

REPORT NUMBER: NCAP-MGA-2007-012

**NEW CAR ASSESSMENT PROGRAM
FRONTAL BARRIER IMPACT TEST**

**CAMI AUTOMOTIVE, INC.
2008 SUZUKI XL7
NHTSA NUMBER: X80500**

**PREPARED BY:
MGA RESEARCH CORPORATION
5000 WARREN ROAD
BURLINGTON, WI 53105**



Test Date: May 21, 2007

Final Report Date: June 22, 2007

FINAL REPORT

**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
RULEMAKING
OFFICE OF CRASHWORTHINESS STANDARDS
1200 NEW JERSEY AVENUE, SE, ROOM W43-410
WASHINGTON, D.C. 20590**

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16. Abstract A frontal barrier impact was conducted on a 2008 Suzuki XL7 at MGA Research Corporation on May 21, 2007. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and foot well intrusion performance. The impact velocity was 56.3 km/h. The ambient temperature at the barrier face at the time of impact was 21 degrees Celsius. The vehicle's maximum post test static crush is 527 mm located to the right of the vehicle's centerline. The test vehicle is equipped with a 3-point continuous belt system and an airbag in both front outboard seating positions. With respect to FMVSS 208 "Occupant Crash Protection", the occupant injury criteria summary is as follows:																												
<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;"><u>Measurement Description</u></th> <th style="text-align: left;"><u>Units</u></th> <th style="text-align: left;"><u>Threshold</u></th> <th style="text-align: left;"><u>Driver ATD</u></th> <th style="text-align: left;"><u>Pass. ATD</u></th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC)</td> <td>N/A</td> <td>1000</td> <td>295</td> <td>326</td> </tr> <tr> <td>Max. Thorax Accel. (3ms Clip)</td> <td>G's</td> <td>60</td> <td>43</td> <td>41</td> </tr> <tr> <td>Left Femur Force</td> <td>Newton</td> <td>10009</td> <td>-3530</td> <td>-3698</td> </tr> <tr> <td>Right Femur Force</td> <td>Newton</td> <td>10009</td> <td>-5260</td> <td>-4484</td> </tr> </tbody> </table>				<u>Measurement Description</u>	<u>Units</u>	<u>Threshold</u>	<u>Driver ATD</u>	<u>Pass. ATD</u>	Head Injury Criteria (HIC)	N/A	1000	295	326	Max. Thorax Accel. (3ms Clip)	G's	60	43	41	Left Femur Force	Newton	10009	-3530	-3698	Right Femur Force	Newton	10009	-5260	-4484
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TABLE OF CONTENTS

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

<u>Data Sheet No.</u>		<u>Page No.</u>
1	Crash Test Summary	3
2	General Test and Vehicle Parameter Data	4
3	Test Vehicle Tire Information	6
4	Test Vehicle Information	7
5	Dummy Positioning in Vehicle	9
6	Seat Belt Positioning Data	11
7	Vehicle Accelerometer Locations	12
8	Summary of FMVSS 212 and FMVSS 219 (Partial) Data	13
9	Summary of FMVSS 301 Data	14
10	Vehicle Measurements	15
11	Camera Locations	18
12	Photographic Reference Target Locations	20
13	Vehicle Intrusion Measurements	21
14	Load Cell Locations on Fixed Barrier	24
15	Accident Investigation Division Data	25
16	Dummy/Vehicle Temperature Stabilization Chart	26

<u>Appendix</u>		
A	Photographs	A
B	Dummy Response Data Traces	B
C	Dummy Calibration Data	C

SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

This 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 an impact in excess of the current 48.3 kph requirements.

SUMMARY

A load cell barrier was impacted by a 2008 Suzuki XL7 at a velocity of 56.3 kph. The test was performed at MGA Research Corporation on May 21, 2007. Pre-and post-test photographs of the vehicle and dummies can be found in Appendix A.

One real-time camera and fourteen 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.

Two Part 572E, 50th percentile male anthropomorphic test devices (ATDs), were placed in the driver and right-front passenger seating positions according to dummy placement instructions specified in the Laboratory Indicant Test Procedure.

Both ATDs were fully instrumented with head, chest and pelvis tri-axial accelerometers, chest displacement potentiometer, upper neck transducers, right/left femur load cells, and lower leg instrumentation. The driver (position 1) ATD (Serial No. 065) and right-front passenger (position 2) ATD (Serial No. 066) were calibrated previous to this test. Certification details, along with instrumentation calibration data, are found in Appendix C.

The 102 channels of data were recorded on an on-board data acquisition system. Appendix B contains the dummy head, chest, and femur response data traces.

There was 92.7 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 527 mm and both the driver and passenger side doors remained closed and latched 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. 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 and side header. The passenger's knees contacted the glove box.

The occupant data is summarized below:

ATD position	HIC	T ¹	T ²	Clip (g)	T ¹	T ²	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver	295	67.6	97.6	43	85.7	88.7	-25	-3530	-5260
Passenger	326	69.9	105.9	41	78.3	81.3	-22	-3698	-4484

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

TEST NOTES

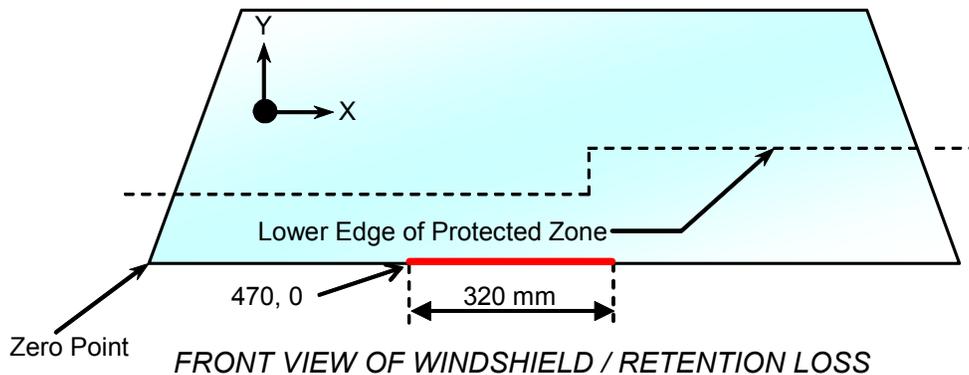
There was no valid data collected for:
 Right Brake Caliper X after 40 msec.
 Top of Engine X after 20 msec.

A 2007 model vehicle was purchased from the dealer and 2008 parts were added as follows:

- Driver Airbag
- Driver / Passenger Seatbelt Assembly (including pretensioner)
- Driver / Passenger Door Trim Panels

The ACU placed in "barrier" mode to allow detection of passenger ATD by suppression system.

Curtain airbags disabled to prevent loss of visual data.



SECTION 2
OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1
CRASH TEST SUMMARY

Test Vehicle: 2008 Suzuki XL7
Test Program: 35mph Frontal Impact

NHTSA No.: X80500
Test Date: 5/21/2007

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
Glazing Damage	The windshield cracked.	

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	1077
Center	mm	943
Right Side	mm	1024
Average	mm	1015

BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	816	806
Lap belt length as measured on ATD	mm	546	567
Remainder of belt on reel	mm	1875	1864
Total belt length for continuous webbing systems	mm	3237	3237

DATA SHEET NO. 2

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2008 Suzuki XL7
 Test Program: 35mph Frontal Impact

NHTSA No.: X80500
 Test Date: 5/21/2007

TEST VEHICLE INFORMATION

Manufacturer	Suzuki
Model	XL7
Body Style	MPV
NHTSA No.	X80500
VIN	2S3DB417076115358
Color	Jet Black
Delivery Date	5/15/2007
Odometer Reading (mile)	242
Dealer	Ray Suzuki
Transmission	Automatic Overdrive
Final Drive	Front
Number of Cylinders	6
Engine Displacement (L)	3.6
Engine Placement	Lateral
Automatic Door Lock (ADL)	Yes
Owners Manual Details Instructions on Disabling ADLs	No
Bucket Seats	Yes

TEST VEHICLE OPTIONS

Front Airbag	Yes
Driver Side Curtain Airbag	Yes
Driver Side Torso Airbag	No
Rear Passenger Side Curtain Airbag	Yes
Rear Passenger Side Torso Airbag	No
Force Limiter	Yes
Pretensioner	Yes
Power Steering	Yes
Power Door Locks	Yes
Tilt Wheel	Yes
Air Conditioning	Yes
Anti-lock Brakes	Yes
Traction Control	No
All Wheel Drive	No
Power Seats (driver only)	Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	CAMI Automotive Inc.
Date of Manufacture	01/07

GVWR (kg)	2475
GAWR Front (kg)	1175
GAWR Rear (kg)	1325

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Split Bench	Split Folding Bench	
Number of Occupants	2	3	2	7
Capacity Wt. (VCW) (kg)				602
Cargo Wt. (RCLW) (kg)				126

DATA SHEET NO. 2... (CONTINUED)
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2008 Suzuki XL7
 Test Program: 35mph Frontal Impact

NHTSA No.: X80500
 Test Date: 5/21/2007

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	512.1	409.2		541.1	518.9	
Right	kg	490.8	413.2		523.0	518.5	
Ratio	%	54.9	45.1		50.6	49.4	
Totals	kg	1002.9	822.4	1825.3	1064.1	1037.4	2101.5

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1825.3
Weight of 2 P572E ATDs	kg	156.0
Rated Cargo/Luggage Weight (RCLW)	kg	126
Calculated Vehicle Target Weight (TVTW)	kg	2107.3

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	833	831	851	854	1289
As Tested	mm	808	810	813	812	1412
Post Test	mm	802	856	803	813	

Vehicle Wheelbase (mm): 2860

Weight of Ballast secured in cargo area (kg): 99.8

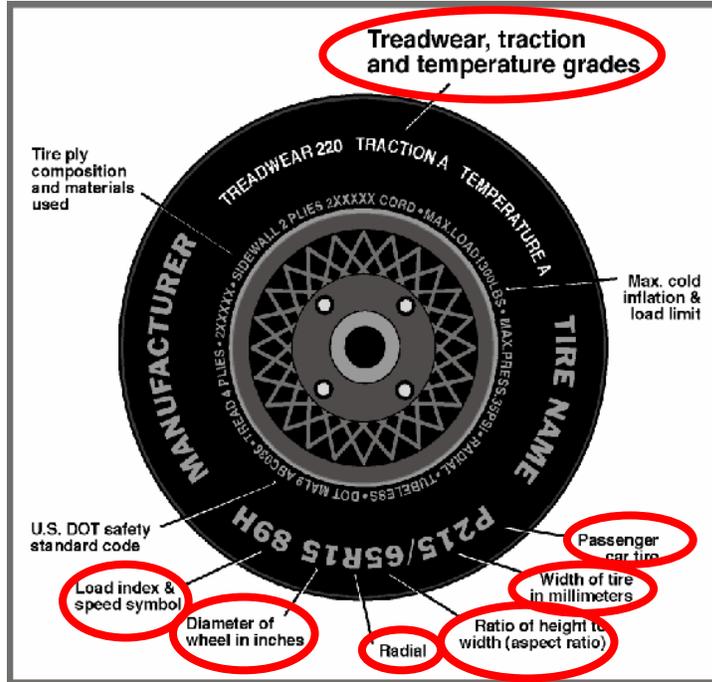
Vehicle Components Removed: Trunk carpet, trunk storage box, 3rd row seats, and engine cover

Ballast weight does not include instrumentation and data acquisition system.

DATA SHEET NO. 3
TEST VEHICLE TIRE INFORMATION

Test Vehicle: 2008 Suzuki XL7
Test Program: 35mph Frontal Impact

NHTSA No.: X80500
Test Date: 5/21/2007



DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	210	230
Recommended Tire Size	P235/60R17	P235/60R17
Tire Size on Vehicle	P235/60R17	P235/60R17
Tire Manufacturer	Bridgestone	Bridgestone
Tire Name	Dueler H/T	Dueler H/T
Tire Type	Passenger	Passenger
Tire Width (mm)	235	235
Ratio of Height to Width (aspect ratio)	60	60
Radial	R	R
Wheel Diameter	17	17
Load Index & Speed Symbol	100S	100S
Treadwear	340	340
Traction Grade	B	B
Temperature Grade	B	B

DATA SHEET NO. 4
TEST VEHICLE INFORMATION

Test Vehicle: 2008 Suzuki XL7
Test Program: 35mph Frontal Impact

NHTSA No.: X80500
Test Date: 5/21/2007

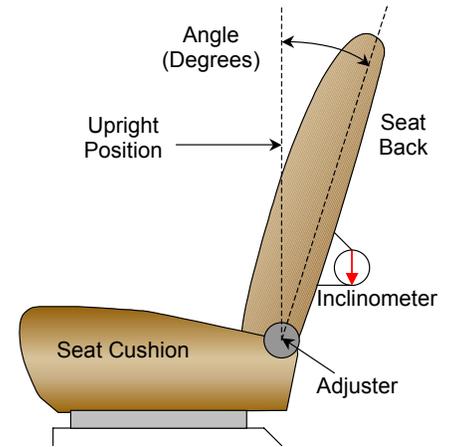
NORMAL DESIGN RIDING POSITION

The driver and passenger seat back is positioned to the manufacturer's designated angle. The procedure is as follows: Seat back angle at test position can be achieved by measuring 4.5 degrees across the headrest support posts.

Driver seat back angle: 5.2 degrees on headrest post
Passenger seat back angle: 4.4 degrees on headrest post

SEAT FORE/AFT POSITIONING

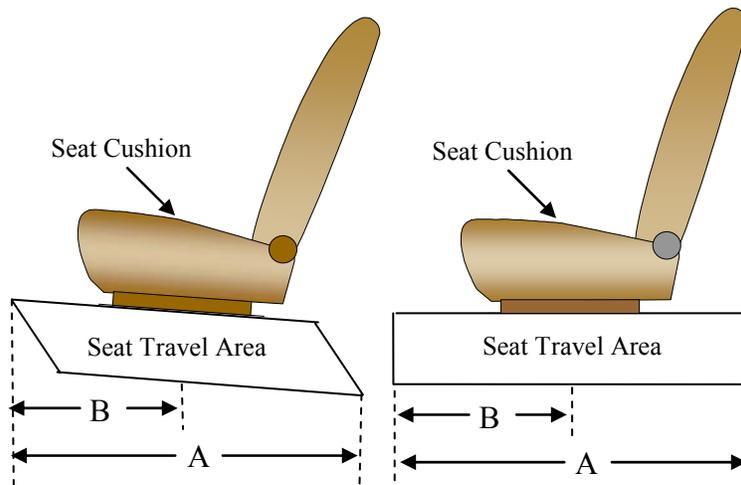
	Total Fore/Aft Travel	Placed in Position #
Driver Seat	240 mm	120 mm
Passenger Seat	24 detents	12 th detent



FRONT SEAT ASSEMBLY

ADJUSTABLE D-RING POSITION

The driver and passenger D-rings were placed in the second position with the uppermost detent defined as 0.



DATA SHEET NO. 4...(CONTINUED)

TEST VEHICLE INFORMATION

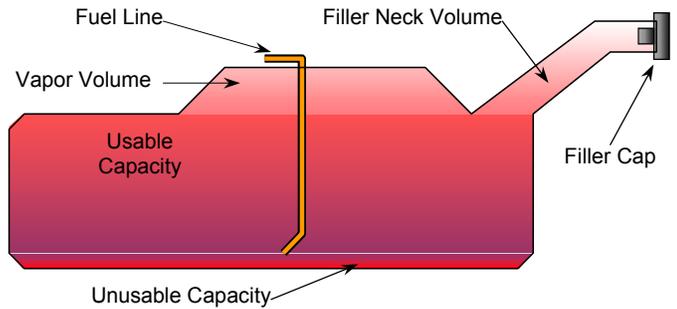
Test Vehicle: 2008 Suzuki XL7
 Test Program: 35mph Frontal Impact

NHTSA No.: X80500
 Test Date: 5/21/2007

FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank"	70.0
Usable Capacity of "Optional" Tank	
92-94% of Usable Capacity	64.4 – 65.8
Actual Amount of Solvent used	65.3
1/3 of Usable Capacity	23.3

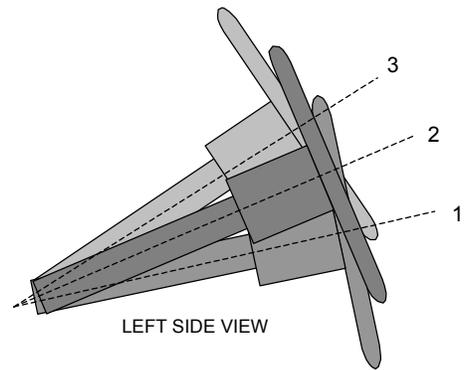
The test vehicle is equipped with an electric fuel pump. Fuel pump runs continuously – excess fuel volume not utilized by the engine is recycled back to the fuel tank. Fuel pump is located in fuel tank and cycling takes place internally in the fuel tank.



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 POSITIONS

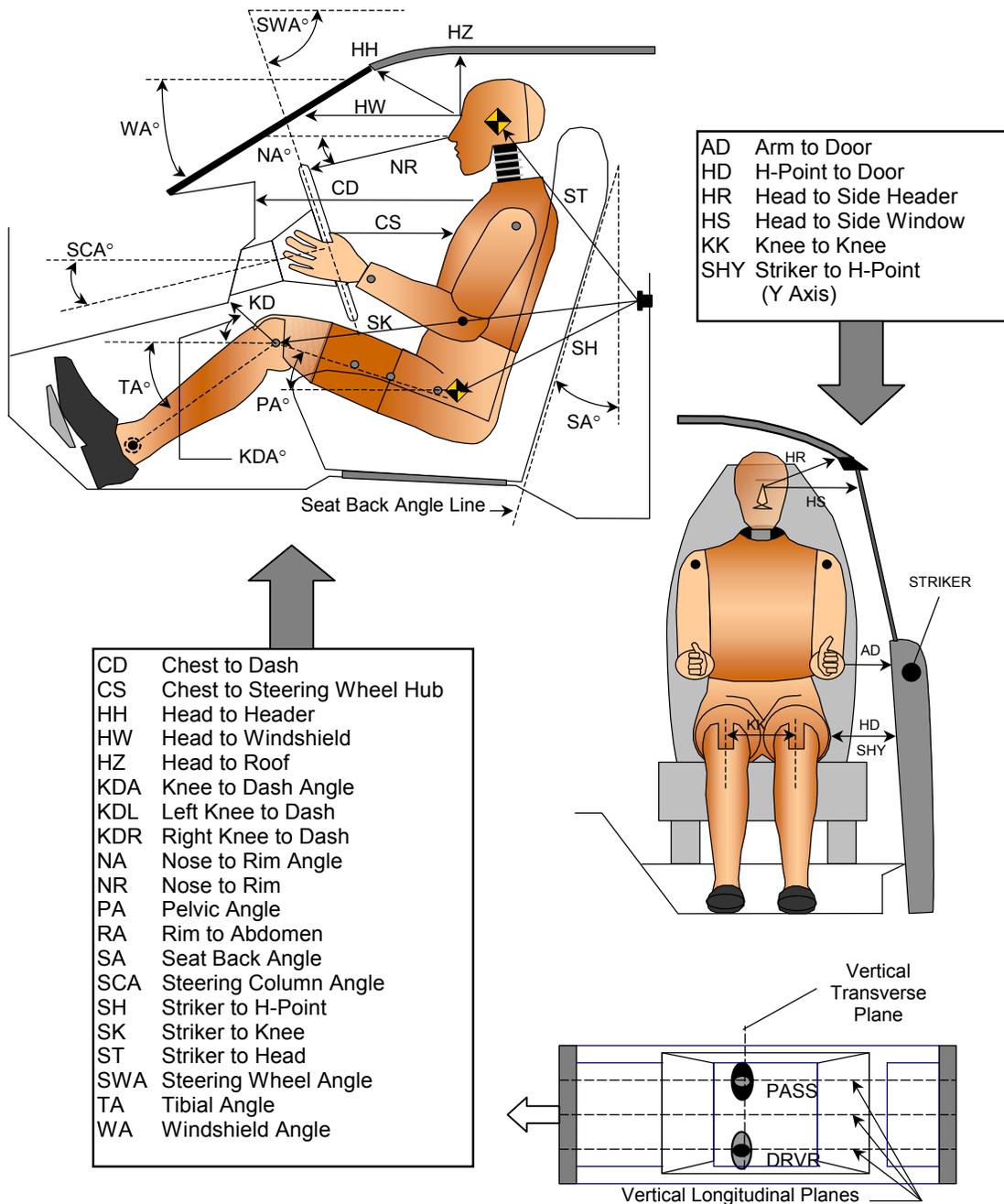
	Fore/Aft Position (mm)	Degrees
Lowermost position No. 1		21.7
Geometric center position No. 2		23.7
Uppermost position No. 3		25.8

DATA SHEET NO. 5 DUMMY POSITIONING IN VEHICLE

Test Vehicle: 2008 Suzuki XL7
 Test Program: 35mph Frontal Impact

NHTSA No.: X80500
 Test Date: 5/21/2007

DUMMY MEASUREMENTS FOR FRONT SEAT OCCUPANTS



DATA SHEET NO. 5... (CONTINUED)

DUMMY POSITIONING IN VEHICLE

Test Vehicle: 2008 Suzuki XL7
 Test Program: 35mph Frontal Impact

NHTSA No.: X80500
 Test Date: 5/21/2007

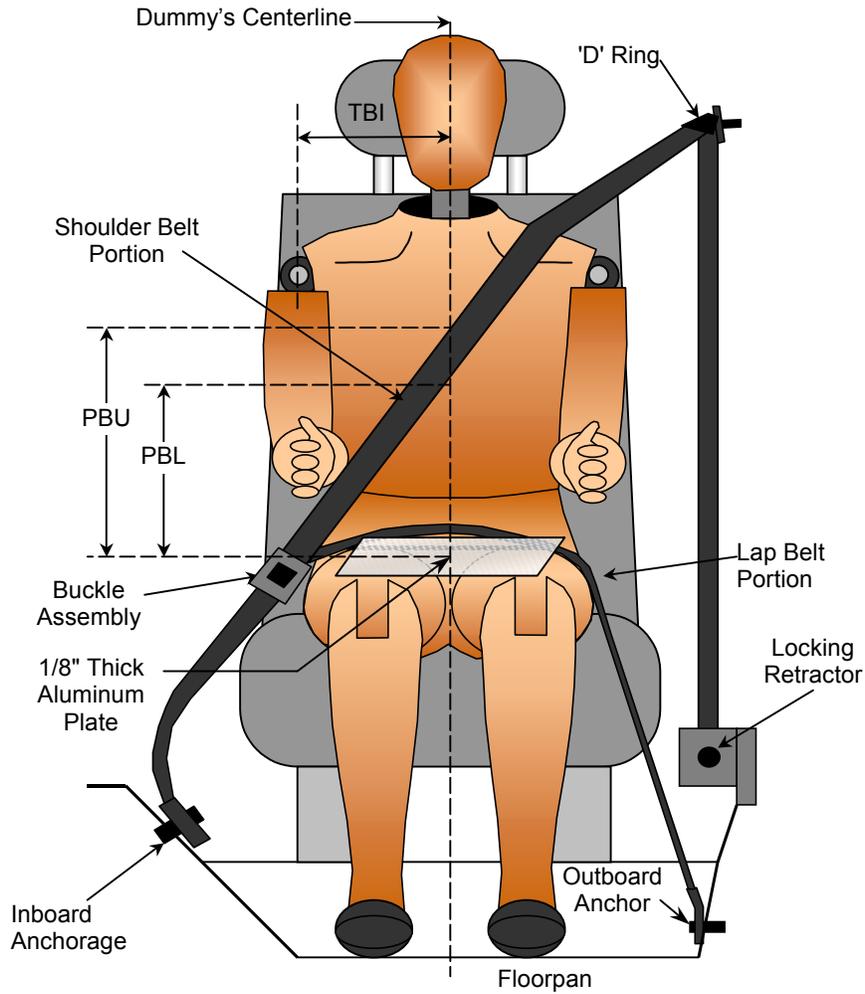
TEST DUMMY POSITION MEASUREMENTS

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA	Windshield Angle		30.7		
SWA	Steering Wheel Angle		64.2		
SCA	Steering Column Angle		23.7		
SA	Seat Back Angle (on headrest post)		5.2		4.4
HZ	Head to Roof (Z)	281	90	244	90
HH	Head to Header	392	20.2	409	16.5
HW	Head to Windshield	731	0	667	0
HR	Head to Side Header (Y)	244		223	
NR	Nose to Rim	431	9.1		
CD	Chest to Dash	558		523	
CS	Chest to Steering Hub	345	6.2		
RA	Rim to Abdomen	221	0		
KDL	Left Knee to Dash	157	41.9	156	
KDR	Right Knee to Dash	131		152	24.3
PA	Pelvic Angle		24.1		23.1
TA	Tibia Angle		40.1		41.8
KK	Knee to Knee (Y)	312		259	
SK	Striker to Knee	569	88.5	570	88.7
ST	Striker to Head	575	2.9	599	4.8
SH	Striker to H-Point	179	112.1	179	111.9
SHY	Striker to H-Point (Y)	242		252	
HS	Head to Side Window	348		341	
HD	H-Point to Door (Y)	126		141	
AD	Arm to Door (Y)	101		106	
AA	Ankle to Ankle	310		210	

DATA SHEET NO. 6
SEAT BELT POSITIONING DATA

Test Vehicle: 2008 Suzuki XL7
 Test Program: 35mph Frontal Impact

NHTSA No.: X80500
 Test Date: 5/21/2007



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	356	355
PBL - To surface of reference to belt lower edge	mm	272	265

DATA SHEET NO. 7
VEHICLE ACCELEROMETER LOCATIONS

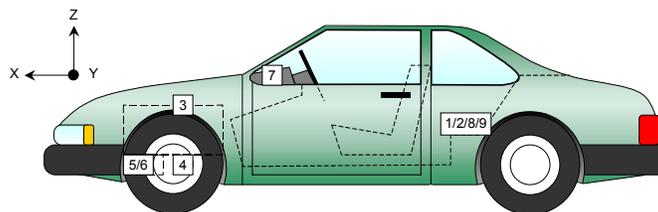
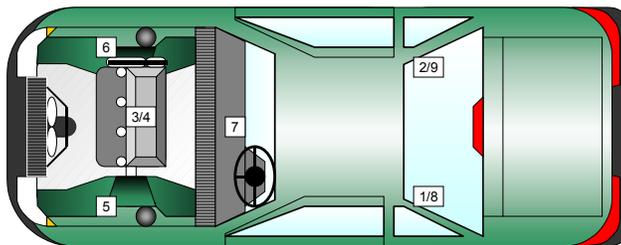
Test Vehicle: 2008 Suzuki XL7
 Test Program: 35mph Frontal Impact

NHTSA No.: X80500
 Test Date: 5/21/2007

VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear X-Member X	2042	-380	465
2	Right Rear X-Member X	2042	376	465
3	Engine Top X	4229	0	968
4	Engine Bottom X	4233	47	211
5	Left Brake Caliper X	4153	-690	263
6	Right Brake Caliper X	4153	690	266
7	Instrument Panel X			
8	Left Rear X-Member Z	2042	-380	465
9	Right Rear X-Member Z	2042	376	465

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



DATA SHEET NO. 8

SUMMARY OF FMVSS 212 AND FMVSS 219 (Partial) DATA

Test Vehicle: 2008 Suzuki XL7
 Test Program: 35mph Frontal Impact

NHTSA No.: X80500
 Test Date: 5/21/2007

Windshield Mounting Details:

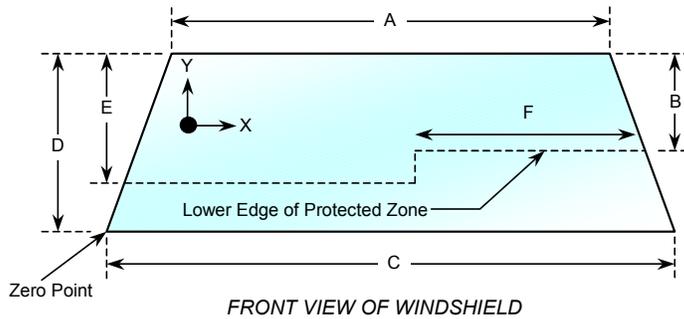
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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	2194	2136	97.4
Right Side	2194	1932	88.1
Total	4388	4068	92.7



Item	Units	Value
A	mm	1190
B	mm	591
C	mm	1478
D	mm	860
E	mm	603
F	mm	386

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. 9
SUMMARY OF FMVSS 301 DATA

Test Vehicle: 2008 Suzuki XL7
 Test Program: 35mph Frontal Impact

NHTSA No.: X80500
 Test Date: 5/21/2007

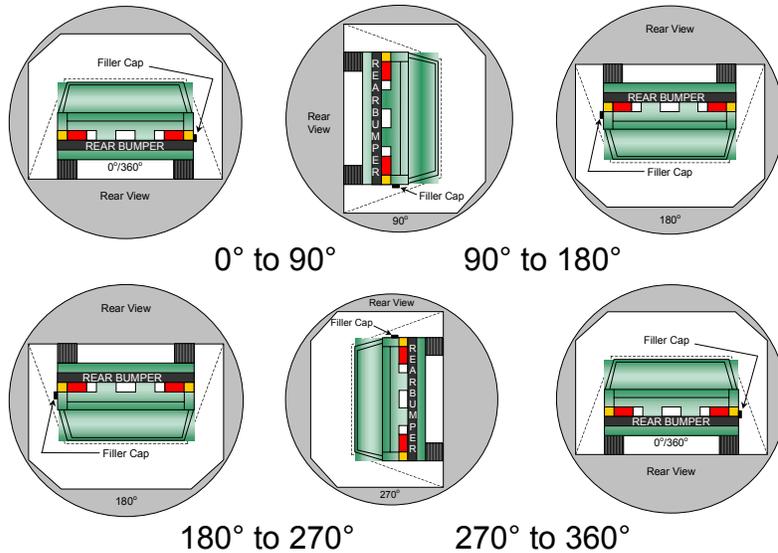
FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21° C Test Time: 1:08 pm

Stoddard Solvent Spillage Measurements

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

FMVSS 301 STATIC ROLLOVER DATA



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 locations:

None

Test Phase	Rotation Time (sec.)	Hold Time (sec.)	Spillage (oz.)
0° to 90°	120	300	0
90° to 180°	118	300	0
180° to 270°	115	300	0
270° to 360°	119	300	0

DATA SHEET NO. 10
VEHICLE MEASUREMENTS

Test Vehicle: 2008 Suzuki XL7
Test Program: 35mph Frontal Impact

NHTSA No.: X80500
Test Date: 5/21/2007

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total length of vehicle at centerline	mm	4971	4460	511
2	RSOV to front of engine	mm	4416	4080	336
3	RSOV to firewall centerline	mm	3956	3858	98
4	RSOV to leading edge of right door	mm	3414	3428	-14
5	RSOV to leading edge of left door	mm	3411	3421	-10
6	RSOV to lower leading edge of right door	mm	3387	3384	3
7	RSOV to lower leading edge of left door	mm	3387	3385	2
8	RSOV to upper leading edge of right door	mm	2374	2386	-12
9	RSOV to upper leading edge of left door	mm	2371	2388	-17
10	RSOV to lower trailing edge of right door	mm	2392	2394	-2
11	RSOV to lower trailing edge of left door	mm	2390	2391	-1
12	RSOV to bottom of right 'A' pillar	mm	3395	3376	19
13	RSOV to bottom of left 'A' pillar	mm	3404	3388	16
14	RSOV to firewall on right side	mm	3869	3859	10
15	RSOV to firewall on left side	mm	3860	3832	28
16	RSOV to steering column	mm	2989	3016	-27
17	Center of steering column to left 'A' pillar	mm	395	415	-20
18	Center of steering column to headlining	mm	444	483	-39
19	RSOV to right side of front bumper	mm	4833	4360	473
20	RSOV to left side of front bumper	mm	4830	4331	499
21	Length of engine block	mm	441	441	0
RD	RSOV to right side of dash panel	mm	3146	3170	-24
CD	RSOV to center of dash panel	mm	3174	3139	35
LD	RSOV to left side of dash panel	mm	3159	3158	1

DATA SHEET NO. 10... (continued)

VEHICLE MEASUREMENTS

Test Vehicle: 2008 Suzuki XL7
 Test Program: 35mph Frontal Impact

NHTSA No.: X80500
 Test Date: 5/21/2007

Target Vehicle Structural Measurement

	Elements	Pre-Test (mm)
1	Total Length	4971
2	Total Width	1784
3	Bumper Top Height	540
4	Bumper Bottom Height	415
5	Longitudinal Member Top Height	351
6	Distance between Longitudinal Members	870
7	Longitudinal Member Width	90
8	Engine Top Height	1024
9	Engine Bottom Height	222
10	Engine and gearbox width	830
11	Front bumper-engine distance	545
12	Front shock absorber fixing height	994
13	Bonnet leading edge height	920
14	Front shock absorber fixing width	1168
15	Front bumper – front axle distance	777
16	Front axle – a pillar distance	430
17	A-pillar – B-pillar distance	1150
18	B-Pillar – rear axle distance	1258
19	B-pillar – C-pillar distance	790
20	Roof sill bottom height	1504
21	Roof sill top height	1662
22	Floor sill bottom height	314
23	Floor sill top height	409

DATA SHEET NO. 11
CAMERA LOCATIONS

Test Vehicle: 2008 Suzuki XL7
Test Program: 35mph Frontal Impact

NHTSA No.: X80500
Test Date: 5/21/2007

No.	Camera View	Location (mm) *			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Side View				13	24
2	Left Front View	1040	-4900	1210	25	1000
3	Steering Column Top	1200	-4900	1280	25	1000
4	Steering Column Bottom	1190	-4900	1100	25	1000
5	Driver Close-up	1270	-5850	1470	35	1000
6	Driver Angle	6800	-4920	2200	50	1000
7	On board Driver Side					
8	On board Passenger Side					
9	Right Overall	1700	6320	1270	19	1000
10	Right Passenger Half	1035	4800	1190	24	1000
11	Right Close-up	1250	5900	1495	35	1000
12	Right Angle	6850	4970	2180	50	1000
13	Windshield	-285	0	2830	24	1000
14	Top Driver	-135	-395	2225	24	1000
15	Top Passenger	-110	515	2245	24	1000
16	Pit Front	1300	0	-3150	24	1000
17	Pit Rear	3410	0	-3150	24	1000

*COORDINATES:

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

Note: Cameras 7 and 8 were not used for this test.

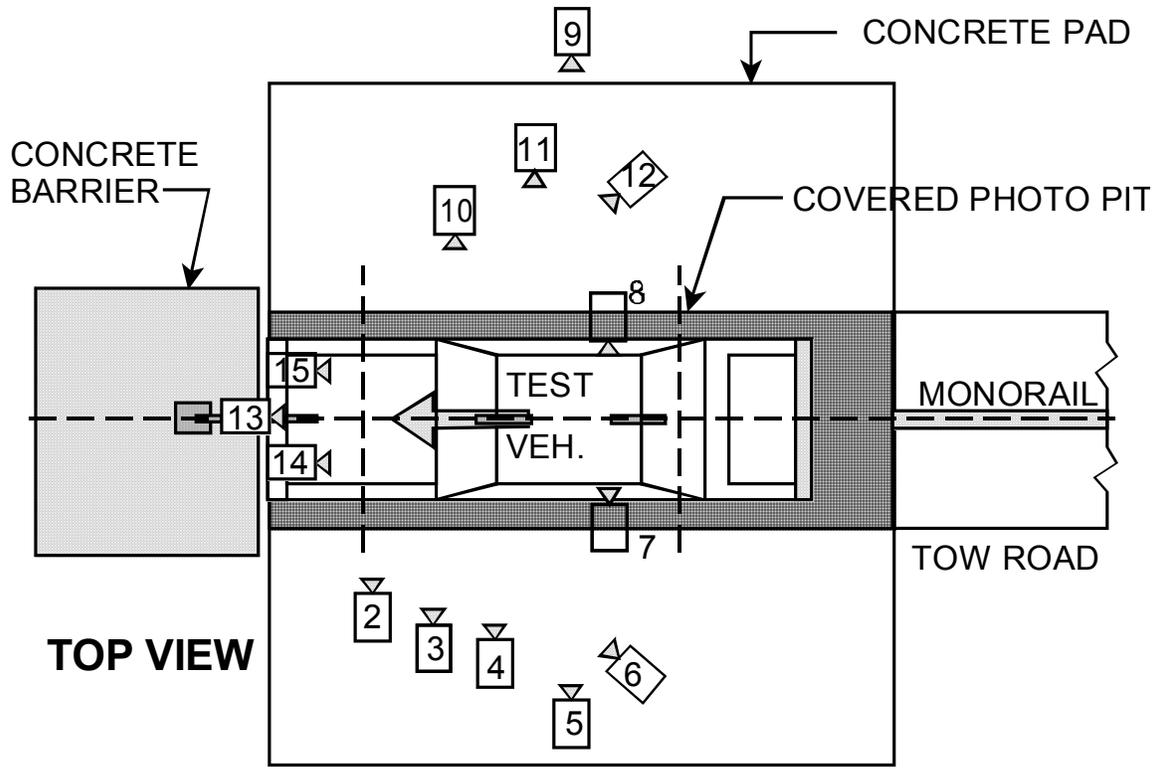
DATA SHEET NO. 11... (continued)

CAMERA LOCATIONS

Test Vehicle: 2008 Suzuki XL7
Test Program: 35mph Frontal Impact

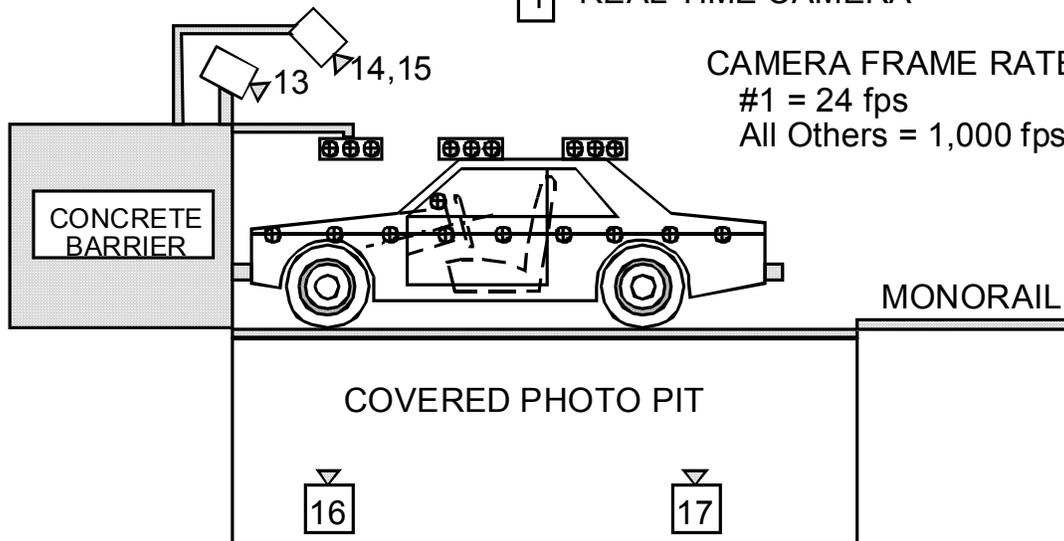
NHTSA No.: X80500
Test Date: 5/21/2007

CAMERA POSITIONS FOR FRONTAL IMPACTS



1 REAL TIME CAMERA

CAMERA FRAME RATES:
#1 = 24 fps
All Others = 1,000 fps

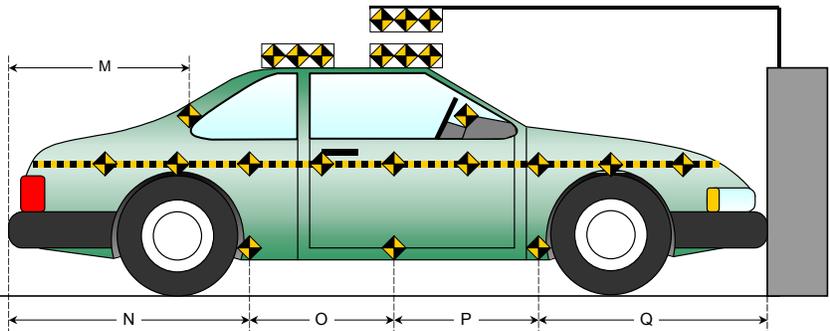
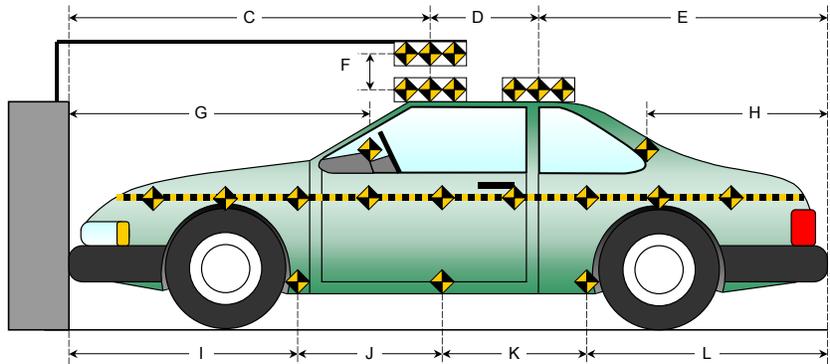
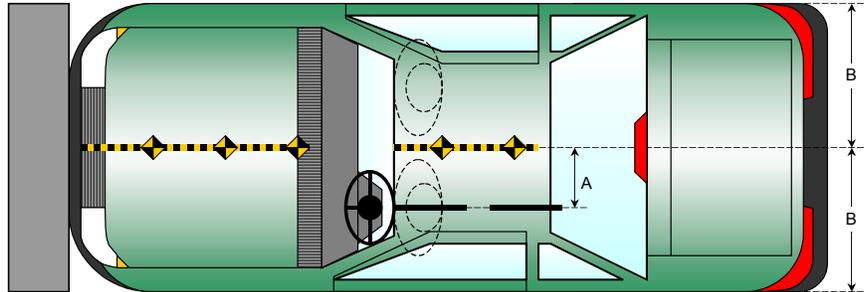


DATA SHEET NO. 12
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2008 Suzuki XL7
 Test Program: 35mph Frontal Impact

NHTSA No.: X80500
 Test Date: 5/21/2007

Item	Value
A	360
B	892
C	2490
D	915
E	1566
F	106
G	
H	1395
I	1448
J	954
K	959
L	1610
M	1404
N	1610
O	955
P	956
Q	1450



DATA SHEET NO. 13
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2008 Suzuki XL7
 Test Program: 35mph Frontal Impact

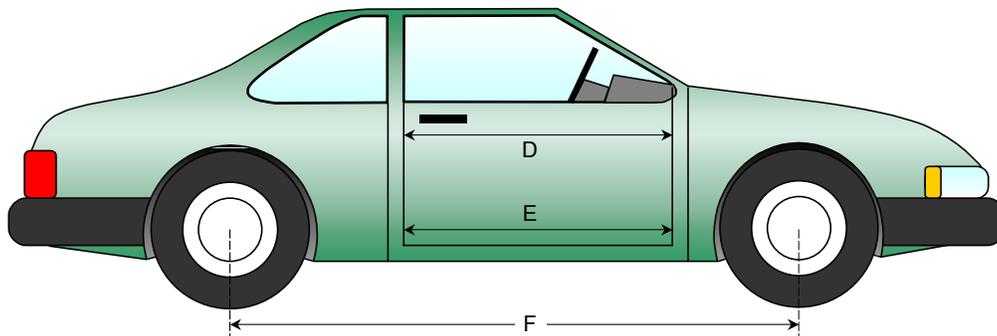
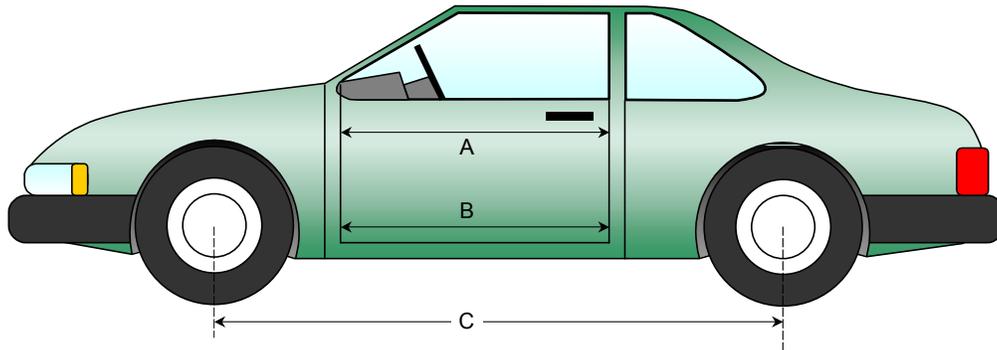
NHTSA No.: X80500
 Test Date: 5/21/2007

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	942	937	5
B	Left Side Lower	mm	859	855	4
D	Right Side Upper	mm	942	929	13
E	Right Side Lower	mm	857	858	-1

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2860	2773	87
F	Right Side Wheelbase	mm	2860	2771	89



DATA SHEET NO. 13... (continued)
VEHICLE INTRUSION MEASUREMENTS

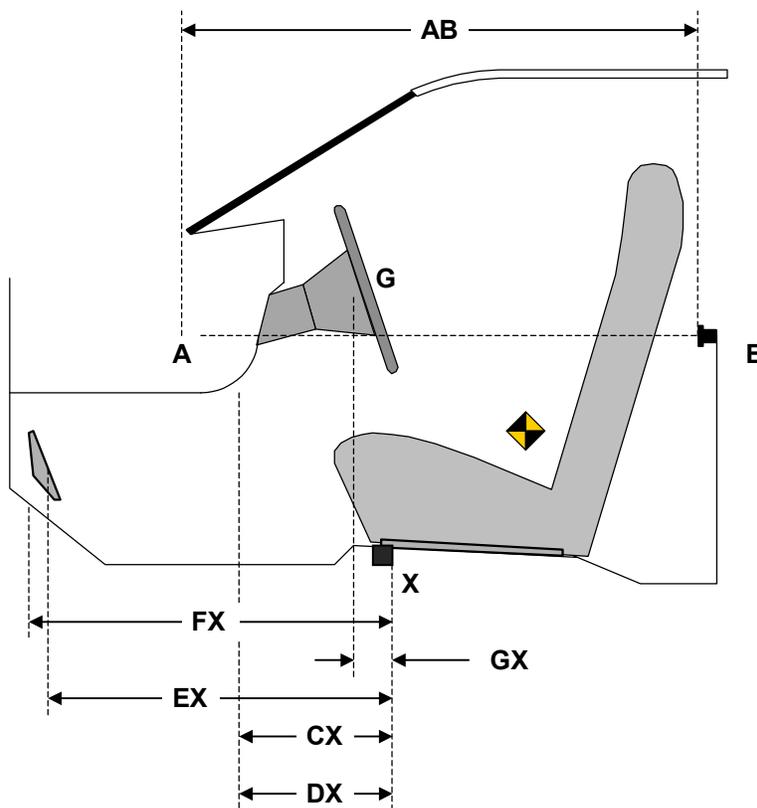
Test Vehicle: 2008 Suzuki XL7
 Test Program: 35mph Frontal Impact

NHTSA No.: X80500
 Test Date: 5/21/2007

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside window jam)	mm	742	740	2
CX	Left Knee Bolster to X	mm	294	283	11
DX	Right Knee Bolster to X	mm	272	262	10
EX	Brake Pedal to X	mm	573	472	101
FX	Foot Rest to X	mm	624	572	52
GX	Center of Steering Column Wheel Hub to X	mm	119	108	11

X = Front of Seat Track (stationary)

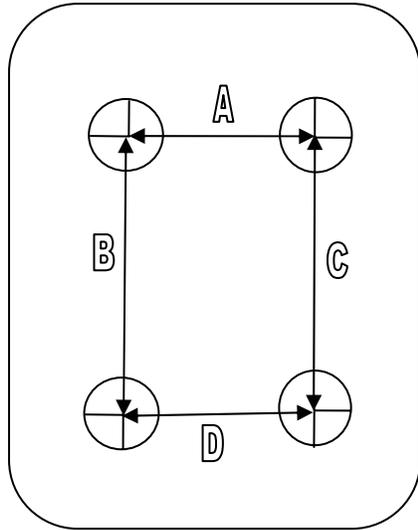


DRIVER COMPARTMENT

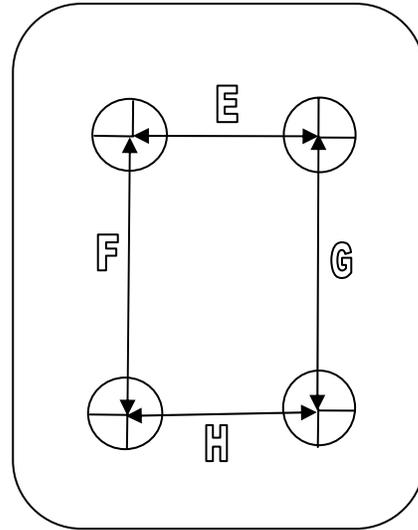
DATA SHEET NO. 13... (continued)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2008 Suzuki XL7
 Test Program: 35mph Frontal Impact

NHTSA No.: X80500
 Test Date: 5/21/2007



Driver



Passenger

UNDERBODY FLOORBOARD DEFORMATION

Measurement	Pre-Test	Post-Test	Difference
A	333	316	17
B	353	341	12
C	354	354	0
D	331	321	10
E	315	315	0
F	341	341	0
G	339	328	11
H	315	298	17

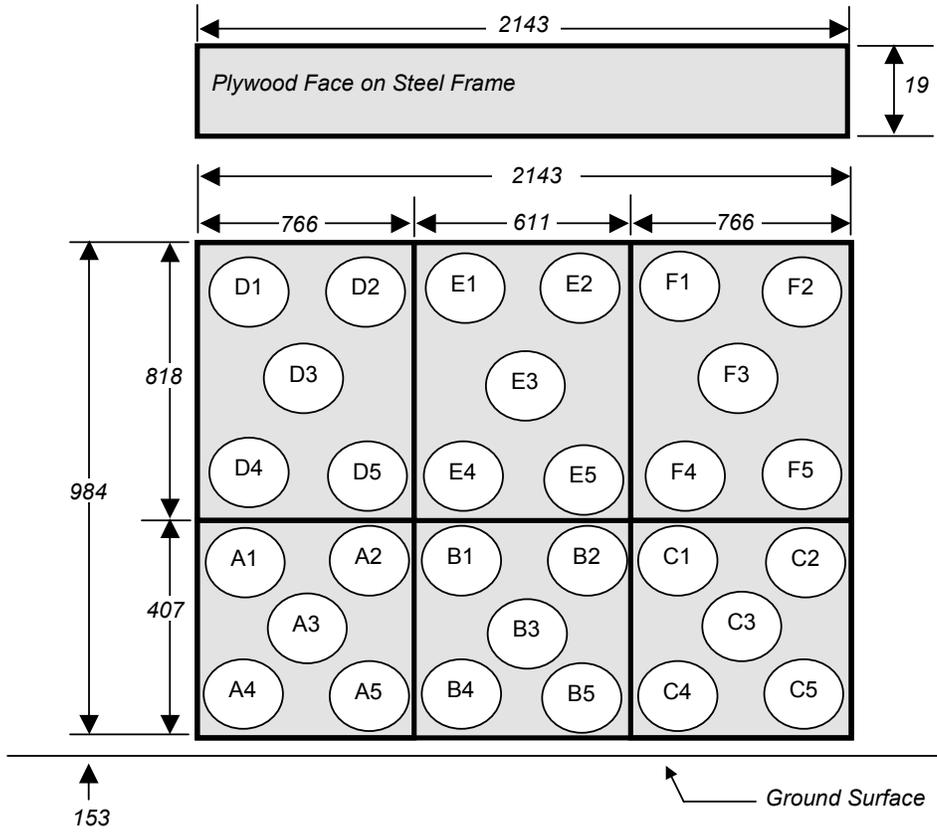
DATA SHEET NO. 14

LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2008 Suzuki XL7
 Test Program: 35mph Frontal Impact

NHTSA No.: X80500
 Test Date: 5/21/2007

30 Load Cell Rigid Barrier
Load Cell Locations on Fixed Barrier



Group 4 D1-D5	Group 5 E1-E5	Group 6 F1-F5
Group 1 A1-A5	Group 2 B1-B5	Group 3 C1-C5

6 Groups of 5 Load Cells Each

APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

Page No.

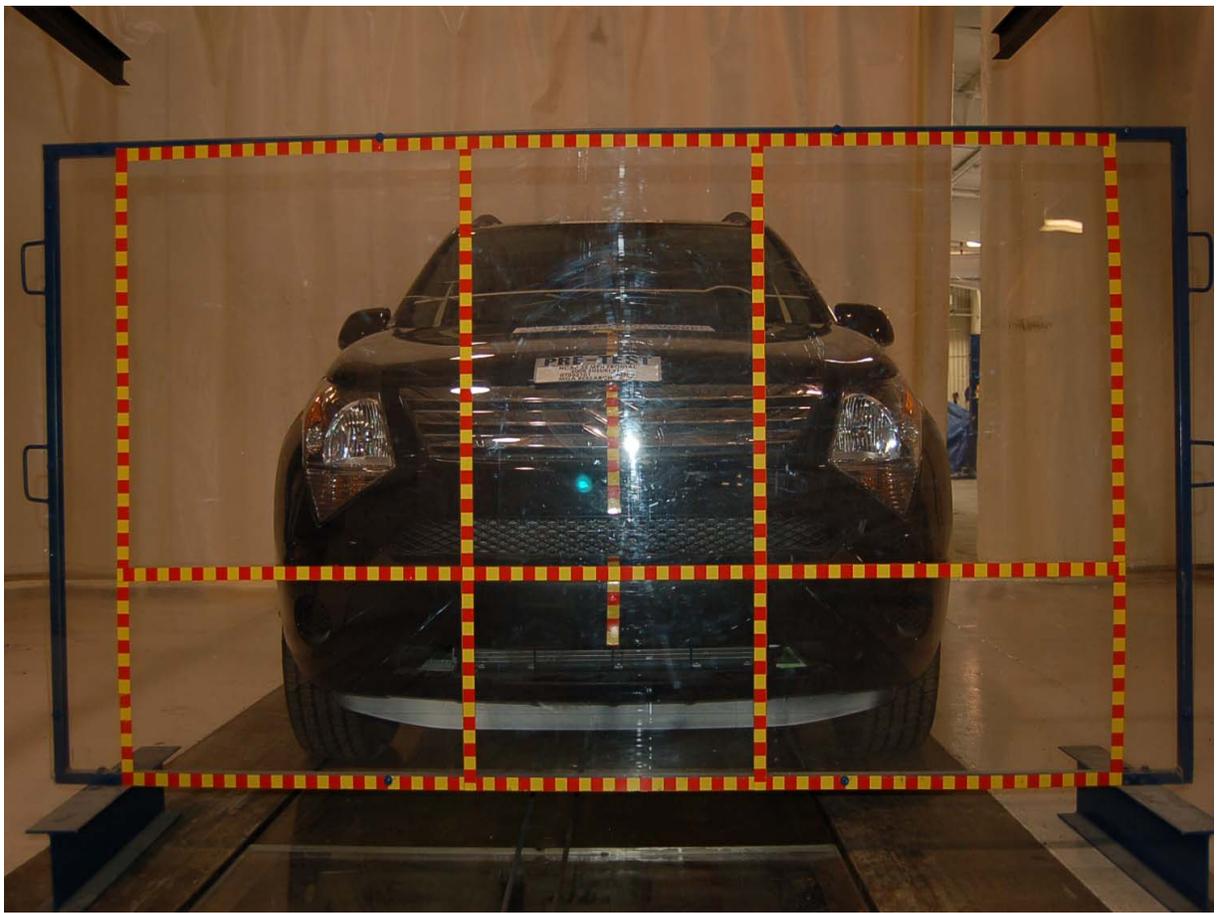
Photo No. 1.	Load Cell Location	A-1
Photo No. 2.	Manufacturer's Label	A-2
Photo No. 3.	Tire Placard	A-2
Photo No. 4.	Left Front $\frac{3}{4}$ View, As Received	A-3
Photo No. 5.	Right Rear $\frac{3}{4}$ View, As Received	A-3
Photo No. 6.	Pre-Test Front View	A-4
Photo No. 7.	Post-Test Front View	A-4
Photo No. 8.	Pre-Test Left Side View	A-5
Photo No. 9.	Post-Test Left Side View	A-5
Photo No. 10.	Pre-Test Right Side View	A-6
Photo No. 11.	Post-Test Right Side View	A-6
Photo No. 12.	Pre-Test Right Front $\frac{3}{4}$ View	A-7
Photo No. 13.	Post-Test Right Front $\frac{3}{4}$ View	A-7
Photo No. 14.	Pre-Test Left Rear $\frac{3}{4}$ View	A-8
Photo No. 15.	Post-Test Left Rear $\frac{3}{4}$ View	A-8
Photo No. 16.	Pre-Test Left Side $\frac{3}{4}$ View of Doors	A-9
Photo No. 17.	Post-Test Left Side $\frac{3}{4}$ View of Doors After Impact	A-9
Photo No. 18.	Pre-Test Right Side $\frac{3}{4}$ View of Doors	A-10
Photo No. 19.	Post-Test Right Side $\frac{3}{4}$ View of Doors After Impact	A-10
Photo No. 20.	Pre-Test Windshield View	A-11
Photo No. 21.	Post-Test Windshield View	A-11
Photo No. 22.	Pre-Test Engine Compartment View	A-12
Photo No. 23.	Post-Test Engine Compartment View	A-12
Photo No. 24.	Pre-Test Fuel Cap View	A-13
Photo No. 25.	Post-Test Fuel Cap View	A-13
Photo No. 26.	Pre-Test Front Underbody View	A-14
Photo No. 27.	Post-Test Front Underbody View	A-14

Page No.

Photo No. 28.	Pre-Test Mid Front Underbody View	A-15
Photo No. 29.	Post-Test Mid Front Underbody View	A-15
Photo No. 30.	Pre-Test Mid Rear Underbody View	A-16
Photo No. 31.	Post-Test Mid Rear Underbody View	A-16
Photo No. 32.	Pre-Test Rear Underbody View	A-17
Photo No. 33.	Post-Test Rear Underbody View	A-17
Photo No. 34.	Pre-Test Driver Dummy Front View (Head Position)	A-18
Photo No. 35.	Post-Test Driver Dummy Front View (Head Position)	A-18
Photo No. 36.	Pre-Test Driver Dummy (Through Window)	A-19
Photo No. 37.	Post-Test Driver Dummy (Through Window)	A-19
Photo No. 38.	Pre-Test Driver Dummy (Door Open)	A-20
Photo No. 39.	Post-Test Driver Dummy (Door Open)	A-20
Photo No. 40.	Pre-Test Driver Dummy Feet	A-21
Photo No. 41.	Post-Test Driver Dummy Feet	A-21
Photo No. 42.	Pre-Test Driver Side Knee Bolster	A-22
Photo No. 43.	Post-Test Driver Side Knee Bolster	A-22
Photo No. 44.	Pre-Test Driver Side Floor Pan	A-23
Photo No. 45.	Post-Test Driver Side Floor Pan	A-23
Photo No. 46.	Post-Test Driver Dummy Head Contact (headrest)	A-24
Photo No. 47.	Post-Test Driver Dummy Knee Contact	A-25
Photo No. 48.	Post-Test Driver Dummy Airbag Contact	A-25
Photo No. 49.	Pre-Test Passenger Dummy Front View (Head Position)	A-26
Photo No. 50.	Post-Test Passenger Dummy Front View (Head Position)	A-26
Photo No. 51.	Pre-Test Passenger Dummy (Through Window)	A-27
Photo No. 52.	Post-Test Passenger Dummy (Through Window)	A-27
Photo No. 53.	Pre-Test Passenger Dummy (Door Open)	A-28
Photo No. 54.	Post-Test Passenger Dummy (Door Open)	A-28
Photo No. 55.	Pre-Test Passenger Dummy Feet	A-29
Photo No. 56.	Post-Test Passenger Dummy Feet	A-29

Page No.

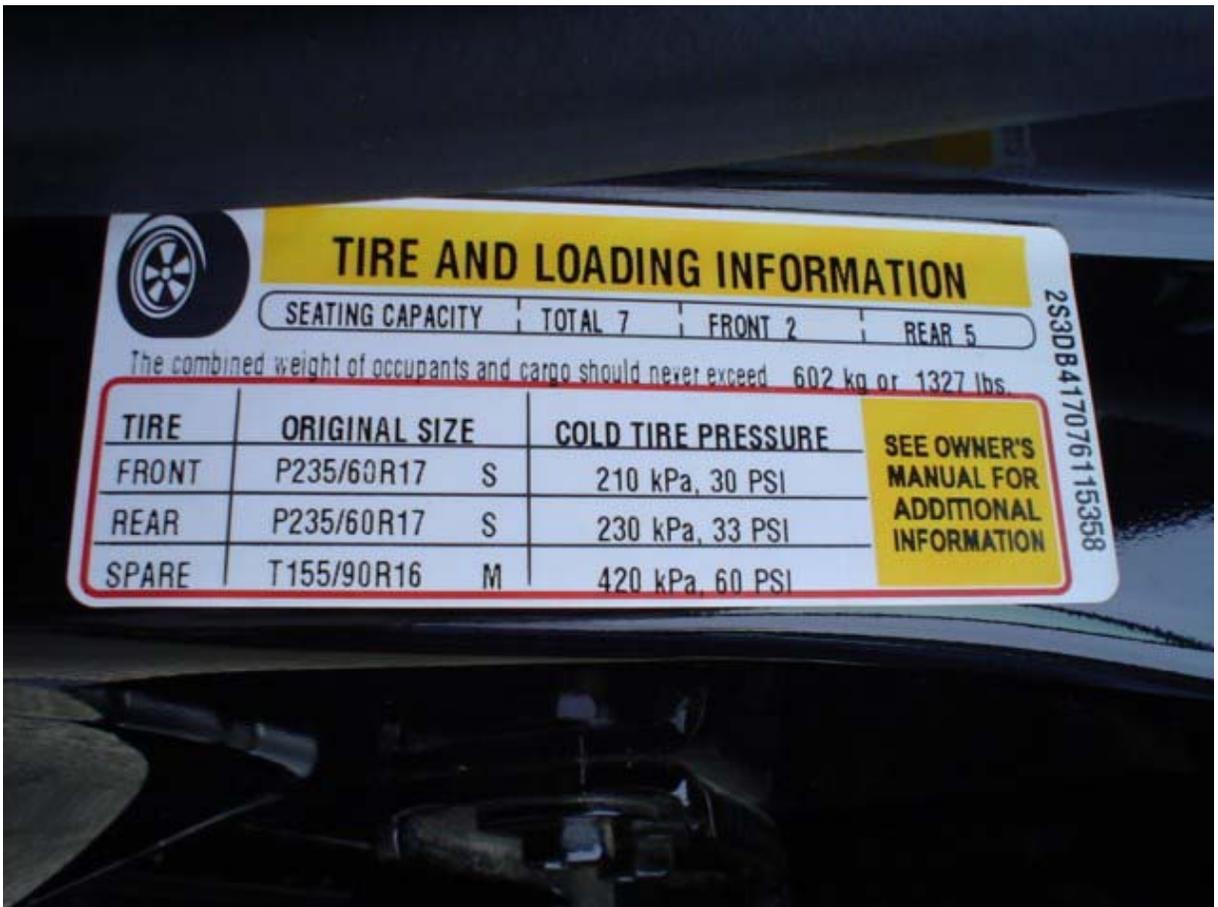
Photo No. 57.	Pre-Test Passenger Side Glove Box	A-30
Photo No. 58.	Post-Test Passenger Side Glove Box	A-30
Photo No. 59.	Pre-Test Passenger Side Floor Pan	A-31
Photo No. 60.	Post-Test Passenger Side Floor Pan	A-31
Photo No. 61.	Post-Test Passenger Dummy Head Contact	A-32
Photo No. 62.	Post-Test Passenger Dummy Knee Contact	A-33
Photo No. 63.	Post-Test Passenger Dummy Airbag Contact	A-33
Photo No. 64.	Rollover 90 Degrees	A-34
Photo No. 65.	Rollover 180 Degrees	A-34
Photo No. 66.	Rollover 270 Degrees	A-35
Photo No. 67.	Rollover 360 Degrees	A-35
Photo No. 68.	Vehicle Impact	A-36



Load Cell Location



Manufacturer's Label



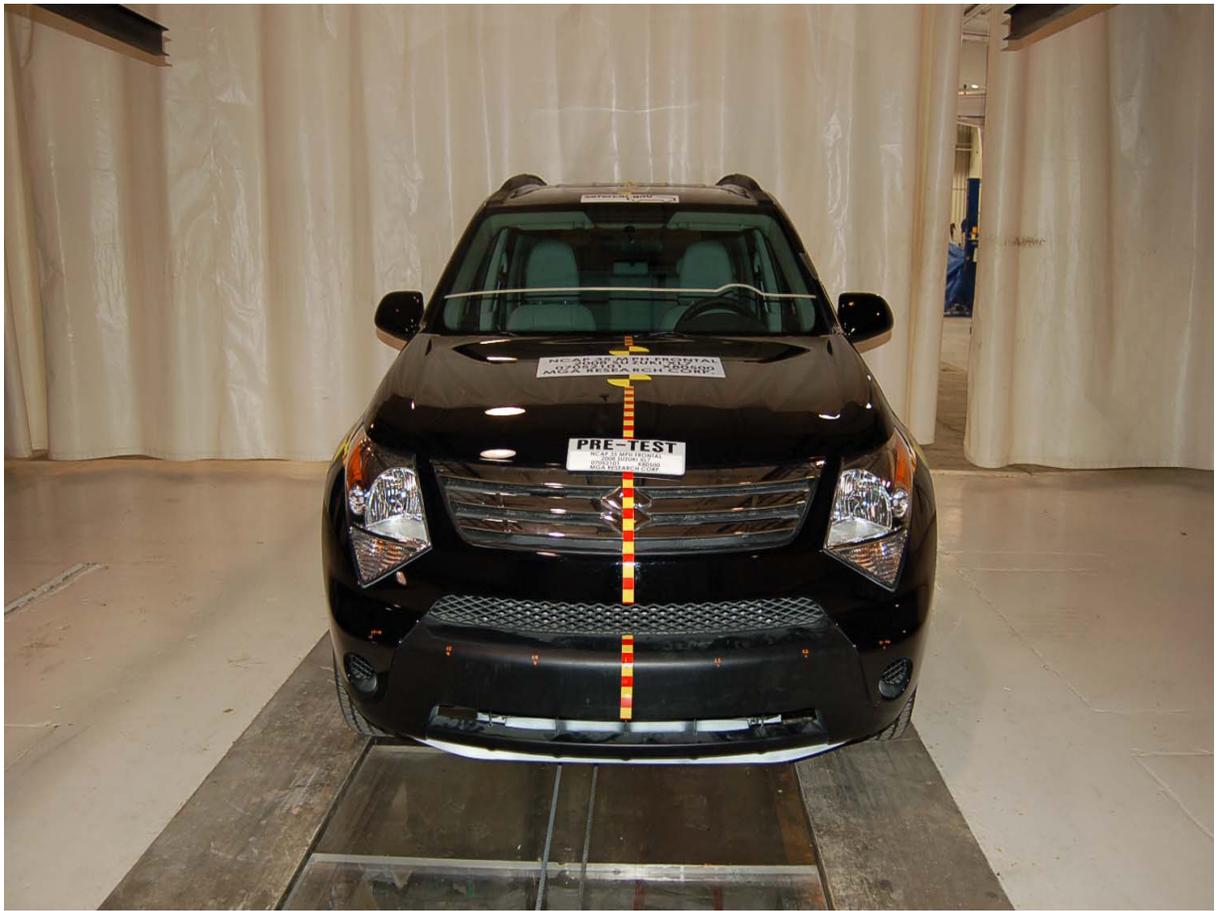
Tire Placard



Left Front $\frac{3}{4}$ View, As Received



Right Rear $\frac{3}{4}$ View, As Received



Pre-Test Front View



Post-Test Front View



Pre-Test Left Side View



Post-Test Left Side View



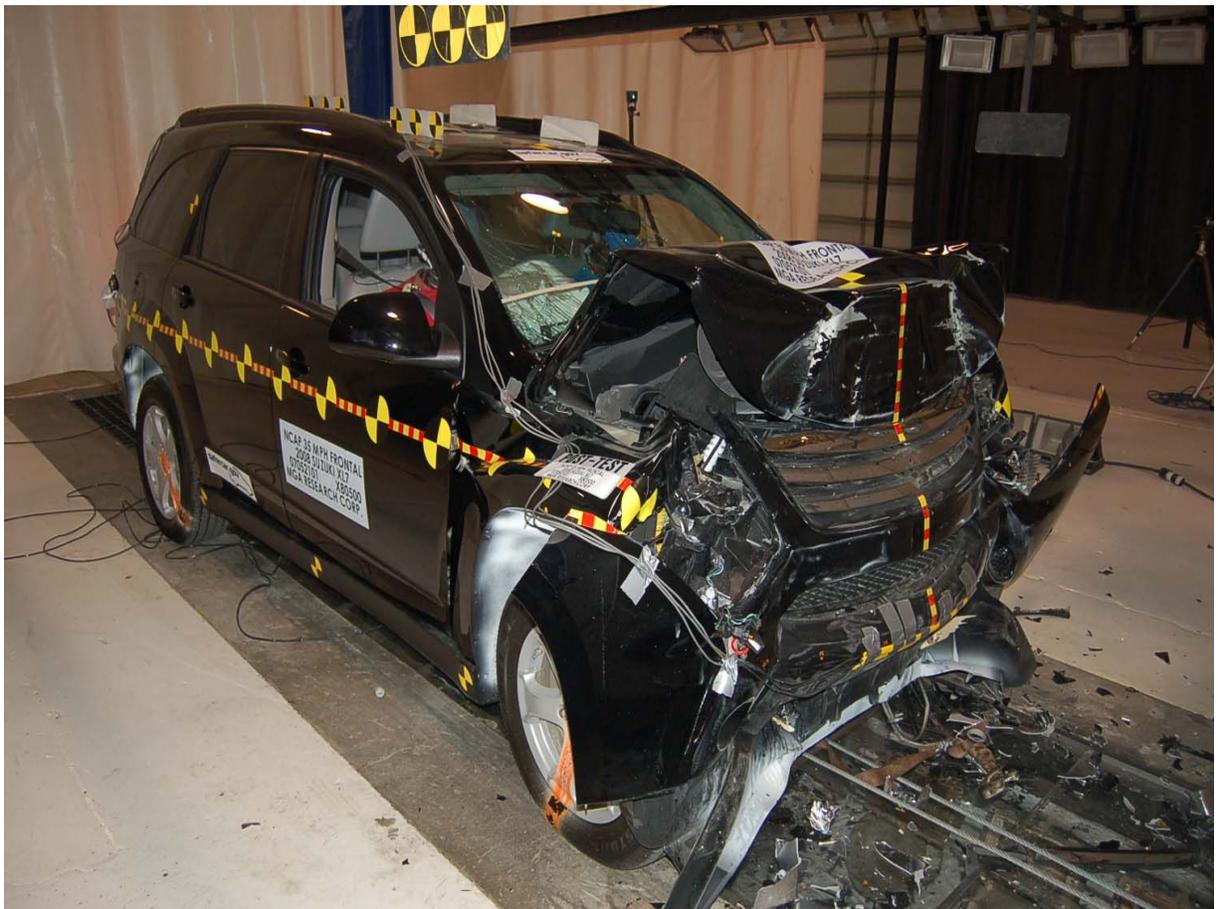
Pre-Test Right Side View



Post-Test Right Side View



Pre-Test Right Front 3/4 View



Post-Test Right Front 3/4 View



Pre-Test Left Rear 3/4 View



Post-Test Left Rear 3/4 View



Pre-Test Left Side 3/4 View of Doors



Post-Test Left Side 3/4 View of Doors After Impact



Pre-Test Right Side ¾ View of Doors



Post-Test Right Side ¾ View of Doors After Impact



Pre-Test Windshield View



Post-Test Windshield View



Pre-Test Engine Compartment View



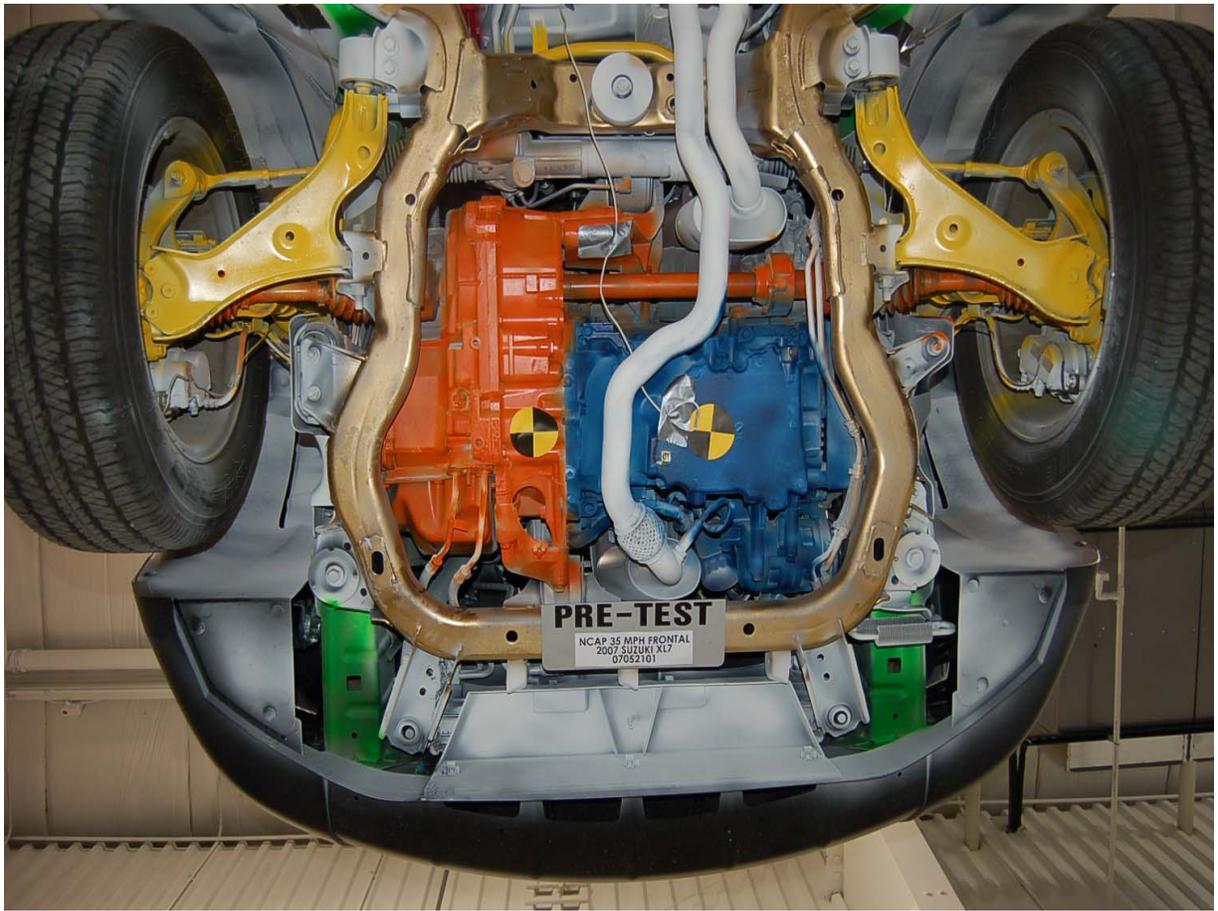
Post-Test Engine Compartment View



Pre-Test Fuel Cap View



Post-Test Fuel Cap View



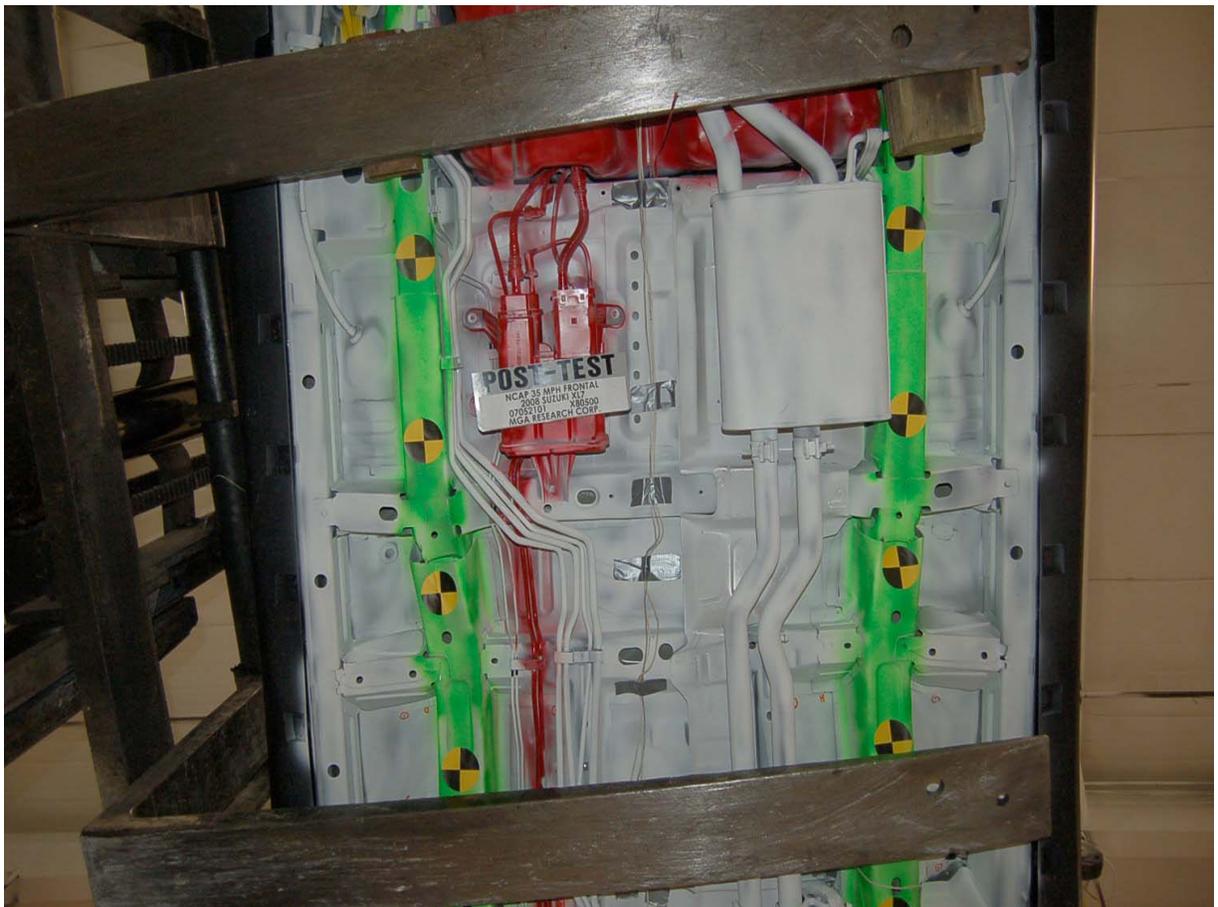
Pre-Test Front Underbody View



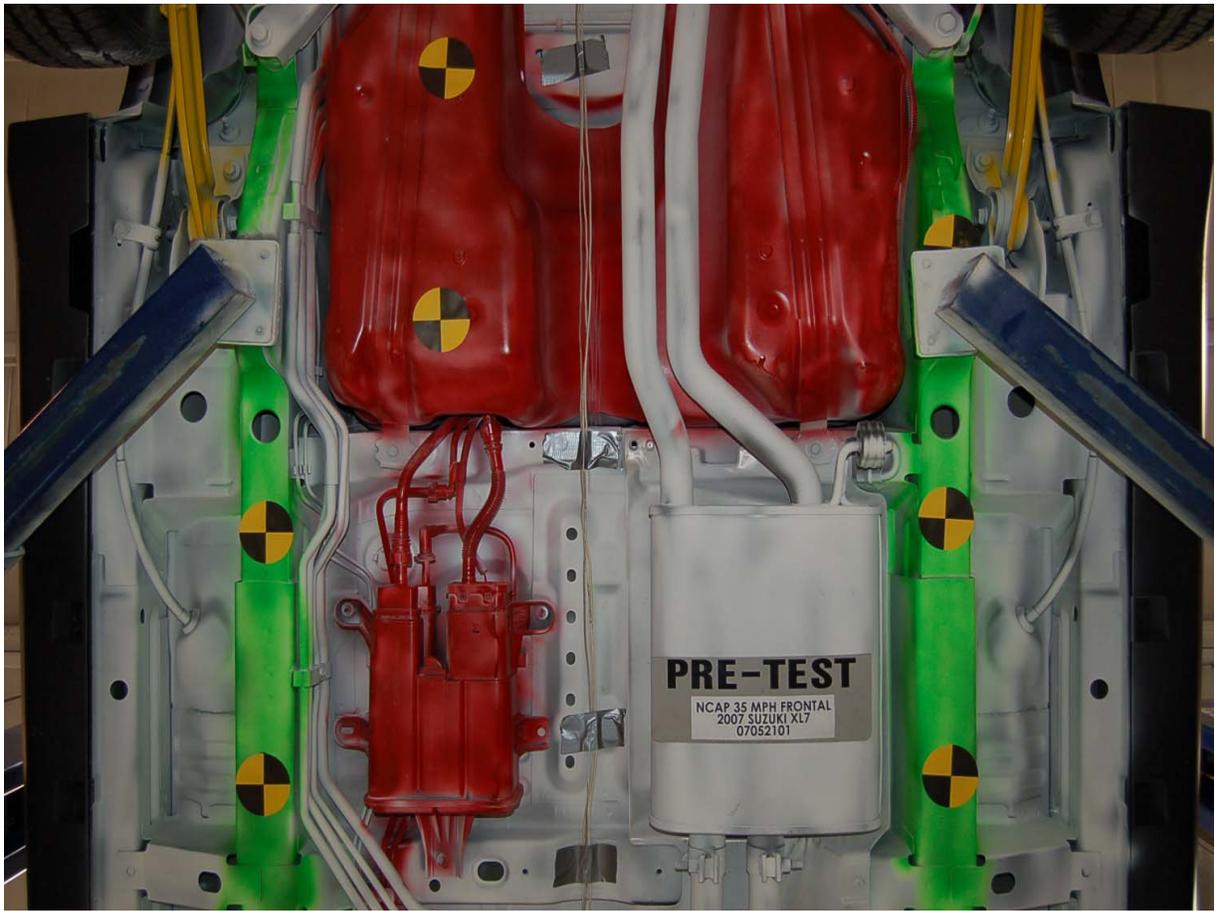
Post-Test Front Underbody View



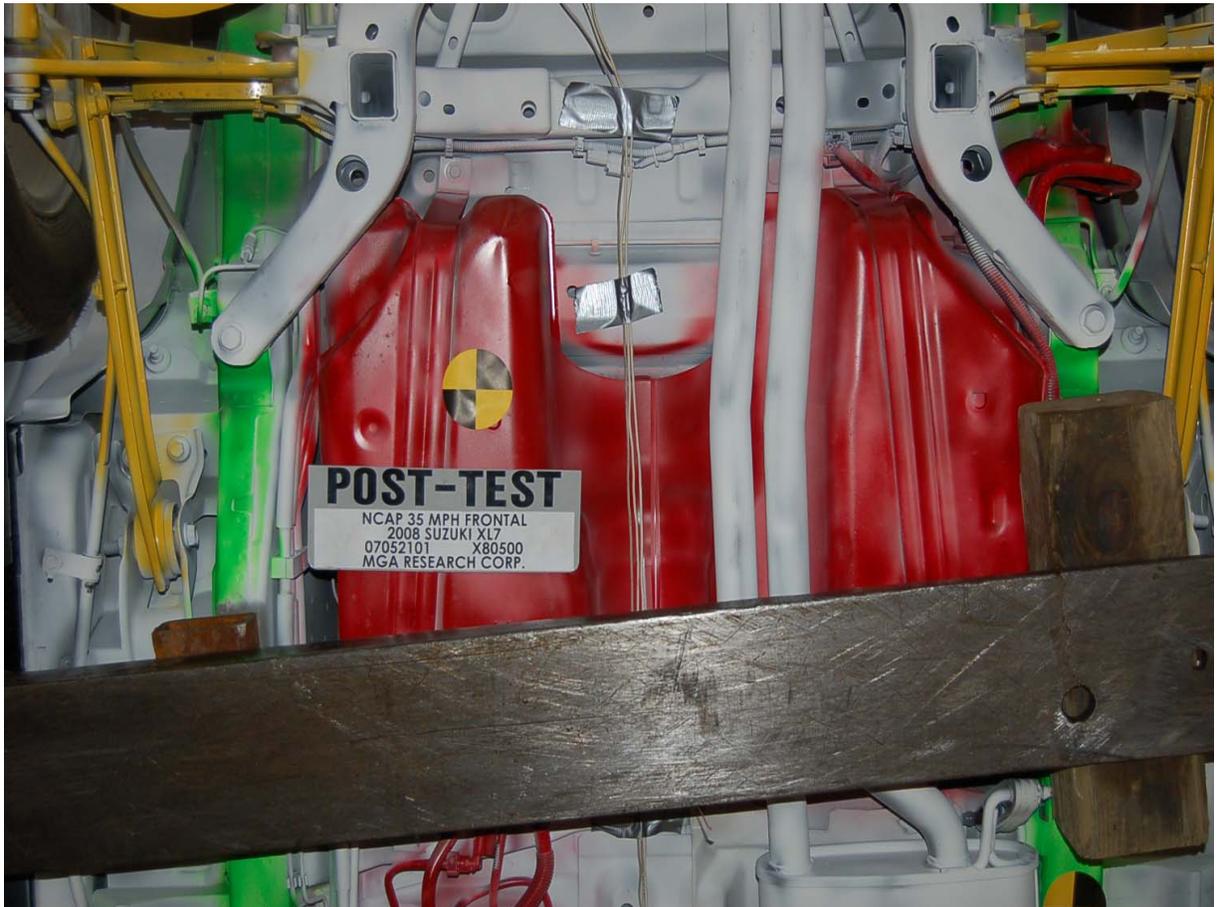
Pre-Test Mid Front Underbody View



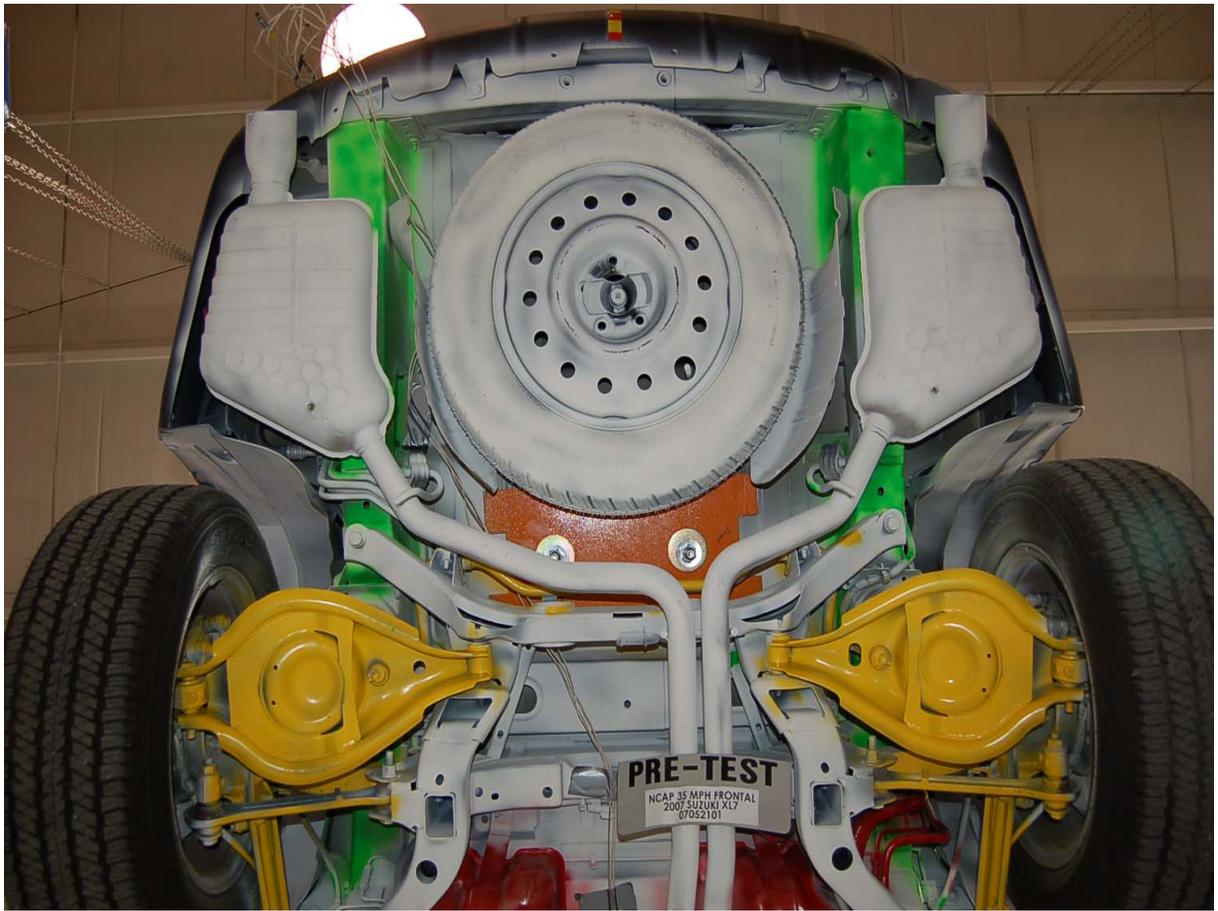
Post-Test Mid Front Underbody View



Pre-Test Mid Rear Underbody View



Post-Test Mid Rear Underbody View



Pre-Test Rear Underbody View



Post-Test Rear Underbody View



Pre-Test Driver Dummy Front View (Head Position)



Post-Test Driver Dummy Front View (Head Position)



Pre-Test Driver Dummy (Through Window)



Post-Test Driver Dummy (Through Window)



Pre-Test Driver Dummy (Door Open)



Post-Test Driver Dummy (Door Open)



Pre-Test Driver Dummy Feet



Post-Test Driver Dummy Feet



Pre-Test Driver Side Knee Bolster



Post-Test Driver Side Knee Bolster



Pre-Test Driver Side Floor Pan



Post-Test Driver Side Floor Pan



Post-Test Driver Dummy Head Contact (headrest)



Post-Test Driver Dummy Knee Contact



Post-Test Driver Dummy Airbag Contact



Pre-Test Passenger Dummy Front View (Head Position)



Post-Test Passenger Dummy Front View (Head Position)



Pre-Test Passenger Dummy (Through Window)



Post-Test Passenger Dummy (Through Window)



Pre-Test Passenger Dummy (Door Open)



Post-Test Passenger Dummy (Door Open)



Pre-Test Passenger Dummy Feet



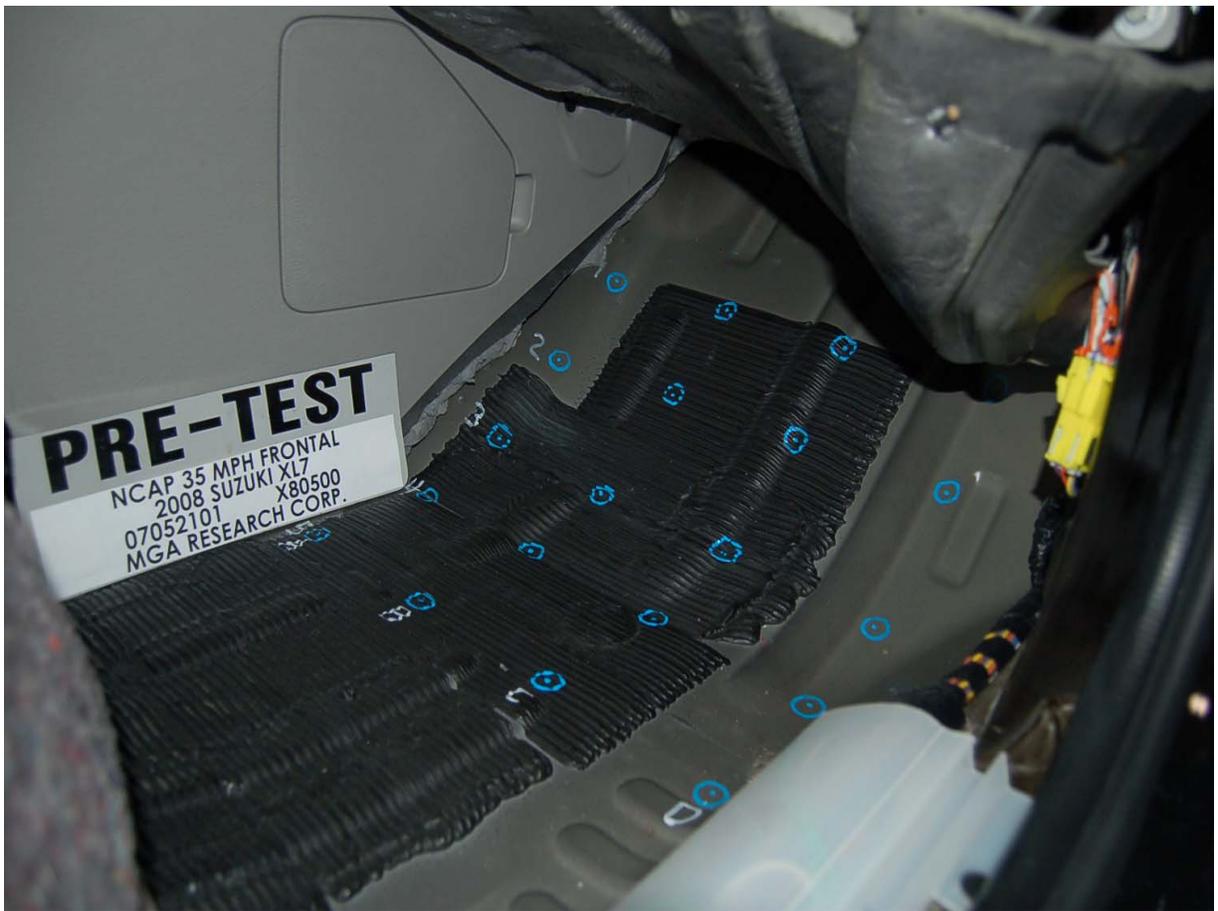
Post-Test Passenger Dummy Feet



Pre-Test Passenger Side Glove Box



Post-Test Passenger Side Glove Box



Pre-Test Passenger Side Floor Pan



Post-Test Passenger Side Floor Pan



Post-Test Passenger Dummy Head Contact (headrest & side header)



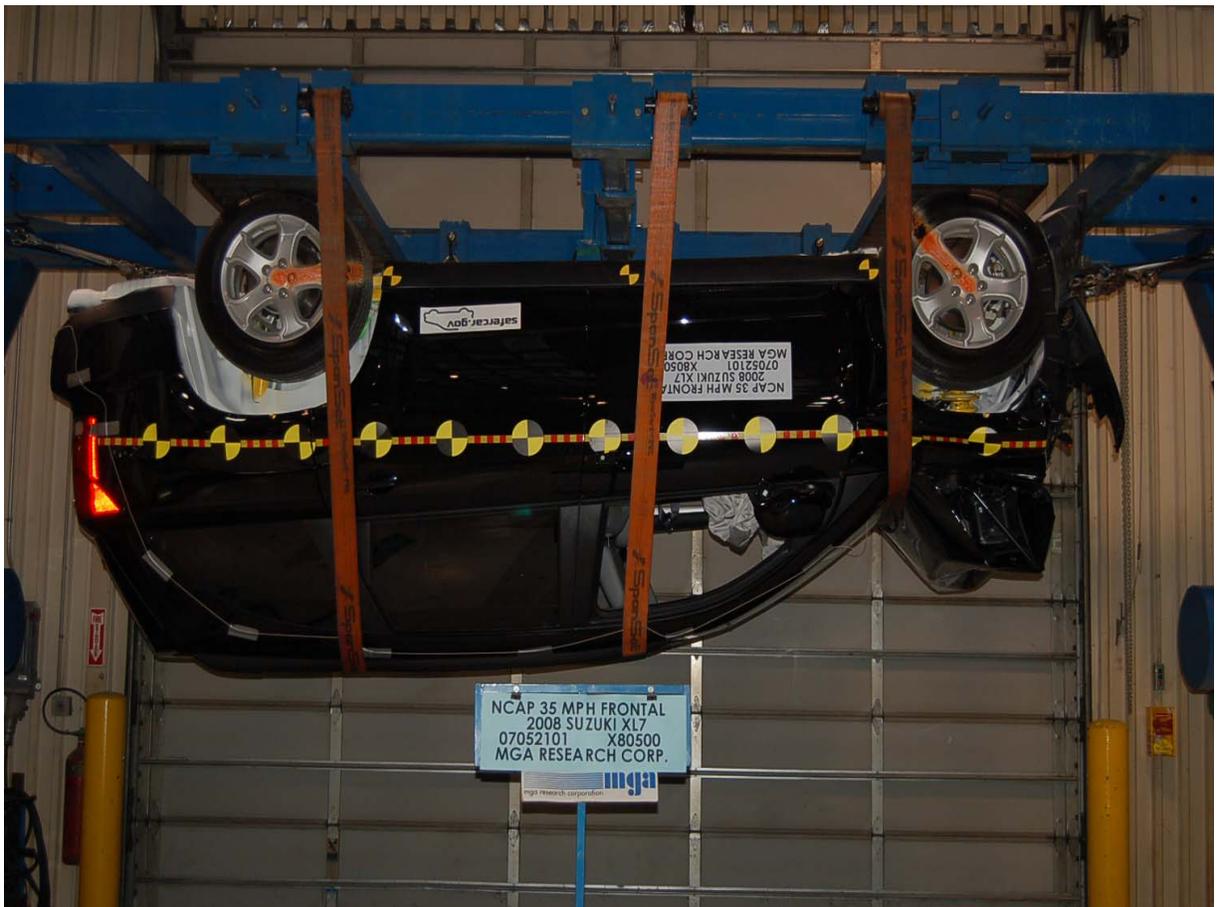
Post-Test Passenger Dummy Knee Contact



Post-Test Passenger Dummy Airbag Contact



Rollover 90 Degrees



Rollover 180 Degrees



Rollover 270 Degrees



Rollover 360 Degrees



93,00 ms 21 May 2007 13:12 • T0: 21 • 1,000 fps • Frame: 114

Vehicle Impact

APPENDIX B
DUMMY RESPONSE DATA TRACES

TABLE OF DATA PLOTS

Page No.

List of Data Plots Provided in the Test Report

Figure No. 1.	Driver Head X Acceleration vs. Time	B-1
Figure No. 2.	Driver Head Y Acceleration vs. Time	B-1
Figure No. 3.	Driver Head Z Acceleration vs. Time	B-1
Figure No. 4.	Driver Head Resultant Acceleration vs. Time	B-1
Figure No. 5.	Driver Head X Velocity vs. Time	B-2
Figure No. 6.	Driver Head Y Velocity vs. Time	B-2
Figure No. 7.	Driver Head Z Velocity vs. Time	B-2
Figure No. 8.	Driver Chest X Acceleration vs. Time	B-3
Figure No. 9.	Driver Chest Y Acceleration vs. Time	B-3
Figure No. 10.	Driver Chest Z Acceleration vs. Time	B-3
Figure No. 11.	Driver Chest Resultant Acceleration vs. Time	B-3
Figure No. 12.	Driver Chest X Velocity vs. Time	B-4
Figure No. 13.	Driver Chest Y Velocity vs. Time	B-4
Figure No. 14.	Driver Chest Z Velocity vs. Time	B-4
Figure No. 15.	Driver Left Femur Force vs. Time	B-5
Figure No. 16.	Driver Right Femur Force vs. Time	B-5
Figure No. 17.	Passenger Head X Acceleration vs. Time	B-6
Figure No. 18.	Passenger Head Y Acceleration vs. Time	B-6
Figure No. 19.	Passenger Head Z Acceleration vs. Time	B-6
Figure No. 20.	Passenger Head Resultant Acceleration vs. Time	B-6
Figure No. 21.	Passenger Head X Velocity vs. Time	B-7
Figure No. 22.	Passenger Head Y Velocity vs. Time	B-7
Figure No. 23.	Passenger Head Z Velocity vs. Time	B-7
Figure No. 24.	Passenger Chest X Acceleration vs. Time	B-8
Figure No. 25.	Passenger Chest Y Acceleration vs. Time	B-8
Figure No. 26.	Passenger Chest Z Acceleration vs. Time	B-8
Figure No. 27.	Passenger Chest Resultant Acceleration vs. Time	B-8
Figure No. 28.	Passenger Chest X Velocity vs. Time	B-9

Figure No. 29.	Passenger Chest Y Velocity vs. Time	B-9
Figure No. 30.	Passenger Chest Z Velocity vs. Time	B-9
Figure No. 31.	Passenger Left Femur Force vs. Time	B-10
Figure No. 32.	Passenger Right Femur Force vs. Time	B-10

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 X

Driver Upper Neck Force Y

Driver Upper Neck Force Z

Driver Upper Neck Moment X

Driver Upper Neck Moment Y

Driver Upper Neck Moment Z

Driver Chest X Redundant

Driver Chest Y Redundant

Driver Chest Z Redundant

Driver Chest Displacement

Driver Pelvis X

Driver Pelvis Y

Driver Pelvis Z

Driver Shoulder Belt Force

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

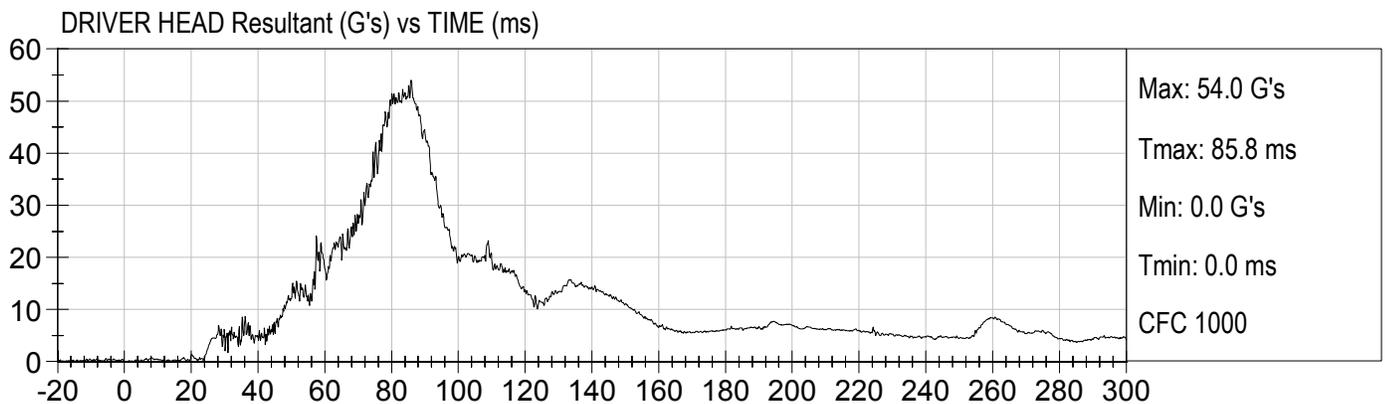
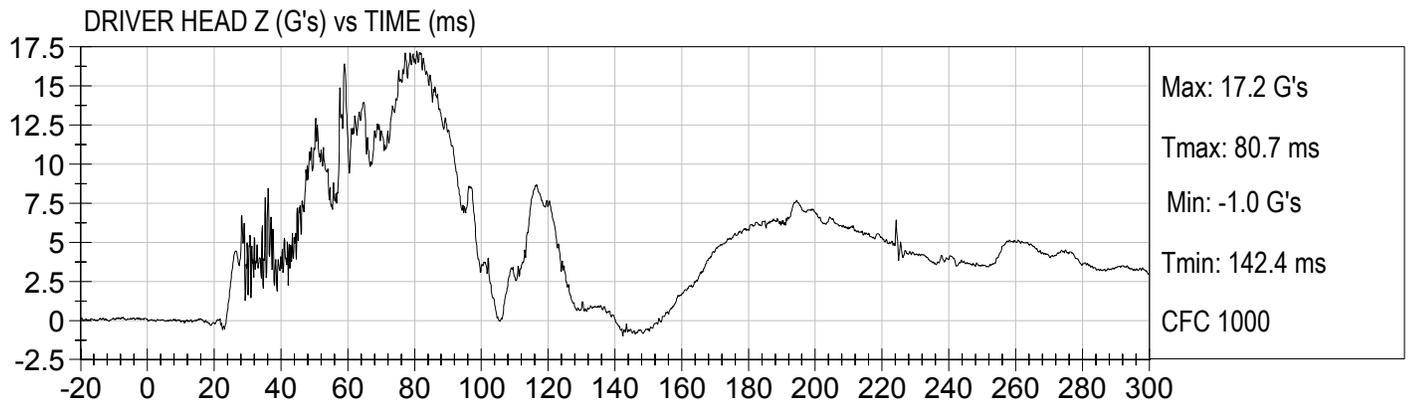
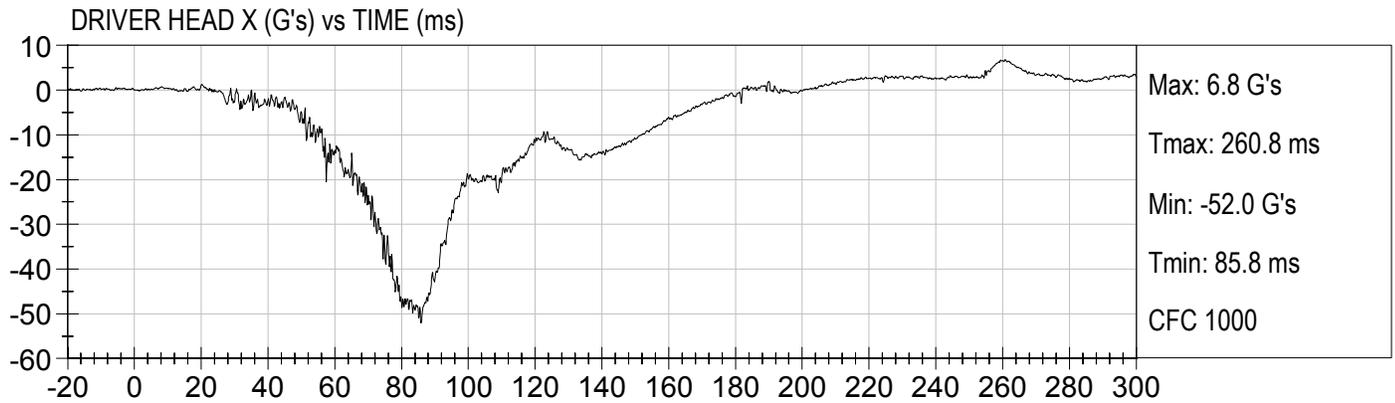
Driver Left Lower Tibia Force Z

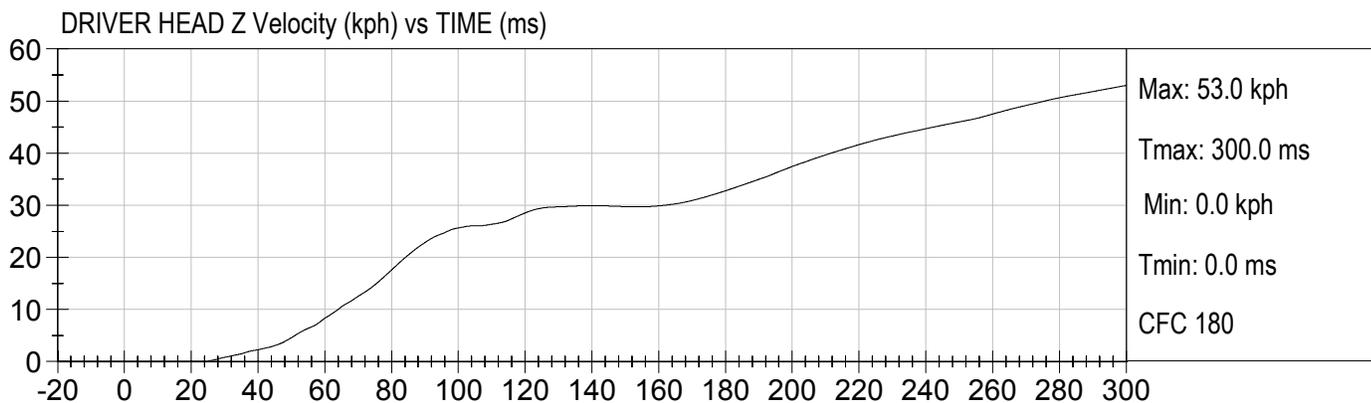
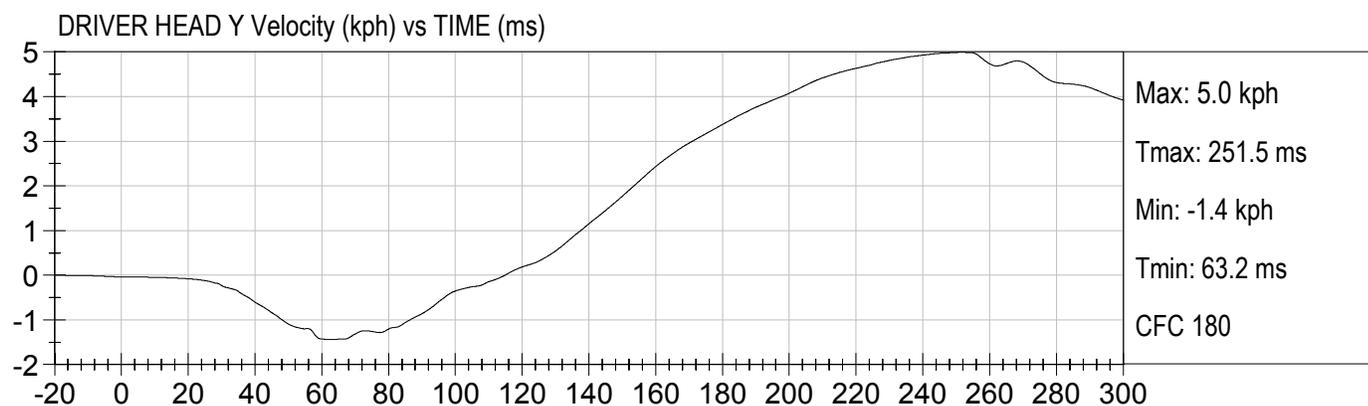
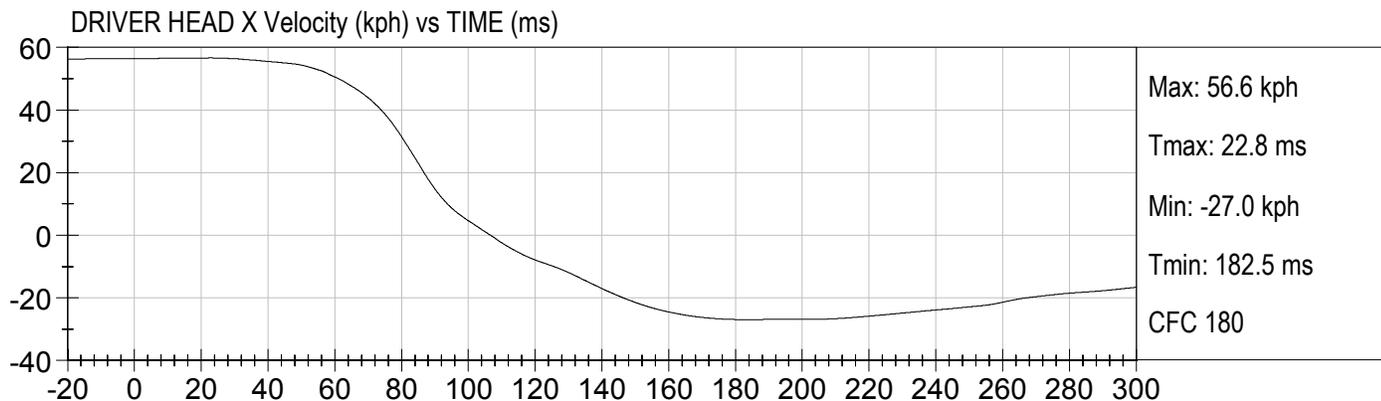
Driver Right Upper Tibia Moment X

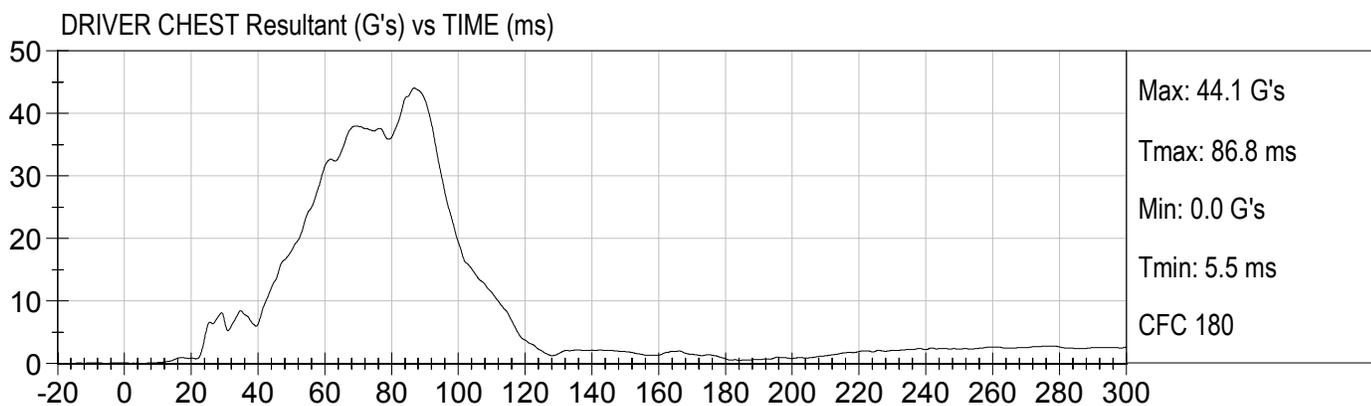
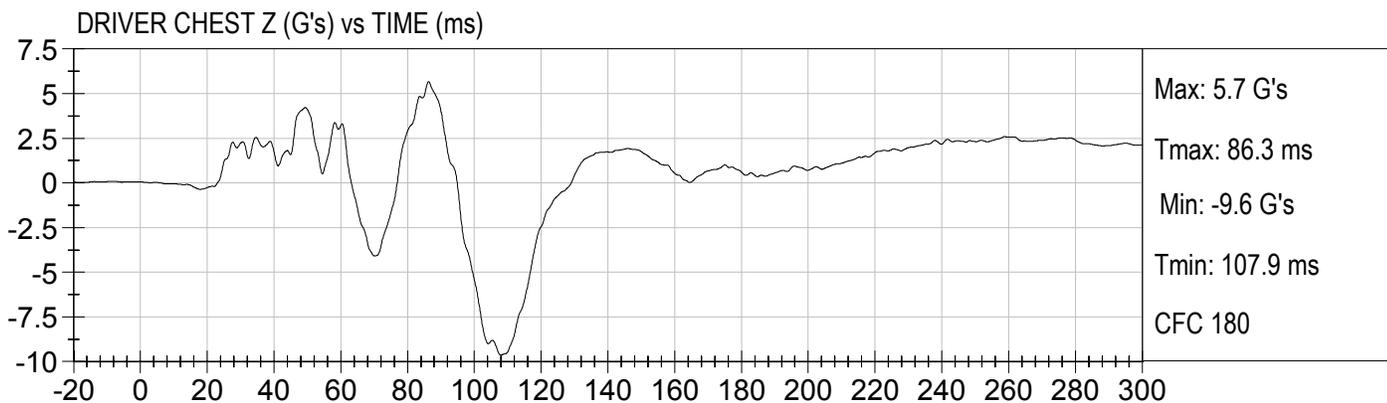
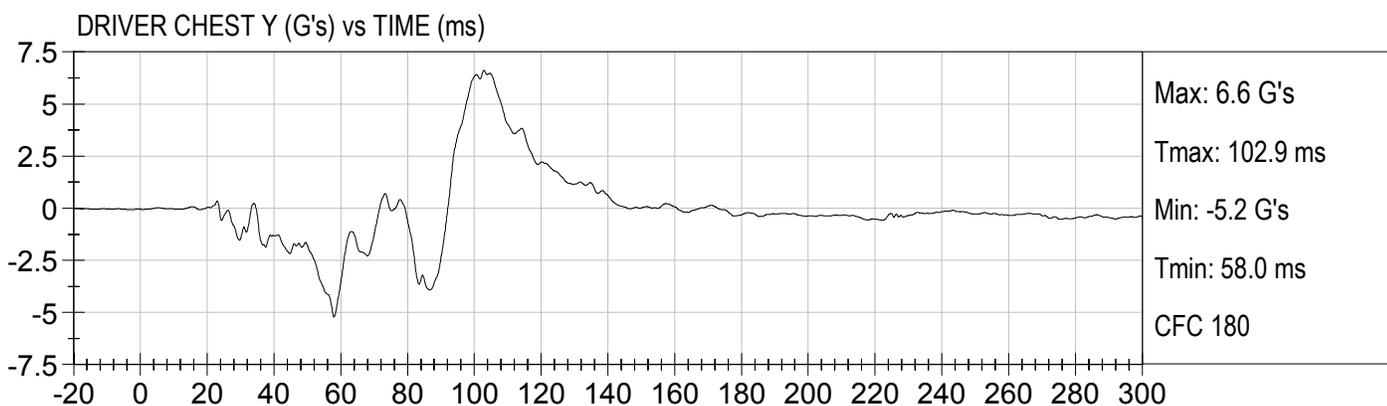
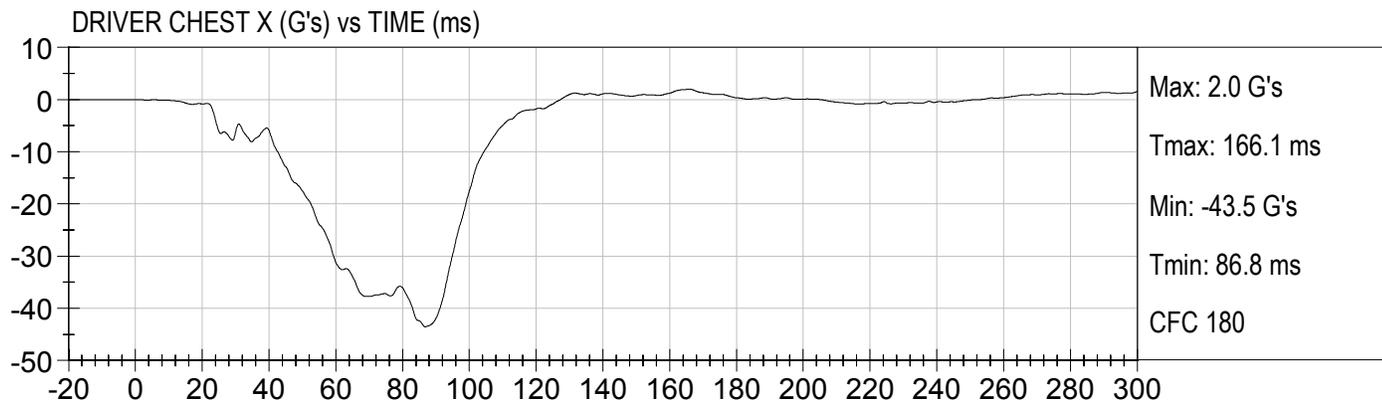
Driver Right Upper Tibia Moment Y

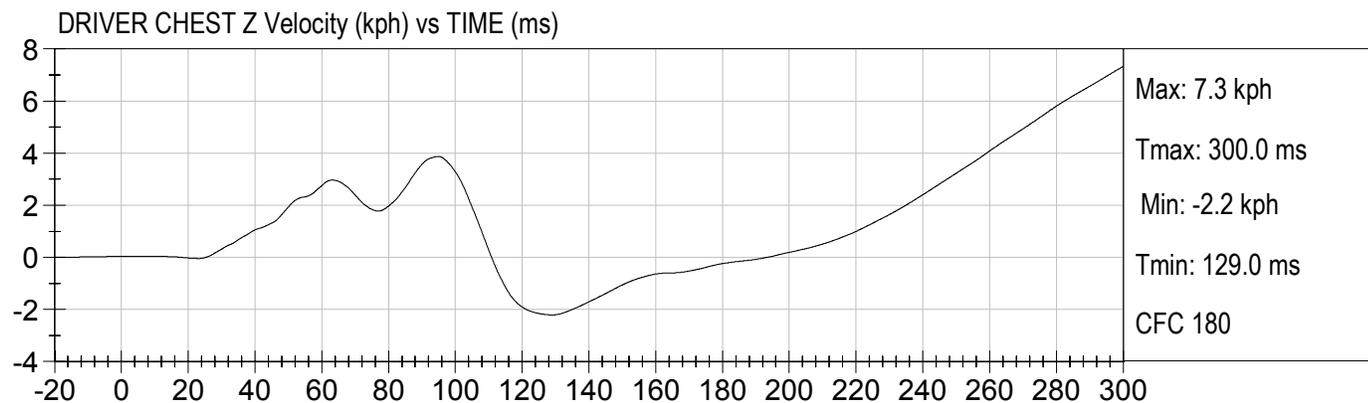
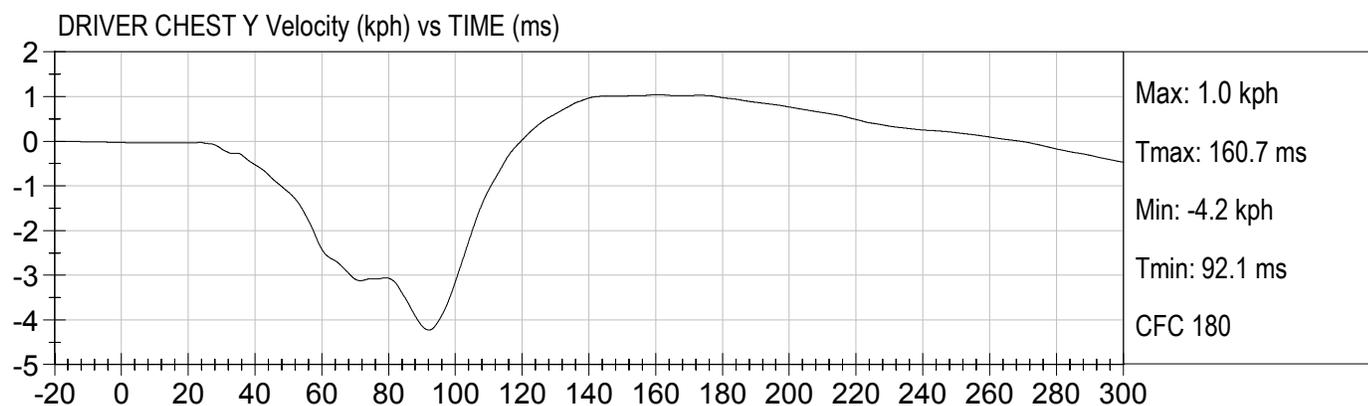
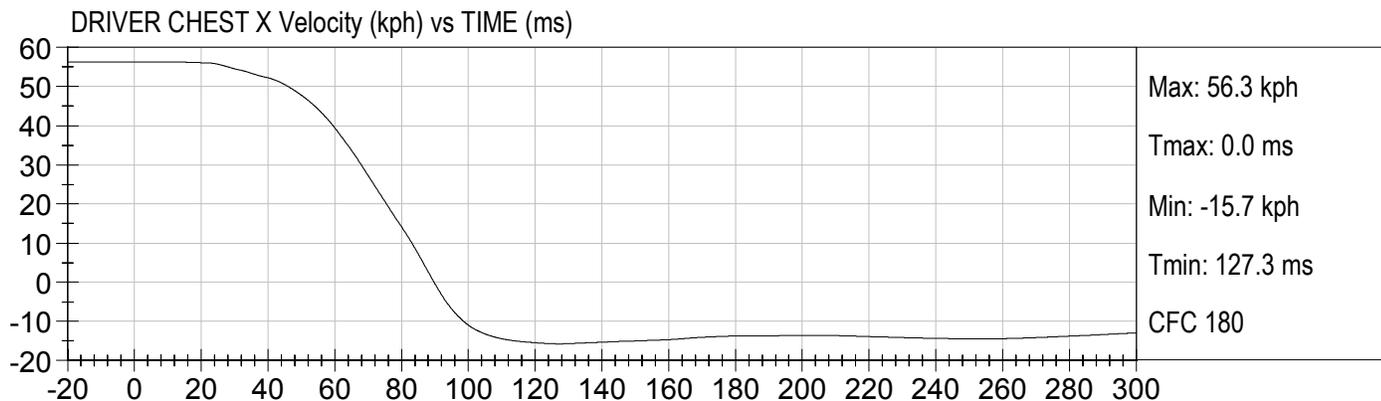
Driver Right Upper Tibia Force Z
Driver Right Lower Tibia Moment X
Driver Right Lower Tibia Moment Y
Driver Right Lower Tibia Force Z
Driver Left Foot Fore Z
Driver Left Foot Aft X
Driver Left Foot Aft Z
Driver Right Foot Fore Z
Driver Right Foot Aft X
Driver Right Foot Aft Z
Passenger Head X Redundant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

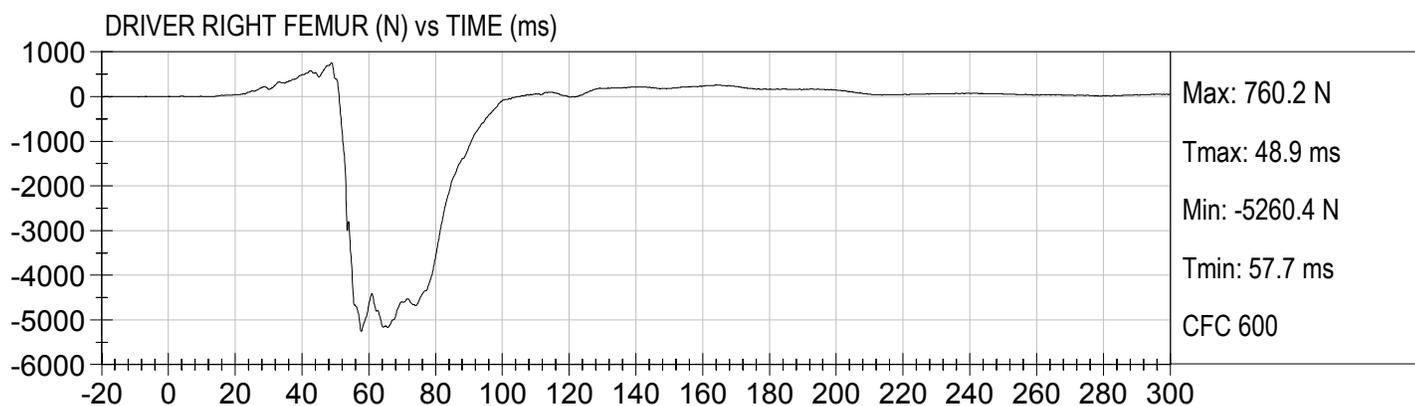
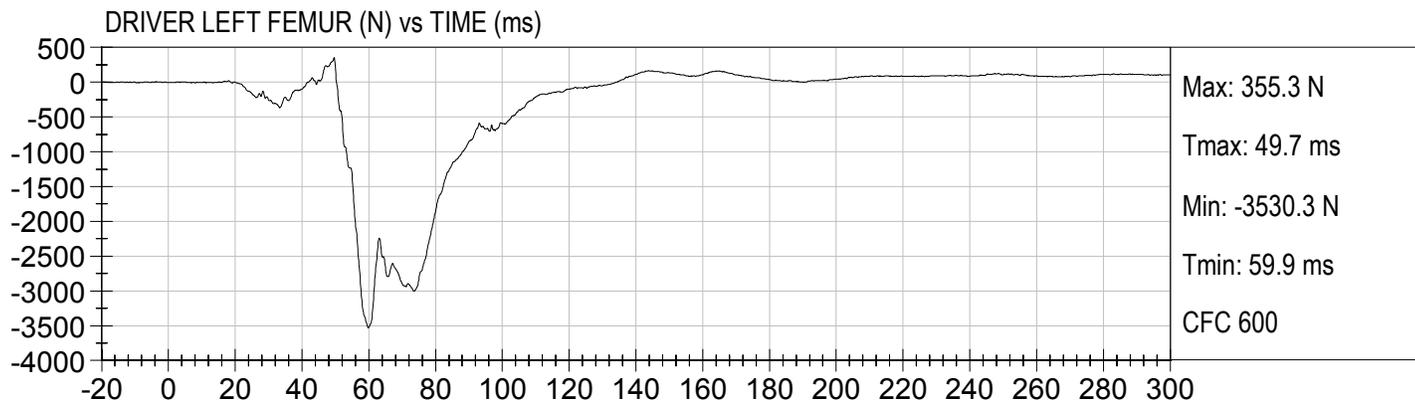
Passenger Left Lower Tibia Moment Y
Passenger Left Lower Tibia Force Z
Passenger Right Upper Tibia Moment X
Passenger Right Upper Tibia Moment Y
Passenger Right Upper Tibia Force Z
Passenger Right Lower Tibia Moment X
Passenger Right Lower Tibia Moment Y
Passenger Right Lower Tibia Force Z
Passenger 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





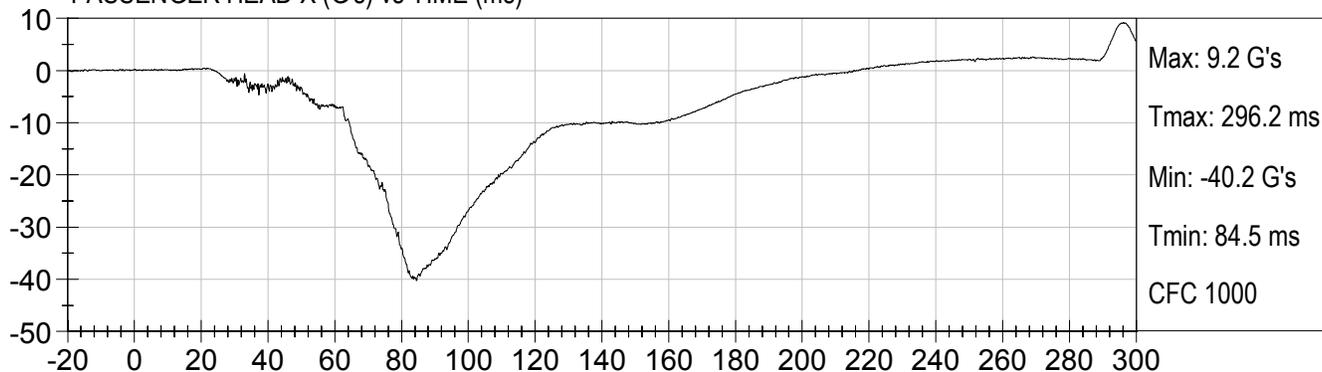




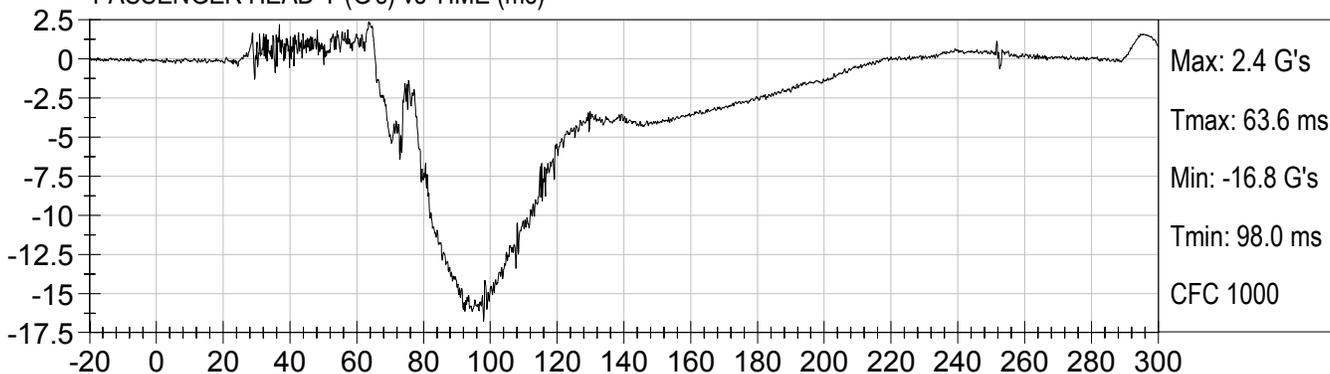




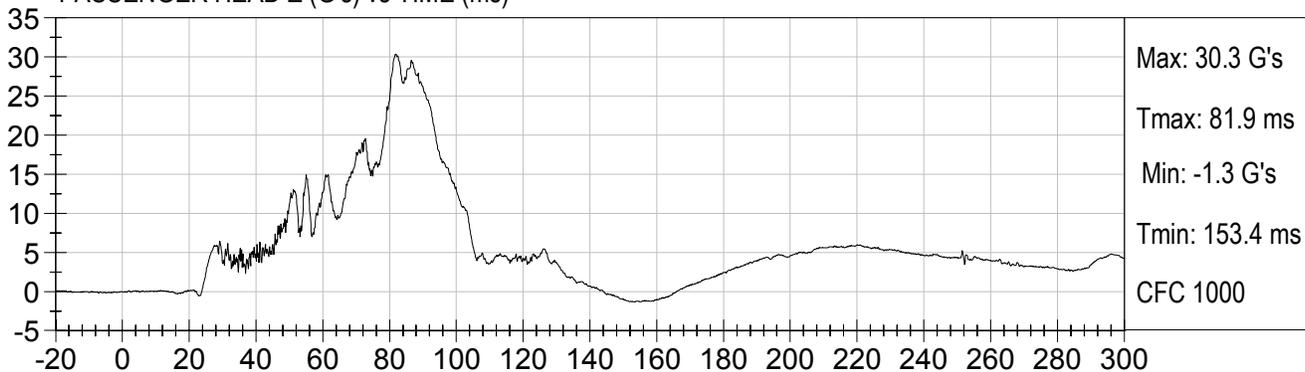
PASSENGER HEAD X (G's) vs TIME (ms)



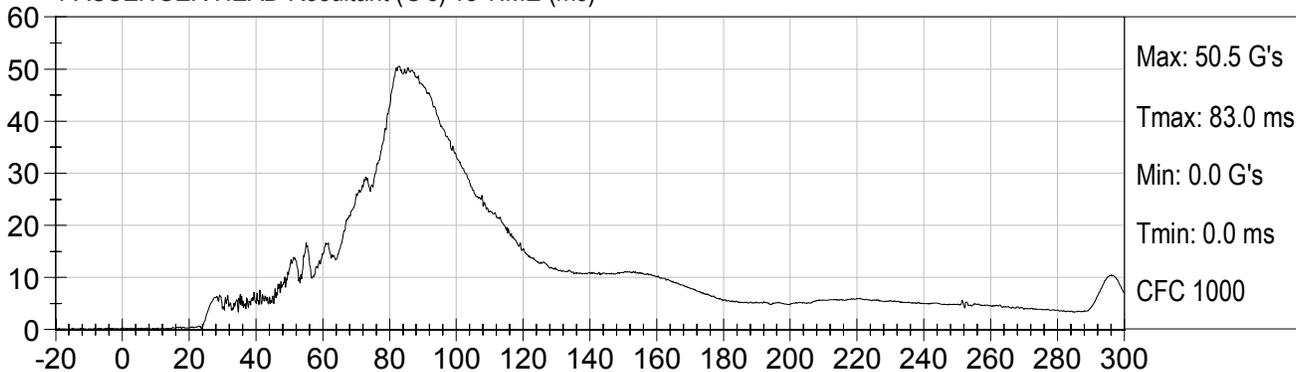
PASSENGER HEAD Y (G's) vs TIME (ms)

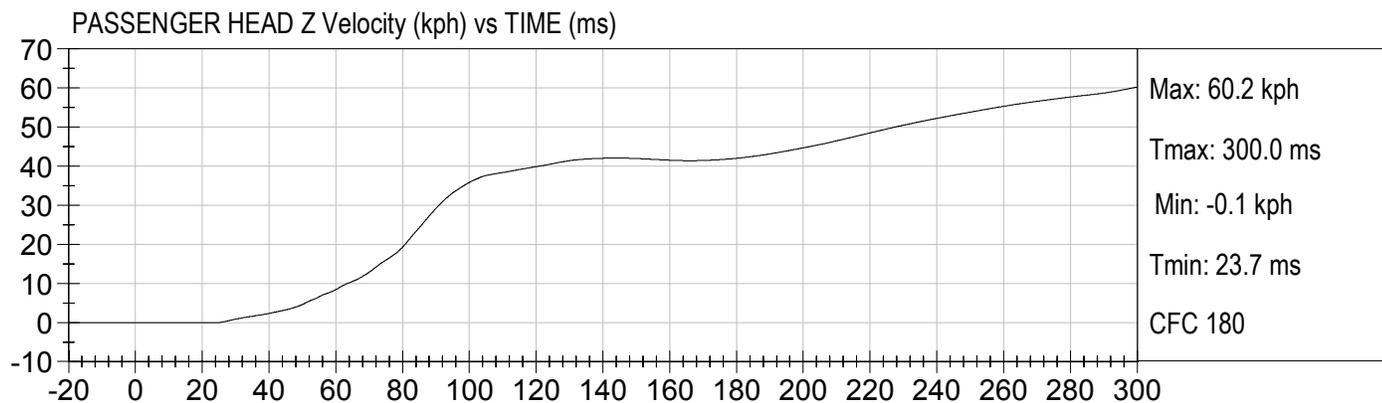
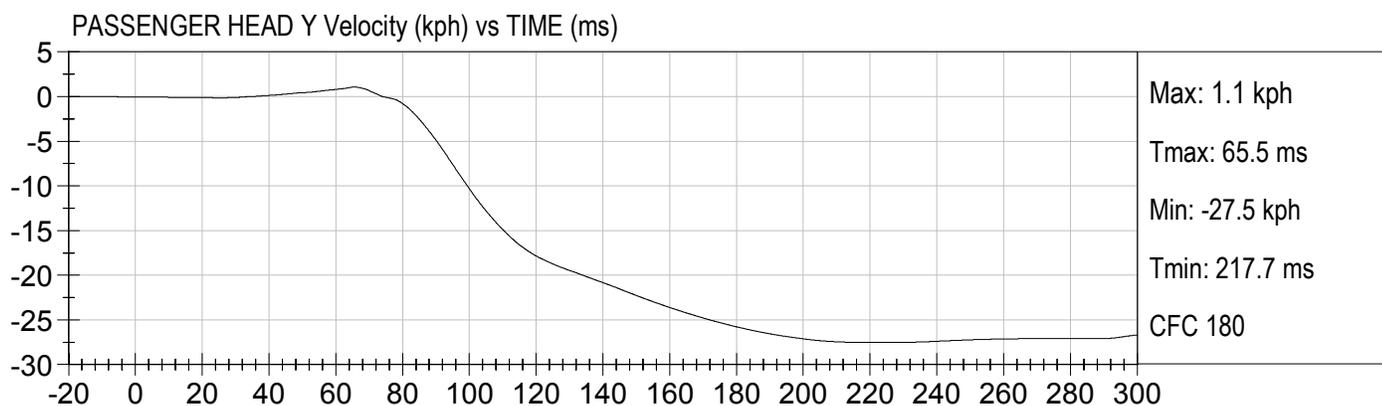
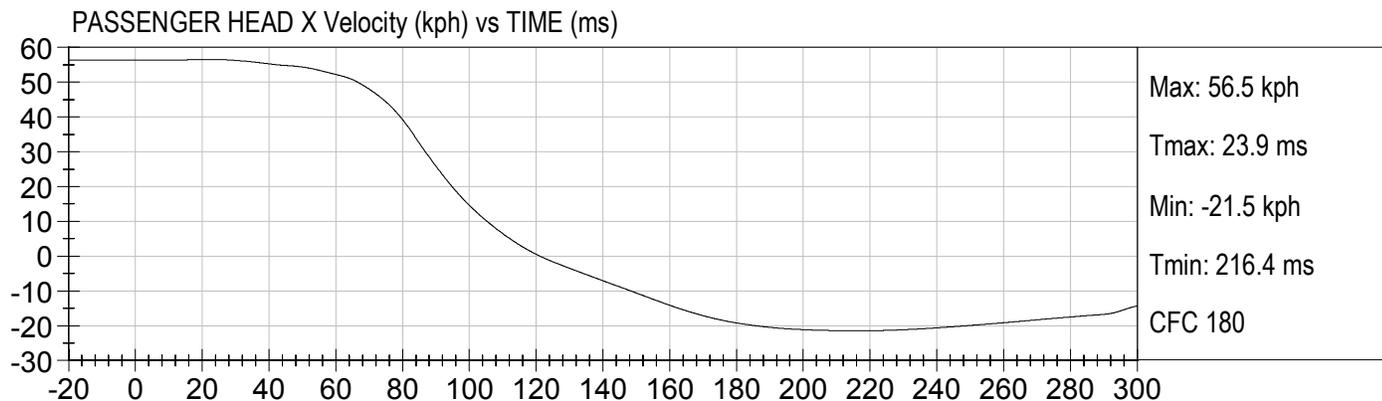


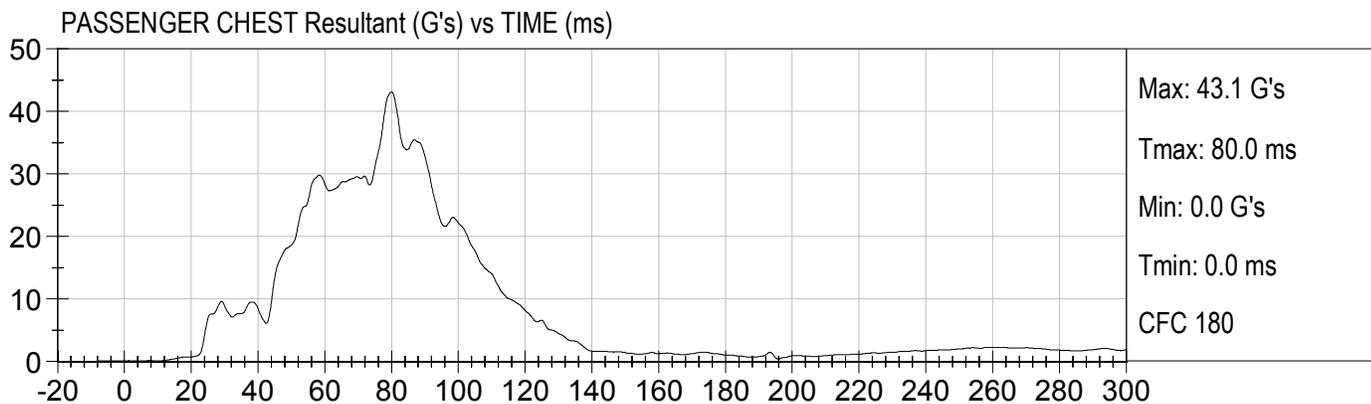
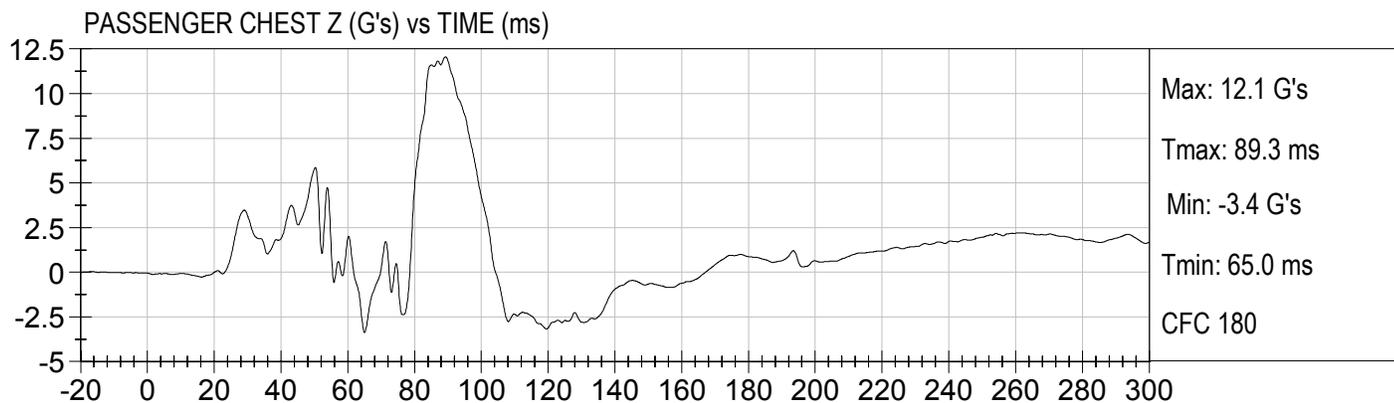
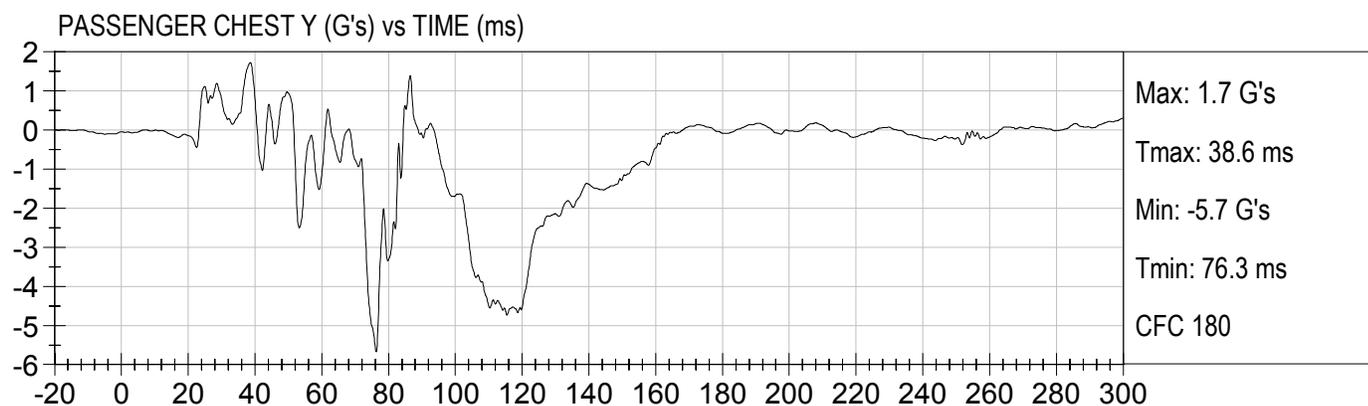
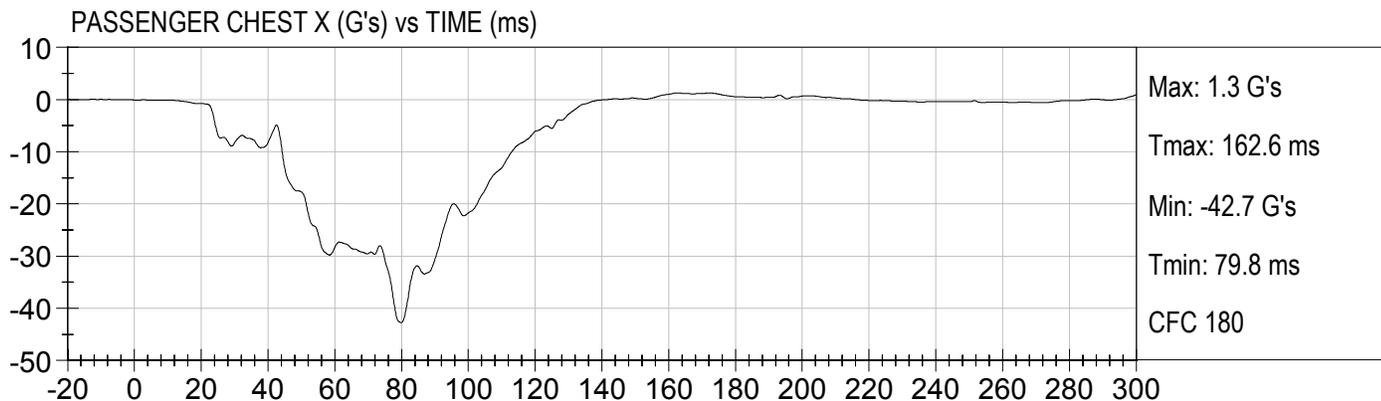
PASSENGER HEAD Z (G's) vs TIME (ms)

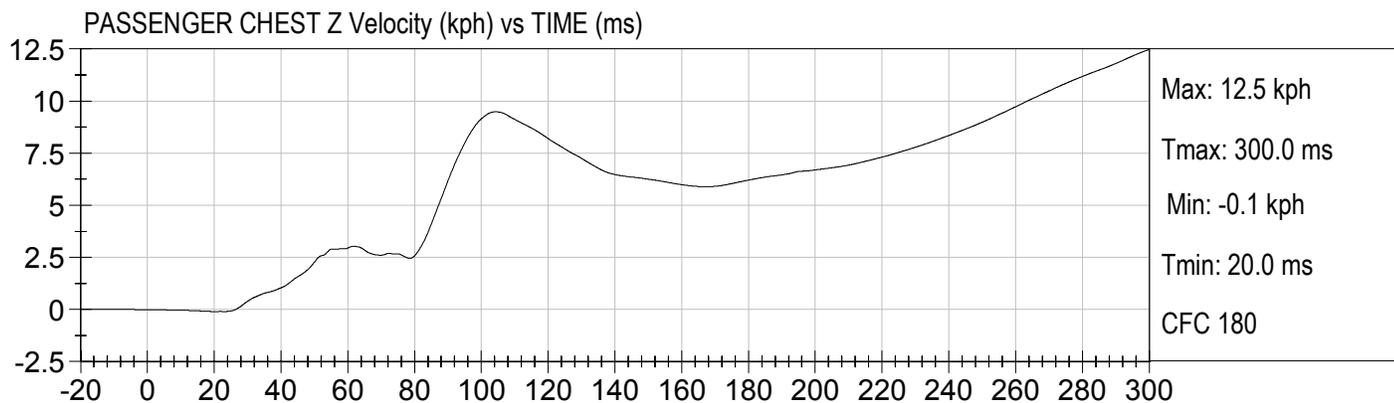
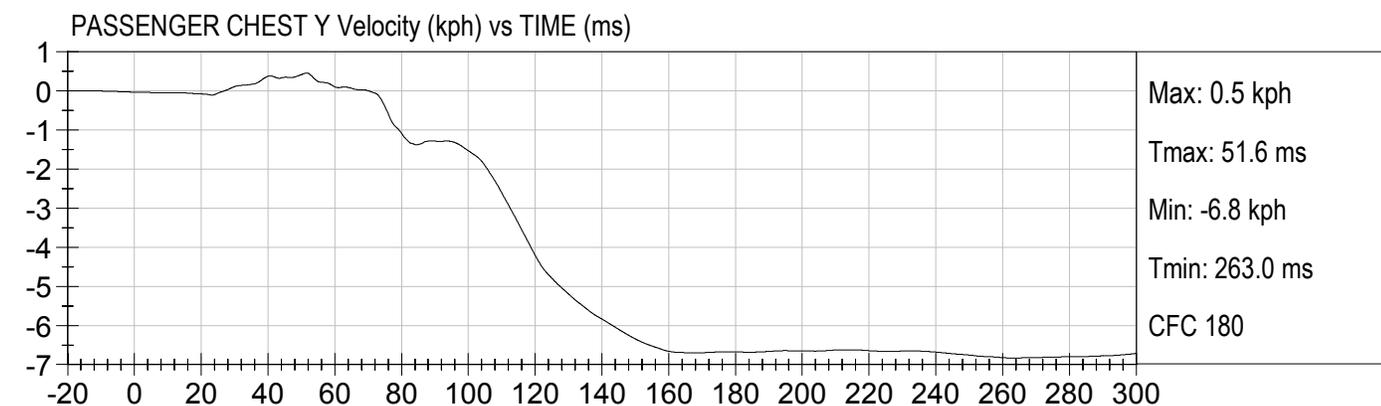
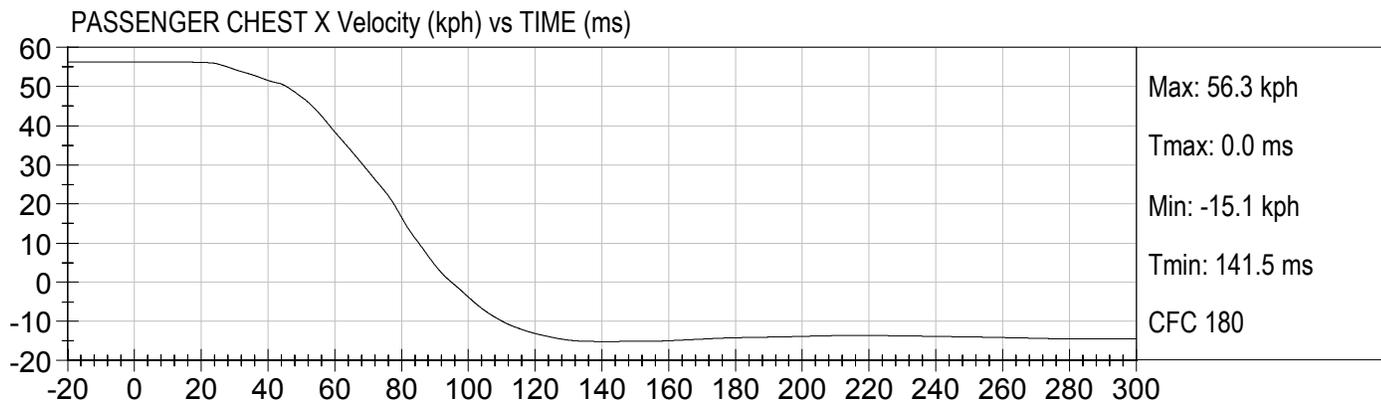


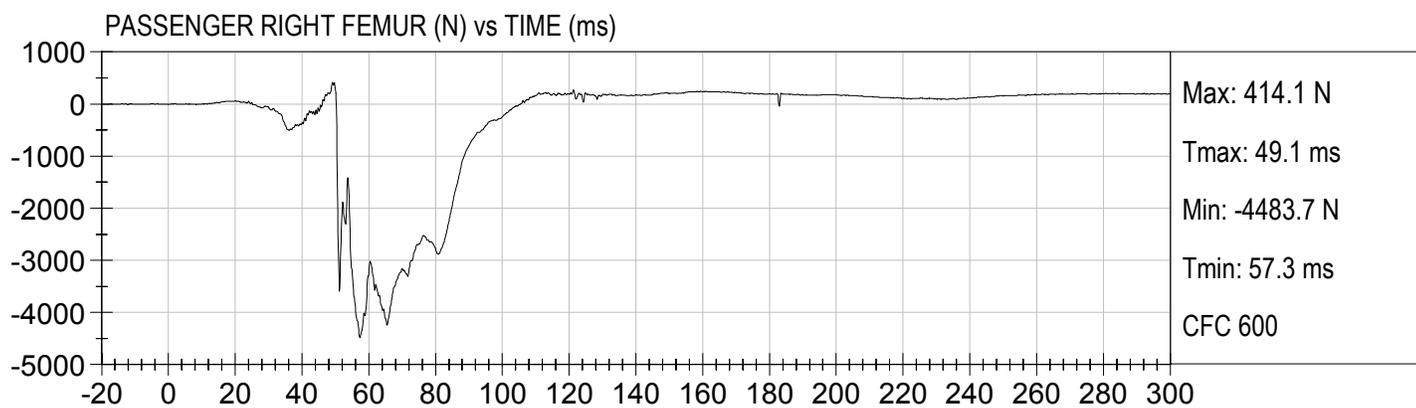
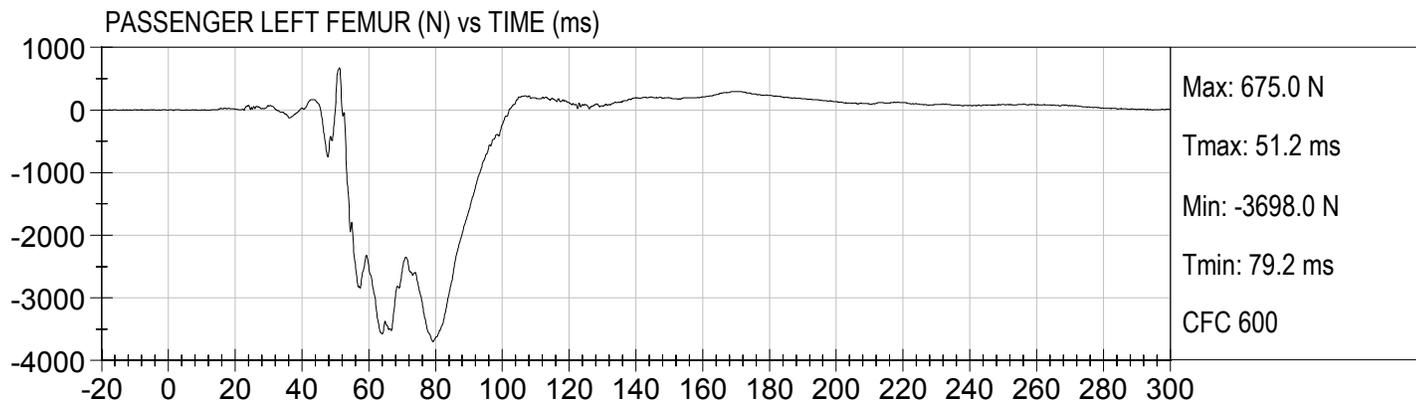
PASSENGER HEAD Resultant (G's) vs TIME (ms)











APPENDIX C
DUMMY CALIBRATION DATA

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

ATD Serial No: 065

Test ID: D071341

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Peak Resultant Acceleration	G's	225 - 275	235	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	4.4	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

Jessica Hall
 Laboratory Technician

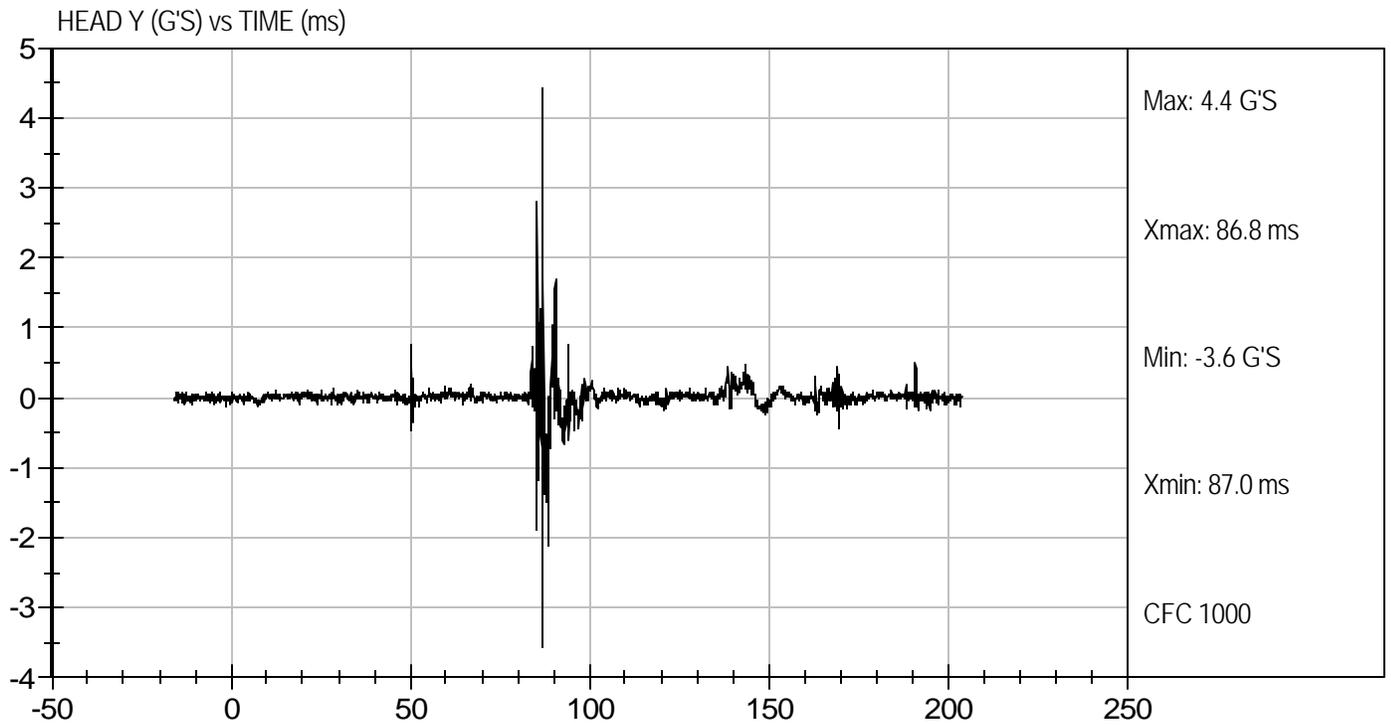
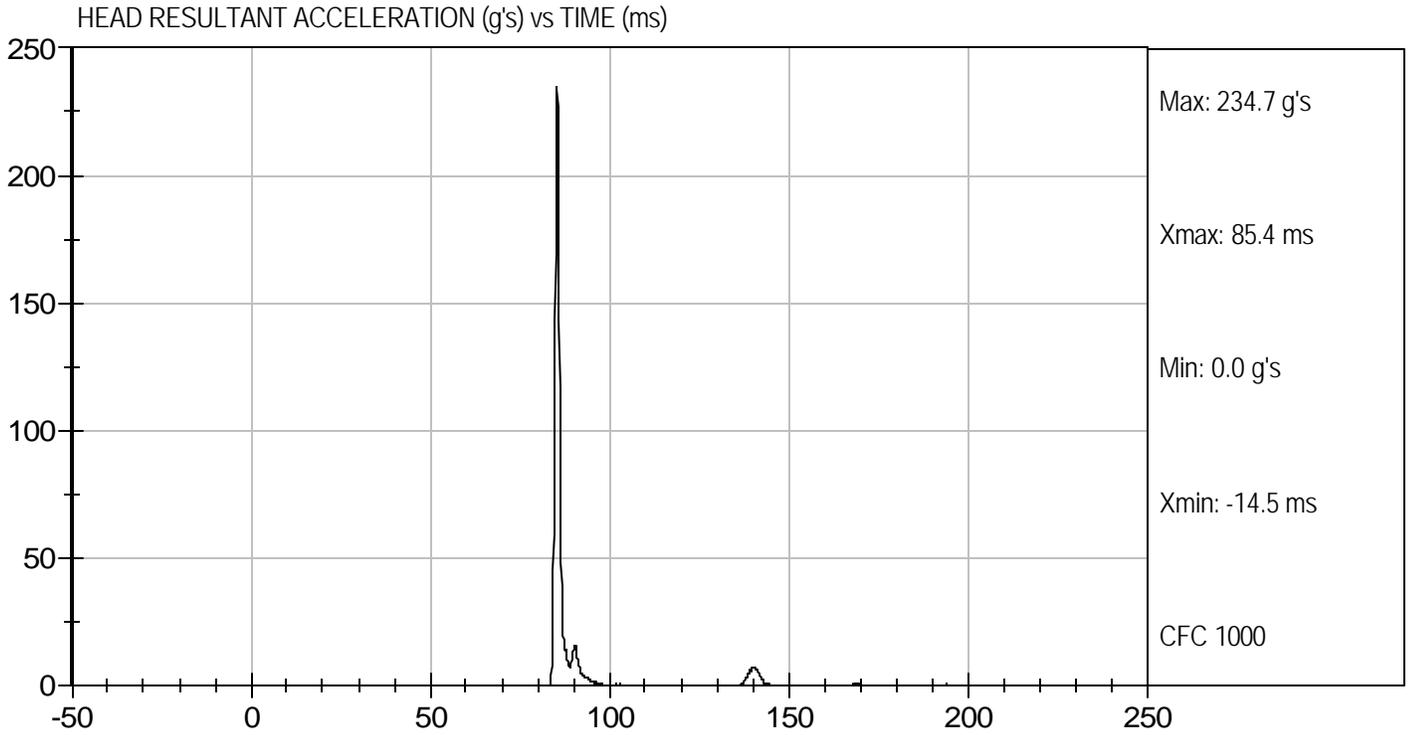
5/14/07
 Test Date

David Winkelbauer
 Approved By



Test Desc: Head Drop
Componet ID: D071341

Test Date: 5/14/07
Velocity: 0 ft/s, 0.00 m/s



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

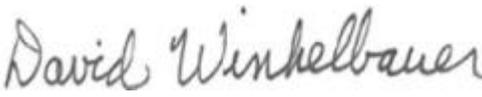
ATD Serial No: 065

Test I.D.: D071342

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	43	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.05	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	22.94	Pass
	20 msec	G's	17.60 to 22.60	17.69	Pass
	30 msec	G's	12.50 to 18.50	13.31	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	13.42	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	37.4	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	73.6	Pass
	Time	msec	57.0 to 64.0	59.1	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	113.5	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	93.1	Pass
	Time	msec	47.0 to 58.0	51.3	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	103.4	Pass
Overall Test Results					Pass

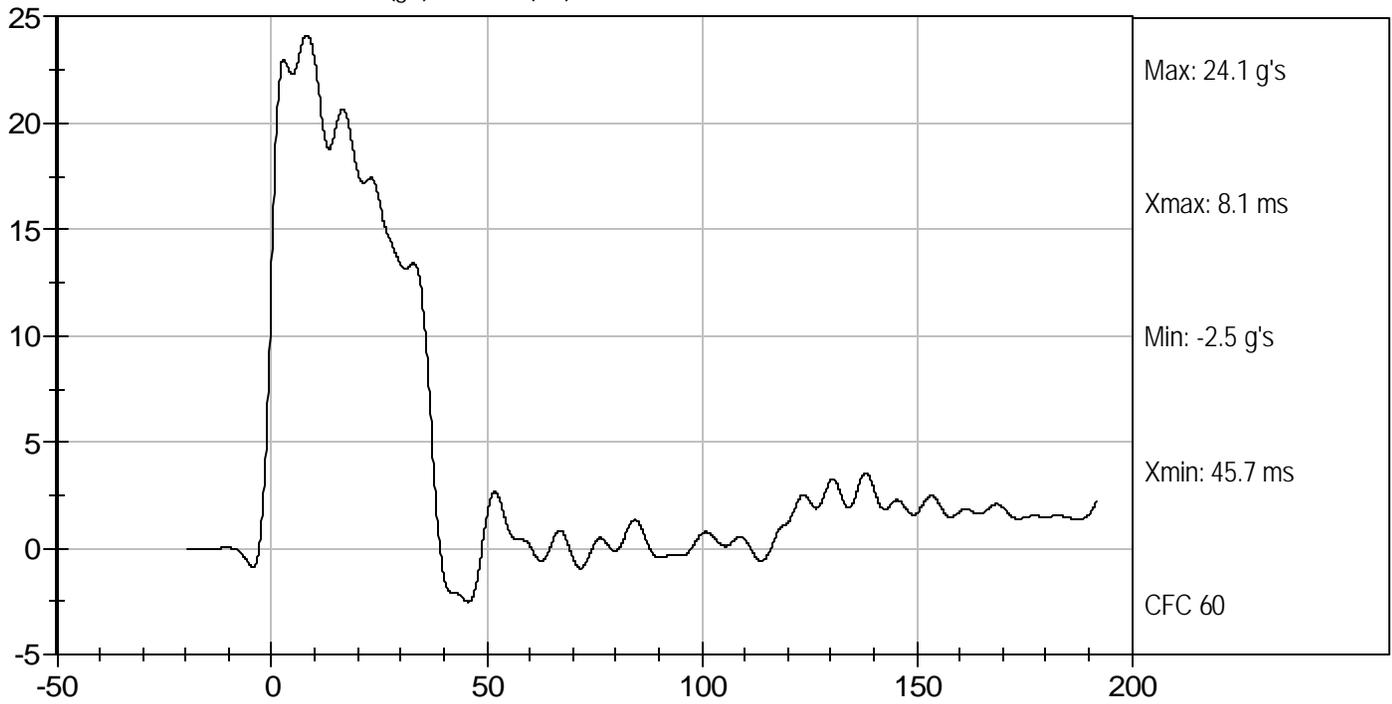

Laboratory Technician

5/15/07
Test Date

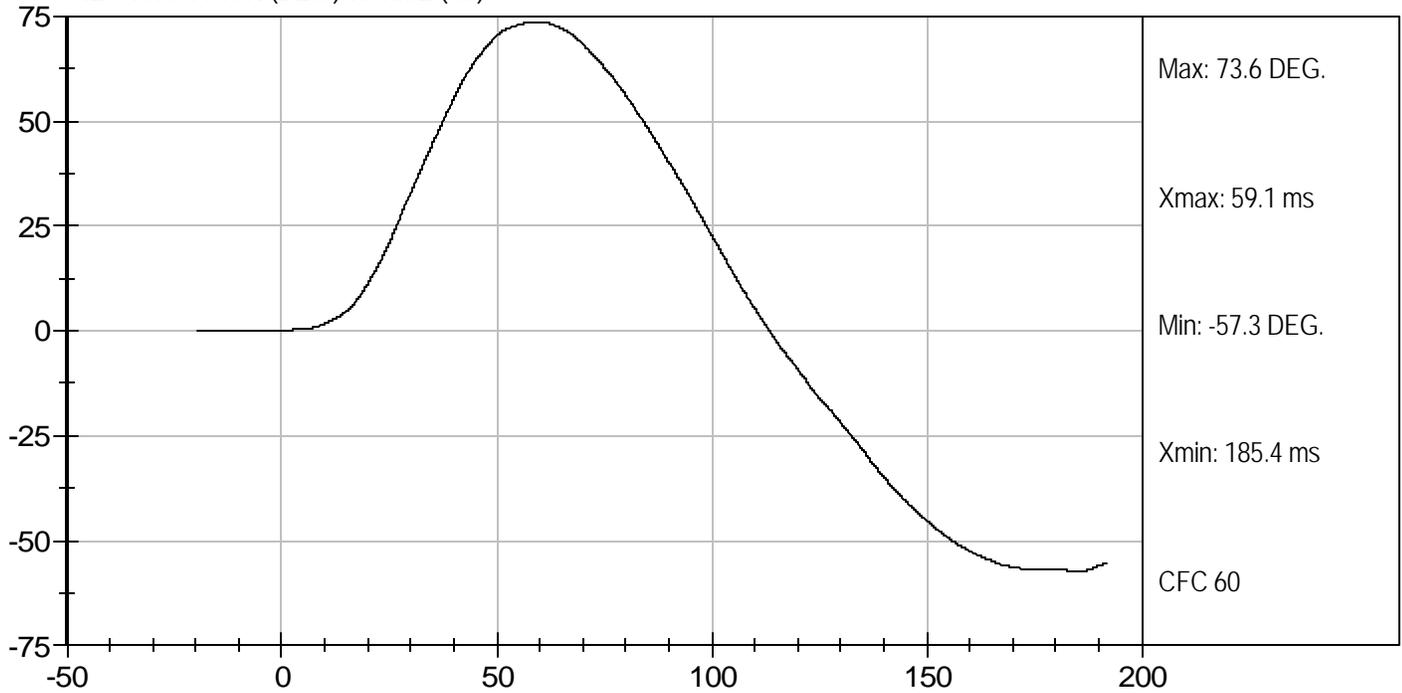

Approved By



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



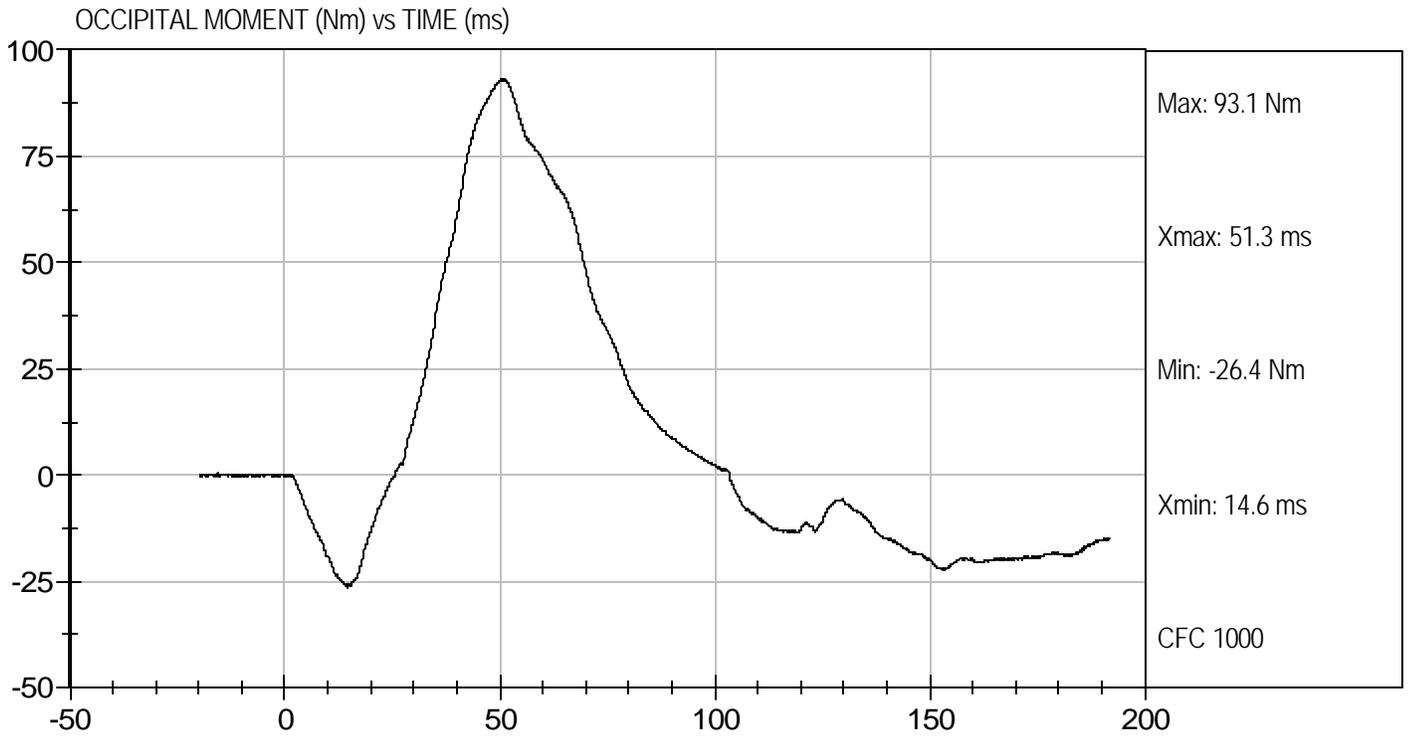
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Flexion
Componet ID: D071342

Test Date: 5/15/07
Velocity: 23.14 ft/s, 7.05 m/s



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

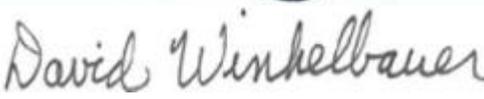
ATD Serial No: 065

Test I.D.: D071343

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	42	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.05	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	18.15	Pass
	20 msec	G's	14.00 to 19.00	14.33	Pass
	30 msec	G's	11.00 to 16.00	12.70	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	13.26	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	39.0	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	98.4	Pass
	Time	msec	72.0 to 82.0	78.3	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	159.3	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-60.1	Pass
	Time	msec	65.0 to 79.0	72.5	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	147.6	Pass
Overall Test Results					Pass

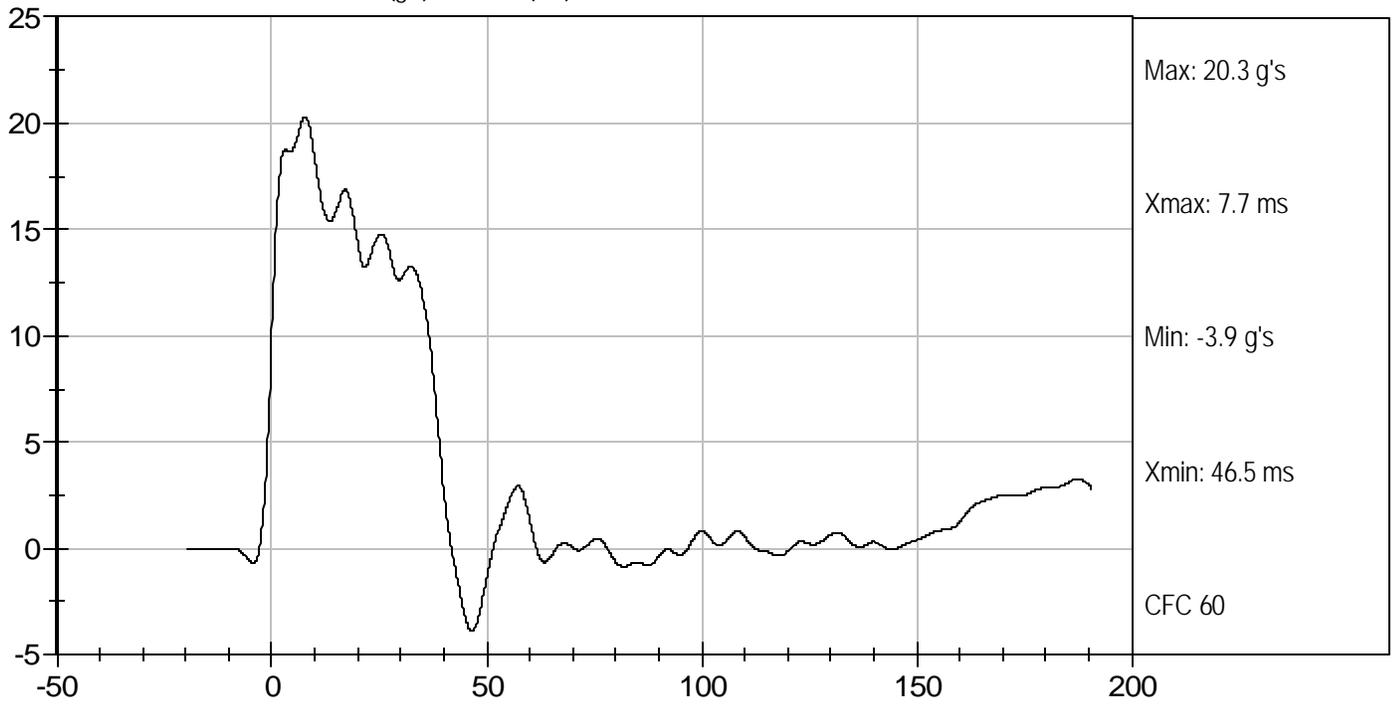

Laboratory Technician

5/15/07
Test Date

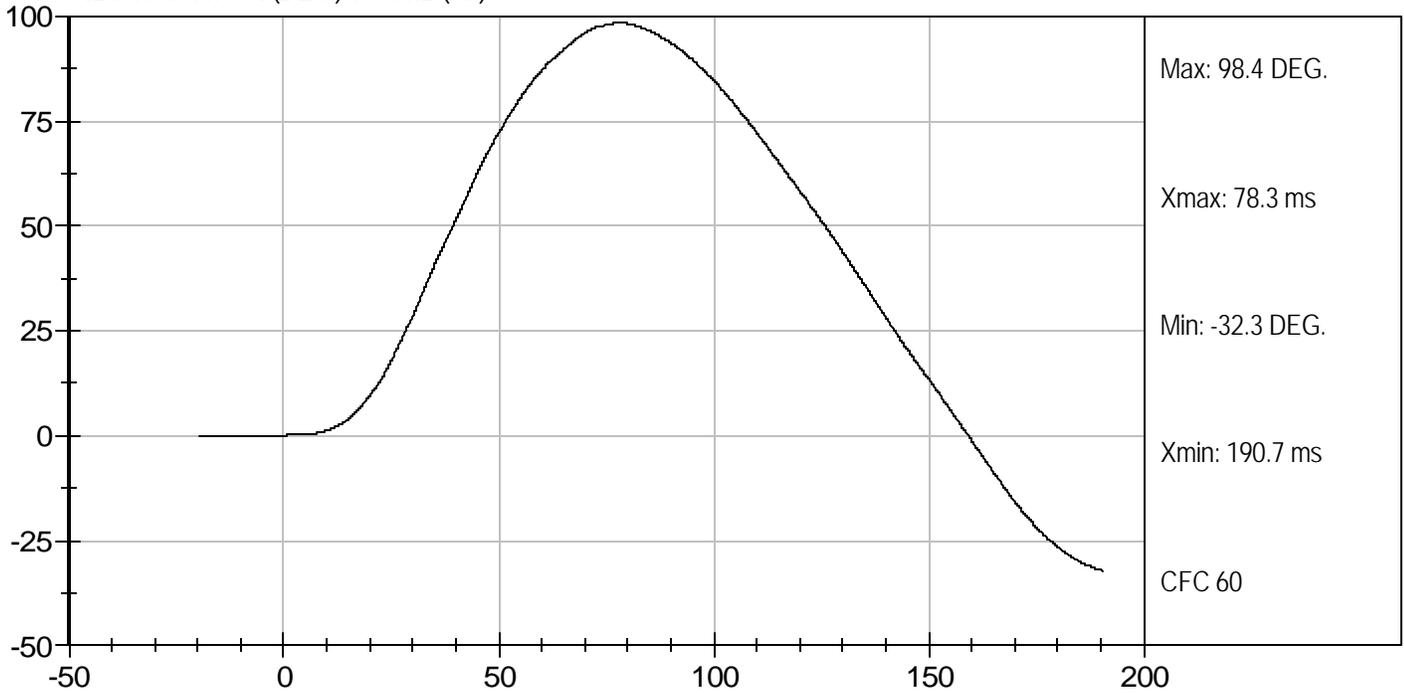

Approved By



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



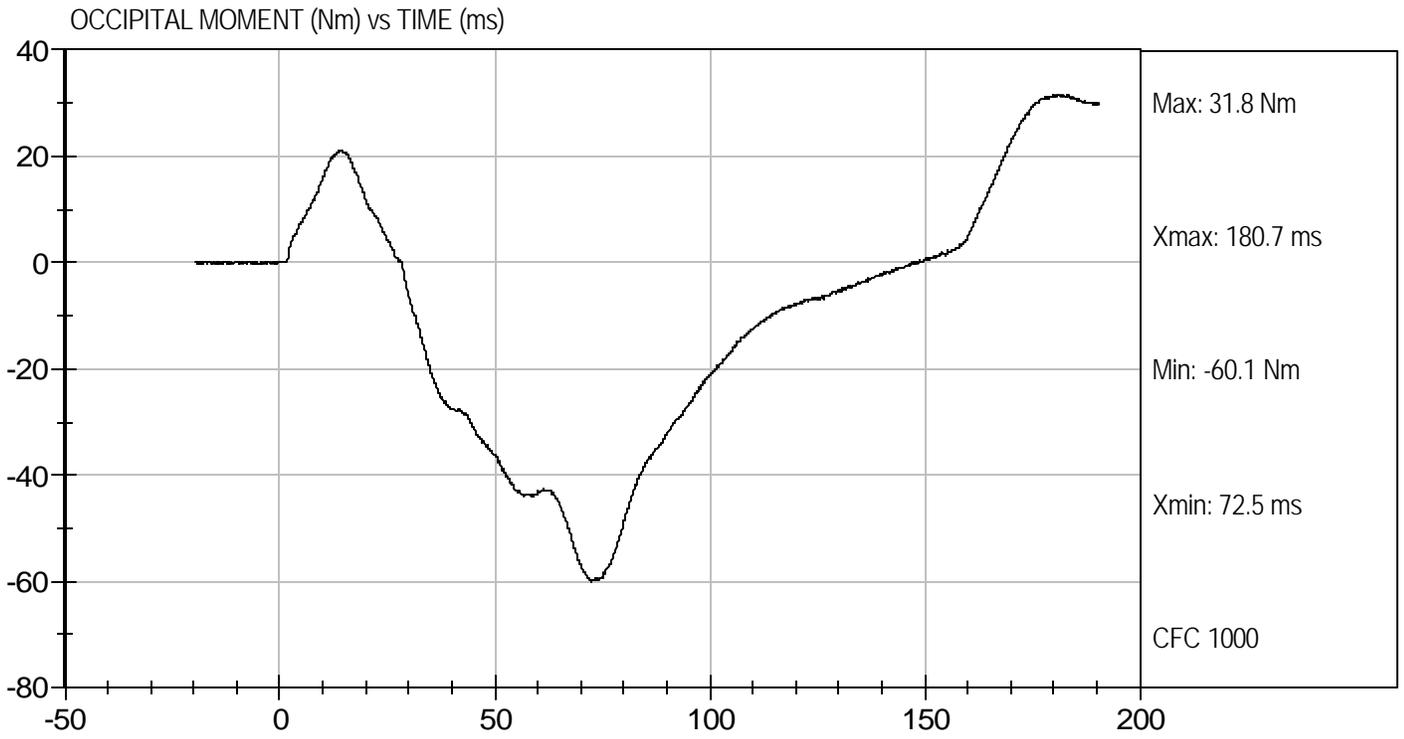
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Extension
Componet ID: D071343

Test Date: 5/15/07
Velocity: 19.84 ft/s, 6.05 m/s



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

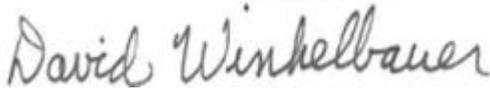
ATD Serial No: 065

Test I.D: D071344

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Probe Velocity	m/s	6.58 to 6.82	6.68	Pass
Peak Probe Force	N	5159 to 5893	5,557	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.73	Pass
Internal Hysteresis	%	69 to 85	71	Pass
			Overall Test Results	Pass


 Laboratory Technician

5/15/07
 Test Date

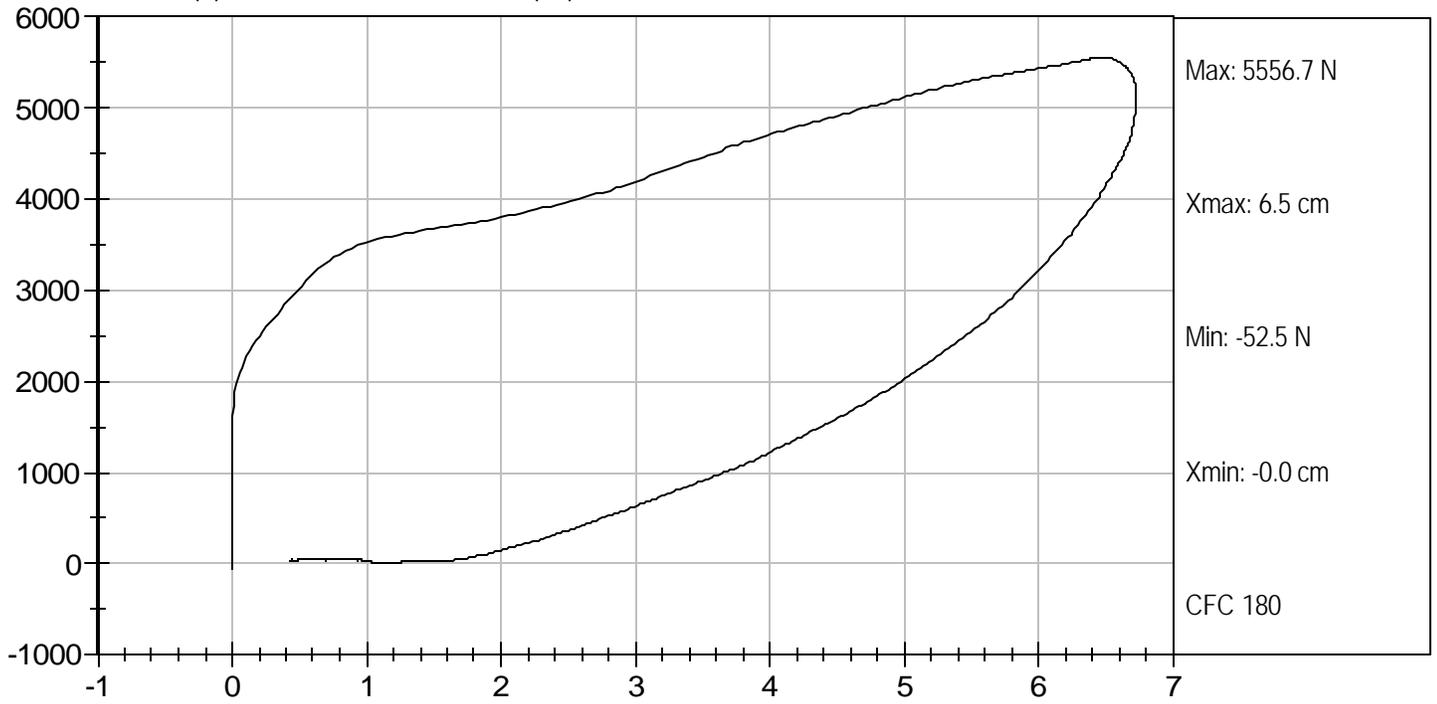

 Approved By



Test Desc: Thorax Impact
Componet ID: D071344

Test Date: 5/15/07
Velocity: 21.92 ft/s, 6.68 m/s

FORCE (N) vs CHEST DISPLACEMENT (cm)



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

ATD Serial No: 065

Test I.D: D071345

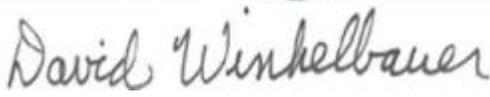
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	41	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	5,444	Pass
Overall Test Results				Pass



Laboratory Technician

5/15/07

Test Date

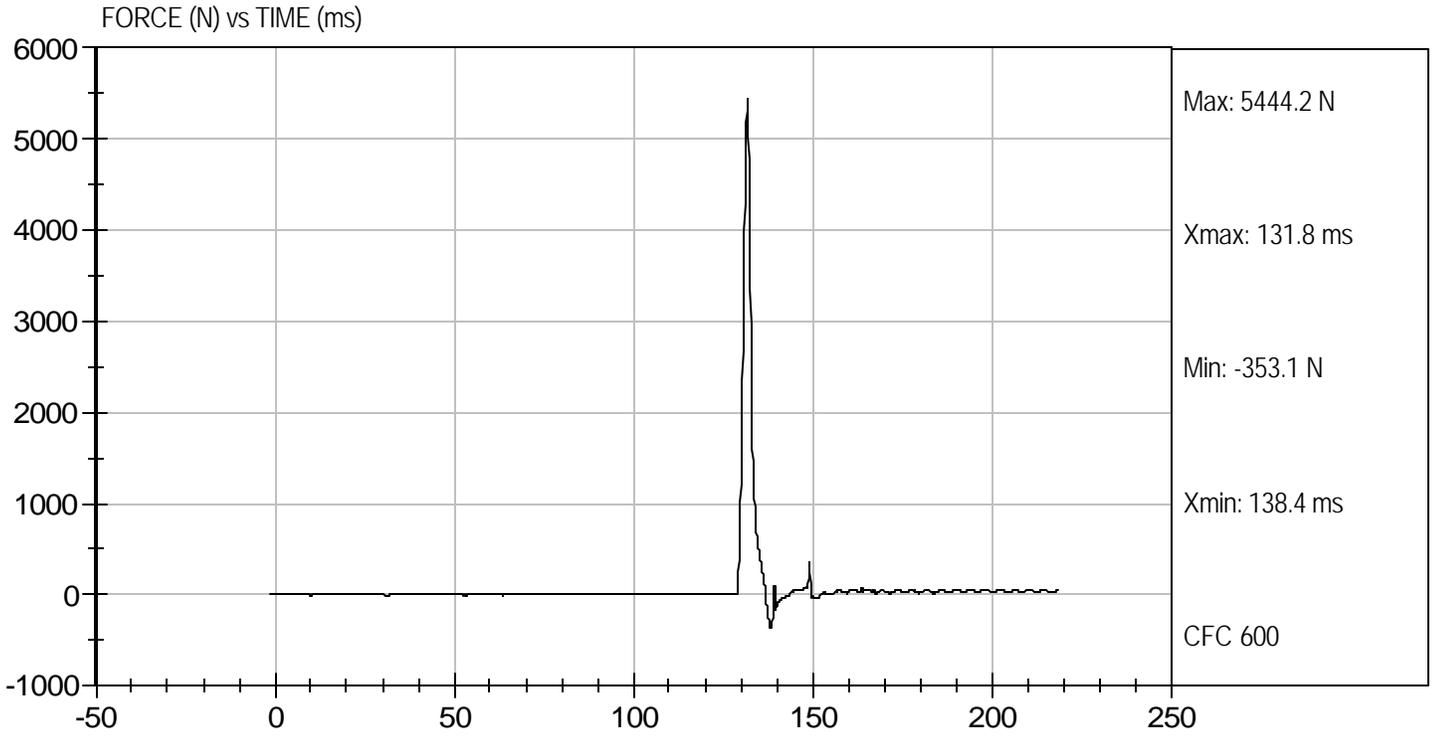


Approved By



Test Desc: Right Knee
Componet ID: D071345

Test Date: 5/15/07
Velocity: 6.91 ft/s, 2.11 m/s



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

ATD Serial No: 065

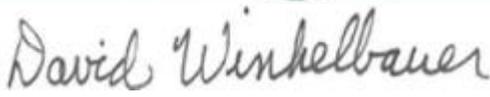
Test I.D: D071346

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	41	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.07	Pass
Peak Probe Force	Newtons	4715 to 5782	5,164	Pass
Overall Test Results				Pass


 Laboratory Technician

5/15/07

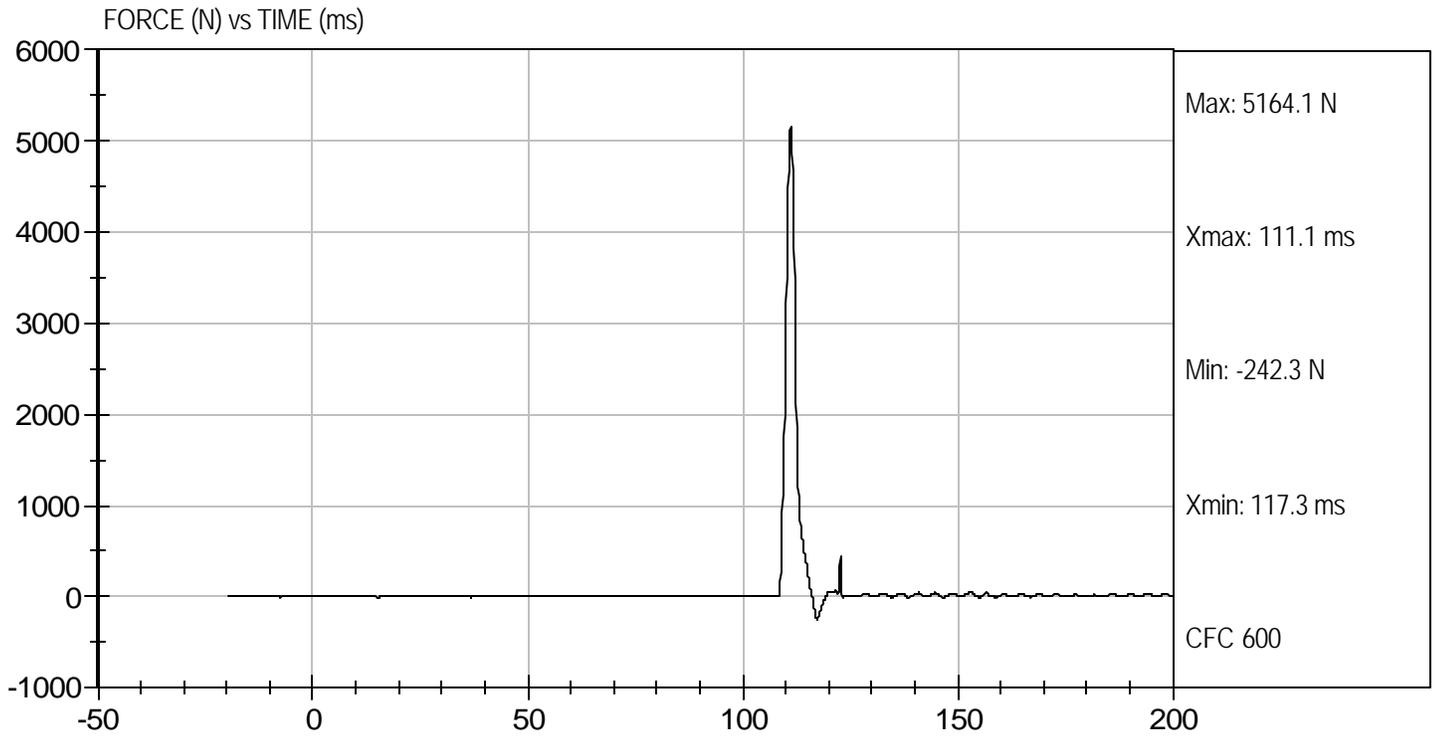
Test Date


 Approved By



Test Desc: Left Knee
Componet ID: D071346

Test Date: 5/15/07
Velocity: 6.803 ft/s, 2.07 m/s



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

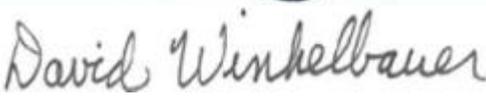
ATD Serial No: 065

Test I.D: D071340

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	39	39	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	62.0	63.0	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	43	41	Pass
Overall Test Results					Pass


 Laboratory Technician

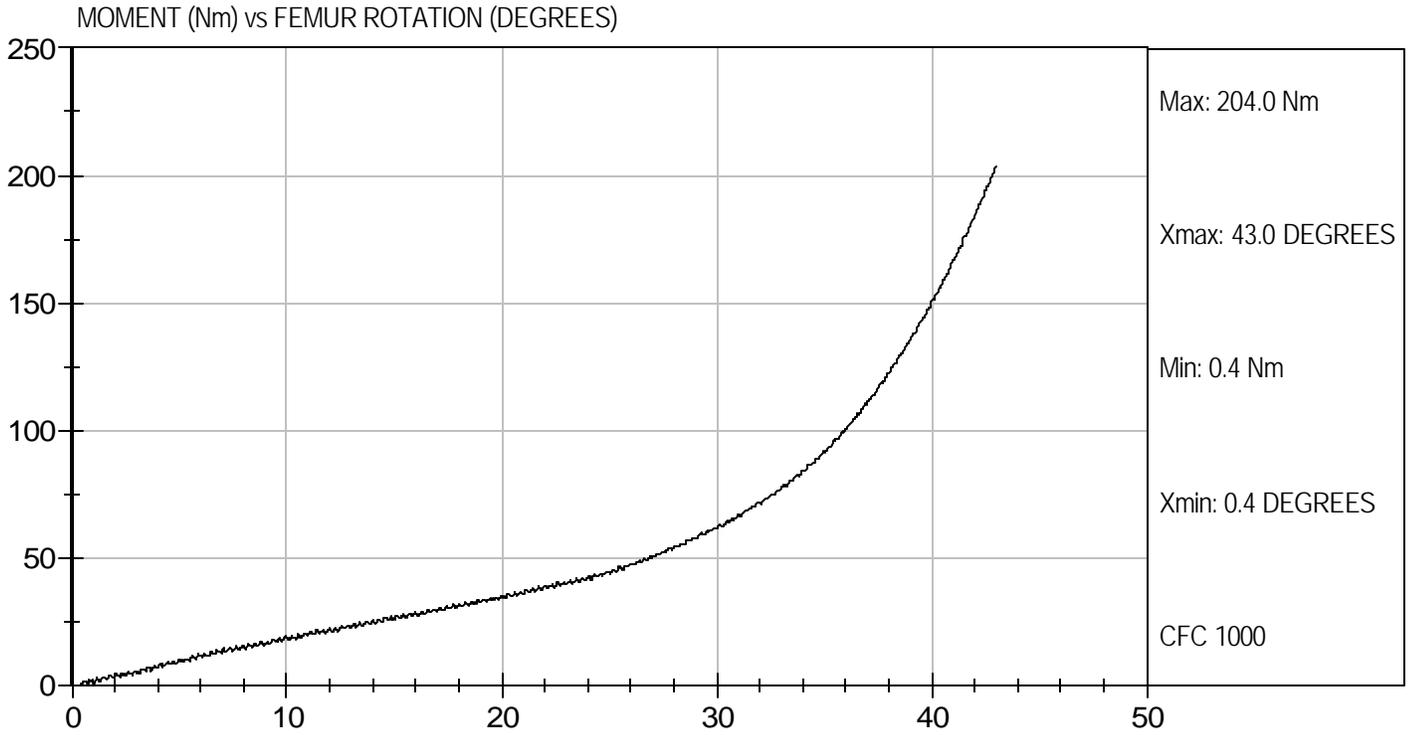
5/14/07
 Test Date


 Approved By



Test Desc: Hip Femur Flexion
Componet ID: D071349

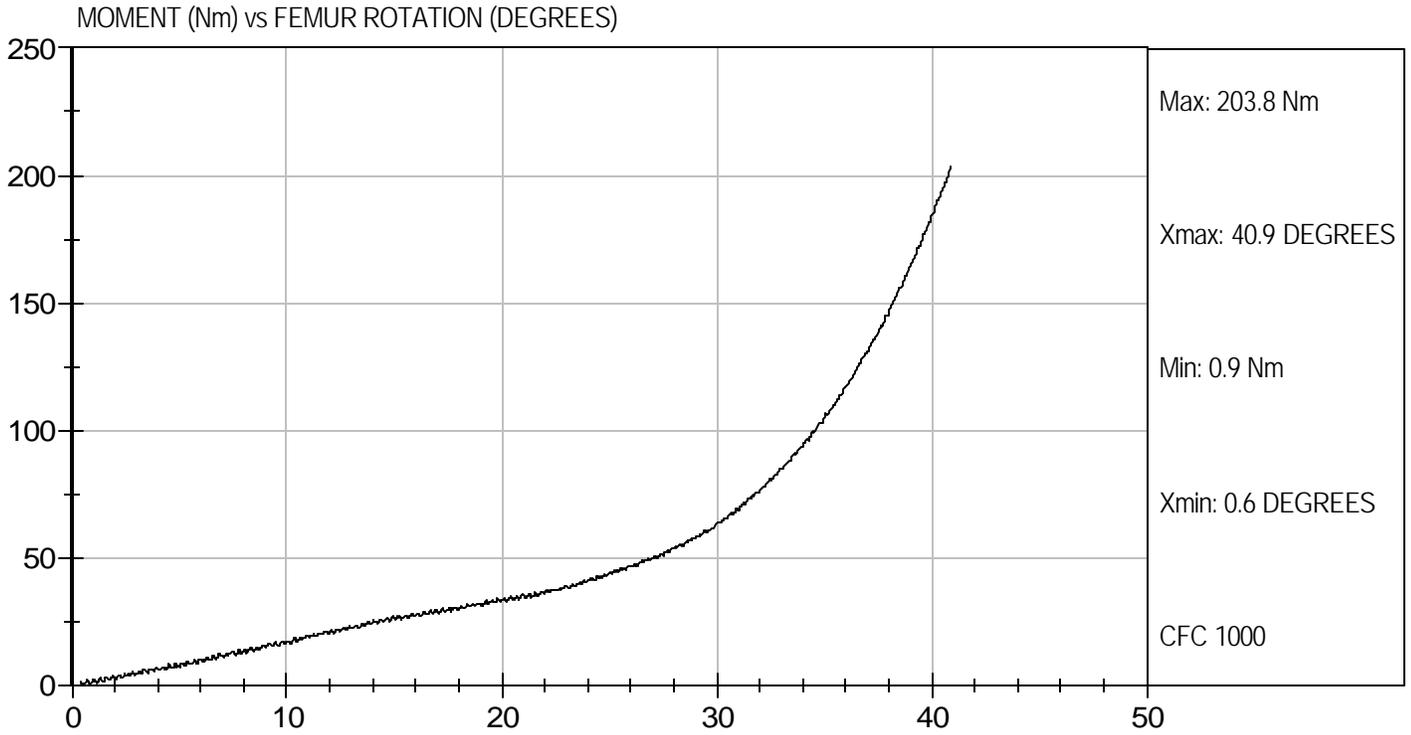
Test Date: 5/14/07
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Componet ID: D071340

Test Date: 5/14/07
Velocity: 0 ft/s, 0.00 m/s



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

ATD Serial No: 066

Test ID: D071351

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Peak Resultant Acceleration	G's	225 - 275	261	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-7.4	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

5/14/07
Test Date

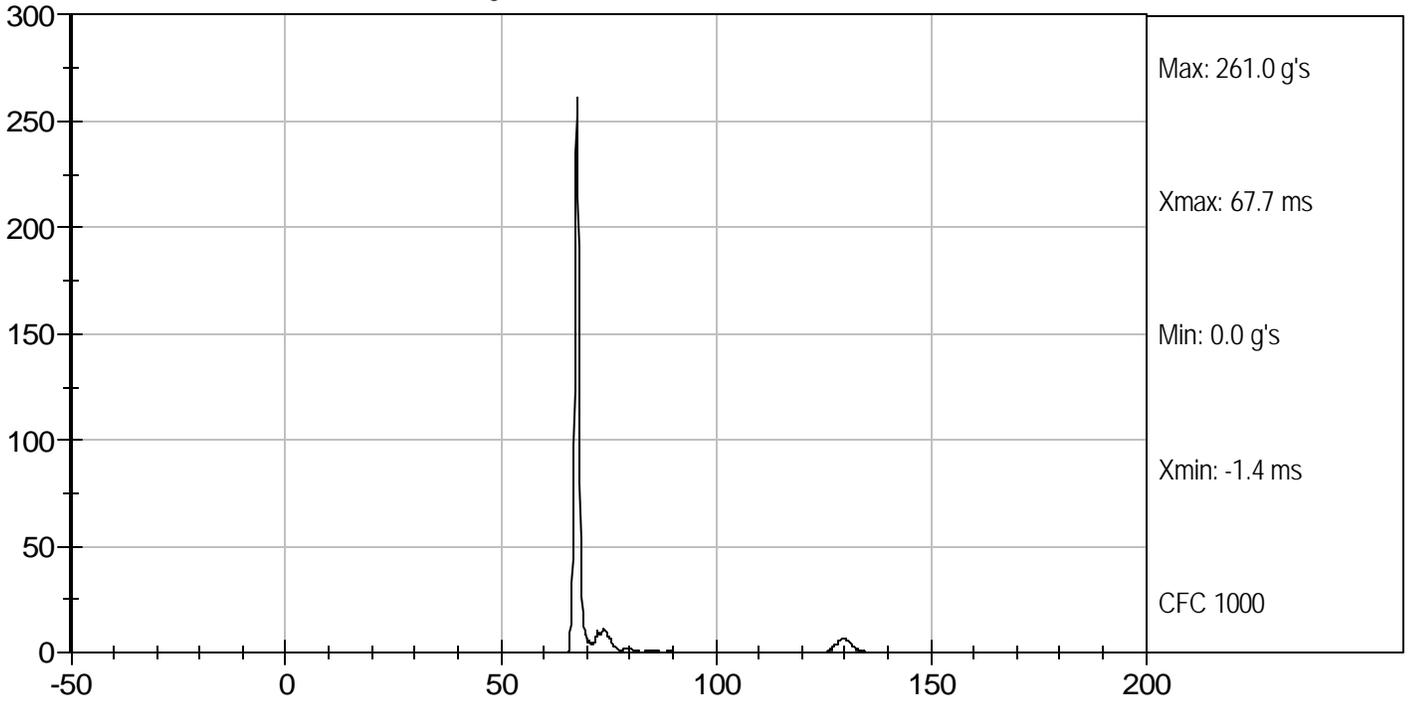
David Winkelbauer
Approved By



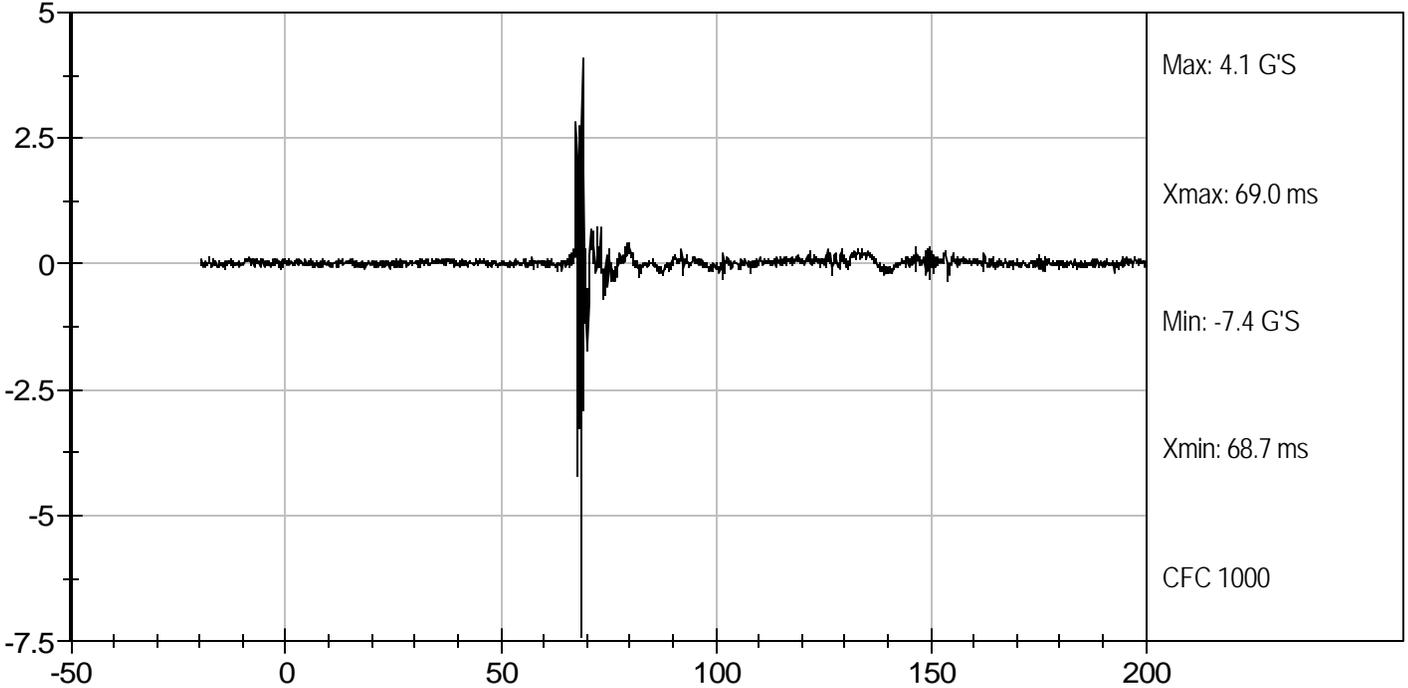
Test Desc: Head Drop
Componet ID: D071351

Test Date: 5/14/07
Velocity: 0 ft/s, 0.00 m/s

HEAD RESULTANT 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: 066

Test I.D.: D071352

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	42	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.96	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	22.73	Pass
	20 msec	G's	17.60 to 22.60	18.05	Pass
	30 msec	G's	12.50 to 18.50	13.59	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	13.65	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	41.3	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	74.3	Pass
	Time	msec	57.0 to 64.0	59.3	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	114.2	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	93.9	Pass
	Time	msec	47.0 to 58.0	52.3	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	100.3	Pass
Overall Test Results					Pass

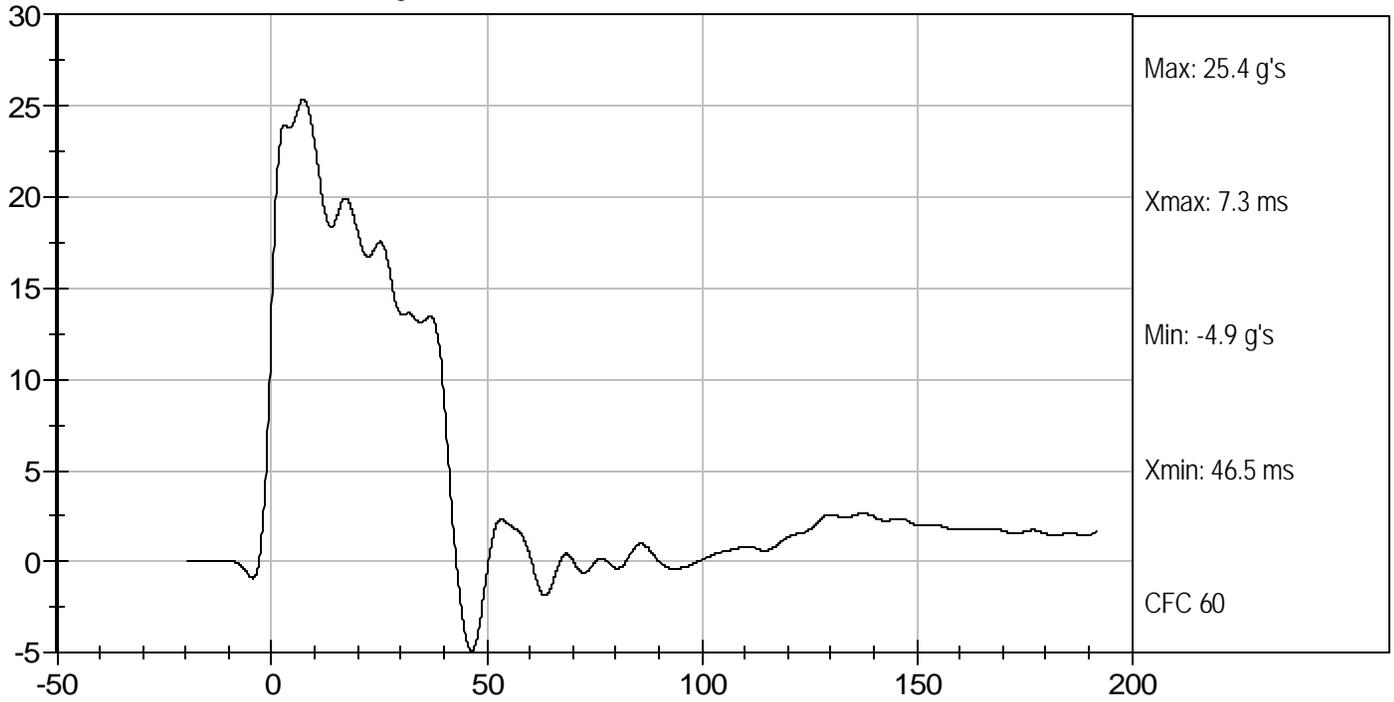

Laboratory Technician

5/15/07
Test Date

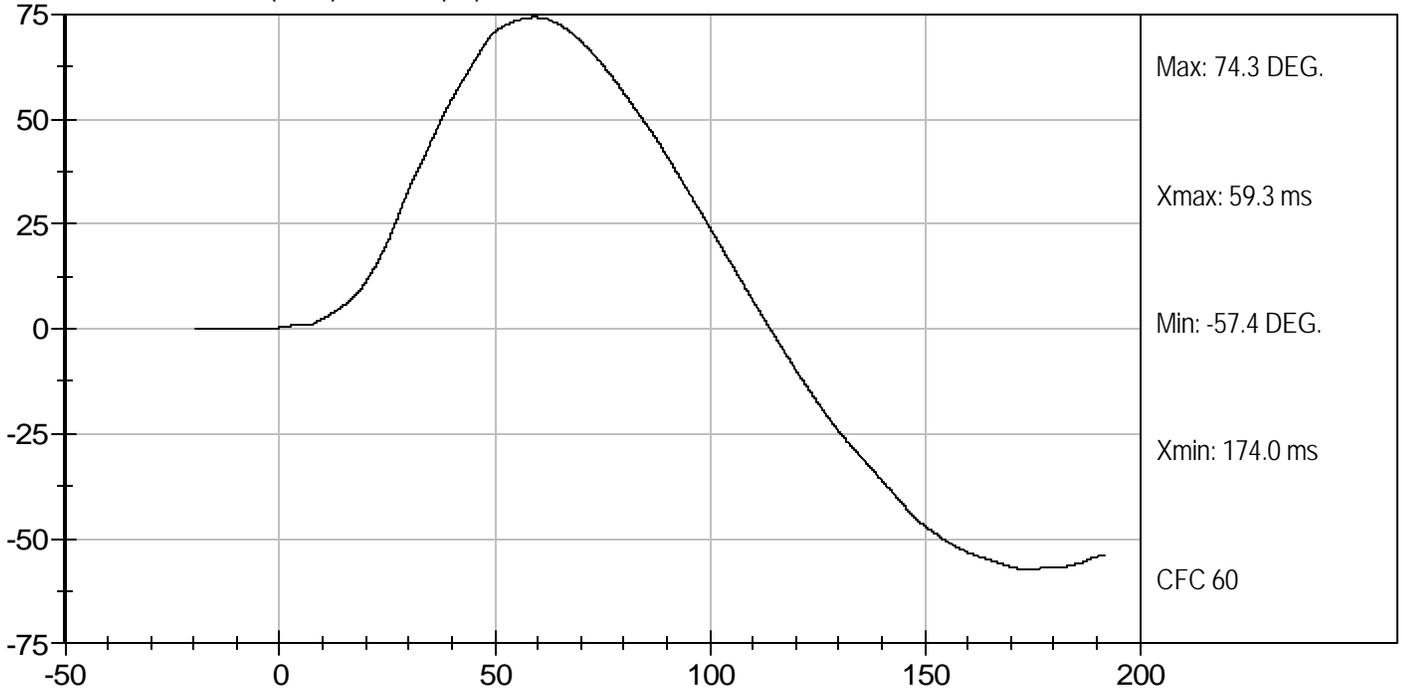

Approved By



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



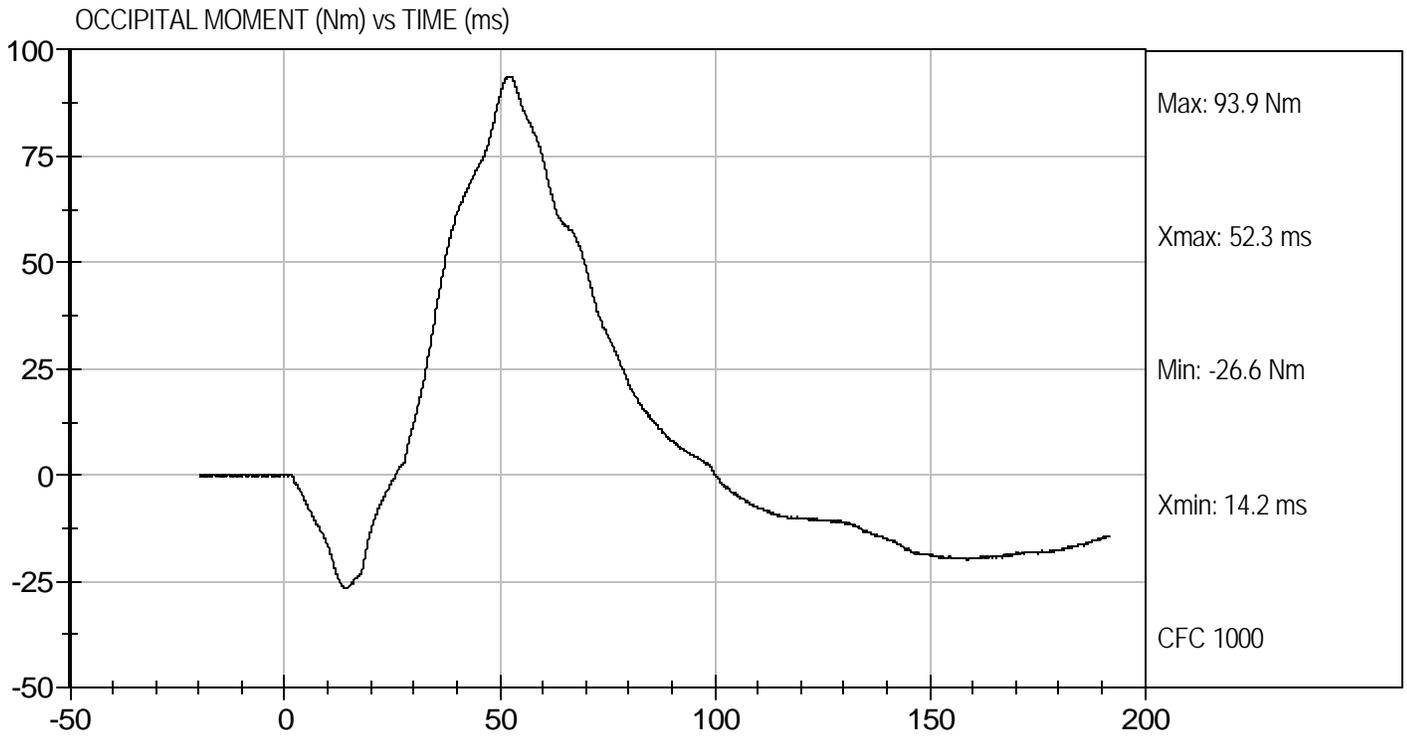
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Flexion
Componet ID: D071352

Test Date: 5/15/07
Velocity: 22.83 ft/s, 6.96 m/s



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

ATD Serial No: 066

Test I.D.: D071353

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	43	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.05	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	19.12	Pass
	20 msec	G's	14.00 to 19.00	16.06	Pass
	30 msec	G's	11.00 to 16.00	12.73	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	12.69	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	38.2	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	98.9	Pass
	Time	msec	72.0 to 82.0	75.2	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	155.4	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-61.1	Pass
	Time	msec	65.0 to 79.0	71.9	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	147.0	Pass
Overall Test Results					Pass

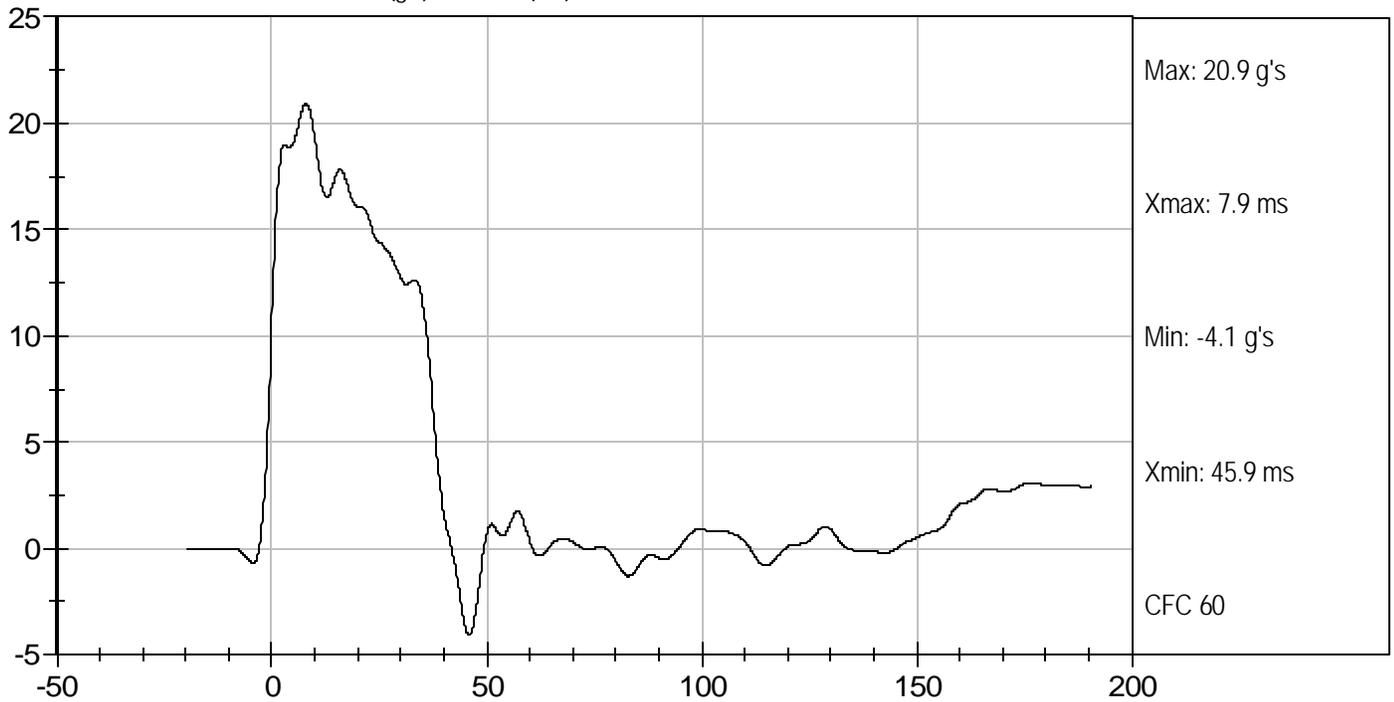

Laboratory Technician

5/15/07
Test Date

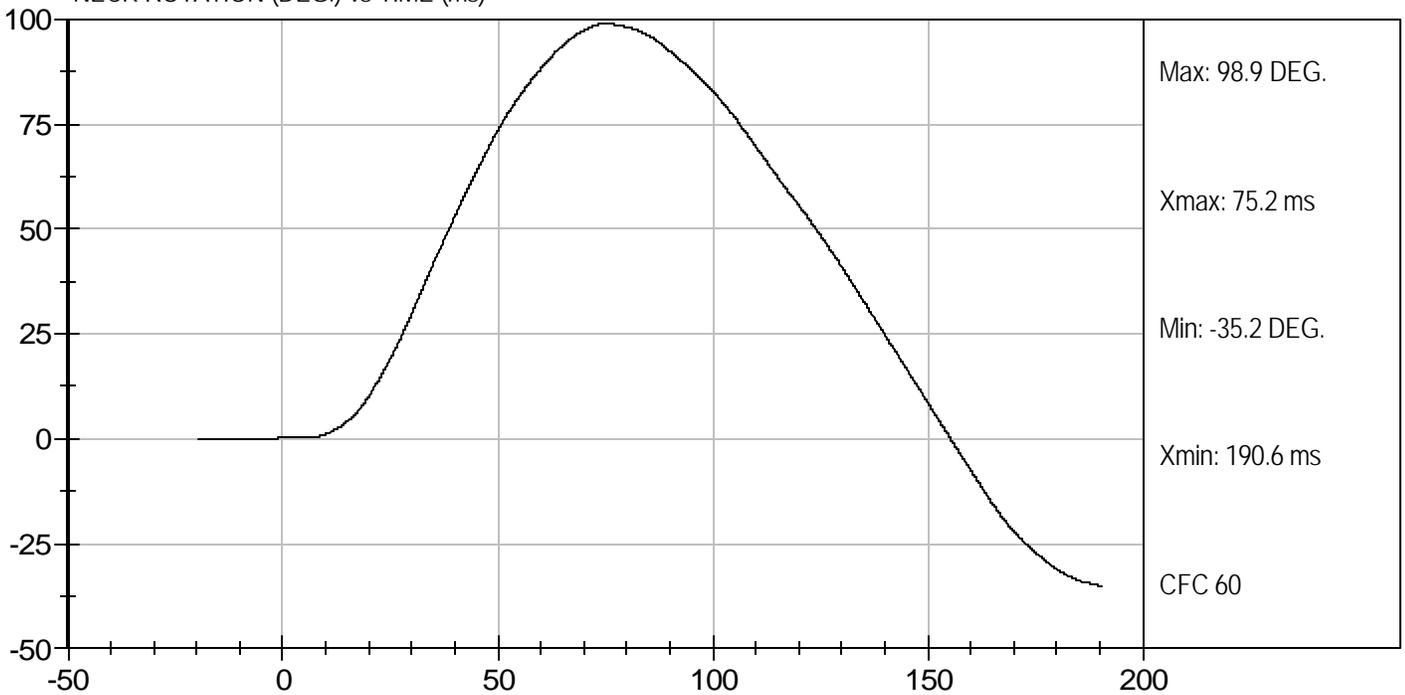

Approved By



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



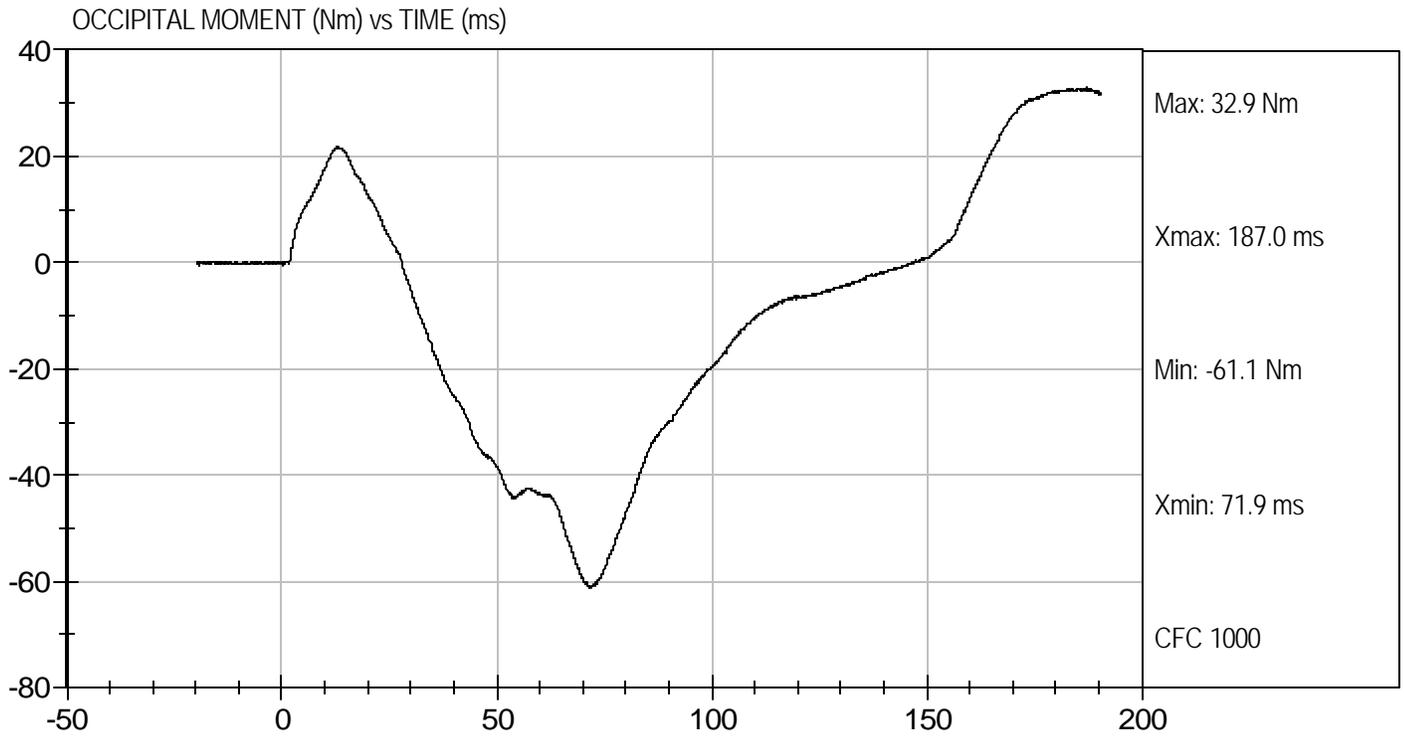
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Extension
Componet ID: D071353

Test Date: 5/15/07
Velocity: 19.84 ft/s, 6.05 m/s



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

ATD Serial No: 066

Test I.D: D071354

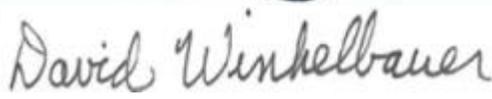
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	38	Pass
Probe Velocity	m/s	6.58 to 6.82	6.68	Pass
Peak Probe Force	N	5159 to 5893	5,450	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.49	Pass
Internal Hysteresis	%	69 to 85	69	Pass
Overall Test Results				Pass



 Laboratory Technician

5/16/07

 Test Date



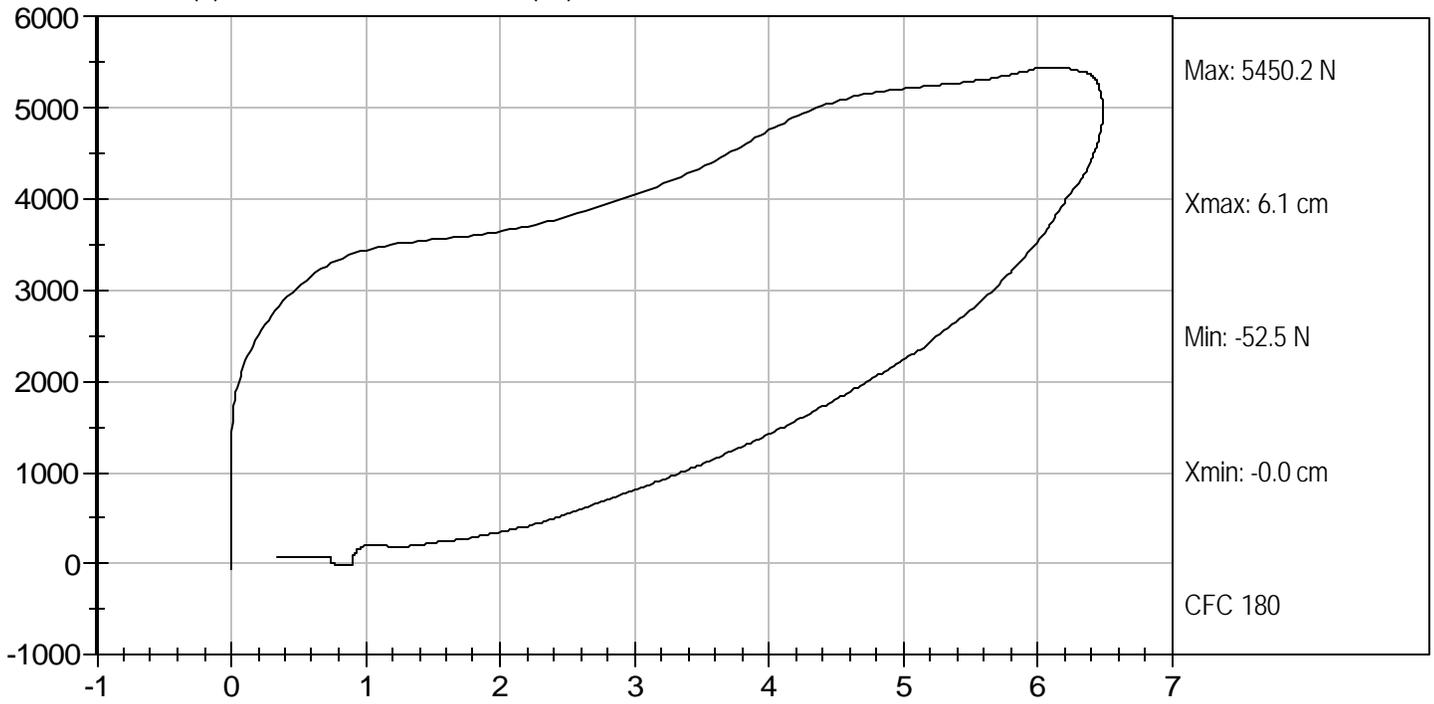
 Approved By



Test Desc: Thorax Impact
Componet ID: D071354

Test Date: 5/16/07
Velocity: 21.92 ft/s, 6.68 m/s

FORCE (N) vs CHEST DISPLACEMENT (cm)

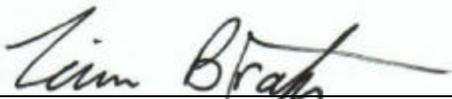


MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066

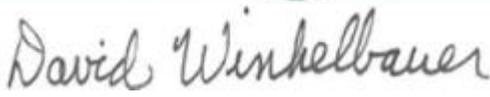
Test I.D.: D071355

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	41	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.08	Pass
Peak Probe Force	Newtons	4715 to 5782	4,926	Pass
Overall Test Results				Pass


 Laboratory Technician

5/15/07

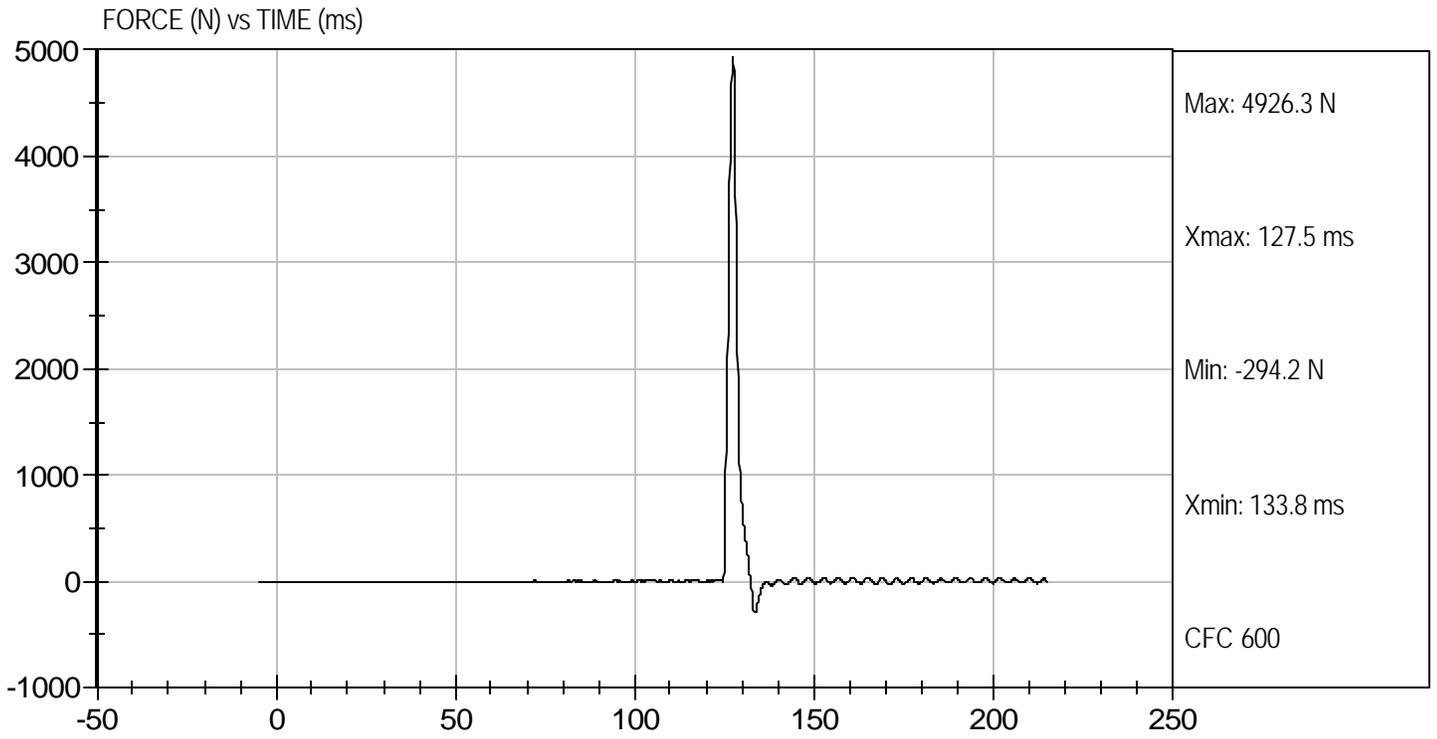
Test Date


 Approved By



Test Desc: Right Knee
Componet ID: D071355

Test Date: 5/15/07
Velocity: 6.83 ft/s, 2.08 m/s

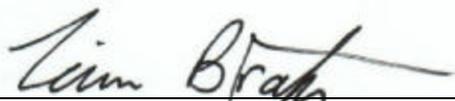


MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066

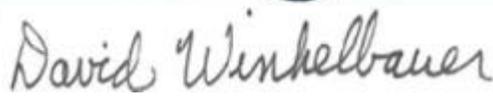
Test I.D: D071356

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	42	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.08	Pass
Peak Probe Force	Newtons	4715 to 5782	4,838	Pass
Overall Test Results				Pass


 Laboratory Technician

5/15/07

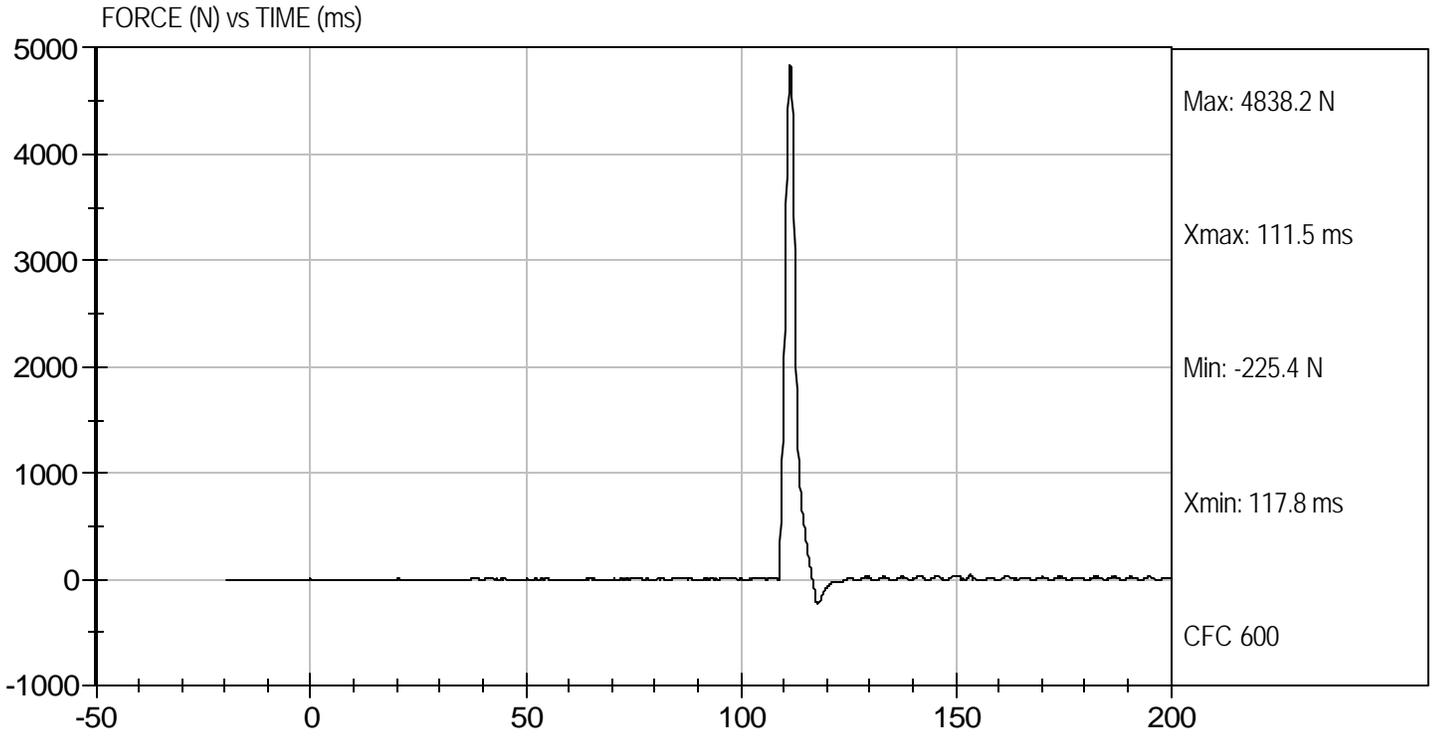
Test Date


 Approved By



Test Desc: Left Knee
Componet ID: D071356

Test Date: 5/15/07
Velocity: 6.83 ft/s, 2.08 m/s



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

ATD Serial No: 066

Test I.D: D071350

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.9	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	37	37	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	62.4	56.1	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	42	42	Pass
Overall Test Results					Pass


 Laboratory Technician

5/14/07
 Test Date

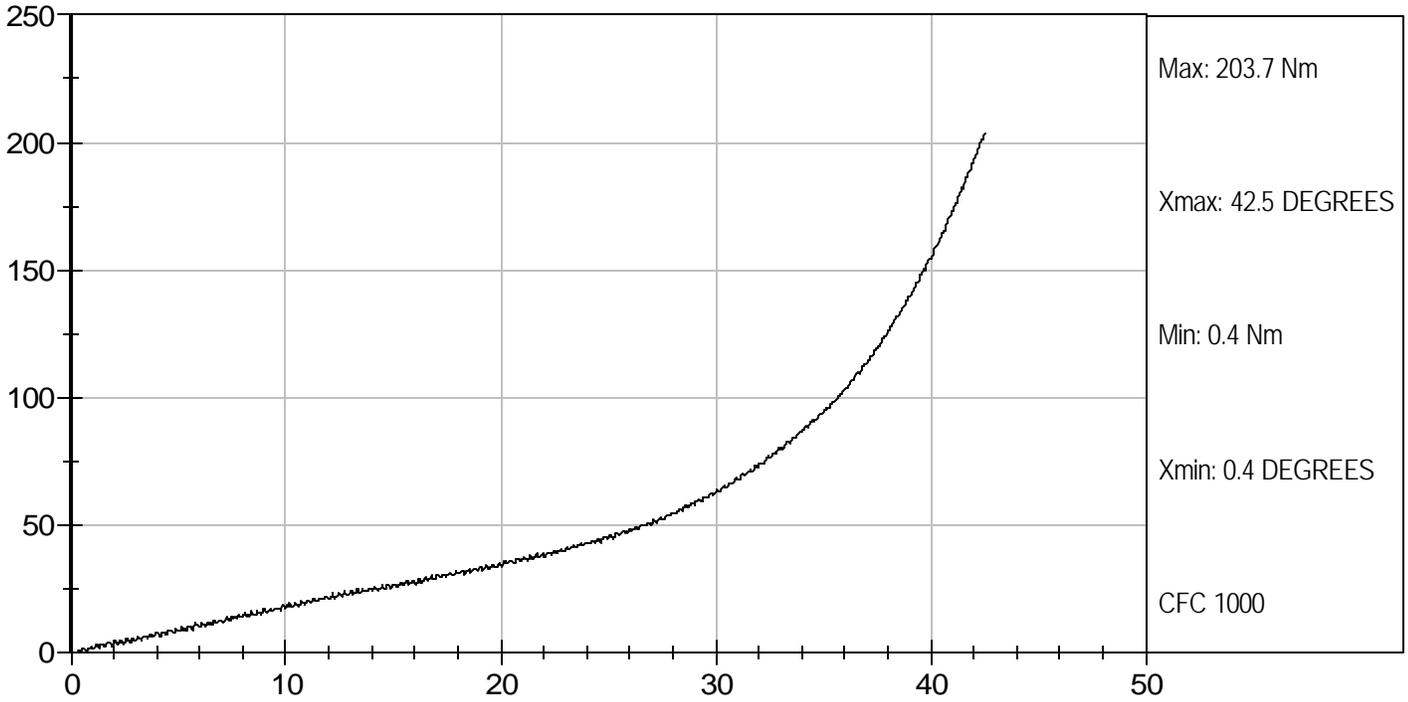

 Approved By



Test Desc: Hip Femur Flexion
Componet ID: D071359

Test Date: 5/14/07
Velocity: 0 ft/s, 0.00 m/s

MOMENT (Nm) vs FEMUR ROTATION (DEGREES)





Test Desc: Hip Femur Flexion
Componet ID: D071350

Test Date: 5/14/07
Velocity: 0 ft/s, 0.00 m/s

MOMENT (Nm) vs FEMUR ROTATION (DEGREES)

