



REPORT NUMBER: TWG-MGA-2018-005

**SIDE AIRBAG OUT-OF-POSITION INJURY
TECHNICAL WORKING GROUP**

**TOYOTA MOTOR CORPORATION
2018 Toyota Camry LE 4-Door Sedan
NHTSA No.: M20185102TWG2**

Test Date: September 27, 2018

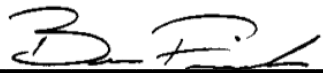
Final Report Date: May 16, 2019

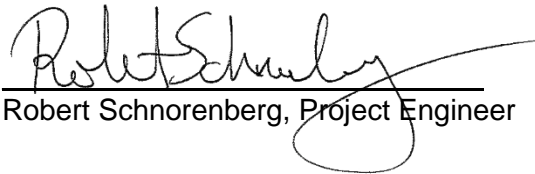
FINAL REPORT

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Approved by: 
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Approval Date: May 16, 2019

FINAL REPORT ACCEPTANCE BY:

Date: _____

The results presented in this report relate only to the specified test items.

TECHNICAL REPORT DOCUMENTATION PAGE

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12. Sponsoring Agency Name and Address United States Department of Transportation National Highway Traffic Safety Administration Office of Crashworthiness Standards (NRM-110) 1200 New Jersey Ave, SE, Room W43-410 Washington, DC 20590				13. Type of Report and Period Covered: Final Test Report September 27, 2018 to May 16, 2019																
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16. Abstract A Side Airbag Out-of-Position Injury evaluation was conducted on the subject 2018 Toyota Camry LE 4-Door Sedan in accordance with the specifications of the Side Airbag Out-of-Position Injury Technical Working Group Laboratory Test Procedure for the generation of consumer information. The test was conducted at MGA Research Corporation in Burlington, Wisconsin on September 27, 2018.																				
Injury Summary (6-Year-Old Out-Of-Position)																				
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 12.5%;">HIC15</th> <th style="width: 16.6%;">Maximum Chest Displacement (mm)</th> <th style="width: 16.6%;">Maximum Chest Displacement Rate m/s</th> <th style="width: 12.5%;">Nij (NTF)</th> <th style="width: 12.5%;">Nij (NTE)</th> <th style="width: 12.5%;">Nij (NCF)</th> <th style="width: 12.5%;">Nij (NCE)</th> </tr> </thead> <tbody> <tr> <td align="center">7.058</td> <td></td> <td></td> <td align="center">0.00</td> <td align="center">0.03</td> <td align="center">0.49</td> <td align="center">0.23</td> </tr> </tbody> </table>							HIC15	Maximum Chest Displacement (mm)	Maximum Chest Displacement Rate m/s	Nij (NTF)	Nij (NTE)	Nij (NCF)	Nij (NCE)	7.058			0.00	0.03	0.49	0.23
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7.058			0.00	0.03	0.49	0.23														
17. Key Words Side Airbag Out-of-Position Technical Working Group OOP TWG HIII 6YO				18. Distribution Statement Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services Division, NPO-411 1200 New Jersey Ave, SE Washington, DC 20590 e-mail: tis@nhtsa.dot.gov FAX: 202-493-2833																
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TABLE OF CONTENTS

<u>Section</u>		<u>Page No.</u>
1	Purpose and Summary of Test	1
2	Occupant and Vehicle Information / Data Sheets	3

<u>Data Sheet No.</u>		<u>Page No.</u>
1	Test Summary	3
2	Test Vehicle Information	4
3	Dummy Positioning in Vehicle	5
4	Dummy Injury Criteria Values	6

<u>Appendix</u>		
A	Photographs	A
B	Dummy Response Data Traces	B
C	Dummy Configuration and Performance Verification Data	C
D	Test Equipment and Instrumentation Calibration Data	D

SECTION 1 PURPOSE AND SUMMARY OF TEST

PURPOSE

The purpose of this test was to obtain data in a static out-of-position side air bag deployment. These data constitute part of the general consumer information collected by Alpha Technology Associate, Inc.

SUMMARY

The effects of both a curtain and torso airbag deployment in a 2018 Toyota Camry LE 4-Door Sedan with an out-of-position Hybrid III 6-Year-Old child dummy were evaluated. The curtain and seat airbags were fired remotely. The test was performed by MGA Research Corporation on September 27, 2018. Pre- and post-test photographs of the vehicle and dummy can be found in Appendix A.

Three high-speed cameras (1000 fps) were used to document the side airbag deployment event. The following camera locations were used:

- Left Side Through Removed Driver Door
- Front Through Windshield
- Left Side ¾ View Through Windshield

One Hybrid III 6-Year-Old child dummy (Serial Number 144) was placed in the right front passenger seat situated in the inboard-facing position along the outboard edge of the seat per Section 3.3.5.1 according to dummy placement instructions specified in the Recommended Procedures for Evaluating Occupant Injury Risk from Deploying Side Airbags as prepared by the Side Airbag Out-of-Position Injury Technical Working Group (TWG).

The dummy was instrumented with the following instrumentation:

- Head Accelerometers
- Upper Neck Load Cell
- Lower Neck Load Cell

The 15 channels of data were recorded using an off board data acquisition system. Appendix B contains the dummy data traces.

The Hybrid III 6-Year-Old child dummy's visible contact points were as follows:

- Side curtain airbag to top of head
- Side torso/pelvis airbag to left side of torso and pelvis

The Hybrid III 6-Year-Old child dummy was placed in the right front passenger seat along the outboard edge of the foam block, facing inboard with its legs extended and arms hanging at its sides. The seat track was positioned forward to maximize the cushion to head interaction. The dummy's pelvis was slid outboard until the dummy's back contacted the door trim panel or armrest and the center of gravity of the head was centered in the deployment trajectory of the airbag. The head remained in its neutral orientation. A vertical plane through the centerline of the dummy's shoulder bolts was parallel to the vehicle centerline. The dummy's arms were bent at the elbow until the fingertips contacted the foam block.

The dummy's skullcap seam was taped with 4mm electrical tape to prevent the airbag from getting caught in the seam. The dummy's head skin was cleaned with alcohol and dusted with baby powder to achieve acceptable frictional characteristics.

This orientation complies with Section 3.3.5.1 of the TWG Recommended Procedures for Evaluating Occupant Injury Risk from Deploying Side Airbags as defined by Lund, et al and the Technical Working Group First Revision dated July, 2003.

**SECTION 2
OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS**

**DATA SHEET NO. 1
TEST SUMMARY**

	Test Data	Description
Seating Position	P2	Right Front Seating Position
Test	3.3.5.1*	Inboard-Facing Child Dummy
Curtain Airbag	Roof-Rail Mounted	Side Curtain Airbag
Torso Airbag	Seat Mounted	Side Torso/Pelvis Airbag
ATD Type/Serial No.	Hybrid III 6-Year-Old / 144	Child Dummy

*Procedure as defined by Lund, et al and the Technical Working Group dated July, 2003

Number of Data Channels	15
Number of Airbag Channels	4
Number of High-Speed Video	3

Visible Dummy Contact Points	
Head Contact	Side curtain airbag to top of head
Left Shoulder Contact	Side torso/pelvis airbag to shoulder
Left Torso Contact	Side torso/pelvis airbag to torso
Left Pelvis Contact	Side torso/pelvis airbag to pelvis

DATA SHEET NO. 2

TEST VEHICLE INFORMATION

Please note that this vehicle had previously been tested in an
NCAP Side Impact on October 2, 2017.

TEST VEHICLE INFORMATION

Manufacturer	Toyota
Model	Camry LE
Body Style	4-Door Sedan
NHTSA No.	M20185102
VIN	JTNB11HK1J3018603
Color	Brownstone
Delivery Date	9/21/2017
Odometer Reading	50 miles
Dealer	Toyota of Brookfield
Transmission	Automatic
Final Drive	FWD
Number of Cylinders	4
Engine Displacement	2.5 L
Engine Placement	Lateral
Automatic Door Lock (ADL)	Yes
Owner's Manual Details Instructions on Disabling ADLs	Yes
Bucket Seats	Yes

TEST VEHICLE OPTIONS

Driver Front Airbag	Yes
Driver Side Curtain Airbag	Yes
Driver Side Torso Airbag	No
Driver Side Torso/Pelvis Airbag	Yes
Rear Pass. Side Curtain Airbag	Yes
Rear Pass. Side Torso Airbag	No
Rear Pass. Side Torso/Pelvis Airbag	Yes
Force Limiter	Yes
Pretensioner	Yes
Power Steering	Yes
Power Door Locks	Yes
Tilt Wheel	Yes
Air Conditioning	Yes
Anti-lock Brakes	Yes
Traction Control	Yes
All-Wheel Drive	No
Power Seats	Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	TOYOTA MOTOR CORPORATION
Date of Manufacture	07/17

GVWR (kg)	2030
GAWR Front (kg)	1129
GAWR Rear (kg)	1098

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Contoured Bench		
Number of Occupants	2	3		5
Capacity Wt. (VCW) (kg)				420
Cargo Wt. (RCLW) (kg)				80

DATA SHEET NO. 3
DUMMY POSITIONING IN VEHICLE

Measurement		Value
Seat Position (from forward-most)		260 of 260 mm
Seat Height Position		Lowest Height
Placed in Position No. 2		-
Seat Back Angle (at outboard headrest post)	SA (°)	3.7
Top of Curtain Airbag Module to Head/Neck Junction	AN (mm)	370
Top of Seat Airbag Module to Head/Neck Junction	AN (mm)	195
Head CG to Window	HD (mm)	140
Head to Seat Back Centerline	HSC (mm)	139
ATD Back to Seatback	CD (mm)	-
Chest to Seatback	CS (mm)	165
Right Arm to Seat Back Centerline	RACL (mm)	250
Left Arm to Seat Back Centerline	LACL (mm)	255
Right Arm to Door Panel	RA (mm)	114
Left Arm to Door Panel	LA (mm)	95
Knee to Knee	KK (mm)	101
Toe to Toe	TT (mm)	78
Right Knee to Seat Cushion Centerline	KSCR (mm)	85
Left Knee to Seat Cushion Centerline	KSCL (mm)	87
Right Toe to Seat Cushion Centerline	TSCR (mm)	420
Left Toe to Seat Cushion Centerline	TSCL (mm)	410
Nose to Dash	ND (mm)	608
Nose to Seatback	NS (mm)	135
Top of Head to Headliner	HH (mm)	151

DATA SHEET NO. 4
DUMMY INJURY CRITERIA VALUES

NHTSA No. M20185102TWG2

DESCRIPTION	UNIT	Position No. 2			
		MAXIMUM	TIME (ms)	MINIMUM	TIME (ms)
Head X	g	9.0	14.6	-7.8	10.2
Head Y	g	22.5	11.9	-7.9	54.9
Head Z	g	23.9	11.5	-5.5	8.6
Head Resultant	g	30.8	10.3		
Upper Neck Fx	N	56.1	0.3	-218.8	92.6
Upper Neck Fy	N	240.2	83.6	-22.1	0.4
Upper Neck Fz	N	68.1	6.3	-1071.1	15.9
Upper Neck F Resultant	N	1089.0	15.9		
Upper Neck Mx	Nm	15.0	52.0	-12.8	11.5
Upper Neck My	Nm	14.9	104.4	-3.1	11.1
Upper Neck Mz	Nm	5.7	106.6	-4.1	59.0
Upper Neck M Resultant	Nm	17.2	62.0		
Lower Neck Fx	N	179.0	10.0	-152.1	17.6
Lower Neck Fy	N	339.7	10.3	-108.1	50.7
Lower Neck Fz	N	62.5	5.9	-945.8	15.6
Lower Neck F Resultant	N	955.4	15.6		
Lower Neck Mx	Nm	37.4	78.8	-0.4	3.7
Lower Neck My	Nm	38.4	85.3	-0.7	0.2
Lower Neck Mz	Nm	15.9	123.4	-1.6	49.5
Lower Neck M Resultant	Nm	53.7	83.7		

DATA SHEET NO. 4 (continued)
DUMMY INJURY CRITERIA VALUES

NHTSA No. M20185102TWG2

Head Injury Summary (Hybrid III 6-Year-Old Child Out-Of-Position)

ATD position	HEAD INJURY CRITERIA (HIC)					
	HIC15			HIC36		
	HIC	T ¹ (msec)	T ² (msec)	HIC	T ¹ (msec)	T ² (msec)
No. 144 Right Front	7.058	10.1	14.6	7.058	10.1	14.6

Neck Injury Summary (Hybrid III 6-Year-Old Child Out-Of-Position)

	Nij	Time (msec)	Z Force (N) (CFC 600)	X Force (N) (CFC 600)	Y Moment (N-m) (CFC 600)
Ntf	0.00	0.0	0.2	6.1	-0.2
Nte	0.03	6.5	51.0	-1.3	-0.5
Ncf	0.49	17.3	-1050.7	-97.4	9.2
Nce	0.23	11.7	-533.6	-38.1	-2.1
Peak Tension (CFC1000)		68.1 N	Peak Compression (CFC 1000)		-1071.1 N

Critical Values

Nij Intercepts				Peak Limits	
Tension (CVt)	2800 N	Extension (mCVe)	37 N-m	Tension	1490 N
Compression (CVc)	2800 N	Flexion (mCVf)	93 N-m	Compression	1820 N
Condyle Offset	0.01778 m				

APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

		<u>Page No.</u>
Photo No. 001	Right Three-Quarter Front View of Vehicle, As Received	A-1
Photo No. 002	Vehicle Certification Placard	A-1
Photo No. 003	Pre-Test Vehicle Left Side View	A-2
Photo No. 004	Post-Test Vehicle Left Side View	A-2
Photo No. 005	Pre-Test 6-Year-Old Child Dummy Left Side View	A-3
Photo No. 006	Post-Test 6-Year-Old Child Dummy Left Side View	A-3
Photo No. 007	Pre-Test 6-Year-Old Child Dummy Left Side Close-Up View	A-4
Photo No. 008	Post-Test 6-Year-Old Child Dummy Left Side Close-Up View	A-4
Photo No. 009	Pre-Test 6-Year-Old Child Dummy Left Three-Quarter Front View	A-5
Photo No. 010	Post-Test 6-Year-Old Child Dummy Left Three-Quarter Front View	A-5
Photo No. 011	Pre-Test 6-Year-Old Child Dummy Left Three-Quarter Front Close-Up View	A-6
Photo No. 012	Post-Test 6-Year-Old Child Dummy Left Three-Quarter Front Close-Up View	A-6
Photo No. 013	Pre-Test 6-Year-Old Child Dummy Front View	A-7
Photo No. 014	Post-Test 6-Year-Old Child Dummy Front View	A-7
Photo No. 015	Pre-Test 6-Year-Old Child Dummy Front Close-Up View	A-8
Photo No. 016	Post-Test 6-Year-Old Child Dummy Front Close-Up View	A-8
Photo No. 017	Pre-Test 6-Year-Old Child Dummy Right Three-Quarter Front View	A-9
Photo No. 018	Post-Test 6-Year-Old Child Dummy Right Three-Quarter Front View	A-9
Photo No. 019	Pre-Test 6-Year-Old Child Dummy Right Side View	A-10
Photo No. 020	Post-Test 6-Year-Old Child Dummy Right Side View	A-10
Photo No. 021	Post-Test 6-Year-Old Child Dummy Right Side View (Door Open)	A-11
Photo No. 022	Post-Test Curtain Airbag Left Side View	A-11
Photo No. 023	Post-Test Curtain Airbag Left Three-Quarter Front View	A-12
Photo No. 024	Post-Test Curtain Airbag Front View	A-12
Photo No. 025	Post-Test Curtain Airbag Right Side View (Door Open)	A-13



Photo No. 001 - Right Three-Quarter Front View of Vehicle, As Received



Photo No. 002 - Vehicle Certification Placard



Photo No. 003 - Pre-Test Vehicle Left Side View



Photo No. 004 - Post-Test Vehicle Left Side View

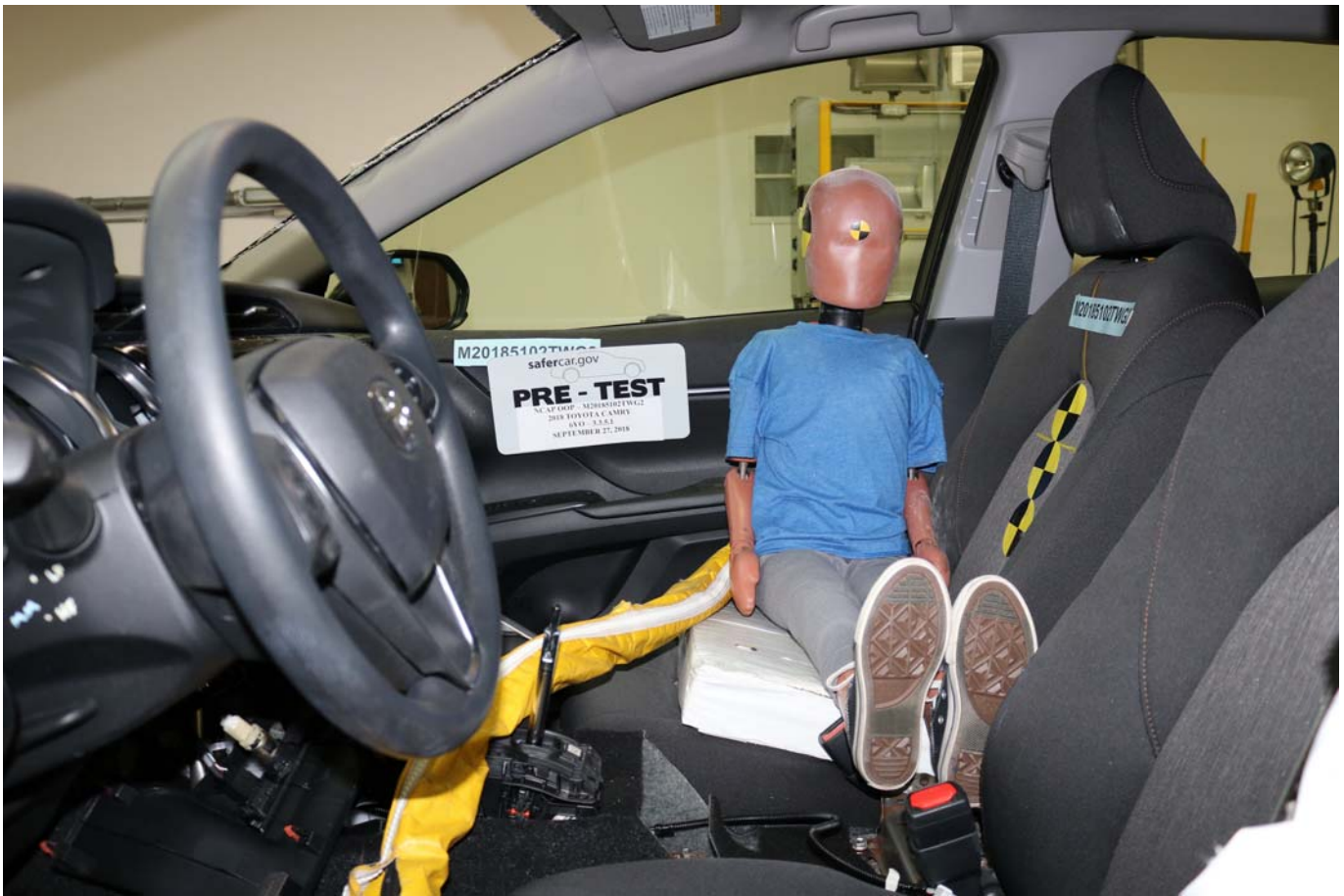


Photo No. 005 - Pre-Test 6-Year-Old Child Dummy Left Side View



Photo No. 006 - Post-Test 6-Year-Old Child Dummy Left Side View



Photo No. 007 - Pre-Test 6-Year-Old Child Dummy Left Side Close-Up View



Photo No. 008 - Post-Test 6-Year-Old Child Dummy Left Side Close-Up View



Photo No. 009 - Pre-Test 6-Year-Old Child Dummy Left Three-Quarter Front View



Photo No. 010 - Post-Test 6-Year-Old Child Dummy Left Three-Quarter Front View



Photo No. 011 - Pre-Test 6-Year-Old Child Dummy Left Three-Quarter Front Close-Up View



Photo No. 012 - Post-Test 6-Year-Old Child Dummy Left Three-Quarter Front Close-Up View



Photo No. 013 - Pre-Test 6-Year-Old Child Dummy Front View



Photo No. 014 - Post-Test 6-Year-Old Child Dummy Front View



Photo No. 015 - Pre-Test 6-Year-Old Child Dummy Front Close-Up View



Photo No. 016 - Post-Test 6-Year-Old Child Dummy Front Close-Up View

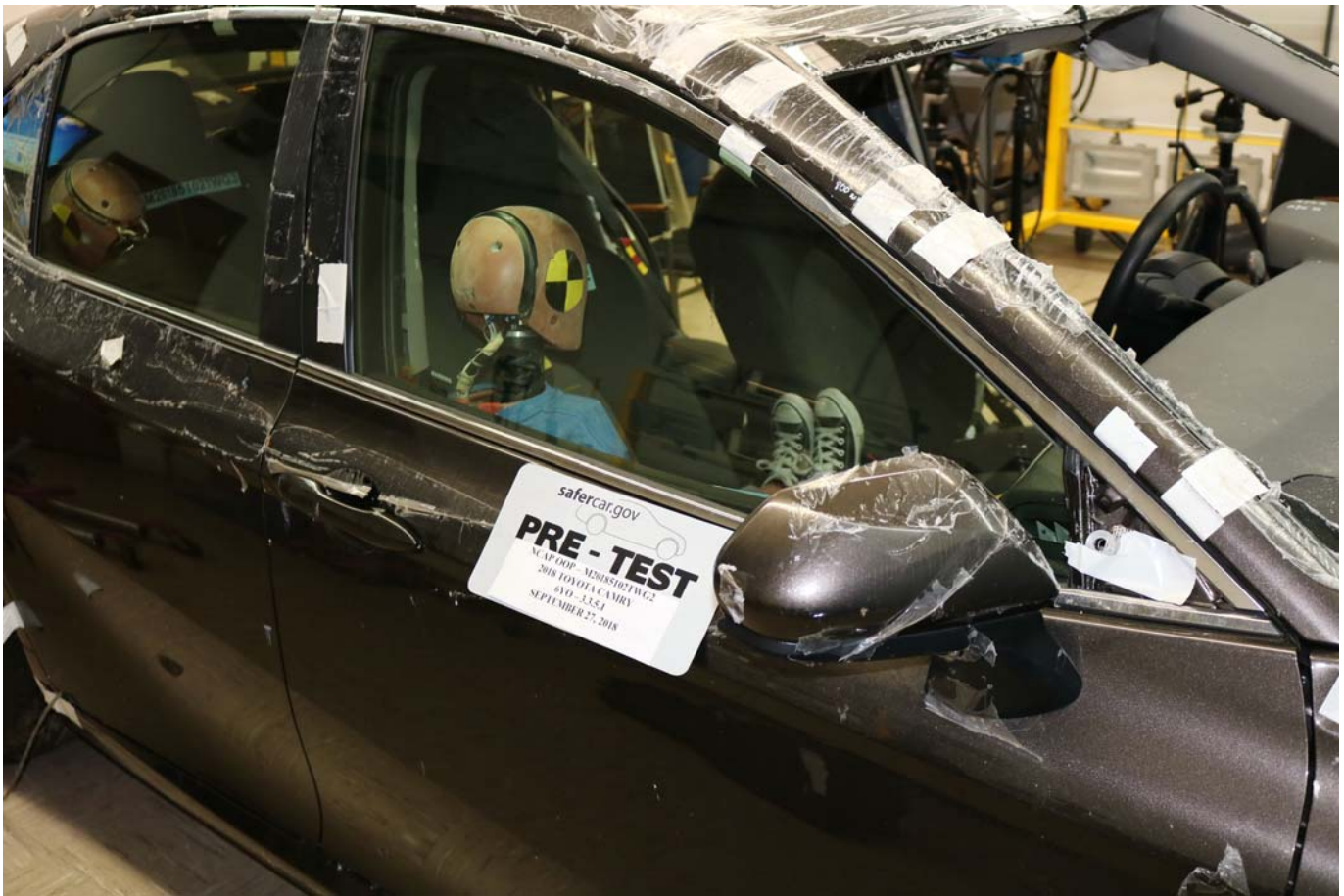


Photo No. 017 - Pre-Test 6-Year-Old Child Dummy Right Three-Quarter Front View



Photo No. 018 - Post-Test 6-Year-Old Child Dummy Right Three-Quarter Front View



Photo No. 019 - Pre-Test 6-Year-Old Child Dummy Right Side View



Photo No. 020 - Post-Test 6-Year-Old Child Dummy Right Side View



Photo No. 021 - Post-Test 6-Year-Old Child Dummy Right Side View (Door Open)

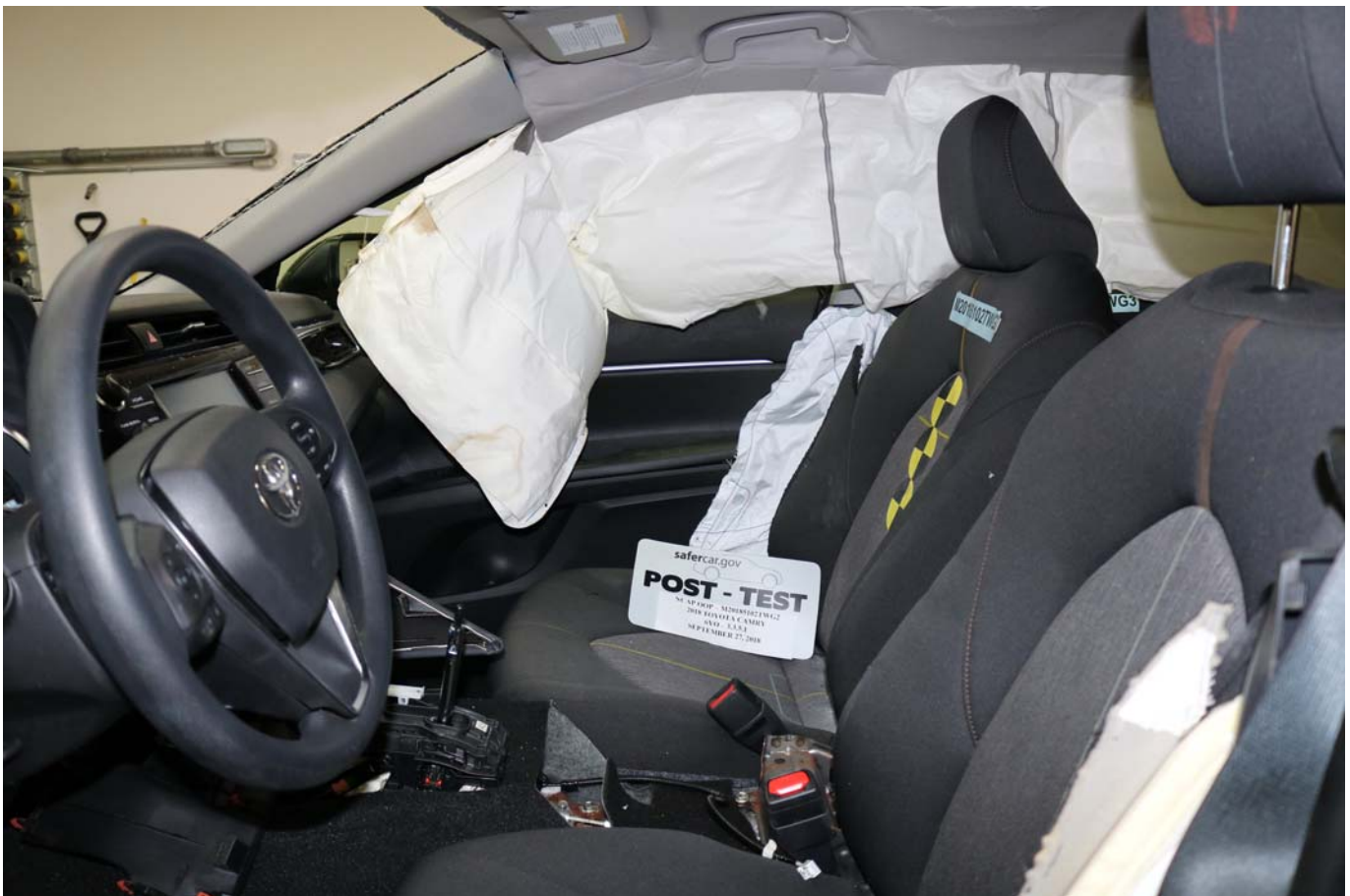


Photo No. 022 - Post-Test Curtain Airbag Left Side View



Photo No. 023 - Post-Test Curtain Airbag Left Three-Quarter Front View



Photo No. 024 - Post-Test Curtain Airbag Front View

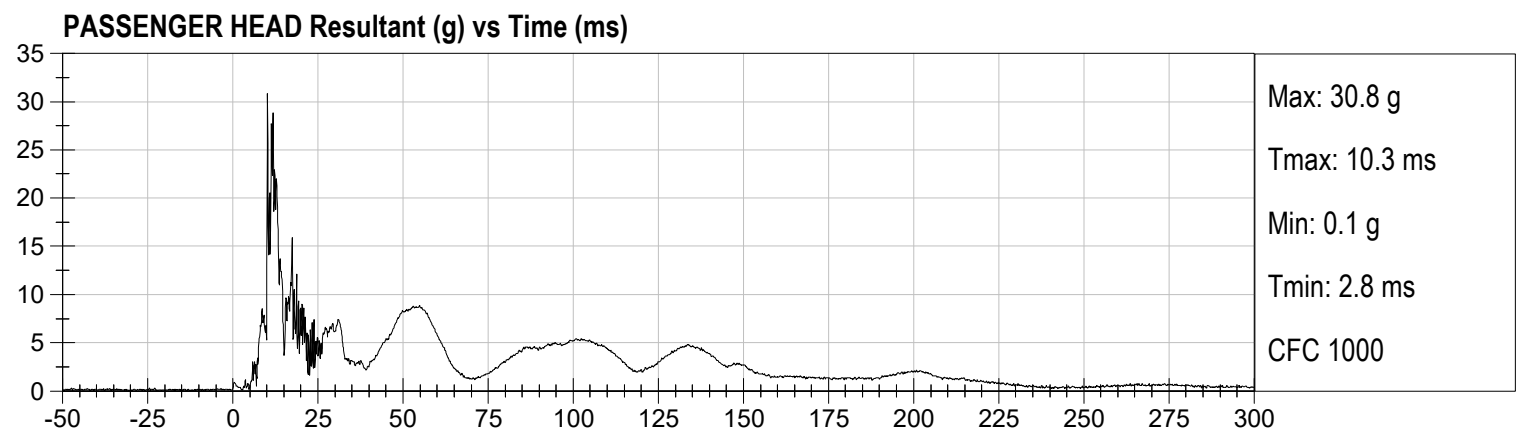
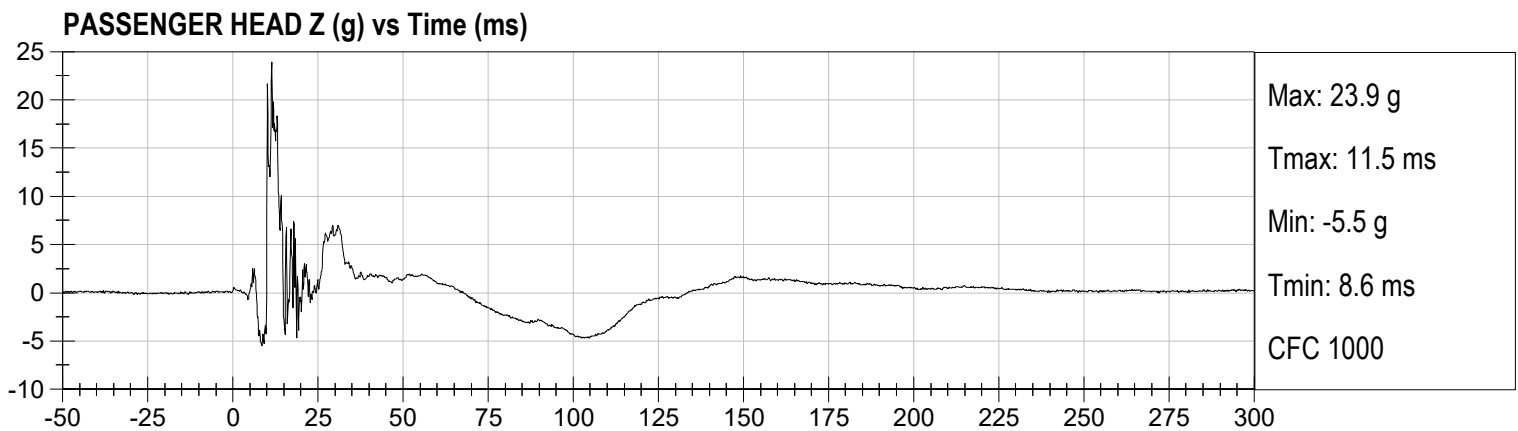
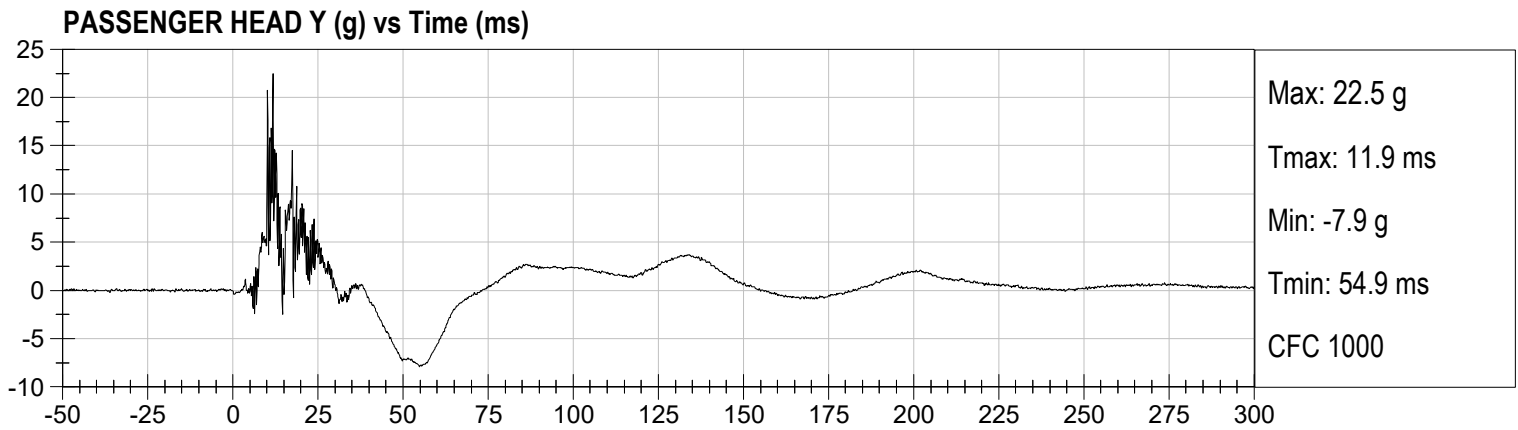
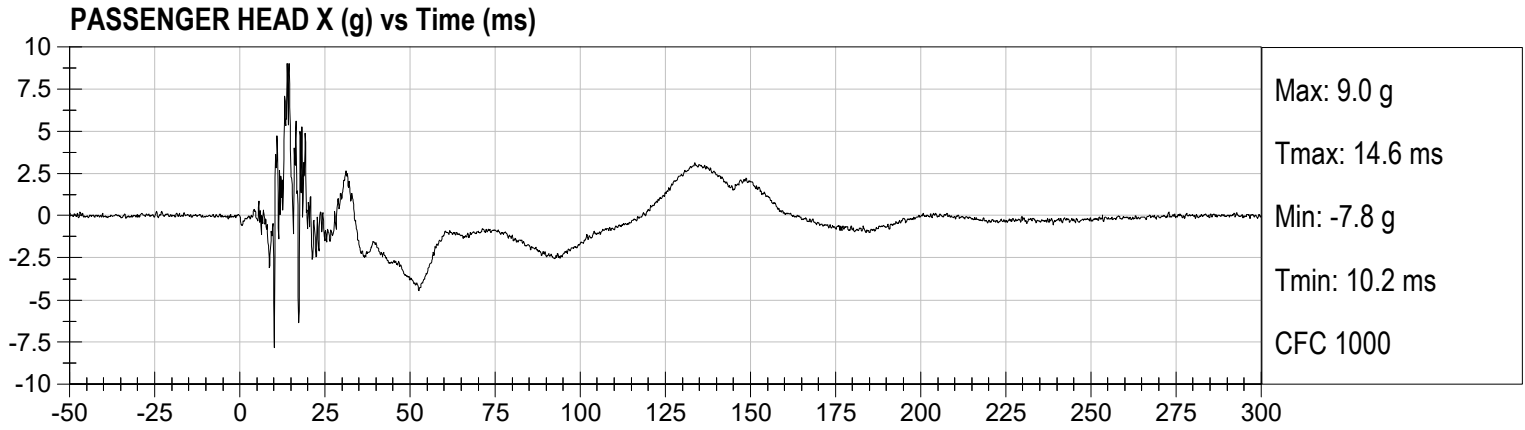


Photo No. 025 - Post-Test Curtain Airbag Right Side View (Door Open)

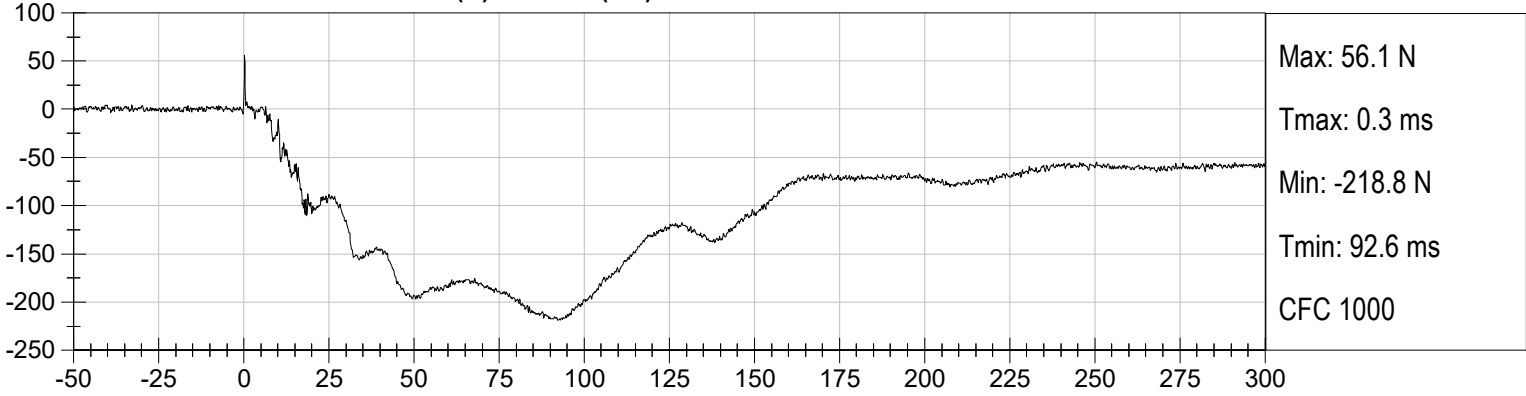
APPENDIX B
DUMMY RESPONSE DATA TRACES

TABLE OF DATA PLOTS

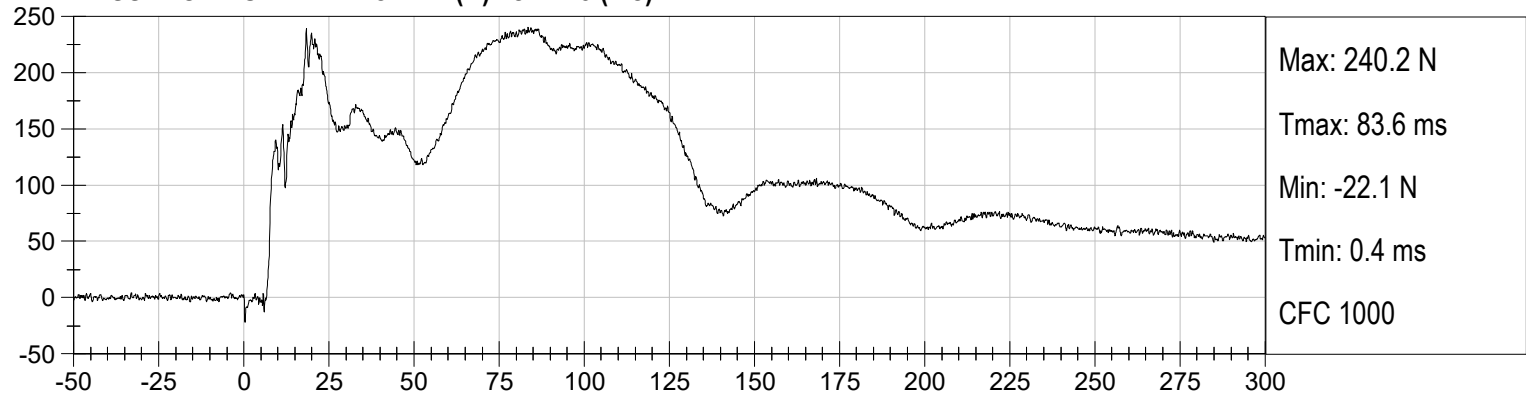
		<u>Page No.</u>
Figure No. 1.	Passenger Head X Acceleration vs. Time	B-1
Figure No. 2.	Passenger Head Y Acceleration vs. Time	B-1
Figure No. 3.	Passenger Head Z Acceleration vs. Time	B-1
Figure No. 4.	Passenger Head Resultant Acceleration vs. Time	B-1
Figure No. 5.	Passenger Upper Neck X Force vs. Time	B-2
Figure No. 6.	Passenger Upper Neck Y Force vs. Time	B-2
Figure No. 7.	Passenger Upper Neck Z Force vs. Time	B-2
Figure No. 8.	Passenger Upper Neck Resultant Force vs. Time	B-2
Figure No. 9.	Passenger Upper Neck X Moment vs. Time	B-3
Figure No. 10.	Passenger Upper Neck Y Moment vs. Time	B-3
Figure No. 11.	Passenger Upper Neck Z Moment vs. Time	B-3
Figure No. 12.	Passenger Upper Neck Resultant Moment vs. Time	B-3
Figure No. 13.	Passenger Lower Neck X Force vs. Time	B-4
Figure No. 14.	Passenger Lower Neck Y Force vs. Time	B-4
Figure No. 15.	Passenger Lower Neck Z Force vs. Time	B-4
Figure No. 16.	Passenger Lower Neck Resultant Force vs. Time	B-4
Figure No. 17.	Passenger Lower Neck X Moment vs. Time	B-5
Figure No. 18.	Passenger Lower Neck Y Moment vs. Time	B-5
Figure No. 19.	Passenger Lower Neck Z Moment vs. Time	B-5
Figure No. 20.	Passenger Lower Neck Resultant Moment vs. Time	B-5
Figure No. 21.	Passenger Curtain Airbag – Fire Voltage vs. Time	B-6
Figure No. 22.	Passenger Curtain Airbag – Fire Current vs. Time	B-6
Figure No. 23.	Passenger Seat Airbag – Fire Voltage vs. Time	B-6
Figure No. 24.	Passenger Seat Airbag – Fire Current vs. Time	B-6



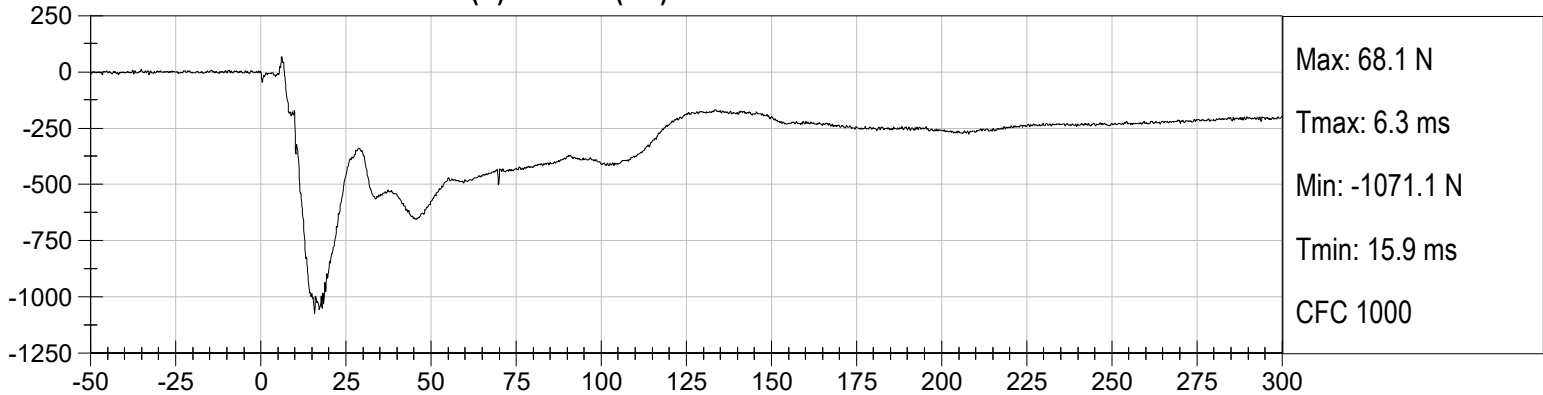
PASSENGER UPPER NECK FX (N) vs Time (ms)



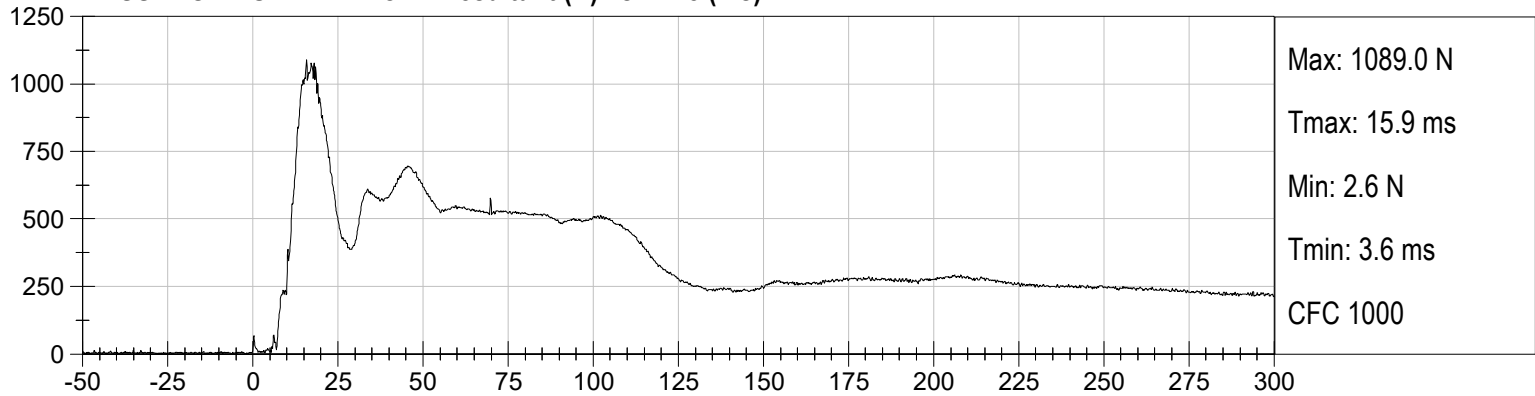
PASSENGER UPPER NECK FY (N) vs Time (ms)



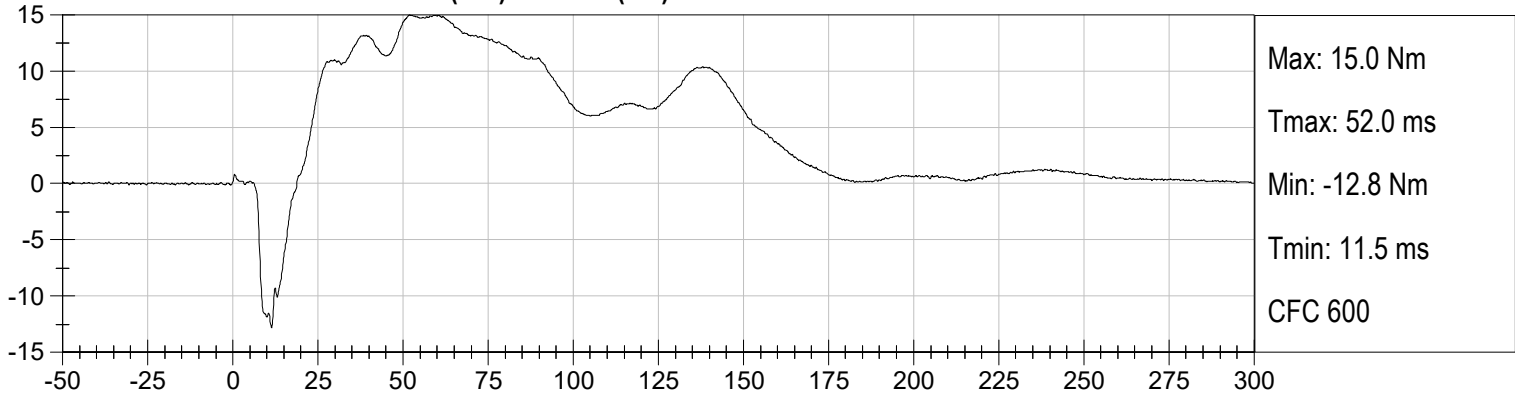
PASSENGER UPPER NECK FZ (N) vs Time (ms)



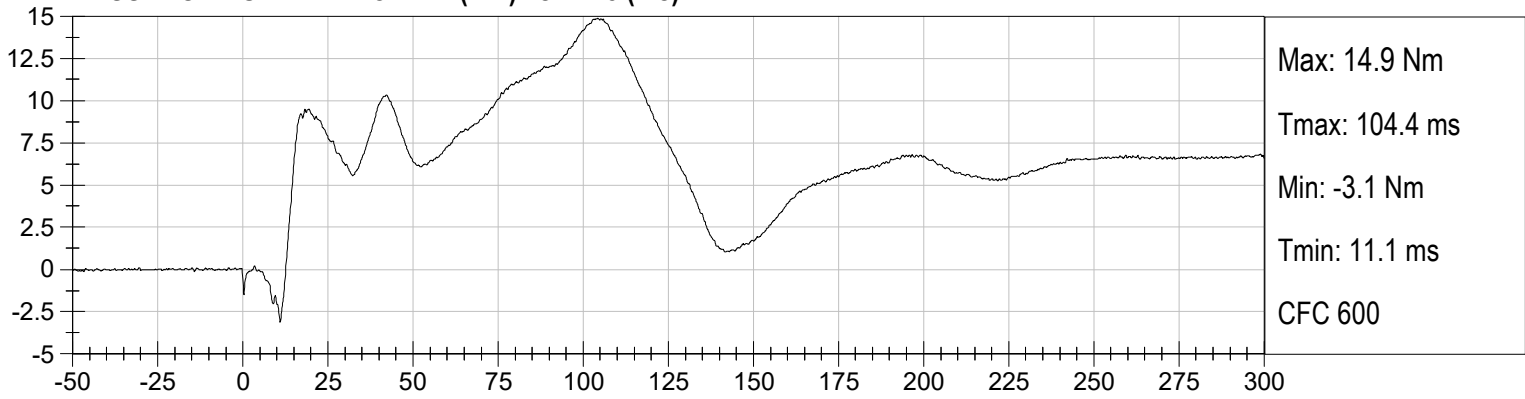
PASSENGER UPPER NECK FResultant (N) vs Time (ms)



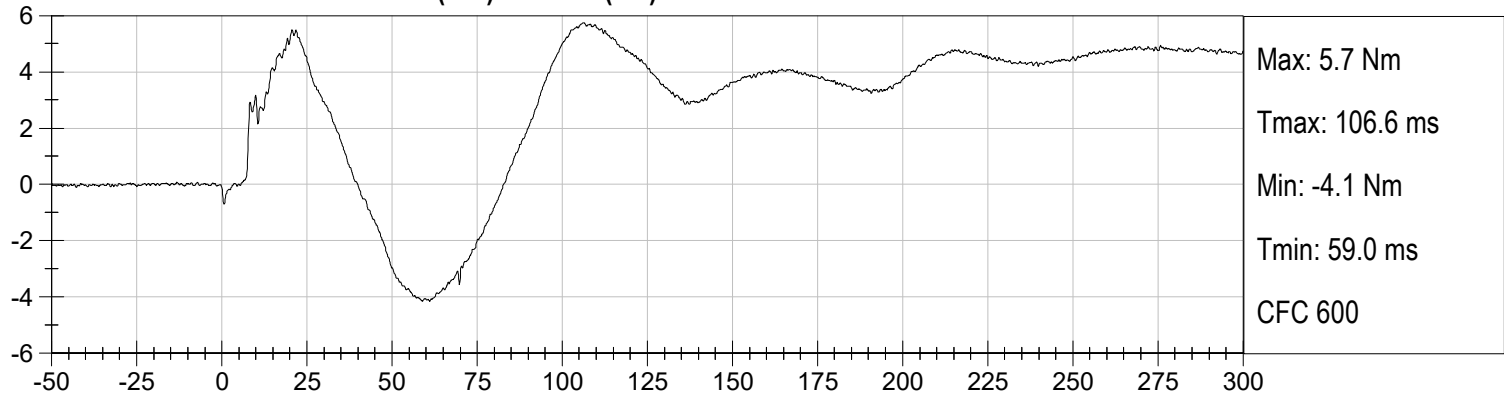
PASSENGER UPPER NECK MX (Nm) vs Time (ms)



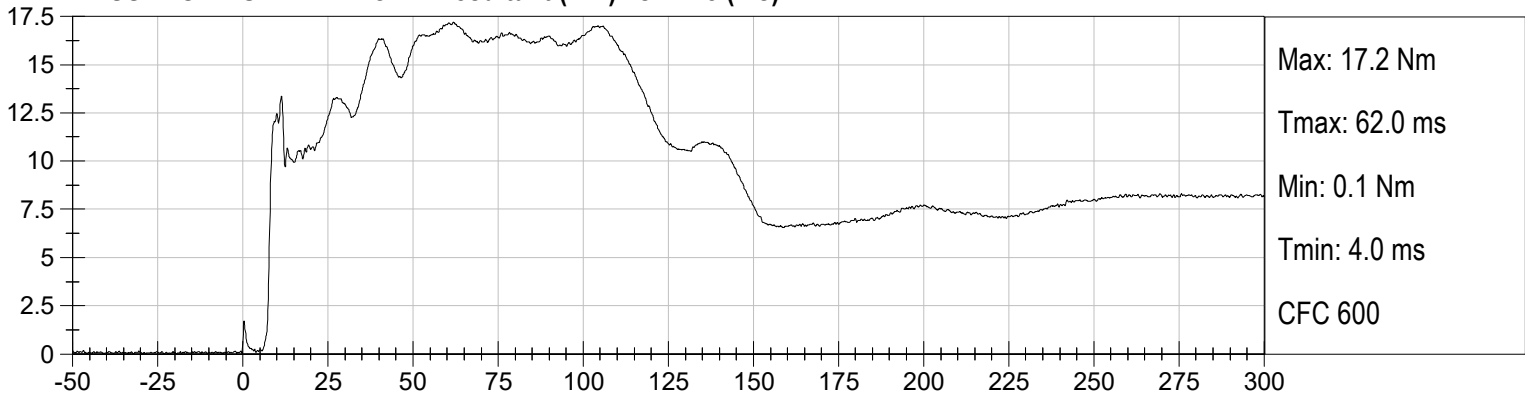
PASSENGER UPPER NECK MY (Nm) vs Time (ms)



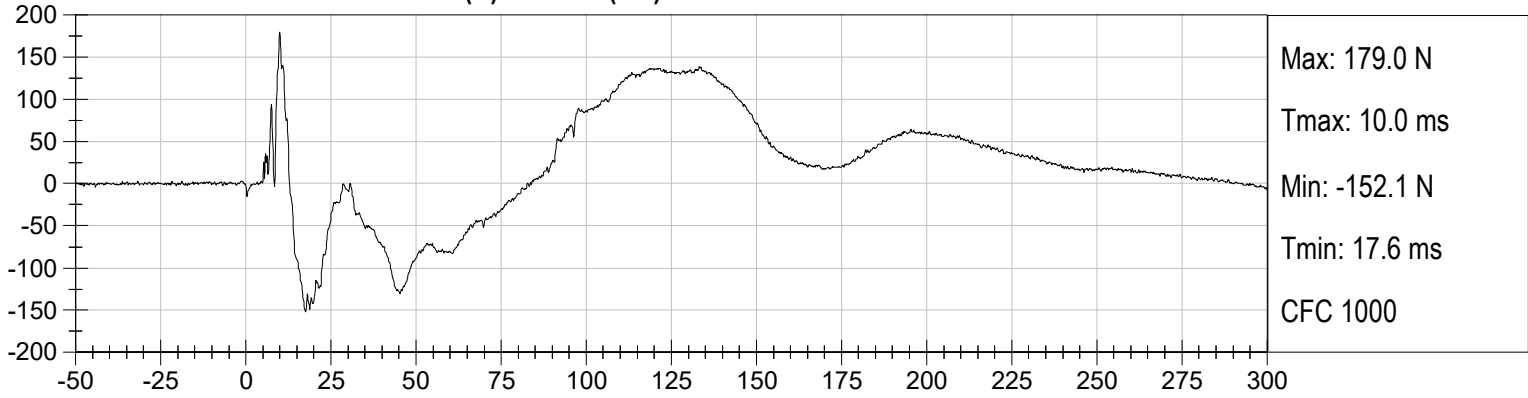
PASSENGER UPPER NECK MZ (Nm) vs Time (ms)



PASSENGER UPPER NECK MResultant (Nm) vs Time (ms)



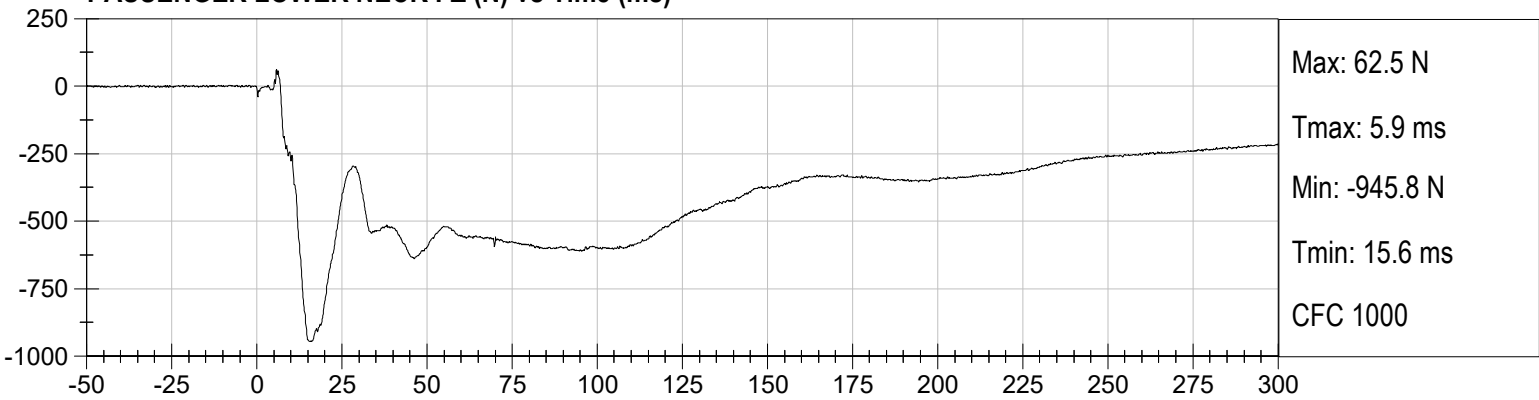
PASSENGER LOWER NECK FX (N) vs Time (ms)



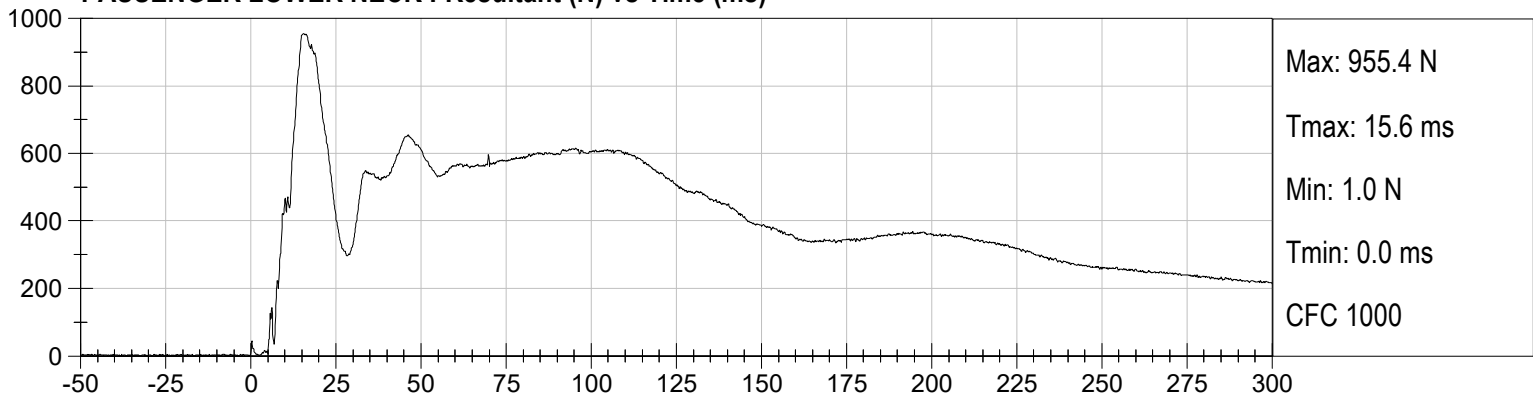
PASSENGER LOWER NECK FY (N) vs Time (ms)



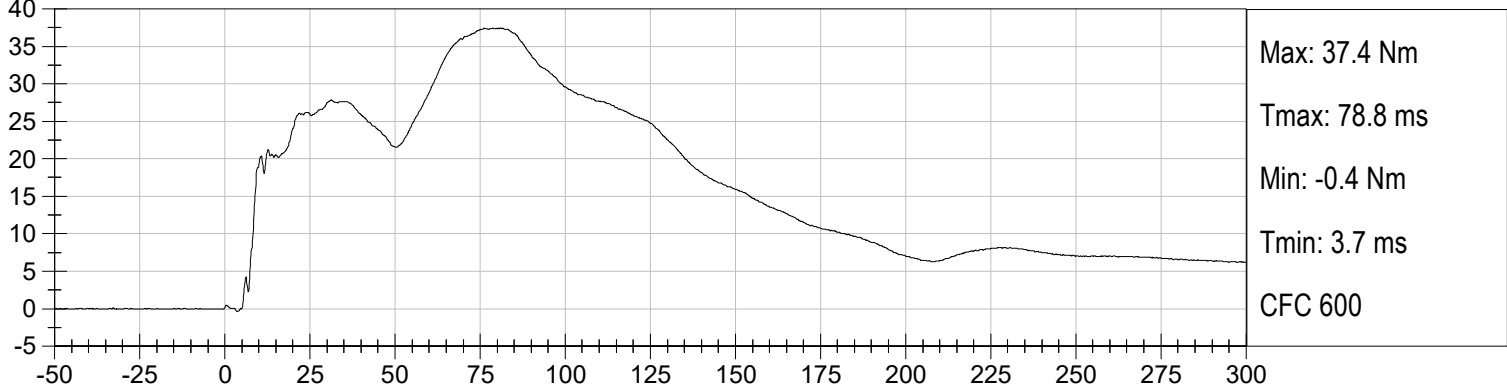
PASSENGER LOWER NECK FZ (N) vs Time (ms)



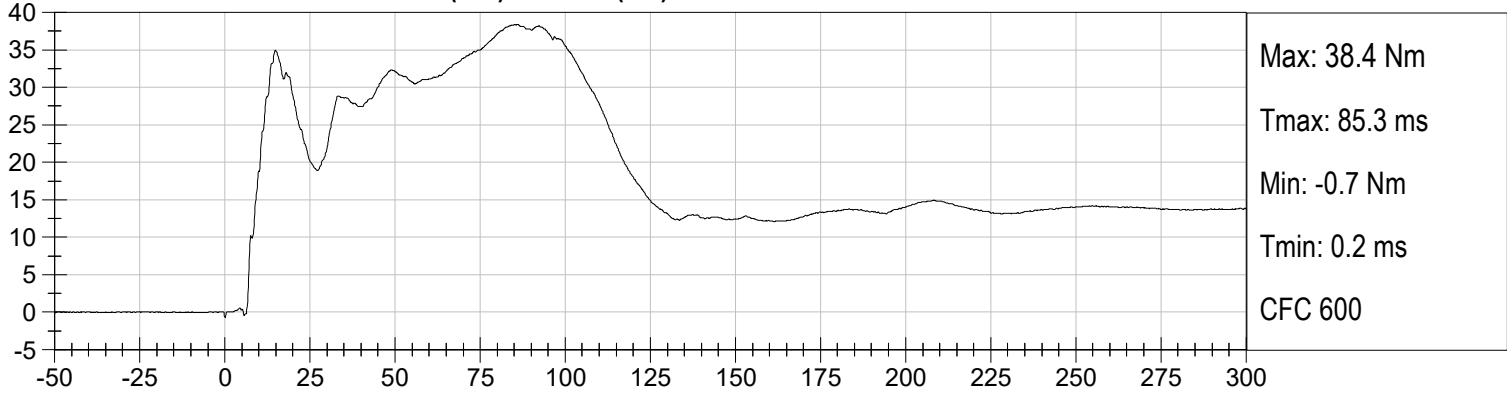
PASSENGER LOWER NECK FResultant (N) vs Time (ms)



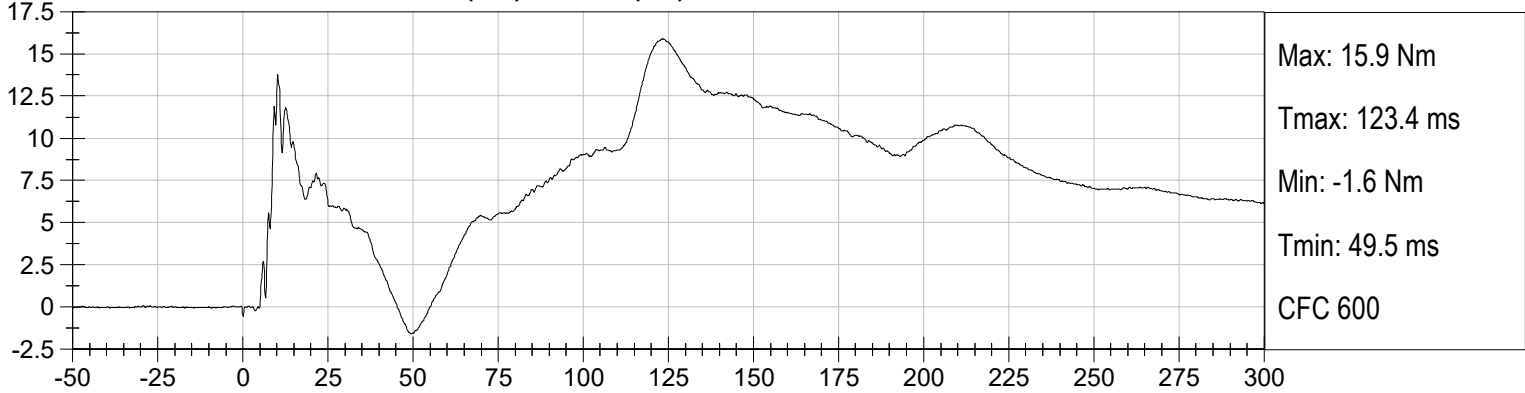
PASSENGER LOWER NECK MX (Nm) vs Time (ms)



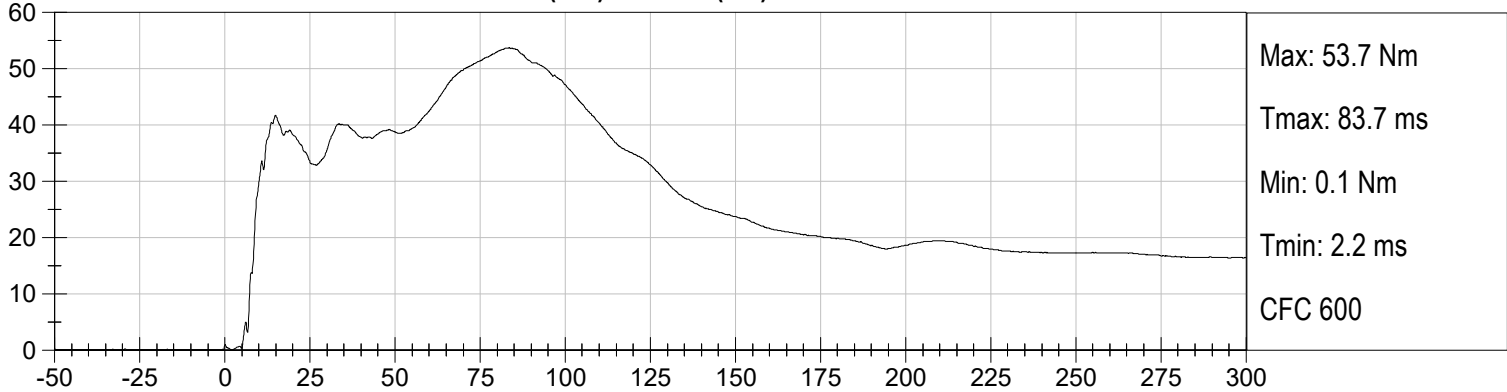
PASSENGER LOWER NECK MY (Nm) vs Time (ms)



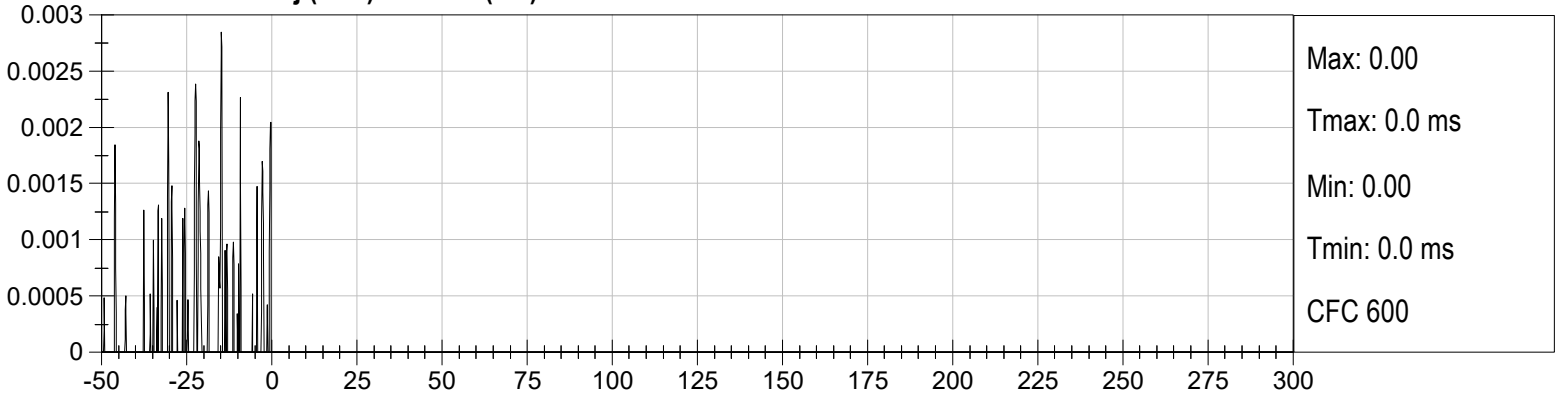
PASSENGER LOWER NECK MZ (Nm) vs Time (ms)



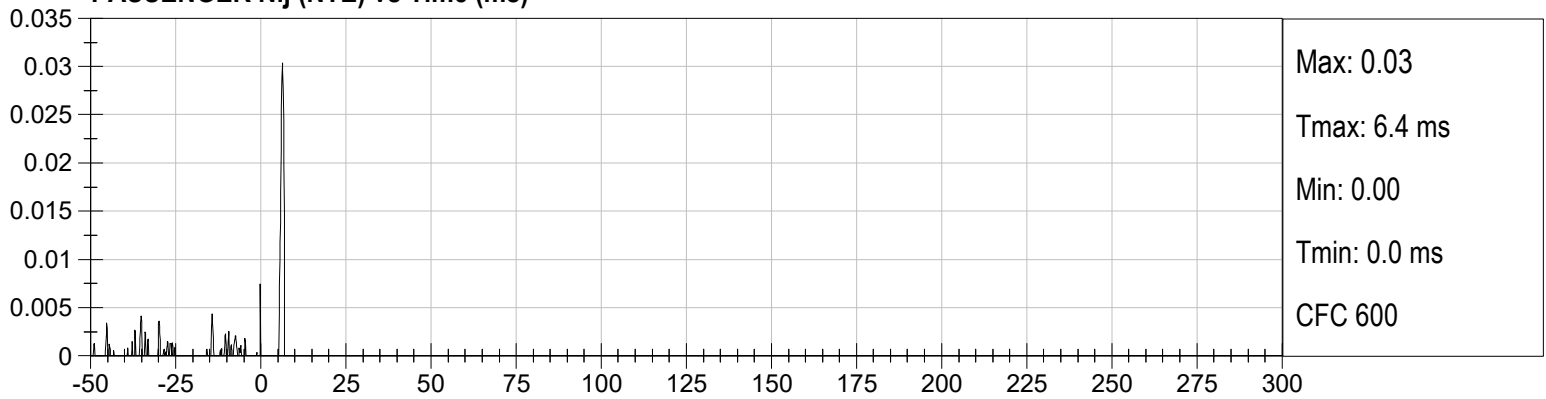
PASSENGER LOWER NECK MResultant (Nm) vs Time (ms)



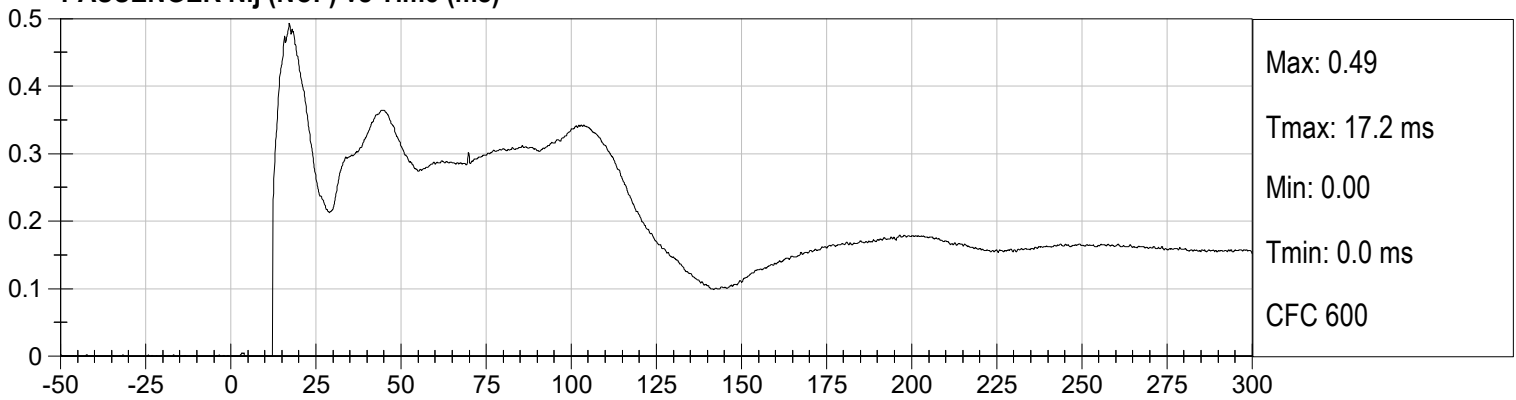
PASSENGER Nij (NTF) vs Time (ms)



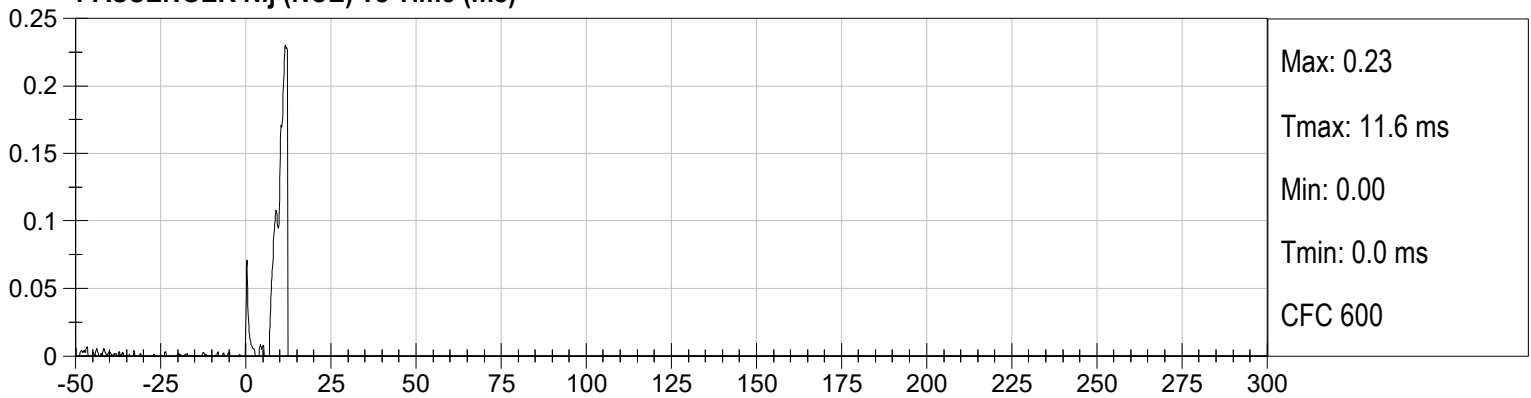
PASSENGER Nij (NTE) vs Time (ms)



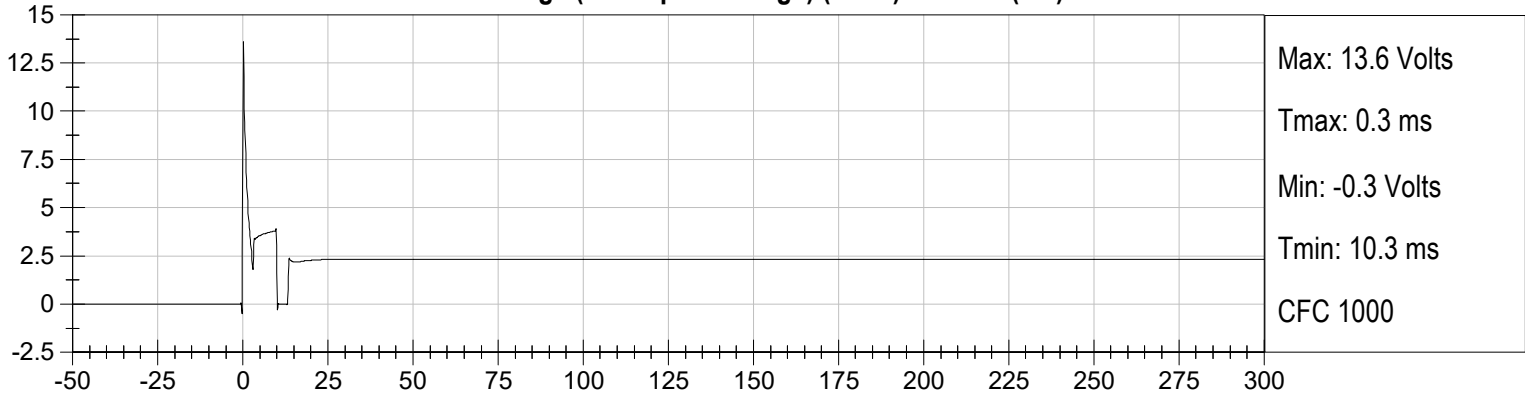
PASSENGER Nij (NCF) vs Time (ms)



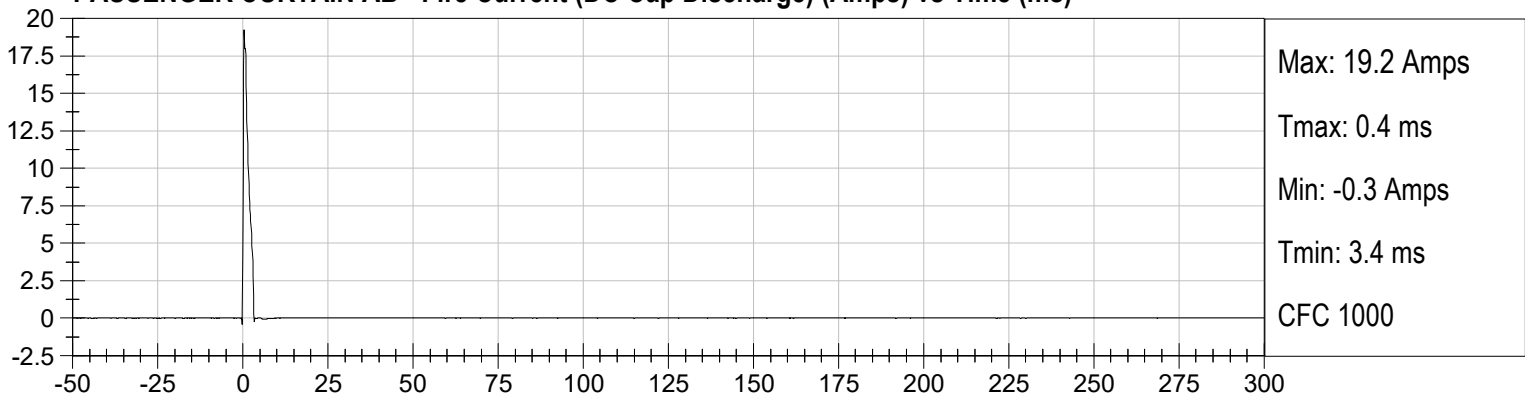
PASSENGER Nij (NCE) vs Time (ms)



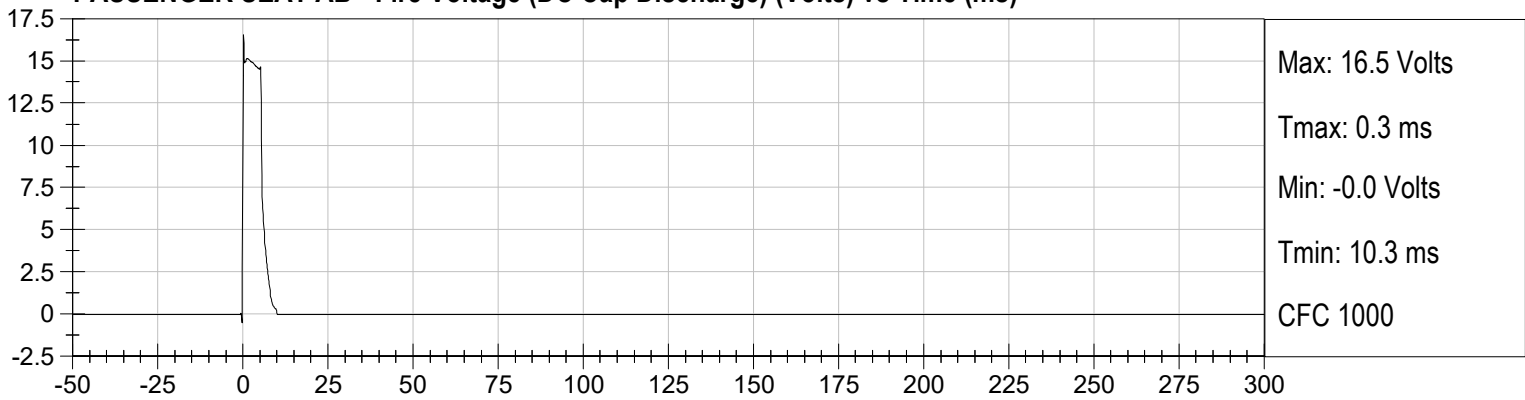
PASSENGER CURTAIN AB - Fire Voltage (DC Cap Discharge) (Volts) vs Time (ms)



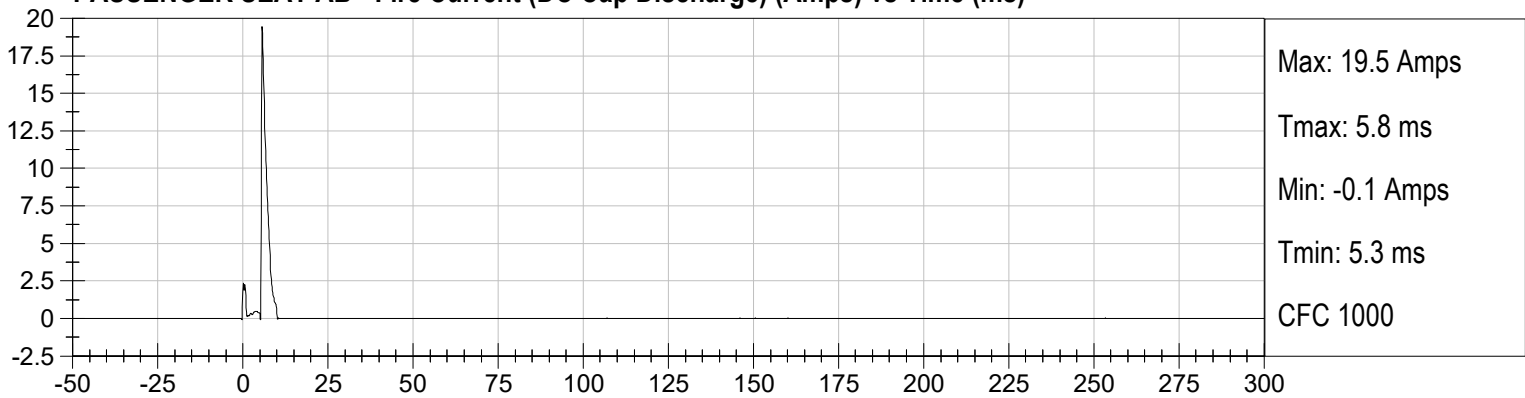
PASSENGER CURTAIN AB - Fire Current (DC Cap Discharge) (Amps) vs Time (ms)



PASSENGER SEAT AB - Fire Voltage (DC Cap Discharge) (Volts) vs Time (ms)



PASSENGER SEAT AB - Fire Current (DC Cap Discharge) (Amps) vs Time (ms)



APPENDIX C
DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

CALIBRATION TEST RESULTS

PRE-TEST

Hybrid III 6-Year-Old ATD

**MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 6 YEAR OLD**

ATD Serial No: 144

Test ID: D182581

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	42	Pass
Peak Resultant Acceleration	G's	245 to 300	276	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	2.7	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

Brian Roach

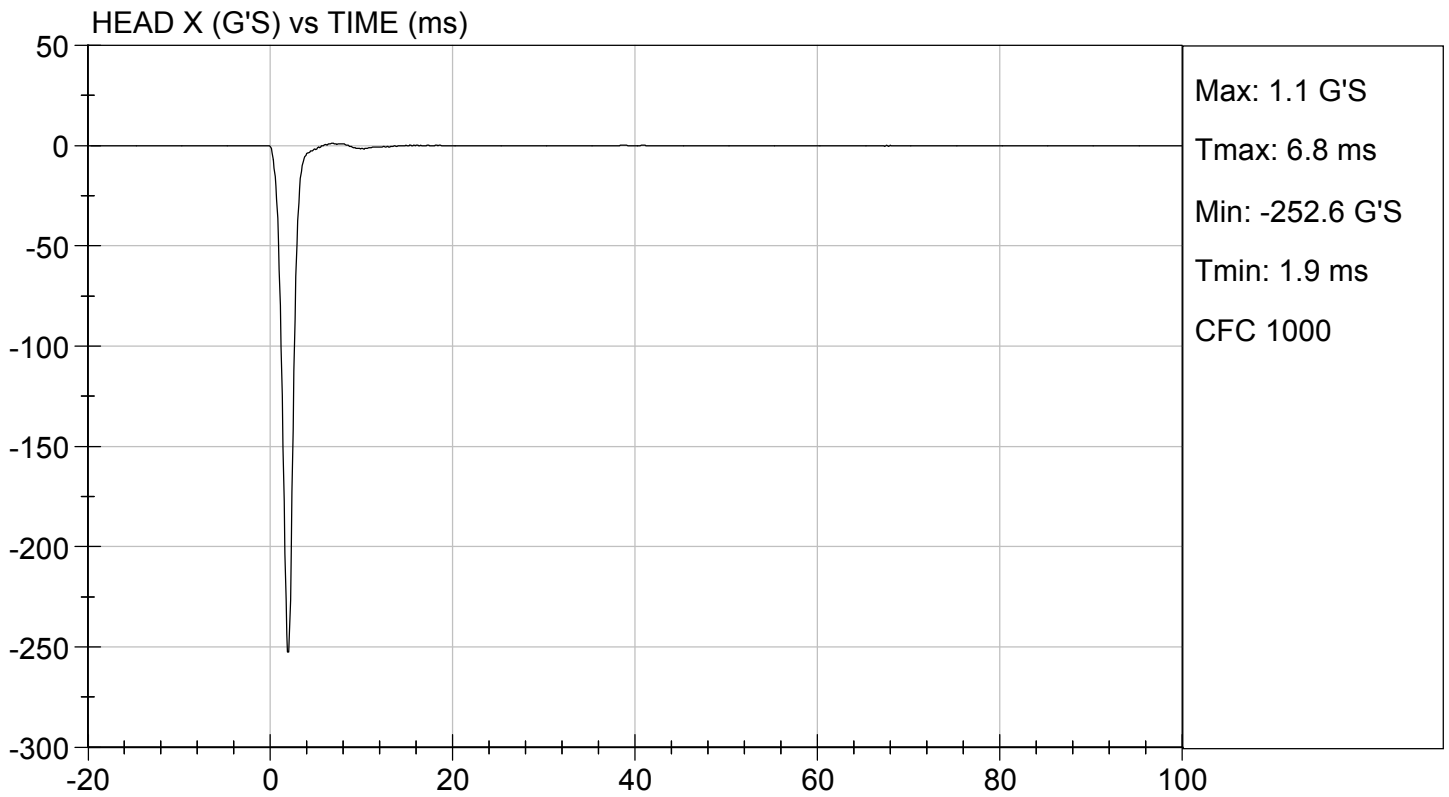
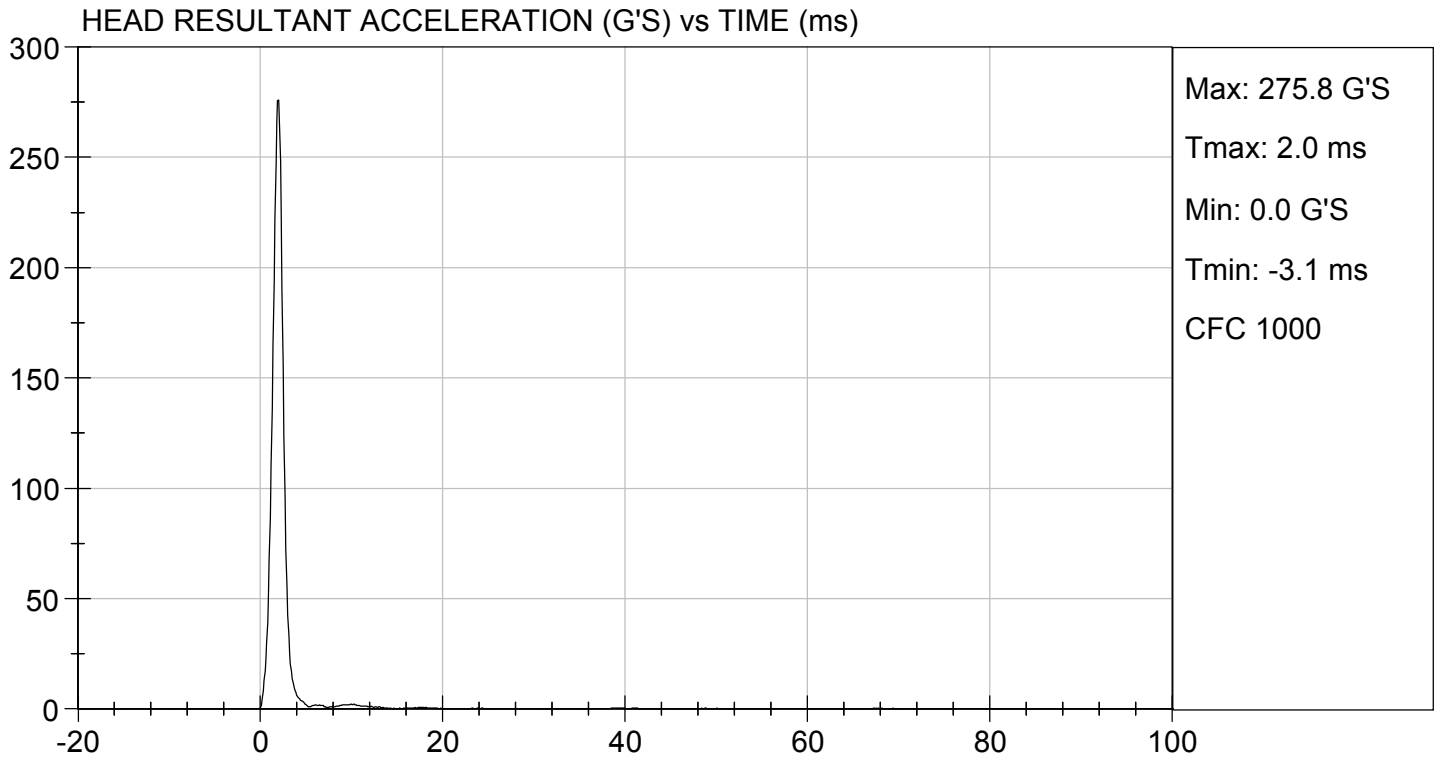
Laboratory Technician

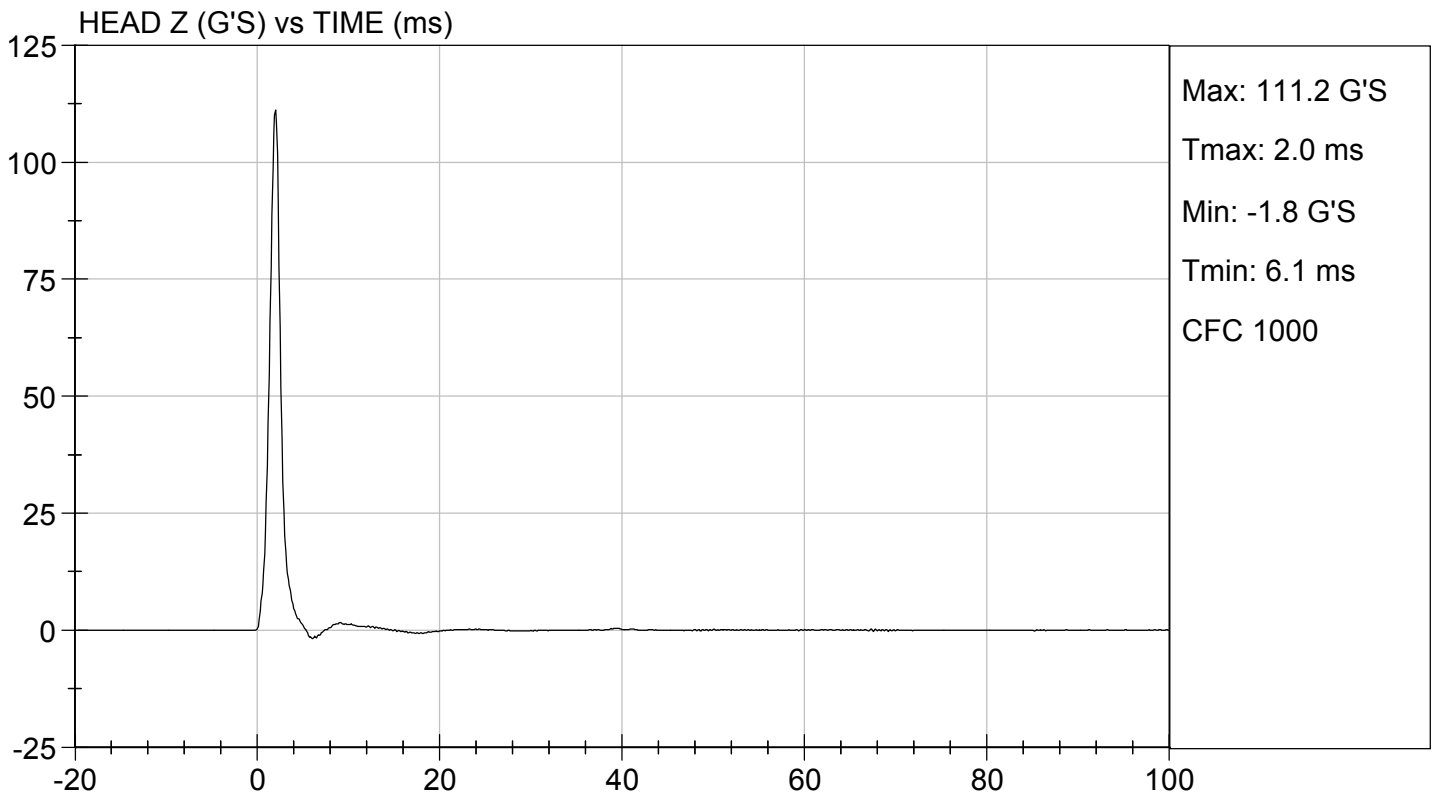
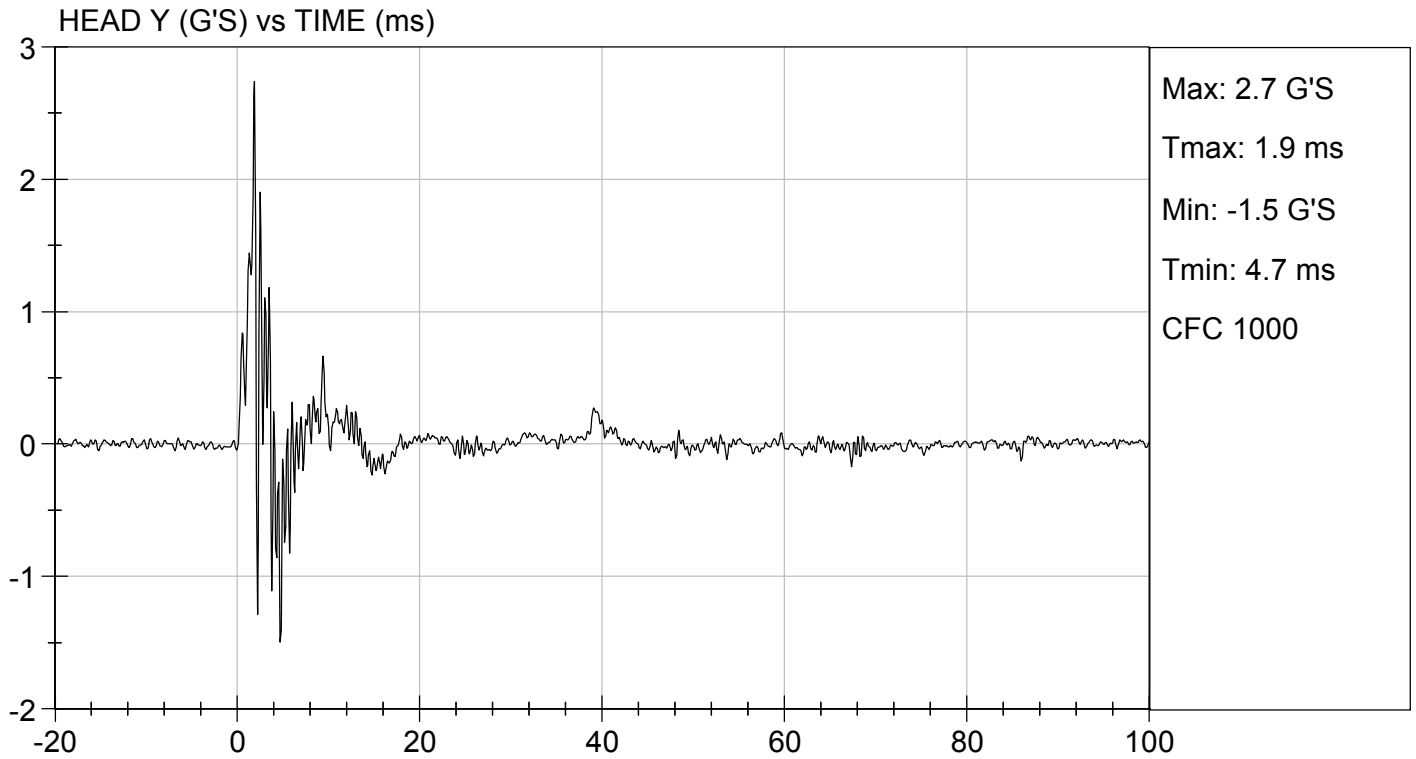
09/14/2018

Test Date

B. F. K.

Approved By





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 144

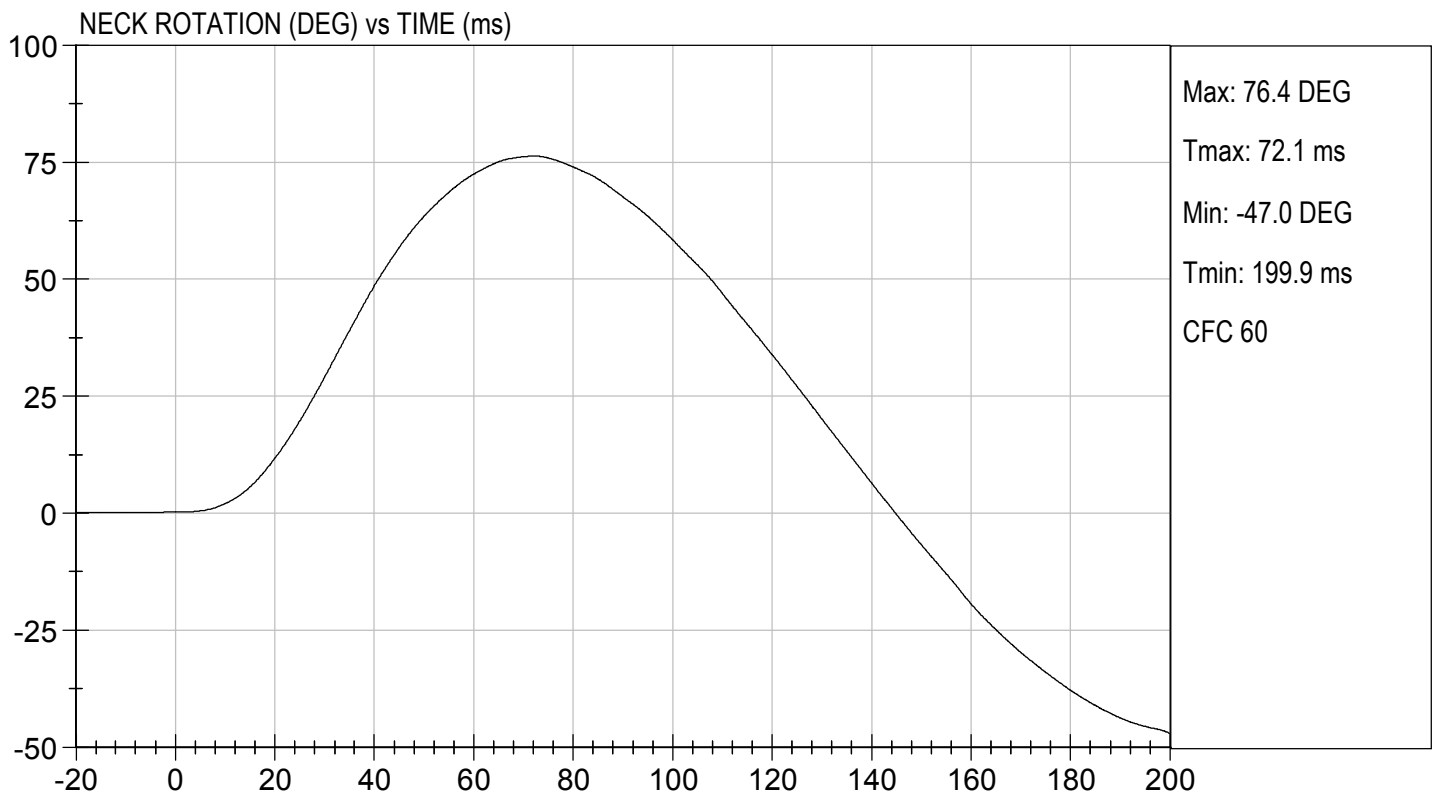
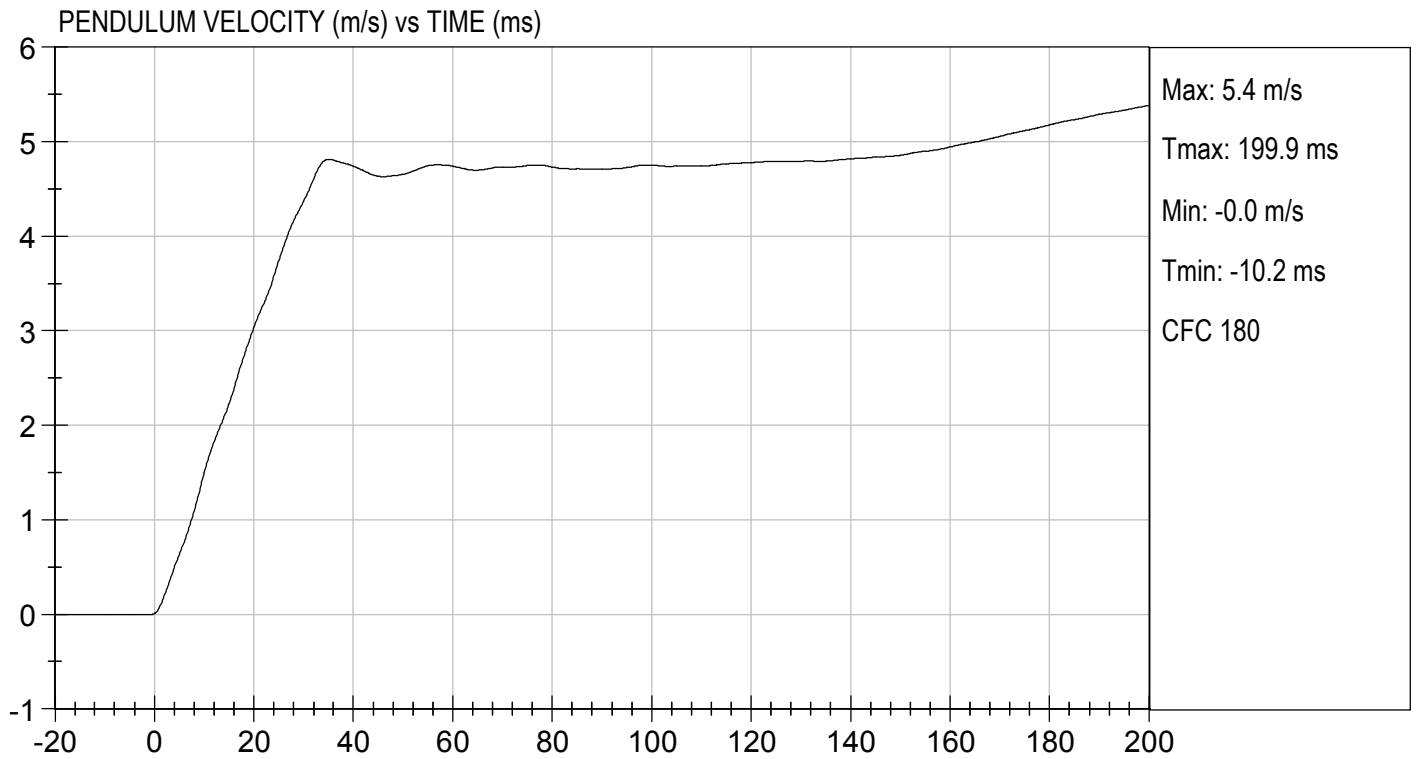
Test I.D: D182582

Tested Parameter	Units	Specification	Result	Pass/Fail	
Laboratory Temperature	deg C	20.6 to 22.2	21.1	Pass	
Laboratory Relative Humidity	%	10 to 70	43	Pass	
Pendulum Speed	m/s	4.83 to 5.07	4.93	Pass	
Pendulum Velocity	10 ms	m/s	1.2 to 1.6	1.5	Pass
	20 ms	m/s	2.4 to 3.4	3.0	Pass
	30 ms	m/s	3.8 to 5.0	4.4	Pass
D Plane Rotation	Max	deg	74 to 92	76	Pass
Occipital Condyle Moment within Deflection Corridor	Nm	27 to 33	32.0	Pass	
Positive Moment Time Curve Decay to 5 Nm	ms	103 to 123	108	Pass	
Overall Results				Pass	

Brian Roach
Laboratory Technician

08/22/2018
Test Date

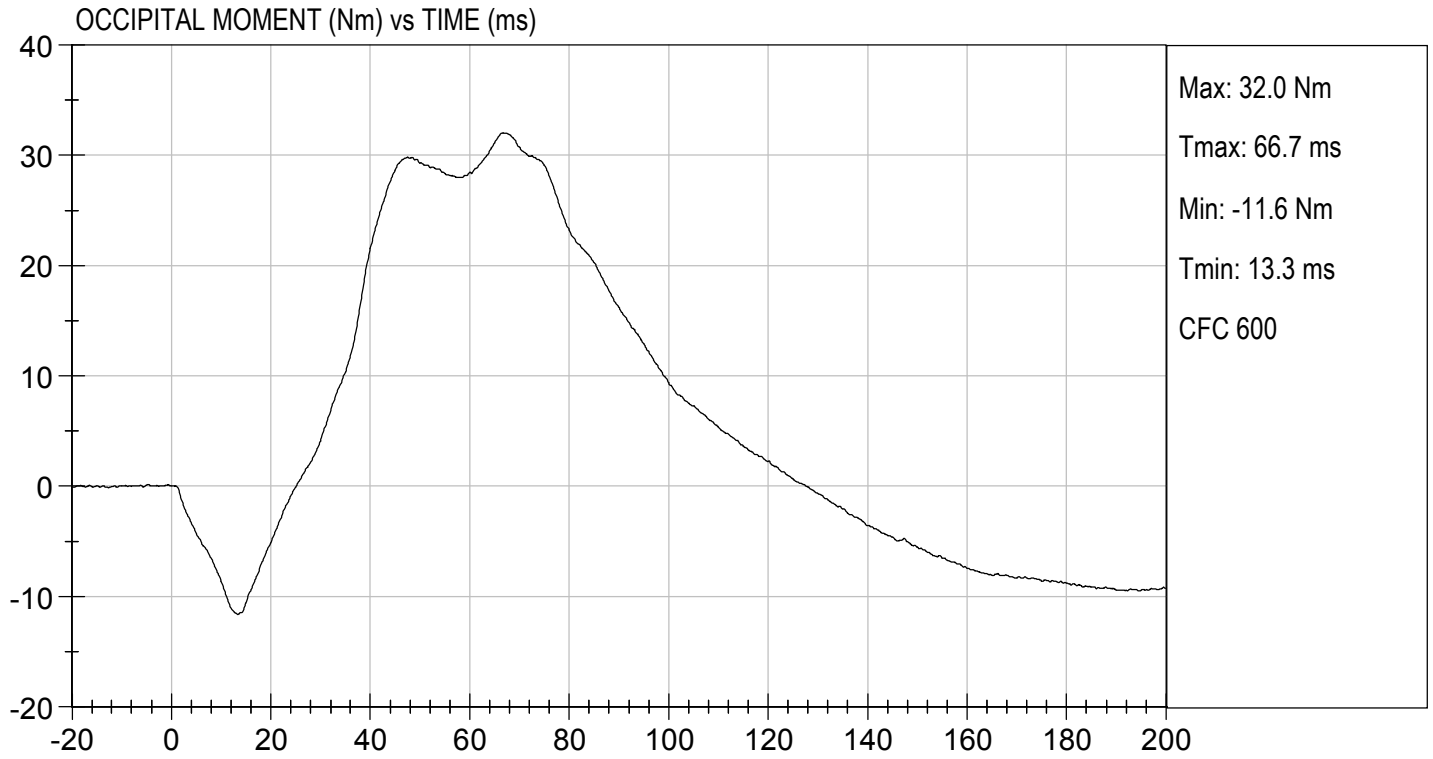
B. F. K.
Approved By





TEST DESC: NECK FLEXION
VELOCITY: 16.18 ft/s, 4.93 m/s

TEST DATE: 08/22/2018
TEST #: D182582



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 144

Test I.D: D182583

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	43	Pass
Pendulum Speed		m/s	4.18 to 4.42	4.34	Pass
Pendulum Velocity	10 ms	m/s	1.0 to 1.4	1.3	Pass
	20 ms	m/s	2.2 to 3.0	2.7	Pass
	30 ms	m/s	3.2 to 4.2	4.0	Pass
D Plane Rotation	Max	deg	85 to 103	93	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-19 to -24	-21	Pass
Positive Moment Time Curve Decay to 5 Nm		msec	123 to 147	135	Pass
Overall Results					Pass

Brian Roach

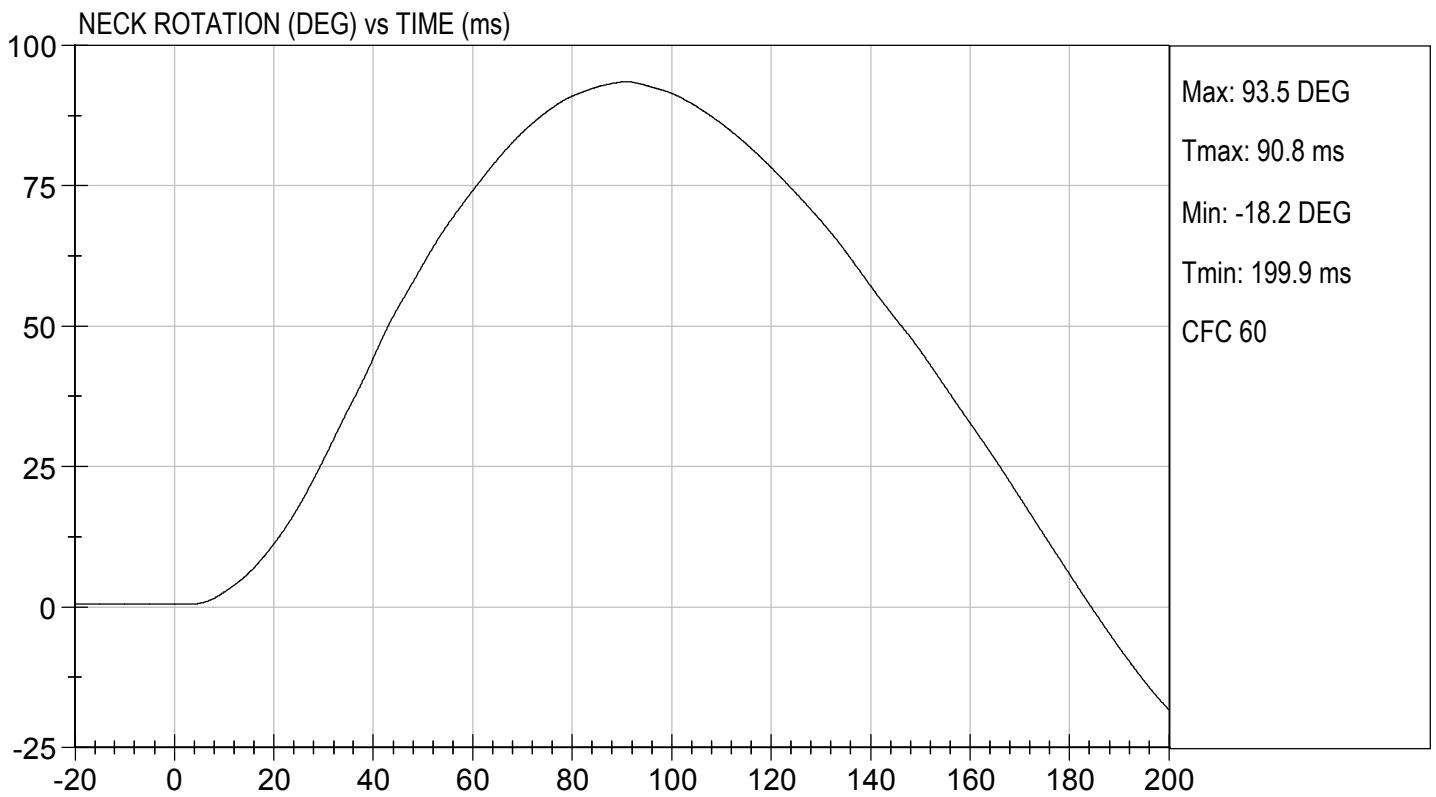
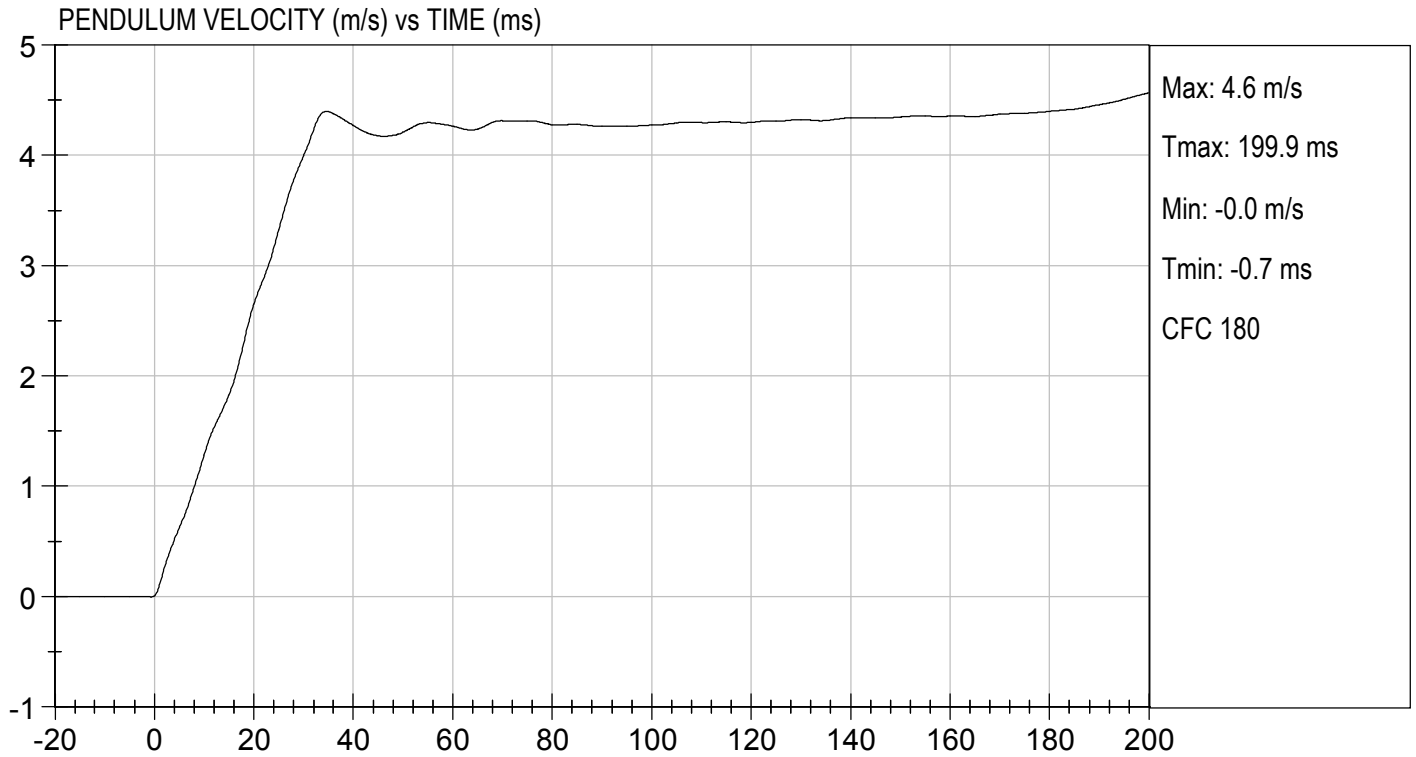
Laboratory Technician

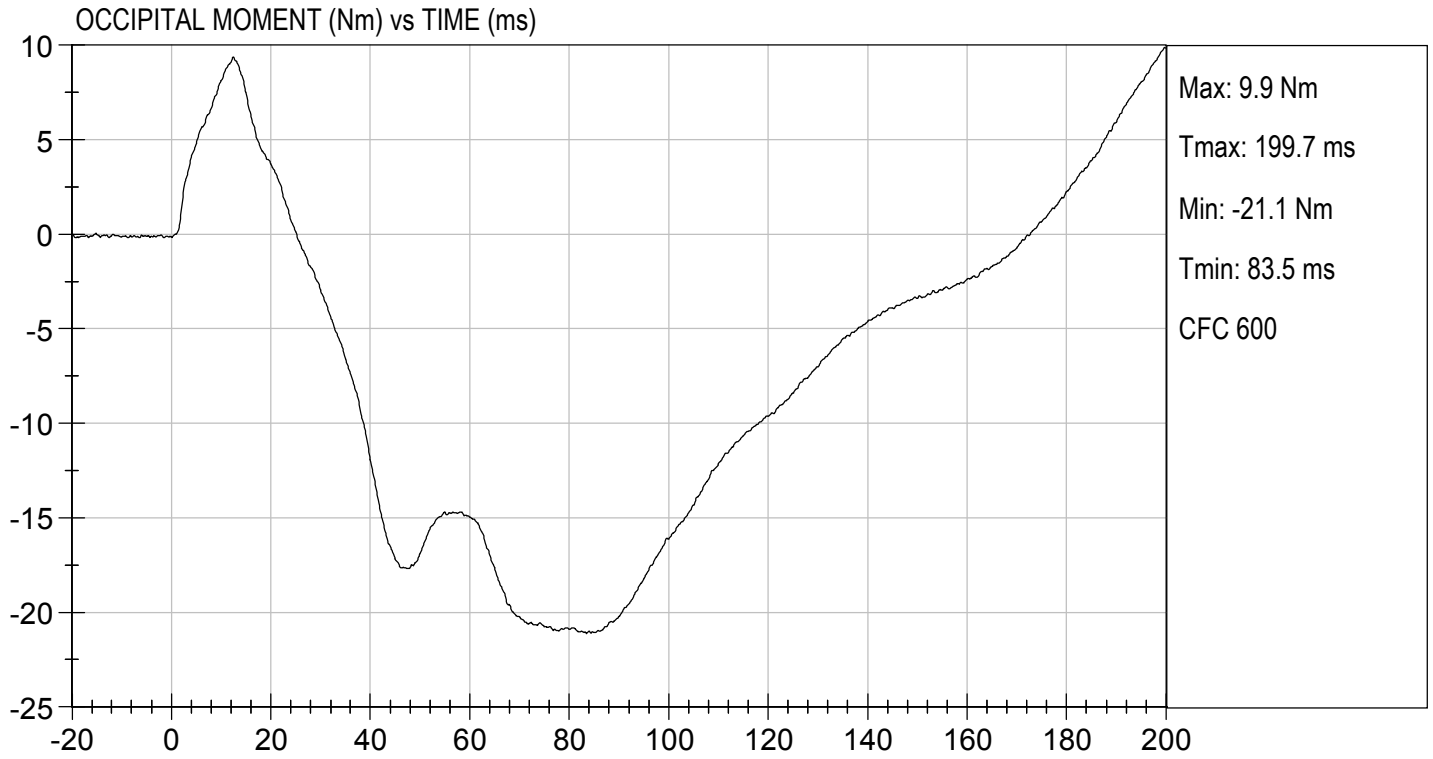
08/22/2018

Test Date

B. F. H.

Approved By





MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 6 YEAR OLD

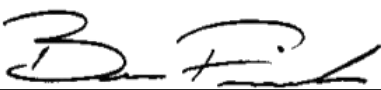
ATD Serial No: 144

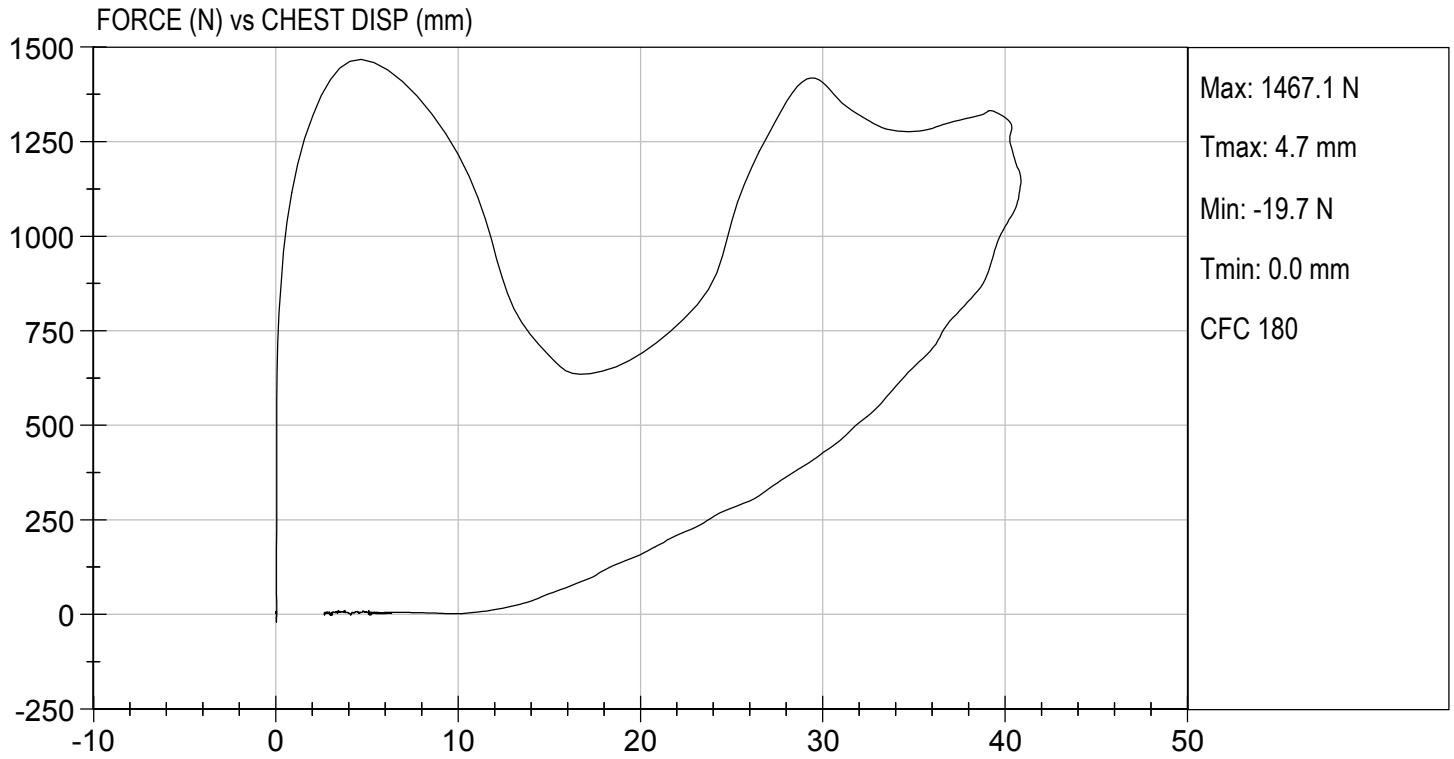
Test I.D: D182584

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.6	Pass
Relative Humidity	%	10 to 70	45	Pass
Probe Speed	m/s	6.59 to 6.83	6.68	Pass
Peak Deflection	mm	38.0 to 46.0	40.9	Pass
Peak Resistive Force w/in Deflection Corridor	N	1150 to 1380	1,332	Pass
Internal Hysteresis	%	65 to 85	76	Pass
Peak Force 12.5 mm - 38.0 mm	N	<= 1,500	1,418	Pass
Overall Test Results				Pass


Laboratory Technician

09/17/2018
Test Date


Approved By



MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 144

Test I.D: D182585

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Probe Speed	m/s	2.07 to 2.13	2.07	Pass
Maximum Force	N	2000 to 3000	2269	Pass
Overall Test Results				Pass

Brian Roach

 Laboratory Technician

08/23/2018

 Test Date

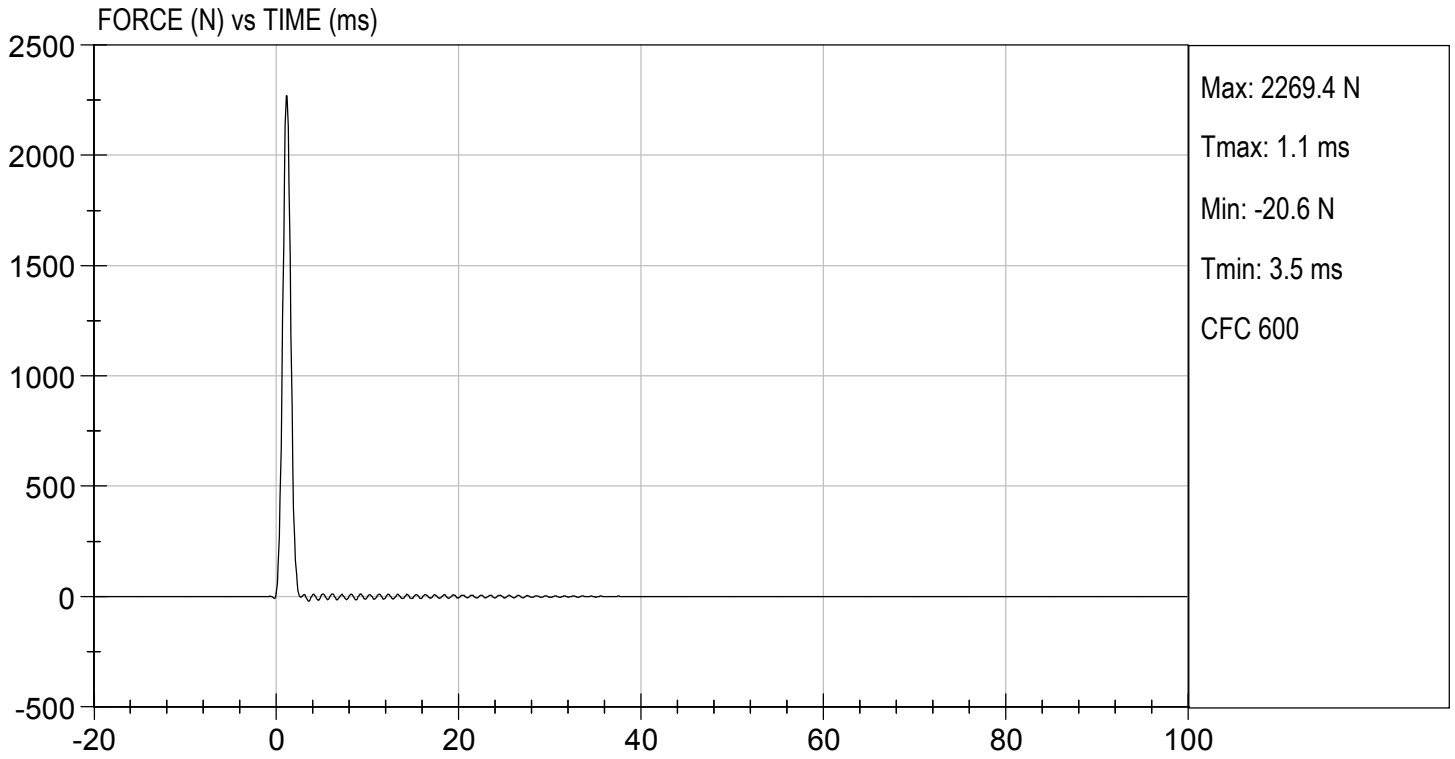
B. F. H.

 Approved By



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

TEST DATE: 08/23/2018
TEST #: D182585



MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 144

Test I.D: D182586

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Probe Speed	m/s	2.07 to 2.13	2.08	Pass
Maximum Force	N	2000 to 3000	2378	Pass
Overall Test Results				Pass

Brian Roach

Laboratory Technician

08/23/2018

Test Date

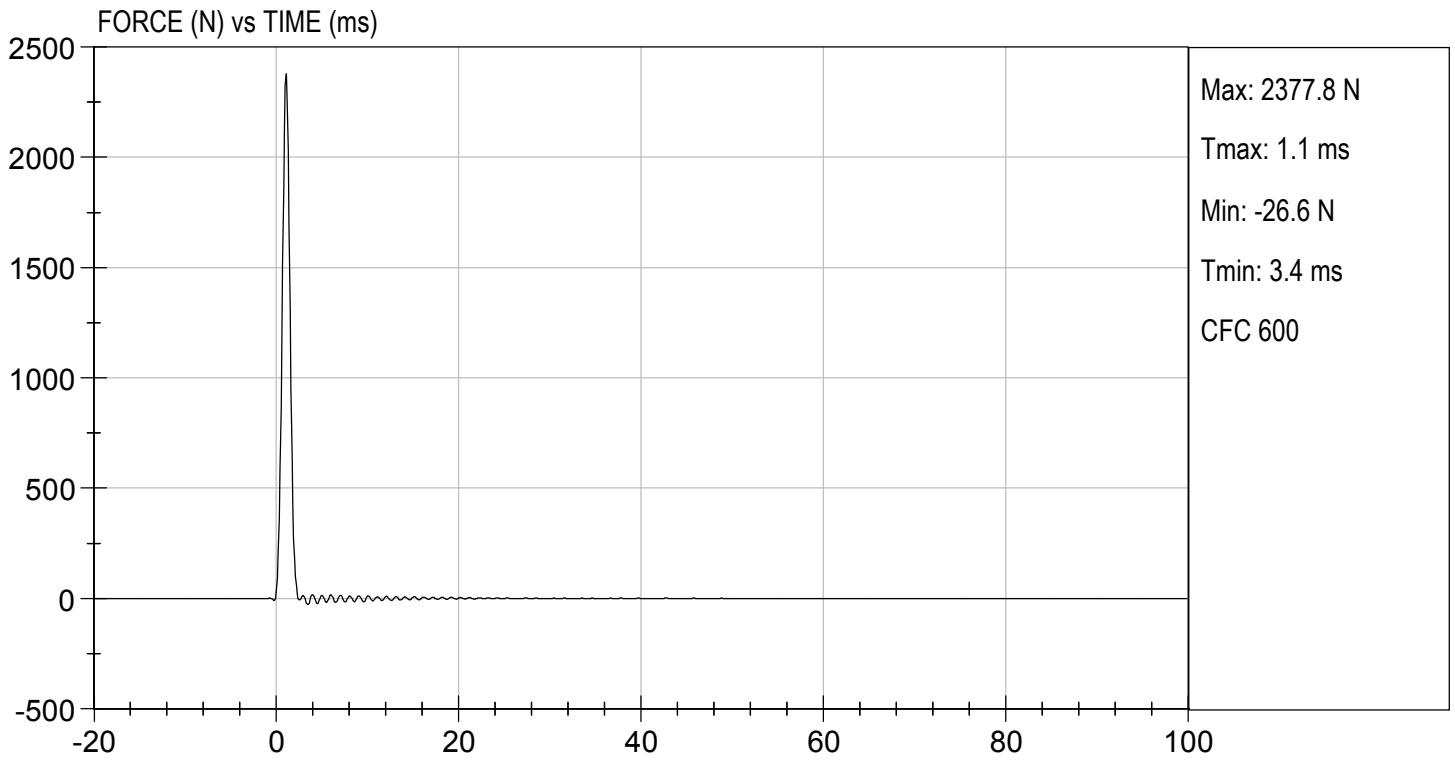
B. F. H.

Approved By



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

TEST DATE: 08/23/2018
TEST #: D182586



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 144

Test I.D: D182587

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	42	Pass
Initial Angle	deg	0 to 22	14	Pass
Return Angle	deg	+/- 8	4	Pass
Force at 45 deg	N	147 to 200	178	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.8	Pass
Overall Result				Pass

Brian Roach

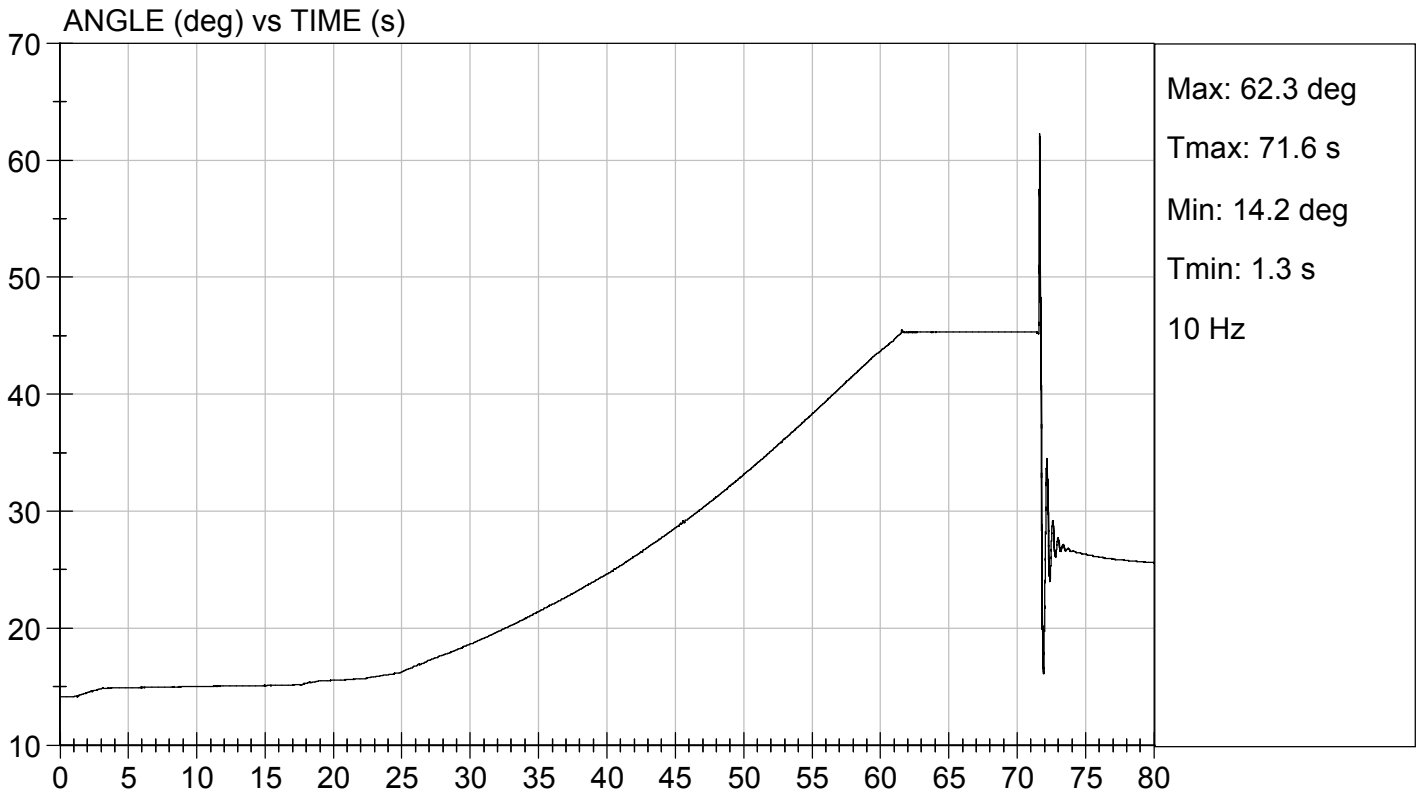
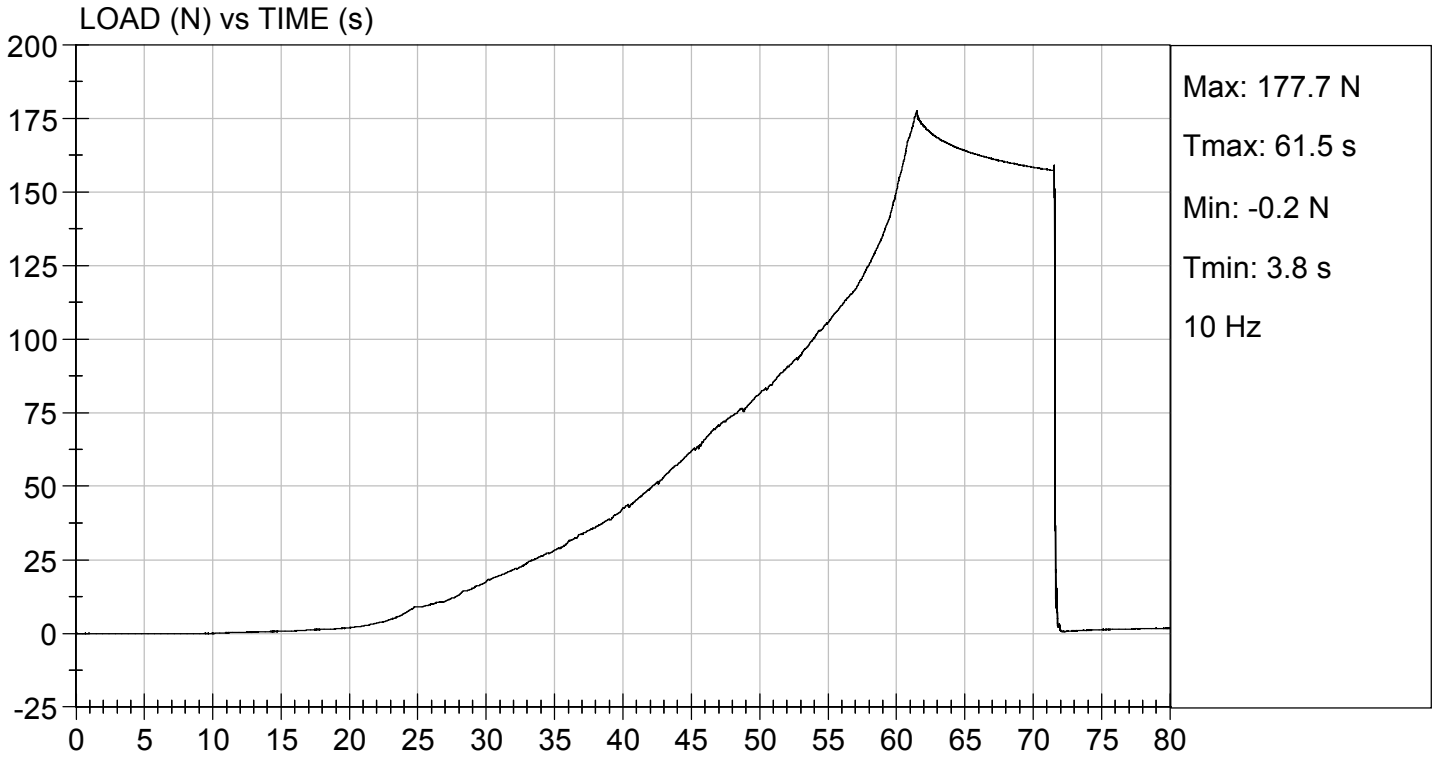
Laboratory Technician

09/14/2018

Test Date

B. Fink

Approved By



CALIBRATION TEST RESULTS

POST-TEST

Hybrid III 6-Year-Old ATD

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 144

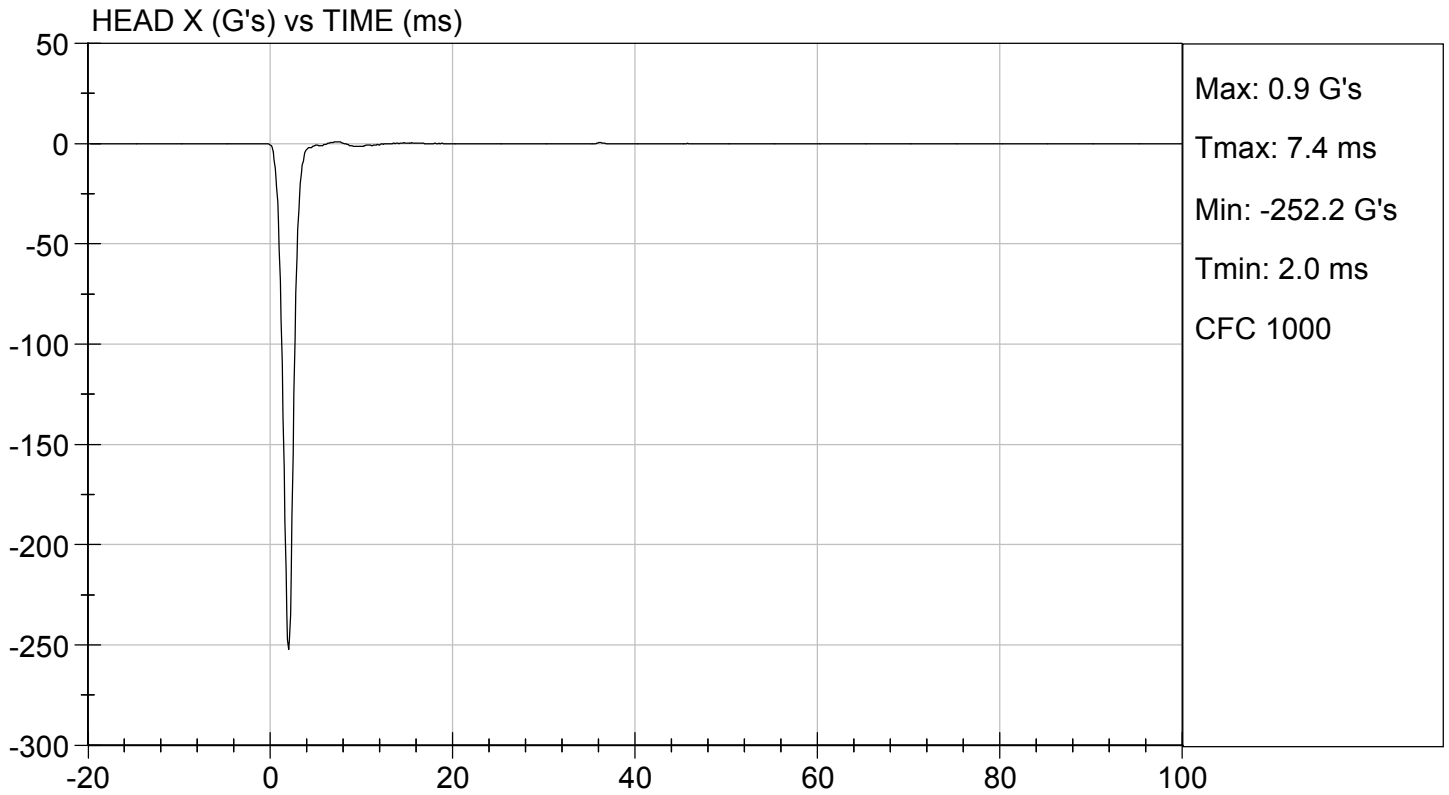
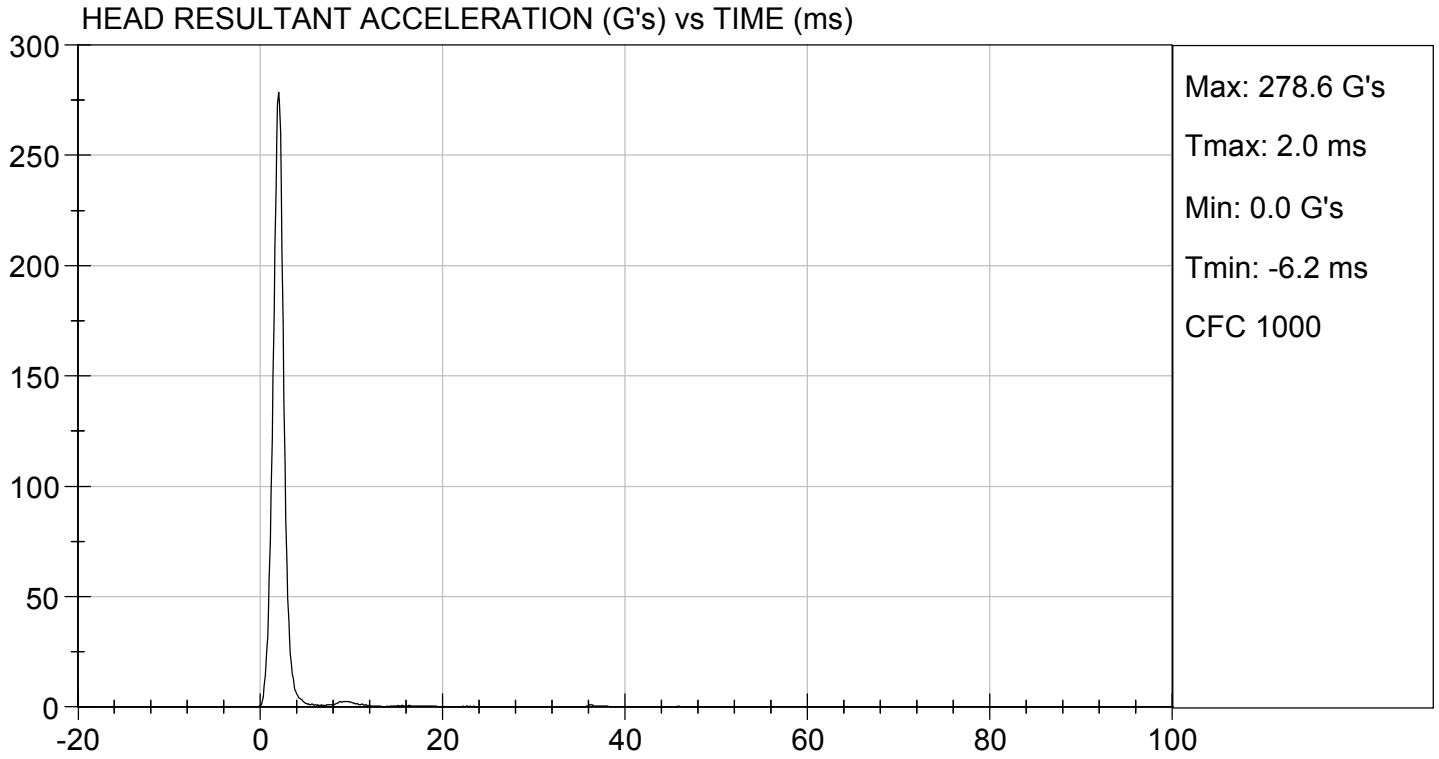
Test ID: D183061

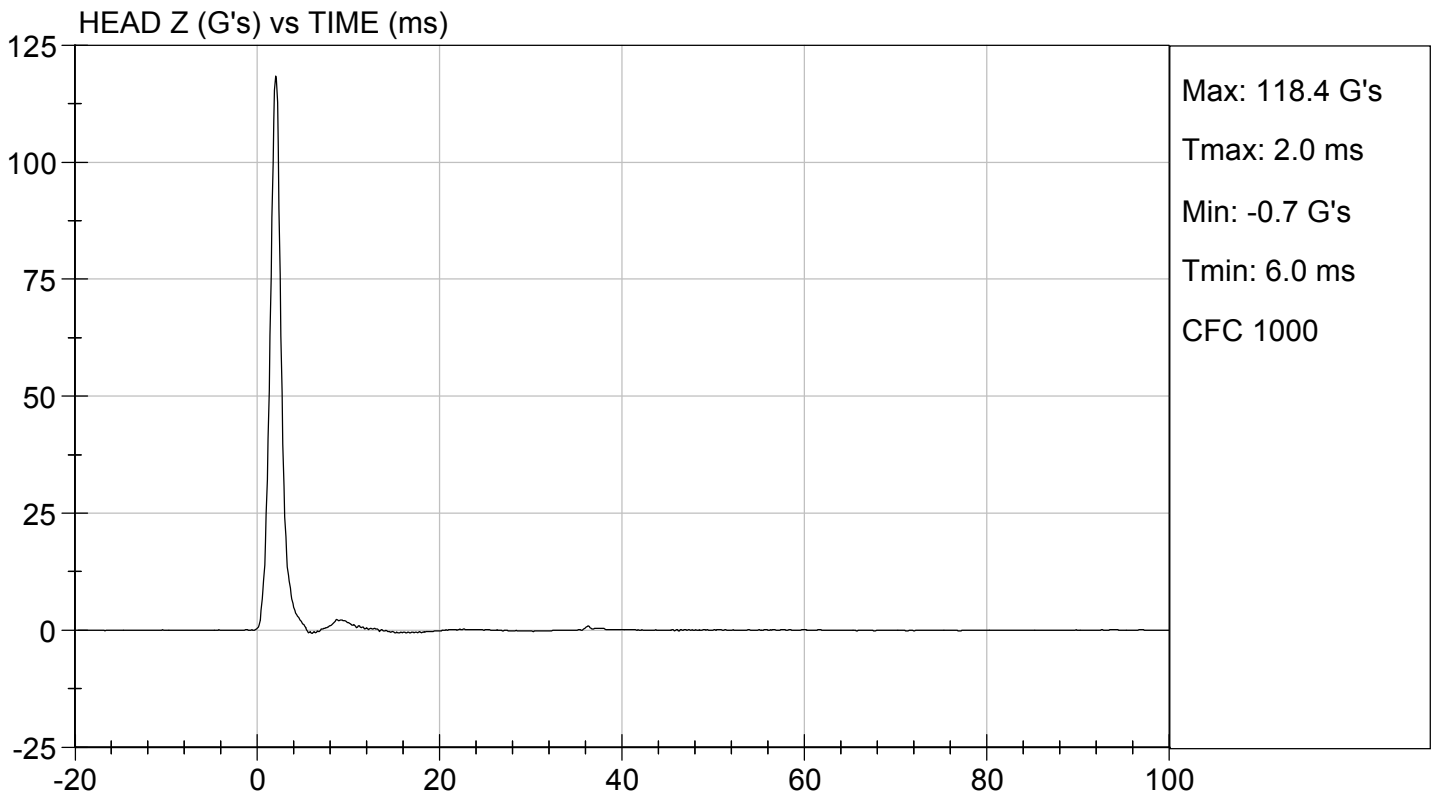
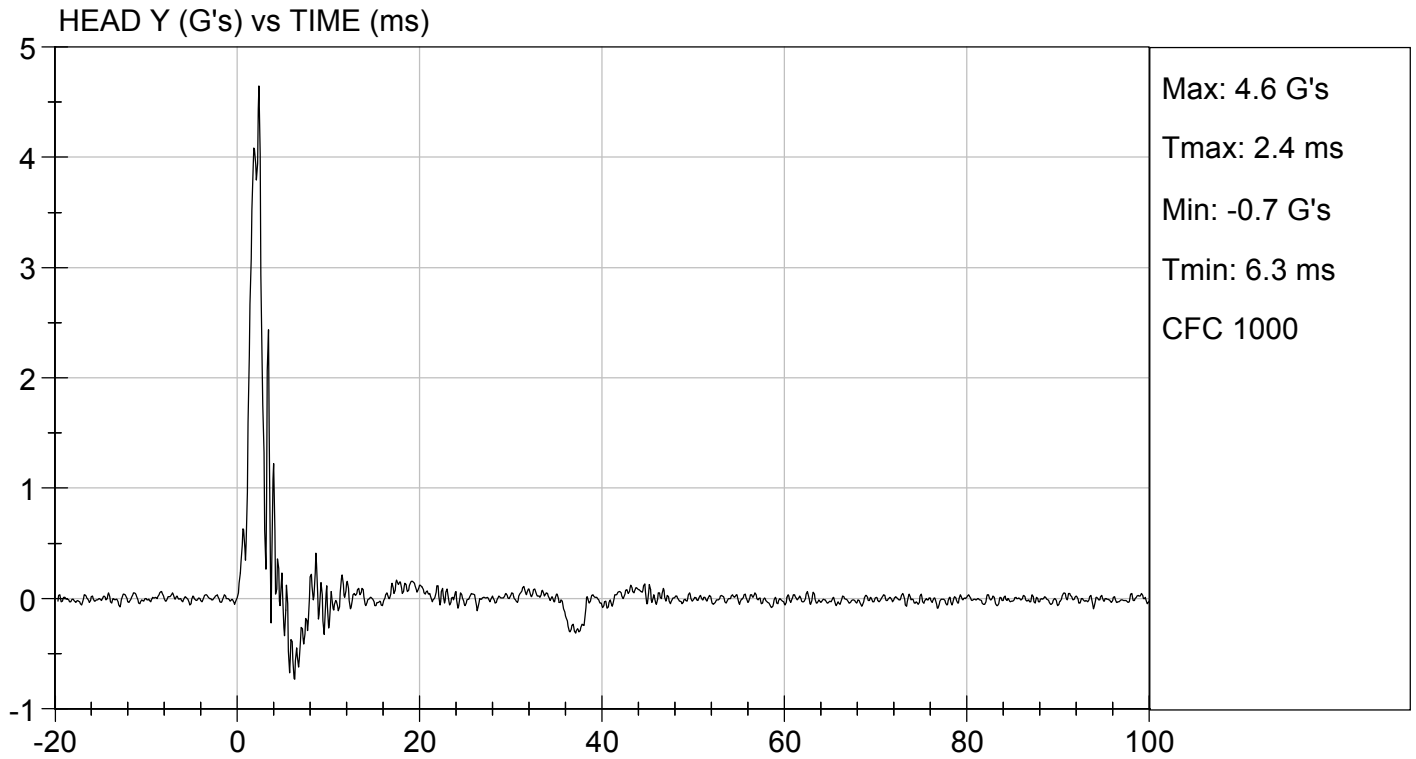
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	32	Pass
Peak Resultant Acceleration	G's	245 to 300	279	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	4.6	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

Brian Roach
 Laboratory Technician

10/11/2018
 Test Date

B. F. K.
 Approved By





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 144

Test I.D.: D183062

Tested Parameter	Units	Specification	Result	Pass/Fail	
Laboratory Temperature	deg C	20.6 to 22.2	21.2	Pass	
Laboratory Relative Humidity	%	10 to 70	36	Pass	
Pendulum Speed	m/s	4.83 to 5.07	4.84	Pass	
Pendulum Velocity	10 ms	m/s	1.2 to 1.6	1.6	Pass
	20 ms	m/s	2.4 to 3.4	3.0	Pass
	30 ms	m/s	3.8 to 5.0	4.3	Pass
D Plane Rotation	Max	deg	74 to 92	76	Pass
Occipital Condyle Moment within Deflection Corridor	Nm	27 to 33	32.9	Pass	
Positive Moment Time Curve Decay to 5 Nm	ms	103 to 123	105	Pass	
Overall Results				Pass	

Brian Roach

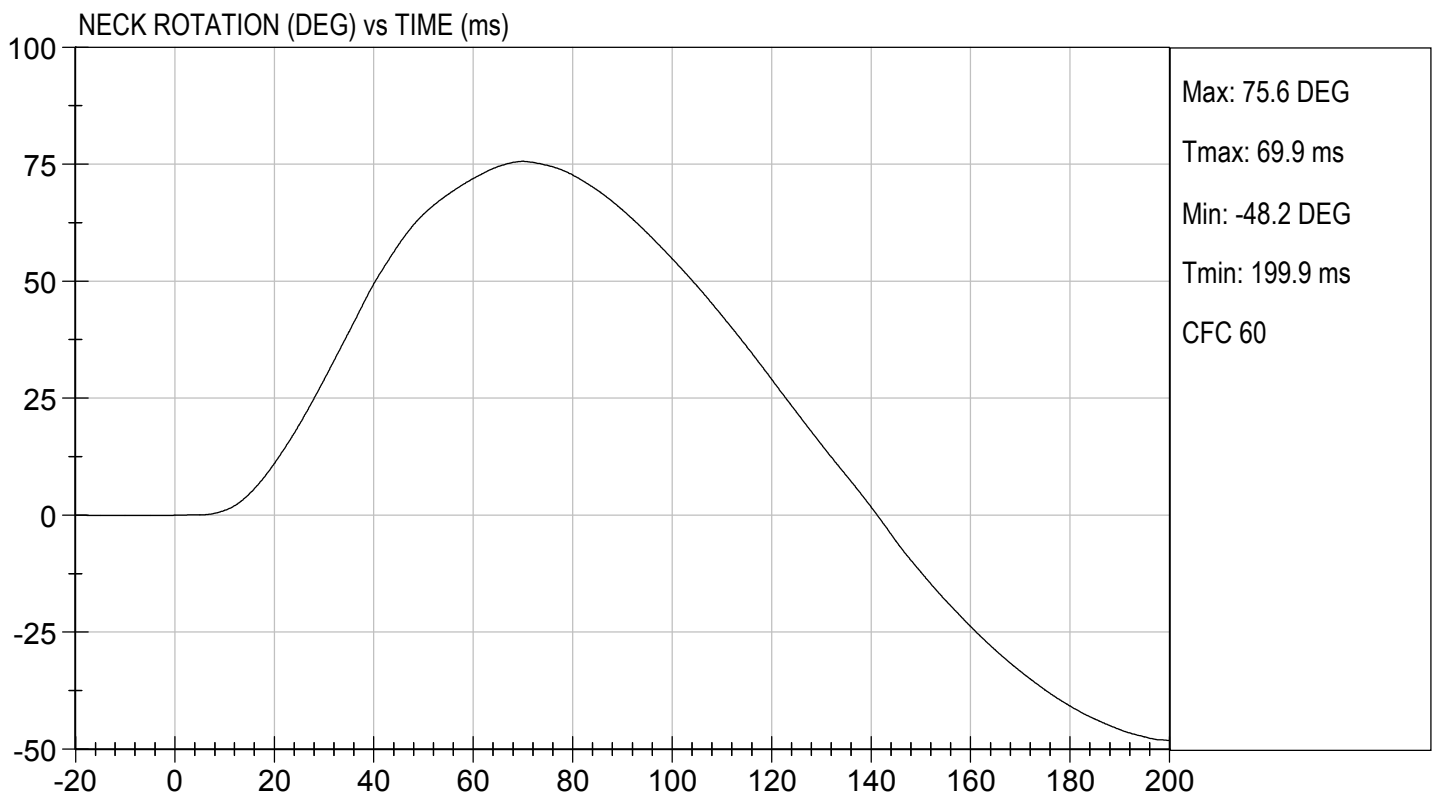
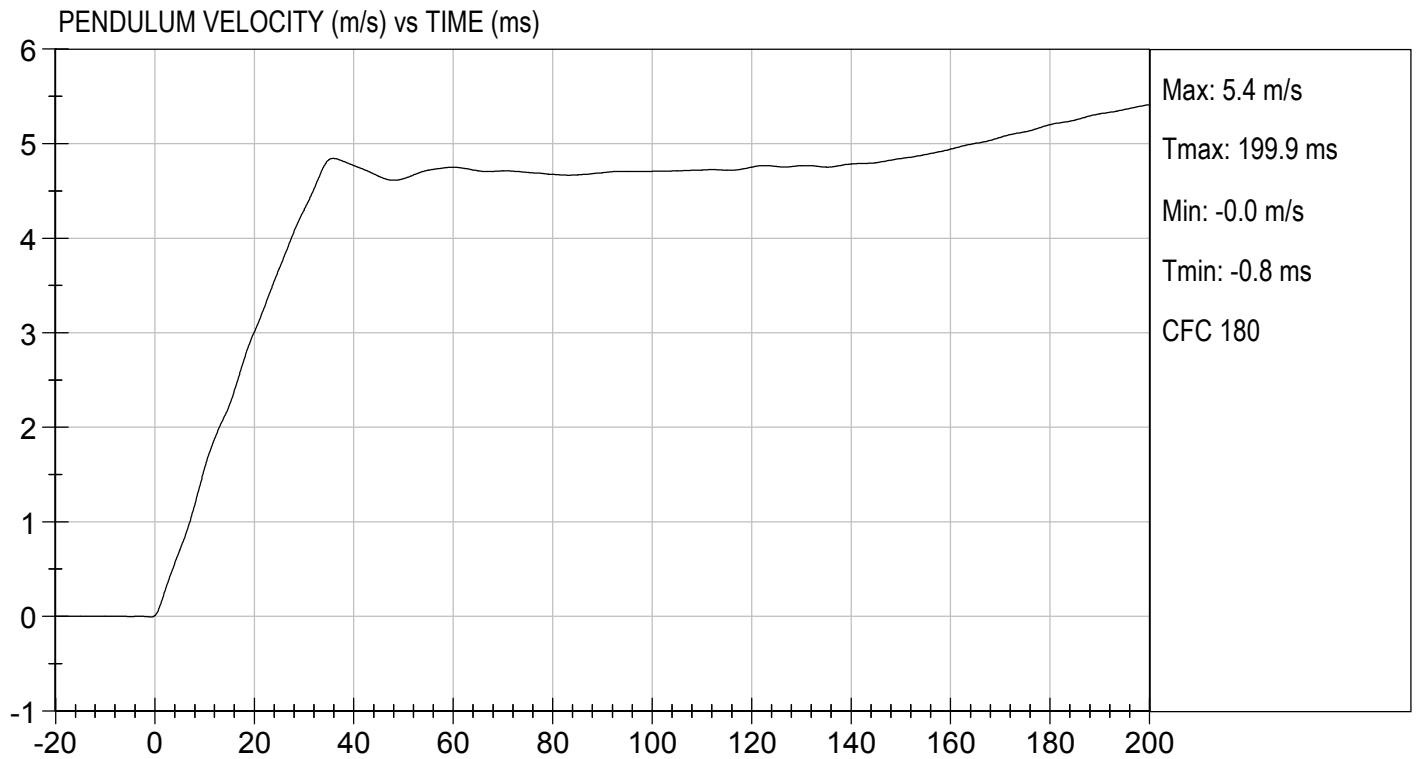
Laboratory Technician

10/11/2018

Test Date

B. F. K.

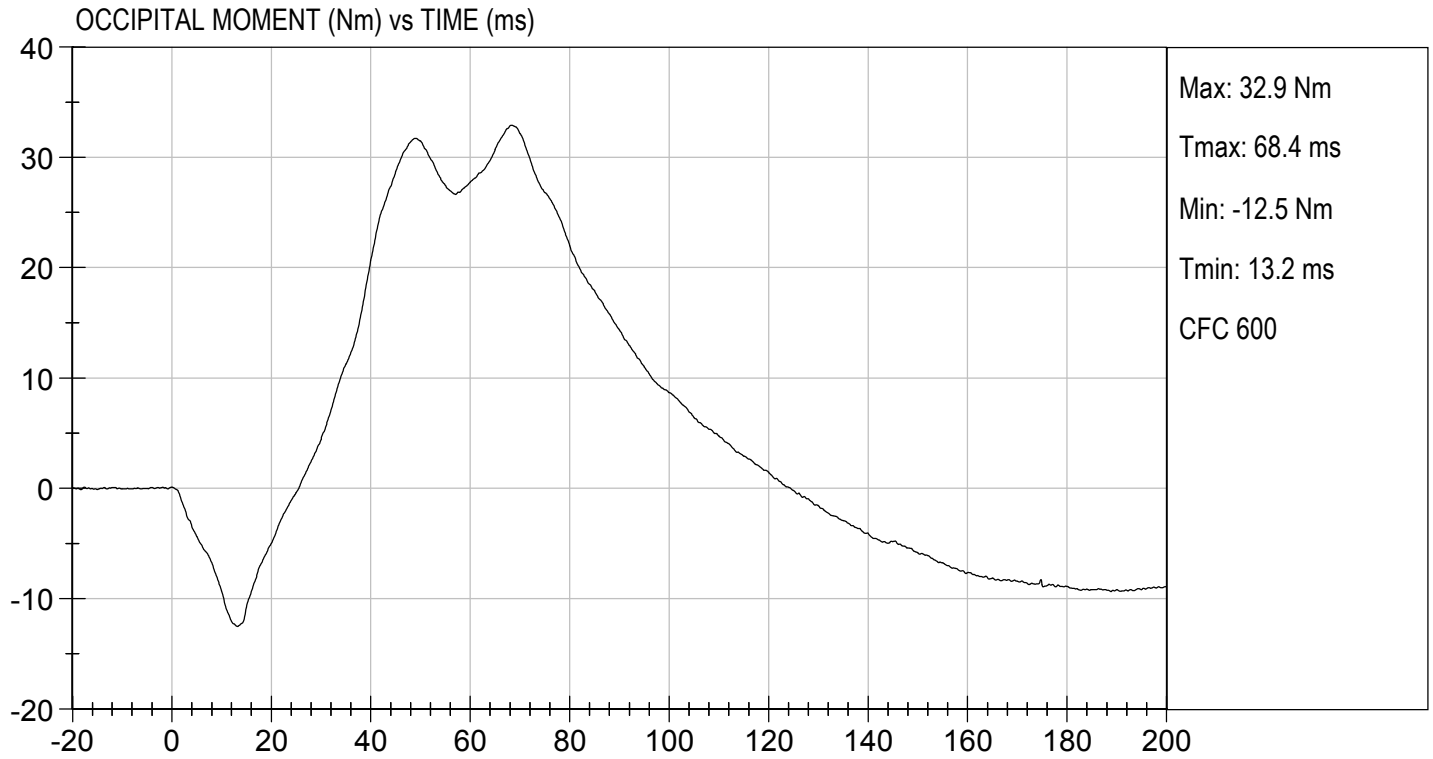
Approved By





TEST DESC: NECK FLEXION
VELOCITY: 15.87 ft/s, 4.84 m/s

TEST DATE: 10/11/2018
TEST #: D183062



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 144

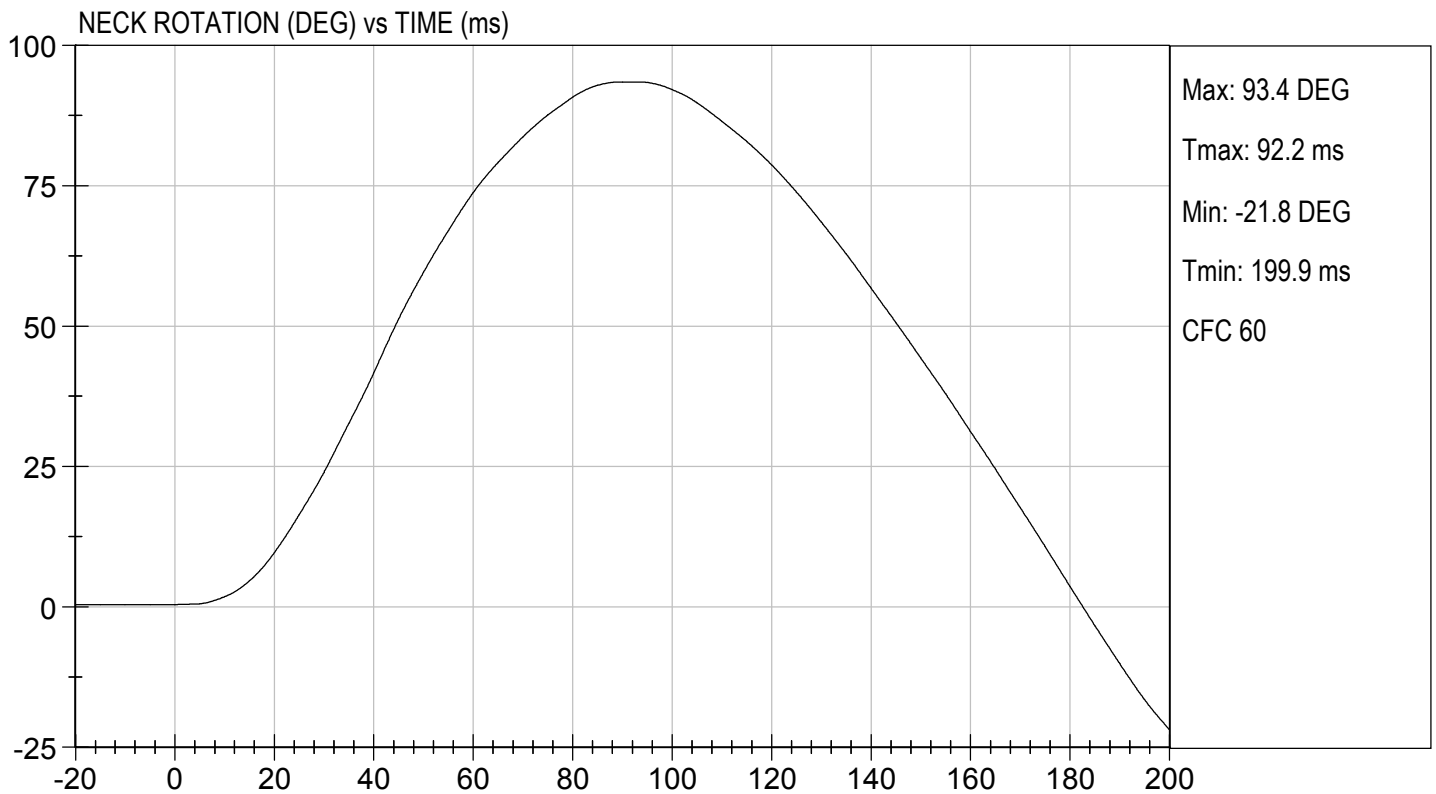
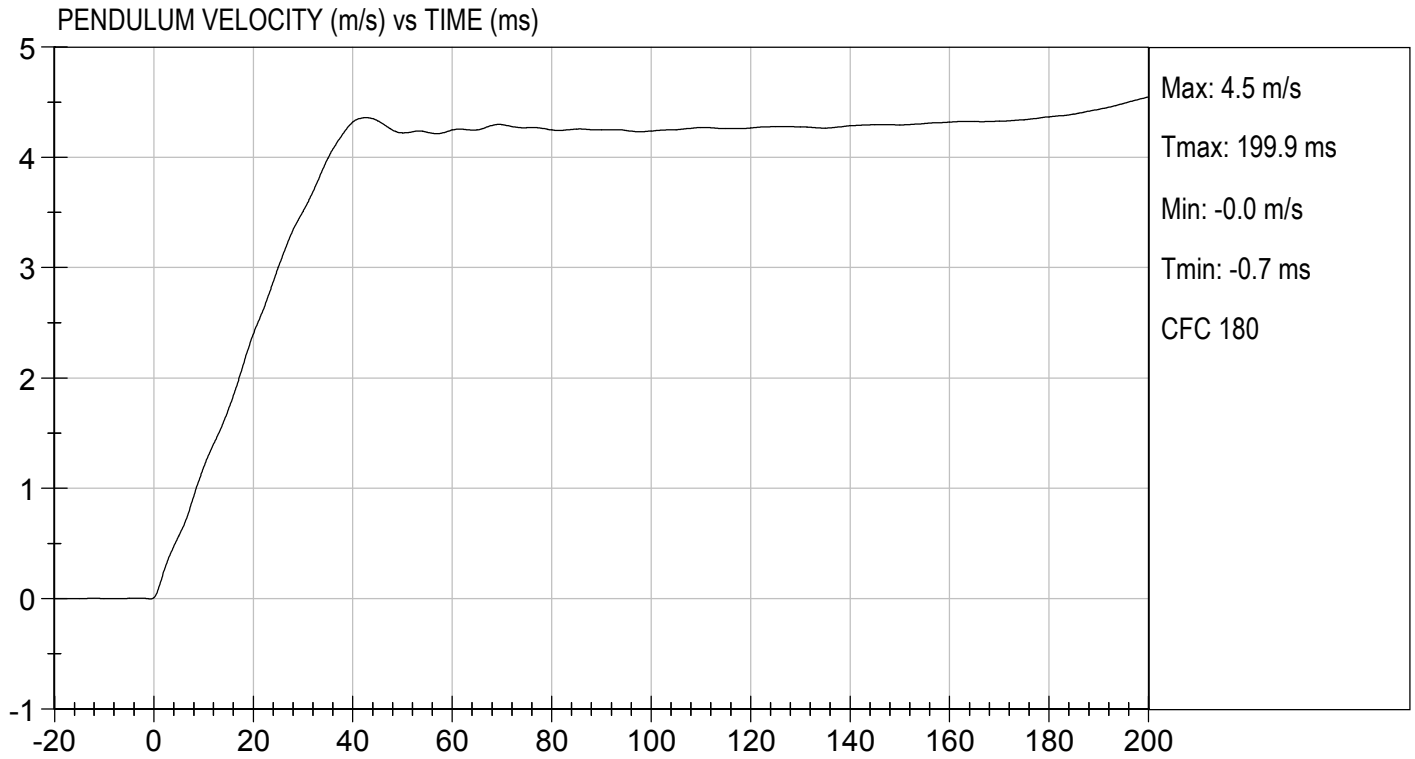
Test I.D: D183063

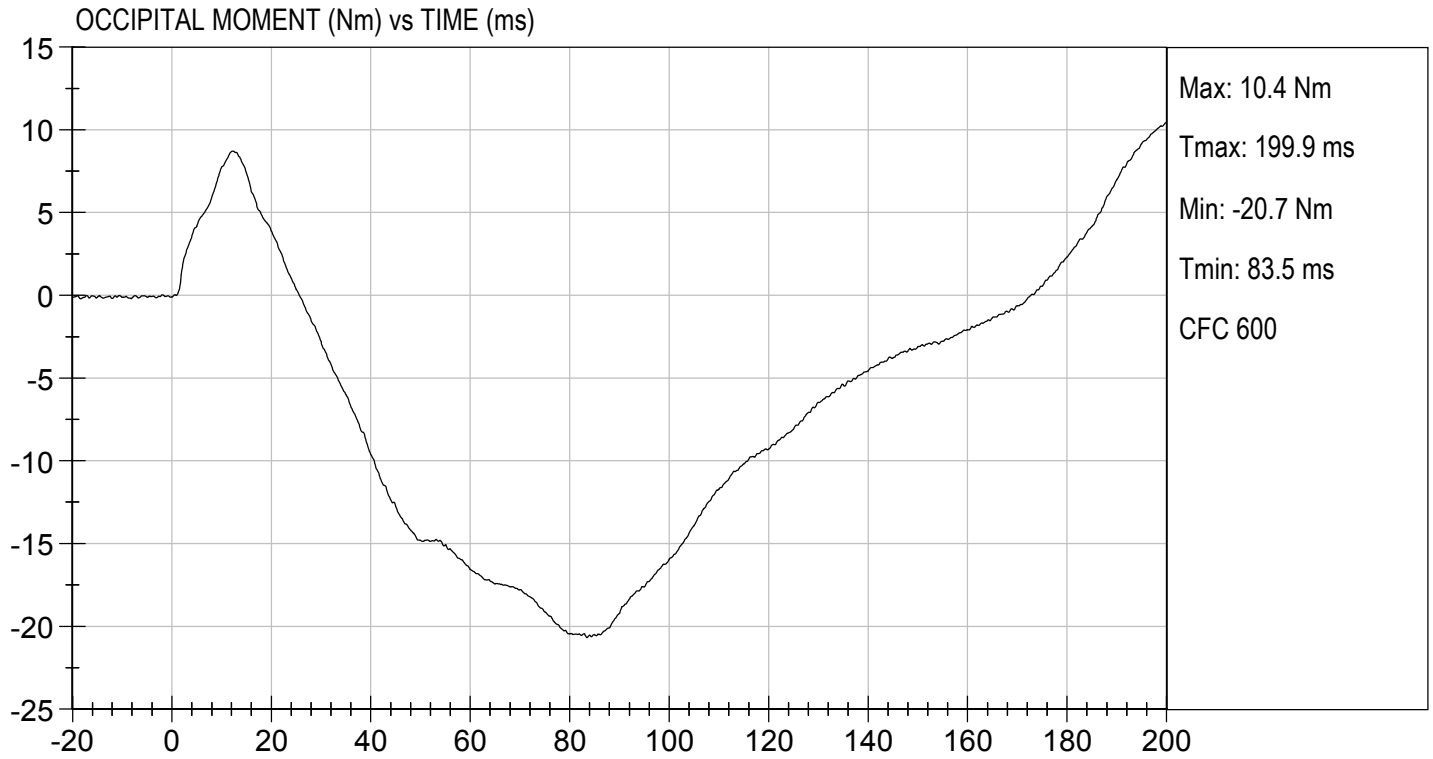
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity		%	10 to 70	36	Pass
Pendulum Speed		m/s	4.18 to 4.42	4.27	Pass
Pendulum Velocity	10 ms	m/s	1.0 to 1.4	1.2	Pass
	20 ms	m/s	2.2 to 3.0	2.4	Pass
	30 ms	m/s	3.2 to 4.2	3.5	Pass
D Plane Rotation	Max	deg	85 to 103	93	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-19 to -24	-21	Pass
Positive Moment Time Curve Decay to 5 Nm		msec	123 to 147	135	Pass
Overall Results					Pass

Brian Roach
 Laboratory Technician

10/11/2018
 Test Date

B. F. K.
 Approved By





MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 6 YEAR OLD

ATD Serial No: 144

Test I.D: D183064

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Relative Humidity	%	10 to 70	51	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	38.0 to 46.0	39.5	Pass
Peak Resistive Force w/in Deflection Corridor	N	1150 to 1380	1,337	Pass
Internal Hysteresis	%	65 to 85	76	Pass
Peak Force 12.5 mm - 38.0 mm	N	<= 1,500	1,441	Pass
Overall Test Results				Pass

Brian Roach

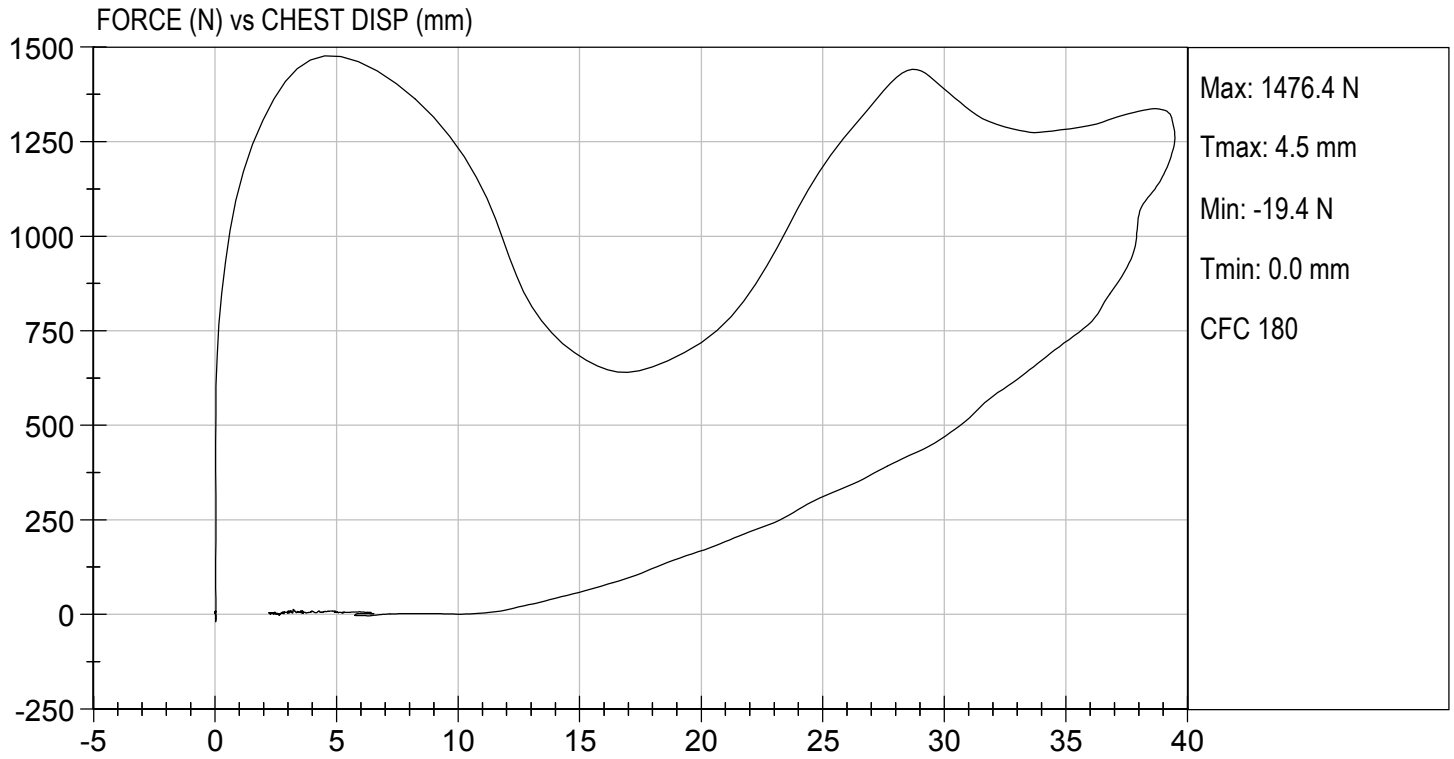
Laboratory Technician

10/10/2018

Test Date

B. F. K.

Approved By



MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 144

Test I.D: D183065

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	52	Pass
Probe Speed	m/s	2.07 to 2.13	2.13	Pass
Maximum Force	N	2000 to 3000	2454	Pass
Overall Test Results				Pass

Brian Roach

Laboratory Technician

10/10/2018

Test Date

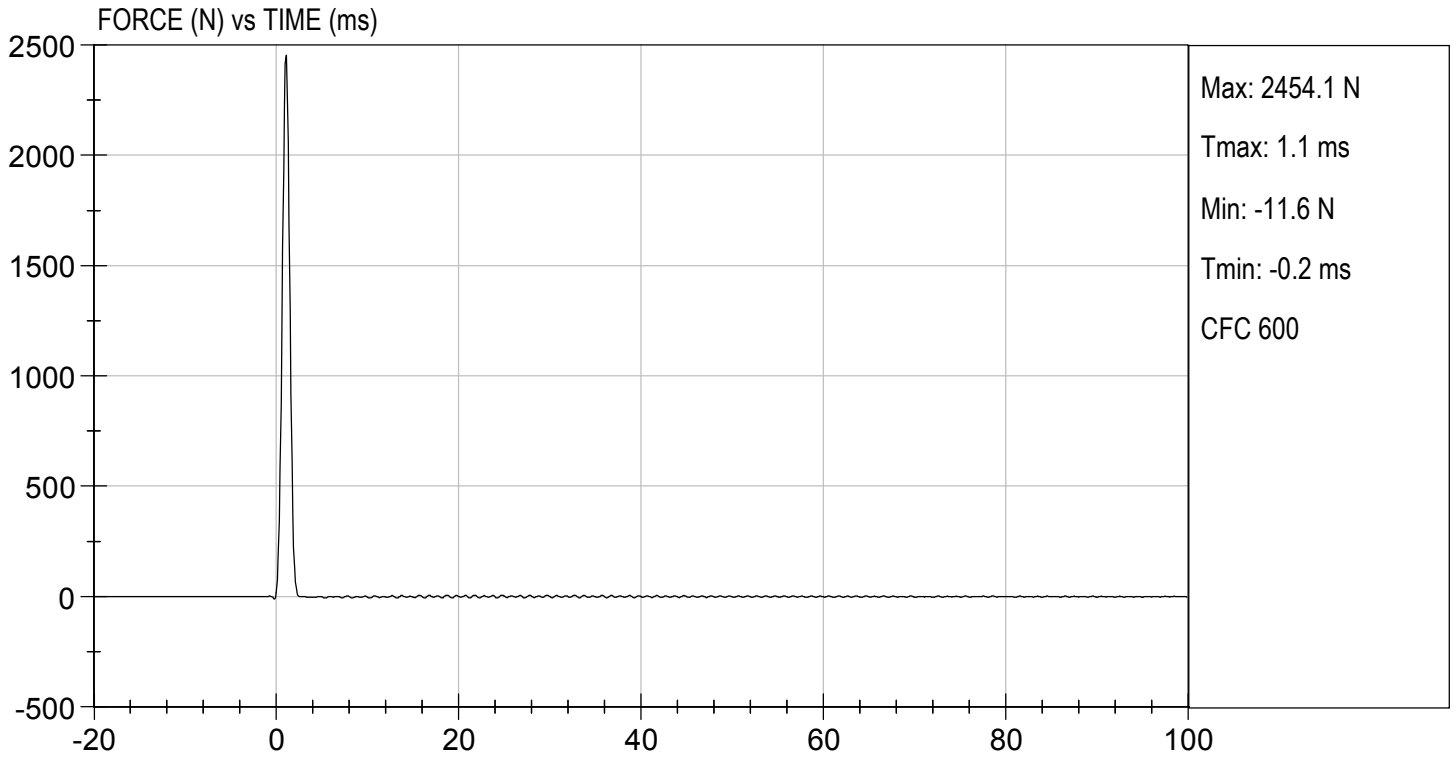
B. Fink

Approved By



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

TEST DATE: 10/10/2018
TEST #: D183065



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 144

Test I.D: D183066

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	52	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	2000 to 3000	2438	Pass
Overall Test Results				Pass

Brian Roach

Laboratory Technician

10/10/2018

Test Date

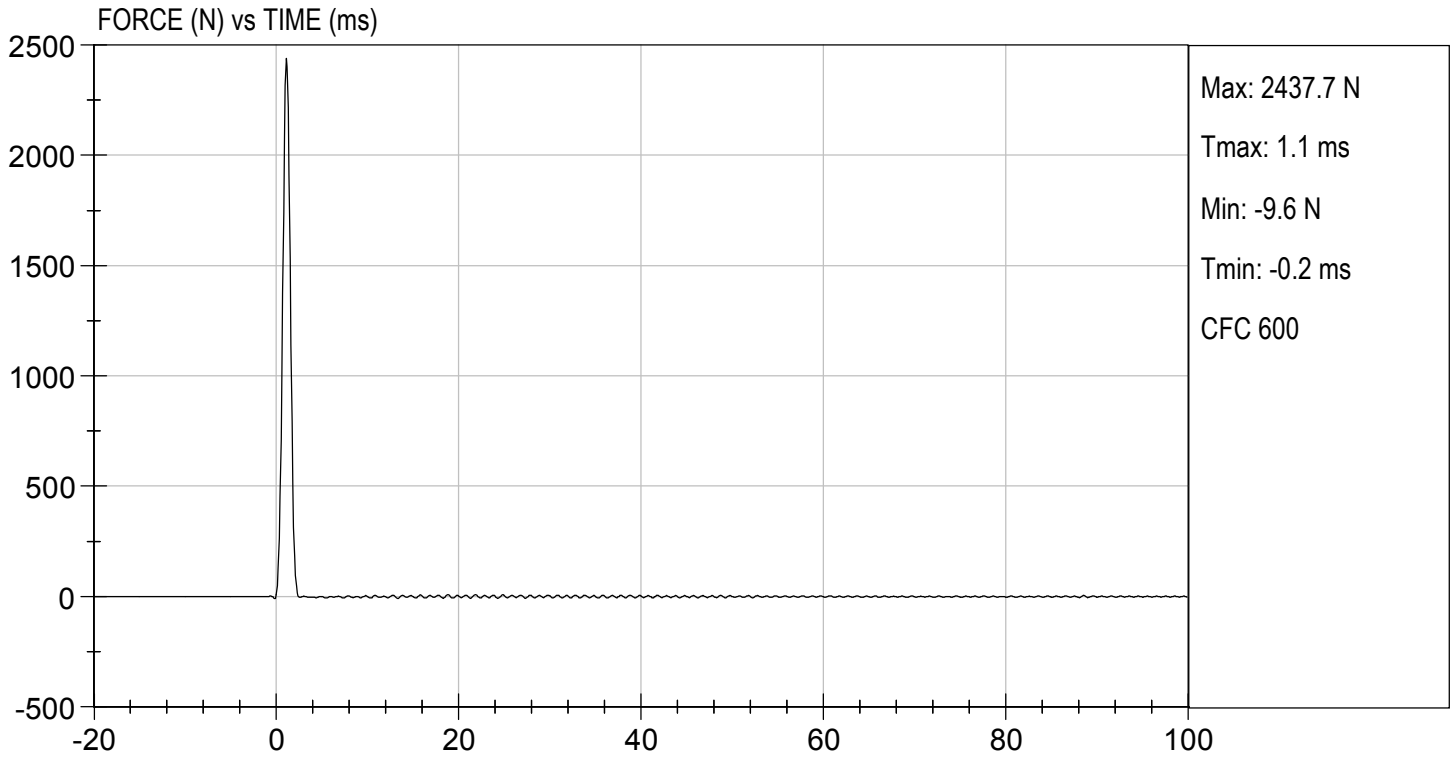
B. F. H.

Approved By



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

TEST DATE: 10/10/2018
TEST #: D183066



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 144

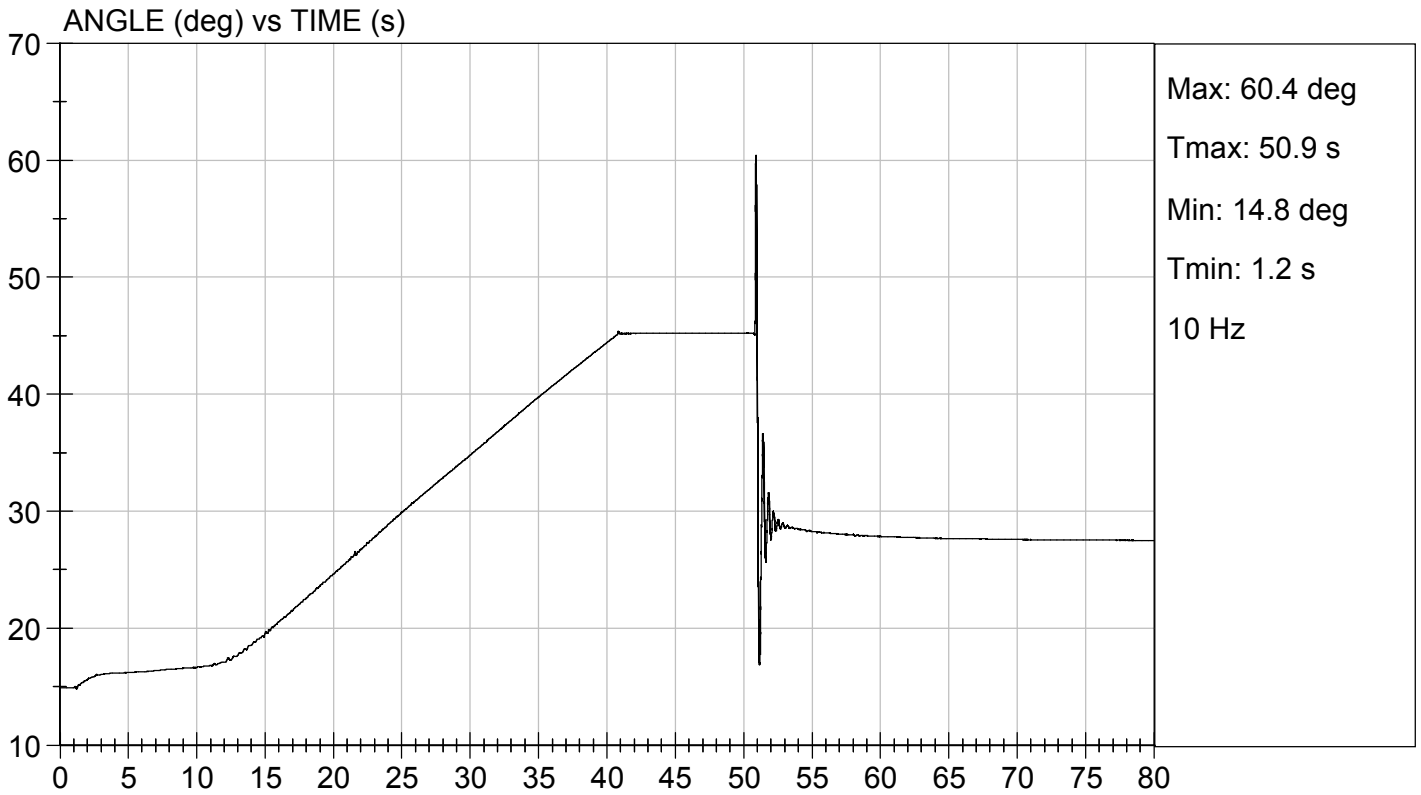
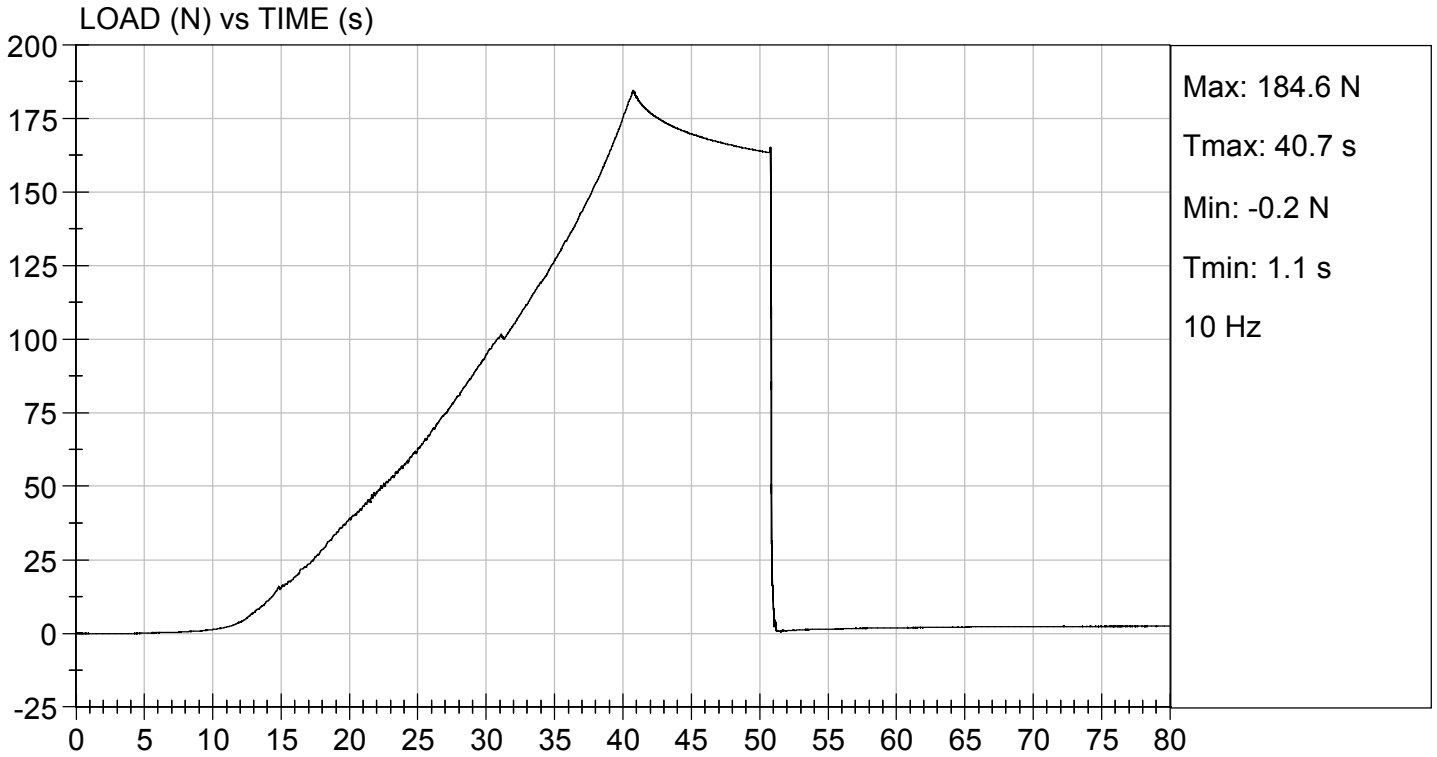
Test I.D: D183067

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	36	Pass
Initial Angle	deg	0 to 22	15	Pass
Return Angle	deg	+/- 8	6	Pass
Force at 45 deg	N	147 to 200	185	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	1.0	Pass
Overall Result				Pass

Brian Roach
Laboratory Technician

10/11/2018
Test Date

B. Fink
Approved By



**APPENDIX D
TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA**

Table 1 – Dummy Instrumentation

		HIII 6-Year-Old S/N 144		
		Serial Number	Manufacturer	Calibration Date
Head CG Accelerometers	X	P91766	Endevco	08/08/18
	Y	P91773	Endevco	08/08/18
	Z	P91774	Endevco	08/08/18
Upper Neck Load Cell		NG1746	Denton	08/02/18
Lower Neck Load Cell		LNG139	Denton	08/02/18