REPORT NUMBER: NCAP-MGA-2015-061

NEW CAR ASSESSMENT PROGRAM (NCAP)
Frontal Barrier Impact Test

FORD MOTOR CO.
2015 Ford F-150 SuperCab XL 4x4 Truck
NHTSA No.: M20150213

MGA RESEARCH CORPORATION
5000 Warren Road
Burlington, WI 53105

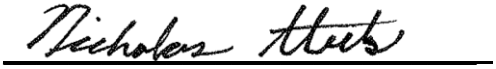
Test Date: February 27, 2015

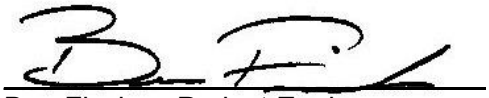
Final Report Date: April 24, 2015

FINAL REPORT

U.S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Office of Crashworthiness Standards
Mail Code: NVS-111
1200 New Jersey Ave, SE
Room W43-410
Washington, DC 20590

This publication is distributed by the U.S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings and conclusions expressed in this publication are those of the author(s) and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof. If trade or manufacturers' names or products are mentioned, it is only because they are considered essential to the object of the publication and should not be construed as an endorsement. The United States Government does not endorse products or manufacturers.

Prepared by: 
Nicholas Abels, Project Engineer

Approved by: 
Ben Fischer, Project Engineer

Approval Date: April 24, 2015

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

1. Report No. NCAP-MGA-2015-061	*2. Government Accession No.*	*3. Recipient's Catalog No.*
4. Title and Subtitle Final Report of New Car Assessment Program Frontal Impact Testing of a 2015 Ford F-150 SuperCab XL 4x4 Truck, NHTSA No.: M20150213		*5. Report Date* April 24, 2015 *6. Performing Organization Code* MGA
7. Author(s) Ben Fischer, Project Engineer		*8. Performing Organization Report No.* NCAP-MGA-2015-061
9. Performing Organization Name and Address MGA Research Corporation 5000 Warren Road Burlington, WI 53105		*10. Work Unit No.* *11. Contract or Grant No.* DTNH22-12-D-00258
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Crashworthiness Standards (NVS-111) 1200 New Jersey Ave, SE, Room W43-410 Washington, D.C. 20590		*13. Type of Report and Period Covered* Final Test Report February 27, 2015 to April 24, 2015 *14. Sponsoring Agency Code* NVS-111
15. Supplementary Notes		

16. Abstract

A 56.3 km/h NCAP Frontal Impact Test was conducted on a 2015 Ford F-150 SuperCab XL 4x4 Truck 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 February 27, 2015.

The impact velocity of the vehicle was 56.4 km/h and the ambient temperature at the barrier face at the time of impact was 20.8°C. The target vehicle post-test maximum crush was 628 located at the vehicle's centerline. The test vehicle's performance was as follows:

Measurement Description	Units	Driver ATD		Passenger ATD	
		Threshold	Result	Threshold	Result
Head Injury Criteria (HIC_{15})	N/A	700	189	700	121
Maximum Chest	mm	63	18	52	10
Nij	N/A	1	0.30	1	0.38
Neck Tension	N	4170	1339	2620	667
Neck Compression	N	4000	84	2520	17
Left Femur Force	N	10000	531	6800	2088
Right Femur Force	N	10000	537	6800	1037

17. Key Words 35 mph Frontal Barrier Impact Test New Car Assessment Program (NCAP)		*18. Distribution Statement* Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services Division, NPO-411 1200 New Jersey Ave, SE Washington, DC 20590 Email: tis@nhtsa.dot.gov FAX: 202-493-2833	
19. Security Classification of Report Unclassified	*20. Security Classification of Page* Unclassified	*21. No. of Pages* 170	22. Price

TABLE OF CONTENTS

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

Data Sheet No.		Page No.
1	General Test and Vehicle Parameter Data	4
2	Seat Adjustment, Fuel System, and Steering Wheel Data	8
3	Dummy Longitudinal Clearance Dimensions	10
4	Dummy Lateral Clearance Dimensions	11
5	Seat Belt Positioning Data	12
6	High-Speed Camera Locations and Data	13
7	Vehicle Accelerometer Locations	15
8	Photographic Reference Target Locations	16
9	Load Cell Locations on Fixed Barrier	17
10	Test Vehicle Summary of Results	18
11	Post-Test Observations	19
12	Vehicle Profile Measurements	20
13	Accident Investigation Division Data	22
14	Vehicle Intrusion Measurements	23
15	Summary of FMVSS 212, FMVSS 219 (Partial) Data, and 301 Data	25
16	FMVSS 301 Static Rollover Results	27
17	Dummy/Vehicle Temperature Stabilization Data	28

Appendix		
A	Photographs	A
B	Dummy Response Data Traces	B
C	Dummy Calibration and Performance Verification Data	C

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 2015 Ford F-150 SuperCab XL 4x4 Truck at a velocity of 56.4 km/h. The test was performed at MGA Research Corporation on February 27, 2015. 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. Seat belt load cells were also installed on the driver's shoulder belt and the passenger's shoulder belt to measure dummy torso section loading.

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 631 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 628 mm 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 and chest contacted the airbag. The driver's head also contacted the headrest. The driver's knees contacted the knee bolster. The passenger's visible contact points were as follows: The passenger's head and chest contacted the airbag. The passenger's head also contacted the headrest. The passenger's knees contacted the glovebox.

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})	189	0.30	1339	84	35	18	531	537
Passenger (5^{th})	121	0.38	667	17	33	10	2088	1037

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

TEST NOTES

Barrier K-16 MY has no valid data after 5 ms.
Barrier D-06 MY has no valid data after 10 ms.

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: 2015 Ford F-150 SuperCab XL 4x4 Truck NHTSA No.: M20150213
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/27/2015

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	M20150213	Traction Control System (TCS)	Yes
Model Year	2015	Power Steering	Yes
Make	Ford	Power Window Auto-Reverse	Yes
Model	F-150 SuperCab XL	Driver Frontal Airbag	Yes
Body Style	2 Door Pickup	Driver Curtain Airbag	Yes
VIN	1FTEX1E80FFA23385	Driver Head/Torso Airbag	No
Body Color	Magnetic Metallic	Driver Torso Airbag	No
Odometer (km/mi)	262 / 163	Driver Torso/Pelvis Airbag	Yes
Engine Displacement (L)	3.5	Driver Pelvis Airbag	No
Type/No. Cylinders	6	Driver Knee Airbag	No
Engine Placement	Longitudinal	Front Pass. Frontal Airbag	Yes
Transmission Type	Automatic	Front Pass. Curtain Airbag	Yes
Transmission Speeds	6	Front Pass. Head/Torso Airbag	No
Overdrive	Yes	Front Pass. Torso Airbag	No
Final Drive	4-Wheel Drive	Front Pass. Torso/Pelvis Airbag	Yes
Roof Rack	No	Front Pass. Pelvis Airbag	No
Sunroof/T-Top	No	Front Pass. Knee Airbag	No
Running Boards	No	Driver Pretensioner	Yes
Tilt Steering Wheel	Yes	Driver Load Limiter	Yes
Power Seats	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?	Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Ford Motor Co.
Date of Manufacture	12/14

GVWR (kg)	2858
GAWR Front (kg)	1463
GAWR Rear (kg)	1497

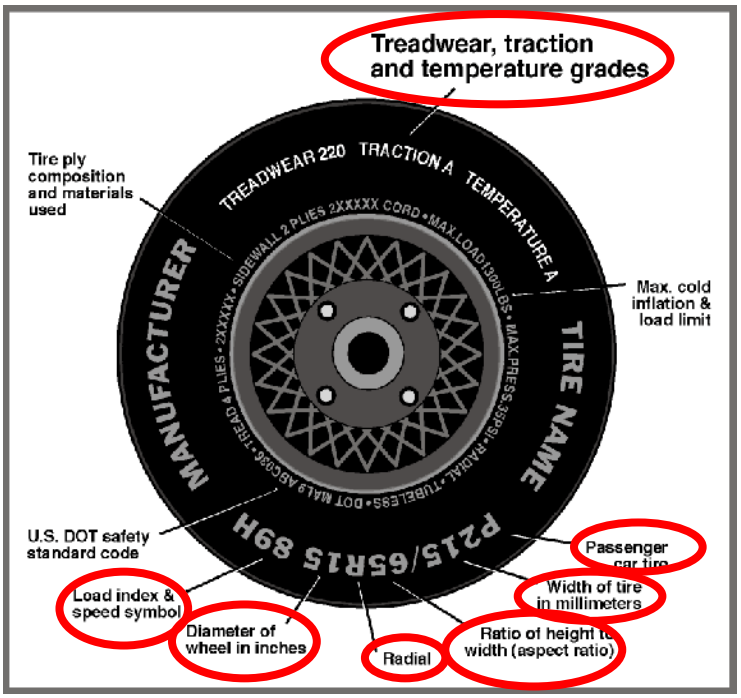
VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Split Bench		
Designated Seating Capacity (DSC)	3	3		6
Capacity Weight (VCW) (kg)				724
Cargo Weight (RCLW) (kg)				316

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

Test Vehicle: 2015 Ford F-150 SuperCab XL 4x4 Truck
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: M20150213
Test Date: 2/27/2015

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	240	240
Recommended Tire Size	265/70/R17	265/70/R17
Tire Size on Vehicle	265/70/R17	265/70/R17
Tire Manufacturer	Goodyear	Goodyear
Tire Model	Wrangler	Wrangler
Treadwear	680	680
Traction	A	A
Temperature Grade	B	B
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 2 Steel, 1 Polyamide	2 Polyester, 2 Steel, 1 Polyamide
Load Index/Speed Symbol	115T	115T
Tire Material	Rubber	Rubber
DOT Safety Code Left	4B1Y JE1R 4714	4B1Y JE1R 4714
DOT Safety Code Right	4B1Y JE1R 4714	4B1Y JE1R 4714

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

Test Vehicle: 2015 Ford F-150 SuperCab XL 4x4 Truck NHTSA No.: M20150213
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/27/2015

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	615.5	467.0		666.0	569.5	
Right	kg	653.0	415.0		643.0	542.0	
Ratio	%	59.0	41.0		54.1	45.9	
Totals	kg	1268.5	882.0	2150.5	1309.0	1111.5	2420.5

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	2150.5
Weight of 1 P572E ATD & 1 P572O ATD	kg	141
Rated Cargo/Luggage Weight (RCLW)	kg	136
Calculated Test Vehicle Target Weight (TVTW)	kg	2427.5

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	964	953	995	1033	1515
As Tested	mm	948	949	984	983	1696
Post Test	mm	875	885	1000	997	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	3694
Total Vehicle Length at Left Side	mm	5390
Total Vehicle Length at Centerline	mm	5886
Total Vehicle Length at Right Side	mm	5390
Weight of Ballast in Cargo Area	kg	48.1
Weight of Vehicle Components Removed	kg	0.0
Amount of Stoddard Solvent in Fuel Tank	L	126.8

List of components removed to meet test weight: None

List of components removed for instrumentation, data box, and equipment installation: None

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

Test Vehicle: 2015 Ford F-150 SuperCab XL 4x4 Truck NHTSA No.: M20150213
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/27/2015

TARGET VEHICLE STRUCTURAL MEASUREMENT

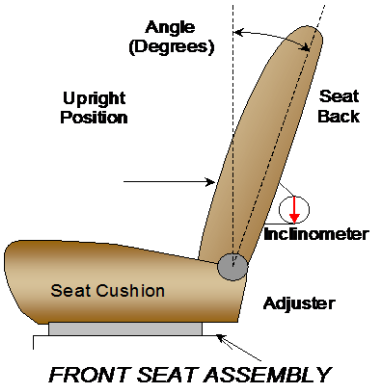
	Elements	Pre-Test (mm)
1	Total Length	5886
2	Total Width	2020
3	Bumper Top Height	680
4	Bumper Bottom Height	435
5	Longitudinal Member Top Height	630
6	Distance between Longitudinal Members	757
7	Longitudinal Member Width	90
8	Engine Top Height	1162
9	Engine Bottom Height	380
10	Engine and Gearbox Width	598
11	Front Bumper-Engine Distance	780
12	Front Shock Absorber Fixing Height	860
13	Bonnet Leading Edge Height	1160
14	Front Shock Absorber Fixing Width	1055
15	Front Bumper – Front Axle Distance	962
16	Front Axle – A-Pillar Distance	672
17	A-Pillar – B-Pillar Distance	1176
18	B-Pillar – Rear Axle Distance	1846
19	B-Pillar – C-Pillar Distance	659
20	Roof Sill Bottom Height	1813
21	Roof Sill Top Height	1873
22	Floor Sill Bottom Height	467
23	Floor Sill Top Height	554

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

Test Vehicle: 2015 Ford F-150 SuperCab XL 4x4 Truck
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: M20150213
Test Date: 2/27/2015

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 August 2013.



	Degrees
Driver Seat Back Angle	3.4° on headrest post
Passenger Seat Back Angle	-2.2° on headrest post

SEAT FORE/AFT POSITIONS

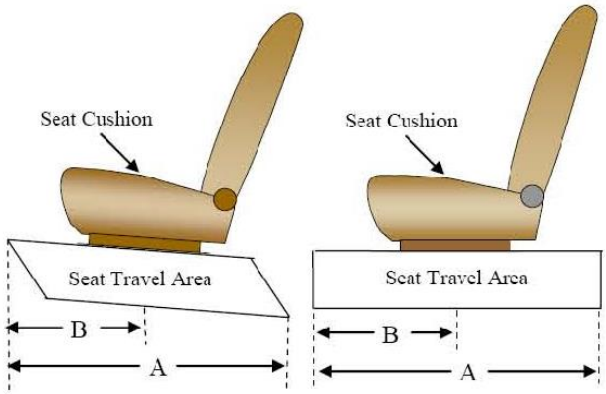
The driver and passenger seat fore/aft positions are adjusted following Appendix F, "Driver & Passenger Dummy Seating & Positioning Procedures" in the NCAP Test Procedure dated August 2013.

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	256 mm / 38 detents (1st as 1)	129 mm / 19th detent (1st as 0)
Passenger Seat	256 mm / 38 detents (1st as 1)	0 mm / 0th detent (1st 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 (1st as 1)	1 (1st as 0)
Passenger Seat	4 (1st as 1)	0 (1st as 0)



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

Test Vehicle: 2015 Ford F-150 SuperCab XL 4x4 Truck NHTSA No.: M20150213
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/27/2015

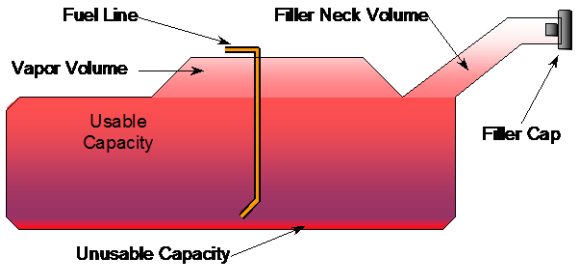
FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of "Standard Tank"	90.8
Usable Capacity of "Optional Tank"	136.3
92-94% of Usable Capacity	125.4 to 128.1
Actual Amount of Solvent used	126.8
1/3 of Usable Capacity	45.4

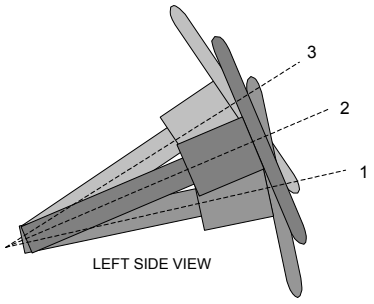
FUEL PUMP

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

The electric fuel pump operates for 3 seconds to pressurize the fuel system following the actuation of the ignition. If no attempt has been made to start the engine within 3 seconds following ignition actuation the fuel pump will shut off. The fuel pump operates continuously while the engine is running. If the engine stalls the fuel pump is deactivated. Also, the fuel pump is shut-off by the restraint control module to stop fuel flow to the engine if the vehicle sustains an impact above a certain magnitude



VEHICLE FUEL TANK ASSEMBLY



STEERING COLUMN ASSEMBLY

STEERING COLUMN ADJUSTMENT

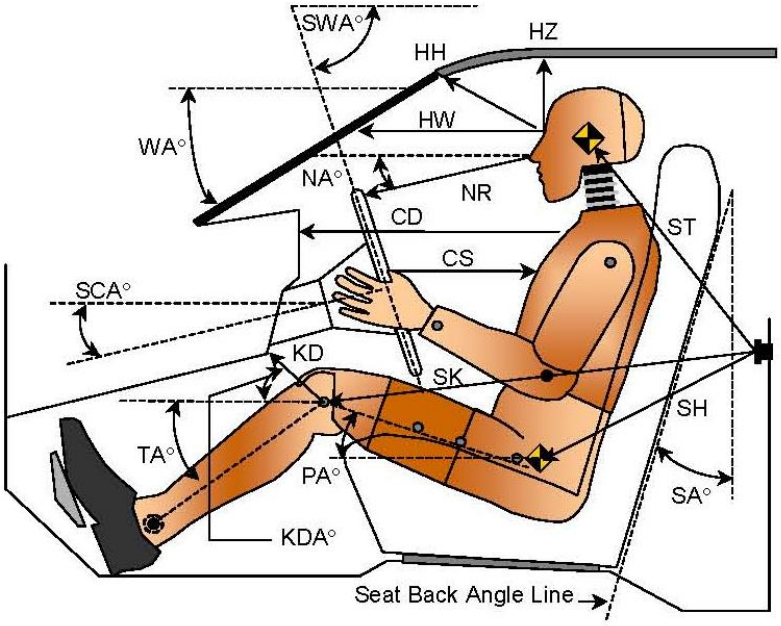
Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes when moved through its full range of motion. An aluminum plate is placed across the rim of the steering wheel, an inclinometer is placed on the plate and the angle is measured.

STEERING COLUMN POSITION

	Degrees	Fore/Aft Position (mm)
Lowermost Position 1	70.6	250
Geometric Center Position 2	68.6	270
Uppermost Position 3	66.6	290
Telescoping Steering Wheel Travel		40
Test Position	68.6	270

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2015 Ford F-150 SuperCab XL 4x4 Truck
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: M20150213
Test Date: 2/27/2015

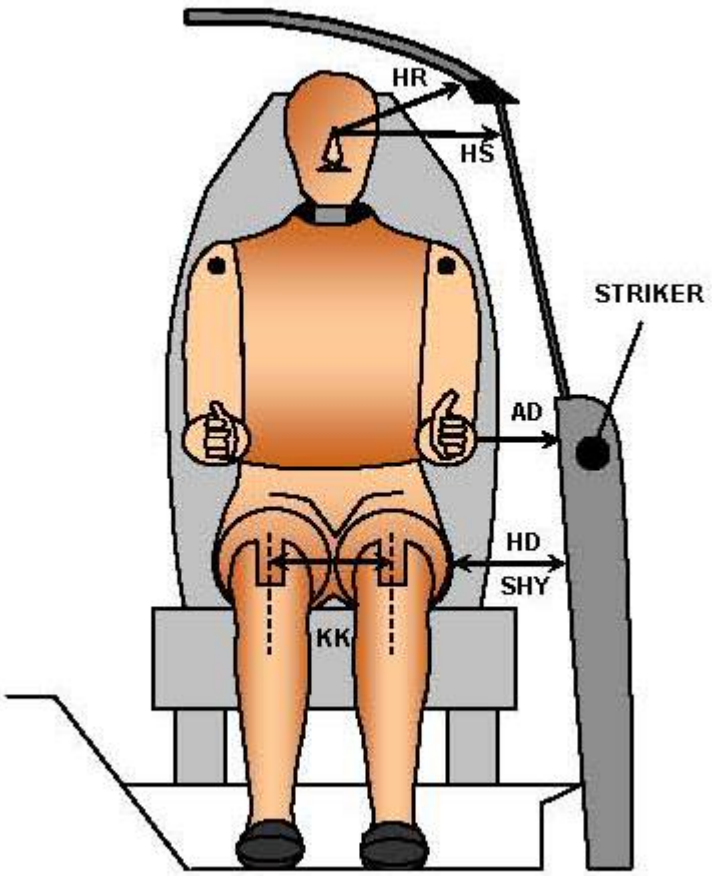


LEFT SIDE VIEW

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		32.0		
SWA°	Steering Wheel Angle		69.2		
SCA°	Steering Column Angle		20.8		
SA°	Seat Back Angle (on headrest post)		3.4		-2.2
HZ	Head to Roof (Z)	230	90	260	90
HH	Head to Header	468	19.3	369	34.7
HW	Head to Windshield	707	0.0	679	0.0
NR	Nose to Rim	428	14.2		
CD	Chest to Dash	595		430	
CS	Chest to Steering Hub	351	4.2		
RA	Rim to Abdomen	224	0.0		
KDL	Left Knee to Dash	188	24.7	80	19.9
KDR	Right Knee to Dash	165	25.1	85	26.4
PA°	Pelvic Angle		23.9		19.6
TA°	Tibia Angle		53.3		64.8
SK	Striker to Knee	680	84.5	759	89.0
ST	Striker to Head	611	20.3	628	129.9
SH	Striker to H-Point	306	102.4	459	6.5

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2015 Ford F-150 SuperCab XL 4x4 Truck
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: M20150213
Test Date: 2/27/2015

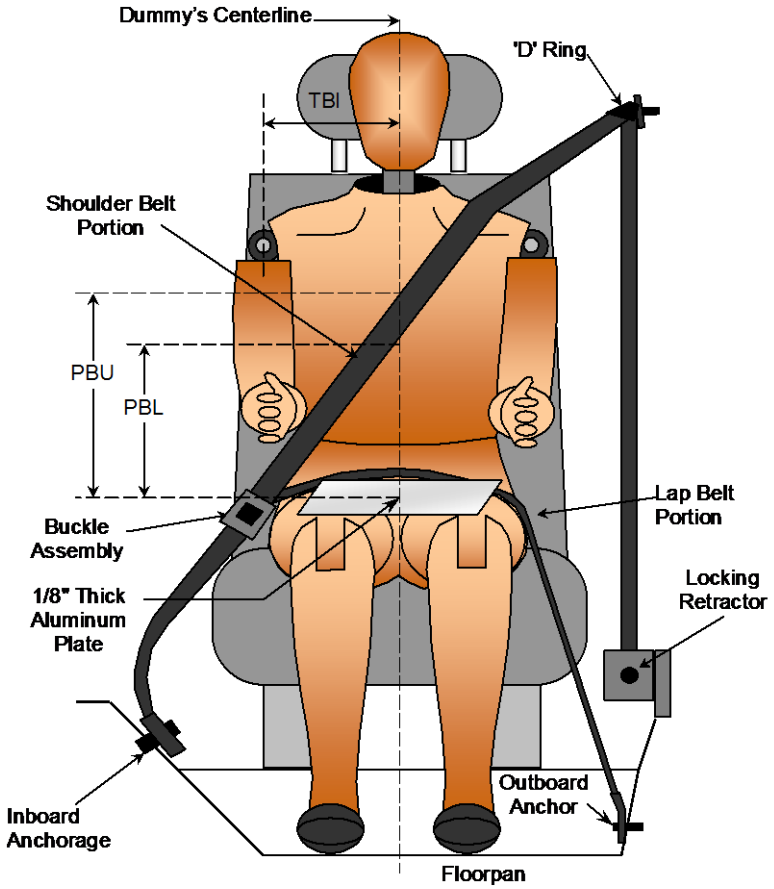


FRONT VIEW OF DUMMY

Code	Measurement Description	Driver	Passenger
		Length (mm)	
AD	Arm to Door	142	93
HD	H-Point to Door	150	189
HR	Head to Side Header	215	266
HS	Head to Side Window	342	362
KK	Knee to Knee	345	229
SHY	Striker to H-Point (Y Direction)	284	340
AA	Ankle to Ankle	305	174

DATA SHEET NO. 5
SEAT BELT POSITIONING DATA

Test Vehicle: 2015 Ford F-150 SuperCab XL 4x4 Truck
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: M20150213
Test Date: 2/27/2015



FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	370	310
PBL - Top surface of reference to belt lower edge	mm	290	220

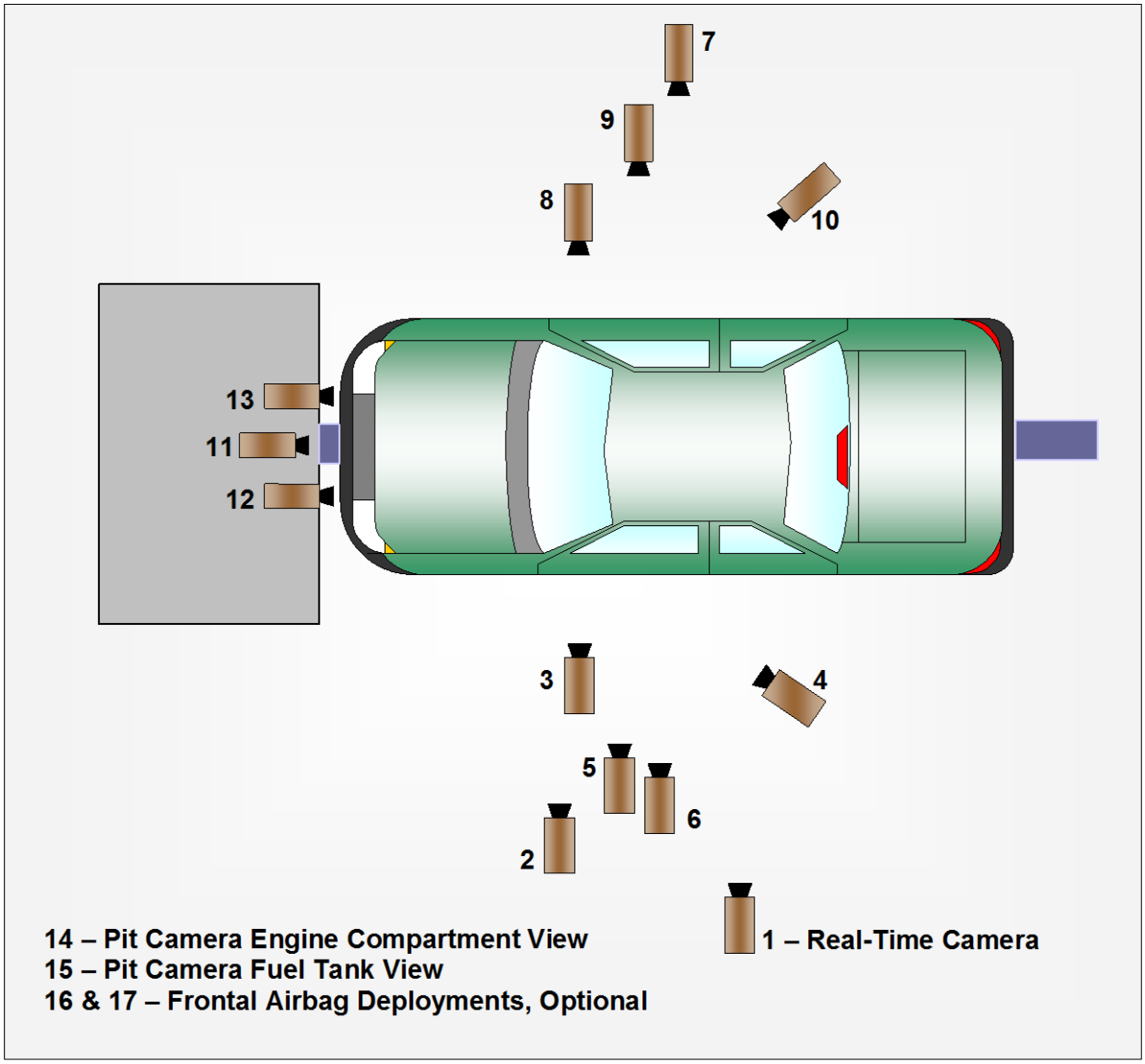
BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as measured on ATD	mm	850	945
Lap Belt Length as measured on ATD	mm	690	760
Remainder of belt on reel	mm	1030	815
Total Belt Length for Continuous Webbing Systems	mm	3270	3270

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

Test Vehicle:	2015 Ford F-150 SuperCab XL 4x4 Truck	NHTSA No.:	M20150213
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	2/27/2015

CAMERA POSITIONS FOR FRONTAL IMPACTS



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

Test Vehicle: 2015 Ford F-150 SuperCab XL 4x4 Truck NHTSA No.: M20150213
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/27/2015

CAMERA LOCATIONS

No.	Camera View	Coordinates (mm)			Lens (mm)	Speed (fps)
		X*	Y*	Z*		
1	Real-Time Left Overall					30
2	Driver Close-Up	-1690	-6420	-1850	35	1000
3	Left Front Half	-1240	-5610	-1180	24	1000
4	Left Angle	-6120	-5260	-1970	50	1000
5	Steering Column - Top					
6	Steering Column - Bottom					
7	Right Overall	-2630	6620	-1280	20	1000
8	Passenger Close-Up	-1650	6680	-1890	35	1000
9	Right Front Half	-1190	5530	-1250	24	1000
10	Right Angle	-6090	4970	-1910	50	1000
11	Windshield	430	0	-2810	20	1000
12	Driver Windshield	20	-450	-2030	8.5	1000
13	Passenger Windshield	20	450	-2030	8.5	1000
14	Pit Front	-1170	0	3150	24	1000
15	Pit Rear	-3210	0	3150	24	1000
16	Onboard Driver Side				12	1000
17	Onboard Passenger Side				12	1000
18	Real-Time Pan View					30

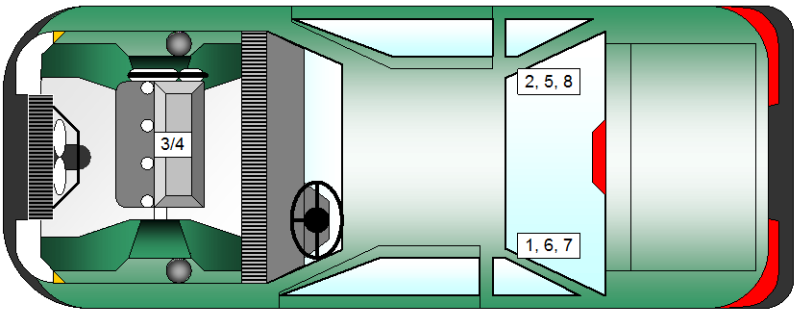
*COORDINATES:

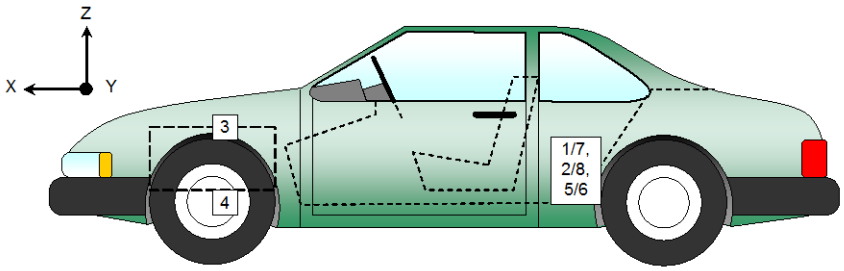
+X = forward of impact plane
+Y = right of monorail centerline
+Z = below ground level

Cameras 5 & 6 were not used for this test.

DATA SHEET NO. 7
VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2015 Ford F-150 SuperCab XL 4x4 Truck
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: M20150213
Test Date: 2/27/2015





VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Crossmember Accelerometer – X Direction	2615	-455	-724
2	Right Rear Crossmember Accelerometer – X Direction	2621	473	-724
3	Engine Top X	4889	60	-1152
4	Engine Bottom X	4787	30	-376
5	Left Rear Crossmember Accelerometer – Z Direction	2615	-485	-724
6	Right Rear Crossmember Accelerometer – Z Direction	2621	520	-724
7	Left Rear Crossmember Accelerometer Redundant – X Direction	2615	-485	-724
8	Right Rear Crossmember Accelerometer Redundant – X Direction	2621	520	-724

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

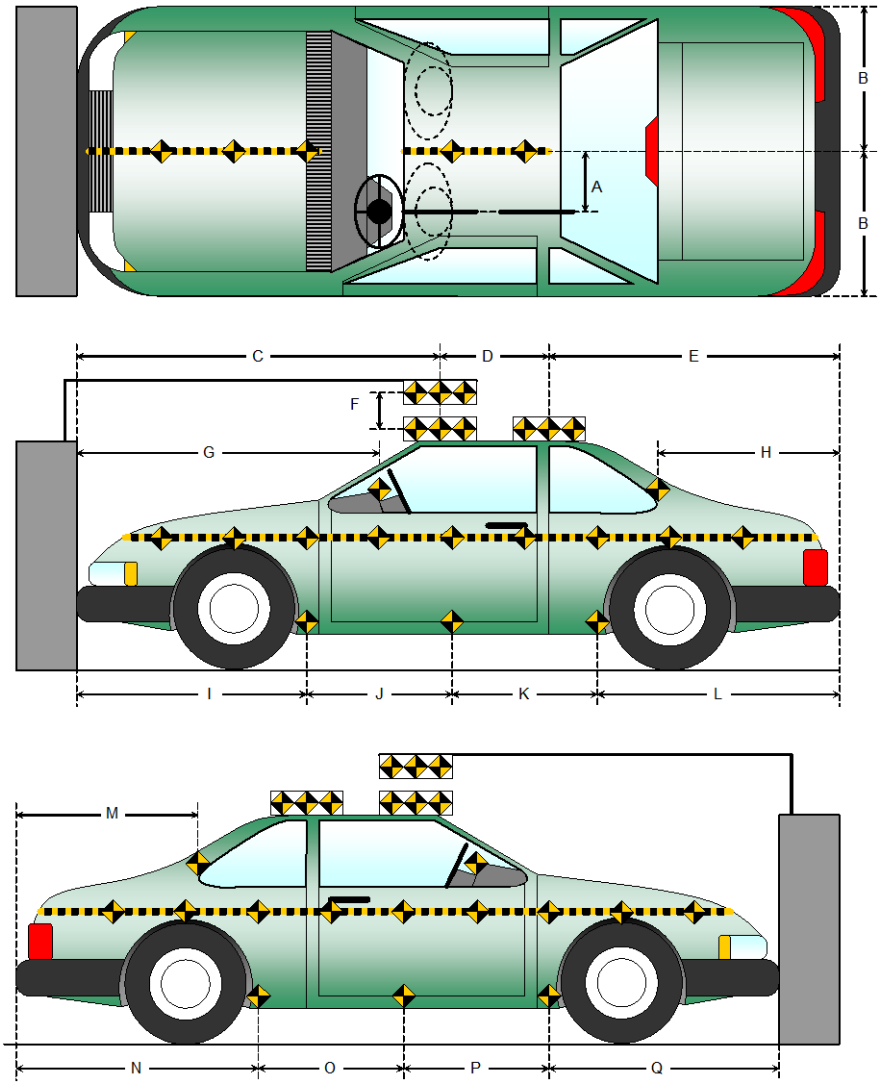
DATA SHEET NO. 8

PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2015 Ford F-150 SuperCab XL 4x4 Truck
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20150213
Test Date: 2/27/2015

Item	Value (mm)
A	475
B	1010
C	2560
D	610
E	2716
F	125
G	
H	2417
I	1510
J	1299
K	1299
L	1778
M	2417
N	1778
O	1299
P	1299
Q	1510



DATA SHEET NO. 9
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2015 Ford F-150 SuperCab XL 4x4 Truck
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: M20150213
Test Date: 2/27/2015

Advanced Research Load Cell Barrier

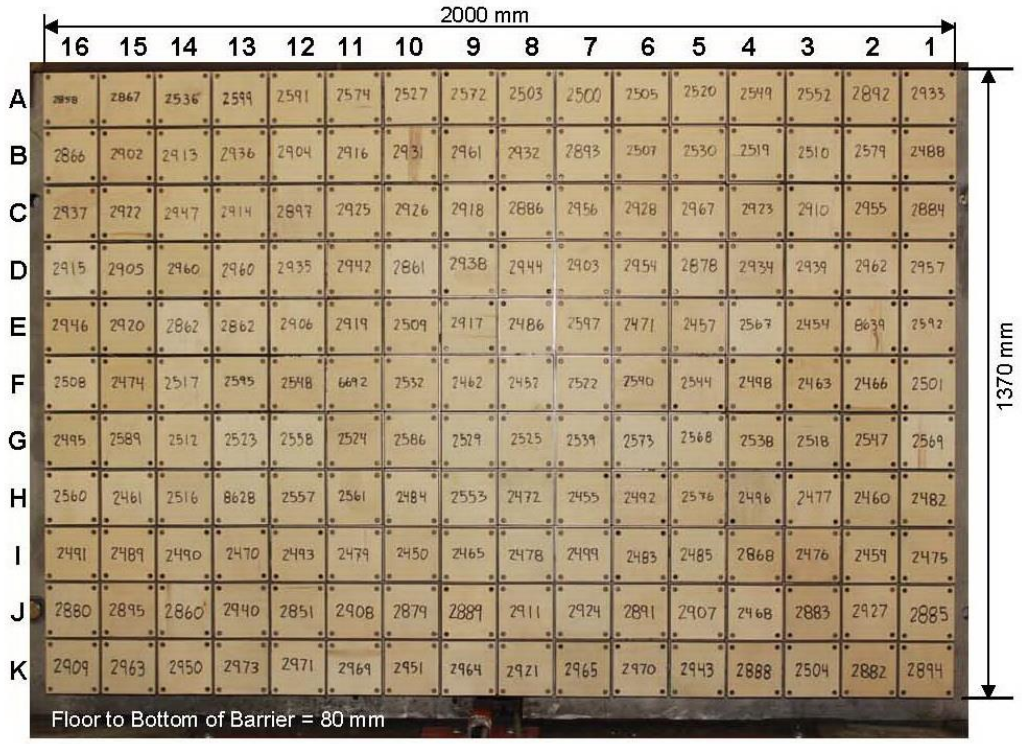


Photo for Reference Only

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: 2015 Ford F-150 SuperCab XL 4x4 Truck NHTSA No.: M20150213
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/27/2015

INSTRUMENTATION

Driver Dummy Data Channels	46
Passenger Dummy Data Channels	49
Vehicle Structure Accelerometers	8
Barrier Channels	528
Total	631

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: 2015 Ford F-150 SuperCab XL 4x4 Truck
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: M20150213
Test Date: 2/27/2015

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

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

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Passenger
Locked/Unlocked Doors	Doors were unlocked	Doors were unlocked
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

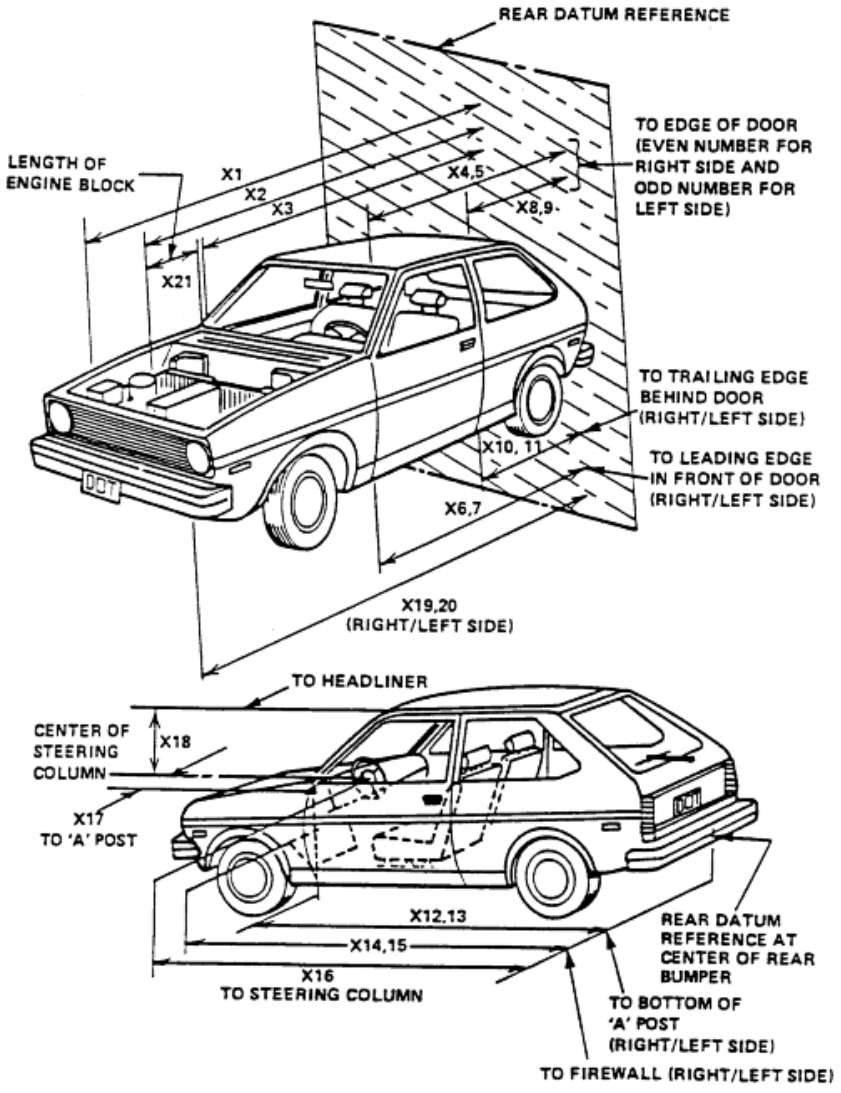
Measured Parameter	Units	Value
Left Side	mm	635
Center	mm	635
Right Side	mm	632
Average	mm	634

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	No	Yes	No
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:	2015 Ford F-150 SuperCab XL 4x4 Truck	NHTSA No.:	M20150213
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	2/27/2015



DATA SHEET NO. 12 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2015 Ford F-150 SuperCab XL 4x4 Truck NHTSA No.: M20150213
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/27/2015

RSOV (Rear Surface of Vehicle)

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	mm	5886	5258	628
2	RSOV to Front of Engine	mm	5035	4916	119
3	RSOV to Firewall	mm	4725	4723	2
4	RSOV to Upper Leading Edge of Right Door	mm	4294	4289	5
5	RSOV to Upper Leading Edge of Left Door	mm	4294	4280	14
6	RSOV to Lower Leading Edge of Right Door	mm	4254	4254	0
7	RSOV to Lower Leading Edge of Left Door	mm	4254	4245	9
8	RSOV to Upper Trailing Edge of Right Door	mm	3076	3067	9
9	RSOV to Upper Trailing Edge of Left Door	mm	3076	3067	9
10	RSOV to Lower Trailing Edge of Right Door	mm	3058	3054	4
11	RSOV to Lower Trailing Edge of Left Door	mm	3058	3050	8
12	RSOV to Bottom of “A” Post of Right Side	mm	4252	4250	2
13	RSOV to Bottom of “A” Post of Left Side	mm	4252	4247	5
14	RSOV to Firewall, Right Side	mm	4611	4606	5
15	RSOV to Firewall, Left Side	mm	4611	4601	10
16	RSOV to Steering Column	mm	3806	3856	-50
17	Center of Steering Column to “A” Post	mm	410	428	-18
18	Center of Steering Column to Headliner	mm	455	502	-47
19	RSOV to Right Side of Front Bumper	mm	5390	5053	337
20	RSOV to Left Side of Front Bumper	mm	5390	5056	334
21	Length of Engine Block	mm	540	540	0
RD	RSOV to Right Side of Dash Panel	mm	4036	4038	-2
CD	RSOV to Center of Dash Panel	mm	4041	4026	15
LD	RSOV to Left Side of Dash Panel	mm	4048	4032	16

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

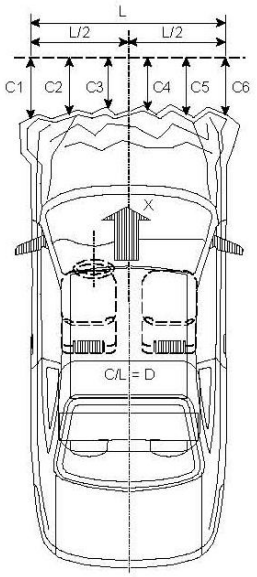
Test Vehicle: 2015 Ford F-150 SuperCab XL 4x4 Truck NHTSA No.: M20150213
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/27/2015

VEHICLE INFORMATION

VIN: 1FTEX1E80FFA23385 Wheelbase (mm): 3694
Vehicle Size Category: Truck Test Weight (kg): 2420.5

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): 56.4
Velocity Change (km/h): 66.0
Time of Separation (msec): 116.3



CRUSH PROFILE

Collision Deformation Classification: Frontal
Midpoint of Damage: Centerline
Damage Region Length (mm): 2380
Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	5390	5056	334
C2	Crush zone 2 at left side	mm	5690	5258	432
C3	Crush zone 3 at left side	mm	5850	5274	576
C4	Crush zone 4 at right side	mm	5850	5281	569
C5	Crush zone 5 at right side	mm	5690	5257	433
C6	Crush zone 6 at right side	mm	5390	5056	334
L	C1 TO C6	mm	2380	2345	35

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

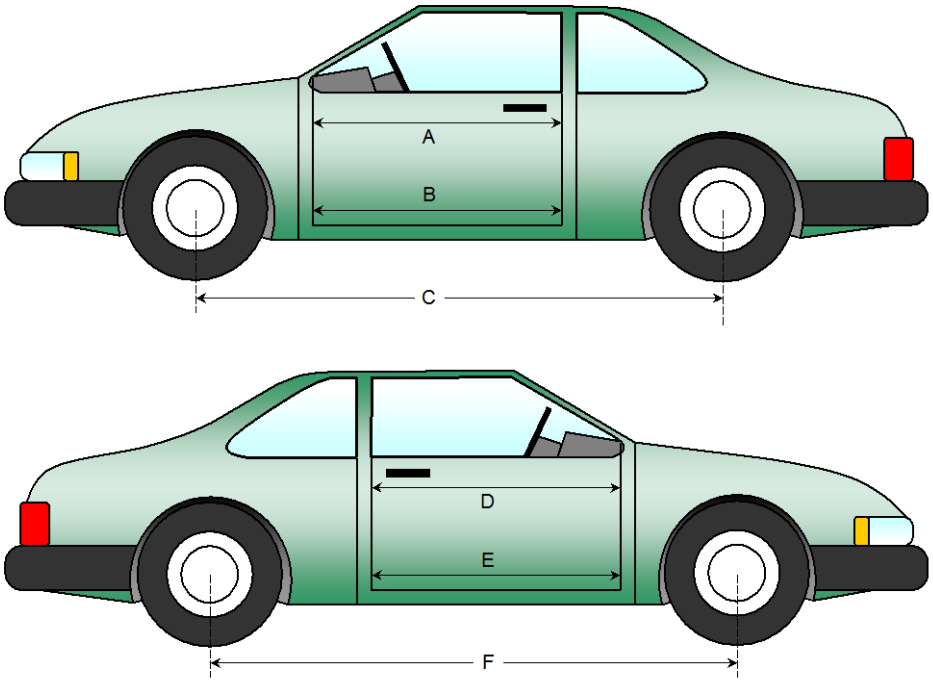
Test Vehicle: 2015 Ford F-150 SuperCab XL 4x4 Truck
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: M20150213
Test Date: 2/27/2015

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1108	1098	10
B	Left Side Lower	mm	1040	1035	5
D	Right Side Upper	mm	1108	1100	8
E	Right Side Lower	mm	1040	1034	6

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	3694	3530	164
F	Right Side Wheelbase	mm	3694	3547	147



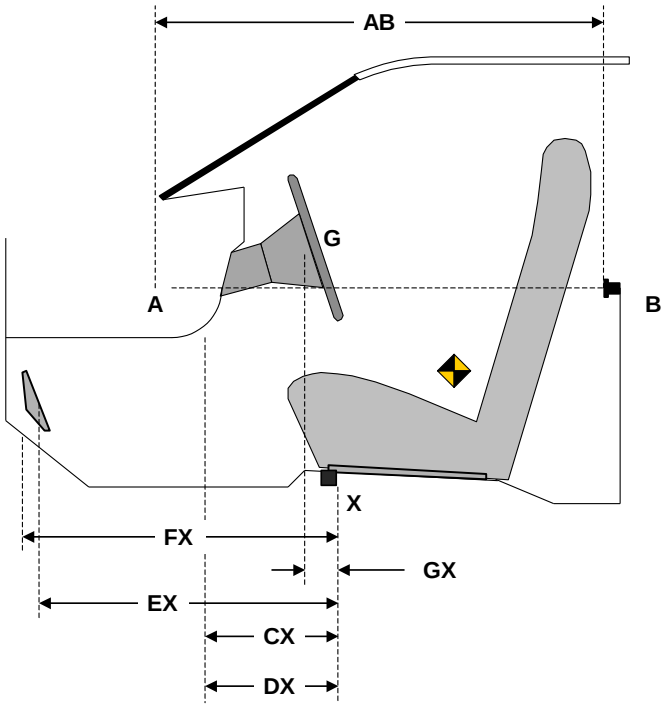
DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2015 Ford F-150 SuperCab XL 4x4 Truck
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: M20150213
Test Date: 2/27/2015

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	845	845	0
CX	Left Knee Bolster to X	mm	282	267	15
DX	Right Knee Bolster to X	mm	285	256	29
EX	Brake Pedal to X	mm	544	513	31
FX	Foot Rest to X	mm	566	550	16
GX	Center of Steering Column Wheel Hub to X	mm	80	127	-47

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: 2015 Ford F-150 SuperCab XL 4x4 Truck
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: M20150213
Test Date: 2/27/2015

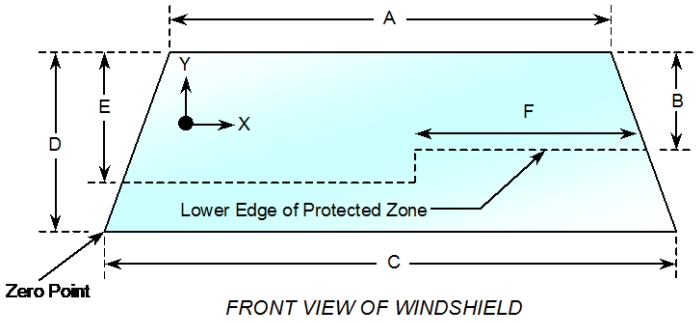
Windshield Mounting Details:
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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: 21.0° C.

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2409	2409	100
Right Side	2409	2409	100
Total	4818	4818	100



FRONT VIEW OF WINDSHIELD

Item	Units	Value
A	mm	1494
B	mm	466
C	mm	1768
D	mm	778
E	mm	534
F	mm	536

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: 2015 Ford F-150 SuperCab XL 4x4 Truck NHTSA No.: M20150213
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/27/2015

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

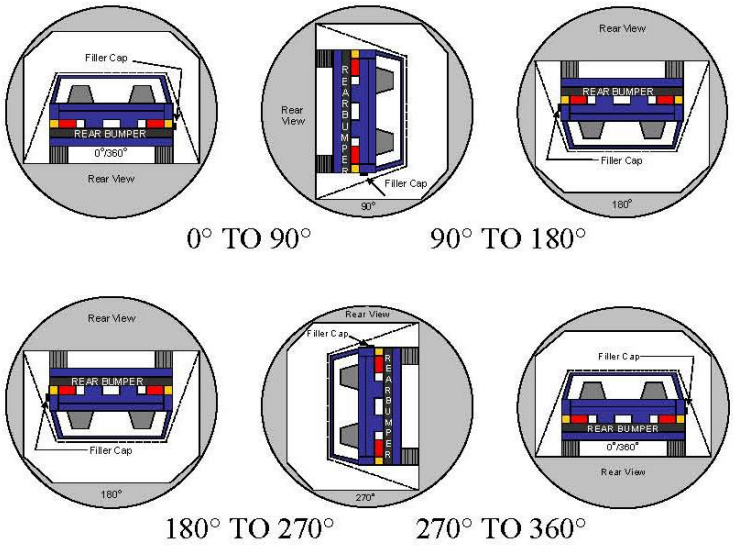
Temperature at Time of Impact: 20.8°C Test Time: 10:30 a.m.

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: 2015 Ford F-150 SuperCab XL 4x4 Truck
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: M20150213
Test Date: 2/27/2015

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°	150	300	450
90° to 180°	134	300	434
180° to 270°	120	300	420
270° to 360°	139	300	439

FMVSS 301 SPILLAGE TABLE (units in ounces)

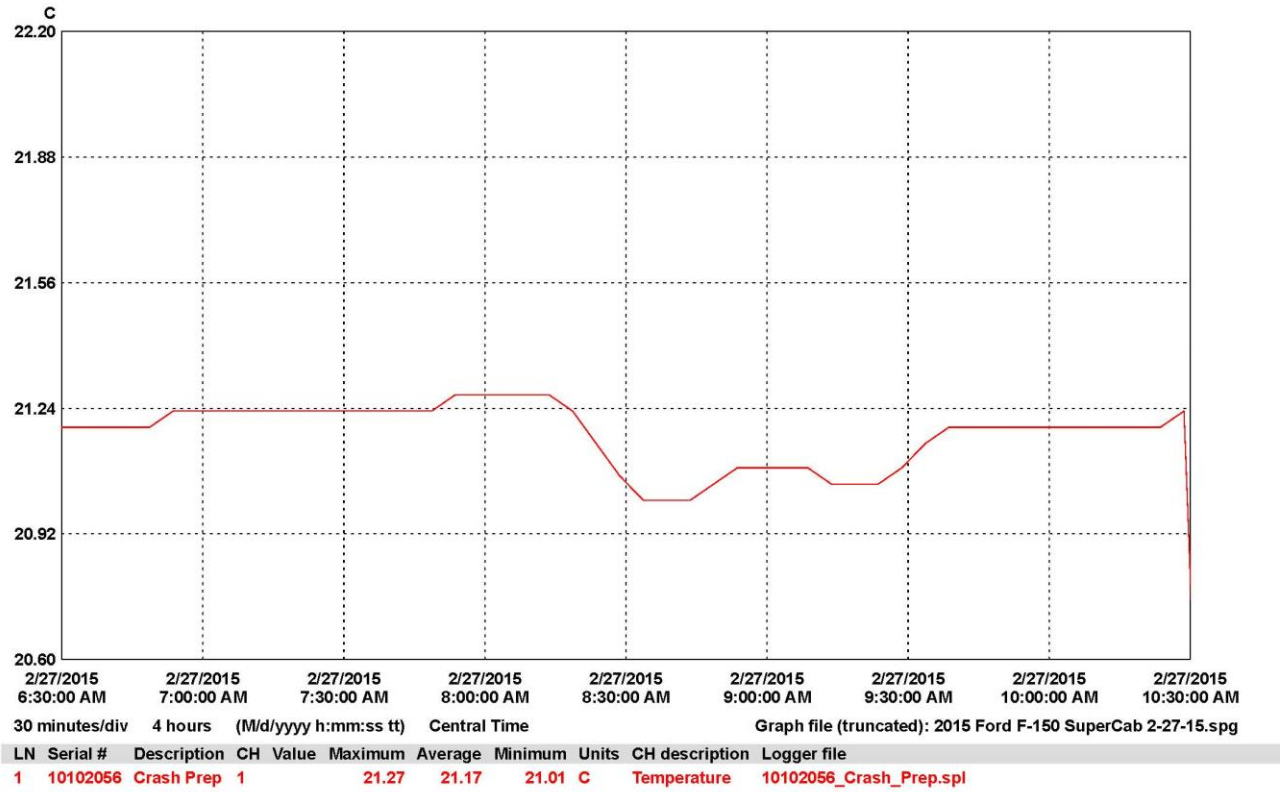
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eight Minute
0° to 90°	0	0	0	0
90° to 180°	0	0	0	0
180° to 270°	0	0	0	0
270° to 360°	0	0	0	0

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: 2015 Ford F-150 SuperCab XL 4x4 Truck NHTSA No.: M20150213
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/27/2015



LN	Serial #	Description	CH	Value	Maximum	Average	Minimum	Units	CH description	Logger file
1	10102056	Crash Prep	1		21.27	21.17	21.01	C	Temperature	10102056_Crash_Prep.spl

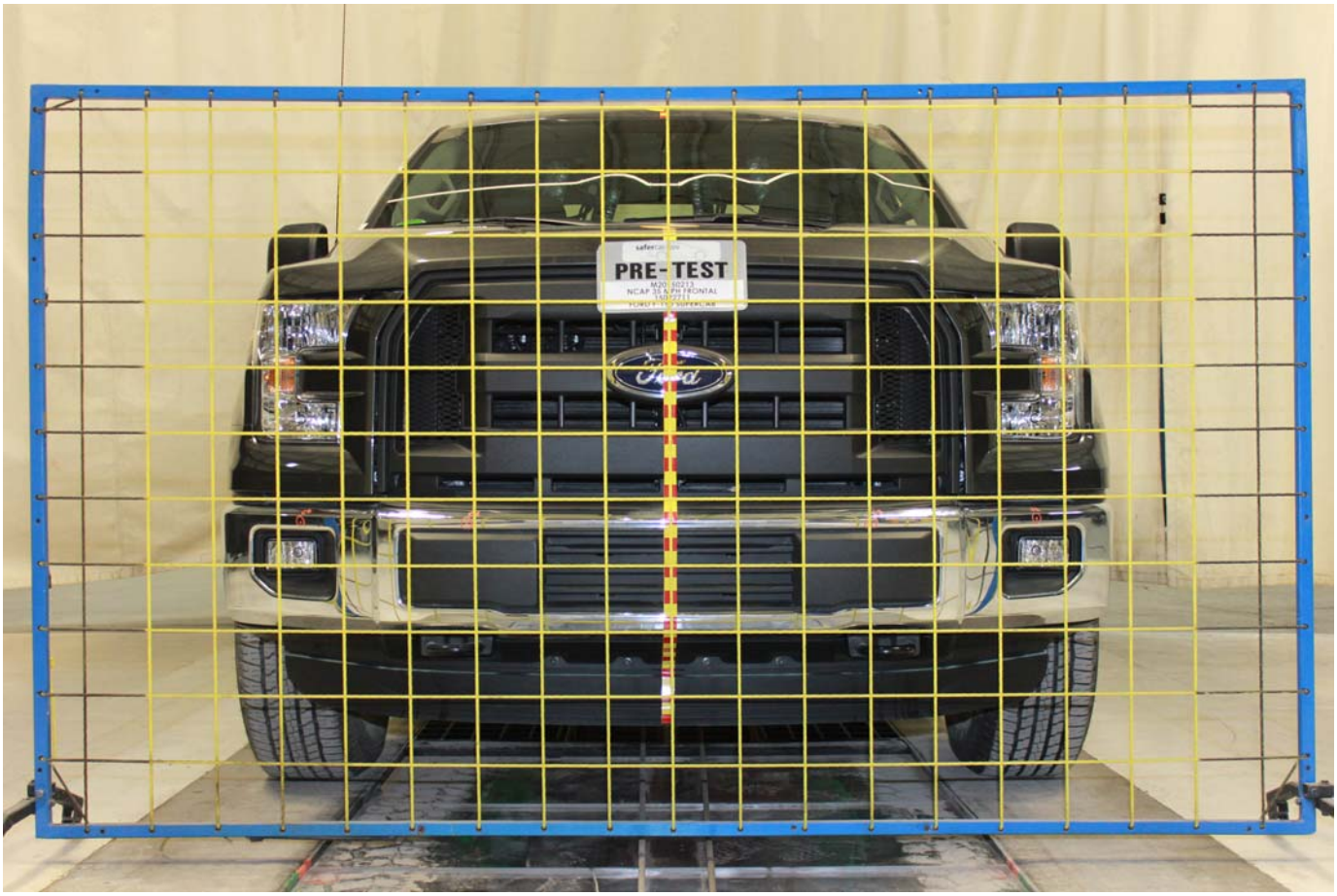
APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

		Page No.
Photo No. 1.	Load Cell Location	A-1
Photo No. 2.	Load Cell Wall	A-1
Photo No. 3.	Manufacturer's Label	A-2
Photo No. 4.	Tire Placard	A-2
Photo No. 5.	2015 Ford F-150 SuperCab 4x4 Frontal As Delivered	A-3
Photo No. 6.	Left Rear 3-4 View, As Received	A-3
Photo No. 7.	Pre-Test Front View of Test Vehicle	A-4
Photo No. 8.	Post-Test Front View of Test Vehicle	A-4
Photo No. 9.	Pre-Test Left View of Test Vehicle	A-5
Photo No. 10.	Post-Test Left View of Test Vehicle	A-5
Photo No. 11.	Pre-Test Right View of Test Vehicle	A-6
Photo No. 12.	Post-Test Right View of Test Vehicle	A-6
Photo No. 13.	Pre-Test Right Front 3-4 View	A-7
Photo No. 14.	Post-Test Right Front 3-4 View	A-7
Photo No. 15.	Pre-Test Left Rear 3-4 View	A-8
Photo No. 16.	Post-Test Left Rear 3-4 View	A-8
Photo No. 17.	Pre-Test Windshield View	A-9
Photo No. 18.	Post-Test Windshield View	A-9
Photo No. 19.	Pre-Test Engine Compartment View	A-10
Photo No. 20.	Post-Test Engine Compartment View	A-10
Photo No. 21.	Pre-Test Fuel Filler Cap View	A-11
Photo No. 22.	Post-Test Fuel Filler Cap View	A-11
Photo No. 23.	Pre-Test Front Underbody View	A-12
Photo No. 24.	Post-Test Front Underbody View	A-12
Photo No. 25.	Pre-Test Mid Front Underbody View	A-13
Photo No. 26.	Post-Test Mid Front Underbody View	A-13
Photo No. 27.	Pre-Test Mid Rear Underbody View	A-14
Photo No. 28.	Post-Test Mid Rear Underbody View	A-14
Photo No. 29.	Pre-Test Rear Underbody View	A-15
Photo No. 30.	Post-Test Rear Underbody View	A-15

		Page No.
Photo No. 31.	Pre-Test Dummy Cable Routing	A-16
Photo No. 32.	Post-Test Dummy Cable Routing	A-16
Photo No. 33.	Pre-Test Driver Dummy Front View	A-17
Photo No. 34.	Post-Test Driver Dummy Front View	A-17
Photo No. 35.	Pre-Test Driver Dummy Window View	A-18
Photo No. 36.	Post-Test Driver Dummy Window View	A-18
Photo No. 37.	Pre-Test Driver Dummy and Vehicle Interior (Door Open)	A-19
Photo No. 38.	Post-Test Driver Dummy and Vehicle Interior (Door Open)	A-19
Photo No. 39.	Pre-Test Driver's Seat Fore-Aft Markings	A-20
Photo No. 40.	Post-Test Driver's Seat Fore-Aft Markings	A-20
Photo No. 41.	Pre-Test View of Belt Anchorage for Driver Dummy	A-21
Photo No. 42.	Post-Test View of Belt Anchorage for Driver Dummy	A-21
Photo No. 43.	Pre-Test Driver Dummy Feet	A-22
Photo No. 44.	Post-Test Driver Dummy Feet	A-22
Photo No. 45.	Pre-Test Driver's Side Knee Bolster (without dummy)	A-23
Photo No. 46.	Post-Test Driver's Side Knee Bolster (without dummy)	A-23
Photo No. 47.	Pre-Test Driver's Side Floorpan	A-24
Photo No. 48.	Post-Test Driver's Side Floorpan	A-24
Photo No. 49.	Post-Test Driver Dummy Face	A-25
Photo No. 50.	Post-Test Driver Dummy Contact with Airbag	A-25
Photo No. 51.	Post-Test Driver Dummy Contact with Headrest	A-26
Photo No. 52.	Post-Test Driver Dummy Contact with Knee Bolster	A-26
Photo No. 53.	Pre-Test View of the Steering Wheel	A-27
Photo No. 54.	Post-Test View of the Steering Wheel	A-27
Photo No. 55.	Pre-Test Passenger Dummy Front View	A-28
Photo No. 56.	Post-Test Passenger Dummy Front View	A-28
Photo No. 57.	Pre-Test Passenger Dummy Window View	A-29
Photo No. 58.	Post-Test Passenger Dummy Window View	A-29
Photo No. 59.	Pre-Test Passenger Dummy and Vehicle Interior (Door Open)	A-30
Photo No. 60.	Post-Test Passenger Dummy and Vehicle Interior (Door Open)	A-30

		Page No.
Photo No. 61.	Pre-Test Passenger's Seat Fore-Aft Markings	A-31
Photo No. 62.	Post-Test Passenger's Seat Fore-Aft Markings	A-31
Photo No. 63.	Pre-Test View of Belt Anchorage for Passenger Dummy	A-32
Photo No. 64.	Post-Test View of Belt Anchorage for Passenger Dummy	A-32
Photo No. 65.	Pre-Test Passenger Dummy Feet	A-33
Photo No. 66.	Post-Test Passenger Dummy Feet	A-33
Photo No. 67.	Pre-Test Passenger's Side Knee Bolster (without dummy)	A-34
Photo No. 68.	Post-Test Passenger's Side Knee Bolster (without dummy)	A-34
Photo No. 69.	Pre-Test Passenger's Side Floorpan	A-35
Photo No. 70.	Post-Test Passenger's Side Floorpan	A-35
Photo No. 71.	Post-Test Passenger Dummy Face	A-36
Photo No. 72.	Post-Test Passenger Dummy Contact with Airbag	A-36
Photo No. 73.	Post-Test Passenger Dummy Contact with Headrest	A-37
Photo No. 74.	Post-Test Passenger Dummy Contact with Glovebox	A-37
Photo No. 75.	Ballast Installed in Vehicle	A-38
Photo No. 75a.	Ballast Installed in Vehicle	A-38
Photo No. 76.	Post-Test Stoddard Solvent Spillage Location View	A-39
Photo No. 77.	Post-Test Speed Trap Read-Out	A-39
Photo No. 78.	Vehicle at 0 Degree on Static Rollover Device	A-40
Photo No. 79.	Vehicle at 90 Degrees on Static Rollover Device	A-40
Photo No. 80.	Vehicle at 180 Degrees on Static Rollover Device	A-41
Photo No. 81.	Vehicle at 270 Degrees on Static Rollover Device	A-41
Photo No. 82.	Vehicle at 360 Degrees on Static Rollover Device	A-42
Photo No. 83.	2015 Ford F-150 SuperCab 4x4 Frontal Impact Event	A-42
Photo No. 84.	Monroney Label Photograph	A-43



No. 001 Load Cell Location

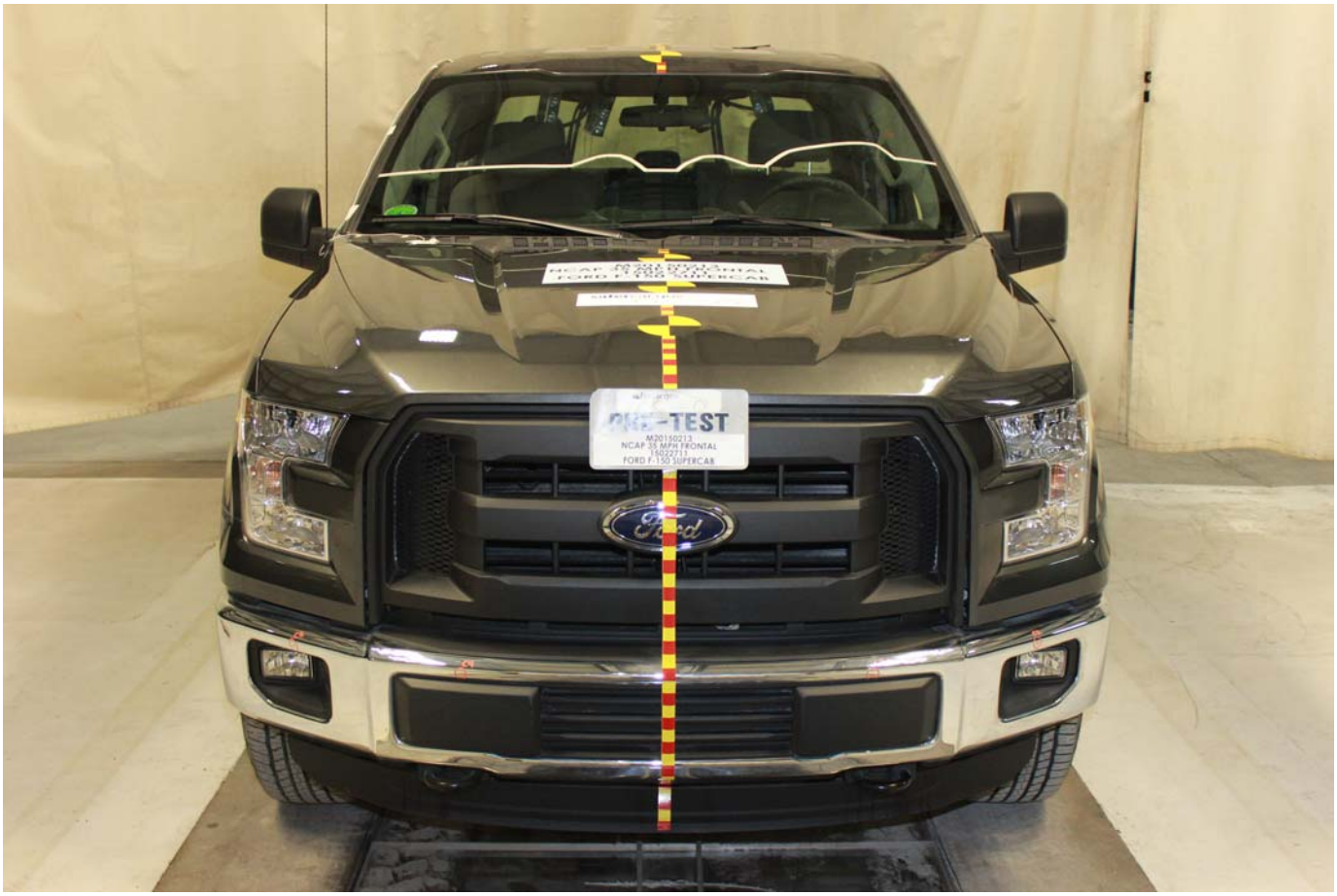
No. 002 Load Cell Wall

No. 003 Manufacturer's Label

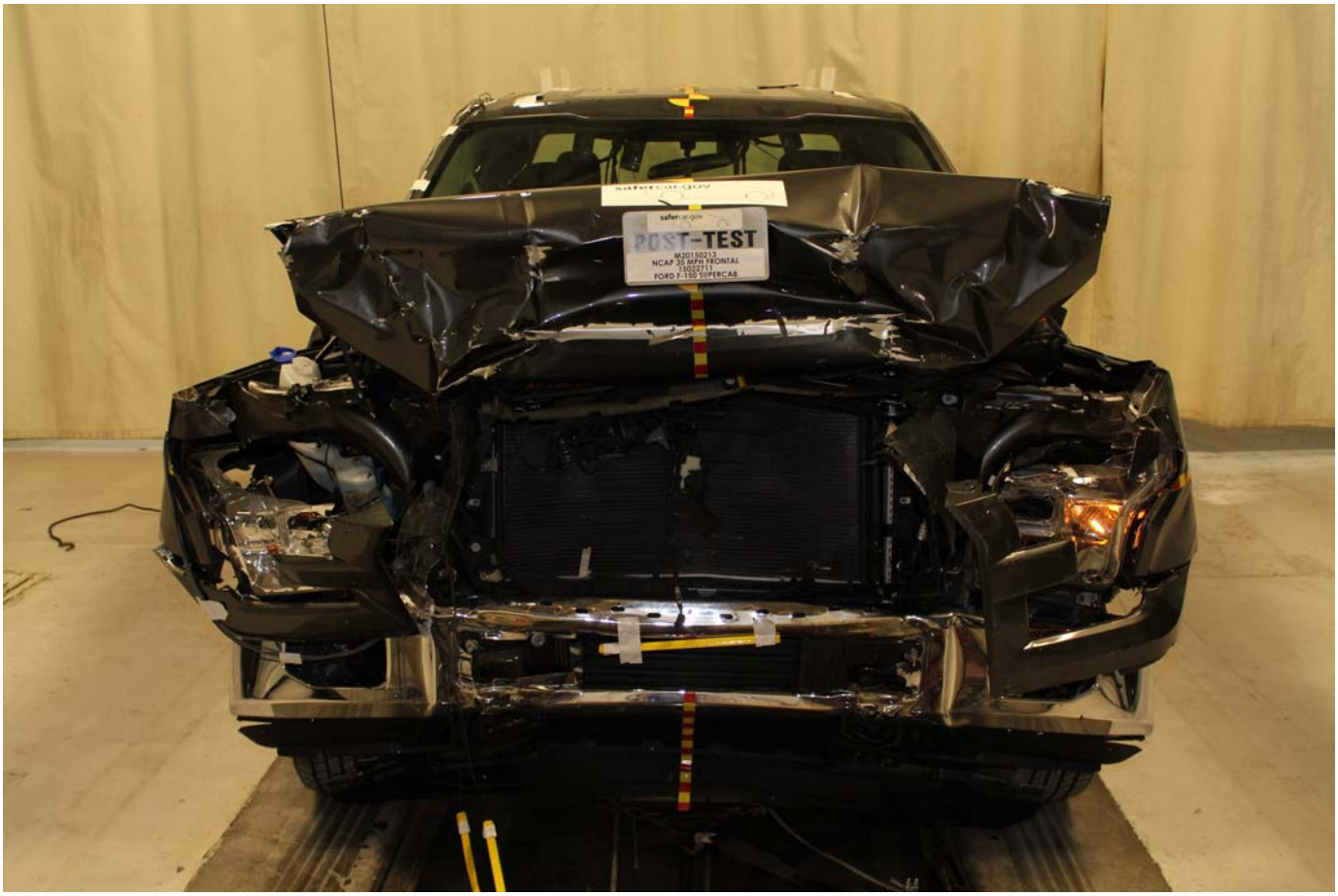
No. 004 Tire Placard

No. 005 2015 Ford F-150 SuperCab 4x4 Frontal As Delivered

No. 006 Left Rear 3-4 View, As Received



No. 007 Pre-Test Front View of Test Vehicle



No. 008 Post-Test Front View of Test Vehicle

No. 009 Pre-Test Left View of Test Vehicle

No. 010 Post-Test Left View of Test Vehicle

No. 011 Pre-Test Right View of Test Vehicle

No. 012 Post-Test Right View of Test Vehicle

No. 013 Pre-Test Right Front 3-4 View

No. 014 Post-Test Right Front 3-4 View

No. 015 Pre-Test Left Rear 3-4 View

No. 016 Post-Test Left Rear 3-4 View

No. 017 Pre-Test Windshield View

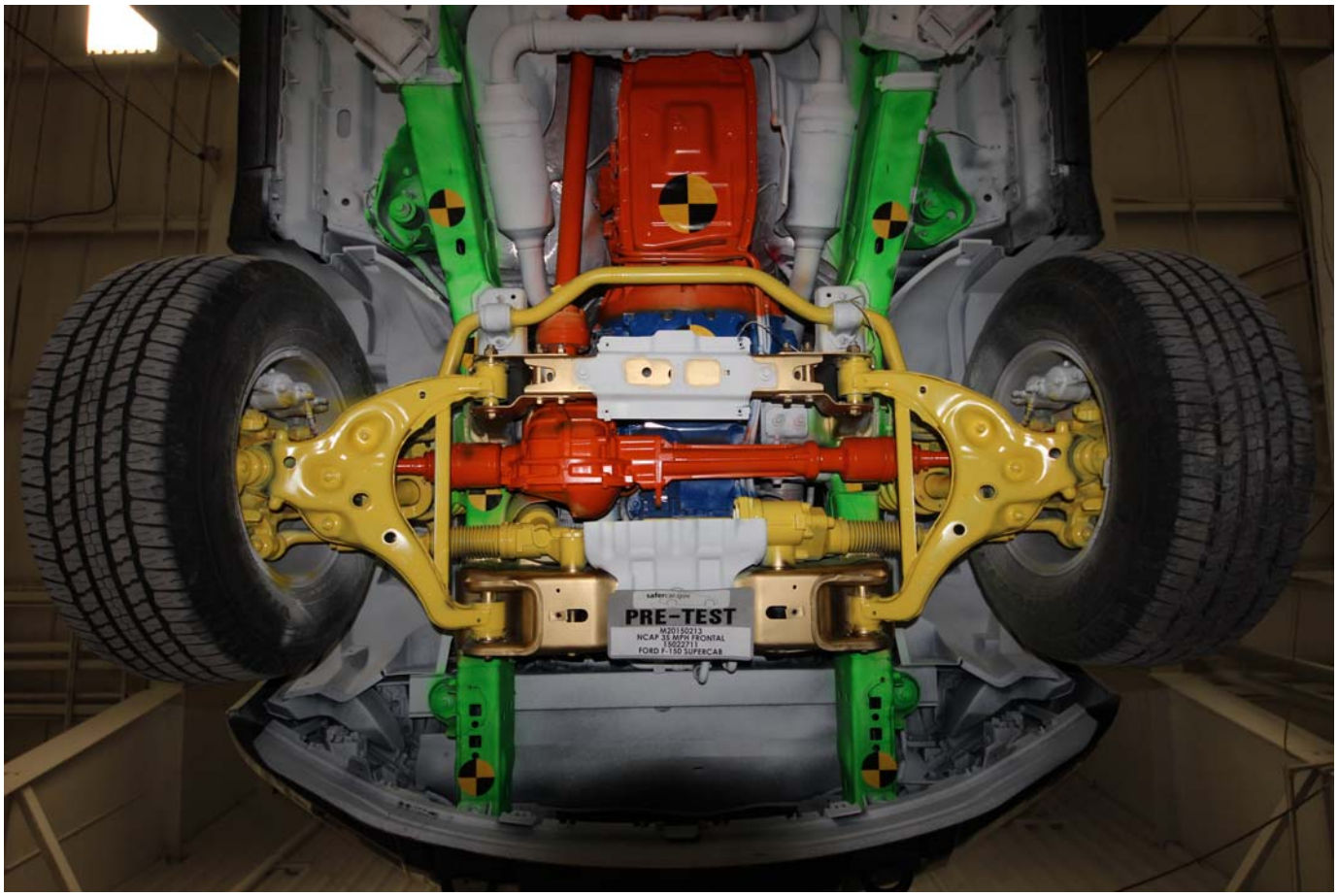
No. 018 Post-Test Windshield View

No. 019 Pre-Test Engine Compartment View

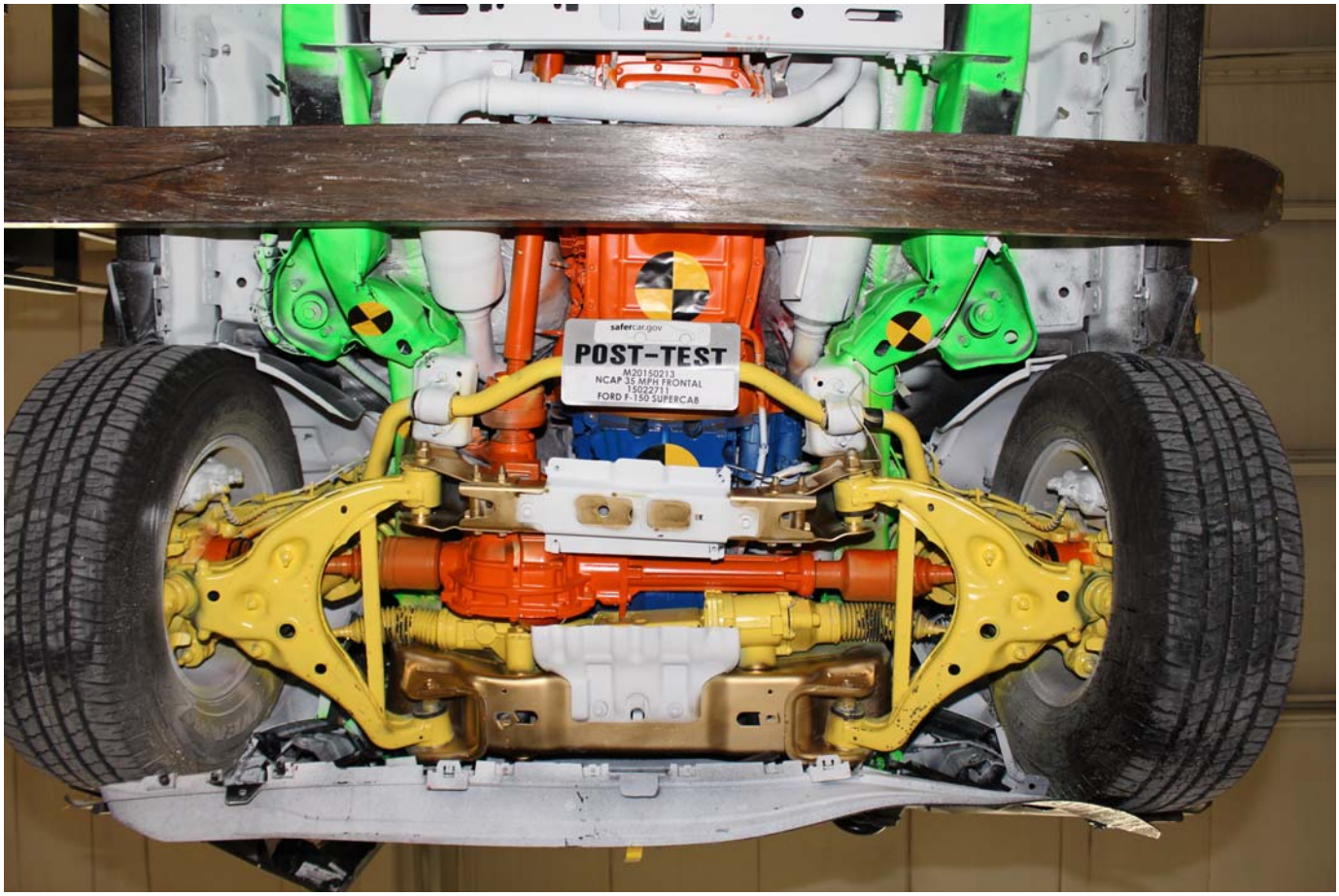
No. 020 Post-Test Engine Compartment View

No. 021 Pre-Test Fuel Filler Cap View

No. 022 Post-Test Fuel Filler Cap View

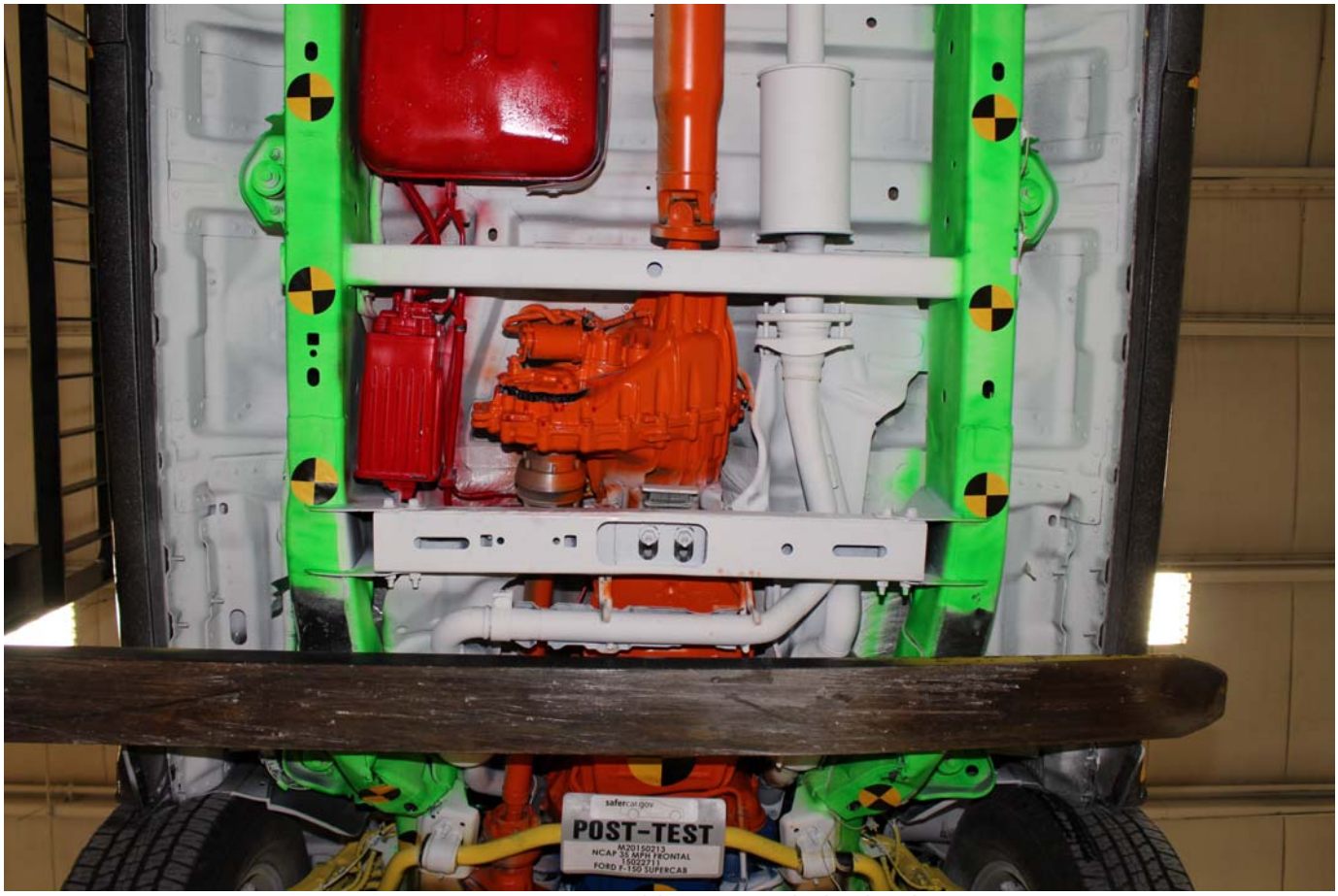


No. 023 Pre-Test Front Underbody View

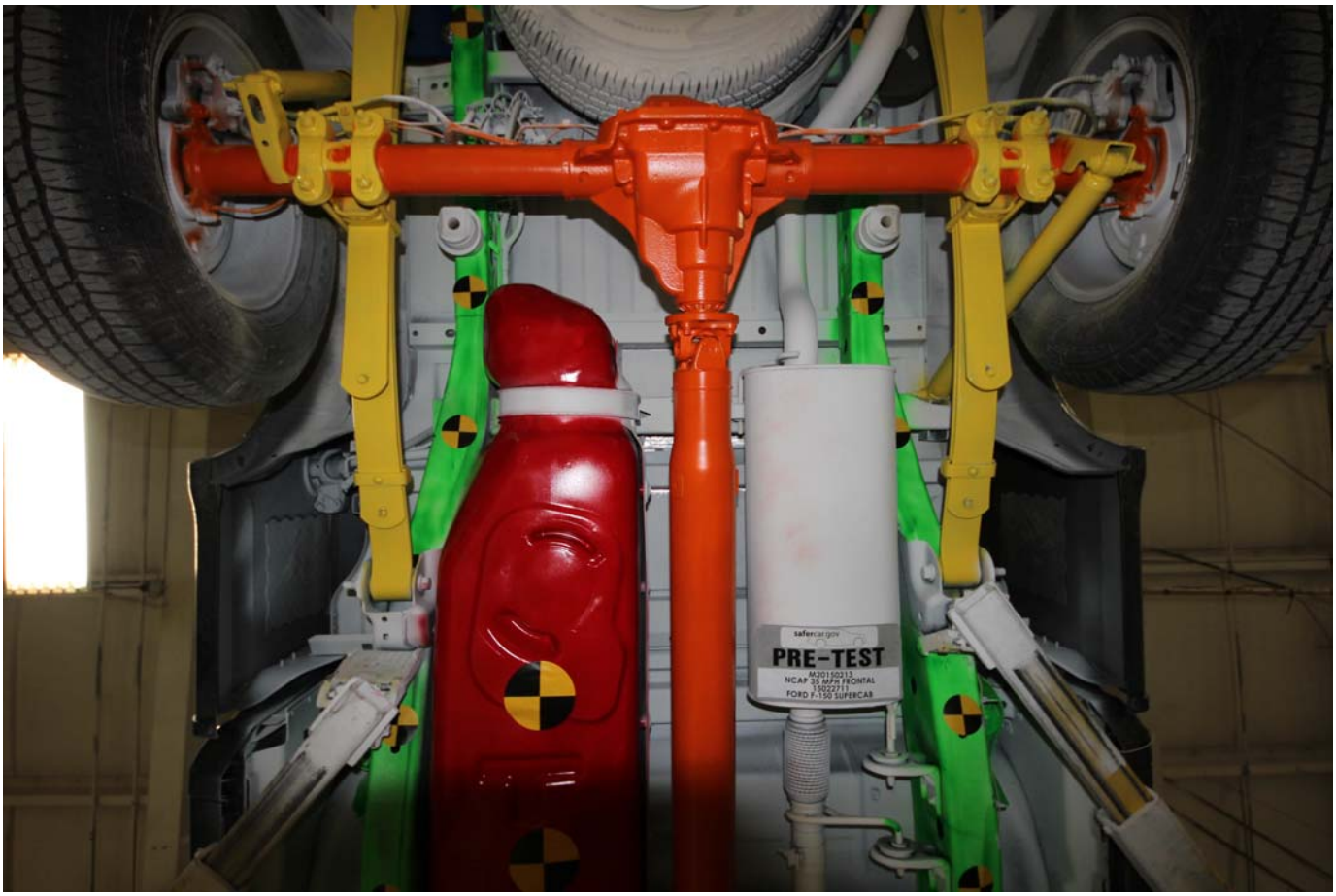


No. 024 Post-Test Front Underbody View

No. 025 Pre-Test Mid Front Underbody View

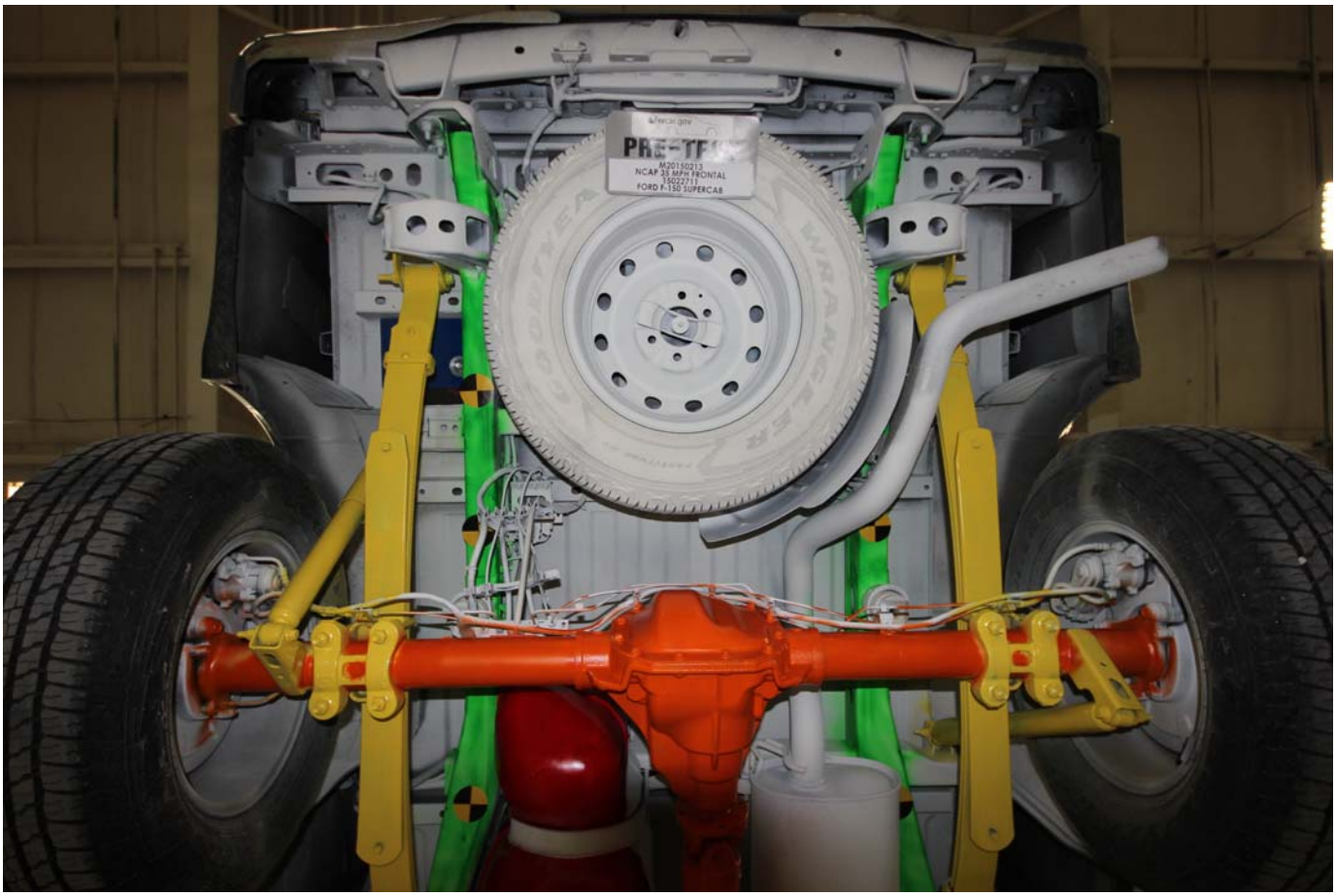


No. 026 Post-Test Mid Front Underbody View

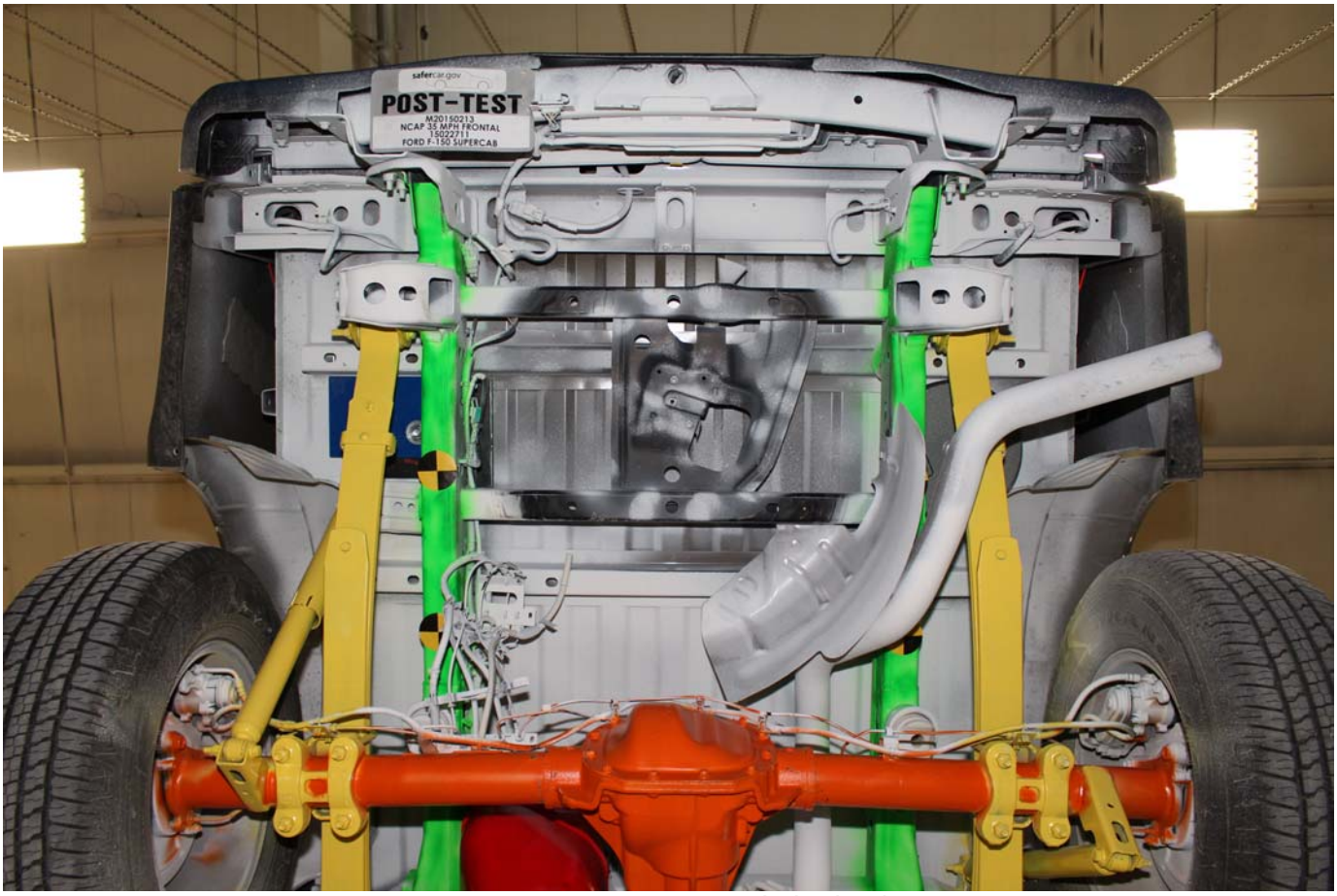


No. 027 Pre-Test Mid Rear Underbody View

No. 028 Post-Test Mid Rear Underbody View



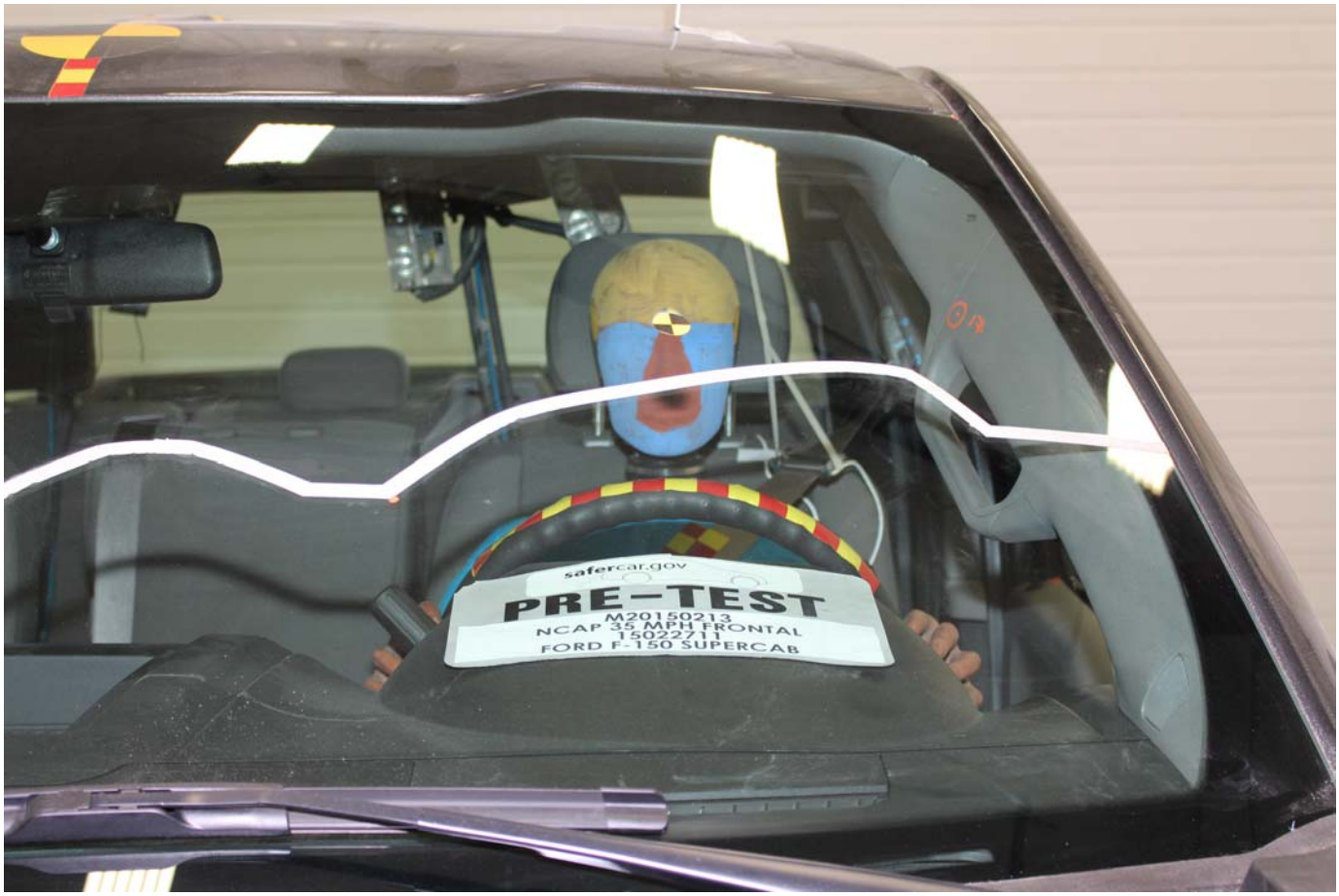
No. 029 Pre-Test Rear Underbody View



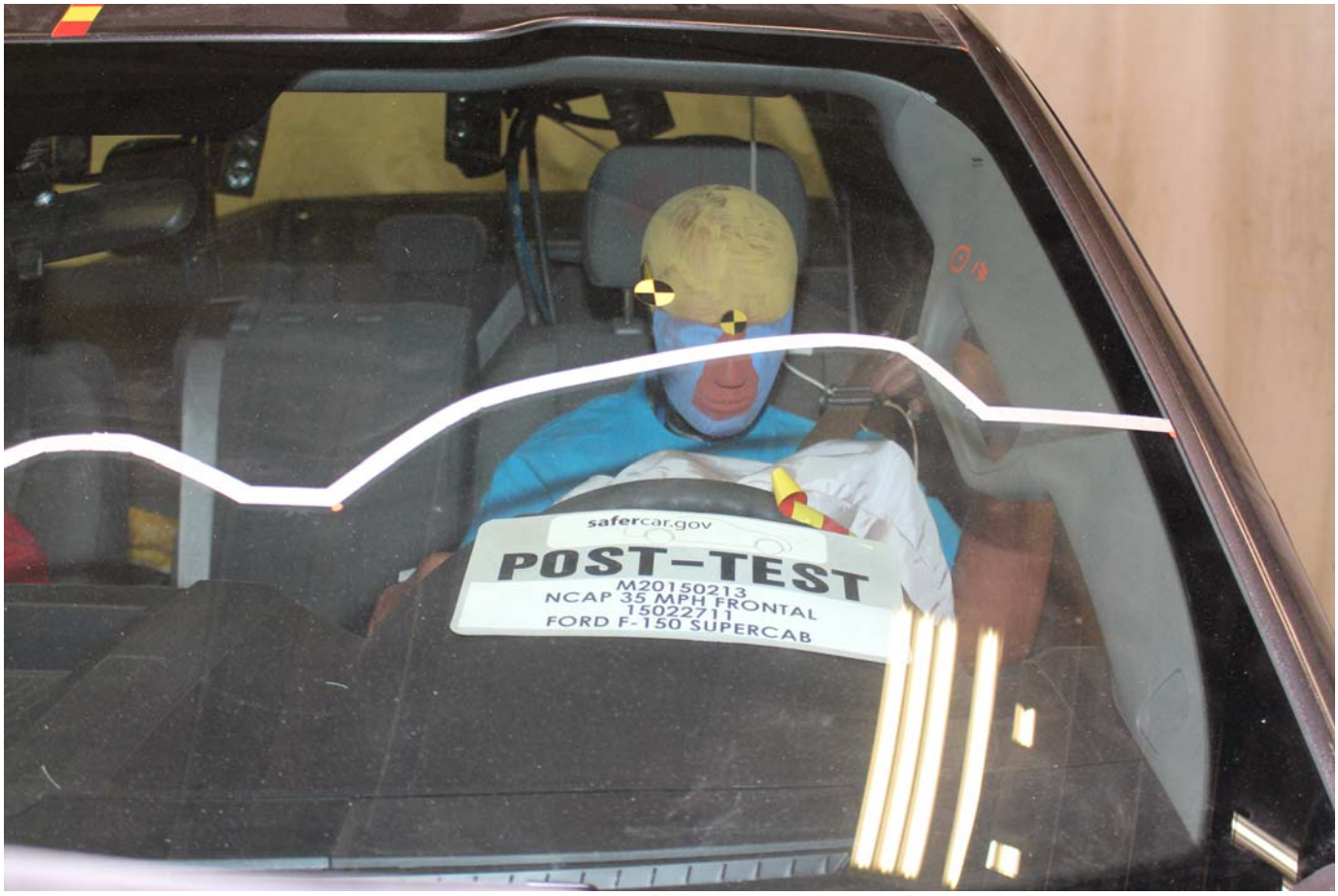
No. 030 Post-Test Rear Underbody View

No. 031 Pre-Test Dummy Cable Routing

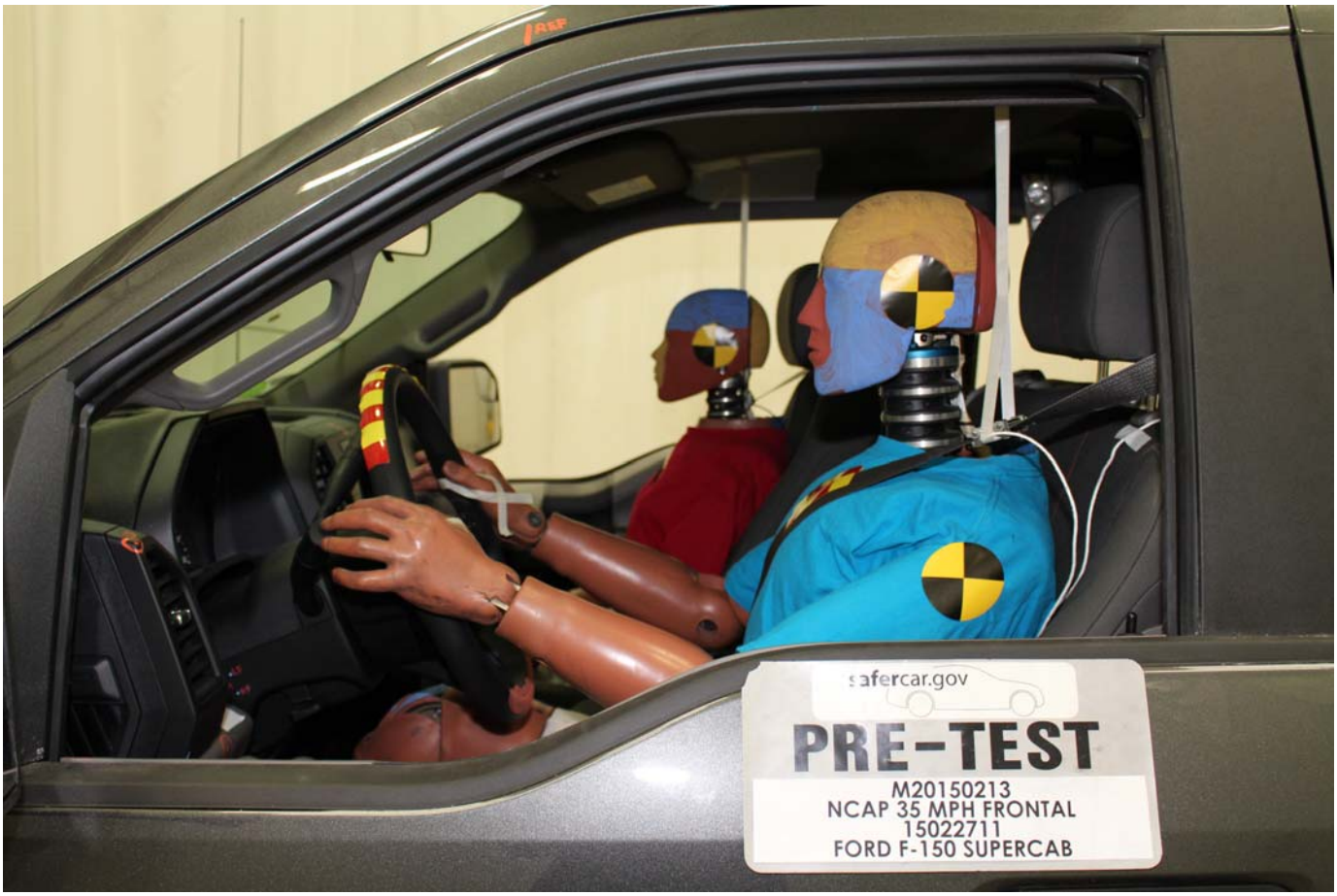
No. 032 Post-Test Dummy Cable Routing



No. 033 Pre-Test Driver Dummy Front View

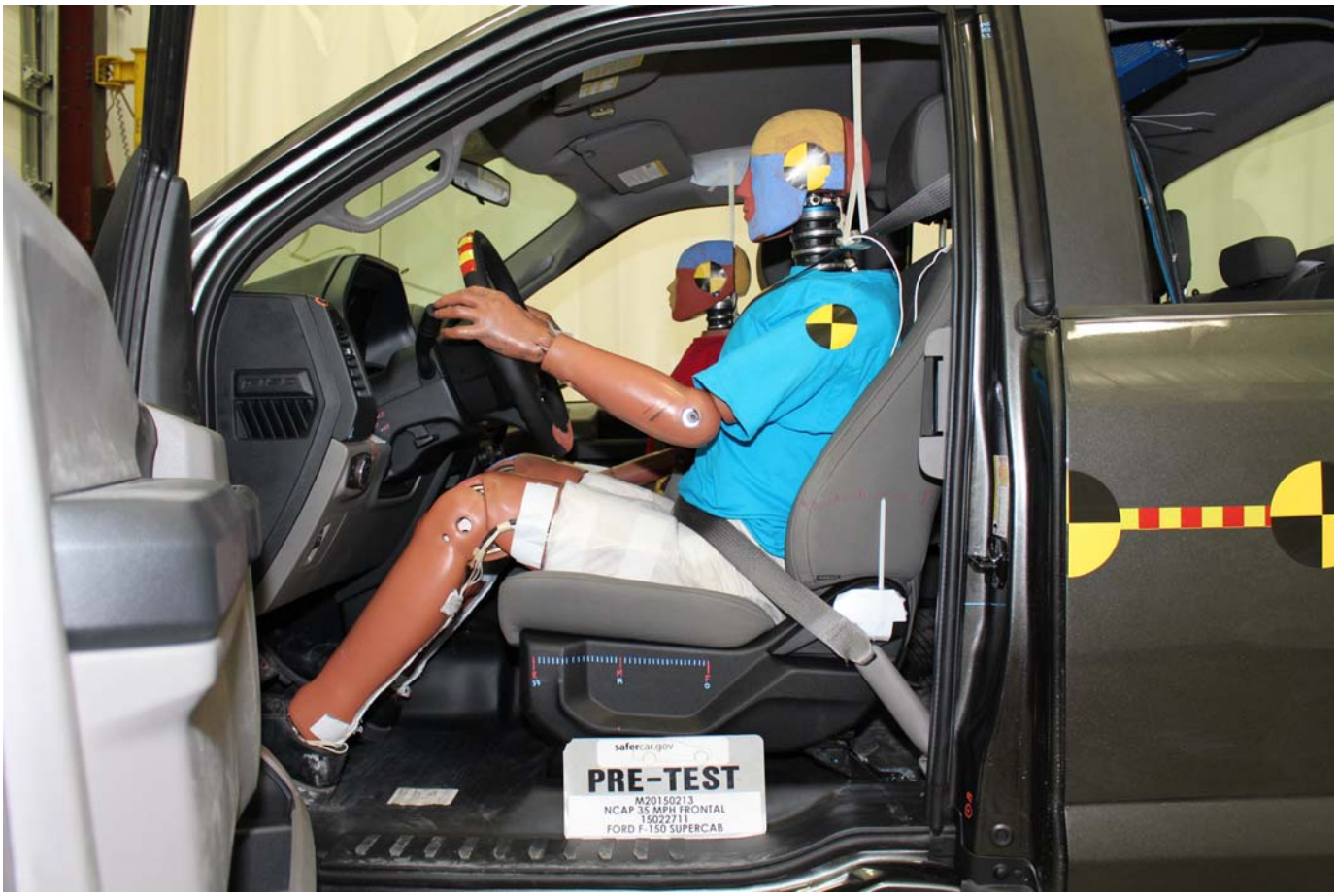


No. 034 Post-Test Driver Dummy Front View



No. 035 Pre-Test Driver Dummy Window View

No. 036 Post-Test Driver Dummy Window View



No. 037 Pre-Test Driver Dummy and Vehicle Interior (Door Open)

No. 038 Post-Test Driver Dummy and Vehicle Interior (Door Open)

No. 039 Pre-Test Driver's Seat Fore-Aft Markings

No. 040 Post-Test Driver's Seat Fore-Aft Markings

No. 041 Pre-Test View of Belt Anchorage for Driver Dummy

No. 042 Post-Test View of Belt Anchorage for Driver Dummy

No. 043 Pre-Test Driver Dummy Feet

No. 044 Post-Test Driver Dummy Feet

No. 045 Pre-Test Driver's Side Knee Bolster (without dummy)

No. 046 Post-Test Driver's Side Knee Bolster (without dummy)

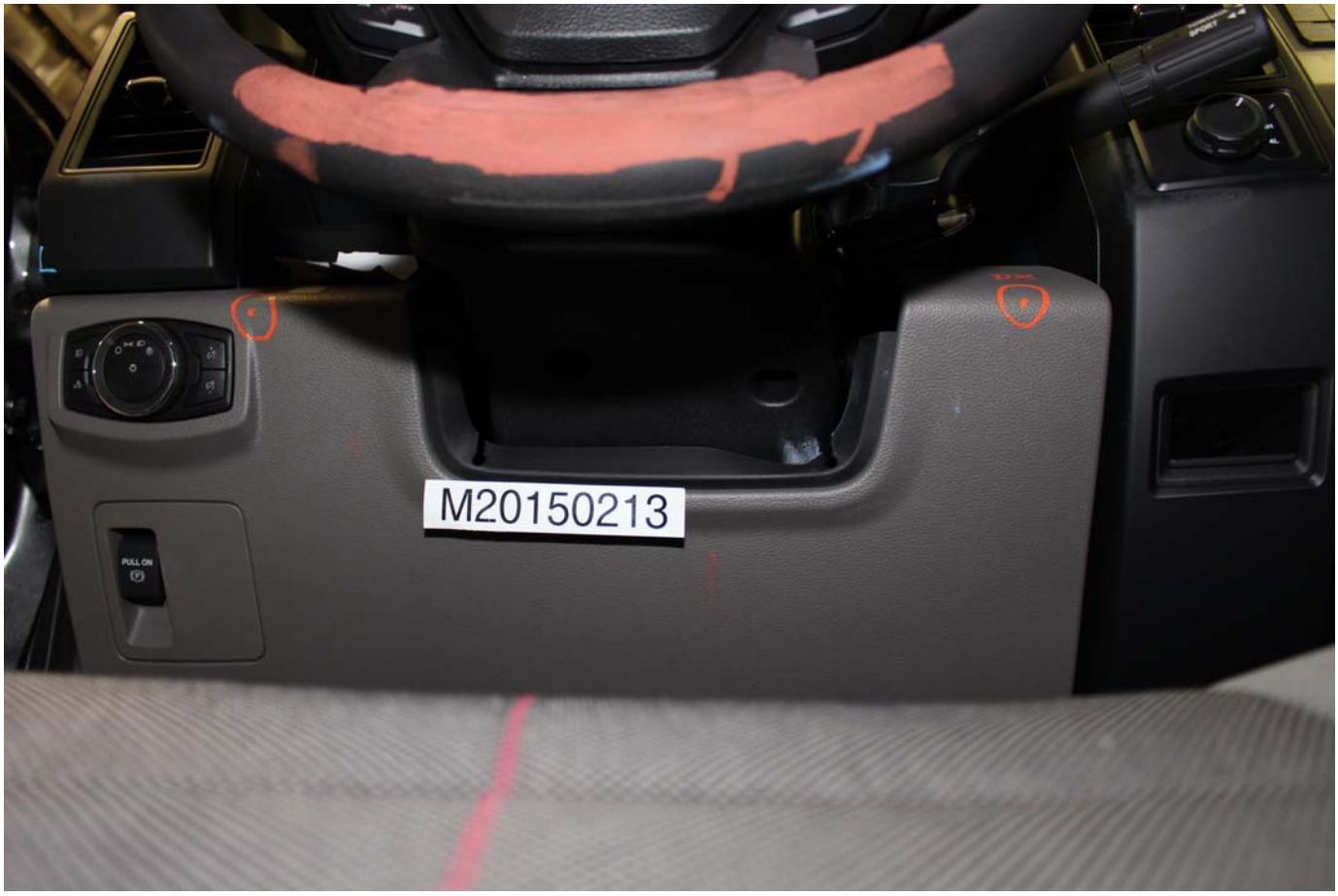
No. 047 Pre-Test Driver's Side Floorpan

No. 048 Post-Test Driver's Side Floorpan

No. 049 Post-Test Driver Dummy Face

No. 050 Post-Test Driver Dummy Contact with Airbag

No. 051 Post-Test Driver Dummy Contact with Headrest



No. 052 Post-Test Driver Dummy Contact with Knee Bolster

No. 053 Pre-Test View of the Steering Wheel

No. 054 Post-Test View of the Steering Wheel

No. 055 Pre-Test Passenger Dummy Front View

No. 056 Post-Test Passenger Dummy Front View

No. 057 Pre-Test Passenger Dummy Window View

No. 058 Post-Test Passenger Dummy Window View

No. 059 Pre-Test Passenger Dummy and Vehicle Interior (Door Open)

No. 060 Post-Test Passenger Dummy and Vehicle Interior (Door Open)

No. 061 Pre-Test Passenger's Seat Fore-Aft Markings

No. 062 Post-Test Passenger's Seat Fore-Aft Markings

No. 063 Pre-Test View of Belt Anchorage for Passenger Dummy

No. 064 Post-Test View of Belt Anchorage for Passenger Dummy

No. 065 Pre-Test Passenger Dummy Feet

No. 066 Post-Test Passenger Dummy Feet

No. 067 Pre-Test Passenger's Side Knee Bolster (without dummy)

No. 068 Post-Test Passenger's Side Knee Bolster (without dummy)

No. 069 Pre-Test Passenger's Side Floorpan

No. 070 Post-Test Passenger's Side Floorpan

No. 071 Post-Test Passenger Dummy Face

No. 072 Post-Test Passenger Dummy Contact with Airbag

No. 073 Post-Test Passenger Dummy Contact with Headrest

No. 074 Post-Test Passenger Dummy Contact with Glovebox

No. 075 Ballast Installed in Vehicle

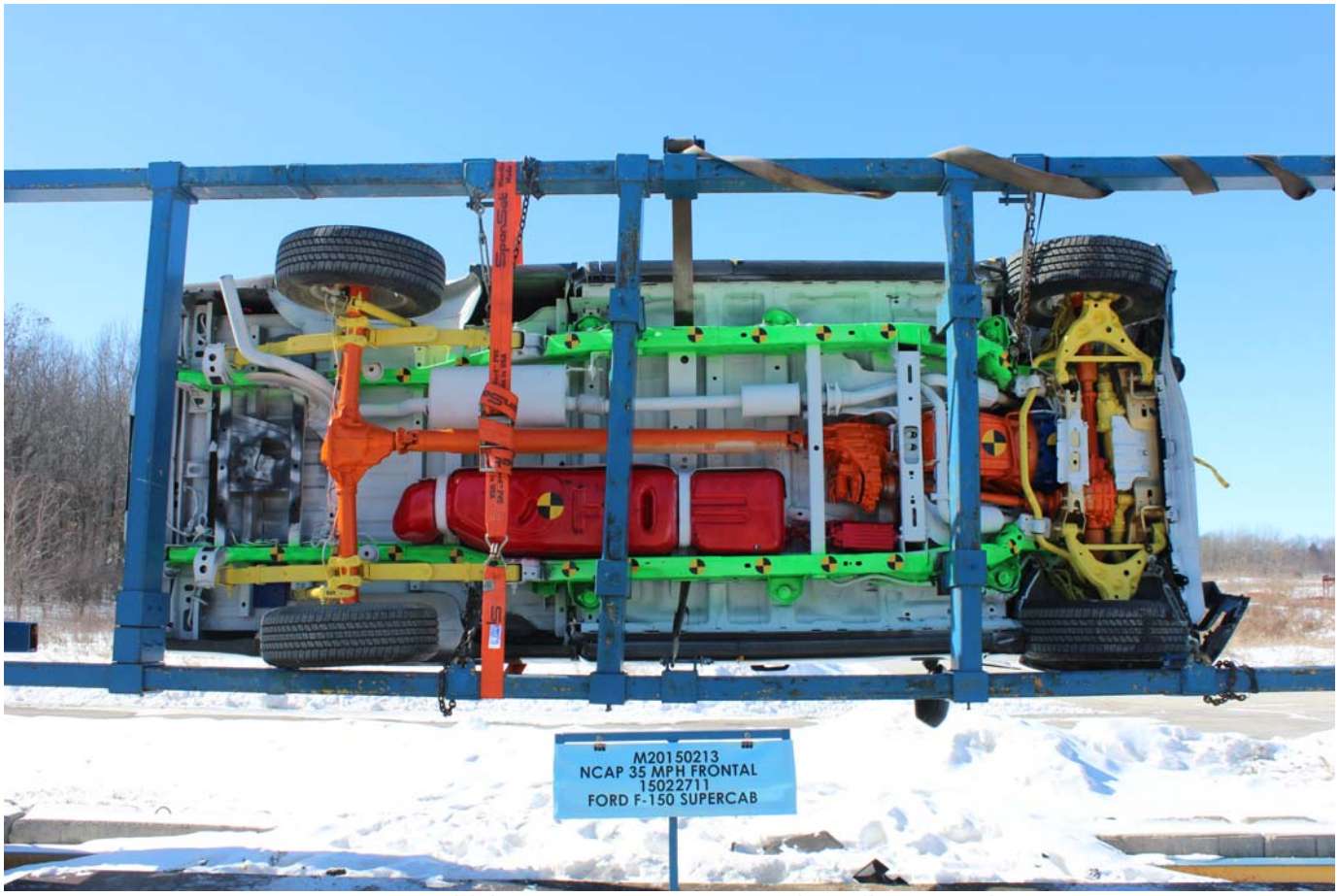
No. 075a Ballast Installed in Vehicle

PHOTOGRAPH NOT APPLICABLE

No. 076 Post-Test Stoddard Solvent Spillage Location View

No. 077 Post-Test Speed Trap Read-Out

No. 078 Vehicle at 0 Degree on Static Rollover Device



No. 079 Vehicle at 90 Degrees on Static Rollover Device

No. 080 Vehicle at 180 Degrees on Static Rollover Device

No. 081 Vehicle at 270 Degrees on Static Rollover Device

No. 082 Vehicle at 360 Degrees on Static Rollover Device

No. 083 2015 Ford F-150 SuperCab 4x4 Frontal Impact Event

No. 084 Monroney Label Photograph

APPENDIX B
DUMMY RESPONSE DATA TRACES

TABLE OF DATA PLOTS

		Page No.
	List of Data Plots Provided in the Test Report	
Figure No. 1.	Driver Head X Acceleration vs. Time	B-1
Figure No. 2.	Driver Head Y Acceleration vs. Time	B-1
Figure No. 3.	Driver Head Z Acceleration vs. Time	B-1
Figure No. 4.	Driver Head Resultant Acceleration vs. Time	B-1
Figure No. 5.	Driver Chest Displacement vs. Time	B-2
Figure No. 6.	Driver Chest X Acceleration vs. Time	B-3
Figure No. 7.	Driver Chest Y Acceleration vs. Time	B-3
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
Figure No. 14.	Driver Nij (NTE) vs. Time	B-5
Figure No. 15.	Driver Nij (NCF) vs. Time	B-5
Figure No. 16.	Driver Nij (NCE) vs. Time	B-5
Figure No. 17.	Driver Left Femur Force vs. Time	B-6
Figure No. 18.	Driver Right Femur Force vs. Time	B-6
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
Figure No. 22.	Passenger Head Resultant Acceleration vs. Time	B-7
Figure No. 23.	Passenger Chest Displacement vs. Time	B-8
Figure No. 24.	Passenger Chest X Acceleration vs. Time	B-9
Figure No. 25.	Passenger Chest Y Acceleration vs. Time	B-9
Figure No. 26.	Passenger Chest Z Acceleration vs. Time	B-9
Figure No. 27.	Passenger Chest Resultant Z Acceleration vs. Time	B-9

		Page No.
Figure No. 28.	Passenger Neck Force X vs. Time	B-10
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 Upper Neck Force Y

Driver Upper Neck Moment X

Driver Upper Neck Moment Z

Driver Chest X Redundant

Driver Chest Y Redundant

Driver Chest Z Redundant

Driver Pelvis X

Driver Pelvis Y

Driver Pelvis Z

Driver Left Femur Redundant

Driver Right Femur Redundant

Driver Left Upper Tibia Moment X

Driver Left Upper Tibia Moment Y

Driver Left Upper Tibia Force Z

Driver Left Lower Tibia Moment X

Driver Left Lower Tibia Moment Y

Driver Left Lower Tibia Force Z

Driver Right Upper Tibia Moment X

Driver Right Upper Tibia Moment Y

Driver Right Upper Tibia Force Z

Driver Right Lower Tibia Moment X

Driver Right Lower Tibia Moment Y

Driver Right Lower Tibia Force Z

Driver Left Foot Fore Z

Driver Left Foot Aft X

Driver Left Foot Aft Z

Driver Right Foot Fore Z

Driver Right Foot Aft X

Driver Right Foot Aft Z

Driver Lap Belt Force

Driver Shoulder Belt Force

Passenger Head X Redundant

Passenger Head Y Redundant

Passenger Head Z Redundant

Passenger Head Angular Velocity X

Passenger Head Angular Velocity Y

Passenger Head Angular Velocity Z

Passenger Upper Neck Force Y

Passenger Upper Neck Moment X

Passenger Upper Neck Moment Z

Passenger Chest X Redundant

Passenger Chest Y Redundant

Passenger Chest Z Redundant

Passenger Pelvis X

Passenger Pelvis Y

Passenger Pelvis Z

Passenger Left Femur Redundant

Passenger Right Femur Redundant

Passenger Left Upper Tibia Moment X

Passenger Left Upper Tibia Moment Y

Passenger Left Upper Tibia Force Z

Passenger Left Lower Tibia Moment X

Passenger Left Lower Tibia Moment Y

Passenger Left Lower Tibia Force Z

Passenger Right Upper Tibia Moment X

Passenger Right Upper Tibia Moment Y

Passenger Right Upper Tibia Force Z

Passenger Right Lower Tibia Moment X

Passenger Right Lower Tibia Moment Y

Passenger Right Lower Tibia Force Z

Passenger Left Foot Fore Z

Passenger Left Foot Aft X

Passenger Left Foot Aft Z

Passenger Right Foot Fore Z

Passenger Right Foot Aft X

Passenger Right Foot Aft Z

Passenger Lap Belt Force

Passenger Shoulder Belt Force

Left Rear Seat Crossmember X

Right Rear Seat Crossmember X

Vehicle Engine Top X

Vehicle Engine Bottom X

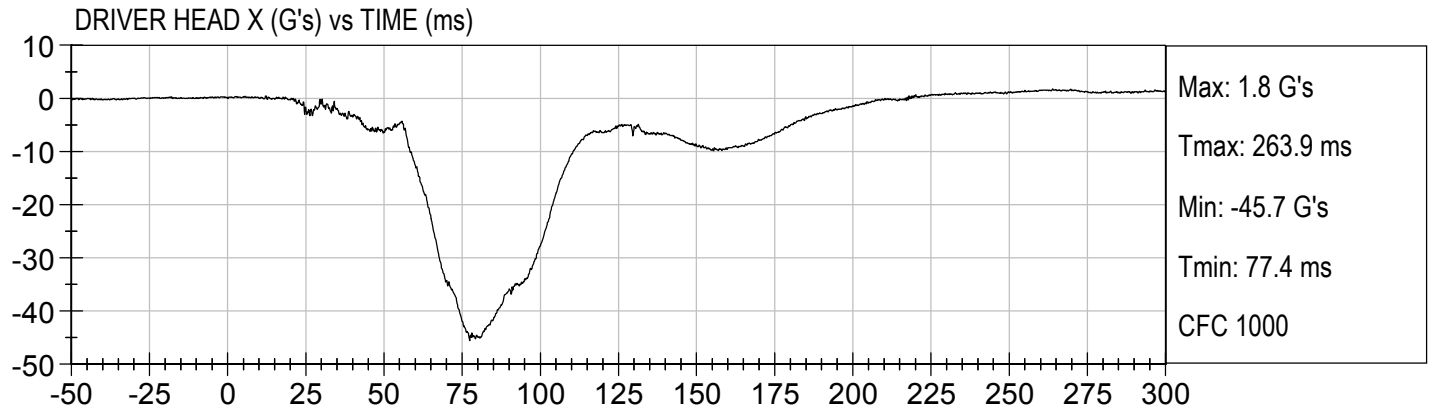
Left Rear Seat Crossmember Z

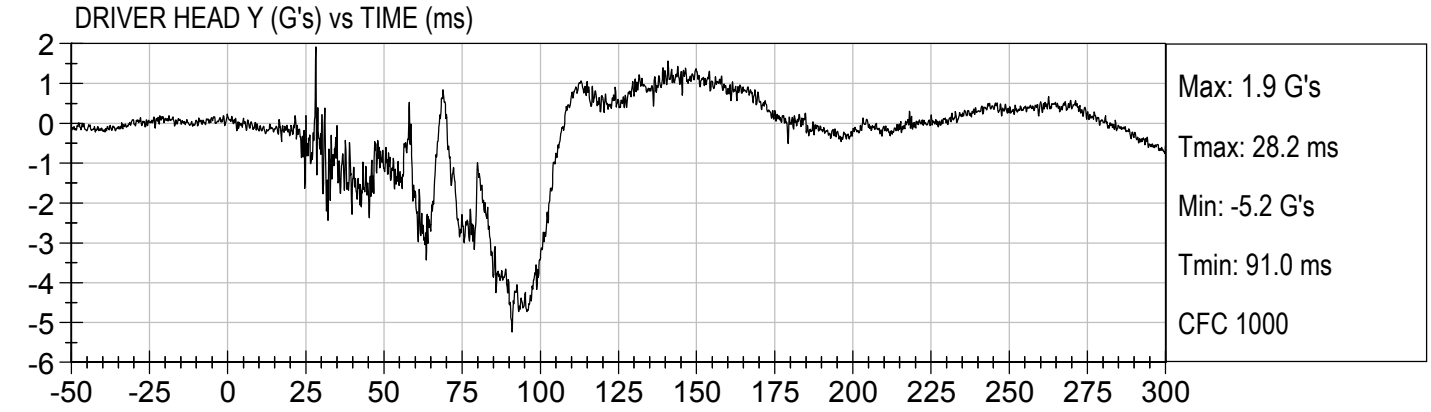
Right Rear Seat Crossmember Z

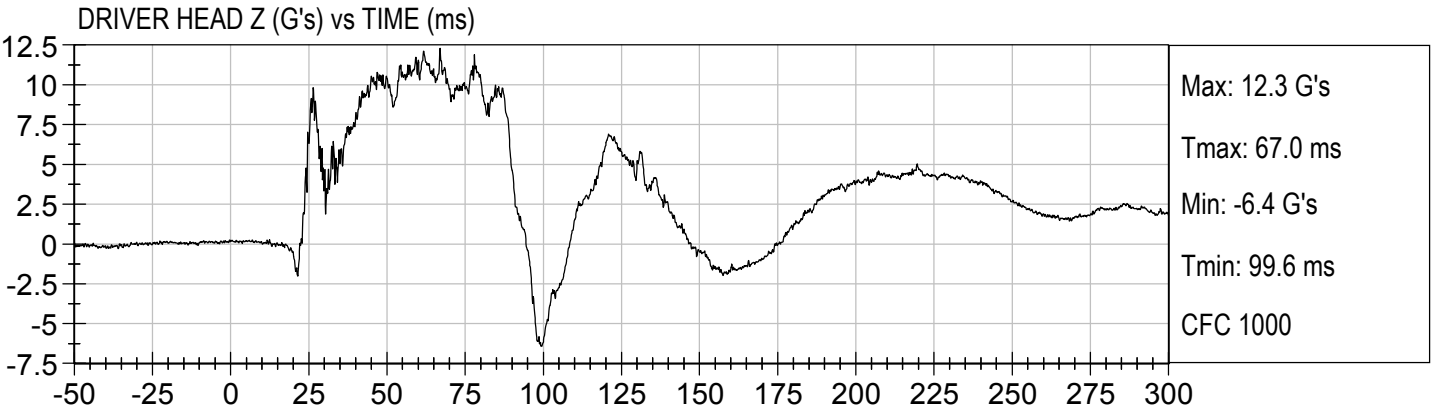
Left Rear Seat Crossmember Xr

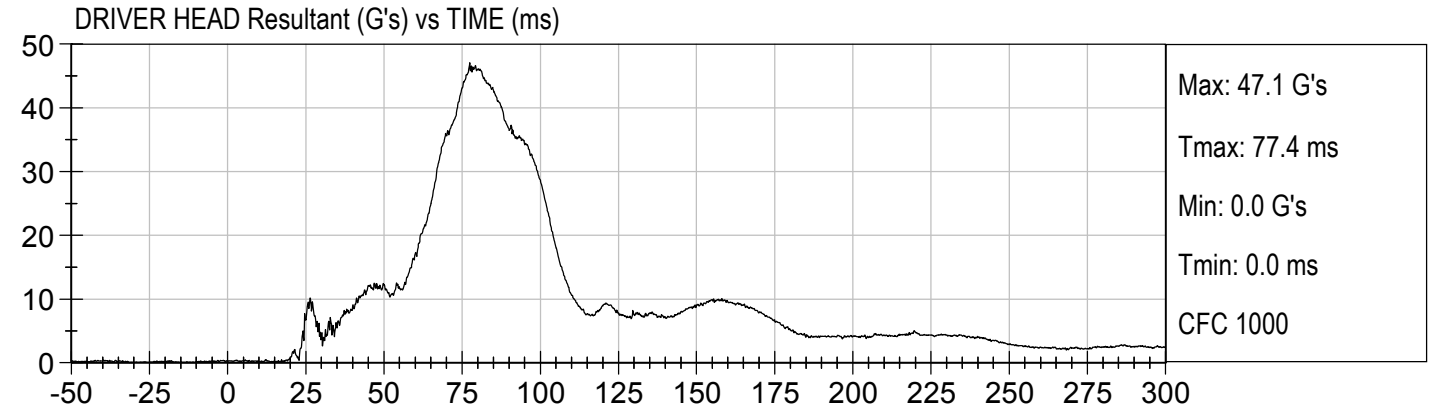
Right Rear Seat Crossmember Xr

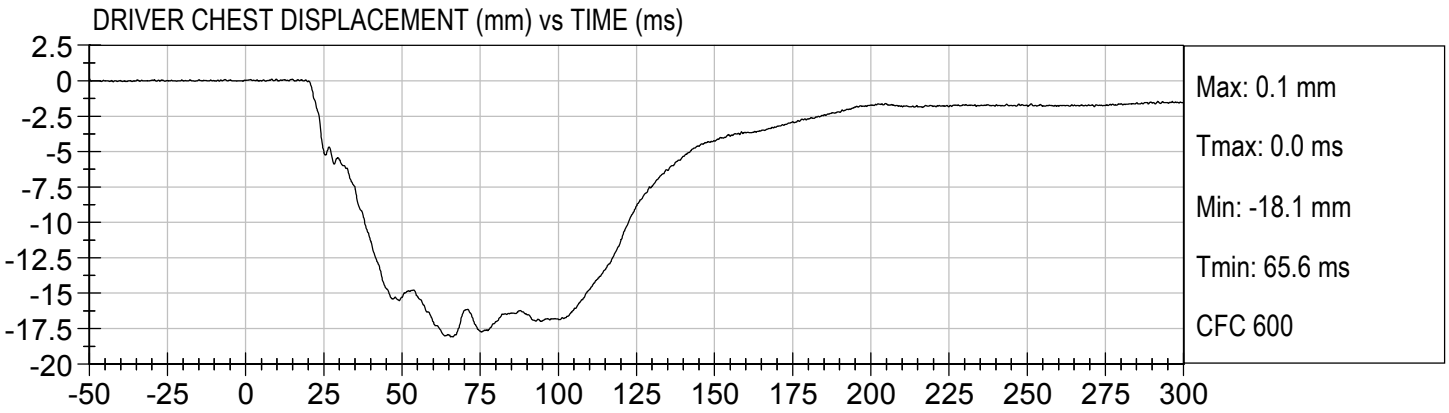
Advanced Research Load Cell Barrier – 528 channels


DRIVER HEAD X (G's) vs TIME (ms)
Max: 1.8 G's
Tmax: 263.9 ms
Min: -45.7 G's
Tmin: 77.4 ms
CFC 1000

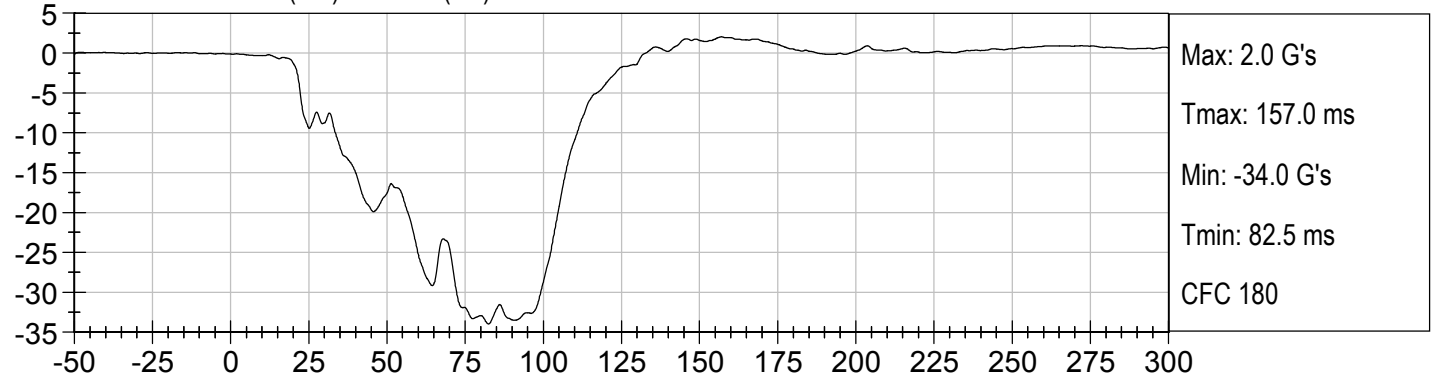

DRIVER HEAD Y (G's) vs TIME (ms)
Max: 1.9 G's
Tmax: 28.2 ms
Min: -5.2 G's
Tmin: 91.0 ms
CFC 1000


DRIVER HEAD Z (G's) vs TIME (ms)
Max: 12.3 G's
Tmax: 67.0 ms
Min: -6.4 G's
Tmin: 99.6 ms
CFC 1000

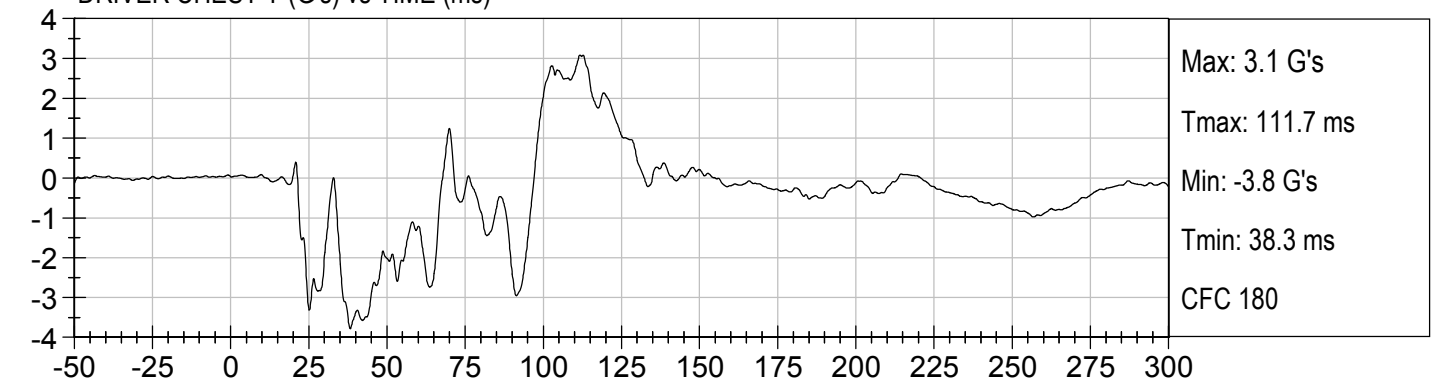

DRIVER HEAD Resultant (G's) vs TIME (ms)
Max: 47.1 G's
Tmax: 77.4 ms
Min: 0.0 G's
Tmin: 0.0 ms
CFC 1000


DRIVER CHEST DISPLACEMENT (mm) vs TIME (ms)
2.5
0
-2.5
-5
-7.5
-10
-12.5
-15
-17.5
-20
-50
-25
0
25
50
75
100
125
150
175
200
225
250
275
300
Max: 0.1 mm
Tmax: 0.0 ms
Min: -18.1 mm
Tmin: 65.6 ms
CFC 600

DRIVER CHEST X (G's) vs TIME (ms)

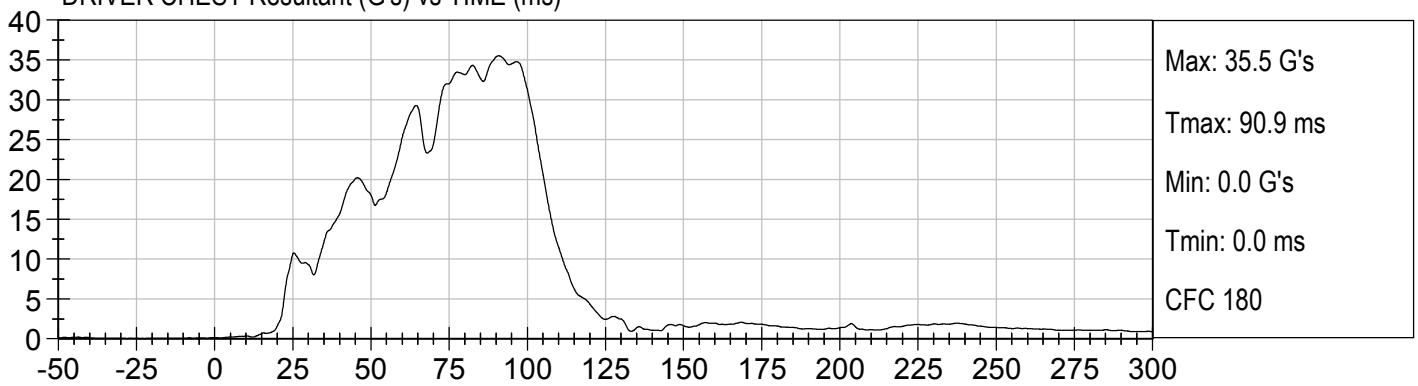


DRIVER CHEST Y (G's) vs TIME (ms)

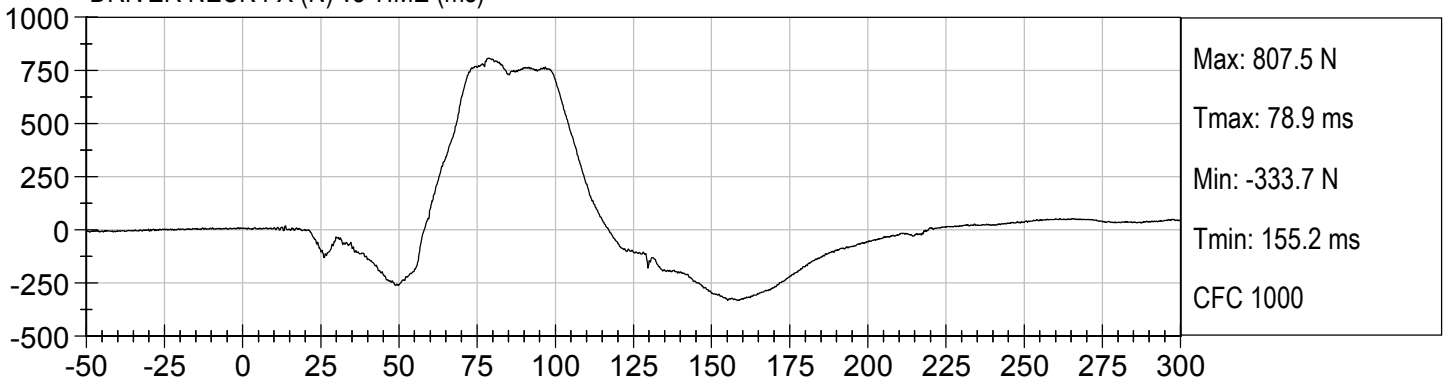


DRIVER CHEST Z (G's) vs TIME (ms)

DRIVER CHEST Resultant (G's) vs TIME (ms)

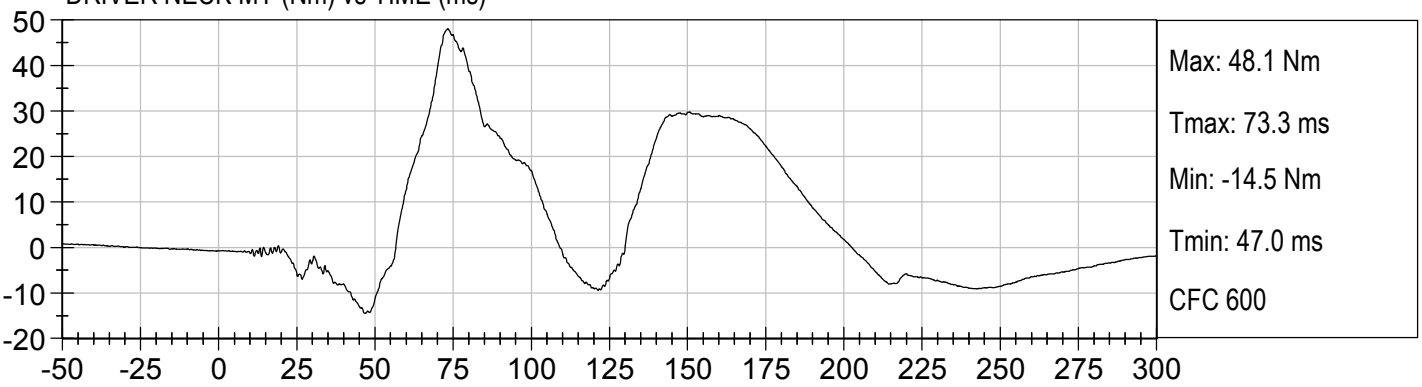


DRIVER NECK FX (N) vs TIME (ms)

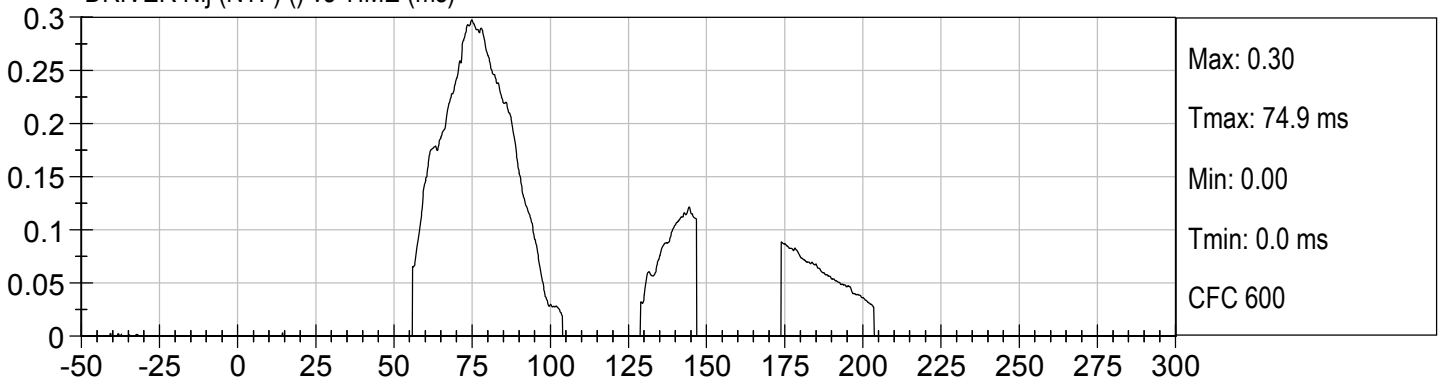


DRIVER NECK FZ (N) vs TIME (ms)

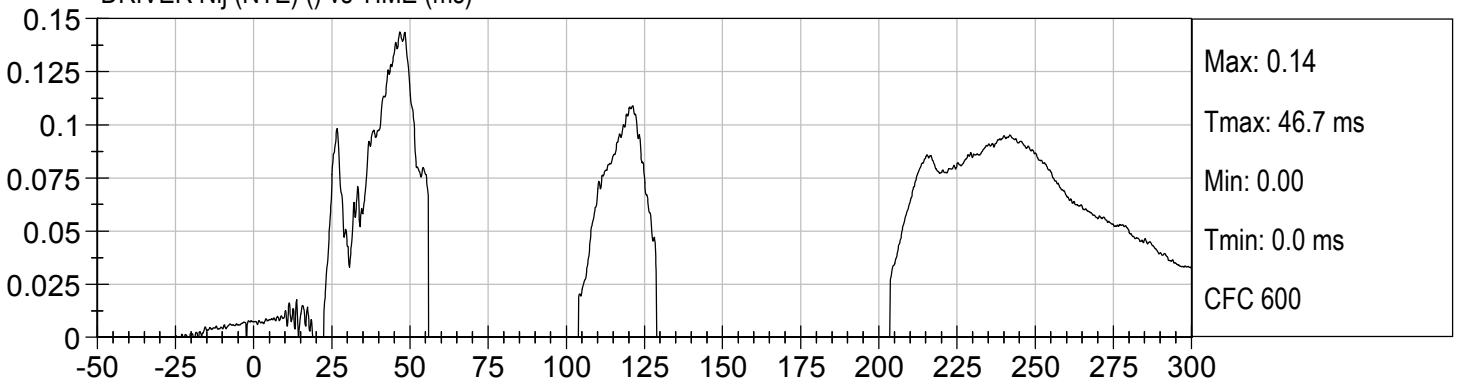
DRIVER NECK MY (Nm) vs TIME (ms)



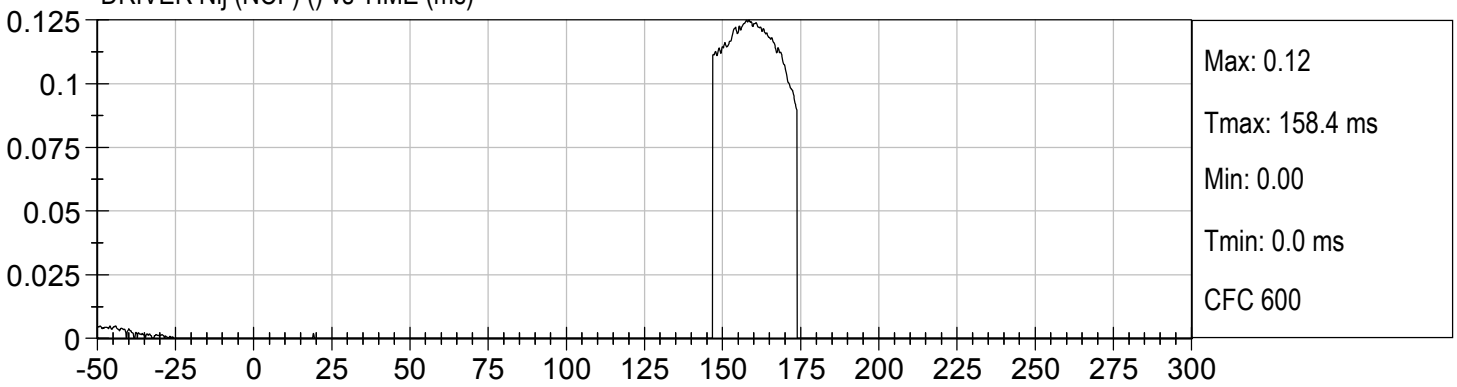
DRIVER Nij (NTF) () vs TIME (ms)



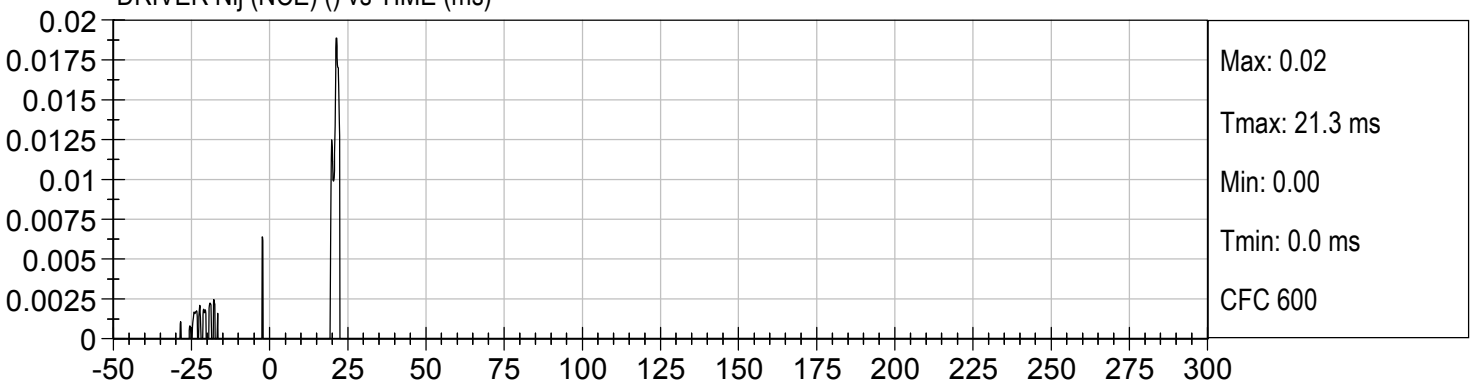
DRIVER Nij (NTE) () vs TIME (ms)



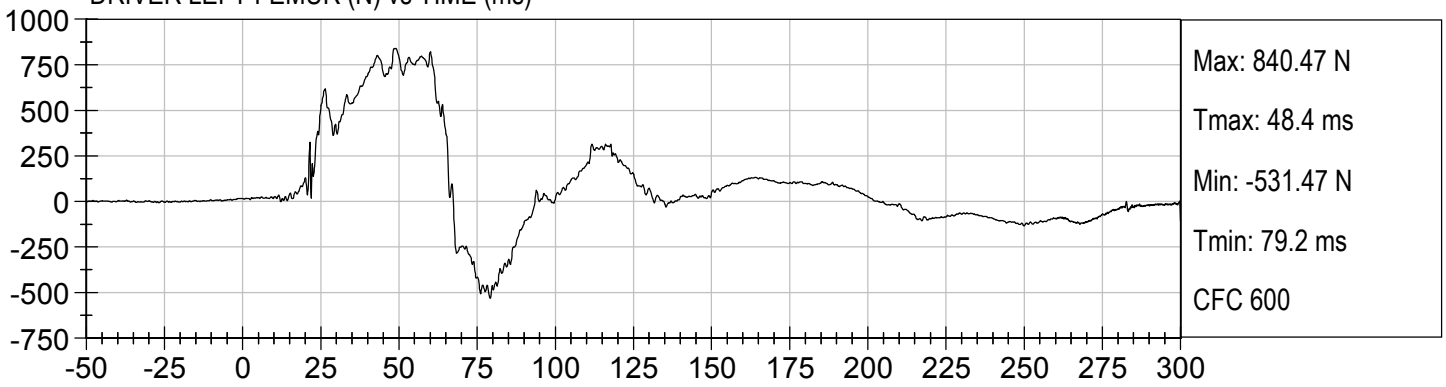
DRIVER Nij (NCF) () vs TIME (ms)



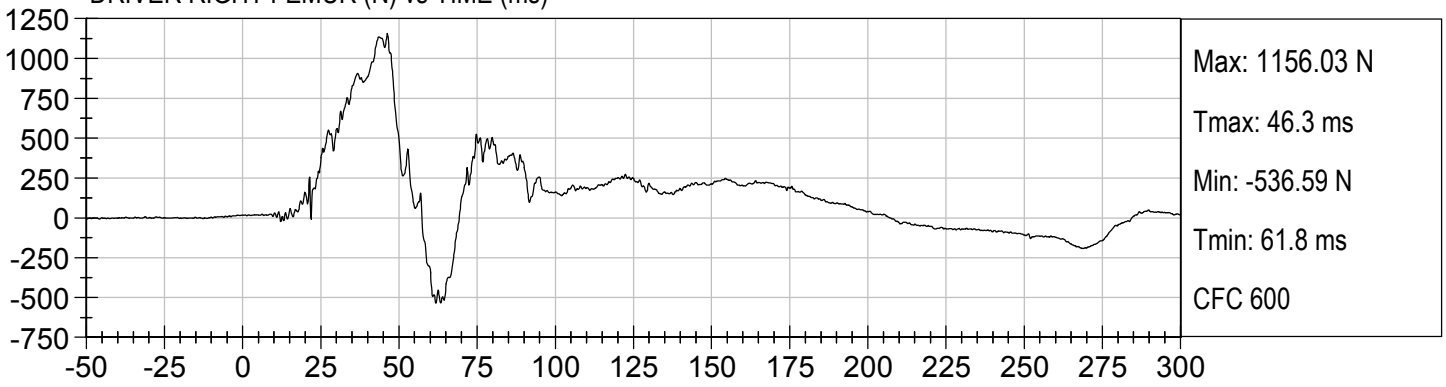
DRIVER Nij (NCE) () vs TIME (ms)



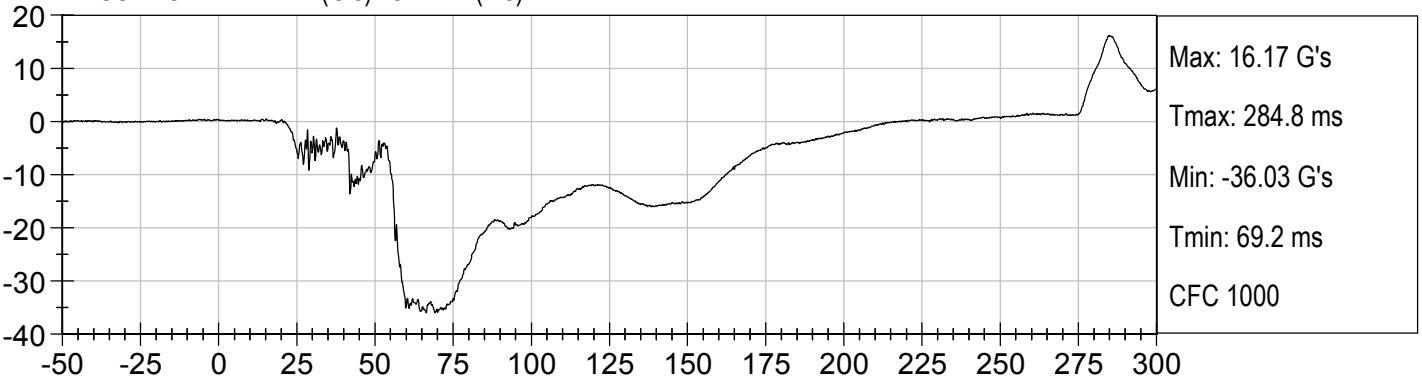
DRIVER LEFT FEMUR (N) vs TIME (ms)



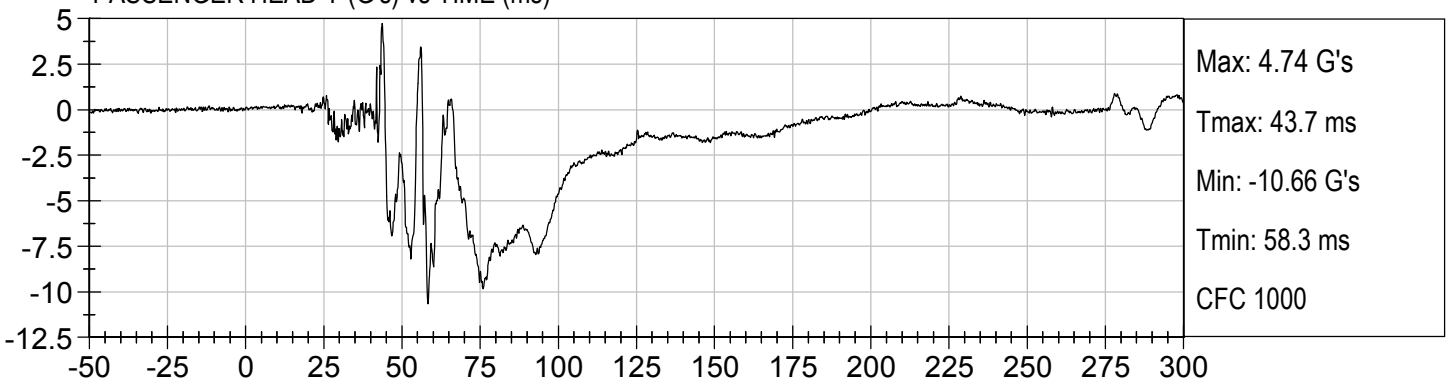
DRIVER RIGHT FEMUR (N) vs TIME (ms)



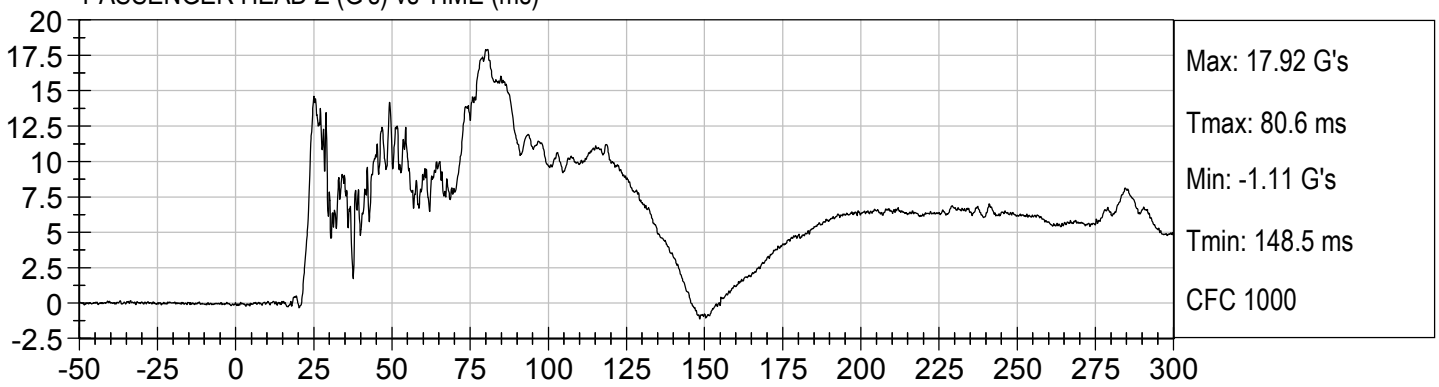
PASSENGER HEAD X (G's) vs TIME (ms)



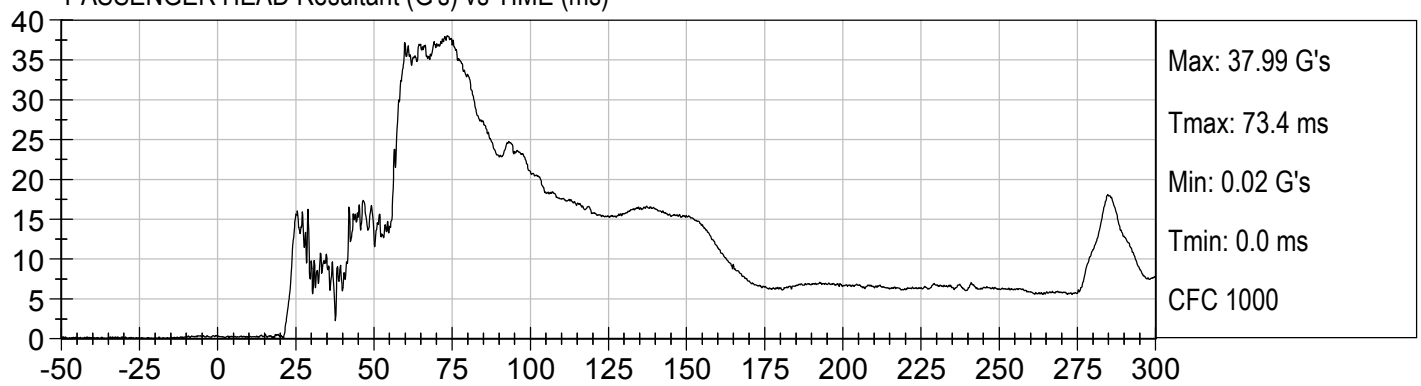
PASSENGER HEAD Y (G's) vs TIME (ms)

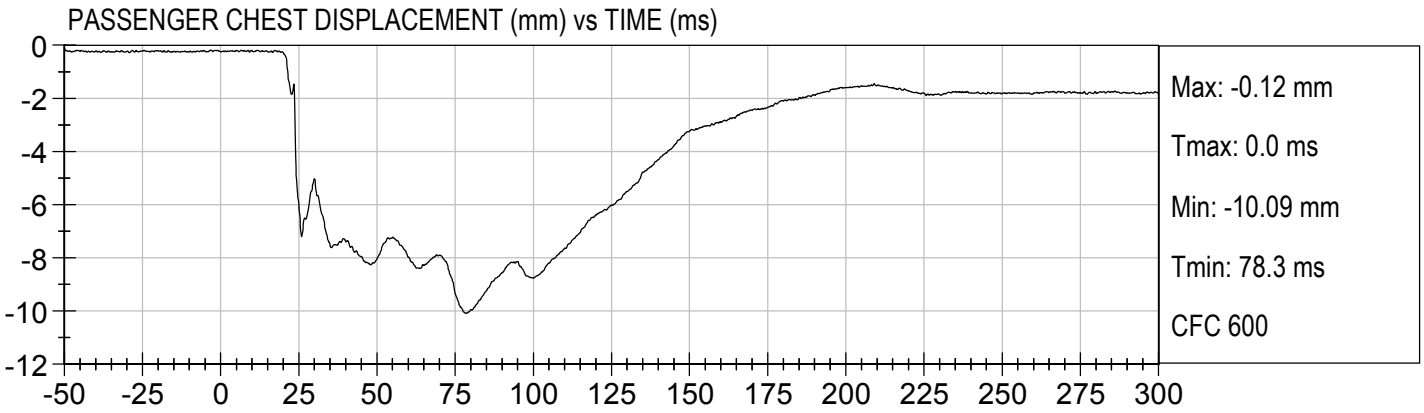


PASSENGER HEAD Z (G's) vs TIME (ms)

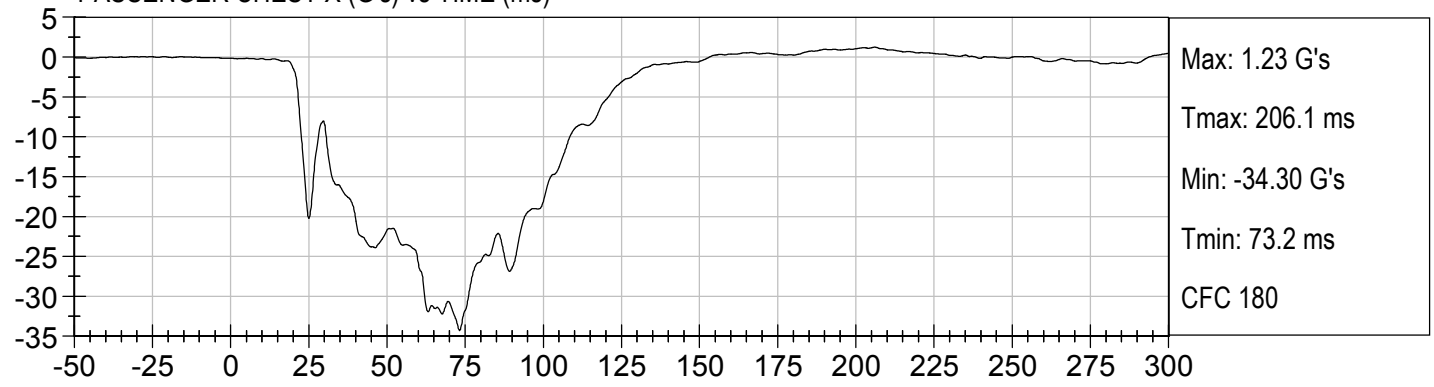


PASSENGER HEAD Resultant (G's) vs TIME (ms)

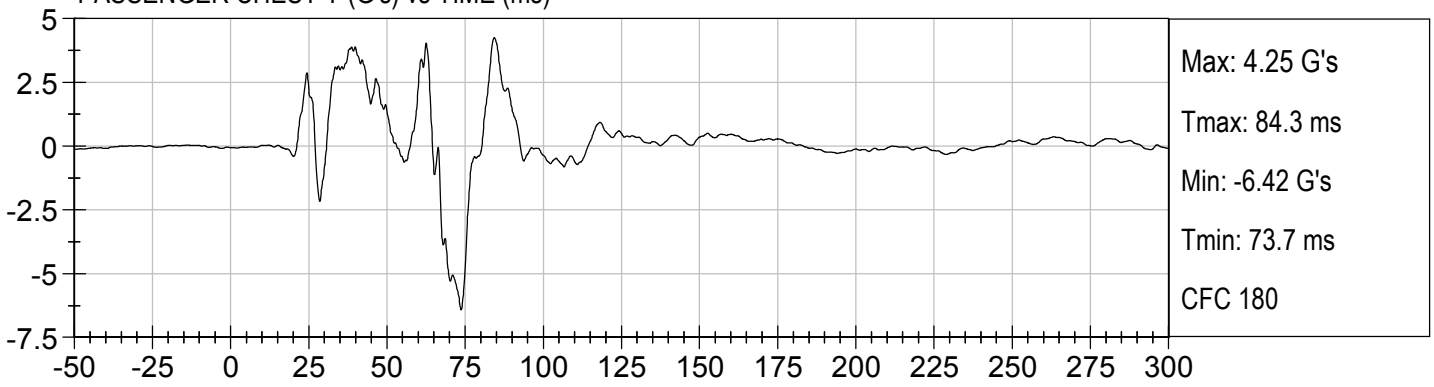



PASSENGER CHEST DISPLACEMENT (mm) vs TIME (ms)
0
-2
-4
-6
-8
-10
-12
-50
-25
0
25
50
75
100
125
150
175
200
225
250
275
300
Max: -0.12 mm
Tmax: 0.0 ms
Min: -10.09 mm
Tmin: 78.3 ms
CFC 600

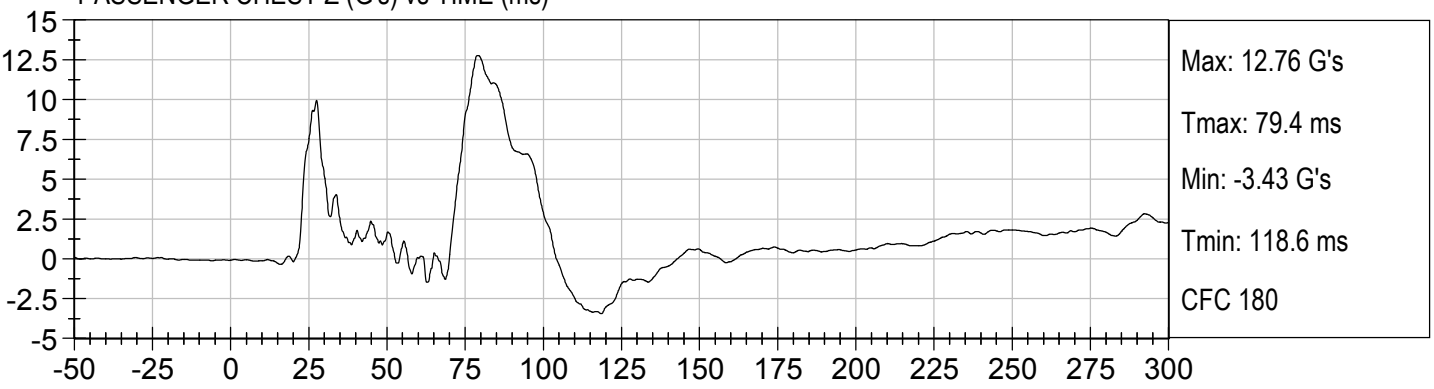
PASSENGER CHEST X (G's) vs TIME (ms)



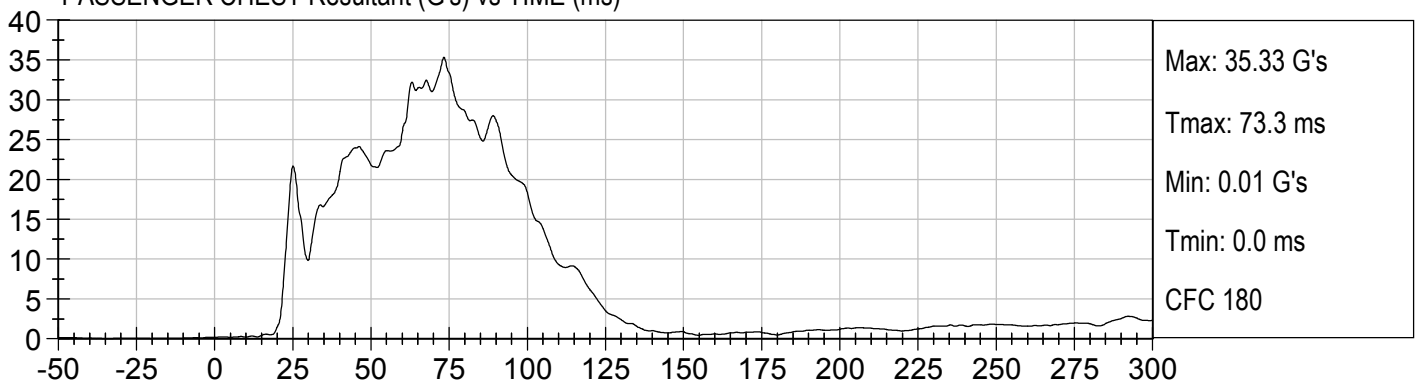
PASSENGER CHEST Y (G's) vs TIME (ms)



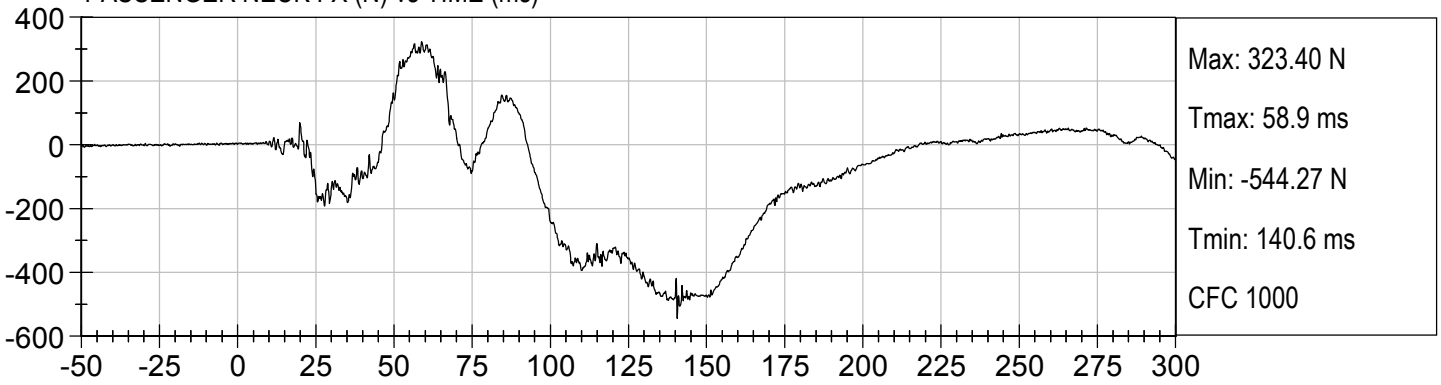
PASSENGER CHEST Z (G's) vs TIME (ms)



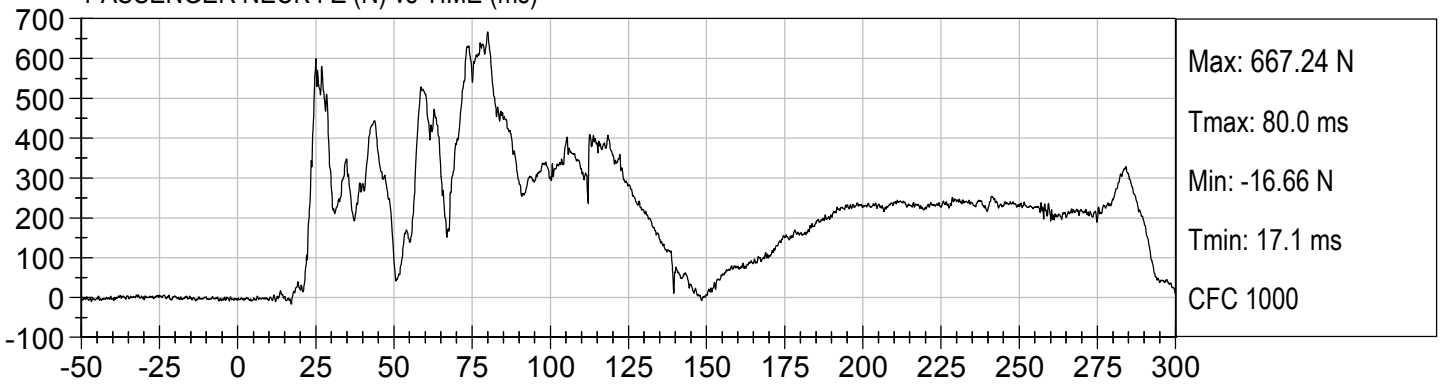
PASSENGER CHEST Resultant (G's) vs TIME (ms)



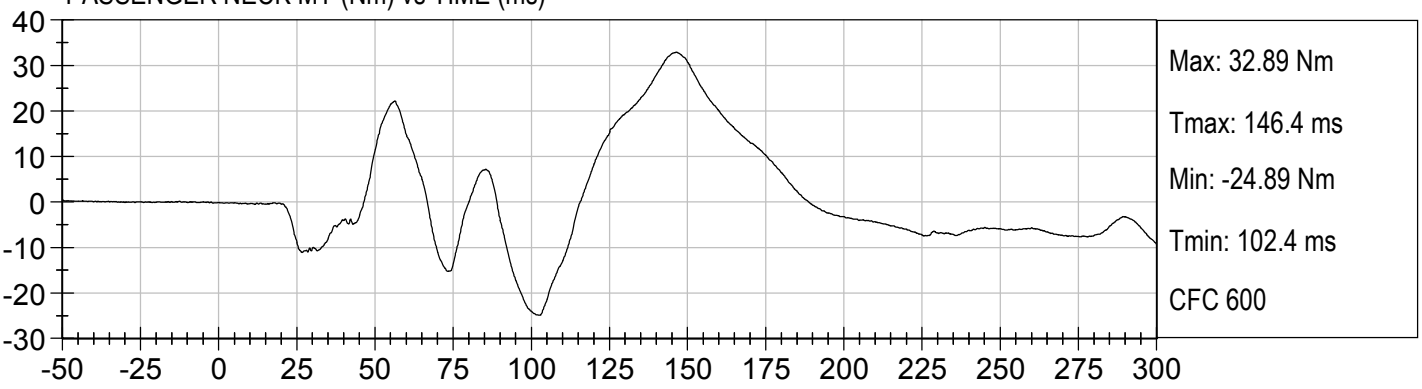
PASSENGER NECK FX (N) vs TIME (ms)



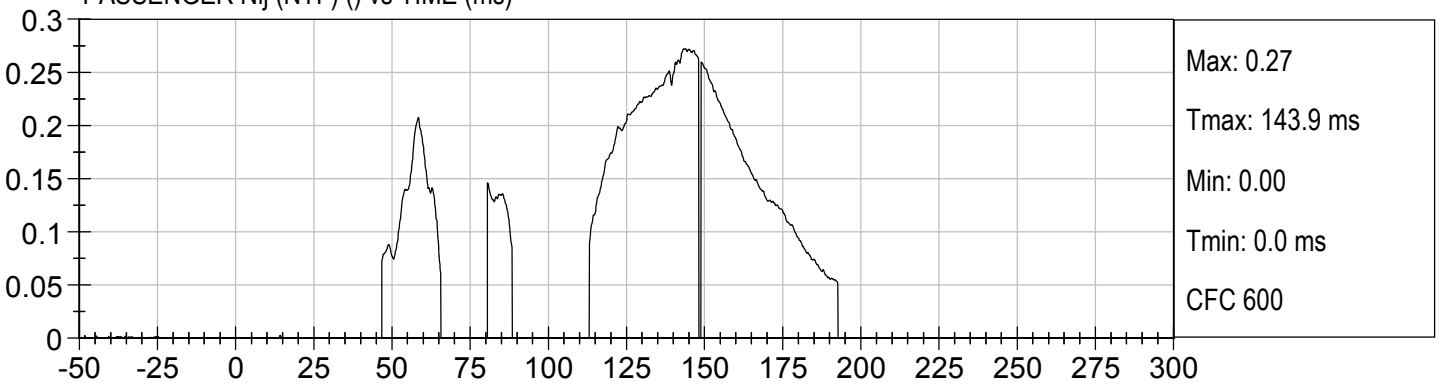
PASSENGER NECK FZ (N) vs TIME (ms)



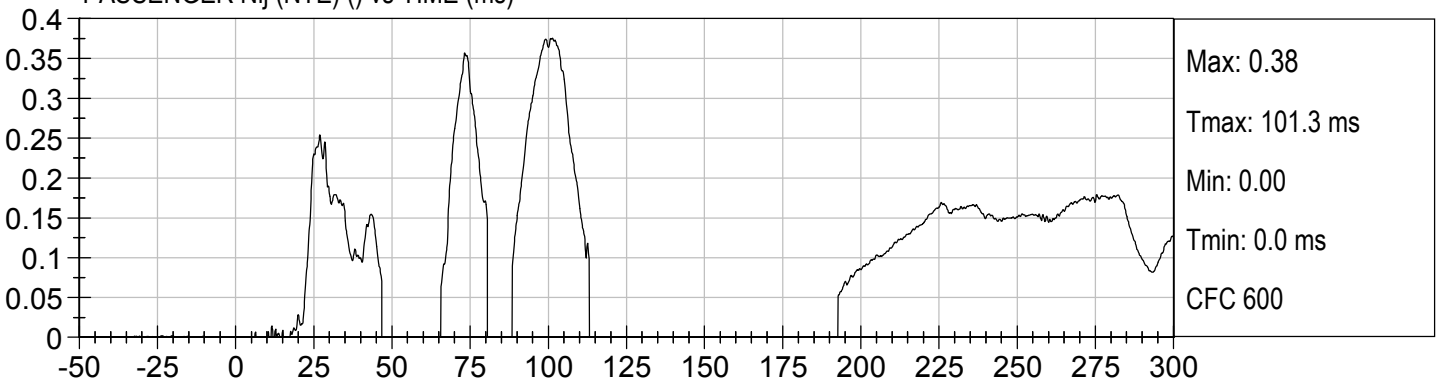
PASSENGER NECK MY (Nm) vs TIME (ms)



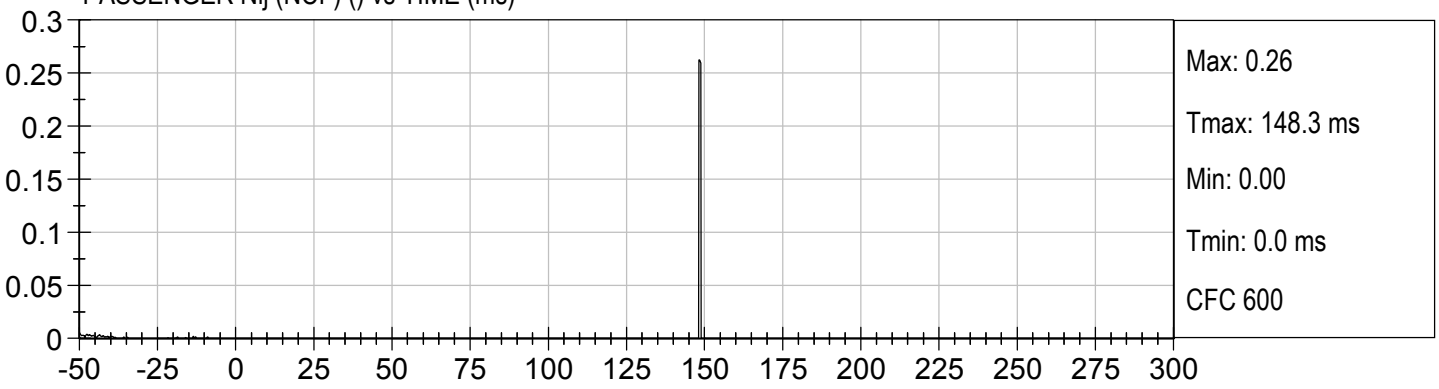
PASSENGER Nij (NTF) () vs TIME (ms)



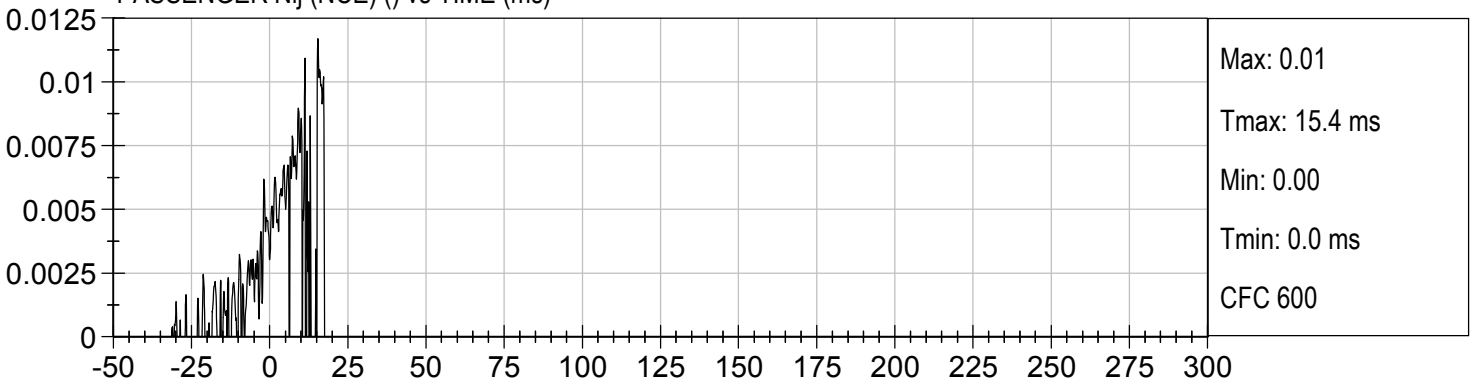
PASSENGER Nij (NTE) () vs TIME (ms)



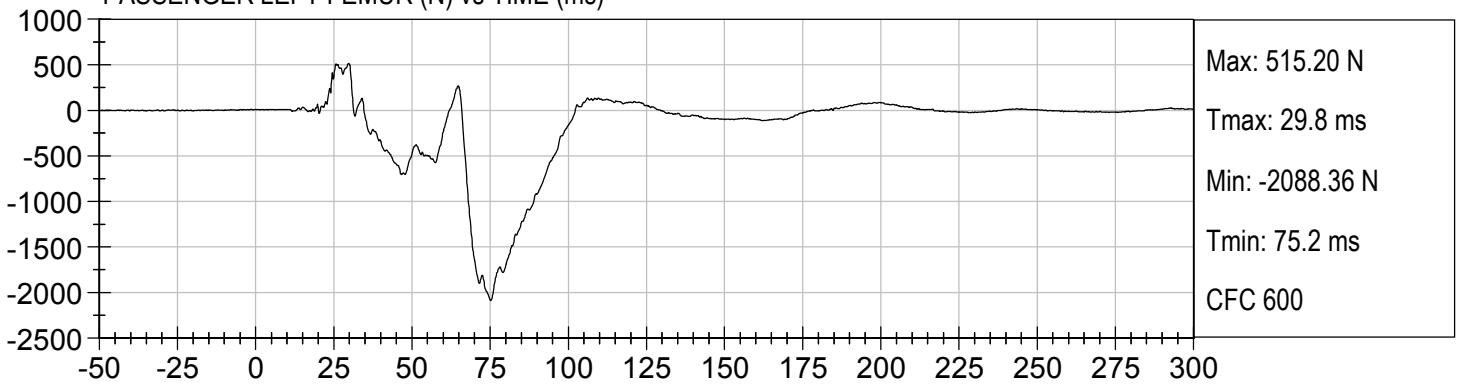
PASSENGER Nij (NCF) () vs TIME (ms)



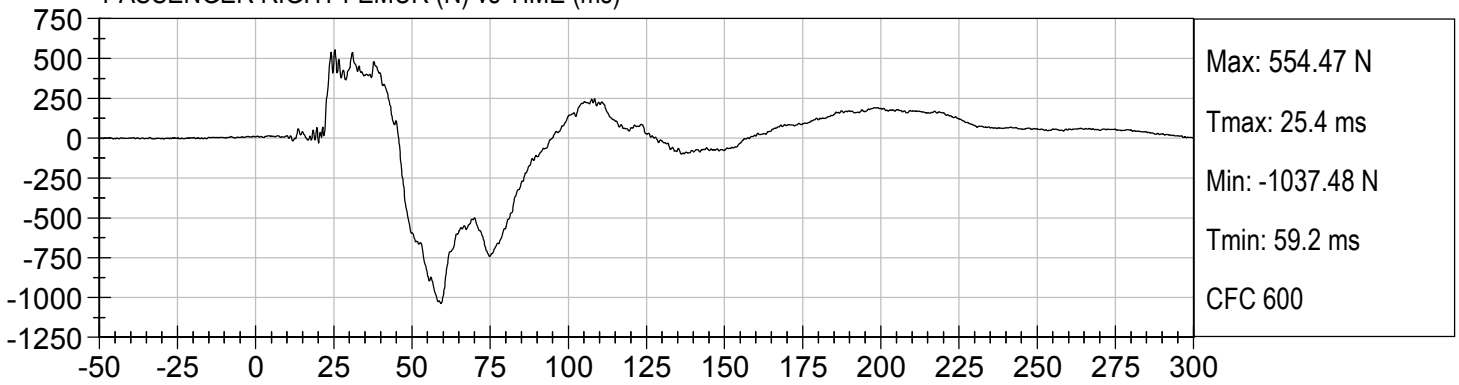
PASSENGER Nij (NCE) () vs TIME (ms)



PASSENGER LEFT FEMUR (N) vs TIME (ms)



PASSENGER RIGHT FEMUR (N) vs TIME (ms)



APPENDIX C
DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

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:** D15511

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	20	Pass
Peak Resultant Acceleration	G's	225 to 275	271	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-14.4	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Maxime Chamberland
Laboratory Technician

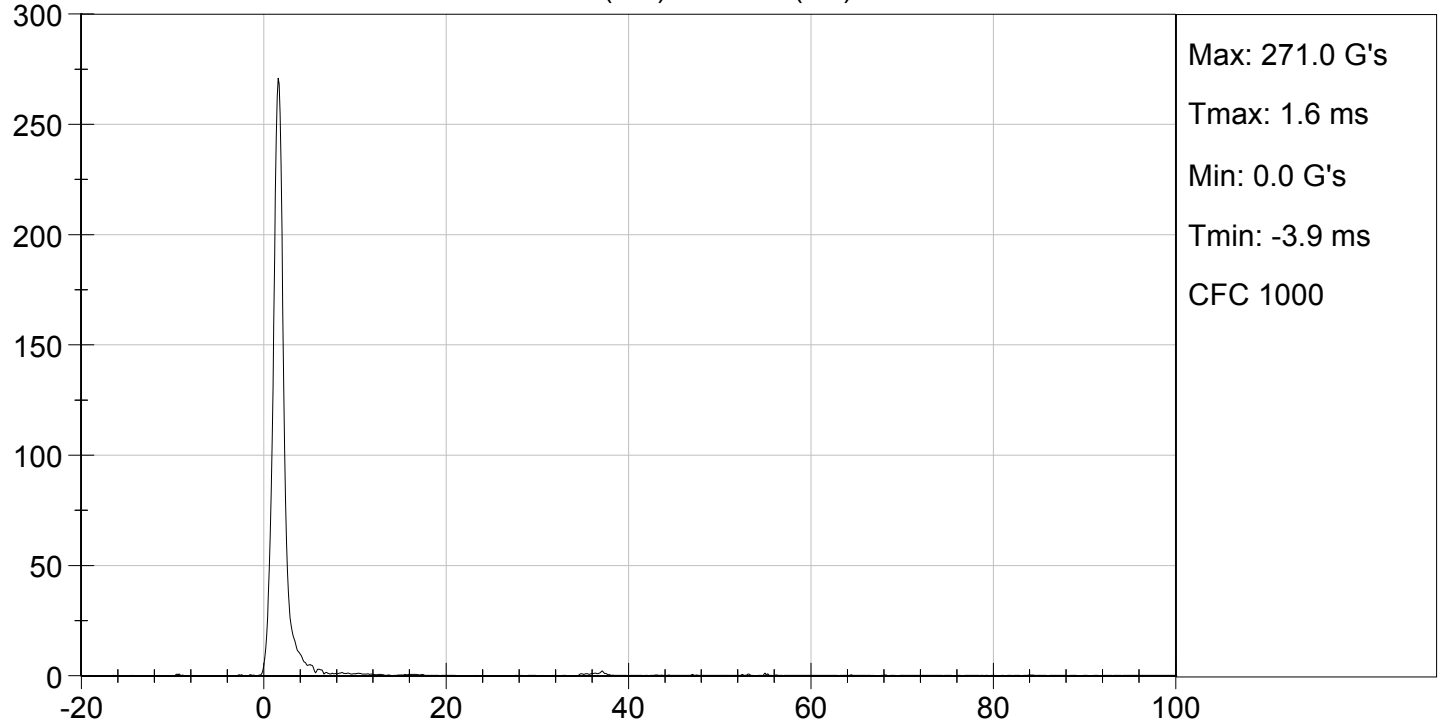
02/19/2015
Test Date

Jessica Hall
Approved By

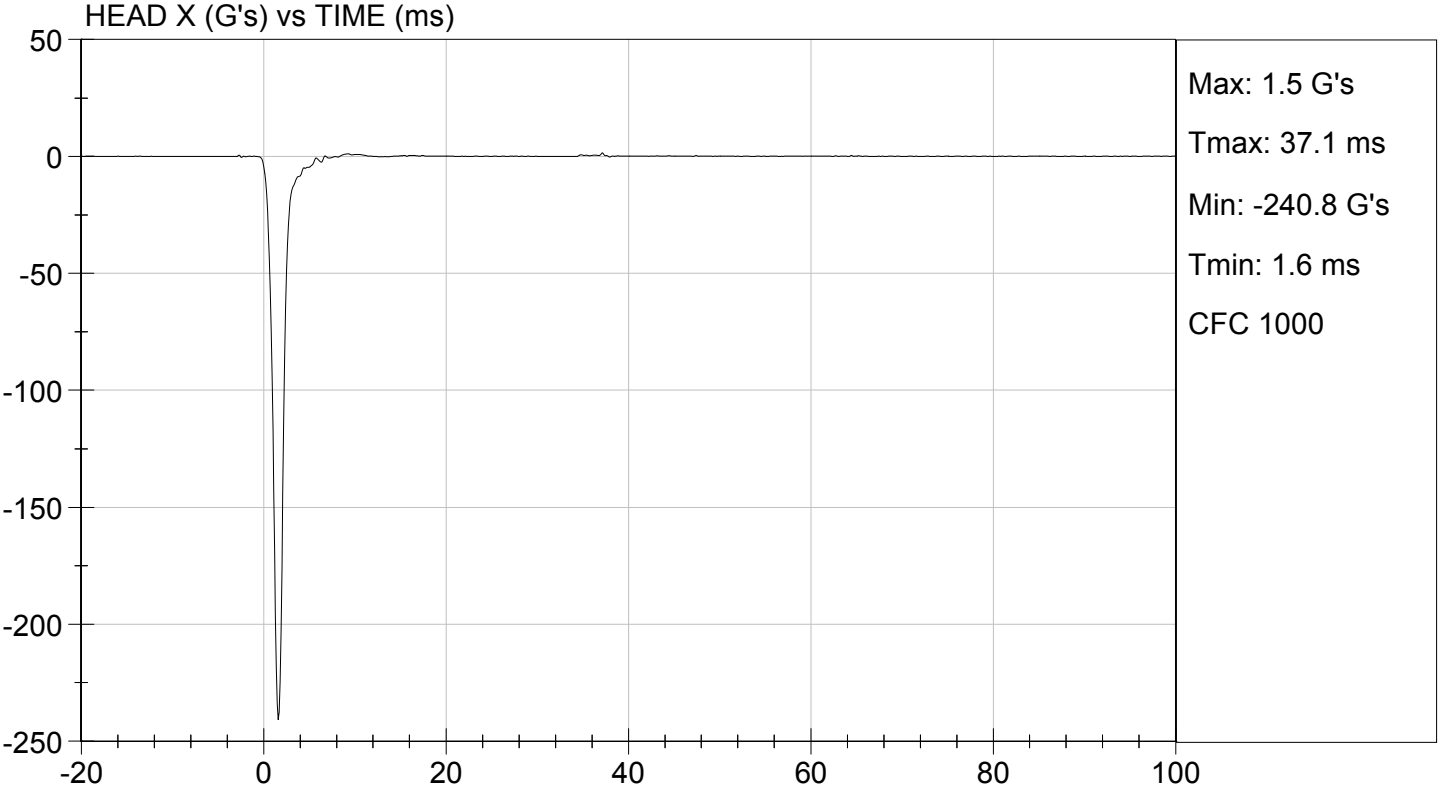
TEST DESC: HEAD DROP

TEST DATE: 02/19/2015
TEST #: D15511

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

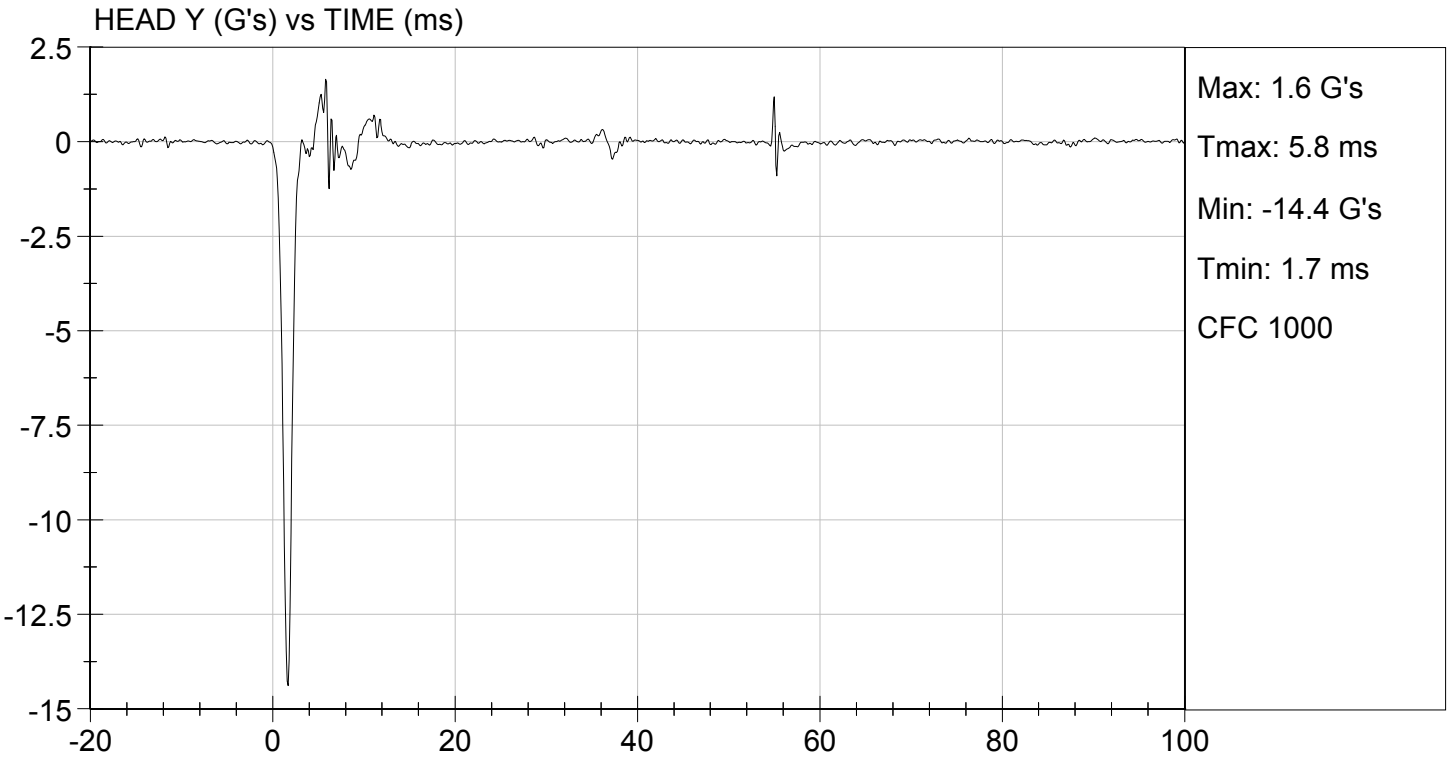


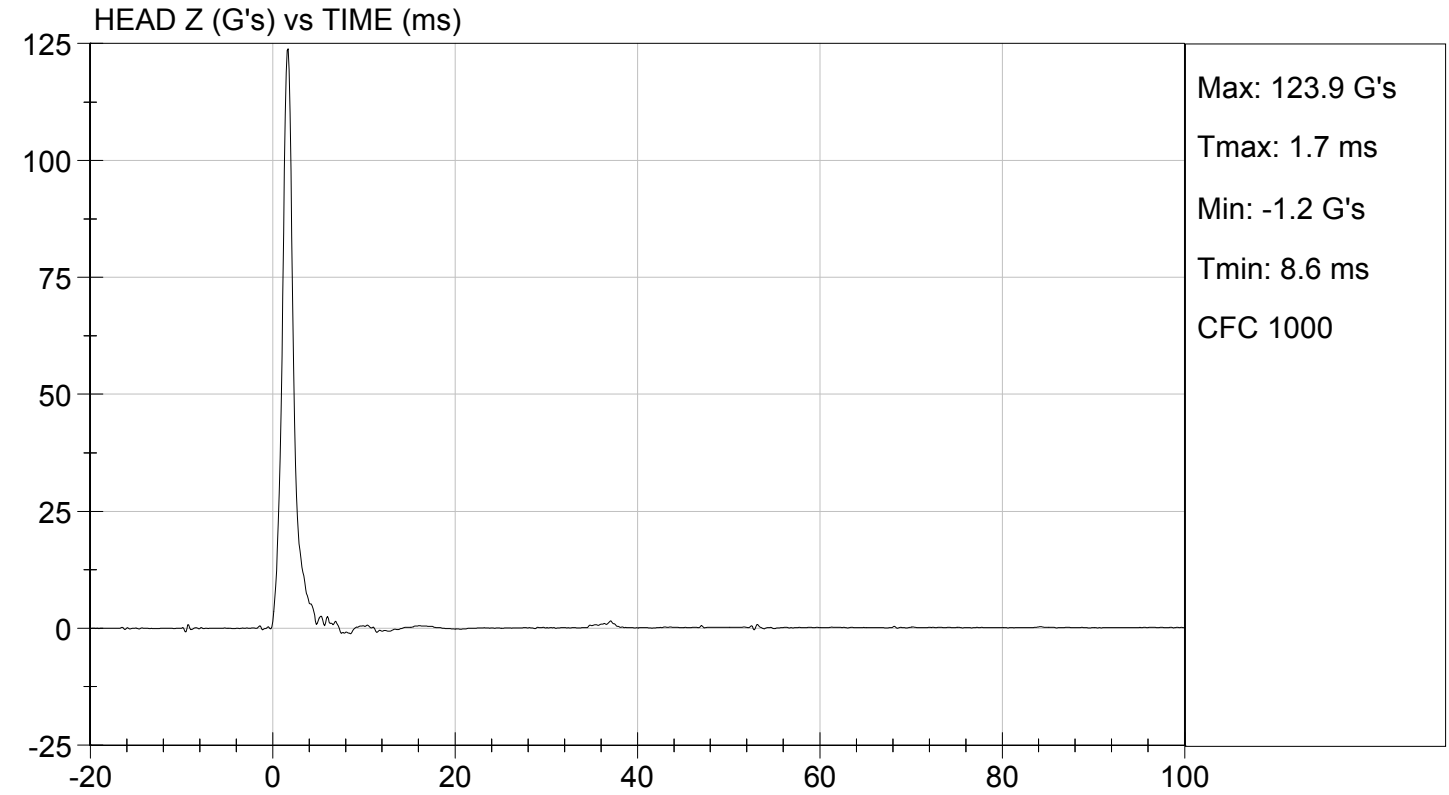
HEAD X (G's) vs TIME (ms)



TEST DESC: HEAD DROP

TEST DATE: 02/19/2015
TEST #: D15511





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D15512

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	14	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	22.73	Pass
	20 ms	G's	17.60 to 22.60	18.13	Pass
	30 ms	G's	12.50 to 18.50	14.60	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	14.5	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	41.9	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	70.8	Pass
	Time	ms	57.0 to 64.0	60.0	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	119.9	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	89.4	Pass
	Time	ms	47.0 to 58.0	54.3	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	103.2	Pass
			Overall Test Results		Pass

David Schoedel

Laboratory Technician

02/19/2015

Test Date

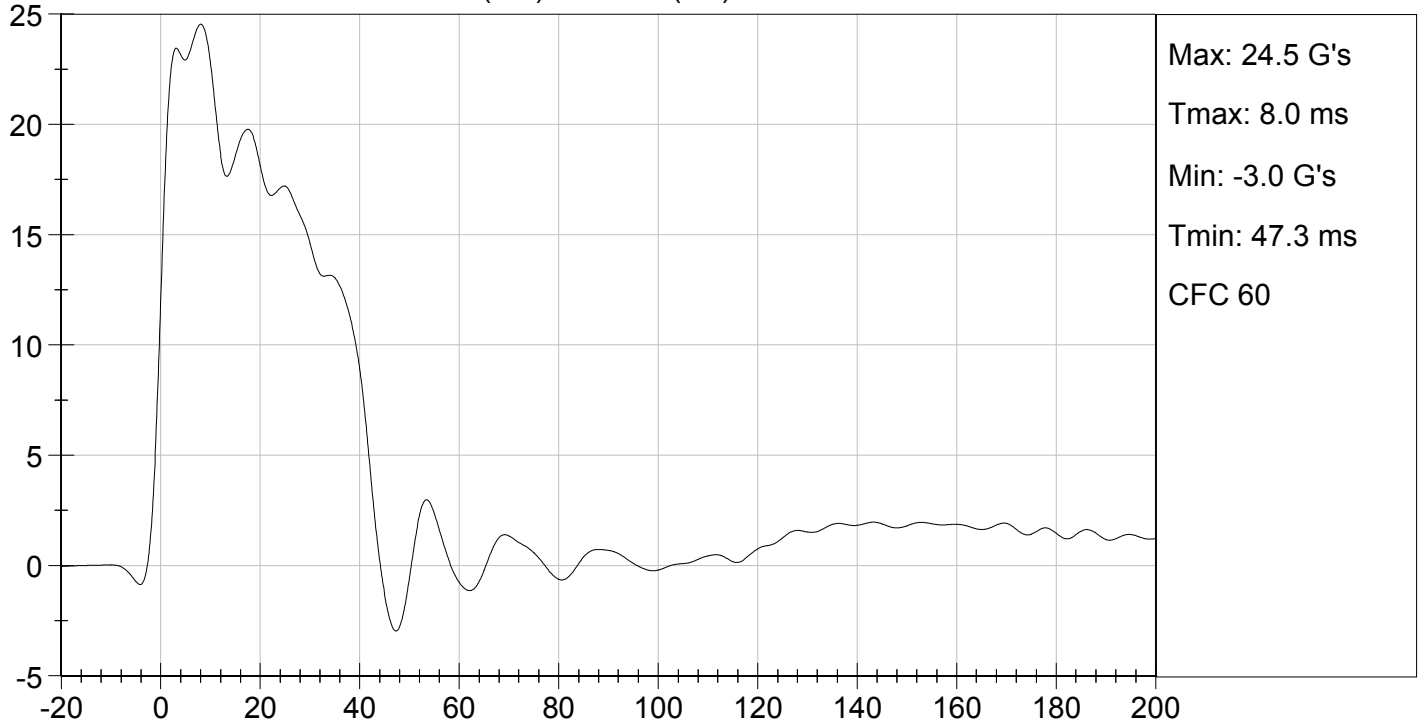
Jessica Hall

Approved By

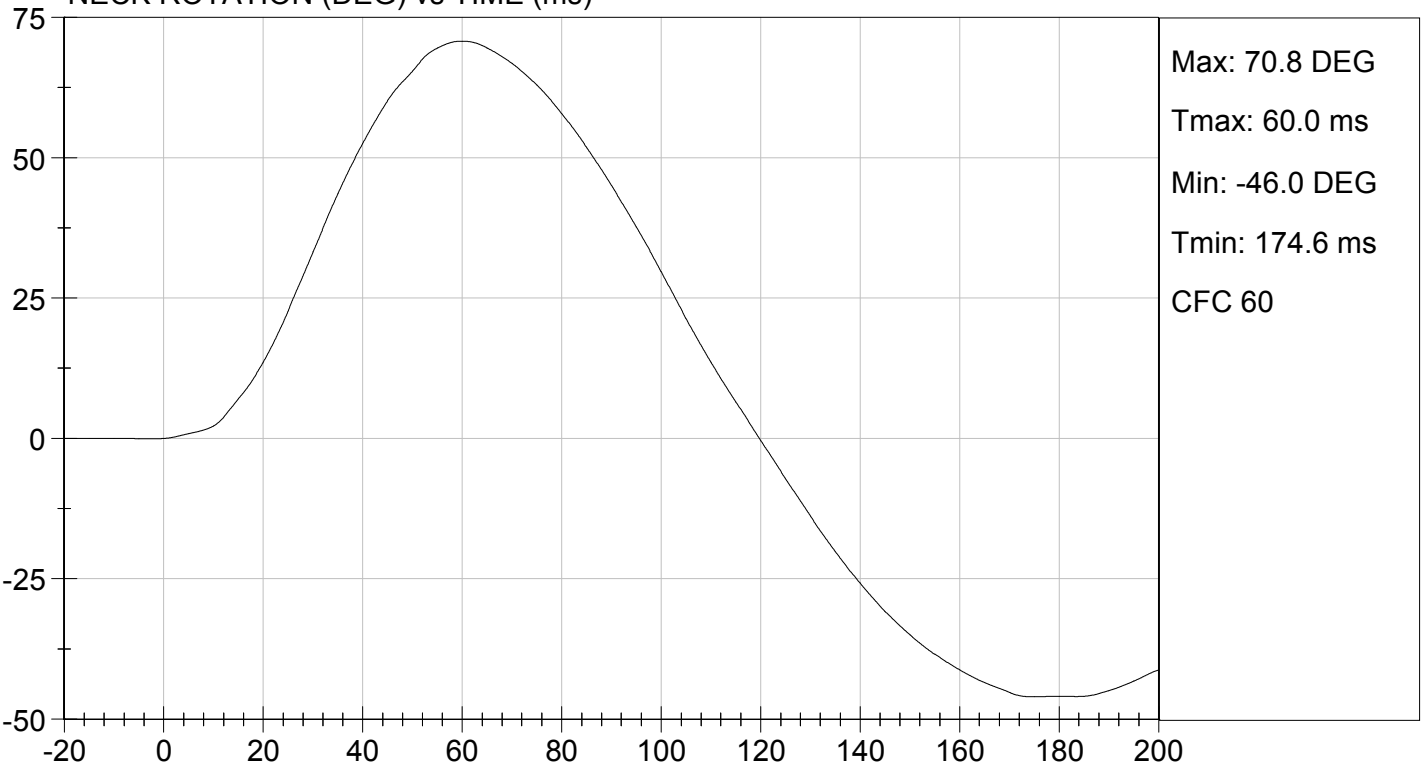
TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

TEST DATE: 02/19/2015
TEST #: D15512

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

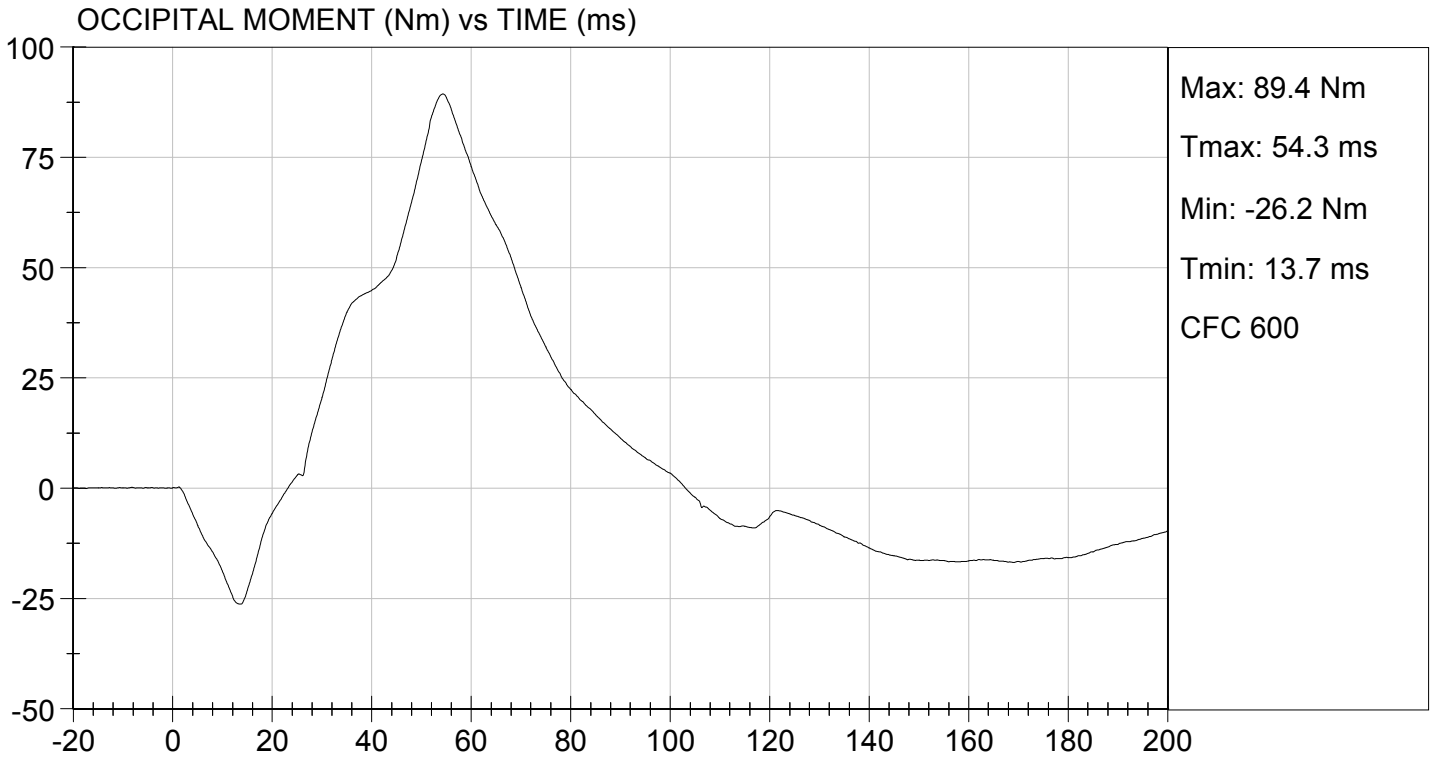


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 02/19/2015
TEST #: D15512



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D15513

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	14	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	19.51	Pass
	20 ms	G's	14.00 to 19.00	15.71	Pass
	30 ms	G's	11.00 to 16.00	14.91	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	15.2	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	42.7	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	94.3	Pass
	Time	ms	72.0 to 82.0	78.9	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	167.2	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-57.2	Pass
	Time	ms	65.0 to 79.0	73.3	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	147.0	Pass
			Overall Test Results		Pass

David Schoedel
Laboratory Technician

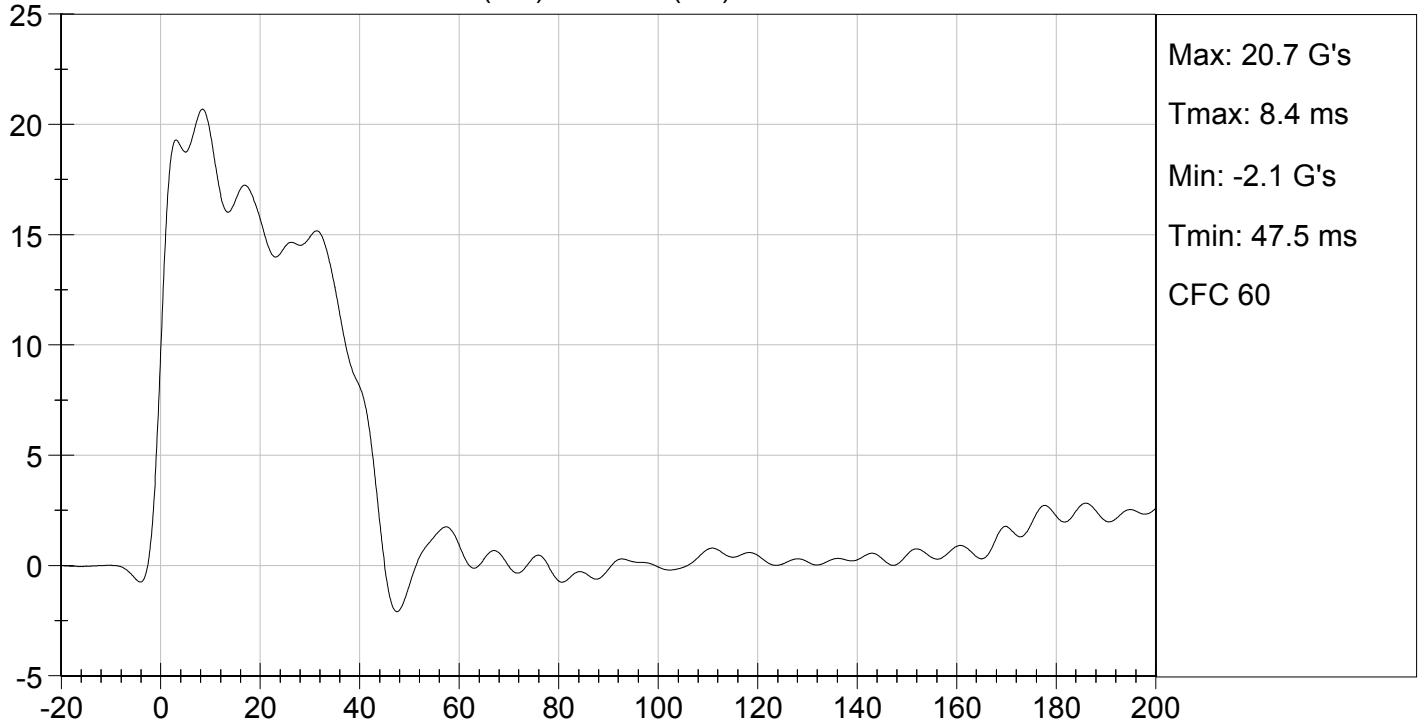
02/19/2015
Test Date

Jessica Gall
Approved By

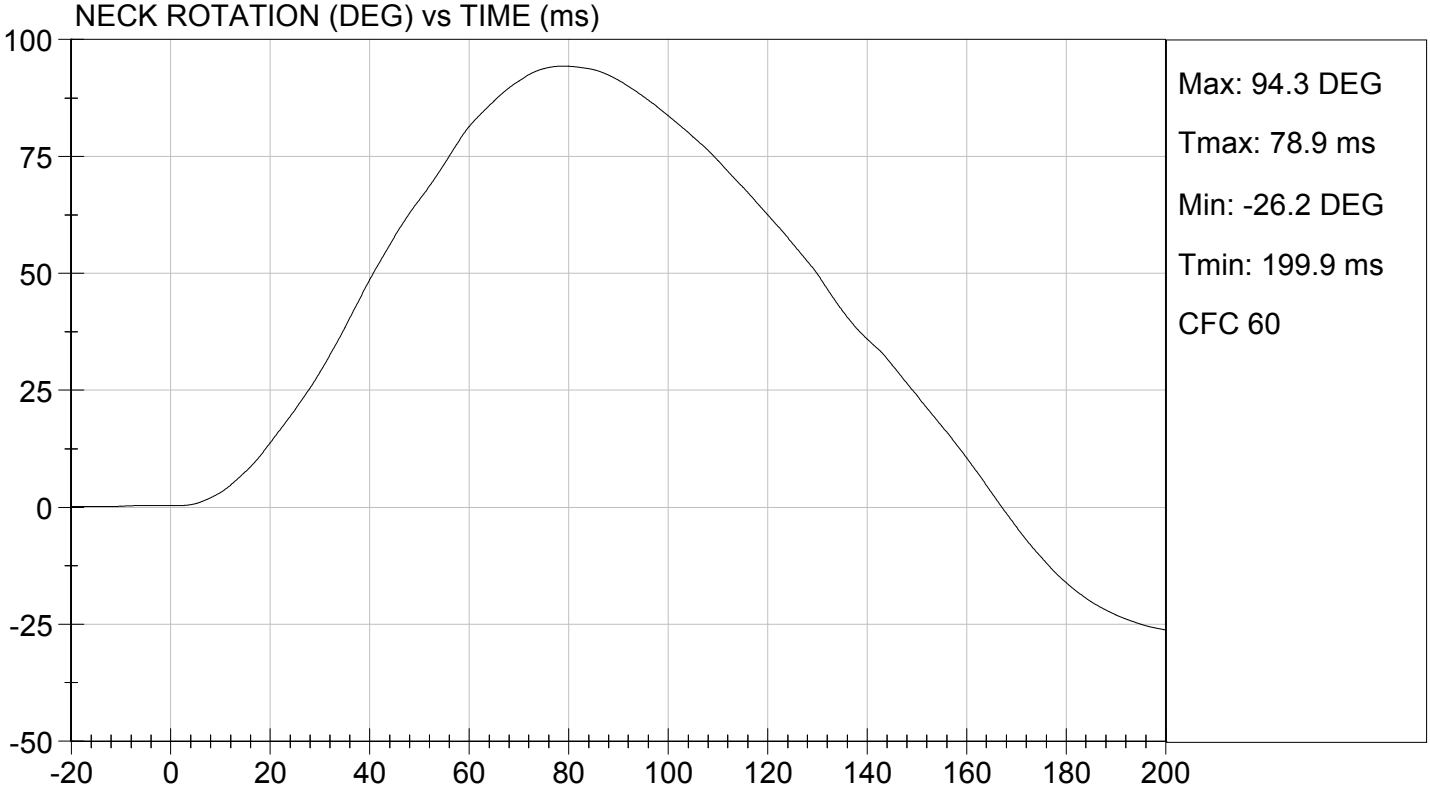
TEST DESC: NECK EXTENSION
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 02/19/2015
TEST #: D15513

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

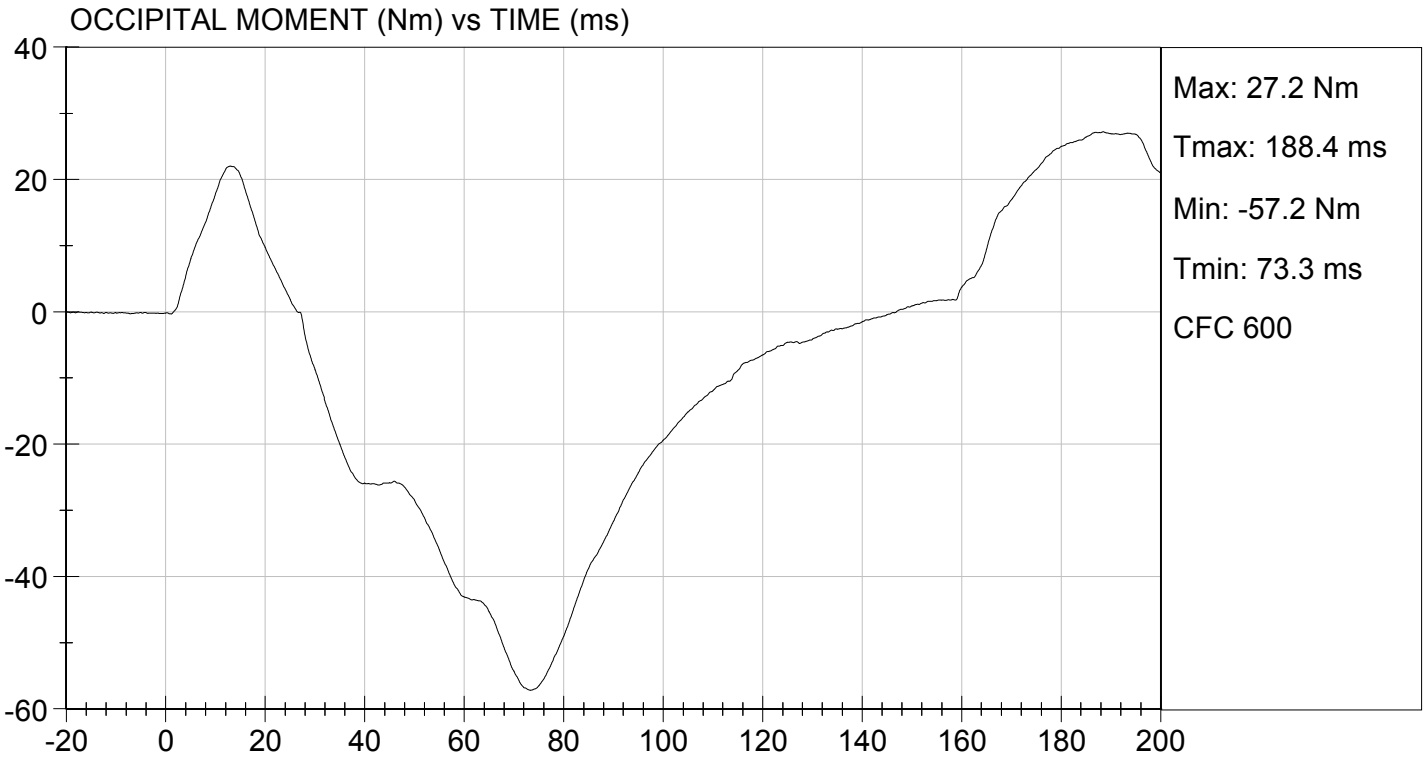


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 02/19/2015
TEST #: D15513



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D15514

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	21	Pass
Probe Velocity	m/s	6.58 to 6.82	6.68	Pass
Peak Probe Force	N	5159 to 5893	5,432	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.57	Pass
Internal Hysteresis	%	69 to 85	71	Pass
		Overall Test Results		Pass

Jack Coleman
Laboratory Technician

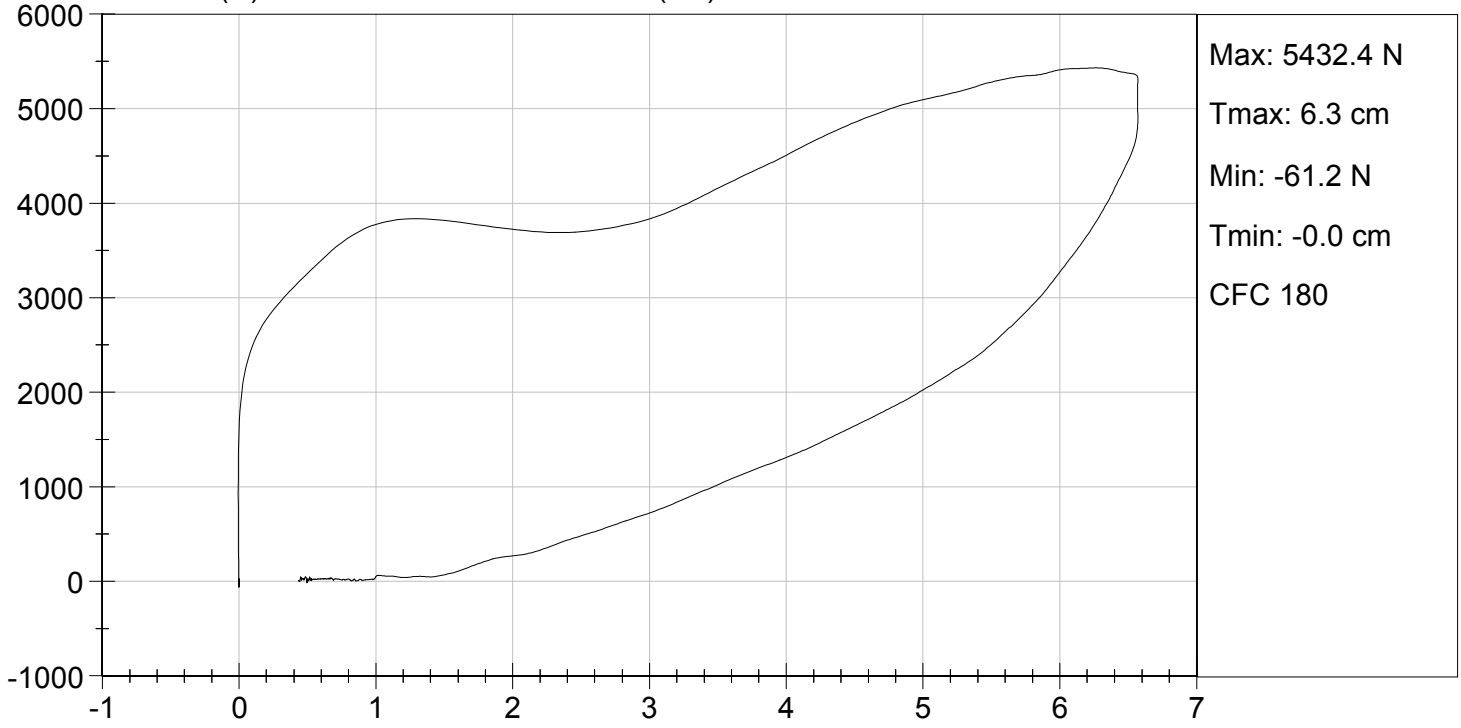
02/20/2015
Test Date

Jessica Hall
Approved By

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

TEST DATE: 02/20/2015
TEST #: D15514

FORCE (N) vs CHEST DISPLACEMENT (cm)



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D15515

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	19	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	N	4715 to 5782	5,066	Pass
		Overall Test Results		Pass

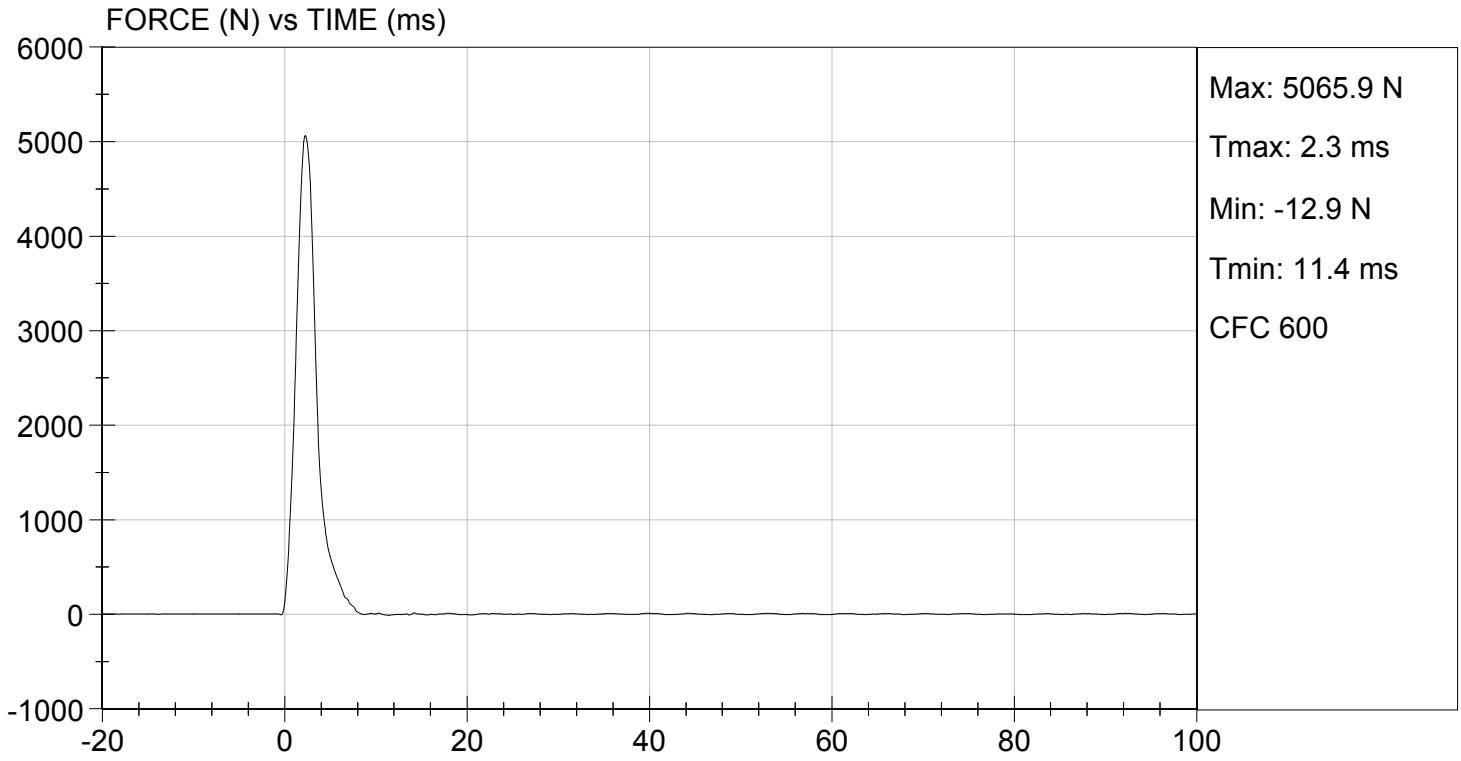
David Schoedel
Laboratory Technician

02/19/2015
Test Date

Jessica Hall
Approved By

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

TEST DATE: 02/19/2015
TEST #: D15515



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D15516

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	19	Pass
Probe Velocity	m/s	2.07 to 2.13	2.13	Pass
Peak Probe Force	N	4715 to 5782	4,761	Pass
		Overall Test Results		Pass

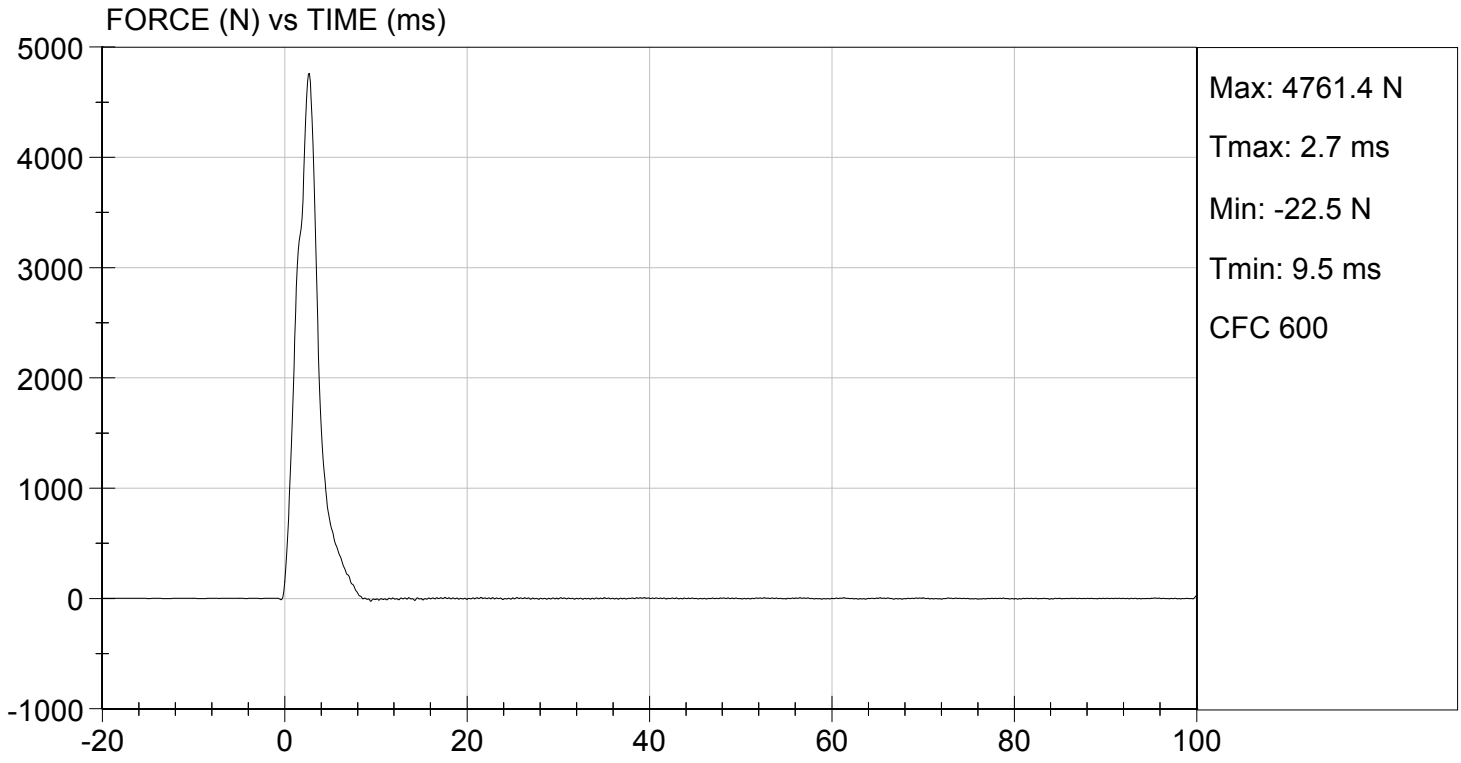
David Schoedel
Laboratory Technician

02/19/2015
Test Date

Jessica Hall
Approved By

TEST DESC: LEFT KNEE
VELOCITY: 6.98 ft/s, 2.13 m/s

TEST DATE: 02/19/2015
TEST #: D15516



MGA RESEARCH CORPORATION

HIP-FEMUR FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D15510

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	20	20	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.3	6.3	Pass
30 Degrees	Nm	94.9 Nm Max	51.4	66.9	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	49.8	47.3	Pass
		Overall Test Results			Pass

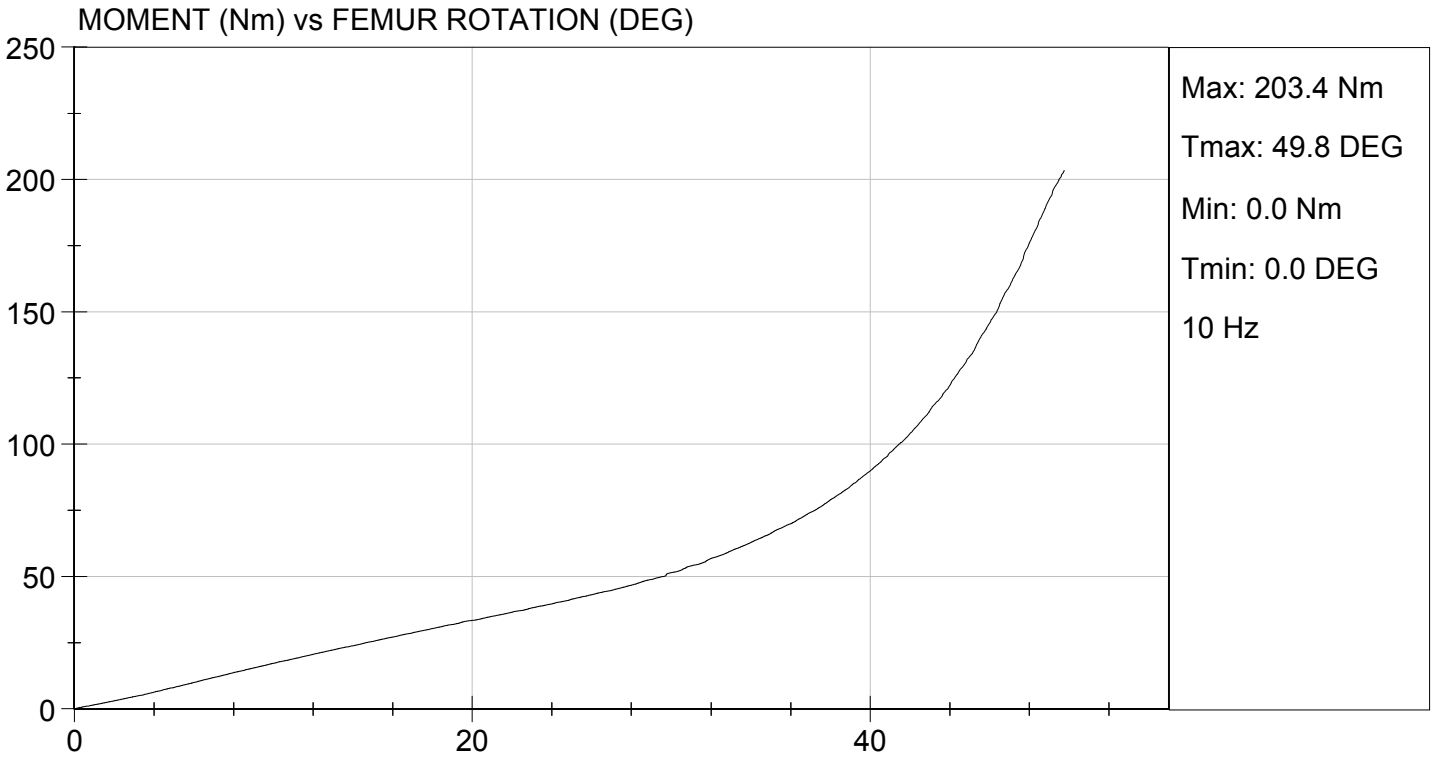
Jack Coleman
Laboratory Technician

02/19/2015
Test Date

Jessica Hall
Approved By

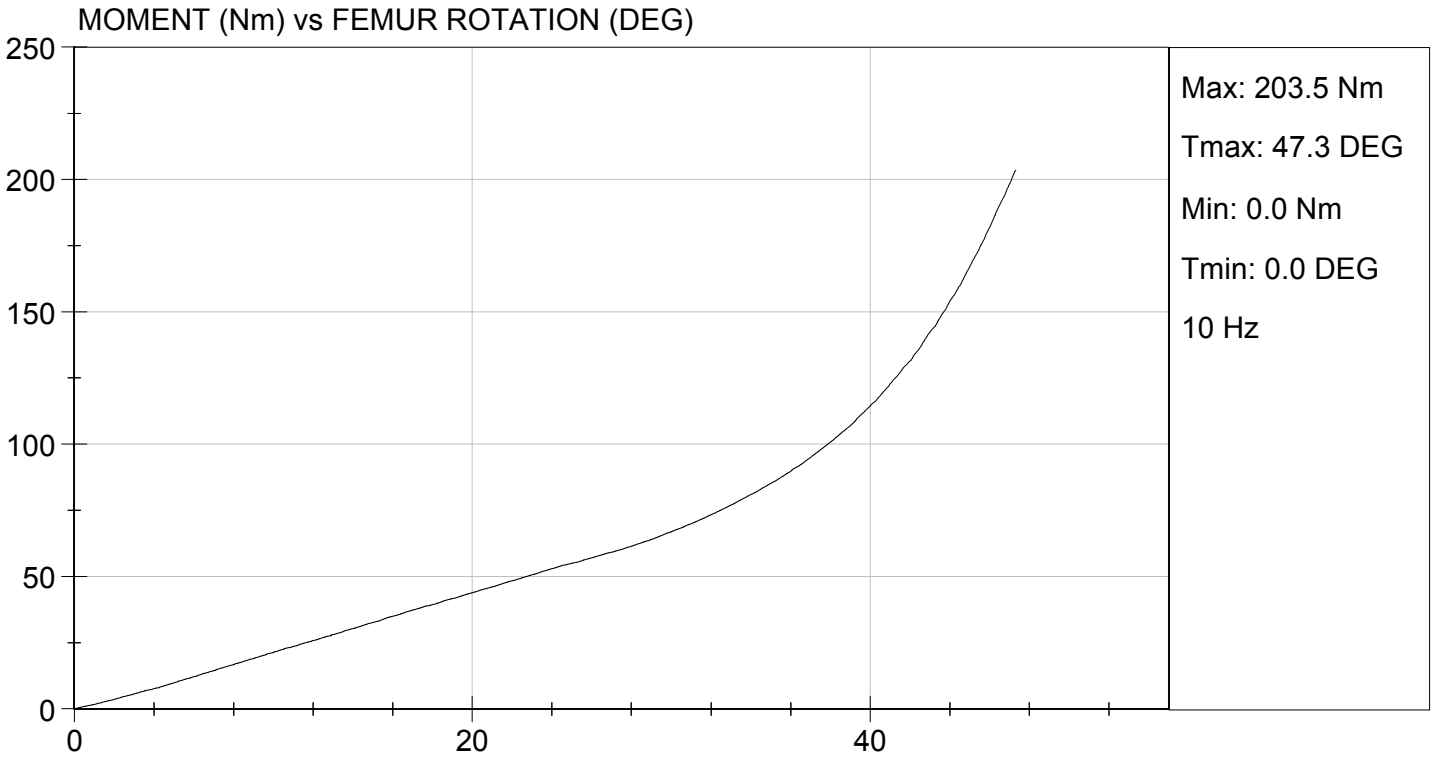
TEST DESC: RIGHT HIP FEMUR FLEXION

TEST DATE: 02/19/2015
TEST #: D15519



TEST DESC: LEFT HIP FEMUR FLEXION

TEST DATE: 02/19/2015
TEST #: D15510



MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test ID:** D15591

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	19	Pass
Peak Resultant Acceleration	G's	225 to 275	253	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	12.7	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Jack Coleman
Laboratory Technician

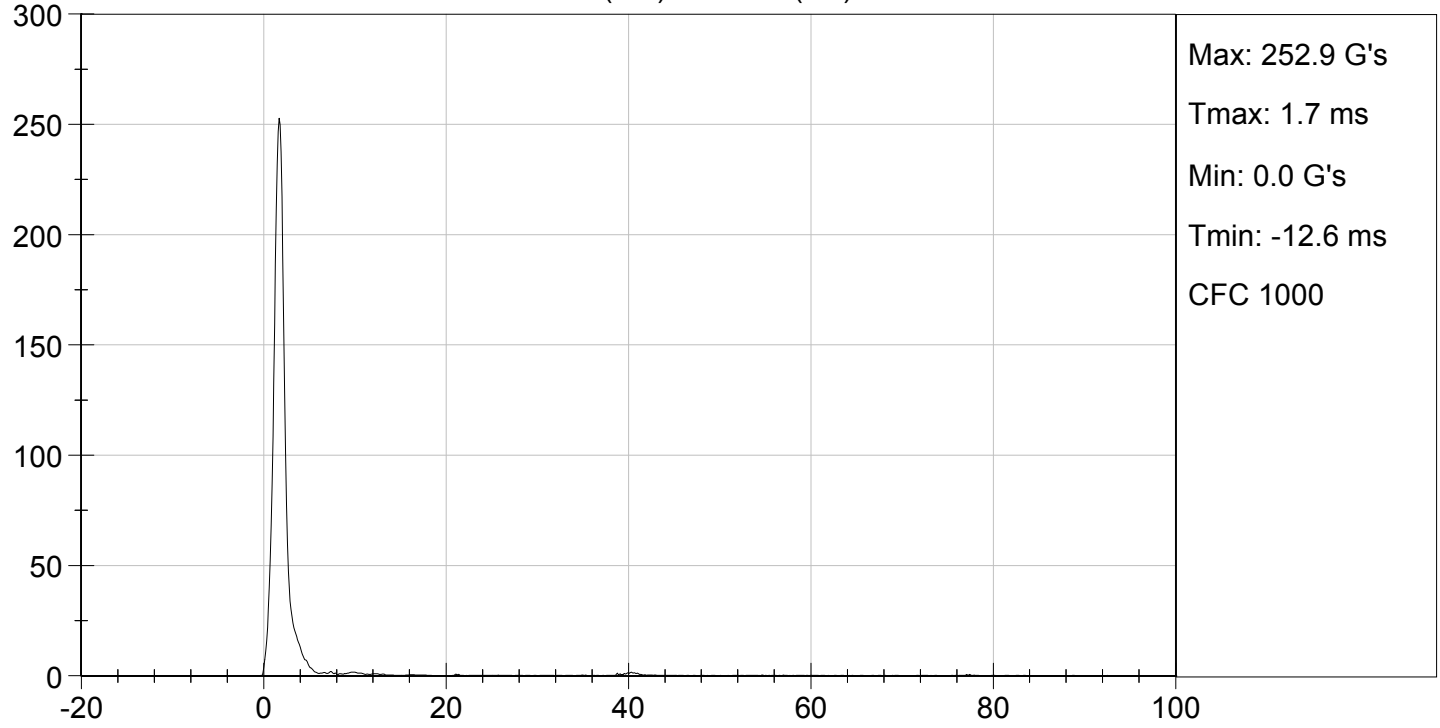
02/27/2015
Test Date

Jessica Hall
Approved By

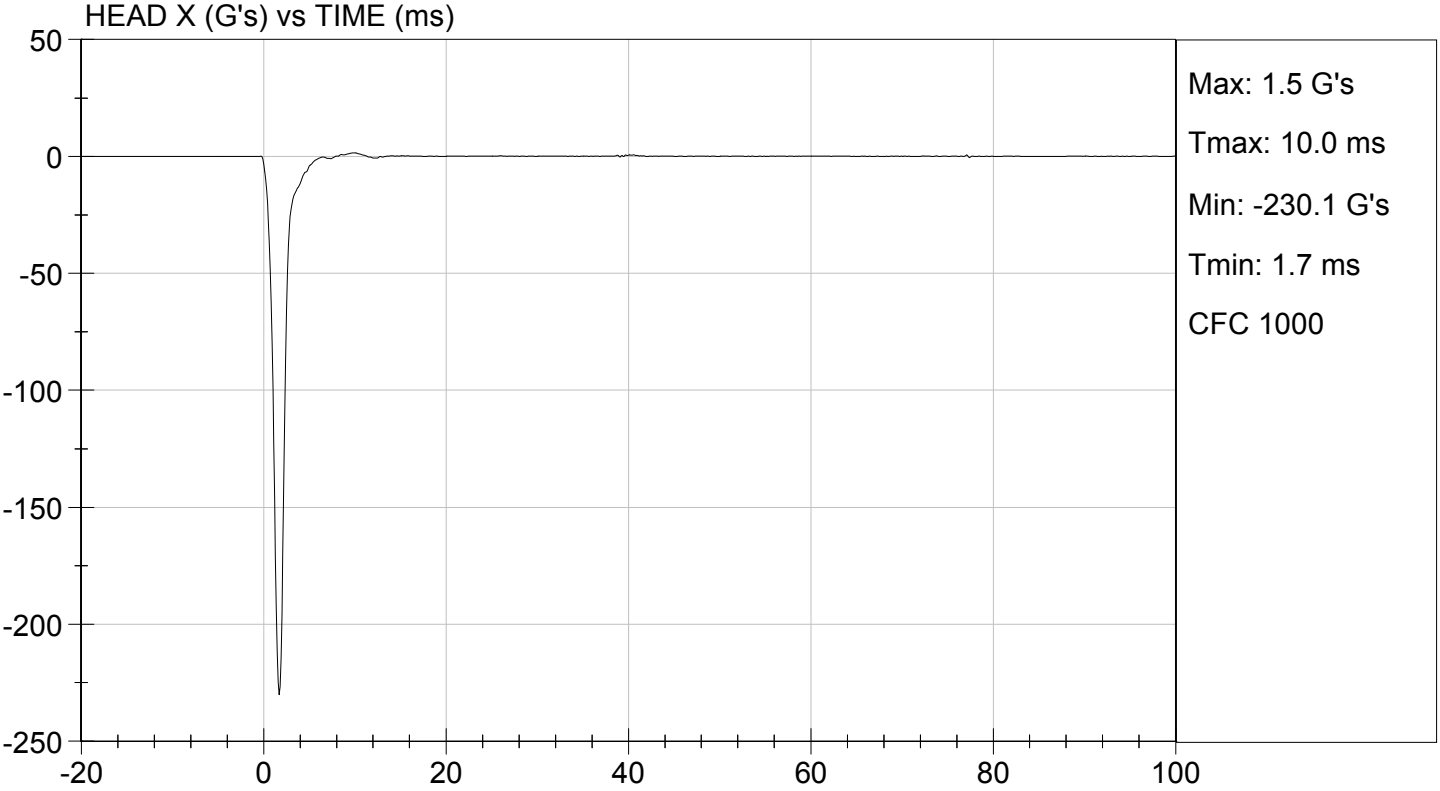
TEST DESC: HEAD DROP

TEST DATE: 02/27/2015
TEST #: D15591

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



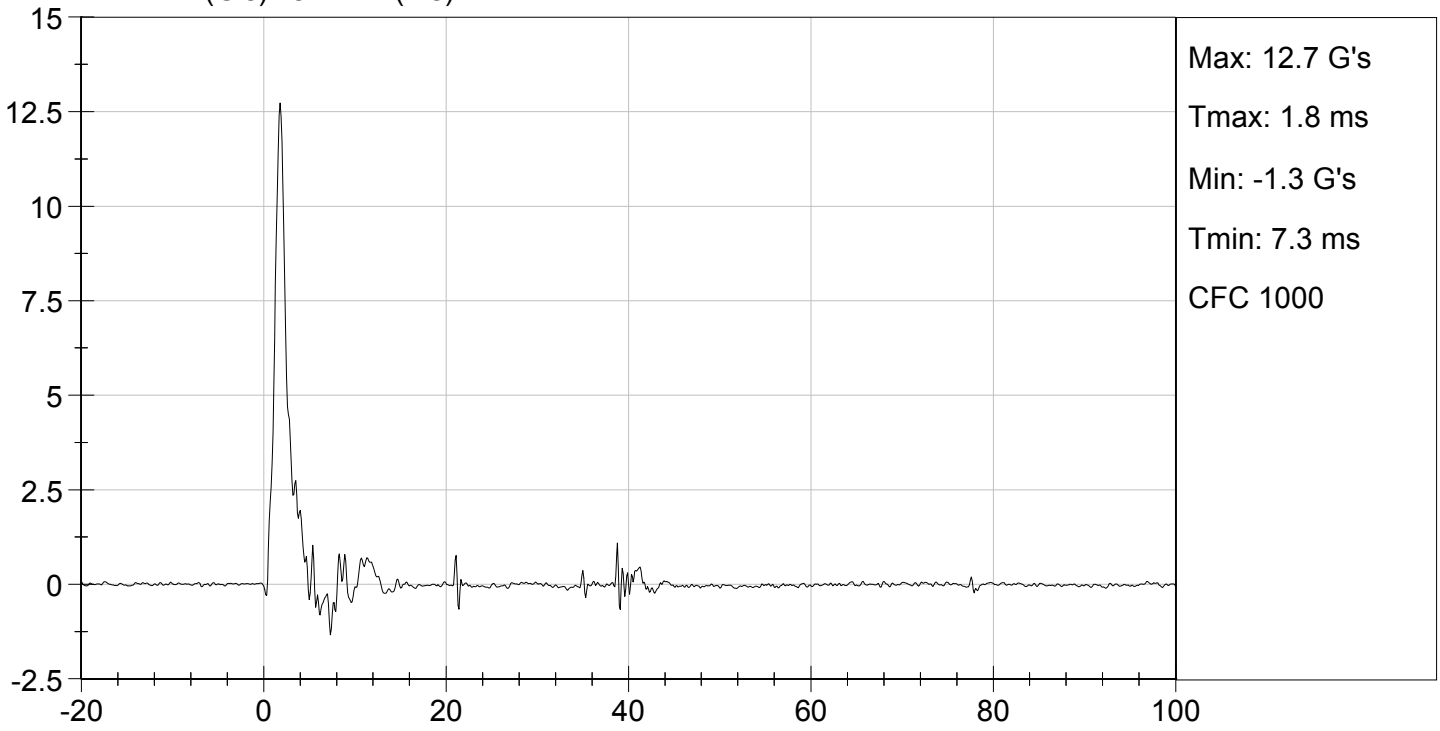
HEAD X (G's) vs TIME (ms)



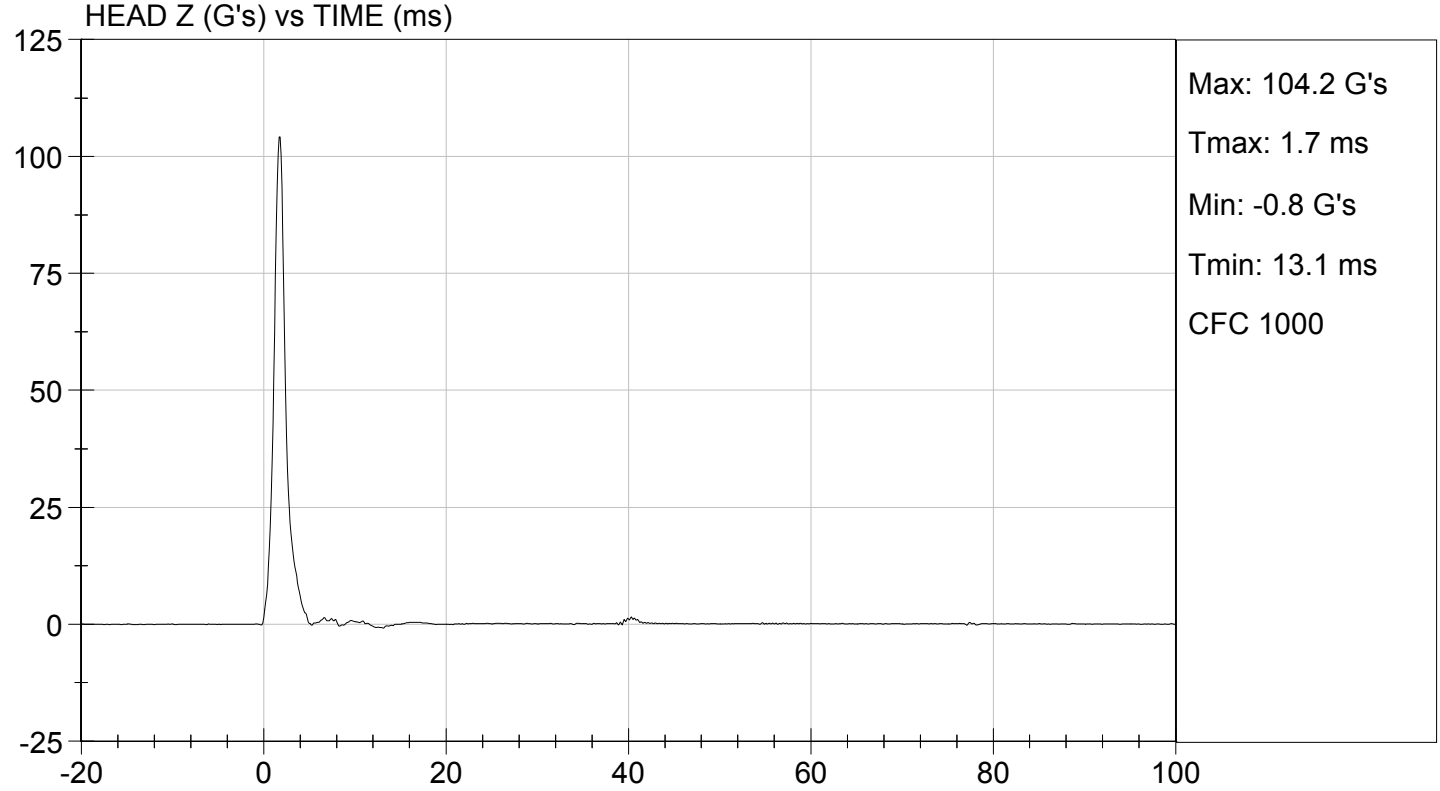
TEST DESC: HEAD DROP

TEST DATE: 02/27/2015
TEST #: D15591

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



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



MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D15592

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity		%	10 to 70	21	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.29	Pass
	20 ms	G's	17.60 to 22.60	19.07	Pass
	30 ms	G's	12.50 to 18.50	13.83	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	15.0	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	38.3	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	71.0	Pass
	Time	ms	57.0 to 64.0	60.2	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	118.5	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	89.1	Pass
	Time	ms	47.0 to 58.0	51.4	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	102.9	Pass
			Overall Test Results		Pass

David Schoedel

Laboratory Technician

02/27/2015

Test Date

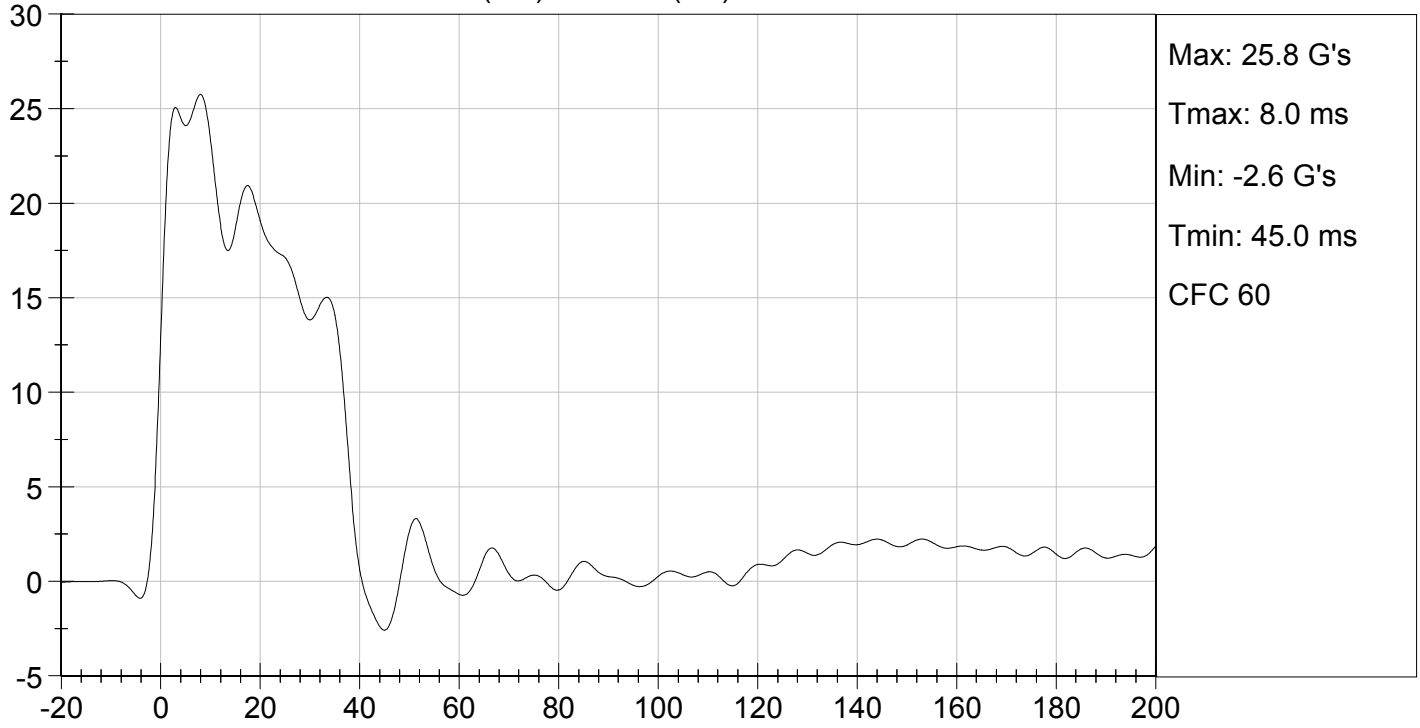
Jessica Gall

Approved By

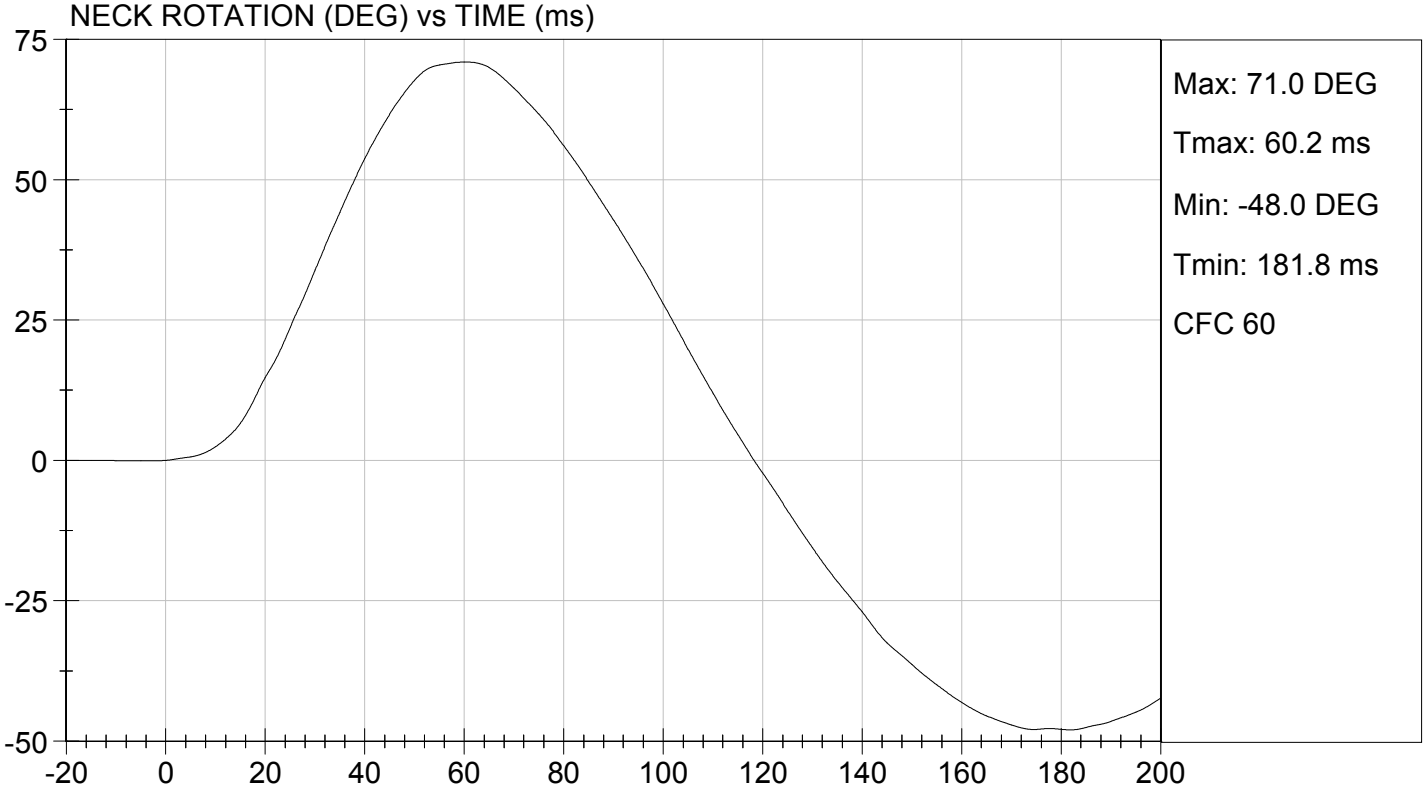
TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

TEST DATE: 02/27/2015
TEST #: D15592

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



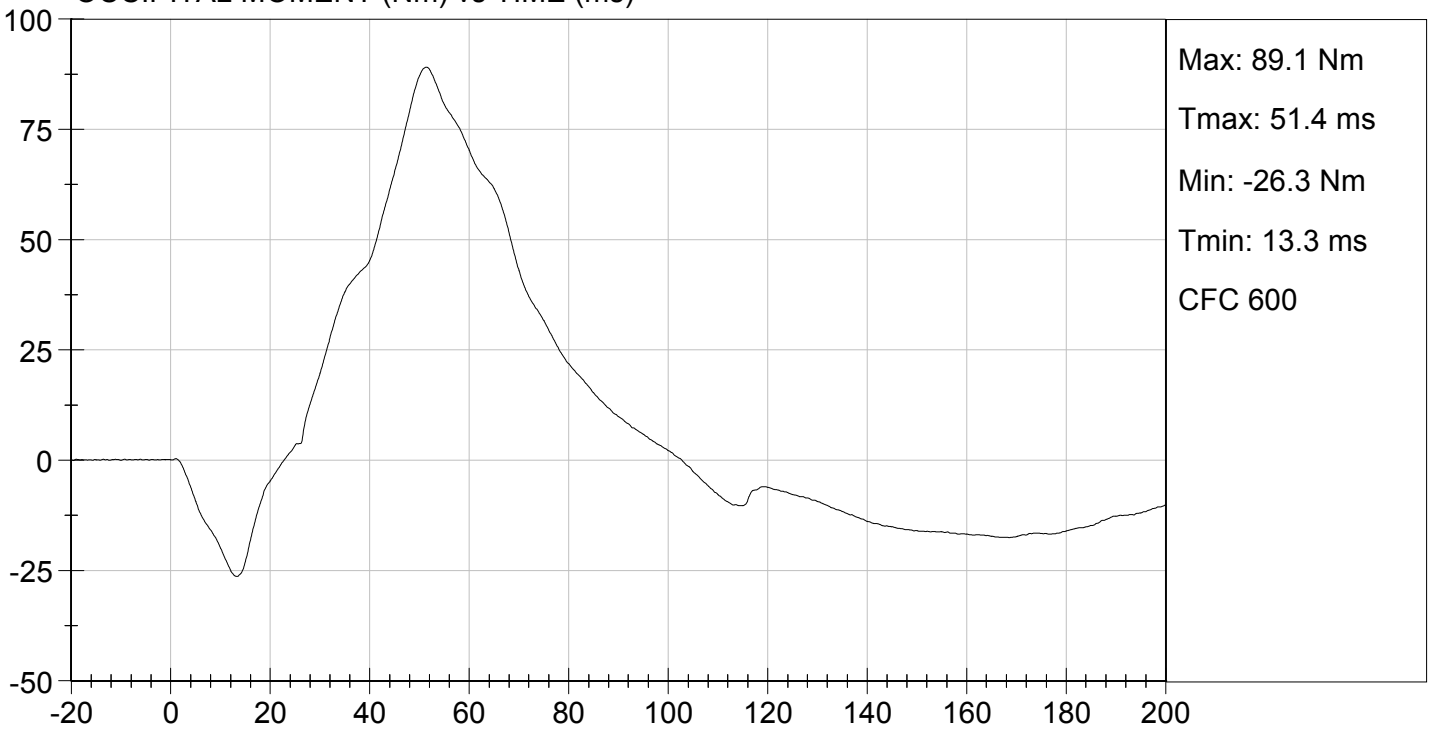
NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 02/27/2015
TEST #: D15592

OCCIPITAL MOMENT (Nm) vs TIME (ms)



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D15593

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity		%	10 to 70	21	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.19	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	18.63	Pass
	20 ms	G's	14.00 to 19.00	16.91	Pass
	30 ms	G's	11.00 to 16.00	12.25	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	14.2	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	40.4	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	98.3	Pass
	Time	ms	72.0 to 82.0	78.9	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	162.7	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-61.6	Pass
	Time	ms	65.0 to 79.0	72.5	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	146.8	Pass
			Overall Test Results		Pass

David Schoedel

Laboratory Technician

02/27/2015

Test Date

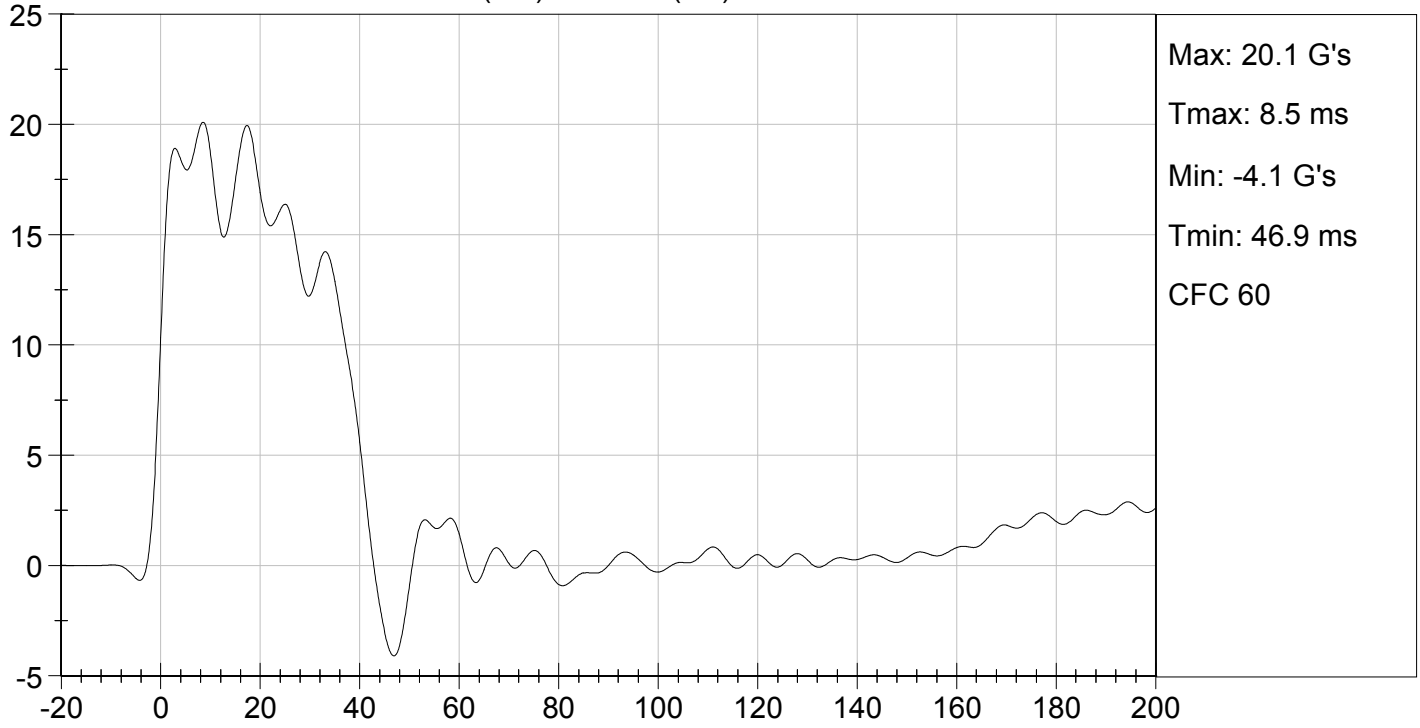
Jessica Hall

Approved By

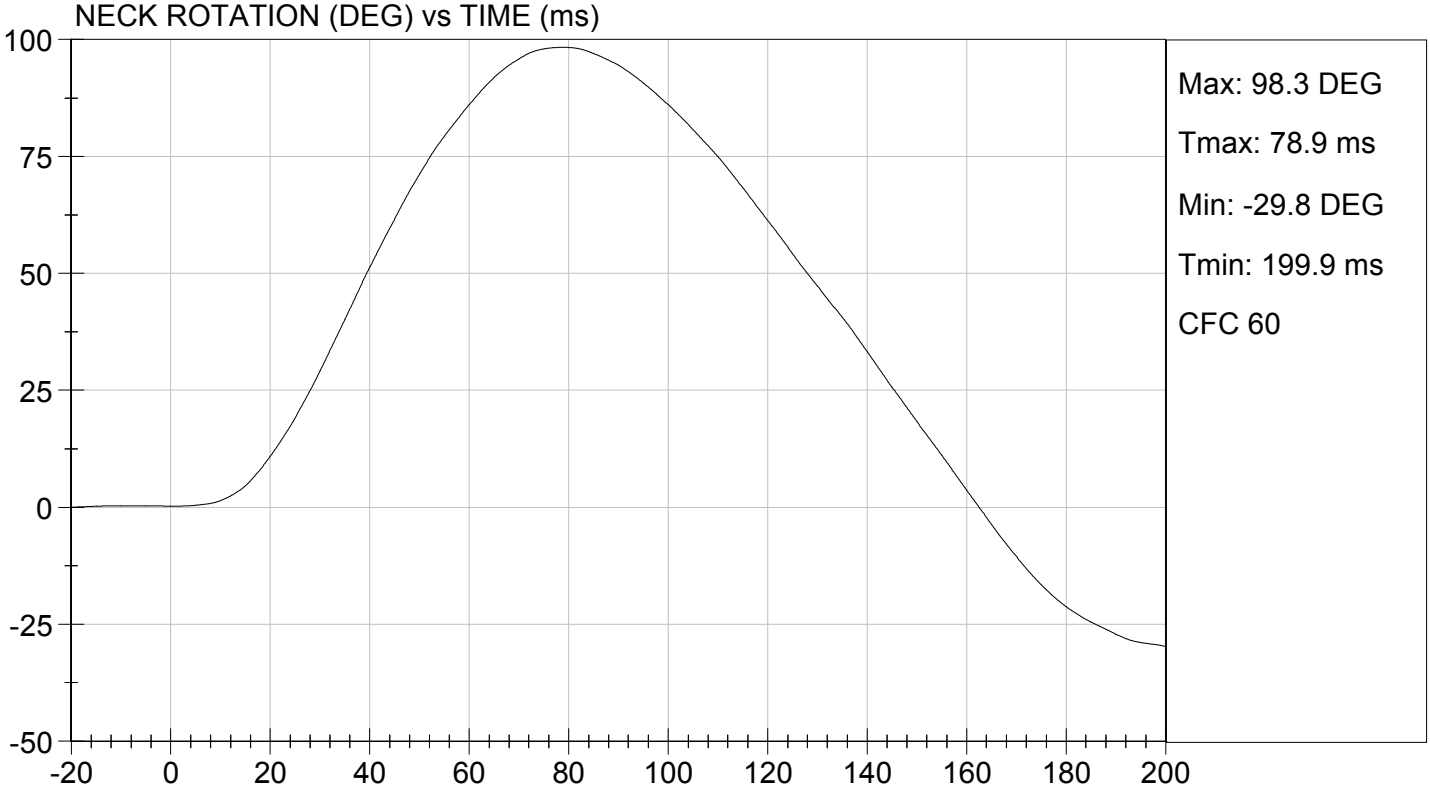
TEST DESC: NECK EXTENSION
VELOCITY: 20.30 ft/s, 6.19 m/s

TEST DATE: 02/27/2015
TEST #: D15593

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

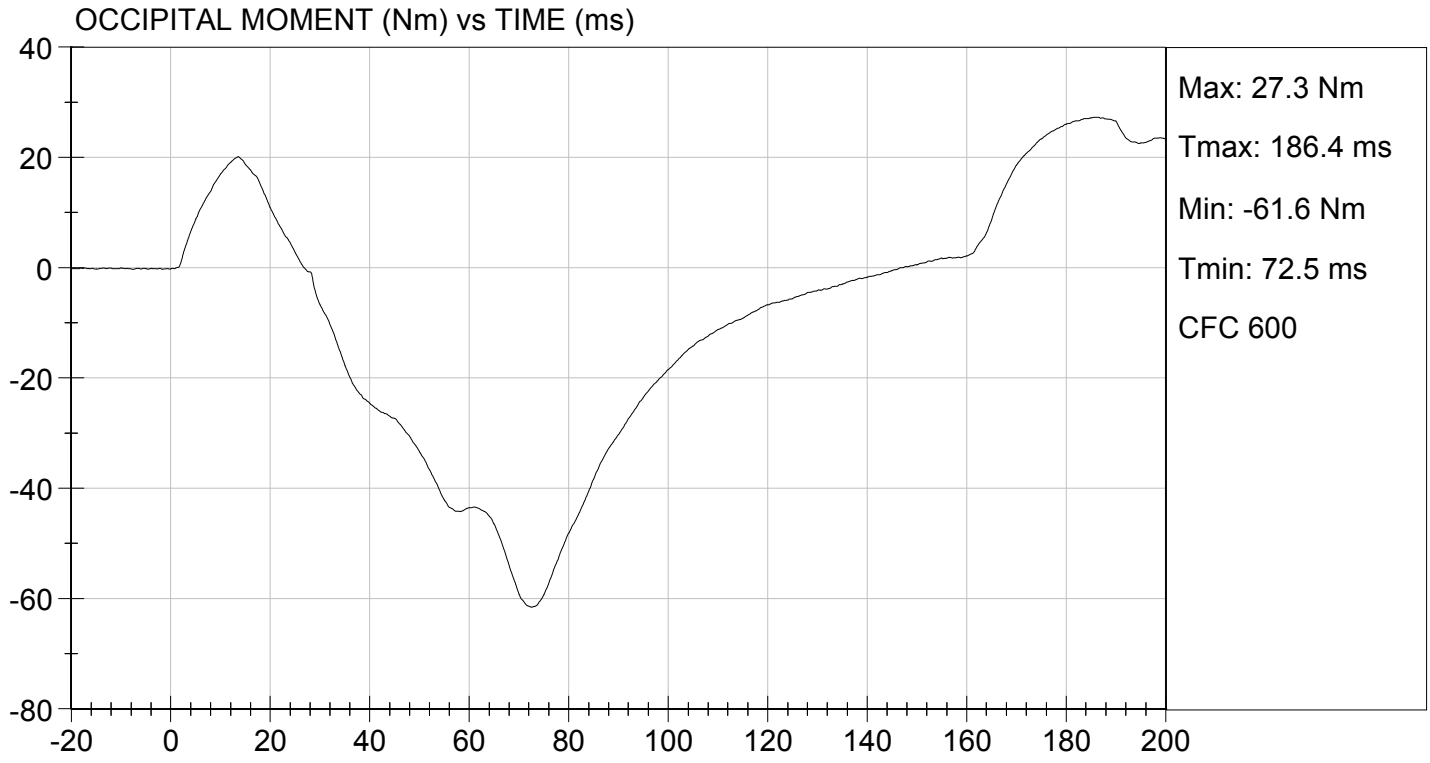


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 02/27/2015
TEST #: D15593



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D15594

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	18	Pass
Probe Velocity	m/s	6.58 to 6.82	6.60	Pass
Peak Probe Force	N	5159 to 5893	5,436	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.57	Pass
Internal Hysteresis	%	69 to 85	72	Pass
		Overall Test Results		Pass

Jack Coleman
Laboratory Technician

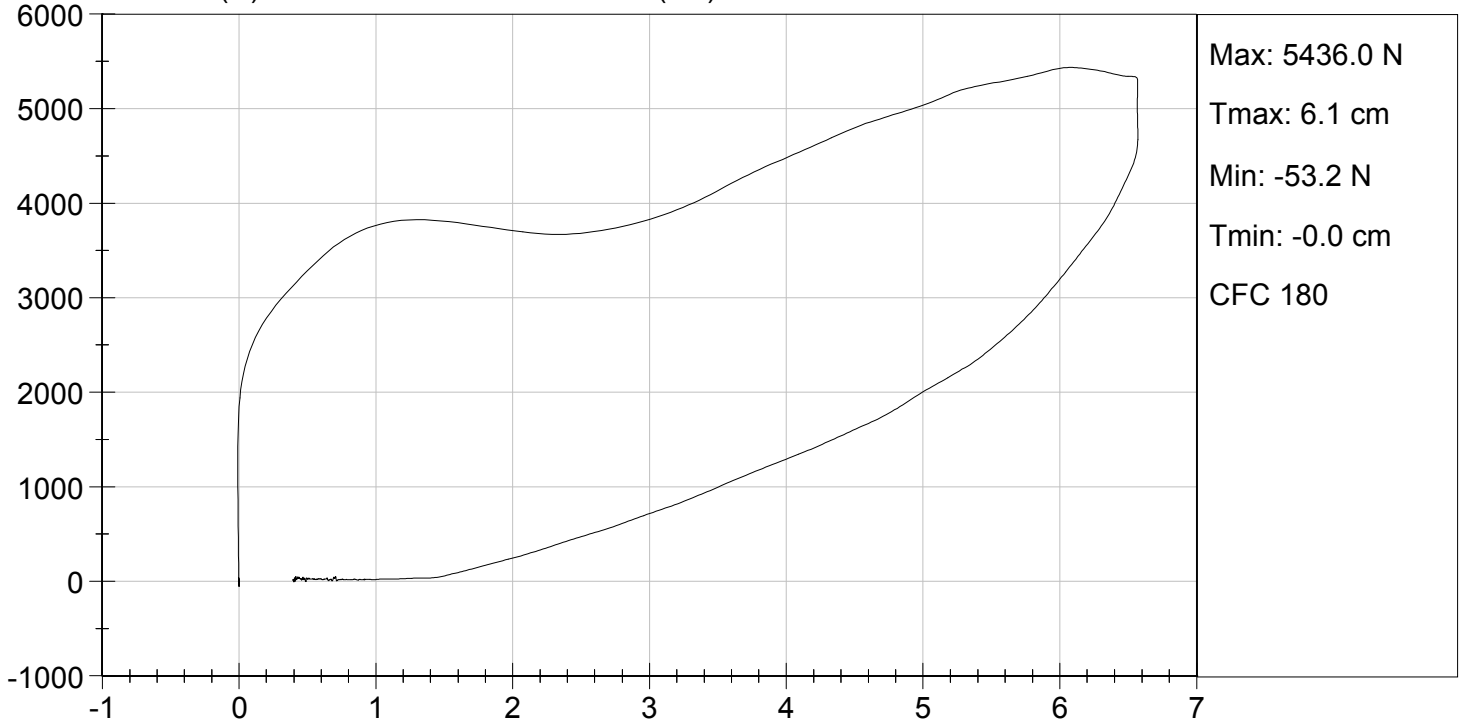
02/27/2015
Test Date

Jessica Hall
Approved By

TEST DESC: THORAX IMPACT
VELOCITY: 21.65 ft/s, 6.60 m/s

TEST DATE: 02/27/2015
TEST #: D15594

FORCE (N) vs CHEST DISPLACEMENT (cm)



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D15595

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	21	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	N	4715 to 5782	5,084	Pass
		Overall Test Results		Pass

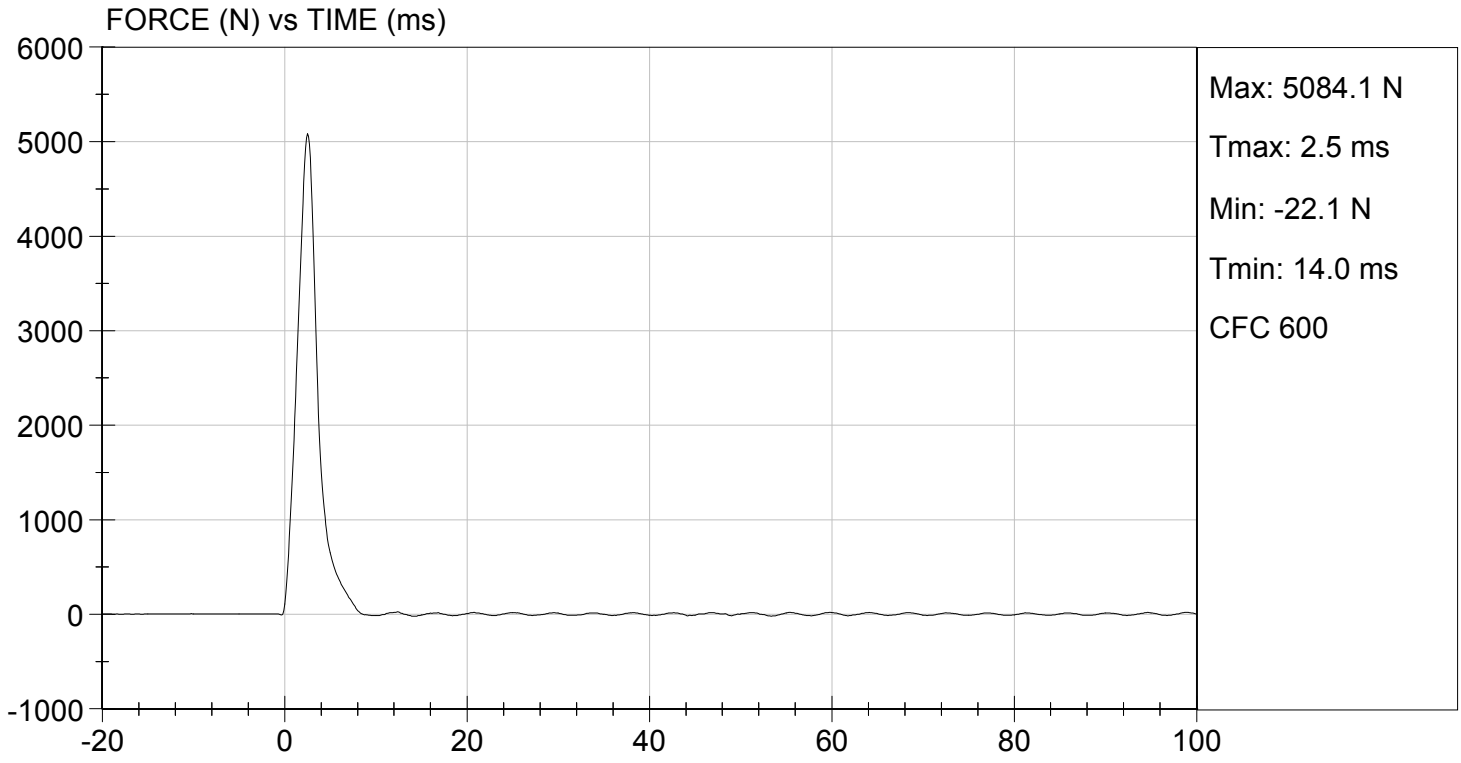
David Schoedel
Laboratory Technician

02/27/2015
Test Date

Jessica Gall
Approved By

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

TEST DATE: 02/27/2015
TEST #: D15595



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D15596

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	21	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	N	4715 to 5782	5,275	Pass
		Overall Test Results		Pass

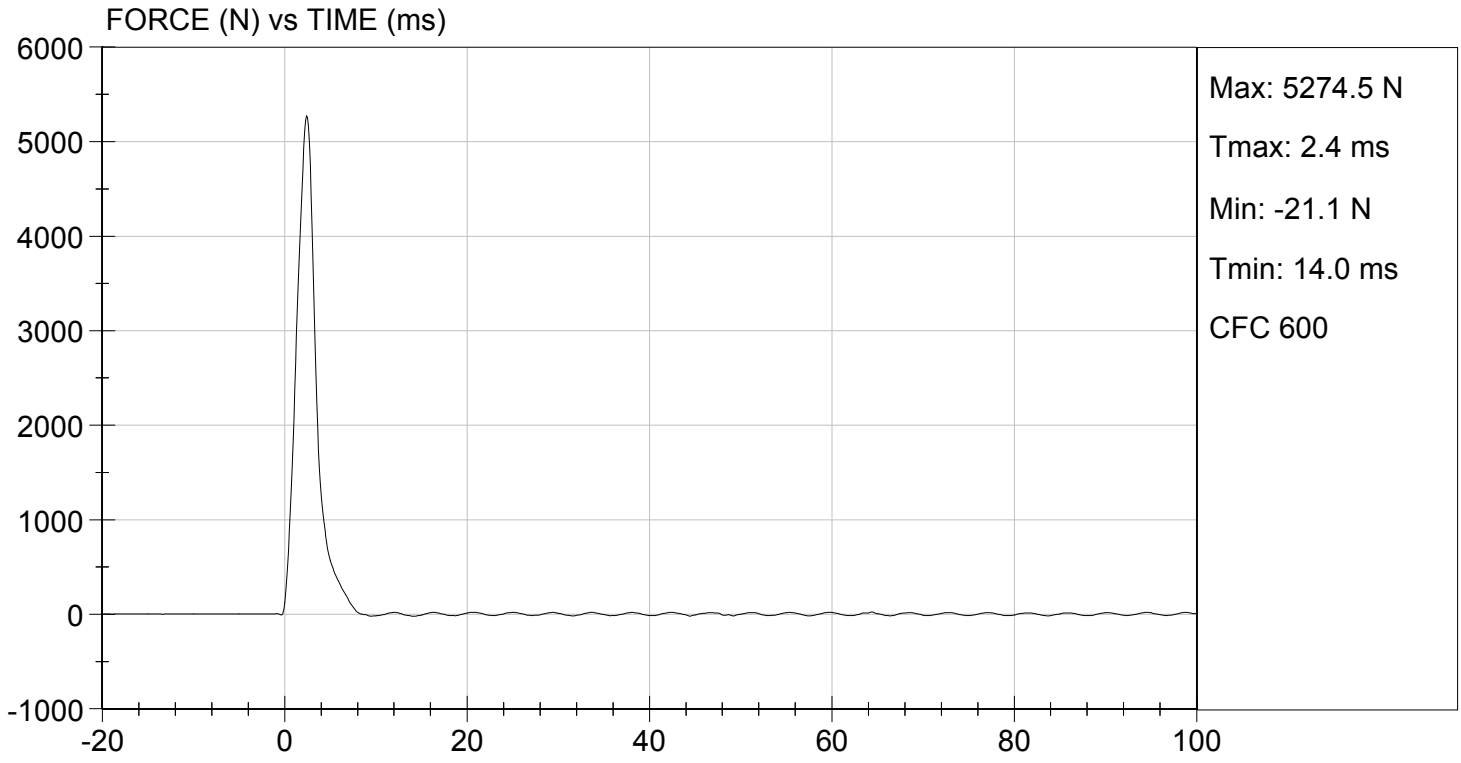
David Schoedel
Laboratory Technician

02/27/2015
Test Date

Jessica Hall
Approved By

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

TEST DATE: 02/27/2015
TEST #: D15596



MGA RESEARCH CORPORATION

HIP-FEMUR FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D15590

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	22.0	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	19	19	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.3	6.3	Pass
30 Degrees	Nm	94.9 Nm Max	50.2	66.3	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	49.8	47.3	Pass
		Overall Test Results			Pass

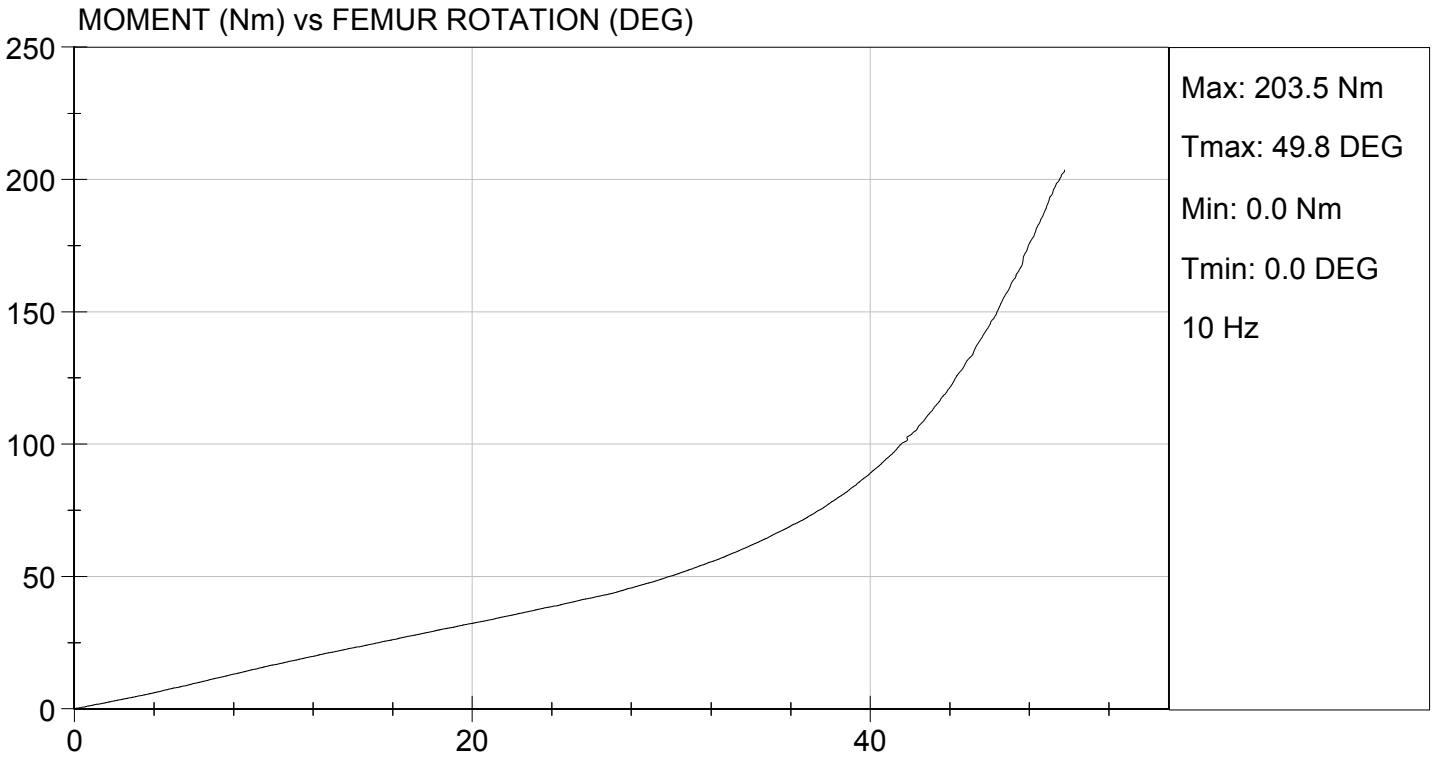
Jack Coleman
Laboratory Technician

02/27/2015
Test Date

Jessica Hall
Approved By

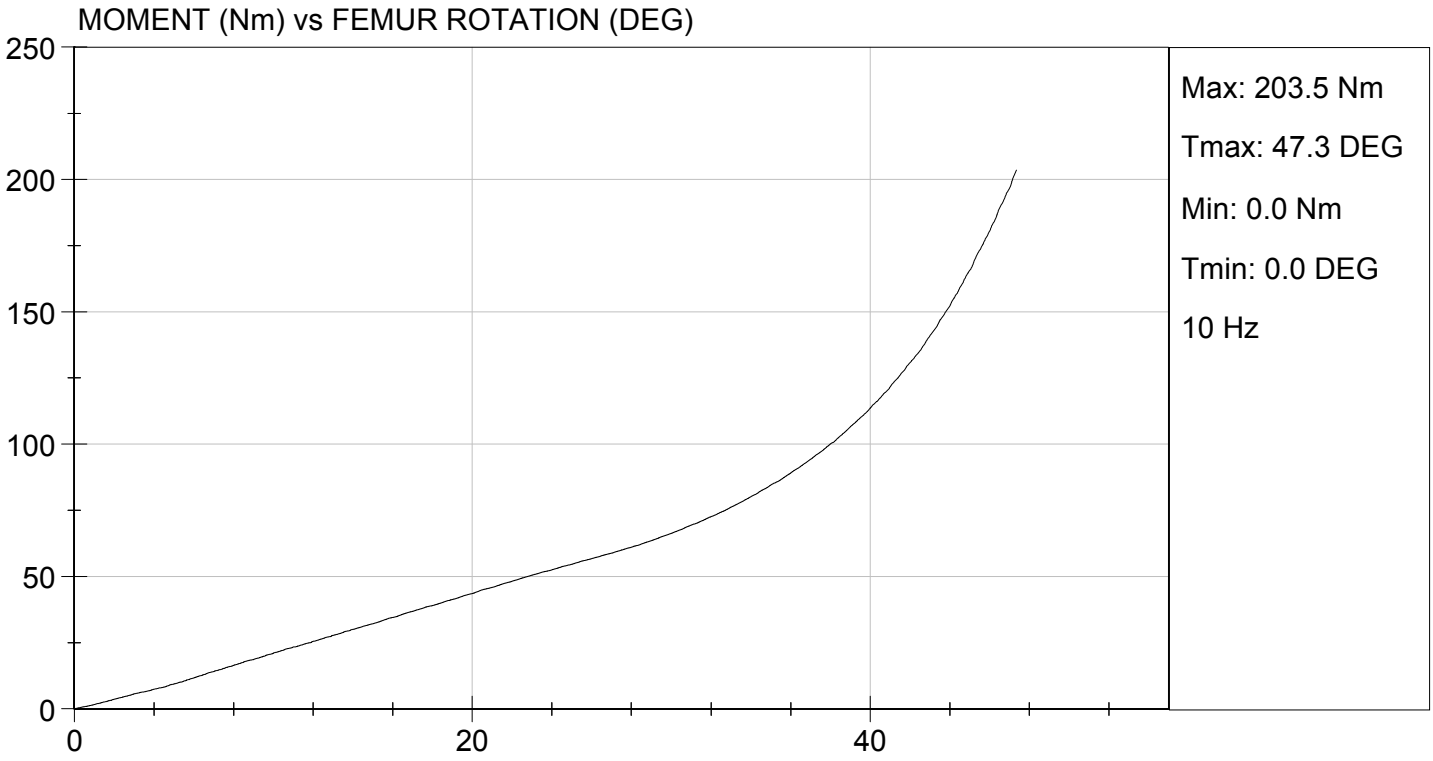
TEST DESC: RIGHT HIP FEMUR FLEXION

TEST DATE: 02/27/2015
TEST #: D15599



TEST DESC: LEFT HIP FEMUR FLEXION

TEST DATE: 02/27/2015
TEST #: D15590



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 heal	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:** D15501

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	20	Pass
Peak Resultant Acceleration	G's	250 to 300	285	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-2.4	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Jack Coleman
Laboratory Technician

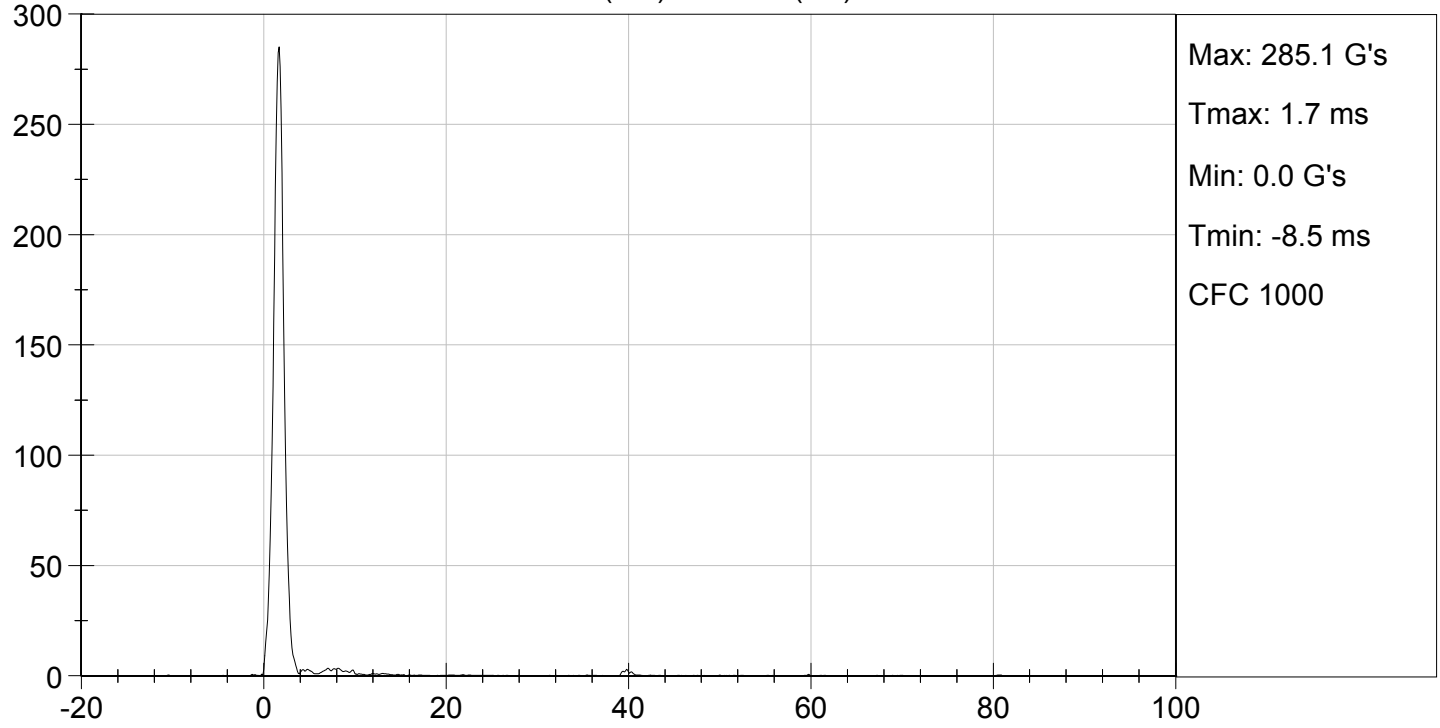
02/19/2015
Test Date

Jessica Hall
Approved By

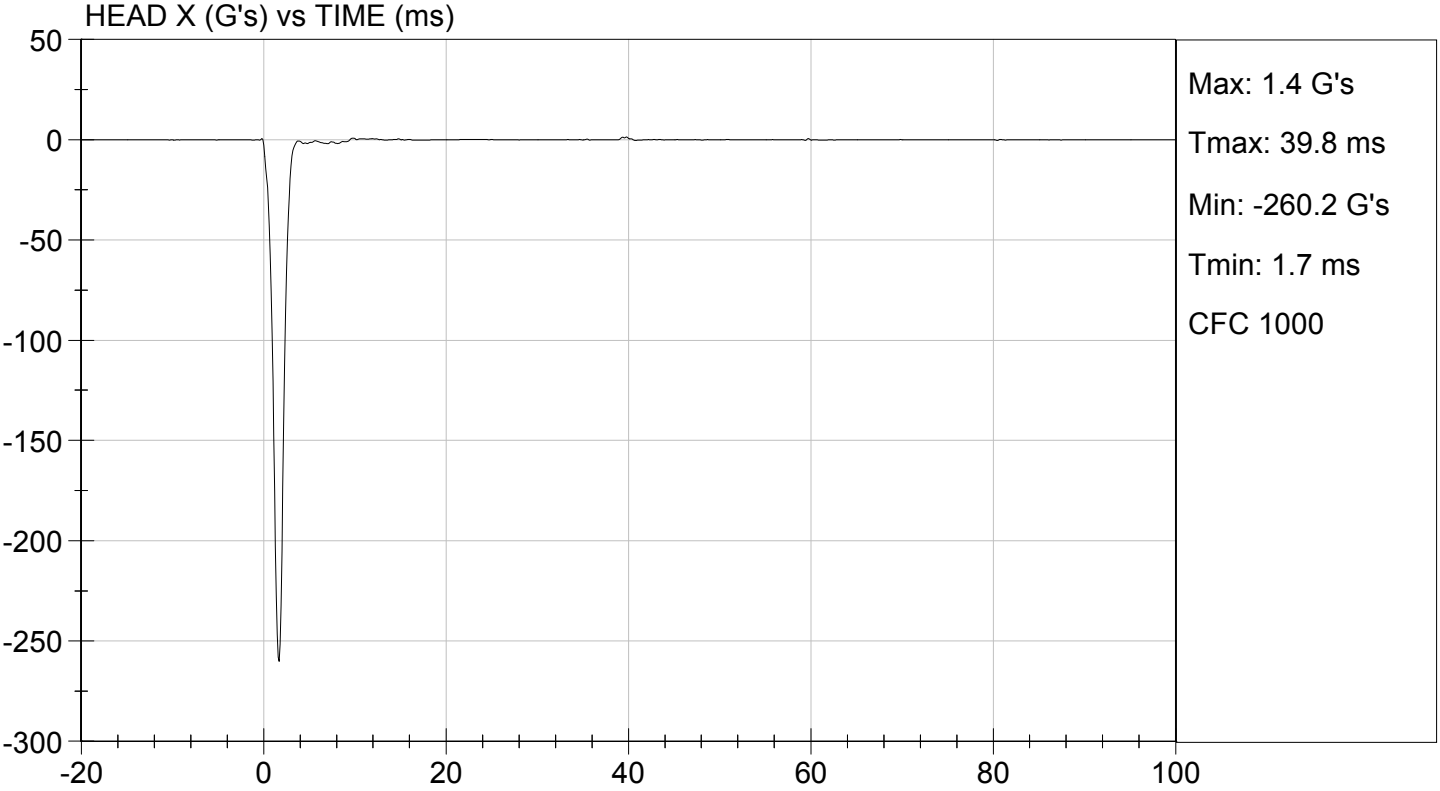
TEST DESC: HEAD DROP

TEST DATE: 02/19/2015
TEST #: D15501

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

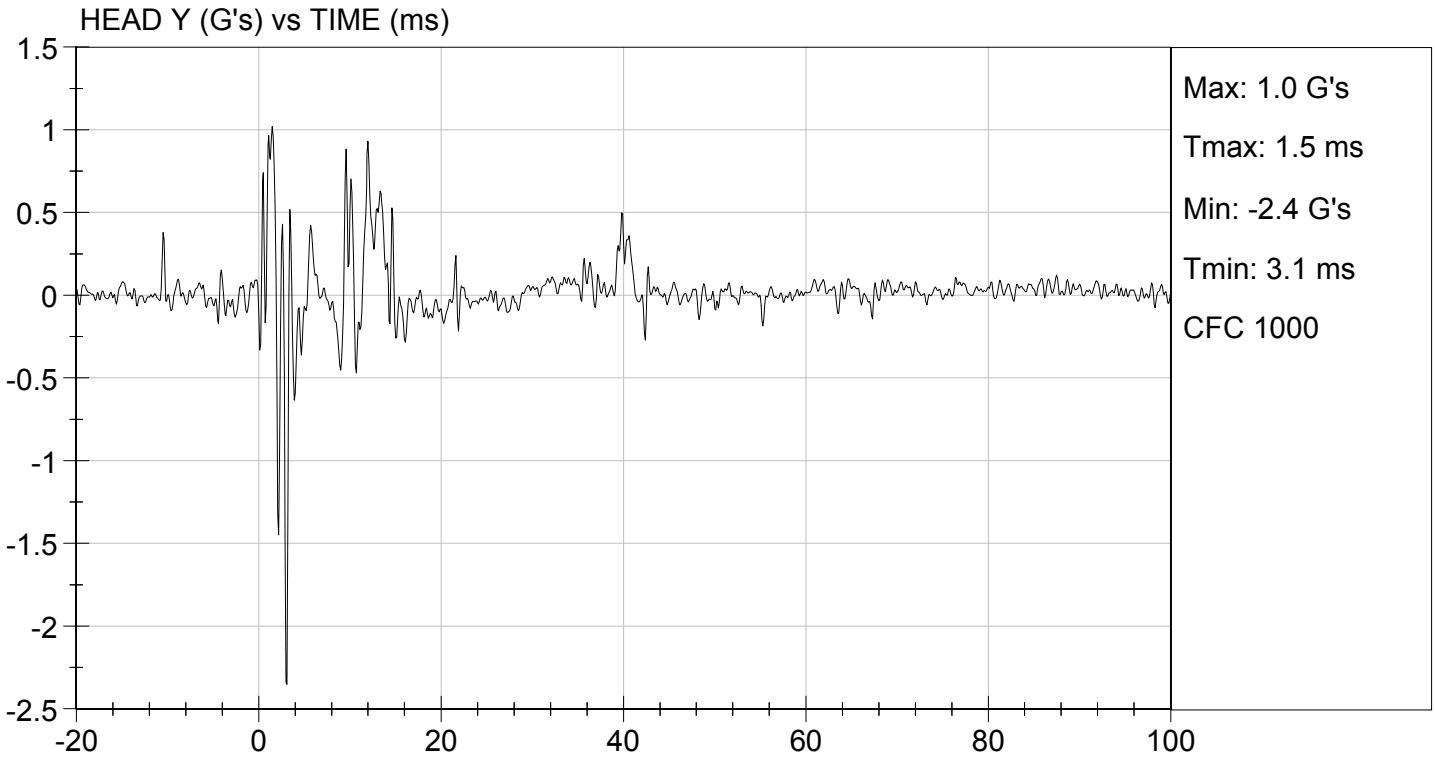


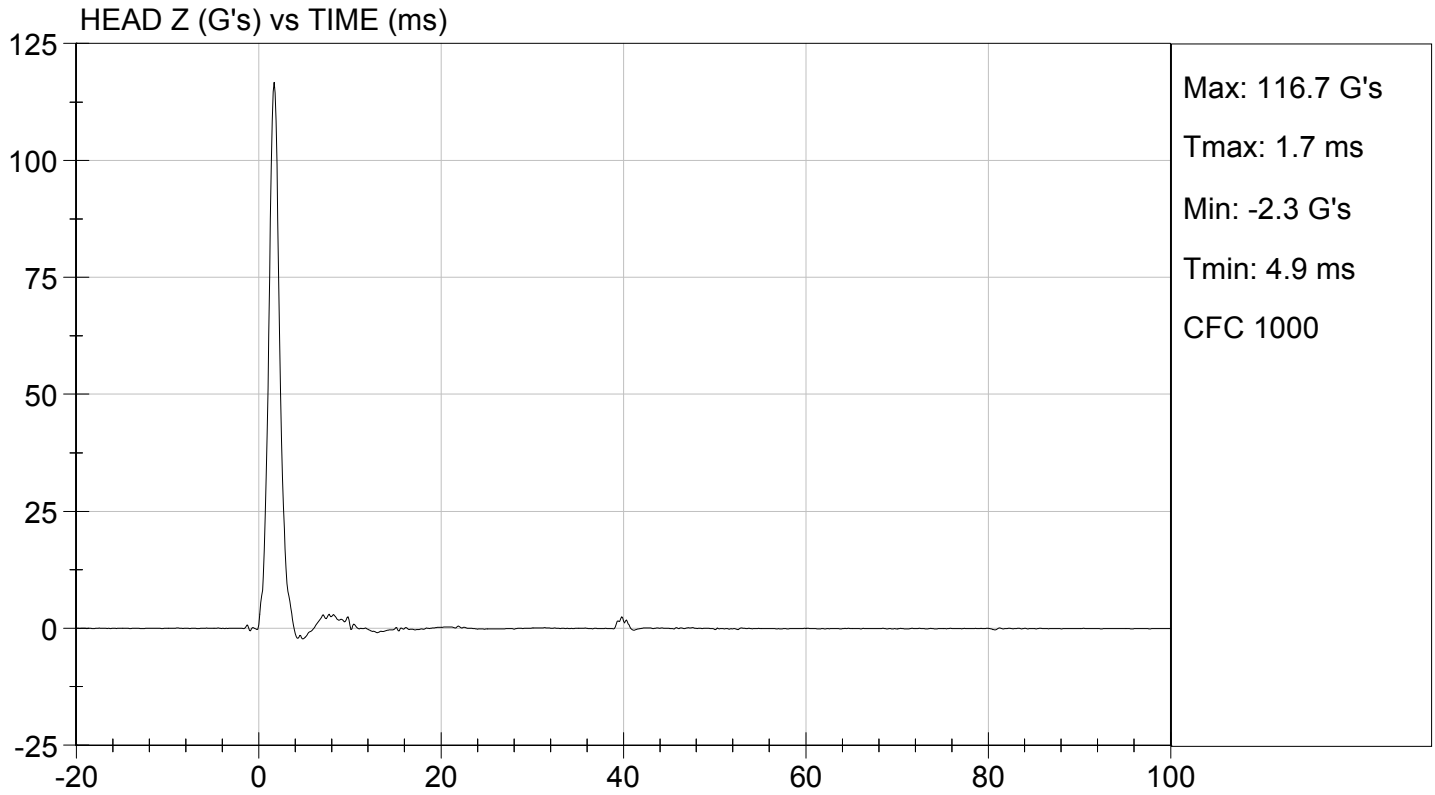
HEAD X (G's) vs TIME (ms)



TEST DESC: HEAD DROP

TEST DATE: 02/19/2015
TEST #: D15501





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138 **Test I.D:** D15502

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity		%	10 to 70	19	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.4	Pass
	20 ms	m/s	4.0 to 5.0	4.6	Pass
	30 ms	m/s	5.8 to 7.0	6.4	Pass
D Plane Rotation	Max	deg	77 to 91	83	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	86	Pass
			Overall Results		Pass

Jack Coleman
Laboratory Technician

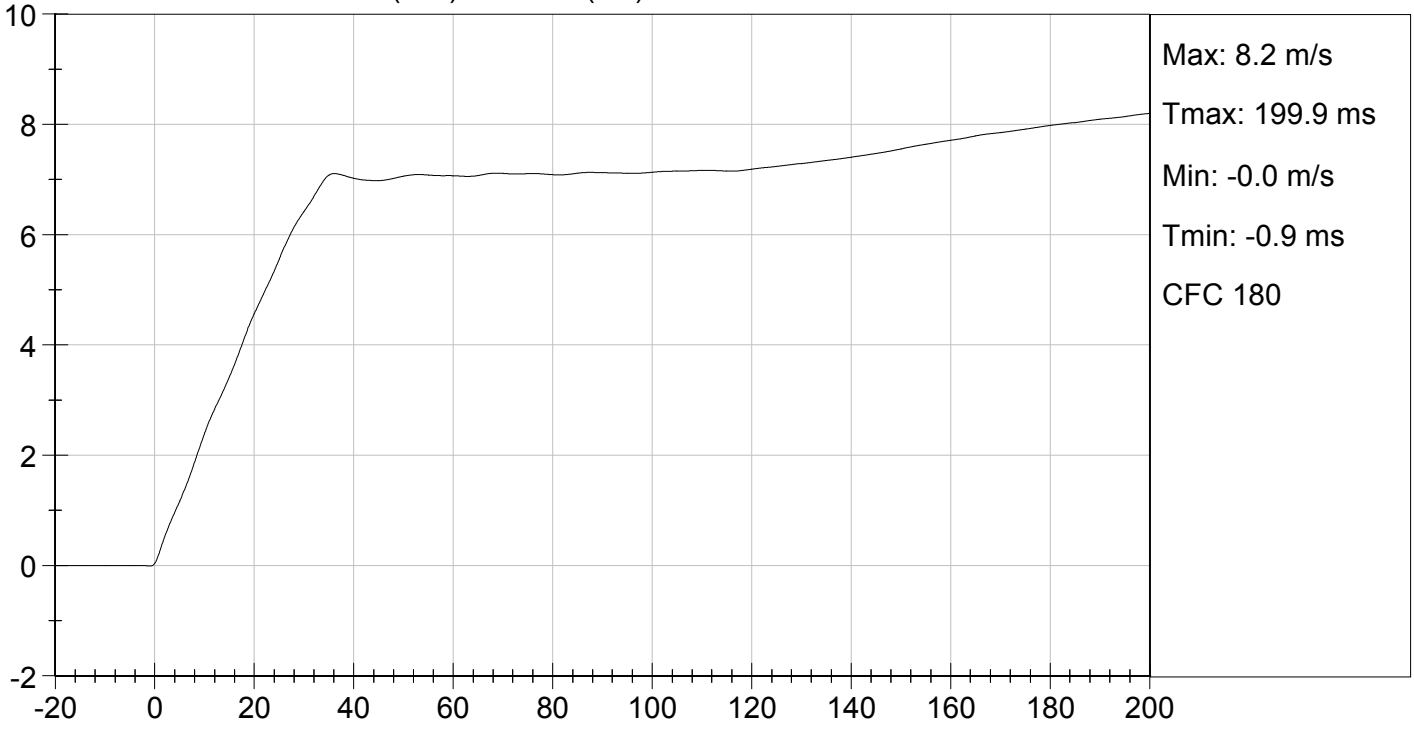
02/19/2015
Test Date

Jessica Hall
Approved By

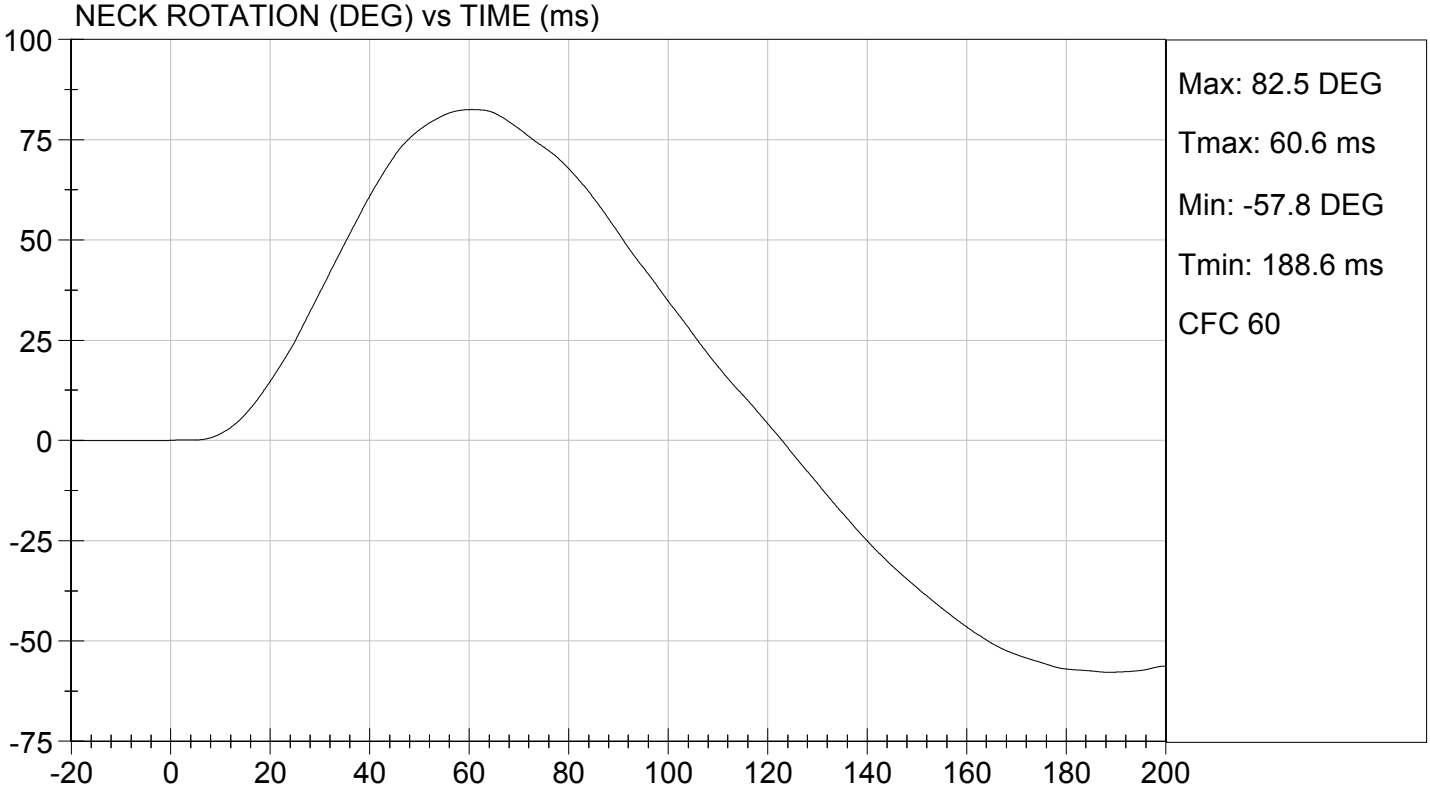
TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

TEST DATE: 02/19/2015
TEST #: D15502

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

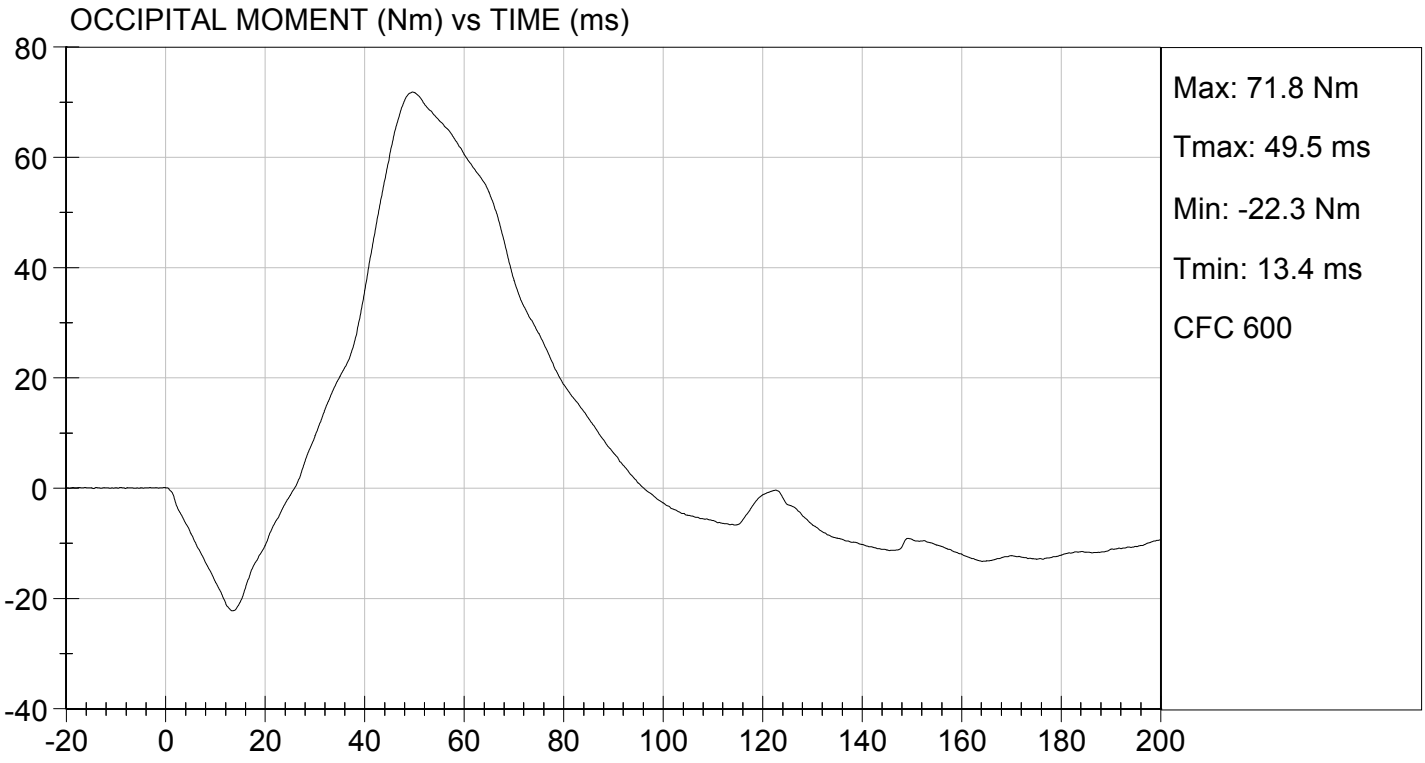


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 02/19/2015
TEST #: D15502



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138 **Test I.D:** D15503

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity		%	10 to 70	19	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	3.4	Pass
	30 ms	m/s	4.6 to 5.6	5.0	Pass
D Plane Rotation	Max	deg	99 to 114	108	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	105	Pass
			Overall Results		Pass

Jack Coleman
Laboratory Technician

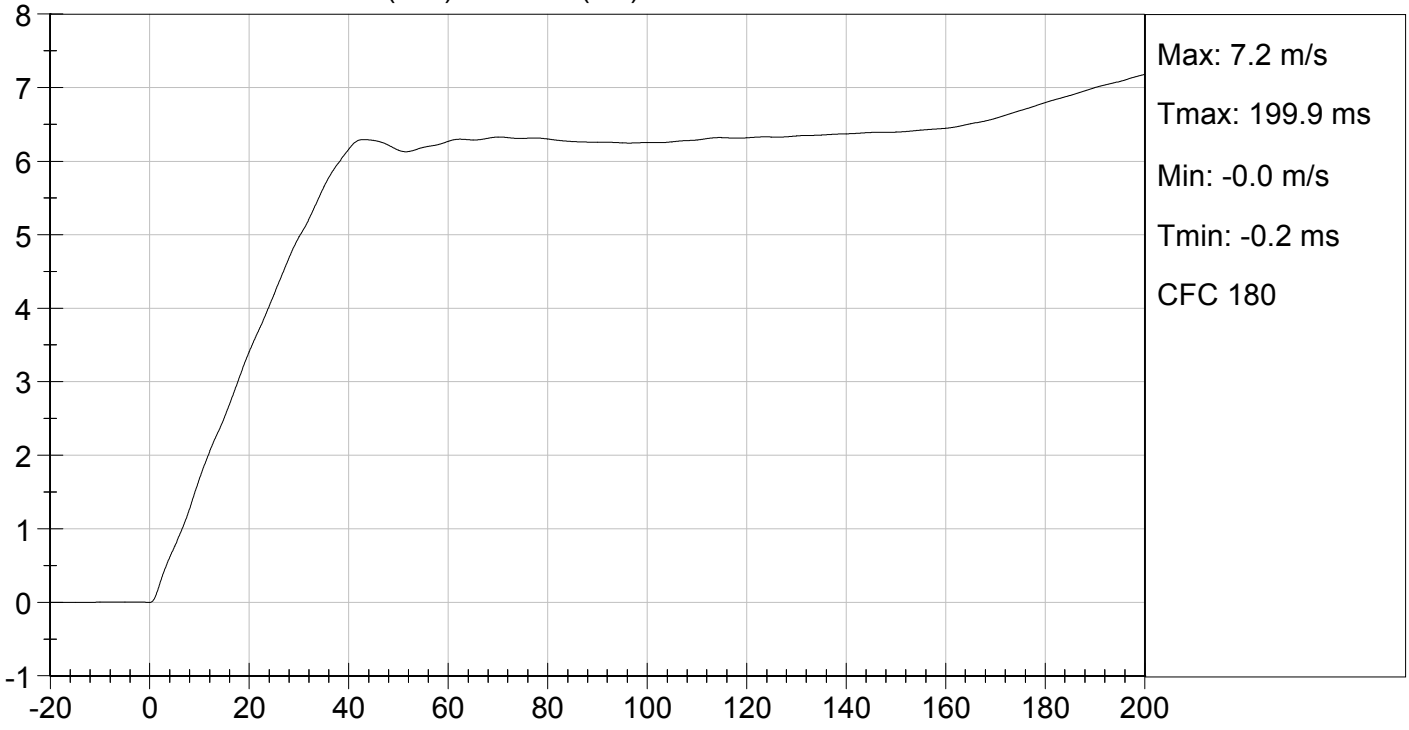
02/19/2015
Test Date

Jessica Hall
Approved By

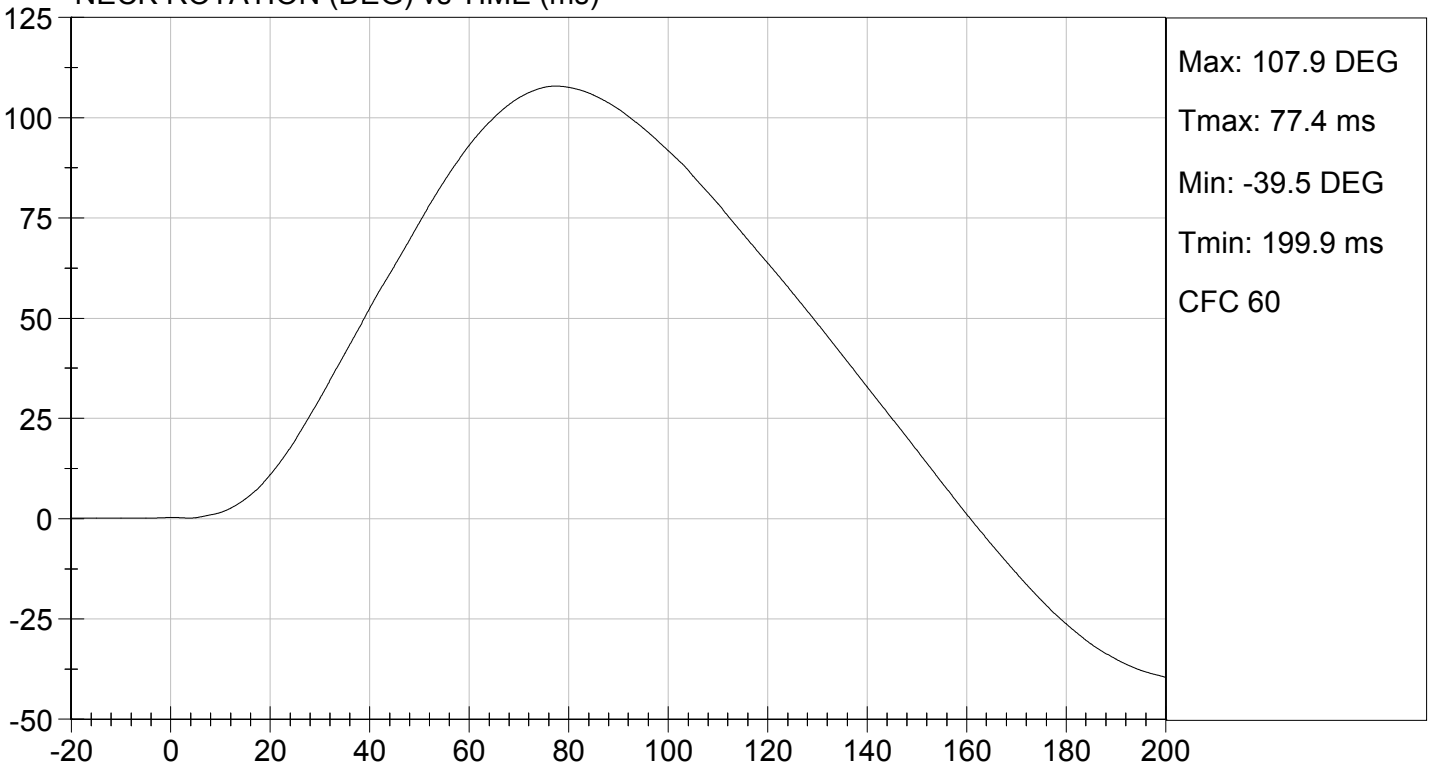
TEST DESC: NECK EXTENSION
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 02/19/2015
TEST #: D15503

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

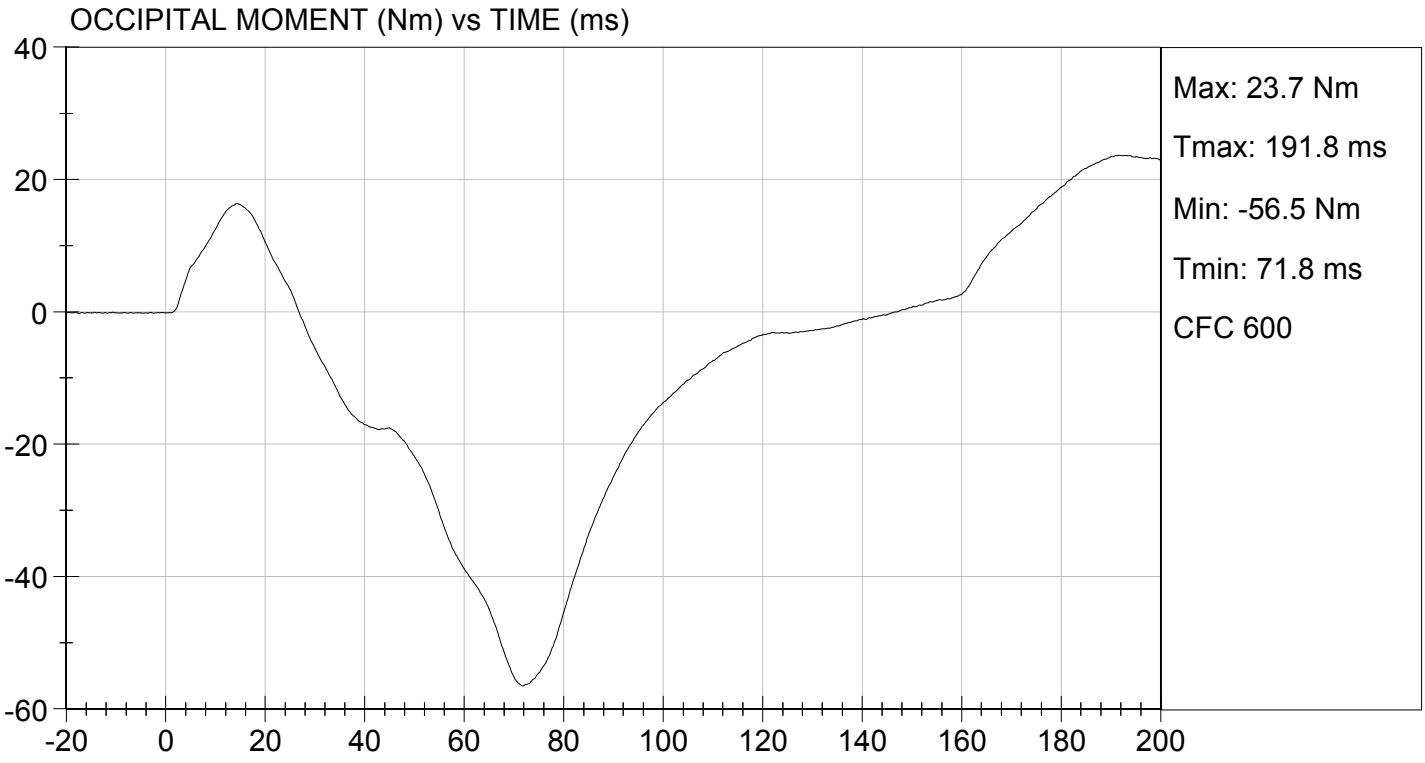


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 02/19/2015
TEST #: D15503



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 5TH PERCENTILE

ATD Serial No: 138 **Test I.D:** D15504

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.9	Pass
Relative Humidity	%	10 to 70	21	Pass
Probe Speed	m/s	6.59 to 6.83	6.60	Pass
Peak Deflection	mm	50 to 58	53	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4263	Pass
Internal Hysteresis	%	69 to 85	72	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4235	Pass
		Overall Test Results		Pass

Jack Coleman
Laboratory Technician

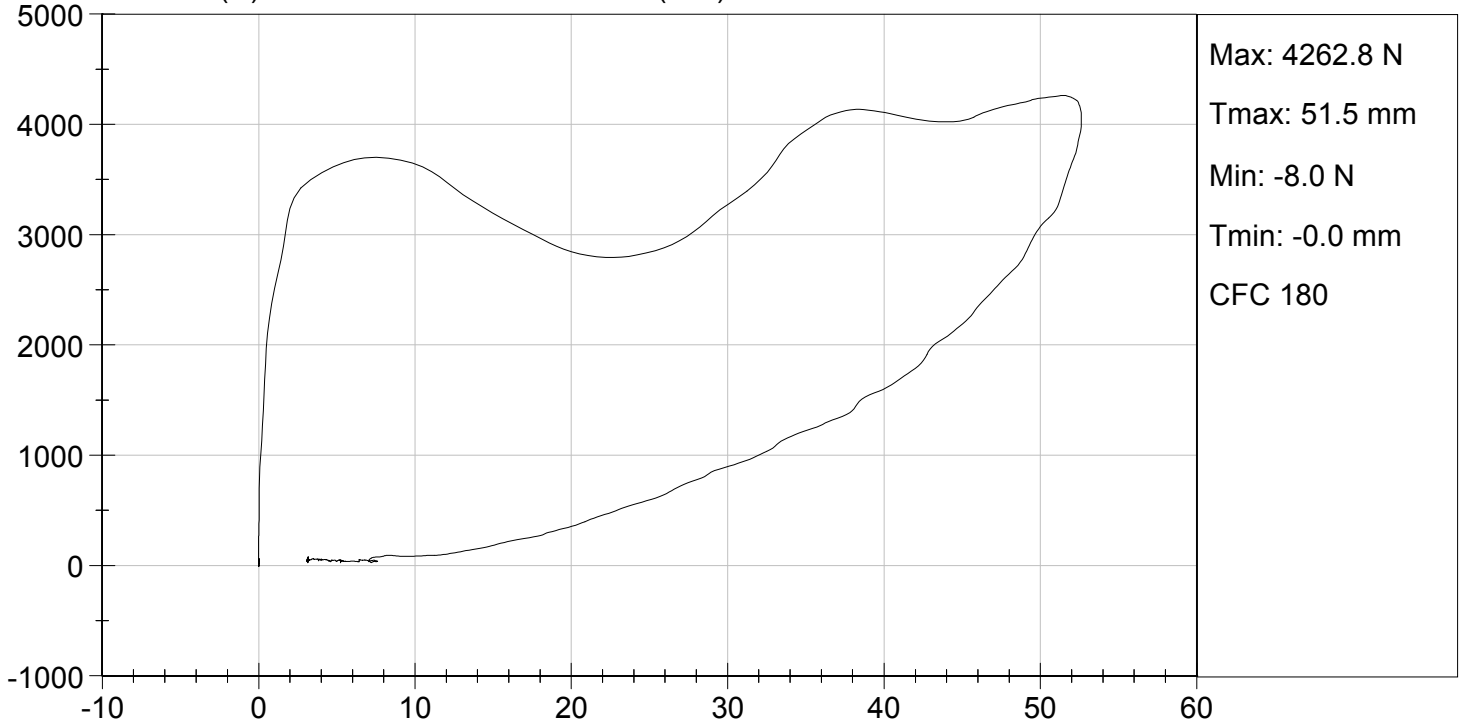
02/20/2015
Test Date

Jessica Hall
Approved By

TEST DESC: THORAX IMPACT
VELOCITY: 21.65 ft/s, 6.60 m/s

TEST DATE: 02/20/2015
TEST #: D15504

FORCE (N) vs CHEST DISPLACEMENT (mm)



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138 **Test I.D:** D15505

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	19	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3624	Pass
		Overall Test Results		Pass

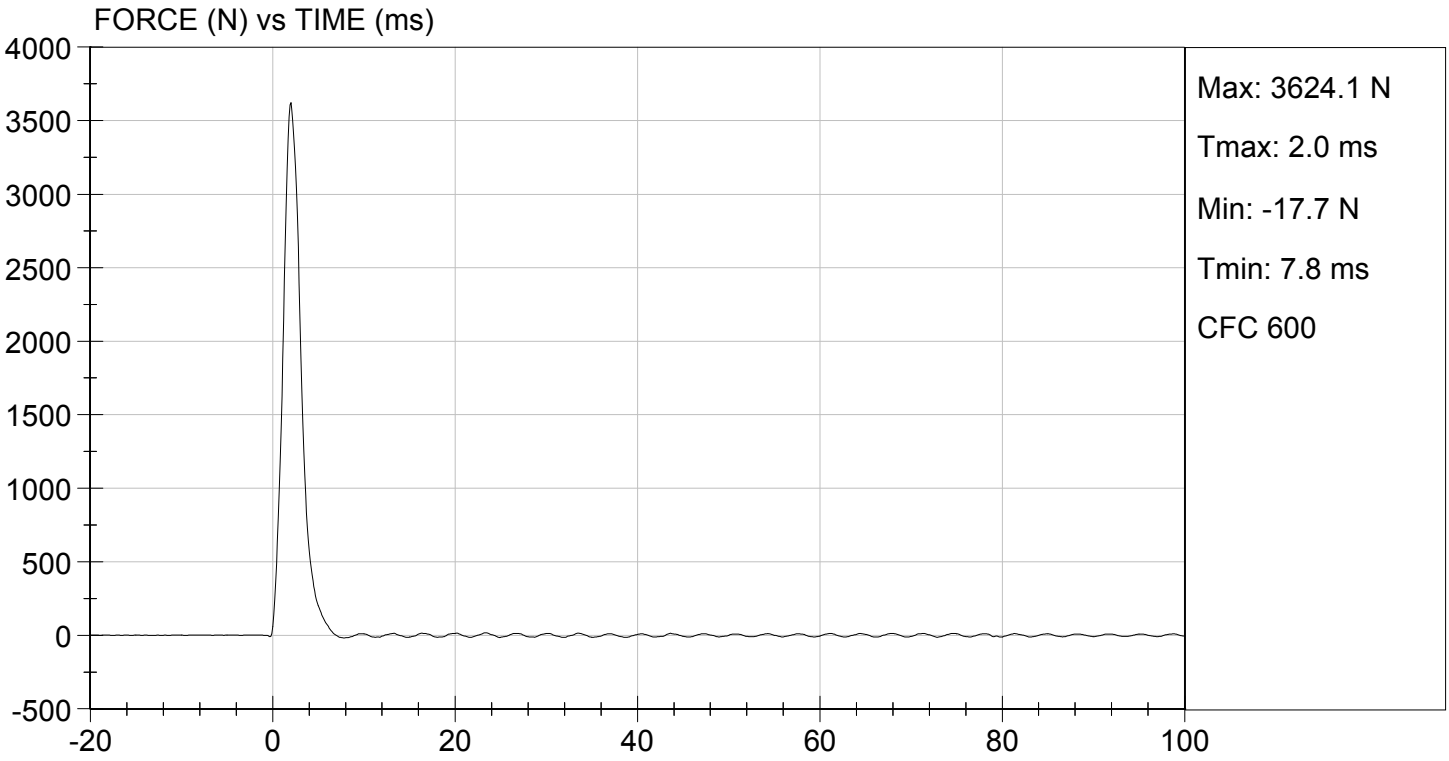
Jack Coleman
Laboratory Technician

02/19/2015
Test Date

Jessica Hall
Approved By

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

TEST DATE: 02/19/2015
TEST #: D15505



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138 **Test I.D:** D15506

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	19	Pass
Probe Speed	m/s	2.07 to 2.13	2.13	Pass
Maximum Force	N	3450 to 4060	3523	Pass
		Overall Test Results		Pass

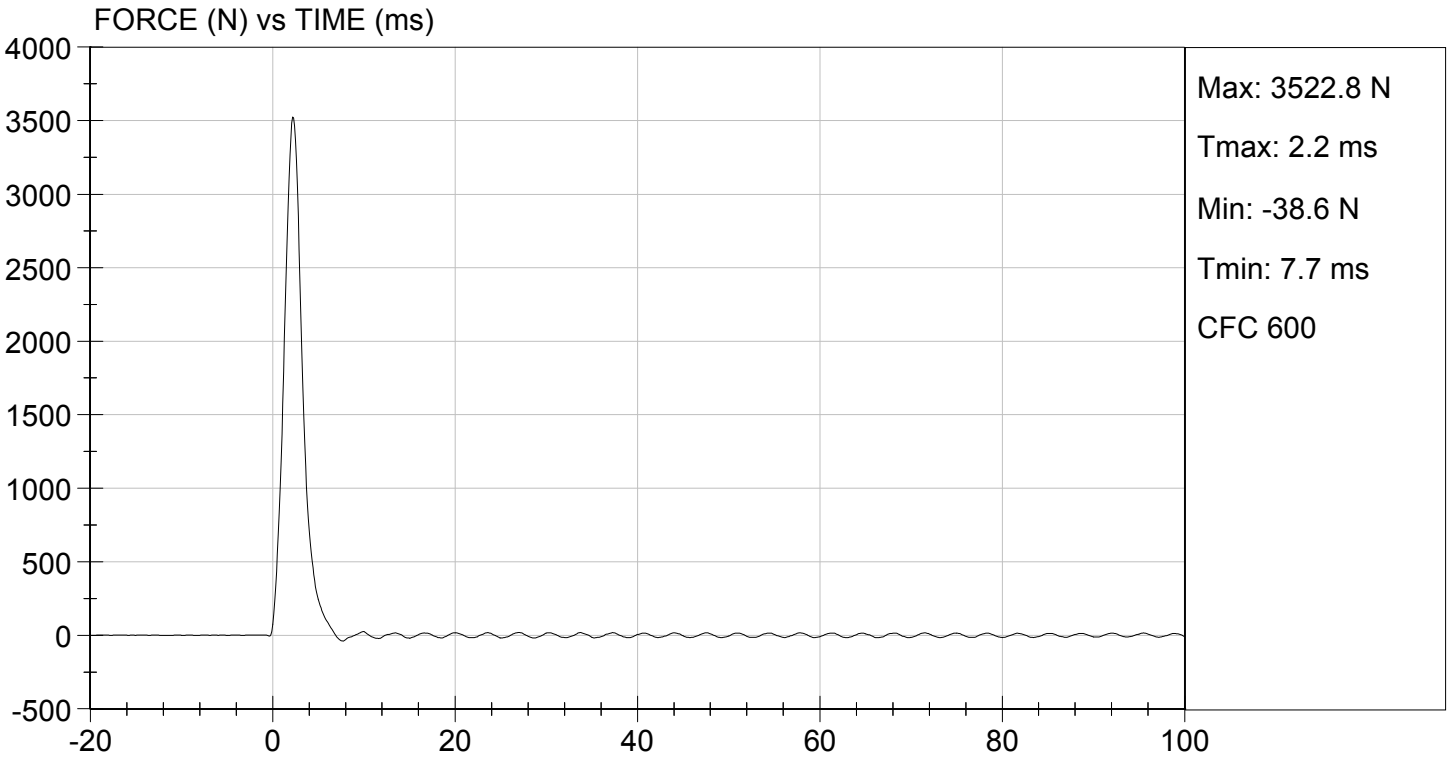
Jack Coleman
Laboratory Technician

02/19/2015
Test Date

Jessica Hall
Approved By

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

TEST DATE: 02/19/2015
TEST #: D15506



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138 **Test I.D:** D15507

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	20	Pass
Initial Angle	deg	0 to 20	18	Pass
Return Angle	deg	+/- 8	5	Pass
Force at 45 deg	N	320 to 390	349	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.9	Pass
		Overall Result		Pass

Jack Coleman
Laboratory Technician

02/19/2015
Test Date

Jessica Gall
Approved By

MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138 **Test ID:** D15601

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	19	Pass
Peak Resultant Acceleration	G's	250 to 300	274	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	5.3	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

David Schoedel
Laboratory Technician

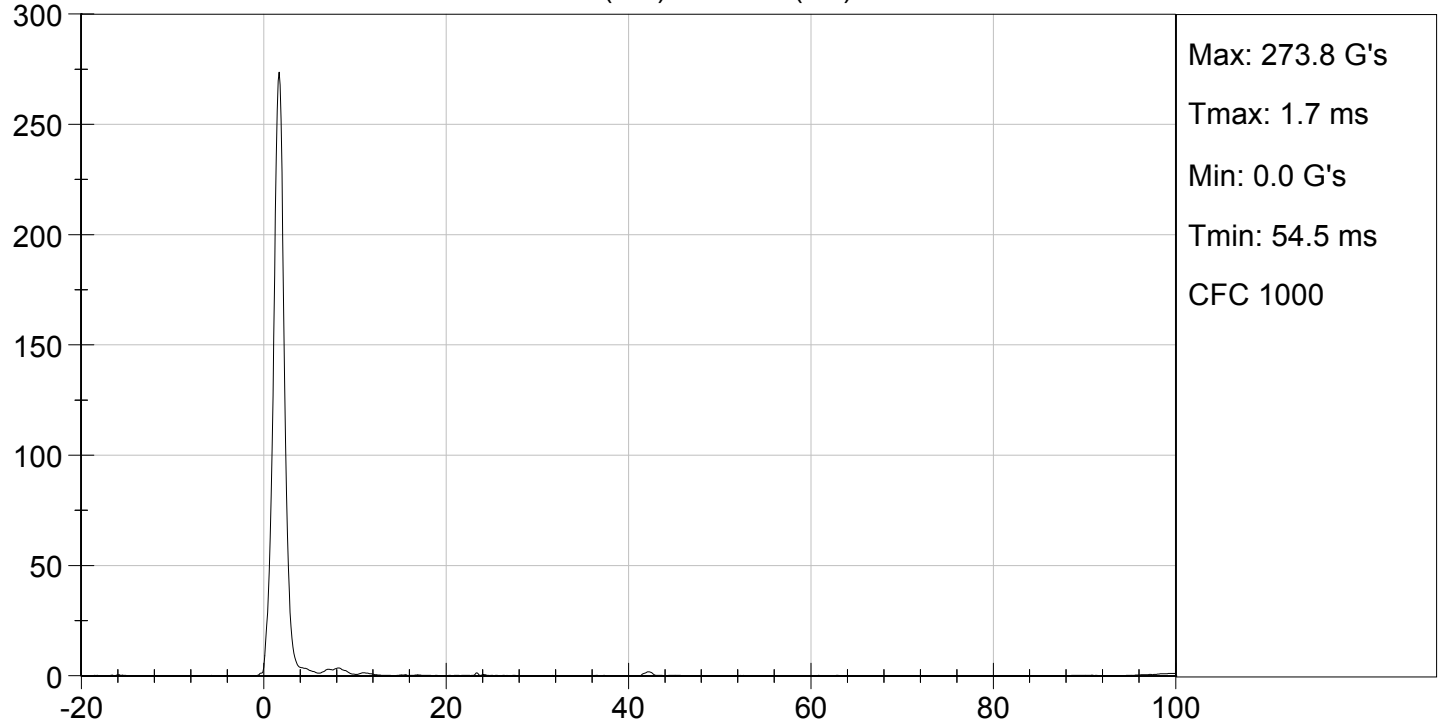
02/27/2015
Test Date

Jessica Gall
Approved By

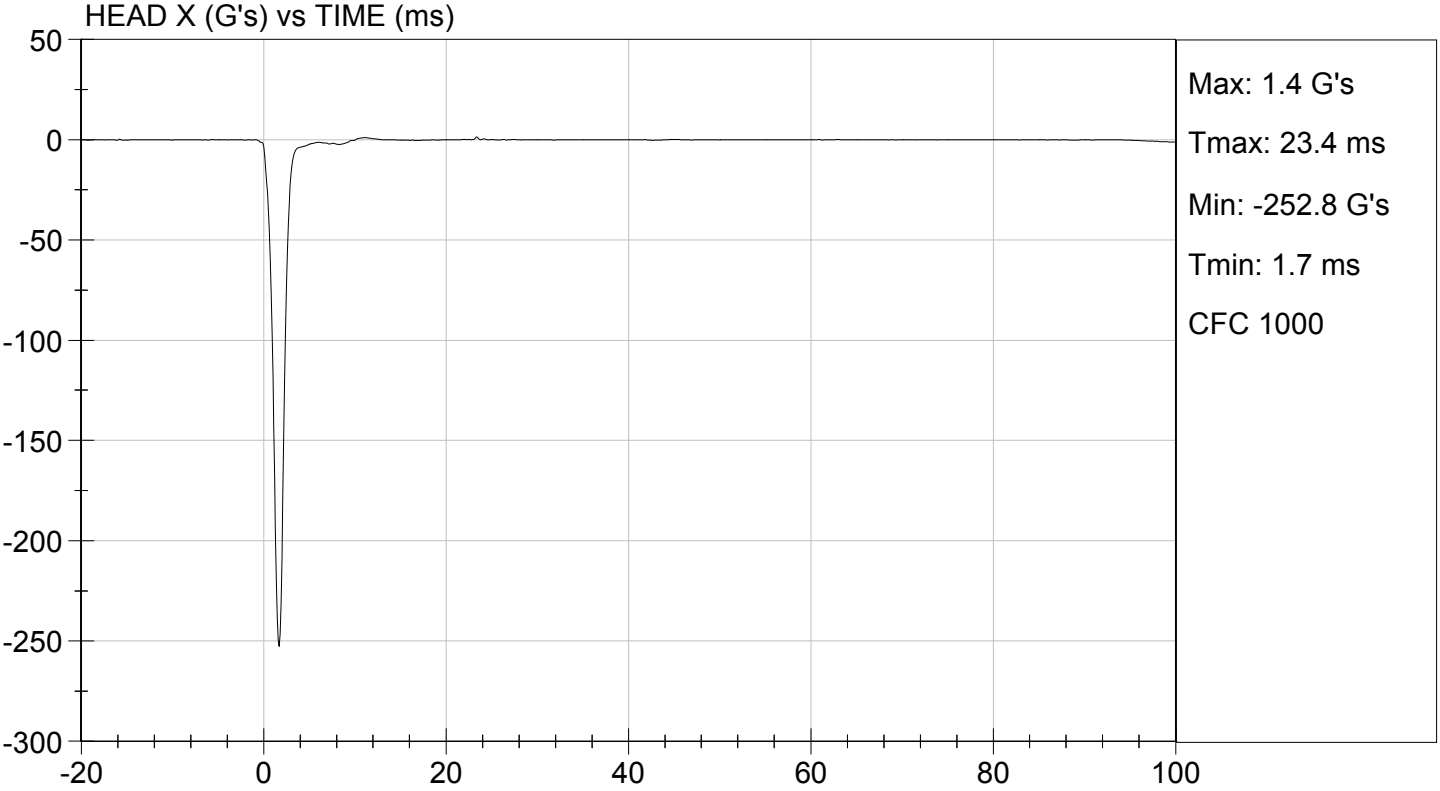
TEST DESC: HEAD DROP

TEST DATE: 02/27/2015
TEST #: D15601

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



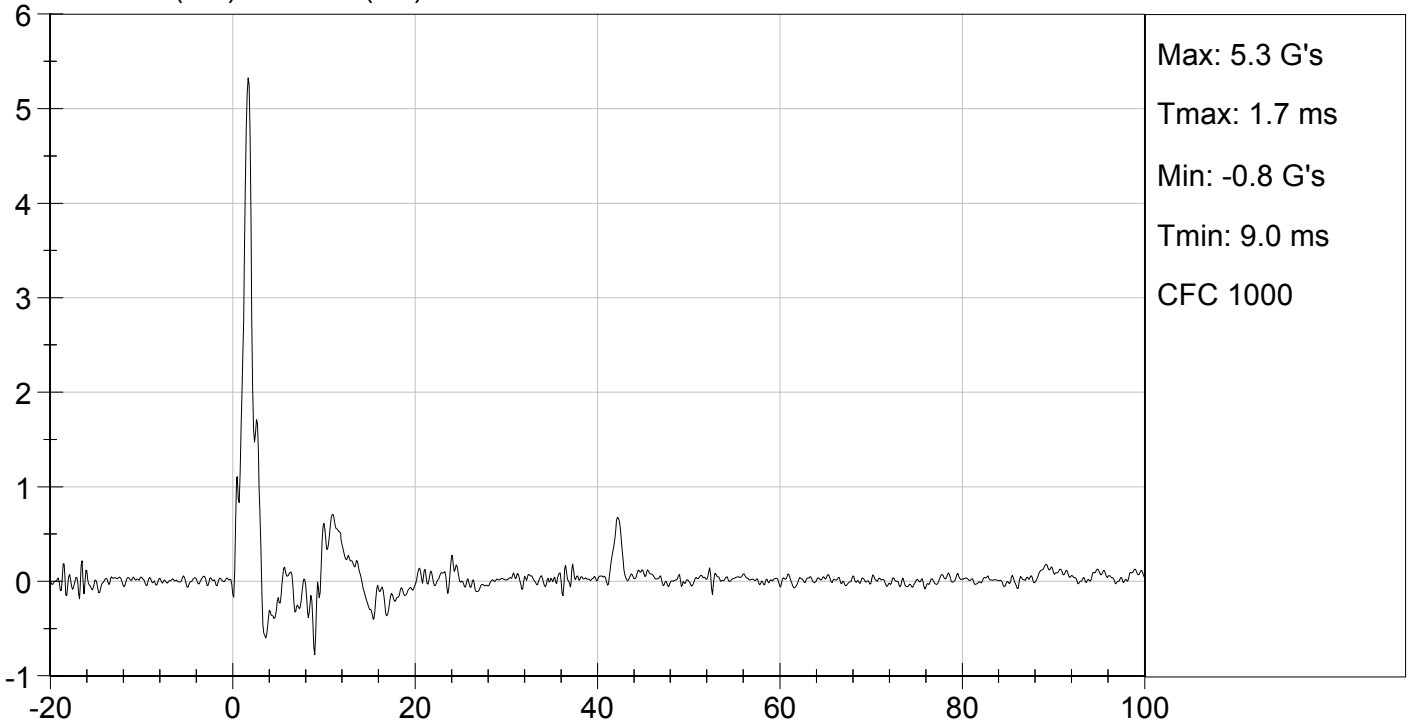
HEAD X (G's) vs TIME (ms)



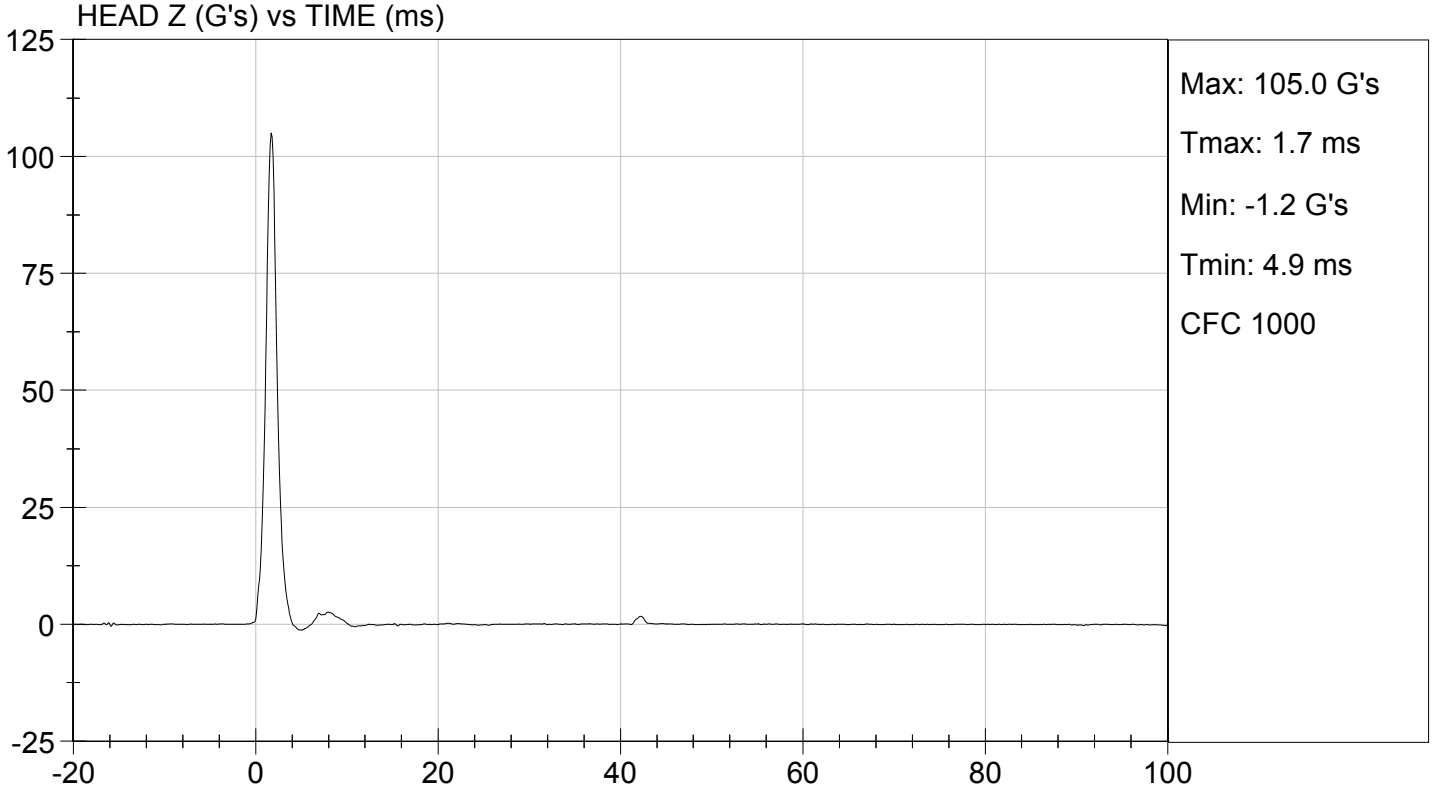
TEST DESC: HEAD DROP

TEST DATE: 02/27/2015
TEST #: D15601

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



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



MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138 **Test I.D:** D15602

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity		%	10 to 70	21	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.13	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.4	Pass
	20 ms	m/s	4.0 to 5.0	4.6	Pass
	30 ms	m/s	5.8 to 7.0	6.3	Pass
D Plane Rotation	Max	deg	77 to 91	82	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	71	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	83	Pass
			Overall Results		Pass

David Schoedel
Laboratory Technician

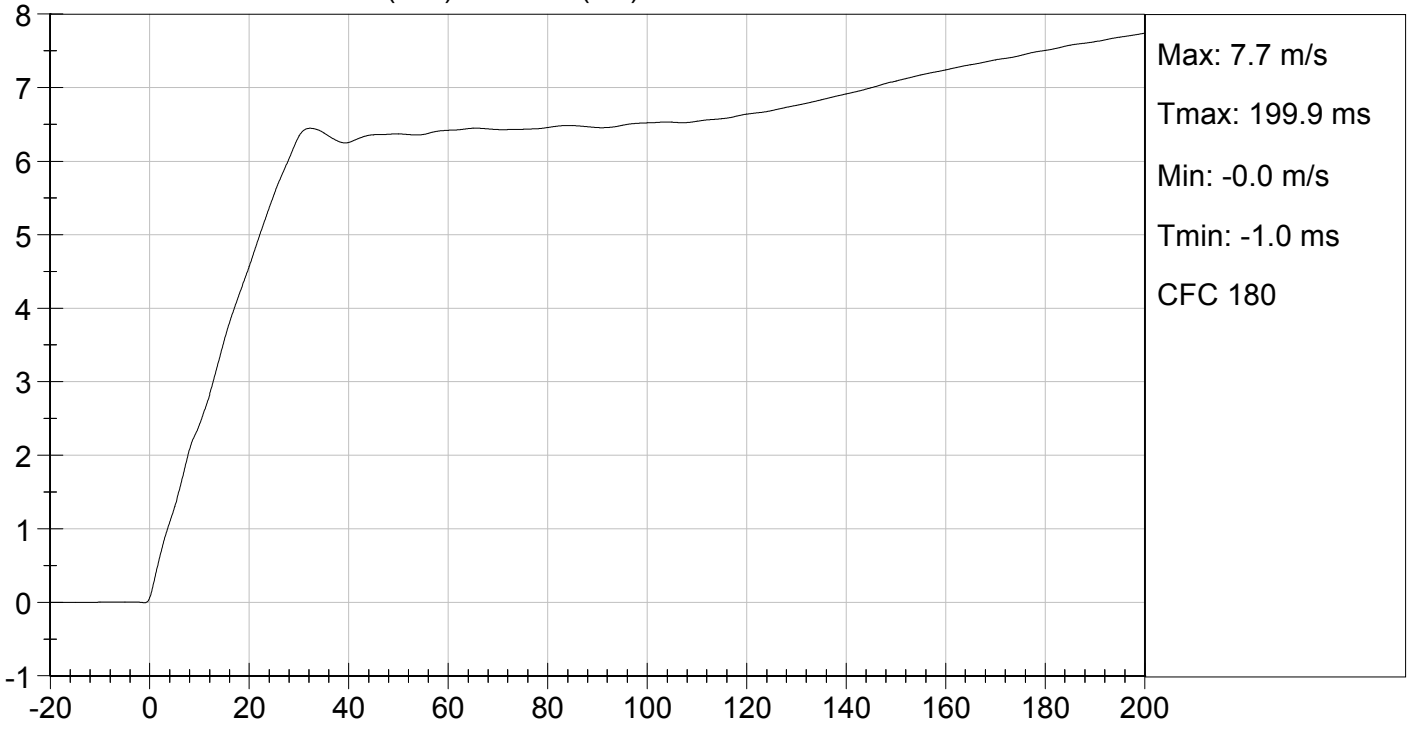
02/27/2015
Test Date

Jessica Hall
Approved By

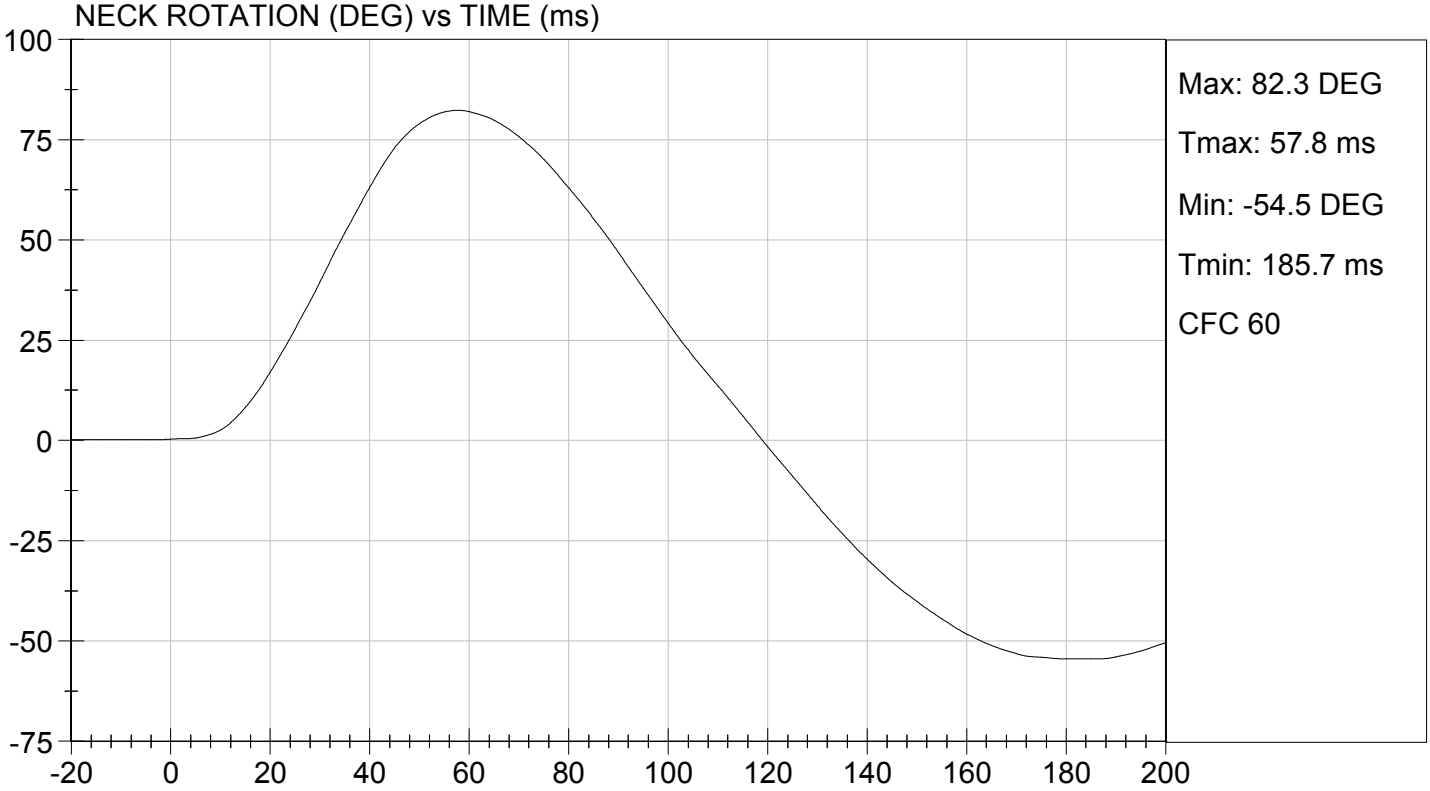
TEST DESC: NECK FLEXION
VELOCITY: 23.40 ft/s, 7.13 m/s

TEST DATE: 02/27/2015
TEST #: D15602

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

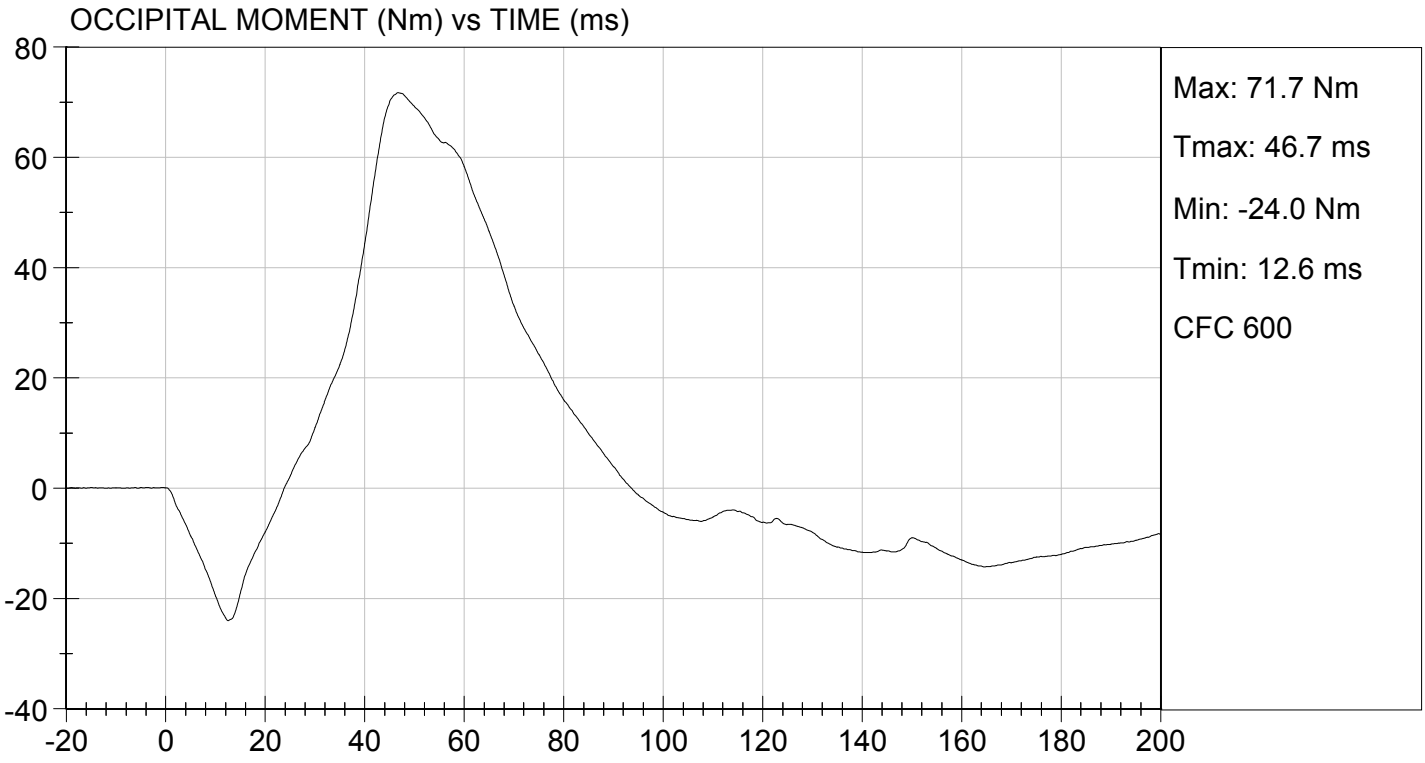


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 02/27/2015
TEST #: D15602



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138 **Test I.D:** D15603

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity		%	10 to 70	21	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.19	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.7	Pass
	20 ms	m/s	3.1 to 3.9	3.6	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	-58	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	99	Pass
			Overall Results		Pass

David Schoedel

Laboratory Technician

02/27/2015

Test Date

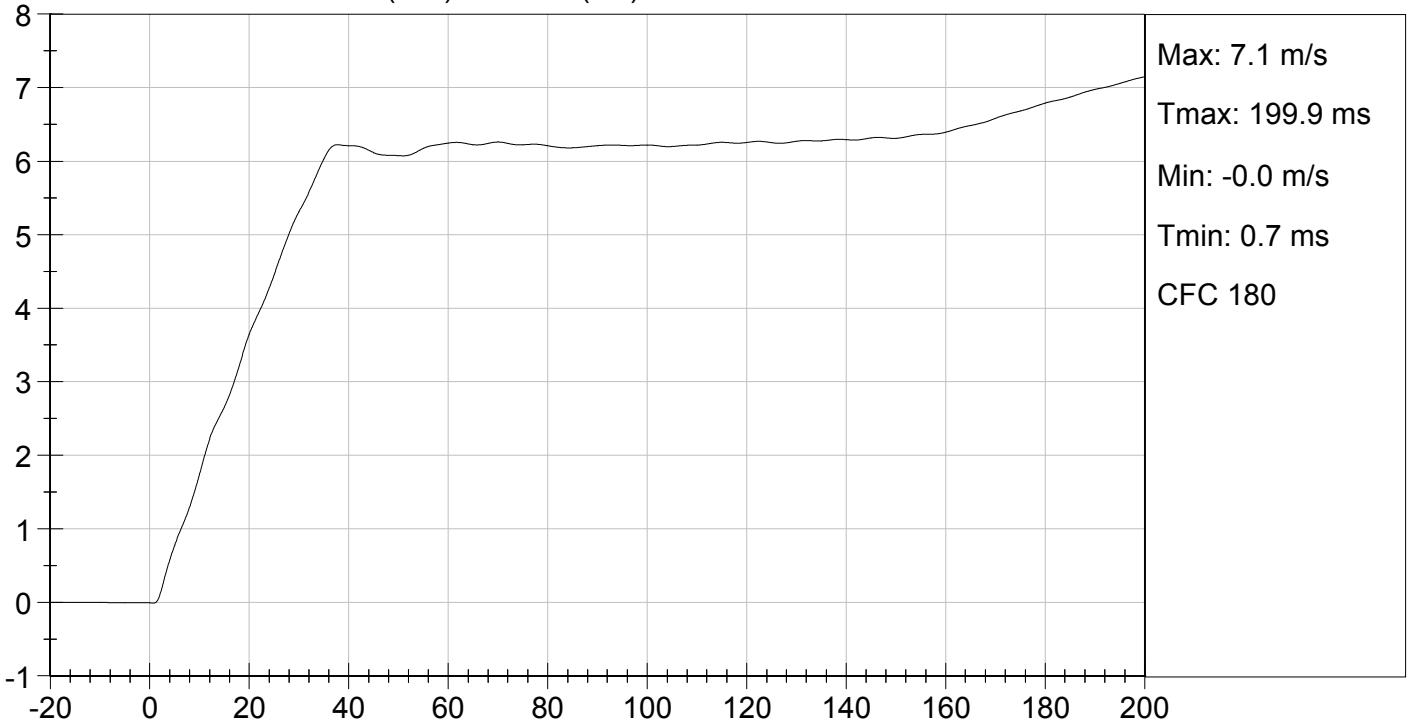
Jessica Hall

Approved By

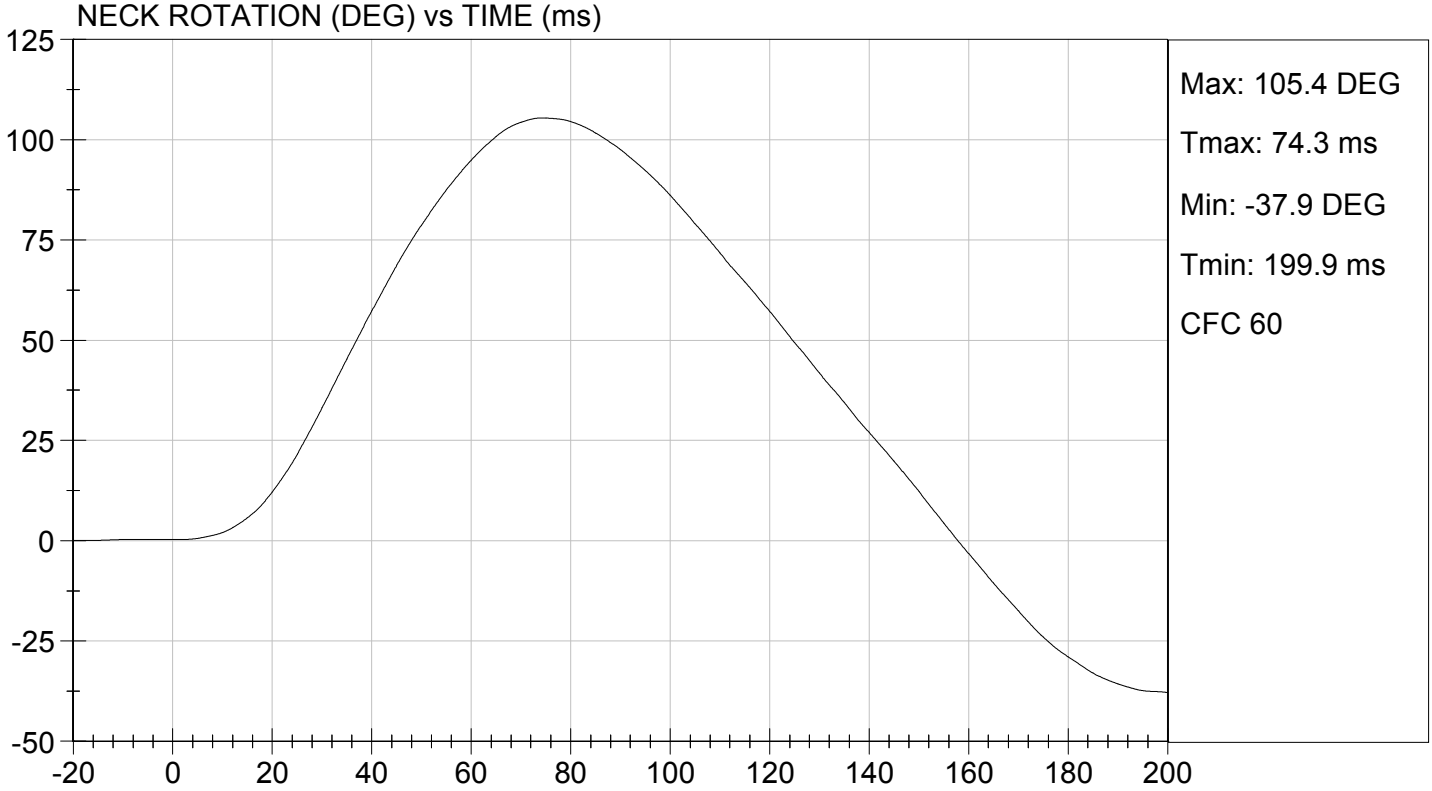
TEST DESC: NECK EXTENSION
VELOCITY: 20.30 ft/s, 6.19 m/s

TEST DATE: 02/27/2015
TEST #: D15603

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

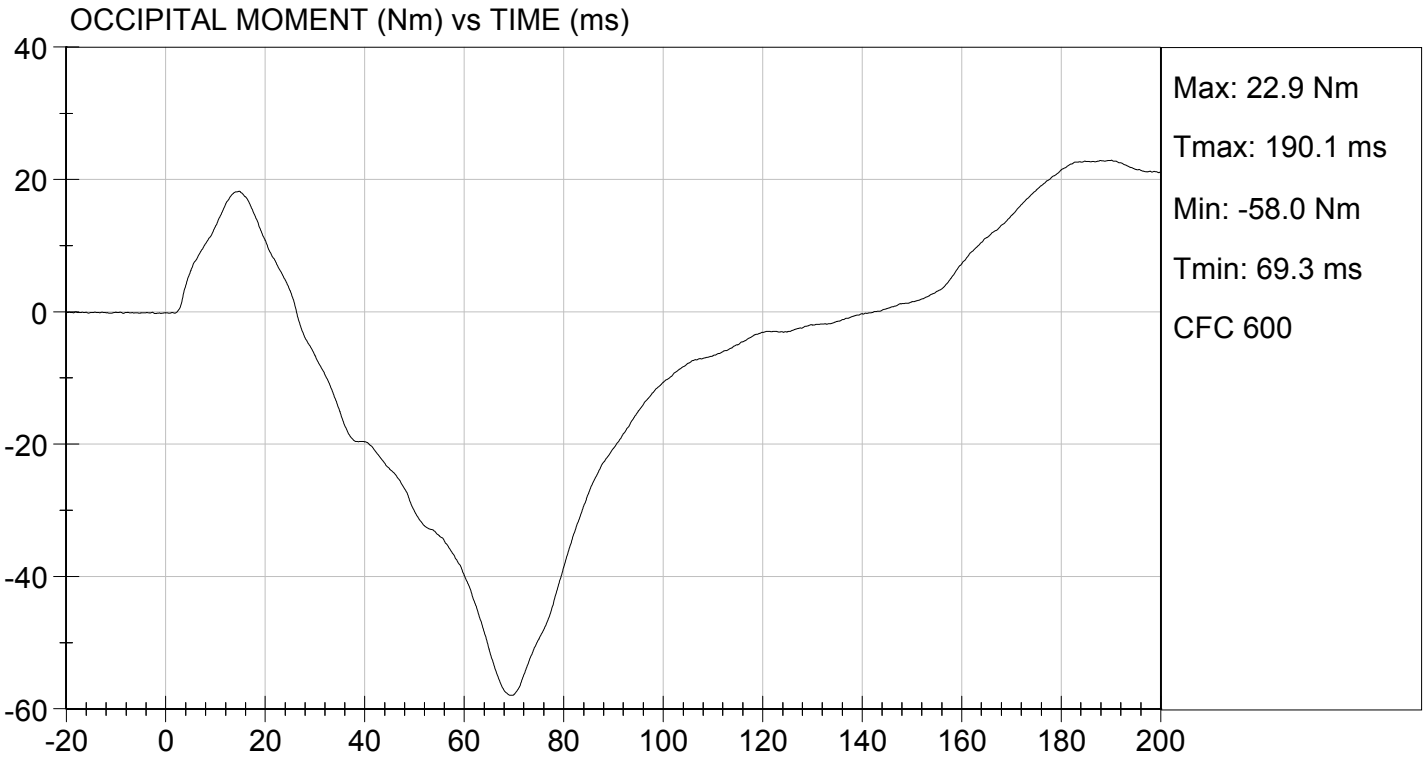


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 02/27/2015
TEST #: D15603



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 5TH PERCENTILE

ATD Serial No: 138 **Test I.D:** D15604

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.7	Pass
Relative Humidity	%	10 to 70	18	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	51	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4397	Pass
Internal Hysteresis	%	69 to 85	74	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4414	Pass
		Overall Test Results		Pass

David Schoedel
Laboratory Technician

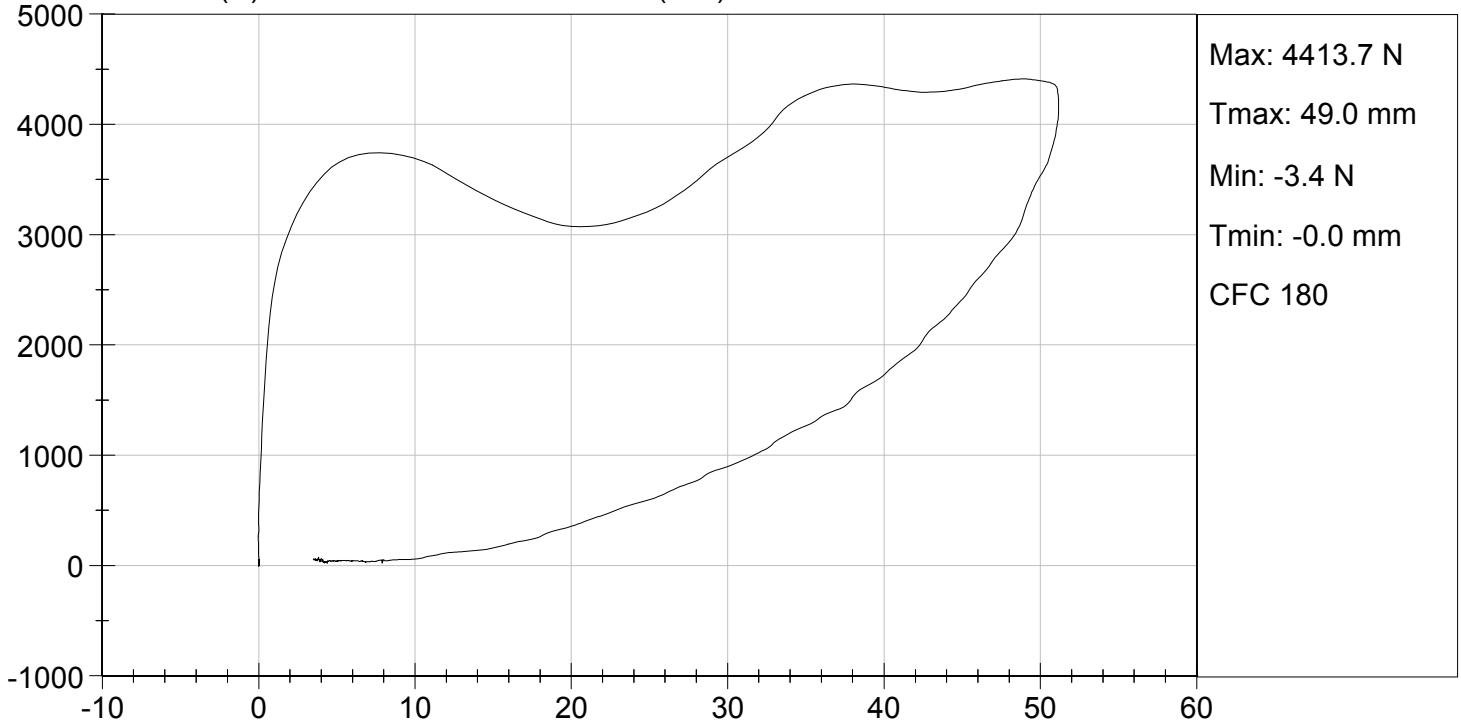
02/27/2015
Test Date

Jessica Gall
Approved By

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

TEST DATE: 02/27/2015
TEST #: D15604

FORCE (N) vs CHEST DISPLACEMENT (mm)



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138 **Test I.D:** D15605

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	21	Pass
Probe Speed	m/s	2.07 to 2.13	2.13	Pass
Maximum Force	N	3450 to 4060	3561	Pass
		Overall Test Results		Pass

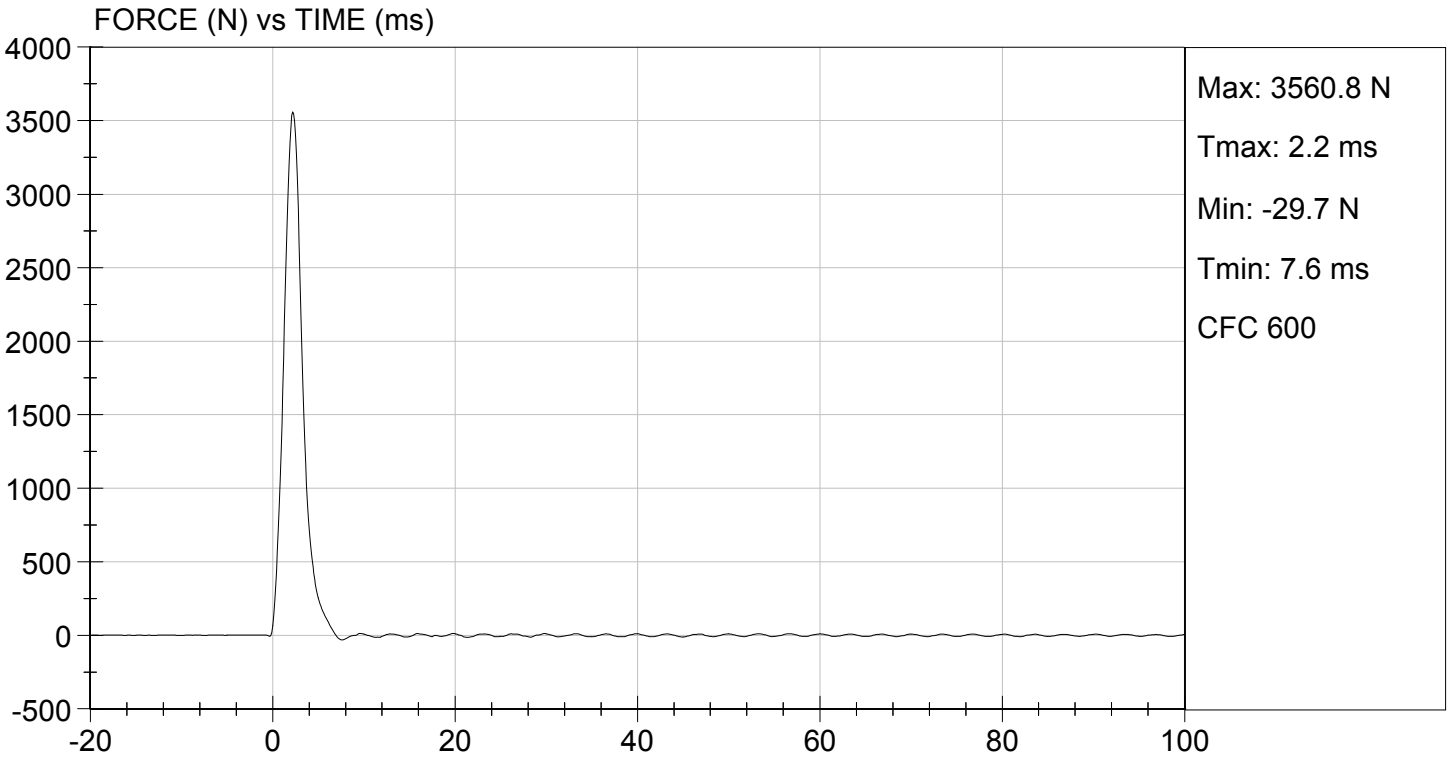
David Schoedel
Laboratory Technician

02/27/2015
Test Date

Jessica Gall
Approved By

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

TEST DATE: 02/27/2015
TEST #: D15605



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138 **Test I.D:** D15606

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	21	Pass
Probe Speed	m/s	2.07 to 2.13	2.13	Pass
Maximum Force	N	3450 to 4060	3714	Pass
		Overall Test Results		Pass

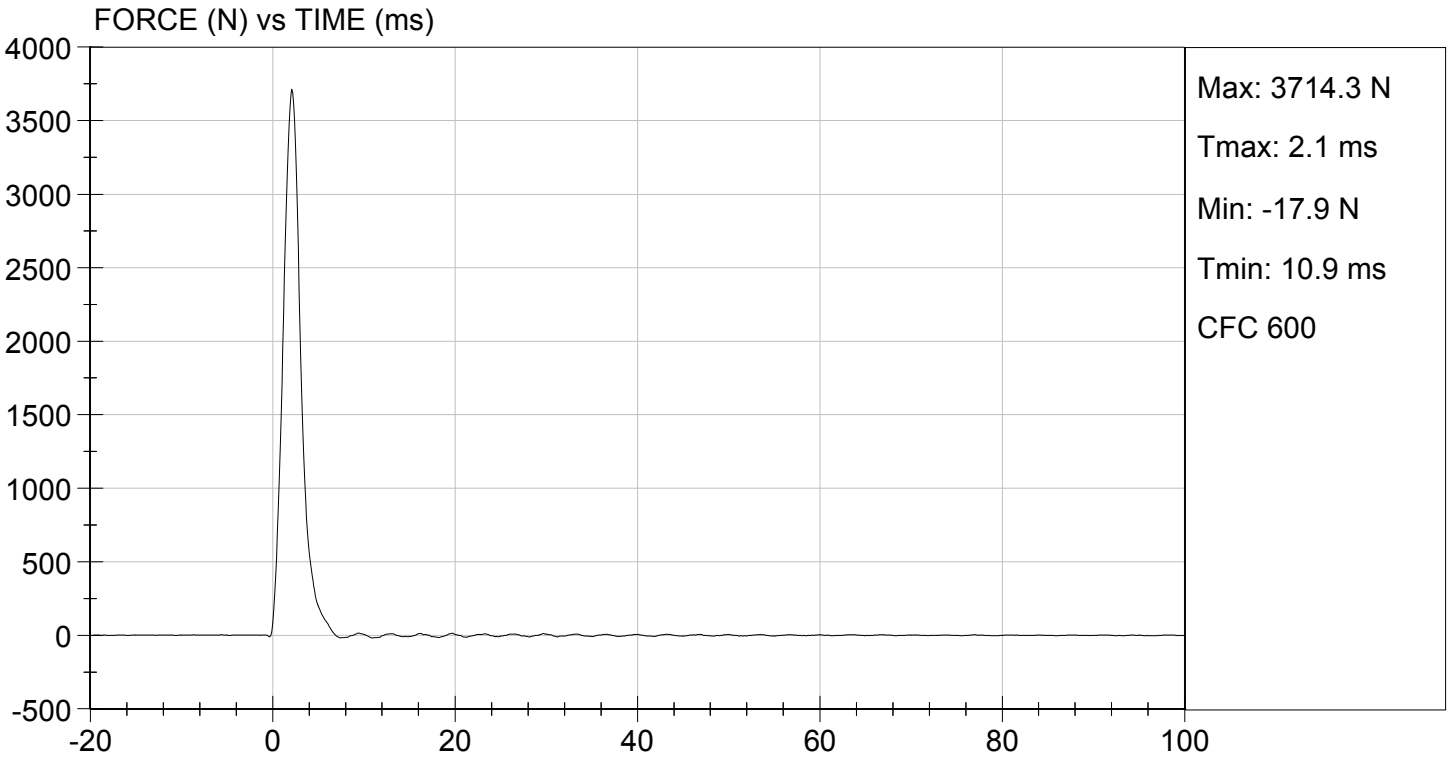
David Schoedel
Laboratory Technician

02/27/2015
Test Date

Jessica Hall
Approved By

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

TEST DATE: 02/27/2015
TEST #: D15606



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138 **Test I.D:** D15607

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	19	Pass
Initial Angle	deg	0 to 20	20	Pass
Return Angle	deg	+/- 8	4	Pass
Force at 45 deg	N	320 to 390	365	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.9	Pass
		Overall Result		Pass

David Schoedel

Laboratory Technician

02/27/2015

Test Date

Jessica Hall

Approved By