REPORT NUMBER: SPNCAP-MGA-2011-032

NEW CAR ASSESSMENT PROGRAM (NCAP)
Side Impact Pole Test

FORD MOTOR COMPANY
2011 Ford Escape XLT FWD SUV
NHTSA No.: MB0203

MGA RESEARCH CORPORATION
5000 Warren Road
Burlington, WI 53105

Test Date: October 18, 2010

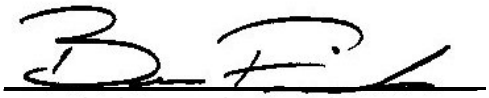
Final Report Date: March 7, 2011

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.

Prepared by: 
Donna Janovicz, Project Manager

Approved by: 
Ben Fischer, Project Engineer

Approval Date: March 7, 2011

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

Technical Report Documentation Page

1. Report No. SPNCAP-MGA-2011-032	*2. Government Accession No.*	*3. Recipient's Catalog No.*
4. Title and Subtitle Final Report of New Car Assessment Program Side Impact Pole Testing of 2011 Ford Escape XLT FWD SUV NHTSA No.: MB0203		*5. Report Date* March 7, 2011 *6. Performing Organization Code* MGA
7. Author(s) Donna Janovicz, Project Manager Ben Fischer, Project Engineer		*8. Performing Organization Report No.* SPNCAP-MGA-2011-032
9. Performing Organization Name and Address MGA Research Corporation 5000 Warren Road Burlington, WI 53105		*10. Work Unit No.* *11. Contract or Grant No.* DTNH22-09-D-00124
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Crashworthiness Standards 1200 New Jersey Ave, SE, Room W43-410 Washington, DC 20590		*13. Type of Report and Period Covered:* Final Test Report October 18, 2010 to March 7, 2011 *14. Sponsoring Agency Code* NVS-111
15. Supplementary Notes		

16. Abstract

A 32.2 km/h (20 mph), 75° oblique impact NCAP Side Pole Test was conducted on the subject 2011 Ford Escape XLT FWD SUV 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 October 18, 2010.

The impact velocity was 32.3 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 447 mm at level 2. The test vehicle's performance was as follows:

	Driver ATD (SID-IIs)		
Measurement Description	**Units**	**Threshold**	**Result**
Head Injury Criteria (HIC_{36})	N/A	1000	358
Resultant Lower Spine Acceleration	Gs	82	53
Combined Acetabular and Iliac Pelvic Force	N	5525	4718

The two doors on the struck side of the vehicle did not separate from the body at the hinges or latches and the opposite doors did not open during the side impact event.

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* 126	22. Price

TABLE OF CONTENTS

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 Ford Escape XLT FWD SUV. 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 Ford Escape XLT FWD SUV. The subject vehicle was towed into the rigid pole at an angle of 75° and a velocity of 32.3 km/h. The test was conducted by MGA Research Corporation in Burlington, Wisconsin, on October 18, 2010. 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 5th Percentile Female	358	53	Iliac Wing	1217
			Acetabular	3716
			Sum	4718

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	No		No	
Side Curtain Airbag	Yes	Yes	Yes	Yes
Side Torso 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 Lower B-Post Y after 25 msec.
Left Mid B-Post Y after 20 msec.
Driver Seat Track Y after 35 msec.

SECTION 3

OCCUPANT AND VEHICLE INFORMATION

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2011 Ford Escape XLT FWD SUV NHTSA No. MB0203
Test Program: NCAP Side Pole Impact Test Test Date: 10/18/2010

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	MB0203	Anti-Lock Brakes	Yes
Model Year	2011	All Wheel Drive	No
Make	Ford	Power Steering	Yes
Model	Escape	Driver Front Airbag	Yes
Body Style	MPV	Driver Curtain Airbag	Yes
VIN	1FMCU0D70BKA13066	Driver Head/Torso Airbag	No
Body Color	Blue Flame Metallic	Driver Torso Airbag	Yes
Delivery Date	9/28/2010	Driver Torso/Pelvis Airbag	No
Odometer (mi)	86	Driver Pelvis Airbag	No
Odometer (km)	138	Driver Knee Airbag	No
Dealer	Griffin Ford	Rear Pass. Front Airbag	No
Transmission	Automatic	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	Yes	Rear Pass. Knee Airbag	No
Sunroof/T-Top	No	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	No	Power Seats	Yes
Does owner's manual provide instruction to turn off automatic door locks?			Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Ford Motor Company
Date of Manufacture	08/10

GVWR (kg)	2014
GAWR Front (kg)	1057
GAWR Rear (kg)	1012

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity (DSC)	2	3		5	
Capacity Weight (VCW) (kg)				483	(A)
DSC x 68.04 kg				340	(B)
Cargo Weight (RCLW) (kg)				143	(A-B)

VEHICLE SEAT TYPE

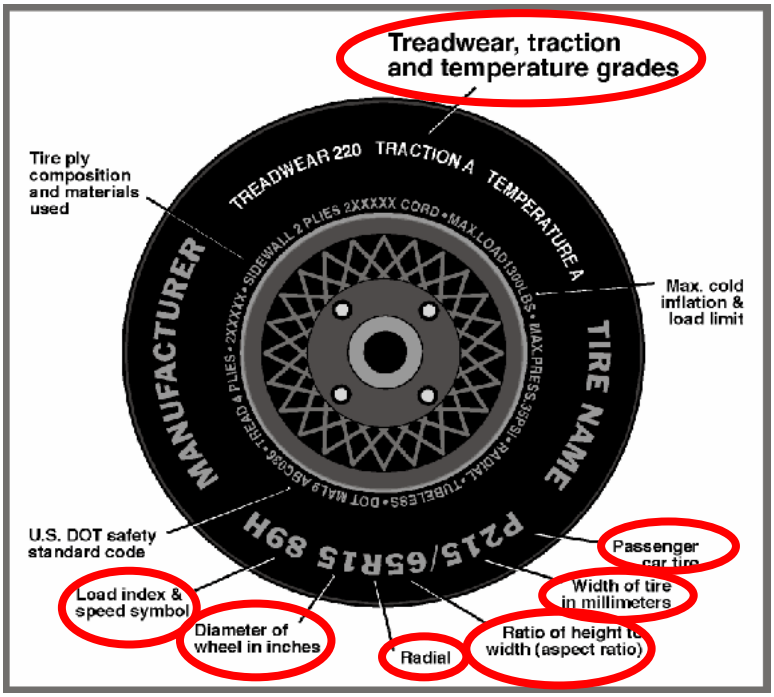
Seating Location	Type of Seat Pan				Type of Seat Back		
	Bucket	Bench	Split Bench	Contoured	Fixed	Adjustable	
						Manual	Power
Front Seat	X					w/Lever	
Rear or Second Row			X		X		
Third Row Seat							

DATA SHEET NO. 1 (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2011 Ford Escape XLT FWD SUV NHTSA No. MB0203
Test Program: NCAP Side Pole Impact Test Test Date: 10/18/2010

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	220	220
Recommended Tire Size	P235/70R16	P235/70R16
Tire Size on Vehicle	P235/70R16	P235/70R16
Tire Manufacturer	Michelin	Michelin
Tire Model	Latitude	Latitude
Treadwear	720	720
Traction	A	A
Temperature Grades	B	B
Tire Plies Sidewall	2	2
Tire Plies Body	5	5
Load Index & Speed Symbol	104T	104T
Tire Material	Rubber	Rubber
DOT Safety Code Right	B37P 7PMX	B37P 7PMX
DOT Safety Code Left	B37P 7PMX	B37P 7PMX

DATA SHEET NO. 1 (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2011 Ford Escape XLT FWD SUV NHTSA No. MB0203
Test Program: NCAP Side Pole Impact Test Test Date: 10/18/2010

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	462.2	311.2		473.1	397.8		468.1	410.5	
Right	kg	434.5	308.9		437.7	389.6		441.4	385.1	
Ratio	%	59.1	40.9		53.6	46.4		53.3	46.7	
Totals	kg	896.7	620.1	1516.8	910.8	787.4	1698.2	909.5	795.6	1705.1

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1516.8	(A)
Actual Weight of 1 P572V ATD (SID-IIs) ATD Used	kg	52.2	(B)
Rated Cargo/Luggage Weight (RCLW)	kg	136	(C)
Calculated Target Vehicle Test Weight (TVTW)	kg	1705.0	(A+B+C)

TEST VEHICLE ATTITUDES AND CG

	Units	As Delivered	As Tested	Fully Loaded
Driver Door Sill Angle (front-to-rear)*	deg	-1.6	-1.1	-1.1
Front Passenger Sill Angle (front-to-rear)*	deg	-1.8	-1.3	-1.1
Front Bumper Angle (left-to-right)**	deg	-0.1	-0.2	-0.3
Rear Bumper Angle (left-to-right)**	deg	-0.3	-0.3	-0.6
Vehicle CG (Aft of Front Axle)	mm	1075	1219	1227
Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline)	mm	15	20	23

*Front up is positive ** Left up is positive

GENERAL VEHICLE TEST DATA

Measurement Description	Units	Value
Weight of Ballast in Cargo Area	kg	59.9
Weight of Vehicle Components Removed	kg	6.8

Vehicle components removed to meet target vehicle test weight: Trunk carpet & plastic, spare tire cover, passenger side mirror, splash guard, and right tail light.

TEST VEHICLE IMPACT POINT DATA

Measurement Parameter	Units	Value
Vertical Impact Reference Line (Aft of Front Axle)	mm	1094
Actual Impact Point (Aft of Front Axle)	mm	1094
Impact Point Difference (- forward / + rearward)	mm	0

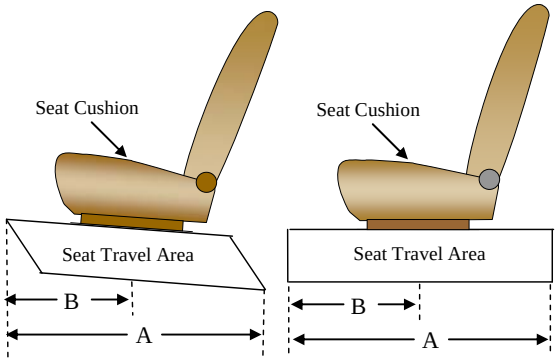
DATA SHEET NO. 2

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

Test Vehicle: 2011 Ford Escape XLT FWD SUV NHTSA No. MB0203
Test Program: NCAP Side Pole Impact Test Test Date: 10/18/2010

SEAT FORE/AFT POSITIONS

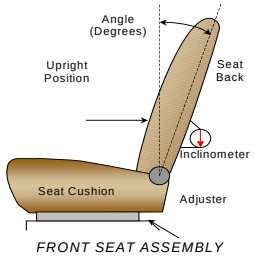
The driver seat was a power fore/aft adjustable seat with a power height/angle adjustment. The seat travel was set as specified in Appendix B of the TP dated January 2010. The right front passenger seat was set to match the driver seat. The rear passenger seats were non-adjustable.



SEAT FORE/AFT POSITIONING	Total Fore/Aft Travel (mm)	Placed in Detent # or Position (mm)
Driver Seat	244 mm	0 mm (full forward)
Front Passenger Seat	240 mm	0 mm (full forward)
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 at the headrest post.



SEAT BACK ANGLE	Degrees	Detents
Driver Seat Back Angle with Seated Dummy	-0.1	
Front Passenger Seat Back Angle	-0.3	
Struck Side Rear Seat Back Angle	Fixed	
Non-Struck Side Rear Passenger Seat Back Angle	Fixed	

SEAT BELT UPPER ANCHORAGE

The driver and passenger seat belt upper anchorages were set at the manufacturer's specified placement in Form 1.

SEAT BELT UPPER ANCHORAGES	Total # of Positions	Placed in Position #
Driver Seat	4 detents	2 (uppermost as 0)
Front Passenger Seat	4 detents	2 (uppermost as 0)

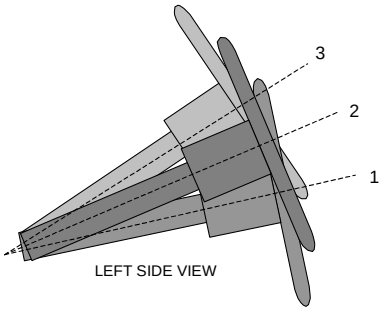
DATA SHEET NO. 2 (CONTINUED)

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

Test Vehicle: 2011 Ford Escape XLT FWD SUV NHTSA No. MB0203
Test Program: NCAP Side Pole Impact Test Test Date: 10/18/2010

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.



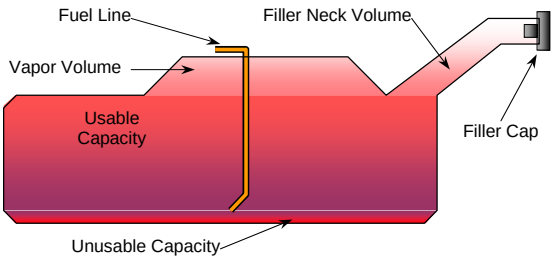
STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITIONING

	Degrees	Fore/Aft Position (mm)
Lowermost - Position 1	69.9	
Geometric Center – Position 2	67.4	
Uppermost – Position 3	64.9	
Telescoping Steering Wheel Travel		
Test Position	67.4	

FUEL PUMP

Describe the fuel pump type, its behavior, and the location of the fuel filler pipe. The vehicle is equipped with an electric fuel pump. The electric fuel pump operates for 2 seconds to pressurize the fuel system following the actuation of the ignition. If no attempt has been made to start the engine within 2 seconds following ignition actuation, the fuel pump will shut off. The fuel pump operates continuously while the engine is running. If the engine stalls, the fuel pump is deactivated. Also, a fuel pump shut-off switch is provided, designed to stop fuel flow to the engine if the vehicle sustains an impact above a certain magnitude. The fuel pipe is on the left side.



VEHICLE FUEL TANK ASSEMBLY

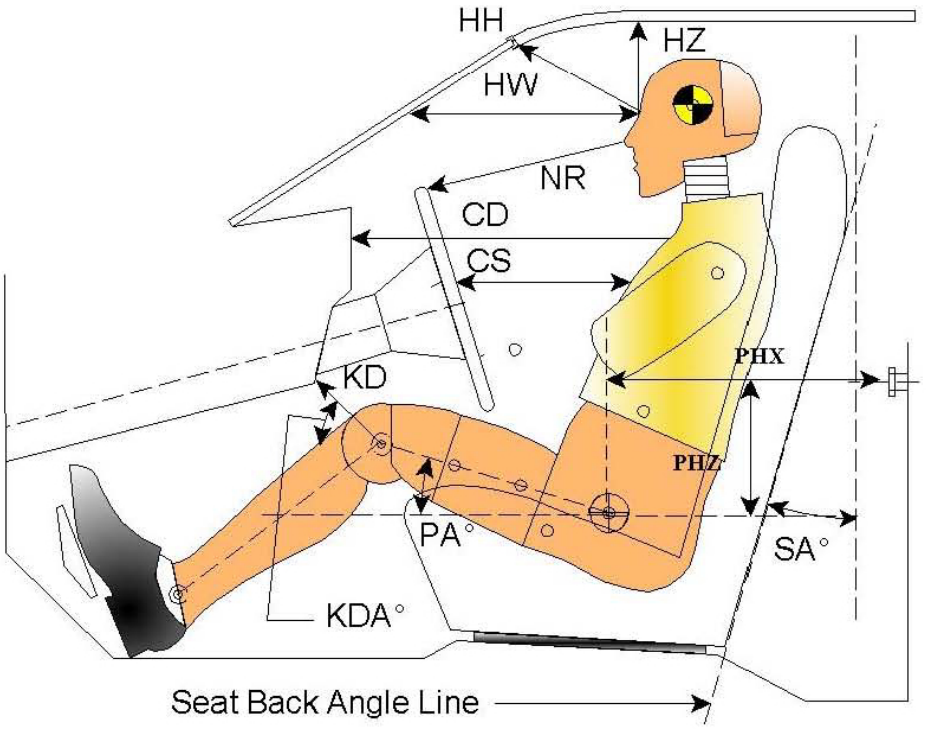
FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of “Standard” Tank	68.1
Usable Capacity of “Optional” Tank	
Usable Capacity of Standard Tank as Specified in Owner’s Manual	66.2
Usable Capacity of Optional Tank as Specified in Owner’s Manual	
92-94% of Usable Capacity	62.7 to 64.0
Actual Amount of Solvent Used	63.2
1/3 of Usable Capacity	22.7

.DATA SHEET NO. 3

DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 Ford Escape XLT FWD SUV NHTSA No. MB0203
Test Program: NCAP Side Pole Impact Test Test Date: 10/18/2010

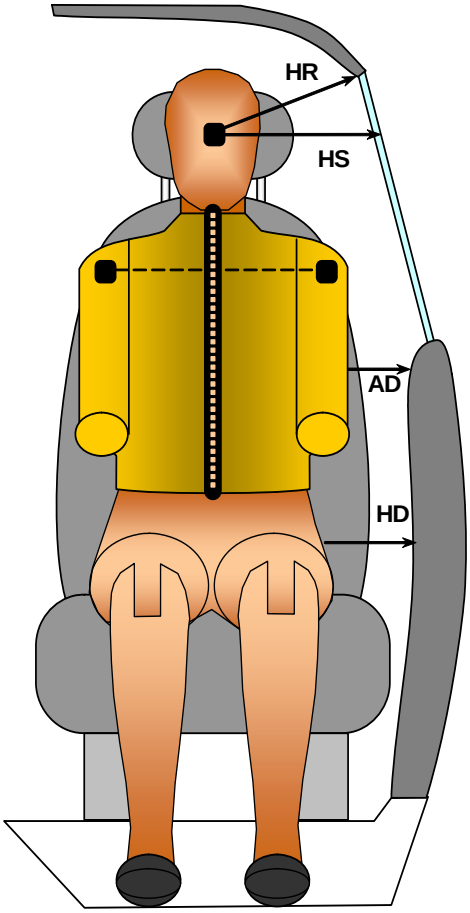


Code	Measurement Description	Driver S/N 296	
		Length (mm)	Angle (°)
HH	Head to Header	259	
HW	Head to Windshield	496	
HZ	Head to Roof	207	
NR	Nose to Rim	218	
CD	Chest to Dash	391	
CS	Chest to Steering Wheel	179	
KDL/KDAL	Left Knee to Dash	69	34.3
KDR/KDAR	Right Knee to Dash	63	36.9
PA	Pelvic Angle		19.4
PHX	H-Point to Striker (X-Axis)	342	
PHZ	H-Point to Striker (Z-Axis)	84	
SA	Seat Back Angle		-0.1

DATA SHEET NO. 4

DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 Ford Escape XLT FWD SUV NHTSA No. MB0203
Test Program: NCAP Side Pole Impact Test Test Date: 10/18/2010



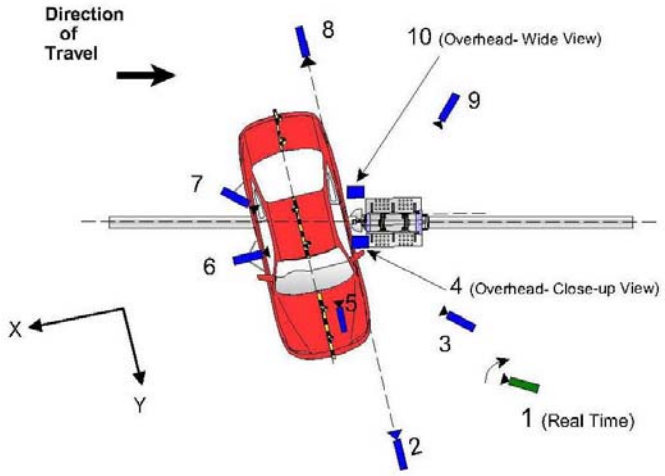
FRONT VIEW OF DUMMY

Code	Measurement Description	Driver S/N 296 Length (mm)
HR	Head to Side Header	242
HS	Head to Side Window	349
AD	Arm to Door	160
HD	H-Point to Door	141

DATA SHEET NO. 5

CAMERA LOCATIONS AND DATA

Test Vehicle: 2011 Ford Escape XLT FWD SUV NHTSA No. MB0203
Test Program: NCAP Side Pole Impact Test Test Date: 10/18/2010



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	5520	-1630	24	1000
3	Impact Side 45° Forward	-1840	4180	-1670	20	1000
4	Overhead Closeup	40	0	-4520	50	1000
5	Onboard – Driver Front				12.5	1000
6	Onboard – Driver Side				8	1000
7	Onboard – Driver Rear				8	1000
8	Rear Ground Level	0	-6620	-1630	24	1000
9	Impact Side 45° Rearward	-3590	-2810	-1710	20	1000
10	Overhead Wide View	110	0	-4580	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.

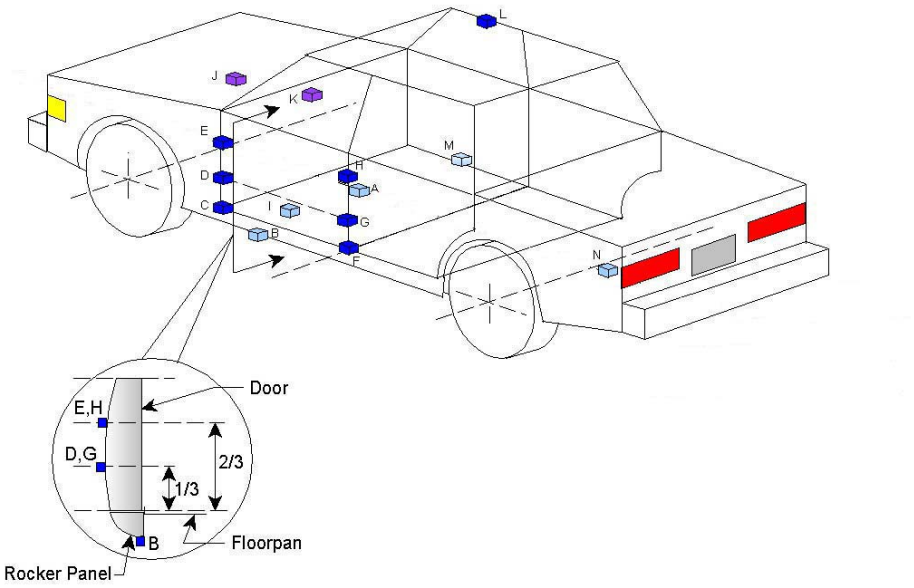
INSTRUMENTATION

	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 Ford Escape XLT FWD SUV NHTSA No. MB0203
Test Program: NCAP Side Pole Impact Test Test Date: 10/18/2010



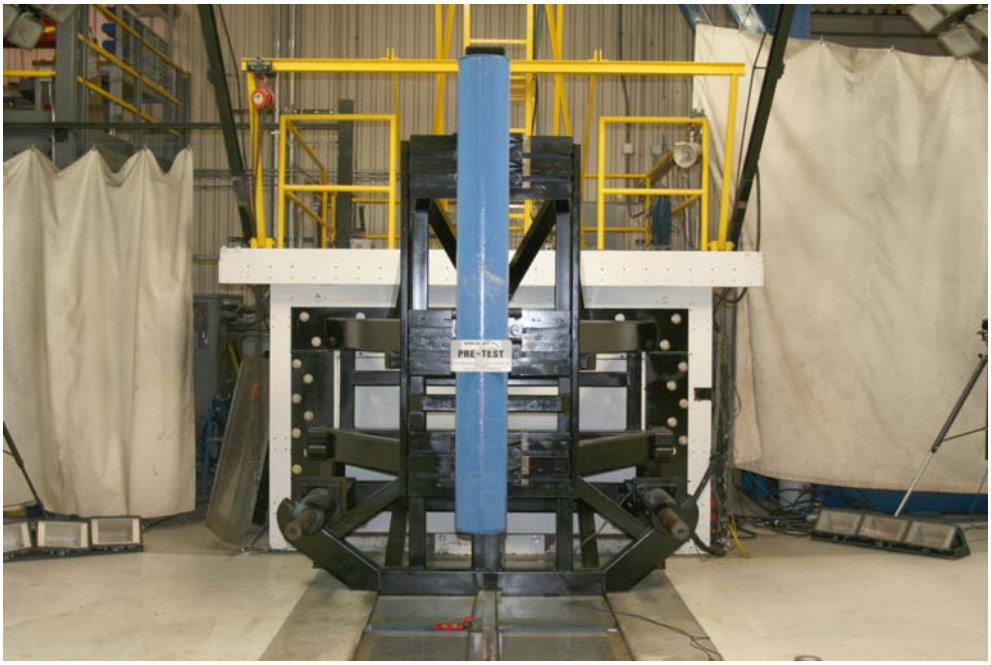
	Accelerometer Location			
	ID	Coordinates (mm)		
		X	Y	Z
A	Vehicle CG	2380	0	-370
	Vehicle CG Sensor	2320	0	-370
B	Left Floor Sill	2675	-688	-295
C	A Pillar Sill	3050	-695	-300
D	A Pillar Low	2990	-632	-665
E	A Pillar Mid	3010	-765	-905
F	B Pillar Sill	1985	-690	-310
G	B Pillar Low	1960	-650	-690
H	B Pillar Mid	1960	-660	-938
I	Driver Seat	1890	-635	-630
L	Engine Top	3820	0	-835
J	Firewall	3460	0	-1050
K	Right Roof	2200	575	-1640
M	Right Floor Sill	2470	688	-320
N	Rear Floorpan	980	0	-595

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 Ford Escape XLT FWD SUV NHTSA No. MB0203
Test Program: NCAP Side Pole Impact Test Test Date: 10/18/2010



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 Ford Escape XLT FWD SUV NHTSA No. MB0203
Test Program: NCAP Side Pole Impact Test Test Date: 10/18/2010

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	Door Panel
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 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	No		No	
Side Curtain Airbag	Yes	Yes	Yes	Yes
Side Torso Airbag	Yes	Yes	No	
Seat Belt Pretensioner	Yes	Yes	No	
Seat Belt Load Limiter	Yes		No	

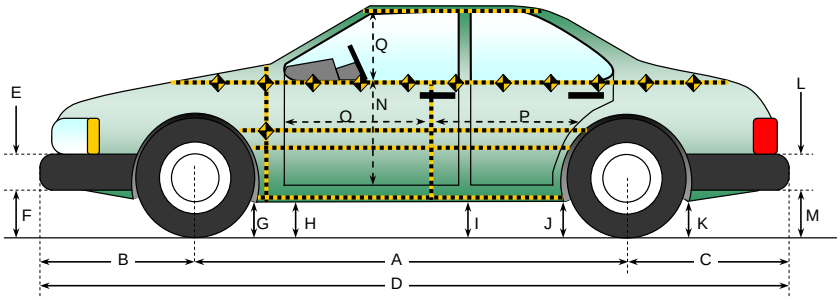
VEHICLE SPEED AND IMPACT DATA

Measured Parameter	Units	Requirement	Value
Horizontal Offset from Vertical Impact Reference Line	mm	+/- 38	0
Trap No. 1 Velocity (Primary)	km/h	31.4 to 33.0	32.3
Trap No. 2 Velocity (Redundant)	km/h	31.4 to 33.0	32.5

DATA SHEET NO. 9

VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2011 Ford Escape XLT FWD SUV NHTSA No. MB0203
Test Program: NCAP Side Pole Impact Test Test Date: 10/18/2010



LEFT SIDE VIEW

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

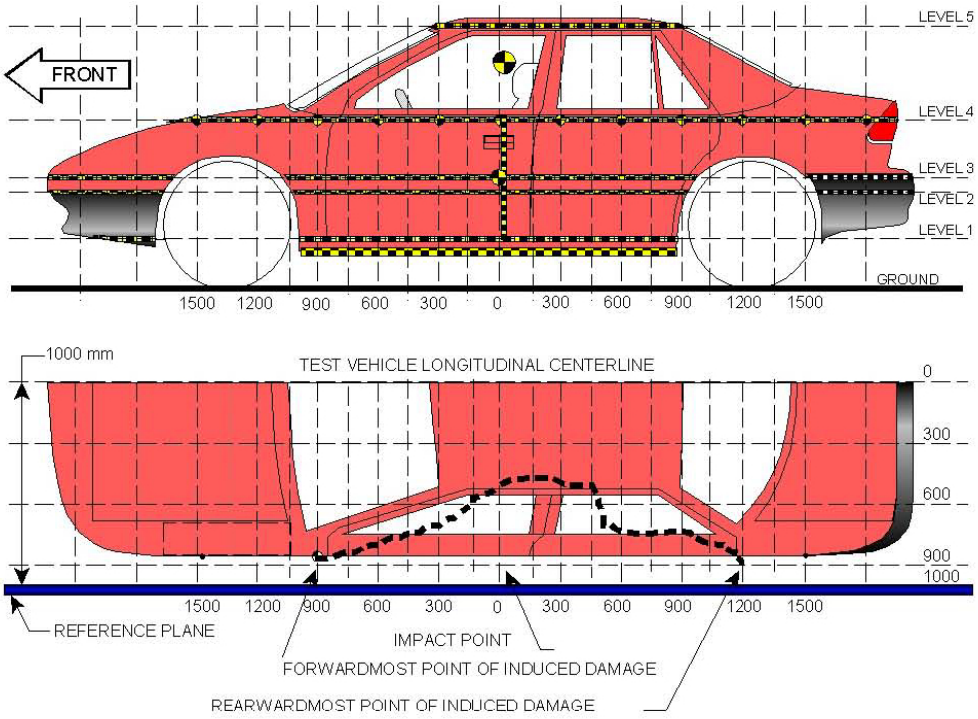
VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2630	2450	180
B	Front Axle to FSOV	860	873	-13
C	Rear Axle to RSOV	943	1062	-119
D1	Total Vehicle Length at Left Side	4340	4104	236
D2	Total Vehicle Length at Centerline	4433	4385	48
D3	Total Vehicle Length at Right Side	4340	4384	-44
E	Front Bumper Thickness	60	60	0
F	Front Bumper Bottom to Ground	205	210	-5
G	Sill Height at Front Wheel Well	279	295	-16
H	Sill Height at Front Door Leading Edge	283	277	6
I	Sill Height at B Pillar	295	321	-26
J1	Sill Height at Rear Wheel Well	307	331	-24
J2	Pinch Weld Height at Rear Wheel Well	305	325	-20
K	Sill Height Aft of Rear Wheel Well	330	336	-6
L	Rear Bumper Thickness	70	70	0
M	Rear Bumper Bottom to Ground	411	406	5
N	Sill Height to Window Bottom Sill	712	720	-8
O	Front Door Leading Edge to Impact CL	585	586	-1
P	Rear Door Trailing Edge to Impact CL	1287	1351	-64
Q	Front Window Opening	455	425	30
R	Right Side Length	4340	4384	-44
S	Left Side Length	4340	4104	236
T	Vehicle Width at B Post	1745	1777	-32

DATA SHEET NO. 10

VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2011 Ford Escape XLT FWD SUV NHTSA No. MB0203
Test Program: NCAP Side Pole Impact Test Test Date: 10/18/2010



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	440
2	Occupant H-Point	730
3	Mid-Door	775
4	Window Sill	1100
5	Window Top	1585

DATA SHEET NO. 10 (CONTINUED)

VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2011 Ford Escape XLT FWD SUV NHTSA No. MB0203
Test Program: NCAP Side Pole Impact Test Test Date: 10/18/2010

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-1200				312					297					-15	
-1050				303					300					-3	
-900			198	296				223	304				25	8	
-750		200	202	288			229	229	294			29	27	6	
-600	240	231	230	280		294	262	256	297		54	31	26	17	
-525	279	232	230	278		353	293	291	315		74	61	61	37	
-450	281	230	230	278		398	346	342	355		117	116	112	77	
-375	279	229	228	276		434	397	394	399		155	168	166	123	
-300	280	228	228	275		480	449	451	452		200	221	223	177	
-225	278	228	226	269		523	505	506	511		245	277	280	242	
-150	278	226	225	268	485	580	565	560	563	655	302	303	335	295	170
-75	277	225	225	263	481	628	618	615	623	685	351	393	390	360	204
0	278	225	224	262	478	658	658	660	656	707	380	433	436	394	229
75	276	225	223	260	481	643	672	663	659	694	367	447	440	399	213
150	275	224	221	258	480	586	619	622	622	672	311	395	401	364	192
225	274	223	221	258	480	616	537	556	554	651	342	314	335	296	171
300	274	223	220	256	476	461	476	483	489	630	187	253	263	233	154
375	274	223	220	254	476	392	419	426	420	610	118	196	206	166	134
450	277	224	221	255	478	358	424	325	369	591	81	200	104	114	113
600	276	225	223	250	475	323	302	302	337	548	47	77	79	87	73
750	277	225	223	250	479	303	284	290	326	531	26	59	67	76	52
900	280	225	224	250	479	267	322	260	308	512	-13	97	36	58	33
1050	245	220	223	250	480	212	316	233	291	508	-33	96	10	41	28
1200		201	199	251	481		169	180	270	505		-32	-19	19	24
1350				253	485				252	504				-1	19
1500				257	489				252	504				-5	15
1650				261	496				272	513				11	17

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 Ford Escape XLT FWD SUV NHTSA No. MB0203
Test Program: NCAP Side Pole Impact Test Test Date: 10/18/2010

MAXIMUM CRUSH DATA

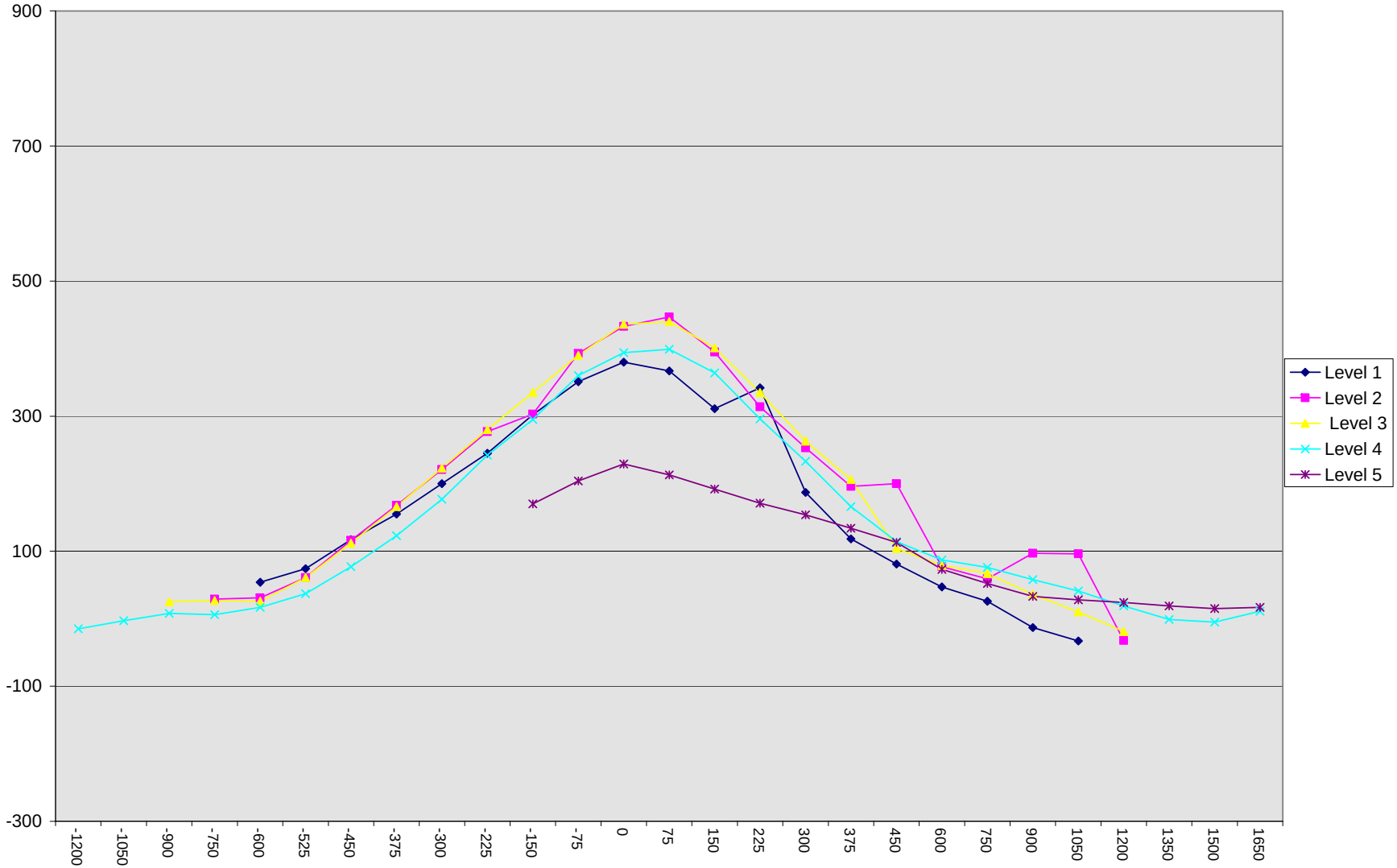
	Level 1	Level 2	Level 3	Level 4	Level 5
Maximum Crush (mm)	380	447	440	399	229
Distance From Impact (mm)	0	75	75	75	0

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 Ford Escape XLT FWD SUV NHTSA No. MB0203
Test Program: NCAP Side Pole Impact Test Test Date: 10/18/2010



DATA SHEET NO. 11

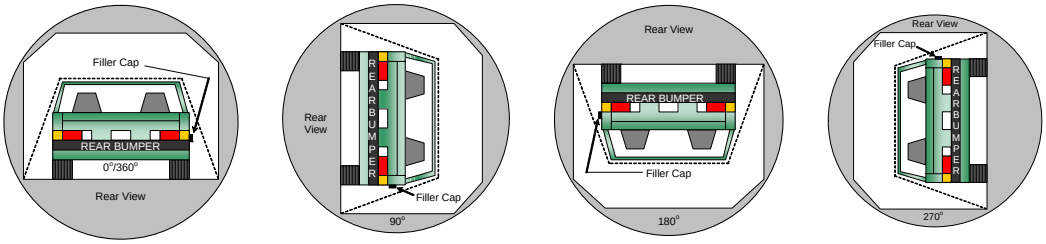
FMVSS 301 FUEL SYSTEM INTEGRITY POST-IMPACT DATA

Test Vehicle: 2011 Ford Escape XLT FWD SUV NHTSA No. MB0203
Test Program: NCAP Side Pole Impact Test Test Date: 10/18/2010

Test Time: 10:28 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



0°/360° 90° 180° 270°

ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	111	300	411
90° to 180°	111	300	411
180° to 270°	108	300	408
270° to 360°	112	300	412

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

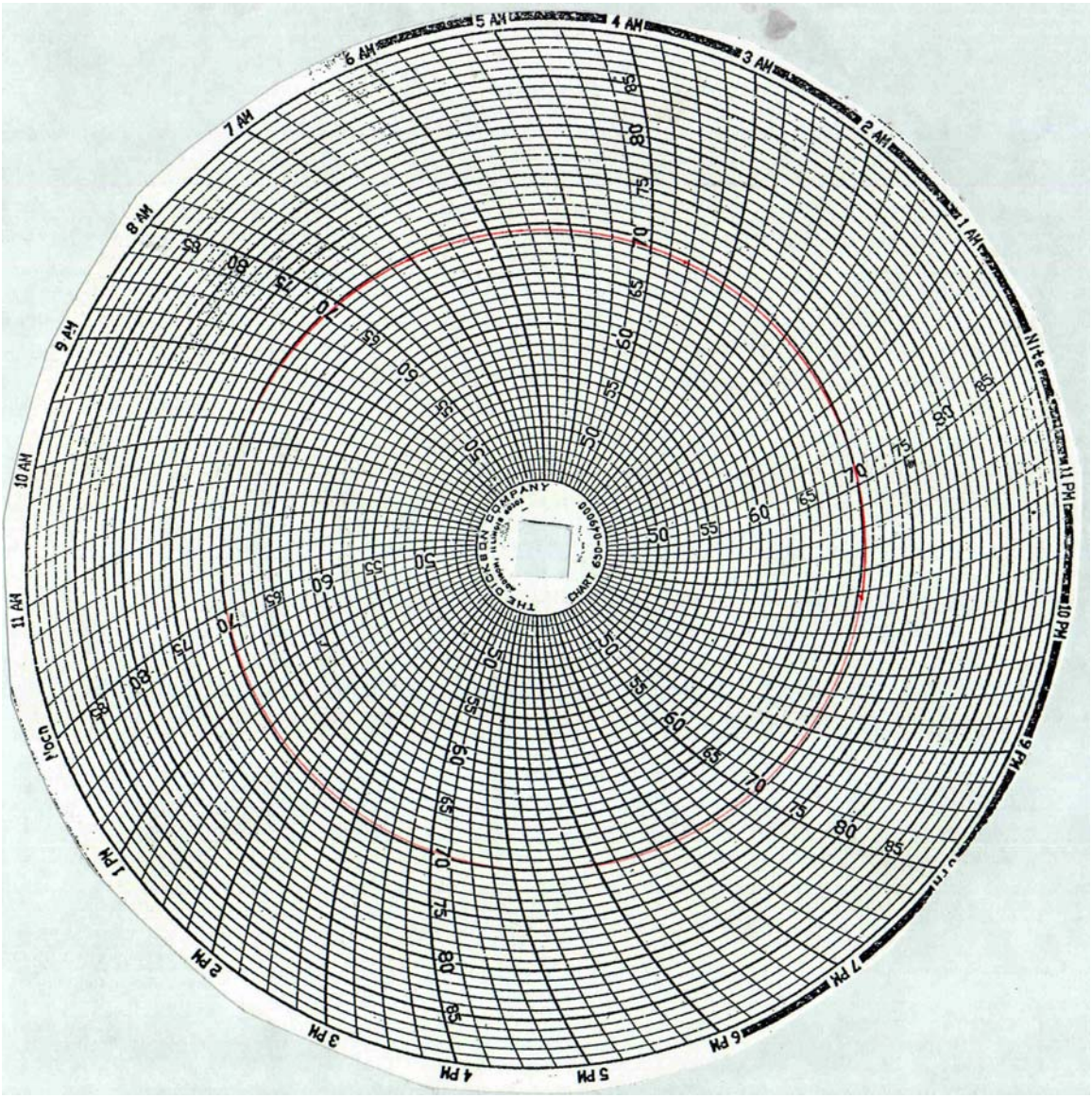
ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

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 Ford Escape XLT FWD SUV	NHTSA No.	MB0203
Test Program:	NCAP Side Pole Impact Test	Test Date:	10/18/2010



APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

As Delivered Right Front ¾ View of Test Vehicle

As Delivered Left Rear ¾ View of Test Vehicle

Pre-Test Frontal View of Test Vehicle

Post-Test Frontal View of Test Vehicle

Pre-Test Left Front ¾ View of Test Vehicle

Post-Test Left Front ¾ View of Test Vehicle

Pre-Test Left Side View of Test Vehicle

Post-Test Left Side View of Test Vehicle

Pre-Test Left Rear ¾ View of Test Vehicle

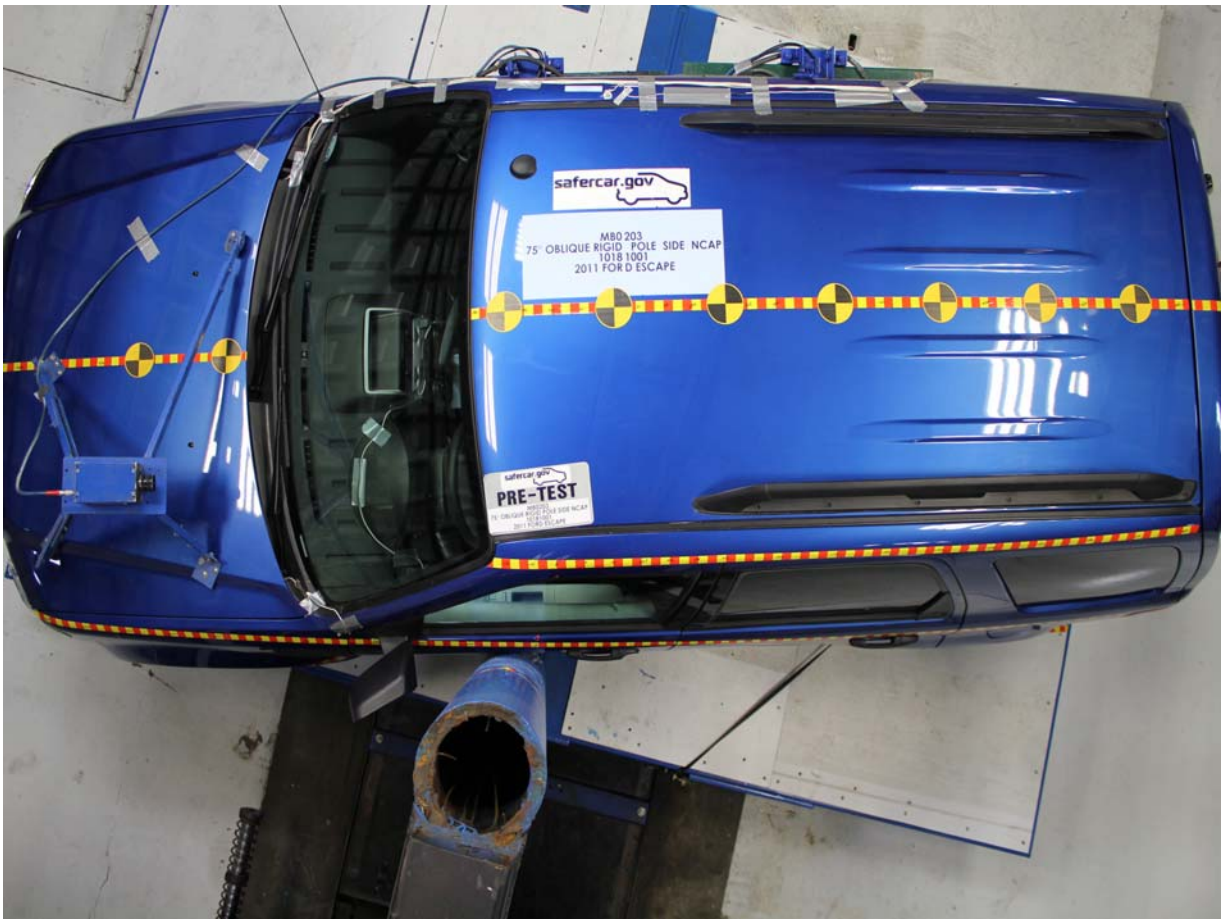
Post-Test Left Rear ¾ View of Test Vehicle

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

PHOTOGRAPH NOT AVAILABLE

Post-Test Overhead View of Test Vehicle and Pole

Pre-Test Left Side View of Pole Positioned Against Side of Vehicle at Ideal Impact Point

Pre-Test Right Side View of Pole Positioned Against Side of Vehicle at Ideal Impact Point

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

Post-Test Front Close-Up View of Dummy

Pre-Test Left Side View of Dummy Showing Belts, Chalking, and Contact Switches

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

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

PHOTOGRAPH NOT APPLICABLE

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

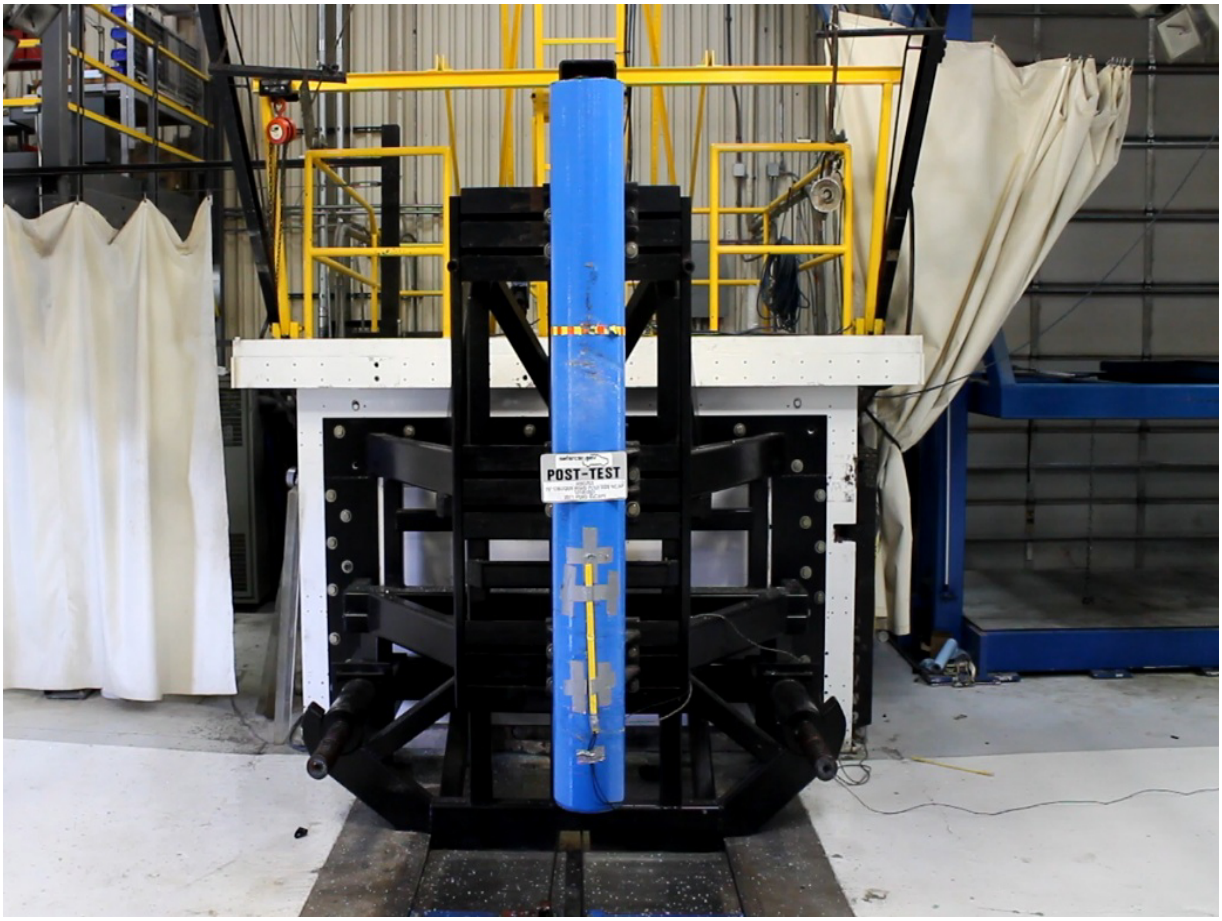
Pre-Test View of Fuel Filler Cap or Fuel Filler Neck

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

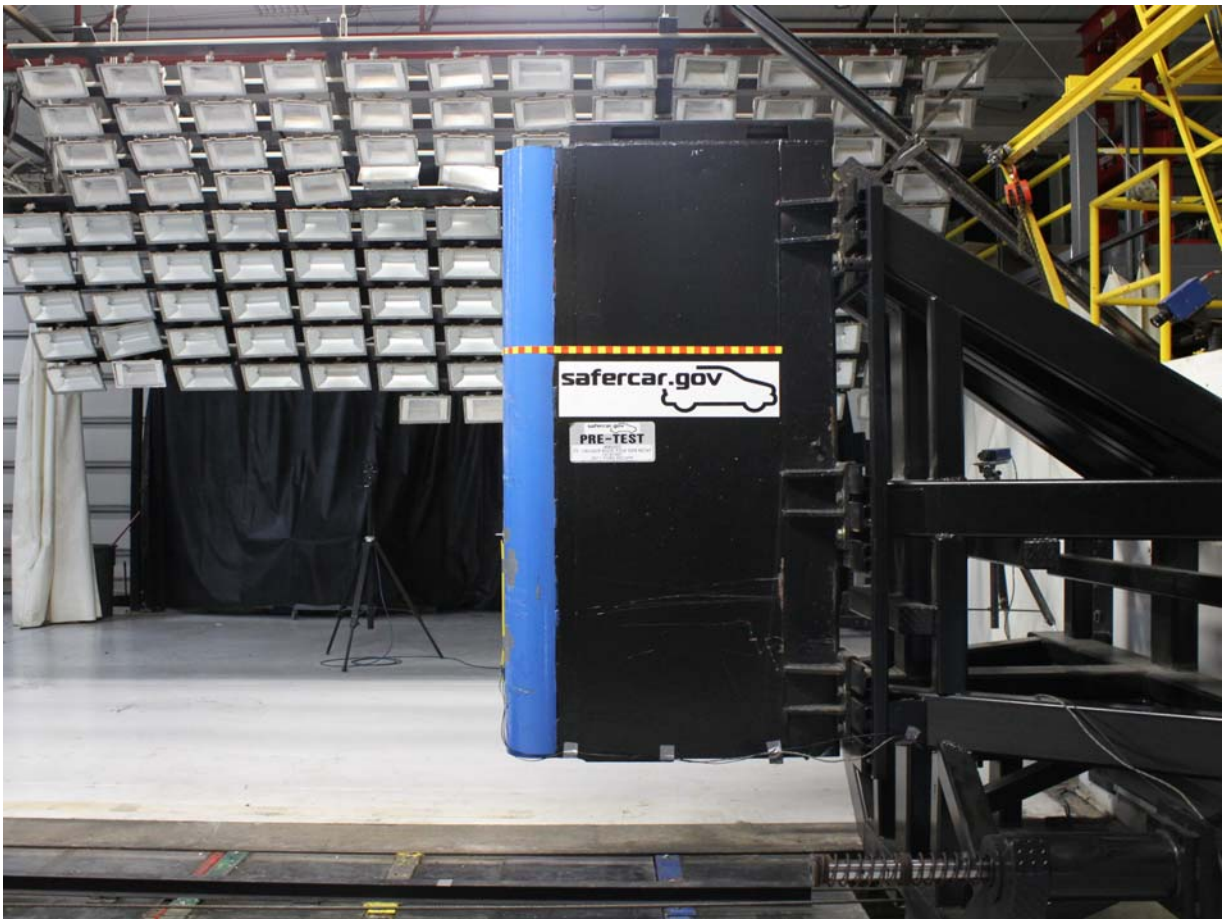
Close-Up View of Vehicle's Certification Label

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

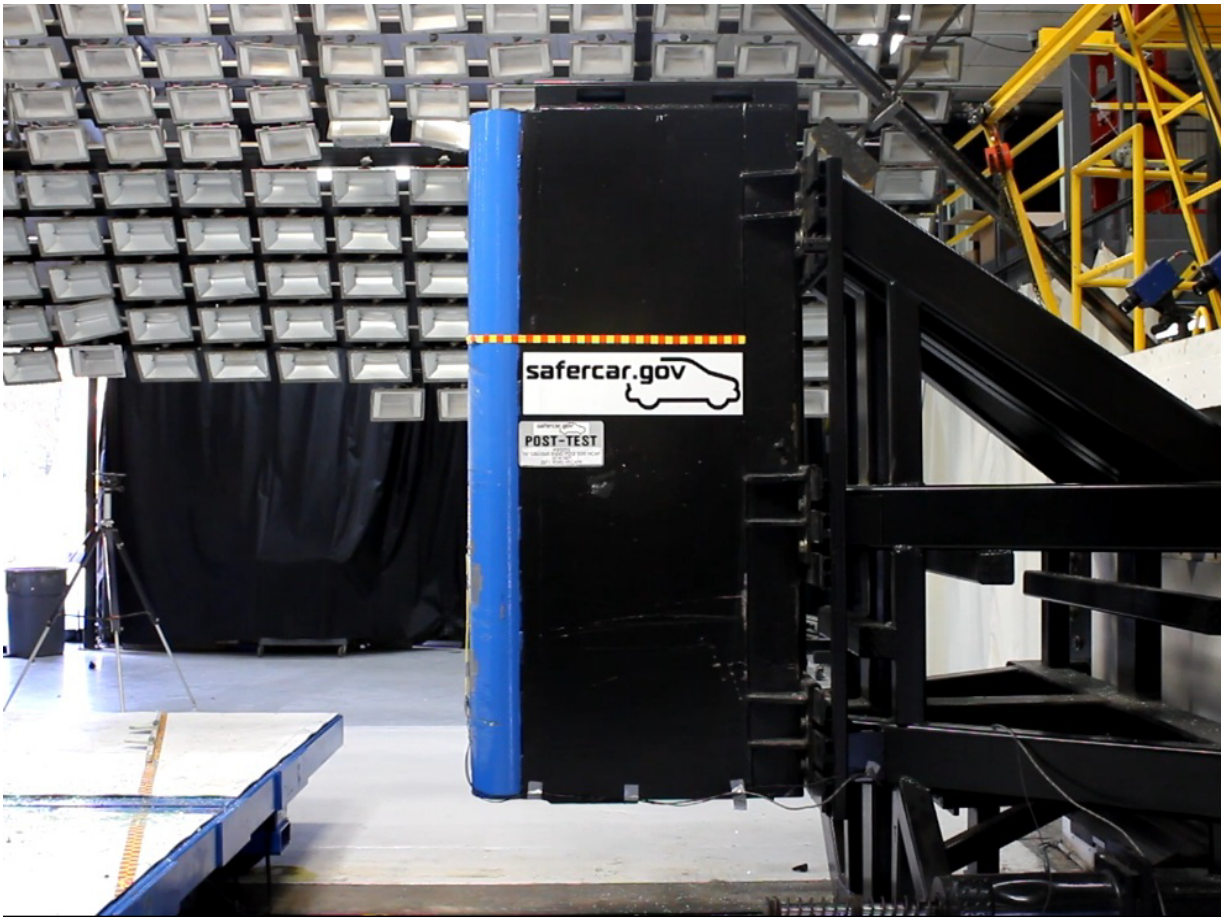
Pre-Test Pole Barrier Front View



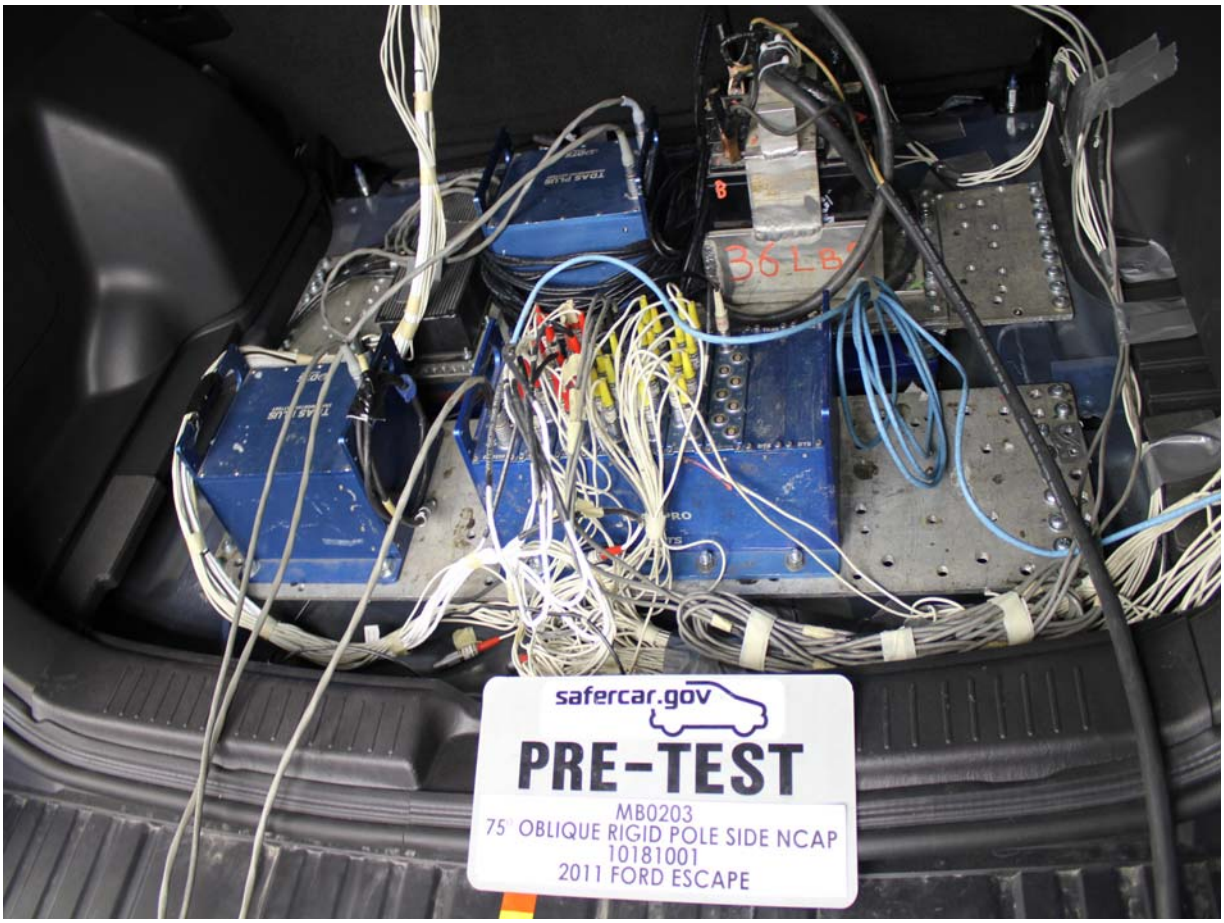
Post-Test Pole Barrier Front View



Pre-Test Pole Barrier Side View

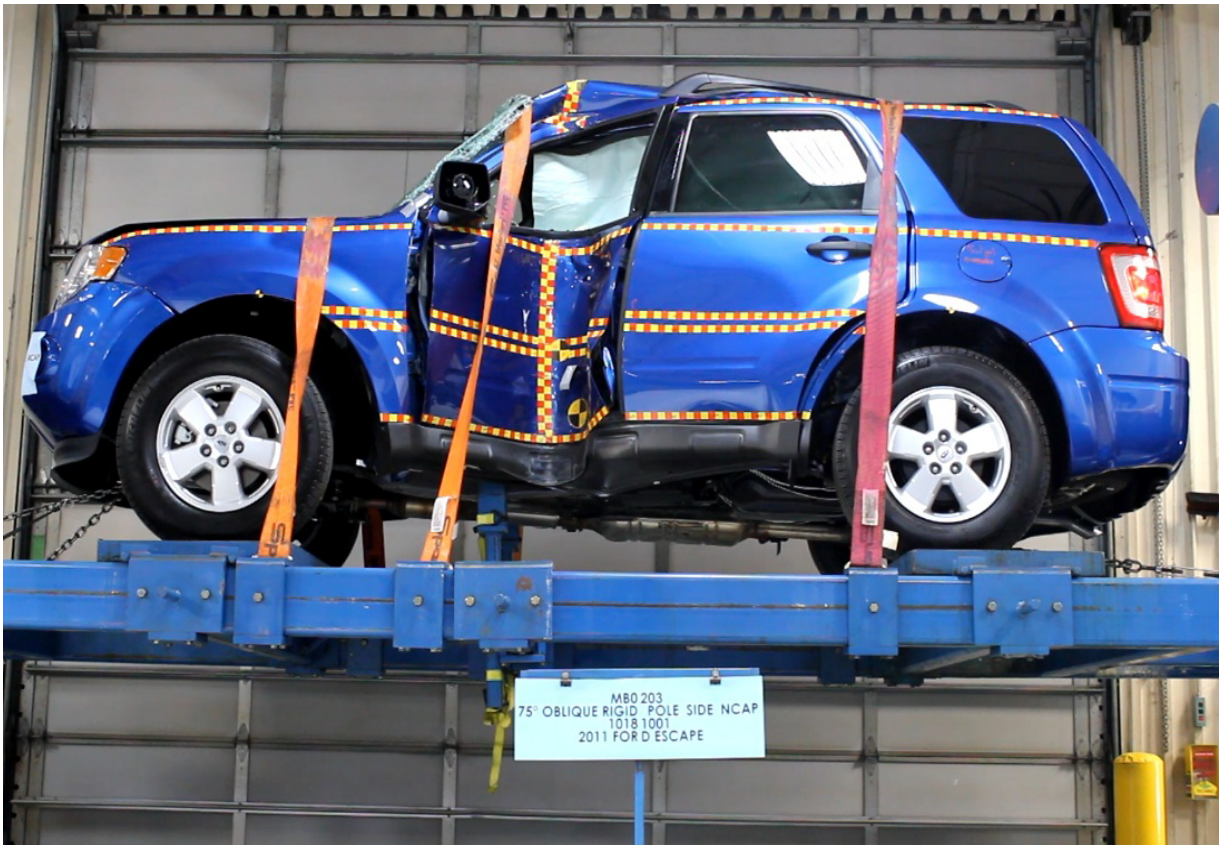


Post-Test Pole Barrier Side View

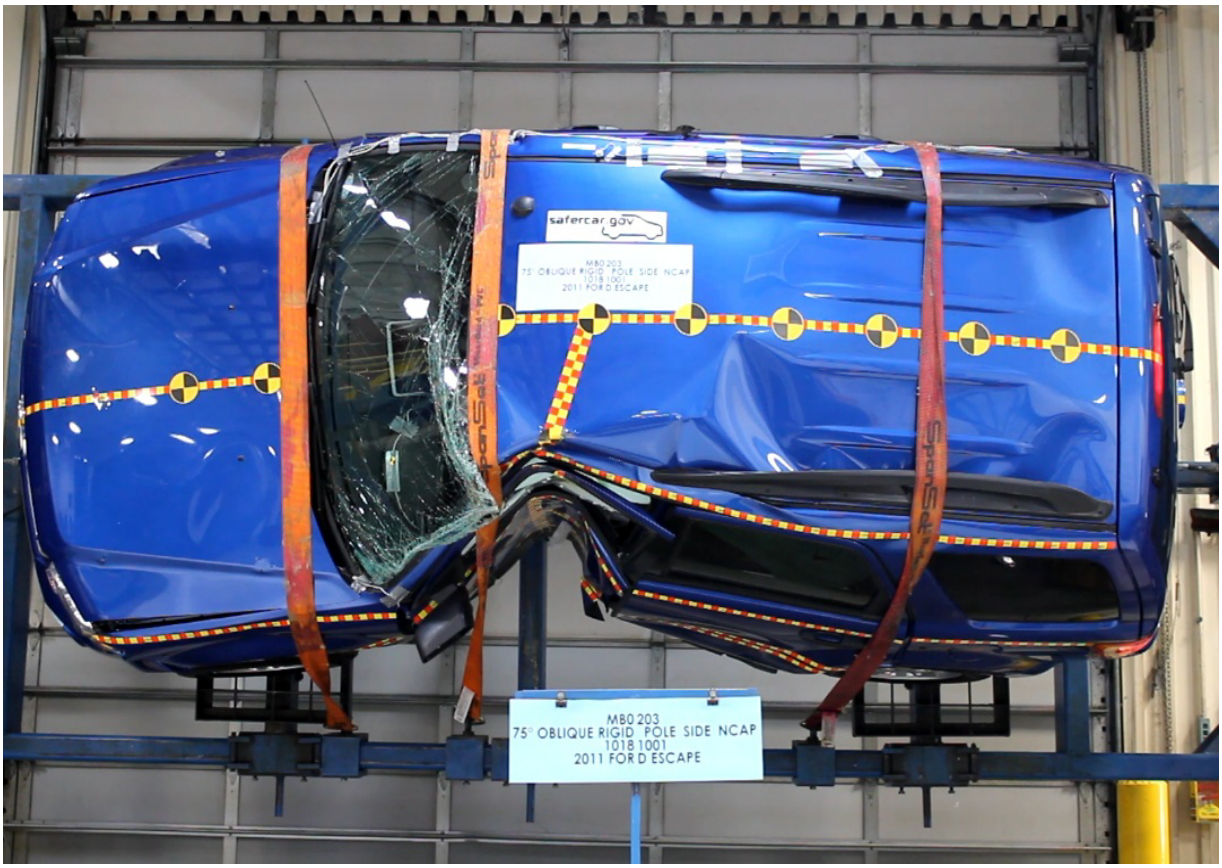


Pre-Test Ballast View

Post-Test Primary and Redundant Speed Trap Read-Out



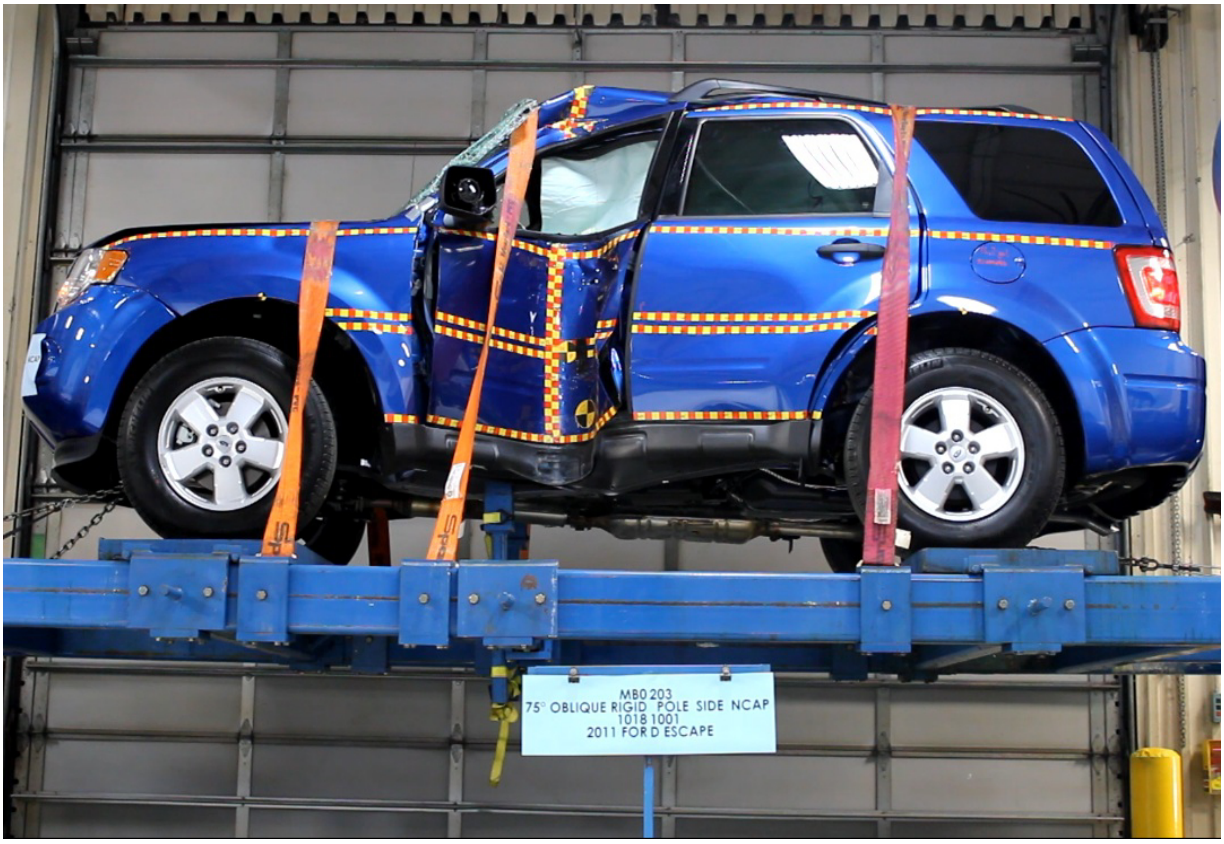
FMVSS No. 301/305 Rollover 0 Degrees



FMVSS No. 301/305 Rollover 90 Degrees

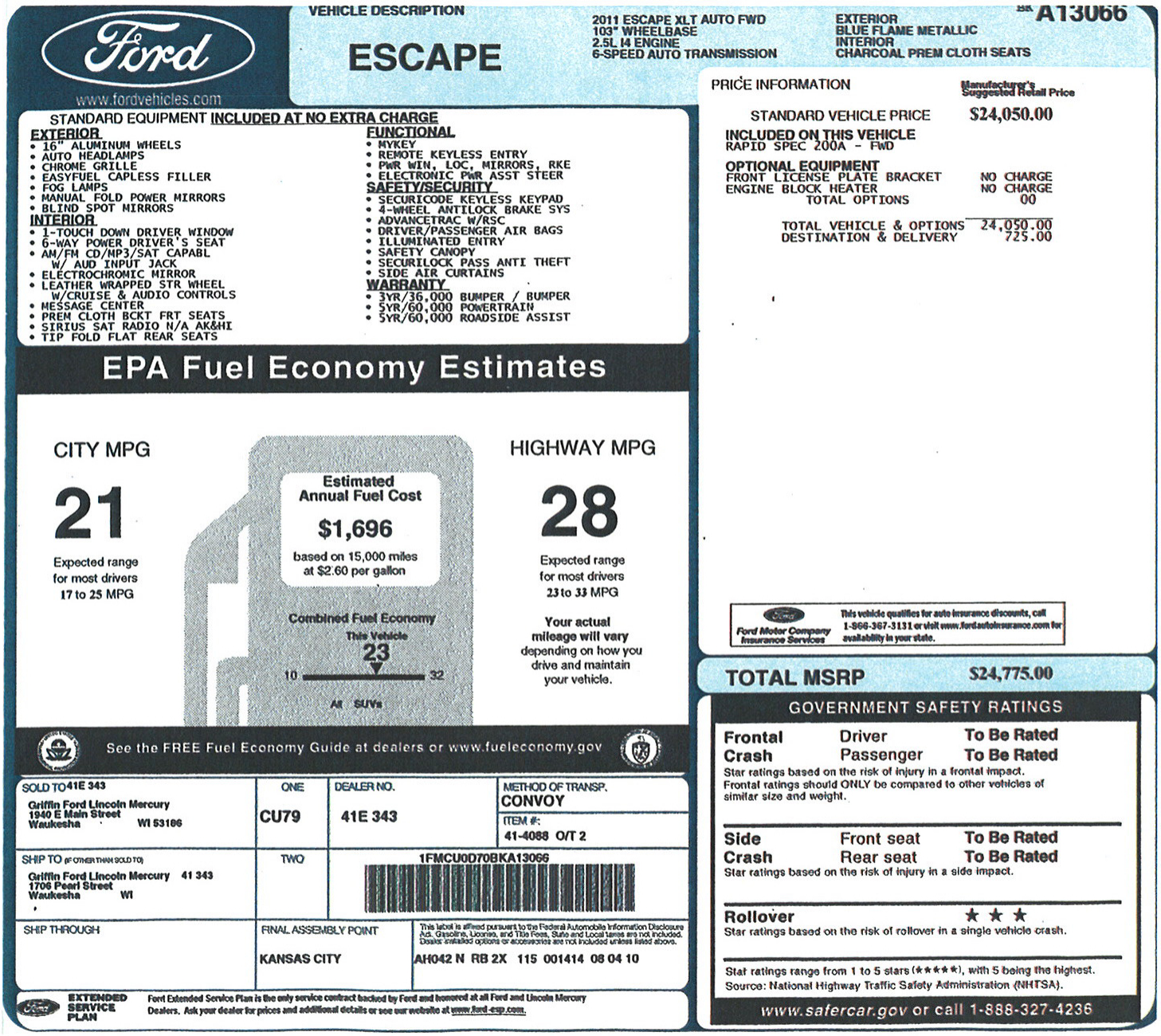
FMVSS No. 301/305 Rollover 180 Degrees

FMVSS No. 301/305 Rollover 270 Degrees



FMVSS No. 301/305 Rollover 360 Degrees

Impact Event



Ford
www.fordvehicles.com

VEHICLE DESCRIPTION

ESCAPE

2011 ESCAPE XLT AUTO FWD
103" WHEELBASE
2.5L I4 ENGINE
6-SPEED AUTO TRANSMISSION

EXTERIOR
BLUE FLAME METALLIC
INTERIOR
CHARCOAL PREM CLOTH SEATS

A13066

STANDARD EQUIPMENT INCLUDED AT NO EXTRA CHARGE

EXTERIOR
- 16" ALUMINUM WHEELS
- AUTO HEADLAMPS
- CHROME GRILLE
- EASYFUEL CAPLESS FILLER
- FOG LAMPS
- MANUAL FOLD POWER MIRRORS
- BLIND SPOT MIRRORS

INTERIOR
- 1-TOUCH DOWN DRIVER WINDOW
- 6-WAY POWER DRIVER'S SEAT
- AM/FM CD/MP3/SAT CAPABL W/ AUD INPUT JACK
- ELECTROCHROMIC MIRROR
- LEATHER WRAPPED STR WHEEL W/CRUISE & AUDIO CONTROLS
- MESSAGE CENTER
- PREM CLOTH BCKT FRT SEATS
- SIRIUS SAT RADIO N/A AK&HI
- TIP FOLD FLAT REAR SEATS

FUNCTIONAL
- MYKEY
- REMOTE KEYLESS ENTRY
- PWR WIN, LOC, MIRRORS, RKE
- ELECTRONIC PWR ASST STEER

SAFETY/SECURITY
- SECURICODE KEYLESS KEYPAD
- 4-WHEEL ANTILOCK BRAKE SYS
- ADVANCETRAC W/RSC
- DRIVER/PASSENGER AIR BAGS
- ILLUMINATED ENTRY
- SAFETY CANOPY
- SECURILOCK PASS ANTI THEFT
- SIDE AIR CURTAINS

WARRANTY
- 3YR/36,000 BUMPER / BUMPER
- 5YR/60,000 POWERTRAIN
- 5YR/60,000 ROADSIDE ASSIST

PRICE INFORMATION

	Manufacturer's Suggested Retail Price
STANDARD VEHICLE PRICE	$24,050.00
INCLUDED ON THIS VEHICLE	
RAPID SPEC 200A - FWD	
OPTIONAL EQUIPMENT	
FRONT LICENSE PLATE BRACKET	NO CHARGE
ENGINE BLOCK HEATER	NO CHARGE
TOTAL OPTIONS	00
TOTAL VEHICLE & OPTIONS	24,050.00
DESTINATION & DELIVERY	725.00

EPA Fuel Economy Estimates

CITY MPG
21
Expected range for most drivers 17 to 25 MPG

Estimated Annual Fuel Cost
$1,696
based on 15,000 miles at $2.60 per gallon

Combined Fuel Economy
This Vehicle
23
10 — 32
All SUVs

HIGHWAY MPG
28
Expected range for most drivers 23 to 33 MPG

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

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

Ford Motor Company Insurance Services
This vehicle qualifies for auto insurance discounts, call 1-866-367-3131 or visit www.fordautoinsurance.com for availability in your state.

TOTAL MSRP $24,775.00

GOVERNMENT SAFETY RATINGS

Frontal Crash	Driver	To Be Rated
	Passenger	To Be Rated

Star ratings based on the risk of injury in a frontal impact. Frontal ratings should ONLY be compared to other vehicles of similar size and weight.

Side Crash	Front seat	To Be Rated
	Rear seat	To Be Rated

Star ratings based on the risk of injury in a side impact.

Rollover ★ ★ ★
Star ratings based on the risk of rollover in a single vehicle crash.

Star ratings range from 1 to 5 stars (★★★★★), with 5 being the highest.
Source: National Highway Traffic Safety Administration (NHTSA).

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

SOLD TO 41E 343 Griffin Ford Lincoln Mercury 1940 E Main Street Waukesha WI 53186	ONE CU79	DEALER NO. 41E 343	METHOD OF TRANSP. CONVOY ITEM #: 41-4088 O/T 2
SHIP TO (IF OTHER THAN SOLD TO) Griffin Ford Lincoln Mercury 41 343 1706 Pearl Street Waukesha WI	TWO	1FMCU0D70BKA13066	
SHIP THROUGH	FINAL ASSEMBLY POINT KANSAS CITY	This label is affixed pursuant to the Federal Automobile Information Disclosure Act. Gasoline, Licenses, and Title Fees, State and Local taxes are not included. Dealer installed options or accessories are not included unless listed above. AH042 N RB 2X 115 001414 08 04 10	

EXTENDED SERVICE PLAN
Ford Extended Service Plan is the only service contract backed by Ford and honored at all Ford and Lincoln Mercury Dealers. Ask your dealer for prices and additional details or see our website at www.ford-esp.com.

Monroney Label

FRONT SEATS

WARNING: Reclining the seatback can cause an occupant to slide under the seat's safety belt, resulting in severe personal injuries in the event of a collision.

WARNING: Do not pile cargo higher than the seatbacks to reduce the risk of injury in a collision or sudden stop.

WARNING: Before returning the seatback to its original position, make sure that cargo or any objects are not trapped behind the seatback. After returning the seatback to its original position, pull on the seatback to ensure that it has fully latched. An unlatched seat may become dangerous in the event of a sudden stop or collision.

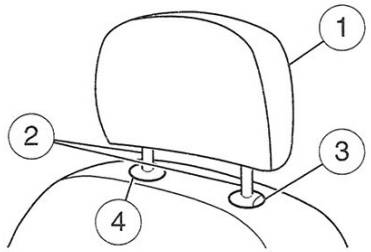
Adjustable head restraints

Your vehicle is equipped with front row outboard head restraints that are vertically adjustable.

WARNING: To minimize the risk of neck injury in the event of a crash, the driver and passenger occupants should not sit in and/or operate the vehicle, until the head restraint is placed in its proper position. The driver should never adjust the head restraint while the vehicle is in motion.

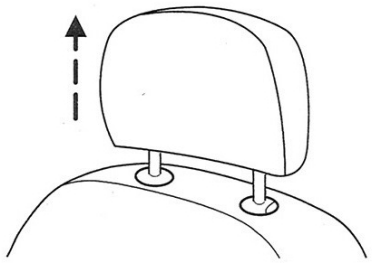
The adjustable head restraints consist of:

- a trimmed energy absorbing foam and structure (1),
- two steel stems (2),
- a guide sleeve adjust/release button (3),
- and a guide sleeve unlock/remove button (4).

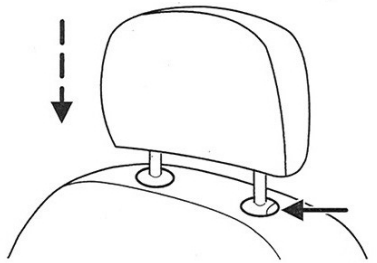


To adjust the head restraint, do the following:

1. Adjust the seatback to an upright driving/riding position.
2. Raise the head restraint by pulling up on the head restraint.



3. Lower the head restraint by pressing and holding the guide sleeve adjust/release button and pushing down on the head restraint.

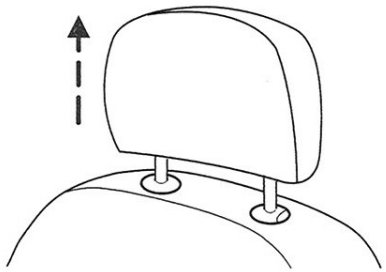


Properly adjust the head restraint so that the top of the head restraint is even with the top of your head and positioned as close as possible to the back of your head. For occupants of extremely tall stature, adjust the head restraint to its full up position.

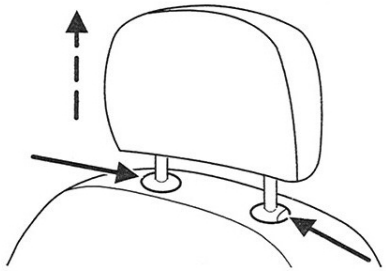
WARNING: The adjustable head restraint is a safety device. Whenever possible it should be installed and properly adjusted when the seat is occupied.

To remove the adjustable head restraint, do the following:

1. Pull up the head restraint until it reaches the highest adjustment position.

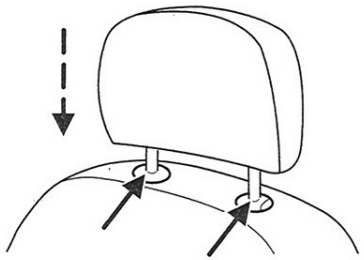


2. Simultaneously press and hold both the adjust/release button and the unlock/remove button, then pull up on the head restraint.



To reinstall the adjustable head restraint, do the following:

1. Insert the two stems into the guide sleeve collars.
2. Push the head restraint down until it locks.



Properly adjust the head restraint so that the top of the head restraint is even with the top of your head and positioned as close as possible to the back of your head. For occupants of extremely tall stature, adjust the head restraint to its full up position.

APPENDIX B

DUMMY RESPONSE DATA

TABLE OF DATA PLOTS

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

Driver Head 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

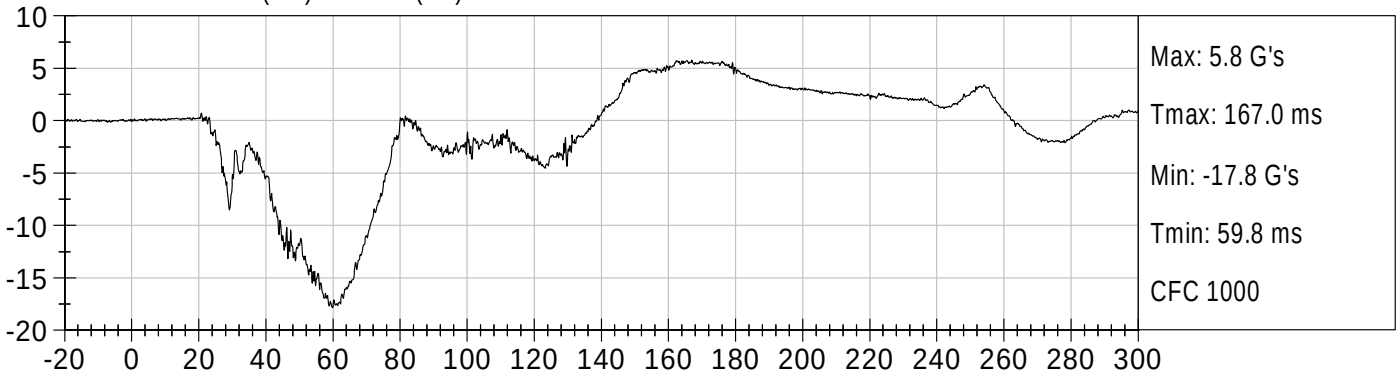
Load Cell Pole Barrier #7 Force (Y) – Not used

Load Cell Pole Barrier #8 Force (Y) – Not used

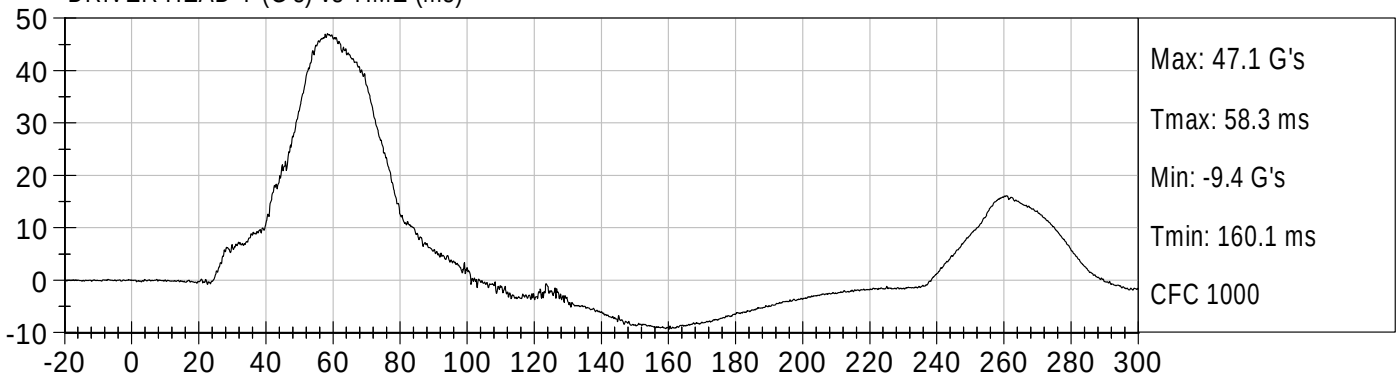
75° Oblique Rigid Pole Side NCAP
2011 Ford Escape - MB0203

Test Date: 10/18/2010
Speed: 20.1 mph (32.3 km/h)

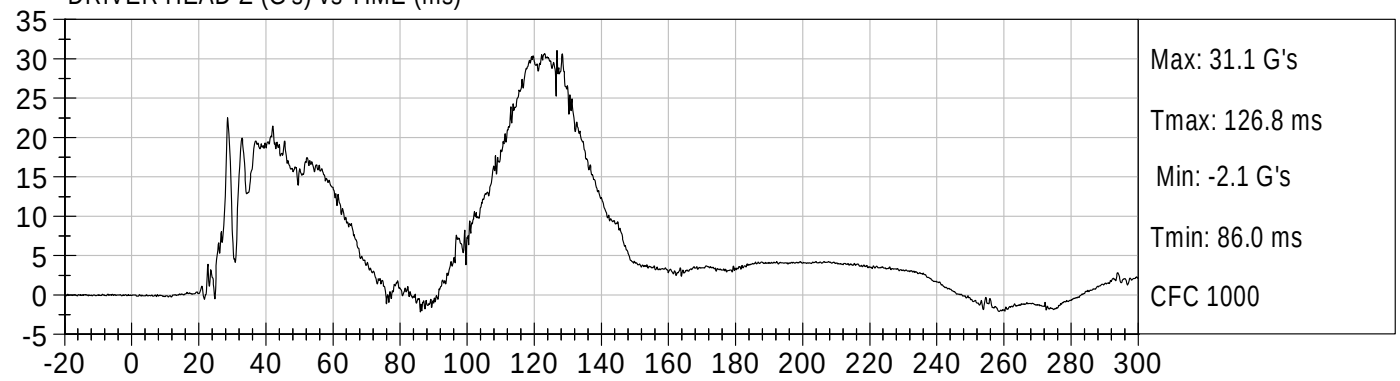
DRIVER HEAD X (G's) vs TIME (ms)



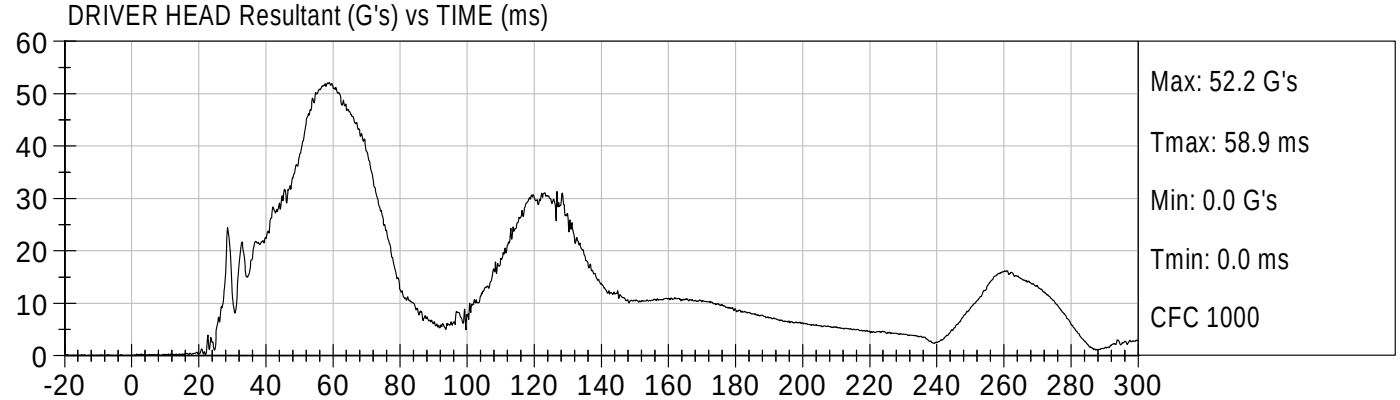
DRIVER HEAD Y (G's) vs TIME (ms)



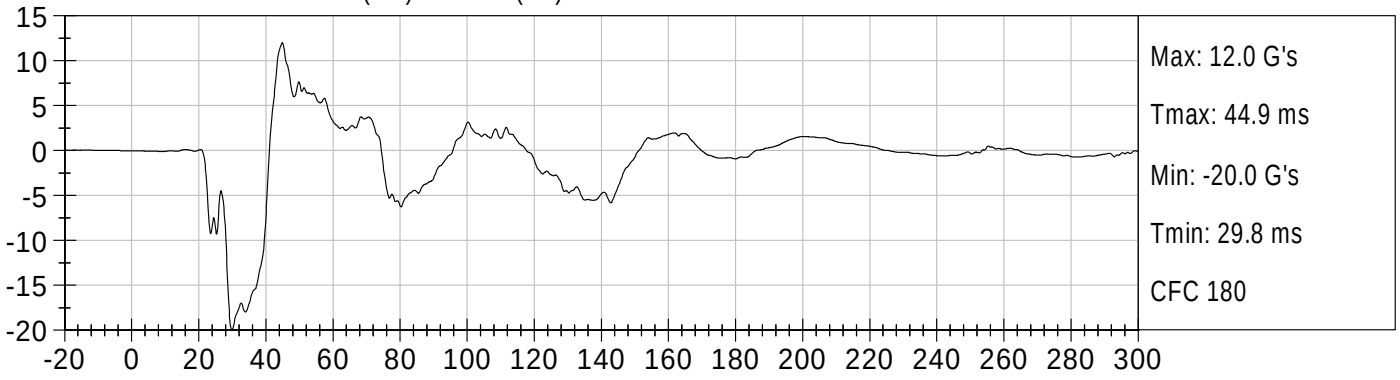
DRIVER HEAD Z (G's) vs TIME (ms)



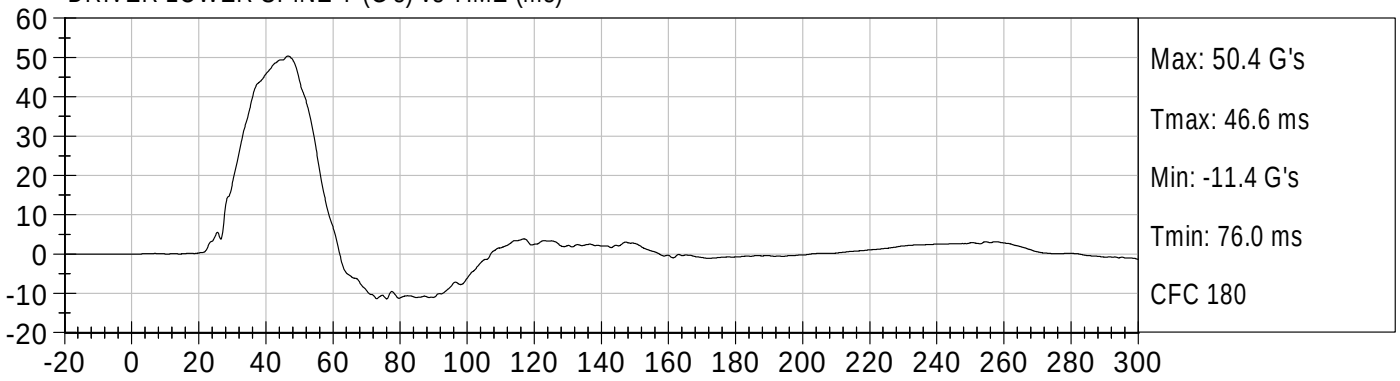
DRIVER HEAD Resultant (G's) vs TIME (ms)



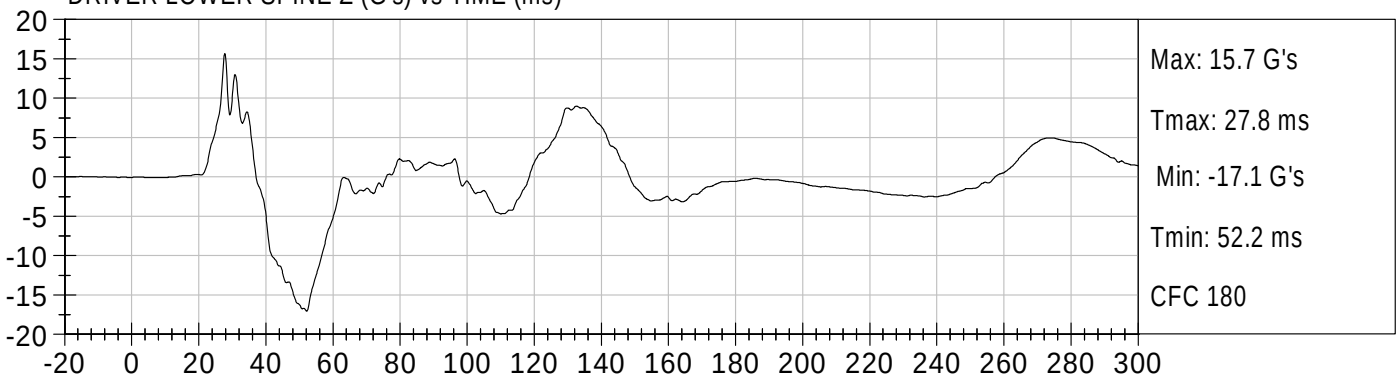
DRIVER LOWER SPINE X (G's) vs TIME (ms)



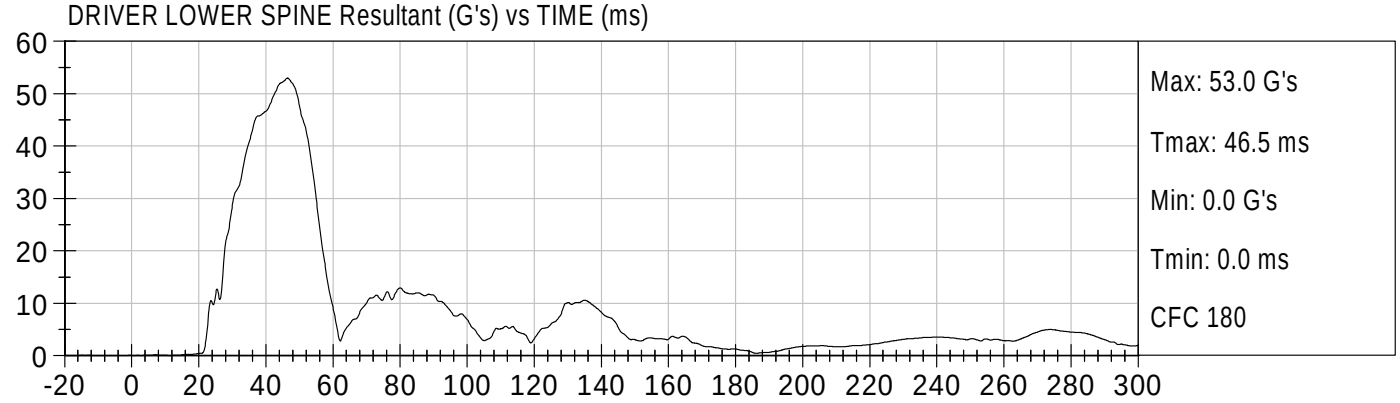
DRIVER LOWER SPINE Y (G's) vs TIME (ms)



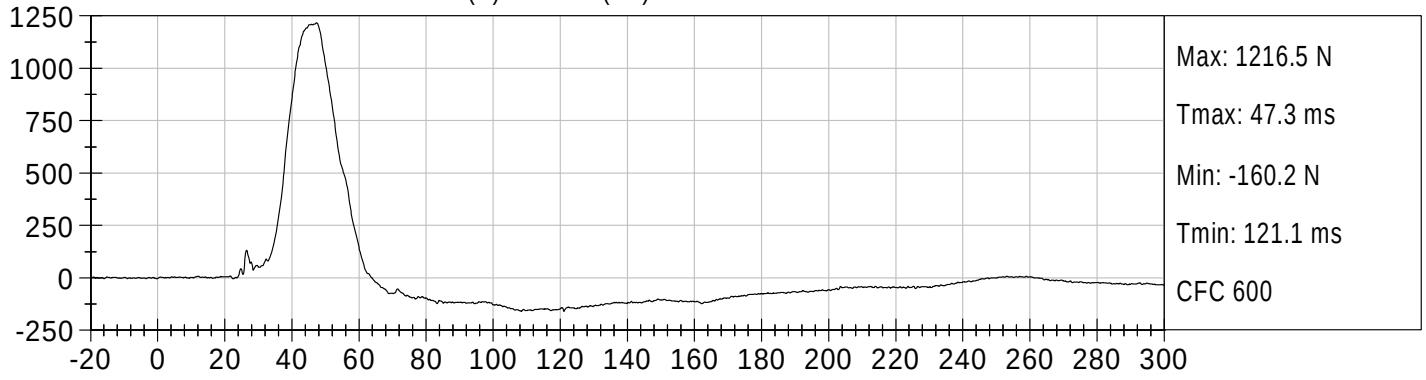
DRIVER LOWER SPINE Z (G's) vs TIME (ms)



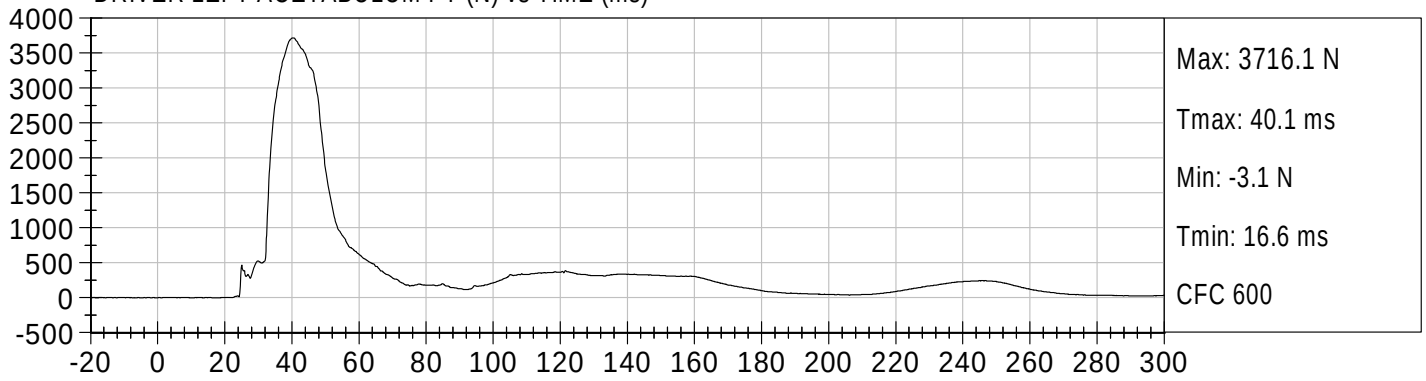
DRIVER LOWER SPINE Resultant (G's) vs TIME (ms)



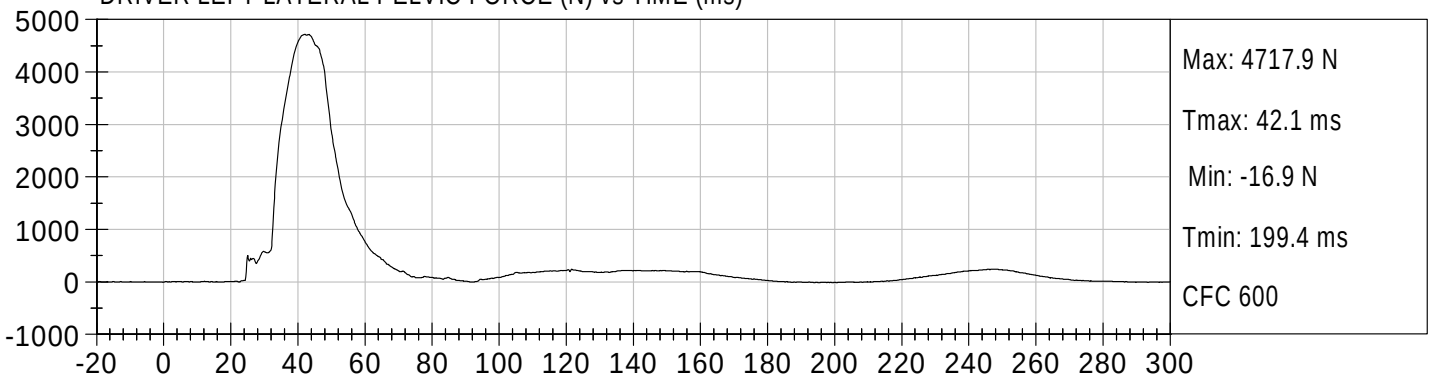
DRIVER LEFT ILLIUM CREST FY (N) vs TIME (ms)



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-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test ID:** D103471

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	40	Pass
Peak Resultant Acceleration	G's	115 to 137	123	Pass
Peak Lateral Acceleration	G's	+/- 15	3	Pass
Unimodal	N/A	<15%	Yes	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

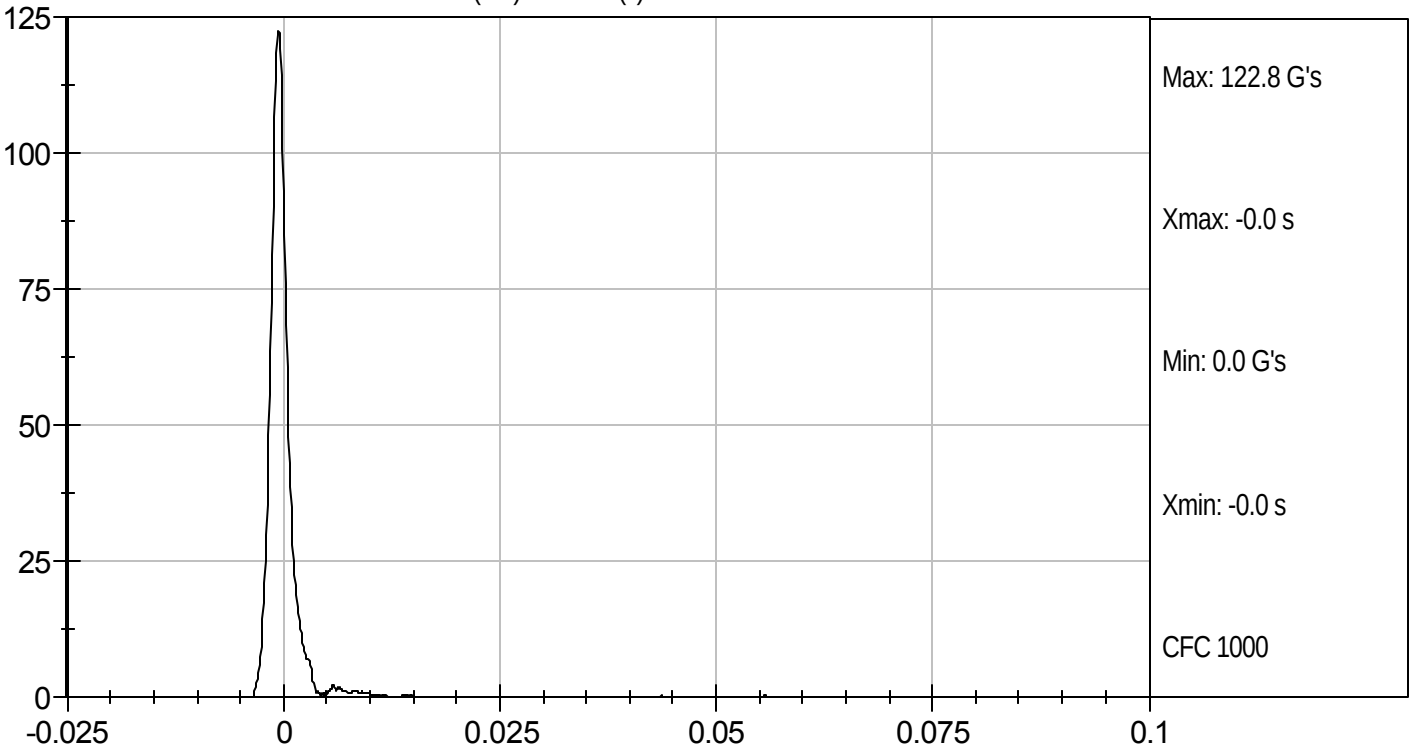
10/13/10
Test Date

David Winkelbauer
Approved By

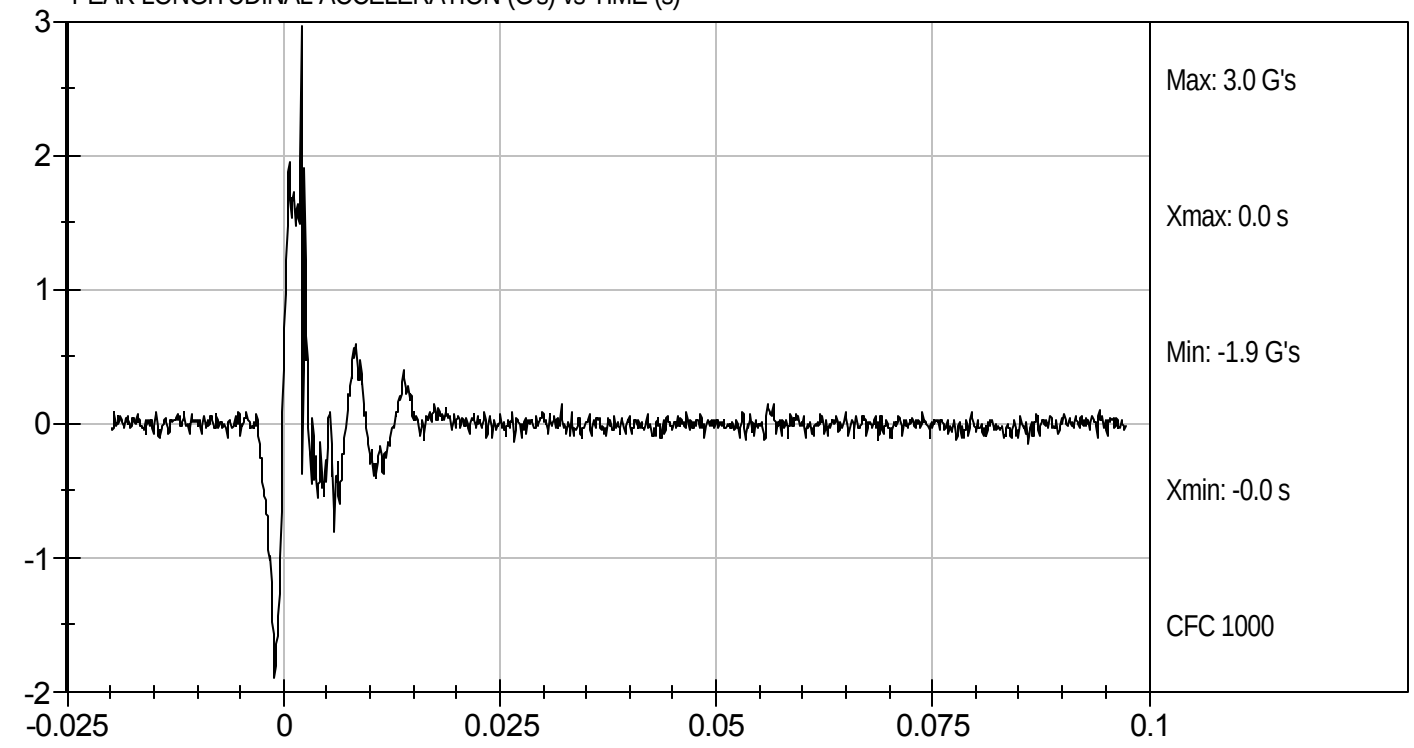
Test Desc: Head Drop
Component ID: D103471

Test Date: 10/13/10
Velocity: 0 ft/s, 0 m/s

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



PEAK LONGITUDINAL ACCELERATION (G's) vs TIME (s)



MGA RESEARCH CORPORATION

LATERAL NECK PENDULUM TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test I.D:** D103472

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.9	Pass
Humidity		%	10 to 70	36	Pass
Impact Velocity		m/s	5.51 to 5.63	5.58	Pass
Delta Velocity	10 ms	m/s	2.20 to 2.80	2.51	Pass
	15 ms	m/s	3.30 to 4.10	3.53	Pass
	20 ms	m/s	4.40 to 5.40	4.69	Pass
	25 ms	m/s	5.40 to 6.10	5.51	Pass
	25-100 ms	m/s	5.50 to 6.20	5.55	Pass
Maximum D-Plane Rotation		deg	71 to 81	71	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	59	Pass
Maximum Occipital Condyle Moment during Rotation Interval		Nm	-44 to -36	-41	Pass
Time of Moment Decay to 0 Nm		ms	102 to 126	116	Pass
			Overall Test Results		Pass

Jessica Hall
Laboratory Technician

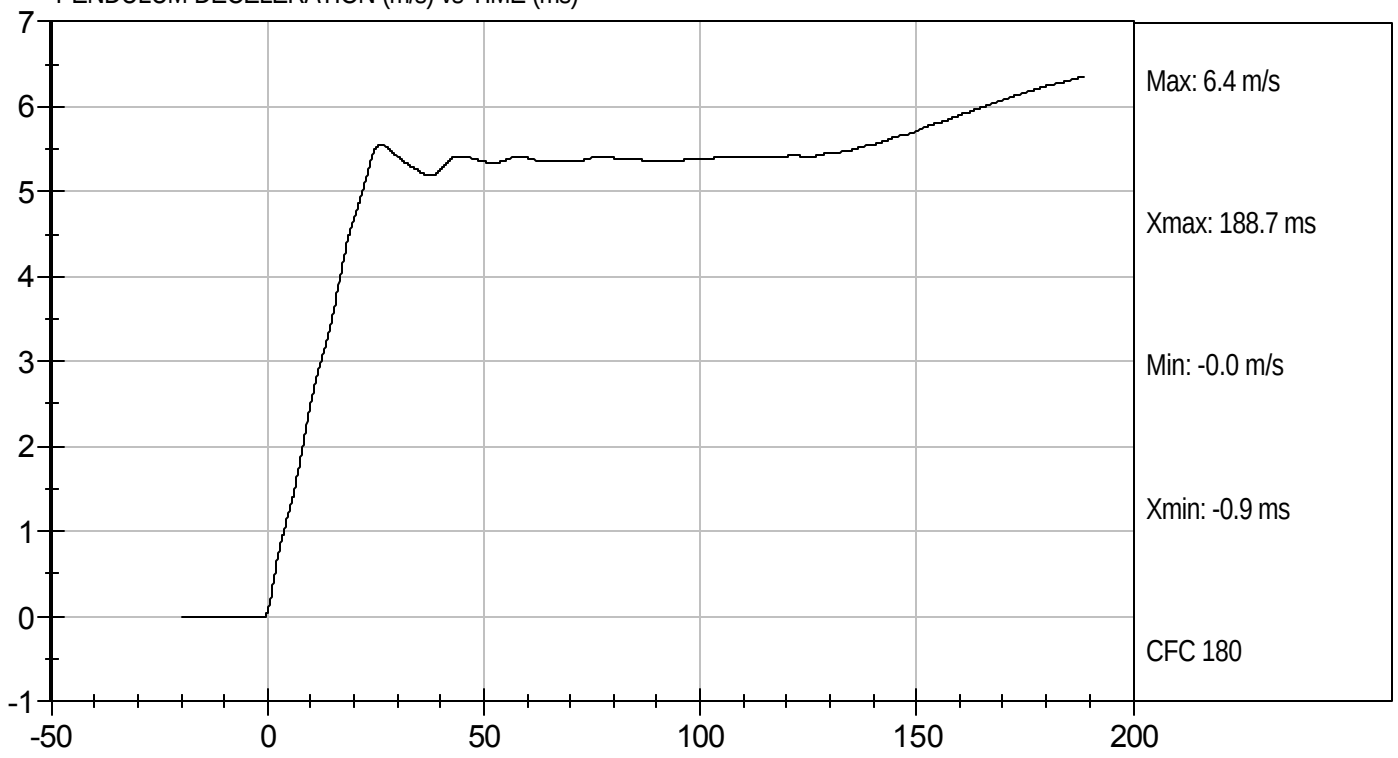
10/13/10
Test Date

David Winkelbauer
Approved By

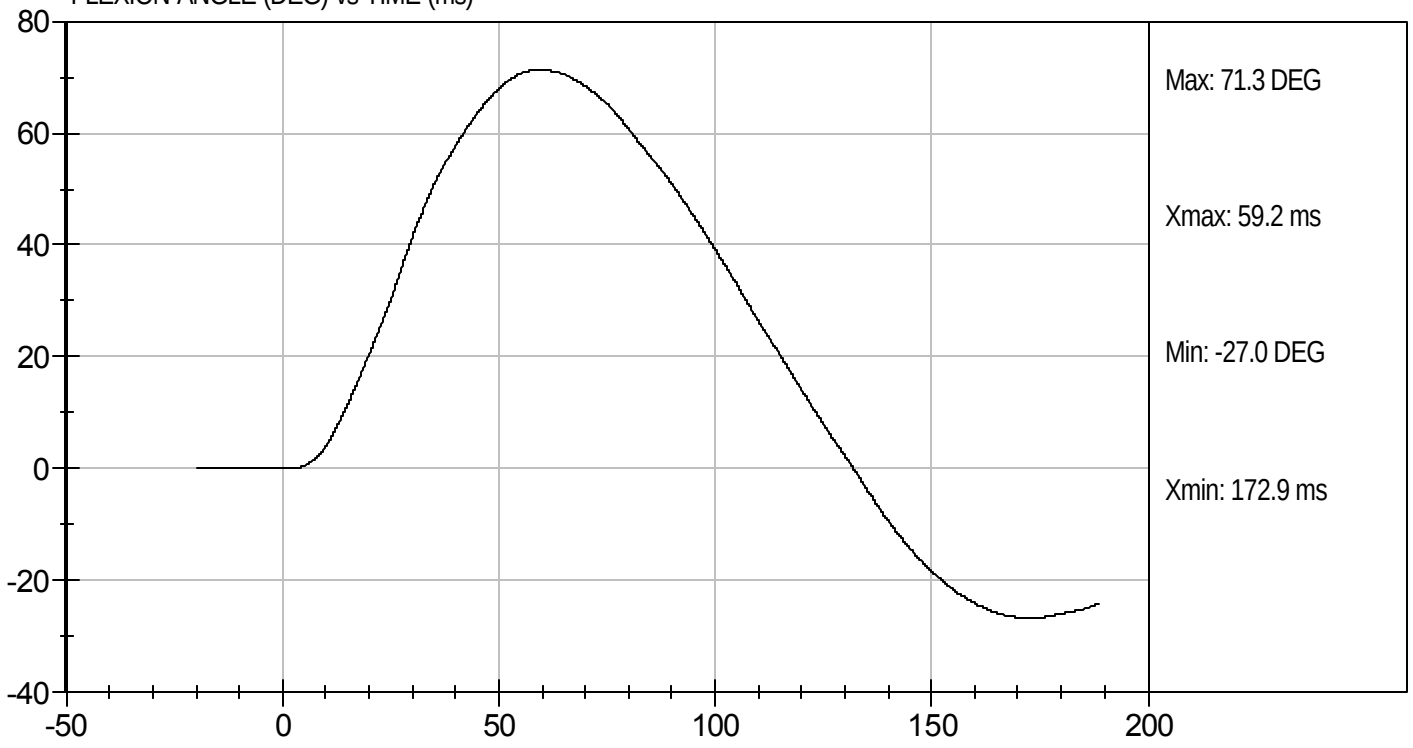
Test Desc: Neck Bending
Component ID: D103472

Test Date: 10/13/10
Velocity: 18.32 ft/s, 5.58 m/s

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

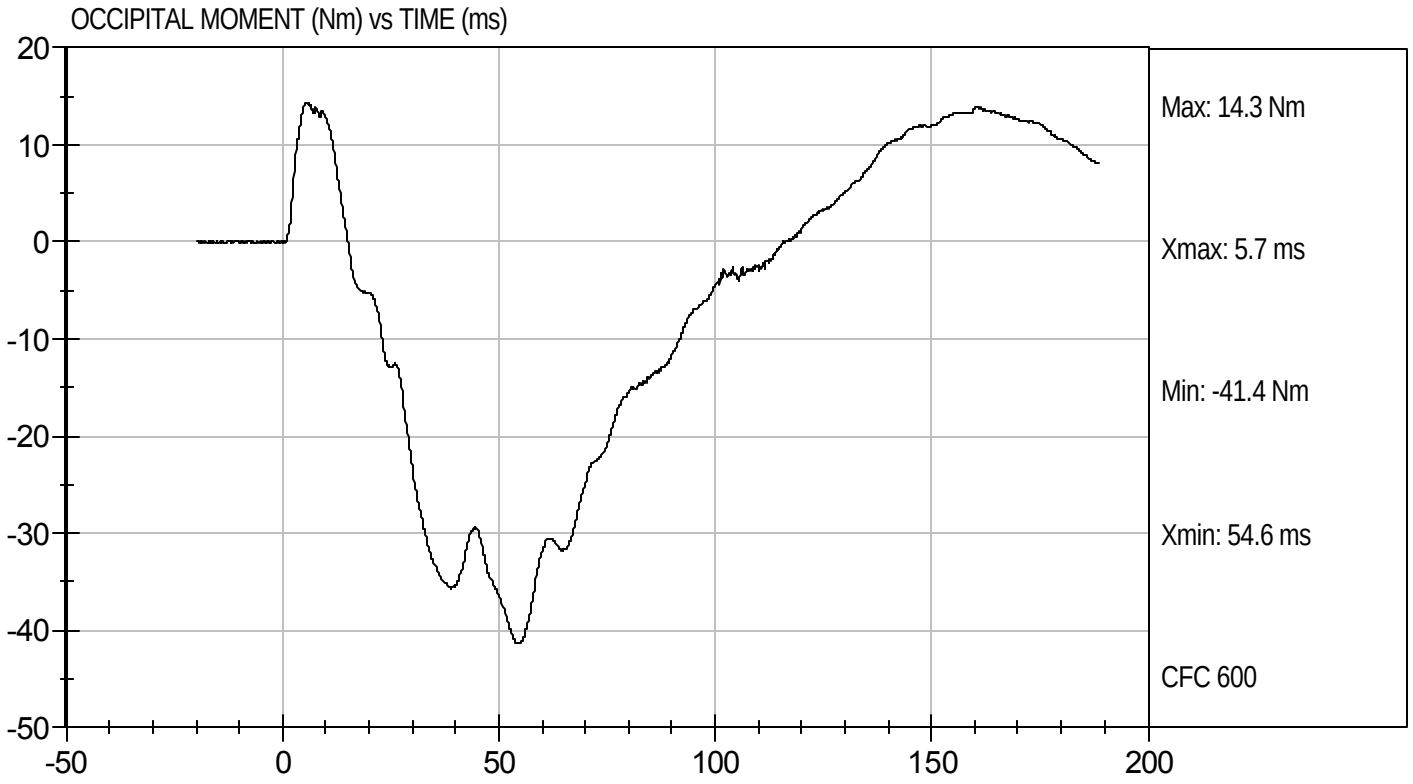


FLEXION ANGLE (DEG) vs TIME (ms)



Test Desc: Neck Bending
Component ID: D103472

Test Date: 10/13/10
Velocity: 18.32 ft/s, 5.58 m/s



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test ID:** D103473

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	40	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Maximum Probe Acceleration	G's	13 to 18	15	Pass
Shoulder Displacement	mm	28 to 37	31	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	18	Pass
		Overall Test Results		Pass

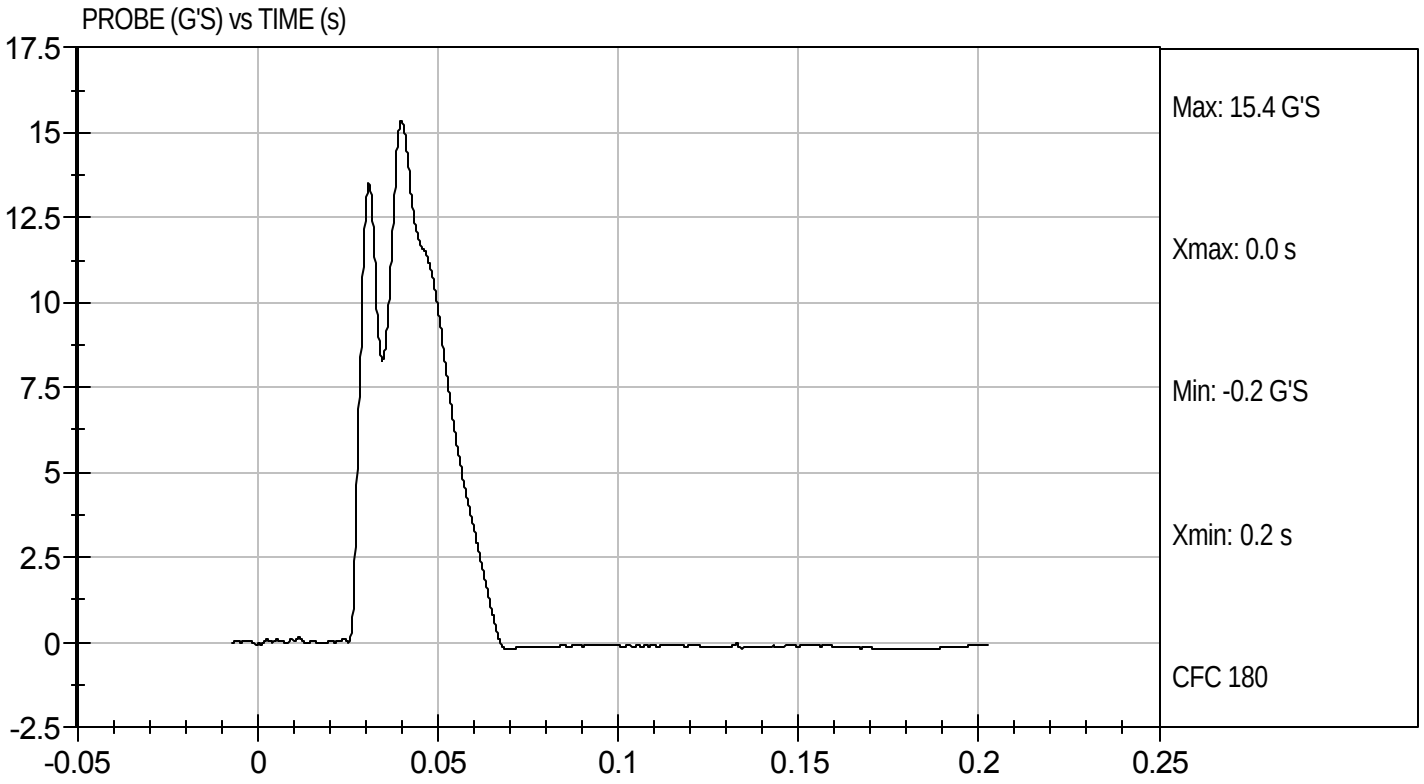
Jessica Gall
Laboratory Technician

10/13/10
Test Date

David Winkelbauer
Approved By

Test Desc: Shoulder Impact
Component ID: D103473

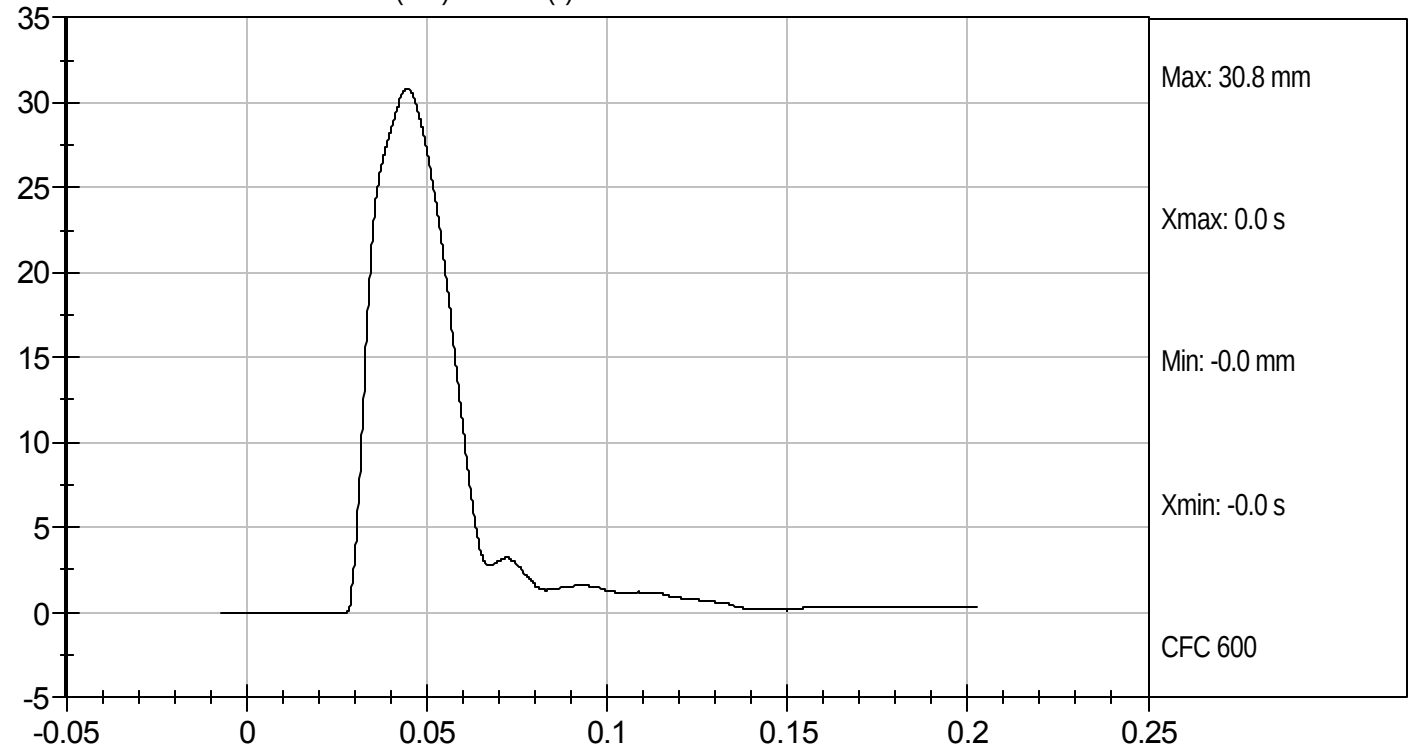
Test Date: 10/13/10
Velocity: 14.12 ft/s, 4.30 m/s



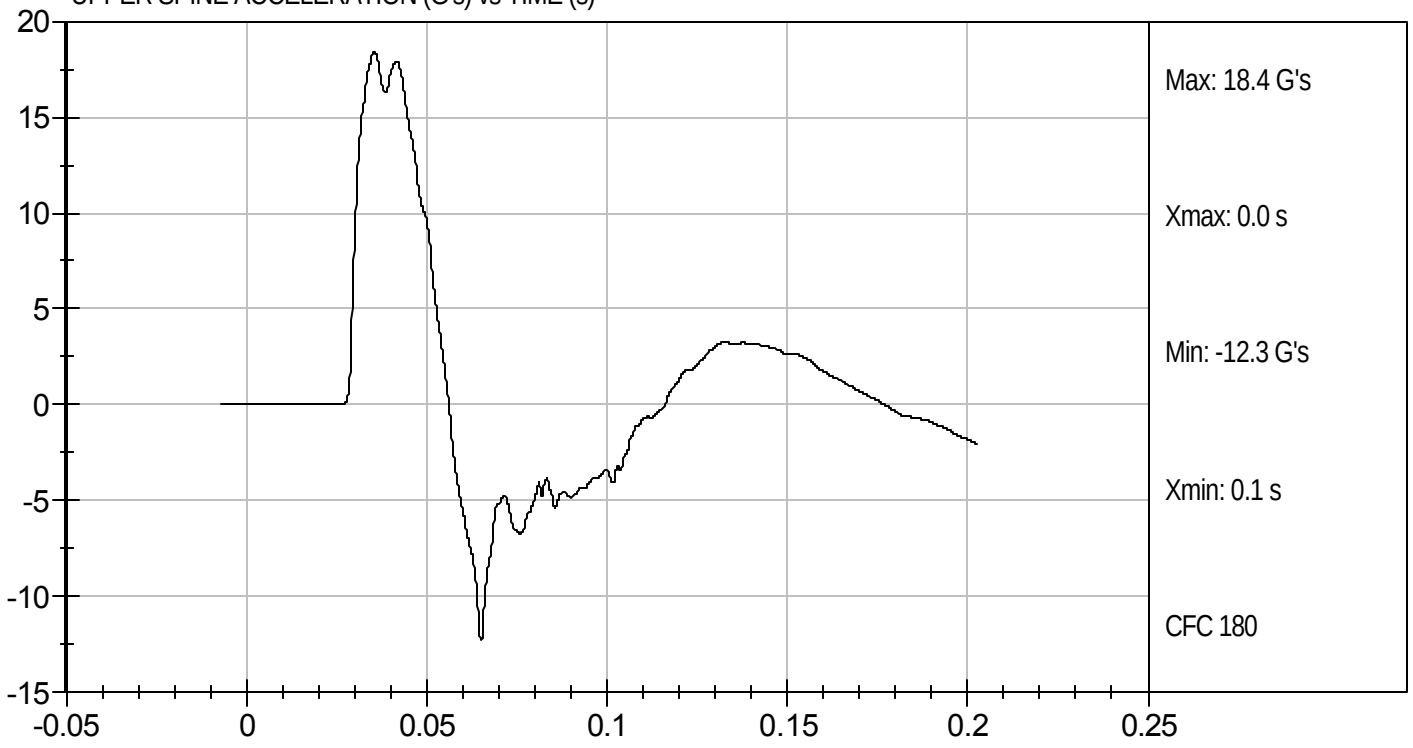
Test Desc: Shoulder Impact
Component ID: D103473

Test Date: 10/13/10
Velocity: 14.12 ft/s, 4.30 m/s

SHOULDER DISPLACEMENT (mm) vs TIME (s)



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



MGA RESEARCH CORPORATION

THORAX (WITH ARM) IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test I.D:** D103474

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.9	Pass
Humidity	%	10 to 70	41	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	37	Pass
Upper Rib Displacement	mm	25 to 32	28	Pass
Middle Rib Displacement	mm	30 to 36	31	Pass
Lower Rib Displacement	mm	32 to 38	32	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	37	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	33	Pass
		Overall Test Results		Pass

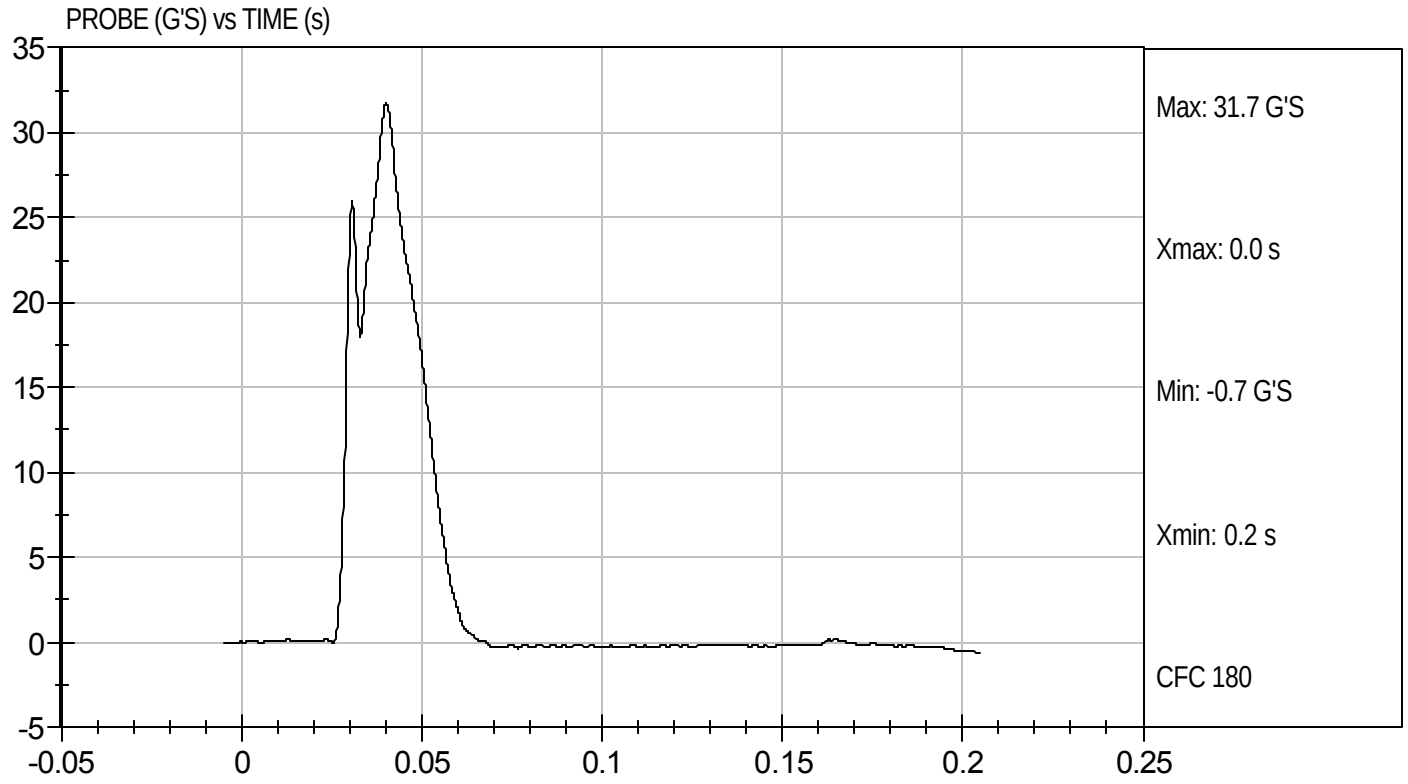
Jessica Hall
Laboratory Technician

10/13/10
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax With Arm
Component ID: D103474

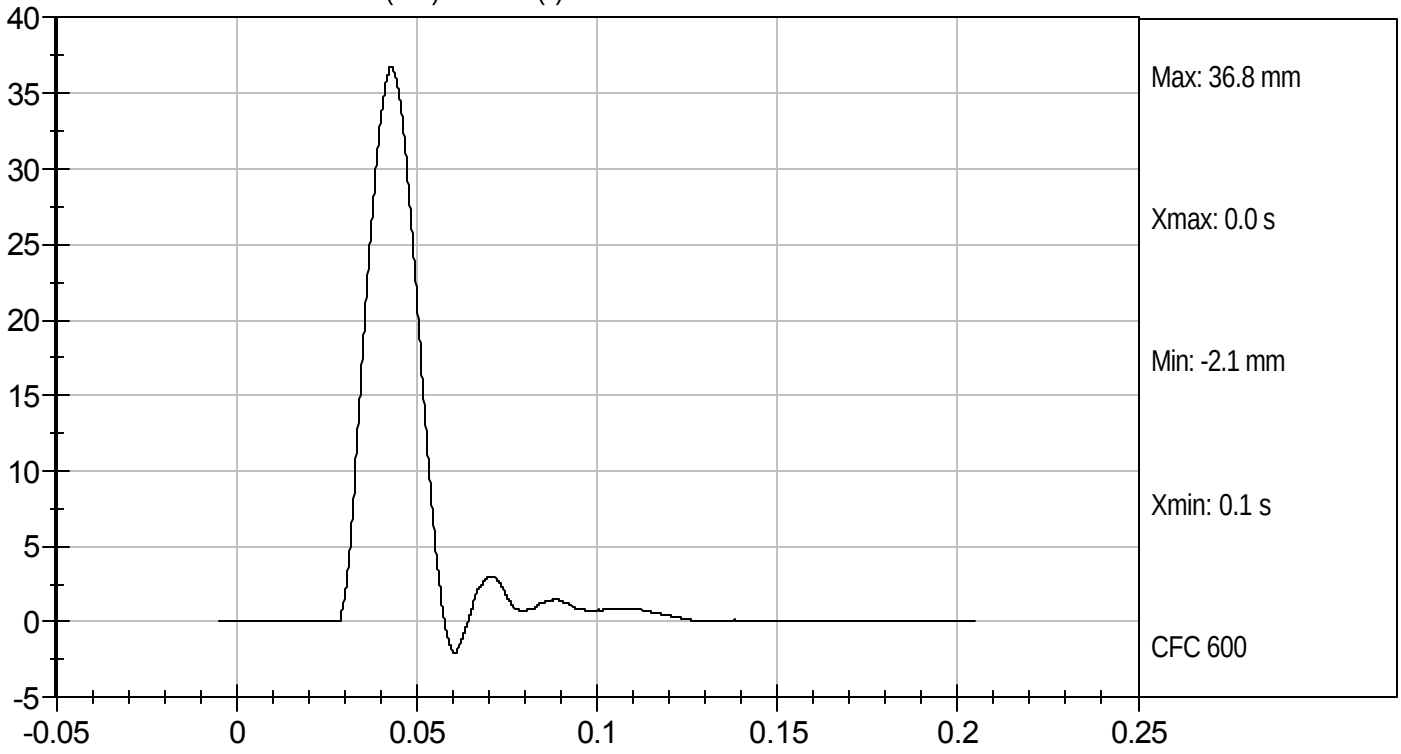
Test Date: 10/13/10
Velocity: 22.22 ft/s, 6.77 m/s



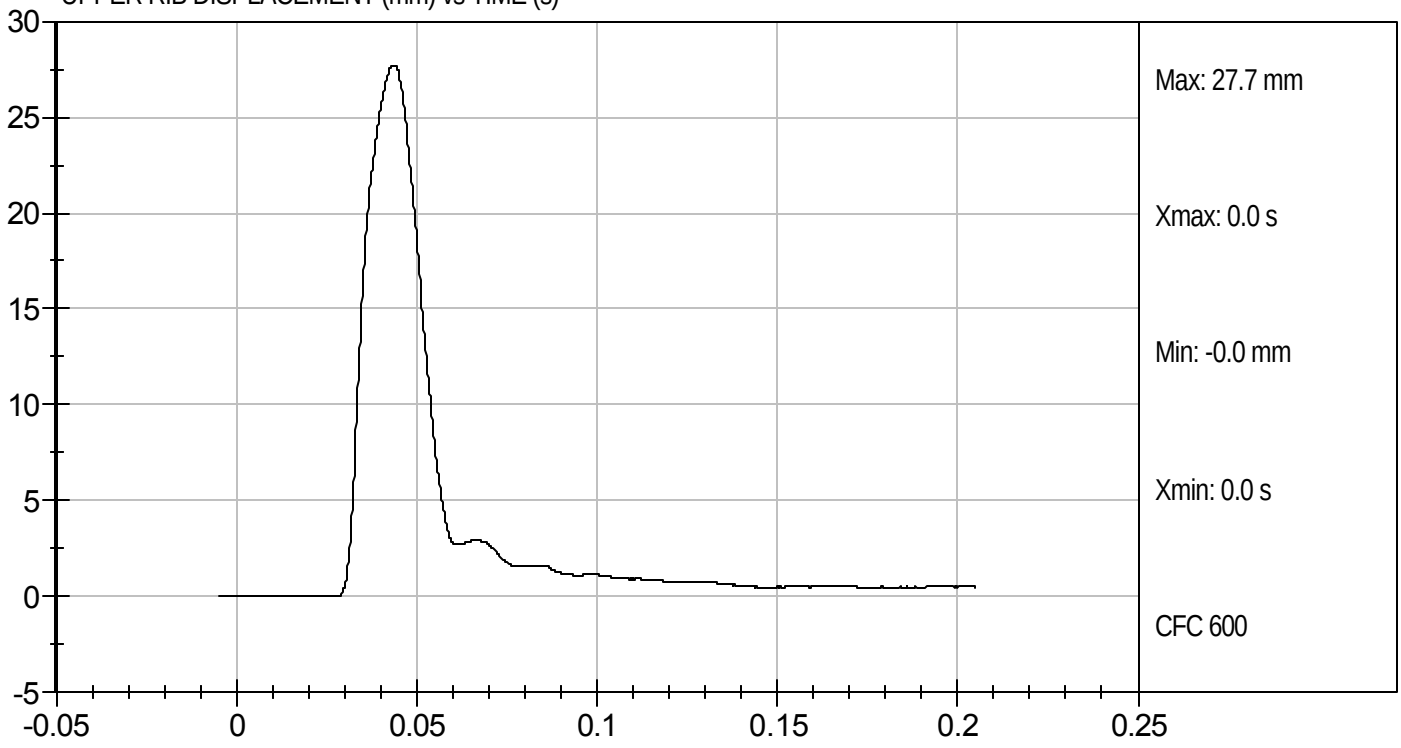
Test Desc: Thorax With Arm
Component ID: D103474

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

SHOULDER DISPLACEMENT (mm) vs TIME (s)



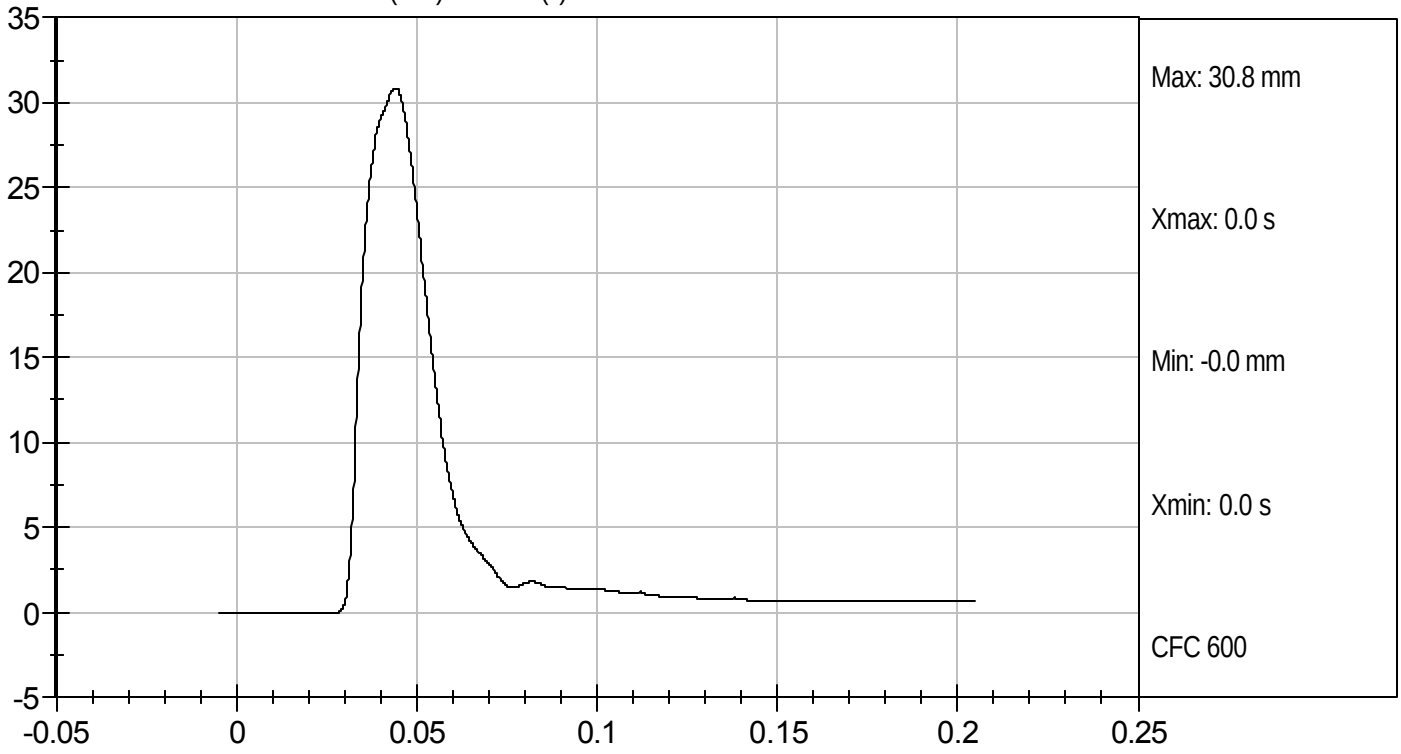
UPPER RIB DISPLACEMENT (mm) vs TIME (s)



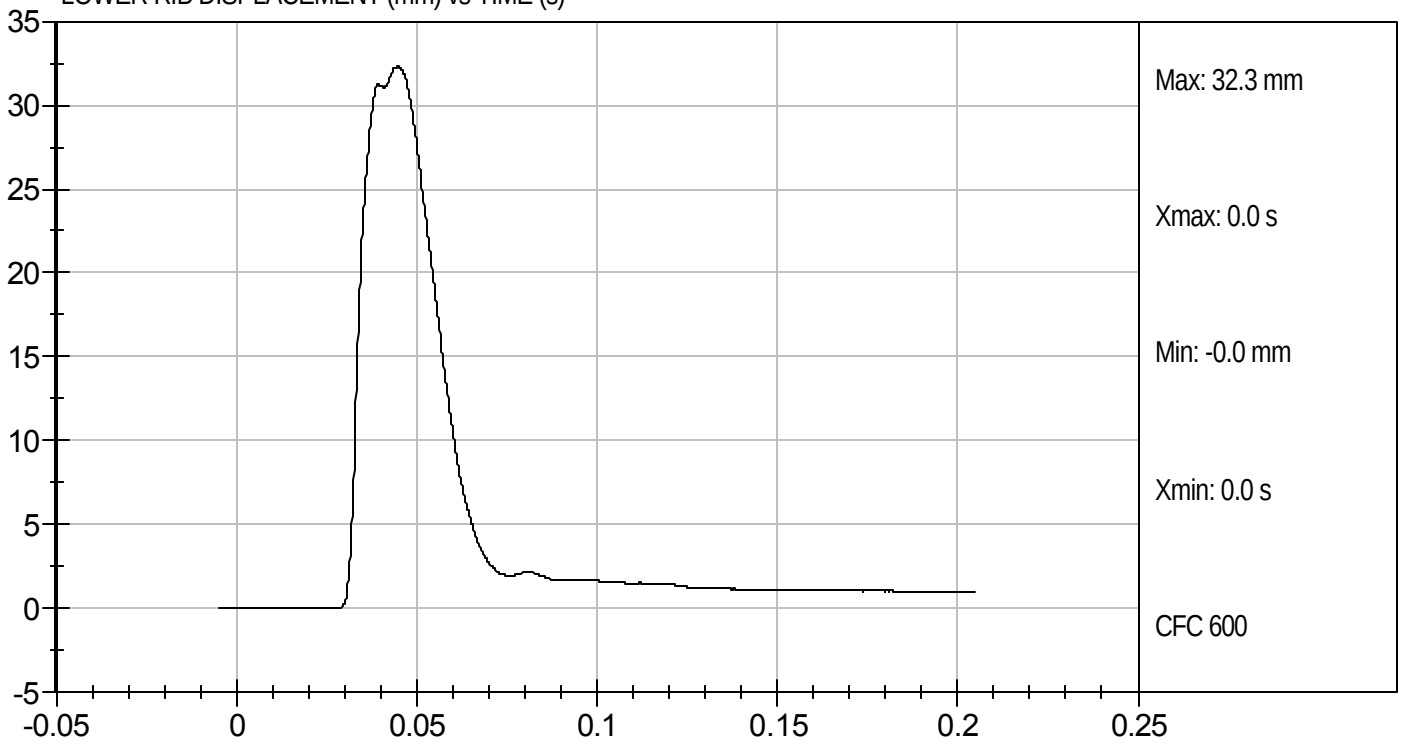
Test Desc: Thorax With Arm
Component ID: D103474

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

MIDDLE RIB DISPLACEMENT (mm) vs TIME (s)



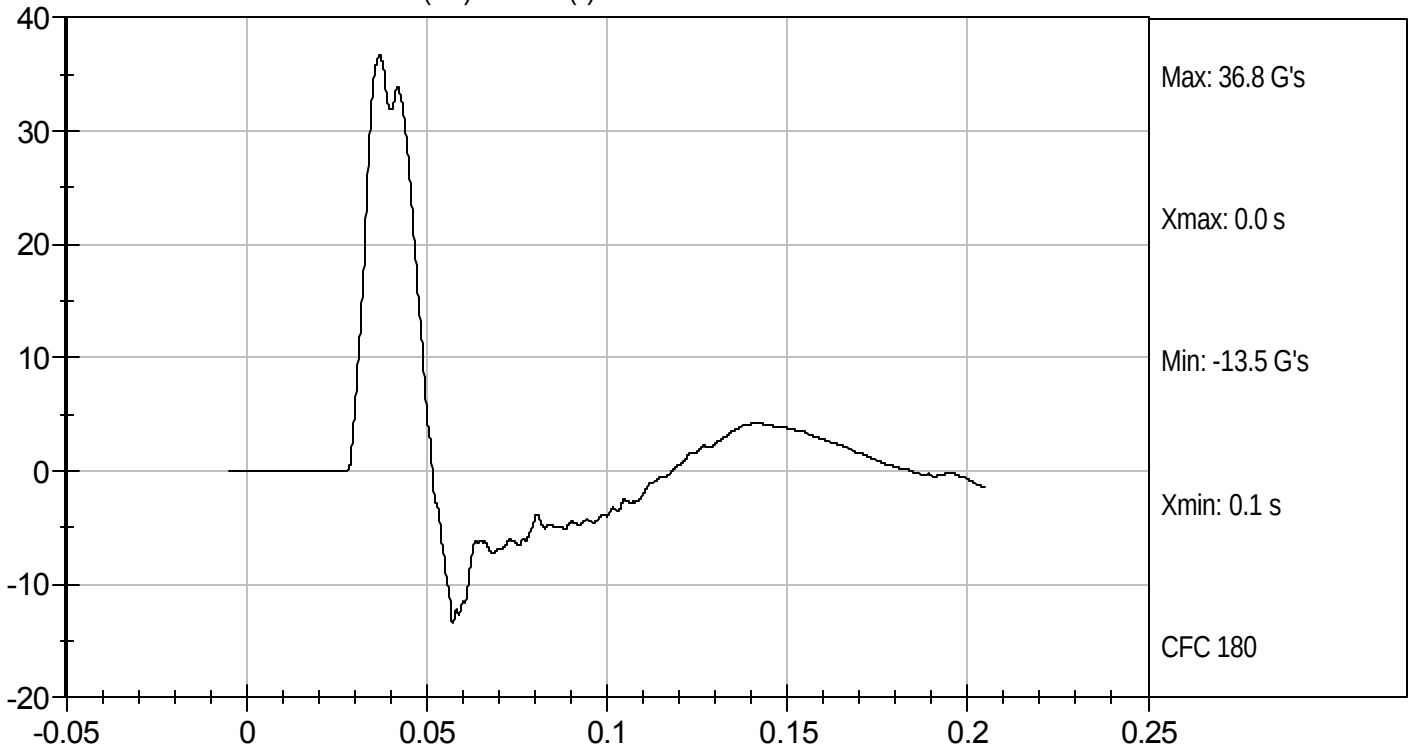
LOWER RIB DISPLACEMENT (mm) vs TIME (s)



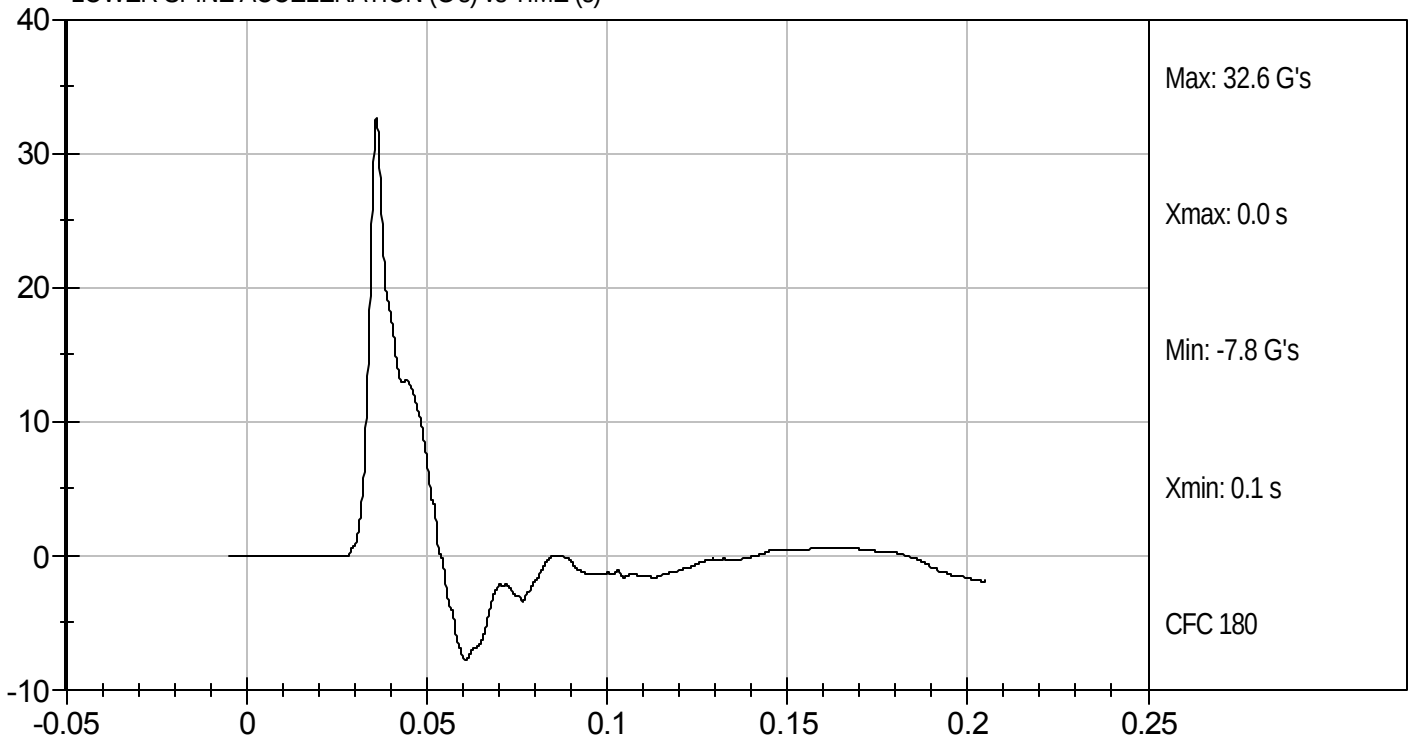
Test Desc: Thorax With Arm
Component ID: D103474

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

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



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



MGA RESEARCH CORPORATION

THORAX (WITHOUT ARM) IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test I.D:** D103475

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.9	Pass
Humidity	%	10 to 70	40	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	38	Pass
Middle Rib Displacement	mm	39 to 45	42	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	8	Pass
		Overall Test Results		Pass

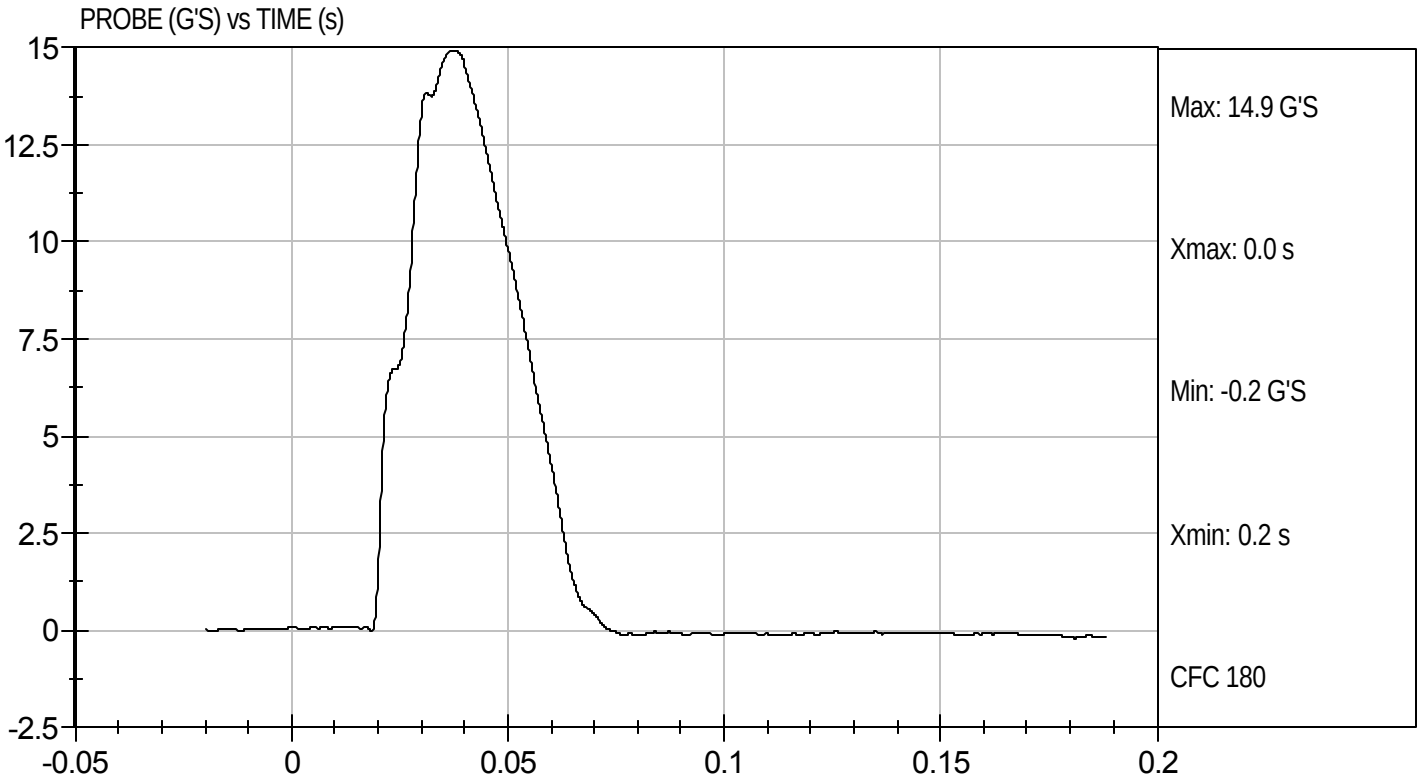
Jessica Hall
Laboratory Technician

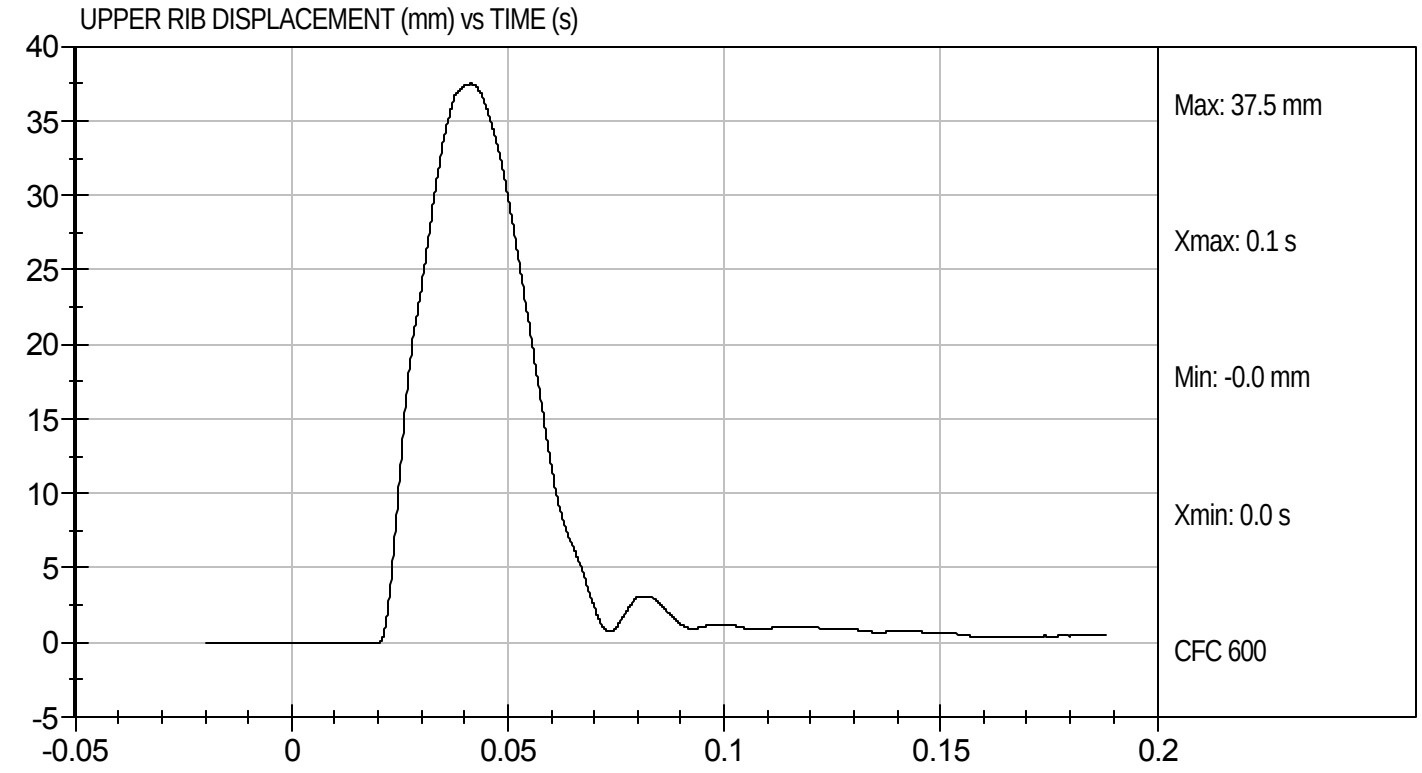
10/13/10
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Without Arm
Component ID: D103475

Test Date: 10/13/10
Velocity: 14.36 ft/s, 4.38 m/s

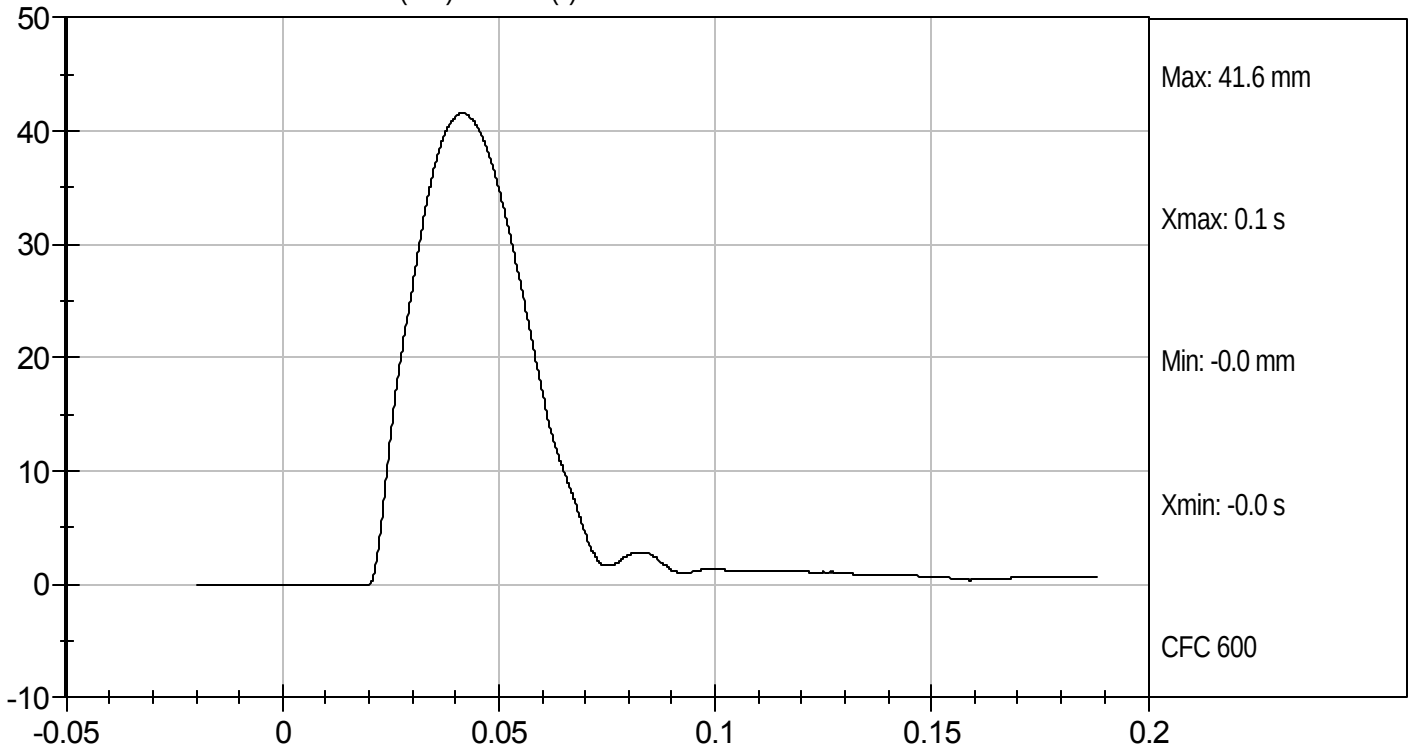




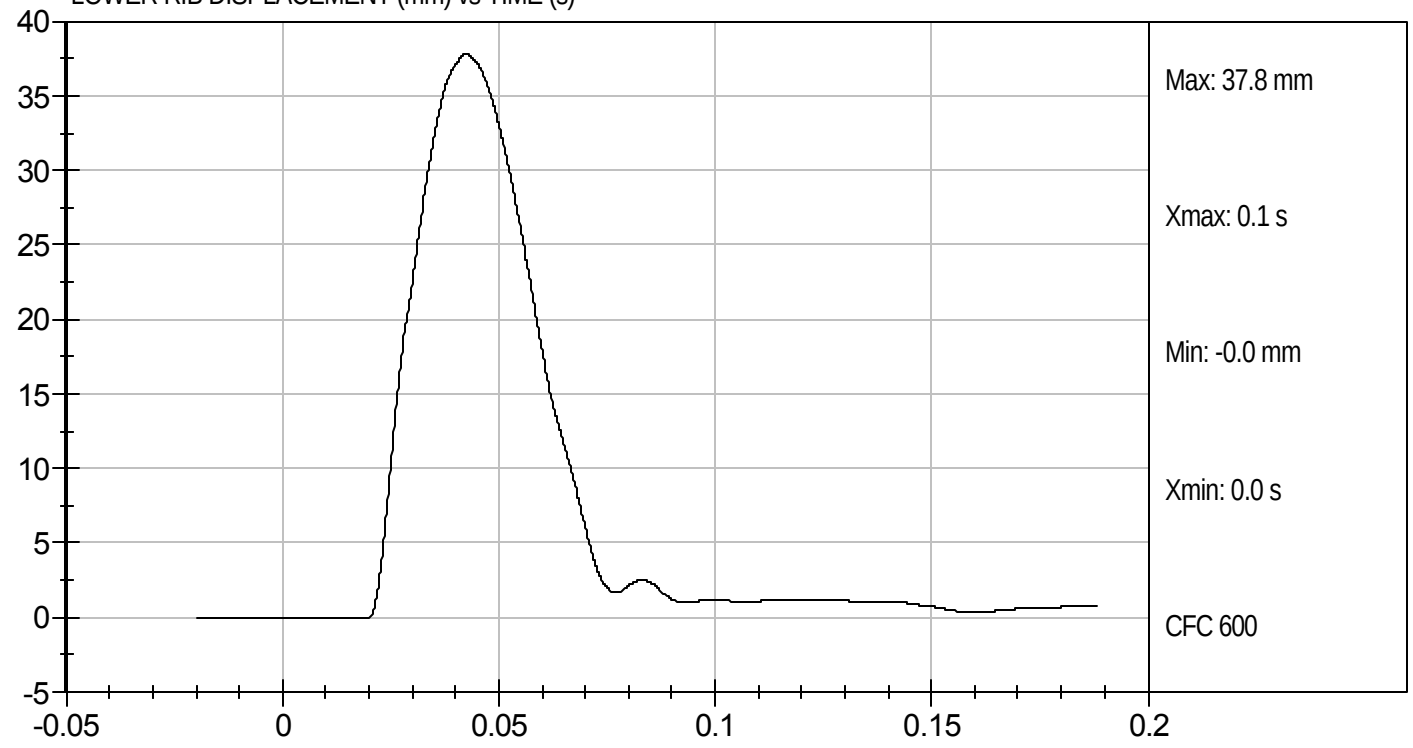
Test Desc: Thorax Without Arm
Component ID: D103475

Test Date: 10/13/10
Velocity: 14.36 ft/s, 4.38 m/s

MIDDLE RIB DISPLACEMENT (mm) vs TIME (s)



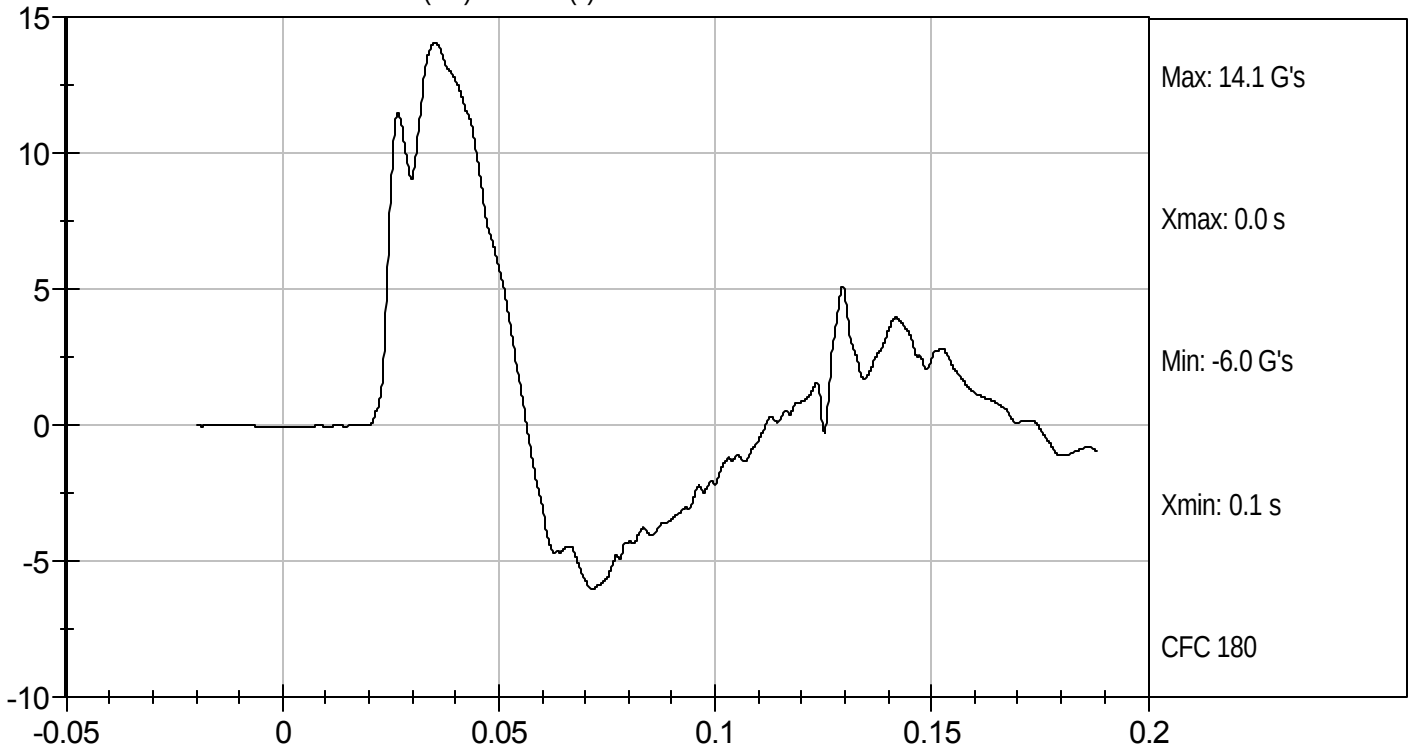
LOWER RIB DISPLACEMENT (mm) vs TIME (s)



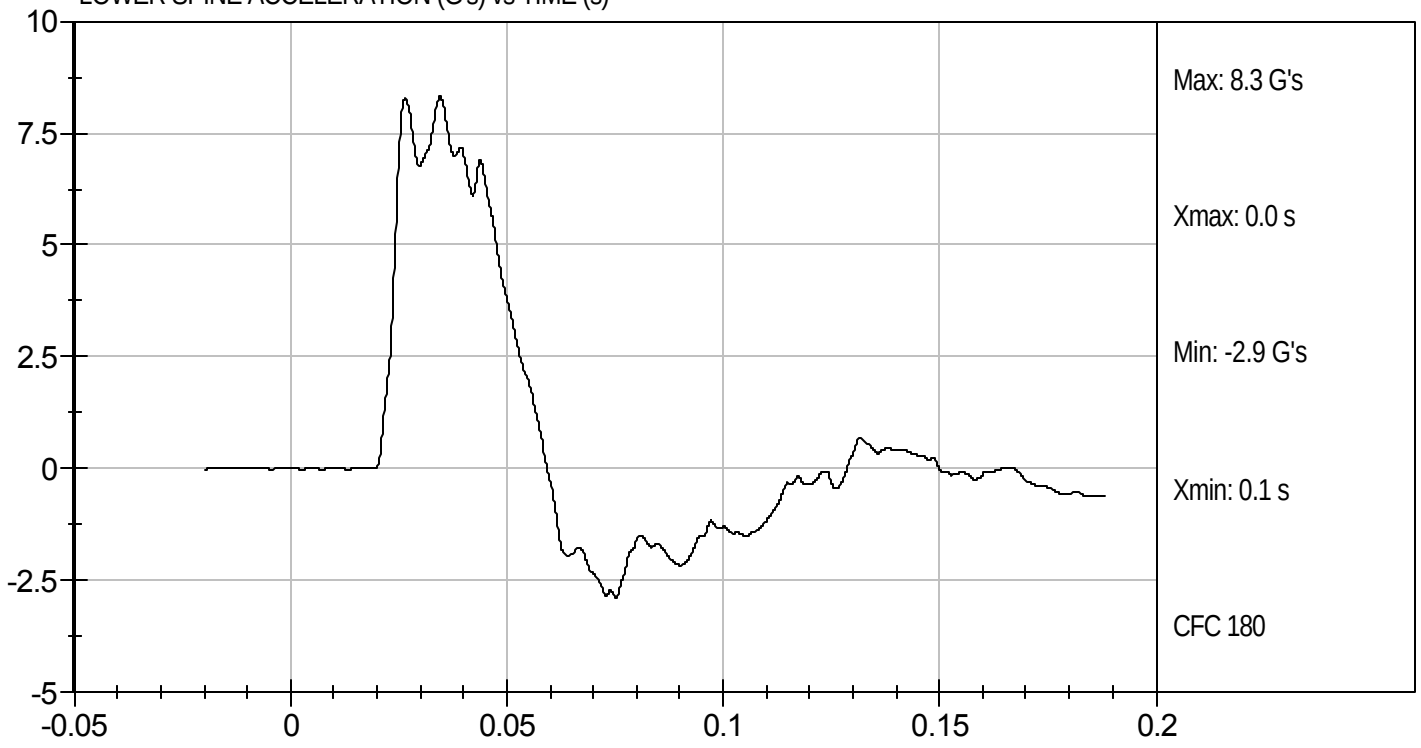
Test Desc: Thorax Without Arm
Component ID: D103475

Test Date: 10/13/10
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:** D103476

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	22.0	Pass
Humidity	%	10 to 70	41	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	43	Pass
Lower Rib Displacement	mm	33 to 44	38	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	11	Pass
		Overall Test Results		Pass

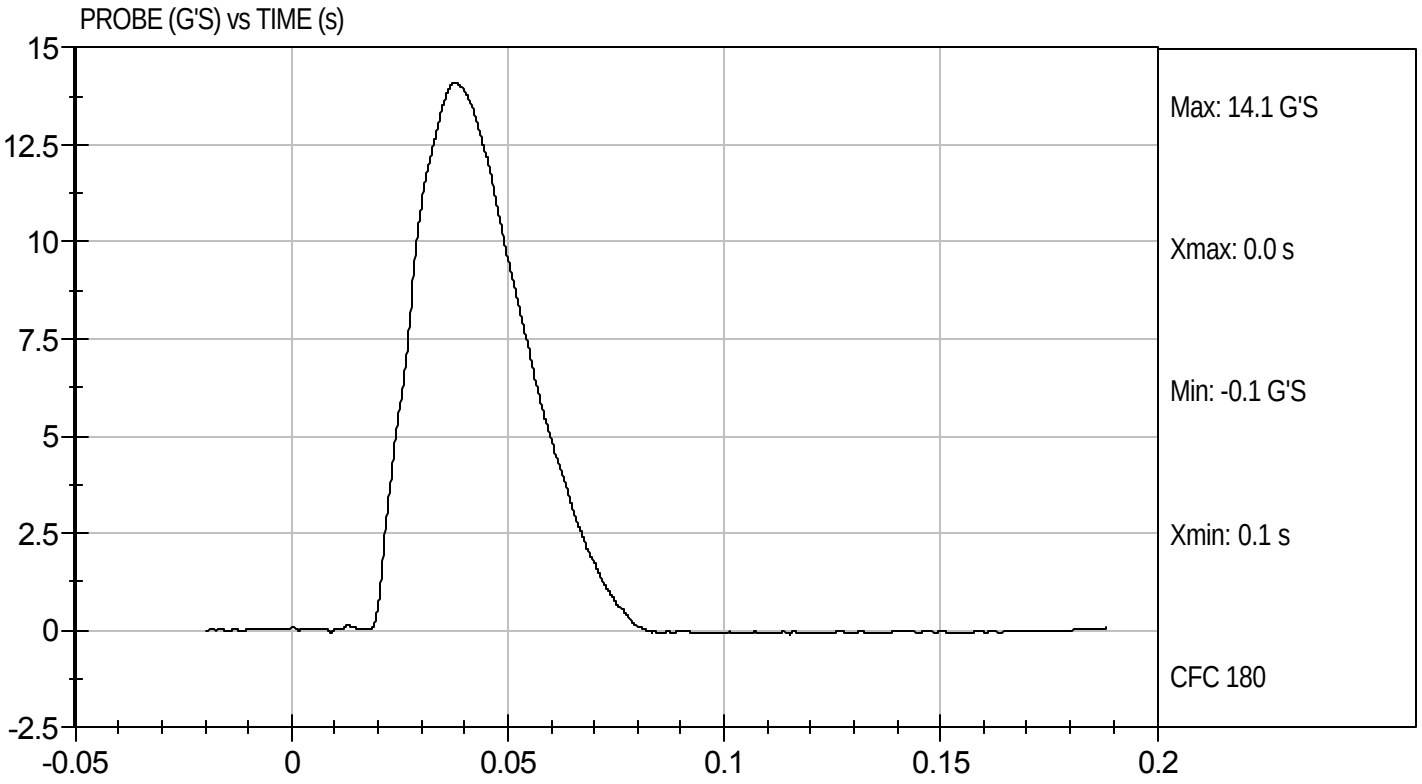
Jessica Hall
Laboratory Technician

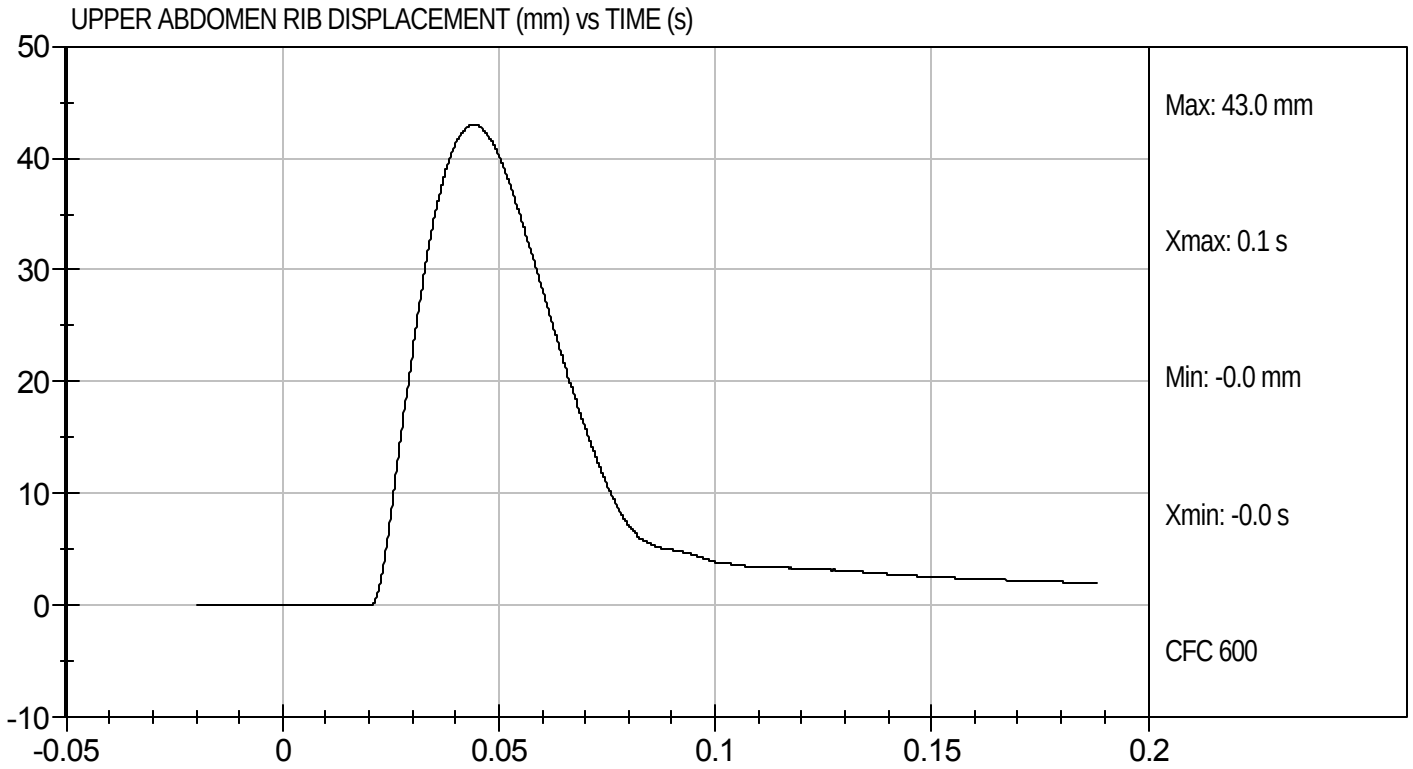
10/13/10
Test Date

David Winkelbauer
Approved By

Test Desc: Abdomen Impact
Component ID: D103476

Test Date: 10/13/10
Velocity: 14.36 ft/s, 4.38 m/s

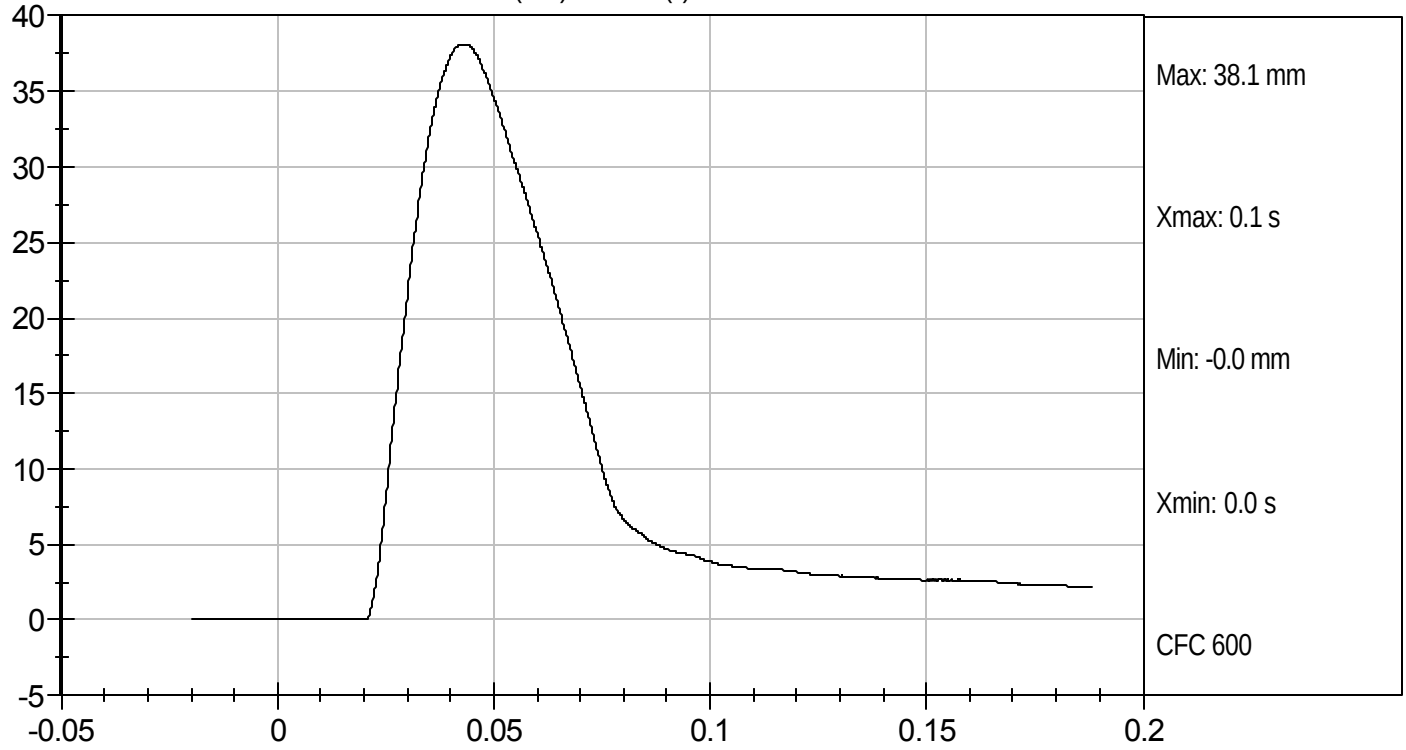




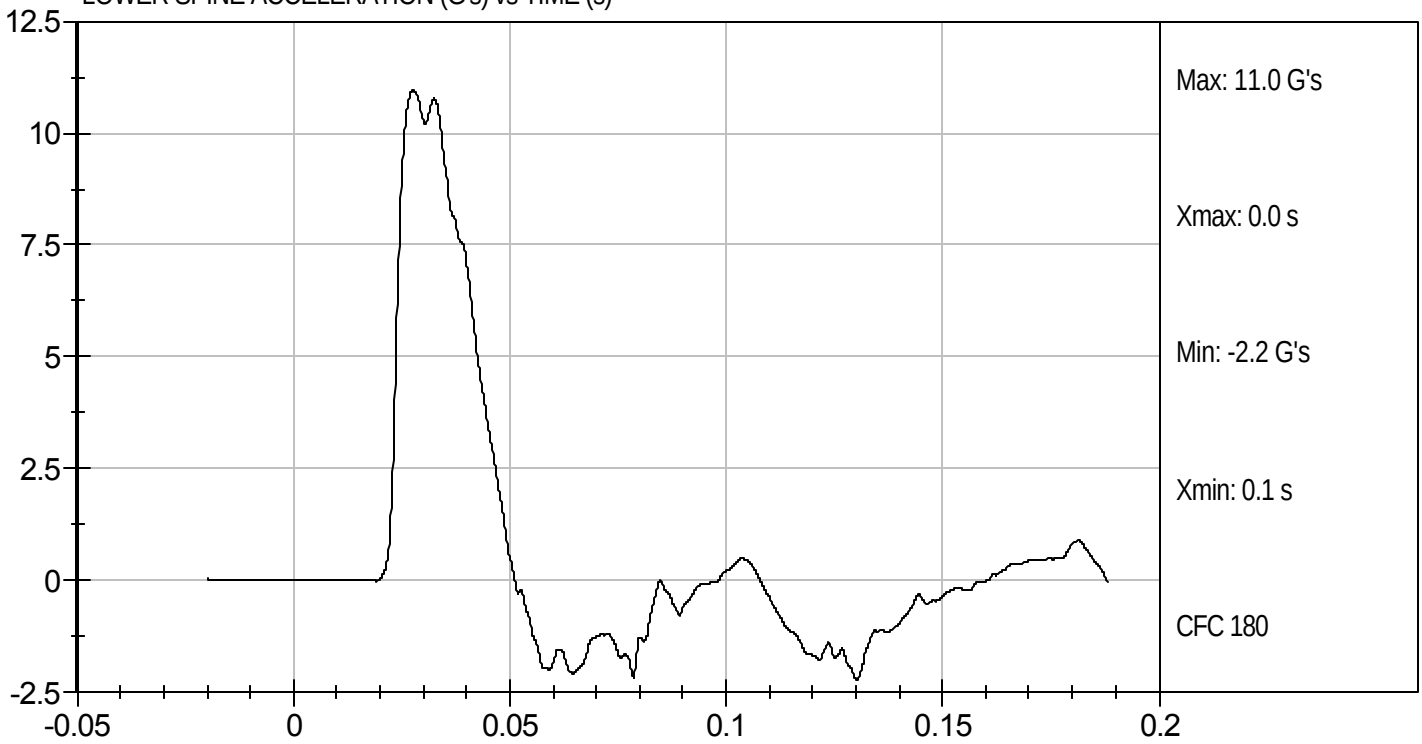
Test Desc: Abdomen Impact
Component ID: D103476

Test Date: 10/13/10
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:** D103477

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Humidity	%	10 to 70	40	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	4139	Pass
		Overall Test Results		Pass

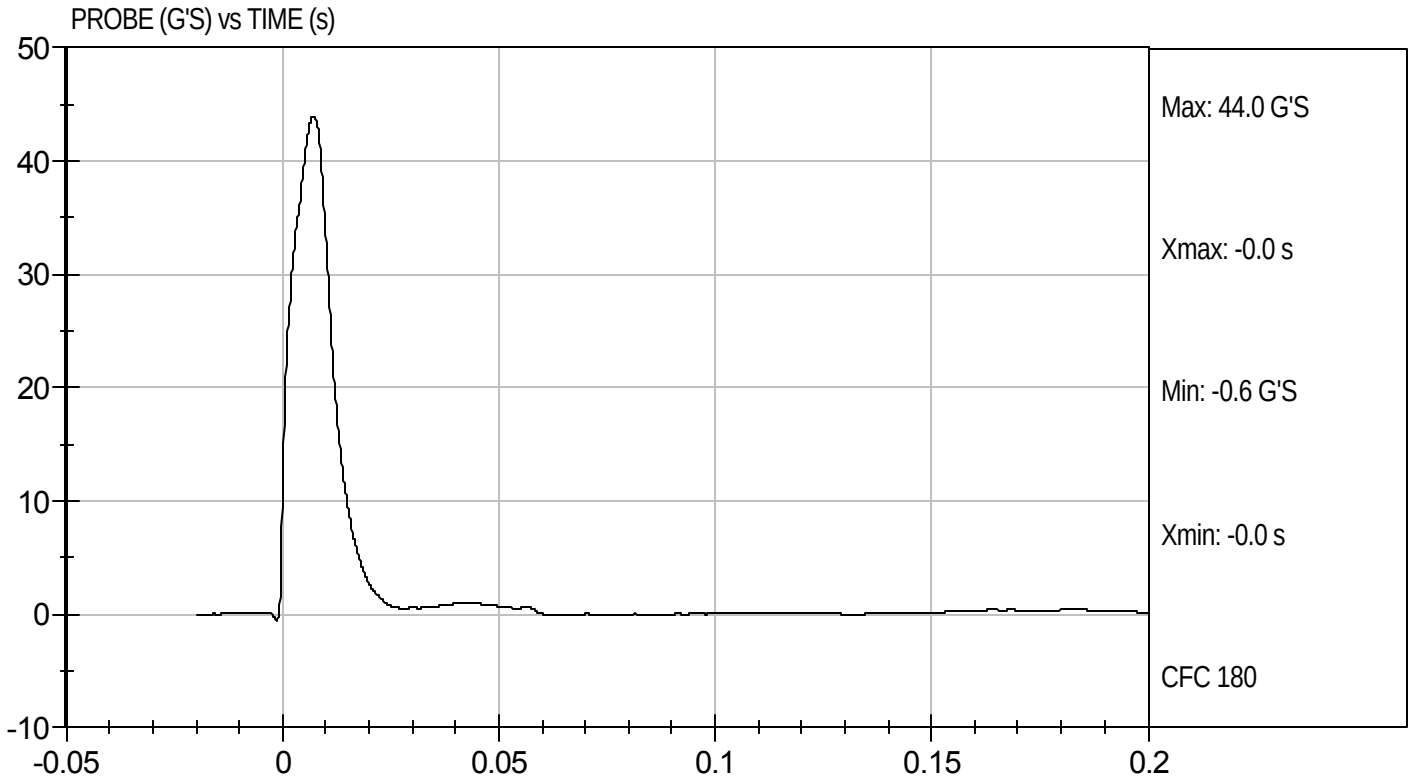
Jessica Hall
Laboratory Technician

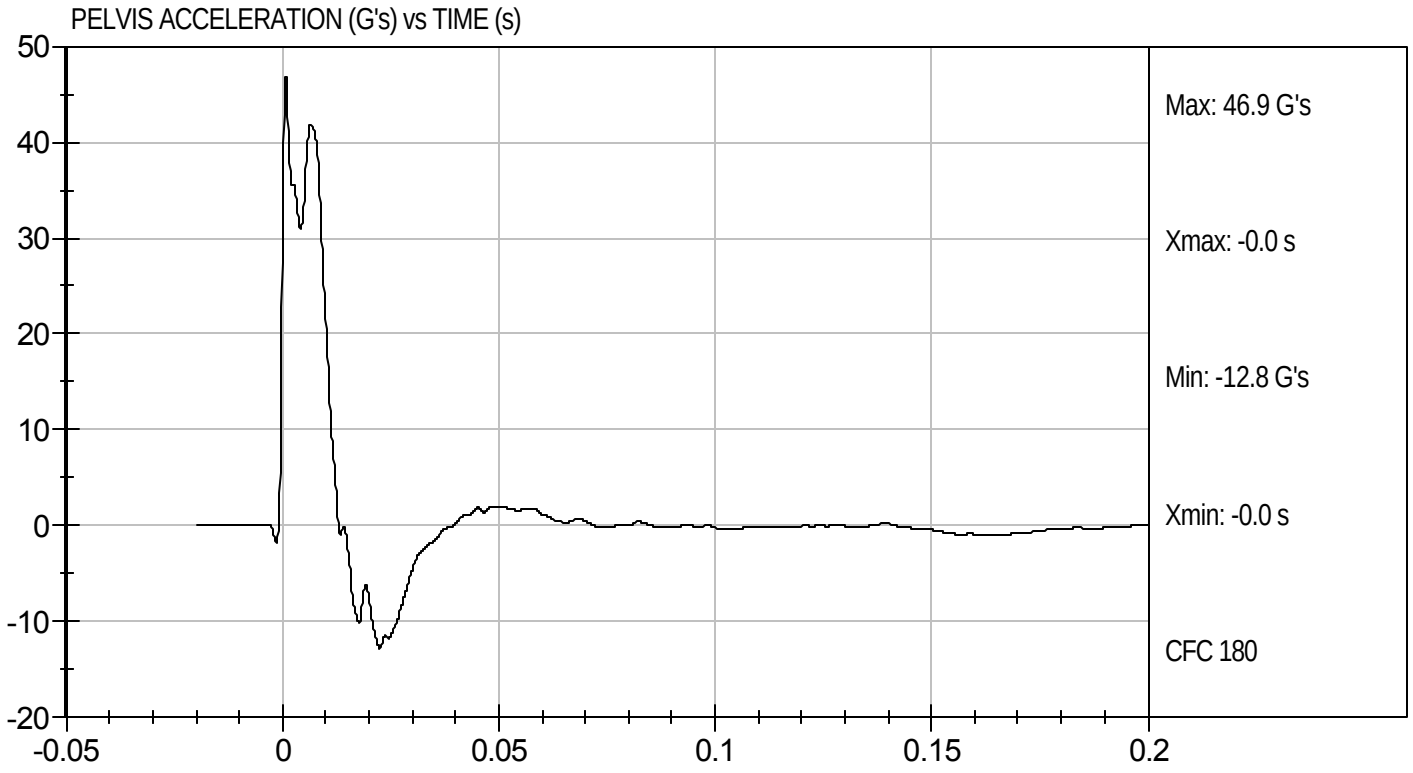
10/13/10
Test Date

David Winkelbauer
Approved By

Test Desc: Pelvis Impact
Component ID: D103477

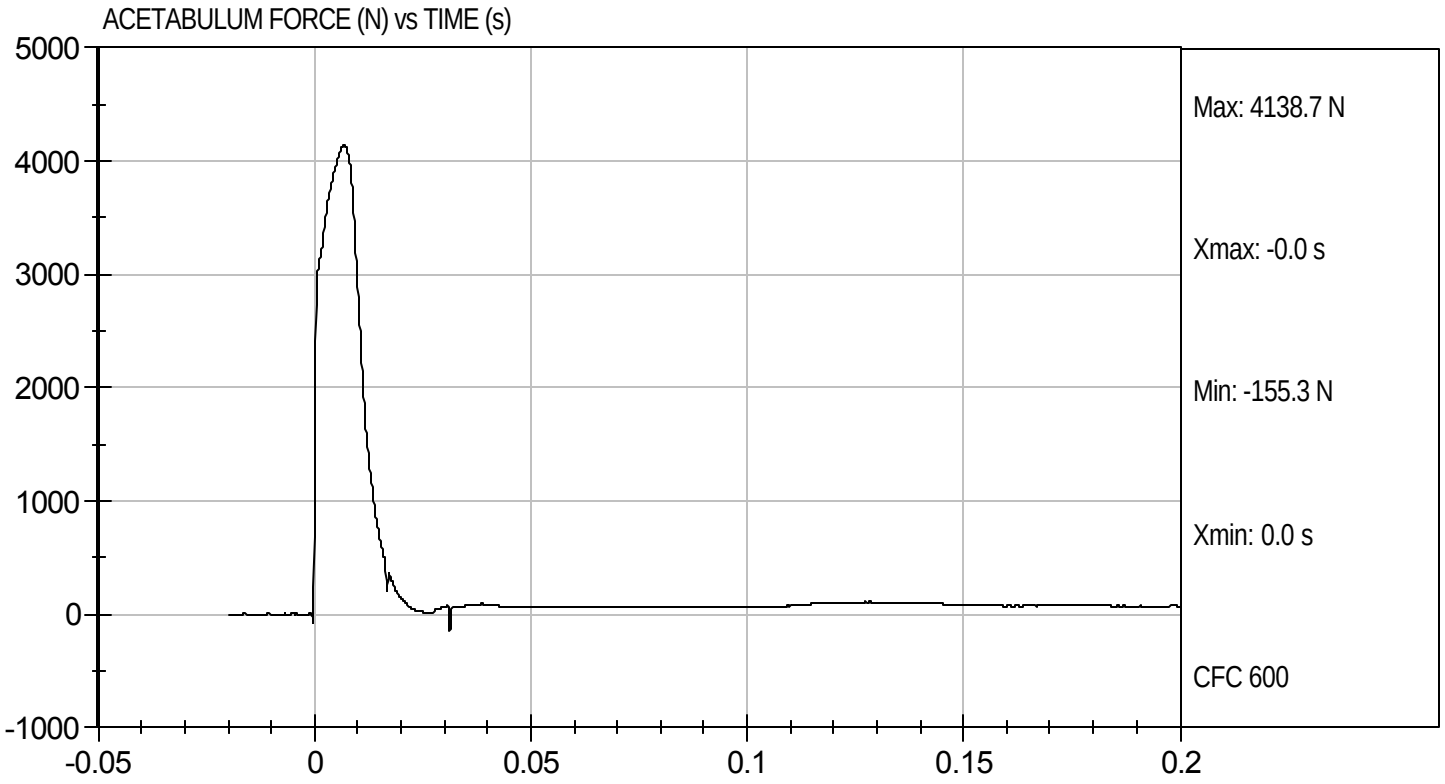
Test Date: 10/13/10
Velocity: 22.20 ft/s, 6.77 m/s





Test Desc: Pelvis Impact
Component ID: D103477

Test Date: 10/13/10
Velocity: 22.20 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:** D103478

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	22.0	Pass
Humidity	%	10 to 70	40	Pass
Impact Velocity	m/s	4.20 to 4.40	4.39	Pass
Peak Impactor Acceleration	G's	36 to 45	38	Pass
Pelvis Y Acceleration	G's	28 to 39	31	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4512	Pass
		Overall Test Results		Pass

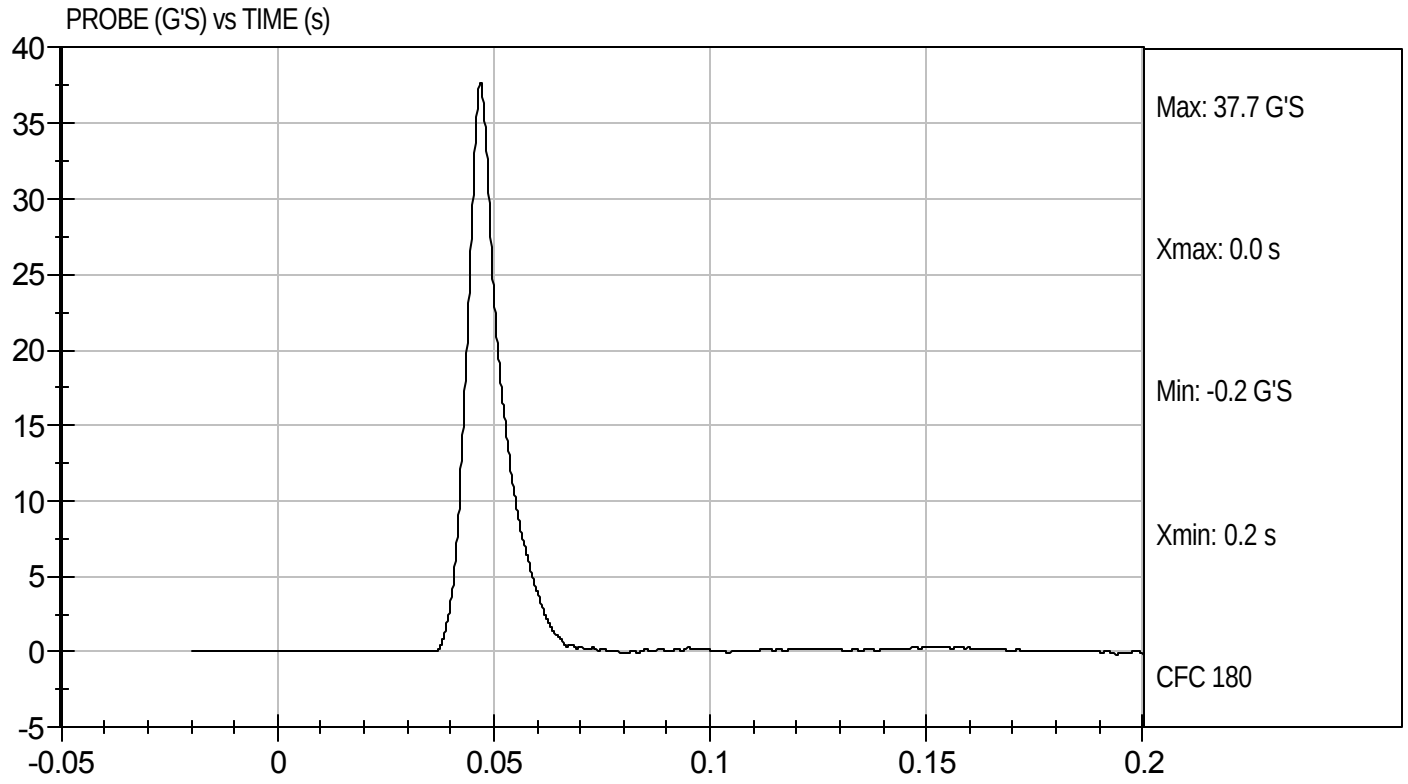
Jessica Hall
Laboratory Technician

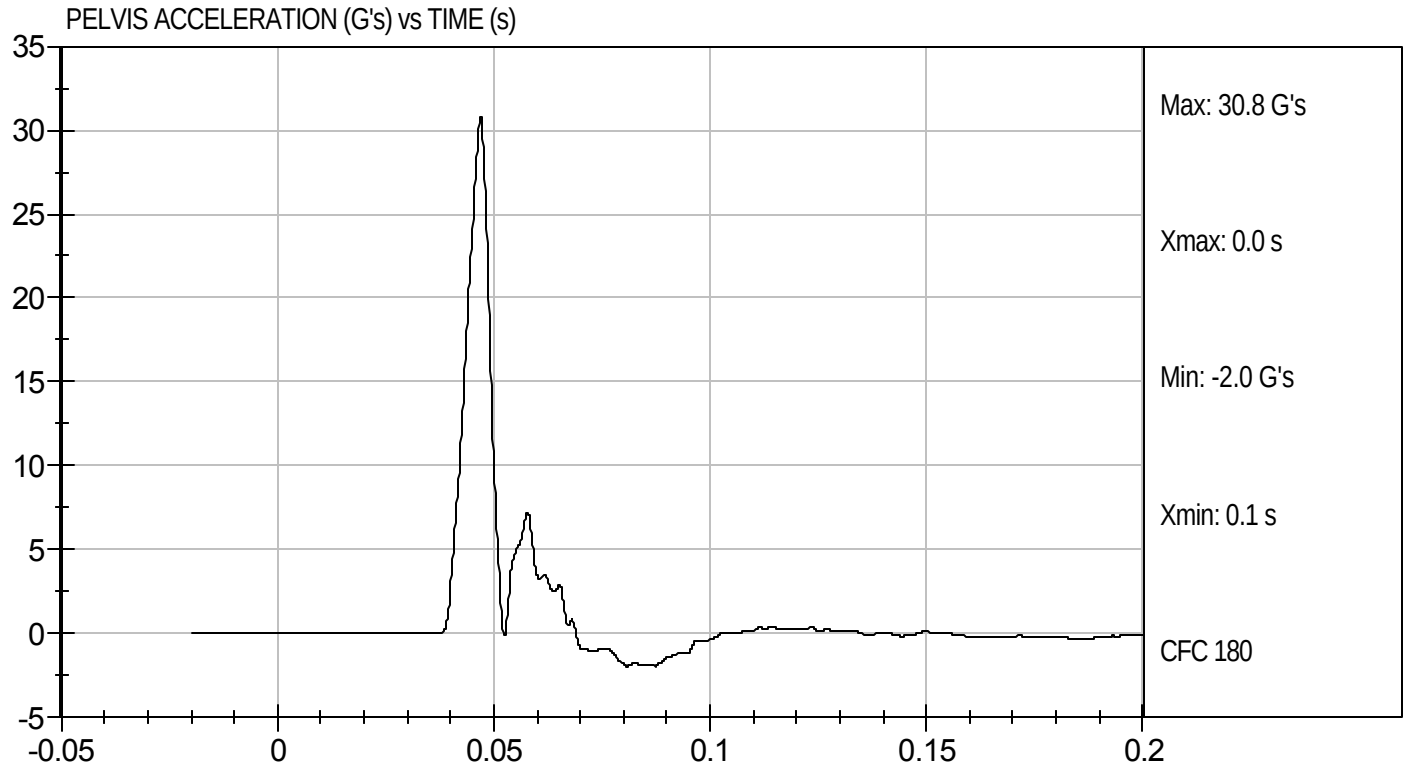
10/13/10
Test Date

David Winkelbauer
Approved By

Test Desc: Iliac Impact
Component ID: D103478

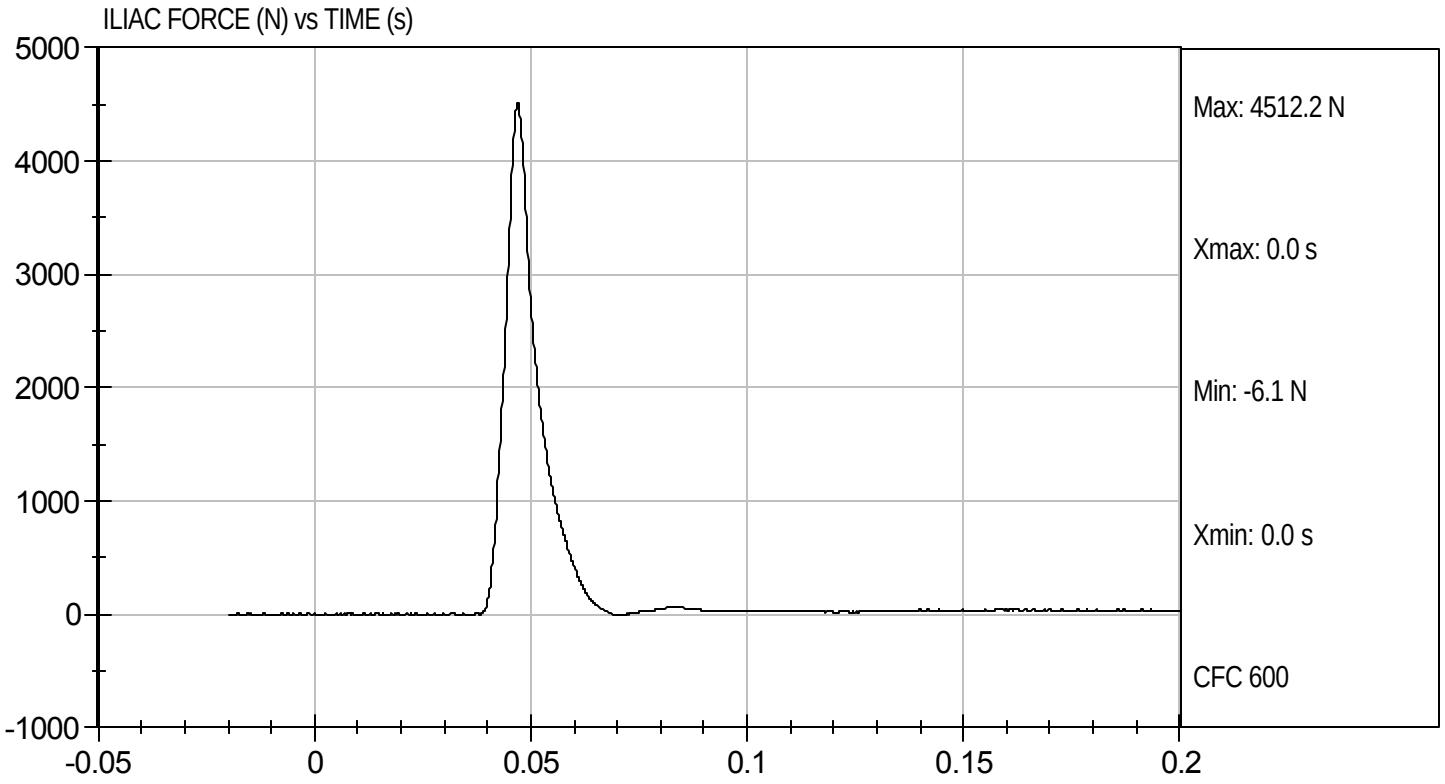
Test Date: 10/13/10
Velocity: 14.40 ft/s, 4.39 m/s





Test Desc: Iliac Impact
Component ID: D103478

Test Date: 10/13/10
Velocity: 14.40 ft/s, 4.39 m/s



MGA RESEARCH CORPORATION

HEAD DROP TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test ID:** D103561

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	33	Pass
Peak Resultant Acceleration	G's	115 to 137	124	Pass
Peak Lateral Acceleration	G's	+/- 15	-1.9	Pass
Unimodal	N/A	<15%	Yes	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

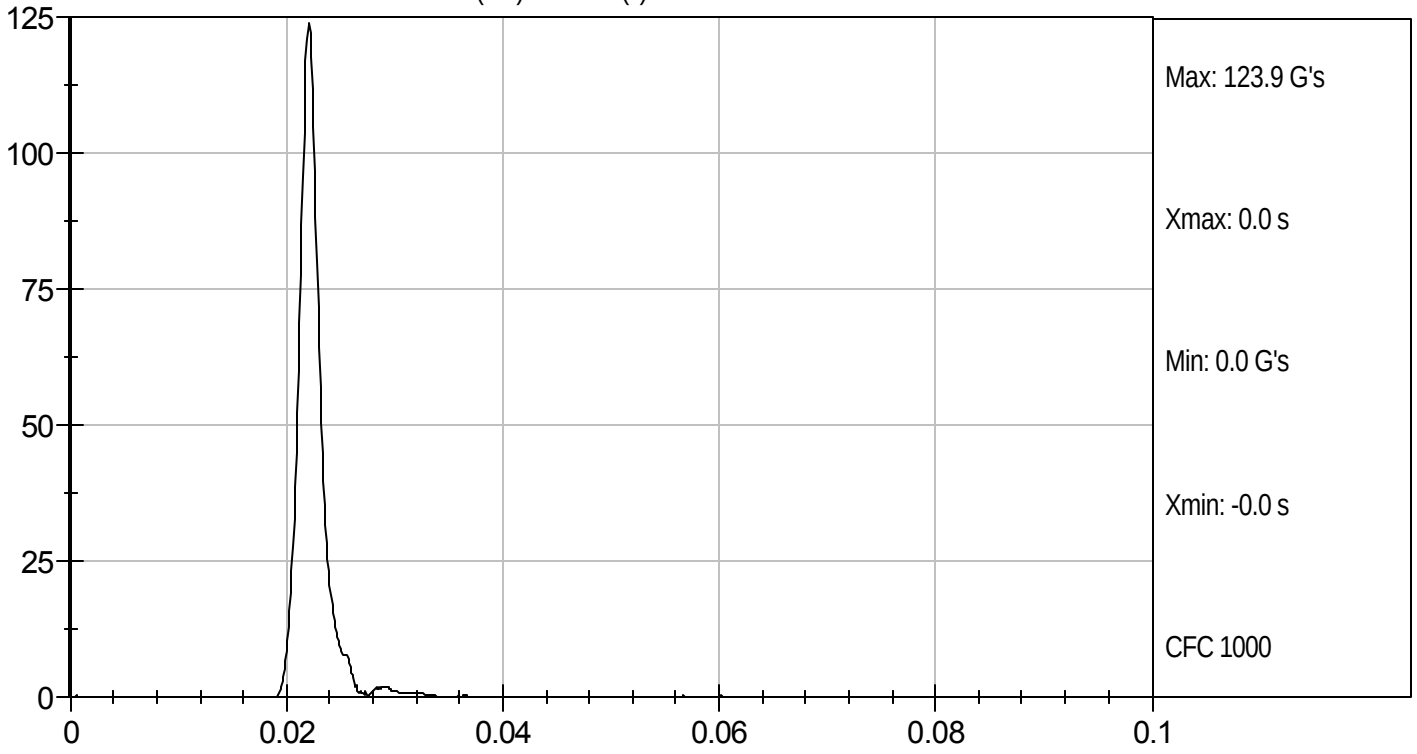
10/19/10
Test Date

David Winkelbauer
Approved By

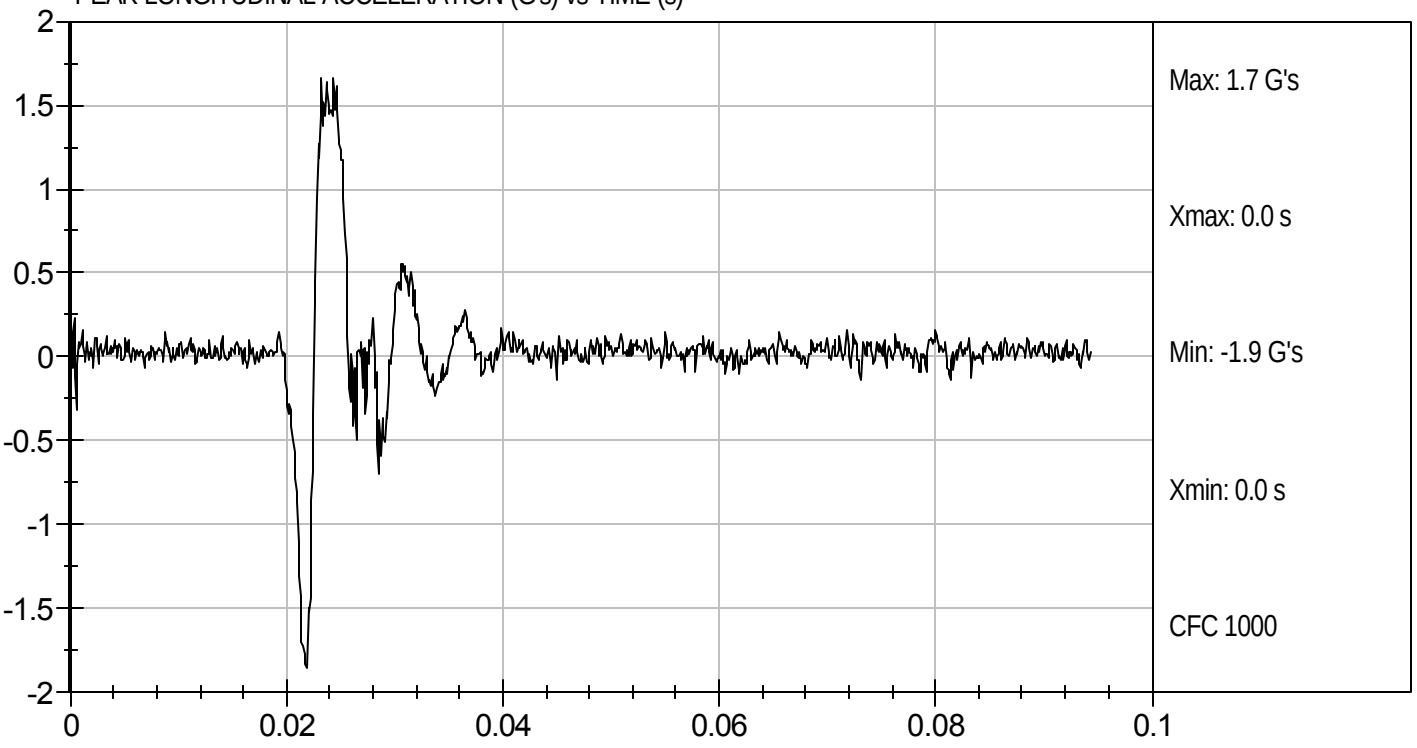
Test Desc: Head Drop
Component ID: D103561

Test Date: 10/19/10
Velocity: 0 ft/s, 0 m/s

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



PEAK LONGITUDINAL ACCELERATION (G's) vs TIME (s)



MGA RESEARCH CORPORATION

LATERAL NECK PENDULUM TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test I.D:** D103562

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.1	Pass
Humidity		%	10 to 70	33	Pass
Impact Velocity		m/s	5.51 to 5.63	5.58	Pass
Delta Velocity	10 ms	m/s	2.20 to 2.80	2.50	Pass
	15 ms	m/s	3.30 to 4.10	3.52	Pass
	20 ms	m/s	4.40 to 5.40	4.68	Pass
	25 ms	m/s	5.40 to 6.10	5.51	Pass
	25-100 ms	m/s	5.50 to 6.20	5.54	Pass
Maximum D-Plane Rotation		deg	71 to 81	71	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	59	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	117	Pass
			Overall Test Results		Pass

Jessica Gall
Laboratory Technician

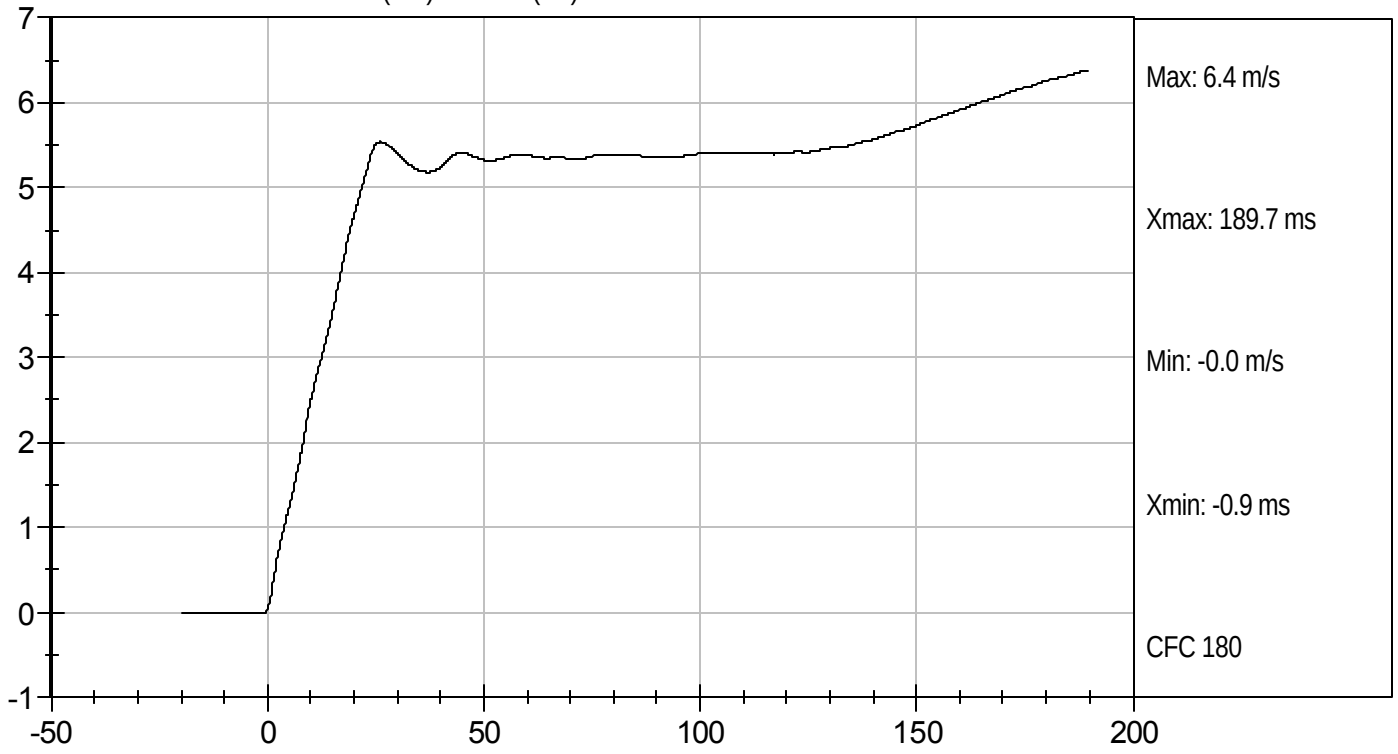
10/19/10
Test Date

David Winkelbauer
Approved By

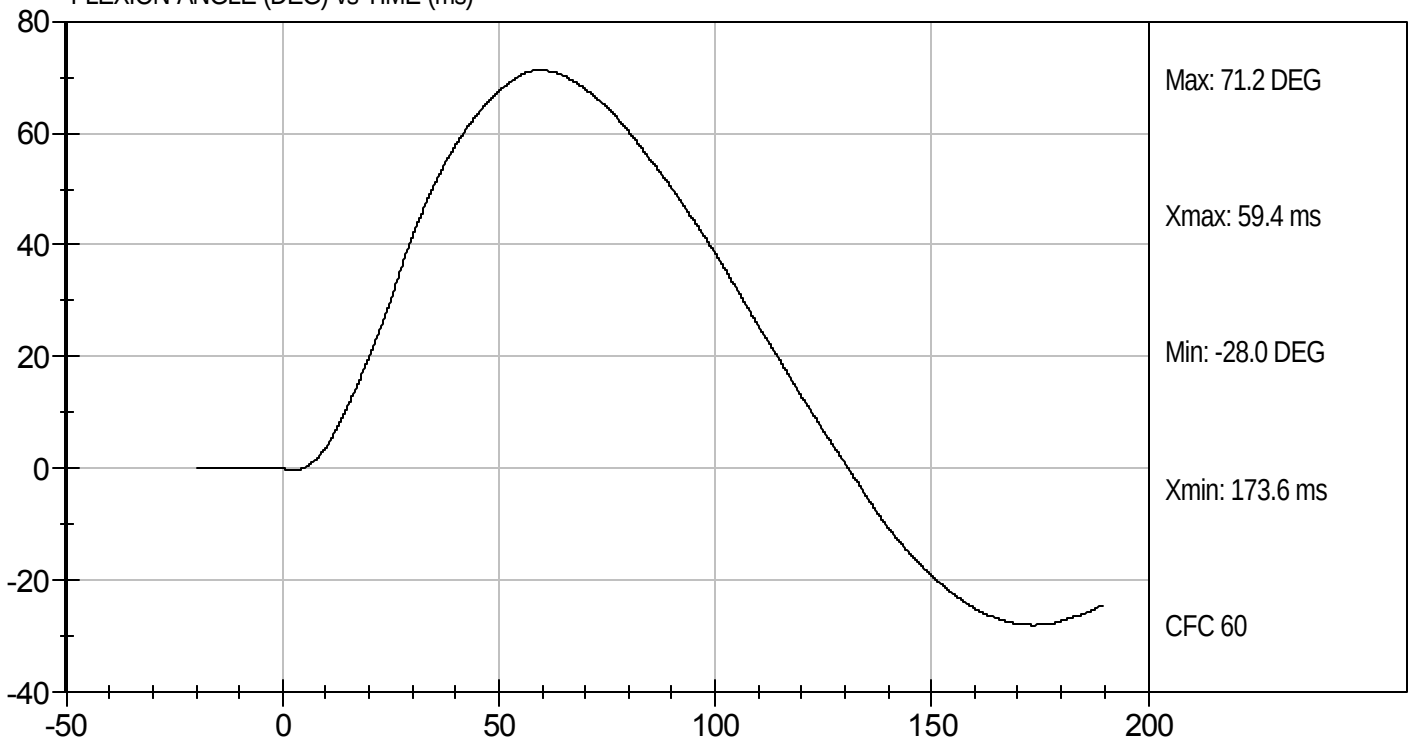
Test Desc: Neck Bending
Component ID: D103562

Test Date: 10/19/10
Velocity: 18.32 ft/s, 5.58 m/s

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

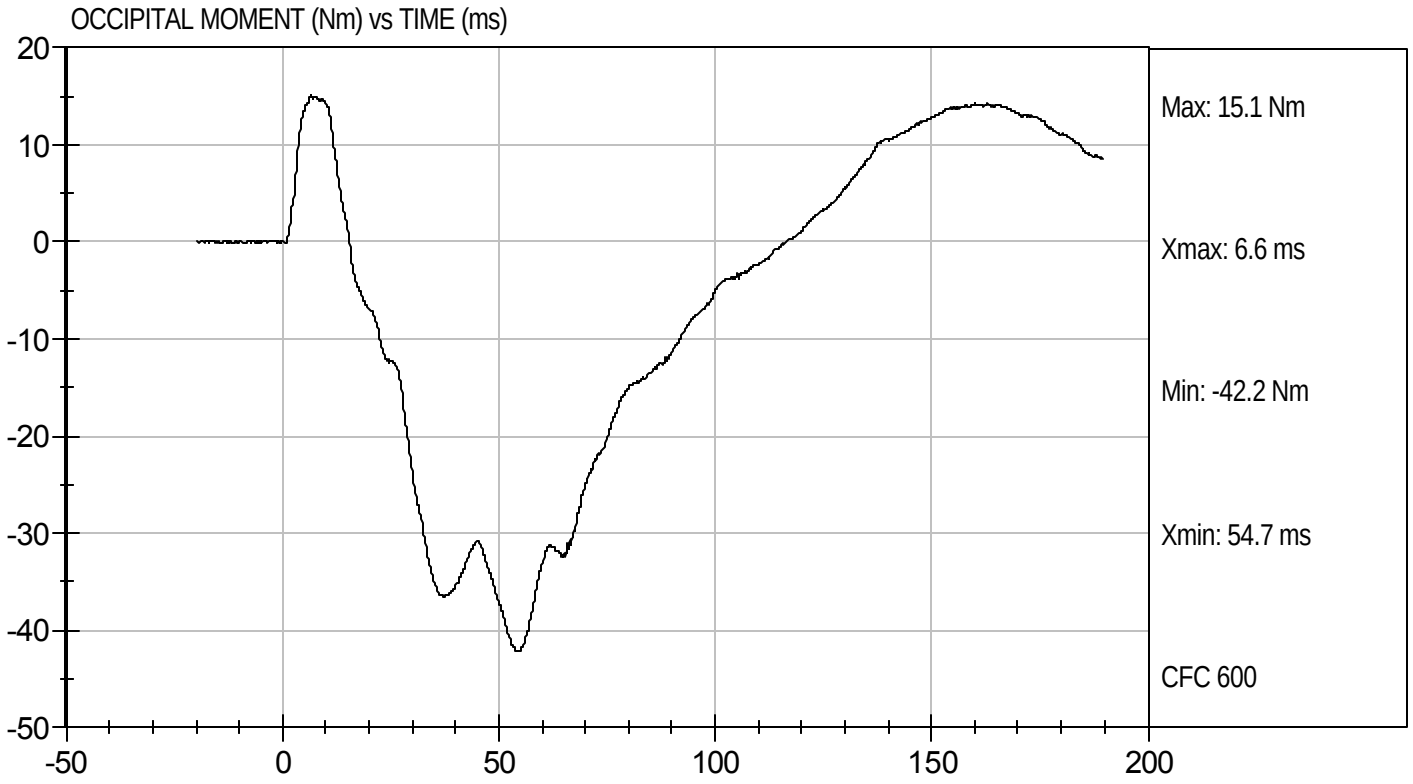


FLEXION ANGLE (DEG) vs TIME (ms)



Test Desc: Neck Bending
Component ID: D103562

Test Date: 10/19/10
Velocity: 18.32 ft/s, 5.58 m/s



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test ID:** D103563

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	31	Pass
Impact Velocity	m/s	4.20 to 4.40	4.27	Pass
Maximum Probe Acceleration	G's	13 to 18	15	Pass
Shoulder Displacement	mm	28 to 37	31	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	18	Pass
		Overall Test Results		Pass

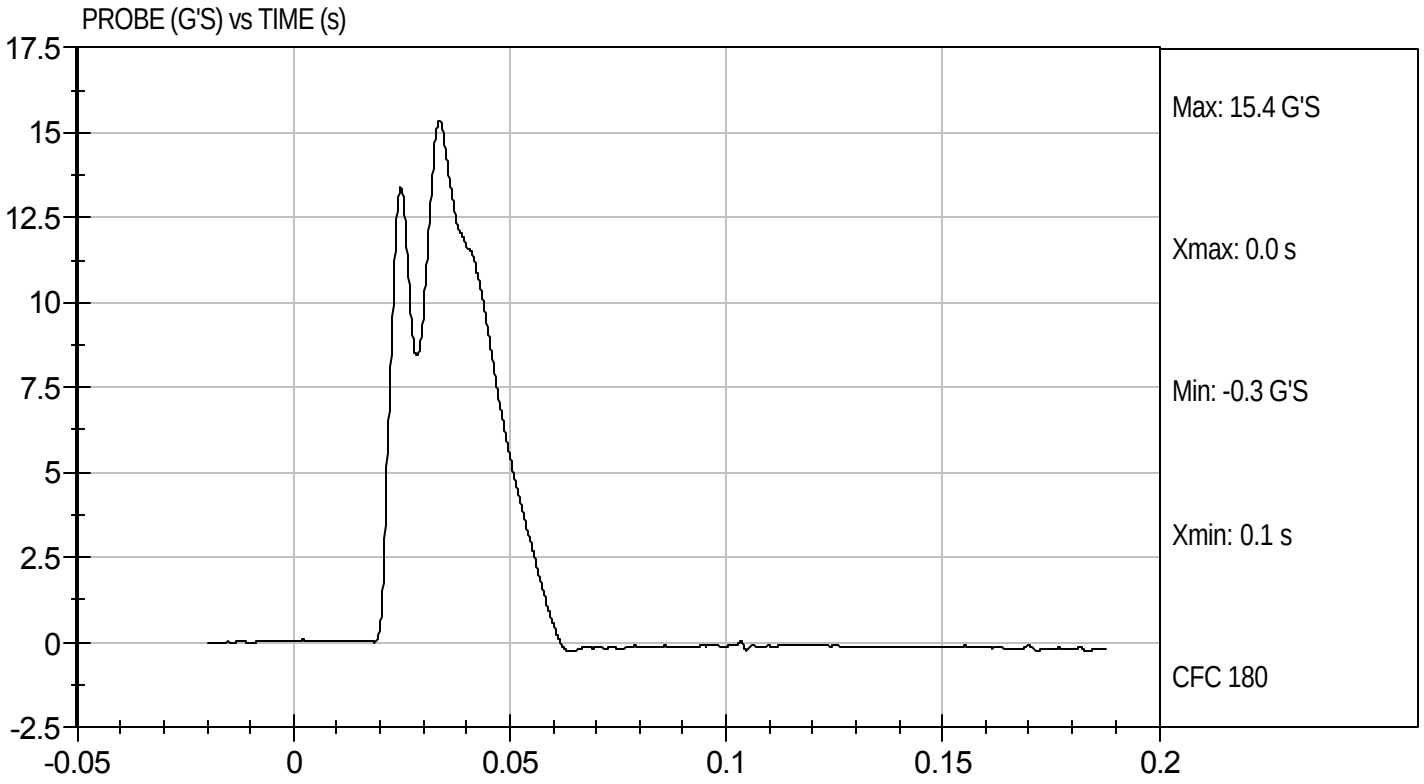
Jessica Hall
Laboratory Technician

10/19/10
Test Date

David Winkelbauer
Approved By

Test Desc: Shoulder Impact
Component ID: D103563

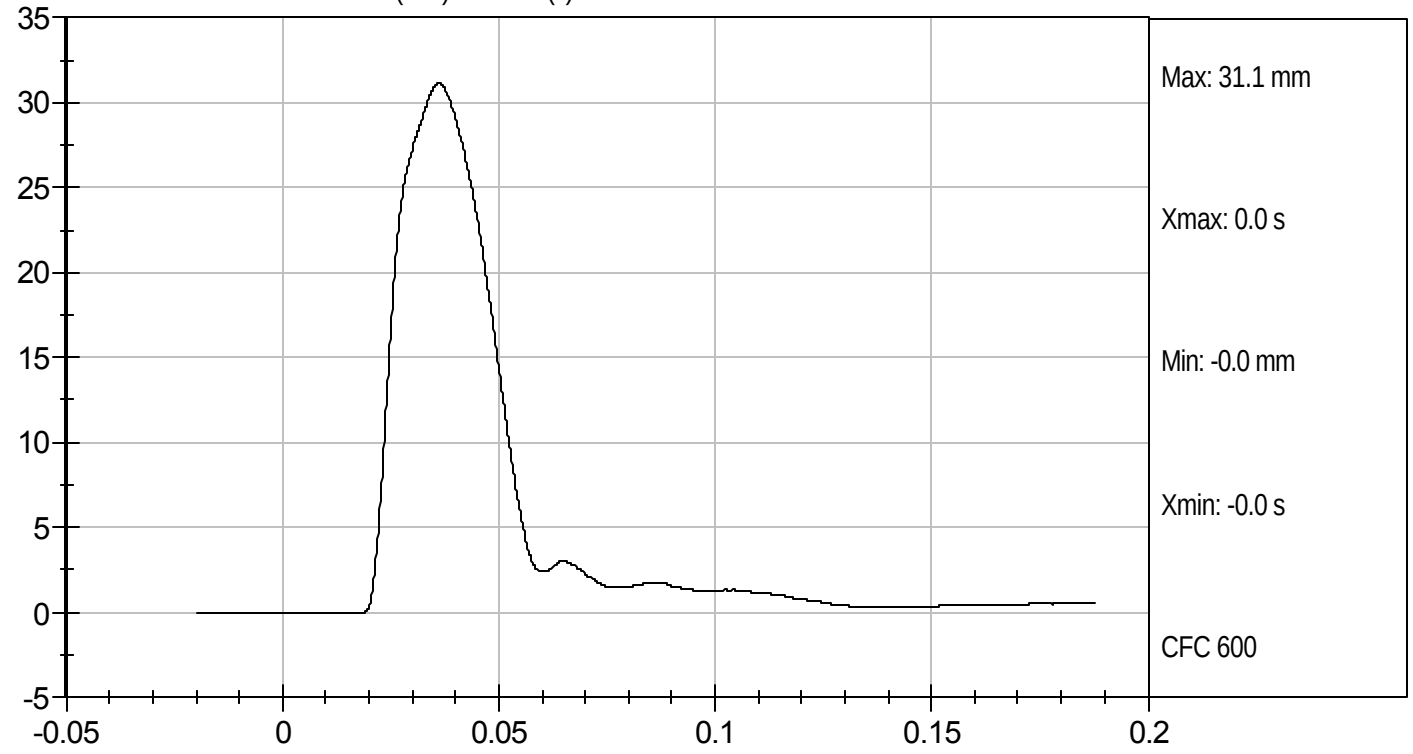
Test Date: 10/19/10
Velocity: 14.01 ft/s, 4.27 m/s



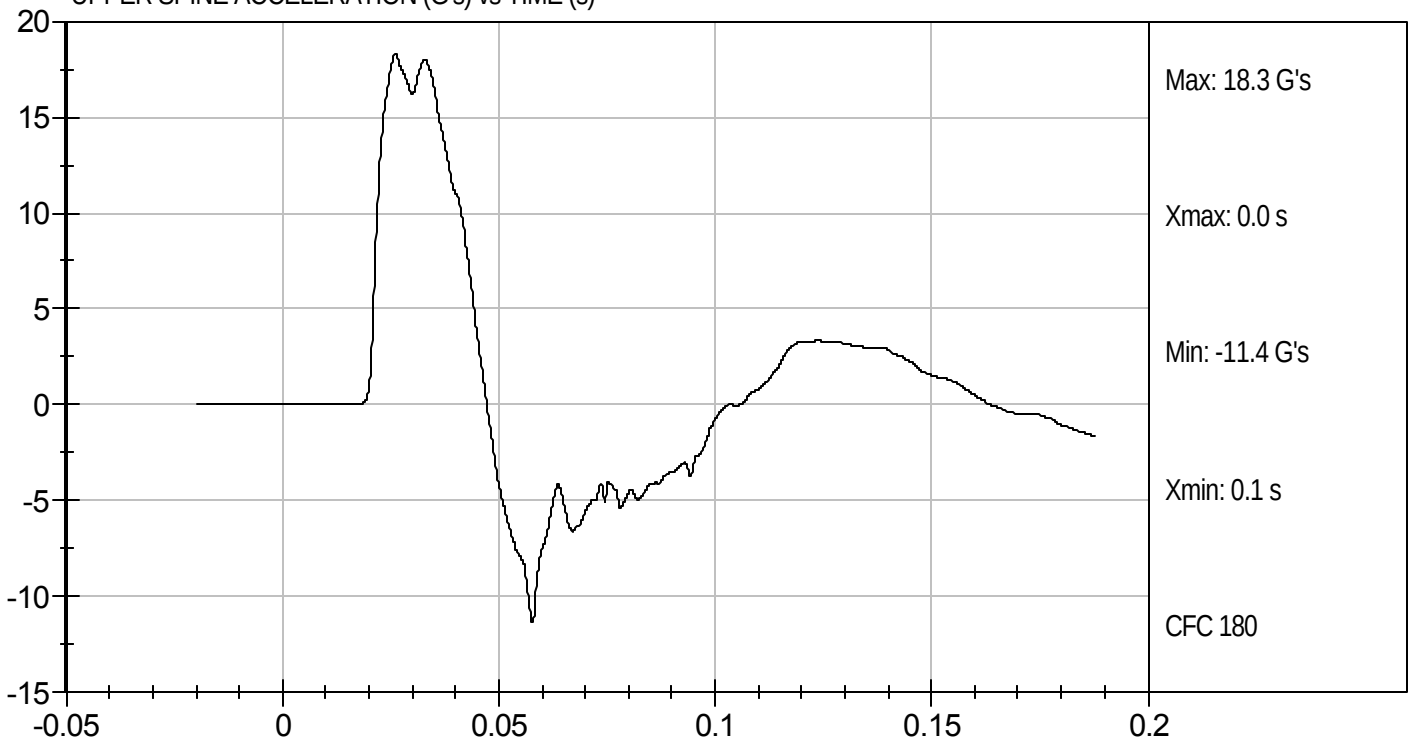
Test Desc: Shoulder Impact
Component ID: D103563

Test Date: 10/19/10
Velocity: 14.01 ft/s, 4.27 m/s

SHOULDER DISPLACEMENT (mm) vs TIME (s)



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



MGA RESEARCH CORPORATION

THORAX (WITH ARM) IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test I.D:** D103564

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Humidity	%	10 to 70	31	Pass
Impact Velocity	m/s	6.60 to 6.80	6.68	Pass
Peak Impactor Acceleration	G's	30 to 36	33	Pass
Shoulder Displacement	mm	31 to 40	36	Pass
Upper Rib Displacement	mm	25 to 32	27	Pass
Middle Rib Displacement	mm	30 to 36	31	Pass
Lower Rib Displacement	mm	32 to 38	32	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	37	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	33	Pass
		Overall Test Results		Pass

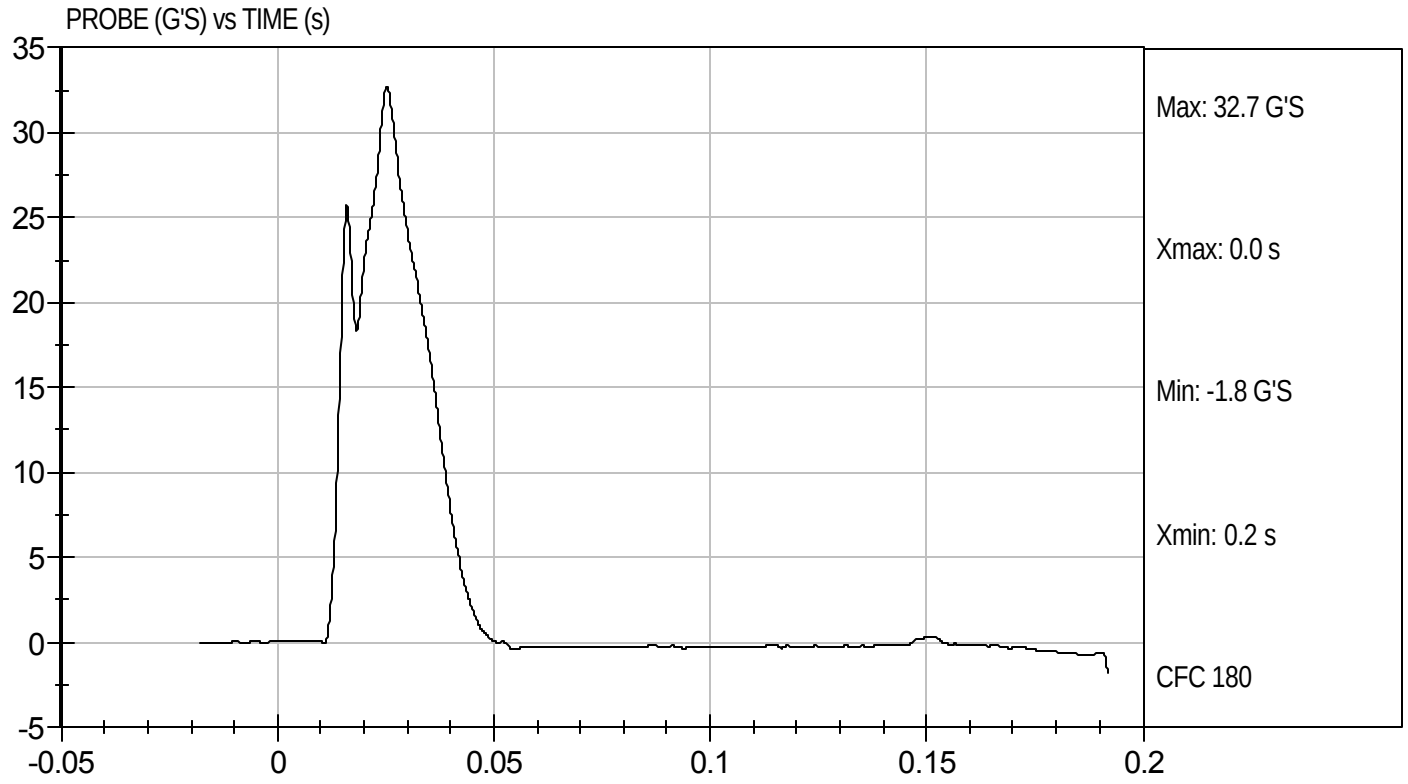
Jessica Hall
Laboratory Technician

10/19/10
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax With Arm
Component ID: D103564

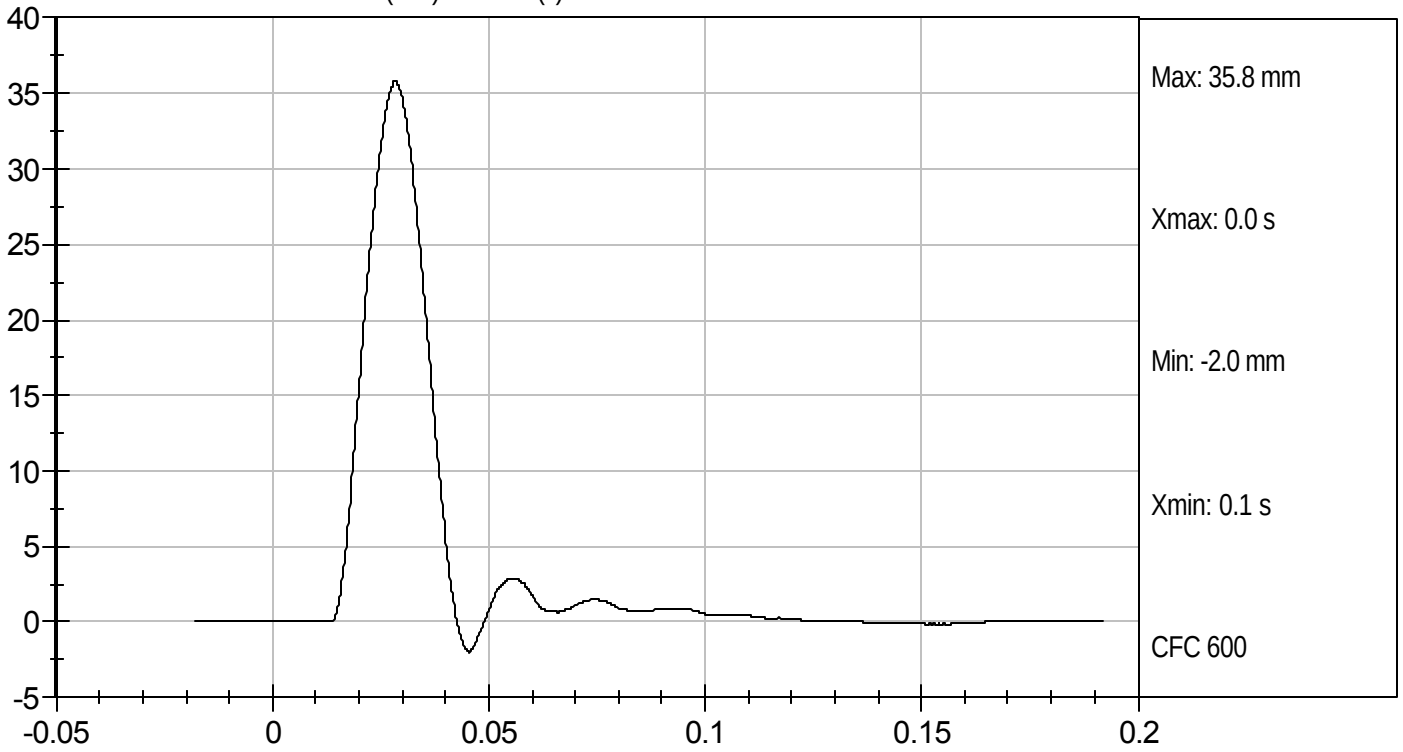
Test Date: 10/19/10
Velocity: 21.93 ft/s, 6.68 m/s



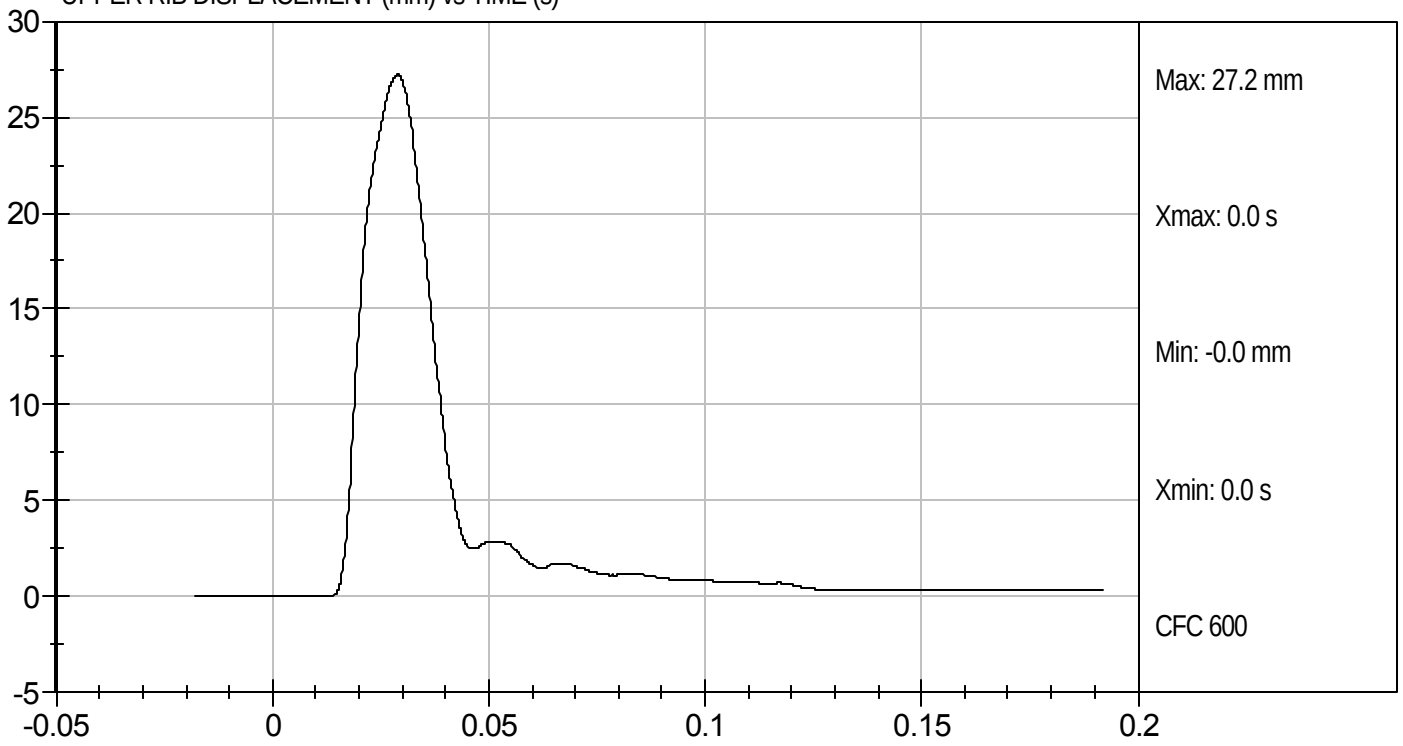
Test Desc: Thorax With Arm
Component ID: D103564

Test Date: 10/19/10
Velocity: 21.93 ft/s, 6.68 m/s

SHOULDER DISPLACEMENT (mm) vs TIME (s)



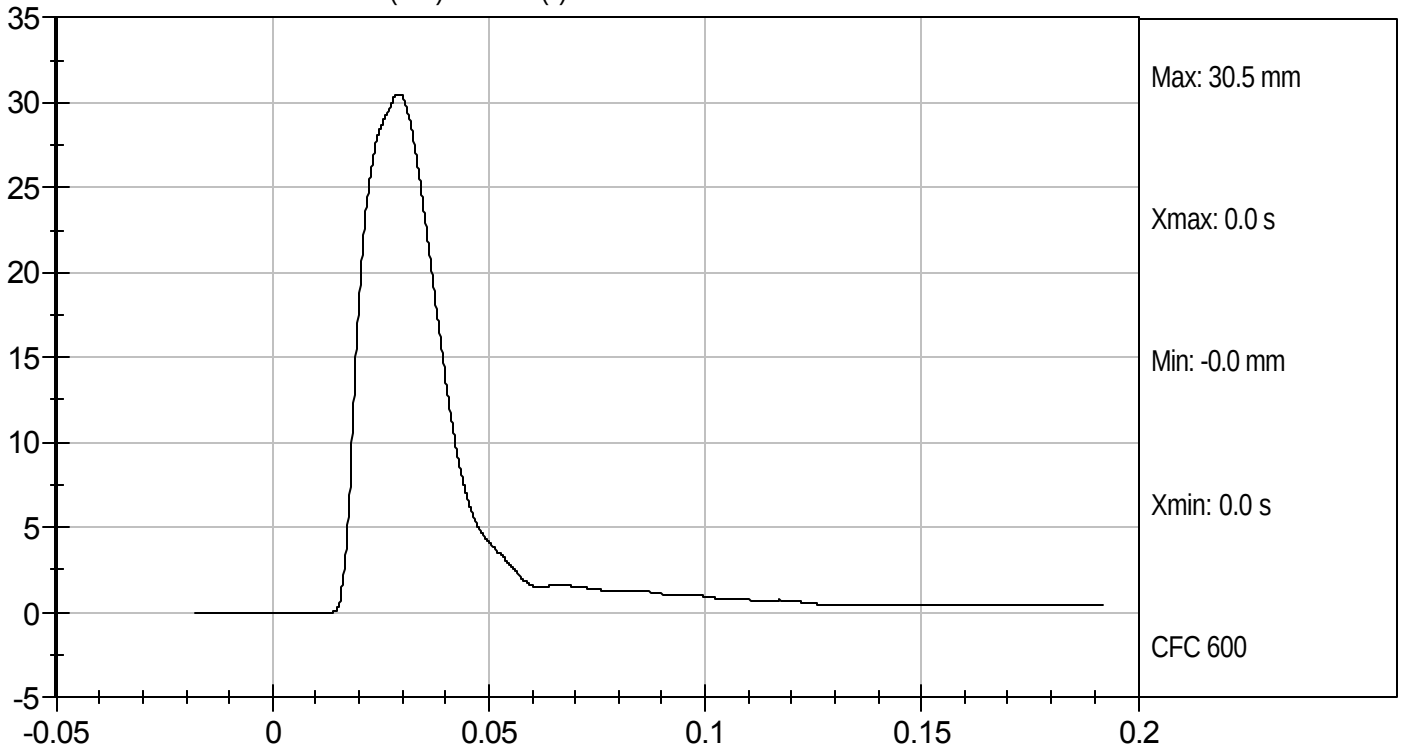
UPPER RIB DISPLACEMENT (mm) vs TIME (s)



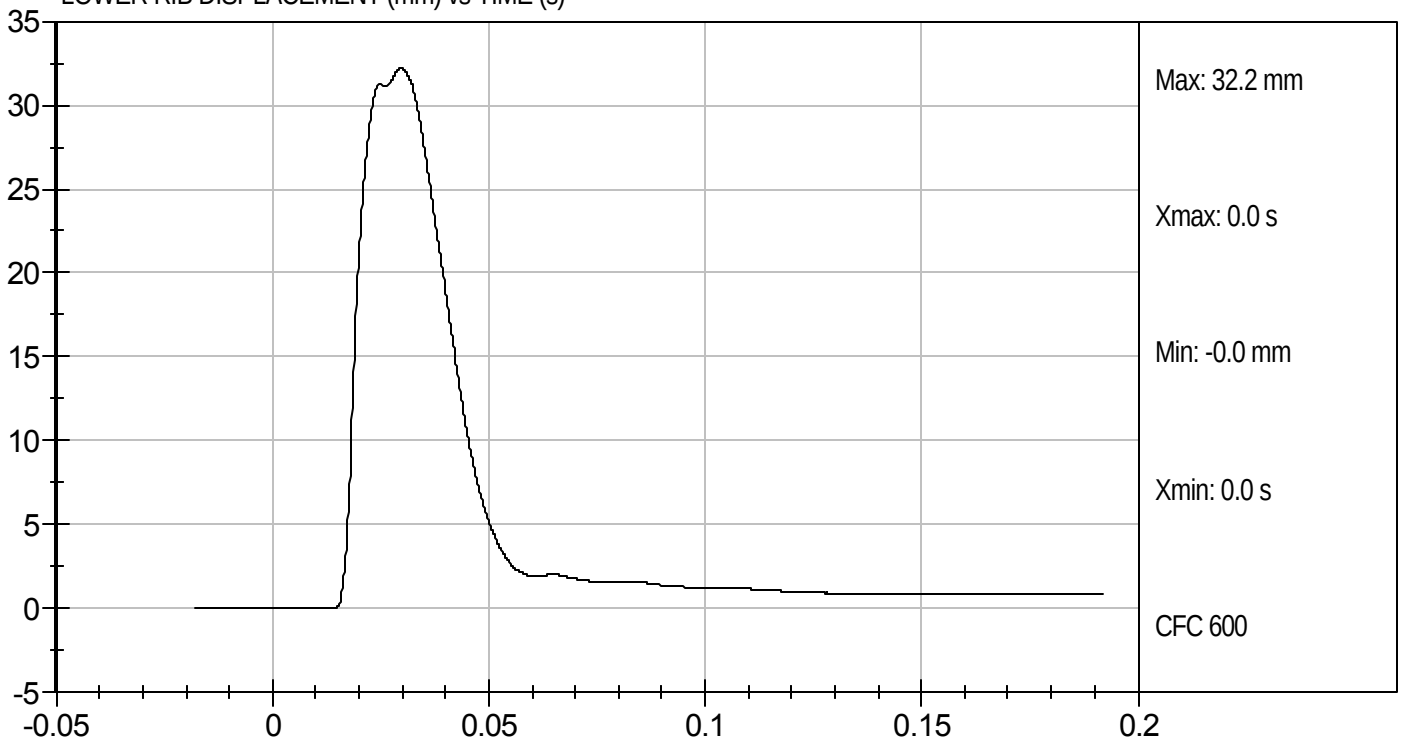
Test Desc: Thorax With Arm
Component ID: D103564

Test Date: 10/19/10
Velocity: 21.93 ft/s, 6.68 m/s

MIDDLE RIB DISPLACEMENT (mm) vs TIME (s)



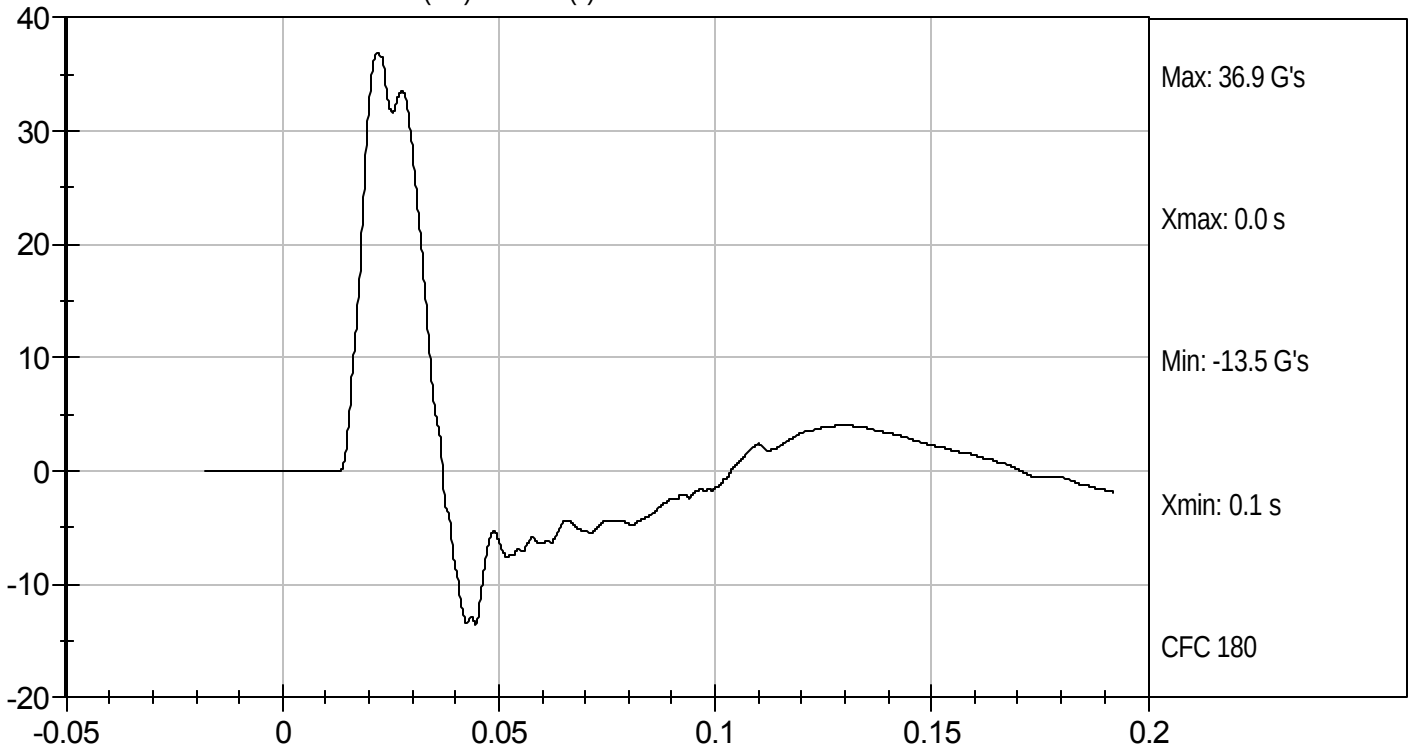
LOWER RIB DISPLACEMENT (mm) vs TIME (s)



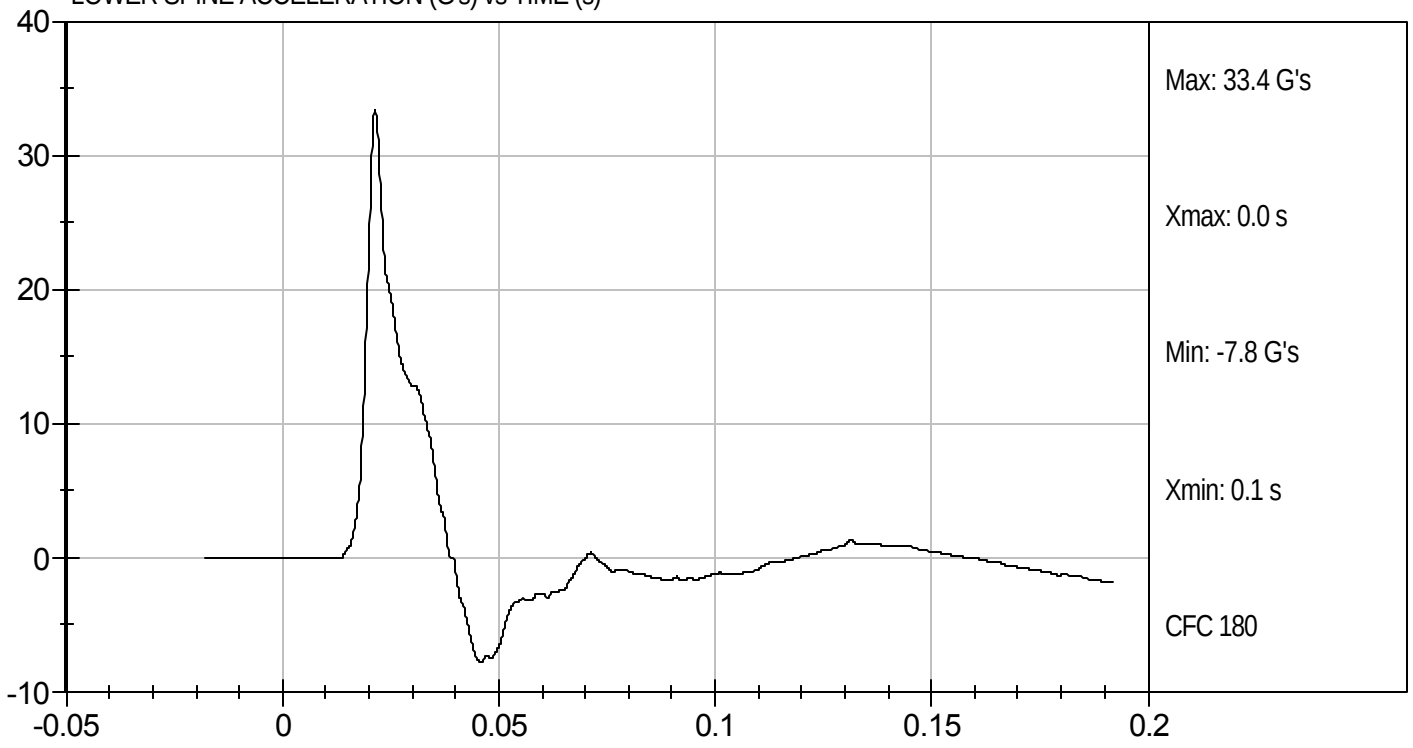
Test Desc: Thorax With Arm
Component ID: D103564

Test Date: 10/19/10
Velocity: 21.93 ft/s, 6.68 m/s

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



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



MGA RESEARCH CORPORATION

THORAX (WITHOUT ARM) IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test I.D:** D103565

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Humidity	%	10 to 70	33	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	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	41	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

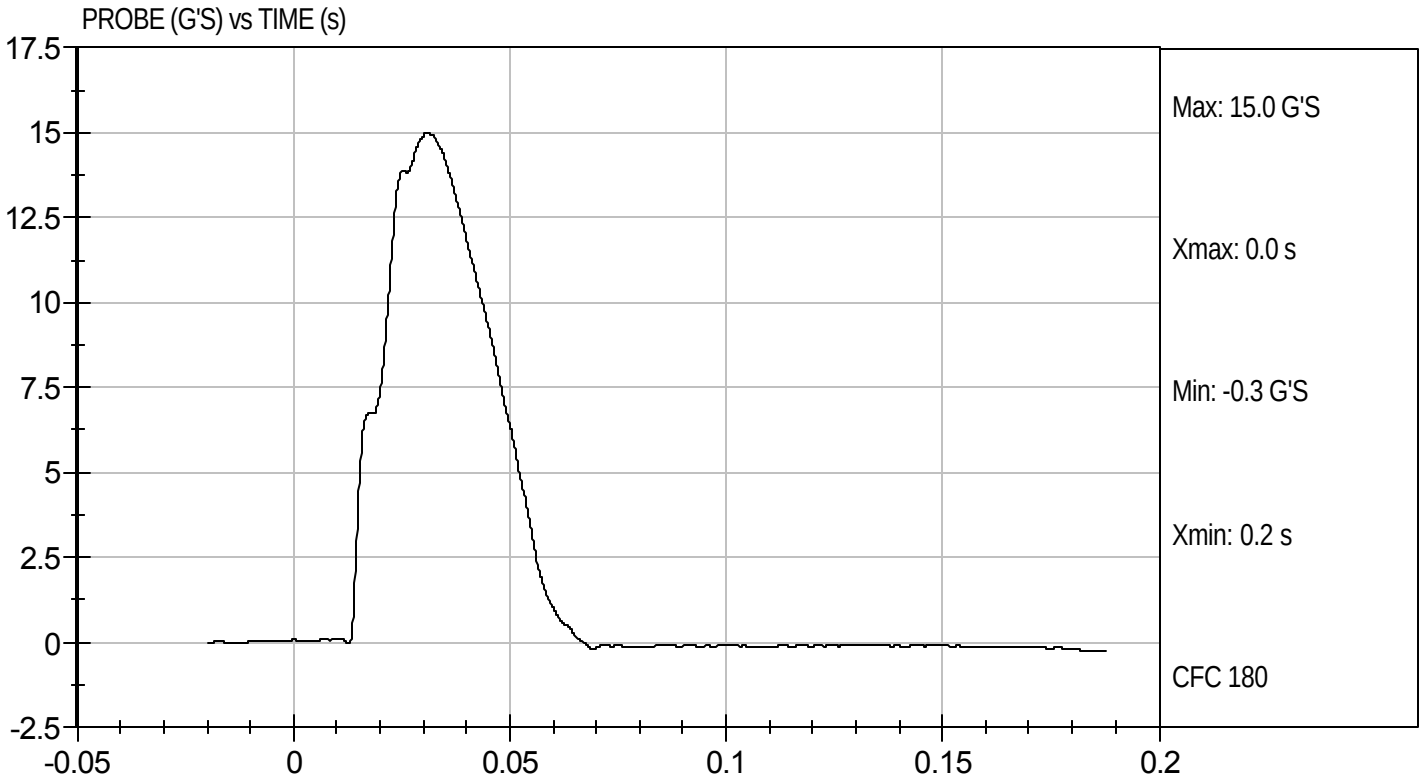
Jessica Gall
Laboratory Technician

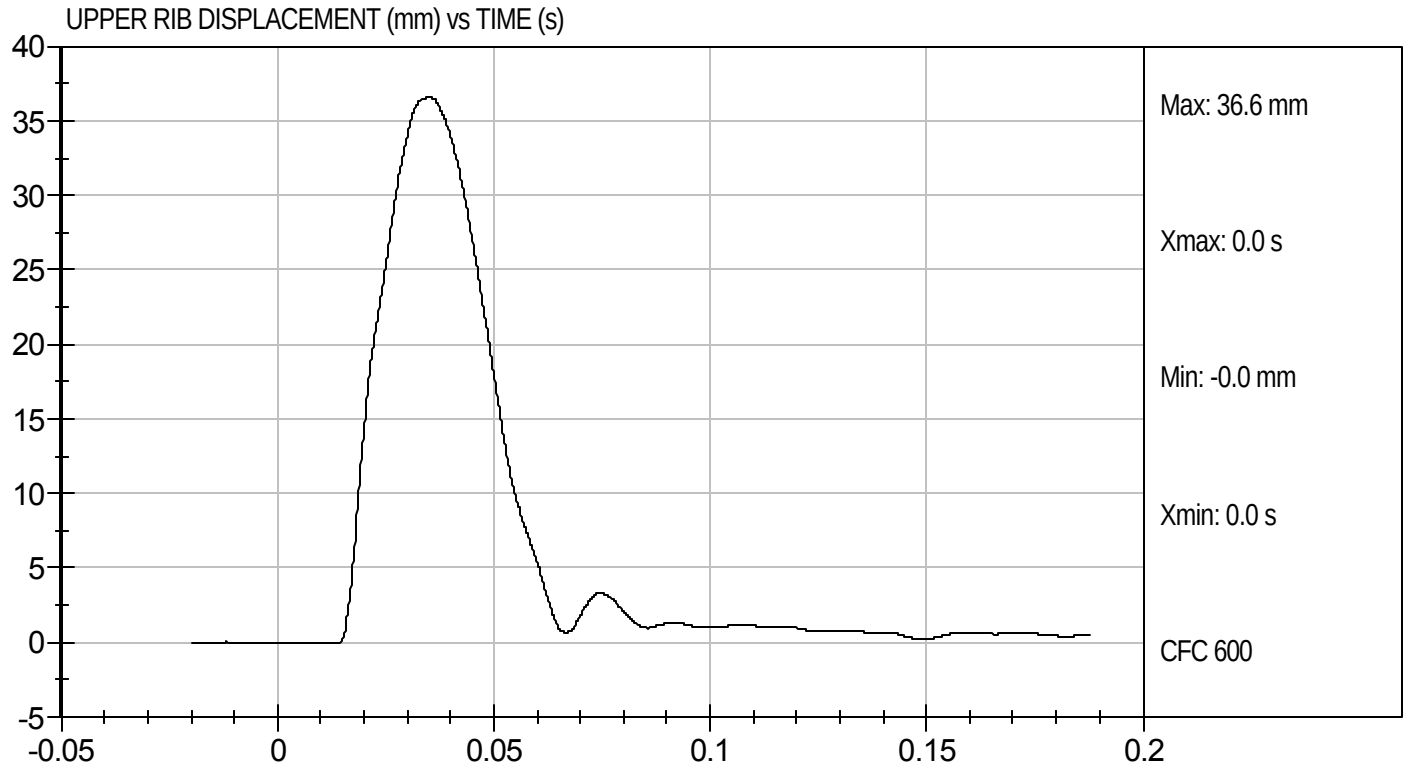
10/19/10
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Without Arm
Component ID: D103565

Test Date: 10/19/10
Velocity: 14.12 ft/s, 4.30 m/s

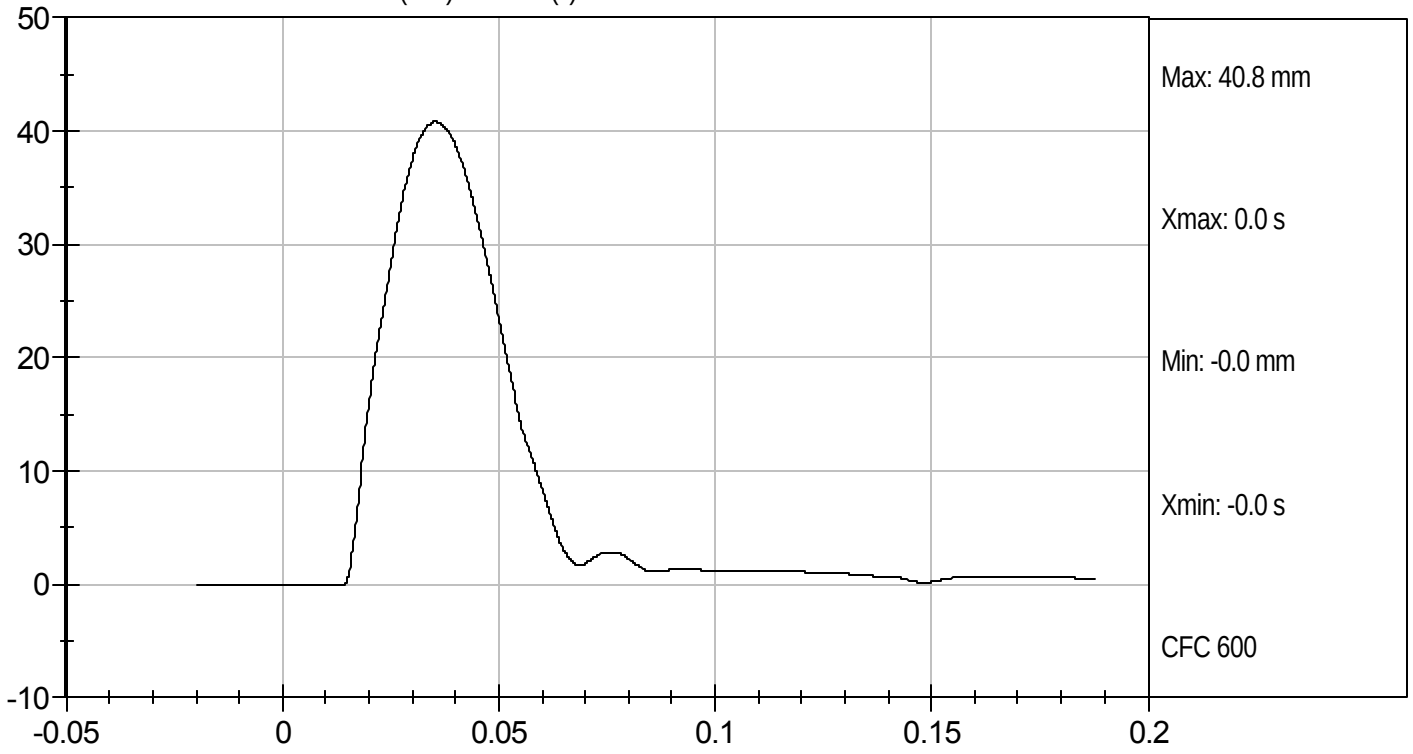




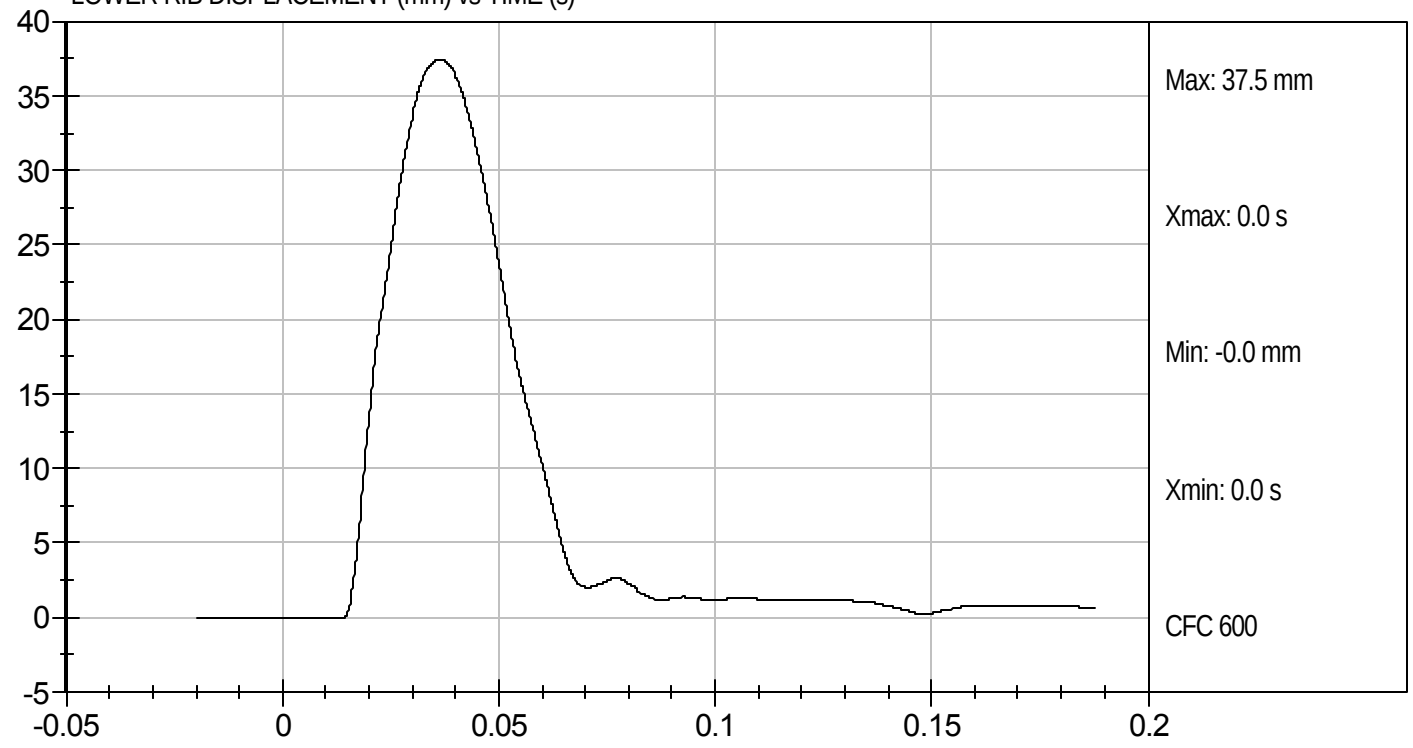
Test Desc: Thorax Without Arm
Component ID: D103565

Test Date: 10/19/10
Velocity: 14.12 ft/s, 4.30 m/s

MIDDLE RIB DISPLACEMENT (mm) vs TIME (s)



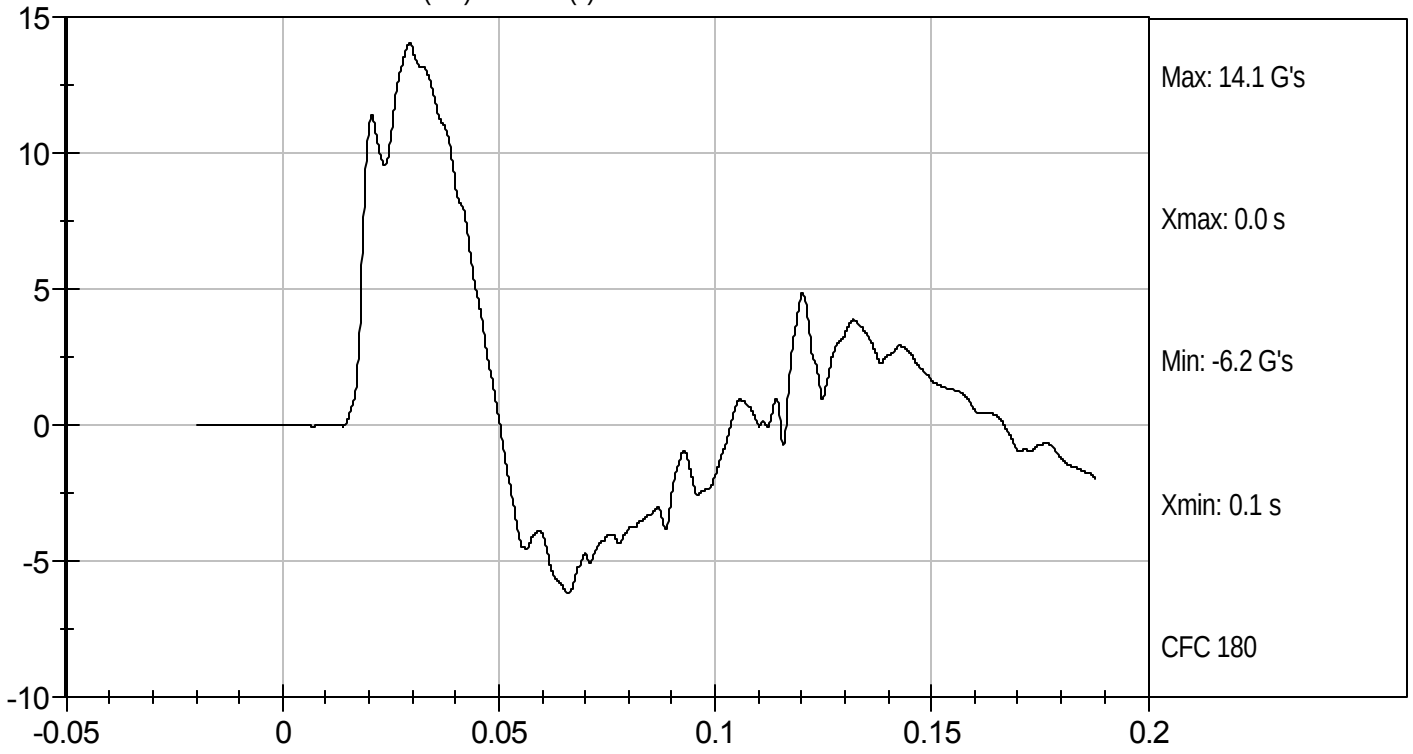
LOWER RIB DISPLACEMENT (mm) vs TIME (s)



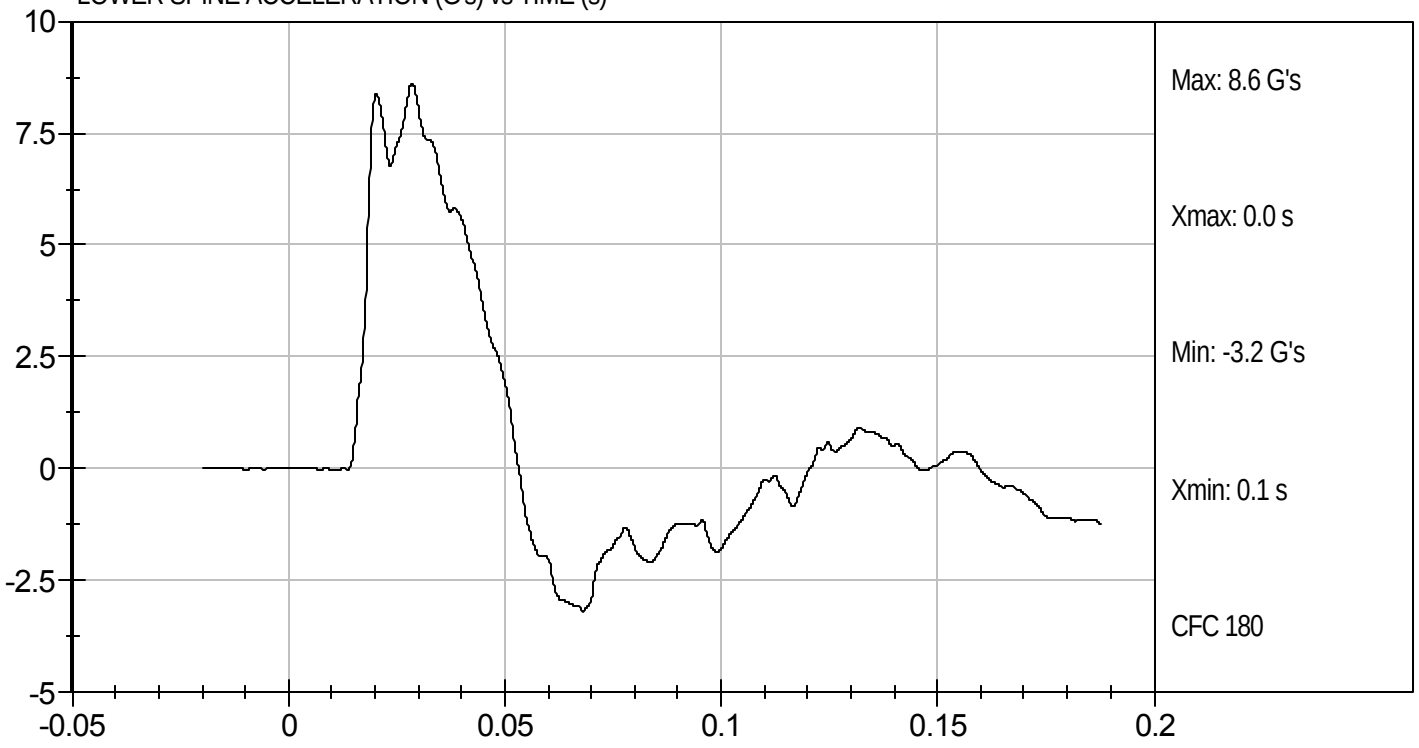
Test Desc: Thorax Without Arm
Component ID: D103565

Test Date: 10/19/10
Velocity: 14.12 ft/s, 4.30 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:** D103566

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Humidity	%	10 to 70	33	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	41	Pass
Lower Rib Displacement	mm	33 to 44	38	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	11	Pass
		Overall Test Results		Pass

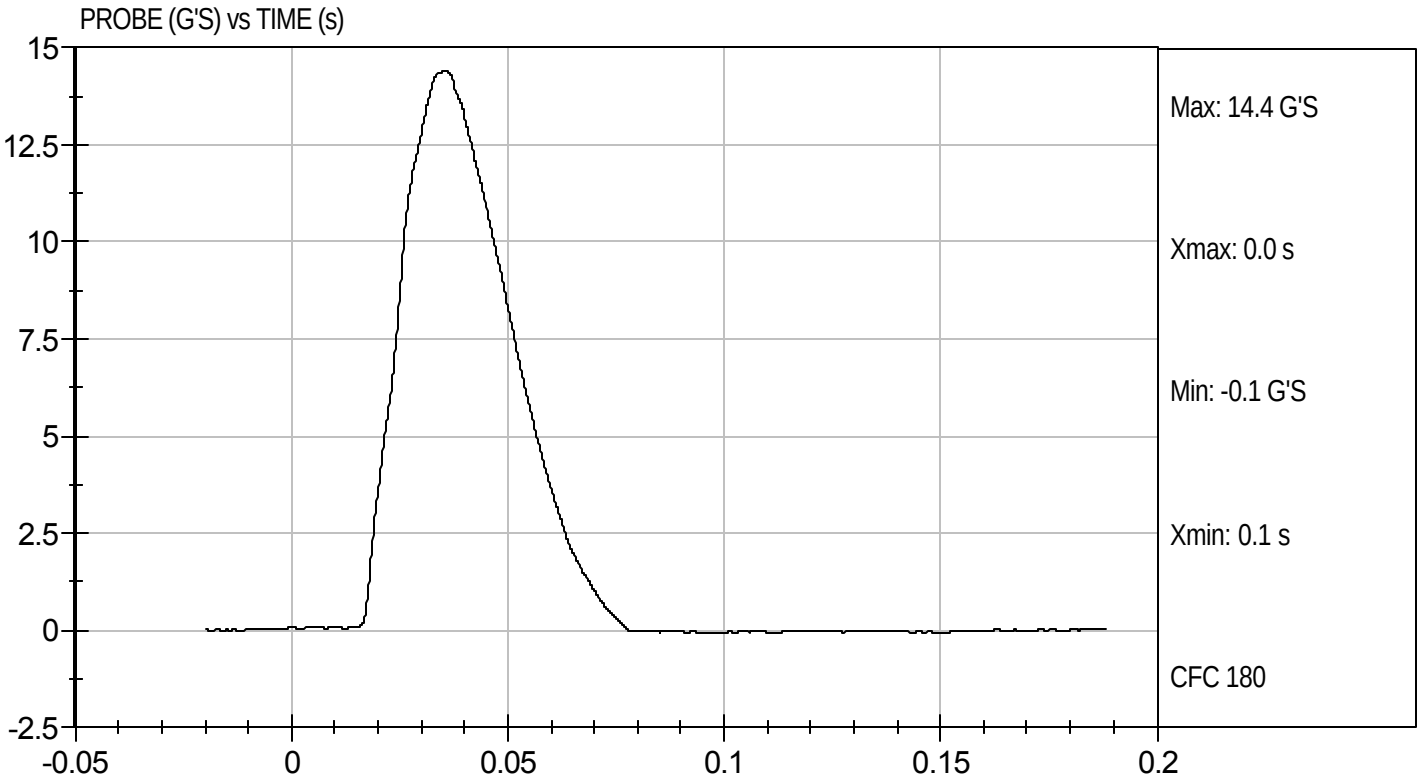
Jessica Hall
Laboratory Technician

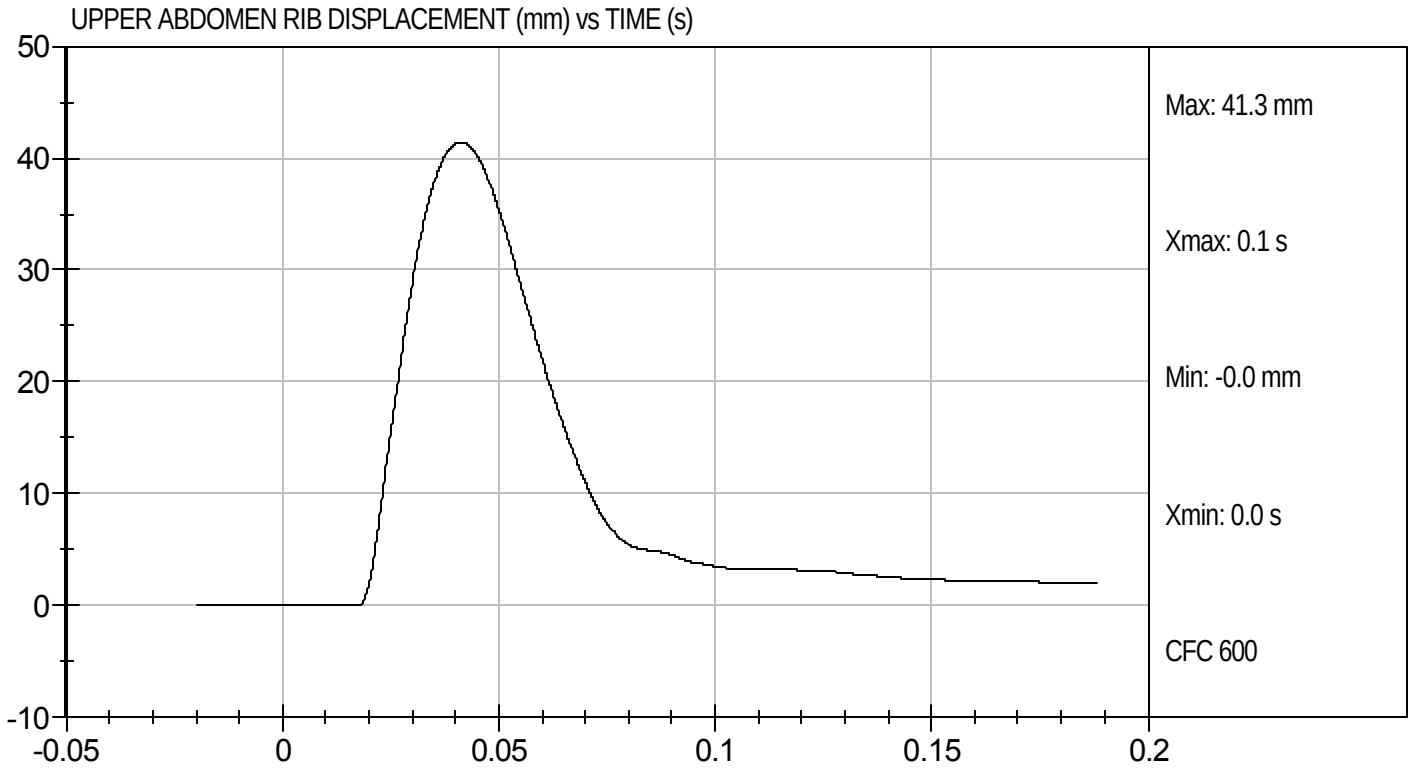
10/19/10
Test Date

David Winkelbauer
Approved By

Test Desc: Abdomen Impact
Component ID: D103566

Test Date: 10/19/10
Velocity: 14.37 ft/s, 4.38 m/s

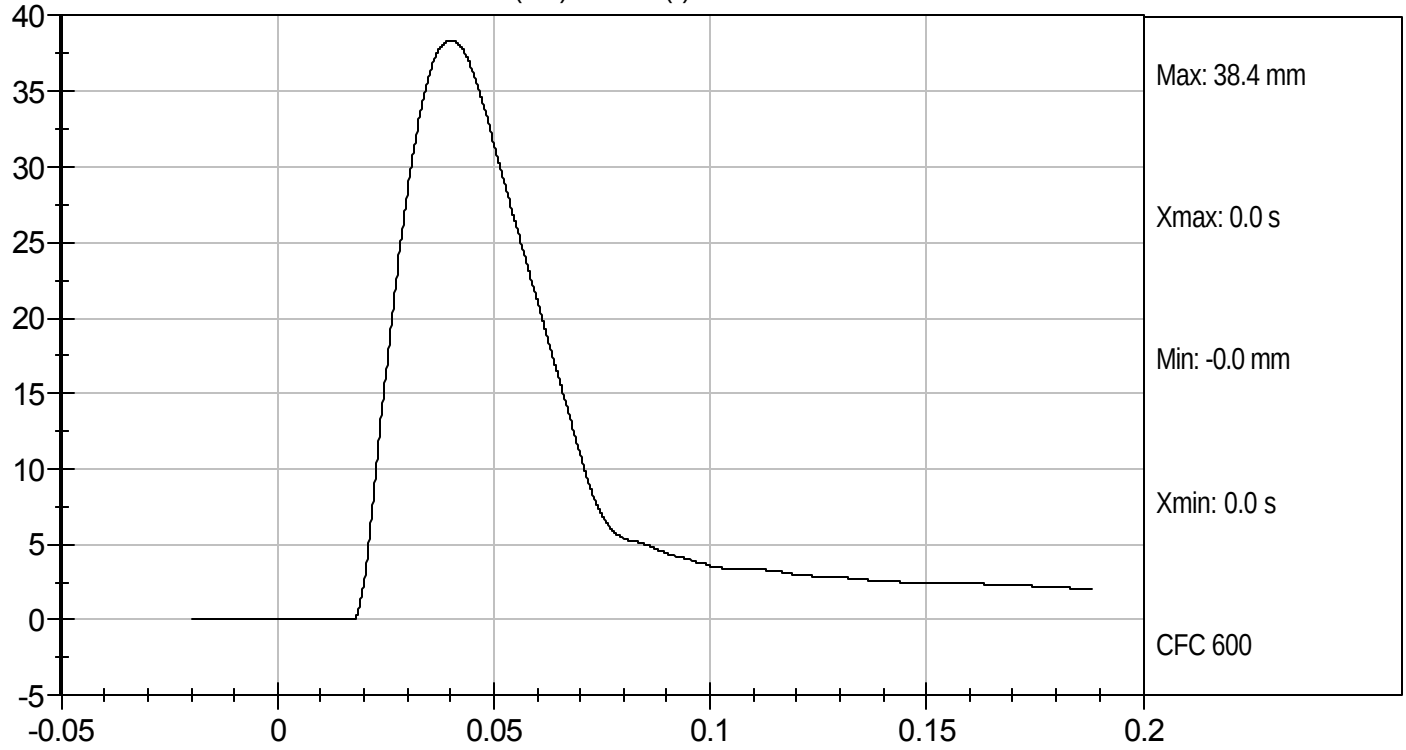




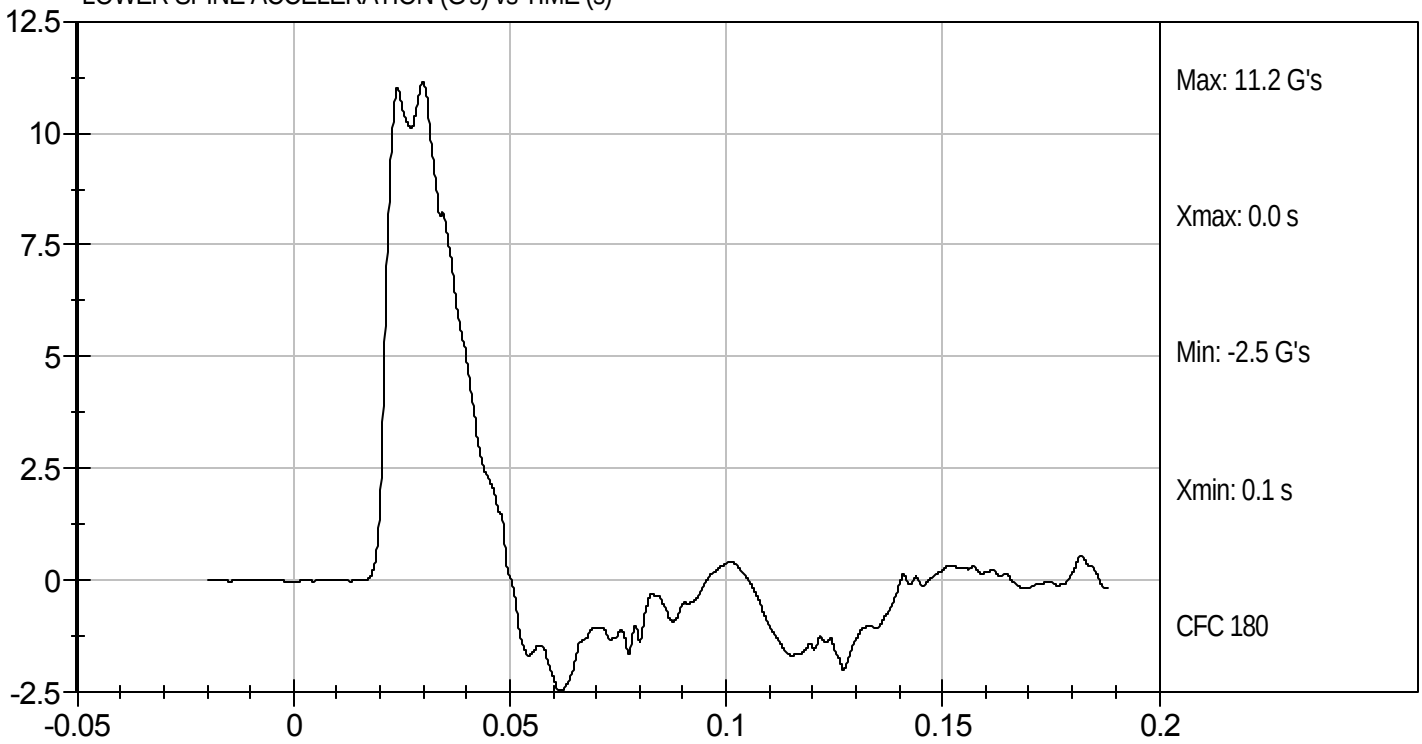
Test Desc: Abdomen Impact
Component ID: D103566

Test Date: 10/19/10
Velocity: 14.37 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:** D103567

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Humidity	%	10 to 70	34	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	41	Pass
Peak Acetabulum Force	N	3600 to 4300	4047	Pass
		Overall Test Results		Pass

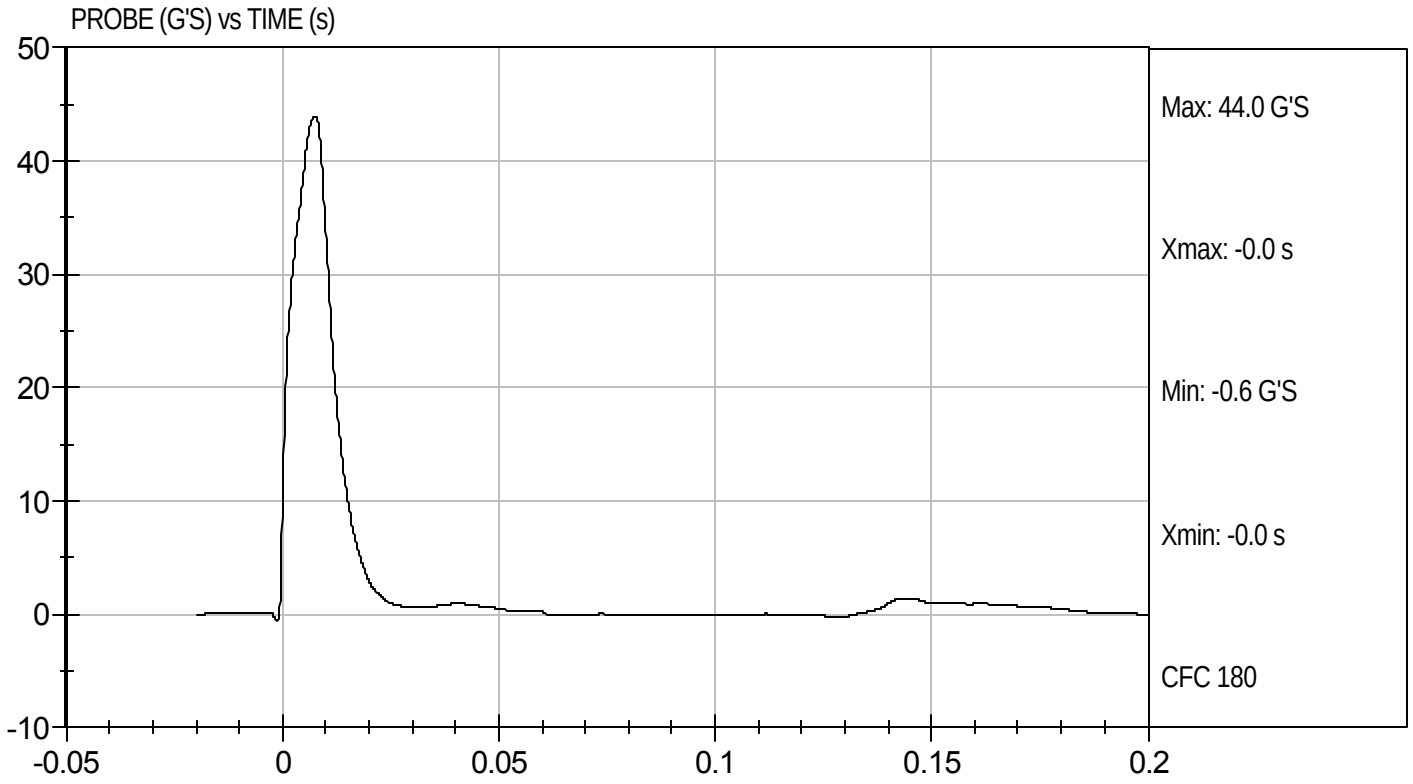
Jessica Hall
Laboratory Technician

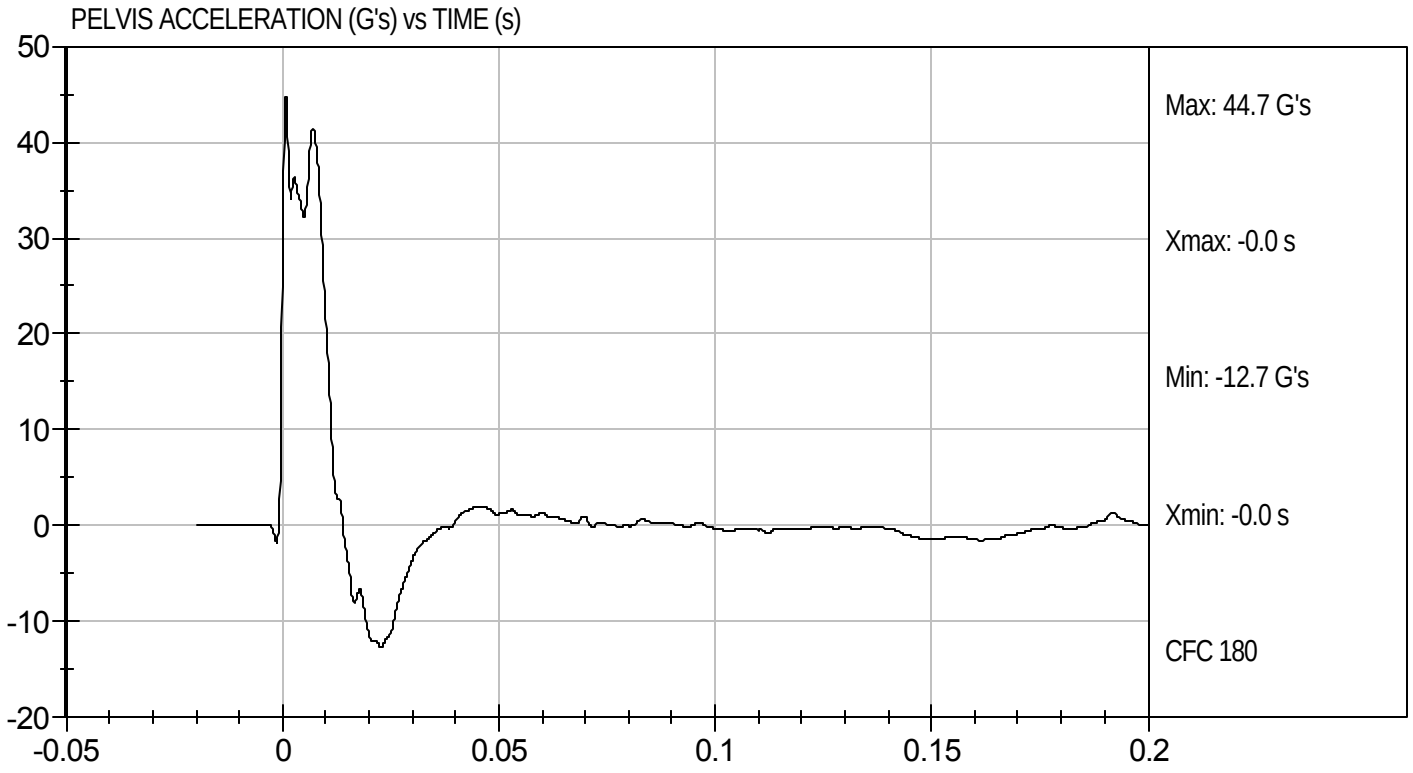
10/19/10
Test Date

David Winkelbauer
Approved By

Test Desc: Pelvis Impact
Component ID: D103567

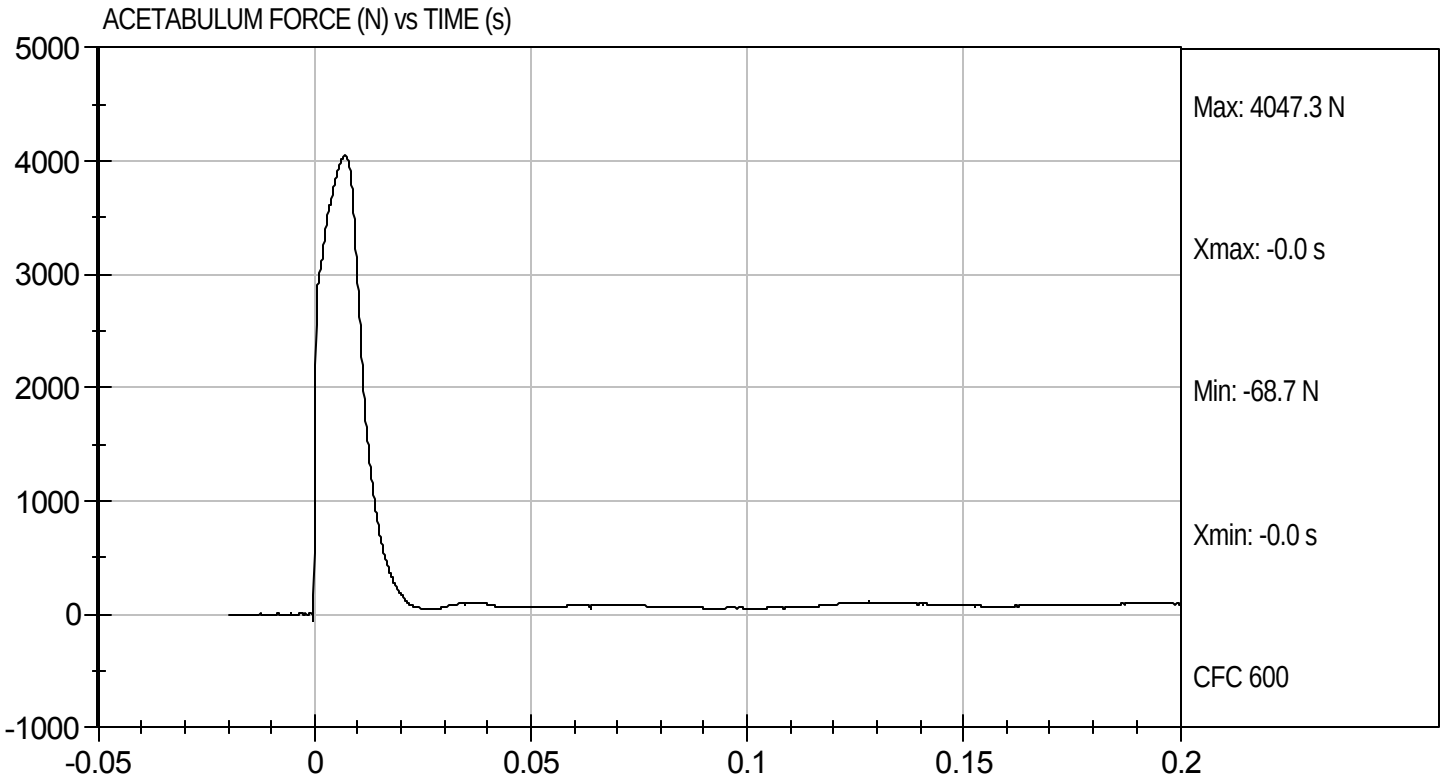
Test Date: 10/19/10
Velocity: 22.22 ft/s, 6.77 m/s





Test Desc: Pelvis Impact
Component ID: D103567

Test Date: 10/19/10
Velocity: 22.22 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:** D103568

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Humidity	%	10 to 70	34	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	33	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4559	Pass
		Overall Test Results		Pass

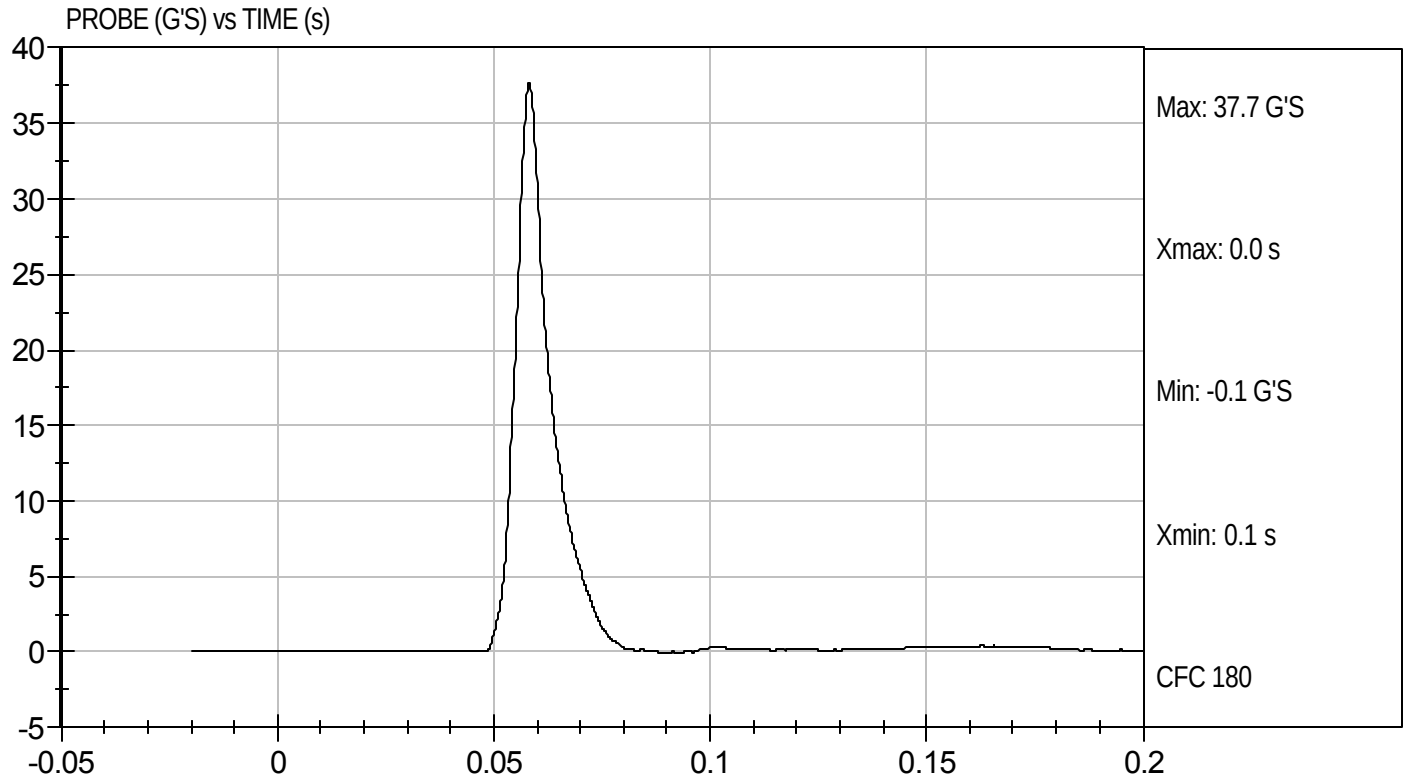
Jessica Hall
Laboratory Technician

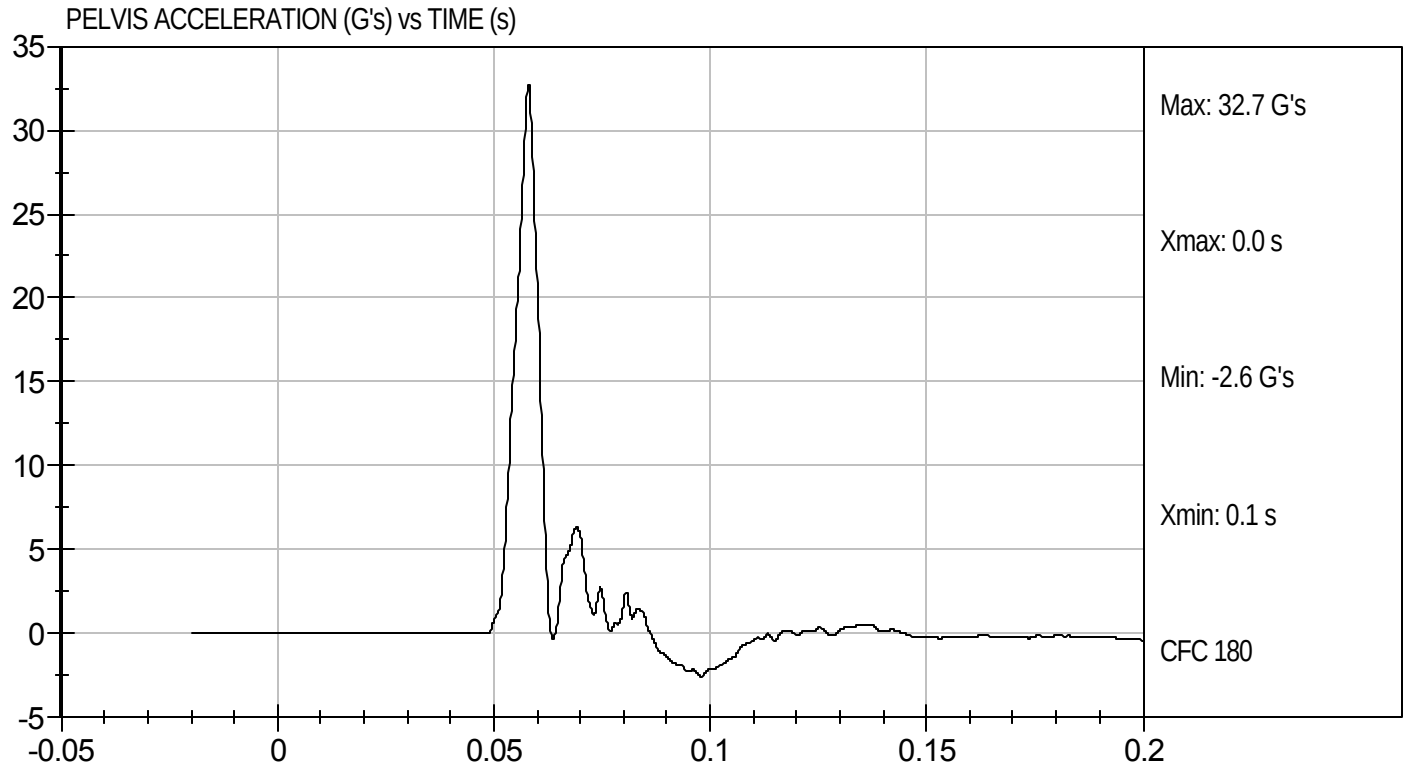
10/19/10
Test Date

David Winkelbauer
Approved By

Test Desc: Iliac Impact
Component ID: D103568

Test Date: 10/19/10
Velocity: 14.37 ft/s, 4.38 m/s





Test Desc: Iliac Impact
Component ID: D103568

Test Date: 10/19/10
Velocity: 14.37 ft/s, 4.38 m/s