REPORT NUMBER: NCAP-MGA-2011-065

NEW CAR ASSESSMENT PROGRAM (NCAP)
Frontal Barrier Impact Test

TOYOTA MOTOR MANUFACTURING, CANADA, INC.
2011 Toyota Corolla 4-Dr Sedan
NHTSA No.: MB5108

MGA RESEARCH CORPORATION
5000 Warren Road
Burlington, WI 53105

Test Date: February 8, 2011

Final Report Date: March 19, 2011

FINAL REPORT

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

This final test report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, in response to Contract Number DTNH22-06-D-00028.

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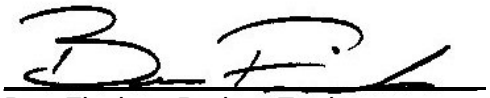
Approved by: 
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Approval Date: March 19, 2011

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

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16. Abstract

A 56.3 km/h Experimental NCAP Frontal Impact Test was conducted on the 2011 Toyota Corolla 4-Dr Sedan in accordance with the specifications of the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure for the generation of consumer information on vehicle frontal crash protection. 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 February 8, 2011.

The impact velocity was 56.5 km/h and the ambient temperature at the barrier face at the time of impact was 21°C. The target vehicle post-test maximum crush was 581 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	217	359
Maximum Chest Compression	mm	63	52	21	15
Nij	N/A	1	1	0.39	0.45
Neck Tension	N	4170	2620	1115	747
Neck Compression	N	4000	2520	107	416
Left Femur Force	N	10008	6805	1173	1938
Right Femur Force	N	10008	6805	1241	1727

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 Adm. Technical Reference Division 1200 New Jersey Ave, SE Washington, D.C. 20590	
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SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

This 56.3 km/h frontal barrier impact test is part of the Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under contract number DTNH22-06-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 Standard's NCAP Frontal Laboratory Test Procedure dated January 2010.

SUMMARY

A load cell barrier was impacted by a 2011 Toyota Corolla 4-Dr Sedan at a velocity of 56.5 kph using high-speed video analysis. The test was performed at MGA Research Corporation on February 8, 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 on the driver's lap 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 verification data, are found in Appendix C of this report.

The 227 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 no Stoddard Solvent leakage after the event or during any phase of the static rollover.

The maximum static crush of the vehicle was 581 mm and both the driver and passenger side doors remained closed during the impact event and were operable after the impact.

The driver's head and chest contacted the airbag. The driver's head also contacted the headrest and headliner. The driver's knees contacted the knee bolster. 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}	T^1	T^2	Chest Disp. (mm)	Nij	Neck Tension (N)	Neck Comp. (N)	Left Femur (N)	Right Femur (N)
Driver (50^{th})	217	65.9	80.9	21	0.39	1115	107	1173	1241
Passenger (5^{th})	359	62.5	77.5	15	0.45	747	416	1938	1727

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 30 msec.

Test vehicle impacted barrier face offset from tow-track centerline.

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

SECTION 2

OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2011 Toyota Corolla 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: MB5108
Test Date: 2/08/2011

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	MB5108
Model Year	2011
Make	Toyota
Model	Corolla
Body Style	Sedan
VIN	2T1BU4EE0BC544824
Body Color	Classic Silver Met
Delivery Date	1/21/2011
Odometer (mi)	79
Odometer (km)	127
Dealer	Classic Toyota Waukegan
Transmission	Automatic
Final Drive	Front
Type/No. Cylinders	4
Engine Displacement (L)	1.8
Engine Placement	Lateral
Roof Rack	No
Sunroof/T-Top	No
Tinted Glass	No
Traction Control	Yes
Power Brakes	Yes
Front Disc	Yes
Rear Disc	No
Does owner's manual provide instructions to turn off automatic door locks?	N/A

Anti-Lock Brakes	Yes
All Wheel Drive	No
Power Steering	Yes
Driver Front Airbag	Yes
Driver Curtain Airbag	Yes
Driver Head/Torso Airbag	No
Driver Torso Airbag	Yes
Driver Torso/Pelvis Airbag	No
Driver Pelvis Airbag	No
Driver Knee Airbag	No
Pass. Front Airbag	Yes
Pass. Curtain Airbag	Yes
Pass. Head/Torso Airbag	No
Pass. Torso Airbag	Yes
Pass. Torso/Pelvis Airbag	No
Pass. Pelvis Airbag	No
Pass. Knee Airbag	No
Pretensioners	Yes
Load Limiters	Yes
Automatic Door Locks	No
Bucket Seats	Yes
Tilt Steering	Yes
Other	

DATA FROM CERTIFICATION LABEL

Manufactured By	Toyota Motor Manufacturing, Canada, Inc.
Date of Manufacture	12/10

GVWR (kg)	1742
GAWR Front (kg)	948
GAWR Rear (kg)	839

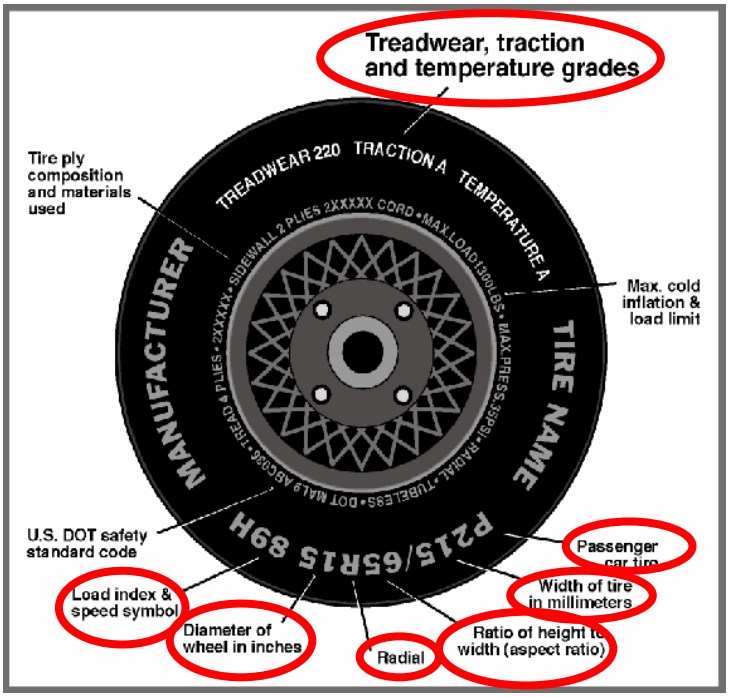
VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench		
Designated Seating Capacity (DSC)	2	3		5
Capacity Weight (VCW) (kg)				365
Cargo Weight (RCLW) (kg)				25

DATA SHEET NO. 1 (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2011 Toyota Corolla 4-Dr Sedan NHTSA No.: MB5108
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/08/2011



Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	210	210
Recommended Tire Size	P195/65R15	P195/65R15
Tire Size on Vehicle	P195/65R15	P195/65R15
Tire Manufacturer	Firestone	Firestone
Tire Model	Affinity	Affinity
Treadwear	500	500
Traction	A	A
Temperature Grades	B	B
Tire Plies Sidewall	1	1
Tire Plies Body	3	3
Load Index & Speed Symbol	89S	89S
Tire Material	Rubber	Rubber
DOT Safety Code Right	W2C6 AA6	W2C6 AA6
DOT Safety Code Left	W2C6 AA6	W2C6 AA6

DATA SHEET NO. 1 (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2011 Toyota Corolla 4-Dr Sedan NHTSA No.: MB5108
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/08/2011

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	381.5	253.6		423.7	306.6	
Right	kg	378.3	239.5		398.7	284.9	
Ratio	%	60.6	39.4		58.2	41.8	
Totals	kg	759.8	493.1	1252.9	822.4	591.5	1413.9

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1252.9
Weight of 1 P572E ATD & 1 P572O ATD	kg	140.6
Rated Cargo/Luggage Weight (RCLW)	kg	25
Calculated Target Vehicle Target Weight (TVTW)	kg	1418.5

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	675	680	698	707	1023
As Tested	mm	659	671	670	681	1088
Post Test	mm	654	635	641	654	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2600
Total Vehicle Length at Left Side	mm	4432
Total Vehicle Length at Centerline	mm	4546
Total Vehicle Length at Right Side	mm	4432
Weight of Ballast in Cargo Area	kg	14.1
Weight of Vehicle Components Removed	kg	24.0
Amount of Stoddard Solvent in Fuel Tank	L	46.4

List of components removed to meet test weight: Spare tire, jack & tools, rear floor mats, trunk carpet and subfloor, all hubcaps.

DATA SHEET NO. 1 (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2011 Toyota Corolla 4-Dr Sedan NHTSA No.: MB5108
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/08/2011

TARGET VEHICLE STRUCTURAL MEASUREMENT

	Elements	Pre-Test (mm)
1	Total Length	4546
2	Total Width	1760
3	Bumper Top Height	522
4	Bumper Bottom Height	410
5	Longitudinal Member Top Height	555
6	Distance between Longitudinal Members	900
7	Longitudinal Member Width	64
8	Engine Top Height	851
9	Engine Bottom Height	198
10	Engine and Gearbox Width	812
11	Front Bumper-Engine Distance	380
12	Front Shock Absorber Fixing Height	864
13	Bonnet Leading Edge Height	806
14	Front Shock Absorber Fixing Width	1143
15	Front Bumper – Front Axle Distance	945
16	Front Axle – A-Pillar Distance	405
17	A-Pillar – B-Pillar Distance	1101
18	B-Pillar – Rear Axle Distance	417
19	B-Pillar – C-Pillar Distance	673
20	Roof Sill Bottom Height	1310
21	Roof Sill Top Height	1425
22	Floor Sill bottom Height	200
23	Floor Sill Top Height	330

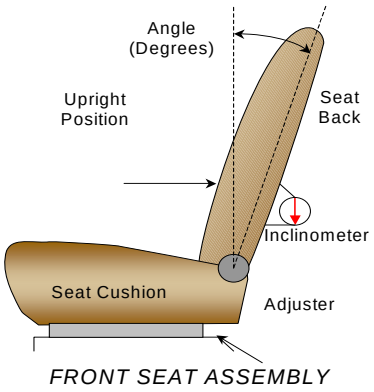
DATA SHEET NO. 2

SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2011 Toyota Corolla 4-Dr Sedan NHTSA No.: MB5108
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/08/2011

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 Seating & Positioning Procedures" in the NCAP Test Procedure dated January 2010.



SEAT BACK ANGLE	Degrees
Driver Seat Back Angle	2.4° on headrest post
Passenger Seat Back Angle	1.4° on headrest post

SEAT FORE/AFT POSITIONS

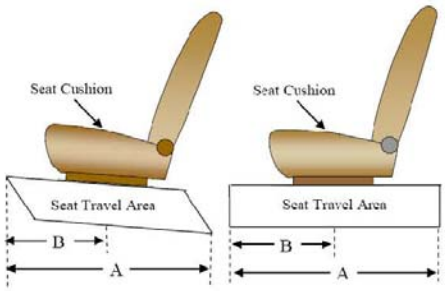
The driver and passenger seat fore/aft positions are adjusted following Appendix F, "Driver & Passenger Seating & Positioning Procedures" in the NCAP Test Procedure dated January 2010.

SEAT FORE/AFT POSITIONS	Total Fore/Aft Travel	Placed in Position #
Driver Seat	17 detents (1st as 1)	7th detent (forward-most as 0)
Passenger Seat	17 detents (1st as 1)	0 detent (forward-most as 0)

SEAT BELT UPPER ANCHORAGES

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

SEAT BELT UPPER ANCHORAGES	Total # of Positions	Placed in Position #
Driver Seat	4	0 (uppermost as 0)
Passenger Seat	4	0 (uppermost as 0)



DATA SHEET NO. 2 (CONTINUED)

SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2011 Toyota Corolla 4-Dr Sedan NHTSA No.: MB5108
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/08/2011

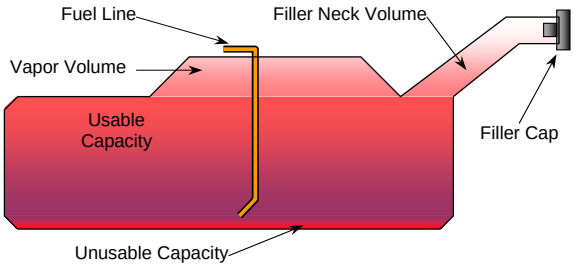
FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of "Standard Tank"	50.0
Usable Capacity of "Optional" Tank	
92-94% of Usable Capacity	46.0 to 47.0
Actual Amount of Solvent used	46.4
1/3 of Usable Capacity	16.7

FUEL PUMP

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

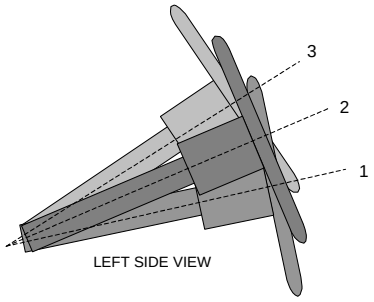
The vehicle is equipped with an electric fuel pump. The pump is activated when the ignition is turned on. The fuel pipe is on the left side.



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

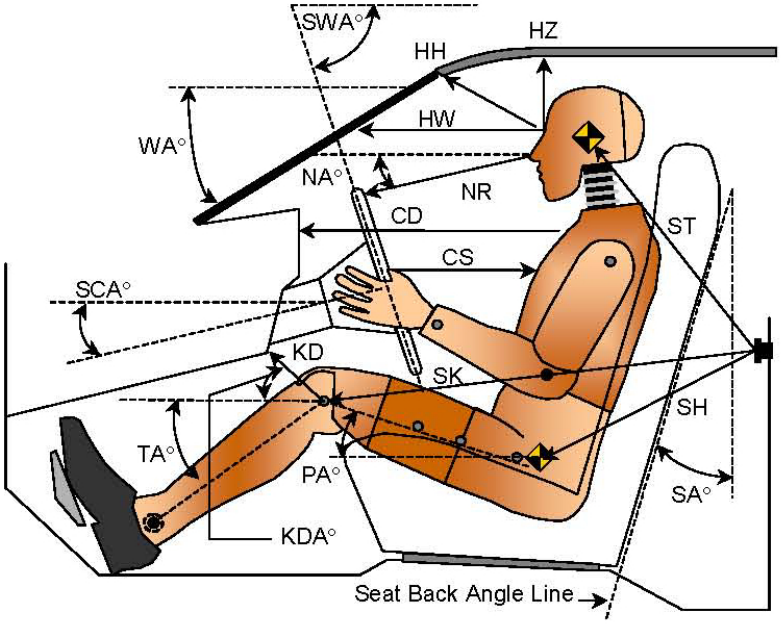
STEERING COLUMN POSITION

	Degrees	Fore/Aft Position (mm)
Lowermost – Position 1	67.5	181
Geometric Center – Position 2	66.1	162
Uppermost – Position 3	64.7	143
Telescoping Steering Wheel Travel		38
Test Position	66.1	162

DATA SHEET NO. 3

DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 Toyota Corolla 4-Dr Sedan NHTSA No.: MB5108
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/08/2011

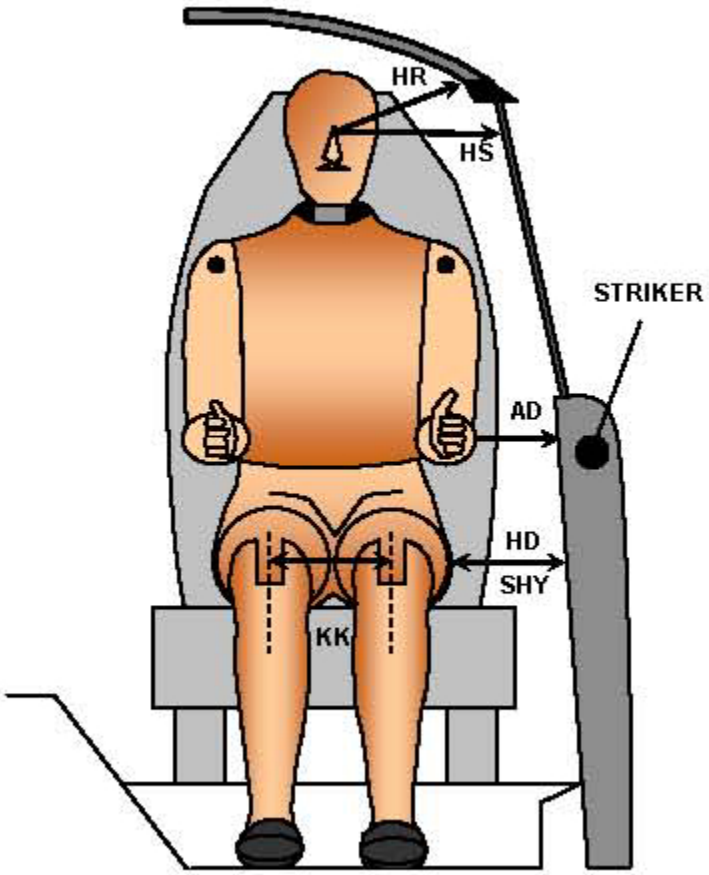


Code	Measurement Description	Driver S/N 036		Passenger S/N 138	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA	Windshield Angle		24.3		
SWA	Steering Wheel Angle		66.1		
SCA	Steering Column Angle		33.9		
SA	Seat Back Angle		2.4		1.4
HZ	Head to Roof (Z)	176	90	182	90
HH	Head to Header	349	22.1	277	43.1
HW	Head to Windshield	644	0	612	0
NR	Nose to Rim	374	12.5		
CD	Chest to Dash	500		387	
CS	Chest to Steering Hub	299	2.8		
RA	Rim to Abdomen	167	0		
KDL	Left Knee to Dash	121	18.8	70	46.2
KDR	Right Knee to Dash	106	31.4	85	32.2
PA	Pelvic Angle		24.2		20.9
TA	Tibia Angle		53.8		51.7
SK	Striker to Knee	574	95.6	682	101.9
ST	Striker to Head	463	13.7	461	40.3
SH	Striker to H-Point	311	138.0	439	112.8

DATA SHEET NO. 4

DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 Toyota Corolla 4-Dr Sedan NHTSA No.: MB5108
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/08/2011



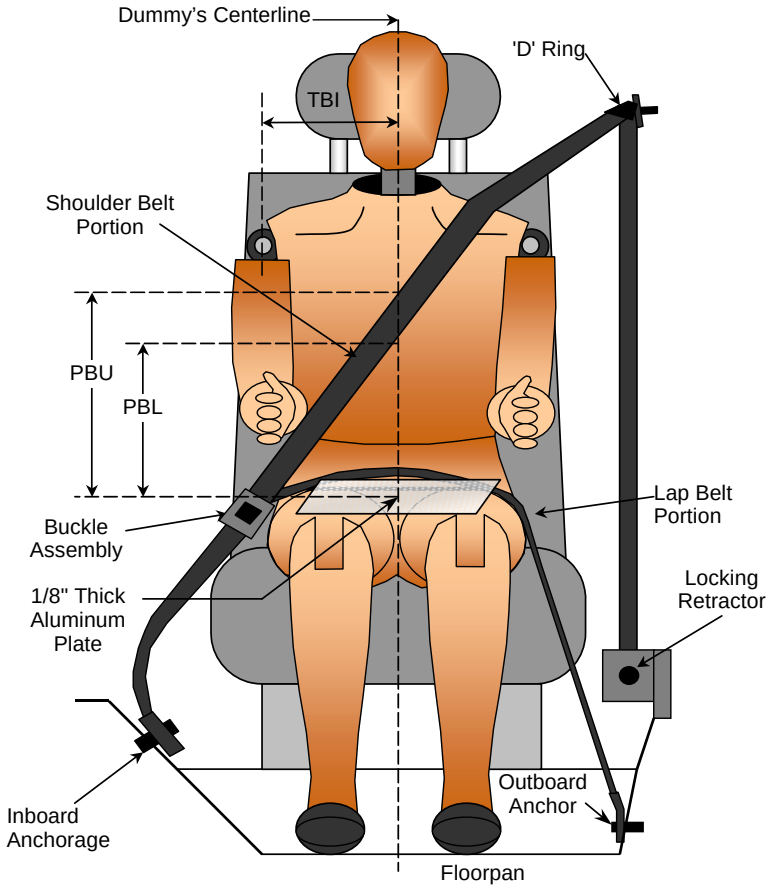
FRONT VIEW OF DUMMY

Code	Measurement Description	Driver S/N 036	Passenger S/N 138
		Length (mm)	
AD	Arm to Door	134	92
HD	H-Point to Door	159	178
HR	Head to Side Header	218	229
HS	Head to Side Window	324	346
KK	Knee to Knee	318	210
SHY	Striker to H-Point (Y Direction)	300	310
AA	Ankle to Ankle	304	175

DATA SHEET NO. 5

SEAT BELT POSITIONING DATA

Test Vehicle: 2011 Toyota Corolla 4-Dr Sedan NHTSA No.: MB5108
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/08/2011



FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	350	320
PBL - Top surface of reference to belt lower edge	mm	280	230

BELT LENGTH DATA

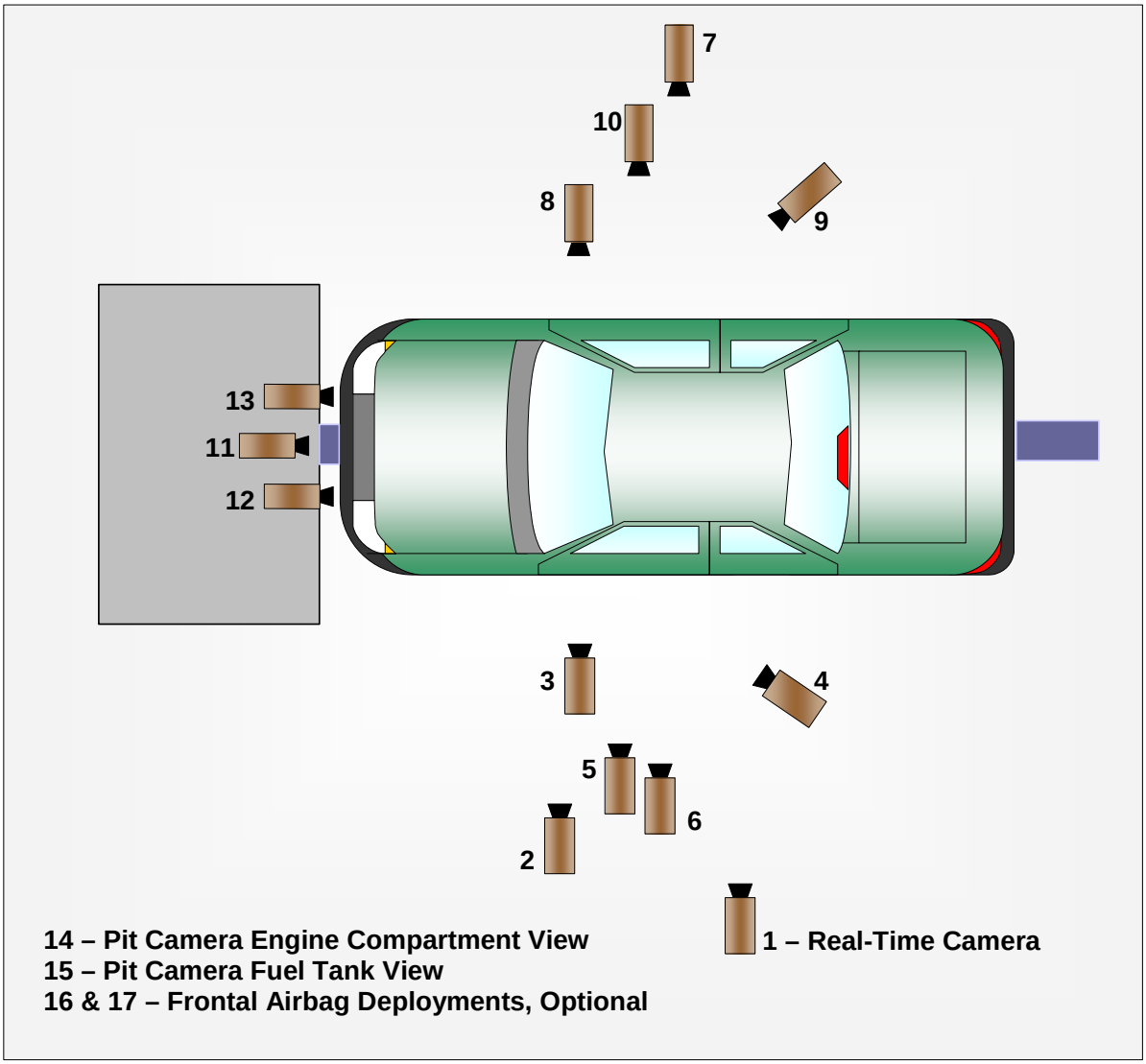
Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as measured on ATD	mm	900	960
Lap Belt Length as measured on ATD	mm	880	930
Remainder of belt on reel	mm	1520	1410
Total Belt Length for Continuous Webbing Systems	mm	3300	3300

DATA SHEET NO. 6

HIGH-SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2011 Toyota Corolla 4-Dr Sedan NHTSA No.: MB5108
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/08/2011

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: 2011 Toyota Corolla 4-Dr Sedan NHTSA No.: MB5108
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/08/2011

CAMERA LOCATIONS

No.	Camera View	Coordinates (mm)			Lens (mm)	Speed (fps)
		X*	Y*	Z*		
1	Real-Time Left Side View					30
2	Left Front Half	1090	-4670	-1060	24	1000
3	Driver Close-Up	1320	-6420	-1870	35	1000
4	Driver Angle	5470	-4850	-1920	50	1000
5	Steering Column Top	670	-4830	-1230	24	1000
6	Steering Column Bottom	650	-4800	-840	24	1000
7	Right Overall	2090	6360	-1080	20	1000
8	Passenger Close-Up	1600	6860	-1790	35	1000
9	Passenger Angle	5670	4770	-1910	50	1000
10	Right Front Half	1220	4810	-1070	24	1000
11	Windshield	-260	0	-2860	24	1000
12	Top Driver	-20	-470	-2030	12.5	1000
13	Top Passenger	-20	470	-2030	12.5	1000
14	Pit Front	1090	0	3150	24	1000
15	Pit Rear	3110	0	3150	24	1000
16	Onboard Driver Side (optional)					
17	Onboard Passenger Side (optional)					
18	Real-Time Pan View					30

*COORDINATES:

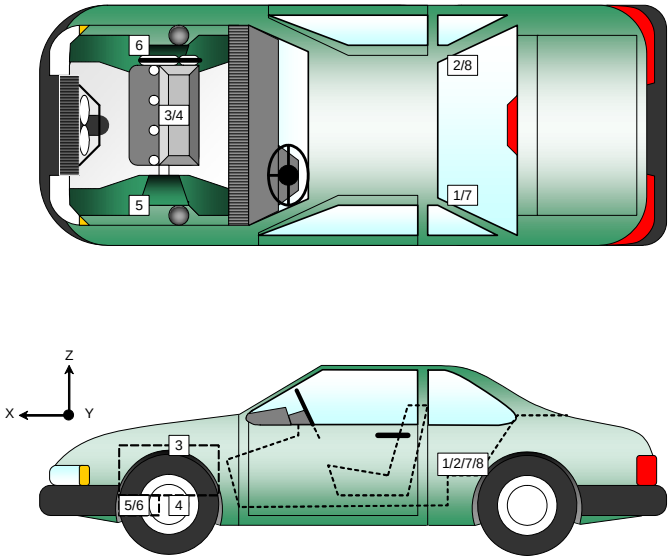
+X = forward of impact plane
+Y = right of monorail centerline
+Z = below ground level

Cameras 16 & 17 were not used for this test.

DATA SHEET NO. 7

VEHICLE ACCELEROMETER DATA

Test Vehicle: 2011 Toyota Corolla 4-Dr Sedan NHTSA No.: MB5108
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/08/2011



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear X-Member X	1842	-415	-180
2	Right Rear X-Member X	1842	345	-180
3	Engine Top X	3715	0	-865
4	Engine Bottom X	3834	55	-333
5	Left Brake Caliper X	3712	-648	-212
6	Right Brake Caliper X	372	648	-212
7	Left Rear X-Member Z	1842	-415	-180
8	Right Rear X-Member Z	1842	345	-180

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

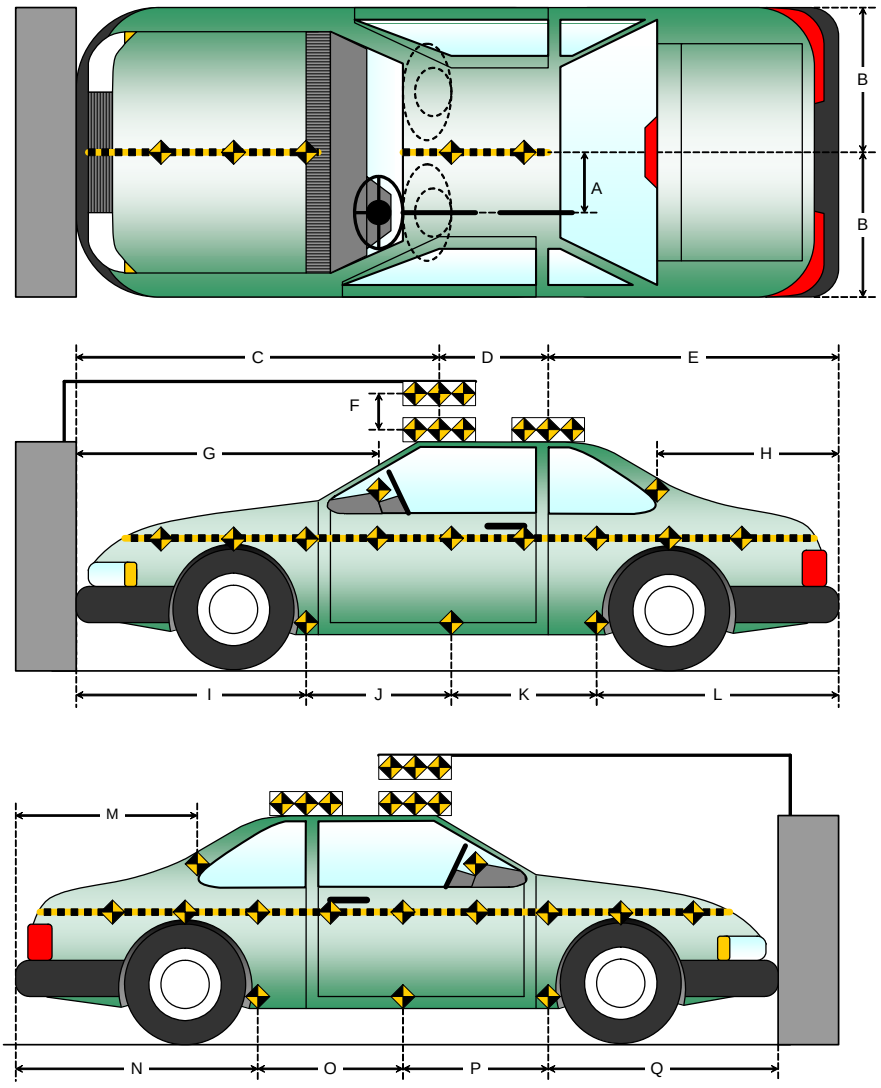
DATA SHEET NO. 8

PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2011 Toyota Corolla 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB5108
Test Date: 2/08/2011

Item	Value (mm)
A	335
B	880
C	2269
D	670
E	1607
F	140
G	
H	1344
I	1350
J	886
K	886
L	1424
M	1344
N	1424
O	886
P	886
Q	1350

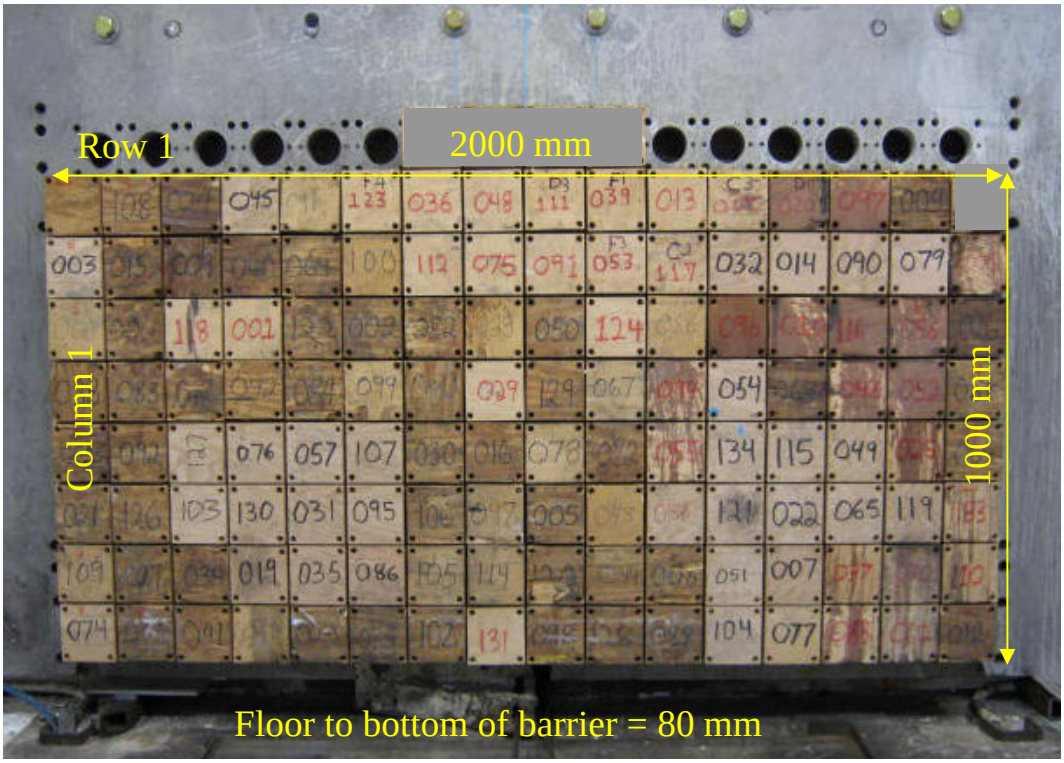


DATA SHEET NO. 9

LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2011 Toyota Corolla 4-Dr Sedan NHTSA No.: MB5108
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/08/2011

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

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: 2011 Toyota Corolla 4-Dr Sedan NHTSA No.: MB5108
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/08/2011

INSTRUMENTATION

Driver Dummy Data Channels	46
Passenger Dummy Data Channels	46
Vehicle Structure Accelerometers	8
Barrier Channels	127
Total	227

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: 2011 Toyota Corolla 4-Dr Sedan NHTSA No.: MB5108
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/08/2011

TEST DUMMY INFORMATION AND CONTACT

Description	Driver	Passenger
Dummy Type / Serial No.	HIII 50% / 036	HIII 5% / 138
Head Contact	Airbag, Headrest, Headliner	Airbag, Headrest
Upper Torso Contact	Airbag	Airbag
Lower Torso Contact	Airbag	Airbag
Left Knee Contact	Knee Bolster	Glovebox
Right Knee Contact	Knee Bolster	Glovebox

DOOR OPENING AND SEAT TRACK INFORMATION

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

POST TEST STRUCTURAL OBSERVATIONS

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

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	766
Center	mm	815
Right Side	mm	845
Average	mm	809

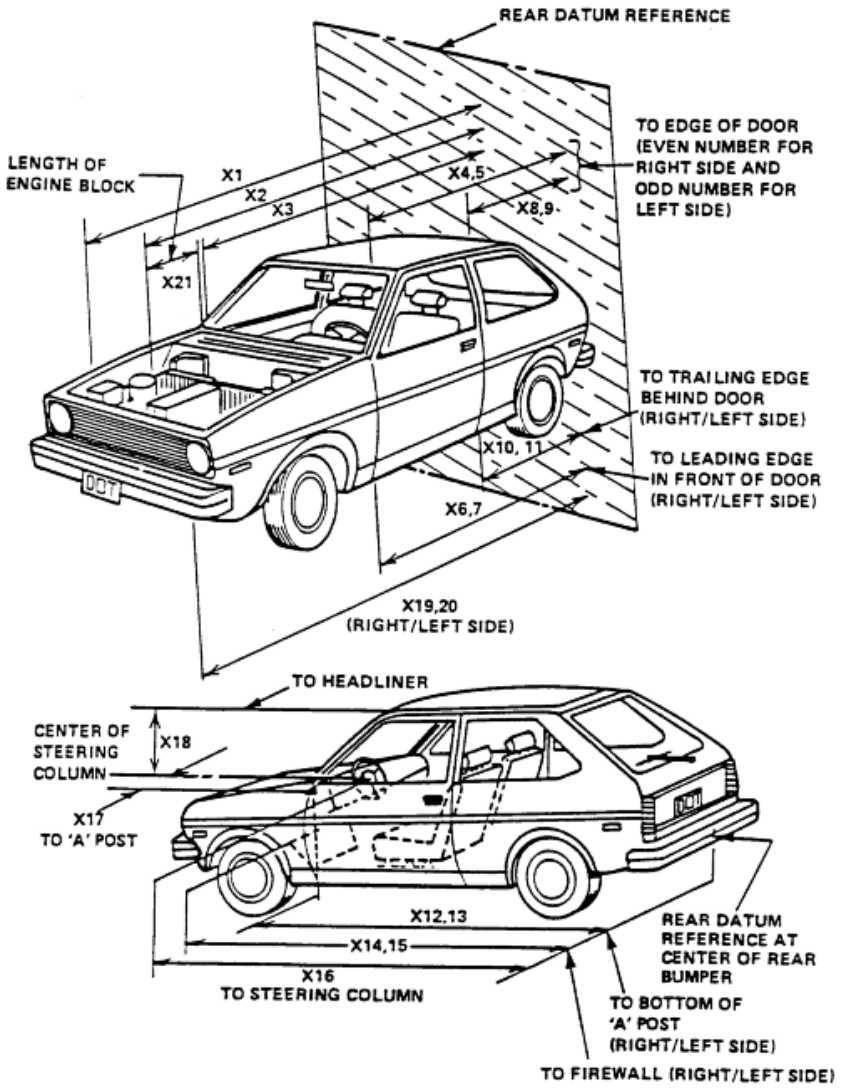
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Left Front (Driver) P1		Left Front (Passenger) P2	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	Yes	Yes	Yes
Knee Airbag	No		No	
Curtain Side Airbag	Yes	No	Yes	No
Torso 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: 2011 Toyota Corolla 4-Dr Sedan NHTSA No.: MB5108
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/08/2011



DATA SHEET NO. 12 (CONTINUED)

VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2011 Toyota Corolla 4-Dr Sedan NHTSA No.: MB5108
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/08/2011

RSOV (Rear Surface of Vehicle)

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	mm	4546	3965	581
2	RSOV to Front of Engine	mm	4026	3620	406
3	RSOV to Firewall	mm	3590	3525	65
4	RSOV to Upper Leading Edge of Right Door	mm	3142	3150	-8
5	RSOV to Upper Leading Edge of Left Door	mm	3142	3143	-1
6	RSOV to Lower Leading Edge of Right Door	mm	3101	3100	1
7	RSOV to Lower Leading Edge of Left Door	mm	3101	3094	7
8	RSOV to Upper Trailing Edge of Right Door	mm	2070	2093	-23
9	RSOV to Upper Trailing Edge of Left Door	mm	2075	2075	0
10	RSOV to Lower Trailing Edge of Right Door	mm	2070	2071	-1
11	RSOV to Lower Trailing Edge of Left Door	mm	2075	2067	8
12	RSOV to Bottom of “A” Post of Right Side	mm	3134	3135	-1
13	RSOV to Bottom of “A” Post of Left Side	mm	3134	3135	-1
14	RSOV to Firewall, Right Side	mm	3570	3508	62
15	RSOV to Firewall, Left Side	mm	3570	3502	68
16	RSOV to Steering Column	mm	2705	2700	5
17	Center of Steering Column to “A” Post	mm	356	360	-4
18	Center of Steering Column to Headliner	mm	419	420	-1
19	RSOV to Right Side of Front Bumper	mm	4432	4030	402
20	RSOV to Left Side of Front Bumper	mm	4432	4064	368
21	Length of Engine Block	mm	495	495	0
RD	RSOV to Right Side of Dash Panel	mm	2830	2829	1
CD	RSOV to Center of Dash Panel	mm	2842	2842	0
LD	RSOV to Left Side of Dash Panel	mm	2830	2828	2

DATA SHEET NO. 13

ACCIDENT INVESTIGATION DIVISION DATA

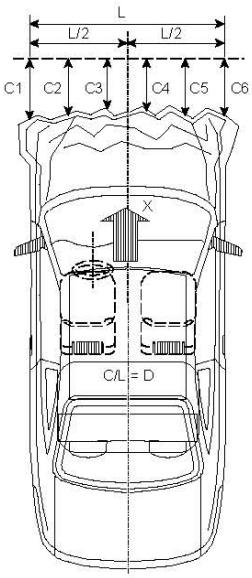
Test Vehicle: 2011 Toyota Corolla 4-Dr Sedan NHTSA No.: MB5108
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/08/2011

VEHICLE INFORMATION

VIN: 2T1BU4EE0BC544824 Wheelbase (mm): 2600
Vehicle Size Category: Sedan Test Weight (kg): 1413.9

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): 56.5
Velocity Change (km/h): 64.7
Time of Separation (msec): 93.7



CRUSH PROFILE

Collision Deformation Classification: Frontal
Midpoint of Damage: Centerline
Damage Region Length (mm): 1088
Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4432	4064	368
C2	Crush zone 2 at left side	mm	4483	4006	477
C3	Crush zone 3 at left side	mm	4510	3977	533
C4	Crush zone 4 at right side	mm	4510	3959	551
C5	Crush zone 5 at right side	mm	4483	3981	502
C6	Crush zone 6 at right side	mm	4432	4030	402
L	C1 TO C6	mm	1088	1068	20

DATA SHEET NO. 14

VEHICLE INTRUSION MEASUREMENTS

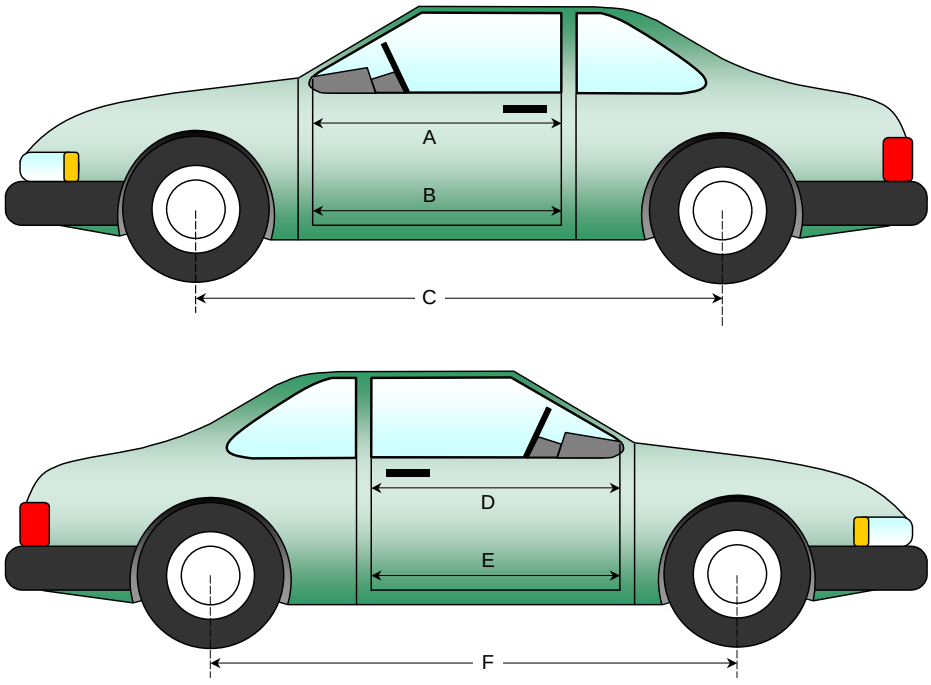
Test Vehicle: 2011 Toyota Corolla 4-Dr Sedan NHTSA No.: MB5108
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/08/2011

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	997	997	0
B	Left Side Lower	mm	875	873	2
D	Right Side Upper	mm	997	996	1
E	Right Side Lower	mm	875	875	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2600	2517	83
F	Right Side Wheelbase	mm	2600	2530	70



DATA SHEET NO. 14 (CONTINUED)

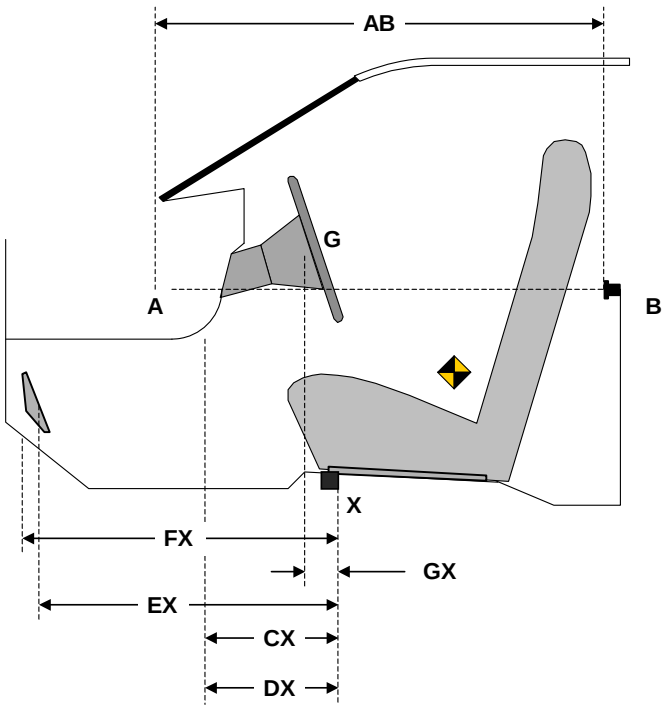
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2011 Toyota Corolla 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: MB5108
Test Date: 2/08/2011

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside window jam)	mm	870	870	0
CX	Left Knee Bolster to X	mm	332	345	-13
DX	Right Knee Bolster to X	mm	330	338	-8
EX	Brake Pedal to X	mm	541	567	-26
FX	Foot Rest to X	mm	533	523	10
GX	Center of Steering Column Wheel Hub to X	mm	49	90	-41

X = Front of Seat Track (stationary)

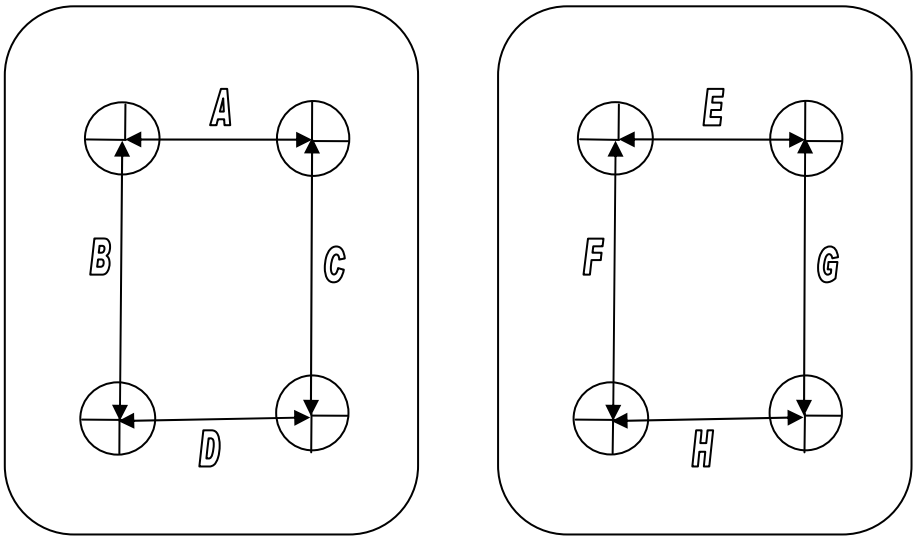


DRIVER COMPARTMENT

DATA SHEET NO. 14 (CONTINUED)

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2011 Toyota Corolla 4-Dr Sedan NHTSA No.: MB5108
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/08/2011



Driver Passenger

TOP VIEW THROUGH FLOOR PAN

UNDERBODY FLOORBOARD DEFORMATION

Measurement	Units	Pre-Test	Post-Test	Difference
A	mm	355	355	0
B	mm	355	355	0
C	mm	355	353	2
D	mm	355	355	0
E	mm	355	355	0
F	mm	355	355	0
G	mm	355	355	0
H	mm	355	355	0

DATA SHEET NO. 15

SUMMARY OF FMVSS 212, 219 (PARTIAL), AND 301 DATA

Test Vehicle: 2011 Toyota Corolla 4-Dr Sedan NHTSA No.: MB5108
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/08/2011

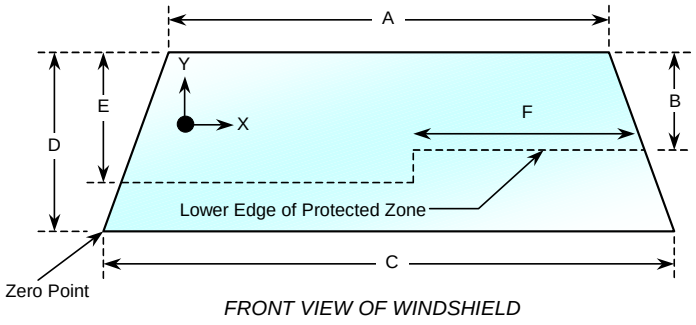
Windshield Mounting Details:
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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°C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2103	2103	100
Right Side	2103	2103	100
Total	4206	4206	100



FRONT VIEW OF WINDSHIELD

Item	Units	Value
A	mm	1136
B	mm	567
C	mm	1456
D	mm	807
E	mm	571
F	mm	511

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:	2011 Toyota Corolla 4-Dr Sedan	NHTSA No.:	MB5108
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	2/08/2011

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Test Time: 11:44 am Temperature: 21° C

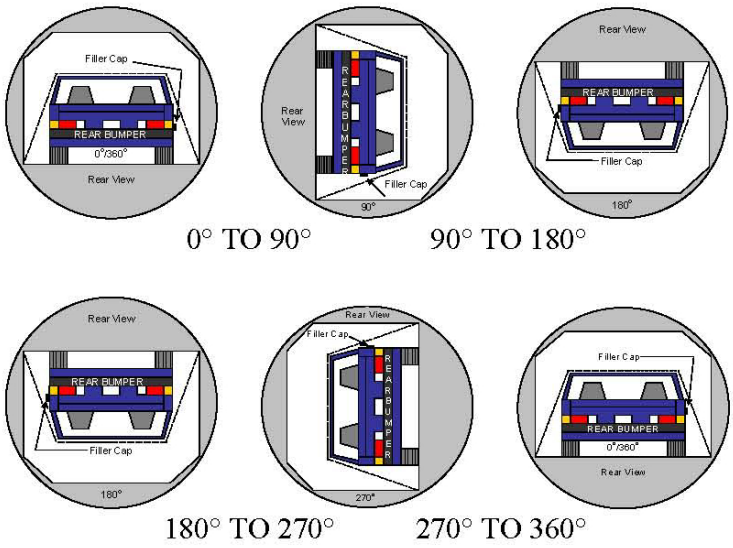
A. From impact until vehicle motion ceases: (Maximum Allowable = 1 ounce)	0 oz.
B. For the 5 minute period after motion ceases: (Maximum allowable = 5 ounces)	None
C. For the following 25 minutes: (Maximum allowable = 1 oz./minute)	None
D. Spillage Details:	None

DATA SHEET NO. 16

FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2011 Toyota Corolla 4-Dr Sedan NHTSA No.: MB5108
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/08/2011

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: **None**



SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	119	300	419
90° to 180°	111	300	411
180° to 270°	104	300	404
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°	0	0	0	0
180° to 270°	0	0	0	0
270° to 360°	0	0	0	0

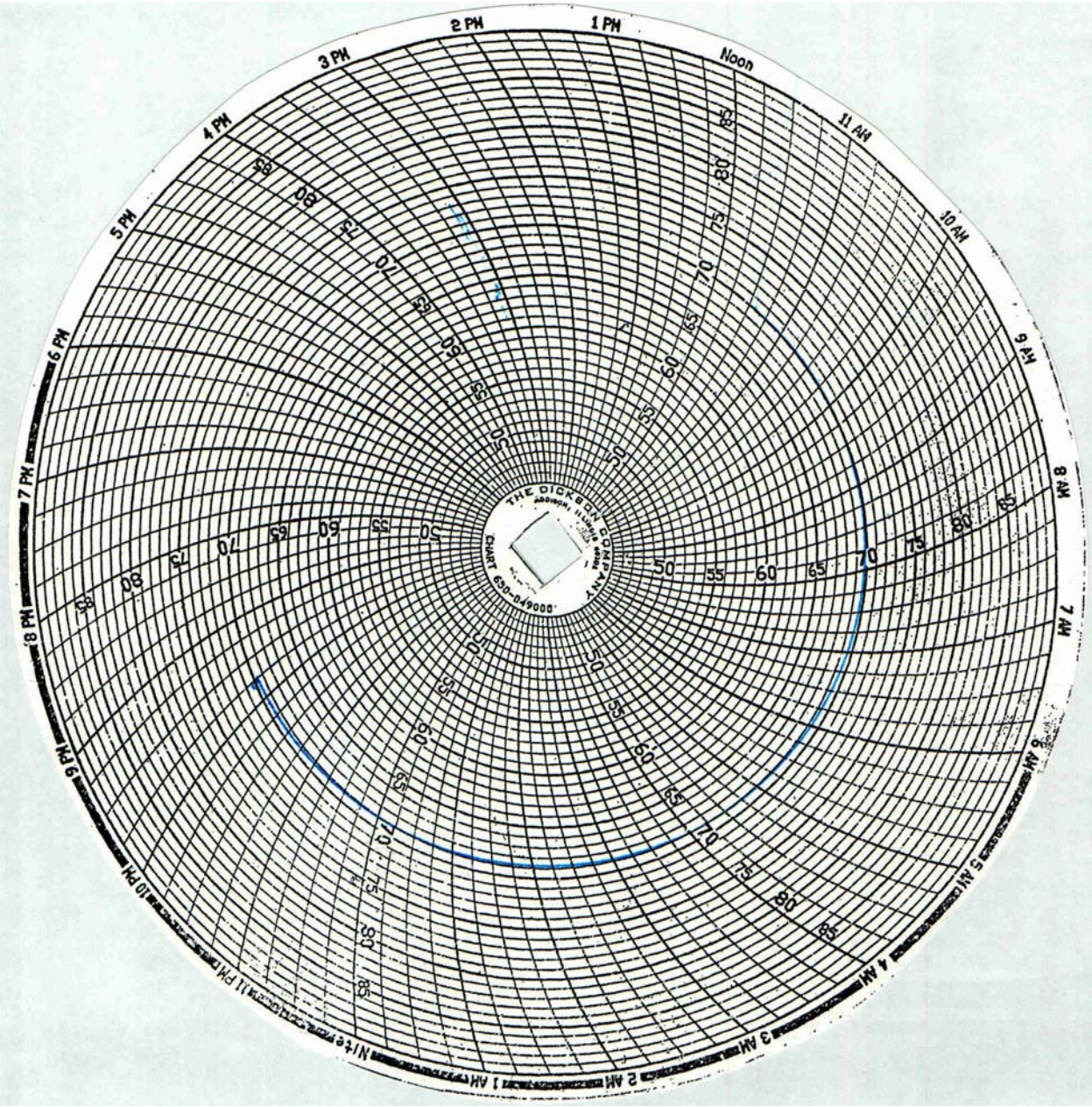
ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

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

DATA SHEET NO. 17

DUMMY/VEHICLE TEMPERATURE STABILIZATION DATA

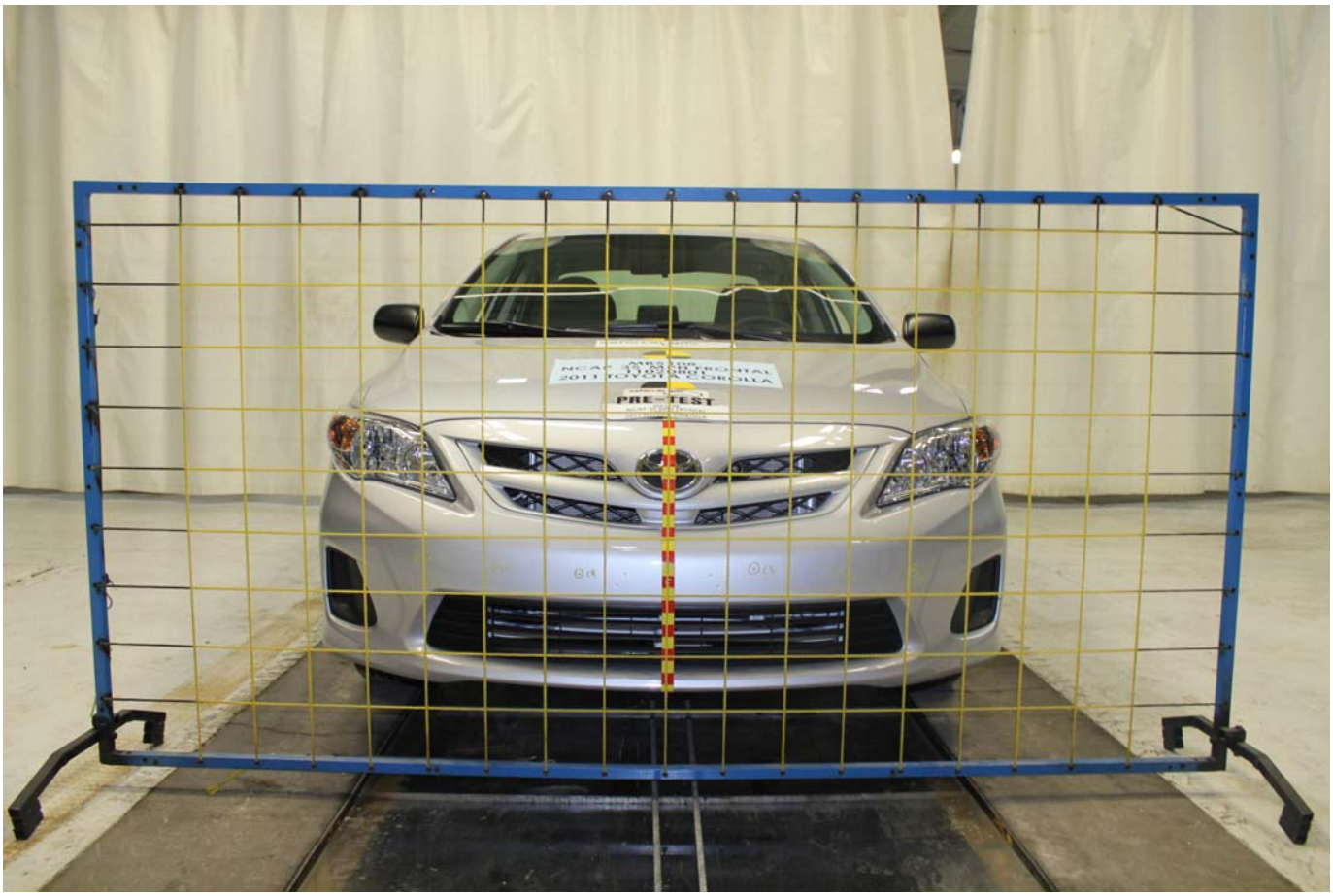
Test Vehicle: 2011 Toyota Corolla 4-Dr Sedan NHTSA No.: MB5108
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/08/2011



APPENDIX A

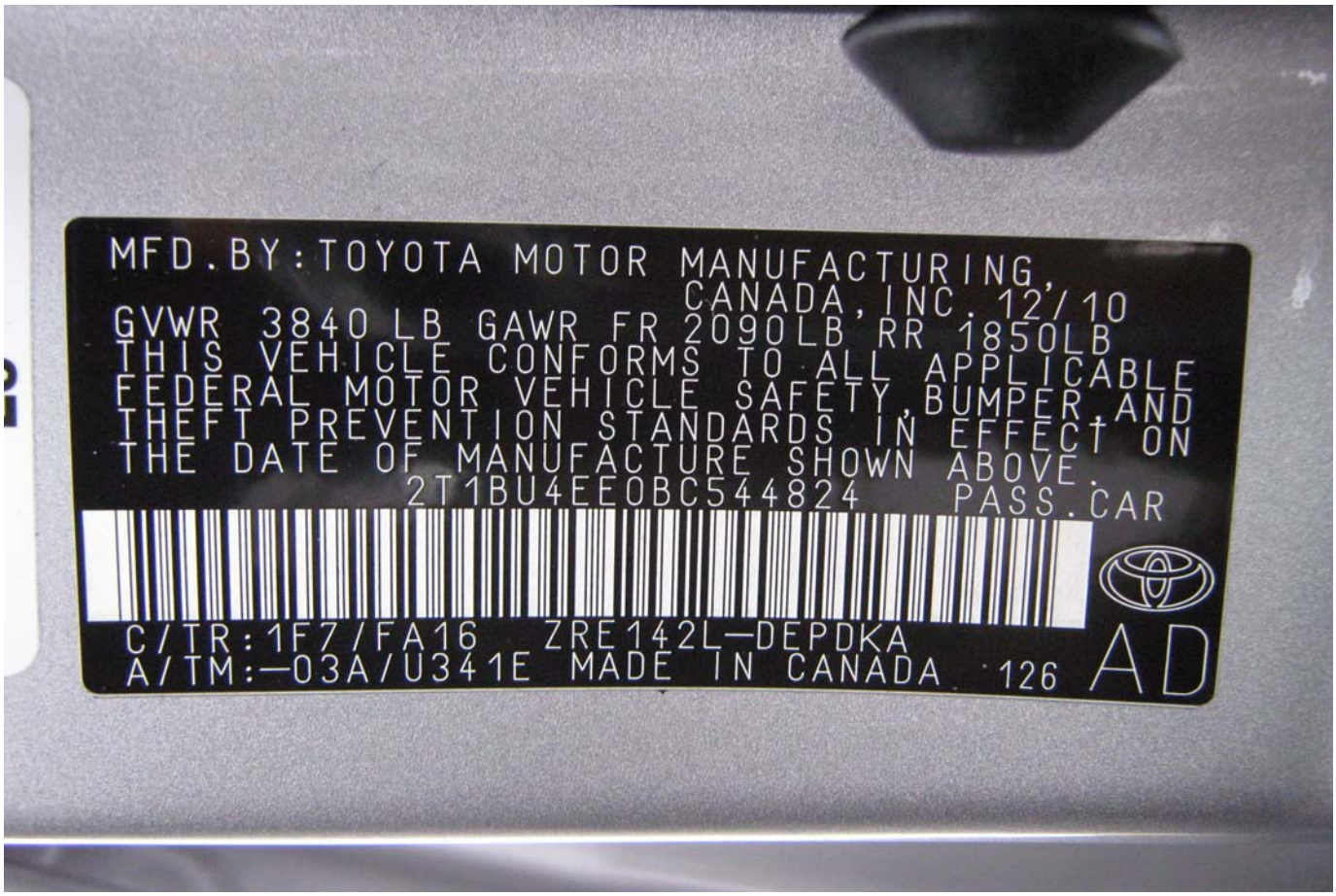
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS



Load Cell Location

Load Cell Wall



Manufacturer's Label

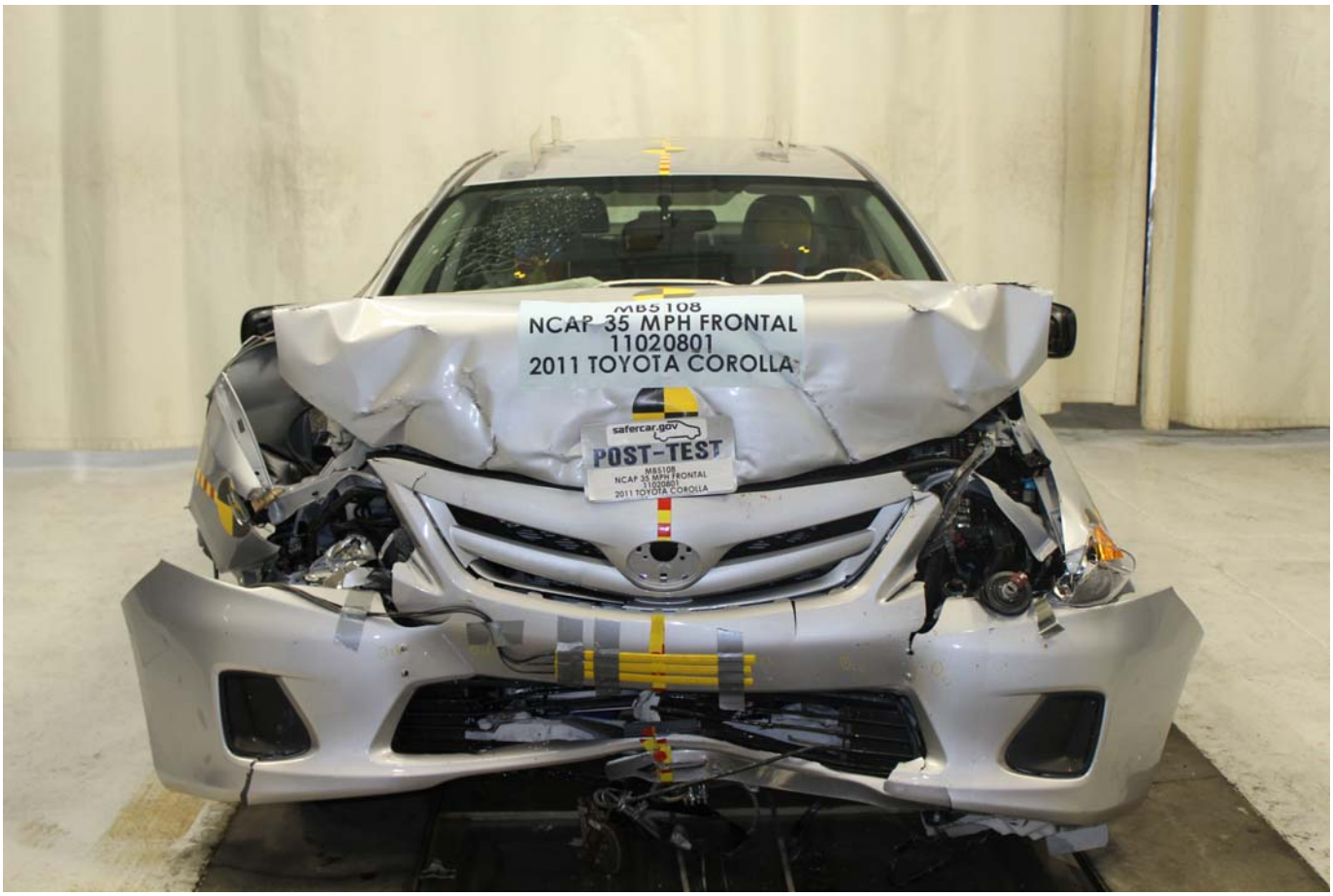
Tire Placard

Vehicle's Load Carrying Capacity Reduced

Right Front Three-Quarter View, As Received

Left Rear Three-Quarter View, As Received

Pre-Test Front View



Post-Test Front View

Pre-Test Left Side View (with vehicle at barrier)

Post-Test Left Side View

Pre-Test Right Side View (with vehicle at barrier)

Post-Test Right Side View

Pre-Test Right Front Three-Quarter View

Post-Test Right Front Three-Quarter View

Pre-Test Left Rear Three-Quarter View (with vehicle at barrier)

Post-Test Left Rear Three-Quarter View

Pre-Test Windshield View

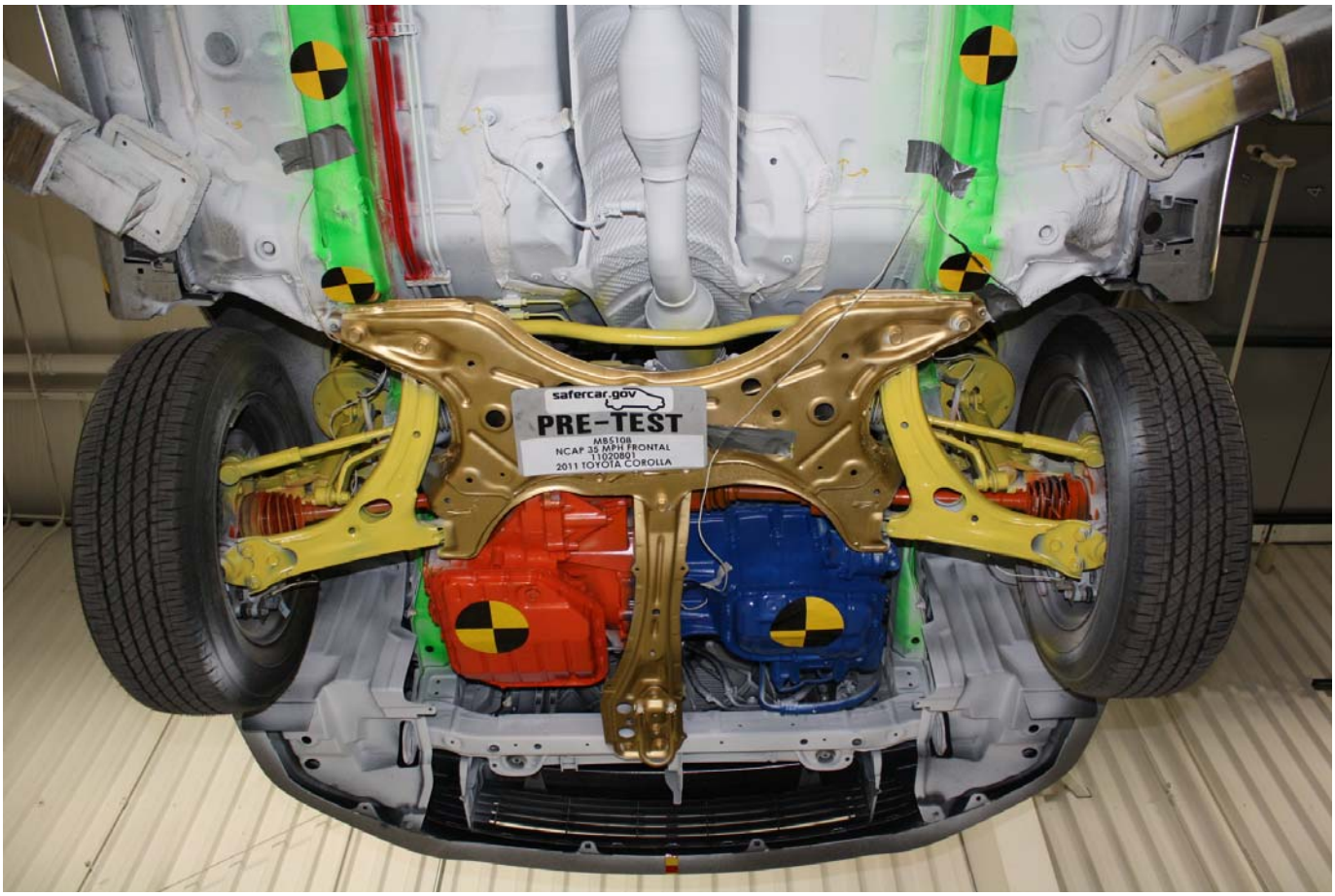
Post-Test Windshield View

Pre-Test Engine Compartment View

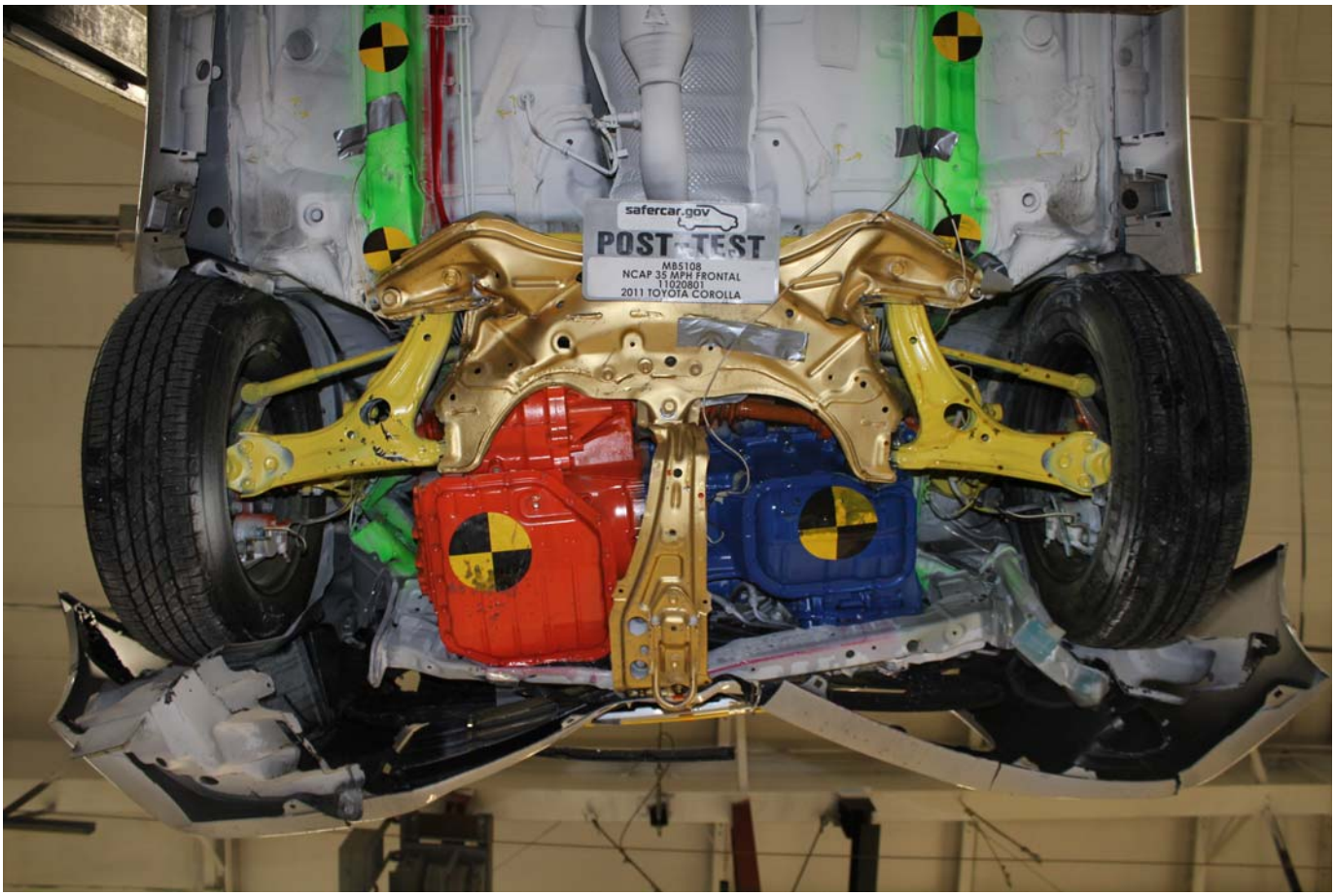
Post-Test Engine Compartment View

Pre-Test Fuel Cap View

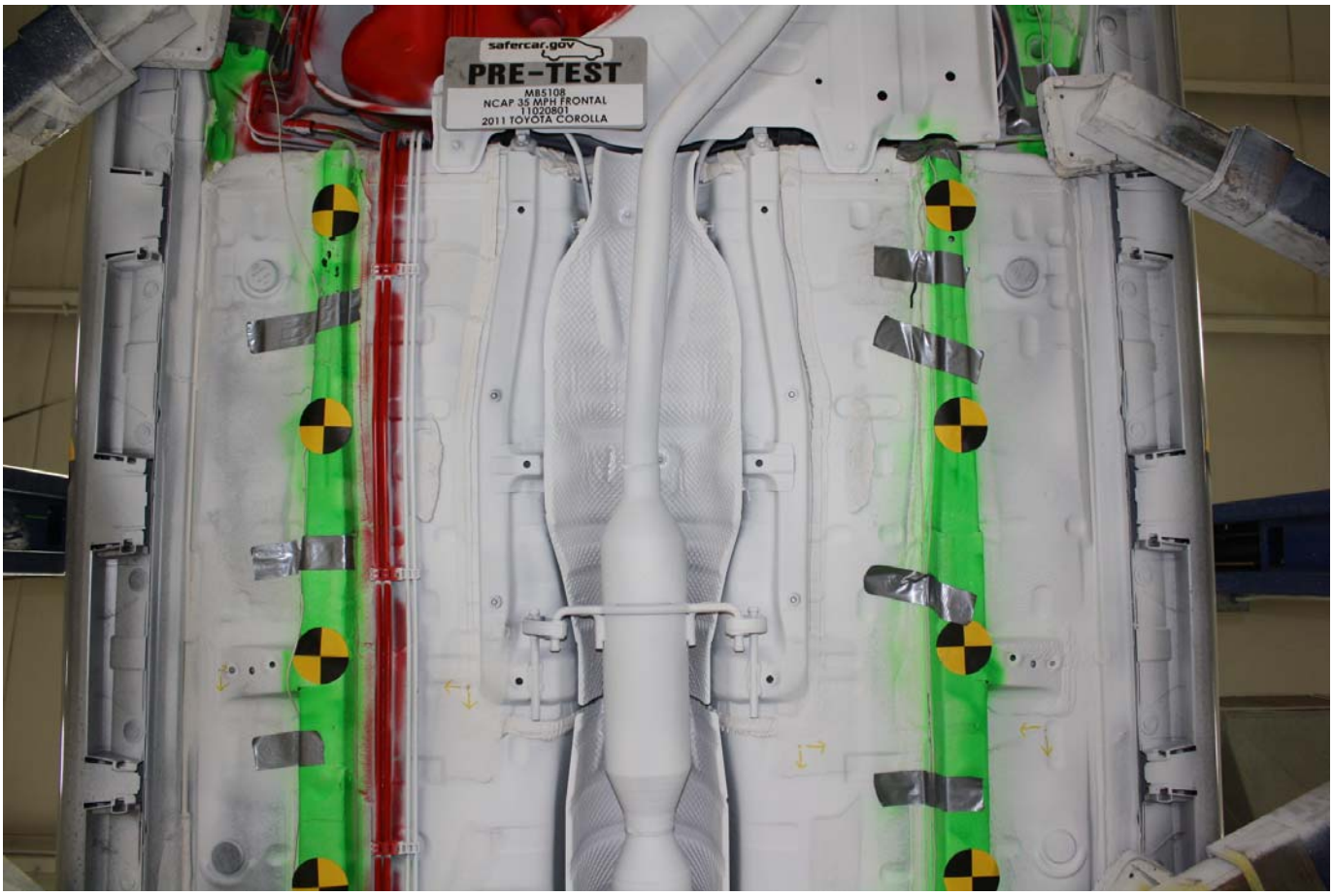
Post-Test Fuel Cap View



Pre-Test Front Underbody View

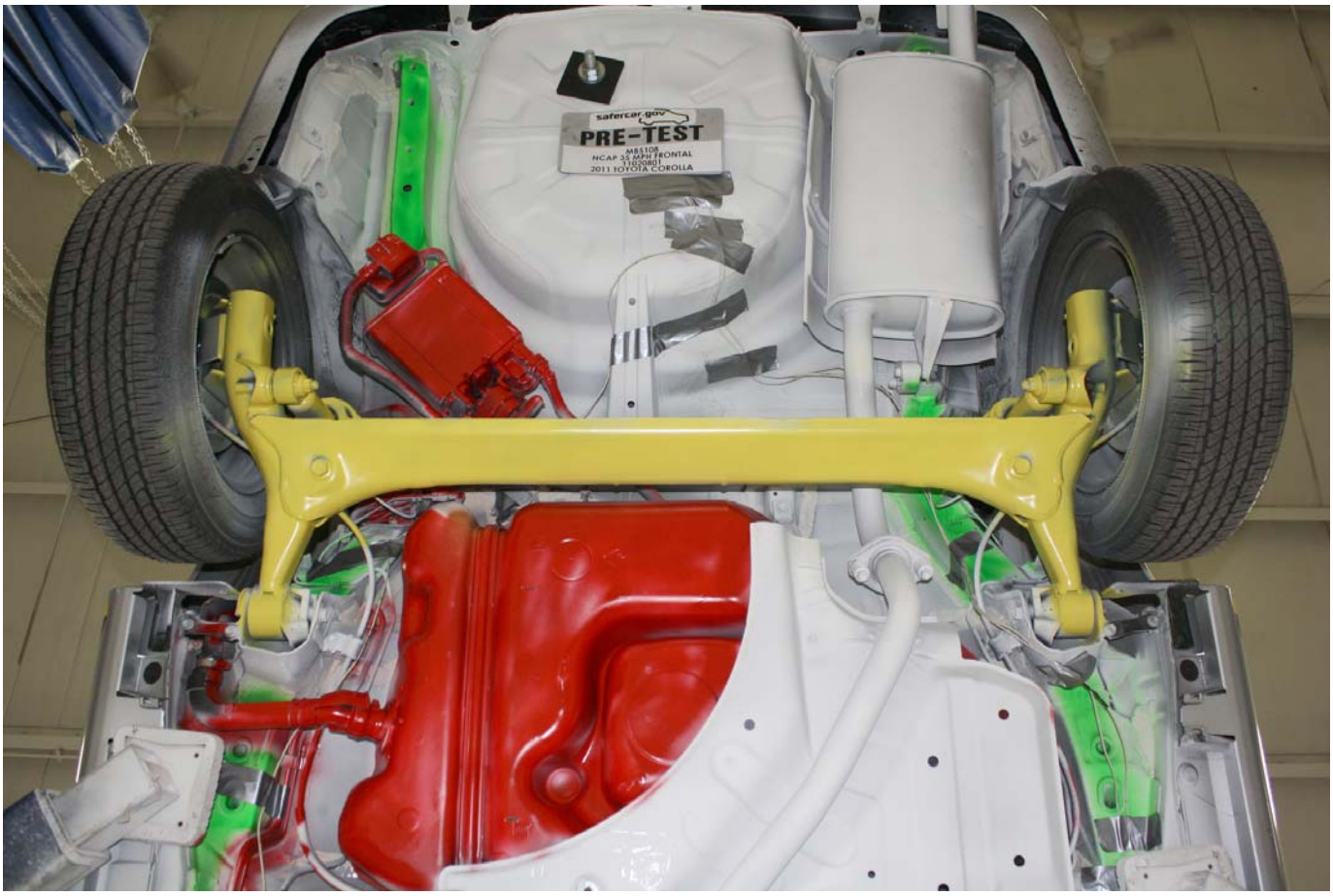


Post-Test Front Underbody View



Pre-Test Mid Underbody View

Post-Test Mid 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

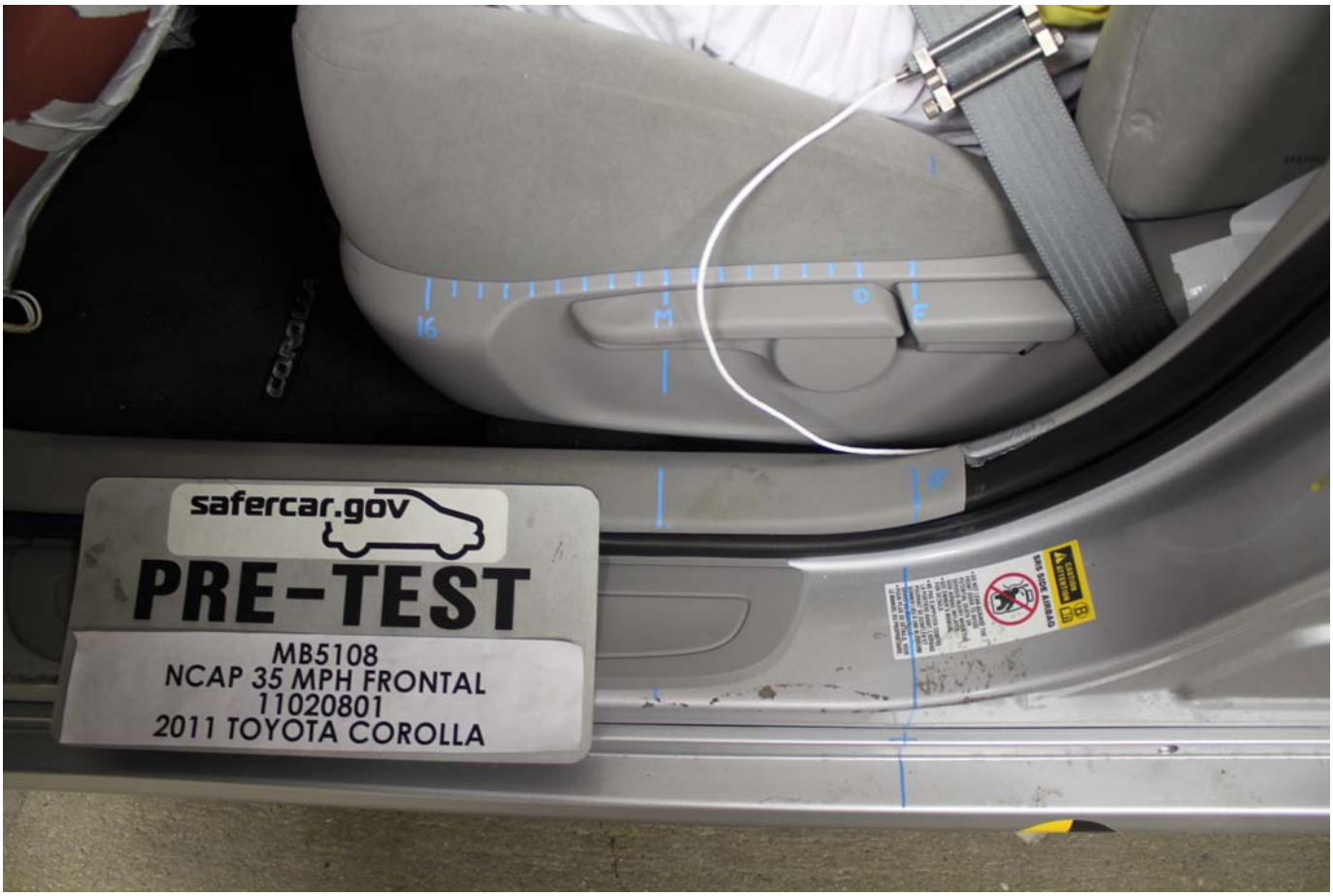
Post-Test Driver Dummy Front View

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

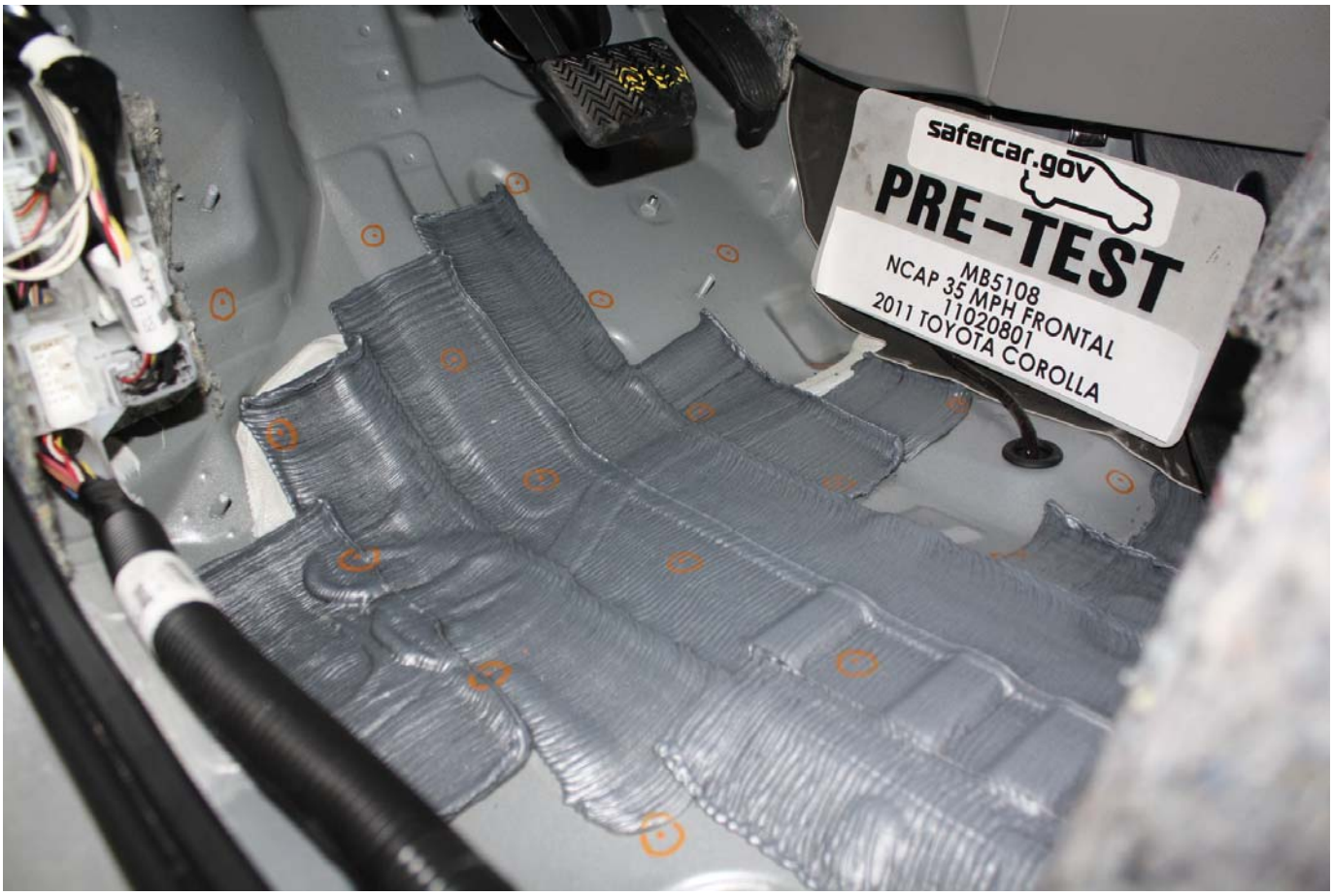
Post-Test Driver's Seat Fore-Aft Markings

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 Contact with Airbag

Post-Test Driver Dummy Contact with Headrest

Post-Test Driver Dummy Contact with Knee Bolster

Post-Test Driver Dummy Contact with Headliner

Pre-Test View of Steering Column Shear Capsule

Post-Test View of Steering Column Shear Capsule

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)

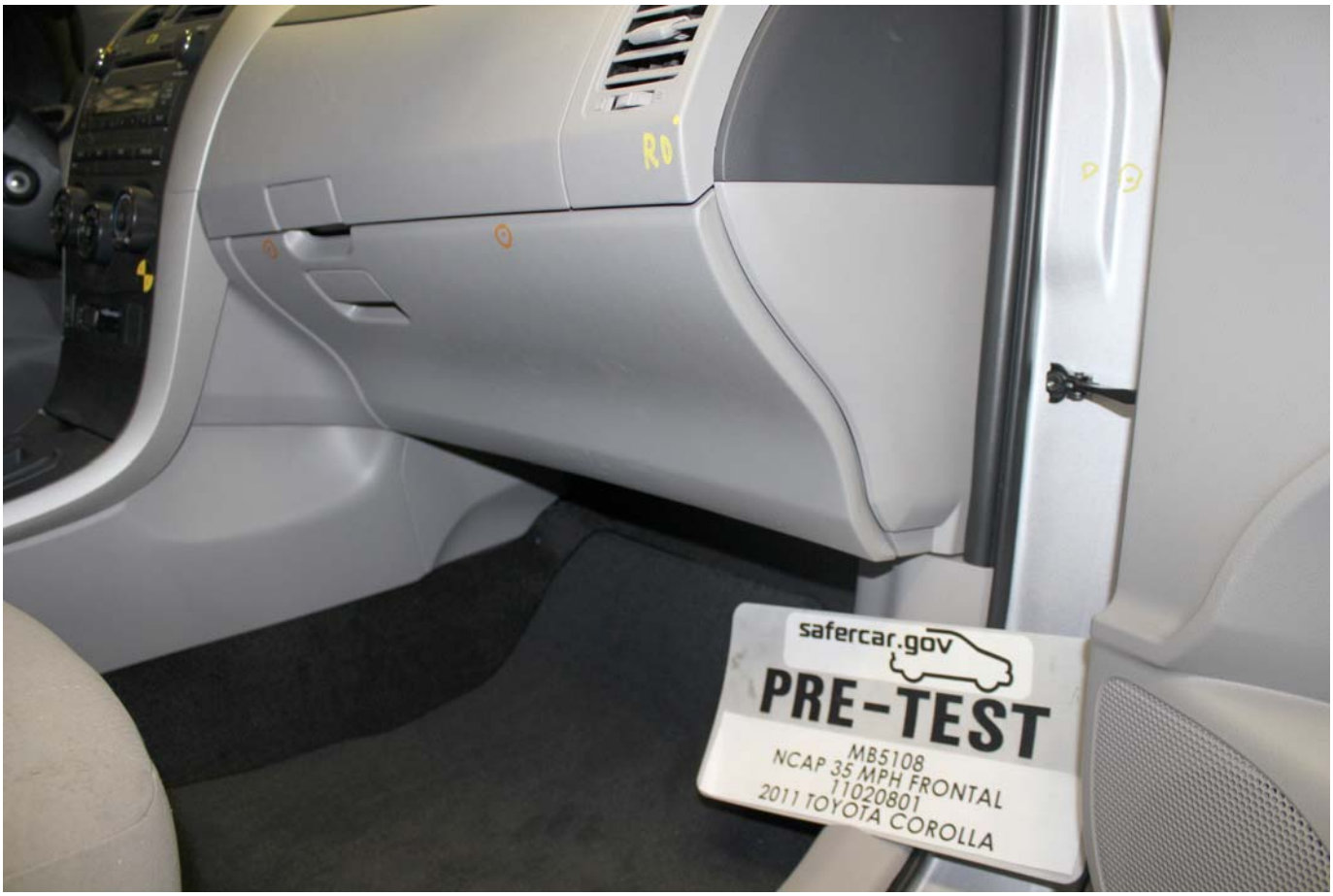
Post-Test Passenger Dummy and Vehicle Interior (Door Open)

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)

Pre-Test Passenger's Side Floorpan

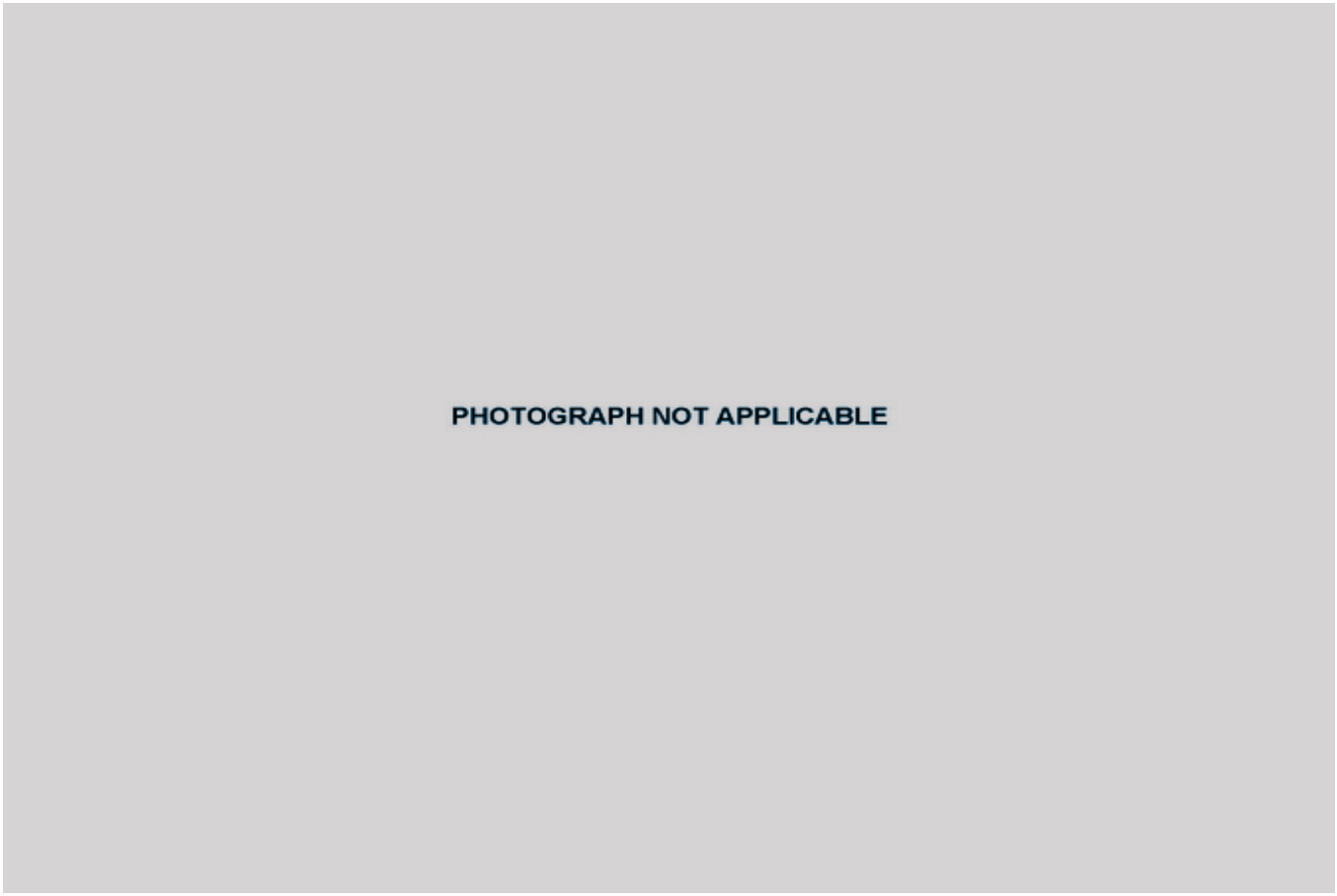
Post-Test Passenger's Side Floorpan

Post-Test Passenger Dummy Contact with Airbag

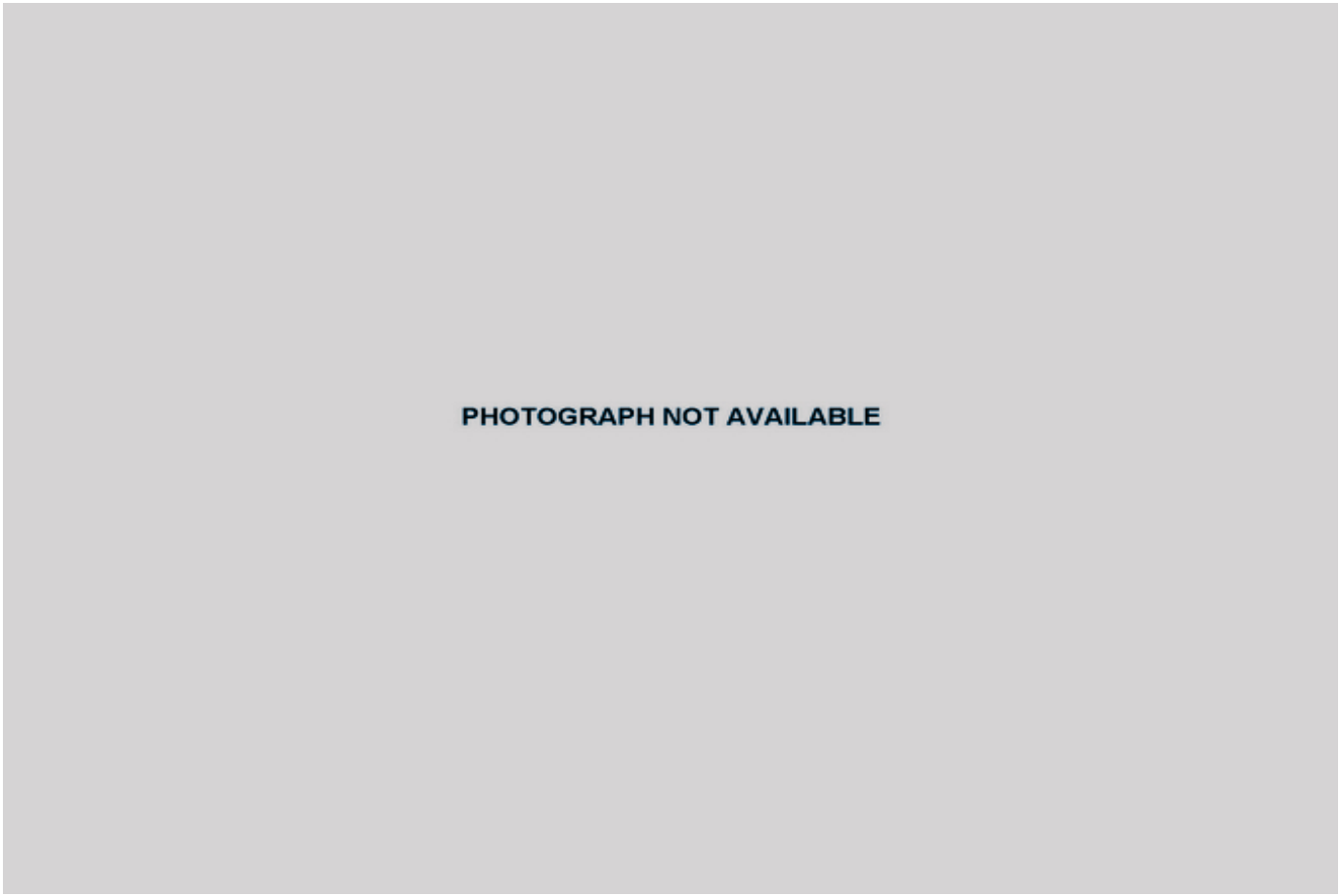
Post-Test Passenger Dummy Contact with Headrest

Post-Test Passenger Dummy Contact with Glovebox

Ballast Installed in Vehicle

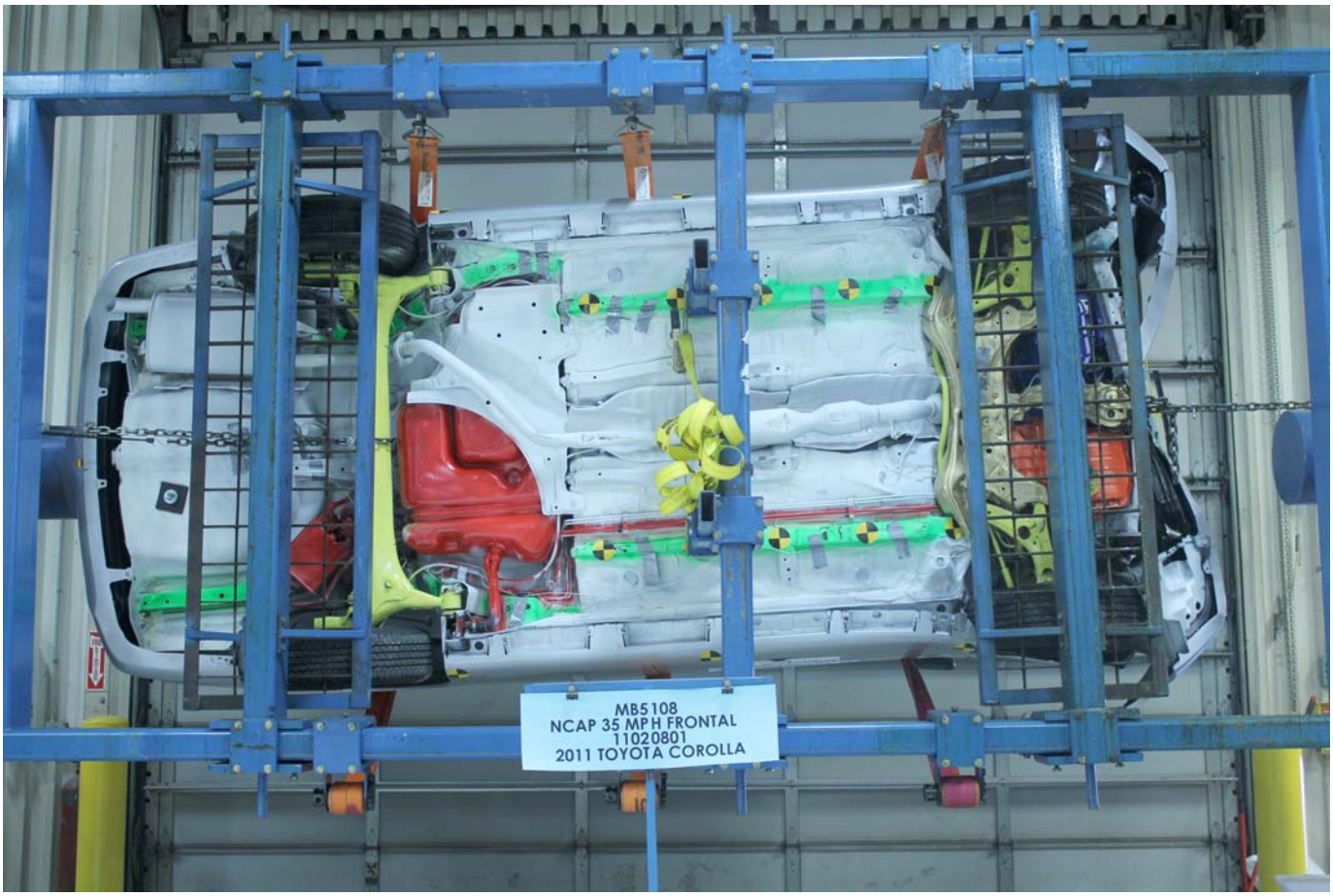


Post-Test Stoddard Solvent Spillage Location View



Post-Test Speed Trap Read-Out

Vehicle at 0 Degrees on Static Rollover Device



Vehicle at 90 Degrees on Static Rollover Device

Vehicle at 180 Degrees on Static Rollover Device

Vehicle at 270 Degrees on Static Rollover Device

Vehicle at 360 Degrees on Static Rollover Device

Vehicle Impact

TOYOTA
moving forward

DESC.: **COROLLA** **4-DOOR SEDAN**
VIN: **2T1BU4EE0BC544824**
YR/MDL: 2011/1832A
CLR: CLASSIC SILVER MET/FA16 (01F7/16)
PORT/PLANT: Detroit, MI/TMMC RAILHEAD:

GOVERNMENT SAFETY RATINGS

This vehicle has not been rated by the government for frontal crash, side crash or rollover risk.

Source: National Highway Traffic Safety Administration (NHTSA).

www.safercar.gov or 1-888-327-4236

EPA Fuel Economy Estimates

CITY MPG
26
Expected range for most drivers
21 to **31** MPG

Estimated Annual Fuel Cost
$1,552
based on 15,000 miles at $3.00 per gallon

Combined Fuel Economy
This Vehicle
29
14 — 42
All Compacts

HIGHWAY MPG
34
Expected range for most drivers
28 to **40** MPG

Your actual mileage will vary depending on how you drive and maintain your vehicle.

See the FREE Fuel Economy Guide at dealers or www.fueleconomy.gov

STANDARD EQUIPMENT

MECHANICAL & PERFORMANCE
- 1.8L DOHC 16-Valve 4 Cyl Dual VVT-i
- 4-Speed Automatic Transmission
- Front Wheel Drive
- MacPherson Strut Front Suspension & Torsion Beam Rear Suspension
- Electric Power Steering (EPS)
- Ventilated Front Disc/Rear Drum Brakes
- 15" Steel Wheels with Full Wheel Covers and P195/65R15 Tires

SAFETY
- Star Safety System Includes: VSC, TRAC, Anti-lock Brake System, EBD, Brake Assist & Smart Stop Technology (SST)
- Dr & Fr Pass Advanced Airbag System
- Dr & Fr Pass Seat Mounted Side Airbags
- Front & Rear Side Curtain Airbags
- Driver & Front Psgr Active Headrests
- 3-Point Seatbelts in All Seat Positions & Front Seatbelt Pretensioners
- LATCH(Lwr Anchor & Tethers for Children) for Outboard Rear Seating Positions Only
- Tire Pressure Monitor System
- Anti-Theft System w/ Engine Immobilizer
- Daytime Running Lights

EXTERIOR
- Multi-Reflector Halogen Headlamps
- Black Power Outside Mirrors
- Intermittent Windshield Wipers
- Color-Keyed Outside Door Handles

COMFORT & CONVENIENCE
- Air Conditioning with Air Filter
- AM/FM/CD MP3/WMA Player w/4 Speakers, Aux. Audio Jack, CD Text Display & ASL
- 6-way Adj. Dr Seat, 4-way Adj. Psgr Seat
- 60/40 Split Fold-Down Rear Seat
- Tilt/Telescopic Steering Wheel
- 12V Auxiliary Power Outlet
- Day/Night Rearview Mirror
- Center Console with Storage Compartment
- Heavy Duty Rear Window Defogger w/Timer
- Digital Clock
- Remote Hood and Fuel-Filler Releases
Full Tank of Gas

MANUFACTURER'S SUGGESTED RETAIL PRICE		**$16,400.00**
OPTIONAL EQUIPMENT		
FE	50 State Emissions	
CF.	Carpet Floor Mats & Trunk Mat	200.00
EF.	Rear Bumper Protector	79.00
DELIVERY PROCESSING AND HANDLING FEE		760.00
TOTAL		**$17,439.00**

T7815

The New Vehicle Limited Warranty provides 3-year/36,000 mile basic coverage, 3-year/60,000 mile powertrain coverage, plus 5-year/unlimited mile corrosion perforation coverage. See Owner's Warranty Information book for details. An extended service contract may be available for the vehicle. Ask dealer for details.
Manufacturer's suggested retail price includes manufacturer's recommended pre-delivery service. Gasoline, license and title fees, applicable federal, state and local taxes and dealer and distributor installed options and accessories are not included in the manufacturer's suggested retail price.

Dealer Name / Address: 12034 **Ship to:**
ELMHURST TOYOTA
440 WEST LAKE STREET
ELMHURST IL60126

Monroney Label

APPENDIX B

DUMMY RESPONSE DATA

TABLE OF DATA PLOTS

The following 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 Shoulder Belt Force – not installed

Driver Lap Belt Force

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

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 Lap Belt Force

Passenger Shoulder Belt Force – not installed

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

Left Rear Seat Crossmember X

Left Rear Seat Crossmember Z

Right Rear Seat Crossmember X

Right Rear Seat Crossmember Z

Vehicle Engine Top X

Vehicle Engine Bottom X

Vehicle Left Brake Caliper X

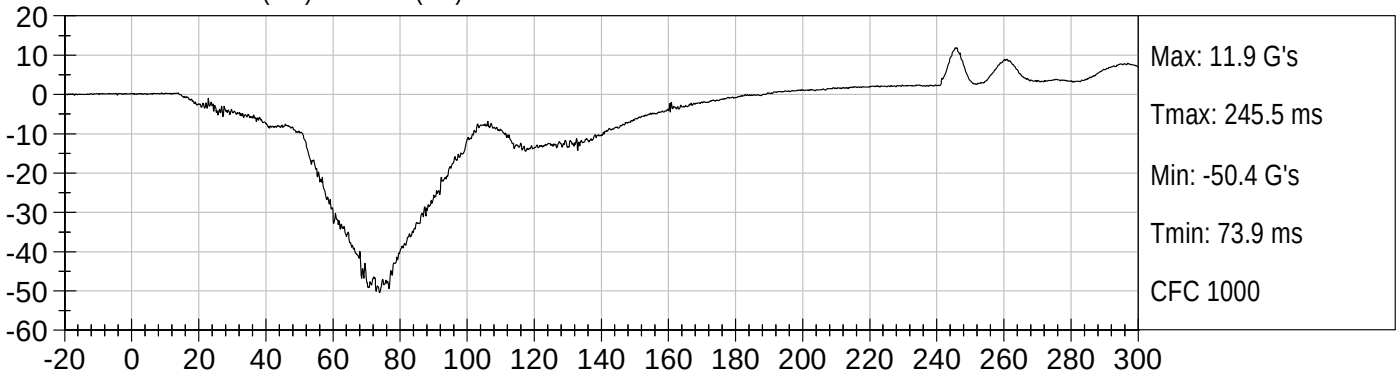
Vehicle Right Brake Caliper X

Advanced Research Load Cell Barrier – 127 channels

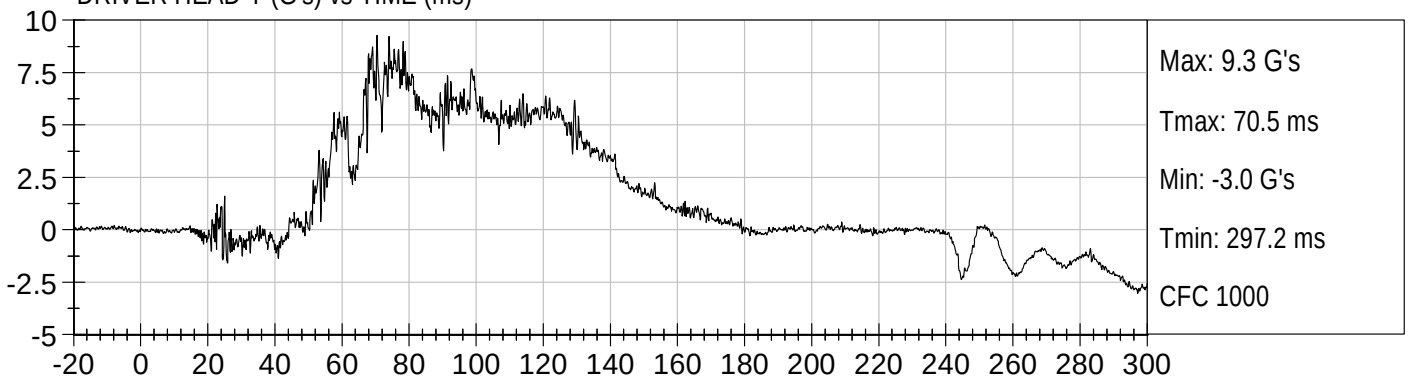
NCAP 35mph Frontal
2011 Toyota Corolla - MB5108

Test Date: 02/08/2011
Speed: 35.1 mph (56.5 km/h)

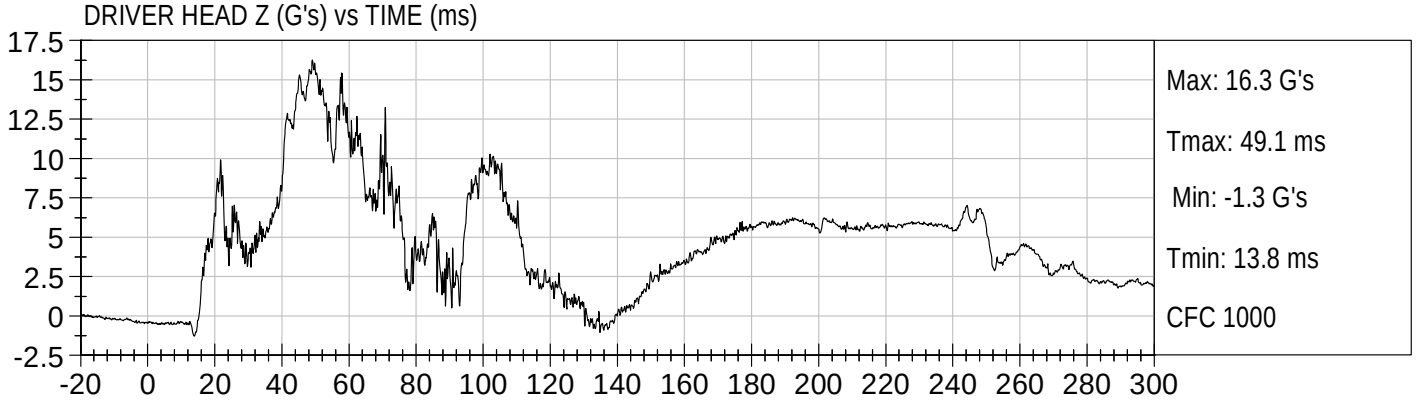
DRIVER HEAD X (G's) vs TIME (ms)



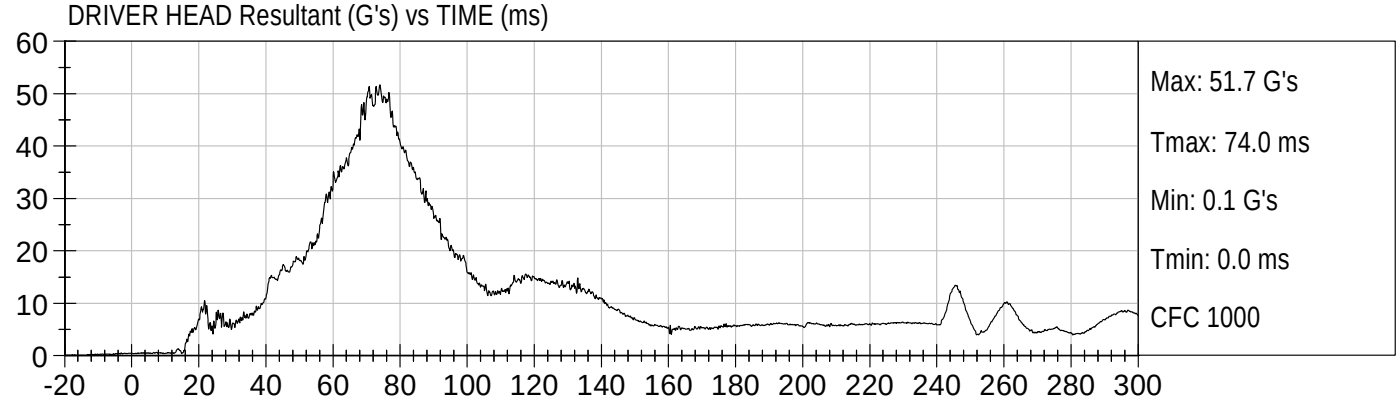
DRIVER HEAD Y (G's) vs TIME (ms)



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

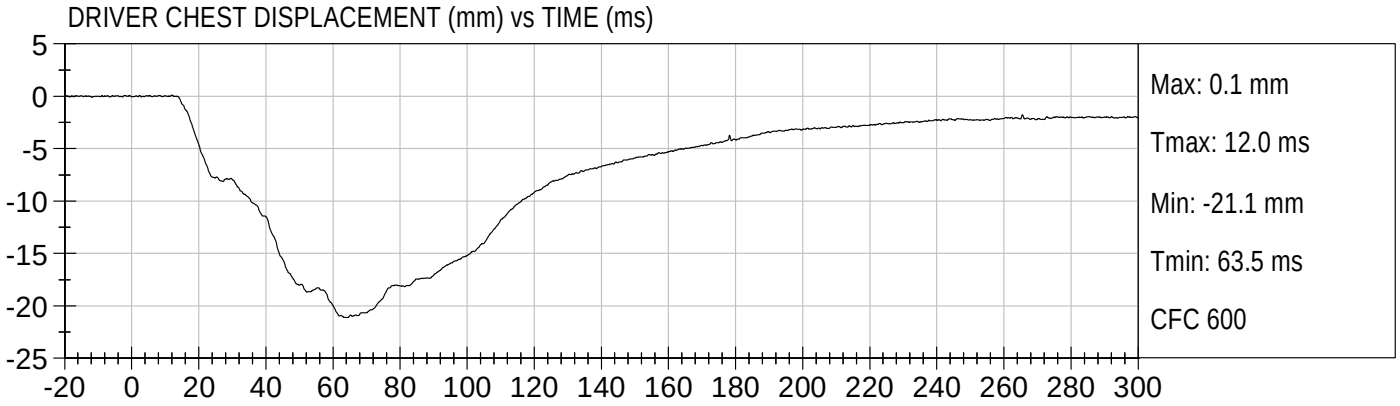


DRIVER HEAD Resultant (G's) vs TIME (ms)



NCAP 35mph Frontal
2011 Toyota Corolla - MB5108

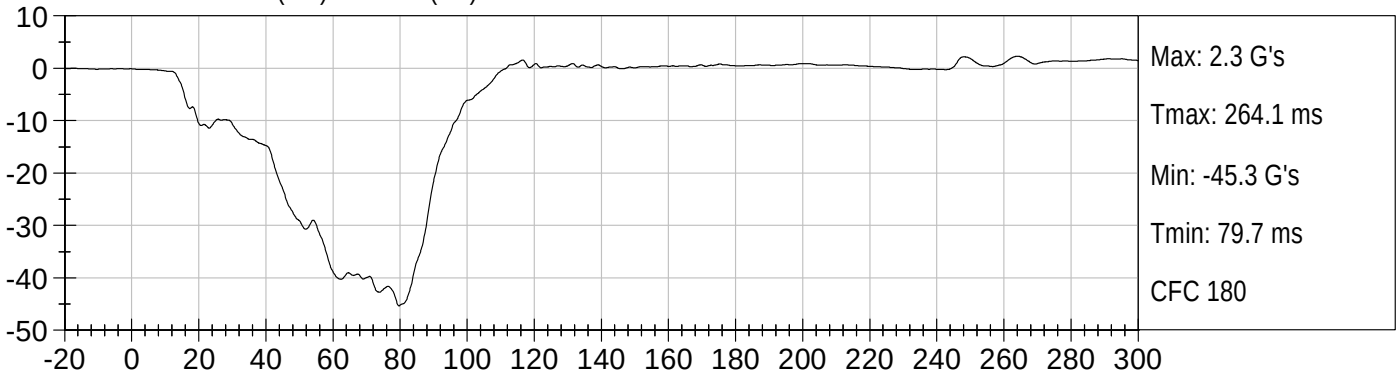
Test Date: 02/08/2011
Speed: 35.1 mph (56.5 km/h)



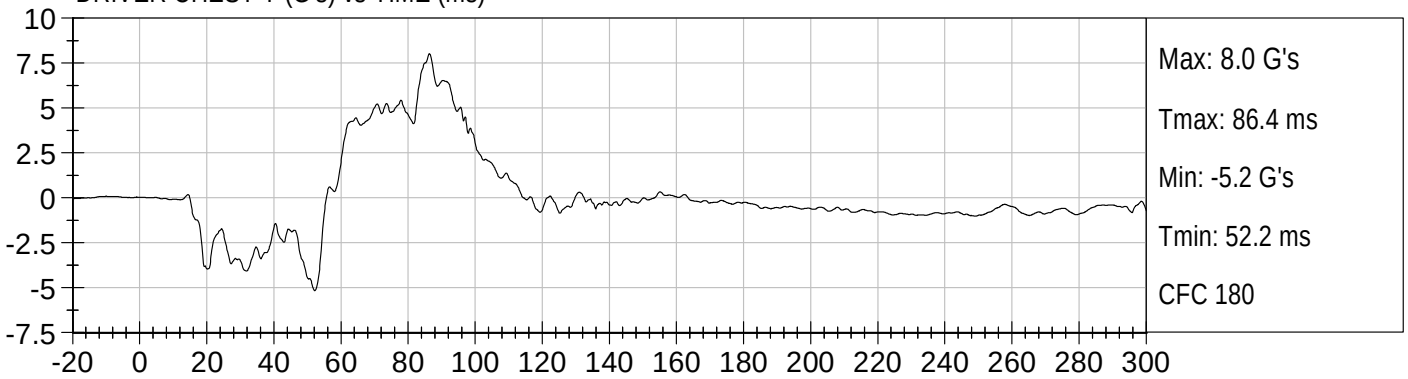
NCAP 35mph Frontal
2011 Toyota Corolla - MB5108

Test Date: 02/08/2011
Speed: 35.1 mph (56.5 km/h)

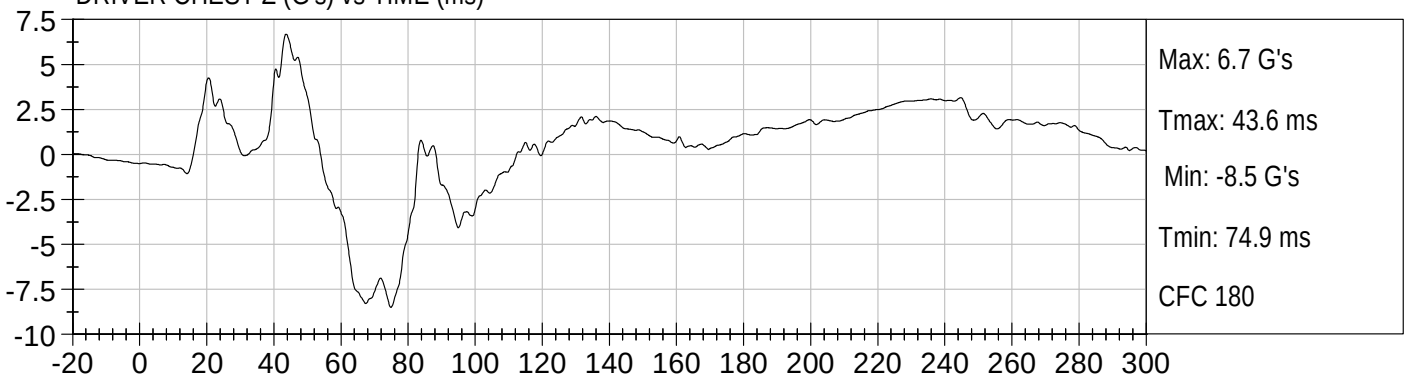
DRIVER CHEST X (G's) vs TIME (ms)



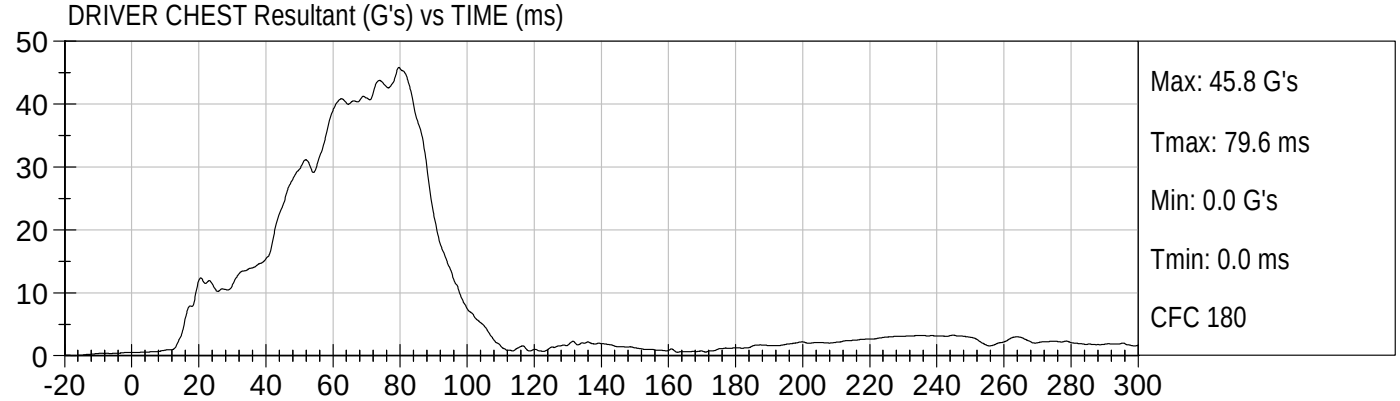
DRIVER CHEST Y (G's) vs TIME (ms)



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



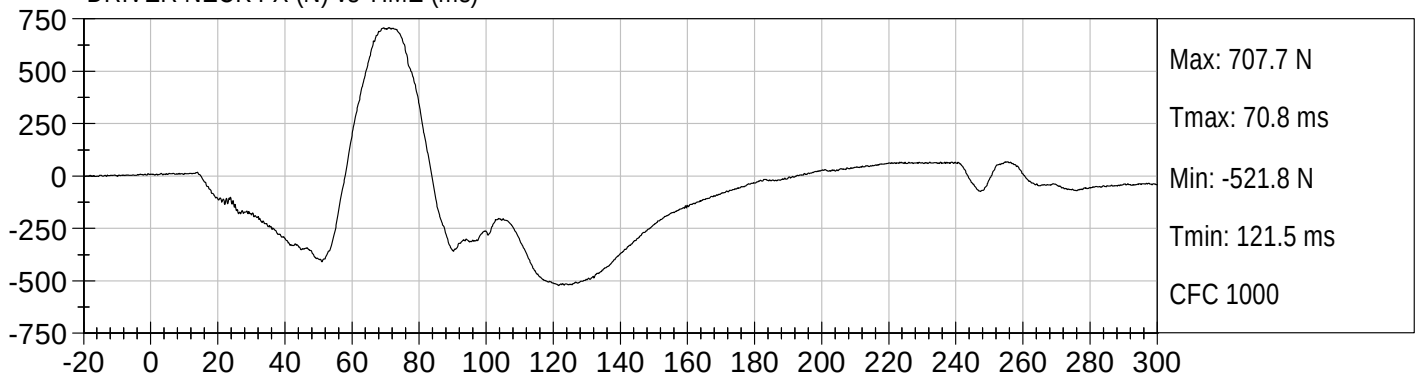
DRIVER CHEST Resultant (G's) vs TIME (ms)



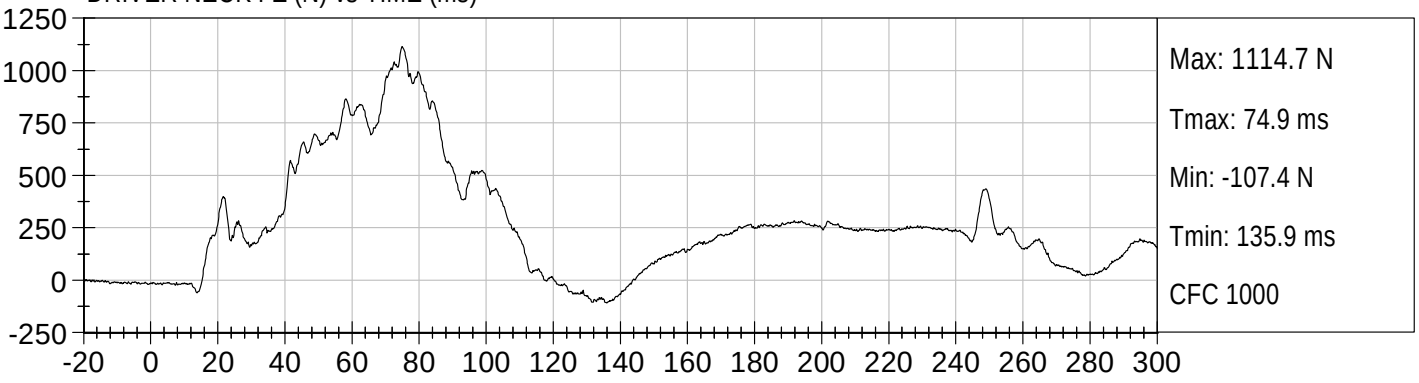
NCAP 35mph Frontal
2011 Toyota Corolla - MB5108

Test Date: 02/08/2011
Speed: 35.1 mph (56.5 km/h)

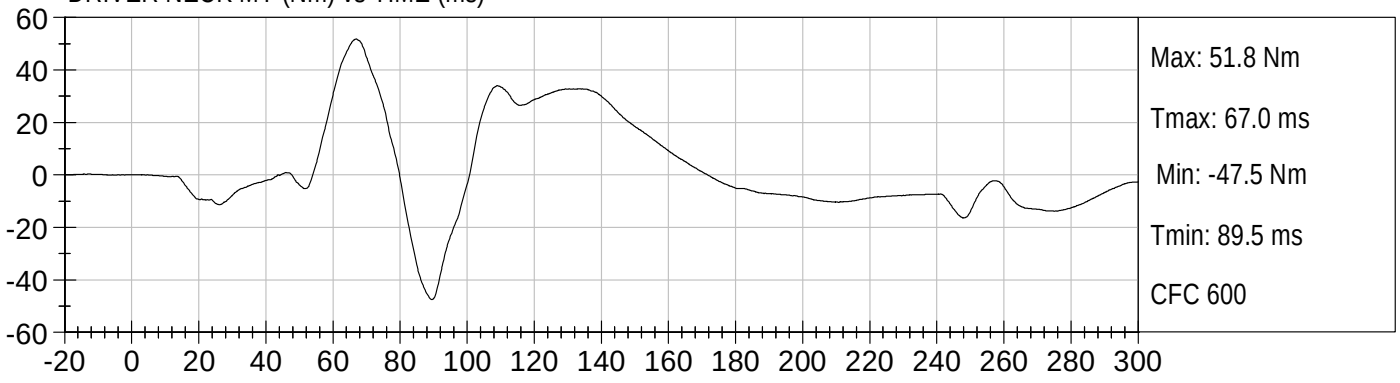
DRIVER NECK FX (N) vs TIME (ms)

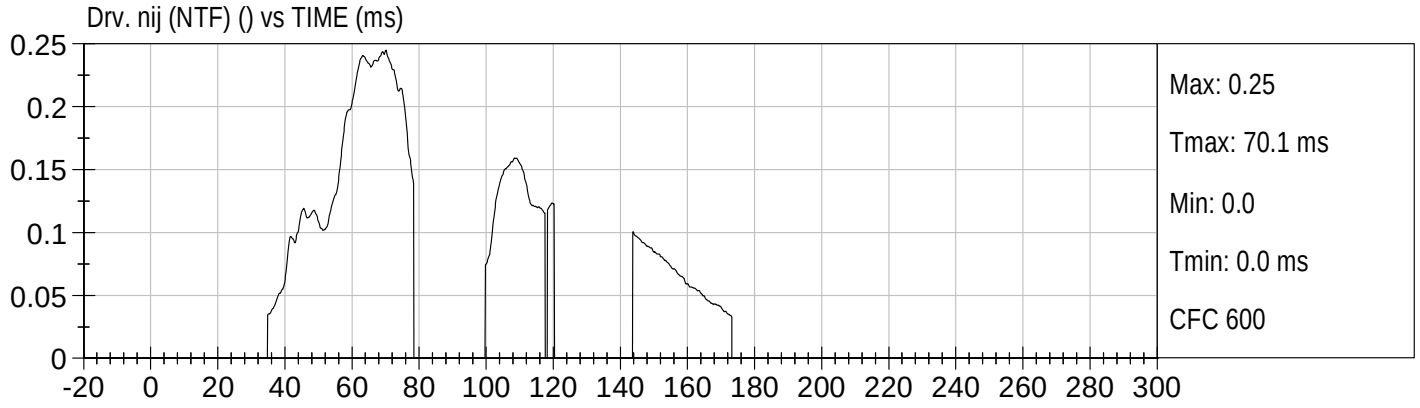


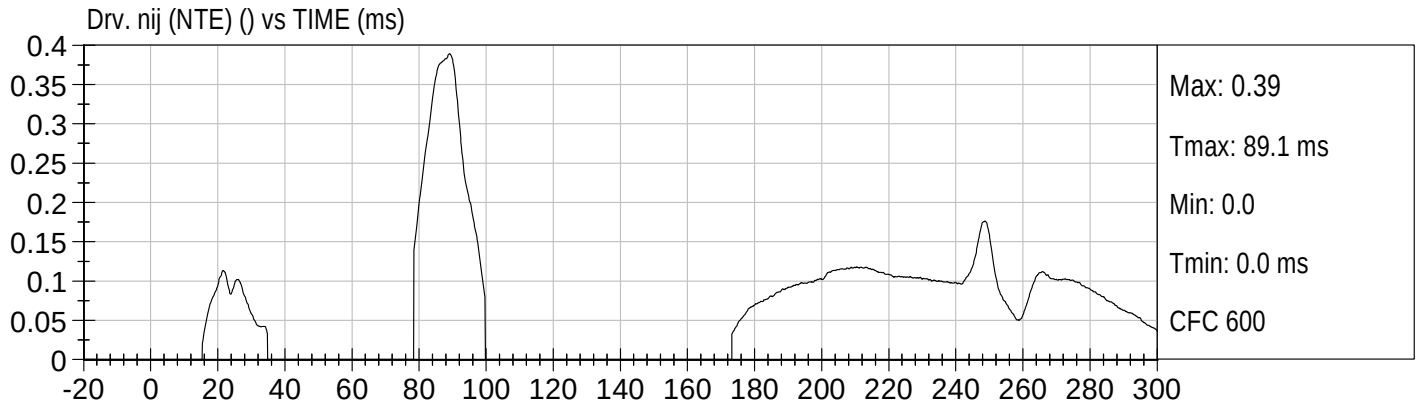
DRIVER NECK FZ (N) vs TIME (ms)

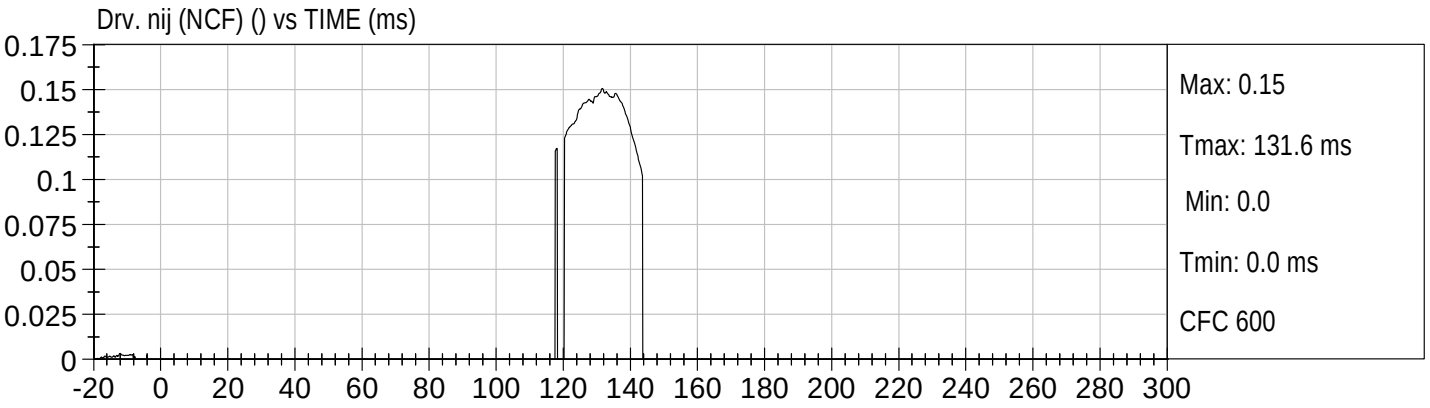


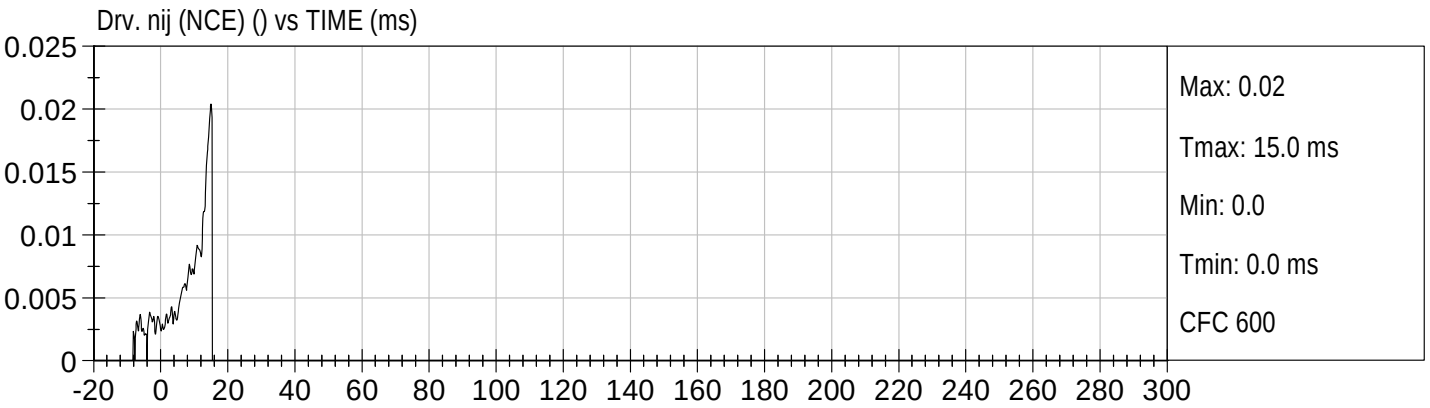
DRIVER NECK MY (Nm) vs TIME (ms)




Drv. nij (NTF) () vs TIME (ms)
0.25
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: 0.25
Tmax: 70.1 ms
Min: 0.0
Tmin: 0.0 ms
CFC 600


Drv. nij (NTE) () vs TIME (ms)
0.4
0.35
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: 0.39
Tmax: 89.1 ms
Min: 0.0
Tmin: 0.0 ms
CFC 600

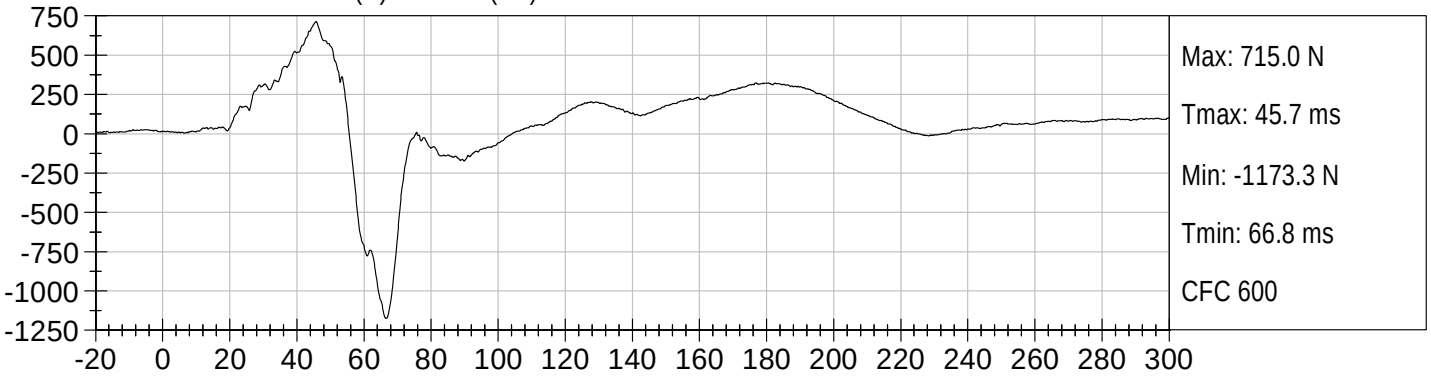

Drv. nij (NCF) () vs TIME (ms)
0.175
0.15
0.125
0.1
0.075
0.05
0.025
0
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 0.15
Tmax: 131.6 ms
Min: 0.0
Tmin: 0.0 ms
CFC 600


Drv. nij (NCE) () vs TIME (ms)
0.025
0.02
0.015
0.01
0.005
0
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 0.02
Tmax: 15.0 ms
Min: 0.0
Tmin: 0.0 ms
CFC 600

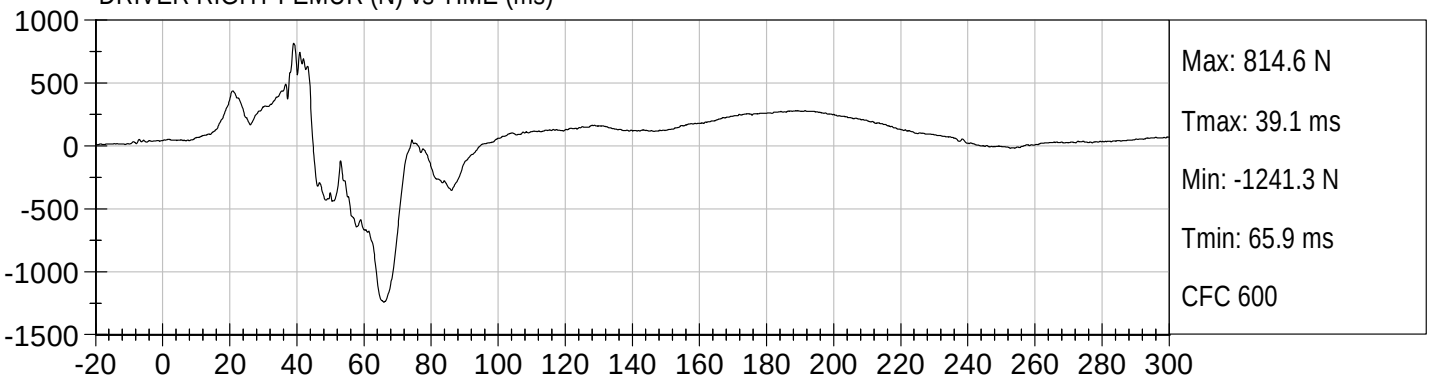
NCAP 35mph Frontal
2011 Toyota Corolla - MB5108

Test Date: 02/08/2011
Speed: 35.1 mph (56.5 km/h)

DRIVER LEFT FEMUR (N) vs TIME (ms)



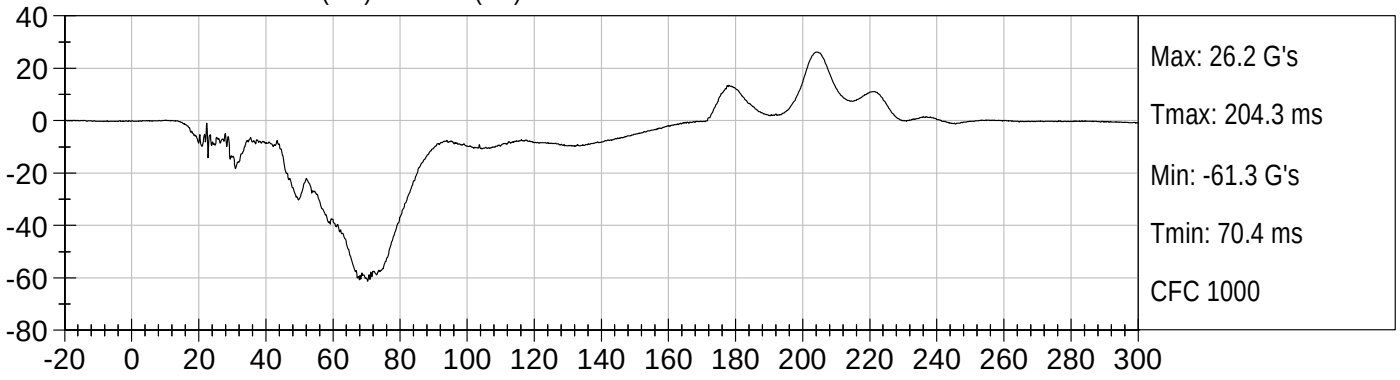
DRIVER RIGHT FEMUR (N) vs TIME (ms)



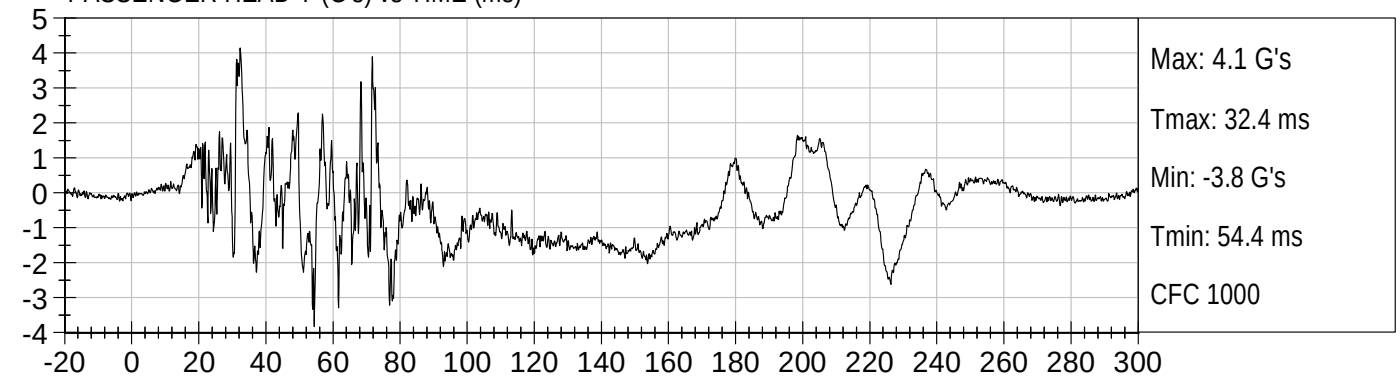
NCAP 35mph Frontal
2011 Toyota Corolla - MB5108

Test Date: 02/08/2011
Speed: 35.1 mph (56.5 km/h)

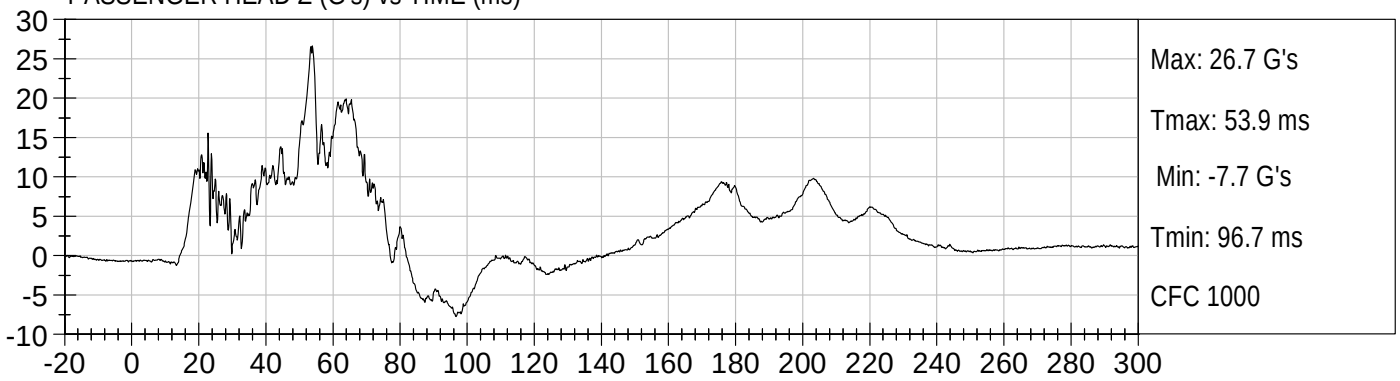
PASSENGER HEAD X (G's) vs TIME (ms)



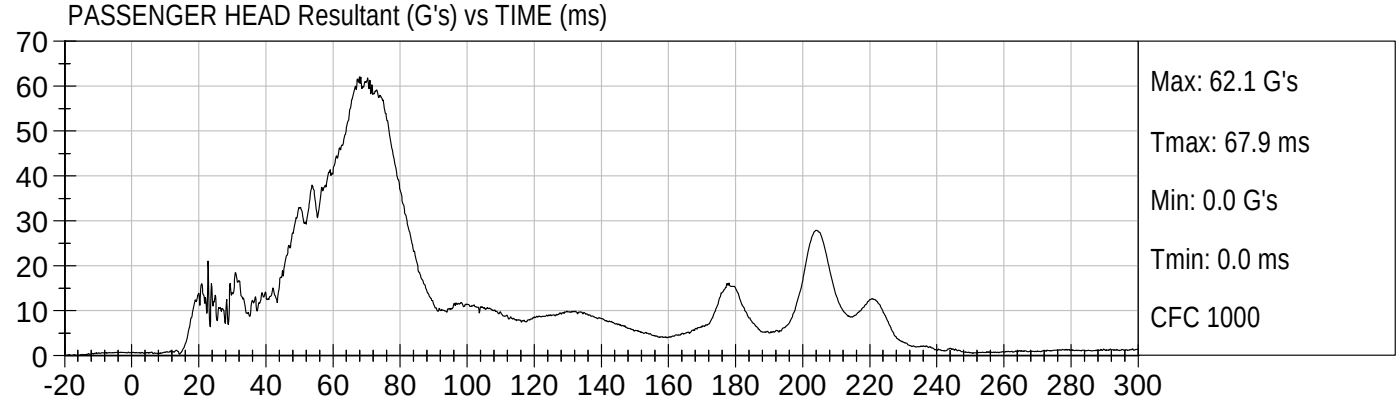
PASSENGER HEAD Y (G's) vs TIME (ms)



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

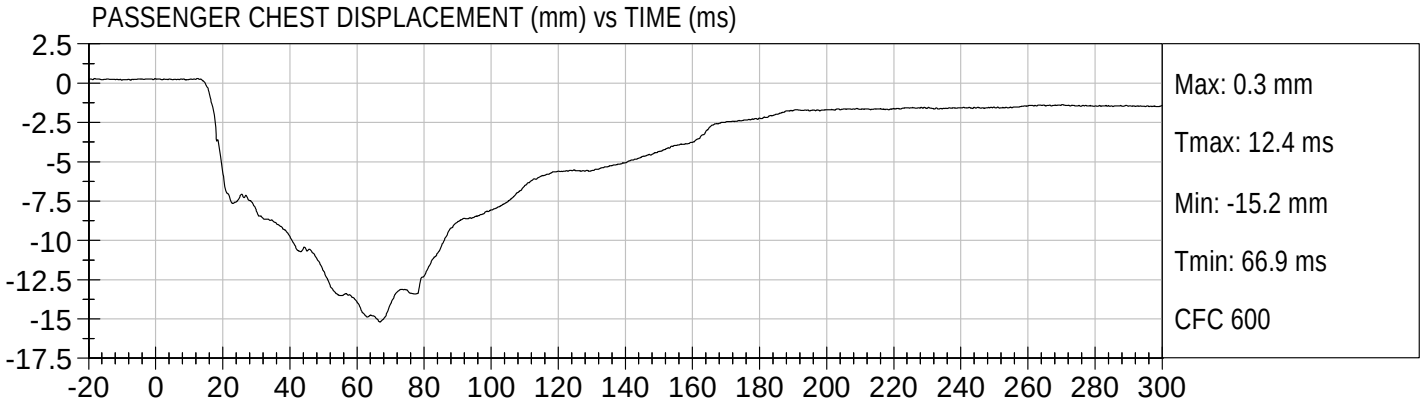


PASSENGER HEAD Resultant (G's) vs TIME (ms)



NCAP 35mph Frontal
2011 Toyota Corolla - MB5108

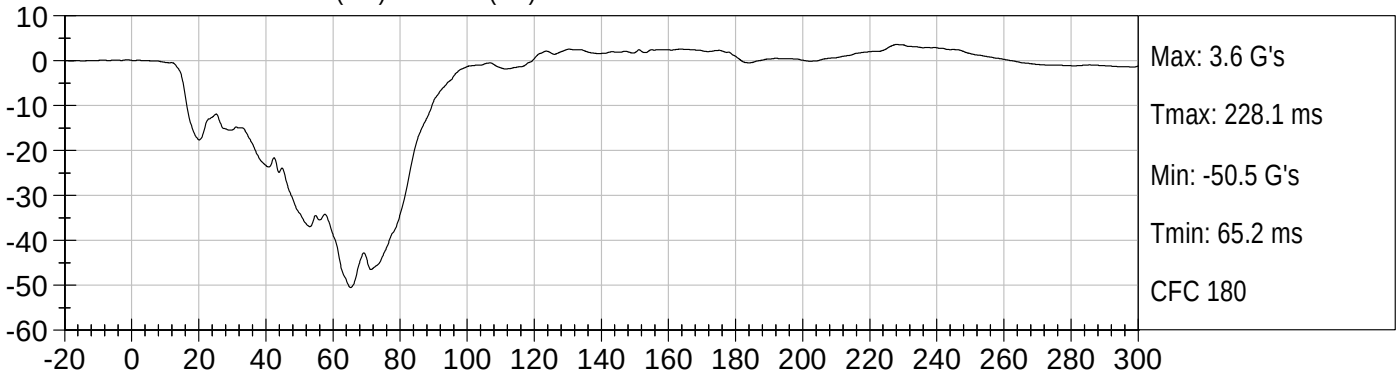
Test Date: 02/08/2011
Speed: 35.1 mph (56.5 km/h)



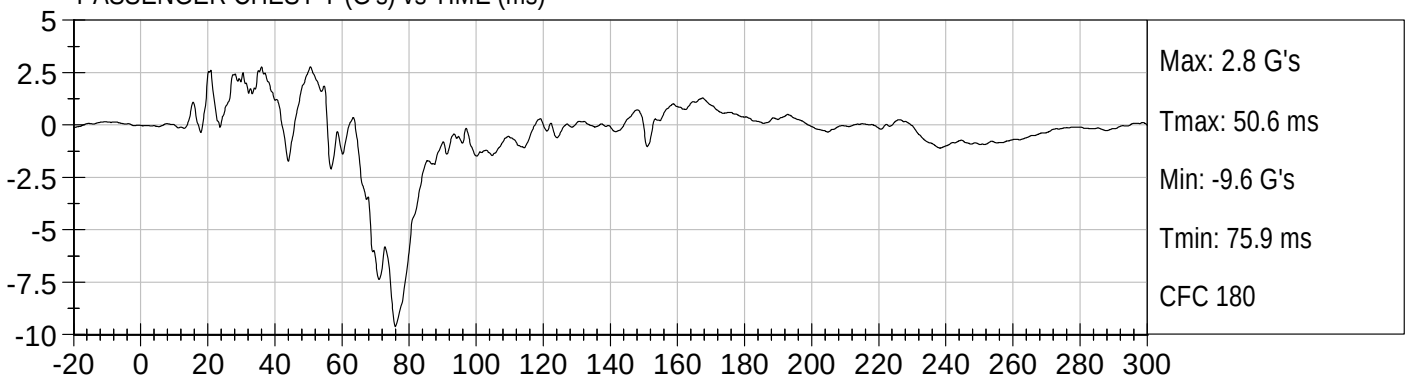
NCAP 35mph Frontal
2011 Toyota Corolla - MB5108

Test Date: 02/08/2011
Speed: 35.1 mph (56.5 km/h)

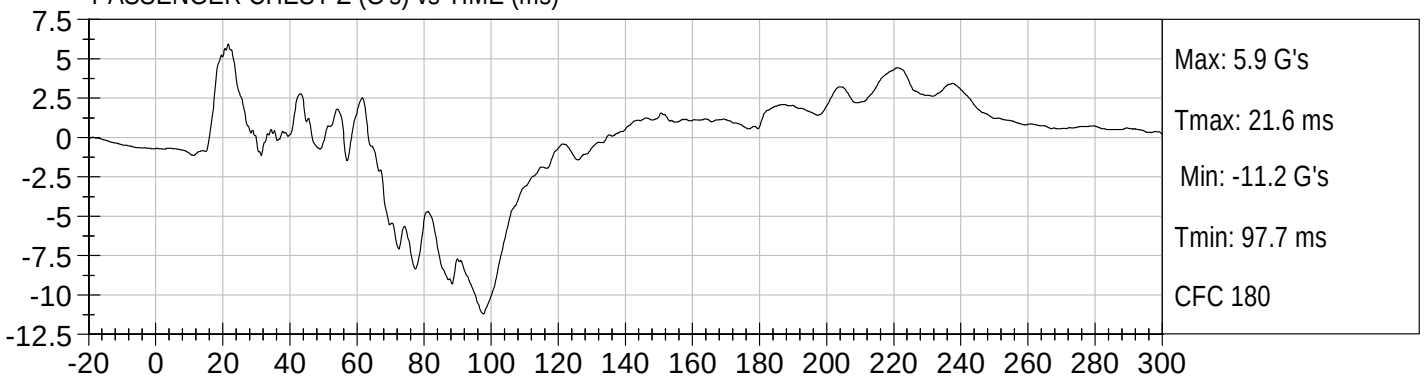
PASSENGER CHEST X (G's) vs TIME (ms)



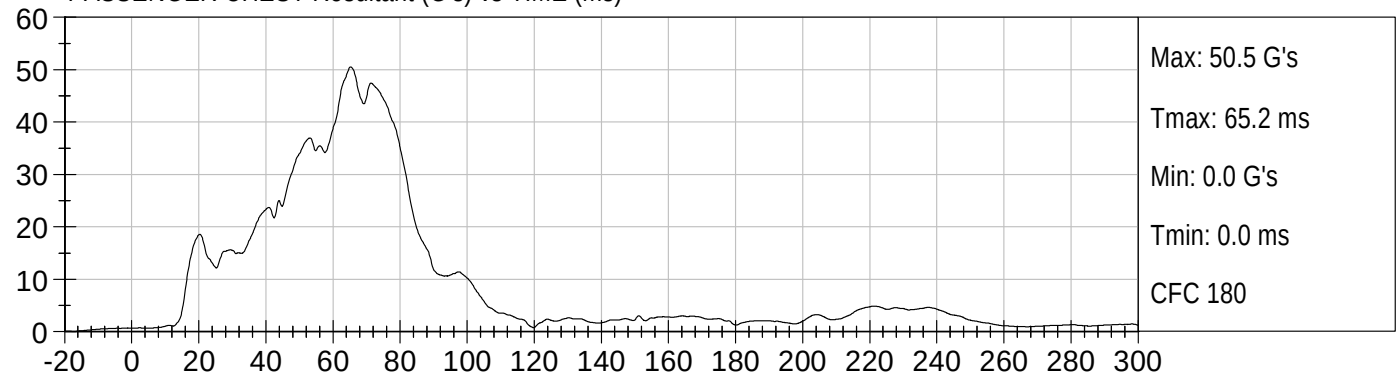
PASSENGER CHEST Y (G's) vs TIME (ms)



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



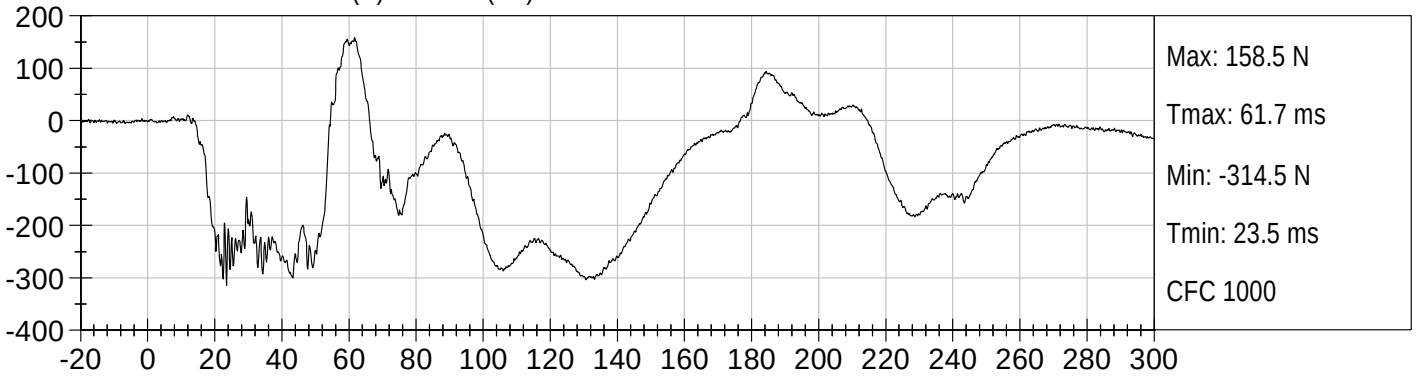
PASSENGER CHEST Resultant (G's) vs TIME (ms)



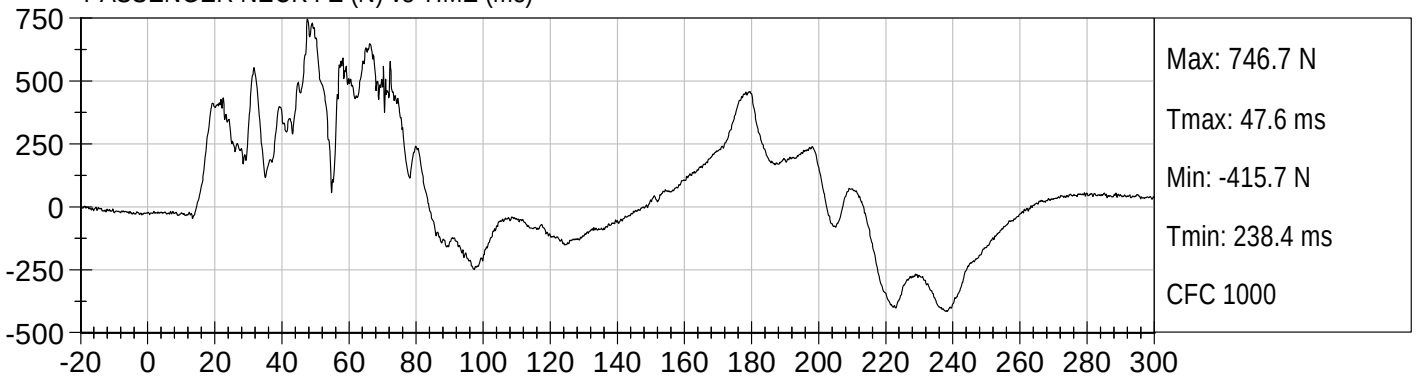
NCAP 35mph Frontal
2011 Toyota Corolla - MB5108

Test Date: 02/08/2011
Speed: 35.1 mph (56.5 km/h)

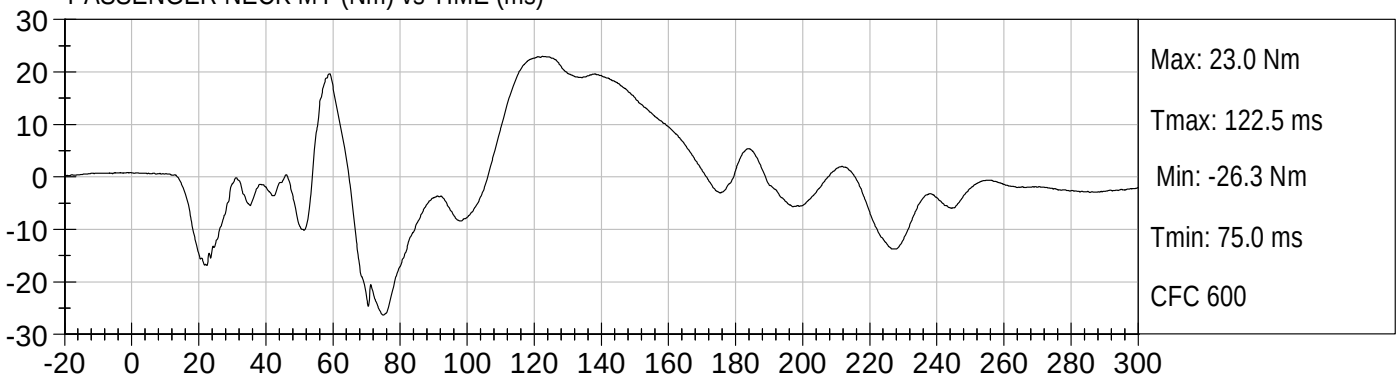
PASSENGER NECK FX (N) vs TIME (ms)



PASSENGER NECK FZ (N) vs TIME (ms)

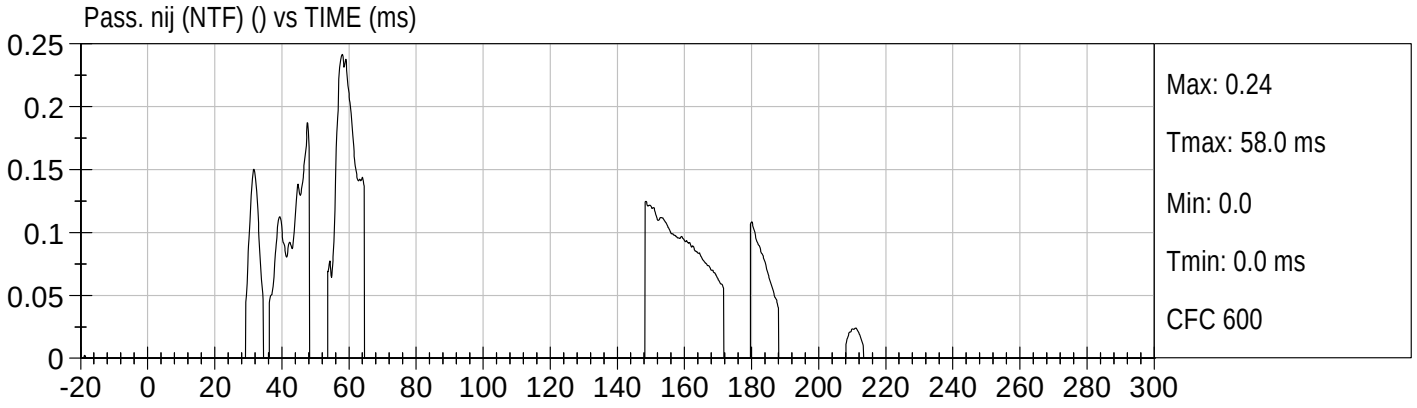


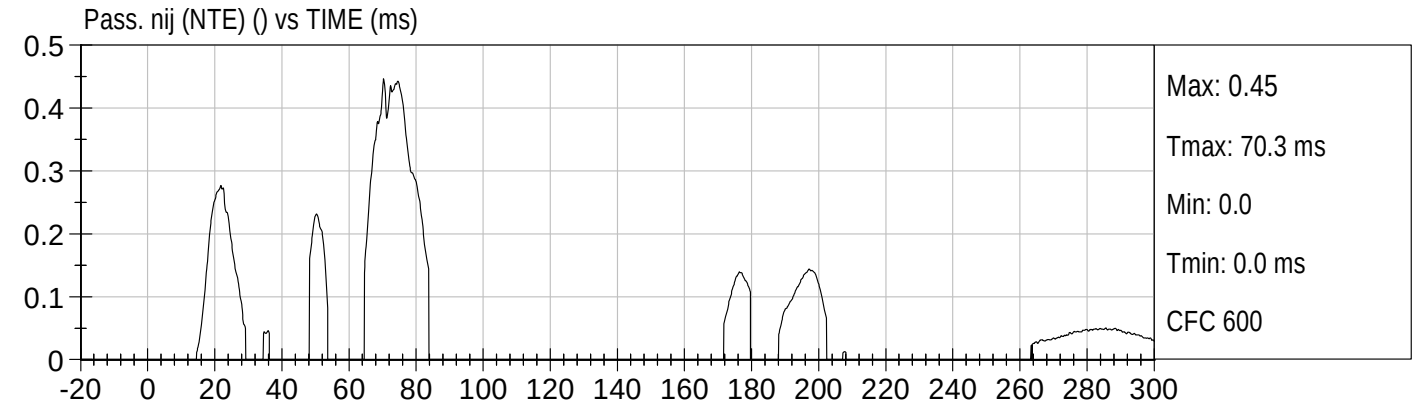
PASSENGER NECK MY (Nm) vs TIME (ms)

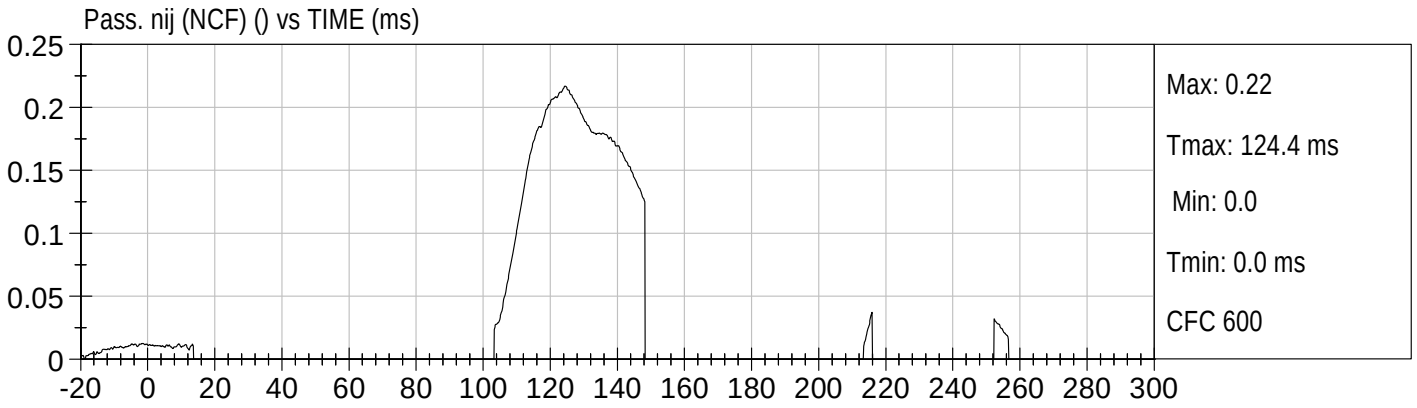


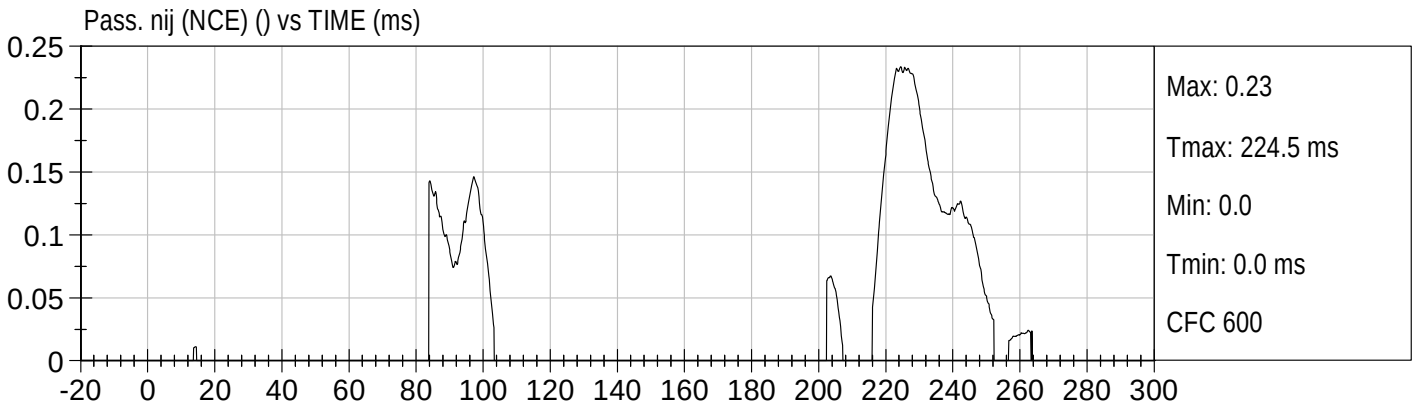
NCAP 35mph Frontal
2011 Toyota Corolla - MB5108

Test Date: 02/08/2011
Speed: 35.1 mph (56.5 km/h)





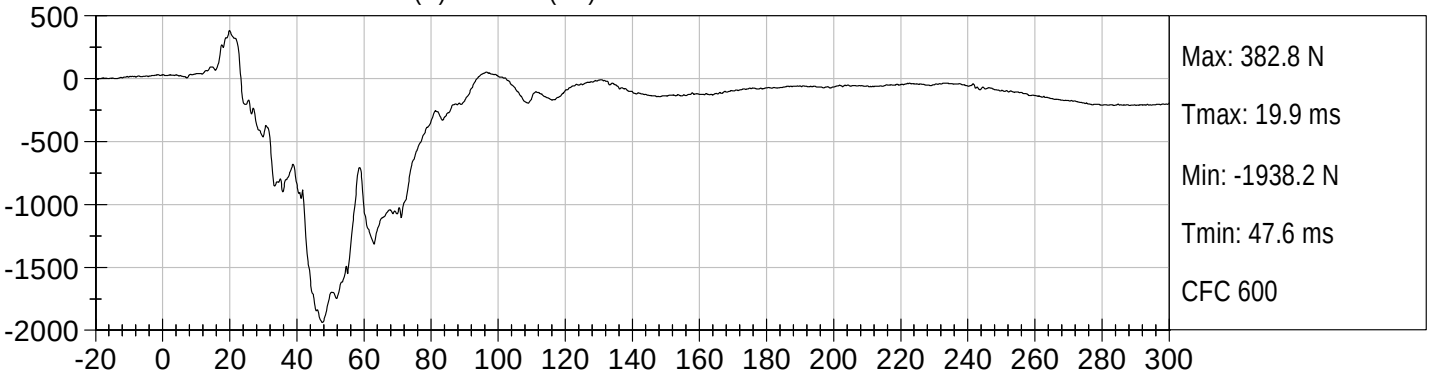




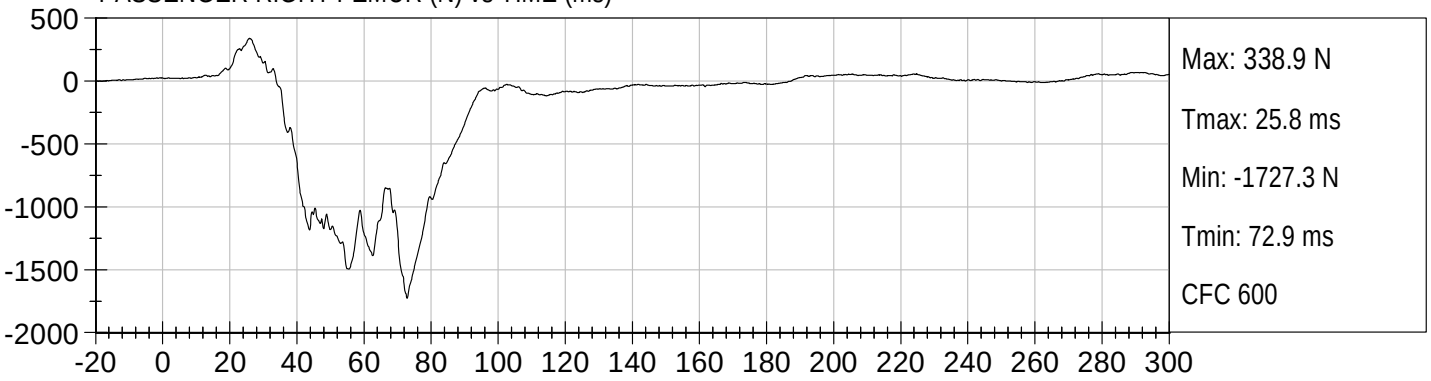
NCAP 35mph Frontal
2011 Toyota Corolla - MB5108

Test Date: 02/08/2011
Speed: 35.1 mph (56.5 km/h)

PASSENGER LEFT FEMUR (N) vs TIME (ms)



PASSENGER RIGHT FEMUR (N) vs TIME (ms)



APPENDIX C

DUMMY CALIBRATION DATA

MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036 **Test ID:** D11401

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	22.2	Pass
Laboratory Relative Humidity	%	10 to 70	12	Pass
Peak Resultant Acceleration	G's	225 - 275	254	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-8.4	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

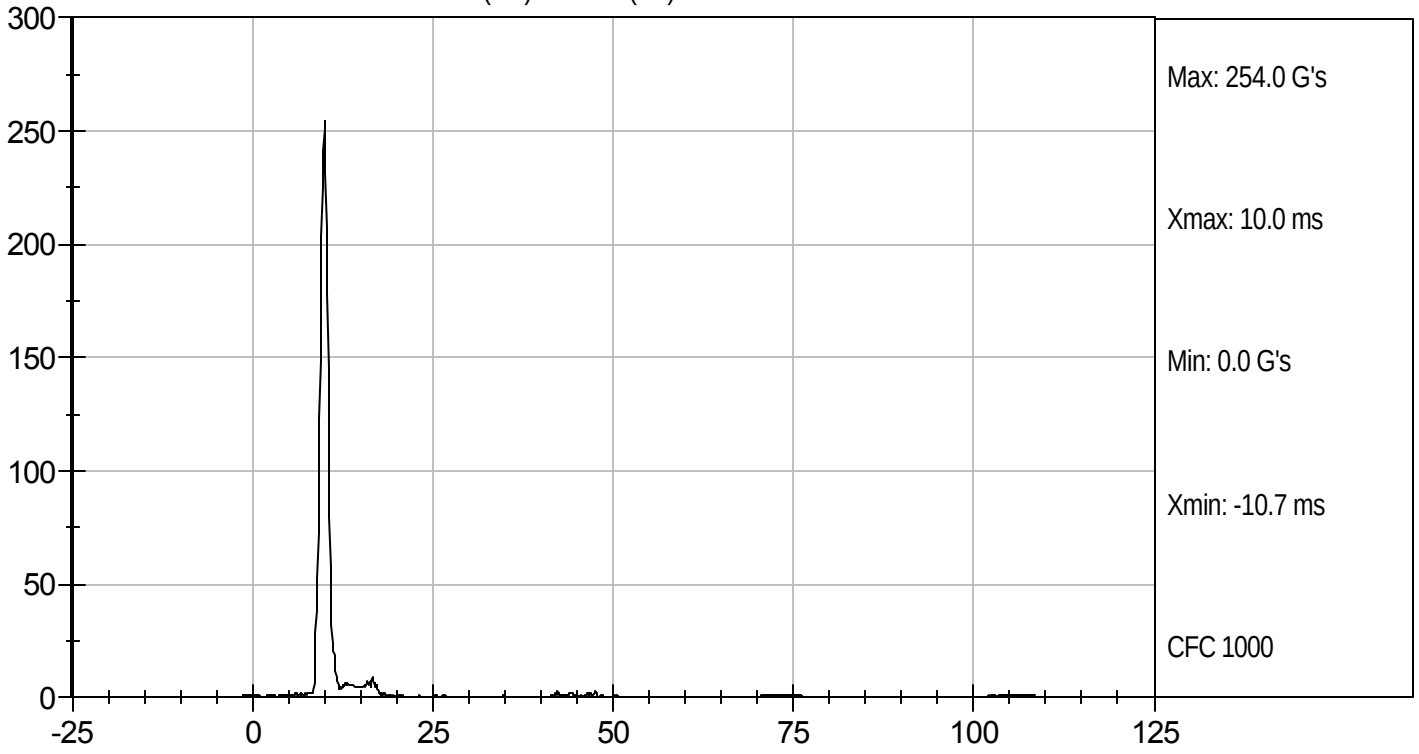
2/4/11
Test Date

David Winkelbauer
Approved By

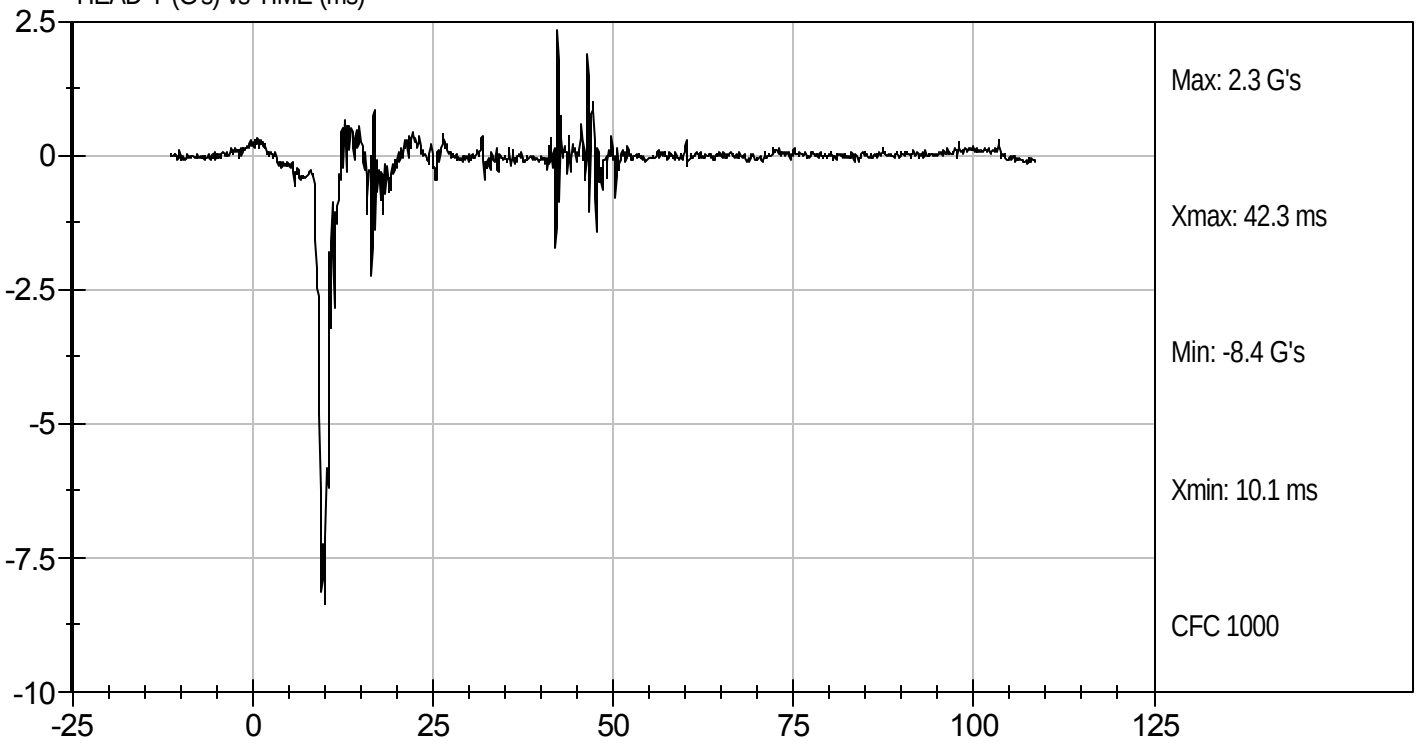
Test Desc: Head Drop
Component ID: D11401

Test Date: 2/4/11
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:** D11402

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.9	Pass
Laboratory Relative Humidity		%	10 to 70	20	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.30	Pass
	20 ms	G's	17.60 to 22.60	18.26	Pass
	30 ms	G's	12.50 to 18.50	13.79	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	13.8	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	35.3	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	71.7	Pass
	Time	ms	57.0 to 64.0	57.1	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	121.1	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	94.9	Pass
	Time	ms	47.0 to 58.0	50.1	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

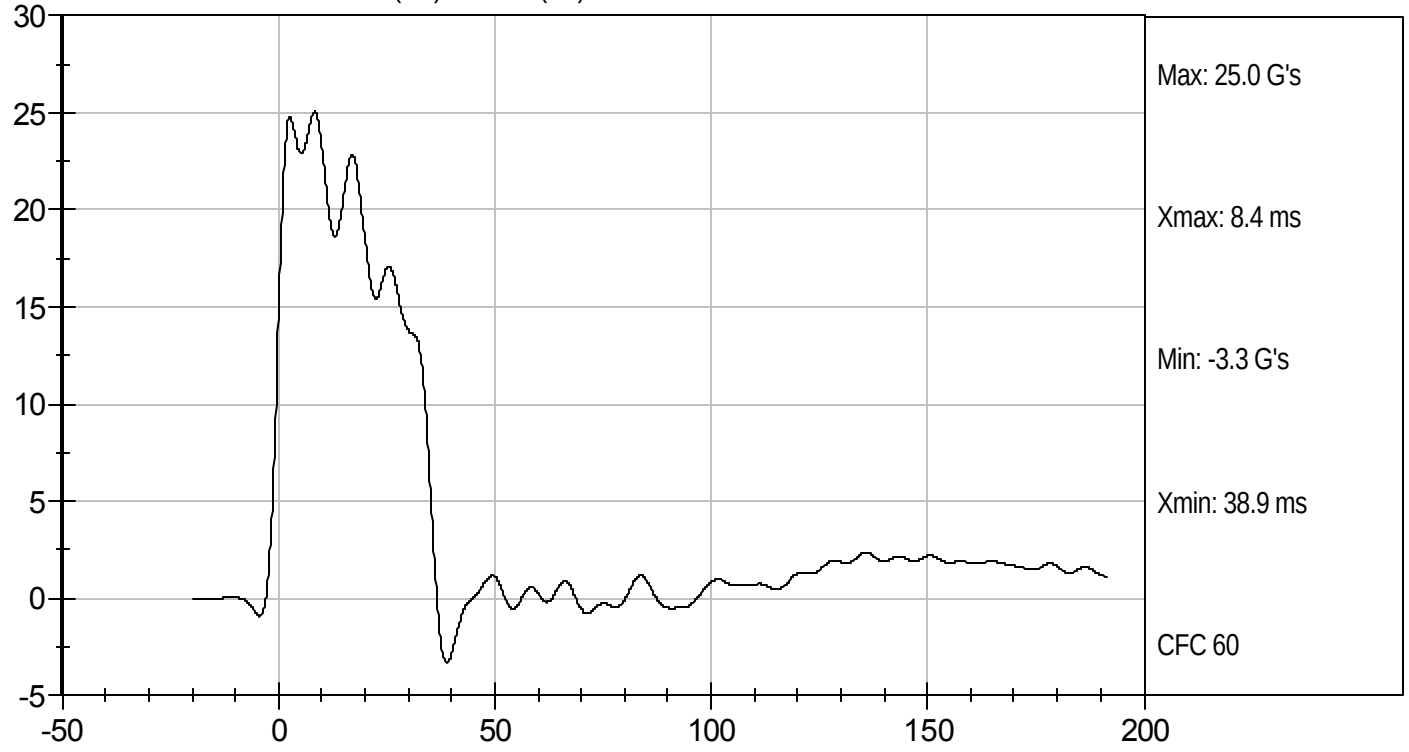
2/7/11
Test Date

David Winkelbauer
Approved By

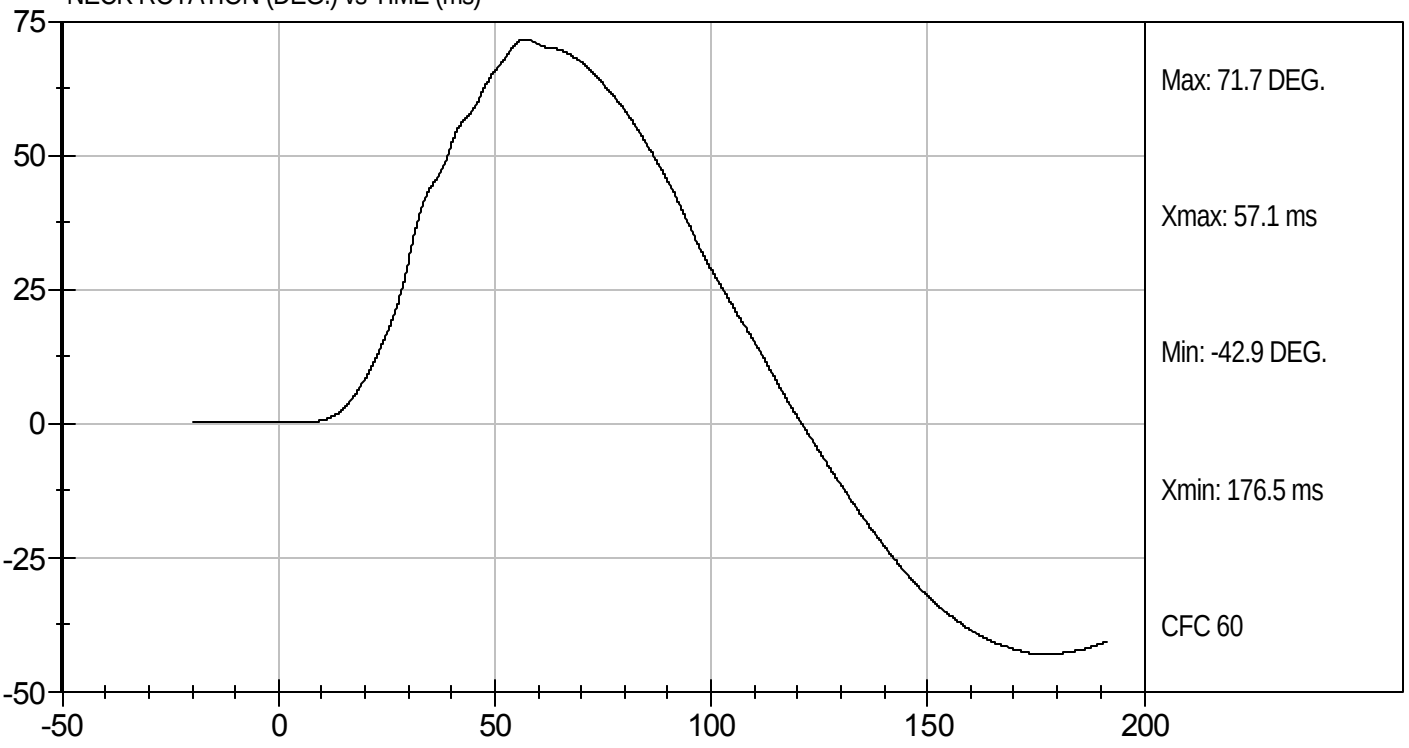
Test Desc: Neck Flexion
Component ID: D11402

Test Date: 2/7/11
Velocity: 23.15 ft/s, 7.06 m/s

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

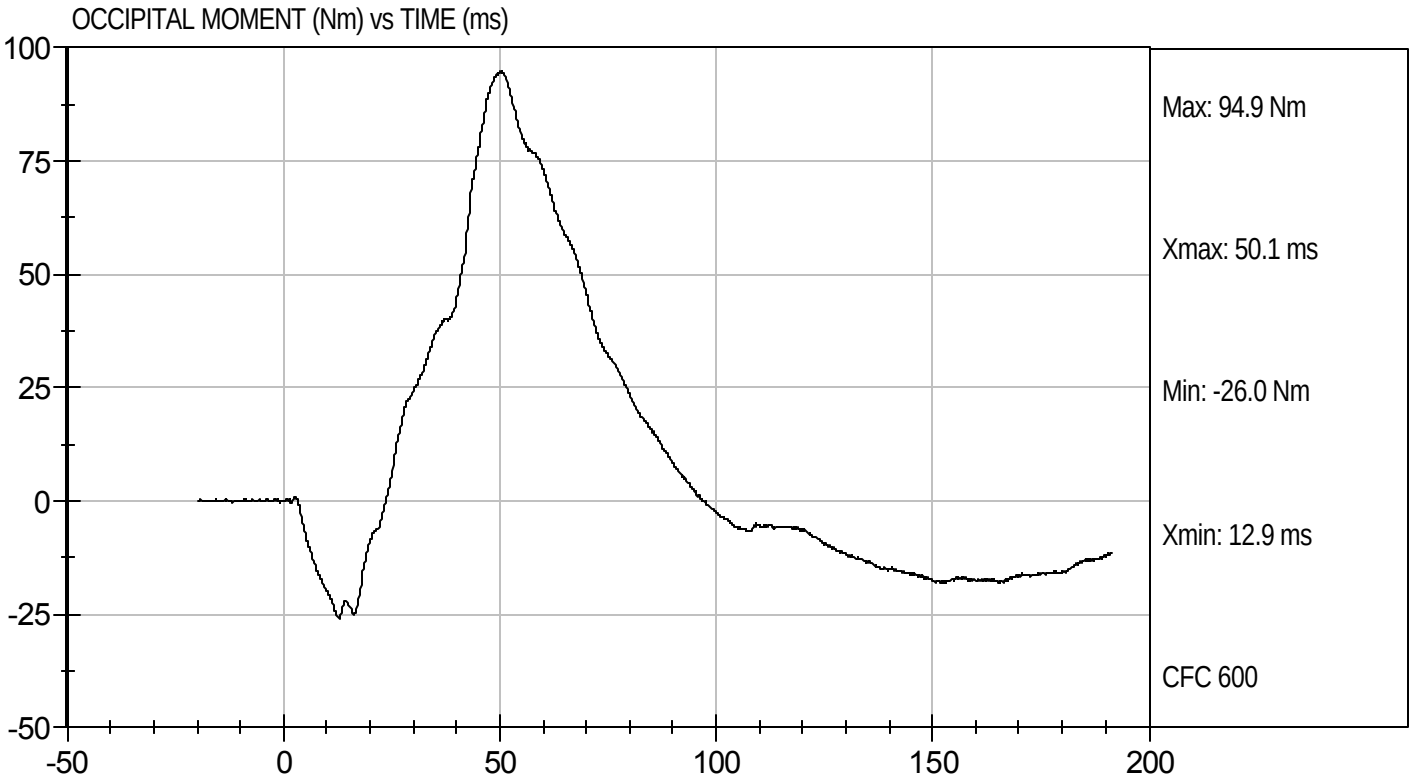


NECK ROTATION (DEG.) vs TIME (ms)



Test Desc: Neck Flexion
Component ID: D11402

Test Date: 2/7/11
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:** D11403

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	20	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.13	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	17.49	Pass
	20 ms	G's	14.00 to 19.00	14.67	Pass
	30 ms	G's	11.00 to 16.00	13.91	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	13.9	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	42.9	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	90.7	Pass
	Time	ms	72.0 to 82.0	79.6	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	160.5	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-56.5	Pass
	Time	ms	65.0 to 79.0	71.2	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	143.2	Pass
			Overall Test Results		Pass

Jessica Hall
Laboratory Technician

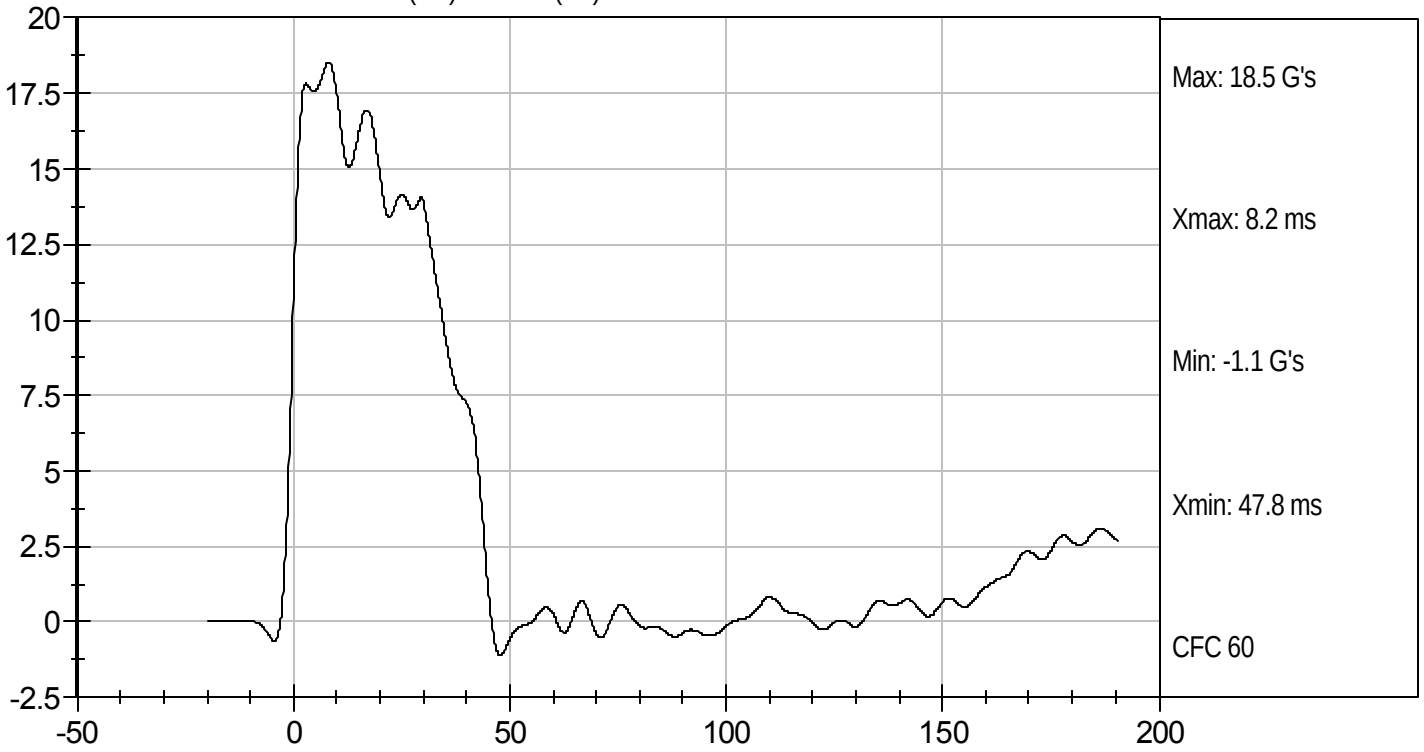
2/7/11
Test Date

David Winkelbauer
Approved By

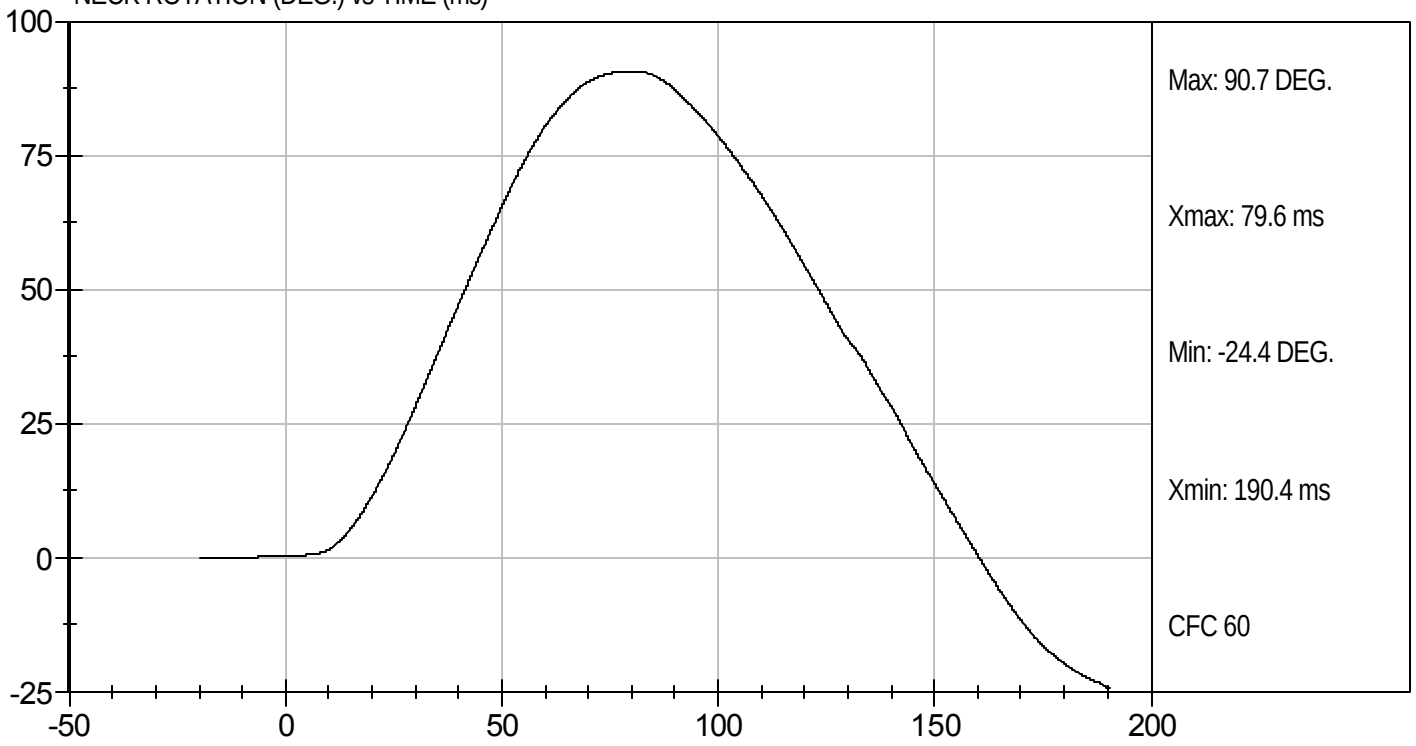
Test Desc: Neck Extension
Component ID: D11403

Test Date: 2/7/11
Velocity: 20.10 ft/s, 6.13 m/s

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

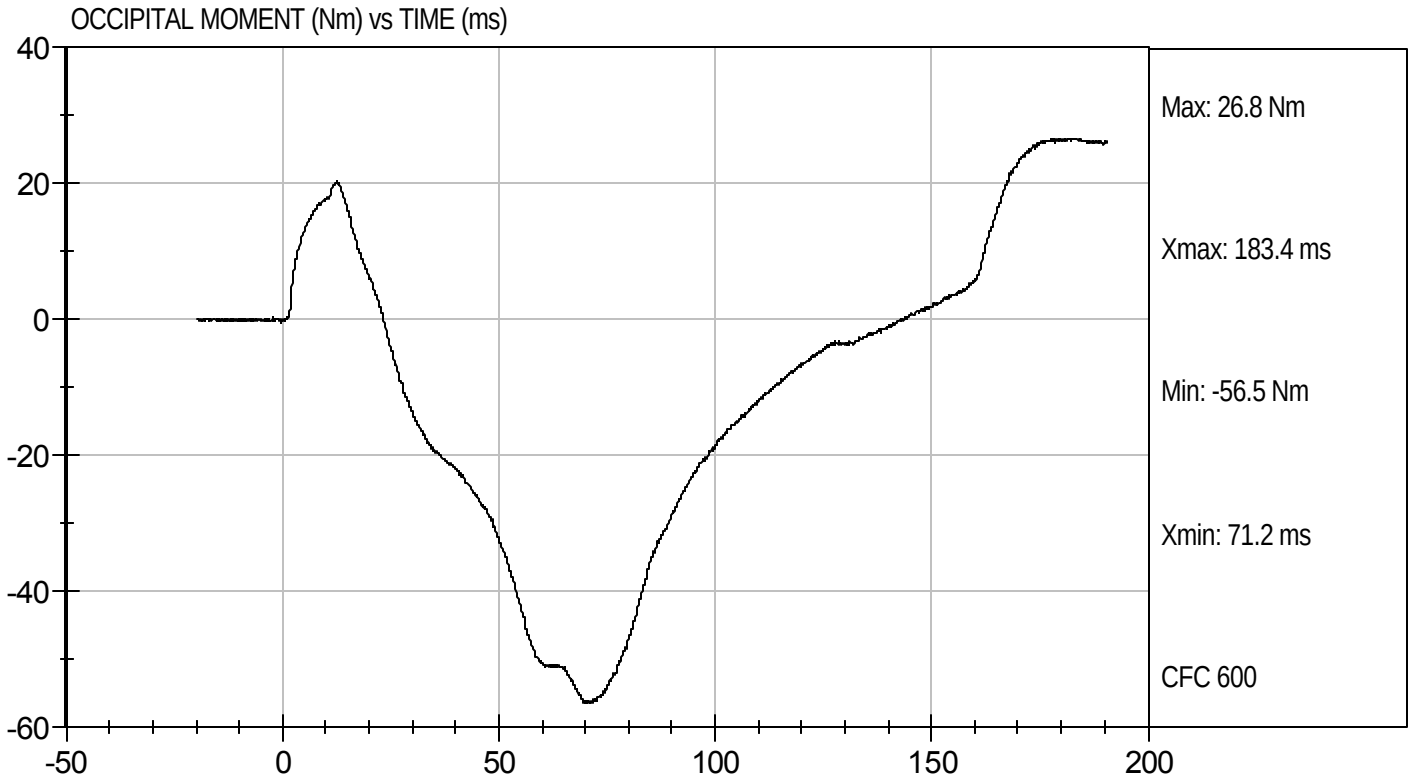


NECK ROTATION (DEG.) vs TIME (ms)



Test Desc: Neck Extension
Component ID: D11403

Test Date: 2/7/11
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:** D11404

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	12	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,565	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.55	Pass
Internal Hysteresis	%	69 to 85	71	Pass
		Overall Test Results		Pass

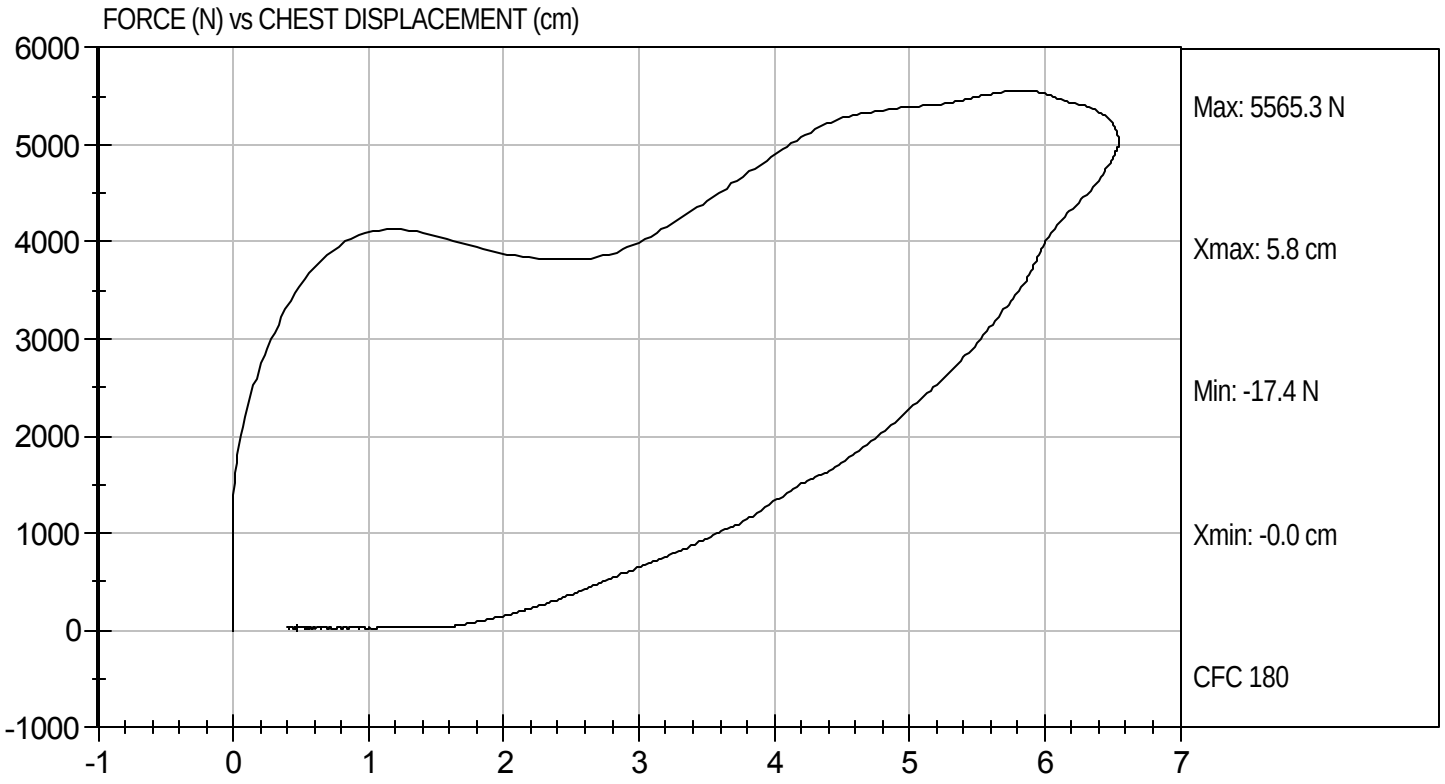
Jessica Hall
Laboratory Technician

2/4/11
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Impact
Component ID: D11404

Test Date: 2/4/11
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:** D11405

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	14	Pass
Probe Velocity	m/s	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	5,038	Pass
		Overall Test Results		Pass

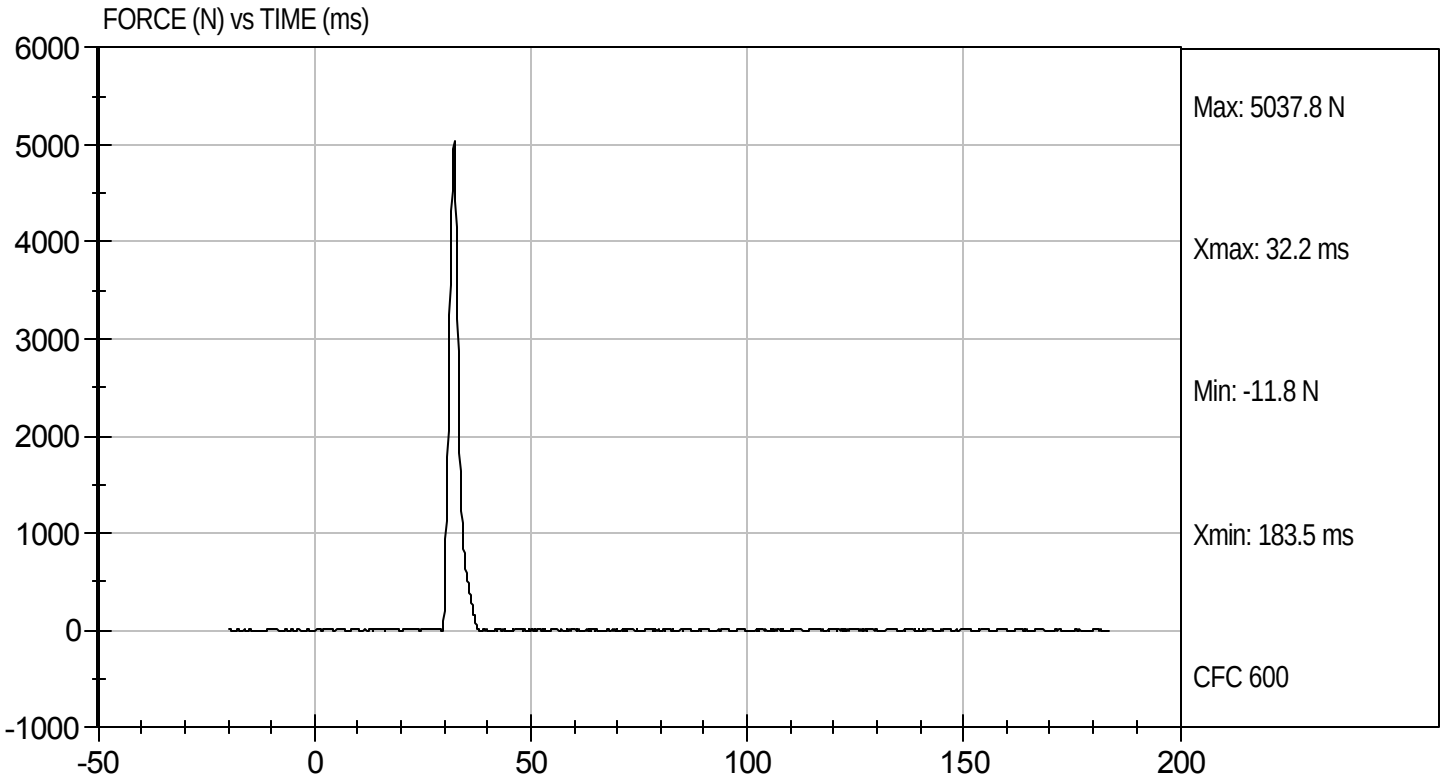
Jessica Gall
Laboratory Technician

2/4/11
Test Date

David Winkelbauer
Approved By

Test Desc: Right Knee
Component ID: D11405

Test Date: 2/4/11
Velocity: 6.89 ft/s, 2.10 m/s



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036 **Test I.D:** D11406

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	14	Pass
Probe Velocity	m/s	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	5,478	Pass
		Overall Test Results		Pass

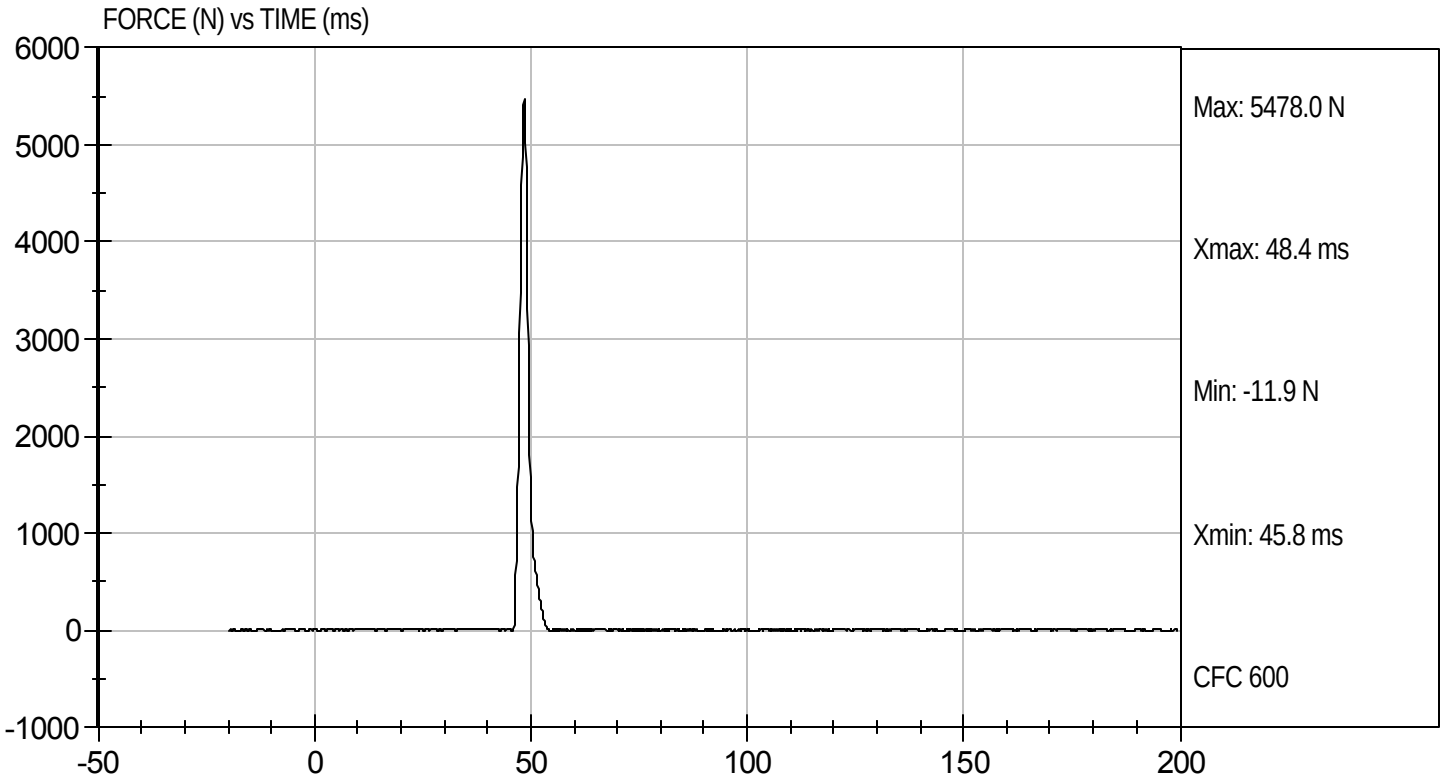
Jessica Gall
Laboratory Technician

2/4/11
Test Date

David Winkelbauer
Approved By

Test Desc: Left Knee
Component ID: D11406

Test Date: 2/4/11
Velocity: 6.89 ft/s, 2.10 m/s



MGA RESEARCH CORPORATION

HIP-FEMUR FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036 **Test I.D:** D11400

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	22.7	22.7	Pass
Laboratory Relative Humidity	%	10 to 70	14	14	Pass
Rotation Rate	deg/s	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	53.1	51.4	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	49	48	Pass
		Overall Test Results			Pass

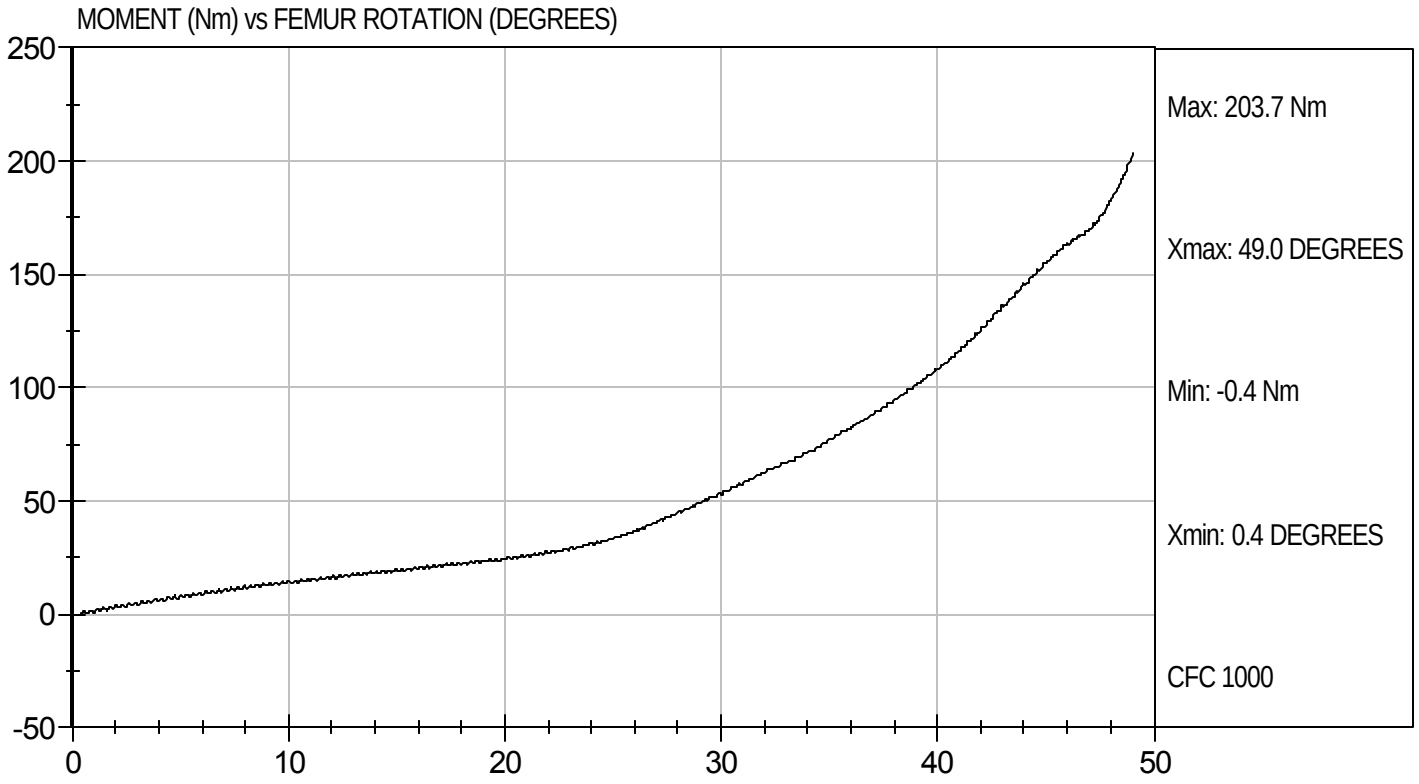
Jessica Hall
Laboratory Technician

2/4/11
Test Date

David Winkelbauer
Approved By

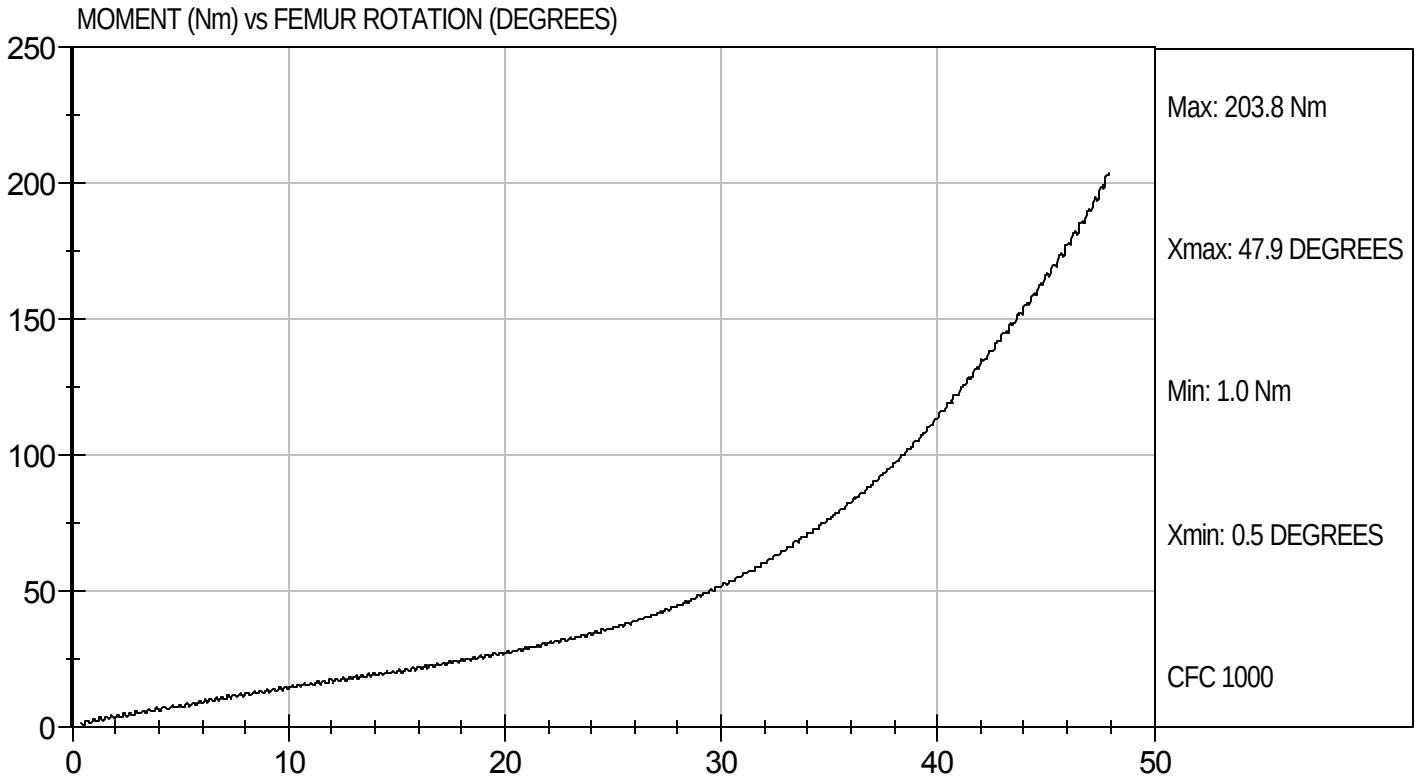
Test Desc: Hip Femur Flexion
Component ID: D11409

Test Date: 2/4/11
Velocity: 0 ft/s, 0.00 m/s



Test Desc: Hip Femur Flexion
Component ID: D11400

Test Date: 2/4/11
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:** D11441

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	14	Pass
Peak Resultant Acceleration	G's	225 - 275	245	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-2.8	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

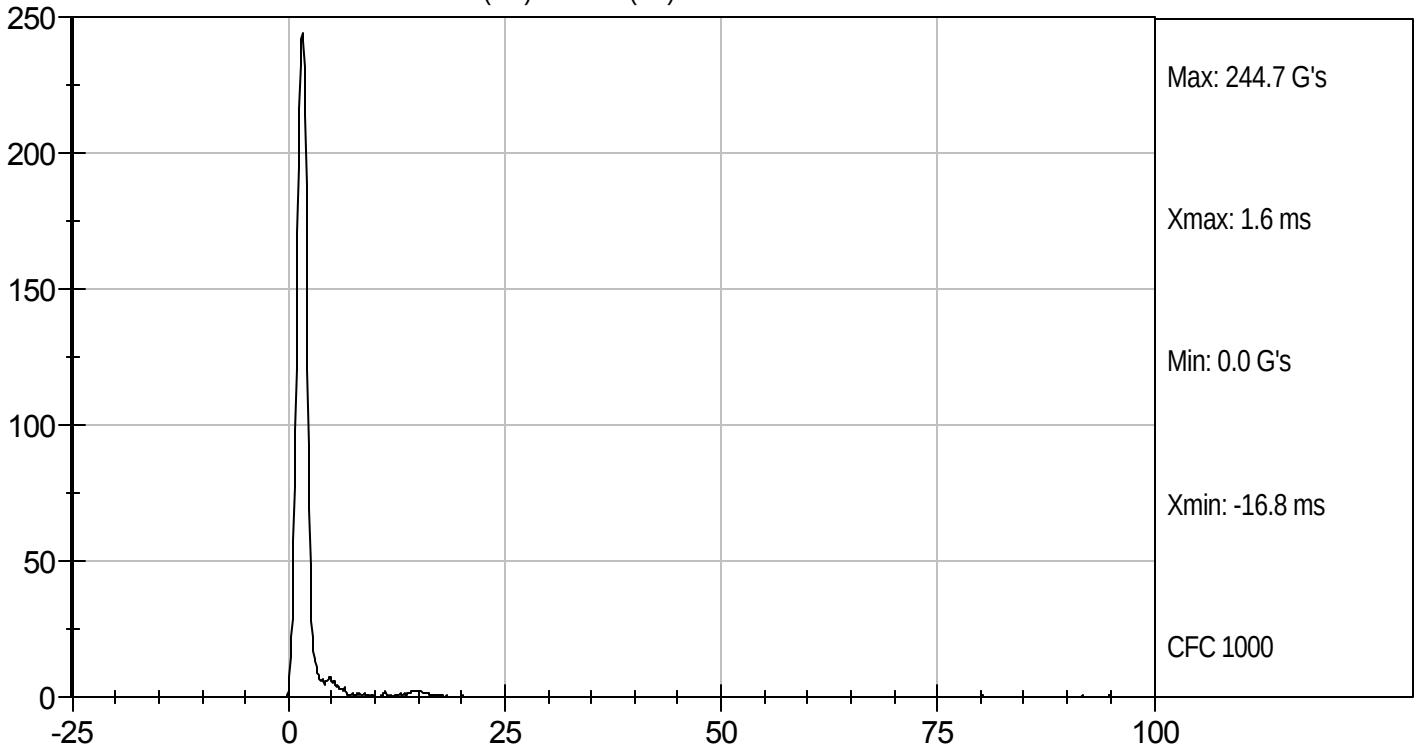
2/8/11
Test Date

David Winkelbauer
Approved By

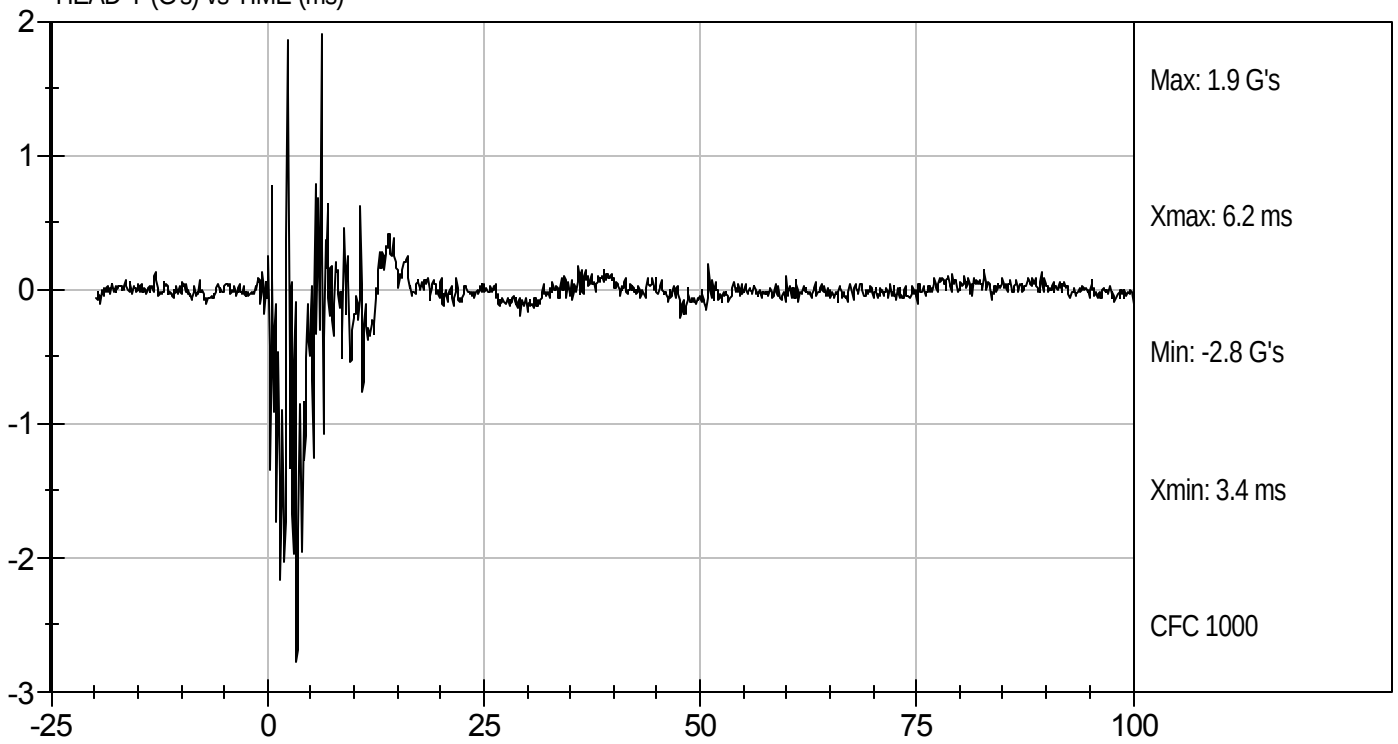
Test Desc: Head Drop
Component ID: D11441

Test Date: 2/8/11
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:** D11442

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity		%	10 to 70	14	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.04	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	22.59	Pass
	20 ms	G's	17.60 to 22.60	18.16	Pass
	30 ms	G's	12.50 to 18.50	16.54	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	16.5	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	39.3	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	72.8	Pass
	Time	ms	57.0 to 64.0	59.0	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	119.3	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	98.7	Pass
	Time	ms	47.0 to 58.0	52.4	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	98.6	Pass
			Overall Test Results		Pass

Jessica Hall
Laboratory Technician

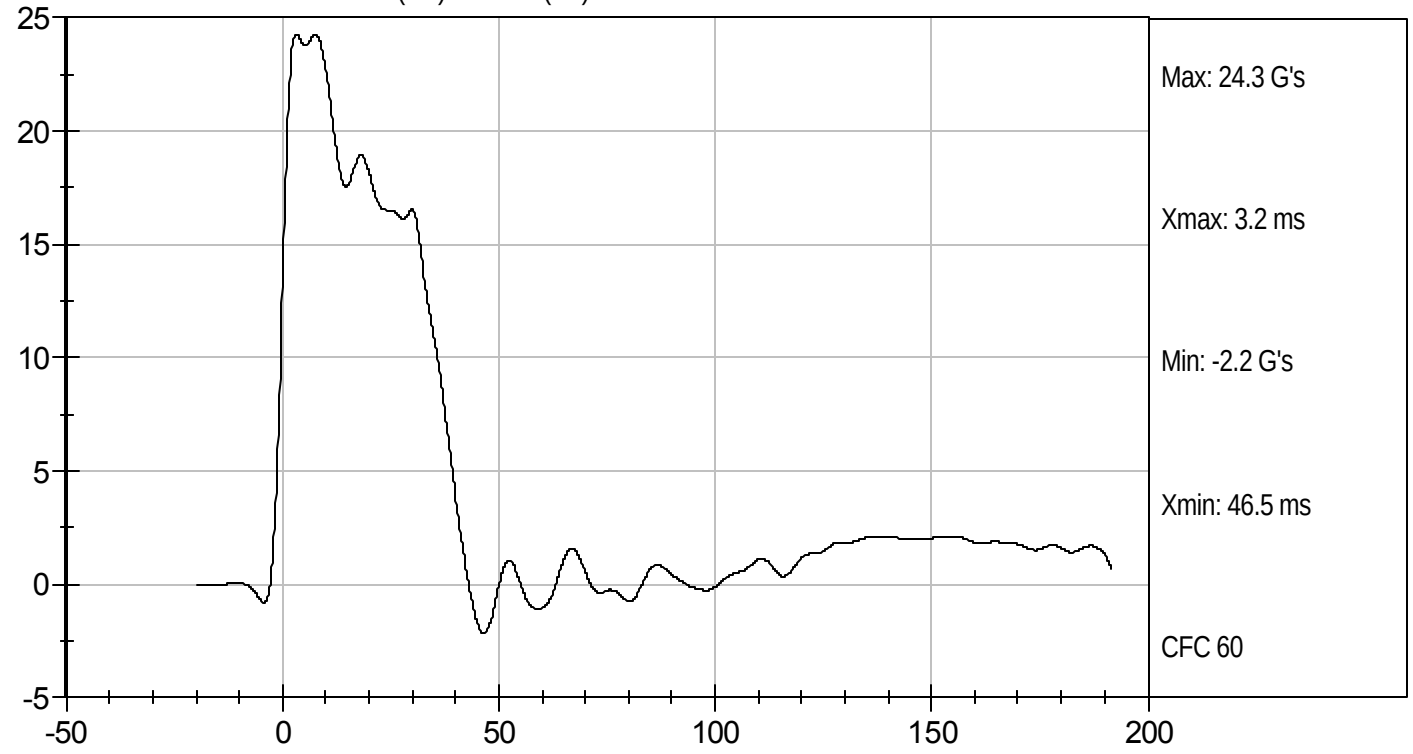
2/8/11
Test Date

David Winkelbauer
Approved By

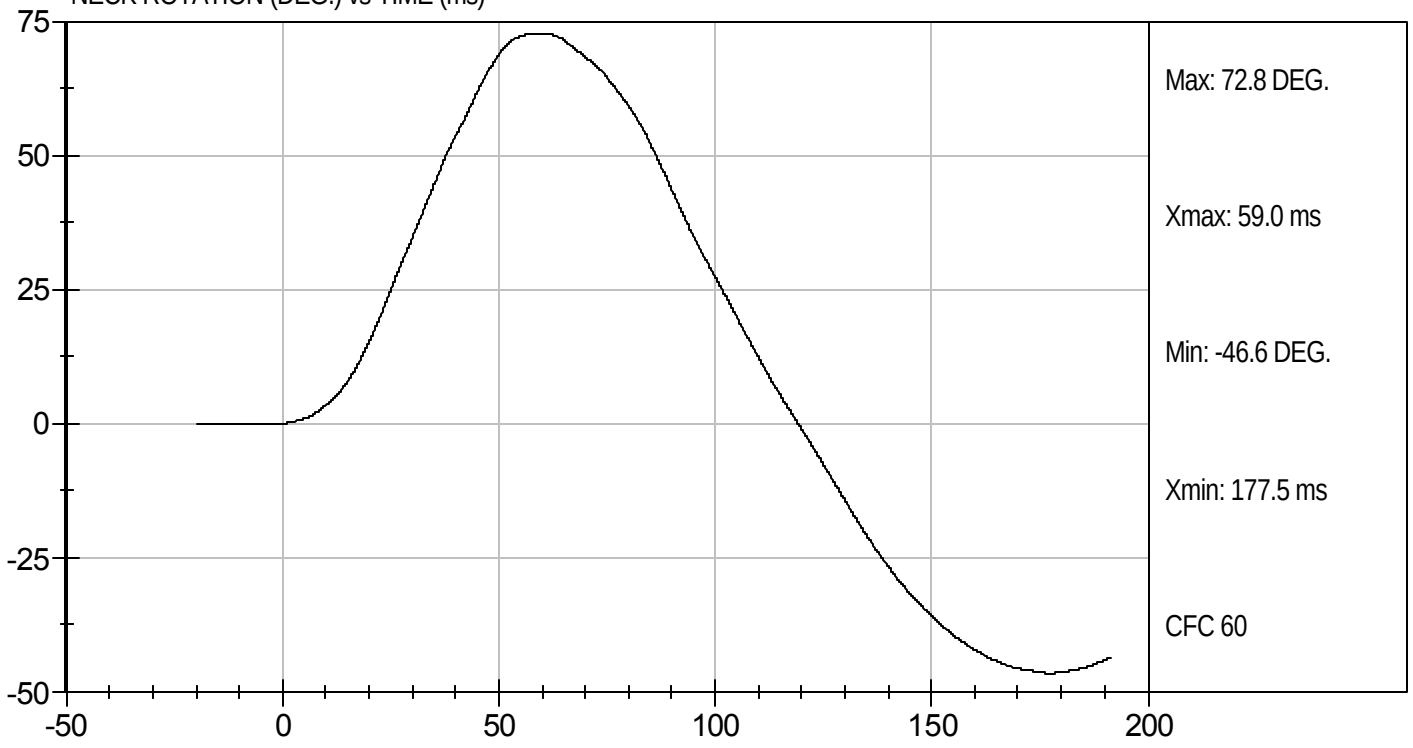
Test Desc: Neck Flexion
Component ID: D11442

Test Date: 2/8/11
Velocity: 23.15 ft/s, 7.06 m/s

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

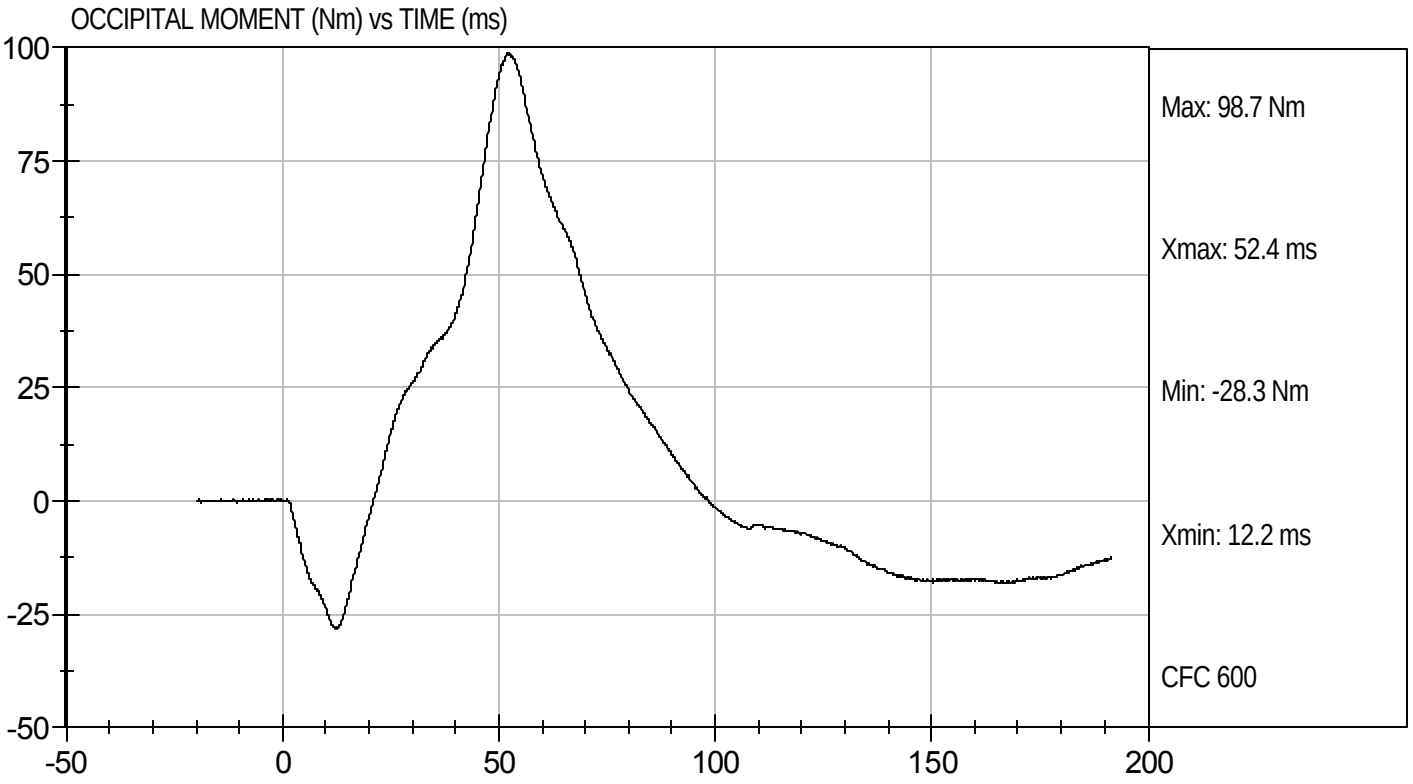


NECK ROTATION (DEG.) vs TIME (ms)



Test Desc: Neck Flexion
Component ID: D11442

Test Date: 2/8/11
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:** D11443

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity		%	10 to 70	14	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.10	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	17.96	Pass
	20 ms	G's	14.00 to 19.00	14.86	Pass
	30 ms	G's	11.00 to 16.00	13.68	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	13.6	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	38.9	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	96.3	Pass
	Time	ms	72.0 to 82.0	74.5	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	157.0	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-68.8	Pass
	Time	ms	65.0 to 79.0	70.3	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	141.0	Pass
			Overall Test Results		Pass

Jessica Hall
Laboratory Technician

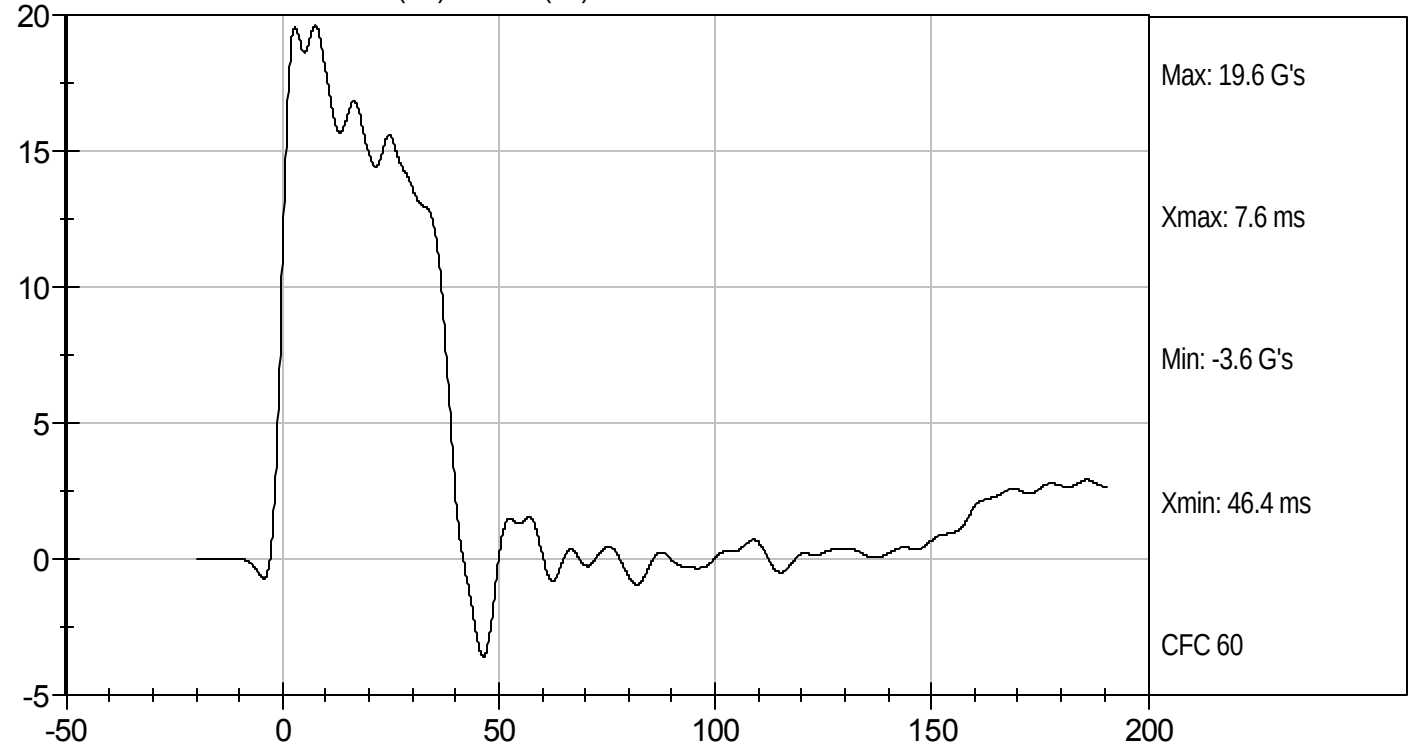
2/8/11
Test Date

David Winkelbauer
Approved By

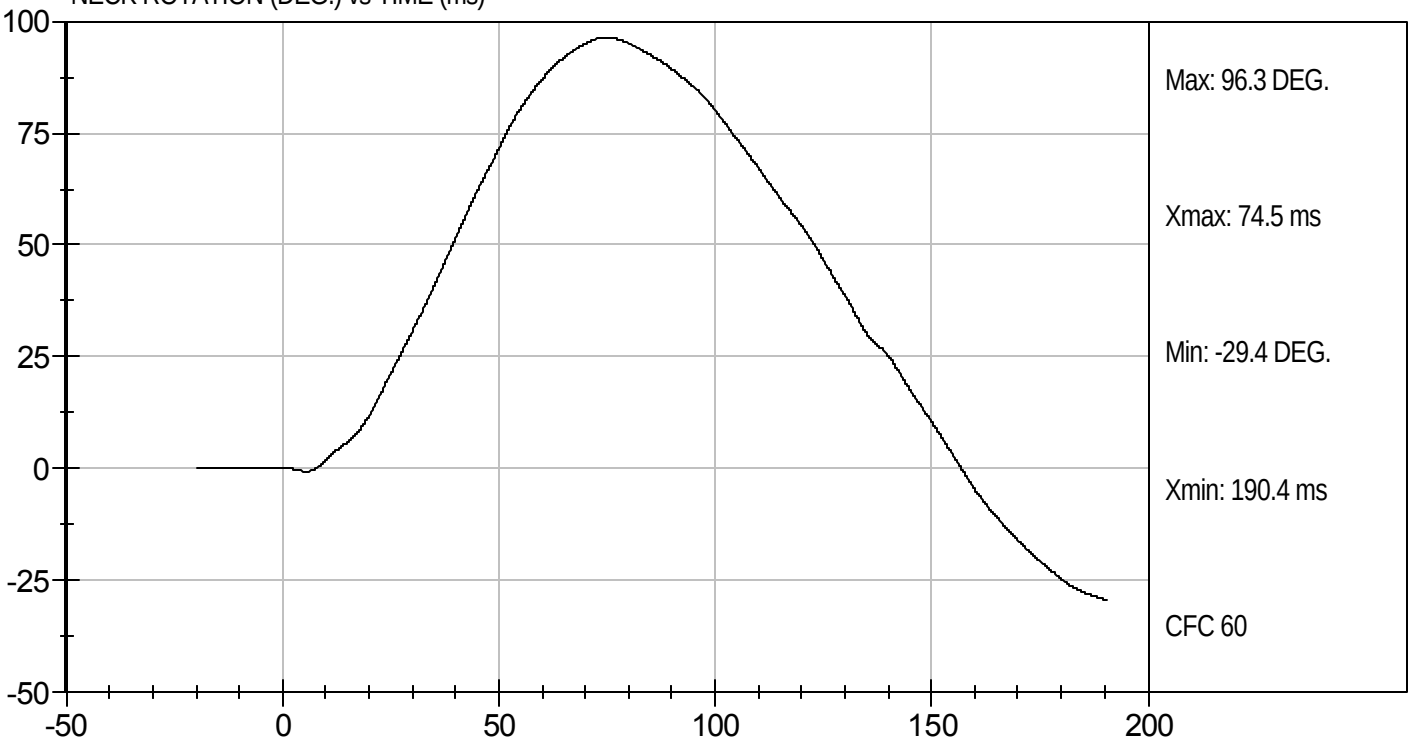
Test Desc: Neck Extension
Component ID: D11443

Test Date: 2/8/11
Velocity: 20.0 ft/s, 6.10 m/s

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

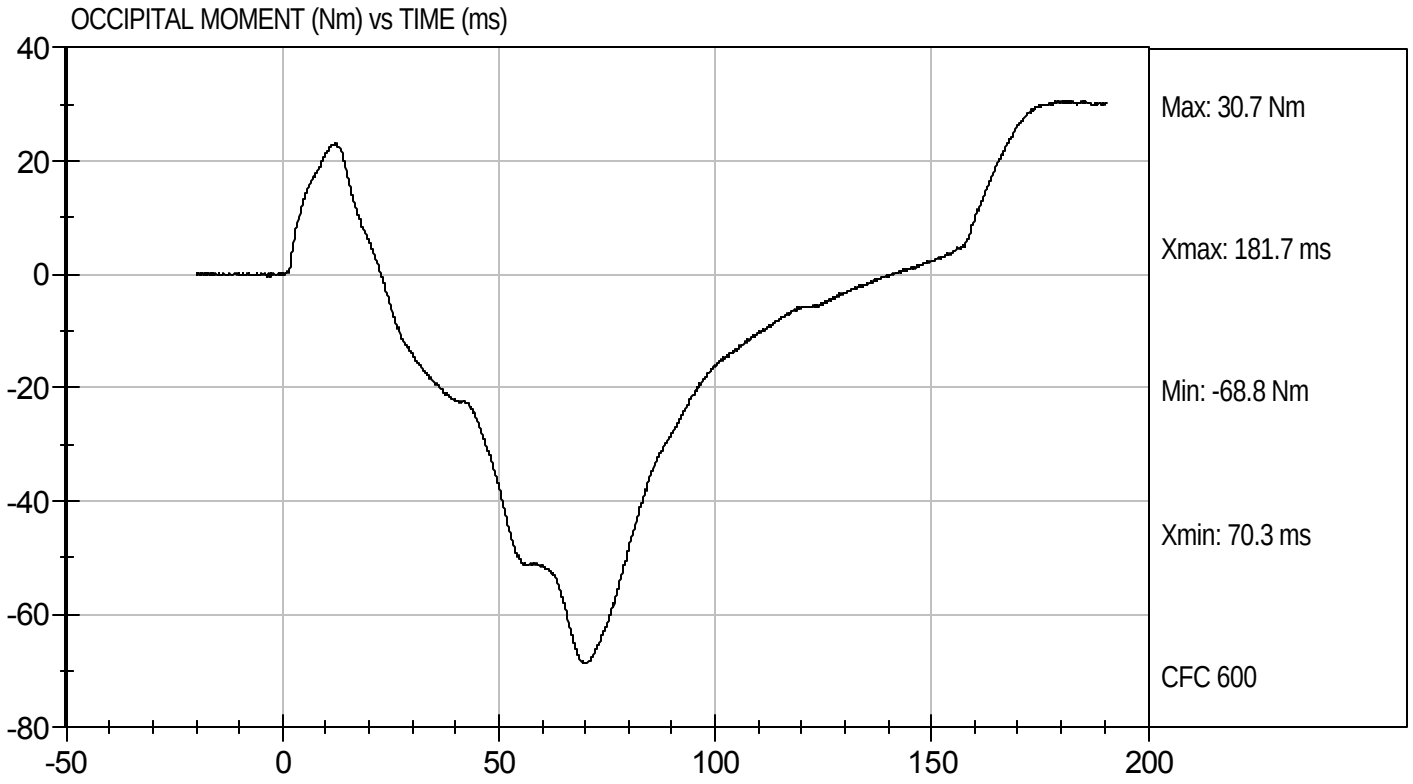


NECK ROTATION (DEG.) vs TIME (ms)



Test Desc: Neck Extension
Component ID: D11443

Test Date: 2/8/11
Velocity: 20.0 ft/s, 6.10 m/s



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036 **Test I.D:** D11444

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	11	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,530	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.73	Pass
Internal Hysteresis	%	69 to 85	70	Pass
		Overall Test Results		Pass

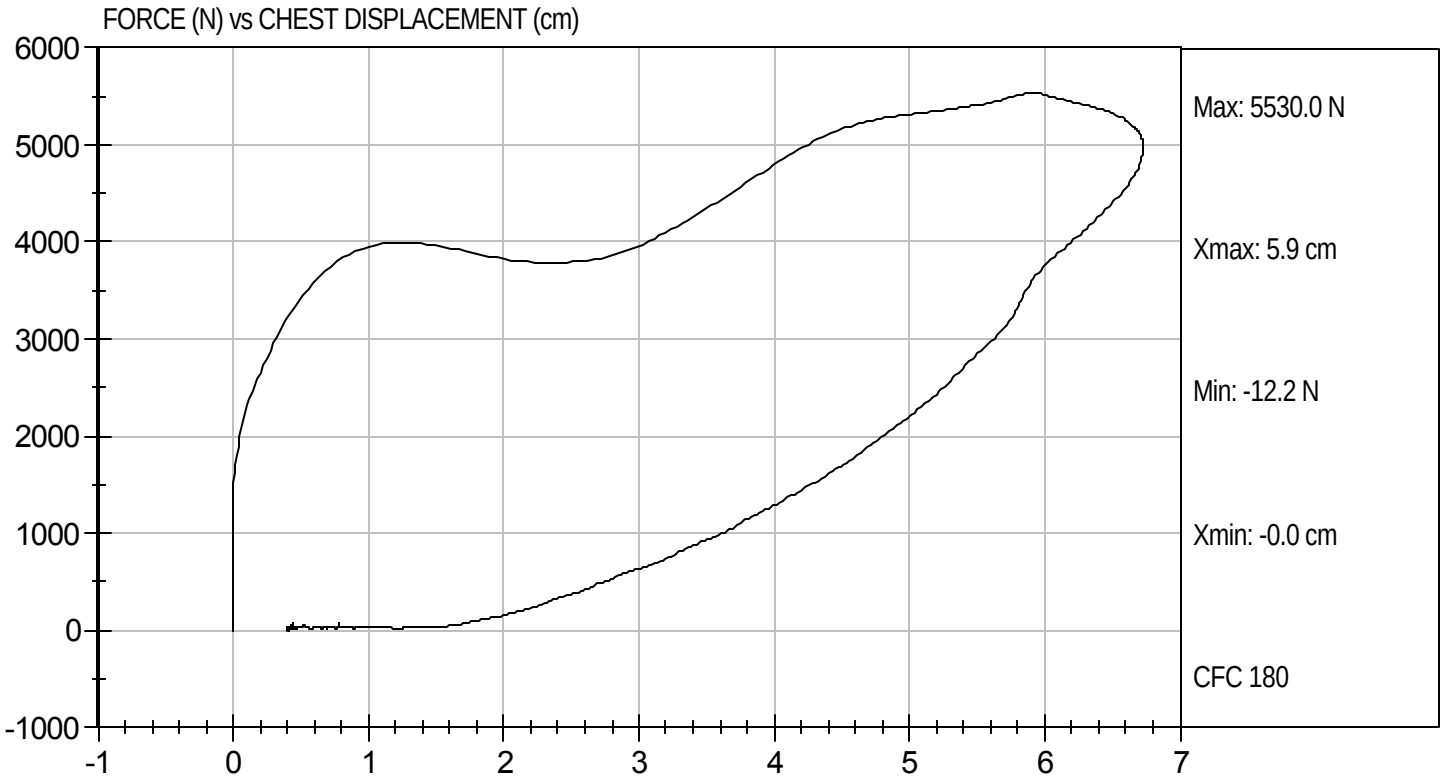
Jessica Gall
Laboratory Technician

2/9/11
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Impact
Component ID: D11444

Test Date: 2/9/11
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:** D11445

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	14	Pass
Probe Velocity	m/s	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	4,866	Pass
		Overall Test Results		Pass

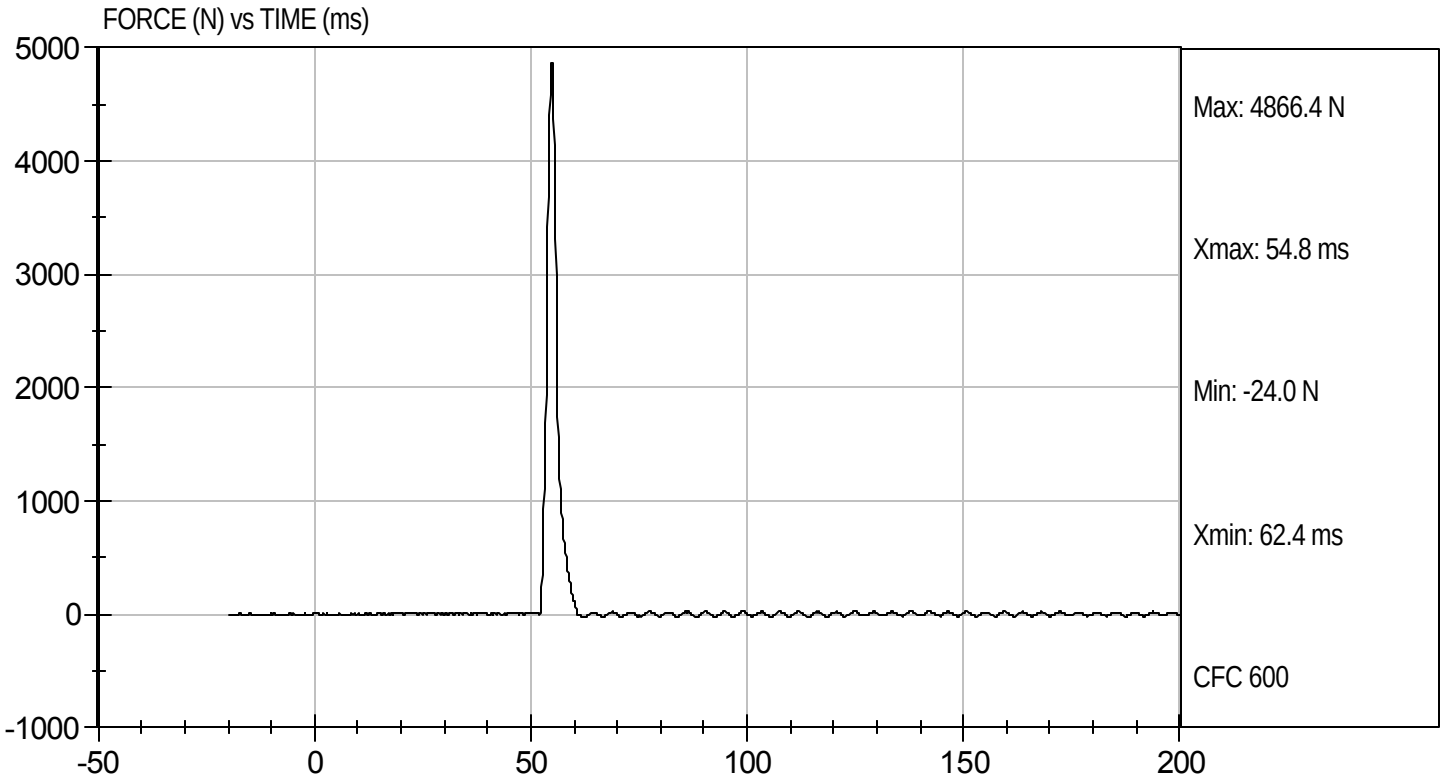
Jessica Gall
Laboratory Technician

2/8/11
Test Date

David Winkelbauer
Approved By

Test Desc: Right Knee
Component ID: D11445

Test Date: 2/8/11
Velocity: 6.9 ft/s, 2.10 m/s



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036 **Test I.D:** D11446

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	14	Pass
Probe Velocity	m/s	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	5,383	Pass
		Overall Test Results		Pass

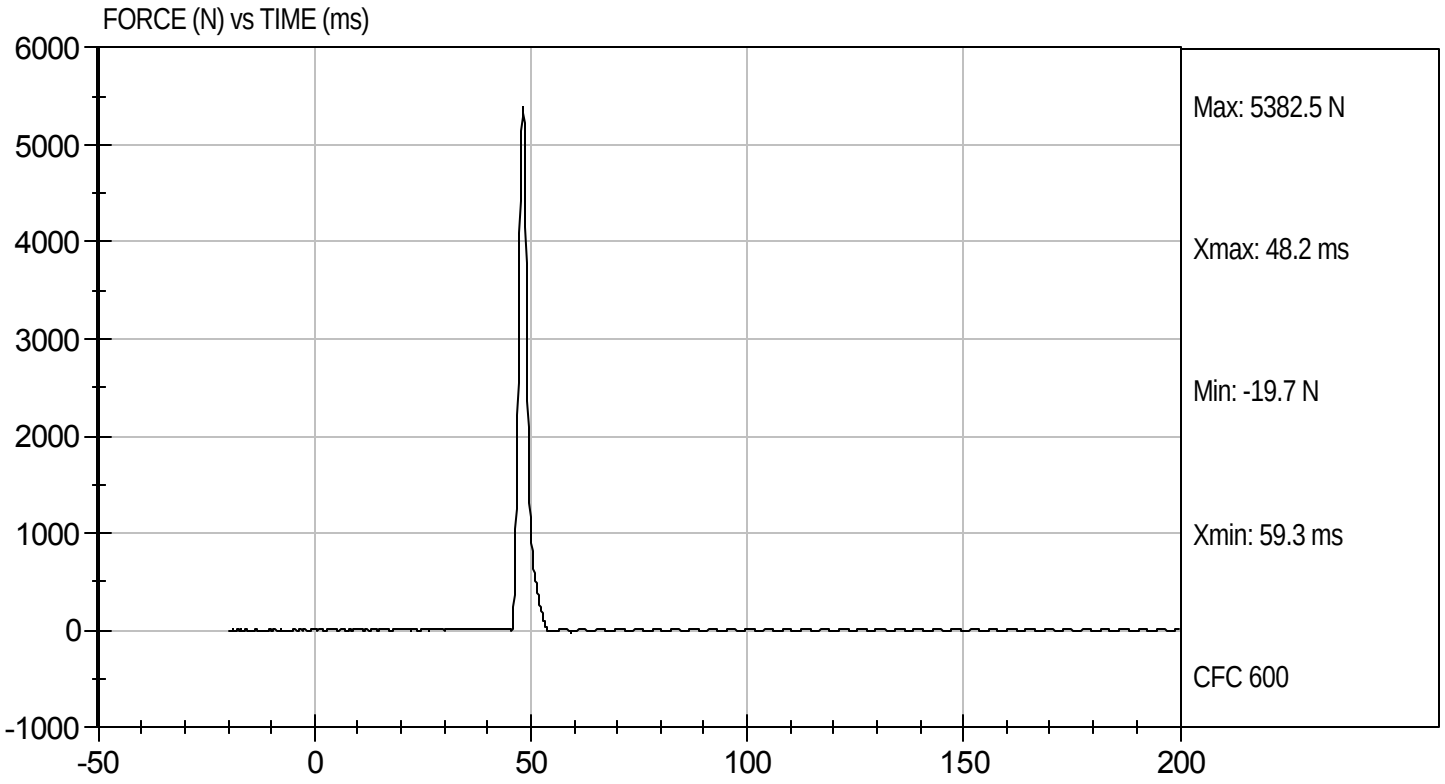
Jessica Gall
Laboratory Technician

2/8/11
Test Date

David Winkelbauer
Approved By

Test Desc: Left Knee
Component ID: D11446

Test Date: 2/8/11
Velocity: 6.9 ft/s, 2.10 m/s



MGA RESEARCH CORPORATION

HIP-FEMUR FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036 **Test I.D:** D11440

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.5	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	16	16	Pass
Rotation Rate	deg/s	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	65.7	56.1	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	47	48	Pass
		Overall Test Results			Pass

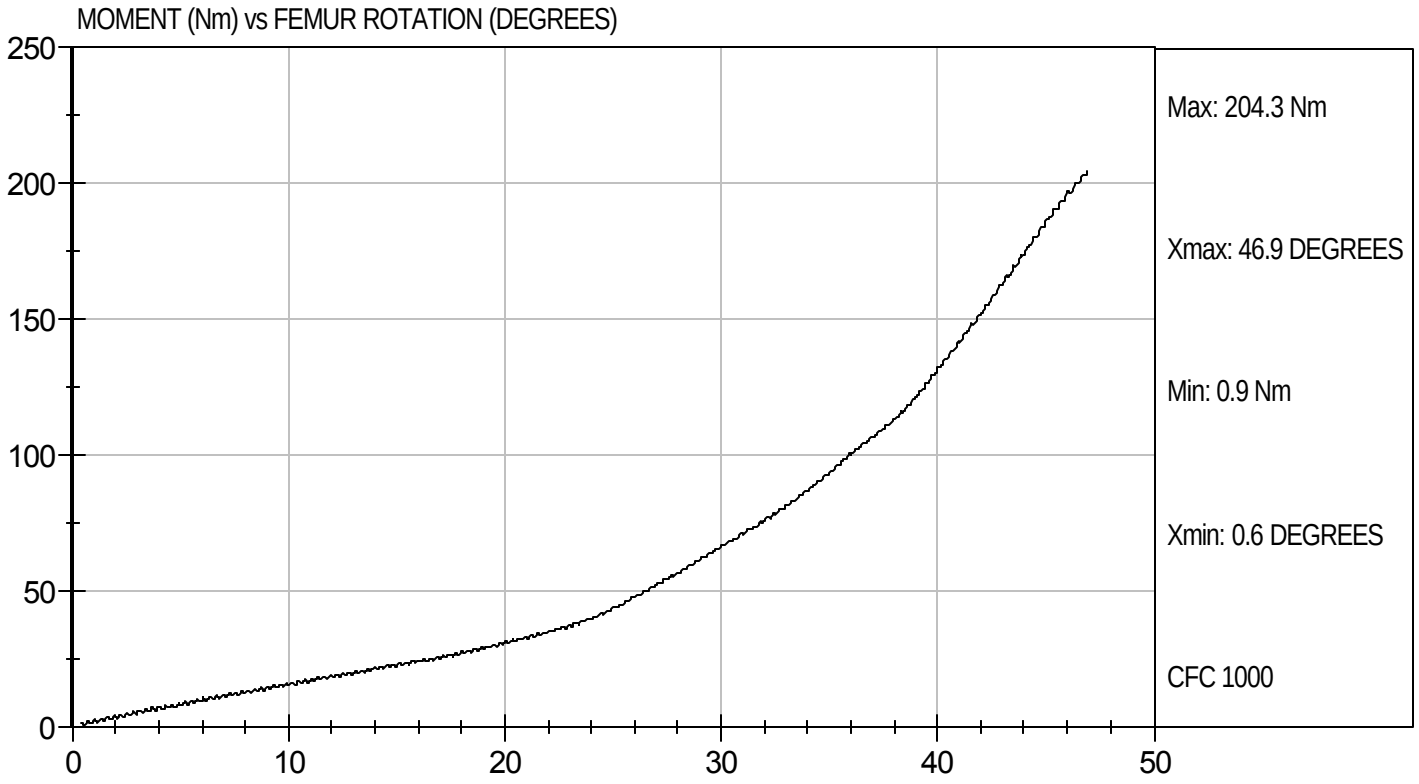
Jessica Hall
Laboratory Technician

2/8/11
Test Date

David Winkelbauer
Approved By

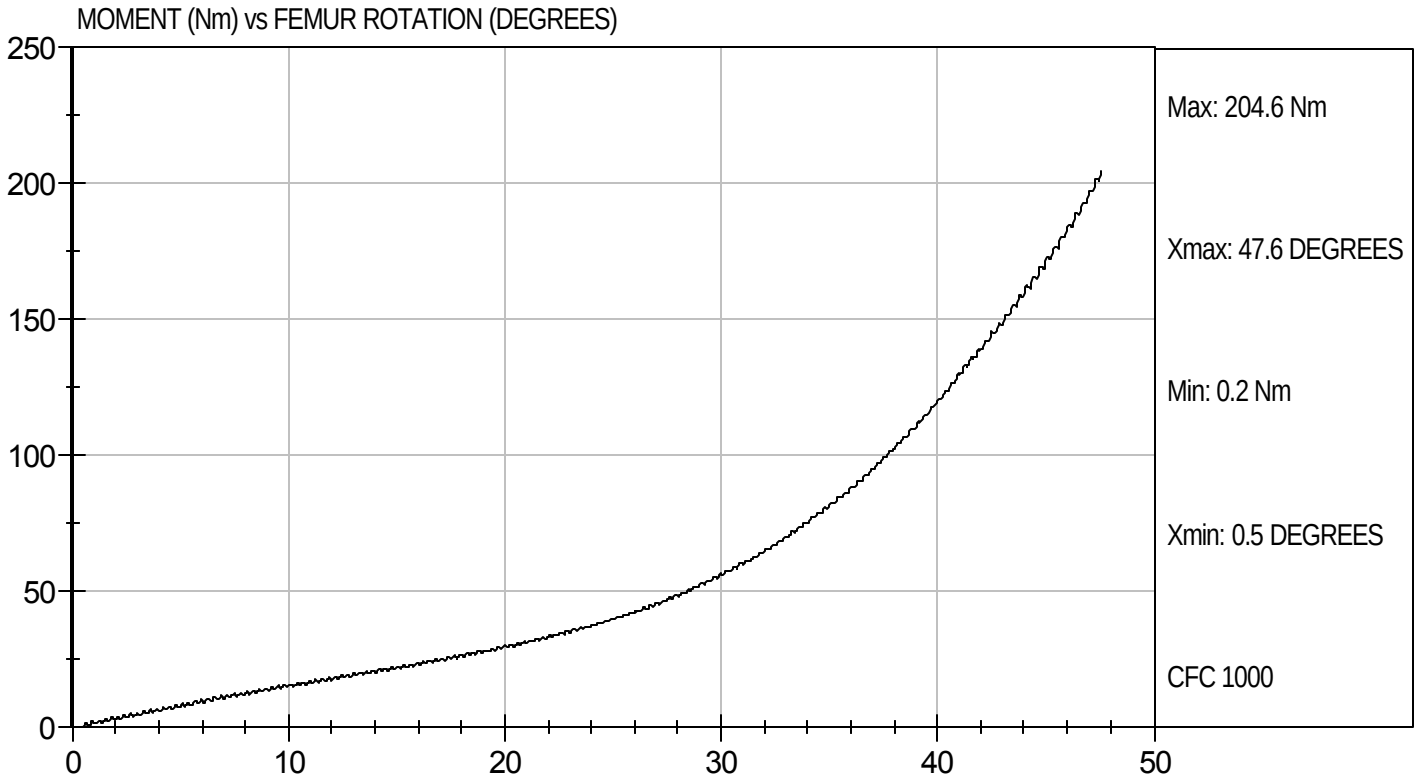
Test Desc: Hip Femur Flexion
Component ID: D11449

Test Date: 2/8/11
Velocity: 0 ft/s, 0.00 m/s



Test Desc: Hip Femur Flexion
Component ID: D11440

Test Date: 2/8/11
Velocity: 0 ft/s, 0.00 m/s



MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138 **Test ID:** D11391

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	22.2	Pass
Laboratory Relative Humidity	%	10 to 70	12	Pass
Peak Resultant Acceleration	G's	250 to 300	281	Pass
Peak Lateral Acceleration	G's	+/- 15	13.6	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

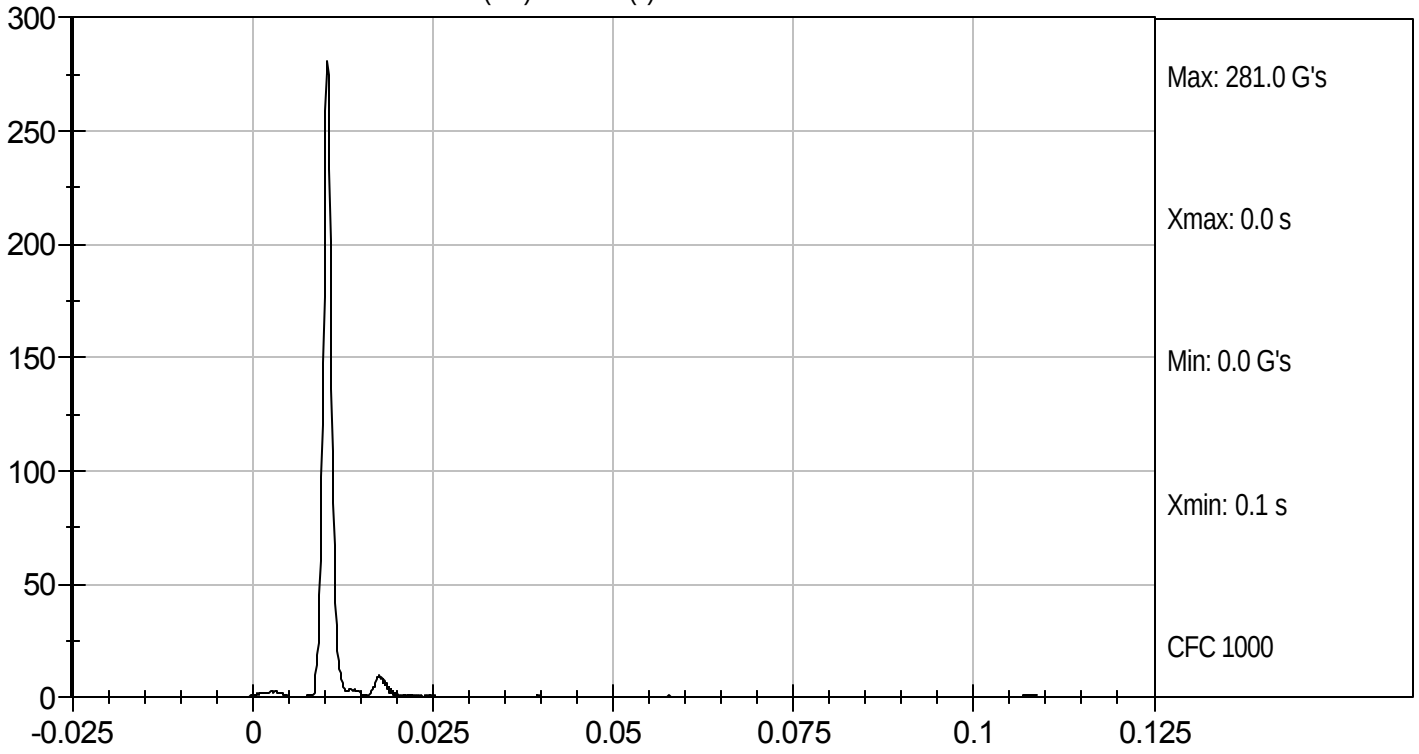
2/4/11
Test Date

David Winkelbauer
Approved By

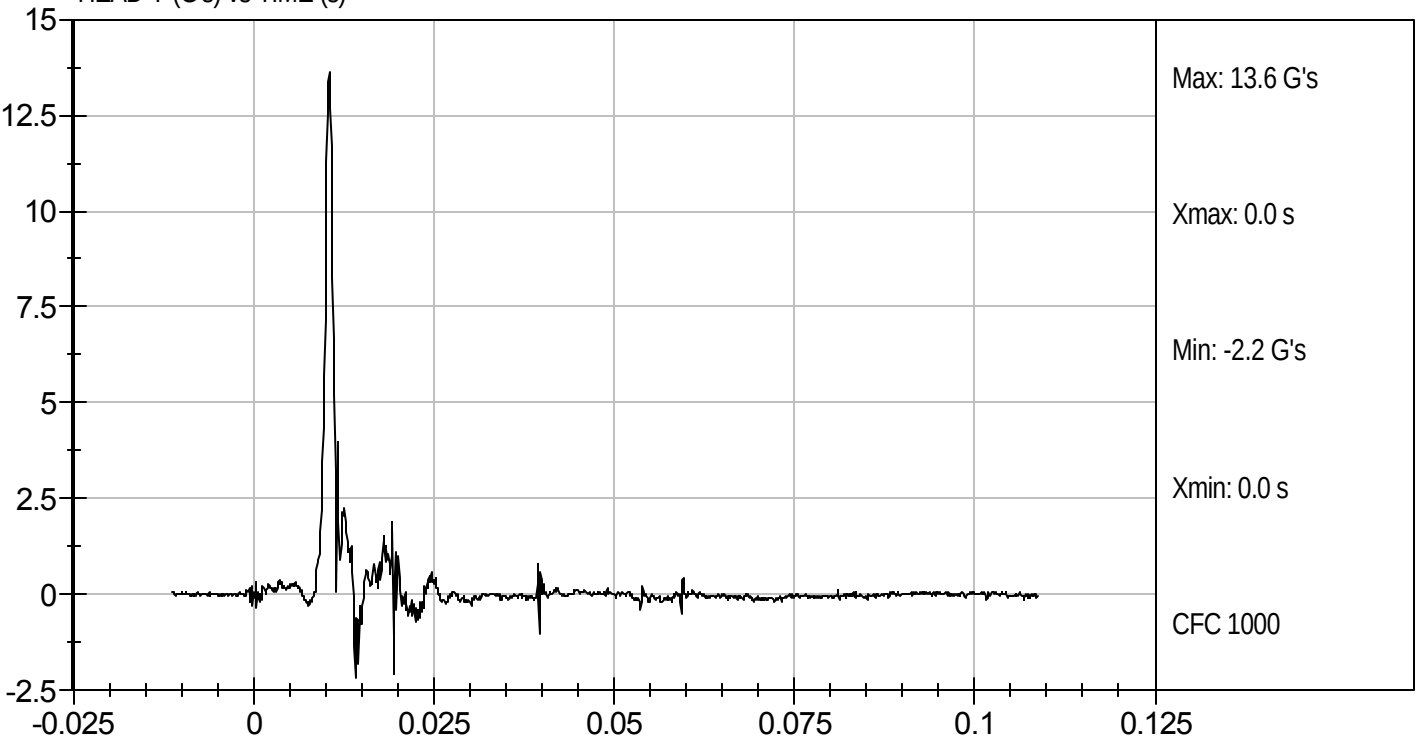
Test Desc: Head Drop
Component ID: D11391

Test Date: 2/4/11
Velocity: 0 ft/s, 0.00 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:** D11392

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity		%	10 to 70	22	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.04	Pass
Pendulum Deceleration	10 ms	m/s	2.1 to 2.5	2.4	Pass
	20 ms	m/s	4.0 to 5.0	4.6	Pass
	30 ms	m/s	5.8 to 7.0	6.3	Pass
D Plane Rotation	Max	deg	77 to 91	80	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	69 to 83	81	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	85	Pass
			Overall Results		Pass

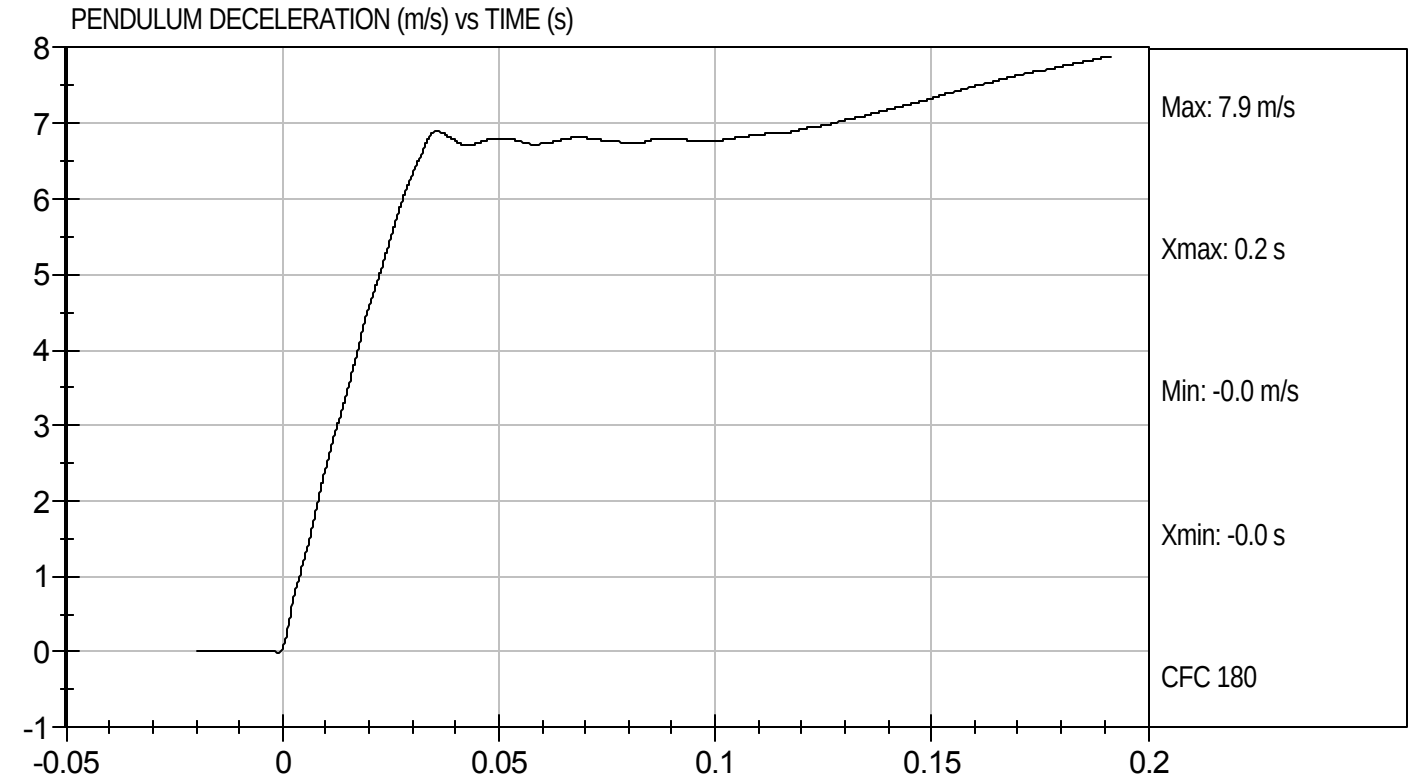
Jessica Hall
Laboratory Technician

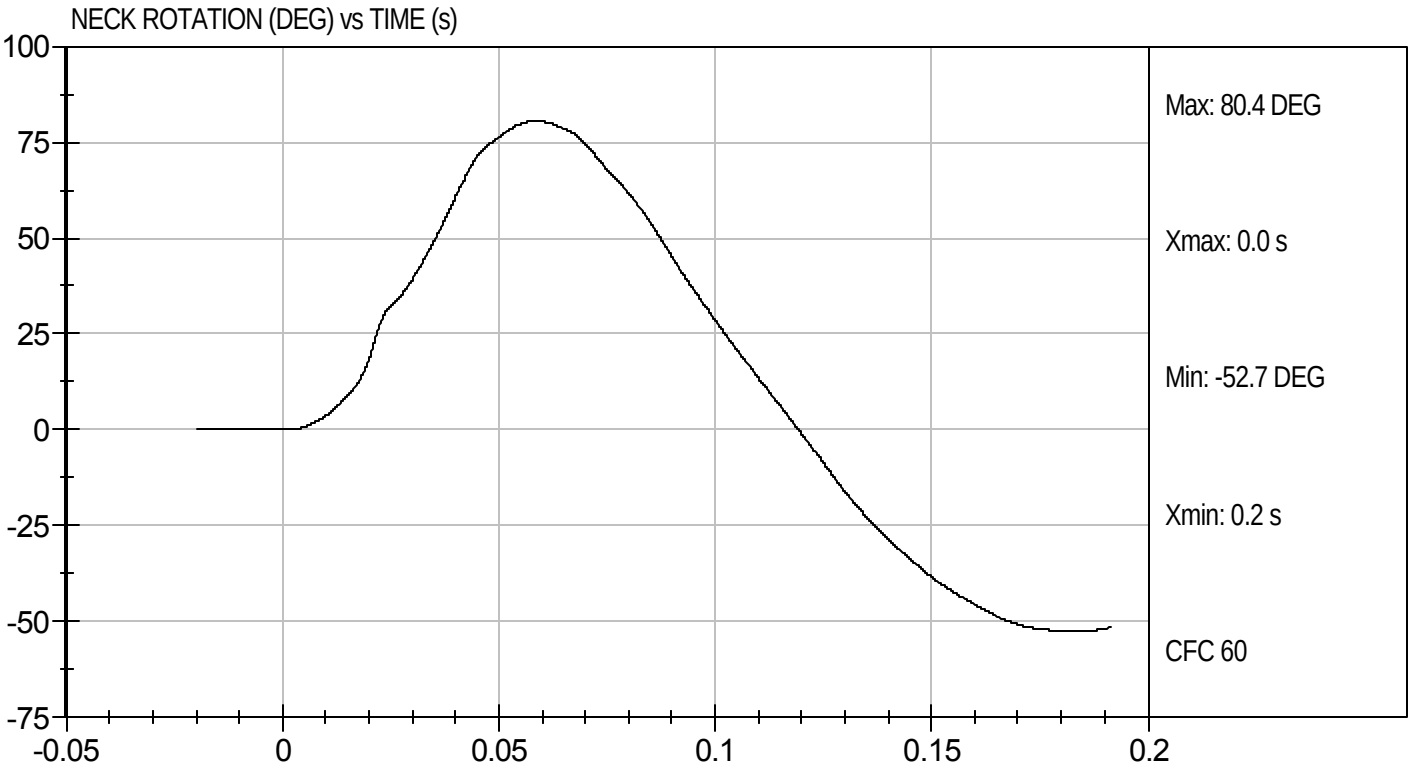
2/7/11
Test Date

David Winkelbauer
Approved By

Test Desc: Neck Flexion
Component ID: D11392

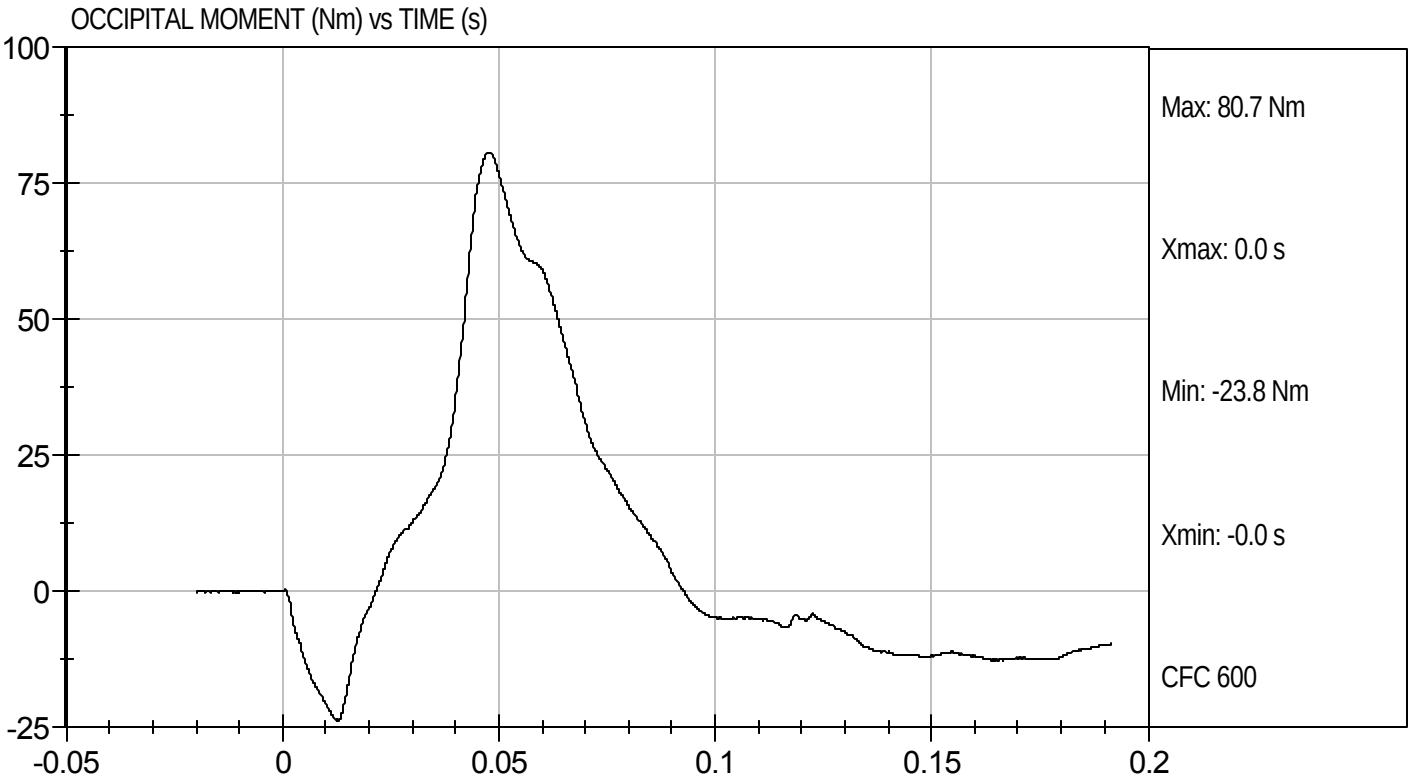
Test Date: 2/7/11
Velocity: 23.1 ft/s, 7.04 m/s





Test Desc: Neck Flexion
Component ID: D11392

Test Date: 2/7/11
Velocity: 23.1 ft/s, 7.04 m/s



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138 **Test I.D:** D11393

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity		%	10 to 70	22	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.10	Pass
Pendulum Deceleration	10 ms	m/s	1.5 to 1.9	1.8	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	102	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-55	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	100	Pass
			Overall Results		Pass

Jessica Hall
Laboratory Technician

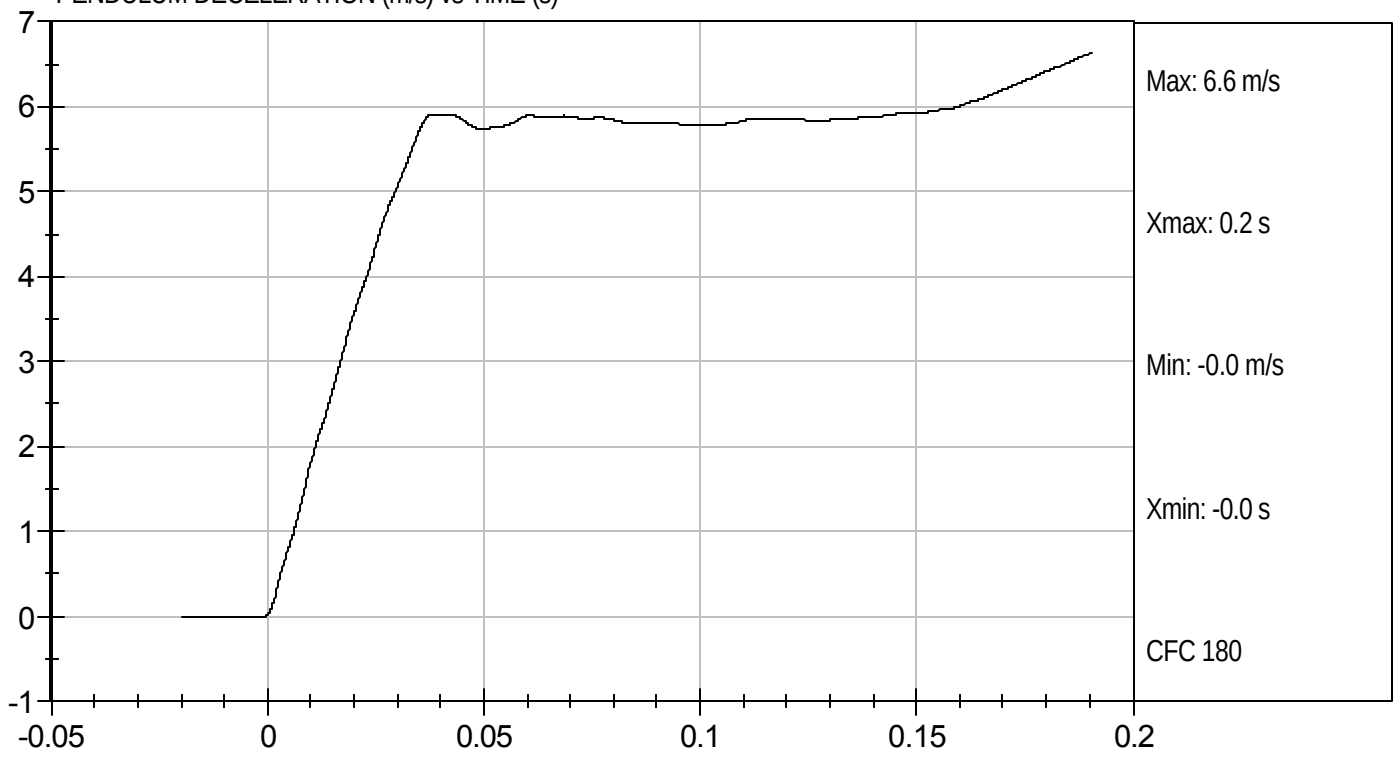
2/7/11
Test Date

David Winkelbauer
Approved By

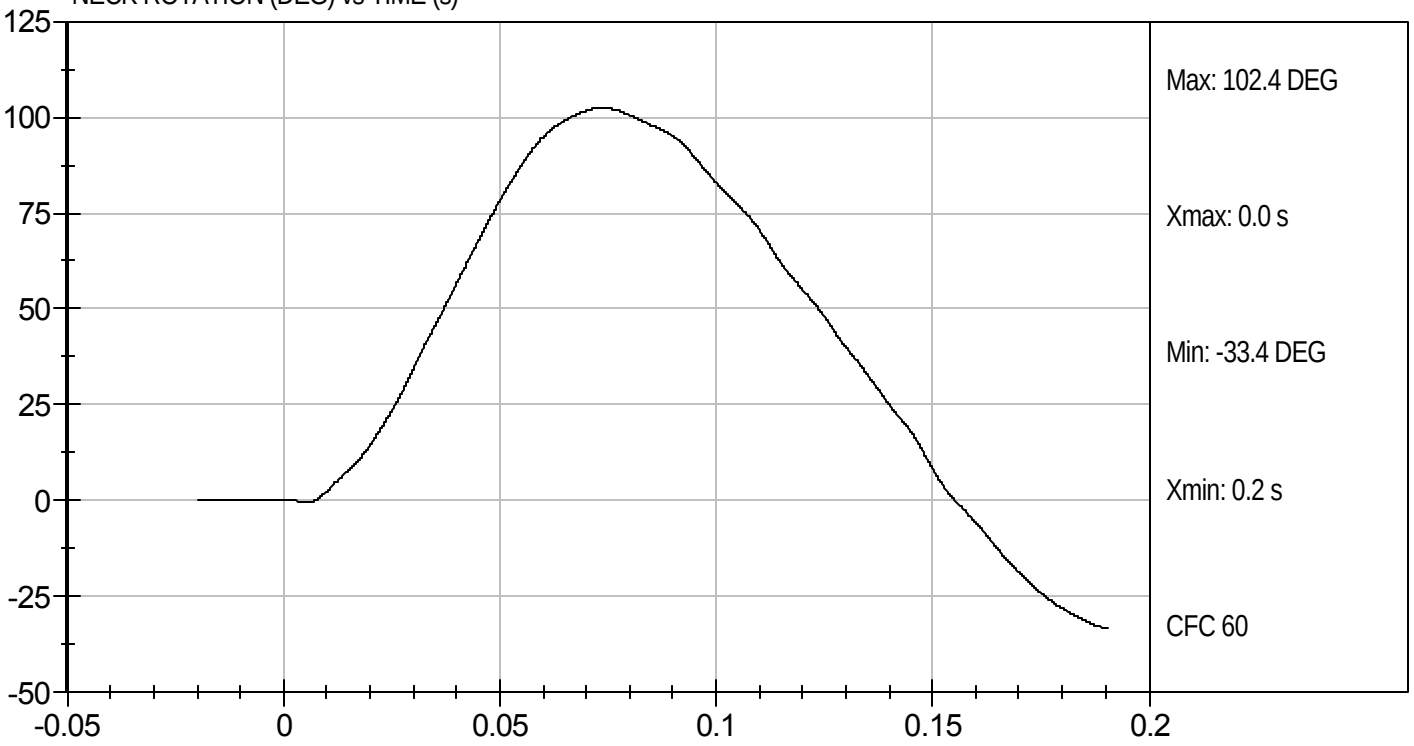
Test Desc: Neck Extension
Component ID: D11393

Test Date: 2/7/11
Velocity: 20.0 ft/s, 6.10 m/s

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

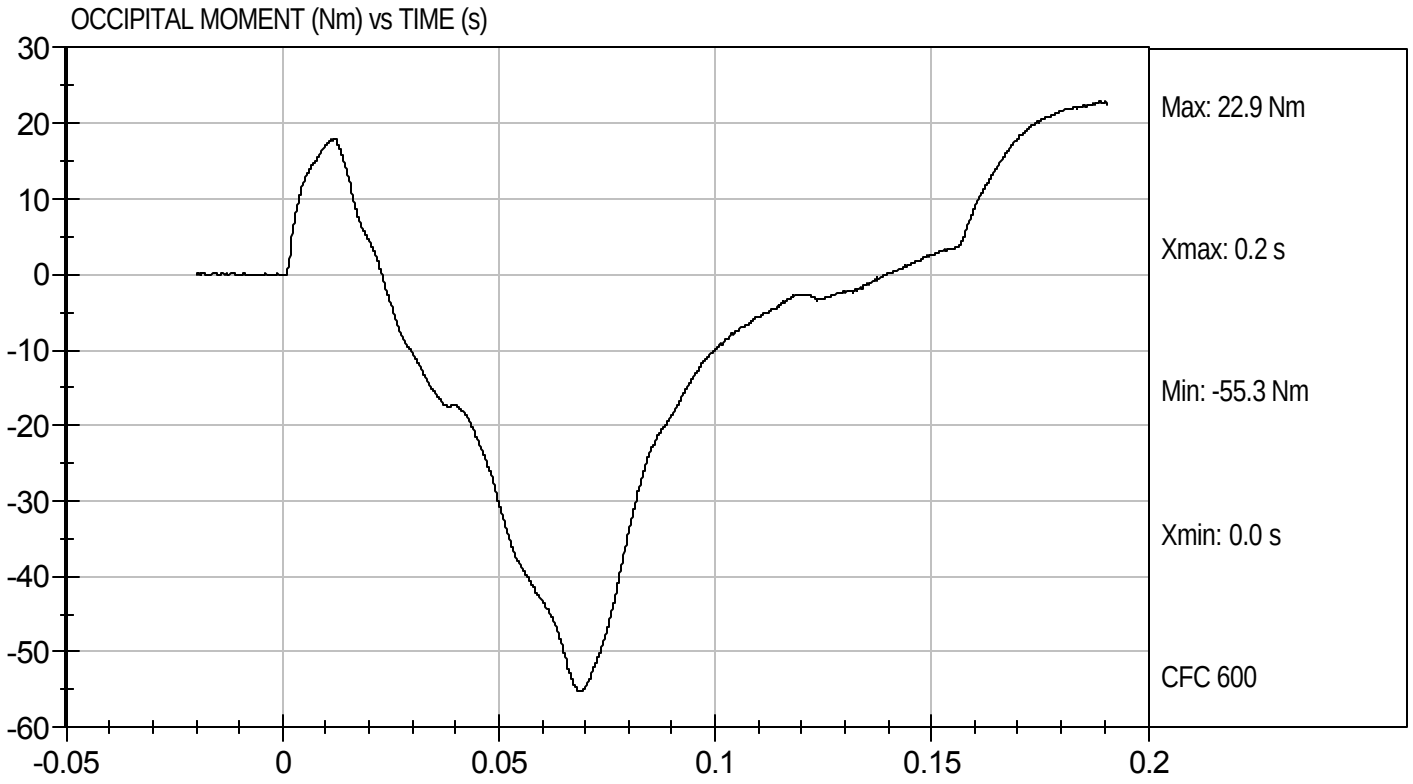


NECK ROTATION (DEG) vs TIME (s)



Test Desc: Neck Extension
Component ID: D11393

Test Date: 2/7/11
Velocity: 20.0 ft/s, 6.10 m/s



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 5TH PERCENTILE

ATD Serial No: 138 **Test I.D:** D11394

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Relative Humidity	%	10 to 70	24	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	53	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	4.2	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Peak Force 18 mm - 50 mm	N	<= 4,600 N	4189	Pass
		Overall Test Results		Pass

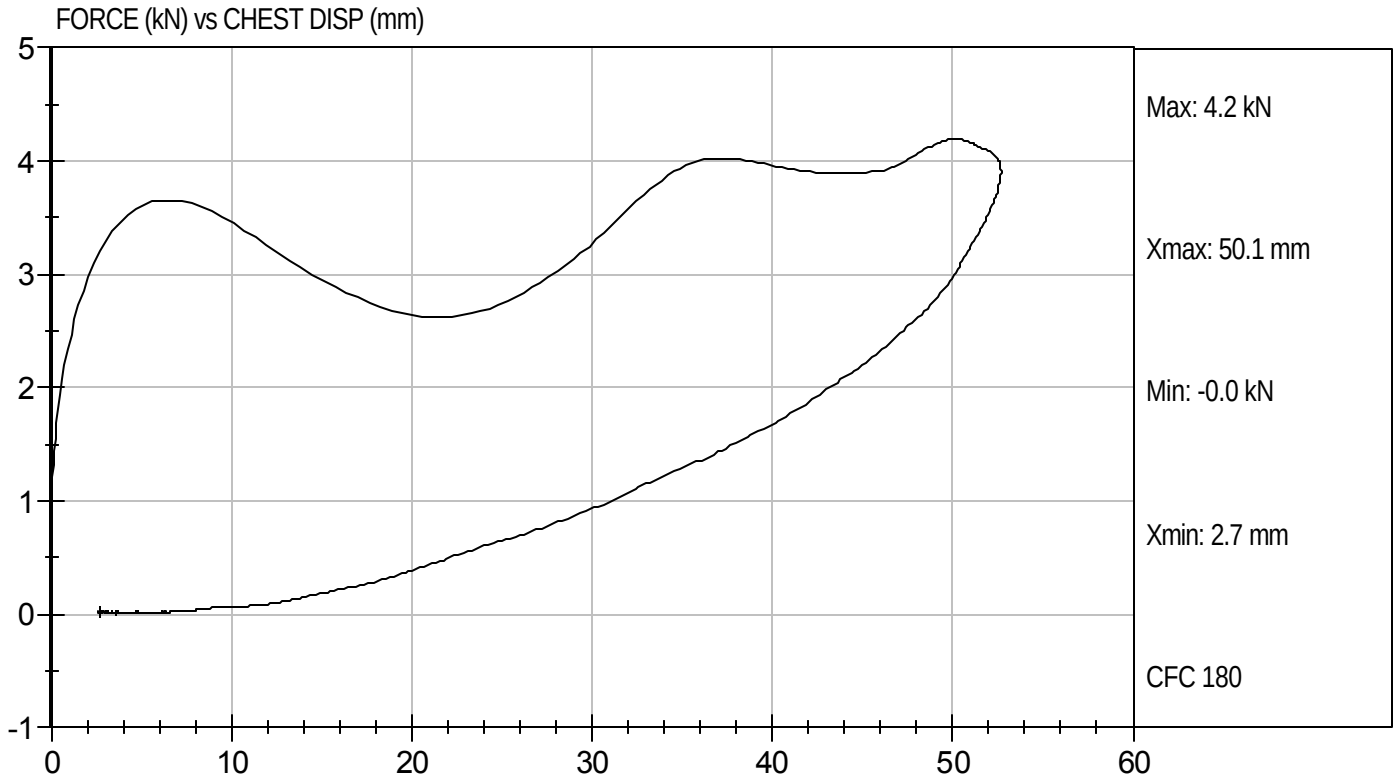
Jessica Hall
Laboratory Technician

2/7/11
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Impact
Component ID: D11394

Test Date: 2/7/11
Velocity: 22.2 ft/s, 6.77 m/s



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138 **Test I.D:** D11395

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	13	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	kN	3.45 to 4.06	3.58	Pass
		Overall Test Results		Pass

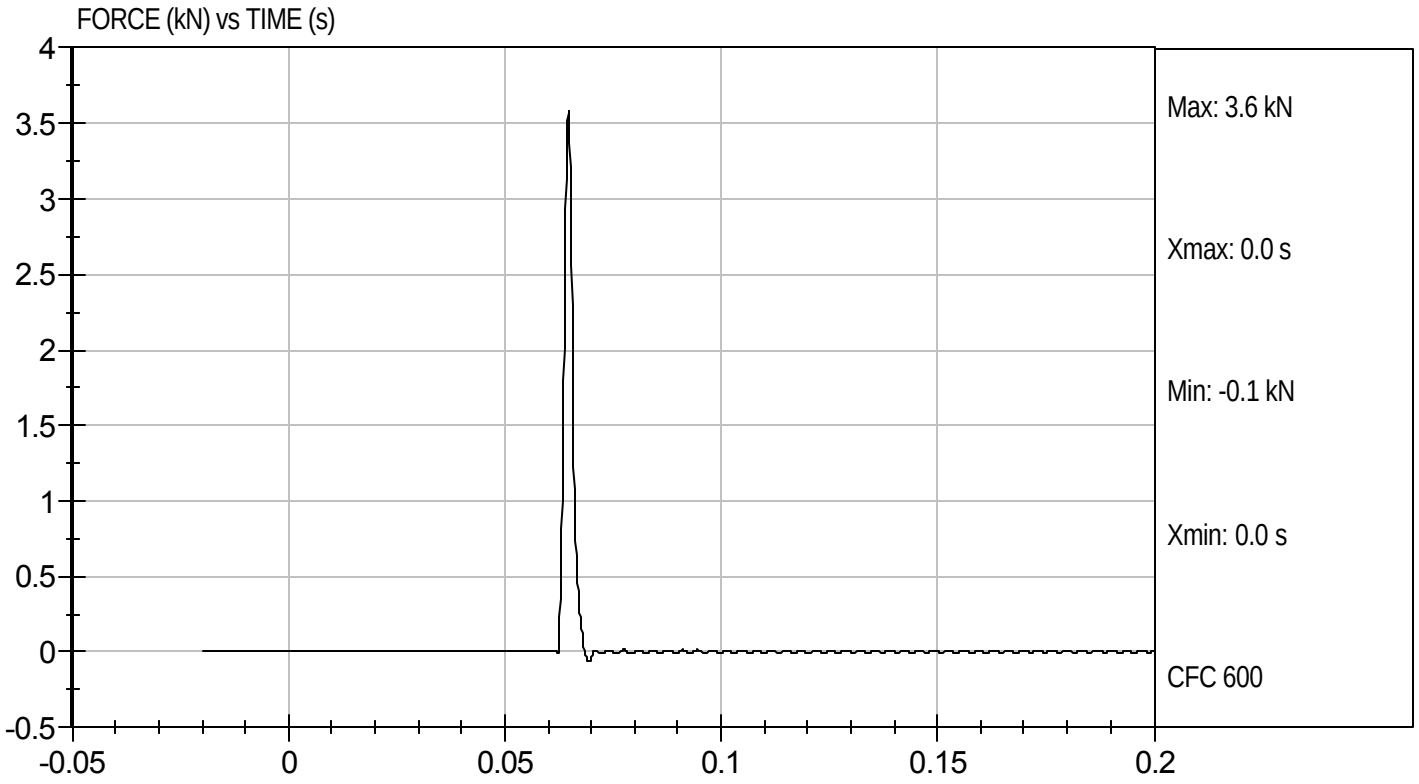
Jessica Hall
Laboratory Technician

2/4/11
Test Date

David Winkelbauer
Approved By

Test Desc: Right Knee
Component ID: D11395

Test Date: 2/4/11
Velocity: 6.94 ft/s, 2.12 m/s



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138 **Test I.D:** D11396

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	13	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

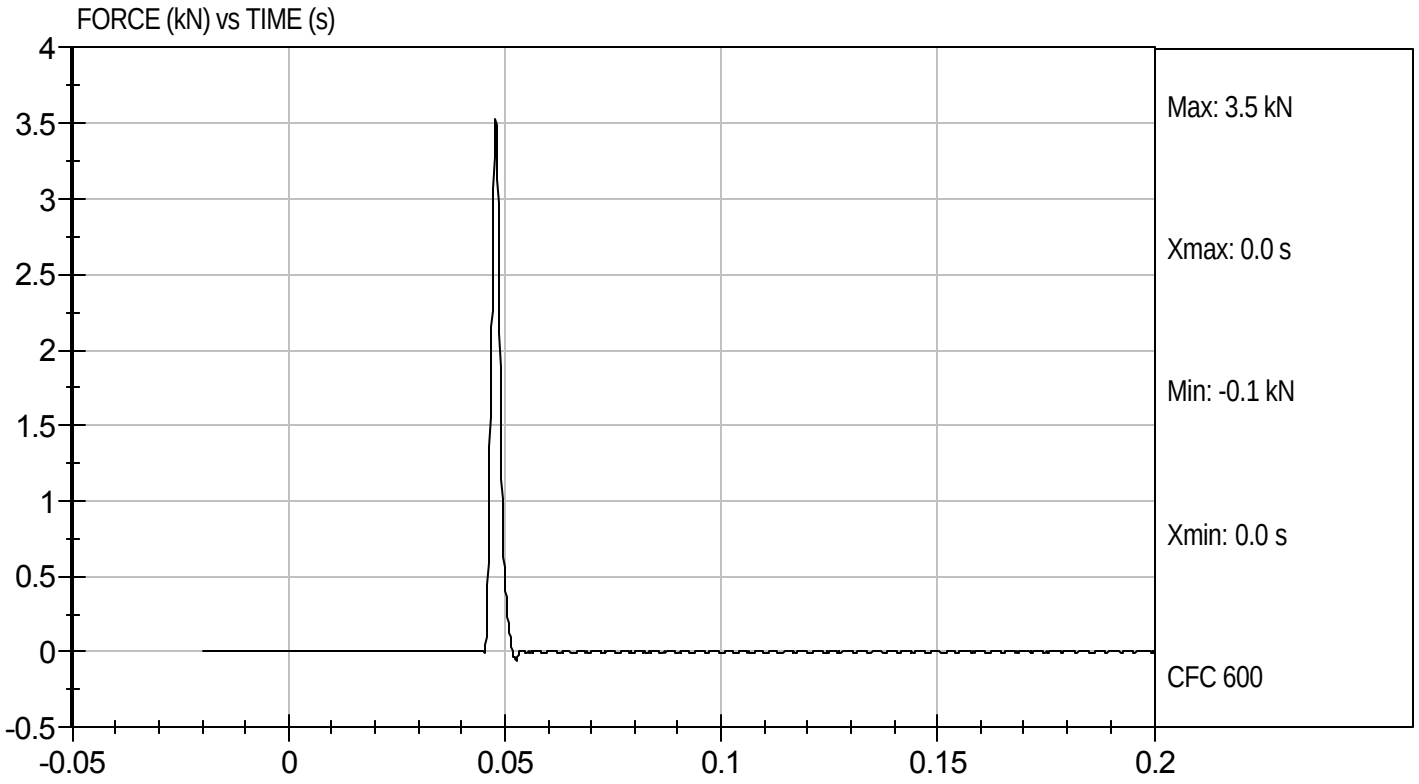
Jessica Gall
Laboratory Technician

2/4/11
Test Date

David Winkelbauer
Approved By

Test Desc: Left Knee
Component ID: D11396

Test Date: 2/4/11
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:** D11397

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	16	Pass
Initial Angle	deg	0 to 20	17	Pass
Return Angle	deg	+/- 8	3	Pass
Force at 45 deg	N	320 to 390	371	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 to 1.5	1.0	Pass
		Overall Result		Pass

Jessica Gall
Laboratory Technician

2/4/11
Test Date

David Winkelbauer
Approved By

MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138 **Test ID:** D11451

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	15	Pass
Peak Resultant Acceleration	G's	250 to 300	278	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 Hall
Laboratory Technician

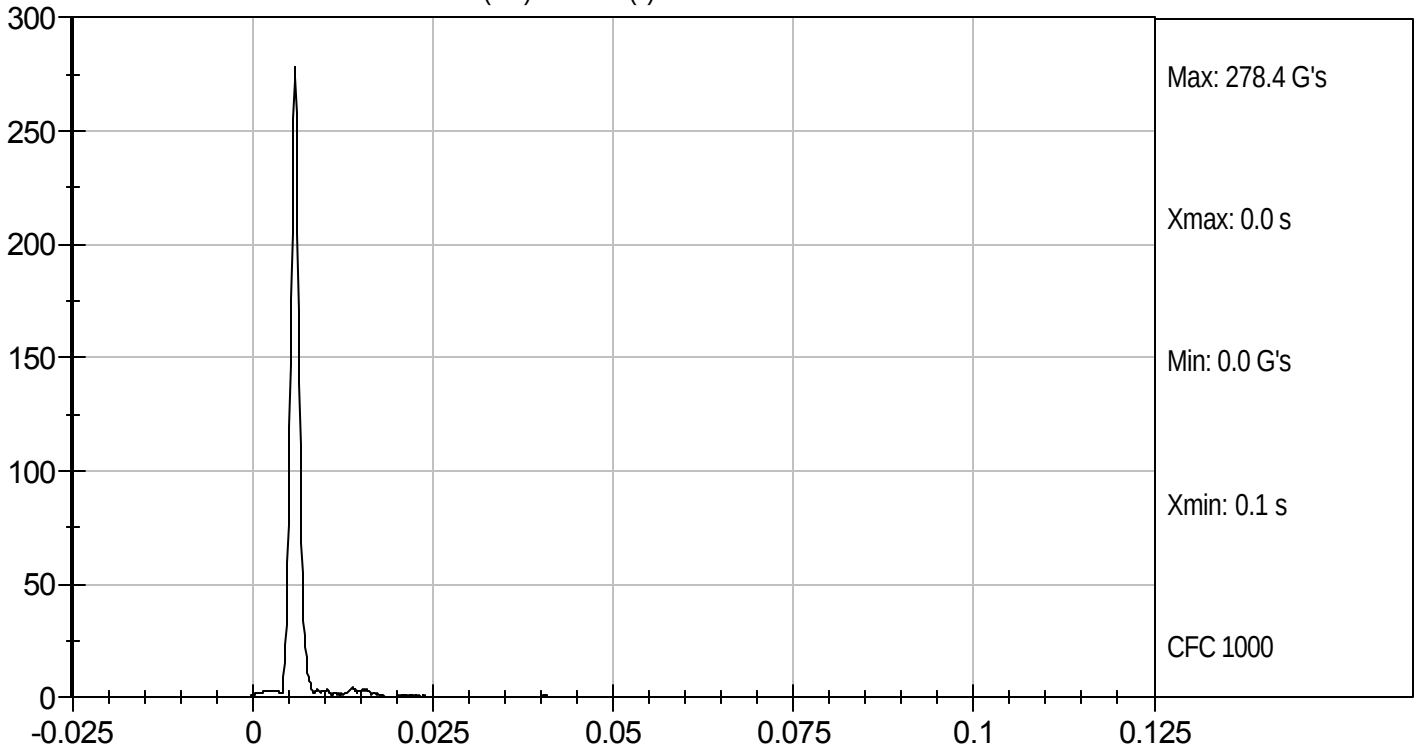
2/8/11
Test Date

David Winkelbauer
Approved By

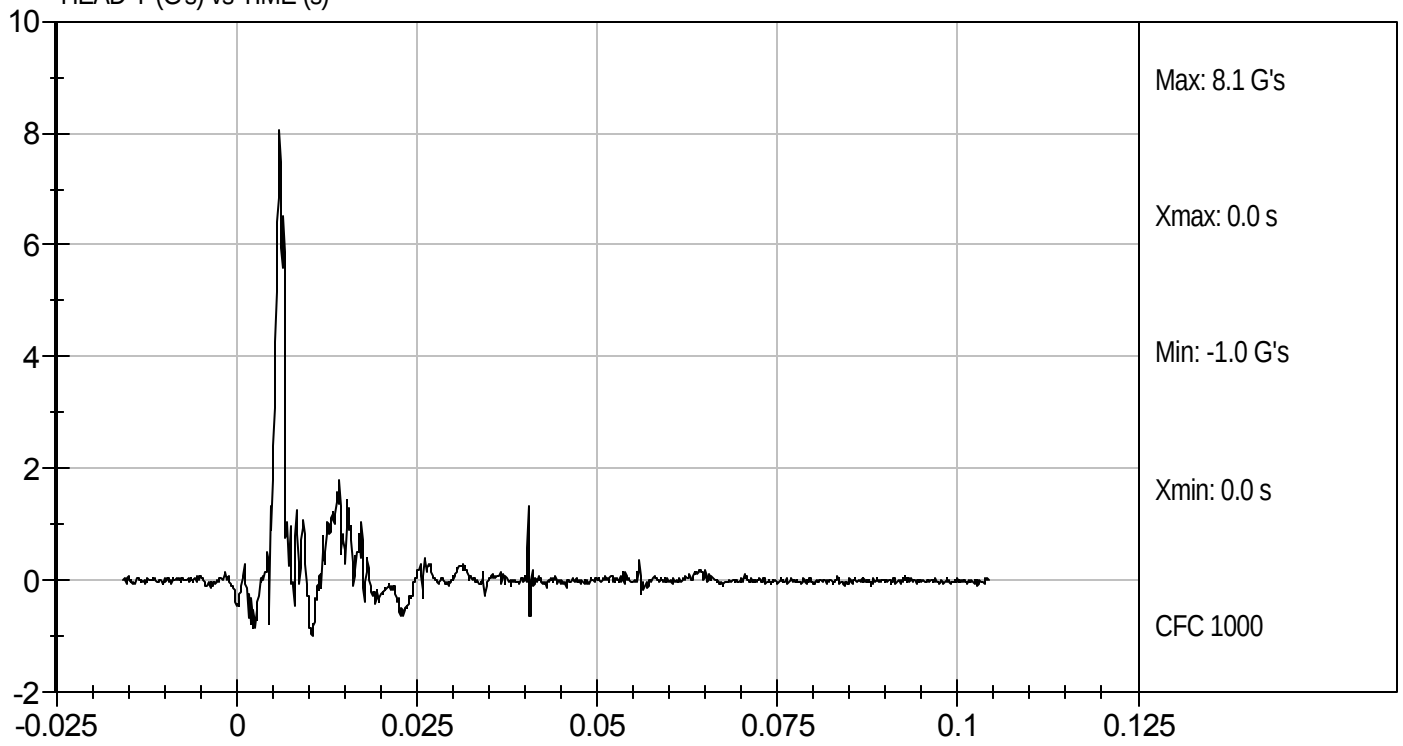
Test Desc: Head Drop
Component ID: D11451

Test Date: 2/8/11
Velocity: 0 ft/s, 0.00 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:** D11452

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	14	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	m/s	2.1 to 2.5	2.4	Pass
	20 ms	m/s	4.0 to 5.0	4.3	Pass
	30 ms	m/s	5.8 to 7.0	5.9	Pass
D Plane Rotation	Max	deg	77 to 91	80	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	69 to 83	79	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	87	Pass
			Overall Results		Pass

Jessica Hall
Laboratory Technician

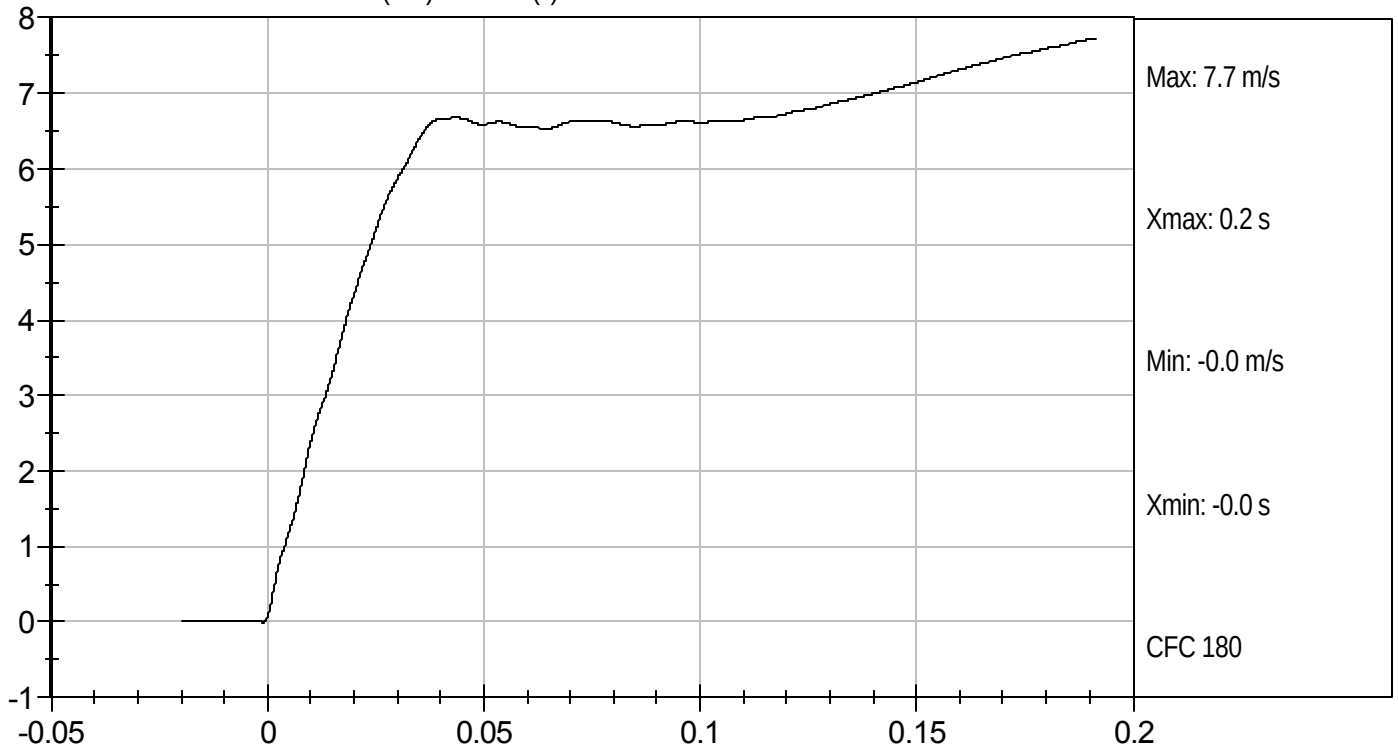
2/8/11
Test Date

David Winkelbauer
Approved By

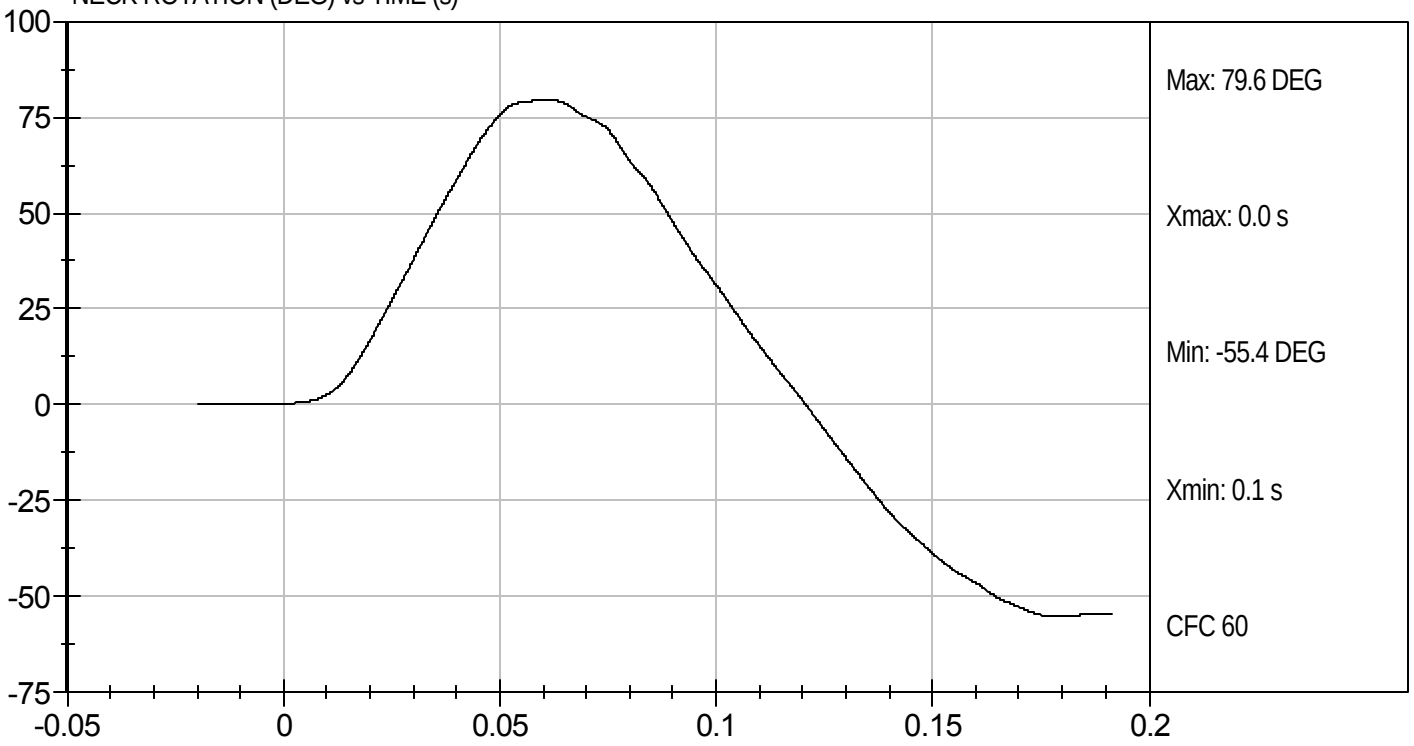
Test Desc: Neck Flexion
Component ID: D11452

Test Date: 2/8/11
Velocity: 23.15 ft/s, 7.06 m/s

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

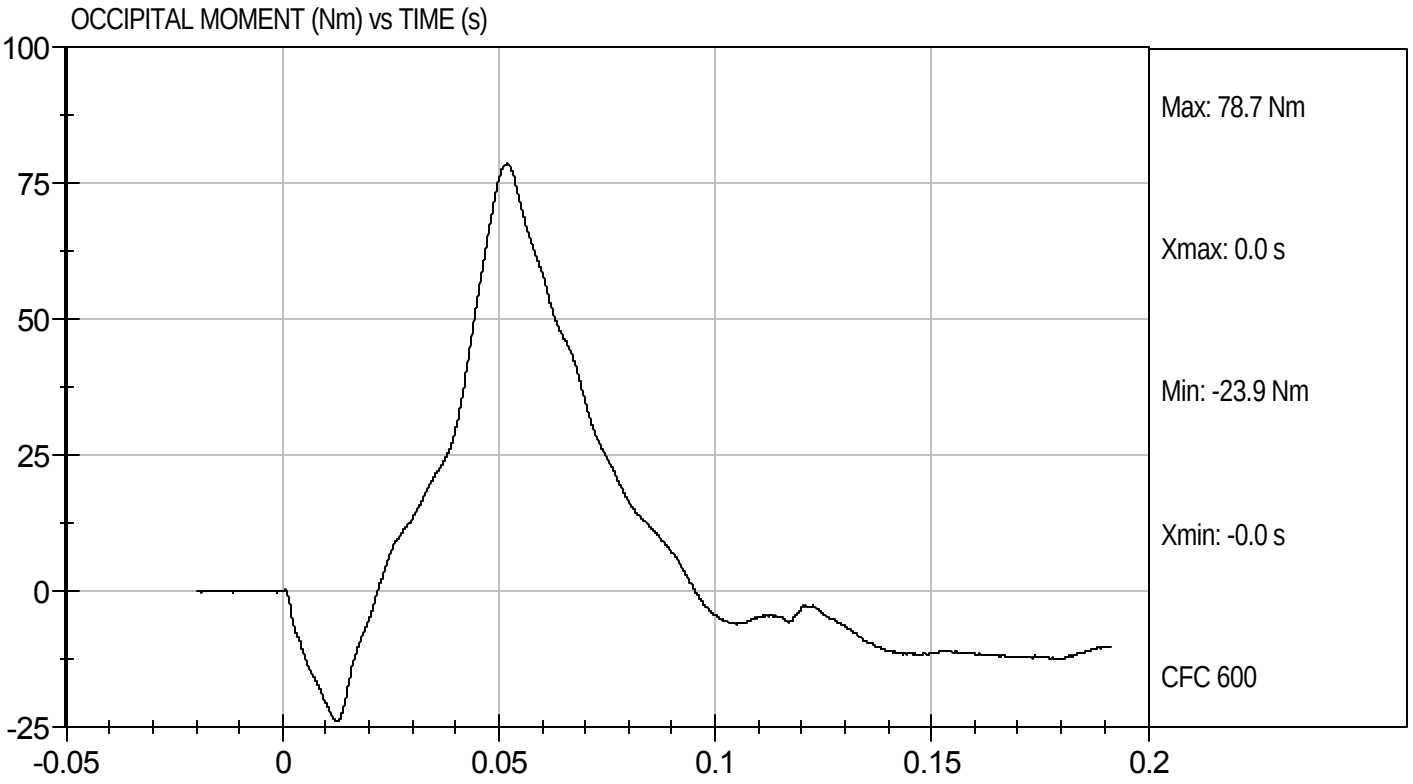


NECK ROTATION (DEG) vs TIME (s)



Test Desc: Neck Flexion
Component ID: D11452

Test Date: 2/8/11
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:** D11453

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	14	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	-54	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	103	Pass
			Overall Results		Pass

Jessica Gall
Laboratory Technician

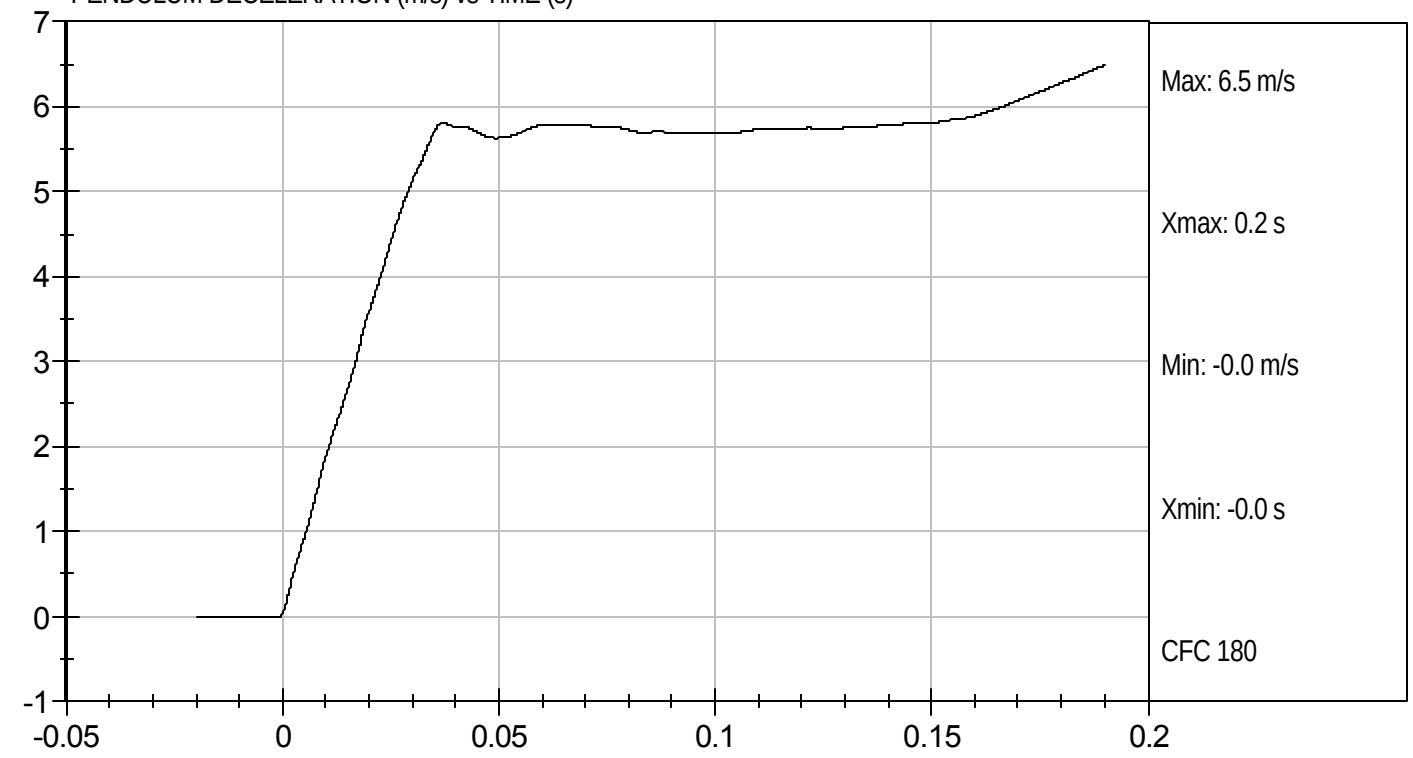
2/8/11
Test Date

David Winkelbauer
Approved By

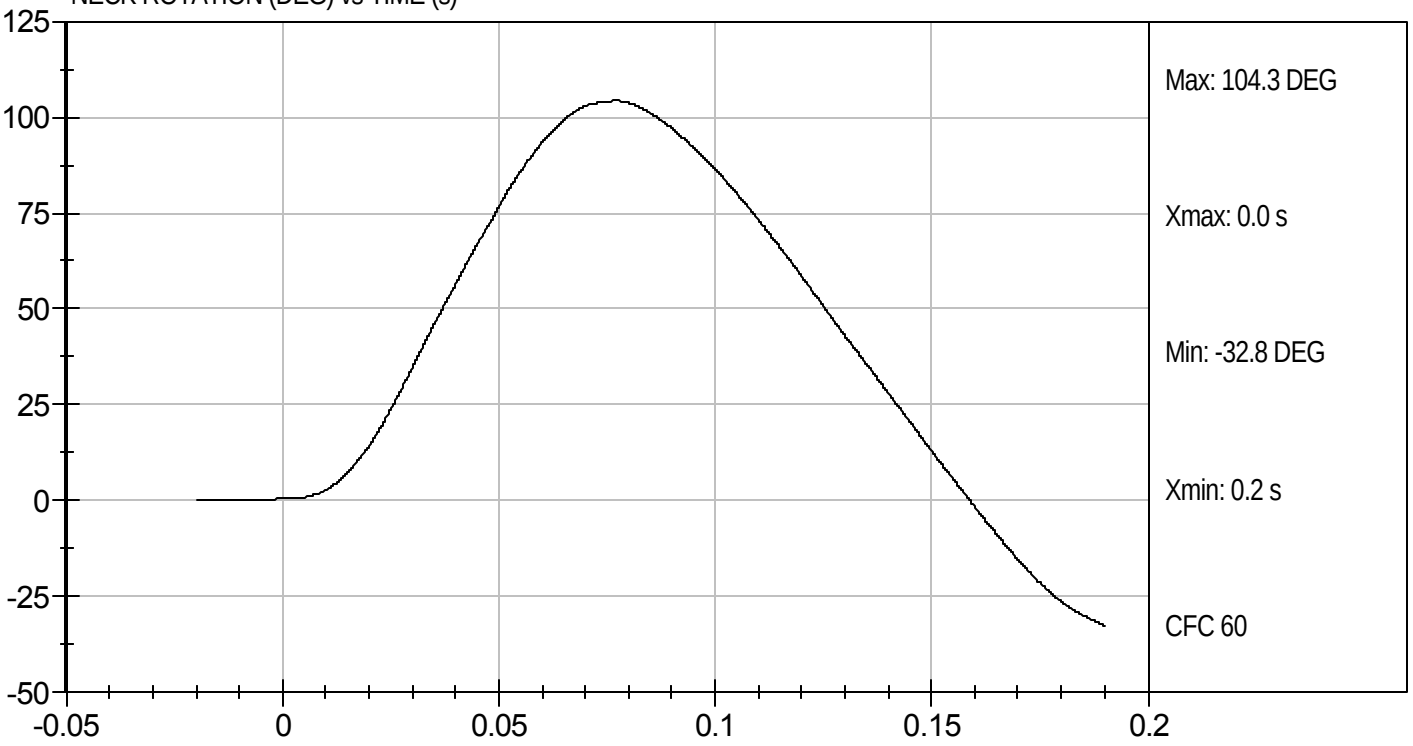
Test Desc: Neck Extension
Component ID: D11453

Test Date: 2/8/11
Velocity: 20.08 ft/s, 6.12 m/s

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

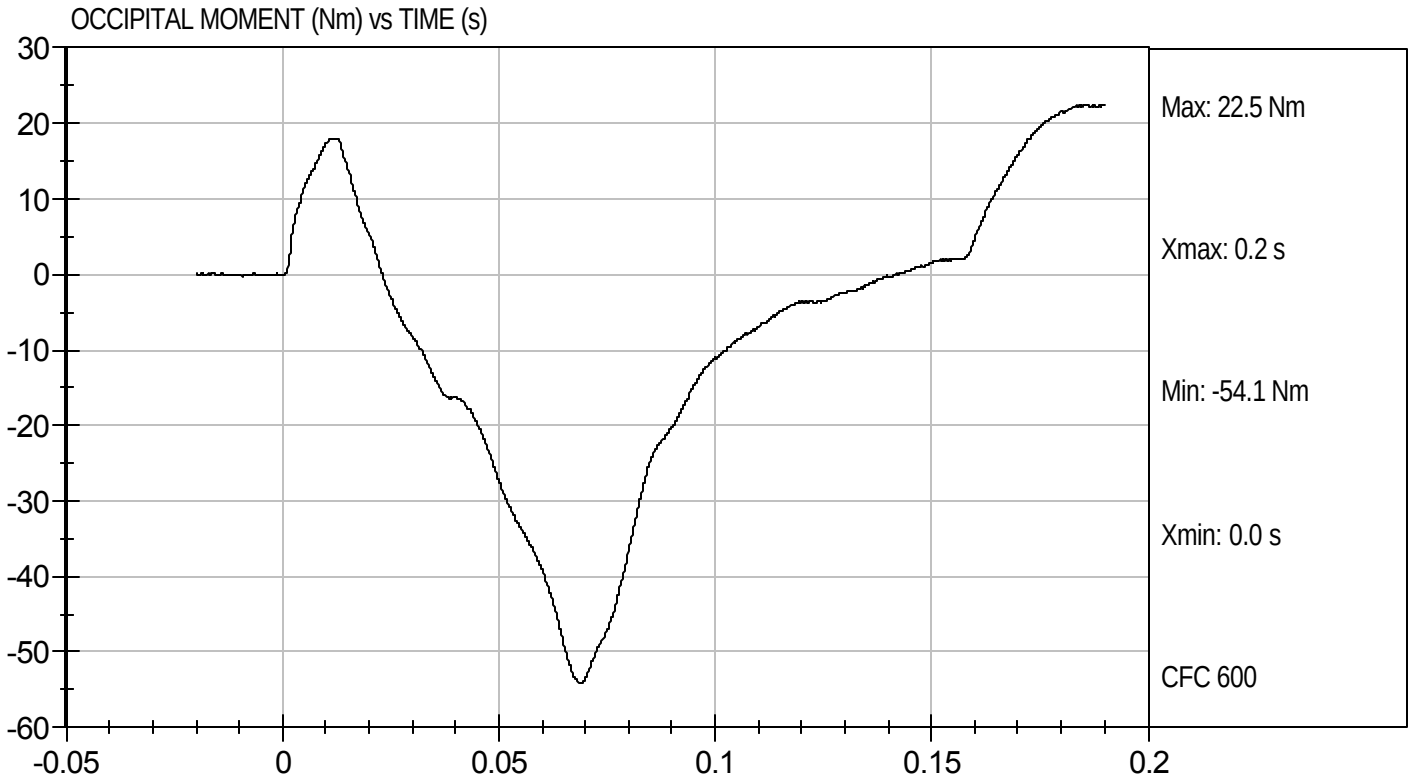


NECK ROTATION (DEG) vs TIME (s)



Test Desc: Neck Extension
Component ID: D11453

Test Date: 2/8/11
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:** D11454

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Relative Humidity	%	10 to 70	11	Pass
Probe Speed	m/s	6.59 to 6.83	6.60	Pass
Peak Deflection	mm	50 to 58	52	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	4.17	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Peak Force 18 mm - 50 mm	N	<= 4,600 N	4174	Pass
		Overall Test Results		Pass

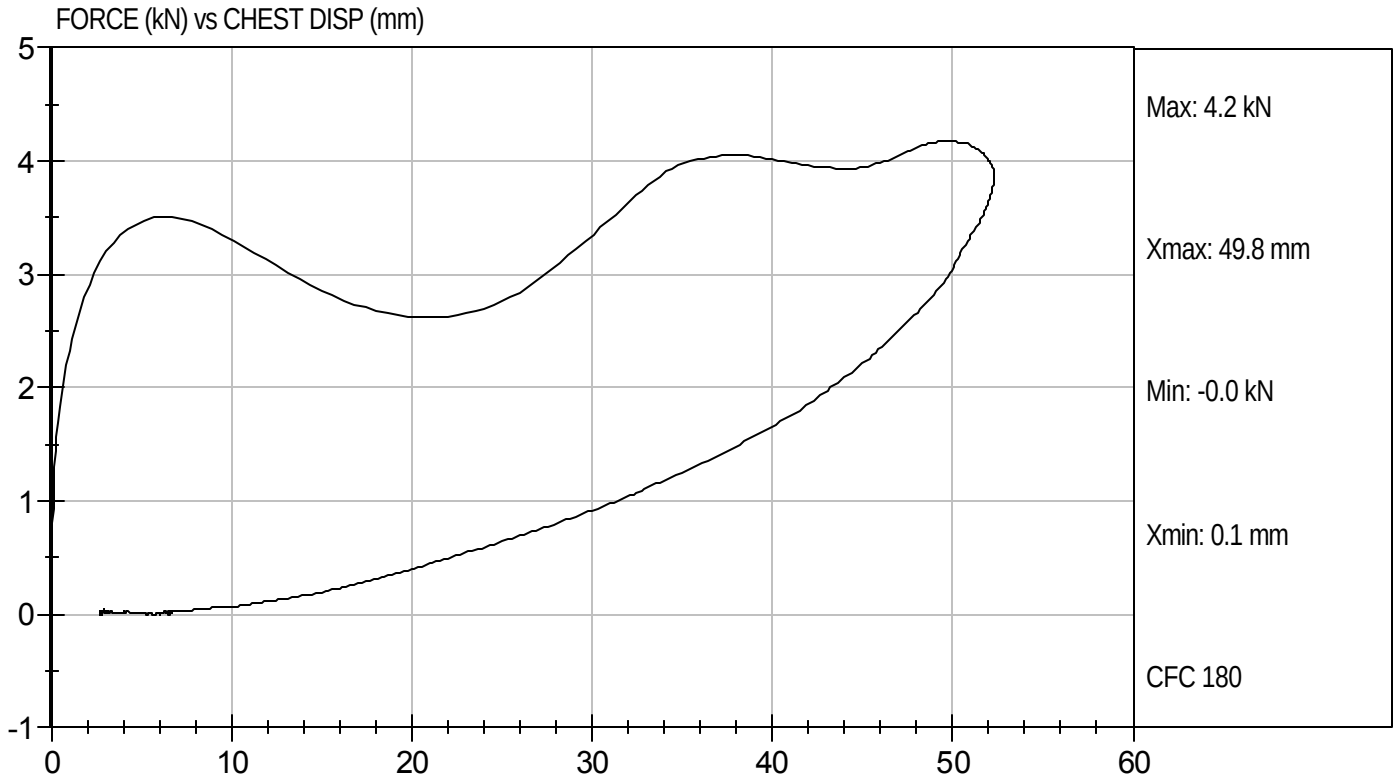
Jessica Hall
Laboratory Technician

2/9/11
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Impact
Component ID: D11454

Test Date: 2/9/11
Velocity: 21.65 ft/s, 6.60 m/s



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138 **Test I.D:** D11455

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	20.6	Pass
Laboratory Relative Humidity	%	10 to 70	12	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	kN	3.45 to 4.06	3.69	Pass
		Overall Test Results		Pass

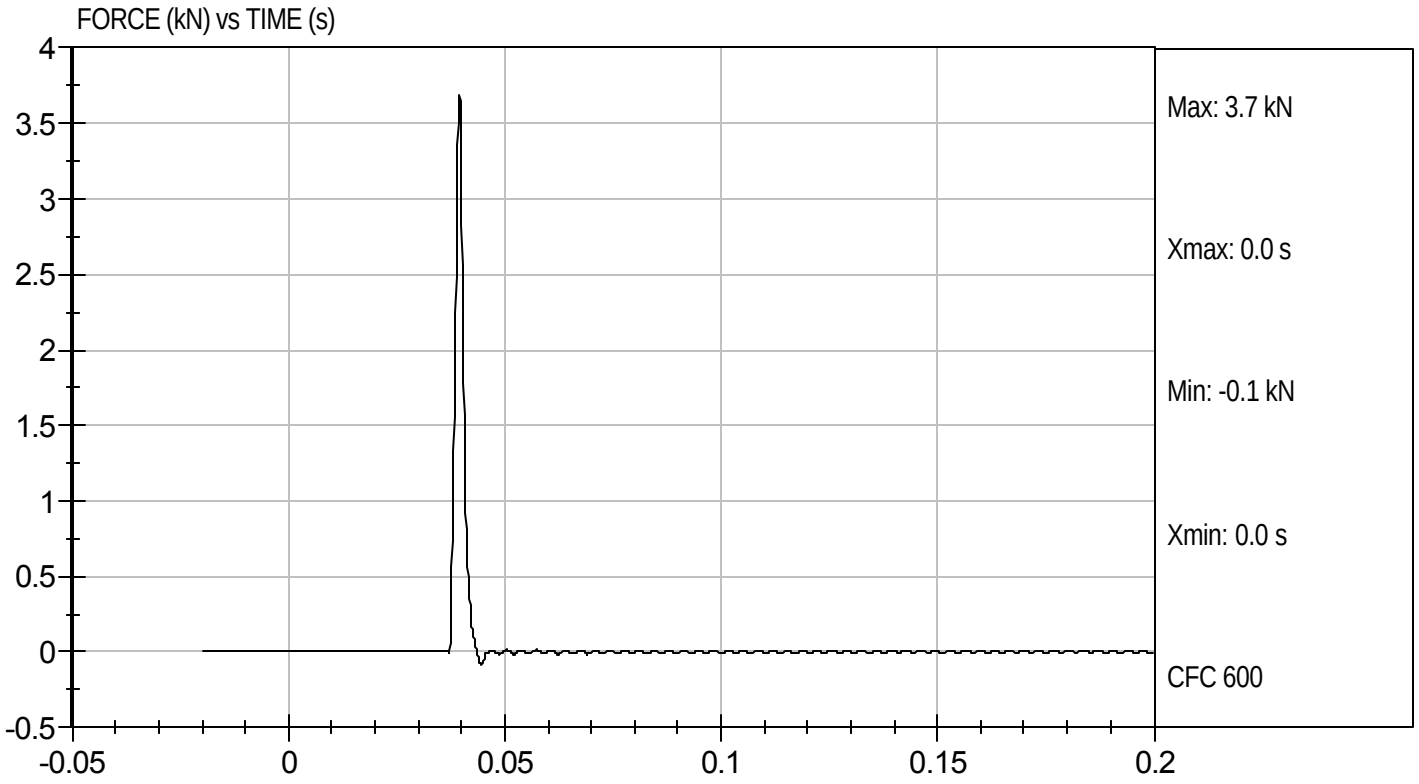
Jessica Gall
Laboratory Technician

2/9/11
Test Date

David Winkelbauer
Approved By

Test Desc: Right Knee
Component ID: D11455

Test Date: 2/9/11
Velocity: 6.94 ft/s, 2.12 m/s



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138 **Test I.D:** D11456

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	20.6	Pass
Laboratory Relative Humidity	%	10 to 70	12	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	kN	3.45 to 4.06	3.68	Pass
		Overall Test Results		Pass

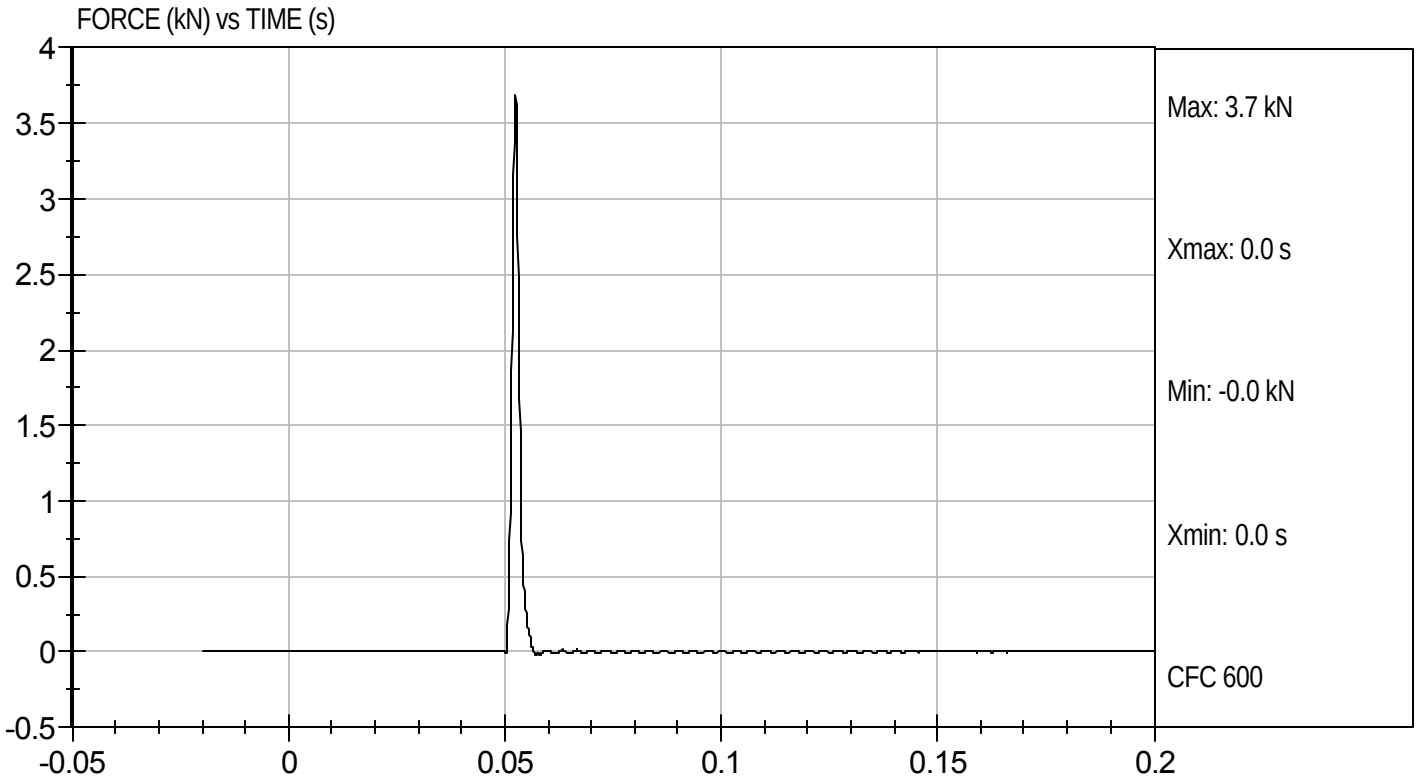
Jessica Hall
Laboratory Technician

2/9/11
Test Date

David Winkelbauer
Approved By

Test Desc: Left Knee
Component ID: D11456

Test Date: 2/9/11
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:** D11457

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	15	Pass
Initial Angle	deg	0 to 20	17	Pass
Return Angle	deg	+/- 8	5	Pass
Force at 45 deg	N	320 to 390	326	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 to 1.5	1.0	Pass
		Overall Result		Pass

Jessica Hall
Laboratory Technician

2/8/11
Test Date

David Winkelbauer
Approved By