

REPORT NUMBER: SPNCAP-MGA-2011-070

**NEW CAR ASSESSMENT PROGRAM (NCAP)
Side Impact Pole Test**

**TOYOTA MOTOR CORPORATION
2011 Scion tC 3-Dr Liftback
NHTSA No.: YB5101**

**MGA RESEARCH CORPORATION
5000 Warren Road
Burlington, WI 53105**



Test Date: February 21, 2011

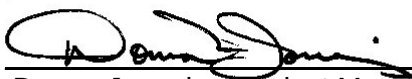
Final Report Date: March 19, 2011

FINAL REPORT

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

This final test report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, in response to Contract Number DTNH22-09-D-00124.

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Approved by: 
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Approval Date: March 19, 2011

FINAL REPORT ACCEPTANCE BY OCWS:

Division Chief, New Car Assessment Program
NHTSA, Office of Crashworthiness Standards

Date: _____

COTR, New Car Assessment Program
NHTSA, Office of Crashworthiness Standards

Date: _____

Technical Report Documentation Page

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16. Abstract A 32.2 km/h (20 mph), 75° oblique impact NCAP Side Pole Test was conducted on the subject 2011 Scion tC 3-Dr Liftback in accordance with the specifications of the Office of Crashworthiness Standards NCAP Side Pole Laboratory Test Procedure for the generation of consumer information on vehicle side pole crash protection. The test was conducted at MGA Research Corporation, in Burlington, Wisconsin, on February 21, 2011. The impact velocity was 32.5 km/h, and the ambient temperature at the struck (driver's) side of the target vehicle at the time of impact was 21°C. The test vehicle post-test maximum crush was 333 mm at level 3. The test vehicle's performance was as follows: <table border="1" style="margin: 10px auto; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2" style="text-align: left;">Measurement Description</th> <th colspan="3">Driver ATD (SID-IIs)</th> </tr> <tr> <th>Units</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td style="text-align: left;">Head Injury Criteria (HIC₃₆)</td> <td>N/A</td> <td>1000</td> <td>340</td> </tr> <tr> <td style="text-align: left;">Resultant Lower Spine Acceleration</td> <td>Gs</td> <td>82</td> <td>46</td> </tr> <tr> <td style="text-align: left;">Combined Acetabular and Iliac Pelvic Force</td> <td>N</td> <td>5525</td> <td>2853</td> </tr> </tbody> </table> The door on the struck side of the vehicle did not separate from the body at the hinges or latch and the opposite door did not open during the side impact event.				Measurement Description	Driver ATD (SID-IIs)			Units	Threshold	Result	Head Injury Criteria (HIC ₃₆)	N/A	1000	340	Resultant Lower Spine Acceleration	Gs	82	46	Combined Acetabular and Iliac Pelvic Force	N	5525	2853
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17. Key Words New Car Assessment Program (NCAP) Side Impact Pole Part 572V SID-IIs		18. Distribution Statement Copies of this report are available from: National Highway Traffic Safety Adm. Technical Reference Division 1200 New Jersey Ave, SE Washington, D.C. 20590																				
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 127	22. Price																			

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SECTION 1

TEST PURPOSE AND PROCEDURE

This side impact test is part of the MY 2011 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. DTNH22-09-D-00124. The purpose of this test is to generate comparative side impact performance in a 2011 Scion tC 3-Dr Liftback. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Side NCAP Pole Laboratory Test Procedure, dated January 2010.

SECTION 2

SUMMARY OF TEST RESULTS

A rigid pole side impact test was conducted on a 2011 Scion tC 3-Dr Liftback. The subject vehicle was towed into the rigid pole at an angle of 75° and a velocity of 32.5 km/h. The test was conducted by MGA Research Corporation in Burlington, Wisconsin, on February 21, 2011. Pre-test and post-test photographs of the test vehicle and side impact dummy (SID-IIs) are included in Appendix A of this report.

One Part 572V (SID-IIs) dummy was placed in the driver designated seating position according to instructions specified in the OCWS NCAP Side Pole Laboratory Test Procedure dated January 2010. Camera locations and other pertinent camera information are included in this report.

The Part 572V (SID-IIs) dummy was instrumented accordingly:

Head CG Triaxial Accelerometers
 Thorax Upper, Middle, and Lower Rib Displacement Potentiometers
 Abdomen Upper and Lower Rib Displacement Potentiometers
 Lower Spine Triaxial Accelerometers
 Iliac Load Cell
 Acetabulum Load Cell

Appendix B contains the vehicle and dummy response data. Dummy configuration and performance verification data can be found in Appendix C of this report.

The following table summarizes the results of the test:

DUMMY INJURY VALUES				
Dummy	HIC (36ms)	Resultant Lower Spine Acceleration	Pelvic Force (N)	
SID-IIs 5 th Percentile Female	340	46	Iliac Wing	934
			Acetabular	1919
			Sum	2853

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Left Front (Driver) P1		Left Rear (Passenger) P4	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	No	No	
Knee Airbag	Yes	No	No	
Side Curtain Airbag	Yes	Yes	Yes	Yes
Side Torso/Pelvis Airbag	Yes	Yes	No	
Seat Belt Pretensioner	Yes	Yes	No	
Seat Belt Load Limiter	Yes		No	

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

GENERAL COMMENTS

There was no valid data collected for:

Left Floor Sill Y after 90 msec.

Left Mid B-Post Y after 10 msec.

Driver Seat Track Y after 40 msec.

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

SECTION 3
OCCUPANT AND VEHICLE INFORMATION

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2011 Scion tC 3-Dr Liftback
 Test Program: NCAP Side Pole Impact Test

NHTSA No. YB5101
 Test Date: 2/21/2011

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	YB5101	Anti-Lock Brakes	Yes
Model Year	2011	All Wheel Drive	No
Make	Scion	Power Steering	Yes
Model	tC	Driver Front Airbag	Yes
Body Style	3-Dr Hatchback	Driver Curtain Airbag	Yes
VIN	JTKJF5C75B3016908	Driver Head/Torso Airbag	No
Body Color	Cement	Driver Torso Airbag	No
Delivery Date	2/11/2011	Driver Torso/Pelvis Airbag	Yes
Odometer (mi)	4	Driver Pelvis Airbag	No
Odometer (km)	6	Driver Knee Airbag	Yes
Dealer	Jack Safo Scion	Rear Pass. Front Airbag	No
Transmission	Manual	Rear Pass. Curtain Airbag	Yes
Final Drive	Front	Rear Pass. Head/Torso Airbag	No
Type/No. Cylinders	4	Rear Pass. Torso Airbag	No
Engine Displacement (L)	2.5	Rear Pass. Torso/Pelvis Airbag	No
Engine Placement	Lateral	Rear Pass. Pelvis Airbag	No
Roof Rack	No	Rear Pass. Knee Airbag	No
Sunroof/T-Top	Yes	Pretensioners	Yes
Tinted Glass	No	Load Limiters	Yes
Traction Control	Yes	Automatic Door Locks	Yes
Power Brakes	Yes	Bucket Seats	Yes
Front Disc	Yes	Tilt Steering	Yes
Rear Disc	Yes	Power Seats	No
Does owner's manual provide instruction to turn off automatic door locks?			Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Toyota Motor Corporation	GVWR (kg)	1882
Date of Manufacture	12/10	GAWR Front (kg)	1150
		GAWR Rear (kg)	950

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity (DSC)	2	3		5	
Capacity Weight (VCW) (kg)				388	(A)
DSC x 68.04 kg				340	(B)
Cargo Weight (RCLW) (kg)				48	(A-B)

VEHICLE SEAT TYPE

Seating Location	Type of Seat Pan				Type of Seat Back		
	Bucket	Bench	Split Bench	Contoured	Fixed	Adjustable	
Front Seat	X					w/Lever	
Rear or Second Row			X		X		
Third Row Seat							

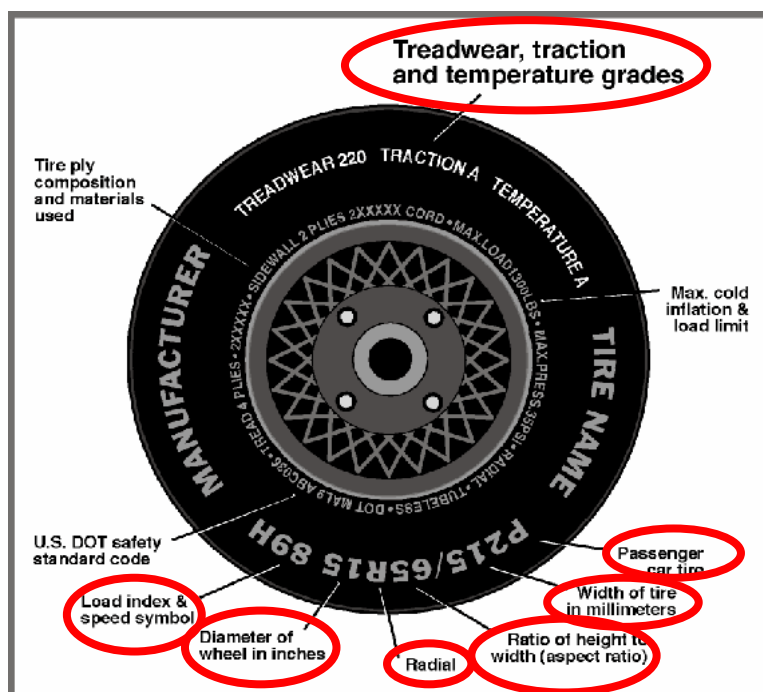
DATA SHEET NO. 1 (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2011 Scion tC 3-Dr Liftback
 Test Program: NCAP Side Pole Impact Test

NHTSA No. YB5101
 Test Date: 2/21/2011

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	230	210
Recommended Tire Size	P225/45R18	P225/45R18
Tire Size on Vehicle	P225/45R18	P225/45R18
Tire Manufacturer	Yokohama	Yokohama
Tire Model	AVID	AVID
Treadwear	360	360
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	2	2
Tire Plies Body	6	6
Load Index & Speed Symbol	91W	91W
Tire Material	Rubber	Rubber
DOT Safety Code Right	FDJ7	FDJ7
DOT Safety Code Left	FDJ7	FDJ7

DATA SHEET NO. 1 (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2011 Scion tC 3-Dr Liftback
 Test Program: NCAP Side Pole Impact Test

NHTSA No. YB5101
 Test Date: 2/21/2011

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	447.3	261.7		473.6	301.6		465.4	305.3	
Right	kg	429.1	262.6		431.8	288.0		435.0	296.2	
Ratio	%	62.6	37.4		60.6	39.4		60.0	40.0	
Totals	kg	876.4	524.3	1400.7	905.4	589.6	1495.0	900.4	601.5	1501.9

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1400.7	(A)
Actual Weight of 1 P572V ATD (SID-IIs) ATD Used	kg	52.2	(B)
Rated Cargo/Luggage Weight (RCLW)	kg	48	(C)
Calculated Target Vehicle Test Weight (TVTW)	kg	1500.9	(A+B+C)

TEST VEHICLE ATTITUDES AND CG

	Units	As Delivered	As Tested	Fully Loaded
Driver Door Sill Angle (front-to-rear)*	deg	-0.8	-0.5	-0.4
Front Passenger Sill Angle (front-to-rear)*	deg	-1.0	-0.5	-0.5
Front Bumper Angle (left-to-right)**	deg	0.3	0.3	0.3
Rear Bumper Angle (left-to-right)**	deg	0.0	-0.1	-0.1
Vehicle CG (Aft of Front Axle)	mm	1011	1065	1081
Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline)	mm	9	28	20

*Front up is positive ** Left up is positive

GENERAL VEHICLE TEST DATA

Measurement Description	Units	Value
Weight of Ballast in Cargo Area	kg	0.0
Weight of Vehicle Components Removed	kg	24.0

Vehicle components removed to meet target vehicle test weight: Tail lights, spare tire, jack & tools, trunk carpet, right side mirror, right rear speaker, rear headrests, right b-pillar cover, right c-pillar cover, plastic tool holders, front splash guards, right rear seat belt, air filter.

TEST VEHICLE IMPACT POINT DATA

Measurement Parameter	Units	Value
Vertical Impact Reference Line (Aft of Front Axle)	mm	1058
Actual Impact Point (Aft of Front Axle)	mm	1057
Impact Point Difference (- forward / + rearward)	mm	-1

DATA SHEET NO. 2

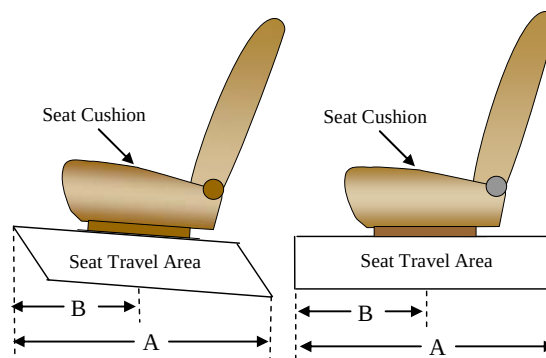
SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT, AND FUEL SYSTEM DATA

Test Vehicle: 2011 Scion tC 3-Dr Liftback
 Test Program: NCAP Side Pole Impact Test

NHTSA No. YB5101
 Test Date: 2/21/2011

SEAT FORE/AFT POSITIONS

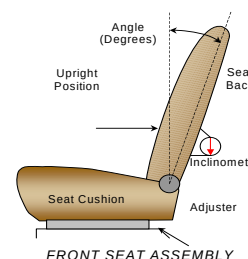
The driver seat was a manual fore/aft adjustable seat with manual height/angle adjustment. The seat travel was set as specified in Appendix B of the TP dated January 2010. The right front passenger seat was set to match the driver seat. The rear passenger seats were fixed.



SEAT FORE/AFT POSITIONING	Total Fore/Aft Travel	Placed in Detent # or Position
Driver Seat	24 detents (1 st as 0)	0 (forward-most as 0)
Front Passenger Seat	26 detents (1 st as 0)	0 (forward-most as 0)
Rear Seat – Struck Side		Fixed
Rear Seat – Non-Struck Side		Fixed

SEAT BACK ANGLE POSITION

The seat back was set as specified in Appendix B of the TP dated January 2010. The seat back angle measurement was made relative to the rocker sill on the headrest post.



SEAT BACK ANGLE	Degrees	Detents
Driver Seat Back Angle with Seated Dummy	-4.7	1 st detent (forward-most detent is 0)
Front Passenger Seat Back Angle	-4.7	0 detent (forward-most detent is 0)
Struck Side Rear Seat Back Angle		0 detent (forward-most detent is 0)
Non-Struck Side Rear Passenger Seat Back Angle		0 detent (forward-most detent is 0)

SEAT BELT UPPER ANCHORAGE

The driver seat belt upper anchorage was set at the manufacturer's specified placement in Form 1.

SEAT BELT UPPER ANCHORAGES	Total # of Positions	Placed in Position #
Driver Seat	Fixed	

DATA SHEET NO. 2 (CONTINUED)

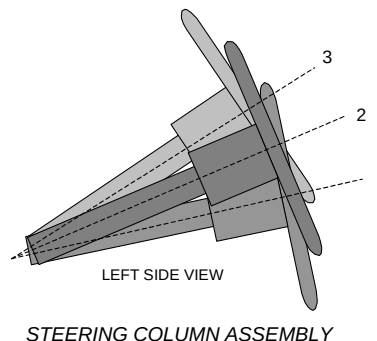
SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT, AND FUEL SYSTEM DATA

Test Vehicle: 2011 Scion tC 3-Dr Liftback
 Test Program: NCAP Side Pole Impact Test

NHTSA No. YB5101
 Test Date: 2/21/2011

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.

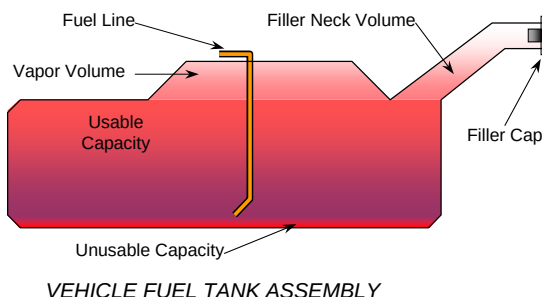


STEERING COLUMN POSITIONING

	Degrees	Fore/Aft Position (mm)
Lowermost - Position 1	72.0	188
Geometric Center – Position 2	70.4	169
Uppermost – Position 3	68.8	150
Telescoping Steering Wheel Travel		38
Test Position	70.4	169

FUEL PUMP

Describe the fuel pump type, its behavior, and the location of the fuel filler pipe. The vehicle is equipped with an electric fuel pump. The fuel pump is activated when the ignition is turned on. The fuel pipe is on the left side.



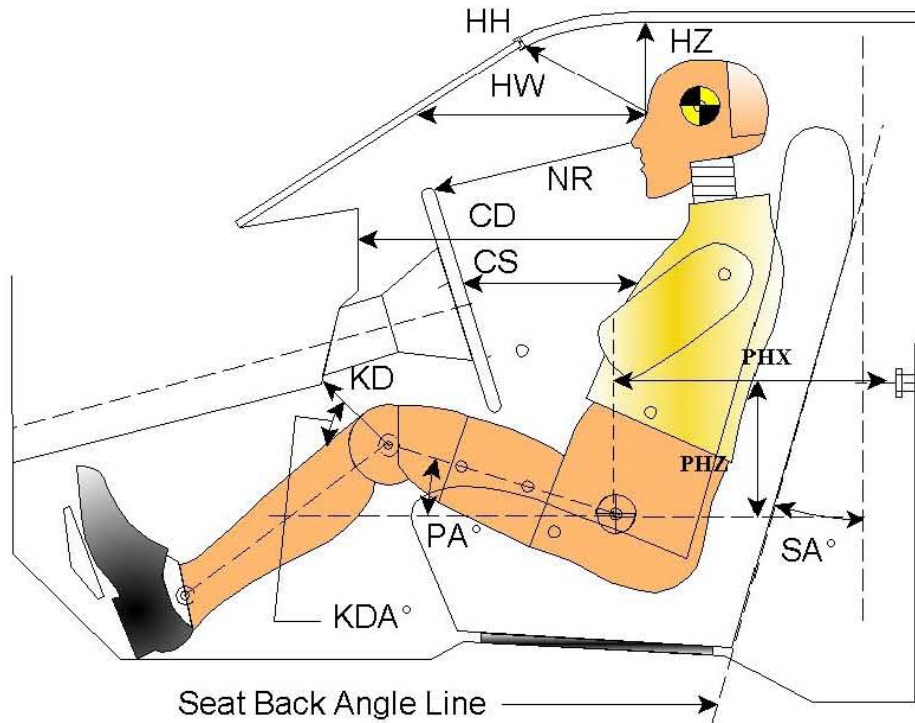
FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of "Standard" Tank	55.0
Usable Capacity of "Optional" Tank	
Usable Capacity of Standard Tank as Specified in Owner's Manual	55.0
Usable Capacity of Optional Tank as Specified in Owner's Manual	
92-94% of Usable Capacity	50.6 to 51.7
Actual Amount of Solvent Used	51.0
1/3 of Usable Capacity	18.3

.DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 Scion tC 3-Dr Liftback
 Test Program: NCAP Side Pole Impact Test

NHTSA No. YB5101
 Test Date: 2/21/2011

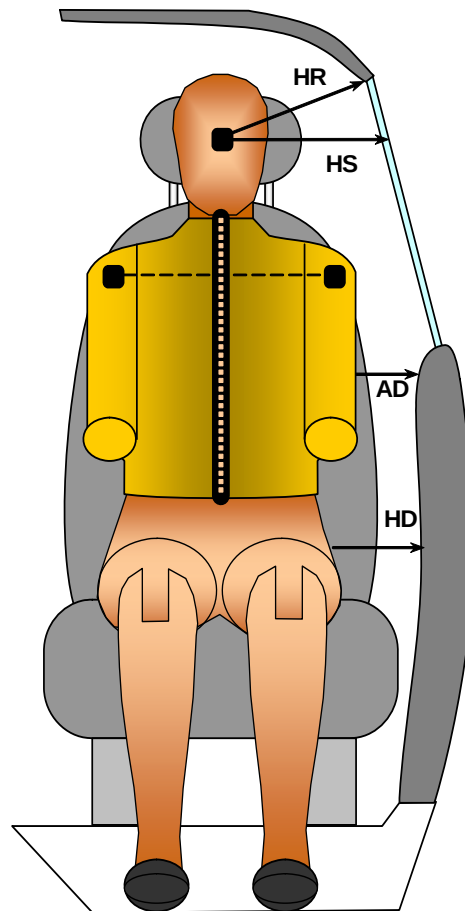


Code	Measurement Description	Driver S/N 296	
		Length (mm)	Angle (°)
HH	Head to Header	301	
HW	Head to Windshield	590	
HZ	Head to Roof	165	
NR	Nose to Rim	191	
CD	Chest to Dash	359	
CS	Chest to Steering Wheel	146	
KDL/KDAL	Left Knee to Dash	165	30.6
KDR/KDAR	Right Knee to Dash	158	28.3
PA	Pelvic Angle		18.0
PHX	H-Point to Striker (X-Axis)	578	
PHZ	H-Point to Striker (Z-Axis)	215	
SA	Seat Back Angle		-4.7

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 Scion tC 3-Dr Liftback
 Test Program: NCAP Side Pole Impact Test

NHTSA No. YB5101
 Test Date: 2/21/2011



FRONT VIEW OF DUMMY

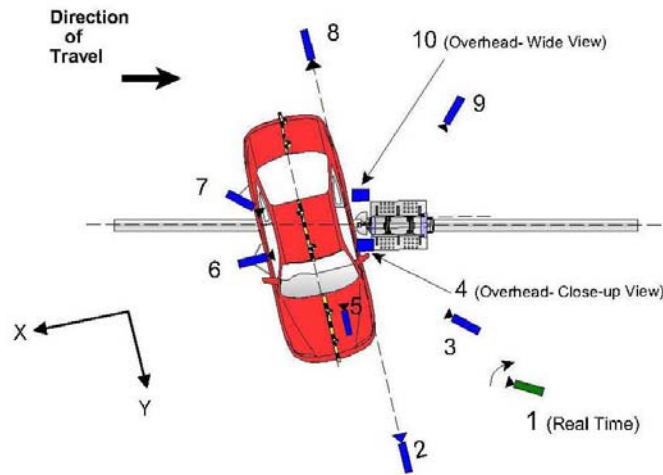
Code	Measurement Description	Driver S/N 296
		Length (mm)
HR	Head to Side Header	231
HS	Head to Side Window	361
AD	Arm to Door	140
HD	H-Point to Door	161

DATA SHEET NO. 5

CAMERA LOCATIONS AND DATA

Test Vehicle: 2011 Scion tC 3-Dr Liftback
 Test Program: NCAP Side Pole Impact Test

NHTSA No. YB5101
 Test Date: 2/21/2011



Reference: (from Point of Impact for X and Y; from Ground for Z):
 +X = Forward of Impact, + Y = Right of Impact, +Z = Down

Camera No.	View	Coordinates (mm)			Lens (mm)	Film Speed (fps)
		X*	Y*	Z*		
1	Real-Time Pan View					30
2	Front Ground Level	40	5390	-1690	24	1000
3	Impact Side 45° Forward	-2230	3860	-1720	20	1000
4	Overhead Closeup	30	0	-4520	50	1000
5	Onboard – Driver Front				16	1000
6	Onboard – Driver Side				8	1000
7	Onboard – Driver Rear				8	1000
8	Rear Ground Level	30	-5680	-1680	24	1000
9	Impact Side 45° Rearward	-3750	-3040	-1700	20	1000
10	Overhead Wide View	280	0	-4610	14	1000
11	Real-Time Dummy Front View					30

* All measurements accurate to ± 6 mm

Note: Vehicle was at a 15° angle to the rigid pole.

INSTRUMENTATION

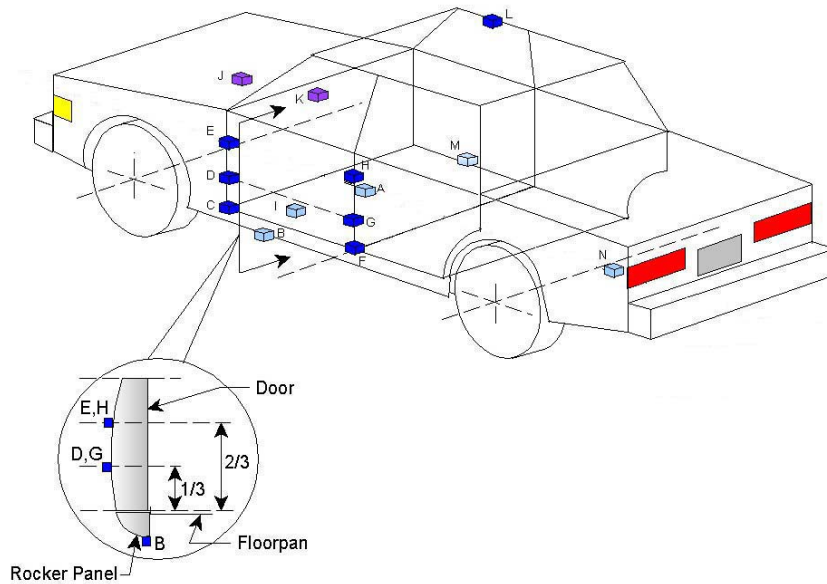
	Number of Channels
Driver Dummy	16
Vehicle Structure	21
Pole Load Cells – Not used	8
Contact Switches	3
Airbag Timing	2
Total No. of Data Channels	50

DATA SHEET NO. 6

VEHICLE ACCELEROMETER DATA

Test Vehicle: 2011 Scion tC 3-Dr Liftback
 Test Program: NCAP Side Pole Impact Test

NHTSA No. YB5101
 Test Date: 2/21/2011



	Accelerometer Location			
	ID	Coordinates (mm)		
		X	Y	Z
A	Vehicle CG	2393	-245	-195
	Vehicle CG Sensor	2368	-245	-195
B	Left Floor Sill	2672	-705	-198
C	A Pillar Sill	3011	-705	-197
D	A Pillar Low	2967	-684	-509
E	A Pillar Mid	3020	-790	-745
F	B Pillar Sill	1607	-705	-203
G	B Pillar Low	1826	-713	-536
H	B Pillar Mid	1814	-712	-806
I	Driver Seat	2296	-563	-486
L	Engine Top	3705	-105	-824
J	Firewall	3505	-10	-883
K	Right Roof	2039	580	-1395
M	Right Floor Sill	2068	705	-213
N	Rear Floorpan	837	0	-543

Reference: From Point of Impact for X and Y; from Ground for Z):
 +X = Forward of Vehicle, + Y = Right of Vehicle, +Z = Down

DATA SHEET NO. 7
RIGID POLE LOAD CELL DATA

Test Vehicle: 2011 Scion tC 3-Dr Liftback
Test Program: NCAP Side Pole Impact Test

NHTSA No. YB5101
Test Date: 2/21/2011



254 mm Diameter Rigid Pole

The pole was not instrumented.

Load Cell Locations	
ID	Height From Ground (m)
1	
2	
3	
4	
5	
6	
7	
8	

DATA SHEET NO. 8**POST-TEST OBSERVATIONS**

Test Vehicle: 2011 Scion tC 3-Dr Liftback
 Test Program: NCAP Side Pole Impact Test

NHTSA No. YB5101
 Test Date: 2/21/2011

TEST DUMMY INFORMATION AND CONTACT

Description	Driver
Dummy Type / Serial No.	SID-IIs / 296
Head Contact	Curtain Airbag, Headrest
Upper Torso Contact	Side Airbag
Lower Torso Contact	Side Airbag
Left Knee Contact	Door Panel
Right Knee Contact	Left Knee

POST TEST DOOR OPENING AND SEAT TRACK INFORMATION

Description	Front	Rear
Left Side Doors	Remained closed and jammed shut	Remained closed and jammed shut
Right Side Doors	Remained closed and operational	Remained closed and operational
Hatch and Other Doors	Remained closed and operational	Remained closed and operational
Seat Movement	0	0
Seat Back Failure	None	None

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	No Separation
Sill Separation	None
Windshield Damage	Cracked
Window Damage	Left Front Window and Sunroof Broke
Other Notable Effects	None

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Left Front (Driver) P1		Left Rear (Passenger) P4	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	No	No	
Knee Airbag	Yes	No	No	
Side Curtain Airbag	Yes	Yes	Yes	Yes
Side Torso/Pelvis Airbag	Yes	Yes	No	
Seat Belt Pretensioner	Yes	Yes	No	
Seat Belt Load Limiter	Yes		No	

VEHICLE SPEED AND IMPACT DATA

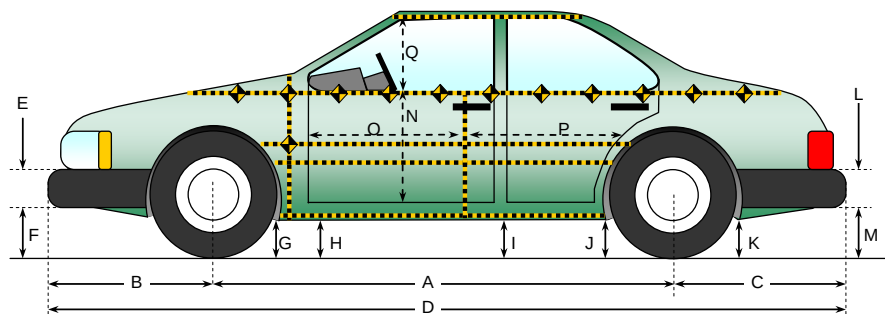
Measured Parameter	Units	Requirement	Value
Horizontal Offset from Vertical Impact Reference Line	mm	+/- 38	1
Trap No. 1 Velocity (Primary)	km/h	31.4 to 33.0	32.5
Trap No. 2 Velocity (Redundant)	km/h	31.4 to 33.0	32.7

DATA SHEET NO. 9

VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2011 Scion tC 3-Dr Liftback
 Test Program: NCAP Side Pole Impact Test

NHTSA No. YB5101
 Test Date: 2/21/2011



All measurements in (mm) with tolerance of ± 3 mm

LEFT SIDE VIEW

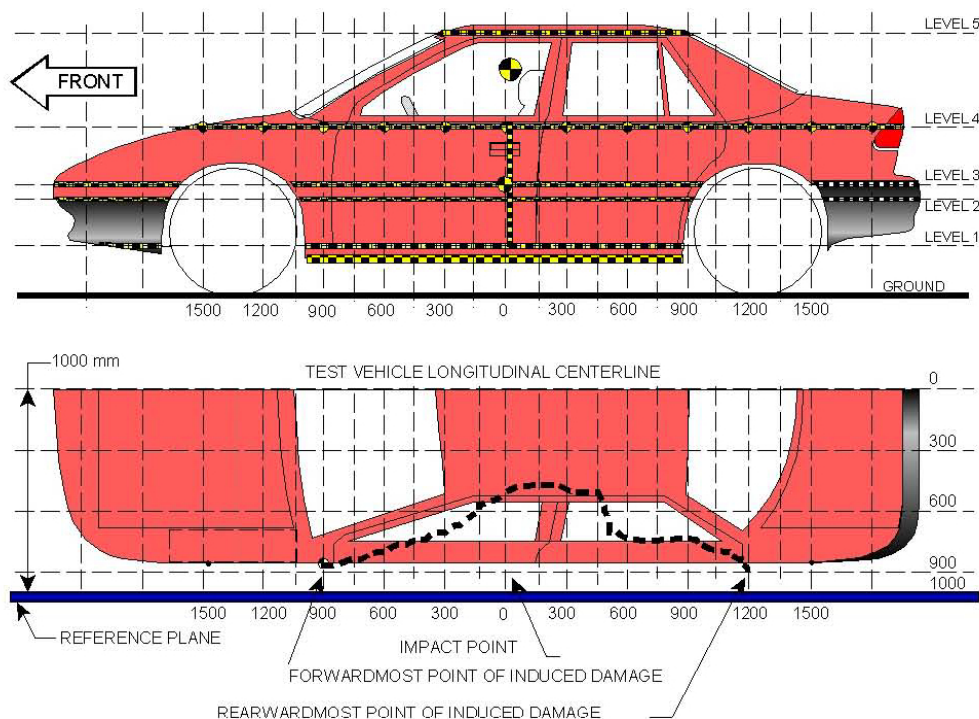
VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2700	2590	110
B	Front Axle to FSOV	910	900	10
C	Rear Axle to RSOV	810	820	-10
D1	Total Vehicle Length at Left Side	3520	3375	145
D2	Total Vehicle Length at Centerline	4420	4310	110
D3	Total Vehicle Length at Right Side	3520	3522	-2
E	Front Bumper Thickness	120	120	0
F	Front Bumper Bottom to Ground	228	263	-35
G	Sill Height at Front Wheel Well	180	188	-8
H	Sill Height at Front Door Leading Edge	181	192	-11
I	Sill Height at B Pillar	191	221	-30
J1	Sill Height at Rear Wheel Well	196	219	-23
J2	Pinch Weld Height at Rear Wheel Well	197	215	-18
K	Sill Height Aft of Rear Wheel Well	247	235	12
L	Rear Bumper Thickness	120	120	0
M	Rear Bumper Bottom to Ground	320	312	8
N	Sill Height to Window Bottom Sill	695	691	4
O	Front Door Leading Edge to Impact CL	634	628	6
P	Rear Door Trailing Edge to Impact CL	704	692	12
Q	Front Window Opening	405	362	43
R	Right Side Length	3520	3522	-2
S	Left Side Length	3520	3375	145
T	Vehicle Width at B Post	1730	1710	20

DATA SHEET NO. 10 **VEHICLE EXTERIOR CRUSH MEASUREMENTS**

Test Vehicle: 2011 Scion tC 3-Dr Liftback
 Test Program: NCAP Side Pole Impact Test

NHTSA No. YB5101
 Test Date: 2/21/2011



NOTE: The measurements are taken along the vertical impact reference line. Vehicle measurements forward of the vertical impact reference line are negative.

Level	Measurement Description	Height Above Ground (mm)
1	Sill Top	250
2	Mid Door	505
3	Occupant H-Point	630
4	Window Sill	935
5	Window Top	1325

DATA SHEET NO. 10 (CONTINUED)
VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2011 Scion tC 3-Dr Liftback
 Test Program: NCAP Side Pole Impact Test

NHTSA No. YB5101
 Test Date: 2/21/2011

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-1350				371					365					-6	
-1200				346					348					2	
-1050				332					346					14	
-900				320					336					16	
-750		212	214	303			224	229	316			12	15	13	
-600	241	227	225	296		263	250	242	308		22	23	17	12	
-525	240	233	225	287		291	297	287	327		51	64	62	40	
-450	240	234	225	289		322	341	326	353		82	107	101	64	
-375	239	235	226	287		352	378	365	390		113	143	139	103	
-300	239	235	225	286		382	407	401	427		143	172	176	141	
-225	239	235	225	286	495	424	442	455	474	572	185	207	230	188	77
-150	239	235	226	285	488	464	484	490	512	590	225	249	264	227	102
-75	239	235	226	285	484	513	534	542	561	628	274	299	316	276	144
0	240	235	226	285	481	547	550	559	573	619	307	315	333	288	138
75	241	236	227	284	480	504	508	522	540	586	263	272	295	256	106
150	242	236	227	281	478	455	466	489	504	569	213	230	262	223	91
225	242	236	228	282	477	396	417	441	477	558	154	181	213	195	81
300	243	236	228	282	477	344	374	387	451	548	101	138	159	169	71
375	243	236	229	282	477	346	365	380	444	559	103	129	151	162	82
450	244	237	229	282	477	326	332	350	408	543	82	95	121	126	66
525	244	237	230	281	477	304	299	319	373	527	60	62	89	92	50
600	244	237	231	281	477	282	263	278	335	515	38	26	47	54	38
750	245	239	233	283	480	262	278	269	318	502	17	39	36	35	22
900	245	242	237	285	484	241	267	261	310	494	-4	25	24	25	10
1050	244	237	236	287	495	226	249	259	305	499	-18	12	23	18	4
1200	238	215	226	296	514	215	210	245	302	518	-23	-5	19	6	4
1350			205	304				220	315				15	11	
1500				308					319					11	
1650				317					325					8	
1800				329					335					6	
1950				349					350					1	

NOTE: The measurements are taken along the vertical impact reference line.
 Vehicle measurements forward of the vertical impact reference line are negative.

DATA SHEET NO. 10 (CONTINUED)
VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2011 Scion tC 3-Dr Liftback
Test Program: NCAP Side Pole Impact Test

NHTSA No. YB5101
Test Date: 2/21/2011

MAXIMUM CRUSH DATA

	Level 1	Level 2	Level 3	Level 4	Level 5
Maximum Crush (mm)	307	315	333	288	144
Distance From Impact (mm)	0	0	0	0	-75

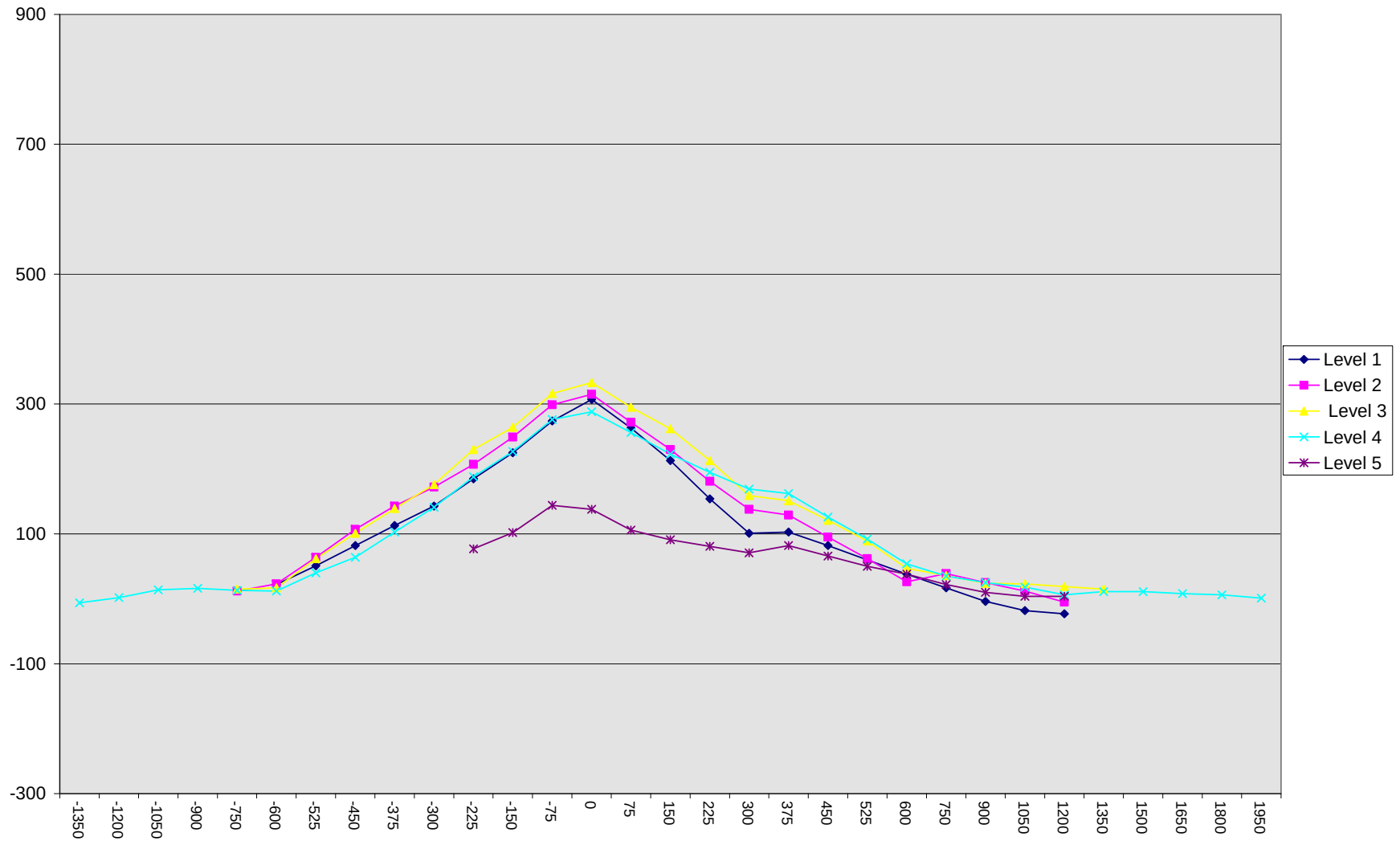
Note: Pre-test measurements are taken when the vehicle is in the "As Tested" weight condition. Vehicle measurements forward of the vertical impact reference line are negative. The crush profile grid is established prior to test based on an estimated impact point. The final distance to impact is determined after the final dummy positioning and the pole is aligned with the center of gravity of the dummy's head.

DATA SHEET NO. 10 (CONTINUED)
VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2011 Scion tC 3-Dr Liftback
Test Program: NCAP Side Pole Impact Test

NHTSA No. YB5101
Test Date: 2/21/2011

20



DATA SHEET NO. 11

FMVSS 301 FUEL SYSTEM INTEGRITY POST-IMPACT DATA

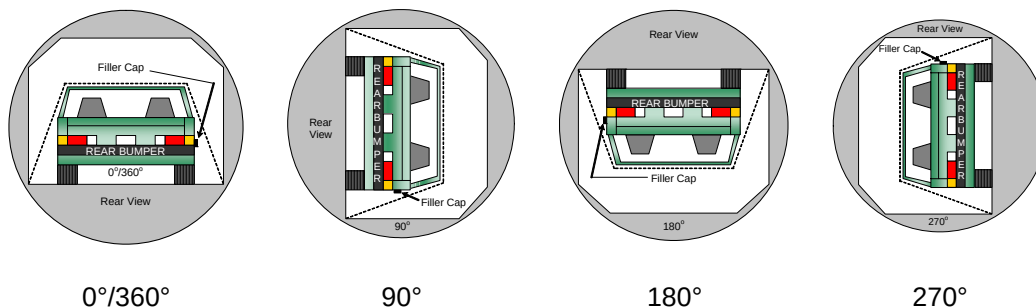
Test Vehicle: 2011 Scion tC 3-Dr Liftback
 Test Program: NCAP Side Pole Impact Test

NHTSA No. YB5101
 Test Date: 2/21/2011

Test Time: 11:00 am Temperature: 21° C

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

FMVSS 301 STATIC ROLLOVER DATA



ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	113	300	413
90° to 180°	109	300	409
180° to 270°	106	300	406
270° to 360°	114	300	414

FMVSS 301 ROLLOVER SPILLAGE TABLE (units in ounces)

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

ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

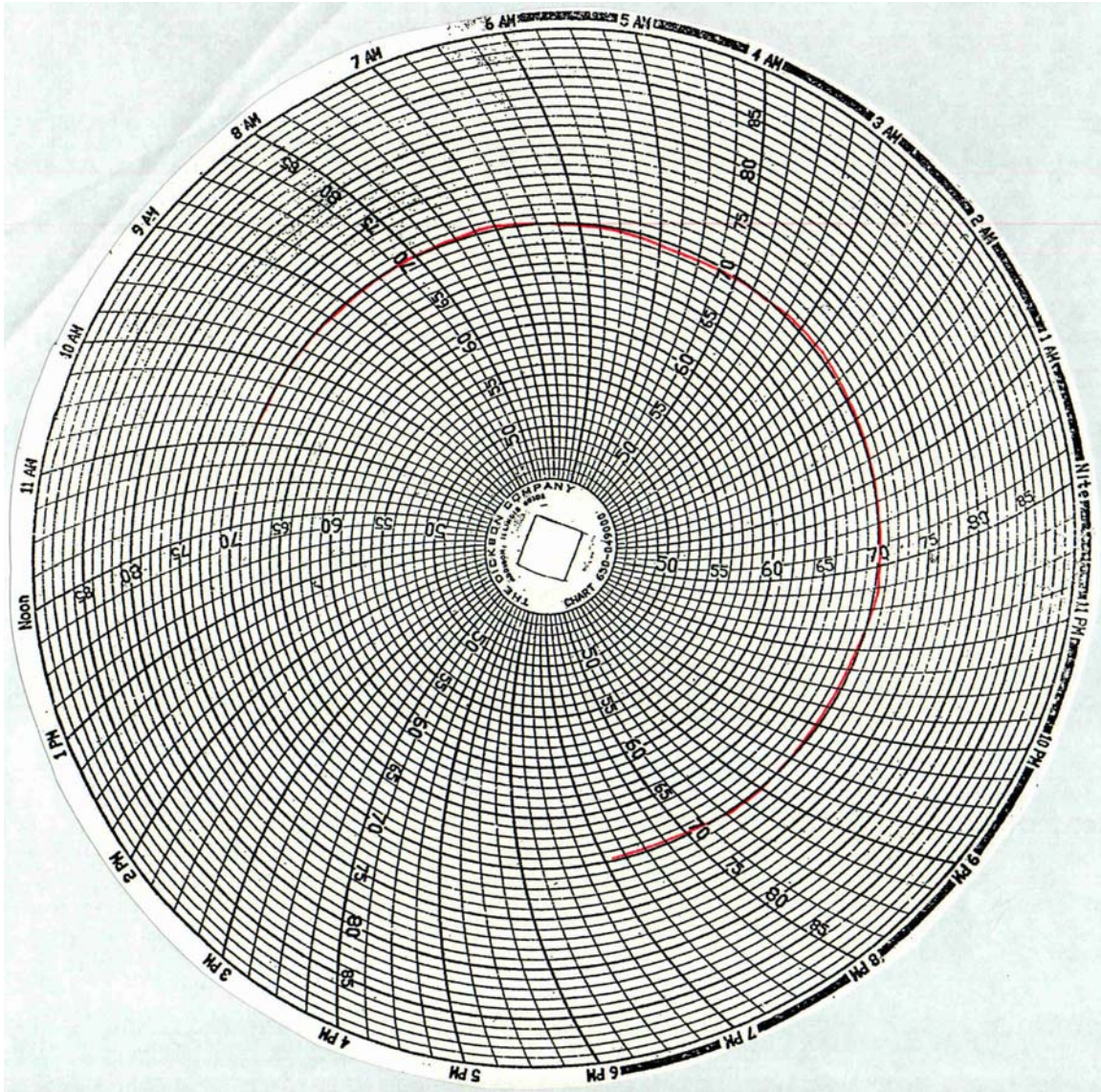
Test Phase	Spillage Location
0° to 90°	
90° to 180°	
180° to 270°	
270° to 360°	

DATA SHEET NO. 12

DUMMY/VEHICLE TEMPERATURE STABILIZATION DATA

Test Vehicle: 2011 Scion tC 3-Dr Liftback
Test Program: NCAP Side Pole Impact Test

NHTSA No. YB5101
Test Date: 2/21/2011



APPENDIX A
PHOTOGRAPHS

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As Delivered Right Front $\frac{3}{4}$ View of Test Vehicle



As Delivered Left Rear $\frac{3}{4}$ View of Test Vehicle



Pre-Test Frontal View of Test Vehicle



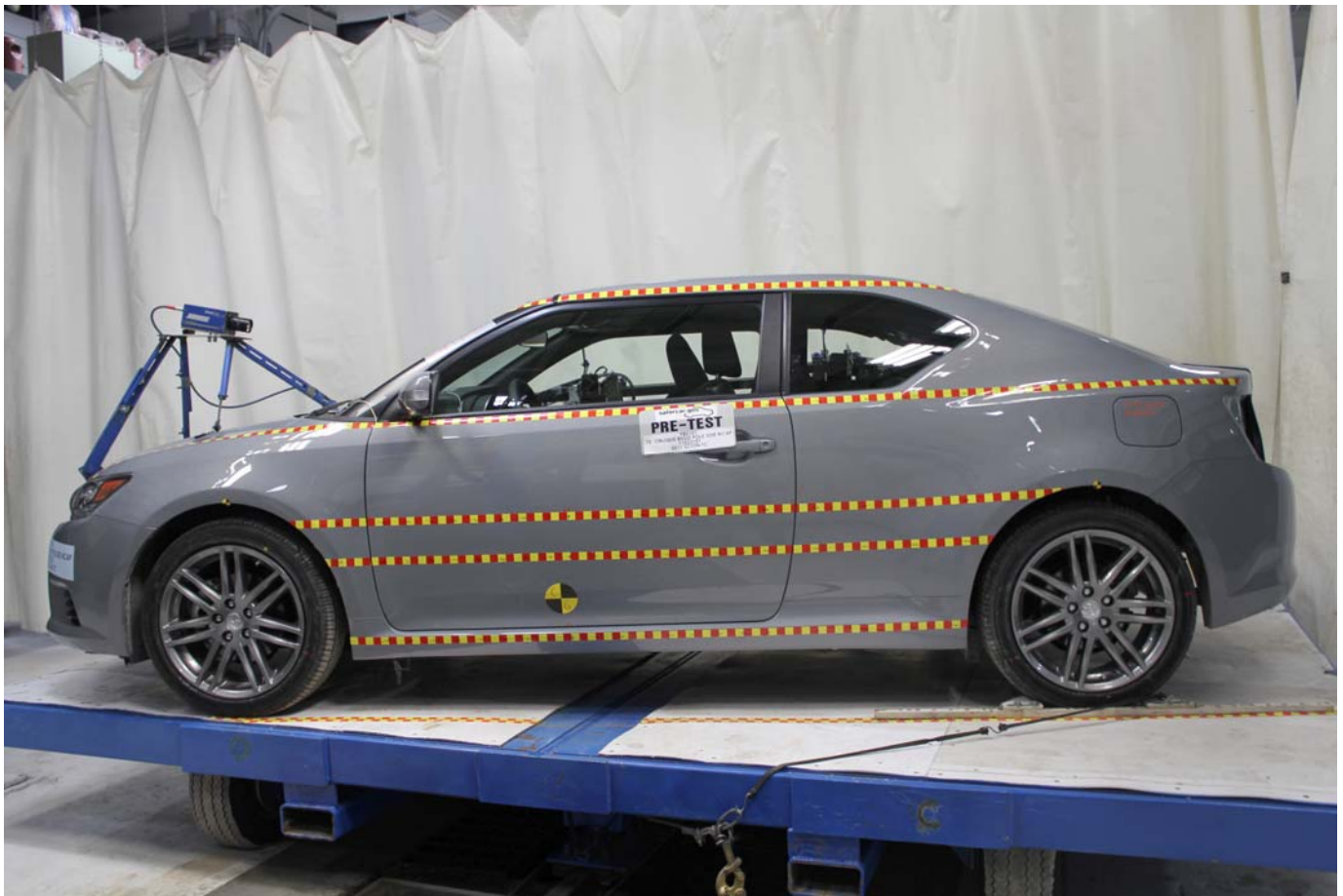
Post-Test Frontal View of Test Vehicle



Pre-Test Left Front $\frac{3}{4}$ View of Test Vehicle



Post-Test Left Front $\frac{3}{4}$ View of Test Vehicle



Pre-Test Left Side View of Test Vehicle



Post-Test Left Side View of Test Vehicle



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



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



Pre-Test Rear View of Test Vehicle



Post-Test Rear View of Test Vehicle



Pre-Test Right Side View of Test Vehicle



Post-Test Right Side View of Test Vehicle



Pre-Test Overhead View of Test Vehicle and Pole



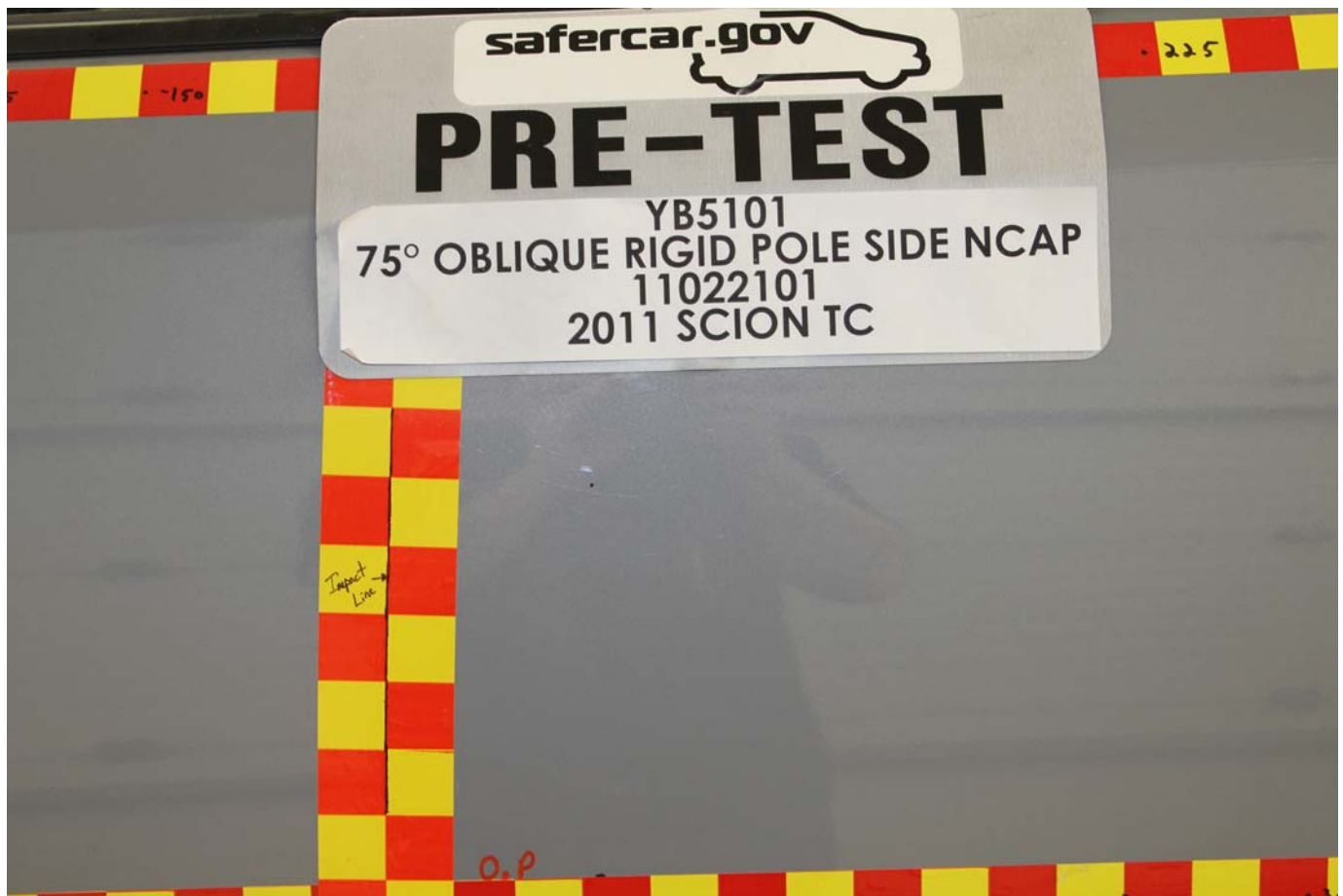
Post-Test Overhead View of Test Vehicle and Pole



Pre-Test Left Side View of Pole Positioned Against Side of Vehicle



Pre-Test Right Side View of Pole Positioned Against Side of Vehicle



Pre-Test Close-Up View of Impact Point Target



Post-Test Close-Up View of Impact Point Target Showing Impact Location



Pre-Test Front Close-Up View of Dummy (through front window)



Post-Test Front Close-Up View of Dummy (through front window)



Pre-Test Left Side View of Dummy Showing Belts, Chalking, and Contact Switches (Door Open)



Pre-Test Left Side View of Dummy Shoulder and Door Top View



Post-Test Left Side View of Dummy Shoulder and Door Top View



Pre-Test Frontal View of Seat Back Prior to Dummy Positioning



Pre-Test Frontal View of Dummy Head and Shoulders in Relation to Head Restraint



Pre-Test Frontal View of Seat Pan Prior to Dummy Positioning



Pre-Test Overhead View of Dummy Thighs on Seat Pan



Pre-Test View of Dummy's Neck Showing Position of Adjustable Neck Bracket



Pre-Test View of Dummy's Head Showing Dummy's Head is Level



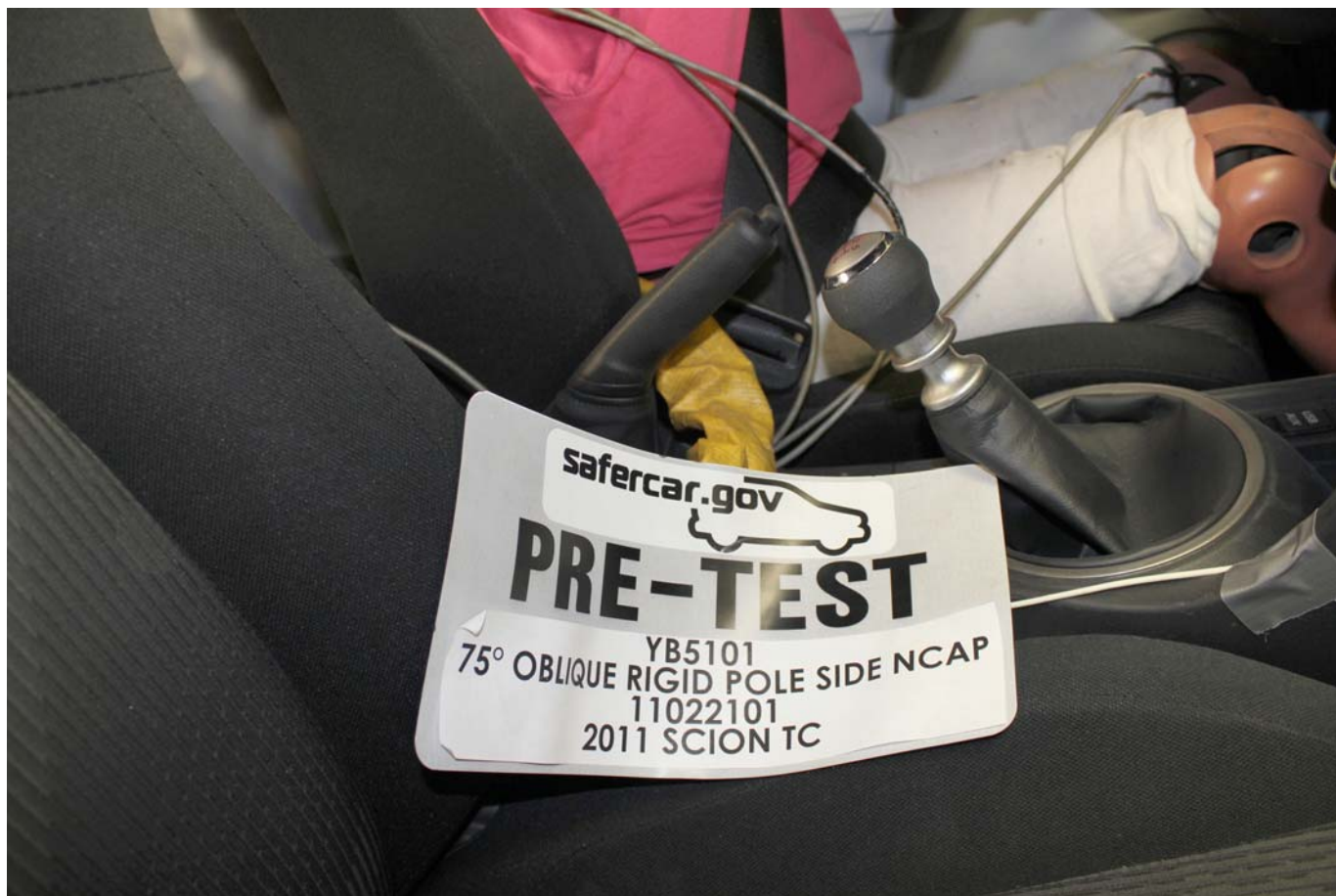
Pre-Test Placement of Dummy's Feet



Pre-Test View of Belt Anchorage for Dummy to Show Position



Pre-Test Left Side View of Steering Wheel to Show Position



Pre-Test View of Parking Brake



Pre-Test Close-Up Left Side View of Driver Seat Track Showing Test Position



Pre-Test Close-Up Left Side View of Driver Seat Back Showing Test Position



Pre-Test Close-Up View of Driver Seat Back or Head Restraint Showing Seat Back Test Position



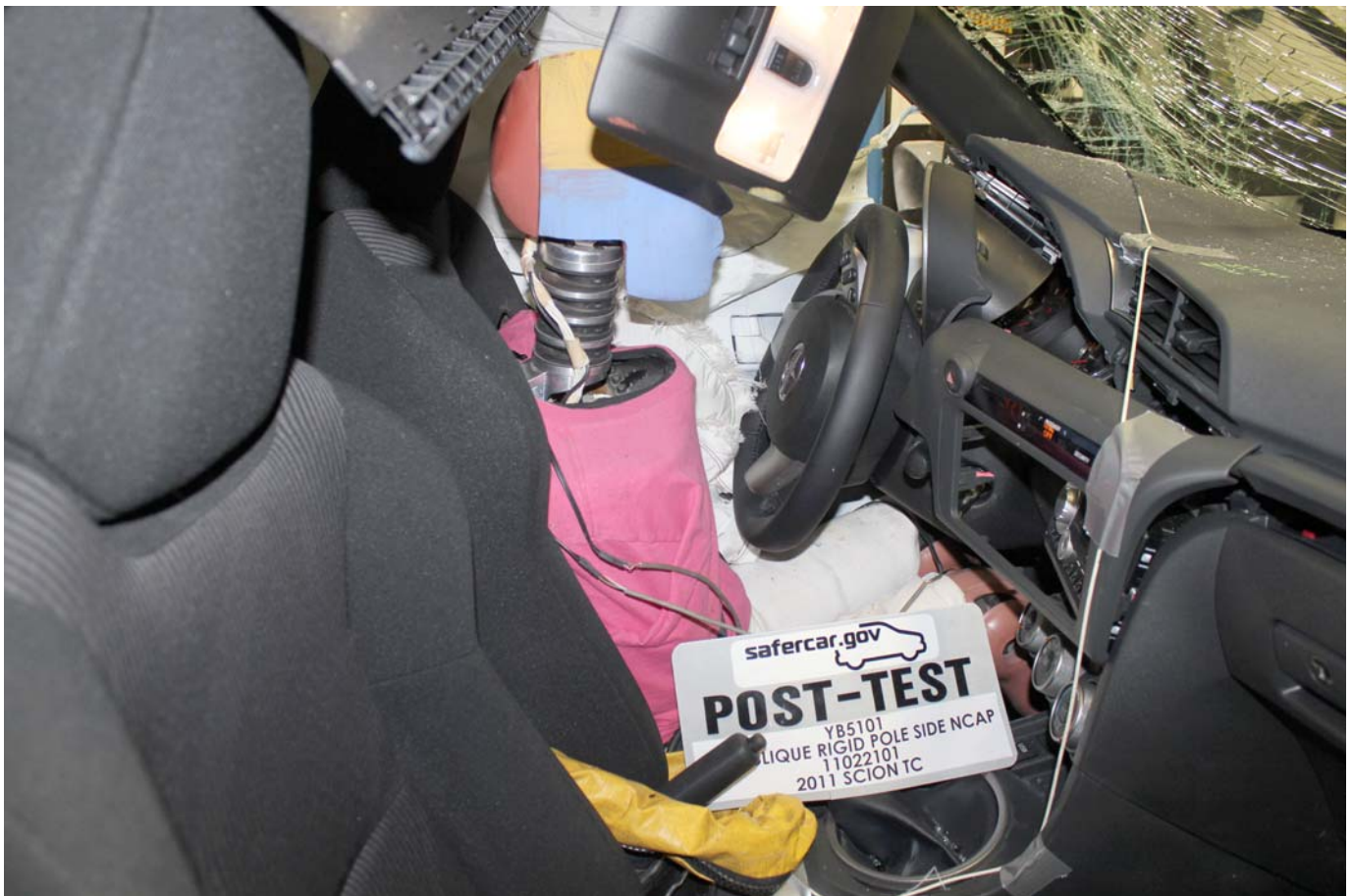
Pre-Test Dummy and Door Clearance View



Post-Test Dummy and Door Clearance View



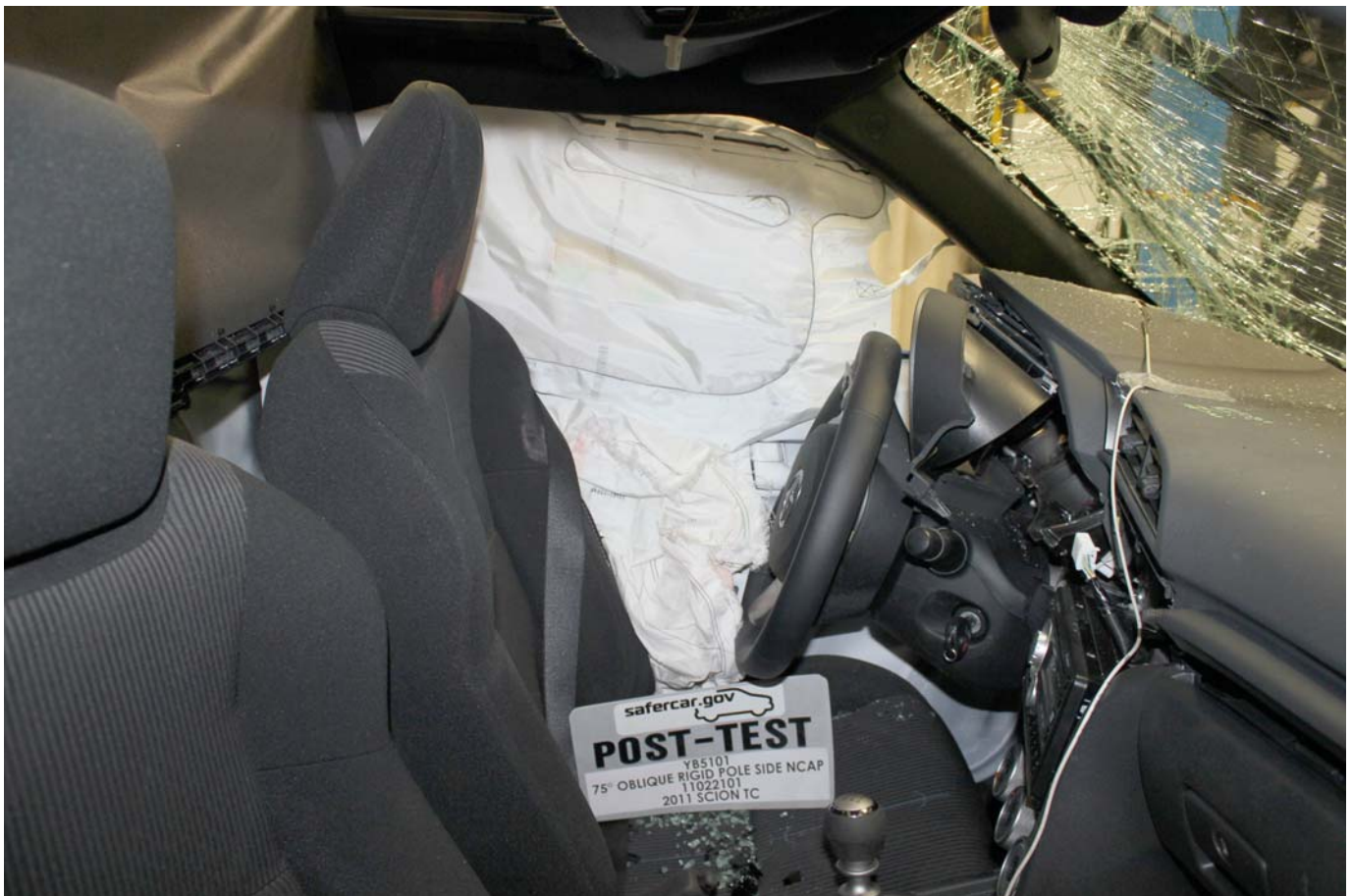
Pre-Test Right Side View of Dummy and Front Seat Occupant Compartment



Post-Test Right Side View of Dummy and Front Seat Occupant Compartment



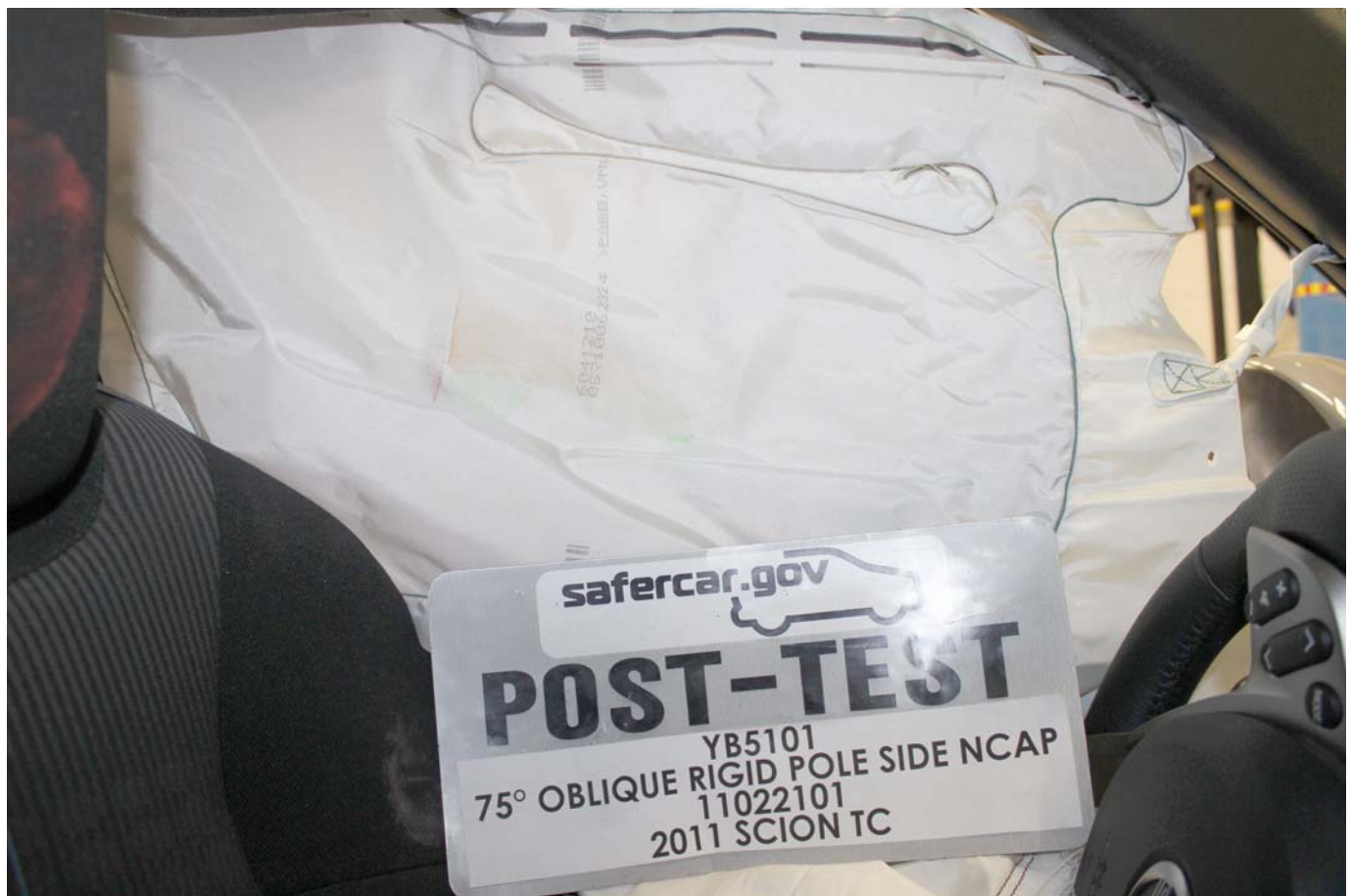
Pre-Test Inner Driver Door Panel View



Post-Test Inner Driver Door Panel View Showing Dummy Contact Location



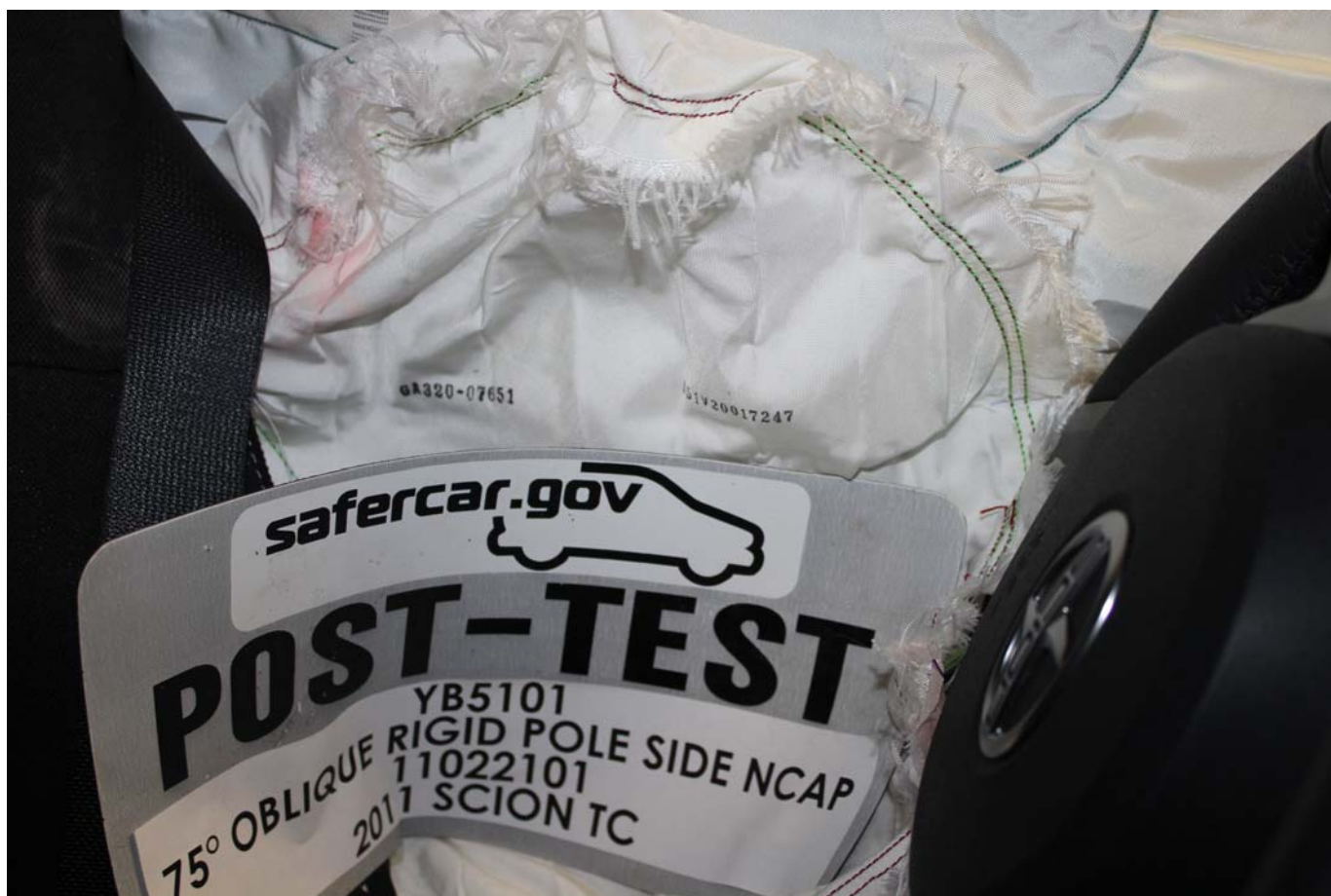
Post-Test Dummy Close-Up Head Contact with Vehicle Interior View



Post-Test Dummy Close-Up Head Contact with Side Airbag View



Post-Test Dummy Close-Up Torso Contact with Vehicle Interior View



Post-Test Dummy Close-Up Torso Contact with Side Airbag View

PHOTOGRAPH NOT APPLICABLE

Post-Test Dummy Close-Up Pelvis Contact with Vehicle Interior View



Post-Test Dummy Close-Up Pelvis Contact with Side Airbag View



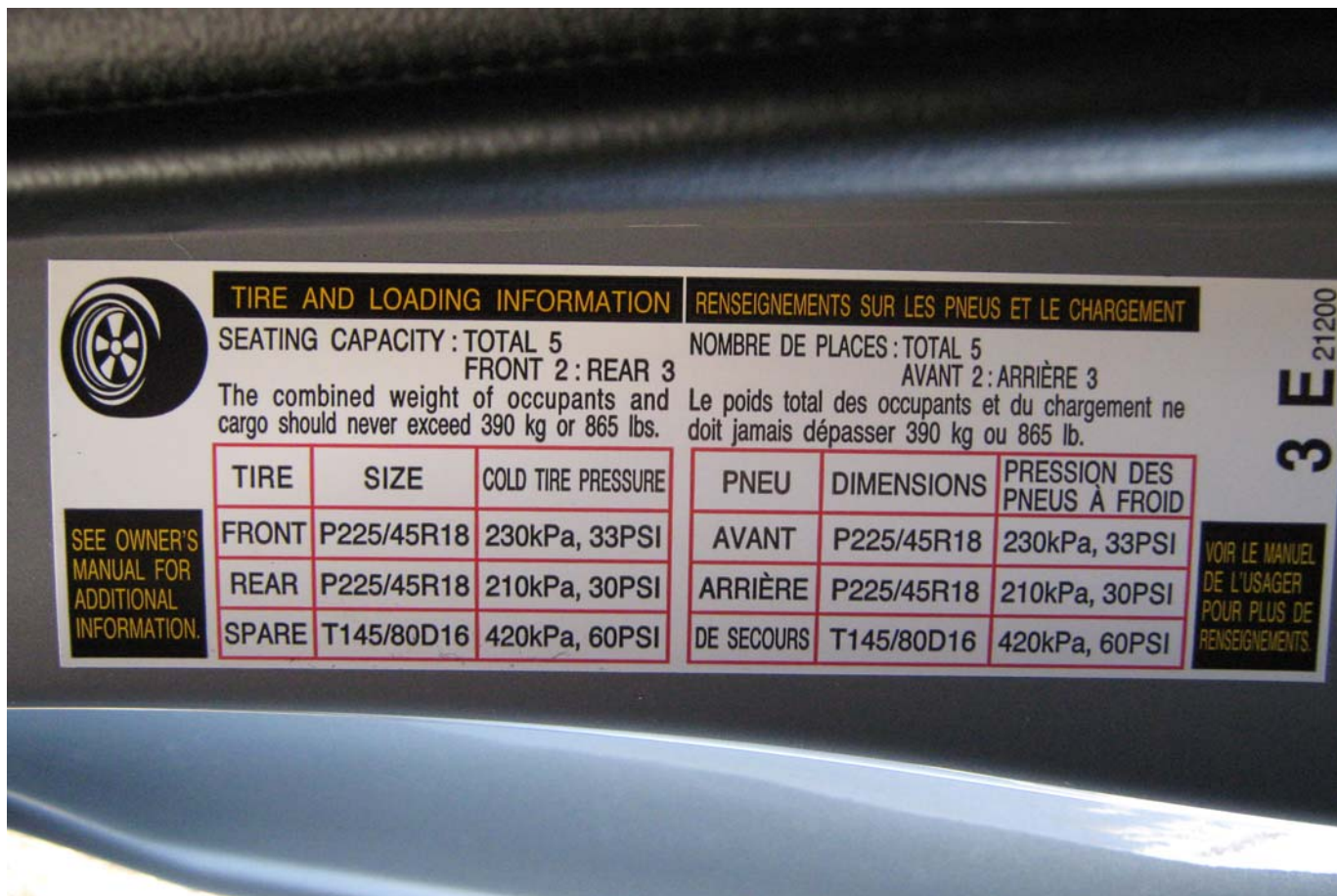
Pre-Test View of Fuel Filler Cap or Fuel Filler Neck



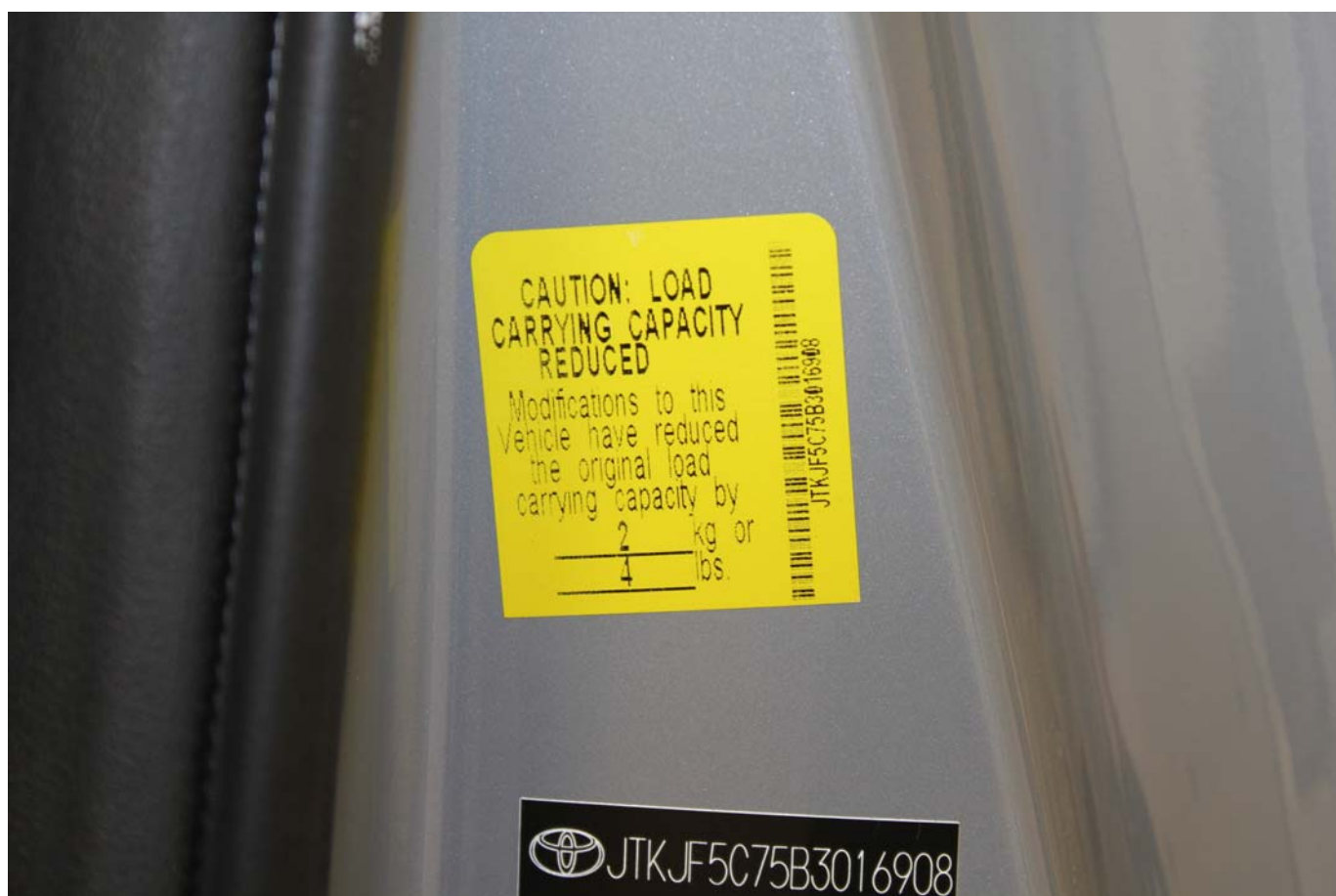
Post-Test View of Fuel Filler Cap or Fuel Filler Neck



Close-Up View of Vehicle's Certification Label



Close-Up View of Vehicle's Tire Information Placard or Label



Close-Up View of Vehicle's Load Carrying Capacity Reduced



Pre-Test Pole Barrier Front View



Post-Test Pole Barrier Front View



Pre-Test Pole Barrier Side View



Post-Test Pole Barrier Side View



Pre-Test Ballast View



Post-Test Primary and Redundant Speed Trap Read-Out



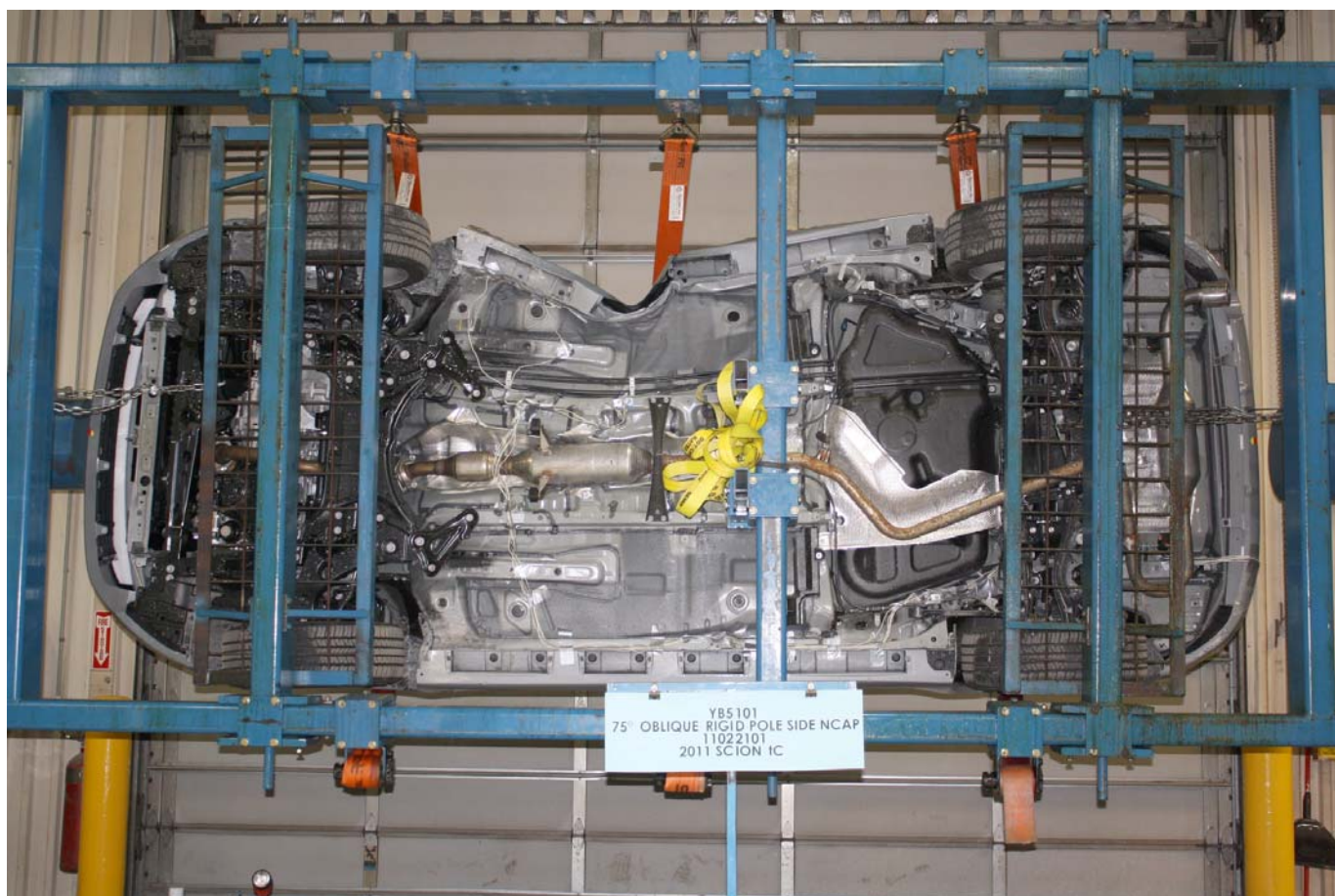
FMVSS No. 301/305 Rollover 0 Degrees



FMVSS No. 301/305 Rollover 90 Degrees



FMVSS No. 301/305 Rollover 180 Degrees



FMVSS No. 301/305 Rollover 270 Degrees



FMVSS No. 301/305 Rollover 360 Degrees



Impact Event

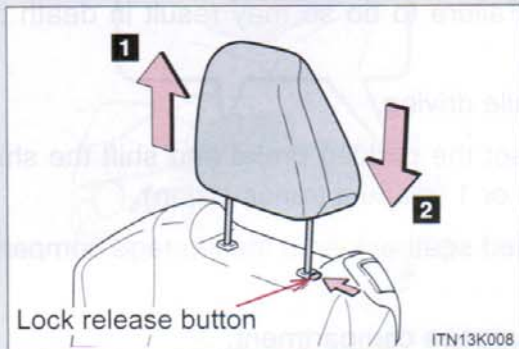


1-3. Adjustable components (seats, mirrors, steering wheel)

Head restraints

Head restraints are provided for all seats.

Front seats



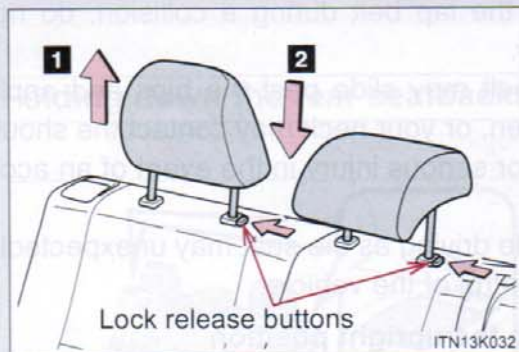
1 Up

Pull the head restraints up.

2 Down

Push the head restraint down while pressing the lock release button.

Rear seats



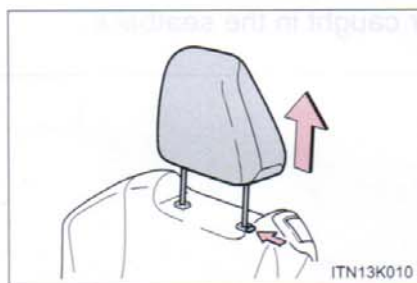
1 Up

Pull the head restraints up.

2 Down

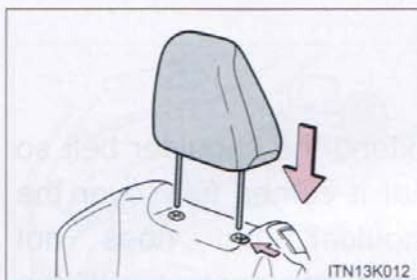
Push the head restraint down while pressing the lock release button.

■ Removing the head restraints



Pull the head restraint up while pressing the lock release button.

■ Installing the head restraints



Align the head restraint with the installation holes and push it down to the lock position.

Press and hold the lock release button when lowering the head restraint.

■ Adjusting the height of the head restraints



Make sure that the head restraints are adjusted so that the center of the head restraint is closest to the top of your ears.

■ Adjusting the rear center seat head restraint

Always raise the head restraint one level from the stowed position when using.

⚠ CAUTION

■ Head restraint precautions

Observe the following precautions regarding the head restraints. Failure to do so may result in death or serious injury.

- Use the head restraints designed for each respective seat.
- Adjust the head restraints to the correct position at all times.
- After adjusting the head restraints, push down on them and make sure they are locked in position.
- Do not drive with the head restraints removed.

APPENDIX B
DUMMY RESPONSE DATA

TABLE OF DATA PLOTS

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Figure No. 2.	Driver Head Acceleration (Y) Primary vs. Time	B-1
Figure No. 3.	Driver Head Acceleration (Z) Primary vs. Time	B-1
Figure No. 4.	Driver Head Resultant Primary Acceleration vs. Time	B-1
Figure No. 5.	Driver Lower Spine T12 Acceleration (X) vs. Time	B-2
Figure No. 6.	Driver Lower Spine T12 Acceleration (Y) vs. Time	B-2
Figure No. 7.	Driver Lower Spine T12 Acceleration (Z) vs. Time	B-2
Figure No. 8.	Driver Lower Spine T12 Resultant Acceleration vs. Time	B-2
Figure No. 9.	Driver Iliac Wing Force on Impact Side (Y) vs. Time	B-3
Figure No. 10.	Driver Acetabulum Force on Impact Side (Y) vs. Time	B-3
Figure No. 11.	Driver Total Pelvis Force on Impact Side (Y) vs. Time	B-3

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 Acceleration (X) Redundant

Driver Head Acceleration (Y) Redundant

Driver Head Acceleration (Z) Redundant

Driver Upper Thorax Rib Deflection (Y)

Driver Middle Thorax Rib Deflection (Y)

Driver Lower Thorax Rib Deflection (Y)

Driver Upper Abdomen Rib Deflection (Y)

Driver Lower Abdomen Rib Deflection (Y)

Driver Shoulder Contact Switch

Driver Torso Contact Switch

Driver Pelvis Contact Switch

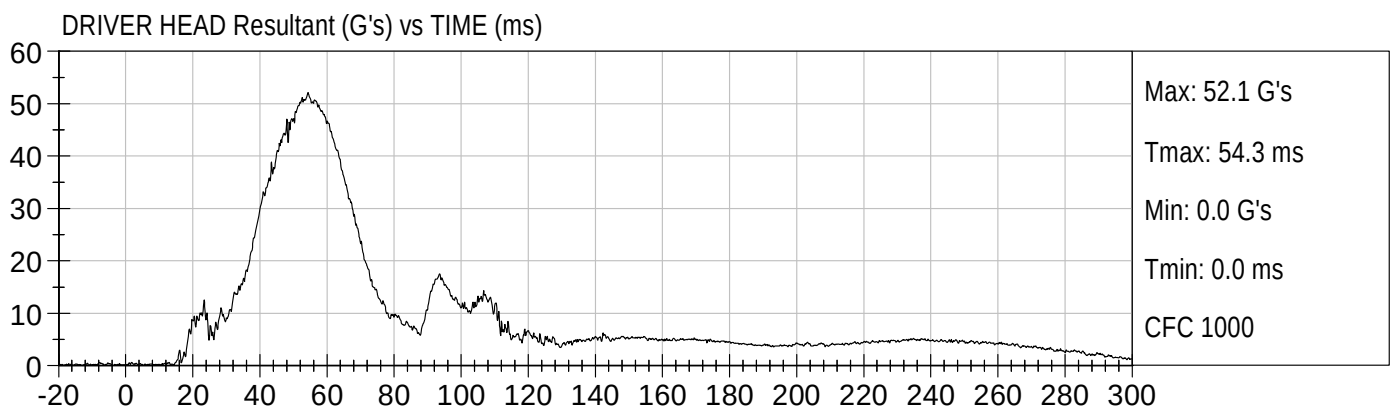
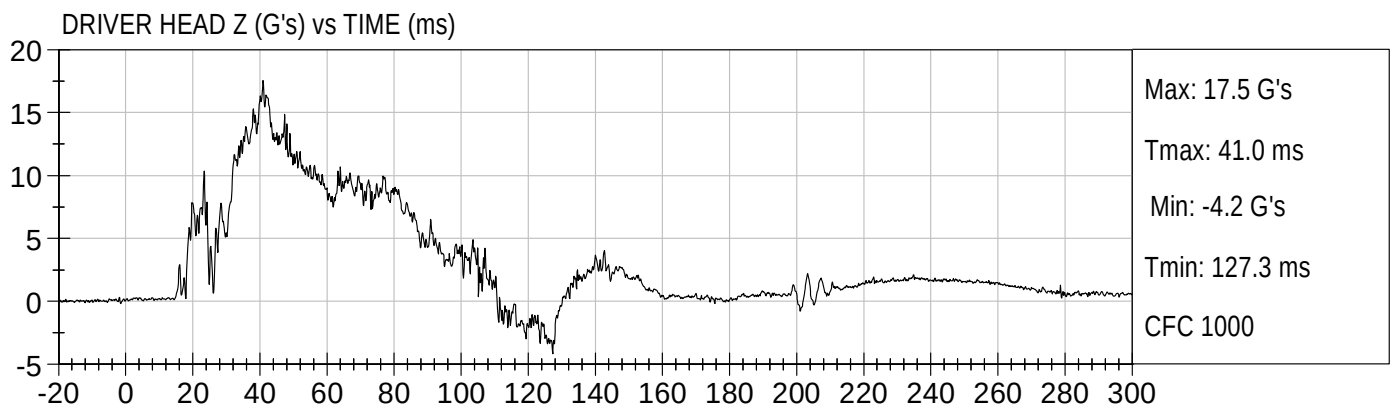
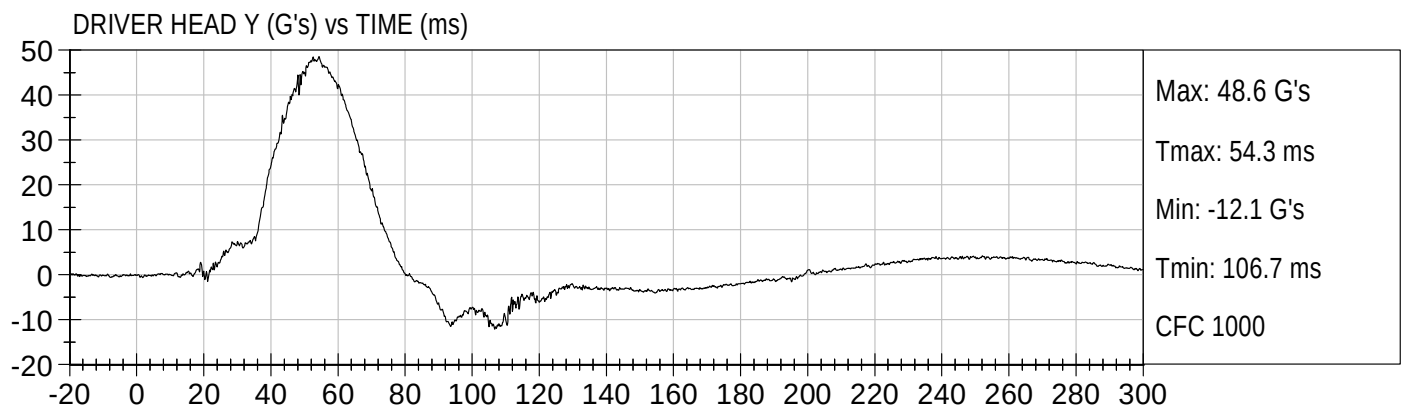
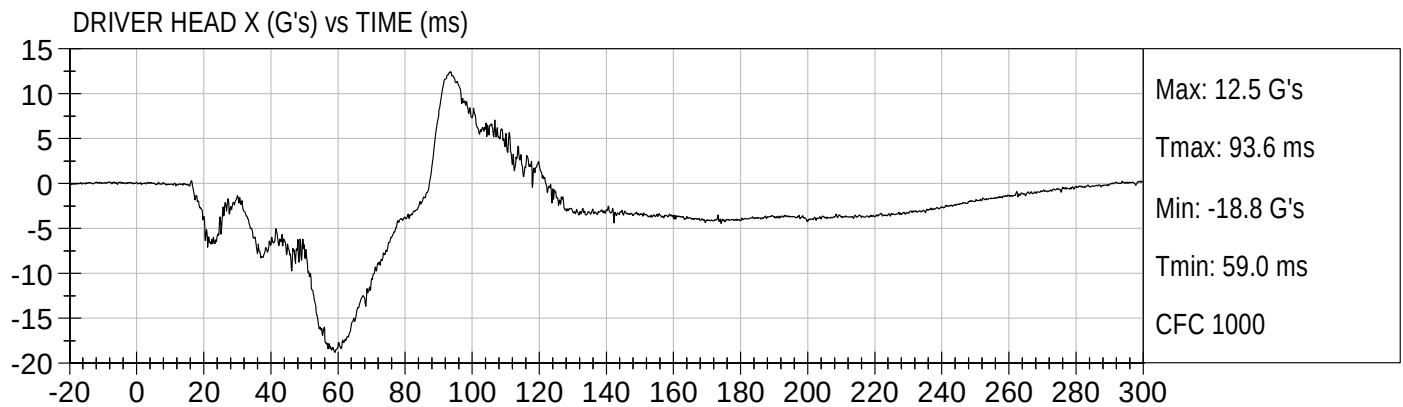
Vehicle CG Acceleration (X)

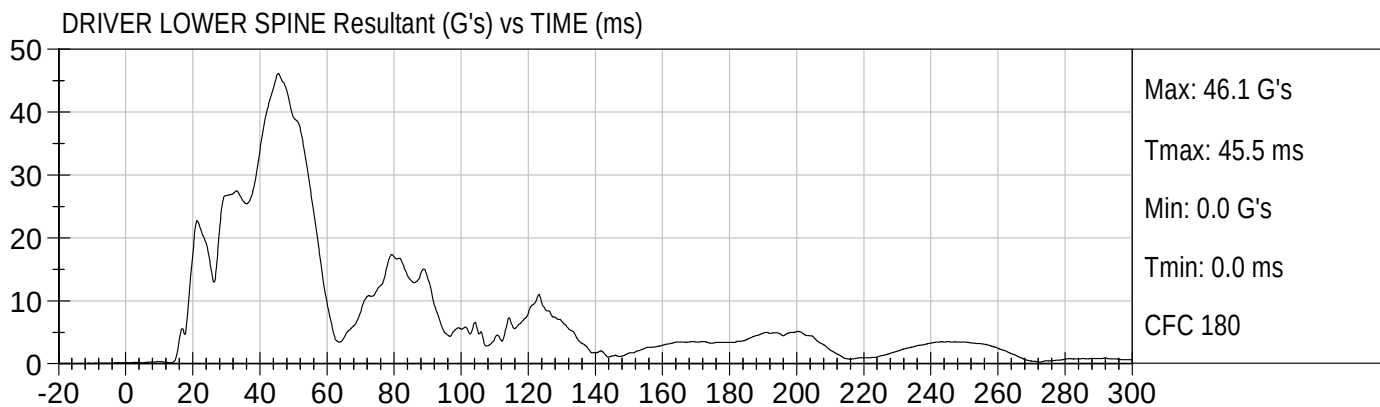
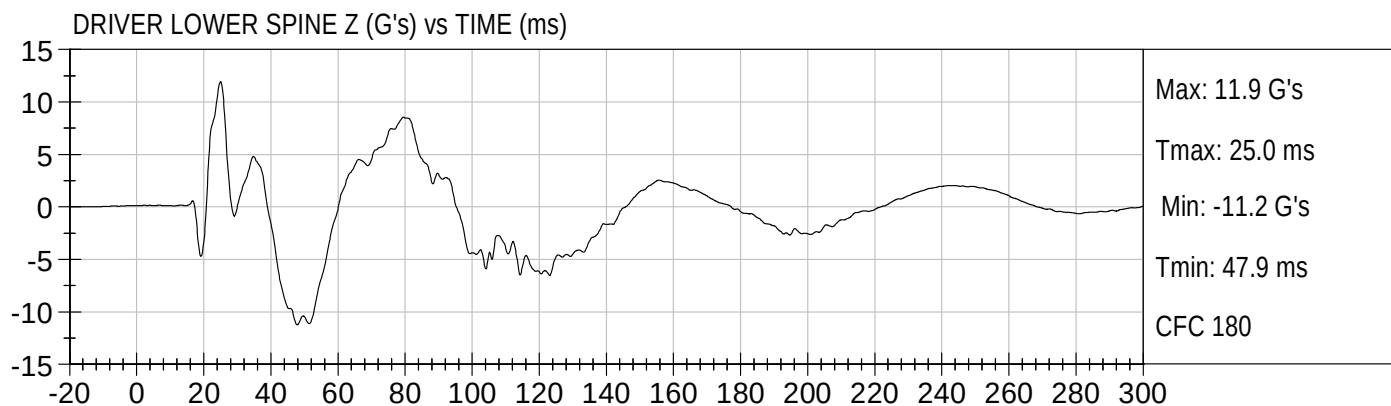
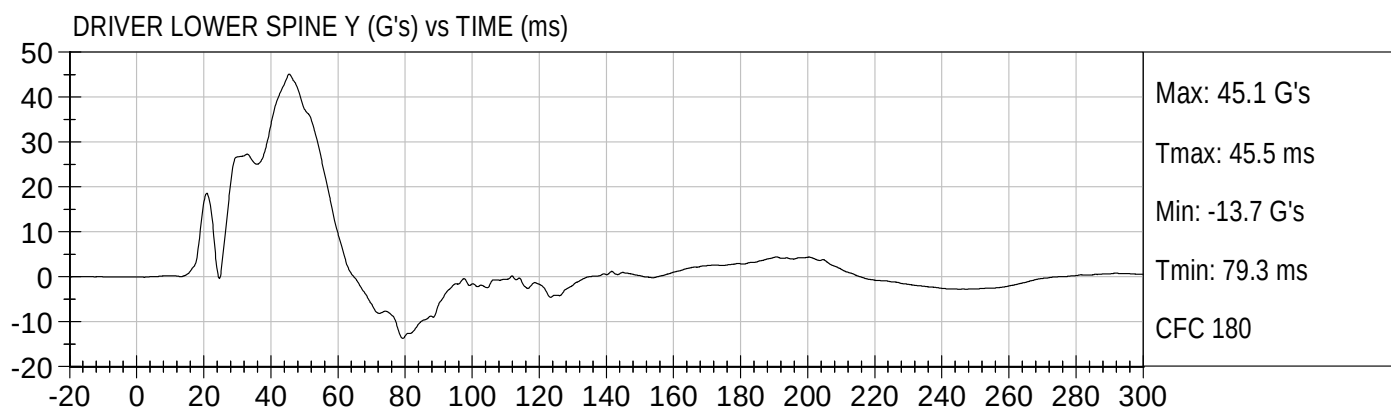
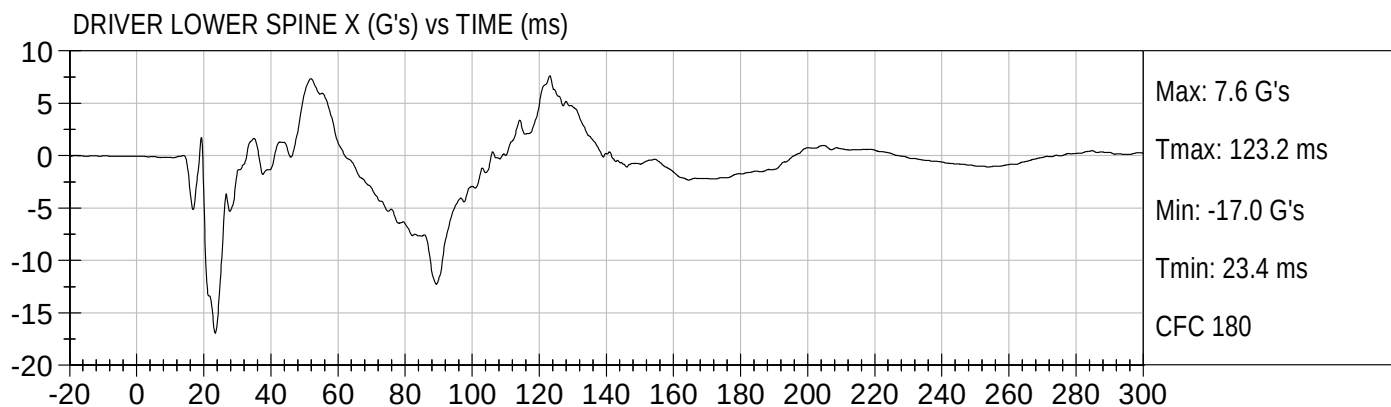
Vehicle CG Acceleration (Y)

Vehicle CG Acceleration (Z)

Vehicle CG Angular Rate About X (Roll)

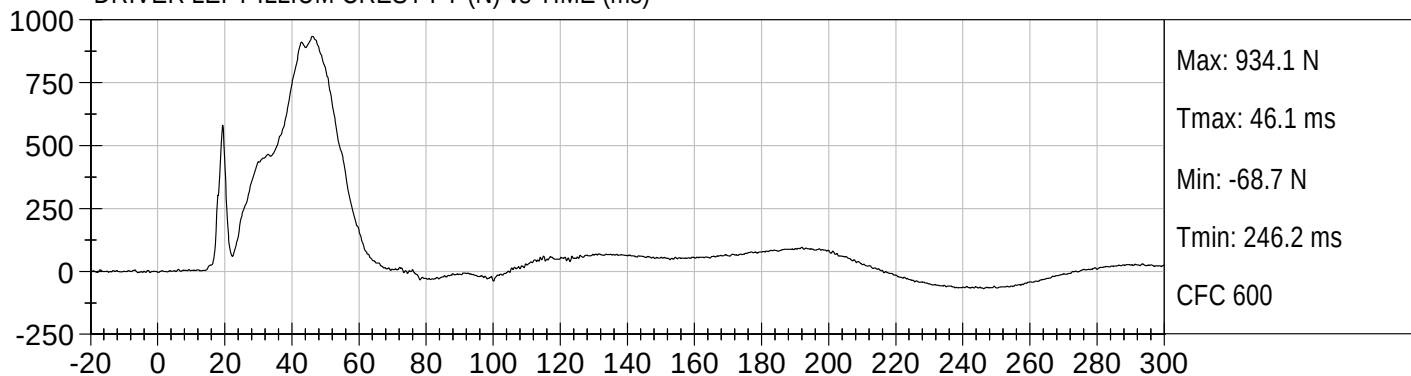
Vehicle CG Angular Rate About Y (Pitch)
Vehicle CG Angular Rate About Z (Yaw)
Left Floor Sill Acceleration (Y)
Left A-Pillar Sill Acceleration (Y)
Left Lower A-Pillar Acceleration (Y)
Left Mid A-Pillar Acceleration (Y)
Left B-Pillar Sill Acceleration (Y)
Left Lower B-Pillar Acceleration (Y)
Left Mid B-Pillar Acceleration (Y)
Driver Seat Track at Dummy H-Point Acceleration (Y)
Engine Top Acceleration (X)
Engine Top Acceleration (Y)
Firewall Center Acceleration (Y)
Right Roof at Vertical Impact Reference Line Acceleration (Y)
Right Sill at Vertical Impact Reference Line Acceleration (Y)
Rear Floorpan Behind Rear Axle at Centerline Acceleration (X)
Rear Floorpan Behind Rear Axle at Centerline Acceleration (Y)
Driver Side Airbag Timing
Driver Side Curtain Airbag Timing – Not Installed
Load Cell Pole Barrier #1 Force (Y) – Not used
Load Cell Pole Barrier #2 Force (Y) – Not used
Load Cell Pole Barrier #3 Force (Y) – Not used
Load Cell Pole Barrier #4 Force (Y) – Not used
Load Cell Pole Barrier #5 Force (Y) – Not used
Load Cell Pole Barrier #6 Force (Y) – Not used
Load Cell Pole Barrier #7 Force (Y) – Not used
Load Cell Pole Barrier #8 Force (Y) – Not used



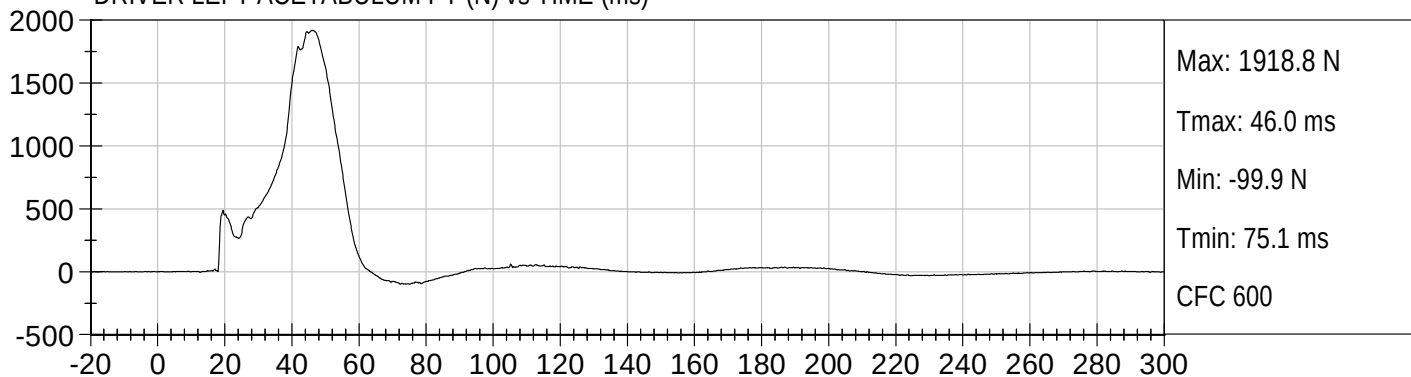




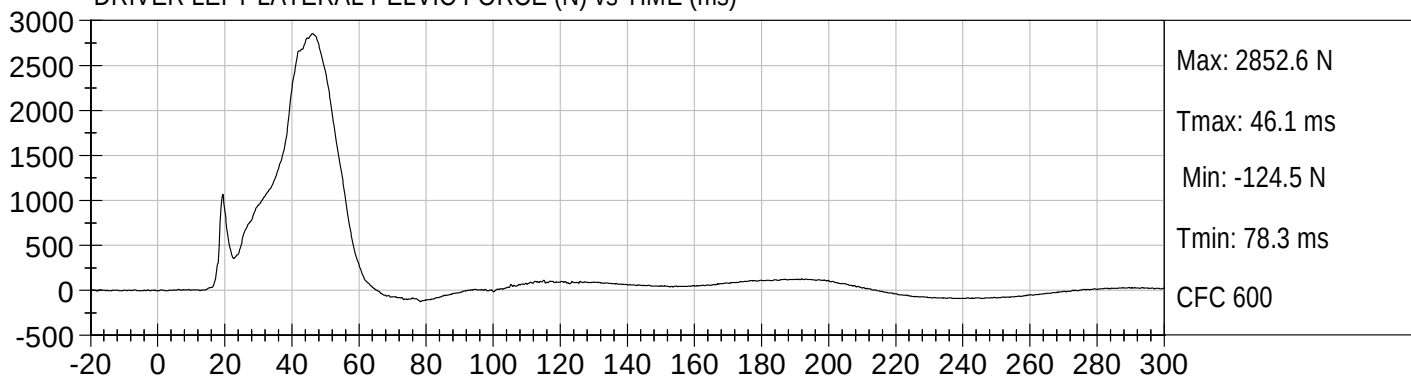
DRIVER LEFT ILLIUM CREST FY (N) vs TIME (ms)



DRIVER LEFT ACETABULUM FY (N) vs TIME (ms)



DRIVER LEFT LATERAL PELVIC FORCE (N) vs TIME (ms)



APPENDIX C

DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

MGA RESEARCH CORPORATION
HEAD DROP TEST
SID-Its BUILD LEVEL D DUMMY

ATD Serial No: 296

Test ID: D11521

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Peak Resultant Acceleration	G's	115 to 137	125	Pass
Peak Lateral Acceleration	G's	+/- 15	-3.4	Pass
Unimodal	N/A	<15%	Yes	Pass
Overall Test Results				Pass

Jessica Gall
Laboratory Technician

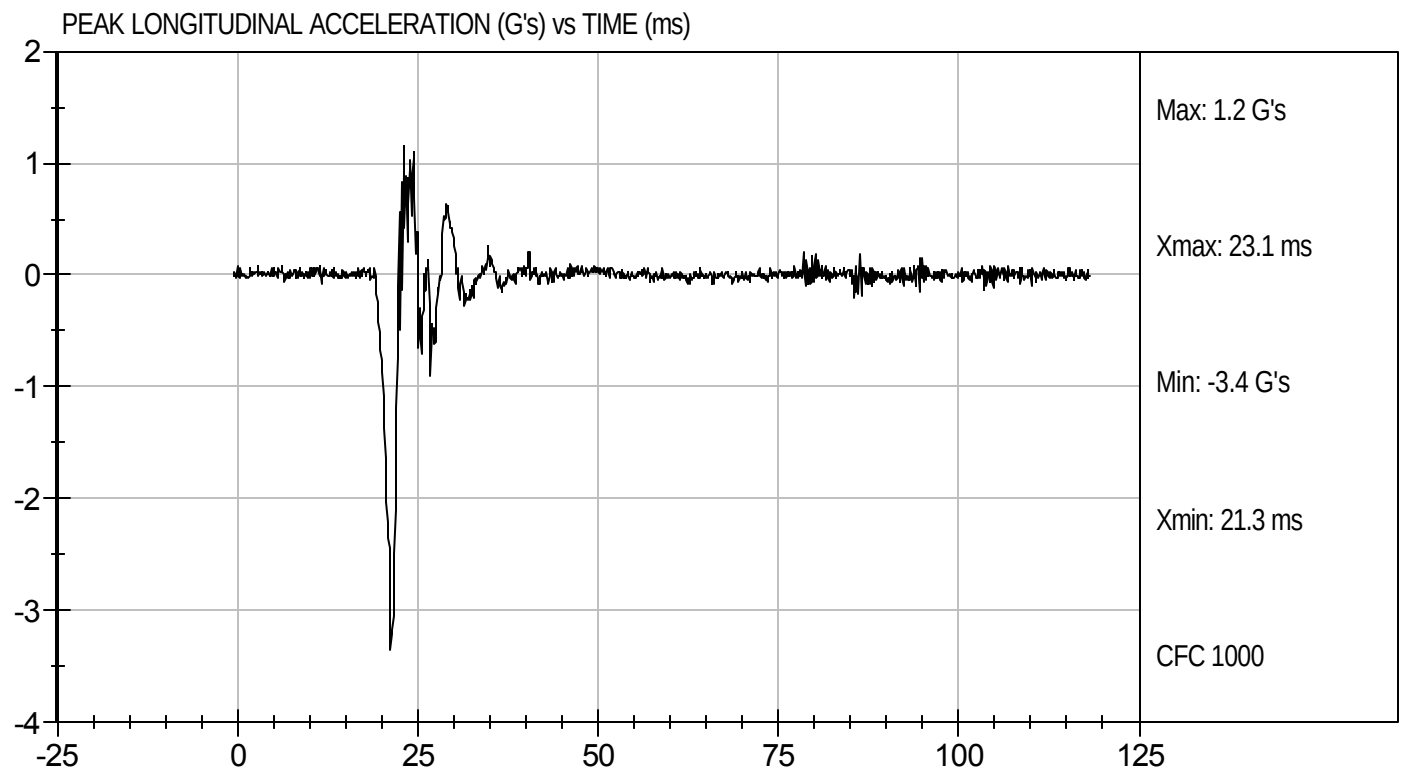
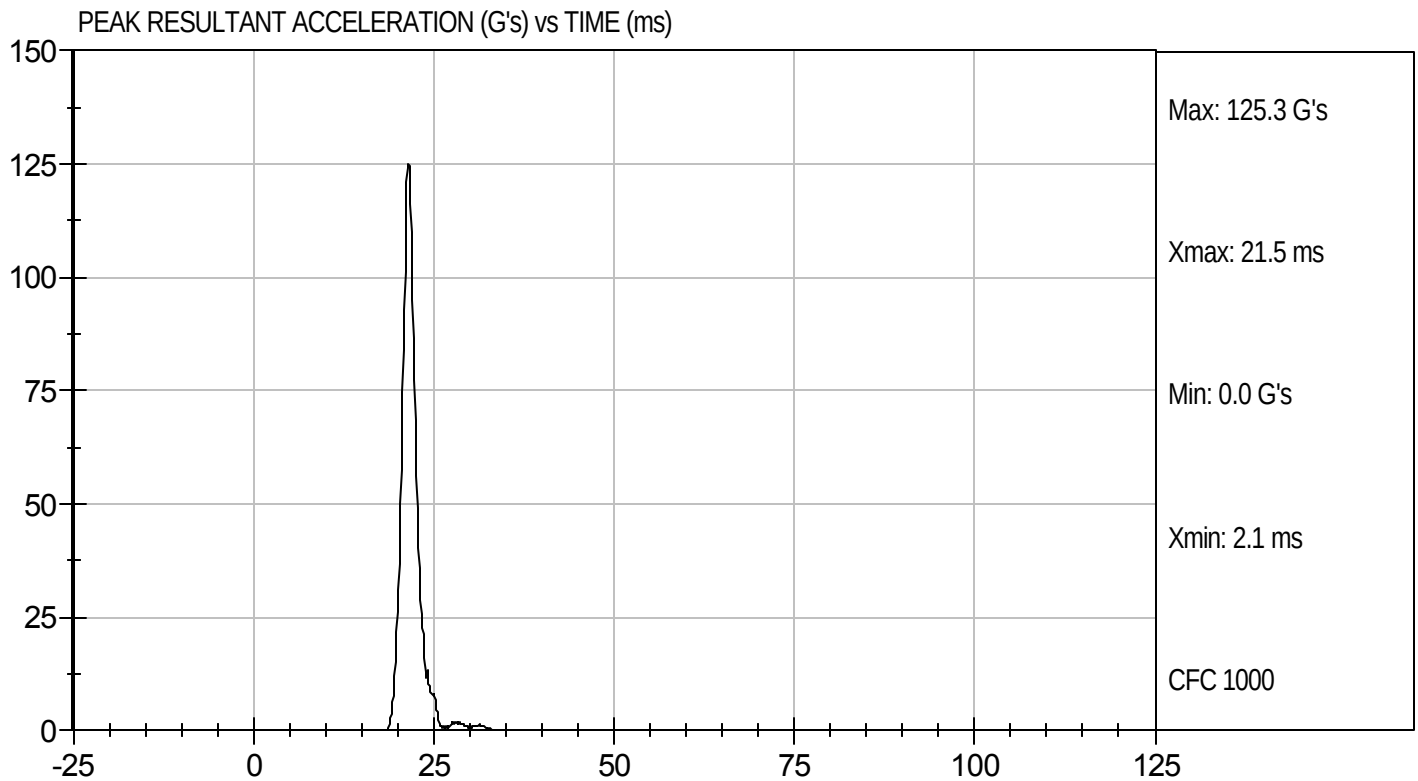
2/14/11
Test Date

David Winkelbauer
Approved By



Test Desc: Head Drop
Component ID: D11521

Test Date: 2/14/11
Velocity: 0 ft/s, 0 m/s

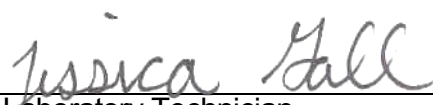


MGA RESEARCH CORPORATION
LATERAL NECK PENDULUM TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D11522

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	22.1	Pass
Humidity		%	10 to 70	23	Pass
Impact Velocity		m/s	5.51 to 5.63	5.58	Pass
Delta Velocity	10 ms	m/s	2.20 to 2.80	2.70	Pass
	15 ms	m/s	3.30 to 4.10	3.80	Pass
	20 ms	m/s	4.40 to 5.40	5.00	Pass
	25 ms	m/s	5.40 to 6.10	5.49	Pass
	25-100 ms	m/s	5.50 to 6.20	5.54	Pass
Maximum D-Plane Rotation		deg	71 to 81	72	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	61	Pass
Maximum Occipital Condyle Moment during Rotation Interval Nm			-44 to -36	-42	Pass
Time of Moment Decay to 0 Nm		ms	102 to 126	116	Pass
Overall Test Results				Pass	


 Laboratory Technician

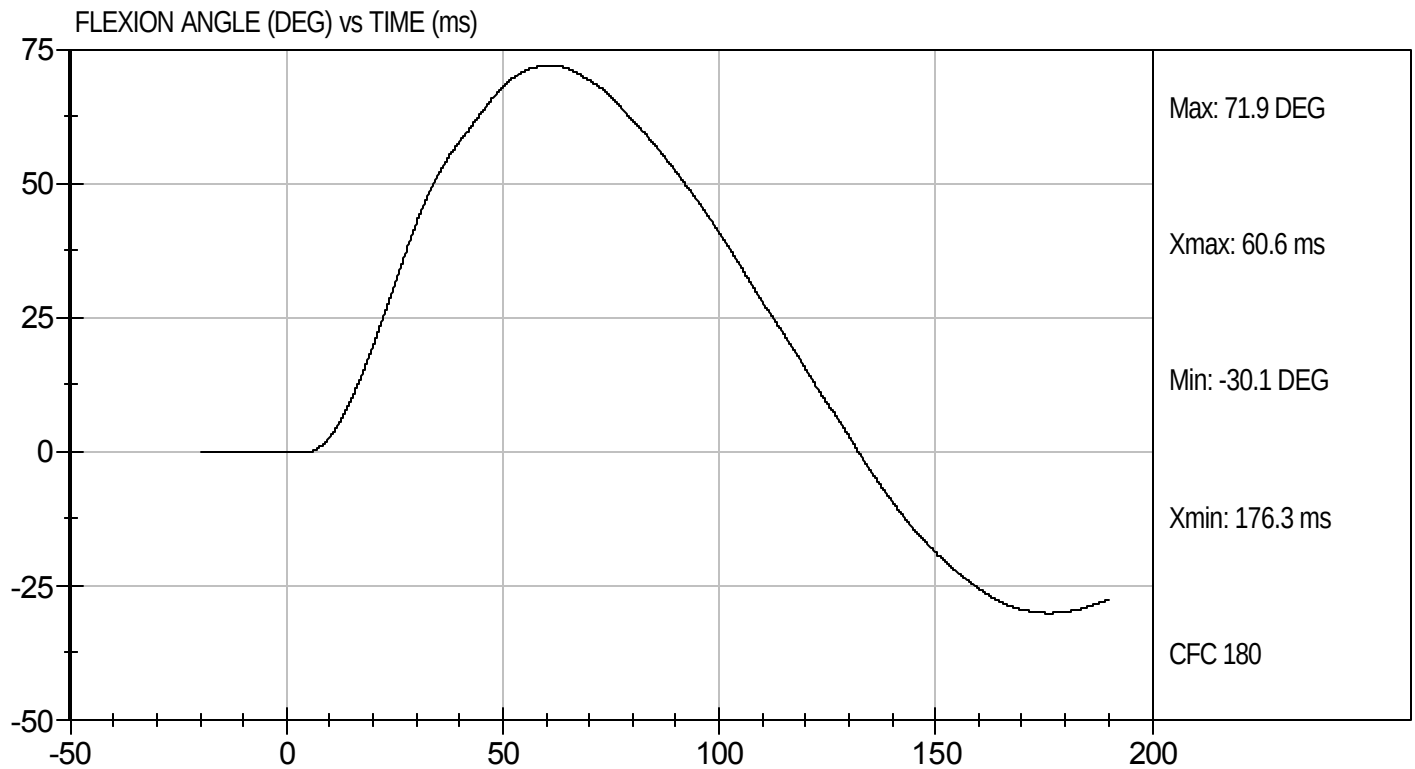
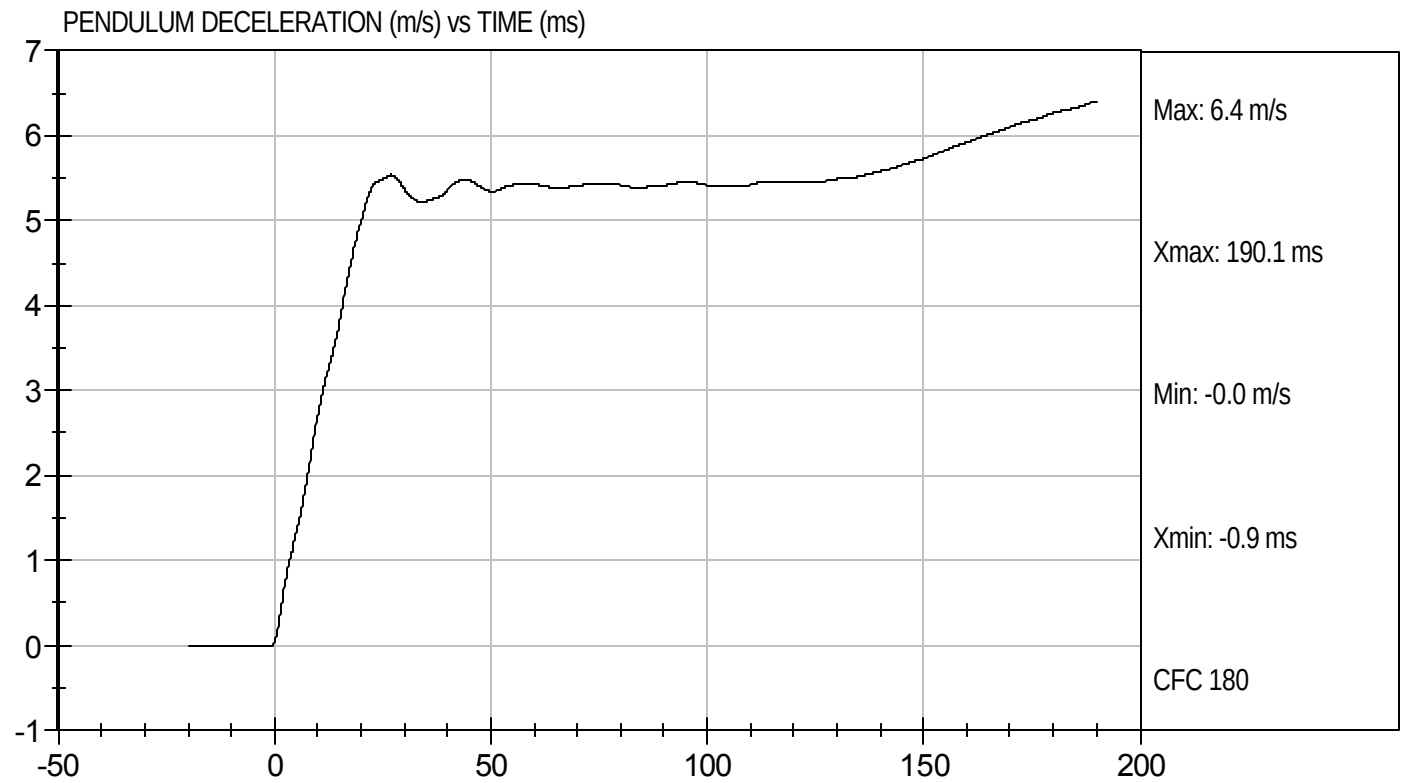
2/14/11
 Test Date


 Approved By



Test Desc: Neck Bending
Component ID: D11522

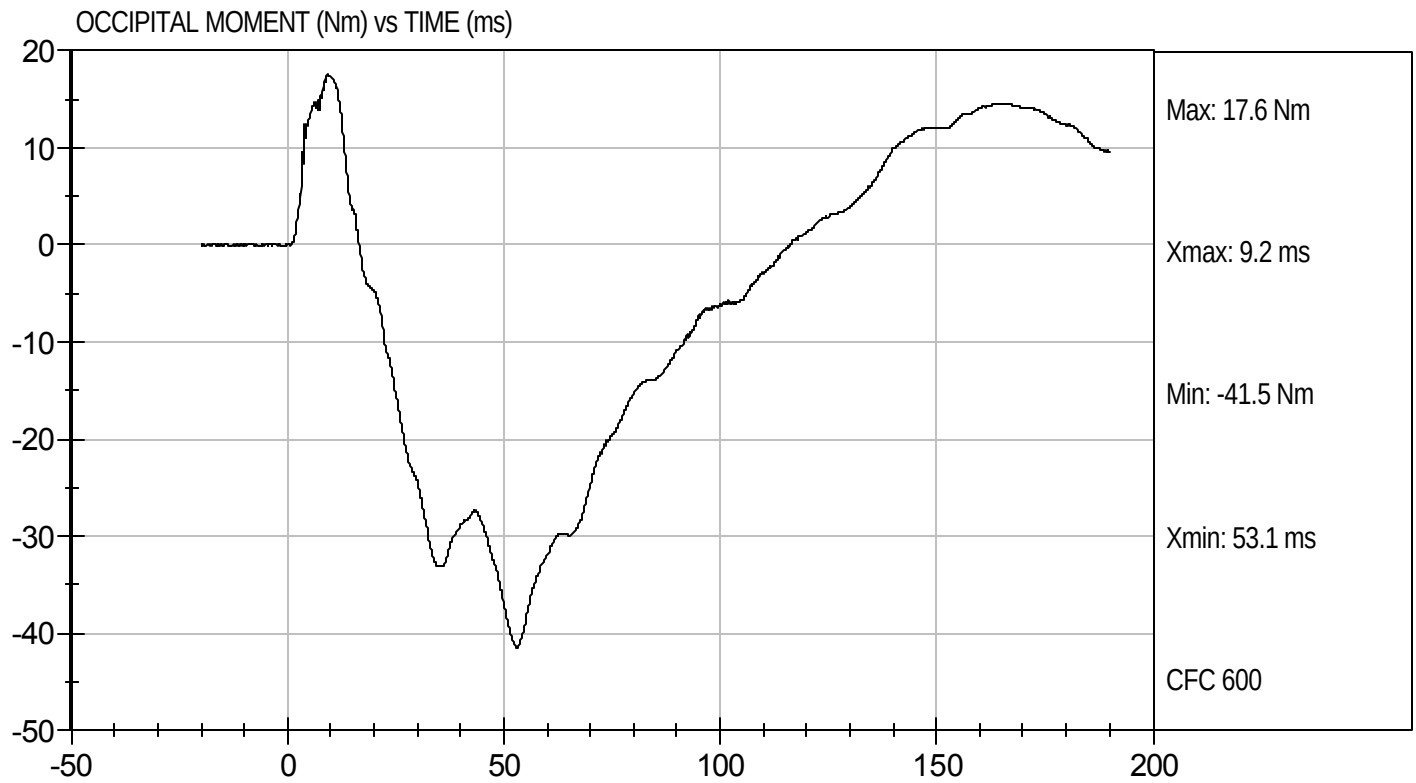
Test Date: 2/14/11
Velocity: 18.32 ft/s, 5.58 m/s





Test Desc: Neck Bending
Component ID: D11522

Test Date: 2/14/11
Velocity: 18.32 ft/s, 5.58 m/s

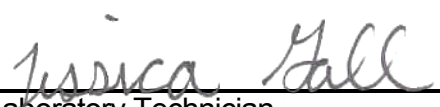


MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
SID-11s BUILD LEVEL D DUMMY

ATD Serial No: 296

Test ID: D11523

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	19	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Maximum Probe Acceleration	G's	13 to 18	15	Pass
Shoulder Displacement	mm	28 to 37	28	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	18	Pass
Overall Test Results			Pass	


Laboratory Technician

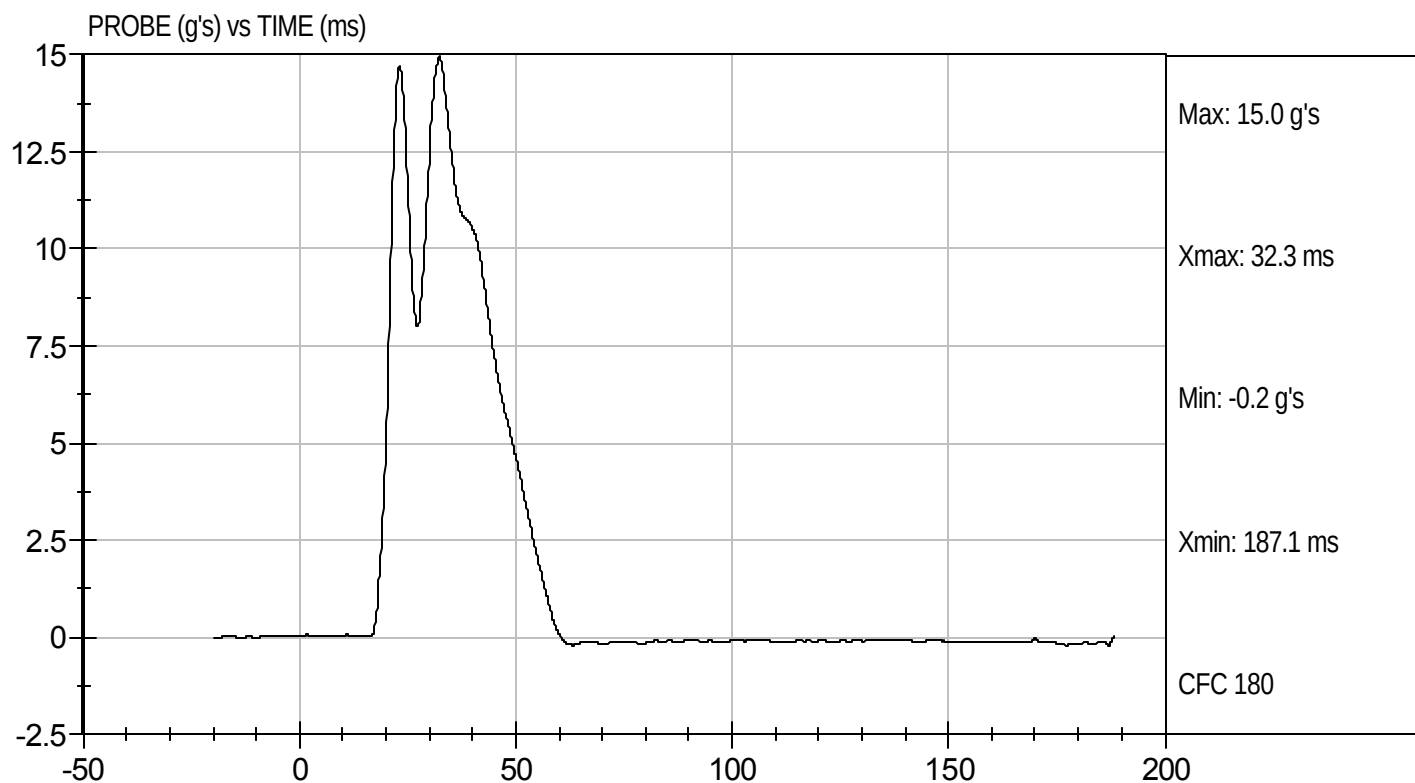
2/15/11
Test Date


Approved By



Test Desc: Shoulder Impact
Component ID: D11523

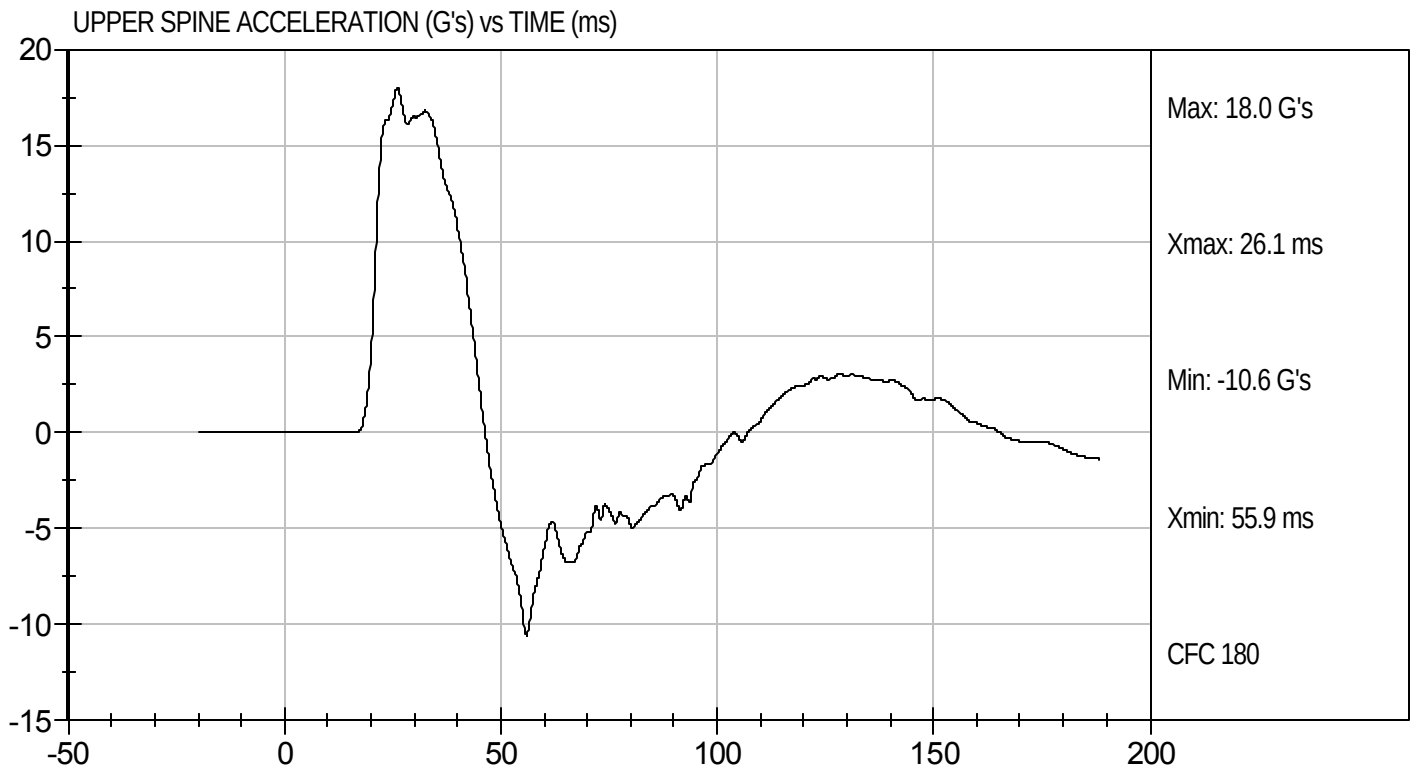
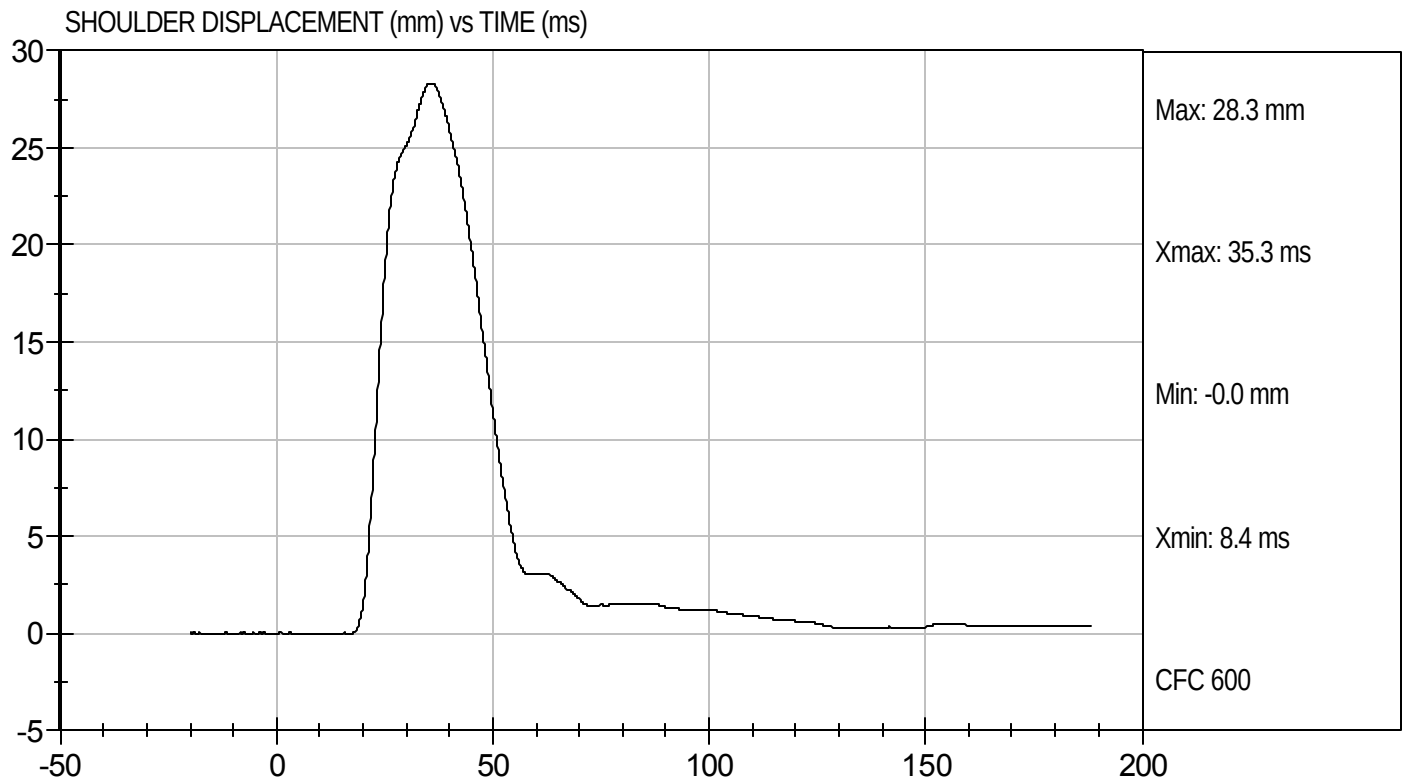
Test Date: 2/15/11
Velocity: 14.36 ft/s, 4.38 m/s





Test Desc: Shoulder Impact
Component ID: D11523

Test Date: 2/15/11
Velocity: 14.36 ft/s, 4.38 m/s

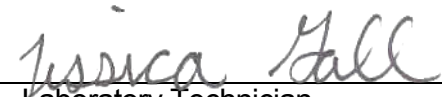


MGA RESEARCH CORPORATION
THORAX (WITH ARM) IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D11524

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.7	Pass
Humidity	%	10 to 70	19	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Peak Impactor Acceleration	G's	30 to 36	33	Pass
Shoulder Displacement	mm	31 to 40	35	Pass
Upper Rib Displacement	mm	25 to 32	30	Pass
Middle Rib Displacement	mm	30 to 36	31	Pass
Lower Rib Displacement	mm	32 to 38	33	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	39	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	34	Pass
Overall Test Results				Pass


Laboratory Technician

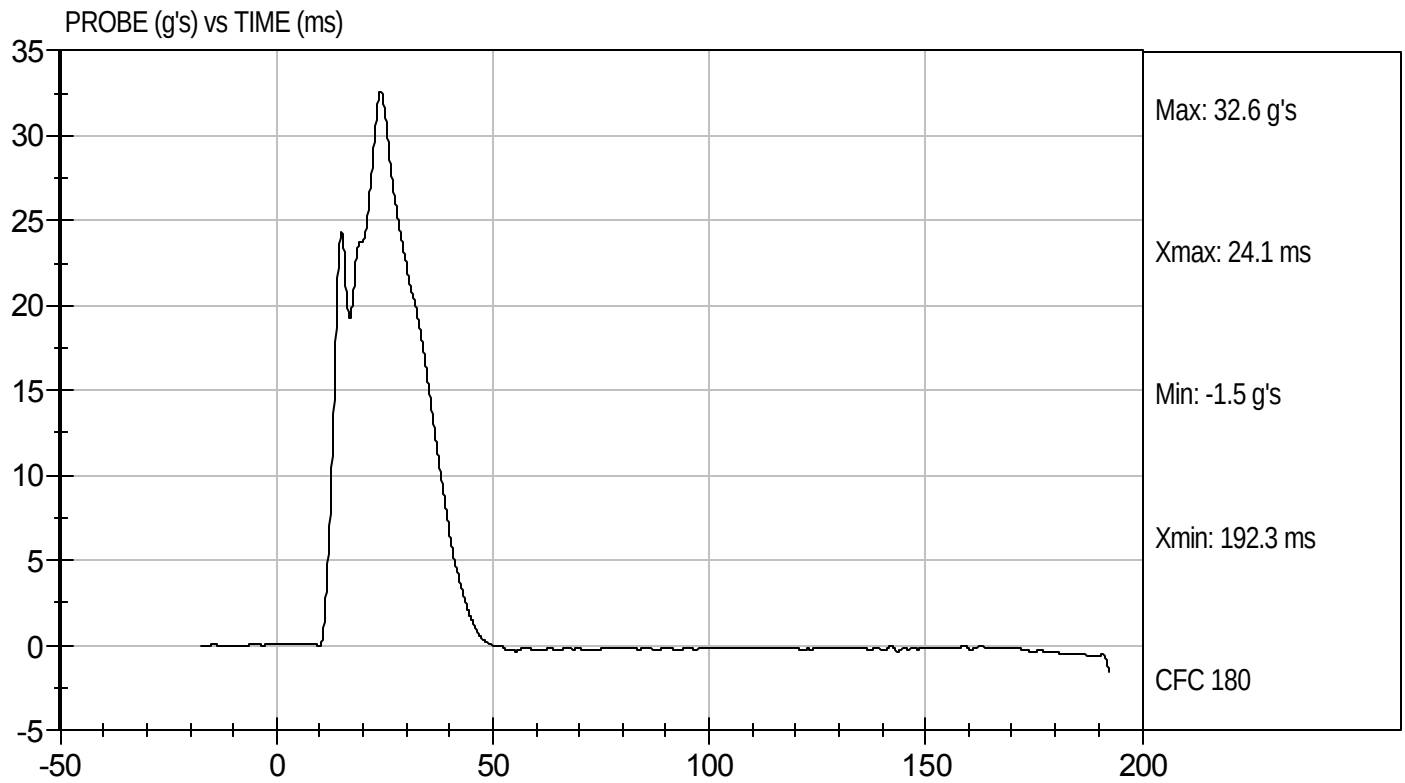
2/15/11
Test Date


Approved By



Test Desc: Thorax With Arm
Component ID: D11524

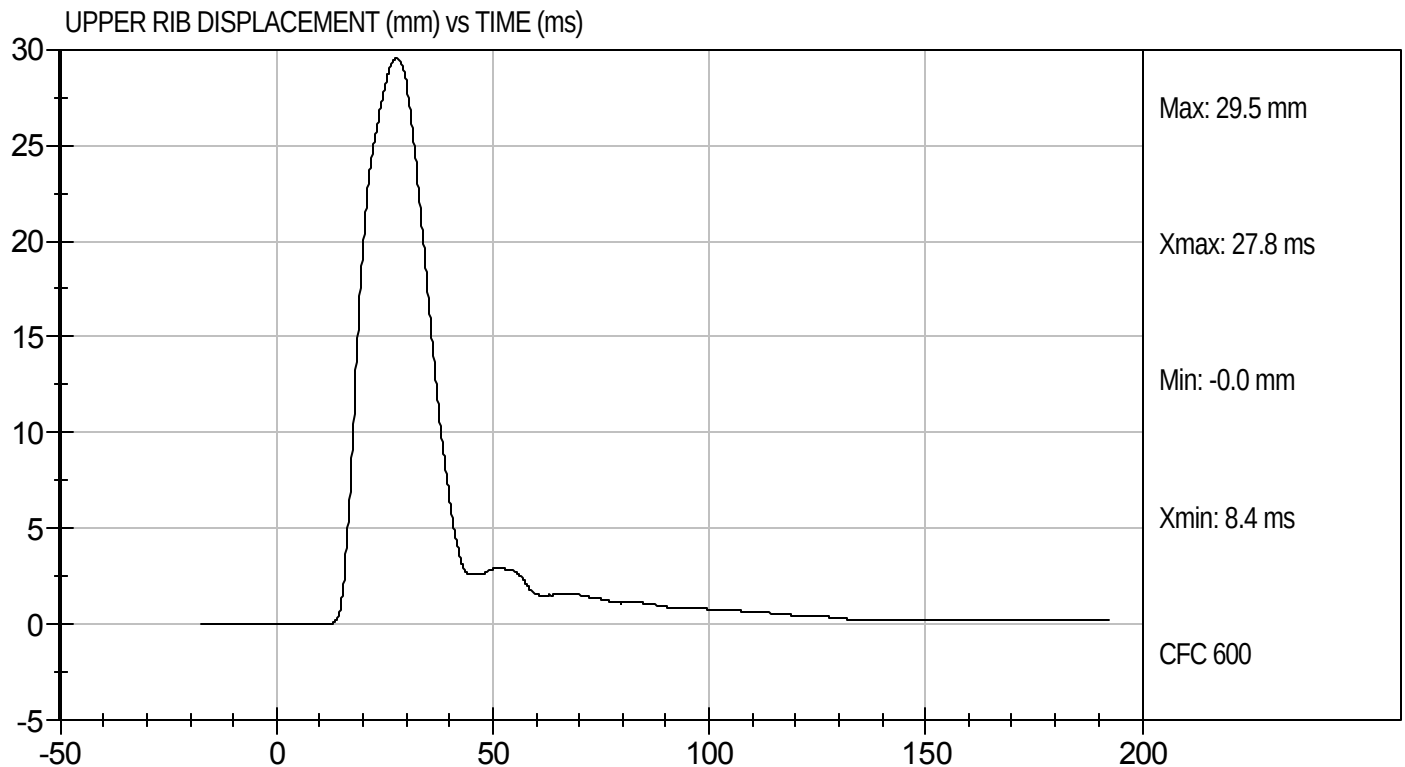
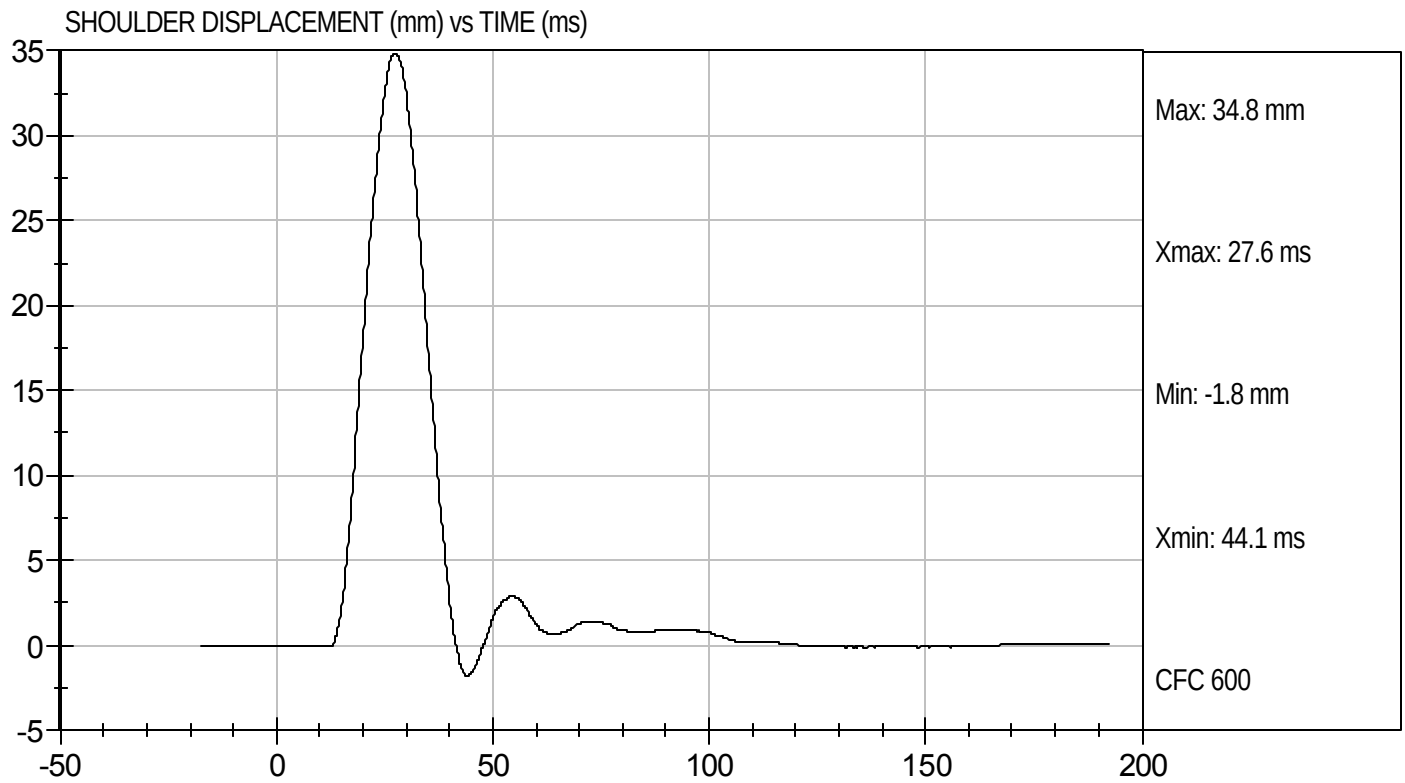
Test Date: 2/15/11
Velocity: 22.2 ft/s, 6.77 m/s





Test Desc: Thorax With Arm
Component ID: D11524

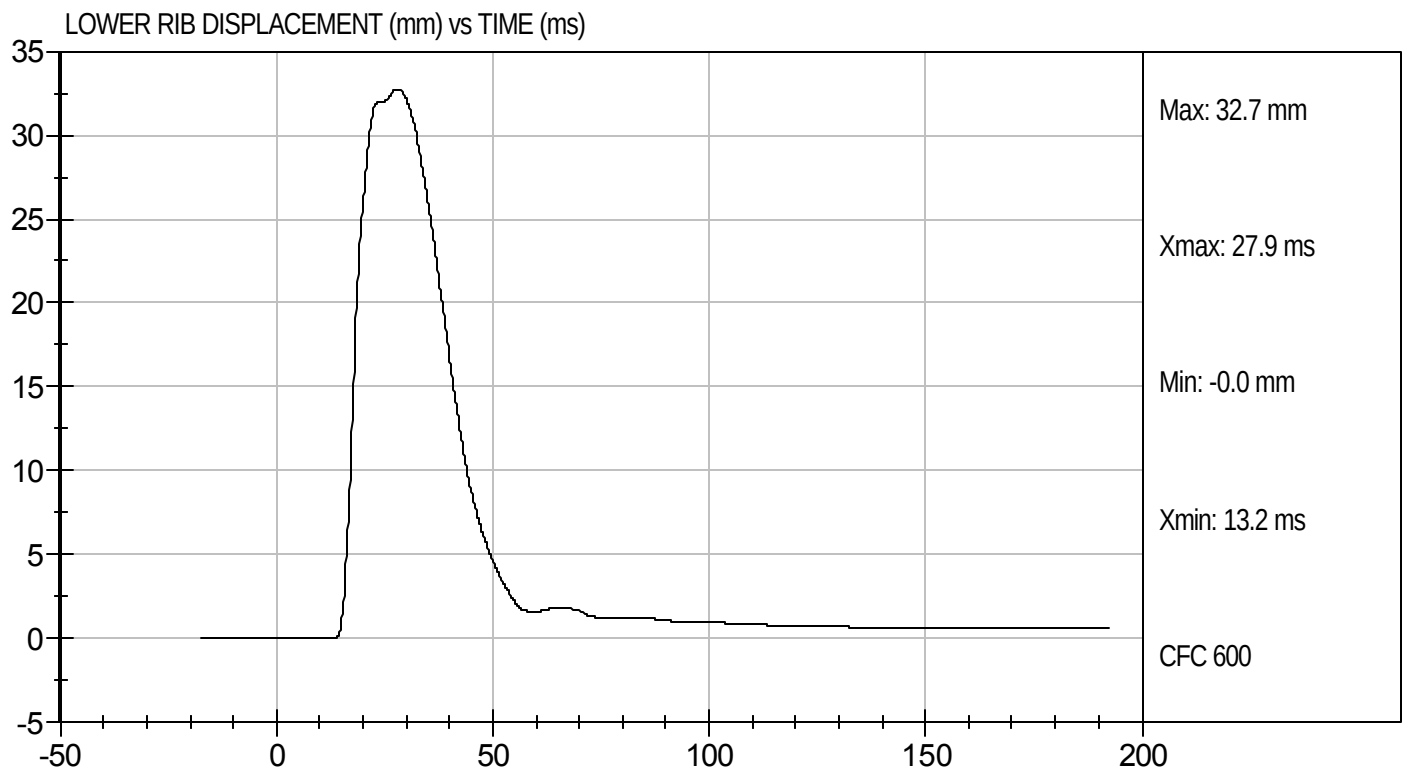
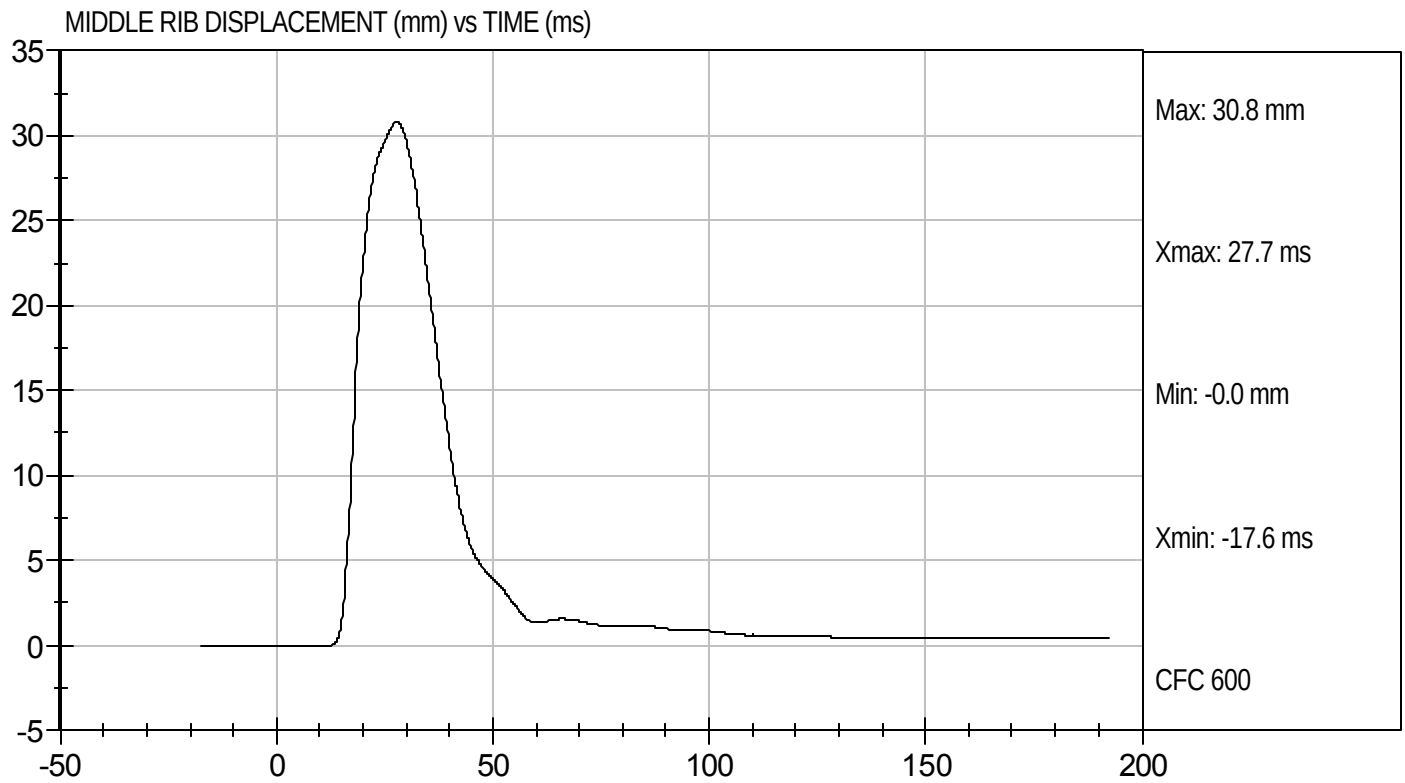
Test Date: 2/15/11
Velocity: 22.2 ft/s, 6.77 m/s





Test Desc: Thorax With Arm
Component ID: D11524

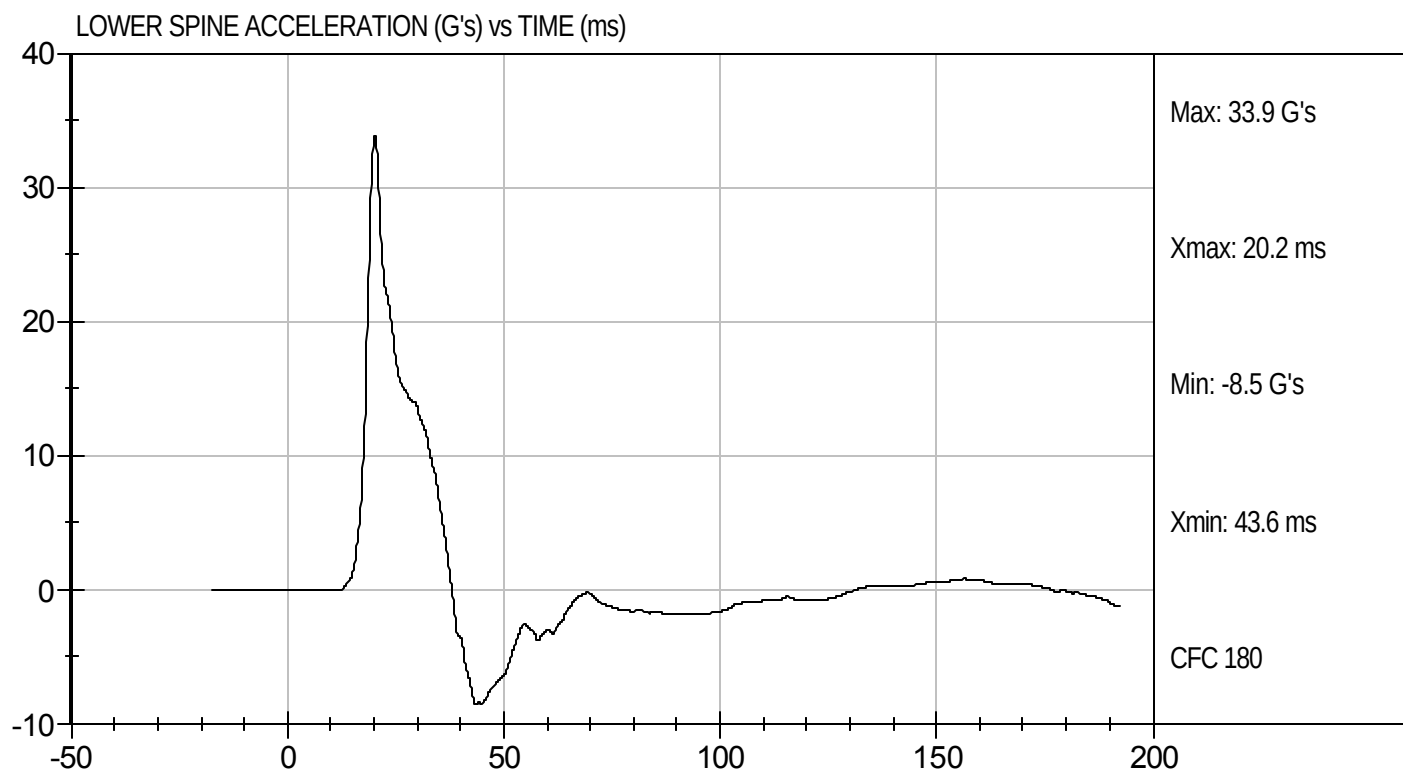
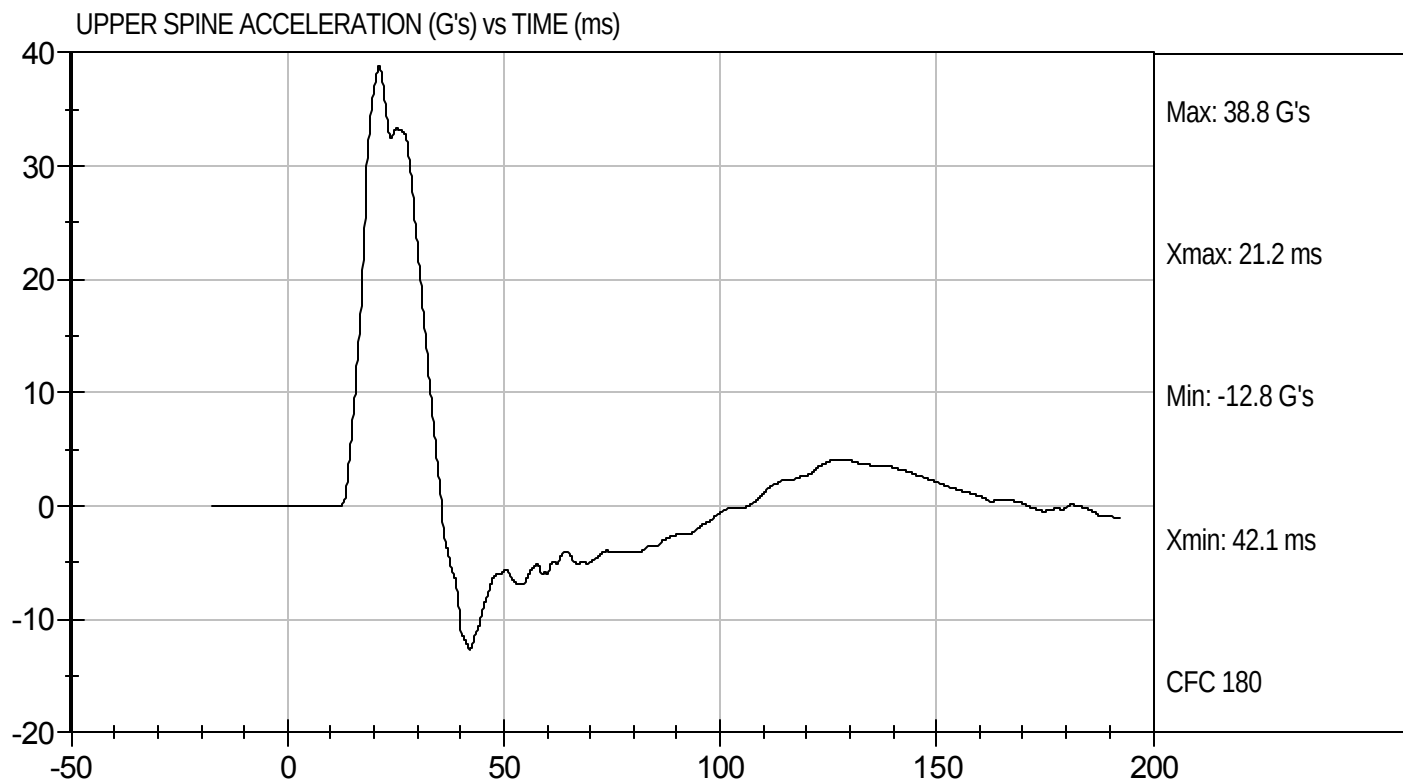
Test Date: 2/15/11
Velocity: 22.2 ft/s, 6.77 m/s





Test Desc: Thorax With Arm
Component ID: D11524

Test Date: 2/15/11
Velocity: 22.2 ft/s, 6.77 m/s



MGA RESEARCH CORPORATION
THORAX (WITHOUT ARM) IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D11525

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.7	Pass
Humidity	%	10 to 70	19	Pass
Impact Velocity	m/s	4.20 to 4.40	4.27	Pass
Peak Impactor Force	G's	14 to 18	15	Pass
Upper Rib Displacement	mm	32 to 40	38	Pass
Middle Rib Displacement	mm	39 to 45	40	Pass
Lower Rib Displacement	mm	35 to 43	37	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 17	14	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	8	Pass
Overall Test Results			Pass	


Laboratory Technician

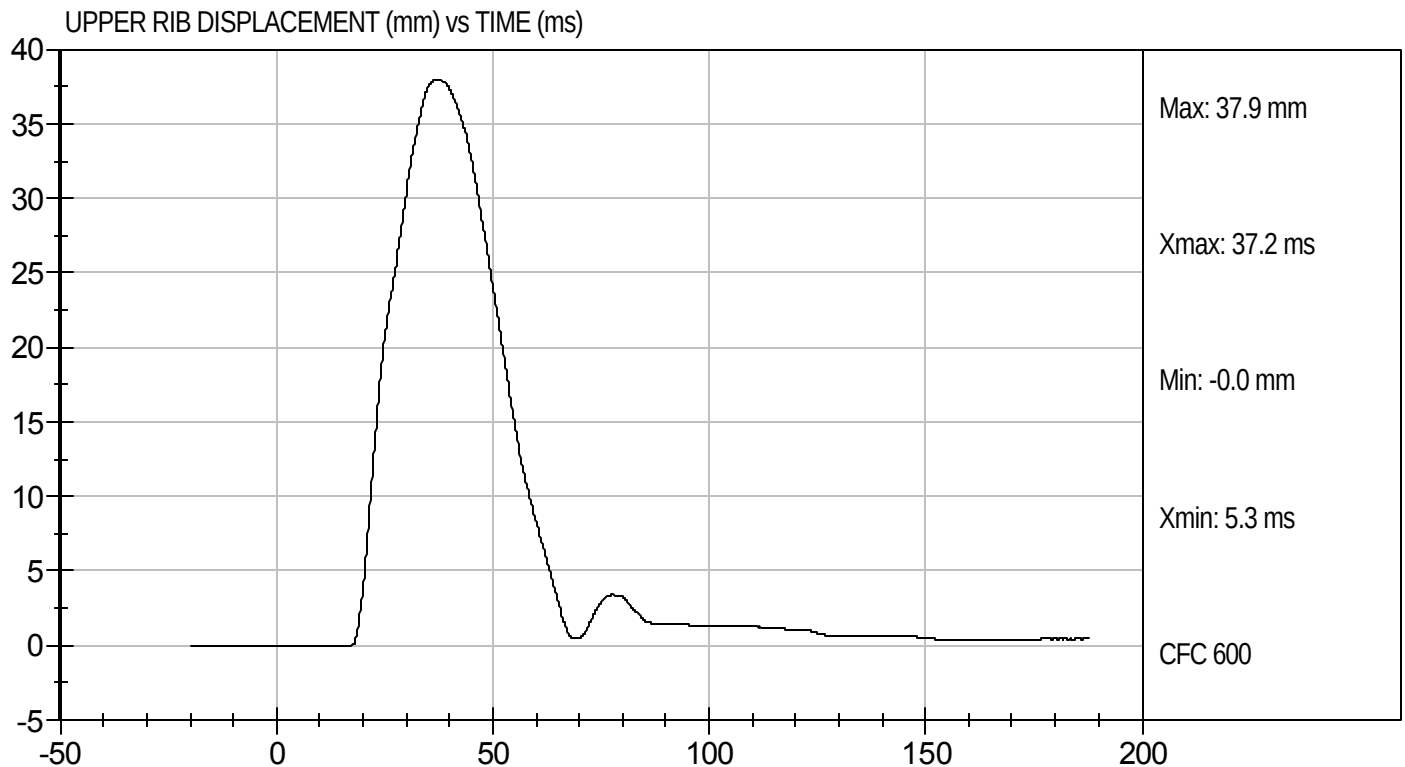
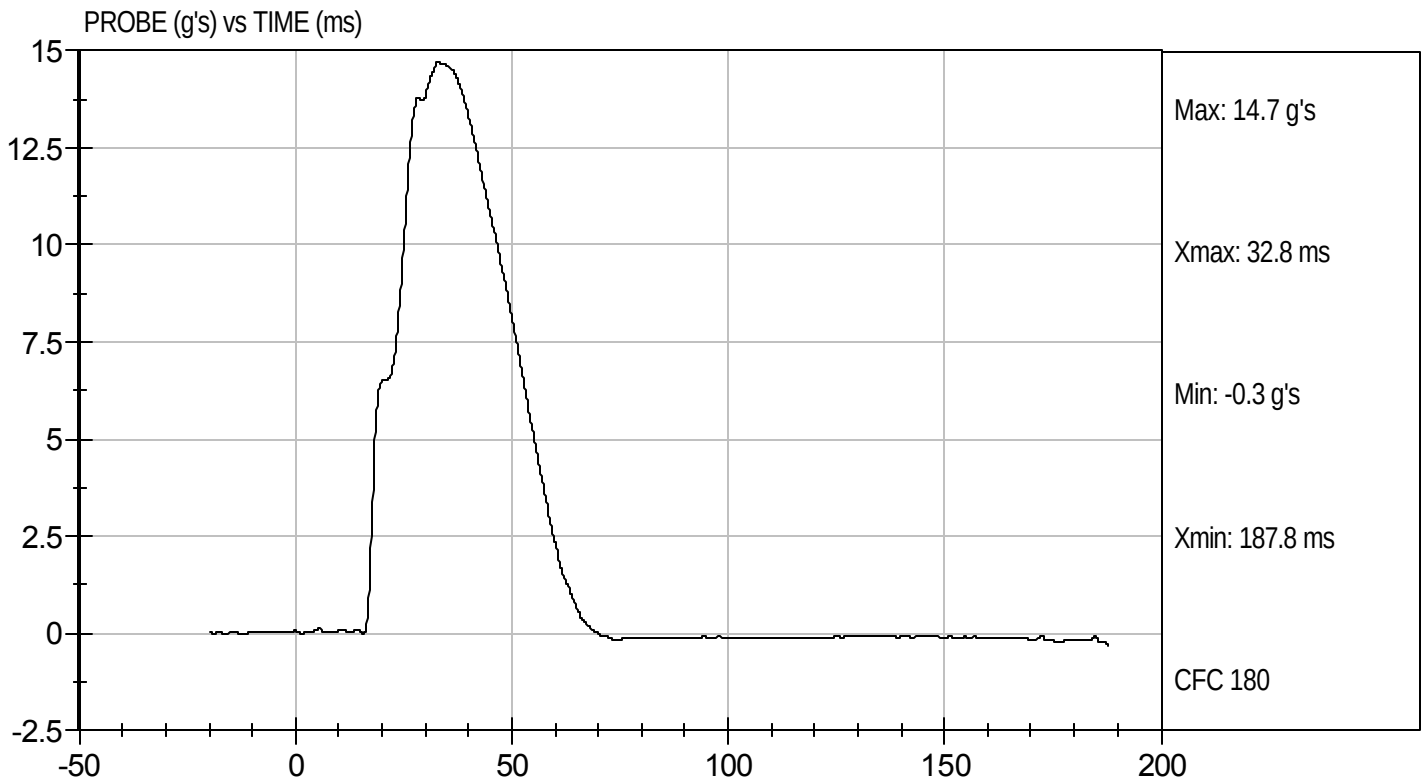
2/15/11
Test Date


Approved By



Test Desc: Thorax Without Arm
Component ID: D11525

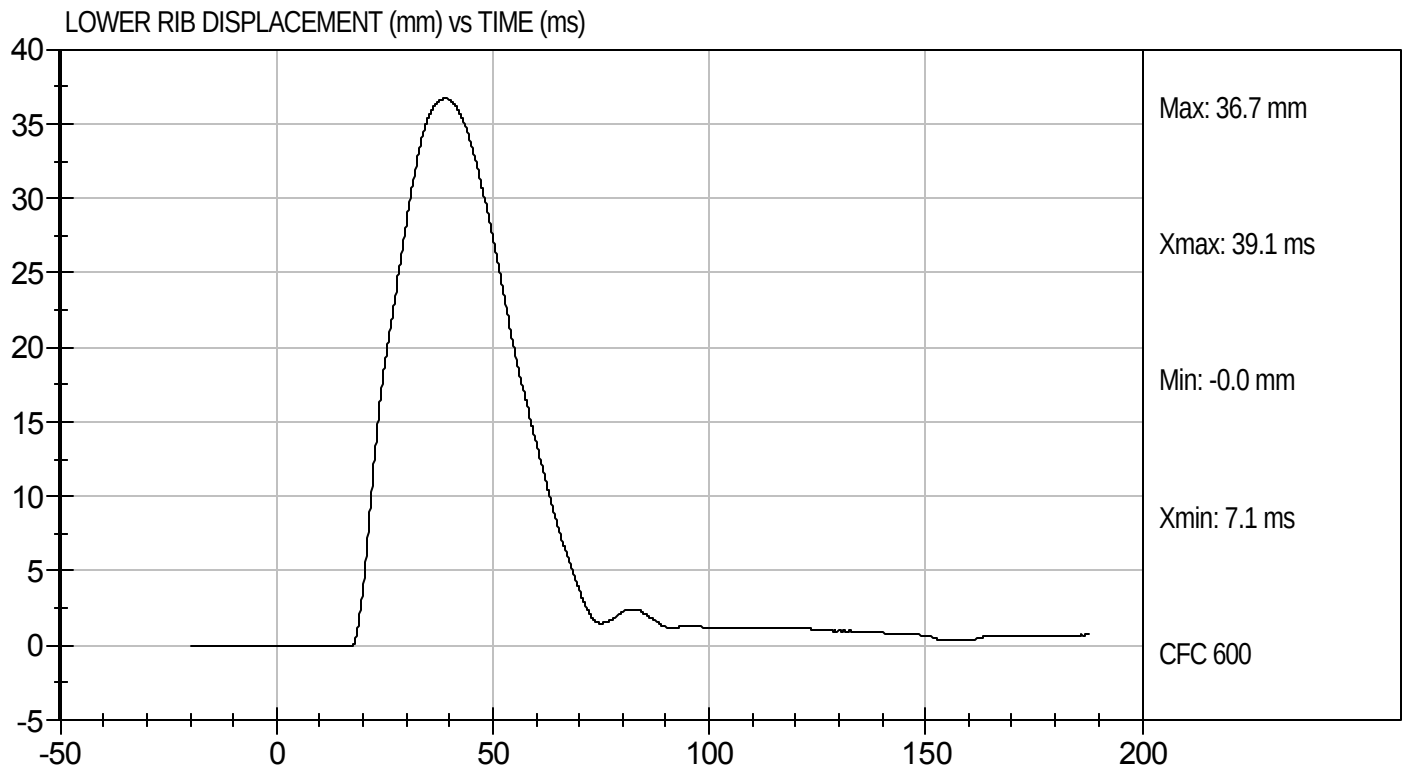
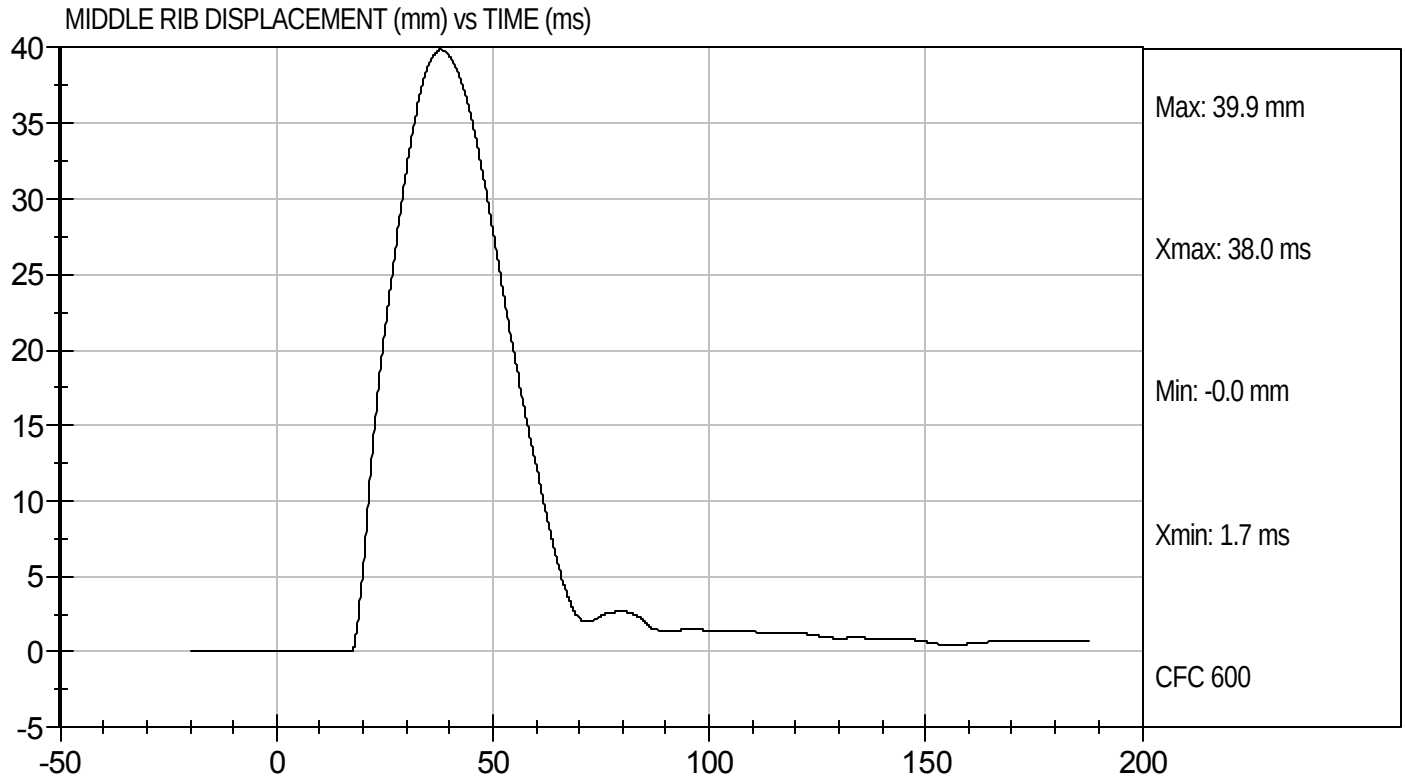
Test Date: 2/15/11
Velocity: 14.0 ft/s, 4.27 m/s





Test Desc: Thorax Without Arm
Component ID: D11525

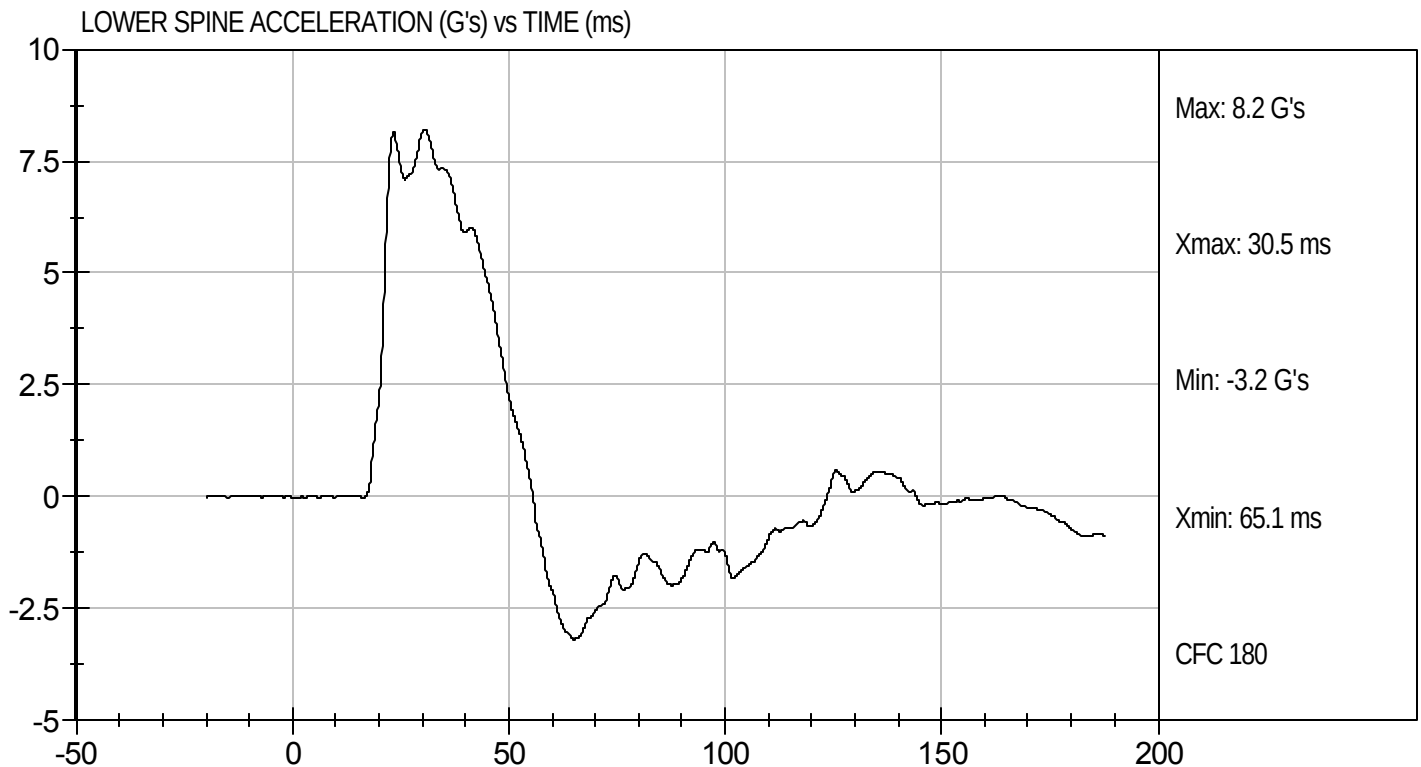
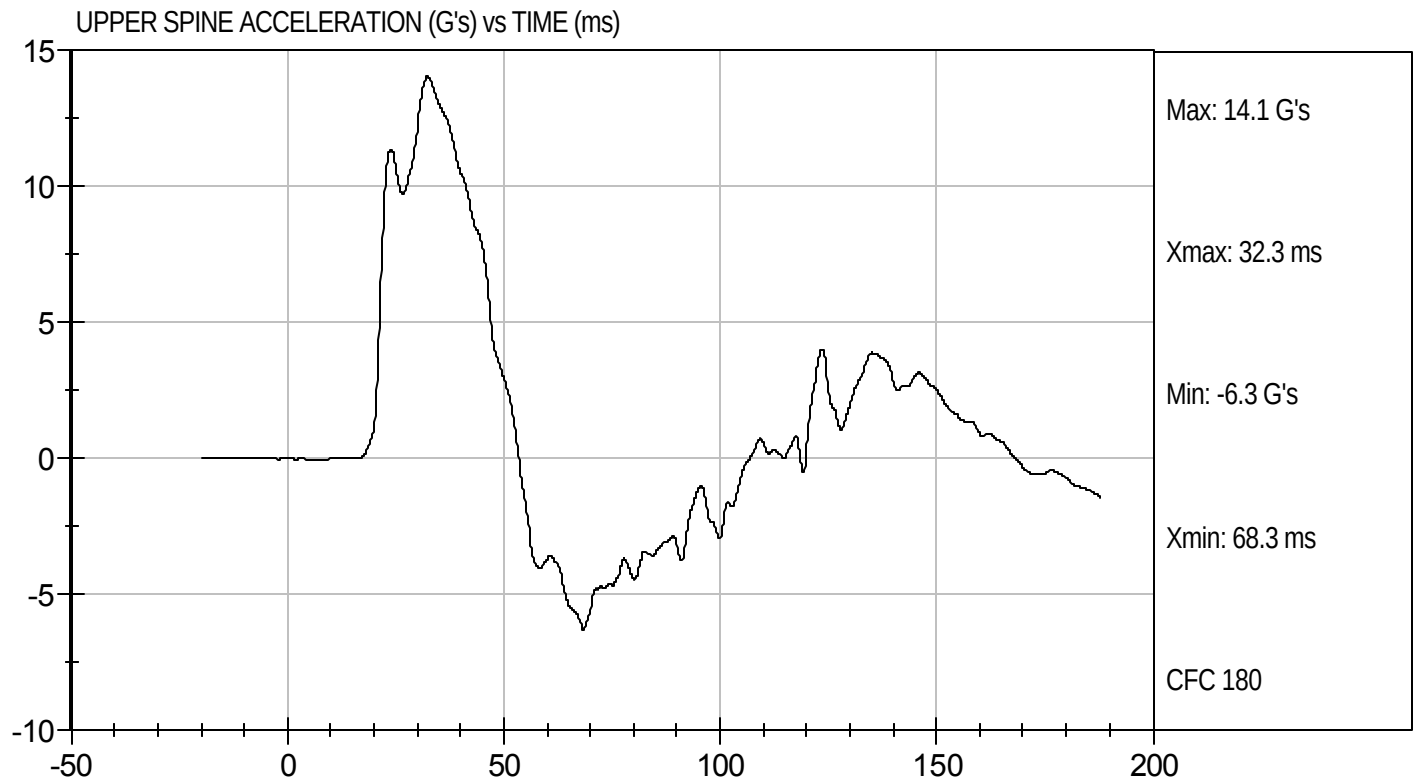
Test Date: 2/15/11
Velocity: 14.0 ft/s, 4.27 m/s





Test Desc: Thorax Without Arm
Component ID: D11525

Test Date: 2/15/11
Velocity: 14.0 ft/s, 4.27 m/s



MGA RESEARCH CORPORATION
ABDOMINAL IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D11526

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.7	Pass
Humidity	%	10 to 70	19	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Peak Impactor Acceleration	G's	12 to 16	14	Pass
Upper Rib Displacement	mm	36 to 47	38	Pass
Lower Rib Displacement	mm	33 to 44	36	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	11	Pass
			Overall Test Results	Pass


Laboratory Technician

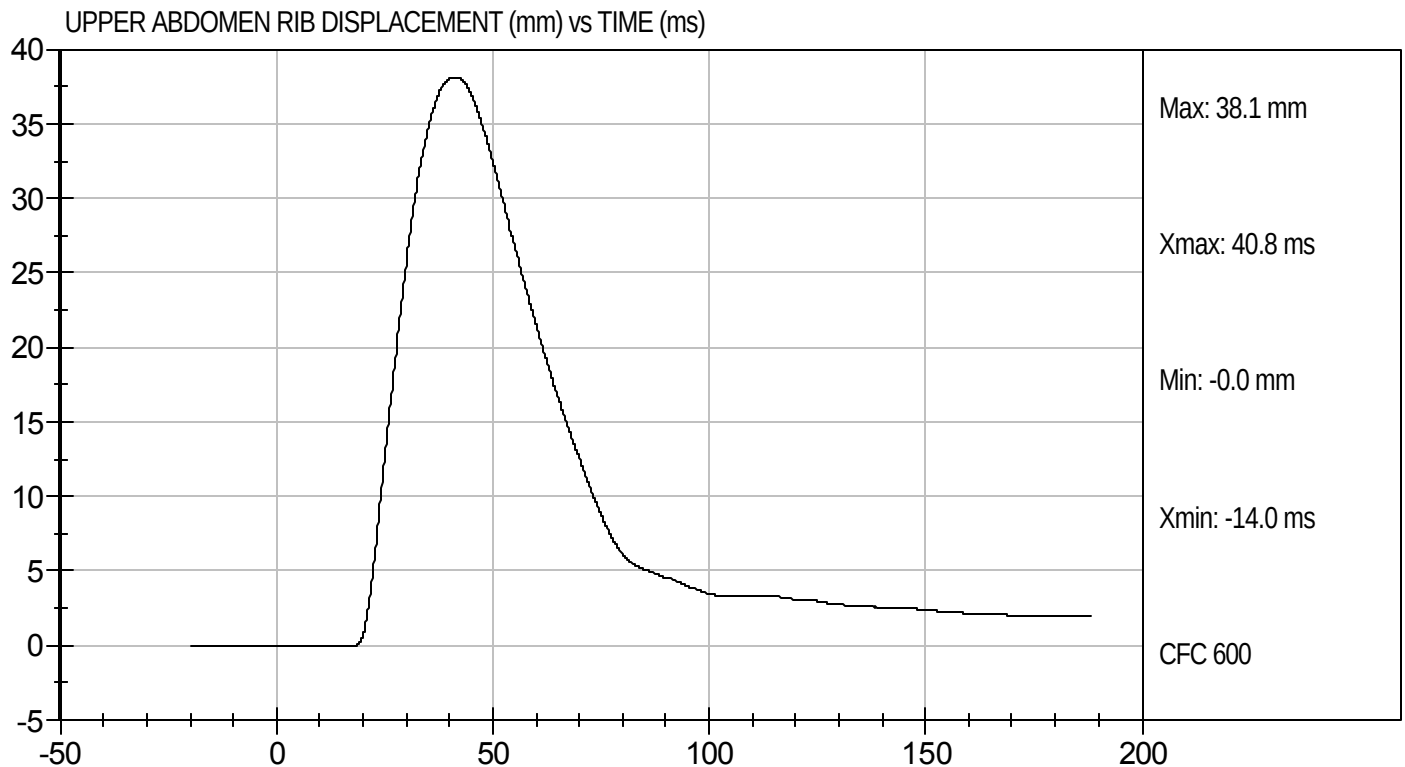
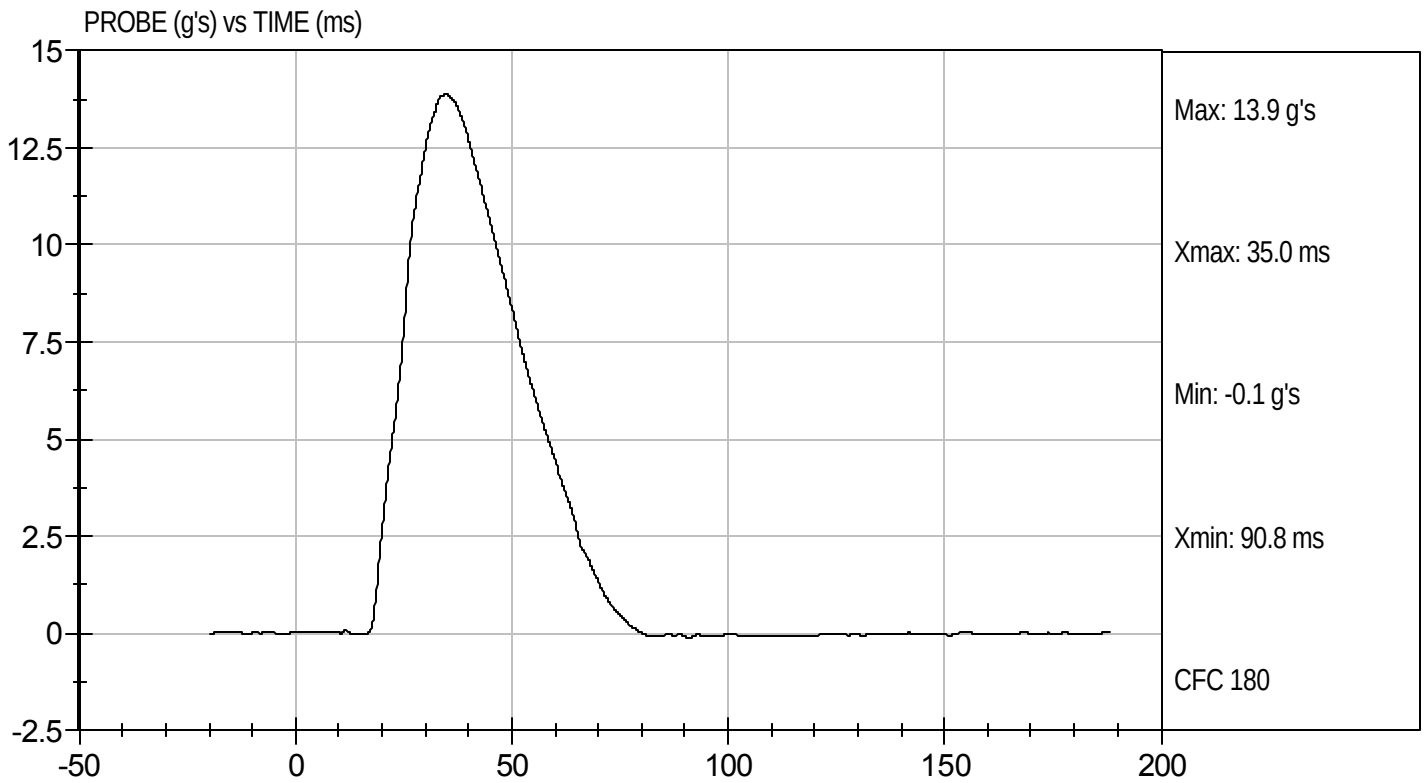
2/15/11
Test Date


Approved By



Test Desc: Abdomen Impact
Component ID: D11526

Test Date: 2/15/11
Velocity: 14.36 ft/s, 4.38 m/s

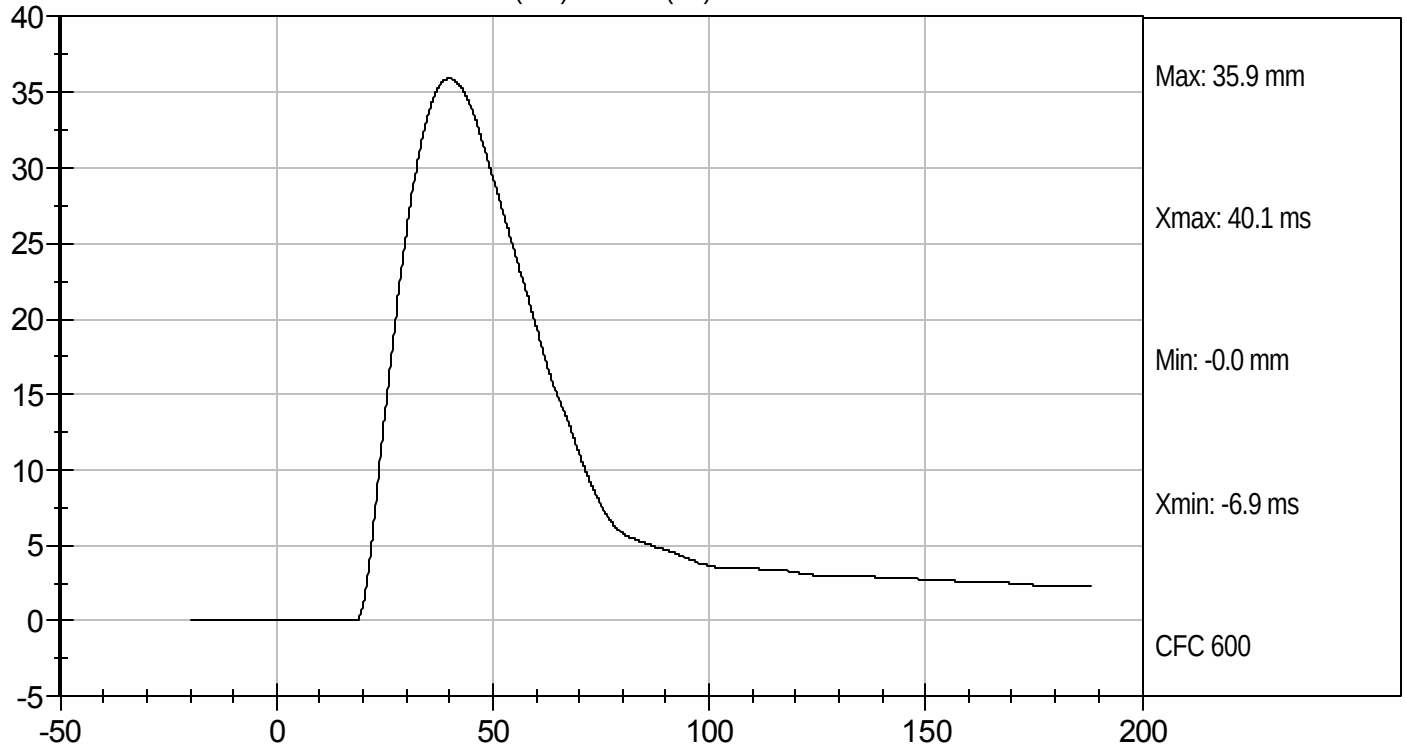




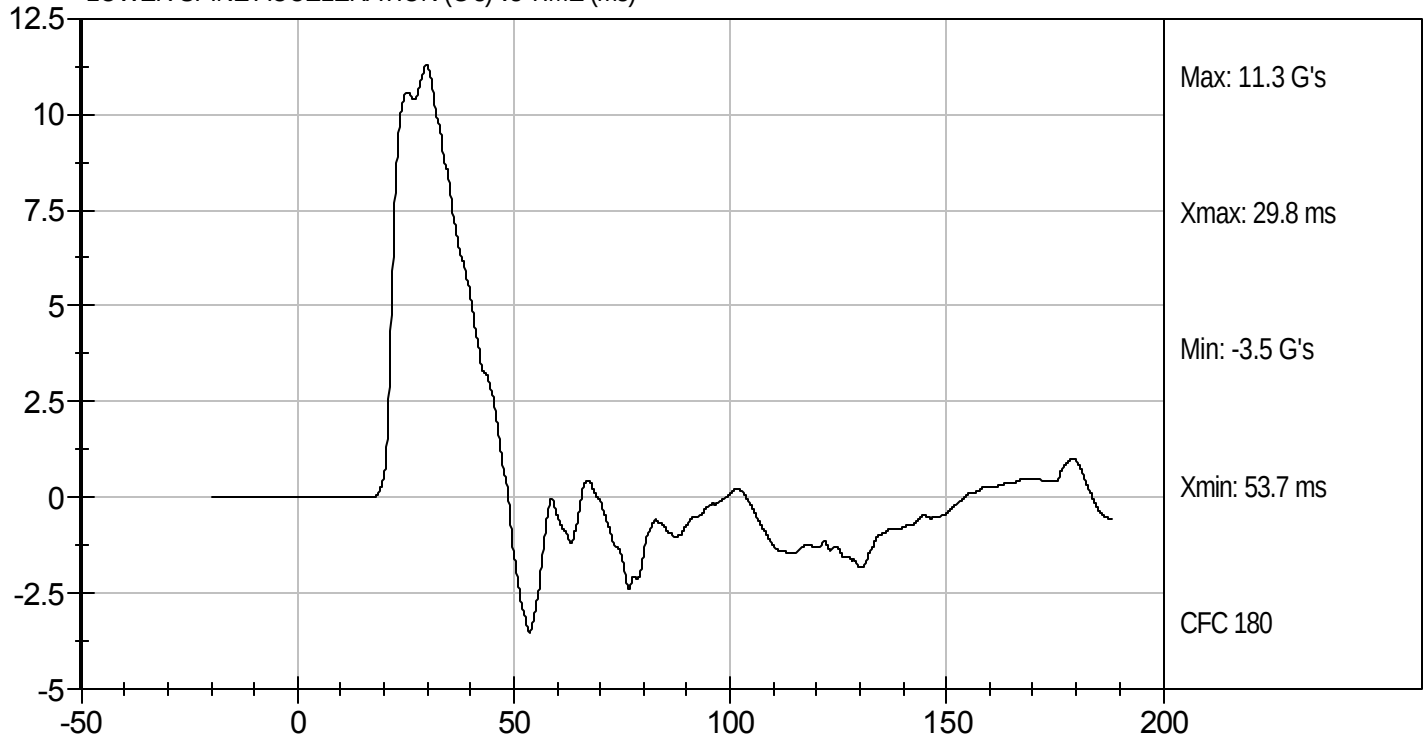
Test Desc: Abdomen Impact
Component ID: D11526

Test Date: 2/15/11
Velocity: 14.36 ft/s, 4.38 m/s

LOWER ABDOMEN RIB DISPLACEMENT (mm) vs TIME (ms)



LOWER SPINE ACCELERATION (G's) vs TIME (ms)



MGA RESEARCH CORPORATION
PELVIS IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D11527

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Humidity	%	10 to 70	20	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Peak Impactor Acceleration	G's	38 to 47	44	Pass
Pelvis Y Acceleration after 6 ms	G's	34 to 42	42	Pass
Peak Acetabulum Force	N	3600 to 4300	4239	Pass
Overall Test Results				Pass


Laboratory Technician

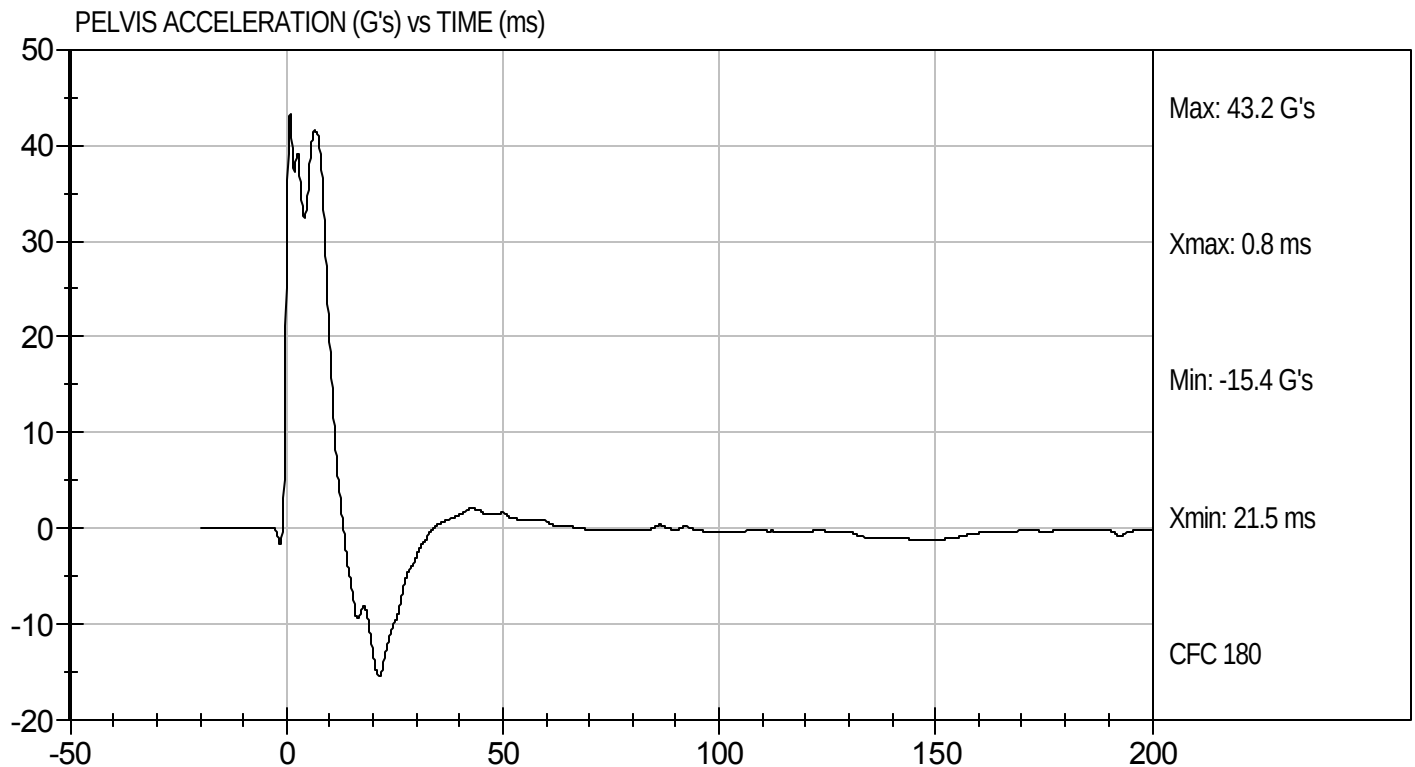
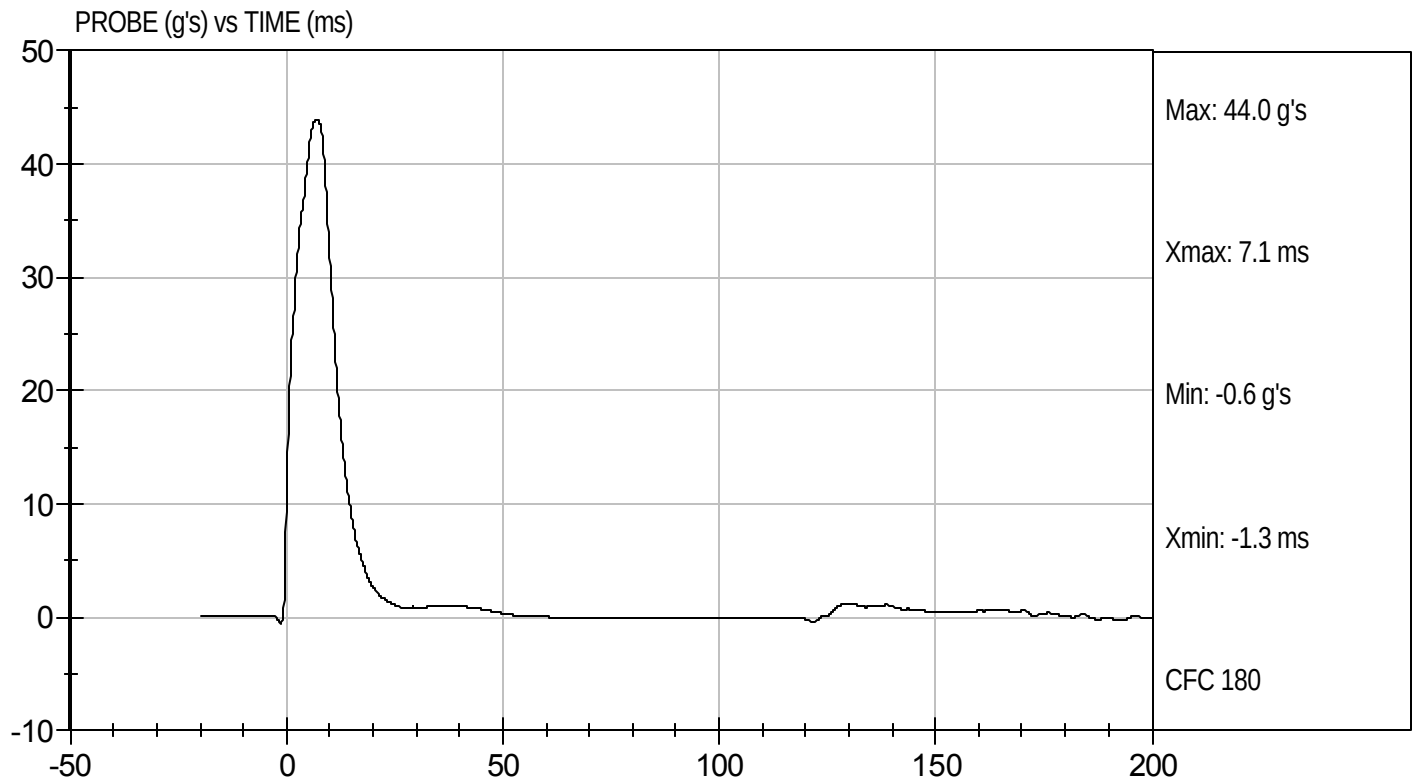
2/15/11
Test Date


Approved By



Test Desc: Pelvis Impact
Component ID: D11527

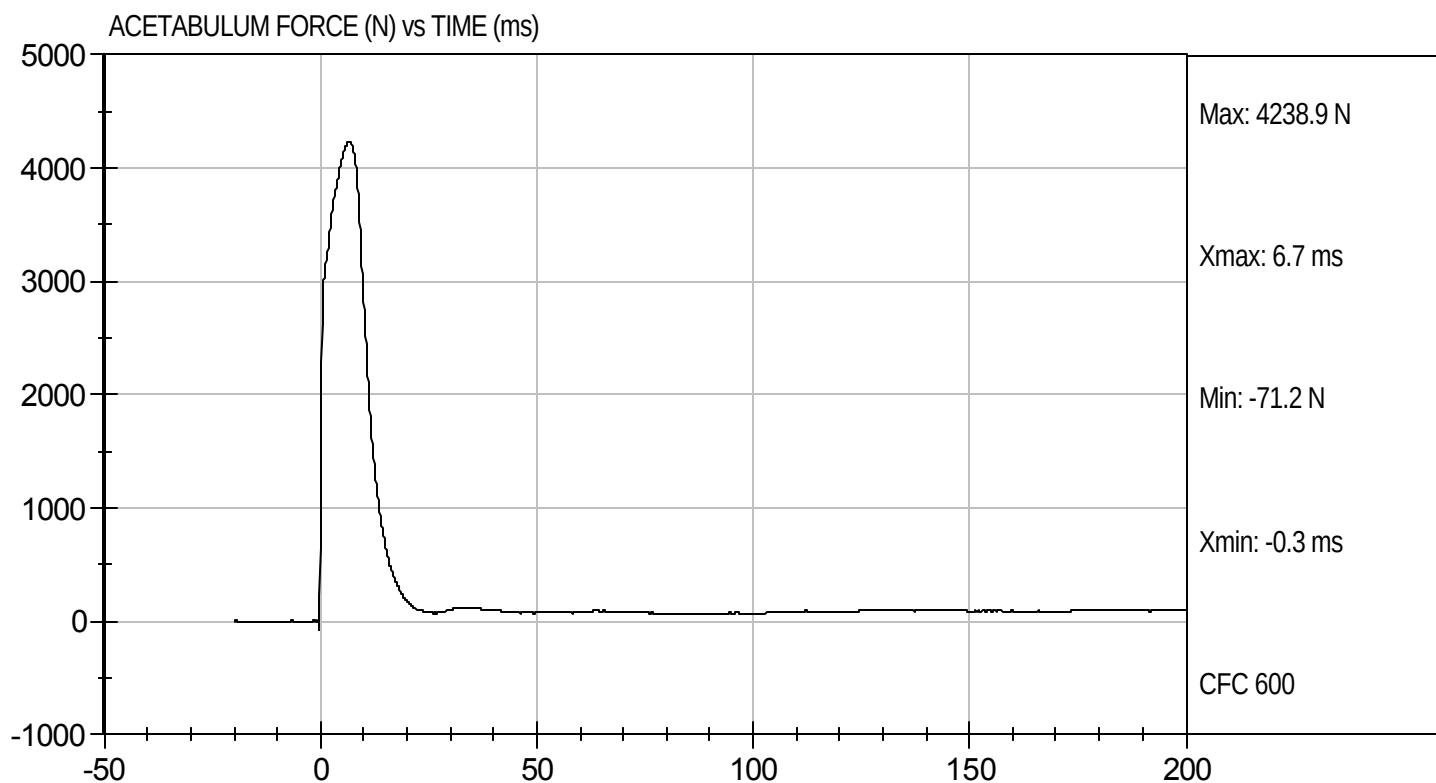
Test Date: 2/15/11
Velocity: 22.2 ft/s, 6.77 m/s





Test Desc: Pelvis Impact
Component ID: D11527

Test Date: 2/15/11
Velocity: 22.2 ft/s, 6.77 m/s



MGA RESEARCH CORPORATION
ILIAC IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D11528

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Humidity	%	10 to 70	20	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Peak Impactor Acceleration	G's	36 to 45	38	Pass
Pelvis Y Acceleration	G's	28 to 39	32	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4738	Pass
Overall Test Results				Pass


Laboratory Technician

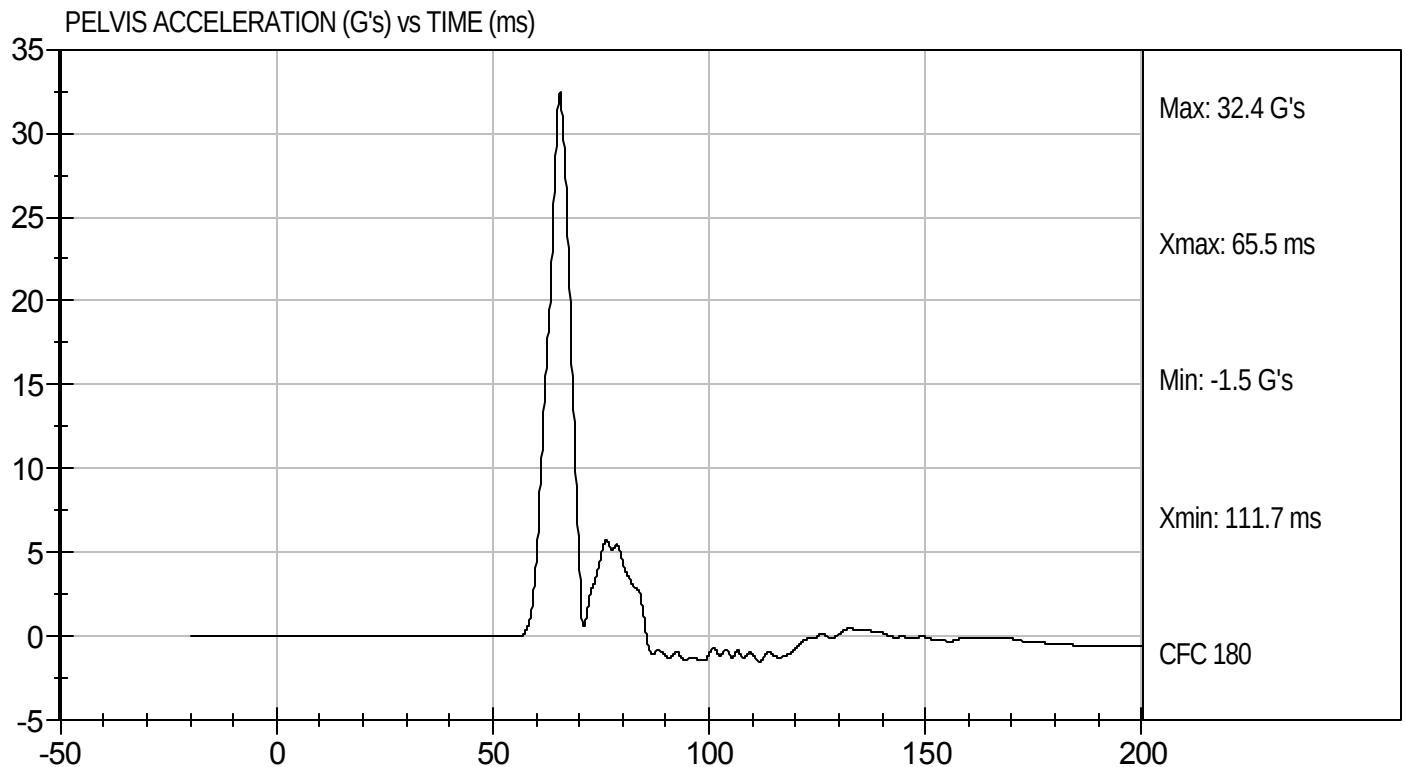
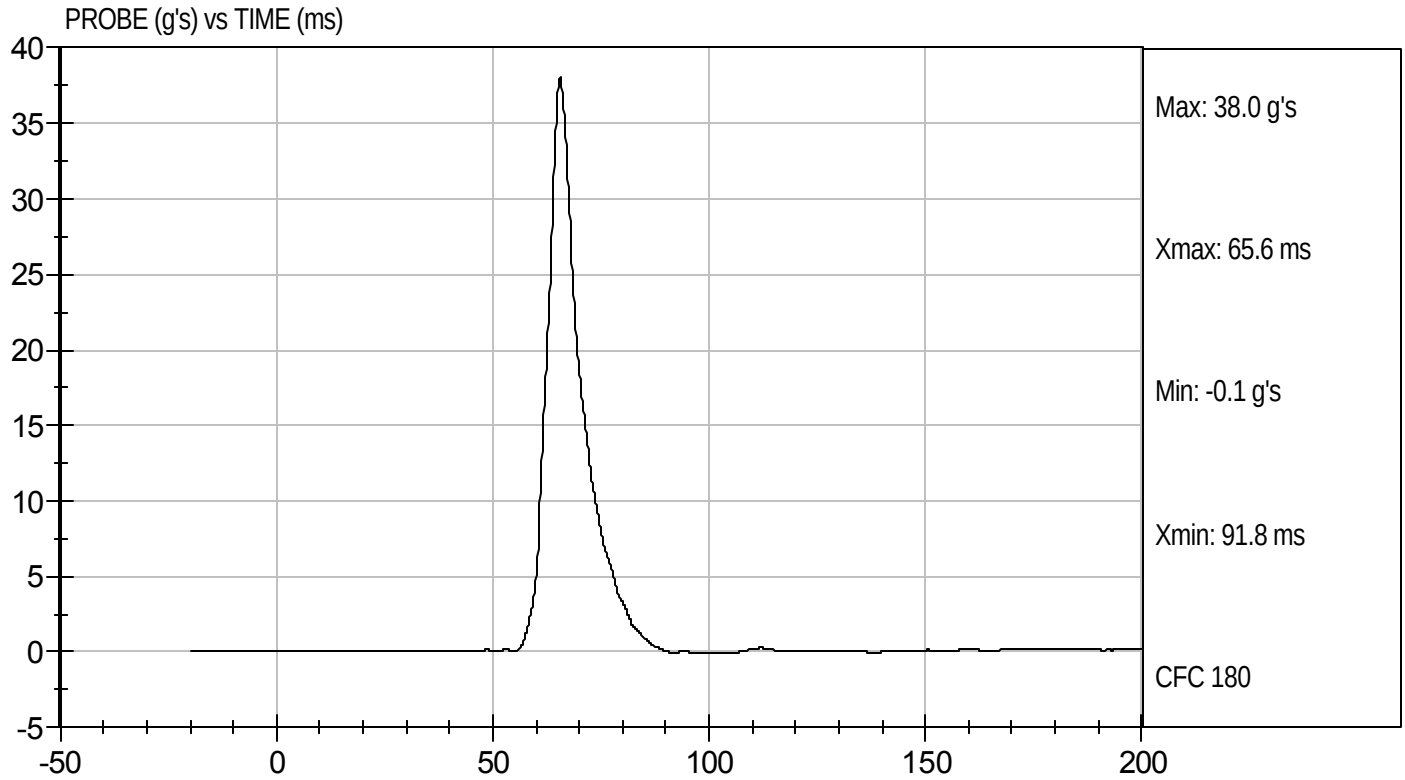
2/15/11
Test Date


Approved By



Test Desc: Iliac Impact
Component ID: D11528

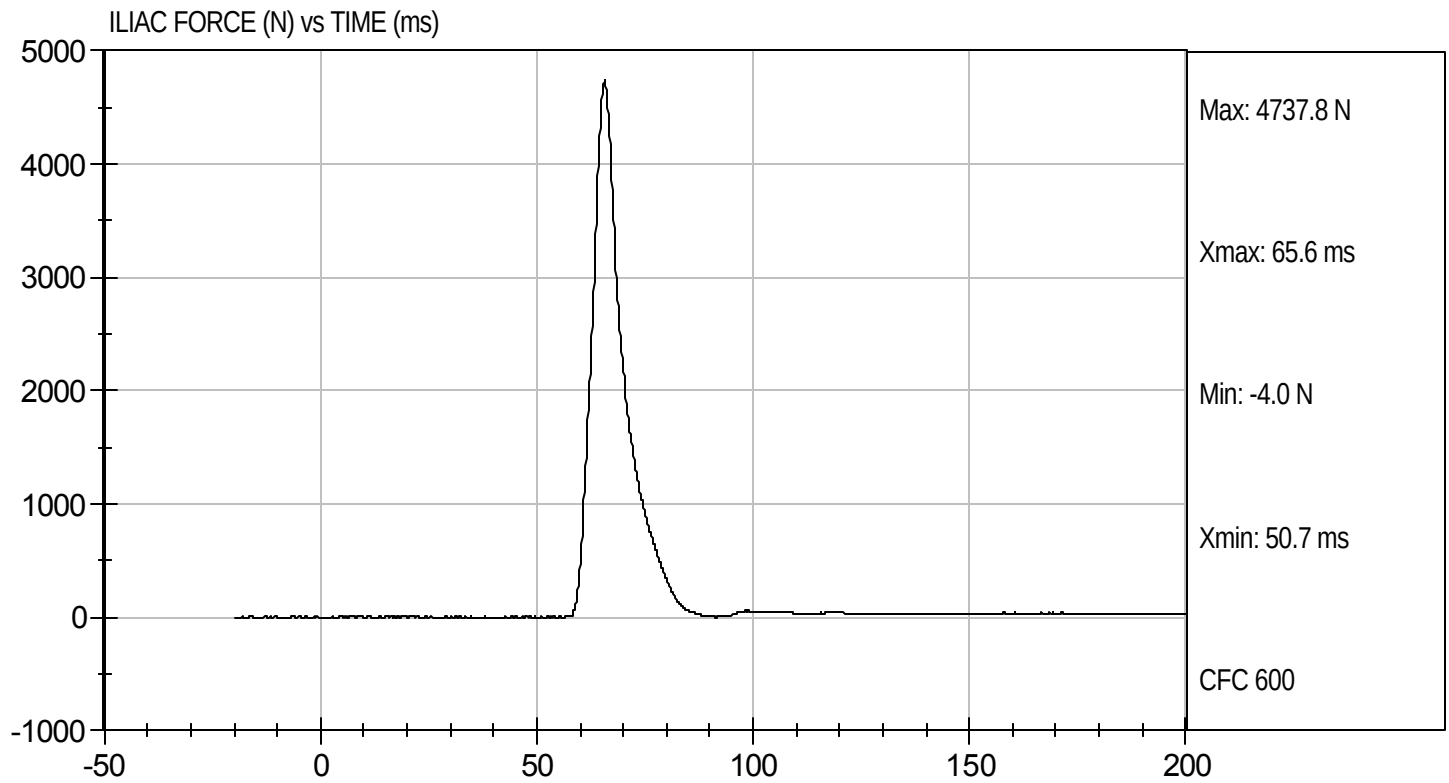
Test Date: 2/15/11
Velocity: 14.36 ft/s, 4.38 m/s





Test Desc: Iliac Impact
Component ID: D11528

Test Date: 2/15/11
Velocity: 14.36 ft/s, 4.38 m/s



MGA RESEARCH CORPORATION
HEAD DROP TEST
SID-Its BUILD LEVEL D DUMMY

ATD Serial No: 296

Test ID: D11631

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	22	Pass
Peak Resultant Acceleration	G's	115 to 137	121	Pass
Peak Lateral Acceleration	G's	+/- 15	-4.9	Pass
Unimodal	N/A	<15%	Yes	Pass
Overall Test Results				Pass

Jessica Galt
Laboratory Technician

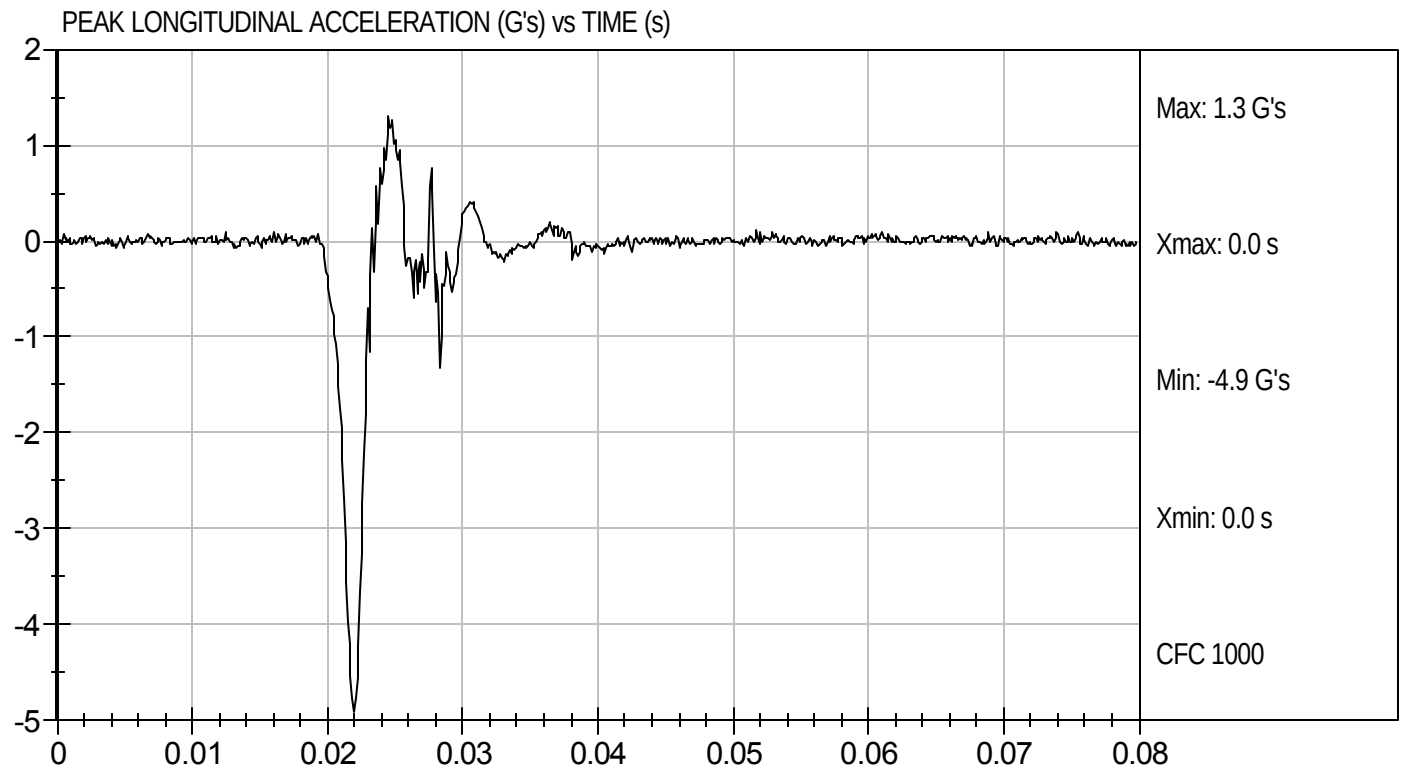
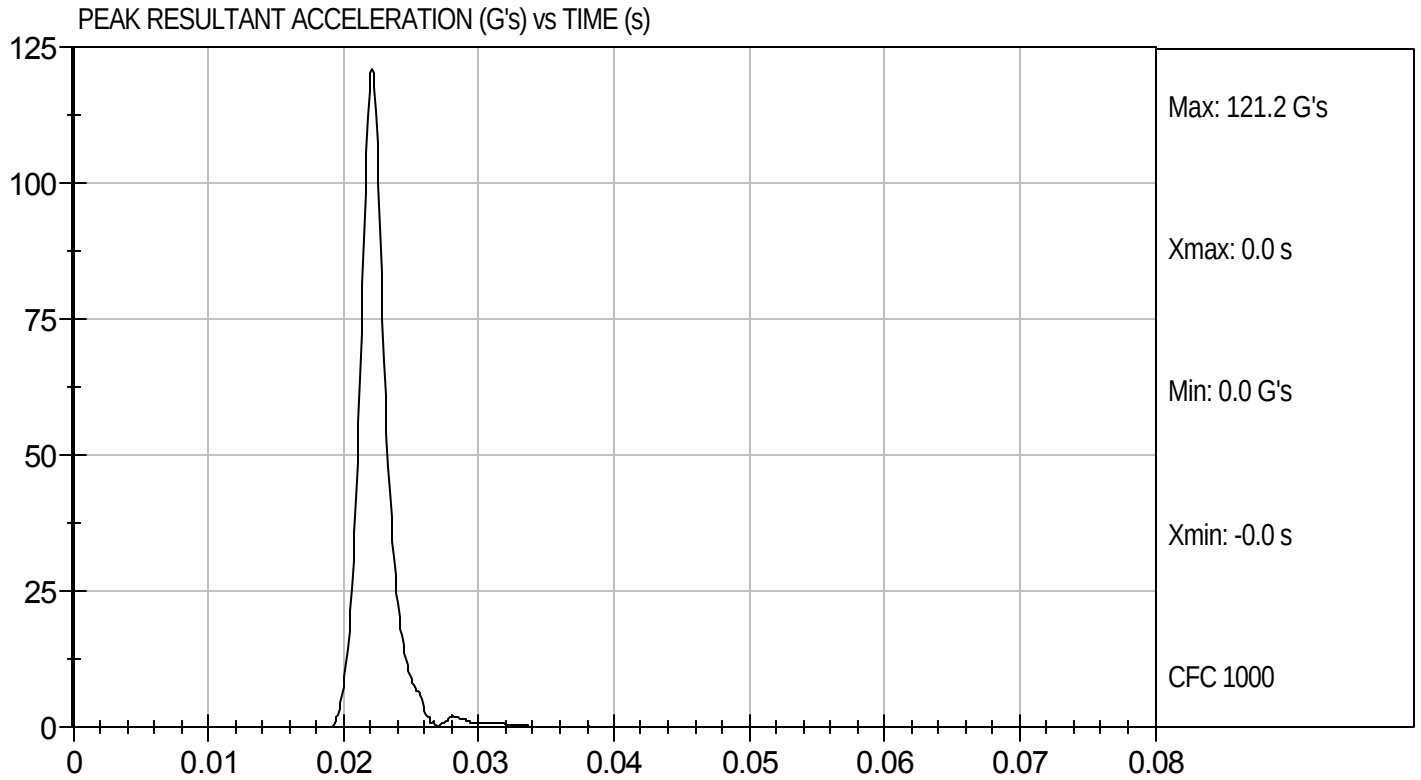
2/22/11
Test Date

David Winkelbauer
Approved By



Test Desc: Head Drop
Component ID: D11631

Test Date: 2/22/11
Velocity: 0 ft/s, 0 m/s

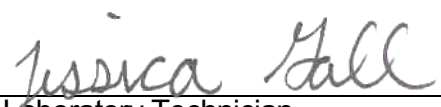


MGA RESEARCH CORPORATION
LATERAL NECK PENDULUM TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D11632

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	22.0	Pass
Humidity		%	10 to 70	20	Pass
Impact Velocity		m/s	5.51 to 5.63	5.58	Pass
Delta Velocity	10 ms	m/s	2.20 to 2.80	2.41	Pass
	15 ms	m/s	3.30 to 4.10	3.42	Pass
	20 ms	m/s	4.40 to 5.40	4.60	Pass
	25 ms	m/s	5.40 to 6.10	5.53	Pass
	25-100 ms	m/s	5.50 to 6.20	5.58	Pass
Maximum D-Plane Rotation		deg	71 to 81	74	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	65	Pass
Maximum Occipital Condyle Moment during Rotation Interval Nm			-44 to -36	-37	Pass
Time of Moment Decay to 0 Nm		ms	102 to 126	123	Pass
Overall Test Results				Pass	


 Laboratory Technician

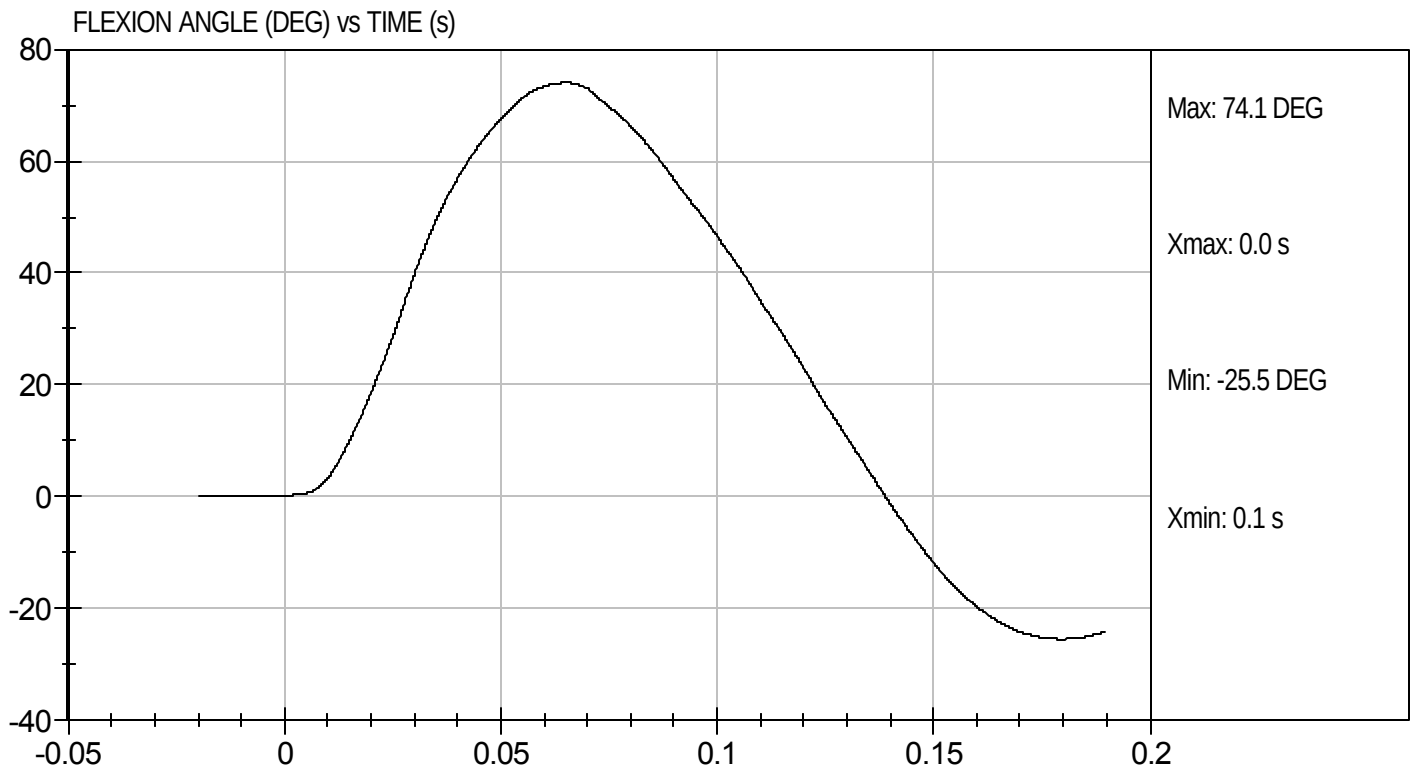
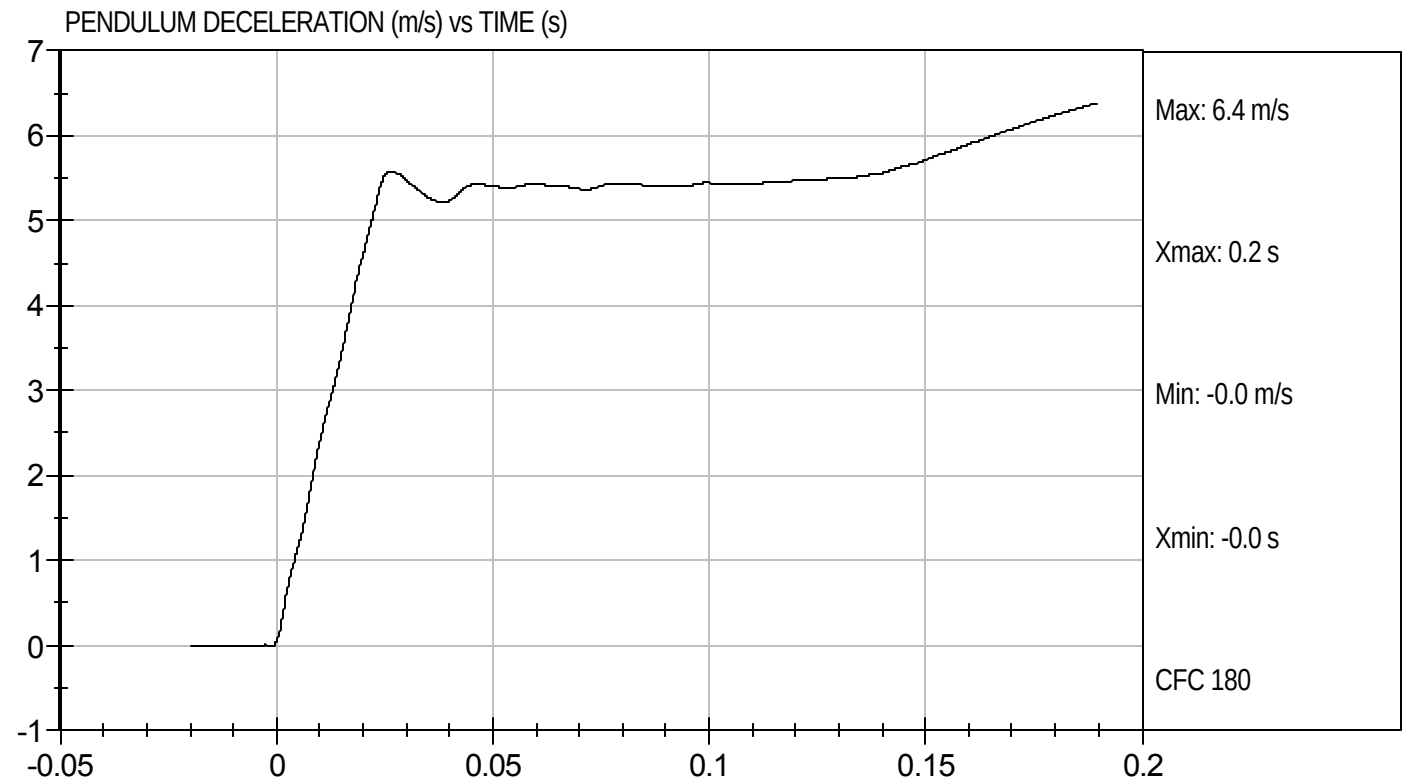
2/22/11
 Test Date


 Approved By



Test Desc: Neck Bending
Component ID: D11632

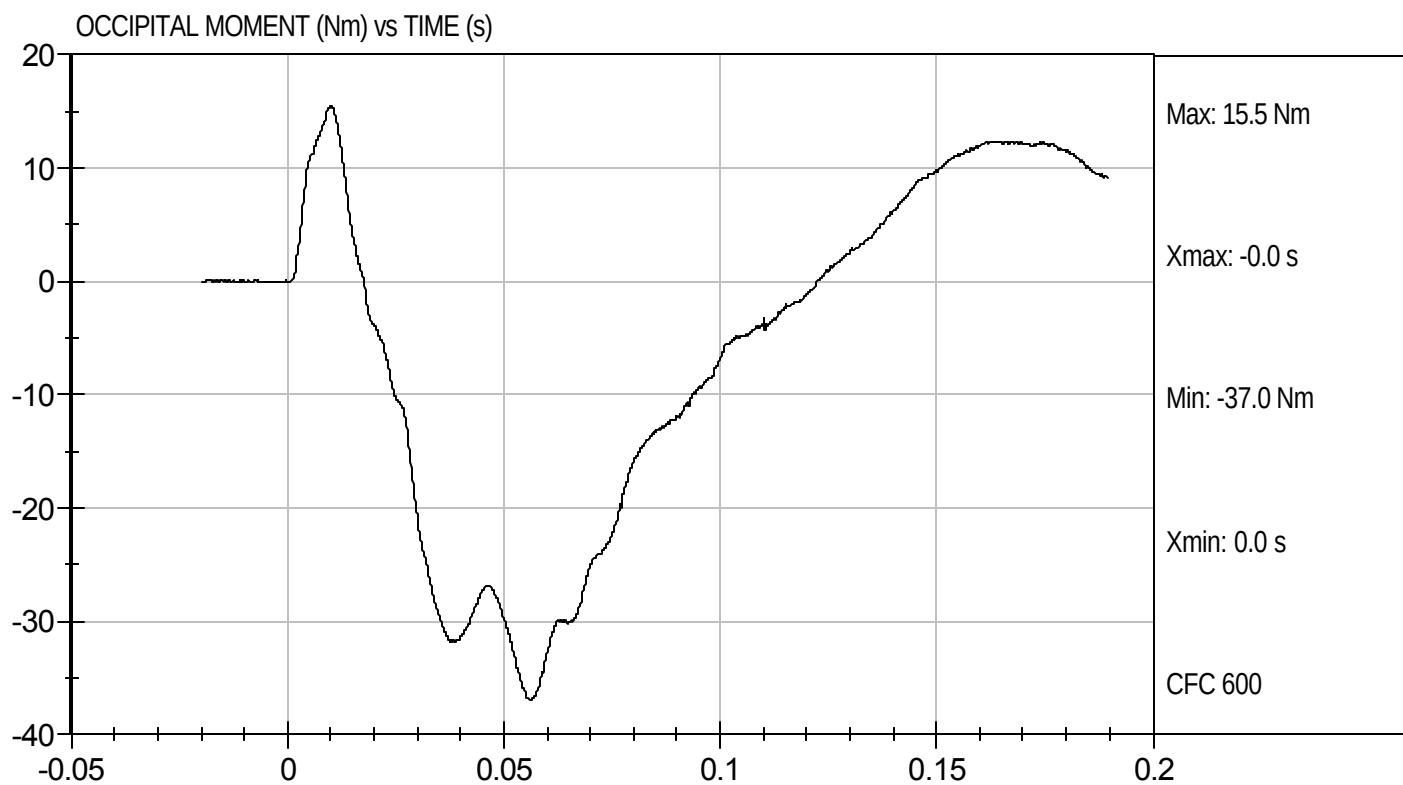
Test Date: 2/22/11
Velocity: 18.32 ft/s, 5.58 m/s





Test Desc: Neck Bending
Component ID: D11632

Test Date: 2/22/11
Velocity: 18.32 ft/s, 5.58 m/s

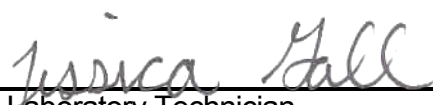


MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
SID-11s BUILD LEVEL D DUMMY

ATD Serial No: 296

Test ID: D11633

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	22	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Maximum Probe Acceleration	G's	13 to 18	15	Pass
Shoulder Displacement	mm	28 to 37	32	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	19	Pass
Overall Test Results				Pass


Laboratory Technician

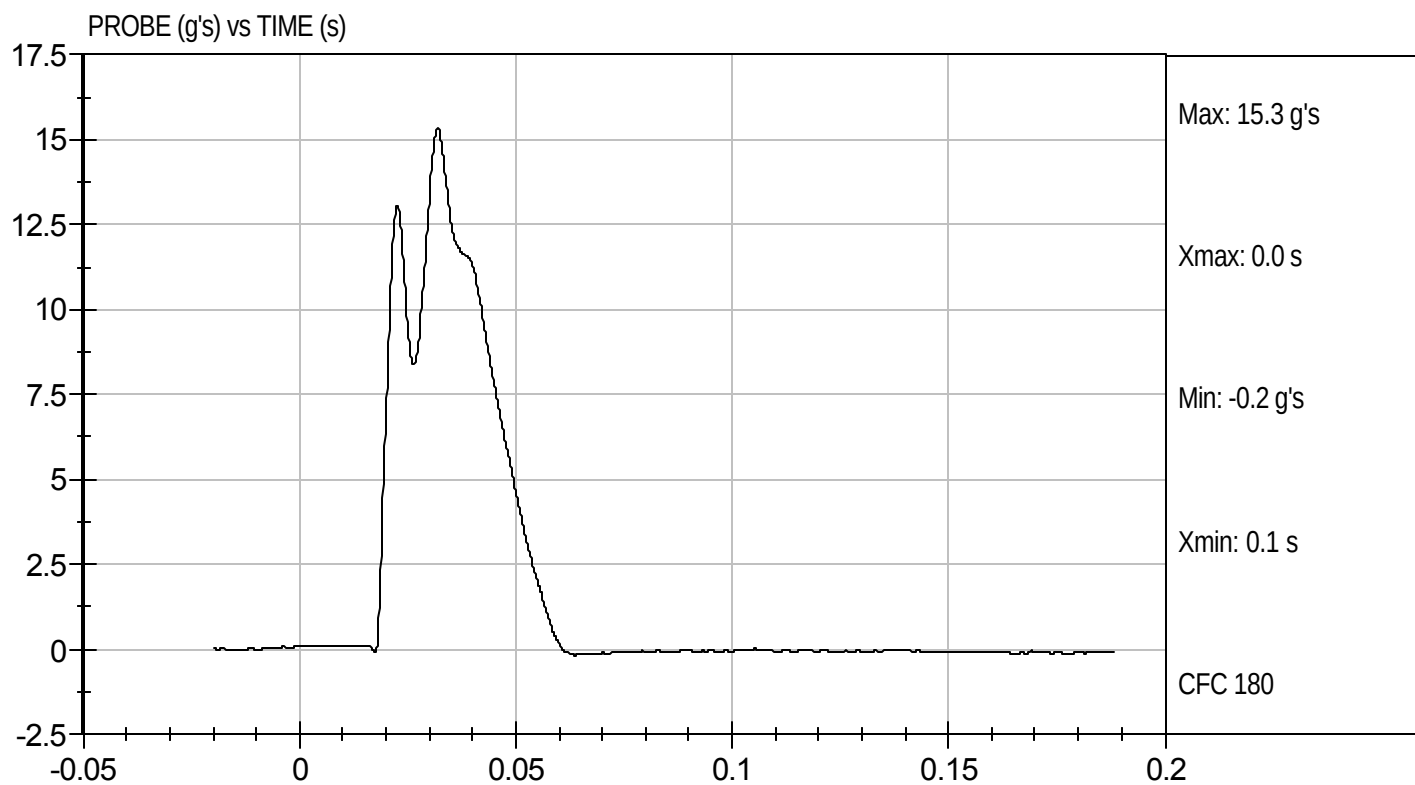
2/22/11
Test Date


Approved By



Test Desc: Shoulder Impact
Component ID: D11633

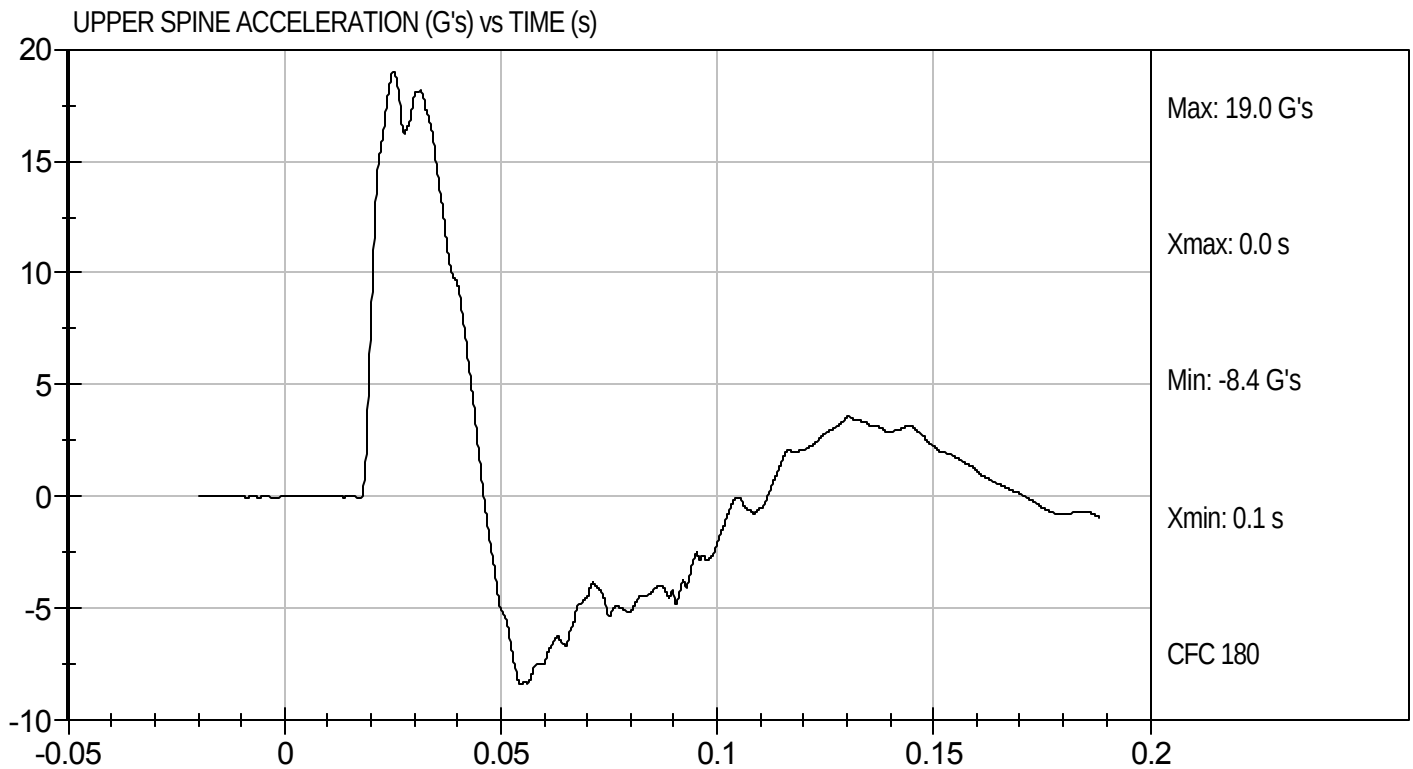
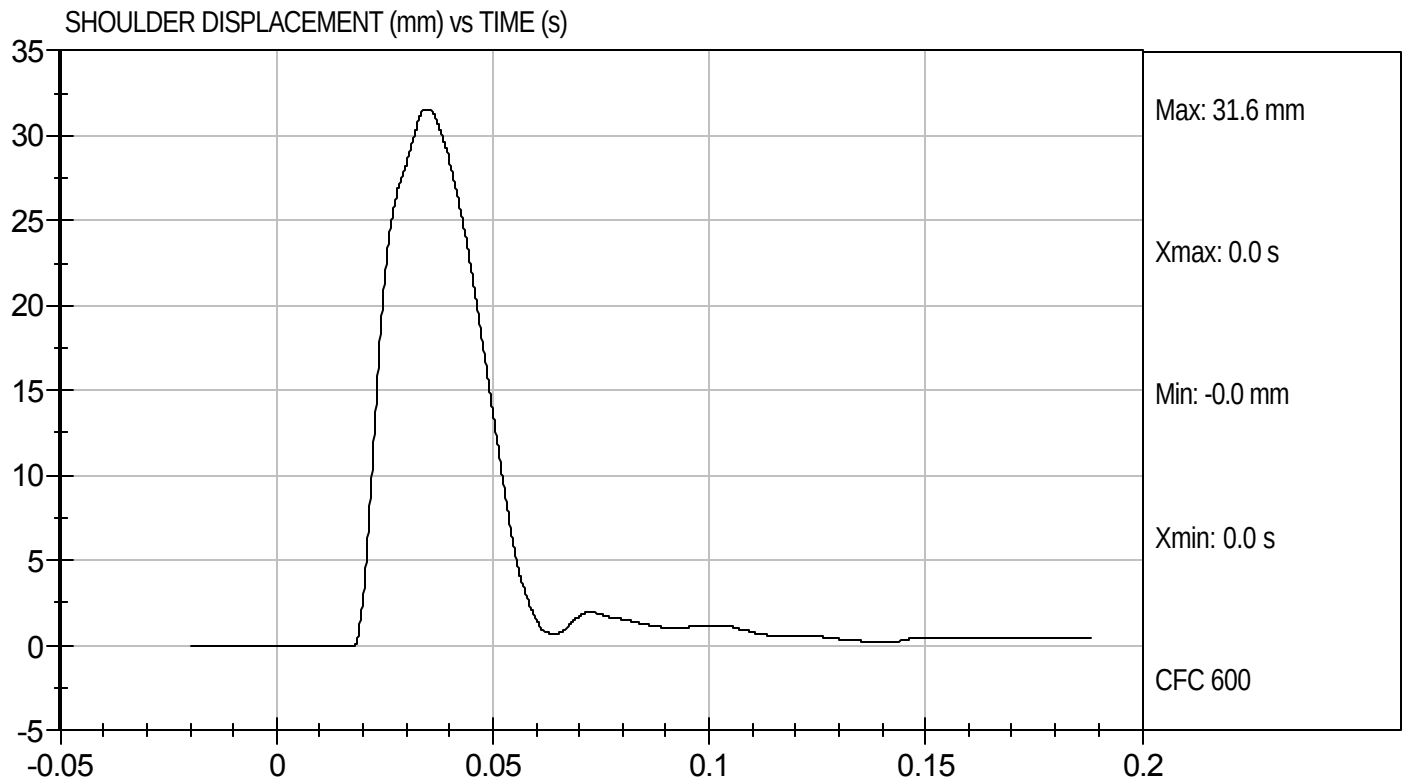
Test Date: 2/22/11
Velocity: 14.36 ft/s, 4.38 m/s





Test Desc: Shoulder Impact
Component ID: D11633

Test Date: 2/22/11
Velocity: 14.36 ft/s, 4.38 m/s



MGA RESEARCH CORPORATION
THORAX (WITH ARM) IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

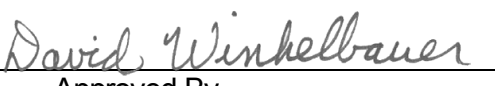
ATD Serial No: 296

Test I.D: D11634

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Humidity	%	10 to 70	22	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Peak Impactor Acceleration	G's	30 to 36	32	Pass
Shoulder Displacement	mm	31 to 40	35	Pass
Upper Rib Displacement	mm	25 to 32	29	Pass
Middle Rib Displacement	mm	30 to 36	31	Pass
Lower Rib Displacement	mm	32 to 38	33	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	38	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	32	Pass
Overall Test Results			Pass	


Laboratory Technician

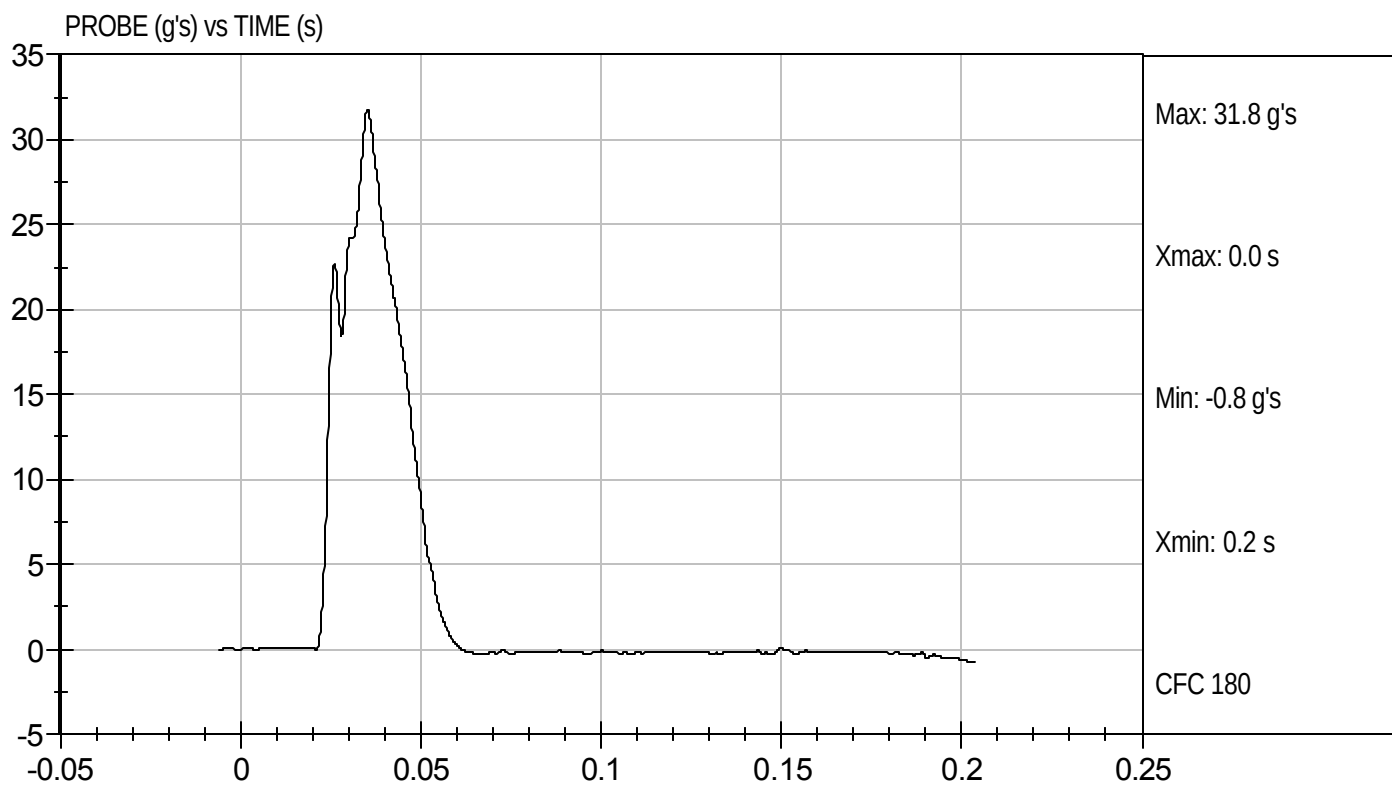
2/22/11
Test Date


Approved By



Test Desc: Thorax With Arm
Component ID: D11634

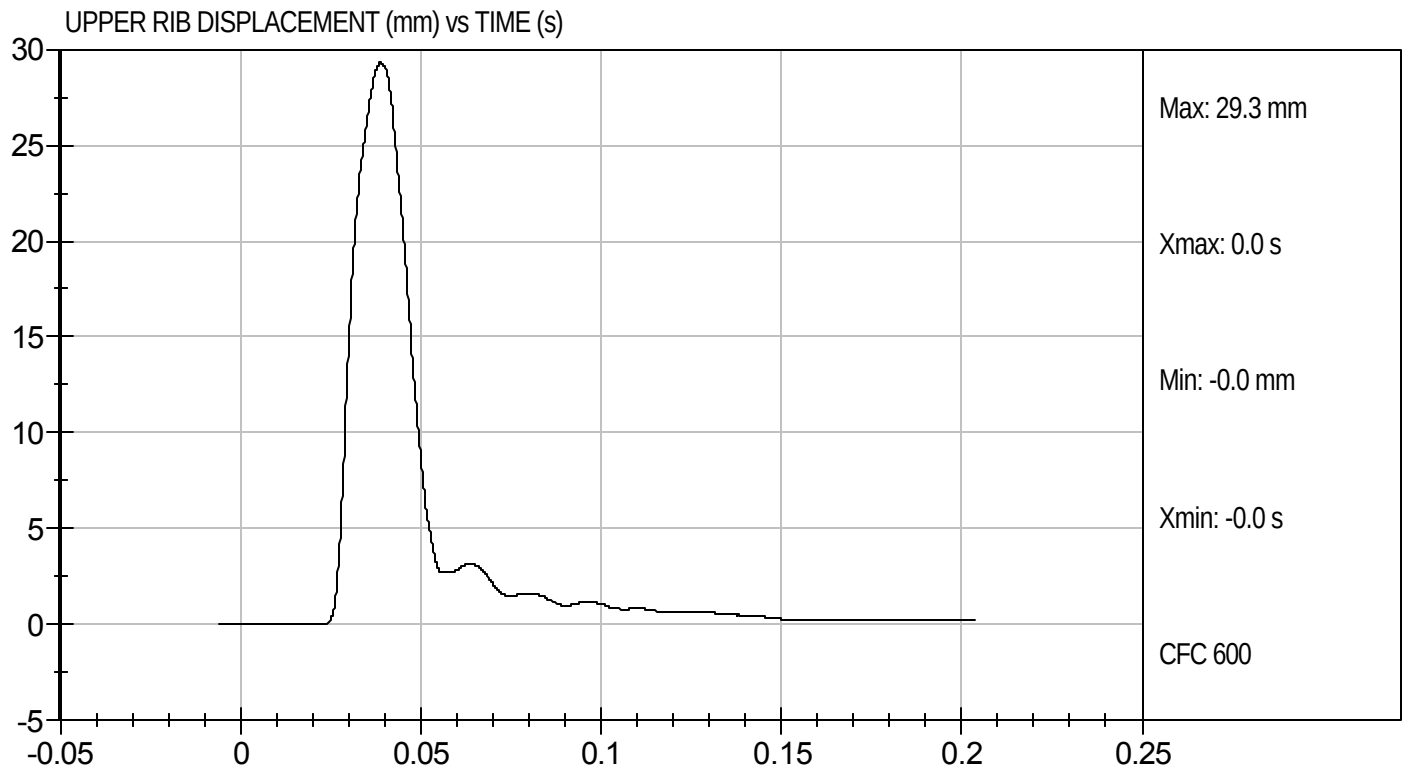
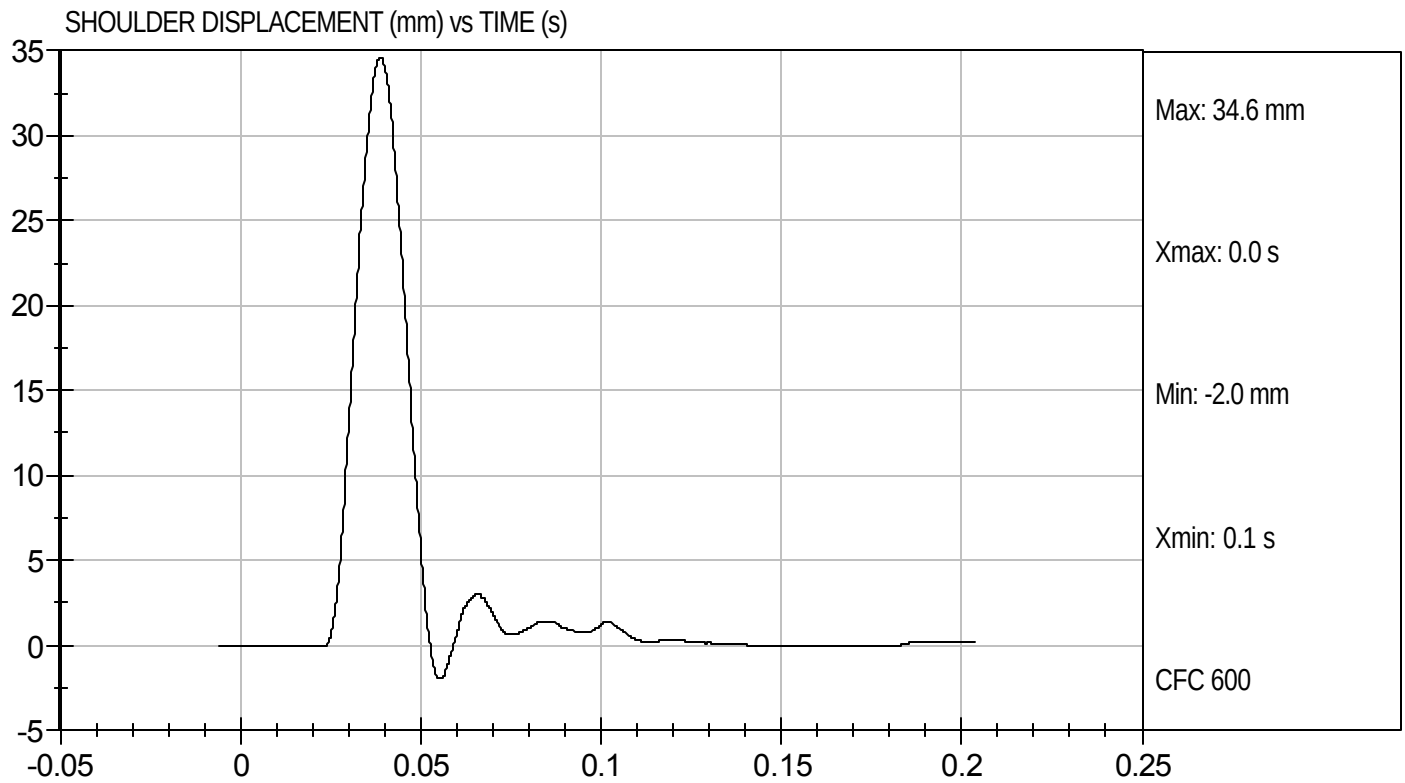
Test Date: 2/22/11
Velocity: 22.2 ft/s, 6.77 m/s





Test Desc: Thorax With Arm
Component ID: D11634

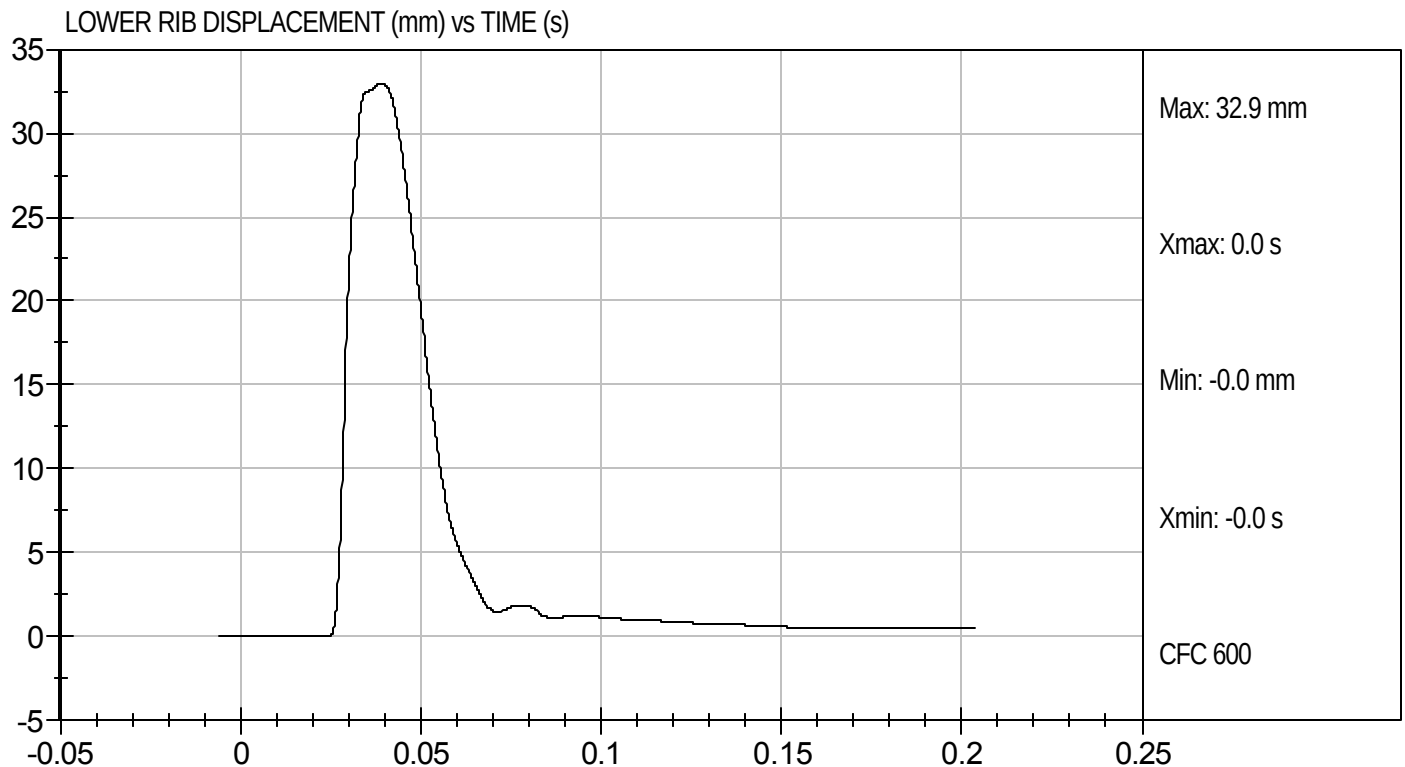
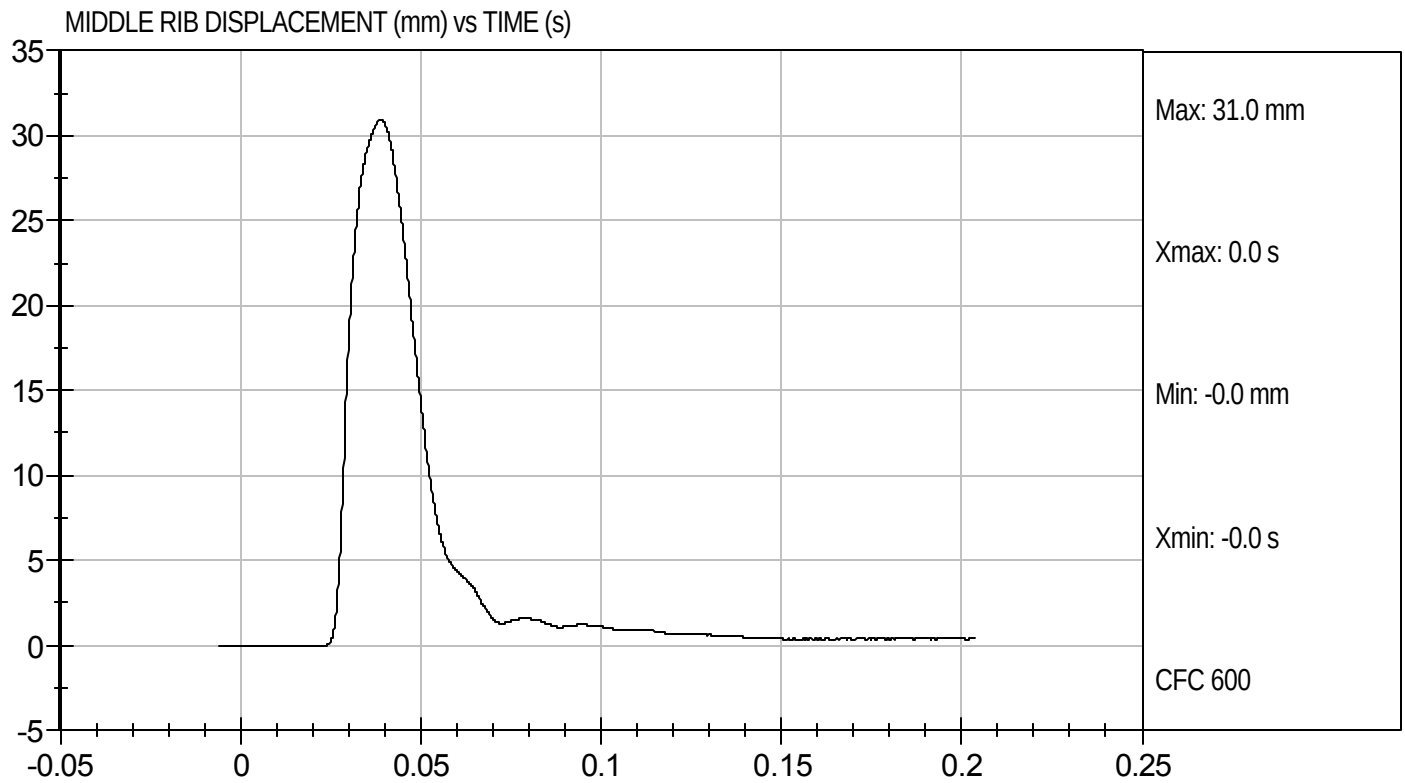
Test Date: 2/22/11
Velocity: 22.2 ft/s, 6.77 m/s





Test Desc: Thorax With Arm
Component ID: D11634

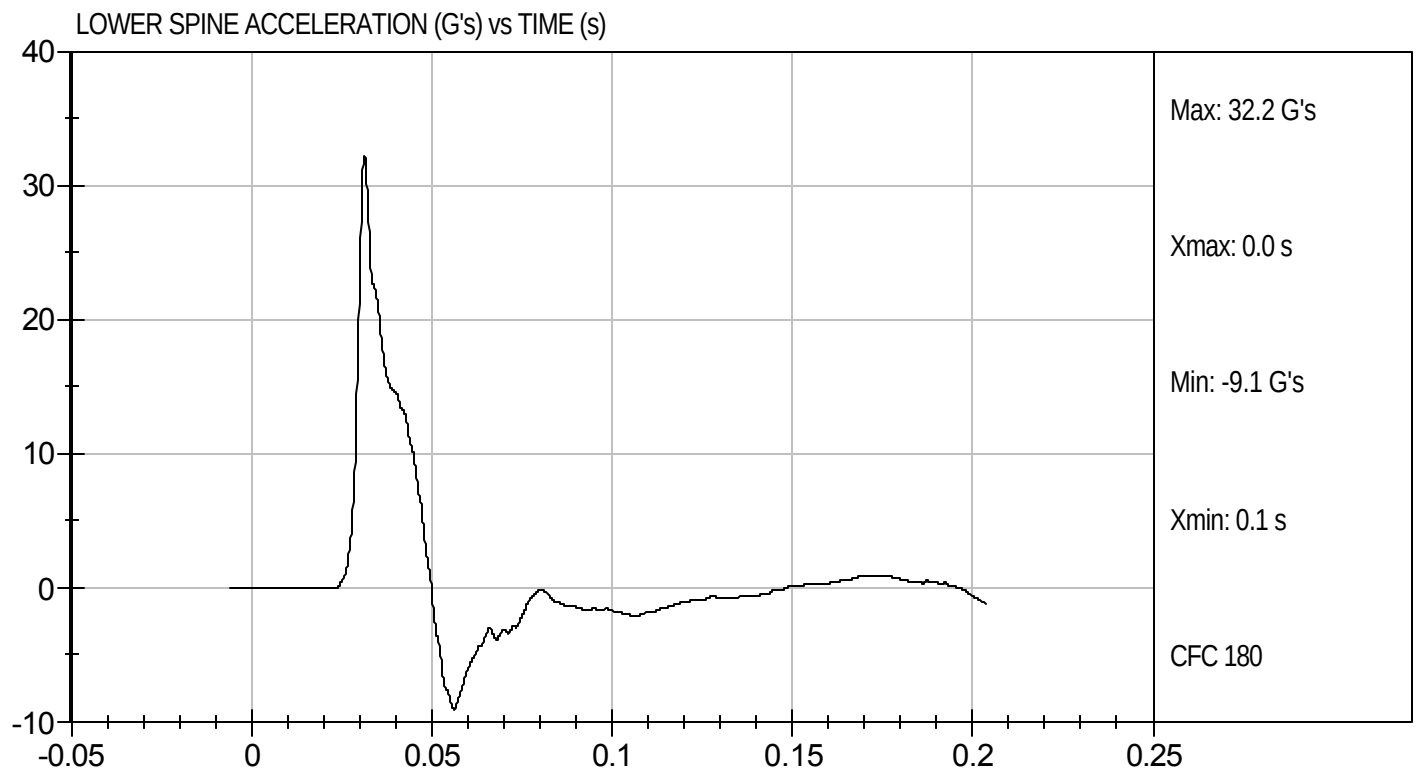
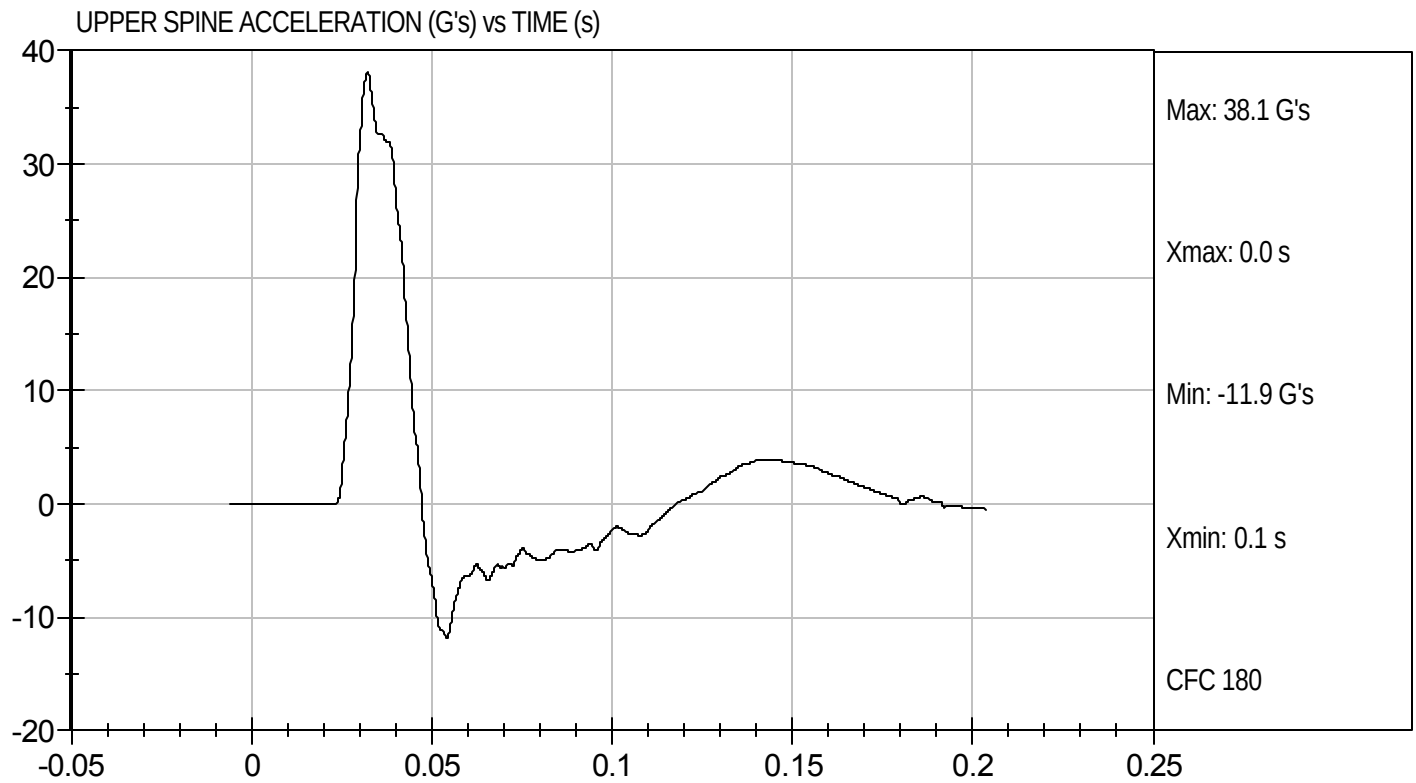
Test Date: 2/22/11
Velocity: 22.2 ft/s, 6.77 m/s





Test Desc: Thorax With Arm
Component ID: D11634

Test Date: 2/22/11
Velocity: 22.2 ft/s, 6.77 m/s



MGA RESEARCH CORPORATION
THORAX (WITHOUT ARM) IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D11635

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Humidity	%	10 to 70	22	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Peak Impactor Force	G's	14 to 18	15	Pass
Upper Rib Displacement	mm	32 to 40	37	Pass
Middle Rib Displacement	mm	39 to 45	40	Pass
Lower Rib Displacement	mm	35 to 43	38	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 17	14	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	9	Pass
Overall Test Results				Pass


Laboratory Technician

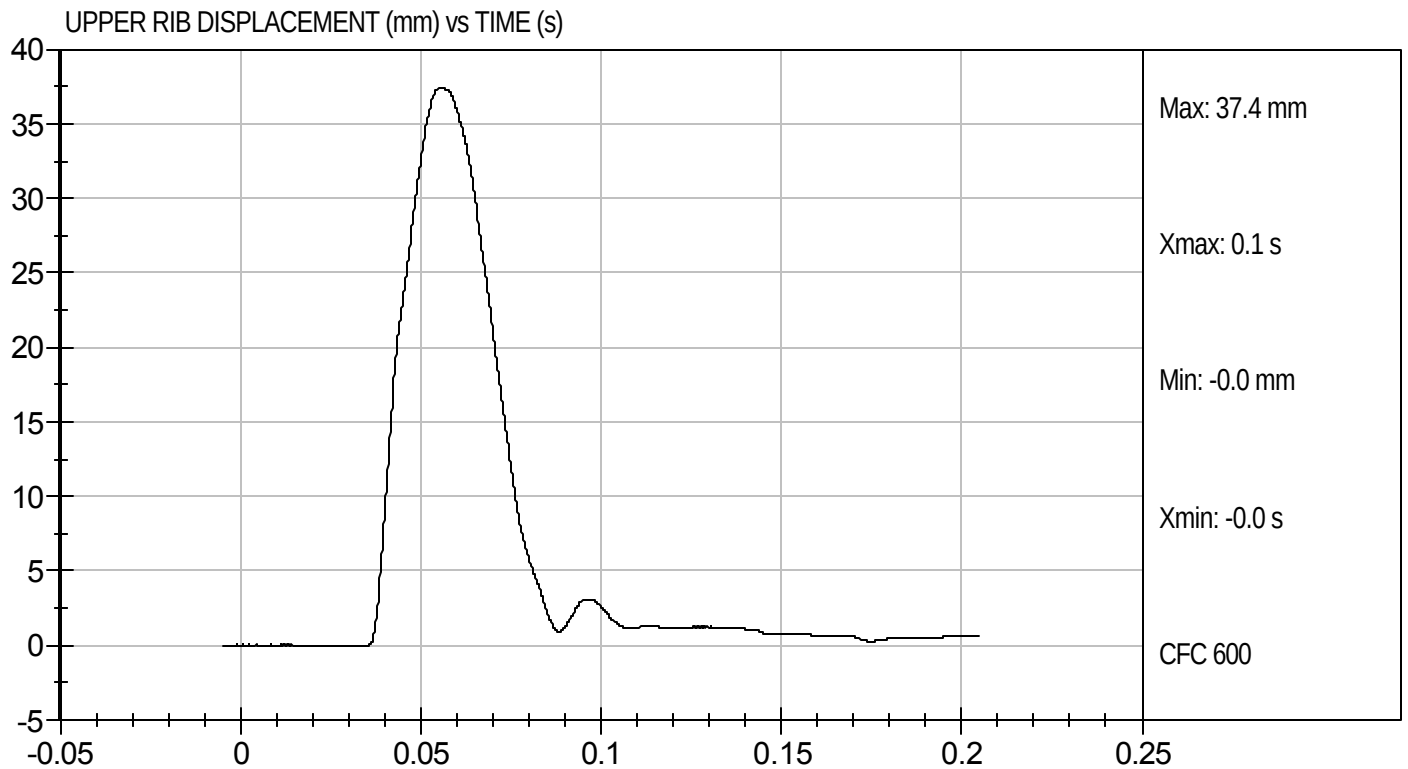
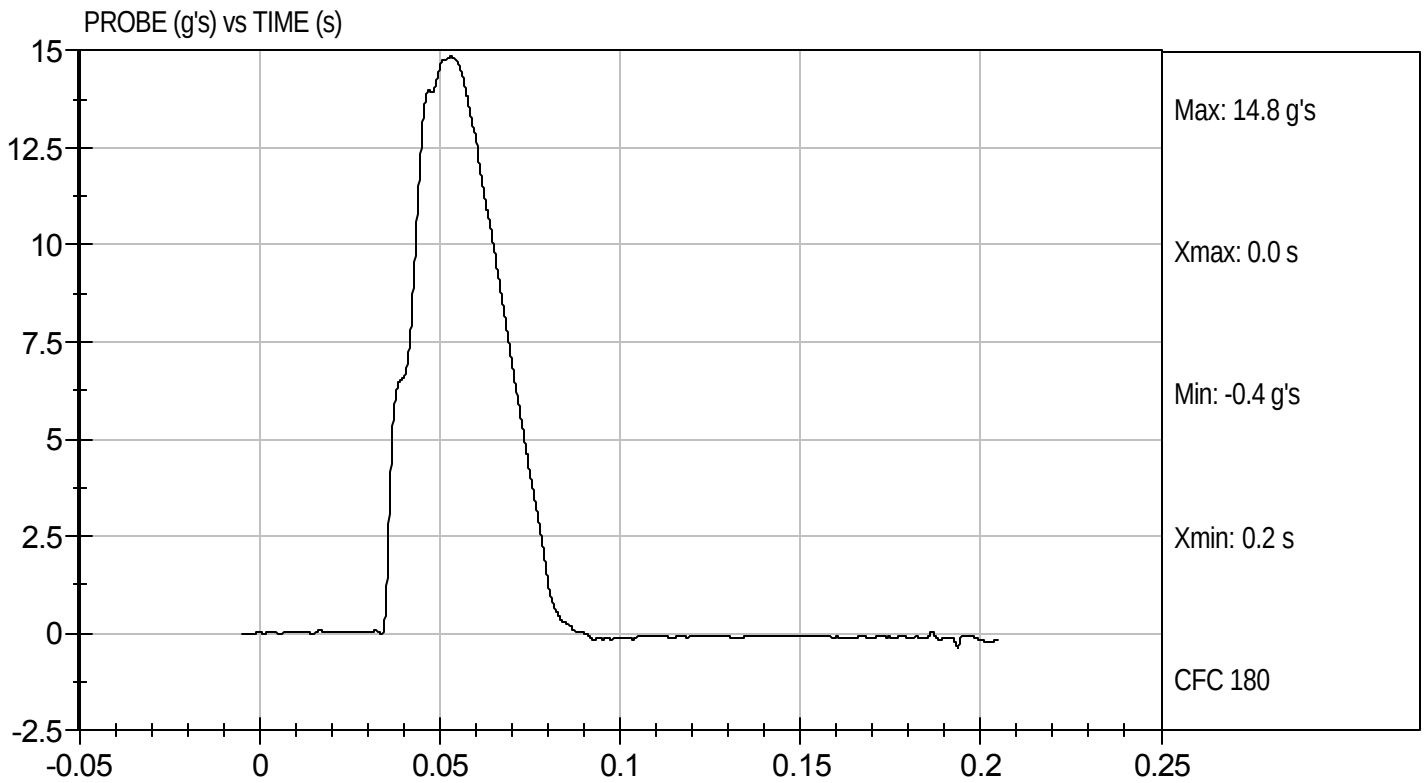
2/22/11
Test Date


Approved By



Test Desc: Thorax Without Arm
Component ID: D11635

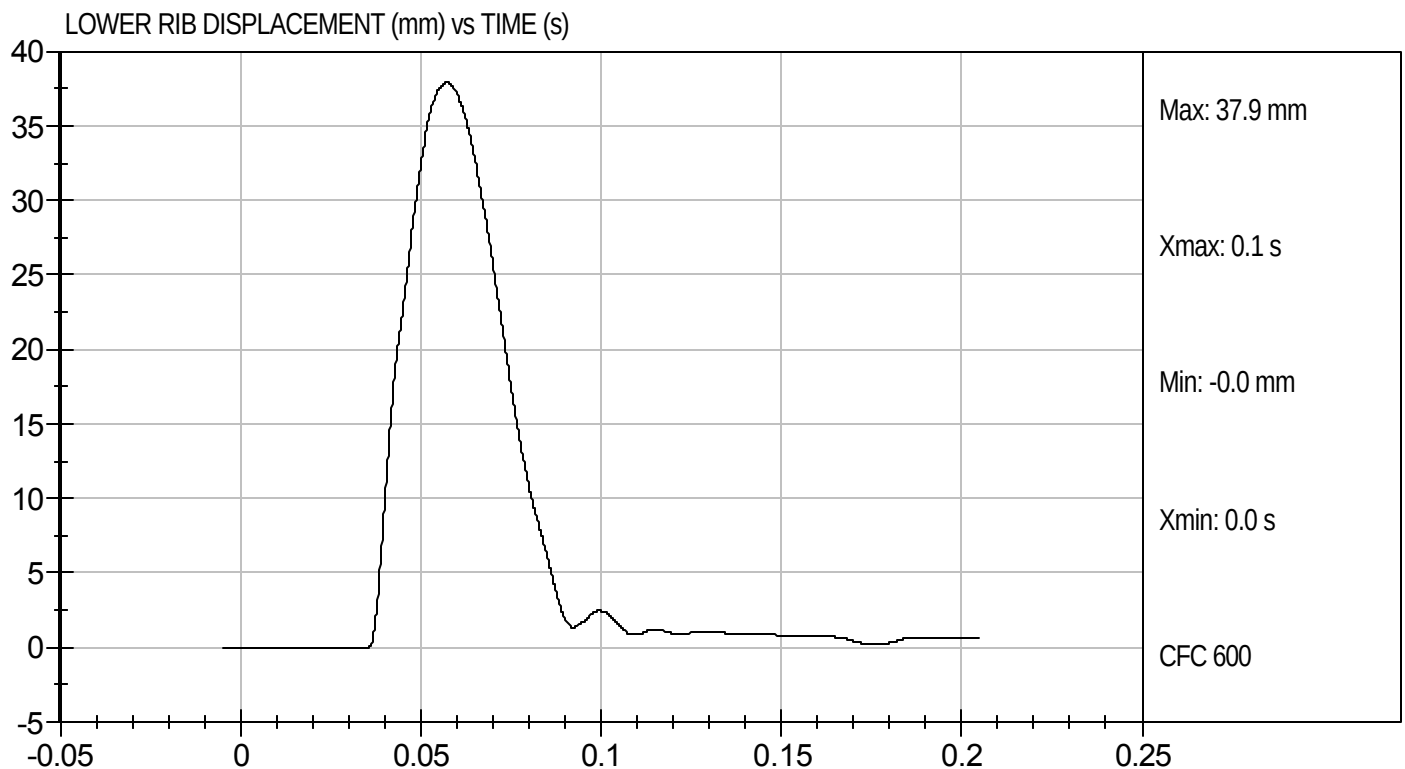
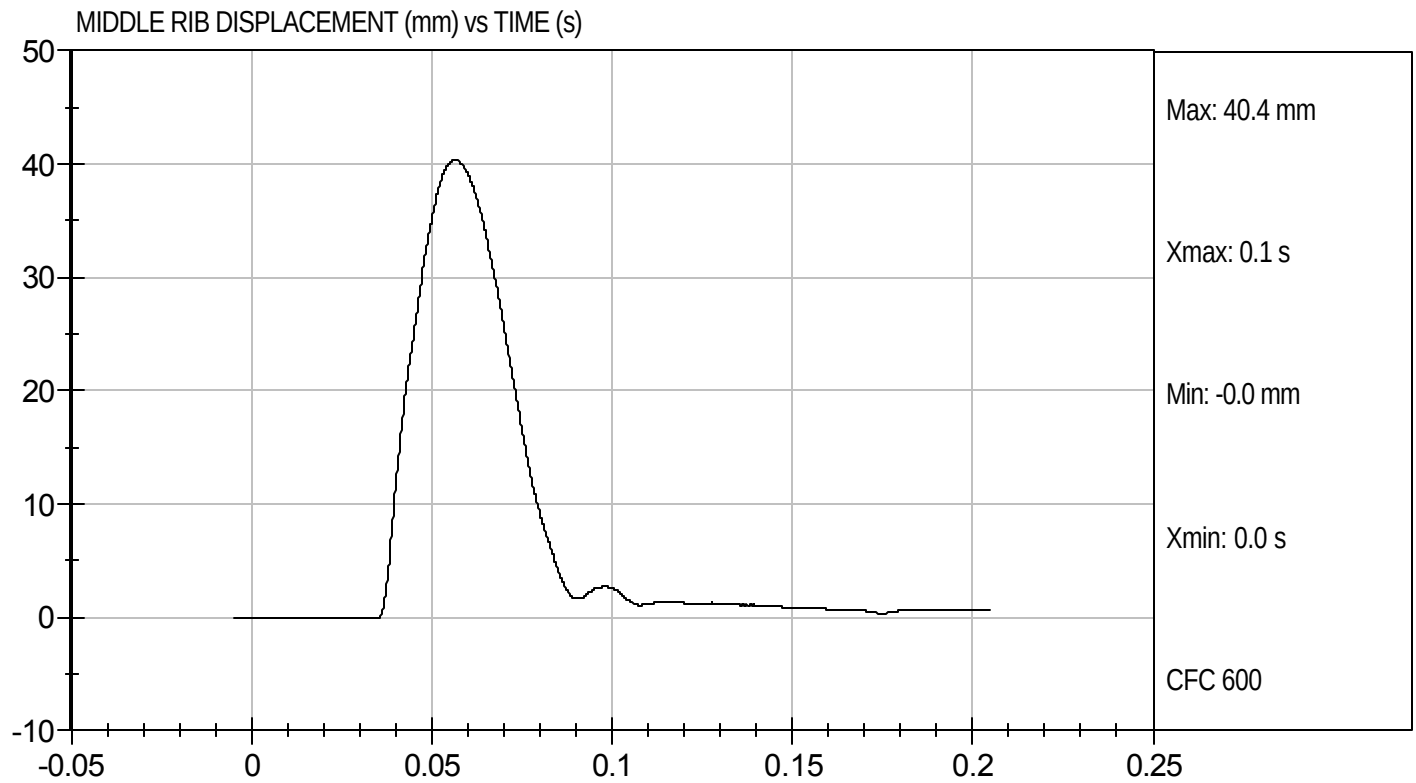
Test Date: 2/22/11
Velocity: 14.36 ft/s, 4.38 m/s





Test Desc: Thorax Without Arm
Component ID: D11635

Test Date: 2/22/11
Velocity: 14.36 ft/s, 4.38 m/s

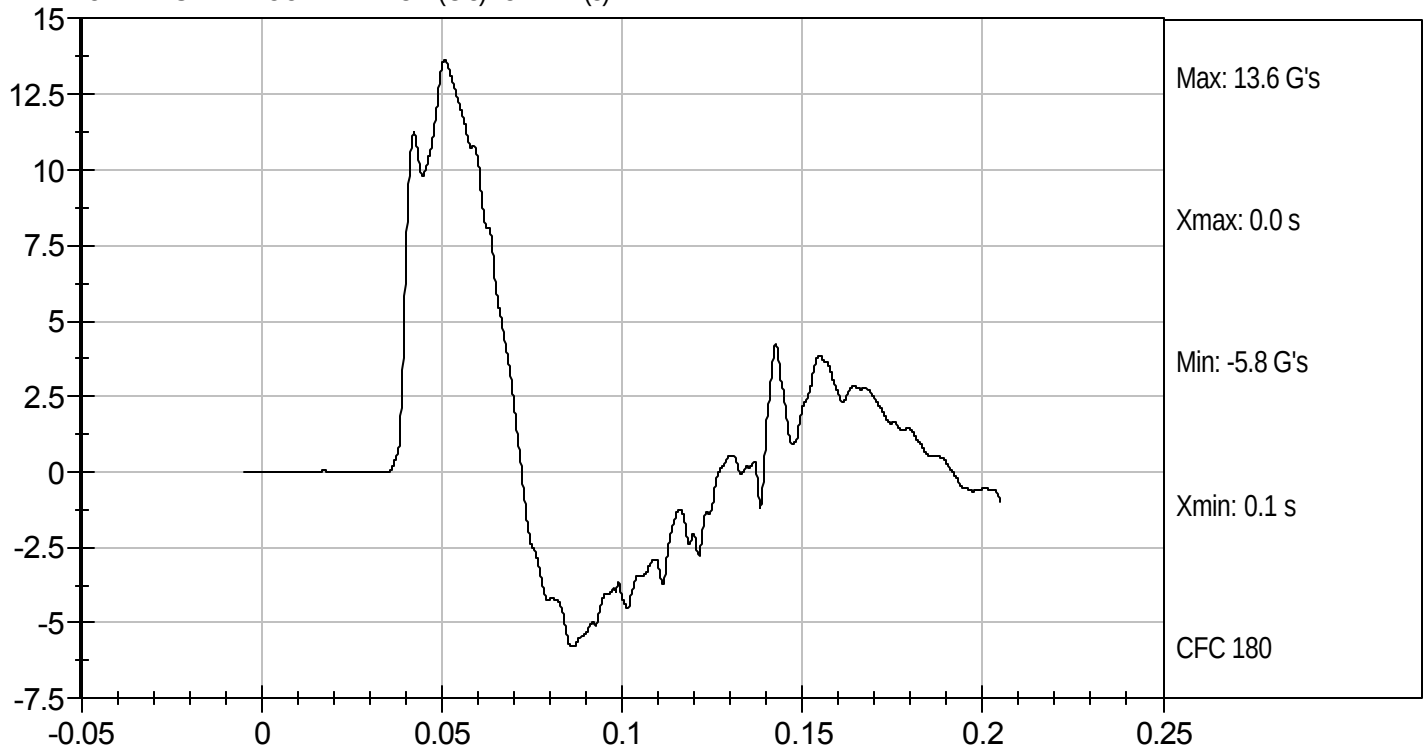




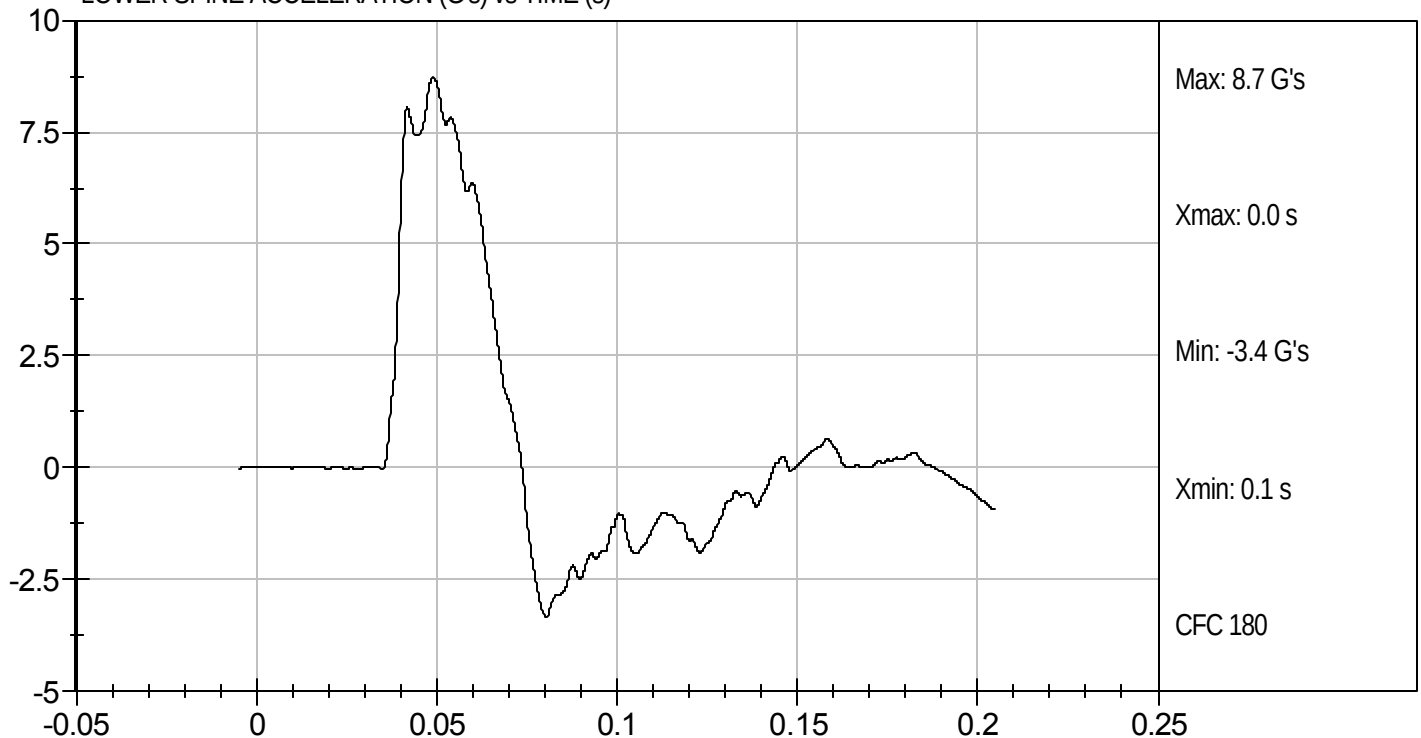
Test Desc: Thorax Without Arm
Component ID: D11635

Test Date: 2/22/11
Velocity: 14.36 ft/s, 4.38 m/s

UPPER SPINE ACCELERATION (G's) vs TIME (s)



LOWER SPINE ACCELERATION (G's) vs TIME (s)



MGA RESEARCH CORPORATION
ABDOMINAL IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D11636

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Humidity	%	10 to 70	22	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Peak Impactor Acceleration	G's	12 to 16	14	Pass
Upper Rib Displacement	mm	36 to 47	40	Pass
Lower Rib Displacement	mm	33 to 44	36	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	11	Pass
			Overall Test Results	Pass


Laboratory Technician

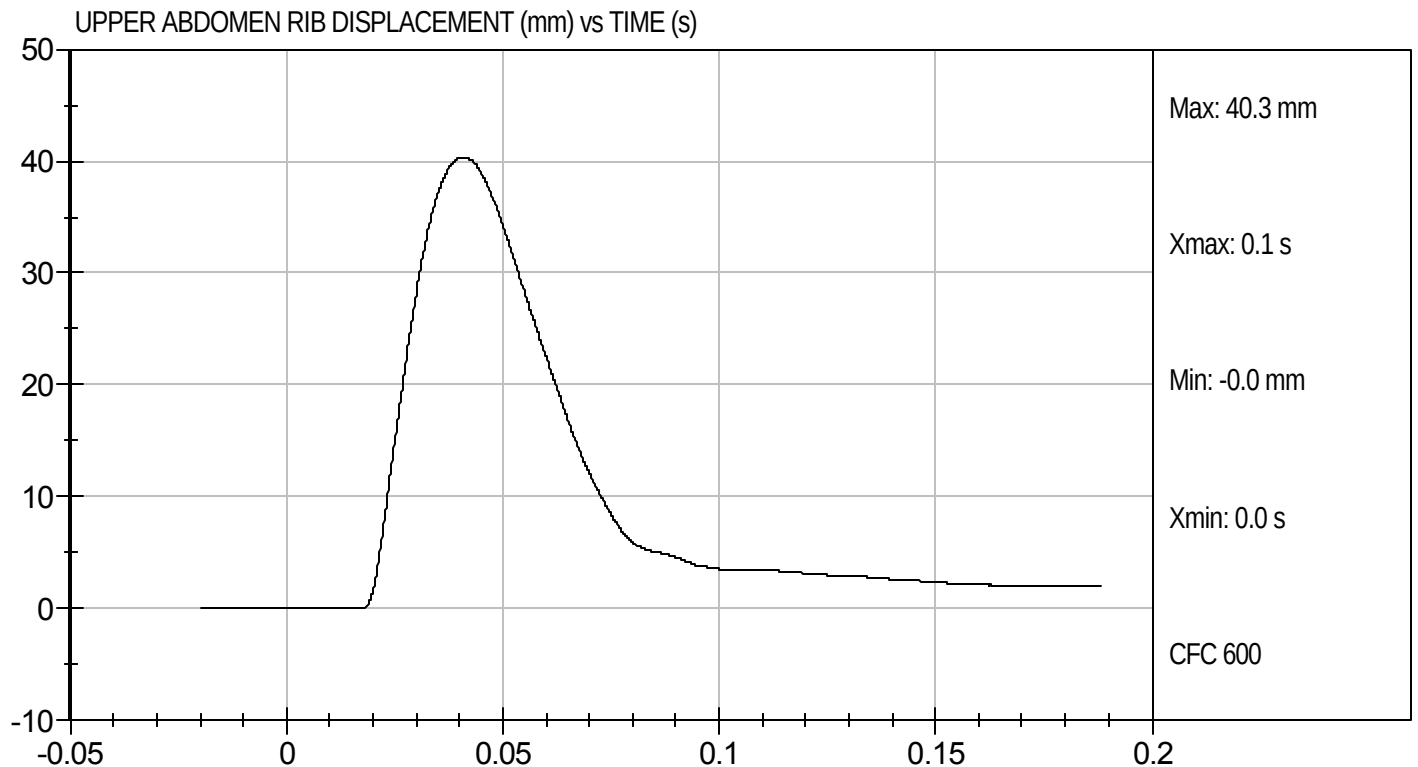
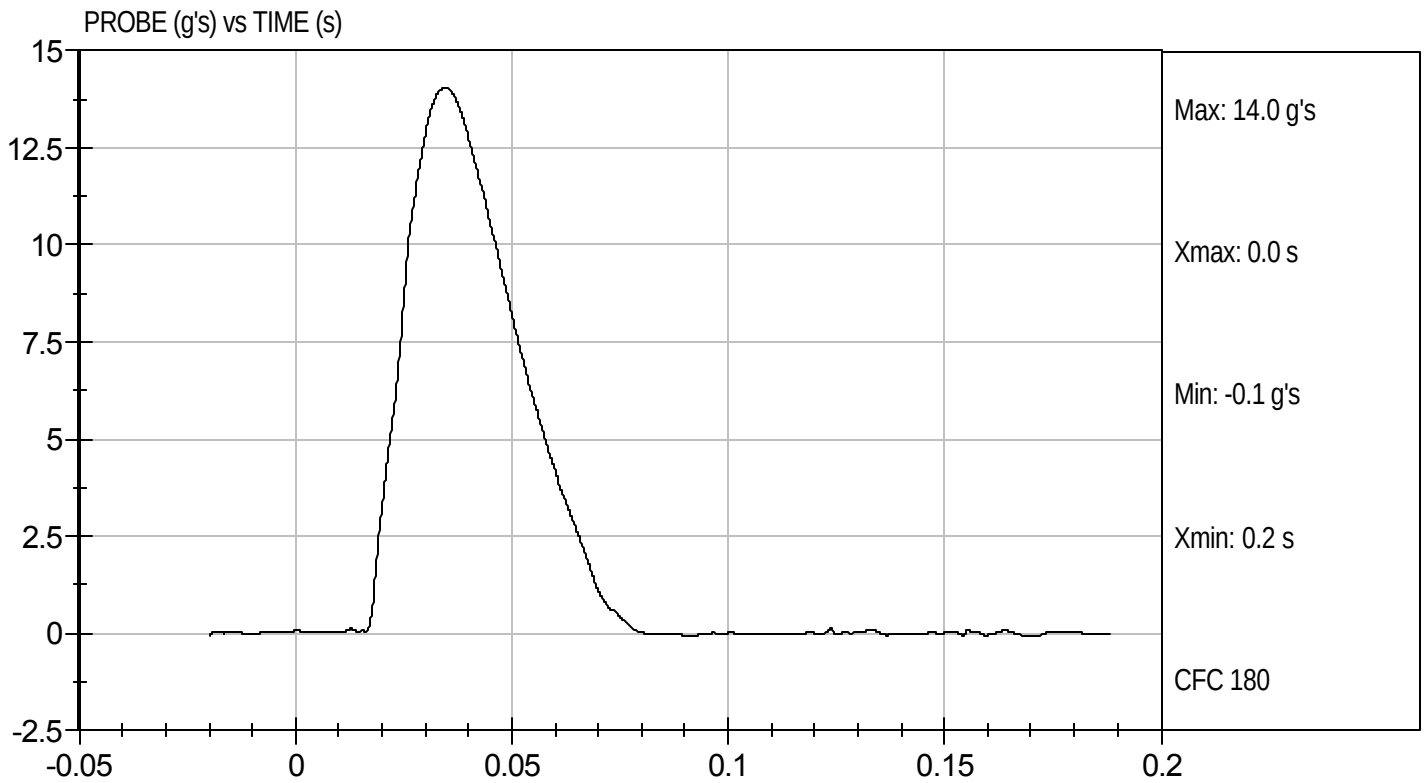
2/22/11
Test Date


Approved By



Test Desc: Abdomen Impact
Component ID: D11636

Test Date: 2/22/11
Velocity: 14.36 ft/s, 4.38 m/s

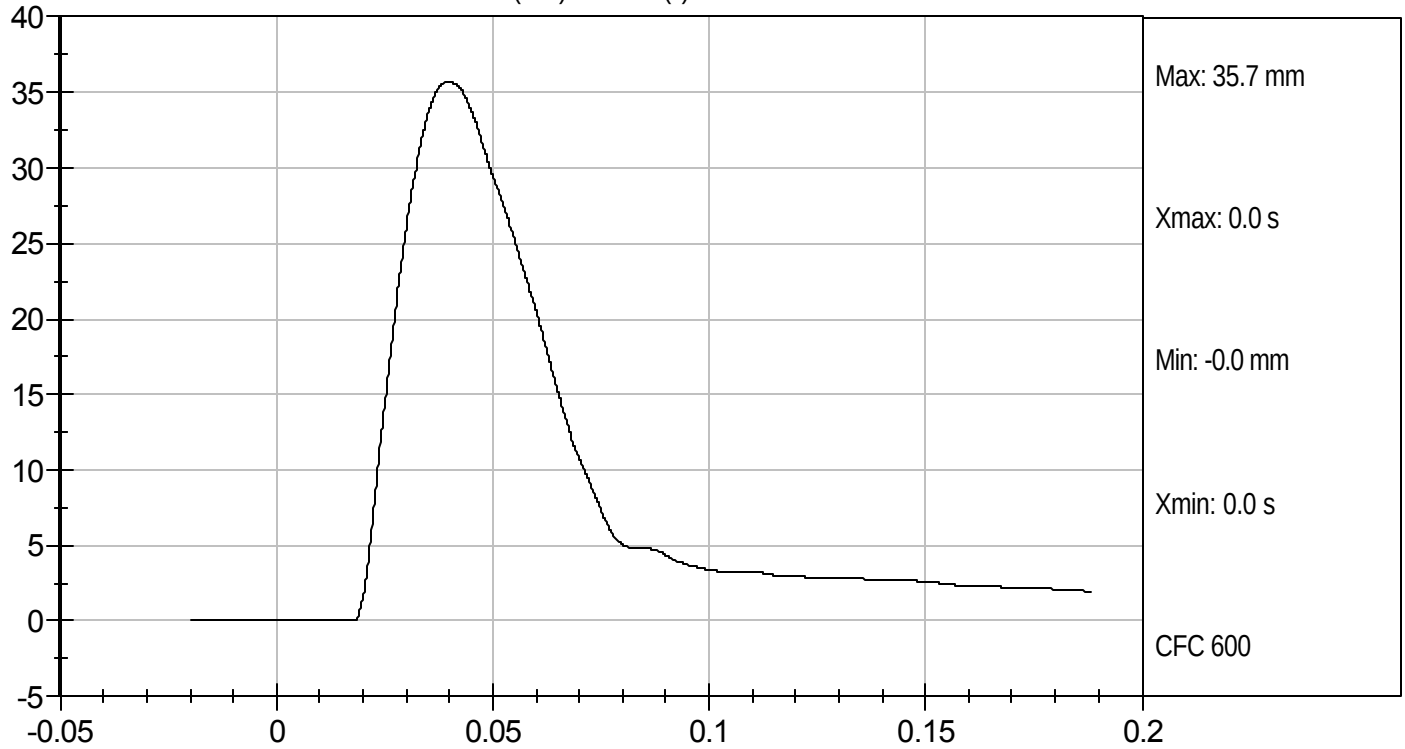




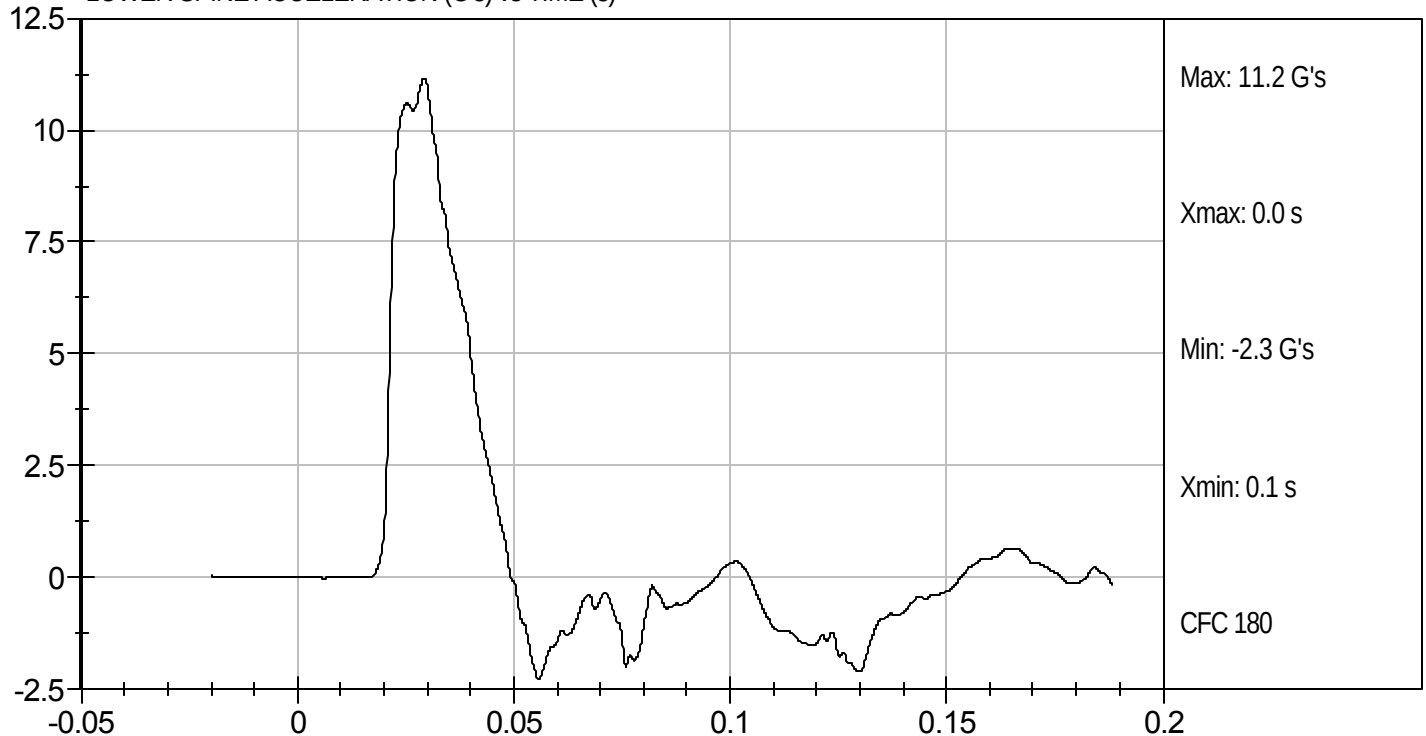
Test Desc: Abdomen Impact
Component ID: D11636

Test Date: 2/22/11
Velocity: 14.36 ft/s, 4.38 m/s

LOWER ABDOMEN RIB DISPLACEMENT (mm) vs TIME (s)



LOWER SPINE ACCELERATION (G's) vs TIME (s)



MGA RESEARCH CORPORATION
PELVIS IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D11637

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Humidity	%	10 to 70	22	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Peak Impactor Acceleration	G's	38 to 47	44	Pass
Pelvis Y Acceleration after 6 ms	G's	34 to 42	42	Pass
Peak Acetabulum Force	N	3600 to 4300	4249	Pass
Overall Test Results			Pass	

Jessica Hall
Laboratory Technician

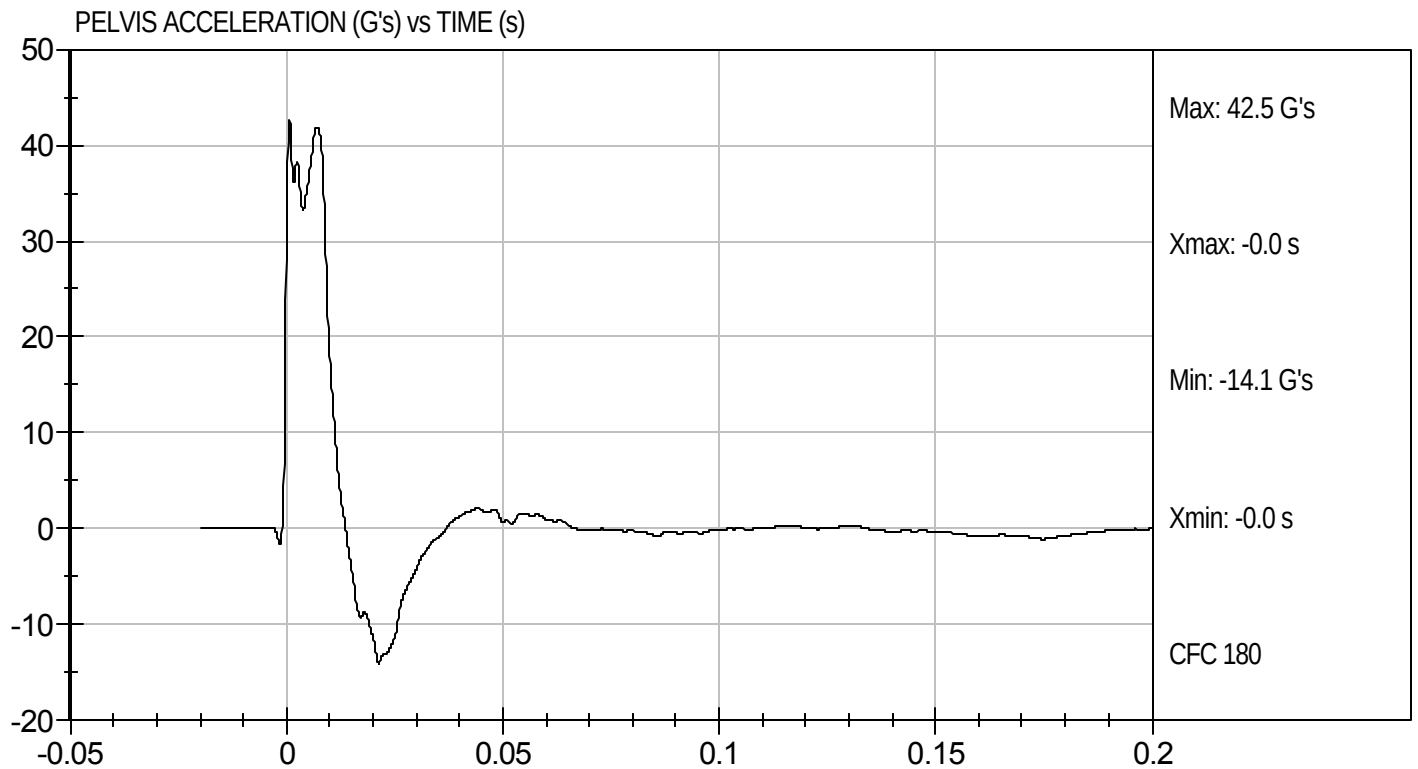
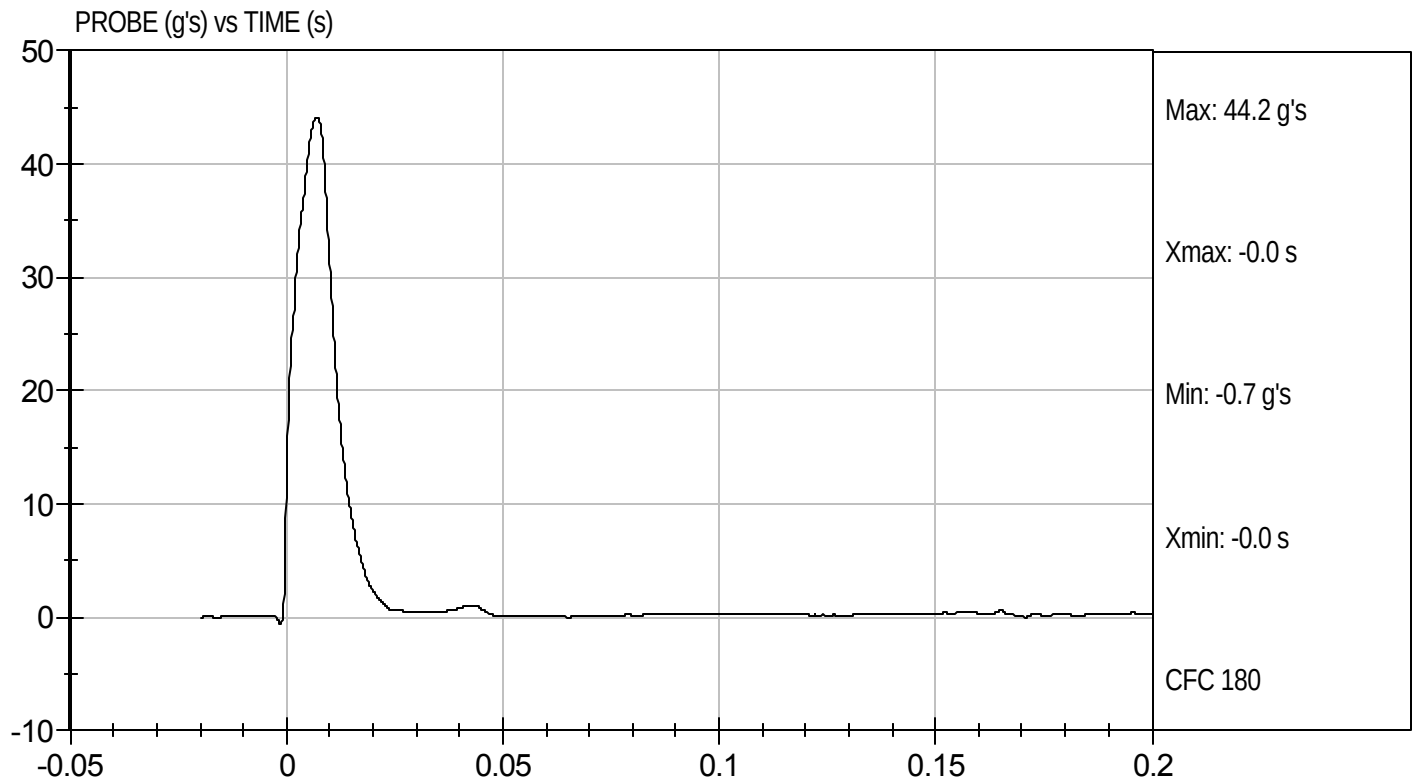
2/22/11
Test Date

David Winkelbauer
Approved By



Test Desc: Pelvis Impact
Component ID: D11637

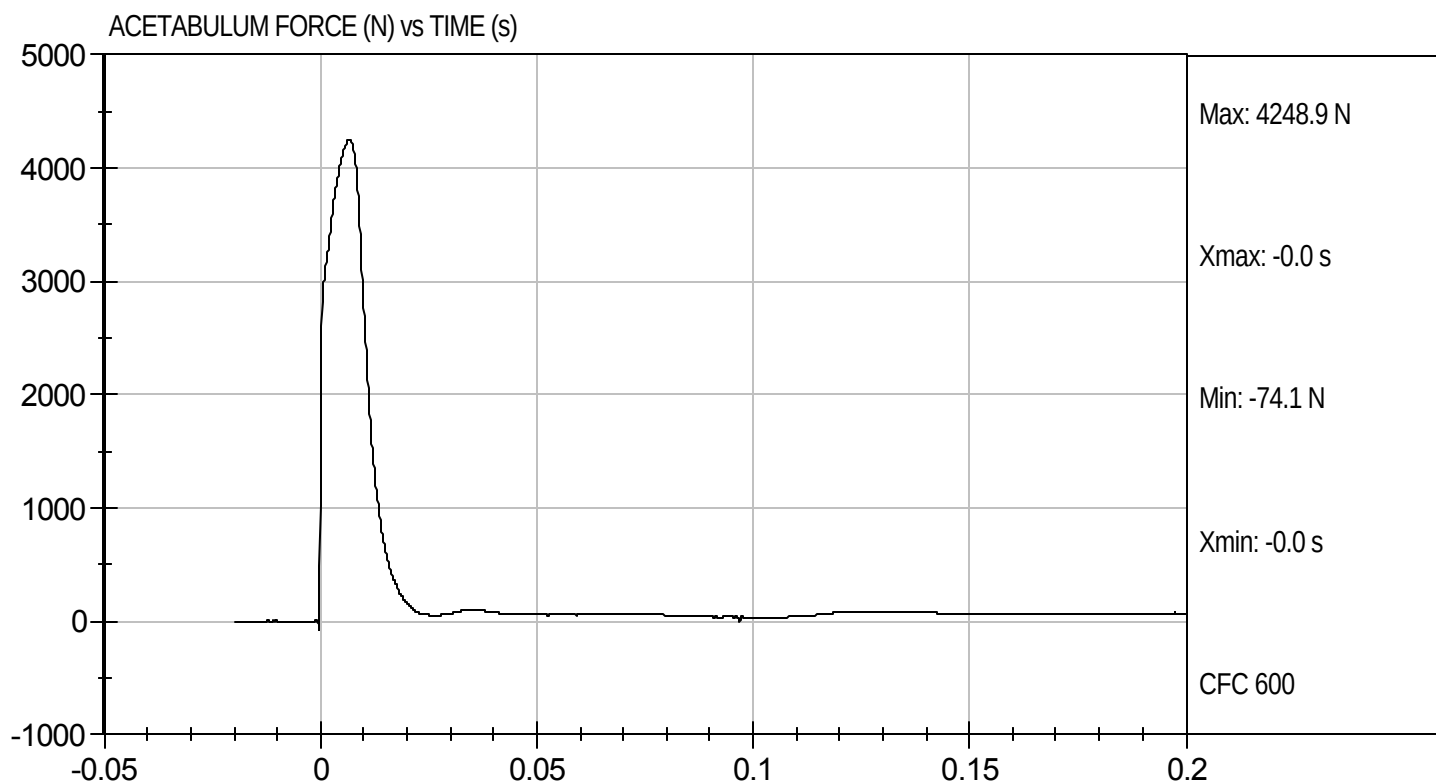
Test Date: 2/22/11
Velocity: 22.2 ft/s, 6.77 m/s





Test Desc: Pelvis Impact
Component ID: D11637

Test Date: 2/22/11
Velocity: 22.2 ft/s, 6.77 m/s



MGA RESEARCH CORPORATION
ILIAC IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D11638

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Humidity	%	10 to 70	22	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Peak Impactor Acceleration	G's	36 to 45	37	Pass
Pelvis Y Acceleration	G's	28 to 39	30	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4478	Pass
Overall Test Results				Pass


Laboratory Technician

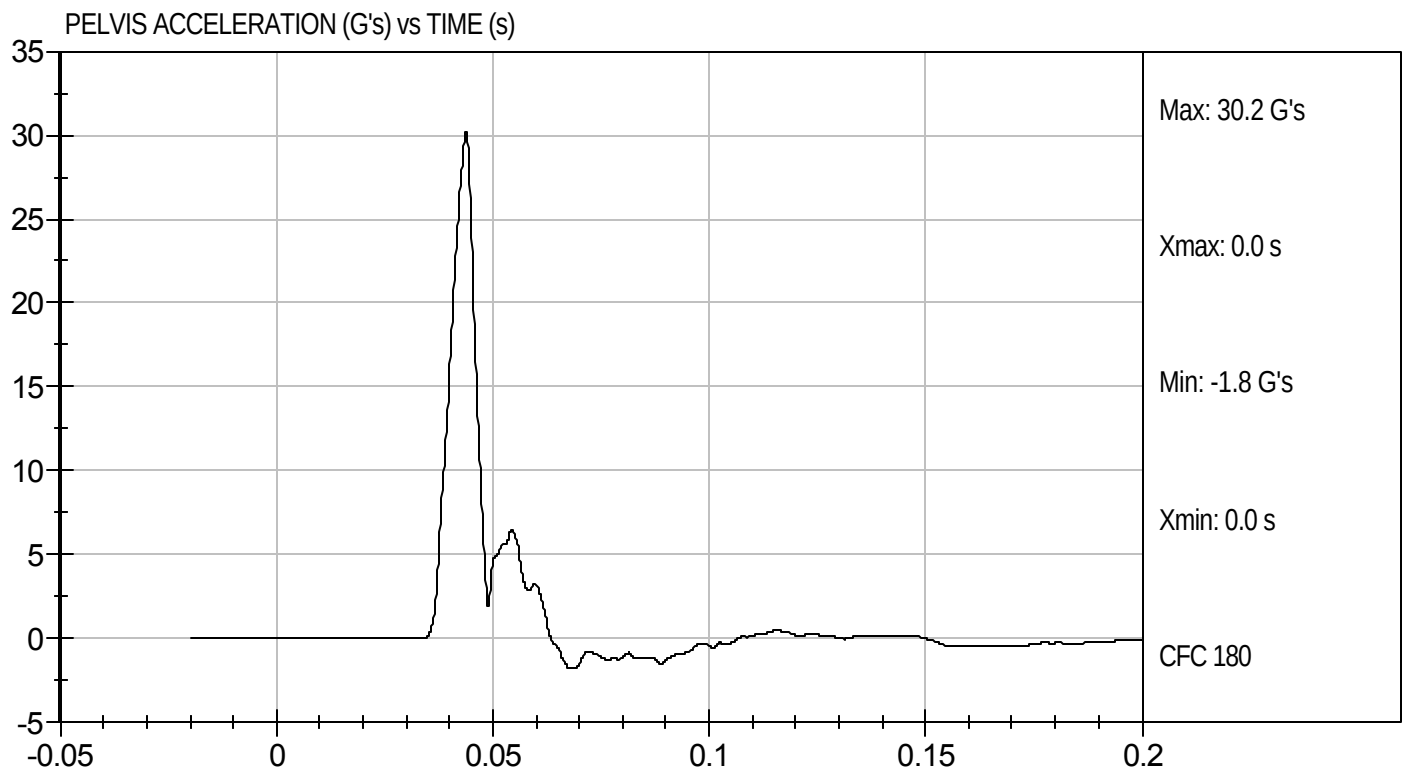
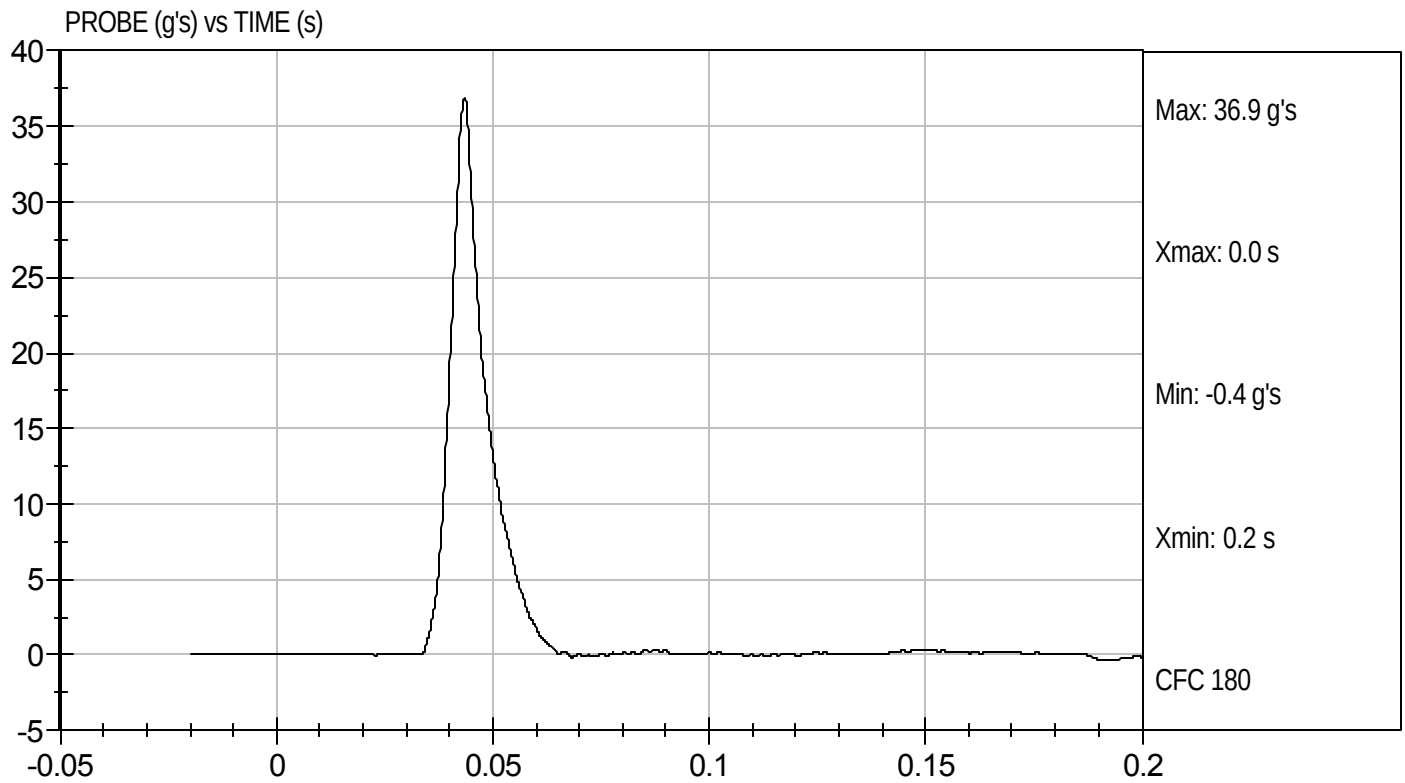
2/22/11
Test Date


Approved By



Test Desc: Iliac Impact
Component ID: D11638

Test Date: 2/22/11
Velocity: 14.36 ft/s, 4.38 m/s





Test Desc: Iliac Impact
Component ID: D11638

Test Date: 2/22/11
Velocity: 14.36 ft/s, 4.38 m/s

