

REPORT NUMBER: NCAP-MGA-2018-006

**NEW CAR ASSESSMENT PROGRAM (NCAP)
Frontal Barrier Impact Test**

**VOLKSWAGEN GROUP OF AMERICA CHATTANOOGA OPERATIONS, LLC
2018 Volkswagen Atlas Launch Edition AWD 5-Door SUV
NHTSA No.: O20185800**

**MGA RESEARCH CORPORATION
5000 Warren Road
Burlington, WI 53105**



Test Date: August 24, 2017

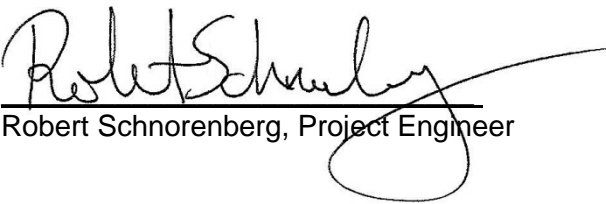
Final Report Date: September 28, 2017

FINAL REPORT

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

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Prepared by: 
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Approved by: 
Robert Schnorenberg, Project Engineer

Approval Date: September 28, 2017

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 MGA Research Corporation 5000 Warren Road Burlington, WI 53105 | | 10. Work Unit No. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 15. Supplementary Notes | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>16. Abstract</p> <p>A 56.3 km/h NCAP Frontal Impact Test was conducted on a 2018 Volkswagen Atlas Launch Edition AWD 5-Door SUV in accordance with the specifications of the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), and 301 performance. The test was conducted at MGA Research Corporation in Burlington, Wisconsin on August 24, 2017.</p> <p>The impact velocity of the vehicle was 56.73 km/h and the ambient temperature at the barrier face at the time of impact was 21.5°C. The target vehicle post-test maximum crush was 464mm located to the right of the vehicle centerline. The test vehicle's performance was as follows:</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th rowspan="2">Units</th> <th colspan="2">Driver ATD</th> <th colspan="2">Passenger ATD</th> </tr> <tr> <th>Threshold</th> <th>Result</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₁₅)</td> <td>N/A</td> <td>700</td> <td style="background-color: yellow;">232</td> <td>700</td> <td style="background-color: yellow;">138</td> </tr> <tr> <td>Maximum Chest</td> <td>mm</td> <td>63</td> <td style="background-color: yellow;">24</td> <td>52</td> <td style="background-color: yellow;">17</td> </tr> <tr> <td>Nij</td> <td>N/A</td> <td>1</td> <td style="background-color: yellow;">0.34</td> <td>1</td> <td style="background-color: yellow;">0.33</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4170</td> <td style="background-color: yellow;">1961</td> <td>2620</td> <td style="background-color: yellow;">802</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4000</td> <td style="background-color: yellow;">229</td> <td>2520</td> <td style="background-color: yellow;">203</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10008</td> <td style="background-color: yellow;">146</td> <td>6805</td> <td style="background-color: yellow;">693</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10008</td> <td style="background-color: yellow;">969</td> <td>6805</td> <td style="background-color: yellow;">1026</td> </tr> </tbody> </table> | | | | | | Measurement Description | Units | Driver ATD | | Passenger ATD | | Threshold | Result | Threshold | Result | Head Injury Criteria (HIC ₁₅) | N/A | 700 | 232 | 700 | 138 | Maximum Chest | mm | 63 | 24 | 52 | 17 | Nij | N/A | 1 | 0.34 | 1 | 0.33 | Neck Tension | N | 4170 | 1961 | 2620 | 802 | Neck Compression | N | 4000 | 229 | 2520 | 203 | Left Femur Force | N | 10008 | 146 | 6805 | 693 | Right Femur Force | N | 10008 | 969 | 6805 | 1026 |
| Measurement Description | Units | Driver ATD | | Passenger ATD | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Threshold | Result | Threshold | Result | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Head Injury Criteria (HIC ₁₅) | N/A | 700 | 232 | 700 | 138 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Maximum Chest | mm | 63 | 24 | 52 | 17 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Nij | N/A | 1 | 0.34 | 1 | 0.33 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Neck Tension | N | 4170 | 1961 | 2620 | 802 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Neck Compression | N | 4000 | 229 | 2520 | 203 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Left Femur Force | N | 10008 | 146 | 6805 | 693 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Right Femur Force | N | 10008 | 969 | 6805 | 1026 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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SECTION 1 PURPOSE AND SUMMARY OF TEST

PURPOSE

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

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

SUMMARY

A load cell barrier consisting of 176 load cells was impacted by a 2018 Volkswagen Atlas Launch Edition AWD 5-Door SUV at a velocity of 56.73 km/h. The test was performed at MGA Research Corporation on August 24, 2017. Pre-test and post-test photographs of the vehicle and dummies can be found in Appendix A.

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

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

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

The driver (position 1) ATD (Serial No. 351) and the right-front passenger (position 2) ATD (Serial No. 138) were calibrated previous to this test. Certification details, along with instrumentation calibration data, are found in Appendix C of this report.

The 630 channels of data were recorded on a data acquisition system. Appendix B contains the dummy response data traces.

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

The maximum static crush of the vehicle was 464mm to the right of the vehicle centerline and both the driver and passenger side doors remained closed during the impact event and were operable after the impact.

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

The occupant data is summarized below:

| ATD position | HIC ₁₅ | Nij | Neck Tension (N) | Neck Comp. (N) | 3ms Chest Clip (Gs) | Chest Disp. (mm) | Left Femur (N) | Right Femur (N) |
|------------------------------|-------------------|------|------------------|----------------|---------------------|------------------|----------------|-----------------|
| Driver (50 th) | 232 | 0.34 | 1961 | 229 | 46 | 24 | 146 | 969 |
| Passenger (5 th) | 138 | 0.33 | 802 | 203 | 37 | 17 | 693 | 1026 |

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

TEST NOTES

Driver Shoulder and Lap Belt load cells were not installed.
 Passenger Shoulder and Lap Belt load cells were not installed.
 Top of Engine X recorded no valid data after 45 milliseconds.
 Barrier K-16 My recorded no valid data.
 Barrier K-09 Fx recorded questionable data.
 Barrier K-09 My recorded questionable data.
 Barrier K-09 Mz recorded questionable data.
 Barrier F-01 Fx recorded no valid data.
 Barrier F-01 My recorded no valid data.
 Barrier F-01 Mz recorded no valid data.
 Barrier C-04 Fx recorded no valid data.
 Barrier C-04 My recorded no valid data.
 Barrier C-04 Mz recorded no valid data.
 Camera No. 7 – Right Overall did not record.
 Camera No. 8 – Right Front Half did not record.
 Camera No. 9 – Passenger Close-Up did not record.
 Camera No. 10 – Right Angle did not record.

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

SECTION 2
OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

**DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2018 Volkswagen Atlas Launch Edition 5-Door SUV NHTSA No.: O20185800
 Test Program: NCAP Frontal Barrier Impact Test Test Date: 8/24/2017

TEST VEHICLE INFORMATION AND OPTIONS

| | | | |
|-----------------------------|------------------------|---------------------------------|-----|
| NHTSA No. | O20185800 | Traction Control System (TCS) | Yes |
| Model Year | 2018 | Power Steering | Yes |
| Make | Volkswagen | Power Window Auto-Reverse | Yes |
| Model | Atlas Launch Edition | Driver Frontal Airbag | Yes |
| Body Style | 5-Door SUV | Driver Curtain Airbag | Yes |
| VIN | 1V2HR2CA4JC504316 | Driver Head/Torso Airbag | No |
| Body Color | Reflex Silver Metallic | Driver Torso Airbag | No |
| Odometer (km/mi) | 164km / 102mi | Driver Torso/Pelvis Airbag | Yes |
| Engine Displacement (L) | 3.6 L | Driver Pelvis Airbag | No |
| Type/No. Cylinders | V6 | Driver Knee Airbag | No |
| Engine Placement | Lateral | Front Pass. Frontal Airbag | Yes |
| Transmission Type | Automatic | Front Pass. Curtain Airbag | Yes |
| Transmission Speeds | 8 | Front Pass. Head/Torso Airbag | No |
| Overdrive | Yes | Front Pass. Torso Airbag | No |
| Final Drive | AWD | Front Pass. Torso/Pelvis Airbag | Yes |
| Roof Rack | No | Front Pass. Pelvis Airbag | No |
| Sunroof/T-Top | Yes | Front Pass. Knee Airbag | No |
| Running Boards | No | Driver Pretensioner | Yes |
| Tilt Steering Wheel | Yes | Driver Load Limiter | Yes |
| Power Seats | No | Front Pass. Pretensioner | Yes |
| Anti-Lock Brakes (ABS) | Yes | Front Pass. Load Limiter | Yes |
| Automatic Door Locks (ADLs) | Yes | Other | N/A |

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

DATA FROM CERTIFICATION LABEL

| | | | |
|---------------------|------------------------------------------------------------|-----------------|------|
| Manufactured By | VOLKSWAGEN GROUP OF AMERICA CHATTANOOGA OPERATIONS, LLC | GVWR (kg) | 2720 |
| | | GAWR Front (kg) | 1340 |
| Date of Manufacture | 04/17 | GAWR Rear (kg) | 1430 |

VEHICLE SEATING AND WEIGHT CAPACITY DATA

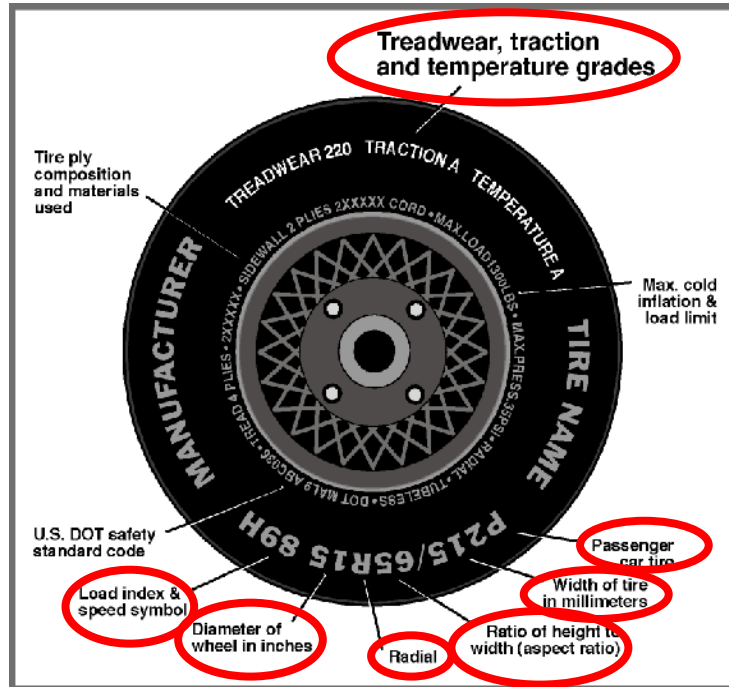
| Measured Parameter | Front | Rear | Third | Total |
|-----------------------------------|--------|-----------|-----------|-------|
| Type of Seats | Bucket | Contoured | Contoured | |
| Designated Seating Capacity (DSC) | 2 | 3 | 2 | 7 |
| Capacity Weight (VCW) (kg) | | | | 550 |
| Cargo Weight (RCLW) (kg) | | | | 74 |

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

Test Vehicle: 2018 Volkswagen Atlas Launch Edition 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20185800
 Test Date: 8/24/2017

VEHICLE TIRE INFORMATION



| Measured Parameter | Front | Rear |
|--------------------------|--------------------------------------|--------------------------------------|
| Max. Tire Pressure (kPa) | 300 | 300 |
| Cold Pressure (kPa) | 240 | 240 |
| Recommended Tire Size | 245/60R18 | 245/60R18 |
| Tire Size on Vehicle | 245/60R18 | 245/60R18 |
| Tire Manufacturer | Continental | Continental |
| Tire Model | Cross Contact LX Sport | Cross Contact LX Sport |
| Treadwear | 480 | 480 |
| Traction | A | A |
| Temperature Grade | A | A |
| Tire Plies Sidewall | 2 Polyester | 2 Polyester |
| Tire Plies Body | 2 Steel, 2 Polyester, 1 Polyamide | 2 Steel, 2 Polyester, 1 Polyamide |
| Load Index/Speed Symbol | 105T | 105T |
| Tire Material | Rubber | Rubber |
| DOT Safety Code Left | A383 WC9V 0417 | A383 WC9V 0417 |
| DOT Safety Code Right | A383 WC9V 0417 | A383 WC9V 0417 |

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

Test Vehicle: 2018 Volkswagen Atlas Launch Edition 5-Door SUV NHTSA No.: O20185800
 Test Program: NCAP Frontal Barrier Impact Test Test Date: 8/24/2017

TEST VEHICLE WEIGHTS

| | Units | As Delivered (UVW) | | | As Tested (ATW) | | |
|--------|-------|--------------------|-------|--------|-----------------|--------|--------|
| | | Front | Rear | Total | Front | Rear | Total |
| Left | kg | 569.5 | 470.5 | | 599.5 | 608.5 | |
| Right | kg | 585.0 | 456.5 | | 555.5 | 525.0 | |
| Ratio | % | 55.5% | 44.5% | | 51.5% | 49.5% | |
| Totals | kg | 1154.5 | 927.0 | 2081.5 | 1155.0 | 1133.5 | 2288.5 |

TARGET TEST WEIGHT CALCULATION

| Measured Parameter | Units | Value |
|----------------------------------------------|-------|--------|
| Total Delivered Weight (UVW) | kg | 2009.0 |
| Weight of 1 P572E ATD & 1 P572O ATD | kg | 141 |
| Rated Cargo/Luggage Weight (RCLW) | kg | 64 |
| Calculated Test Vehicle Target Weight (TVTW) | kg | 2214.0 |

TEST VEHICLE ATTITUDES AND CG

| | Units | LF | RF | LR | RR | CG (aft of front axle) |
|--------------|-------|-----|-----|-----|-----|------------------------|
| As Delivered | mm | 844 | 845 | 872 | 871 | 1326 |
| As Tested | mm | 825 | 829 | 836 | 838 | 1407 |
| Post Test | mm | 802 | 795 | 830 | 825 | |

GENERAL TEST VEHICLE DATA

| Measurement Description | Units | Value |
|-----------------------------------------|-------|-------|
| Total Vehicle Wheel Base | mm | 2979 |
| Total Vehicle Length at Left Side | mm | 4914 |
| Total Vehicle Length at Centerline | mm | 5020 |
| Total Vehicle Length at Right Side | mm | 4914 |
| Weight of Ballast in Cargo Area | kg | 25 |
| Weight of Vehicle Components Removed | kg | 37 |
| Amount of Stoddard Solvent in Fuel Tank | L | 65.1 |

List of components removed to meet test weight: None.

List of components removed for instrumentation, data box, and equipment installation: Cargo area carpet and trim, 2nd and 3rd row floor mats, jack/tool kit, spare tire.

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

Test Vehicle: 2018 Volkswagen Atlas Launch Edition 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20185800
 Test Date: 8/24/2017

TARGET VEHICLE STRUCTURAL MEASUREMENT

| | Elements | Pre-Test (mm) |
|----|---------------------------------------|---------------|
| 1 | Total Length | 5020 |
| 2 | Total Width | 1980 |
| 3 | Bumper Top Height | 612 |
| 4 | Bumper Bottom Height | 487 |
| 5 | Longitudinal Member Top Height | 610 |
| 6 | Distance between Longitudinal Members | 892 |
| 7 | Longitudinal Member Width | 75 |
| 8 | Engine Top Height | 935 |
| 9 | Engine Bottom Height | 246 |
| 10 | Engine and Gearbox Width | 877 |
| 11 | Front Bumper-Engine Distance | 390 |
| 12 | Front Shock Absorber Fixing Height | 1002 |
| 13 | Bonnet Leading Edge Height | 990 |
| 14 | Front Shock Absorber Fixing Width | 1064 |
| 15 | Front Bumper – Front Axle Distance | 904 |
| 16 | Front Axle – A-Pillar Distance | 526 |
| 17 | A-Pillar – B-Pillar Distance | 1076 |
| 18 | B-Pillar – Rear Axle Distance | 1372 |
| 19 | B-Pillar – C-Pillar Distance | 853 |
| 20 | Roof Sill Bottom Height | 1520 |
| 21 | Roof Sill Top Height | 1674 |
| 22 | Floor Sill Bottom Height | 285 |
| 23 | Floor Sill Top Height | 460 |

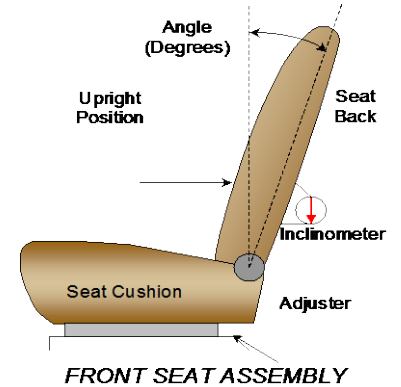
DATA SHEET NO. 2
SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2018 Volkswagen Atlas Launch Edition 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20185800
 Test Date: 8/24/2017

NOMINAL DESIGN RIDING POSITION

The driver seat back is positioned as close as possible to the manufacturer’s design angle. For the passenger seat back, seat back is adjusted following Appendix F, “Driver & Passenger Dummy Seating & Positioning Procedures” in the NCAP Test Procedure dated October 2015.



| | Degrees |
|---------------------------|---------------------------|
| Driver Seat Back Angle | 14.5° on seat back center |
| Passenger Seat Back Angle | 12.7° on seat back center |

SEAT FORE/AFT POSITIONS

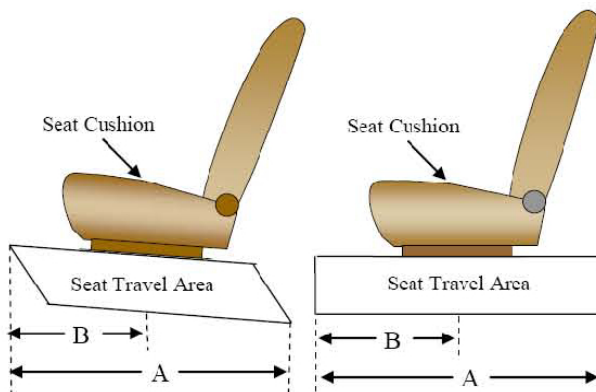
The driver and passenger seat fore/aft positions are adjusted following Appendix F, “Driver & Passenger Dummy Seating & Positioning Procedures” in the NCAP Test Procedure dated October 2015.

| | Total Fore/Aft Travel | Placed in Position # |
|----------------|--------------------------------------------|---------------------------------------------------------|
| Driver Seat | 320 mm / 39 detents (1 st as 1) | 167 mm / 15 th detent (1 st as 0) |
| Passenger Seat | 254 mm / 39 detents (1 st as 1) | 0 mm / 0 th detent (1 st as 0) |

SEAT BELT UPPER ANCHORAGES

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

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



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

Test Vehicle: 2018 Volkswagen Atlas Launch Edition 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20185800
 Test Date: 8/24/2017

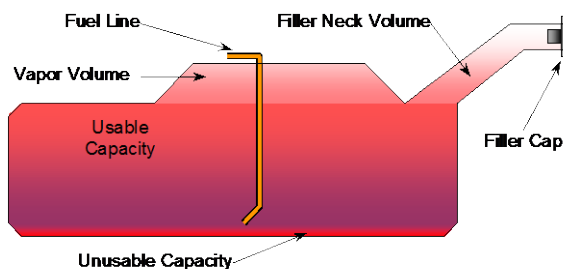
FUEL TANK CAPACITY DATA

| | Liters |
|------------------------------------|--------------|
| Usable Capacity of "Standard Tank" | 70.4 |
| Usable Capacity of "Optional Tank" | |
| 92-94% of Usable Capacity | 64.7 to 65.9 |
| Actual Amount of Solvent used | 68.5 |
| 1/3 of Usable Capacity | 65.1 |

FUEL PUMP

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

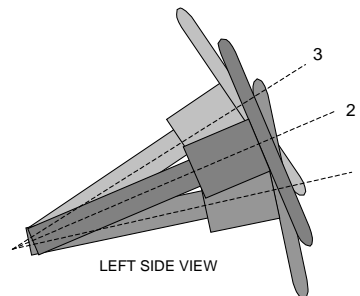
The vehicle is equipped with an electronic fuel pump. The fuel pump runs for 2 seconds after ignition is switched on. If the engine doesn't run, the fuel pump stops running. The filler neck is located on the passenger's side.



VEHICLE FUEL TANK ASSEMBLY

STEERING COLUMN ADJUSTMENT

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



STEERING COLUMN ASSEMBLY

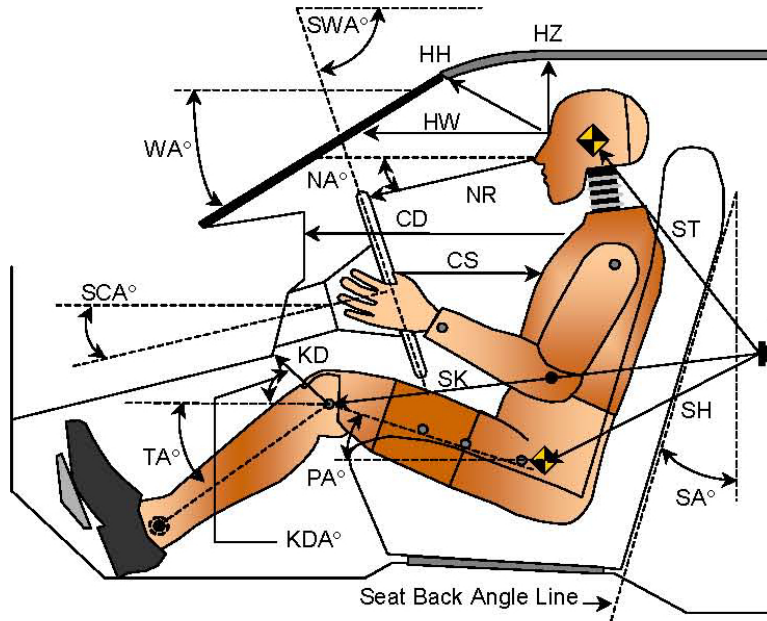
STEERING COLUMN POSITION

| | Degrees | Fore/Aft Position (mm) |
|-----------------------------------|---------|------------------------|
| Lowermost Position 1 | 65.2 | 134 |
| Geometric Center Position 2 | 62.6 | 162 |
| Uppermost Position 3 | 60.0 | 190 |
| Telescoping Steering Wheel Travel | | 56 |
| Test Position | 62.6 | 162 |

**DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS**

Test Vehicle: 2018 Volkswagen Atlas Launch Edition 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20185800
 Test Date: 8/24/2017



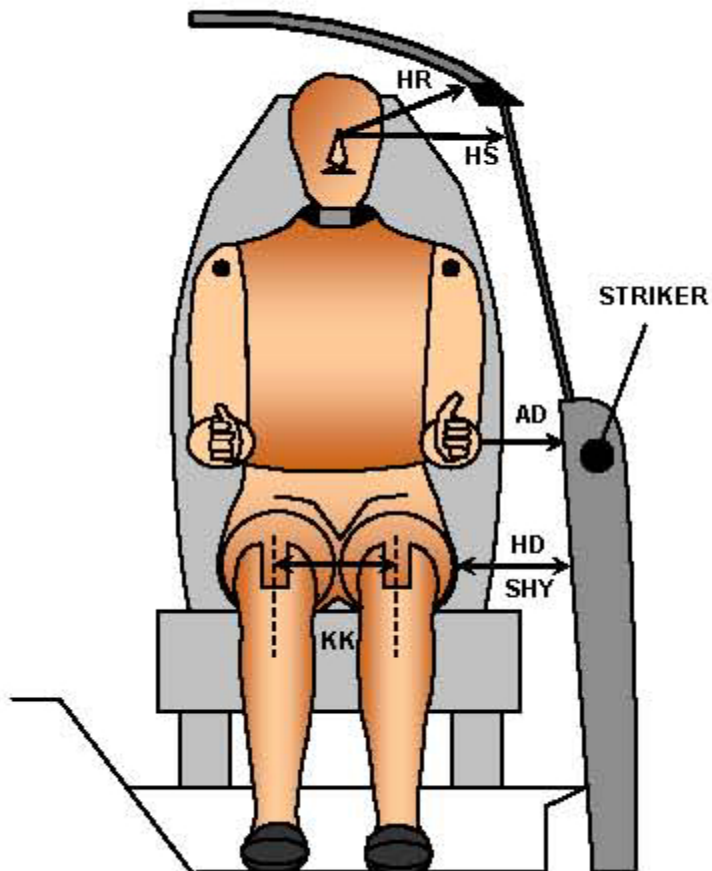
LEFT SIDE VIEW

| Code | Measurement Description | Driver | | Passenger | |
|------|-------------------------|-------------|-----------|-------------|-----------|
| | | Length (mm) | Angle (°) | Length (mm) | Angle (°) |
| WA° | Windshield Angle | | 28.7 | | |
| SWA° | Steering Wheel Angle | | 62.6 | | |
| SCA° | Steering Column Angle | | 27.4 | | |
| SA° | Seat Back Angle | | 14.5 | | 12.7 |
| HZ | Head to Roof (Z) | 225 | 90 | 265 | 90 |
| HH | Head to Header | 356 | 27.6 | 336 | 45.5 |
| HW | Head to Windshield | 671 | 0 | 685 | 0 |
| NR | Nose to Rim | 373 | 9.2 | | |
| CD | Chest to Dash | 528 | | 380 | |
| CS | Chest to Steering Hub | 314 | 1.1 | | |
| RA | Rim to Abdomen | 196 | 0 | | |
| KDL | Left Knee to Dash | 203 | 31.5 | 103 | 34.2 |
| KDR | Right Knee to Dash | 193 | 32.2 | 111 | 33.8 |
| PA° | Pelvic Angle | | 24.4 | | 22.1 |
| TA° | Tibia Angle | | 48.2 | | 57.1 |
| SK | Striker to Knee | 623 | 102.3 | 746 | 103.8 |
| ST | Striker to Head | 443 | 22.2 | 437 | 39.3 |
| SH | Striker to H-Point | 316 | 140.4 | 445 | 119.0 |

**DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS**

Test Vehicle: 2018 Volkswagen Atlas Launch Edition 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20185800
 Test Date: 8/24/2017



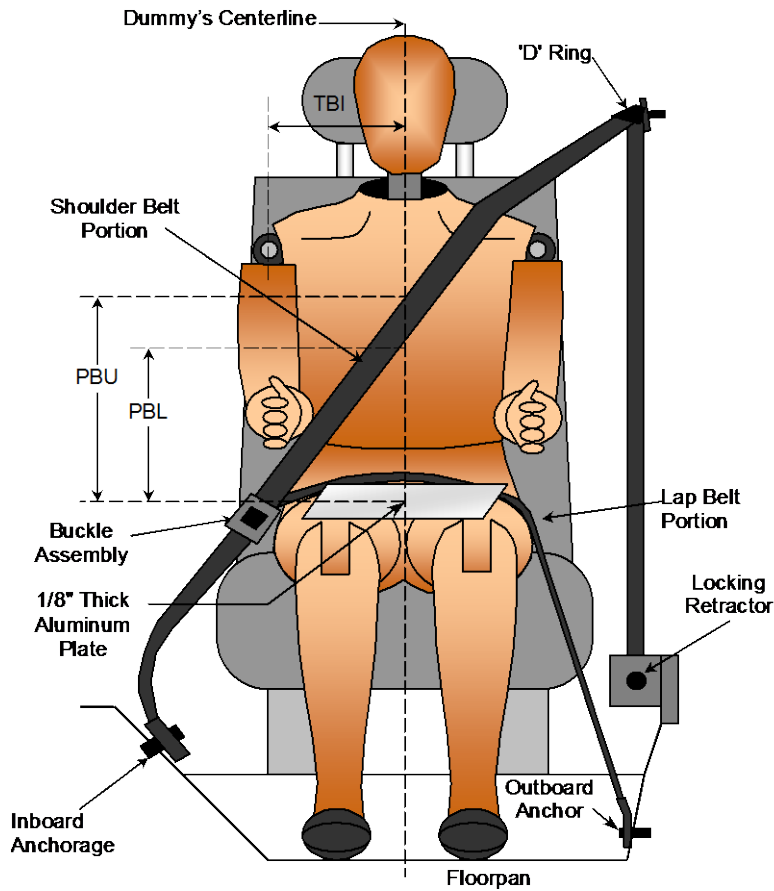
FRONT VIEW OF DUMMY

| Code | Measurement Description | Driver | Passenger |
|------|----------------------------------|-------------|-----------|
| | | Length (mm) | |
| AD | Arm to Door | 149 | 104 |
| HD | H-Point to Door | 166 | 185 |
| HR | Head to Side Header | 274 | 314 |
| HS | Head to Side Window | 380 | 407 |
| KK | Knee to Knee | 355 | 225 |
| SHY | Striker to H-Point (Y Direction) | 331 | 325 |
| AA | Ankle to Ankle | 344 | 174 |

**DATA SHEET NO. 5
SEAT BELT POSITIONING DATA**

Test Vehicle: 2018 Volkswagen Atlas Launch Edition 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20185800
 Test Date: 8/24/2017



FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

| Measurement Description | Units | Driver | Passenger |
|---------------------------------------------------|-------|--------|-----------|
| PBU - Top surface of reference to belt upper edge | mm | 350 | 340 |
| PBL - Top surface of reference to belt lower edge | mm | 265 | 250 |

BELT LENGTH DATA

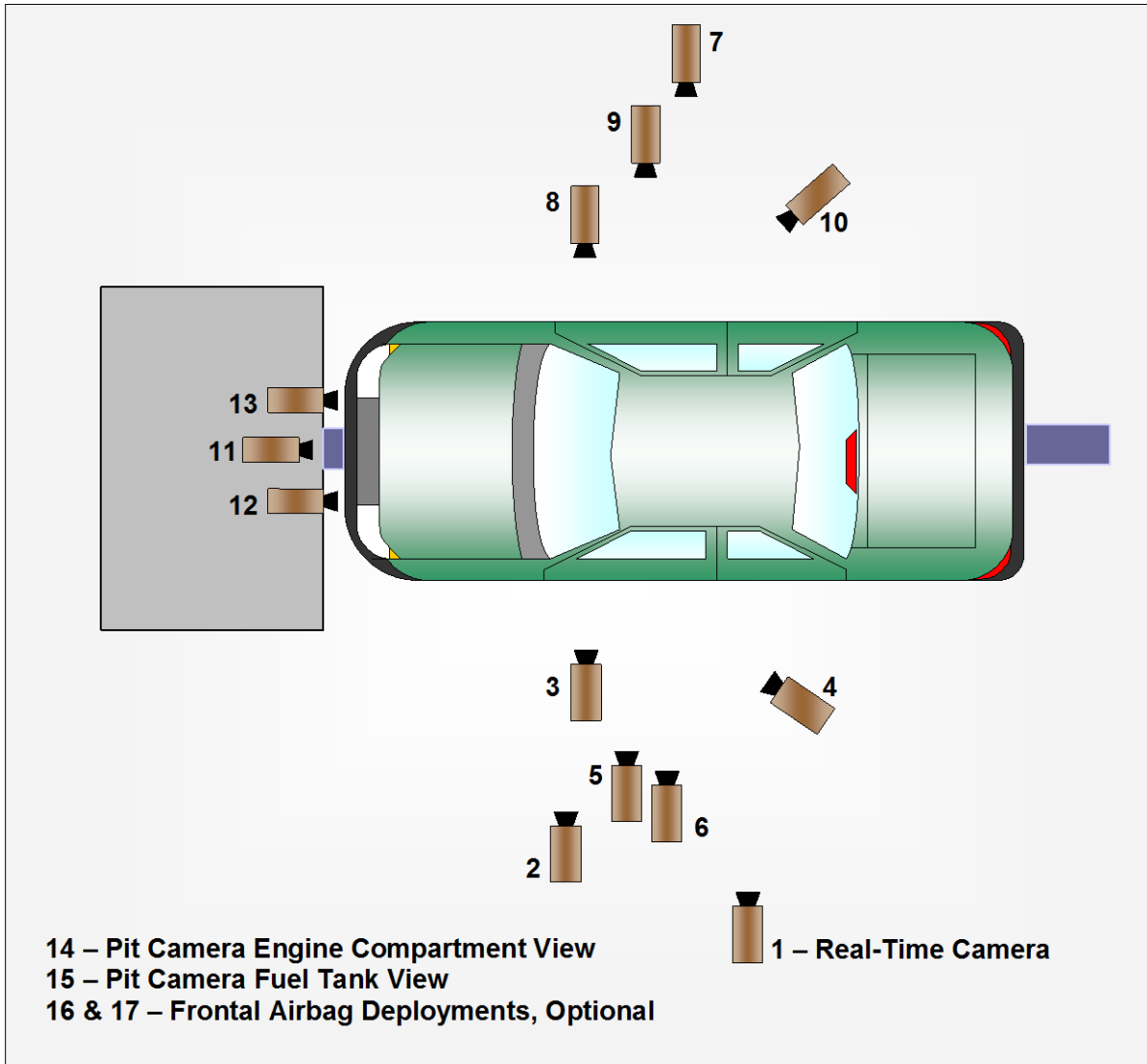
| Measurement Description | Units | Driver | Passenger |
|--------------------------------------------------|-------|--------|-----------|
| Shoulder Belt Length as measured on ATD | mm | 955 | 1015 |
| Lap Belt Length as measured on ATD | mm | 710 | 845 |
| Remainder of belt on reel | mm | 985 | 790 |
| Total Belt Length for Continuous Webbing Systems | mm | 3300 | 3300 |

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

Test Vehicle: 2018 Volkswagen Atlas Launch Edition 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20185800
Test Date: 8/24/2017

CAMERA POSITIONS FOR FRONTAL IMPACTS



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

Test Vehicle: 2018 Volkswagen Atlas Launch Edition 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20185800
 Test Date: 8/24/2017

CAMERA LOCATIONS

| No. | Camera View | Coordinates (mm) | | | Lens (mm) | Speed (fps) |
|-----|--------------------------|------------------|-------|-------|-----------|-------------|
| | | X* | Y* | Z* | | |
| 1 | Real-Time Left Overall | | | | | 30 |
| 2 | Driver Close-Up | -1620 | -6270 | -2080 | 50 | 1000 |
| 3 | Left Front Half | -1140 | -5510 | -1280 | 25 | 1000 |
| 4 | Left Angle | -6520 | -5350 | -2080 | 75 | 1000 |
| 5 | Steering Column - Top | | | | | |
| 6 | Steering Column - Bottom | | | | | |
| 7 | Right Overall | -2330 | 6660 | -1270 | 16 | 1000 |
| 8 | Passenger Close-Up | -1580 | 6290 | -2050 | 50 | 1000 |
| 9 | Right Front Half | -1030 | 5530 | -1310 | 25 | 1000 |
| 10 | Right Angle | -5440 | 5880 | -2110 | 75 | 1000 |
| 11 | Windshield | 170 | 0 | -2340 | 11 | 1000 |
| 12 | Driver Windshield | 270 | -370 | -2260 | 25 | 1000 |
| 13 | Passenger Windshield | 270 | 370 | -2260 | 25 | 1000 |
| 14 | Pit Front | -1050 | 0 | 3340 | 24 | 1000 |
| 15 | Pit Rear | -3060 | 0 | 3340 | 24 | 1000 |
| 16 | Onboard Driver Side | | | | 12 | 1000 |
| 17 | Onboard Passenger Side | | | | 12 | 1000 |
| 18 | Real-Time Pan View | | | | | 30 |

***COORDINATES:**

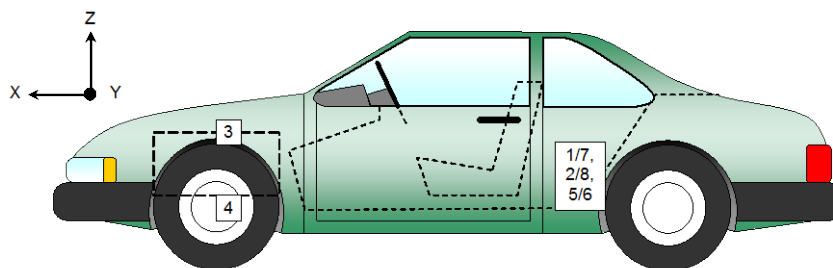
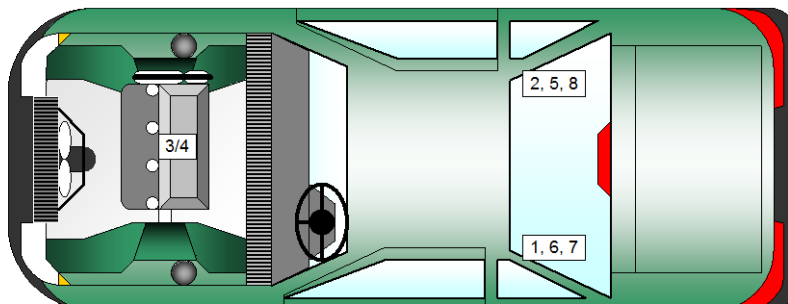
- +X = forward of impact plane
- +Y = right of monorail centerline
- +Z = below ground level

Cameras 5 & 6 were not used for this test.

**DATA SHEET NO. 7
VEHICLE ACCELEROMETER LOCATIONS**

Test Vehicle: 2018 Volkswagen Atlas Launch Edition 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20185800
 Test Date: 8/24/2017



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

| No. | Accelerometer Location | Measurements (mm) | | |
|-----|--------------------------------------------------------------|-------------------|------|------|
| | | X | Y | Z |
| 1 | Left Rear Crossmember Accelerometer – X Direction | 2261 | -410 | -381 |
| 2 | Right Rear Crossmember Accelerometer – X Direction | 2261 | 430 | -381 |
| 3 | Engine Top X | 4318 | 0 | -935 |
| 4 | Engine Bottom X | 4315 | 135 | -246 |
| 5 | Left Rear Crossmember Accelerometer – Z Direction | 2261 | -410 | -381 |
| 6 | Right Rear Crossmember Accelerometer – Z Direction | 2261 | 430 | -381 |
| 7 | Left Rear Crossmember Accelerometer Redundant – X Direction | 2221 | -410 | -381 |
| 8 | Right Rear Crossmember Accelerometer Redundant – X Direction | 2221 | 430 | -381 |

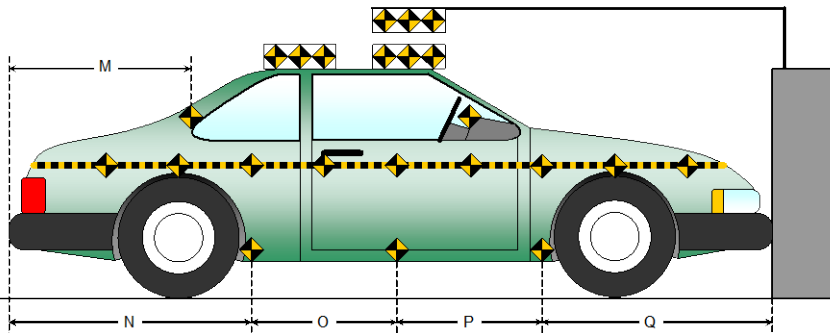
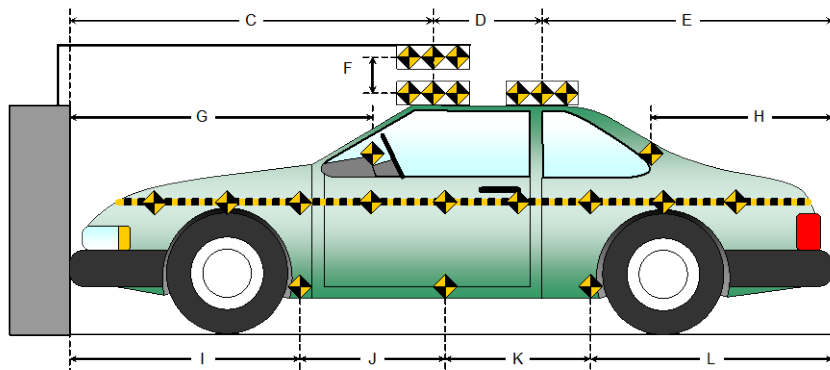
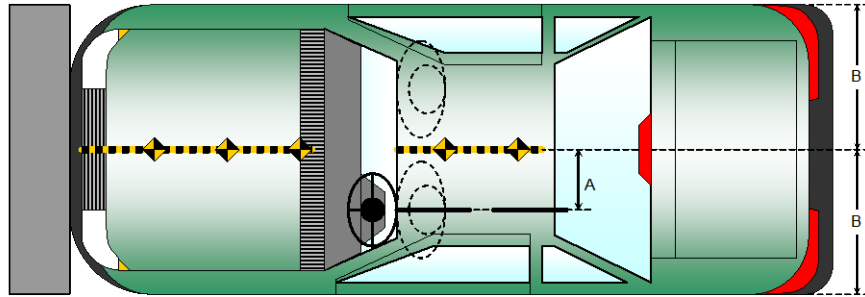
Reference Points: X - Rear Surface of Vehicle (+ forward)
 Y - Vehicle Centerline (+ to right)
 Z - Ground Plane (+ down)

DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2018 Volkswagen Atlas Launch Edition 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20185800
 Test Date: 8/24/2017

| Item | Value (mm) |
|------|------------|
| A | 396 |
| B | 990 |
| C | 2316 |
| D | 608 |
| E | 2096 |
| F | 161 |
| G | |
| H | 1478 |
| I | 1431 |
| J | 967 |
| K | 967 |
| L | 1655 |
| M | 1478 |
| N | 1655 |
| O | 967 |
| P | 967 |
| Q | 1431 |



**DATA SHEET NO. 9
LOAD CELL LOCATIONS ON FIXED BARRIER**

Test Vehicle: 2018 Volkswagen Atlas Launch Edition 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20185800
 Test Date: 8/24/2017

Advanced Research Load Cell Barrier

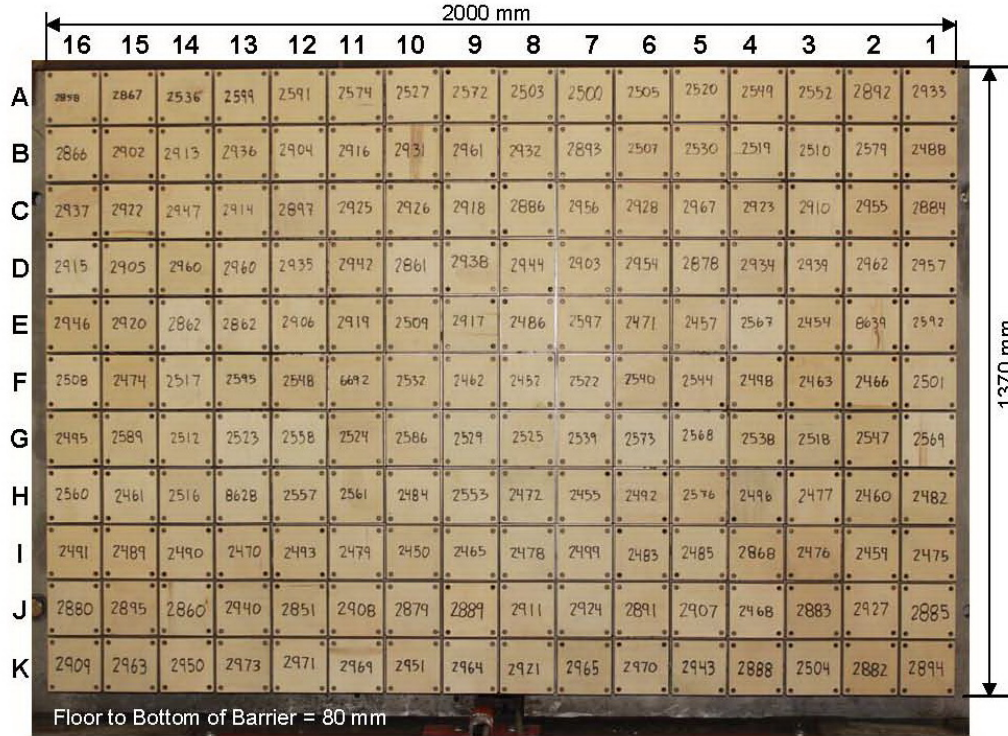


Photo for Reference Only

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

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

**DATA SHEET NO. 10
TEST VEHICLE SUMMARY OF RESULTS**

Test Vehicle: 2018 Volkswagen Atlas Launch Edition 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20185800
Test Date: 8/24/2017

INSTRUMENTATION

| | |
|----------------------------------|-----|
| Driver Dummy Data Channels | 47 |
| Passenger Dummy Data Channels | 47 |
| Vehicle Structure Accelerometers | 8 |
| Barrier Channels | 528 |
| Total | 630 |

CAMERA COVERAGE

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

**DATA SHEET NO. 11
POST-TEST OBSERVATIONS**

Test Vehicle: 2018 Volkswagen Atlas Launch Edition 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20185800
 Test Date: 8/24/2017

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

| Description | Driver | Passenger |
|-------------------------|------------------------------------------|------------------|
| Dummy Type / Serial No. | HIII 50% / 351 | HIII 5% / 138 |
| Head Contact | Airbag, Headrest, Side Curtain Airbag | Airbag, Headrest |
| Upper Torso Contact | Airbag | Airbag |
| Lower Torso Contact | None | None |
| Left Knee Contact | None | Glove Box |
| Right Knee Contact | Knee Bolster | Glove Box |

DOOR OPENING AND SEAT TRACK INFORMATION

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

POST TEST STRUCTURAL OBSERVATIONS

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

VEHICLE REBOUND FROM BARRIER

| Measured Parameter | Units | Value |
|--------------------|-------|-------|
| Left Side | mm | 3400 |
| Center | mm | 3300 |
| Right Side | mm | 3350 |
| Average | mm | 3350 |

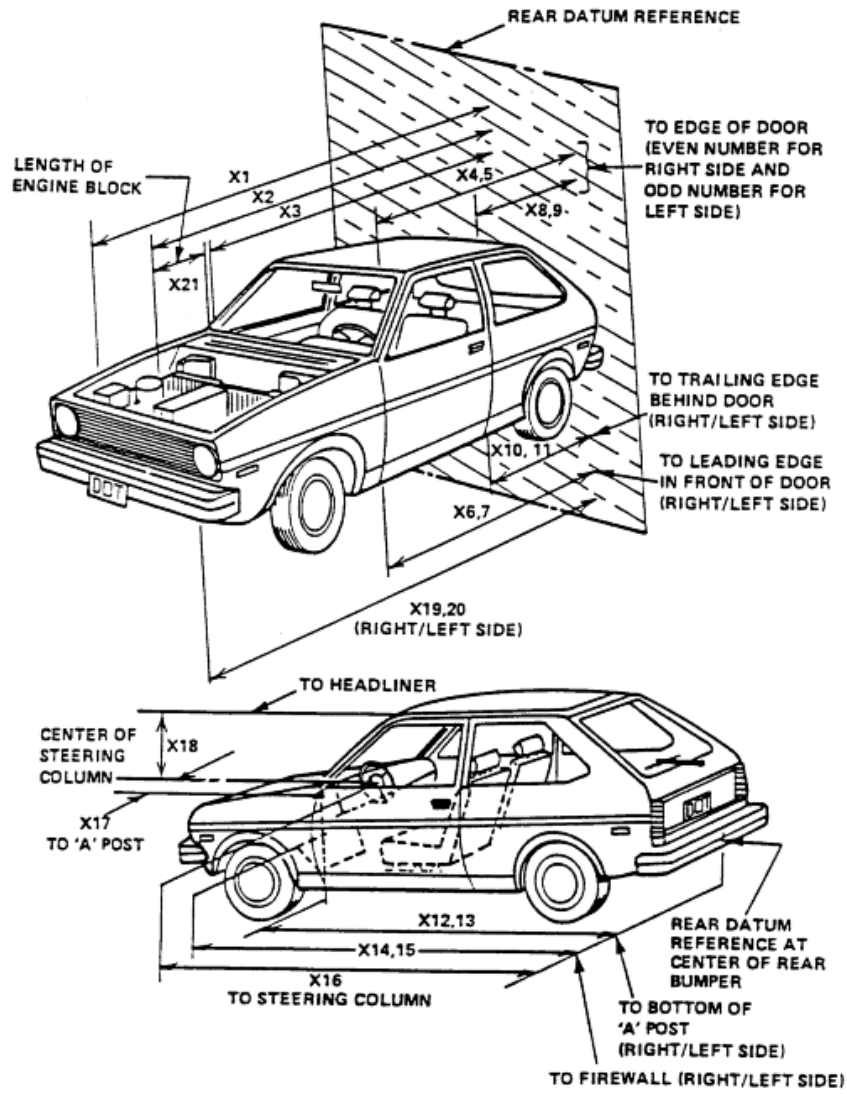
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

DATA SHEET NO. 12 VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2018 Volkswagen Atlas Launch Edition 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20185800
 Test Date: 8/24/2017



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

Test Vehicle: 2018 Volkswagen Atlas Launch Edition 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20185800
 Test Date: 8/24/2017

RSOV (Rear Surface of Vehicle)

| No. | Measurement Description | Units | Pre-Test | Post-Test | Difference |
|-----|-------------------------------------------|-------|----------|-----------|------------|
| 1 | Total Length of Vehicle at Centerline | mm | 5020 | 4651 | 369 |
| 2 | RSOV to Front of Engine | mm | 4585 | 4430 | 155 |
| 3 | RSOV to Firewall | mm | 3984 | 3936 | 48 |
| 4 | RSOV to Upper Leading Edge of Right Door | mm | 3512 | 3518 | -6 |
| 5 | RSOV to Upper Leading Edge of Left Door | mm | 3512 | 3517 | -5 |
| 6 | RSOV to Lower Leading Edge of Right Door | mm | 3547 | 3547 | 0 |
| 7 | RSOV to Lower Leading Edge of Left Door | mm | 3547 | 3549 | -2 |
| 8 | RSOV to Upper Trailing Edge of Right Door | mm | 2430 | 2432 | -2 |
| 9 | RSOV to Upper Trailing Edge of Left Door | mm | 2430 | 2430 | 0 |
| 10 | RSOV to Lower Trailing Edge of Right Door | mm | 2505 | 2505 | 0 |
| 11 | RSOV to Lower Trailing Edge of Left Door | mm | 2505 | 2504 | 1 |
| 12 | RSOV to Bottom of "A" Post of Right Side | mm | 3543 | 3516 | 37 |
| 13 | RSOV to Bottom of "A" Post of Left Side | mm | 3543 | 3519 | 24 |
| 14 | RSOV to Firewall, Right Side | mm | 4128 | 4091 | 37 |
| 15 | RSOV to Firewall, Left Side | mm | 4125 | 4095 | 30 |
| 16 | RSOV to Steering Column | mm | 3080 | 3267 | -187 |
| 17 | Center of Steering Column to "A" Post | mm | 385 | 382 | 3 |
| 18 | Center of Steering Column to Headliner | mm | 446 | 481 | -35 |
| 19 | RSOV to Right Side of Front Bumper | mm | 4914 | 4672 | 242 |
| 20 | RSOV to Left Side of Front Bumper | mm | 4914 | 4483 | 431 |
| 21 | Length of Engine Block | mm | 510 | 510 | 0 |
| RD | RSOV to Right Side of Dash Panel | mm | 3379 | 3371 | 8 |
| CD | RSOV to Center of Dash Panel | mm | 3329 | 3328 | 1 |
| LD | RSOV to Left Side of Dash Panel | mm | 3351 | 3367 | -16 |

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

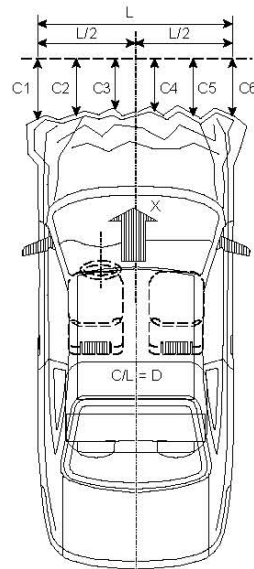
Test Vehicle: 2018 Volkswagen Atlas Launch Edition 5-Door SUV NHTSA No.: O20185800
 Test Program: NCAP Frontal Barrier Impact Test Test Date: 8/24/2017

VEHICLE INFORMATION

VIN: 1V2HR2CA4JC504316 Wheelbase (mm): 2979
 Vehicle Size Category: MPV Test Weight (kg): 2288.5

ACCELEROMETER DATA

Accelerometer Locations: As per measurements on Page 15
 Cal. Procedure/Interval: MGA procedure / 6 month
 Integration Algorithm: Trapezoidal
 Linearity: > 99%
 Impact Velocity (km/h): 56.73
 Velocity Change (km/h): 63.9
 Time of Separation (msec): 91



CRUSH PROFILE

Collision Deformation Classification: Frontal
 Midpoint of Damage: Centerline
 Damage Region Length (mm): 1236
 Impact Mode: Frontal

| No. | Measurement Description | Units | Pre-Test | Post-Test | Difference |
|-----|----------------------------|-------|----------|-----------|------------|
| C1 | Crush zone 1 at left side | mm | 4914 | 4483 | 431 |
| C2 | Crush zone 2 at left side | mm | 4993 | 4544 | 449 |
| C3 | Crush zone 3 at left side | mm | 5008 | 4595 | 413 |
| C4 | Crush zone 4 at right side | mm | 5008 | 4544 | 464 |
| C5 | Crush zone 5 at right side | mm | 4993 | 4673 | 320 |
| C6 | Crush zone 6 at right side | mm | 4914 | 4672 | 244 |
| L | C1 TO C6 | mm | 1236 | 1199 | 37 |

**DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS**

Test Vehicle: 2018 Volkswagen Atlas Launch Edition 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

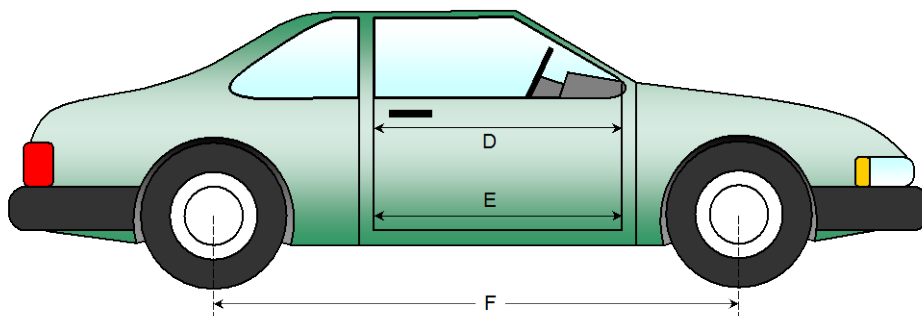
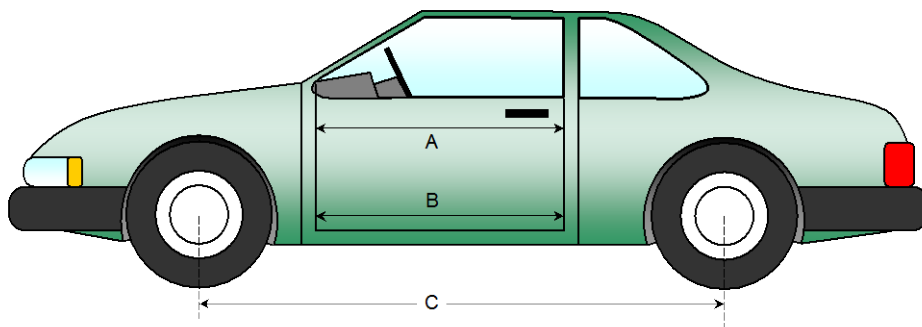
NHTSA No.: O20185800
 Test Date: 8/24/2017

DOOR OPENING WIDTH

| Item | Description | Units | Pre-Test | Post-Test | Difference |
|------|------------------|-------|----------|-----------|------------|
| A | Left Side Upper | mm | 965 | 965 | 0 |
| B | Left Side Lower | mm | 858 | 858 | 0 |
| D | Right Side Upper | mm | 965 | 965 | 0 |
| E | Right Side Lower | mm | 858 | 858 | 0 |

WHEELBASE MEASUREMENTS

| Item | Description | Units | Pre-Test | Post-Test | Difference |
|------|----------------------|-------|----------|-----------|------------|
| C | Left Side Wheelbase | mm | 2979 | 2961 | 18 |
| F | Right Side Wheelbase | mm | 2979 | 2967 | 12 |



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

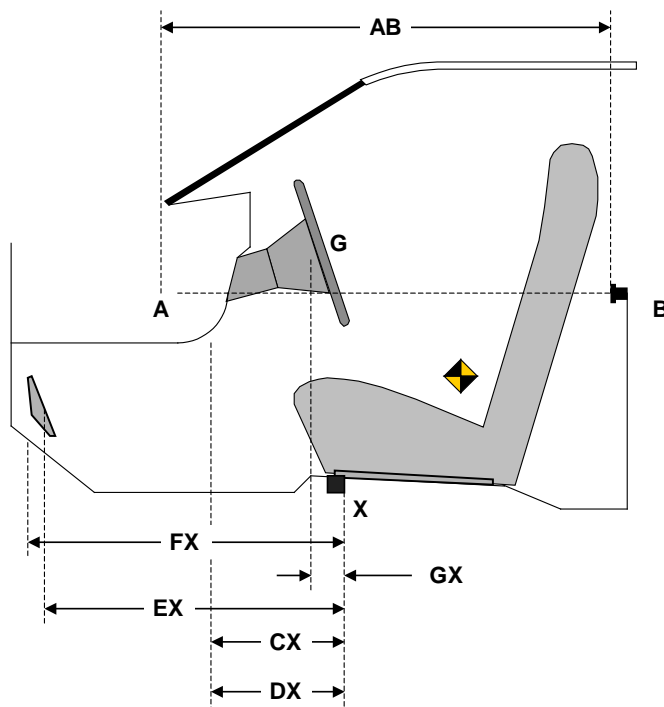
Test Vehicle: 2018 Volkswagen Atlas Launch Edition 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20185800
 Test Date: 8/24/2017

DRIVER COMPARTMENT INTRUSION

| Item | Description | Units | Pre-Test | Post-Test | Difference |
|------|------------------------------------------|-------|----------|-----------|------------|
| AB | Door Opening (Inside Window Jam) | mm | 720 | 720 | 0 |
| CX | Left Knee Bolster to X | mm | 310 | 313 | -3 |
| DX | Right Knee Bolster to X | mm | 302 | 309 | -7 |
| EX | Brake Pedal to X | mm | 545 | 552 | -7 |
| FX | Foot Rest to X | mm | 596 | 589 | 7 |
| GX | Center of Steering Column Wheel Hub to X | mm | 90 | 164 | -74 |

X = Front of Seat Track (stationary)



DRIVER COMPARTMENT

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

Test Vehicle: 2018 Volkswagen Atlas Launch Edition 5-Door SUV NHTSA No.: O20185800
 Test Program: NCAP Frontal Barrier Impact Test Test Date: 8/24/2017

Windshield Mounting Details:

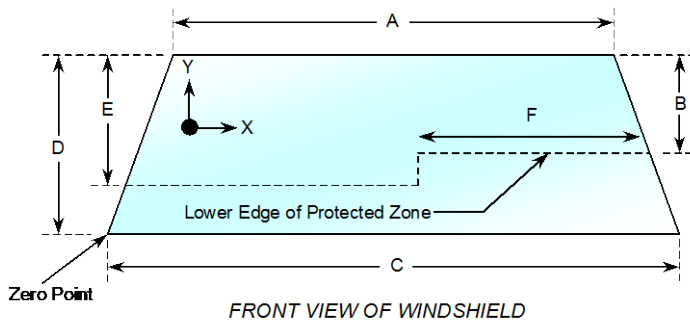
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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

Temperature of windshield molding during test: 21.5° C.

WINDSHIELD PERIPHERY MEASUREMENTS

| Measurement | Pre-Test (mm) | Post-Test (mm) | % of Retention |
|-------------|---------------|----------------|----------------|
| Left Side | 2289 | 2289 | 100.0 |
| Right Side | 2289 | 2289 | 100.0 |
| Total | 4579 | 4579 | 100.0 |



| Item | Units | Value |
|------|-------|-------|
| A | mm | 1385 |
| B | mm | 455 |
| C | mm | 1820 |
| D | mm | 687 |
| E | mm | 469 |
| F | mm | 578 |

AREA OF PROTECTED ZONE FAILURES - NONE

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

| X | Y |
|---|---|
| | |
| | |
| | |
| | |

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

| X | Y |
|---|---|
| | |
| | |
| | |
| | |

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

Test Vehicle: 2018 Volkswagen Atlas Launch Edition 5-Door SUV NHTSA No.: O20185800
Test Program: NCAP Frontal Barrier Impact Test Test Date: 8/24/2017

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21.5°C Test Time: 11:14 a.m.

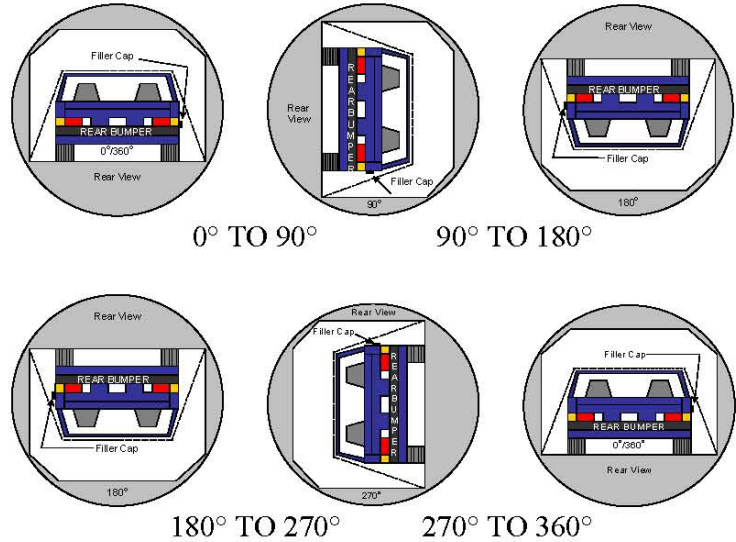
- A. From impact until vehicle motion ceases: 0 oz.
(Maximum allowable = 1 oz.)
- B. For the 5 minute period after motion ceases: 0 oz.
(Maximum allowable = 5 oz.)
- C. For the following 25 minutes: 0 oz.
(Maximum allowable = 1 oz./minute)
- D. Spillage: None

**DATA SHEET NO. 16
FMVSS 301 STATIC ROLLOVER RESULTS**

Test Vehicle: 2018 Volkswagen Atlas Launch Edition 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20185800
 Test Date: 8/24/2017

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



SOLVENT COLLECTION TIME TABLE IN SECONDS

| Test Phase | Rotation Time | Hold Time | Total Time |
|--------------|---------------|-----------|------------|
| 0° to 90° | 92 | 300 | 392 |
| 90° to 180° | 91 | 300 | 391 |
| 180° to 270° | 84 | 300 | 384 |
| 270° to 360° | 86 | 300 | 386 |

FMVSS 301 SPILLAGE TABLE (units in ounces)

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

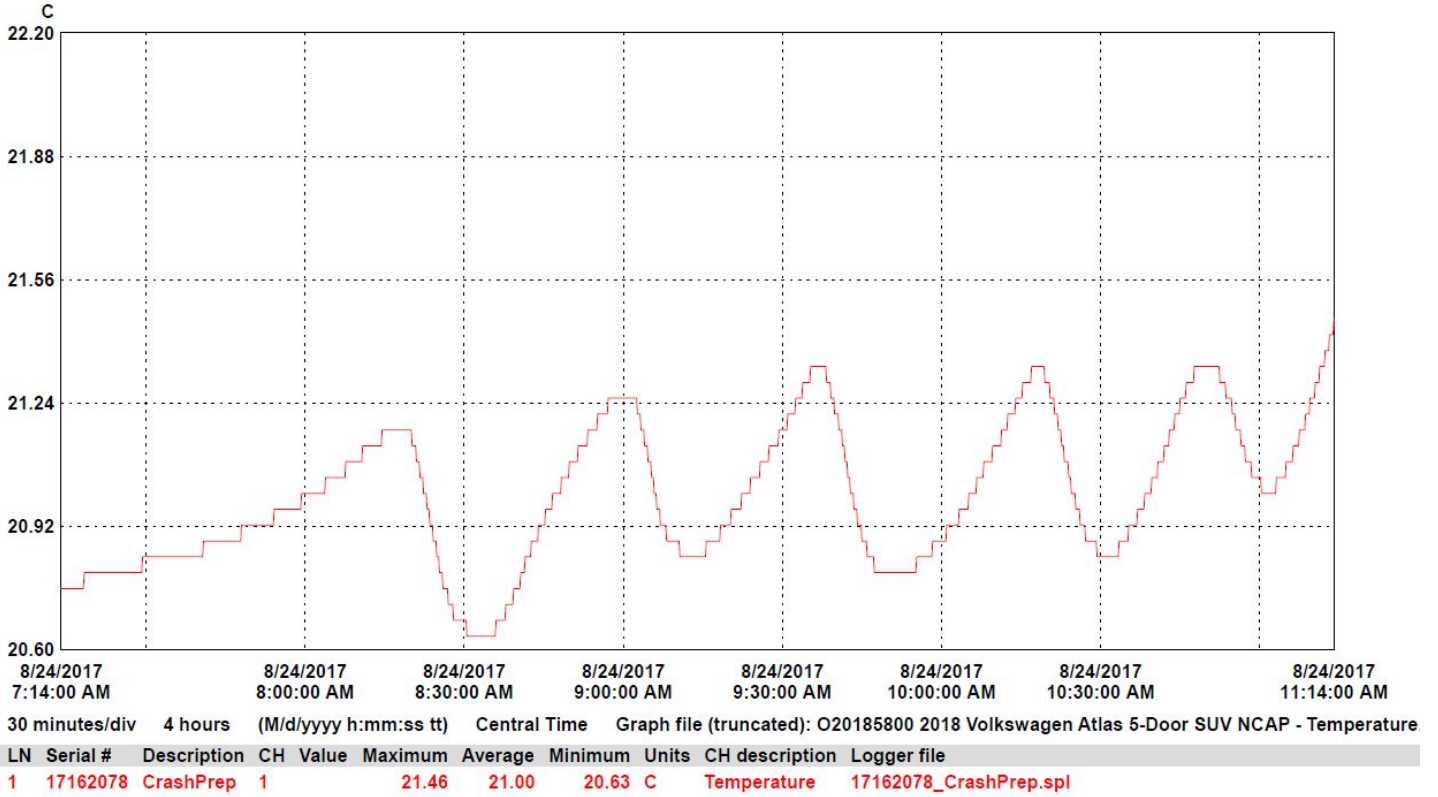
SOLVENT SPILLAGE LOCATION TABLE

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

DATA SHEET NO. 17
DUMMY/VEHICLE TEMPERATURE STABILIZATION DATA

Test Vehicle: 2018 Volkswagen Atlas Launch Edition 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20185800
 Test Date: 8/24/2017



**APPENDIX A
PHOTOGRAPHS**

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| Photo No. 036 | Pre-Test Driver's Seat Fore-Aft Markings | A-18 |
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| Photo No. 038 | Pre-Test View of Belt Anchorage for Driver Dummy | A-19 |
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| Photo No. 077 | Vehicle at 360 Degrees on Static Rollover Device | A-39 |
| Photo No. 078 | 2018 Volkswagen Atlas Launch Edition AWD 5-Door SUV Frontal Impact Event | A-39 |
| Photo No. 079 | Monroney Label Photograph | A-40 |

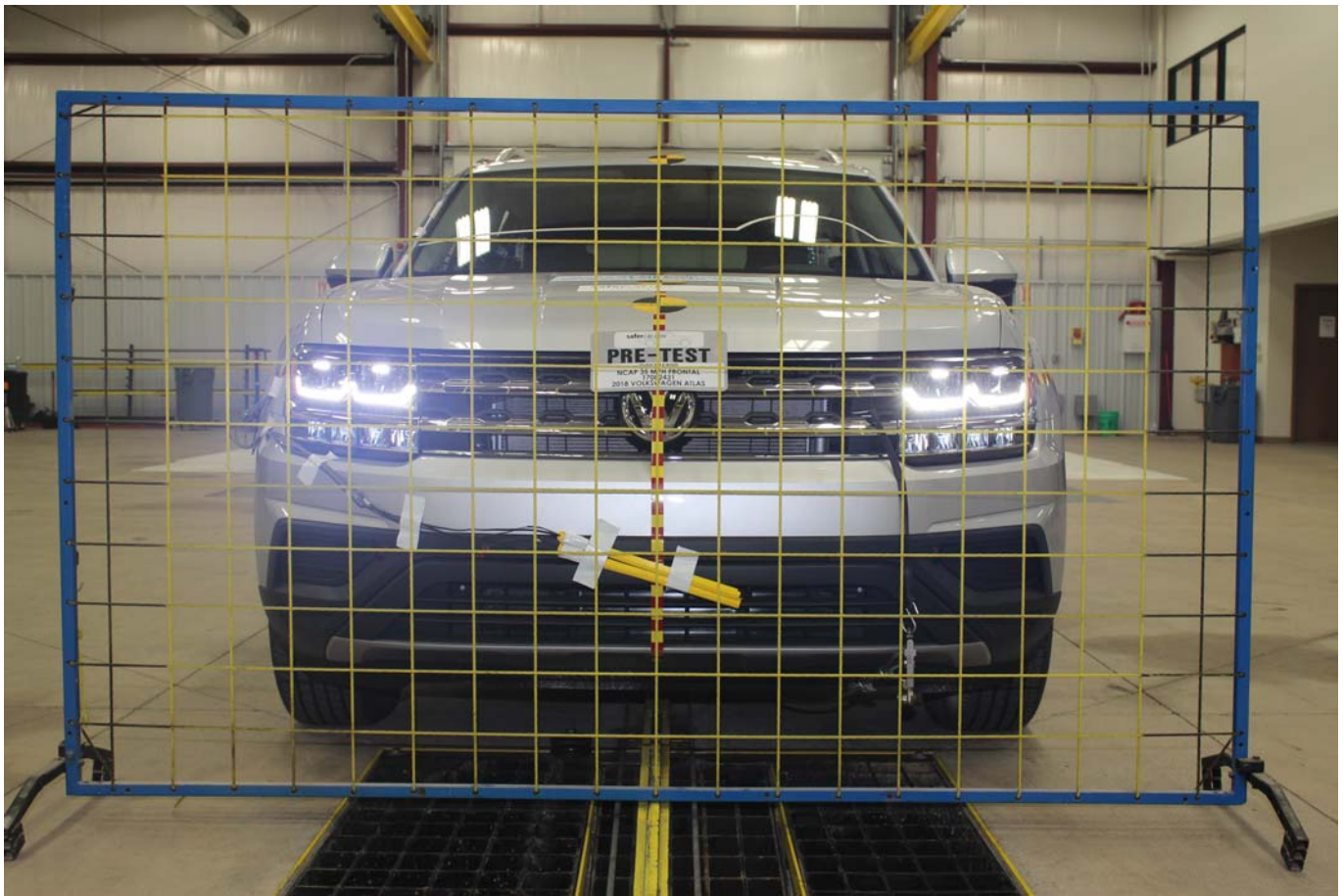


Photo No. 001 - Load Cell Location



Photo No. 002 - Pre-Test Load Cell Wall



Photo No. 003 - Post-Test Load Cell Wall

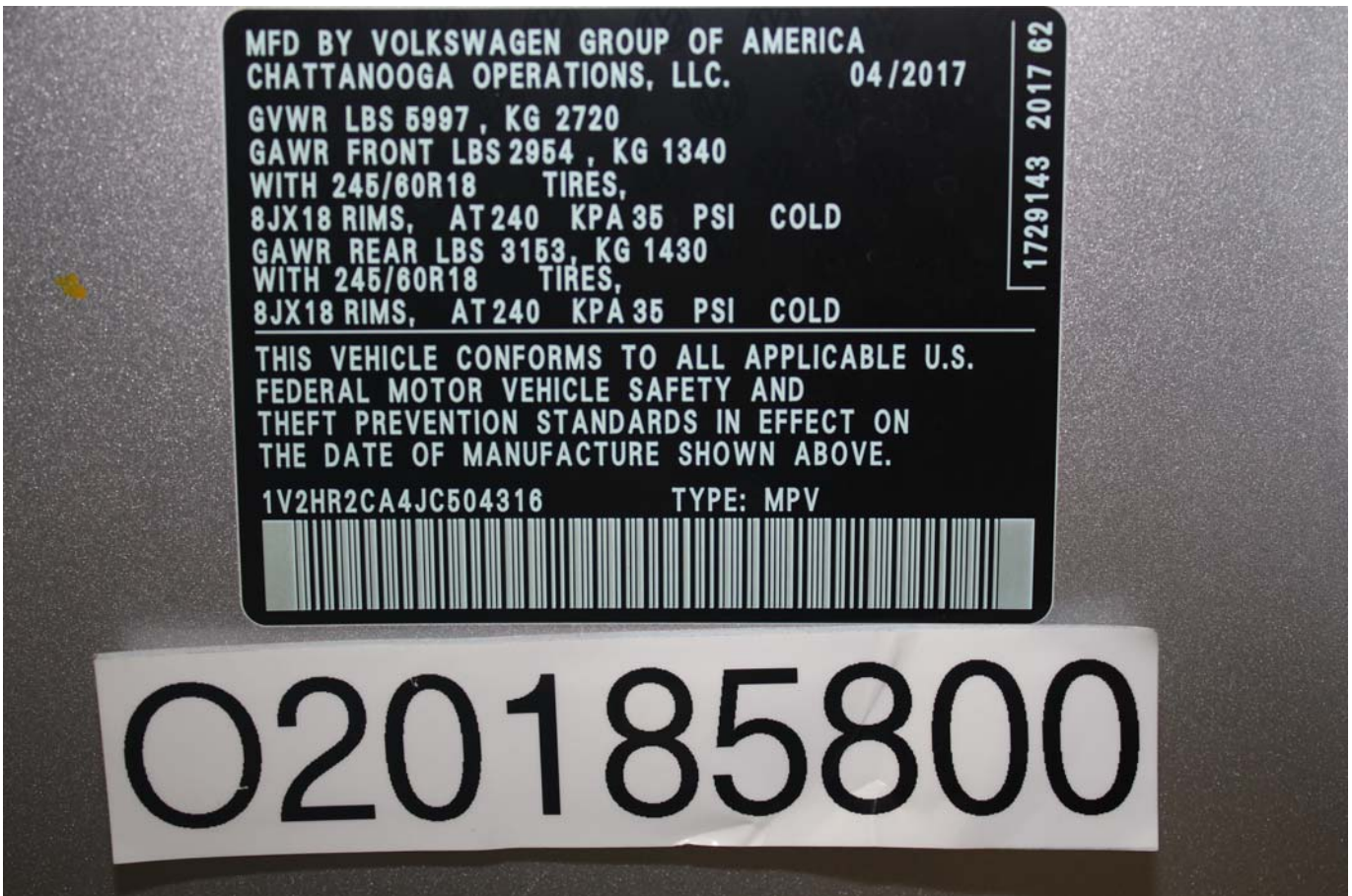


Photo No. 004 - Manufacturer Label



Photo No. 005 - Tire Placard



Photo No. 006 - 2018 Volkswagen Atlas Launch Edition AWD Frontal As Delivered



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

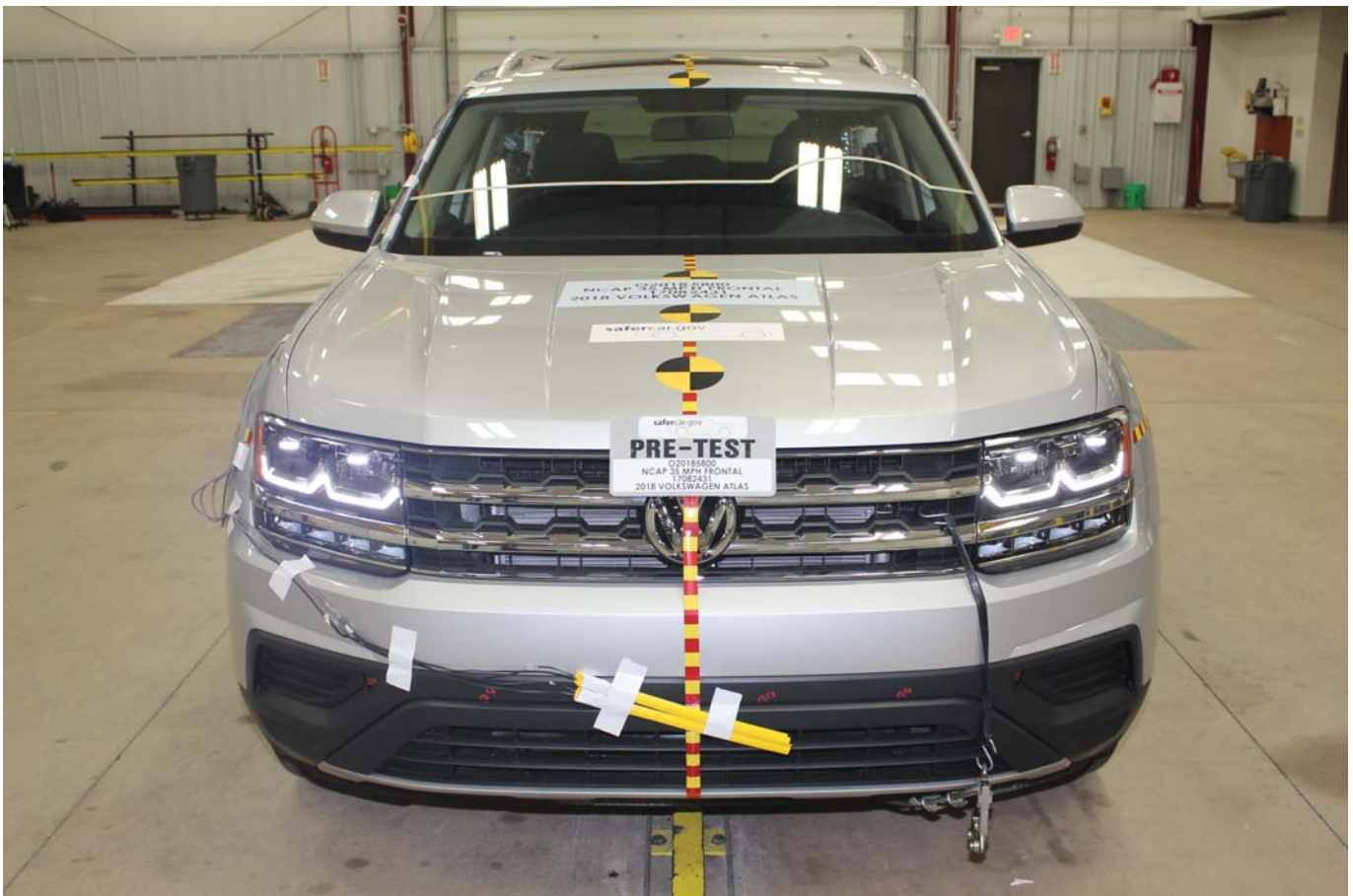


Photo No. 008 - Pre-Test Front View of Test Vehicle

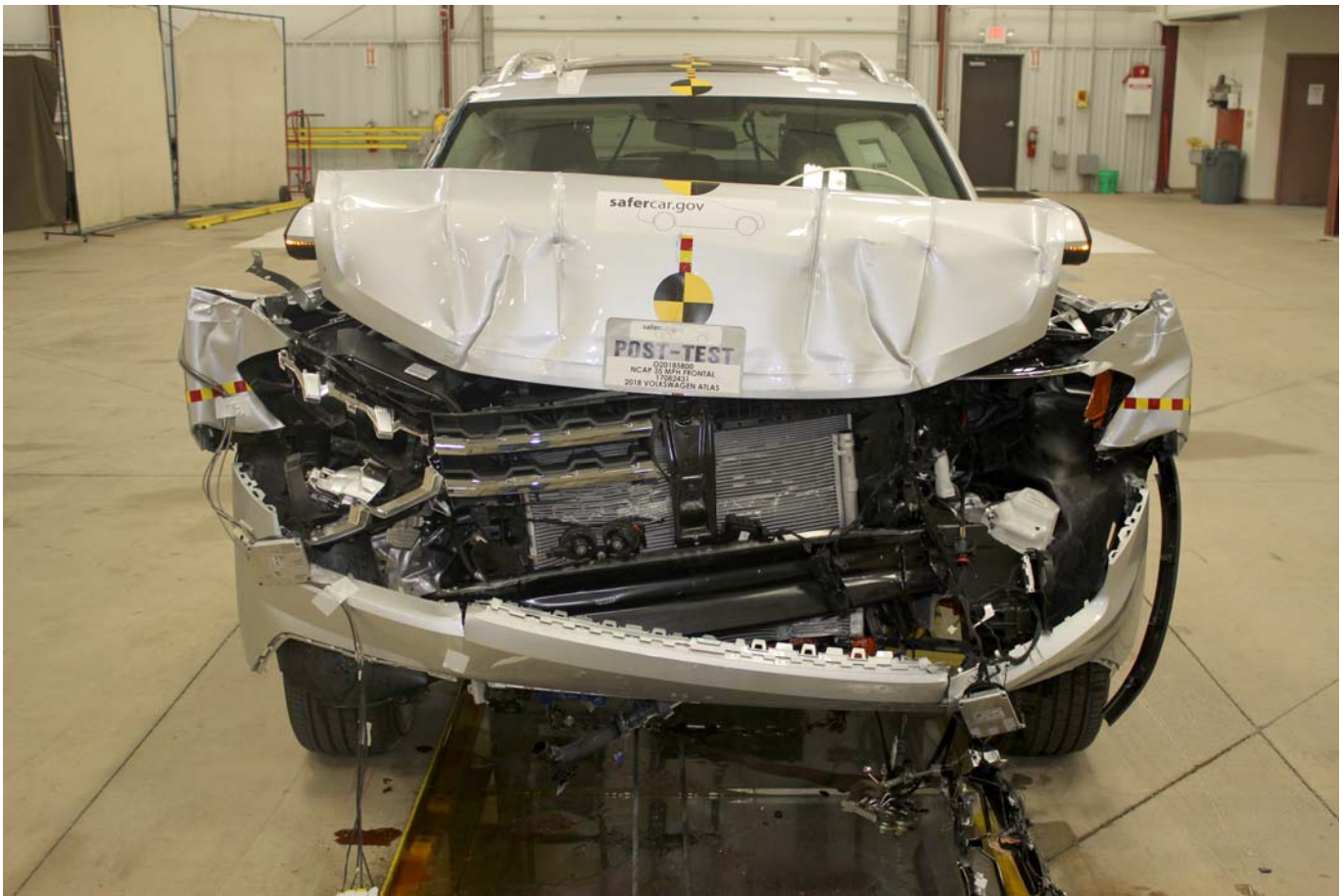


Photo No. 009 - Post-Test Front View of Test Vehicle



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



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



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



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

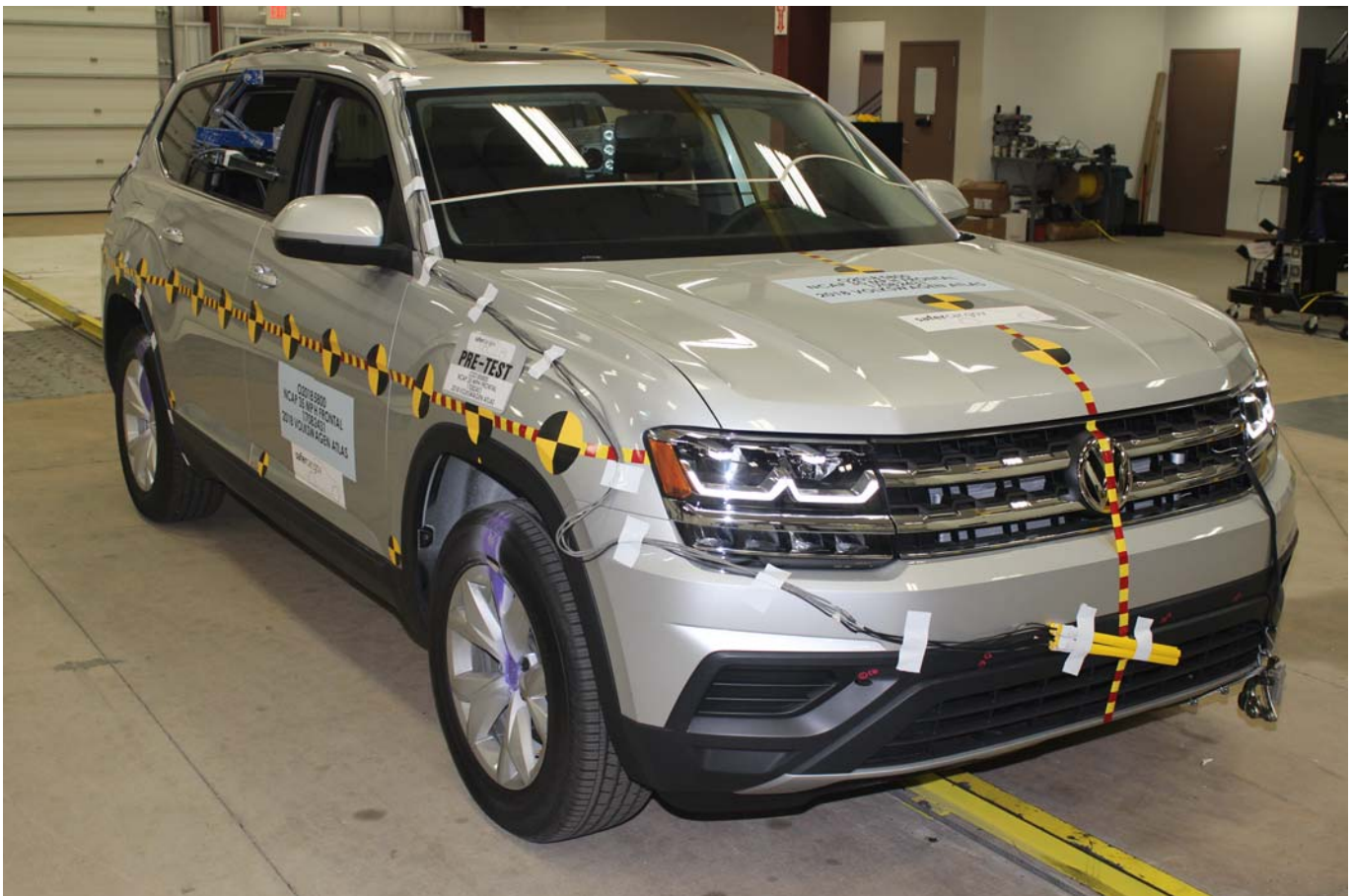


Photo No. 014 - Pre-Test Right Front 3-4 View



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

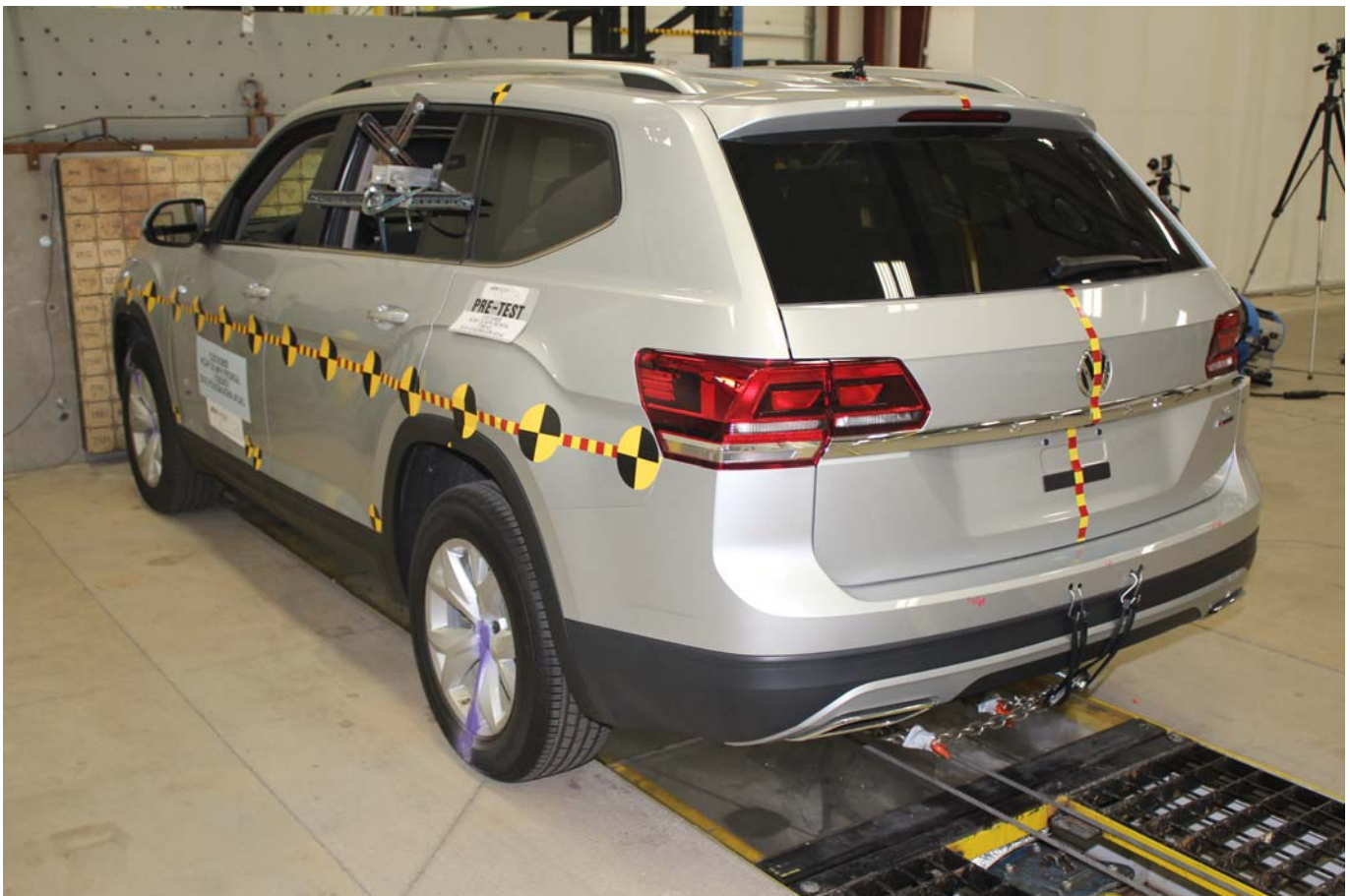


Photo No. 016 - Pre-Test Left Rear 3-4 View



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



Photo No. 018 - Pre-Test Windshield View



Photo No. 019 - Post-Test Windshield View

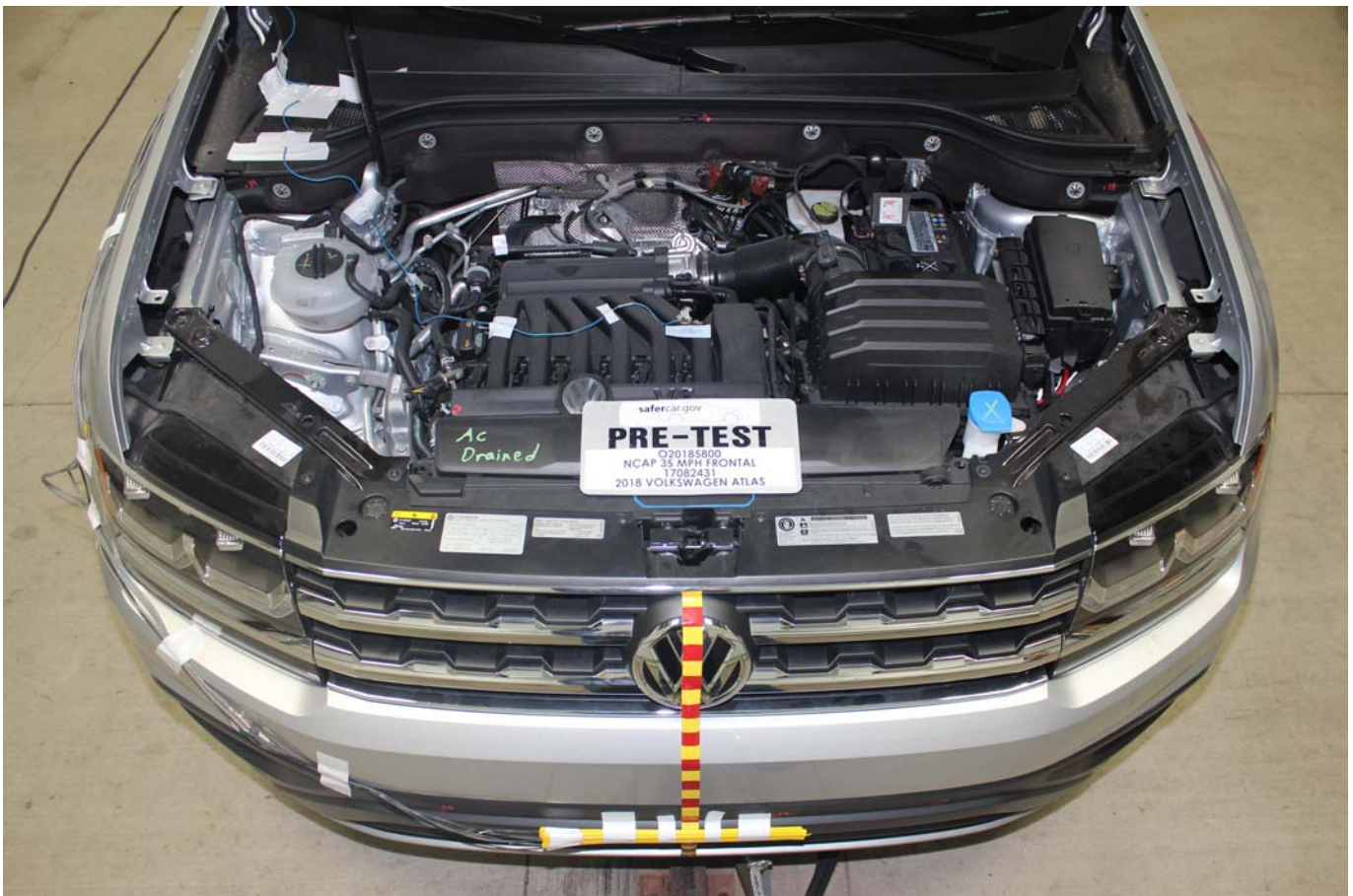


Photo No. 020 - Pre-Test Engine Compartment View



Photo No. 021 - Post-Test Engine Compartment View



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



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



Photo No. 024 - Pre-Test Front Underbody View



Photo No. 025 - Post-Test Front Underbody View



Photo No. 026 - Pre-Test Rear Underbody View

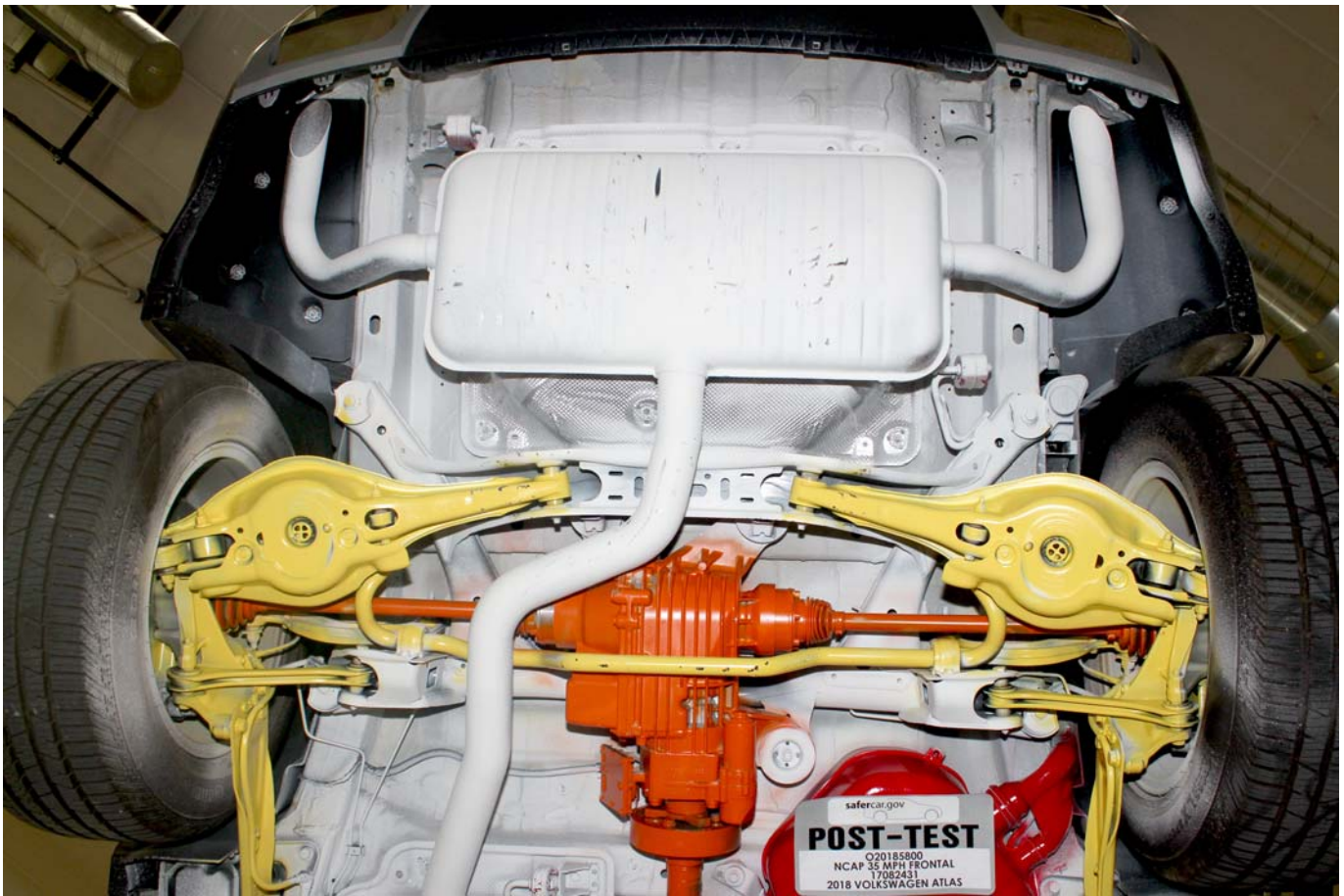


Photo No. 027 - Post-Test Rear Underbody View

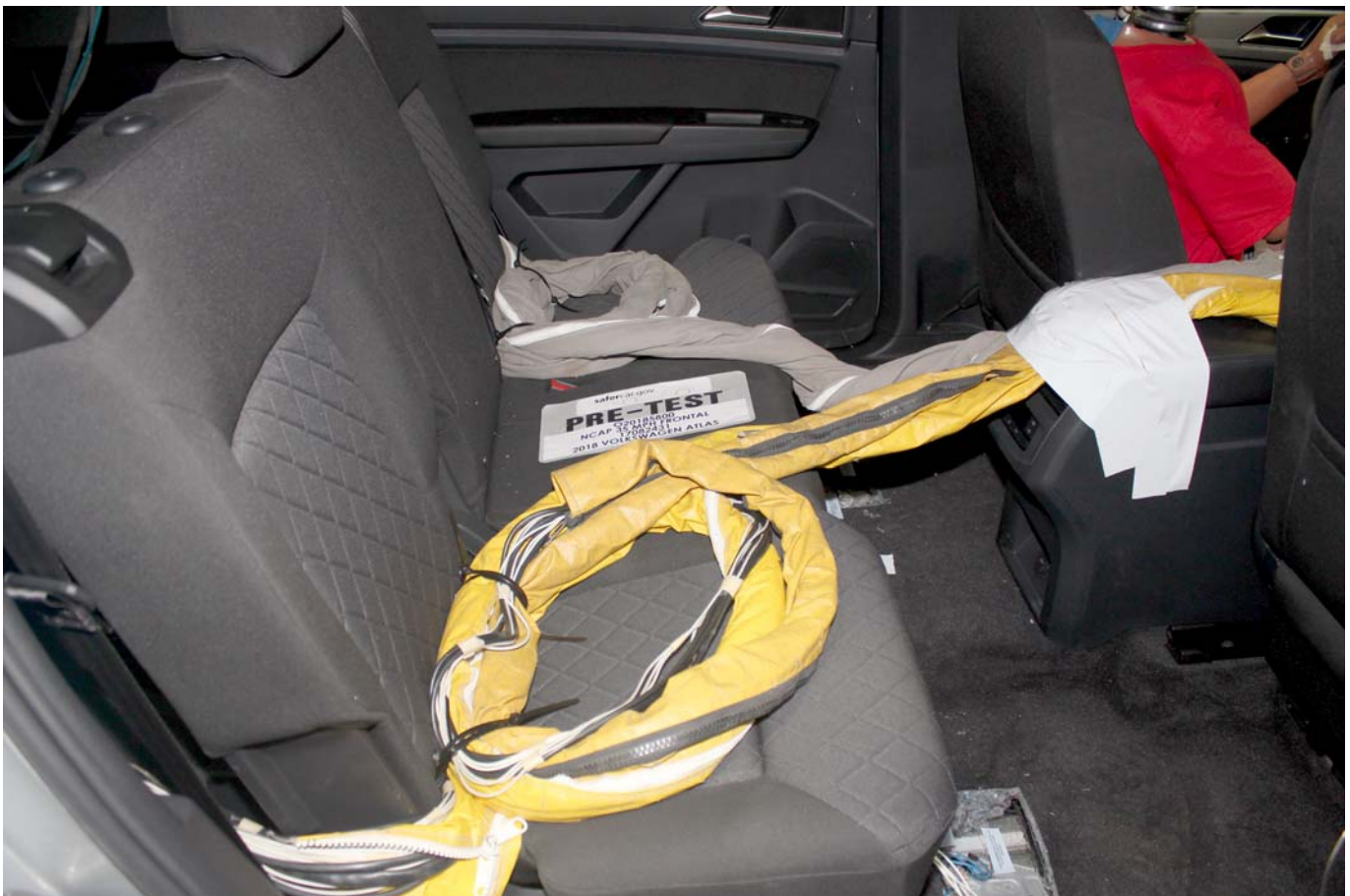


Photo No. 028 - Pre-Test Dummy Cable Routing

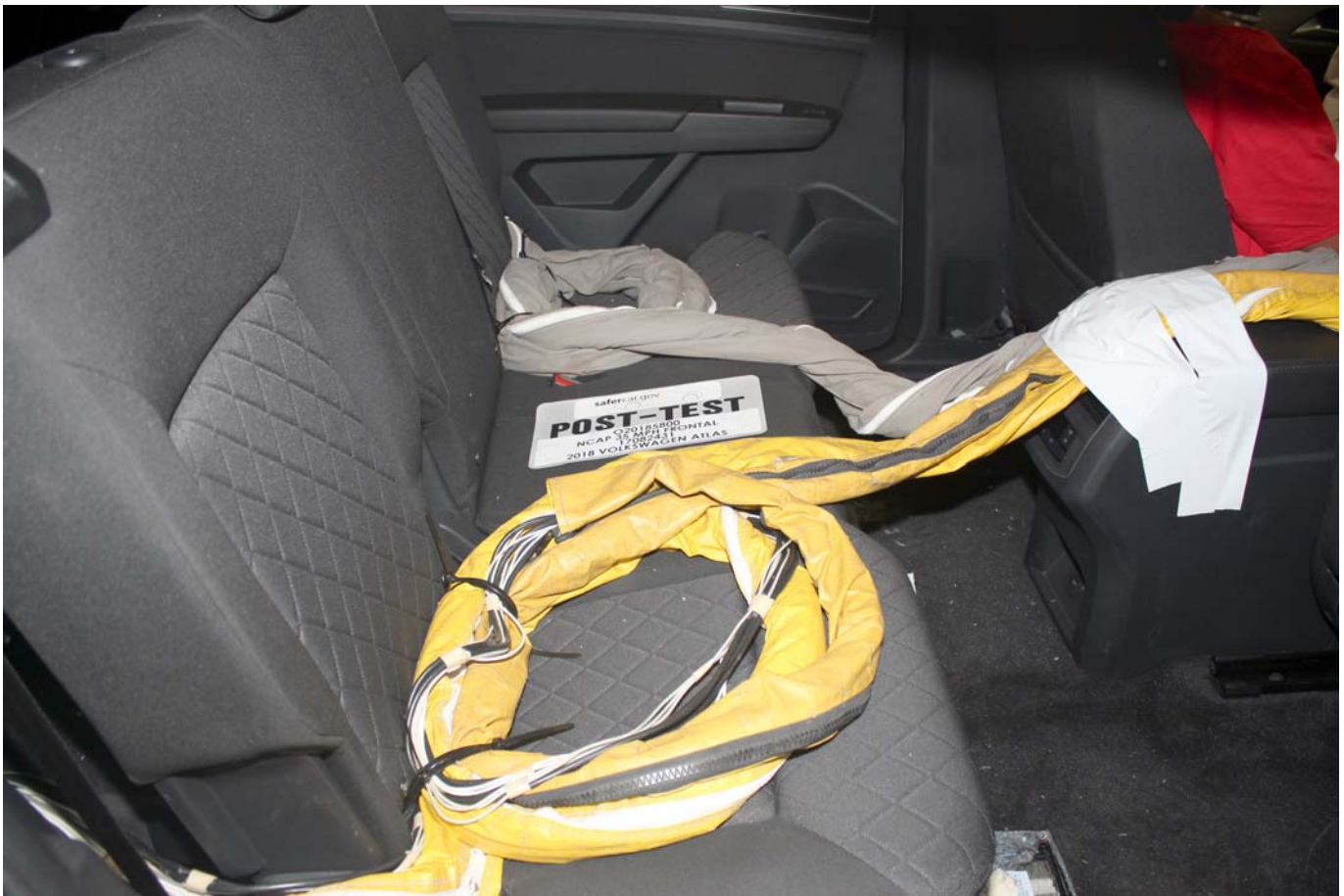


Photo No. 029 - Post-Test Dummy Cable Routing



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



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



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



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



Photo No. 034 - Pre-Test Driver Dummy and Vehicle Interior (Door Open)



Photo No. 035 - Post-Test Driver Dummy and Vehicle Interior (Door Open)



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



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



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



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



Photo No. 040 - Pre-Test Driver Dummy Feet



Photo No. 041 - Post-Test Driver Dummy Feet



Photo No. 042 - Pre-Test Driver Side Knee Bolster (without dummy)



Photo No. 043 - Post-Test Driver Side Knee Bolster (without dummy)



Photo No. 044 - Pre-Test Driver Side Floorpan



Photo No. 045 - Post-Test Driver Side Floorpan



Photo No. 046 - Post-Test Driver Dummy Face



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



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



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



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



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



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



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



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



Photo No. 055 - Pre-Test Passenger Dummy and Vehicle Interior (Door Open)



Photo No. 056 - Post-Test Passenger Dummy and Vehicle Interior (Door Open)



Photo No. 057 - Pre-Test Passenger Seat Fore-Aft Markings



Photo No. 058 - Post-Test Passenger Seat Fore-Aft Markings



Photo No. 059 - Pre-Test View of Belt Anchorage for Passenger Dummy

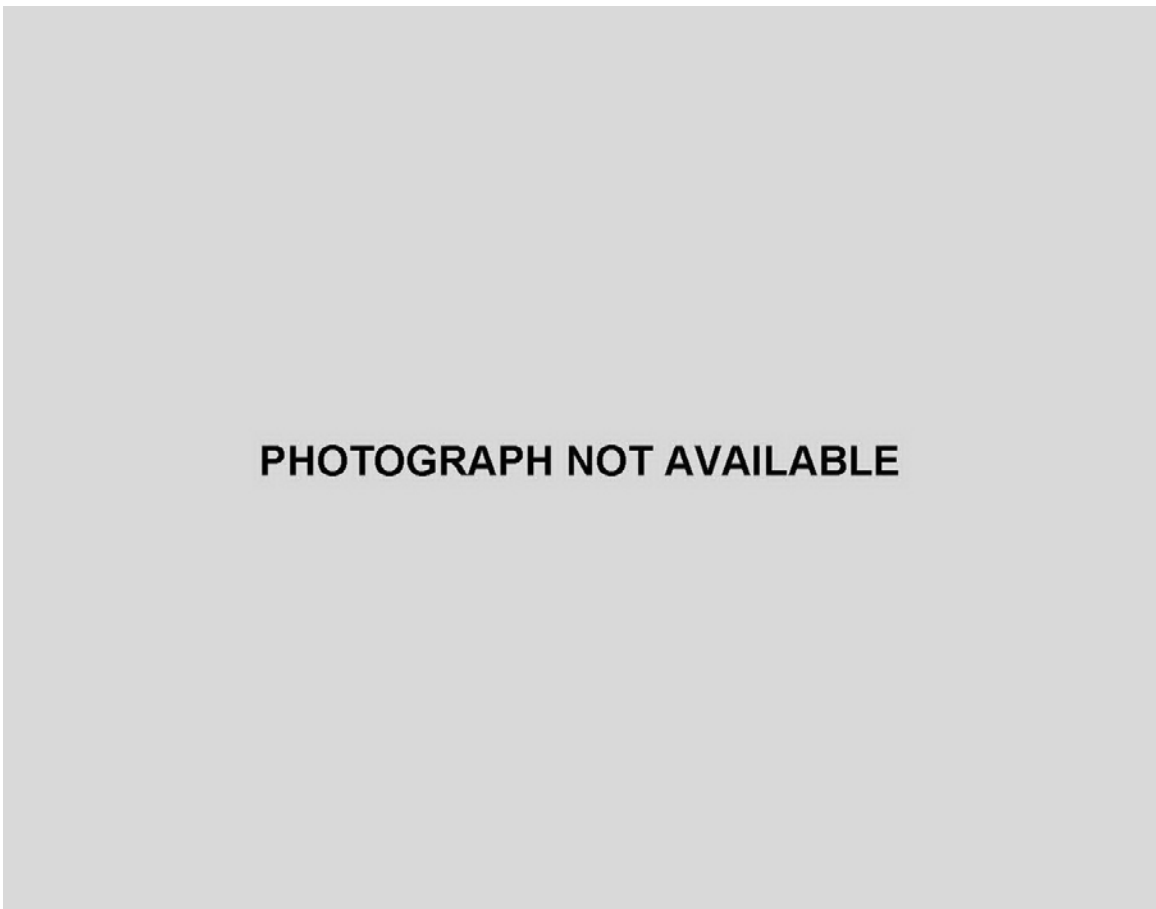


Photo No. 060 - Post-Test View of Belt Anchorage for Passenger Dummy



Photo No. 061 - Pre-Test Passenger Dummy Feet



Photo No. 062 - Post-Test Passenger Dummy Feet



Photo No. 063 - Pre-Test Passenger Side Knee Bolster (without dummy)



Photo No. 064 - Post-Test Passenger Side Knee Bolster (without dummy)



Photo No. 065 - Pre-Test Passenger Side Floorpan



Photo No. 066 - Post-Test Passenger Side Floorpan



Photo No. 067 - Post-Test Passenger Dummy Face



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



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



Photo No. 070 - Ballast Installed in Vehicle

PHOTOGRAPH NOT APPLICABLE

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



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



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



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



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

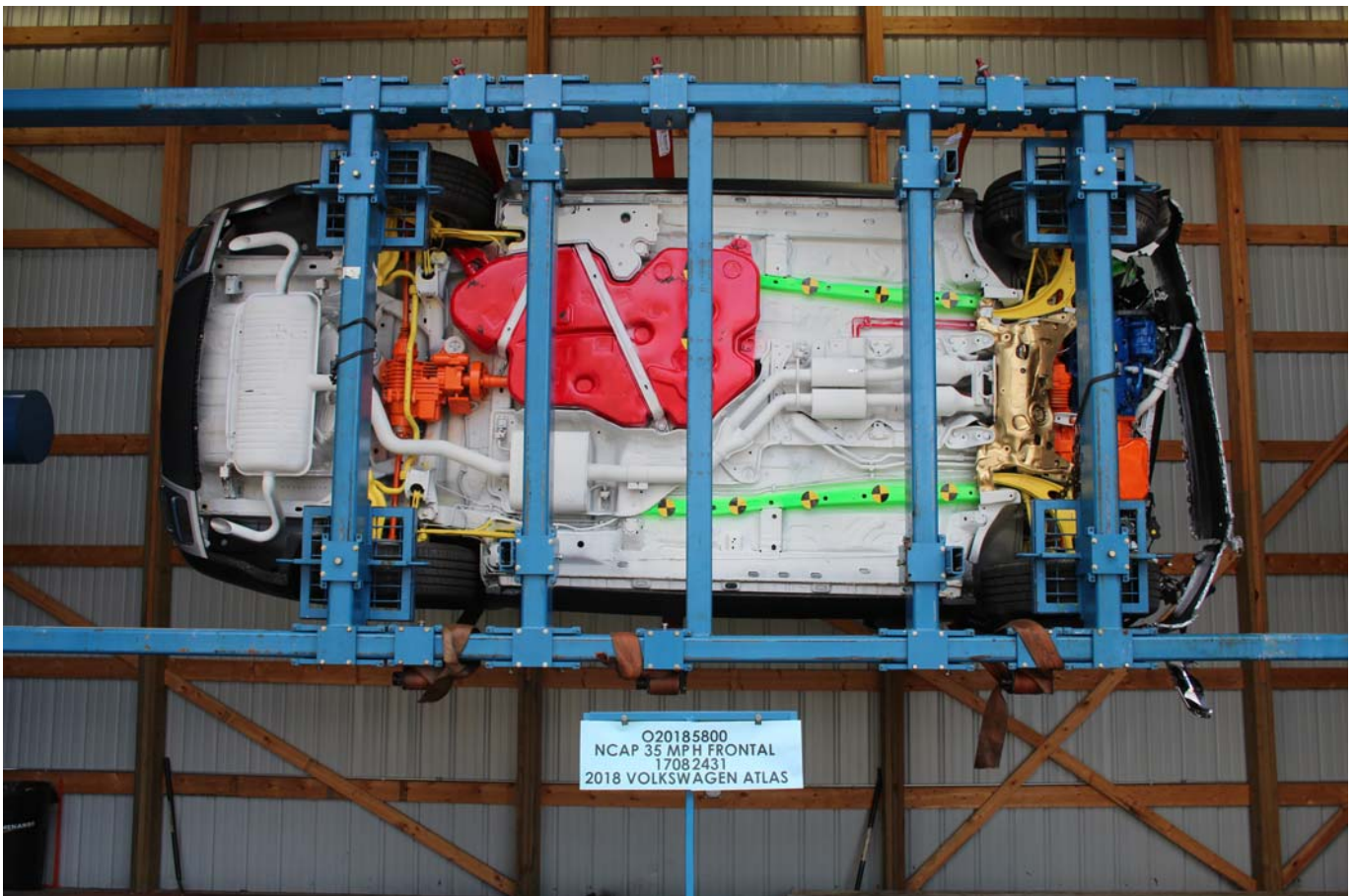


Photo No. 076 - Vehicle at 270 Degrees on Static Rollover Device

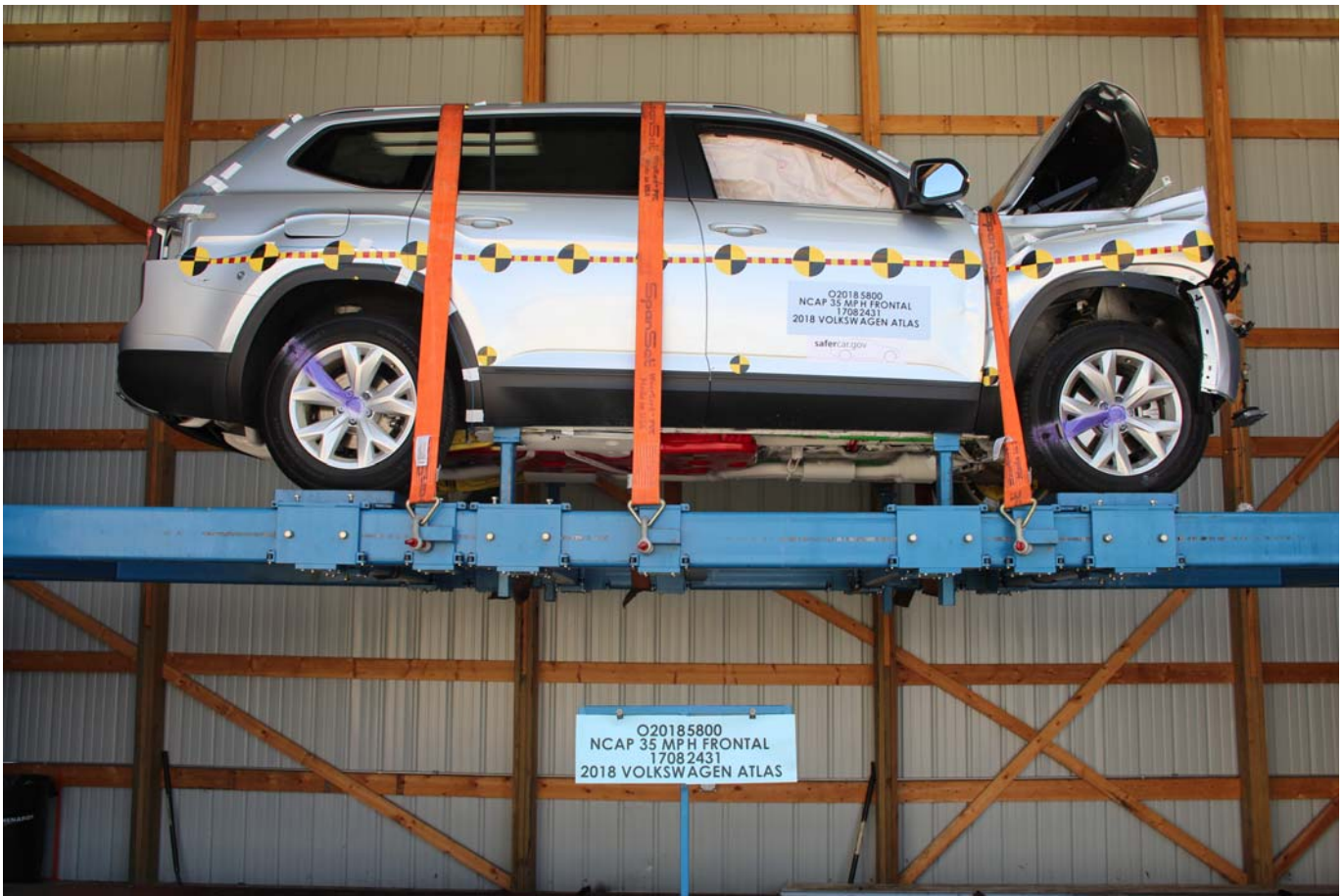


Photo No. 077 - Vehicle at 360 Degrees on Static Rollover Device



Photo No. 078 - 2018 Volkswagen Atlas Launch Edition AWD Frontal Impact Event

2018 Atlas V6 Launch Edition w/ 4MOTION®

Reflex Silver Metallic Exterior Titan Black Cloth Interior



STANDARD FEATURES (unless replaced by options)

- PERFORMANCE**
- 3.6L 24-valve DOHC narrow-angle V6 engine w/ FSI® direct fuel injection
 - 4MOTION® all-wheel-drive w/ Active Control
 - Four-wheel independent suspension
- SAFETY FEATURES**
- Driver & front passenger front & side airbag supplemental restraint systems
 - Side Curtain Protection® head impact airbags
 - 3-point safety belts, all seating positions
 - Anti-lock Braking System (ABS) w/ disc brakes
 - Anti-Slip Regulation (ASR) & Engine Brake Assist (EBA)
 - Electronic Brake-pressure Distribution (EBD) & Hydraulic Brake Assist (HBA)
 - Electronic Stability Control (ESC) & Electronic Differential Lock (EDL)
 - Intelligent Crash Response System (ICRS)
 - Lower Anchors & Tethers for Children (LATCH)
 - Tire Pressure Monitoring System (TPMS)

- EXTERIOR**
- 18" alloy wheels w/ all-season tires
 - LED headlights w/ LED Daytime Running Lights (DRL)
 - Foldable, power adjustable side mirrors w/ integrated turn signals
 - Variable intermittent front wipers
 - Silver roof rails & chrome window trim
 - Power tilting & sliding panoramic sunroof

- INTERIOR**
- Dual-zone manual climate control w/ air vents for all three rows
 - 3-spoke, multi-function steering wheel
 - Tilt & telescoping adjustable steering column
 - Driver's seat: 6-way manual w/ height adjustment
 - Front passenger seat: 4-way manual
 - 2nd-row seat: 60/40 split-folding, adjustable w/ 3rd-row Easy Access
 - 3rd-row seat: 50/50 split-folding & folds flat
 - Cloth seating surfaces
 - Front center console w/ cup holders, armrest & storage
 - Reading lights, all three rows (2 per row)

- TECHNOLOGY**
- Rear View Camera System
 - Composition Media: 8" touchscreen AM/FM/HD radio & CD player w/ USB input, aux-in & voice control
 - 6-speaker sound system
 - Bluetooth® connectivity (for compatible devices)
 - SiriusXM® Satellite Radio (w/ limited time trial subscription)
 - Cruise control
 - Color multi-function display (MFD) w/ trip computer
 - HomeLink® integrated garage door opener
 - Electric parking brake

Manufacturer's Suggested Retail Price: \$35,300.00

VW CAR-NET® EQUIPPED. Features include:
- 3-App-Connect® (Smartphone Integration & Interface)

DRIVER CARE PACKAGE

- WARRANTY INFORMATION**
- Volkswagen New Vehicle Limited Warranty
 - * 6 years/72,000 miles (whichever occurs first)
 - * Includes coverage for powertrain components
 - Limited Warranty against Corrosion Perforation
 - * 7 years/100,000 miles (whichever occurs first)
- Please ask your dealer for a copy of the Volkswagen warranty booklet for details.
- 24-HOUR ROADSIDE ASSISTANCE**
- * 3 years/36,000 miles (whichever occurs first) (Towing, Jump Starts, Tire Changes, Out of Fuel, and Lock-Out) Provided by a third party supplier.

PACKAGES/OPTIONS

- Reflex Silver Metallic Exterior No Charge
- Titan Black Cloth Interior No Charge
- Monster Mats® w/ Heavy Duty Trunk Liner & VW CarGo Blocks \$285.00
- Roadside Assistance Kit \$55.00
- Wheel locks & dust caps (4 each) w/ coded key \$60.00
- 8-Speed Automatic w/ Tiptronic® No Charge

Destination Charge **\$925.00**

Total Price: \$36,675.00

Fuel, license, title fees, taxes and dealer-installed accessories are not included.

PARTS CONTENT INFORMATION

| | |
|-------------------------------|------------------------|
| FOR VEHICLES IN THIS CARLINE: | FOR THIS VEHICLE: |
| U.S./CANADIAN | FINAL ASSEMBLY POINT: |
| PARTS CONTENT: 46% | CHATTANOOGA TN, U.S.A. |
| MAJOR SOURCES OF FOREIGN | COUNTRY OF ORIGIN: |
| PARTS CONTENT: | ENGINE: GERMANY |
| GERMANY: 27% | TRANSMISSION: JAPAN |

NOTE: PARTS CONTENT DOES NOT INCLUDE FINAL ASSEMBLY, DISTRIBUTION OR OTHER NON-PARTS COSTS.

EPA DOT Fuel Economy and Environment Gasoline Vehicle

Fuel Economy

19 MPG combined city/hwy

17 city 23 highway

5.3 gallons per 100 miles

Small Sport Utility Vehicles range from 18 to 34 MPG. The best vehicle rates 136 MPGe.

You spend \$2,750 more in fuel costs over 5 years compared to the average new vehicle.

Annual fuel cost \$1,900

Fuel Economy & Greenhouse Gas Rating (tailpipe only) **3**

Smog Rating (tailpipe only) **5**

This vehicle emits 454 grams of CO₂ per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel also create emissions. Learn more at fuelconomy.gov.

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 27 MPG and costs \$6,750 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$2.40 per gallon. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

fuelconomy.gov Calculate personalized estimates and compare vehicles

SOLD TO: 402617
VOLKSWAGEN OF MILWAUKEE NORTH
1400 W SILVER SPRING DR
MILWAUKEE, WI 53209

SHIP TO: 402617
VOLKSWAGEN OF MILWAUKEE NORTH
1400 W SILVER SPRING DR
MILWAUKEE, WI 53209

Port of Entry: CHATTANOOGA
VIN: 1V2HR2CA4JC504316



GOVERNMENT 5-STAR SAFETY RATINGS

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

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

Who better to get you into a Volkswagen than us? Volkswagen Credit

Photo No. 079 - Monroney Label Photograph

APPENDIX B
DUMMY RESPONSE DATA TRACES

TABLE OF DATA PLOTS

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| Figure No. 2. | Driver Head Y Acceleration vs. Time | B-1 |
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| Figure No. 8. | Driver Chest Z Acceleration vs. Time | B-3 |
| Figure No. 9. | Driver Chest Resultant Acceleration vs. Time | B-3 |
| Figure No. 10. | Driver Neck Force X vs. Time | B-4 |
| Figure No. 11. | Driver Neck Force Z vs. Time | B-4 |
| Figure No. 12. | Driver Neck Moment Y vs. Time | B-4 |
| Figure No. 13. | Driver Nij (NTF) vs. Time | B-5 |
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| Figure No. 15. | Driver Nij (NCF) vs. Time | B-5 |
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| Figure No. 19. | Passenger Head X Acceleration vs. Time | B-7 |
| Figure No. 20. | Passenger Head Y Acceleration vs. Time | B-7 |
| Figure No. 21. | Passenger Head Z Acceleration vs. Time | B-7 |
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| Figure No. 26. | Passenger Chest Z Acceleration vs. Time | B-9 |
| Figure No. 27. | Passenger Chest Resultant Z Acceleration vs. Time | B-9 |

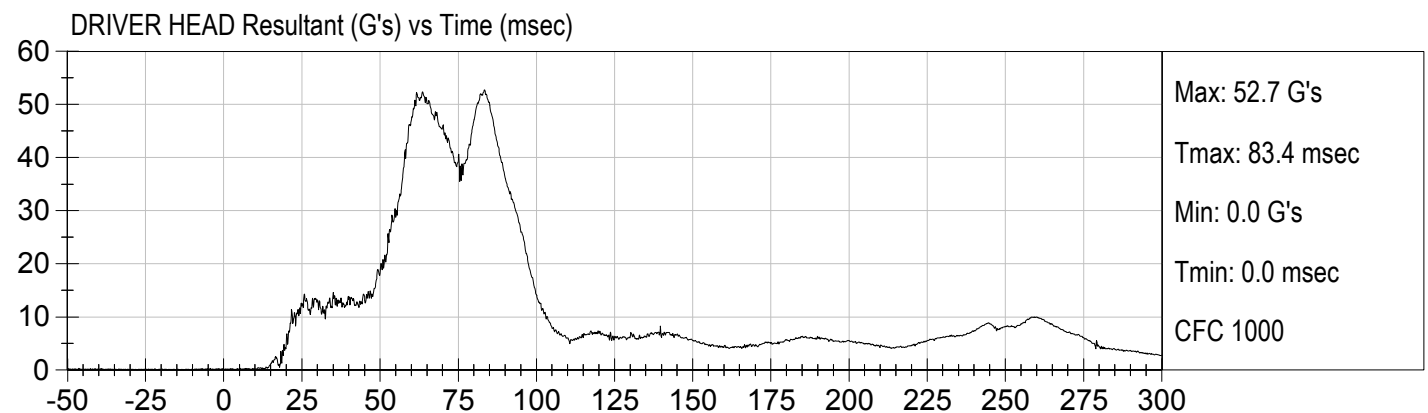
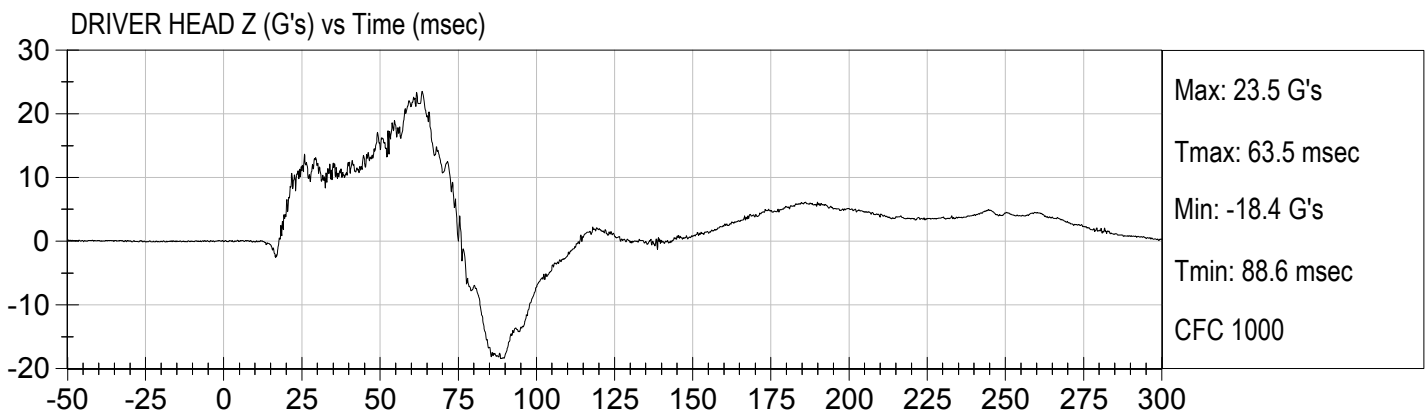
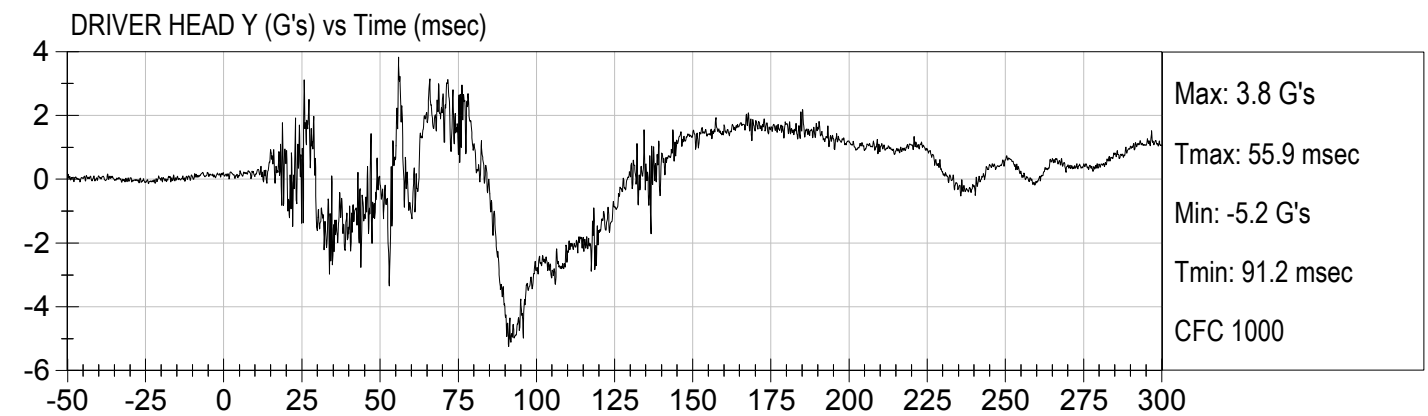
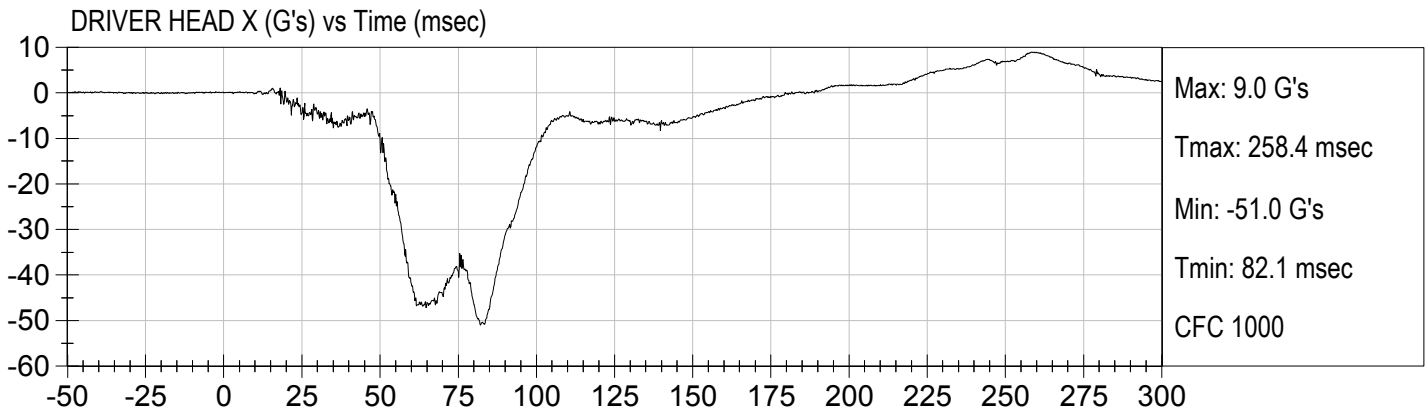
| | <u>Page No.</u> |
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| Figure No. 29. Passenger Neck Force Z vs. Time | B-10 |
| Figure No. 30. Passenger Neck Moment Y vs. Time | B-10 |
| Figure No. 31. Passenger Nij (NTF) vs. Time | B-11 |
| Figure No. 32. Passenger Nij (NTE) vs. Time | B-11 |
| Figure No. 33. Passenger Nij (NCF) vs. Time | B-11 |
| Figure No. 34. Passenger Nij (NCE) vs. Time | B-11 |
| Figure No. 35. Passenger Left Femur Force vs. Time | B-12 |
| Figure No. 36. Passenger Right Femur Force vs. Time | B-12 |

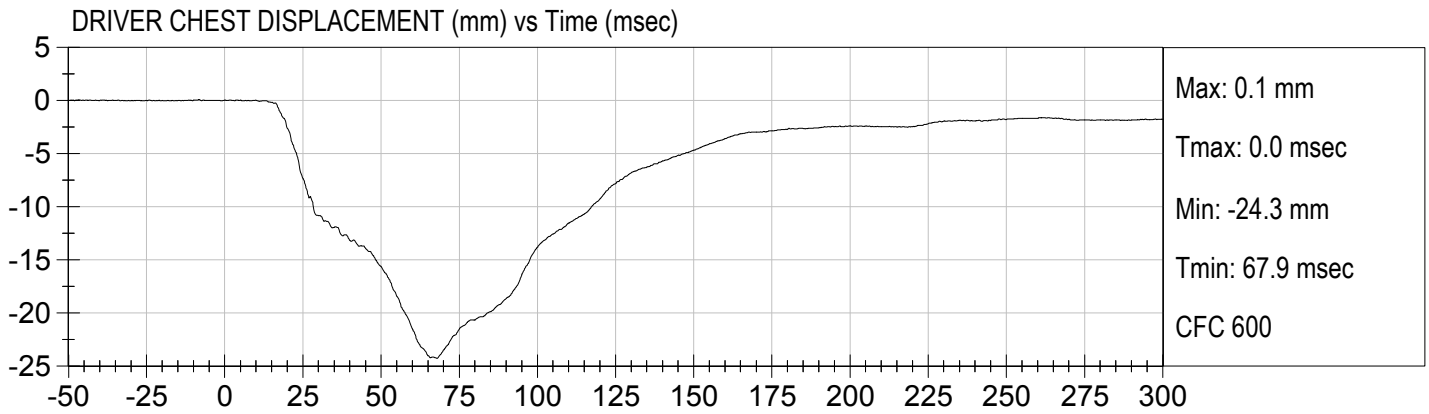
The following additional dummy and vehicle response data can be found in the R&D section of the NHTSA website at www.nhtsa.dot.gov

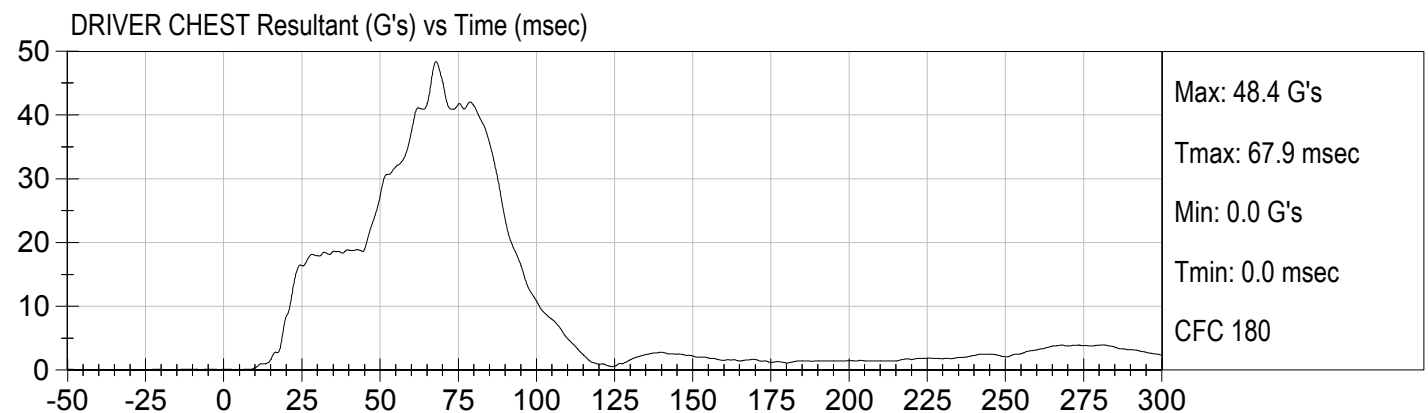
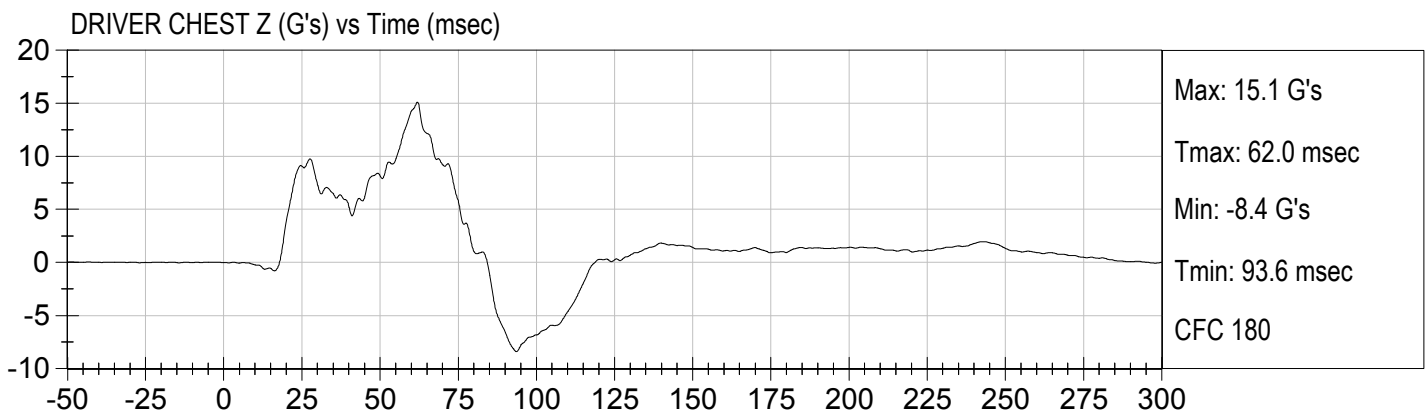
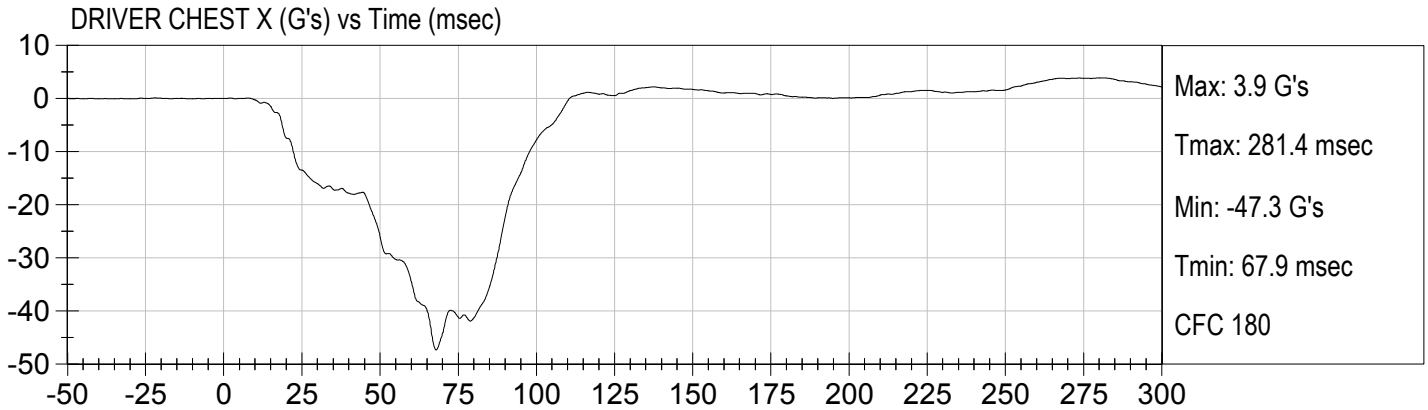
Driver Head X Redundant
 Driver Head Y Redundant
 Driver Head Z Redundant
 Driver Head Angular Velocity X
 Driver Head Angular Velocity Y
 Driver Head Angular Velocity Z
 Driver Upper Neck Force Y
 Driver Upper Neck Moment X
 Driver Upper Neck Moment Z
 Driver Chest X Redundant
 Driver Chest Y Redundant
 Driver Chest Z Redundant
 Driver Pelvis X
 Driver Pelvis Y
 Driver Pelvis Z
 Driver Left Femur Redundant
 Driver Right Femur Redundant
 Driver Left Upper Tibia Moment X
 Driver Left Upper Tibia Moment Y

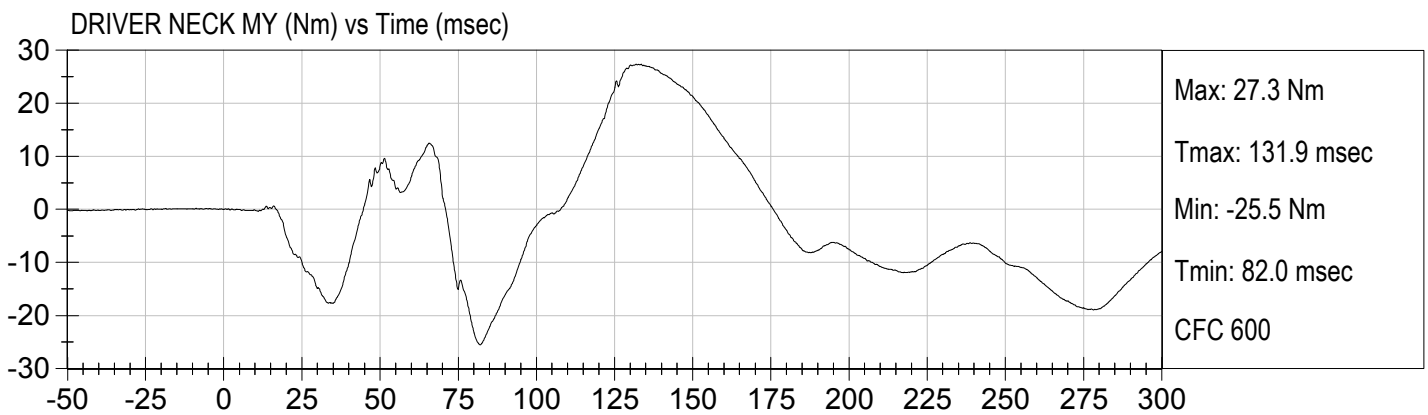
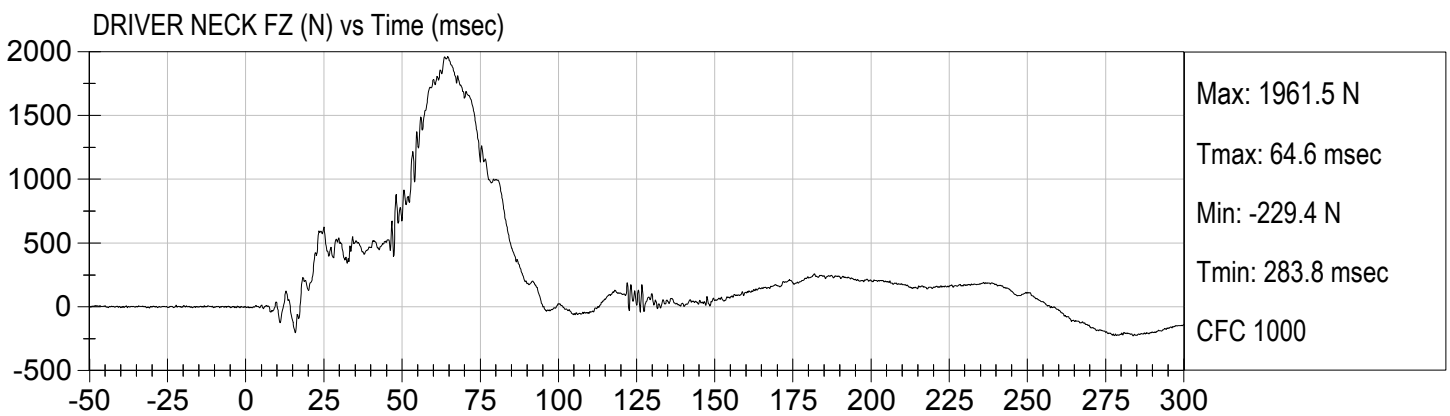
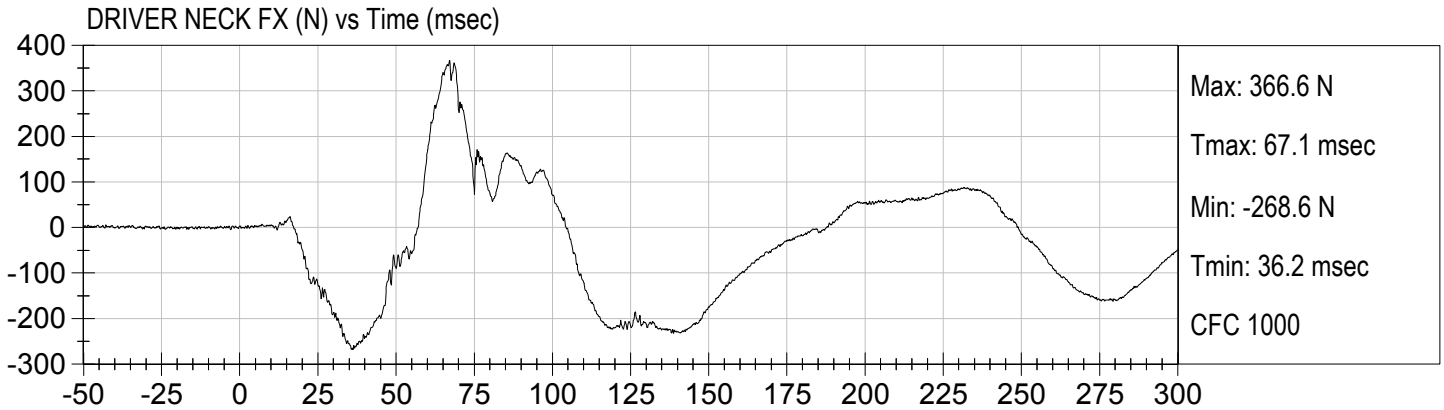
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Driver Left Lower Tibia Moment X
Driver Left Lower Tibia Moment Y
Driver Left Lower Tibia Force Z
Driver Right Upper Tibia Moment X
Driver Right Upper Tibia Moment Y
Driver Right Upper Tibia Force Z
Driver Right Lower Tibia Moment X
Driver Right Lower Tibia Moment Y
Driver Right Lower Tibia Force Z
Driver Left Foot Fore Z
Driver Left Foot Aft X
Driver Left Foot Aft Z
Driver Right Foot Fore Z
Driver Right Foot Aft X
Driver Right Foot Aft Z
Driver Lap Belt Force
Driver Shoulder Belt Force
Passenger Head X Redundant
Passenger Head Y Redundant
Passenger Head Z Redundant
Passenger Head Angular Velocity X
Passenger Head Angular Velocity Y
Passenger Head Angular Velocity Z
Passenger Upper Neck Force Y
Passenger Upper Neck Moment X
Passenger Upper Neck Moment Z
Passenger Chest X Redundant
Passenger Chest Y Redundant
Passenger Chest Z Redundant
Passenger Pelvis X
Passenger Pelvis Y

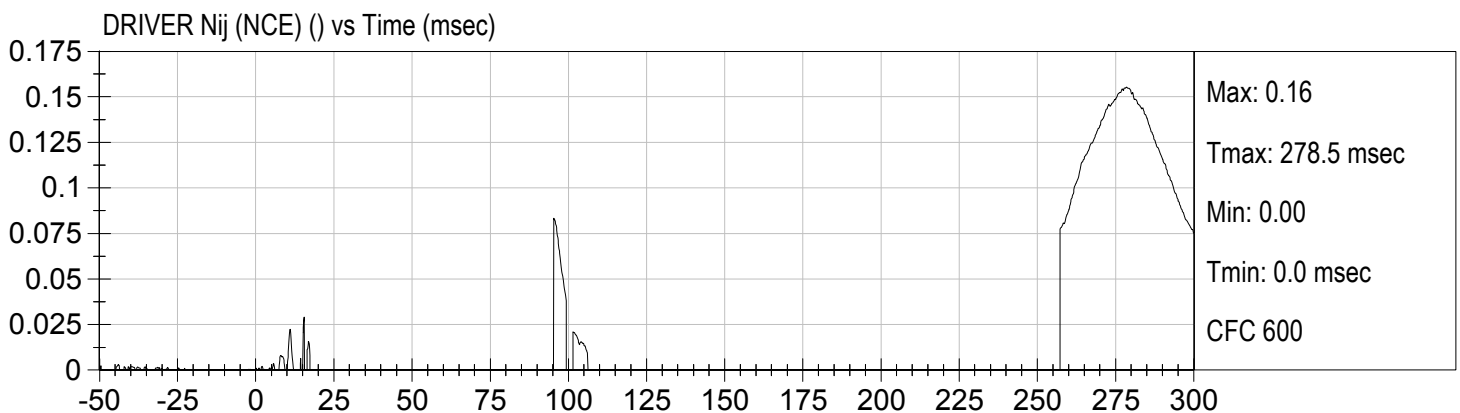
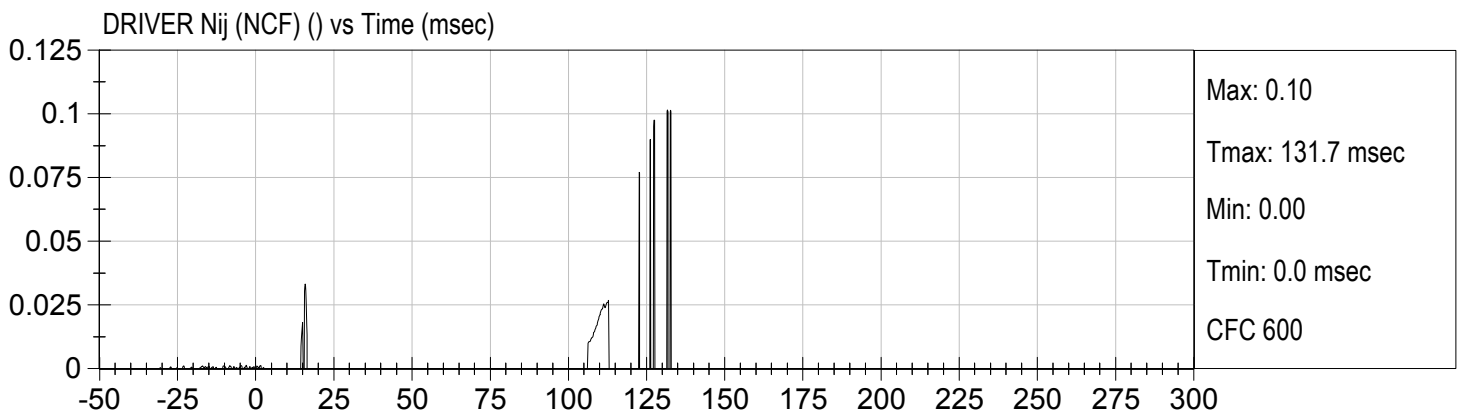
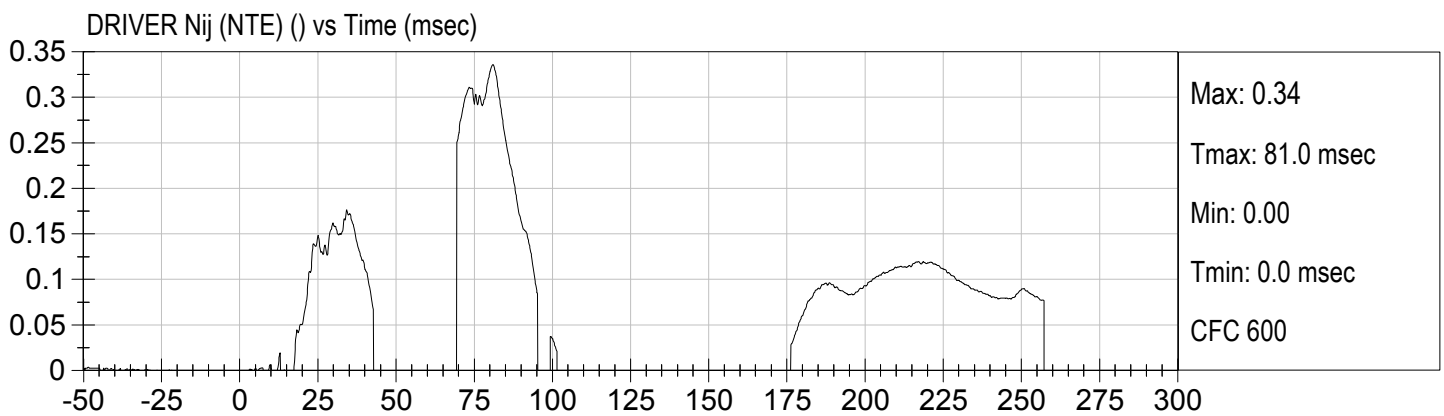
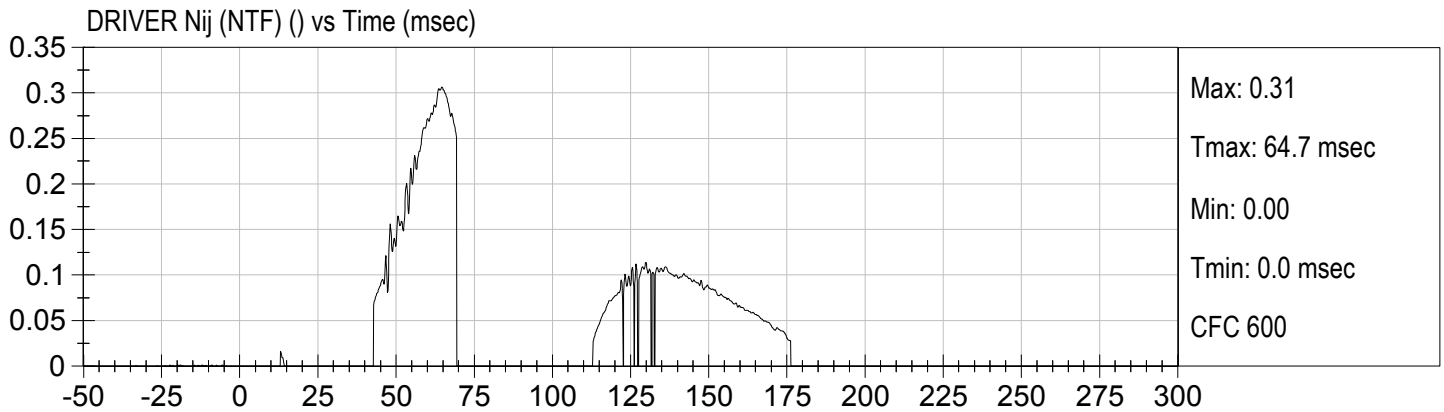
Passenger Pelvis Z
Passenger Left Femur Redundant
Passenger Right Femur Redundant
Passenger Left Upper Tibia Moment X
Passenger Left Upper Tibia Moment Y
Passenger Left Upper Tibia Force Z
Passenger Left Lower Tibia Moment X
Passenger Left Lower Tibia Moment Y
Passenger Left Lower Tibia Force Z
Passenger Right Upper Tibia Moment X
Passenger Right Upper Tibia Moment Y
Passenger Right Upper Tibia Force Z
Passenger Right Lower Tibia Moment X
Passenger Right Lower Tibia Moment Y
Passenger Right Lower Tibia Force Z
Passenger Left Foot Fore Z
Passenger Left Foot Aft X
Passenger Left Foot Aft Z
Passenger Right Foot Fore Z
Passenger Right Foot Aft X
Passenger Right Foot Aft Z
Passenger Lap Belt Force
Passenger Shoulder Belt Force
Left Rear Seat Crossmember X
Right Rear Seat Crossmember X
Vehicle Engine Top X
Vehicle Engine Bottom X
Left Rear Seat Crossmember Z
Right Rear Seat Crossmember Z
Left Rear Seat Crossmember Xr
Right Rear Seat Crossmember Xr
Advanced Research Load Cell Barrier – 528 channels

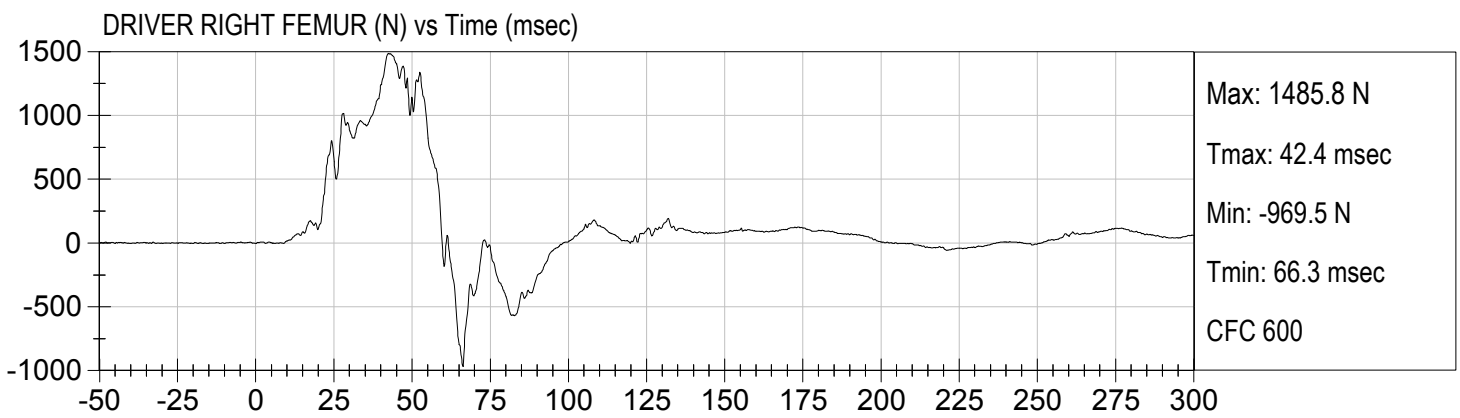


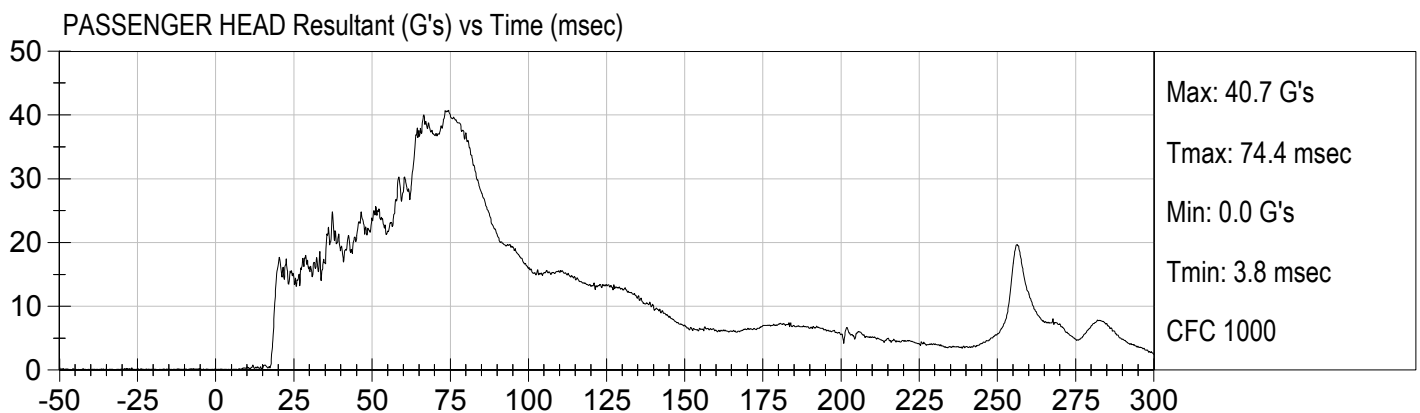
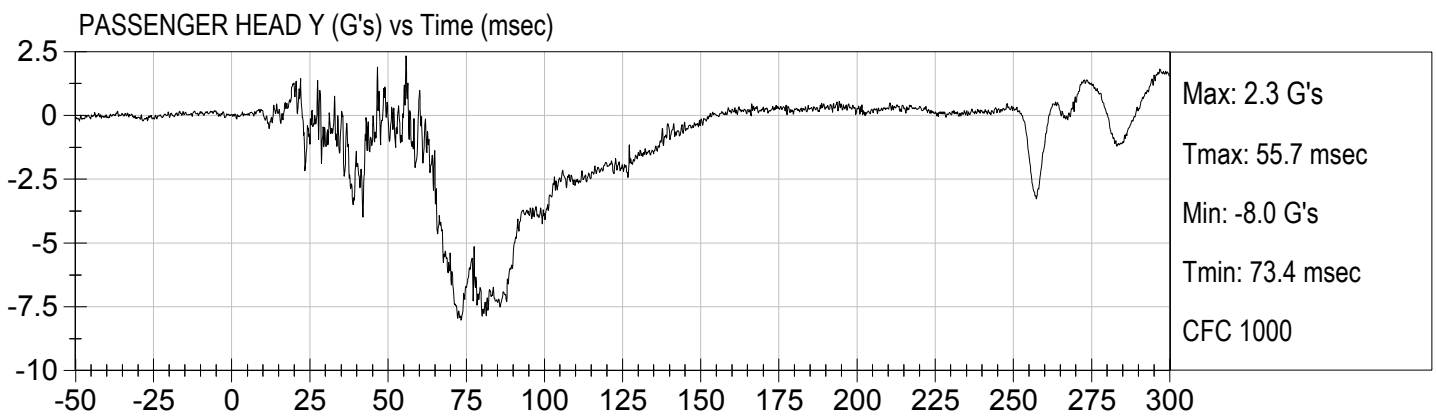
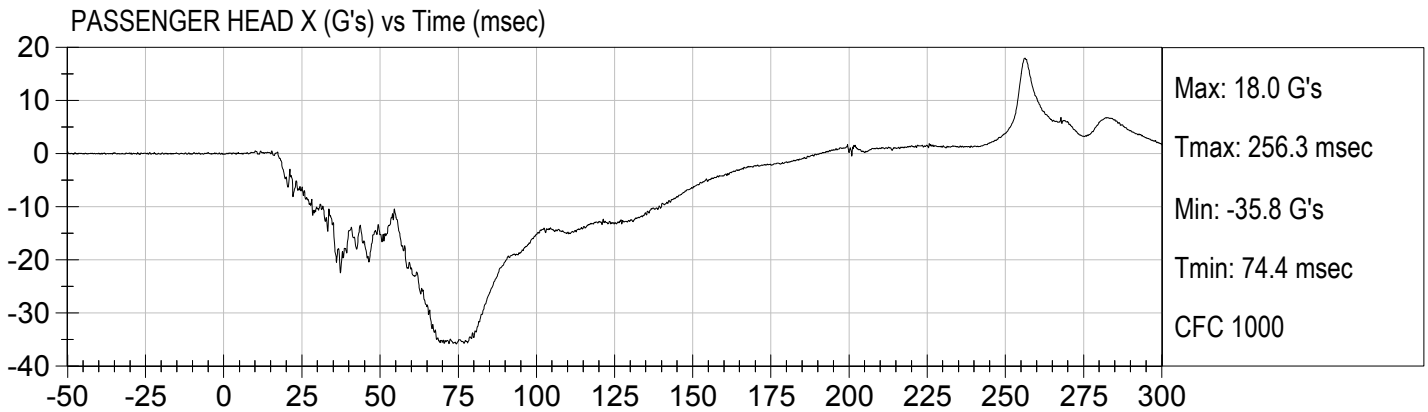


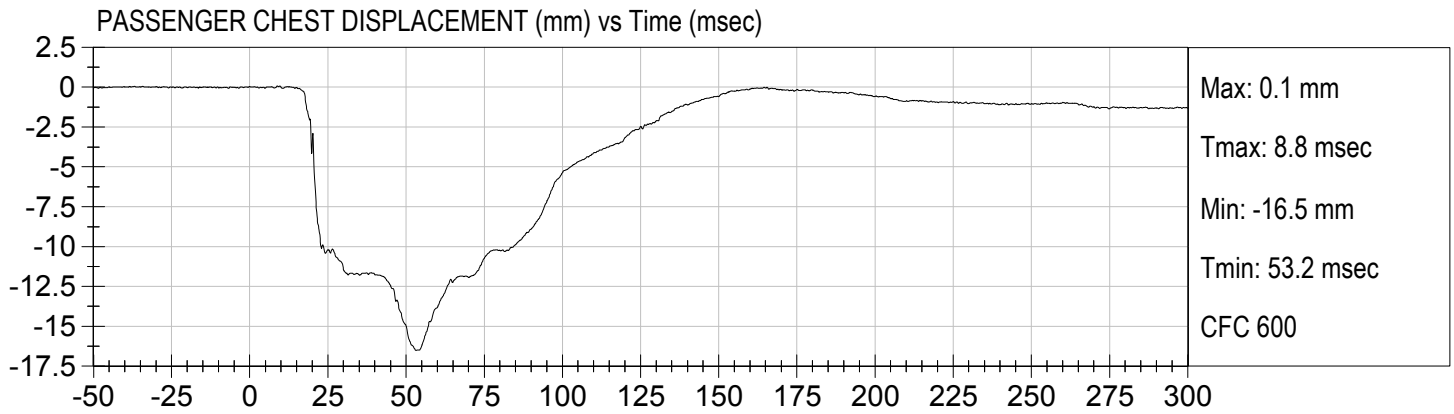


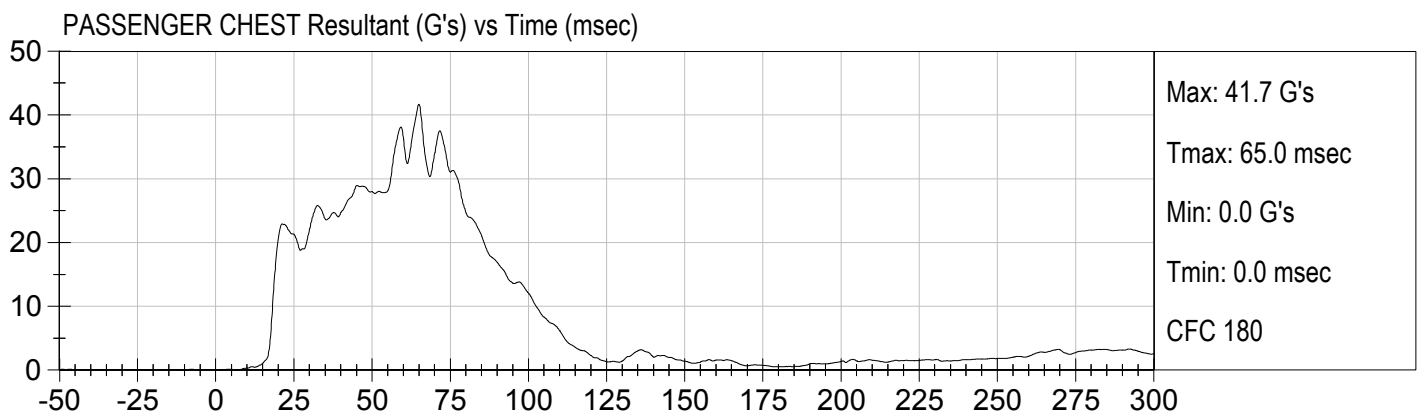
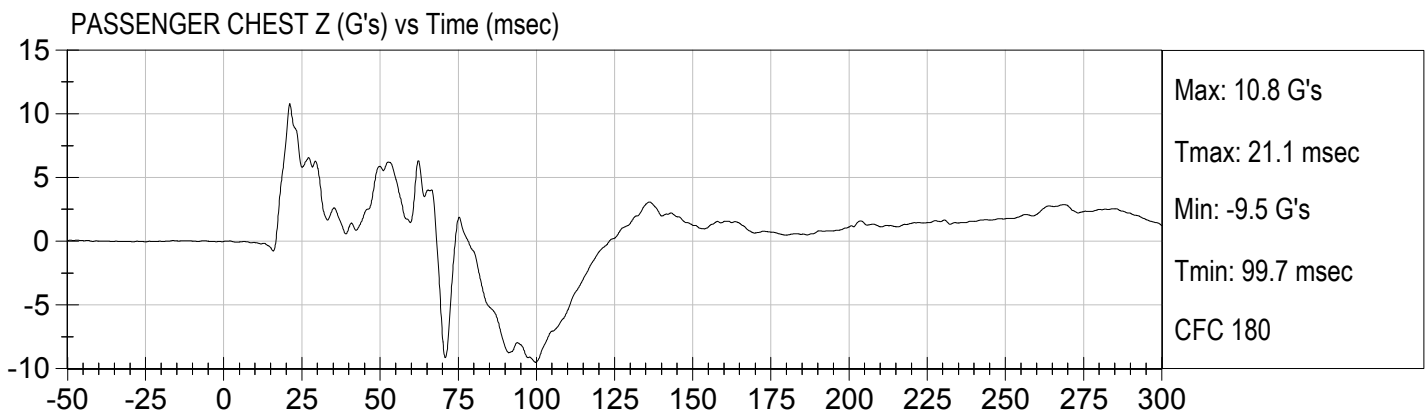
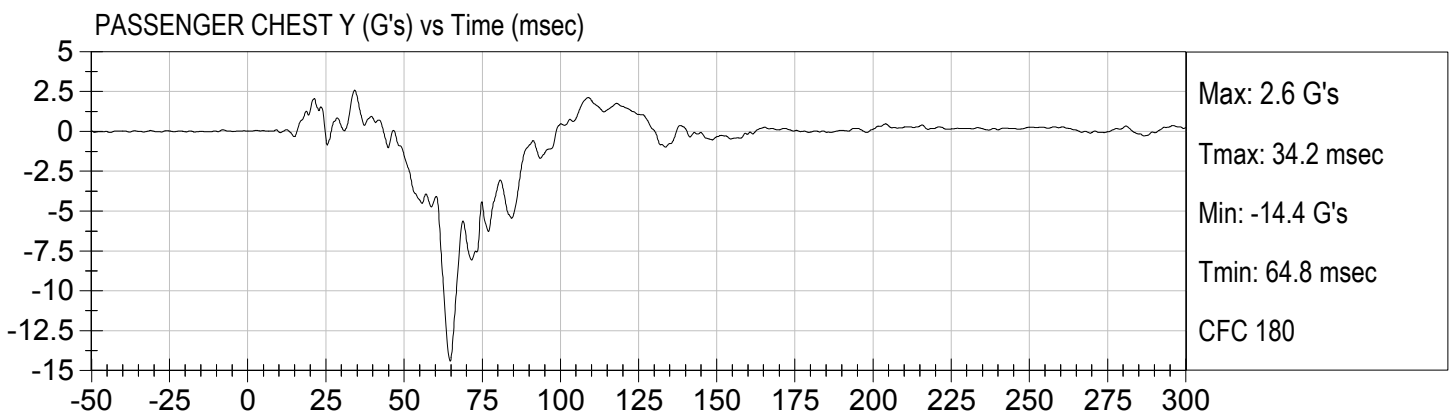
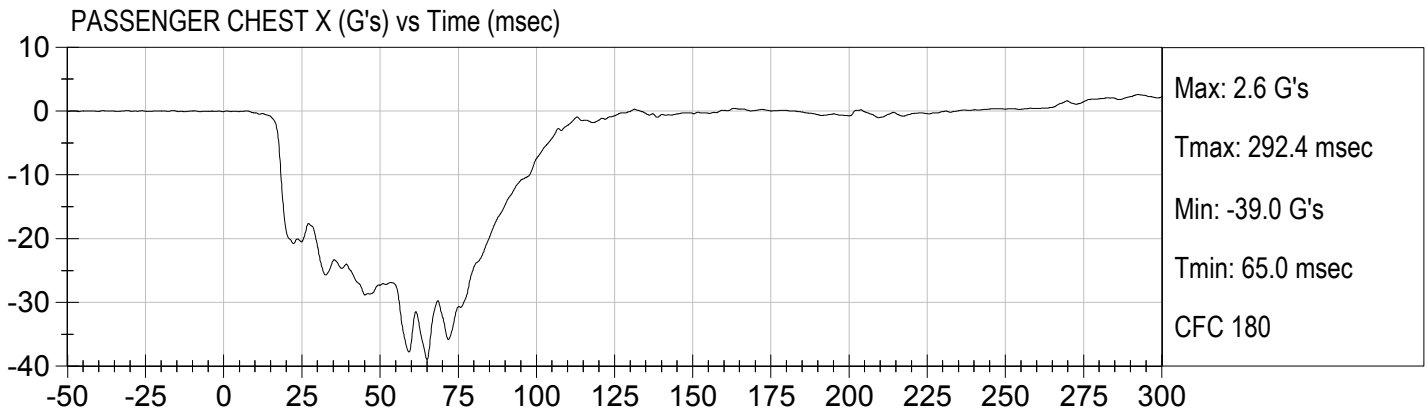


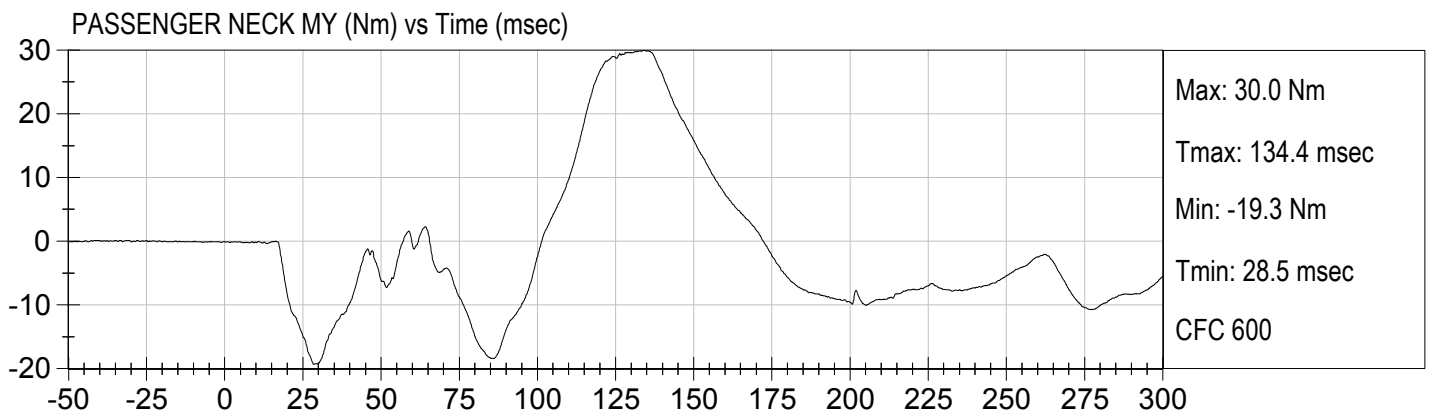
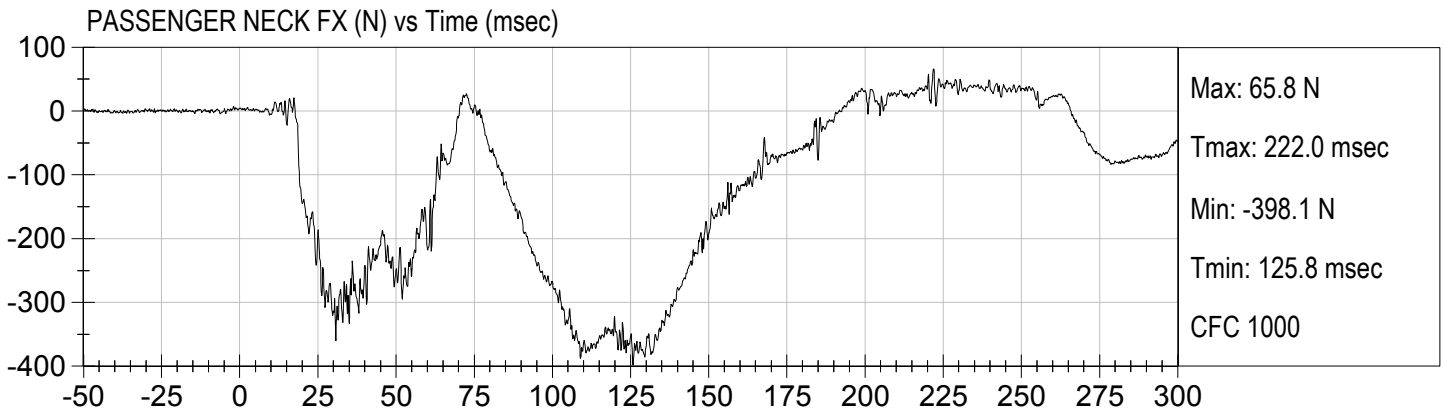


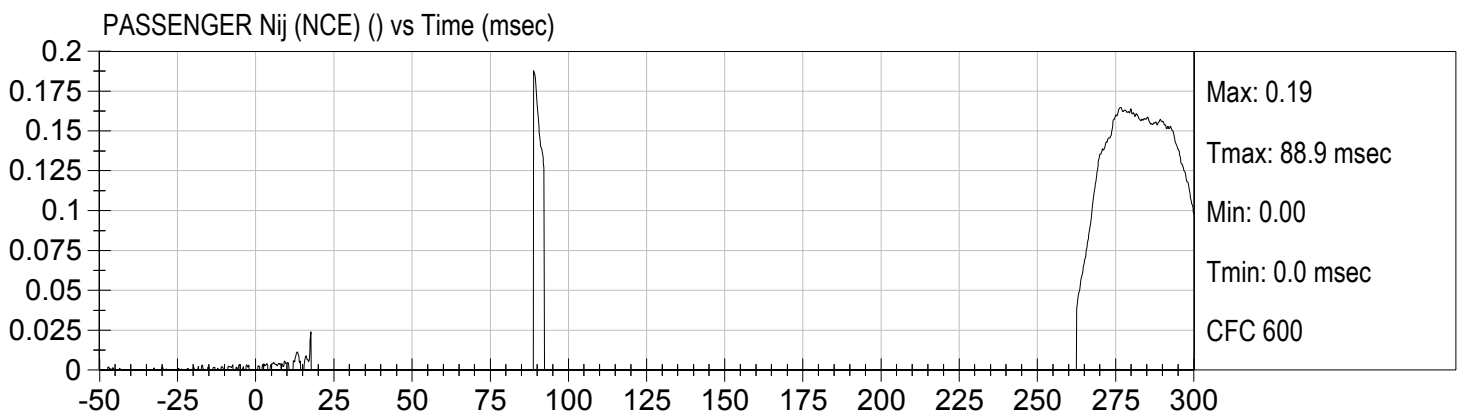
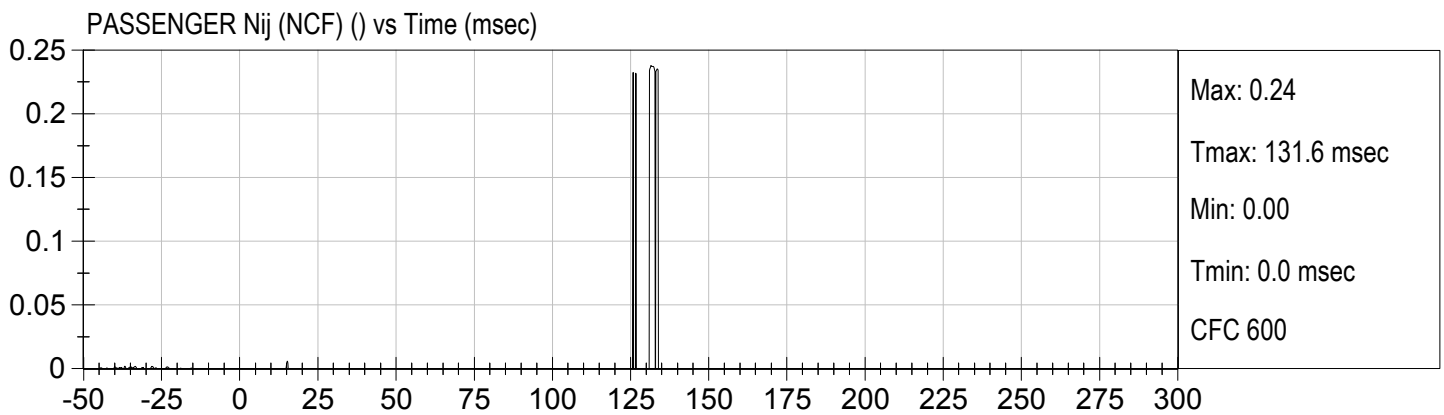
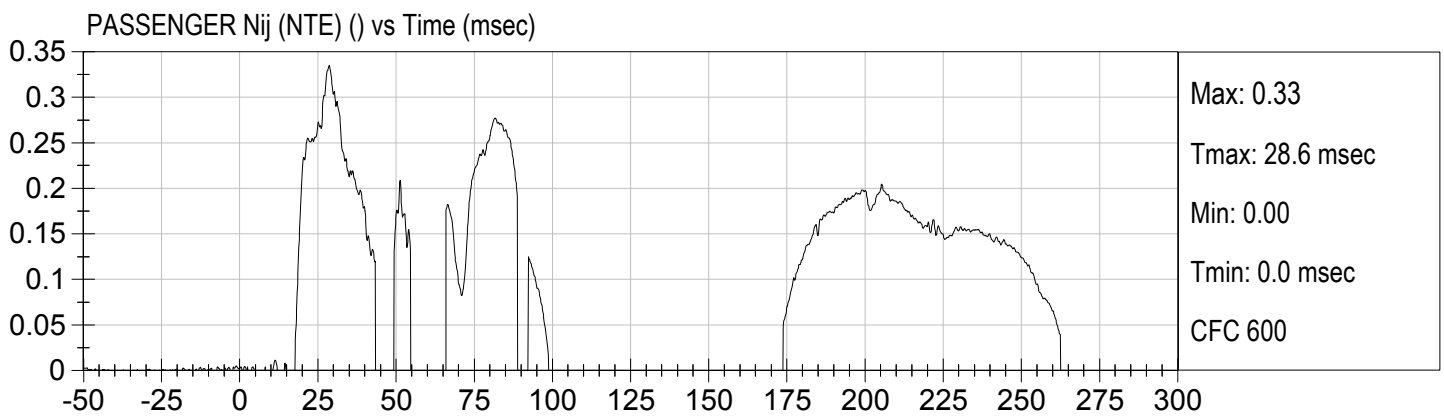
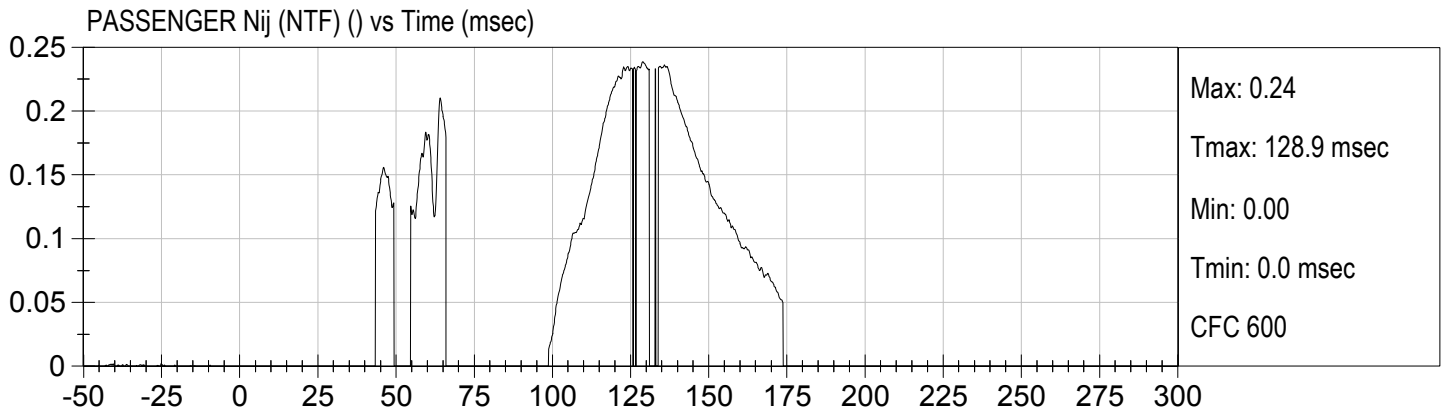


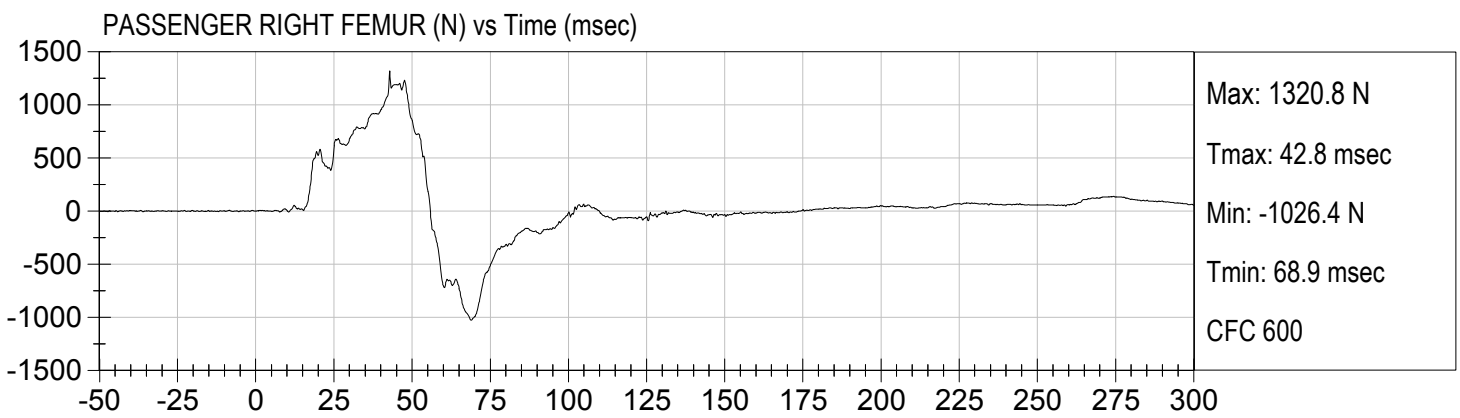
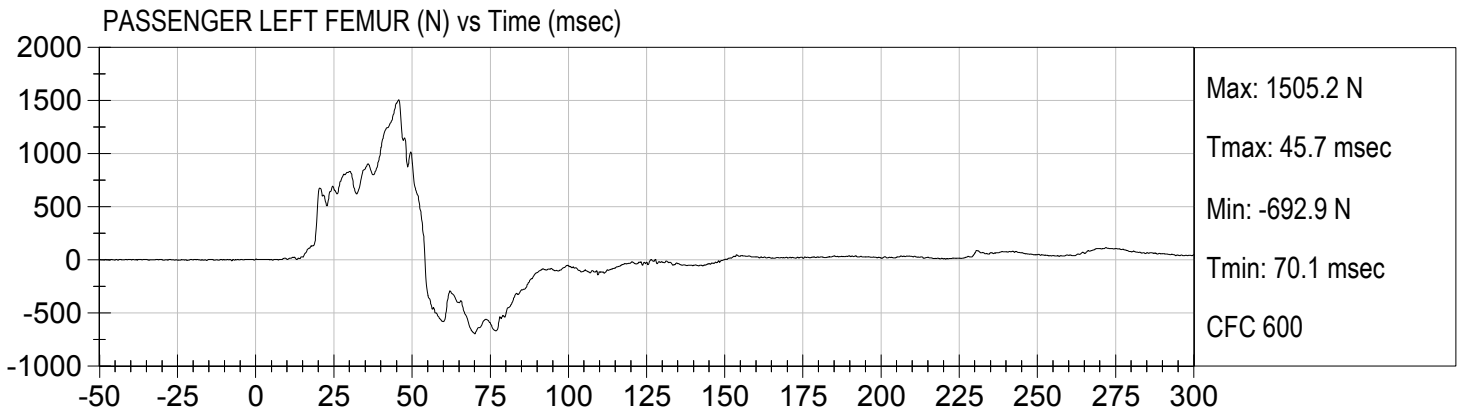












APPENDIX C
DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

**Hybrid III, 50th External Measurements
SN: 351**

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

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

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

**MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 50TH PERCENTILE MALE**

ATD Serial No: 351

Test ID: D172121

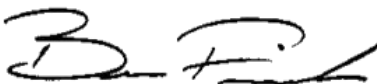
| Tested Parameter | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|--------------------|--------|-------------|
| Laboratory Temperature | deg C | 18.9 to 25.6 | 21.3 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 43 | Pass |
| Peak Resultant Acceleration | G's | 225 to 275 | 265 | Pass |
| Peak Lateral Acceleration | G's | <= +/- 15.0 | -4.8 | Pass |
| Unimodal | N/A | Yes | Yes | Pass |
| Oscillations | N/A | within 10% of peak | Yes | Pass |
| Overall Test Results | | | | Pass |



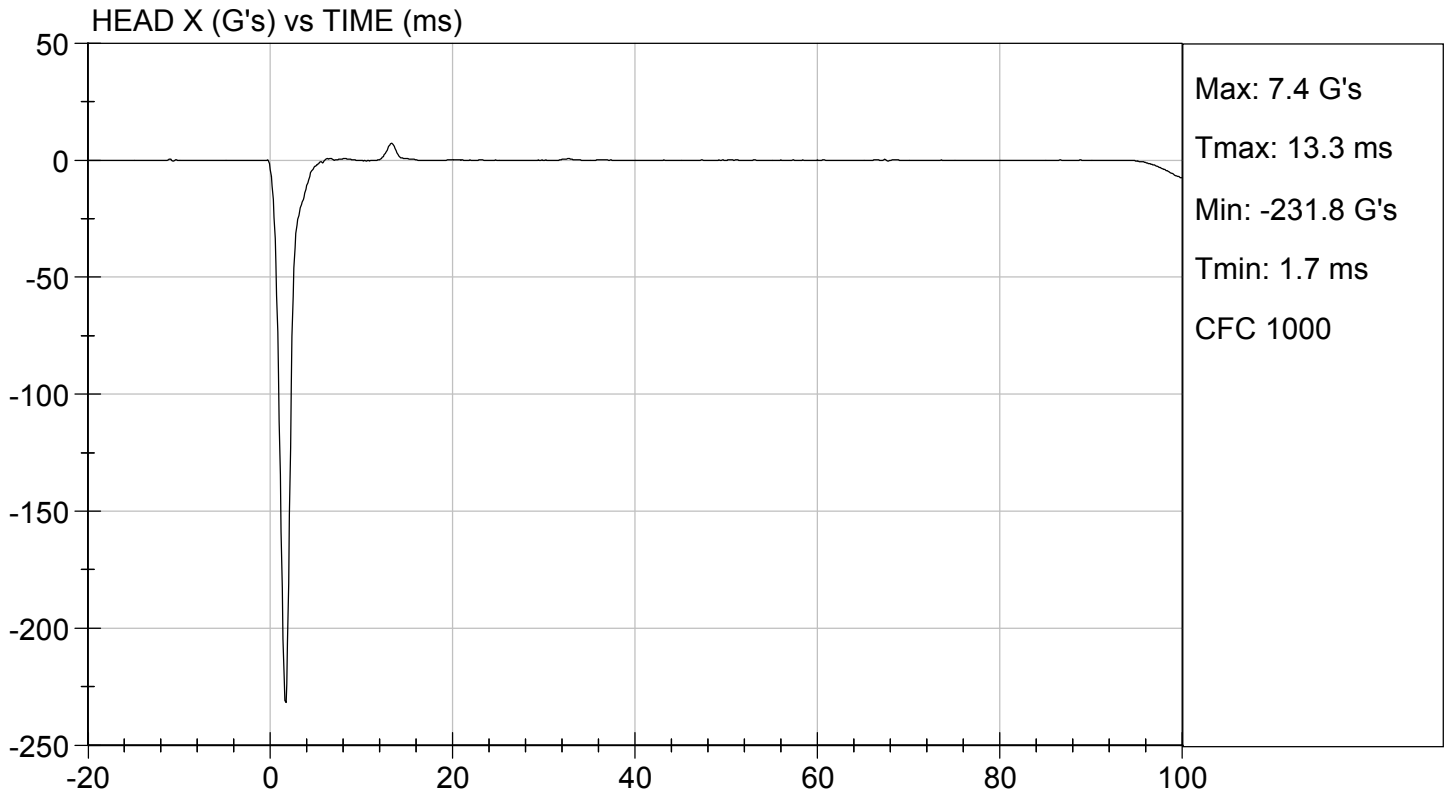
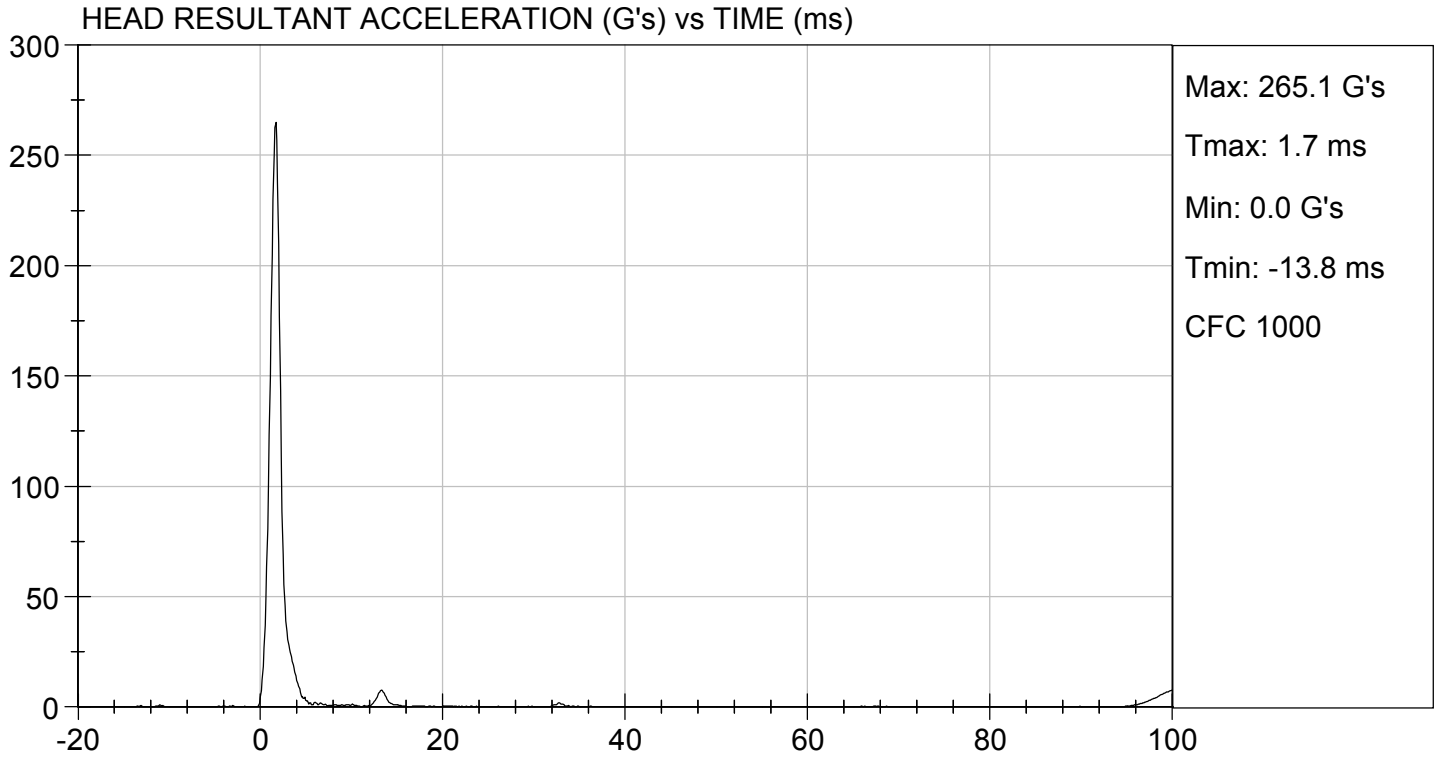
 Laboratory Technician

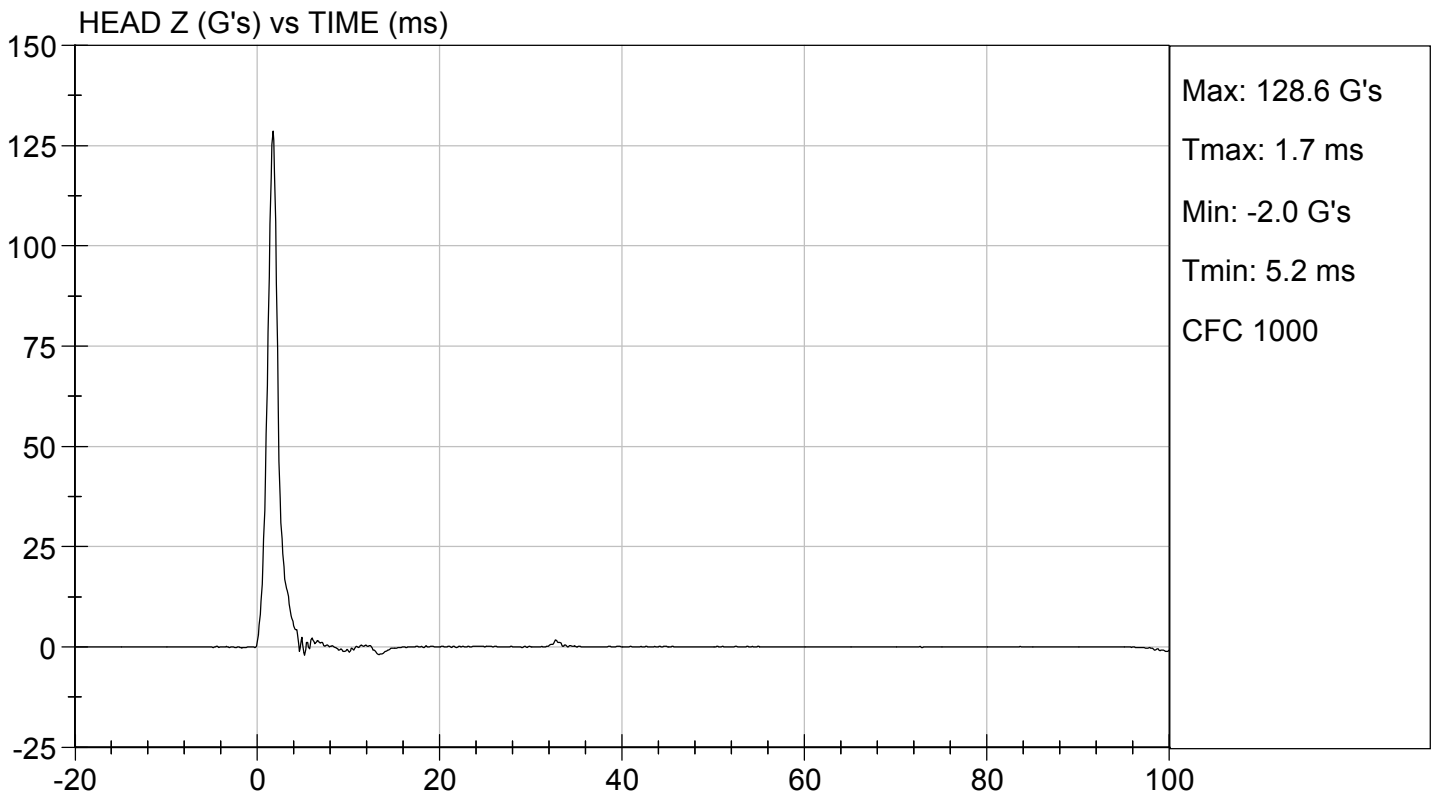
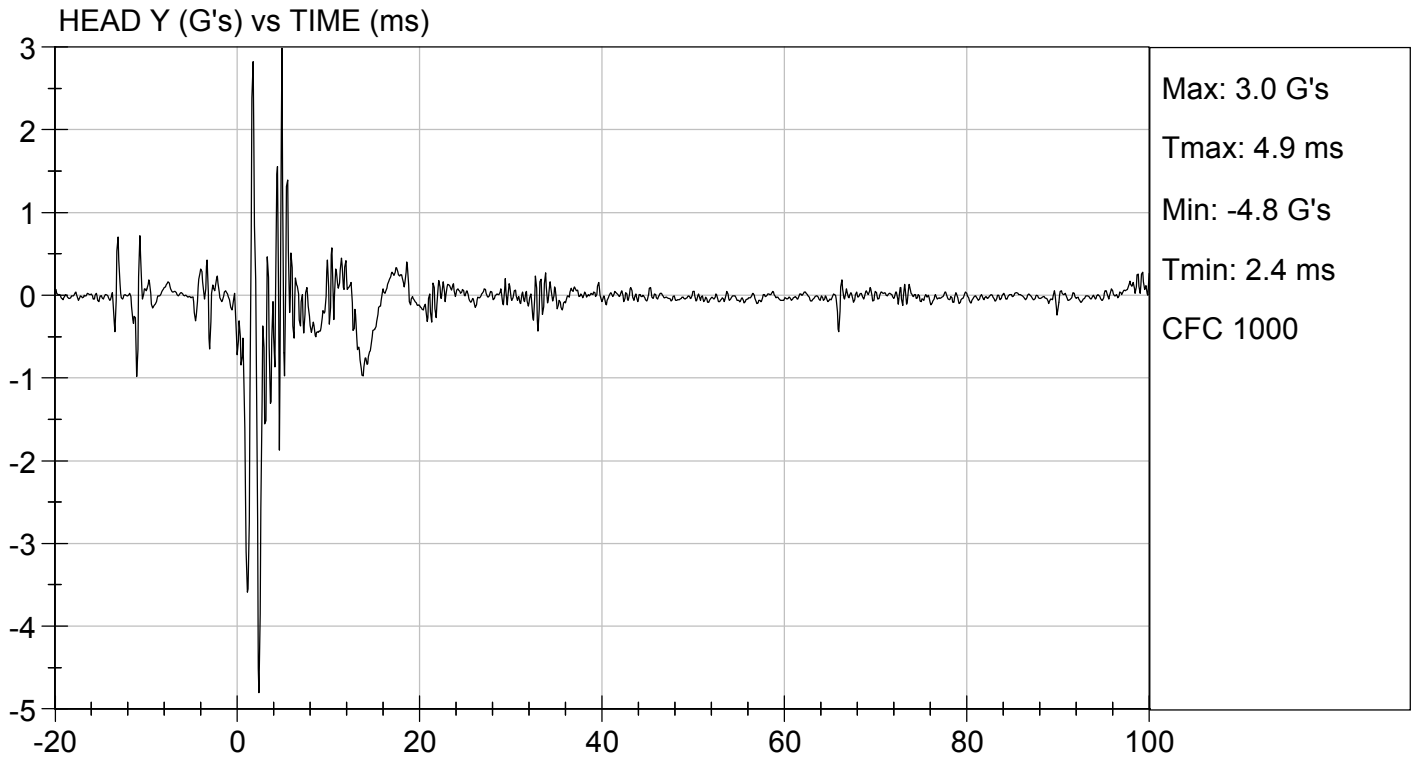
08/09/2017

 Test Date



 Approved By



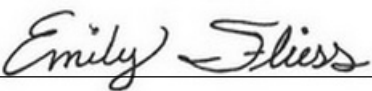


MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

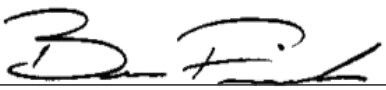
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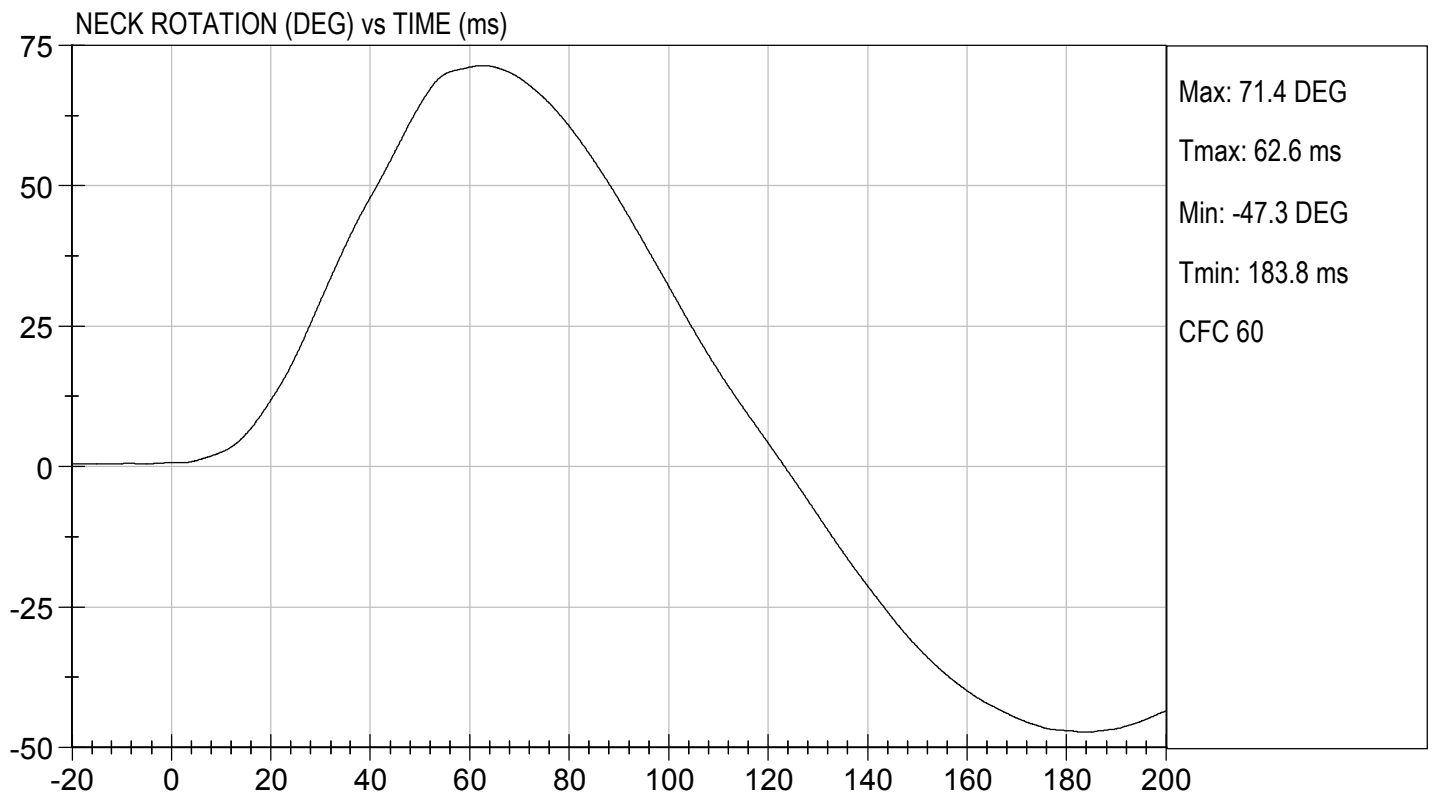
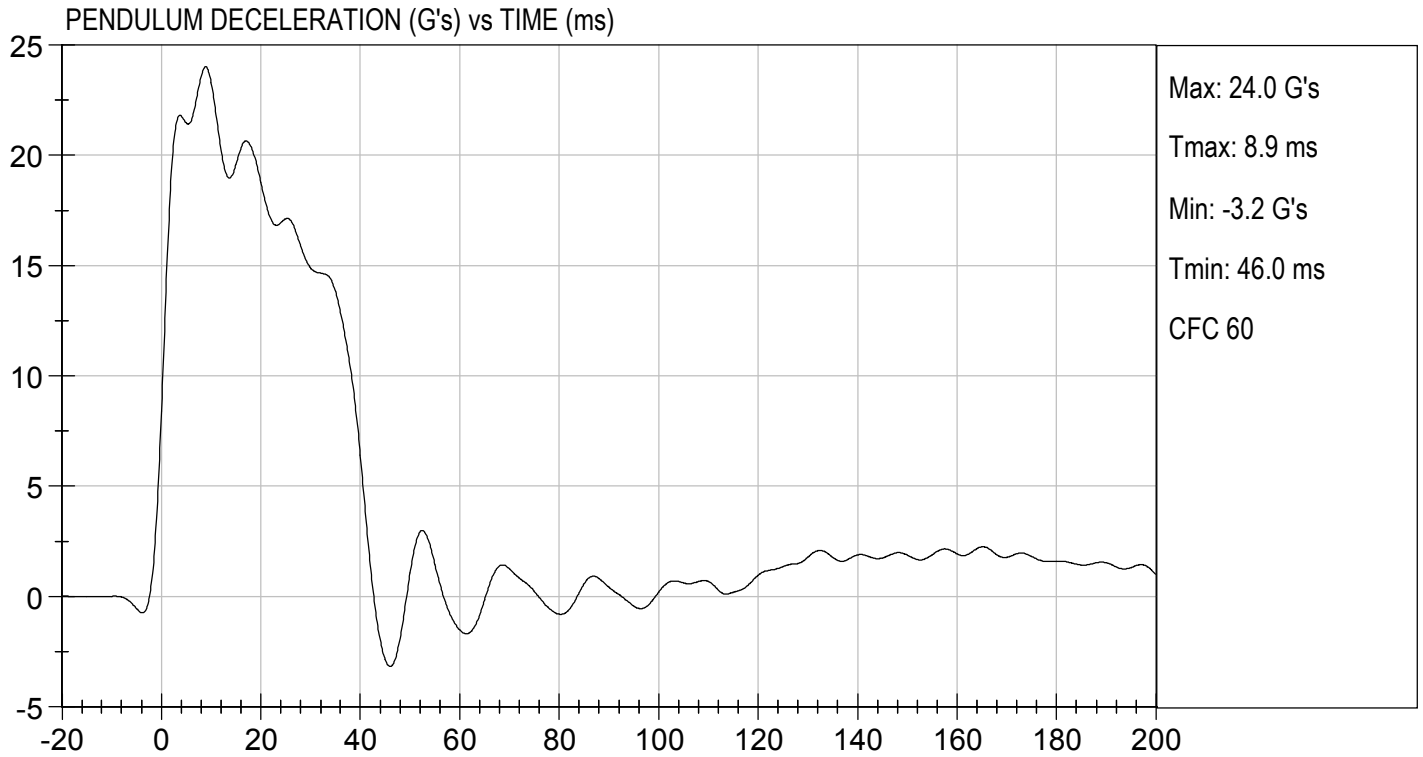
Test I.D: D172122

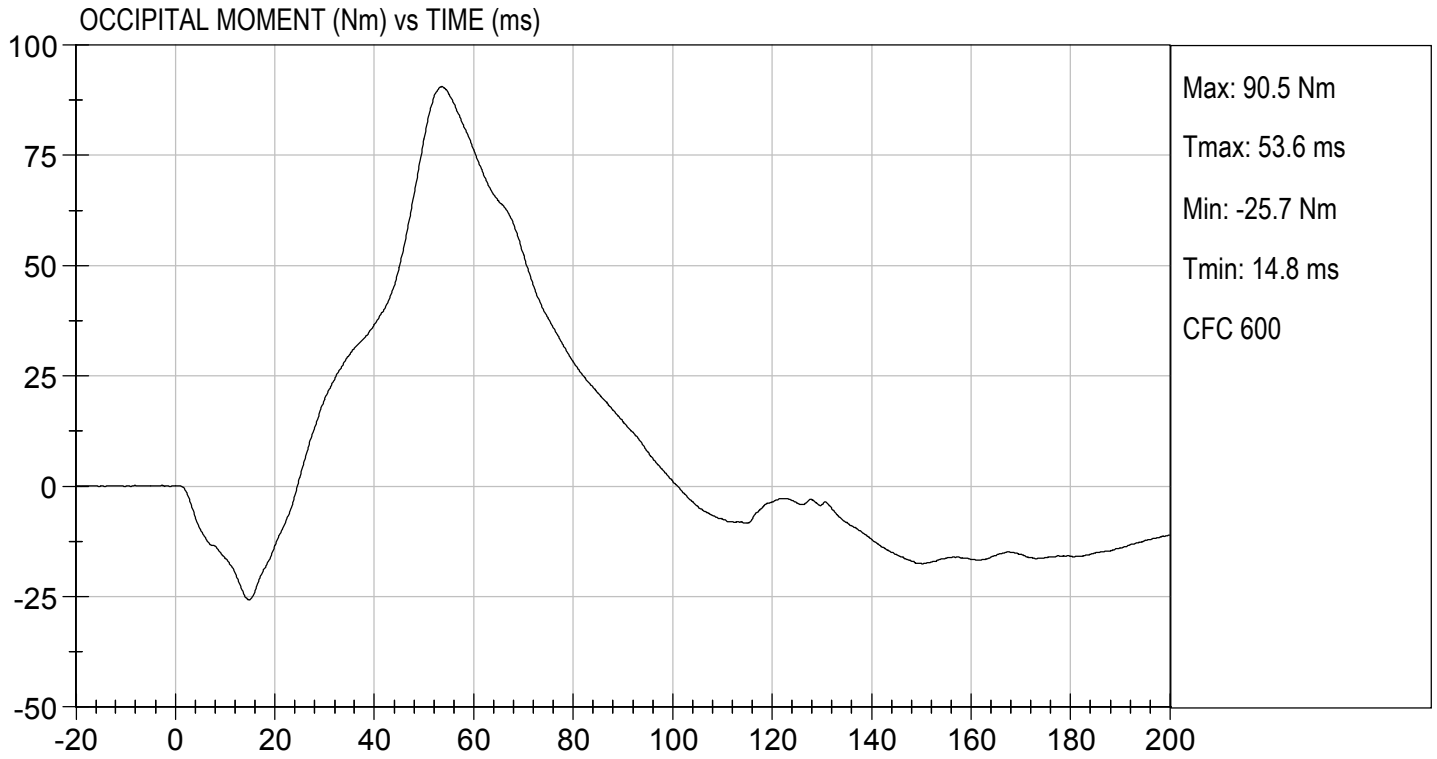
| Tested Parameter | | Units | Specification | Result | Pass/Fail |
|------------------------------------------------|---------|-------|----------------|--------|-------------|
| Laboratory Temperature | | deg C | 20.6 to 22.2 | 21.6 | Pass |
| Laboratory Relative Humidity | | % | 10 to 70 | 46 | Pass |
| Pendulum Velocity | | m/s | 6.89 to 7.13 | 6.96 | Pass |
| Pendulum Deceleration | 10 ms | G's | 22.50 to 27.50 | 23.31 | Pass |
| | 20 ms | G's | 17.60 to 22.60 | 18.77 | Pass |
| | 30 ms | G's | 12.50 to 18.50 | 14.89 | Pass |
| Peak Pendulum Deceleration After 30 ms | | G's | <= 29.0 | 14.9 | Pass |
| Deceleration Decay Time to Cross 5 G's | | ms | 34.0 to 42.0 | 40.6 | Pass |
| Maximum "D" Plane Rotation | Maximum | Deg | 64.0 to 78.0 | 71.4 | Pass |
| | Time | ms | 57.0 to 64.0 | 62.6 | Pass |
| "D" Plane Rotation Decay Time To Zero Crossing | | ms | 113.0 to 128.0 | 123.5 | Pass |
| Moment About Occipital Condyle | Maximum | Nm | 88.1 to 108.5 | 90.5 | Pass |
| | Time | ms | 47.0 to 58.0 | 53.6 | Pass |
| Positive Moment Decay Time To Zero Crossing | | ms | 97.0 to 107.0 | 101.2 | Pass |
| Overall Test Results | | | | | Pass |


 Laboratory Technician

08/09/2017
 Test Date


 Approved By



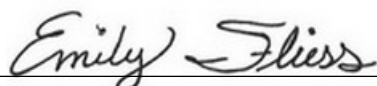


MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 50TH PERCENTILE MALE

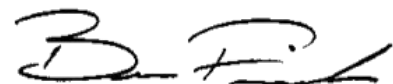
ATD Serial No: 351

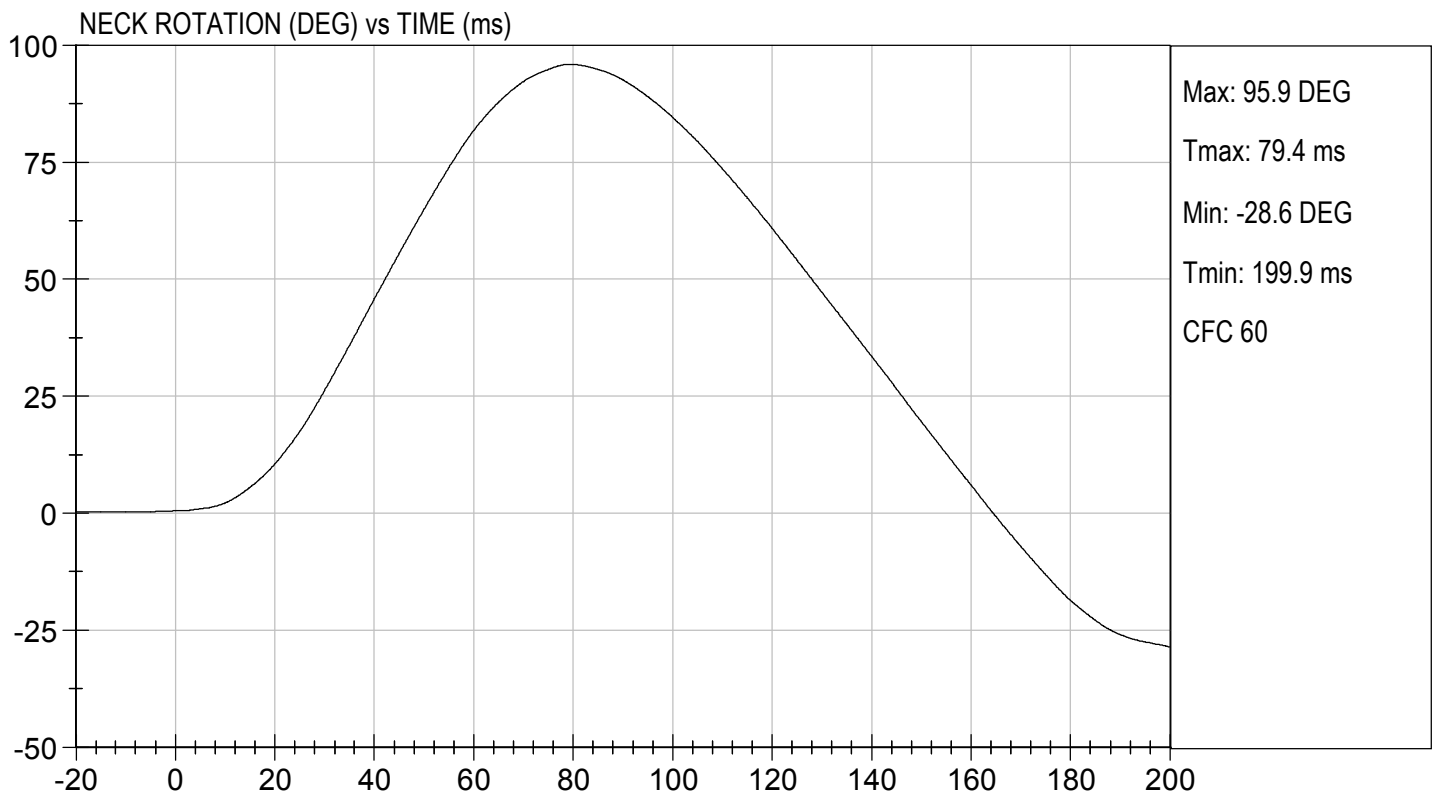
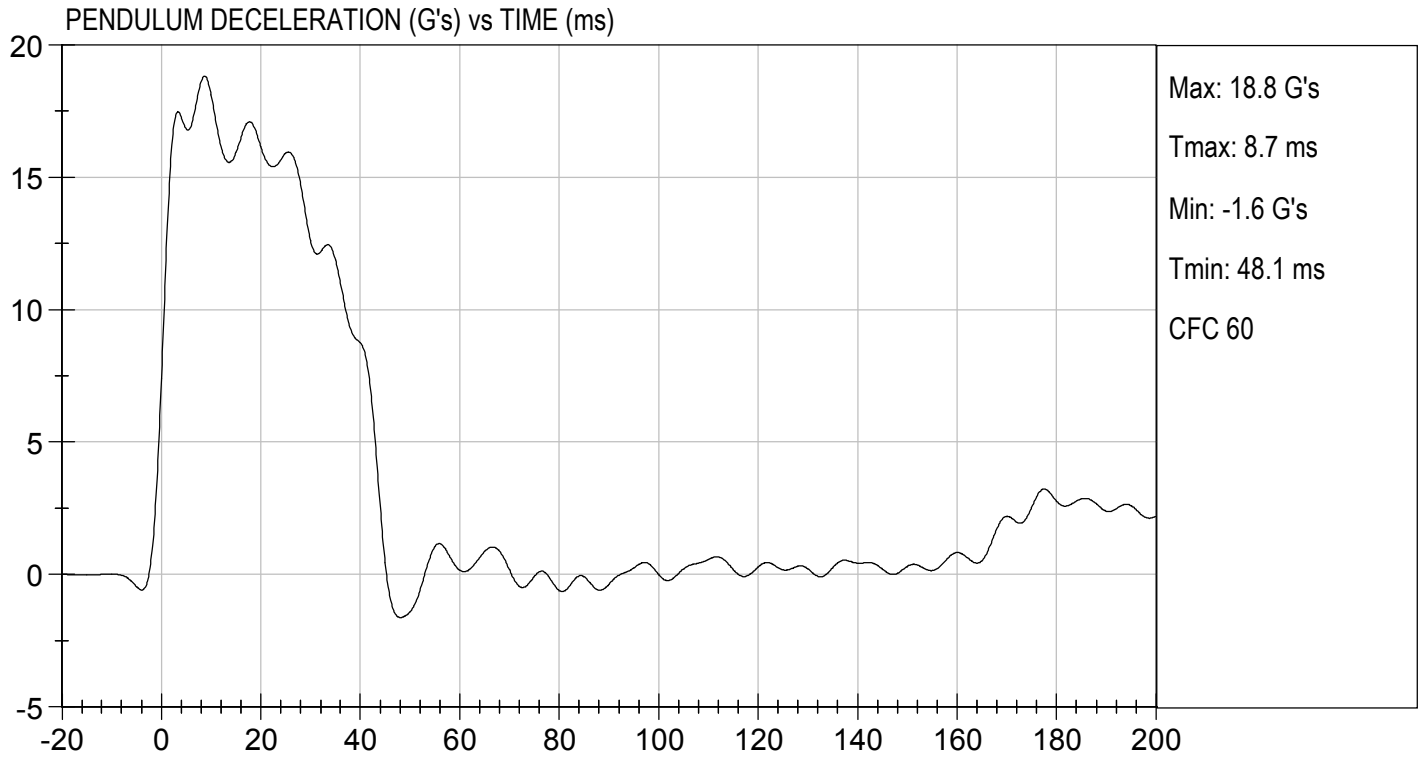
Test I.D.: D172123

| Tested Parameter | | Units | Specification | Result | Pass/Fail |
|------------------------------------------------|---------|---------|----------------|--------|-----------|
| Laboratory Temperature | | deg C | 20.6 to 22.2 | 21.6 | Pass |
| Laboratory Relative Humidity | | % | 10 to 70 | 46 | Pass |
| Pendulum Velocity | | m/s | 5.95 to 6.19 | 6.12 | Pass |
| Pendulum Deceleration | 10 ms | G's | 17.20 to 21.20 | 18.11 | Pass |
| | 20 ms | G's | 14.00 to 19.00 | 16.15 | Pass |
| | 30 ms | G's | 11.00 to 16.00 | 12.60 | Pass |
| Peak Pendulum Deceleration After 30 ms | | G's | <= 22.0 | 12.5 | Pass |
| Deceleration Decay Time to Cross 5 G's | | ms | 38.0 to 46.0 | 43.1 | Pass |
| Maximum "D" Plane Rotation | Maximum | Degrees | 81.0 to 106.0 | 95.9 | Pass |
| | Time | ms | 72.0 to 82.0 | 79.4 | Pass |
| "D" Plane Rotation Decay Time To Zero Crossing | | ms | 147.0 to 174.0 | 164.6 | Pass |
| Moment About Occipital Condyle | Maximum | Nm | -52.9 to -79.9 | -57.6 | Pass |
| | Time | ms | 65.0 to 79.0 | 74.4 | Pass |
| Negative Moment Decay Time To Zero Crossing | | ms | 120.0 to 148.0 | 147.0 | Pass |
| Overall Test Results | | | | | Pass |


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08/09/2017
 Test Date


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**MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE**

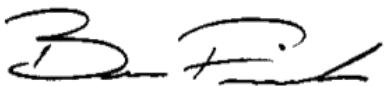
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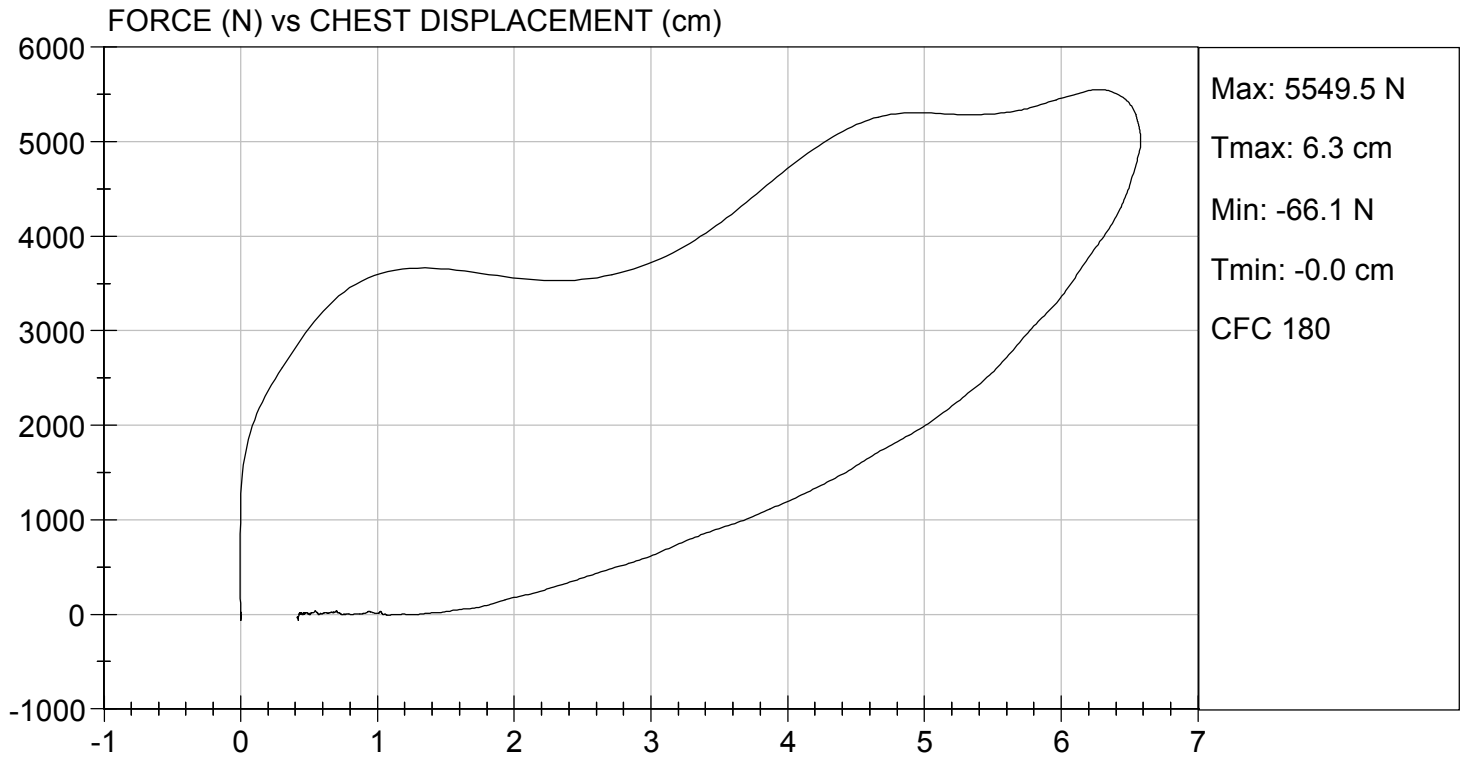
Test I.D.: D172124

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-------------|
| Laboratory Temperature | deg C | 20.6 to 22.2 | 21.7 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 43 | Pass |
| Probe Velocity | m/s | 6.58 to 6.82 | 6.68 | Pass |
| Peak Probe Force | N | 5159 to 5893 | 5,549 | Pass |
| Peak Sternum Displacement | cm | 6.35 to 7.26 | 6.58 | Pass |
| Internal Hysteresis | % | 69 to 85 | 72 | Pass |
| Overall Test Results | | | | Pass |


 Laboratory Technician

08/09/2017
 Test Date


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MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D: D172125

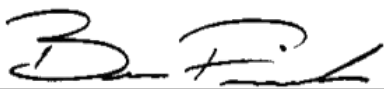
| Tested Parameter | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature | deg C | 18.9 to 25.6 | 21.5 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 45 | Pass |
| Probe Velocity | m/s | 2.07 to 2.13 | 2.10 | Pass |
| Peak Probe Force | N | 4715 to 5782 | 5,187 | Pass |
| Overall Test Results | | | | Pass |



 Laboratory Technician

08/09/2017

 Test Date

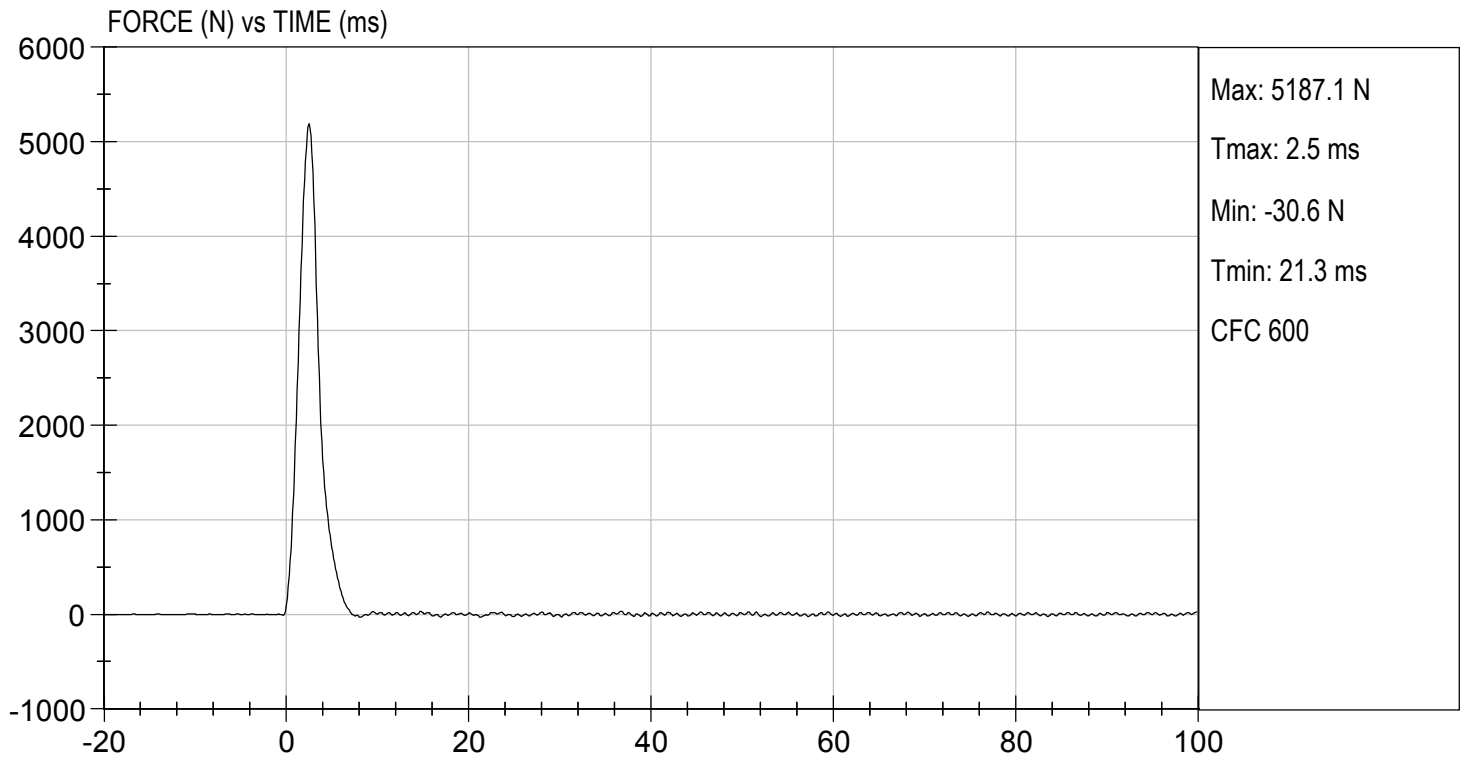


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TEST DESC: RIGHT KNEE
VELOCITY: 6.89 ft/s, 2.10 m/s

TEST DATE: 08/09/2017
TEST #: D172125

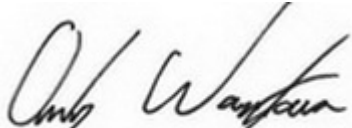


MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D: D172126

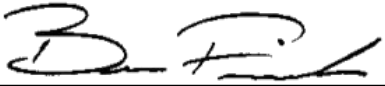
| Tested Parameter | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature | deg C | 18.9 to 25.6 | 21.5 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 45 | Pass |
| Probe Velocity | m/s | 2.07 to 2.13 | 2.10 | Pass |
| Peak Probe Force | N | 4715 to 5782 | 5,224 | Pass |
| Overall Test Results | | | | Pass |



 Laboratory Technician

08/09/2017

 Test Date

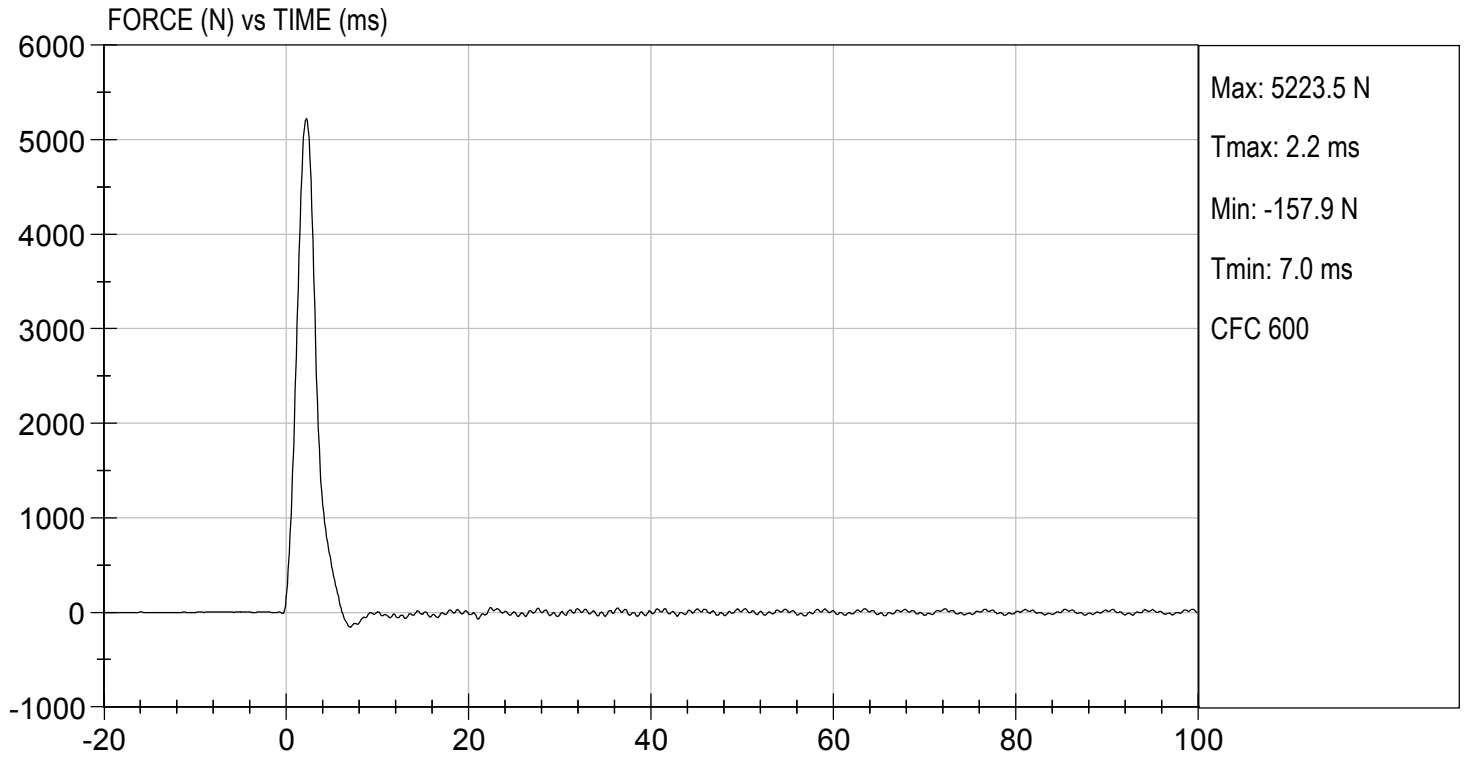


 Approved By



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

TEST DATE: 08/09/2017
TEST #: D172126



MGA RESEARCH CORPORATION
HIP-FEMUR FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

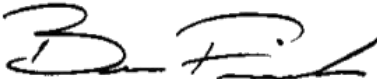
ATD Serial No: 351

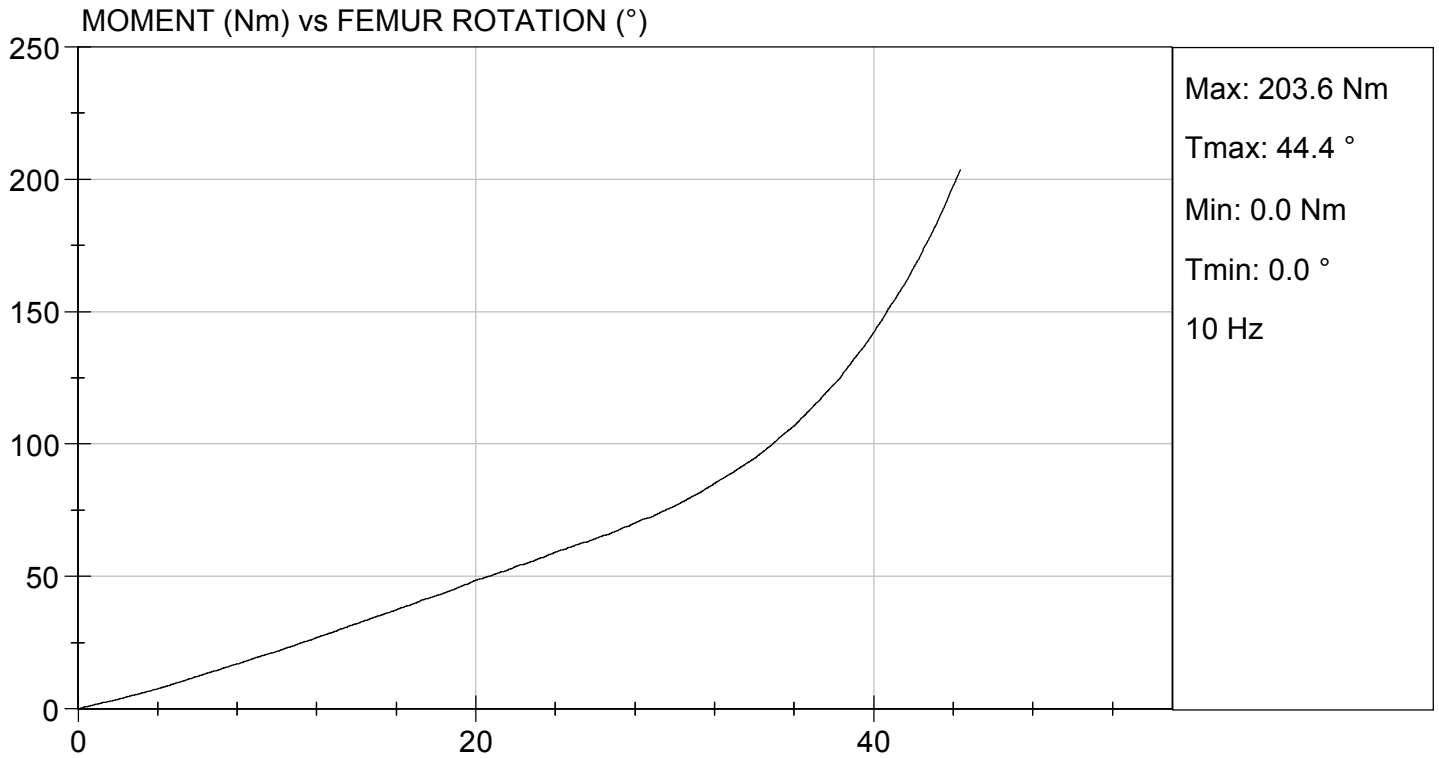
Test I.D: D172120

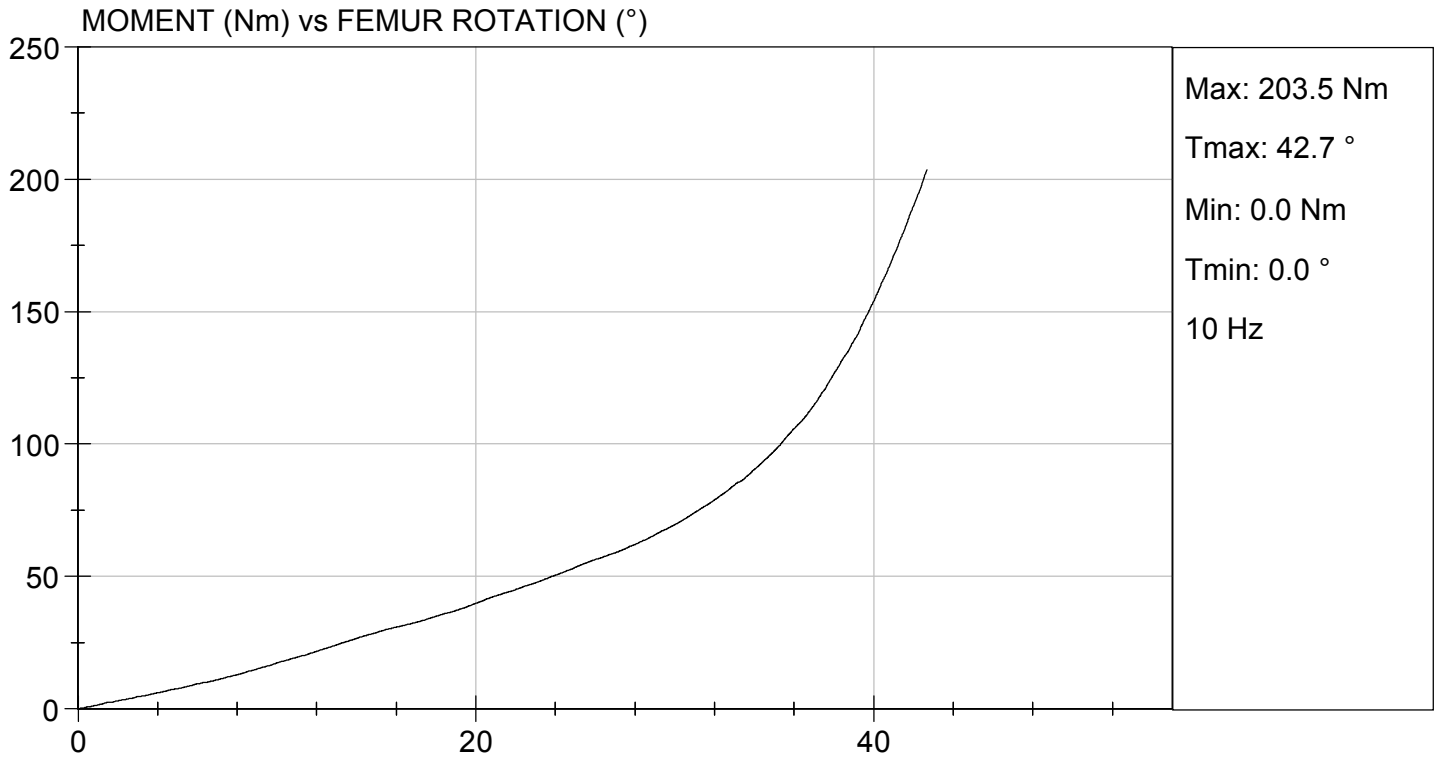
| Tested Parameter | Units | Specification | Result | | Pass/Fail |
|------------------------------|-------|-------------------------------------|--------|------|-----------|
| | | | Right | Left | |
| Laboratory Temperature | deg C | 18.9 to 25.6 | 20.9 | 20.9 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 46 | 46 | Pass |
| Rotation Rate | deg/s | 5.0 to 10.0 | 6.5 | 6.4 | Pass |
| 30 Degrees | Nm | 94.9 Nm Max | 76.7 | 69.6 | Pass |
| 150 ft-lbf / 203.4 Nm | Deg | 40.0 to 50.0 Degree Max Rotation | 44.4 | 42.7 | Pass |
| Overall Test Results | | | | | Pass |


 Laboratory Technician

08/08/2017
 Test Date


 Approved By





**MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 50TH PERCENTILE MALE**

ATD Serial No: 351

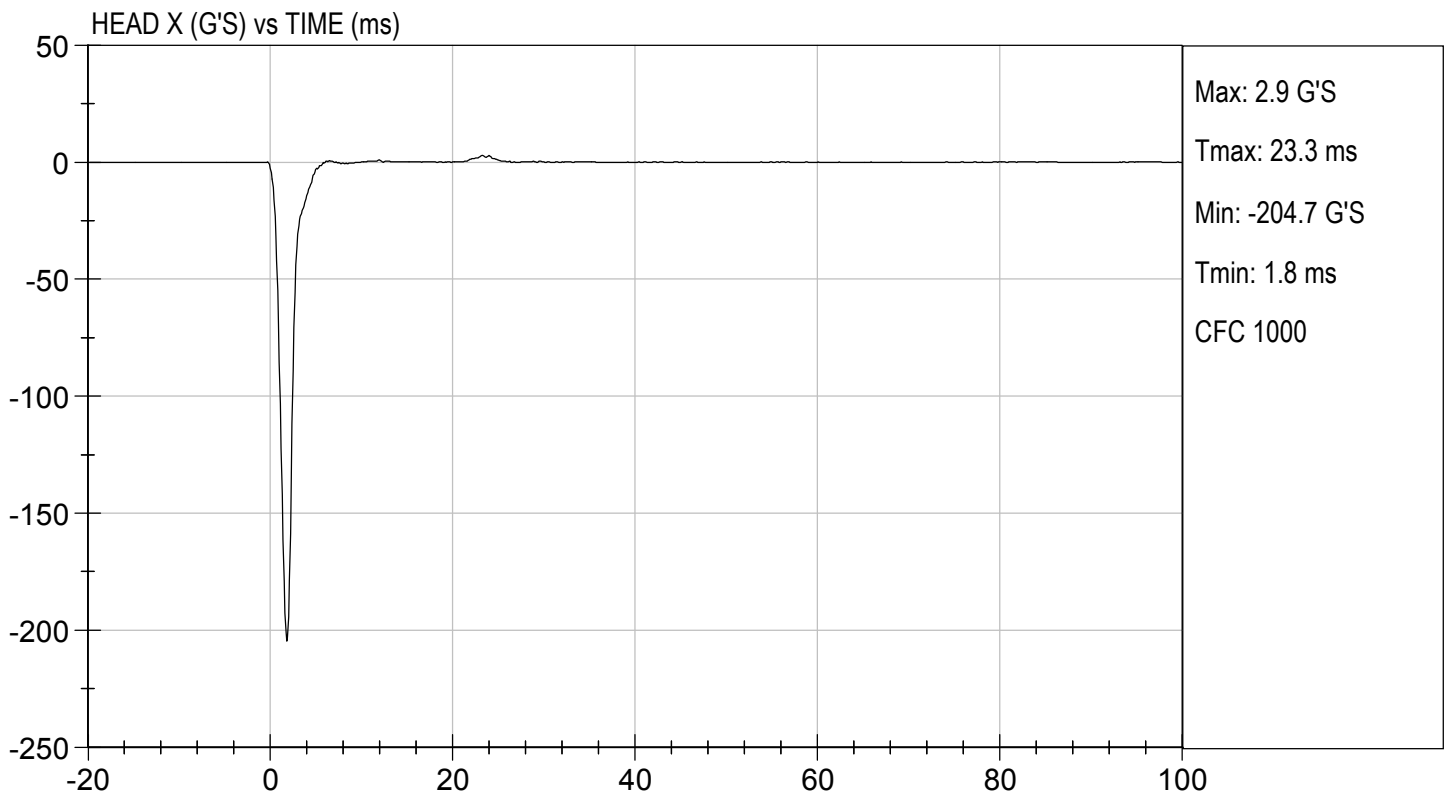
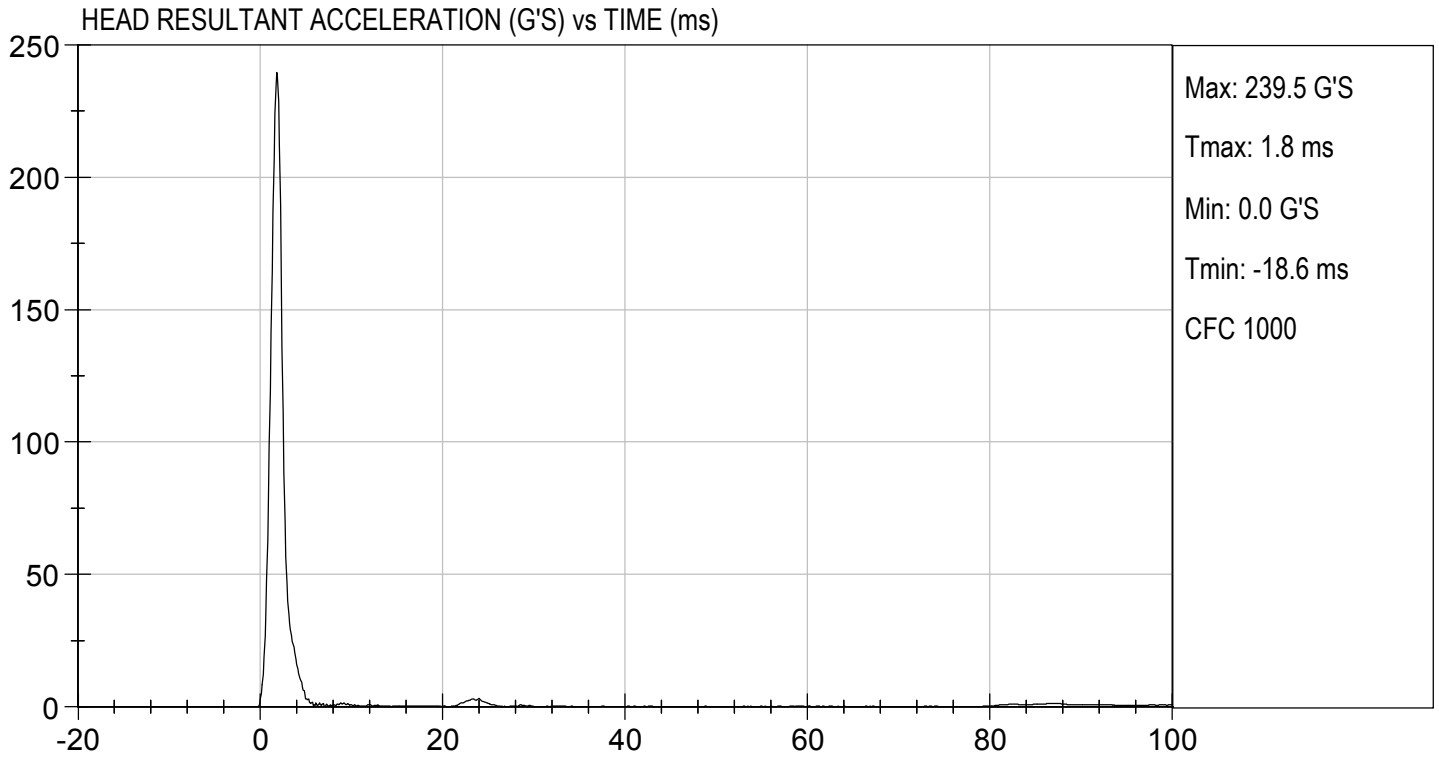
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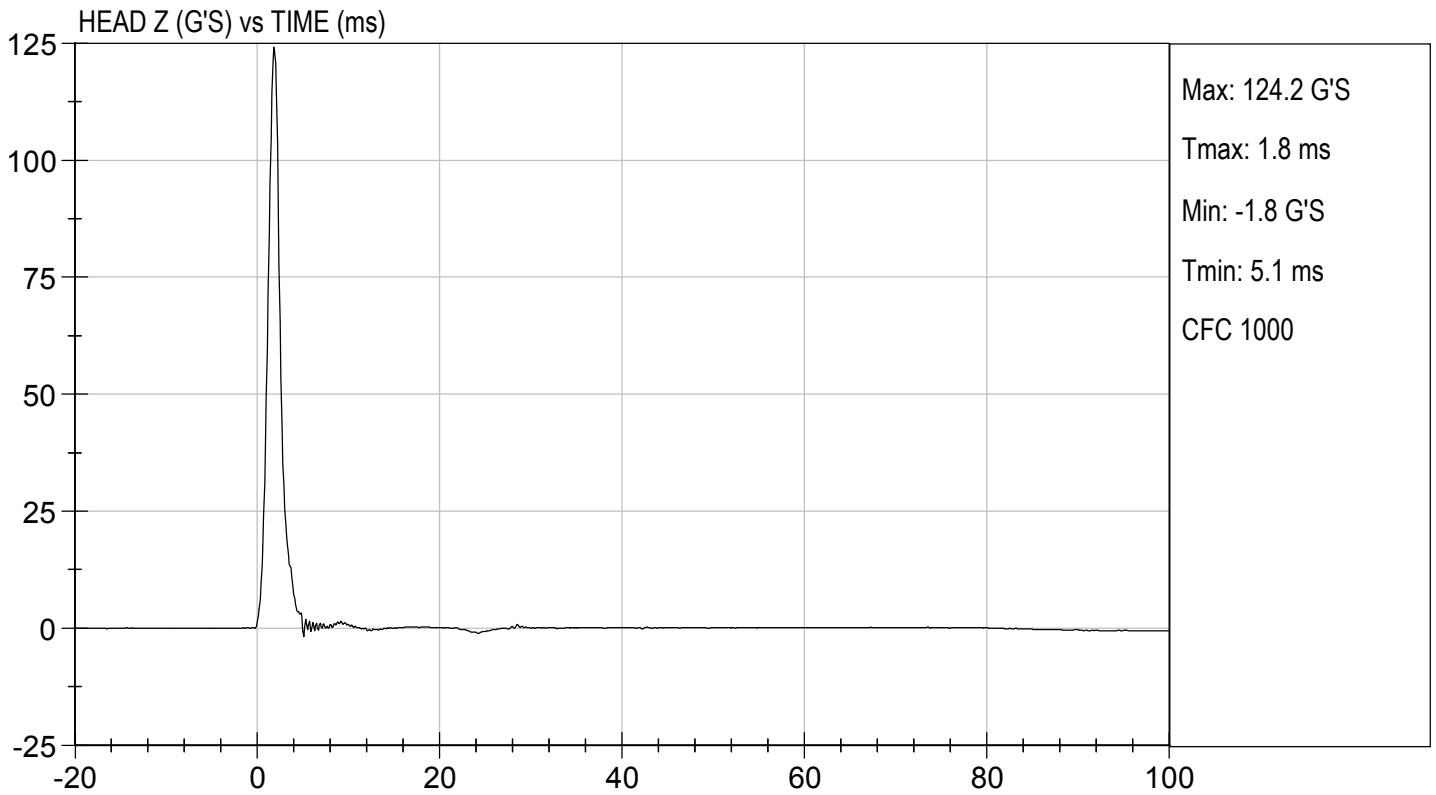
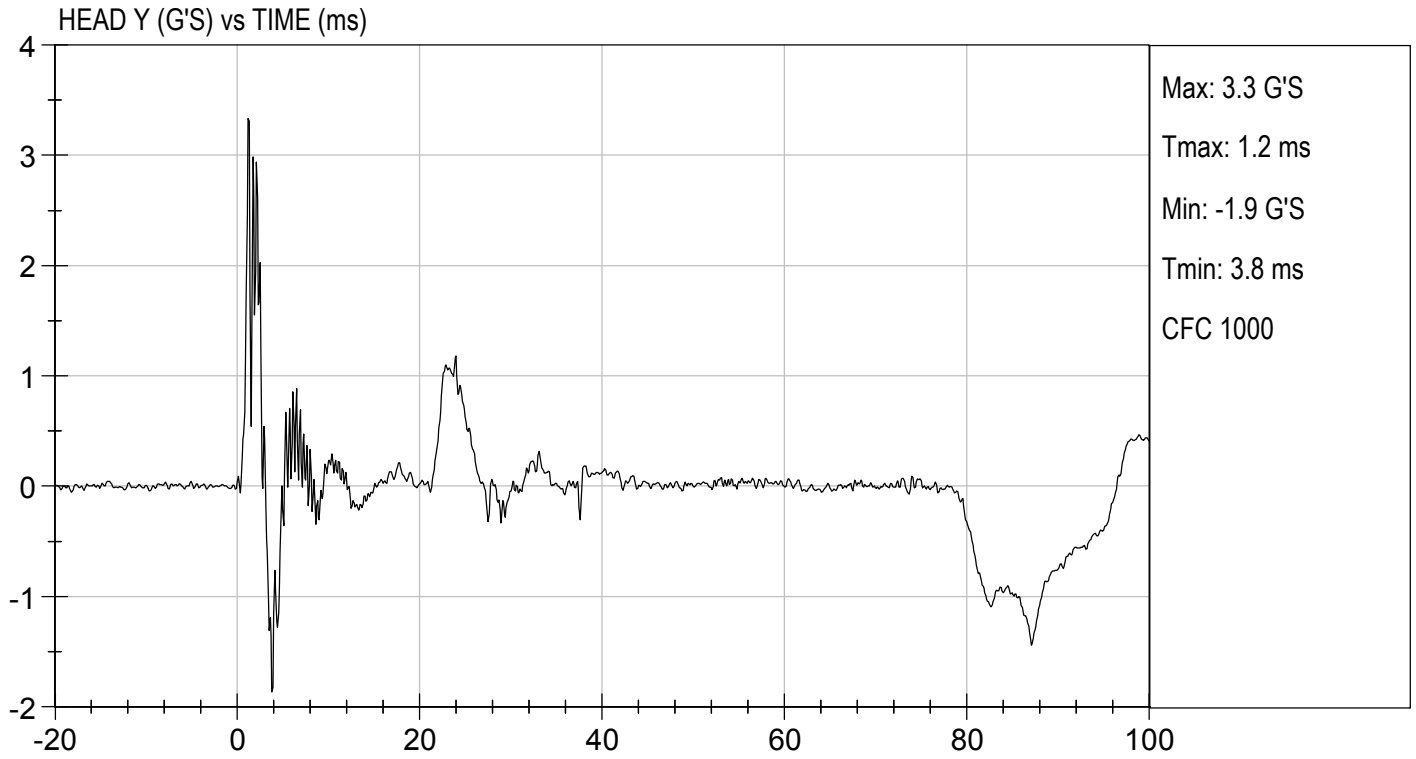
| Tested Parameter | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|--------------------|--------|-------------|
| Laboratory Temperature | deg C | 18.9 to 25.6 | 21.6 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 42 | Pass |
| Peak Resultant Acceleration | G's | 225 to 275 | 239 | Pass |
| Peak Lateral Acceleration | G's | <= +/- 15.0 | 3.3 | Pass |
| Unimodal | N/A | Yes | Yes | Pass |
| Oscillations | N/A | within 10% of peak | Yes | Pass |
| Overall Test Results | | | | Pass |

Danielle Redinlaugh
Laboratory Technician

08/24/2017
Test Date

B. F. K.
Approved By





MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D: D172352

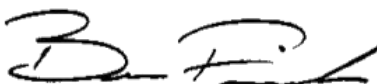
| Tested Parameter | | Units | Specification | Result | Pass/Fail |
|------------------------------------------------|---------|-------|----------------|--------|-------------|
| Laboratory Temperature | | deg C | 20.6 to 22.2 | 21.5 | Pass |
| Laboratory Relative Humidity | | % | 10 to 70 | 42 | Pass |
| Pendulum Velocity | | m/s | 6.89 to 7.13 | 6.96 | Pass |
| Pendulum Deceleration | 10 ms | G's | 22.50 to 27.50 | 24.08 | Pass |
| | 20 ms | G's | 17.60 to 22.60 | 20.00 | Pass |
| | 30 ms | G's | 12.50 to 18.50 | 17.25 | Pass |
| Peak Pendulum Deceleration After 30 ms | | G's | <= 29.0 | 17.1 | Pass |
| Deceleration Decay Time to Cross 5 G's | | ms | 34.0 to 42.0 | 34.9 | Pass |
| Maximum "D" Plane Rotation | Maximum | Deg | 64.0 to 78.0 | 64.7 | Pass |
| | Time | ms | 57.0 to 64.0 | 61.5 | Pass |
| "D" Plane Rotation Decay Time To Zero Crossing | | ms | 113.0 to 128.0 | 120.5 | Pass |
| Moment About Occipital Condyle | Maximum | Nm | 88.1 to 108.5 | 89.8 | Pass |
| | Time | ms | 47.0 to 58.0 | 48.3 | Pass |
| Positive Moment Decay Time To Zero Crossing | | ms | 97.0 to 107.0 | 98.9 | Pass |
| Overall Test Results | | | | | Pass |



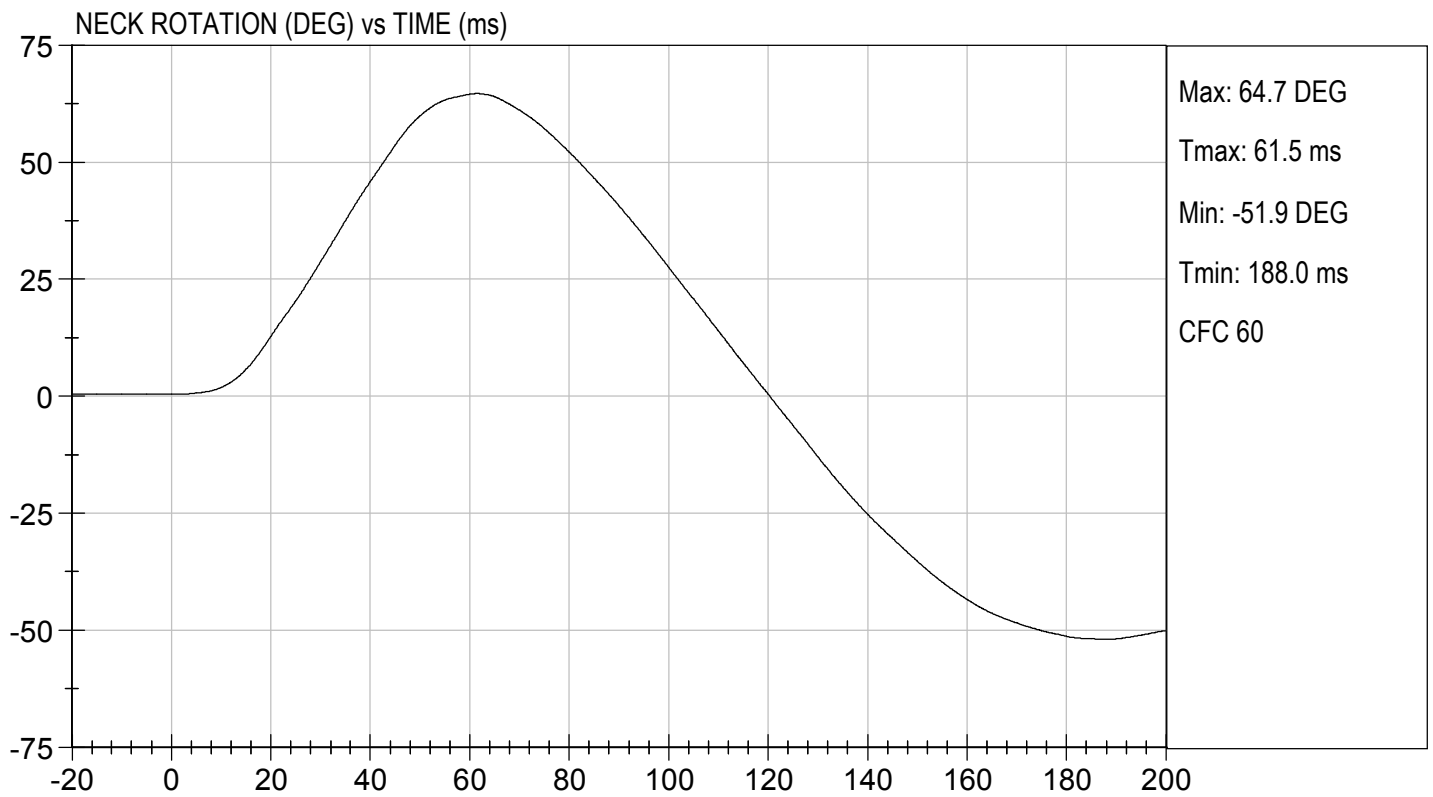
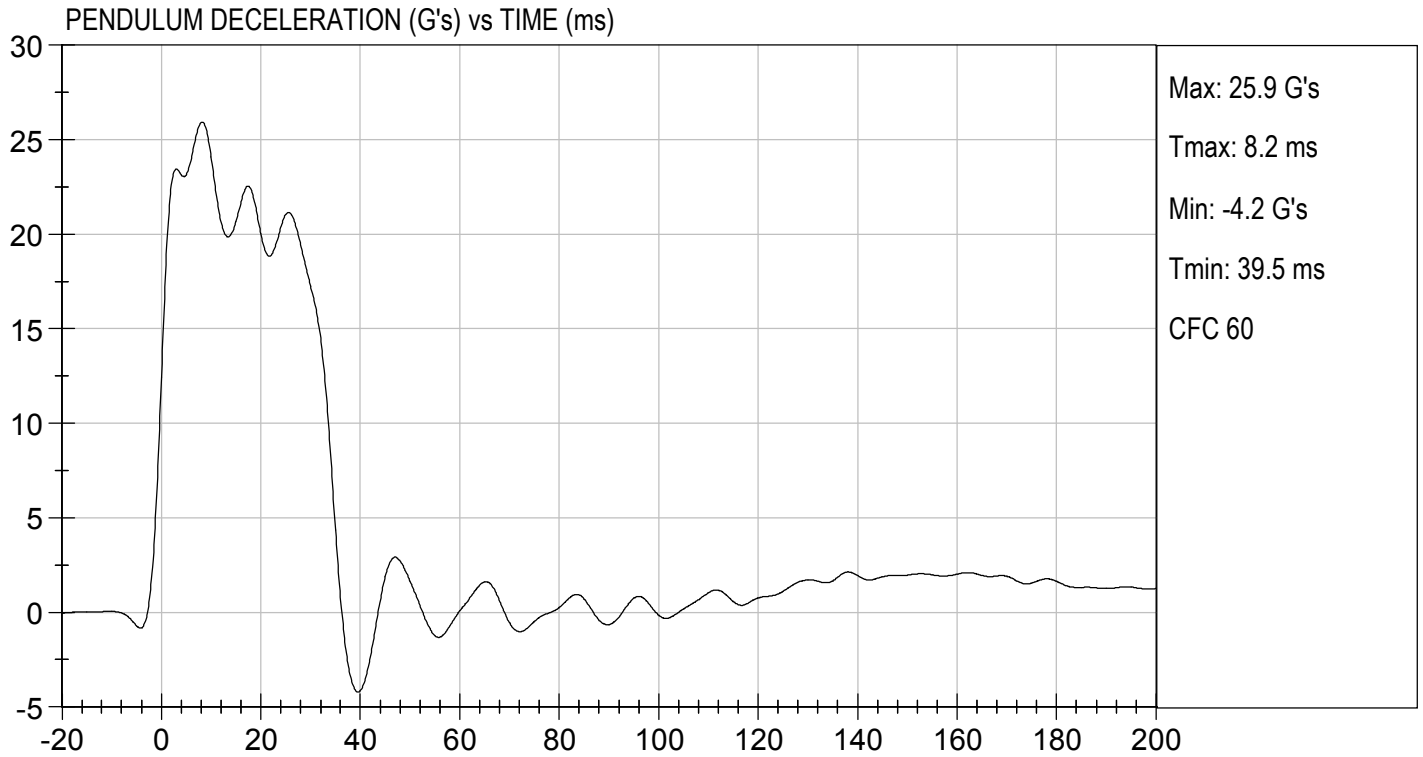
 Laboratory Technician

08/25/2017

 Test Date



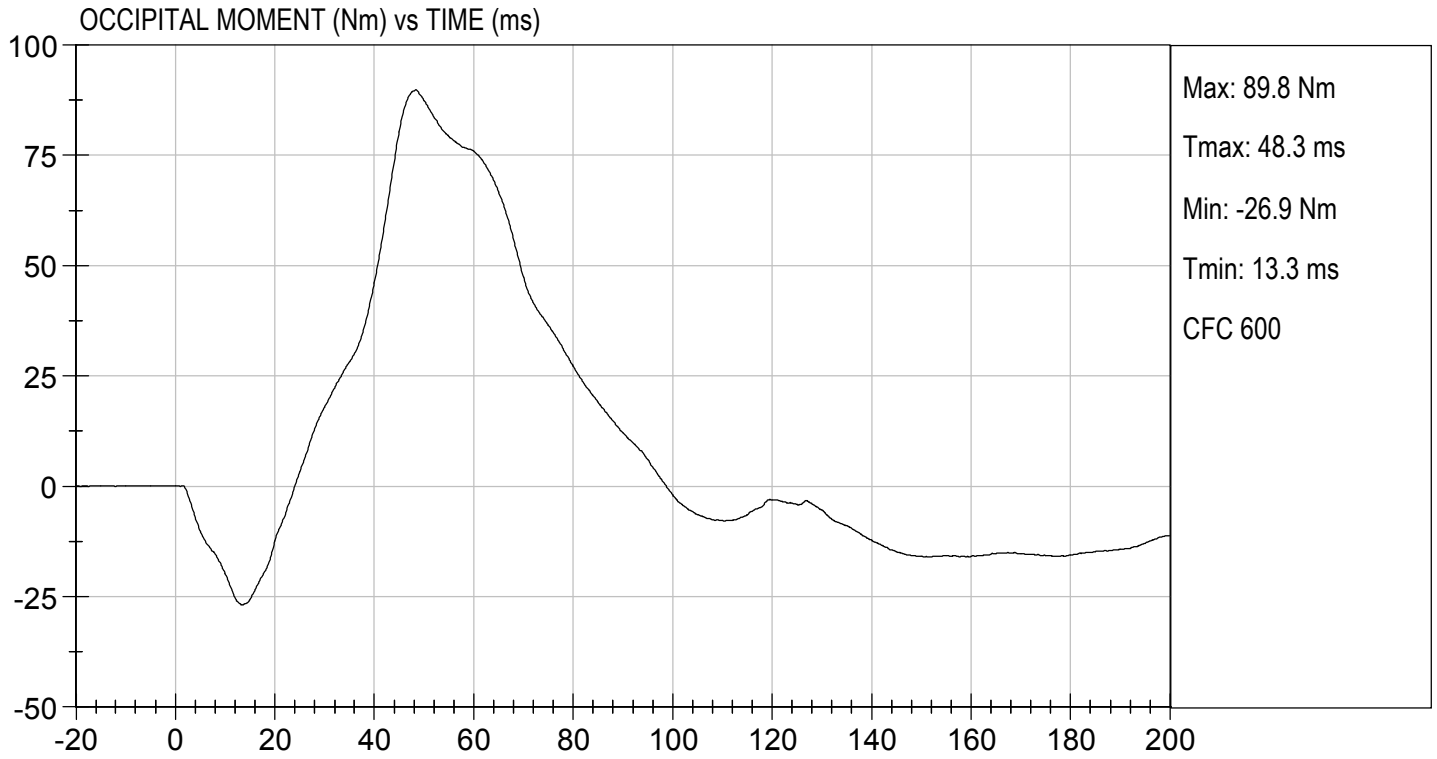
 Approved By





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

TEST DATE: 08/25/2017
TEST #: D172352



MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

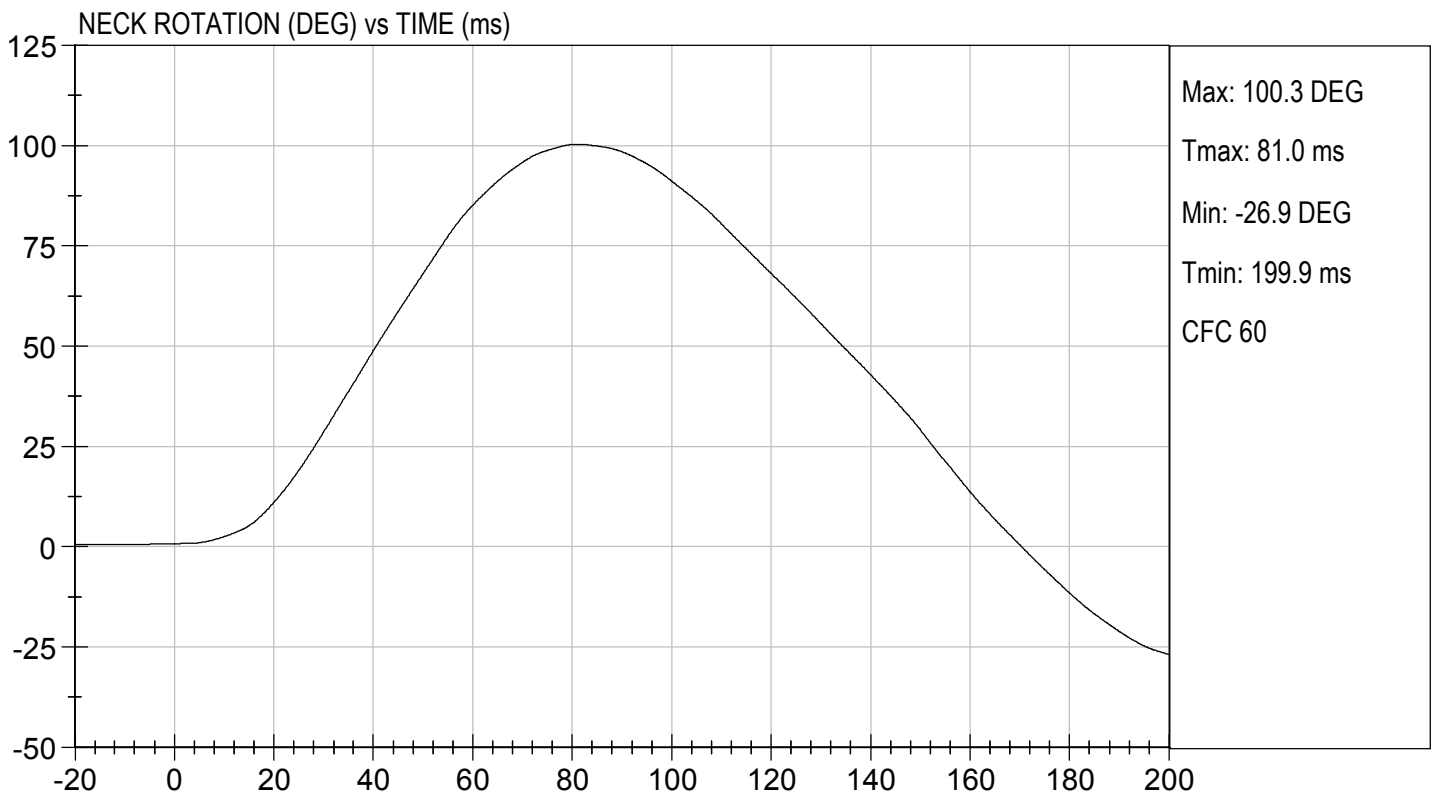
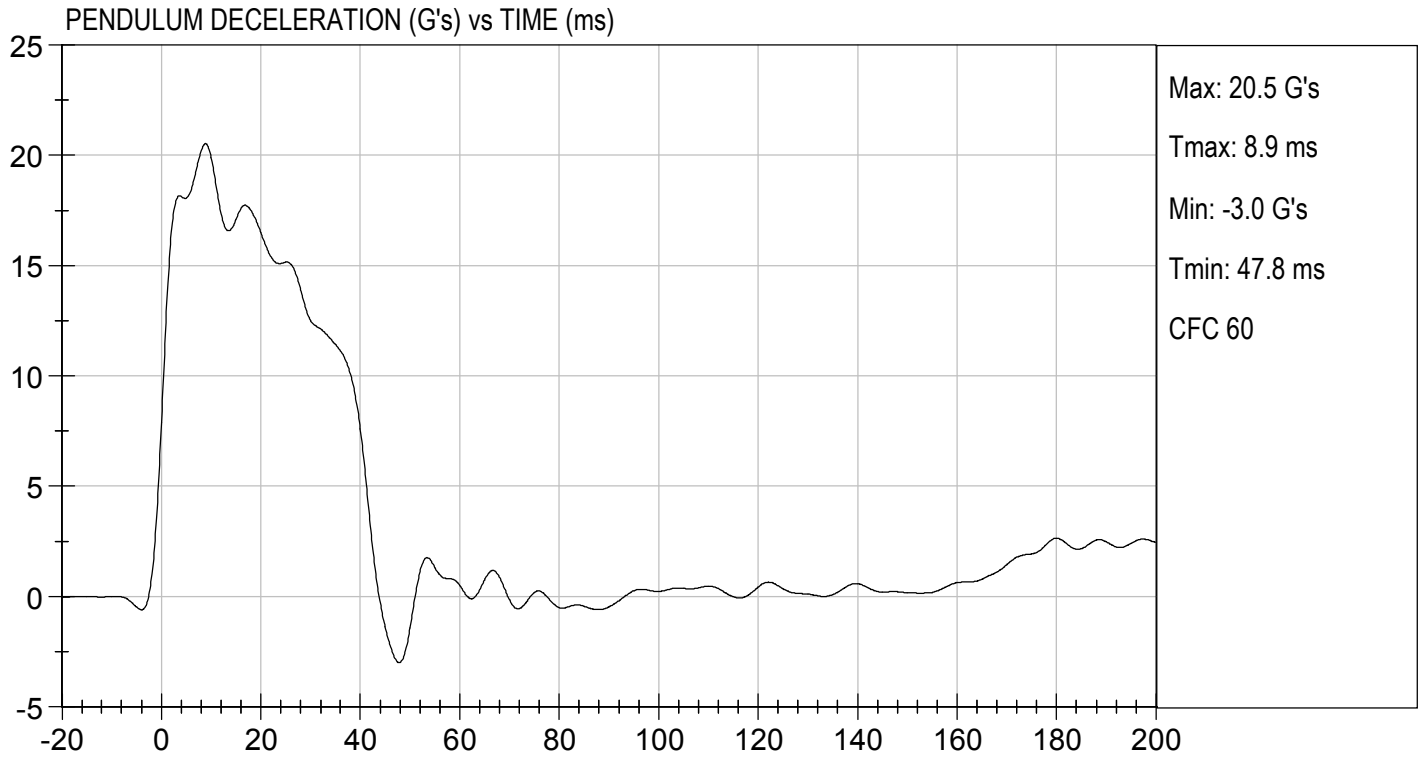
Test I.D: D172353

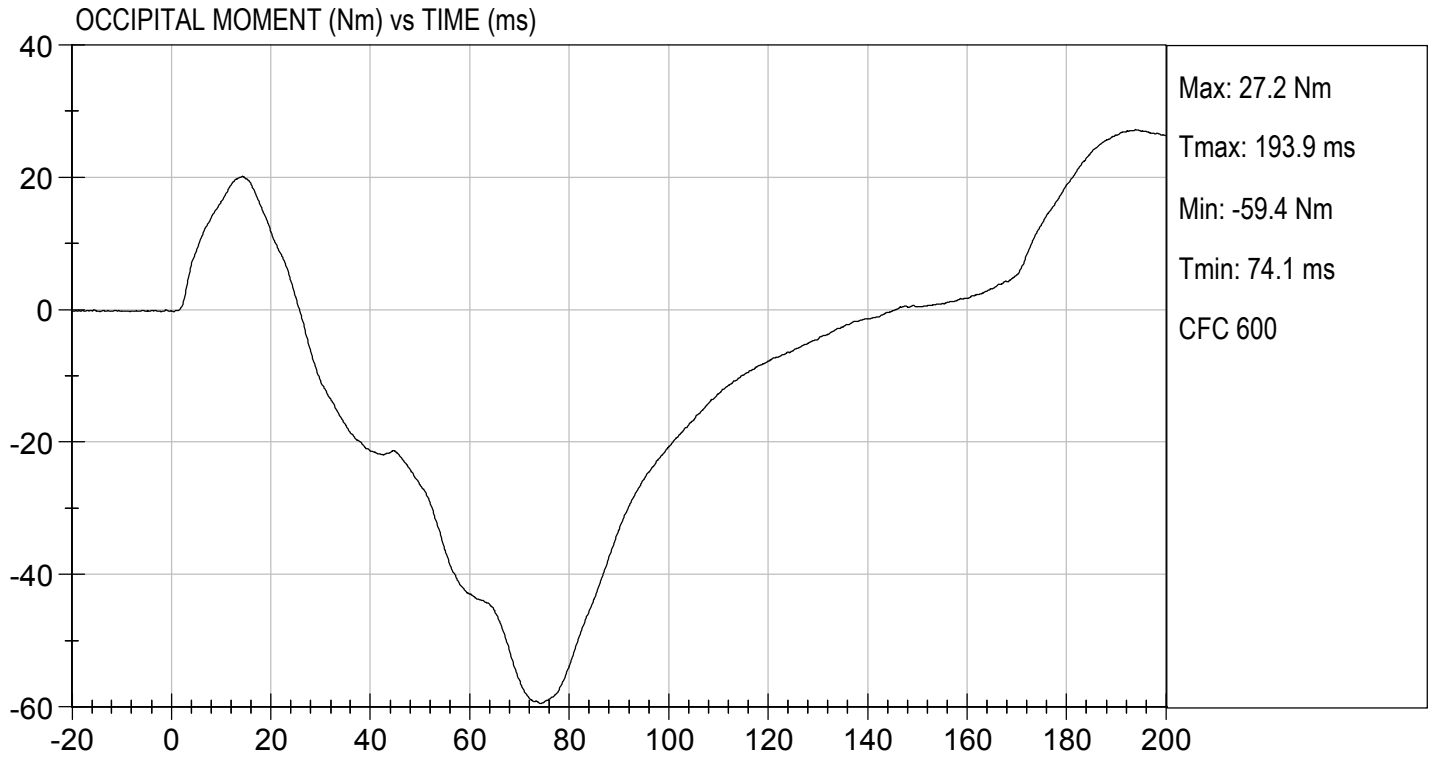
| Tested Parameter | | Units | Specification | Result | Pass/Fail |
|------------------------------------------------|---------|---------|----------------|--------|-----------|
| Laboratory Temperature | | deg C | 20.6 to 22.2 | 21.6 | Pass |
| Laboratory Relative Humidity | | % | 10 to 70 | 42 | Pass |
| Pendulum Velocity | | m/s | 5.95 to 6.19 | 6.05 | Pass |
| Pendulum Deceleration | 10 ms | G's | 17.20 to 21.20 | 19.90 | Pass |
| | 20 ms | G's | 14.00 to 19.00 | 16.49 | Pass |
| | 30 ms | G's | 11.00 to 16.00 | 12.51 | Pass |
| Peak Pendulum Deceleration After 30 ms | | G's | <= 22.0 | 12.5 | Pass |
| Deceleration Decay Time to Cross 5 G's | | ms | 38.0 to 46.0 | 41.3 | Pass |
| Maximum "D" Plane Rotation | Maximum | Degrees | 81.0 to 106.0 | 100.3 | Pass |
| | Time | ms | 72.0 to 82.0 | 81.0 | Pass |
| "D" Plane Rotation Decay Time To Zero Crossing | | ms | 147.0 to 174.0 | 170.5 | Pass |
| Moment About Occipital Condyle | Maximum | Nm | -52.9 to -79.9 | -59.4 | Pass |
| | Time | ms | 65.0 to 79.0 | 74.1 | Pass |
| Negative Moment Decay Time To Zero Crossing | | ms | 120.0 to 148.0 | 145.7 | Pass |
| Overall Test Results | | | | | Pass |

Danielle Redinlaugh
 Laboratory Technician

08/25/2017
 Test Date

B. F. K.
 Approved By



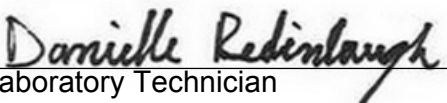


MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

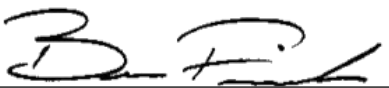
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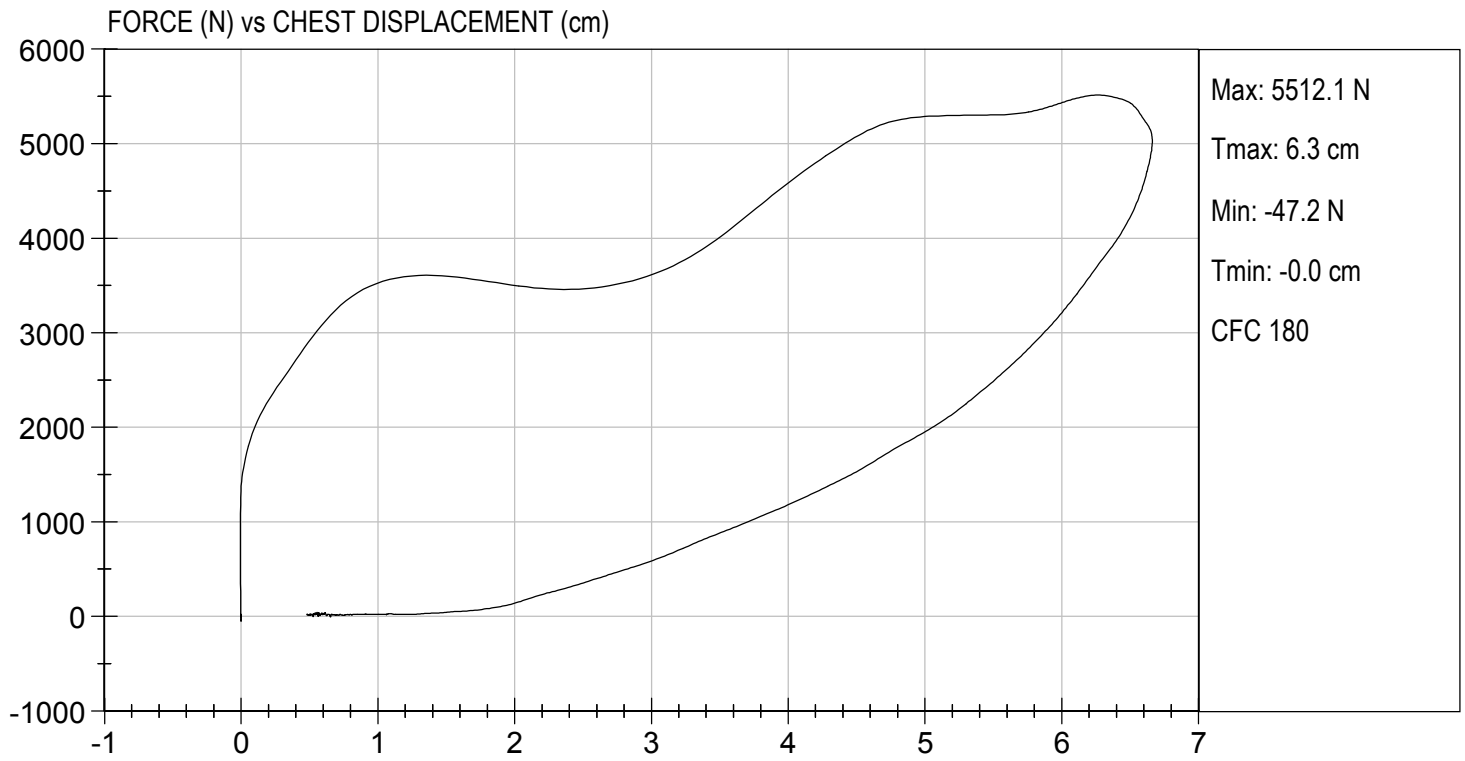
Test I.D: D172354

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-------------|
| Laboratory Temperature | deg C | 20.6 to 22.2 | 21.6 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 48 | Pass |
| Probe Velocity | m/s | 6.58 to 6.82 | 6.58 | Pass |
| Peak Probe Force | N | 5159 to 5893 | 5,512 | Pass |
| Peak Sternum Displacement | cm | 6.35 to 7.26 | 6.66 | Pass |
| Internal Hysteresis | % | 69 to 85 | 72 | Pass |
| Overall Test Results | | | | Pass |


 Laboratory Technician

08/28/2017
 Test Date


 Approved By



MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

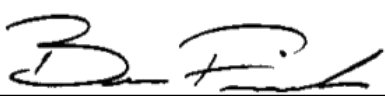
ATD Serial No: 351

Test I.D: D172355

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature | deg C | 18.9 to 25.6 | 21.4 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 43 | Pass |
| Probe Velocity | m/s | 2.07 to 2.13 | 2.12 | Pass |
| Peak Probe Force | N | 4715 to 5782 | 5,124 | Pass |
| Overall Test Results | | | | Pass |


 Laboratory Technician

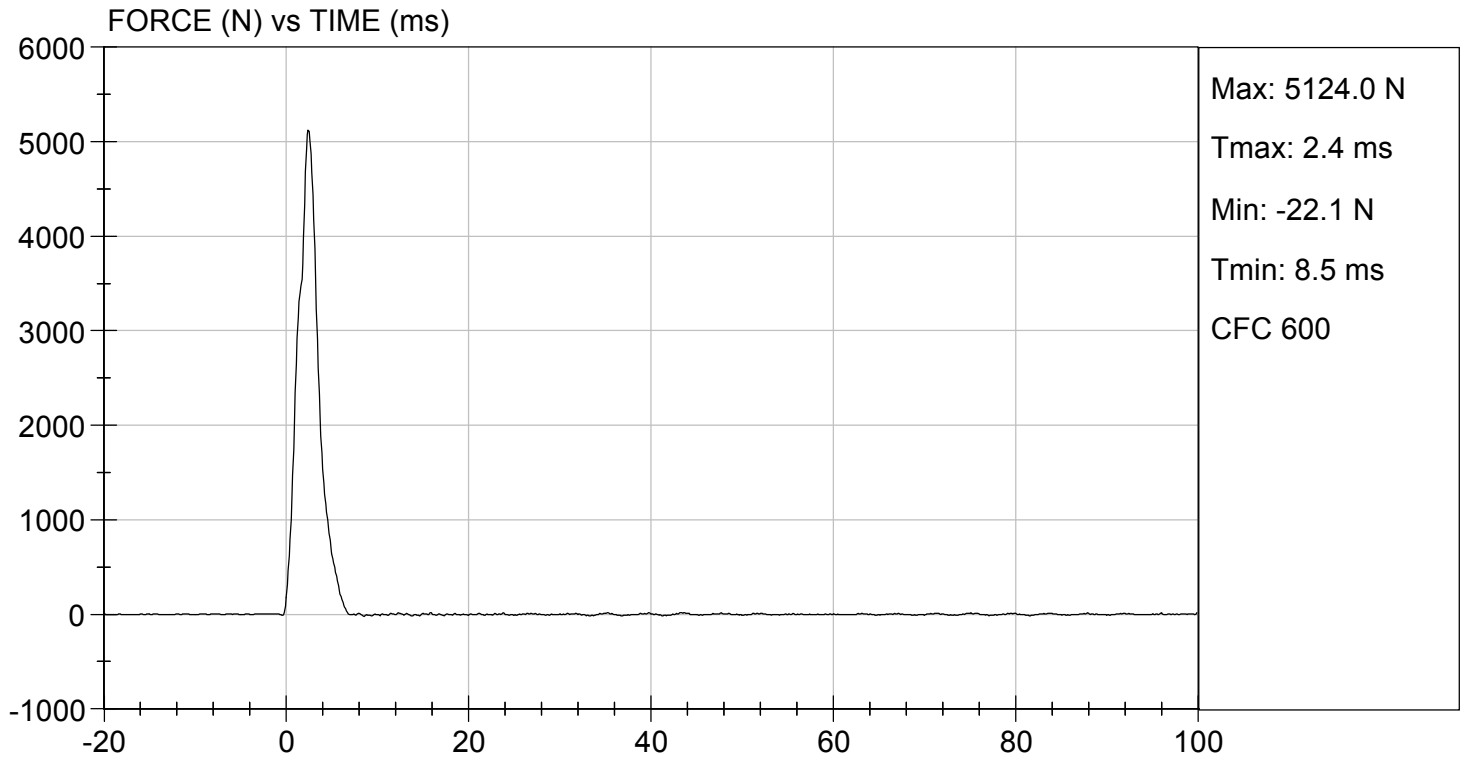
08/25/2017
 Test Date


 Approved By



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

TEST DATE: 08/25/2017
TEST #: D172355



MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

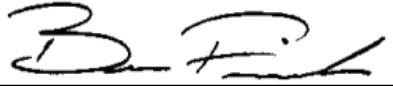
ATD Serial No: 351

Test I.D: D172356

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature | deg C | 18.9 to 25.6 | 21.4 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 43 | Pass |
| Probe Velocity | m/s | 2.07 to 2.13 | 2.08 | Pass |
| Peak Probe Force | N | 4715 to 5782 | 5,516 | Pass |
| Overall Test Results | | | | Pass |


 Laboratory Technician

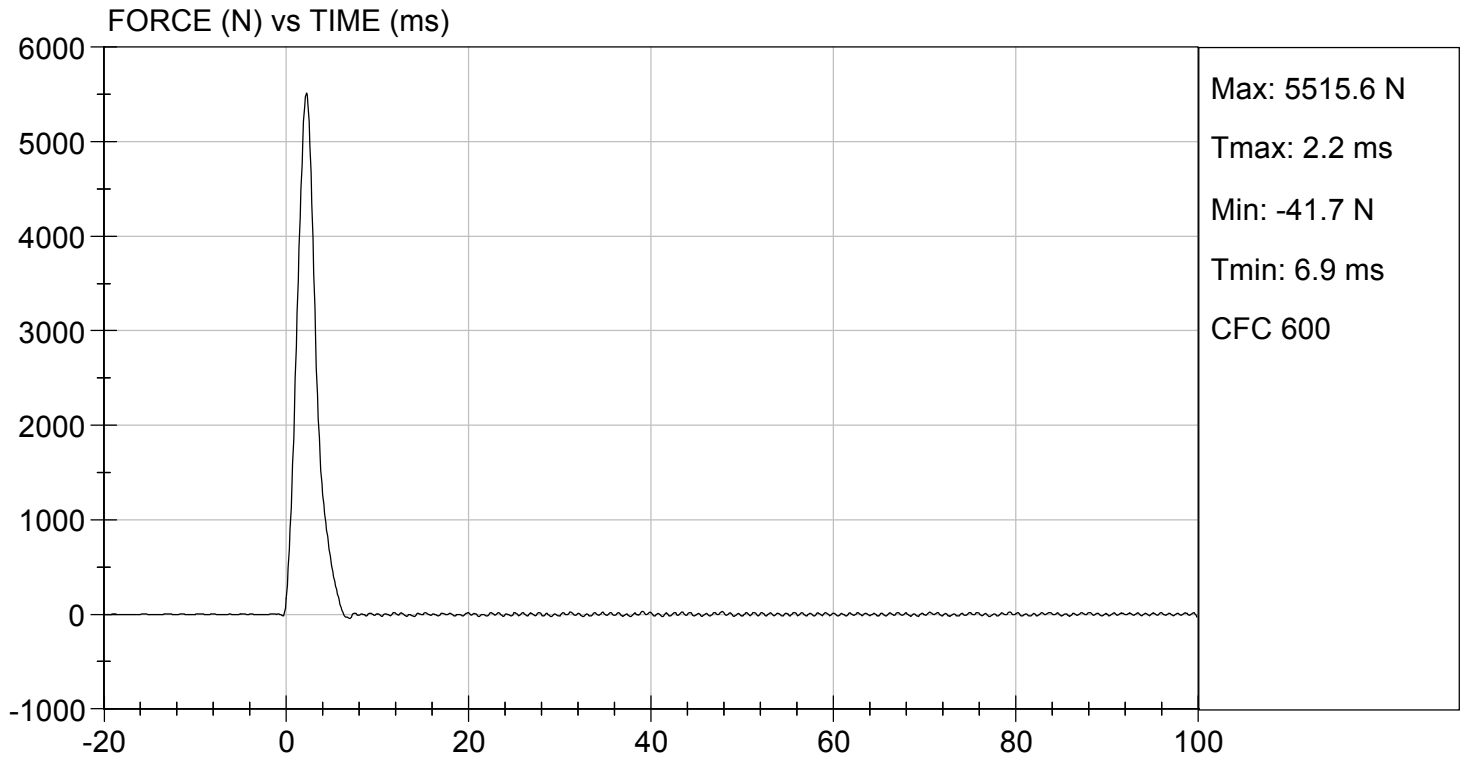
08/25/2017
 Test Date


 Approved By



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

TEST DATE: 08/25/2017
TEST #: D172356



**MGA RESEARCH CORPORATION
HIP-FEMUR FLEXION TEST
HYBRID III 50TH PERCENTILE MALE**

ATD Serial No: 351

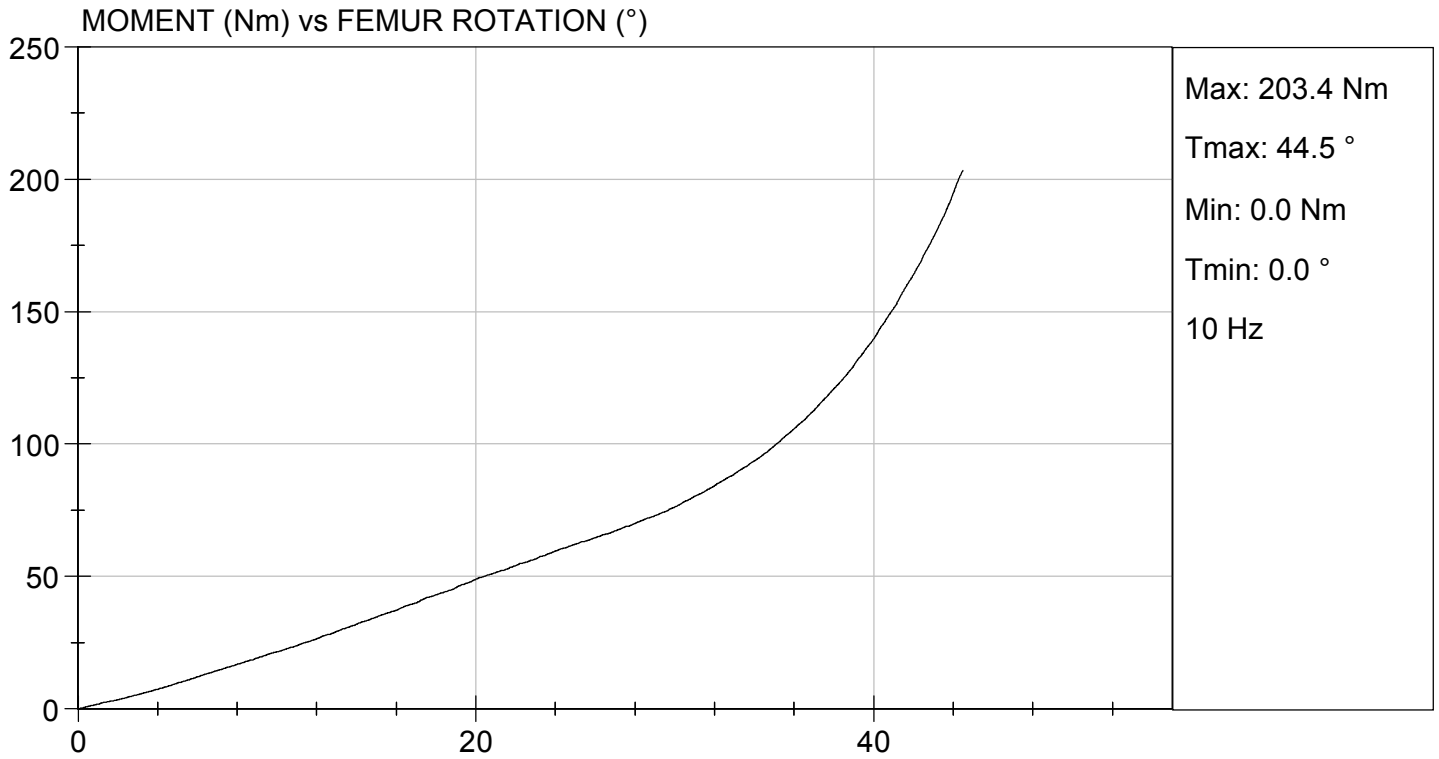
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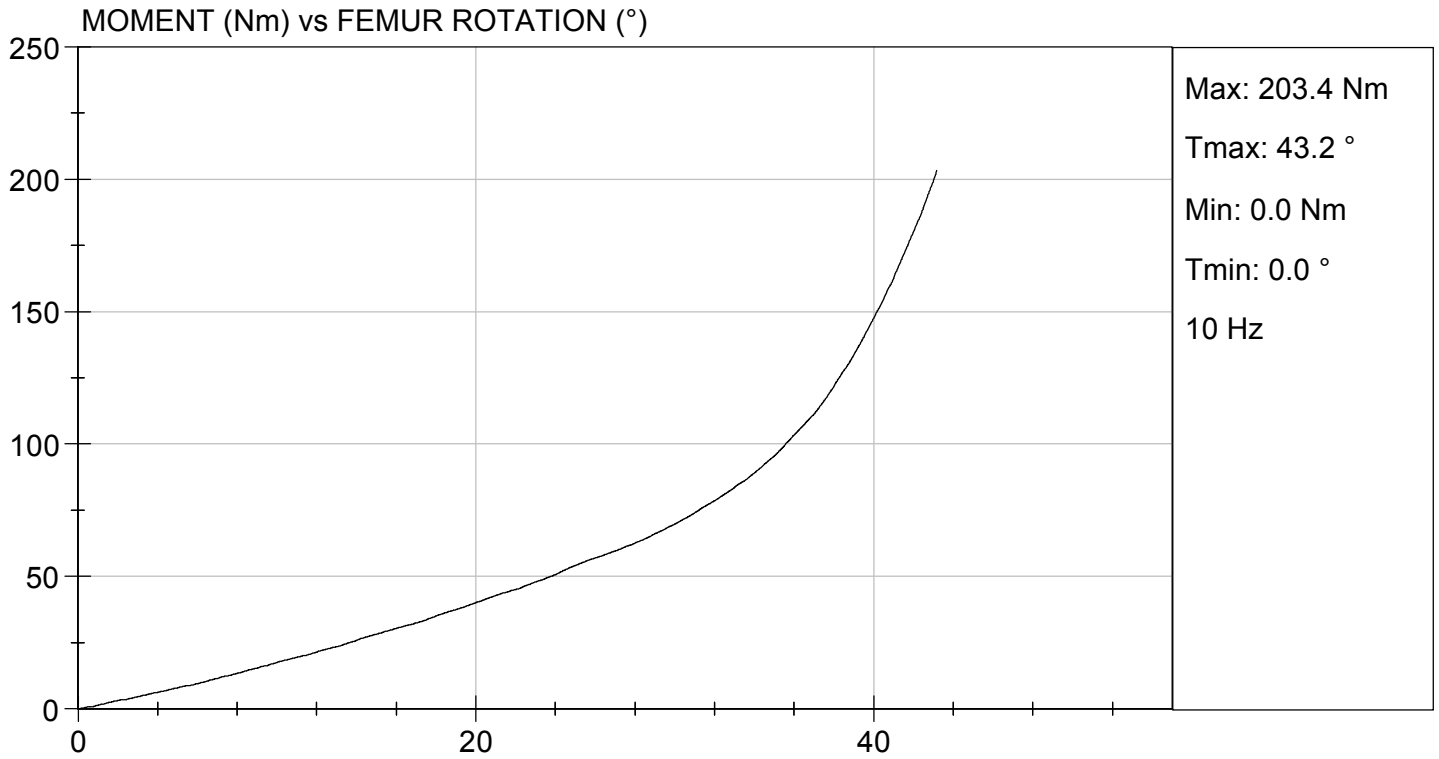
| Tested Parameter | Units | Specification | Result | | Pass/Fail |
|------------------------------|-------|-------------------------------------|--------|------|-----------|
| | | | Right | Left | |
| Laboratory Temperature | deg C | 18.9 to 25.6 | 21.4 | 21.4 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 43 | 43 | Pass |
| Rotation Rate | deg/s | 5.0 to 10.0 | 6.5 | 6.5 | Pass |
| 30 Degrees | Nm | 94.9 Nm Max | 76.3 | 69.8 | Pass |
| 150 ft-lbf / 203.4 Nm | Deg | 40.0 to 50.0 Degree Max Rotation | 44.5 | 43.2 | Pass |
| Overall Test Results | | | | | Pass |

Danielle Redinlaugh
Laboratory Technician

08/24/2017
Test Date

B. F. K.
Approved By





Hybrid III, 5th External Measurements
SN: 138

| HYBRID III, PART 572, SUBPART O EXTERNAL DIMENSIONS | | | | |
|-----------------------------------------------------|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|--------------------|
| DIMENSION | DESCRIPTION | DETAILS | ASSEMBLY DIMENSION (mm) | ACTUAL MEASUREMENT |
| A | TOTAL SITTING HEIGHT | Seat surface to highest point on top of the head. | 774.7-800.1 | 785.1 |
| B | SHOULDER PIVOT HEIGHT | Centerline of shoulder pivot bolt to the seat surface. | 431.8-457.2 | 456.8 |
| C | H-POINT HEIGHT | Reference | 81.3-86.3 | 84.0 |
| D | H-POINT LOCATION FROM BACKLINE | Reference | 144.8-149.8 | 146.2 |
| E | SHOULDER PIVOT FROM BACKLINE | Center of the shoulder clevis to the rear vertical surface of the fixture. | 68.6-83.8 | 78.0 |
| F | THIGH CLEARANCE | Measured at the highest point on the upper femur segment. | 119.4-134.6 | 127.5 |
| G | BACK OF ELBOW TO WRIST PIVOT | back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots | 243.9-259.1 | 249.6 |
| H | HEAD BACK TO BACKLINE | Back of Skull cap skin to seat rear vertical surface (Reference) | 43.2-48.2 | 45.0 |
| I | SHOULDER TO- ELBOW LENGTH | Measure from the highest point on top of the shoulder clevis to the lowest part of the flesh on the elbow in line with the elbow pivot bolt. | 276.8-297.2 | 280.2 |
| J | ELBOW REST HEIGHT | Measure from the flesh below the elbow pivot bolt to the seat surface. | 182.8-203.2 | 201.9 |
| K | BUTTOCK TO KNEE LENGTH | The forward most part of the knee flesh to the rear vertical surface of the fixture. | 520.7-546.1 | 526.7 |
| L | POPLITEAL HEIGHT | Seat surface to the plane of the horizontal plane of the bottom of the feet. | 355.6-376.0 | 362.3 |
| M | KNEE PIVOT HEIGHT | Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet. | 393.7-419.1 | 398.0 |

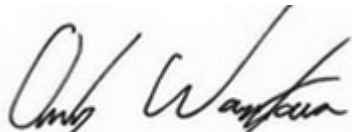
| N | BUTTOCK POPLITEAL LENGTH | The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K". | 414-439.4 | 430.5 |
|------------------------------------------------------|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|-------------------------|--------------------|
| HYBRID III, SUBPART O EXTERNAL DIMENSIONS, continued | | | | |
| DIMENSION | DESCRIPTION | DETAILS | ASSEMBLY DIMENSION (mm) | ACTUAL MEASUREMENT |
| O | CHEST DEPTH WITHOUT JACKET | Measured 304.8 ± 5.1 mm above seat surface | 175.3-190.5 | 184.6 |
| P | FOOT LENGTH | Tip of toe to rear of heel | 218.5-233.7 | 221.0 |
| Q | STANDING HEIGHT | (THEORETICAL) | 1501.1 | N/A |
| R | BUTTOCK TO KNEE PIVOT LENGTH | The rear surface of the buttocks to the knee pivot bolt | 457.2-482.6 | 472.6 |
| S | HEAD BREADTH | The widest part of the head | 137.1-147.3 | 141.9 |
| T | HEAD DEPTH | Back of the head to the forehead | 177.8-188.0 | 184.2 |
| U | HIP BREADTH | The widest part of the hip | 299.7-314.9 | 307.4 |
| V | SHOULDER BREADTH | Outside edges of right and left shoulder clevises | 350.5-365.7 | 360.5 |
| W | FOOT BREADTH | The widest part of the foot | 78.8-94.0 | 85.0 |
| X | HEAD CIRCUMFERENCE | Measured at the point as in dim. "T" | 528.3-548.7 | 546.2 |
| Y | CHEST CIRCUMFERENCE (WITH CHEST JACKET) | Measured 345.4 ± 12.7 mm above seat surface | 850.9-881.3 | 875.1 |
| Z | WAIST CIRCUMFERENCE | Measured 165.1 ± 5.1 mm above seat surface | 759.5-789.9 | 785.4 |
| AA | REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE | Reference | 332.7-358.1 | 345.4 |
| BB | REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE | Reference | 160.1-170.2 | 165.1 |

**MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE**

ATD Serial No: 138

Test ID: D172231

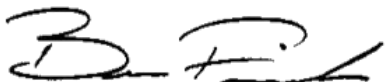
| Tested Parameter | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|--------------------|--------|-------------|
| Laboratory Temperature | deg C | 18.9 to 25.6 | 21.6 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 46 | Pass |
| Peak Resultant Acceleration | G's | 250 to 300 | 266 | Pass |
| Peak Lateral Acceleration | G's | <= +/- 15.0 | -7.4 | Pass |
| Unimodal | N/A | Yes | Yes | Pass |
| Oscillations | N/A | within 10% of peak | Yes | Pass |
| Overall Test Results | | | | Pass |



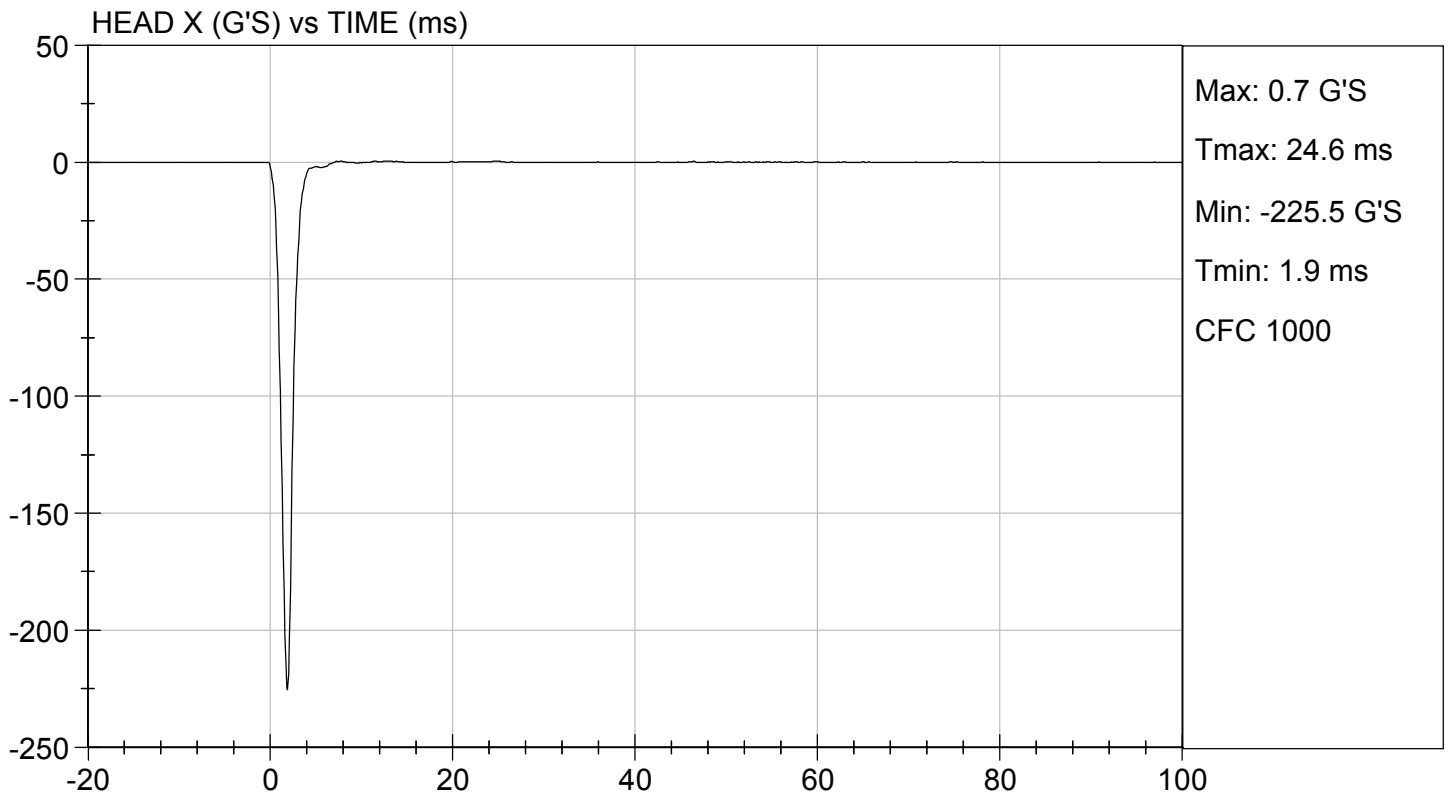
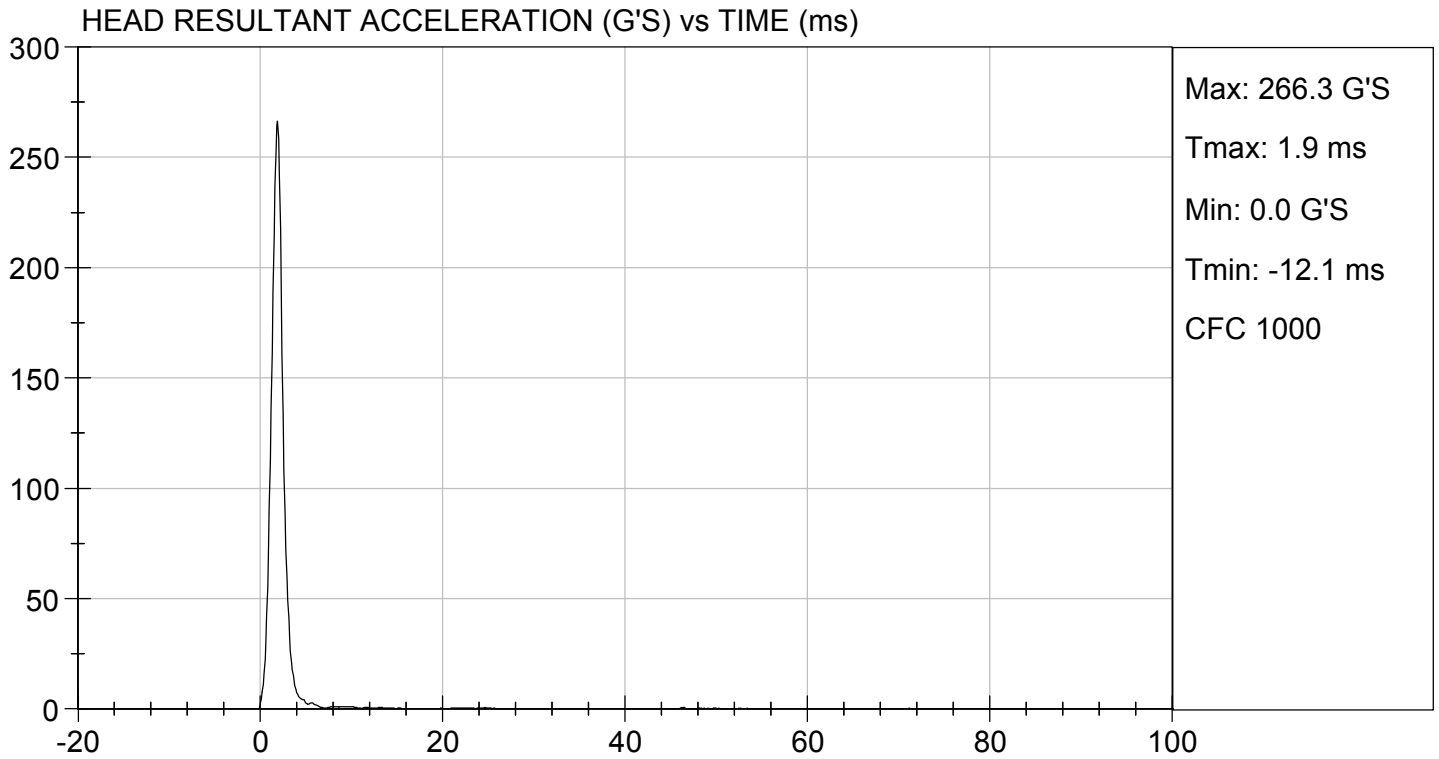
Laboratory Technician

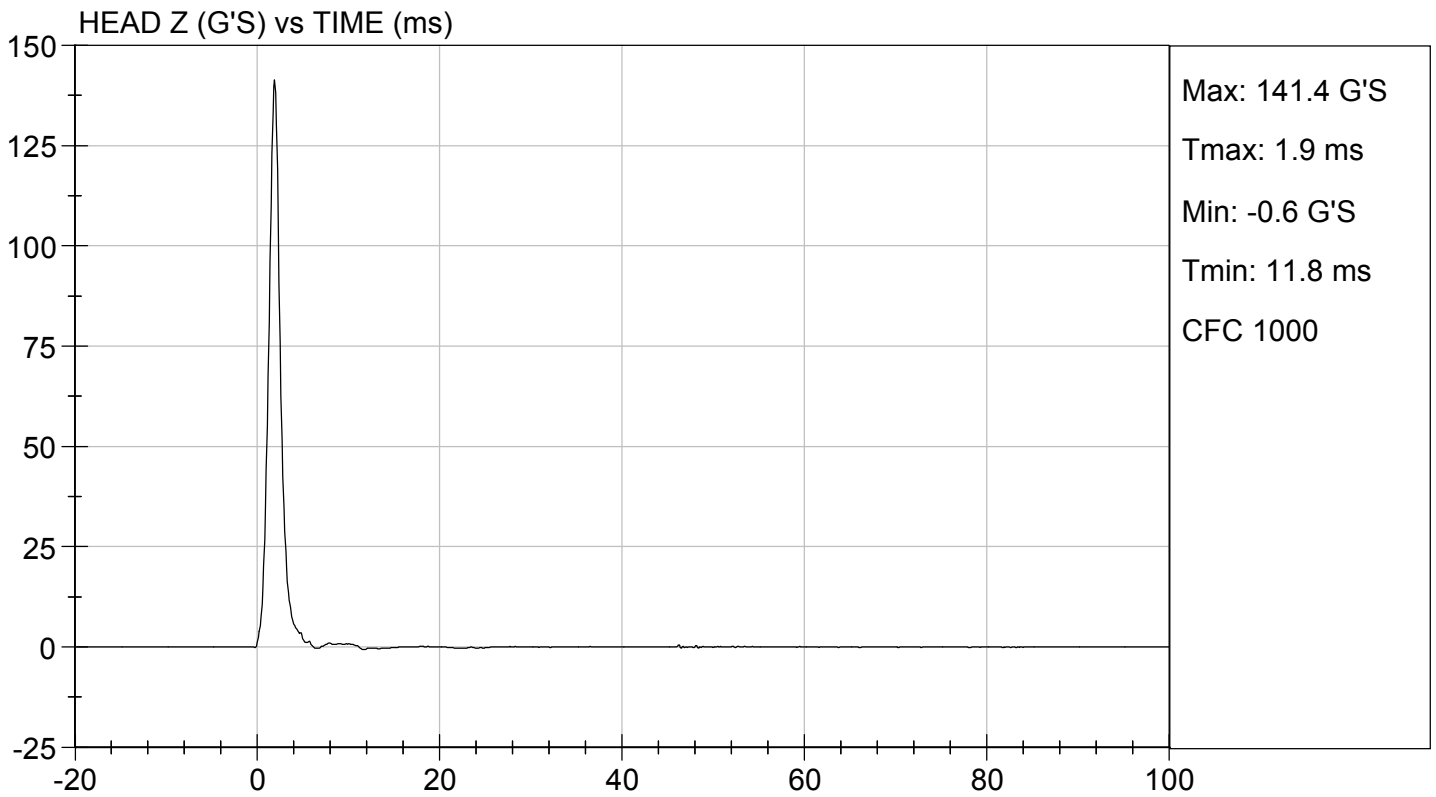
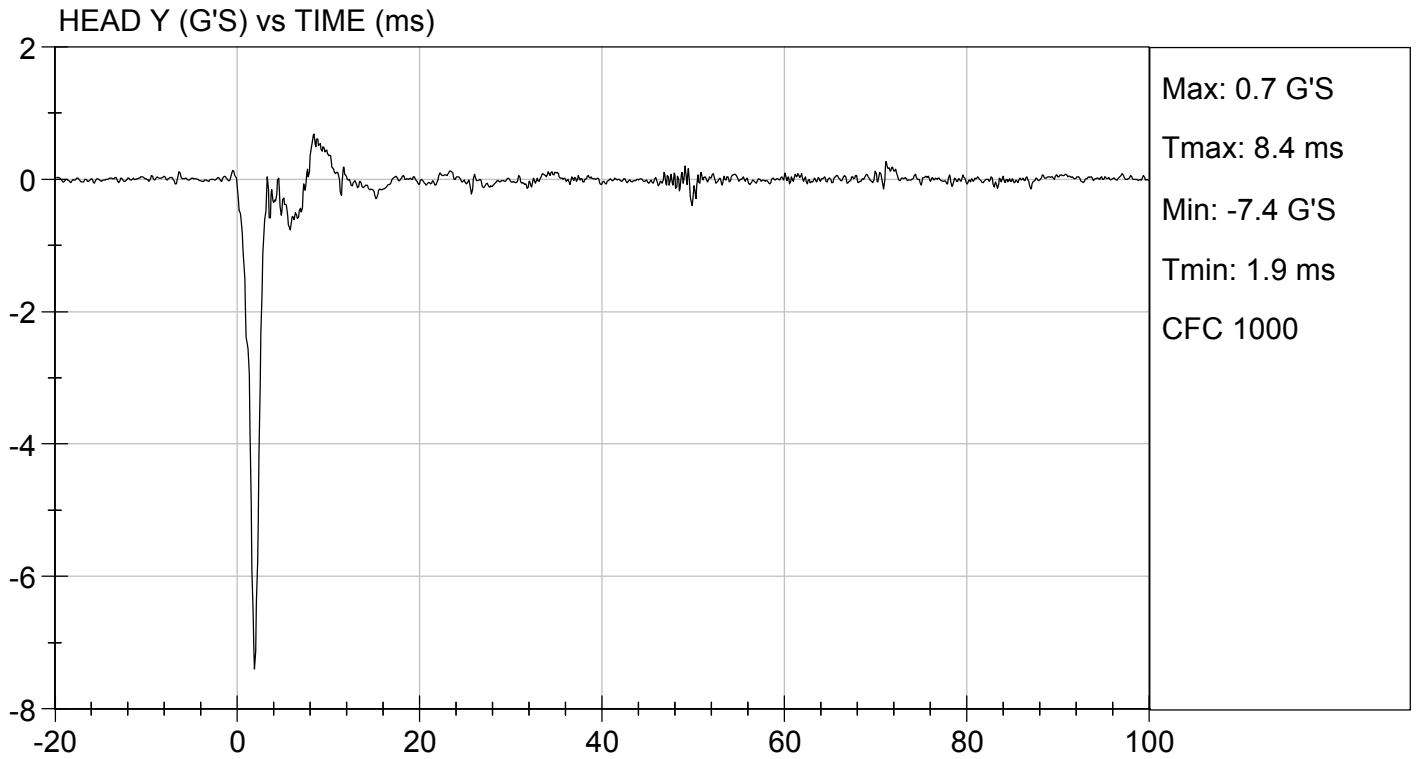
08/16/2017

Test Date



Approved By





MGA RESEARCH CORPORATION

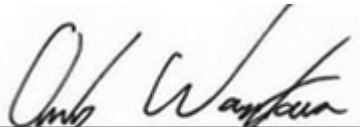
NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D.: D172232

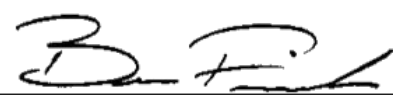
| Tested Parameter | | Units | Specification | Result | Pass/Fail |
|---------------------------------------------------|-------|-------|---------------|--------|-----------|
| Laboratory Temperature | | deg C | 20.6 to 22.2 | 21.7 | Pass |
| Laboratory Relative Humidity | | % | 10 to 70 | 43 | Pass |
| Pendulum Speed | | m/s | 6.89 to 7.13 | 7.06 | Pass |
| Pendulum Velocity | 10 ms | m/s | 2.1 to 2.5 | 2.4 | Pass |
| | 20 ms | m/s | 4.0 to 5.0 | 4.8 | Pass |
| | 30 ms | m/s | 5.8 to 7.0 | 6.8 | Pass |
| D Plane Rotation | Max | deg | 77 to 91 | 82 | Pass |
| Occipital Condyle Moment within Rotation Corridor | | Nm | 69 to 83 | 70 | Pass |
| Positive Moment Time Curve Decay to 10 Nm | | ms | 80 to 100 | 82 | Pass |
| Overall Results | | | | | Pass |



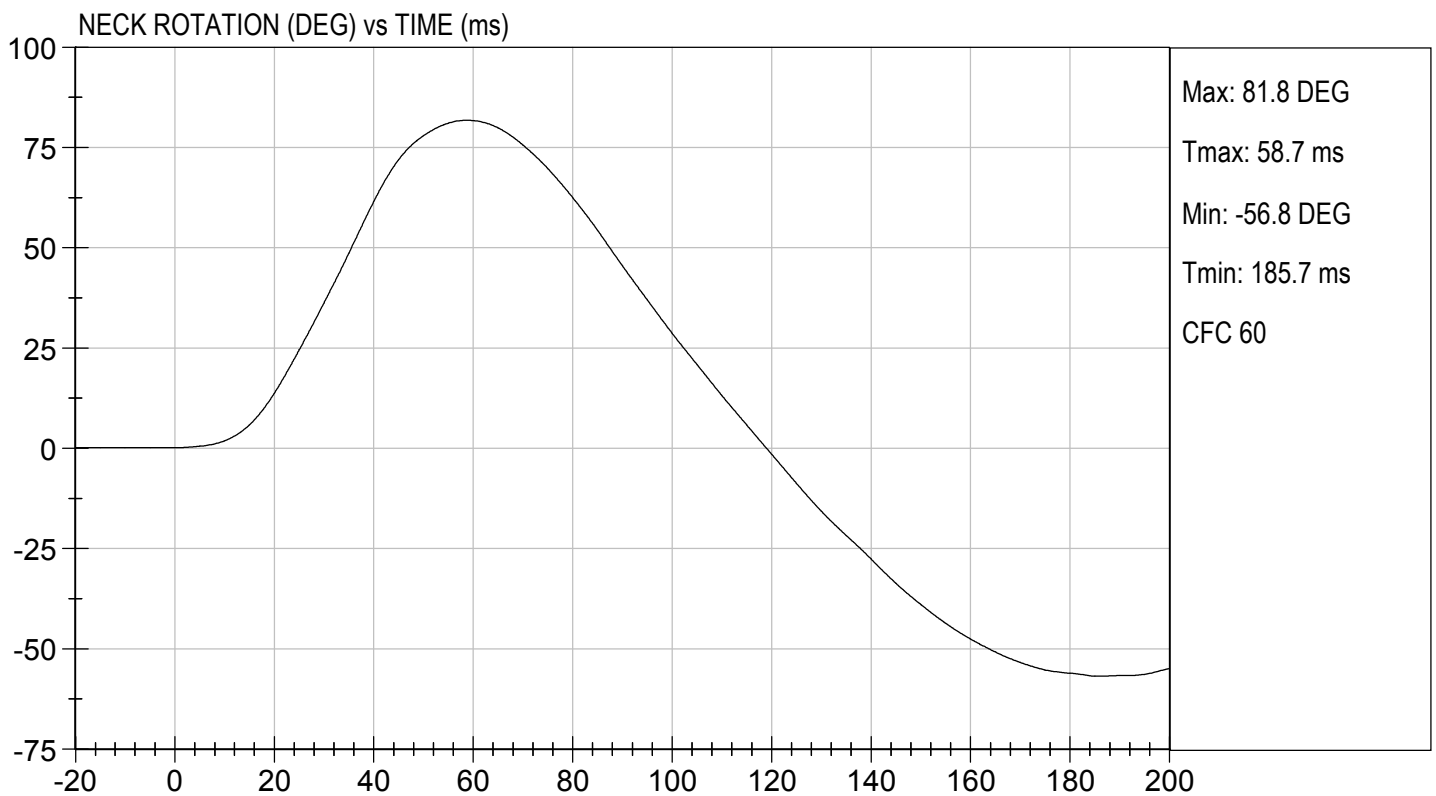
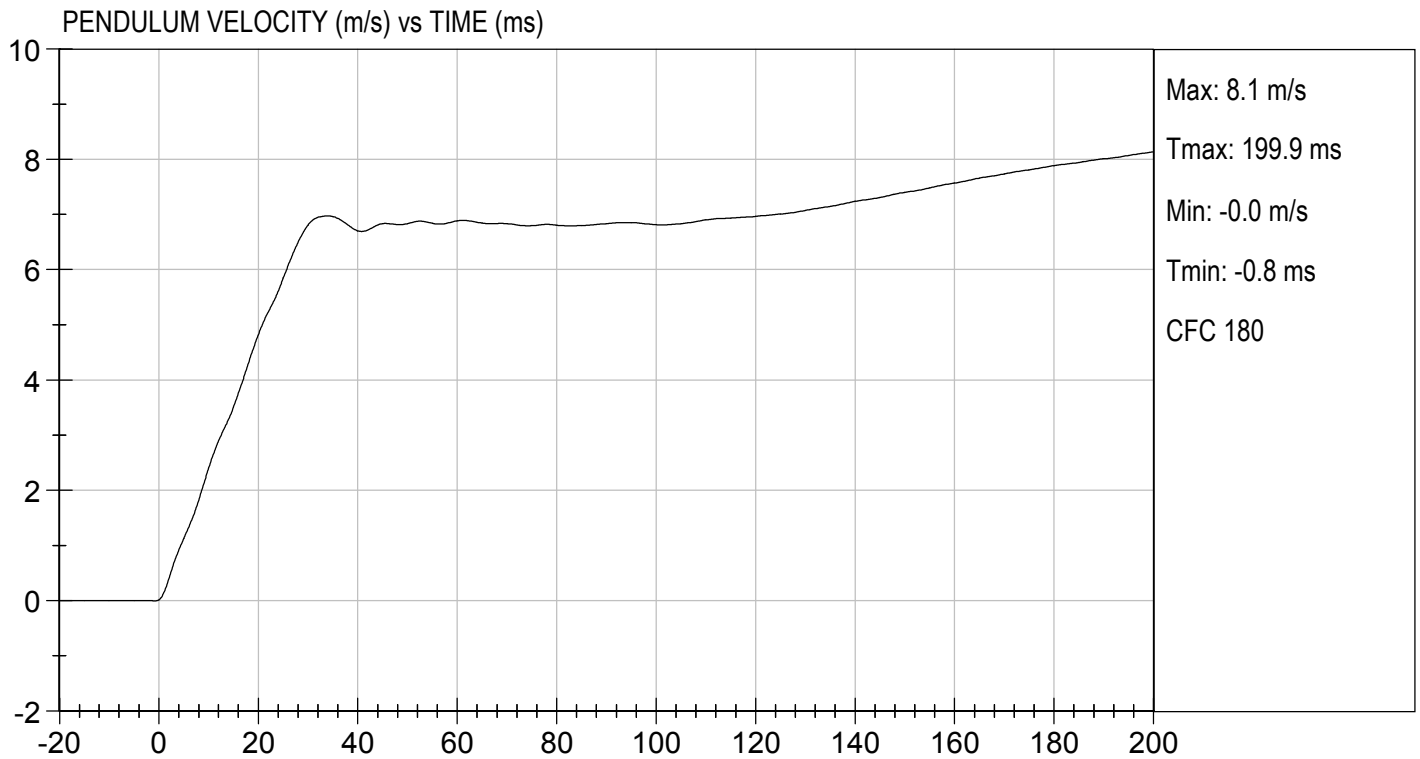
 Laboratory Technician

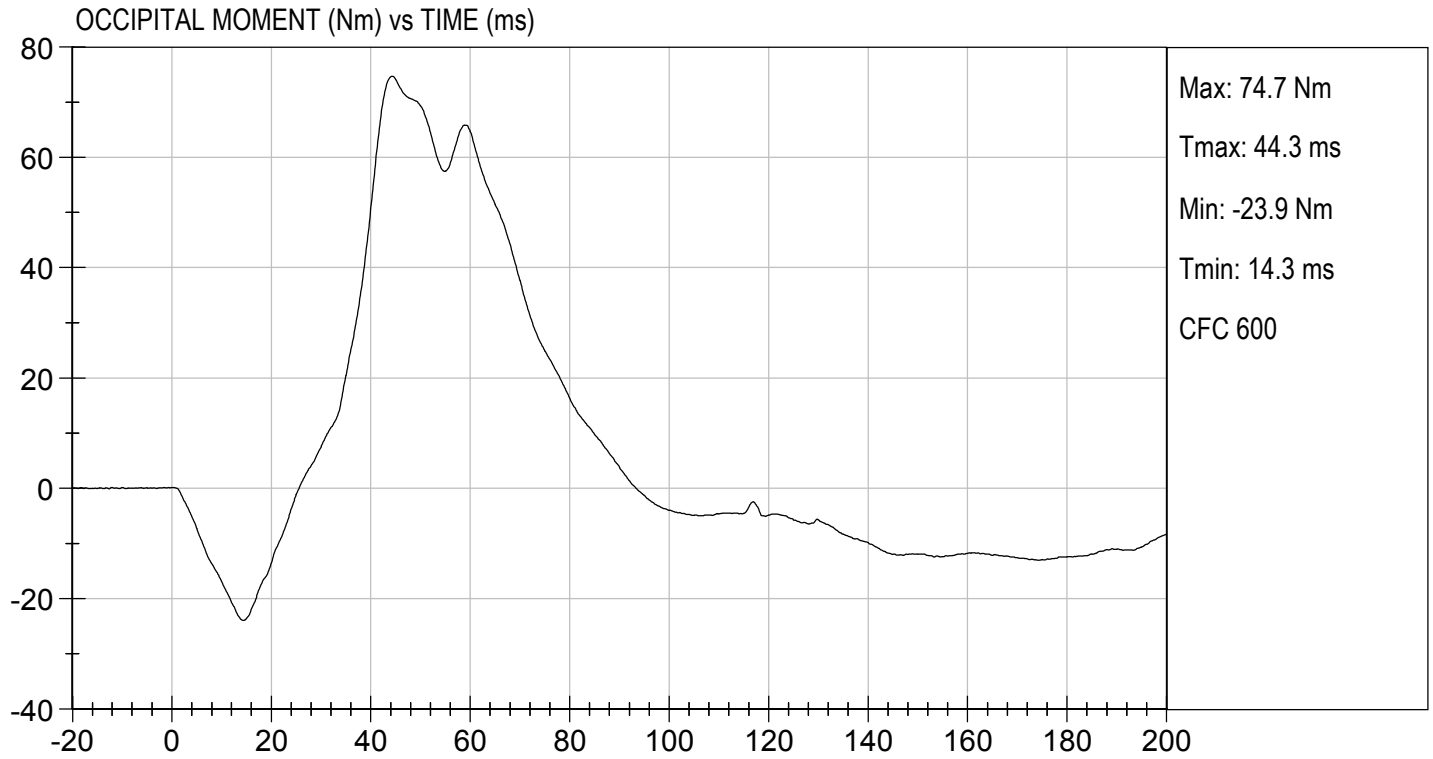
08/16/2017

 Test Date



 Approved By



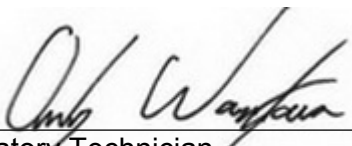


MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

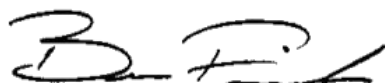
ATD Serial No: 138

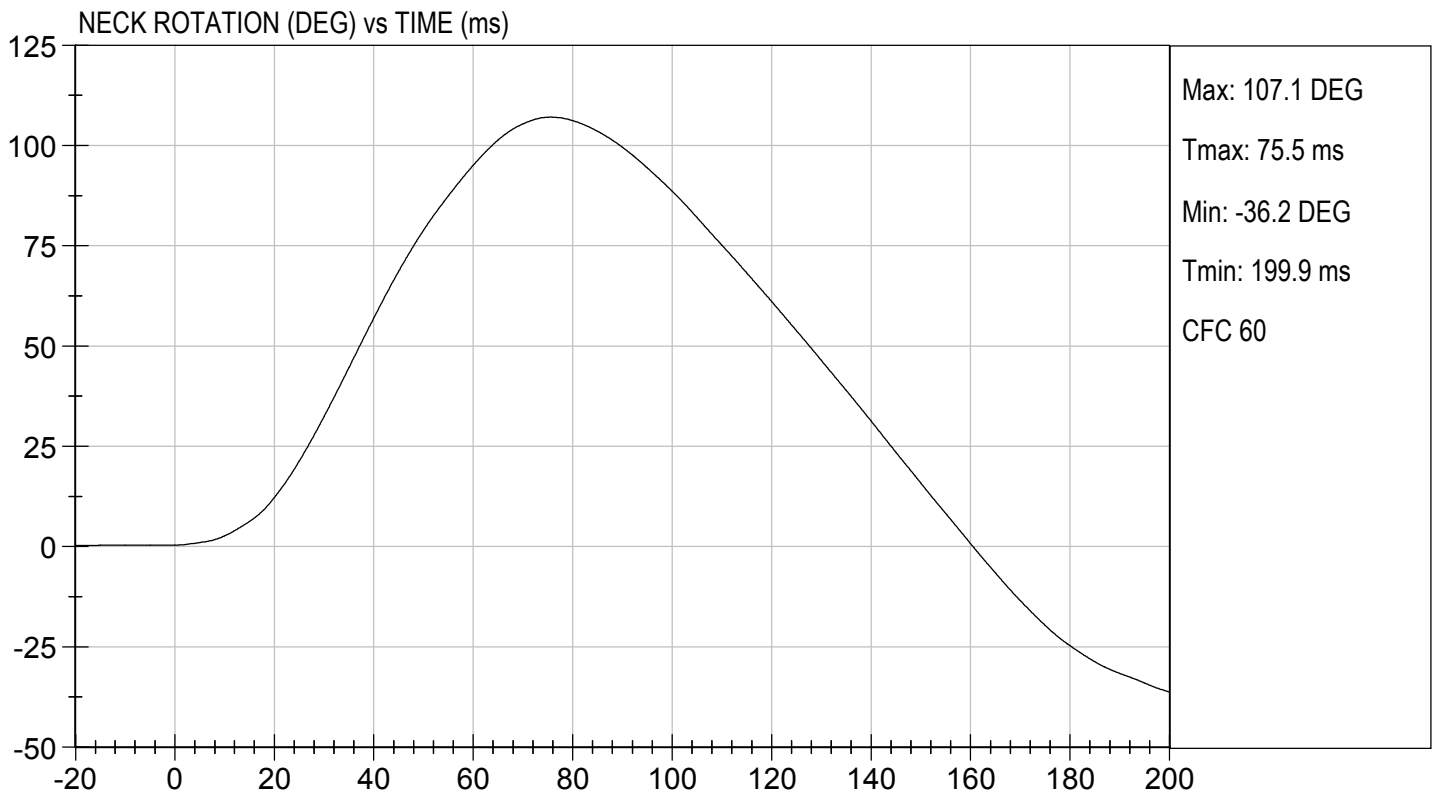
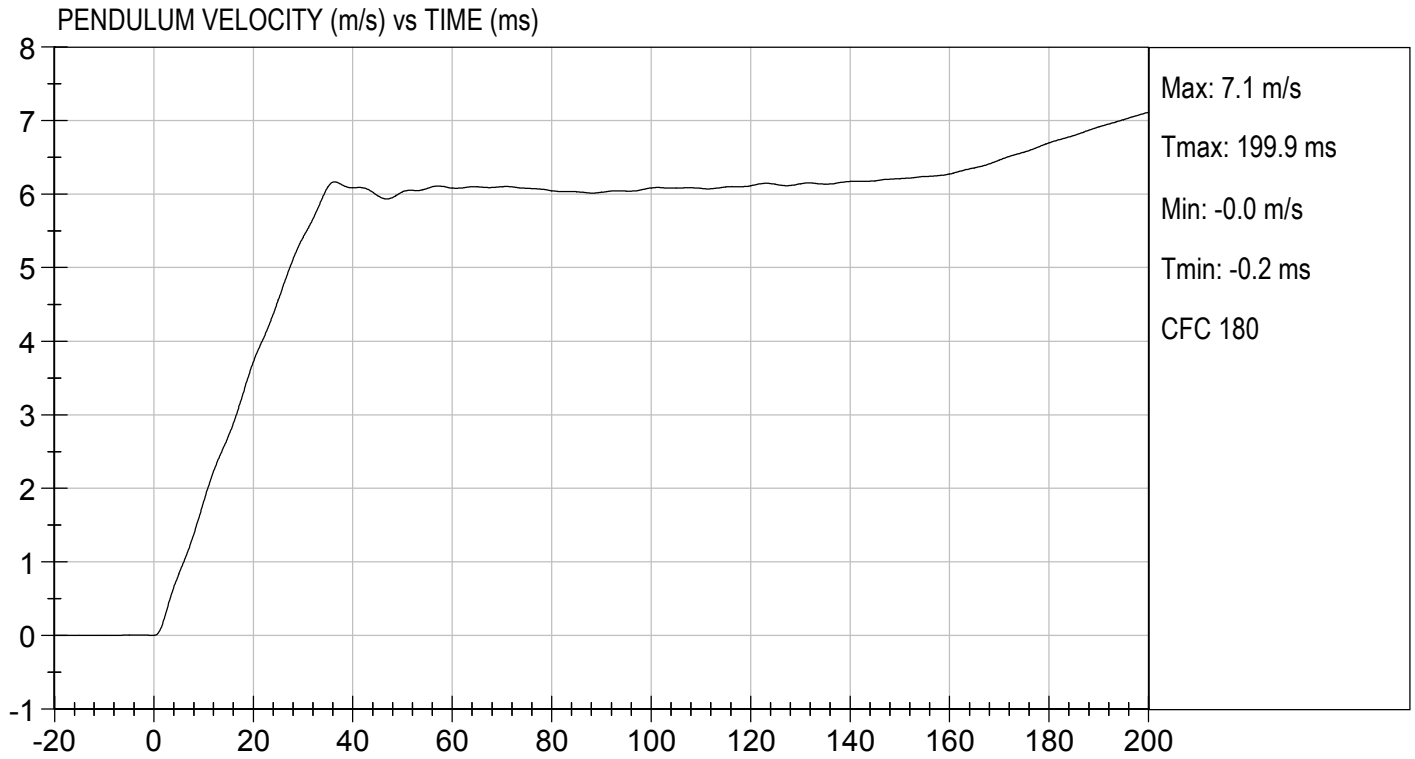
Test I.D: D172233

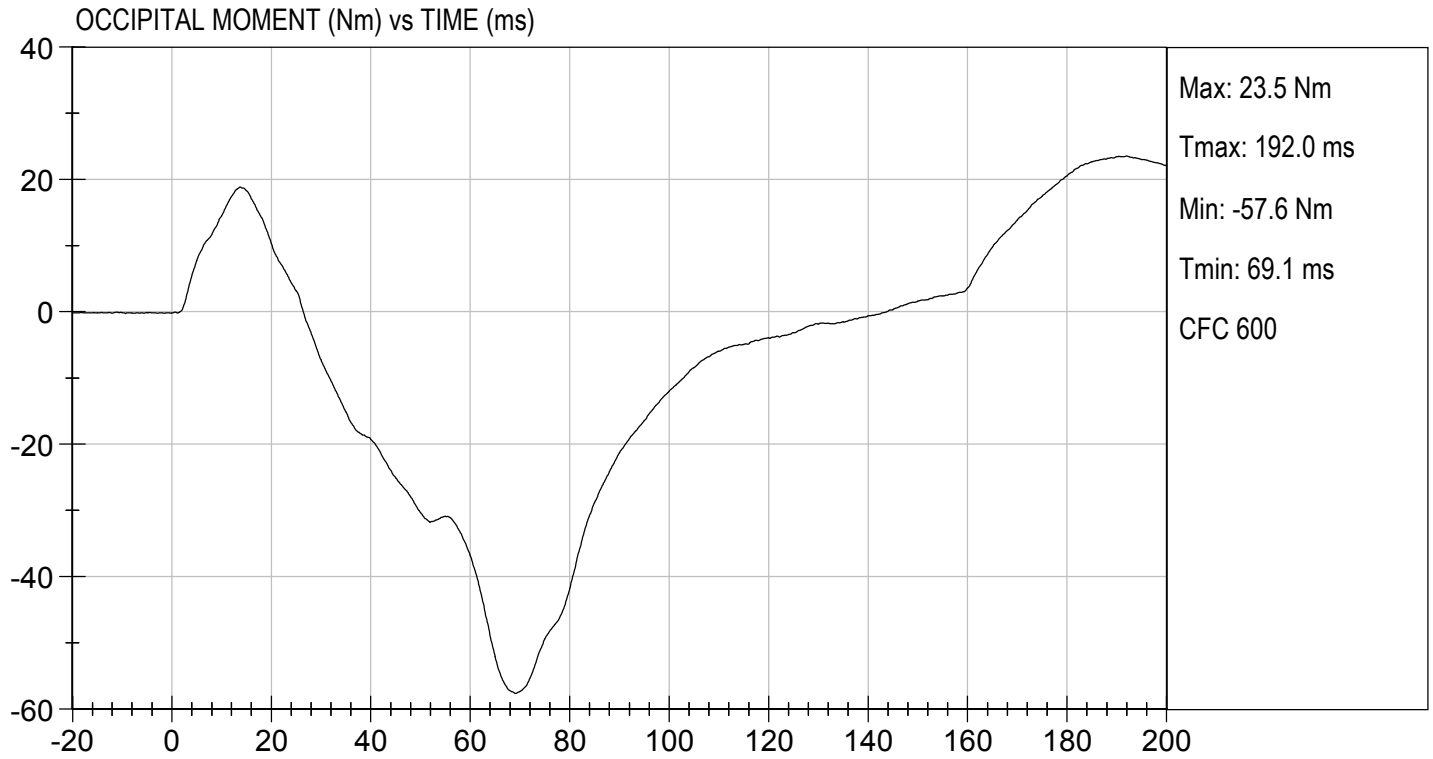
| Tested Parameter | | Units | Specification | Result | Pass/Fail |
|---------------------------------------------------|-------|-------|---------------|--------|-----------|
| Laboratory Temperature | | deg C | 20.6 to 22.2 | 21.7 | Pass |
| Laboratory Relative Humidity | | % | 10 to 70 | 43 | Pass |
| Pendulum Speed | | m/s | 5.95 to 6.19 | 6.12 | Pass |
| Pendulum Velocity | 10 ms | m/s | 1.5 to 1.9 | 1.8 | Pass |
| | 20 ms | m/s | 3.1 to 3.9 | 3.7 | Pass |
| | 30 ms | m/s | 4.6 to 5.6 | 5.4 | Pass |
| D Plane Rotation | Max | deg | 99 to 114 | 107 | Pass |
| Occipital Condyle Moment within Rotation Corridor | | Nm | -65 to -53 | -58 | Pass |
| Negative Moment Time Curve Decay to -10 Nm | | ms | 94 to 114 | 103 | Pass |
| Overall Results | | | | | Pass |


 Laboratory Technician

08/16/2017
 Test Date


 Approved By



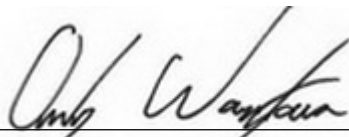


MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D172234

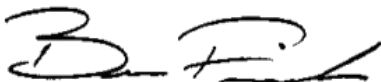
| Tested Parameter | Units | Specification | Result | Pass/Fail |
|-----------------------------------------------|-------|---------------|--------|-----------|
| Temperature | deg C | 20.6 to 22.2 | 21.4 | Pass |
| Relative Humidity | % | 10 to 70 | 45 | Pass |
| Probe Speed | m/s | 6.59 to 6.83 | 6.68 | Pass |
| Peak Deflection | mm | 50 to 58 | 56 | Pass |
| Peak Resistive Force w/in Deflection Corridor | N | 3900 to 4400 | 4304 | Pass |
| Internal Hysteresis | % | 69 to 85 | 71 | Pass |
| Peak Force 18 mm - 50 mm | N | <= 4600 | 4120 | Pass |
| Overall Test Results | | | | Pass |



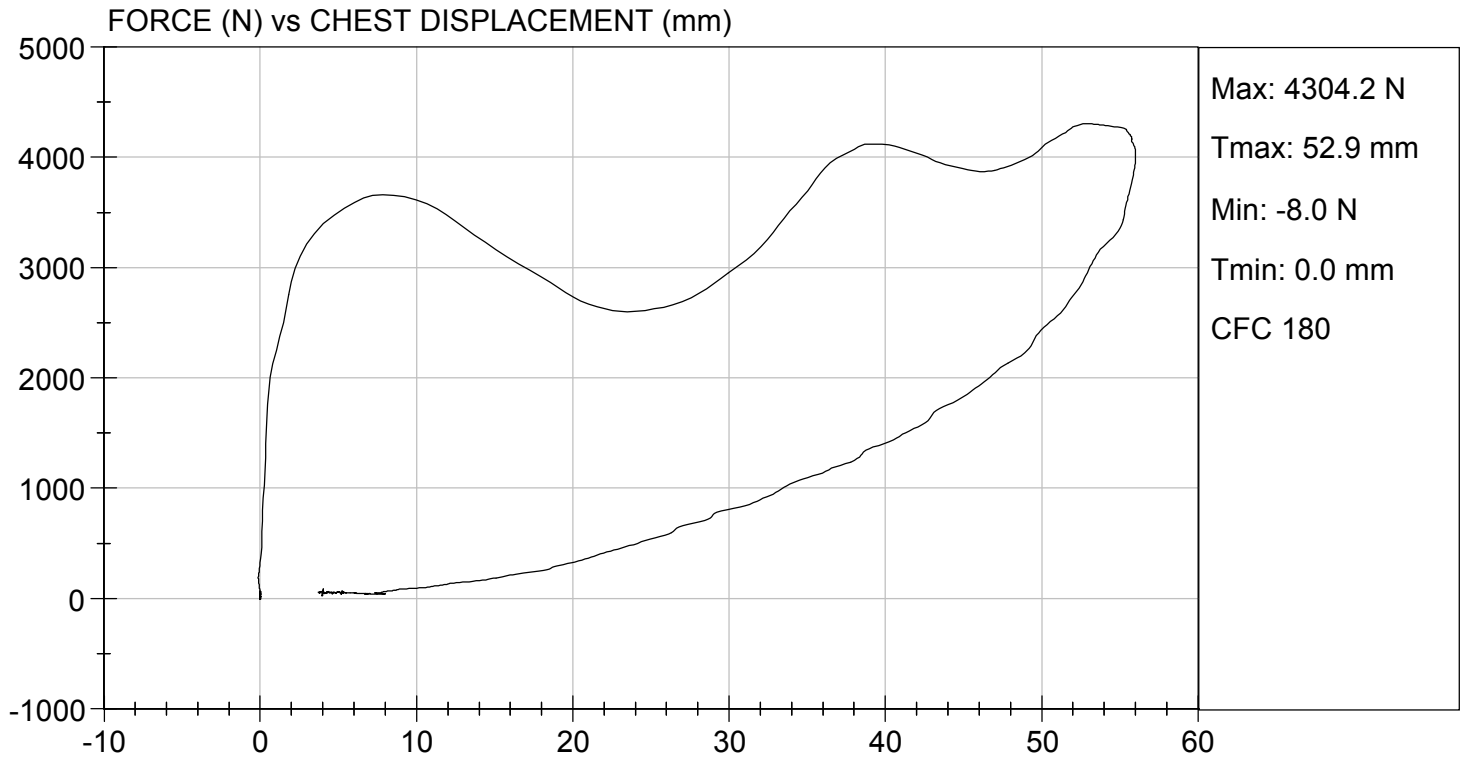
Laboratory Technician

08/16/2017

Test Date



Approved By



MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D172235

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature | deg C | 18.9 to 25.6 | 21.2 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 42 | Pass |
| Probe Speed | m/s | 2.07 to 2.13 | 2.07 | Pass |
| Maximum Force | N | 3450 to 4060 | 3497 | Pass |
| Overall Test Results | | | | Pass |

Danielle Redinlaugh
 Laboratory Technician

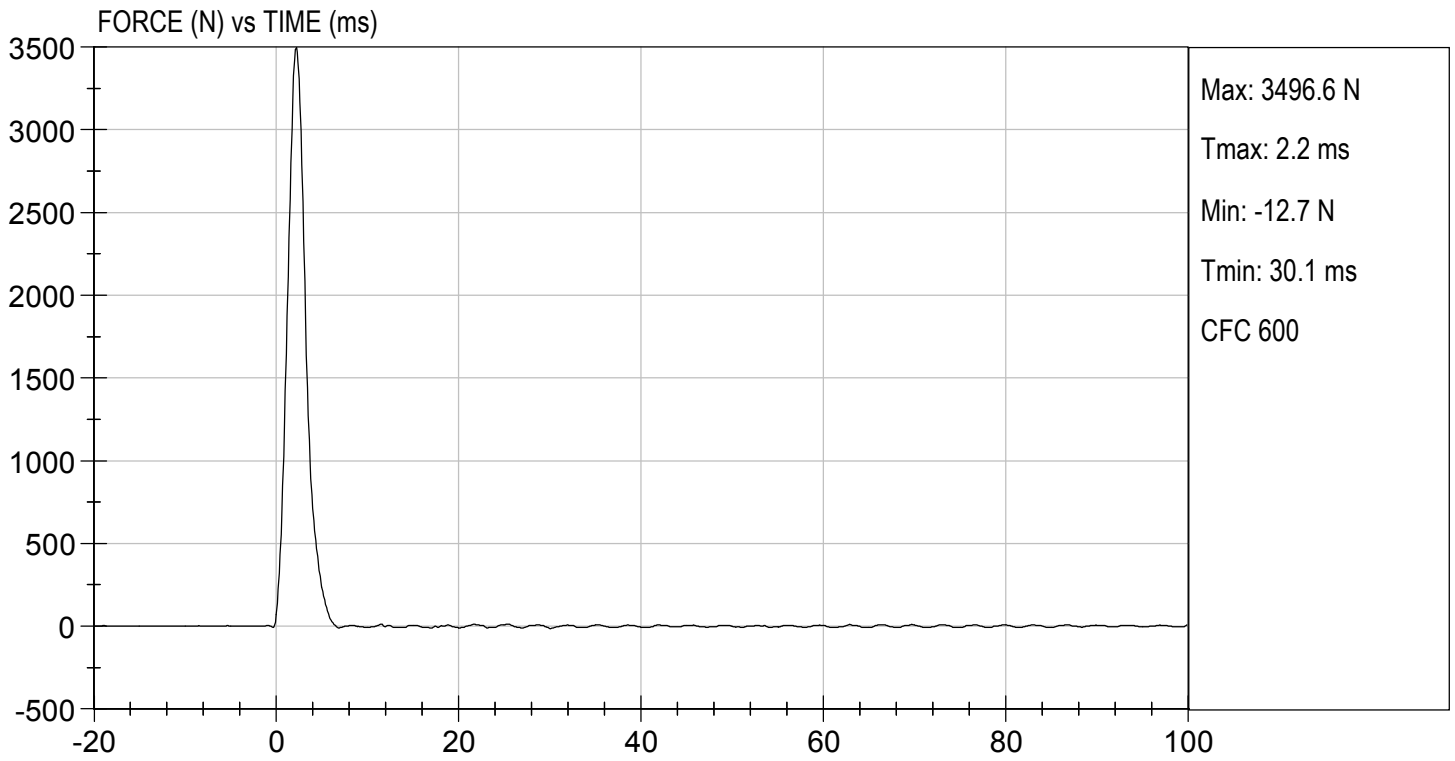
08/16/2017
 Test Date

B. F.
 Approved By



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

TEST DATE: 08/16/2017
TEST #: D172235



MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D172236

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature | deg C | 18.9 to 25.6 | 21.2 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 42 | Pass |
| Probe Speed | m/s | 2.07 to 2.13 | 2.07 | Pass |
| Maximum Force | N | 3450 to 4060 | 3985 | Pass |
| Overall Test Results | | | | Pass |

Danielle Redinlaugh
Laboratory Technician

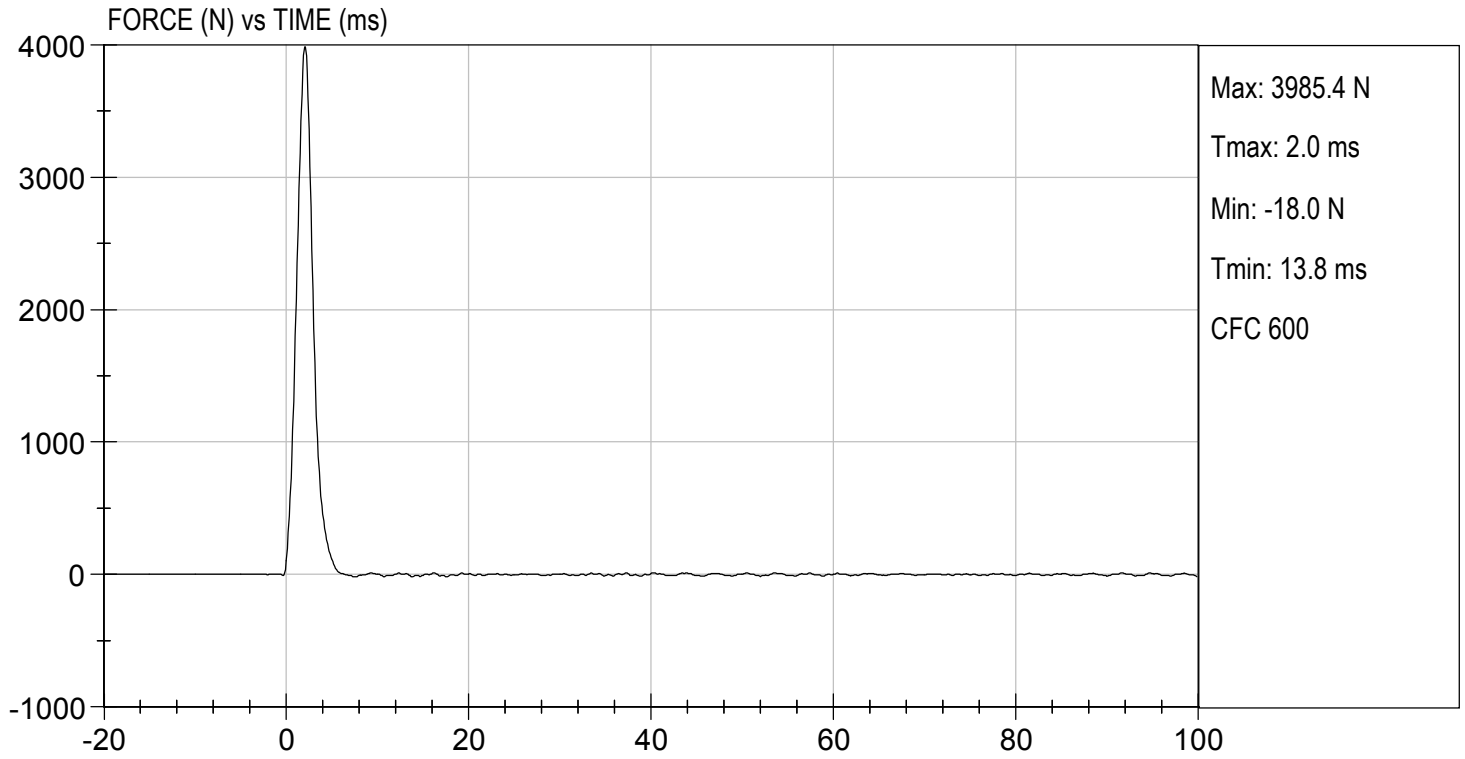
08/16/2017
Test Date

B. F.
Approved By



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

TEST DATE: 08/16/2017
TEST #: D172236



MGA RESEARCH CORPORATION

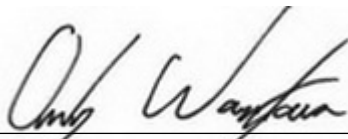
TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D172237T

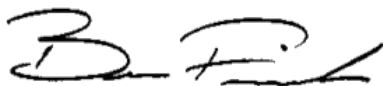
| Tested Parameter | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-------------|
| Laboratory Temperature | deg C | 18.9 to 25.6 | 22.0 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 44 | Pass |
| Initial Angle | deg | 0 to 20 | 15 | Pass |
| Return Angle | deg | +/- 8 | 4 | Pass |
| Force at 45 deg | N | 320 to 390 | 375 | Pass |
| Upper Torso Deflection Rate | deg/s | 0.5 to 1.5 | 0.9 | Pass |
| Overall Result | | | | Pass |



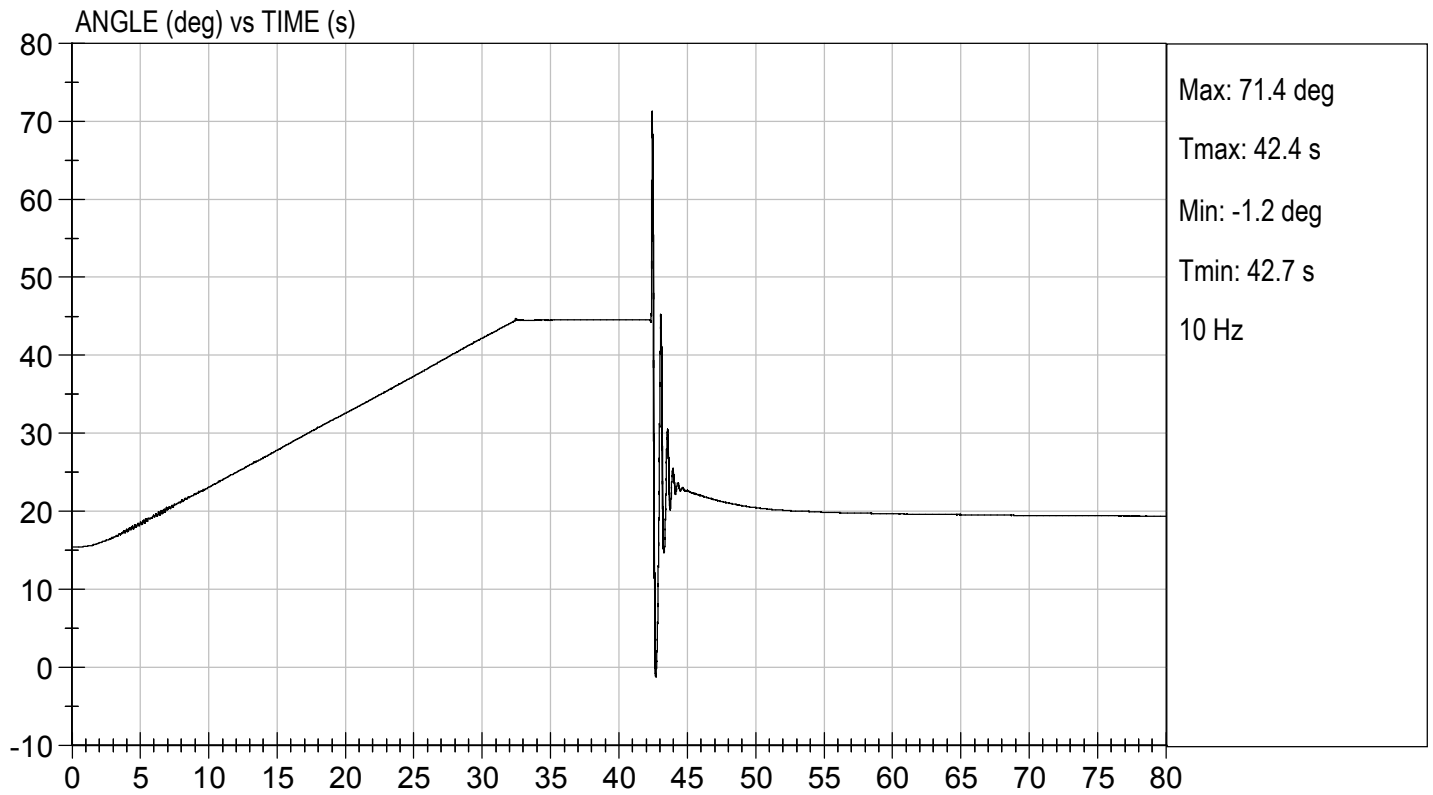
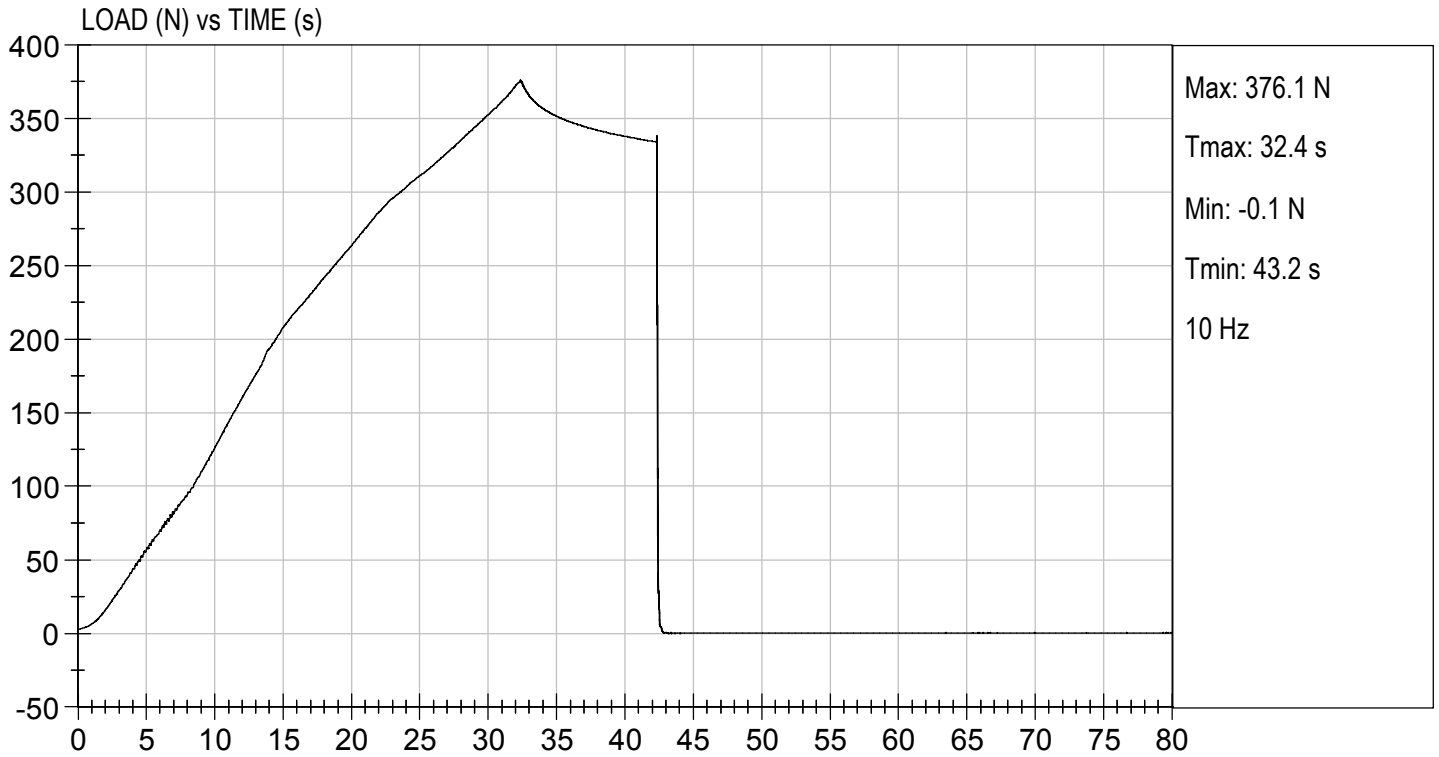
Laboratory Technician

08/16/2017

Test Date



Approved By



**MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE**

ATD Serial No: 138

Test ID: D172341

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|--------------------|--------|-------------|
| Laboratory Temperature | deg C | 18.9 to 25.6 | 21.6 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 42 | Pass |
| Peak Resultant Acceleration | G's | 250 to 300 | 264 | Pass |
| Peak Lateral Acceleration | G's | <= +/- 15.0 | -3.1 | Pass |
| Unimodal | N/A | Yes | Yes | Pass |
| Oscillations | N/A | within 10% of peak | Yes | Pass |
| Overall Test Results | | | | Pass |

Emily Fliess

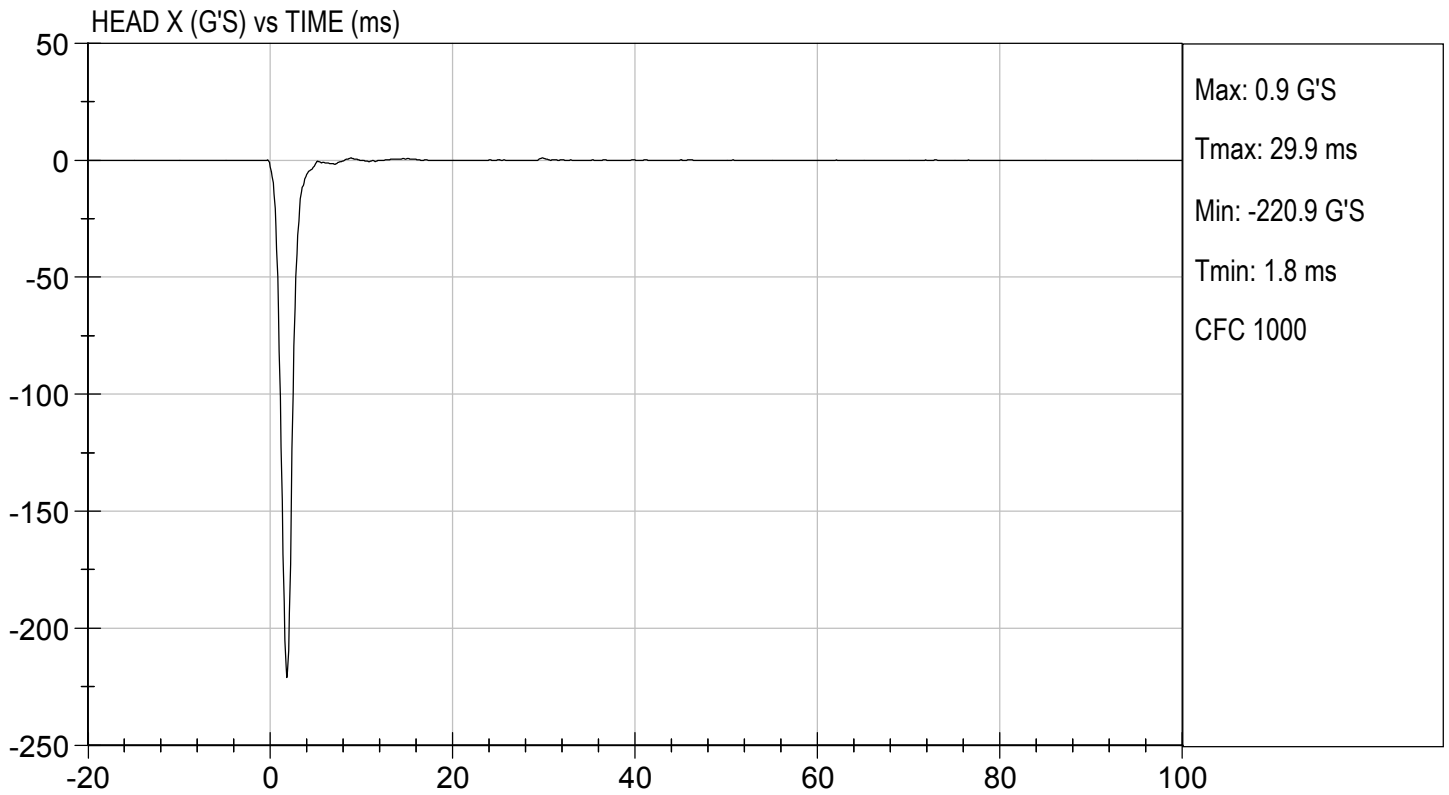
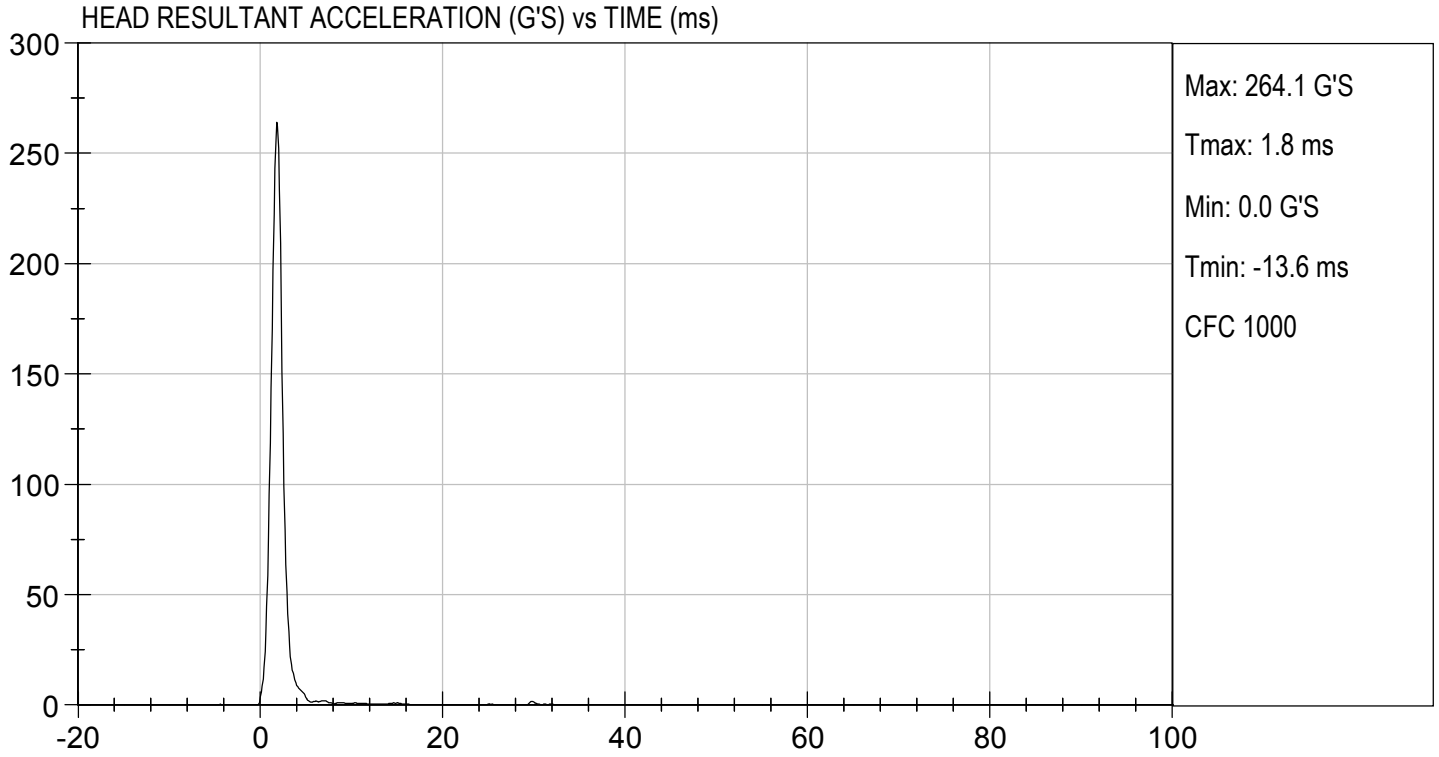
Laboratory Technician

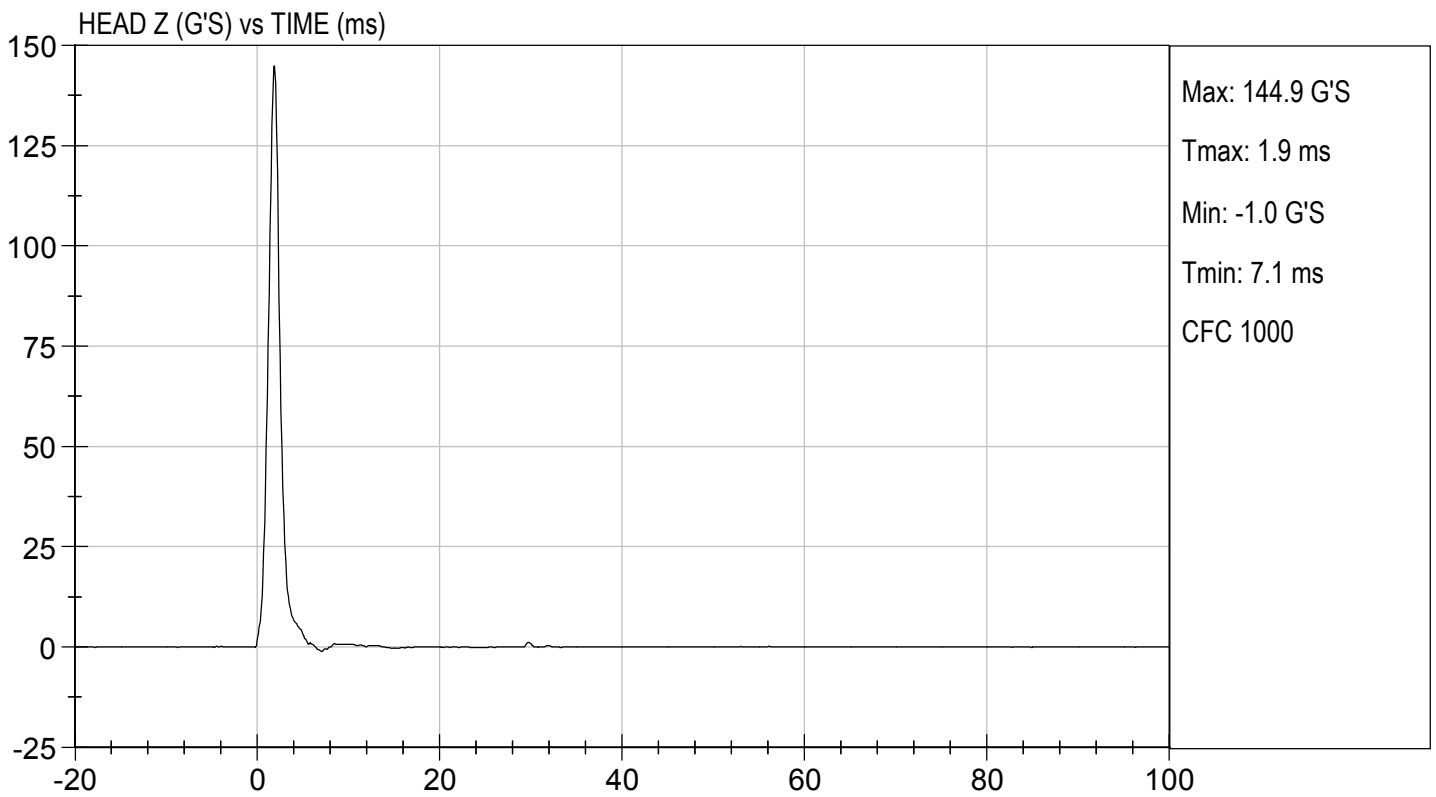
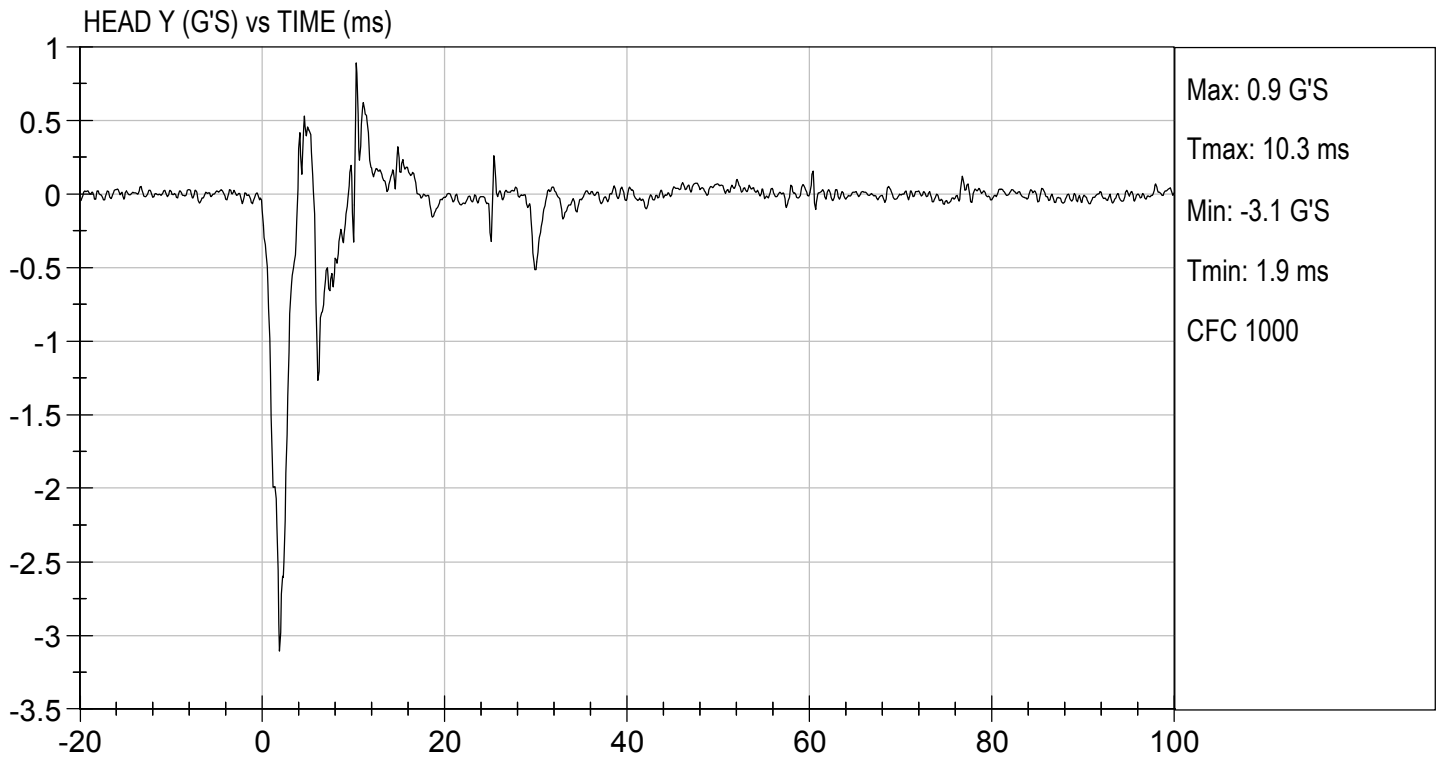
08/24/2017

Test Date

B. F. H.

Approved By





MGA RESEARCH CORPORATION

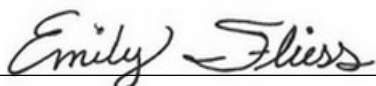
NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D.: D172342

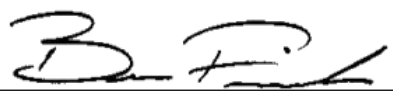
| Tested Parameter | | Units | Specification | Result | Pass/Fail |
|---------------------------------------------------|-------|-------|---------------|--------|-----------|
| Laboratory Temperature | | deg C | 20.6 to 22.2 | 21.4 | Pass |
| Laboratory Relative Humidity | | % | 10 to 70 | 39 | Pass |
| Pendulum Speed | | m/s | 6.89 to 7.13 | 7.06 | Pass |
| Pendulum Velocity | 10 ms | m/s | 2.1 to 2.5 | 2.3 | Pass |
| | 20 ms | m/s | 4.0 to 5.0 | 4.8 | Pass |
| | 30 ms | m/s | 5.8 to 7.0 | 6.9 | Pass |
| D Plane Rotation | Max | deg | 77 to 91 | 82 | Pass |
| Occipital Condyle Moment within Rotation Corridor | | Nm | 69 to 83 | 72 | Pass |
| Positive Moment Time Curve Decay to 10 Nm | | ms | 80 to 100 | 83 | Pass |
| Overall Results | | | | | Pass |



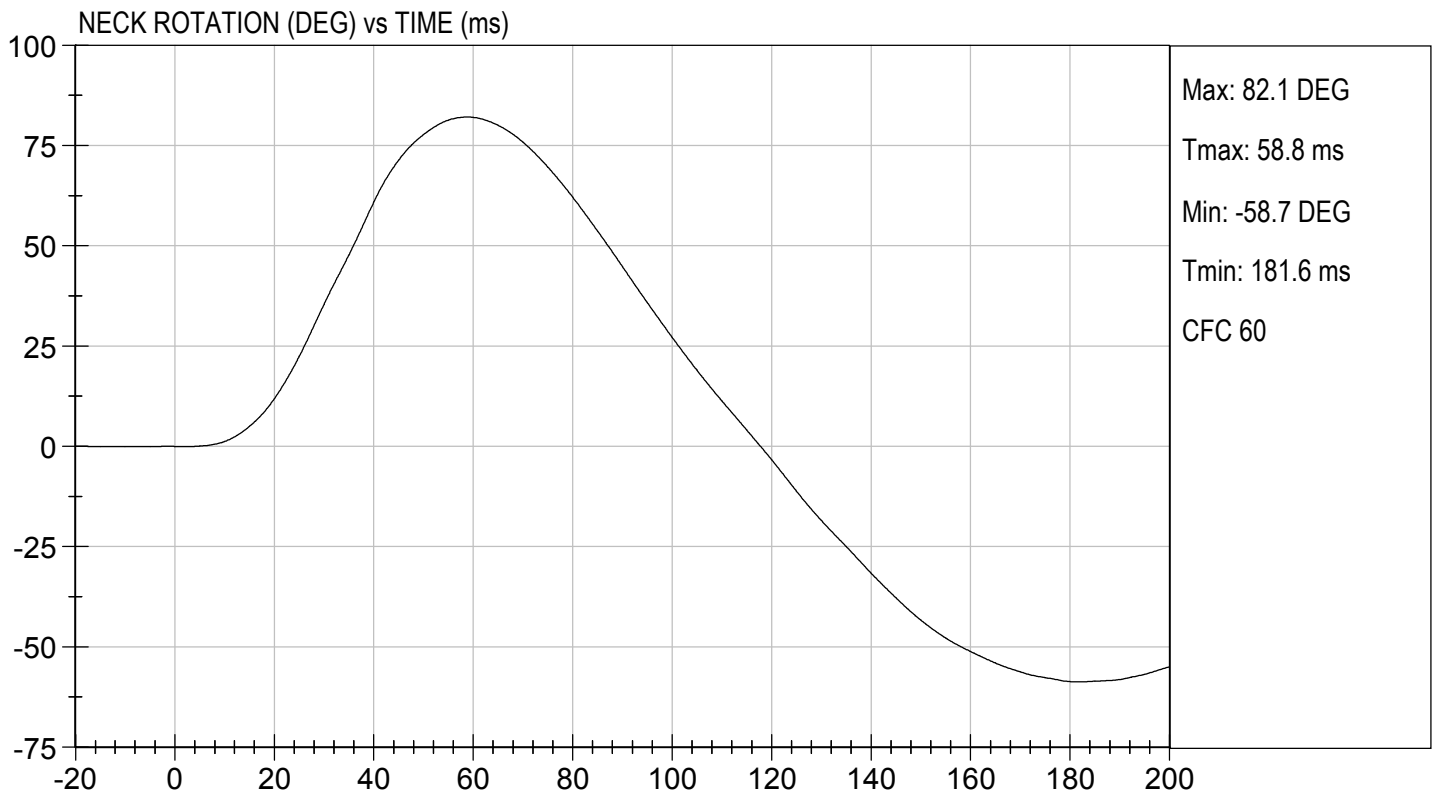
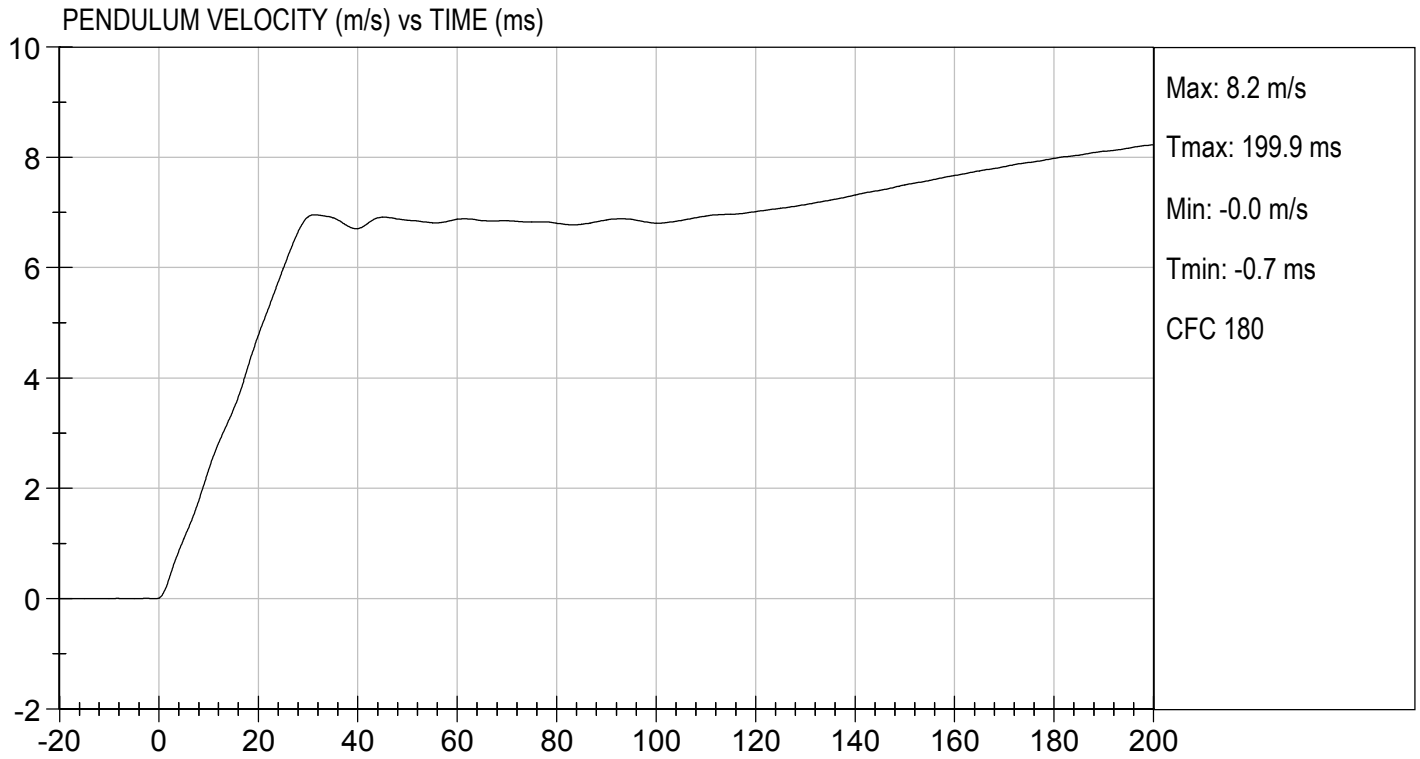
 Laboratory Technician

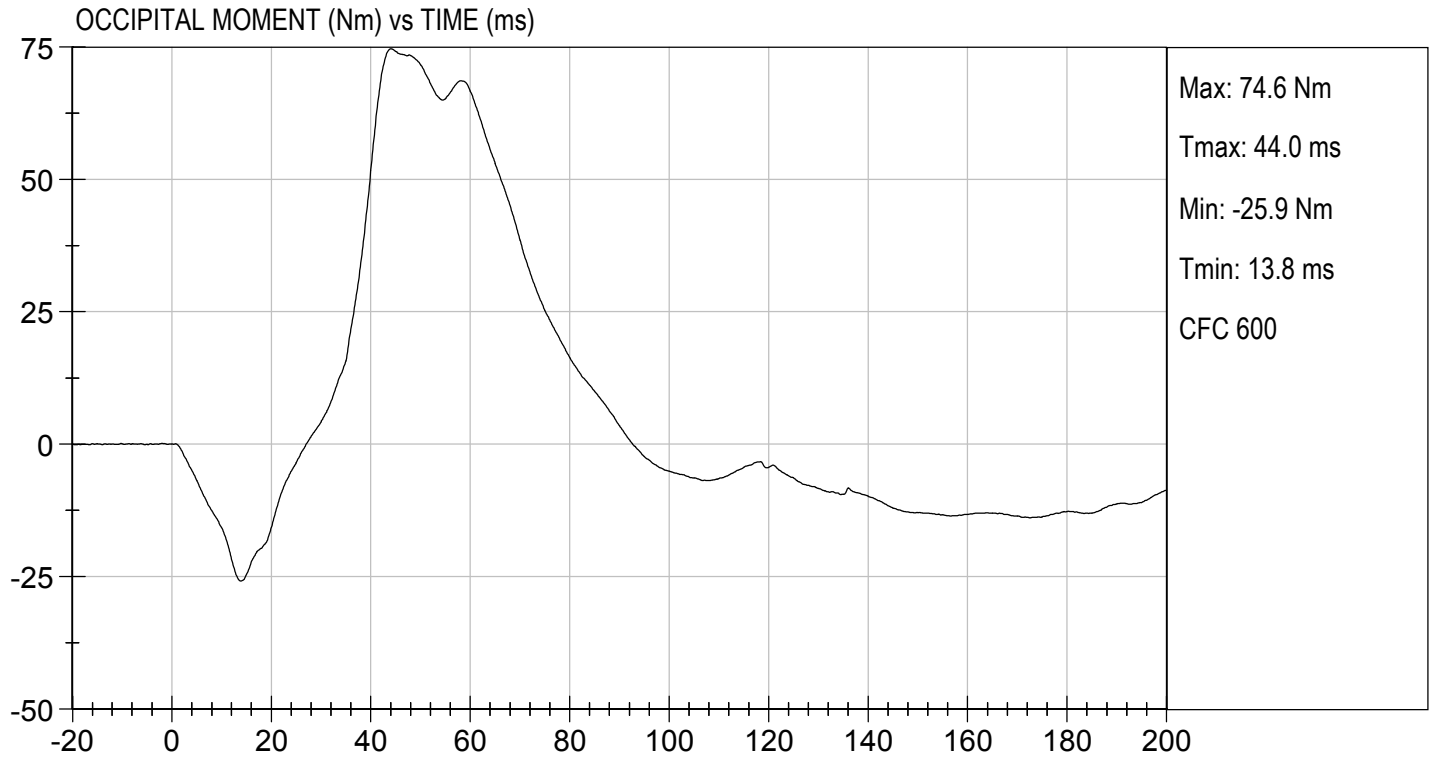
08/25/2017

 Test Date



 Approved By





MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

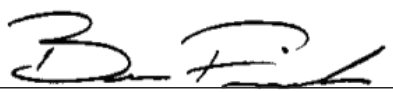
ATD Serial No: 138

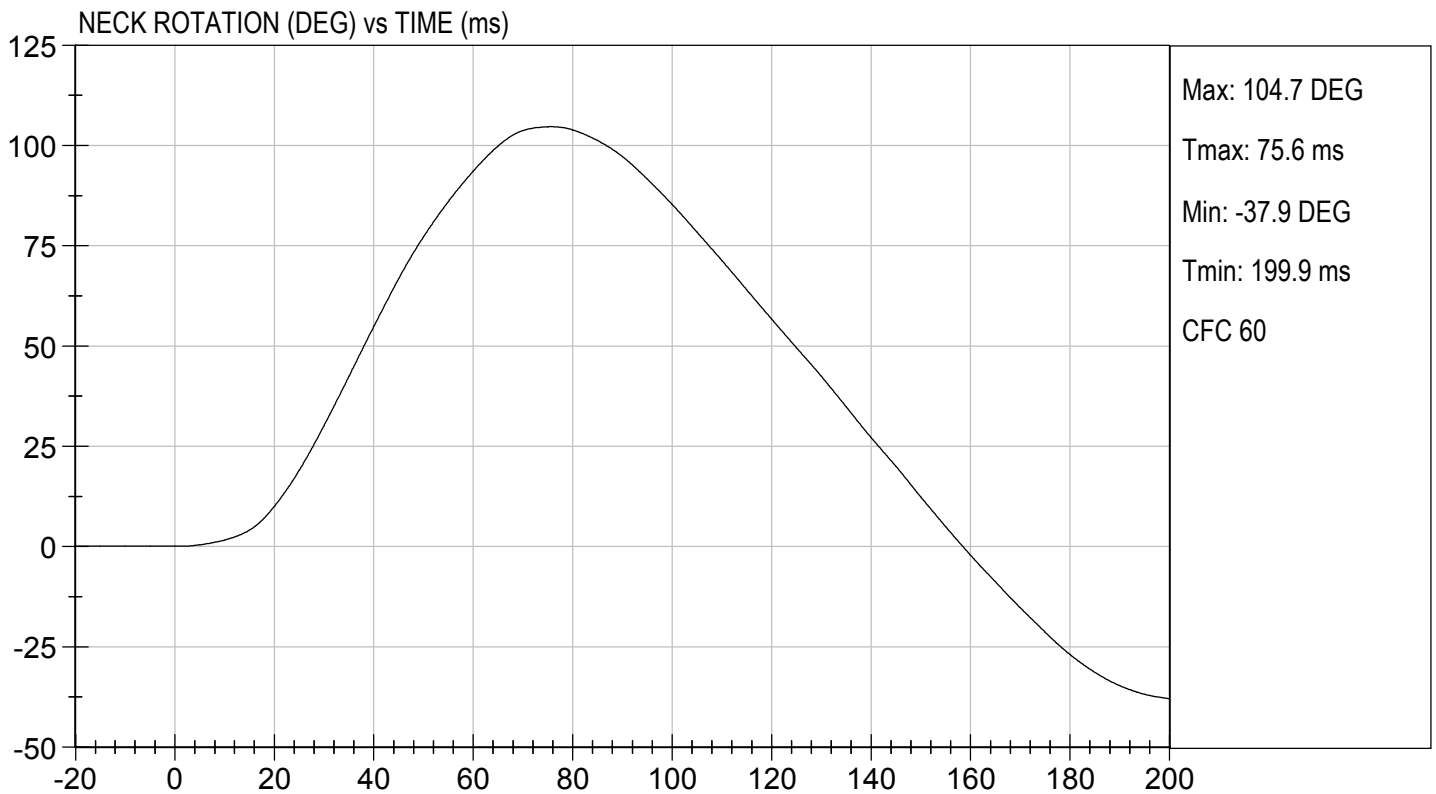
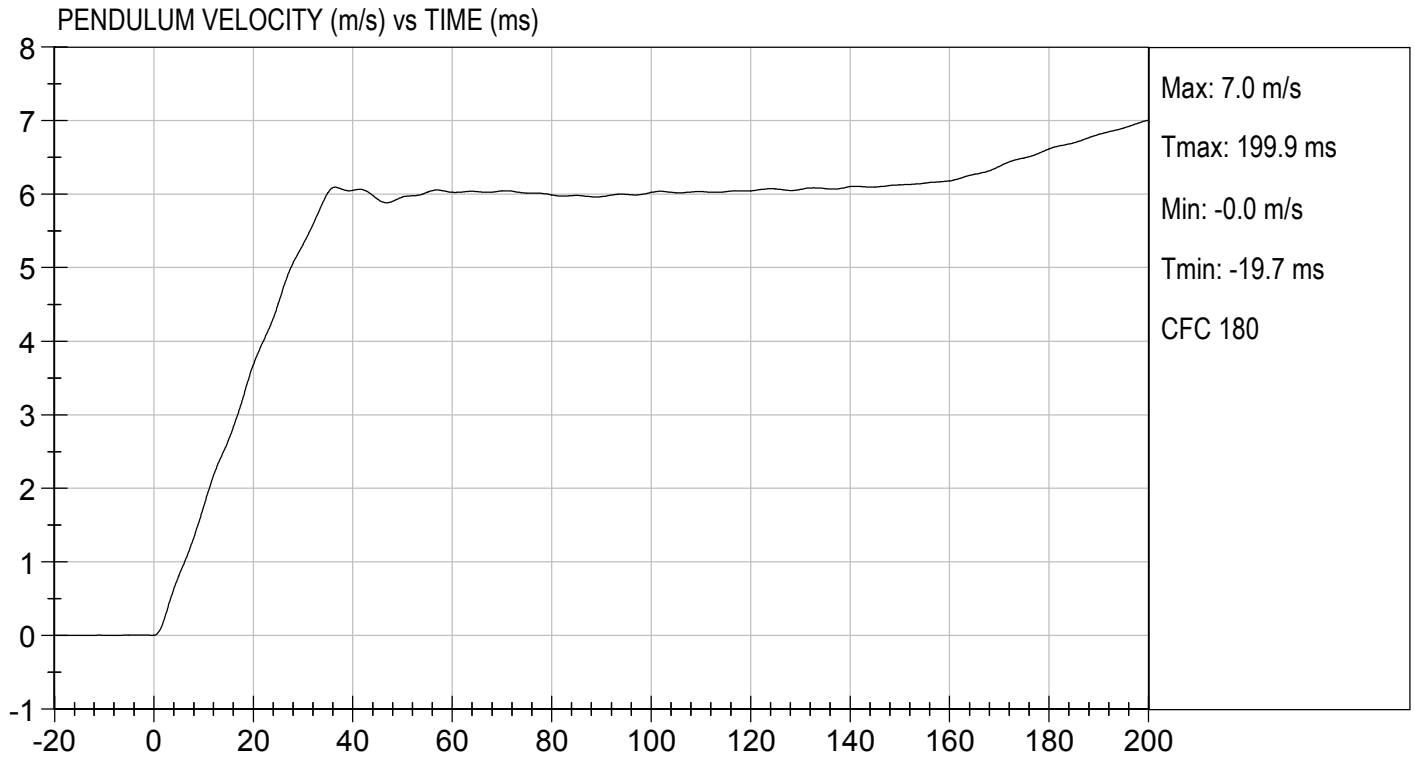
Test I.D: D172343

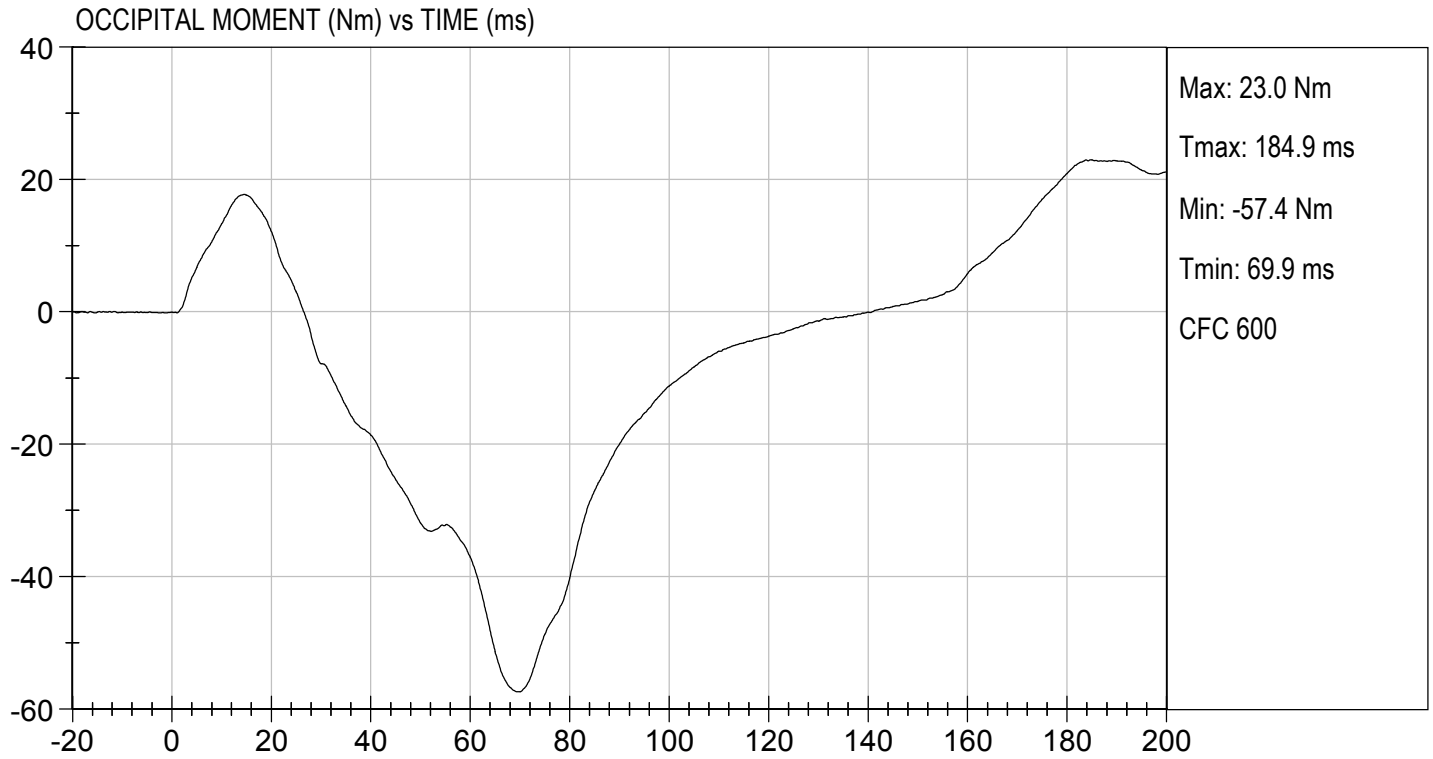
| Tested Parameter | | Units | Specification | Result | Pass/Fail |
|---------------------------------------------------|-------|-------|---------------|--------|-----------|
| Laboratory Temperature | | deg C | 20.6 to 22.2 | 21.4 | Pass |
| Laboratory Relative Humidity | | % | 10 to 70 | 39 | Pass |
| Pendulum Speed | | m/s | 5.95 to 6.19 | 6.12 | Pass |
| Pendulum Velocity | 10 ms | m/s | 1.5 to 1.9 | 1.7 | Pass |
| | 20 ms | m/s | 3.1 to 3.9 | 3.7 | Pass |
| | 30 ms | m/s | 4.6 to 5.6 | 5.3 | Pass |
| D Plane Rotation | Max | deg | 99 to 114 | 105 | Pass |
| Occipital Condyle Moment within Rotation Corridor | | Nm | -65 to -53 | -57 | Pass |
| Negative Moment Time Curve Decay to -10 Nm | | ms | 94 to 114 | 102 | Pass |
| Overall Results | | | | | Pass |


 Laboratory Technician

08/25/2017
 Test Date


 Approved By





MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D172344

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|-----------------------------------------------|-------|---------------|--------|-------------|
| Temperature | deg C | 20.6 to 22.2 | 21.6 | Pass |
| Relative Humidity | % | 10 to 70 | 48 | Pass |
| Probe Speed | m/s | 6.59 to 6.83 | 6.77 | Pass |
| Peak Deflection | mm | 50 to 58 | 55 | Pass |
| Peak Resistive Force w/in Deflection Corridor | N | 3900 to 4400 | 4279 | Pass |
| Internal Hysteresis | % | 69 to 85 | 72 | Pass |
| Peak Force 18 mm - 50 mm | N | <= 4600 | 4140 | Pass |
| Overall Test Results | | | | Pass |

Emily Fliess

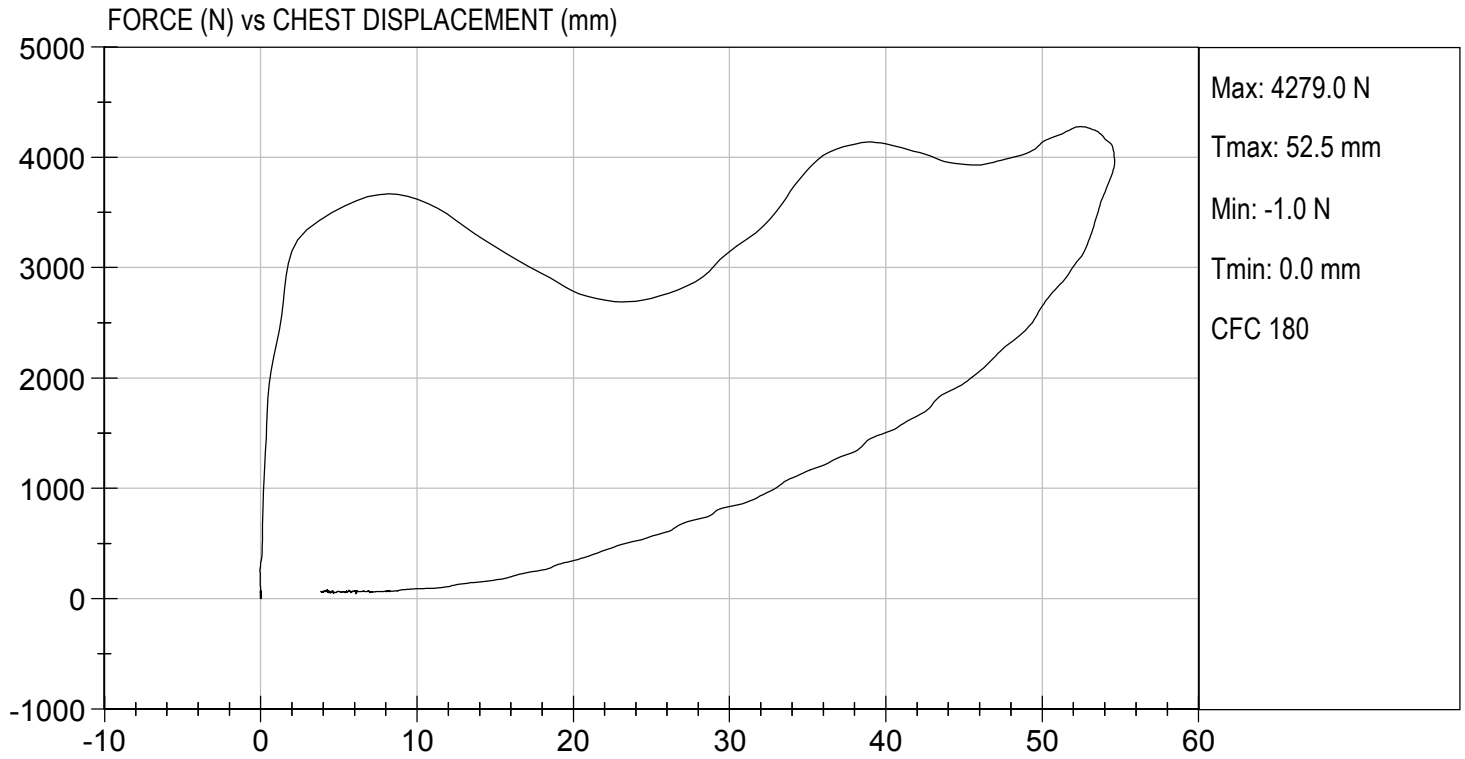
Laboratory Technician

08/28/2017

Test Date

B. F.

Approved By



MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

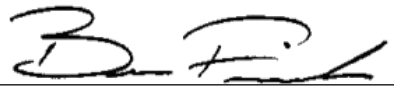
ATD Serial No: 138

Test I.D: D172345

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature | deg C | 18.9 to 25.6 | 21.6 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 42 | Pass |
| Probe Speed | m/s | 2.07 to 2.13 | 2.13 | Pass |
| Maximum Force | N | 3450 to 4060 | 3501 | Pass |
| Overall Test Results | | | | Pass |


 Laboratory Technician

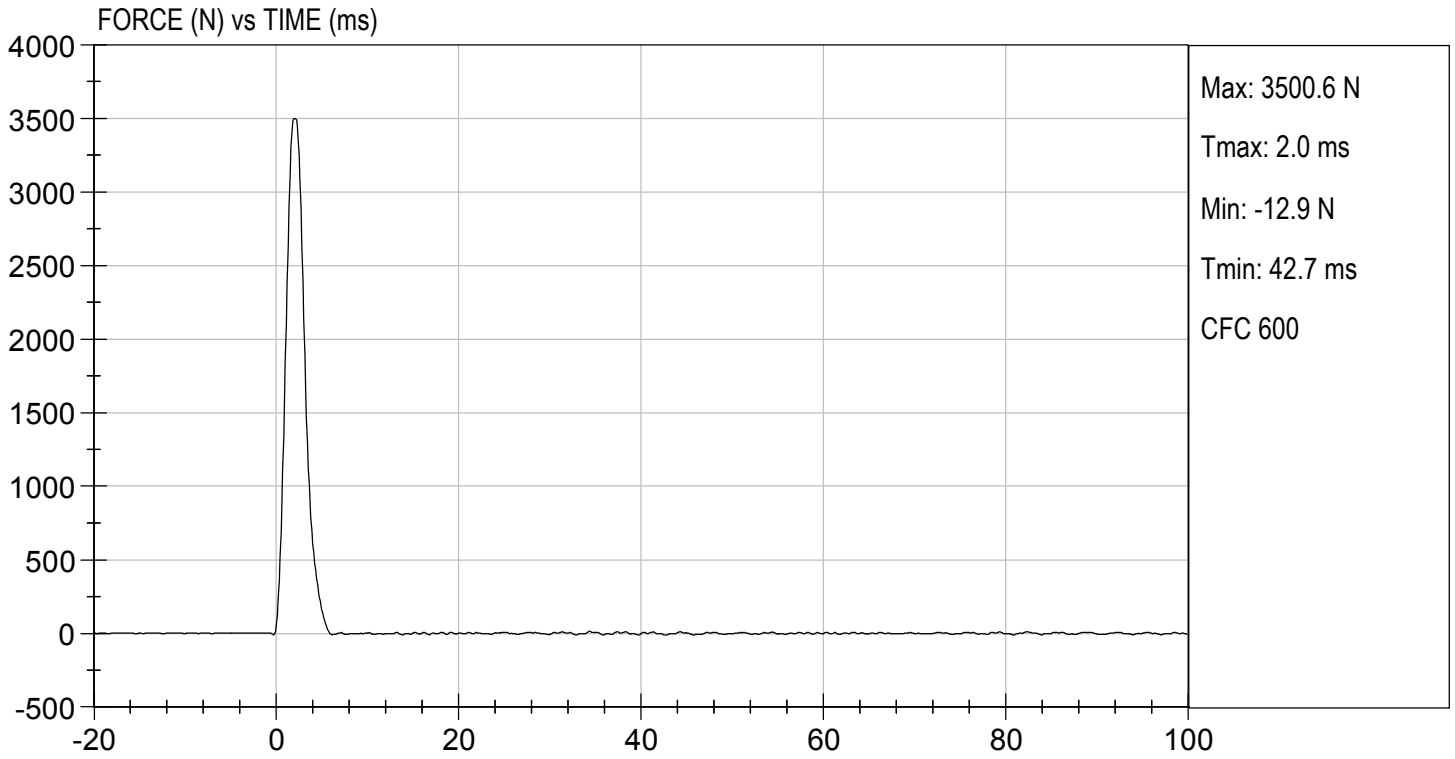
08/24/2017
 Test Date


 Approved By



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

TEST DATE: 08/24/2017
TEST #: D172345



MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D172346

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-------------|
| Laboratory Temperature | deg C | 18.9 to 25.6 | 21.6 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 42 | Pass |
| Probe Speed | m/s | 2.07 to 2.13 | 2.10 | Pass |
| Maximum Force | N | 3450 to 4060 | 3625 | Pass |
| Overall Test Results | | | | Pass |

Emily Fliess

Laboratory Technician

08/24/2017

Test Date

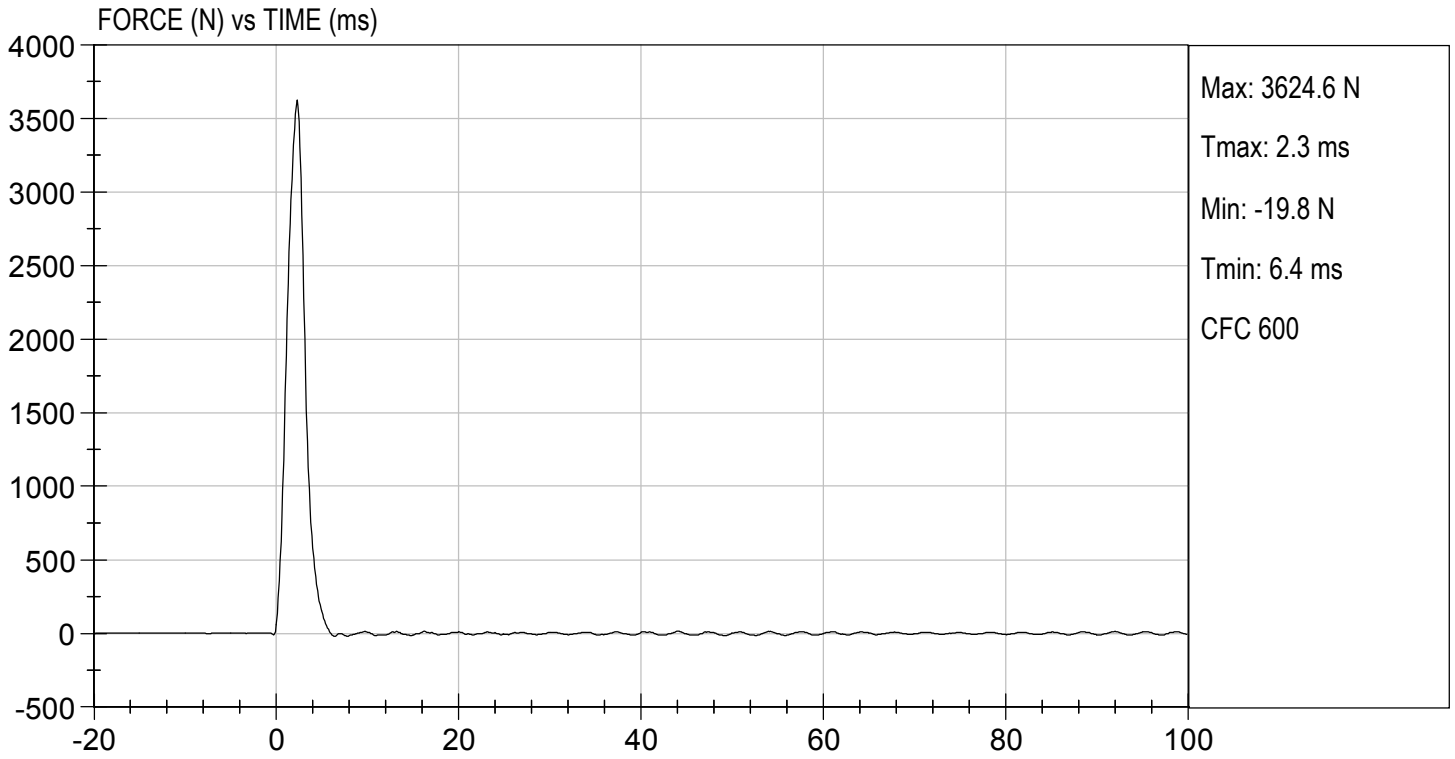
B. Fink

Approved By



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

TEST DATE: 08/24/2017
TEST #: D172346



**MGA RESEARCH CORPORATION
 TORSO FLEXION TEST
 HYBRID III 5TH PERCENTILE**

ATD Serial No: 138

Test I.D: D172347

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-------------|
| Laboratory Temperature | deg C | 18.9 to 25.6 | 21.9 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 45 | Pass |
| Initial Angle | deg | 0 to 20 | 18 | Pass |
| Return Angle | deg | +/- 8 | 2 | Pass |
| Force at 45 deg | N | 320 to 390 | 372 | Pass |
| Upper Torso Deflection Rate | deg/s | 0.5 to 1.5 | 0.5 | Pass |
| Overall Result | | | | Pass |

Danielle Redinlaugh
 Laboratory Technician

08/28/2017
 Test Date

B. F. H.
 Approved By

