

REPORT NUMBER: NCAP-MGA-2008-007

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

**TOYOTA MOTOR CORPORATION
2008 TOYOTA YARIS 3-DOOR LIFTBACK
NHTSA NUMBER: M85116**

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



Test Date: October 10, 2007

Final Report Date: November 15, 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 Toyota Yaris 3-Door Liftback at MGA Research Corporation on October 10, 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 56.2 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 517 mm located to the left 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 border="1" style="width: 100%; margin-top: 10px; 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>390</td> <td>559</td> </tr> <tr> <td>Max. Thorax Accel. (3ms Clip)</td> <td>G's</td> <td>60</td> <td>43</td> <td>42</td> </tr> <tr> <td>Left Femur Force</td> <td>Newton</td> <td>10009</td> <td>-6035</td> <td>-5222</td> </tr> <tr> <td>Right Femur Force</td> <td>Newton</td> <td>10009</td> <td>-5327</td> <td>-599</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	390	559	Max. Thorax Accel. (3ms Clip)	G's	60	43	42	Left Femur Force	Newton	10009	-6035	-5222	Right Femur Force	Newton	10009	-5327	-599
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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 Toyota Yaris 3-Door Liftback at a velocity of 56.2 kph. The test was performed at MGA Research Corporation on October 10, 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 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 517 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. 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	390	60.4	96.4	43	52.0	55.0	-22	-6035	-5327
Passenger	559	61.6	86.3	42	59.7	62.7	-21	-5222	-599

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

TEST NOTES

There was no valid data collected for:
Bottom of Engine X after 20 msec.
Right Brake Caliper after 30 msec.
Left Brake Caliper after 30 msec.

SECTION 2
OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1
CRASH TEST SUMMARY

Test Vehicle: 2008 Toyota Yaris 3-Door Liftback
 Test Program: 35mph Frontal Impact

NHTSA No.: M85116
 Test Date: 10/10/2007

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)	None	None
Seat Back Failure	None	None
Glazing Damage	None	

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	1500
Center	mm	1435
Right Side	mm	1360
Average	mm	1432

BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	977	949
Lap belt length as measured on ATD	mm	902	891
Remainder of belt on reel	mm	1592	1715
Total belt length for continuous webbing systems	mm	3471	3555

DATA SHEET NO. 2
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2008 Toyota Yaris 3-Door Liftback
 Test Program: 35mph Frontal Impact

NHTSA No.: M85116
 Test Date: 10/10/2007

TEST VEHICLE INFORMATION

Manufacturer	Toyota
Model	Yaris
Body Style	3-Door Liftback
NHTSA No.	M85116
VIN	JTDJT923285140508
Color	Bayou Blue
Delivery Date	9/20/2007
Odometer Reading (mile)	41
Dealer	Wilde Toyota
Transmission	Manual Overdrive
Final Drive	Front
Number of Cylinders	4
Engine Displacement (L)	1.5
Engine Placement	Lateral
Automatic Door Lock (ADL)	No
Owners Manual Details Instructions on Disabling ADLs	N/A
Bucket Seats	Yes

TEST VEHICLE OPTIONS

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

DATA FROM CERTIFICATION LABEL

Manufactured By	Toyota Motor Corporation
Date of Manufacture	08/07

GVWR (kg)	1445
GAWR Front (kg)	830
GAWR Rear (kg)	830

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench		
Number of Occupants	2	3		5
Capacity Wt. (VCW) (kg)				383
Cargo Wt. (RCLW) (kg)				43

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

Test Vehicle: 2008 Toyota Yaris 3-Door Liftback
 Test Program: 35mph Frontal Impact

NHTSA No.: M85116
 Test Date: 10/10/2007

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	320.2	207.7		370.1	256.7	
Right	kg	314.3	208.7		364.7	253.1	
Ratio	%	60.4	39.6		59.0	41.0	
Totals	kg	634.5	416.4	1050.9	734.8	509.8	1244.6

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1050.9
Weight of 2 P572E ATDs	kg	156.0
Rated Cargo/Luggage Weight (RCLW)	kg	43
Calculated Vehicle Target Weight (TVTW)	kg	1249.9

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	676	673	673	672	976
As Tested	mm	640	638	638	642	1009
Post Test	mm	633	647	634	625	

Vehicle Wheelbase (mm): 2463

Weight of Ballast secured in cargo area (kg): 0

Vehicle Components Removed: Cargo carpet, spare tire, jack, spare tire lid, rear windows, tail lights, hub caps, rear floor mats, rear bumper and cover, exhaust, heat shields, rear seatbelt retractors, rear tail gate, mirrors, headrest on rear seat.

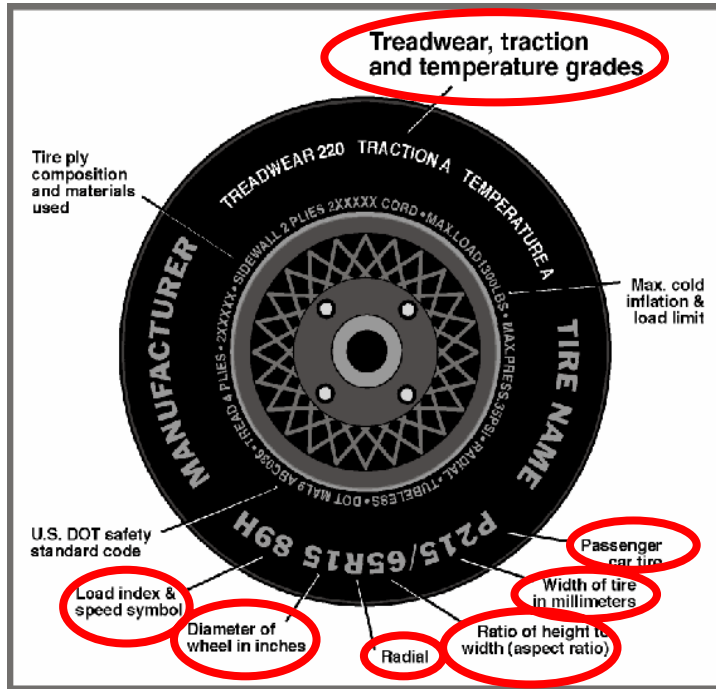
Ballast weight does not include instrumentation and data acquisition system.

DATA SHEET NO. 3

TEST VEHICLE TIRE INFORMATION

Test Vehicle: 2008 Toyota Yaris 3-Door Liftback
 Test Program: 35mph Frontal Impact

NHTSA No.: M85116
 Test Date: 10/10/2007



DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	220	220
Recommended Tire Size	P185/60R15	P185/60R15
Tire Size on Vehicle	P185/60R15	P185/60R15
Tire Manufacturer	Bridgestone	Bridgestone
Tire Name	Potenza	Potenza
Tire Type	Passenger	Passenger
Tire Width (mm)	185	185
Ratio of Height to Width (aspect ratio)	60	60
Radial	R	R
Wheel Diameter	15	15
Load Index & Speed Symbol	84T	84T
Treadwear	160	160
Traction Grade	A	A
Temperature Grade	A	A

DATA SHEET NO. 4 **TEST VEHICLE INFORMATION**

Test Vehicle: 2008 Toyota Yaris 3-Door Liftback
 Test Program: 35mph Frontal Impact

NHTSA No.: M85116
 Test Date: 10/10/2007

NORMAL DESIGN RIDING POSITION

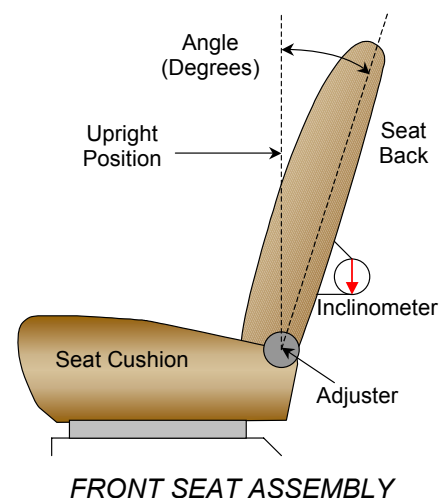
The driver and passenger seat back is positioned to the manufacturer's designated angle. The procedure is as follows: For both the driver and front passenger set in the 6th detent with the forward-most detent defined as 0 (26 total detents).

Driver seat back angle: 6th detent (1st as 0)

Passenger seat back angle: 6th detent (1st as 0)

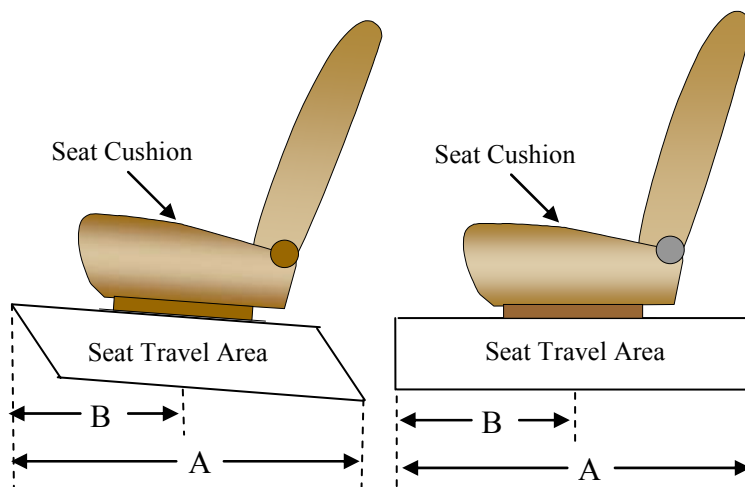
SEAT FORE/AFT POSITIONING

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	17 detents	8 th detent (1 st as 0)
Passenger Seat	17 detents	8 th detent (1 st as 0)



ADJUSTABLE D-RING POSITION

The driver and passenger D-rings are non-adjustable.



DATA SHEET NO. 4...(CONTINUED)

TEST VEHICLE INFORMATION

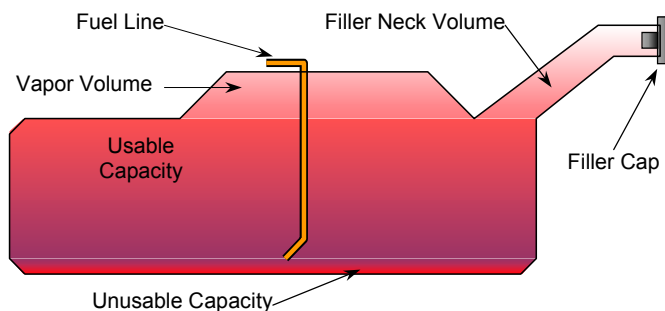
Test Vehicle: 2008 Toyota Yaris 3-Door Liftback
Test Program: 35mph Frontal Impact

NHTSA No.: M85116
Test Date: 10/10/2007

FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank"	42.0
Usable Capacity of "Optional" Tank	
92-94% of Usable Capacity	38.6 – 39.5
Actual Amount of Solvent used	15.1
1/3 of Usable Capacity	14

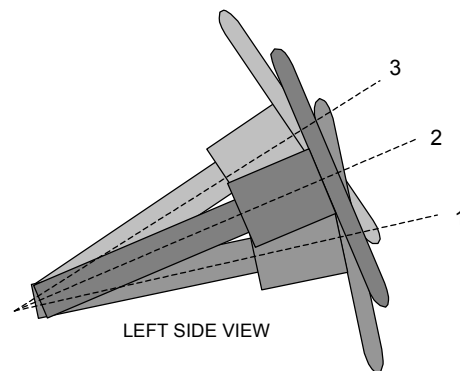
The test vehicle is equipped with an electric fuel pump. The fuel pump will pump fuel when the ignition is on.



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

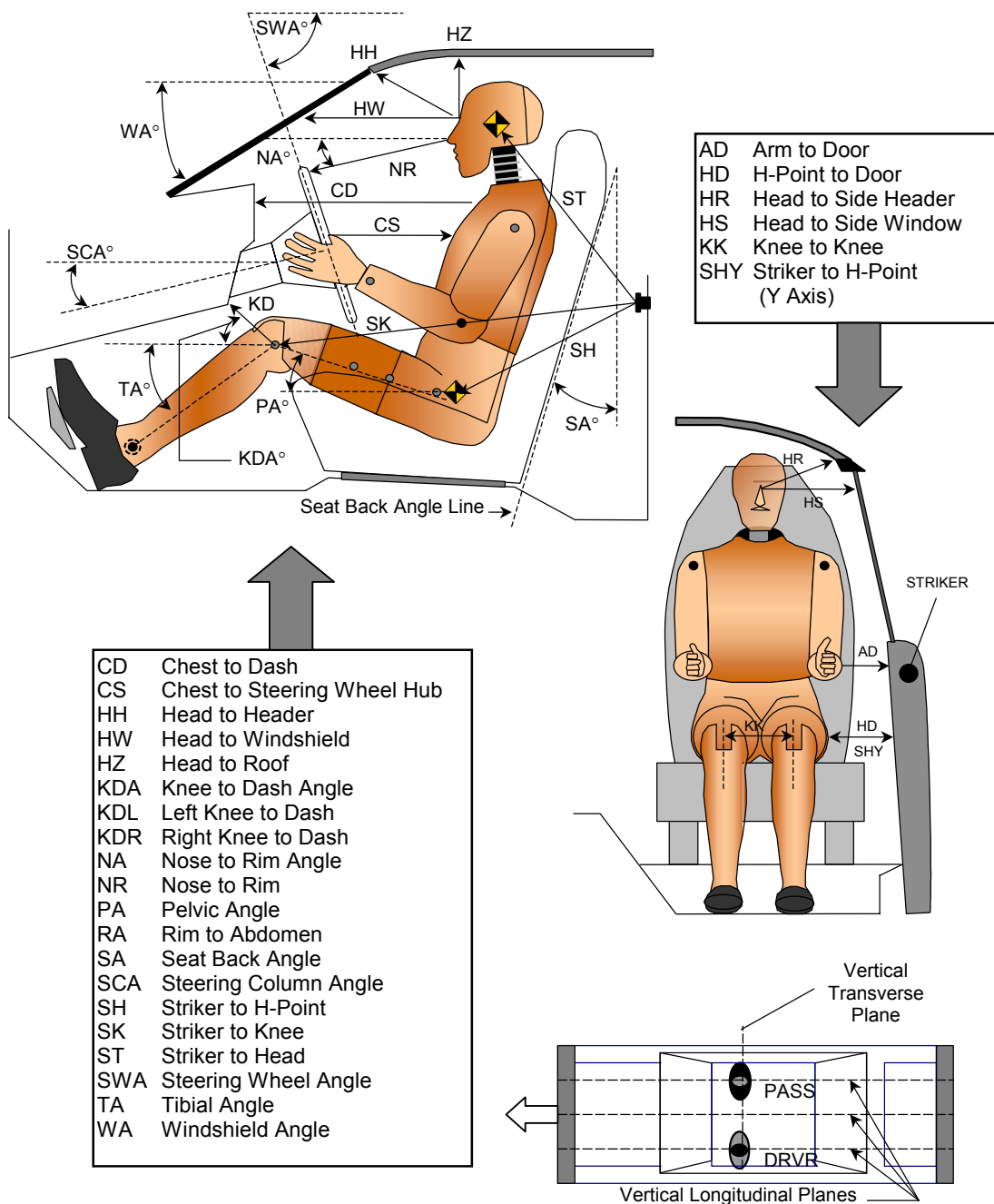
	Fore/Aft Position (mm)	Degrees
Lowermost position No. 1		60.5
Geometric center position No. 2		62.3
Uppermost position No. 3		64.0

DATA SHEET NO. 5 **DUMMY POSITIONING IN VEHICLE**

Test Vehicle: 2008 Toyota Yaris 3-Door Liftback
 Test Program: 35mph Frontal Impact

NHTSA No.: M85116
 Test Date: 10/10/2007

DUMMY MEASUREMENTS FOR FRONT SEAT OCCUPANTS



DATA SHEET NO. 5... (CONTINUED)

DUMMY POSITIONING IN VEHICLE

Test Vehicle: 2008 Toyota Yaris 3-Door Liftback
 Test Program: 35mph Frontal Impact

NHTSA No.: M85116
 Test Date: 10/10/2007

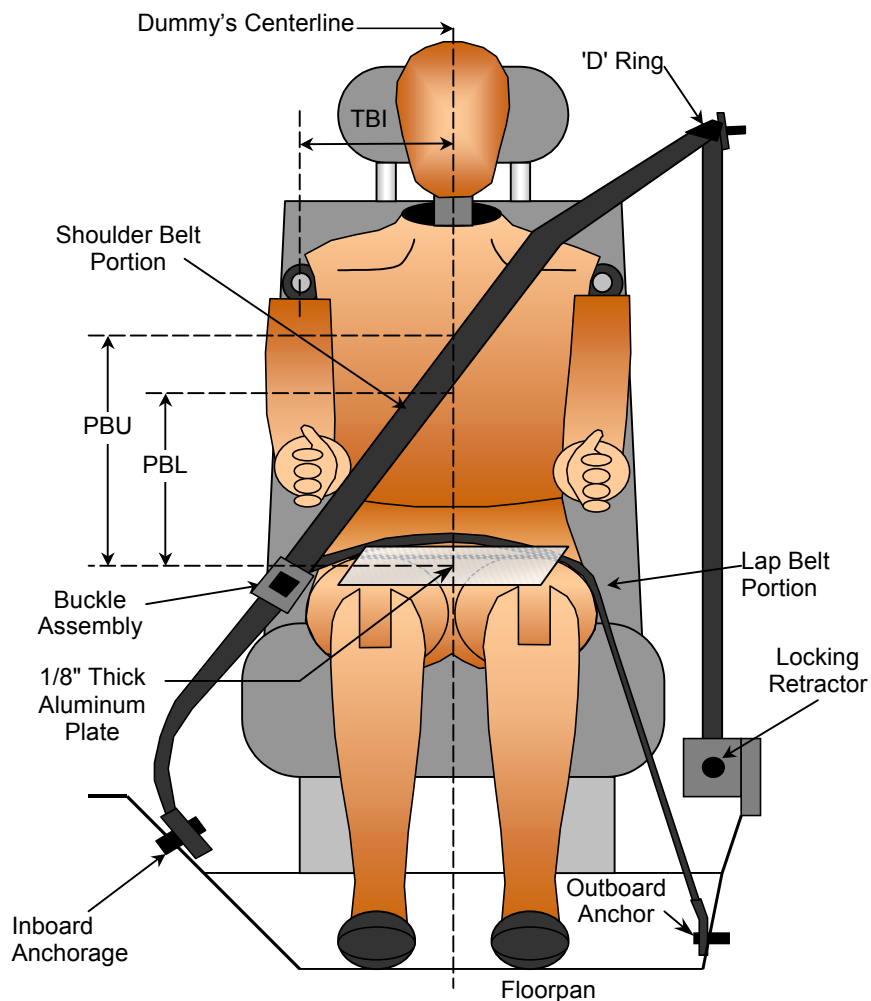
TEST DUMMY POSITION MEASUREMENTS

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA	Windshield Angle		26.4		
SWA	Steering Wheel Angle		62.3		
SCA	Steering Column Angle		27.8		
SA	Seat Back Angle (on headrest post)		1.6		1.9
HZ	Head to Roof (Z)	185	90	186	90
HH	Head to Header	355	17.4	377	18.7
HW	Head to Windshield	641	0	651	0
HR	Head to Side Header (Y)	214		211	
NR	Nose to Rim	424	18.0		
CD	Chest to Dash	644		527	
CS	Chest to Steering Hub	317	4.0		
RA	Rim to Abdomen	183	0		
KDL	Left Knee to Dash	151	16.2	151	
KDR	Right Knee to Dash	132		175	19.2
PA	Pelvic Angle		22.4		21.7
TA	Tibia Angle		53.2		55.7
KK	Knee to Knee (Y)	322		285	
SK	Striker to Knee	782	96.8	784	97.2
ST	Striker to Head	518	29.5	517	32.3
SH	Striker to H-Point	455	118.9	453	119.0
SHY	Striker to H-Point (Y)	247		247	
HS	Head to Side Window	321		322	
HD	H-Point to Door (Y)	138		139	
AD	Arm to Door (Y)	96		136	
AA	Ankle to Ankle	337		230	

DATA SHEET NO. 6 **SEAT BELT POSITIONING DATA**

Test Vehicle: 2008 Toyota Yaris 3-Door Liftback
 Test Program: 35mph Frontal Impact

NHTSA No.: M85116
 Test Date: 10/10/2007



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	335	335
PBL - To surface of reference to belt lower edge	mm	255	255

DATA SHEET NO. 7
VEHICLE ACCELEROMETER LOCATIONS

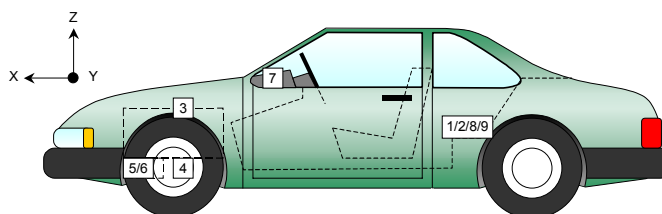
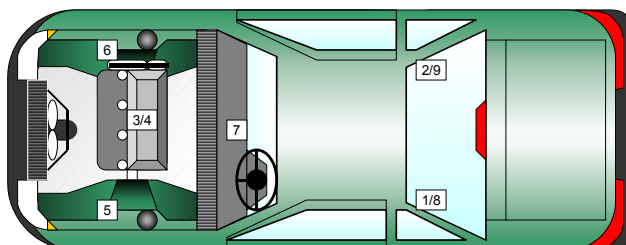
Test Vehicle: 2008 Toyota Yaris 3-Door Liftback
 Test Program: 35mph Frontal Impact

NHTSA No.: M85116
 Test Date: 10/10/2007

VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear X-Member X	1080	-508	280
2	Right Rear X-Member X	1080	575	280
3	Engine Top X	3045	0	779
4	Engine Bottom X	3087	15	305
5	Left Brake Caliper X	3007	-643	240
6	Right Brake Caliper X	3009	643	240
7	Instrument Panel X			
8	Left Rear X-Member Z	1080	-508	280
9	Right Rear X-Member Z	1080	575	280

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 Toyota Yaris 3-Door Liftback
 Test Program: 35mph Frontal Impact

NHTSA No.: M85116
 Test Date: 10/10/2007

Windshield Mounting Details:

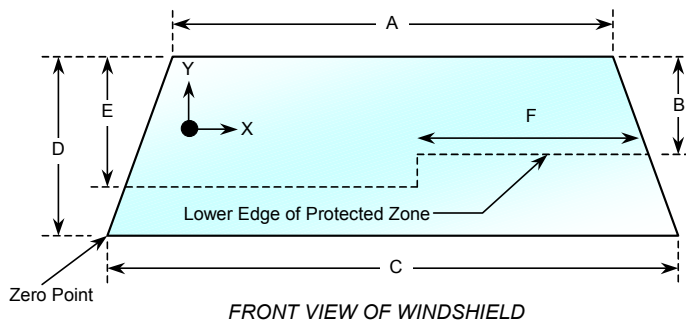
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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	2057	2057	100
Right Side	2057	2057	100
Total	4114	4114	100



Item	Units	Value
A	mm	1096
B	mm	622
C	mm	1348
D	mm	835
E	mm	616
F	mm	493

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 Toyota Yaris 3-Door Liftback
 Test Program: 35mph Frontal Impact

NHTSA No.: M85116
 Test Date: 10/10/2007

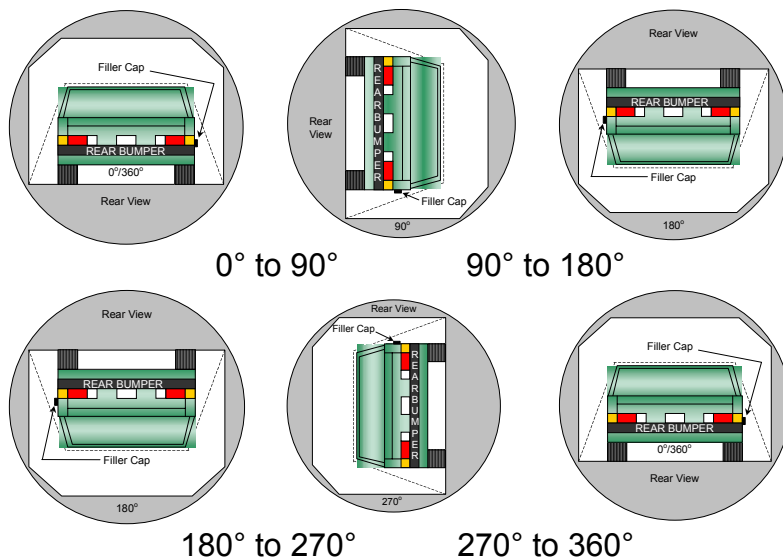
FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21° C Test Time: 11:27 am

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°	125	300	0
90° to 180°	117	300	0
180° to 270°	111	300	0
270° to 360°	113	300	0

DATA SHEET NO. 10
VEHICLE MEASUREMENTS

Test Vehicle: 2008 Toyota Yaris 3-Door Liftback
Test Program: 35mph Frontal Impact

NHTSA No.: M85116
Test Date: 10/10/2007

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total length of vehicle at centerline	mm	3641	3128	513
2	RSOV to front of engine	mm	3252	2980	436
3	RSOV to firewall centerline	mm	2847	2814	197
4	RSOV to leading edge of right door	mm	2485	2474	11
5	RSOV to leading edge of left door	mm	2488	2495	-7
6	RSOV to lower leading edge of right door	mm	2453	2443	10
7	RSOV to lower leading edge of left door	mm	2450	2443	7
8	RSOV to upper leading edge of right door	mm	1249	1259	-10
9	RSOV to upper leading edge of left door	mm	1252	1276	-24
10	RSOV to lower trailing edge of right door	mm	1304	1294	10
11	RSOV to lower trailing edge of left door	mm	1314	1312	2
12	RSOV to bottom of right 'A' pillar	mm	2446	2432	14
13	RSOV to bottom of left 'A' pillar	mm	2449	2434	15
14	RSOV to firewall on right side	mm	2923	2854	69
15	RSOV to firewall on left side	mm	2926	2827	99
16	RSOV to steering column	mm	2068	2161	-93
17	Center of steering column to left 'A' pillar	mm	400	380	20
18	Center of steering column to headlining	mm	450	462	-12
19	RSOV to right side of front bumper	mm	3528	3106	422
20	RSOV to left side of front bumper	mm	3538	3107	431
21	Length of engine block	mm	458	459	-1
RD	RSOV to right side of dash panel	mm	2304	2300	4
CD	RSOV to center of dash panel	mm	2316	2312	4
LD	RSOV to left side of dash panel	mm	2308	2324	-16

DATA SHEET NO. 10... (continued)

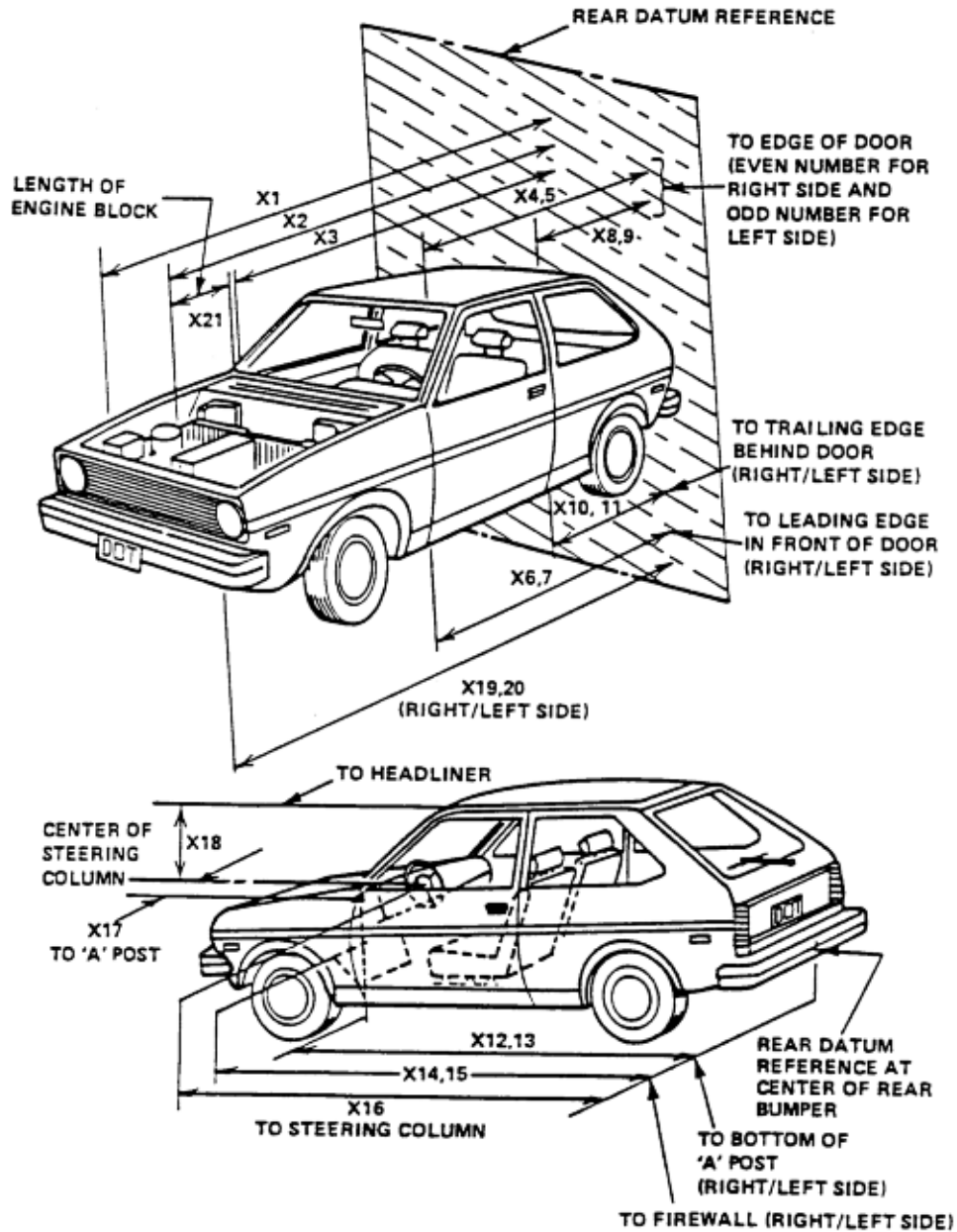
VEHICLE MEASUREMENTS

Test Vehicle: 2008 Toyota Yaris 3-Door Liftback

NHTSA No.: M85116

Test Program: 35mph Frontal Impact

Test Date: 10/10/2007



DATA SHEET NO. 10... (continued)**VEHICLE MEASUREMENTS**Test Vehicle: 2008 Toyota Yaris 3-Door LiftbackNHTSA No.: M85116Test Program: 35mph Frontal ImpactTest Date: 10/10/2007**Target Vehicle Structural Measurement**

	Elements	Pre-Test (mm)
1	Total Length	3641
2	Total Width	1690
3	Bumper Top Height	566
4	Bumper Bottom Height	411
5	Longitudinal Member Top Height	516
6	Distance between Longitudinal Members	851
7	Longitudinal Member Width	66
8	Engine Top Height	777
9	Engine Bottom Height	192
10	Engine and gearbox width	814
11	Front bumper-engine distance	318
12	Front shock absorber fixing height	894
13	Bonnet leading edge height	847
14	Front shock absorber fixing width	1134
15	Front bumper – front axle distance	727
16	Front axle – a pillar distance	387
17	A-pillar – B-pillar distance	1285
18	B-Pillar – rear axle distance	787
19	B-pillar – C-pillar distance	854
20	Roof sill bottom height	1360
21	Roof sill top height	1450
22	Floor sill bottom height	225
23	Floor sill top height	347

DATA SHEET NO. 11
CAMERA LOCATIONS

Test Vehicle: 2008 Toyota Yaris 3-Door Liftback
Test Program: 35mph Frontal Impact

NHTSA No.: M85116
Test Date: 10/10/2007

No.	Camera View	Location (mm) *			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Side View				13	24
2	Left Front View	1100	-4500	1110	24	1000
3	Steering Column Top	1150	-5100	1180	25	1000
4	Steering Column Bottom	1160	-5110	1150	25	1000
5	Driver Close-up	1210	-5380	1290	35	1000
6	Driver Angle	6750	-5050	2110	50	1000
7	On board Driver Side					
8	On board Passenger Side					
9	Right Overall	1430	6710	1250	24	1000
10	Right Passenger Half	1130	4580	1130	24	1000
11	Right Close-up	1280	5350	1260	35	1000
12	Right Angle	6790	5280	2160	50	1000
13	Windshield	-285	0	2860	12.5	1000
14	Top Driver	-135	-470	2180	24	1000
15	Top Passenger	-110	420	2180	24	1000
16	Pit Front	1190	0	-3150	24	1000
17	Pit Rear	3020	0	-3150	24	1000

***COORDINATES:**

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

Cameras 7 and 8 did not run.

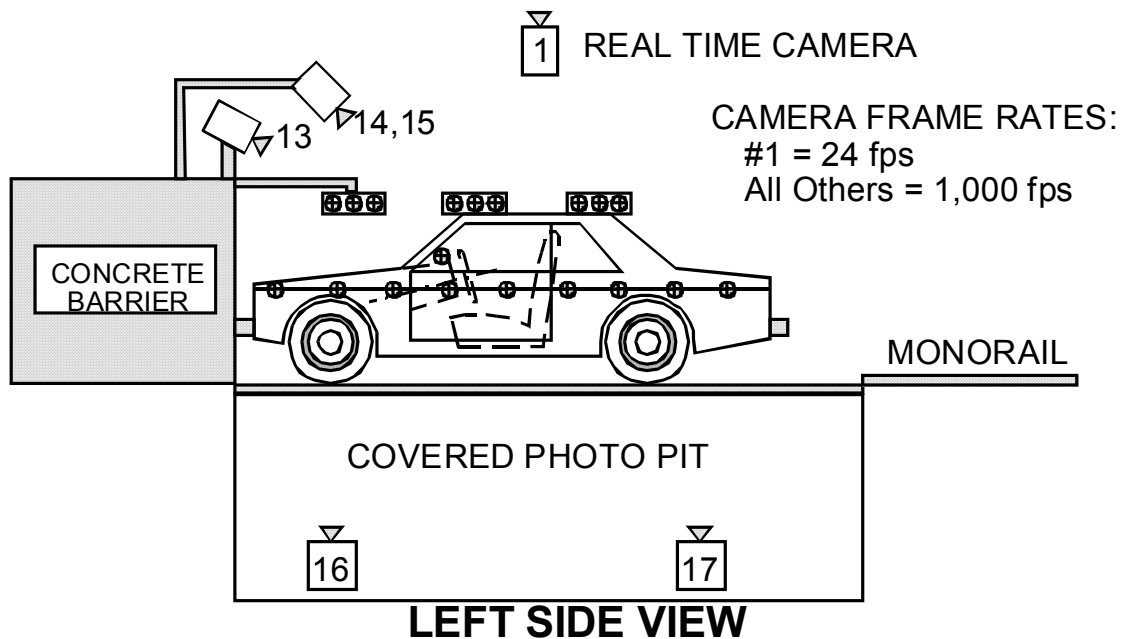
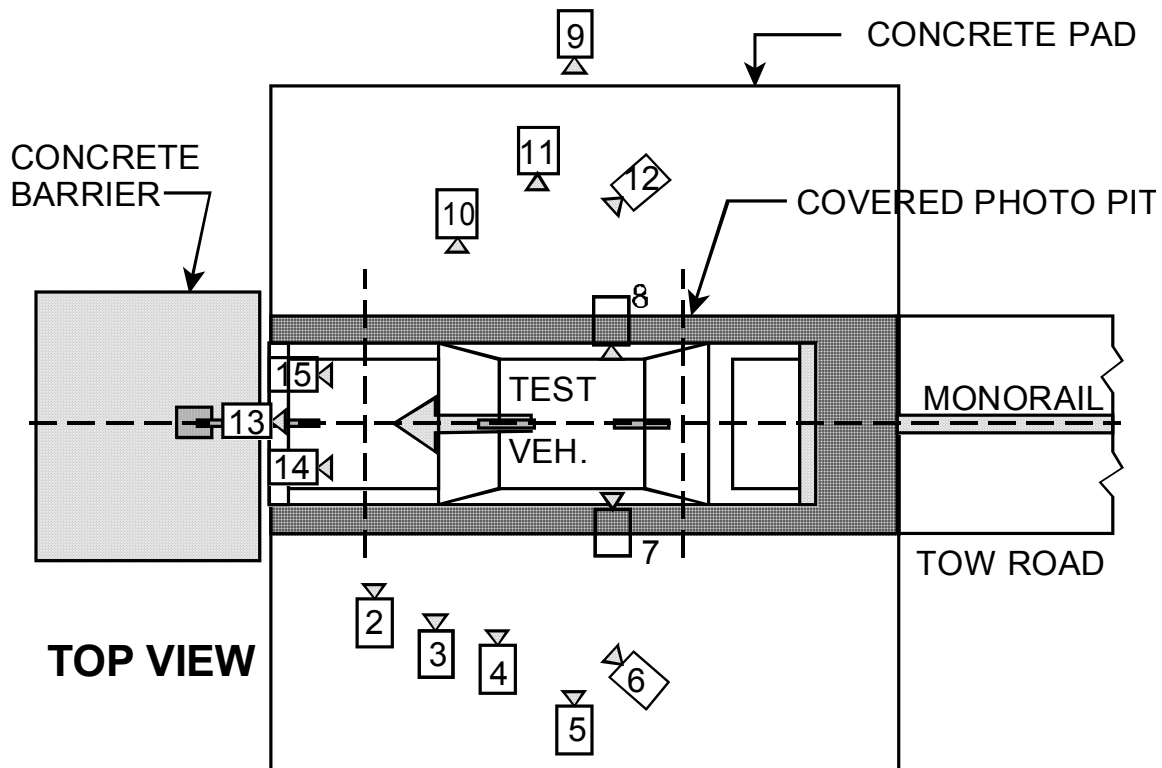
DATA SHEET NO. 11... (continued)

CAMERA LOCATIONS

Test Vehicle: 2008 Toyota Yaris 3-Door Liftback
Test Program: 35mph Frontal Impact

NHTSA No.: M85116
Test Date: 10/10/2007

CAMERA POSITIONS FOR FRONTAL IMPACTS

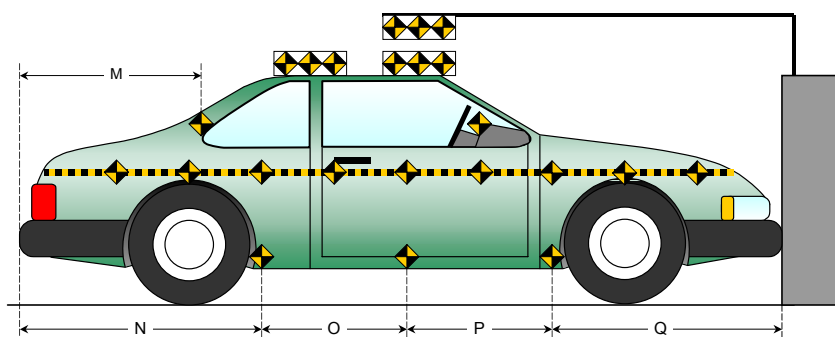
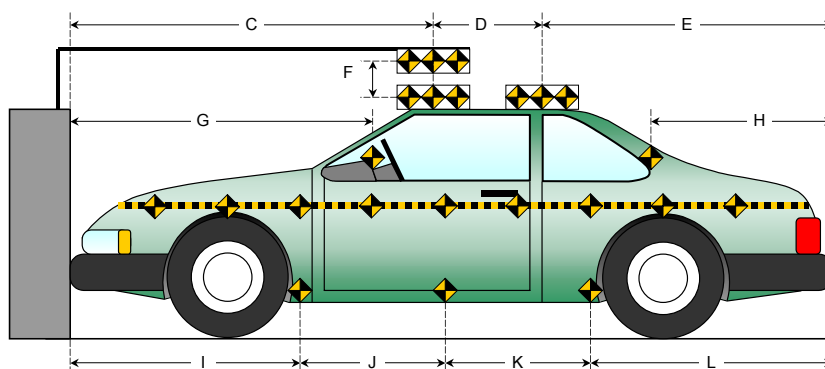
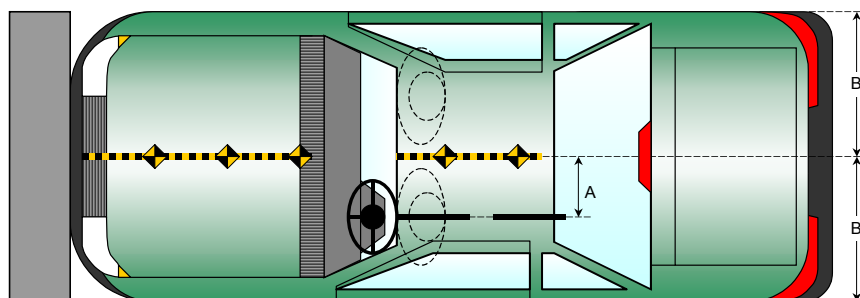


DATA SHEET NO. 12 **PHOTOGRAPHIC REFERENCE TARGET LOCATIONS**

Test Vehicle: 2008 Toyota Yaris 3-Door Liftback
 Test Program: 35mph Frontal Impact

NHTSA No.: M85116
 Test Date: 10/10/2007

Item	Value
A	320
B	845
C	1914
D	915
E	812
F	1515
G	
H	582
I	1114
J	834
K	834
L	859
M	593
N	831
O	834
P	834
Q	1142



DATA SHEET NO. 13
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2008 Toyota Yaris 3-Door Liftback
 Test Program: 35mph Frontal Impact

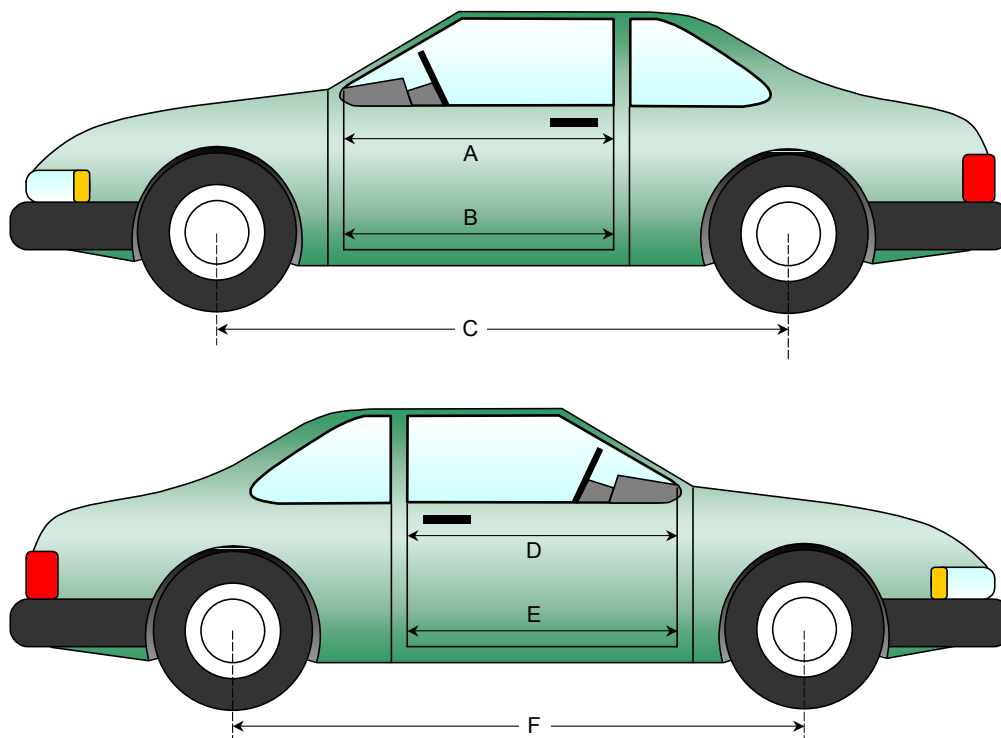
NHTSA No.: M85116
 Test Date: 10/10/2007

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1141	1139	2
B	Left Side Lower	mm	1089	1088	1
D	Right Side Upper	mm	1140	1134	6
E	Right Side Lower	mm	1090	1081	9

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2463	2454	9
F	Right Side Wheelbase	mm	2463	2388	75



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

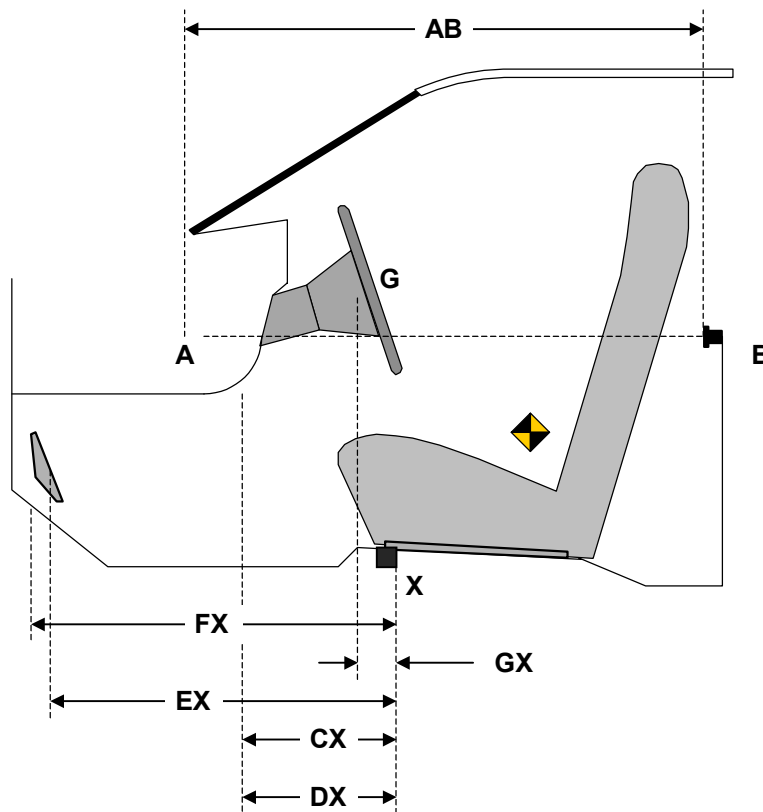
Test Vehicle: 2008 Toyota Yaris 3-Door Liftback
 Test Program: 35mph Frontal Impact

NHTSA No.: M85116
 Test Date: 10/10/2007

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside window jam)	mm	1141	1139	2
CX	Left Knee Bolster to X	mm	310	329	-19
DX	Right Knee Bolster to X	mm	312	334	-22
EX	Brake Pedal to X	mm	532	571	-39
FX	Foot Rest to X	mm	539	534	5
GX	Center of Steering Column Wheel Hub to X	mm	82	196	-114

X = Front of Seat Track (stationary)

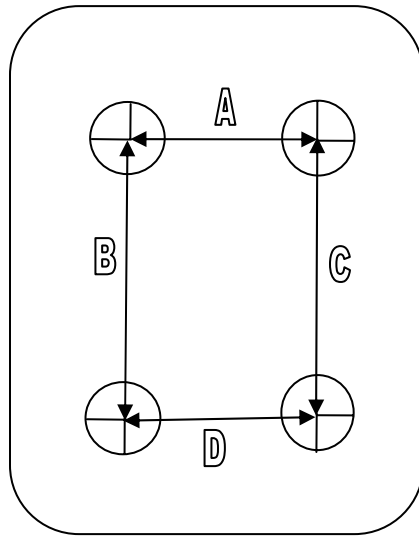


DRIVER COMPARTMENT

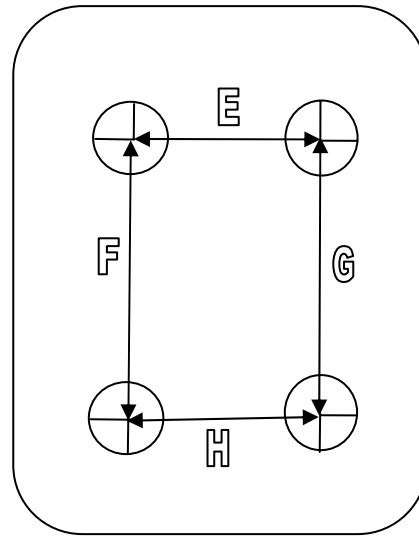
DATA SHEET NO. 13... (continued)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2008 Toyota Yaris 3-Door Liftback
 Test Program: 35mph Frontal Impact

NHTSA No.: M85116
 Test Date: 10/10/2007



Driver



Passenger

UNDERBODY FLOORBOARD DEFORMATION

Measurement	Pre-Test	Post-Test	Difference
A	240	236	4
B	280	280	0
C	281	281	0
D	237	237	0
E	234	234	0
F	225	225	0
G	232	232	0
H	254	252	2

DATA SHEET NO. 14

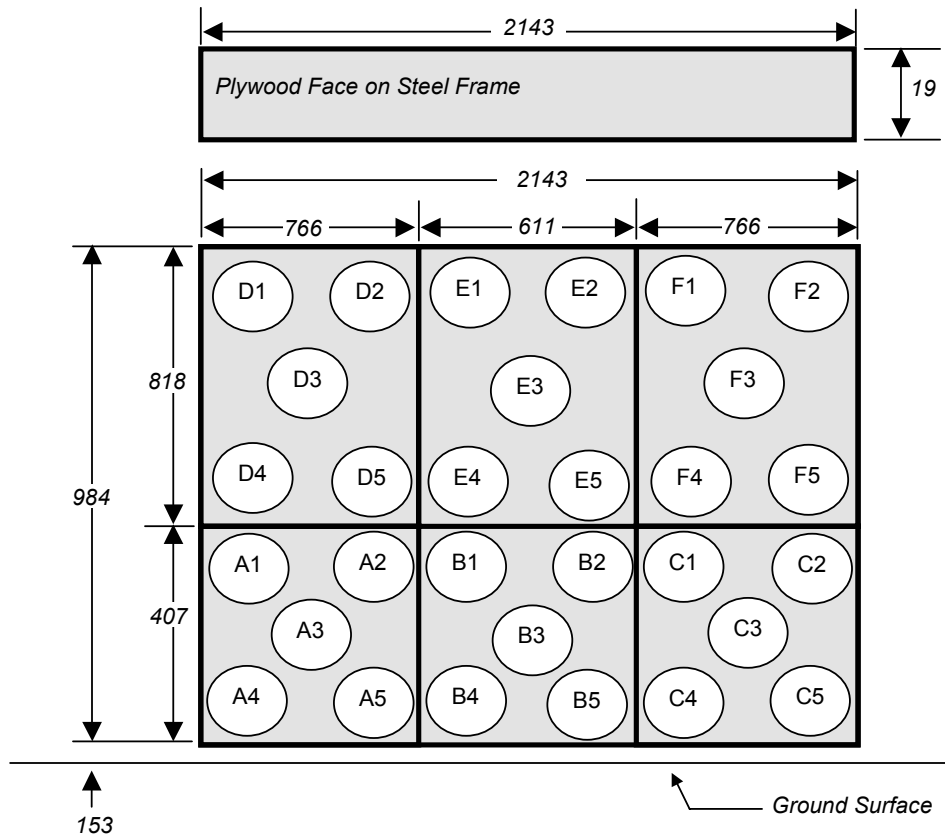
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2008 Toyota Yaris 3-Door Liftback
 Test Program: 35mph Frontal Impact

NHTSA No.: M85116
 Test Date: 10/10/2007

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

DATA SHEET NO. 15
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2008 Toyota Yaris 3-Door Liftback NHTSA No.: M85116
 Test Program: 35mph Frontal Impact Test Date: 10/10/2007

VEHICLE INFORMATION

VIN: JTDJT923285140508 Wheelbase (mm) : 2463
 Vehicle Size Category: Coupe Test Weight (kg) : 1244.6

ACCELEROMETER DATA

Accelerometer Locations: As per measurements on Page 12
 Cal. Procedure/Interval: MGA procedure / 6 month
 Integration Algorithm: Trapezoidal Linearity: > 99%
 Impact Velocity (km/h): 56.2
 Velocity Change (km/h): 62.8 Time of Separation (msec): 85

CRUSH PROFILE

Collision Deformation Classification: Frontal Midpoint of Damage: Centerline
 Damage Region Length (mm): 1164 Impact Mode: Frontal

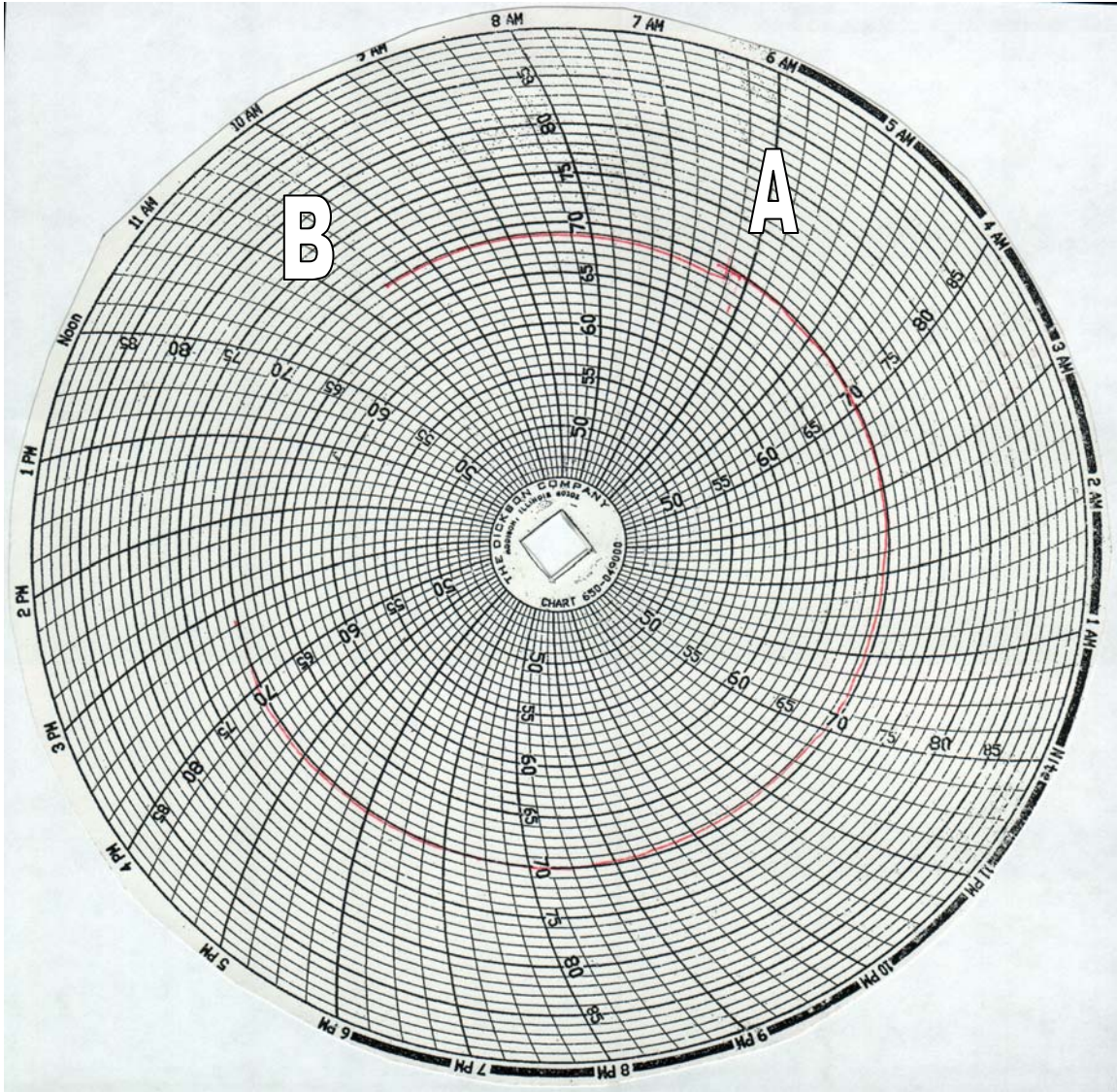
No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	Mm	3538	3107	431
C2	Crush zone 2 at left side	mm	3609	3118	491
C3	Crush zone 3 at left side	mm	3633	3116	517
C4	Crush zone 4 at right side	mm	3630	3123	507
C5	Crush zone 5 at right side	mm	3608	3111	497
C6	Crush zone 6 at right side	mm	3528	3107	421
L	C1 TO C6	mm	1164	1156	8

DATA SHEET NO. 16

DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART

Test Vehicle: 2008 Toyota Yaris 3-Door Liftback
Test Program: 35mph Frontal Impact

NHTSA No.: M85116
Test Date: 10/10/2007



A = Dummies installed in vehicle at 6:00 am

B = Test conducted at 11:27 am

APPENDIX A
PHOTOGRAPHS

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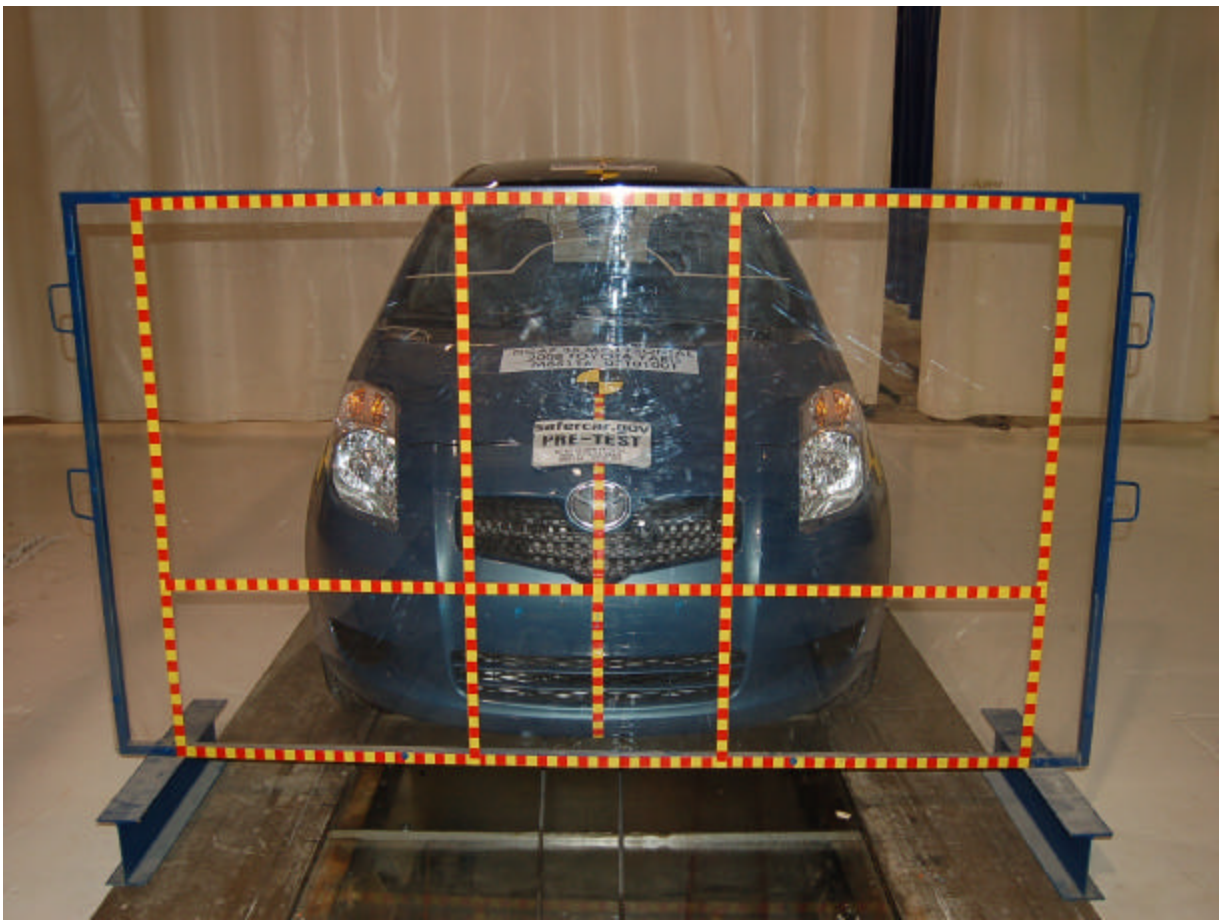
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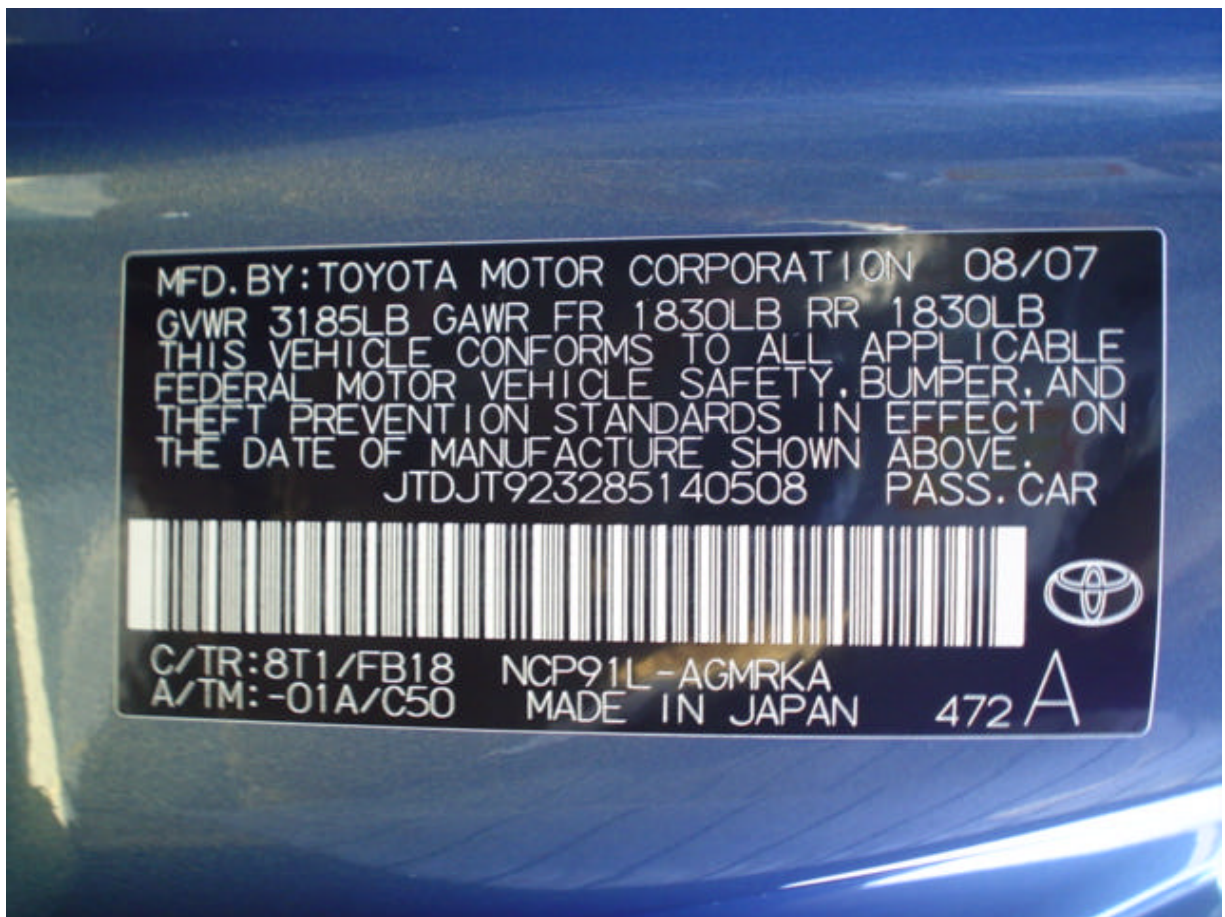
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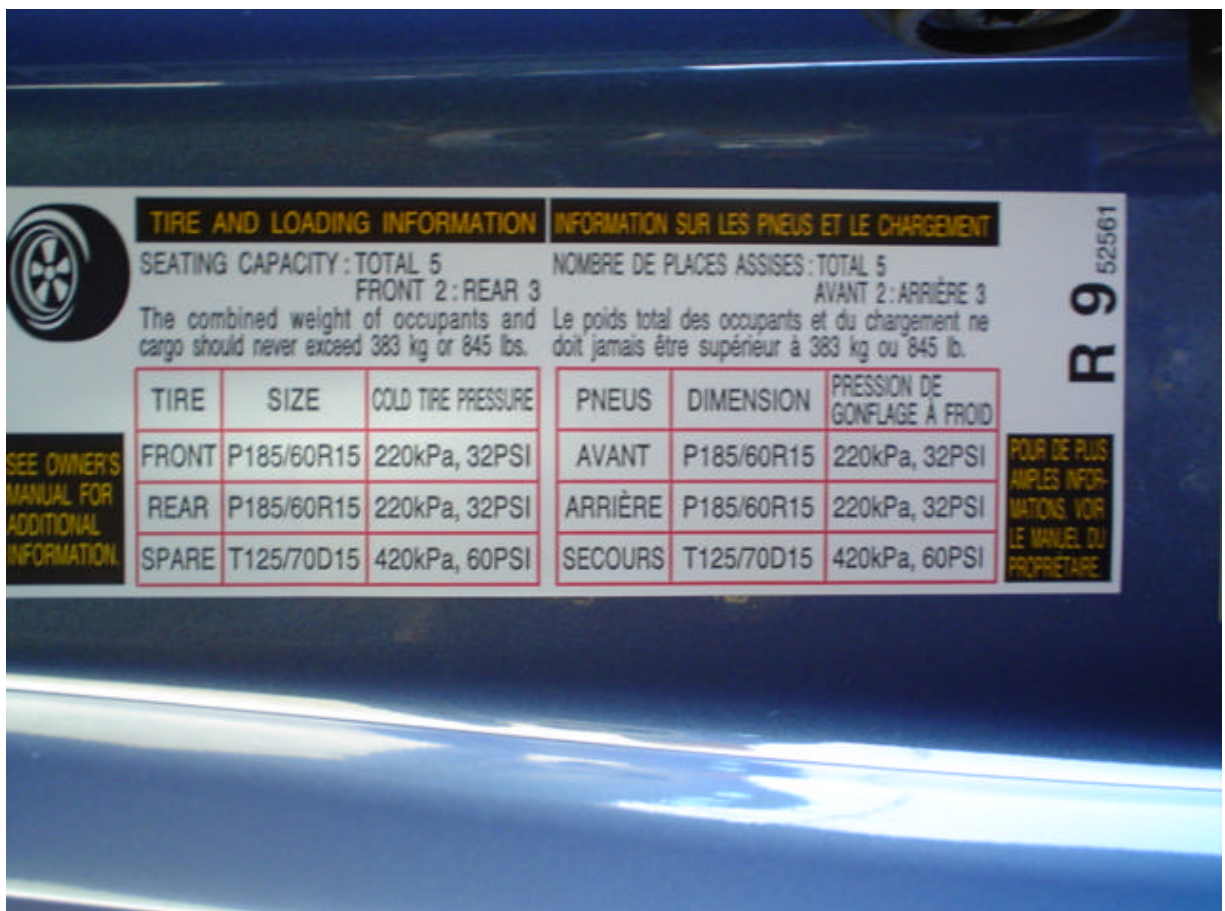
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Load Cell Location



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 $\frac{3}{4}$ View



Post-Test Right Front $\frac{3}{4}$ View



Pre-Test Left Rear $\frac{3}{4}$ View



Post-Test Left Rear $\frac{3}{4}$ View



Pre-Test Left Side $\frac{3}{4}$ View of Doors



Post-Test Left Side $\frac{3}{4}$ View of Doors After Impact



Pre-Test Right Side 3/4 View of Doors



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



Pre-Test Windshield View



Post-Test Windshield View



Pre-Test Engine Compartment View



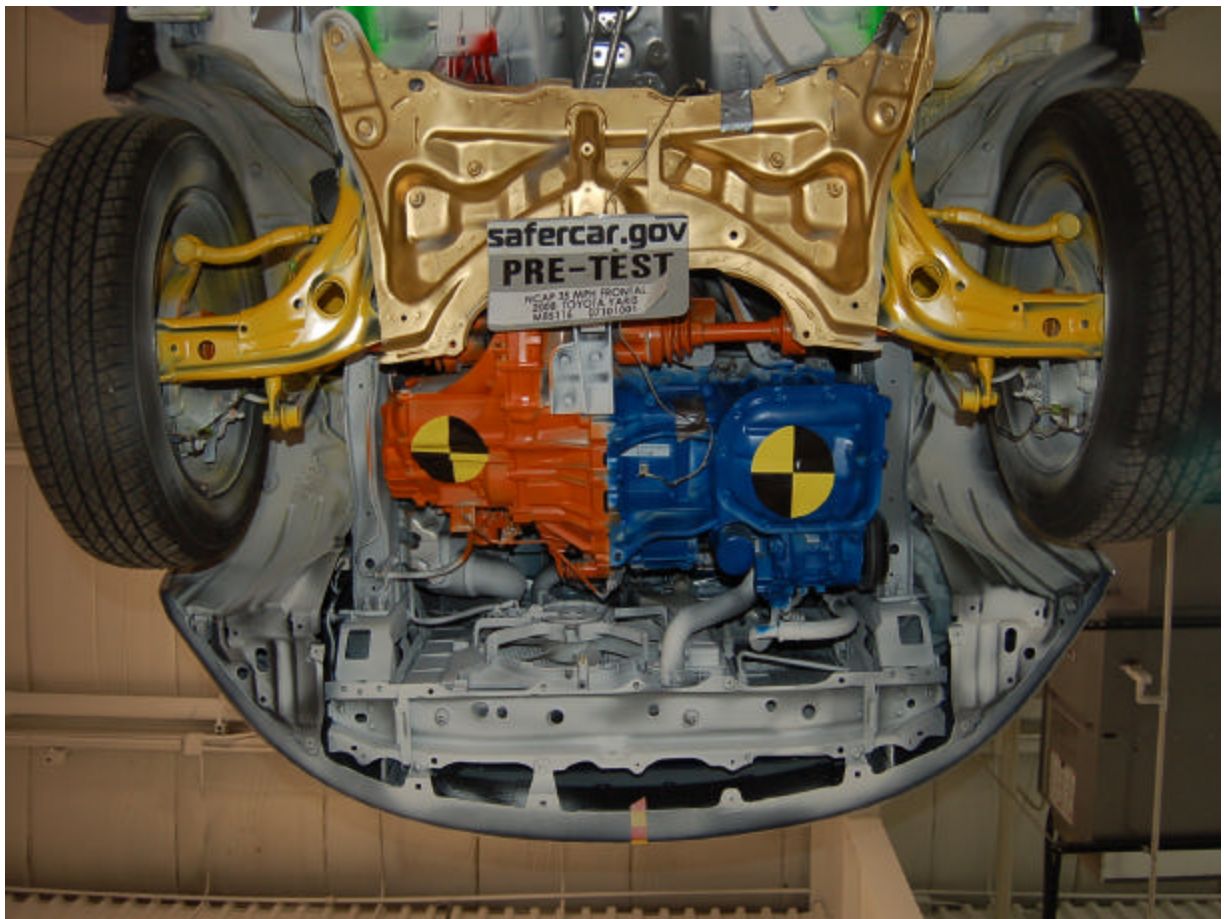
Post-Test Engine Compartment View



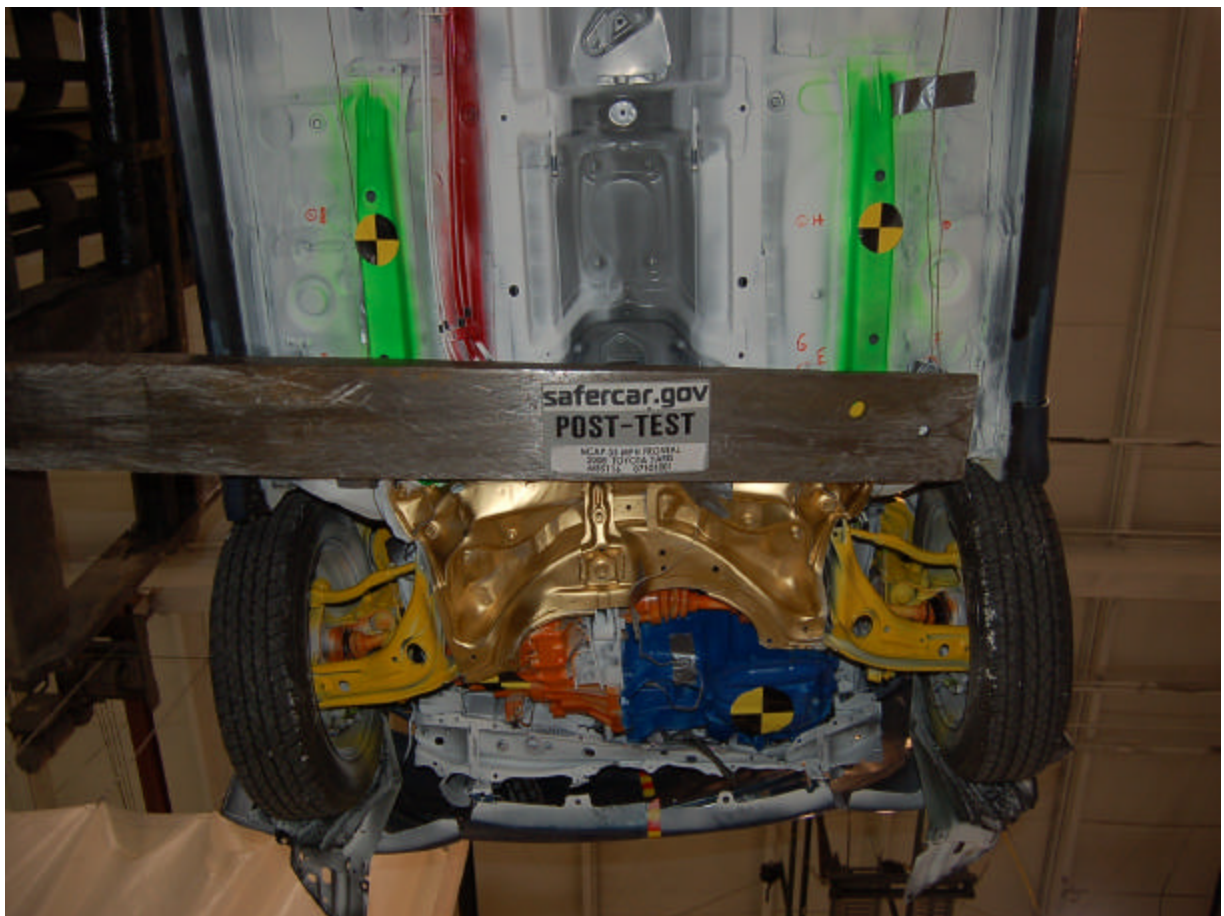
Pre-Test Fuel Cap View



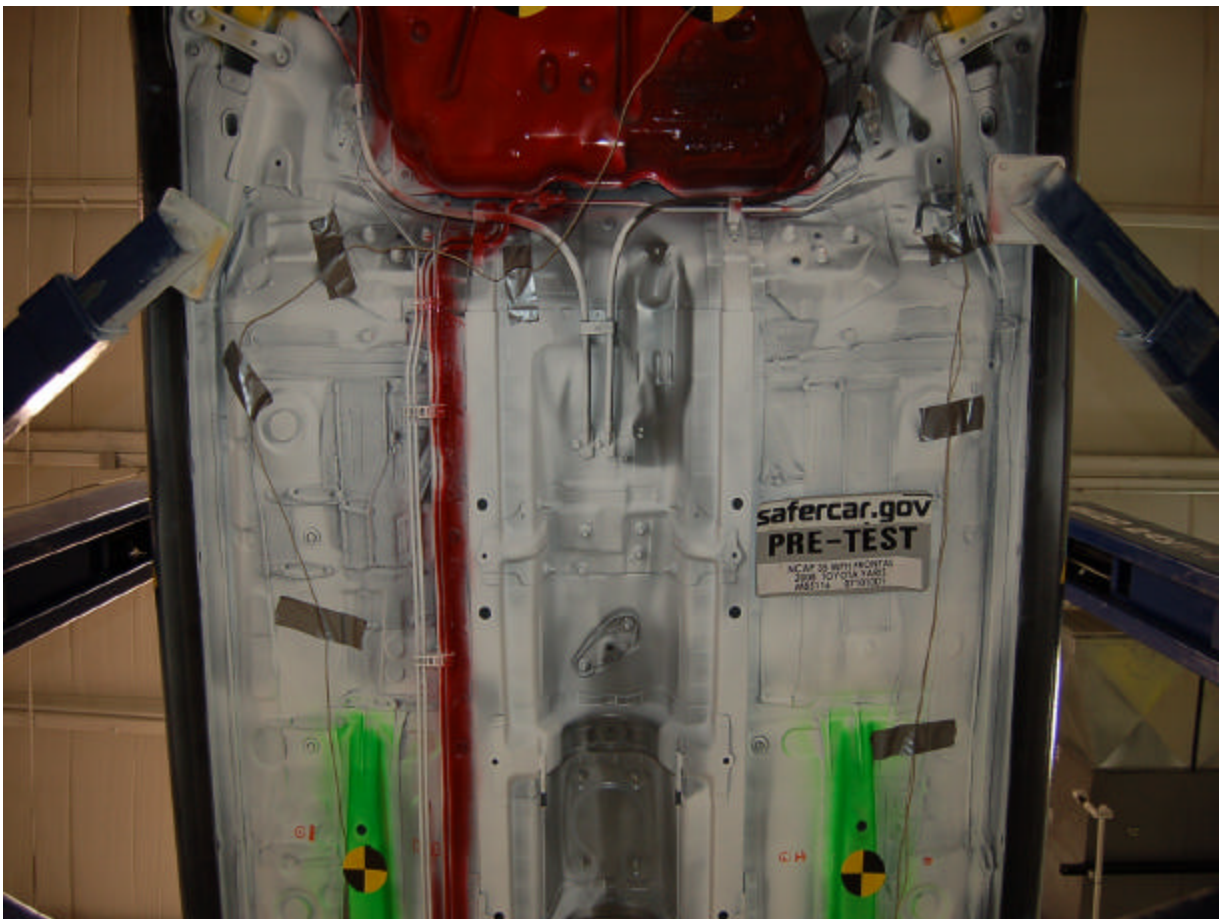
Post-Test Fuel Cap View



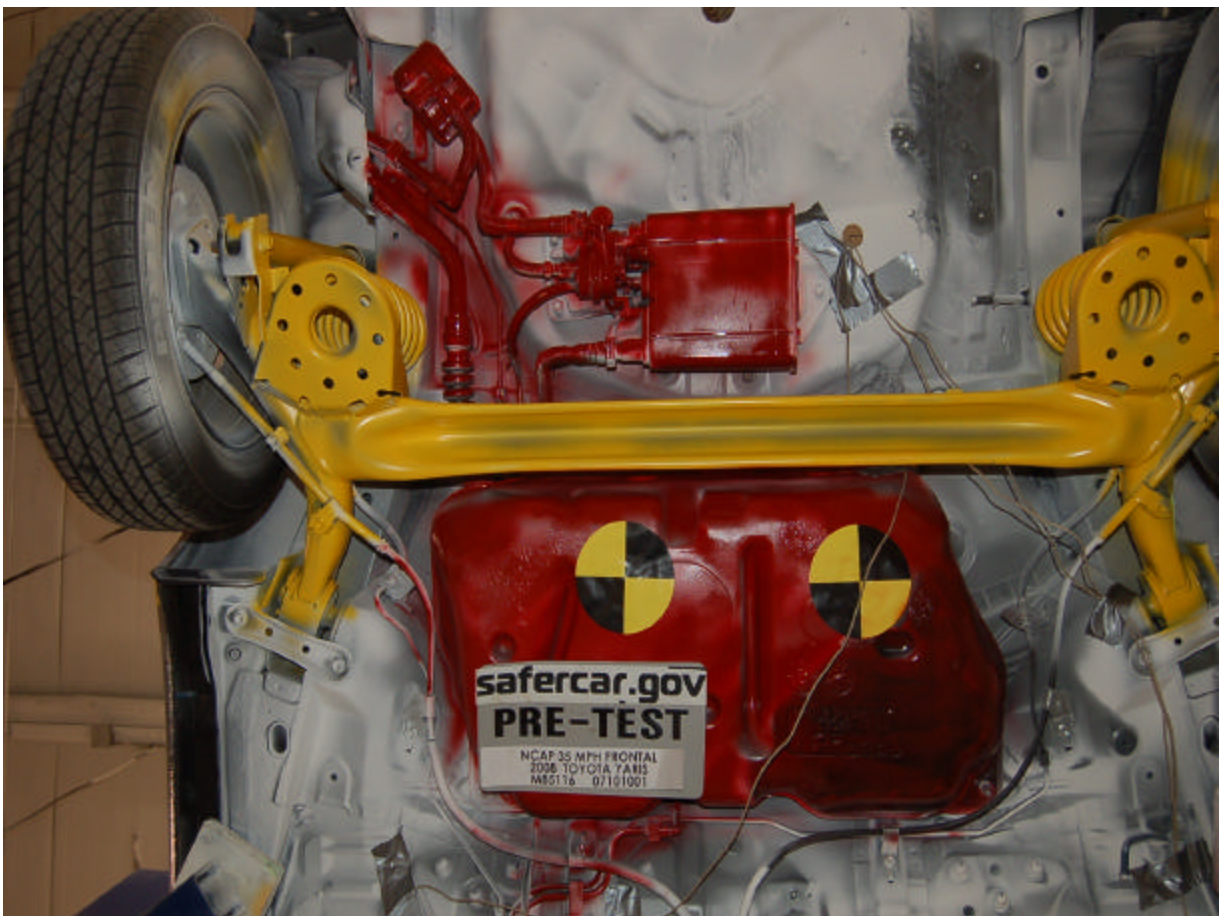
Pre-Test Front Underbody View



Post-Test Front Underbody View



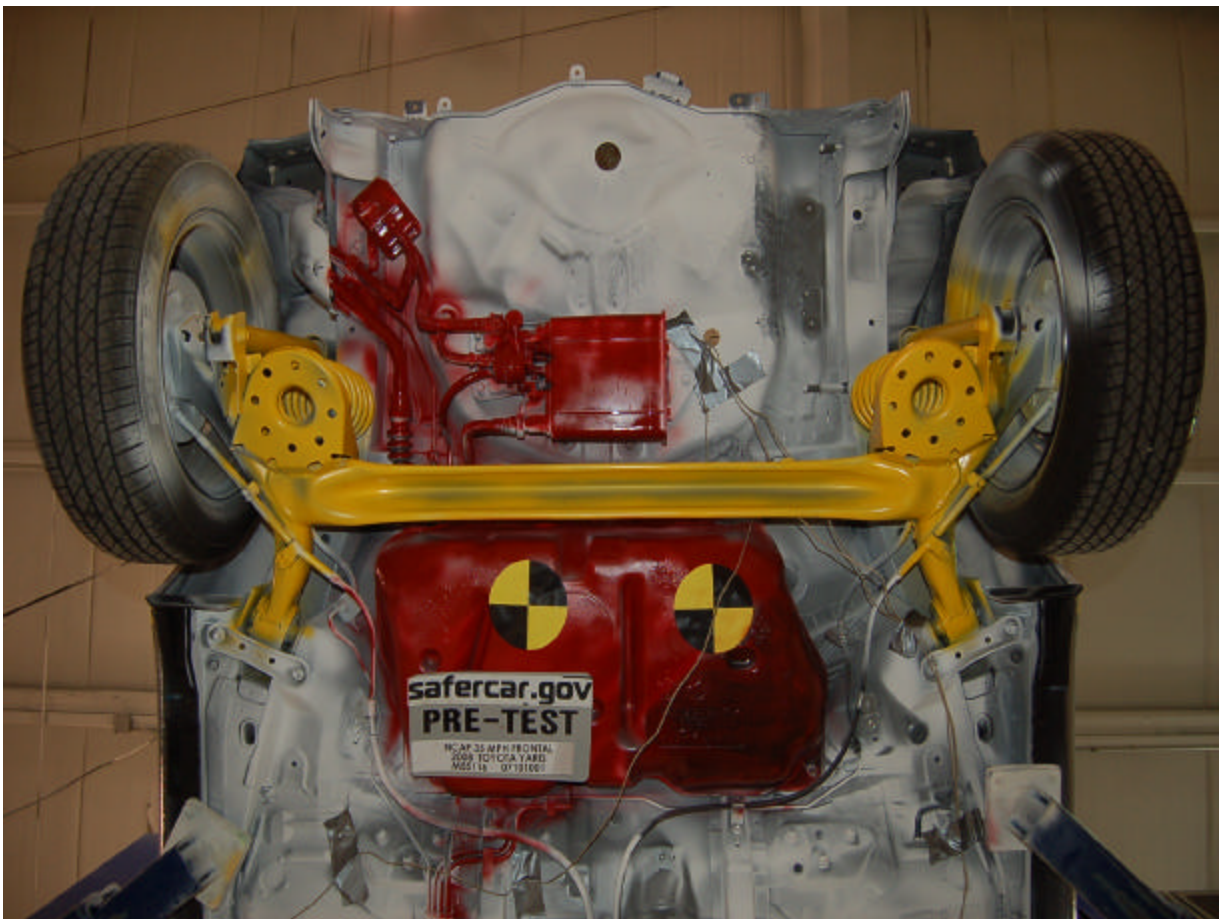
Pre-Test Mid Front Underbody View



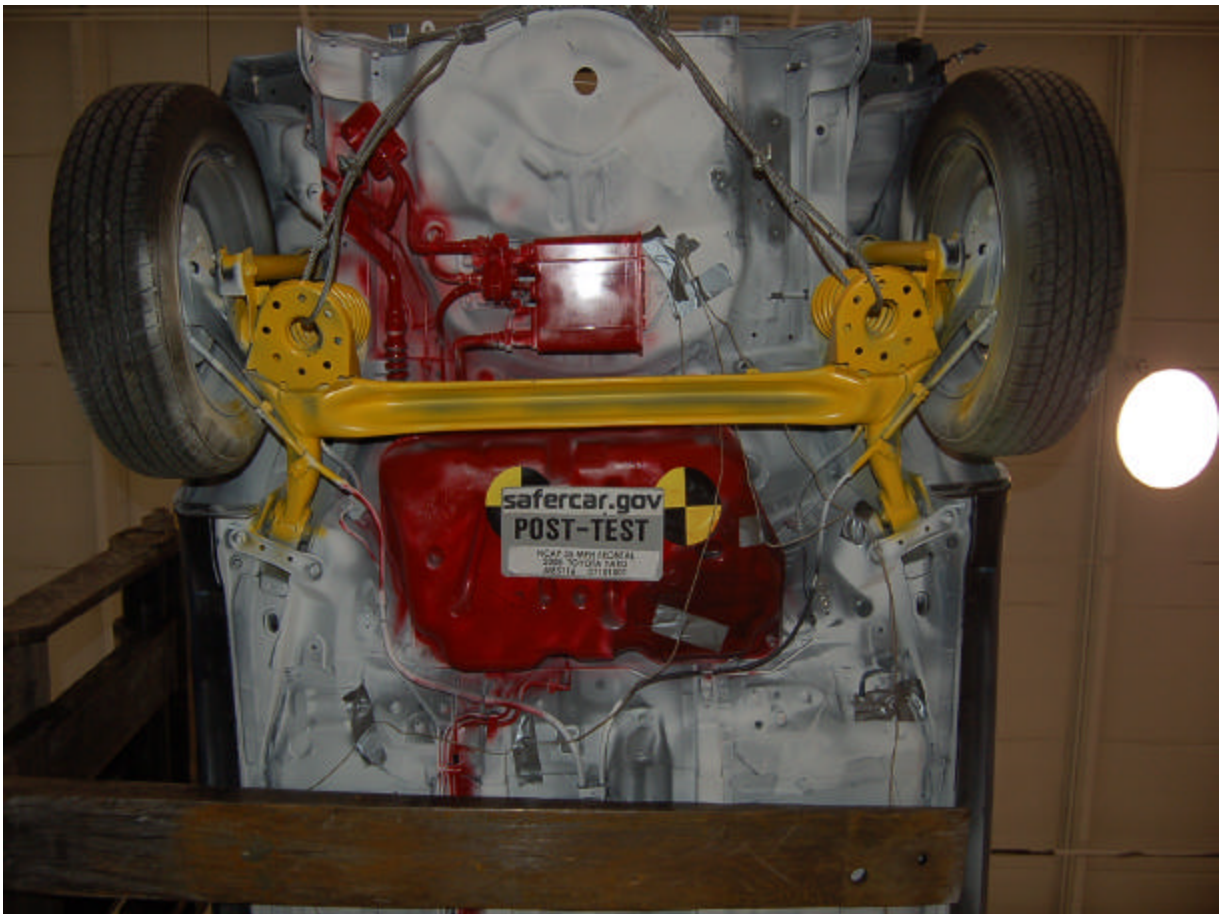
Pre-Test Mid Rear Underbody View



Post-Test Mid 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)



Post-Test Passenger Dummy Knee Contact



Post-Test Passenger Dummy Airbag Contact



Rollover 90 Degrees



Rollover 180 Degrees



Rollover 270 Degrees



Rollover 360 Degrees



Vehicle Impact

APPENDIX B
DUMMY RESPONSE DATA TRACES

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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

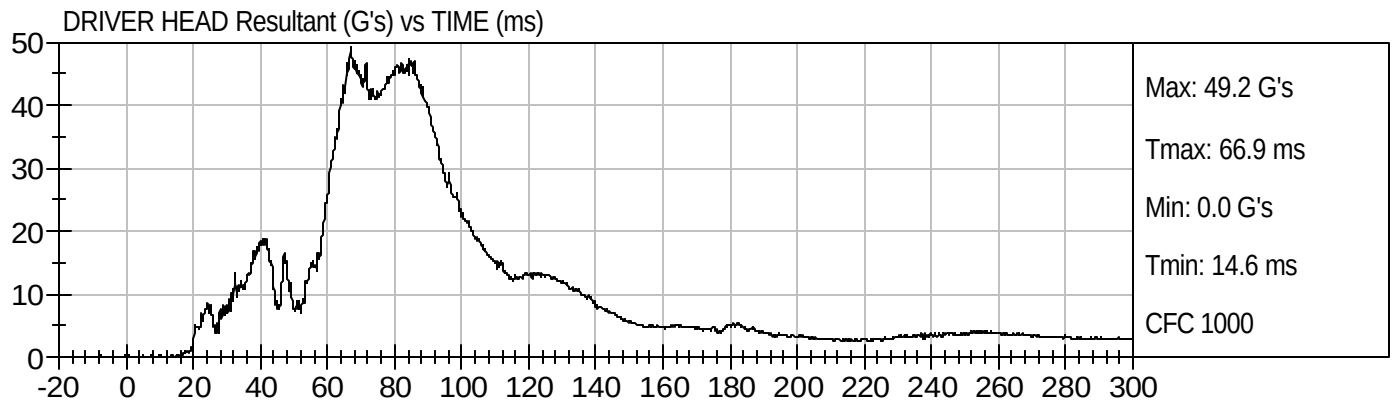
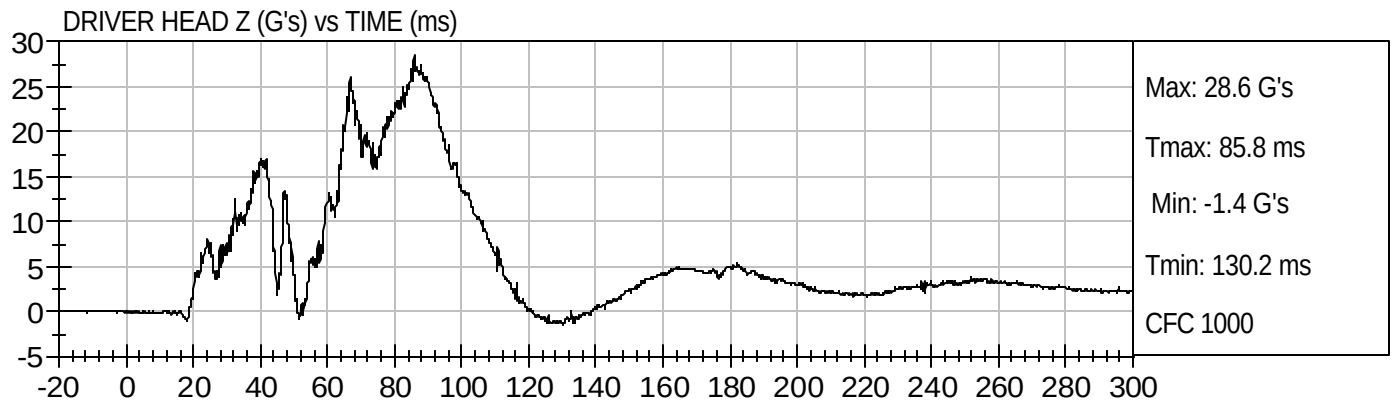
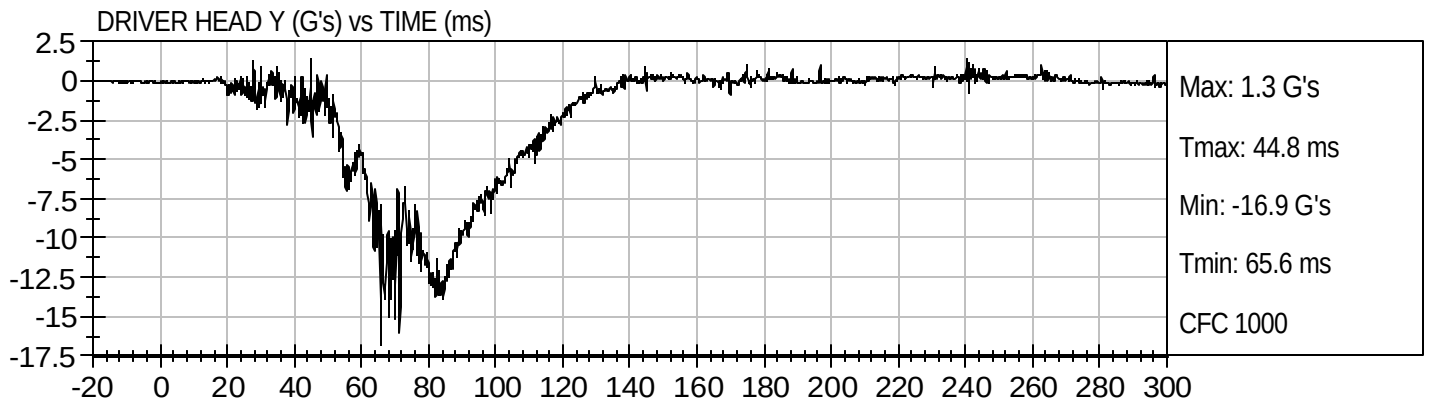
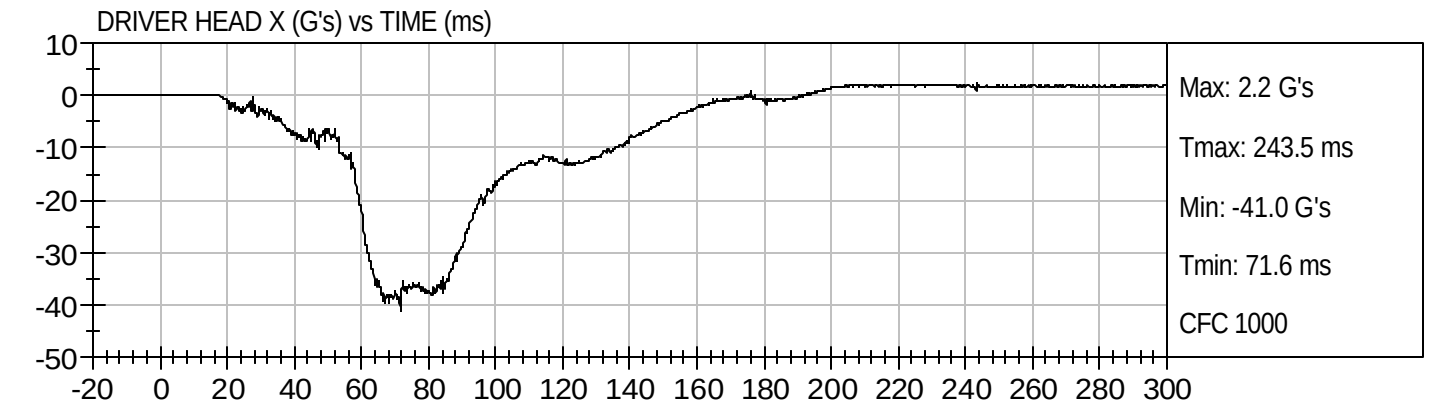
Driver Left Lower Tibia Force Z

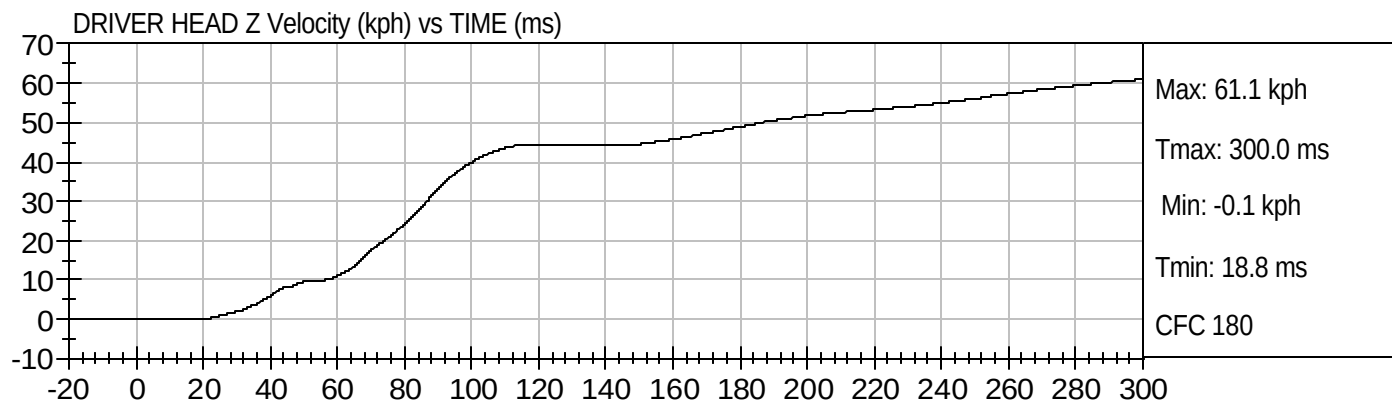
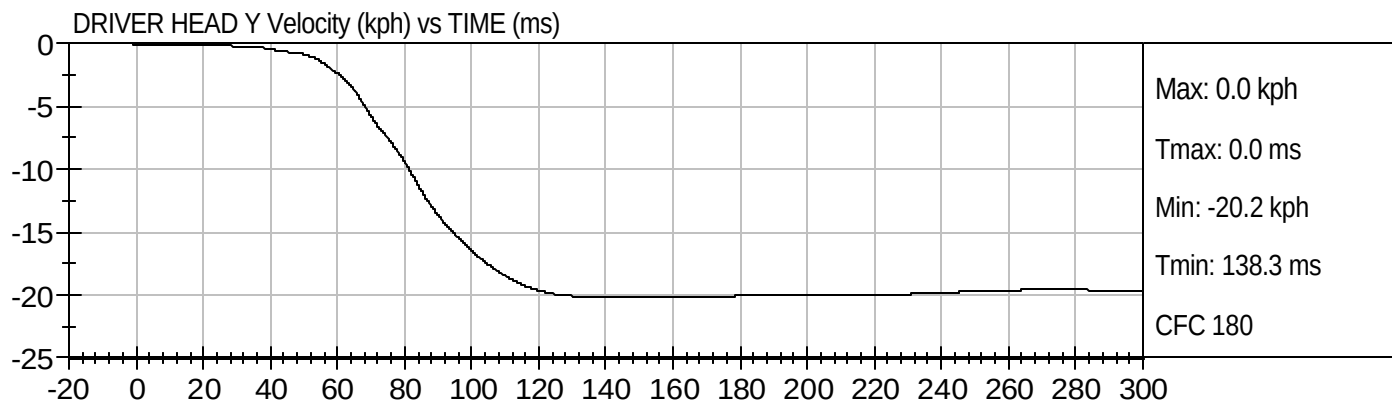
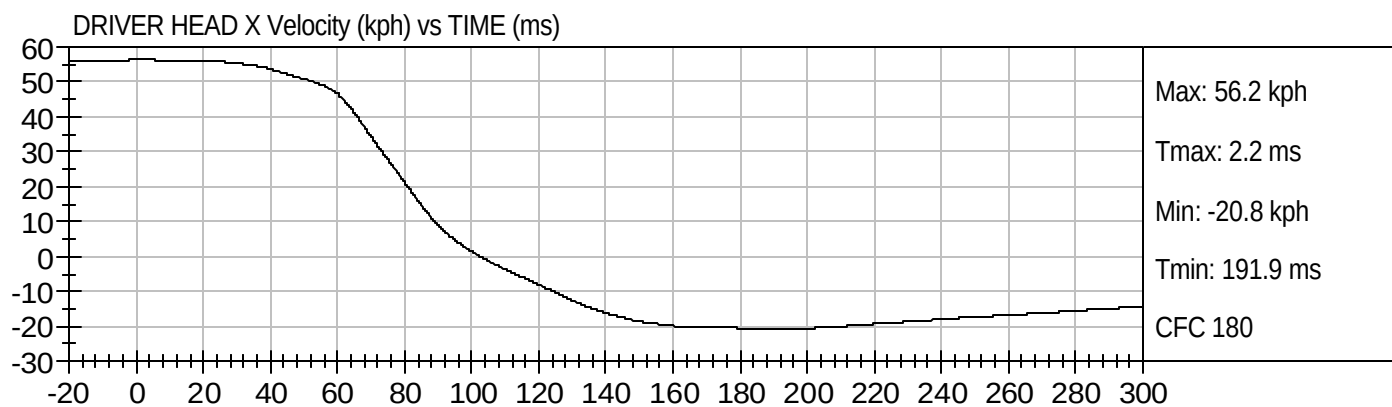
Driver Right Upper Tibia Moment X

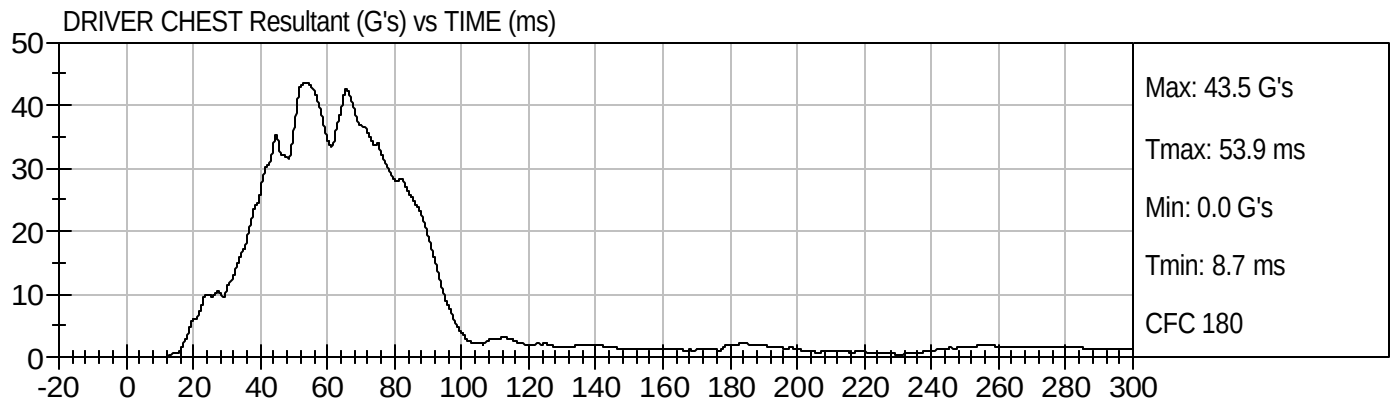
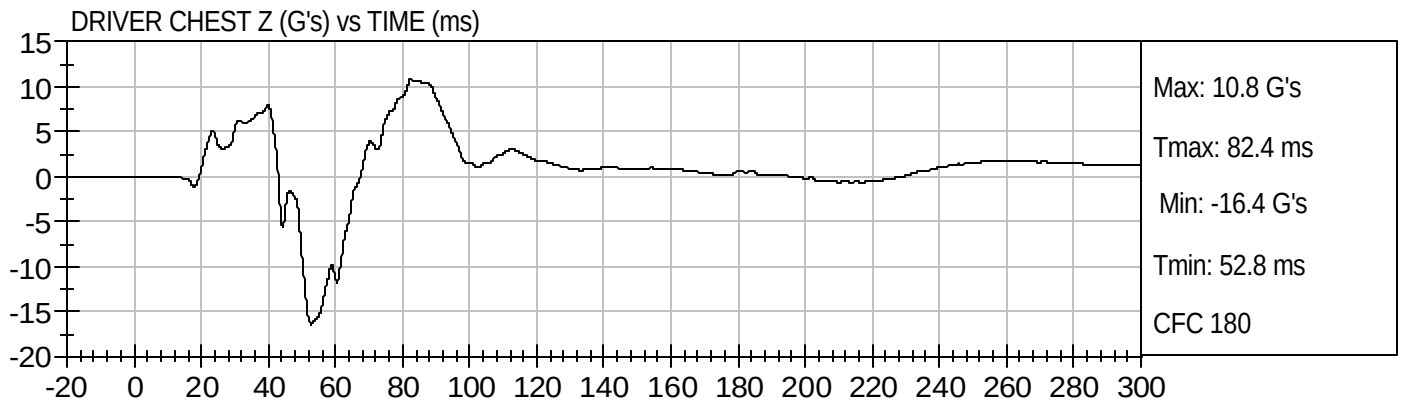
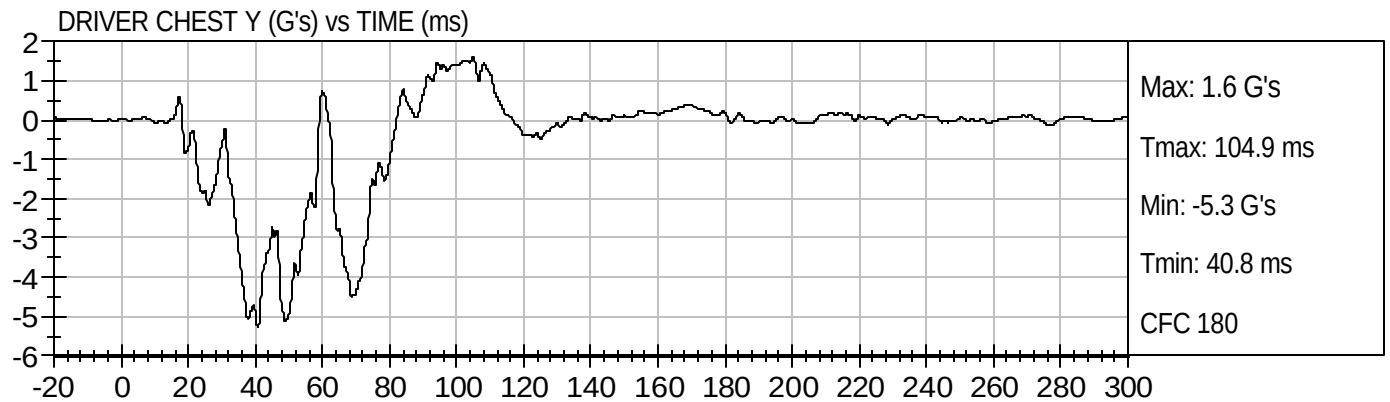
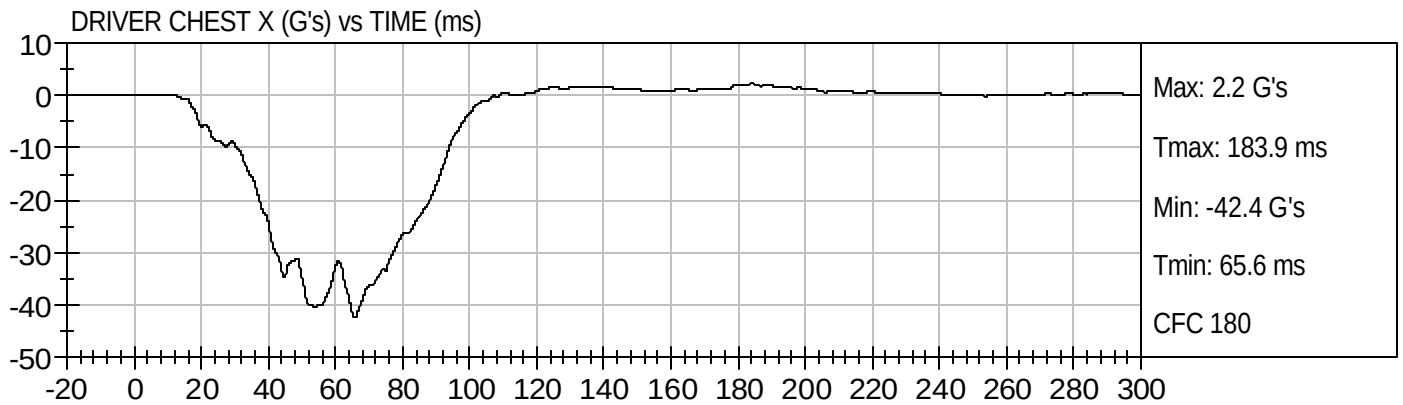
Driver Right Upper Tibia Moment Y

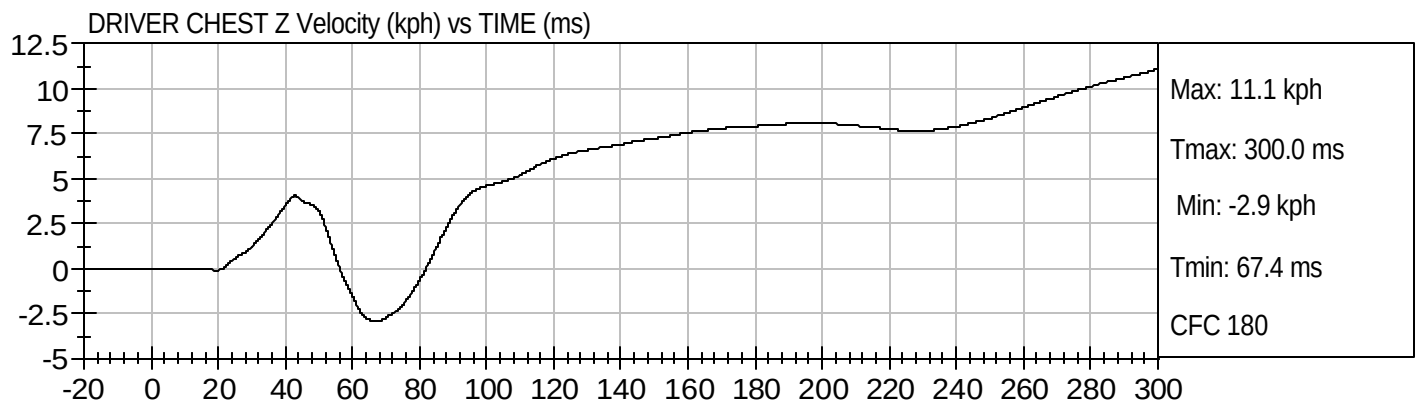
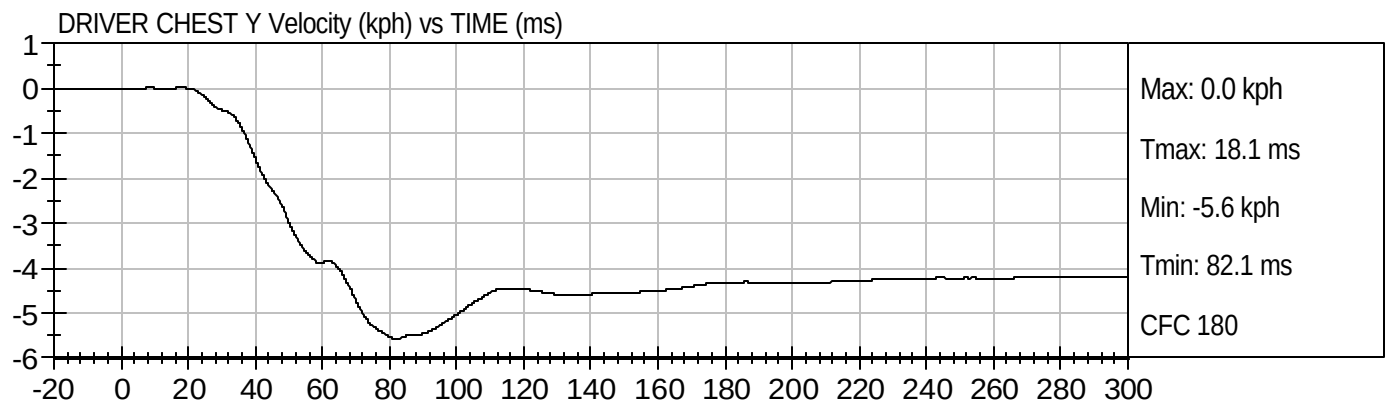
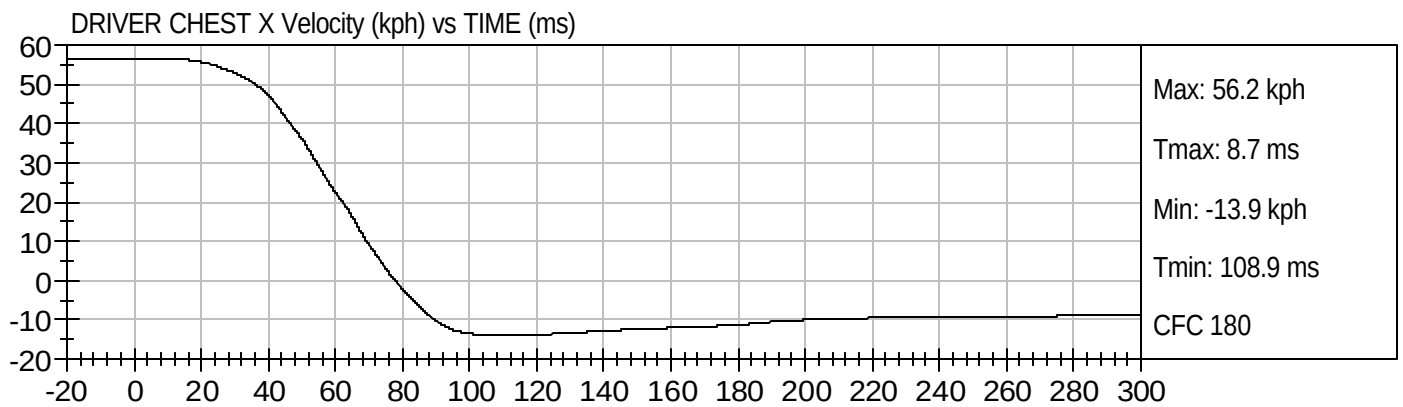
Driver Right Upper Tibia Force Z
Driver Right Lower Tibia Moment X
Driver Right Lower Tibia Moment Y
Driver Right Lower Tibia Force Z
Driver Left Foot Fore Z
Driver Left Foot Aft X
Driver Left Foot Aft Z
Driver Right Foot Fore Z
Driver Right Foot Aft X
Driver Right Foot Aft Z
Passenger Head X Redundant
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

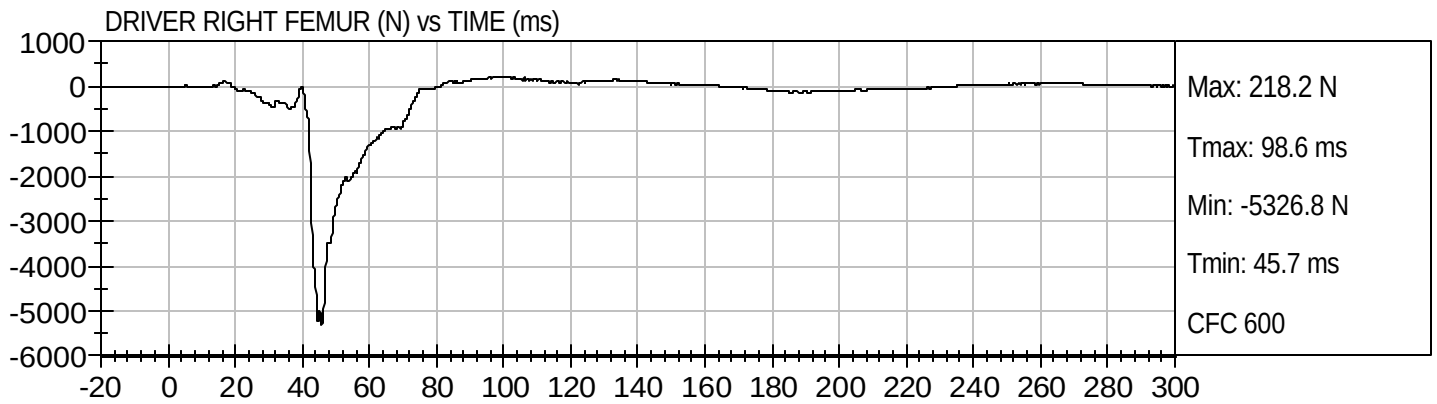
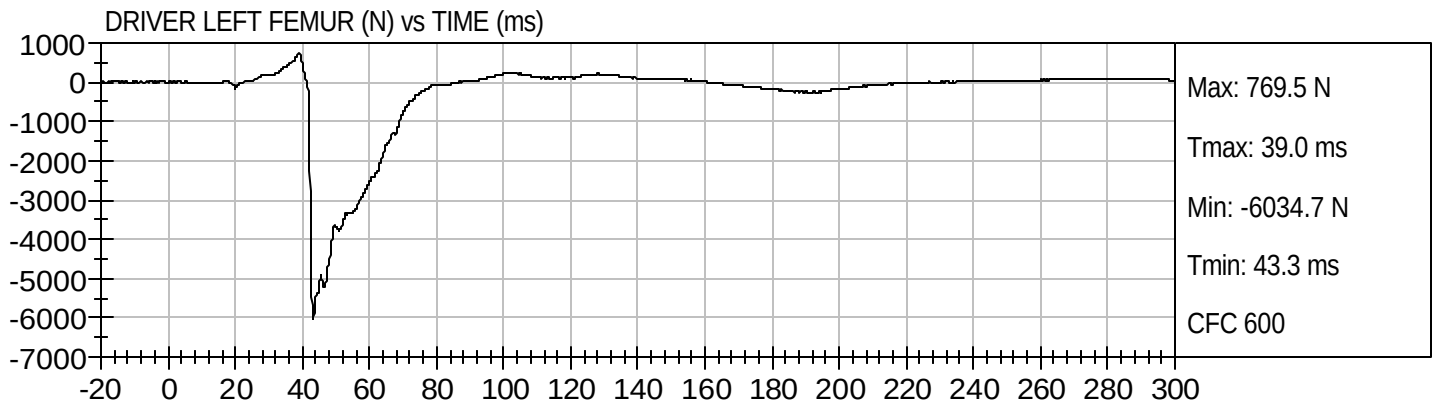
Passenger Left Lower Tibia Moment Y
Passenger Left Lower Tibia Force Z
Passenger Right Upper Tibia Moment X
Passenger Right Upper Tibia Moment Y
Passenger Right Upper Tibia Force Z
Passenger Right Lower Tibia Moment X
Passenger Right Lower Tibia Moment Y
Passenger Right Lower Tibia Force Z
Passenger 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
Barrier Force – Upper Left
Barrier Force – Upper Center
Barrier Force – Upper Right
Barrier Force – Lower Left
Barrier Force – Lower Center
Barrier Force – Lower Right





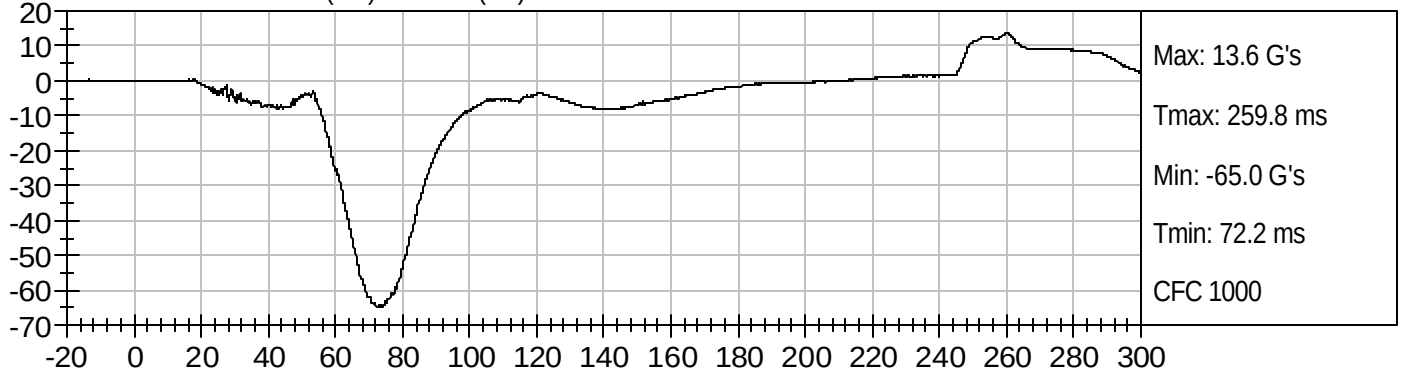




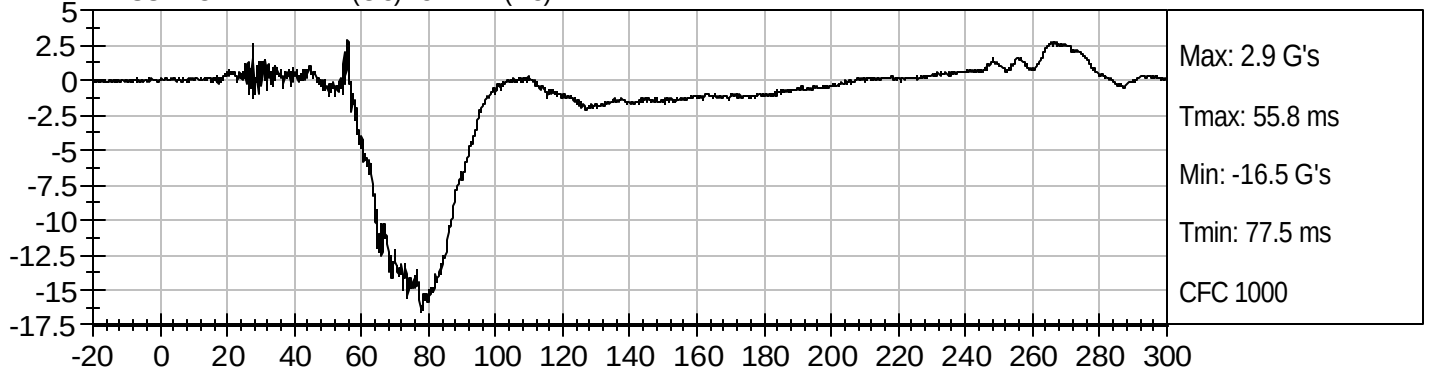




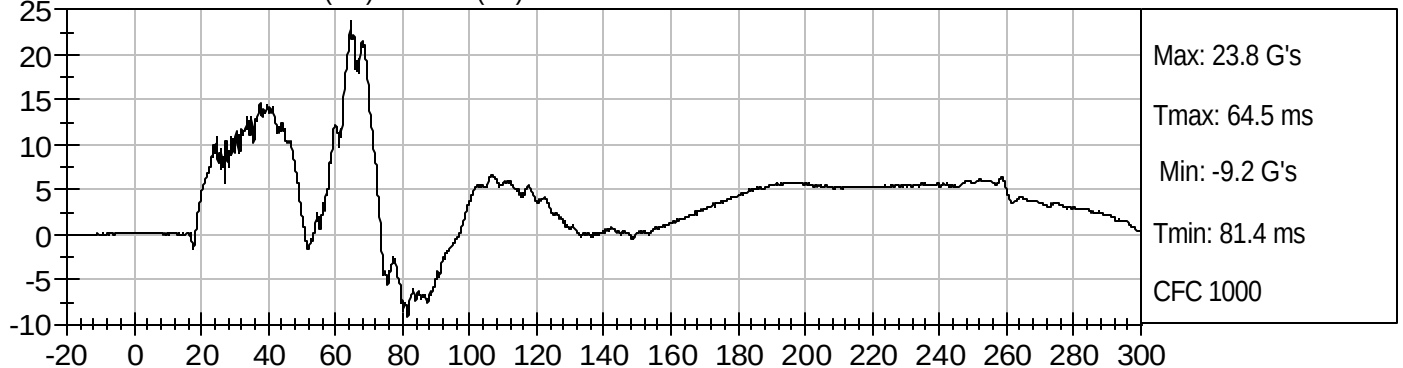
PASSENGER HEAD X (G's) vs TIME (ms)



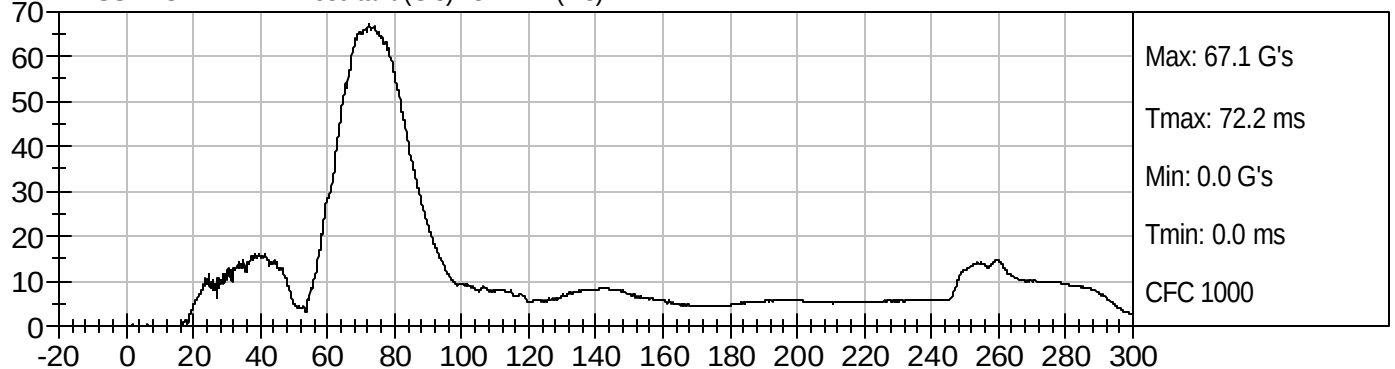
PASSENGER HEAD Y (G's) vs TIME (ms)

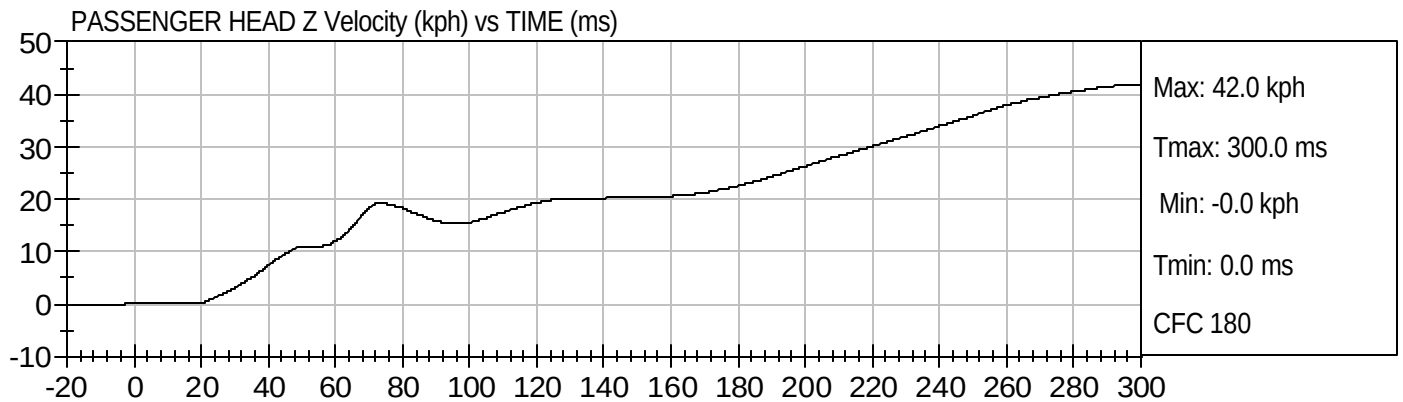
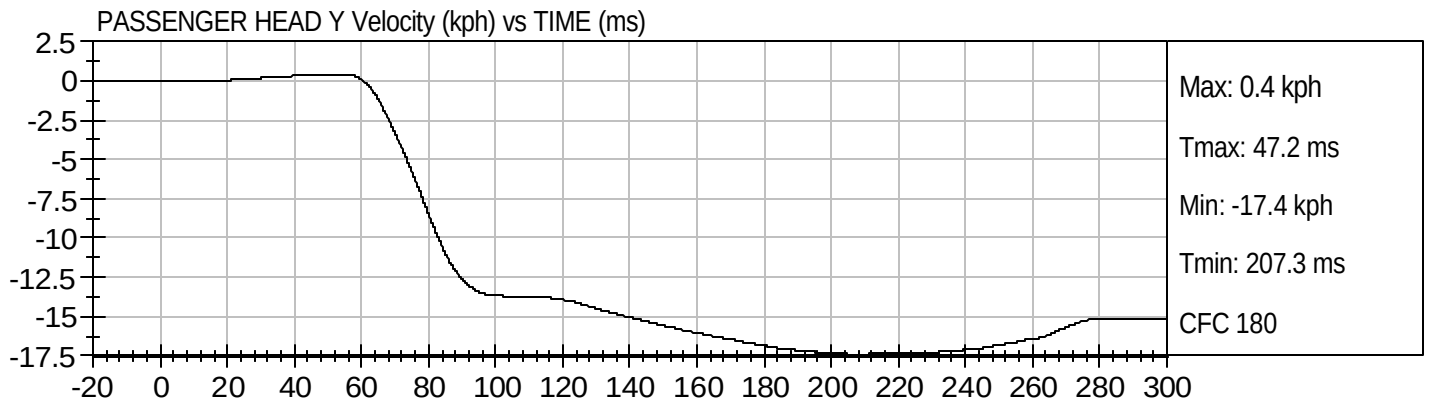
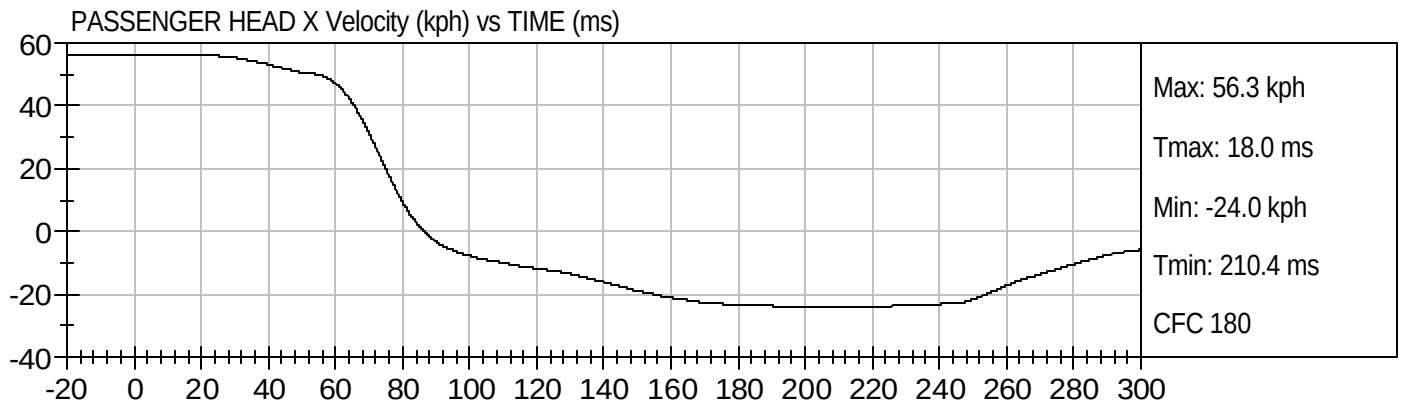


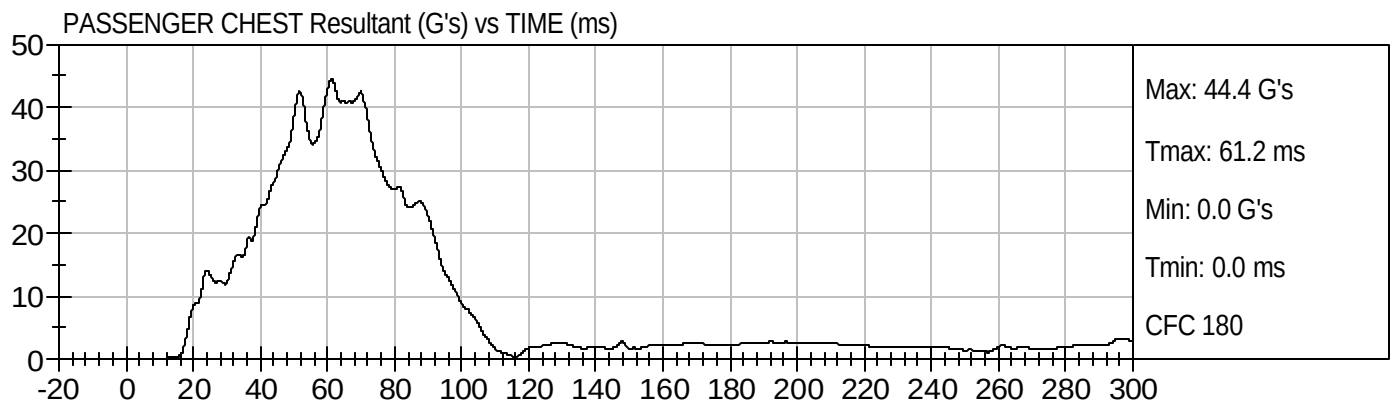
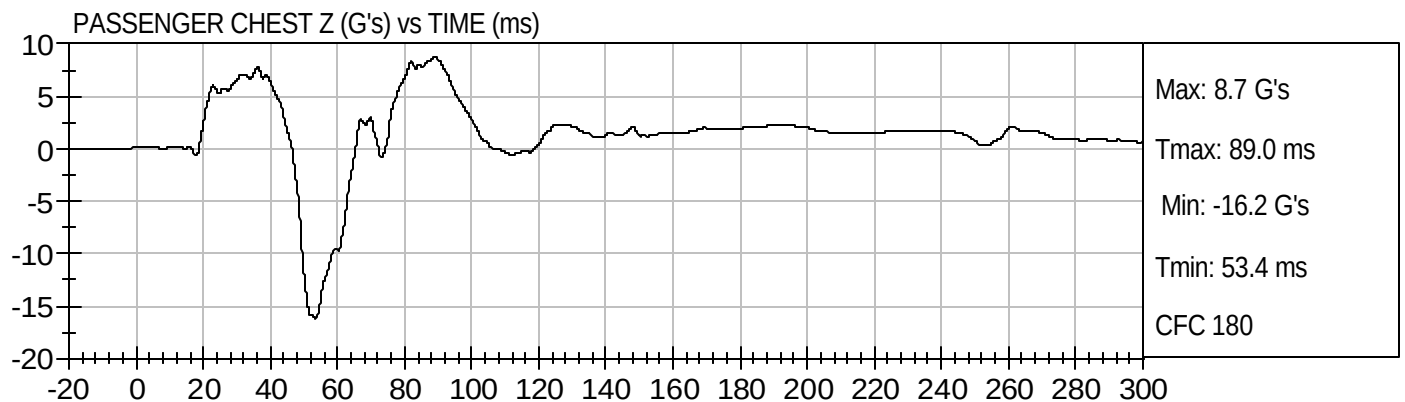
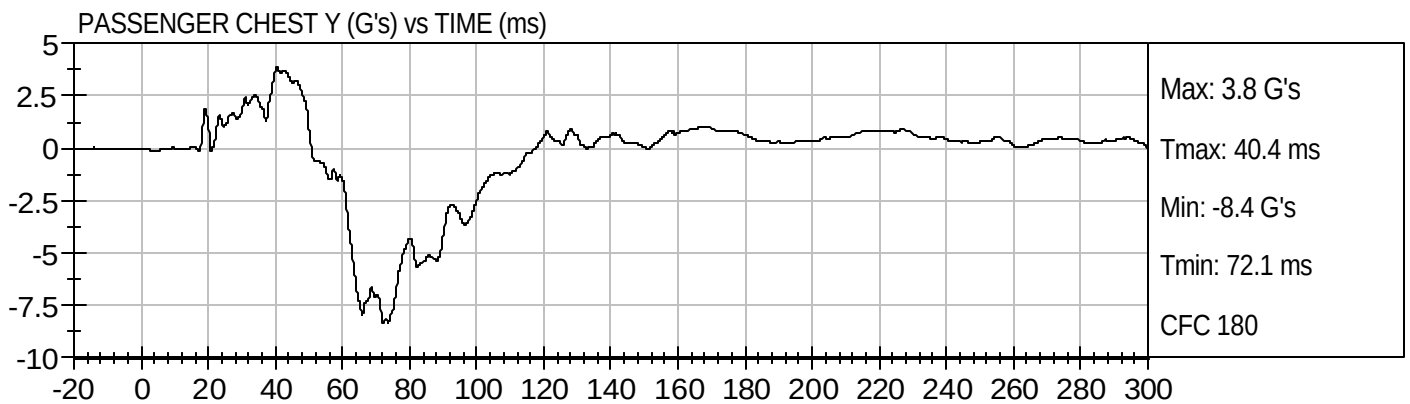
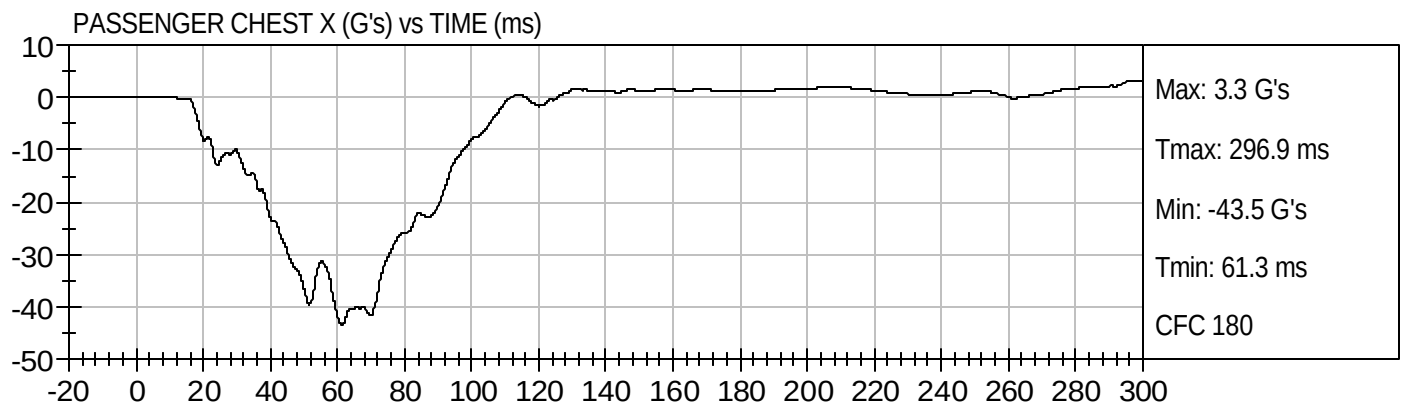
PASSENGER HEAD Z (G's) vs TIME (ms)

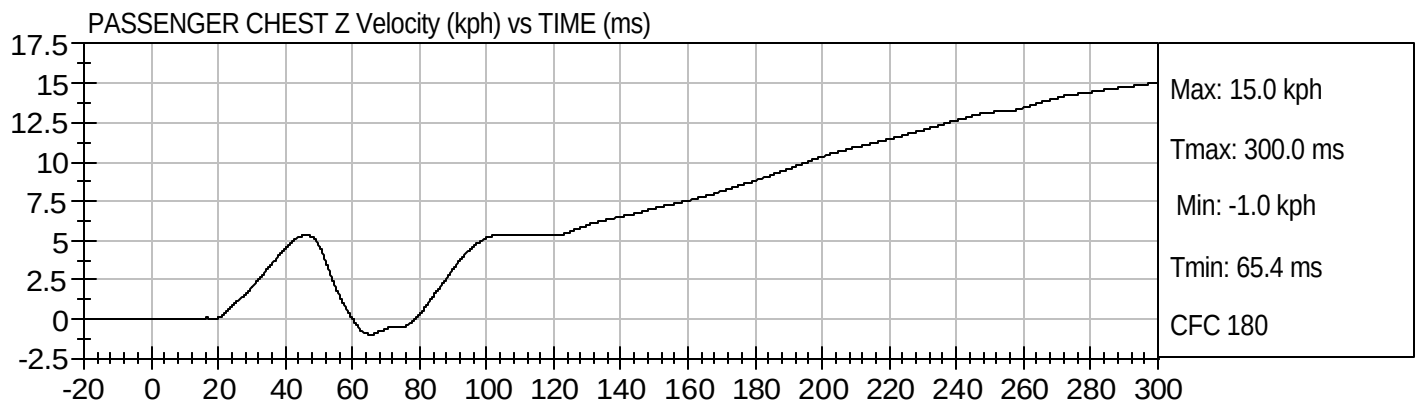
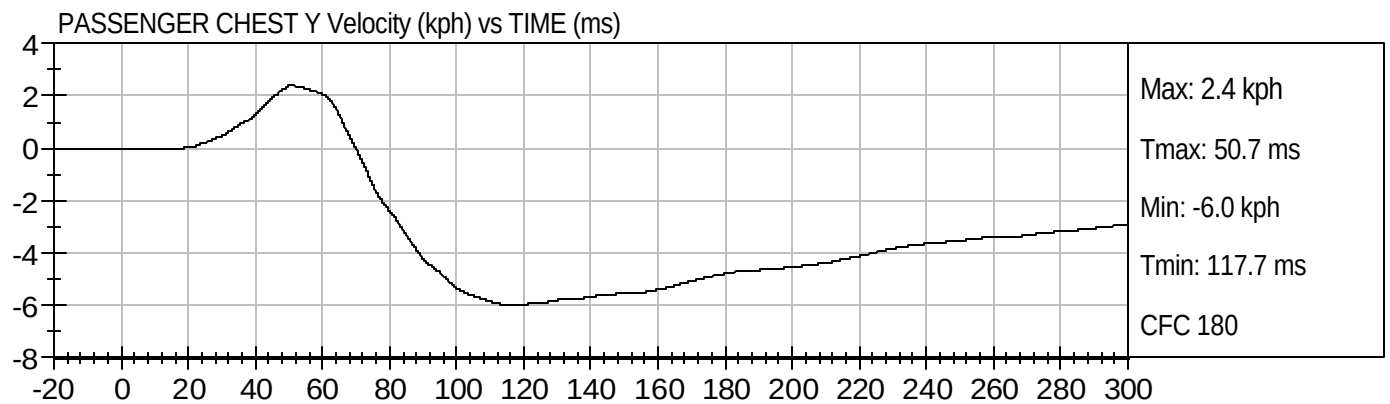
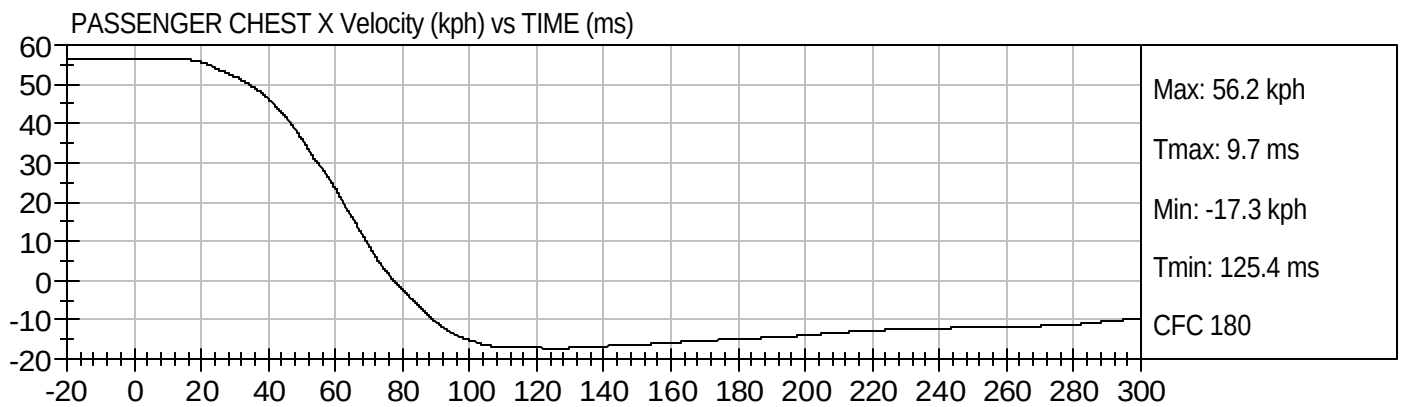


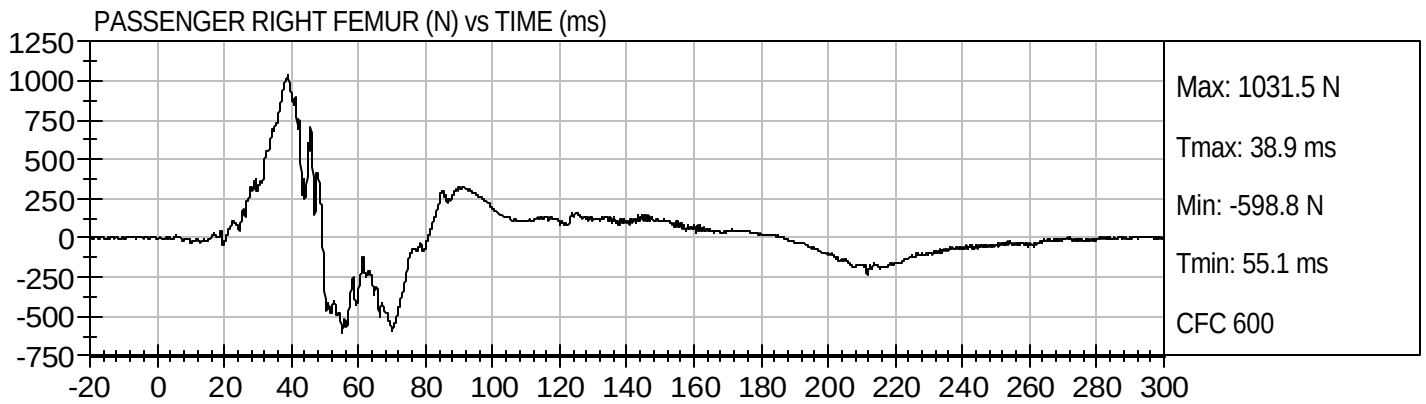
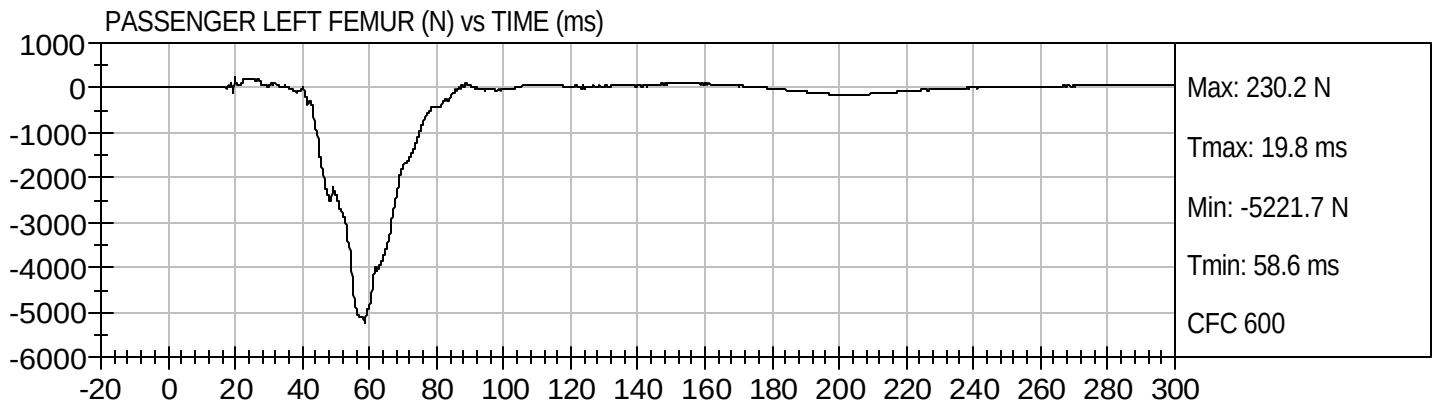
PASSENGER HEAD Resultant (G's) vs TIME (ms)











APPENDIX C
DUMMY CALIBRATION DATA

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

ATD Serial No: 065

Test ID: D073091

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Peak Resultant Acceleration	G's	225 - 275	247	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-5.1	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass



Laboratory Technician



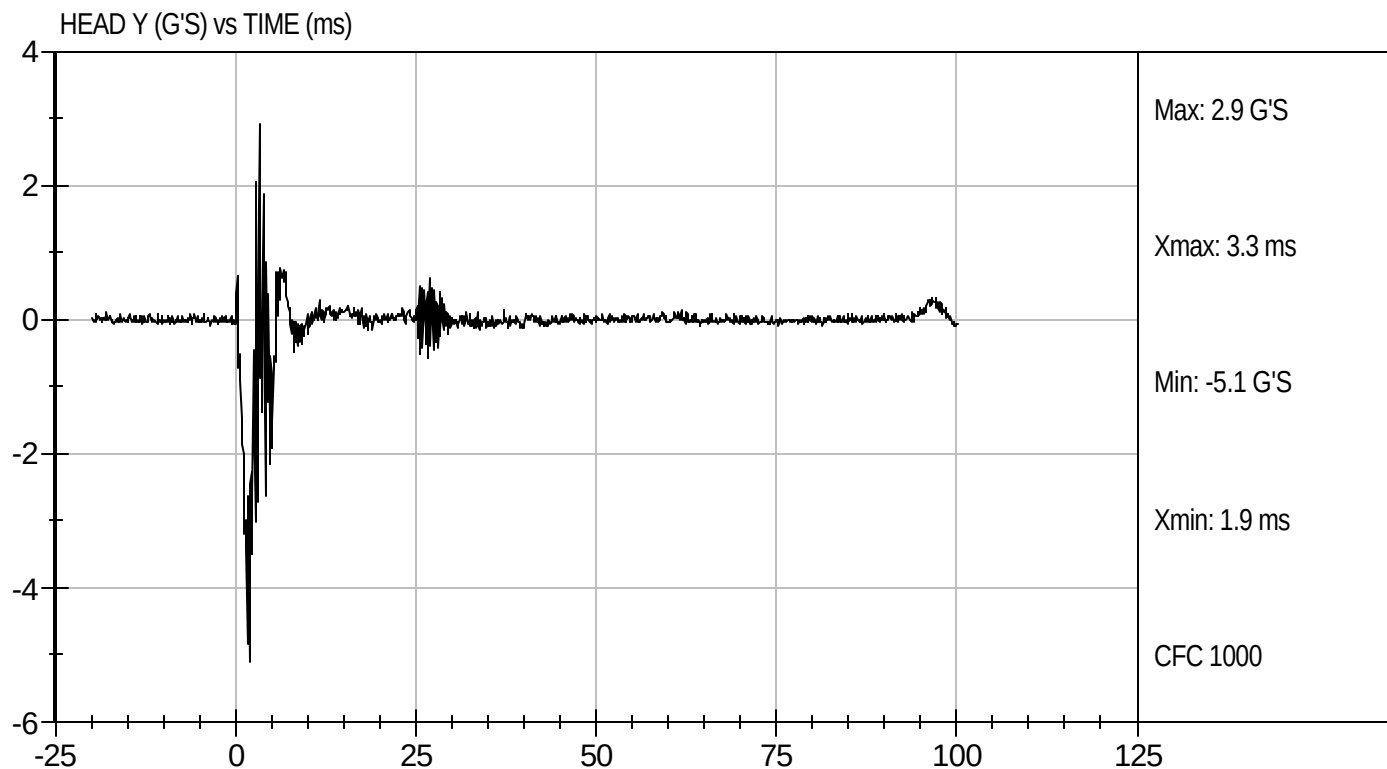
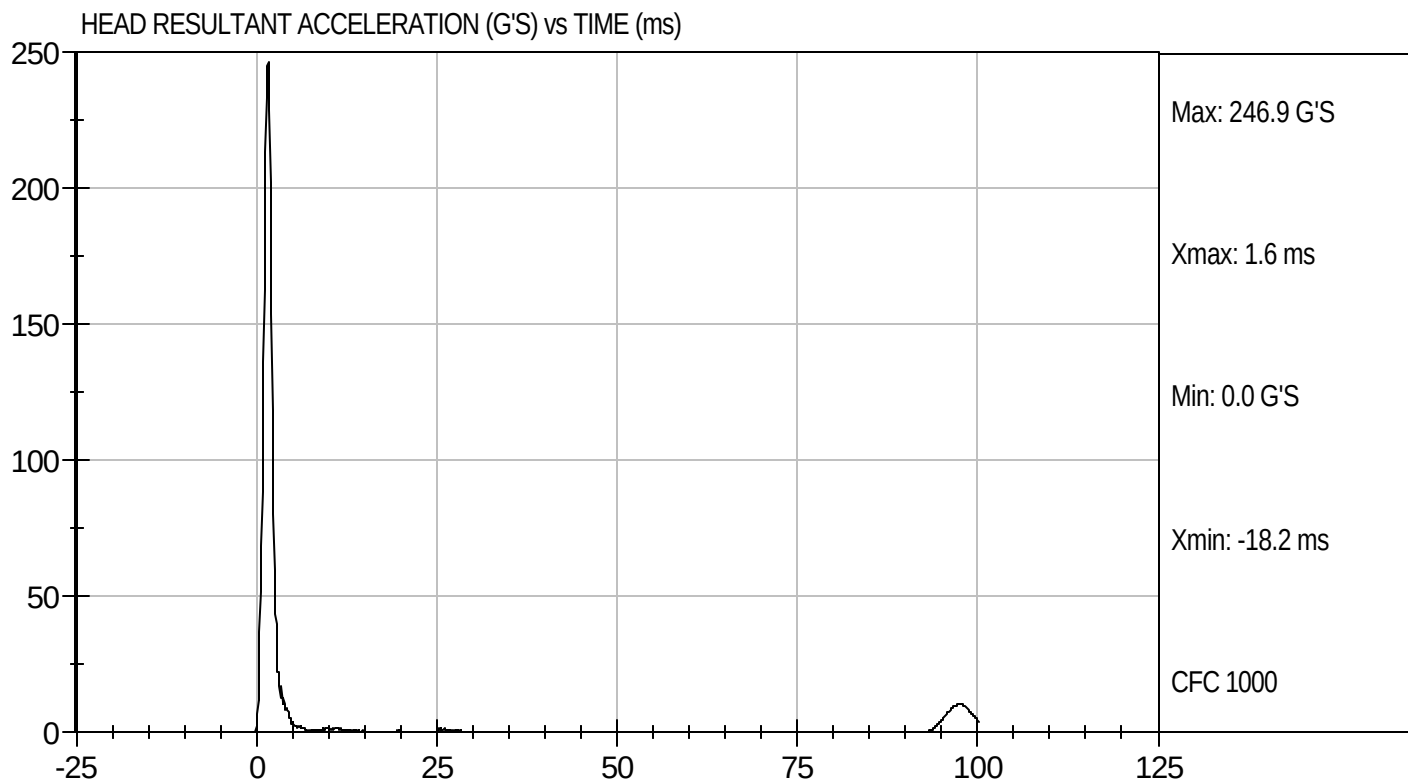
Approved By

10/3/07
Test Date



Test Desc: Head Drop
Component ID: D073091

Test Date: 10/3/07
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: D073092

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.8	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	22.84	Pass
	20 msec	G's	17.60 to 22.60	19.49	Pass
	30 msec	G's	12.50 to 18.50	14.22	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	14.21	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	36.6	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	72.2	Pass
	Time	msec	57.0 to 64.0	60.3	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	113.2	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	93.0	Pass
	Time	msec	47.0 to 58.0	47.7	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	103.0	Pass
Overall Test Results					Pass


 Laboratory Technician

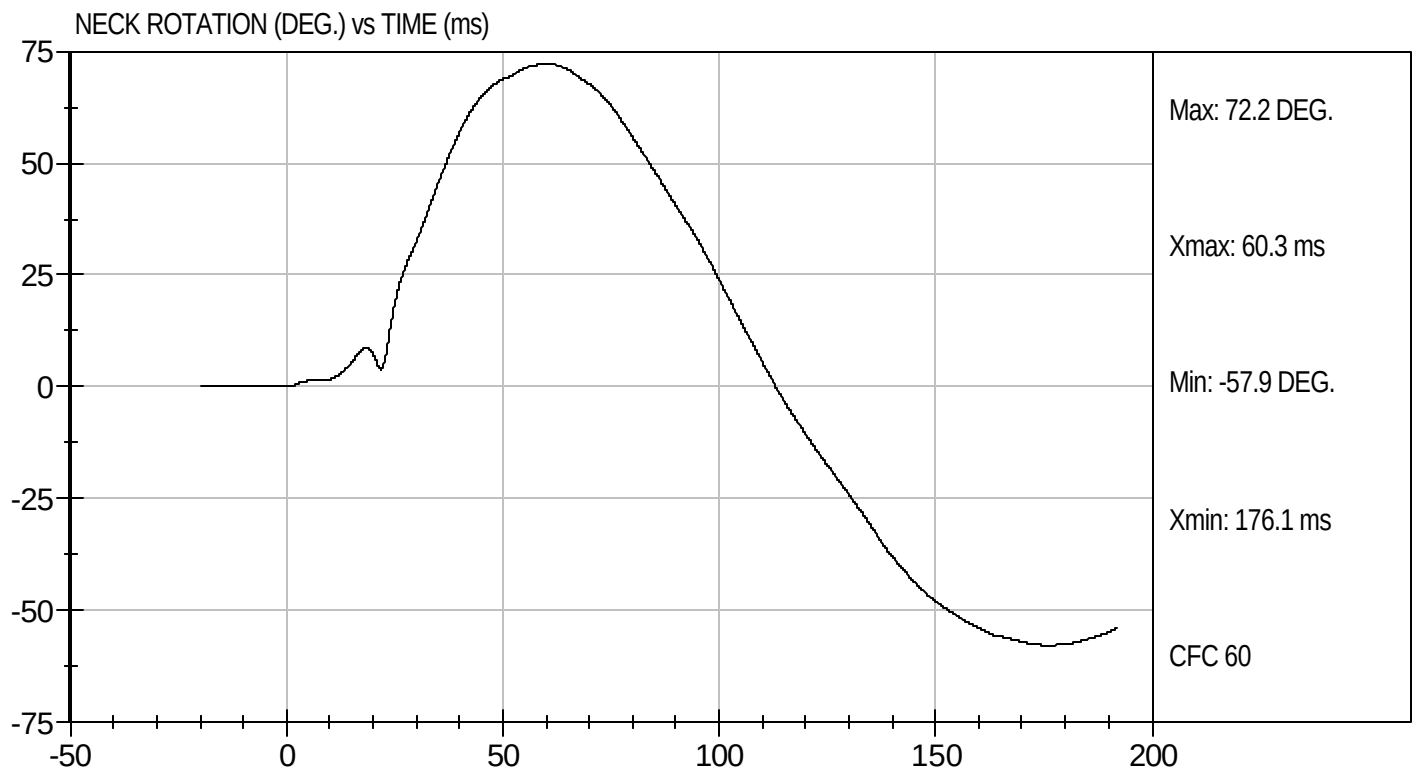
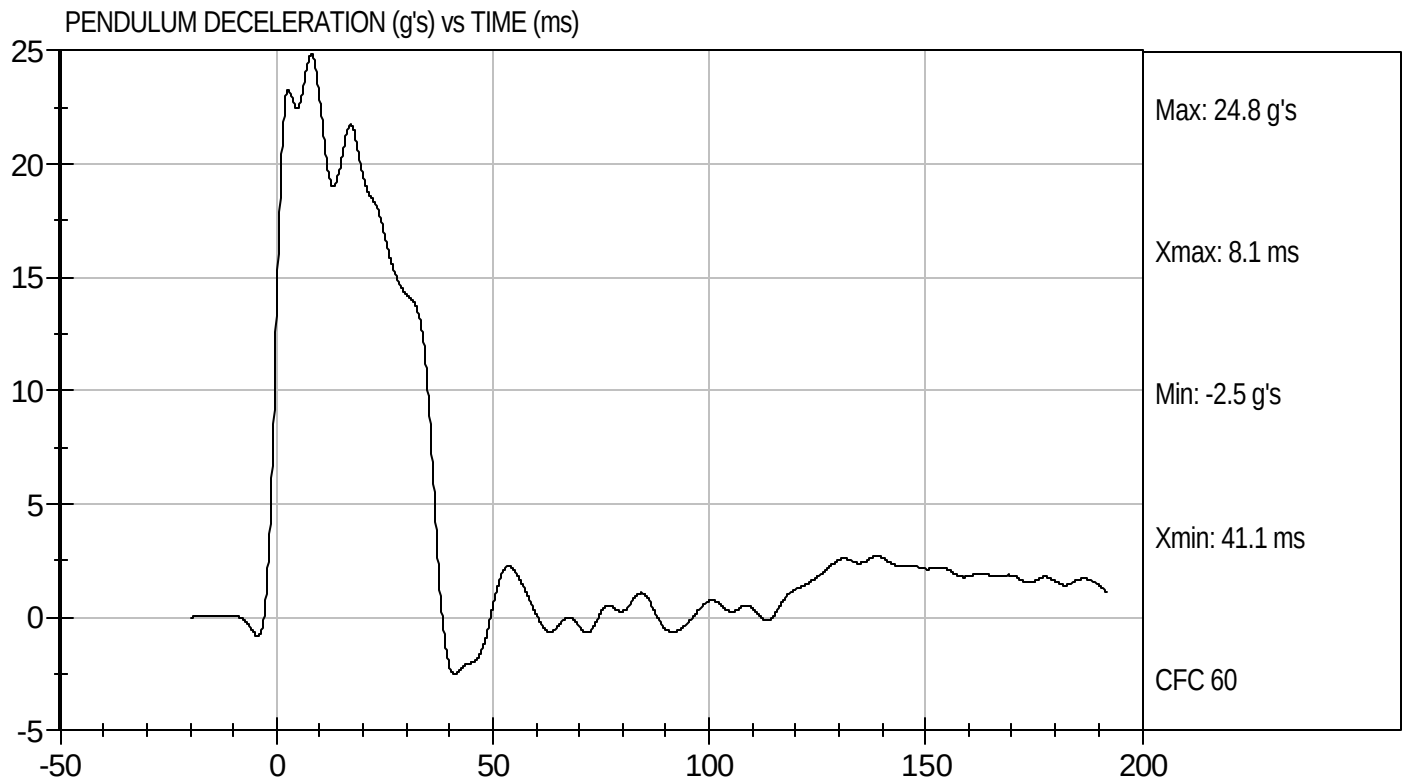
10/3/07
 Test Date


 Approved By



Test Desc: Neck Flexion
Component ID: D073092

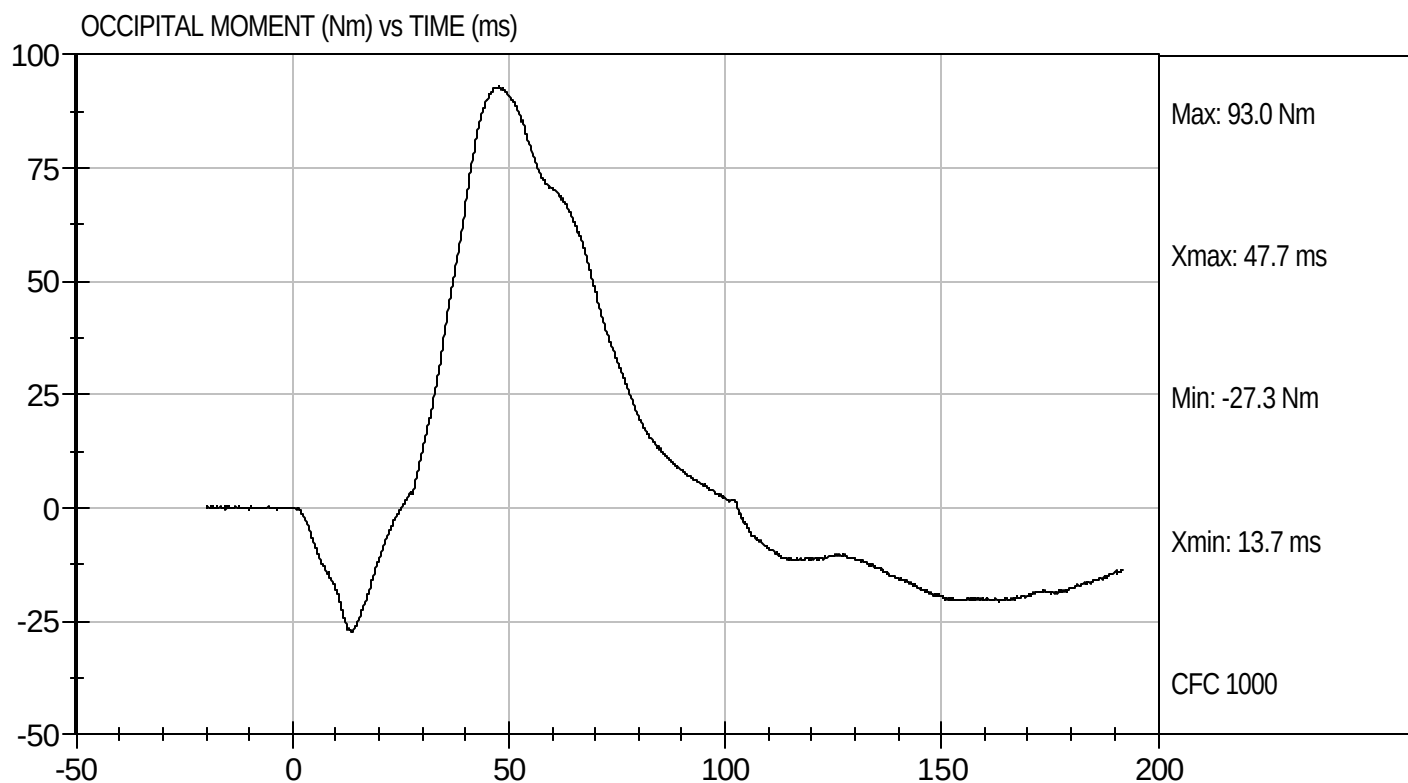
Test Date: 10/3/07
Velocity: 23.14 ft/s, 7.05 m/s





Test Desc: Neck Flexion
Component ID: D073092

Test Date: 10/3/07
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: D073093

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity		%	10 to 70	40	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	18.16	Pass
	20 msec	G's	14.00 to 19.00	15.37	Pass
	30 msec	G's	11.00 to 16.00	11.96	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	12.40	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	39.1	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	83.8	Pass
	Time	msec	72.0 to 82.0	76.0	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	149.6	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-61.9	Pass
	Time	msec	65.0 to 79.0	70.9	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	140.7	Pass
Overall Test Results					Pass


 Laboratory Technician

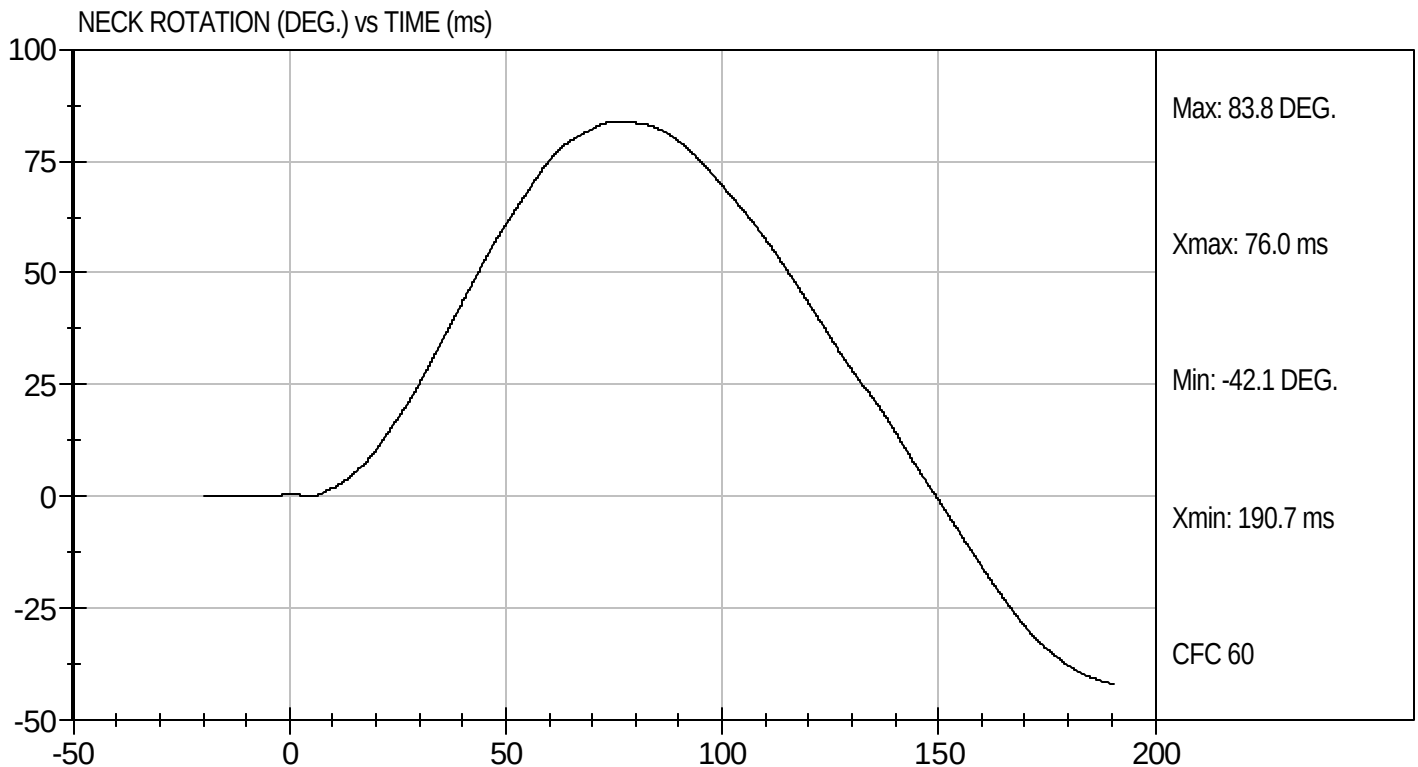
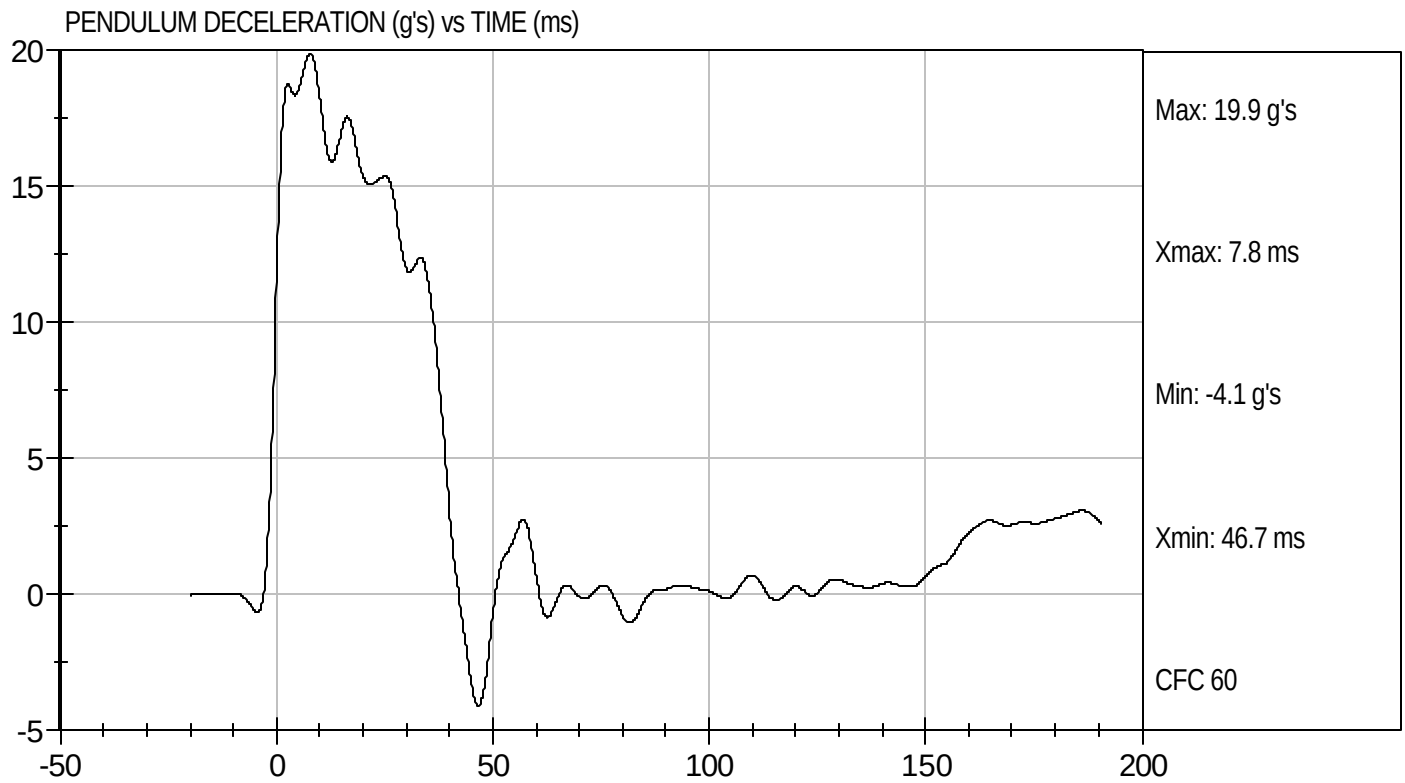
10/3/07
 Test Date


 Approved By



Test Desc: Neck Extension
Component ID: D073093

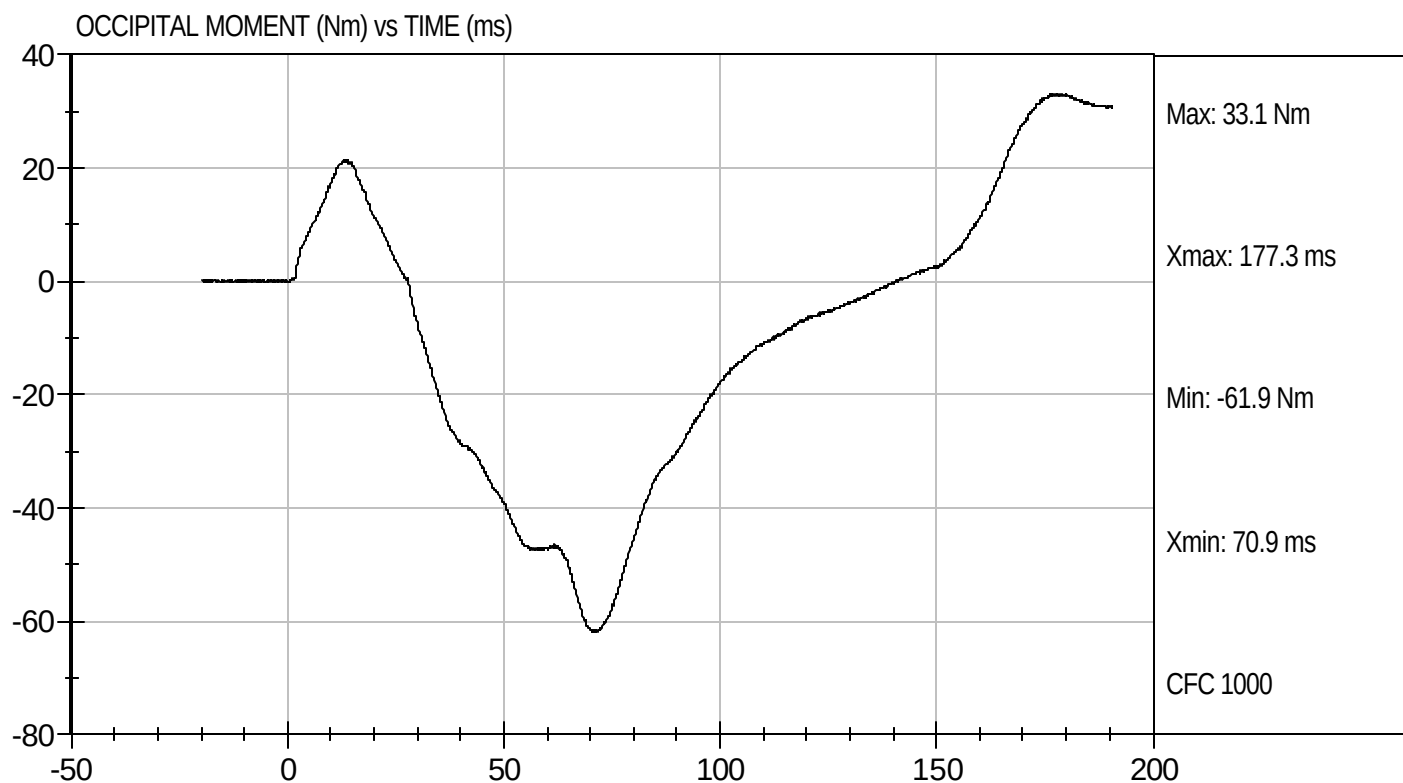
Test Date: 10/3/07
Velocity: 20.08 ft/s, 6.12 m/s





Test Desc: Neck Extension
Component ID: D073093

Test Date: 10/3/07
Velocity: 20.08 ft/s, 6.12 m/s



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065

Test I.D: D073094

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,261	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.50	Pass
Internal Hysteresis	%	69 to 85	74	Pass
Overall Test Results			Pass	



Laboratory Technician



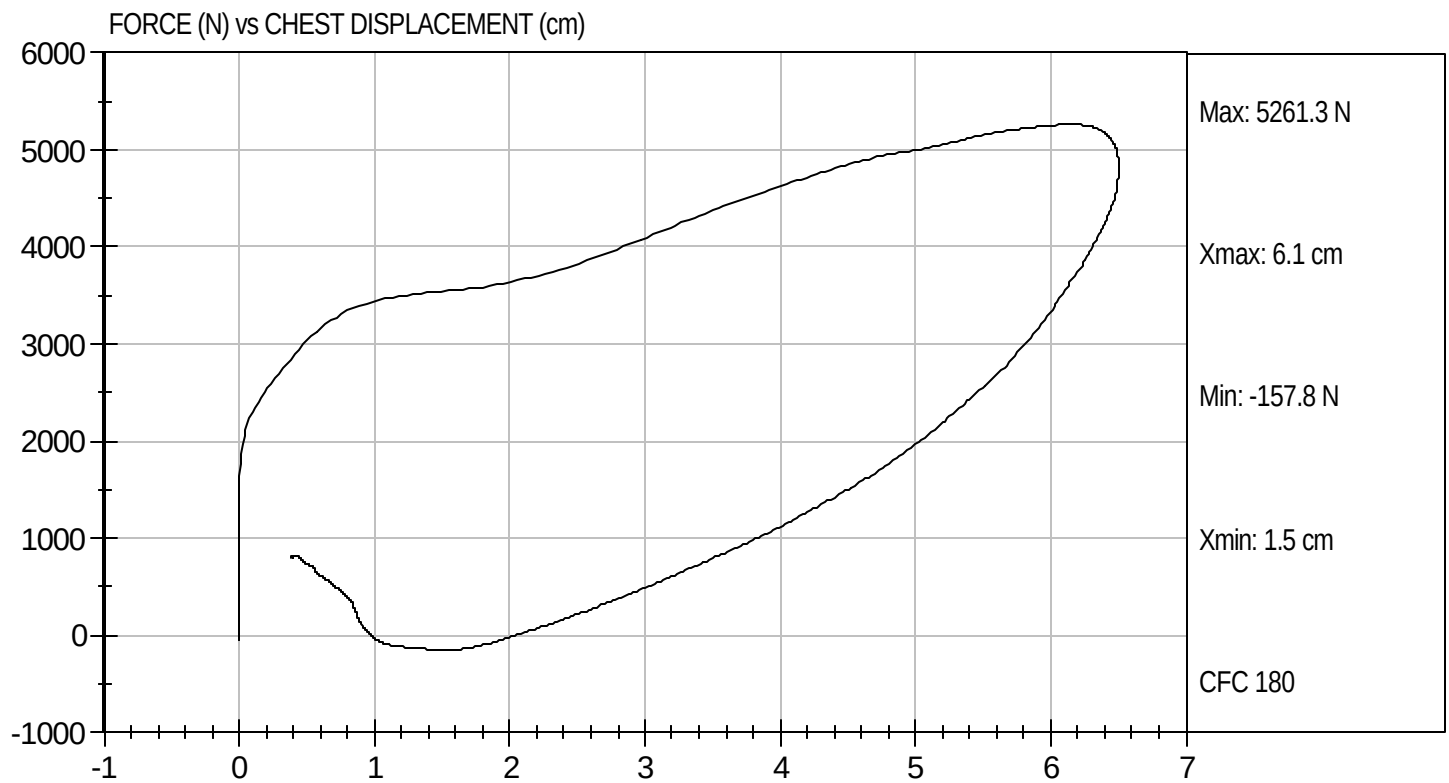
Approved By

10/3/07
Test Date



Test Desc: Thorax Impact
Component ID: D073094

Test Date: 10/3/07
Velocity: 22.22 ft/s, 6.77 m/s



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

ATD Serial No: 065

Test I.D: D073095

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	39	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	5,469	Pass
Overall Test Results				Pass


Laboratory Technician

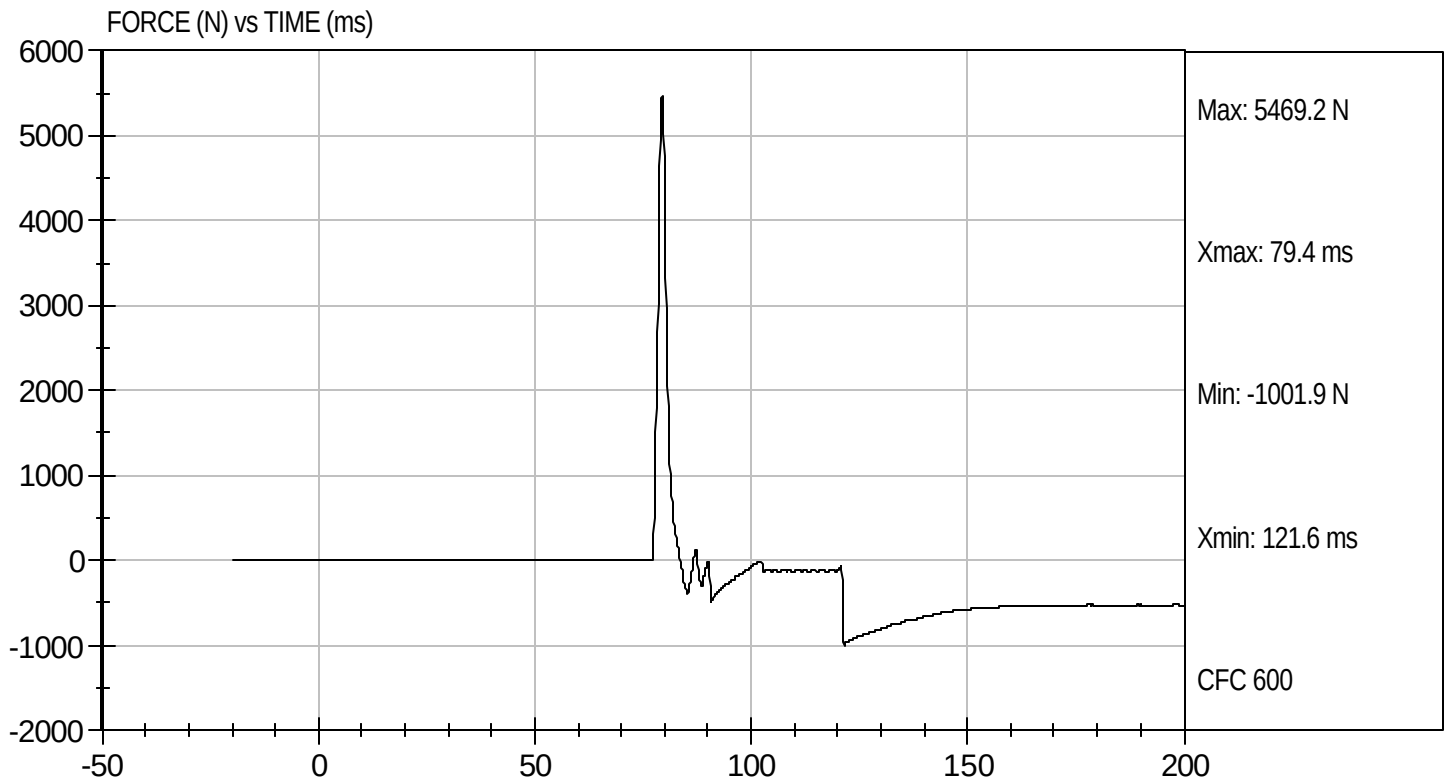

Approved By

10/3/07
Test Date



Test Desc: Right Knee
Component ID: D073095

Test Date: 10/3/07
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: D073096

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	39	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.09	Pass
Peak Probe Force	Newtons	4715 to 5782	5,542	Pass
Overall Test Results				Pass


Laboratory Technician

10/3/07

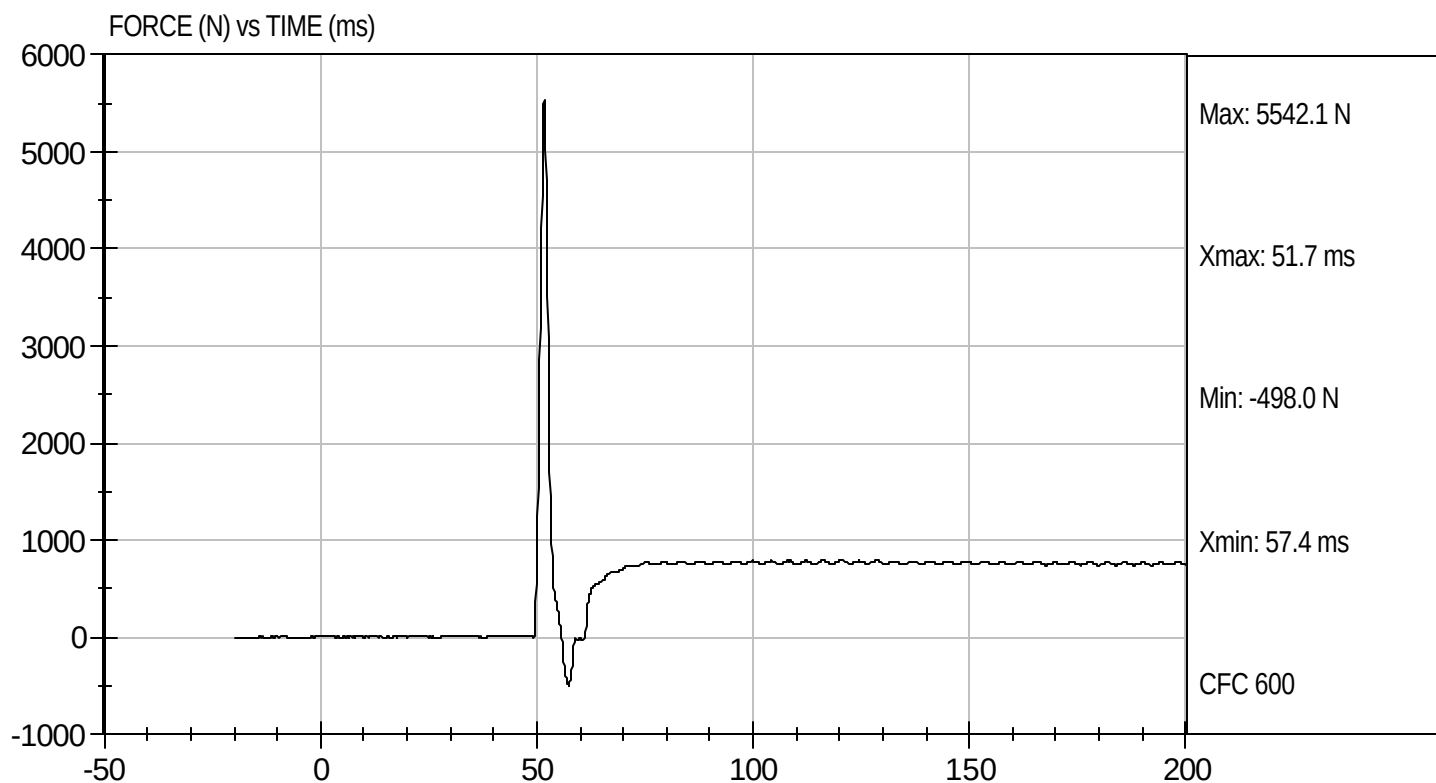
Test Date


Approved By



Test Desc: Left Knee
Component ID: D073096

Test Date: 10/3/07
Velocity: 6.86 ft/s, 2.09 m/s



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

ATD Serial No: 065

Test I.D: D073090

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	20.8	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	48	48	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	62.5	59.4	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	43	41	Pass
Overall Test Results					Pass


 Laboratory Technician

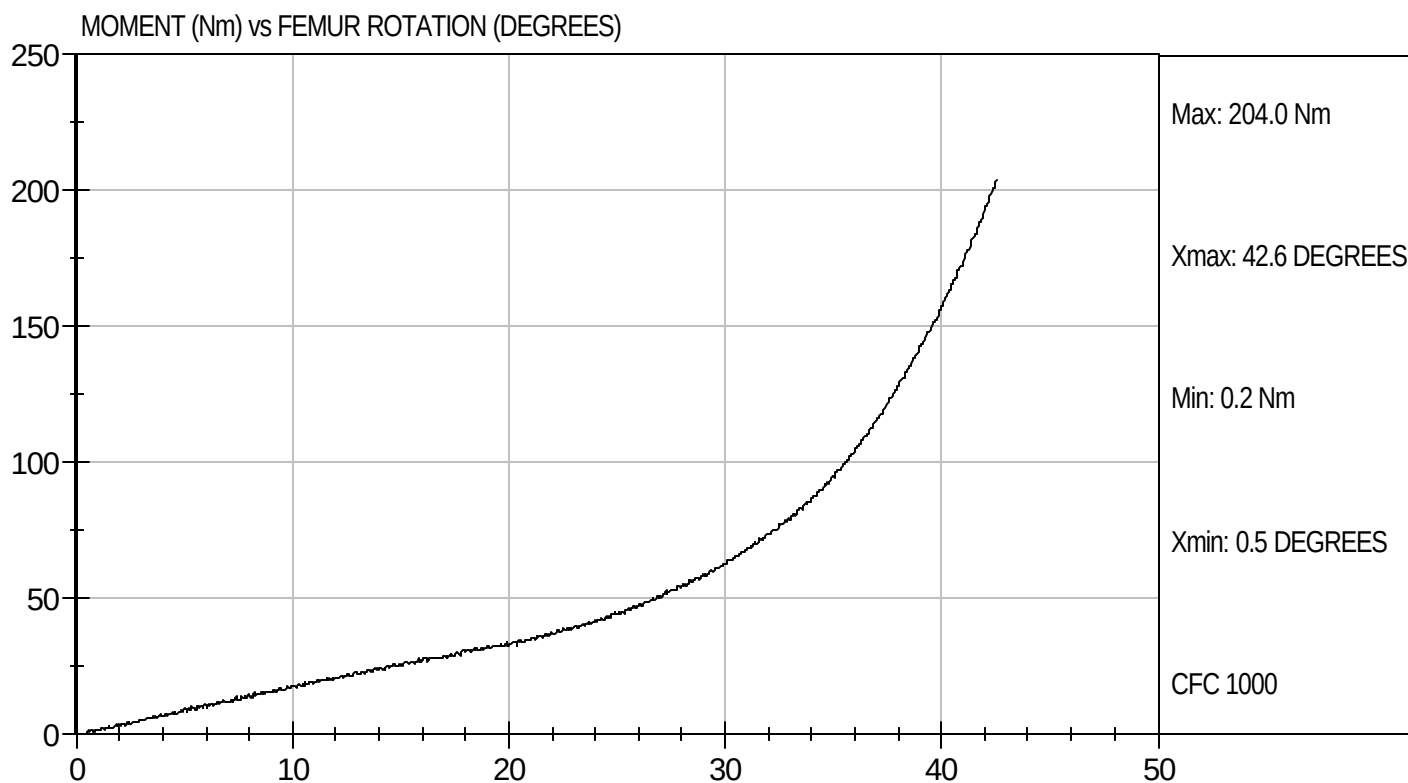
10/3/07
 Test Date


 Approved By



Test Desc: Hip Femur Flexion
Component ID: D073099

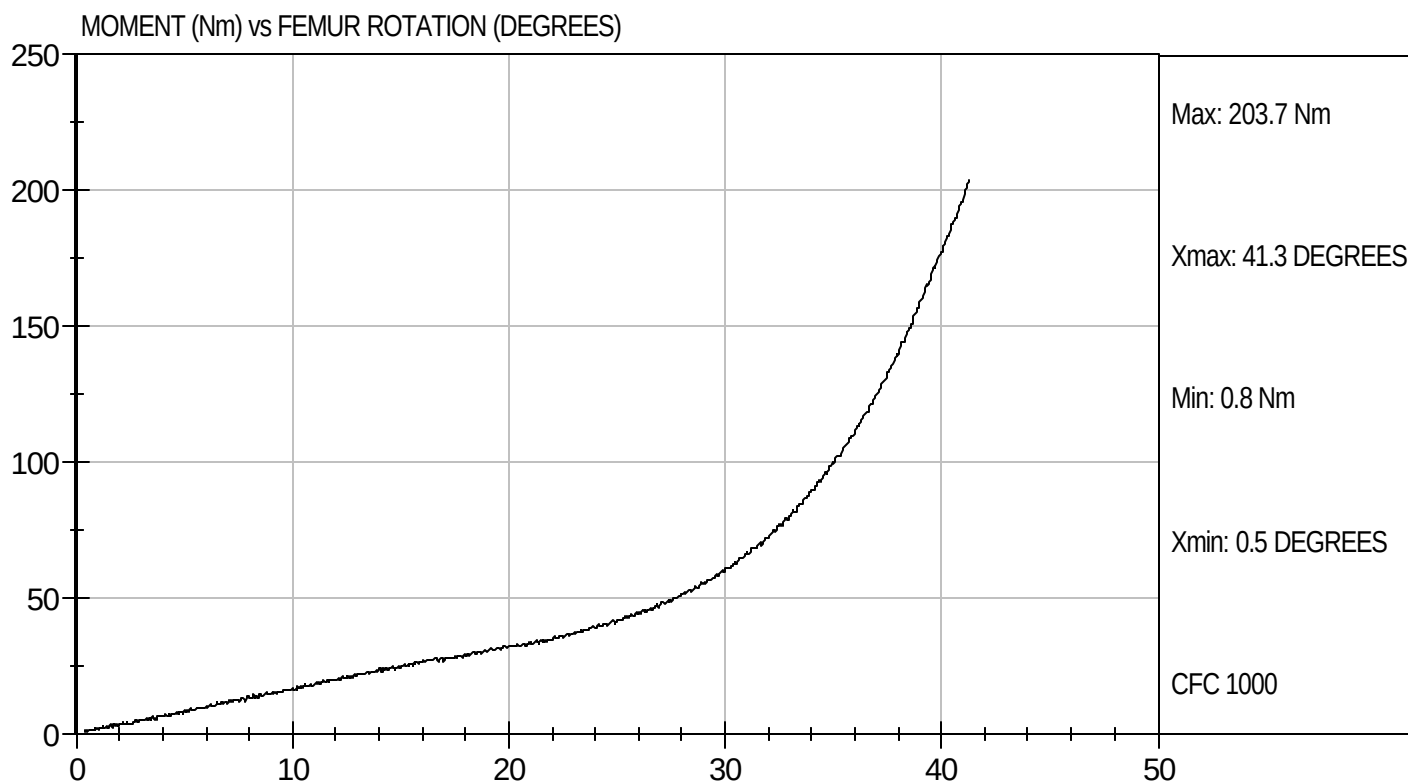
Test Date: 10/3/07
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Component ID: D073090

Test Date: 10/3/07
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: D073101

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Peak Resultant Acceleration	G's	225 - 275	246	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-6.0	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass



Laboratory Technician

10/3/07
Test Date

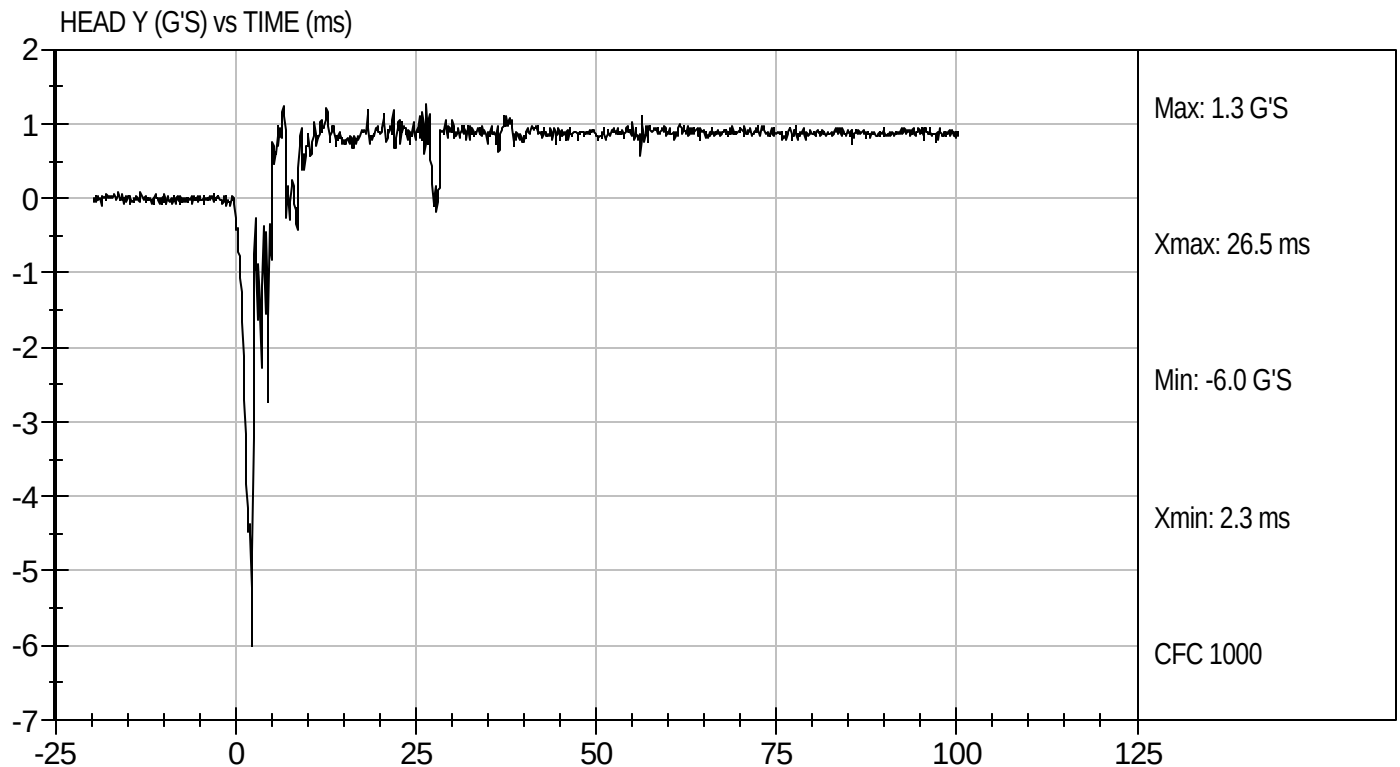
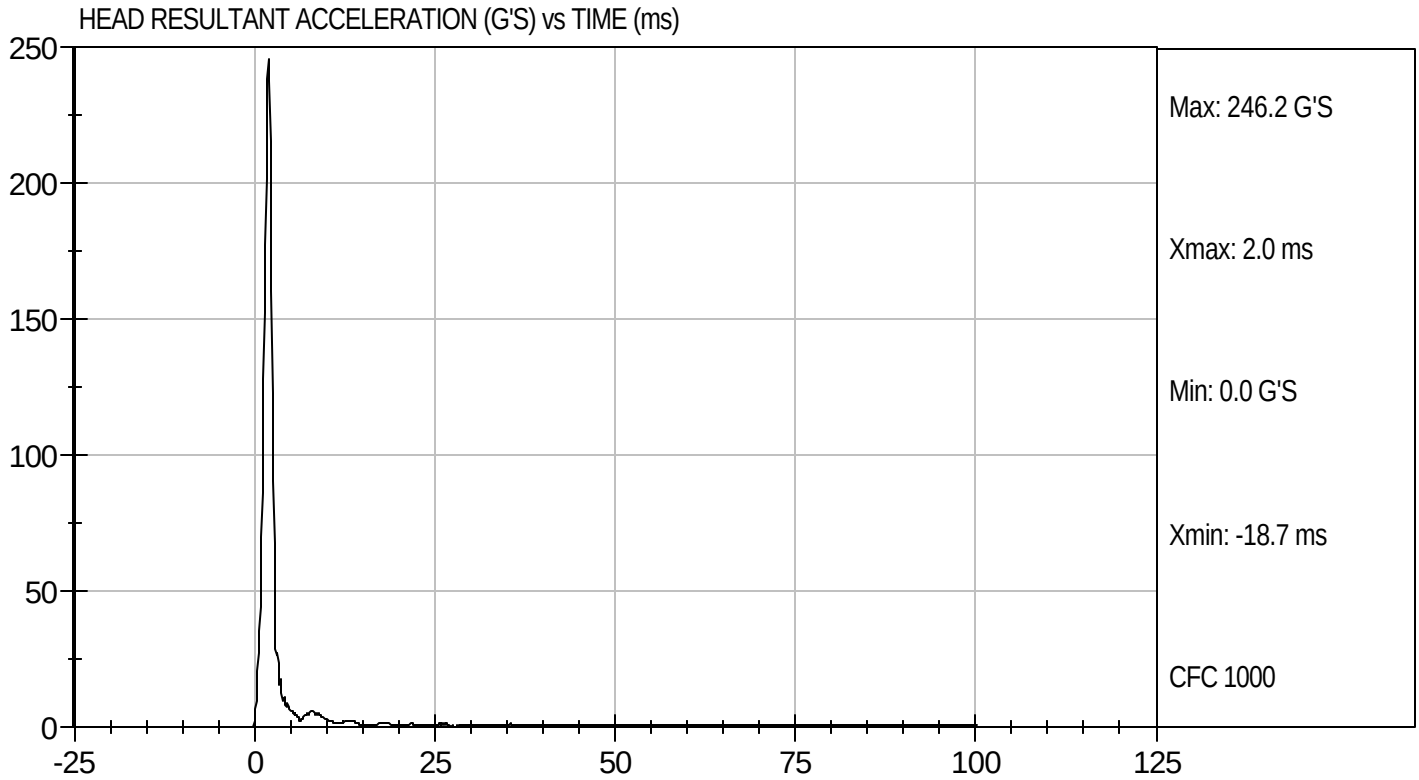


Approved By



Test Desc: Head Drop
Component ID: D073101

Test Date: 10/3/07
Velocity: 0 ft/s, 0.00 m/s



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

ATD Serial No: 066

Test I.D: D073102

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	40	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.05	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	23.13	Pass
	20 msec	G's	17.60 to 22.60	20.11	Pass
	30 msec	G's	12.50 to 18.50	12.96	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	14.29	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	39.4	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	70.3	Pass
	Time	msec	57.0 to 64.0	57.2	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	113.4	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	92.6	Pass
	Time	msec	47.0 to 58.0	52.0	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	100.3	Pass
Overall Test Results					Pass


 Laboratory Technician

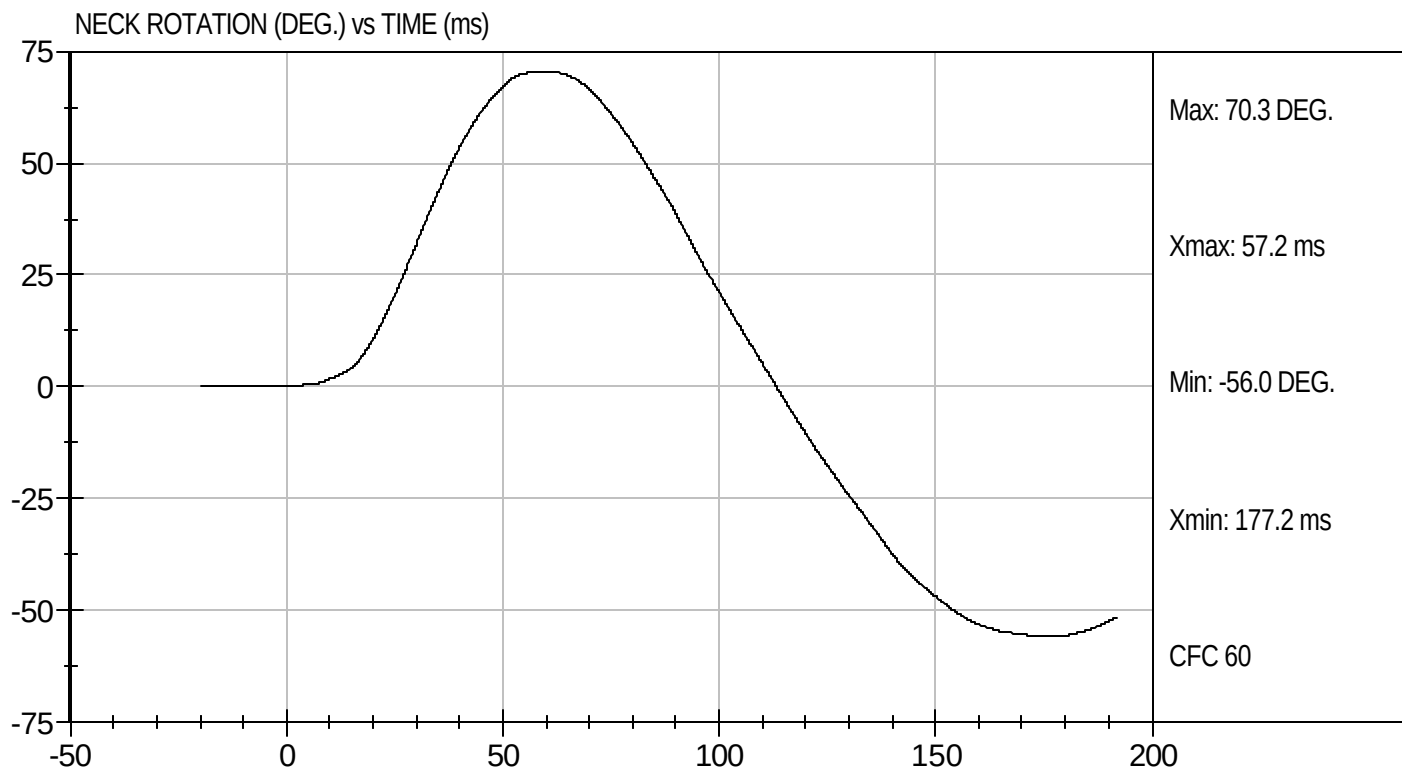
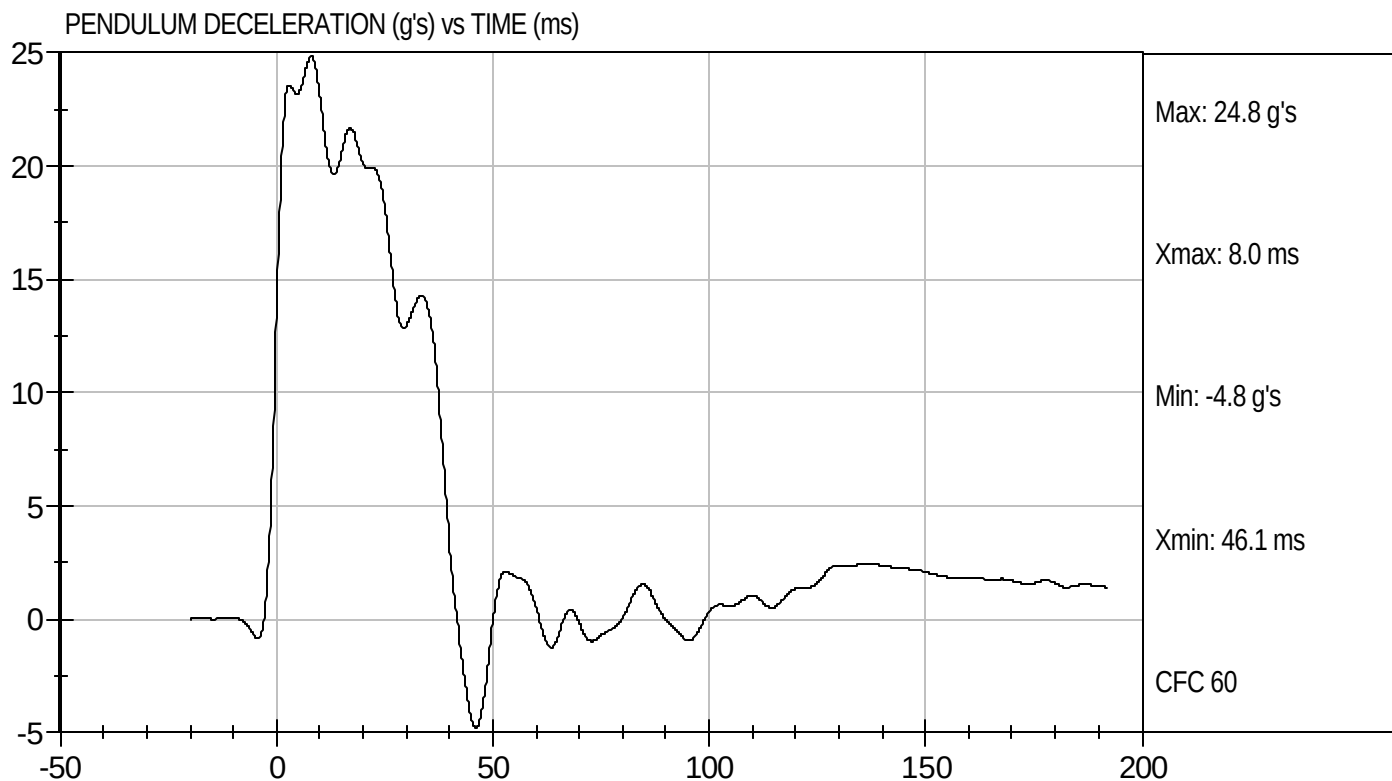
10/3/07
 Test Date


 Approved By



Test Desc: Neck Flexion
Component ID: D073102

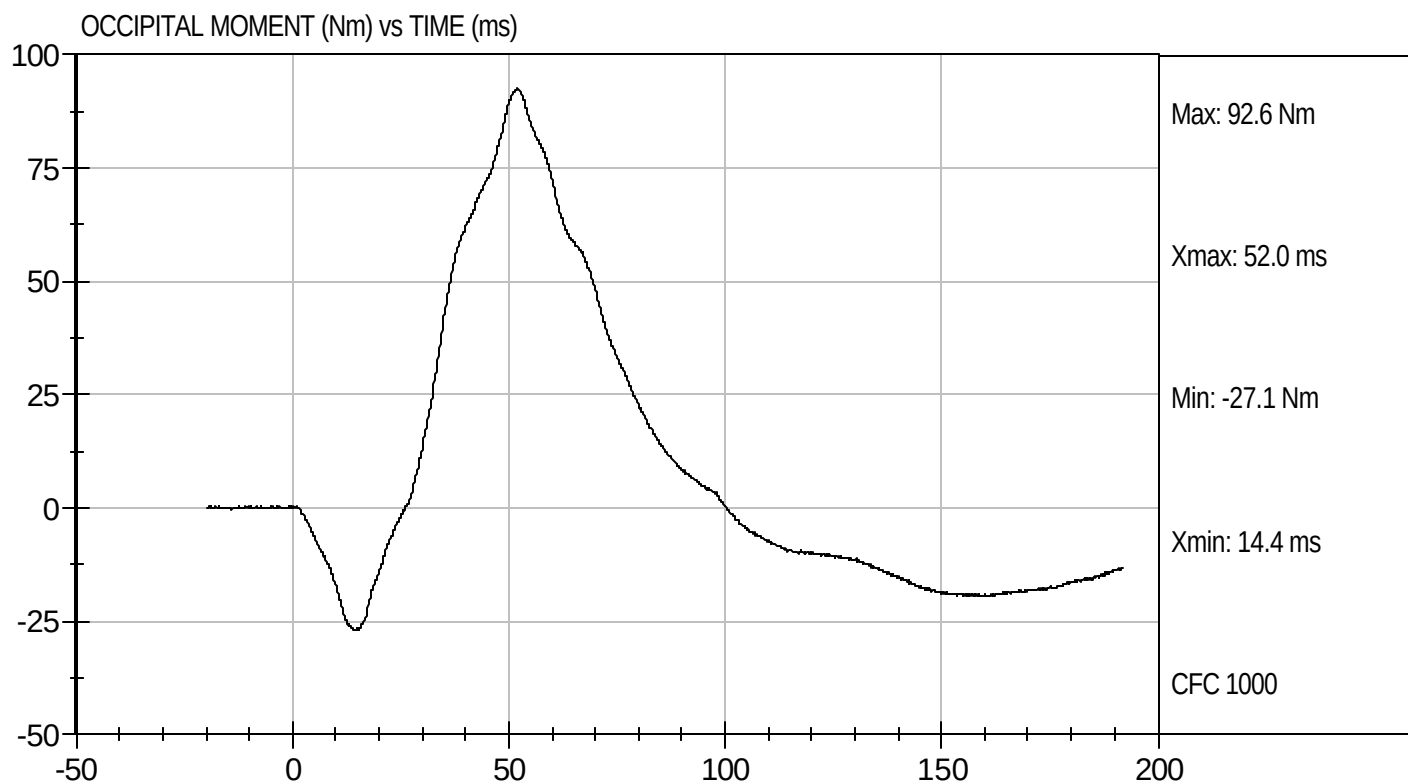
Test Date: 10/3/07
Velocity: 23.14 ft/s, 7.05 m/s





Test Desc: Neck Flexion
Component ID: D073102

Test Date: 10/3/07
Velocity: 23.14 ft/s, 7.05 m/s



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

ATD Serial No: 066

Test I.D: D073103

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	38	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	20.65	Pass
	20 msec	G's	14.00 to 19.00	16.68	Pass
	30 msec	G's	11.00 to 16.00	12.17	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	13.77	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	38.1	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	100.2	Pass
	Time	msec	72.0 to 82.0	73.7	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	152.6	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-67.8	Pass
	Time	msec	65.0 to 79.0	70.4	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	142.8	Pass
Overall Test Results					Pass


 Laboratory Technician

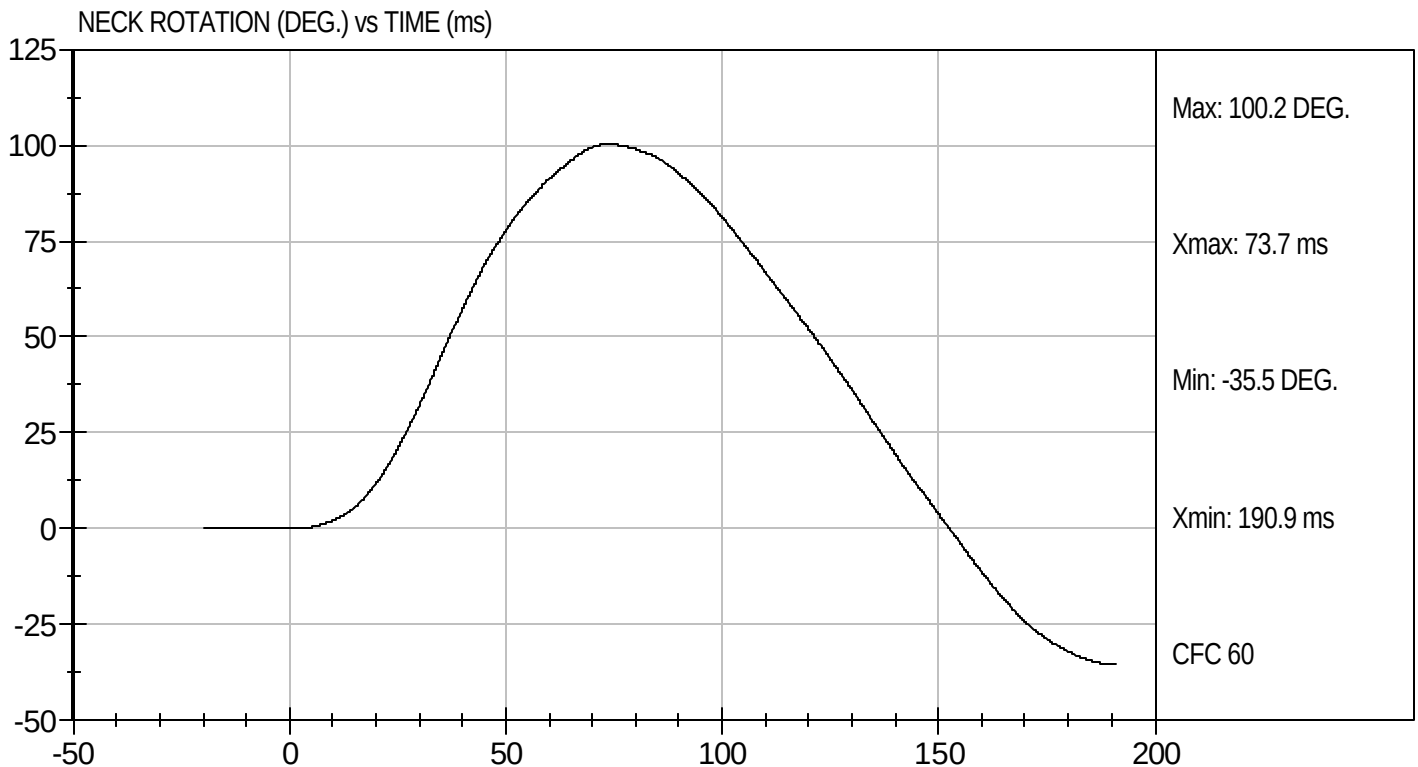
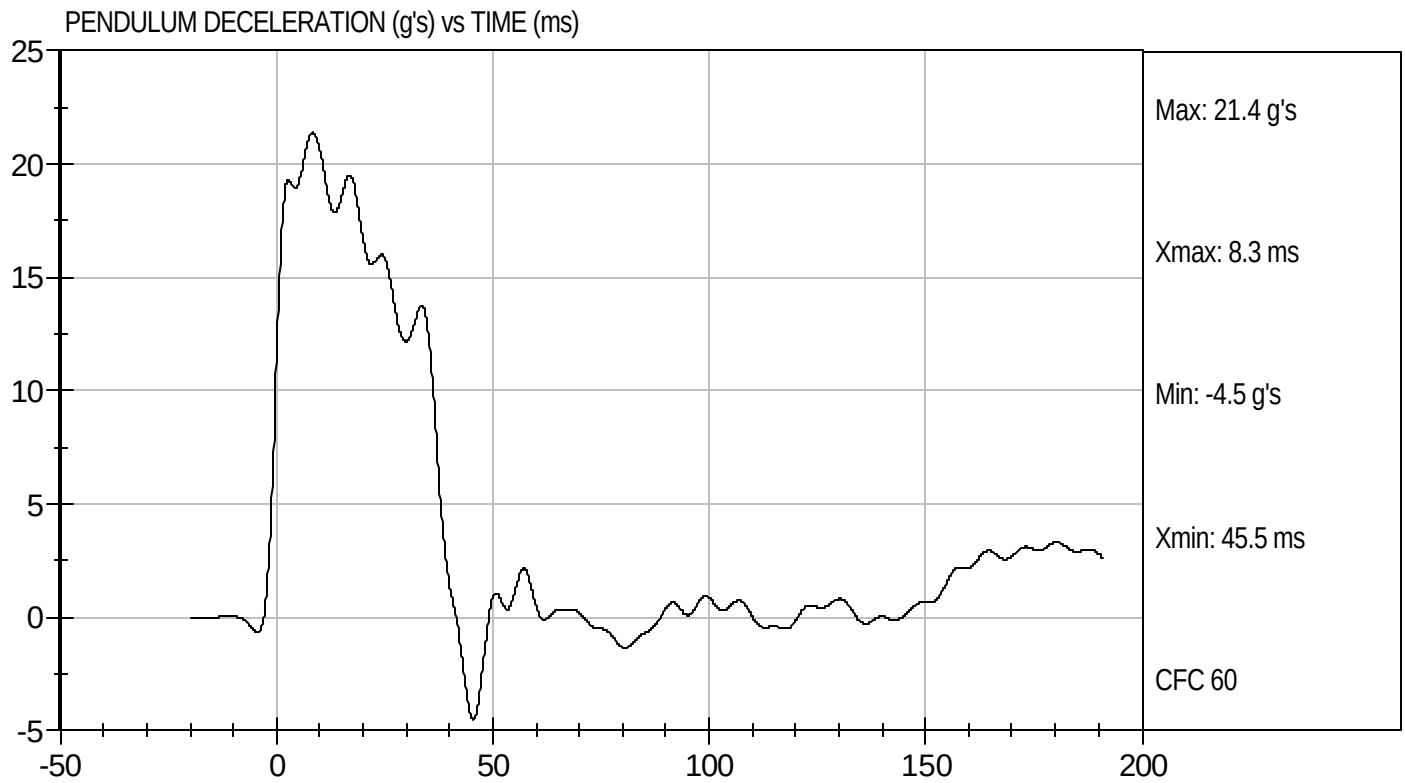
10/3/07
 Test Date


 Approved By



Test Desc: Neck Extension
Component ID: D073103

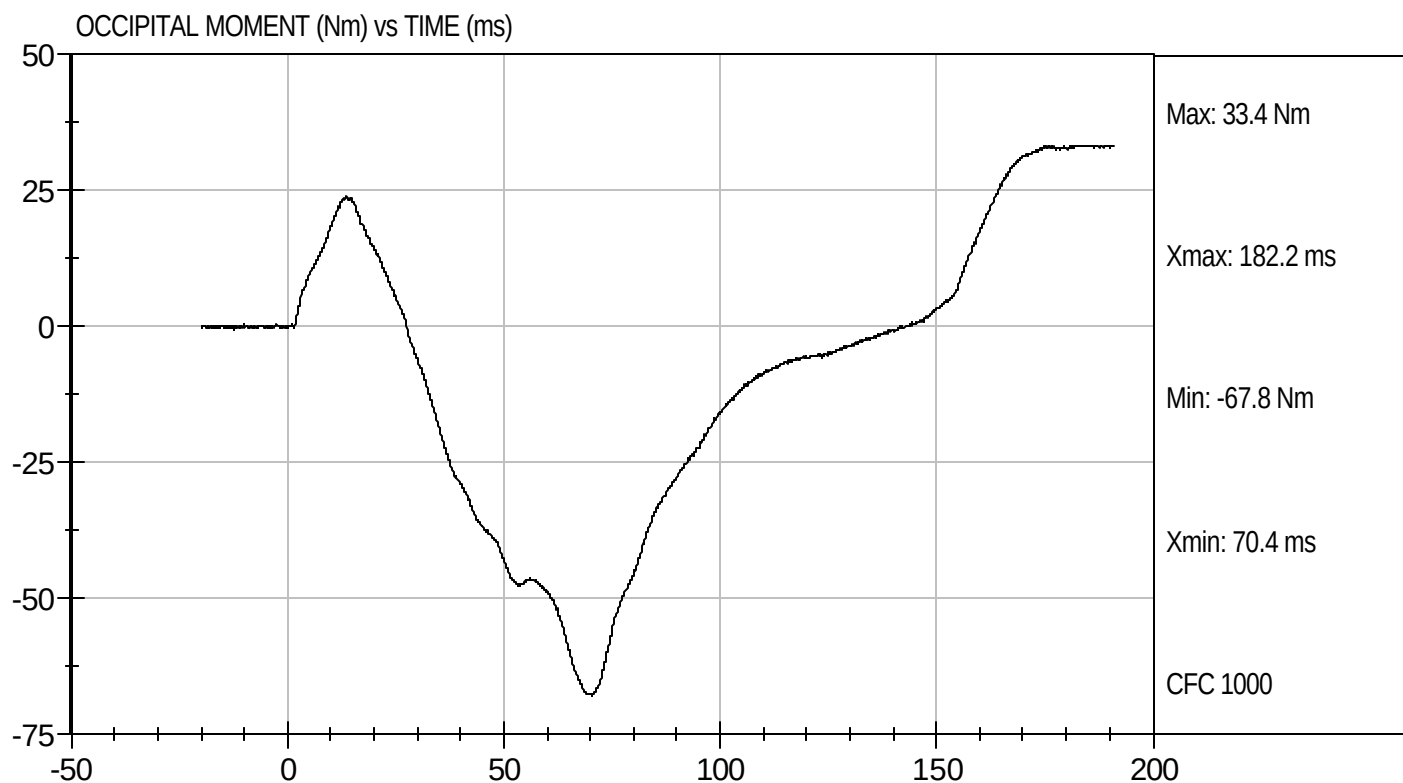
Test Date: 10/3/07
Velocity: 20.08 ft/s, 6.12 m/s





Test Desc: Neck Extension
Component ID: D073103

Test Date: 10/3/07
Velocity: 20.08 ft/s, 6.12 m/s



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066

Test I.D: D073104

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,413	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.66	Pass
Internal Hysteresis	%	69 to 85	69	Pass
Overall Test Results			Pass	



Laboratory Technician



Approved By

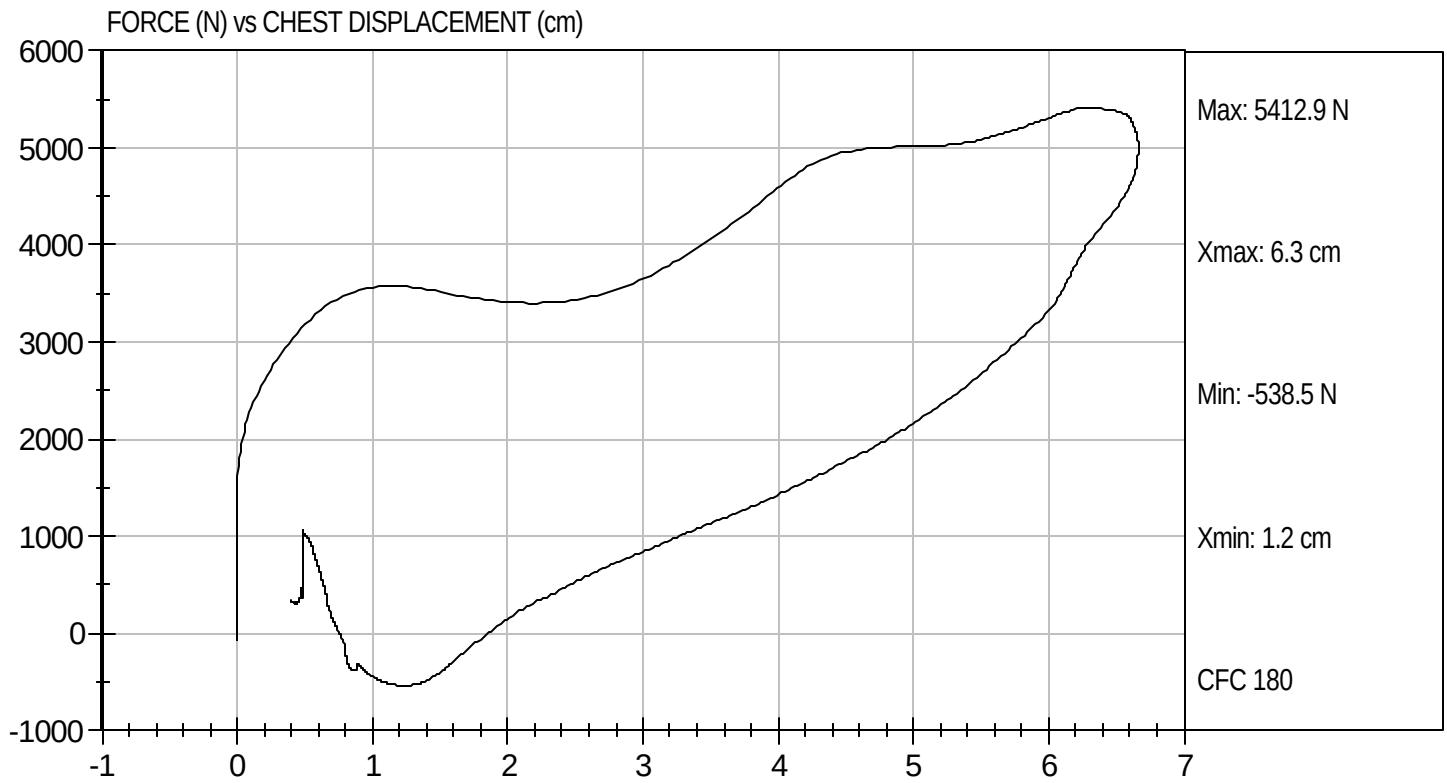
10/3/07

Test Date



Test Desc: Thorax Impact
Component ID: D073104

Test Date: 10/3/07
Velocity: 22.22 ft/s, 6.77 m/s



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

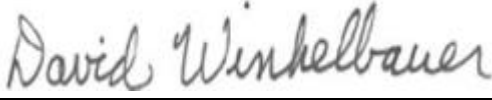
ATD Serial No: 066

Test I.D: D073105

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	39	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.08	Pass
Peak Probe Force	Newtons	4715 to 5782	5,538	Pass
Overall Test Results				Pass



Laboratory Technician



Approved By

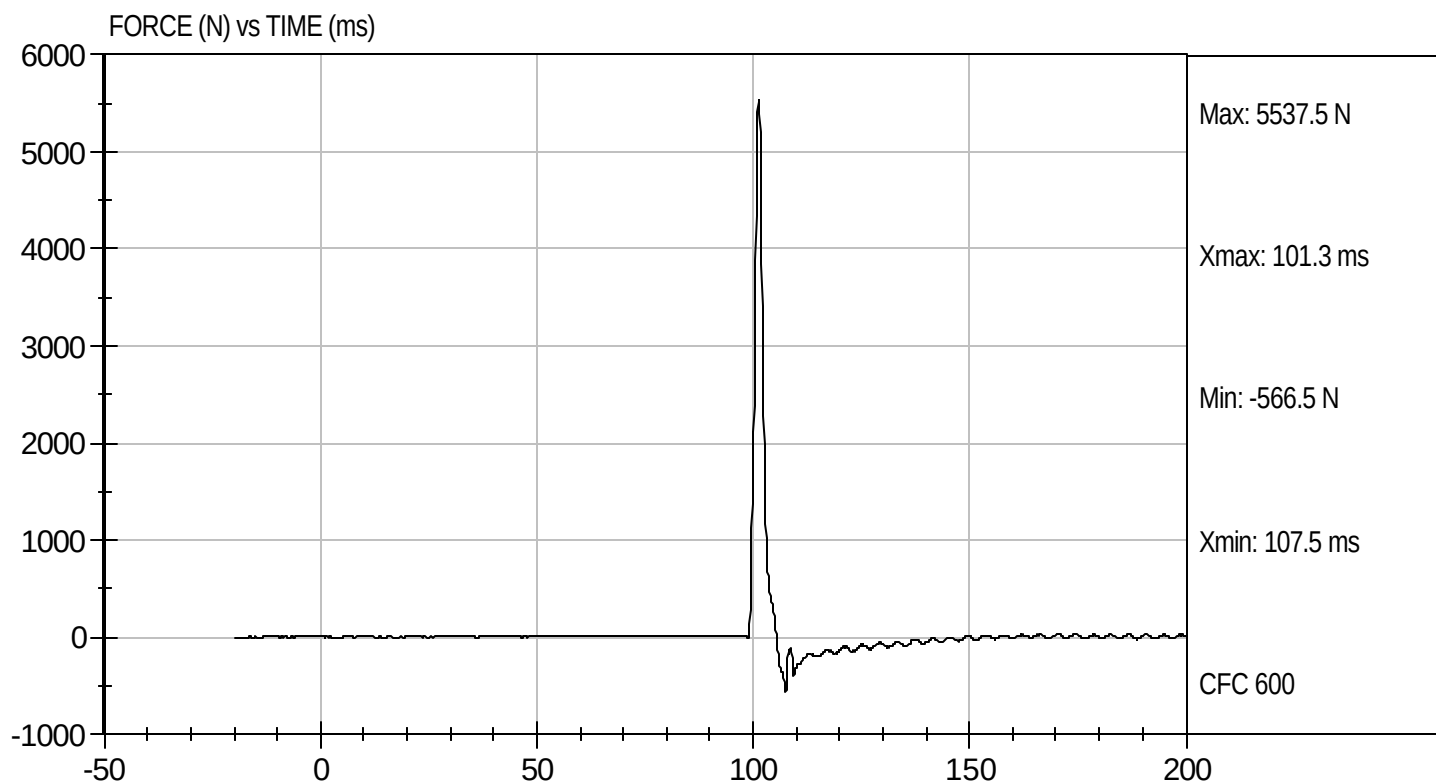
10/3/07

Test Date



Test Desc: Right Knee
Component ID: D073105

Test Date: 10/3/07
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: D073106

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	39	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	5,298	Pass
Overall Test Results				Pass



Laboratory Technician



Approved By

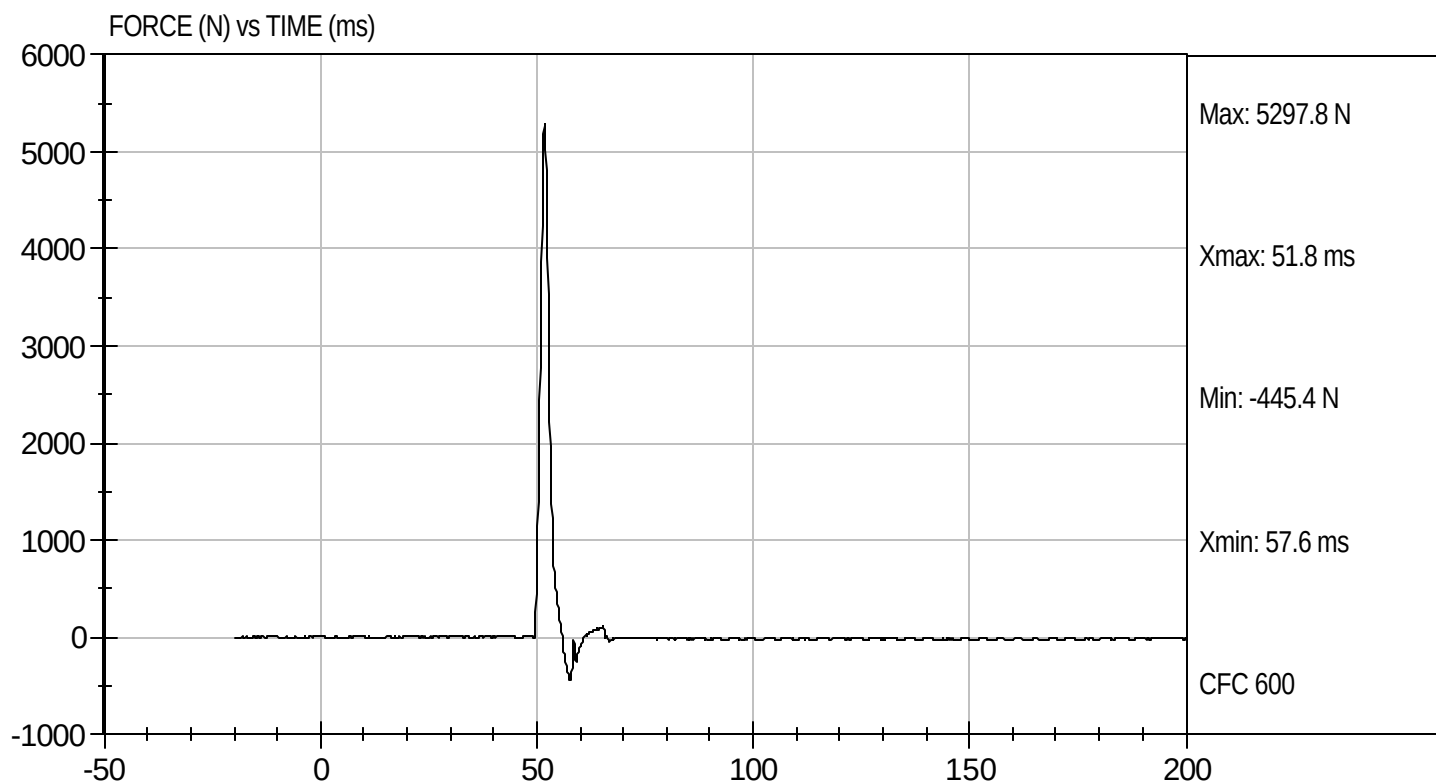
10/3/07

Test Date



Test Desc: Left Knee
Component ID: D073106

Test Date: 10/3/07
Velocity: 6.91 ft/s, 2.11 m/s

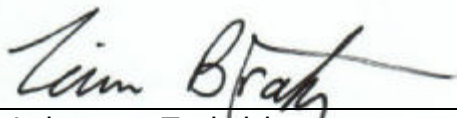


MGA RESEARCH CORPORATION
HIP-FEMUR FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066

Test I.D: D073100

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	20.8	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	43	43	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	66.7	52.2	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	41	42	Pass
Overall Test Results					Pass


 Laboratory Technician

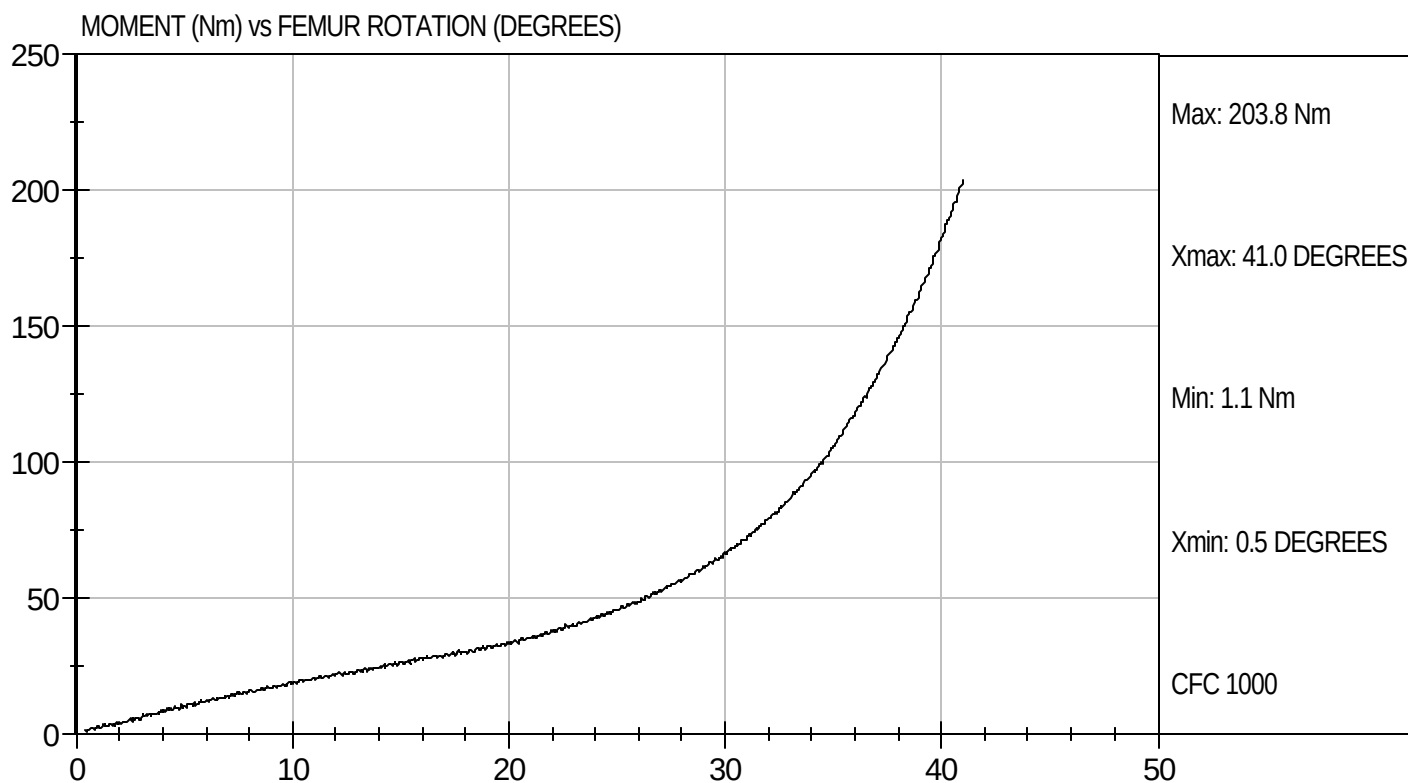
10/3/07
 Test Date


 Approved By



Test Desc: Hip Femur Flexion
Component ID: D073109

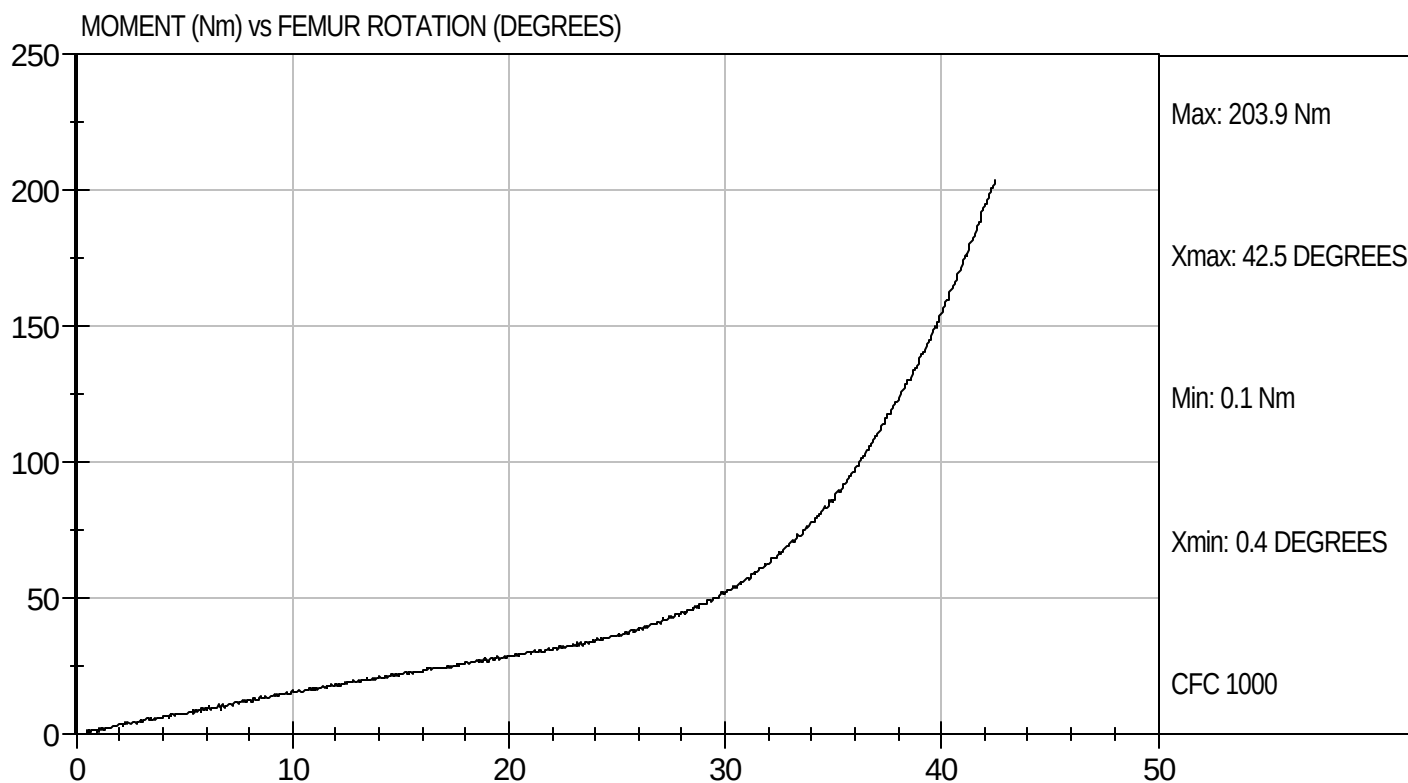
Test Date: 10/3/07
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Component ID: D073100

Test Date: 10/3/07
Velocity: 0 ft/s, 0.00 m/s



APPENDIX D
CHILD DUMMY DATA

SUMMARY OF TEST

Measurement Description	Units	Threshold	P3 ATD	P4 ATD
Head Injury Criteria (HIC36)	N/A	N/A	1391	1487
Head Injury Criteria (HIC15)	N/A	390	865	880
Max. Thorax Accel. (3msec Clip)	G's	50	61	59

Both child dummies were instrumented with head, chest, and upper six axial neck force and moment sensors.

The right rear (Position 3) child dummy (S/N 093) and left rear (Position 4) child dummy (S/N 090) were calibrated previous to this test. Child dummy certification information can be found in this Appendix.

Positions 3 and 4 were rear facing and used the vehicle LATCH attachment.

TEST VEHICLE WEIGHTS

	Units	As Tested (ATW) (Axle)		
		Front	Rear	Total
Left	kg	370.1	256.7	
Right	kg	364.7	253.1	
Ratio	%	59.0	41.0	
Totals	kg	734.8	509.8	1244.6

As tested weight of vehicle includes two ATDs, two CRABIs with CRS, cargo, equipment and instrumentation.

TEST NOTES

There was no valid data collected for:

Left Rear Passenger Child Seat X after 30 msec.

Left Rear Passenger Child Seat Y after 30 msec.

Left Rear Passenger Child Seat Z after 30 msec.

TEST DUMMY INFORMATION

Description	Position 3 CRS	Position 4 CRS
Dummy Type / Serial No.	12 month old CRABI / 093	12 month old CRABI / 090
Number of Data Channels	12	12
Restraint System	Graco Snugride (Rear Facing)	Evenflo Embrace (Rear Facing)

POST TEST SEAT DATA

Location	Seat Movement (mm)	Seat Back Failure
P1 (Left Front)	0	None
P2 (Right Front)	0	None
P3 (Right Rear)	0	None
P4 (Left Rear)	0	None

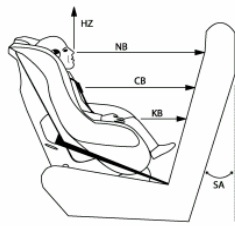
VISIBLE DUMMY CONTACT POINTS

Description	Position 3 CRS	Position 4 CRS
Head Contact	Vehicle rear seat headrest	None
Upper Torso Contact	None	None
Lower Torso Contact	None	None
Left Foot Contact	Foot to vehicle rear seat	Foot to vehicle rear seat
Right Foot Contact	Foot to vehicle rear seat	Foot to vehicle rear seat

CHILD DUMMY POSITIONING IN VEHICLE

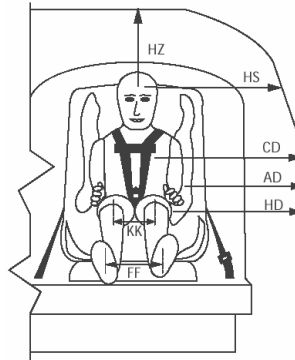
Child Restraint System (Position 3)	Graco Snugride (Rear Facing)
NHTSA No.	M85116

Dummy Measurements for Rear-facing CRS Passengers



X—Z View

HZ	-	Head to Roof
NB	-	Nose to Front of Back Seat
CB	-	Chest to Front of Back Seat
KB	-	Knee to Front of Back Seat
SA	-	Seat Back Angle



Y—Z View

X—Z View

HZ	-	Head to Roof
HS	-	Head to Side Window
CD	-	Chest to Door
AD	-	Arm to Door
HD	-	H-Point to Door
KK	-	Knee to Knee
FF	-	Foot to Foot
NB	-	Nose to Front Seat Back
CB	-	Chest to Front Seat Back
KB	-	Knee to Front Seat Back
TB	-	Toe to Front Seat Back
SA	-	Seat Back Angle

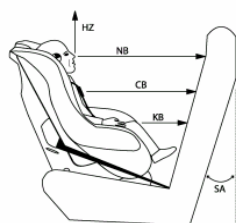
Measurement	Pre-Test (mm)	Post-Test (mm)
	P3 CRS (093)	P3 CRS (093)
SA (deg)	15	
HS	357	311
CD	377	354
AD	242	242
HD	281	273
HZ	447	451
NB	507	544
CB	402	422
KK	96	93
FF	102	80
KB - LEFT	172	176
KB – RIGHT	170	193
TB – LEFT	42	81
TB - RIGHT	41	113

All dimensions in mm (unless noted)
P3 – Right Rear Passenger (Rear Facing)

CHILD DUMMY POSITIONING IN VEHICLE

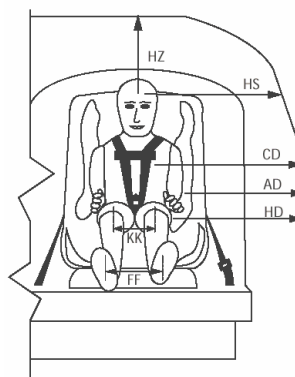
Child Restraint System (Position 4)	Evenflo Embrace (Rear Facing)
NHTSA No.	M85116

Dummy Measurements for Rear-facing CRS Passengers



X—Z View

HZ	-	Head to Roof
NB	-	Nose to Front of Back Seat
CB	-	Chest to Front of Back Seat
KB	-	Knee to Front of Back Seat
SA	-	Seat Back Angle



Y—Z View

X—Z View

HZ	-	Head to Roof
HS	-	Head to Side Window
CD	-	Chest to Door
AD	-	Arm to Door
HD	-	H-Point to Door
KK	-	Knee to Knee
FF	-	Foot to Foot
NB	-	Nose to Front Seat Back
CB	-	Chest to Front Seat Back
KB	-	Knee to Front Seat Back
TB	-	Toe to Front Seat Back
SA	-	Seat Back Angle

Measurement	Pre-Test (mm)	Post-Test (mm)
	P4 CRS (090)	P4 CRS (090)
SA (deg)	14.4	
HS	333	304
CD	368	331
AD	233	212
HD	287	272
HZ	462	454
NB	451	468
CB	352	403
KK	105	131
FF	100	144
KB - LEFT	163	176
KB - RIGHT	172	178
TB - LEFT	54	62
TB - RIGHT	47	63

All dimensions in mm (unless noted)
P4 – Left Rear Passenger (Rear facing)

CRS PERFORMANCE DATA

Child Restraint System (Position 3)	Graco Snugride (Rear Facing)
Child Restraint System (Position 4)	Evenflo Embrace (Rear Facing)
NHTSA No.	M85116

POSITION 3 CRS POST-TEST INSPECTION

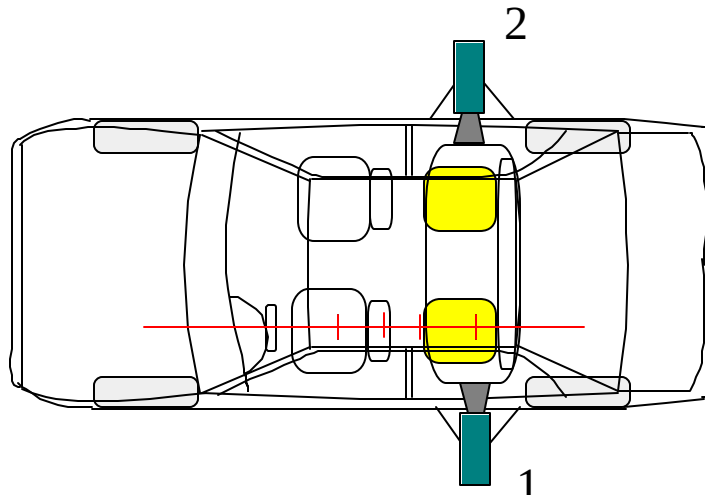
Location	Damage	Remarks
Upper Tether Strap		
Upper Tether Buckle		
Upper Tether Hook		
Vehicle Upper Tether Anchor		
Lower Anchor Strap	None	
Lower Anchor Buckle		
Lower Anchor Hooks	None	
Vehicle Lower CRS Anchors	None	
Five Point Harness Connections	None	
Cracks on CRS	None	
Fabric Tears on CRS	None	
Vehicle Seat Structure	None	
Vehicle Seat Fabric Tears	None	
Child Dummy	None	CRABI 12 Month Old

POSITION 4 CRS POST-TEST INSPECTION

Location	Damage	Remarks
Upper Tether Strap		
Upper Tether Buckle		
Upper Tether Hook		
Vehicle Upper Tether Anchor		
Lower Anchor Strap	None	
Lower Anchor Buckle		
Lower Anchor Hooks	None	
Vehicle Lower CRS Anchors	None	
Five Point Harness Connections	None	
Cracks on CRS	None	
Fabric Tears on CRS	None	
Vehicle Seat Structure	None	
Vehicle Seat Fabric Tears	None	
Child Dummy	None	CRABI 12 Month Old

CRS CAMERA DATA

Child Restraint System (Position 3)	Graco Snugride (Rear Facing)
Child Restraint System (Position 4)	Evenflo Embrace (Rear Facing)
NHTSA No.	M85116



No.	Camera View	Location (mm) *			Angle (deg)	Lens (mm)	Speed (fps)
		X	Y	Z			
1	Left Side CRS Lateral View						
2	Right Side CRS Lateral View						

*COORDINATES:

+X = film plane rearward of barrier

+Y = film plane to right of monorail centerline

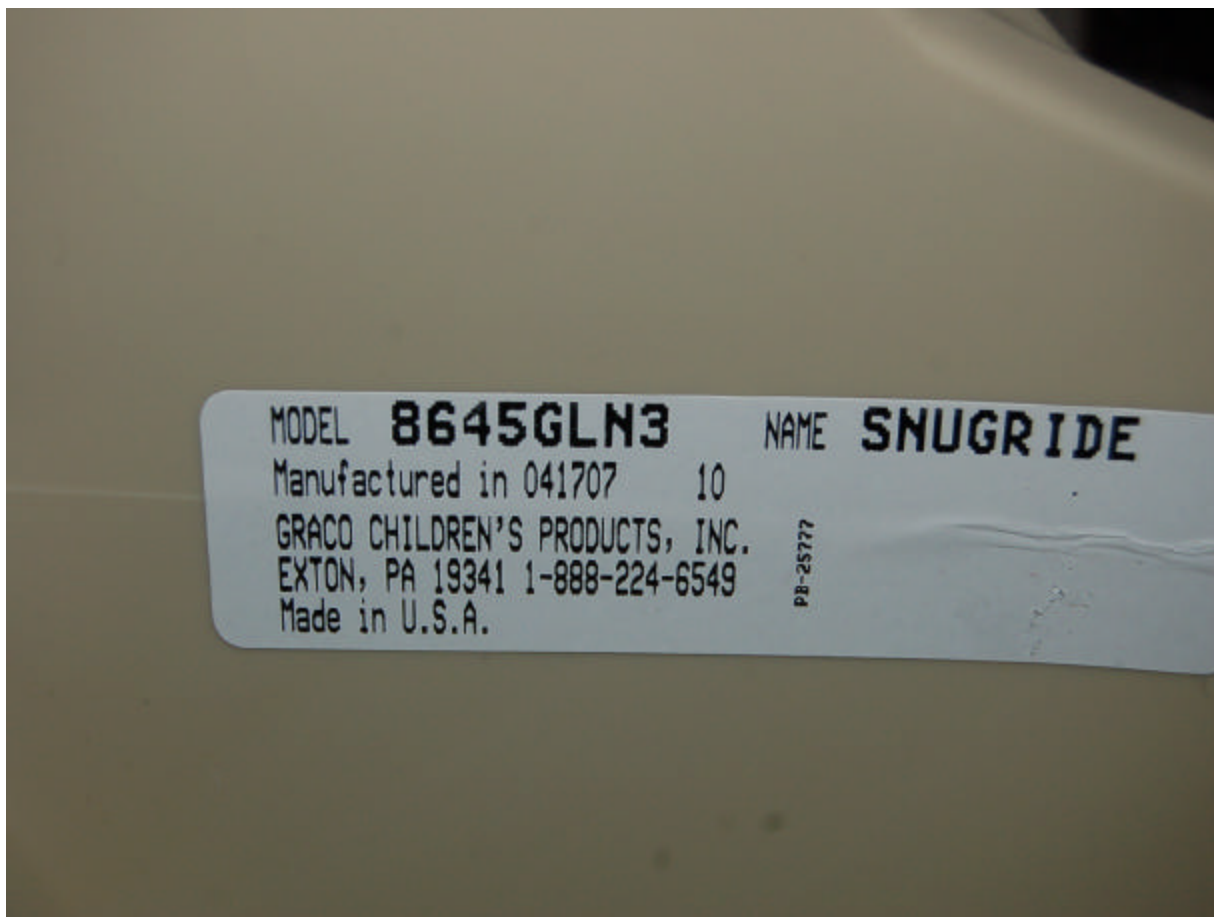
+Z = film plane above ground level

Cameras 1 and 2 did not run.

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Close-up View of Position 3 CRS Label



Pre-Test Front View of Position 3 CRS



Post-Test Front View of Position 3 CRS



Pre-Test Rear View of Position 3 CRS



Post-Test Rear View of Position 3 CRS



Pre-Test Left Side View of Position 3 CRS



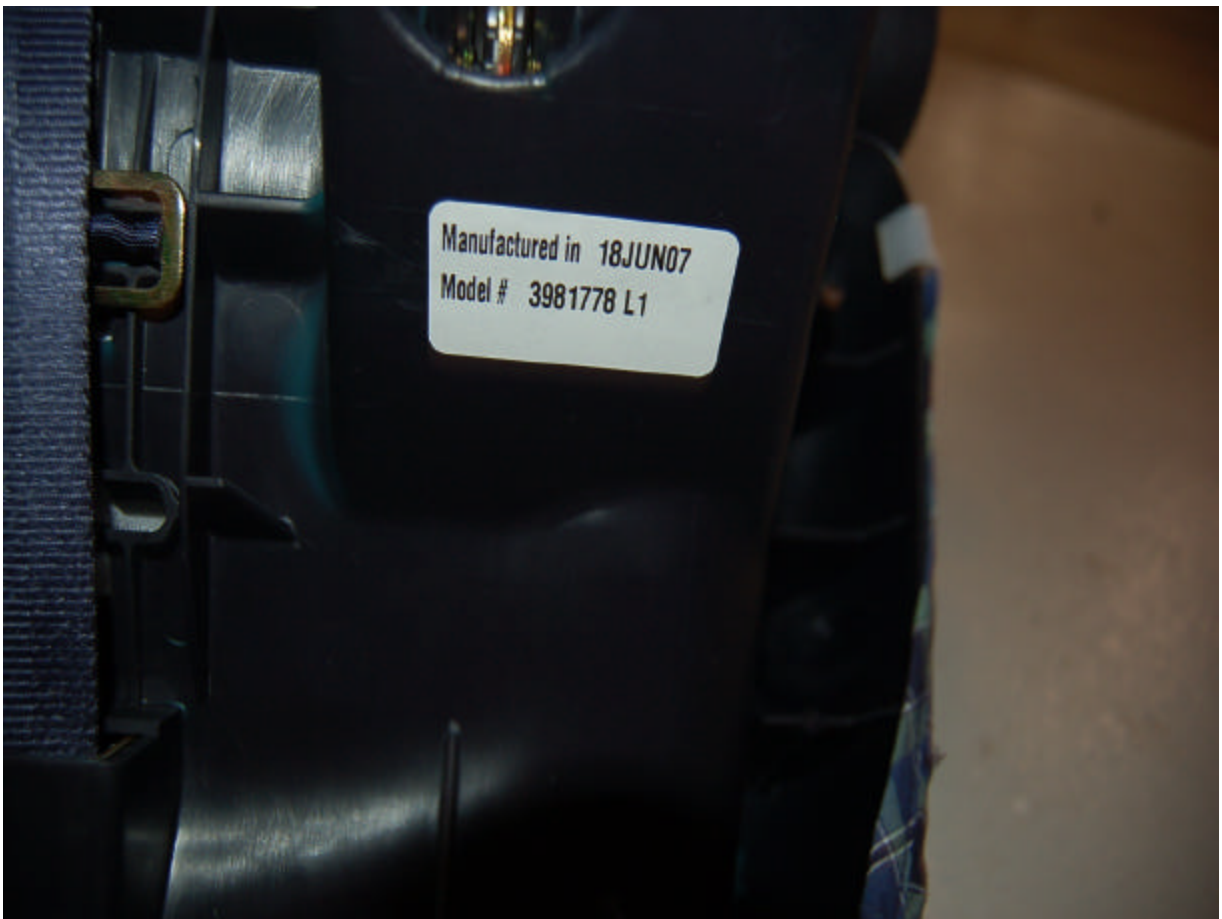
Post-Test Left Side View of Position 3 CRS



Pre-Test Right Side View of Position 3 CRS



Post-Test Right Side View of Position 3 CRS



Close-up View of Position 4 CRS Label



Pre-Test Front View of Position 4 CRS



Post-Test Front View of Position 4 CRS



Pre-Test Rear View of Position 4 CRS



Post-Test Rear View of Position 4 CRS



Pre-Test Left Side View of Position 4 CRS



Post-Test Left Side View of Position 4 CRS



Pre-Test Right Side View of Position 4 CRS



Post-Test Right Side View of Position 4 CRS



Pre-Test Position 3 Left Side View



Post-Test Position 3 Left Side View



Pre-Test Position 4 Left Side View



Post-Test Position 4 Left Side View



Pre-Test Position 3 Right Side View



Post-Test Position 3 Right Side View



Pre-Test Position 4 Right Side View



Post-Test Position 4 Right Side View

CHILD DUMMY RESPONSE DATA TRACES

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The following dummy response data can be found in the R&D section of the NHTSA website at www.nhtsa.dot.gov

LRP Child Upper Neck Force X vs. Time

LRP Child Upper Neck Force Y vs. Time

LRP Child Upper Neck Force Z vs. Time

LRP Child Upper Neck Force Resultant vs. Time

LRP Child Upper Neck Moment X vs. Time

LRP Child Upper Neck Moment Y vs. Time

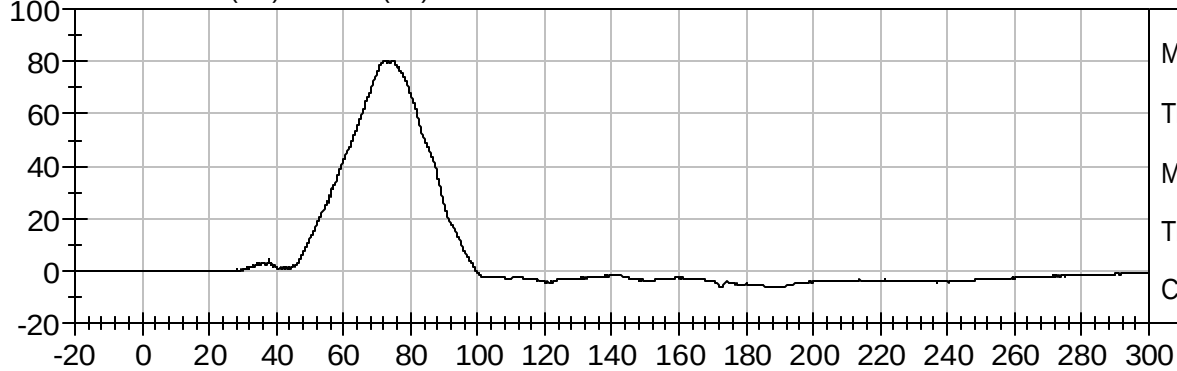
LRP Child Upper Neck Moment Z vs. Time

LRP Child Upper Neck Moment Resultant vs. Time

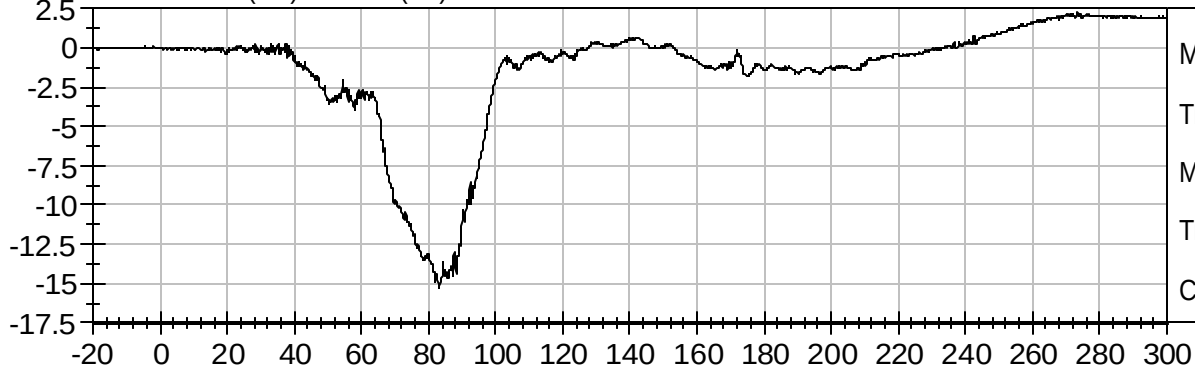
RRP Child Upper Neck Force X vs. Time
RRP Child Upper Neck Force Y vs. Time
RRP Child Upper Neck Force Z vs. Time
RRP Child Upper Neck Force Resultant vs. Time
RRP Child Upper Neck Moment X vs. Time
RRP Child Upper Neck Moment Y vs. Time
RRP Child Upper Neck Moment Z vs. Time
RRP Child Upper Neck Moment Resultant vs. Time
LRP Child Seat X Acceleration vs. Time
LRP Child Seat Y Acceleration vs. Time
LRP Child Seat Z Acceleration vs. Time
LRP Child Seat Resultant Acceleration vs. Time
RRP Child Seat X Acceleration vs. Time
RRP Child Seat Y Acceleration vs. Time
RRP Child Seat Z Acceleration vs. Time
RRP Child Seat Resultant Acceleration vs. Time



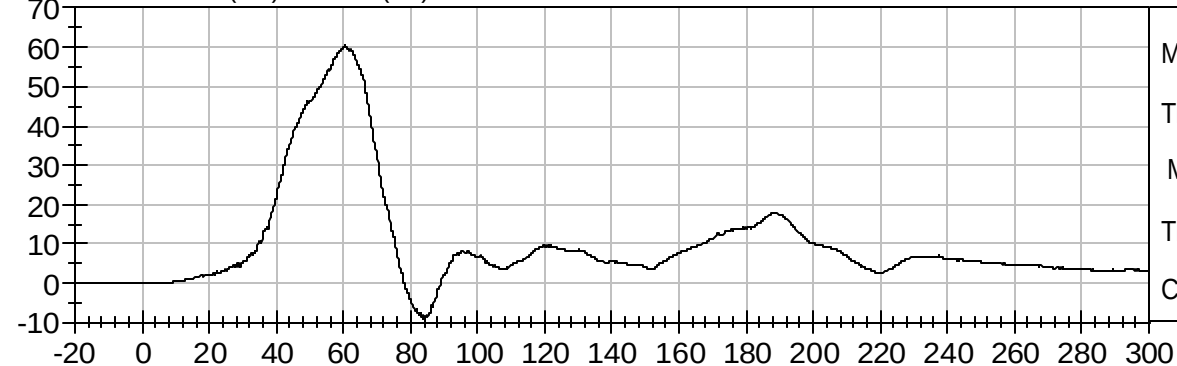
LRP HEAD X (G's) vs TIME (ms)



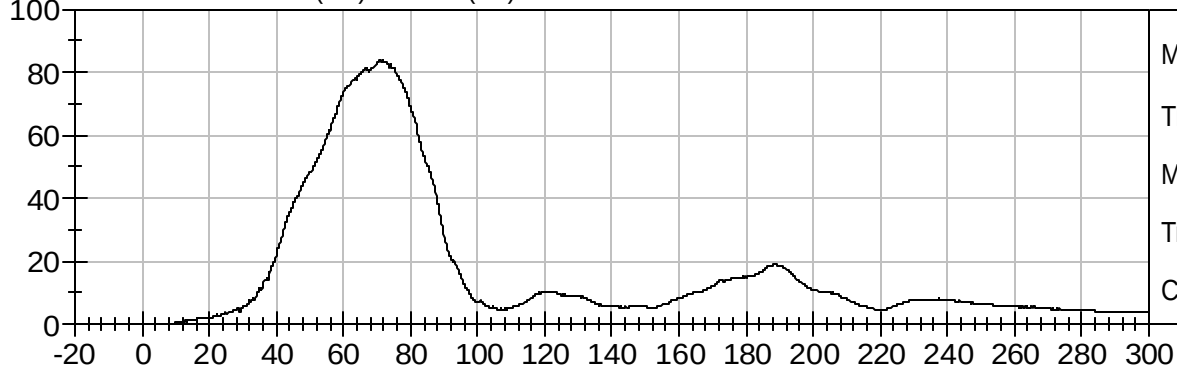
LRP HEAD Y (G's) vs TIME (ms)

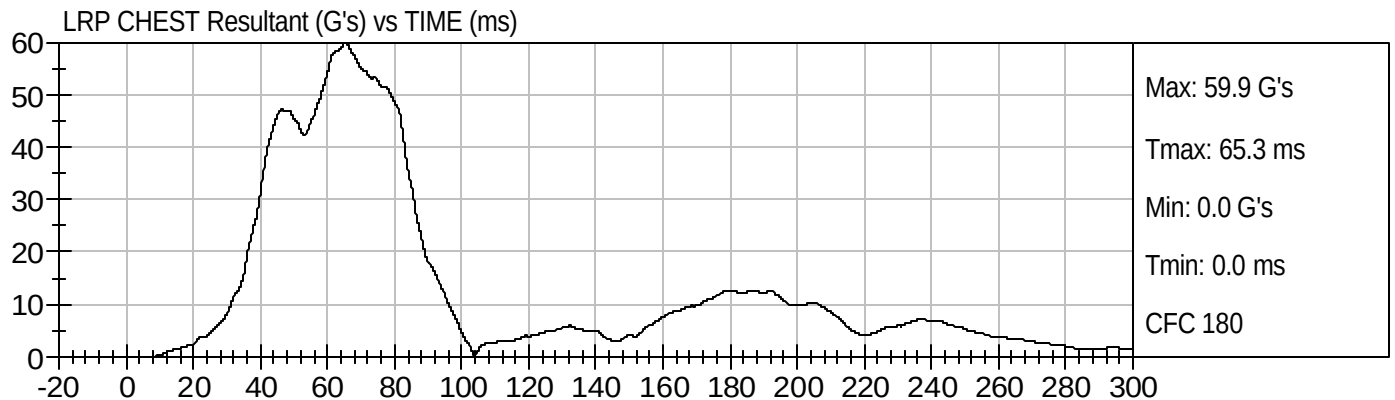
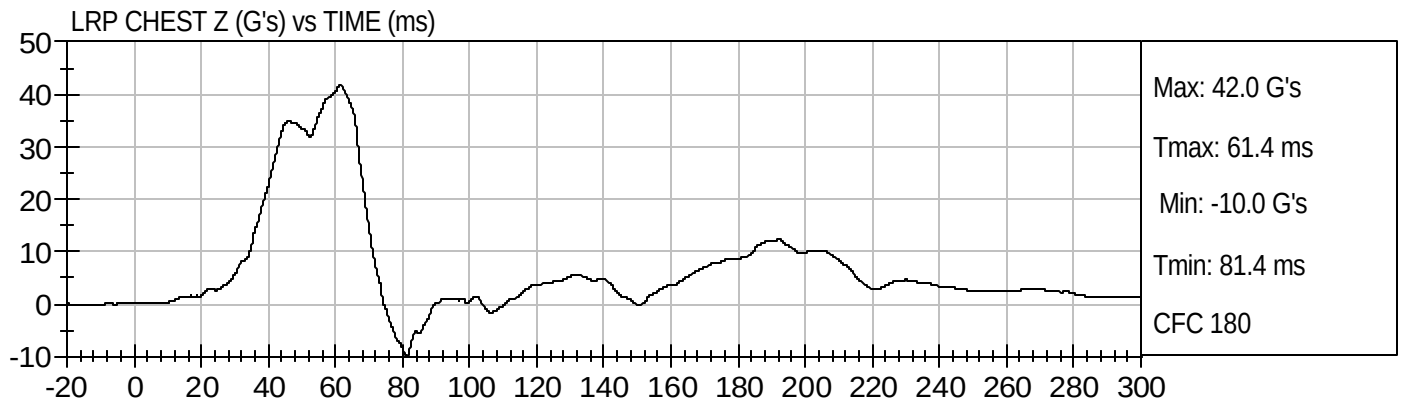
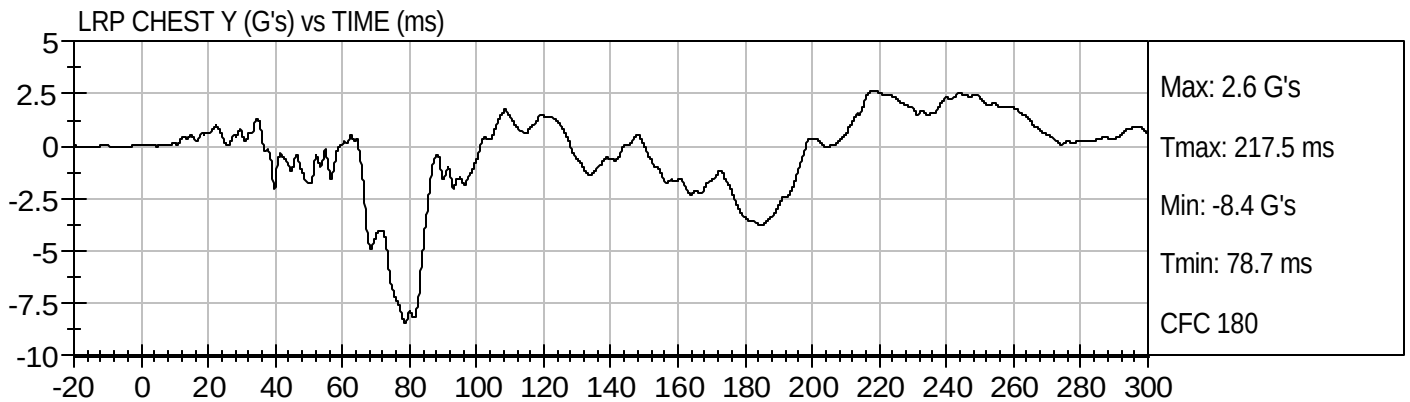
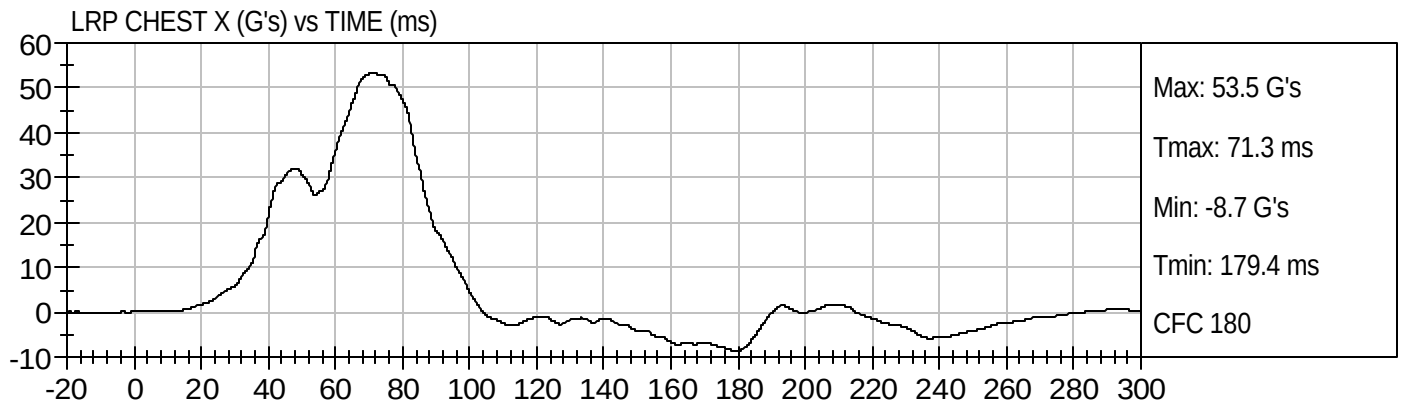


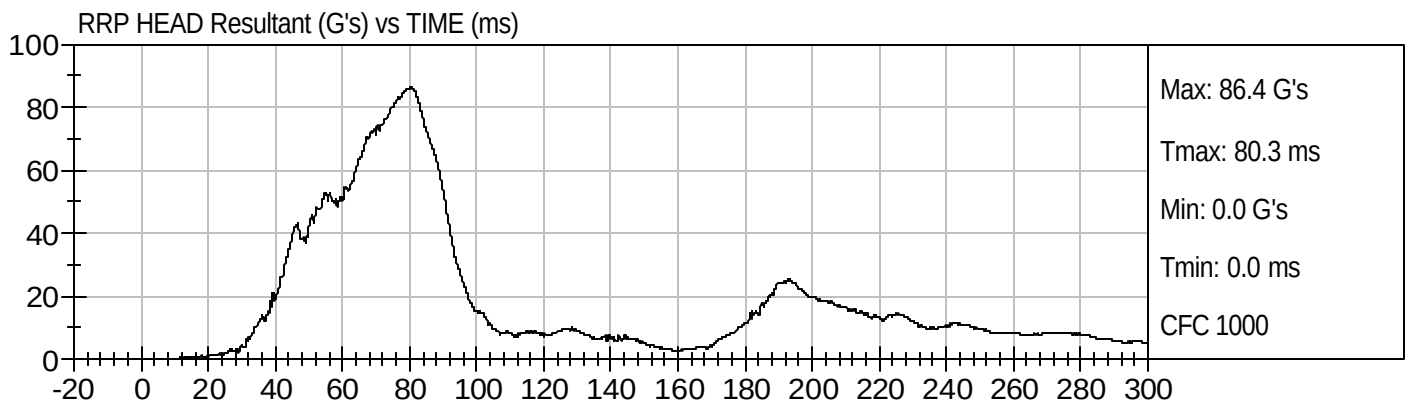
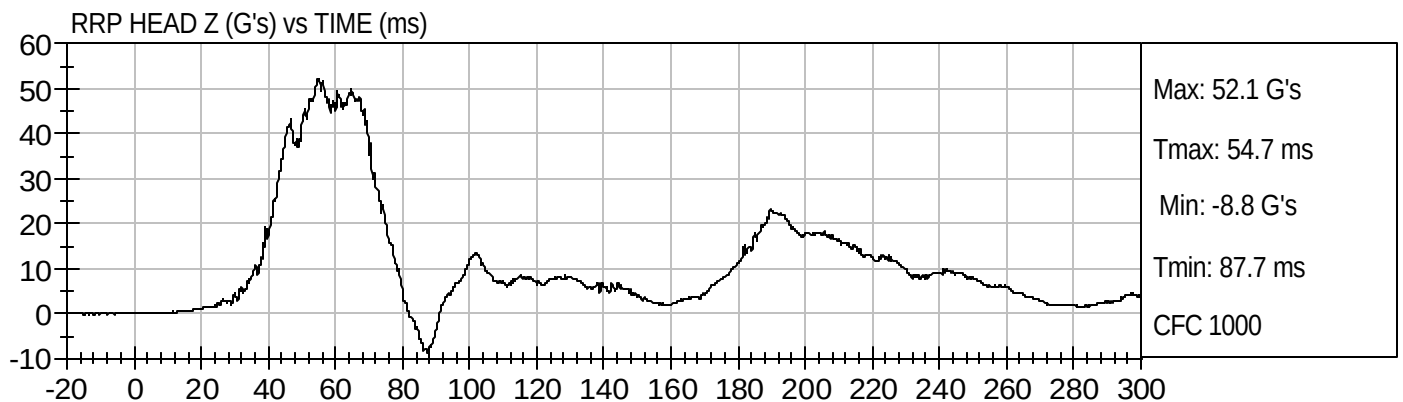
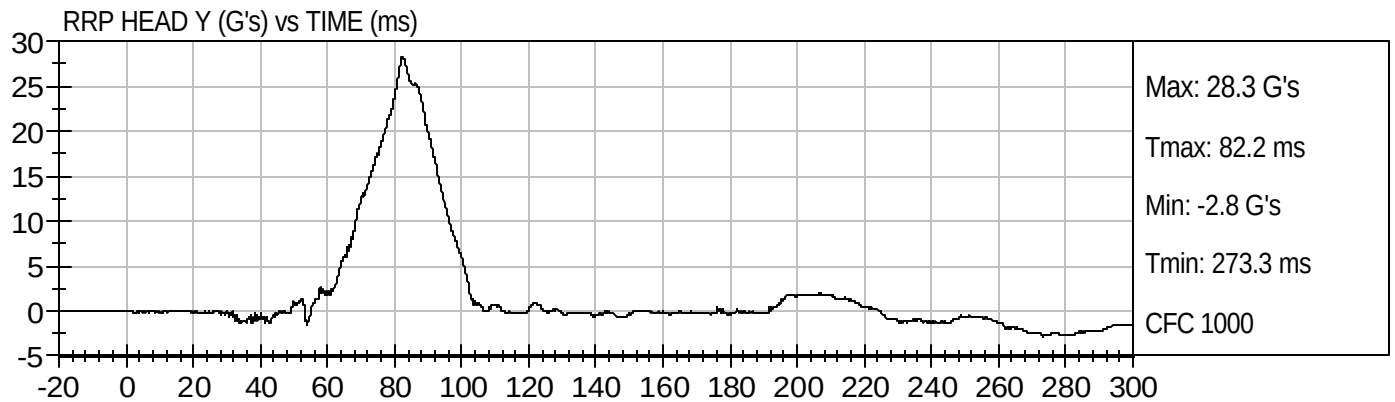
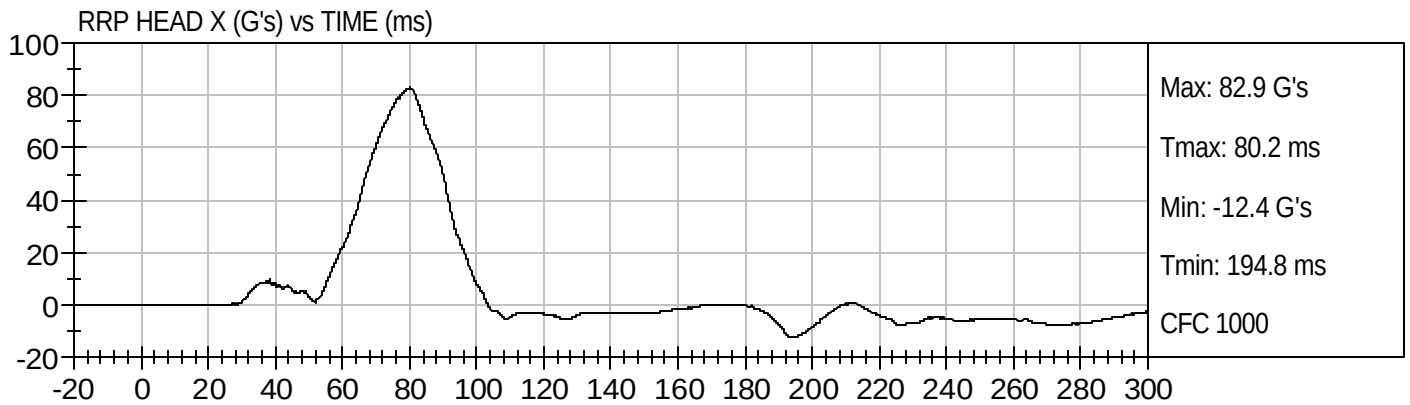
LRP HEAD Z (G's) vs TIME (ms)

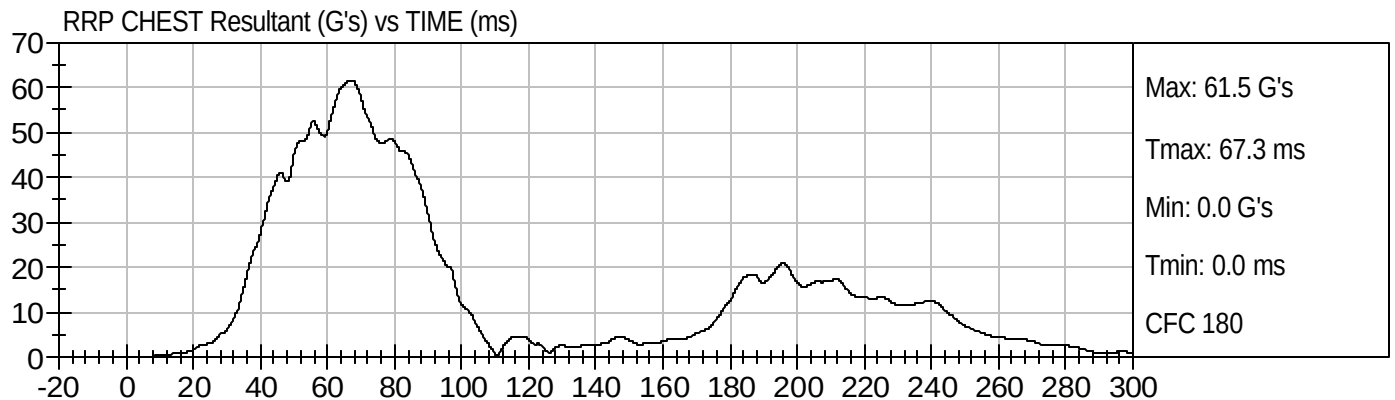
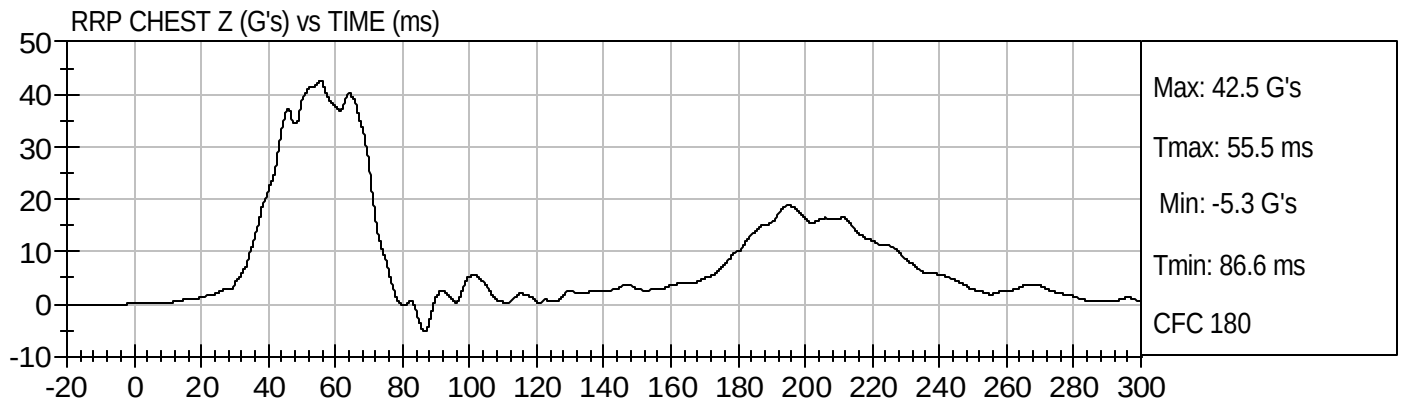
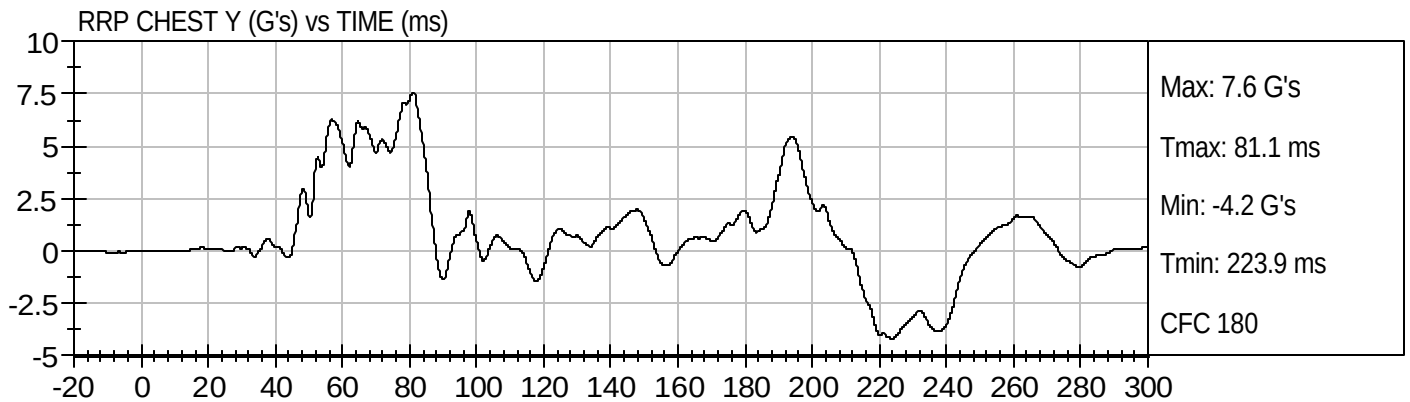
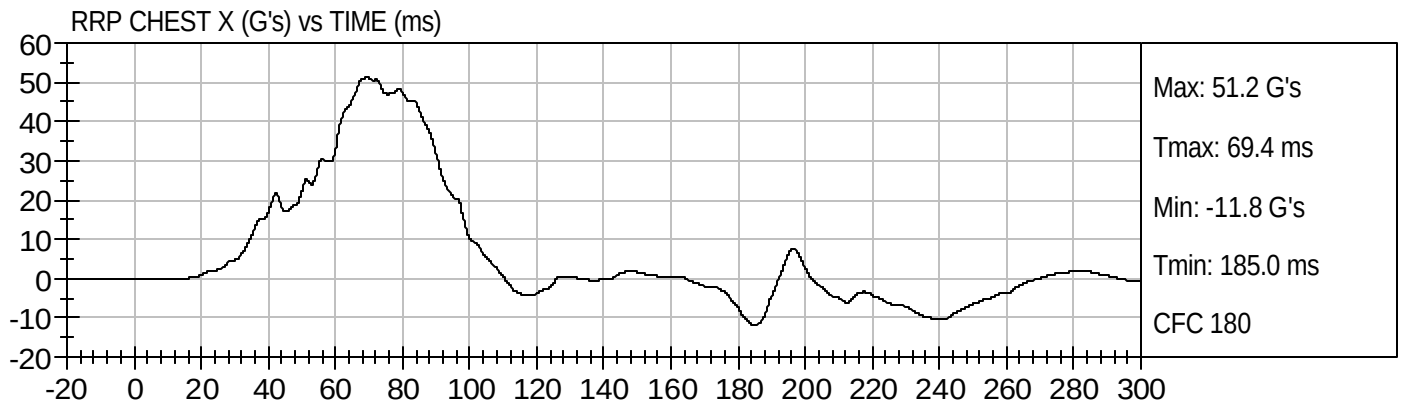


LRP HEAD Resultant (G's) vs TIME (ms)









CHILD DUMMY CALIBRATION INFORMATION

MGA RESEARCH CORPORATION
FRONT HEAD DROP TEST
CRABI 12 MONTH

ATD Serial No: 093

Test ID: D072541

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Peak Resultant Acceleration	G's	100 to 120	110	Pass
Peak Lateral Acceleration	G's	+/- 15	-3	Pass
Unimodal	N/A	within 17% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician


Approved By

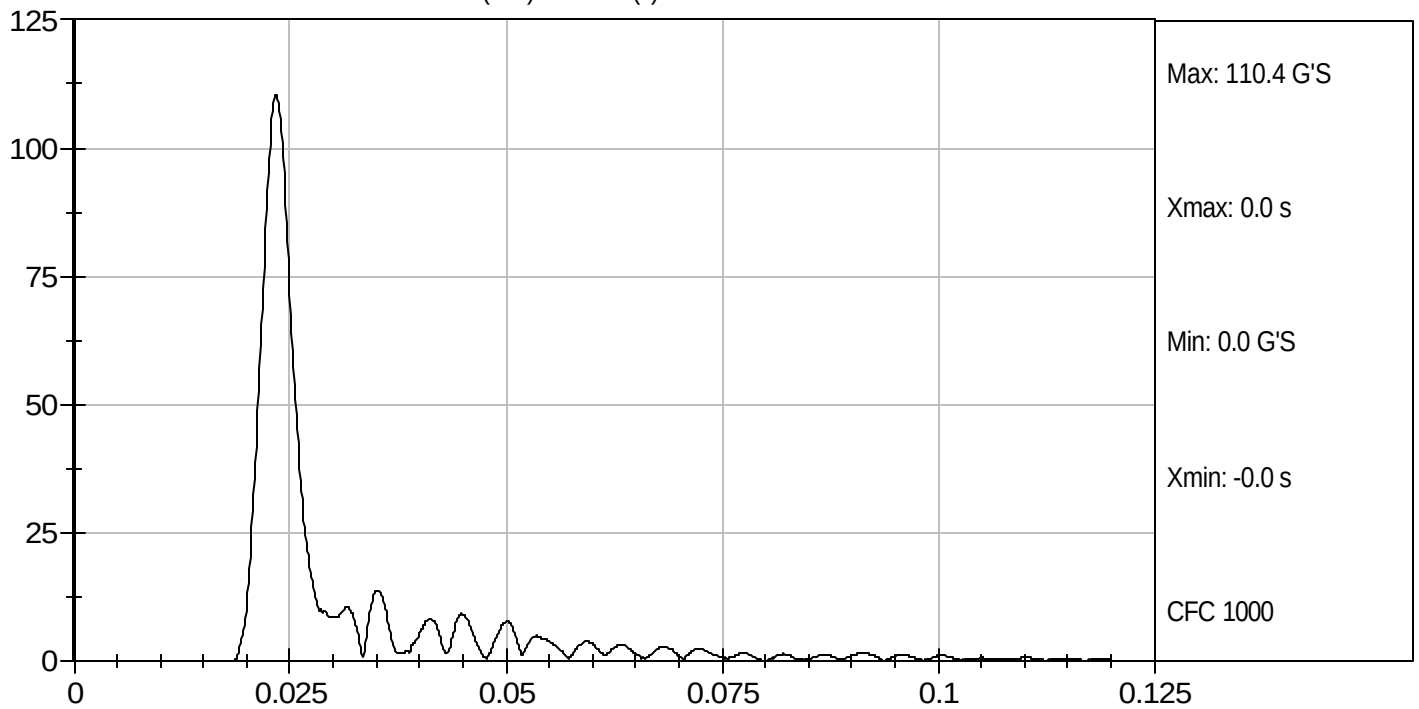
8/23/07
Test Date



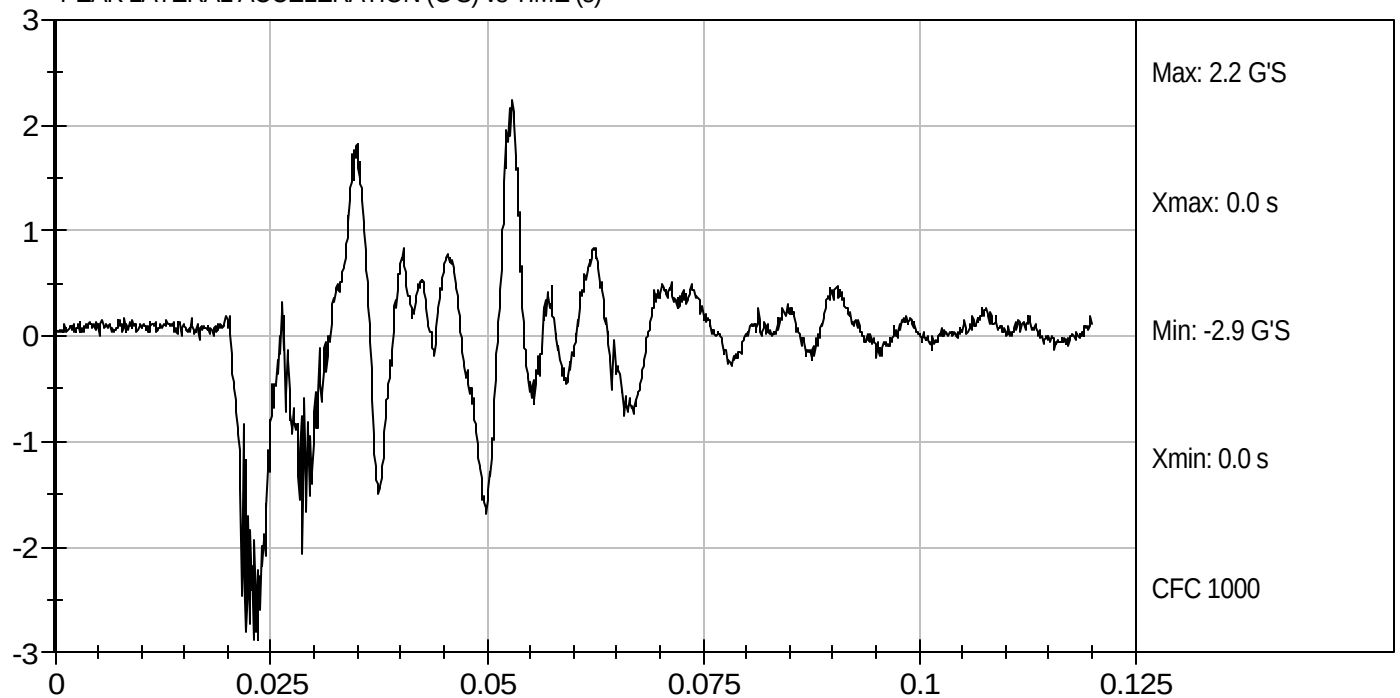
Test Desc: Head Drop
Component ID: D072541

Test Date: 8/23/07
Velocity: 0 ft/s, 0 m/s

PEAK RESULTANT ACCELERATION (G'S) vs TIME (s)



PEAK LATERAL ACCELERATION (G'S) vs TIME (s)



MGA RESEARCH CORPORATION
NECK FLEXION TEST
CRABI 12 MONTH

ATD Serial No: 093

Test I.D: D072542

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	20.8	Pass
Humidity		%	10 to 70	46	Pass
Impact Velocity		m/s	5.1 to 5.3	5.2	Pass
Pendulum Deceleration	10 msec	m/s	1.6 to 2.3	1.9	Pass
	20 msec	m/s	3.4 to 4.2	3.6	Pass
	25 msec	m/s	4.3 to 5.2	4.4	Pass
D Plane Rotation		deg	75.0 to 86.0	83.1	Pass
Moment About Occipital Condyle		Nm	36.0 to 45.0	40.2	Pass
Positive Moment - Time Curve Decay to 5 Nm		msec	60 to 80	74	Pass
Overall Test Results					Pass



Laboratory Technician

8/23/07

Test Date



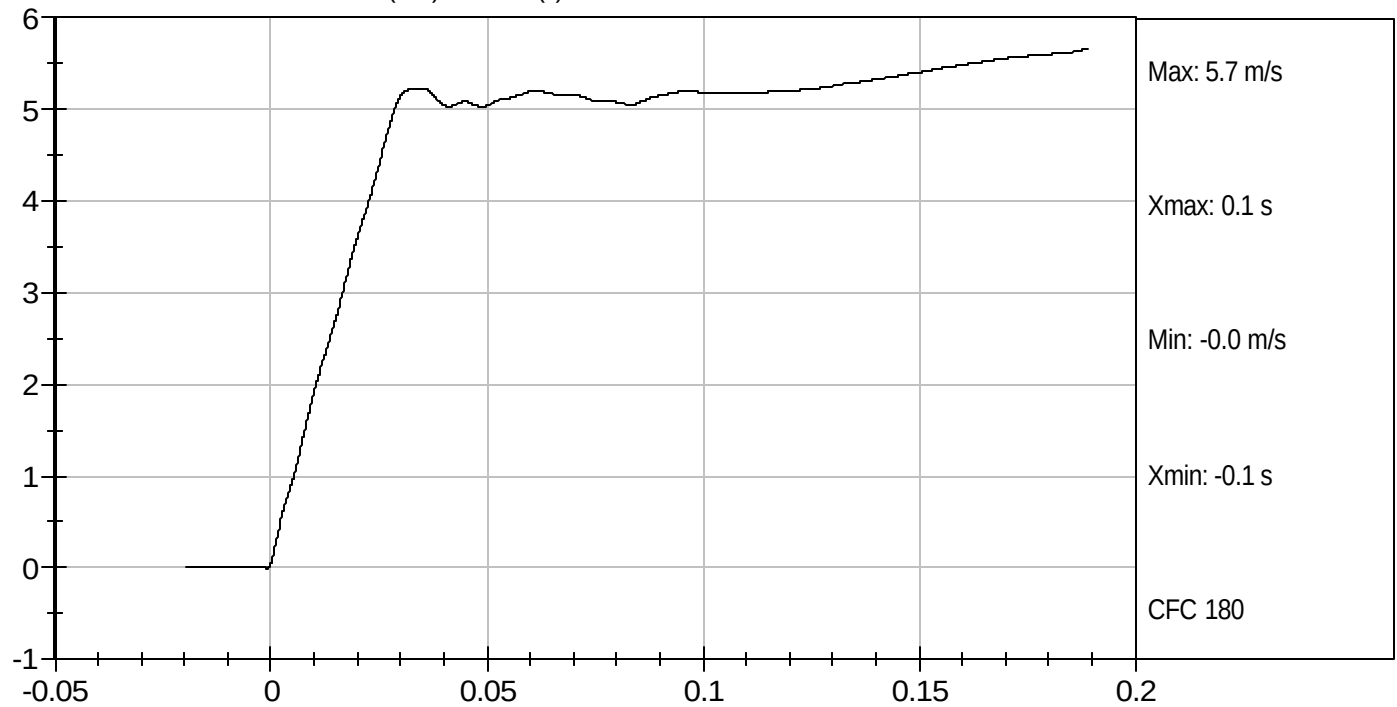
Approved By



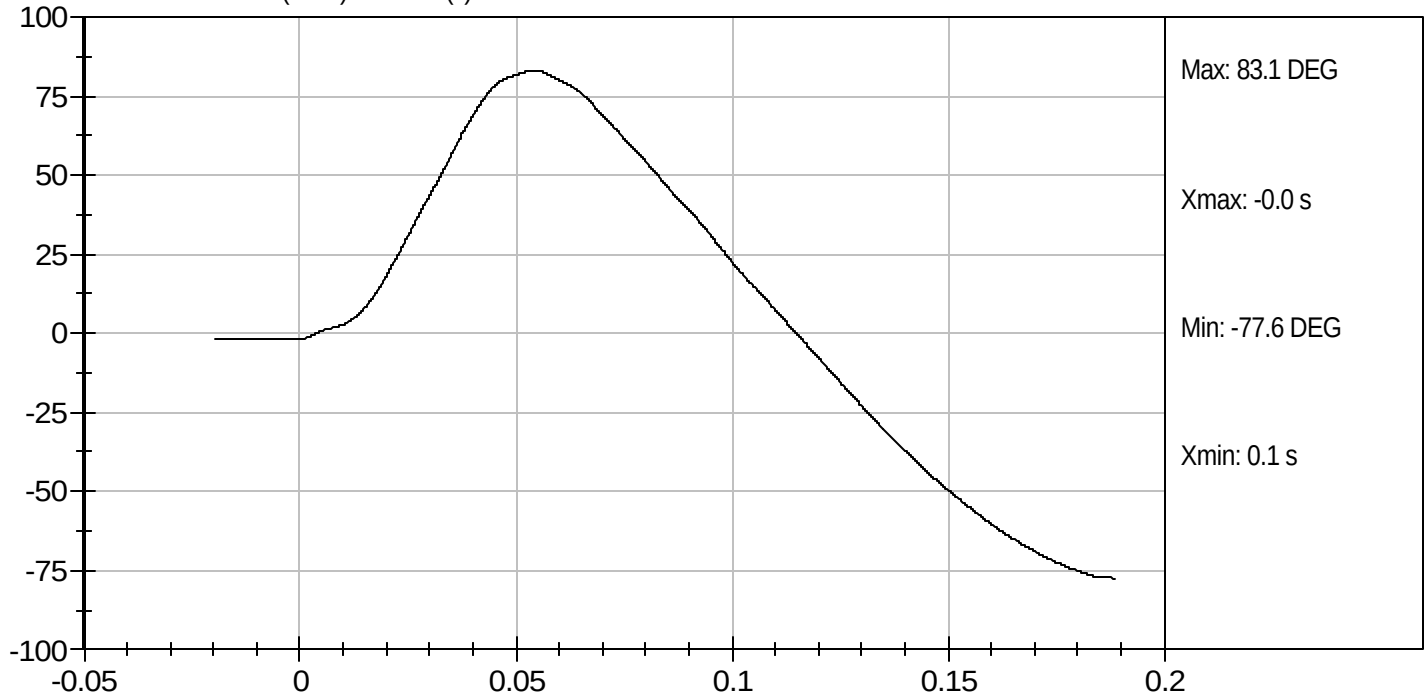
Test Desc: Neck Flexion
Component ID: D072542

Test Date: 8/23/07
Velocity: 17.006 ft/s, 5.2 m/s

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



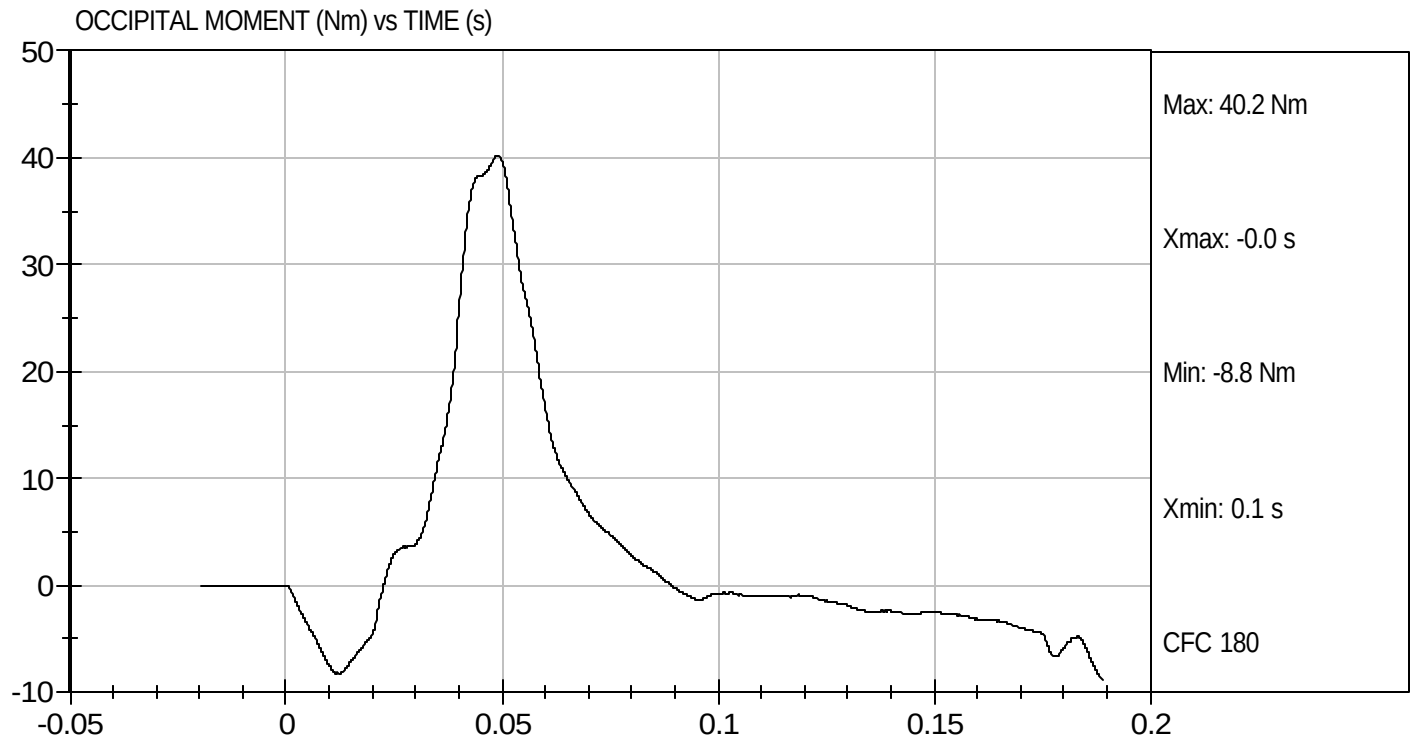
FLEXION ANGLE (DEG) vs TIME (s)





Test Desc: Neck Flexion
Component ID: D072542

Test Date: 8/23/07
Velocity: 17.006 ft/s, 5.2 m/s



MGA RESEARCH CORPORATION
NECK EXTENSION TEST
CRABI 12 MONTH

ATD Serial No: 093

Test I.D: D072543

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	20.8	Pass
Humidity		%	10 to 70	46	Pass
Pendulum Speed		m/s	2.4 to 2.6	2.5	Pass
Pendulum Deceleration	6 msec	m/s	0.8 to 1.2	1.0	Pass
	10 msec	m/s	1.5 to 2.1	2.0	Pass
	14 msec	m/s	2.2 to 2.9	2.3	Pass
D Plane Rotation		deg	80.0 to 92.0	80.3	Pass
Moment About Occipital Condyle		Nm	-23.0 to -12.0	-19.1	Pass
Negative Moment - Time Curve Decay to -5 Nm		msec	76 to 90	77	Pass
Overall Test Results				Pass	



Laboratory Technician

8/23/07

Test Date

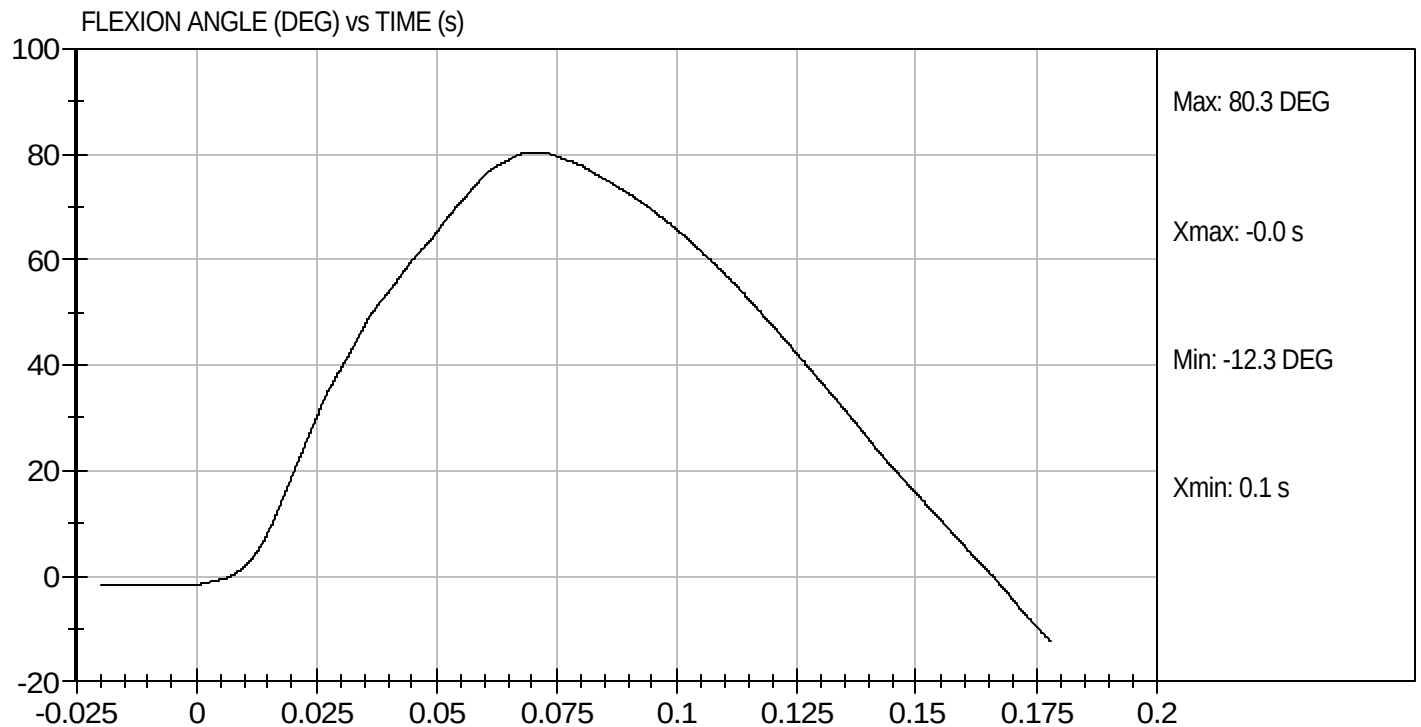
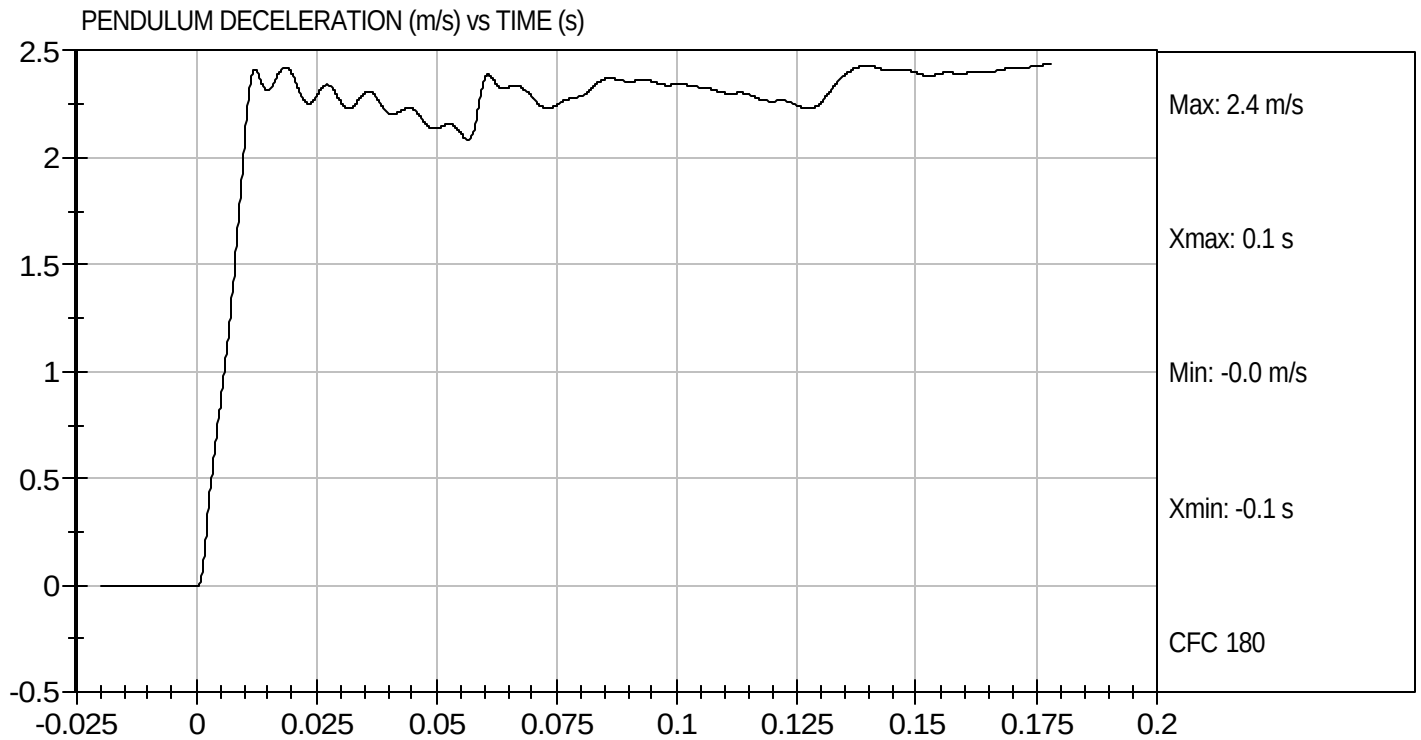


Approved By



Test Desc: Neck Extension
Component ID: D072543

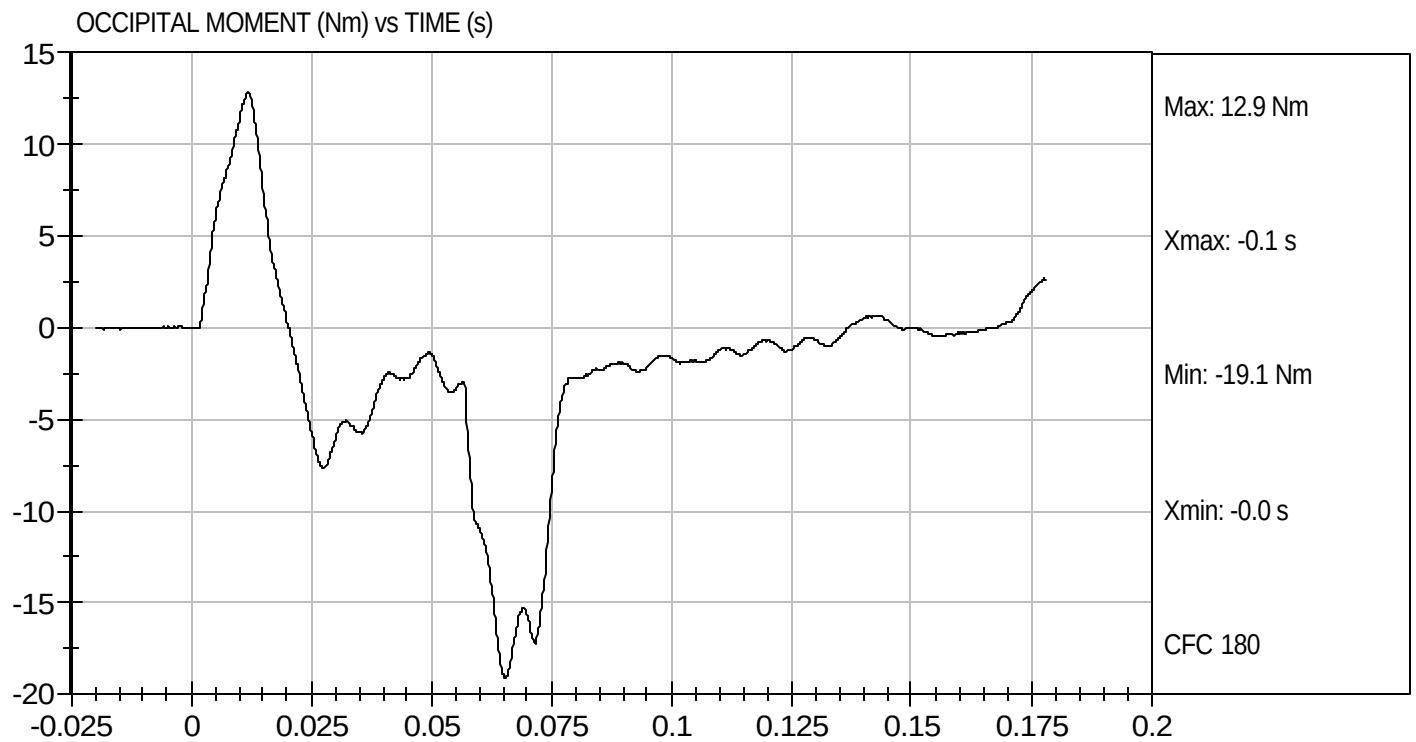
Test Date: 8/23/07
Velocity: 8.33 ft/s, 2.5 m/s





Test Desc: Neck Extension
Component ID: D072543

Test Date: 8/23/07
Velocity: 8.33 ft/s, 2.5 m/s



MGA RESEARCH CORPORATION
THORAX IMPACT TEST
CRABI 12 MONTH

ATD Serial No: 093

Test I.D: D072544

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
Probe Speed	m/sec	4.9 to 5.1	5.03	Pass
Probe Force	kN	1.51 to 1.80	1.55	Pass
Overall Test Results				Pass


Laboratory Technician


Approved By

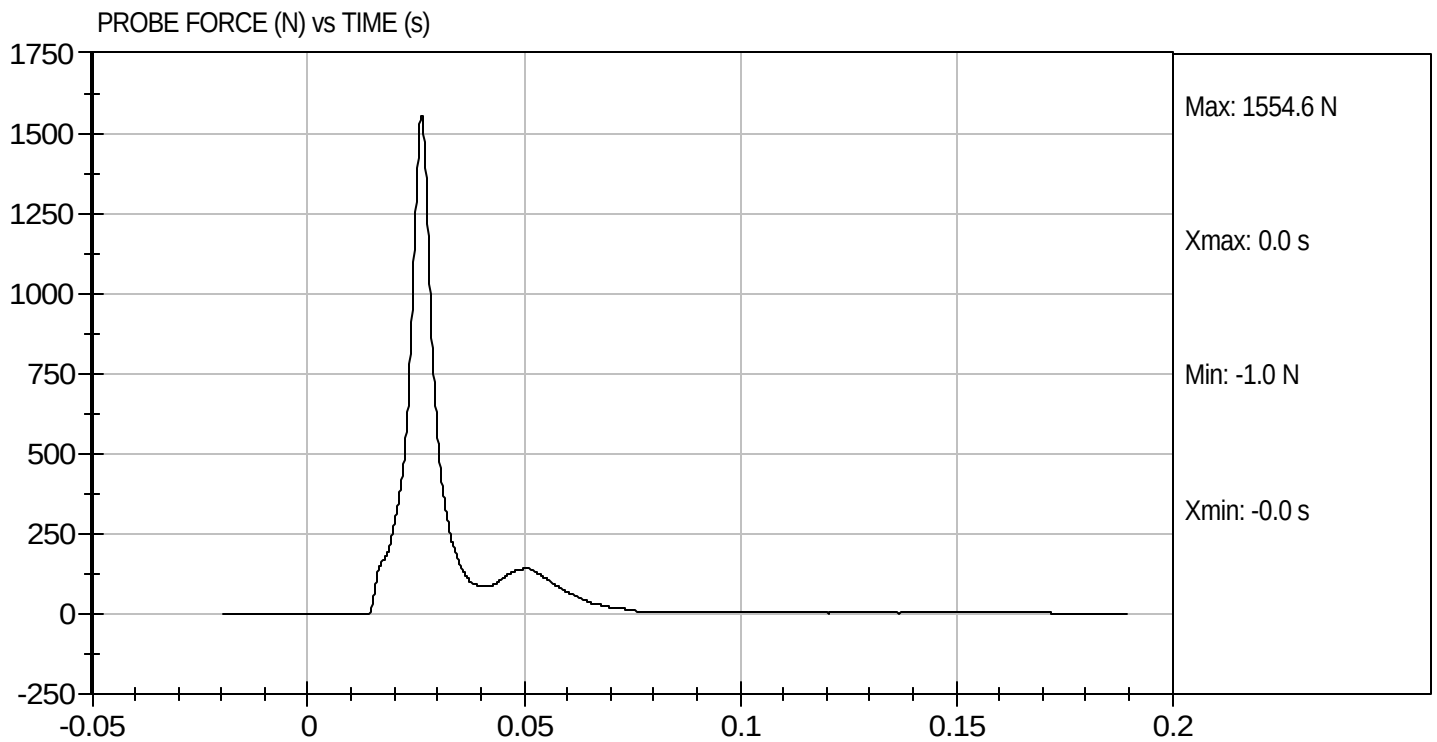
8/23/07

Test Date



Test Desc: Thorax Impact
Component ID: D072544

Test Date: 8/23/07
Velocity: 16.5 ft/s, 5.03 m/s



MGA RESEARCH CORPORATION
REAR HEAD DROP TEST
CRABI 12 MONTH

ATD Serial No: 093

Test ID: D072545

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Peak Resultant Acceleration	G's	55 to 71	69	Pass
Peak Lateral Acceleration	G's	+/- 15	3	Pass
Unimodal	N/A	within 17% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

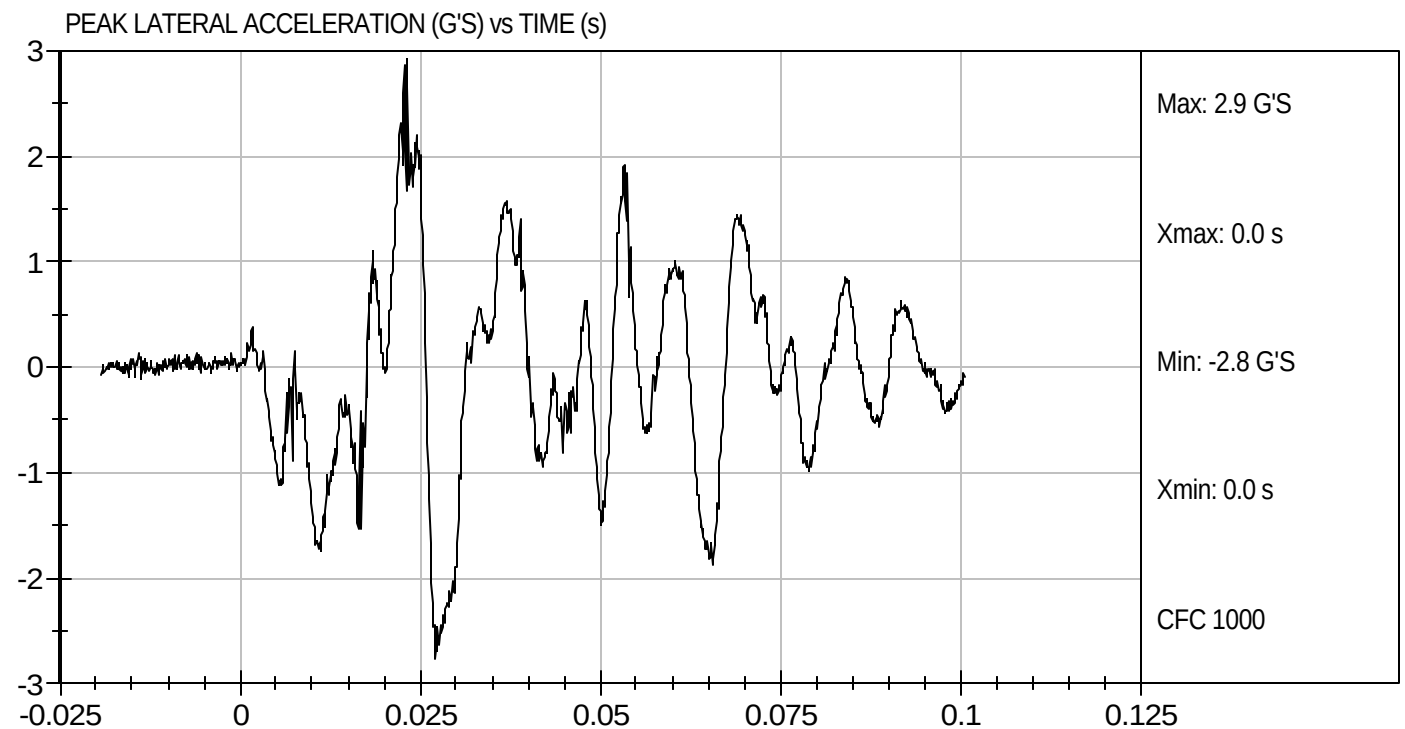
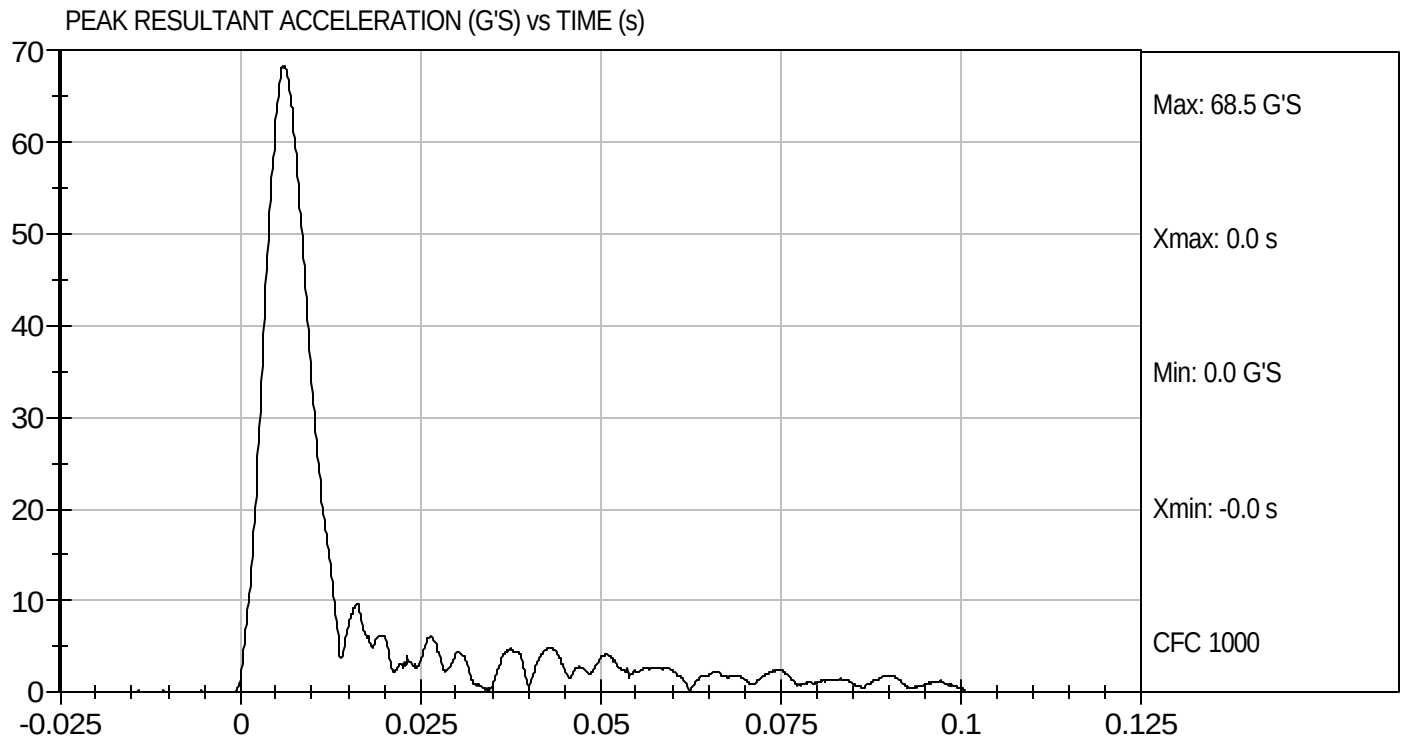

Approved By

8/23/07
Test Date



Test Desc: Head Drop
Component ID: D072545

Test Date: 8/23/07
Velocity: 0 ft/s, 0 m/s



MGA RESEARCH CORPORATION
FRONT HEAD DROP TEST
CRABI 12 MONTH

ATD Serial No: 090

Test ID: D072531

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	45	Pass
Peak Resultant Acceleration	G's	100 to 120	108	Pass
Peak Lateral Acceleration	G's	+/- 15	-4	Pass
Unimodal	N/A	within 17% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician


Approved By

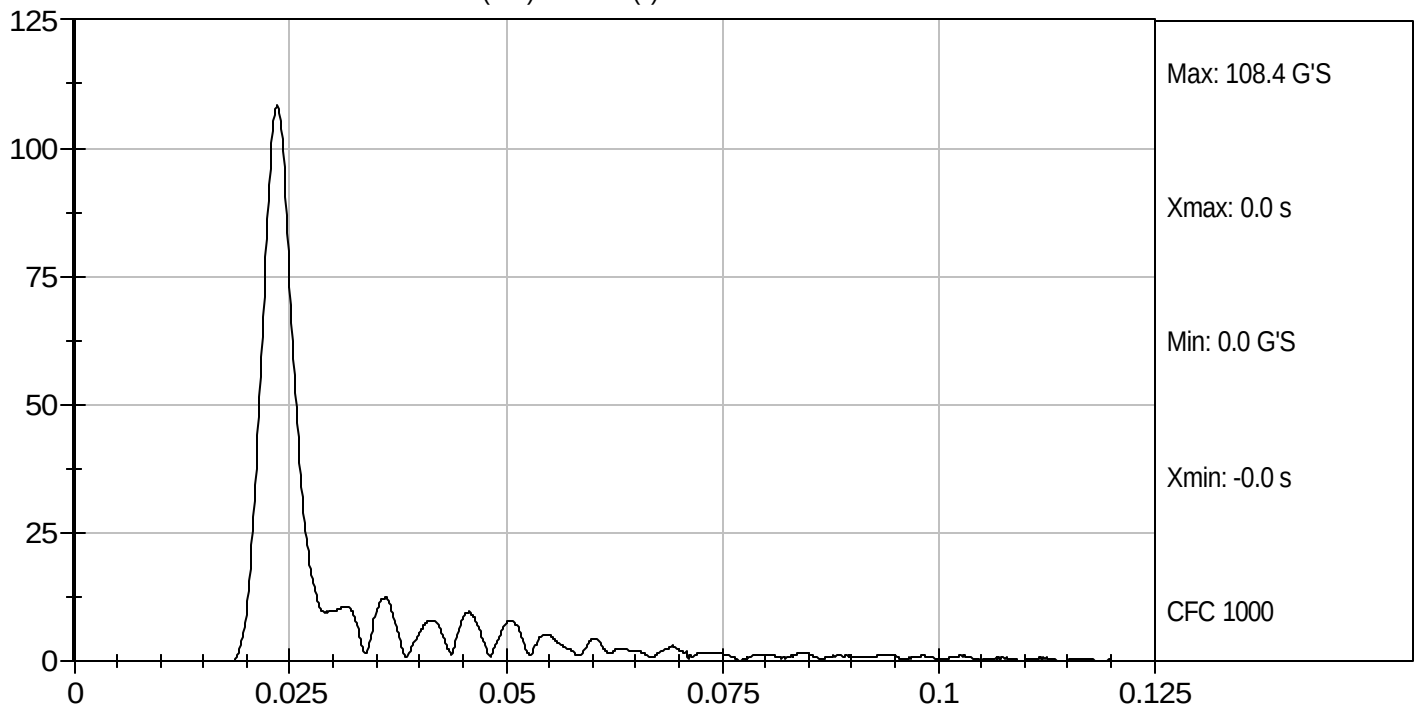
8/23/07
Test Date



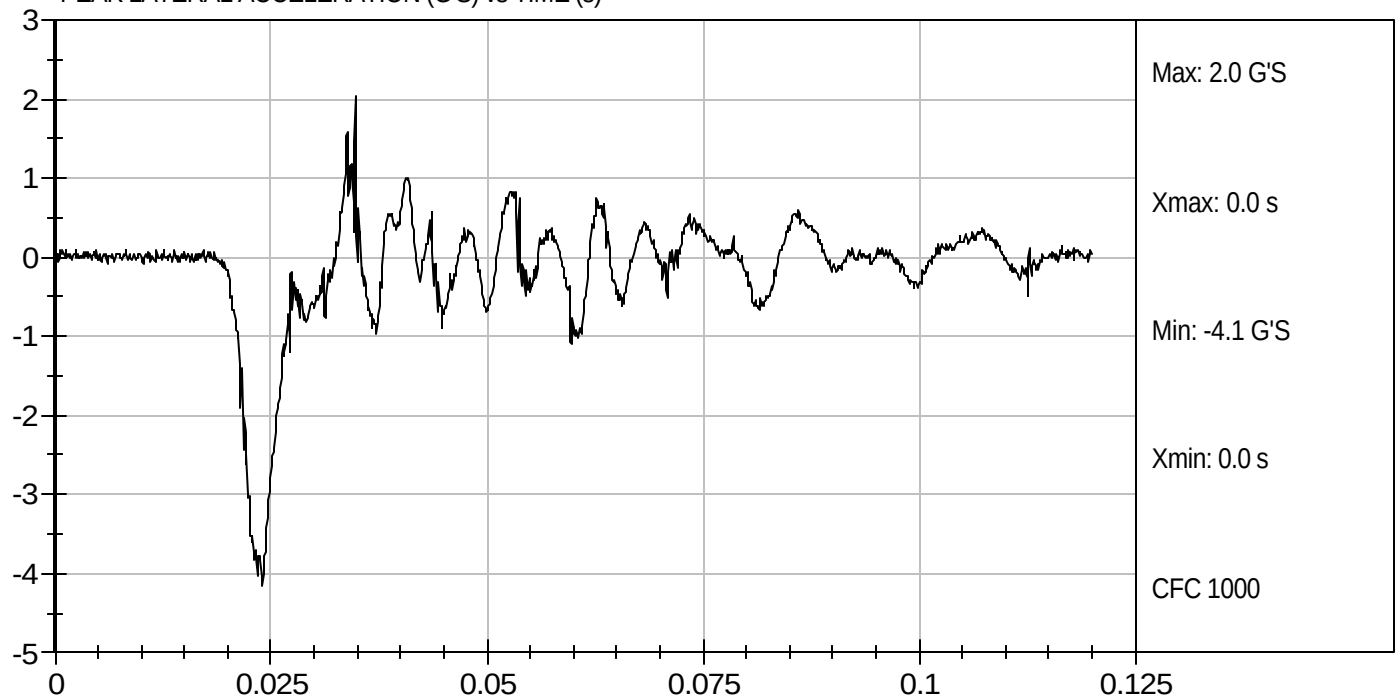
Test Desc: Head Drop
Component ID: D072531

Test Date: 8/23/07
Velocity: 0 ft/s, 0 m/s

PEAK RESULTANT ACCELERATION (G'S) vs TIME (s)



PEAK LATERAL ACCELERATION (G'S) vs TIME (s)



MGA RESEARCH CORPORATION
NECK FLEXION TEST
CRABI 12 MONTH

ATD Serial No: 090

Test I.D: D072532

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	20.7	Pass
Humidity		%	10 to 70	46	Pass
Impact Velocity		m/s	5.1 to 5.3	5.2	Pass
Pendulum Deceleration	10 msec	m/s	1.6 to 2.3	2.0	Pass
	20 msec	m/s	3.4 to 4.2	3.6	Pass
	25 msec	m/s	4.3 to 5.2	4.3	Pass
D Plane Rotation		deg	75.0 to 86.0	79.7	Pass
Moment About Occipital Condyle		Nm	36.0 to 45.0	37.0	Pass
Positive Moment - Time Curve Decay to 5 Nm		msec	60 to 80	75	Pass
Overall Test Results					Pass



Laboratory Technician

8/23/07

Test Date



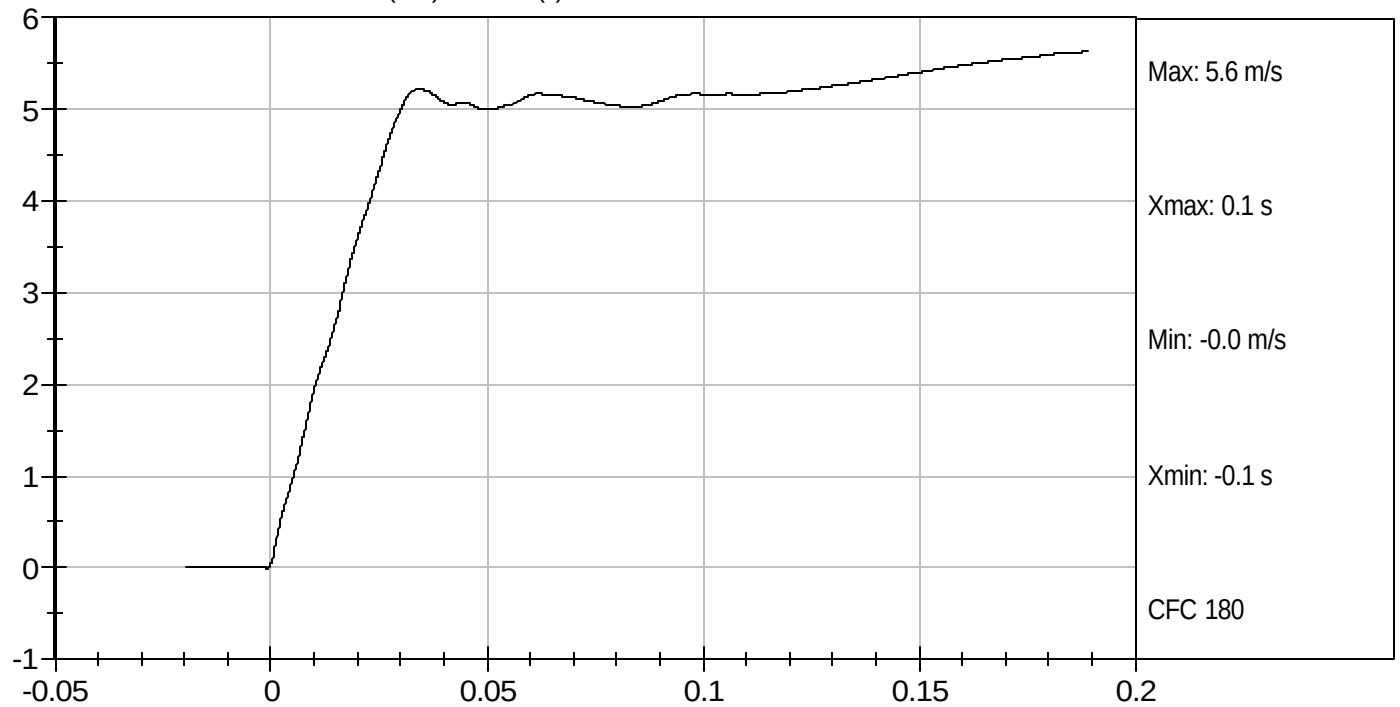
Approved By



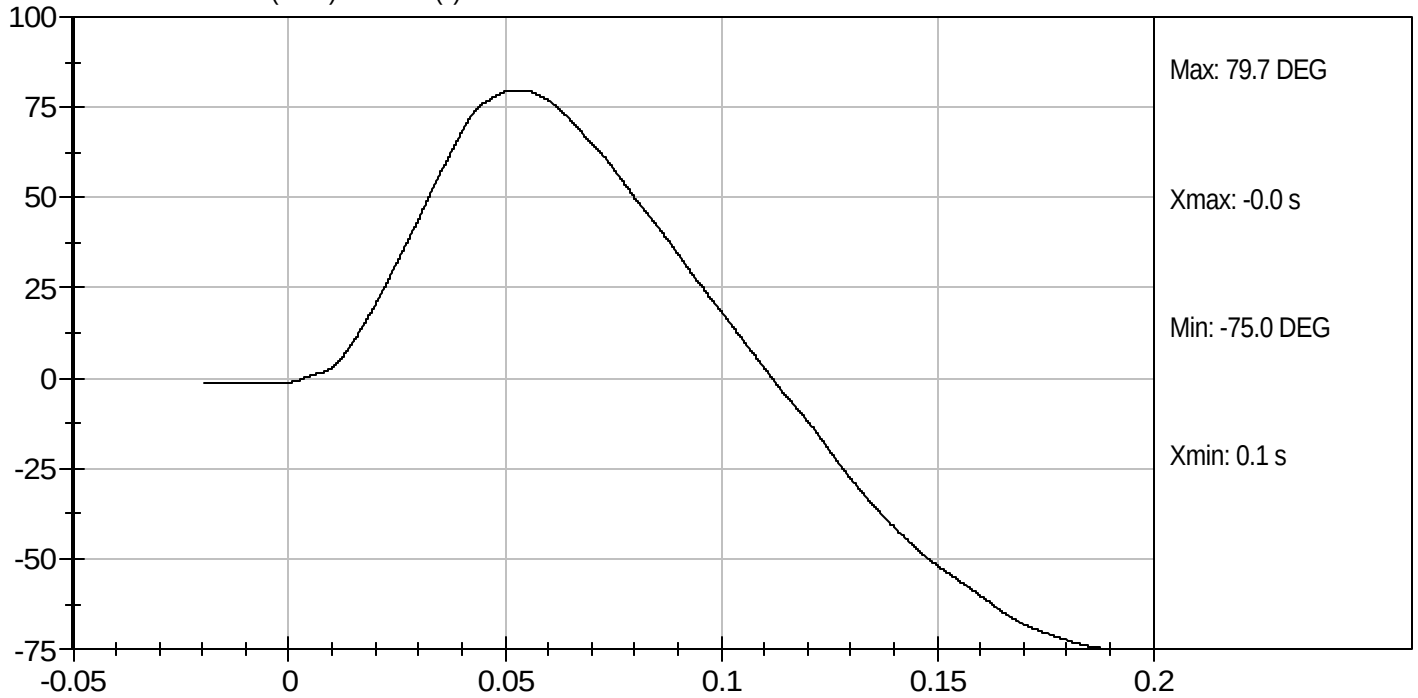
Test Desc: Neck Flexion
Component ID: D072532

Test Date: 8/23/07
Velocity: 17.182 ft/s, 5.2 m/s

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



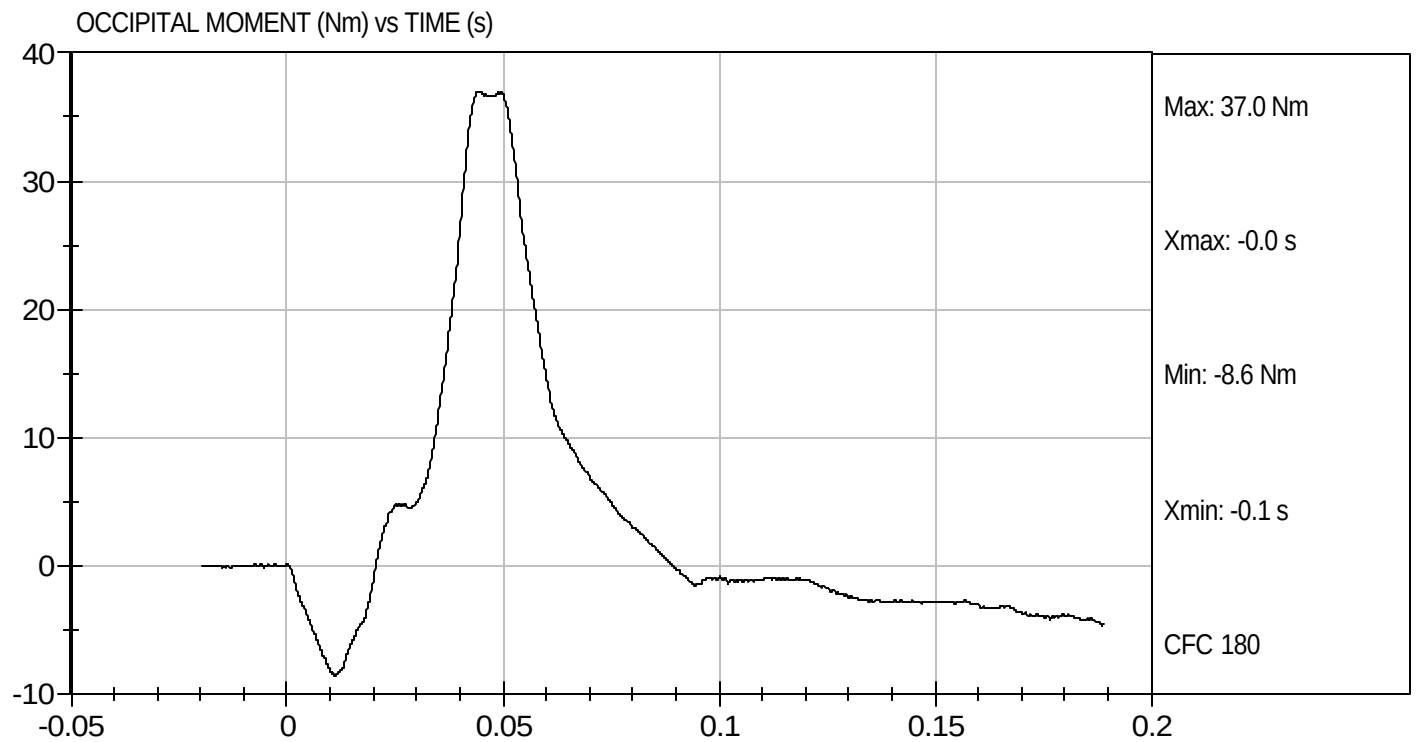
FLEXION ANGLE (DEG) vs TIME (s)





Test Desc: Neck Flexion
Component ID: D072532

Test Date: 8/23/07
Velocity: 17.182 ft/s, 5.2 m/s



MGA RESEARCH CORPORATION
NECK EXTENSION TEST
CRABI 12 MONTH

ATD Serial No: 090

Test I.D: D072533

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	20.7	Pass
Humidity		%	10 to 70	46	Pass
Pendulum Speed		m/s	2.4 to 2.6	2.5	Pass
Pendulum Deceleration	6 msec	m/s	0.8 to 1.2	0.9	Pass
	10 msec	m/s	1.5 to 2.1	1.7	Pass
	14 msec	m/s	2.2 to 2.9	2.3	Pass
D Plane Rotation		deg	80.0 to 92.0	80.2	Pass
Moment About Occipital Condyle		Nm	-23.0 to -12.0	-14.8	Pass
Negative Moment - Time Curve Decay to -5 Nm		msec	76 to 90	84	Pass
Overall Test Results					Pass


 Laboratory Technician

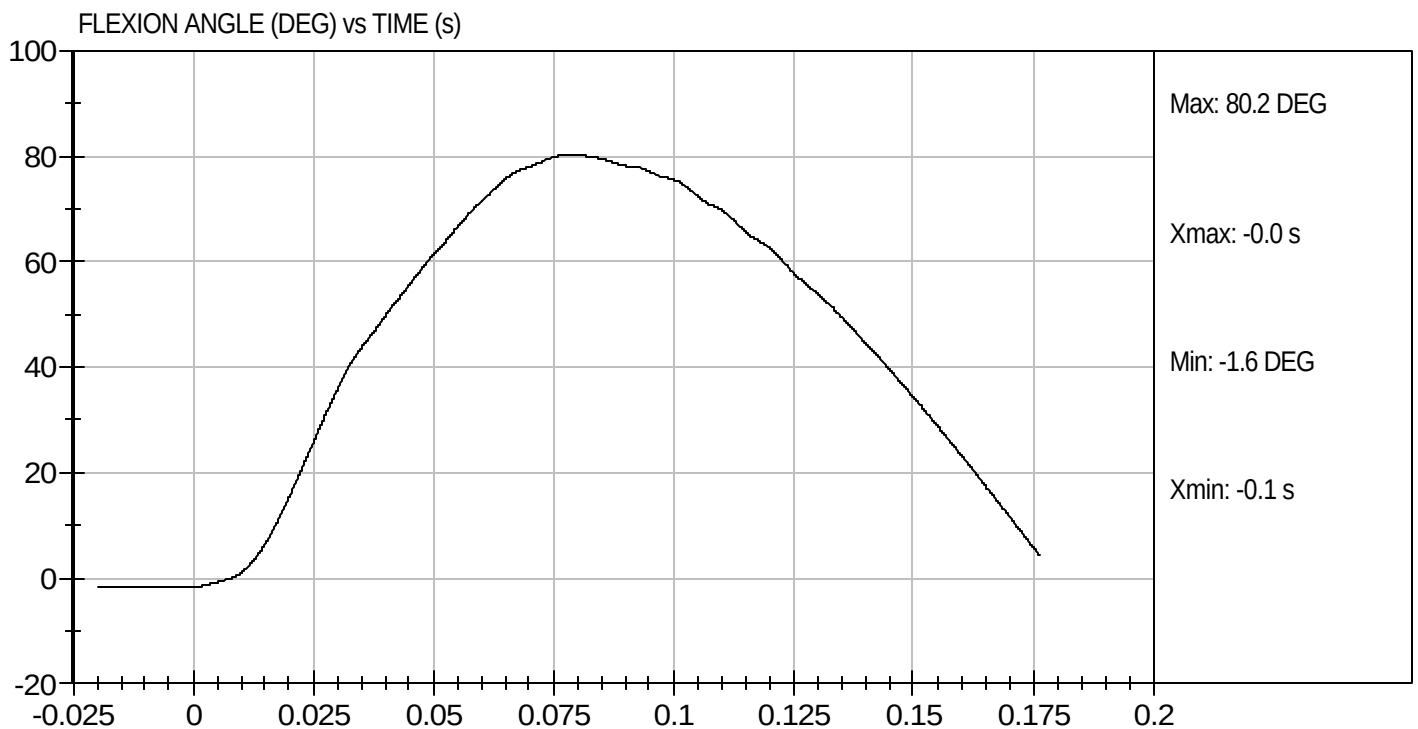
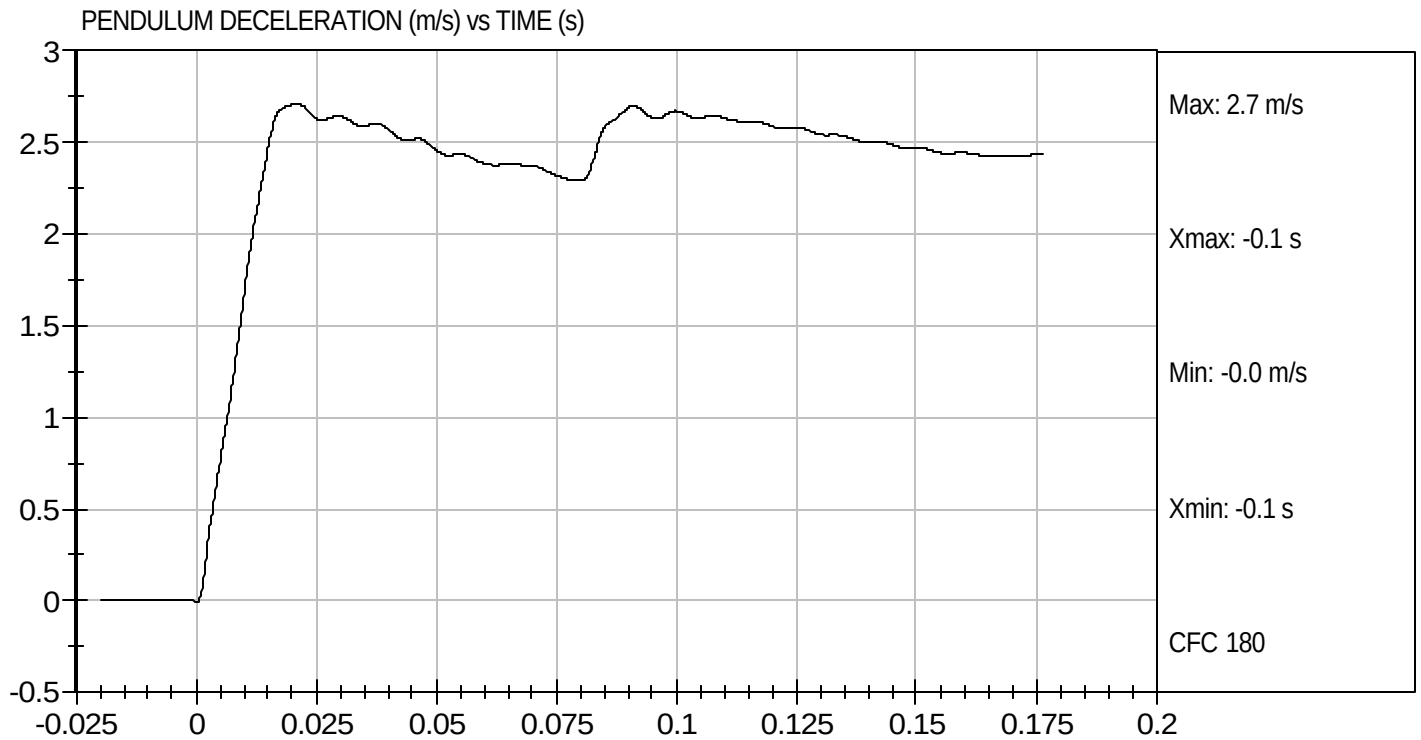
8/23/07
 Test Date


 Approved By



Test Desc: Neck Flexion
Component ID: D072533

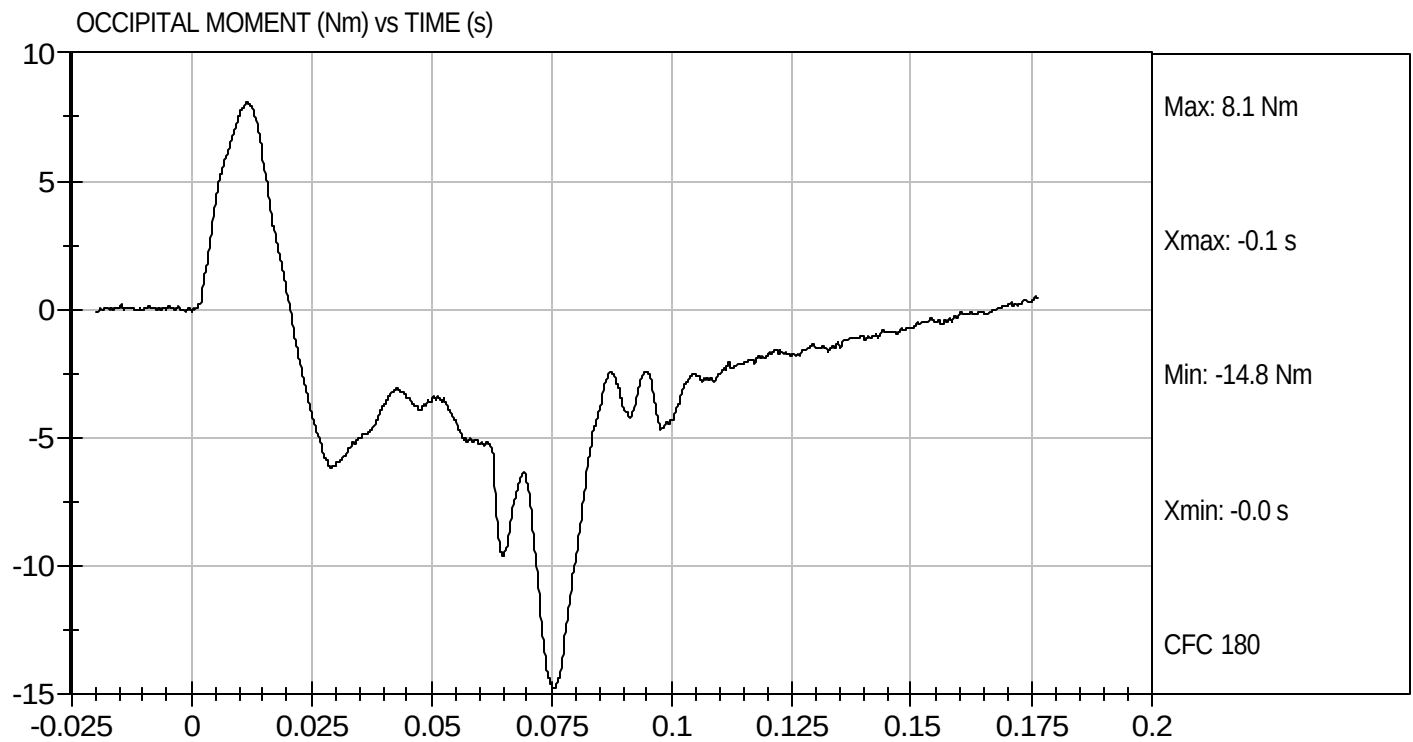
Test Date: 8/23/07
Velocity: 8.33 ft/s, 2.5 m/s





Test Desc: Neck Flexion
Component ID: D072533

Test Date: 8/23/07
Velocity: 8.33 ft/s, 2.5 m/s



MGA RESEARCH CORPORATION
THORAX IMPACT TEST
CRABI 12 MONTH

ATD Serial No: 090

Test I.D: D072534

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
Probe Speed	m/sec	4.9 to 5.1	5.03	Pass
Probe Force	kN	1.51 to 1.80	1.55	Pass
Overall Test Results				Pass



Laboratory Technician

8/23/07

Test Date

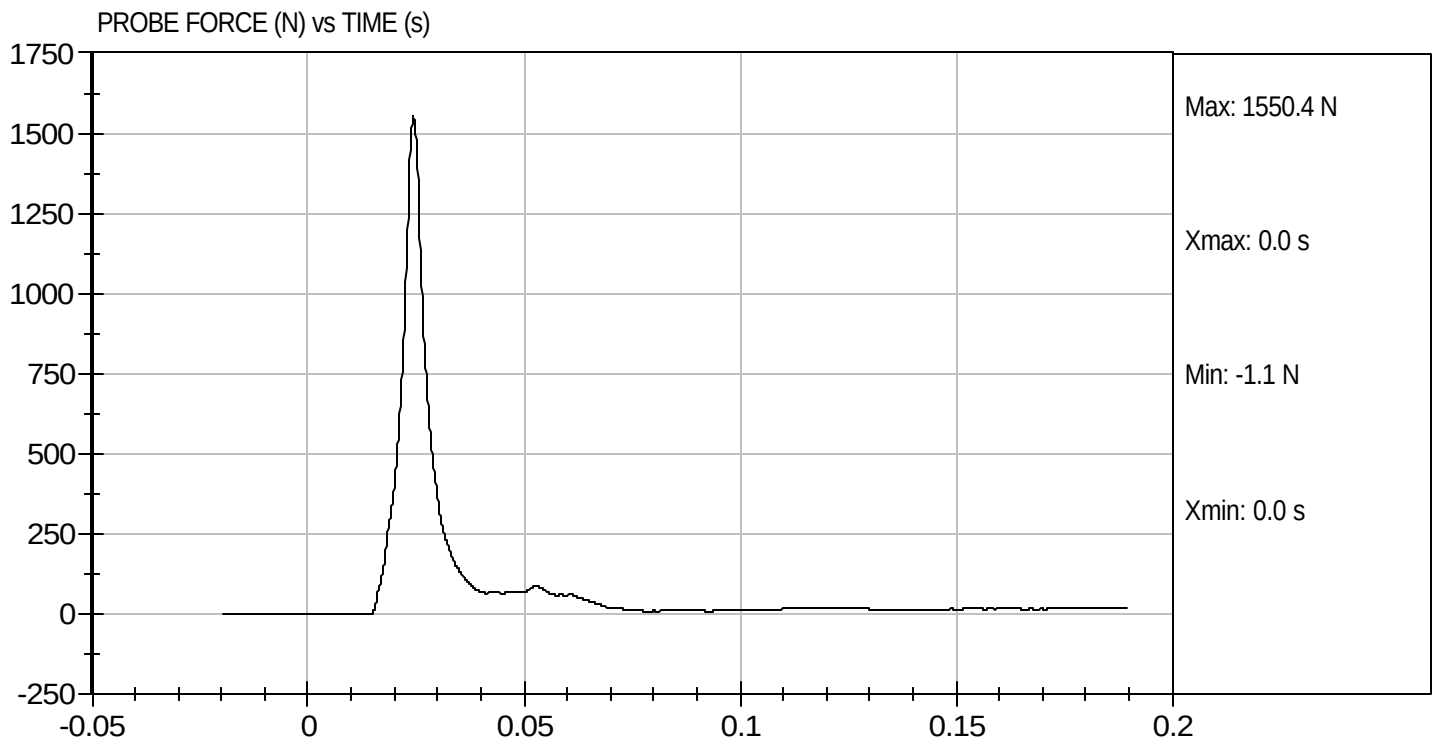


Approved By



Test Desc: Thorax Impact
Component ID: D072534

Test Date: 8/23/07
Velocity: 16.501 ft/s, 5.03 m/s



MGA RESEARCH CORPORATION
REAR HEAD DROP TEST
CRABI 12 MONTH

ATD Serial No: 090

Test ID: D072535

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	45	Pass
Peak Resultant Acceleration	G's	55 to 71	67	Pass
Peak Lateral Acceleration	G's	+/- 15	-3	Pass
Unimodal	N/A	within 17% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician


Approved By

8/23/07
Test Date



Test Desc: Head Drop
Component ID: D072535

Test Date: 8/23/07
Velocity: 0 ft/s, 0 m/s

