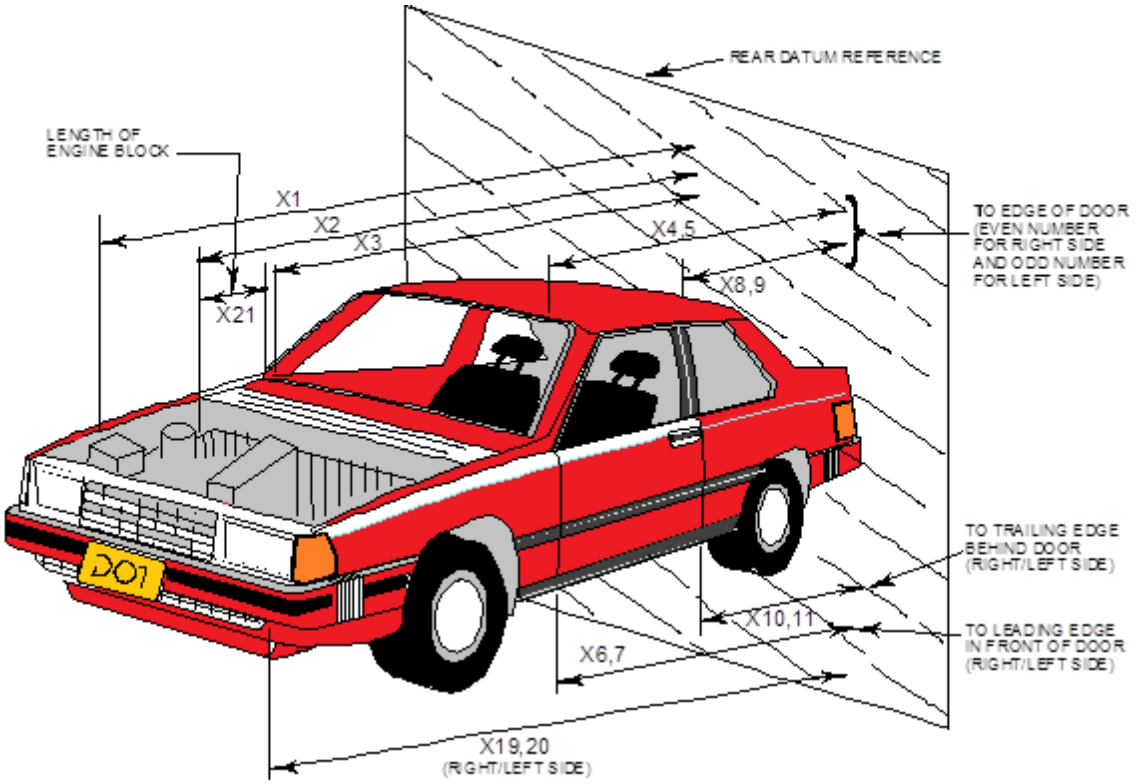
Measured Parameter	Units	Value
Left Side	mm	697
Center	mm	673
Right Side	mm	732
Average	mm	701

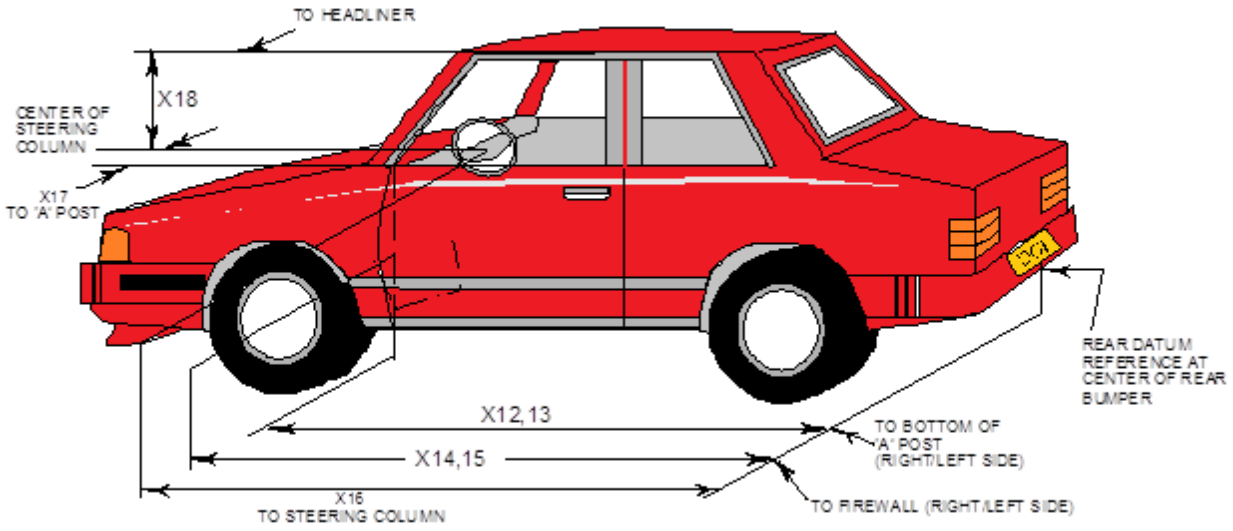
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Driver		Passenger	
	Installed	Deployed	Installed	Deployed
Front Airbag	Yes	Yes	Yes	Yes
Side Airbag 1 - Curtain	Yes	No	Yes	No
Side Airbag 2 - Torso/Pelvis Airbag	Yes	No	Yes	No
Knee Airbag	Yes	Yes	Yes	Yes
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes	Yes	Yes	Yes
Other				

DATA SHEET NO. 12
VEHICLE PROFILE MEASUREMENTS

Test Vehicle:	2020 Chrysler Pacifica Hybrid Minivan	NHTSA No.:	M20200316
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	9/8/2020





DATA SHEET NO. 12 … (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2020 Chrysler Pacifica Hybrid Minivan NHTSA No.: M20200316
Test Program: NCAP Frontal Barrier Impact Test Test Date: 9/8/2020

No.	Measurement Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	5175	4761	-414
2	Rear Surface of Vehicle (RSOV) to Front of Engine	4691	4493	-198
3	RSOV to Firewall	4241	4234	-7
4	RSOV to Upper Leading Edge of Right Door	3702	3702	0
5	RSOV to Upper Leading Edge of Left Door	3703	3703	0
6	RSOV to Lower Leading Edge of Right Door	3688	3688	0
7	RSOV to Lower Leading Edge of Left Door	3689	3689	0
8	RSOV to Upper Trailing Edge of Right Door	2643	2644	1
9	RSOV to Upper Trailing Edge of Left Door	2646	2646	0
10	RSOV to Lower Trailing Edge of Right Door	2650	2652	2
11	RSOV to Lower Trailing Edge of Left Door	2652	2652	0
12	RSOV to Bottom of “A” Post of Right Side	3798	3799	1
13	RSOV to Bottom of “A” Post of Left Side	3799	3796	-3
14	RSOV to Firewall, Right Side	4252	4246	-6
15	RSOV to Firewall, Left Side	4255	4250	-5
16	RSOV to Steering Column	3284	3393	109
17	Center of Steering Column to “A” Post	341	342	1
18	Center of Steering Column to Headliner	416	438	22
19	RSOV to Right Side of Front Bumper	5123	4696	-427
20	RSOV to Left Side of Front Bumper	5119	4731	-388
21	Length of Engine Block	247	247	0
RD	RSOV to Right Side of Dash Panel	3486	3489	3
CD	RSOV to Center of Dash Panel	3306	3303	-3
LD	RSOV to Left Side of Dash Panel	3489	3492	3

*UR= Unrecoverable data point
All Dimensions in mm

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

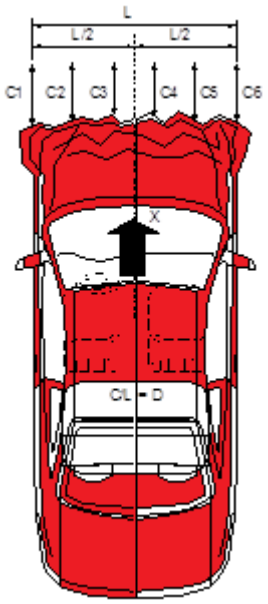
Test Vehicle:	2020 Chrysler Pacifica Hybrid Minivan	NHTSA No.:	M20200316
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	9/8/2020

VEHICLE INFORMATION

VIN:	2C4RC1L70LR242553	Wheelbase (mm):	3091
Vehicle Size Category:	MPV	Test Weight (kg):	2433

ACCELEROMETER DATA

Accelerometer Locations:	Please See Data Sheet No. 7
Cal. Procedure / Interval:	Calspan Procedure / 6 month
Integration Algorithm:	Trapezoidal
Linearity:	> 99%
Impact Velocity (km/h):	56.36
Velocity Change (km/h):	65.33
Time of Separation (ms):	119



CRUSH PROFILE

Collision Deformation Classification:	12FDEW2
Midpoint of Damage:	C4
Damage Region Length (mm):	1596
Impact Mode:	Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush Zone 1 at Left Side	mm	4956	4678	278
C2	Crush Zone 2 at Left Side	mm	5116	4744	372
C3	Crush Zone 3 at Left Side	mm	5164	4763	401
C4	Crush Zone 4 at Right Side	mm	5163	4758	405
C5	Crush Zone 5 at Right Side	mm	5112	4744	368
C6	Crush Zone 6 at Right Side	mm	4937	4704	233
L	C1 to C6	mm	1596	1684	-88

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

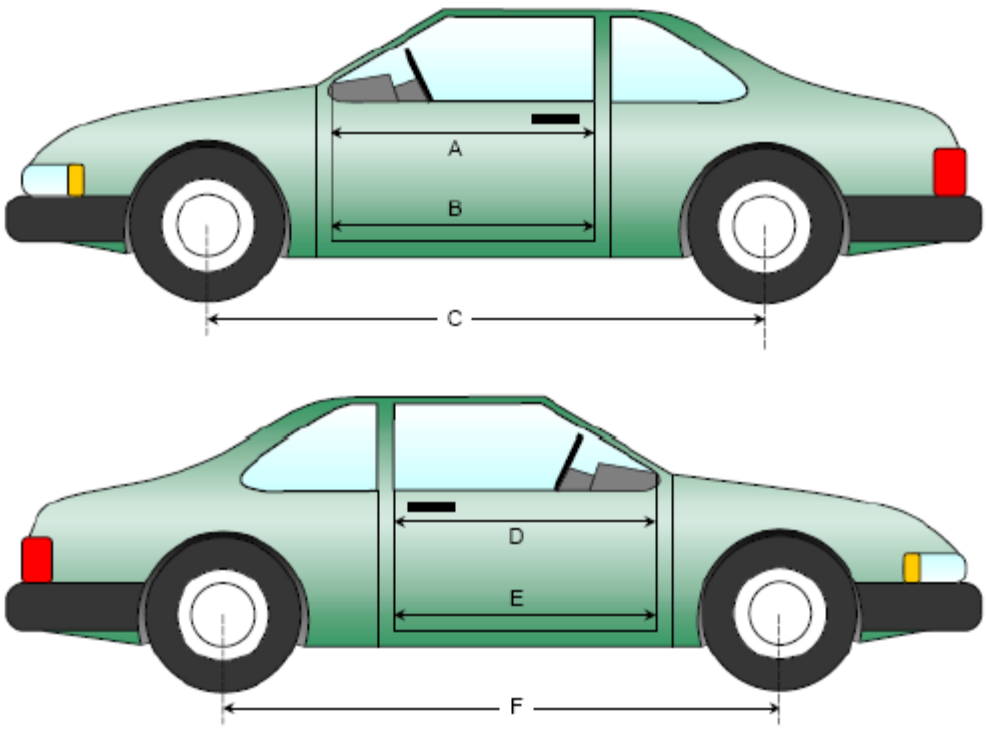
Test Vehicle: 2020 Chrysler Pacifica Hybrid Minivan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: M20200316
Test Date: 9/8/2020

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	941	941	0
B	Left Side Lower	mm	843	841	-2
D	Right Side Upper	mm	937	936	-1
E	Right Side Lower	mm	835	834	-1

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	3091	2994	-97
F	Right Side Wheelbase	mm	3091	3024	-67



Left & Right Side Views

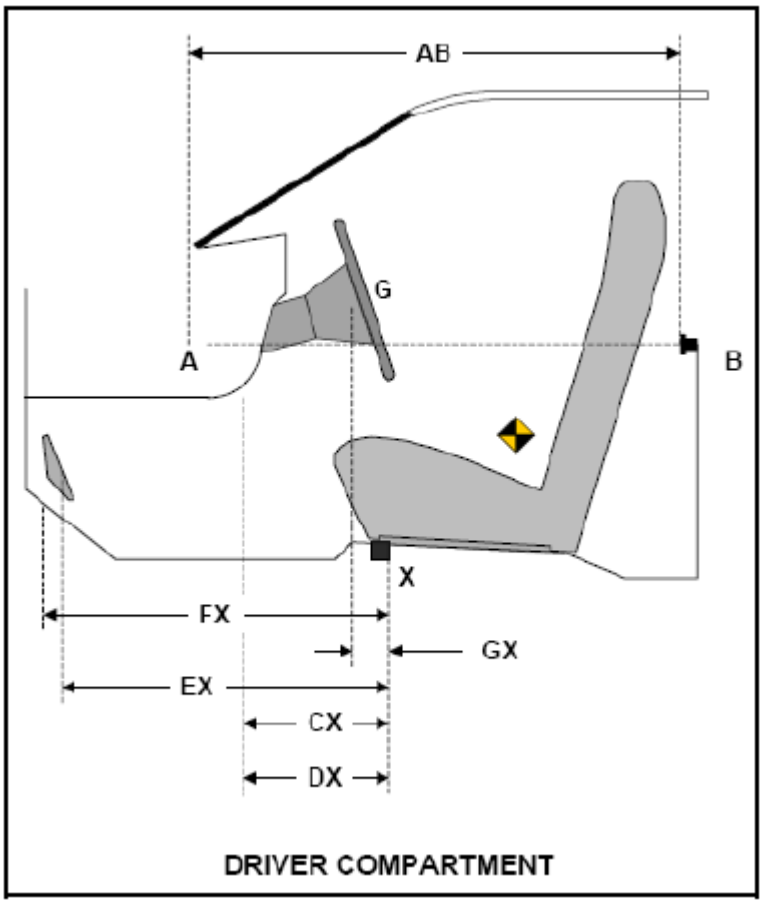
DATA SHEET NO.14 … (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2020 Chrysler Pacifica Hybrid Minivan NHTSA No.: M20200316
Test Program: NCAP Frontal Barrier Impact Test Test Date: 9/8/2020

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	767	767	0
CX	Left Knee Bolster to X	mm	353	354	1
DX	Right Knee Bolster to X	mm	340	340	0
EX	Brake Pedal to X	mm	532	439	-93
FX	Foot Rest to X	mm	526	513	-13
GX	Center of Steering Column Wheel Hub to X	mm	56	168	112

X = Front of Seat Track (Stationary)



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

Test Vehicle:	2020 Chrysler Pacifica Hybrid Minivan	NHTSA No.:	M20200316
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	9/8/2020

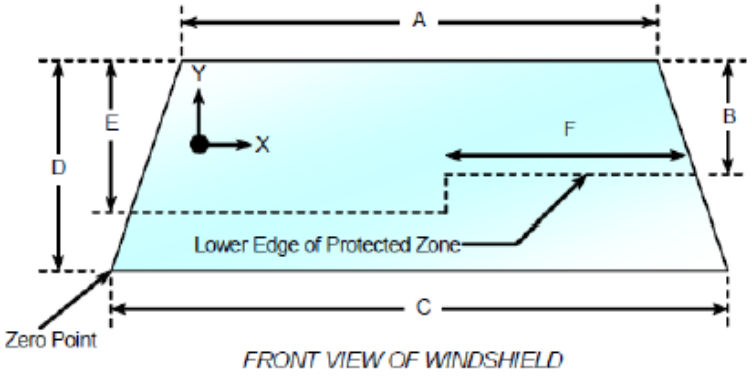
Windshield Mounting Details: A 0.8 mm trim surrounds the top and side of windshield while a plastic shroud is on the bottom.

The standard requires that the post-test retention measurement be a minimum of 75% of the pre-test total periphery measurement for vehicles not equipped with occupant passive restraints and 50% for each side of the windshield for vehicles which are equipped with occupant passive restraints.

Temperature of windshield molding during test: 21 ° C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% Retention
Left Side	2445.5	2445.5	100
Right Side	2445.5	2445.5	100
Total	4891	4891	100



FRONT VIEW OF WINDSHIELD

Item	Units	Value
A	mm	1399
B	mm	506
C	mm	1430
D	mm	1031
E	mm	600
F	mm	682

AREAS OF PROTECTED ZONE FAILURES

A. *Provide coordinates of the area that the protected zone was penetrated more than .25 inches by a vehicle component other than one that is normally in contact with the windshield.*
- No Penetration

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.*
- No Penetration

X	Y

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

Test Vehicle:	2020 Chrysler Pacifica Hybrid Minivan	NHTSA No.:	M20200316
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	9/8/2020

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21 ° C Test Time: 10:00 AM

STODDARD SOLVENT SPILLAGE MEASUREMENTS

A. From impact until vehicle motion ceases: 0 oz.
(Maximum allowable is 1 oz.)

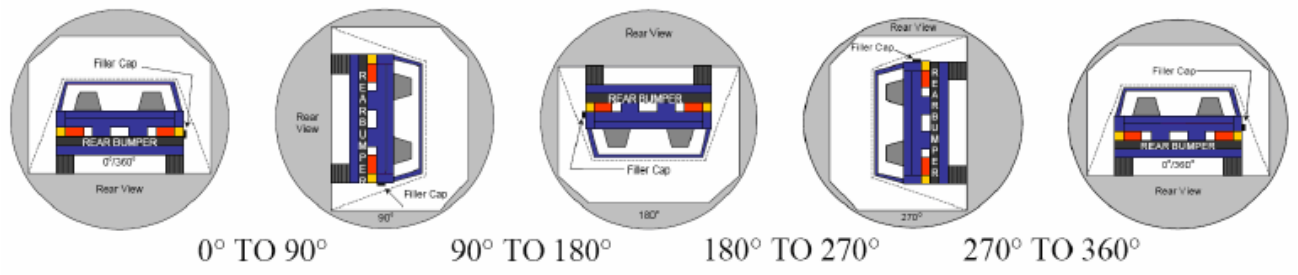
B. For the 5-minute period after motion ceases: 0 oz.
(Maximum allowable is 5 oz.)

C. For the following 25 minutes: 0 oz.
(Maximum allowable is 1 oz./minute)

D. Spillage: No Spillage Occurred

DATA SHEET NO. 16
FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2020 Chrysler Pacifica Hybrid Minivan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: M20200316
Test Date: 9/8/2020



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: No Spillage Occurred

SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	72	300	372
90° to 180°	70	300	370
180° to 270°	73	300	373
270° to 360°	72	300	372

FMVSS 301 SPILLAGE TABLE

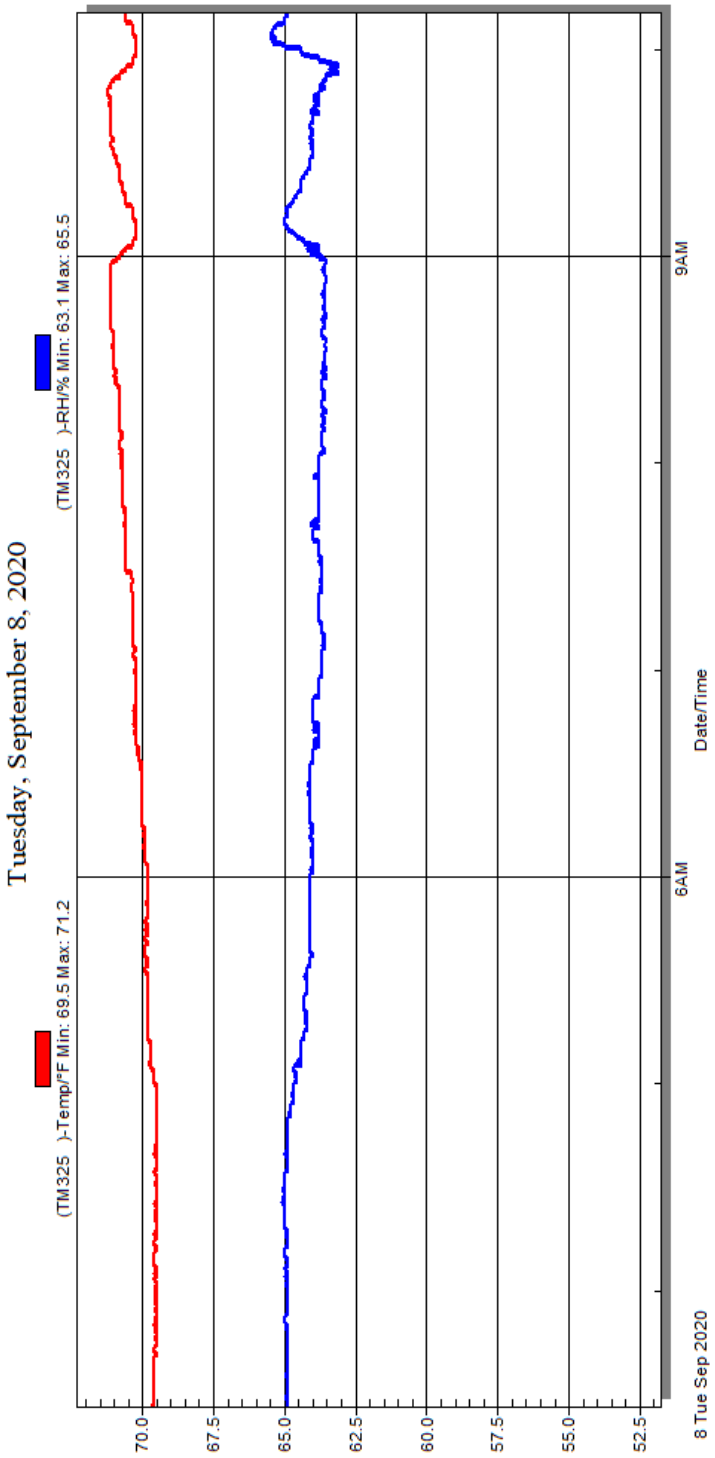
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0° to 90°	0	0	0	
90° to 180°	0	0	0	
180° to 270°	0	0	0	
270° to 360°	0	0	0	

SOLVENT SPILLAGE LOCATION TABLE

Test Phase	Spillage Location
0° to 90°	None
90° to 180°	None
180° to 270°	None
270° to 360°	None

DATA SHEET NO. 17
DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART

Test Vehicle:	2020 Chrysler Pacifica Hybrid Minivan	NHTSA No.:	M20200316
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	9/8/2020



Temperature and Humidity Stabilization Chart/Data for Dummies and Test Vehicle

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

Test Vehicle: 2020 Chrysler Pacifica Hybrid Minivan NHTSA No.: M20200316
Test Program: NCAP Frontal Barrier Impact Test Test Date: 9/8/2020

ELECTRIC VEHICLE PROPULSION SYSTEM

Measured Parameter	Value
Type of Electric Vehicle (Electric/Gas-Electric Hybrid/Fuel Cell-Electric Hybrid)	Gas-Electric Hybrid
Propulsion Battery Type	Lithium-Ion
Nominal Voltage (Volts)	360
Is this Vehicle equipped with an Automatic Propulsion Battery Disconnect?	Yes
Physical Location of Automatic Propulsion Battery Disconnect, if applicable	Inside Battery Pack
Auxiliary Battery Type	12V AGM

PROPULSION BATTERY SYSTEM DATA (COTR SUPPLIED)

Measured Parameter	Value
Electrolyte Fluid Type	Gel-type, Organic Carbonate Based
Electrolyte Fluid Specific Gravity	1.3 g/cc
Electrolyte Fluid Kinematic Viscosity (centistokes)	2.2 cP
Electrolyte Fluid Color	Colorless
Propulsion Battery Coolant Type, Color and Specific Gravity (if applicable)	50/50 Glycol/Water
Location of Battery Modules (Inside or Outside of Passenger Compartment?)	Outside

PROPULSION BATTERY STATE OF CHARGE

Measured Parameter	Units	Value
For all battery types: Voltage Range corresponding to **useable energy** of the battery:		
Minimum State of Charge	V	0
Maximum State of Charge	V	392
95% of Maximum	V	372.4
Test Voltage *	V	387.7
For batteries that are rechargeable ONLY by an energy source on the vehicle: Voltage range corresponding to **useable energy** of the battery :		
Minimum State of Charge	V	
Maximum State of Charge	V	
95% of Maximum	V	
Test Voltage *	V	

* *For all battery types-No less than 95% of Maximum Operating Voltage; for batteries that are rechargeable ONLY by an energy source on the vehicle-maximum practicable state of charge within normal operating range*.

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

Test Vehicle: 2020 Chrysler Pacifica Hybrid Minivan NHTSA No.: M20200316
Test Program: NCAP Frontal Barrier Impact Test Test Date: 9/8/2020

VEHICLE CHASSIS GROUND PT(S) LOCATION(S) & PROPULSION BATTERY SYSTEM

Measured Parameter	Value
Details of Vehicle Chassis Ground Points & Locations	Ground point was located on the outside vehicle body rear quarter
Details of Propulsion Battery Components	All battery components are internal to the battery located on the underside of the vehicle.

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

Test Vehicle:	2020 Chrysler Pacifica Hybrid Minivan	NHTSA No.:	M20200316
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	9/8/2020

VOLTMETER INFORMATION

Measured Parameter	Units	Value
Make & Model		Fluke 87
Serial No.		65280327
Internal Impedance Value	MΩ	10
Resolution	V	0.001
Last Calibration Date		8/5/2020

NOTES:

- *The voltmeter used in this test shall measure DC values and have an internal impedance of at least 10 M Ω*
- *An oscilloscope meeting the above requirements may need to be used to adequately measure voltage in some vehicles.*

PROPULSION BATTERY VOLTAGE, RESISTANCE & ELECTRICAL ISOLATION MEASUREMENTS & CALCULATIONS

Measured Parameter	Symbol	Units	Value
Normal operating voltage range specified by the manufacturer	V_b	V	392
Propulsion Battery Voltage : (ready to drive position)	V_b	V	387.7
Propulsion Battery to Vehicle Chassis	V_1	V	348.8
Propulsion Battery to Vehicle Chassis	V_2	V	149.1
Propulsion Battery to Vehicle Chassis Across Known Resistor	R_o	Ω	180500
Propulsion Battery to Vehicle Chassis with R_o installed	V_1'	V	11.2
Propulsion Battery to Vehicle Chassis with R_o installed	V_2'	V	11.3
$R_{i1}= R_o*(1+V_2/V_1)*[(V_1-V_1')/V_1']$	R_{i1}	Ω	7766534
$R_{i2}= R_o*(1+V_1/V_2)*[(V_2-V_2')/V_2']$	R_{i2}	Ω	7350425
Lesser value of R_{i1} and R_{i2}	R_i	Ω	7350425
Electrical Isolation Value (Minimum E.I. Value is 500 Ω/V)	R_i/V_b	Ω/V	18959

Is the Electrical Isolation Value ≥ 500 Ω/V (Yes/No)? [X] Yes [ ] No (Fail)

NOTES:

- *The measurement shall be made with the propulsion battery connected to the vehicle propulsion system, and the vehicle in the "ready-to-drive" (propulsion motor(s) activated) position.*
- *If the voltage measurement is not at the voltage or within the normal operating voltage range specified by the manufacturer, the battery must be charged.*
- *The known resistance Ro (in Ohms) should be approximately 500 times the nominal operating voltage of the vehicle (in volts) per SAE J1766*
- *If measured voltage is zero and results in a division by zero, record "Zero Volts." This "zero voltage" condition is considered as being compliant*

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

Test Vehicle: 2020 Chrysler Pacifica Hybrid Minivan NHTSA No.: M20200316
Test Program: NCAP Frontal Barrier Impact Test Test Date: 9/8/2020

VOLTMETER INFORMATION

Measured Parameter	Units	Value
Make & Model		Fluke 87
Serial No.		65280327
Internal Impedance Value	MΩ	10
Nominal Propulsion Battery Voltage (V_b)	V	0.056

NOTES:

- *The voltmeter used in this test shall measure DC values and have an internal impedance of at least 10 M Ω*
- *An oscilloscope meeting the above requirements may need to be used to adequately measure voltage in some vehicles.*

ELECTRICAL ISOLATION MEASUREMENTS & IMPACT CALCULATIONS

Parameter	Value	Units		Value		Value	
V_1 =	0.502	V	Time:	3	Minutes	31	Seconds
V_2 =	0.408	V	Time:	3	Minutes	44	Seconds
$R_{o\,=}$	180500	Ω	Time:		Minutes		Seconds
V_1' =	0.031	V	Time:	3	Minutes	58	Seconds
V_2' =	0.027	V	Time:	4	Minutes	07	Seconds
R_{i1} =	4971347	Ω	Time:	4	Minutes	21	Seconds
R_{i2} =	5680933	Ω	Time:	4	Minutes	29	Seconds
R_i =	4971347	Ω	Time:	4	Minutes	38	Seconds
R_i/V_b =	88774057	Ω/V	Time:	4	Minutes	46	Seconds

Is the Electrical Isolation Value ≥ 500 Ω/V (Yes/No)? X Yes ____ No (Fail)

NOTES:

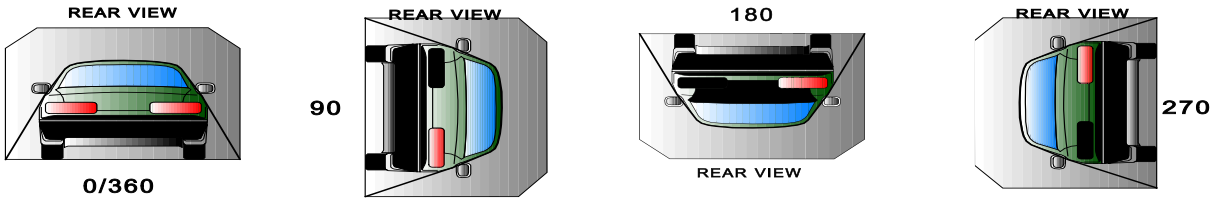
- *R_{i1}= R_o*(1+V_2/V_1)*[(V_1-V_1')/V_1'], R_{i2}= R_o*(1+V_1/V_2)*[(V_2-V_2')/V_2'], R_i = Lesser value of R_{i1} and R_{i2}*
- *If measured voltage is zero and results in a division by zero, record "Zero Volts." This "zero voltage" condition is considered as being compliant*
- *Minimum Electrical Isolation Value is 500 Ω/V*

. **PROPULSION BATTERY SYSTEM COMPONENTS**

Measured Parameter	Comments	Passed	Failed
Propulsion Battery Module movement within the passenger compartment	None	X	
Intrusion of an outside Propulsion Battery Component into the passenger compartment	None	X	
Is propulsion battery electrolyte spillage visible in the passenger compartment?		X	

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

Test Vehicle: 2020 Chrysler Pacifica Hybrid Minivan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: M20200316
Test Date: 9/8/2020



Rear View

DETERMINATION OF PROPULSION BATTERY ELECTROLYTE COLLECTION TIME PERIOD

Rollover Stage	Rotation Time (spec. 1 -3 min)		FMVSS 301 Hold Time	Total Time		Next Whole Minute Interval
	Minutes	Seconds	Minutes	Minutes	Seconds	Minutes
0° to 90°	1	12	5	6	12	7
90° to 180°	1	10	5	6	10	7
180° to 270°	1	13	5	6	13	7
270° to 360°	1	12	5	6	12	7

ACTUAL TEST VEHICLE PROPULSION BATTERY ELECTROLYTE SPILLAGE

Rollover Stage	Propulsion Battery Electrolyte Spillage	Units	Spillage Location
0° to 90°	0.0	Liters	None
90° to 180°	0.0	Liters	None
180° to 270°	0.0	Liters	None
270° to 360°	0.0	Liters	None
Total Spillage	0.0	Liters	None

** FMVSS 305 Requirements: Maximum allowable propulsion battery electrolyte spillage is **5.0 Liters***

Is the total spillage of propulsion battery electrolyte greater than 5.0 Liters? [ ] Yes (Fail) [X] No
Is propulsion battery electrolyte spillage visible in the passenger compartment? [ ] Yes (Fail) [X] No

VOLTMETER INFORMATION

Measured Parameter	Units	Value
Make & Model		Fluke 87
Serial No.		65280327
Internal Impedance Value	MΩ	10
Nominal Propulsion Battery Voltage (V_b)	V	0.052

NOTES:

- *The voltmeter used in this test shall measure DC values and have an internal impedance of at least 10 M Ω*
- *An oscilloscope meeting the above requirements may need to be used to adequately measure voltage in some vehicles.*

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

Test Vehicle: 2020 Chrysler Pacifica Hybrid Minivan NHTSA No.: M20200316
Test Program: NCAP Frontal Barrier Impact Test Test Date: 9/8/2020

ELECTRICAL ISOLATION MEASUREMENTS & CALCULATIONS

Parameter	Rollover Stage	Value	Units		Minutes	Seconds
V_1 =	90°	0.052	V	Time:	1	54
	180°	0.051	V		8	35
	270°	0.051	V		15	05
	360°	0.052	V		20	54
V_2 =	90°	0.054	V	Time:	2	02
	180°	0.004	V		8	43
	270°	0.003	V		15	16
	360°	0.004	V		21	08
V_1' =	90°	0.004	V	Time:	2	20
	180°	0.004	V		8	50
	270°	0.004	V		15	27
	360°	0.004	V		21	14
V_2' =	90°	0.001	V	Time:	2	30
	180°	0.001	V		9	01
	270°	0.001	V		15	36
	360°	0.001	V		21	19
R_{i1} =	90°	4415308	Ω	Time:	2	35
	180°	2287218	Ω		9	19
	270°	2245632	Ω		15	42
	360°	2332615	Ω		21	29
R_{i2} =	90°	18778685	Ω	Time:	2	37
	180°	7445625	Ω		9	27
	270°	6498000	Ω		15	50
	360°	7851000	Ω		21	34
R_i =	90°	4415308	Ω	Time:	2	40
	180°	2287218	Ω		9	40
	270°	2245632	Ω		15	55
	360°	2332615	Ω		21	40
R_i/V_b =	90°	84909763	Ω/V	Time:	2	43
	180°	43984964	Ω/V		9	45
	270°	43185238	Ω/V		15	58
	360°	44857988	Ω/V		21	52

Is the Electrical Isolation Value ≥ 500 Ω/V (Yes/No)? [X] Yes [ ] No (Fail)

APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

[1]**NOTE**: *The underbody views should include the following vehicle components: fuel pump, fuel lines, sender unit, fuel tank filler pipe and any other visible system components.*

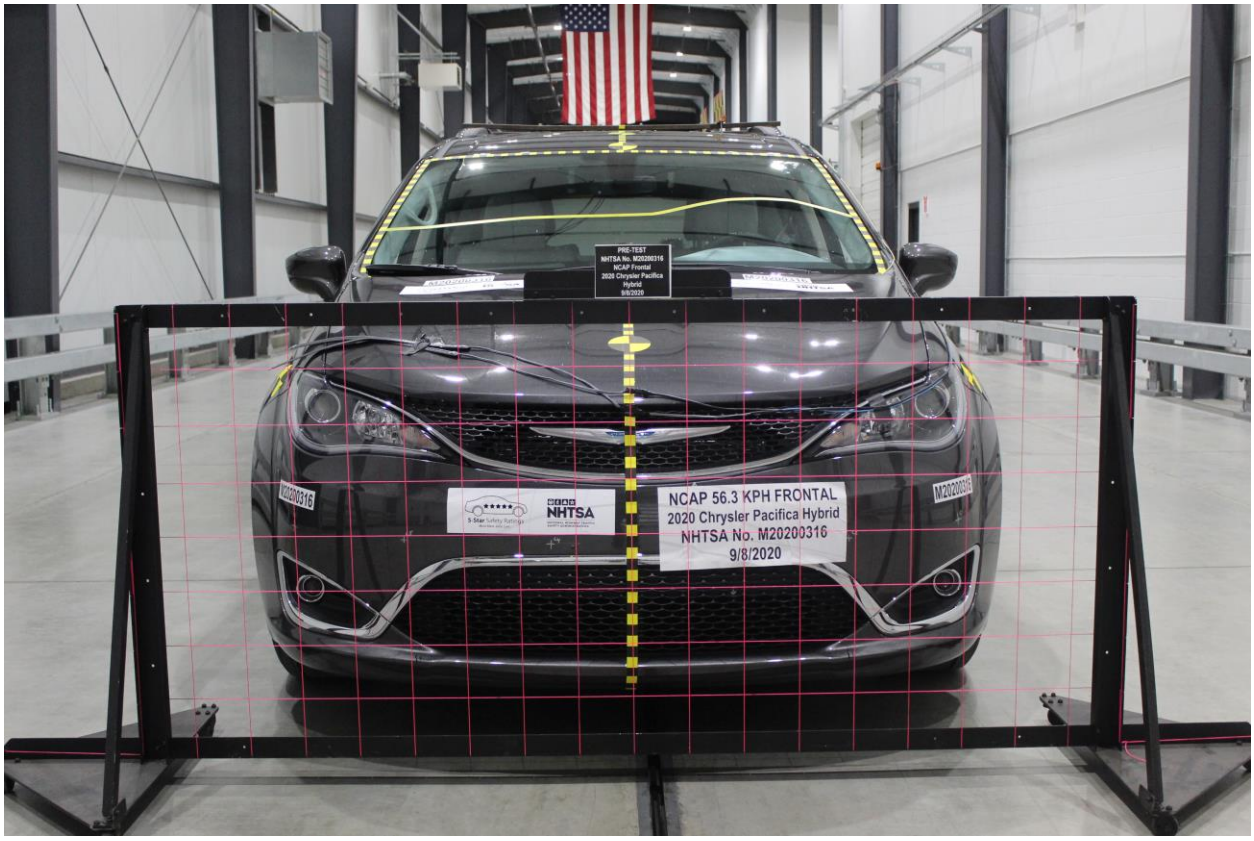


Figure A-1: Load Cell Location

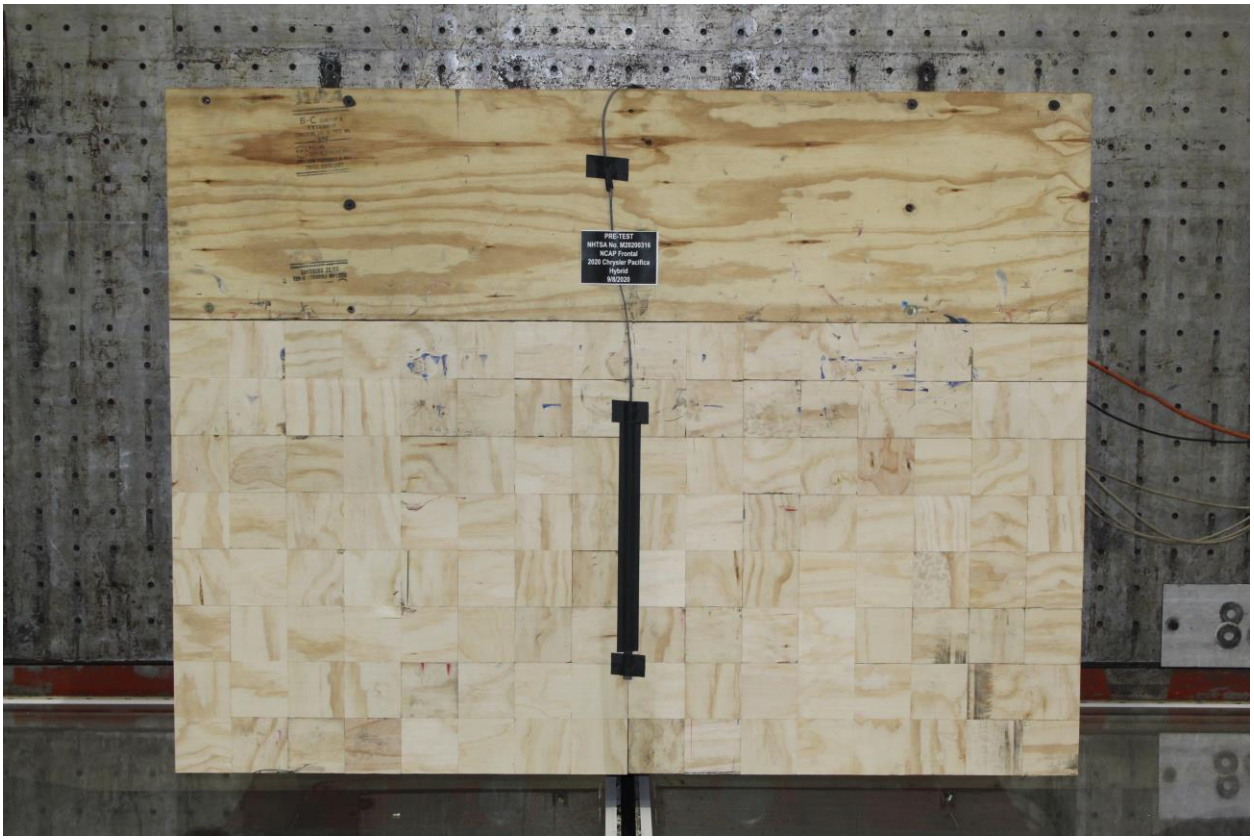


Figure A-2: Pre-Test Load Cell Wall

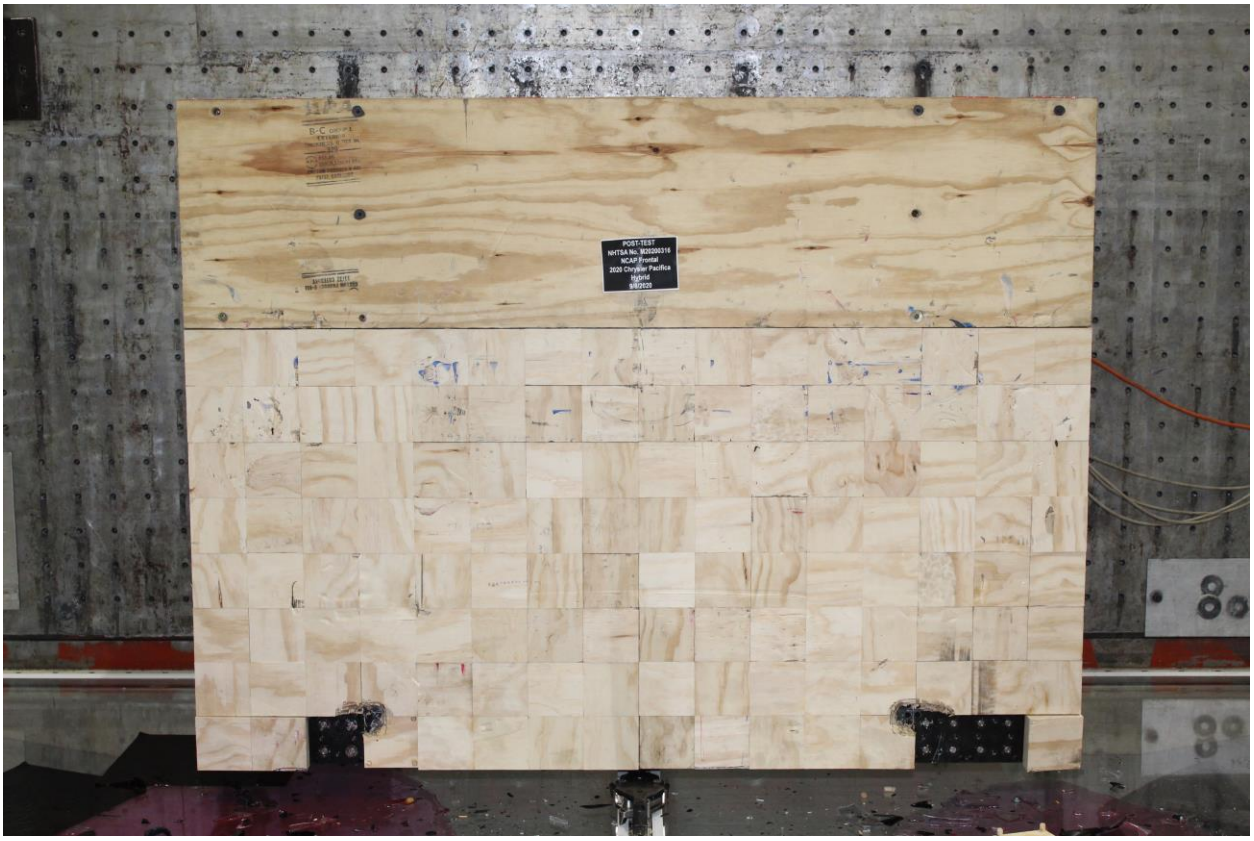


Figure A-3: Post-Test Load Cell Wall

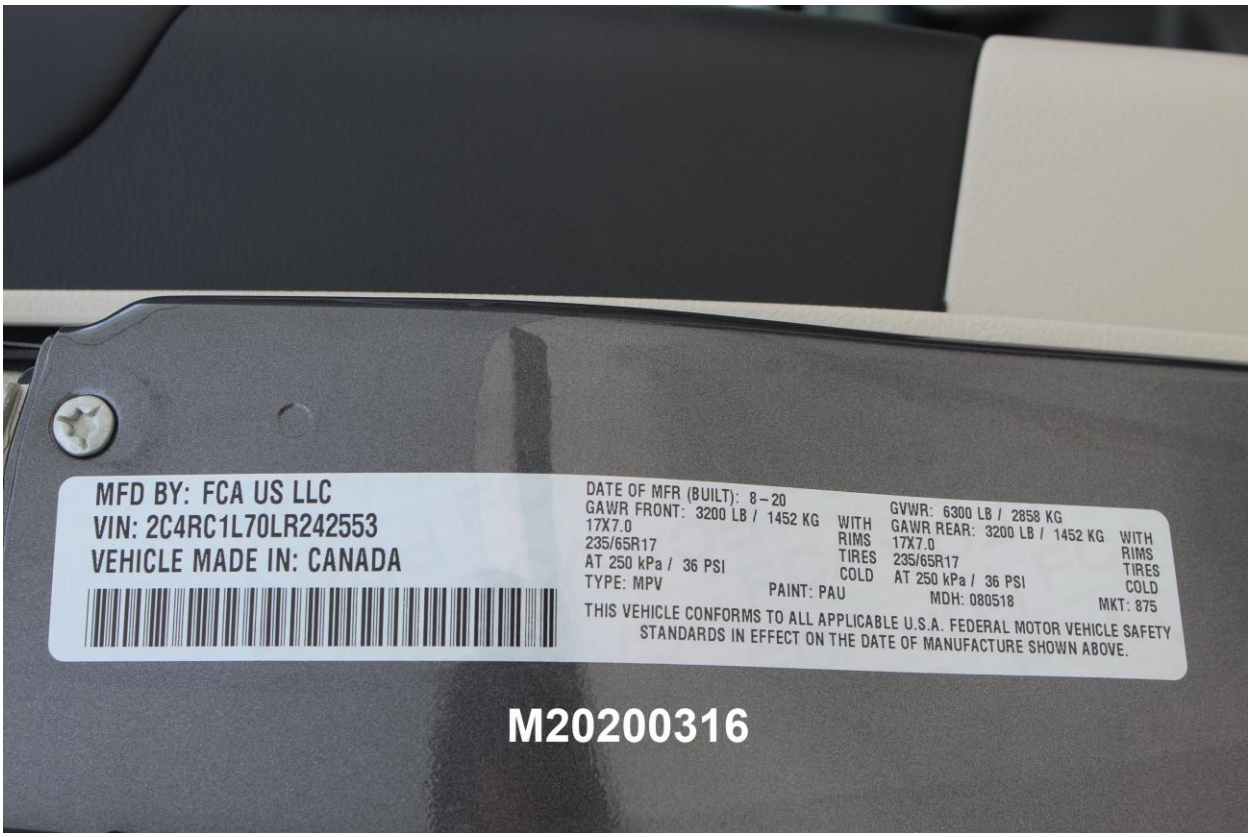


Figure A-4: Manufacturer's Label

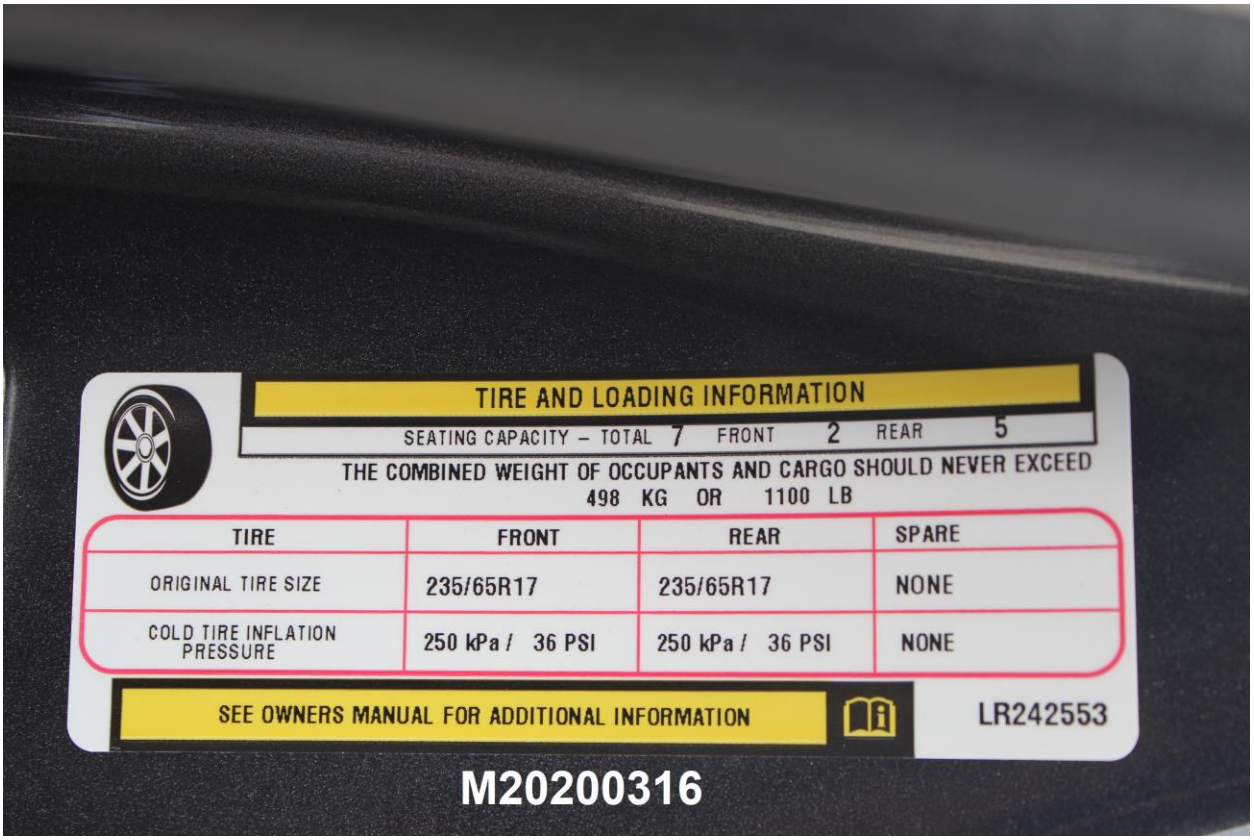


Figure A-5: Tire Placard

Figure A-6: 2020 Chrysler Pacifica Frontal As Delivered

Figure A-7: Left Rear 3-4 View, As Received

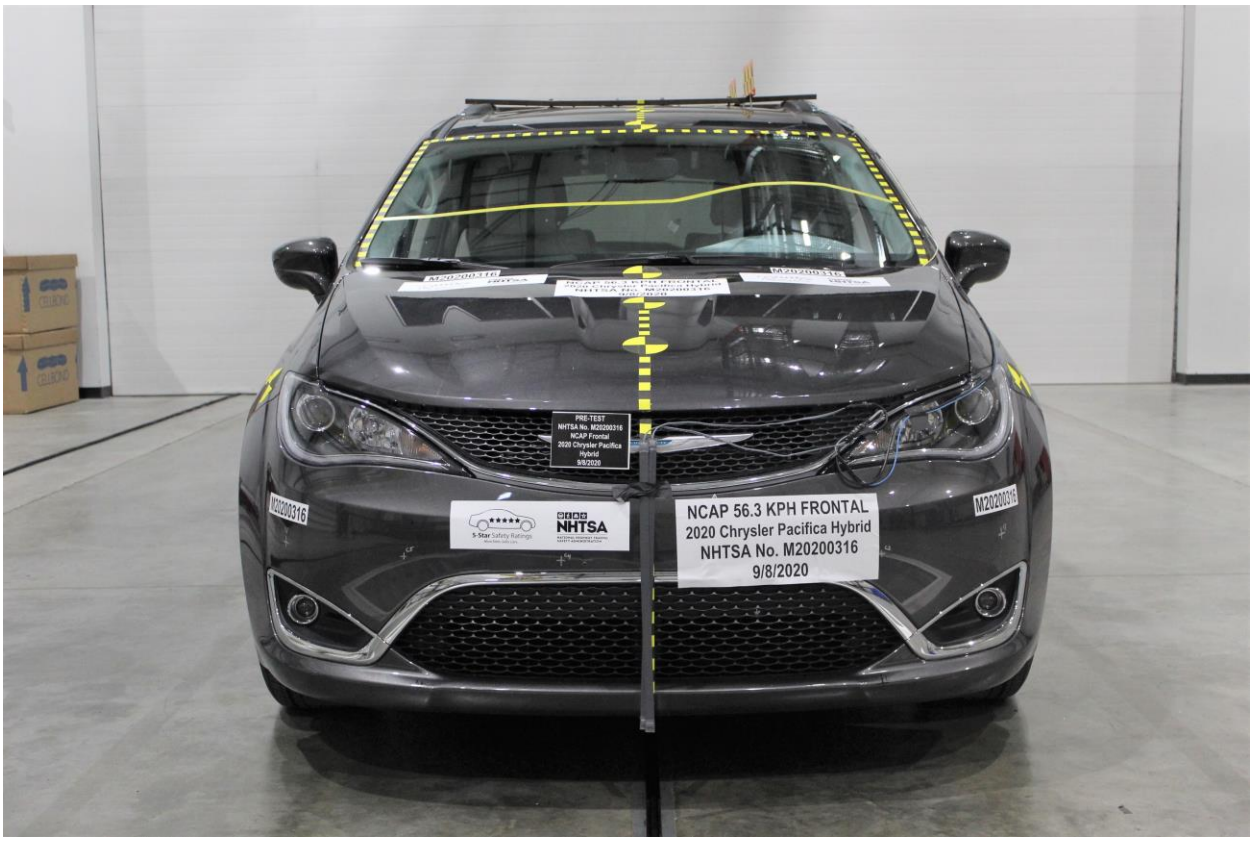


Figure A-8: Pre-Test Front View of Test Vehicle

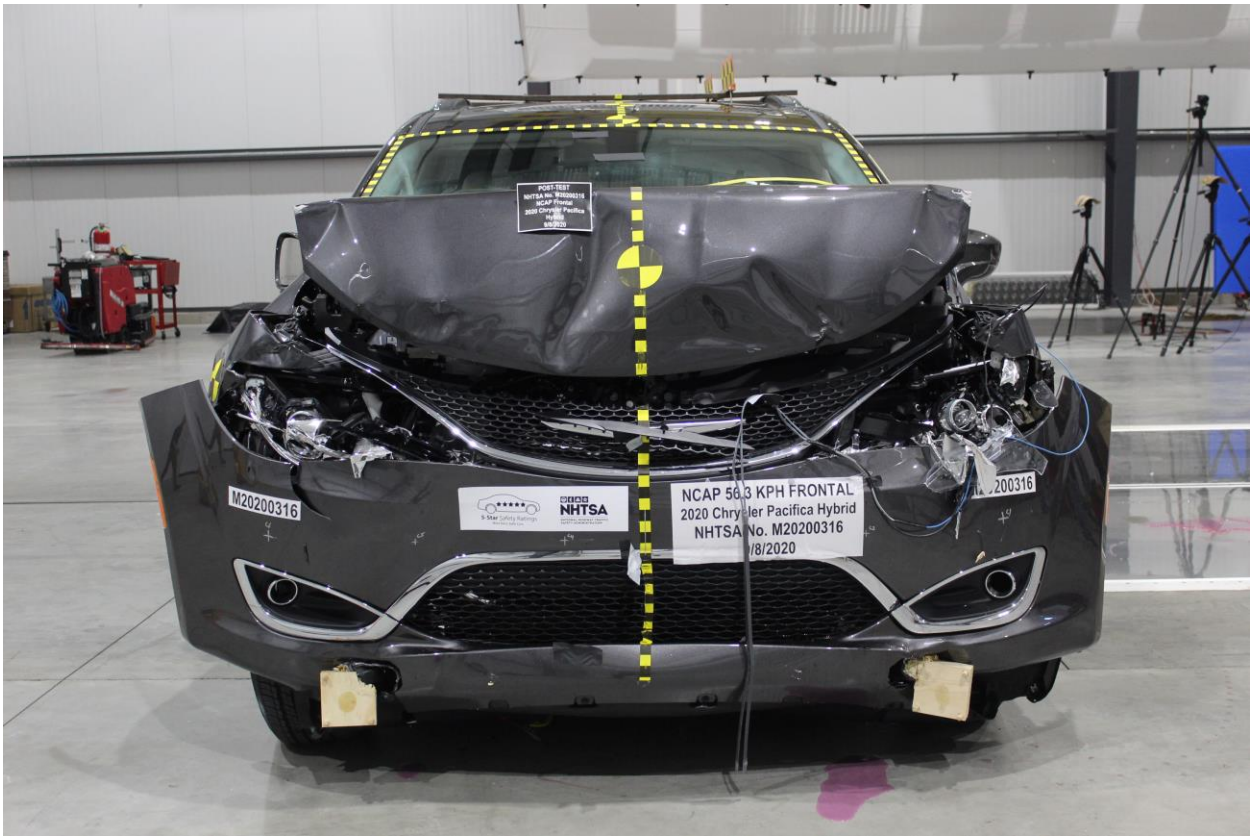


Figure A-9: Post-Test Front View of Test Vehicle

Figure A-10: Pre-Test Left View of Test Vehicle

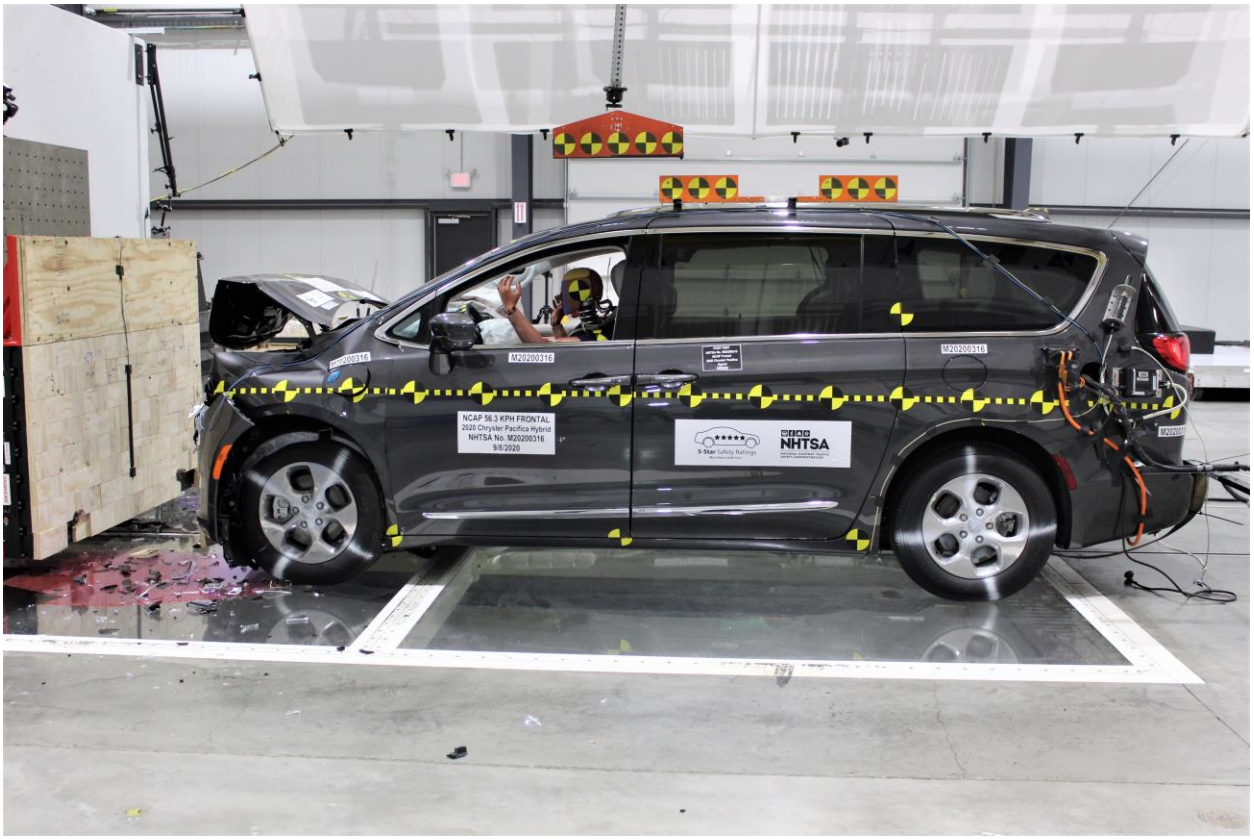


Figure A-11: Post-Test Left View of Test Vehicle

Figure A-12: Pre-Test Right View of Test Vehicle

Figure A-13: Post-Test Right View of Test Vehicle

Figure A-14: Pre-Test Right Front 3-4 View

Figure A-15: Post-Test Right Front 3-4 View

Figure A-16: Pre-Test Left Rear 3-4 View

Figure A-17: Post-Test Left Rear 3-4 View

Figure A-18: Pre-Test Windshield View

Figure A-19: Post-Test Windshield View

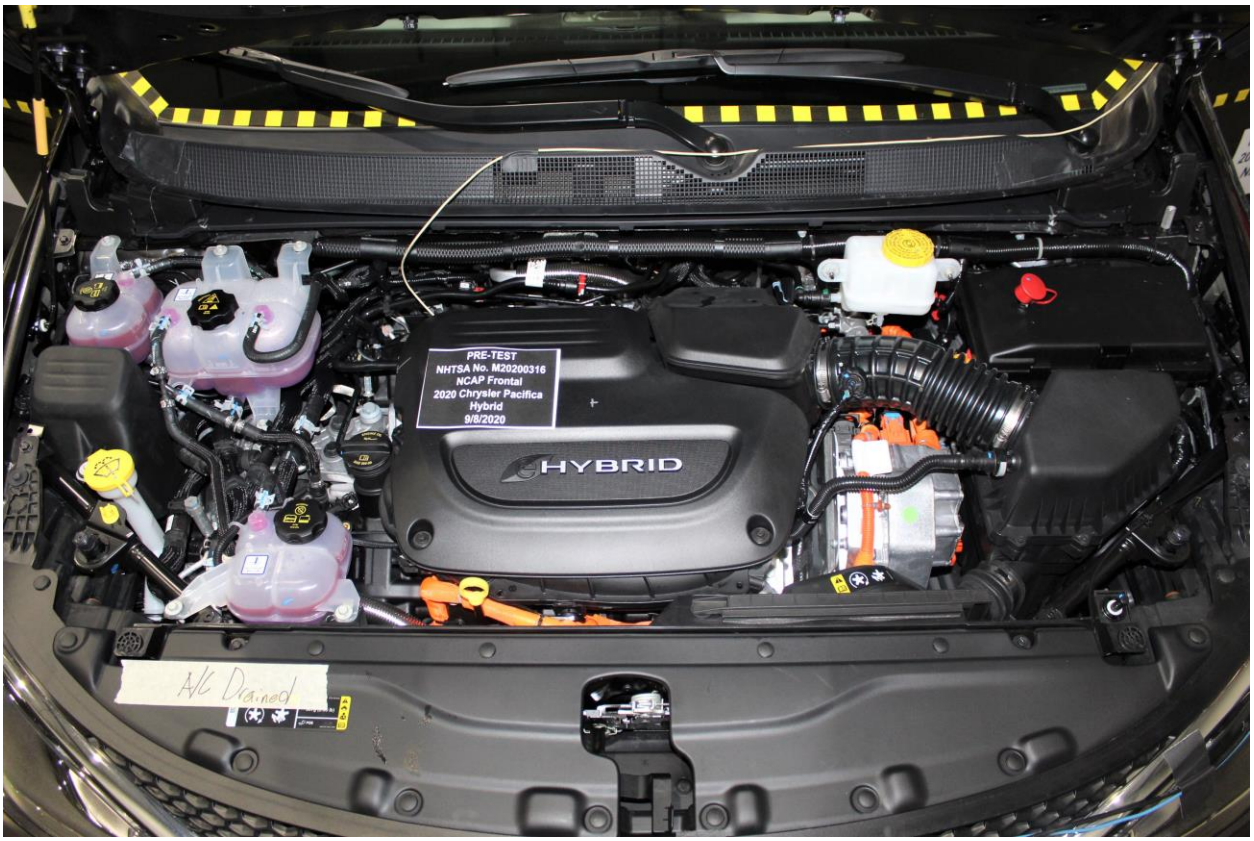


Figure A-20: Pre-Test Engine Compartment View

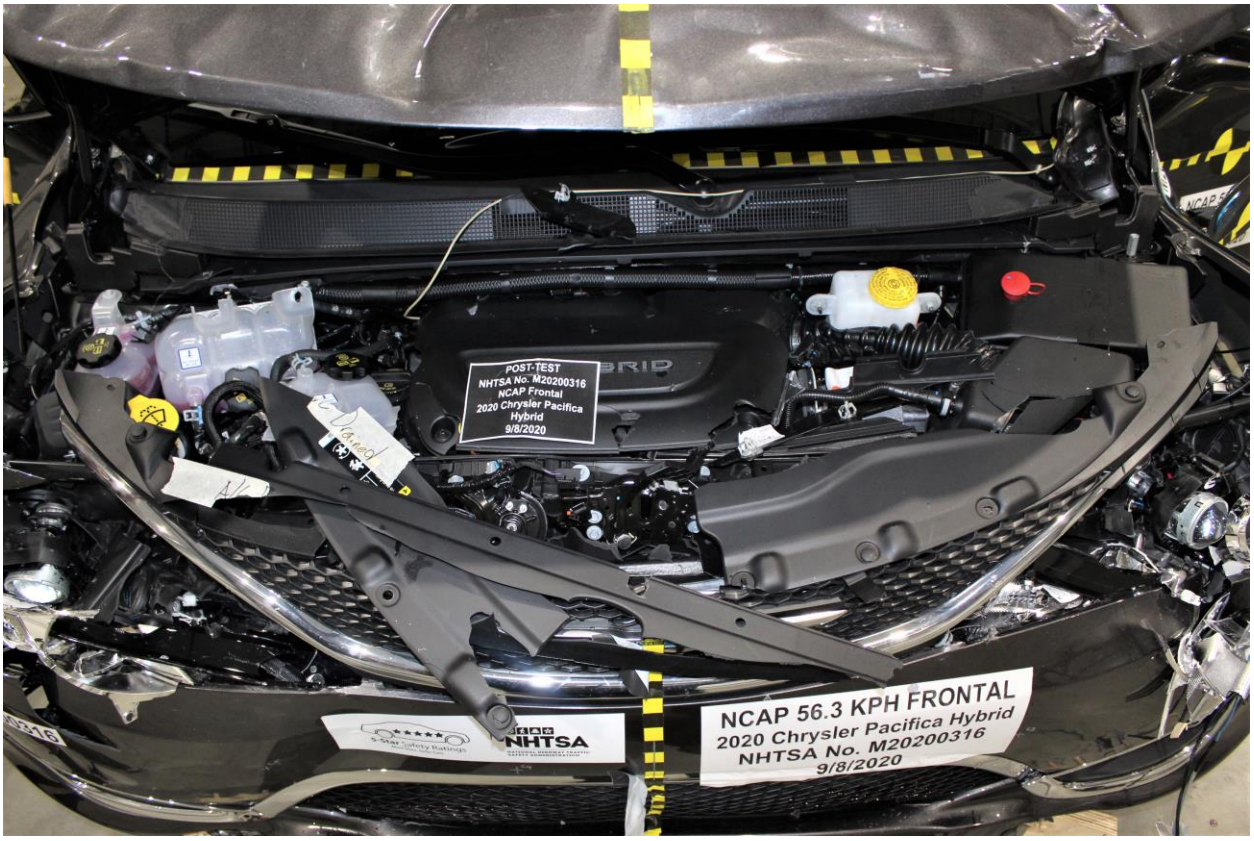


Figure A-21: Post-Test Engine Compartment View

Figure A-22: Pre-Test Fuel Filler Cap View

Figure A-23: Post-Test Fuel Filler Cap View

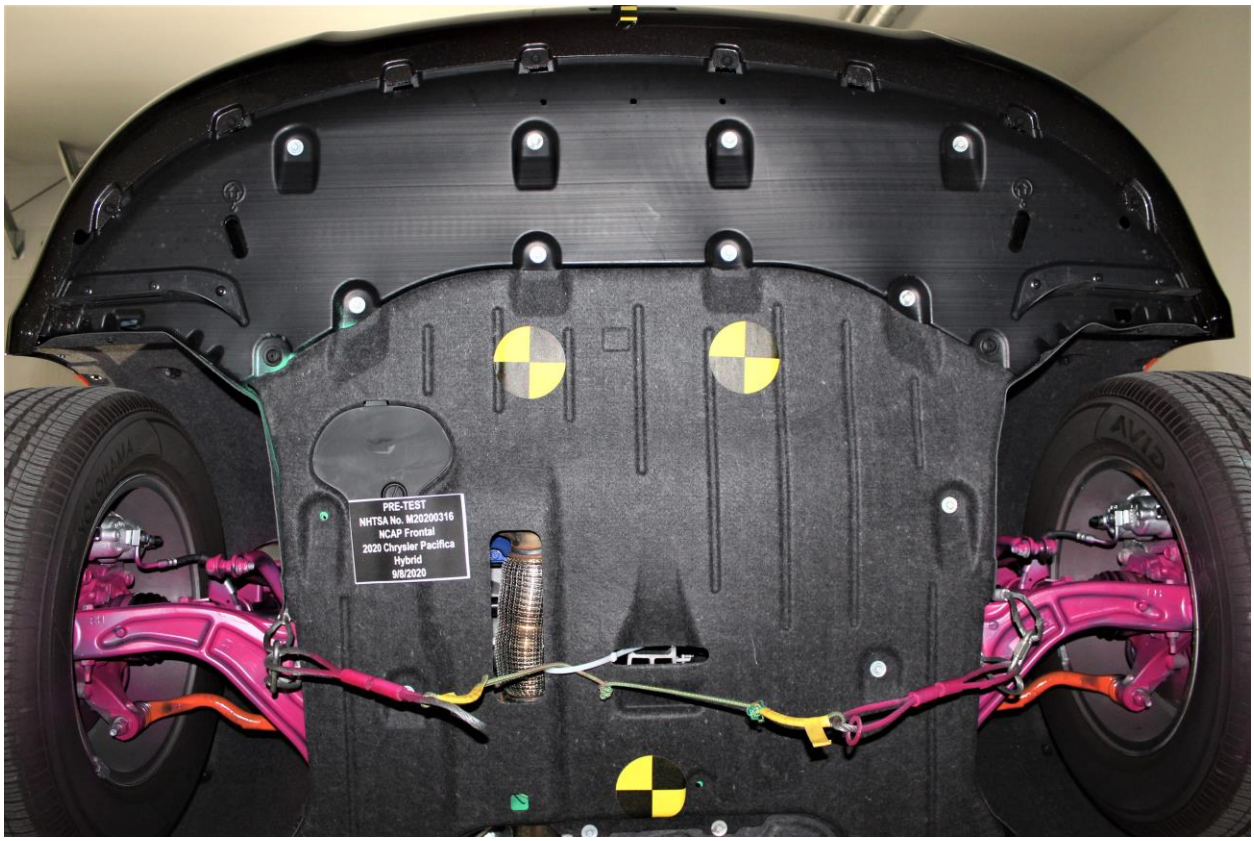


Figure A-24: Pre-Test Front Underbody View

Figure A-25: Post-Test Front Underbody View

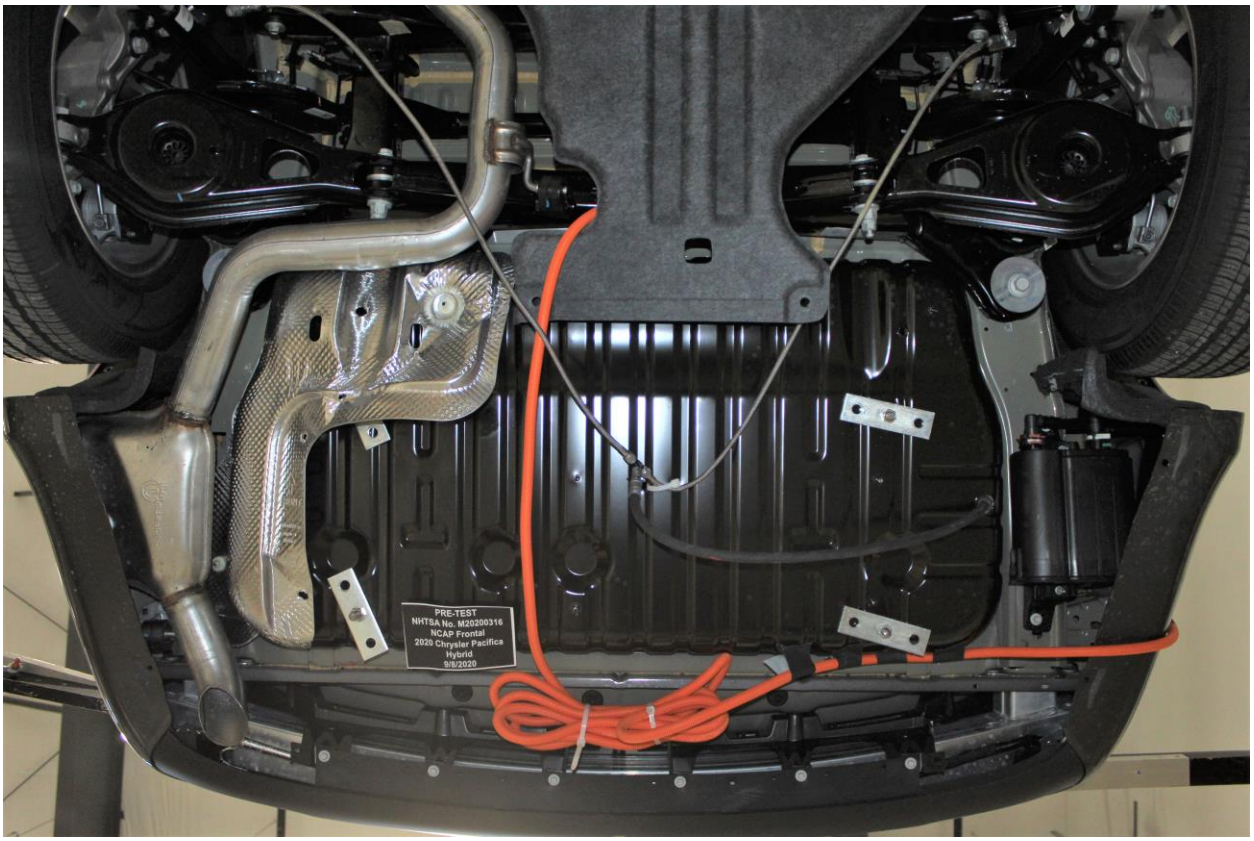


Figure A-26: Pre-Test Rear Underbody View

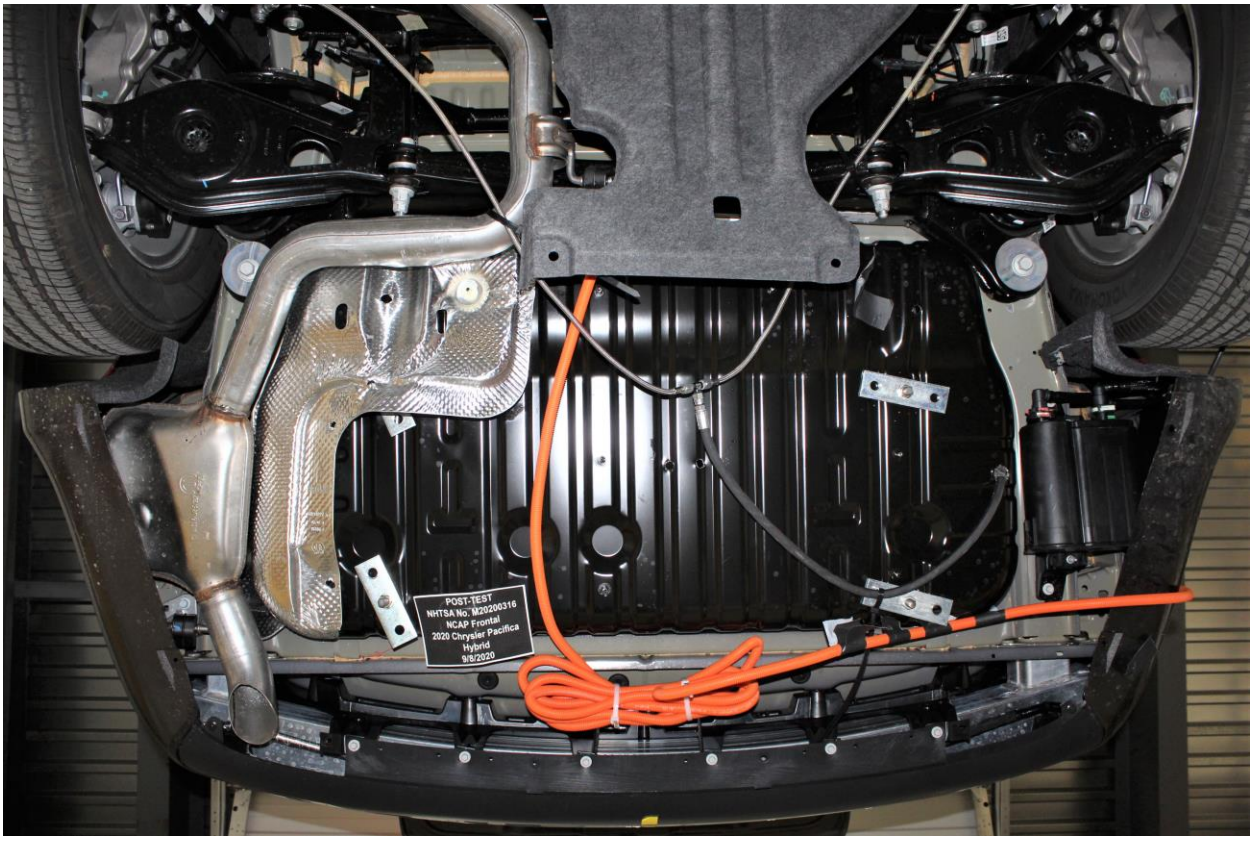


Figure A-27: Post-Test Rear Underbody View

Figure A-28: Pre-Test Dummy Cable Routing

Figure A-29: Post-Test Dummy Cable Routing

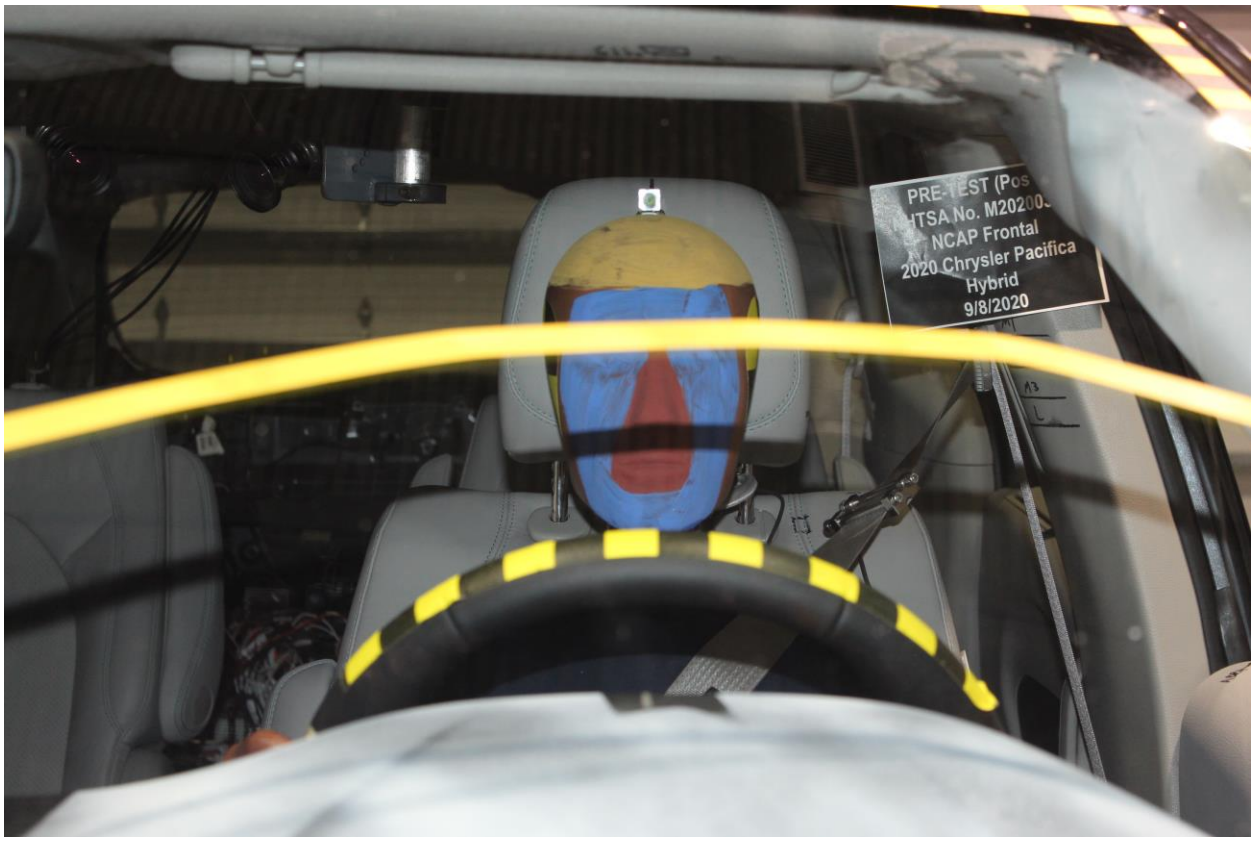


Figure A-30: Pre-Test Driver Dummy Front View

Figure A-31: Post-Test Driver Dummy Front View

Figure A-32: Pre-Test Driver Dummy Window View

Figure A-33: Post-Test Driver Dummy Window View

Figure A-34: Pre-Test Driver Dummy and Vehicle Interior View

Figure A-35: Post-Test Driver Dummy and Vehicle Interior View

Figure A-36: Pre-Test Driver's Seat Fore-Aft Markings

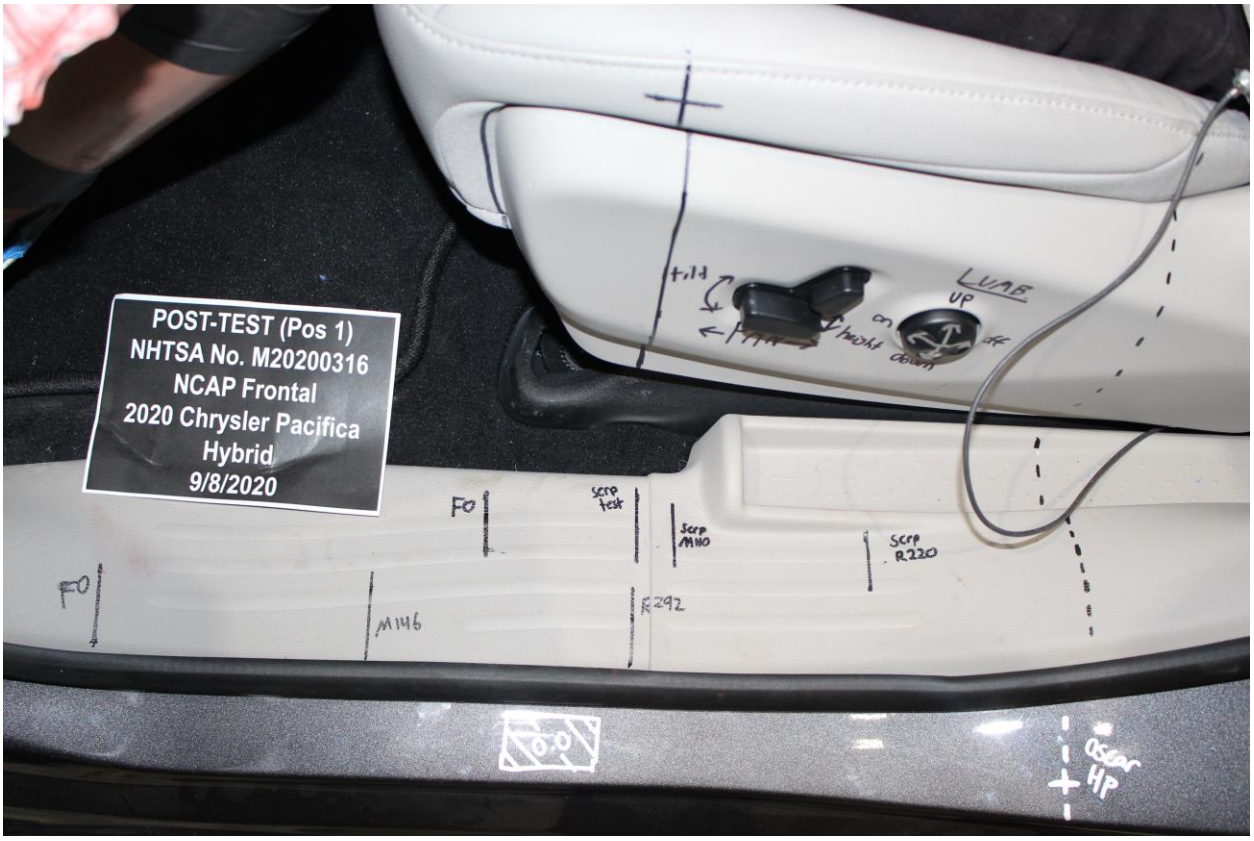


Figure A-37: Post-Test Driver's Seat Fore-Aft Markings

Figure A-38: Pre-Test View of Belt Anchorage for Driver Dummy

Figure A-39: Post-Test View of Belt Anchorage for Driver Dummy

Figure A-40: Pre-Test View of Belt Buckle and Latch Plate for Driver Dummy

Figure A-41: Post-Test View of Belt Buckle and Latch Plate for Driver Dummy

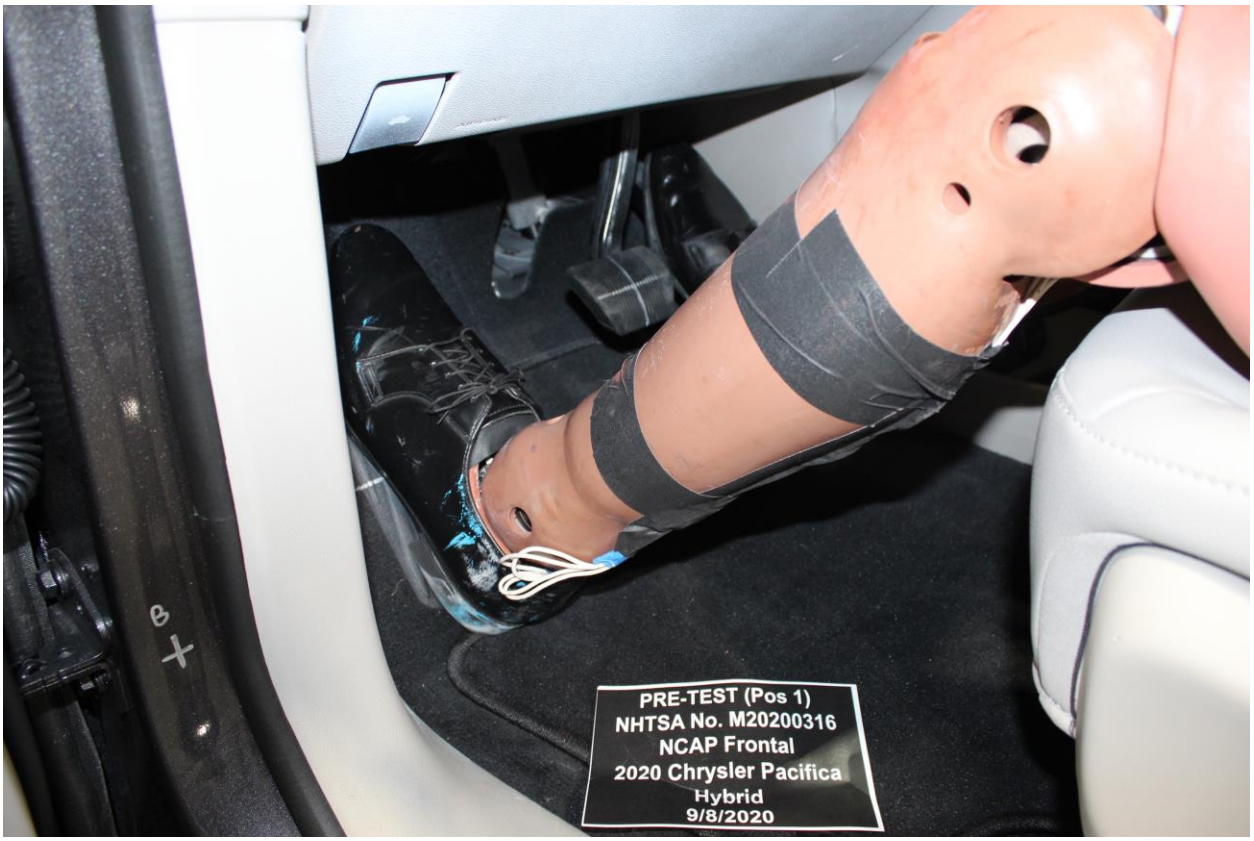


Figure A-42: Pre-Test Driver Dummy Feet

Figure A-43: Post-Test Driver Dummy Feet

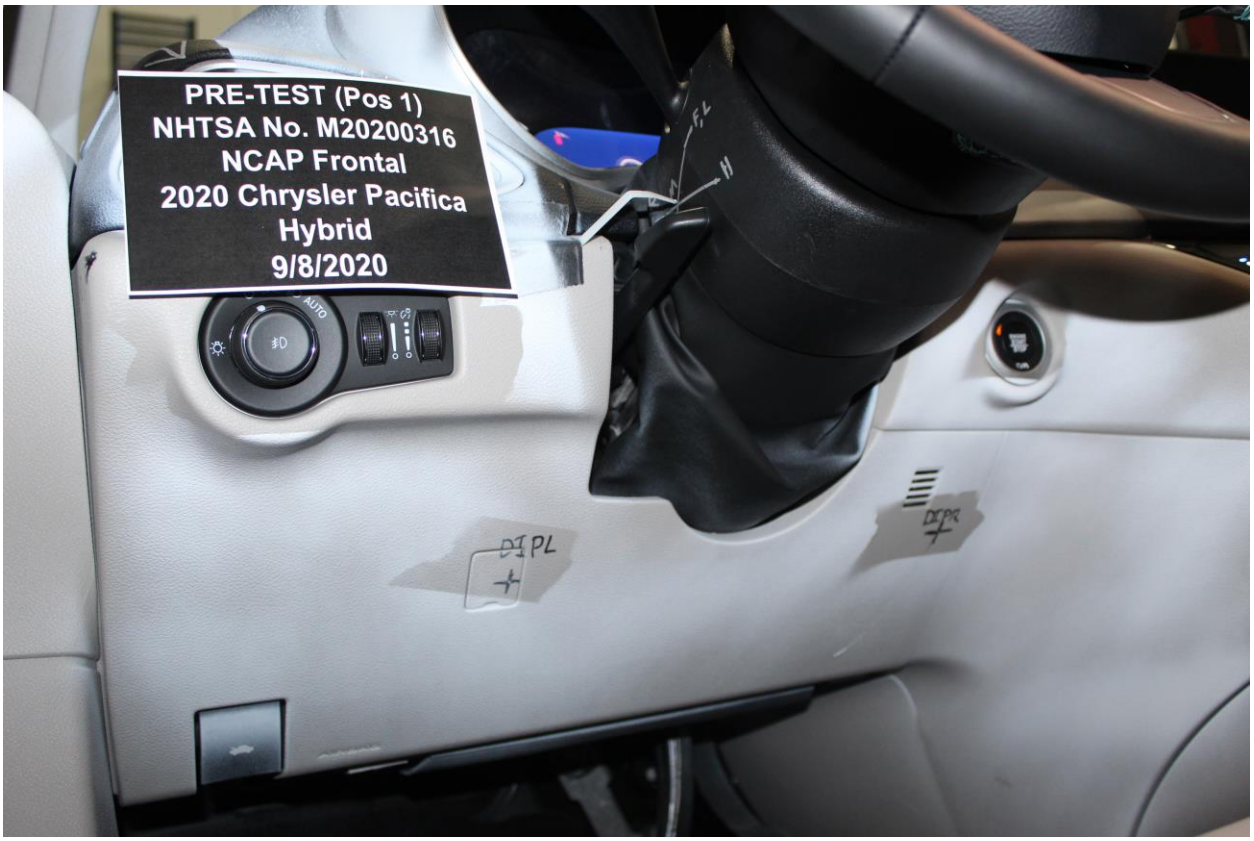


Figure A-44: Pre-Test Driver's Side Knee Bolster

Figure A-45: Post-Test Driver's Side Knee Bolster

Figure A-46: Pre-Test Driver's Side Floorpan

Figure A-47: Post-Test Driver's Side Floorpan

Figure A-48: Post-Test Driver Dummy Face

Figure A-49: Post-Test Driver Dummy Contact With Airbag

Figure A-50: Post-Test Driver Dummy Contact With Headrest

Figure A-51: Pre-Test View of the Steering Wheel

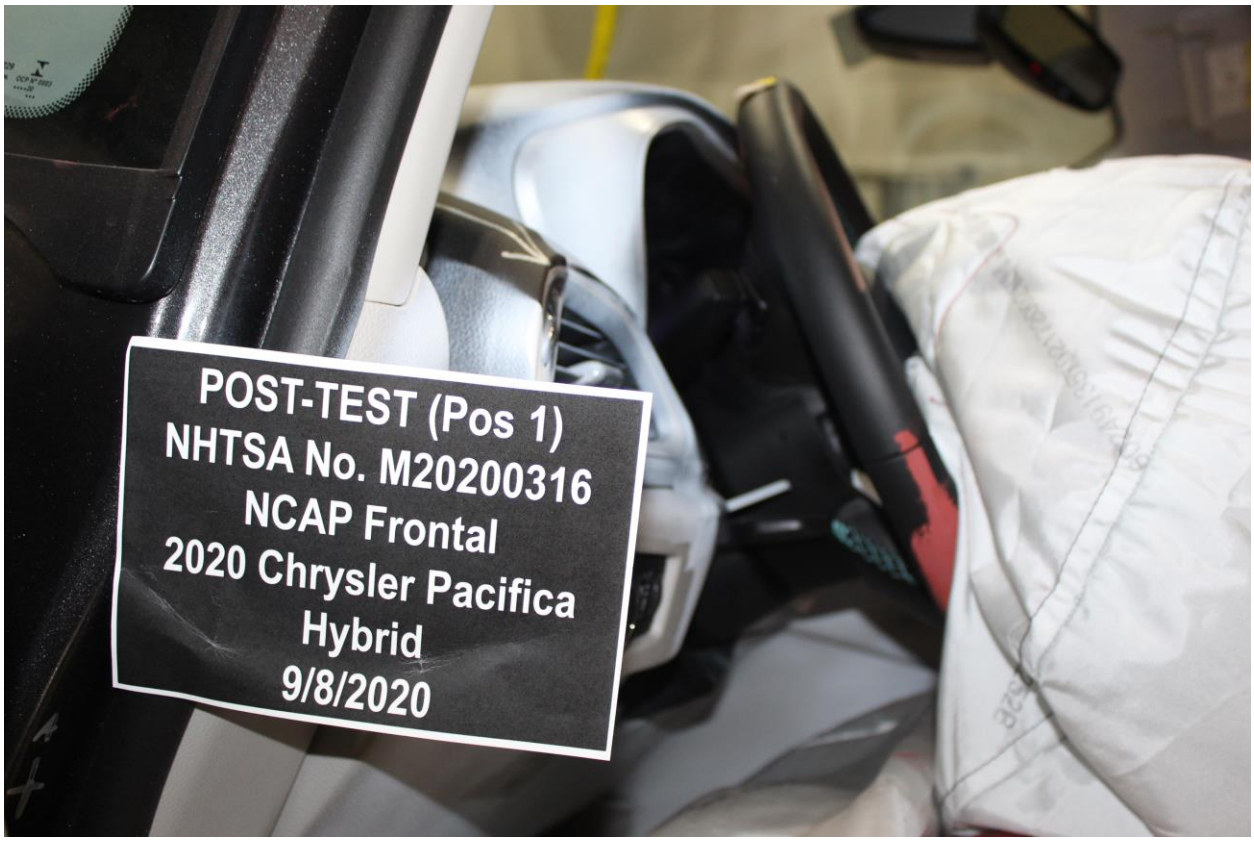


Figure A-52: Post-Test View of the Steering Wheel

Figure A-53: Pre-Test Passenger Dummy Front View

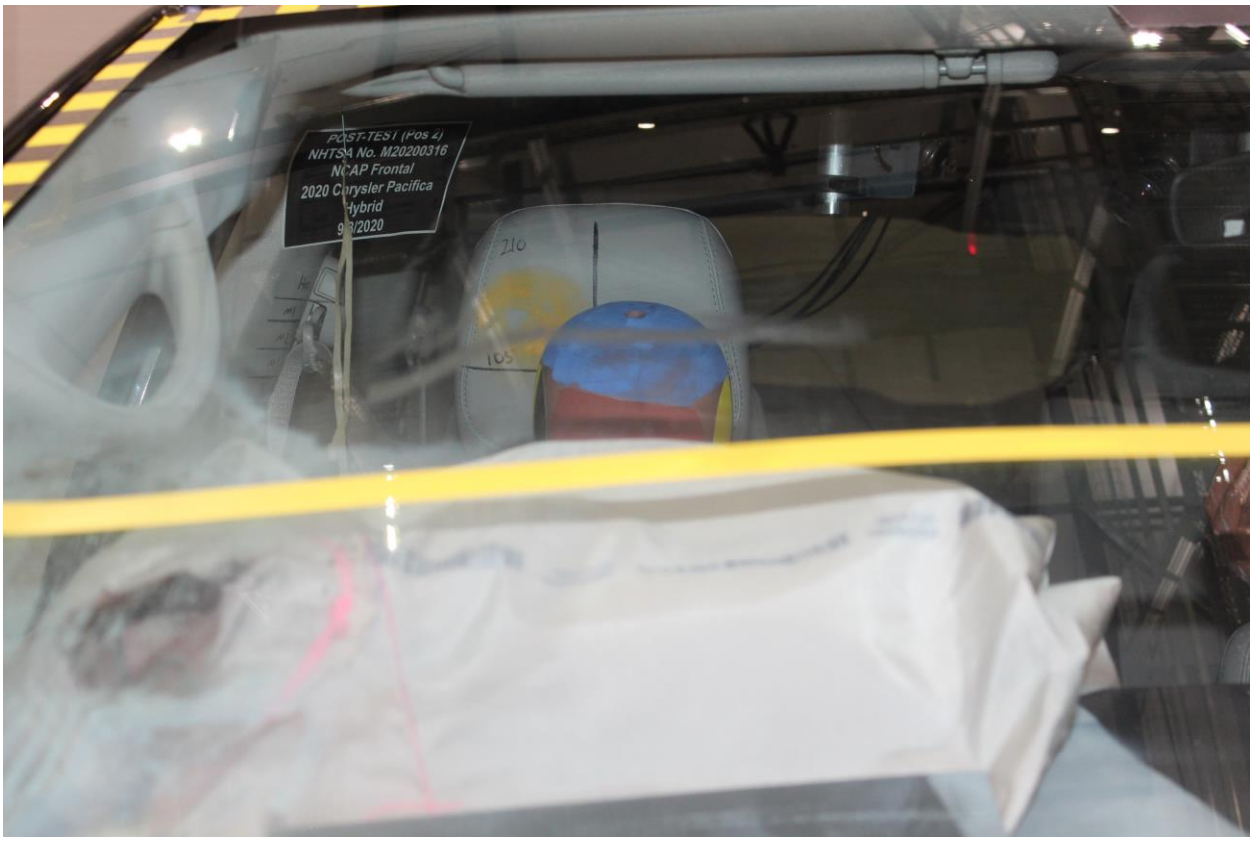


Figure A-54: Post-Test Passenger Dummy Front View

Figure A-55: Pre-Test Passenger Dummy Window View

Figure A-56: Post-Test Passenger Dummy Window View

Figure A-57: Pre-Test Passenger Dummy and Vehicle Interior View

Figure A-58: Post-Test Passenger Dummy and Vehicle Interior View

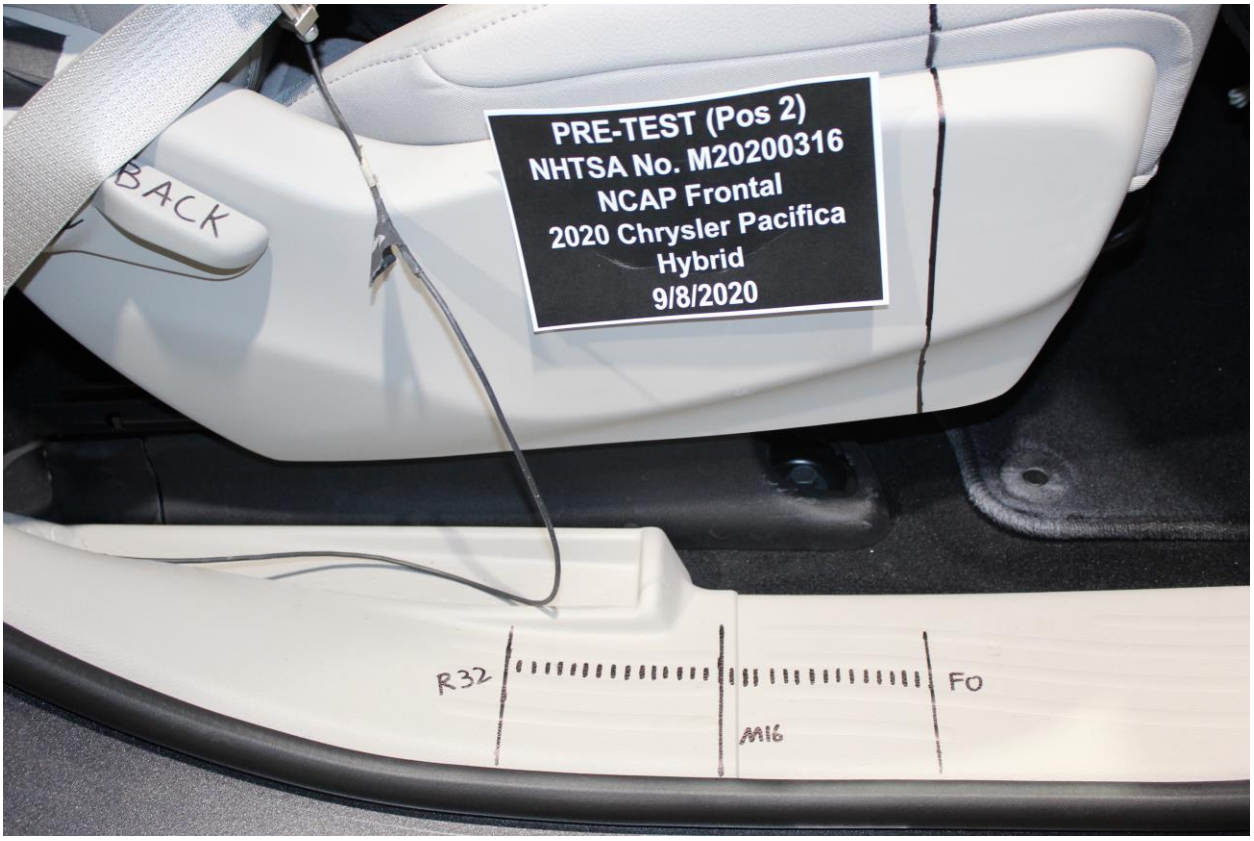


Figure A-59: Pre-Test Passenger's Seat Fore-Aft Markings

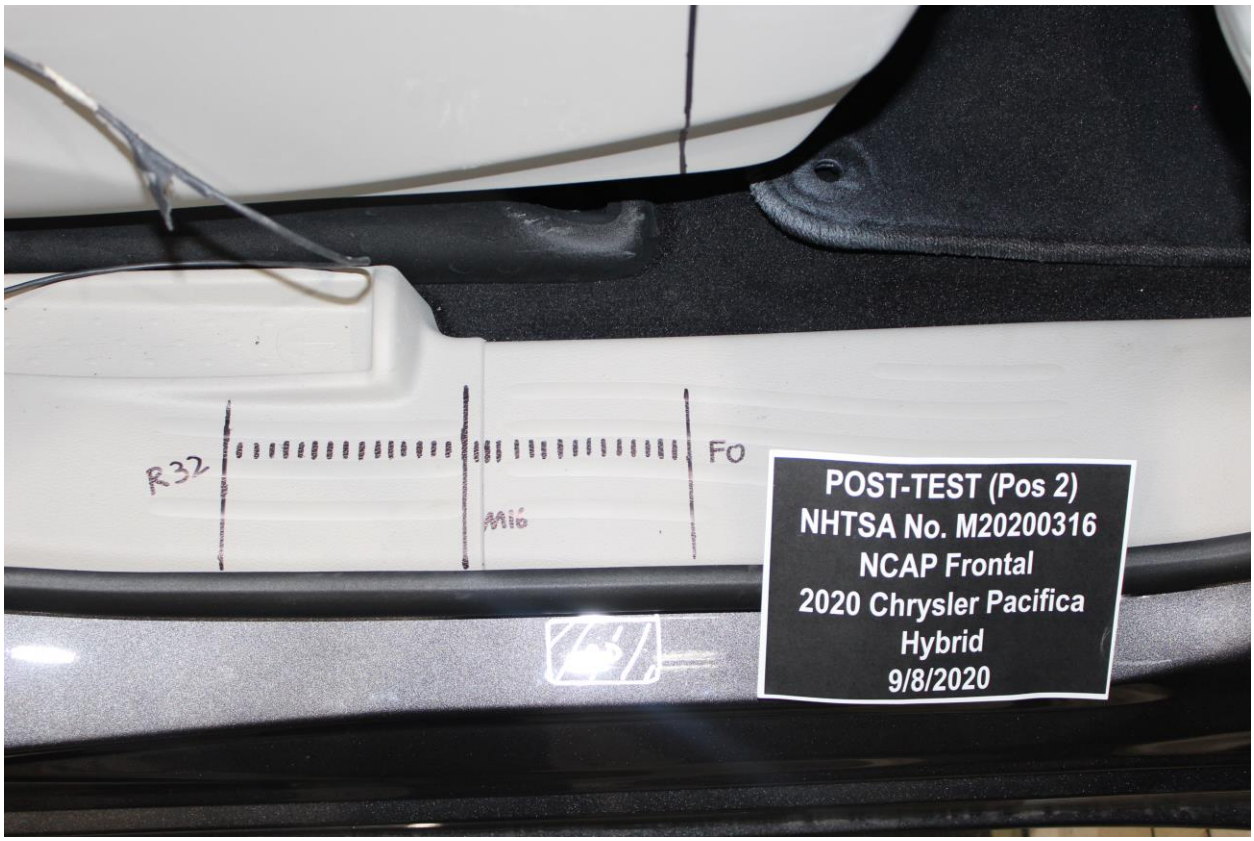


Figure A-60: Post-Test Passenger's Seat Fore-Aft Markings

Figure A-61: Pre-Test View of Belt Anchorage for Passenger Dummy

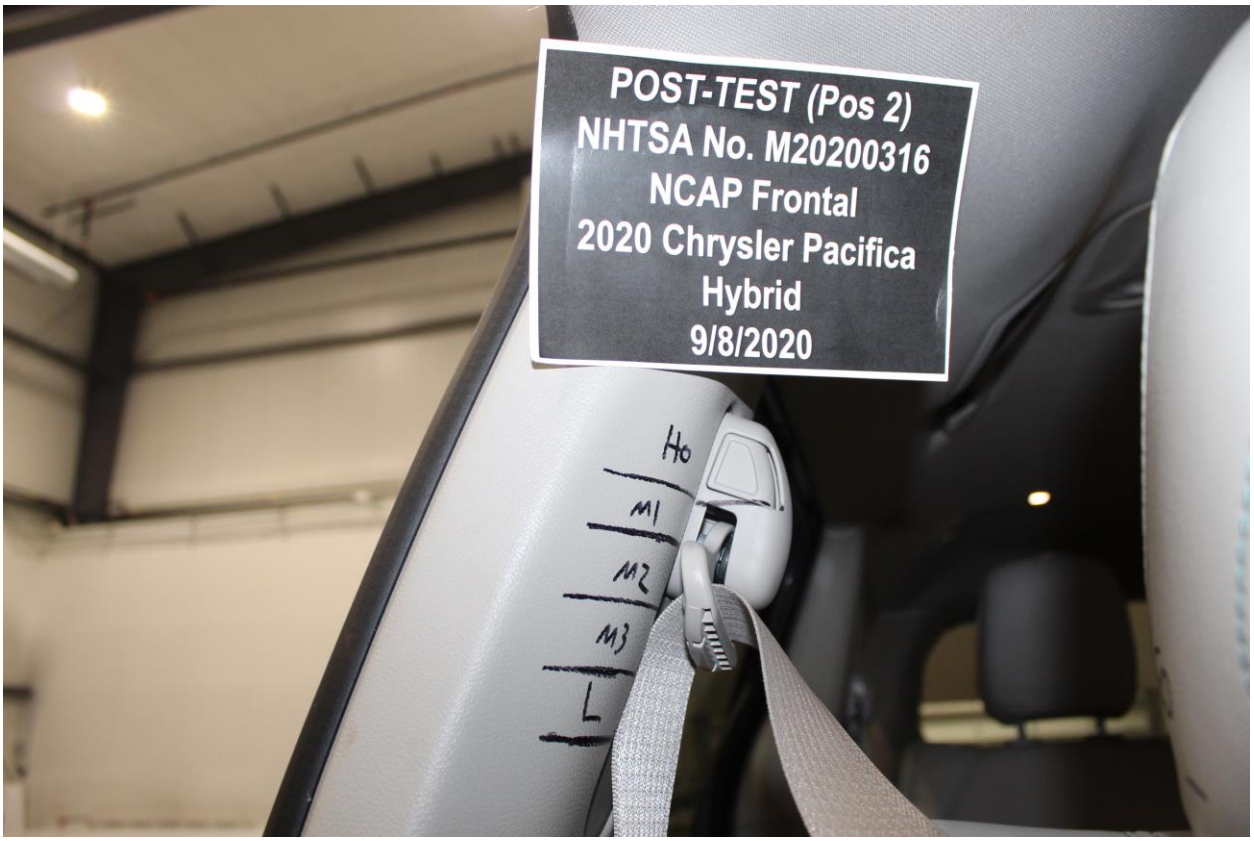


Figure A-62: Post-Test View of Belt Anchorage for Passenger Dummy

Figure A-63: Pre-Test View of Belt Buckle and Latch Plate for Passenger Dummy

Figure A-64: Post-Test View of Belt Buckle and Latch Plate for Passenger Dummy

Figure A-65: Pre-Test Passenger Dummy Feet

Figure A-66: Post-Test Passenger Dummy Feet

Figure A-67: Pre-Test Passenger's Side Knee Bolster

Figure A-68: Post-Test Passenger's Side Knee Bolster

Figure A-69: Pre-Test Passenger's Side Floorpan

Figure A-70: Post-Test Passenger's Side Floorpan

Figure A-71: Post-Test Passenger Dummy Face

Figure A-72: Post-Test Passenger Dummy Contact With Airbag

Figure A-73: Post-Test Passenger Dummy Contact With Headrest

Figure A-74: Photograph of Ballast Installed in Vehicle

Photo Not Applicable

Figure A-75: Post-Test Stoddard Solvent Spillage Location View, If Required

Figure A-76: Post-Test Speed Trap Read-Out

Figure A-77: Vehicle at 0º on Static Rollover Device

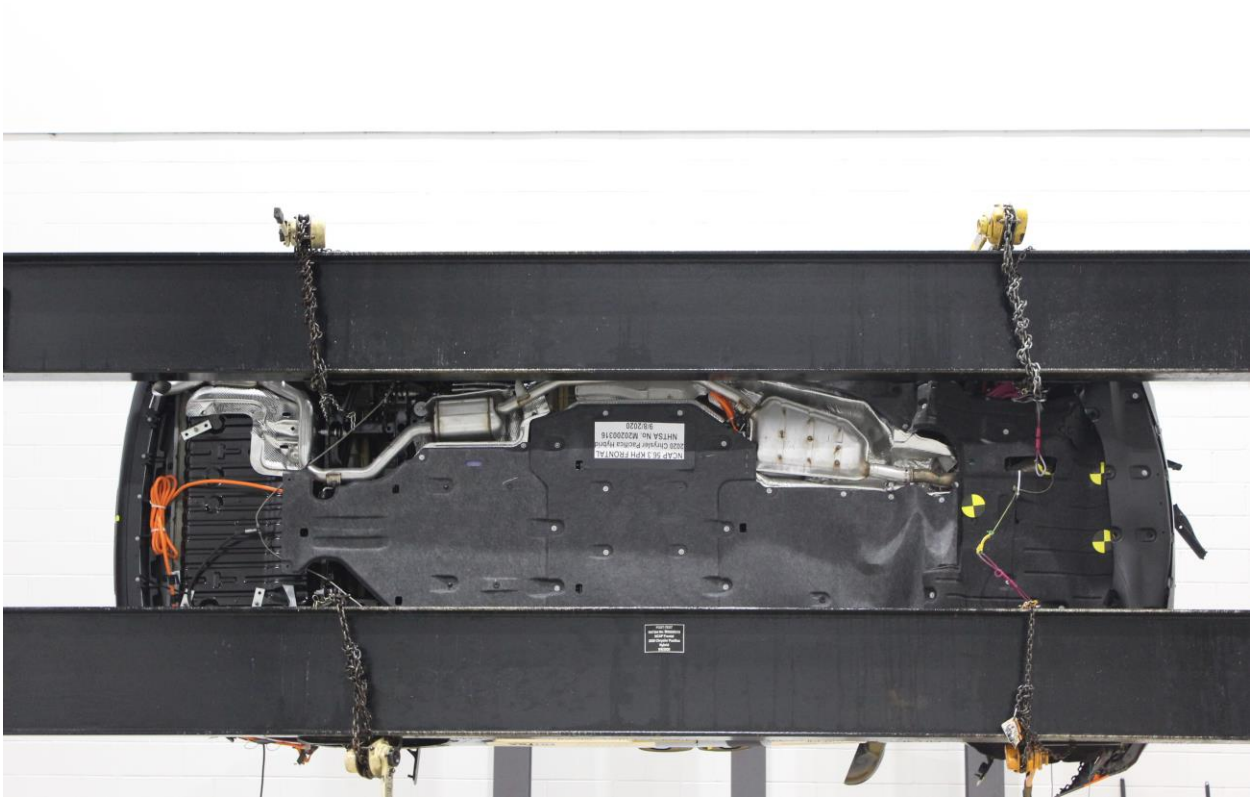


Figure A-78: Vehicle at 90º on Static Rollover Device

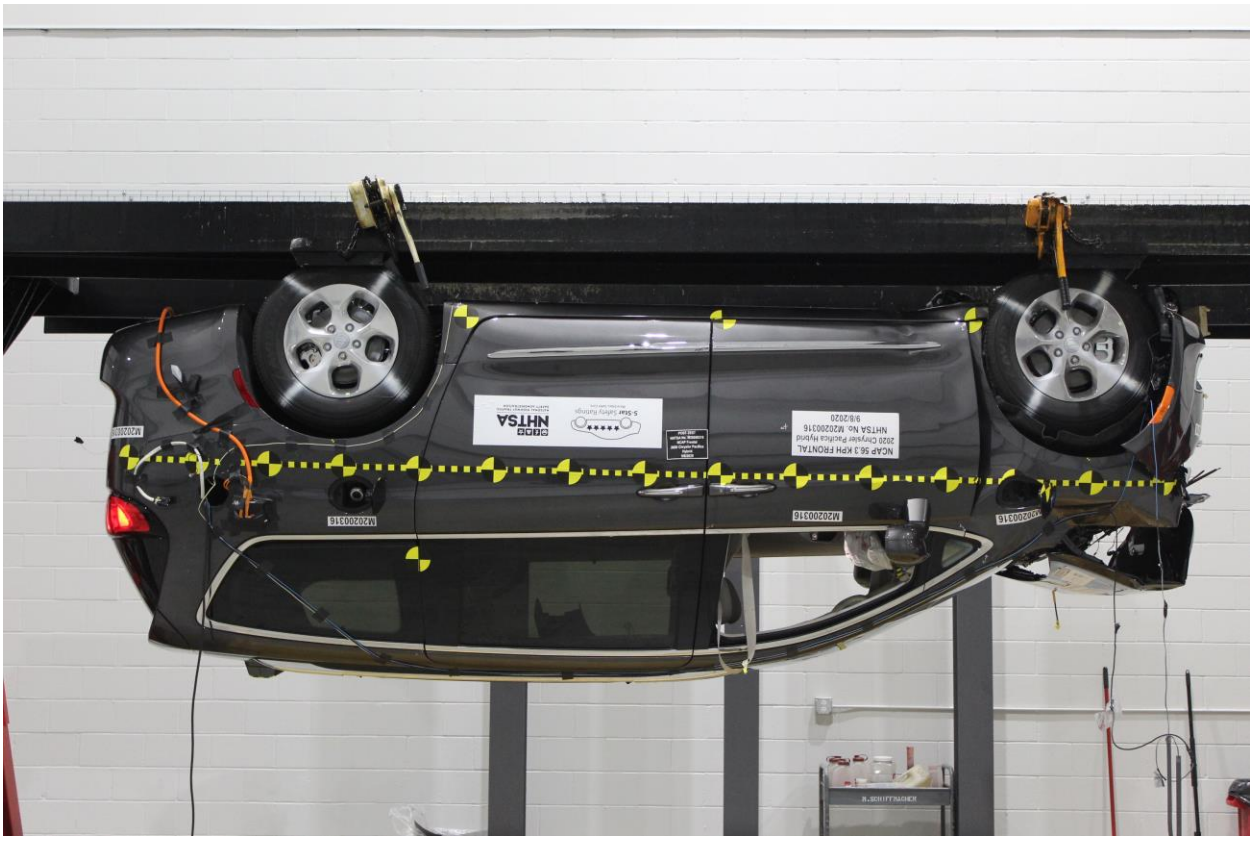


Figure A-79: Vehicle at 180º on Static Rollover Device

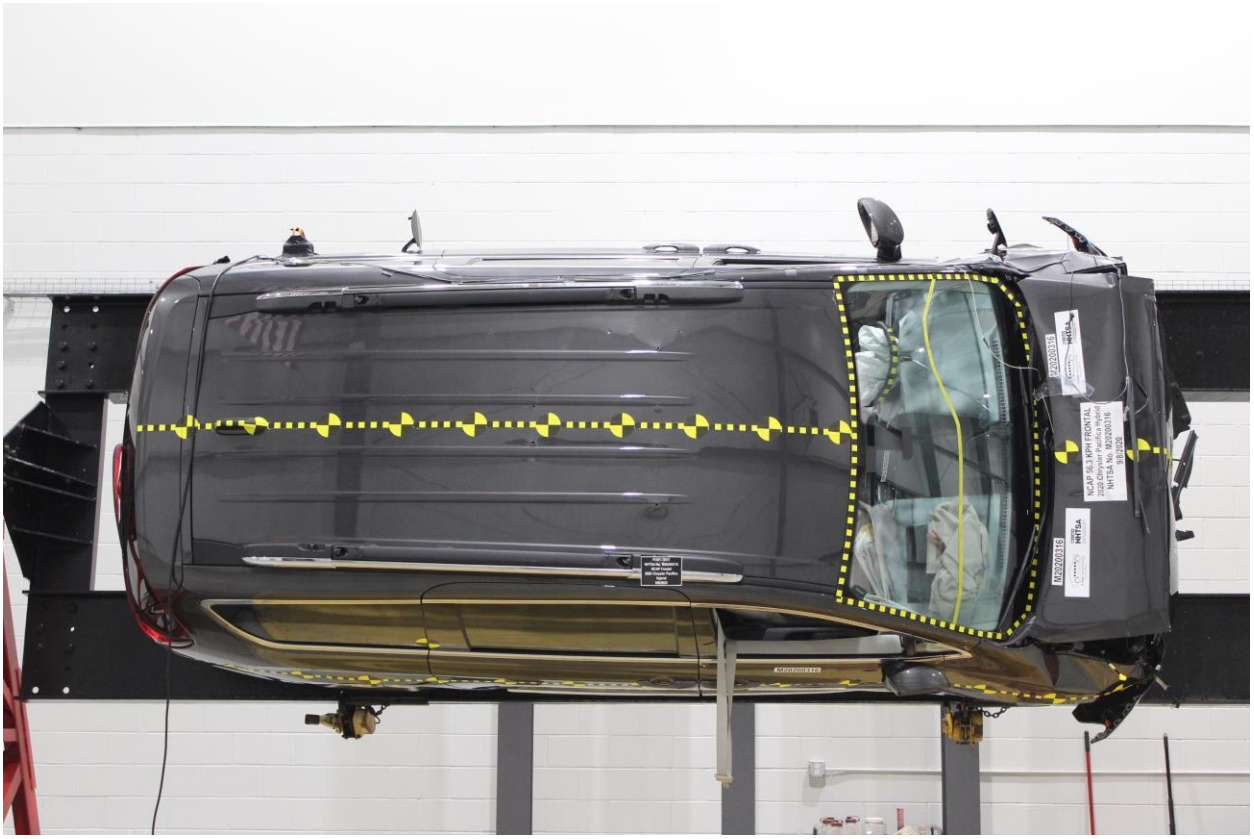


Figure A-80: Vehicle at 270º on Static Rollover Device

Figure A-81: Vehicle at 360º on Static Rollover Device

Figure A-82: 2020 Chrysler Pacifica Frontal Impact Event

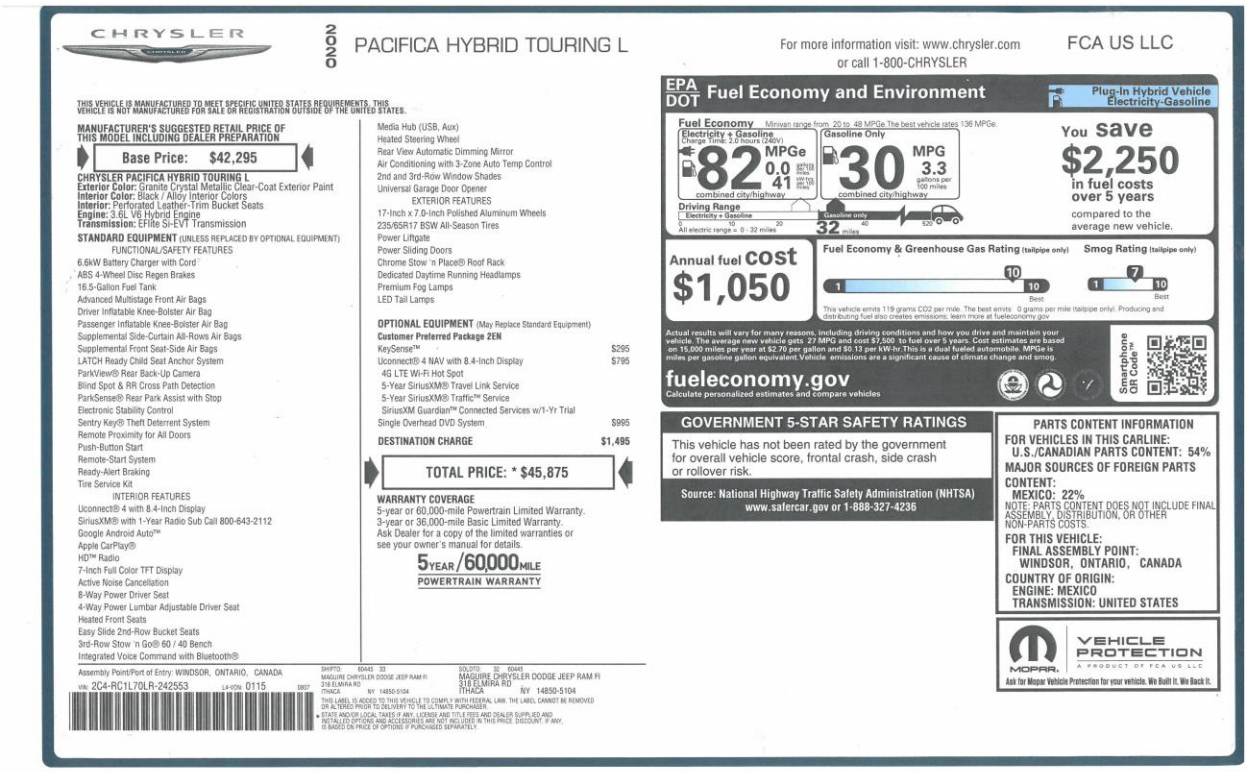


Figure A-83: Monroney Label Photograph

Photo Not Applicable

Figure 305-1: Auxiliary Power Module Warning Label

Photo Not Applicable

Figure 305-2: Power Inverter Warning Label

Figure 305-3 First Responder Warning Label

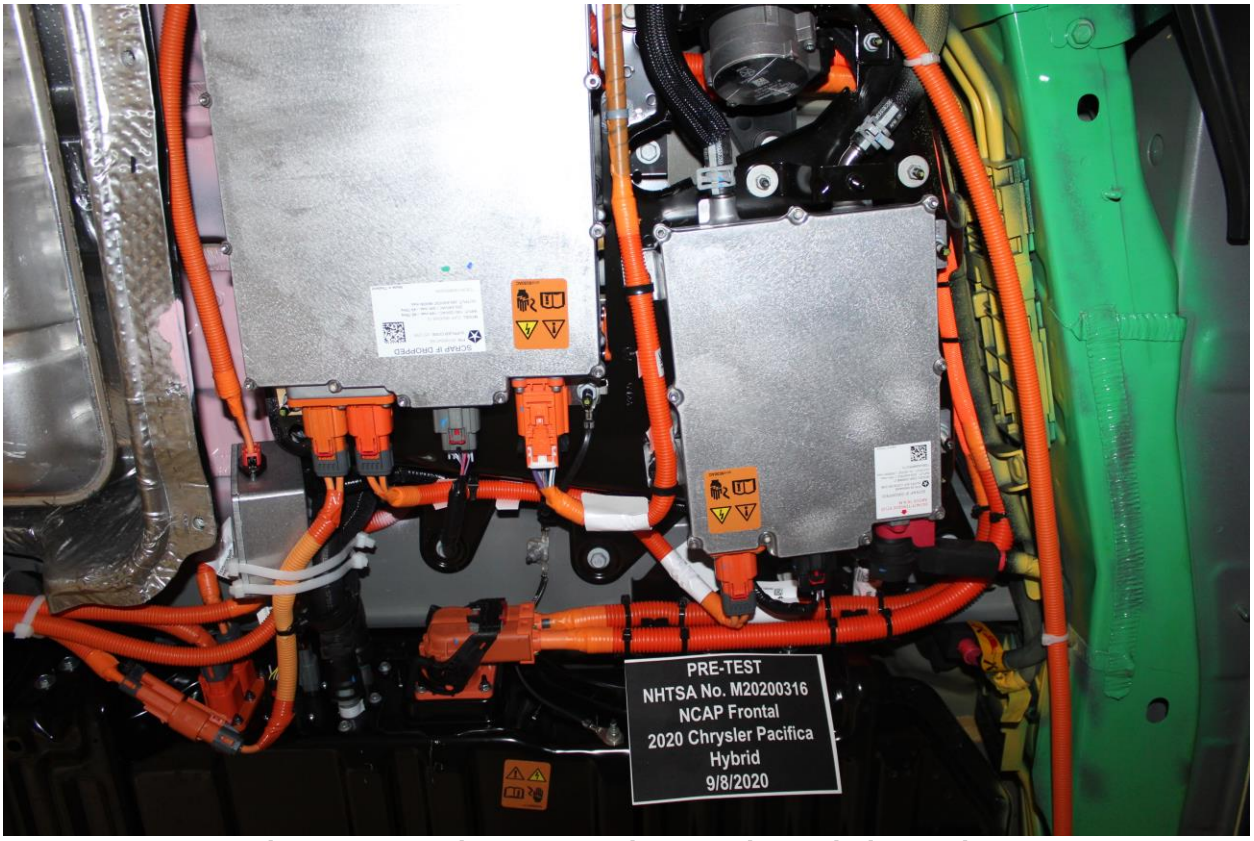


Figure 305-4: First Responder Warning Label Location

Photo Not Applicable

Figure 305-5: Other Vehicle Label Related to Electric Propulsion System

Figure 305-6: Manual High Voltage Service Disconnect in Place

Figure 305-7: Manual High Voltage Service Disconnect Removed (Show Plug)

Figure 305-8: Manual High Voltage Service Disconnect Removed Location

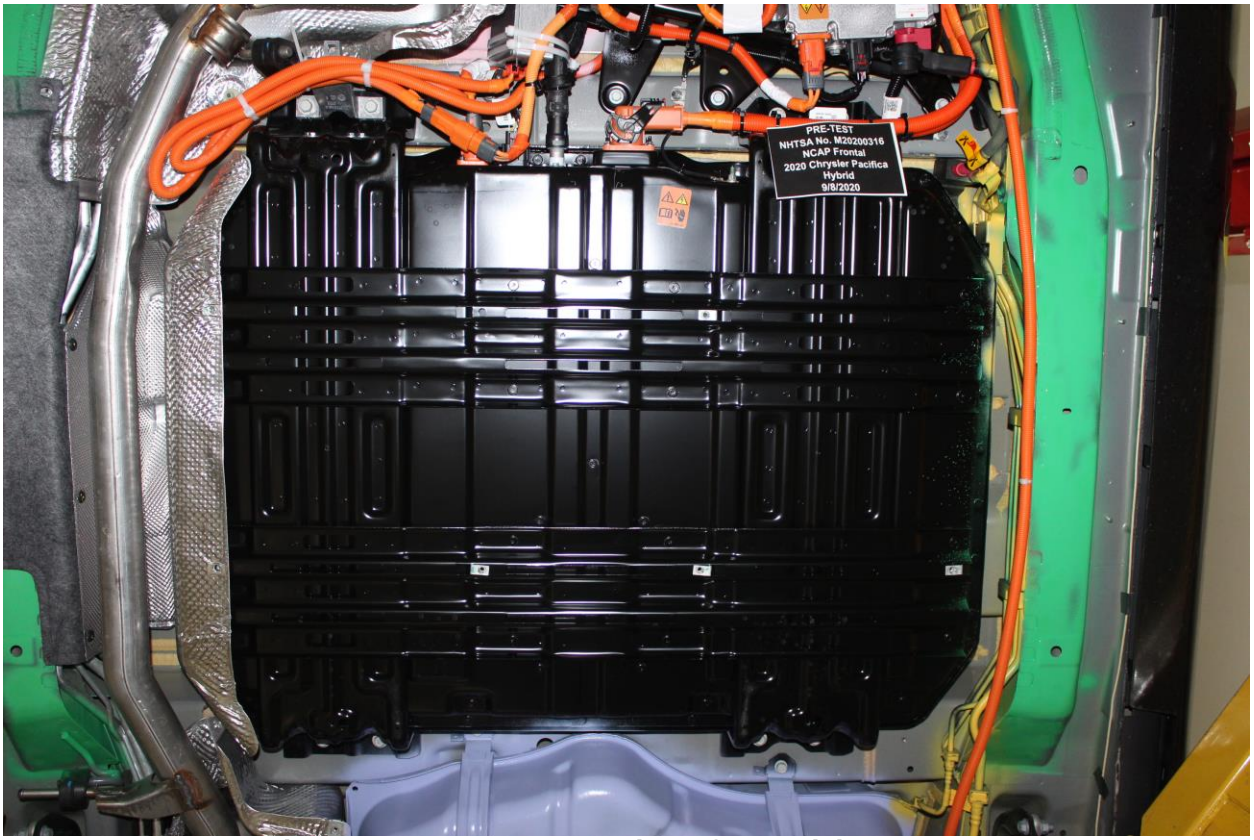


Figure 305-9: Pre-Impact View of Propulsion Battery

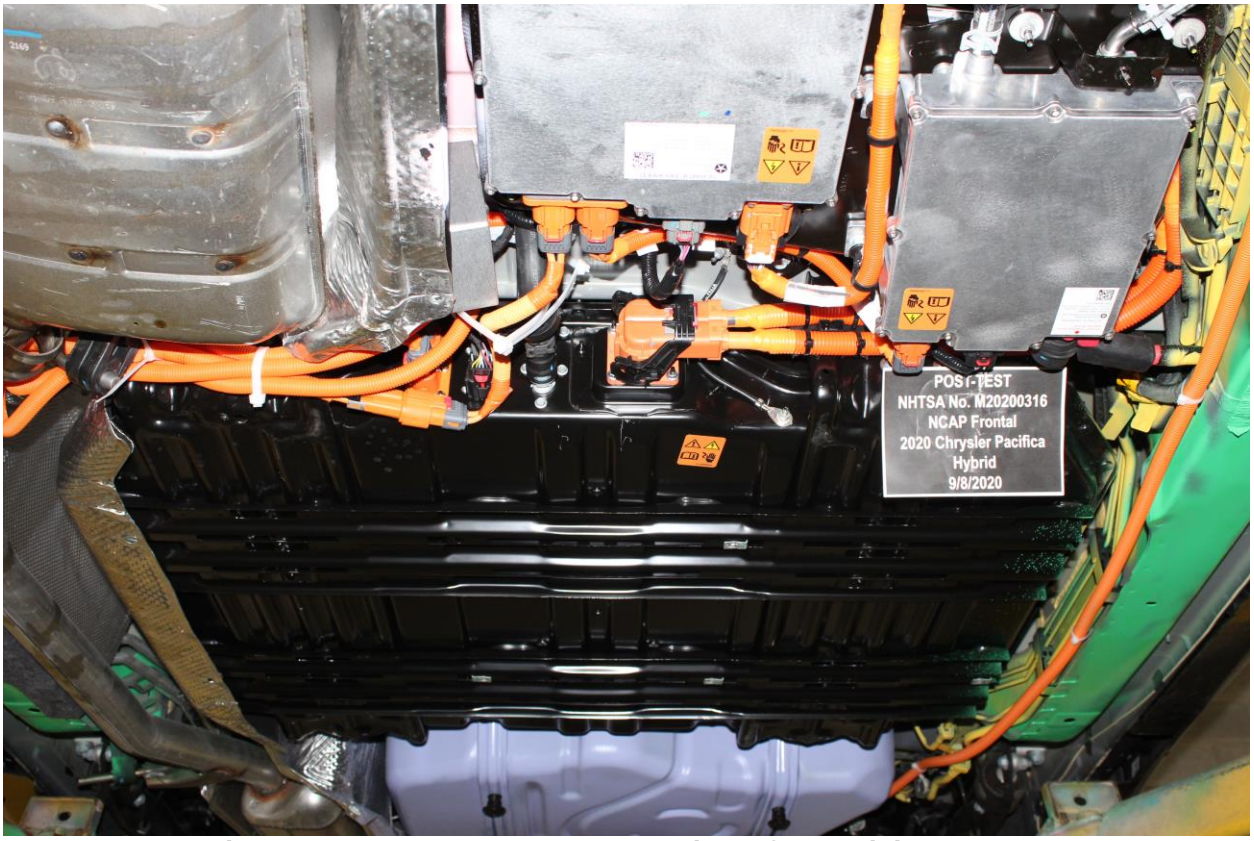


Figure 305-10: Post-Impact Front View of Propulsion Battery

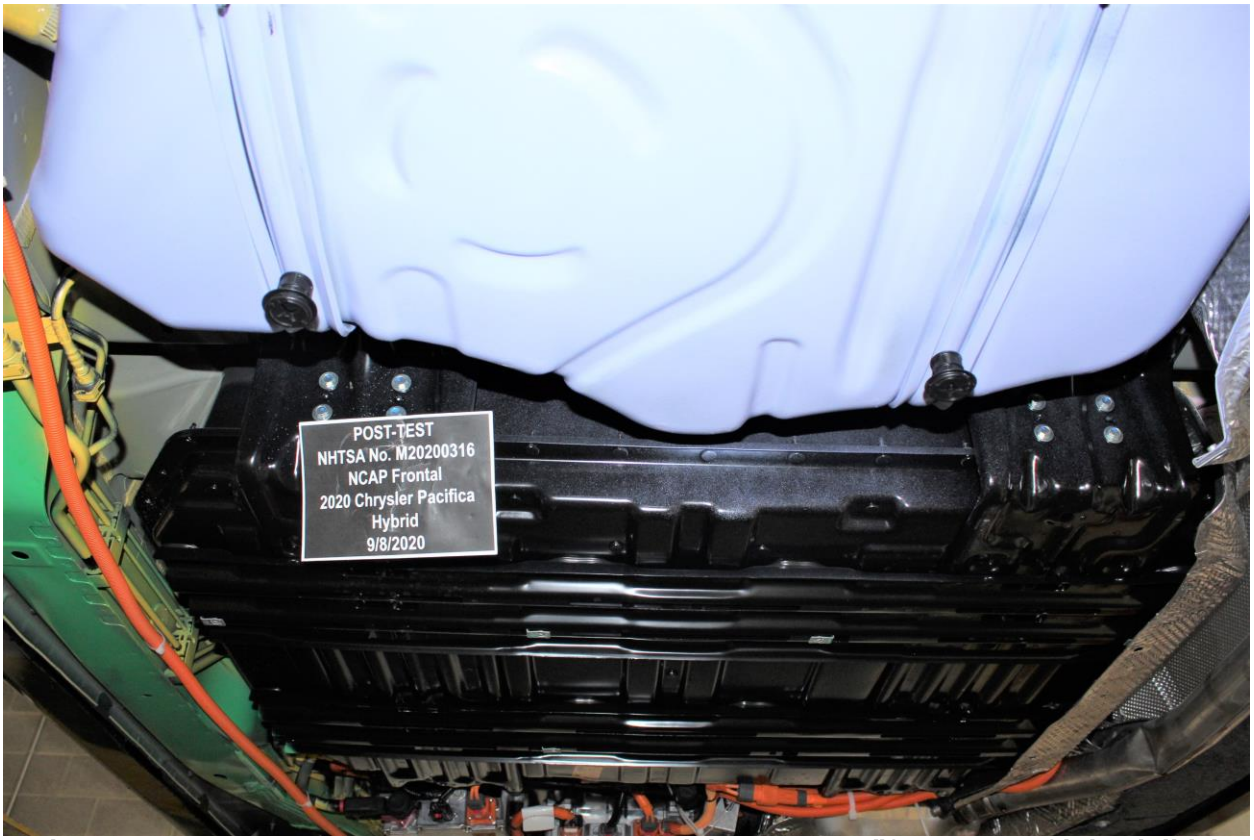


Figure 305-11: Post-Impact Rear View of Propulsion Battery (if any part of it is visible)

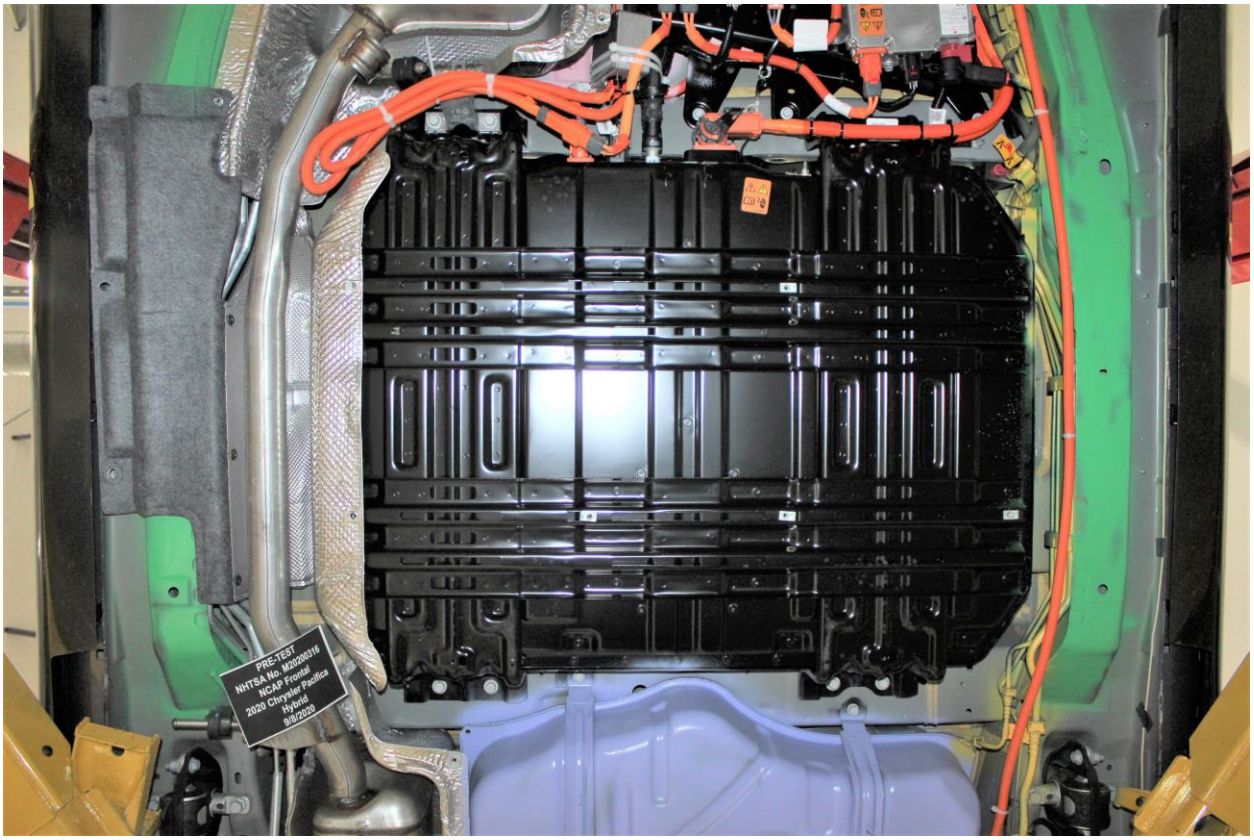


Figure 305-12: Pre-Impact View of Battery Box(s) or Container(s) Which Holds Individual Battery Modules

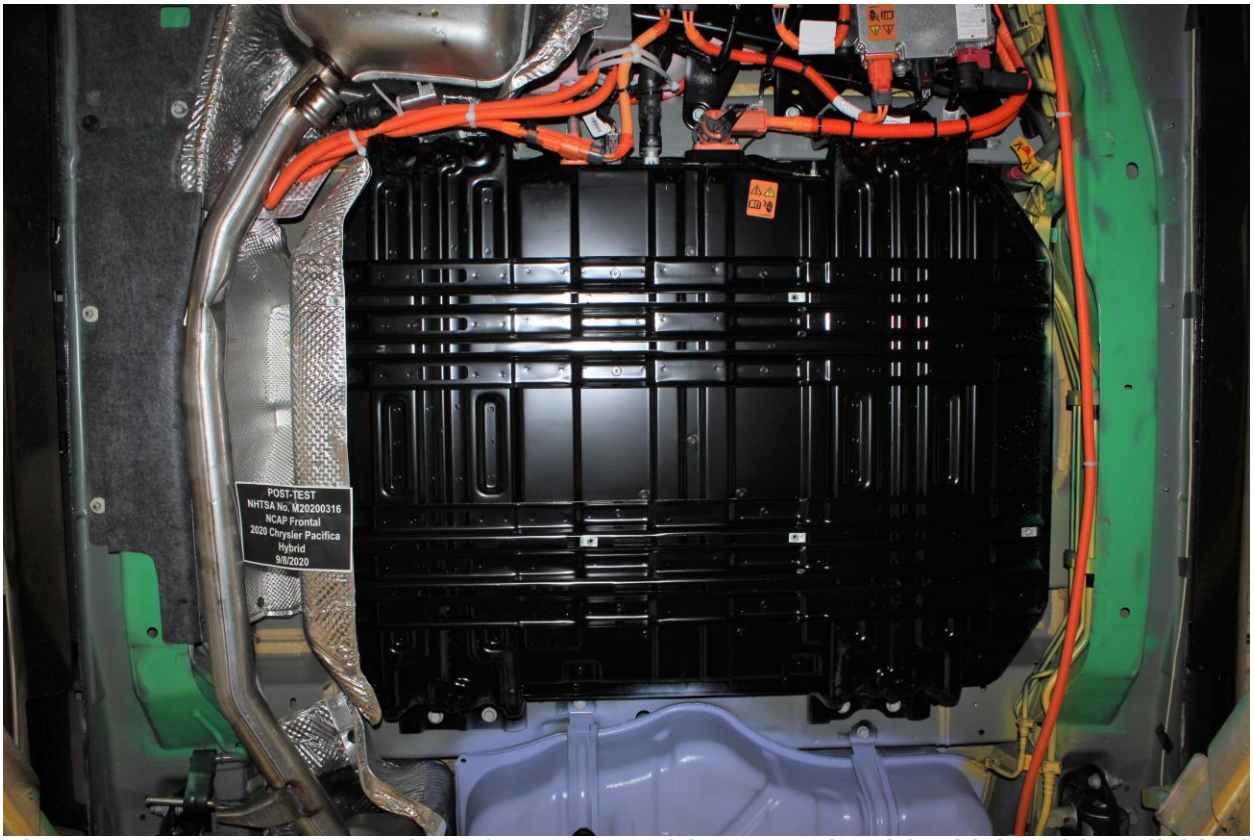


Figure 305-13: Post-Impact View of Battery Box(s) or Container(s) Which Holds Individual Battery Modules

Photo Not Applicable

Figure 305-14: Pre-Impact View of Propulsion Battery Module(s)

Photo Not Applicable

Figure 305-15: Post-Impact View of Propulsion Battery Module(s)

Figure 305-16: Pre-Impact View of Electric Propulsion Drive

Figure 305-17: Post-Impact View of Electric Propulsion Drive

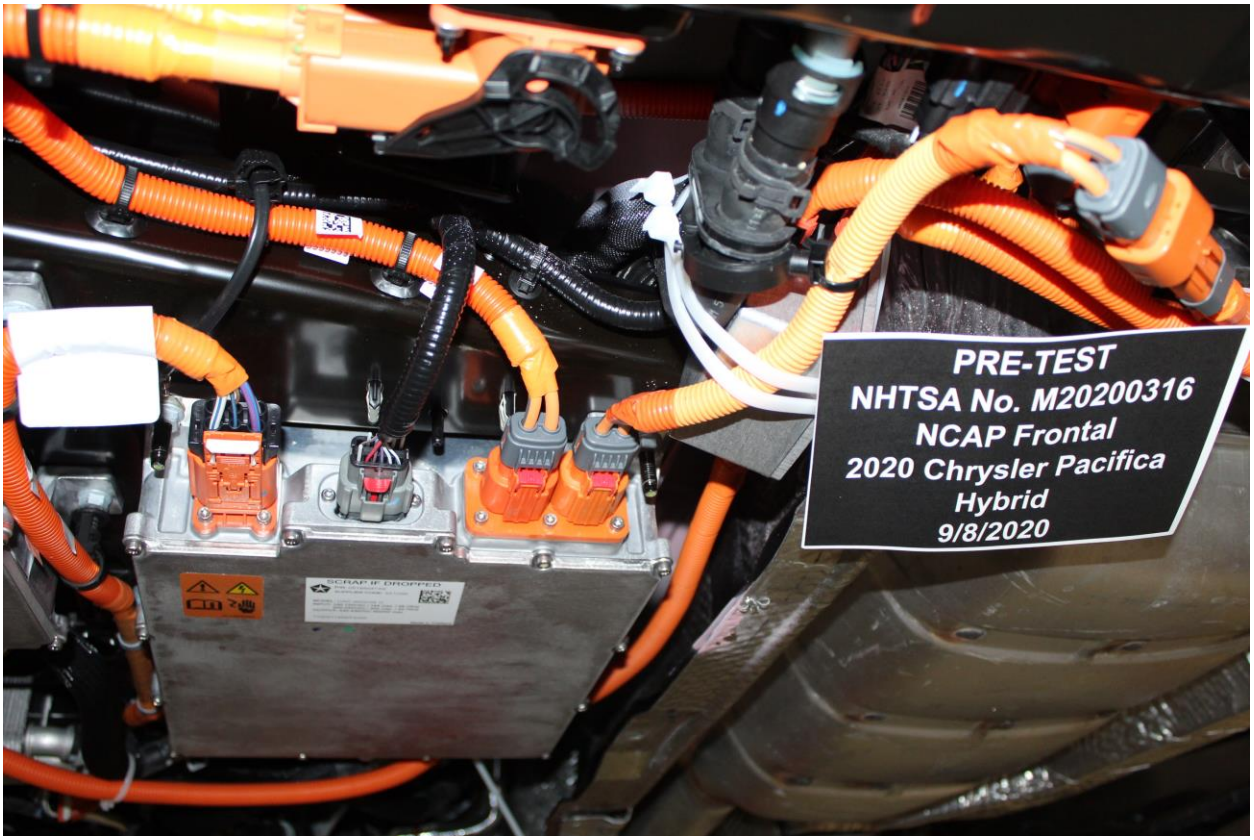


Figure 305-18: Pre-Impact View of High Voltage Interconnects

Photo Not Applicable

Figure 305-19: Pre-Impact View of Propulsion Battery Venting System

Figure 305-20: Pre-Impact View of Other Visible Electric Propulsion Components

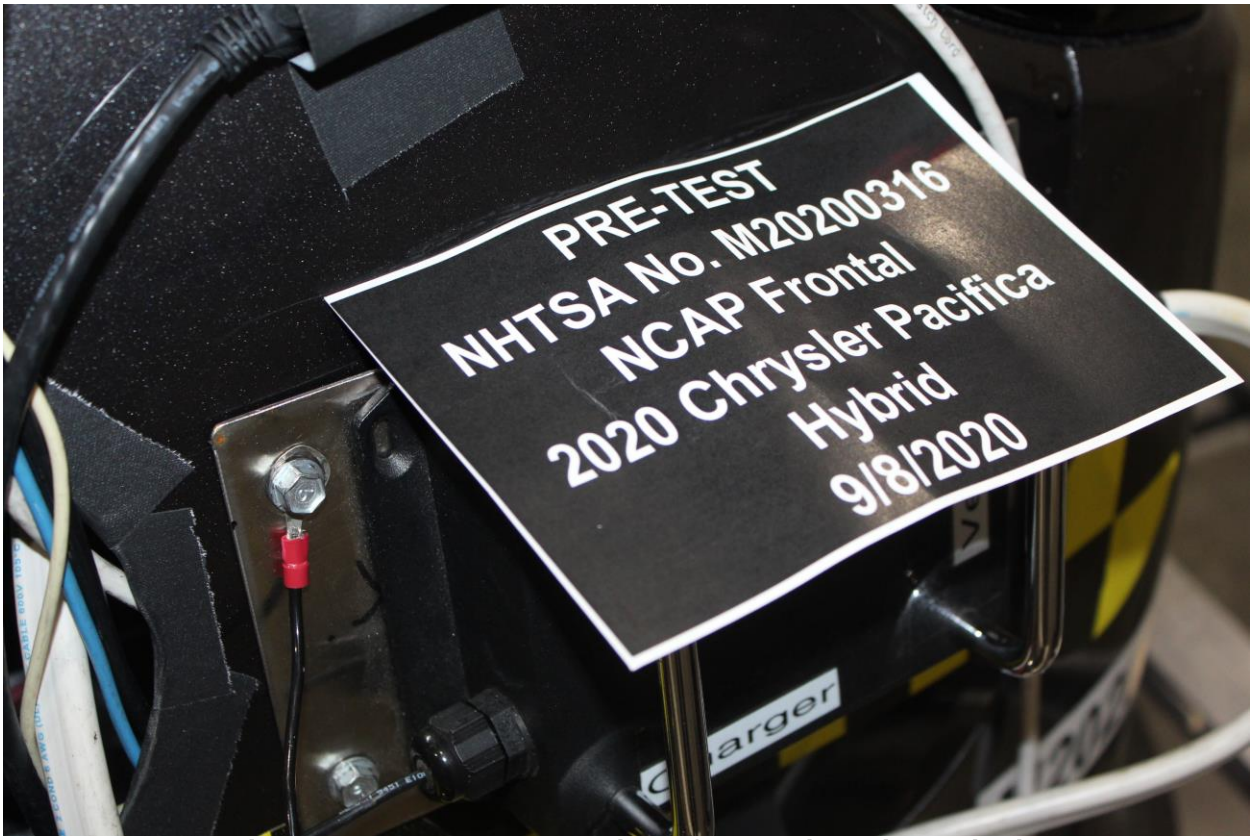


Figure 305-21: Pre-Impact View of Ground Lead Attached

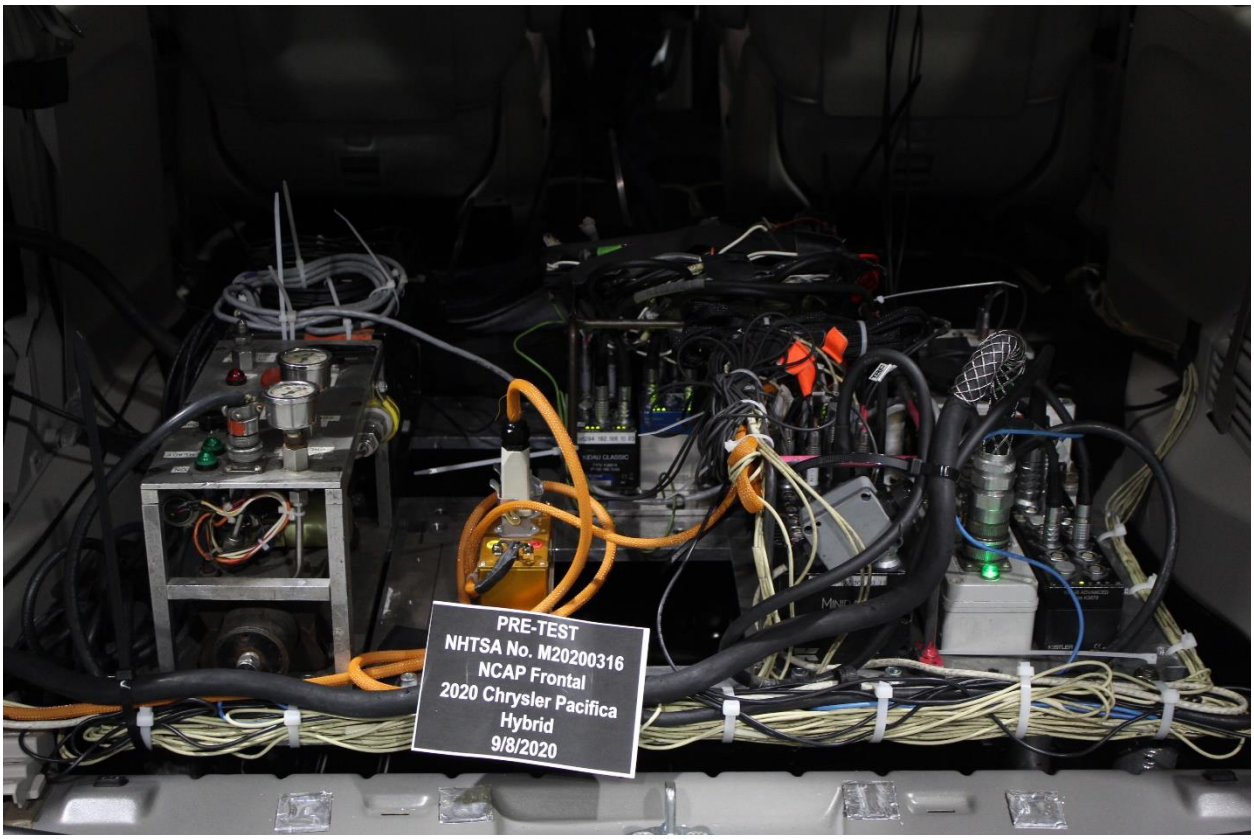


Figure 305-22: Pre-Impact View of High Voltage Leads Attached

Figure 305-23: Pre-Impact Close Up View of High Voltage Leads Attached

Figure 305-24: Pre-Impact View of Installed Test Interface Port

Figure 305-25: Post-Impact View of Installed Test Interface Port

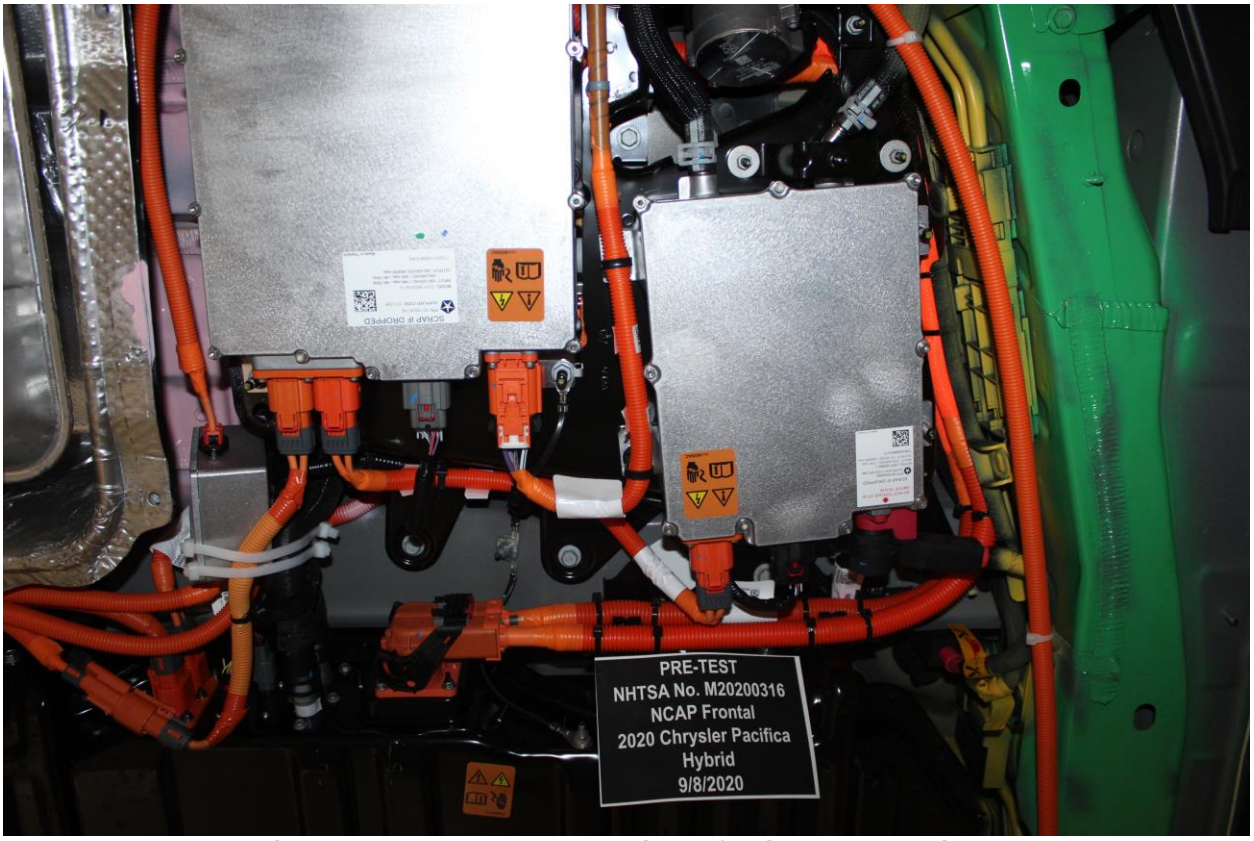


Figure 305-26: Pre-Impact View of Other Test Devices

Figure 305-27: Post-Impact View of Other Test Devices

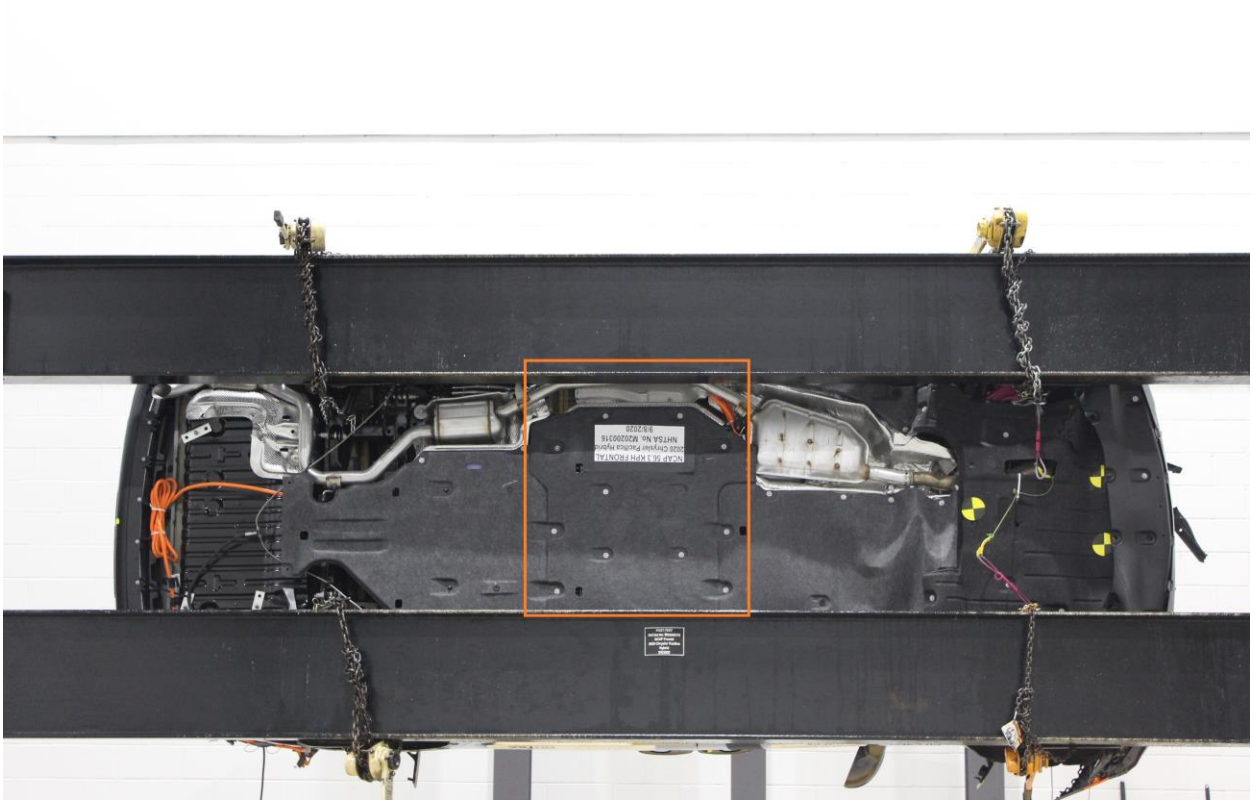


Figure 305-28: FMVSS No. 305 Static Rollover 90 Degrees

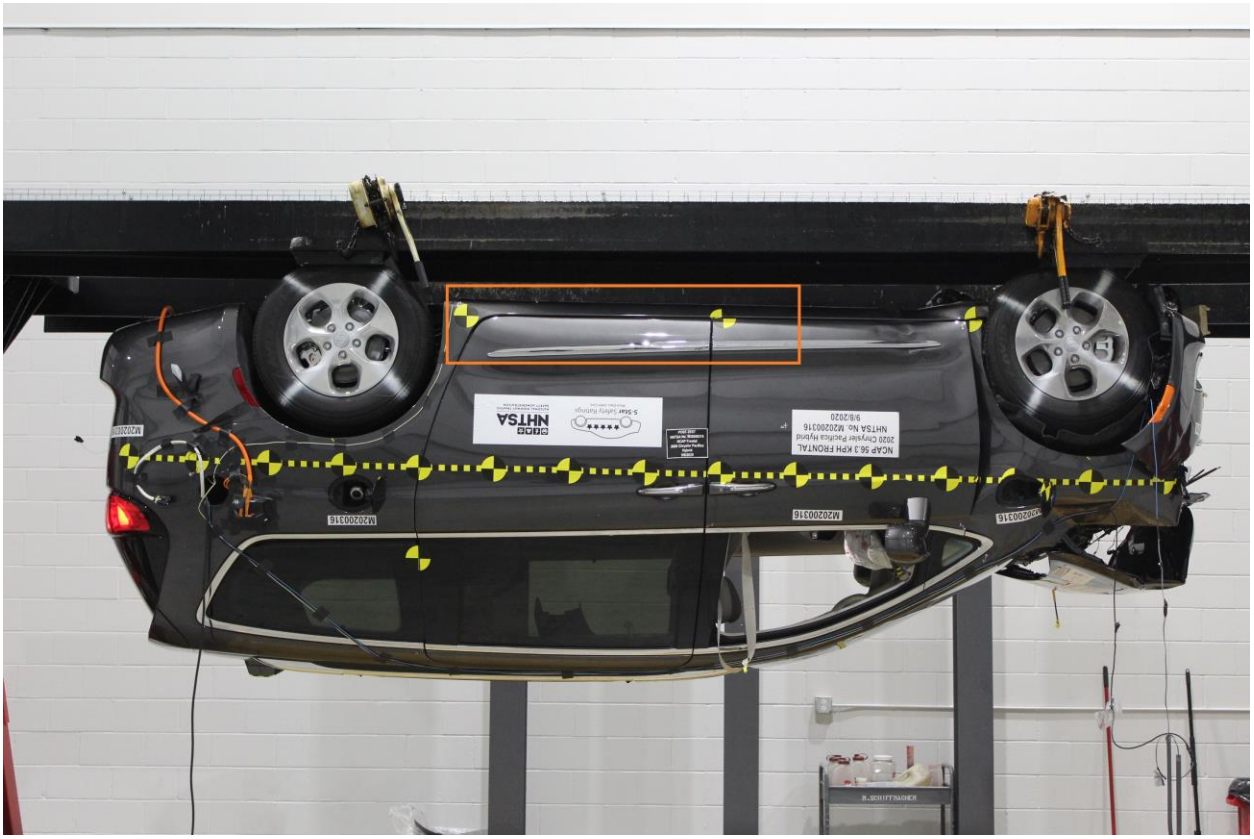


Figure 305-29: FMVSS No. 305 Static Rollover 180 Degrees

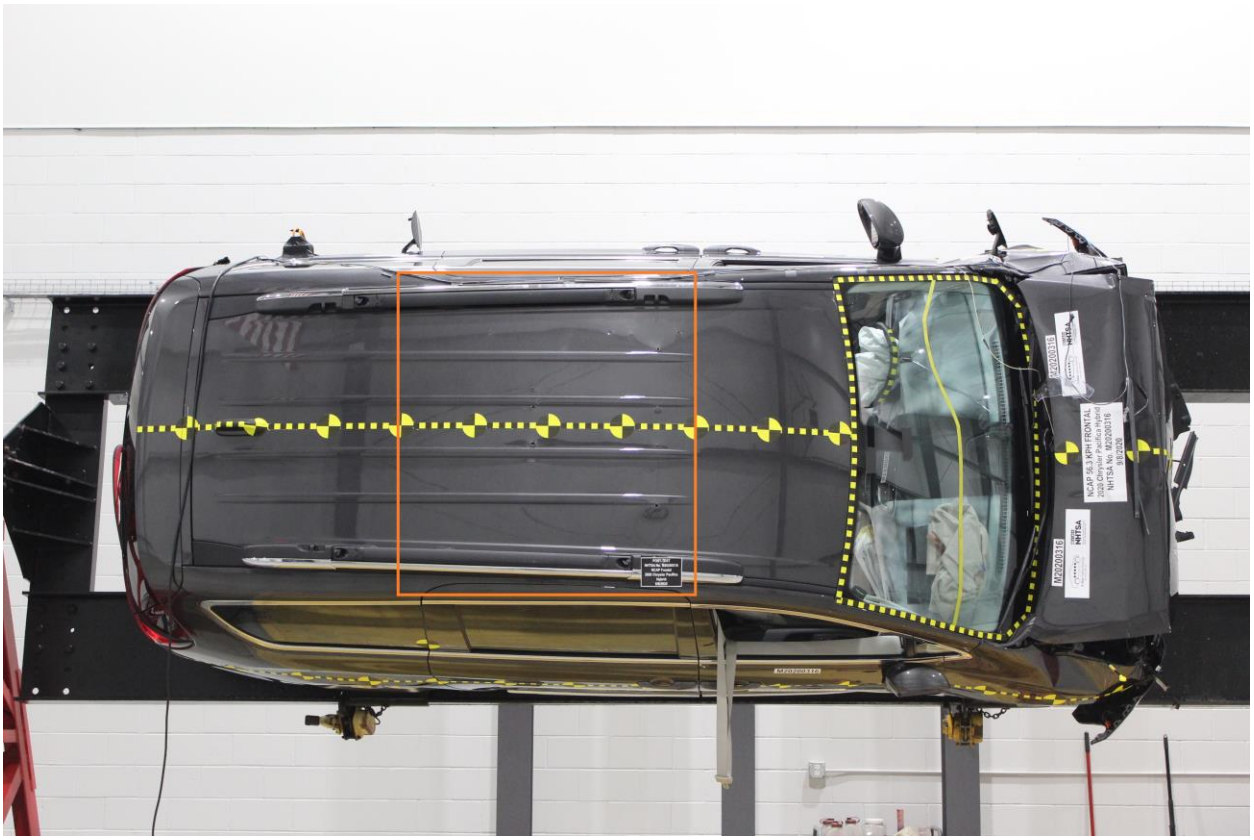


Figure 305-30: FMVSS No. 305 Static Rollover 270 Degrees

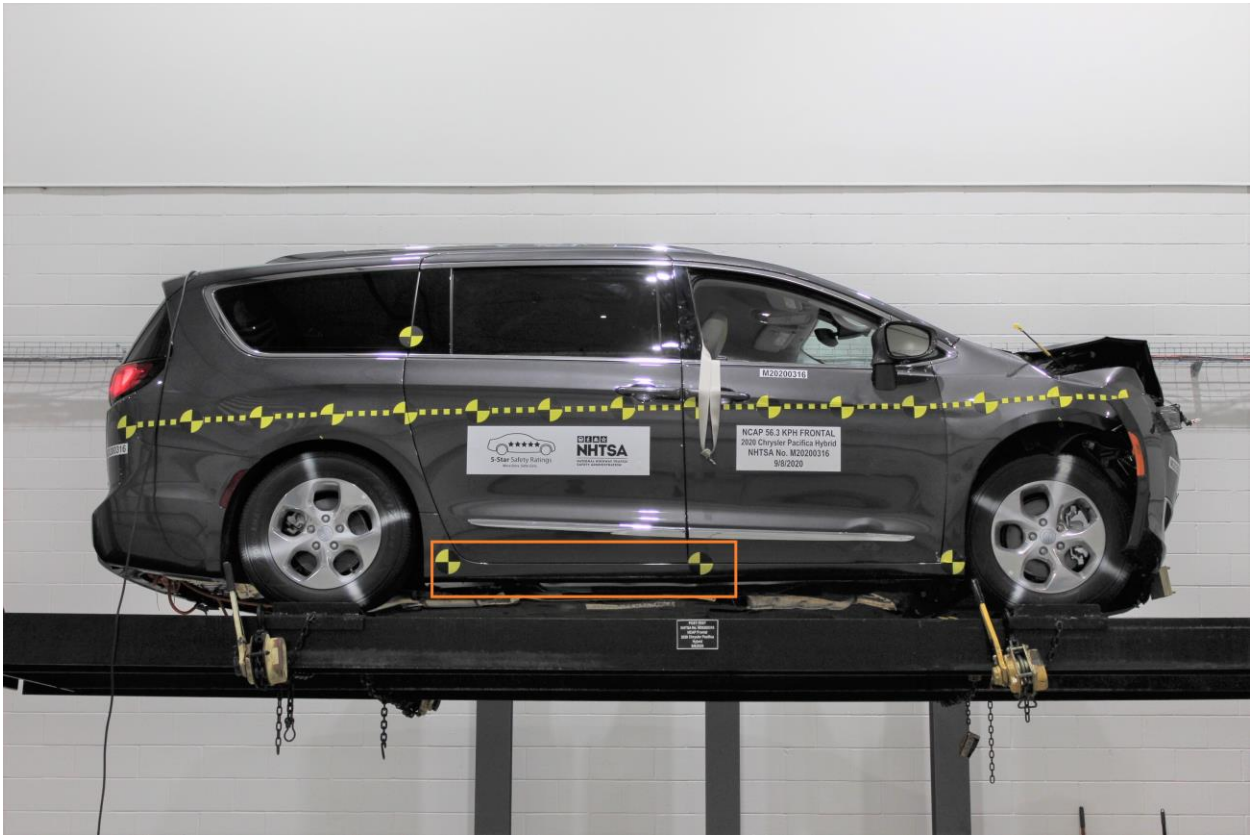


Figure 305-31: FMVSS No. 305 Static Rollover 360 Degrees

Figure 305-32: Pre-Impact View of the Vehicle Passenger Compartment Adjacent to Propulsion Battery

Figure 305-33: Post-Impact View of the Vehicle Passenger Compartment Adjacent to Propulsion Battery

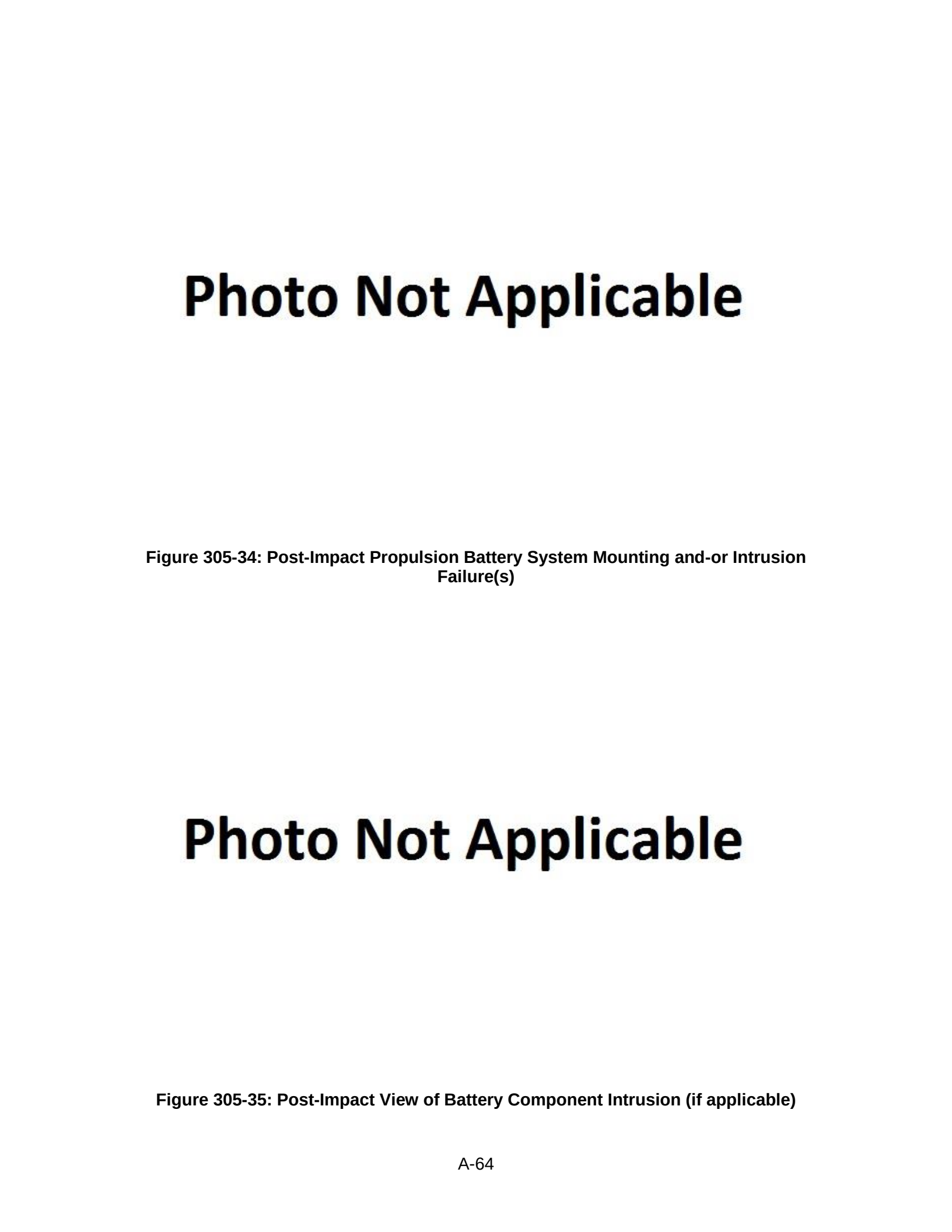


Figure 305-34: Post-Impact Propulsion Battery System Mounting and-or Intrusion Failure(s)

Figure 305-35: Post-Impact View of Battery Component Intrusion (if applicable)

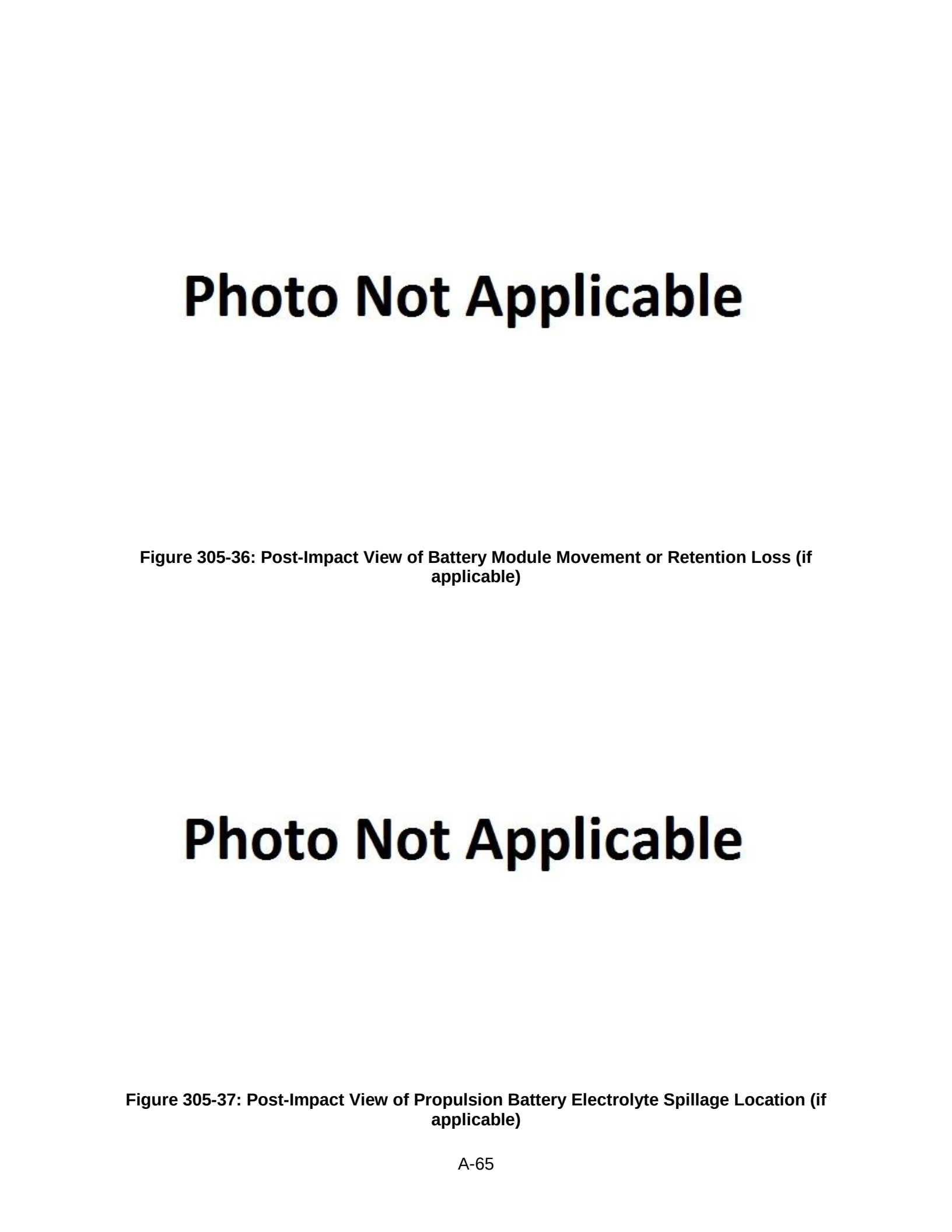


Figure 305-36: Post-Impact View of Battery Module Movement or Retention Loss (if applicable)

Figure 305-37: Post-Impact View of Propulsion Battery Electrolyte Spillage Location (if applicable)

Figure 305-38: Post-Impact View of Propulsion Battery Electrolyte Spillage Location (after rollover)

APPENDIX B
VEHICLE & DUMMY RESPONSE DATA TRACES

Table of Data Plots

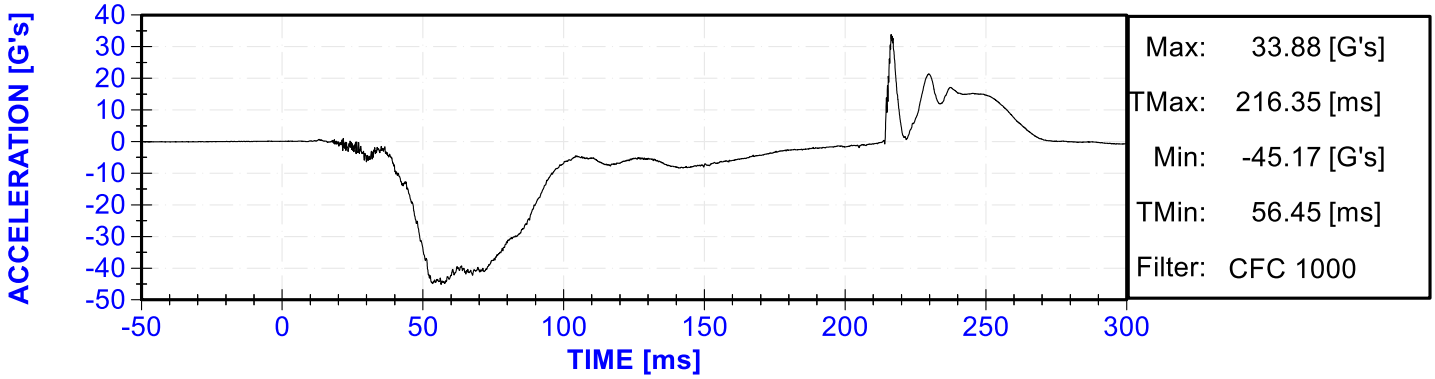
The following additional dummy and vehicle response data can be found in the R&D section of the NHTSA website at www.NHTSA.gov

Driver Head X Acceleration Redundant
Driver Head Y Acceleration Redundant
Driver Head Z Acceleration Redundant
Driver Upper Neck Force Y
Driver Upper Neck Moment X
Driver Upper Neck Moment Z
Driver Chest X Acceleration Redundant
Driver Chest Y Acceleration Redundant
Driver Chest Z Acceleration 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

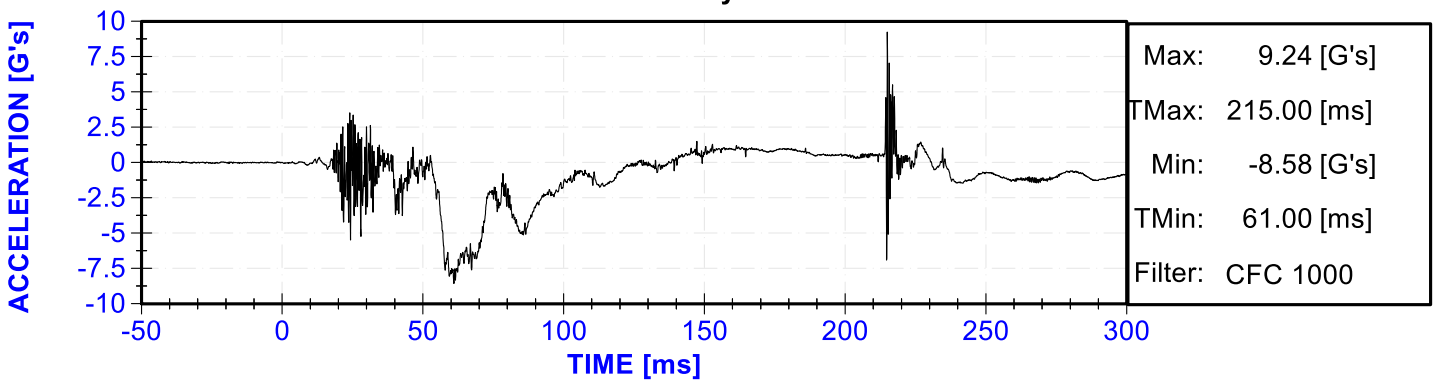
Driver Left Upper Tibia Force Z
Driver Left Lower Tibia Moment X
Driver Left Lower Tibia Moment Y
Driver Left Lower Tibia Force Z
Driver Right Upper Tibia Moment X
Driver Right Upper Tibia Moment Y
Driver Right Upper Tibia Force Z
Driver Right Lower Tibia Moment X
Driver Right Lower Tibia Moment Y
Driver 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 Shoulder Belt Force
Driver Lap Belt Force
Driver Head Angular Velocity X
Driver Head Angular Velocity Y
Driver Head Angular Velocity Z
Passenger Head X Acceleration Redundant
Passenger Head Y Acceleration Redundant
Passenger Head Z Acceleration Redundant
Passenger Upper Neck Force X
Passenger Upper Neck Force Z
Passenger Upper Neck Moment Y
Passenger Chest X Acceleration Redundant
Passenger Chest Y Acceleration Redundant
Passenger Chest Z Acceleration 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 Food Fore Z
Passenger Right Foot Aft X
Passenger Right Foot Aft Z
Passenger Shoulder Belt Force
Passenger Lap Belt Force
Passenger Head Angular Velocity X
Passenger Head Angular Velocity Y
Passenger Head Angular Velocity Z
Left Rear Seat Crossmember X
Left Rear Seat Crossmember Z
Right Rear Seat Crossmember X
Right Rear Seat Crossmember Z
Left Rear Seat Crossmember X Redundant
Right Rear Seat Crossmember X Redundant
Vehicle Engine Top X
Vehicle Engine Bottom X
Load Cell Barrier Forces and Moments

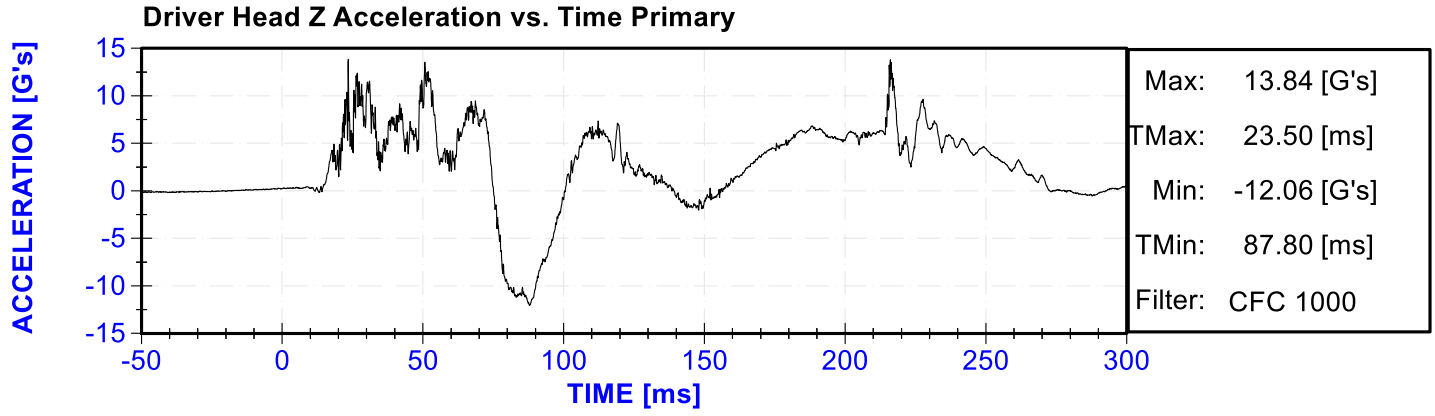
Driver Head X Acceleration vs. Time Primary



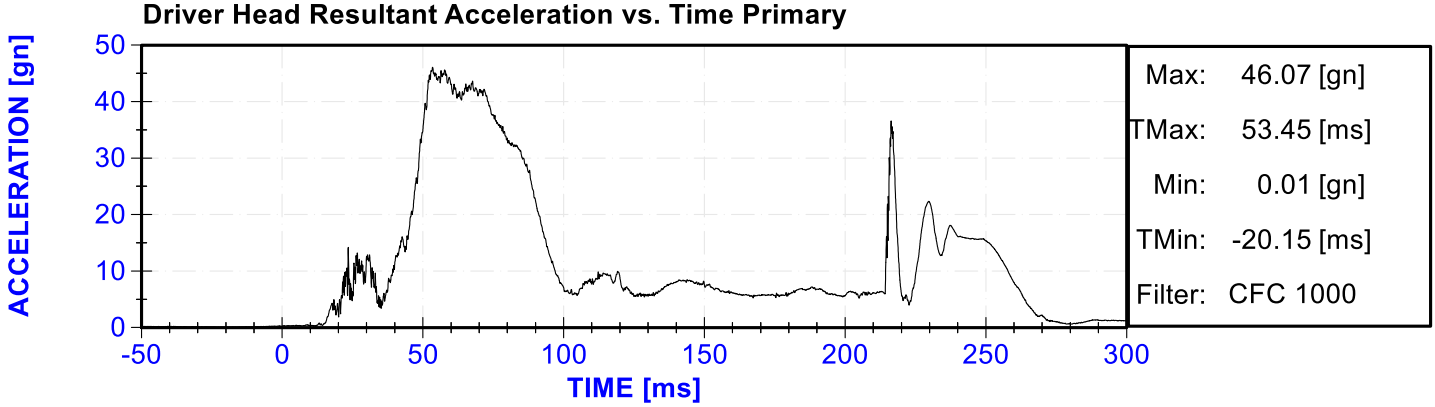
Driver Head Y Acceleration vs. Time Primary



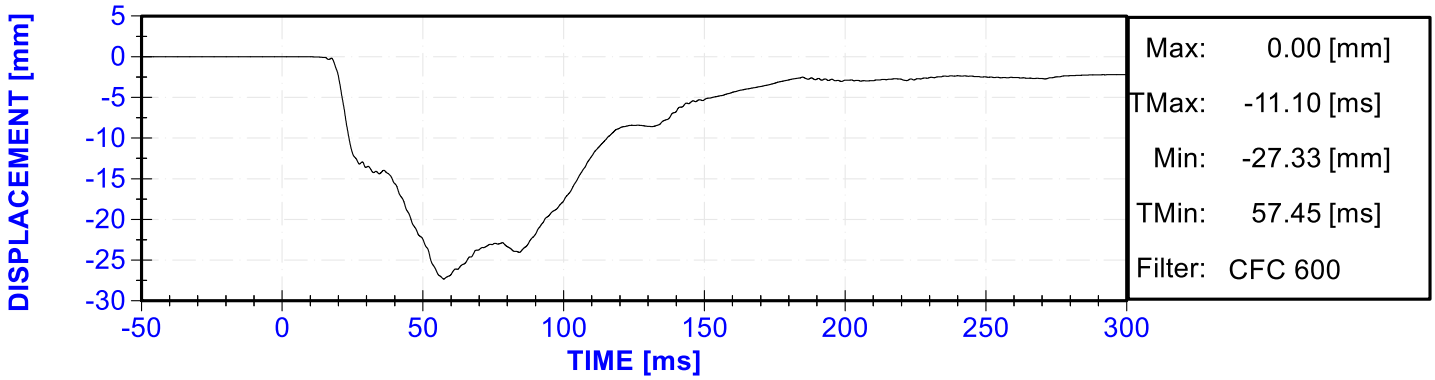
Driver Head Z Acceleration vs. Time Primary



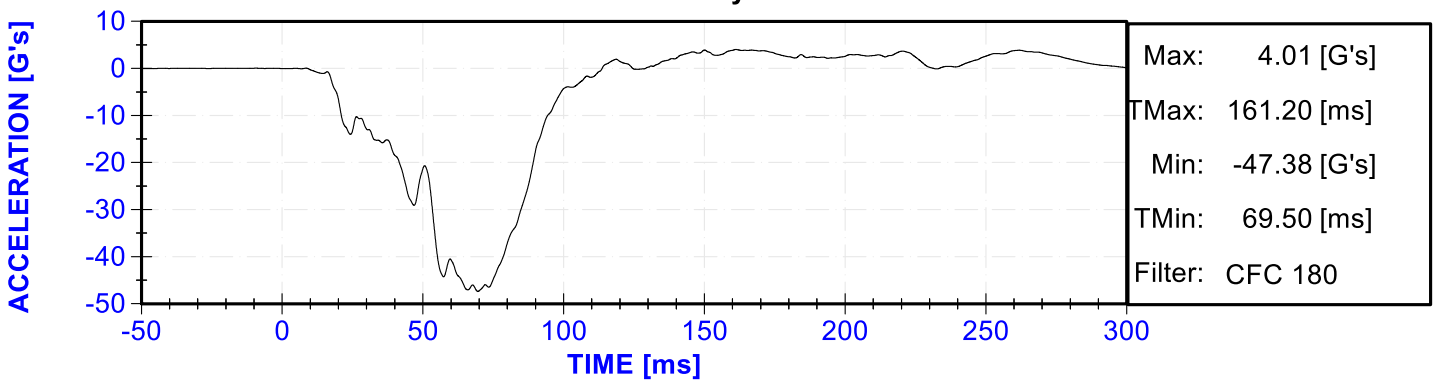
Driver Head Resultant Acceleration vs. Time Primary



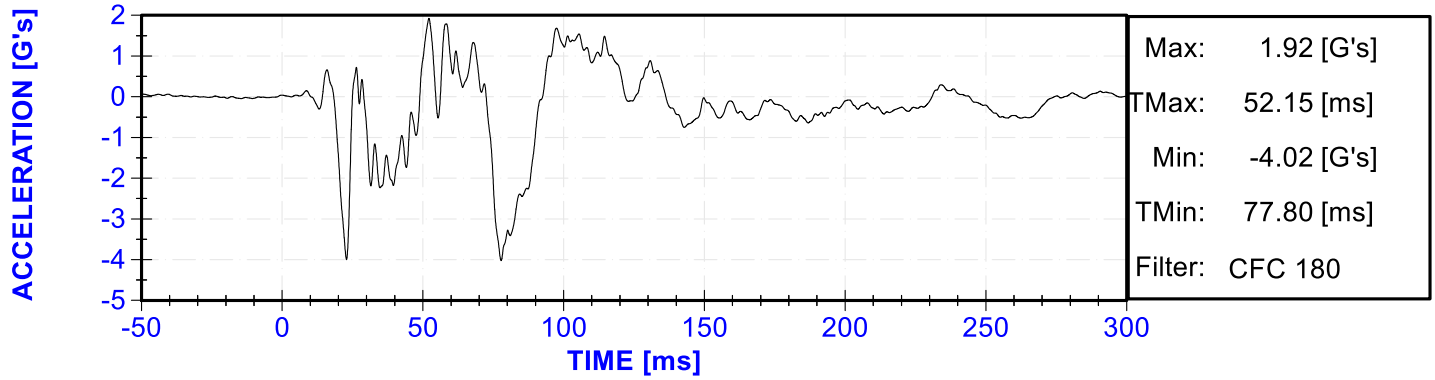
Driver Chest X Deflection vs. Time



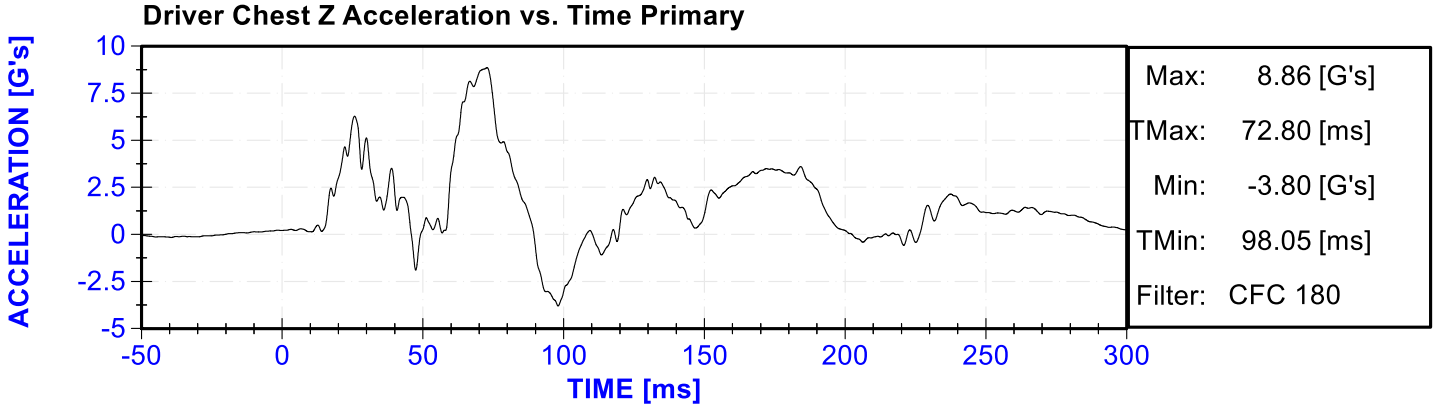
Driver Chest X Acceleration vs. Time Primary



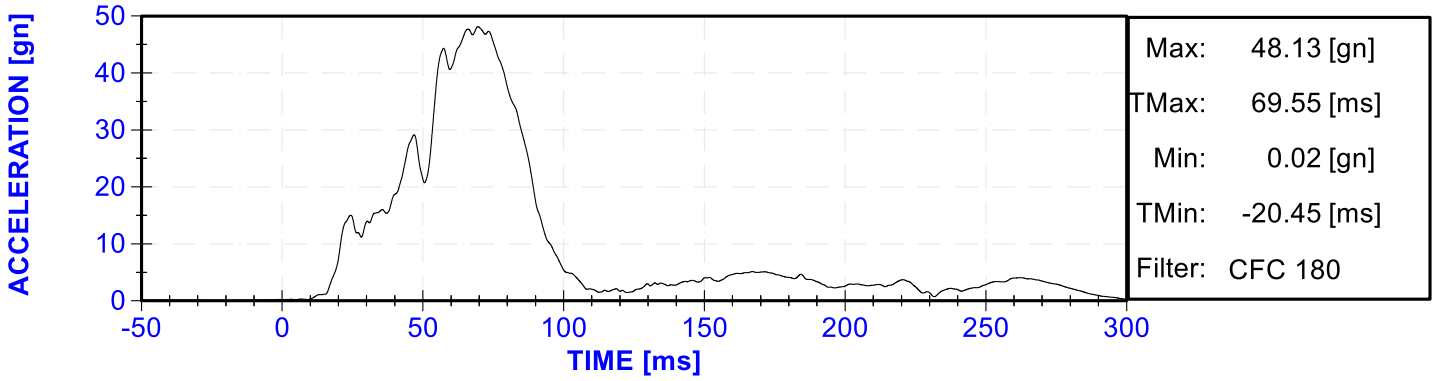
Driver Chest Y Acceleration vs. Time Primary



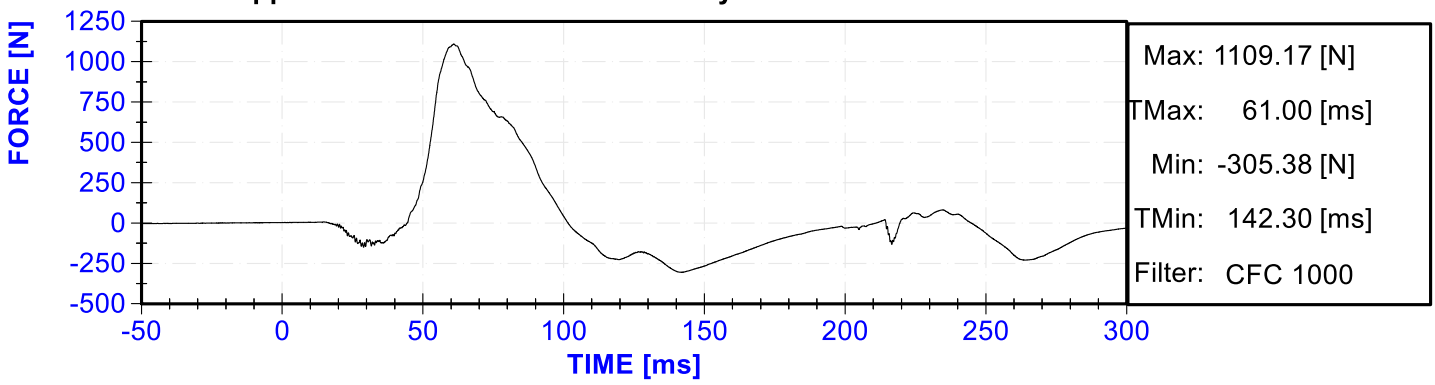
Driver Chest Z Acceleration vs. Time Primary



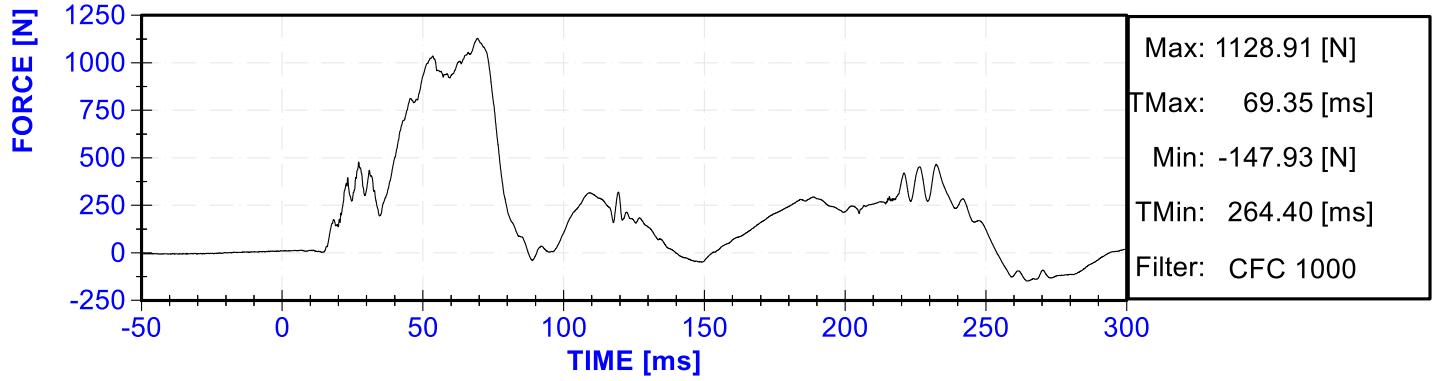
Driver Chest Resultant Acceleration vs. Time Primary



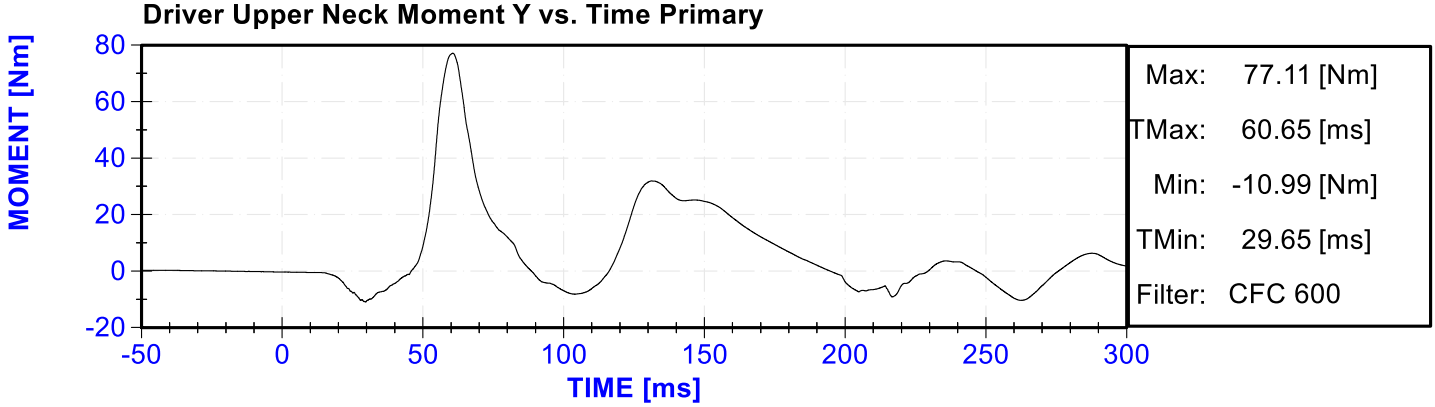
Driver Upper Neck Force X vs. Time Primary



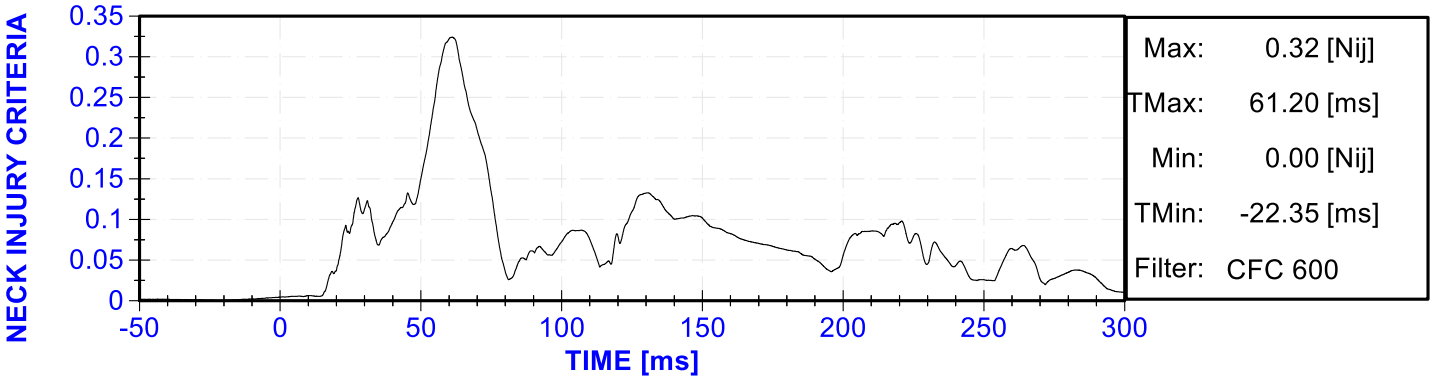
Driver Upper Neck Force Z vs. Time Primary



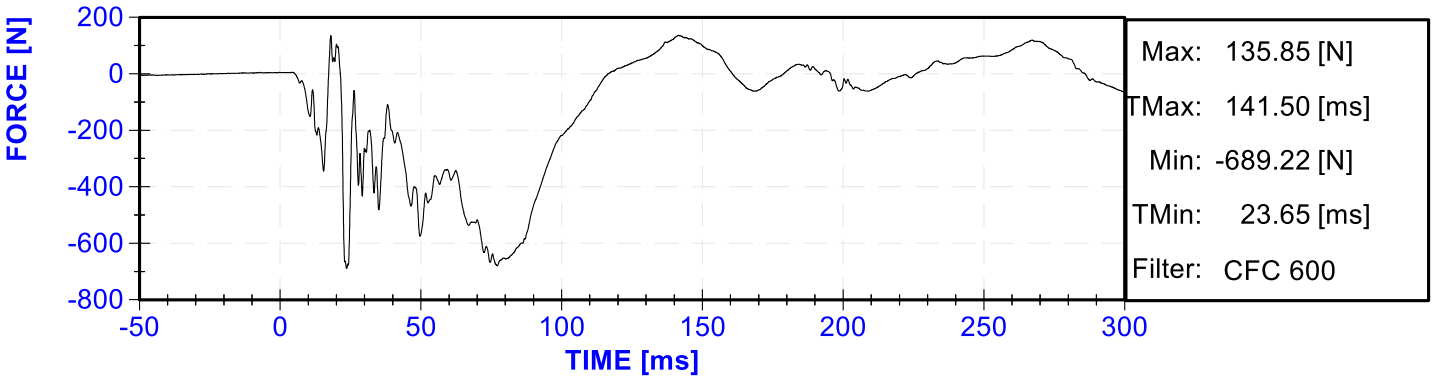
Driver Upper Neck Moment Y vs. Time Primary



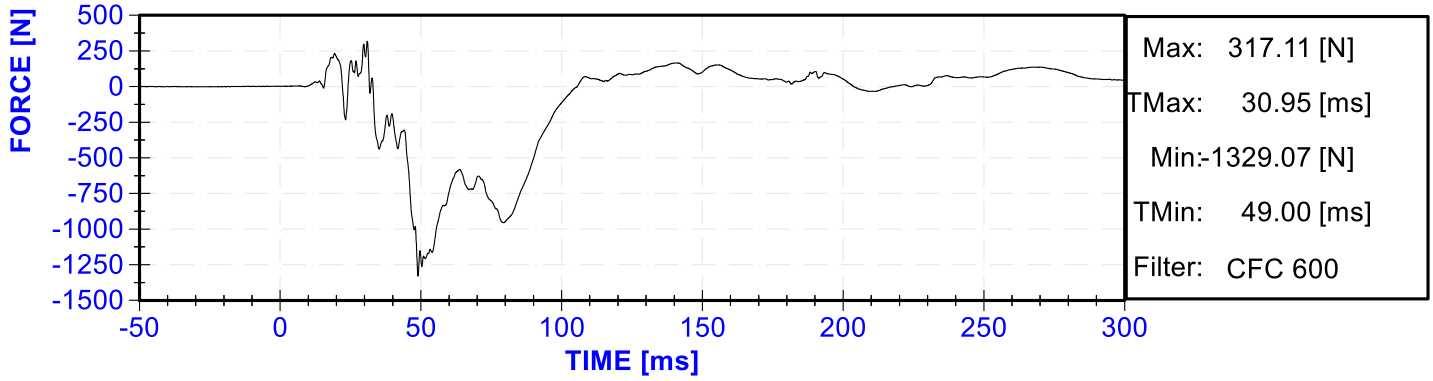
Driver Nij vs. Time Primary



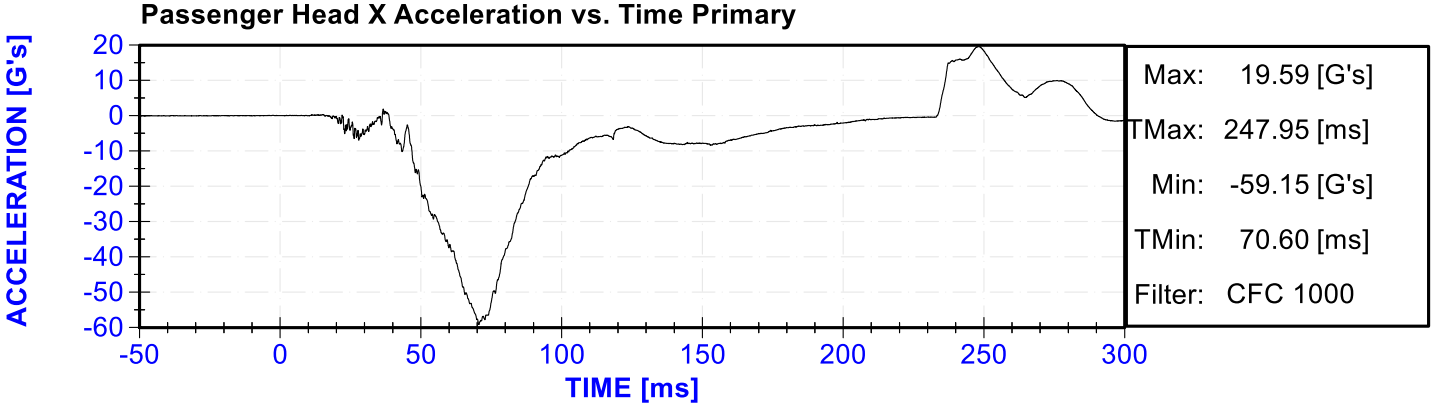
Driver Left Femur Force vs. Time



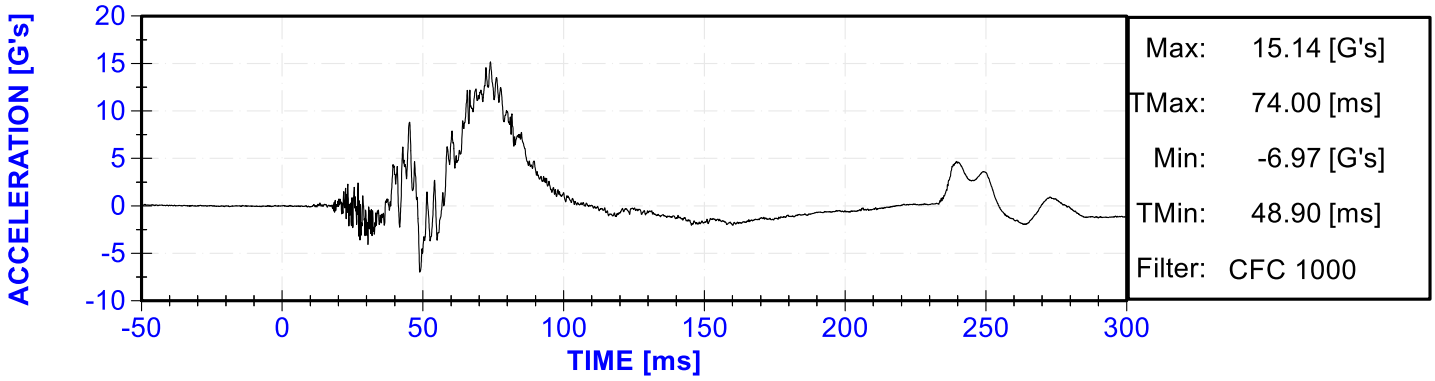
Driver Right Femur Force vs. Time



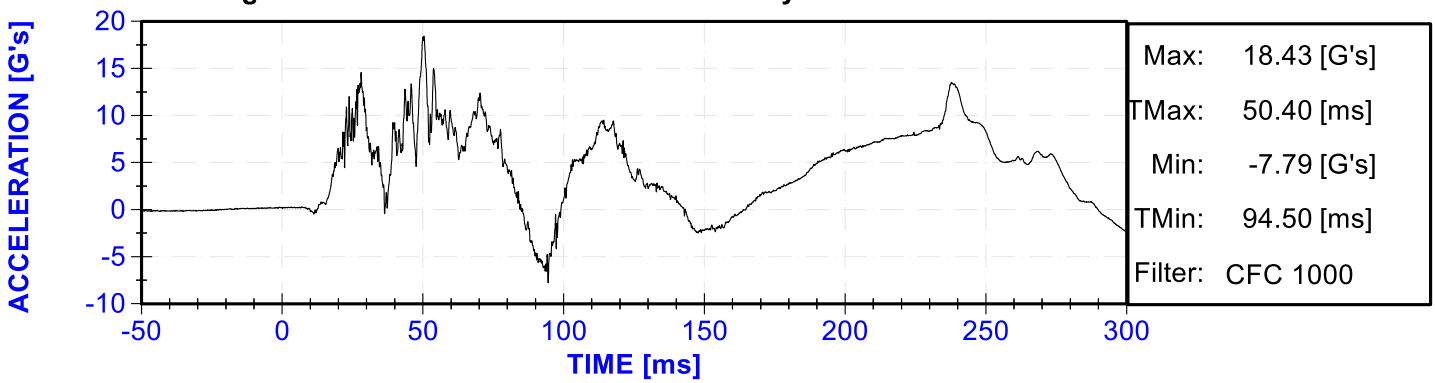
Passenger Head X Acceleration vs. Time Primary



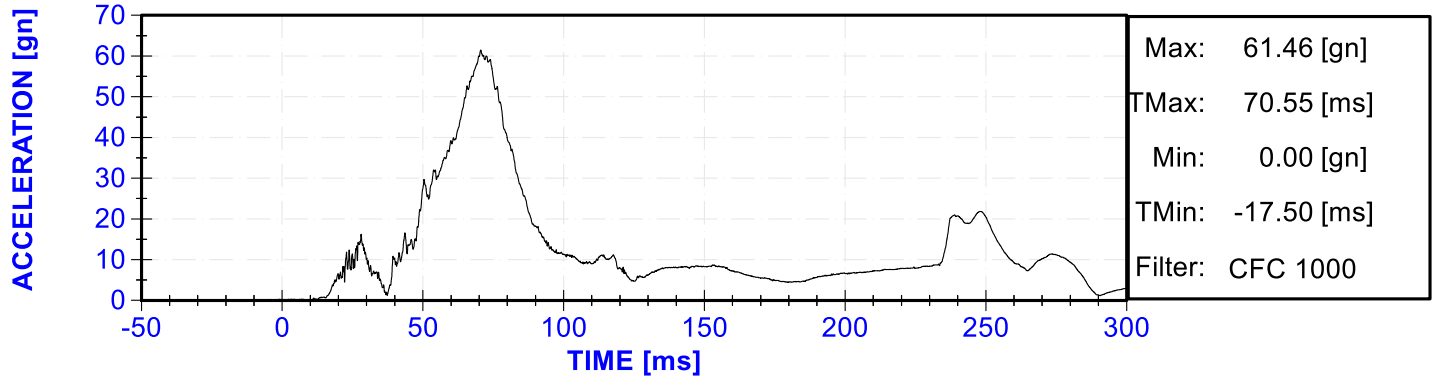
Passenger Head Y Acceleration vs. Time Primary



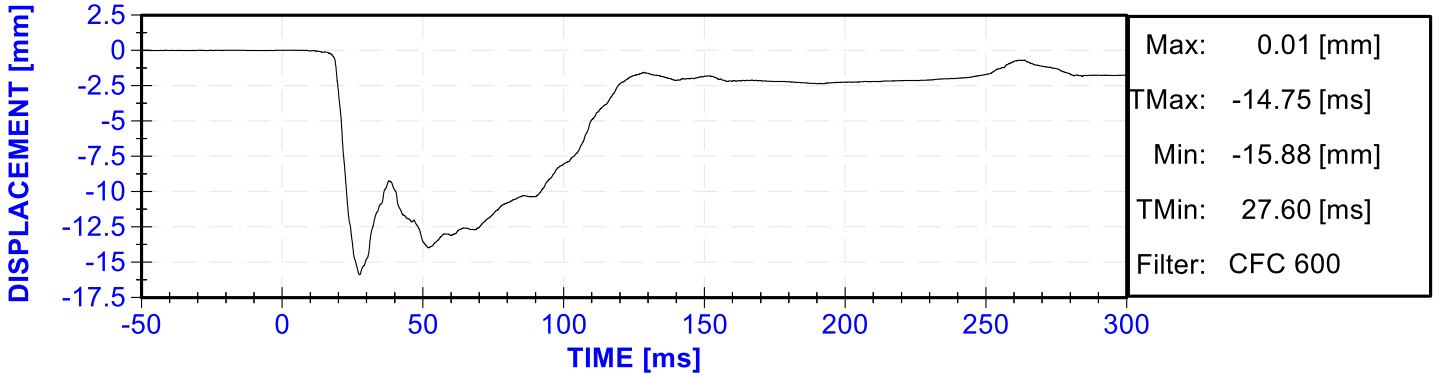
Passenger Head Z Acceleration vs. Time Primary



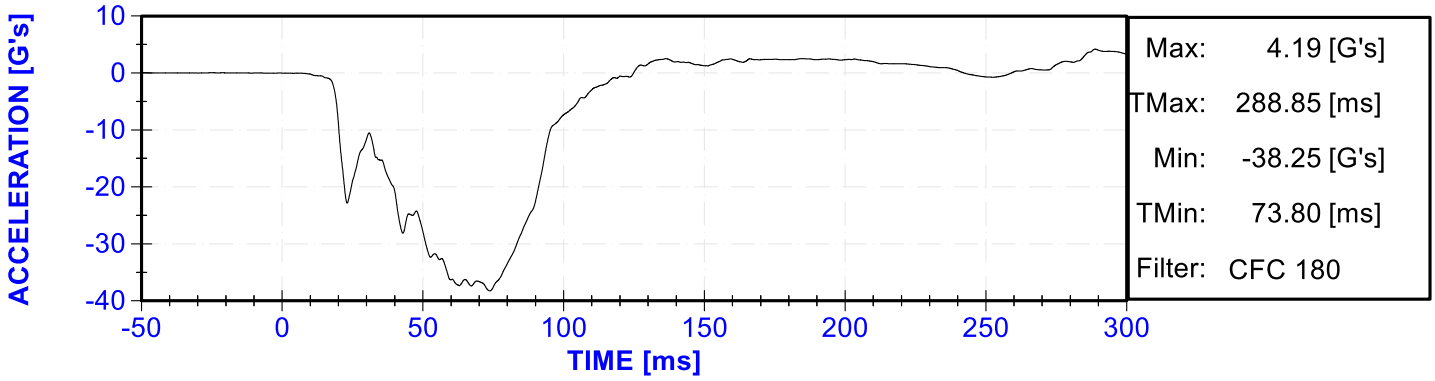
Passenger Head Resultant Acceleration vs. Time Primary



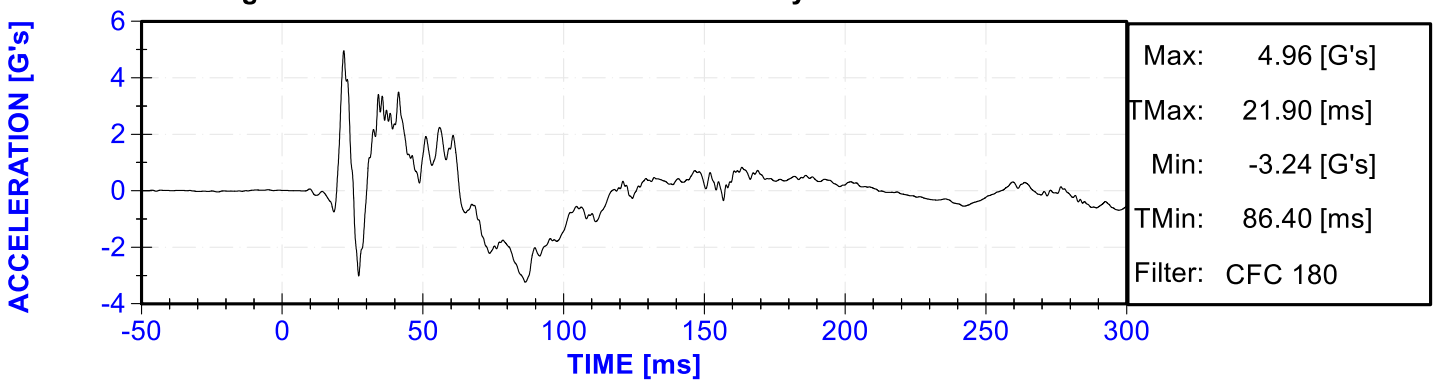
Passenger Chest X Deflection vs. Time



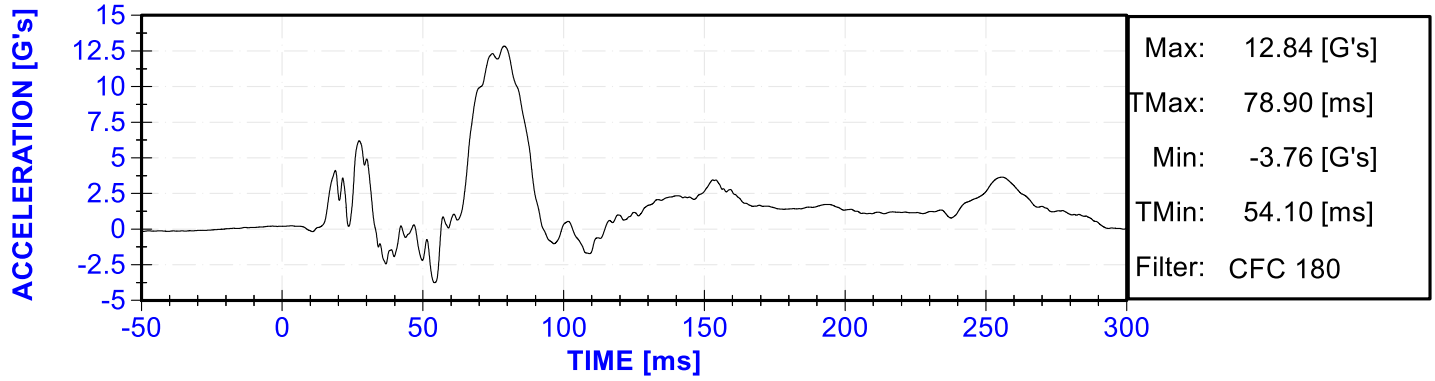
Passenger Chest X Acceleration vs. Time Primary



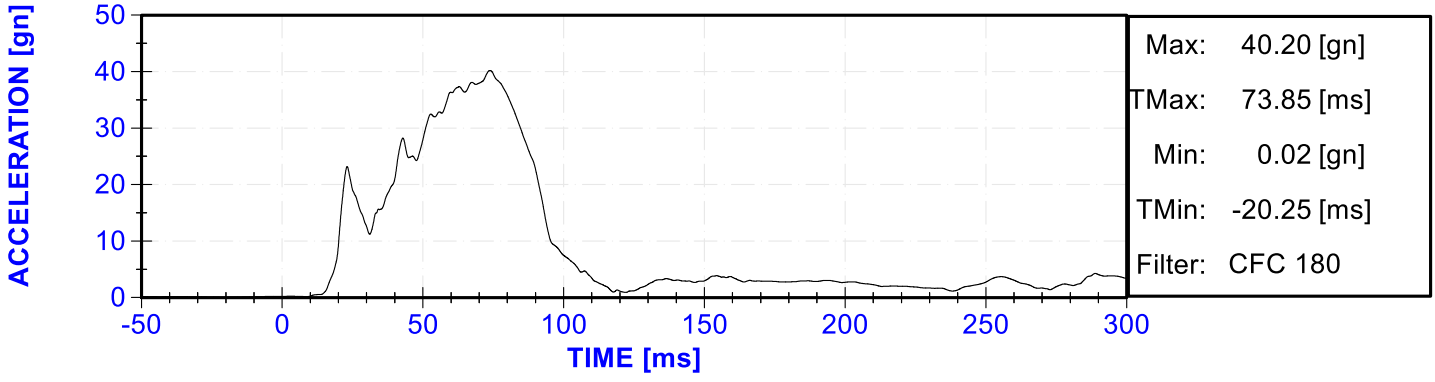
Passenger Chest Y Acceleration vs. Time Primary



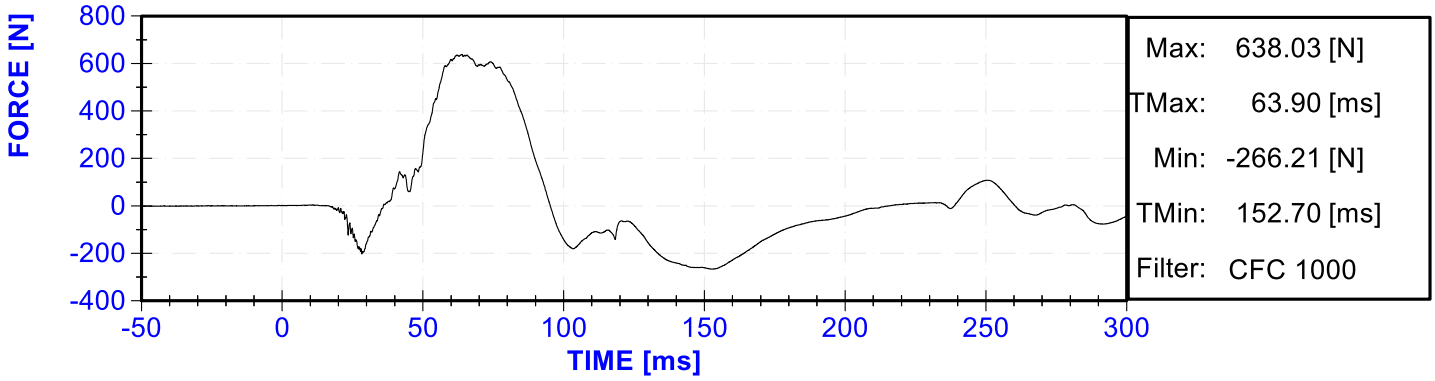
Passenger Chest Z Acceleration vs. Time Primary



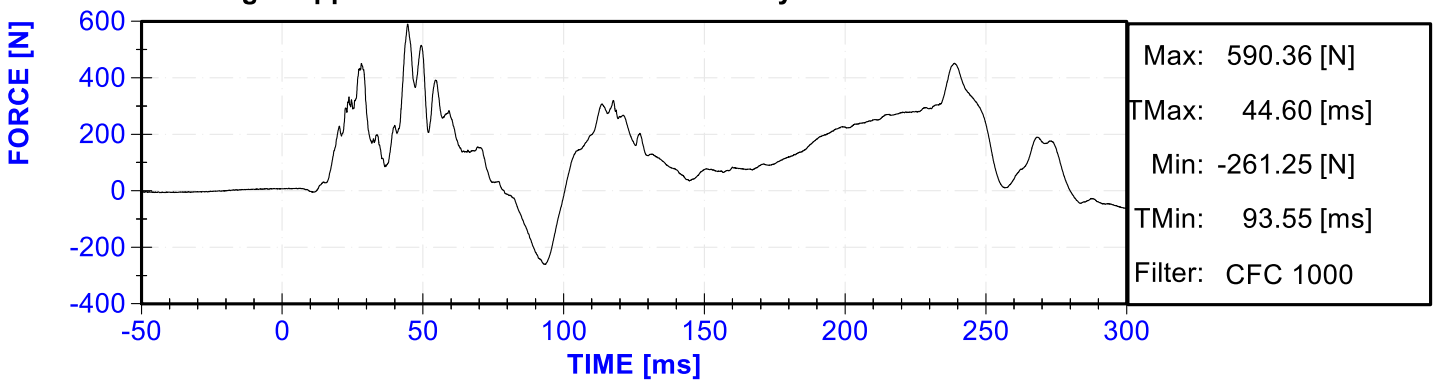
Passenger Chest Resultant Acceleration vs. Time Primary



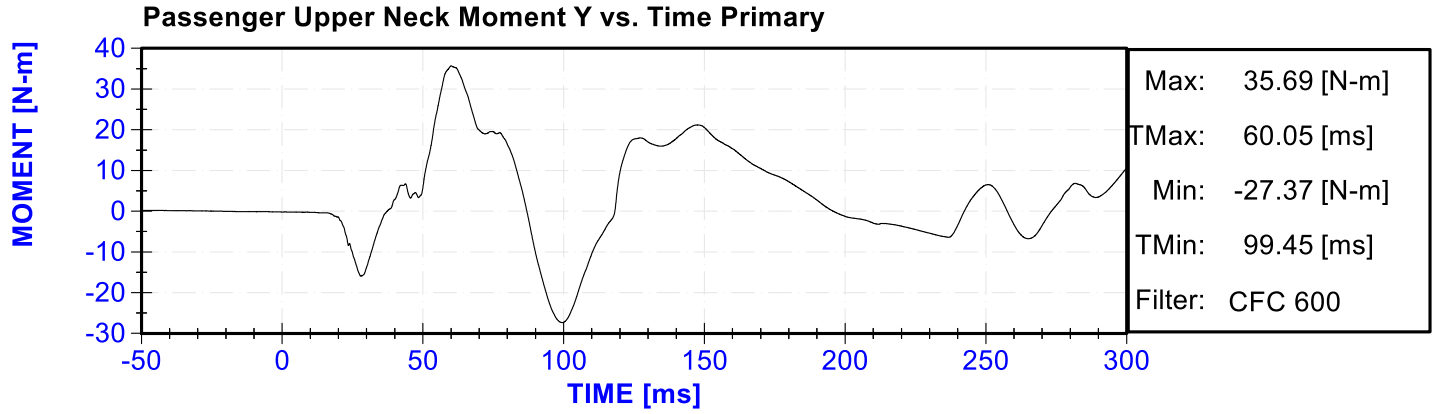
Passenger Upper Neck Force X vs. Time Primary



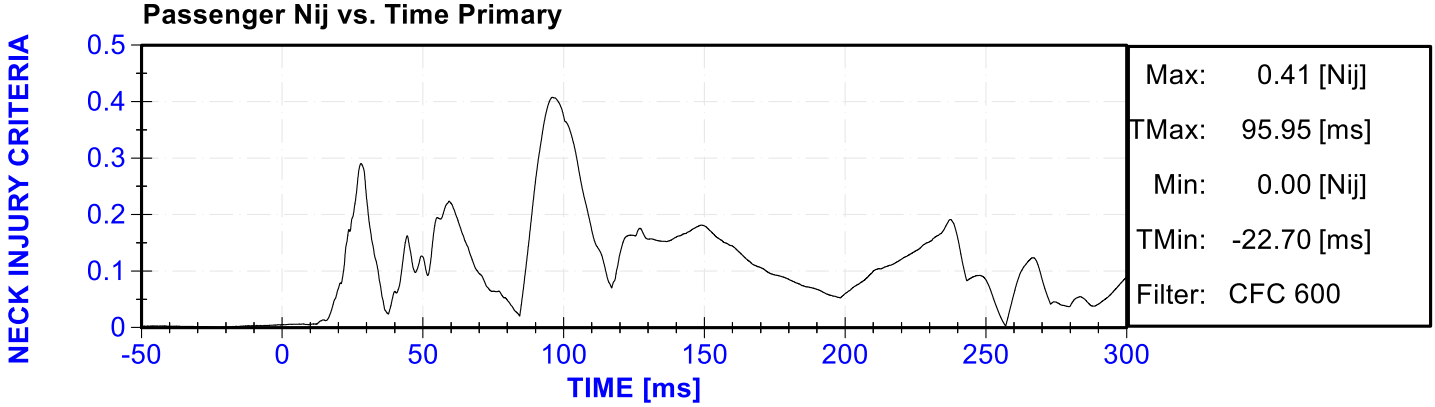
Passenger Upper Neck Force Z vs. Time Primary

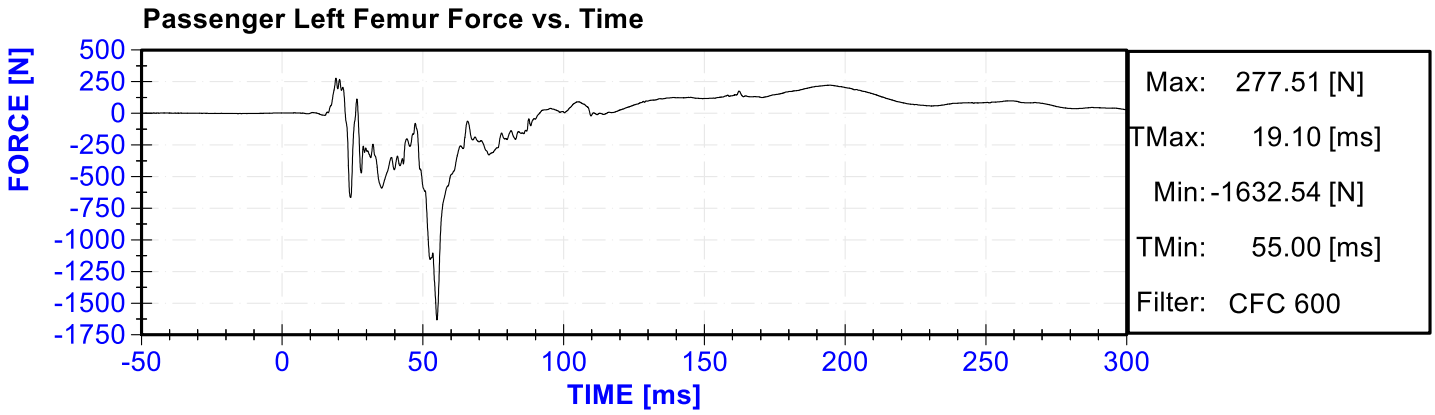


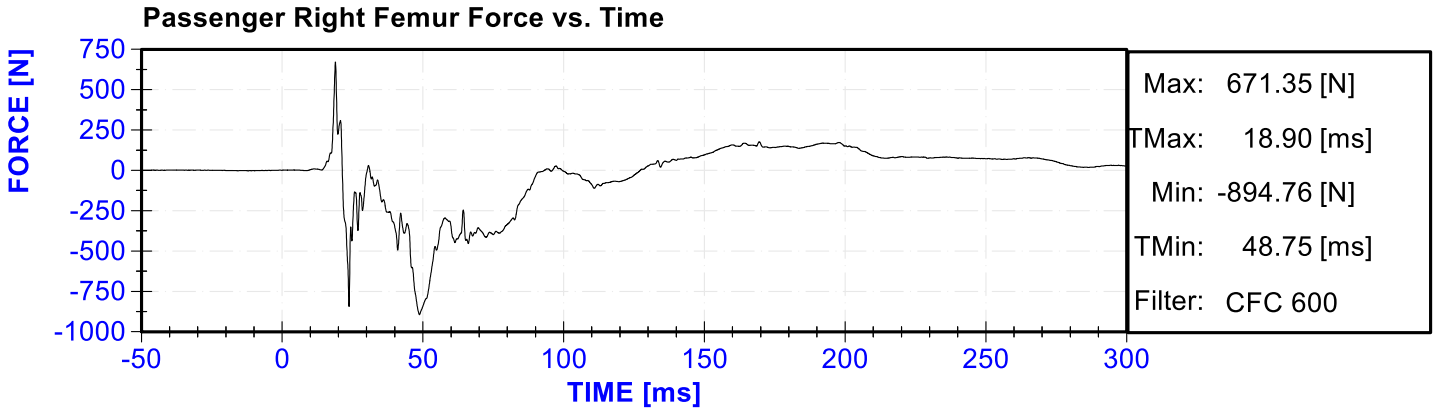
Passenger Upper Neck Moment Y vs. Time Primary



Passenger Nij vs. Time Primary




Passenger Left Femur Force vs. Time
FORCE [N]
500
250
0
-250
-500
-750
-1000
-1250
-1500
-1750
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 277.51 [N]
TMax: 19.10 [ms]
Min: -1632.54 [N]
TMin: 55.00 [ms]
Filter: CFC 600


Passenger Right Femur Force vs. Time
FORCE [N]
750
500
250
0
-250
-500
-750
-1000
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 671.35 [N]
TMax: 18.90 [ms]
Min: -894.76 [N]
TMin: 48.75 [ms]
Filter: CFC 600

APPENDIX C

DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

CALIBRATION TEST RESULTS

PRE-TEST

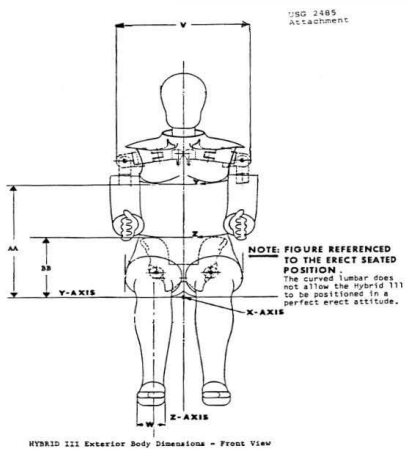
HYBRID III 50TH PERCENTILE MALE - DRIVER ATD

SERIAL NO: 142

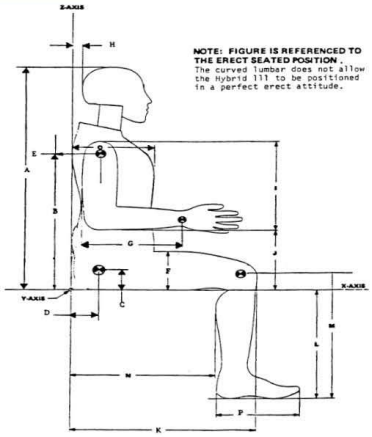
External Measurements - Hybrid 3 - 50th Male

Technician: K. Dutton Date: 08/11/2020

Dummy Serial Number: 142



HYBRID III Exterior Body Dimensions - Front View



HYBRID III Exterior Body Dimensions - Side View

Symbol	Description	Specification (in)		Result (in)	Pass/Fail
A	Sitting Height	34.6	35.0	34.8	Pass
B	Shoulder Pivot Height	19.9	20.5	20.2	Pass
C	H-Point Height	3.3	3.5	3.4	Pass
D	H-Point from Backline	5.3	5.5	5.4	Pass
E	Shoulder Pivot from Backline	3.3	3.7	3.6	Pass
F	Thigh Clearance	5.5	6.1	5.9	Pass
G	Back of Elbow to Wrist Pivot	11.4	12.0	11.6	Pass
H	Head Back to Backline	1.6	1.8	1.7	Pass
I	Shoulder to Elbow Length	13.0	13.6	13.4	Pass
J	Elbow Rest Height	7.5	8.3	8.1	Pass
K	Buttock to Knee Length	22.8	23.8	23.1	Pass
L	Popliteal Height	16.9	17.9	17.4	Pass
M	Knee Pivot Height	19.1	19.7	19.5	Pass
N	Buttock Popliteal Length	17.8	18.8	18.4	Pass
O	Chest Depth without Jacket	8.4	9.0	8.6	Pass
P	Foot Length (right)	9.9	10.5	10.2	Pass
V	Shoulder Breadth	16.3	17.2	16.9	Pass
W	Foot Breadth	3.6	4.2	3.8	Pass
Y	Chest Circumference with Jacket	38.2	39.4	38.8	Pass
Z	Waist Circumference	32.9	34.1	33.7	Pass
AA	Reference Location (Chest Circumference)	16.9	17.1	17.0	Pass
BB	Reference Location (Waist Circumference)	8.9	9.1	9.0	Pass

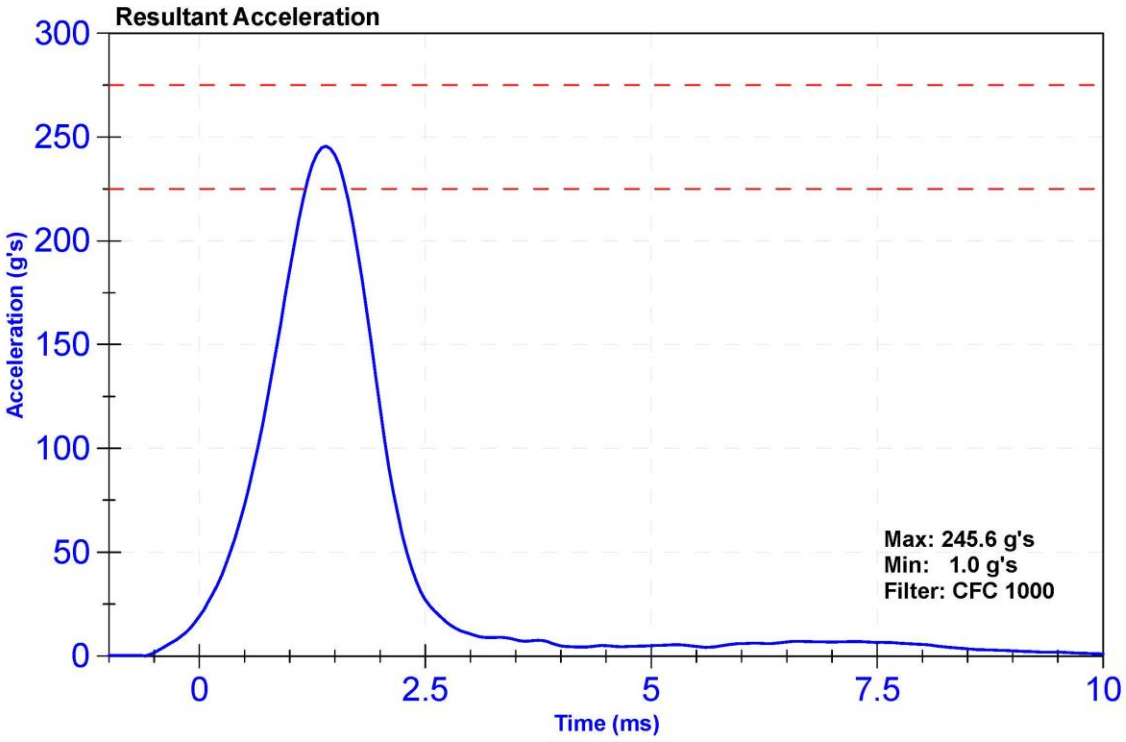
ATD Manufacturer	Humanetics	Test Technician	C. Mantell
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

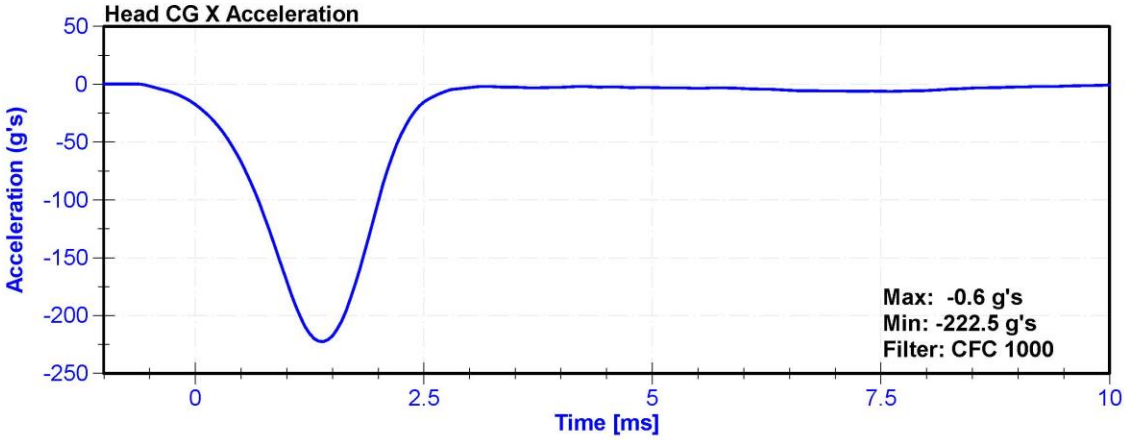
Results

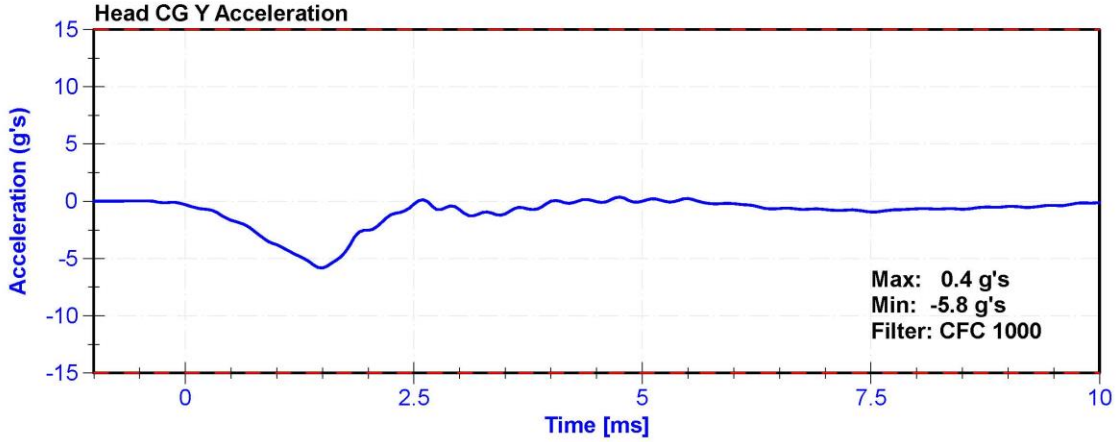
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21.3	Pass
Humidity	10	70	%	55.6	Pass
Resultant Acceleration	225	275	g's	245.6	Pass
Oscillation	0	10	%	3.6	Pass
Lateral Acceleration	-15	15	g's	-5.8	Pass

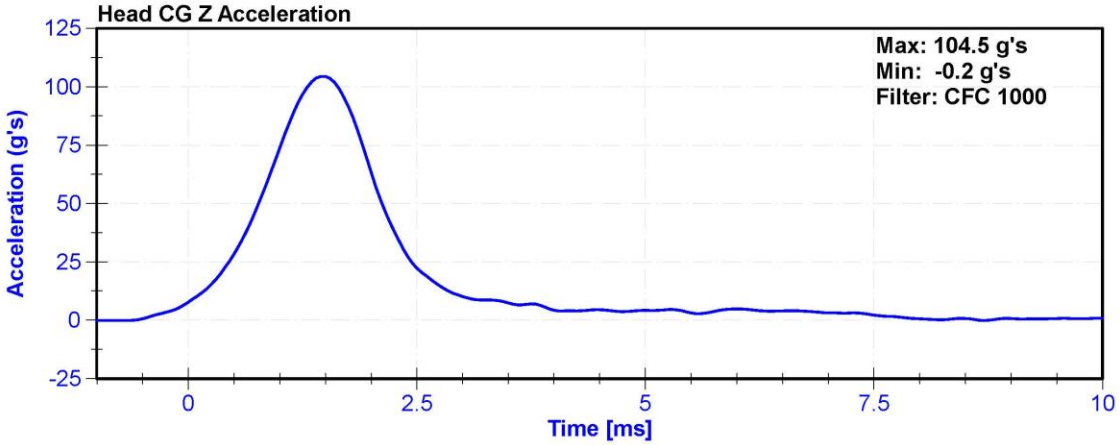
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264	P51681	4/17/2020	10/16/2020
Y Accelerometer	ENDEVCO 7264	P64151	4/17/2020	10/16/2020
Z Accelerometer	ENDEVCO 7264	P52114	4/17/2020	10/16/2020




Head CG X Acceleration
Acceleration (g's)
50
0
-50
-100
-150
-200
-250
0
2.5
5
7.5
10
Time [ms]
Max: -0.6 g's
Min: -222.5 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]
Max: 0.4 g's
Min: -5.8 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]
Max: 104.5 g's
Min: -0.2 g's
Filter: CFC 1000

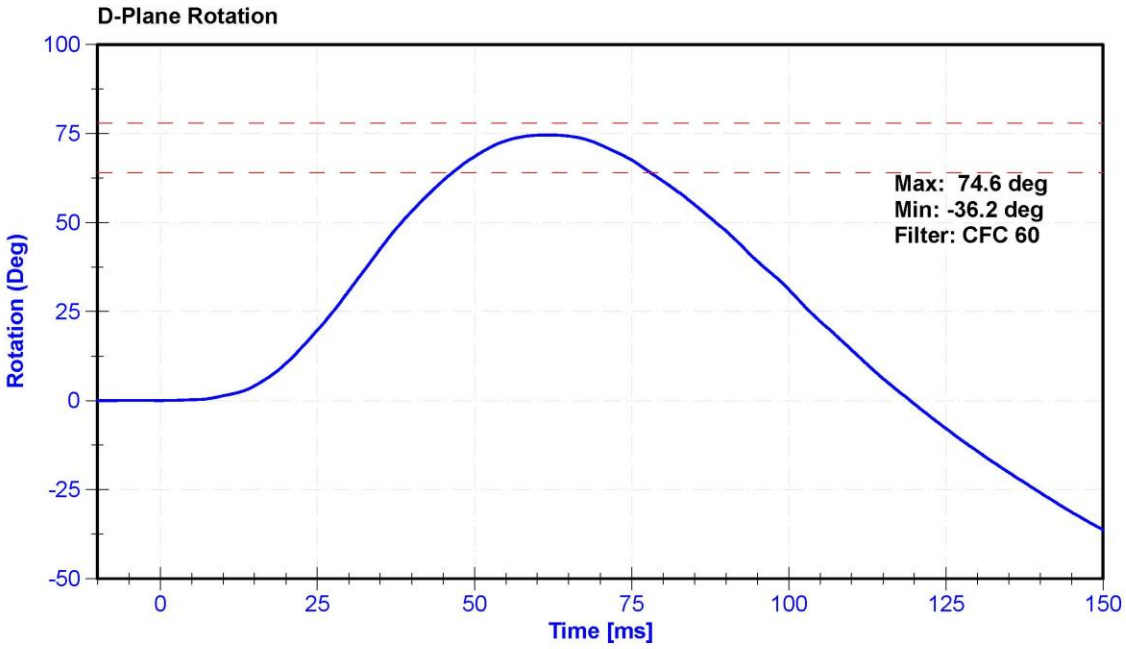
ATD Manufacturer	Humanetics	Test Technician	E. Helenbrook
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

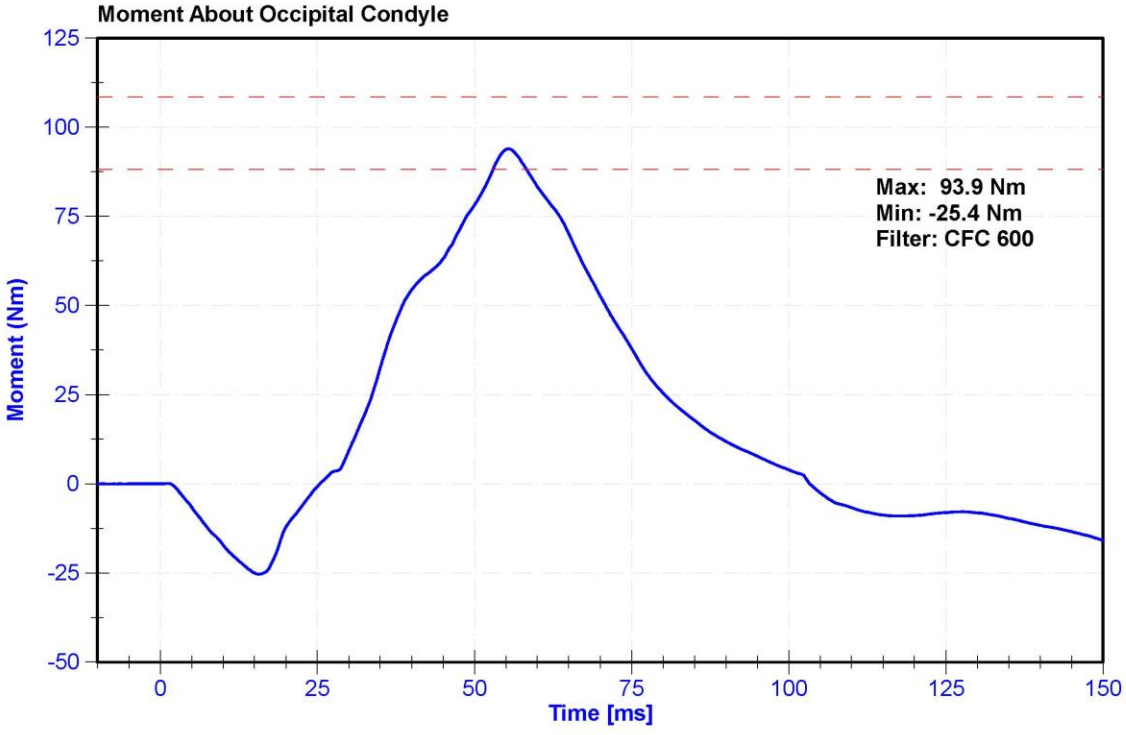
Results

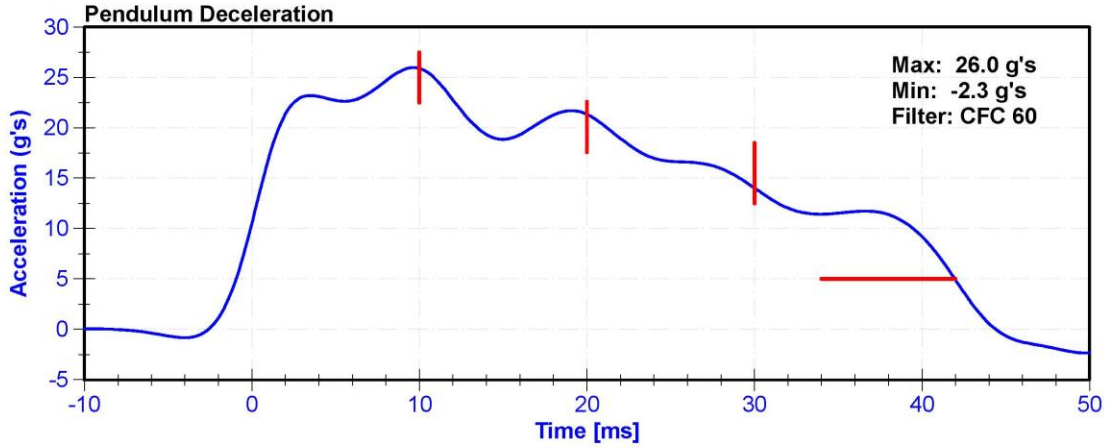
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.5	Pass
Humidity	10	70	%	65.7	Pass
Velocity	6.89	7.13	m/s	6.958	Pass
Pendulum Deceleration at 10ms	22.5	27.5	g's	25.91	Pass
Pendulum Deceleration at 20ms	17.6	22.6	g's	21.34	Pass
Pendulum Deceleration at 30ms	12.5	18.5	g's	14.03	Pass
Max. Pendulum Deceleration After 30ms	0	29	g's	26.0	Pass
Pendulum Deceleration Time to 5 g's	34	42	ms	42.0	Pass
Maximum D Plane Rotation	64	78	deg	74.6	Pass
Time to Maximum Rotation	57	64	ms	61.5	Pass
Rotation Decay to Zero	113	127	ms	119.3	Pass
Moment About Occipital Condyle	88.1	108.4	Nm	93.86	Pass
Time to Maximum Moment	47	58	ms	55.4	Pass
Moment Decay to Zero	97	107	ms	103.4	Pass

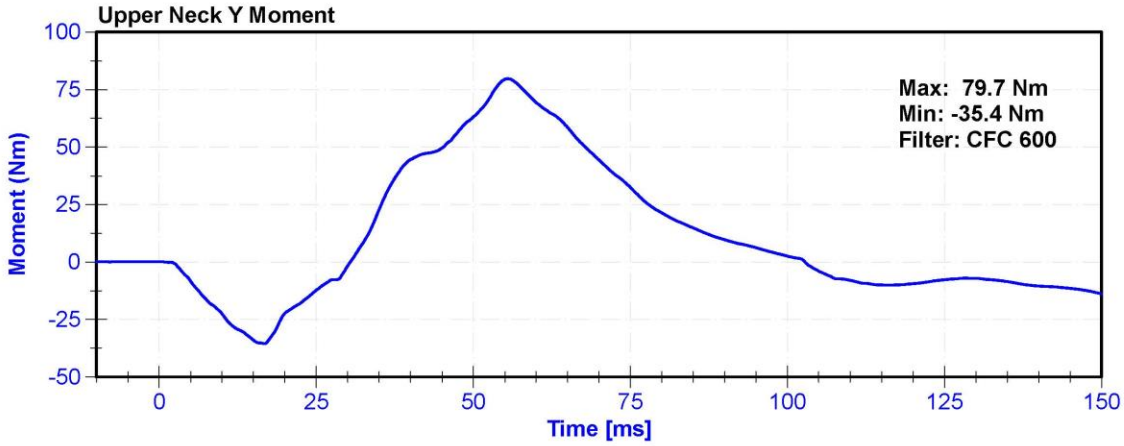
Transducer Calibrations

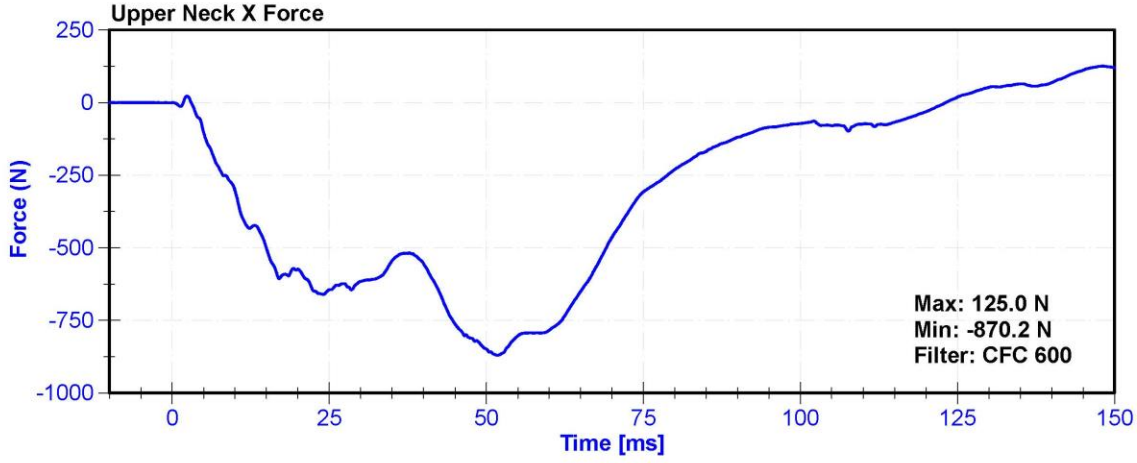
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5M9 Pend	1/30/2020	1/29/2021
Pendulum Potentiometer	ETI SP22G	DS-LABPOT1	9/13/2019	9/12/2020
Condyle Potentiometer	ETI SP22G	DS-LABPOT2	9/13/2019	9/12/2020
Upper Neck Load Cell	Denton IF-205	LC-280FxGFE	10/3/2019	10/2/2020


D-Plane Rotation
Rotation (Deg)
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 74.6 deg
Min: -36.2 deg
Filter: CFC 60


Moment About Occipital Condyle
Moment (Nm)
125
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 93.9 Nm
Min: -25.4 Nm
Filter: CFC 600


Pendulum Deceleration
Acceleration (g's)
Time [ms]
Max: 26.0 g's
Min: -2.3 g's
Filter: CFC 60


Upper Neck Y Moment
Moment (Nm)
Time [ms]
Max: 79.7 Nm
Min: -35.4 Nm
Filter: CFC 600


Upper Neck X Force
Force (N)
Time [ms]
Max: 125.0 N
Min: -870.2 N
Filter: CFC 600

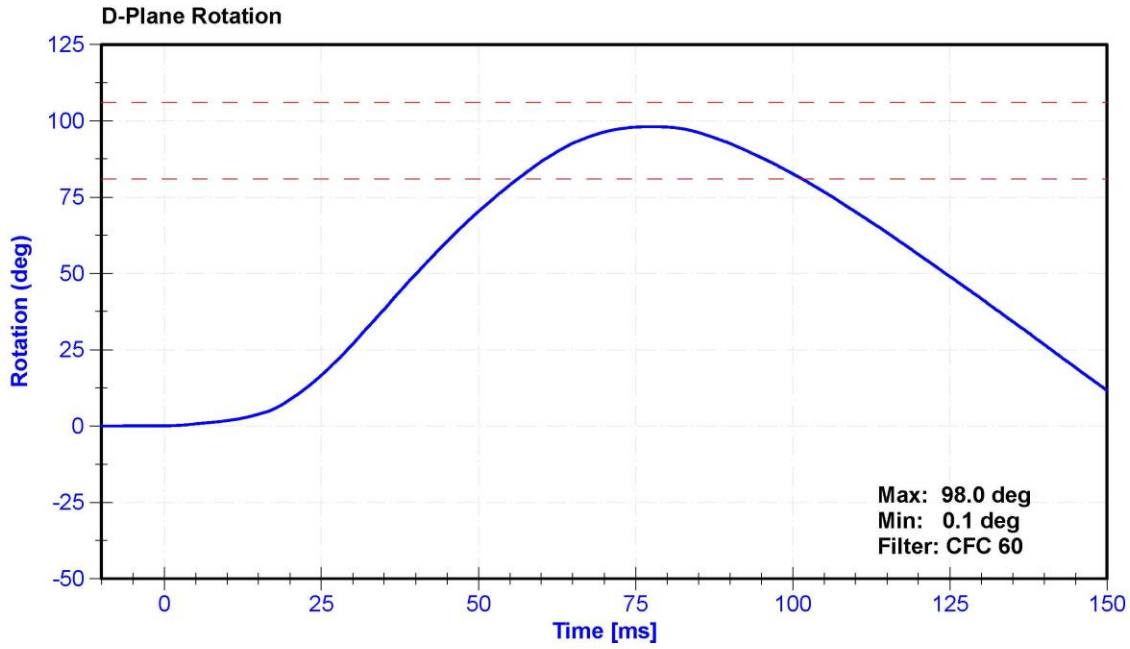
ATD Manufacturer	Humanetics	Test Technician	C. Mantell
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

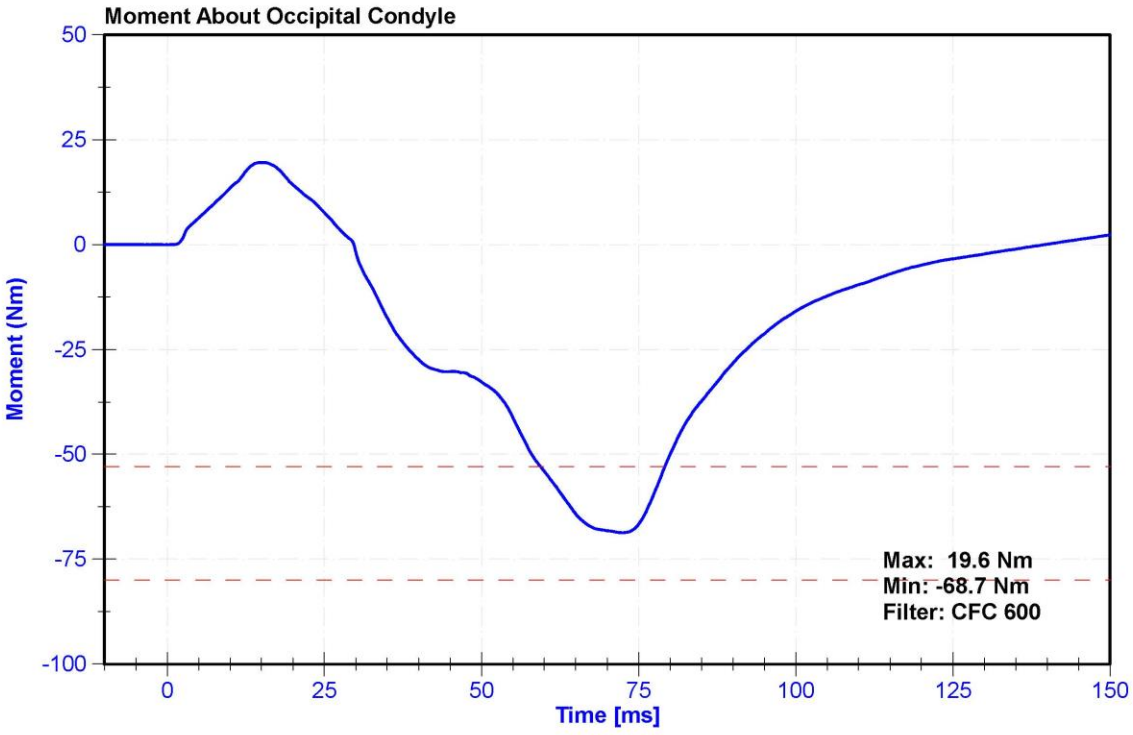
Results

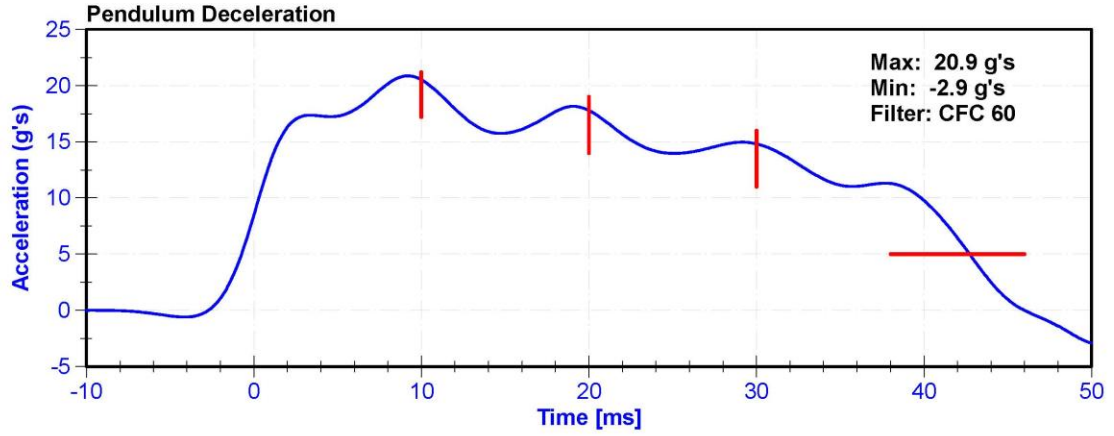
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.5	Pass
Humidity	10	70	%	67	Pass
Velocity	5.94	6.19	m/s	6.005	Pass
Pendulum Deceleration at 10ms	17.2	21.2	g's	20.52	Pass
Pendulum Deceleration at 20ms	14	19	g's	17.8	Pass
Pendulum Deceleration at 30ms	11	16	g's	14.8	Pass
Max. Pendulum Deceleration After 30ms	0	22	g's	20.9	Pass
Pendulum Deceleration Time to 5 g's	38	46	ms	42.8	Pass
Maximum D Plane Rotation	81	106	deg	98.0	Pass
Time to Maximum Rotation	72	82	ms	77.5	Pass
Rotation Decay to Zero	147	174	ms	158.1	Pass
Minimum Moment About OC	-80	-52.9	Nm	-68.71	Pass
Time to Minimum Moment	65	79	ms	72.5	Pass
Moment Decay to Zero	120	148	ms	139.8	Pass

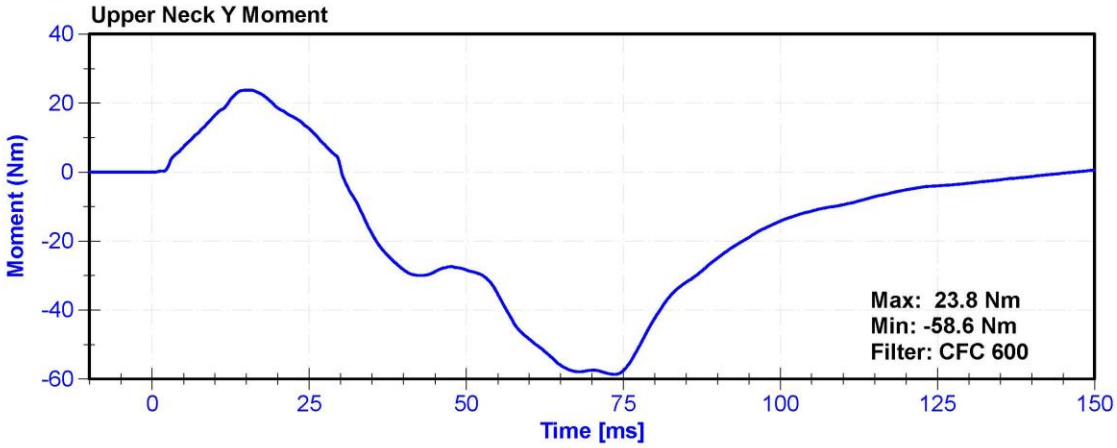
Transducer Calibrations

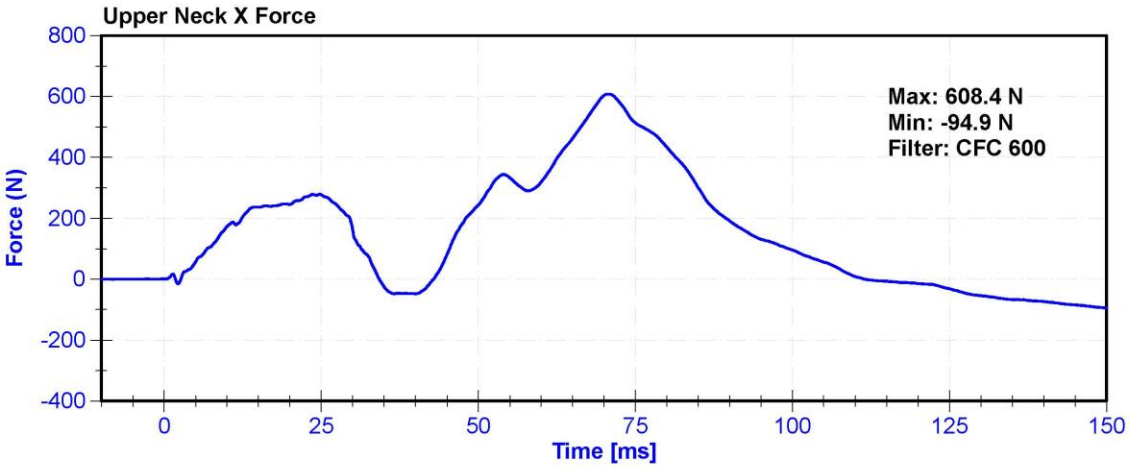
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5M9 Pend	1/30/2020	1/29/2021
Pendulum Potentiometer	ETI SP22G	DS-LABPOT1	9/13/2019	9/12/2020
Condyle Potentiometer	ETI SP22G	DS-LABPOT2	9/13/2019	9/12/2020
Upper Neck Load Cell	Denton IF-205	LC-280FxGFE	10/3/2019	10/2/2020


D-Plane Rotation
Rotation (deg)
125
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 98.0 deg
Min: 0.1 deg
Filter: CFC 60


Moment About Occipital Condyle
Moment (Nm)
50
25
0
-25
-50
-75
-100
0
25
50
75
100
125
150
Time [ms]
Max: 19.6 Nm
Min: -68.7 Nm
Filter: CFC 600


Pendulum Deceleration
Max: 20.9 g's
Min: -2.9 g's
Filter: CFC 60
Acceleration (g's)
Time [ms]


Upper Neck Y Moment
Max: 23.8 Nm
Min: -58.6 Nm
Filter: CFC 600
Moment (Nm)
Time [ms]


Upper Neck X Force
Max: 608.4 N
Min: -94.9 N
Filter: CFC 600
Force (N)
Time [ms]

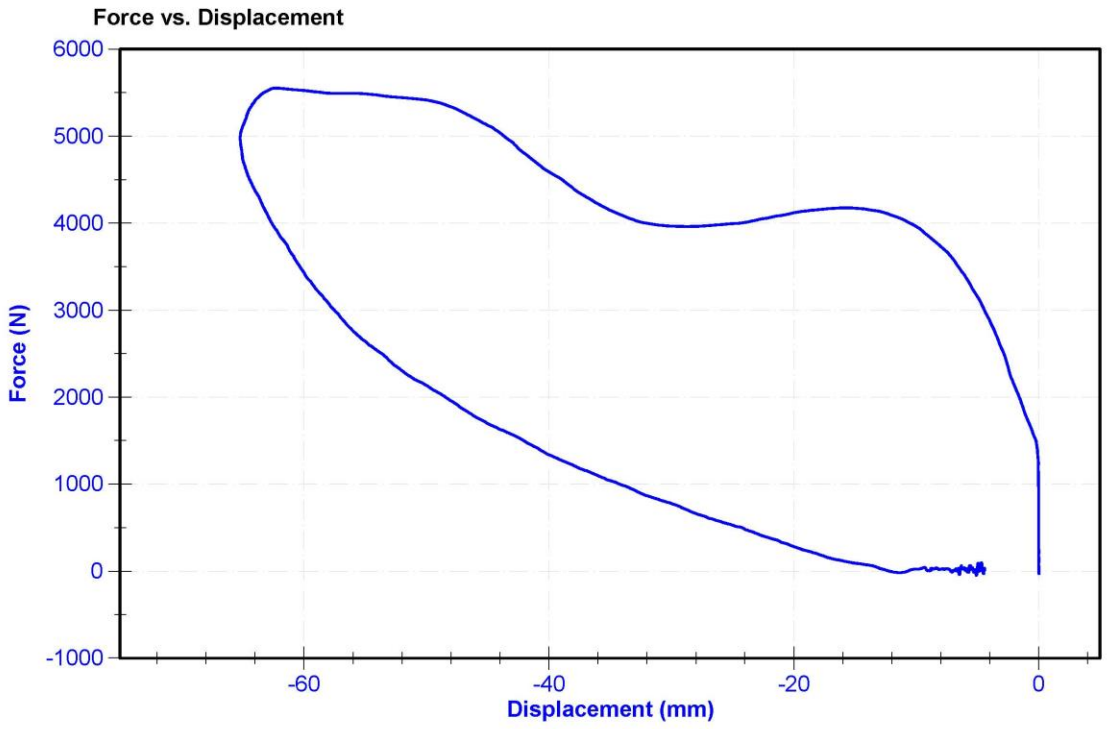
ATD Manufacturer	Humanetics	Test Technician	D.Reinhard
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

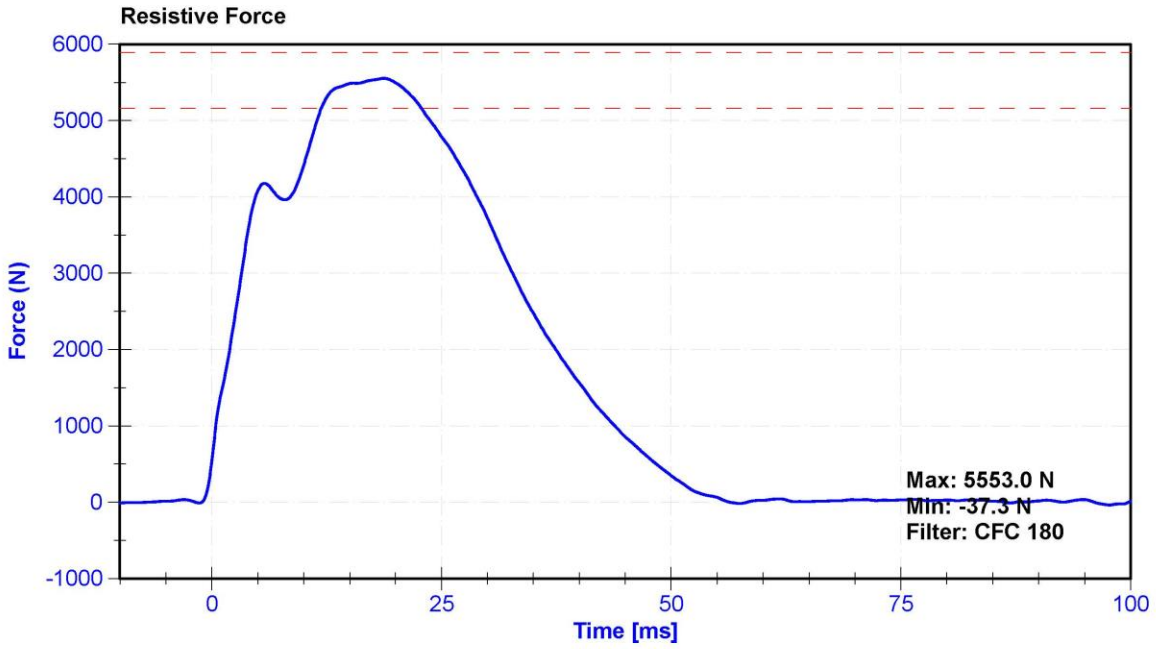
Results

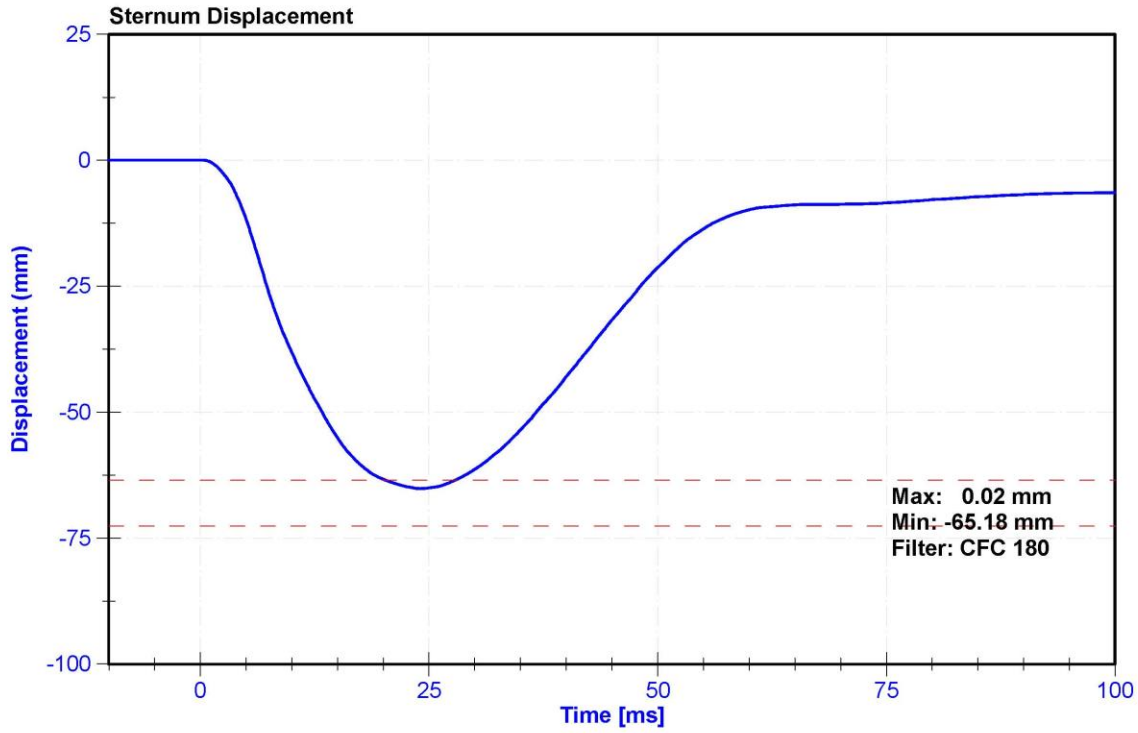
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.7	Pass
Humidity	10	70	%	56	Pass
Velocity	6.59	6.83	m/s	6.597	Pass
Chest Displacement	-72.6	-63.5	mm	-65.18	Pass
Resistive Force	5160	5894	N	5553.0	Pass
Hysteresis	65	85	%	71.5	Pass

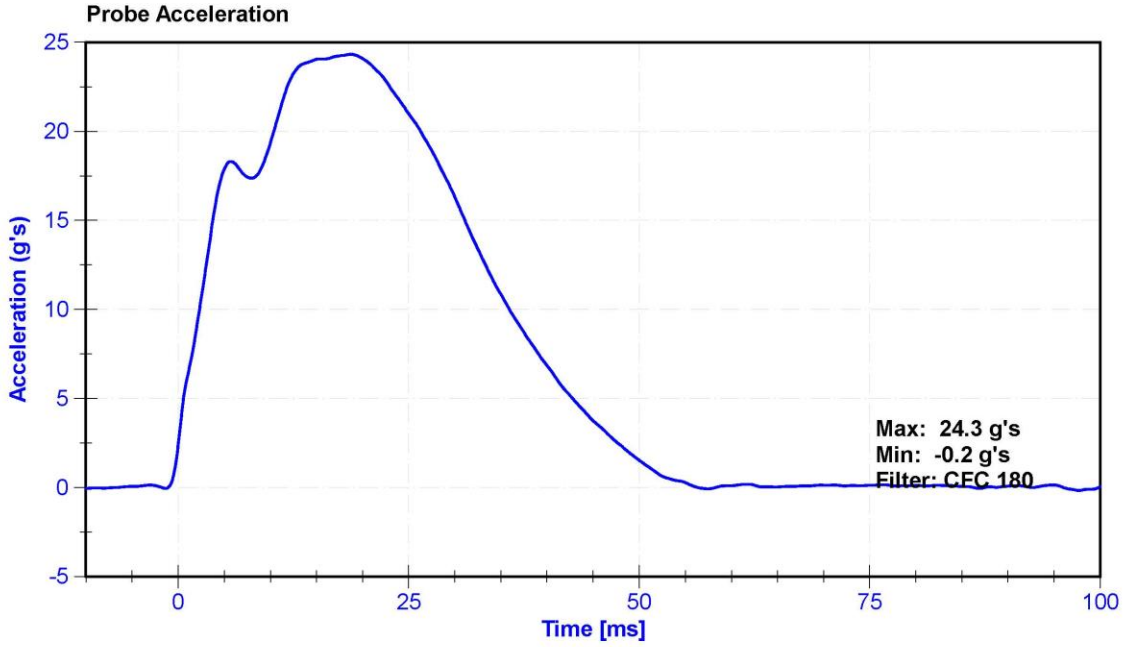
Transducer Calibrations

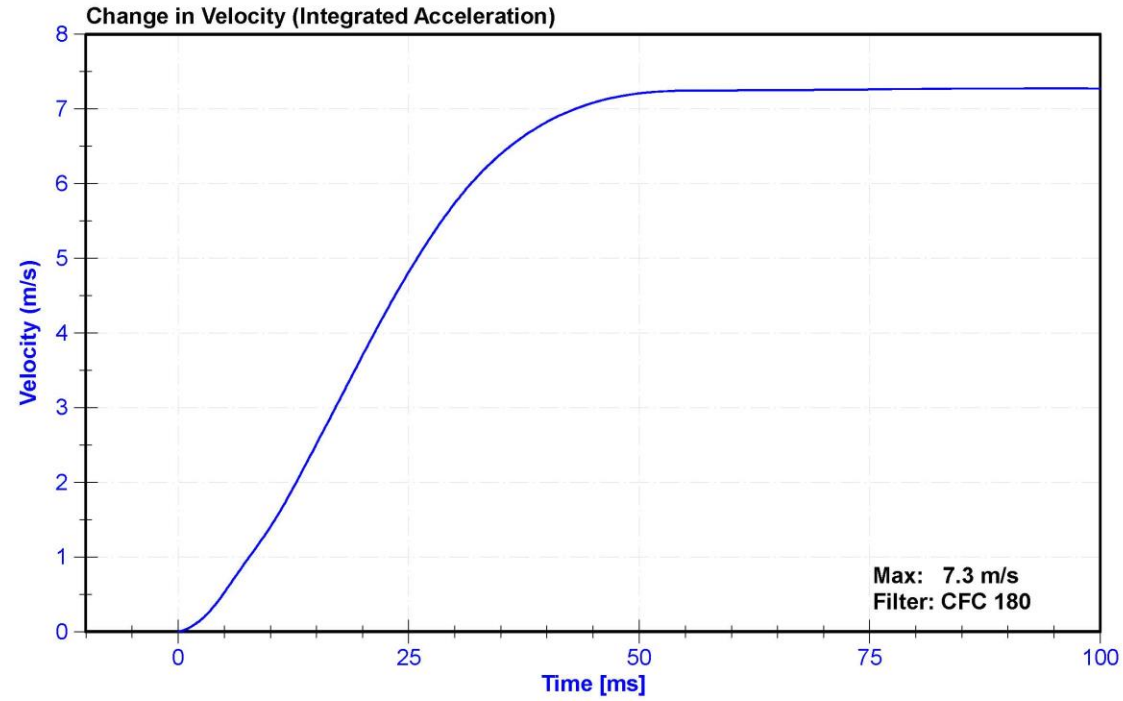
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A286228	1/29/2020	1/28/2021
Chest Potentiometer	Servo 6209-2038	DS-142	6/23/2020	12/22/2020




Resistive Force
Force (N)
6000
5000
4000
3000
2000
1000
0
-1000
0
25
50
75
100
Time [ms]
Max: 5553.0 N
Min: -37.3 N
Filter: CFC 180


Sternum Displacement
Displacement (mm)
25
0
-25
-50
-75
-100
0
25
50
75
100
Time [ms]
Max: 0.02 mm
Min: -65.18 mm
Filter: CFC 180


Probe Acceleration
Acceleration (g's)
25
20
15
10
5
0
-5
0
25
50
75
100
Time [ms]
Max: 24.3 g's
Min: -0.2 g's
Filter: CFC 180


Change in Velocity (Integrated Acceleration)
Velocity (m/s)
8
7
6
5
4
3
2
1
0
0
25
50
75
100
Time [ms]
Max: 7.3 m/s
Filter: CFC 180

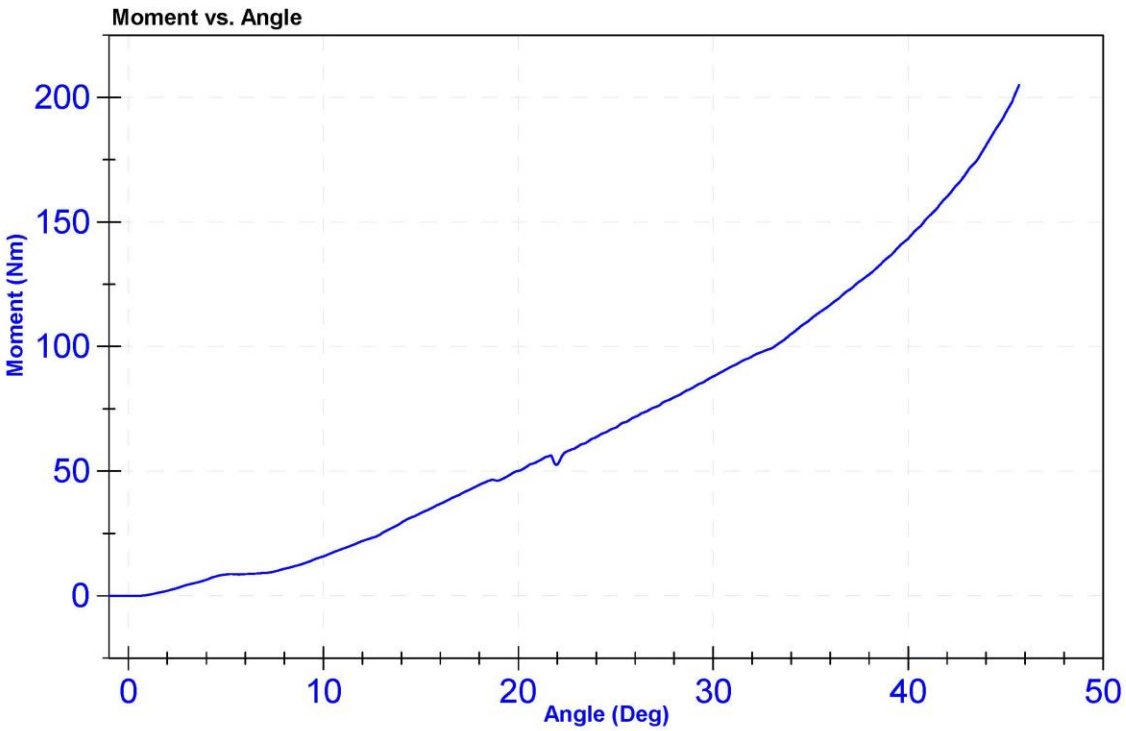
ATD Manufacturer	Humanetics	Test Technician	D.Reinhard
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21.5	Pass
Humidity	10	70	%	65.9	Pass
Average Velocity	5	10	deg/s	7.2	Pass
Angle at 203Nm	40	50	deg	45.6	Pass
Moment at 30 degrees	0	94.9	Nm	88.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	ETI SP22	DS-0008	9/18/2019	9/17/2020
Load Cell	Key Trans 2301-02	LC-115 My	9/12/2019	9/11/2020



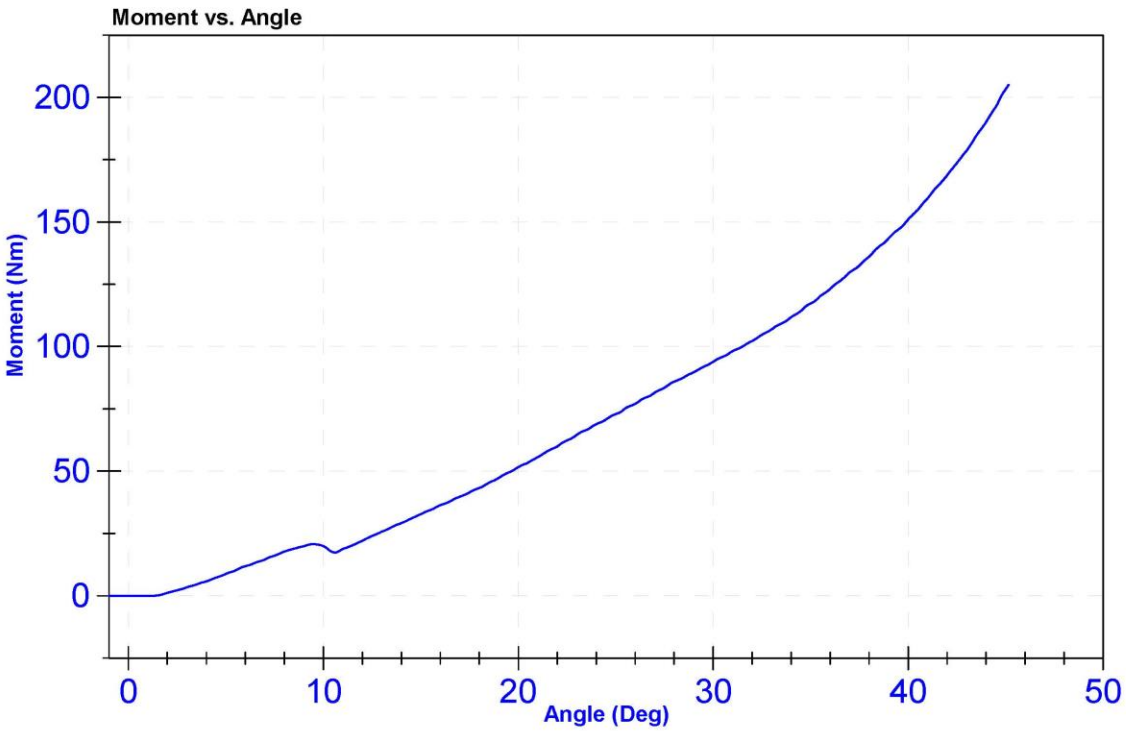
ATD Manufacturer	Humanetics	Test Technician	D.Reinhard
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	20.7	Pass
Humidity	10	70	%	57.0	Pass
Average Velocity	5	10	deg/s	7.3	Pass
Angle at 203Nm	40	50	deg	45.0	Pass
Moment at 30 degrees	0	94.9	Nm	94.0	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	ETI SP22	DS-0008	9/18/2019	9/17/2020
Load Cell	Key Trans 2301-02	LC-115 My	9/12/2019	9/11/2020



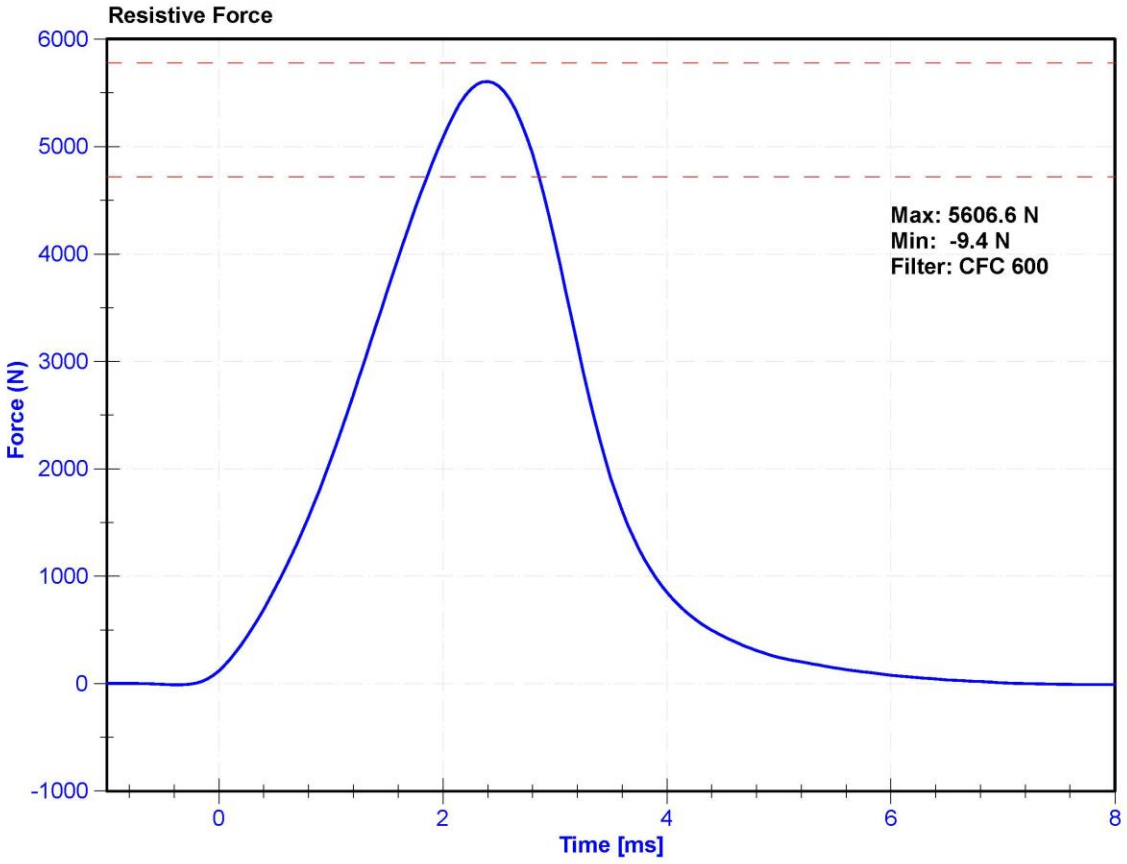
ATD Manufacturer	Humanetics	Test Technician	D.Reinhard
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

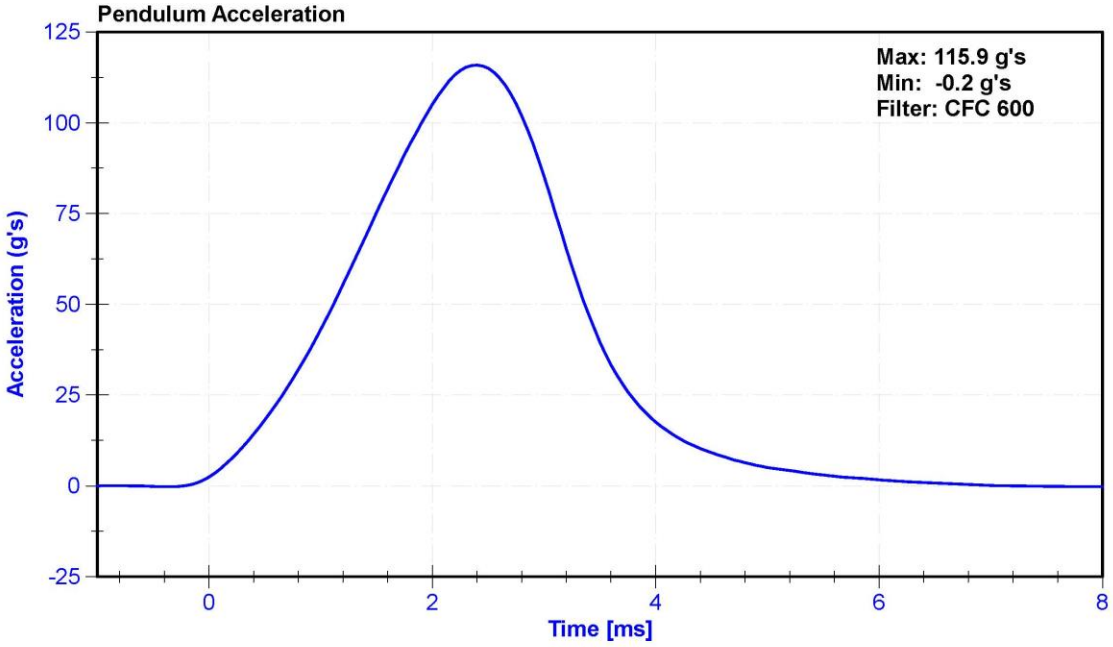
Results

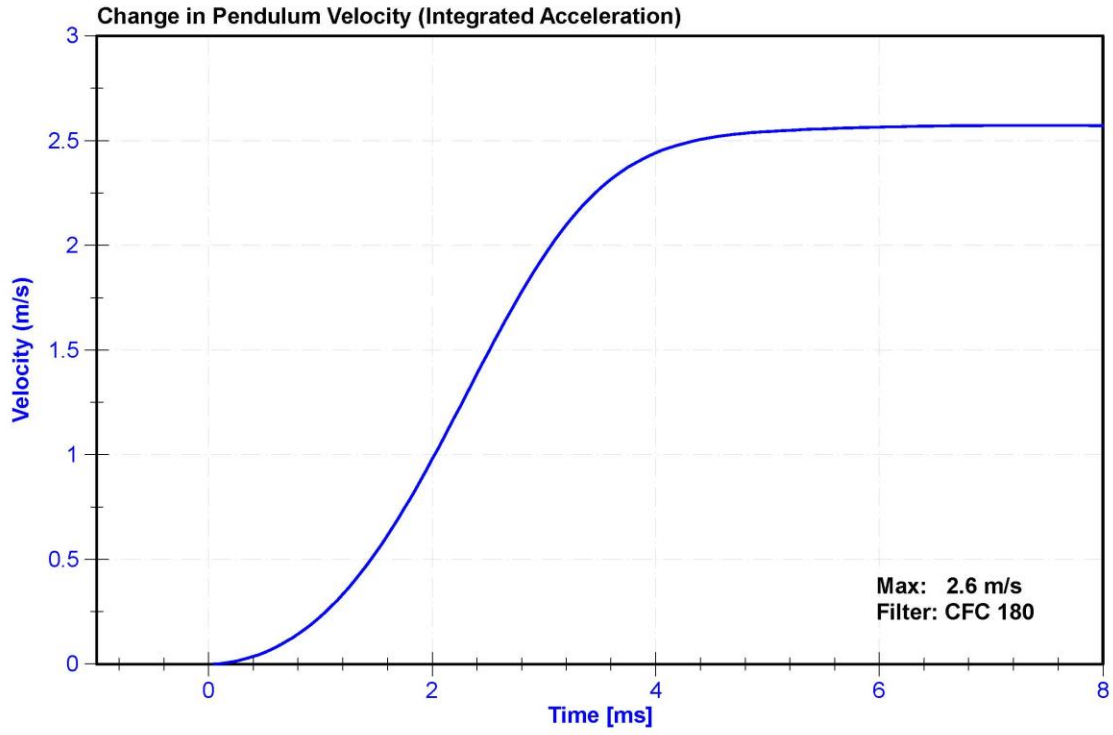
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	20.7	Pass
Humidity	10	70	%	57	Pass
Velocity	2.07	2.13	m/s	2.104	Pass
Maximum Resistive Force	4720	5780	N	5606.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A279031	5/8/2020	5/8/2021




Pendulum Acceleration
Max: 115.9 g's
Min: -0.2 g's
Filter: CFC 600
Acceleration (g's)
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]


Change in Pendulum Velocity (Integrated Acceleration)
Velocity (m/s)
3
2.5
2
1.5
1
0.5
0
Max: 2.6 m/s
Filter: CFC 180
0
2
4
6
8
Time [ms]

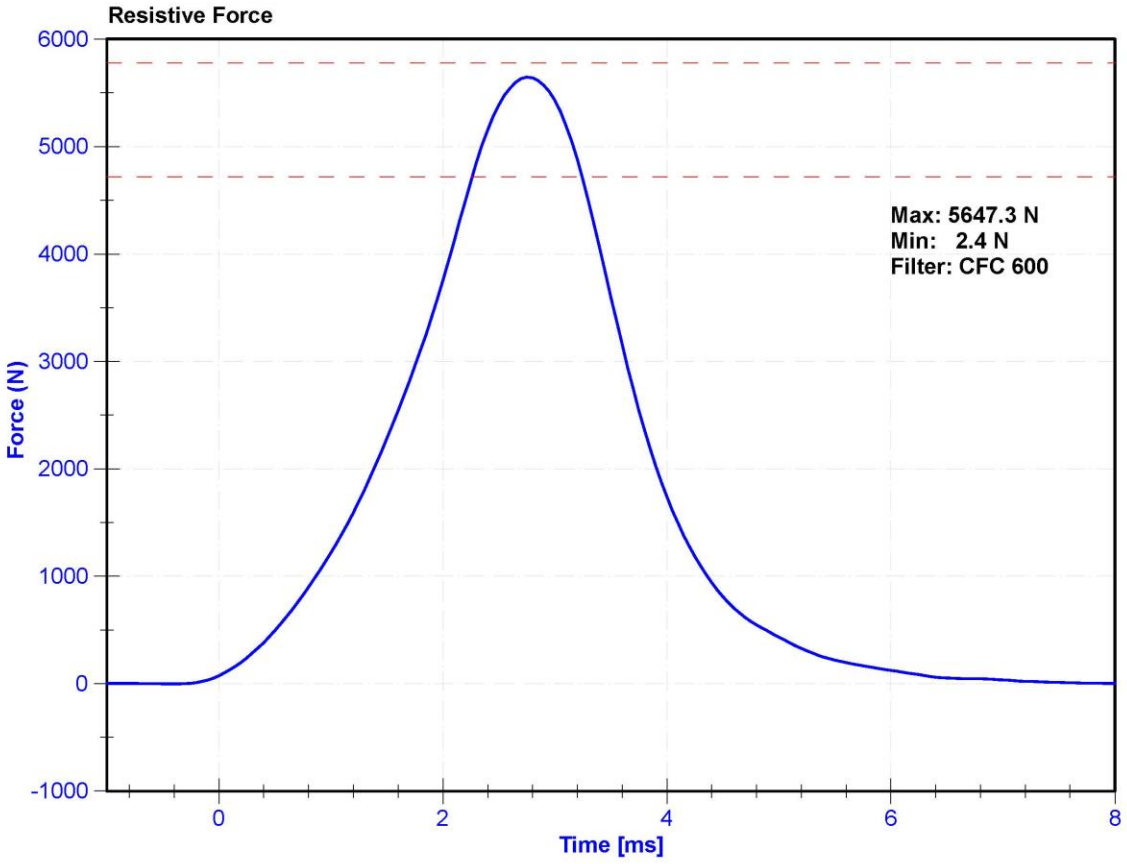
ATD Manufacturer	Humanetics	Test Technician	D.Reinhard
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

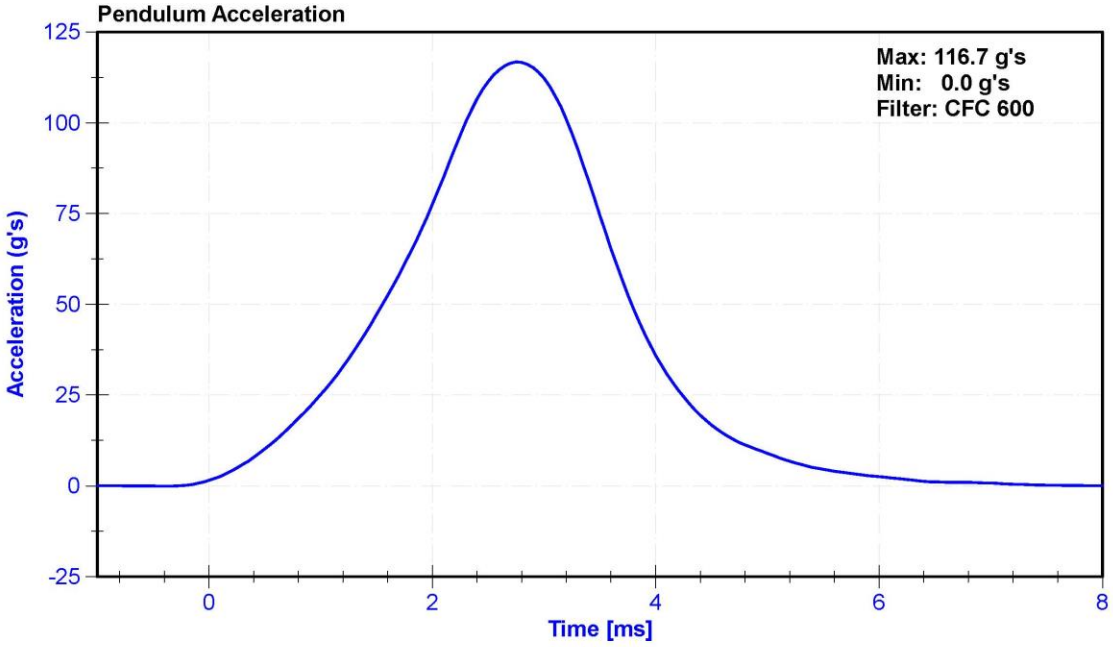
Results

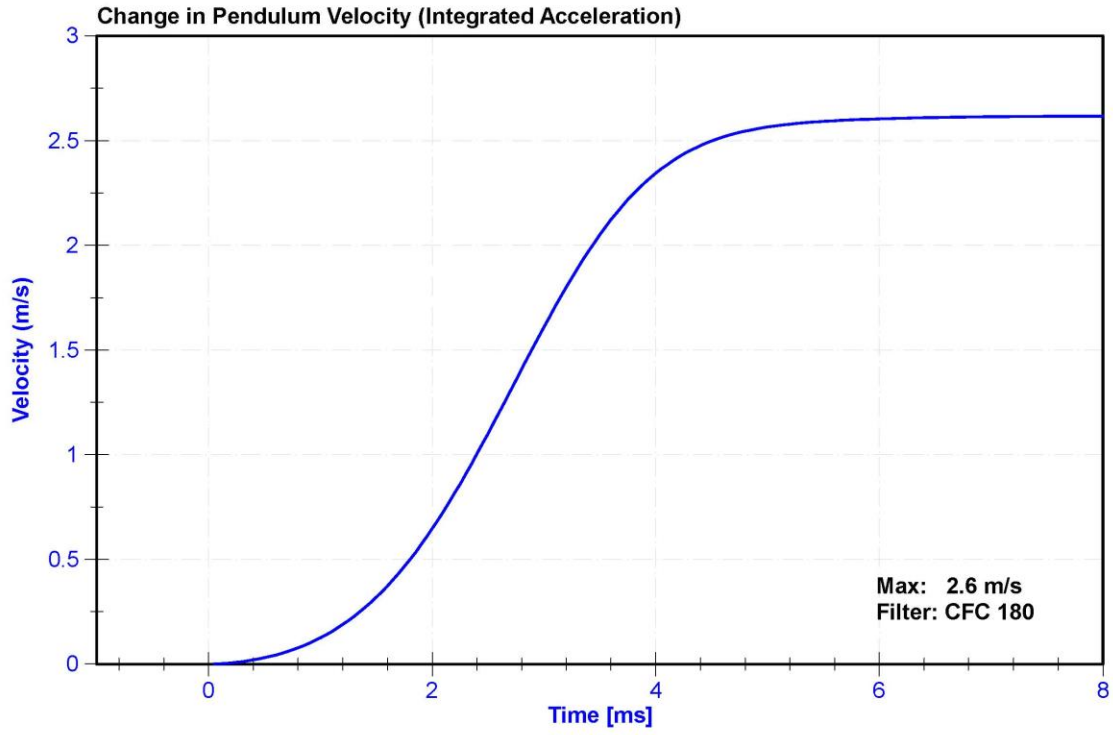
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	20.6	Pass
Humidity	10	70	%	53	Pass
Velocity	2.07	2.13	m/s	2.105	Pass
Maximum Resistive Force	4720	5780	N	5647.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A279031	5/8/2020	5/8/2021




Pendulum Acceleration
Max: 116.7 g's
Min: 0.0 g's
Filter: CFC 600
Acceleration (g's)
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]


Change in Pendulum Velocity (Integrated Acceleration)
Max: 2.6 m/s
Filter: CFC 180
Velocity (m/s)
3
2.5
2
1.5
1
0.5
0
0
2
4
6
8
Time [ms]

CALIBRATION TEST RESULTS

PRE-TEST

HYBRID III 5TH PERCENTILE - PASSENGER ATD

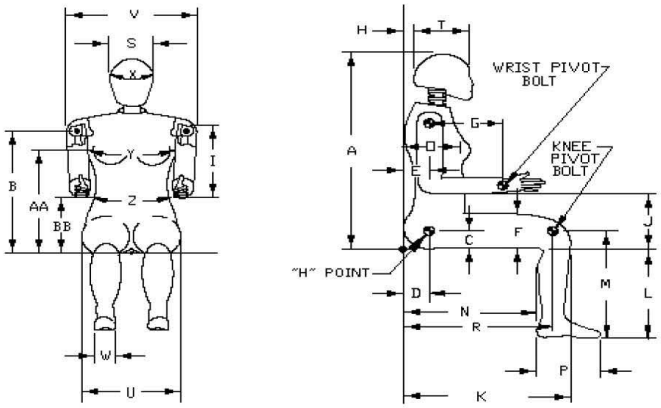
SERIAL NO: 288

Calspan

External Measurements - Hybrid 3 - 5th Female

Technician: K. Dutton Date: 08/03/2020

Dummy Serial Number: 288



Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	775	800	787	Pass
B	Shoulder Pivot Height	432	457	451	Pass
C	H-Point Height	81	86	85	Pass
D	H-Point from Backline	145	150	147	Pass
E	Shoulder Pivot from Backline	69	84	77	Pass
F	Thigh Clearance	119	135	126	Pass
G	Back of Elbow to Wrist Pivot	244	259	255	Pass
H	Head Back to Backline	43	48	45	Pass
I	Shoulder to Elbow Length	277	297	284	Pass
J	Elbow Rest Height	183	203	191	Pass
K	Buttock to Knee Length	521	546	538	Pass
L	Popliteal Height	356	376	365	Pass
M	Knee Pivot Height	394	419	410	Pass
N	Buttock Popliteal Length	414	439	429	Pass
O	Chest Depth without Jacket	175	191	182	Pass
P	Foot Length (right)	219	234	222	Pass
R	Buttock To Knee Pivot Length	457	483	465	Pass
S	Head Breadth	137	147	141	Pass
T	Head Depth	178	188	183	Pass
U	Hip Breadth	300	315	310	Pass
V	Shoulder Breadth	351	366	361	Pass
W	Foot Breadth	79	94	85	Pass
X	Head Circumference	528	549	537	Pass
Y	Chest Circumference with Jacket	851	881	865	Pass
Z	Waist Circumference	460	790	777	Pass
AA	Reference Location (Chest Circumference)	333	358	345	Pass
BB	Reference Location (Waist Circumference)	160	170	164	Pass

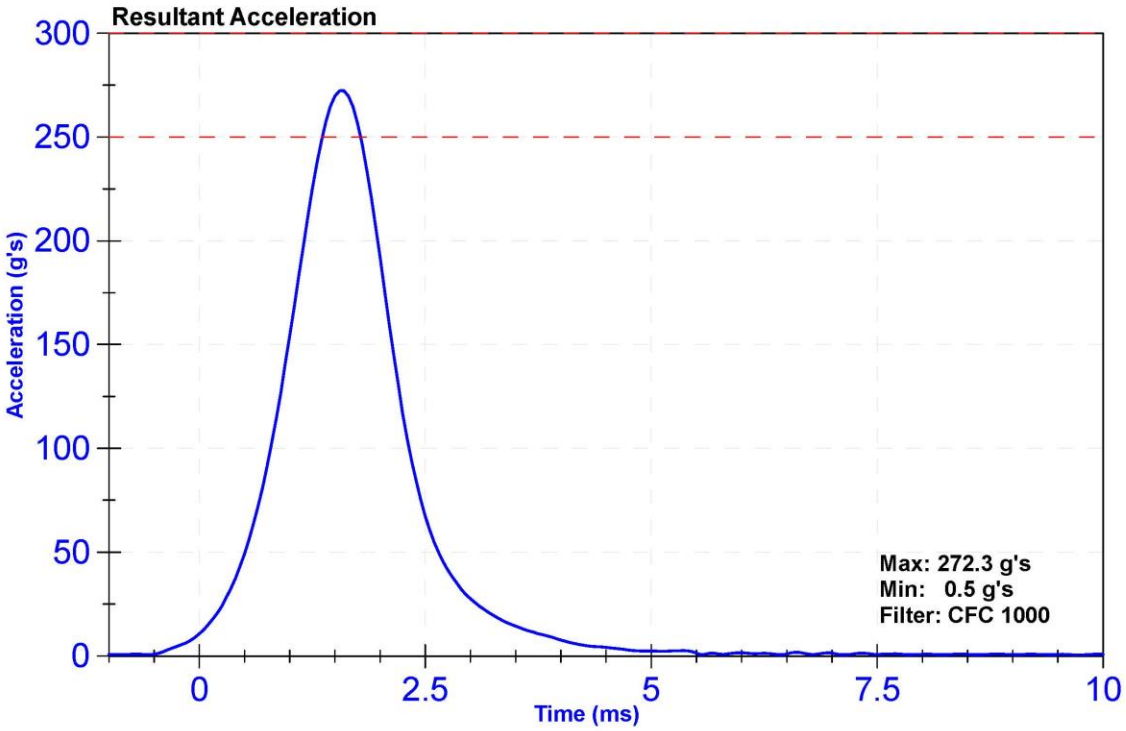
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	288	Laboratory Supervisor	K. Brogan

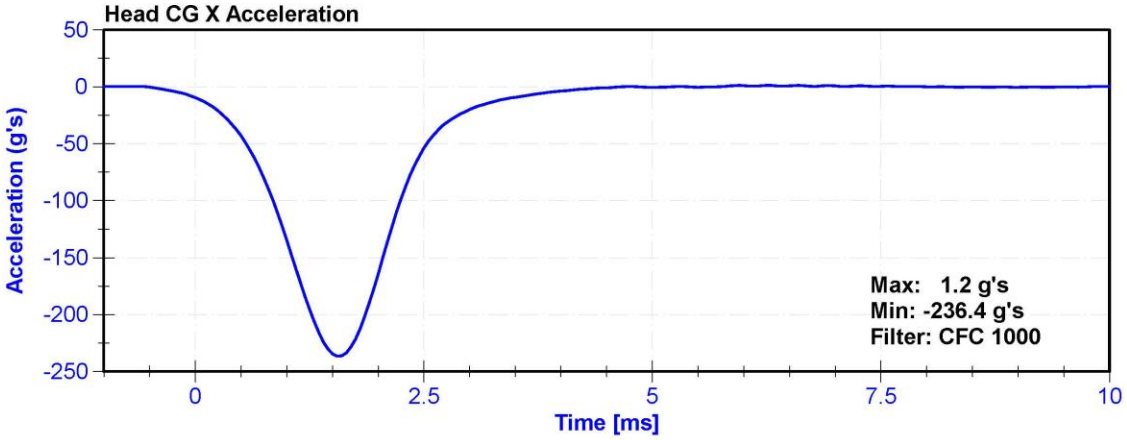
Results

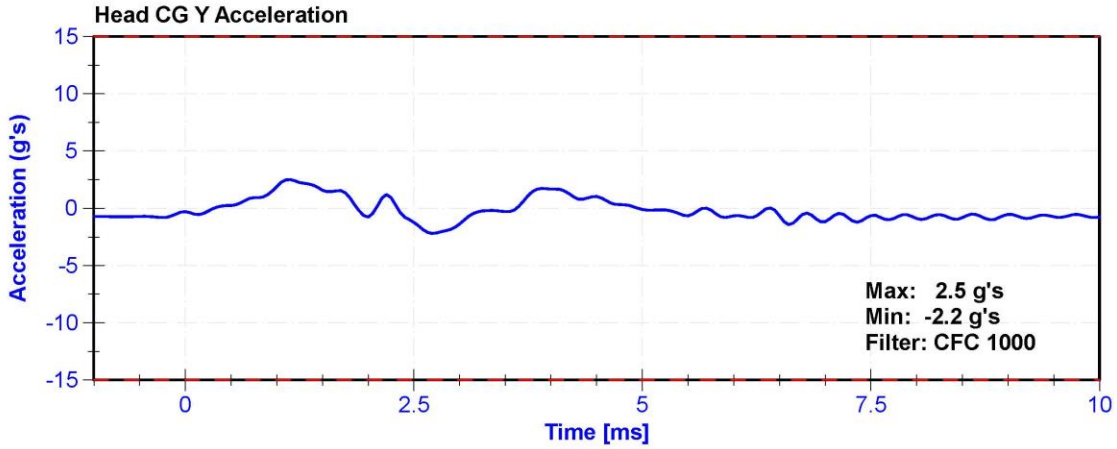
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	20.6	Pass
Humidity	10	70	%	53.1	Pass
Resultant Acceleration	250	300	g's	272.3	Pass
Oscillation	0	10	%	0.9	Pass
Lateral Acceleration	-15	15	g's	2.5	Pass

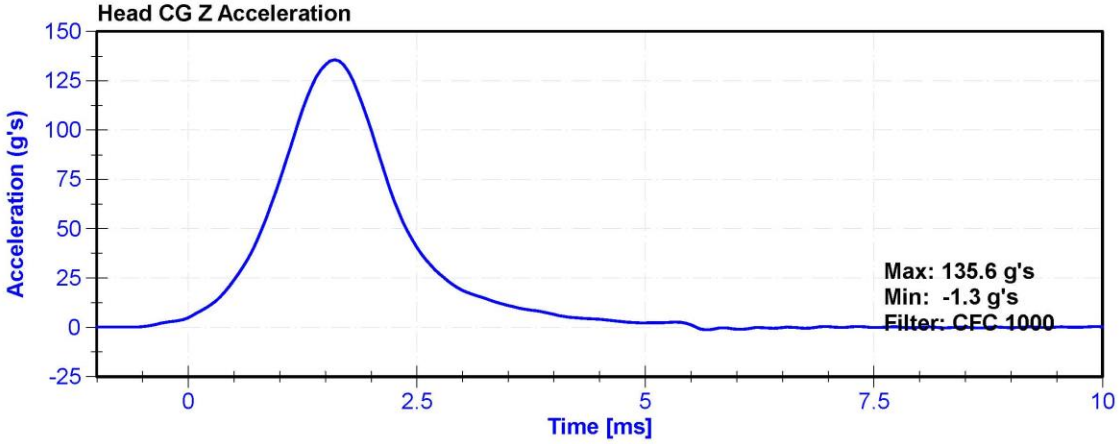
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264C-2K-TZ2	AC-P51945	4/14/2020	10/13/2020
Y Accelerometer	ENDEVCO 7264C-2K-TZ2	AC-P51974	4/14/2020	10/13/2020
Z Accelerometer	ENDEVCO 7264C-2K-TZ2	AC-P51946	4/14/2020	10/13/2020




Head CG X Acceleration
Acceleration (g's)
50
0
-50
-100
-150
-200
-250
0
2.5
5
7.5
10
Time [ms]
Max: 1.2 g's
Min: -236.4 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]
Max: 2.5 g's
Min: -2.2 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
150
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]
Max: 135.6 g's
Min: -1.3 g's
Filter: CFC 1000

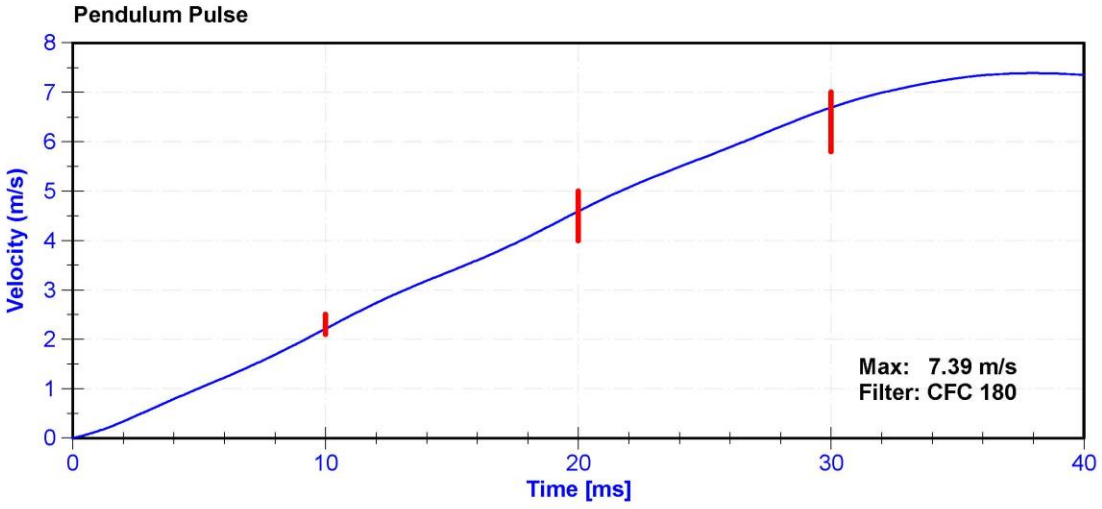
ATD Manufacturer	FTSS	Test Technician	E. Helenbrook
ATD Serial Number	288	Laboratory Supervisor	K. Brogan

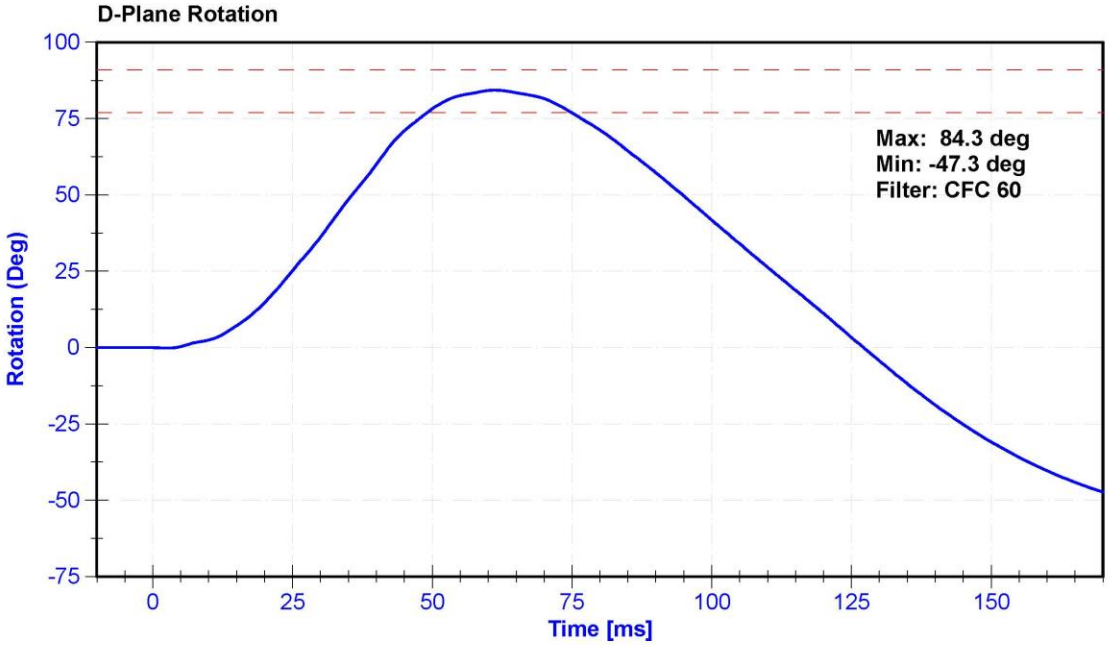
Results

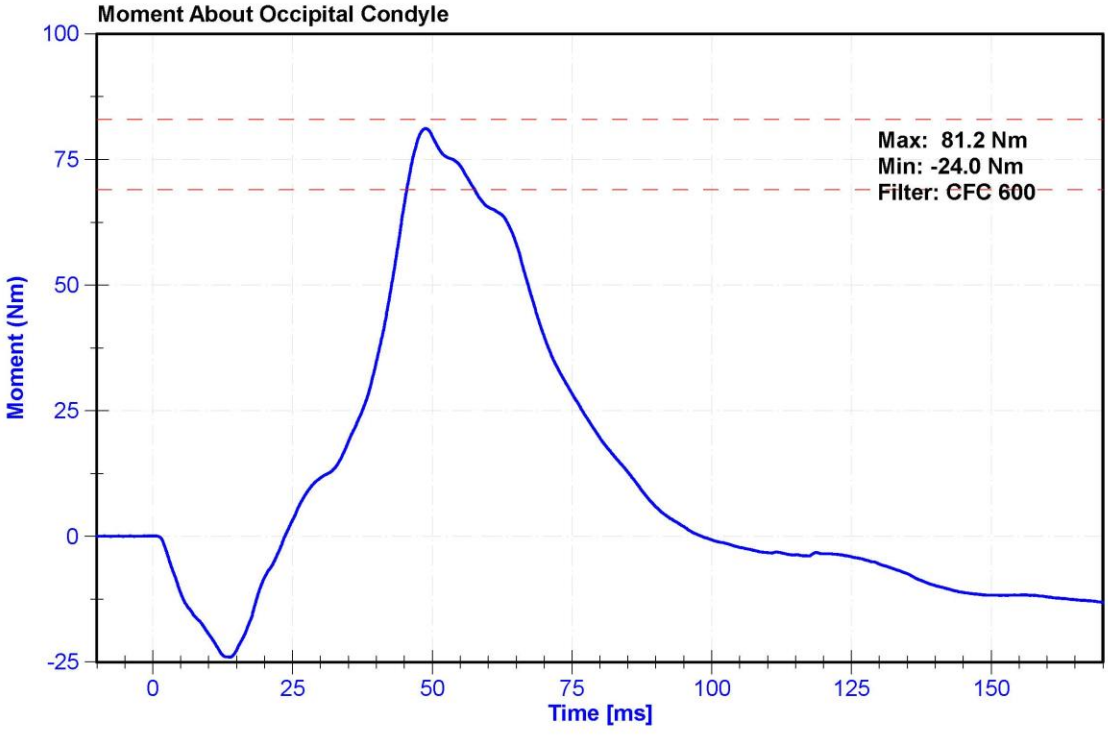
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	55.4	Pass
Velocity	6.89	7.13	m/s	6.958	Pass
Pendulum Impulse at 10ms	2.1	2.5	m/s	2.21	Pass
Pendulum Impulse at 20ms	4.0	5.0	m/s	4.59	Pass
Pendulum Impulse at 30ms	5.8	7.0	m/s	6.69	Pass
Max D Plane Rotation	77	91	deg	84.3	Pass
Max Moment During Rotation Interval	69	83	Nm	81.2	Pass
Moment Decay to 10.0 Nm	80	100	ms	87.0	Pass

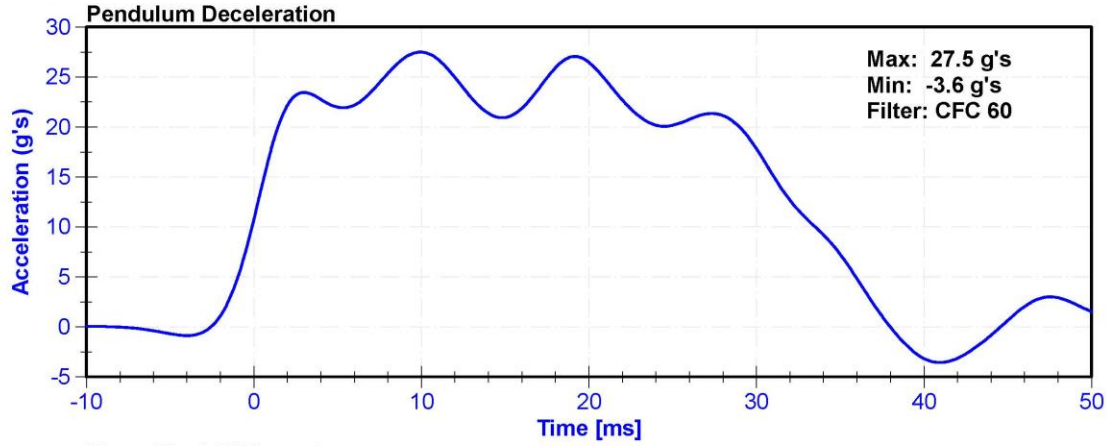
Transducer Calibrations

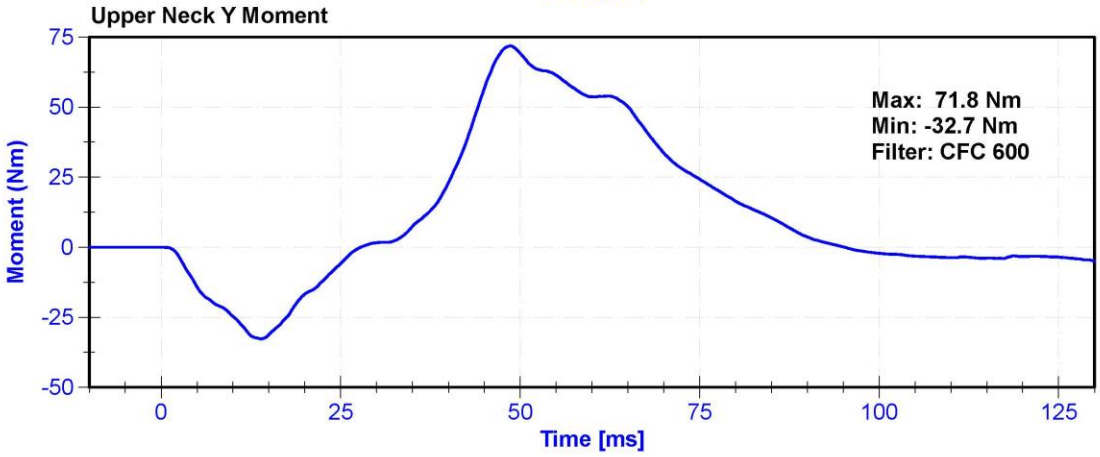
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C16503 Striker	2/6/2020	2/5/2021
Pendulum Potentiometer	ETI SP22G	DS-LABPOT1	9/13/2019	9/12/2020
Condyle Potentiometer	ETI SP22G	DS-LABPOT2	9/13/2019	9/12/2020
Upper Neck Load Cell	FTSS 1716	LC-851 Fx	7/9/2020	7/9/2021

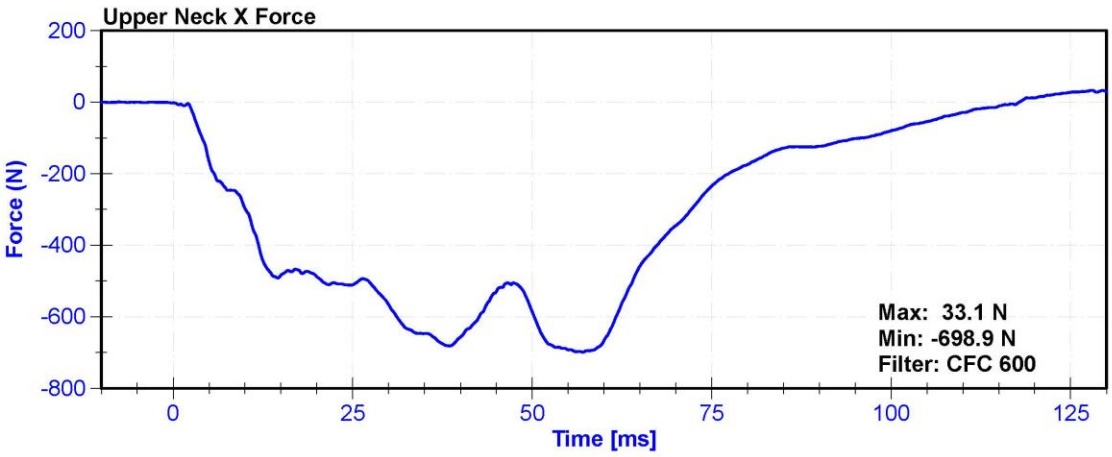



D-Plane Rotation
Rotation (Deg)
100
75
50
25
0
-25
-50
-75
0
25
50
75
100
125
150
Time [ms]
Max: 84.3 deg
Min: -47.3 deg
Filter: CFC 60


Moment About Occipital Condyle
Moment (Nm)
100
75
50
25
0
-25
0
25
50
75
100
125
150
Time [ms]
Max: 81.2 Nm
Min: -24.0 Nm
Filter: CFC 600


Pendulum Deceleration
Max: 27.5 g's
Min: -3.6 g's
Filter: CFC 60
Acceleration (g's)
Time [ms]


Upper Neck Y Moment
Max: 71.8 Nm
Min: -32.7 Nm
Filter: CFC 600
Moment (Nm)
Time [ms]


Upper Neck X Force
Max: 33.1 N
Min: -698.9 N
Filter: CFC 600
Force (N)
Time [ms]

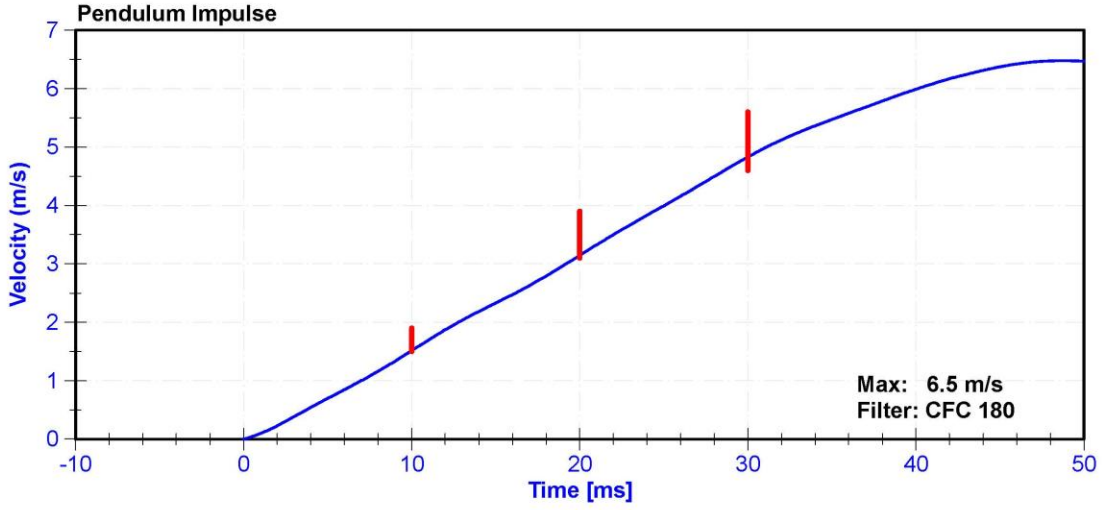
ATD Manufacturer	FTSS	Test Technician	E. Helenbrook
ATD Serial Number	288	Laboratory Supervisor	K. Brogan

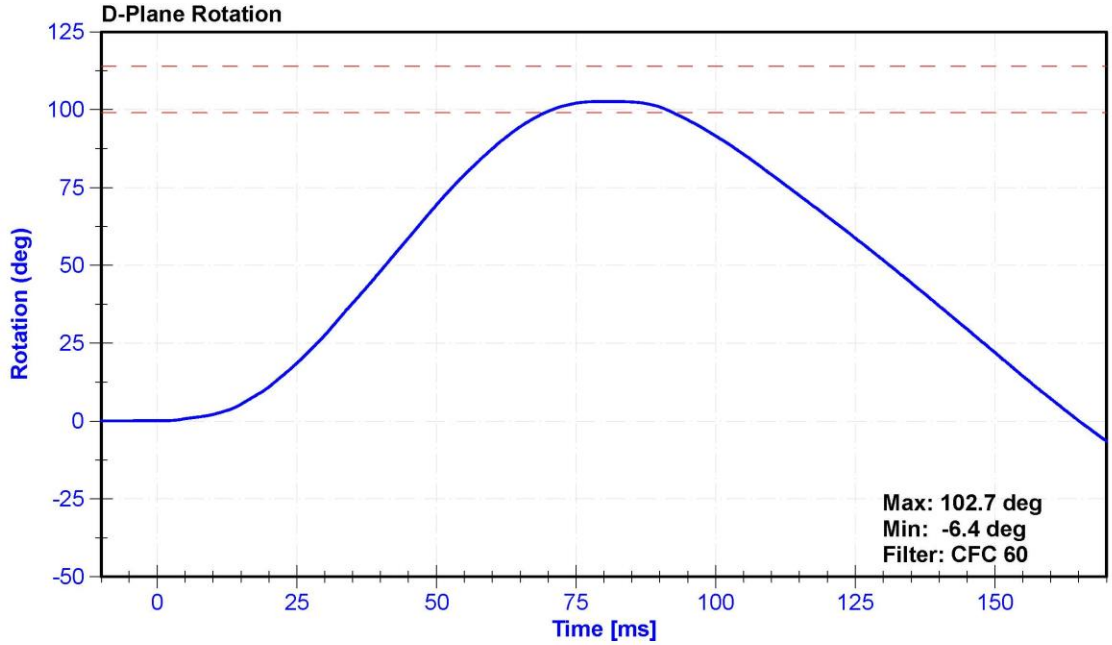
Results

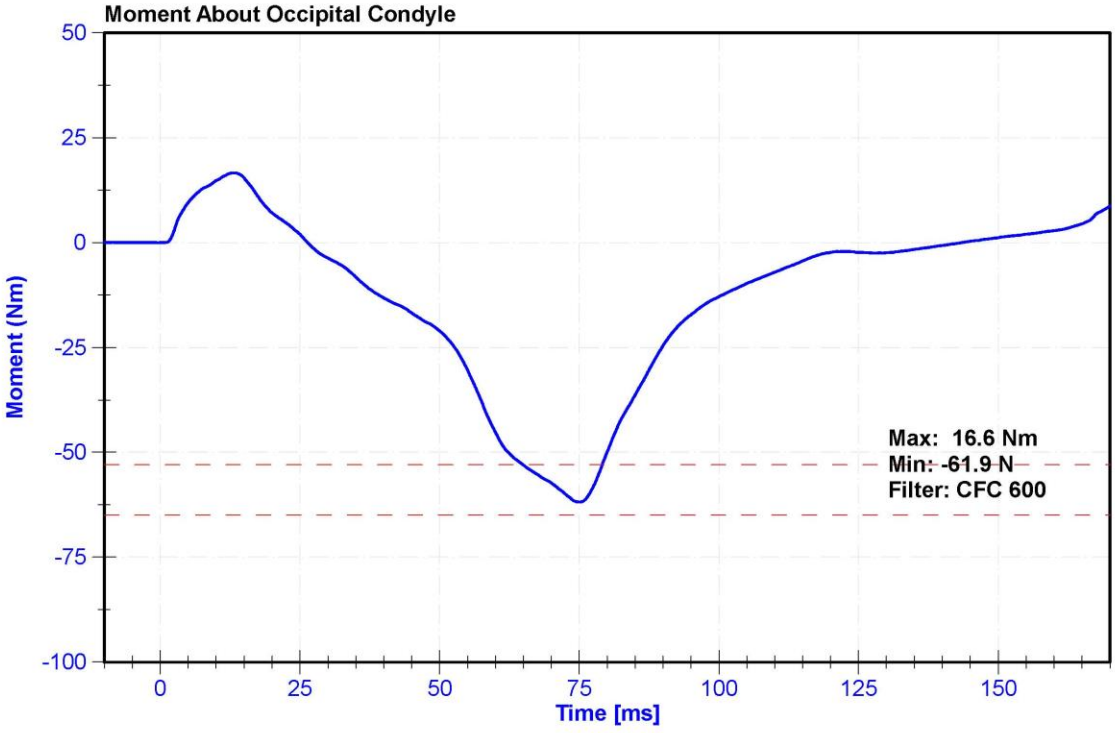
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.3	Pass
Humidity	10	70	%	55.4	Pass
Velocity	5.95	6.19	m/s	6.046	Pass
Pendulum Impulse at 10ms	1.5	1.9	m/s	1.51	Pass
Pendulum Impulse at 20ms	3.1	3.9	m/s	3.15	Pass
Pendulum Impulse at 30ms	4.6	5.6	m/s	4.83	Pass
D Plane Rotation	99	114	deg	102.7	Pass
Moment During Rotation Interval	-65	-53	Nm	-61.9	Pass
Moment Decay to -10Nm	94	114	ms	104.7	Pass

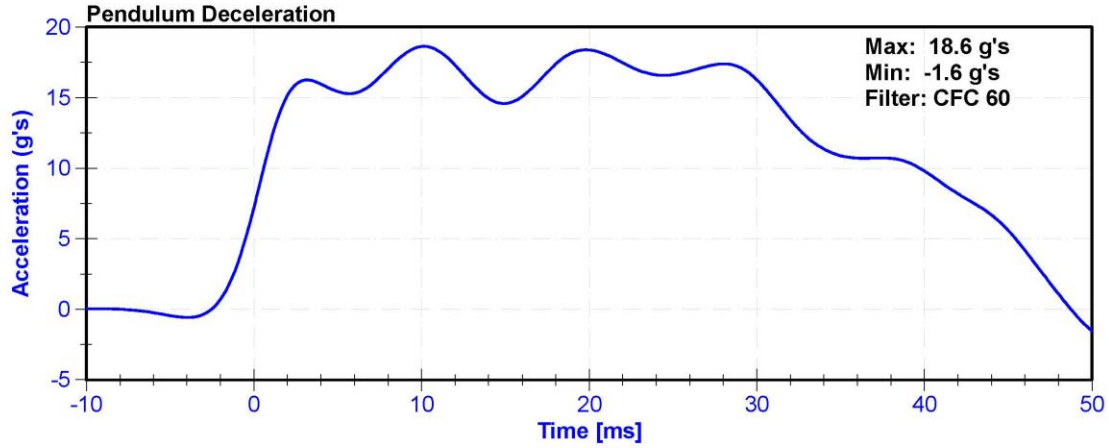
Transducer Calibrations

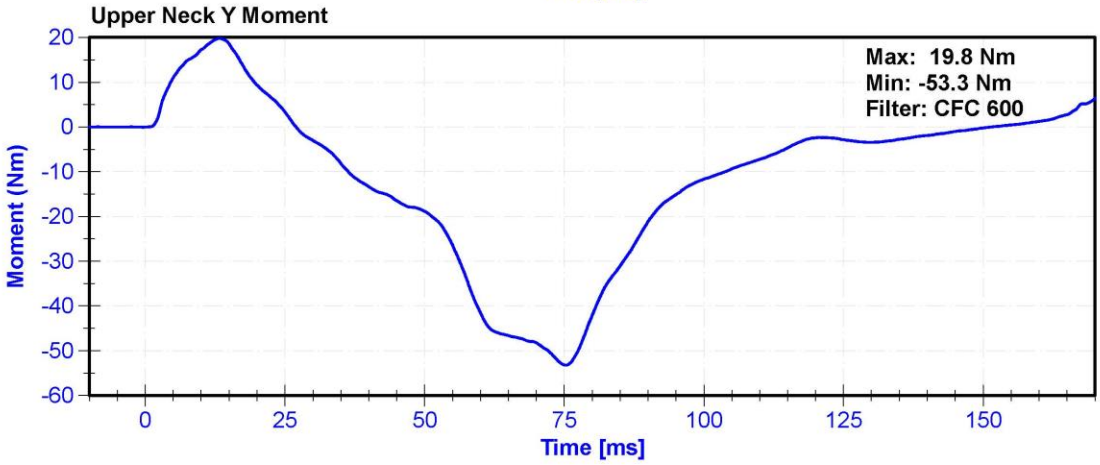
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C16503 Striker	2/6/2020	2/5/2021
Pendulum Potentiometer	ETI SP22G	DS-LABPOT1	9/13/2019	9/12/2020
Condyle Potentiometer	ETI SP22G	DS-LABPOT2	9/13/2019	9/12/2020
Upper Neck Load Cell	FTSS 1716	LC-851 Fx	7/9/2020	7/9/2021

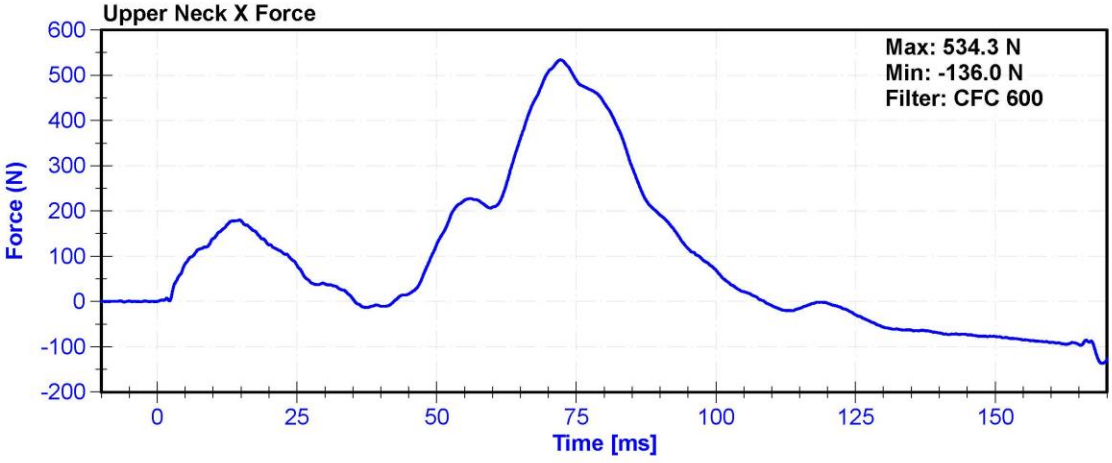



D-Plane Rotation
Rotation (deg)
125
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 102.7 deg
Min: -6.4 deg
Filter: CFC 60


Moment About Occipital Condyle
Moment (Nm)
50
25
0
-25
-50
-75
-100
0
25
50
75
100
125
150
Time [ms]
Max: 16.6 Nm
Min: -61.9 N
Filter: CFC 600


Pendulum Deceleration
Max: 18.6 g's
Min: -1.6 g's
Filter: CFC 60
Acceleration (g's)
Time [ms]


Upper Neck Y Moment
Max: 19.8 Nm
Min: -53.3 Nm
Filter: CFC 600
Moment (Nm)
Time [ms]


Upper Neck X Force
Max: 534.3 N
Min: -136.0 N
Filter: CFC 600
Force (N)
Time [ms]

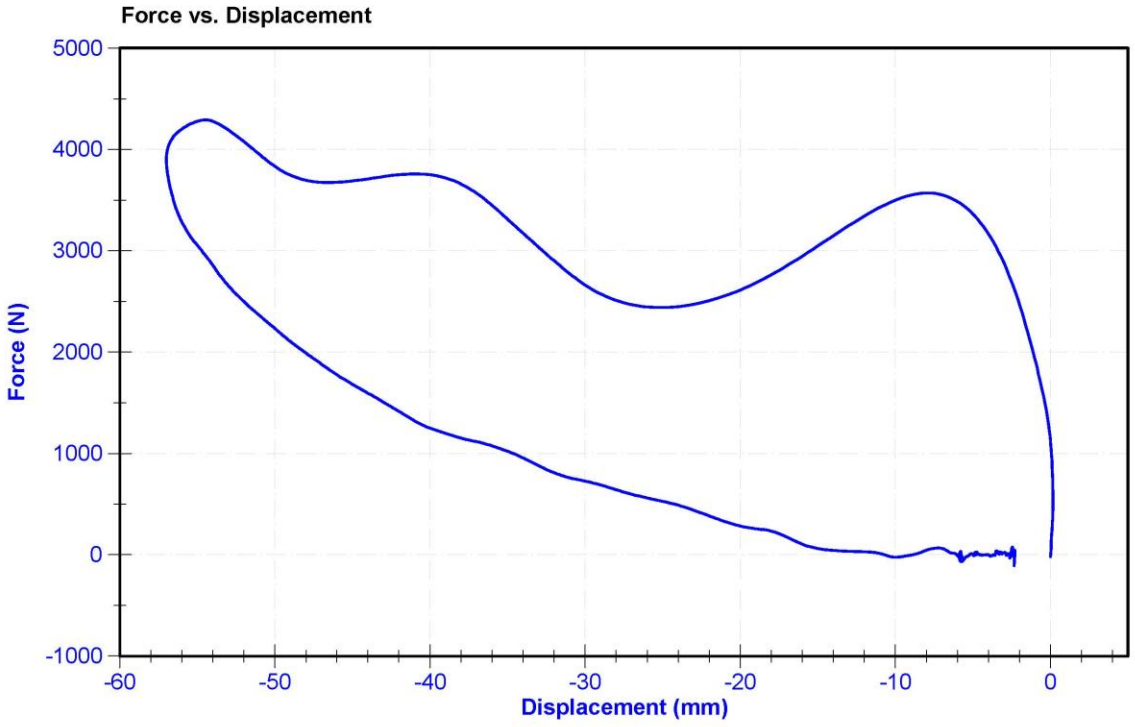
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	288	Laboratory Supervisor	K. Brogan

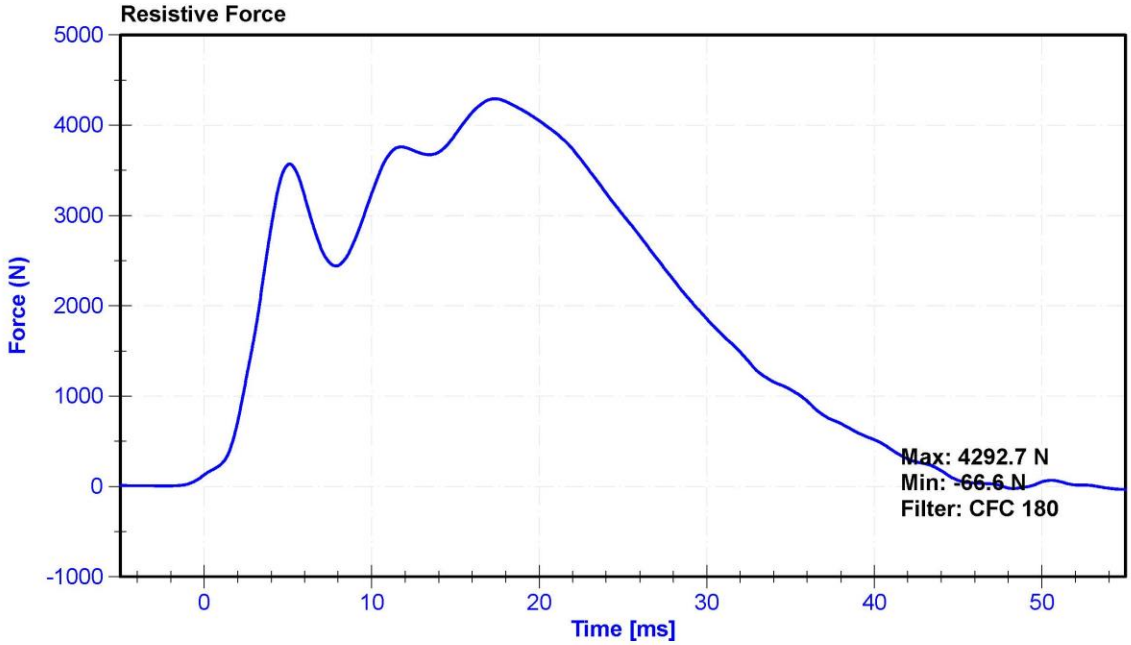
Results

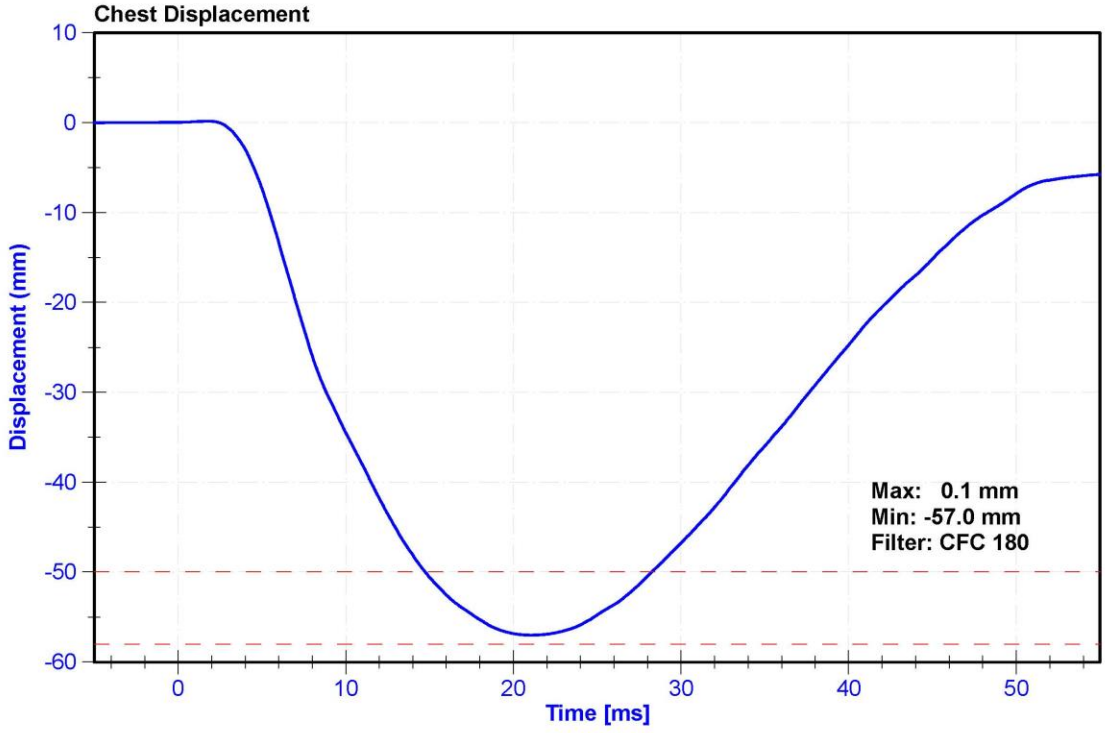
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.7	Pass
Humidity	10	70	%	62	Pass
Velocity	6.59	6.83	m/s	6.670	Pass
Chest Deflection	-58	-50	mm	-57.0	Pass
Maximum Resistive Force (50 to 58mm)	3900	4400	N	4292.7	Pass
Maximum Resistive Force (18 to 50mm)	0	4600	N	3823.1	Pass
Hysteresis	69	85	%	71.4	Pass

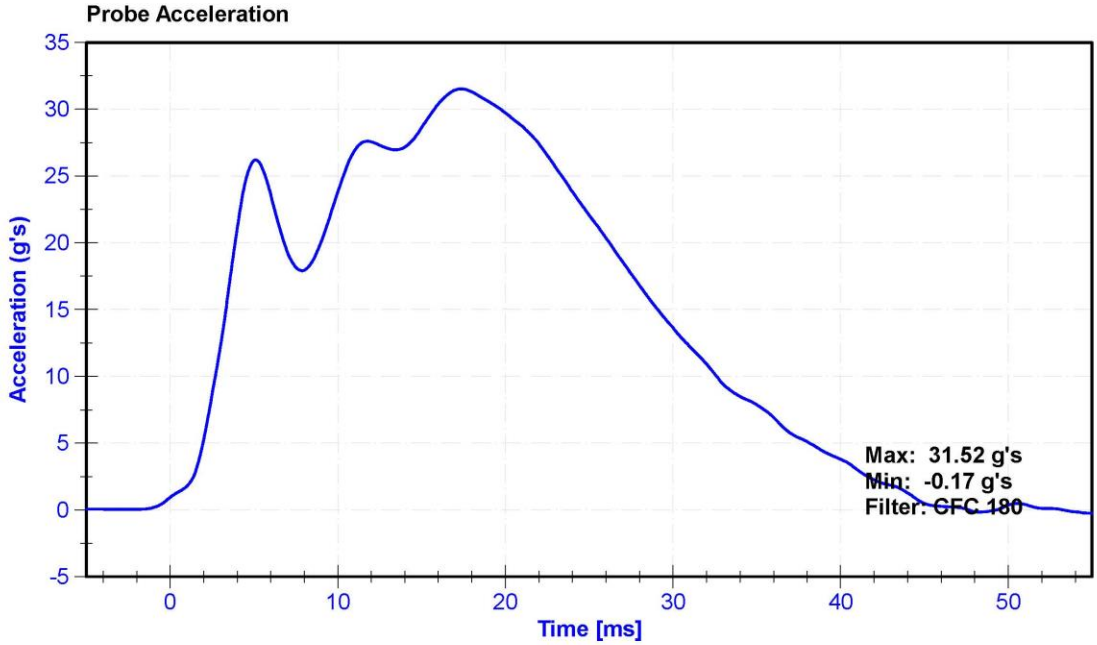
Transducer Calibrations

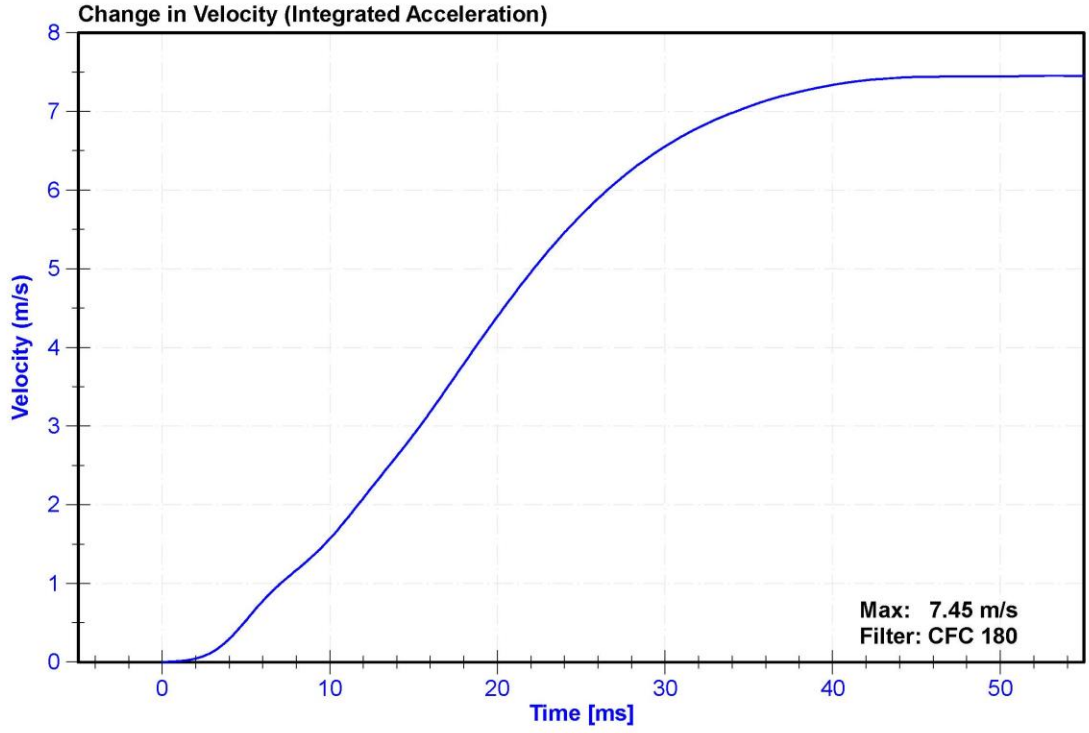
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A286228	1/29/2020	1/28/2021
Chest Potentiometer	SERVO 14CB1-2897	DS-288GFE	4/17/2020	10/16/2020




Resistive Force
Force (N)
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]
Max: 4292.7 N
Min: -66.6 N
Filter: CFC 180


Chest Displacement
Displacement (mm)
10
0
-10
-20
-30
-40
-50
-60
0
10
20
30
40
50
Time [ms]
Max: 0.1 mm
Min: -57.0 mm
Filter: CFC 180


Probe Acceleration
Acceleration (g's)
35
30
25
20
15
10
5
0
-5
0
10
20
30
40
50
Time [ms]
Max: 31.52 g's
Min: -0.17 g's
Filter: CFC 180


Change in Velocity (Integrated Acceleration)
Velocity (m/s)
8
7
6
5
4
3
2
1
0
0
10
20
30
40
50
Time [ms]
Max: 7.45 m/s
Filter: CFC 180

ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	288	Laboratory Supervisor	K. Brogan

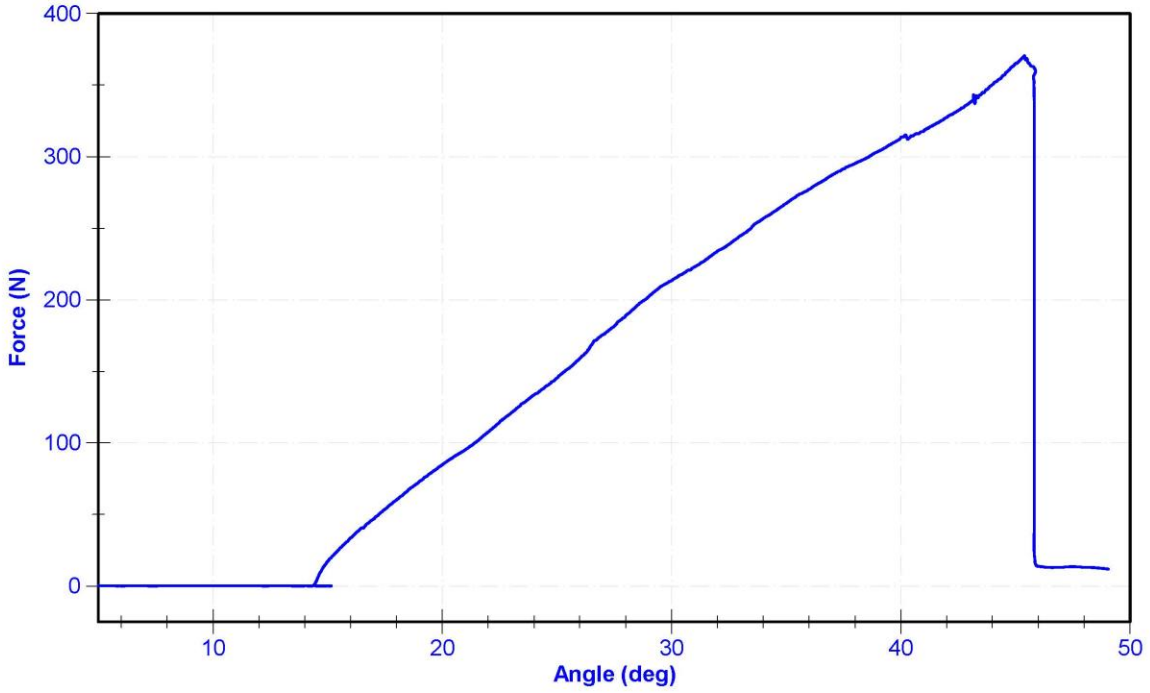
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.6	25.6	ºC	20.7	Pass
Humidity	10	70	%	51	Pass
Initial Angle	0	20	deg	14.1	Pass
Force at 45 Degrees	320	390	N	370.5	Pass
Return Angle Relative to Initial	0	8	deg	2.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	Rieker N4C-1	DS-13051548	12/9/2019	12/8/2020
Load Cell	Interface SML-200	LC-493319	1/10/2020	1/9/2021

Force vs. Displacement



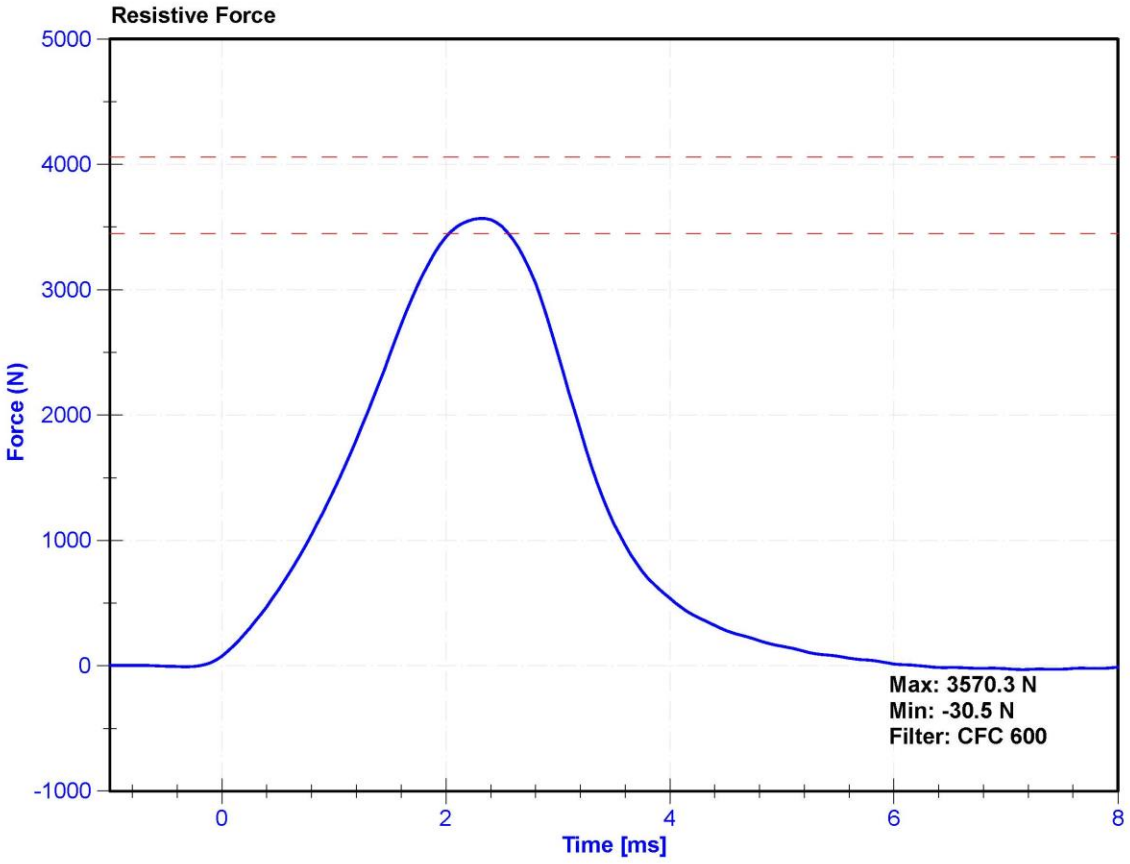
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	288	Laboratory Supervisor	K. Brogan

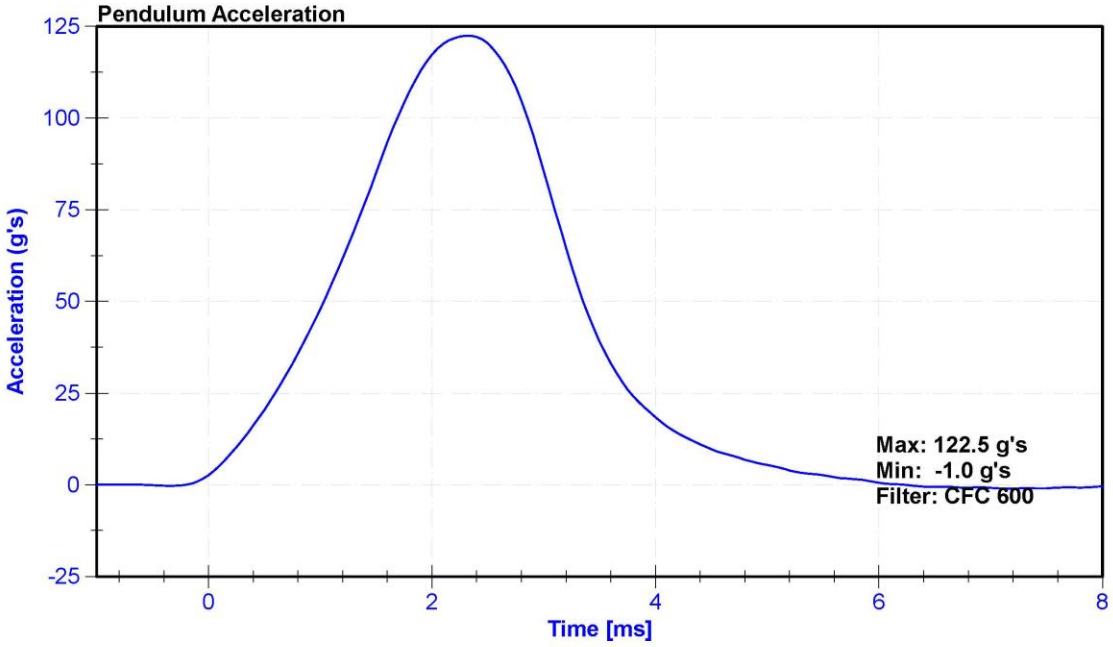
Results

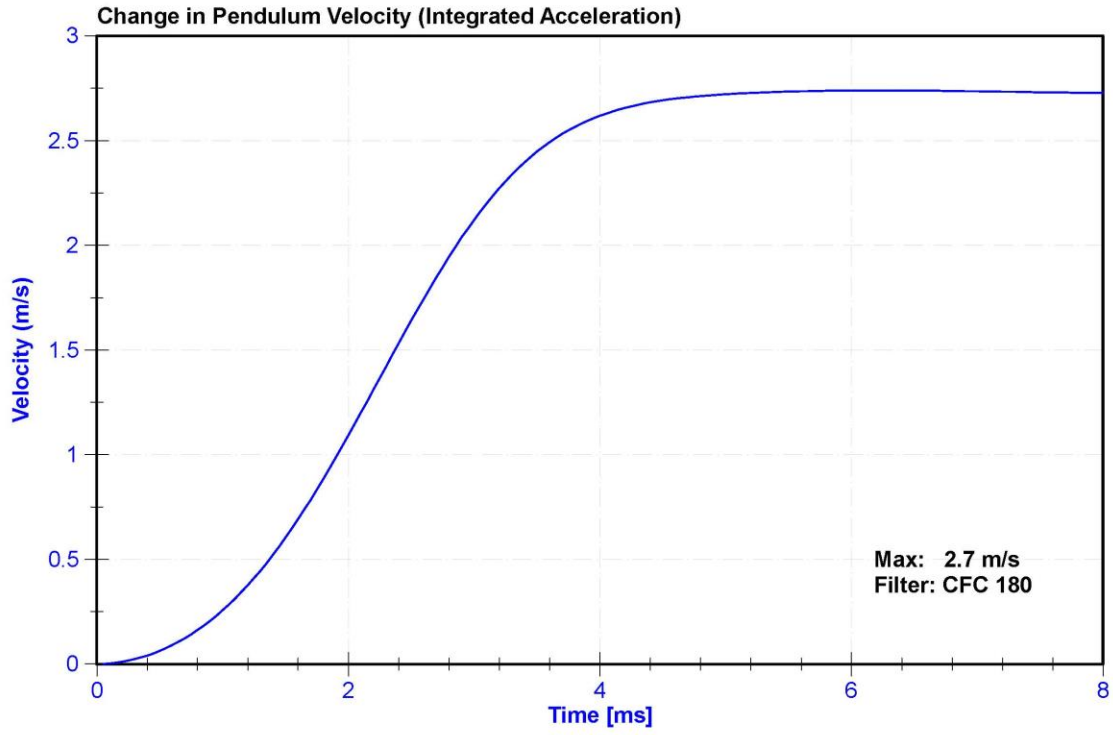
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	20.8	Pass
Humidity	10	70	%	51.0	Pass
Velocity	2.07	2.13	m/s	2.093	Pass
Resistive Force	3450	4060	N	3570.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A279031	5/8/2020	5/8/2021




Pendulum Acceleration
Acceleration (g's)
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]
Max: 122.5 g's
Min: -1.0 g's
Filter: CFC 600


Change in Pendulum Velocity (Integrated Acceleration)
Velocity (m/s)
3
2.5
2
1.5
1
0.5
0
0
2
4
6
8
Time [ms]
Max: 2.7 m/s
Filter: CFC 180

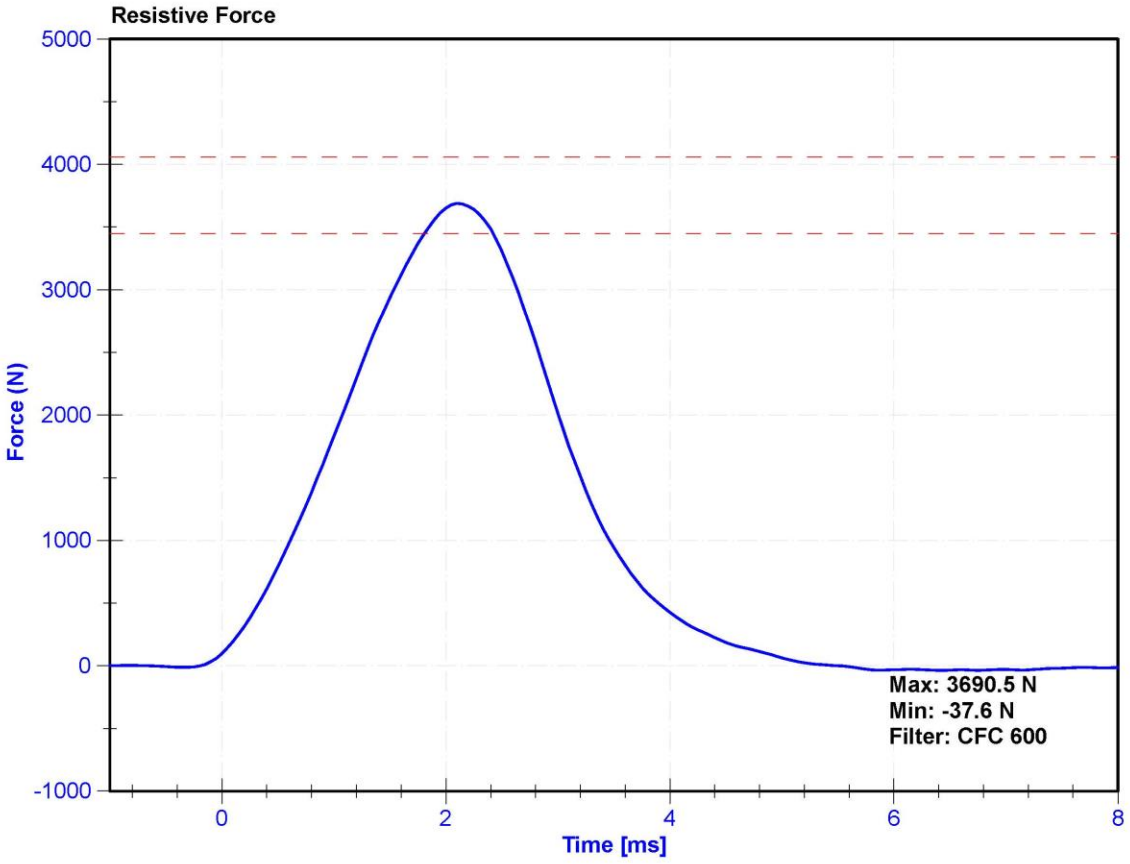
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	288	Laboratory Supervisor	K. Brogan

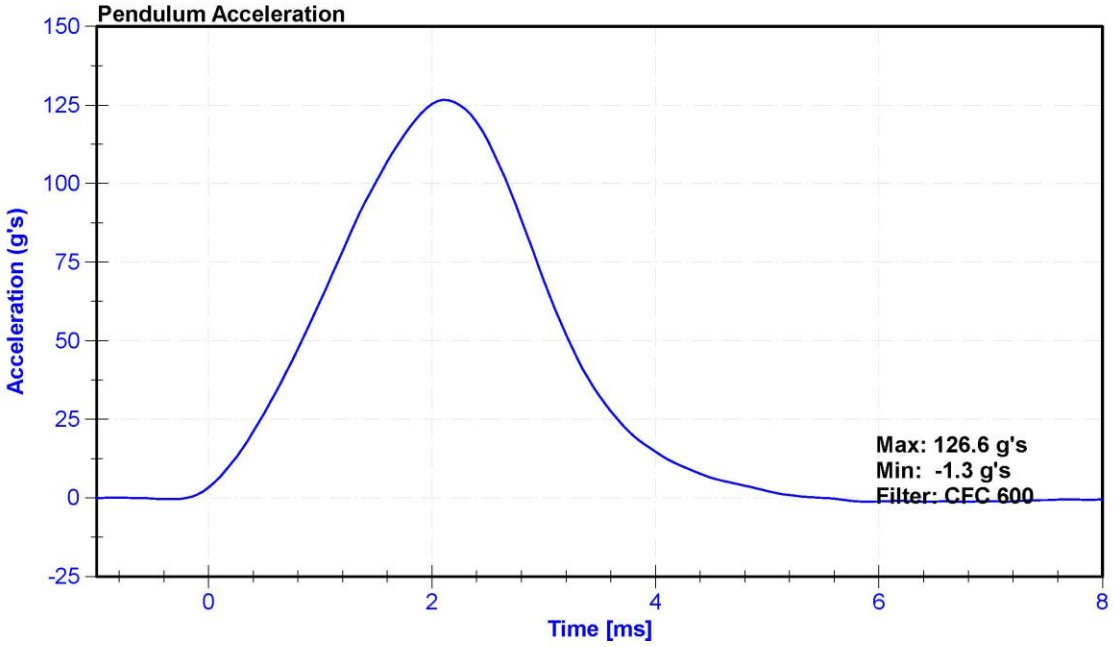
Results

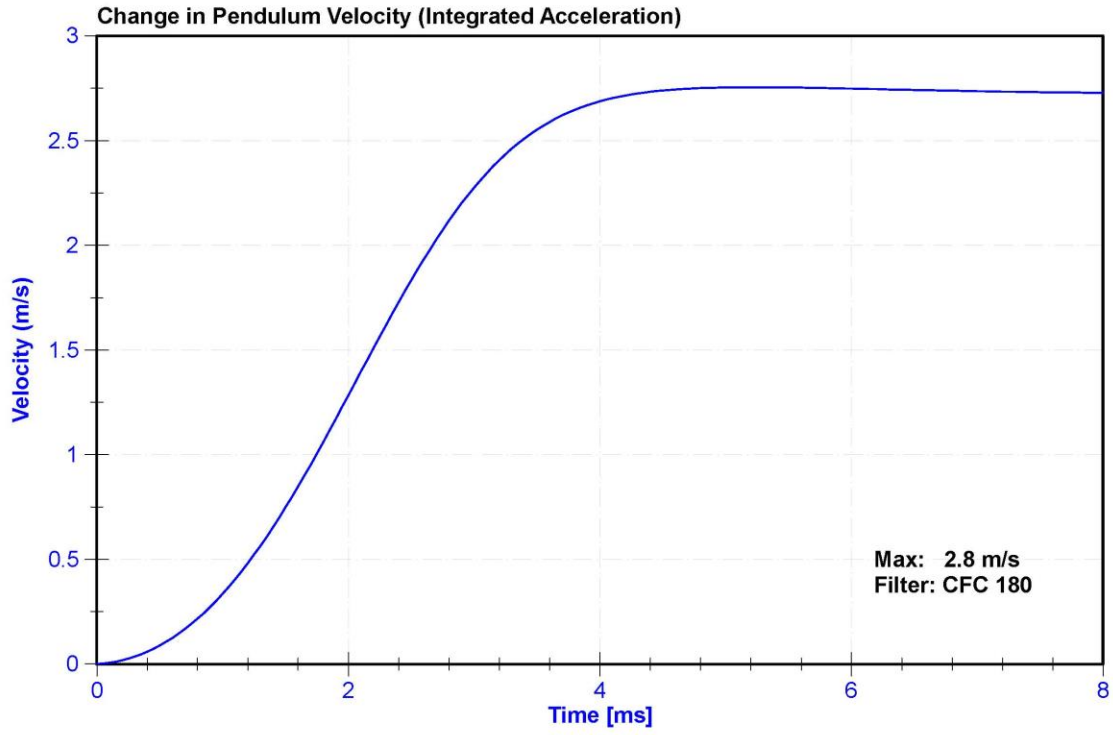
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	20.6	Pass
Humidity	10	70	%	59.0	Pass
Velocity	2.07	2.13	m/s	2.098	Pass
Resistive Force	3450	4060	N	3690.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A279031	5/8/2020	5/8/2021




Pendulum Acceleration
Acceleration (g's)
150
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]
Max: 126.6 g's
Min: -1.3 g's
Filter: CFC 600


Change in Pendulum Velocity (Integrated Acceleration)
Velocity (m/s)
3
2.5
2
1.5
1
0.5
0
0
2
4
6
8
Time [ms]
Max: 2.8 m/s
Filter: CFC 180

CALIBRATION TEST RESULTS

POST-TEST

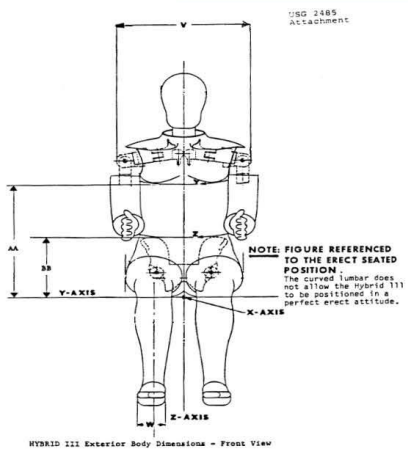
HYBRID III 50TH PERCENTILE MALE - DRIVER ATD

SERIAL NO: 142

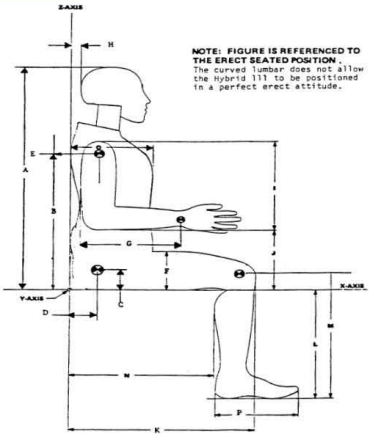
External Measurements - Hybrid 3 - 50th Male

Technician: K. Dutton Date: 09/09/2020

Dummy Serial Number: 142



HYBRID III Exterior Body Dimensions - Front View



HYBRID III Exterior Body Dimensions - Side View

Symbol	Description	Specification (in)		Result (in)	Pass/Fail
A	Sitting Height	34.6	35.0	34.8	Pass
B	Shoulder Pivot Height	19.9	20.5	20.3	Pass
C	H-Point Height	3.3	3.5	3.4	Pass
D	H-Point from Backline	5.3	5.5	5.4	Pass
E	Shoulder Pivot from Backline	3.3	3.7	3.5	Pass
F	Thigh Clearance	5.5	6.1	5.9	Pass
G	Back of Elbow to Wrist Pivot	11.4	12.0	11.6	Pass
H	Head Back to Backline	1.6	1.8	1.7	Pass
I	Shoulder to Elbow Length	13.0	13.6	13.4	Pass
J	Elbow Rest Height	7.5	8.3	8.1	Pass
K	Buttock to Knee Length	22.8	23.8	23.1	Pass
L	Popliteal Height	16.9	17.9	17.4	Pass
M	Knee Pivot Height	19.1	19.7	19.5	Pass
N	Buttock Popliteal Length	17.8	18.8	18.3	Pass
O	Chest Depth without Jacket	8.4	9.0	8.6	Pass
P	Foot Length (right)	9.9	10.5	10.2	Pass
V	Shoulder Breadth	16.3	17.2	16.9	Pass
W	Foot Breadth	3.6	4.2	3.8	Pass
Y	Chest Circumference with Jacket	38.2	39.4	38.8	Pass
Z	Waist Circumference	32.9	34.1	33.7	Pass
AA	Reference Location (Chest Circumference)	16.9	17.1	17.0	Pass
BB	Reference Location (Waist Circumference)	8.9	9.1	9.0	Pass

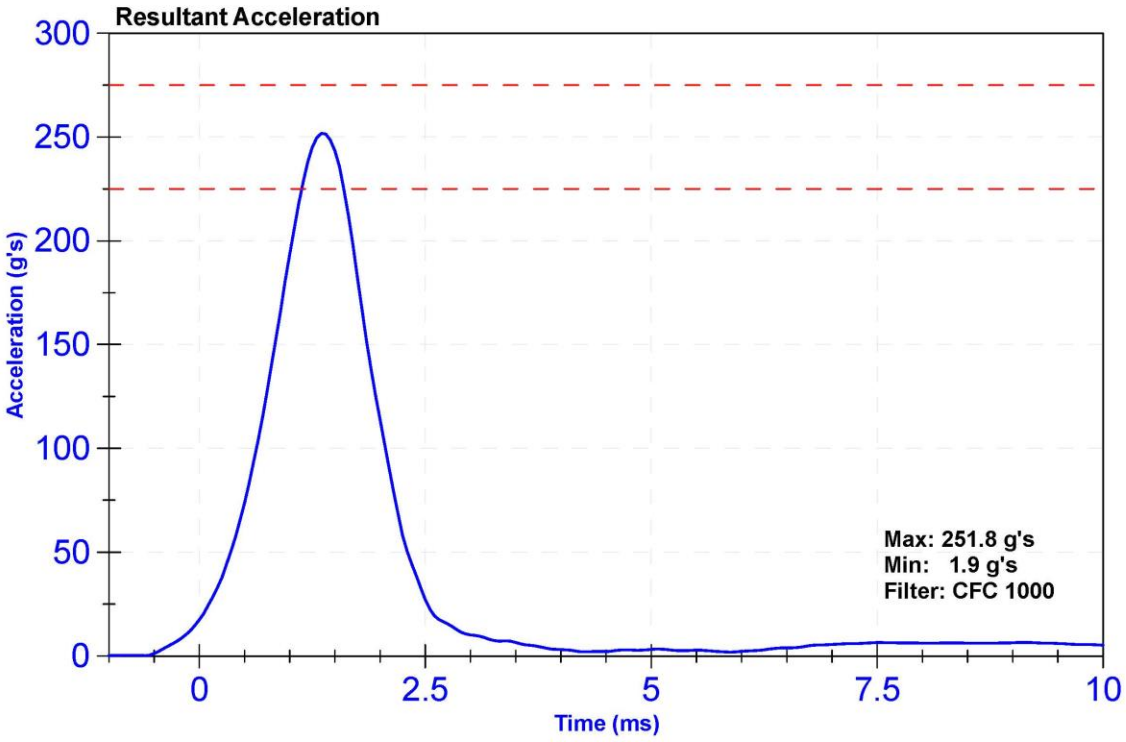
ATD Manufacturer	Humanetics	Test Technician	D.Reinhard
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

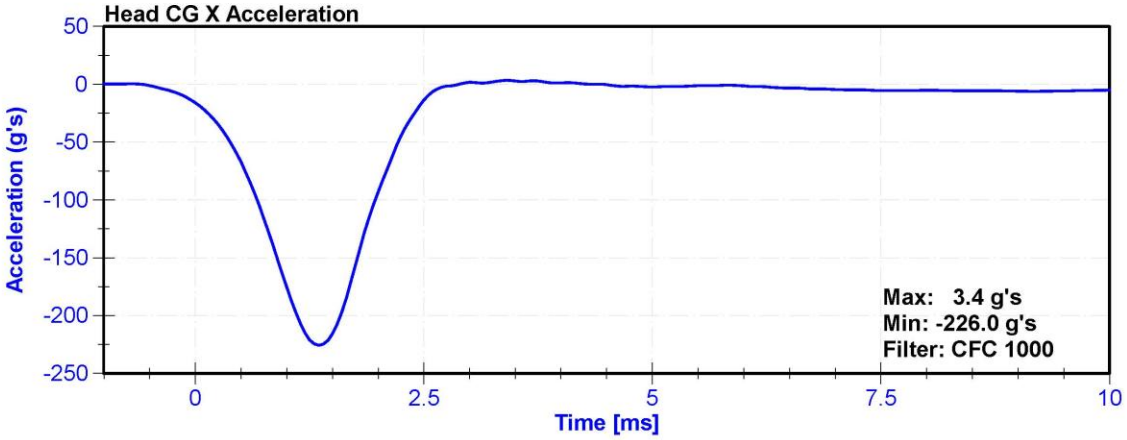
Results

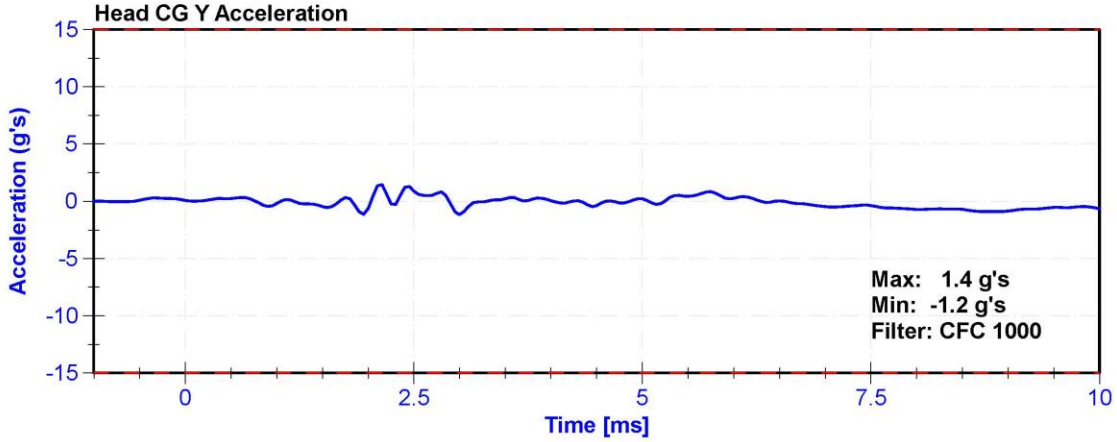
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	20.2	Pass
Humidity	10	70	%	62.0	Pass
Resultant Acceleration	225	275	g's	251.8	Pass
Oscillation	0	10	%	2.9	Pass
Lateral Acceleration	-15	15	g's	1.4	Pass

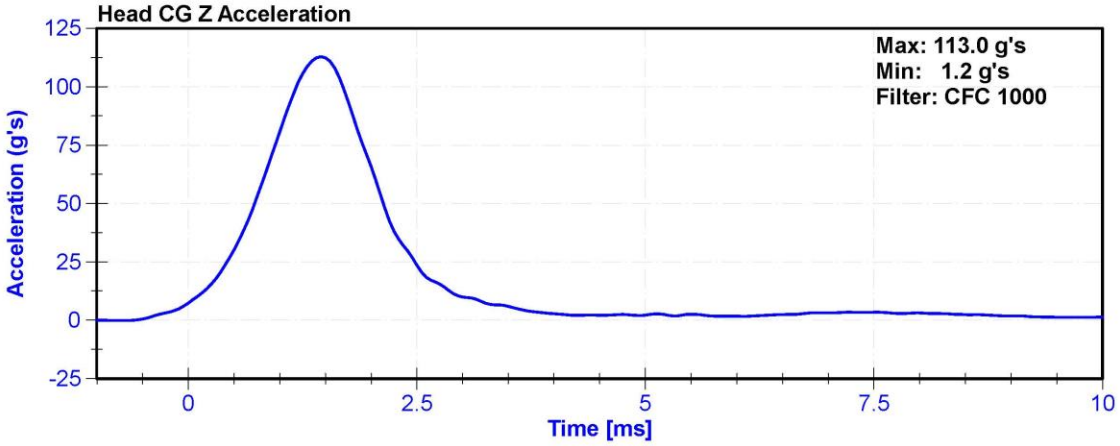
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264	P51681	4/17/2020	10/16/2020
Y Accelerometer	ENDEVCO 7264	P64151	4/17/2020	10/16/2020
Z Accelerometer	ENDEVCO 7264	P52114	4/17/2020	10/16/2020




Head CG X Acceleration
Acceleration (g's)
50
0
-50
-100
-150
-200
-250
0
2.5
5
7.5
10
Time [ms]
Max: 3.4 g's
Min: -226.0 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]
Max: 1.4 g's
Min: -1.2 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]
Max: 113.0 g's
Min: 1.2 g's
Filter: CFC 1000

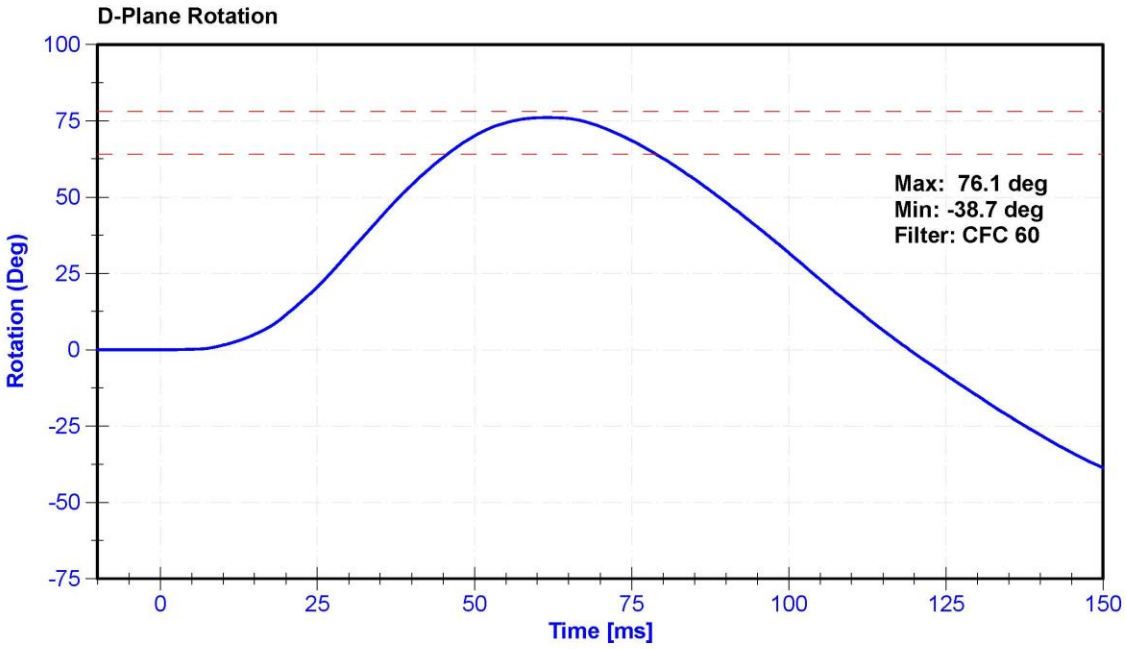
ATD Manufacturer	Humanetics	Test Technician	E. Helenbrook
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

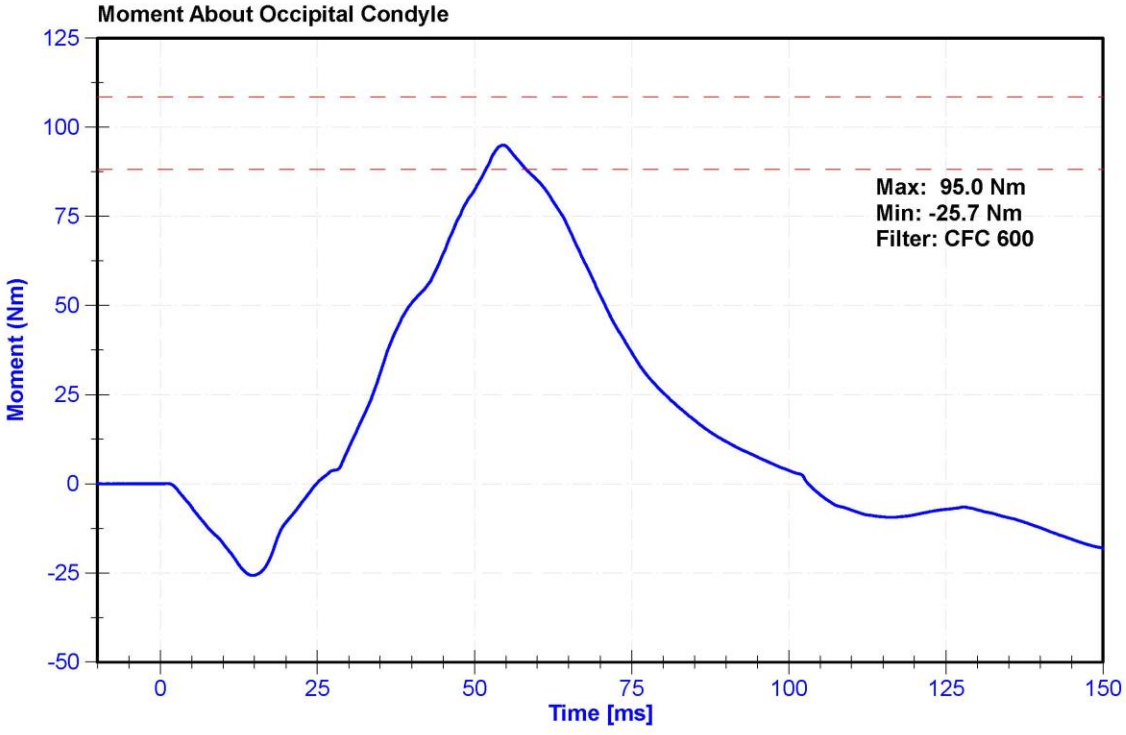
Results

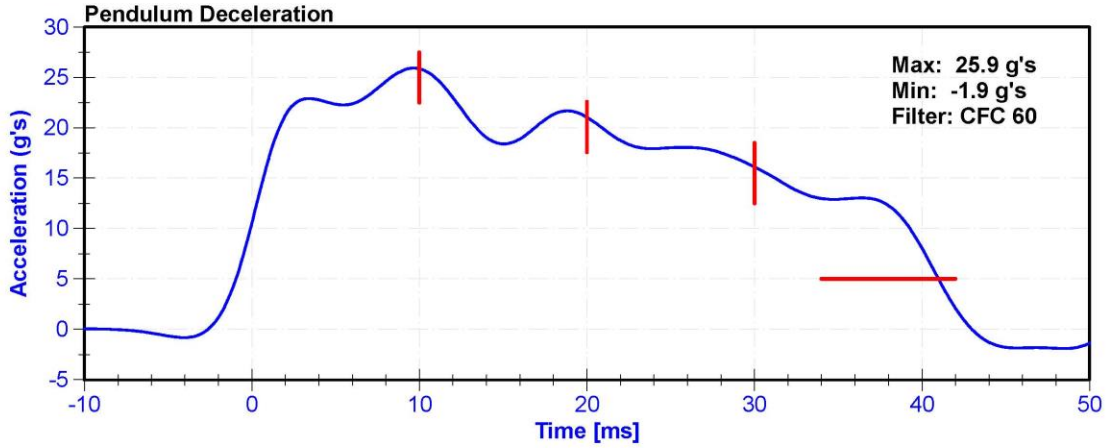
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.5	Pass
Humidity	10	70	%	60.4	Pass
Velocity	6.89	7.13	m/s	6.958	Pass
Pendulum Deceleration at 10ms	22.5	27.5	g's	25.87	Pass
Pendulum Deceleration at 20ms	17.6	22.6	g's	21.05	Pass
Pendulum Deceleration at 30ms	12.5	18.5	g's	16.12	Pass
Max. Pendulum Deceleration After 30ms	0	29	g's	25.9	Pass
Pendulum Deceleration Time to 5 g's	34	42	ms	41.0	Pass
Maximum D Plane Rotation	64	78	deg	76.1	Pass
Time to Maximum Rotation	57	64	ms	61.6	Pass
Rotation Decay to Zero	113	127	ms	119.2	Pass
Moment About Occipital Condyle	88.1	108.4	Nm	94.99	Pass
Time to Maximum Moment	47	58	ms	54.6	Pass
Moment Decay to Zero	97	107	ms	103.1	Pass

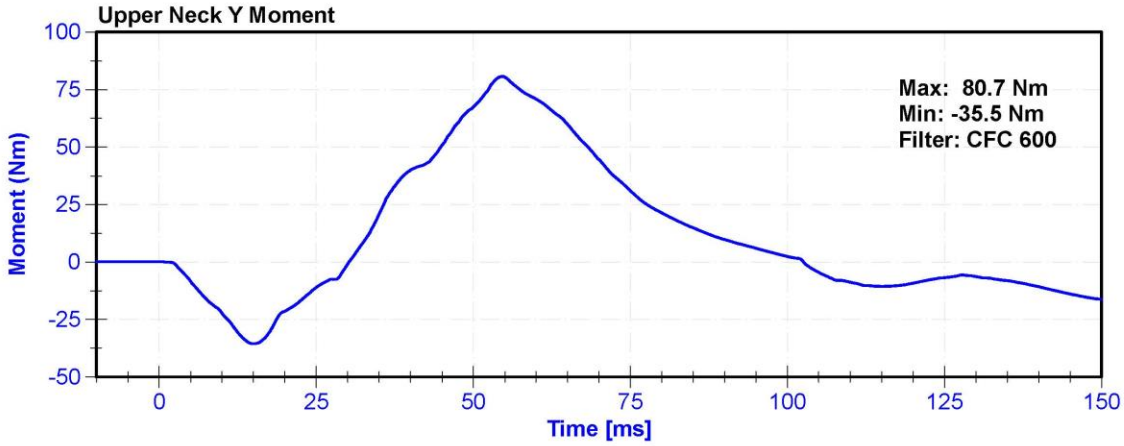
Transducer Calibrations

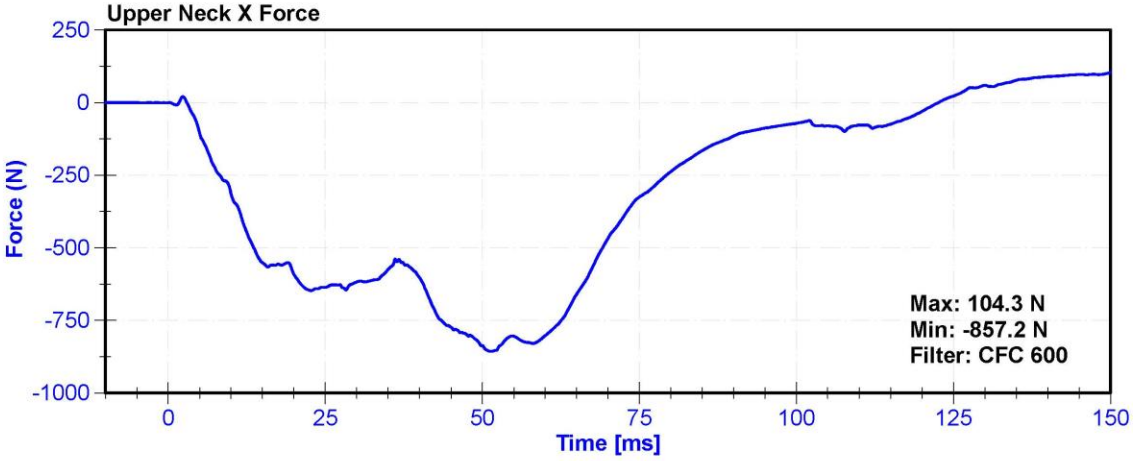
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C16503	2/6/2020	2/5/2021
Pendulum Potentiometer	ETI SP22G	DS-LABPOT1	9/13/2019	9/12/2020
Condyle Potentiometer	ETI SP22G	DS-LABPOT2	9/13/2019	9/12/2020
Upper Neck Load Cell	Denton IF-205	LC-280FxGFE	10/3/2019	10/2/2020


D-Plane Rotation
Rotation (Deg)
100
75
50
25
0
-25
-50
-75
0
25
50
75
100
125
150
Time [ms]
Max: 76.1 deg
Min: -38.7 deg
Filter: CFC 60


Moment About Occipital Condyle
Moment (Nm)
125
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 95.0 Nm
Min: -25.7 Nm
Filter: CFC 600


Pendulum Deceleration
Max: 25.9 g's
Min: -1.9 g's
Filter: CFC 60
Acceleration (g's)
Time [ms]


Upper Neck Y Moment
Max: 80.7 Nm
Min: -35.5 Nm
Filter: CFC 600
Moment (Nm)
Time [ms]


Upper Neck X Force
Max: 104.3 N
Min: -857.2 N
Filter: CFC 600
Force (N)
Time [ms]

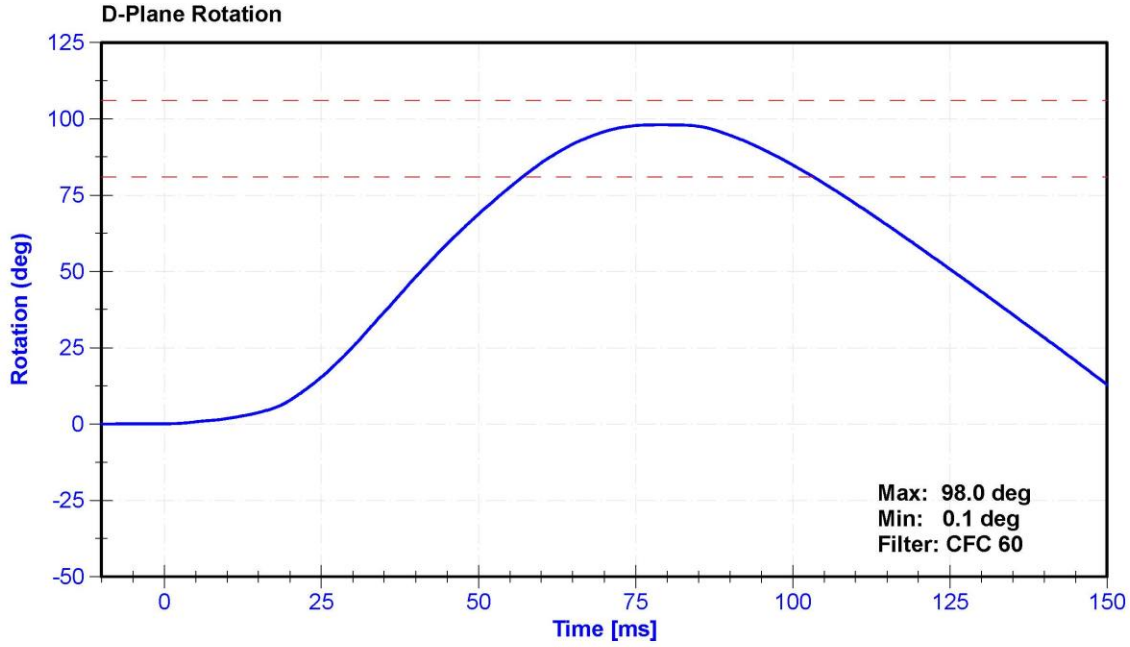
ATD Manufacturer	Humanetics	Test Technician	E. Helenbrook
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

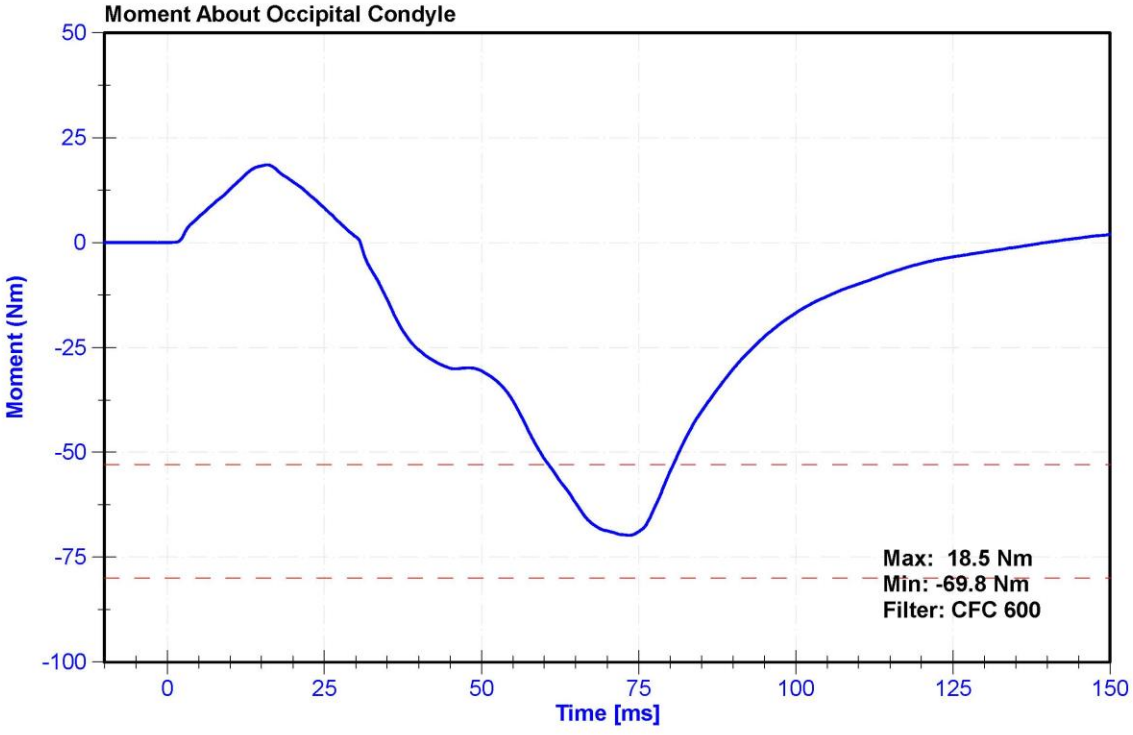
Results

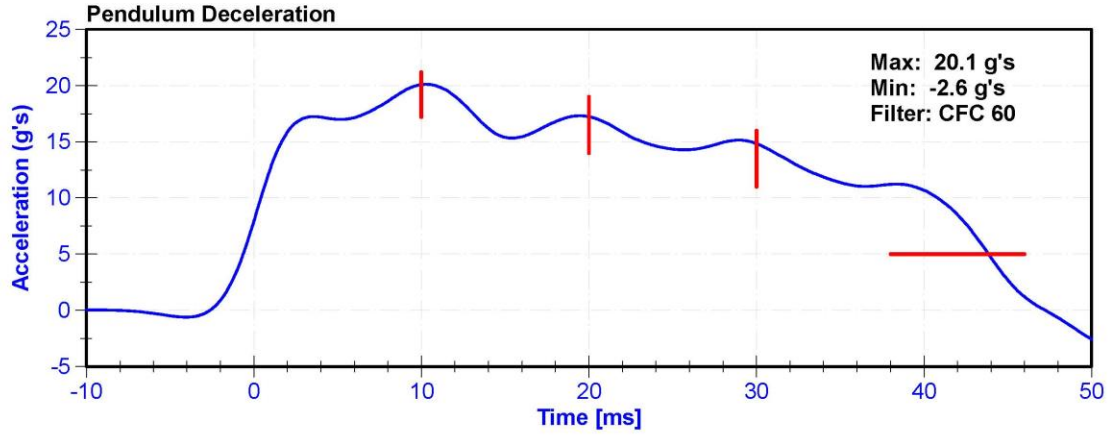
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.5	Pass
Humidity	10	70	%	60.4	Pass
Velocity	5.94	6.19	m/s	6.005	Pass
Pendulum Deceleration at 10ms	17.2	21.2	g's	20.11	Pass
Pendulum Deceleration at 20ms	14	19	g's	17.2	Pass
Pendulum Deceleration at 30ms	11	16	g's	14.8	Pass
Max. Pendulum Deceleration After 30ms	0	22	g's	20.1	Pass
Pendulum Deceleration Time to 5 g's	38	46	ms	43.9	Pass
Maximum D Plane Rotation	81	106	deg	98.0	Pass
Time to Maximum Rotation	72	82	ms	79.0	Pass
Rotation Decay to Zero	147	174	ms	158.5	Pass
Minimum Moment About OC	-80	-52.9	Nm	-69.76	Pass
Time to Minimum Moment	65	79	ms	73.5	Pass
Moment Decay to Zero	120	148	ms	139.9	Pass

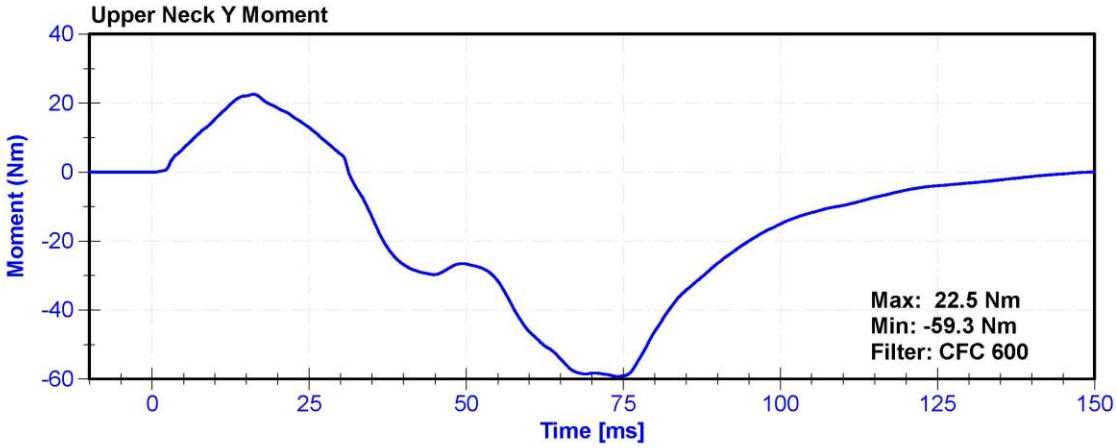
Transducer Calibrations

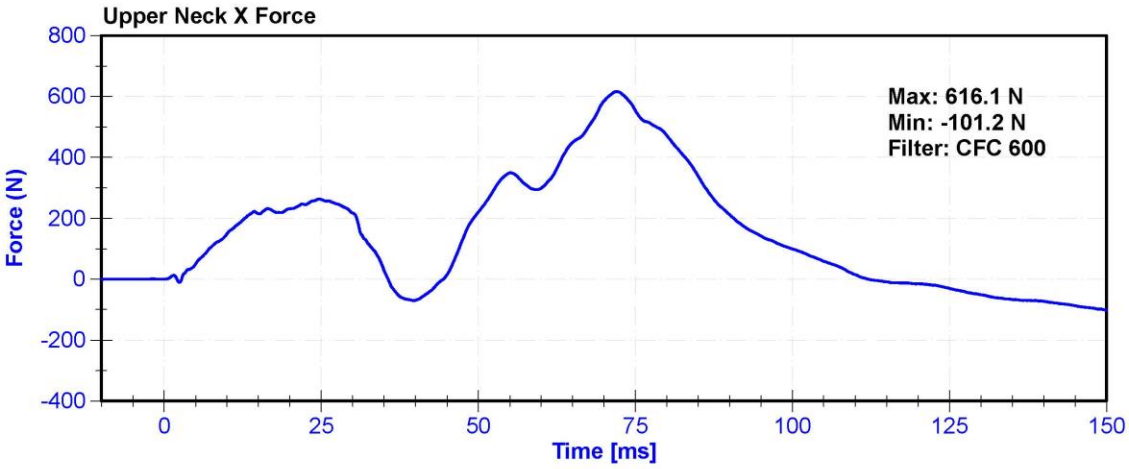
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C16503 Striker	2/6/2020	2/5/2021
Pendulum Potentiometer	ETI SP22G	DS-LABPOT1	9/13/2019	9/12/2020
Condyle Potentiometer	ETI SP22G	DS-LABPOT2	9/13/2019	9/12/2020
Upper Neck Load Cell	Denton IF-205	LC-280FxGFE	10/3/2019	10/2/2020


D-Plane Rotation
Rotation (deg)
125
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 98.0 deg
Min: 0.1 deg
Filter: CFC 60


Moment About Occipital Condyle
Moment (Nm)
50
25
0
-25
-50
-75
-100
0
25
50
75
100
125
150
Time [ms]
Max: 18.5 Nm
Min: -69.8 Nm
Filter: CFC 600


Pendulum Deceleration
Max: 20.1 g's
Min: -2.6 g's
Filter: CFC 60
Acceleration (g's)
25
20
15
10
5
0
-5
-10
0
10
20
30
40
50
Time [ms]


Upper Neck Y Moment
Max: 22.5 Nm
Min: -59.3 Nm
Filter: CFC 600
Moment (Nm)
40
20
0
-20
-40
-60
0
25
50
75
100
125
150
Time [ms]


Upper Neck X Force
Max: 616.1 N
Min: -101.2 N
Filter: CFC 600
Force (N)
800
600
400
200
0
-200
-400
0
25
50
75
100
125
150
Time [ms]

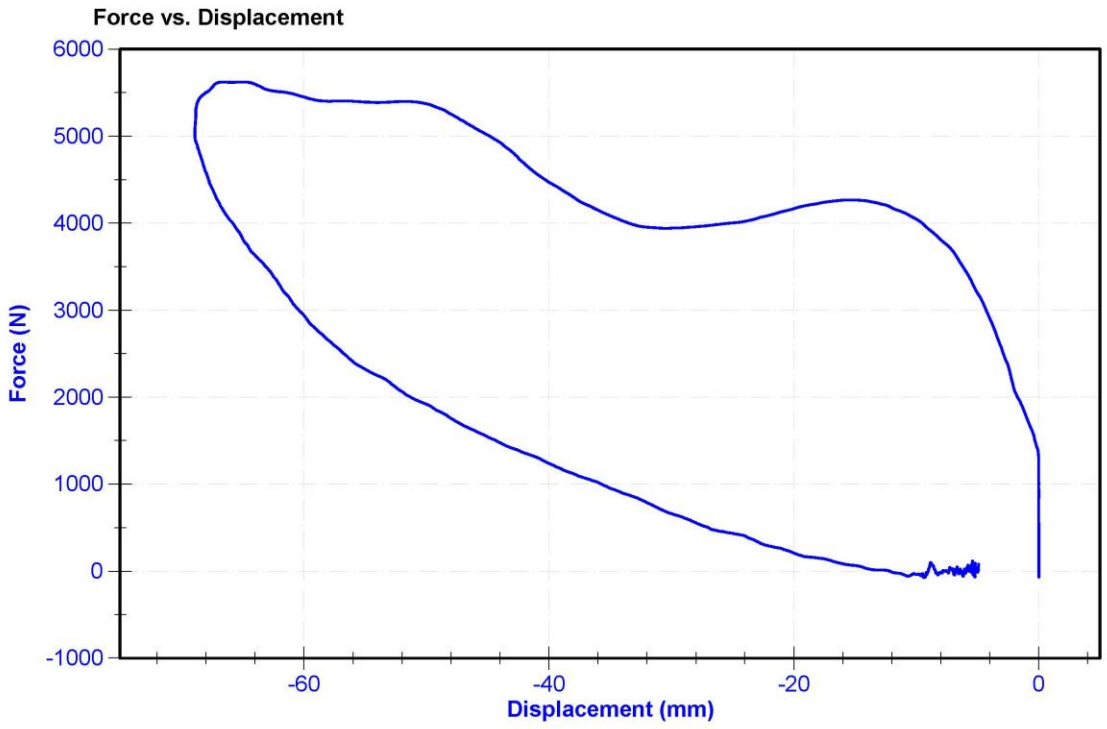
ATD Manufacturer	Humanetics	Test Technician	D.Reinhard
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

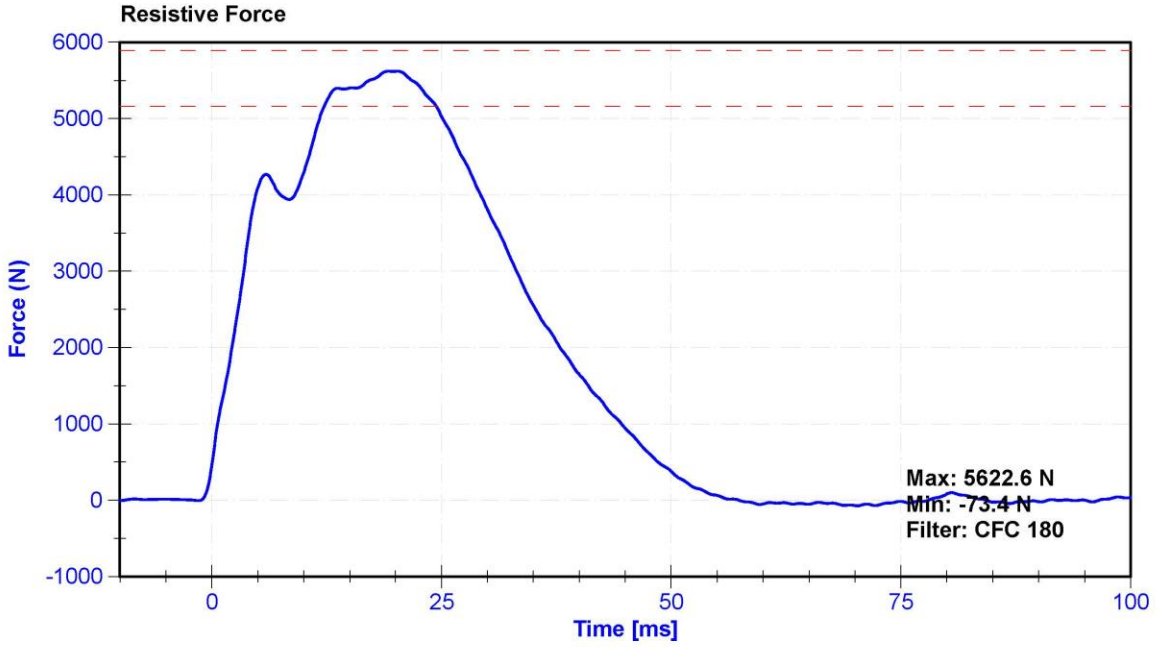
Results

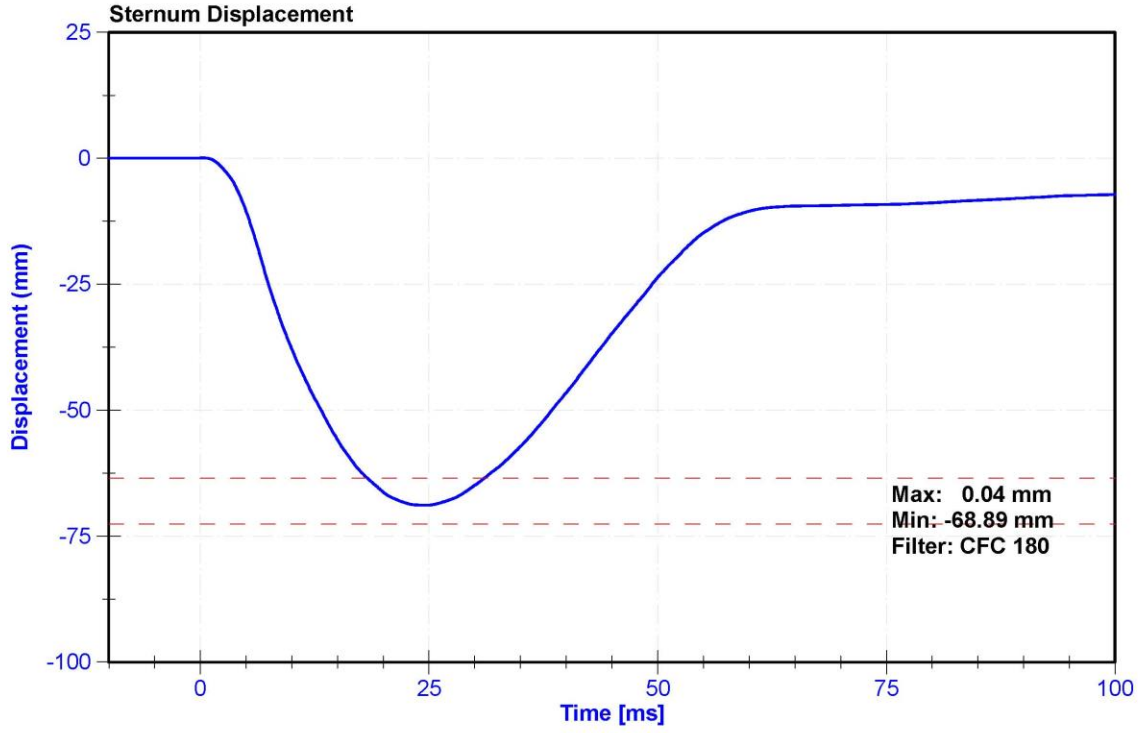
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	66	Pass
Velocity	6.59	6.83	m/s	6.699	Pass
Chest Displacement	-72.6	-63.5	mm	-68.89	Pass
Resistive Force	5160	5894	N	5622.6	Pass
Hysteresis	65	85	%	71.5	Pass

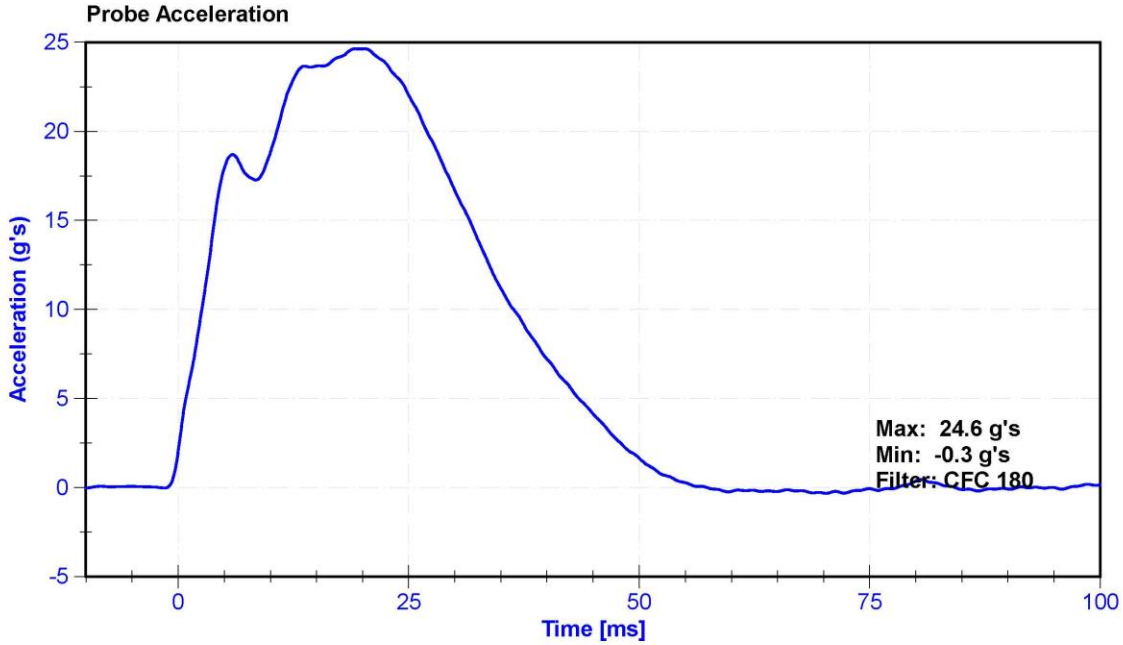
Transducer Calibrations

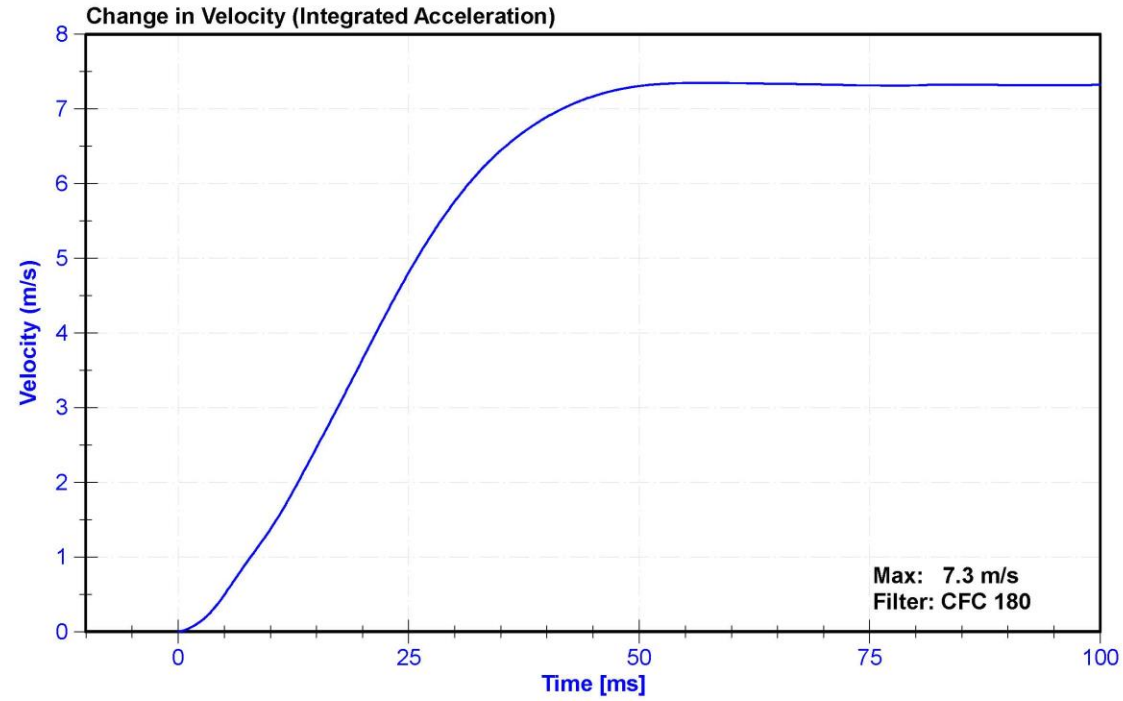
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A286228	1/29/2020	1/28/2021
Chest Potentiometer	Servo 6209-2038	DS-142	6/23/2020	12/22/2020




Resistive Force
6000
5000
4000
3000
2000
1000
0
-1000
Force (N)
0
25
50
75
100
Time [ms]
Max: 5622.6 N
Min: -73.4 N
Filter: CFC 180


Sternum Displacement
25
0
-25
-50
-75
-100
Displacement (mm)
0
25
50
75
100
Time [ms]
Max: 0.04 mm
Min: -68.89 mm
Filter: CFC 180


Probe Acceleration
Acceleration (g's)
25
20
15
10
5
0
-5
0
25
50
75
100
Time [ms]
Max: 24.6 g's
Min: -0.3 g's
Filter: CFC 180


Change in Velocity (Integrated Acceleration)
Velocity (m/s)
8
7
6
5
4
3
2
1
0
0
25
50
75
100
Time [ms]
Max: 7.3 m/s
Filter: CFC 180

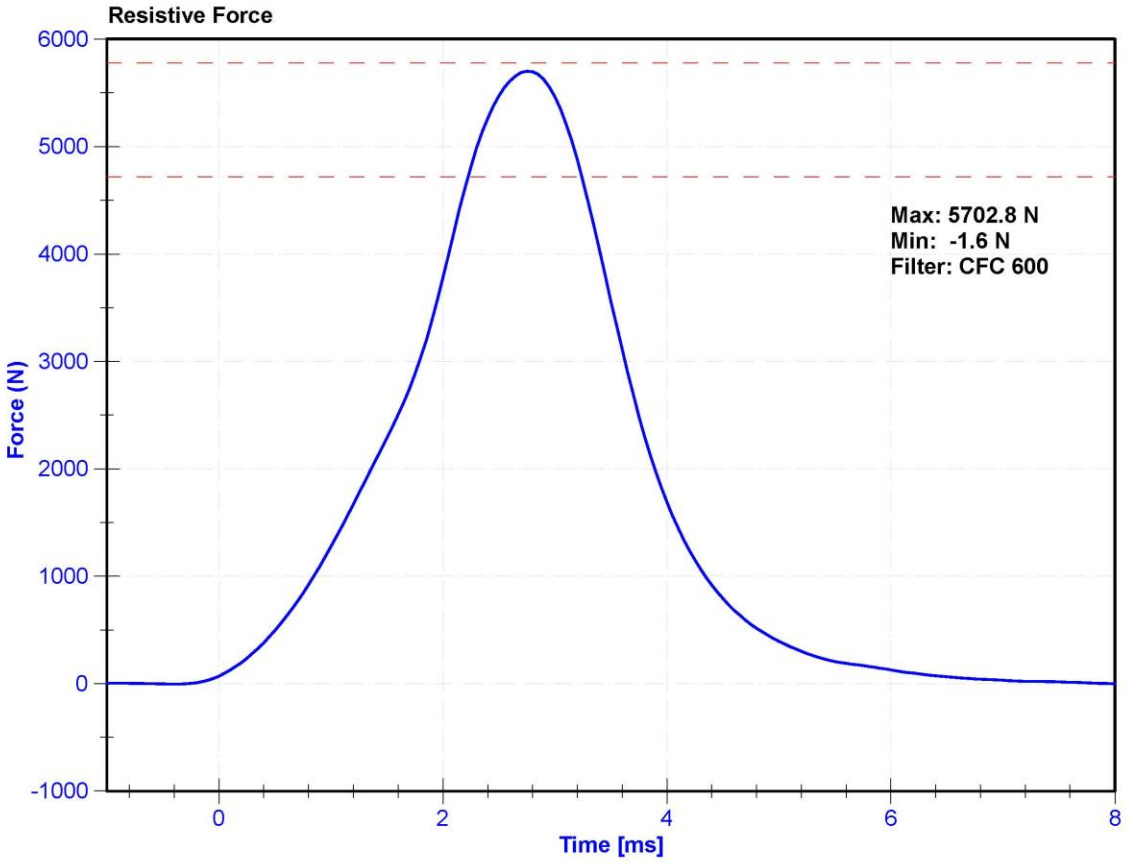
ATD Manufacturer	Humanetics	Test Technician	D.Reinhard
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

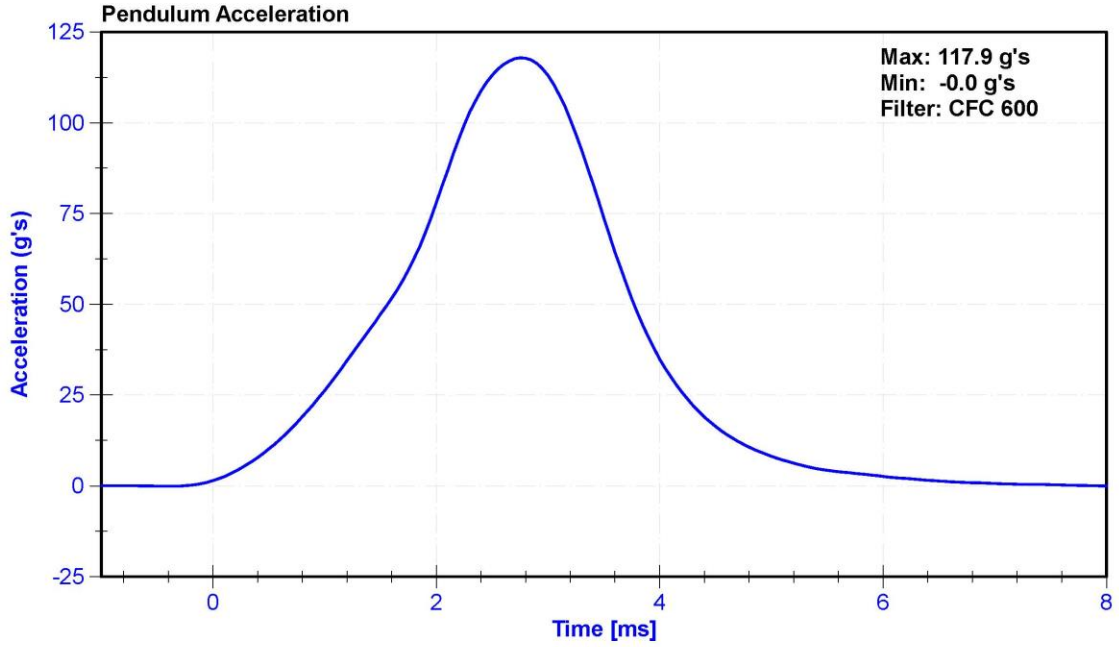
Results

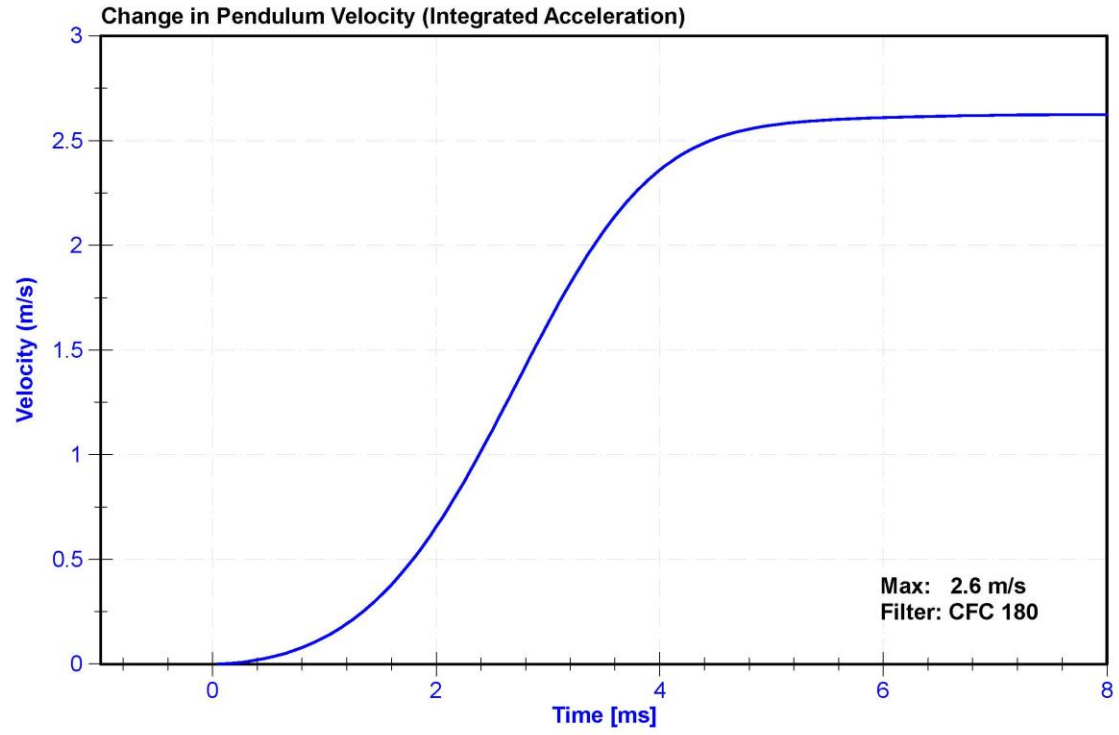
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	20.6	Pass
Humidity	10	70	%	62	Pass
Velocity	2.07	2.13	m/s	2.102	Pass
Maximum Resistive Force	4720	5780	N	5702.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A279031	5/8/2020	5/8/2021




Pendulum Acceleration
Max: 117.9 g's
Min: -0.0 g's
Filter: CFC 600
Acceleration (g's)
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]


Change in Pendulum Velocity (Integrated Acceleration)
Max: 2.6 m/s
Filter: CFC 180
Velocity (m/s)
3
2.5
2
1.5
1
0.5
0
0
2
4
6
8
Time [ms]

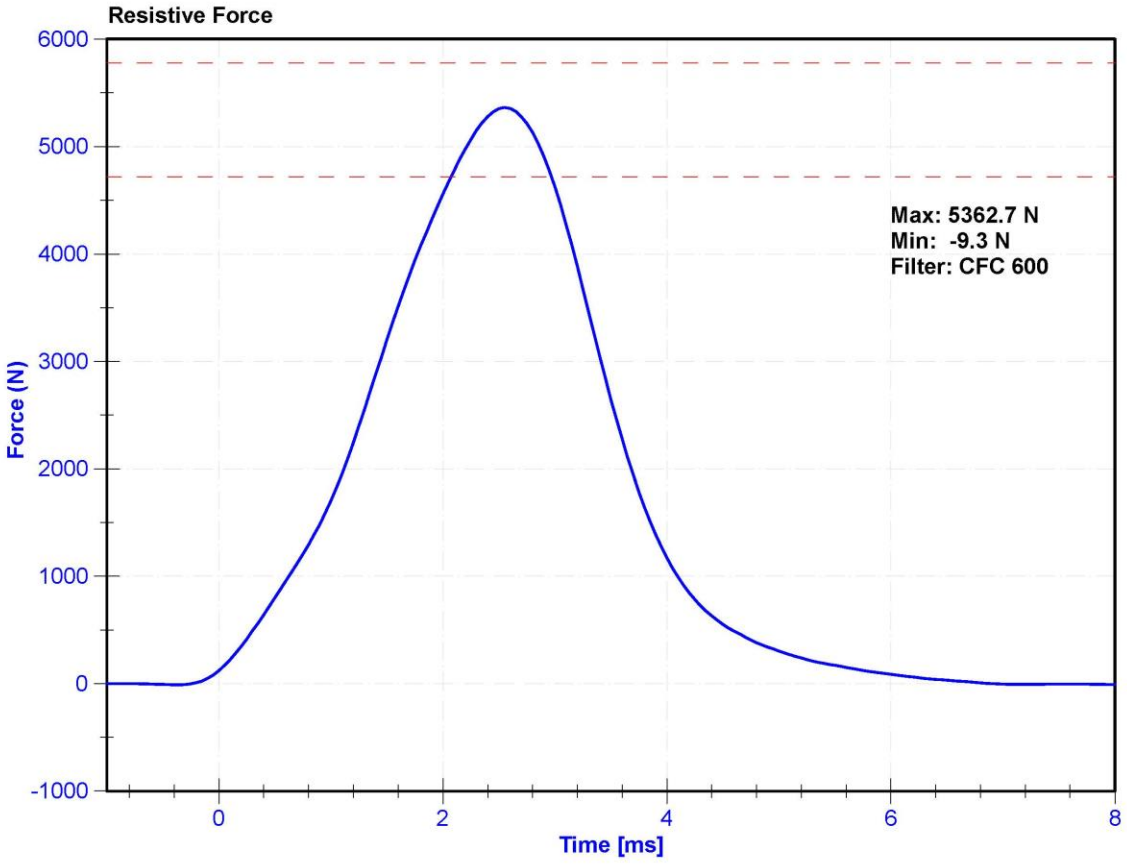
ATD Manufacturer	Humanetics	Test Technician	D.Reinhard
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

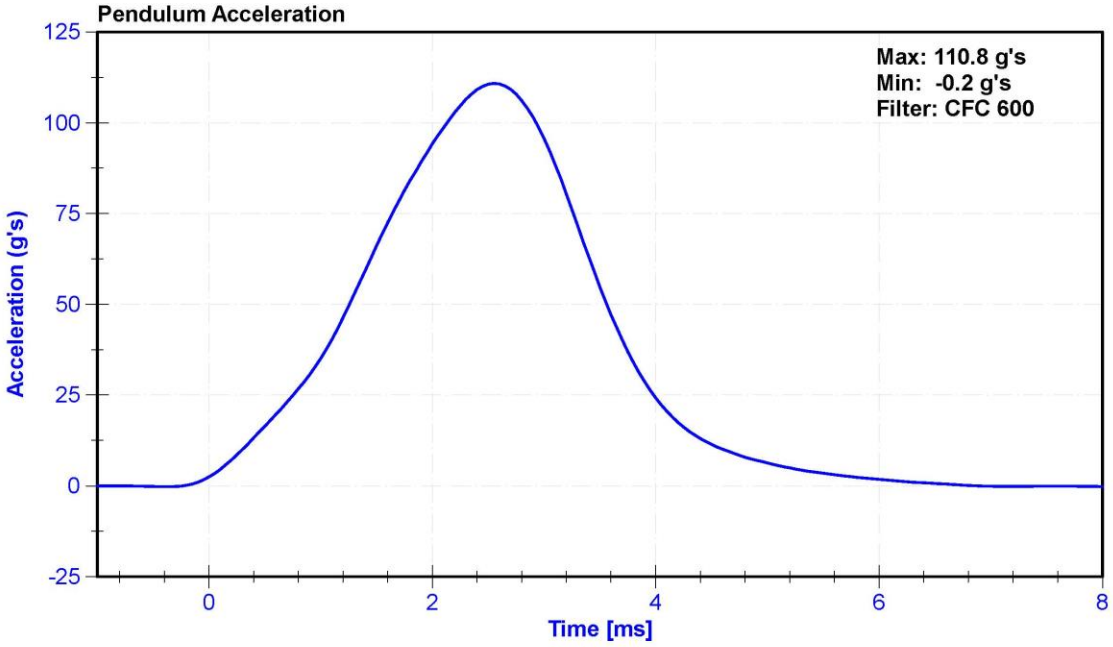
Results

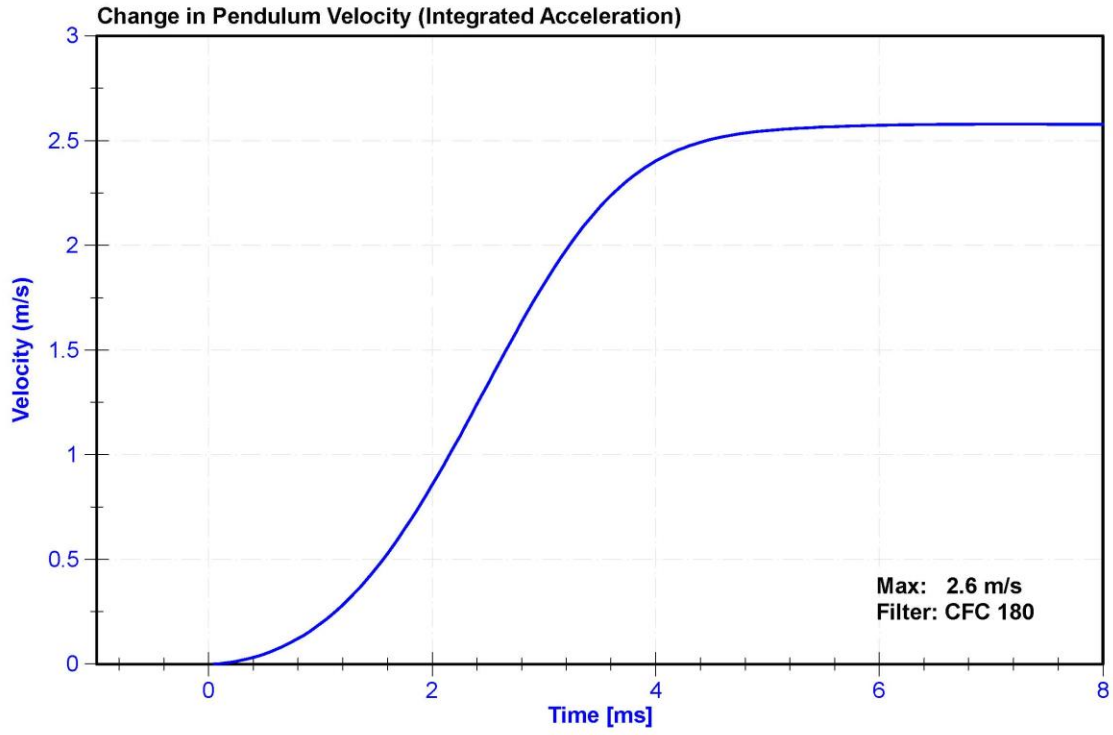
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	20.6	Pass
Humidity	10	70	%	61	Pass
Velocity	2.07	2.13	m/s	2.096	Pass
Maximum Resistive Force	4720	5780	N	5362.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A279031	5/8/2020	5/8/2021




Pendulum Acceleration
Max: 110.8 g's
Min: -0.2 g's
Filter: CFC 600
Acceleration (g's)
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]


Change in Pendulum Velocity (Integrated Acceleration)
Velocity (m/s)
3
2.5
2
1.5
1
0.5
0
Max: 2.6 m/s
Filter: CFC 180
0
2
4
6
8
Time [ms]

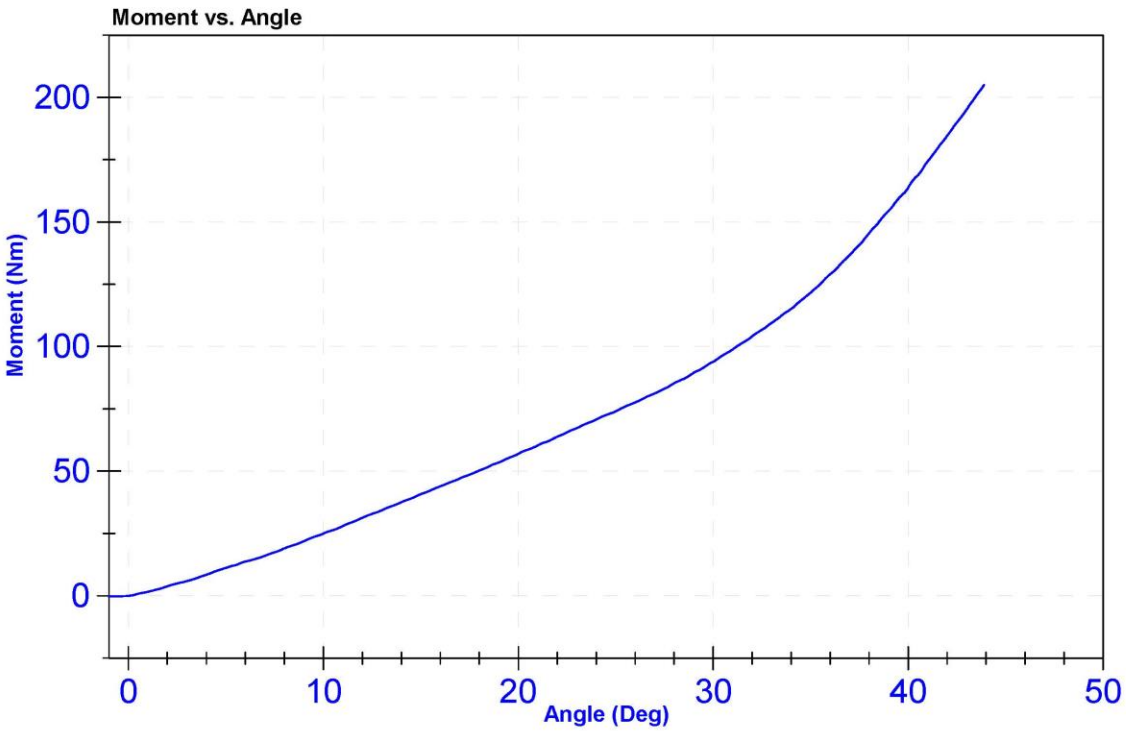
ATD Manufacturer	Humanetics	Test Technician	D.Reinhard
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	20.6	Pass
Humidity	10	70	%	62.0	Pass
Average Velocity	5	10	deg/s	7.3	Pass
Angle at 203Nm	40	50	deg	43.7	Pass
Moment at 30 degrees	0	94.9	Nm	94.0	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	ETI SP22	DS-0008	9/18/2019	9/17/2020
Load Cell	Key Trans 2301-02	LC-115 My	9/12/2019	9/11/2020



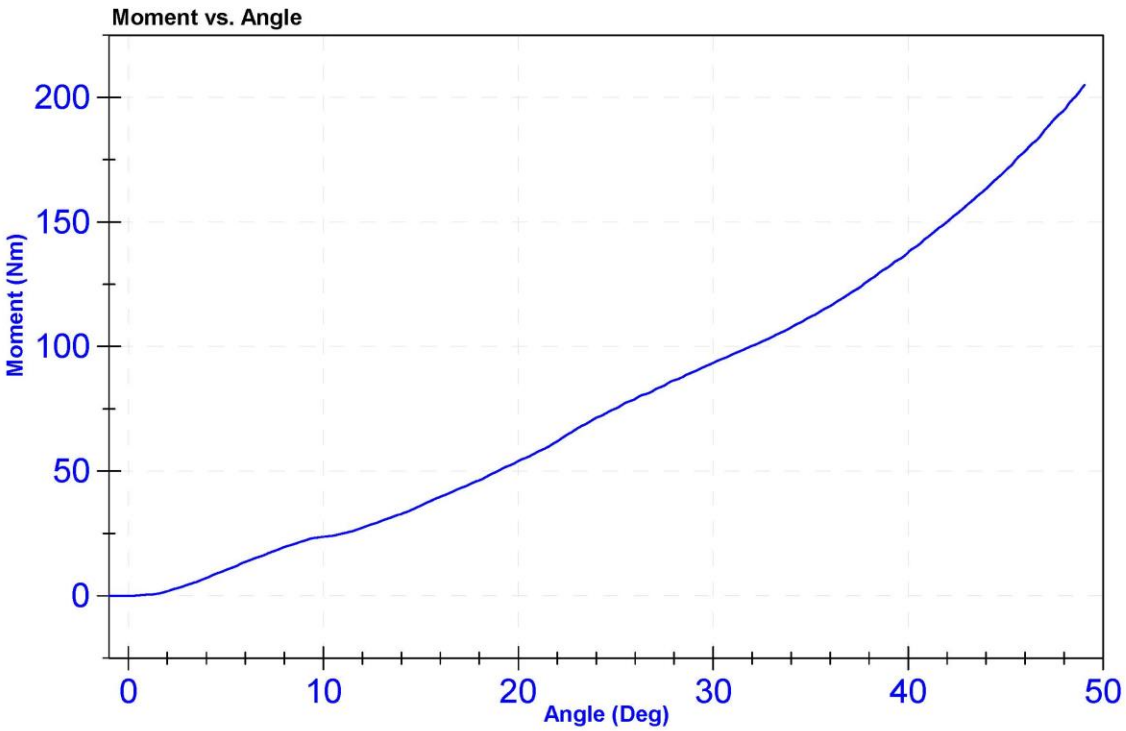
ATD Manufacturer	Humanetics	Test Technician	D.Reinhard
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	20.7	Pass
Humidity	10	70	%	57.0	Pass
Average Velocity	5	10	deg/s	7.2	Pass
Angle at 203Nm	40	50	deg	48.9	Pass
Moment at 30 degrees	0	94.9	Nm	93.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	ETI SP22	DS-0008	9/18/2019	9/17/2020
Load Cell	Key Trans 2301-02	LC-115 My	9/12/2019	9/11/2020



CALIBRATION TEST RESULTS

POST-TEST

HYBRID III 5TH PERCENTILE FEMALE - PASSENGER ATD

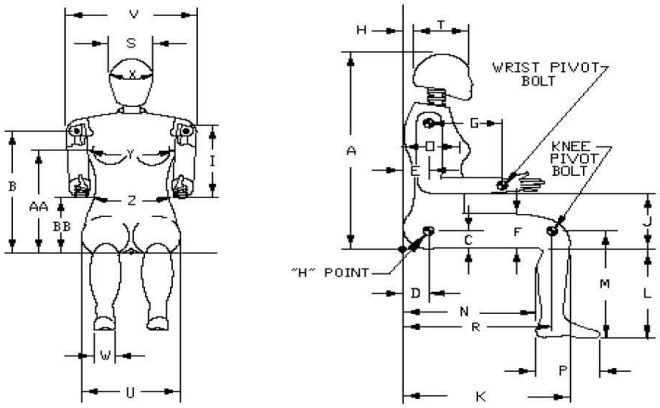
SERIAL NO: 288

Calspan

External Measurements - Hybrid 3 - 5th Female

Technician: K. Dutton Date: 09/08/2020

Dummy Serial Number: 288



Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	775	800	787	Pass
B	Shoulder Pivot Height	432	457	450	Pass
C	H-Point Height	81	86	85	Pass
D	H-Point from Backline	145	150	147	Pass
E	Shoulder Pivot from Backline	69	84	77	Pass
F	Thigh Clearance	119	135	127	Pass
G	Back of Elbow to Wrist Pivot	244	259	255	Pass
H	Head Back to Backline	43	48	45	Pass
I	Shoulder to Elbow Length	277	297	284	Pass
J	Elbow Rest Height	183	203	192	Pass
K	Buttock to Knee Length	521	546	538	Pass
L	Popliteal Height	356	376	365	Pass
M	Knee Pivot Height	394	419	410	Pass
N	Buttock Popliteal Length	414	439	429	Pass
O	Chest Depth without Jacket	175	191	182	Pass
P	Foot Length (right)	219	234	221	Pass
R	Buttock To Knee Pivot Length	457	483	465	Pass
S	Head Breadth	137	147	141	Pass
T	Head Depth	178	188	183	Pass
U	Hip Breadth	300	315	310	Pass
V	Shoulder Breadth	351	366	361	Pass
W	Foot Breadth	79	94	85	Pass
X	Head Circumference	528	549	537	Pass
Y	Chest Circumference with Jacket	851	881	865	Pass
Z	Waist Circumference	460	790	777	Pass
AA	Reference Location (Chest Circumference)	333	358	345	Pass
BB	Reference Location (Waist Circumference)	160	170	164	Pass

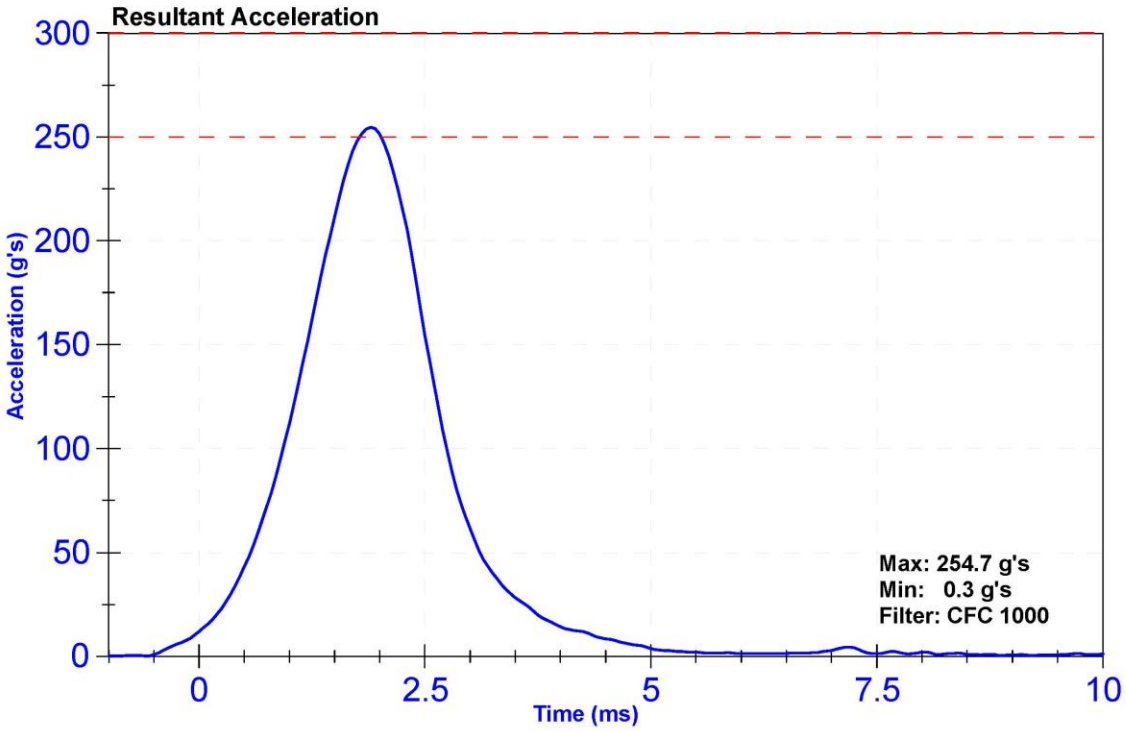
ATD Manufacturer	FTSS	Test Technician	K. Dutton
ATD Serial Number	288	Laboratory Supervisor	K. Brogan

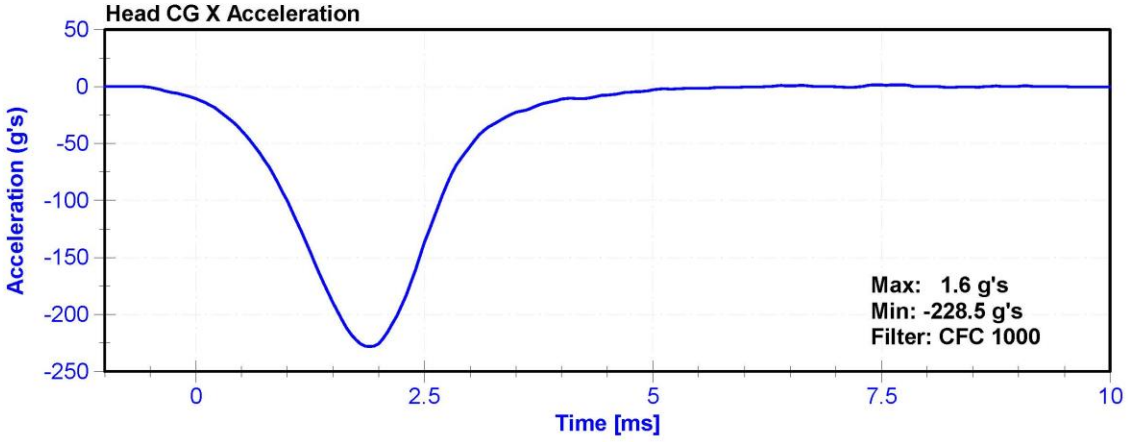
Results

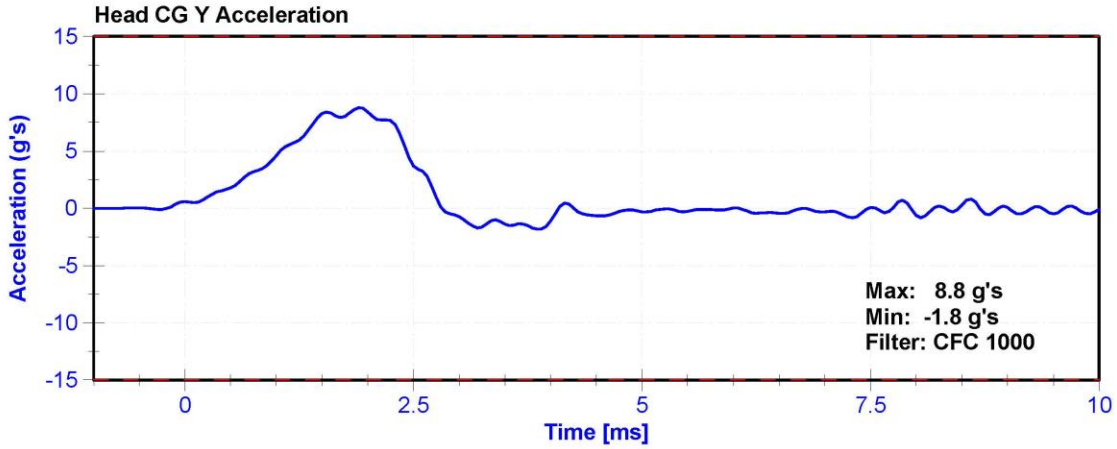
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21.3	Pass
Humidity	10	70	%	45.7	Pass
Resultant Acceleration	250	300	g's	254.7	Pass
Oscillation	0	10	%	1.7	Pass
Lateral Acceleration	-15	15	g's	8.8	Pass

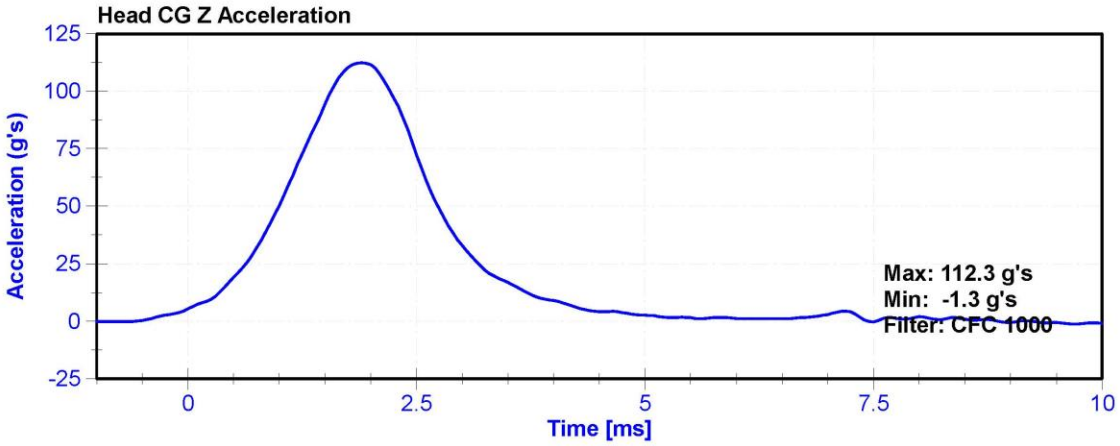
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264C-2K-TZ2	AC-P51945	4/14/2020	10/13/2020
Y Accelerometer	ENDEVCO 7264C-2K-TZ2	AC-P51974	4/14/2020	10/13/2020
Z Accelerometer	ENDEVCO 7264C-2K-TZ2	AC-P51946	4/14/2020	10/13/2020




Head CG X Acceleration
Acceleration (g's)
50
0
-50
-100
-150
-200
-250
0
2.5
5
7.5
10
Time [ms]
Max: 1.6 g's
Min: -228.5 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]
Max: 8.8 g's
Min: -1.8 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]
Max: 112.3 g's
Min: -1.3 g's
Filter: CFC 1000

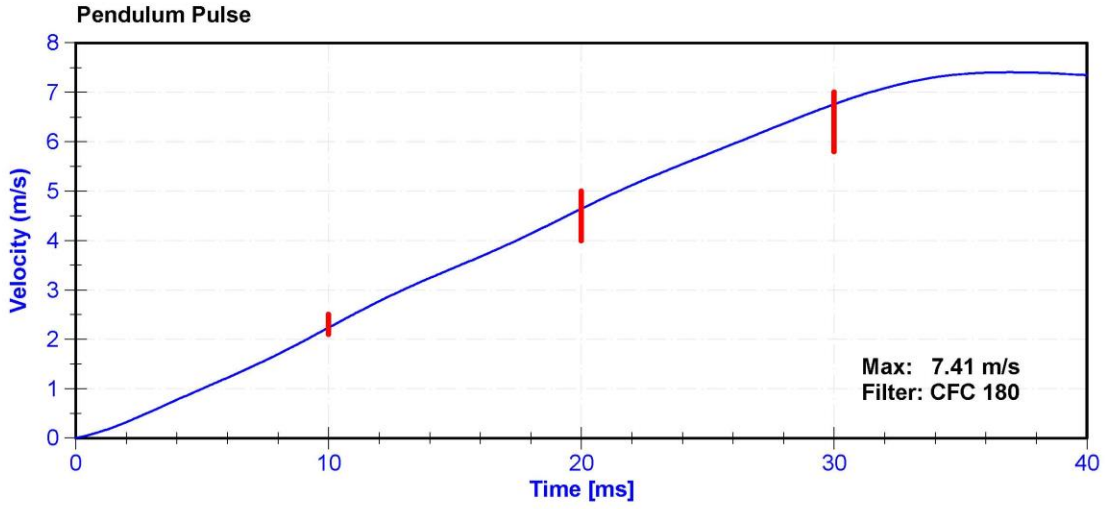
ATD Manufacturer	FTSS	Test Technician	E. Helenbrook
ATD Serial Number	288	Laboratory Supervisor	K. Brogan

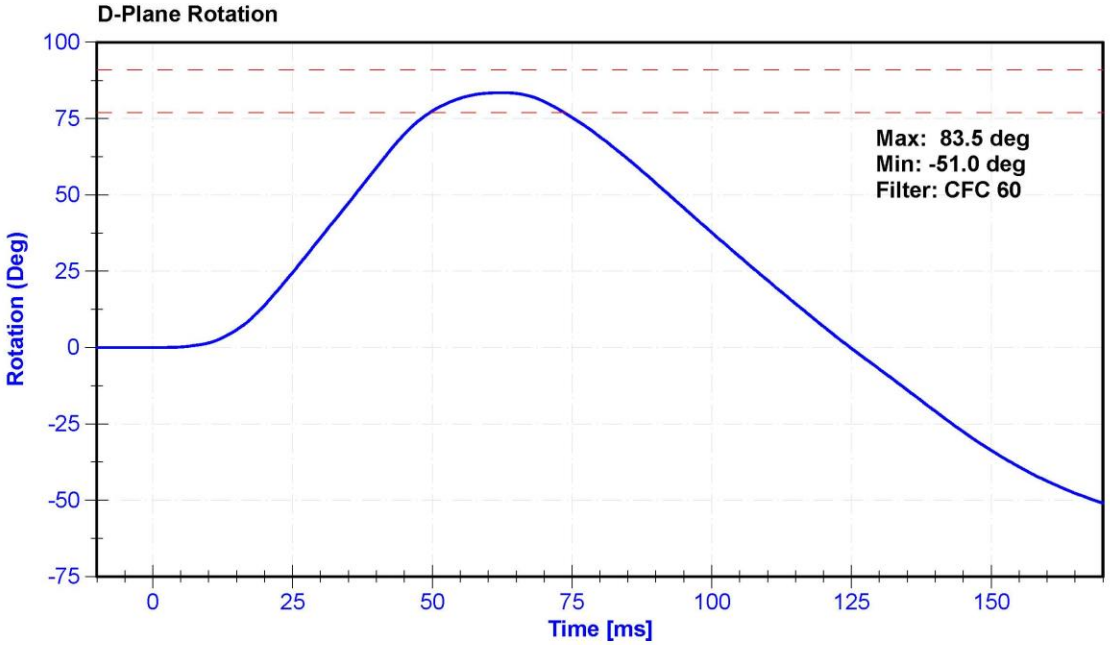
Results

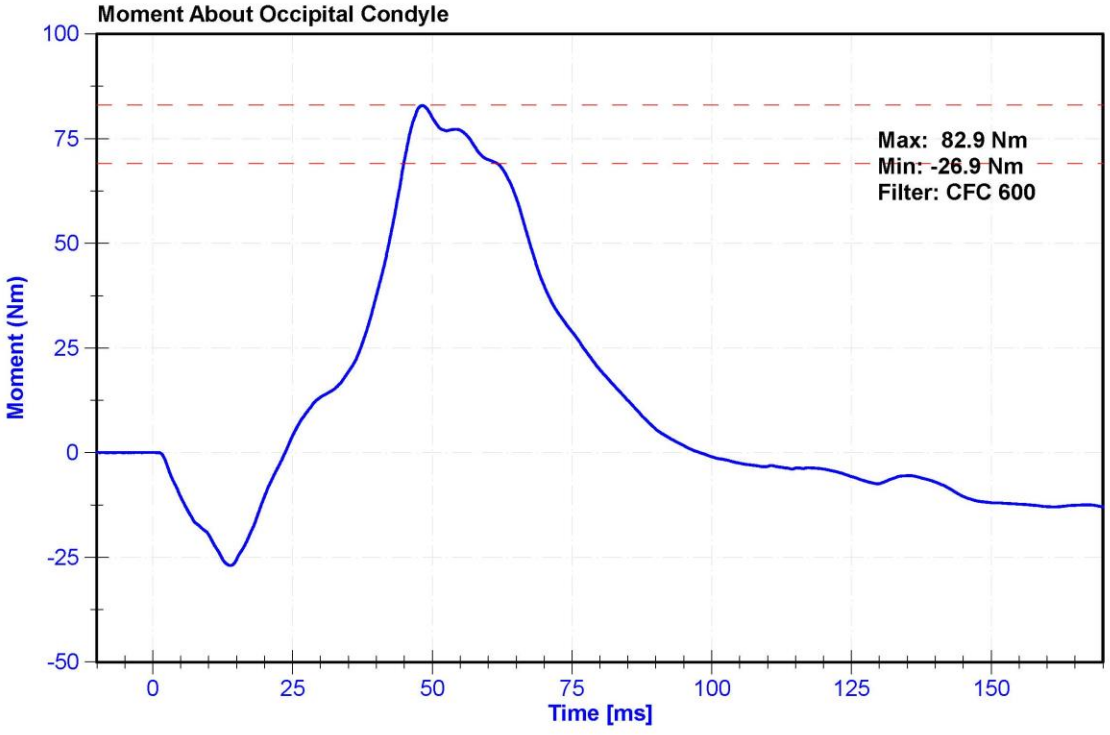
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.5	Pass
Humidity	10	70	%	60.4	Pass
Velocity	6.89	7.13	m/s	6.958	Pass
Pendulum Impulse at 10ms	2.1	2.5	m/s	2.23	Pass
Pendulum Impulse at 20ms	4.0	5.0	m/s	4.64	Pass
Pendulum Impulse at 30ms	5.8	7.0	m/s	6.76	Pass
Max D Plane Rotation	77	91	deg	83.5	Pass
Max Moment During Rotation Interval	69	83	Nm	82.9	Pass
Moment Decay to 10.0 Nm	80	100	ms	86.8	Pass

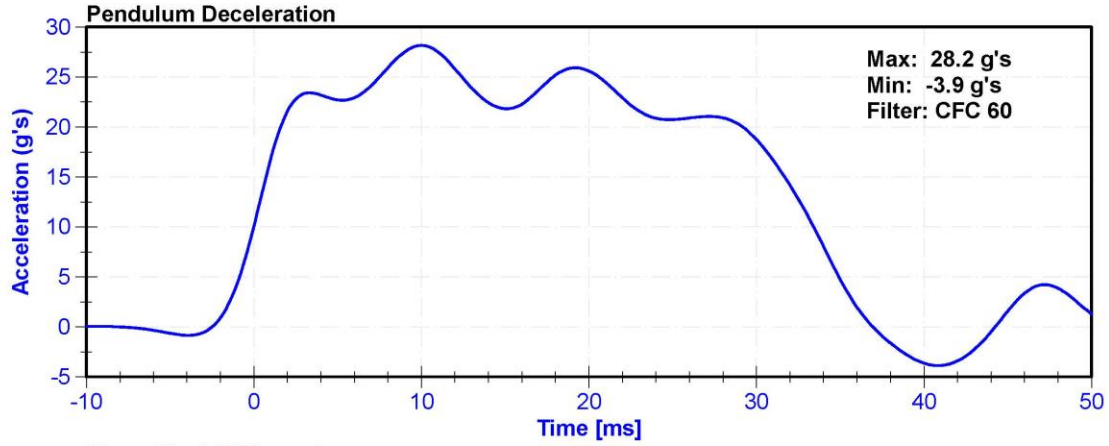
Transducer Calibrations

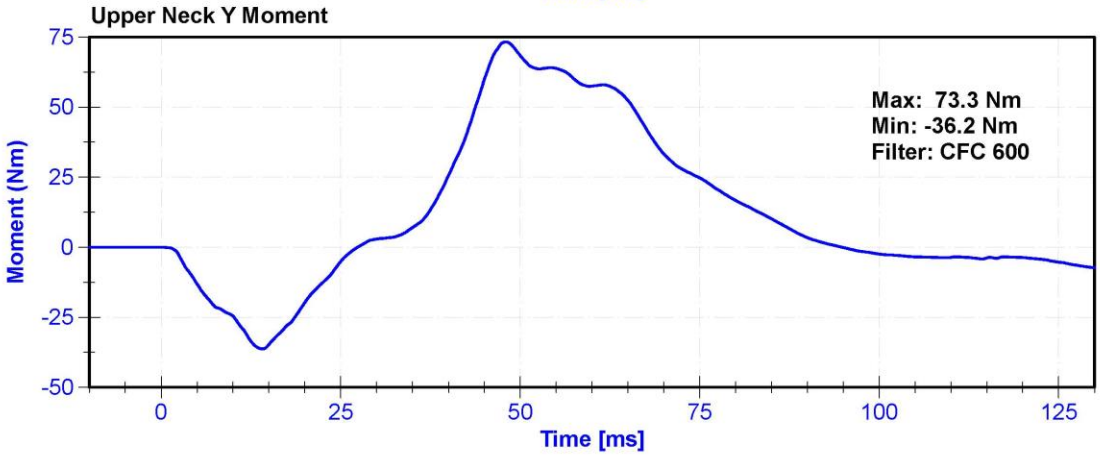
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C16503 Striker	2/6/2020	2/5/2021
Pendulum Potentiometer	ETI SP22G	DS-LABPOT1	9/13/2019	9/12/2020
Condyle Potentiometer	ETI SP22G	DS-LABPOT2	9/13/2019	9/12/2020
Upper Neck Load Cell	DENTON 1716A	17162206Fx	3/18/2020	3/18/2021

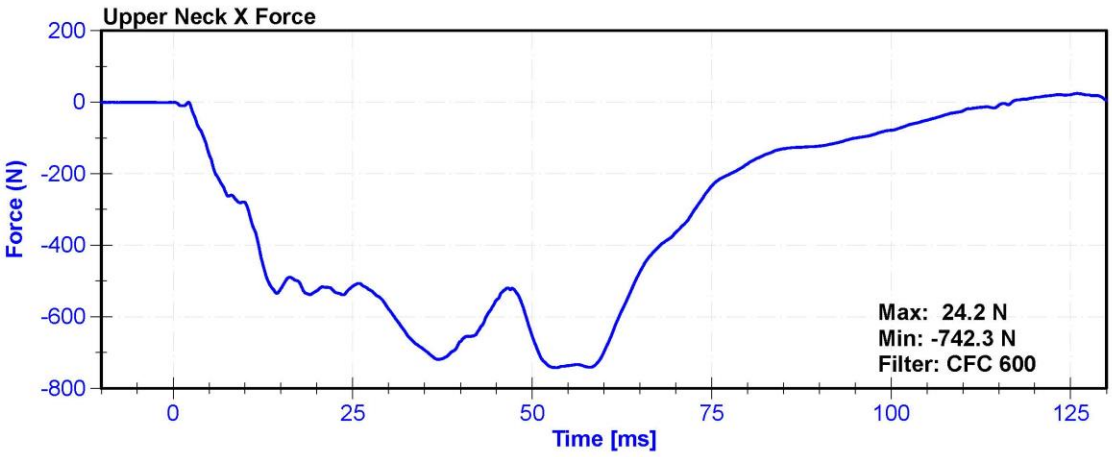



D-Plane Rotation
Max: 83.5 deg
Min: -51.0 deg
Filter: CFC 60
Rotation (Deg)
Time [ms]
100
75
50
25
0
-25
-50
-75
0
25
50
75
100
125
150


Moment About Occipital Condyle
Max: 82.9 Nm
Min: -26.9 Nm
Filter: CFC 600
Moment (Nm)
Time [ms]
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150


Pendulum Deceleration
Max: 28.2 g's
Min: -3.9 g's
Filter: CFC 60
Acceleration (g's)
Time [ms]


Upper Neck Y Moment
Max: 73.3 Nm
Min: -36.2 Nm
Filter: CFC 600
Moment (Nm)
Time [ms]


Upper Neck X Force
Max: 24.2 N
Min: -742.3 N
Filter: CFC 600
Force (N)
Time [ms]

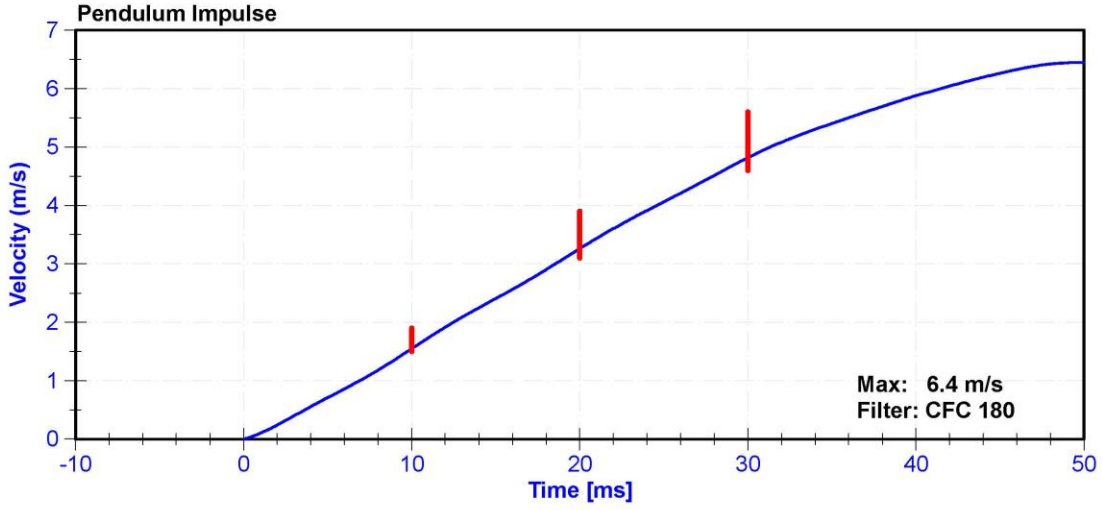
ATD Manufacturer	FTSS	Test Technician	E. Helenbrook
ATD Serial Number	288	Laboratory Supervisor	K. Brogan

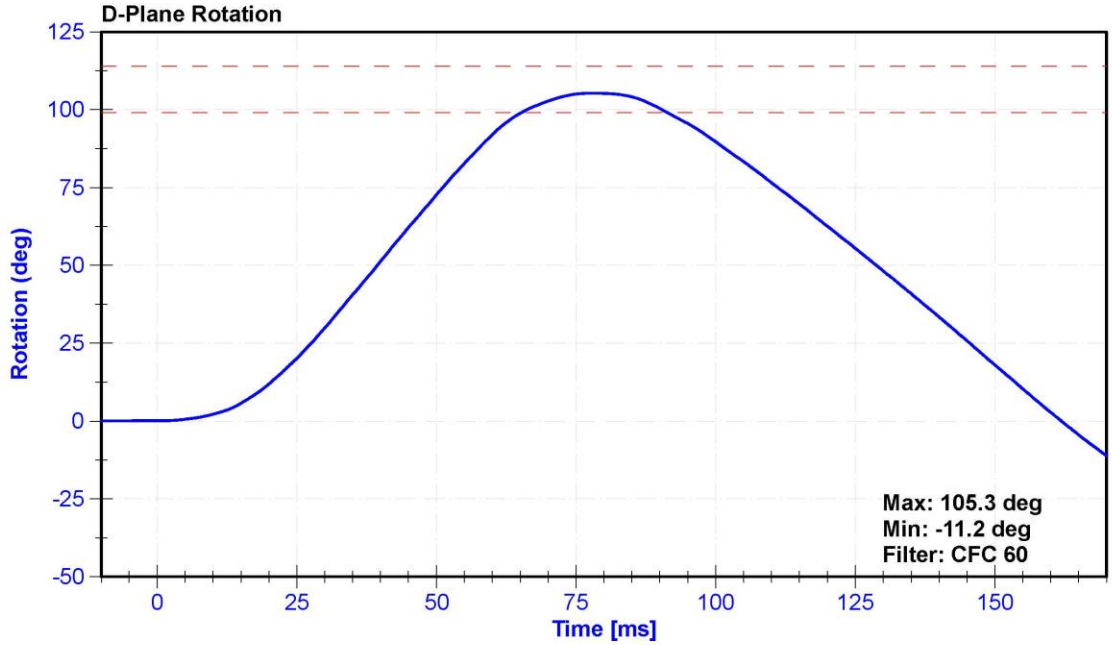
Results

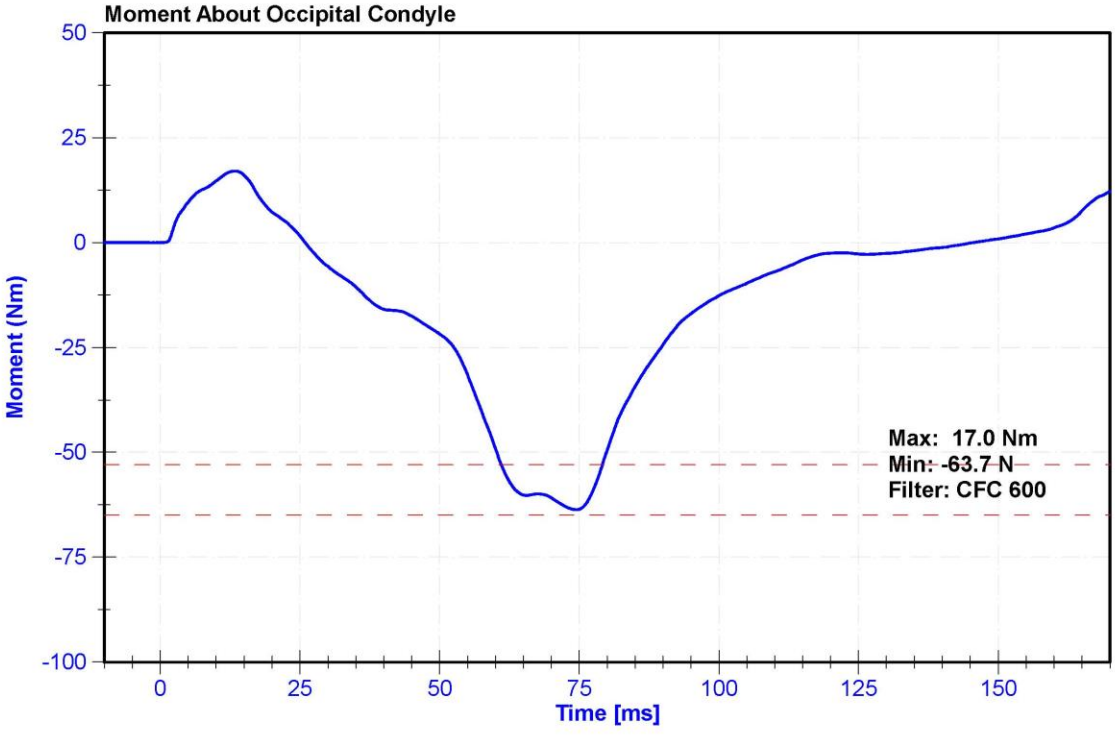
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.5	Pass
Humidity	10	70	%	60.4	Pass
Velocity	5.95	6.19	m/s	6.046	Pass
Pendulum Impulse at 10ms	1.5	1.9	m/s	1.55	Pass
Pendulum Impulse at 20ms	3.1	3.9	m/s	3.26	Pass
Pendulum Impulse at 30ms	4.6	5.6	m/s	4.82	Pass
D Plane Rotation	99	114	deg	105.3	Pass
Moment During Rotation Interval	-65	-53	Nm	-63.7	Pass
Moment Decay to -10Nm	94	114	ms	104.6	Pass

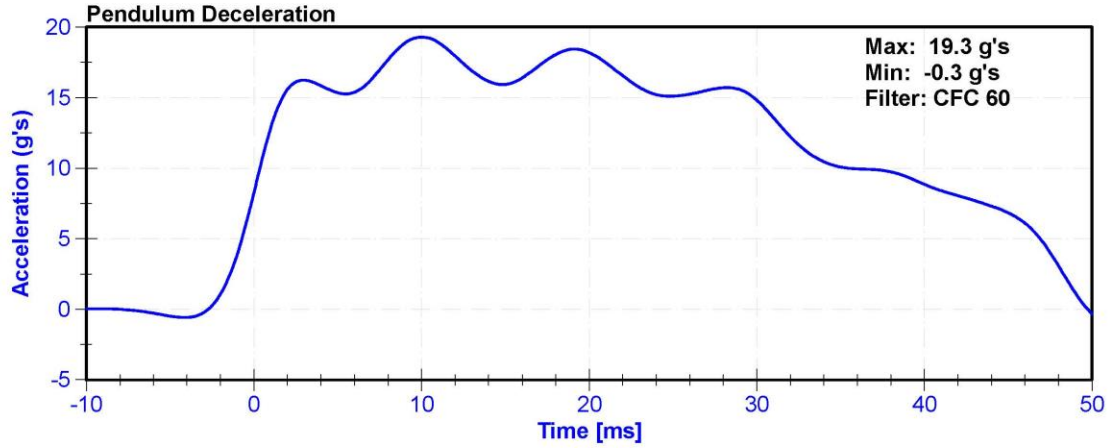
Transducer Calibrations

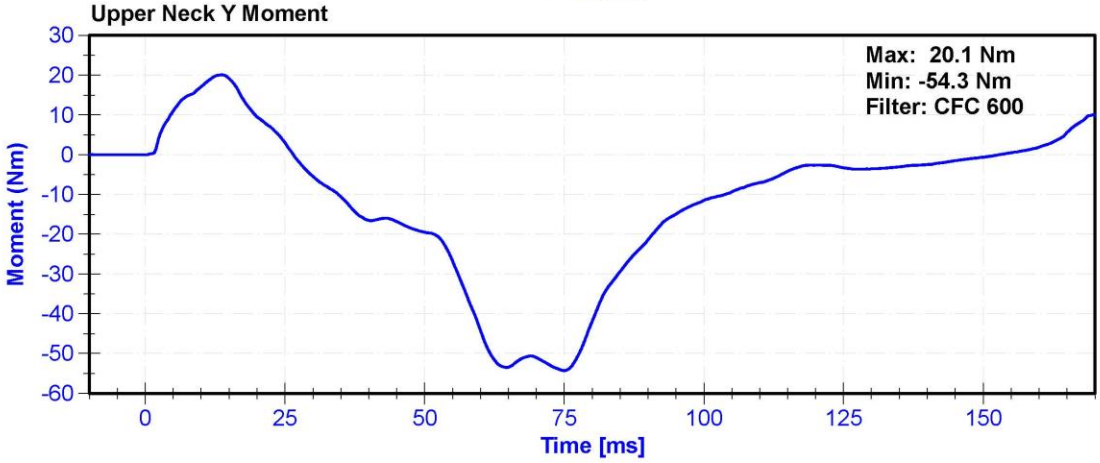
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C16503 Striker	2/6/2020	2/5/2021
Pendulum Potentiometer	ETI SP22G	DS-LABPOT1	9/13/2019	9/12/2020
Condyle Potentiometer	ETI SP22G	DS-LABPOT2	9/13/2019	9/12/2020
Upper Neck Load Cell	DENTON 1716A	17162206Fx	3/18/2020	3/18/2021

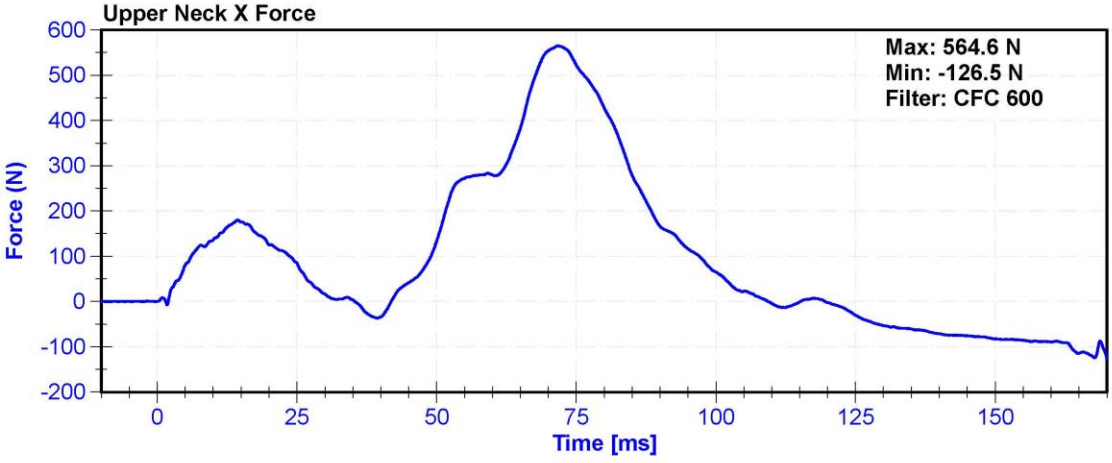



D-Plane Rotation
Rotation (deg)
125
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 105.3 deg
Min: -11.2 deg
Filter: CFC 60


Moment About Occipital Condyle
Moment (Nm)
50
25
0
-25
-50
-75
-100
0
25
50
75
100
125
150
Time [ms]
Max: 17.0 Nm
Min: -63.7 N
Filter: CFC 600


Pendulum Deceleration
Max: 19.3 g's
Min: -0.3 g's
Filter: CFC 60
Acceleration (g's)
Time [ms]


Upper Neck Y Moment
Max: 20.1 Nm
Min: -54.3 Nm
Filter: CFC 600
Moment (Nm)
Time [ms]


Upper Neck X Force
Max: 564.6 N
Min: -126.5 N
Filter: CFC 600
Force (N)
Time [ms]

ATD Manufacturer	FTSS	Test Technician	E. Helenbrook
ATD Serial Number	288	Laboratory Supervisor	K. Brogan

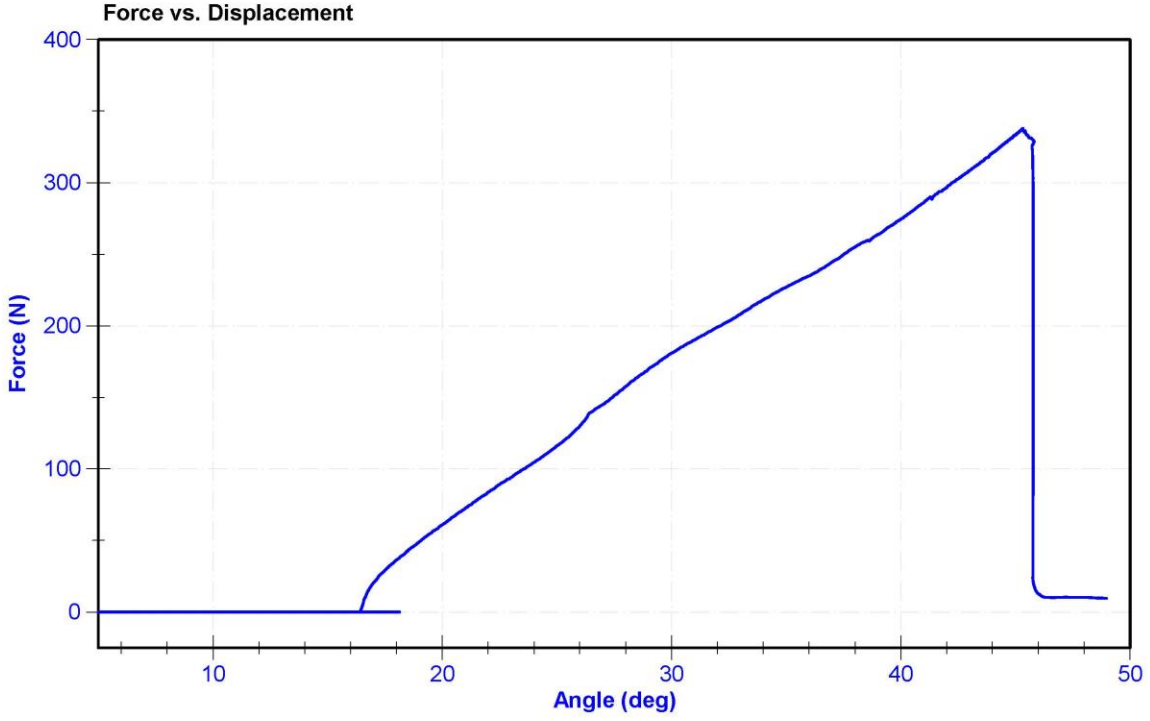
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.6	25.6	ºC	21.5	Pass
Humidity	10	70	%	55.4	Pass
Initial Angle	0	20	deg	16.4	Pass
Force at 45 Degrees	320	390	N	338.0	Pass
Return Angle Relative to Initial	0	8	deg	3.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	Rieker N4C-1	DS-13051548	12/9/2019	12/8/2020
Load Cell	Interface SML-200	LC-493319	1/10/2020	1/9/2021

Force vs. Displacement



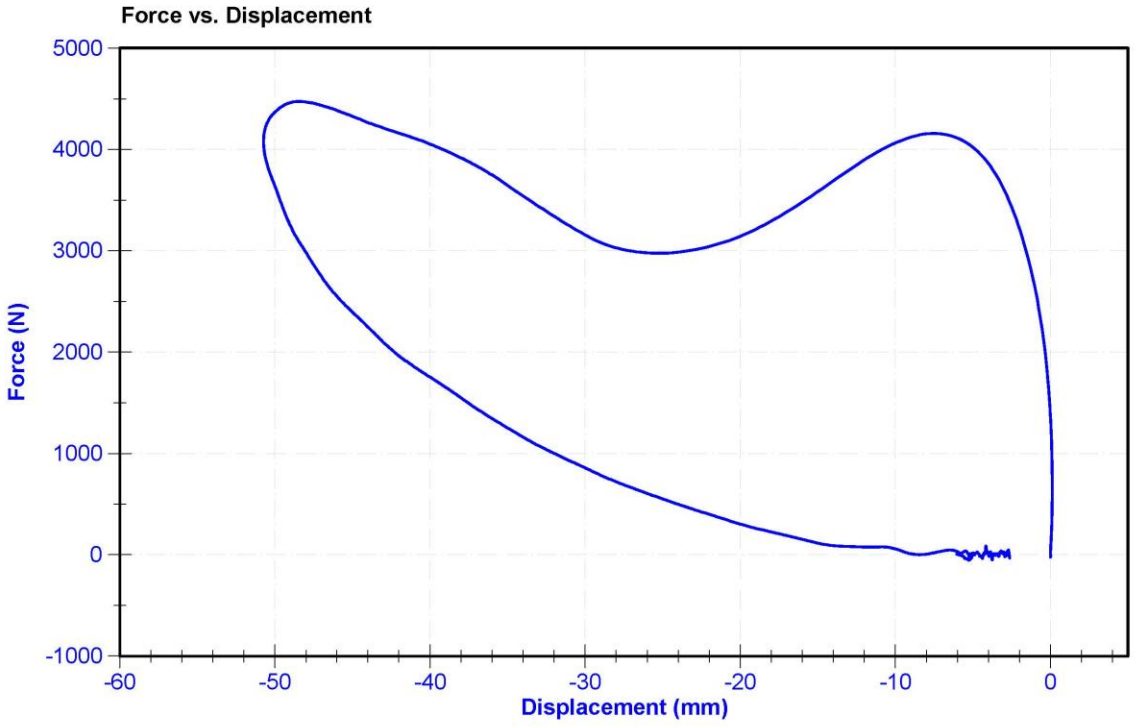
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	288	Laboratory Supervisor	K. Brogan

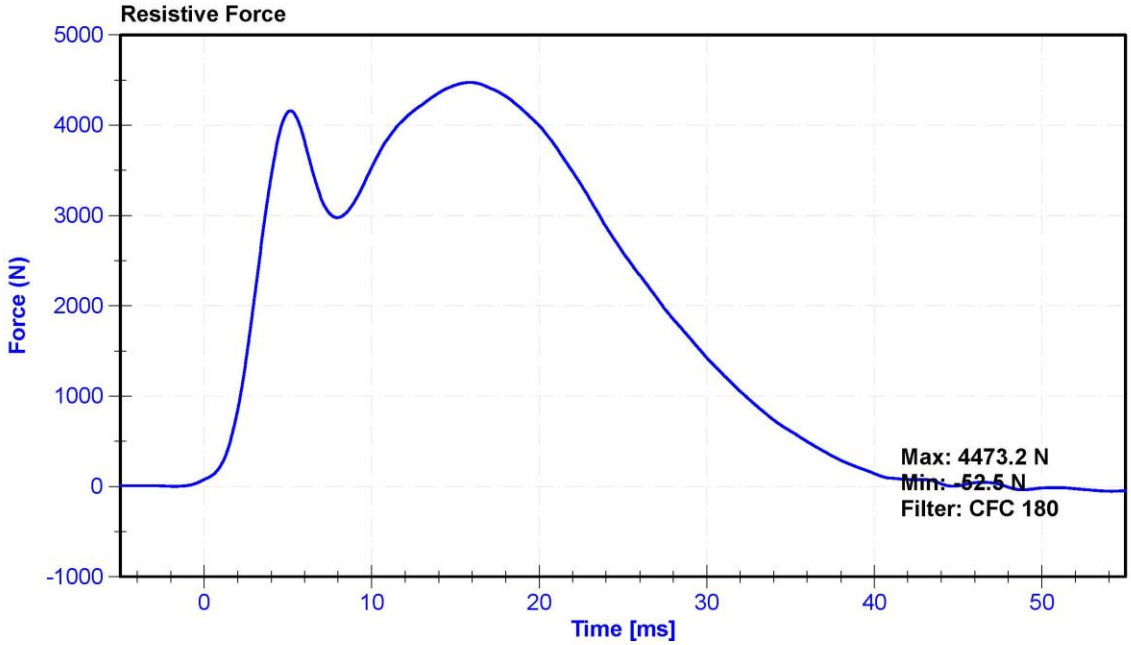
Results

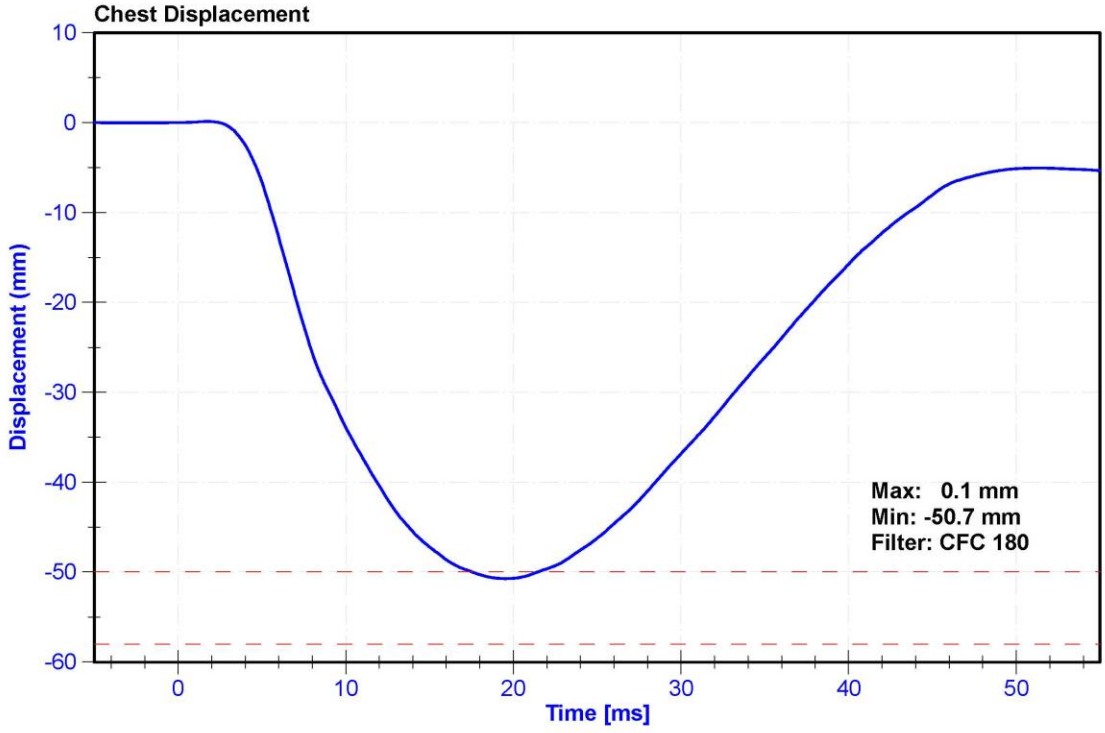
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.7	Pass
Humidity	10	70	%	62	Pass
Velocity	6.59	6.83	m/s	6.655	Pass
Chest Deflection	-58	-50	mm	-50.7	Pass
Maximum Resistive Force (50 to 58mm)	3900	4400	N	4368.2	Pass
Maximum Resistive Force (18 to 50mm)	0	4600	N	4473.2	Pass
Hysteresis	69	85	%	74.5	Pass

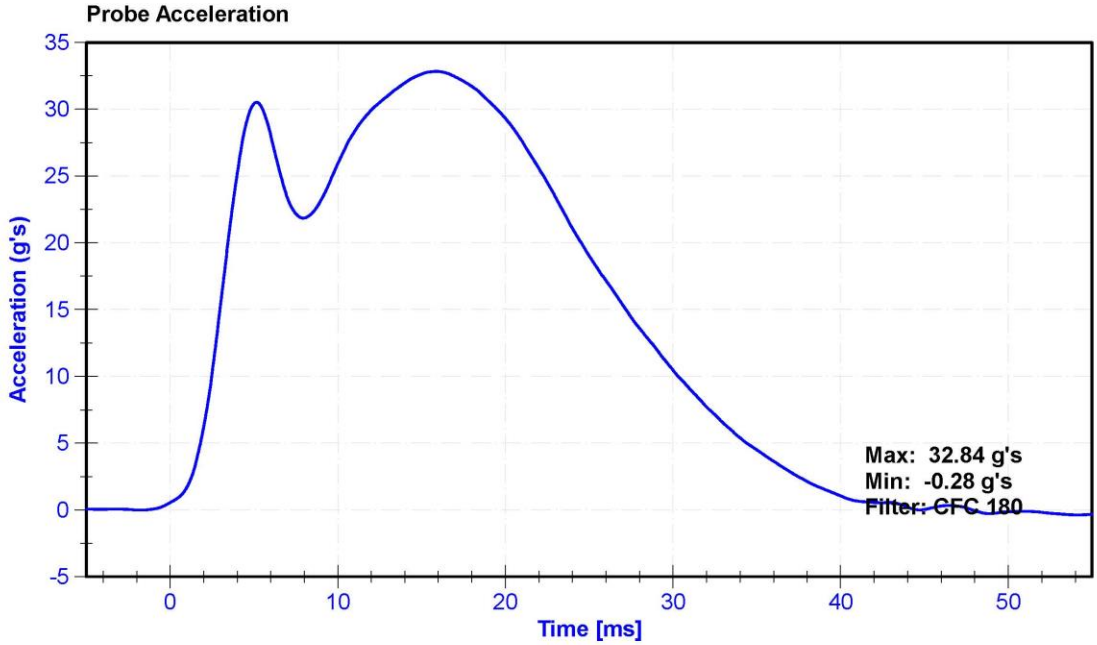
Transducer Calibrations

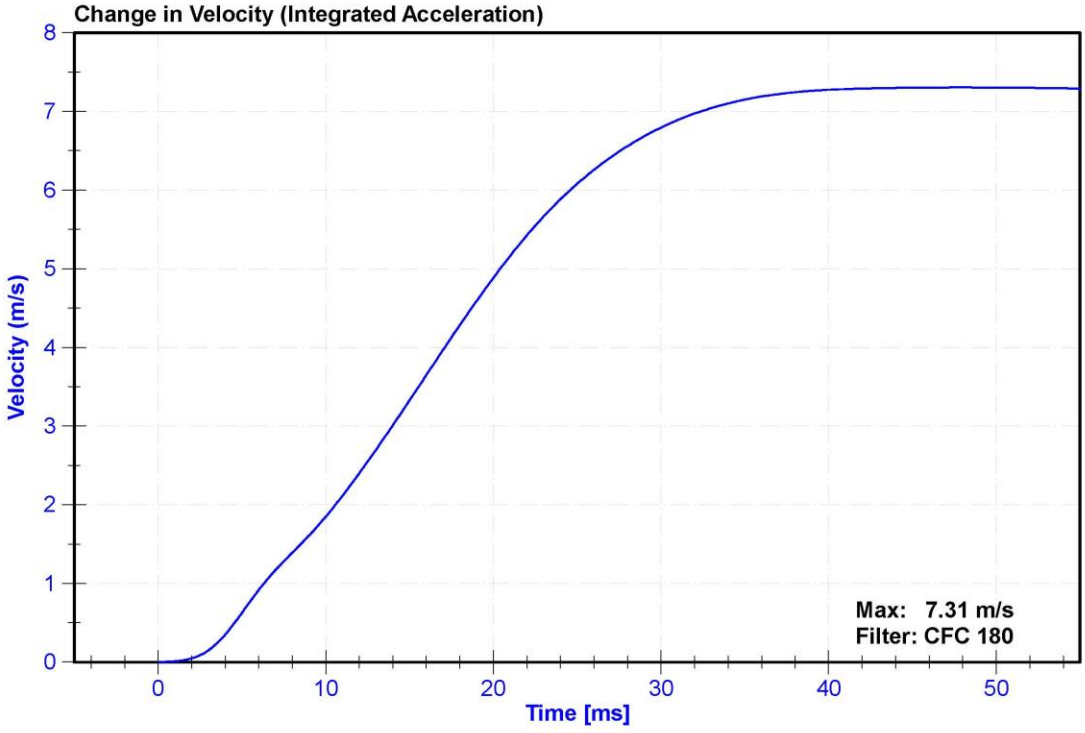
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A286228	1/29/2020	1/28/2021
Chest Potentiometer	SERVO 14CB1-2897	DS-288GFE	4/17/2020	10/16/2020




Resistive Force
Force (N)
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]
Max: 4473.2 N
Min: -52.5 N
Filter: CFC 180


Chest Displacement
Displacement (mm)
10
0
-10
-20
-30
-40
-50
-60
0
10
20
30
40
50
Time [ms]
Max: 0.1 mm
Min: -50.7 mm
Filter: CFC 180


Probe Acceleration
Acceleration (g's)
35
30
25
20
15
10
5
0
-5
0
10
20
30
40
50
Time [ms]
Max: 32.84 g's
Min: -0.28 g's
Filter: CFC 180


Change in Velocity (Integrated Acceleration)
Velocity (m/s)
8
7
6
5
4
3
2
1
0
0
10
20
30
40
50
Time [ms]
Max: 7.31 m/s
Filter: CFC 180

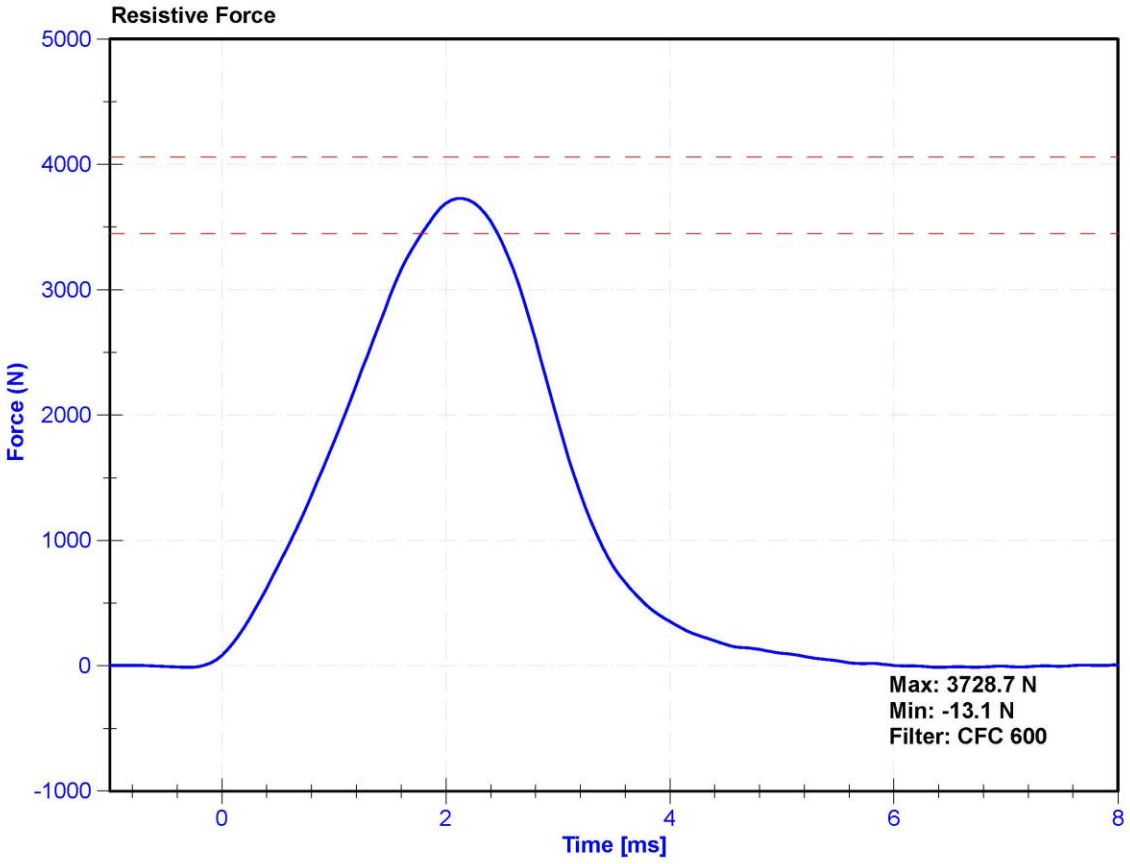
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	288	Laboratory Supervisor	K. Brogan

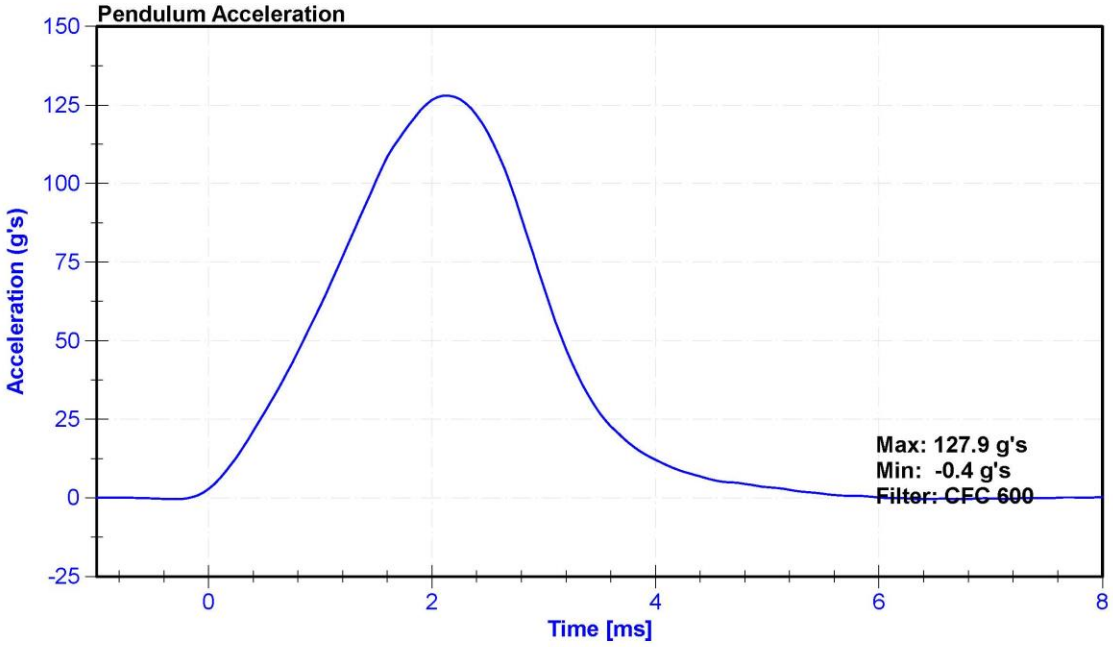
Results

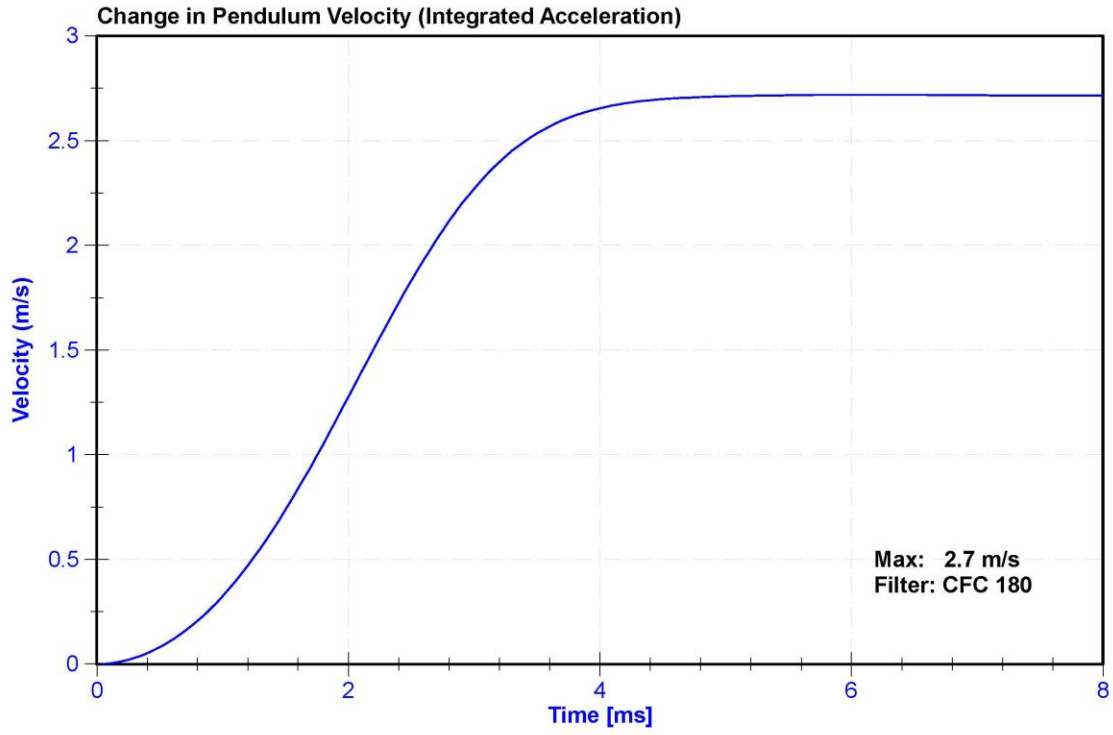
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	20.6	Pass
Humidity	10	70	%	60.0	Pass
Velocity	2.07	2.13	m/s	2.108	Pass
Resistive Force	3450	4060	N	3728.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A279031	5/8/2020	5/8/2021




Pendulum Acceleration
Acceleration (g's)
150
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]
Max: 127.9 g's
Min: -0.4 g's
Filter: CFC 600


Change in Pendulum Velocity (Integrated Acceleration)
Velocity (m/s)
3
2.5
2
1.5
1
0.5
0
0
2
4
6
8
Time [ms]
Max: 2.7 m/s
Filter: CFC 180

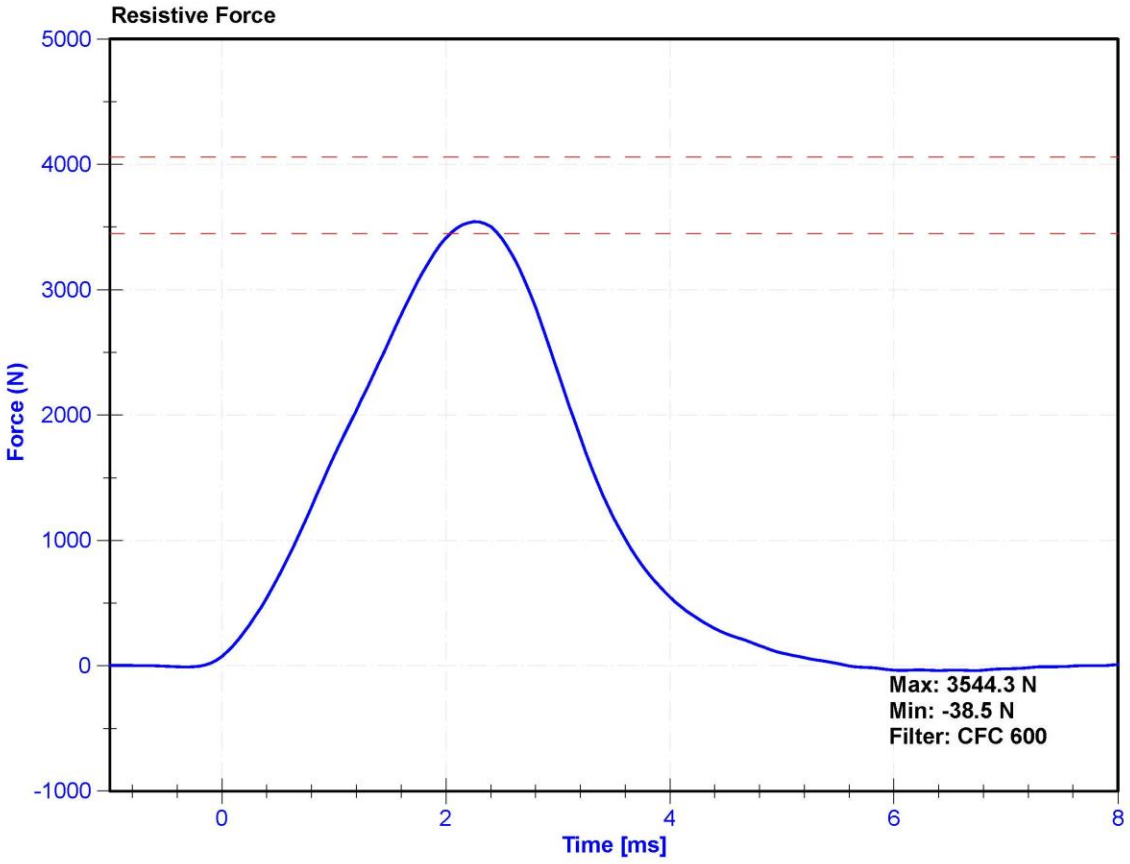
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	288	Laboratory Supervisor	K. Brogan

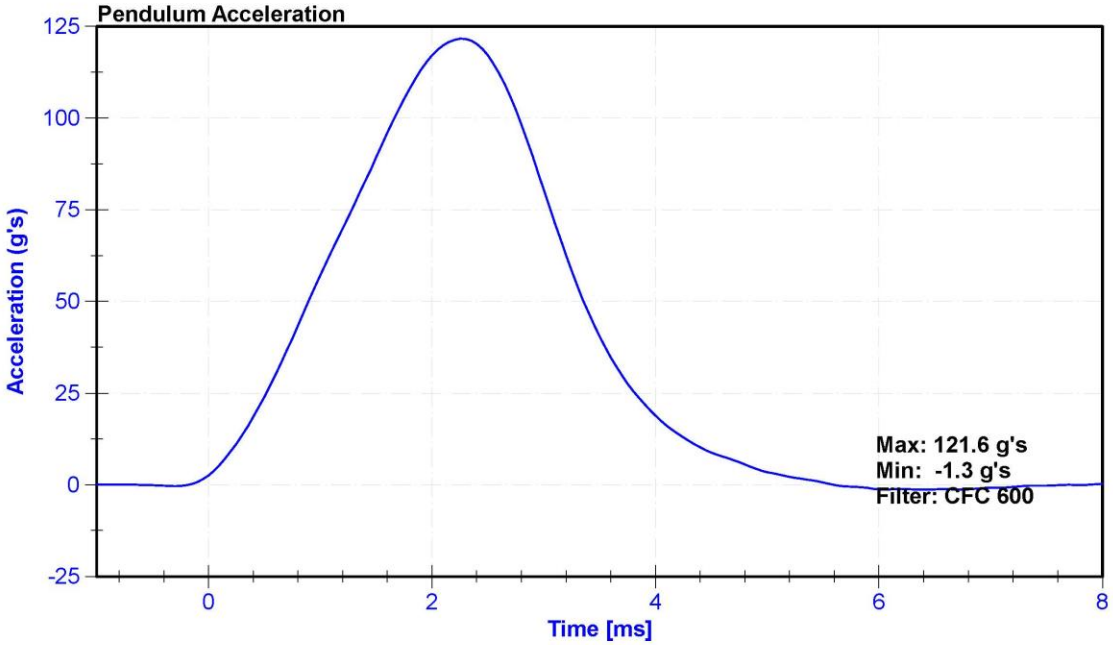
Results

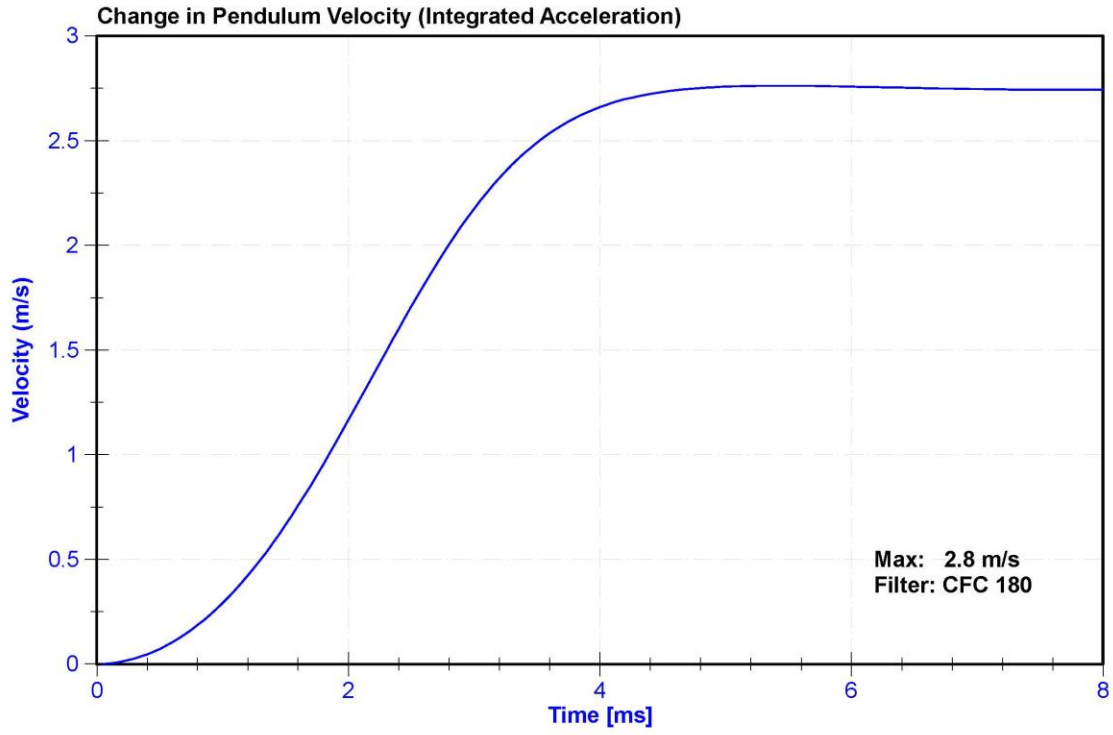
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	20.6	Pass
Humidity	10	70	%	59.0	Pass
Velocity	2.07	2.13	m/s	2.105	Pass
Resistive Force	3450	4060	N	3544.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A279031	5/8/2020	5/8/2021




Pendulum Acceleration
Acceleration (g's)
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]
Max: 121.6 g's
Min: -1.3 g's
Filter: CFC 600


Change in Pendulum Velocity (Integrated Acceleration)
Velocity (m/s)
3
2.5
2
1.5
1
0.5
0
0
2
4
6
8
Time [ms]
Max: 2.8 m/s
Filter: CFC 180

APPENDIX D

DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

Table 1 – Driver Dummy Instrumentation

Instrumentation		Axis/Location	Hybrid III 50th S/N:142		
			Serial Number	Manufacturer	Calibration Date
Head Accelerometers	Primary	X	P51681	ENDEVCO	4/17/2020
		Y	P64151	ENDEVCO	4/17/2020
		Z	P52114	ENDEVCO	4/17/2020
	Redundant	X	P58833	ENDEVCO	4/17/2020
		Y	P58905	ENDEVCO	4/17/2020
		Z	P63996	ENDEVCO	4/17/2020
Head Angular Rate Sensors		X	ARS15217GFE	DTS ARS	2/21/2020
		Y	ARS15697GFE	DTS ARS	2/21/2020
		Z	ARS15696GFE	DTS ARS	2/21/2020
Upper Neck Load Cell		FX, Fy, Fz MX,MY, MZ	LC-280FxGFE	Denton	10/3/2019
Chest Accelerometers	Primary	X	AC-P51994	ENDEVCO	5/15/2020
		Y	AC-P51991	ENDEVCO	5/15/2020
		Z	AC-P49185	ENDEVCO	5/15/2020
	Redundant	X	AC-P51713	ENDEVCO	5/15/2020
		Y	AC-P68059	ENDEVCO	5/15/2020
		Z	AC-P78824	ENDEVCO	5/15/2020
Chest Potentiometer		X	DS-142	Servo	6/23/2020
Pelvis Accelerometer		X	AC-P58800	ENDEVCO	4/17/2020
		Y	AC-P52157	ENDEVCO	4/17/2020
		Z	AC-P52156	ENDEVCO	4/17/2020
Femur Load Cells - Left	Primary	Z	LC-115-1 Fz	Denton	10/3/2019
	Redundant	Z	LC-115-2 Fz	Denton	10/3/2019
Femur Load Cells - Right	Primary	Z	LC-DI4210FZ1	Denton	10/3/2019
	Redundant	Z	LC-DI4210FZ2	Denton	10/3/2019
Tibia Load Cells - Left	Upper	MX, MY, FZ	LC-404Fx	Denton	9/25/2019
	Lower	MX, MY, FZ	LC-396Fz	Denton	9/25/2019
Tibia Load Cells – Right	Upper	MX, MY, FZ	LC-364Fz	Denton	10/3/2019
	Lower	MX, MY, FZ	36440364 FZ	Denton	9/25/2019
Foot Accelerometers - Left	Rear	X	AC-P50084	ENDEVCO	4/20/2020
	Front	Z	AC-P58779	ENDEVCO	4/20/2020
Foot Accelerometers - Right	Rear	X	AC-P51872	ENDEVCO	4/20/2020
	Front	Z	AC-P58893	ENDEVCO	4/20/2020
Seat belt Load Cells	Lap		LC-174	FTSS IF-964	5/1/2020
	Shoulder		LC-DK1753	FTSS IF-964	5/1/2020

Table 2 – Front Passenger Dummy Instrumentation

Instrumentation		Axis/Location	Hybrid III 5th S/N: 288		
			Serial Number	Manufacturer	Calibration Date
Head Accelerometers	Primary	X	AC-P51945	ENDEVCO	4/14/2020
		Y	AC-P51974	ENDEVCO	4/14/2020
		Z	AC-P51946	ENDEVCO	4/14/2020
	Redundant	X	AC-P49200	ENDEVCO	4/14/2020
		Y	AC-P51950	ENDEVCO	4/14/2020
		Z	AC-P49440	ENDEVCO	4/14/2020
Head Angular Rate Sensors		X	ARS14917GFE	DTS ARS	2/21/2020
		Y	ARS15692GFE	DTS ARS	2/21/2020
		Z	ARS15695GFE	DTS ARS	2/21/2020
Upper Neck Load Cell		FX, Fy, Fz MX,MY, MZ	17162206Fx	DENTON	3/18/2020
Chest Accelerometers	Primary	X	AC-P52064	ENDEVCO	9/4/2020
		Y	AC-P63995	ENDEVCO	9/4/2020
		Z	AC-P83317	ENDEVCO	5/8/2020
	Redundant	X	AC-P52087	ENDEVCO	9/4/2020
		Y	T20868	ENDEVCO	5/22/2020
		Z	AC-P59020	ENDEVCO	5/8/2020
Chest Potentiometer		X	DS-288GFE	SERVO	4/17/2020
Pelvis Accelerometer		X	AC-P58871	ENDEVCO	4/7/2020
		Y	AC-P51734	ENDEVCO	4/20/2020
		Z	AC-P58776	ENDEVCO	4/20/2020
Femur Load Cells - Left	Primary	Z	LC-DI4213-1	DENTON	3/19/2020
	Redundant	Z	LC-DI4213-2	DENTON	3/19/2020
Femur Load Cells - Right	Primary	Z	LC-DH3271Fz1	DENTON	3/19/2020
	Redundant	Z	LC-DH3271Fz2	DENTON	3/19/2020
Tibia Load Cells - Left	Upper	MX, MY, FZ	LC-651 Fz	DENTON	3/19/2020
	Lower	MX, MY, FZ	LC-505 Fz	DENTON	3/19/2020
Tibia Load Cells – Right	Upper	MX, MY, FZ	LC-652 Fz	DENTON	3/19/2020
	Lower	MX, MY, FZ	LC-673 Fz	DENTON	3/19/2020
Foot Accelerometers - Left	Rear	X	AC-P77587	ENDEVCO	4/17/2020
	Front	Z	AC-P79602	ENDEVCO	4/20/2020
Foot Accelerometers - Right	Rear	X	P12566	ENDEVCO	4/15/2020
	Front	Z	AC-P64122	ENDEVCO	4/15/2020
Seat belt Load Cells	Lap		LC-278	FTSS IF-964	5/1/2020
	Shoulder		LC-290	FTSS IF-964	5/1/2020

Table 3 – Vehicle Instrumentation

Instrumentation			Axis	Serial Number	Manufacturer	Calibration Date
Crossmember/Rear Seat Accelerometers	Left	Primary	X	A280945	MSI 1201-1000	7/14/2020
			Z	A284983	MSI 1201-1000	7/14/2020
		Redundant	X	A247202	MSI 1201-1000	1/28/2020
	Right	Primary	X	A229241	MSI 1201-1000	5/1/2020
			Z	A280191	MSI 1201-1000	5/1/2020
		Redundant	X	A262051	MSI 1201-1000	5/1/2020
Engine Accelerometers	Top		X	A315971	MSI 1201-1000	8/6/2020
	Bottom		X	A315949	MSI 1201-1000	5/6/2020