REPORT NUMBER: NCAP-MGA-2012-019

NEW CAR ASSESSMENT PROGRAM (NCAP)
Frontal Barrier Impact Test

FORD MOTOR COMPANY
2012 Ford Explorer XLT 4WD SUV
NHTSA No.: MC0204

MGA RESEARCH CORPORATION
5000 Warren Road
Burlington, WI 53105

Test Date: October 28, 2011

Final Report Date: November 28, 2011

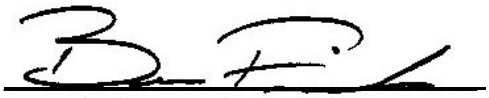
FINAL REPORT

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: 
Donna Janovicz, Project Manager

Approved by: 
Ben Fischer, Project Engineer

Approval Date: November 28, 2011

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-2012-019	*2. Government Accession No.*	*3. Recipient's Catalog No.*
4. Title and Subtitle Final Report of New Car Assessment Program Frontal Impact Testing of 2012 Ford Explorer XLT 4WD SUV, NHTSA No.: MC0204		*5. Report Date* November 28, 2011 *6. Performing Organization Code* MGA
7. Author(s) Donna Janovicz, Project Manager Ben Fischer, Project Engineer		*8. Performing Organization Report No.* NCAP-MGA-2012-019
9. Performing Organization Name and Address MGA Research Corporation 5000 Warren Road Burlington, WI 53105		*10. Work Unit No.* *11. Contract or Grant No.* DTNH22-06-D-00028
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 October 28 to November 28, 2011 *14. Sponsoring Agency Code* NVS-111
15. Supplementary Notes		

16. Abstract

A 56.3 km/h NCAP Frontal Impact Test was conducted on the 2012 Ford Explorer XLT 4WD SUV in accordance with the specifications of the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and foot well intrusion performance. The test was conducted at MGA Research Corporation in Burlington, Wisconsin, on October 28, 2011.

The impact velocity was 56.4 km/h and the ambient temperature at the barrier face at the time of impact was 21.7°C. The target vehicle post-test maximum crush was 641 mm located at the vehicle's centerline. The test vehicle's performance was as follows:

Measurement Description	Units	Threshold		Driver ATD	Passenger ATD
		50th	5th		
Head Injury Criteria (HIC_{15})	N/A	700	700	185	146
Maximum Chest Compression	mm	63	52	27	13
Nij	N/A	1	1	0.28	0.44
Neck Tension	N	4170	2620	1563	855
Neck Compression	N	4000	2520	36	234
Left Femur Force	N	10008	6805	1853	3404
Right Femur Force	N	10008	6805	2946	3843

There was a trace amount of Stoddard Solvent leakage during multiple phases of the static rollover, see Data Sheet 16.

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, Room E12-100 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* 158	22. Price

TABLE OF CONTENTS

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 DTNH22-06-D-00028. 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 was impacted by a 2012 Ford Explorer XLT 4WD SUV at a velocity of 56.4 kph. The test was performed at MGA Research Corporation on October 28, 2011. Pre-and post-test photographs of the vehicle and dummies can be found in Appendix A.

Two 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 on the driver's lap and shoulder belts and the passenger's lap belt to measure dummy torso and pelvic section loading.

The driver (position 1) ATD (Serial No. 036) 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 228 channels of data were recorded on an on-board data acquisition system. Appendix B contains the dummy head, chest displacement, neck, and femur response data traces.

There was 100 percent windshield retention and no intrusion into the protected zone of the windshield during the event. There was a trace amount of Stoddard Solvent leakage during multiple phases of the static rollover, see Data Sheet 16.

The maximum static crush of the vehicle was 641 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})	185	0.28	1563	36	39	27	1853	2946
Passenger (5^{th})	146	0.44	855	234	32	13	3404	3843

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

TEST NOTES

There was no valid data collected for:
Top of Engine X after 33 msec.
Left Brake Caliper X after 20 msec.

Load Cell 6-13 is questionable data.

There was a trace amount of Stoddard Solvent leakage during multiple phases of the static rollover, see Data Sheet 16.

SECTION 2
OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2012 Ford Explorer XLT 4WD SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: MC0204
Test Date: 10/28/2011

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	MC0204	Traction Control System (TCS)	Yes
Model Year	2012	Auto-Leveling System	No
Make	Ford	Automatic Door Locks (ADLs)	Yes
Model	Explorer	Power Window Auto-Reverse	Yes
Body Style	MPV	Other Optional Feature	N/A
VIN	1FMHK8D81CGA03959	Driver Front Airbag	Yes
Body Color	Golden Bronze Metallic	Driver Curtain Airbag	Yes
Odometer (km/mi)	274 / 170	Driver Head/Torso Airbag	No
Engine Displacement (L)	3.5	Driver Torso Airbag	No
Type/No. Cylinders	6	Driver Torso/Pelvis Airbag	Yes
Engine Placement	Lateral	Driver Pelvis Airbag	No
Transmission Type	Automatic	Driver Knee Airbag	No
Transmission Speeds	6	Pass. Curtain Airbag	Yes
Overdrive	Yes	Pass. Head/Torso Airbag	No
Final Drive	4WD	Pass. Torso Airbag	No
Roof Rack	Yes	Pass. Torso/Pelvis Airbag	Yes
Sunroof/T-Top	Yes	Pass. Pelvis Airbag	No
Running Boards	No	Driver Seat Belt Pretensioner	Yes
Tilt Steering Wheel	Yes	Pass. Seat Belt Pretensioner	Yes
Power Seats	Yes	Driver Load Limiter	Yes
Anti-Lock Brakes (ABS)	Yes	Rear Pass. Load Limiter	Yes
All-Wheel Drive (AWD)	Yes	Rear Inflatable Belts	Yes
Does owner's manual provide instructions to turn off automatic door locks?			No

DATA FROM CERTIFICATION LABEL

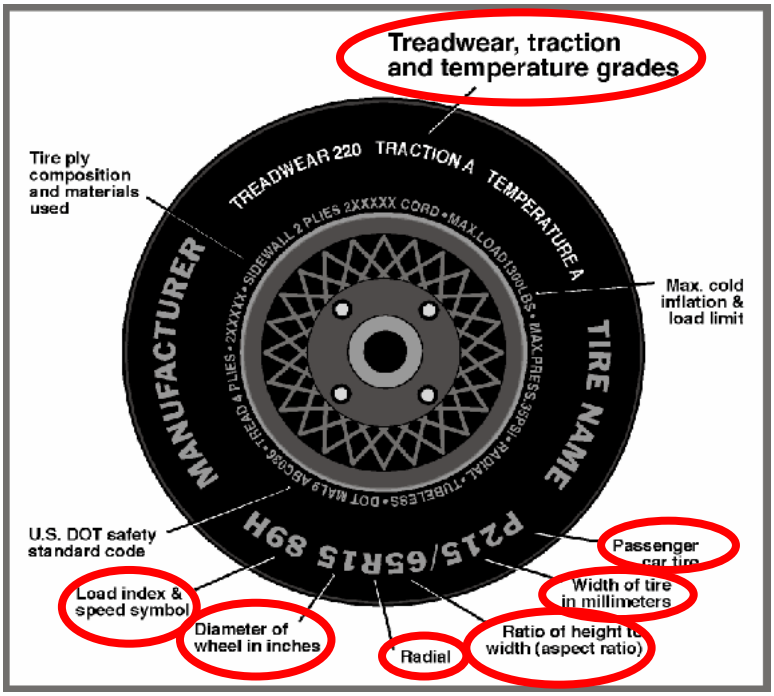
Manufactured By	Ford Motor Co.	GVWR (kg)	2794
Date of Manufacture	07/11	GAWR Front (kg)	1397
Vehicle Type	Truck	GAWR Rear (kg)	1497

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Split Bench	Bucket	
Designated Seating Capacity (DSC)	2	3	2	7
Capacity Weight (VCW) (kg)				595
Cargo Weight (RCLW) (kg)				119

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

Test Vehicle: 2012 Ford Explorer XLT 4WD SUV NHTSA No.: MC0204
Test Program: NCAP Frontal Barrier Impact Test Test Date: 10/28/2011



TIRE PLACARD INFORMATION

Measured Parameter	Front	Rear
Recommended Cold Tire Pressure (kPa)	240	240
Recommended Tire Size	P245/60R18	P245/60R18

TIRE SIDEWALL INFORMATION

Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	300	300
Tire Size on Vehicle	245/60R18	245/60R18
Tire Manufacturer	Michelin	Michelin
Tire Name	Latitude Tour HP	Latitude Tour HP
Tire Type	Passenger	Passenger
Tire Width	245	245
Aspect Ratio	60	60
Radial	Yes	Yes
Wheel Diameter	18	18
Load Index/Speed Symbol	104H	104H
Treadwear	440	440
Traction Grade	A	A
Temperature Grade	A	A
Tire Material	Rubber	Rubber

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

Test Vehicle: 2012 Ford Explorer XLT 4WD SUV NHTSA No.: MC0204
Test Program: NCAP Frontal Barrier Impact Test Test Date: 10/28/2011

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	596.0	497.6		621.9	594.2	
Right	kg	581.5	489.4		605.1	596.0	
Ratio	%	54.4	45.6		50.8	49.2	
Totals	kg	1177.5	987.0	2164.5	1227.0	1190.2	2417.2

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	2164.5
Weight of 1 P572E ATD & 1 P572O ATD	kg	140.6
Rated Cargo/Luggage Weight (RCLW)	kg	119
Calculated Vehicle Target Weight (TVTW)	kg	2424.1

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	818	818	840	843	1304
As Tested	mm	812	809	816	812	1408
Post Test	mm	722	777	825	805	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2860
Total Vehicle Length at Left Side	mm	4851
Total Vehicle Length at Centerline	mm	5008
Total Vehicle Length at Right Side	mm	4851
Weight of Ballast in Cargo Area	kg	114.3
Weight of Vehicle Components Removed	kg	28.6
Amount of Stoddard Solvent in Fuel Tank	L	65.5

List of components removed: Right taillight, rear floor mats, cargo area carpet/lining, spare tire, jack, and tool kit.

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

Test Vehicle: 2012 Ford Explorer XLT 4WD SUV NHTSA No.: MC0204
Test Program: NCAP Frontal Barrier Impact Test Test Date: 10/28/2011

TARGET VEHICLE STRUCTURAL MEASUREMENT

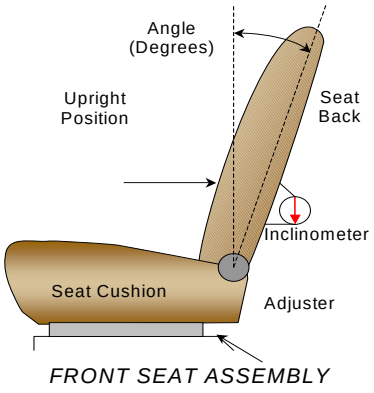
	Elements	Pre-Test (mm)
1	Total Length	5008
2	Total Width	1978
3	Bumper Top Height	639
4	Bumper Bottom Height	564
5	Longitudinal Member Top Height	660
6	Distance between Longitudinal Members	1000
7	Longitudinal Member Width	85
8	Engine Top Height	974
9	Engine Bottom Height	266
10	Engine and Gearbox Width	764
11	Front Bumper-Engine Distance	300
12	Front Shock Absorber Fixing Height	1013
13	Bonnet Leading Edge Height	1006
14	Front Shock Absorber Fixing Width	1257
15	Front Bumper – Front Axle Distance	960
16	Front Axle – A-Pillar Distance	492
17	A-Pillar – B-Pillar Distance	1094
18	B-Pillar – Rear Axle Distance	1275
19	B-Pillar – C-Pillar Distance	827
20	Roof Sill Bottom Height	1525
21	Roof Sill Top Height	1706
22	Floor Sill Bottom Height	267
23	Floor Sill Top Height	442

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

Test Vehicle: 2012 Ford Explorer XLT 4WD SUV NHTSA No.: MC0204
Test Program: NCAP Frontal Barrier Impact Test Test Date: 10/28/2011

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 January 2010.



SEAT BACK ANGLE	Degrees
Driver Seat Back Angle	16.7° on headrest post
Passenger Seat Back Angle	8th detent (1st as 0)

SEAT FORE/AFT POSITIONS

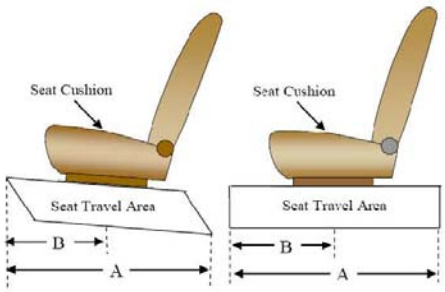
The driver and passenger seat fore/aft positions are adjusted following Appendix F, "Driver & Passenger Dummy Seating & Positioning Procedures" in the NCAP Test Procedure dated January 2010.

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	339 mm	170 mm (1st as 0)
Passenger Seat	274 mm	17 mm (foremost 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 0)	0 (uppermost as 0)
Passenger Seat	4 (1st as 0)	0 (uppermost as 0)



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

Test Vehicle: 2012 Ford Explorer XLT 4WD SUV NHTSA No.: MC0204
Test Program: NCAP Frontal Barrier Impact Test Test Date: 10/28/2011

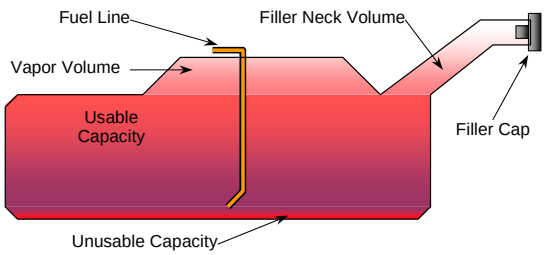
FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of "Standard Tank"	70.4
Usable Capacity of "Optional Tank"	
92-94% of Usable Capacity	64.8 to 66.2
Actual Amount of Solvent used	65.5
1/3 of Usable Capacity	23.5

FUEL PUMP

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

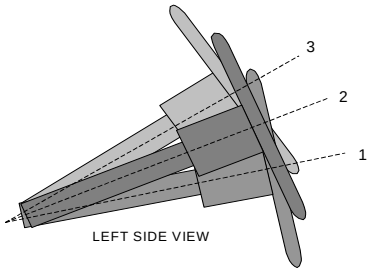
The vehicle is equipped with an electric fuel pump. The electric fuel pump operates for two seconds to pressurize the fuel system following the actuation of the ignition. If no attempt has been made to start the engine within two seconds following ignition actuation, the fuel pump will shut off. The fuel pump operates continuously while the engine is running; if the engine stalls, the fuel pump is deactivated. Also a fuel pump shut-off system is provided and designed to stop fuel flow to the engine if the vehicle sustains an impact above a certain magnitude. The fuel pipe is on the right side.



VEHICLE FUEL TANK ASSEMBLY

STEERING COLUMN ADJUSTMENT

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



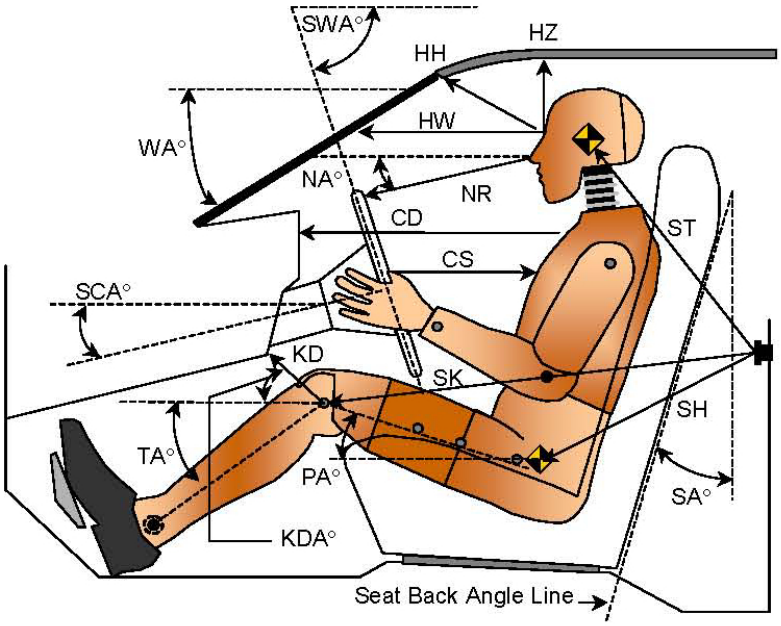
STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITION

	Degrees	Fore/Aft Position (mm)
Lowermost – Position 1	65.2	207
Geometric Center – Position 2	62.5	182
Uppermost – Position 3	59.8	157
Telescoping Steering Wheel Travel		50
Test Position	62.5	182

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

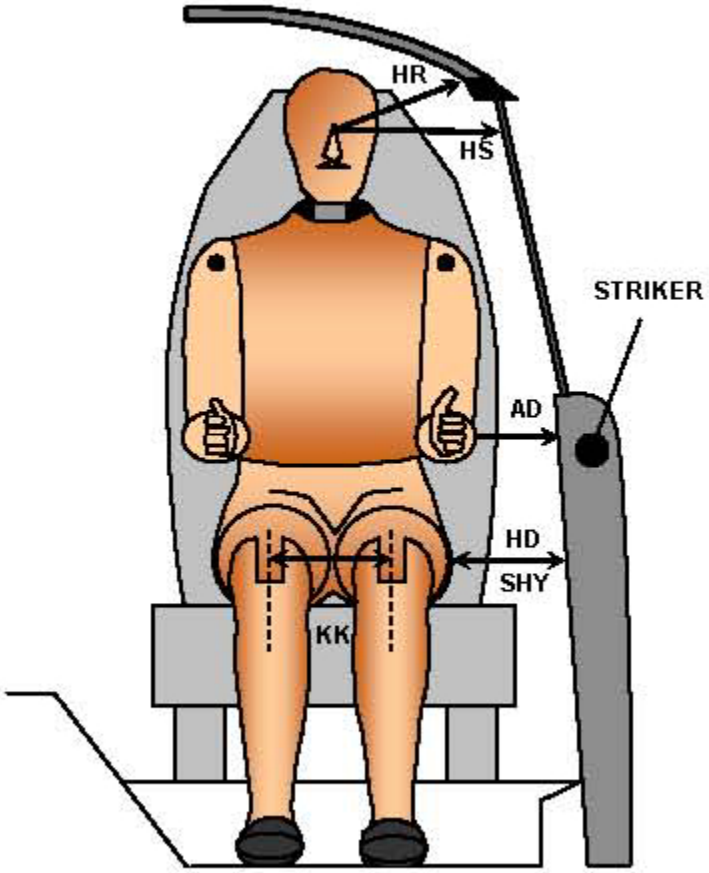
Test Vehicle: 2012 Ford Explorer XLT 4WD SUV NHTSA No.: MC0204
Test Program: NCAP Frontal Barrier Impact Test Test Date: 10/28/2011



Code	Measurement Description	Driver S/N 036		Passenger S/N 138	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		30.3		
SWA°	Steering Wheel Angle		62.5		
SCA°	Steering Column Angle		27.5		
SA°	Seat Back Angle (on headrest post)		16.7		18.0
HZ	Head to Roof (Z)	237	90	250	90
HH	Head to Header	432	23.8	366	36.2
HW	Head to Windshield	760	0	715	0
NR	Nose to Rim	402	10.8		
CD	Chest to Dash	547		440	
CS	Chest to Steering Hub	307	4.2		
RA	Rim to Abdomen	162	0		
KDL	Left Knee to Dash	137	27.0	74	39.9
KDR	Right Knee to Dash	113	32.4	70	38.4
PA°	Pelvic Angle		24.2		21.9
TA°	Tibia Angle		59.3		58.9
SK	Striker to Knee	611	84.2	690	89.5
ST	Striker to Head	551	12.7	528	32.0
SH	Striker to H-Point	227	118.7	464	103.2

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2012 Ford Explorer XLT 4WD SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: MC0204
Test Date: 10/28/2011

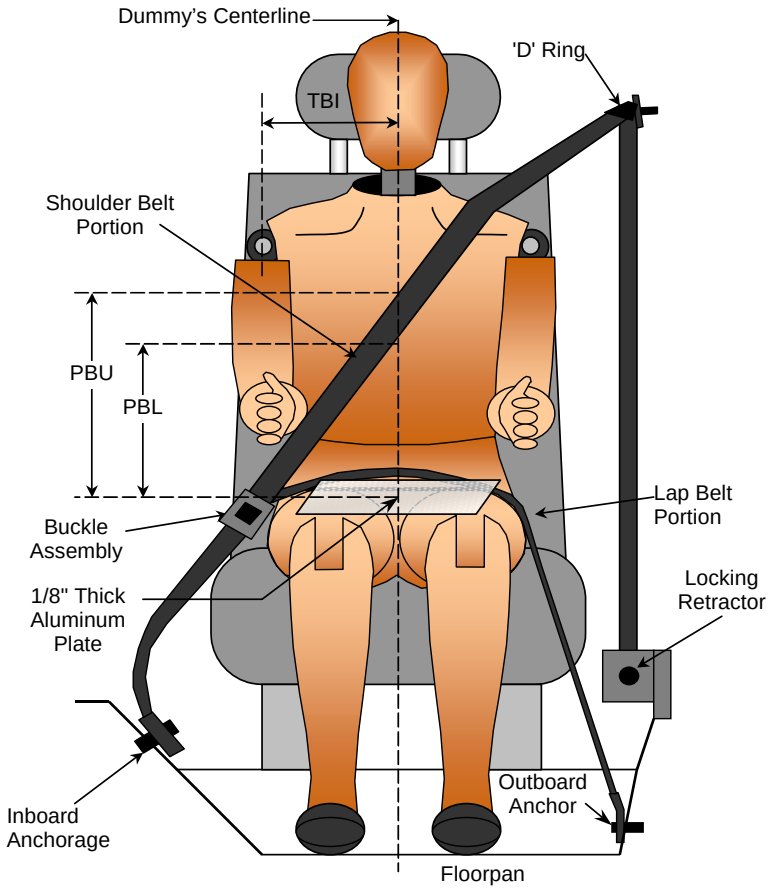


FRONT VIEW OF DUMMY

Code	Measurement Description	Driver S/N 036	Passenger S/N 138
		Length (mm)	
AD	Arm to Door	155	103
HD	H-Point to Door	180	184
HR	Head to Side Header	268	305
HS	Head to Side Window	397	449
KK	Knee to Knee	381	218
SHY	Striker to H-Point (Y Direction)	350	355
AA	Ankle to Ankle	330	184

DATA SHEET NO. 5
SEAT BELT POSITIONING DATA

Test Vehicle: 2012 Ford Explorer XLT 4WD SUV NHTSA No.: MC0204
Test Program: NCAP Frontal Barrier Impact Test Test Date: 10/28/2011



FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	330	330
PBL - Top surface of reference to belt lower edge	mm	250	230

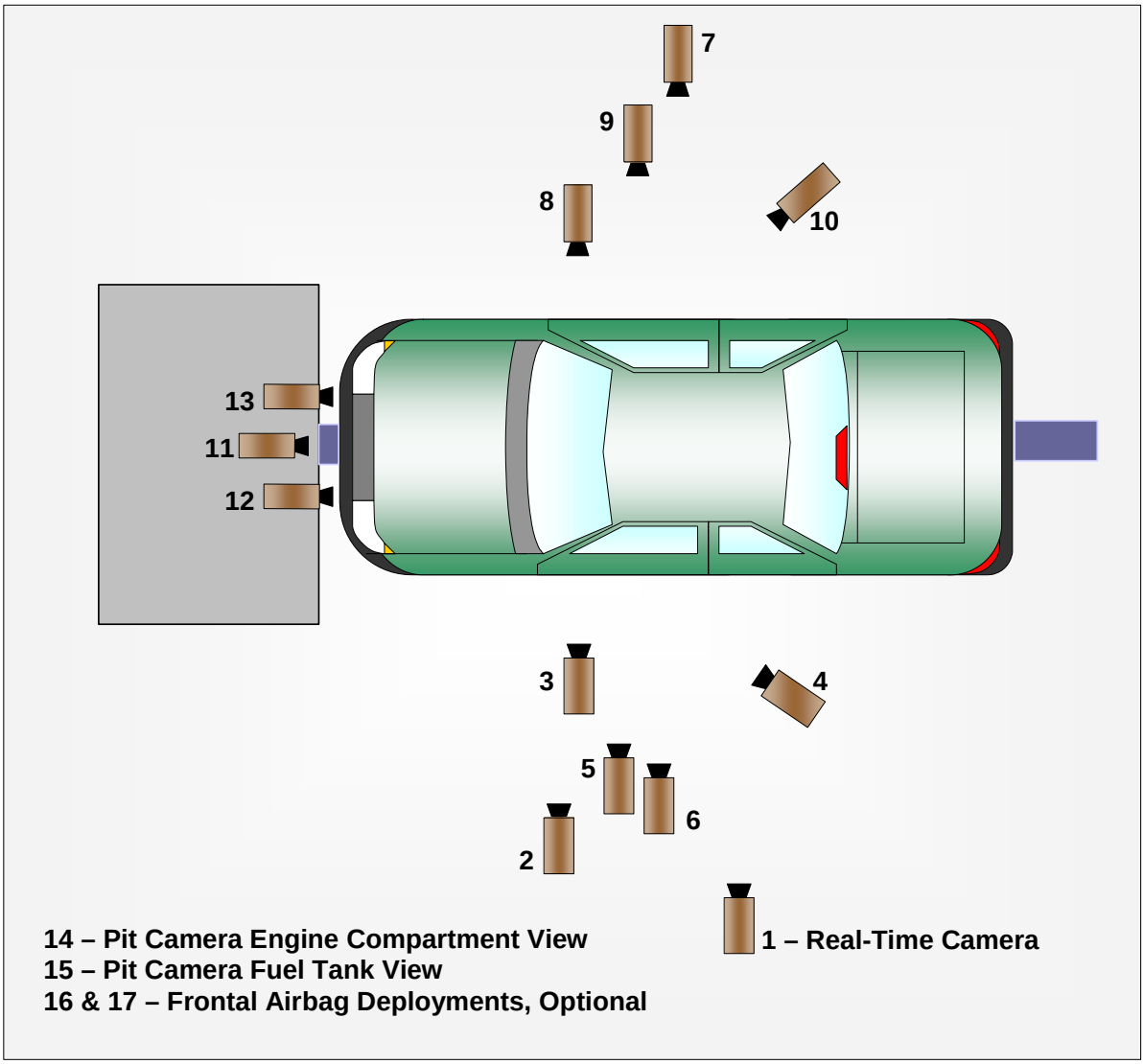
BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as measured on ATD	mm	884	930
Lap Belt Length as measured on ATD	mm	592	540
Remainder of belt on reel	mm	1825	1805
Total Belt Length for Continuous Webbing Systems	mm	3301	3275

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

Test Vehicle:	2012 Ford Explorer XLT 4WD SUV	NHTSA No.:	MC0204
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	10/28/2011

CAMERA POSITIONS FOR FRONTAL IMPACTS



14 – Pit Camera Engine Compartment View
15 – Pit Camera Fuel Tank View
16 & 17 – Frontal Airbag Deployments, Optional

1 – Real-Time Camera

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

Test Vehicle: 2012 Ford Explorer XLT 4WD SUV NHTSA No.: MC0204
Test Program: NCAP Frontal Barrier Impact Test Test Date: 10/28/2011

CAMERA LOCATIONS

No.	Camera View	Coordinates (mm)			Lens (mm)	Speed (fps)
		X*	Y*	Z*		
1	Real-Time Left Overall					30
2	Driver Close-Up	1520	-6630	-1810	35	1000
3	Left Front Half	1260	-5220	-1100	24	1000
4	Left Angle	5720	-5060	-1930	50	1000
5	Steering Column - Top	510	-5290	-1240	24	1000
6	Steering Column - Bottom	530	-5260	-830	24	1000
7	Right Overall	2260	7130	-1110	20	1000
8	Passenger Close-Up	1670	6680	-1840	35	1000
9	Right Front Half	1310	5260	-1090	24	1000
10	Right Angle	5810	4900	-1940	50	1000
11	Windshield	-320	0	-2860	24	1000
12	Driver Windshield	-30	-360	-2040	12.5	1000
13	Passenger Windshield	-30	360	-2040	12.5	1000
14	Pit Front	1100	0	3150	24	1000
15	Pit Rear	3060	0	3150	24	1000
16	Onboard Driver Side (optional)					
17	Onboard Passenger Side (optional)					
18	Real-Time Pan View					30

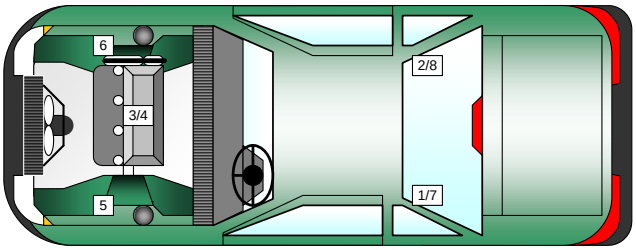
*COORDINATES:

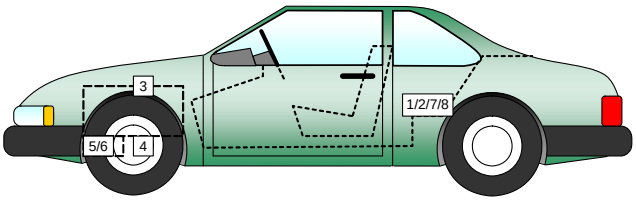
+X = forward of impact plane
+Y = right of monorail centerline
+Z = below ground level

Cameras 16 & 17 were not used for this test.

DATA SHEET NO. 7
VEHICLE ACCELEROMETER DATA

Test Vehicle: 2012 Ford Explorer XLT 4WD SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: MC0204
Test Date: 10/28/2011





VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

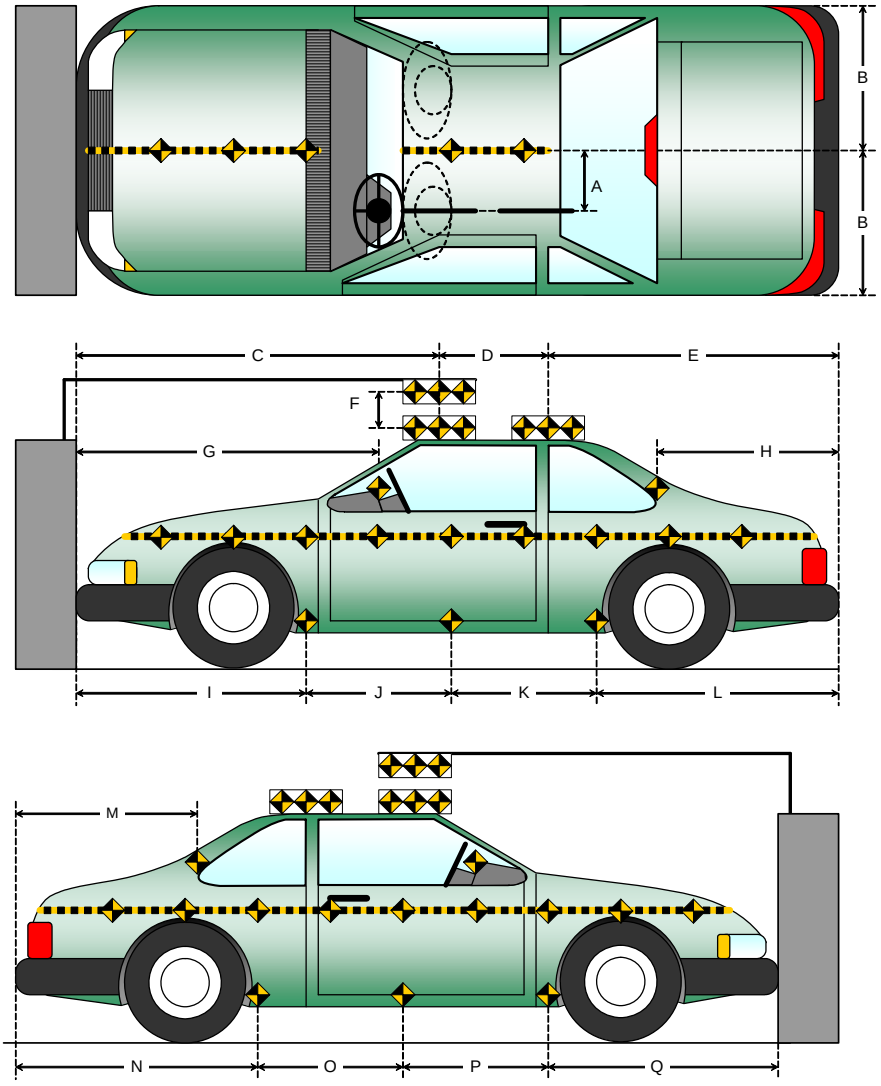
No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Accelerometer – X Direction	2112	-410	-372
2	Right Rear Accelerometer – X Direction	2112	410	-372
3	Engine Top X	4127	0	-948
4	Engine Bottom X	4095	0	-340
5	Left Brake Caliper X	4174	-762	-261
6	Right Brake Caliper X	4174	762	-261
7	Left Rear Accelerometer Redundant – X Direction	2112	-410	-372
8	Right Rear Accelerometer Redundant – X Direction	2112	410	-372

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: 2012 Ford Explorer XLT 4WD SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: MC0204
Test Date: 10/28/2011

Item	Value (mm)
A	418
B	989
C	2378
D	810
E	1820
F	127
G	
H	1530
I	1342
J	972
K	972
L	1722
M	1530
N	1769
O	960
P	966
Q	1313



DATA SHEET NO. 9
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2012 Ford Explorer XLT 4WD SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: MC0204
Test Date: 10/28/2011

Advanced Research Load Cell Barrier

1-1	1-2	1-3	1-4	1-5	1-6	1-7	1-8	1-9	1-10	1-11	1-12	1-13	1-14	1-15	1-16
2-1	2-2	2-3	2-4	2-5	2-6	2-7	2-8	2-9	2-10	2-11	2-12	2-13	2-14	2-15	2-16
3-1	3-2	3-3	3-4	3-5	3-6	3-7	3-8	3-9	3-10	3-11	3-12	3-13	3-14	3-15	3-16
4-1	4-2	4-3	4-4	4-5	4-6	4-7	4-8	4-9	4-10	4-11	4-12	4-13	4-14	4-15	4-16
5-1	5-2	5-3	5-4	5-5	5-6	5-7	5-8	5-9	5-10	5-11	5-12	5-13	5-14	5-15	5-16
6-1	6-2	6-3	6-4	6-5	6-6	6-7	6-8	6-9	6-10	6-11	6-12	6-13	6-14	6-15	6-16
7-1	7-2	7-3	7-4	7-5	7-6	7-7	7-8	7-9	7-10	7-11	7-12	7-13	7-14	7-15	7-16
8-1	8-2	8-3	8-4	8-5	8-6	8-7	8-8	8-9	8-10	8-11	8-12	8-13	8-14	8-15	8-16
9-1	9-2	9-3	9-4	9-5	9-6	9-7	9-8	9-9	9-10	9-11	9-12	9-13	9-14	9-15	9-16
10-1	10-2	10-3	10-4	10-5	10-6	10-7	10-8	10-9	10-10	10-11	10-12	10-13	10-14	10-15	10-16
11-1	11-2	11-3	11-4	11-5	11-6	11-7	11-8	11-9	11-10	11-11	11-12	11-13	11-14	11-15	11-16

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: 2012 Ford Explorer XLT 4WD SUV NHTSA No.: MC0204
Test Program: NCAP Frontal Barrier Impact Test Test Date: 10/28/2011

INSTRUMENTATION

Driver Dummy Data Channels	46
Passenger Dummy Data Channels	46
Vehicle Structure Accelerometers	8
Barrier Channels	128
Total	228

CAMERA COVERAGE

High-Speed Vehicle Onboard	0
High-Speed Offboard	14
Real-Time	2
Total	16

DATA SHEET NO. 11
POST-TEST OBSERVATIONS

Test Vehicle: 2012 Ford Explorer XLT 4WD SUV NHTSA No.: MC0204
Test Program: NCAP Frontal Barrier Impact Test Test Date: 10/28/2011

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Passenger
Dummy Type / Serial No.	HIII 50% / 036	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 locked	Doors were locked
Front Door Opening	Door remained closed and latched; Door opened without tools	Door remained closed and latched; Door opened without tools
Rear Door Opening	Door remained closed and latched; Door opened without tools	Door remained closed and latched; Door opened without tools
Seat Track Shift (mm)	0	0
Seat Back Failure	None	None

POST TEST STRUCTURAL OBSERVATIONS

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

VEHICLE REBOUND FROM BARRIER

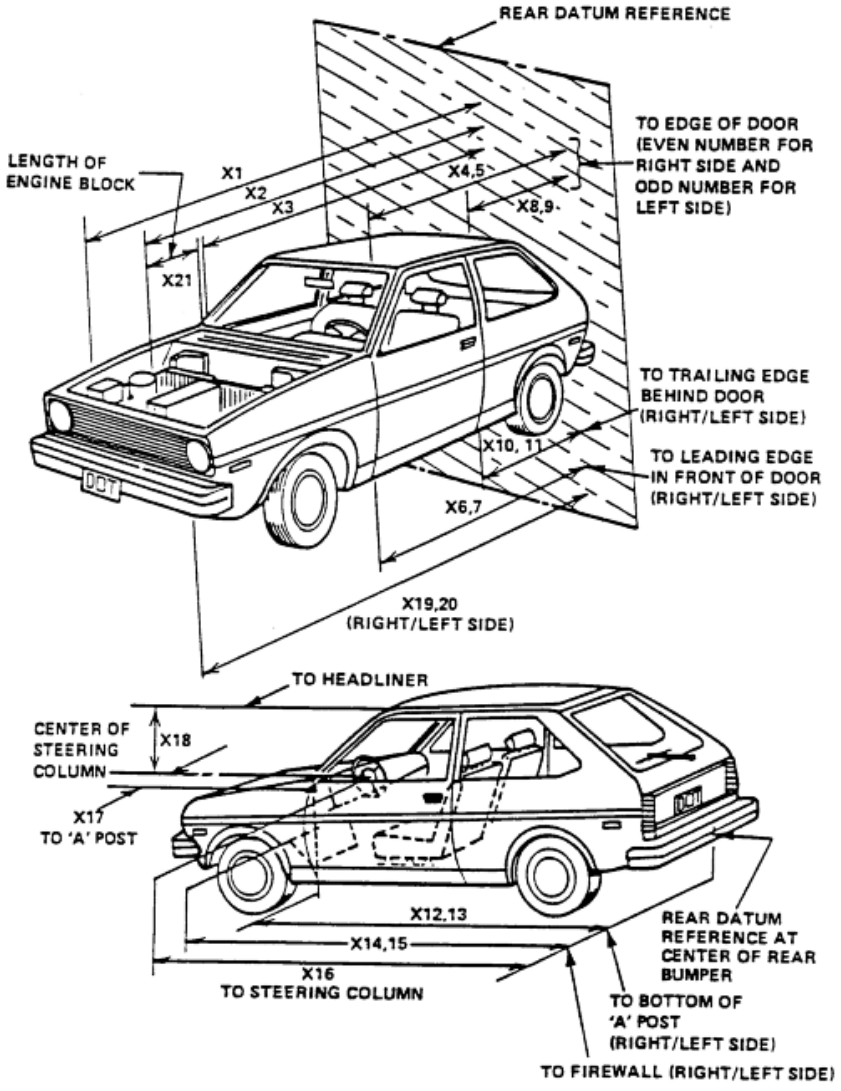
Measured Parameter	Units	Value
Left Side	mm	1115
Center	mm	1090
Right Side	mm	1075
Average	mm	1093

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Left Front (Driver) P1		Right Front (Passenger)	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	Yes	Yes	Yes
Knee Airbag	No		No	
Curtain Side Airbag	Yes	No	Yes	No
Torso/Abdomen/Pelvis Side Airbag	Yes	No	Yes	No
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes		Yes	

DATA SHEET NO. 12
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2012 Ford Explorer XLT 4WD SUV NHTSA No.: MC0204
Test Program: NCAP Frontal Barrier Impact Test Test Date: 10/28/2011



DATA SHEET NO. 12 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2012 Ford Explorer XLT 4WD SUV NHTSA No.: MC0204
Test Program: NCAP Frontal Barrier Impact Test Test Date: 10/28/2011

RSOV (Rear Surface of Vehicle)

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	mm	5008	4367	641
2	RSOV to Front of Engine	mm	4465	4171	294
3	RSOV to Firewall	mm	3877	3760	117
4	RSOV to Upper Leading Edge of Right Door	mm	3466	3460	6
5	RSOV to Upper Leading Edge of Left Door	mm	3468	3468	0
6	RSOV to Lower Leading Edge of Right Door	mm	3449	3429	20
7	RSOV to Lower Leading Edge of Left Door	mm	3450	3439	11
8	RSOV to Upper Trailing Edge of Right Door	mm	2368	2362	6
9	RSOV to Upper Trailing Edge of Left Door	mm	2370	2370	0
10	RSOV to Lower Trailing Edge of Right Door	mm	2421	2411	10
11	RSOV to Lower Trailing Edge of Left Door	mm	2424	2416	8
12	RSOV to Bottom of “A” Post of Right Side	mm	3446	3419	27
13	RSOV to Bottom of “A” Post of Left Side	mm	3446	3437	9
14	RSOV to Firewall, Right Side	mm	3877	3720	157
15	RSOV to Firewall, Left Side	mm	3857	3749	108
16	RSOV to Steering Column	mm	3011	3030	-19
17	Center of Steering Column to “A” Post	mm	420	419	1
18	Center of Steering Column to Headliner	mm	451	470	-19
19	RSOV to Right Side of Front Bumper	mm	4851	4290	561
20	RSOV to Left Side of Front Bumper	mm	4851	4311	540
21	Length of Engine Block	mm	455	455	0
RD	RSOV to Right Side of Dash Panel	mm	3198	3195	3
CD	RSOV to Center of Dash Panel	mm	3336	3328	8
LD	RSOV to Left Side of Dash Panel	mm	3219	3214	5

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

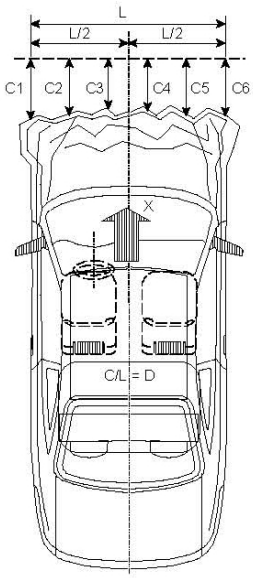
Test Vehicle: 2012 Ford Explorer XLT 4WD SUV NHTSA No.: MC0204
Test Program: NCAP Frontal Barrier Impact Test Test Date: 10/28/2011

VEHICLE INFORMATION

VIN:` 1FMHK8D81CGA03959 Wheelbase (mm): 2860
Vehicle Size Category: MPV Test Weight (kg): 2417.2

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): 64.7
Time of Separation (msec): 99.4



CRUSH PROFILE

Collision Deformation Classification: Frontal
Midpoint of Damage: Centerline
Damage Region Length (mm): 1410
Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4851	4311	540
C2	Crush zone 2 at left side	mm	4926	4342	584
C3	Crush zone 3 at left side	mm	4961	4335	626
C4	Crush zone 4 at right side	mm	4861	4330	531
C5	Crush zone 5 at right side	mm	4926	4325	601
C6	Crush zone 6 at right side	mm	4851	4290	561
L	C1 TO C6	mm	1410	1334	76

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

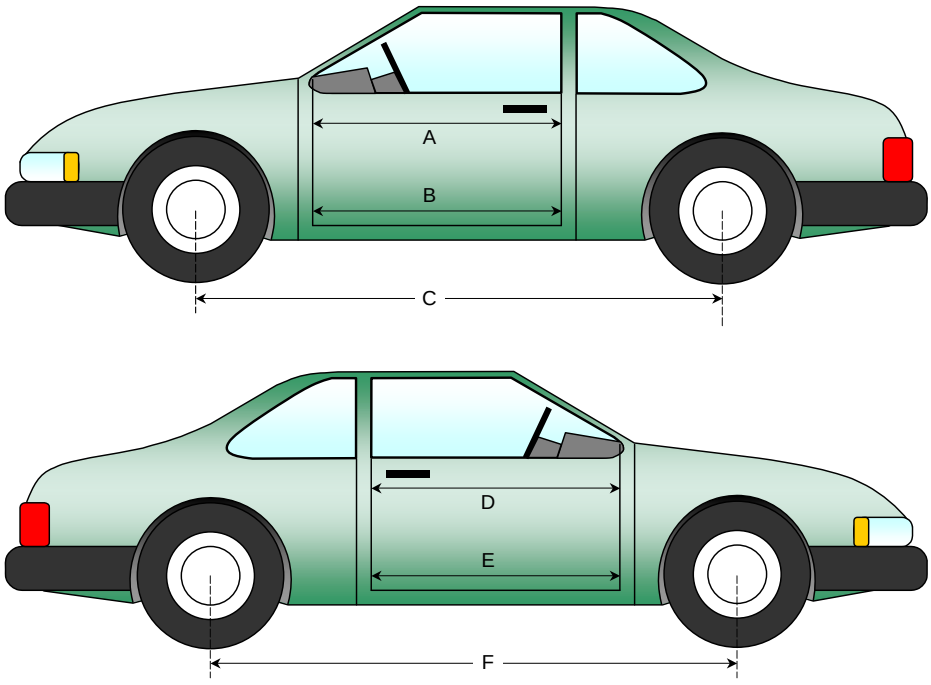
Test Vehicle: 2012 Ford Explorer XLT 4WD SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: MC0204
Test Date: 10/28/2011

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	970	960	10
B	Left Side Lower	mm	872	870	2
D	Right Side Upper	mm	970	960	10
E	Right Side Lower	mm	872	864	8

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2860	2757	103
F	Right Side Wheelbase	mm	2860	2768	92



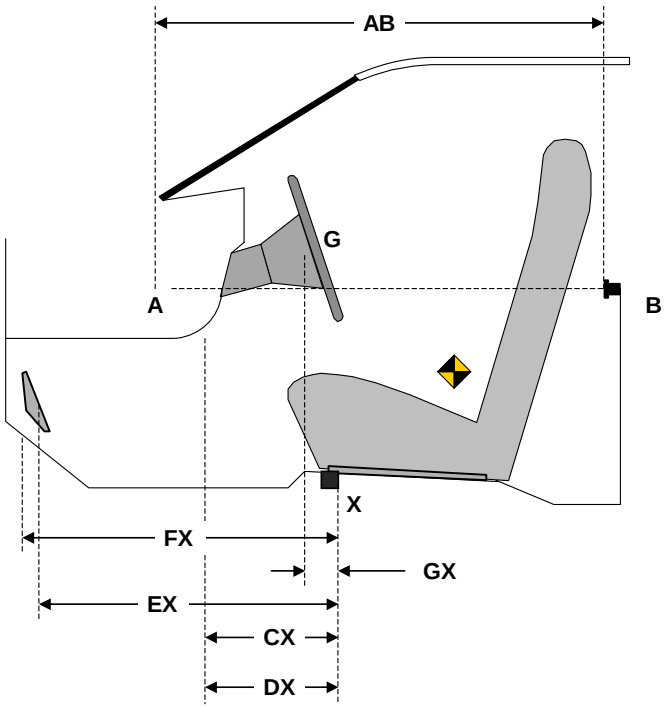
DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2012 Ford Explorer XLT 4WD SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: MC0204
Test Date: 10/28/2011

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside window jam)	mm	795	795	0
CX	Left Knee Bolster to X	mm	213	176	37
DX	Right Knee Bolster to X	mm	197	176	21
EX	Brake Pedal to X	mm	477	393	84
FX	Foot Rest to X	mm	510	450	60
GX	Center of Steering Column Wheel Hub to X	mm	22	69	-47

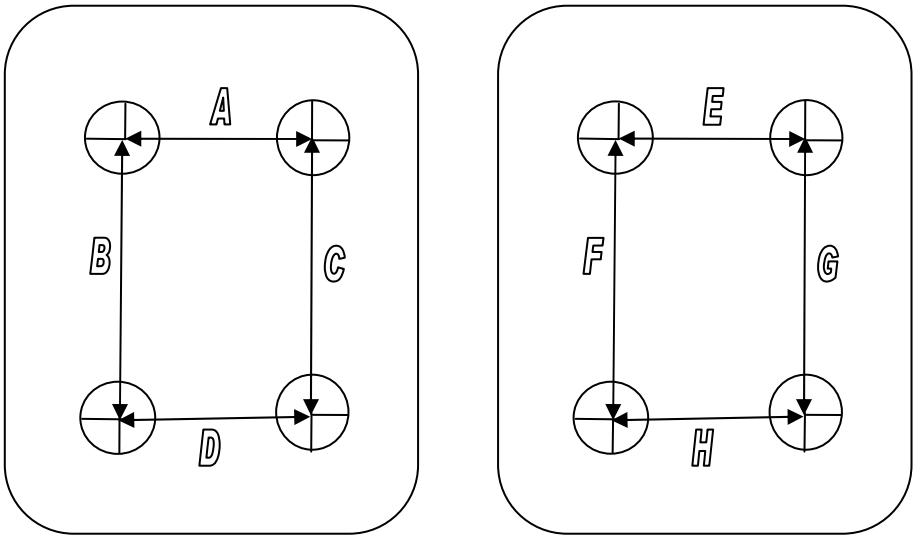
X = Front of Seat Track (stationary)



DRIVER COMPARTMENT

DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2012 Ford Explorer XLT 4WD SUV NHTSA No.: MC0204
Test Program: NCAP Frontal Barrier Impact Test Test Date: 10/28/2011



Driver Passenger

TOP VIEW THROUGH FLOOR PAN

UNDERBODY FLOORBOARD DEFORMATION

Measurement	Units	Pre-Test	Post-Test	Difference
A	mm	295	290	5
B	mm	295	291	4
C	mm	295	287	8
D	mm	295	300	-5
E	mm	295	285	10
F	mm	295	294	1
G	mm	295	295	0
H	mm	295	297	-2

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

Test Vehicle: 2012 Ford Explorer XLT 4WD SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: MC0204
Test Date: 10/28/2011

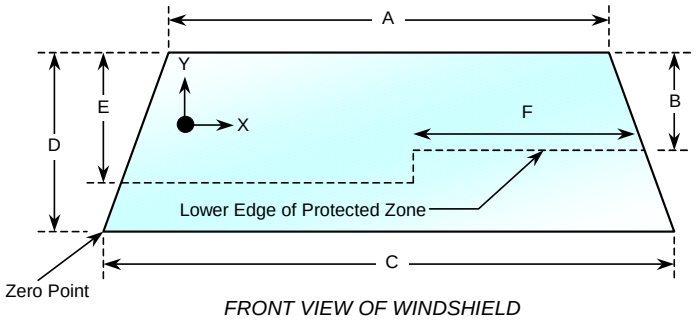
Windshield Mounting Details:
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

The standard requires that the post-test retention measurement be a minimum of 75 percent of the pretest 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: 21.7°C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2339	2339	100
Right Side	2339	2339	100
Total	4678	4678	100



FRONT VIEW OF WINDSHIELD

Item	Units	Value
A	mm	1384
B	mm	617
C	mm	1694
D	mm	800
E	mm	607
F	mm	895

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, 219 (PARTIAL), AND 301 DATA

Test Vehicle: 2012 Ford Explorer XLT 4WD SUV NHTSA No.: MC0204
Test Program: NCAP Frontal Barrier Impact Test Test Date: 10/28/2011

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

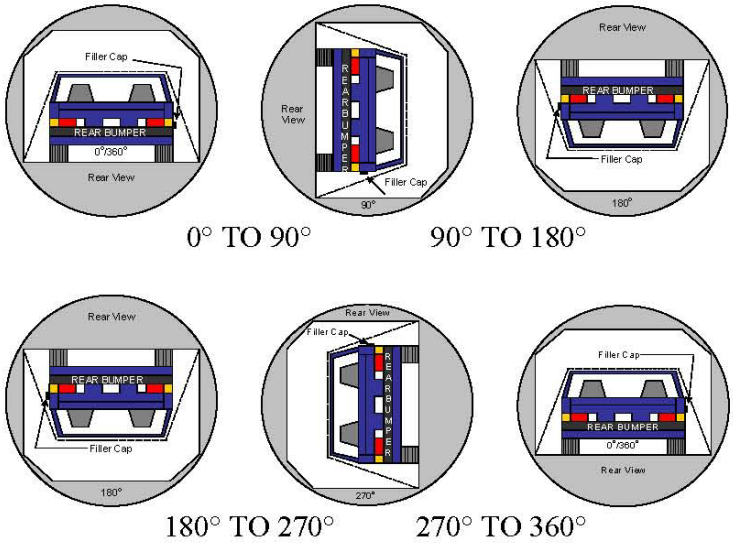
Test Time: 11:30 am Temperature: 21.7° C

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

DATA SHEET NO. 16
FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2012 Ford Explorer XLT 4WD SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: MC0204
Test Date: 10/28/2011

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: **Trace**



0° TO 90° 90° TO 180°
180° TO 270° 270° TO 360°

SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	112	300	412
90° to 180°	112	300	412
180° to 270°	107	300	407
270° to 360°	114	300	414

FMVSS 301 ROLLOVER SPILLAGE TABLE (units in ounces)

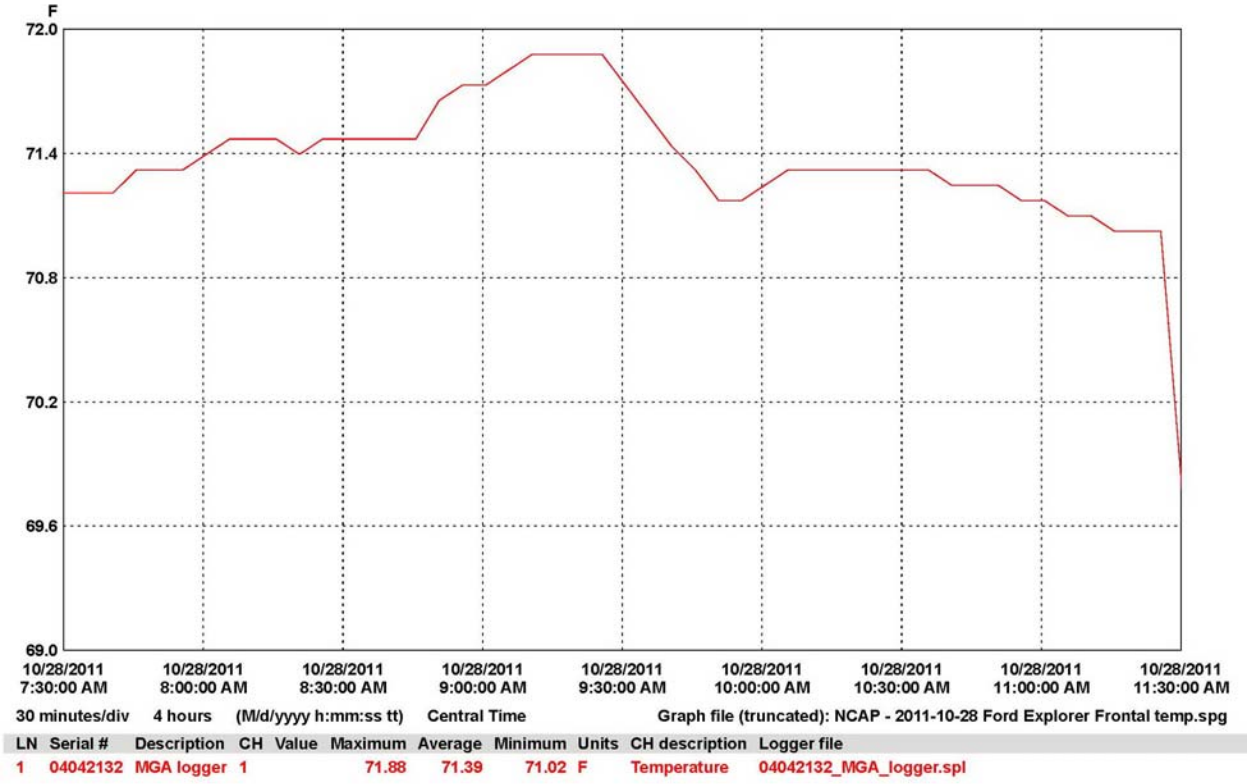
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eight Minute
0° to 90°	0	0	0	0
90° to 180°	Trace	0	0	0
180° to 270°	0.2	0	0	0
270° to 360°	0.2	0	0	0

ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

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

DATA SHEET NO. 17
DUMMY/VEHICLE TEMPERATURE STABILIZATION DATA

Test Vehicle: 2012 Ford Explorer XLT 4WD SUV NHTSA No.: MC0204
Test Program: NCAP Frontal Barrier Impact Test Test Date: 10/28/2011

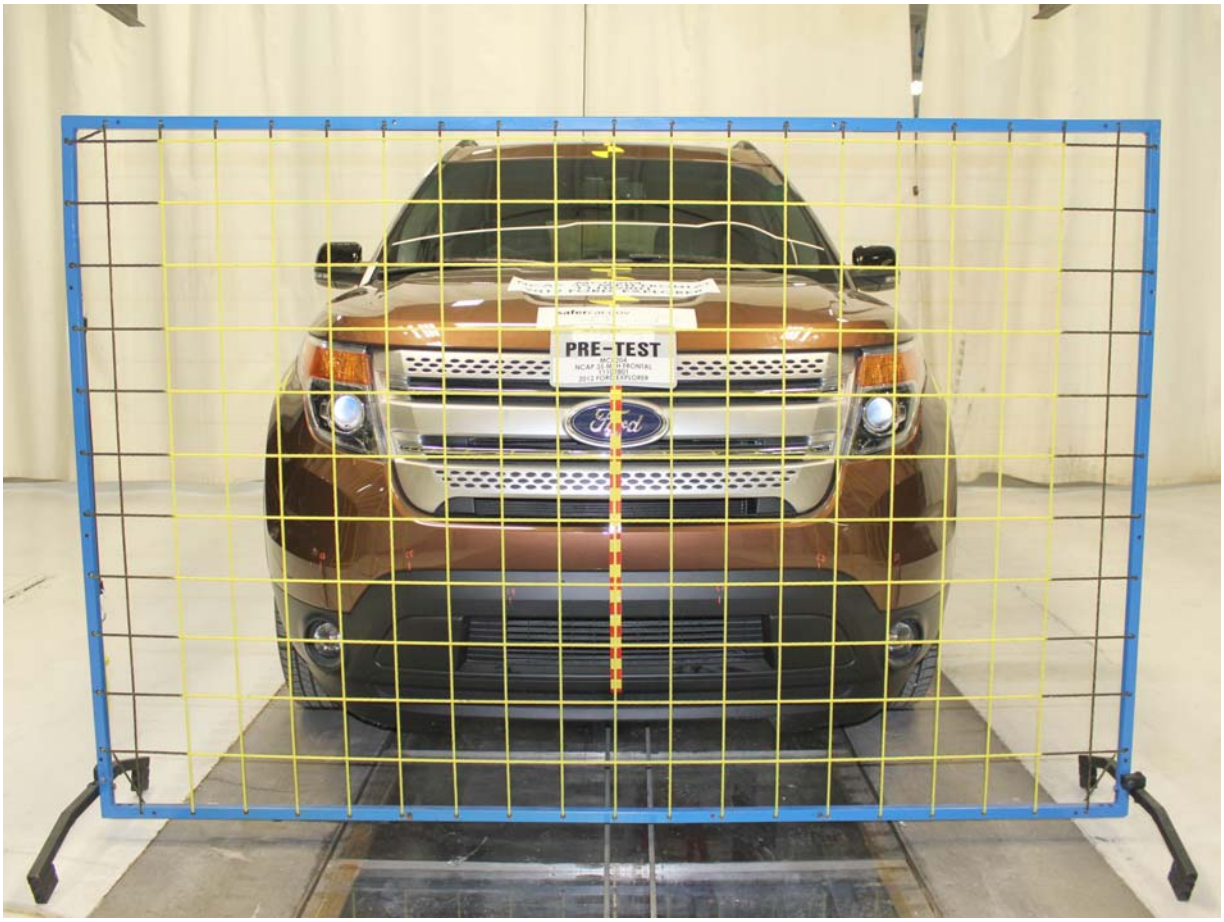


LN	Serial #	Description	CH	Value	Maximum	Average	Minimum	Units	CH description	Logger file
1	04042132	MGA logger	1		71.88	71.39	71.02	F	Temperature	04042132_MGA_logger.spl

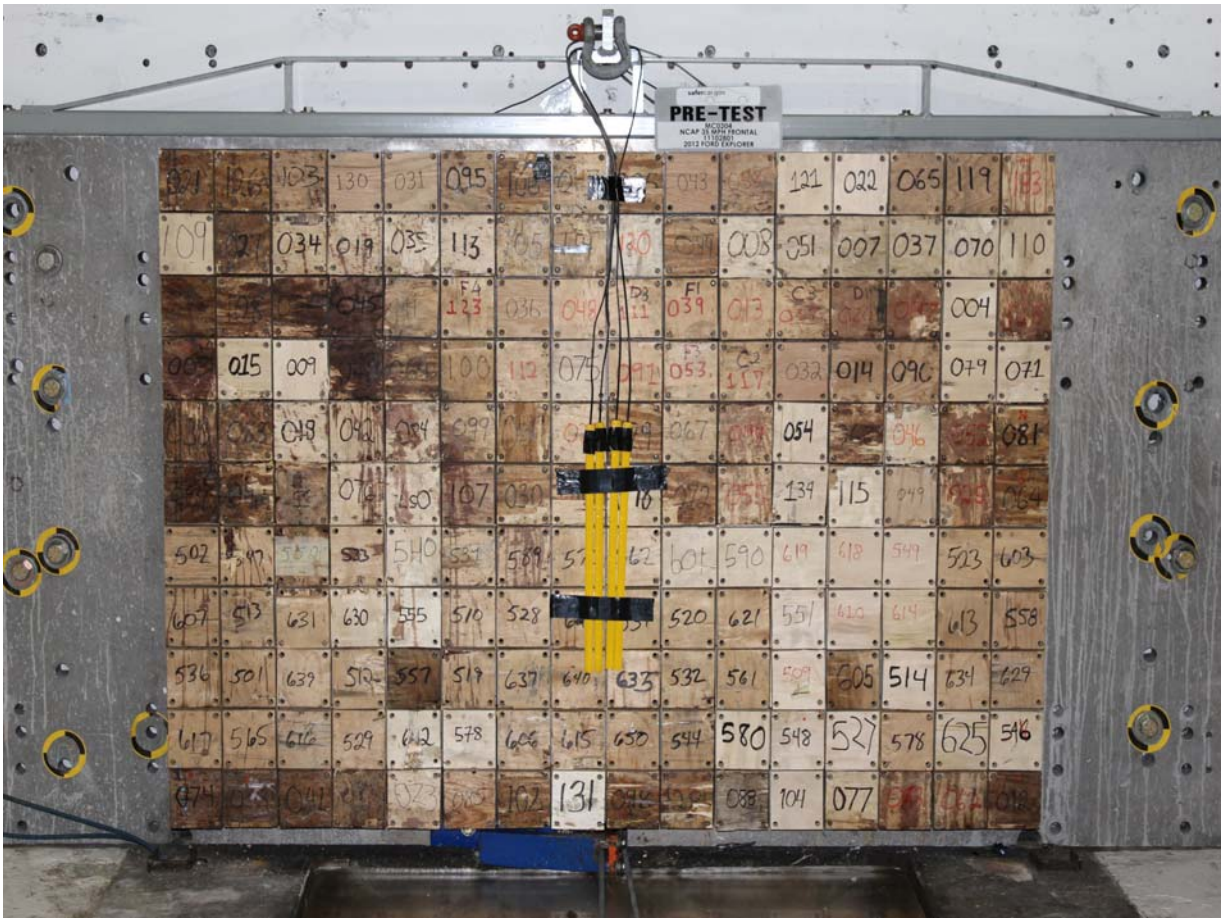
APPENDIX A

PHOTOGRAPHS

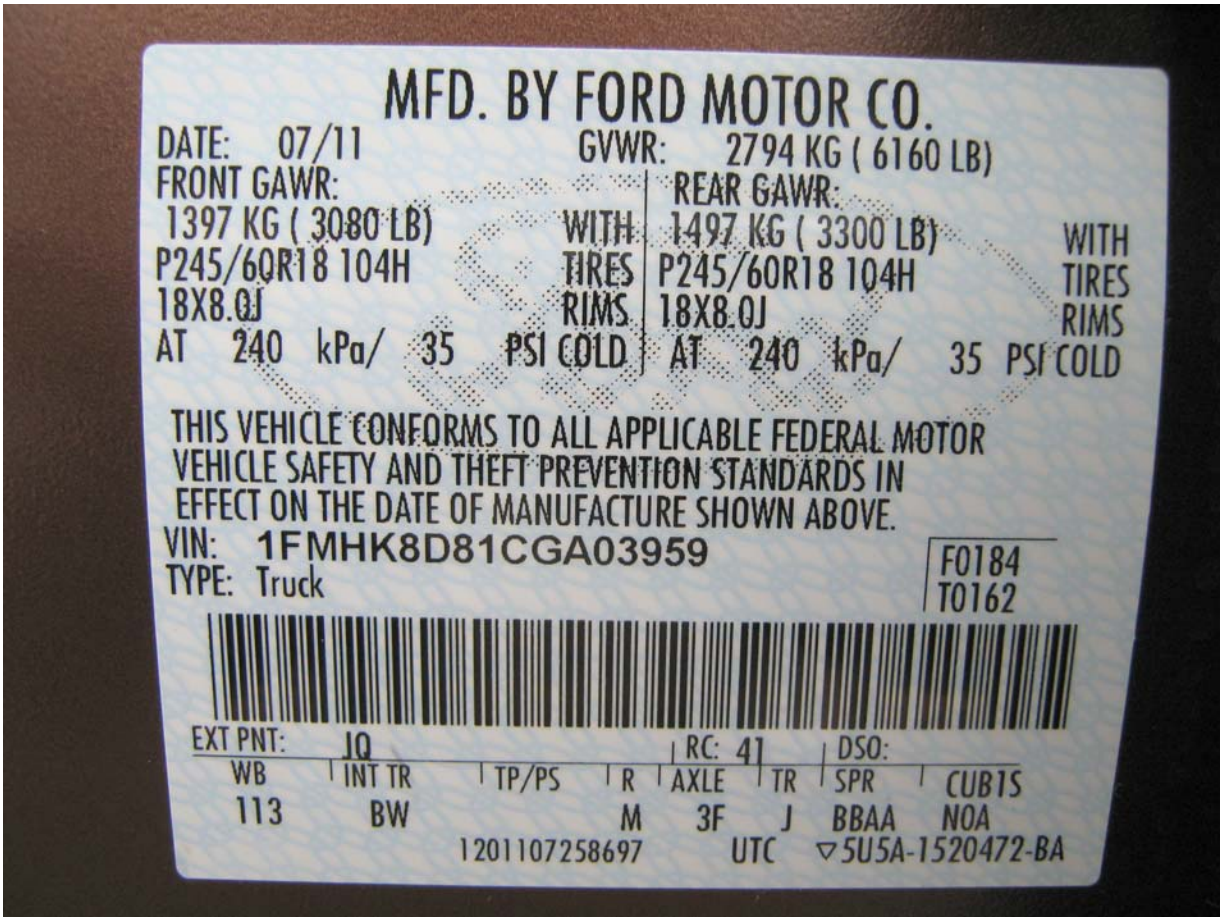
TABLE OF PHOTOGRAPHS



Load Cell Location



Load Cell Wall



Manufacturer's Label

Tire Placard

2012 Ford Explorer Frontal As Delivered

Left Rear Three-Quarter View, As Received

Pre-Test Front View of Test Vehicle

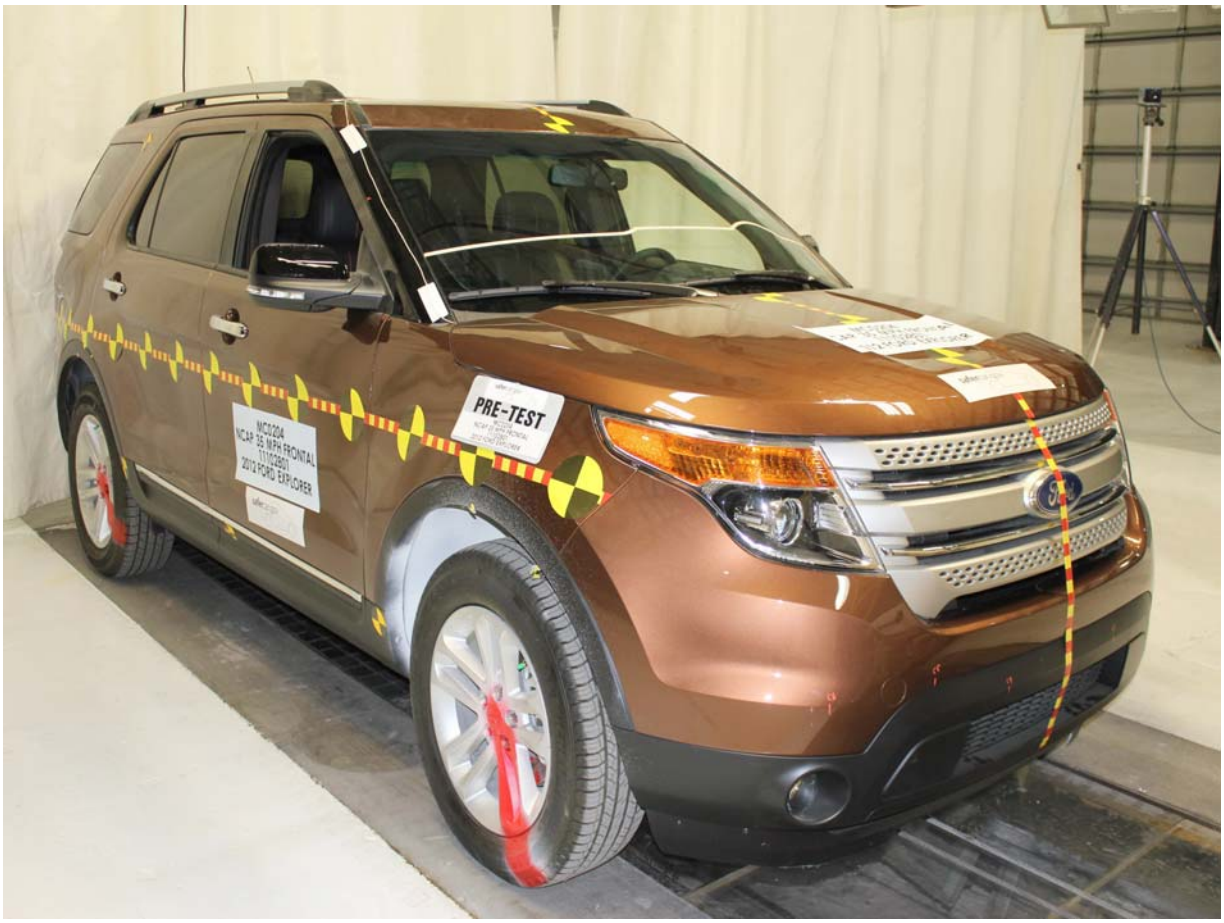
Post-Test Front View of Test Vehicle

Pre-Test Left View of Test Vehicle

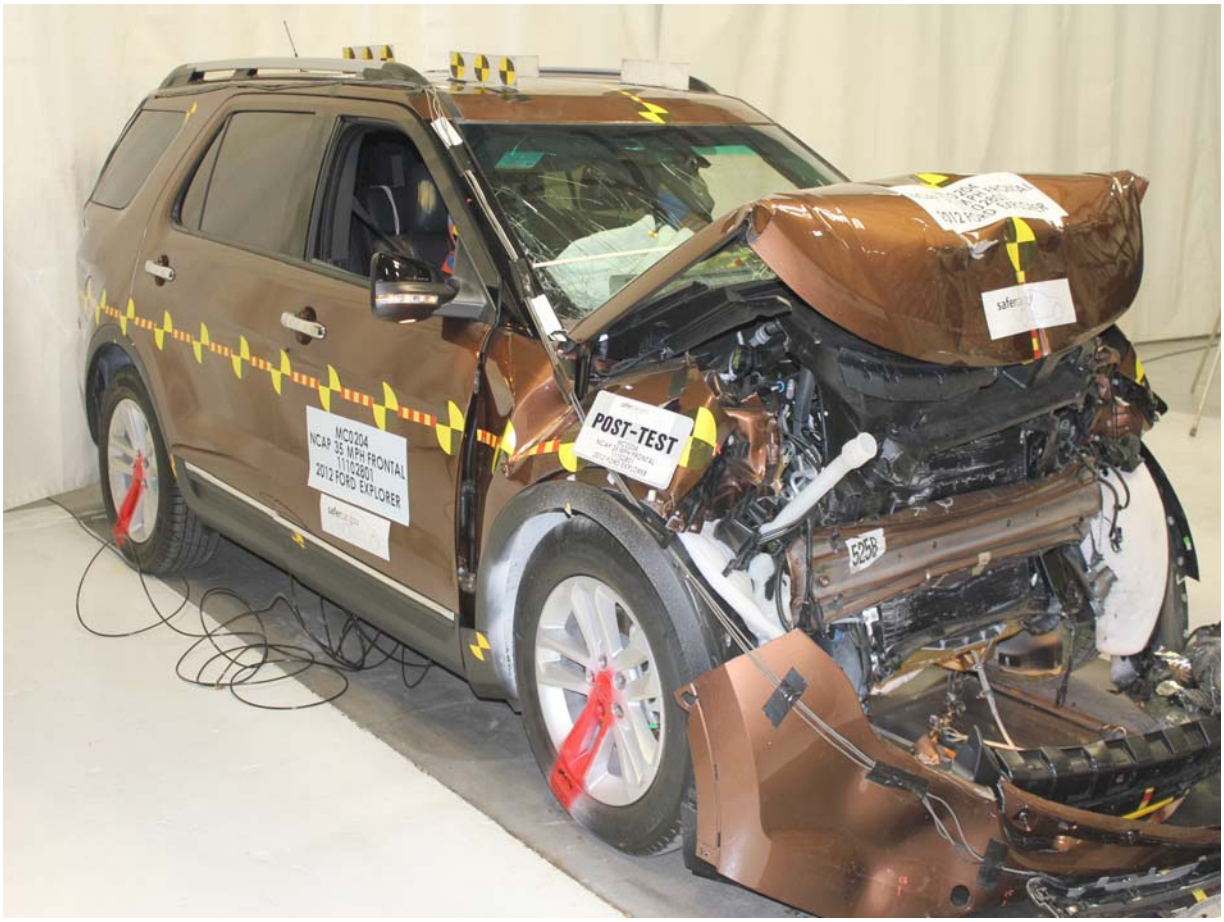
Post-Test Left View of Test Vehicle

Pre-Test Right View of Test Vehicle

Post-Test Right View of Test Vehicle



Pre-Test Right Front Three-Quarter View



Post-Test Right Front Three-Quarter View

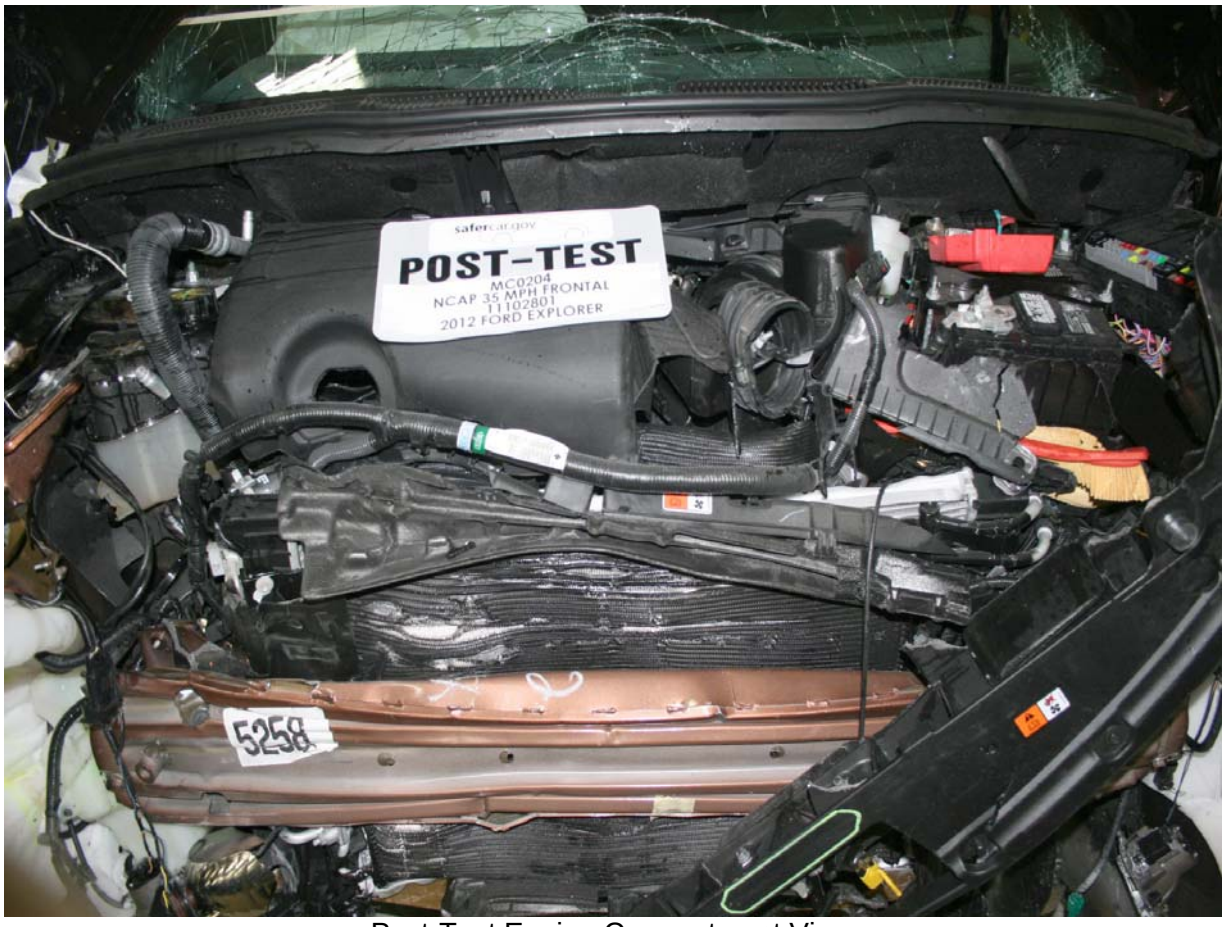
Pre-Test Left Rear Three-Quarter View

Post-Test Left Rear Three-Quarter View

Pre-Test Windshield View

Post-Test Windshield View

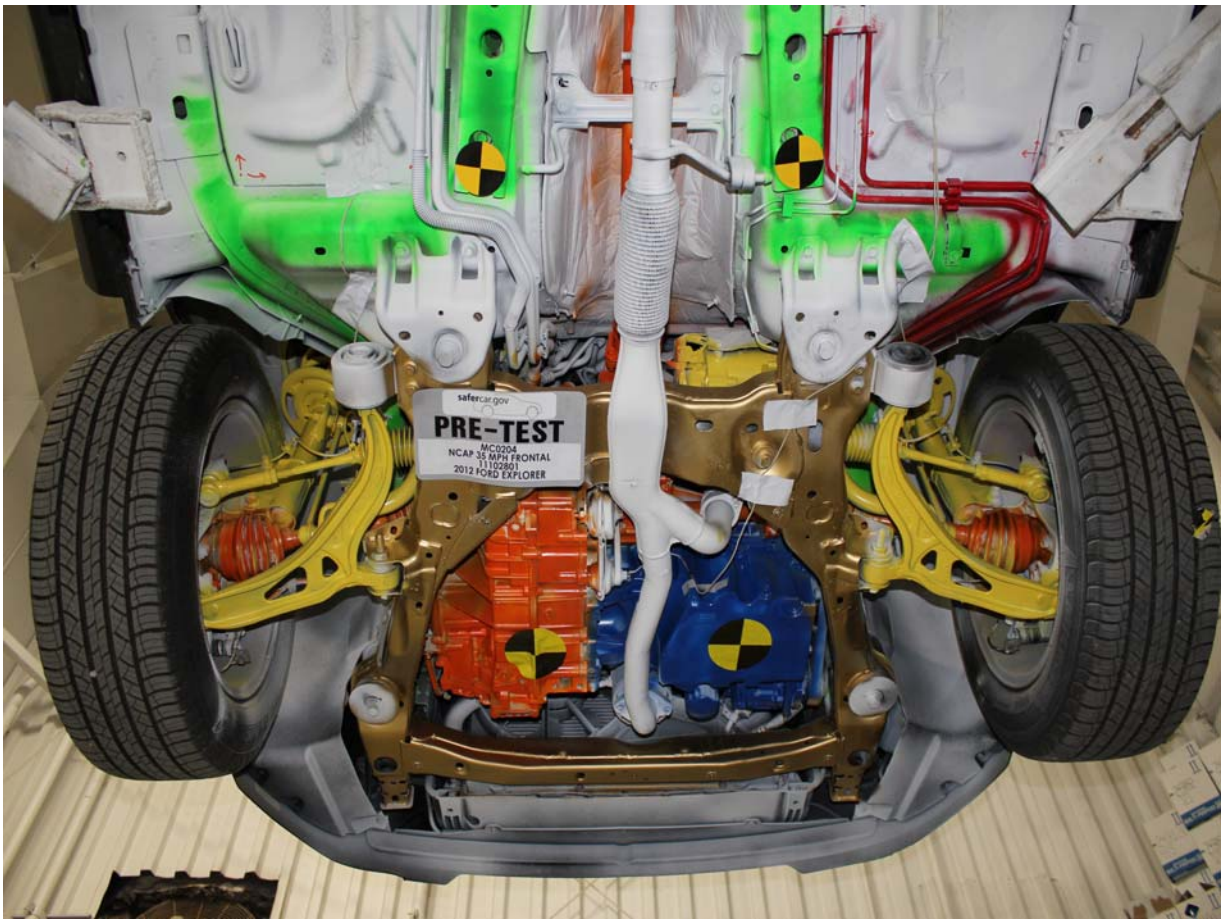
Pre-Test Engine Compartment View



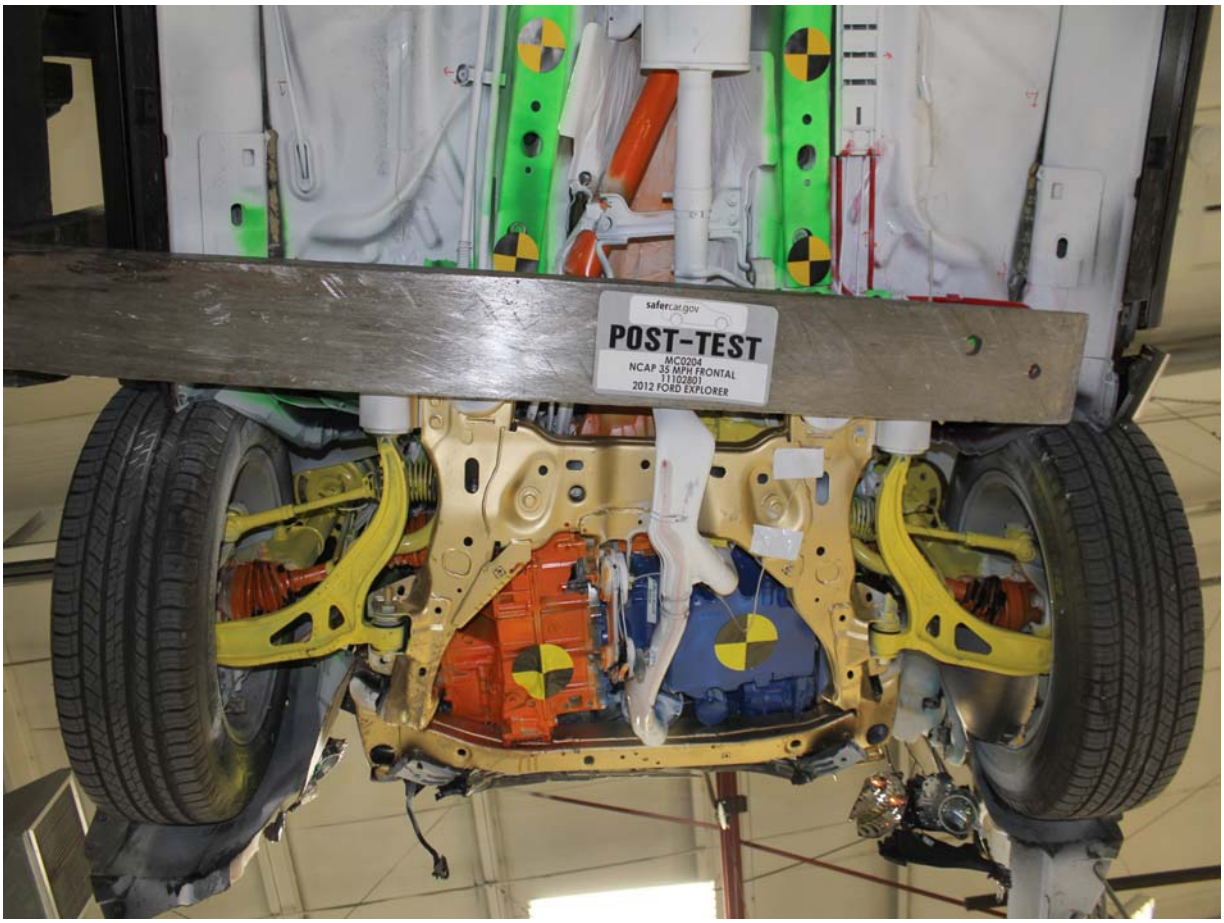
Post-Test Engine Compartment View

Pre-Test Fuel Filler Cap View

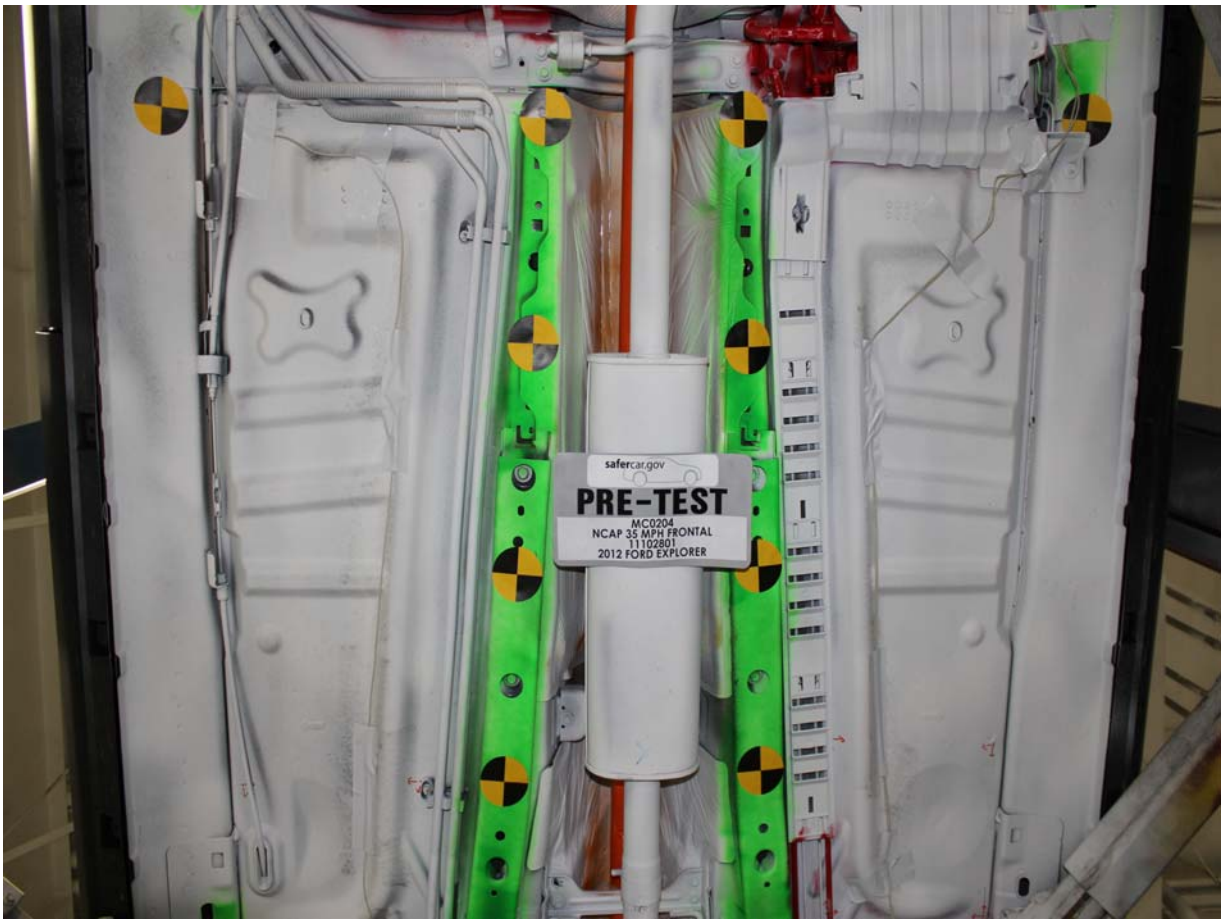
Post-Test Fuel Filler Cap View



Pre-Test Front Underbody View

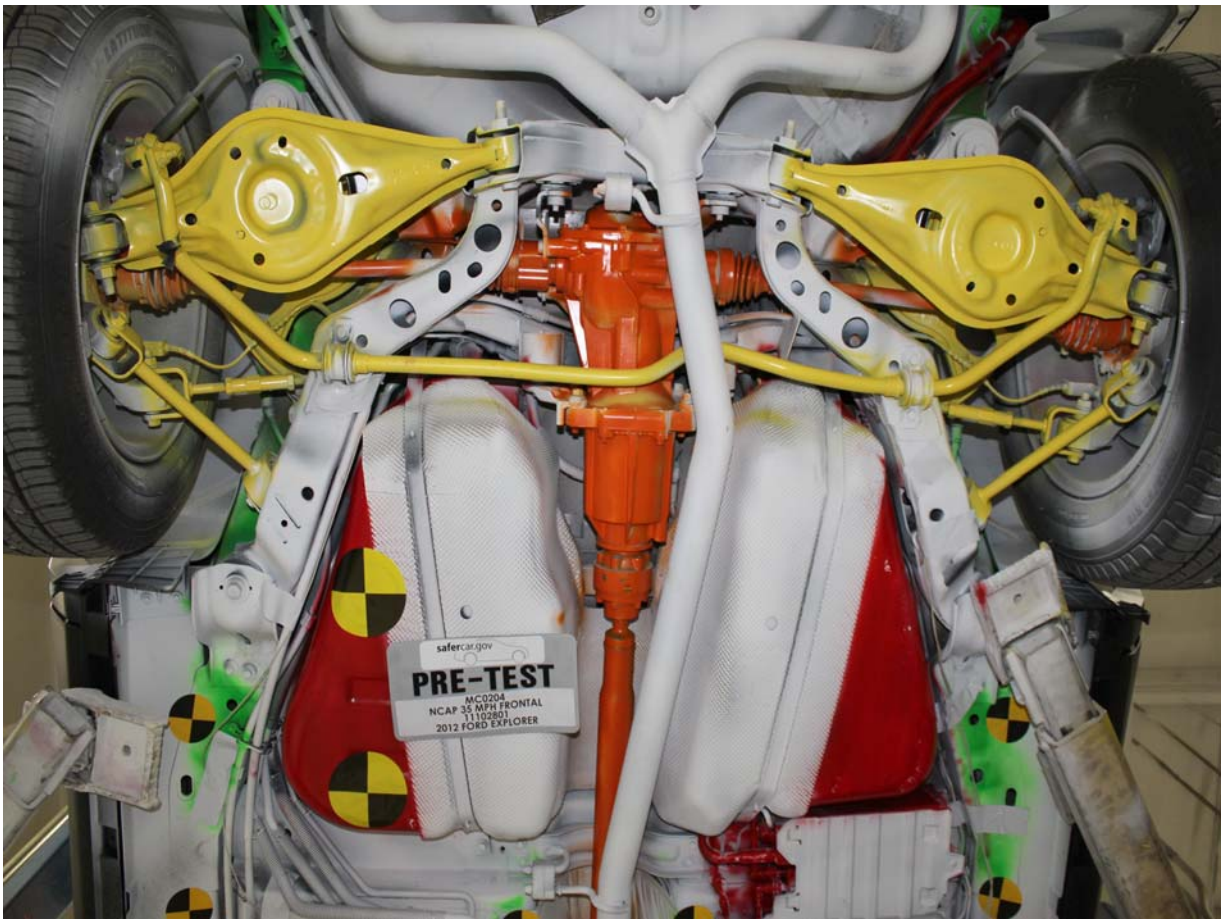


Post-Test Front Underbody View

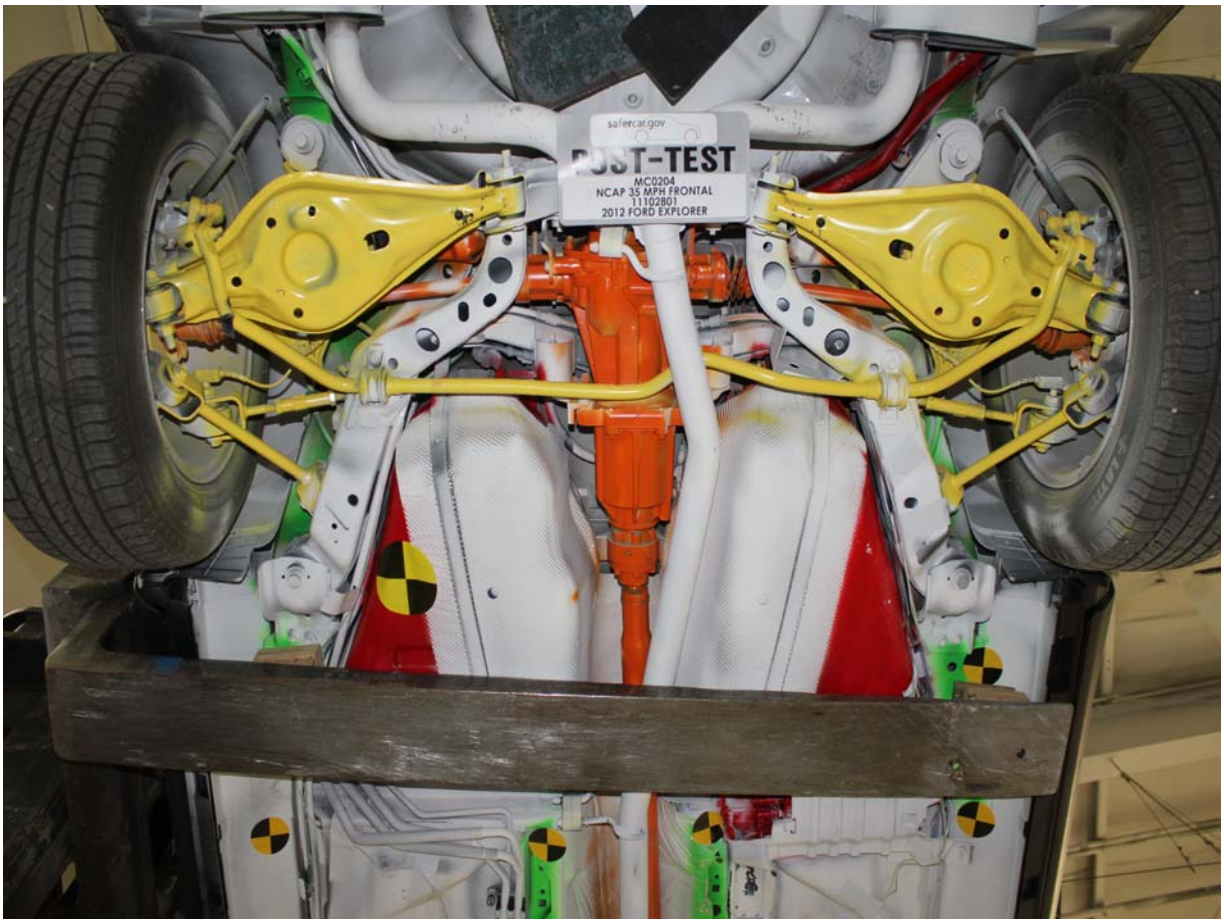


Pre-Test Mid Front Underbody View

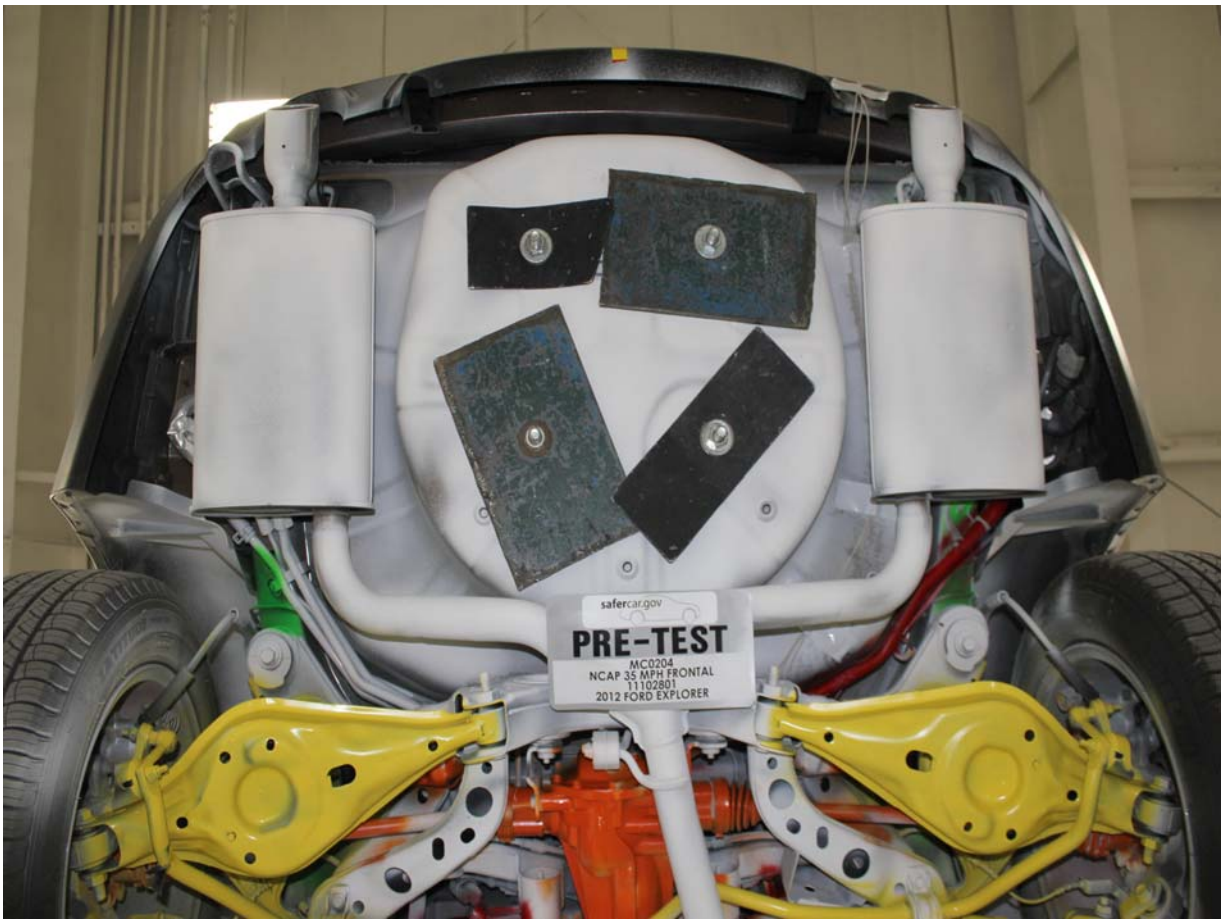
Post-Test Mid Front Underbody View



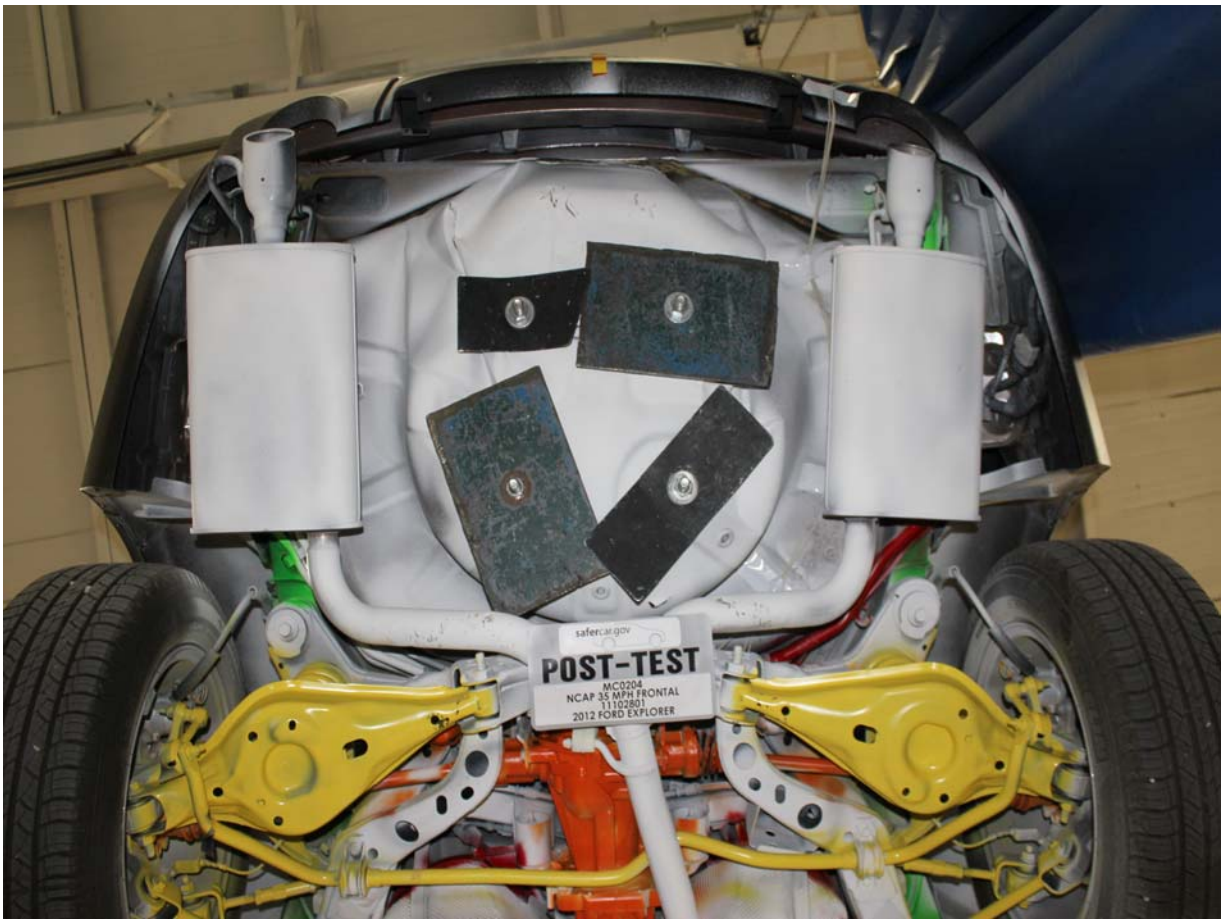
Pre-Test Mid Rear Underbody View



Post-Test Mid Rear Underbody View



Pre-Test Rear Underbody View



Post-Test Rear Underbody View

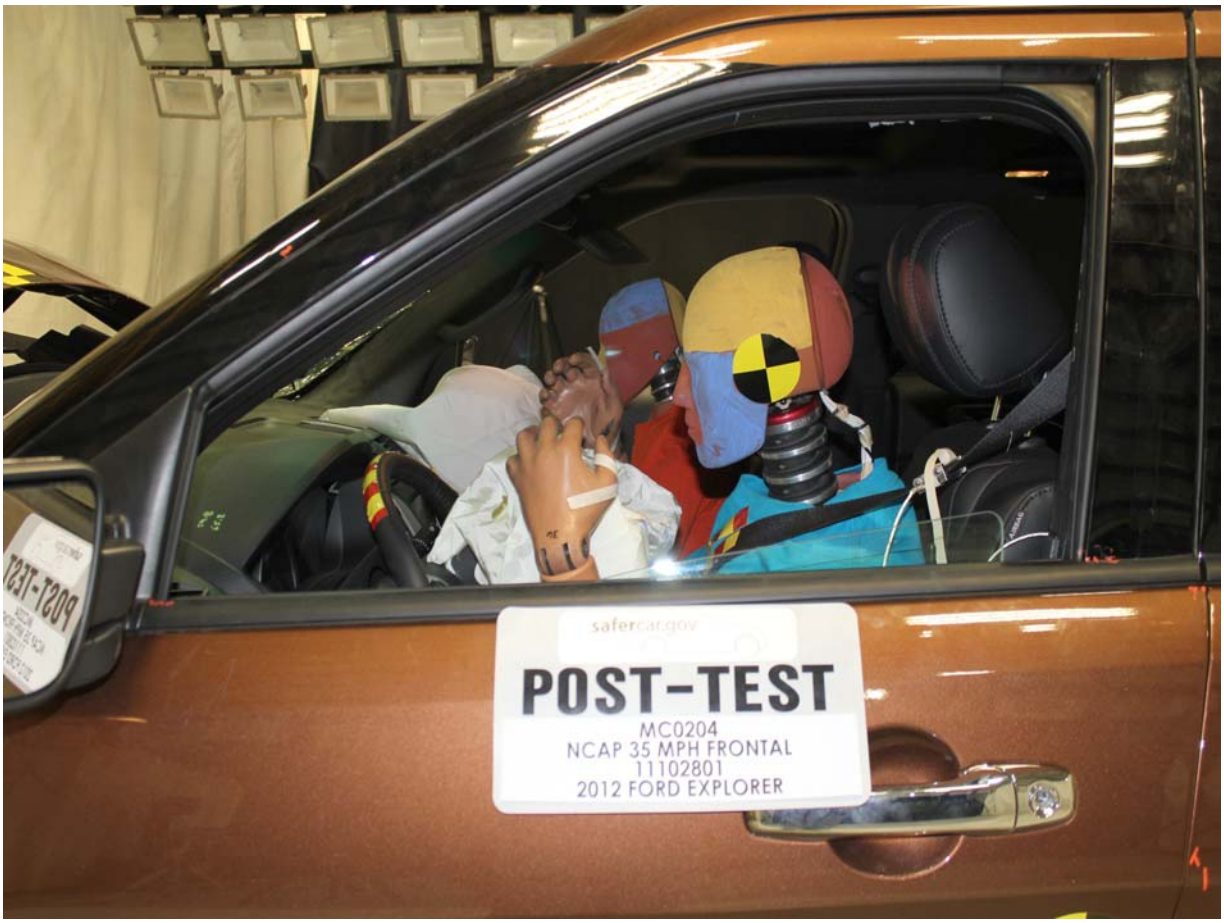
Pre-Test Dummy Cable Routing

Post-Test Dummy Cable Routing

Pre-Test Driver Dummy Front View

Post-Test Driver Dummy Front View

Pre-Test Driver Dummy Window View



Post-Test Driver Dummy Window View

Pre-Test Driver Dummy and Vehicle Interior (Door Open)

Post-Test Driver Dummy and Vehicle Interior (Door Open)

Pre-Test Driver's Seat Fore-Aft Markings

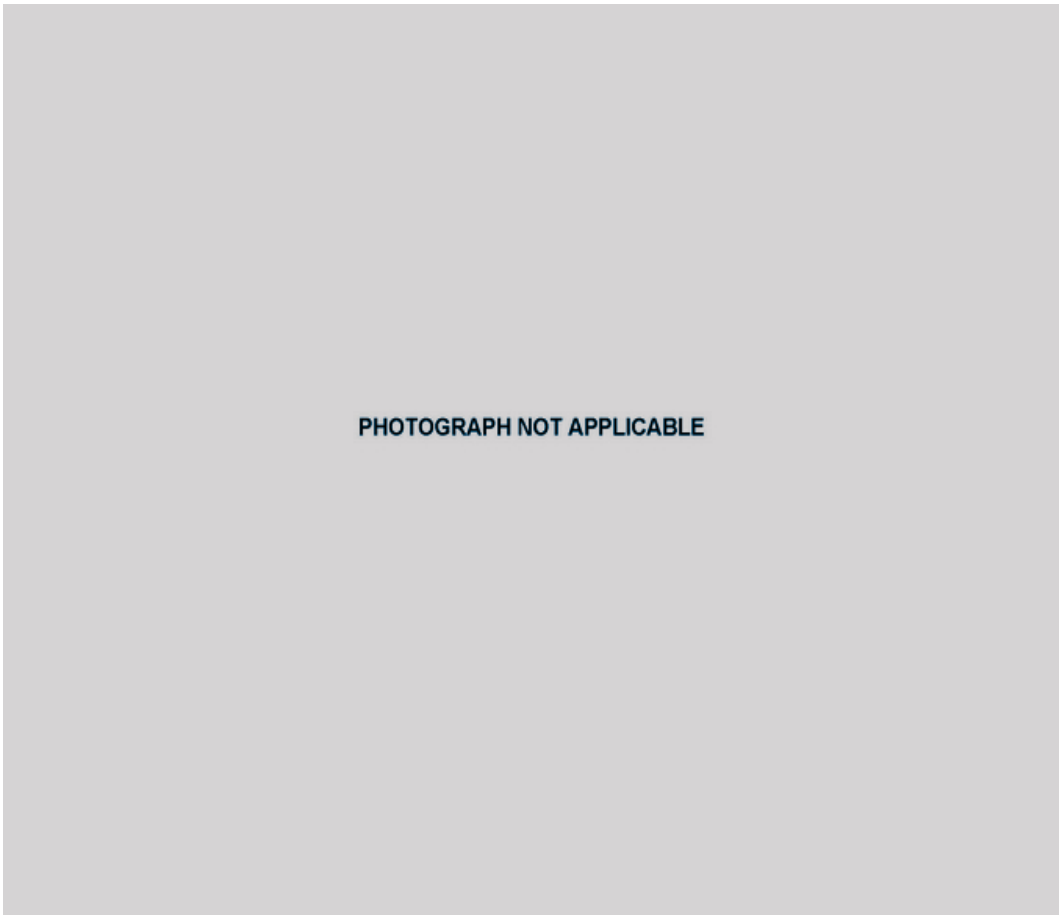
Post-Test Driver's Seat Fore-Aft Markings

Pre-Test Driver Dummy Feet

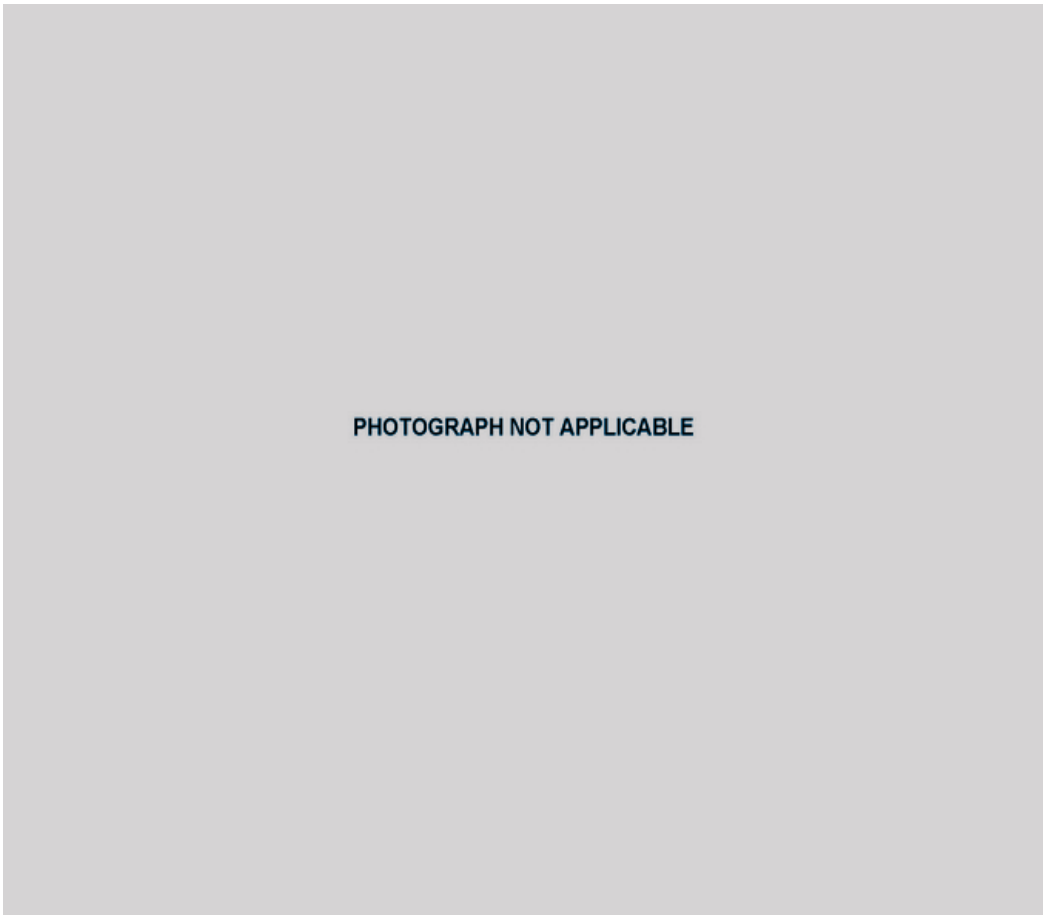
Post-Test Driver Dummy Feet

Pre-Test Driver's Side Knee Bolster (without dummy)

Post-Test Driver's Side Knee Bolster (without dummy)

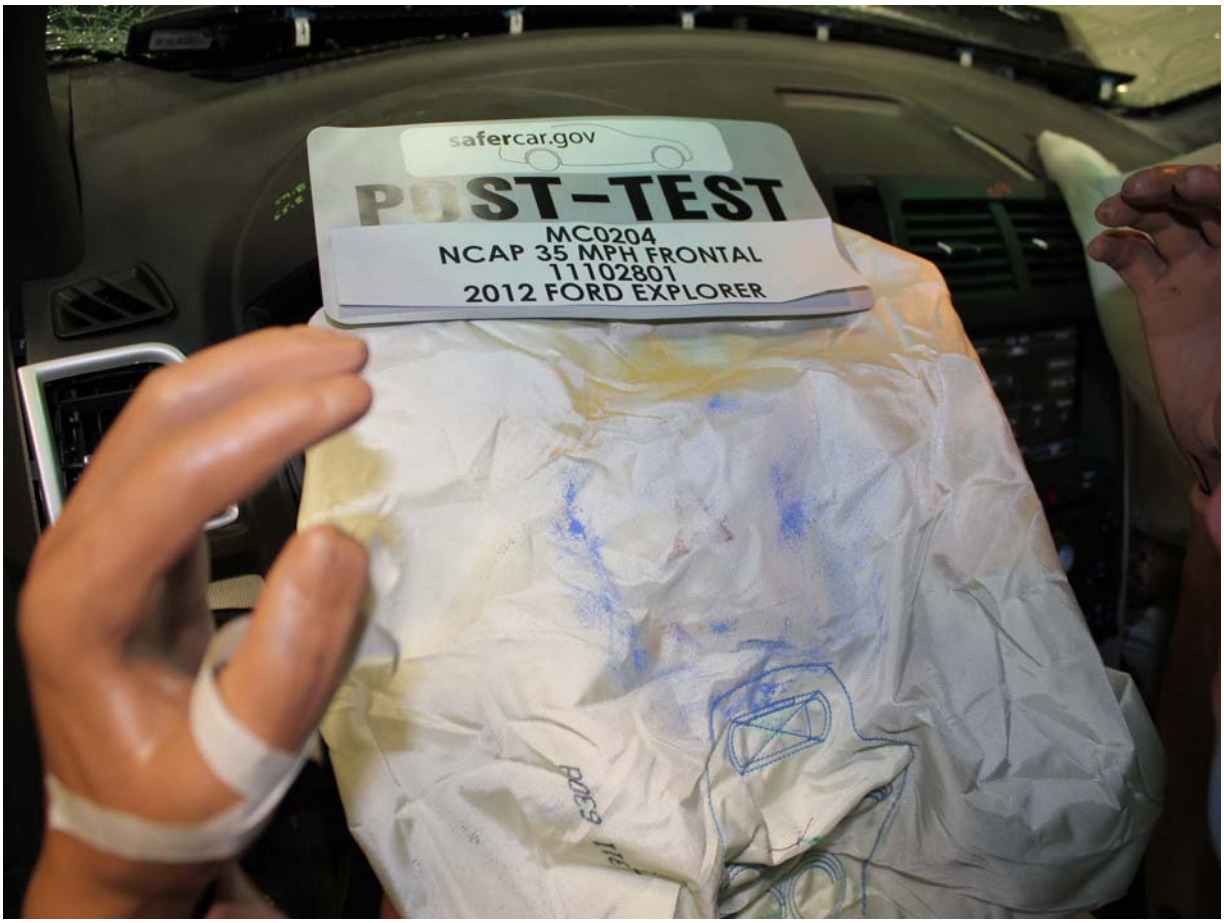


Pre-Test Driver's Side Floorpan



Post-Test Driver's Side Floorpan

Post-Test Driver Dummy Face



Post-Test Driver Dummy Contact with Airbag

Post-Test Driver Dummy Contact with Headrest

Pre-Test View of the Steering Wheel

Post-Test View of the Steering Wheel

Pre-Test Passenger Dummy Front View

Post-Test Passenger Dummy Front View

Pre-Test Passenger Dummy Window View

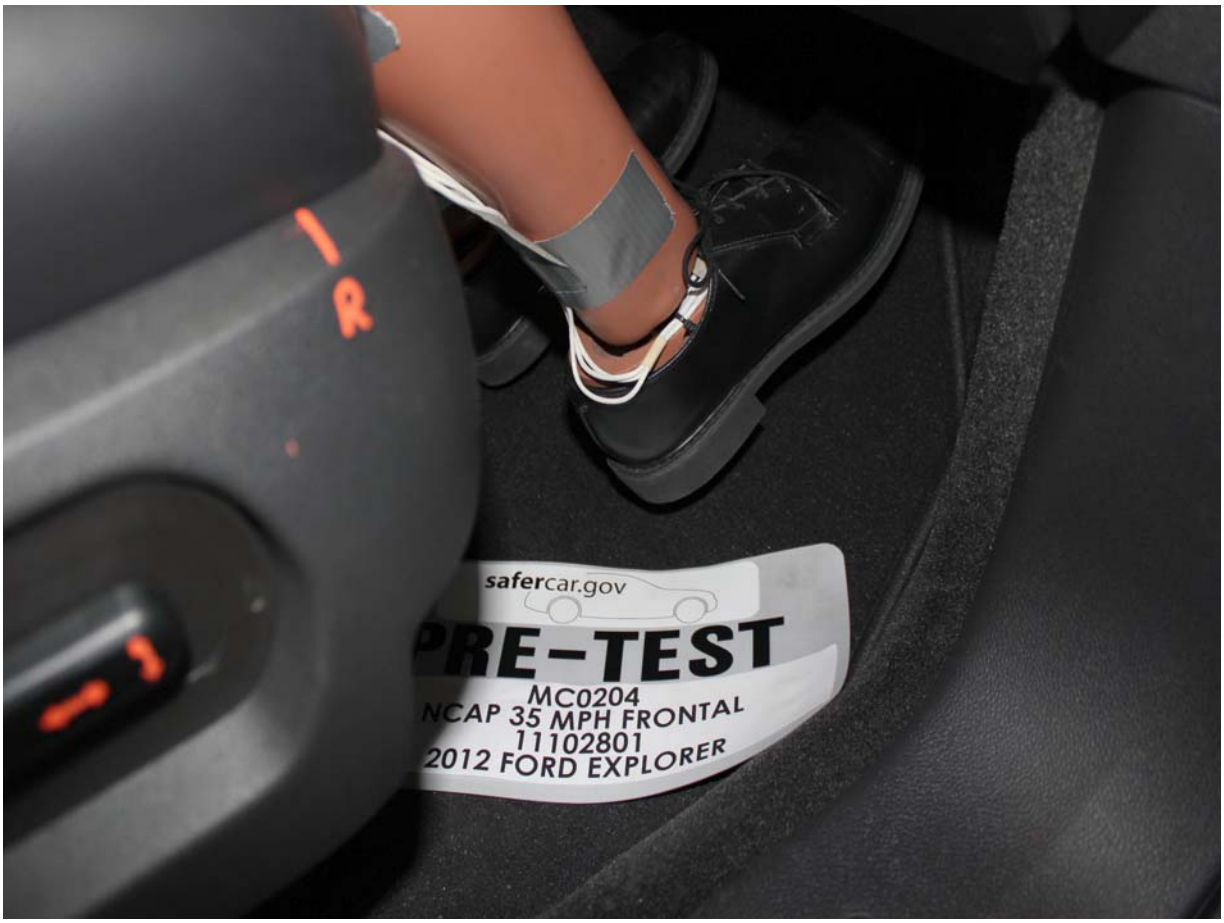
Post-Test Passenger Dummy Window View

Pre-Test Passenger Dummy and Vehicle Interior (Door Open)

Post-Test Passenger Dummy and Vehicle Interior (Door Open)

Pre-Test Passenger's Seat Fore-Aft Markings

Post-Test Passenger's Seat Fore-Aft Markings



Pre-Test Passenger Dummy Feet

Post-Test Passenger Dummy Feet

Pre-Test Passenger's Side Knee Bolster (without dummy)

Post-Test Passenger's Side Knee Bolster (without dummy)

PHOTOGRAPH NOT APPLICABLE

Pre-Test Passenger's Side Floorpan

PHOTOGRAPH NOT APPLICABLE

Post-Test Passenger's Side Floorpan

Post-Test Passenger Dummy Contact with Airbag

Post-Test Passenger Dummy Contact with Headrest

Ballast Installed in Vehicle

PHOTOGRAPH NOT AVAILABLE

Post-Test Stoddard Solvent Spillage Location View

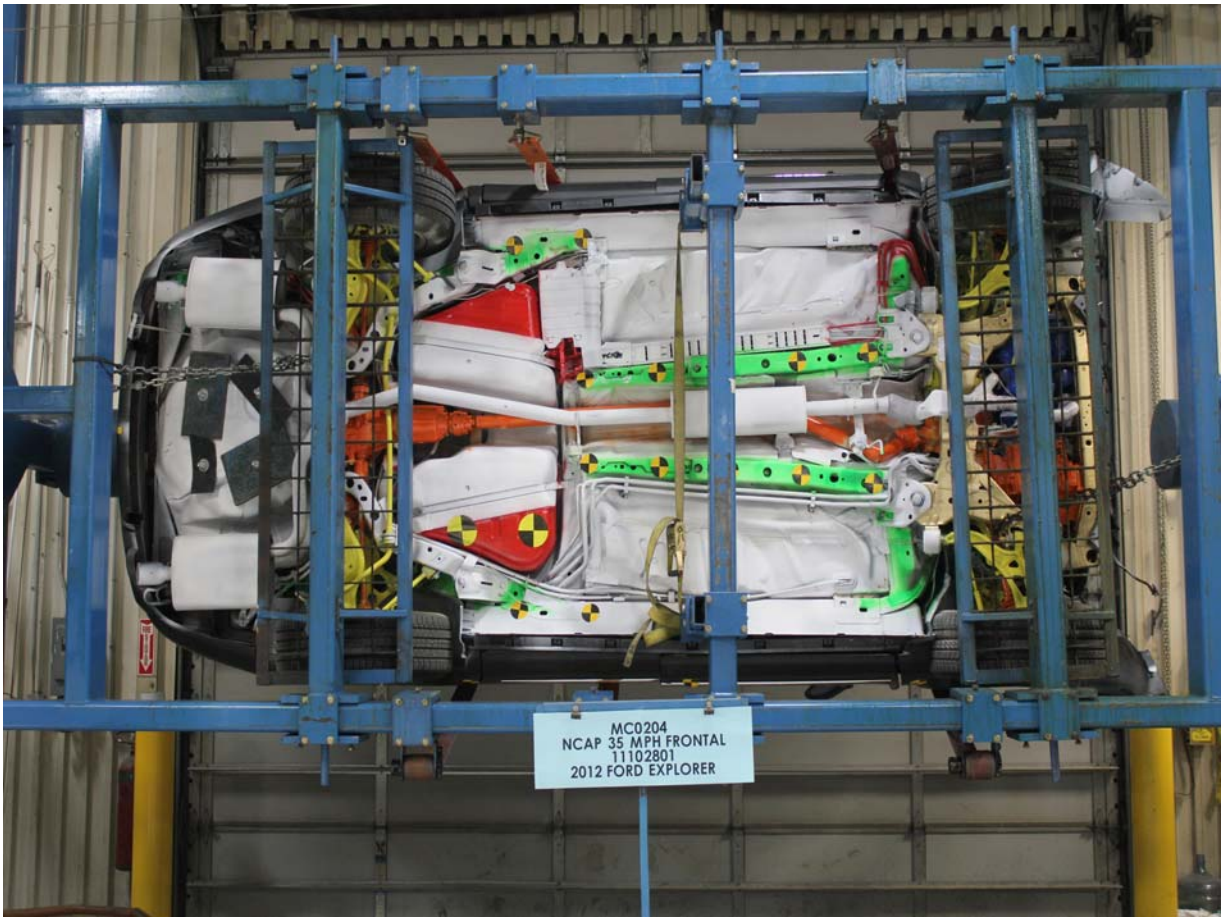
Post-Test Speed Trap Read-Out

Vehicle at 0 Degrees on Static Rollover Device

Vehicle at 90 Degrees on Static Rollover Device

PHOTOGRAPH NOT AVAILABLE

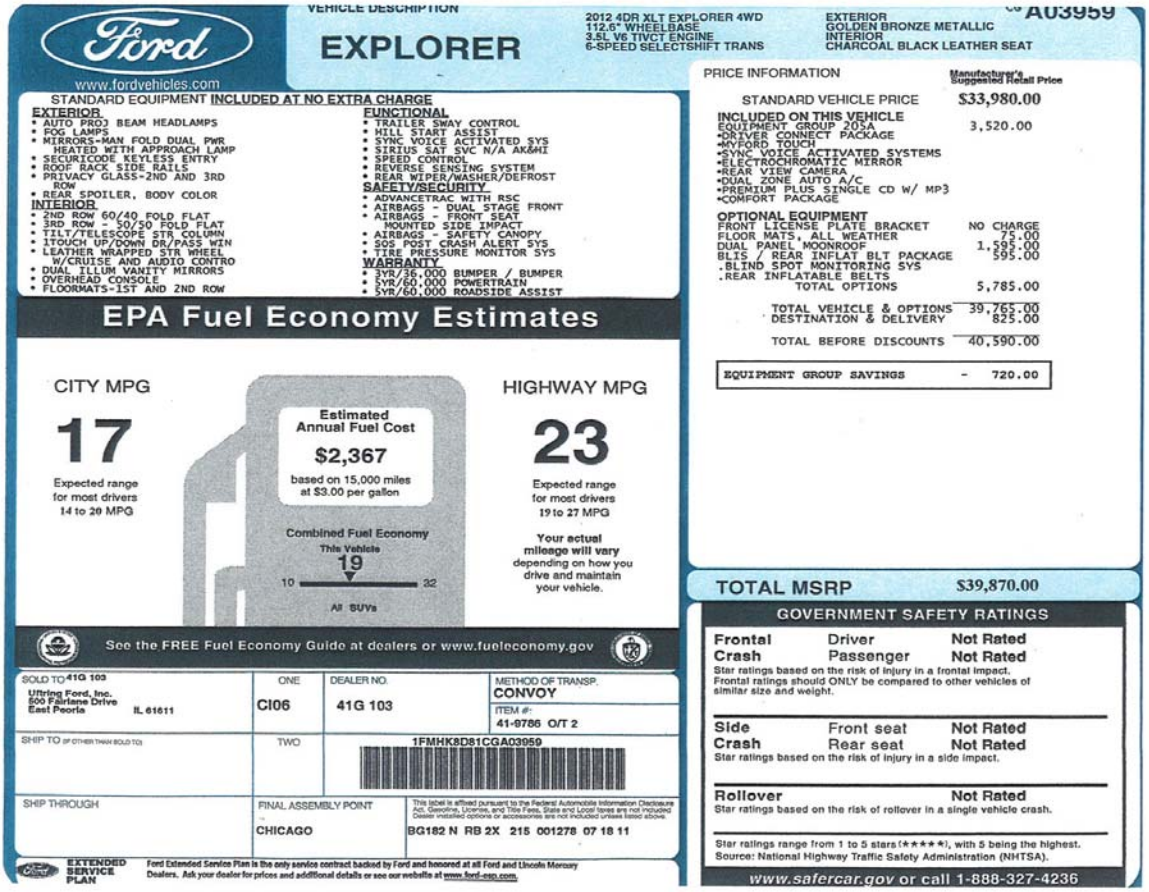
Vehicle at 180 Degrees on Static Rollover Device



Vehicle at 270 Degrees on Static Rollover Device

Vehicle at 360 Degrees on Static Rollover Device

2012 Ford Explorer Frontal Impact Event



Monroney Label

APPENDIX B

DUMMY RESPONSE DATA TRACES

TABLE OF DATA PLOTS

The following additional dummy and vehicle response data can be found in the R&D section of the NHTSA website at www.nhtsa.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 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 – Not Installed

Left Rear Seat Crossmember X

Right Rear Seat Crossmember X

Vehicle Engine Top X

Vehicle Engine Bottom X

Vehicle Left Brake Caliper X

Vehicle Right Brake Caliper X

Left Rear Seat Crossmember Xr

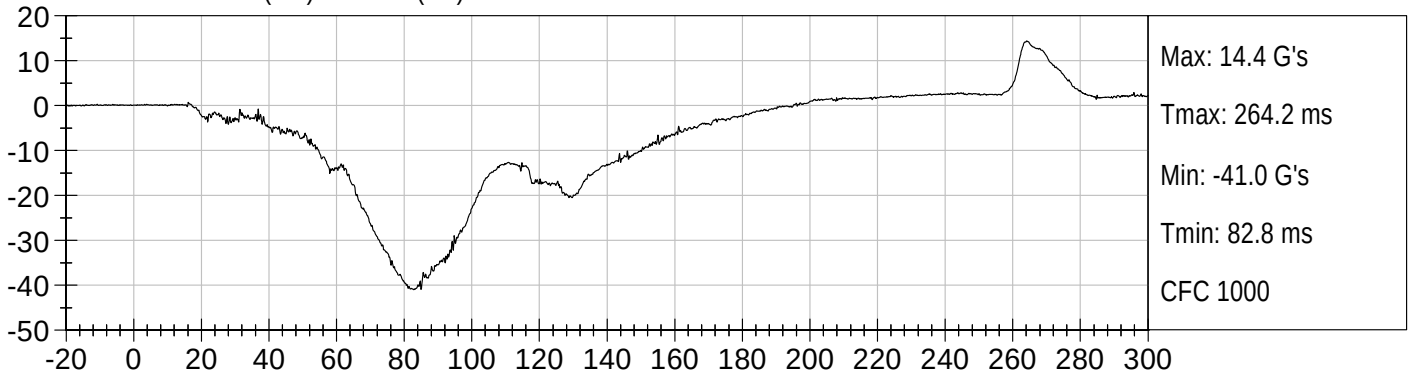
Right Rear Seat Crossmember Xr

Advanced Research Load Cell Barrier – 128 channels

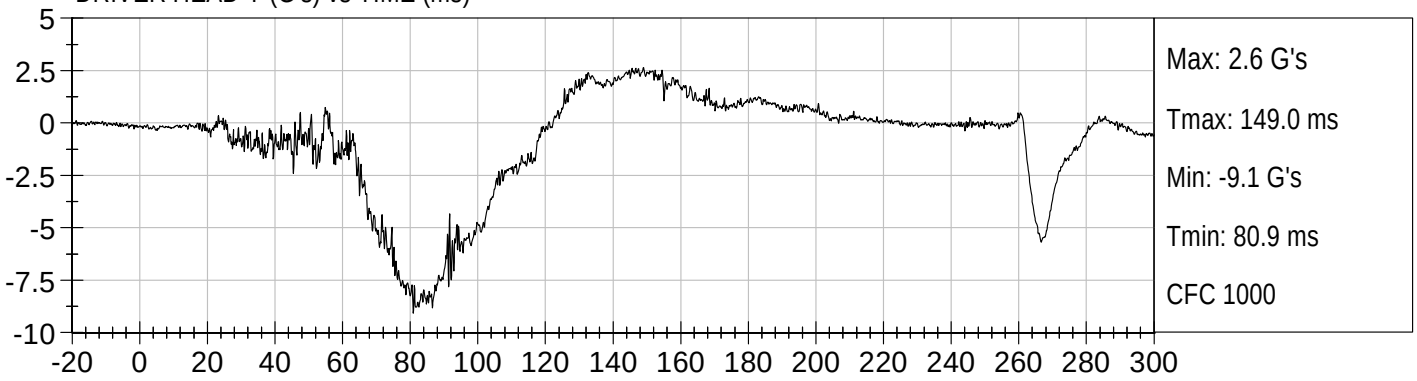
NCAP 35mph Frontal
2012 Ford Explorer - MC0204

Test Date: 10/28/2011
Speed: 35.1 mph (56.4 km/h)

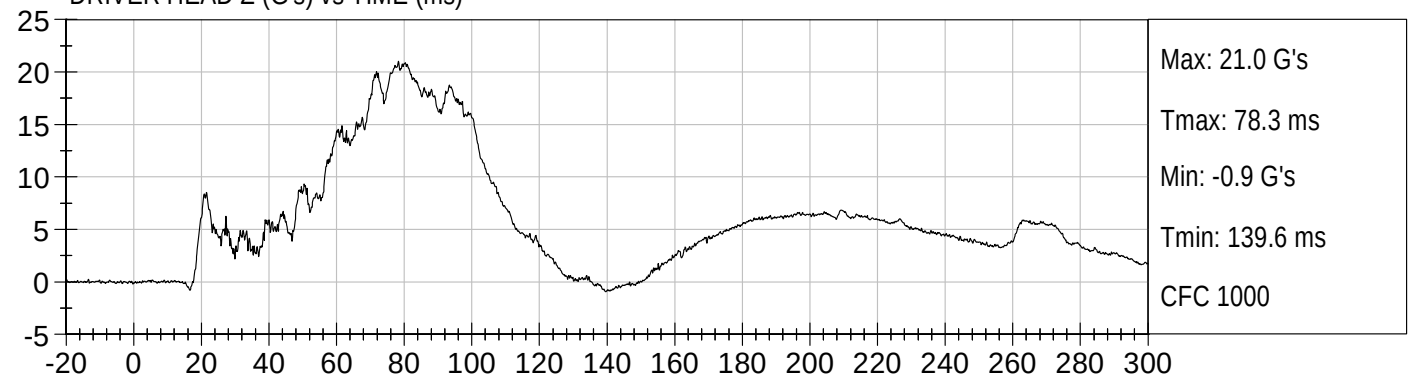
DRIVER HEAD X (G's) vs TIME (ms)



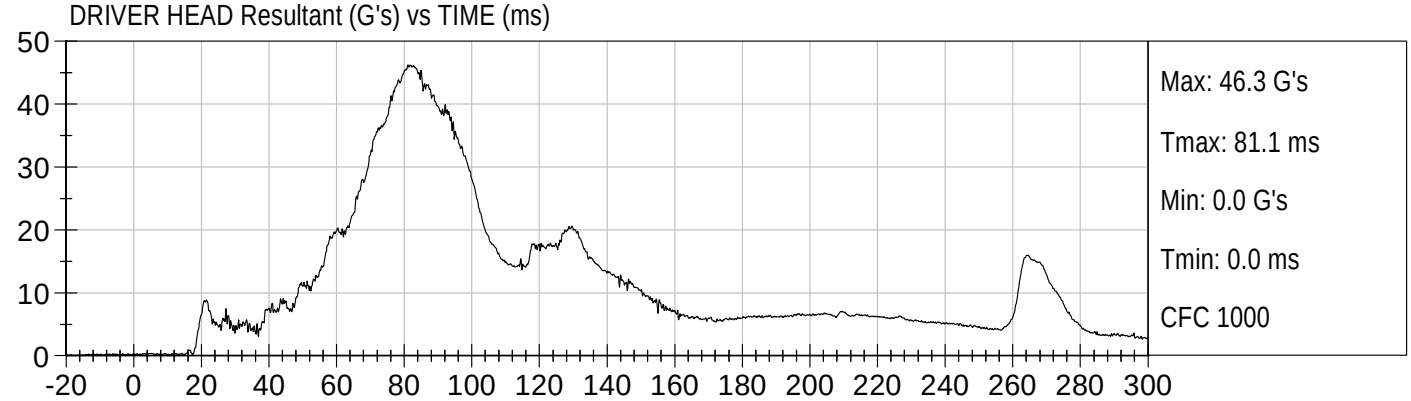
DRIVER HEAD Y (G's) vs TIME (ms)



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

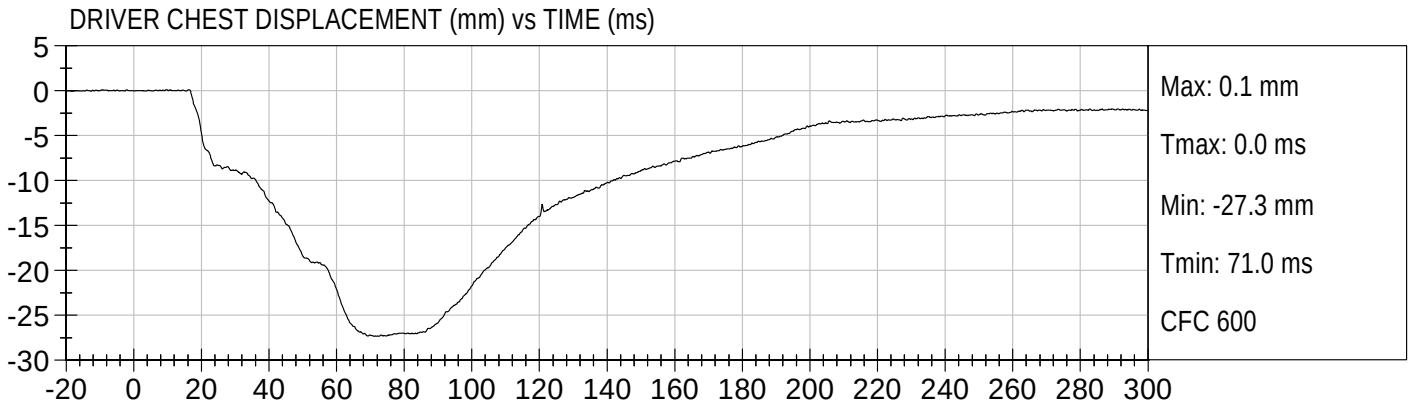


DRIVER HEAD Resultant (G's) vs TIME (ms)



NCAP 35mph Frontal
2012 Ford Explorer - MC0204

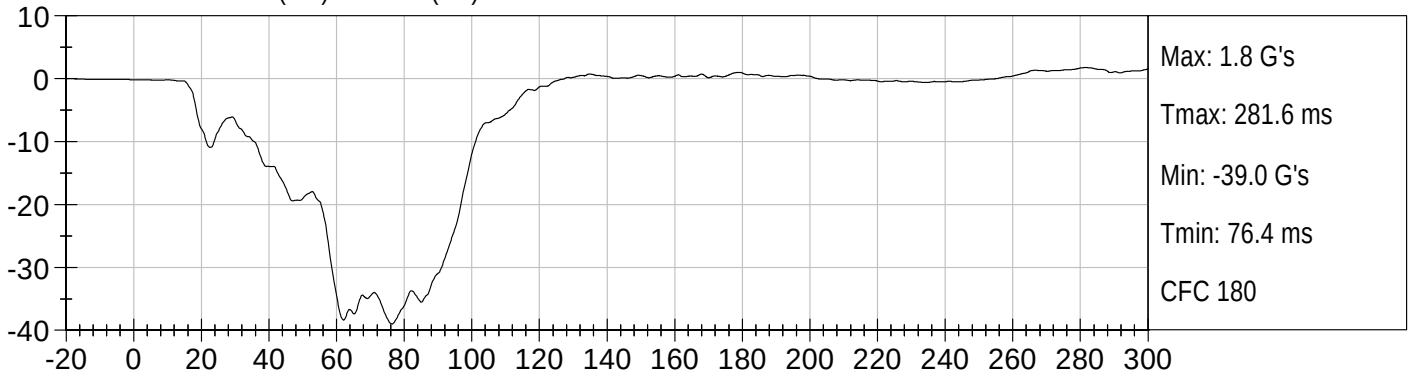
Test Date: 10/28/2011
Speed: 35.1 mph (56.4 km/h)



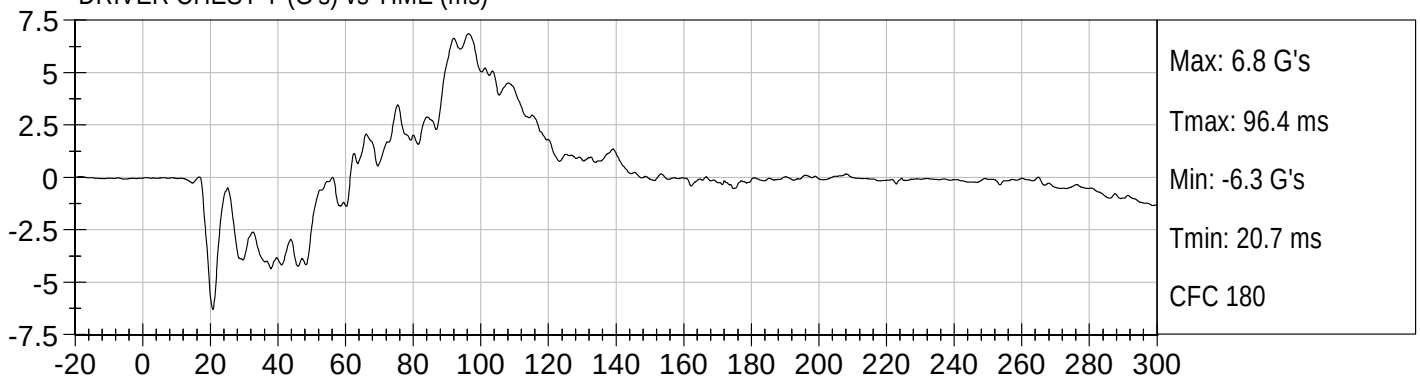
NCAP 35mph Frontal
2012 Ford Explorer - MC0204

Test Date: 10/28/2011
Speed: 35.1 mph (56.4 km/h)

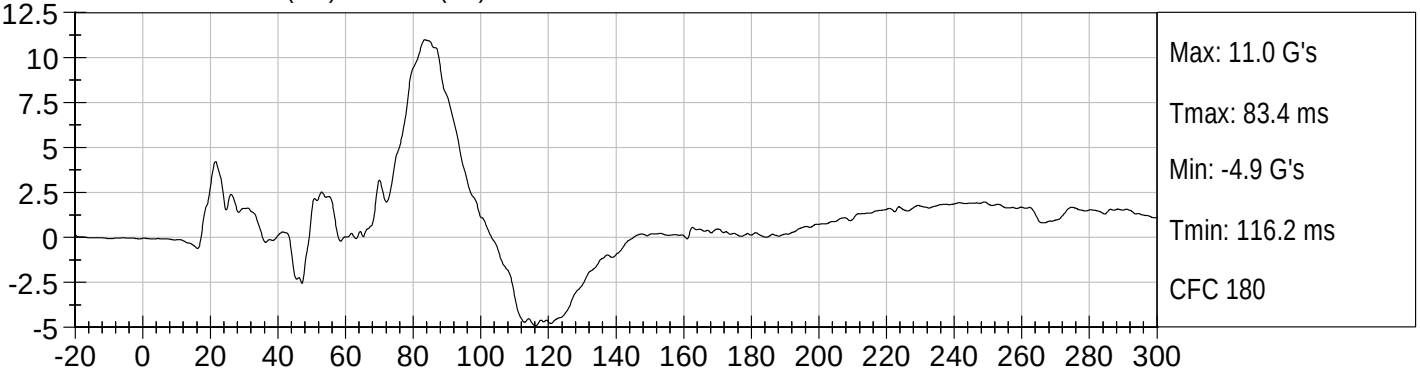
DRIVER CHEST X (G's) vs TIME (ms)



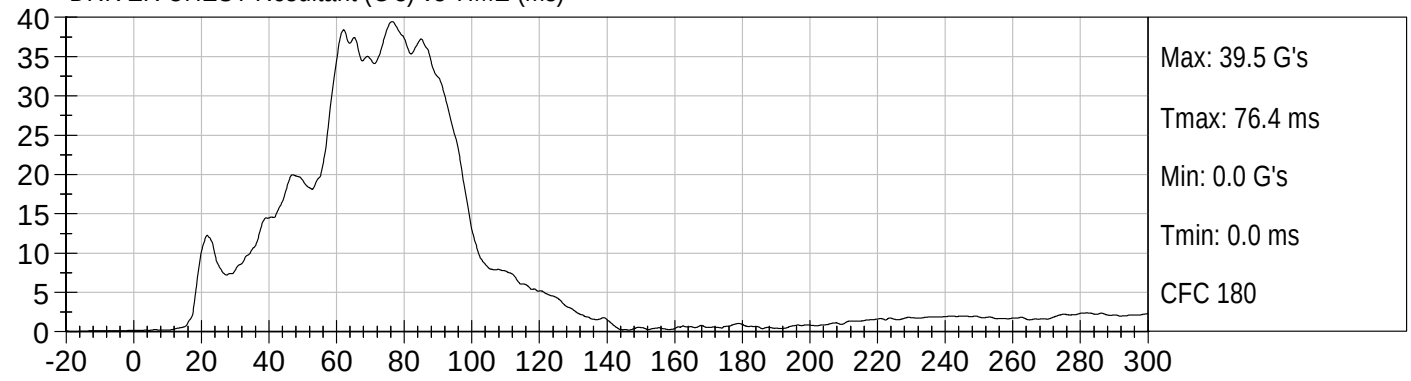
DRIVER CHEST Y (G's) vs TIME (ms)



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



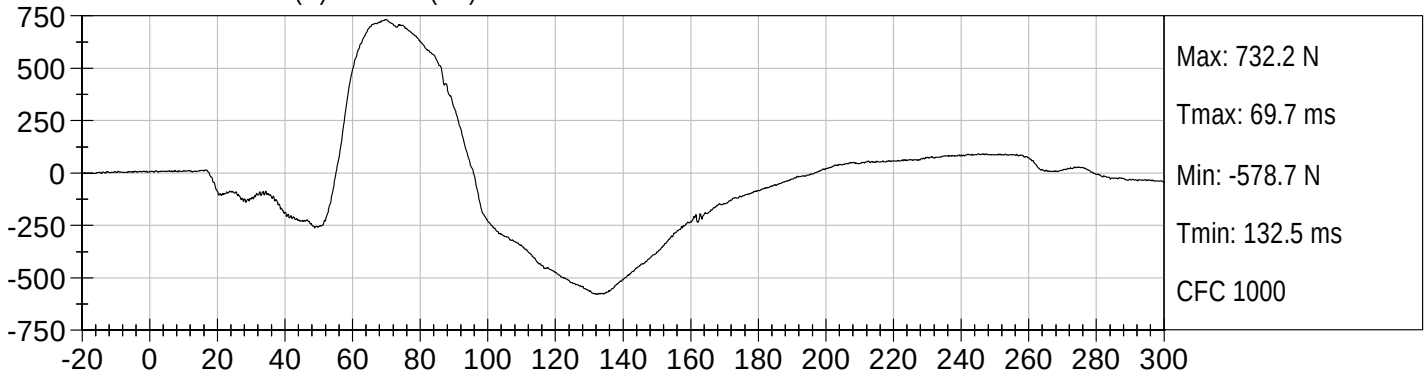
DRIVER CHEST Resultant (G's) vs TIME (ms)



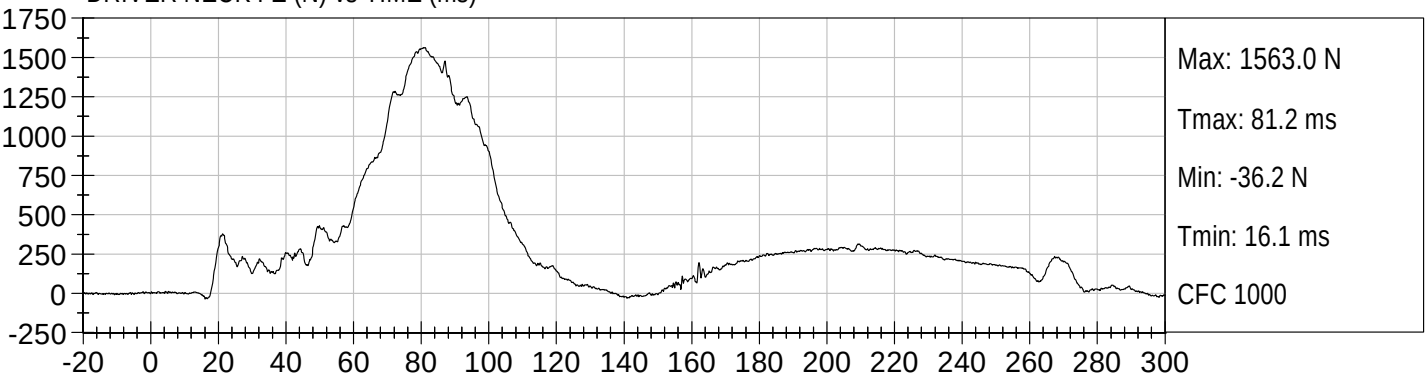
NCAP 35mph Frontal
2012 Ford Explorer - MC0204

Test Date: 10/28/2011
Speed: 35.1 mph (56.4 km/h)

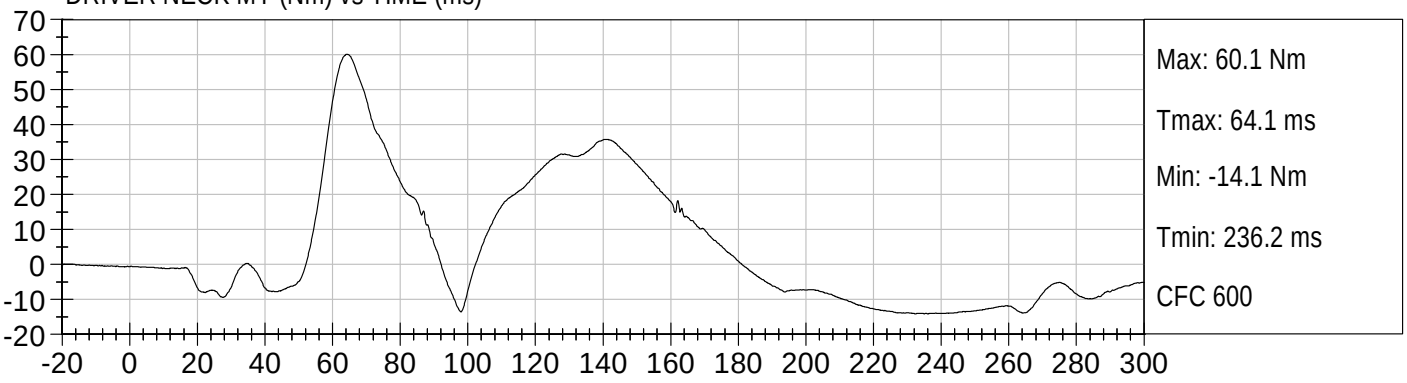
DRIVER NECK FX (N) vs TIME (ms)

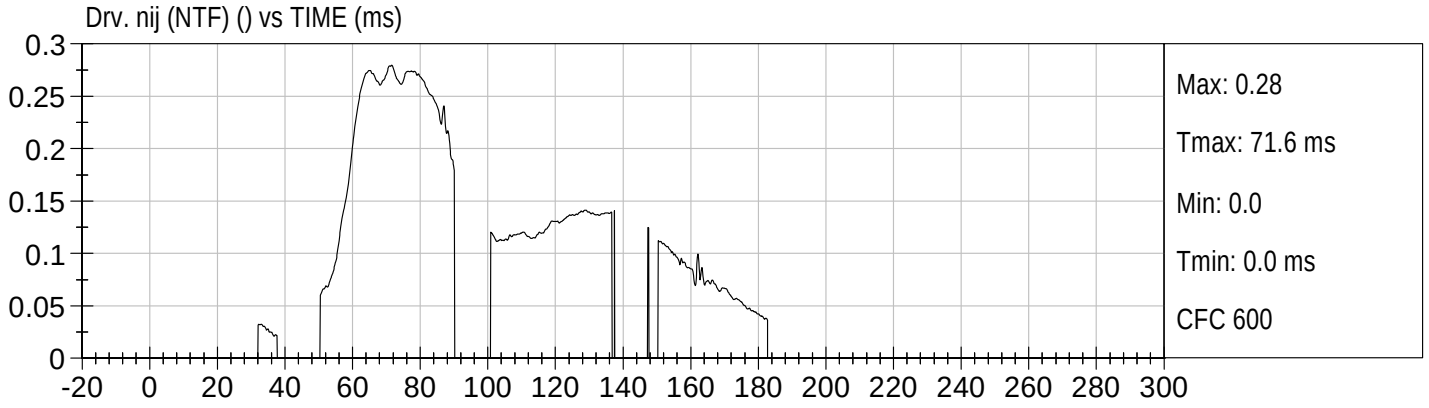


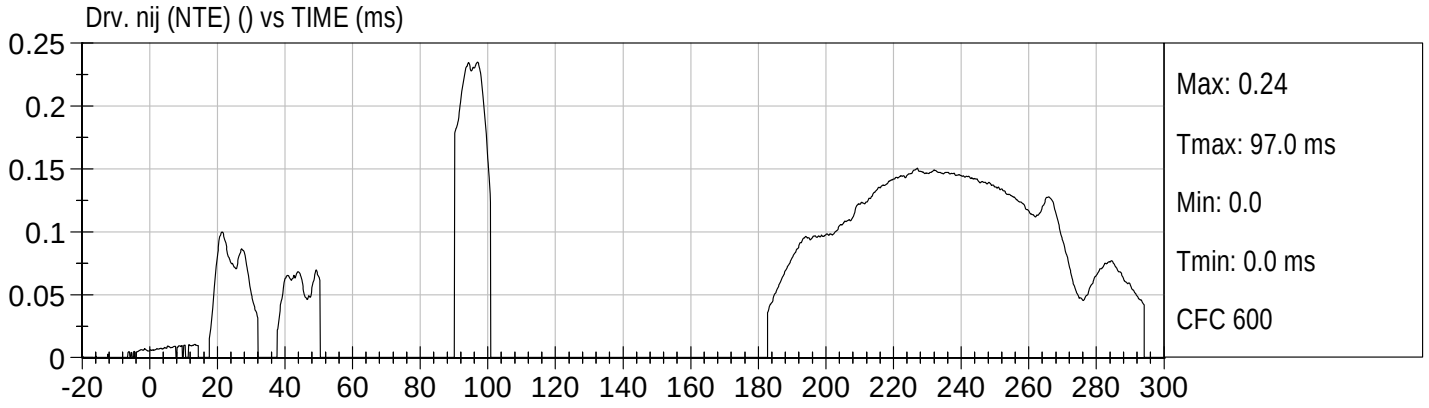
DRIVER NECK FZ (N) vs TIME (ms)

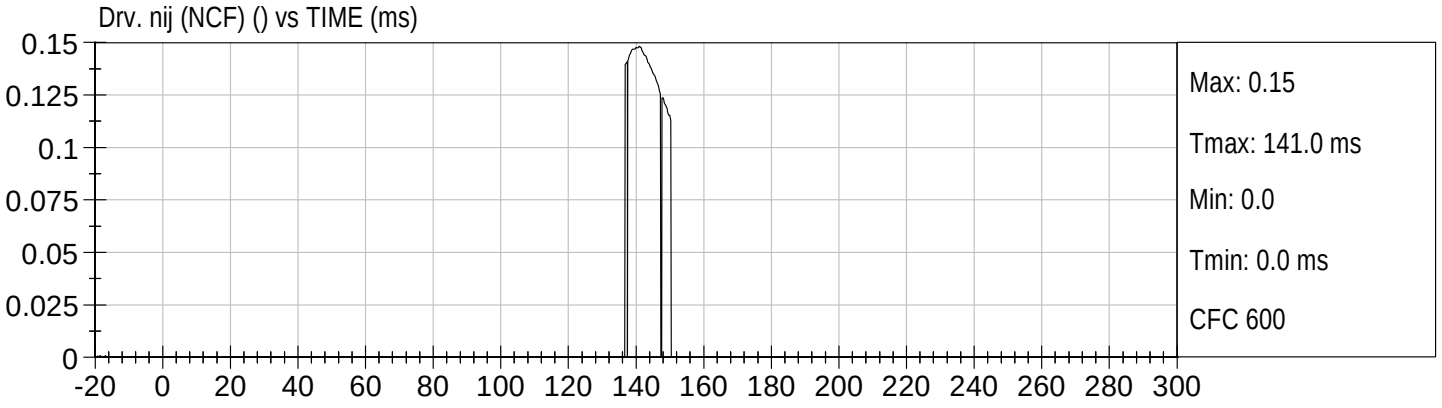


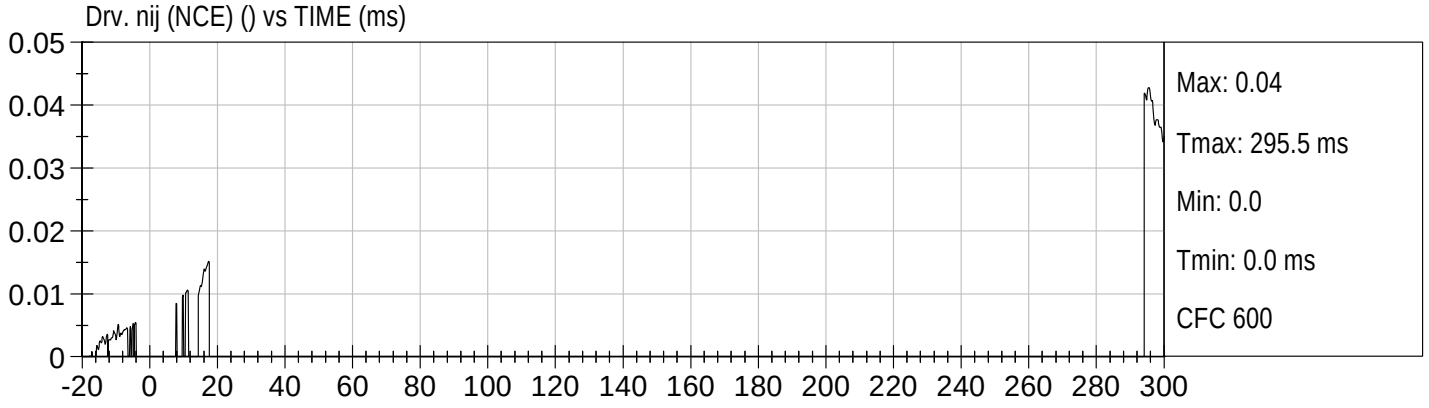
DRIVER NECK MY (Nm) vs TIME (ms)




Drv. nij (NTF) () vs TIME (ms)
0.3
0.25
0.2
0.15
0.1
0.05
0
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 0.28
Tmax: 71.6 ms
Min: 0.0
Tmin: 0.0 ms
CFC 600


Drv. nij (NTE) () vs TIME (ms)
0.25
0.2
0.15
0.1
0.05
0
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 0.24
Tmax: 97.0 ms
Min: 0.0
Tmin: 0.0 ms
CFC 600

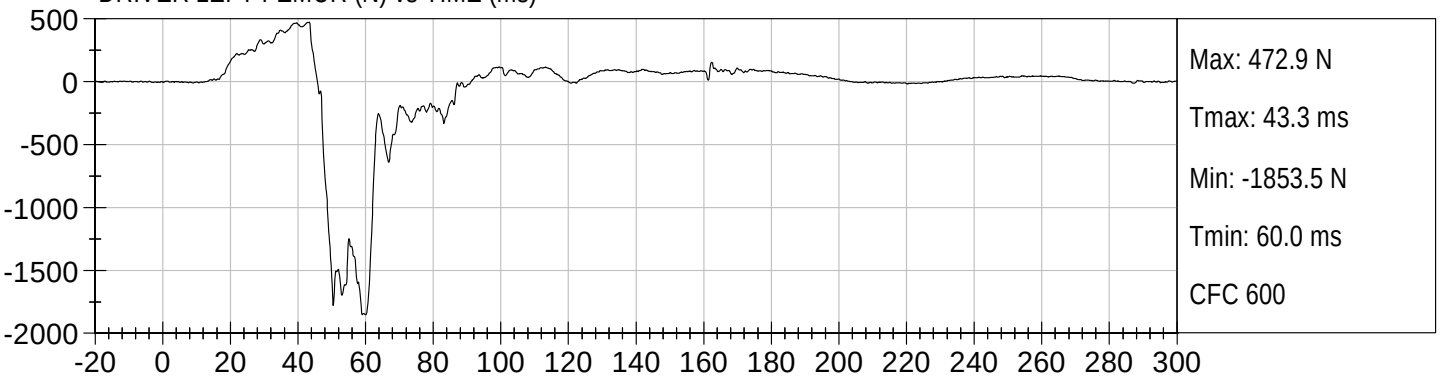

Drv. nij (NCF) () vs TIME (ms)
0.15
0.125
0.1
0.075
0.05
0.025
0
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 0.15
Tmax: 141.0 ms
Min: 0.0
Tmin: 0.0 ms
CFC 600


Drv. nij (NCE) () vs TIME (ms)
0.05
0.04
0.03
0.02
0.01
0
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 0.04
Tmax: 295.5 ms
Min: 0.0
Tmin: 0.0 ms
CFC 600

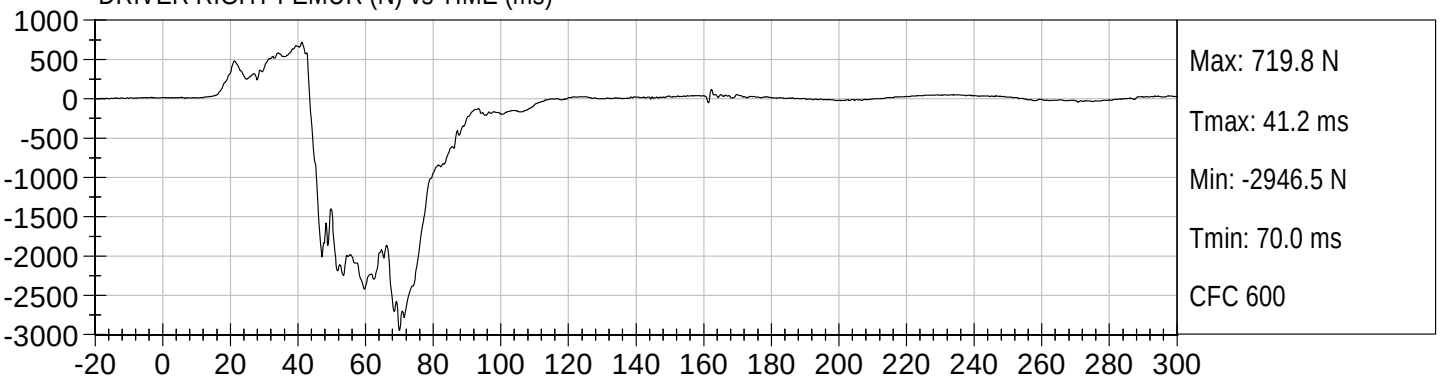
NCAP 35mph Frontal
2012 Ford Explorer - MC0204

Test Date: 10/28/2011
Speed: 35.1 mph (56.4 km/h)

DRIVER LEFT FEMUR (N) vs TIME (ms)



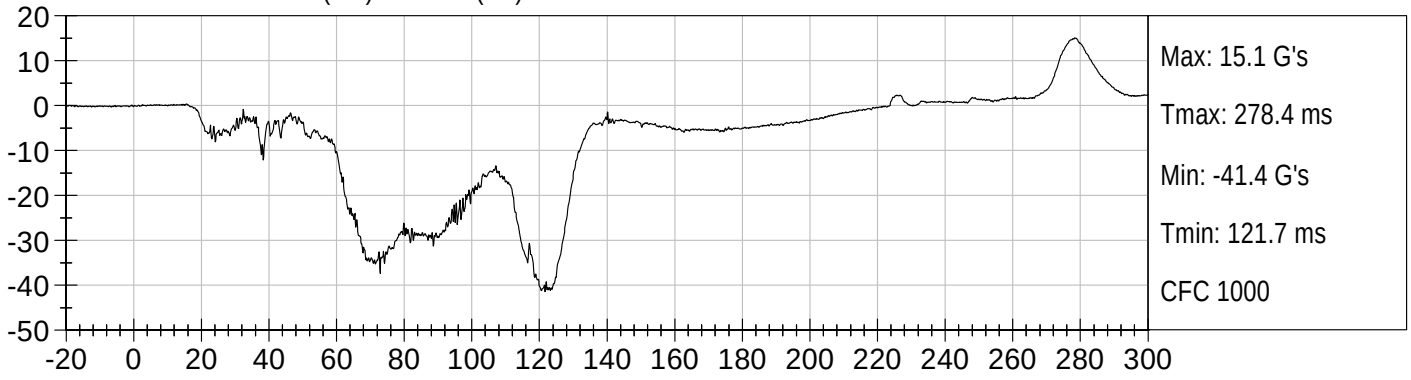
DRIVER RIGHT FEMUR (N) vs TIME (ms)



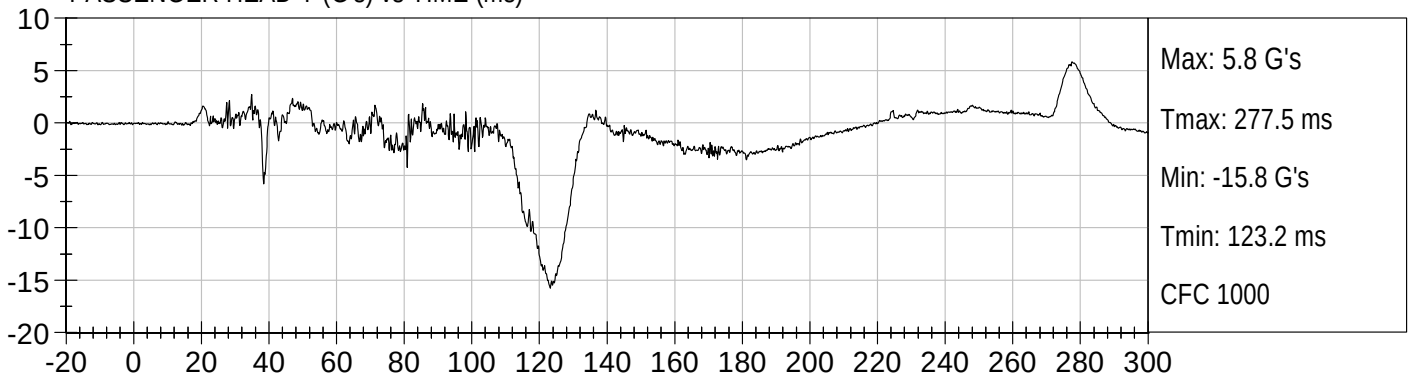
NCAP 35mph Frontal
2012 Ford Explorer - MC0204

Test Date: 10/28/2011
Speed: 35.1 mph (56.4 km/h)

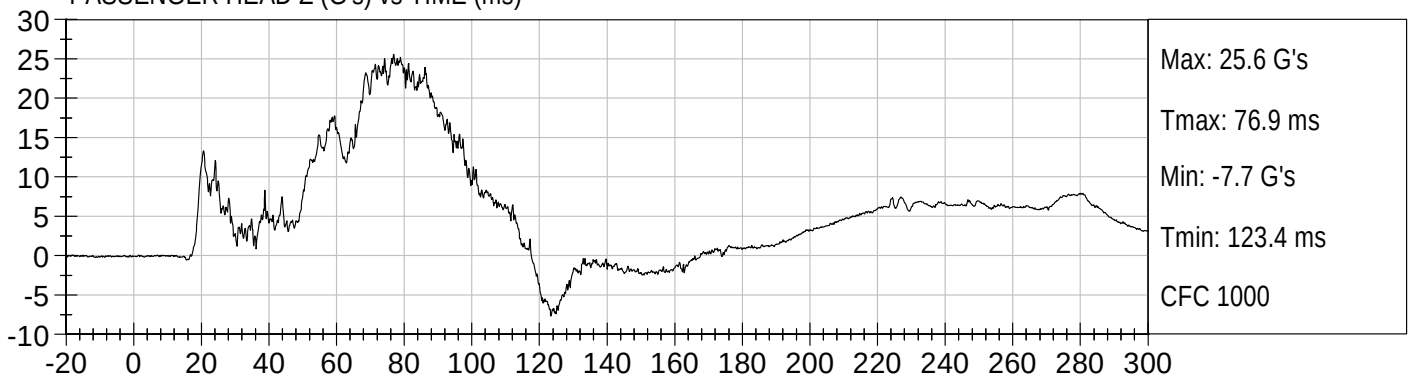
PASSENGER HEAD X (G's) vs TIME (ms)



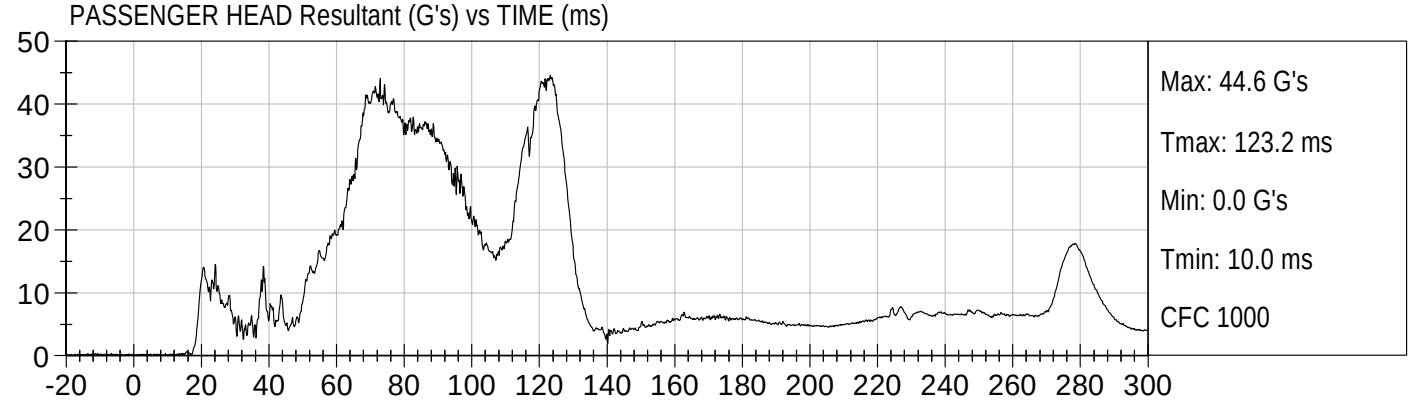
PASSENGER HEAD Y (G's) vs TIME (ms)



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

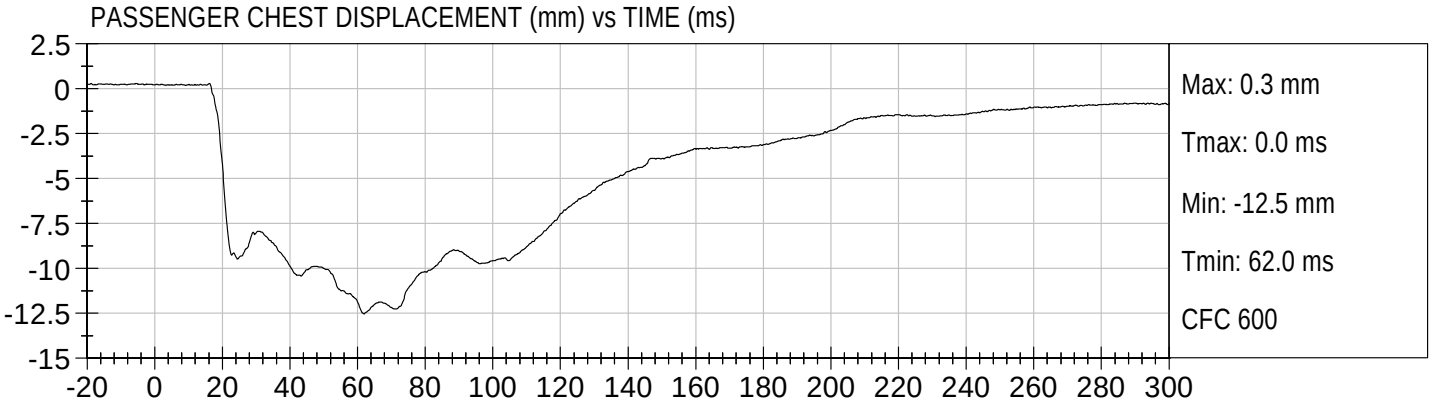


PASSENGER HEAD Resultant (G's) vs TIME (ms)



NCAP 35mph Frontal
2012 Ford Explorer - MC0204

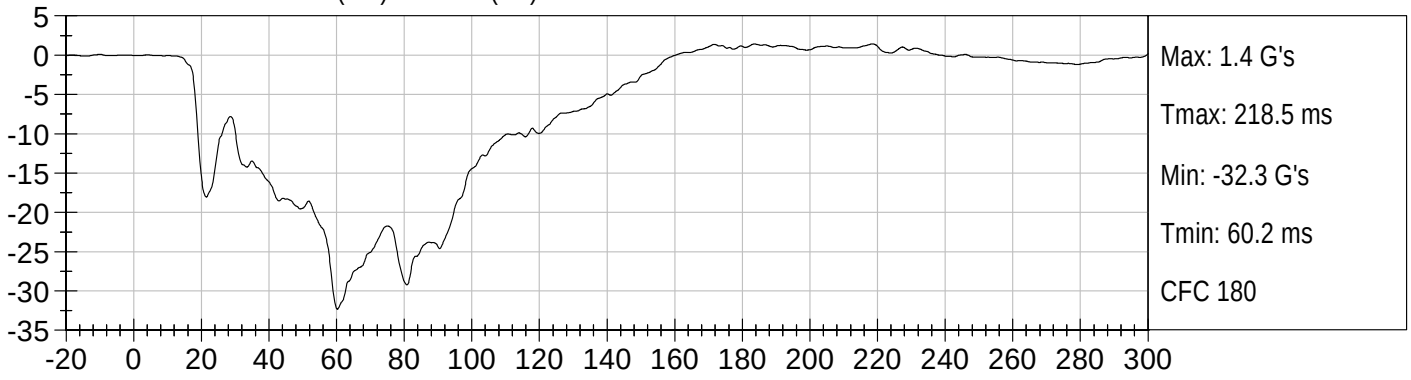
Test Date: 10/28/2011
Speed: 35.1 mph (56.4 km/h)



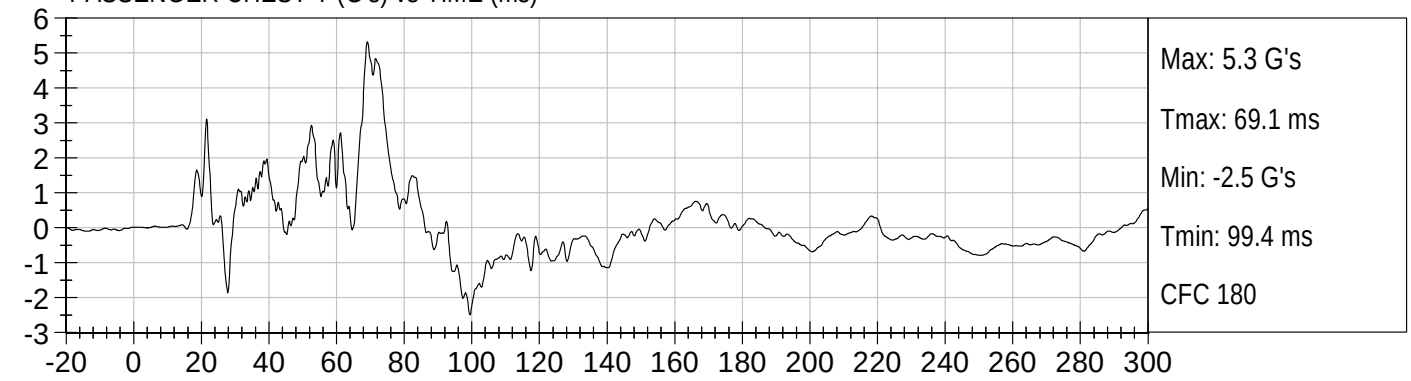
NCAP 35mph Frontal
2012 Ford Explorer - MC0204

Test Date: 10/28/2011
Speed: 35.1 mph (56.4 km/h)

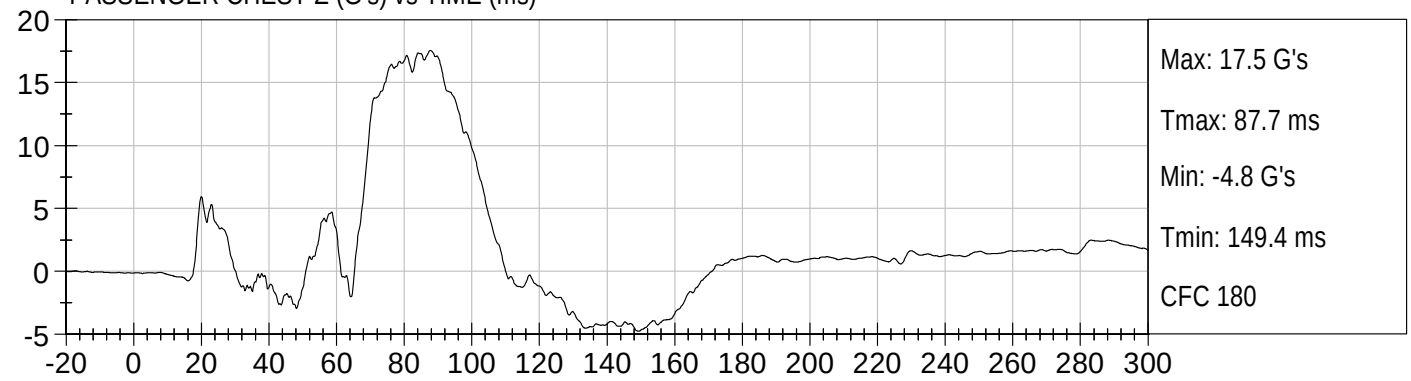
PASSENGER CHEST X (G's) vs TIME (ms)



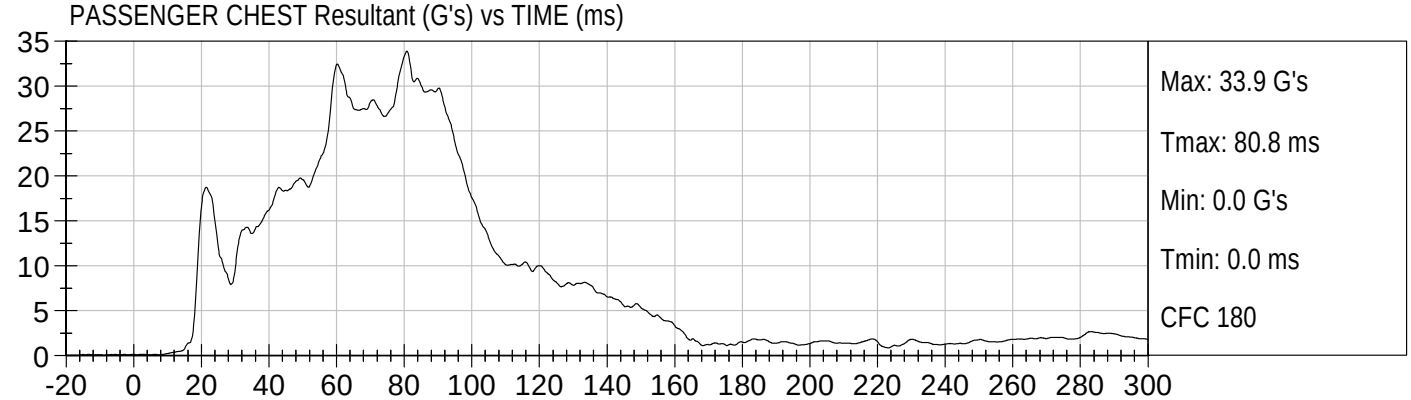
PASSENGER CHEST Y (G's) vs TIME (ms)



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



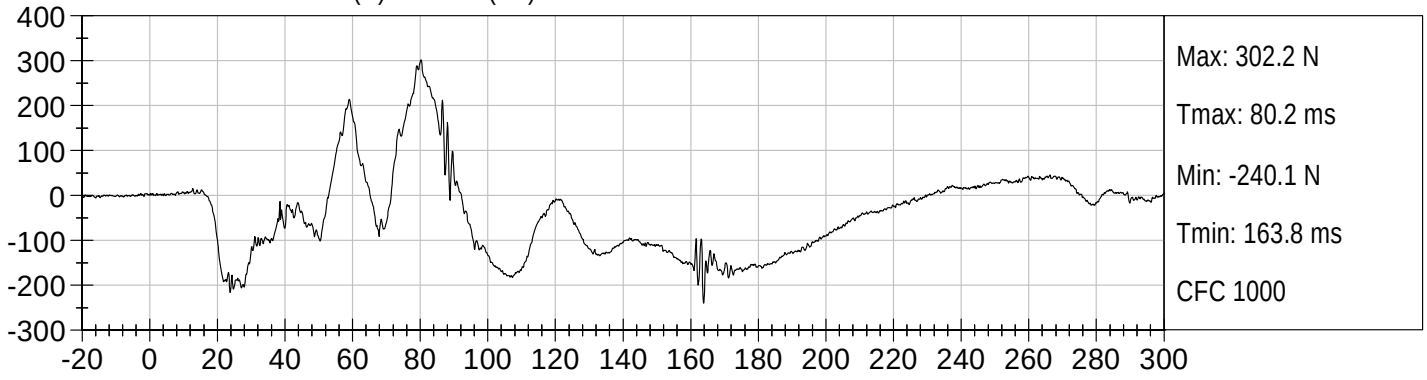
PASSENGER CHEST Resultant (G's) vs TIME (ms)



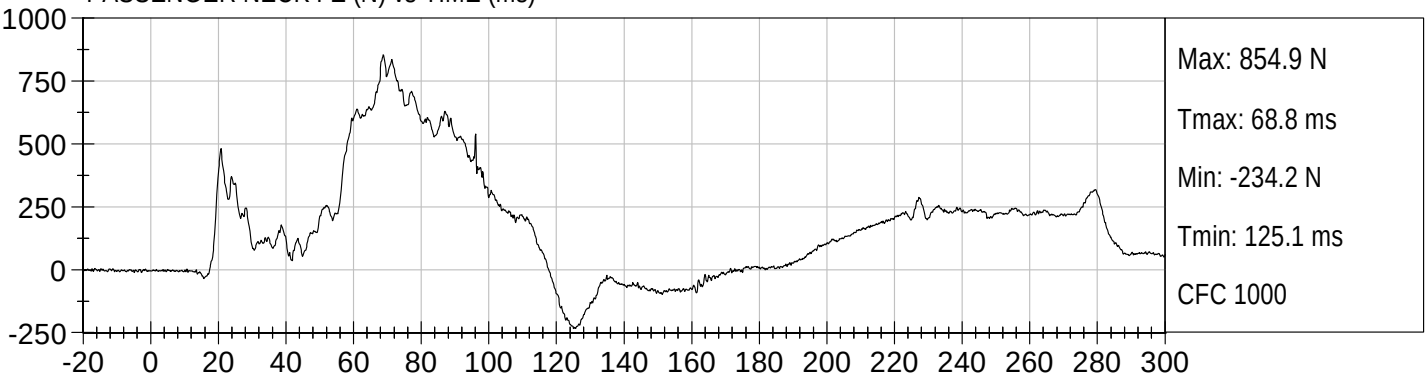
NCAP 35mph Frontal
2012 Ford Explorer - MC0204

Test Date: 10/28/2011
Speed: 35.1 mph (56.4 km/h)

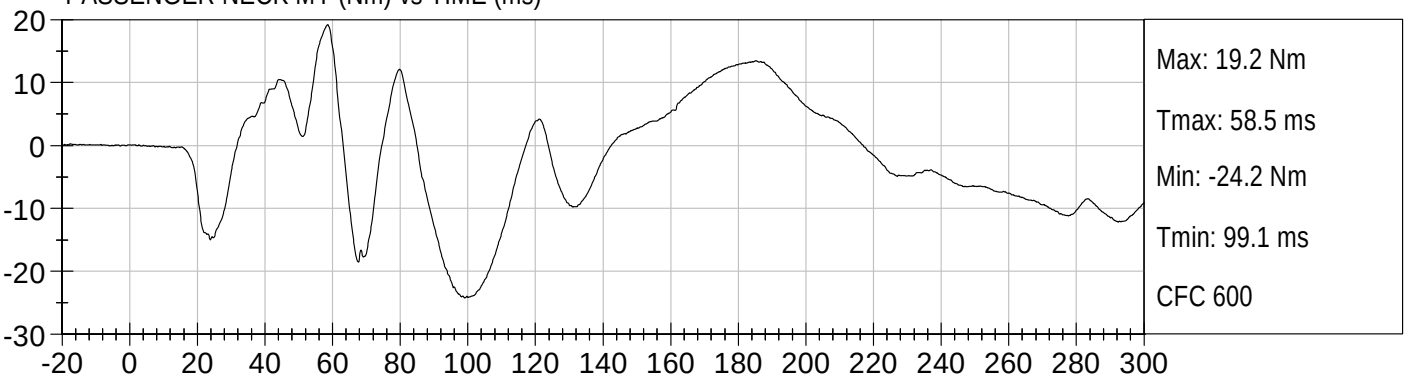
PASSENGER NECK FX (N) vs TIME (ms)



PASSENGER NECK FZ (N) vs TIME (ms)

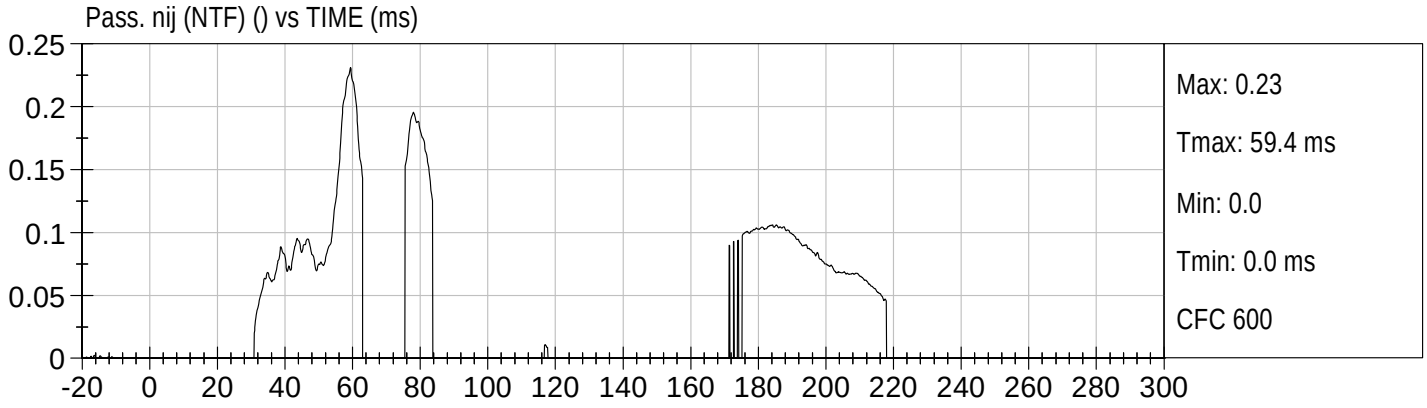


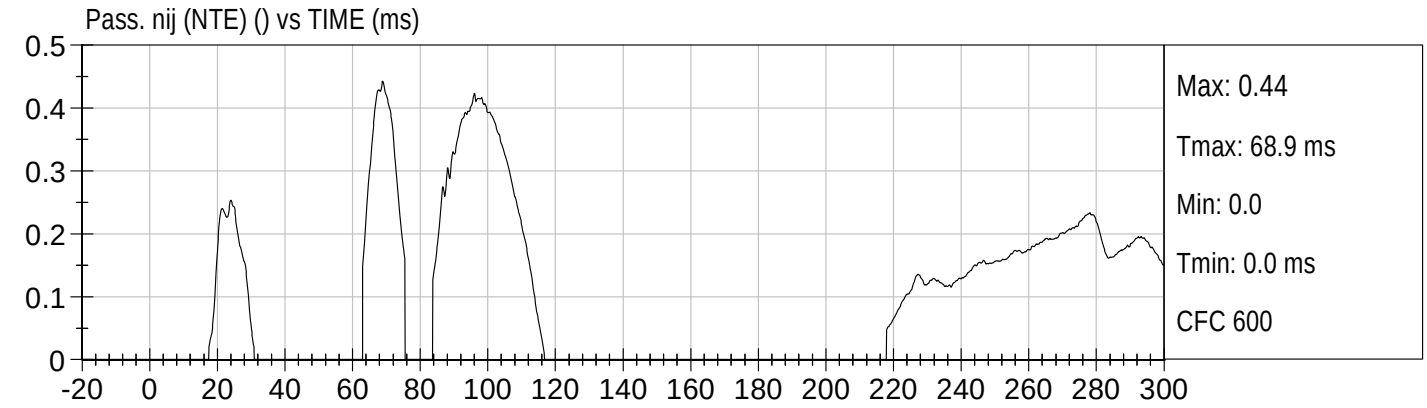
PASSENGER NECK MY (Nm) vs TIME (ms)

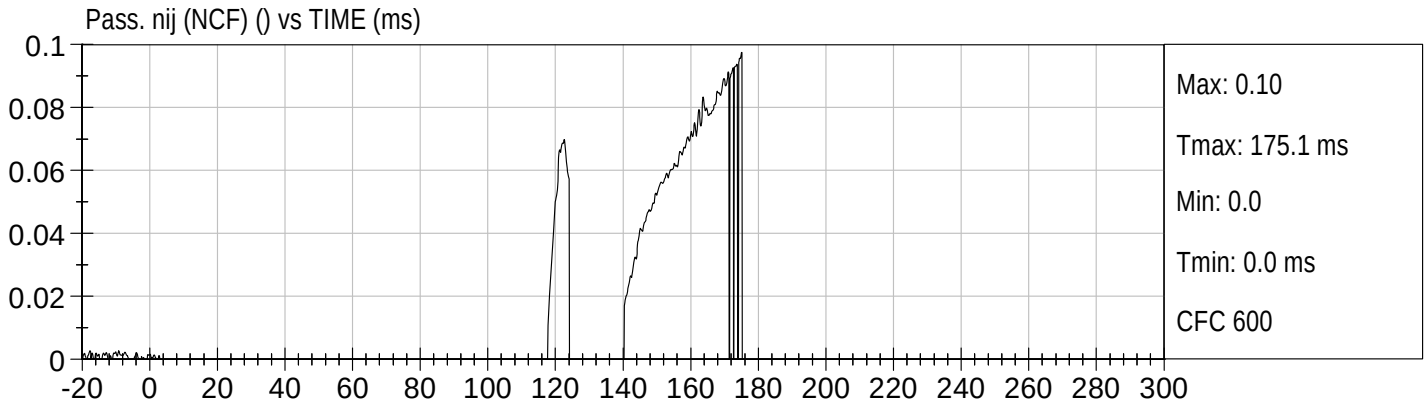


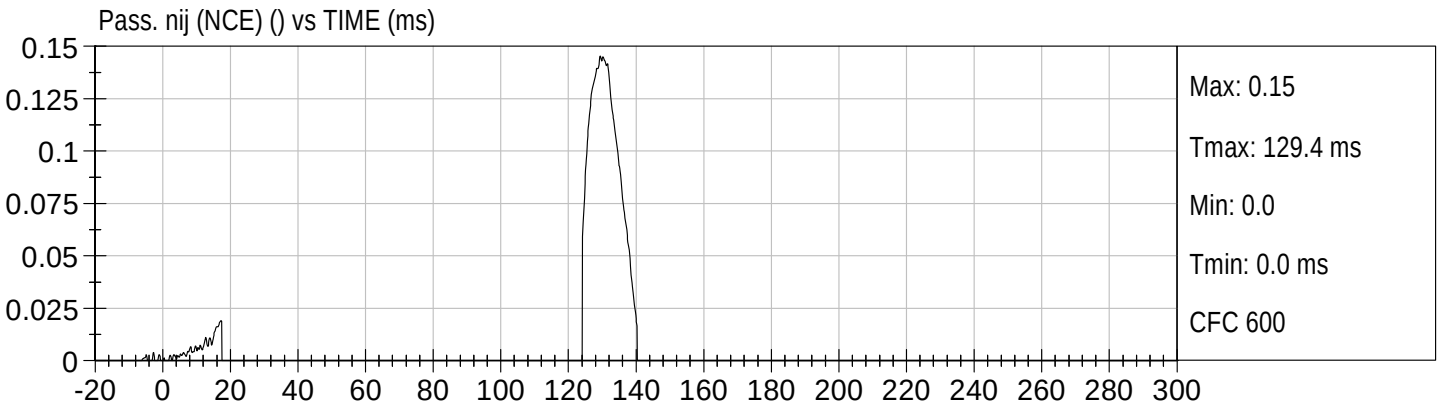
NCAP 35mph Frontal
2012 Ford Explorer - MC0204

Test Date: 10/28/2011
Speed: 35.1 mph (56.4 km/h)





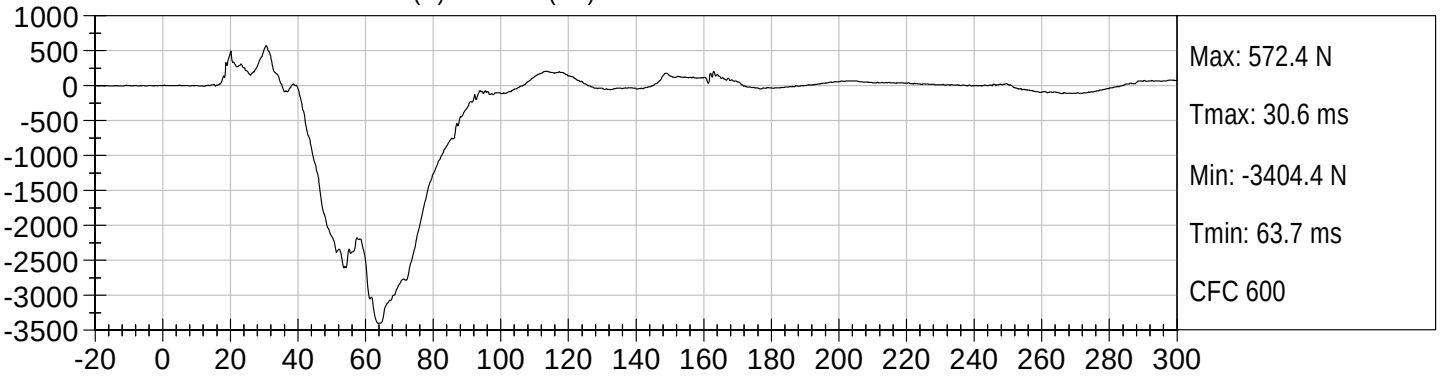




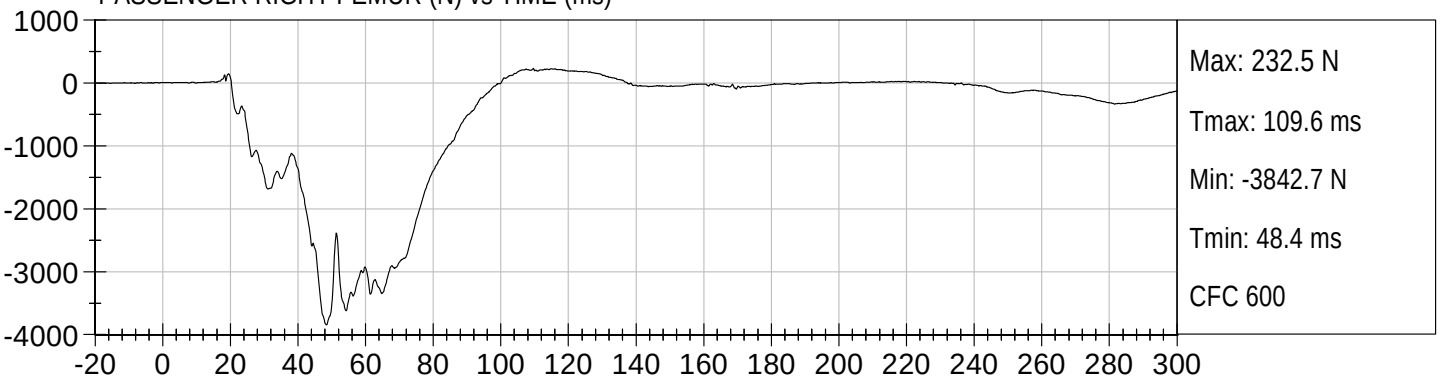
NCAP 35mph Frontal
2012 Ford Explorer - MC0204

Test Date: 10/28/2011
Speed: 35.1 mph (56.4 km/h)

PASSENGER LEFT FEMUR (N) vs TIME (ms)



PASSENGER RIGHT FEMUR (N) vs TIME (ms)



APPENDIX C

DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036 **Test ID:** D113591

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	35	Pass
Peak Resultant Acceleration	G's	225 - 275	269	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-6.0	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

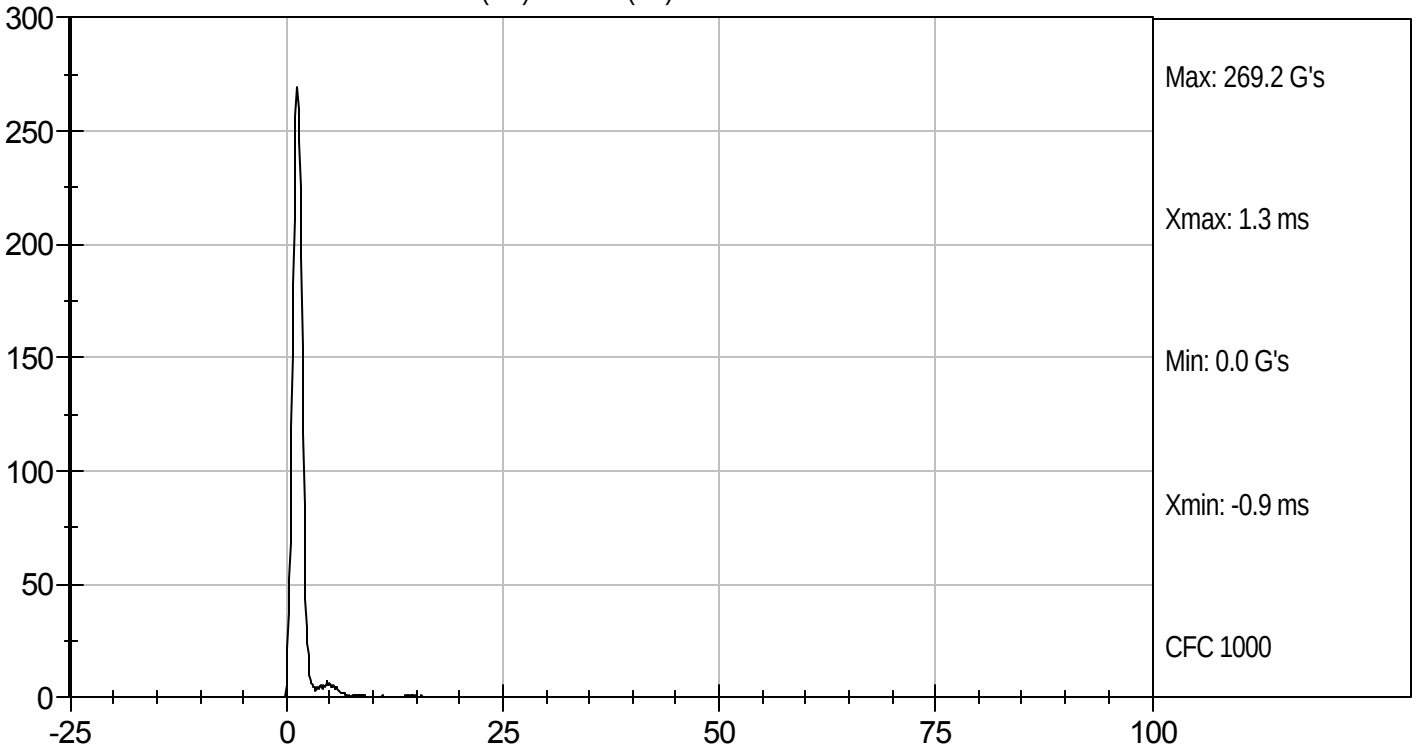
10/26/11
Test Date

David Winkelbauer
Approved By

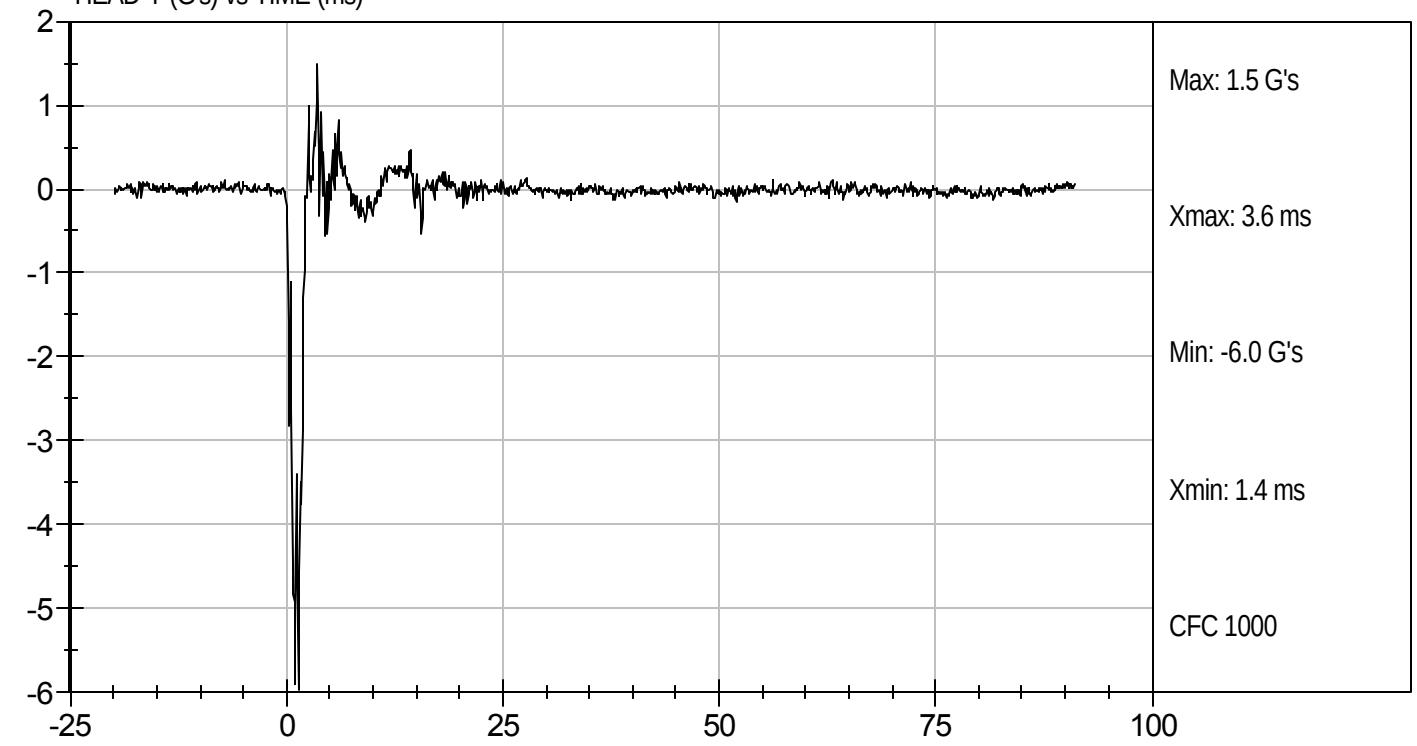
Test Desc: Head Drop
Component ID: D113591

Test Date: 10/26/11
Velocity: 0 ft/s, 0.00 m/s

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



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



MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036 **Test I.D:** D113592

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity		%	10 to 70	33	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.37	Pass
	20 ms	G's	17.60 to 22.60	17.98	Pass
	30 ms	G's	12.50 to 18.50	14.76	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	14.7	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	35.0	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	70.4	Pass
	Time	ms	57.0 to 64.0	59.1	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	117.4	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	97.2	Pass
	Time	ms	47.0 to 58.0	47.5	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	97.3	Pass
			Overall Test Results		Pass

Jessica Hall
Laboratory Technician

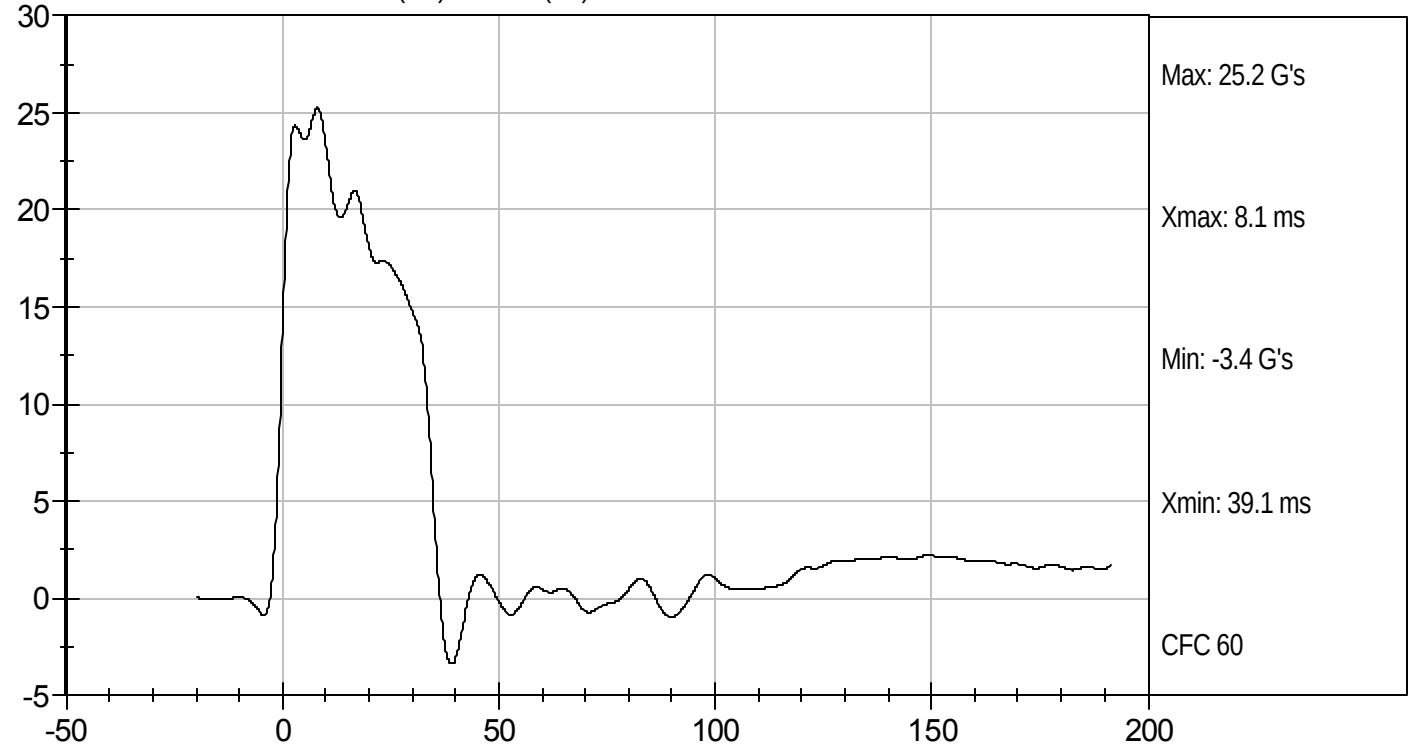
10/27/11
Test Date

David Winkelbauer
Approved By

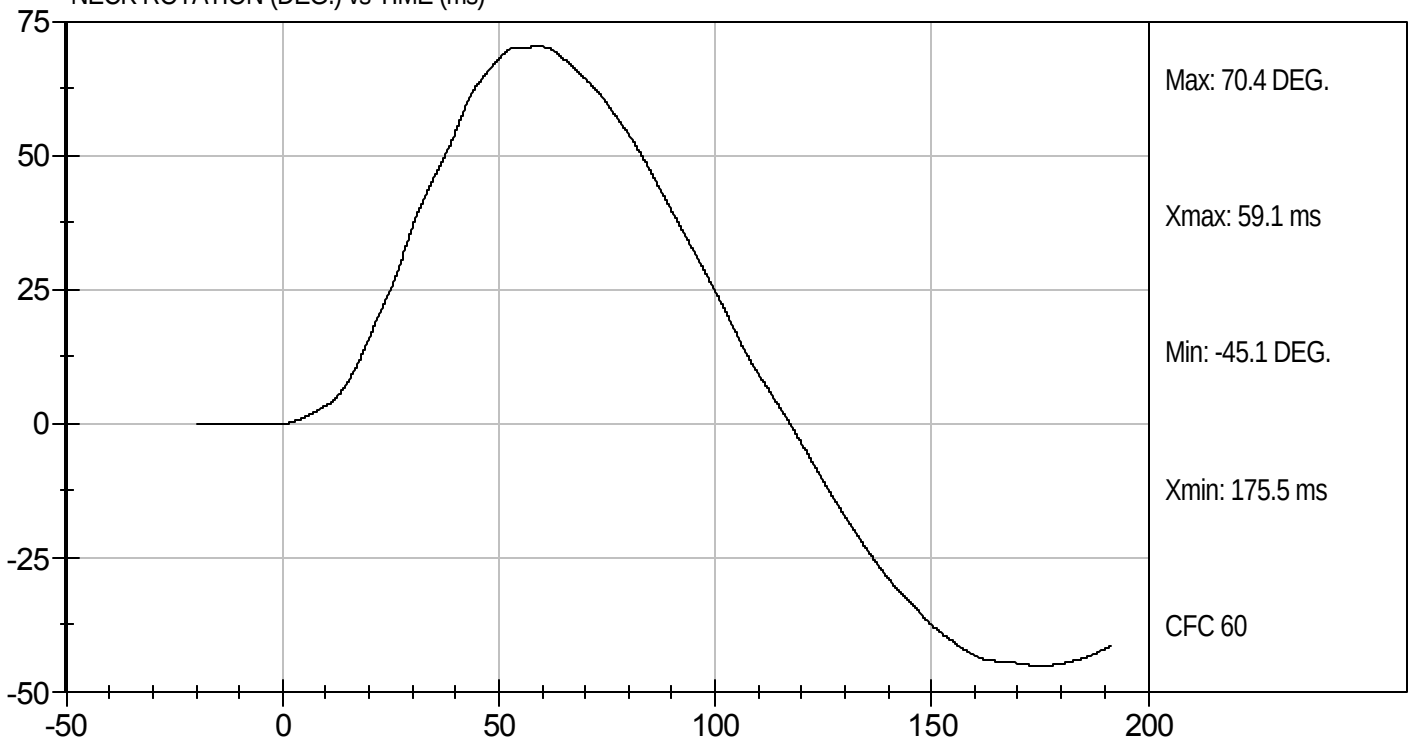
Test Desc: Neck Flexion
Component ID: D113592

Test Date: 10/27/11
Velocity: 23.15 ft/s, 7.06 m/s

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

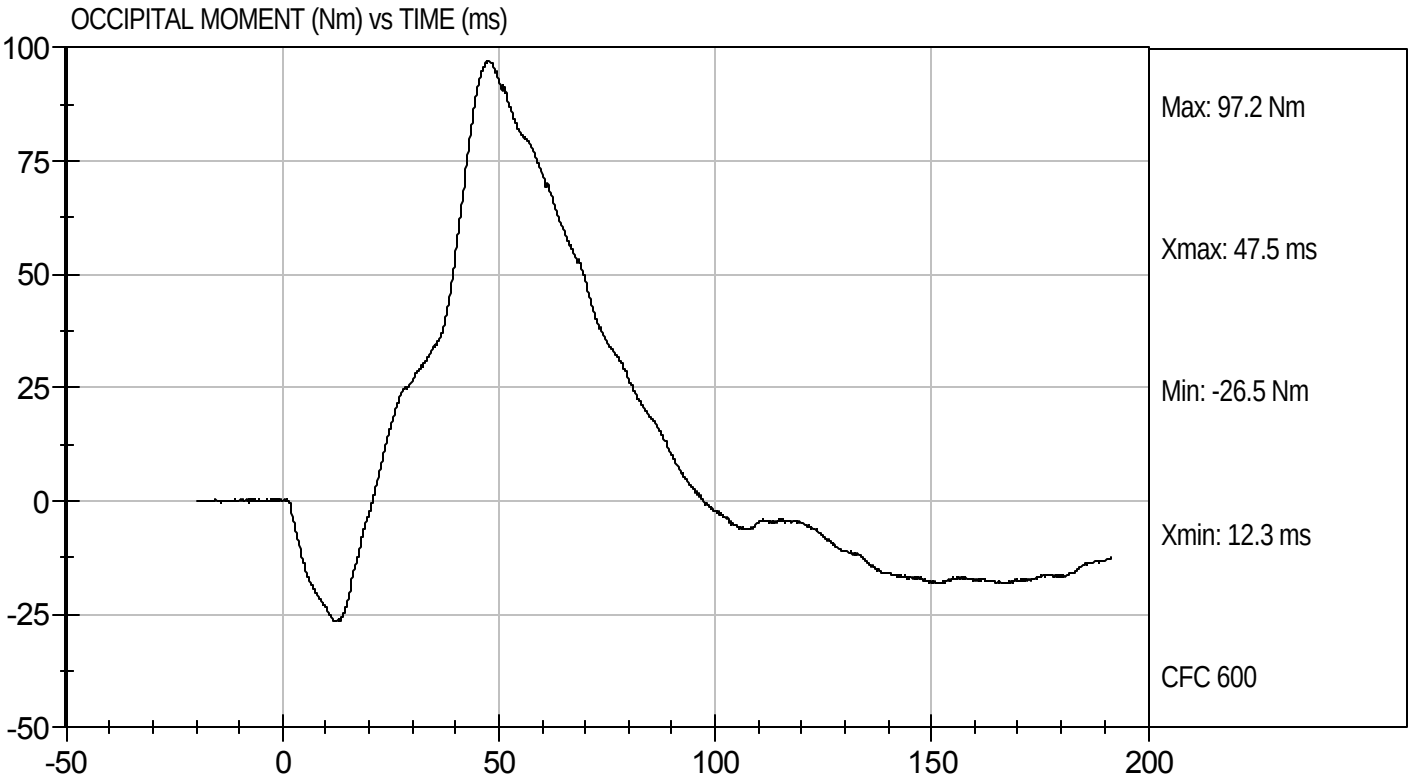


NECK ROTATION (DEG.) vs TIME (ms)



Test Desc: Neck Flexion
Component ID: D113592

Test Date: 10/27/11
Velocity: 23.15 ft/s, 7.06 m/s



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036 **Test I.D:** D113593

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity		%	10 to 70	33	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	17.82	Pass
	20 ms	G's	14.00 to 19.00	14.65	Pass
	30 ms	G's	11.00 to 16.00	12.76	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	12.9	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	41.4	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	159.0	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-64.3	Pass
	Time	ms	65.0 to 79.0	70.9	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	142.0	Pass
			Overall Test Results		Pass

Jessica Hall
Laboratory Technician

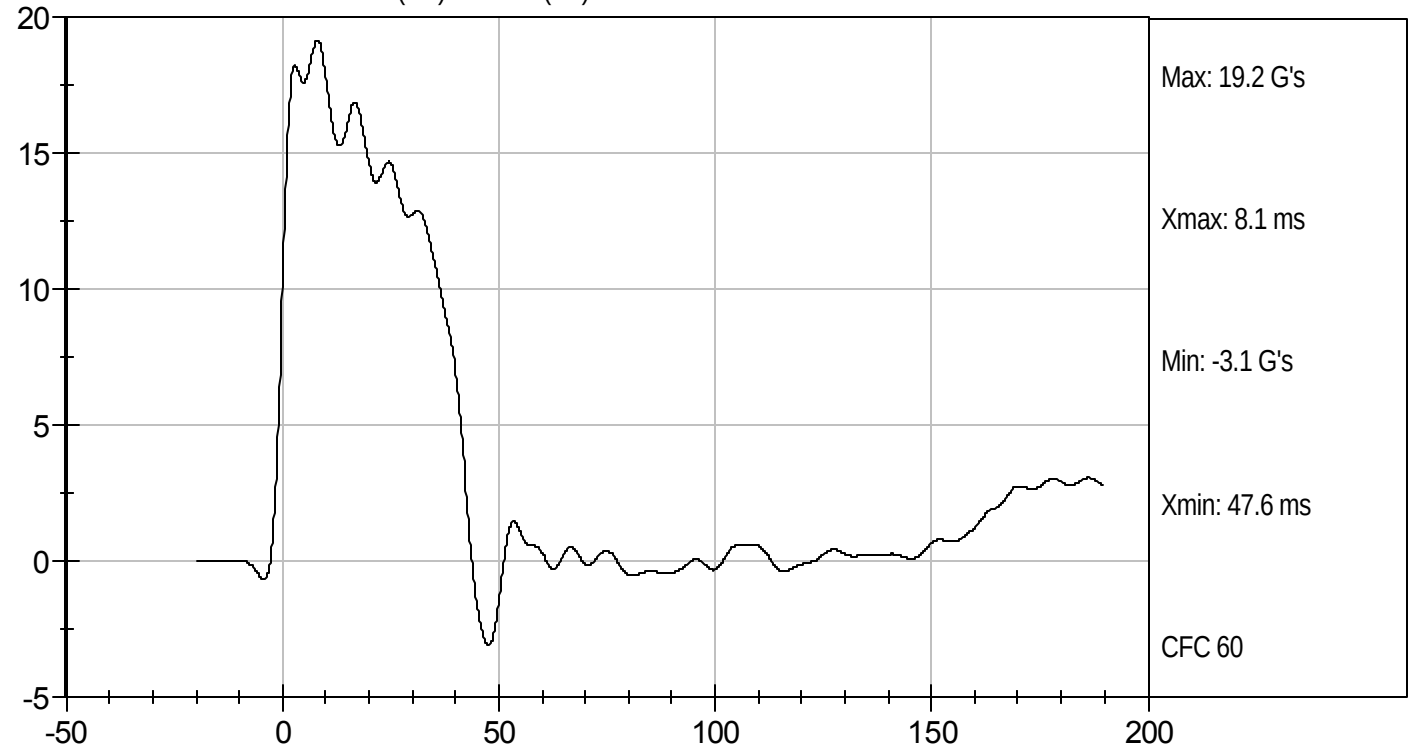
10/27/11
Test Date

David Winkelbauer
Approved By

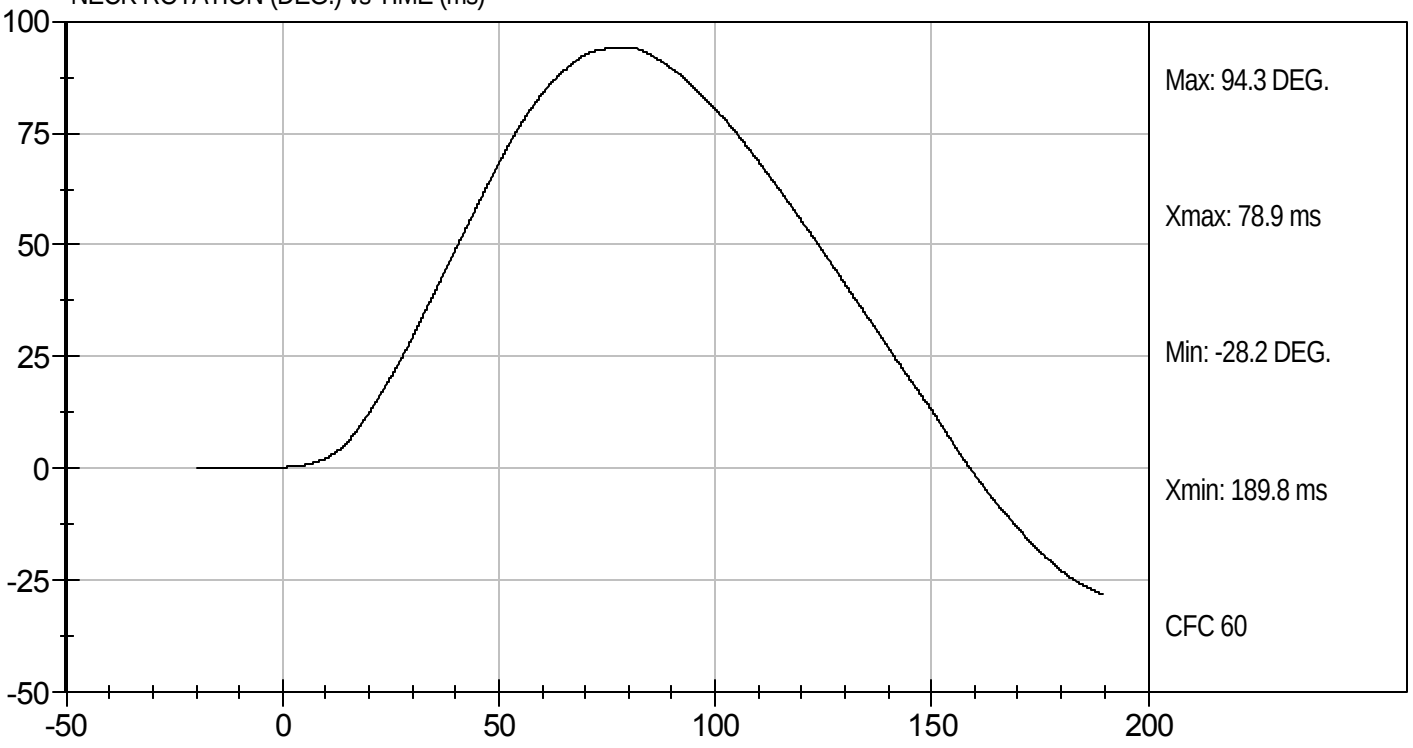
Test Desc: Neck Extension
Component ID: D113593

Test Date: 10/27/11
Velocity: 20.08 ft/s, 6.12 m/s

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

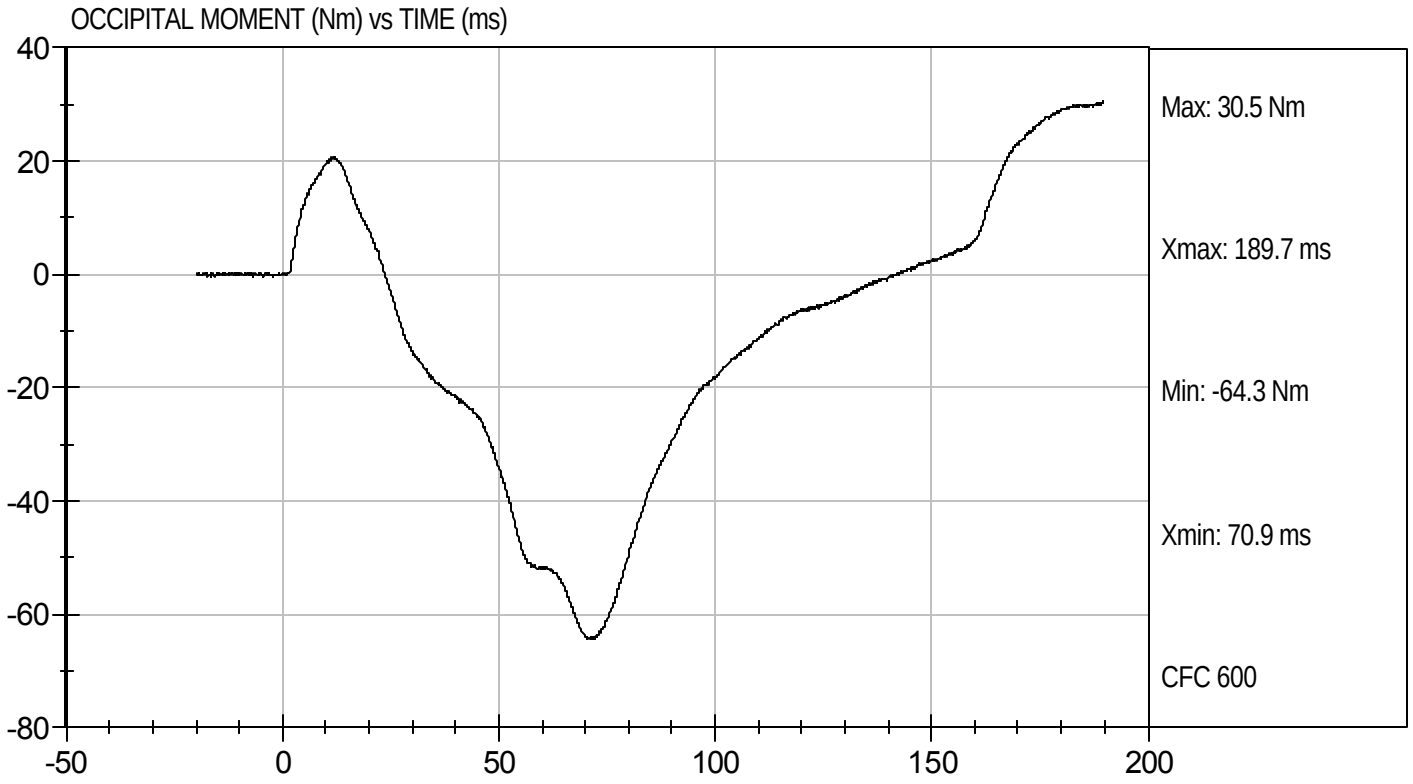


NECK ROTATION (DEG.) vs TIME (ms)



Test Desc: Neck Extension
Component ID: D113593

Test Date: 10/27/11
Velocity: 20.08 ft/s, 6.12 m/s



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036 **Test I.D:** D113594

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	34	Pass
Probe Velocity	m/s	6.58 to 6.82	6.68	Pass
Peak Probe Force	N	5159 to 5893	5,458	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.57	Pass
Internal Hysteresis	%	69 to 85	70	Pass
		Overall Test Results		Pass

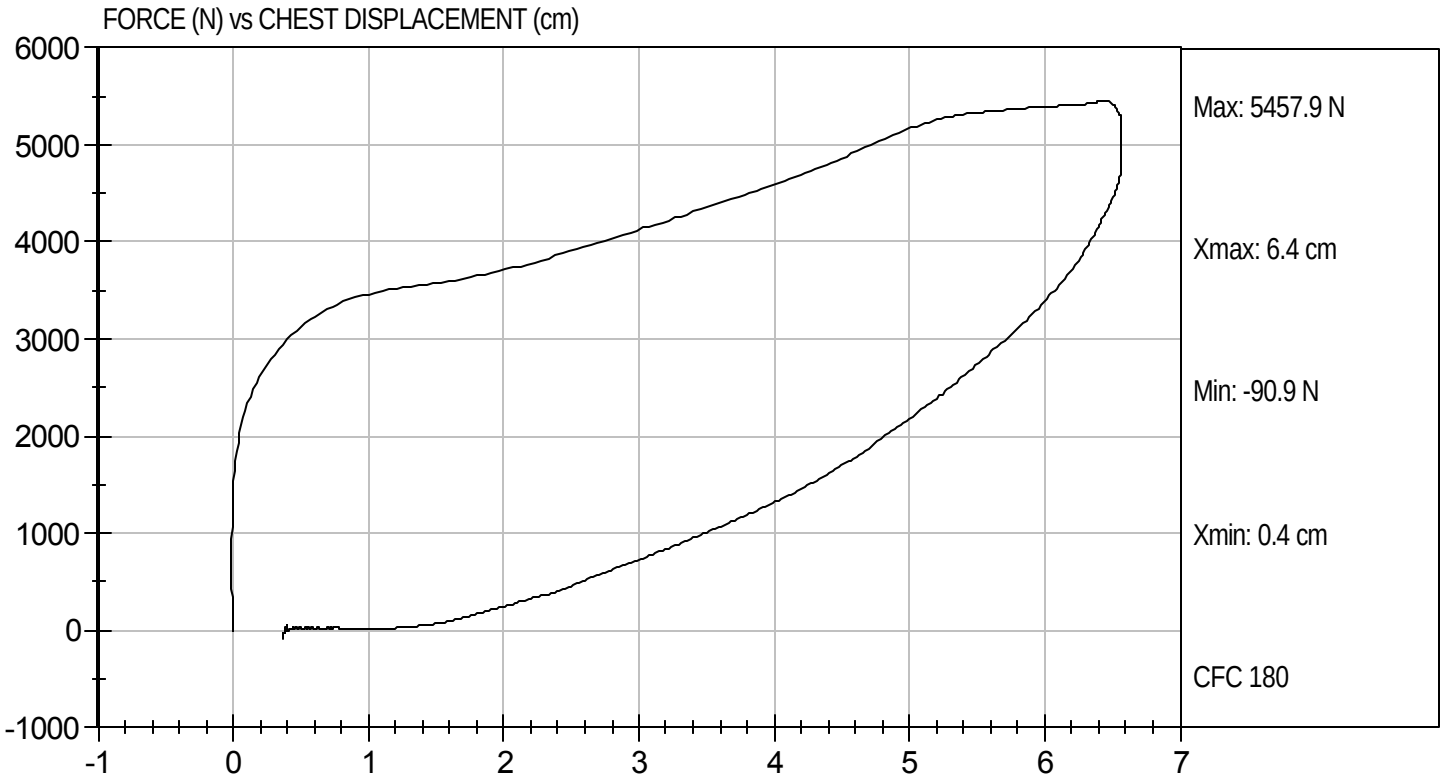
Jessica Hall
Laboratory Technician

10/26/11
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Impact
Component ID: D113594

Test Date: 10/26/11
Velocity: 21.92 ft/s, 6.68 m/s



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036 **Test I.D:** D113595

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	35	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	Newtons	4715 to 5782	5,325	Pass
		Overall Test Results		Pass

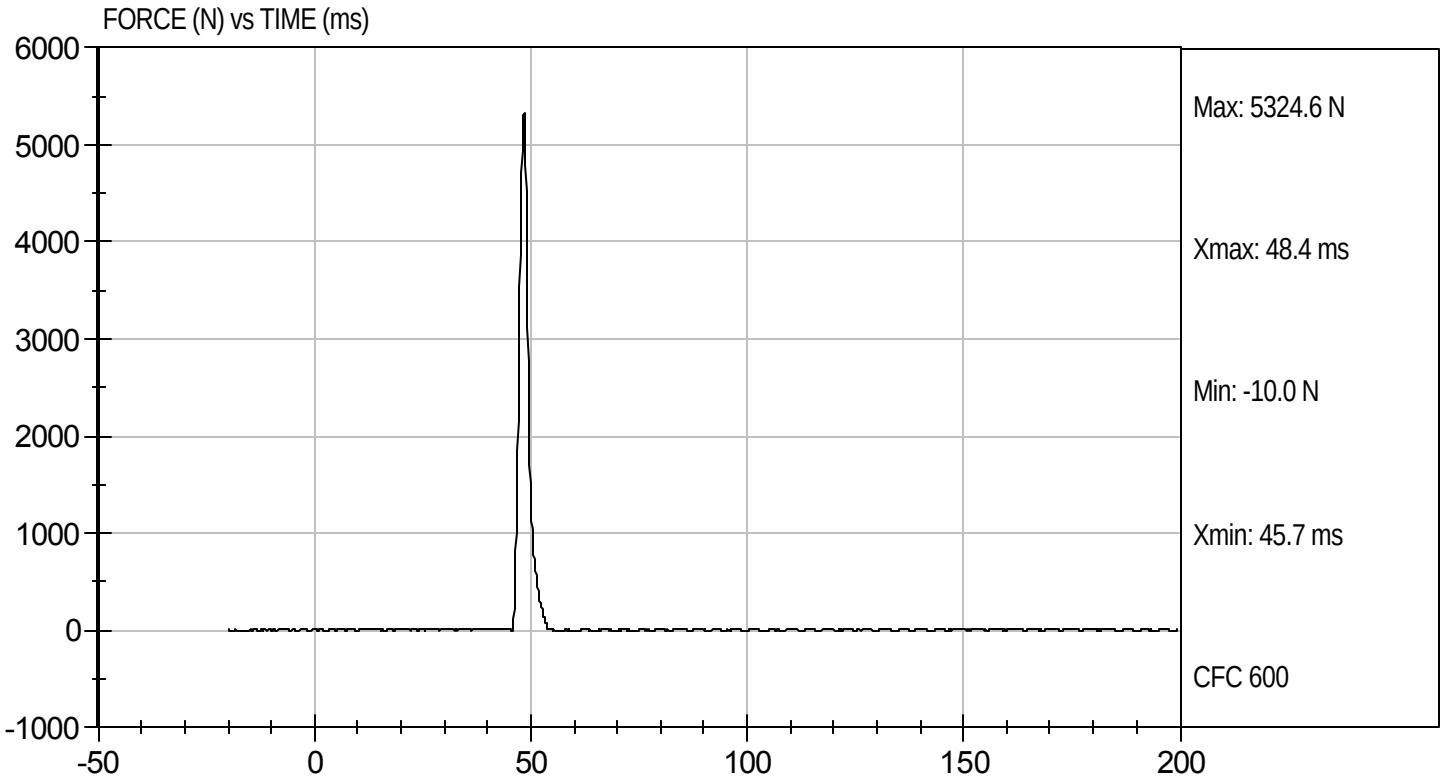
Jessica Hall
Laboratory Technician

10/26/11
Test Date

David Winkelbauer
Approved By

Test Desc: Right Knee
Component ID: D113595

Test Date: 10/26/11
Velocity: 6.97 ft/s, 2.12 m/s



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036 **Test I.D:** D113596

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	35	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	Newtons	4715 to 5782	5,554	Pass
		Overall Test Results		Pass

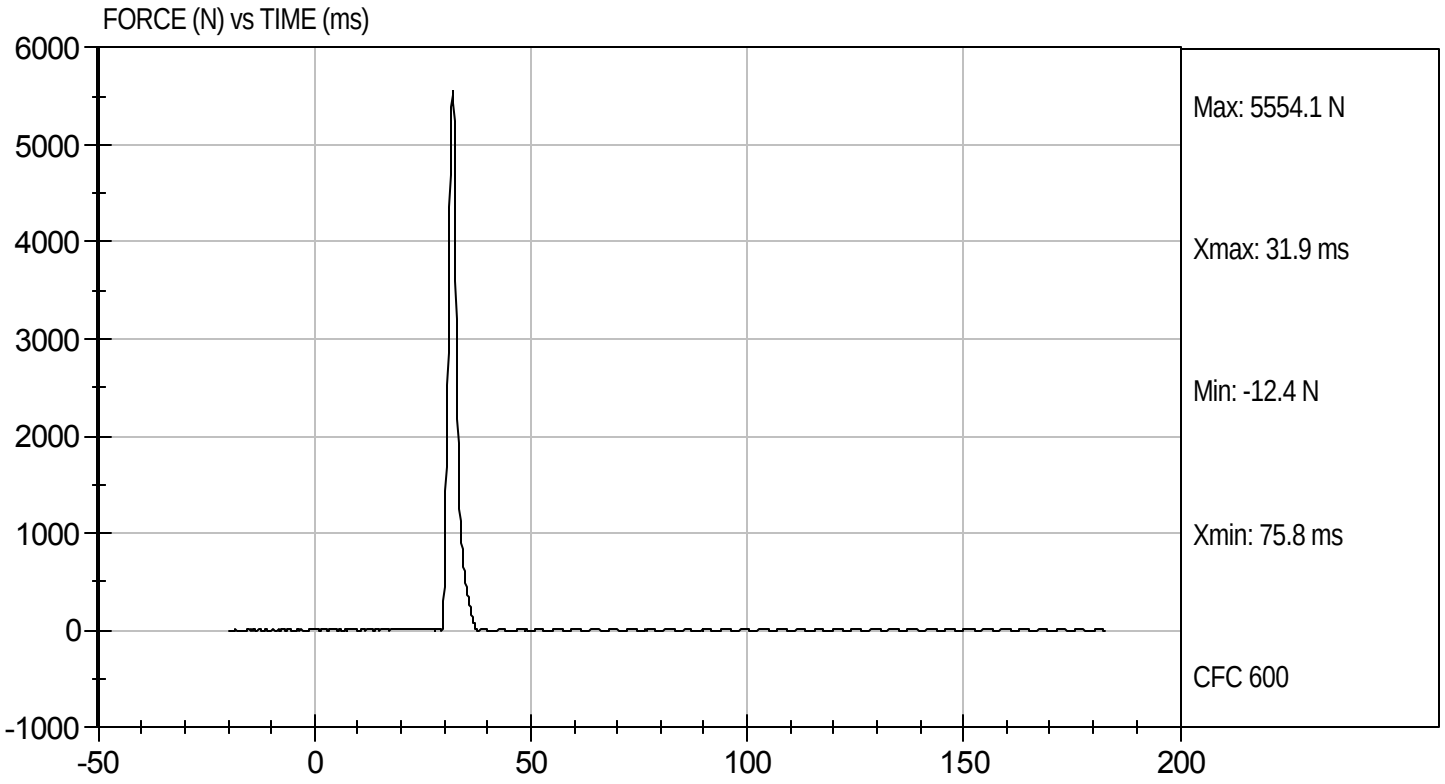
Jessica Hall
Laboratory Technician

10/26/11
Test Date

David Winkelbauer
Approved By

Test Desc: Left Knee
Component ID: D113596

Test Date: 10/26/11
Velocity: 6.97 ft/s, 2.12 m/s



MGA RESEARCH CORPORATION

HIP-FEMUR FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036 **Test I.D:** D113590

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.4	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	36	36	Pass
Rotation Rate	deg/s	5.0 -10.0	5.7	5.7	Pass
30 Degrees	Nm	94.9 Nm Max	91.7	82.2	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 - 50.0 Degree Max Rotation	40.1	40.7	Pass
		Overall Test Results			Pass

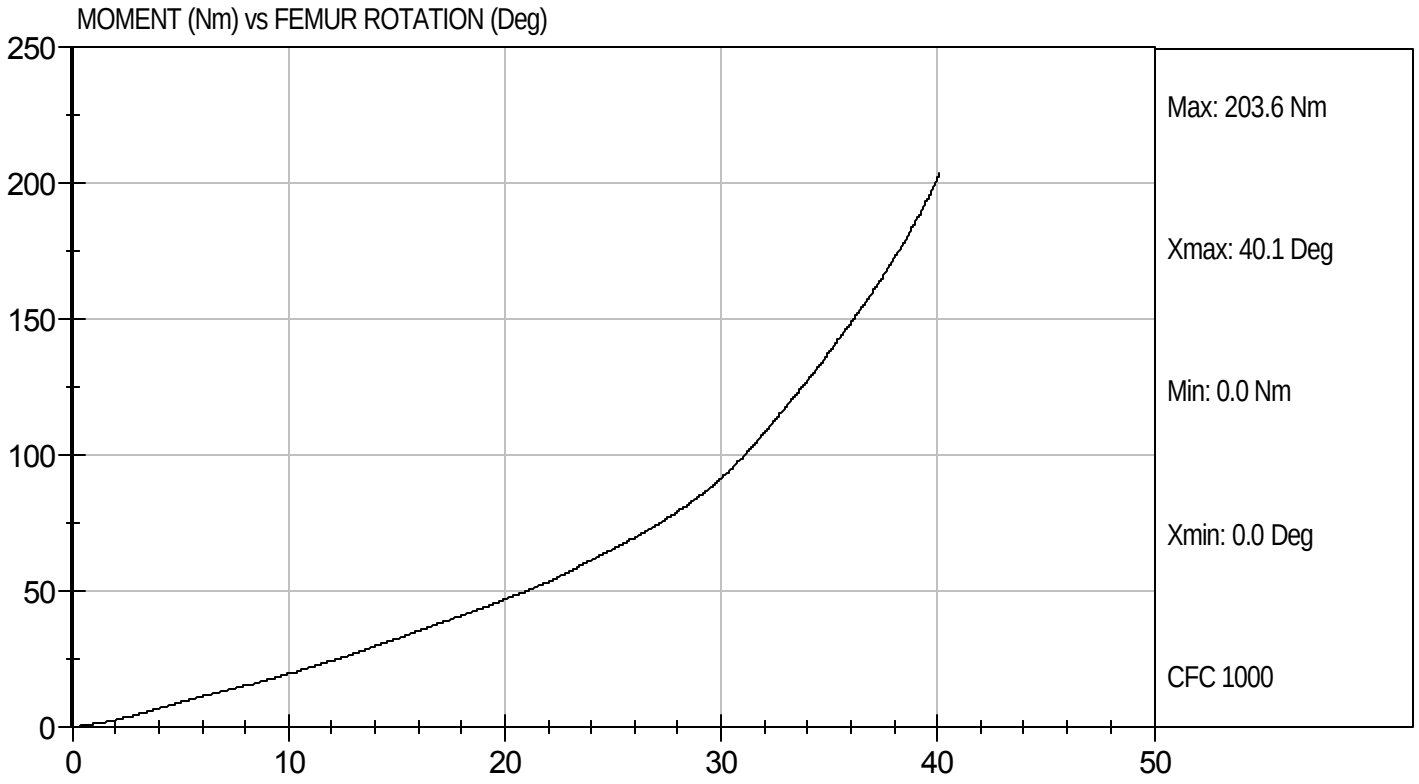
Jessica Hall
Laboratory Technician

10/26/11
Test Date

David Winkelbauer
Approved By

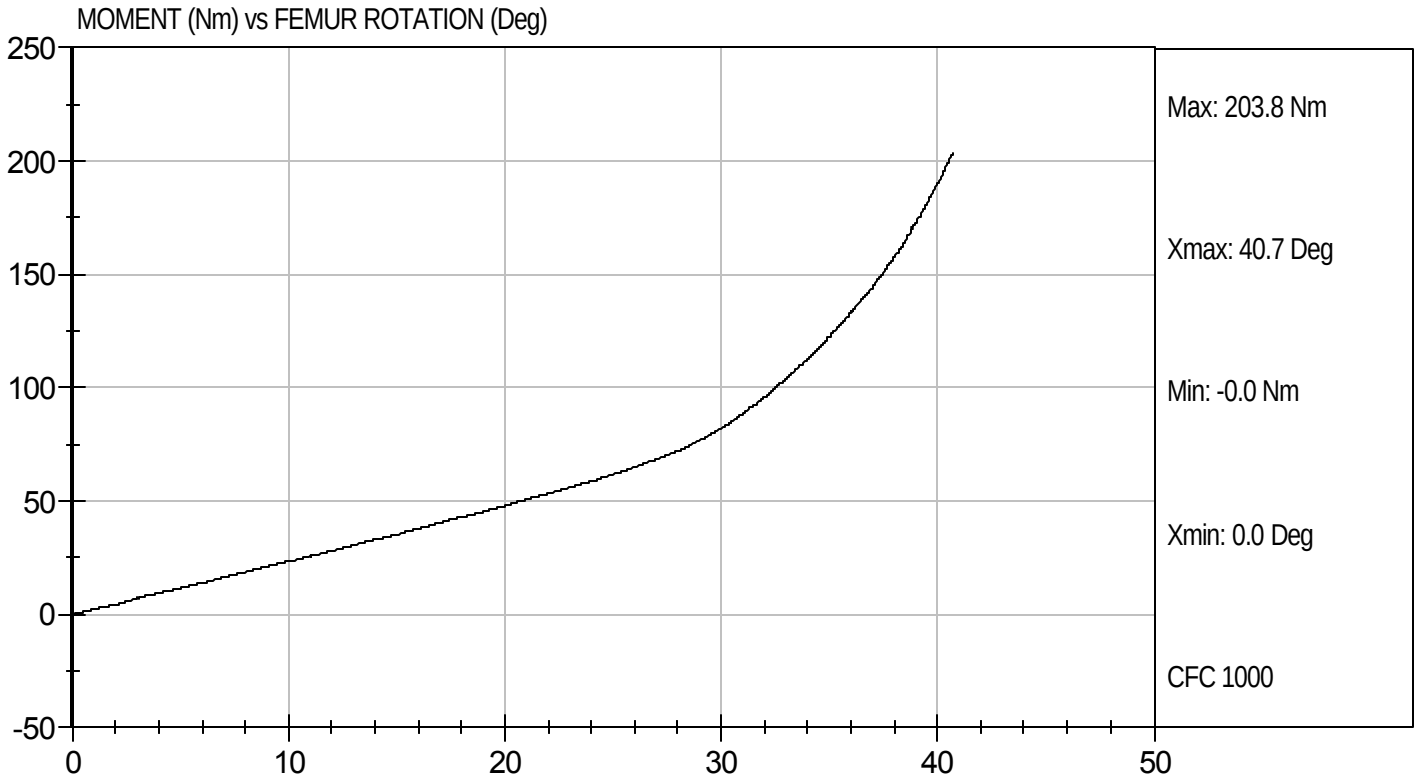
Test Desc: Hip Femur Flexion
Component ID: D113599

Test Date: 10/26/11
Velocity: 0 ft/s, 0.00 m/s



Test Desc: Hip Femur Flexion
Component ID: D113590

Test Date: 10/26/11
Velocity: 0 ft/s, 0.00 m/s



MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036 **Test ID:** D113611

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Peak Resultant Acceleration	G's	225 - 275	244	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-5.0	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

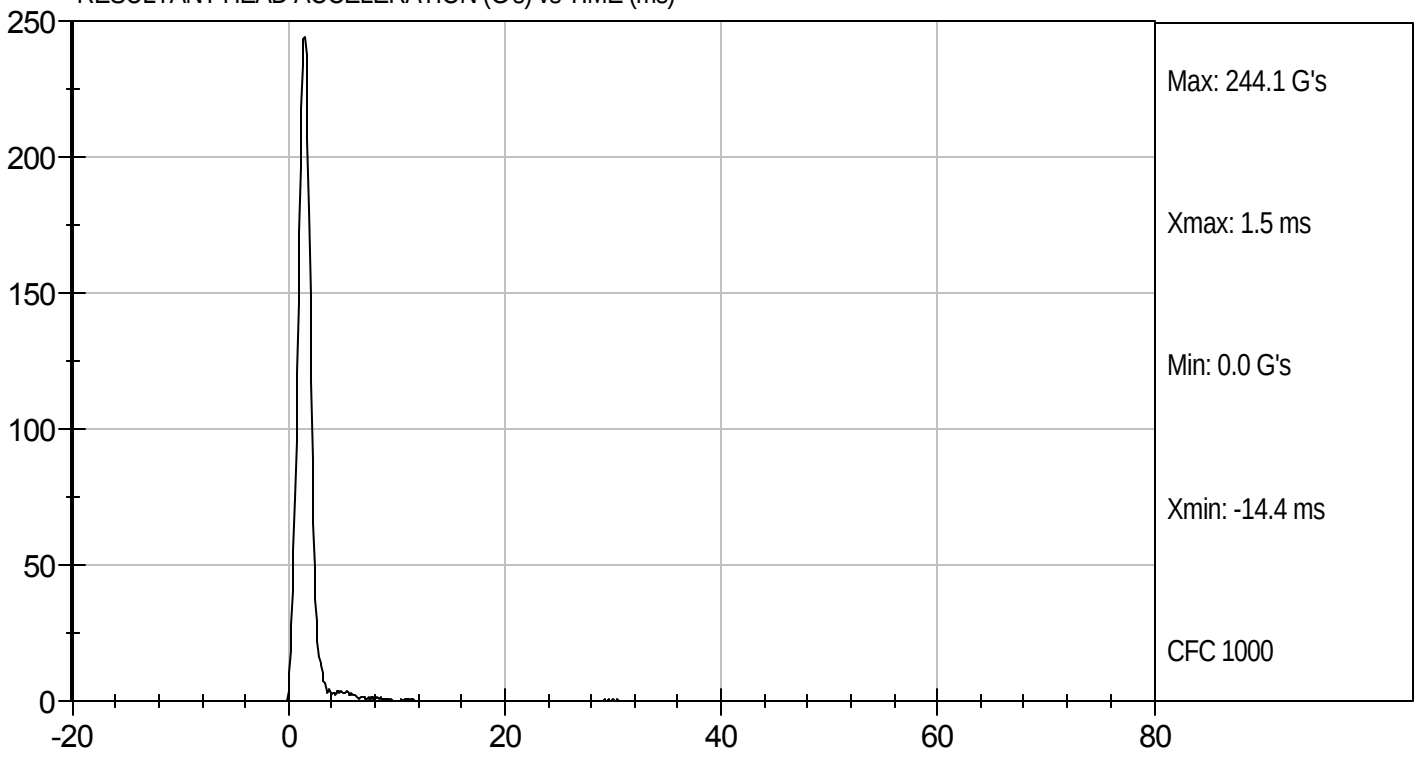
10/28/11
Test Date

David Winkelbauer
Approved By

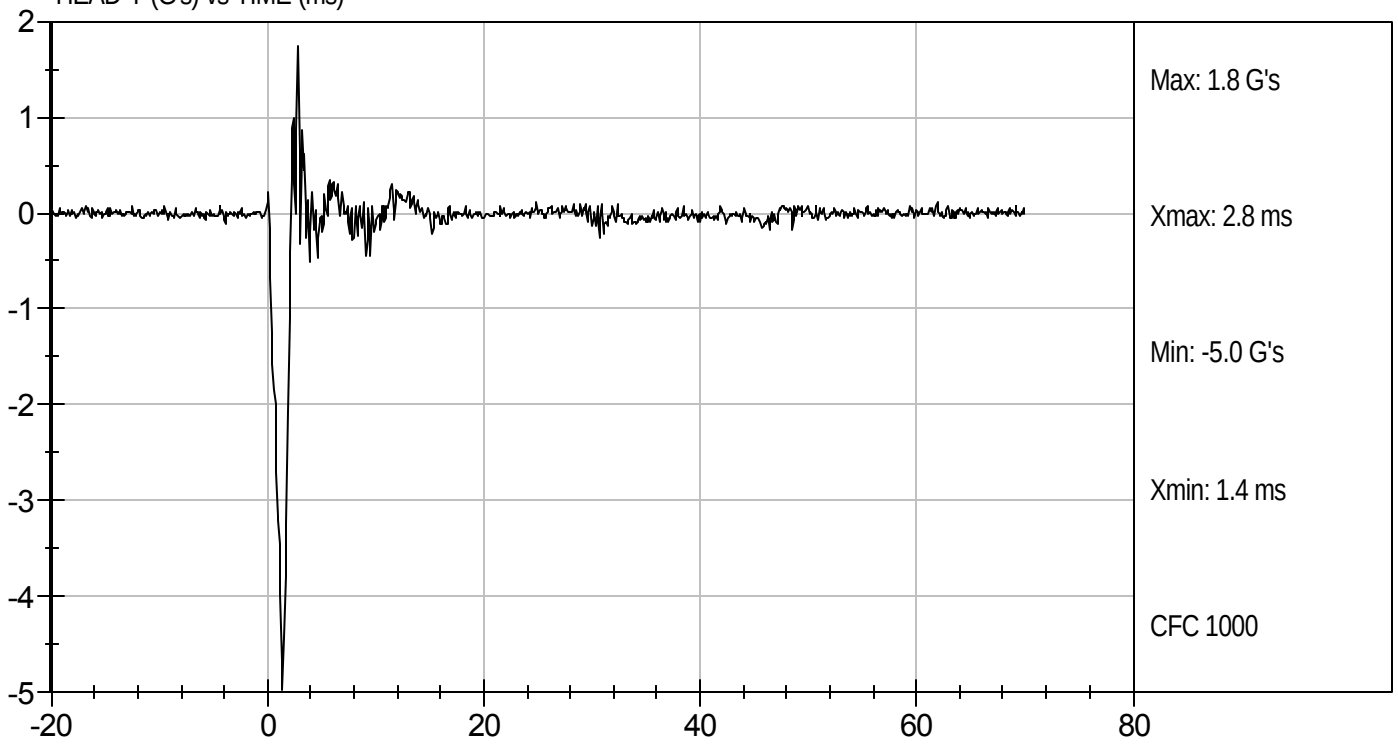
Test Desc: Head Drop
Component ID: D113611

Test Date: 10/28/11
Velocity: 0 ft/s, 0.00 m/s

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



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



MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036 **Test I.D:** D113612

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.0	Pass
Laboratory Relative Humidity		%	10 to 70	28	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	22.61	Pass
	20 ms	G's	17.60 to 22.60	18.50	Pass
	30 ms	G's	12.50 to 18.50	13.24	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	13.2	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	35.1	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	71.5	Pass
	Time	ms	57.0 to 64.0	57.4	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	117.4	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	95.1	Pass
	Time	ms	47.0 to 58.0	47.8	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	97.1	Pass
			Overall Test Results		Pass

Jessica Hall
Laboratory Technician

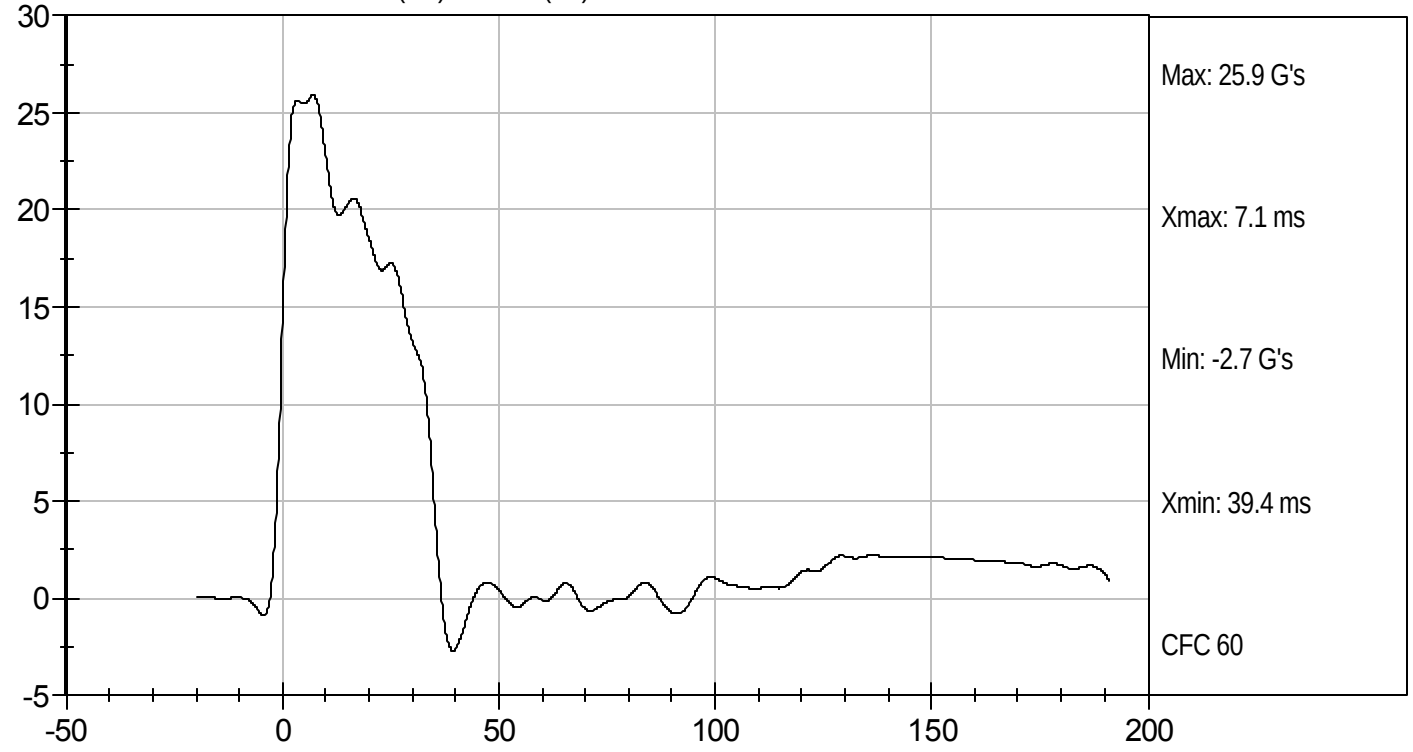
10/28/11
Test Date

David Winkelbauer
Approved By

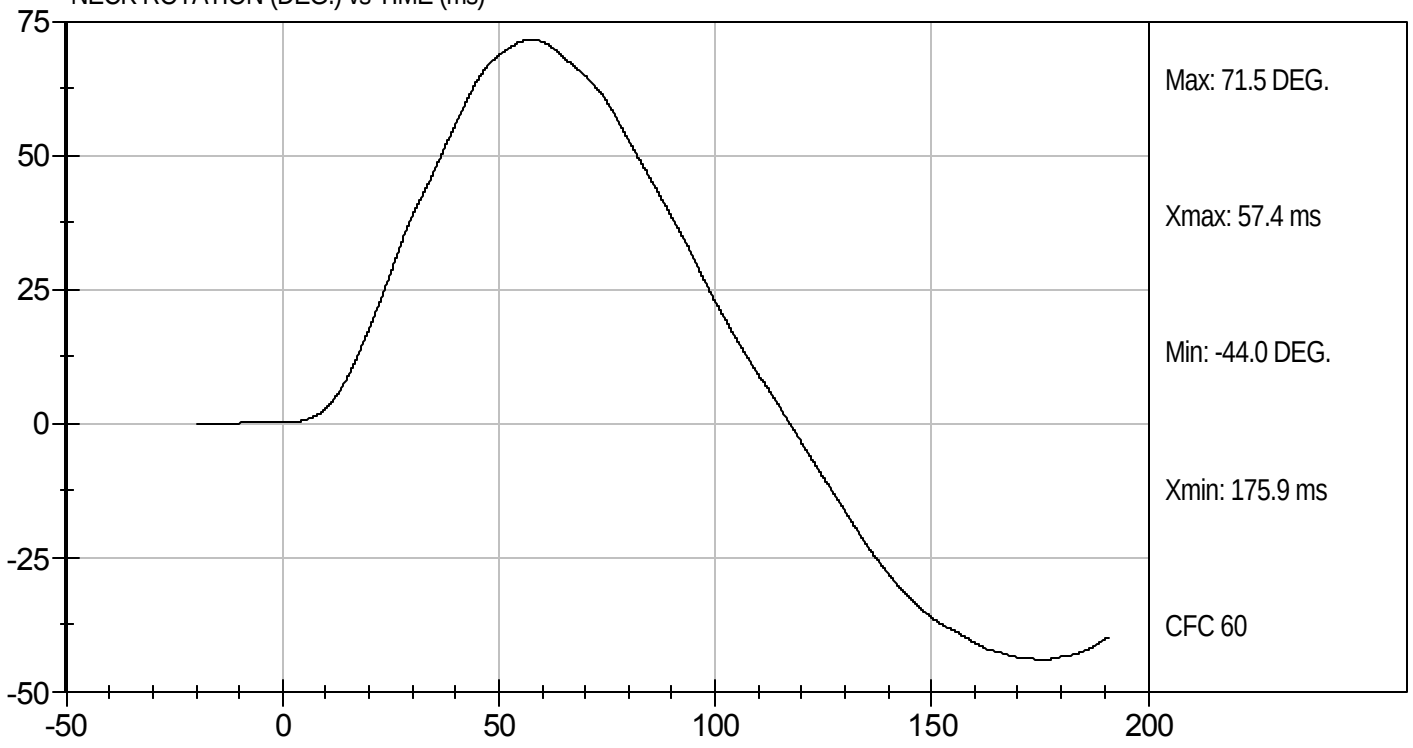
Test Desc: Neck Flexion
Component ID: D113612

Test Date: 10/28/11
Velocity: 23.15 ft/s, 7.06 m/s

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

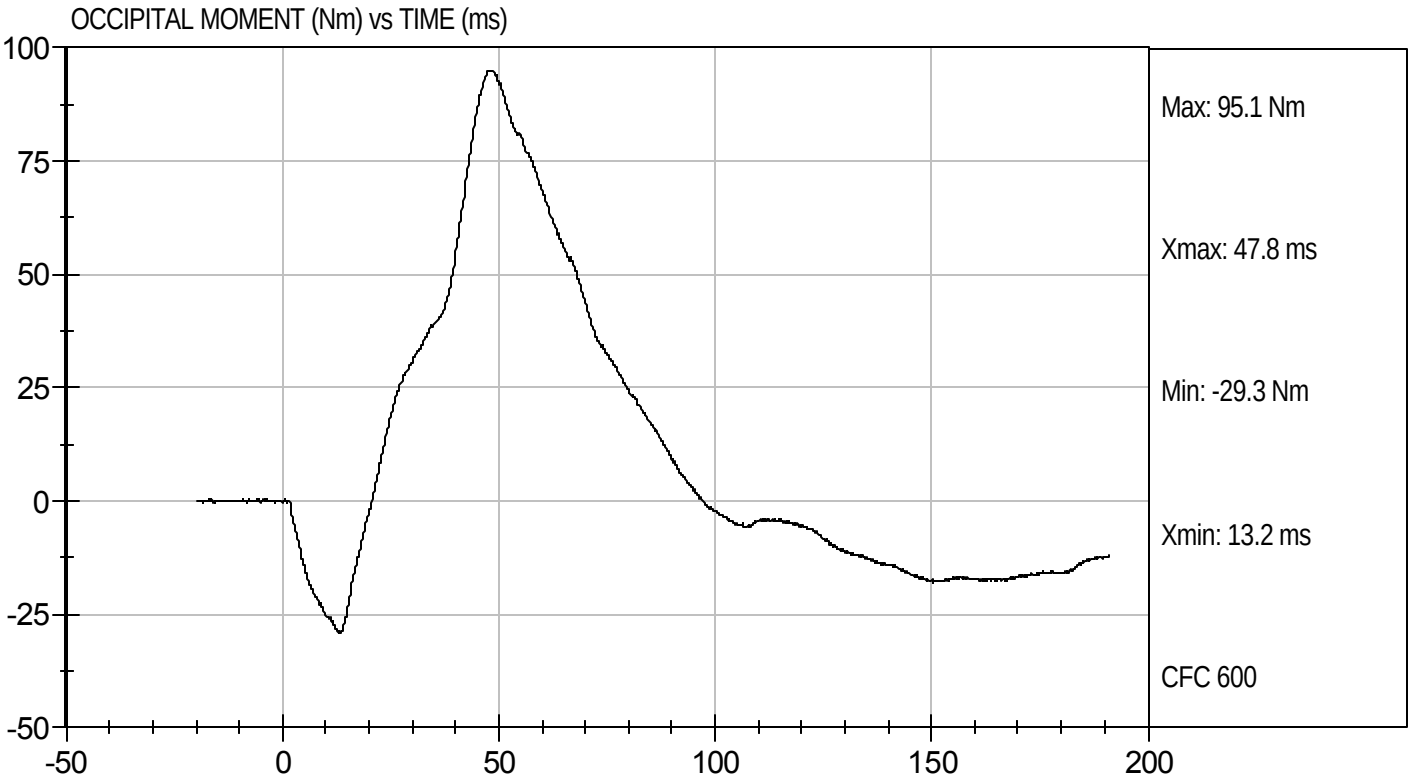


NECK ROTATION (DEG.) vs TIME (ms)



Test Desc: Neck Flexion
Component ID: D113612

Test Date: 10/28/11
Velocity: 23.15 ft/s, 7.06 m/s



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036 **Test I.D:** D113613

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.6	Pass
Laboratory Relative Humidity		%	10 to 70	34	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.13	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	17.46	Pass
	20 ms	G's	14.00 to 19.00	14.47	Pass
	30 ms	G's	11.00 to 16.00	13.28	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	13.26	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	41.5	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	93.8	Pass
	Time	ms	72.0 to 82.0	78.2	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	160.9	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-59.0	Pass
	Time	ms	65.0 to 79.0	70.3	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	140.1	Pass
			Overall Test Results		Pass

Jessica Hall
Laboratory Technician

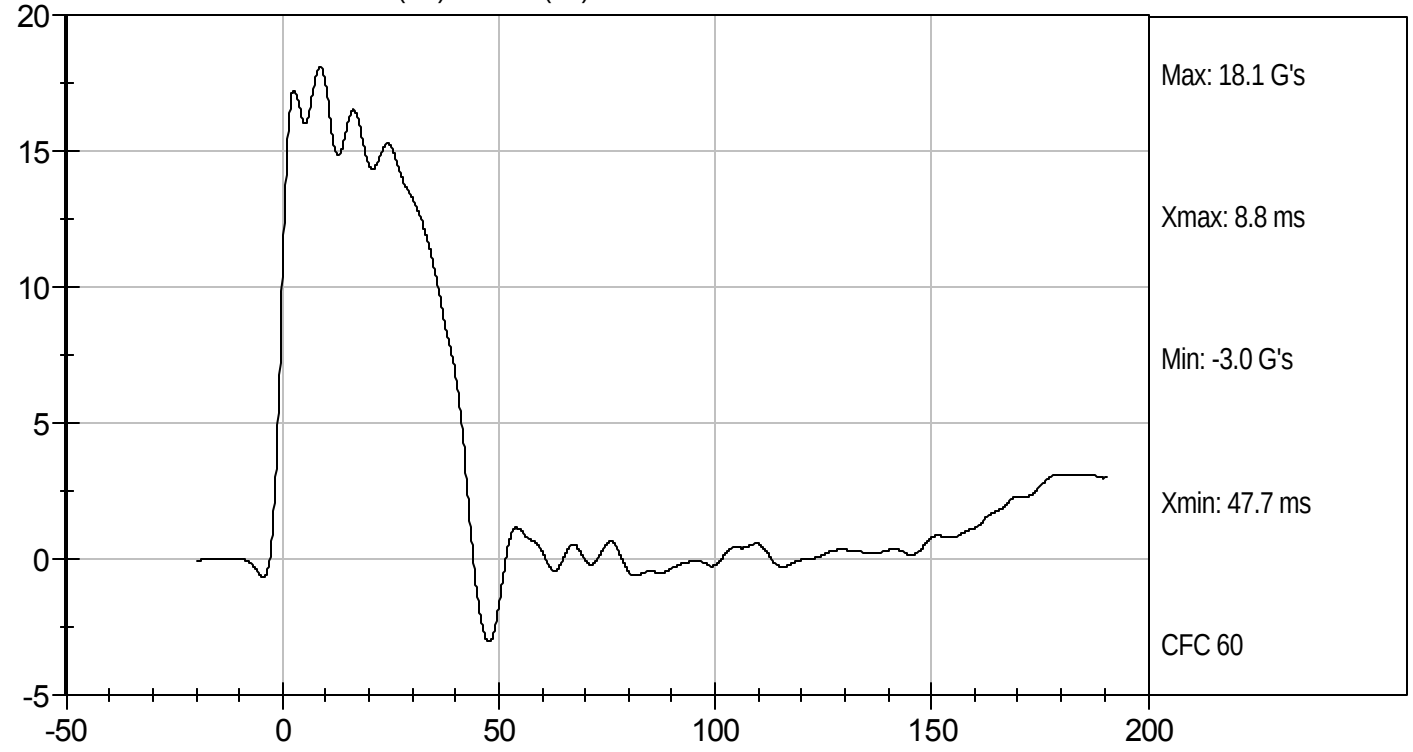
10/31/11
Test Date

David Winkelbauer
Approved By

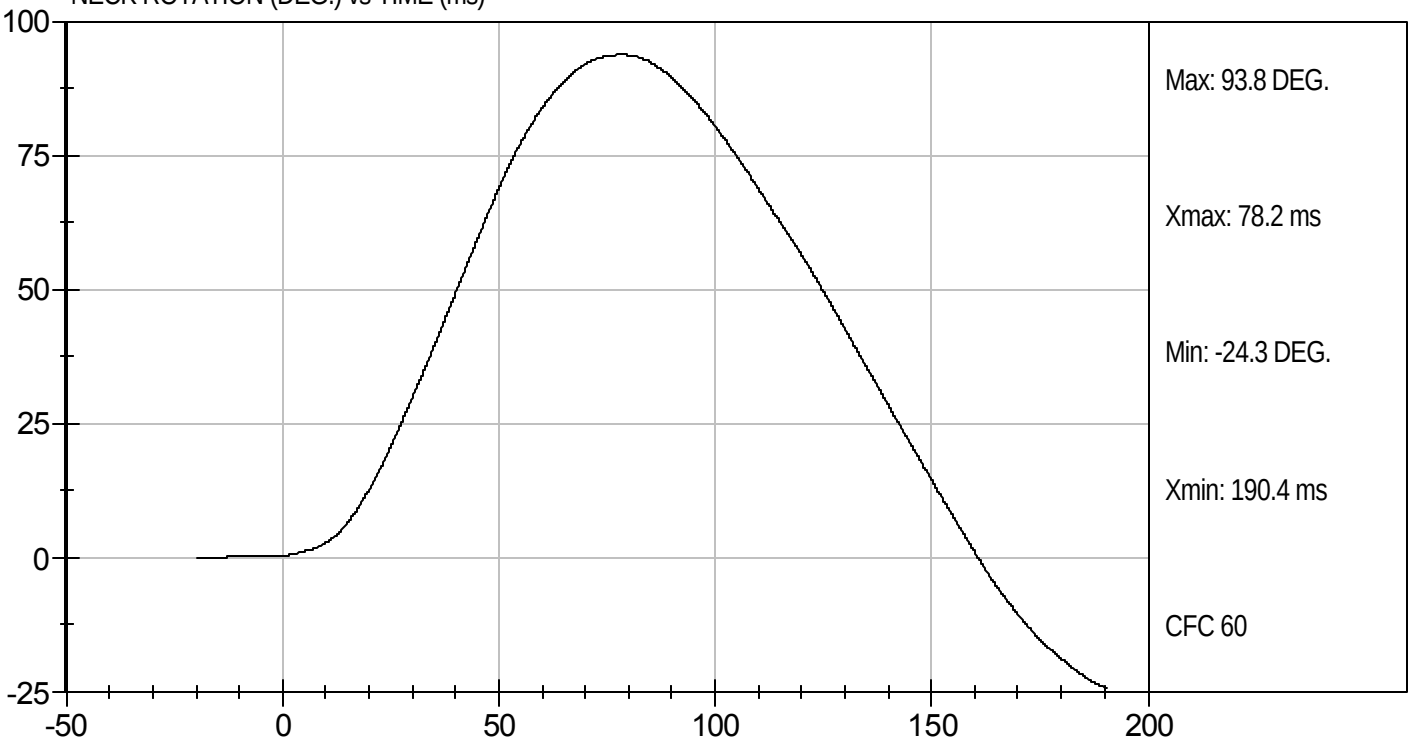
Test Desc: Neck Extension
Component ID: D113613

Test Date: 10/31/11
Velocity: 20.10 ft/s, 6.13 m/s

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

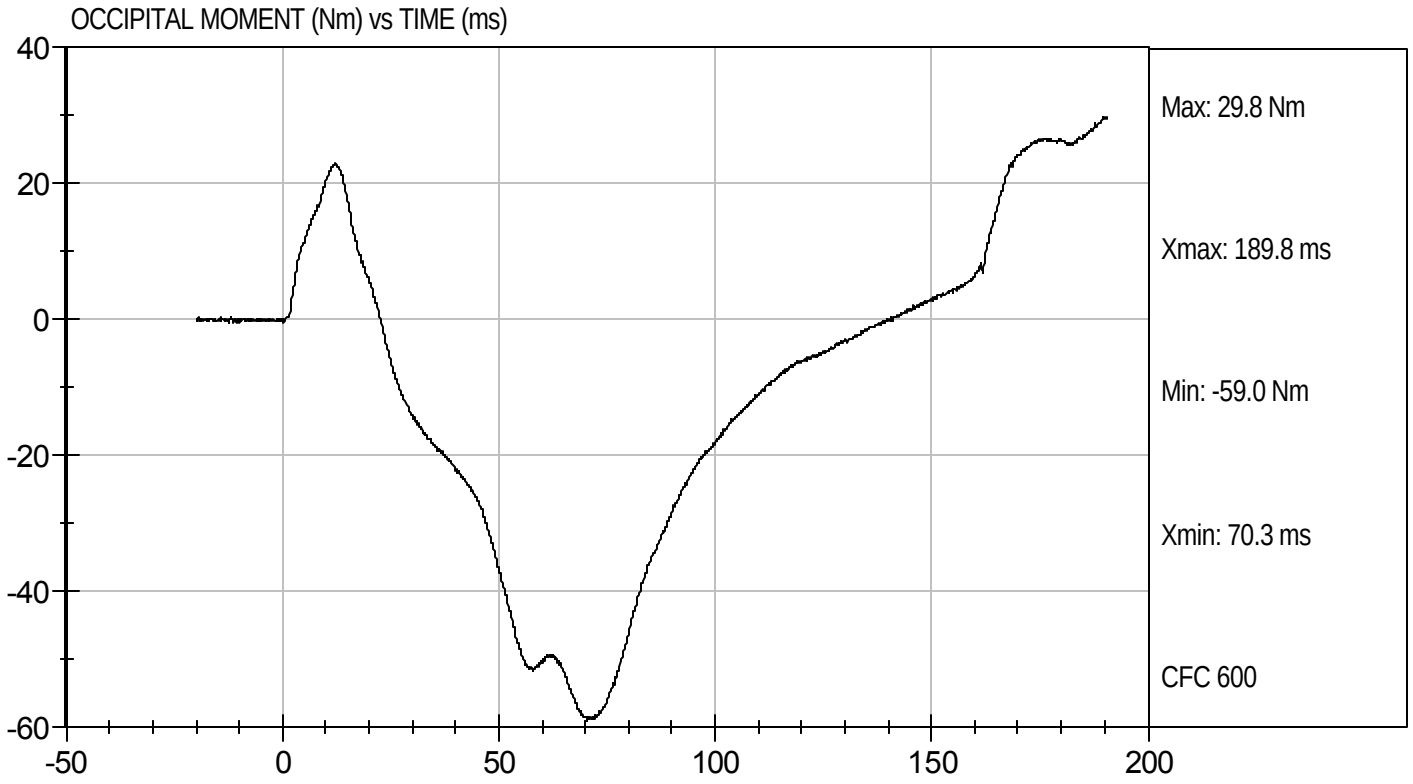


NECK ROTATION (DEG.) vs TIME (ms)



Test Desc: Neck Extension
Component ID: D113613

Test Date: 10/31/11
Velocity: 20.10 ft/s, 6.13 m/s



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036 **Test I.D:** D113614

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	34	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,424	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.78	Pass
Internal Hysteresis	%	69 to 85	71	Pass
		Overall Test Results		Pass

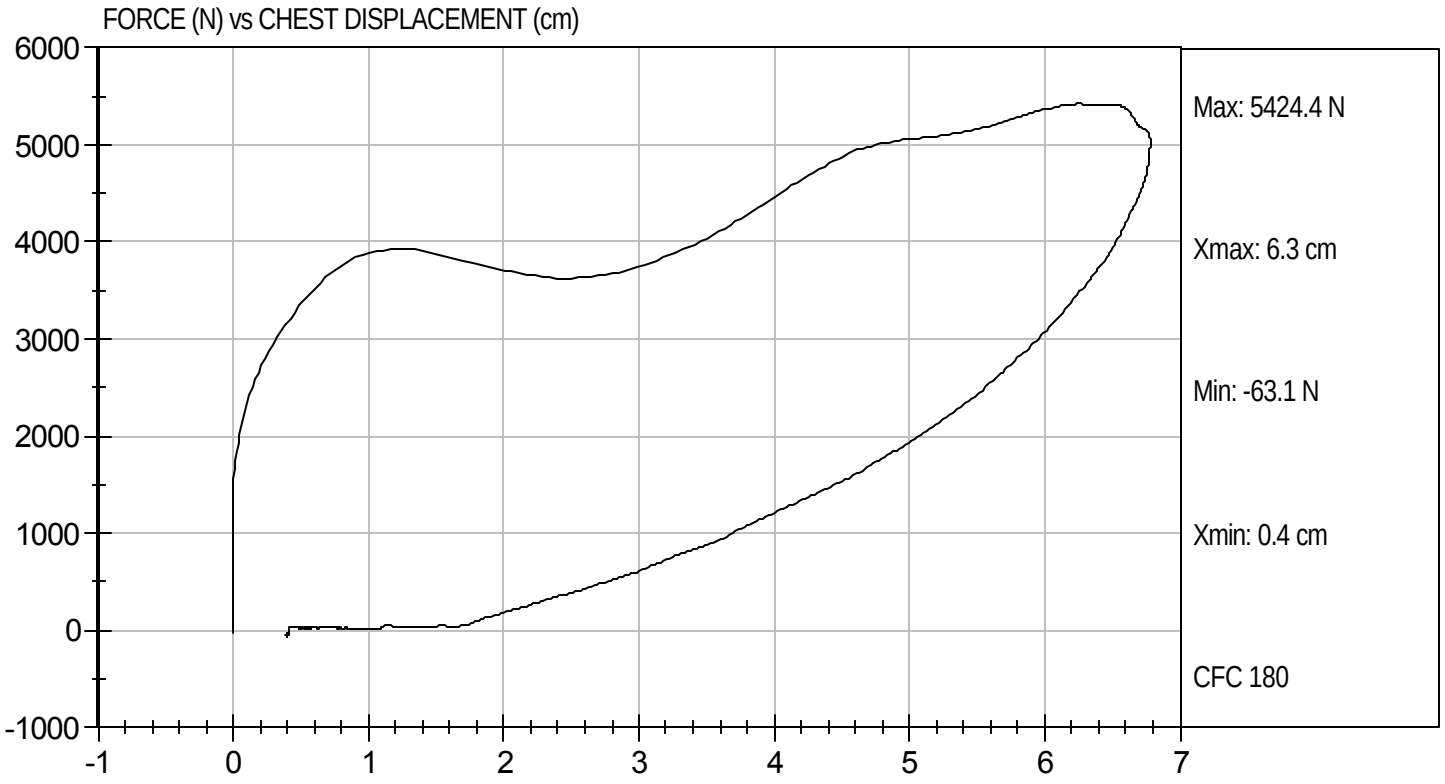
Jessica Gall
Laboratory Technician

10/31/11
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Impact
Component ID: D113614

Test Date: 10/31/11
Velocity: 22.22 ft/s, 6.77 m/s



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036 **Test I.D:** D113615

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Probe Velocity	m/s	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	4,789	Pass
		Overall Test Results		Pass

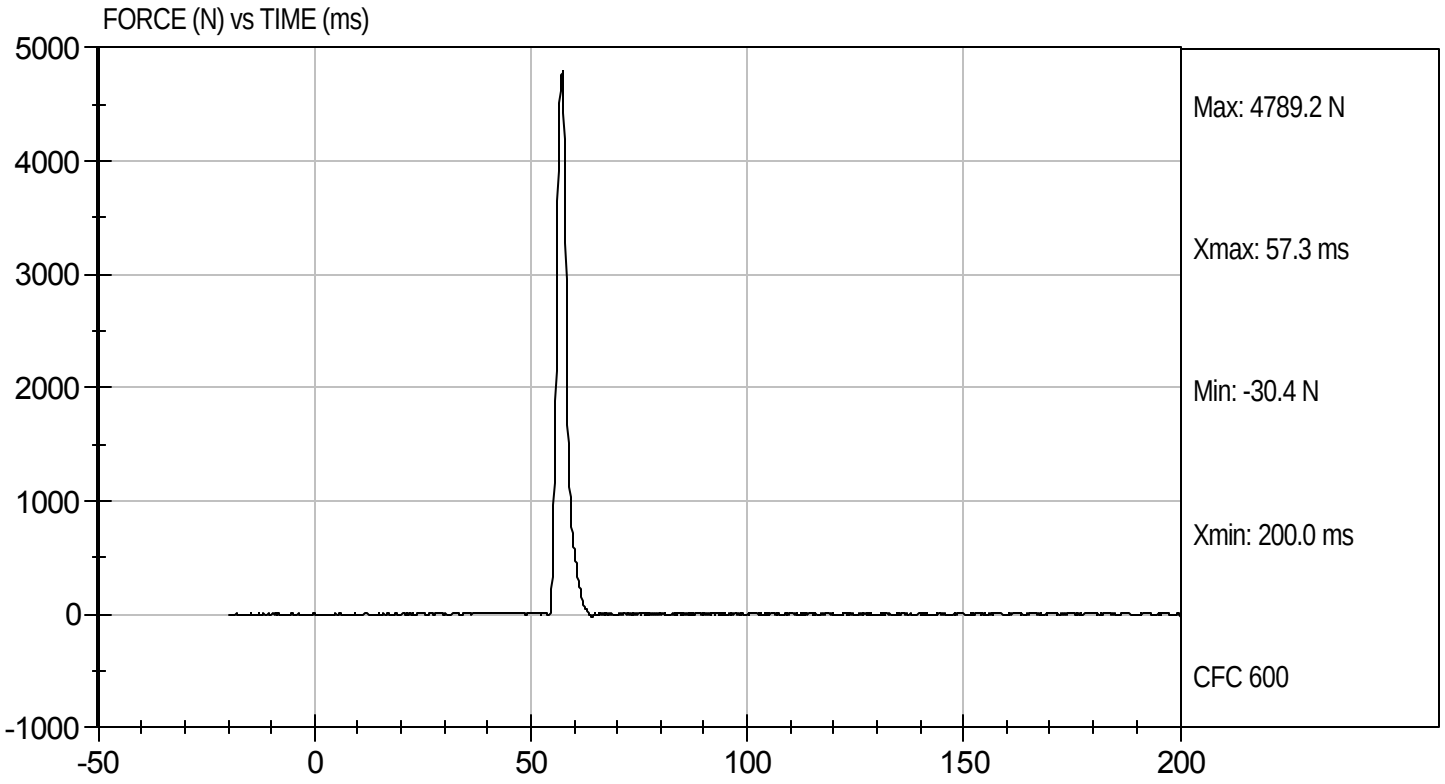
Jessica Hall
Laboratory Technician

10/28/11
Test Date

David Winkelbauer
Approved By

Test Desc: Right Knee
Component ID: D113615

Test Date: 10/28/11
Velocity: 6.92 ft/s, 2.11 m/s



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036 **Test I.D:** D113616

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	Newtons	4715 to 5782	5,372	Pass
		Overall Test Results		Pass

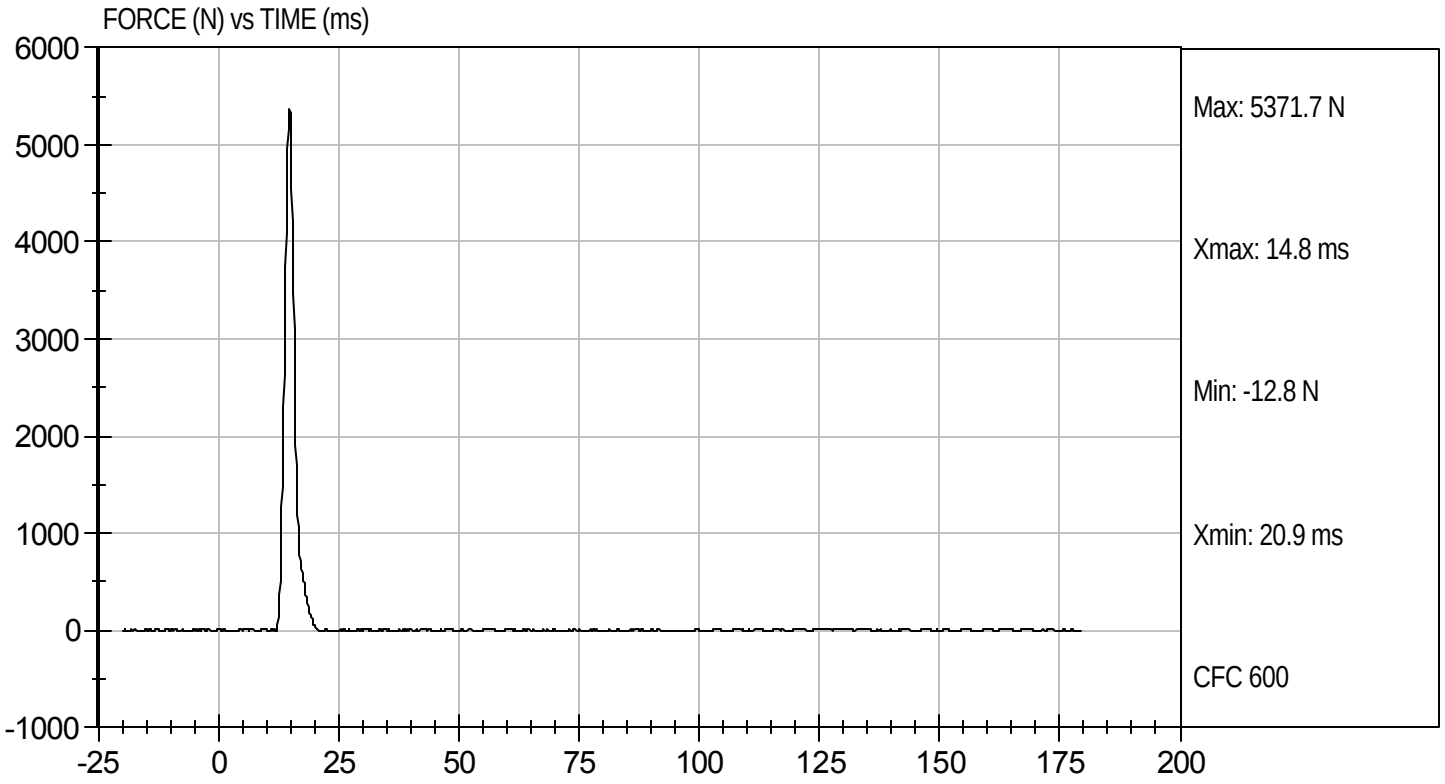
Jessica Hall
Laboratory Technician

10/28/11
Test Date

David Winkelbauer
Approved By

Test Desc: Left Knee
Component ID: D113616

Test Date: 10/28/11
Velocity: 6.94 ft/s, 2.12 m/s



MGA RESEARCH CORPORATION

HIP-FEMUR FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036 **Test I.D:** D113610

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.0	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	28	28	Pass
Rotation Rate	deg/s	5.0 -10.0	5.7	5.7	Pass
30 Degrees	Nm	94.9 Nm Max	89.9	78.1	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 - 50.0 Degree Max Rotation	40.7	41.1	Pass
		Overall Test Results			Pass

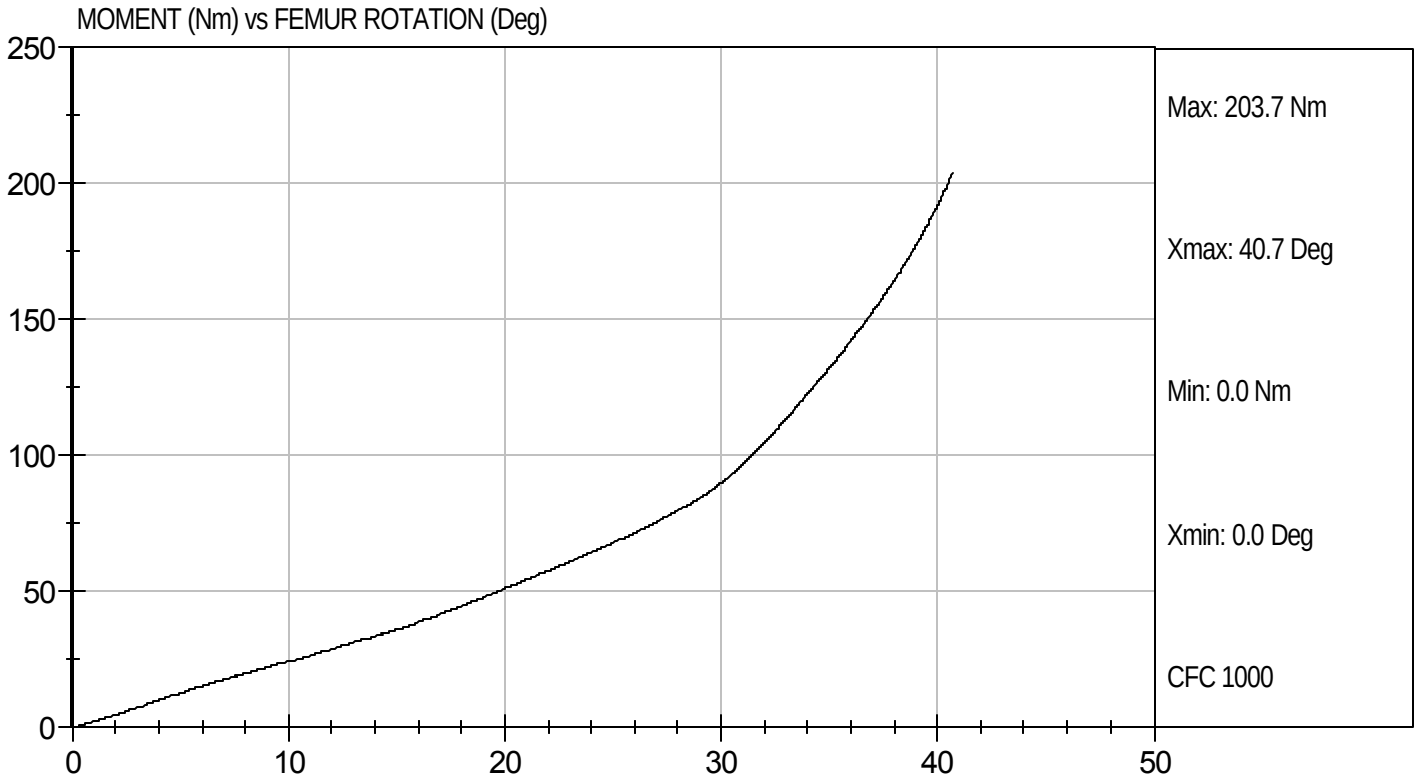
Jessica Gall
Laboratory Technician

10/28/11
Test Date

David Winkelbauer
Approved By

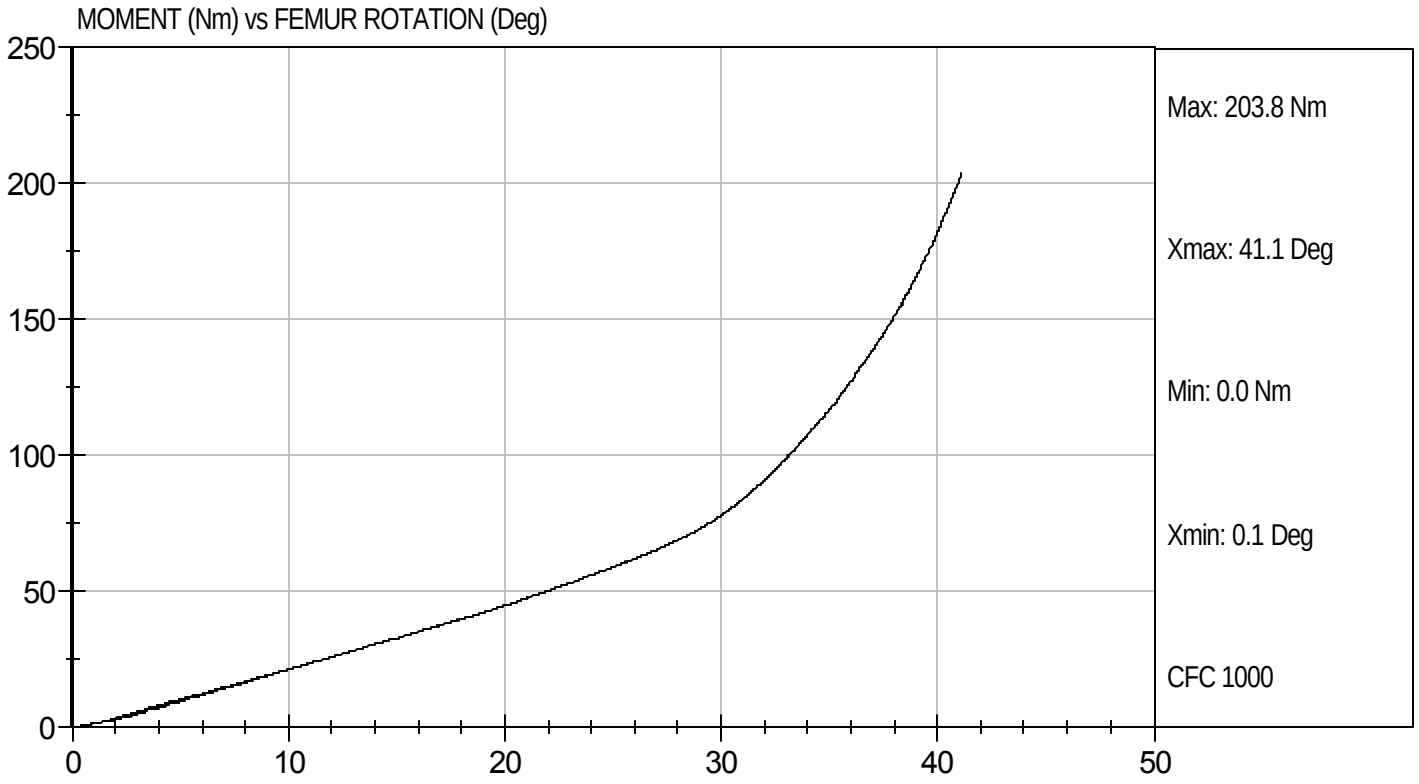
Test Desc: Hip Femur Flexion
Component ID: D113619

Test Date: 10/28/11
Velocity: 0 ft/s, 0.00 m/s



Test Desc: Hip Femur Flexion
Component ID: D113610

Test Date: 10/28/11
Velocity: 0 ft/s, 0.00 m/s



MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138 **Test ID:** D113451

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Peak Resultant Acceleration	G's	250 to 300	280	Pass
Peak Lateral Acceleration	G's	+/- 15	8.1	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

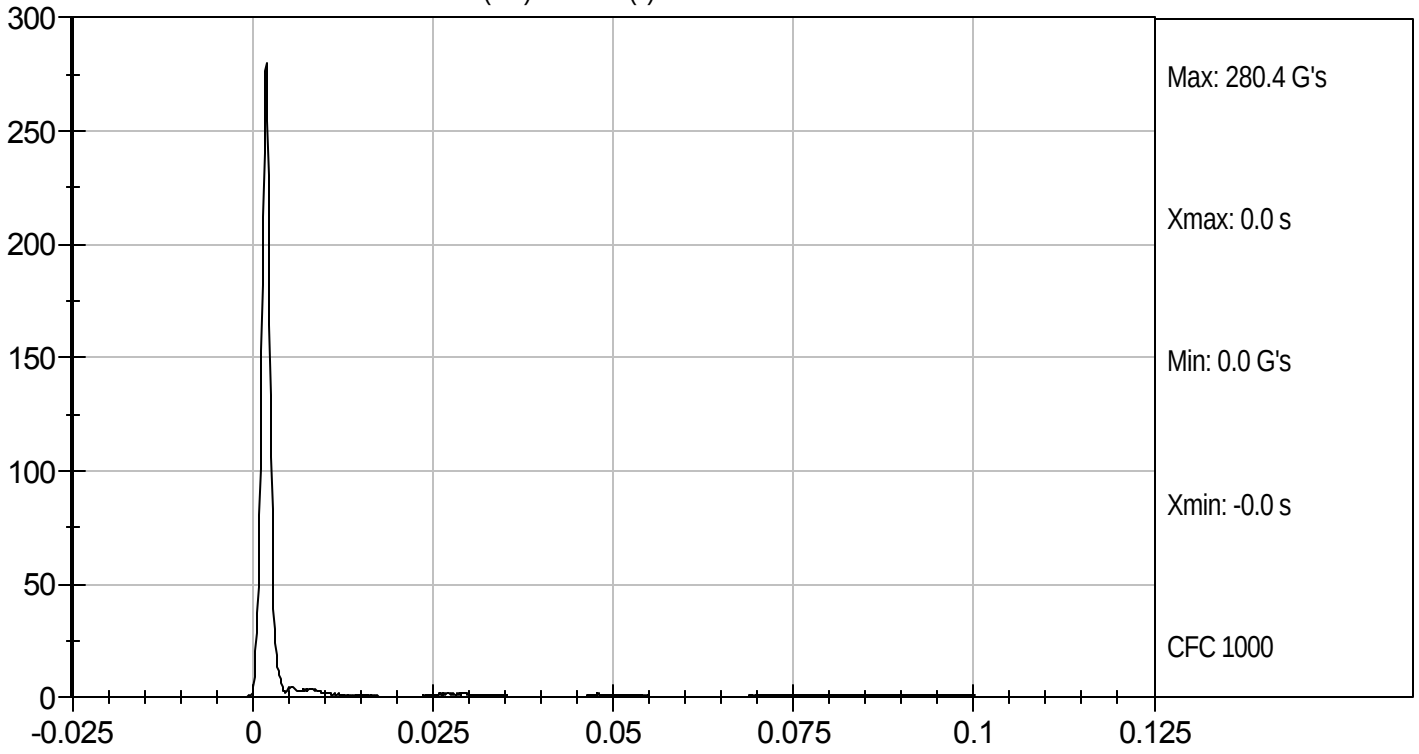
10/12/11
Test Date

David Winkelbauer
Approved By

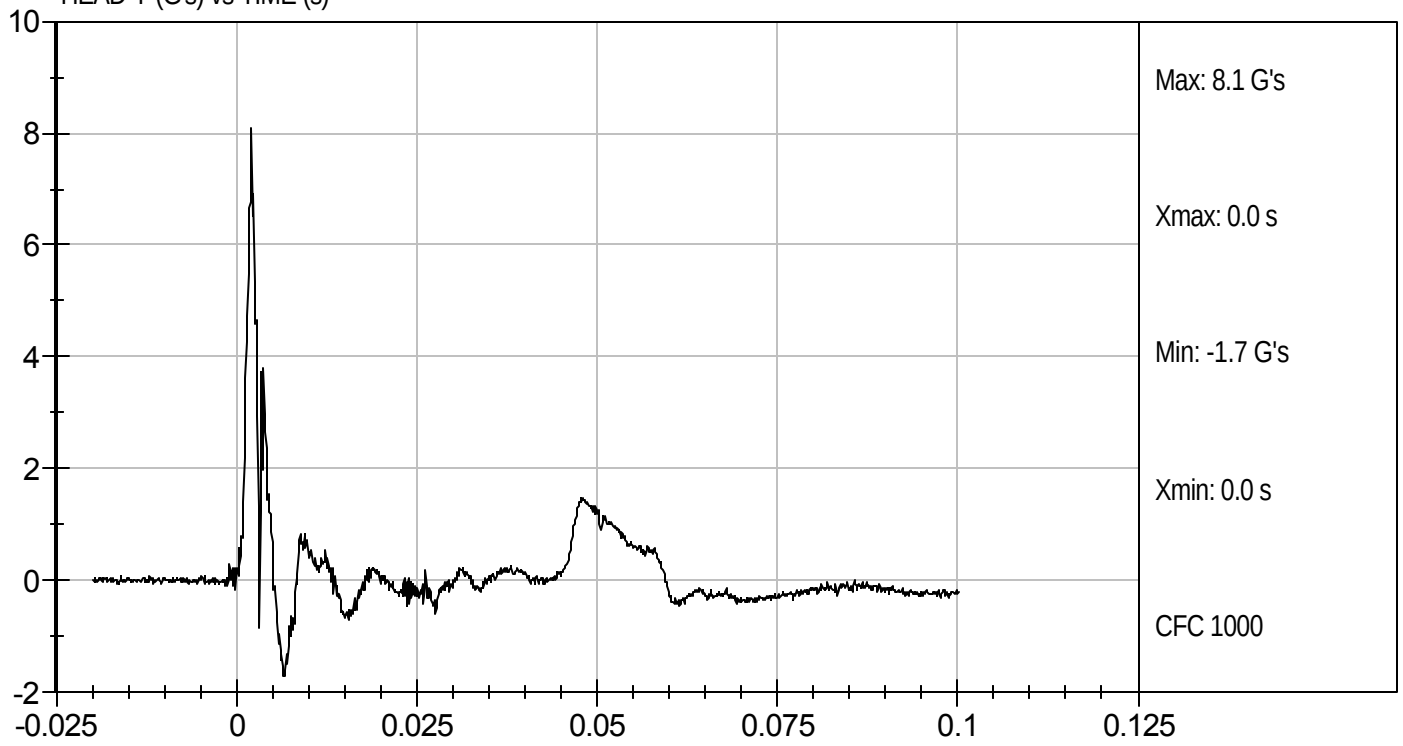
Test Desc: Head Drop
Component ID: D113451

Test Date: 10/12/11
Velocity: 0 ft/s, 0 m/s

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



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



MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138 **Test I.D:** D113452

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	44	Pass
Pendulum Speed		m/s	6.89 to 7.13	6.96	Pass
Pendulum Deceleration	10 ms	m/s	2.1 to 2.5	2.5	Pass
	20 ms	m/s	4.0 to 5.0	4.4	Pass
	30 ms	m/s	5.8 to 7.0	6.1	Pass
D Plane Rotation	Max	deg	77 to 91	79	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	69 to 83	76	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	85	Pass
			Overall Results		Pass

Jessica Hall
Laboratory Technician

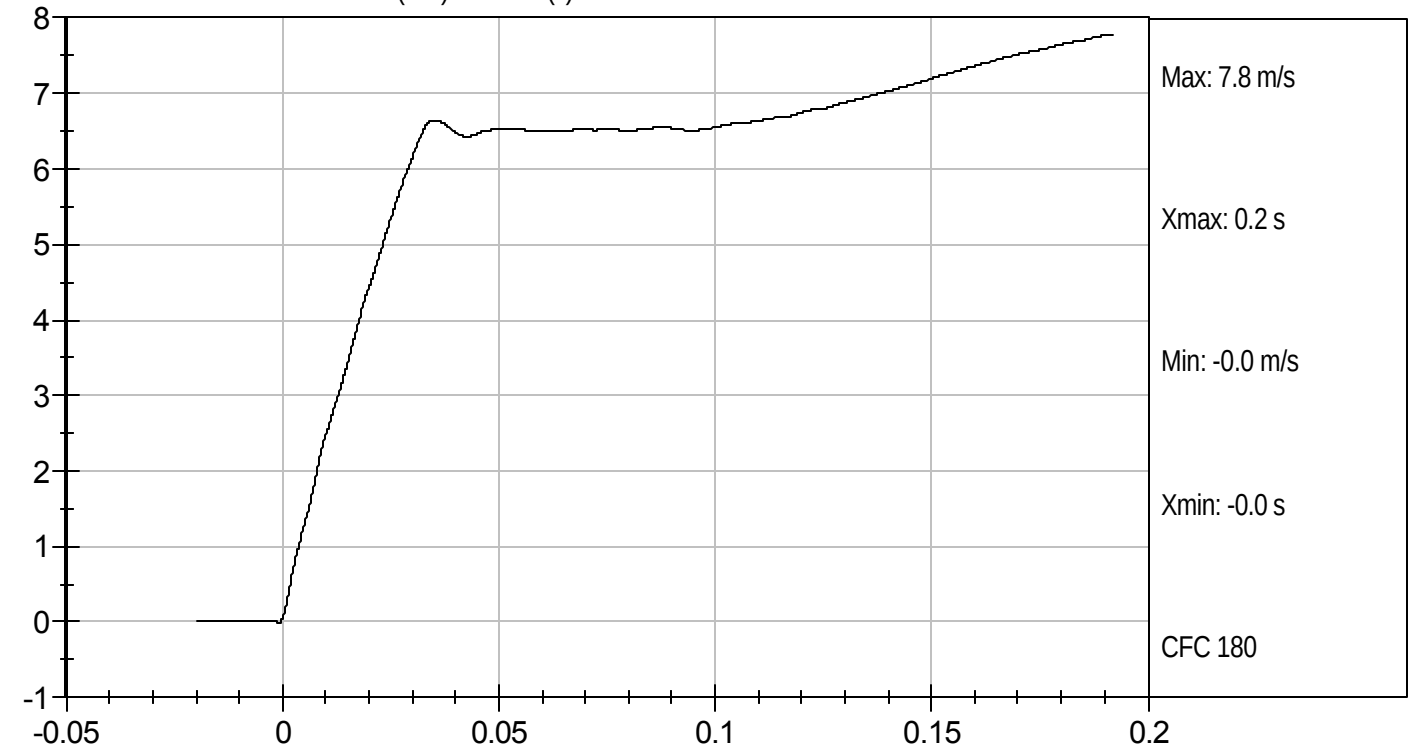
10/12/11
Test Date

David Winkelbauer
Approved By

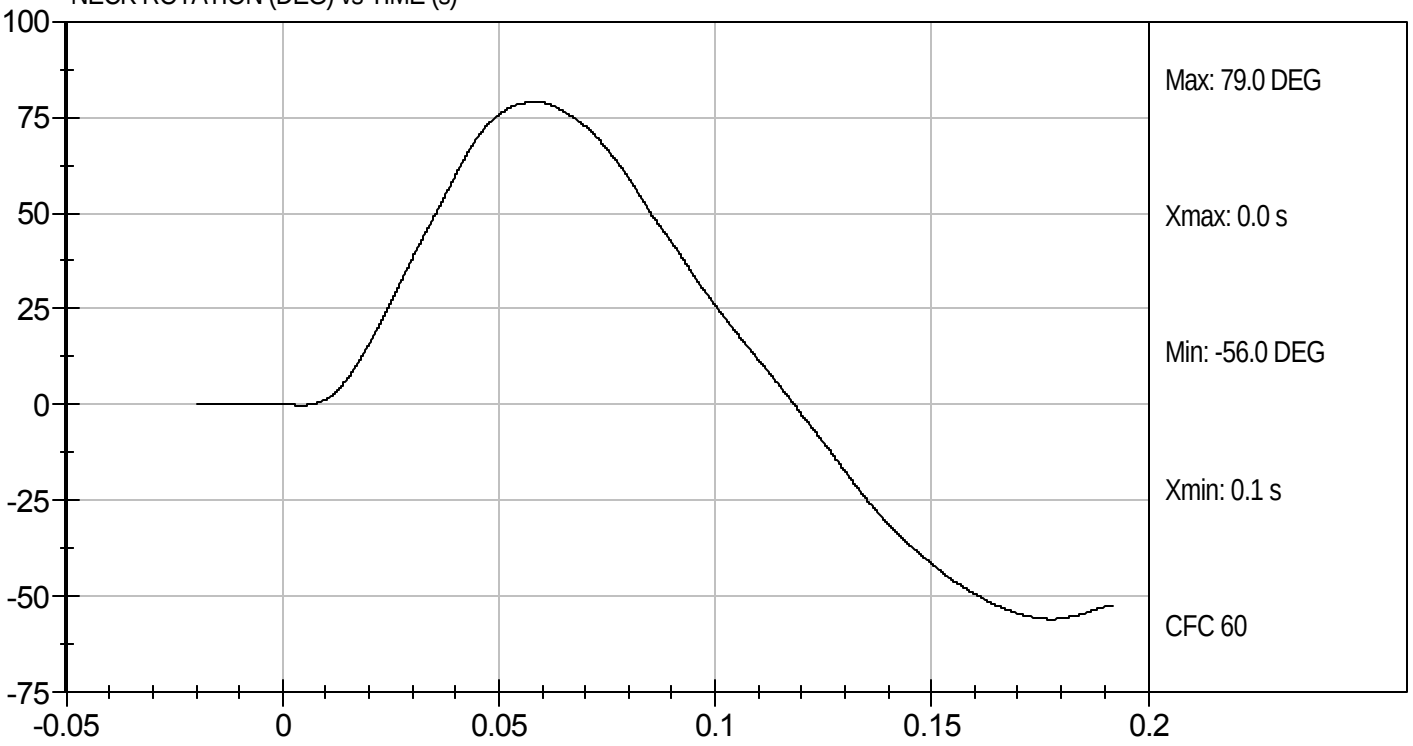
Test Desc: Neck Flexion
Component ID: D113452

Test Date: 10/12/11
Velocity: 22.83 ft/s, 6.96 m/s

PENDULUM DECELERATION (m/s) vs TIME (s)

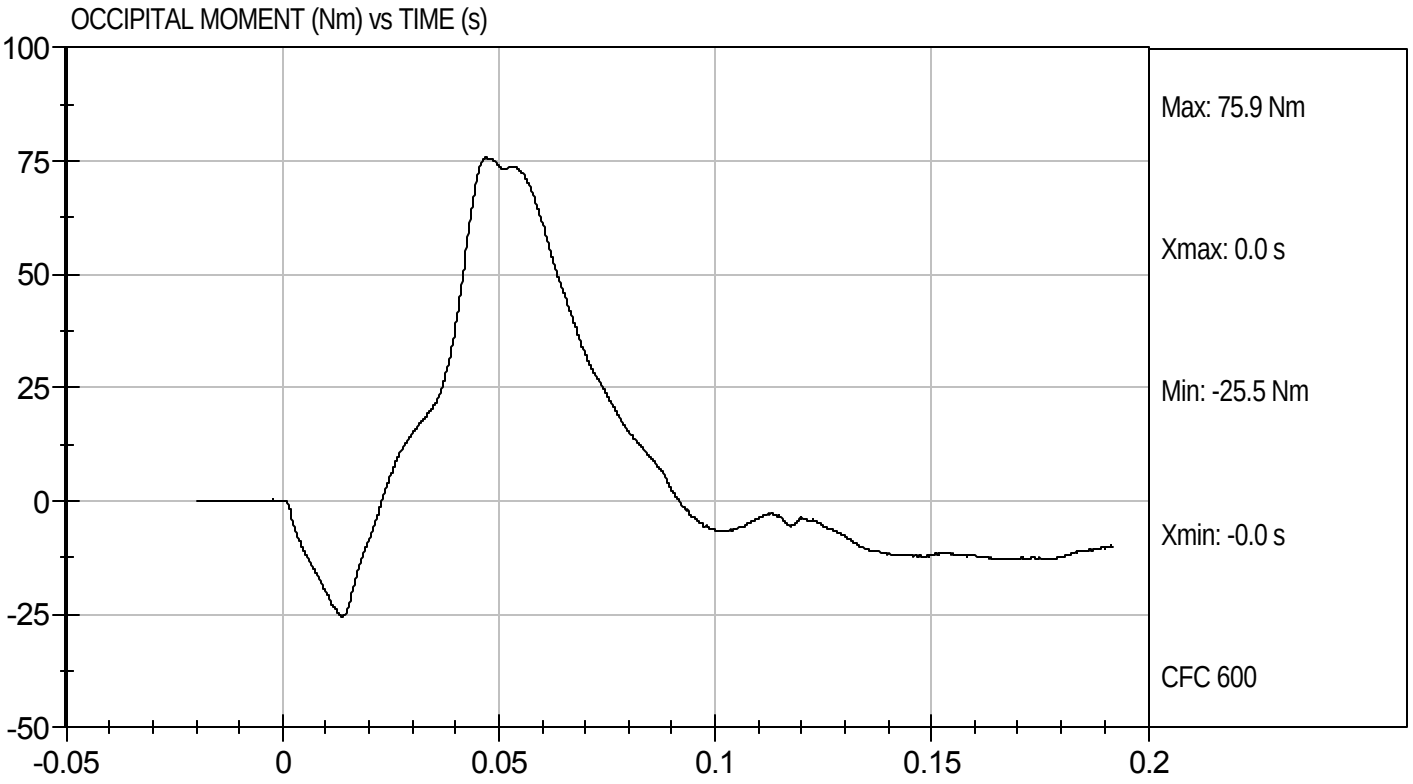


NECK ROTATION (DEG) vs TIME (s)



Test Desc: Neck Flexion
Component ID: D113452

Test Date: 10/12/11
Velocity: 22.83 ft/s, 6.96 m/s



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138 **Test I.D:** D113453

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity		%	10 to 70	44	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	m/s	1.5 to 1.9	1.9	Pass
	20 ms	m/s	3.1 to 3.9	3.6	Pass
	30 ms	m/s	4.6 to 5.6	5.1	Pass
D Plane Rotation	Max	deg	99 to 114	104	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-56	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	102	Pass
			Overall Results		Pass

Jessica Hall
Laboratory Technician

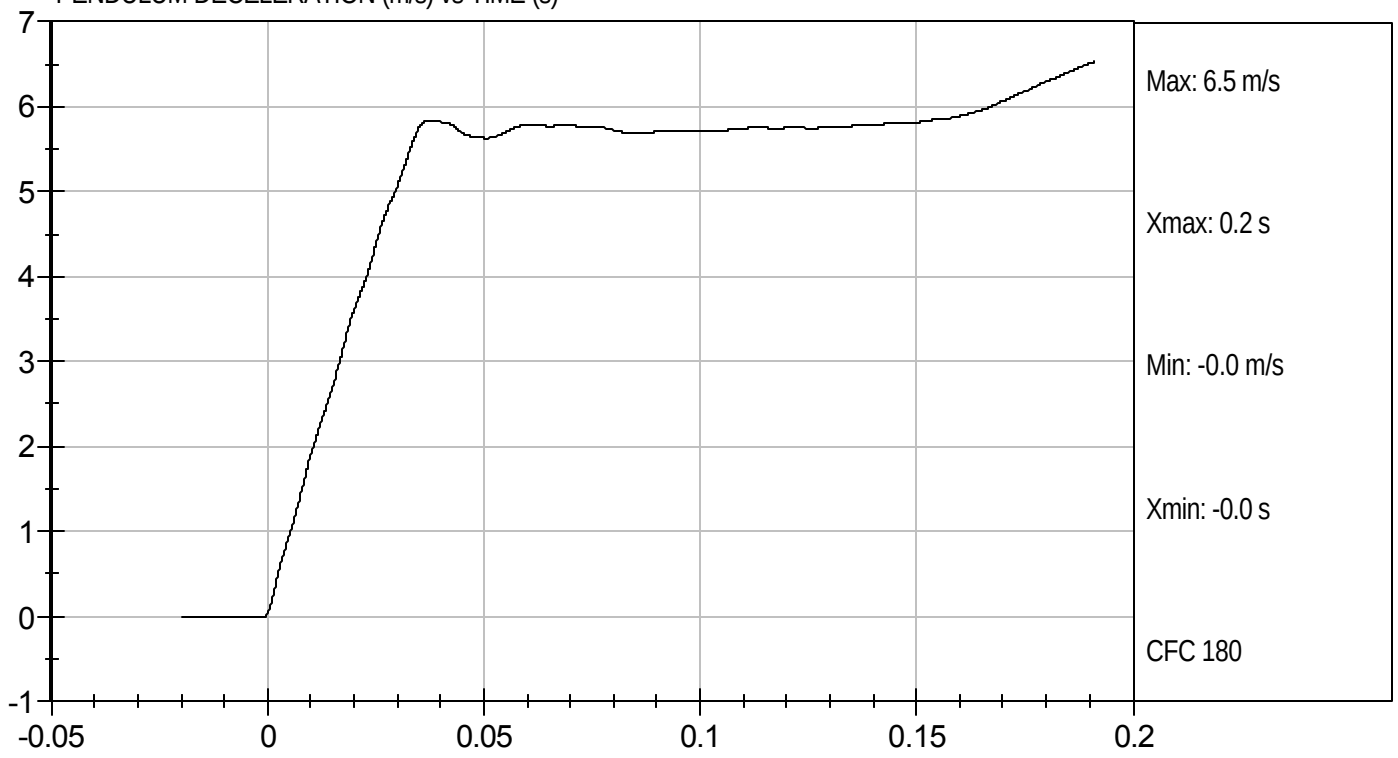
10/12/11
Test Date

David Winkelbauer
Approved By

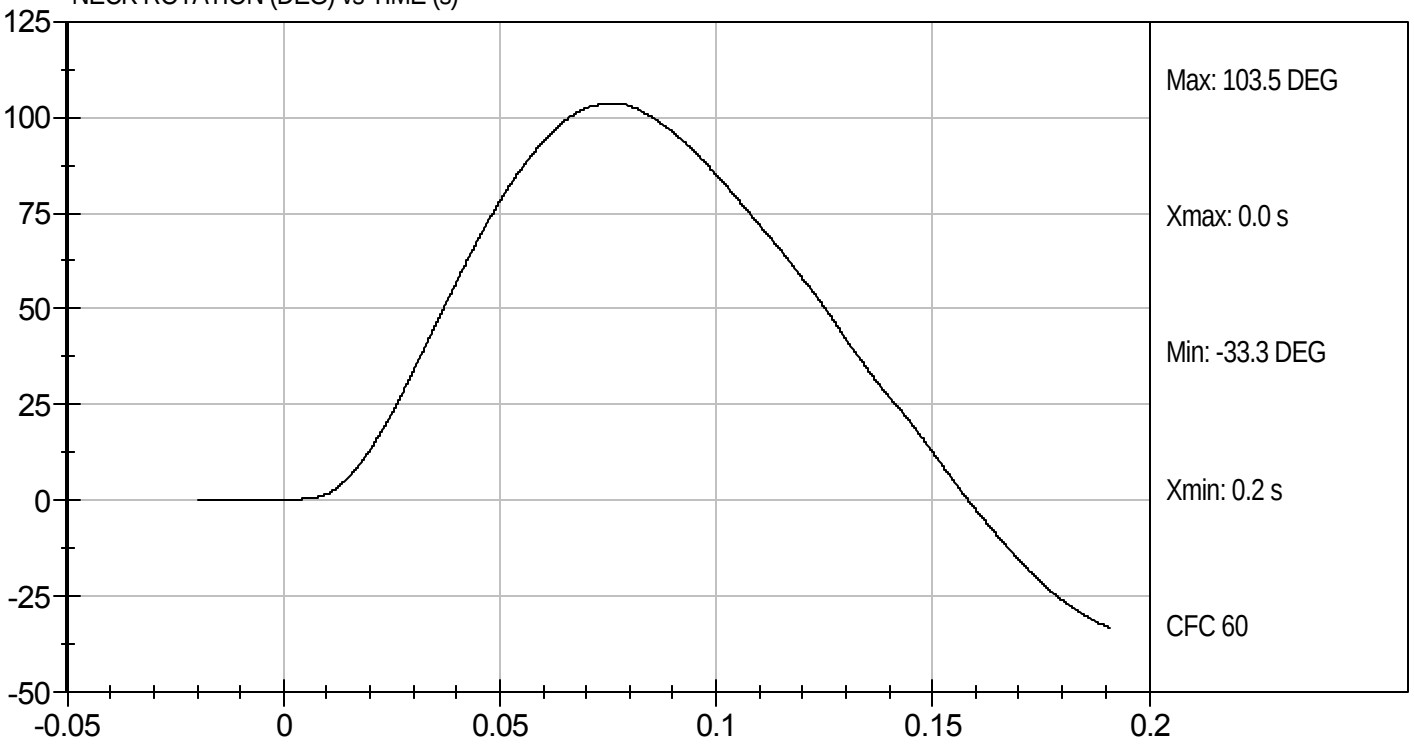
Test Desc: Neck Extension
Component ID: D113453

Test Date: 10/12/11
Velocity: 20.08 ft/s, 6.12 m/s

PENDULUM DECELERATION (m/s) vs TIME (s)

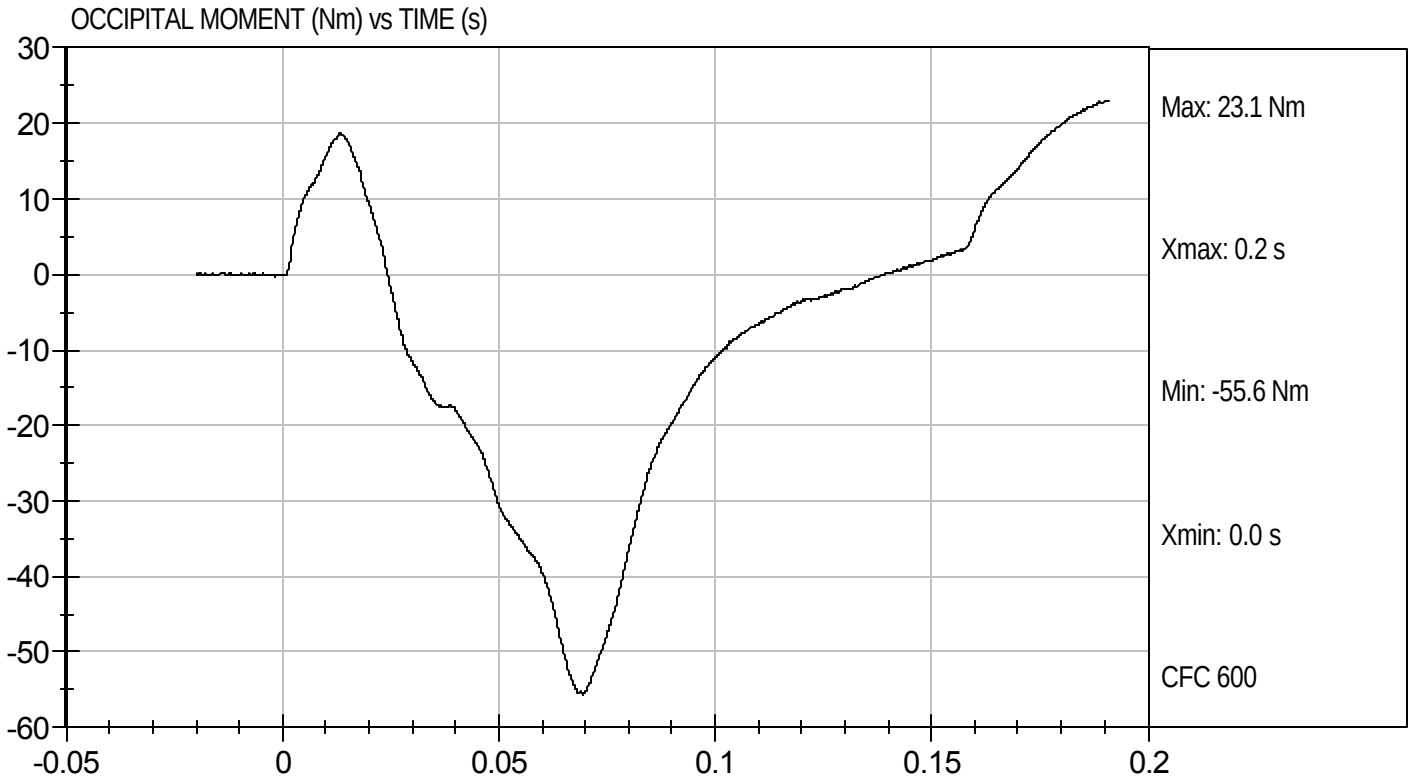


NECK ROTATION (DEG) vs TIME (s)



Test Desc: Neck Extension
Component ID: D113453

Test Date: 10/12/11
Velocity: 20.08 ft/s, 6.12 m/s



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 5TH PERCENTILE

ATD Serial No: 138 **Test I.D:** D113454

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	22.0	Pass
Relative Humidity	%	10 to 70	46	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	56	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	4.16	Pass
Internal Hysteresis	%	69 to 85	69	Pass
Peak Force 18 mm - 50 mm	N	<= 4,600 N	3952	Pass
		Overall Test Results		Pass

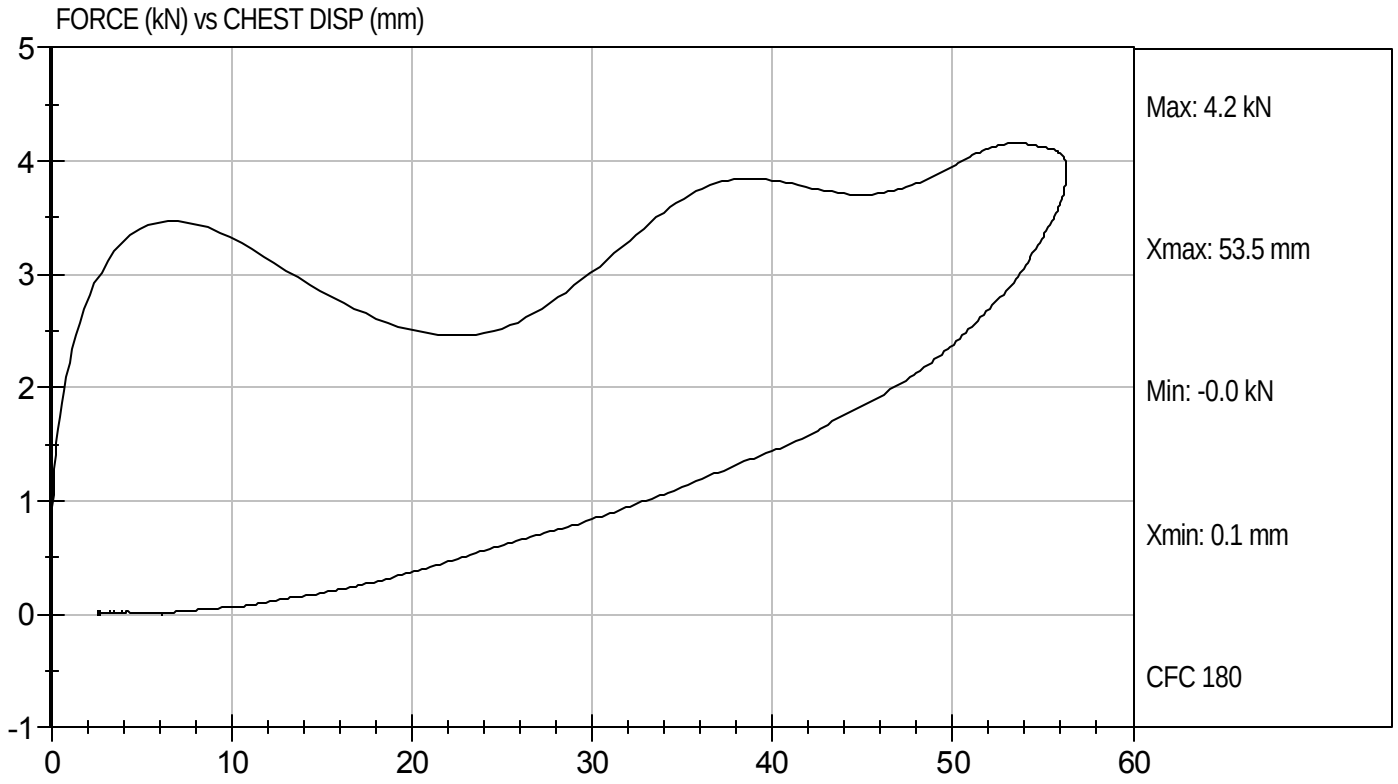
Jessica Gall
Laboratory Technician

10/13/11
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Impact
Component ID: D113454

Test Date: 10/13/11
Velocity: 22.22 ft/s, 6.77 m/s



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138 **Test I.D:** D113455

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Probe Speed	m/s	2.07 to 2.13	2.13	Pass
Maximum Force	kN	3.45 to 4.06	3.73	Pass
		Overall Test Results		Pass

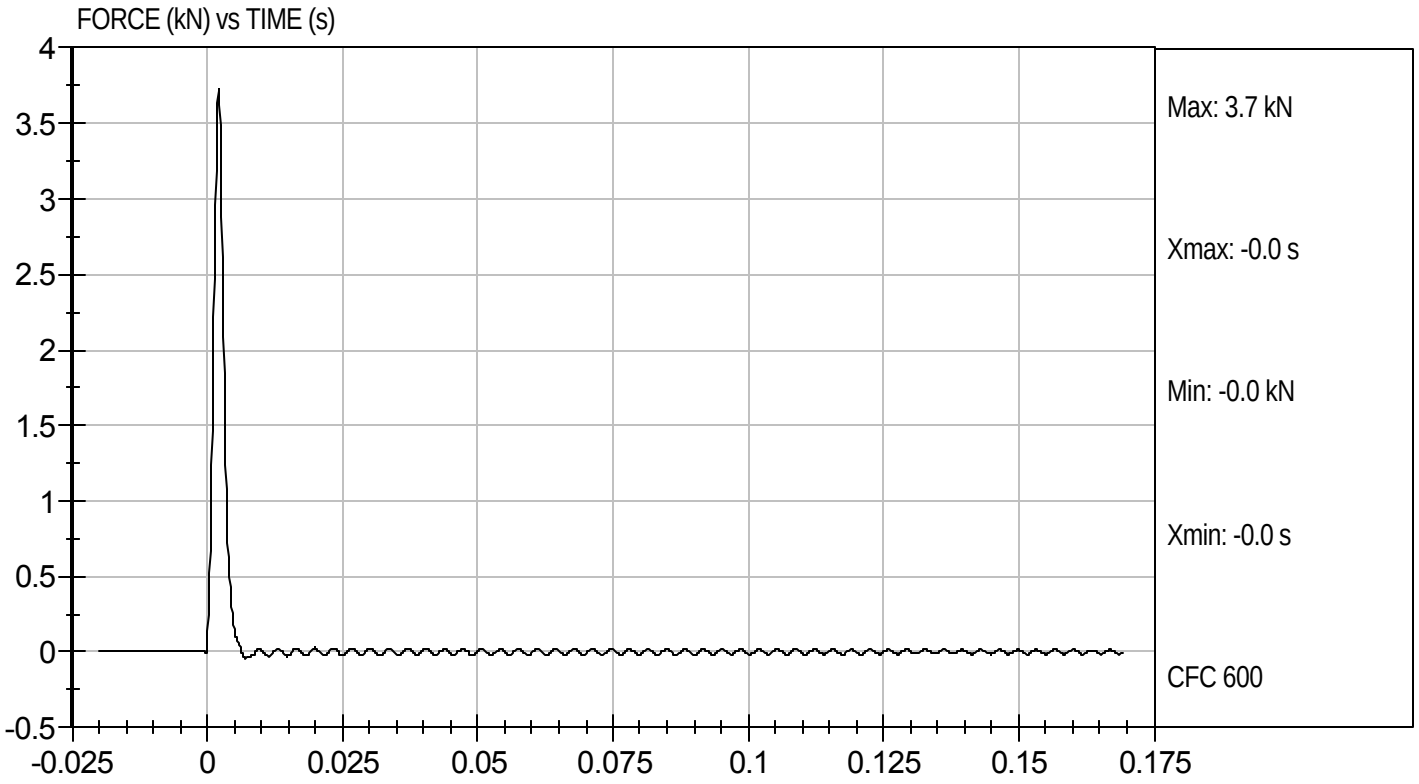
Jessica Gall
Laboratory Technician

10/12/11
Test Date

David Winkelbauer
Approved By

Test Desc: Right Knee
Component ID: D113455

Test Date: 10/12/11
Velocity: 6.97 ft/s, 2.13 m/s



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138 **Test I.D:** D113456

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	kN	3.45 to 4.06	3.65	Pass
		Overall Test Results		Pass

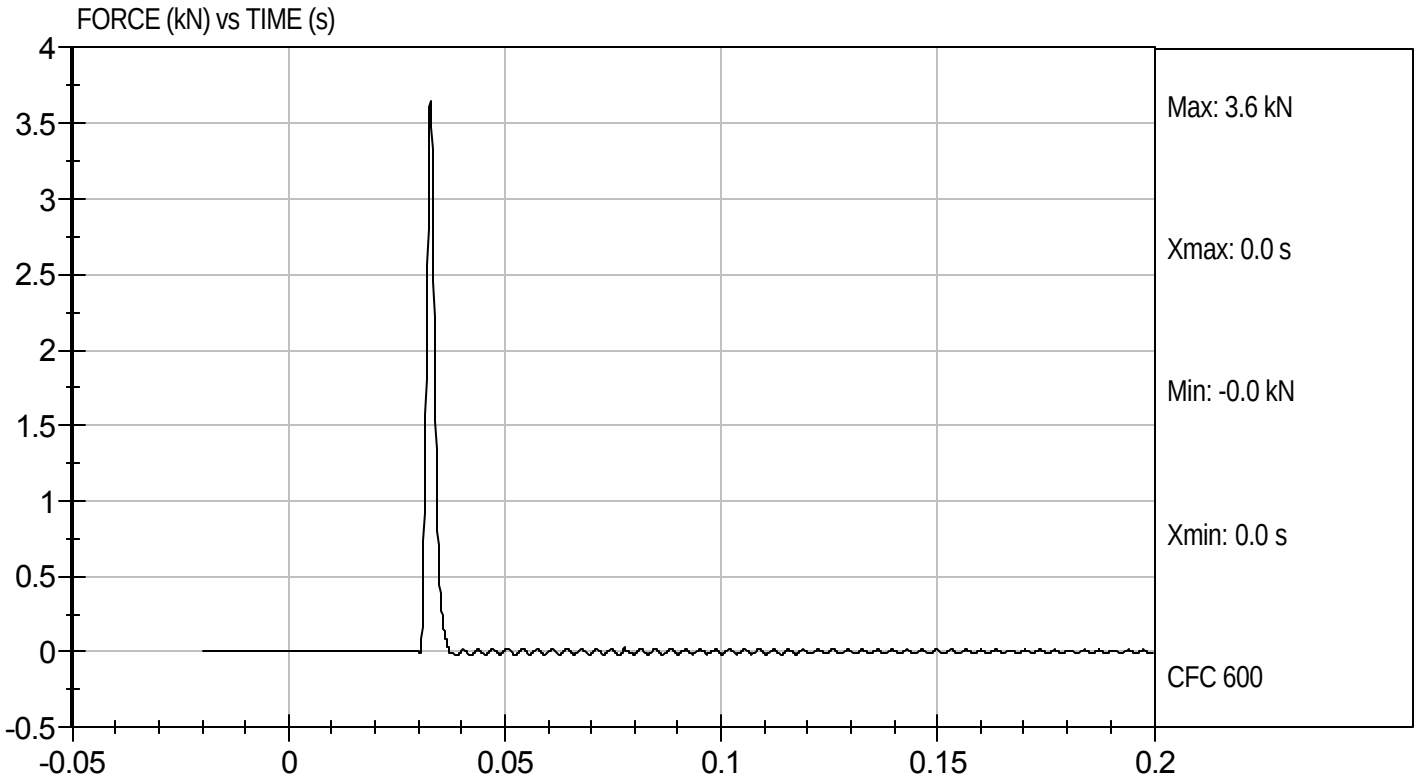
Jessica Gall
Laboratory Technician

10/12/11
Test Date

David Winkelbauer
Approved By

Test Desc: Left Knee
Component ID: D113456

Test Date: 10/12/11
Velocity: 6.94 ft/s, 2.12 m/s



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138 **Test I.D:** D113457

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	45	Pass
Initial Angle	deg	0 to 20	16	Pass
Return Angle	deg	+/- 8	4	Pass
Force at 45 deg	N	320 to 390	380	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 to 1.5	1.0	Pass
		Overall Result		Pass

Jessica Gall
Laboratory Technician

10/13/11
Test Date

David Winkelbauer
Approved By

MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138 **Test ID:** D113621

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Peak Resultant Acceleration	G's	250 to 300	277	Pass
Peak Lateral Acceleration	G's	+/- 15	-7.5	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

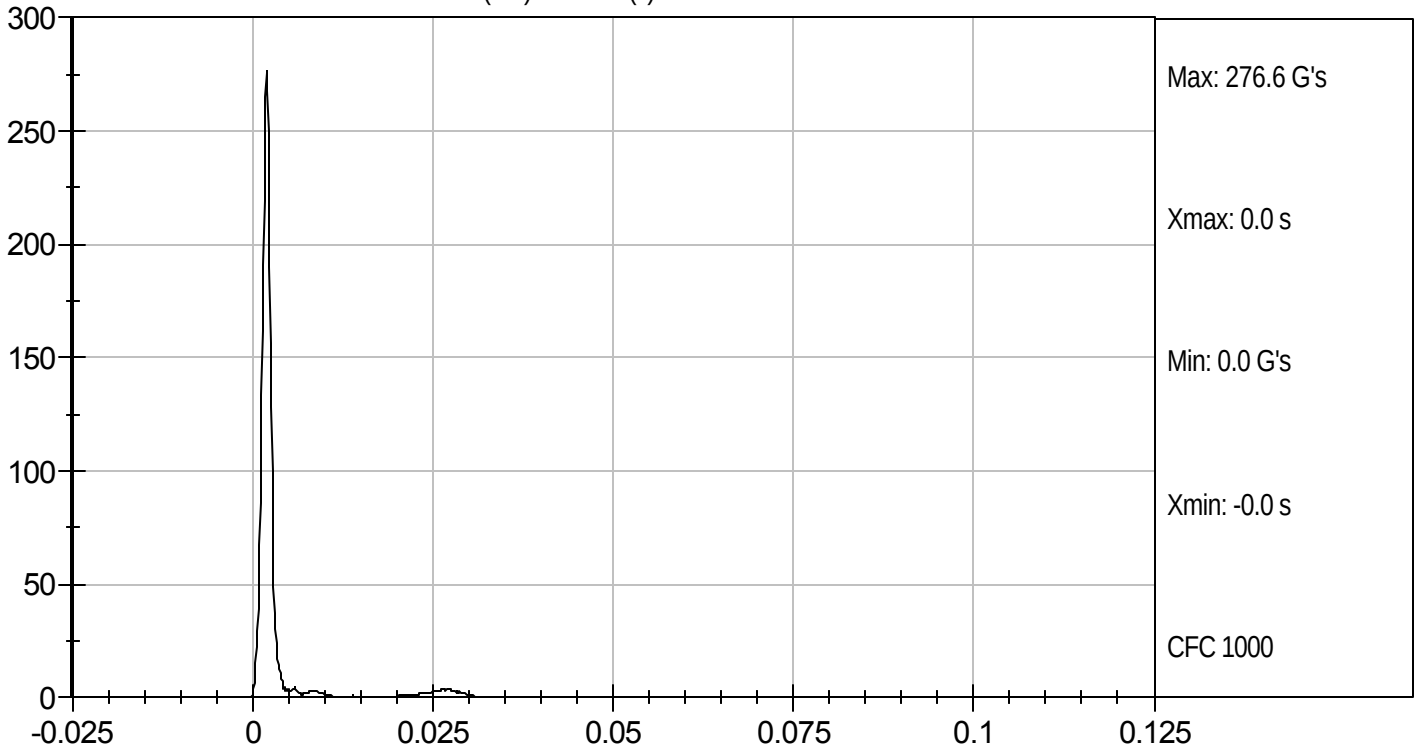
10/28/11
Test Date

David Winkelbauer
Approved By

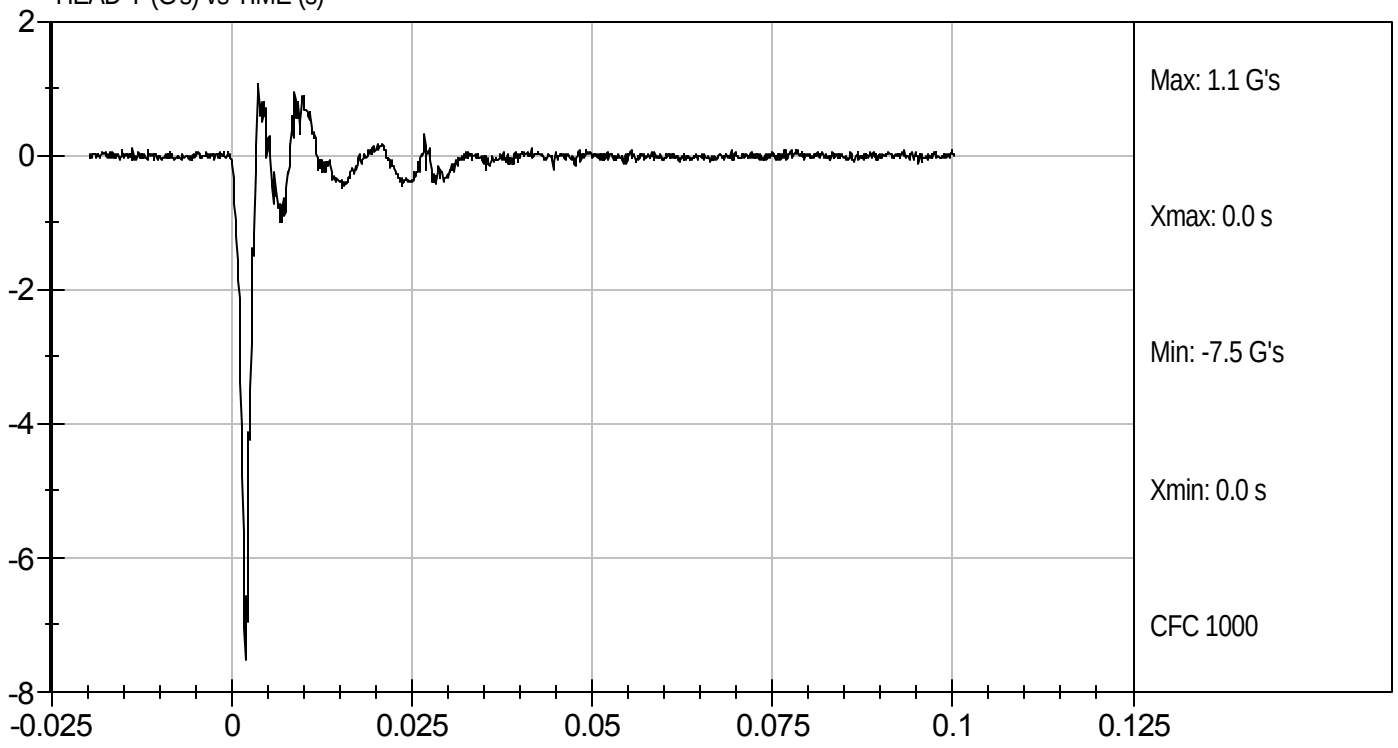
Test Desc: Head Drop
Component ID: D113621

Test Date: 10/28/11
Velocity: 0 ft/s, 0 m/s

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



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



MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138 **Test I.D:** D113622

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	35	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	m/s	2.1 to 2.5	2.2	Pass
	20 ms	m/s	4.0 to 5.0	4.2	Pass
	30 ms	m/s	5.8 to 7.0	5.8	Pass
D Plane Rotation	Max	deg	77 to 91	79	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	69 to 83	76	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	87	Pass
			Overall Results		Pass

Jessica Hall
Laboratory Technician

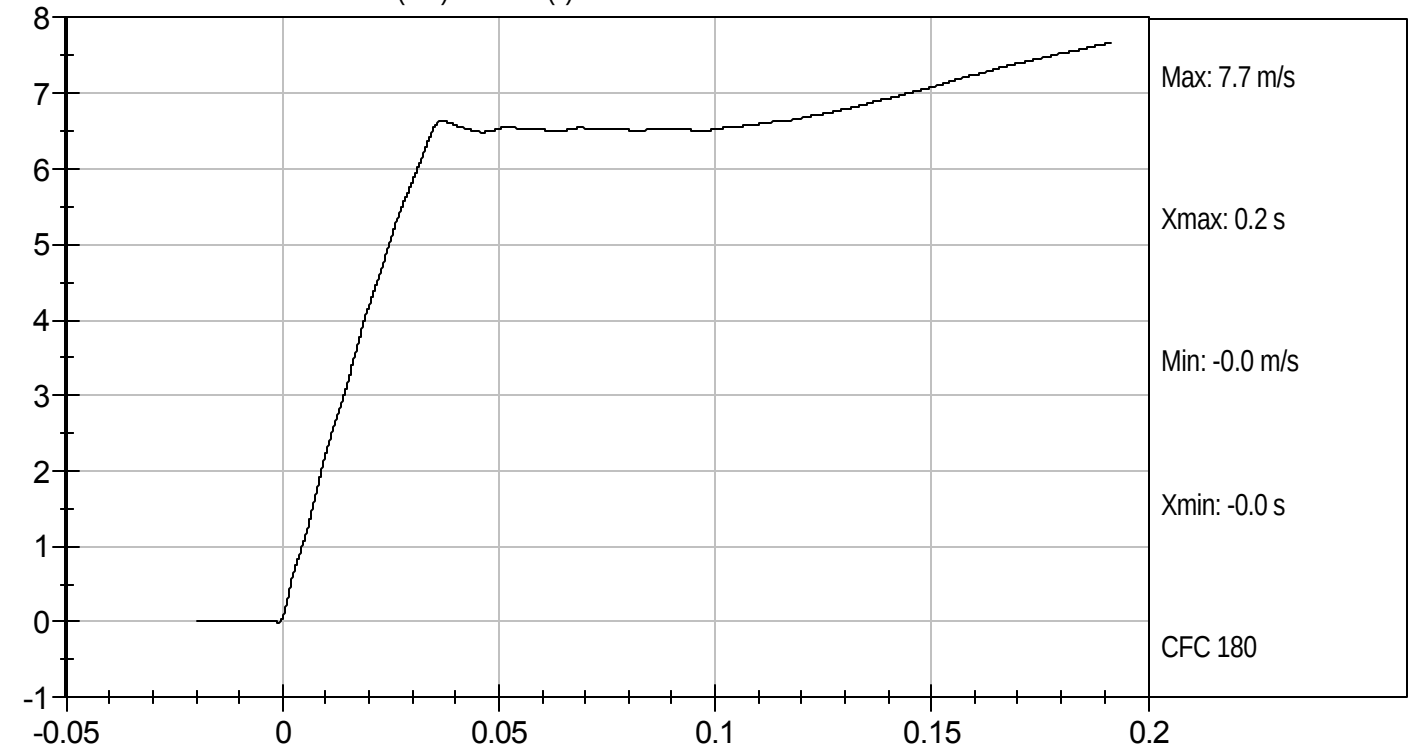
10/31/11
Test Date

David Winkelbauer
Approved By

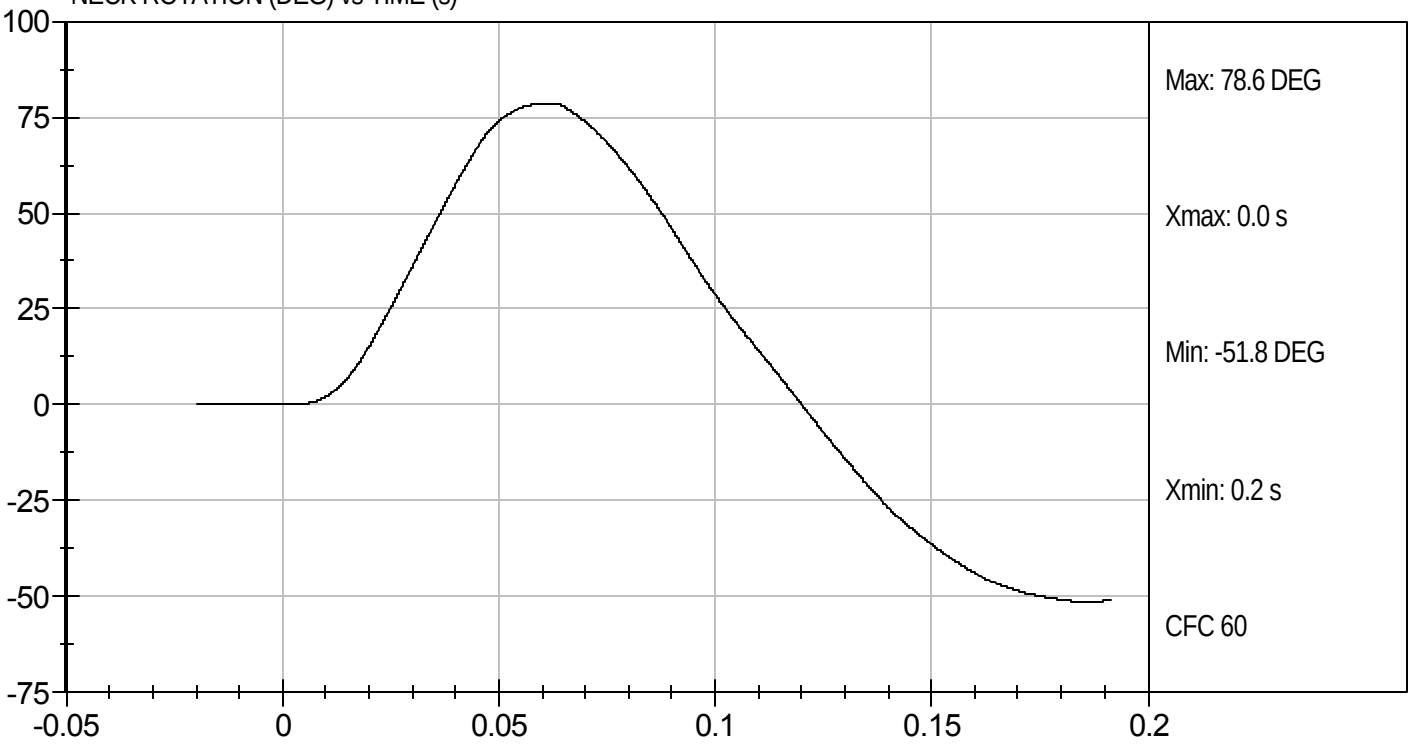
Test Desc: Neck Flexion
Component ID: D113622

Test Date: 10/31/11
Velocity: 23.15 ft/s, 7.06 m/s

PENDULUM DECELERATION (m/s) vs TIME (s)

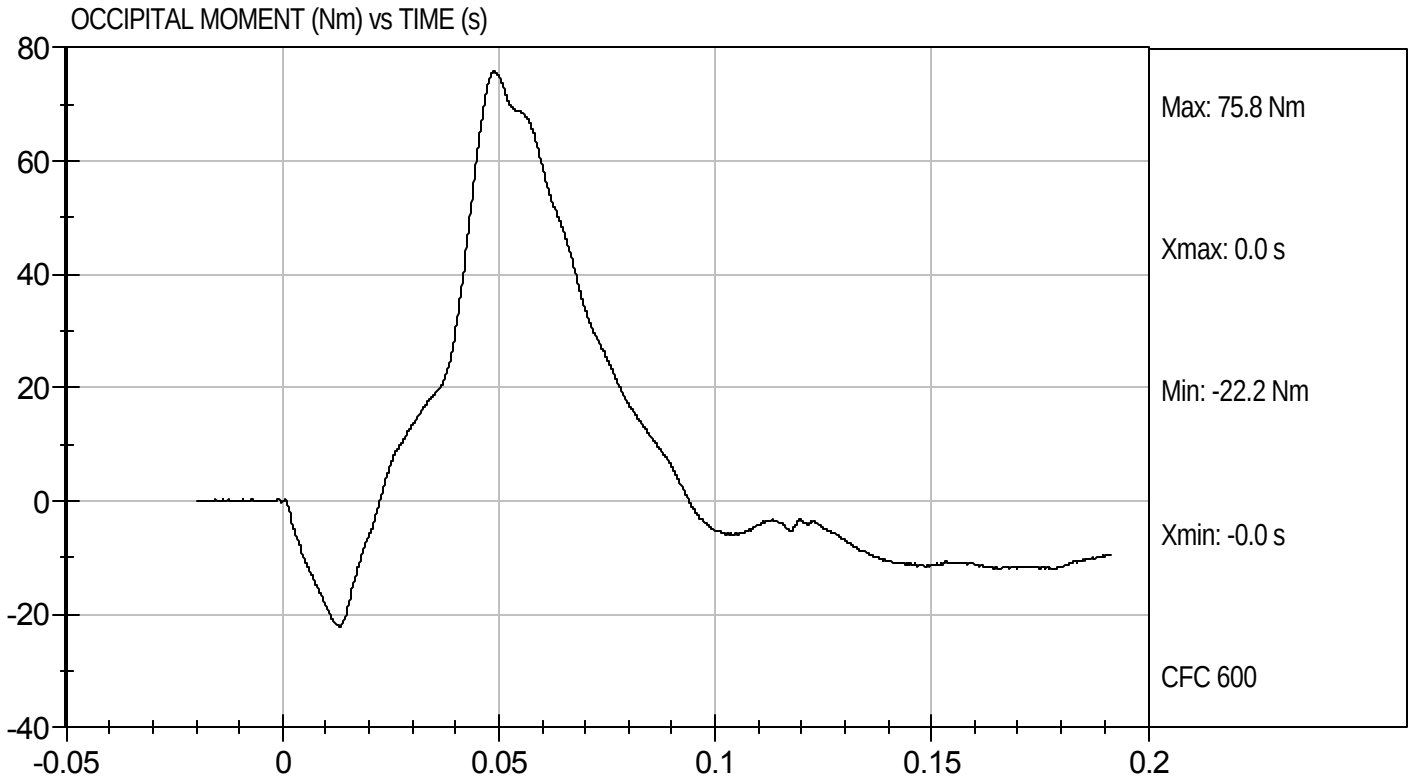


NECK ROTATION (DEG) vs TIME (s)



Test Desc: Neck Flexion
Component ID: D113622

Test Date: 10/31/11
Velocity: 23.15 ft/s, 7.06 m/s



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138 **Test I.D:** D113623

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	34	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.13	Pass
Pendulum Deceleration	10 ms	m/s	1.5 to 1.9	1.9	Pass
	20 ms	m/s	3.1 to 3.9	3.5	Pass
	30 ms	m/s	4.6 to 5.6	4.9	Pass
D Plane Rotation	Max	deg	99 to 114	101	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-53	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	101	Pass
			Overall Results		Pass

Jessica Gall
Laboratory Technician

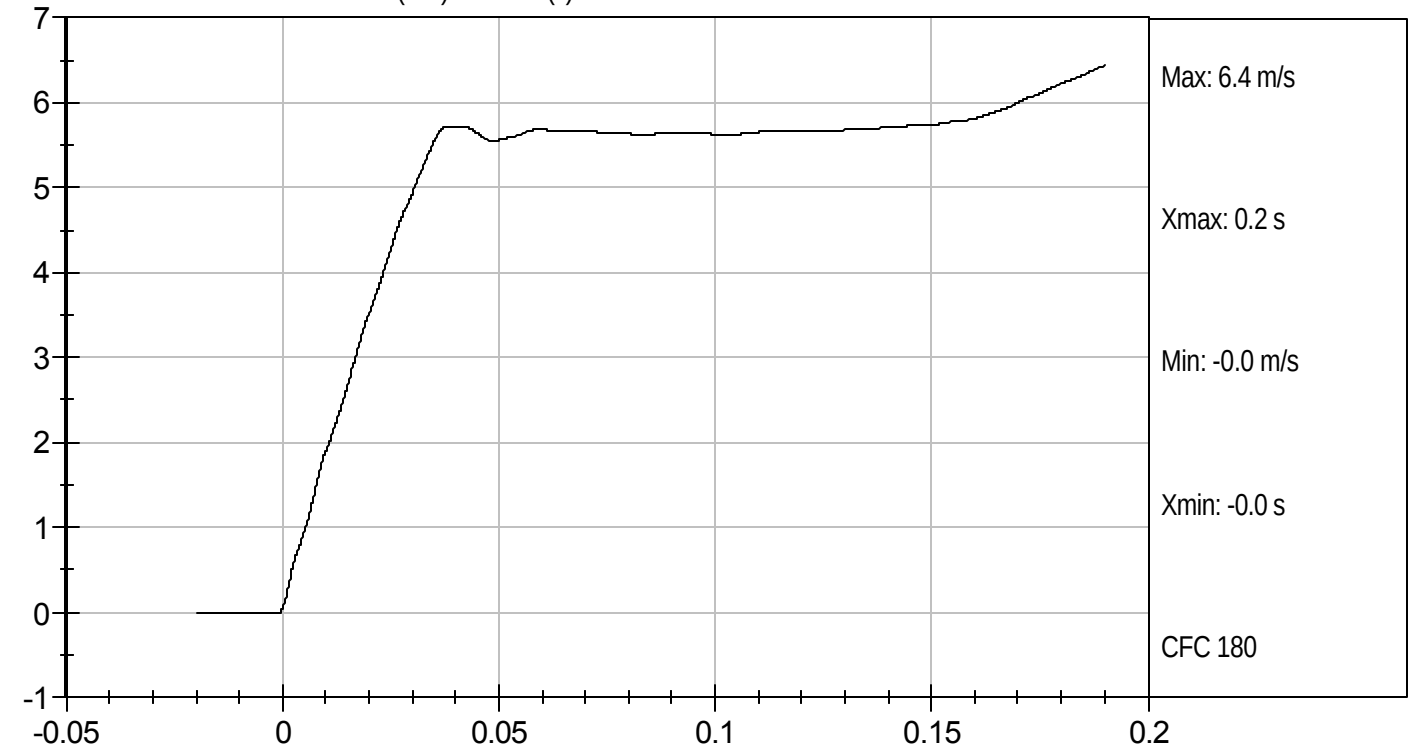
10/31/11
Test Date

David Winkelbauer
Approved By

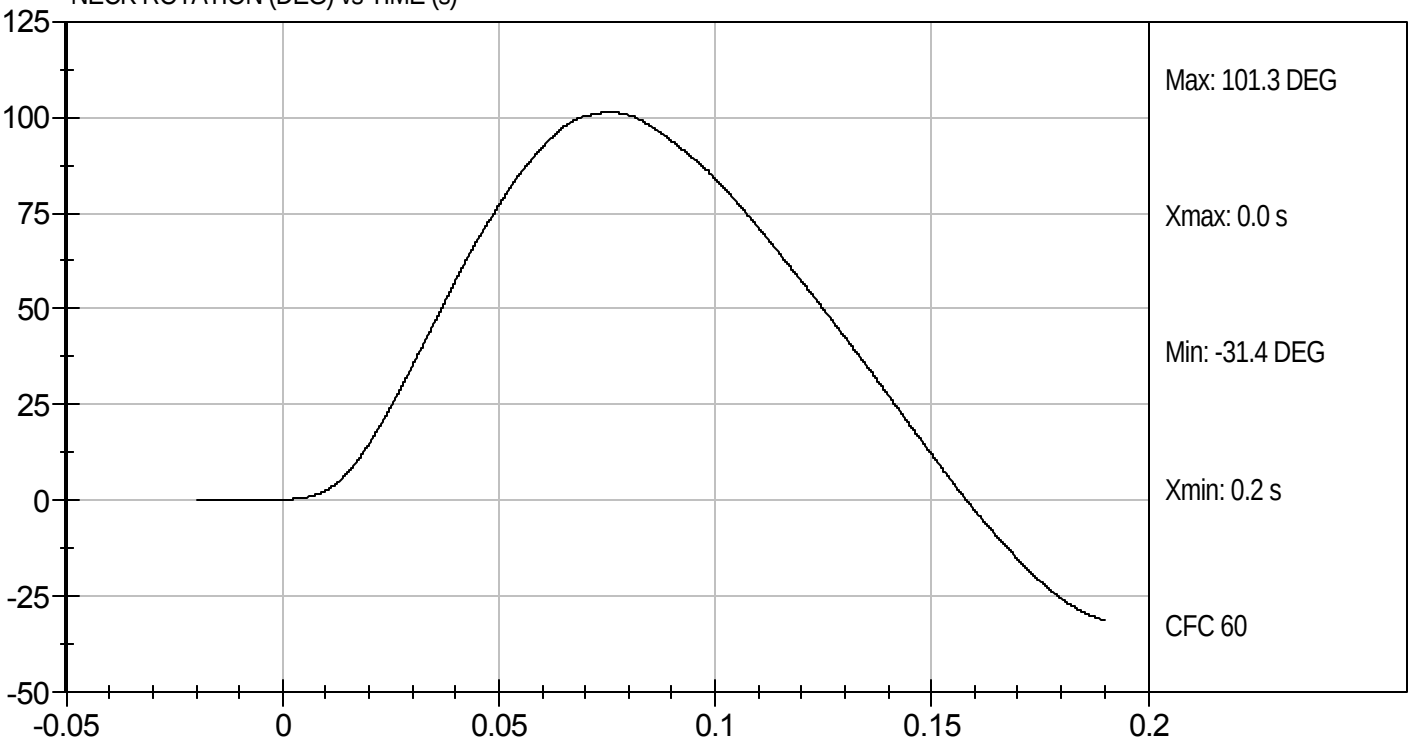
Test Desc: Neck Extension
Component ID: D113623

Test Date: 10/31/11
Velocity: 20.10 ft/s, 6.13 m/s

PENDULUM DECELERATION (m/s) vs TIME (s)

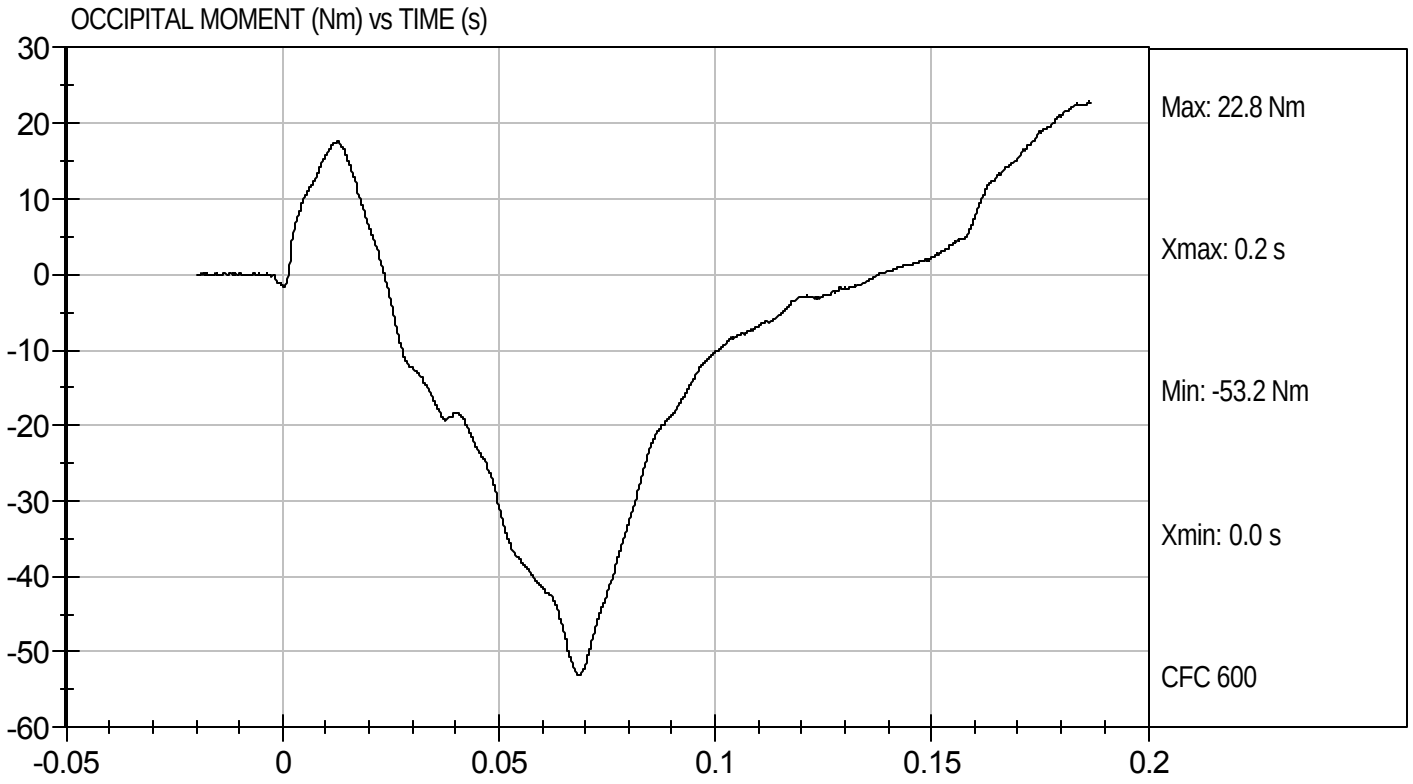


NECK ROTATION (DEG) vs TIME (s)



Test Desc: Neck Extension
Component ID: D113623

Test Date: 10/31/11
Velocity: 20.10 ft/s, 6.13 m/s



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 5TH PERCENTILE

ATD Serial No: 138 **Test I.D:** D113624

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Relative Humidity	%	10 to 70	34	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	55	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	4.07	Pass
Internal Hysteresis	%	69 to 85	70	Pass
Peak Force 18 mm - 50 mm	N	<= 4,600 N	4004	Pass
		Overall Test Results		Pass

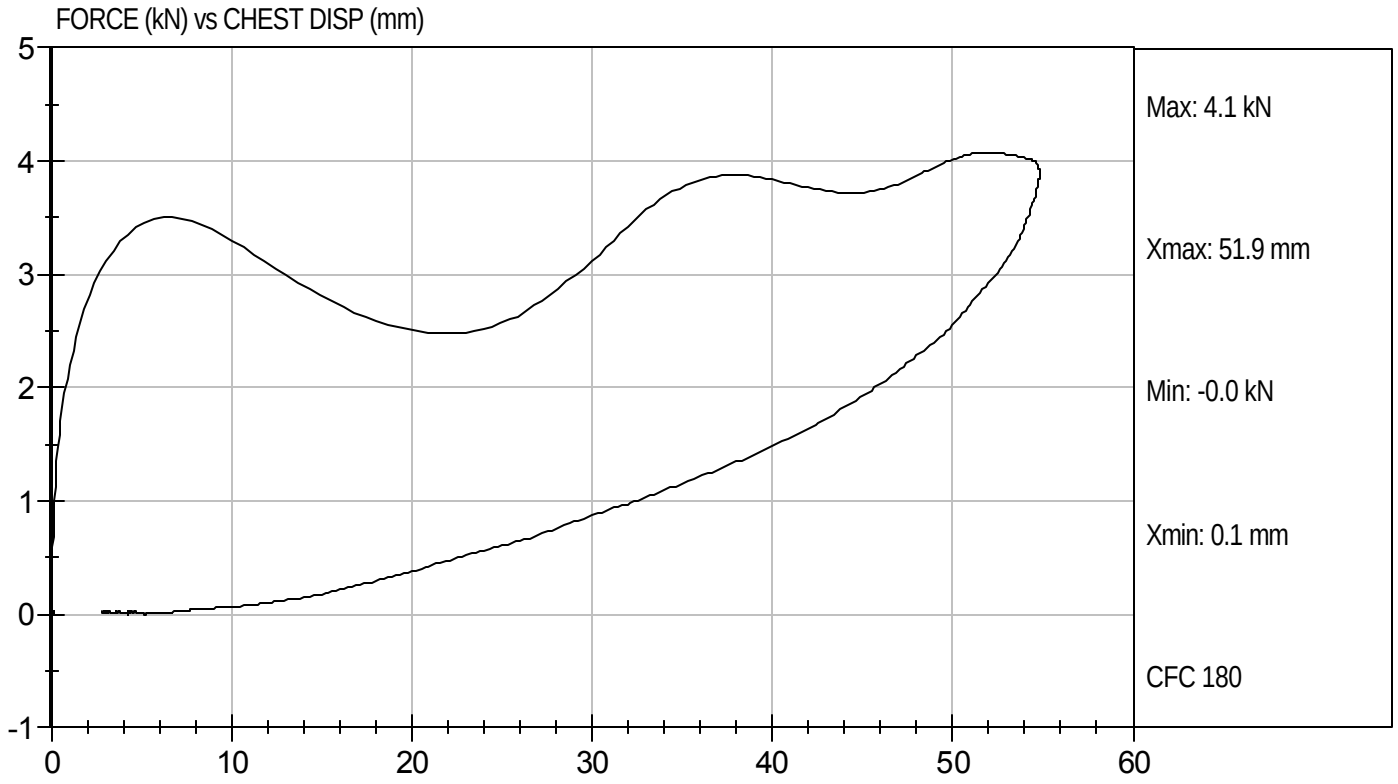
Jessica Gall
Laboratory Technician

10/31/11
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Impact
Component ID: D113624

Test Date: 10/31/11
Velocity: 22.22 ft/s, 6.77 m/s



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138 **Test I.D:** D113625

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	kN	3.45 to 4.06	3.52	Pass
		Overall Test Results		Pass

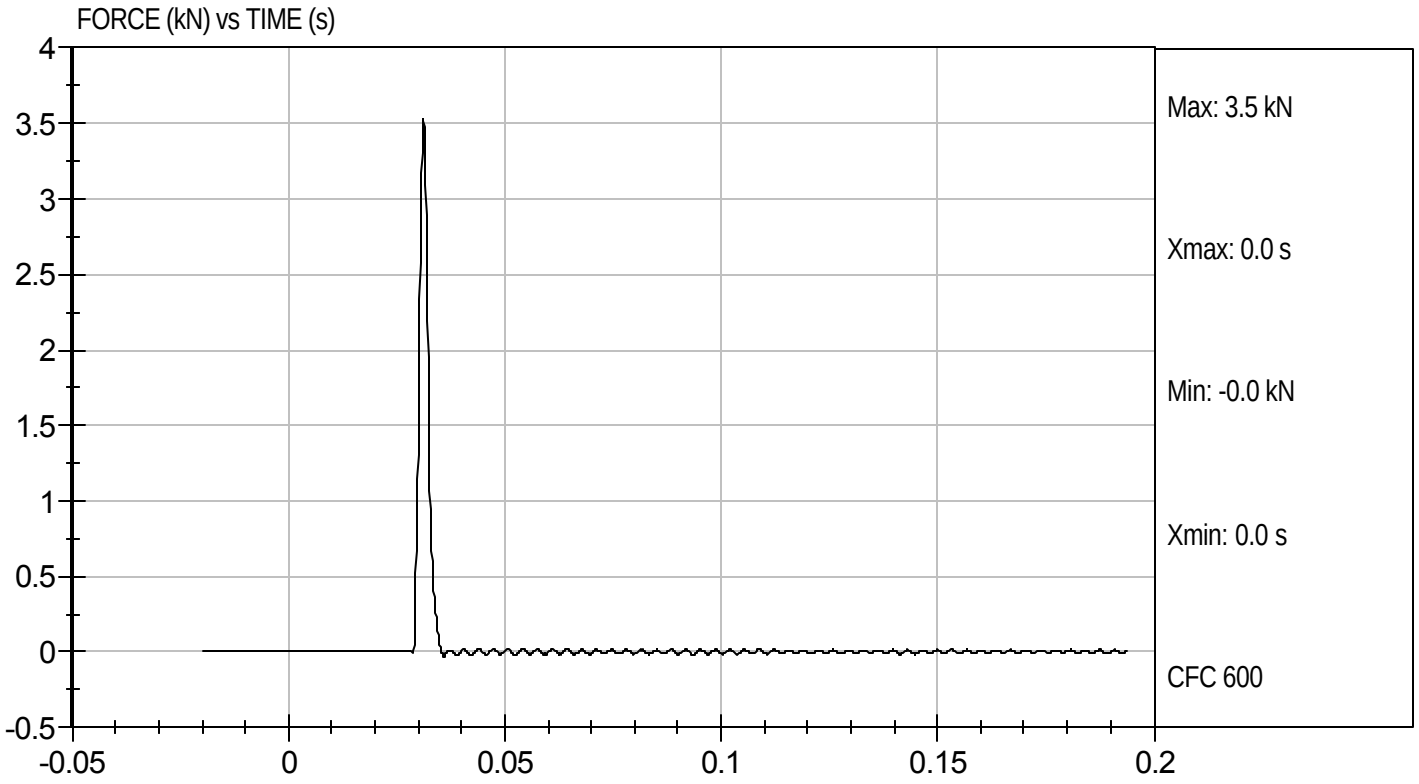
Jessica Hall
Laboratory Technician

10/28/11
Test Date

David Winkelbauer
Approved By

Test Desc: Right Knee
Component ID: D113625

Test Date: 10/28/11
Velocity: 6.97 ft/s, 2.12 m/s



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138 **Test I.D:** D113626

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	kN	3.45 to 4.06	3.59	Pass
		Overall Test Results		Pass

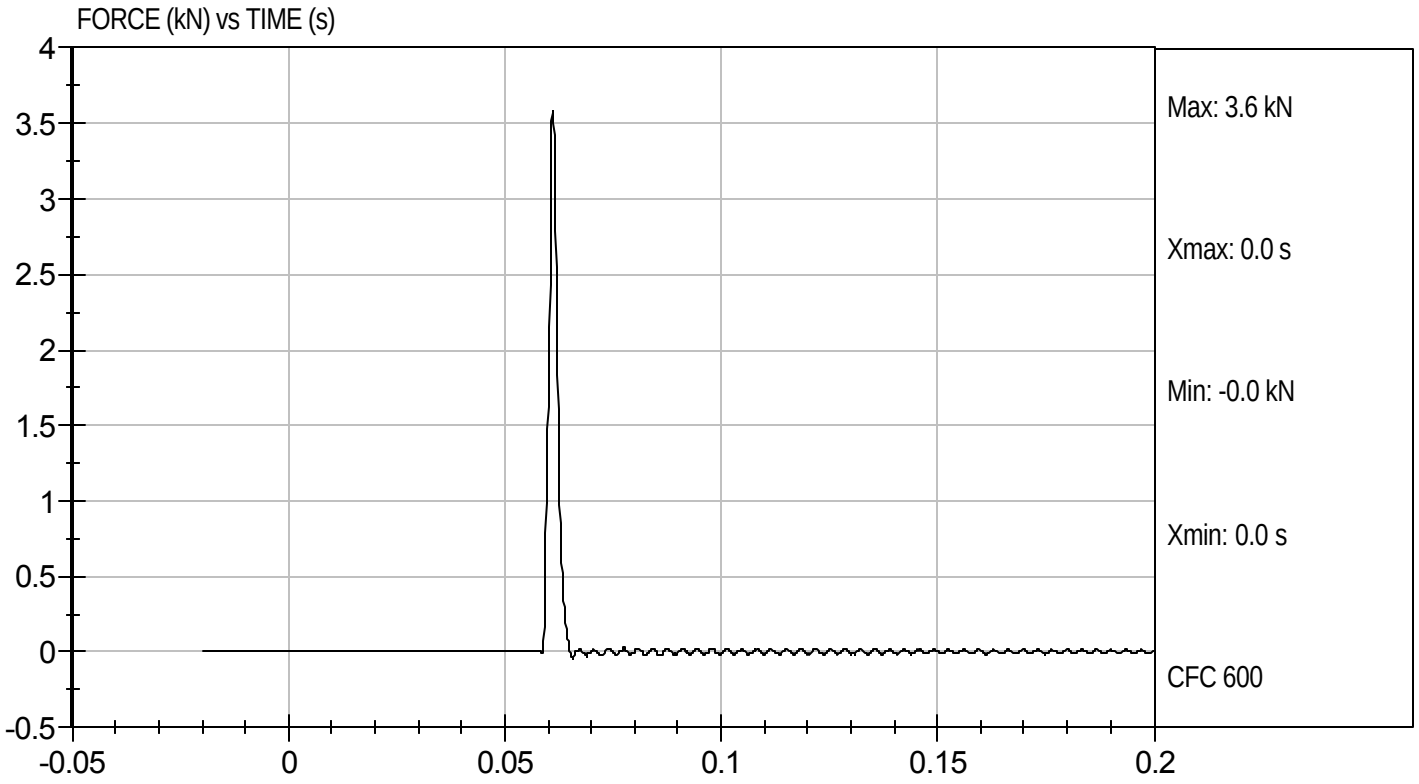
Jessica Hall
Laboratory Technician

10/28/11
Test Date

David Winkelbauer
Approved By

Test Desc: Left Knee
Component ID: D113626

Test Date: 10/28/11
Velocity: 6.97 ft/s, 2.12 m/s



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138 **Test I.D:** D113627

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	27	Pass
Initial Angle	deg	0 to 20	14	Pass
Return Angle	deg	+/- 8	6	Pass
Force at 45 deg	N	320 to 390	380	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 to 1.5	1.0	Pass
		Overall Result		Pass

Jessica Gall
Laboratory Technician

10/28/11
Test Date

David Winkelbauer
Approved By