REPORT NUMBER: NCAP-MGA-2007-009

NEW CAR ASSESSMENT PROGRAM
FRONTAL BARRIER IMPACT TEST

NISSAN MOTOR CO., LTD.
2007 NISSAN ALTIMA
NHTSA NUMBER: M75202

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

Test Date: December 4, 2006

Final Report Date: January 2, 2007

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
RULEMAKING
OFFICE OF CRASHWORTHINESS STANDARDS
400 SEVENTH STREET, SW, ROOM 5311
WASHINGTON, D.C. 20590

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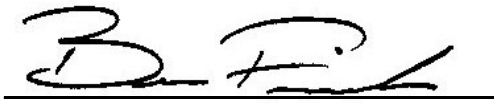
Prepared by:  Date: 1/02/07

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Technical Report Documentation Page

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16. Abstract

A frontal barrier impact was conducted on a 2007 Nissan Atlima at MGA Research Corporation on December 4, 2006. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and foot well intrusion performance. The impact velocity was 56.5 km/h. The ambient temperature at the barrier face at the time of impact was 21 degrees Celsius. The vehicle's maximum post test static crush is 591 mm located at the vehicle's centerline. The test vehicle is equipped with a 3-point continuous belt system and an airbag in both front outboard seating positions. With respect to FMVSS 208 "Occupant Crash Protection", the occupant injury criteria summary is as follows:

Measurement Description	Units	Threshold	Driver ATD	Pass. ATD
Head Injury Criteria (HIC)	N/A	1000	264	434
Max. Thorax Accel. (3ms Clip)	G's	60	42	39
Left Femur Force	Newton	10009	-590	-731
Right Femur Force	Newton	10009	-3499	-973

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SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

This frontal barrier impact test is part of the Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under contract number DTNH22-06-D-00028. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for an impact in excess of the current 48.3 kph requirements.

SUMMARY

A load cell barrier was impacted by a 2007 Nissan Altima at a velocity of 56.5 kph. The test was performed at MGA Research Corporation on December 4, 2006. Pre-and post-test photographs of the vehicle and dummies can be found in Appendix A.

One real-time camera and fourteen high-speed cameras were used to document the frontal barrier impact event. Camera locations and other pertinent camera information can be found in this report.

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

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

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

There was 100 percent windshield retention and no intrusion into the protected zone of the windshield during the event. There was no Stoddard Solvent leakage after the event. There was a trace of leakage during the last phase of the static rollover.

The maximum static crush of the vehicle was 591 mm and both the driver and passenger side doors remained closed and latched during the impact event and were operable after the impact.

The driver's head and chest contacted the airbag. The driver's head also contacted the headrest. The driver's knees contacted the bolster. The passenger's head and chest contacted the airbag. The passenger's head also contacted the headrest. The passenger's knees contacted the glove box.

The occupant data is summarized below:

ATD position	HIC	T^1	T^2	Clip (g)	T^1	T^2	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver	264	56.9	92.9	42	68.2	71.2	-21	-590	-3499
Passenger	434	66.7	102.7	39	77.1	80.1	-26	-731	-973

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

TEST NOTES

There was no valid data collected for:
Bottom of Engine X after 30 msec.

There was no Stoddard Solvent leakage after the event. There was a trace of leakage during the last phase of the static rollover. There were two cuts in the fuel line by the firewall.

SECTION 2

OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1

CRASH TEST SUMMARY

Test Vehicle: 2007 Nissan Altima
Test Program: 35mph Frontal Impact
NHTSA No.: M75202
Test Date: 12/04/2006

DOOR OPENING AND SEAT TRACK INFORMATION

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

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	1430
Center	mm	1440
Right Side	mm	1445
Average	mm	1438

BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	828	887
Lap belt length as measured on ATD	mm	847	910
Remainder of belt on reel	mm	1576	1413
Total belt length for continuous webbing systems	mm	3251	3210

DATA SHEET NO. 2

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2007 Nissan Altima
Test Program: 35mph Frontal Impact
NHTSA No.: M75202
Test Date: 12/04/2006

TEST VEHICLE INFORMATION

Manufacturer	Nissan
Model	Altima
Body Style	Sedan
NHTSA No.	M75202
VIN	1N4AL21E57C109067
Color	Super Black
Delivery Date	11/13/06
Odometer Reading (mile)	59
Dealer	Boucher Nissan
Transmission	Automatic
Final Drive	Front
Number of Cylinders	4
Engine Displacement (L)	2.5
Engine Placement	Lateral
Automatic Door Lock (ADL)	No
Owners Manual Details Instructions on Disabling ADLs	N/A
Bucket Seats	Yes

TEST VEHICLE OPTIONS

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

DATA FROM CERTIFICATION LABEL

Manufactured By	Nissan Motor Co., Ltd.
Date of Manufacture	10/06

GVWR (kg)	1941
GAWR Front (kg)	1017
GAWR Rear (kg)	993

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Split Bench		
Number of Occupants	2	3		5
Capacity Wt. (VCW) (kg)				408
Cargo Wt. (RCLW) (kg)				68

DATA SHEET NO. 2... (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2007 Nissan Altima
Test Program: 35mph Frontal Impact
NHTSA No.: M75202
Test Date: 12/04/2006

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	432.3	301.2		469.9	374.7	
Right	kg	437.7	279.4		469.9	351.1	
Ratio	%	60.0	40.0		56.4	43.6	
Totals	kg	870.0	580.6	1450.6	939.8	725.8	1665.6

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1450.6
Weight of 2 P572E ATDs	kg	156.0
Rated Cargo/Luggage Weight (RCLW)	kg	68
Calculated Vehicle Target Weight (TVTW)	kg	1674.6

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	720	718	704	710	1112
As Tested	mm	708	709	663	665	1211
Post Test	mm	766	834	644	658	

Vehicle Wheelbase (mm): 2778

Weight of Ballast secured in cargo area (kg): 40.8

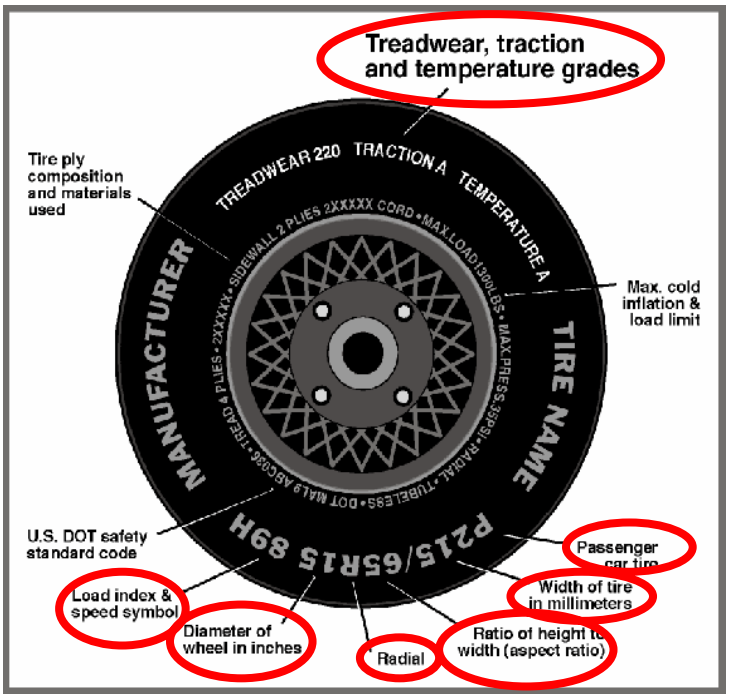
Vehicle Components Removed: Jack, right tail light, trunk carpet, spare tire, rear seat bottom

Ballast weight does not include instrumentation and data acquisition system.

DATA SHEET NO. 3

TEST VEHICLE TIRE INFORMATION

Test Vehicle:	2007 Nissan Altima	NHTSA No.:	M75202
Test Program:	35mph Frontal Impact	Test Date:	12/04/2006



DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	220	220
Recommended Tire Size	P215/60R16	P215/60R16
Tire Size on Vehicle	P215/60R16	P215/60R16
Tire Manufacturer	Continental	Continental
Tire Name	Conti Pro Contact	Conti Pro Contact
Tire Type	Passenger	Passenger
Tire Width (mm)	215	215
Ratio of Height to Width (aspect ratio)	60	60
Radial	R	R
Wheel Diameter	16	16
Load Index & Speed Symbol	94T	94T
Treadwear	400	400
Traction Grade	AA	AA
Temperature Grade	A	A

DATA SHEET NO. 4

TEST VEHICLE INFORMATION

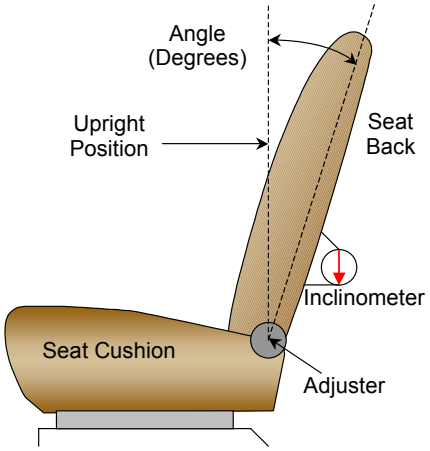
Test Vehicle:	2007 Nissan Altima	NHTSA No.:	M75202
Test Program:	35mph Frontal Impact	Test Date:	12/04/2006

NORMAL DESIGN RIDING POSITION

The driver and passenger seat back is positioned to the manufacturer's designated angle. The procedure is as follows: Zero Inclinometer on the sill surface before any measurement is taken. Measure angle from headrest post. Set at 7th notch with the forward-most detent as 0.

Driver seat back angle: 7th notch, 1st as 0

Passenger seat back angle: 7th notch, 1st as 0



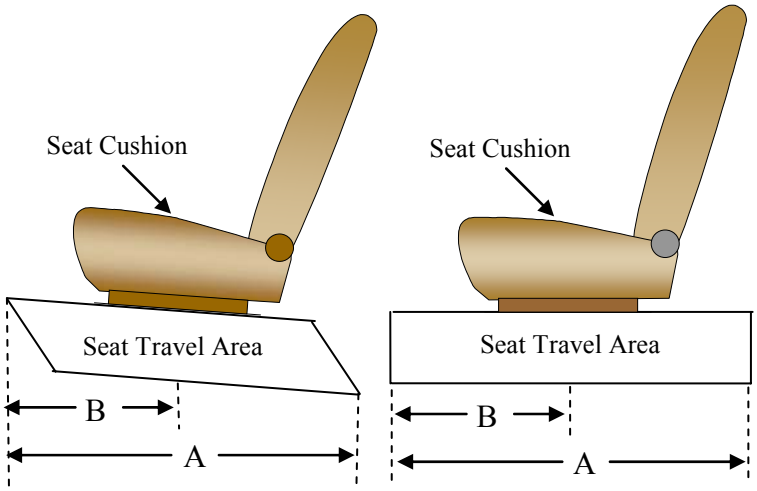
FRONT SEAT ASSEMBLY

SEAT FORE/AFT POSITIONING

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	25 detents	10th detent, 1st as 0
Passenger Seat	25 detents	12th detent, 1st as 0

ADJUSTABLE D-RING POSITION

The driver and passenger D-rings were placed in the uppermost position.



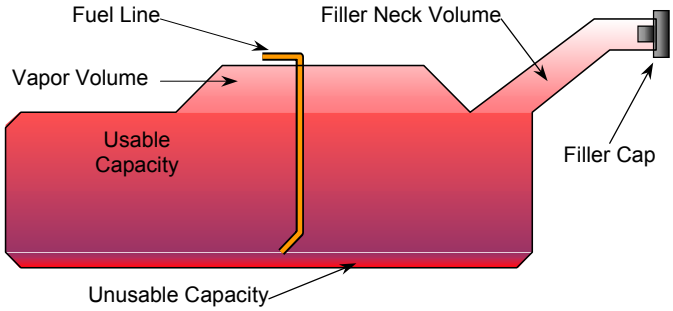
DATA SHEET NO. 4…(CONTINUED)
TEST VEHICLE INFORMATION

Test Vehicle: 2007 Nissan Altima NHTSA No.: M75202
Test Program: 35mph Frontal Impact Test Date: 12/04/2006

FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank"	75.7
Usable Capacity of "Optional" Tank	
92-94% of Usable Capacity	69.6 – 71.2
Actual Amount of Solvent used	70.1
1/3 of Usable Capacity	25.2

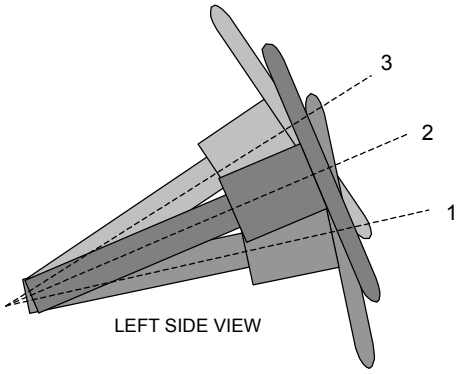
The test vehicle is equipped with an electric fuel pump. The fuel pump will pump fuel 1) for 1.0 seconds after the ignition is switched to "ON", 2) while the engine is running, and 3) for 1.5 seconds after the engine stops running.



VEHICLE FUEL TANK ASSEMBLY

STEERING COLUMN ADJUSTMENT

Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes when moved through its full range of motion. An aluminum plate is placed across the rim of the steering wheel, an inclinometer is placed on the plate and the angle is measured.



STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITIONS

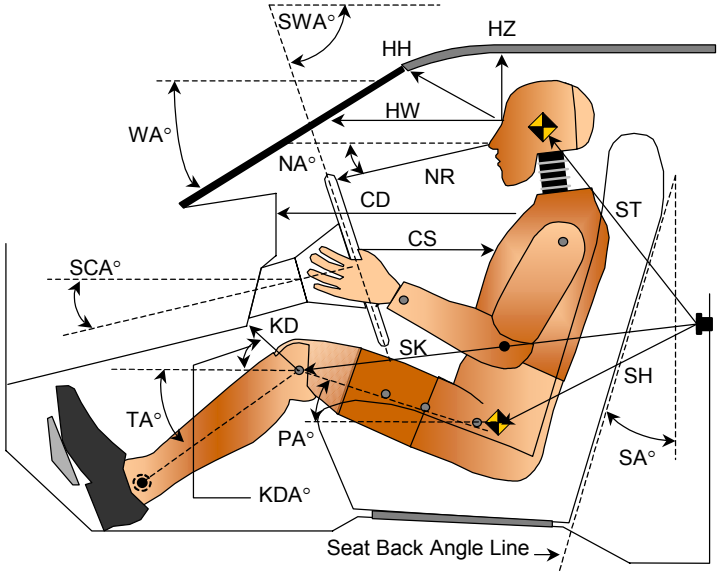
	Fore/Aft Position (mm)	Degrees
Lowermost position No. 1	175	16.1
Geometric center position No. 2	194	23.6
Uppermost position No. 3	214	31.3

DATA SHEET NO. 5

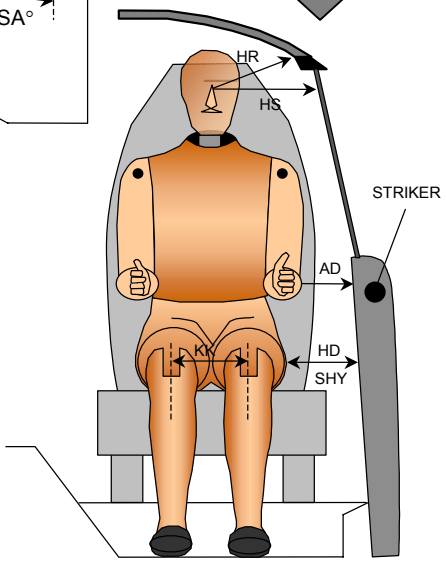
DUMMY POSITIONING IN VEHICLE

Test Vehicle:	2007 Nissan Altima	NHTSA No.:	M75202
Test Program:	35mph Frontal Impact	Test Date:	12/04/2006

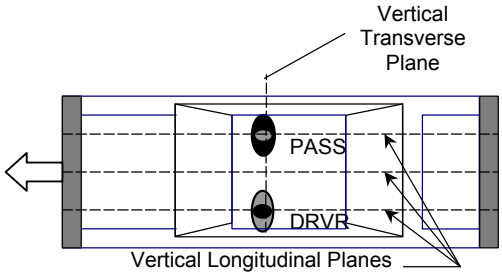
DUMMY MEASUREMENTS FOR FRONT SEAT OCCUPANTS



AD	Arm to Door
HD	H-Point to Door
HR	Head to Side Header
HS	Head to Side Window
KK	Knee to Knee
SHY	Striker to H-Point (Y Axis)



CD	Chest to Dash
CS	Chest to Steering Wheel Hub
HH	Head to Header
HW	Head to Windshield
HZ	Head to Roof
KDA	Knee to Dash Angle
KDL	Left Knee to Dash
KDR	Right Knee to Dash
NA	Nose to Rim Angle
NR	Nose to Rim
PA	Pelvic Angle
RA	Rim to Abdomen
SA	Seat Back Angle
SCA	Steering Column Angle
SH	Striker to H-Point
SK	Striker to Knee
ST	Striker to Head
SWA	Steering Wheel Angle
TA	Tibial Angle
WA	Windshield Angle



DATA SHEET NO. 5... (CONTINUED)

DUMMY POSITIONING IN VEHICLE

Test Vehicle: 2007 Nissan Altima NHTSA No.: M75202
Test Program: 35mph Frontal Impact Test Date: 12/04/2006

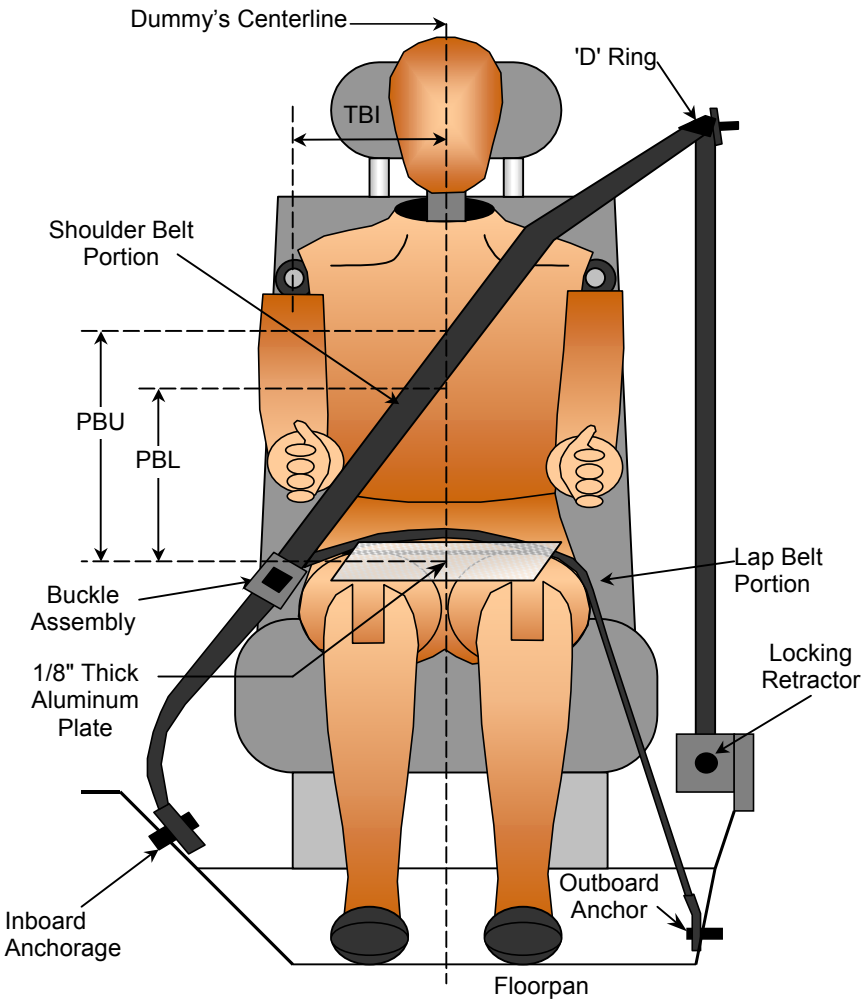
TEST DUMMY POSITION MEASUREMENTS

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA	Windshield Angle		24.6		
SWA	Steering Wheel Angle		67.8		
SCA	Steering Column Angle		23.6		
SA	Seat Back Angle (headrest post)		5.1		2.5
HZ	Head to Roof (Z)	181	90	169	90
HH	Head to Header	376	22.4	362	20.8
HW	Head to Windshield	676	0	642	0
HR	Head to Side Header (Y)	202		208	
NR	Nose to Rim	381	11.0		
CD	Chest to Dash	527		552	
CS	Chest to Steering Hub	283	4.2		
RA	Rim to Abdomen	176	0		
KDL	Left Knee to Dash	170	34.0	152	
KDR	Right Knee to Dash	155		166	35.4
PA	Pelvic Angle		23.6		23.9
TA	Tibia Angle		43.6		45.9
KK	Knee to Knee (Y)	330		264	
SK	Striker to Knee	585	90.9	605	93.8
ST	Striker to Head	522	8.1	540	11.5
SH	Striker to H-Point	257	119.3	247	120.3
SHY	Striker to H-Point (Y)	256		263	
HS	Head to Side Window	300		308	
HD	H-Point to Door (Y)	134		144	
AD	Arm to Door (Y)	122		129	
AA	Ankle to Ankle	380		228	

DATA SHEET NO. 6

SEAT BELT POSITIONING DATA

Test Vehicle: 2007 Nissan Altima NHTSA No.: M75202
Test Program: 35mph Frontal Impact Test Date: 12/04/2006



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	380	380
PBL - To surface of reference to belt lower edge	mm	290	290

DATA SHEET NO. 7

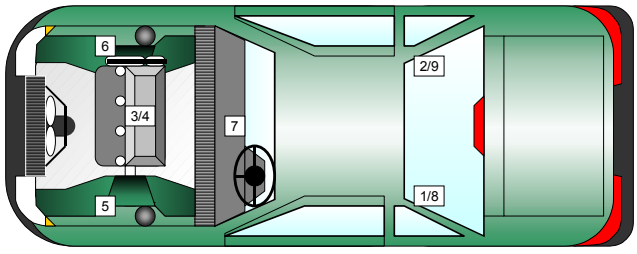
VEHICLE ACCELEROMETER LOCATIONS

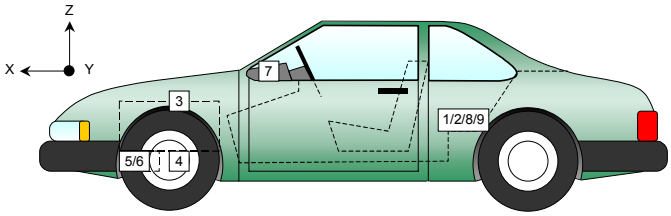
Test Vehicle: 2007 Nissan Altima
Test Program: 35mph Frontal Impact
NHTSA No.: M75202
Test Date: 12/04/2006

VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear X-Member X	1848	-357	460
2	Right Rear X-Member X	1835	357	460
3	Engine Top X	4078	0	780
4	Engine Bottom X	4035	142	165
5	Left Brake Caliper X	3970	-678	237
6	Right Brake Caliper X	3975	678	237
7	Instrument Panel X			
8	Left Rear X-Member Z	1848	-357	460
9	Right Rear X-Member Z	1835	357	460

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





DATA SHEET NO. 8

SUMMARY OF FMVSS 212 AND FMVSS 219 (Partial) DATA

Test Vehicle: 2007 Nissan Altima
Test Program: 35mph Frontal Impact
NHTSA No.: M75202
Test Date: 12/04/2006

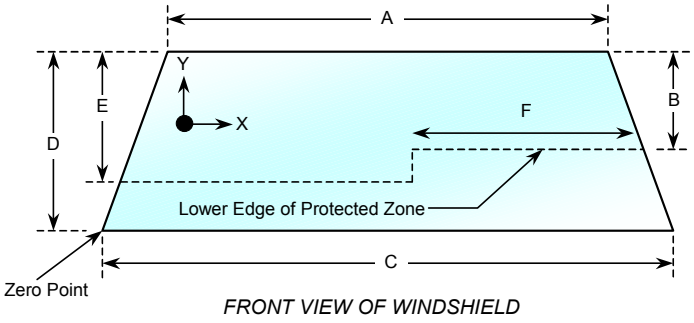
Windshield Mounting Details:
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

The standard requires that the post-test retention measurement be a minimum of 75 percent of the pretest total periphery measurement for vehicles not equipped with occupant passive restraints and 50 percent for each side of the windshield for vehicles, which are equipped with occupant passive restraints.

Temperature of windshield molding during test: 21°C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2171	2171	100
Right Side	2171	2171	100
Total	4342	4342	100



FRONT VIEW OF WINDSHIELD

Item	Units	Value
A	mm	1160
B	mm	504
C	mm	1412
D	mm	885
E	mm	543
F	mm	632

AREA OF PROTECTED ZONE FAILURES - NONE

A. Provide coordinates of the area that the protected zone was penetrated more than 0.25 inches by a vehicle component other than one that is normally in contact with the windshield. **None**

X	Y

B. Provide coordinates of the area beneath the protected zone that the inner surface of the windshield was penetrated by a vehicle component. **None**

X	Y

DATA SHEET NO. 9

SUMMARY OF FMVSS 301 DATA

Test Vehicle: 2007 Nissan Altima NHTSA No.: M75202
Test Program: 35mph Frontal Impact Test Date: 12/04/2006

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21° C Test Time: 7:10 pm

Stoddard Solvent Spillage Measurements

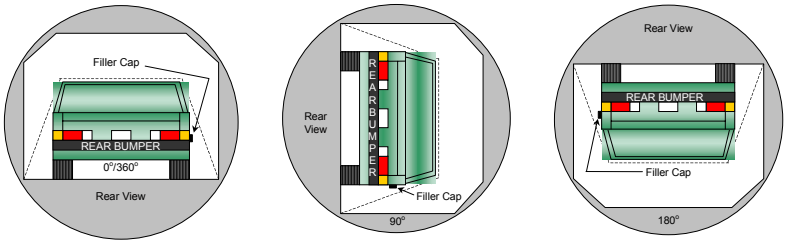
A. From impact until vehicle motion ceases: 0 oz.
(Maximum Allowable = 1 ounce)

B. For the 5 minute period after motion ceases: 0 oz.
(Maximum Allowable = 5 ounces)

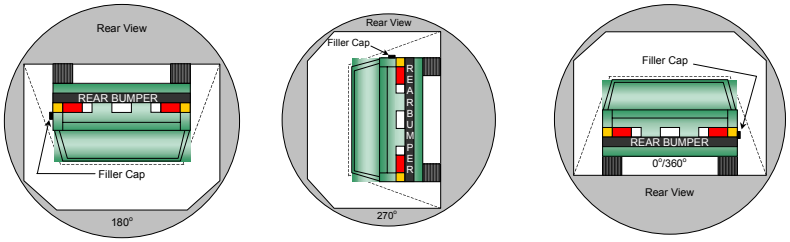
C. For the following 25 minutes: 0 oz.
(Maximum Allowable = 1 oz. /minute)

D. Spillage: None

FMVSS 301 STATIC ROLLOVER DATA



0° to 90° 90° to 180°



180° to 270° 270° to 360°

1. The specified fixture rollover rate for each 90° of rotation is 60 to 180 seconds.

2. The position hold time at each position is 300 seconds (minimum).

3. Details of Stoddard Solvent spillage locations:

Fuel Line by Fire Wall

Test Phase	Rotation Time (sec.)	Hold Time (sec.)	Spillage (oz.)
0° to 90°	119	300	0
90° to 180°	118	300	0
180° to 270°	113	300	0
270° to 360°	112	300	Trace

DATA SHEET NO. 10

VEHICLE MEASUREMENTS

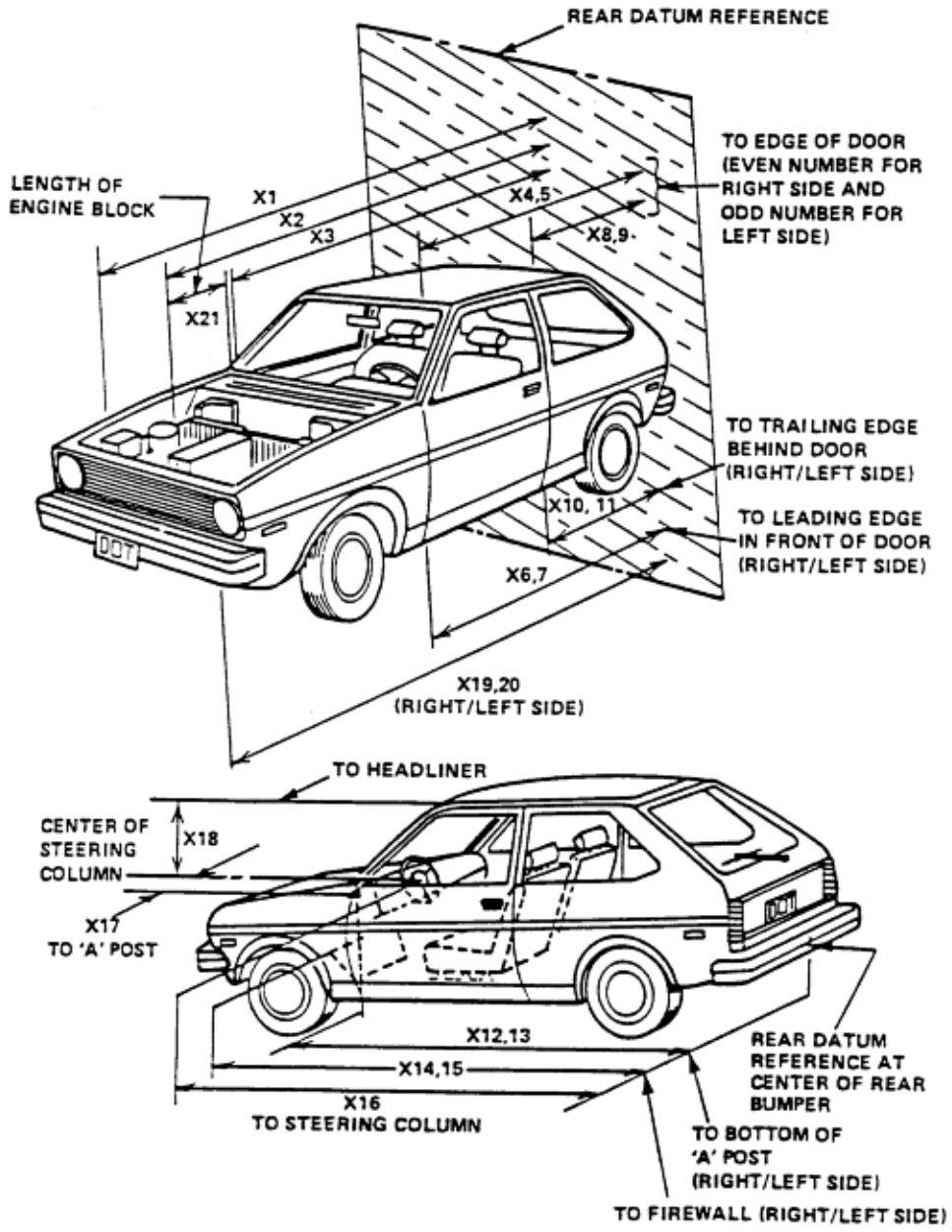
Test Vehicle: 2007 Nissan Altima
Test Program: 35mph Frontal Impact
NHTSA No.: M75202
Test Date: 12/04/2006

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total length of vehicle at centerline	mm	4791	4200	591
2	RSOV to front of engine	mm	4194	3964	230
3	RSOV to firewall centerline	mm	3661	3661	0
4	RSOV to leading edge of right door	mm	3318	3320	-2
5	RSOV to leading edge of left door	mm	3323	3315	8
6	RSOV to lower leading edge of right door	mm	3335	3334	1
7	RSOV to lower leading edge of left door	mm	3335	3330	5
8	RSOV to upper leading edge of right door	mm	2184	2176	8
9	RSOV to upper leading edge of left door	mm	2185	2169	16
10	RSOV to lower trailing edge of right door	mm	2180	2180	0
11	RSOV to lower trailing edge of left door	mm	2183	2176	7
12	RSOV to bottom of right 'A' pillar	mm	3277	3274	3
13	RSOV to bottom of left 'A' pillar	mm	3273	3267	6
14	RSOV to firewall on right side	mm	3680	3622	58
15	RSOV to firewall on left side	mm	3691	3639	52
16	RSOV to steering column	mm	2849	2759	90
17	Center of steering column to left 'A' pillar	mm	376	366	10
18	Center of steering column to headlining	mm	423	407	16
19	RSOV to right side of front bumper	mm	4645	4145	500
20	RSOV to left side of front bumper	mm	4640	4120	520
21	Length of engine block	mm	500	500	0
RD	RSOV to right side of dash panel	mm	3067	3094	-27
CD	RSOV to center of dash panel	mm	3156	3101	55
LD	RSOV to left side of dash panel	mm	3068	3065	3

DATA SHEET NO. 10... (continued)

VEHICLE MEASUREMENTS

Test Vehicle:	2007 Nissan Altima	NHTSA No.:	M75202
Test Program:	35mph Frontal Impact	Test Date:	12/04/2006



DATA SHEET NO. 10... (continued)

VEHICLE MEASUREMENTS

Test Vehicle: 2007 Nissan Altima
Test Program: 35mph Frontal Impact
NHTSA No.: M75202
Test Date: 12/04/2006

Target Vehicle Structural Measurement

	Elements	Pre-Test (mm)
1	Total Length	4791
2	Total Width	1787
3	Bumper Top Height	523
4	Bumper Bottom Height	400
5	Longitudinal Member Top Height	560
6	Distance between Longitudinal Members	945
7	Longitudinal Member Width	90
8	Engine Top Height	800
9	Engine Bottom Height	170
10	Engine and gearbox width	926
11	Front bumper-engine distance	512
12	Front shock absorber fixing height	850
13	Bonnet leading edge height	756
14	Front shock absorber fixing width	1170
15	Front bumper – front axle distance	890
16	Front axle – a pillar distance	460
17	A-pillar – B-pillar distance	1168
18	B-Pillar – rear axle distance	1150
19	B-pillar – C-pillar distance	1020
20	Roof sill bottom height	1382
21	Roof sill top height	1444
22	Floor sill bottom height	210
23	Floor sill top height	293

DATA SHEET NO. 11

CAMERA LOCATIONS

Test Vehicle: 2007 Nissan Altima
Test Program: 35mph Frontal Impact
NHTSA No.: M75202
Test Date: 12/04/2006

No.	Camera View	Location (mm) *			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Side View				13	24
2	Left Front View	890	-4700	1180	25	1000
3	Steering Column Top	1100	-5050	1280	25	1000
4	Steering Column Bottom	1105	-5035	890	25	1000
5	Driver Close-up	1290	-6085	1420	35	1000
6	Driver Angle	6925	-5050	2045	50	1000
7	On board Driver Side					
8	On board Passenger Side					
9	Right Overall	2060	6320	1260	19	1000
10	Right Passenger Half	1065	4770	1185	24	1000
11	Right Close-up	1315	5860	1440	35	1000
12	Right Angle	6765	4985	2055	50	1000
13	Windshield	-285	0	2830	24	1000
14	Top Driver	-145	-390	2205	24	1000
15	Top Passenger	-145	505	2215	24	1000
16	Pit Front	1075	0	-3150	24	1000
17	Pit Rear	3255	0	-3150	24	1000

*COORDINATES:

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

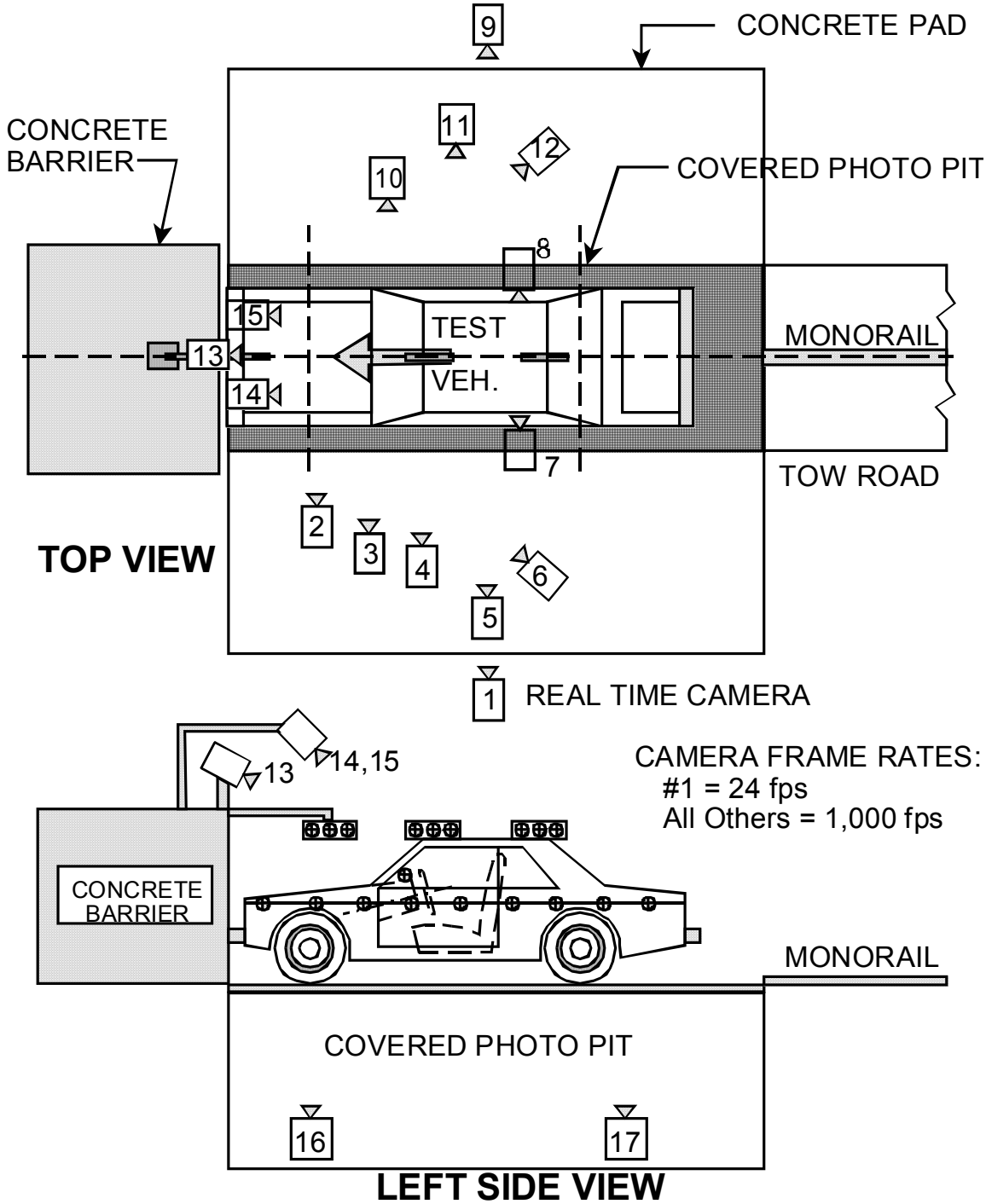
Note: Cameras 7 and 8 were not used for this test.

DATA SHEET NO. 11... (continued)

CAMERA LOCATIONS

Test Vehicle:	2007 Nissan Altima	NHTSA No.:	M75202
Test Program:	35mph Frontal Impact	Test Date:	12/04/2006

CAMERA POSITIONS FOR FRONTAL IMPACTS



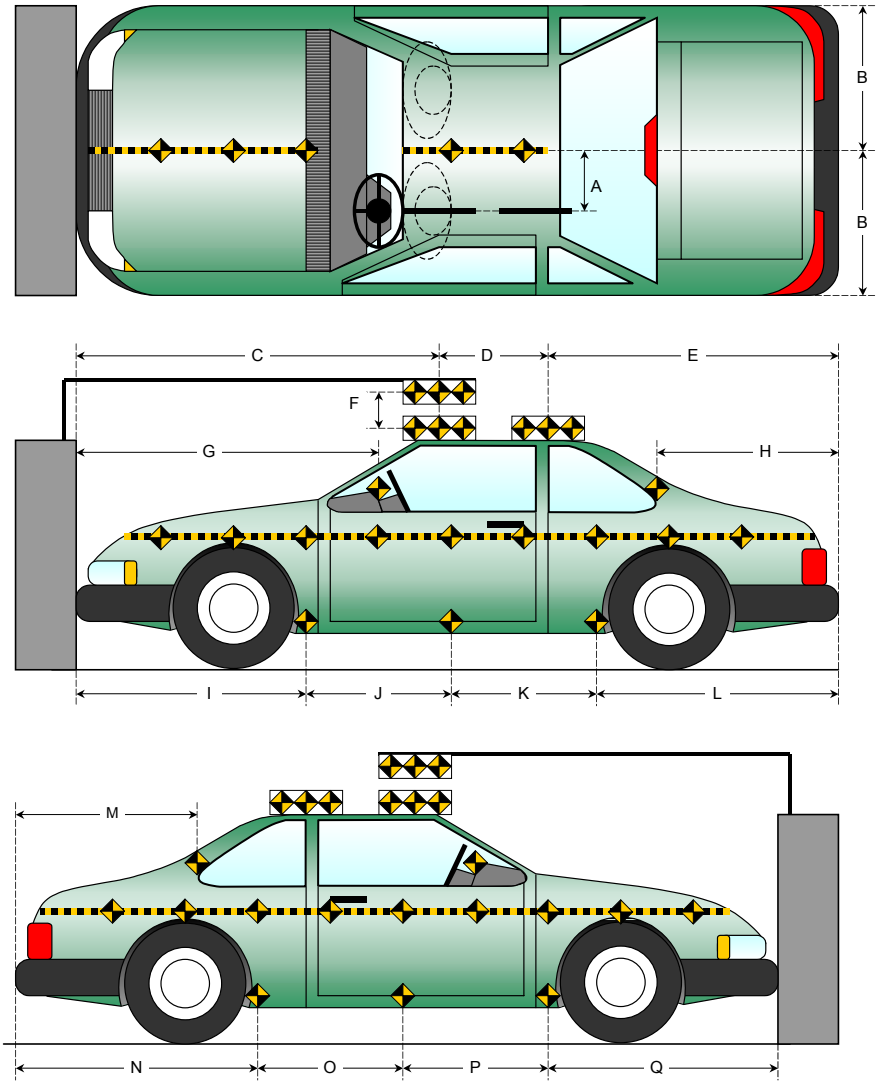
DATA SHEET NO. 12

PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2007 Nissan Altima
Test Program: 35mph Frontal Impact

NHTSA No.: M75202
Test Date: 12/04/2006

Item	Value
A	376
B	893
C	2446
D	611
E	1734
F	1468
G	
H	928
I	1393
J	961
K	954
L	1483
M	955
N	1476
O	954
P	970
Q	1391



DATA SHEET NO. 13

VEHICLE INTRUSION MEASUREMENTS

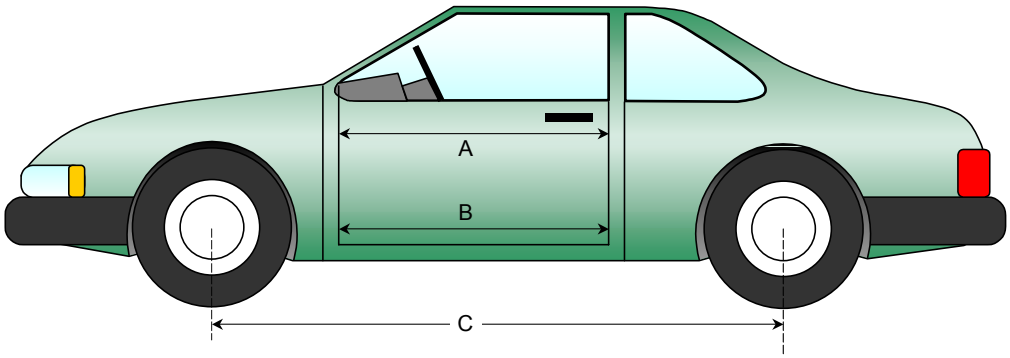
Test Vehicle: 2007 Nissan Altima
Test Program: 35mph Frontal Impact
NHTSA No.: M75202
Test Date: 12/04/2006

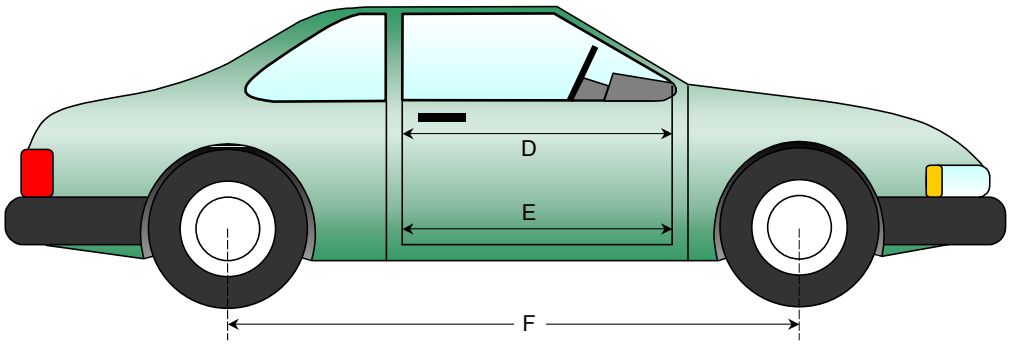
DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1056	1055	1
B	Left Side Lower	mm	1030	1027	3
D	Right Side Upper	mm	1058	1056	2
E	Right Side Lower	mm	1032	1024	8

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2778	2726	52
F	Right Side Wheelbase	mm	2778	2692	80





DATA SHEET NO. 13... (continued)

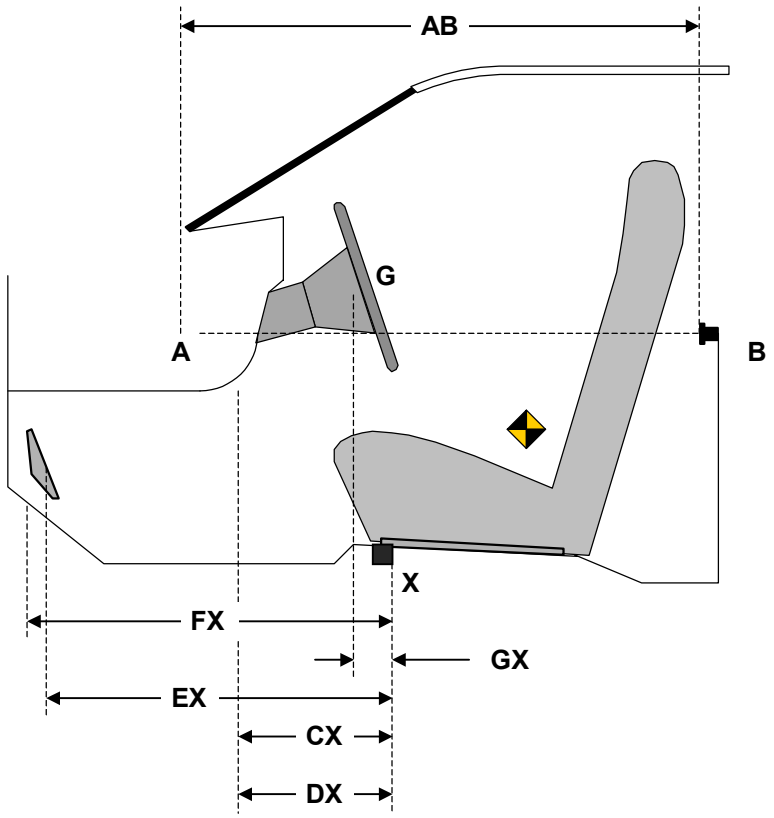
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2007 Nissan Altima
Test Program: 35mph Frontal Impact
NHTSA No.: M75202
Test Date: 12/04/2006

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside window jam)	mm	853	852	1
CX	Left Knee Bolster to X	mm	260	265	-5
DX	Right Knee Bolster to X	mm	256	205	51
EX	Brake Pedal to X	mm	620	510	110
FX	Foot Rest to X	mm	565	555	10
GX	Center of Steering Column Wheel Hub to X	mm	48	0	48

X = Front of Seat Track (stationary)



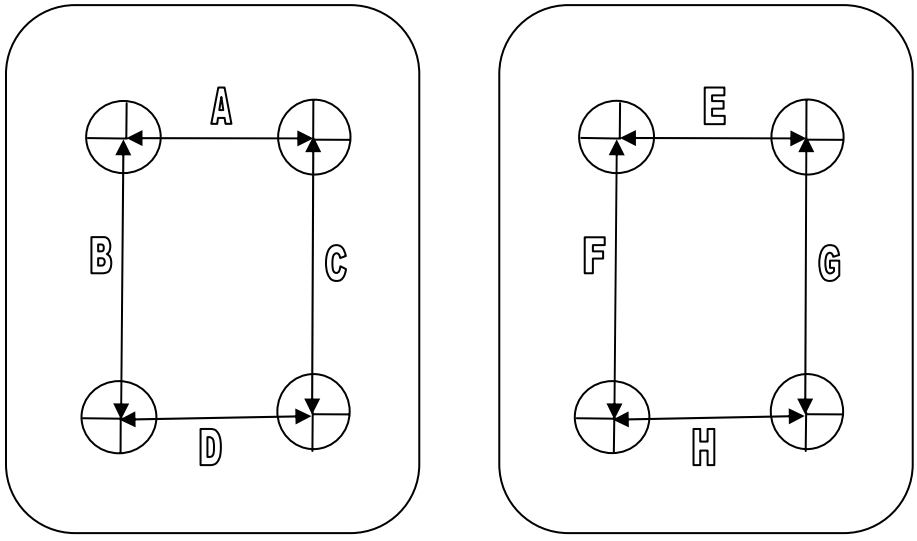
DRIVER COMPARTMENT

DATA SHEET NO. 13... (continued)

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2007 Nissan Altima
Test Program: 35mph Frontal Impact

NHTSA No.: M75202
Test Date: 12/04/2006



Driver Passenger

UNDERBODY FLOORBOARD DEFORMATION

Measurement	Pre-Test	Post-Test	Difference
A	196	185	11
B	233	232	1
C	235	225	10
D	190	183	7
E	260	240	20
F	238	232	6
G	228	225	3
H	272	260	12

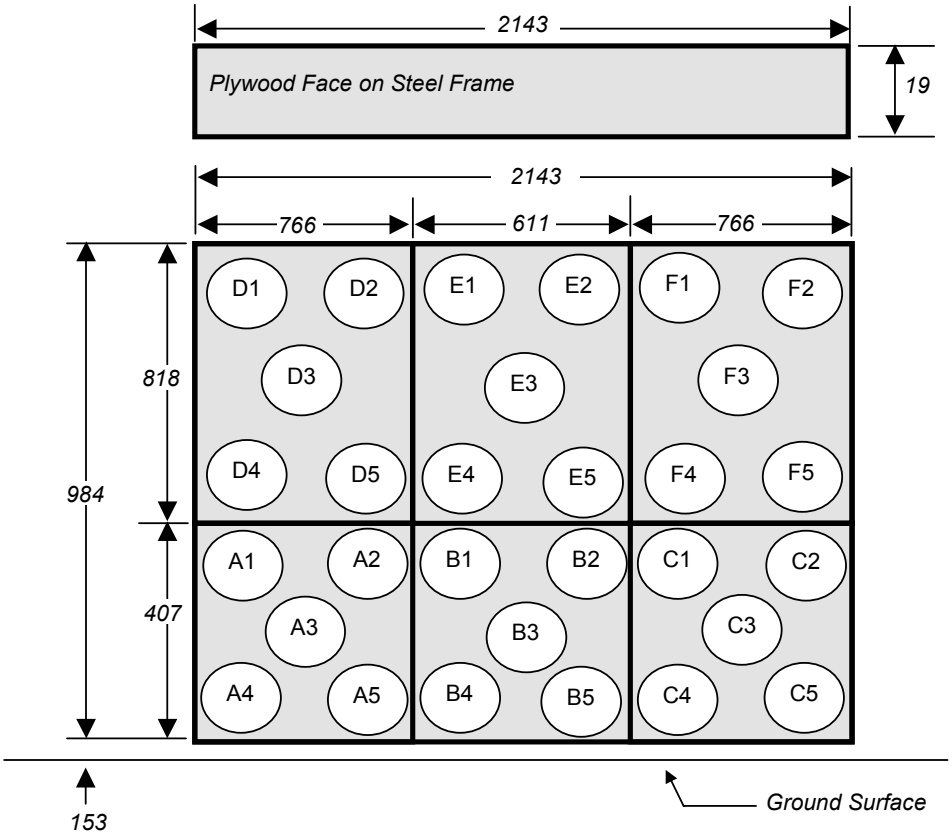
DATA SHEET NO. 14

LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2007 Nissan Altima
Test Program: 35mph Frontal Impact
NHTSA No.: M75202
Test Date: 12/04/2006

30 Load Cell Rigid Barrier

Load Cell Locations on Fixed Barrier



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

6 Groups of 5 Load Cells Each

DATA SHEET NO. 15

ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2007 Nissan Altima NHTSA No.: M75202
Test Program: 35mph Frontal Impact Test Date: 12/04/2006

VEHICLE INFORMATION

VIN: 1N4AL21E57C109067 Wheelbase (mm) : 2778
Vehicle Size Category: Sedan Test Weight (kg) : 1665.6

ACCELEROMETER DATA

Accelerometer Locations: As per measurements on Page 12
Cal. Procedure/Interval: MGA procedure / 6 month
Integration Algorithm: Trapezoidal Linearity: > 99%
Impact Velocity (km/h): 56.5
Velocity Change (km/h): 63.9 Time of Separation (msec): 110

CRUSH PROFILE

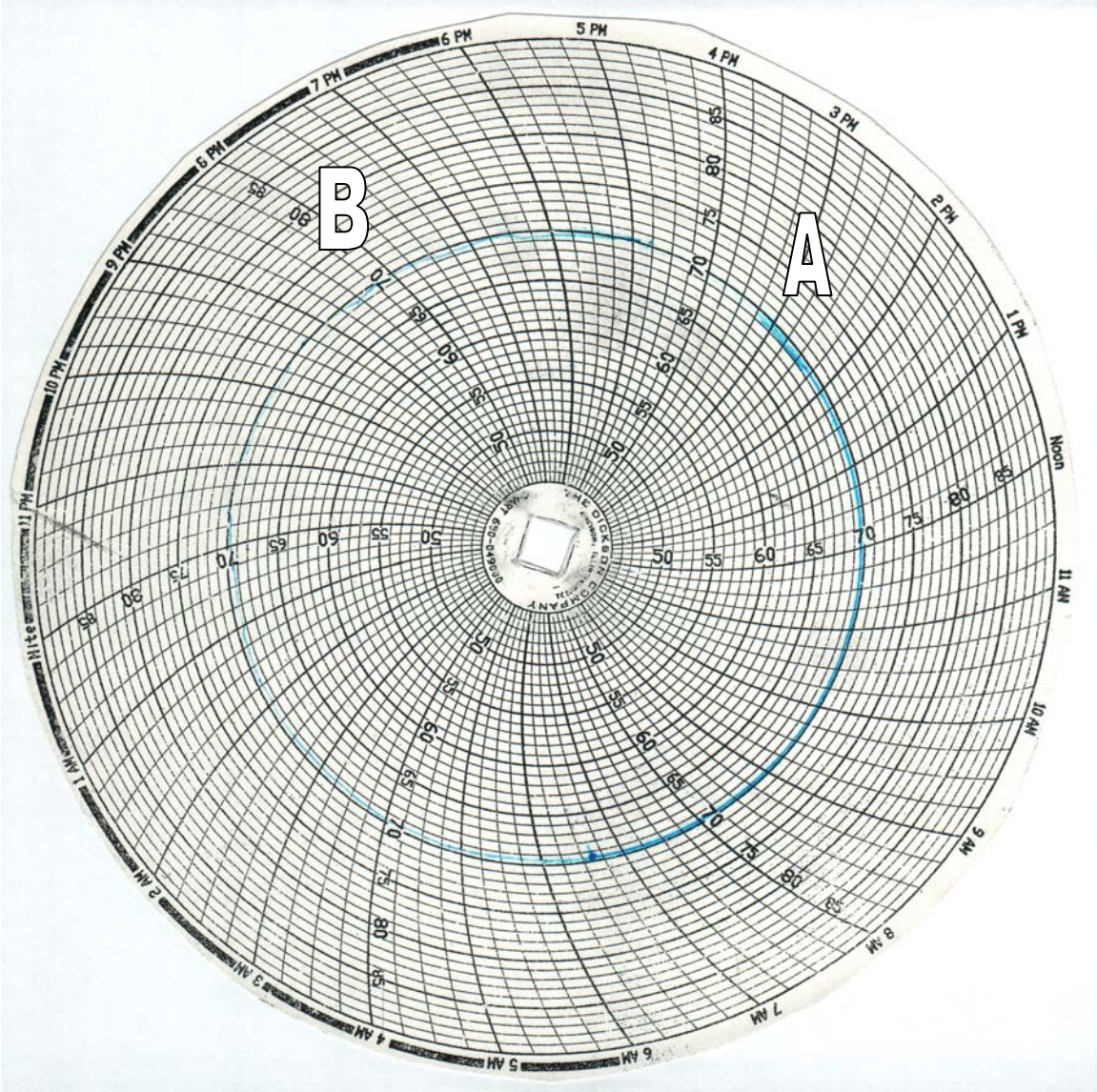
Collision Deformation Classification: Frontal Midpoint of Damage: Centerline
Damage Region Length (mm): 1362 Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4640	4120	520
C2	Crush zone 2 at left side	mm	4729	4183	546
C3	Crush zone 3 at left side	mm	4772	4203	569
C4	Crush zone 4 at right side	mm	4774	4208	566
C5	Crush zone 5 at right side	mm	4731	4190	541
C6	Crush zone 6 at right side	mm	4645	4145	500
L	C1 TO C6	mm	1362	1355	7

DATA SHEET NO. 16

DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART

Test Vehicle:	2007 Nissan Altima	NHTSA No.:	M75202
Test Program:	35mph Frontal Impact	Test Date:	12/04/2006



A = Dummies installed in vehicle at 3:30 pm

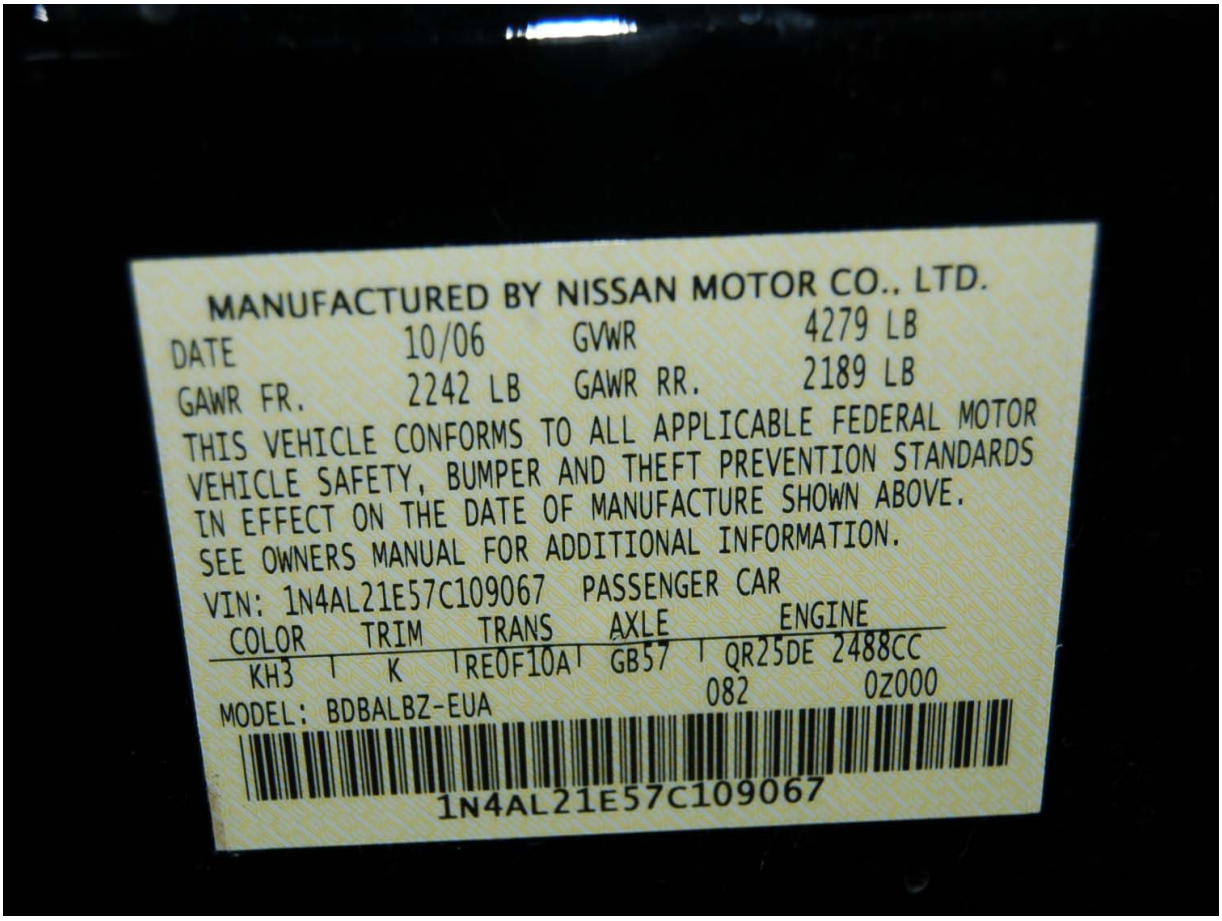
B = Test conducted at 7:10 pm

APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

Load Cell Location



Manufacturer's Label

Tire Placard

Left Front ¾ View, As Received

Right Rear ¾ View, As Received

Pre-Test Front View

Post-Test Front View

Pre-Test Left Side View

Post-Test Left Side View

Pre-Test Right Side View

Post-Test Right Side View

Pre-Test Right Front ¾ View

Post-Test Right Front ¾ View

Pre-Test Left Rear ¾ View

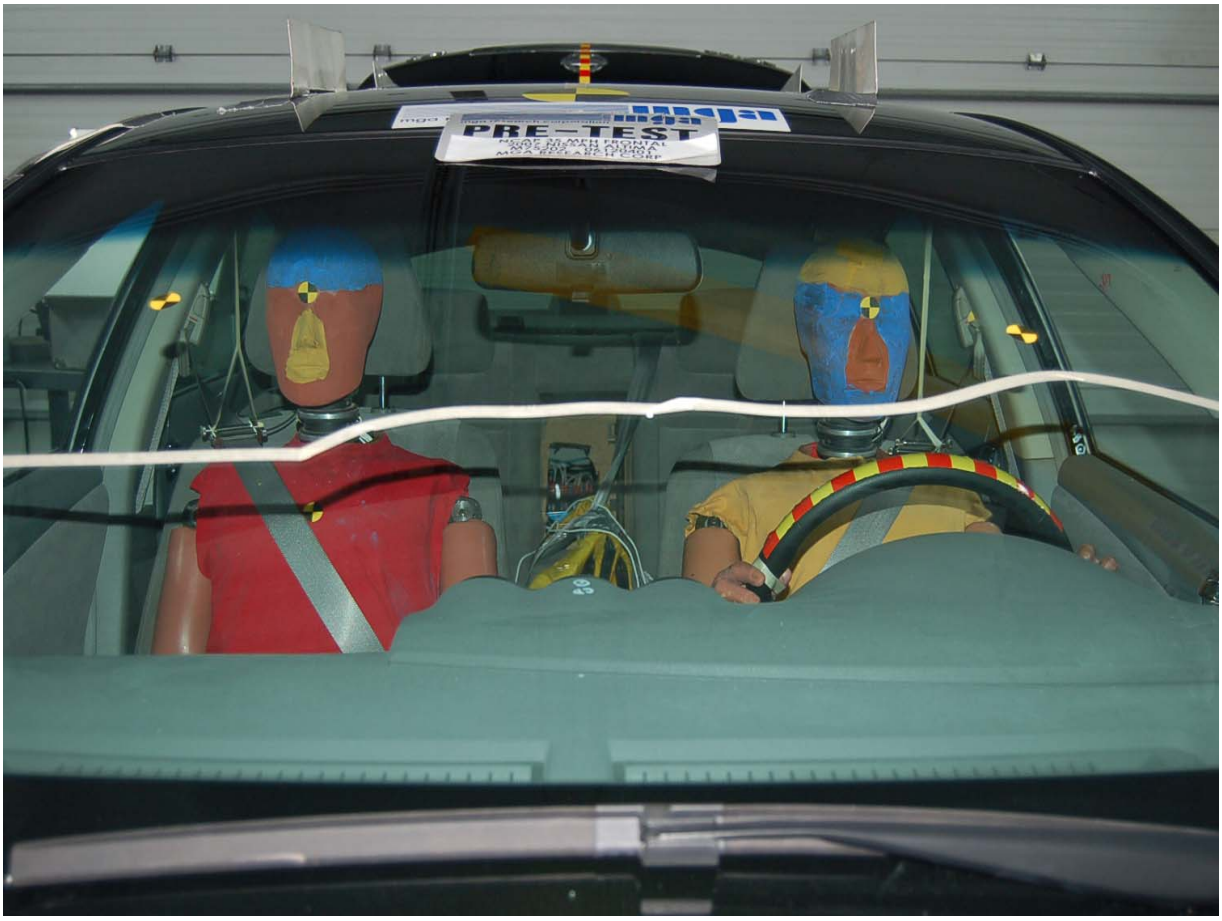
Post-Test Left Rear ¾ View

Pre-Test Left Side ¾ View of Doors

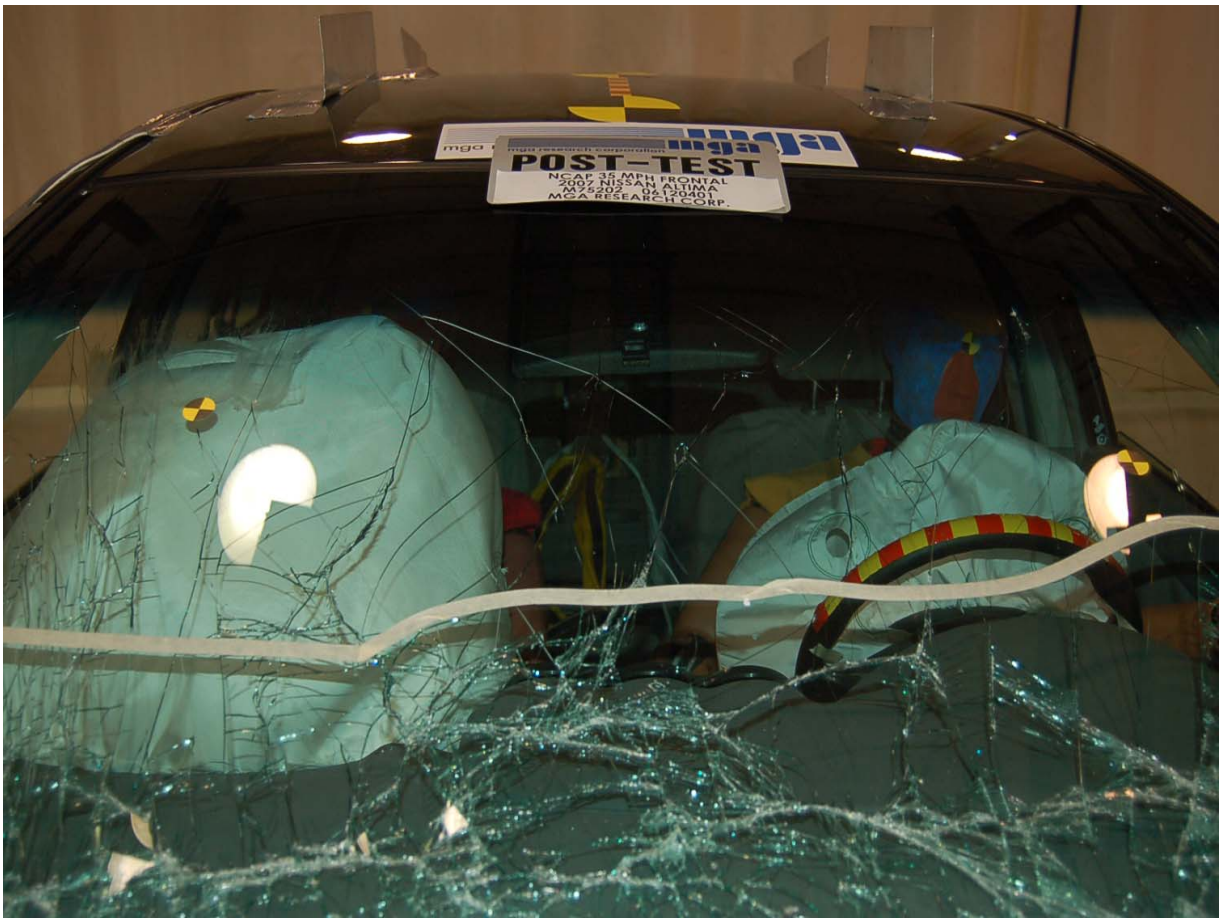
Post-Test Left Side ¾ View of Doors After Impact

Pre-Test Right Side ¾ View of Doors

Post-Test Right Side ¾ View of Doors After Impact



Pre-Test Windshield View



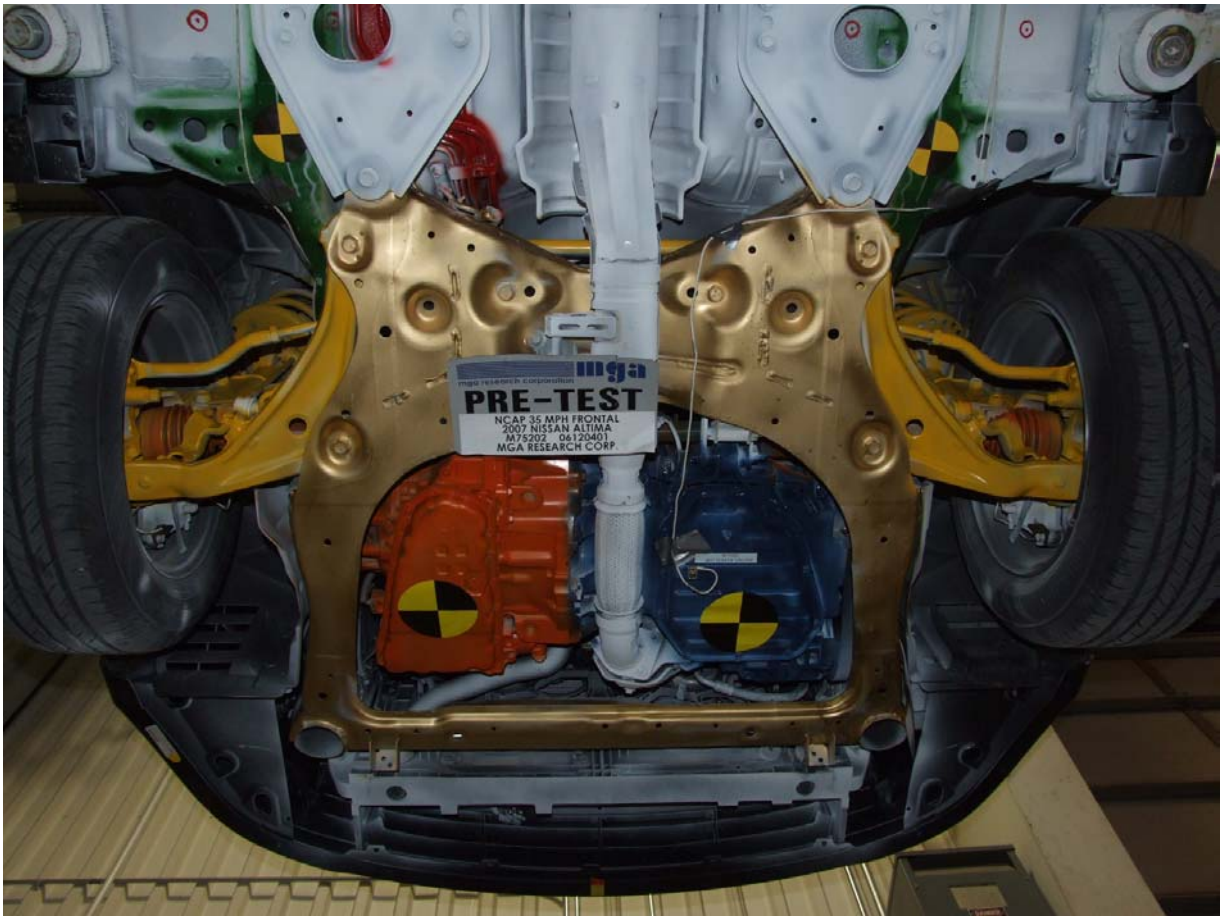
Post-Test Windshield View

Pre-Test Engine Compartment View

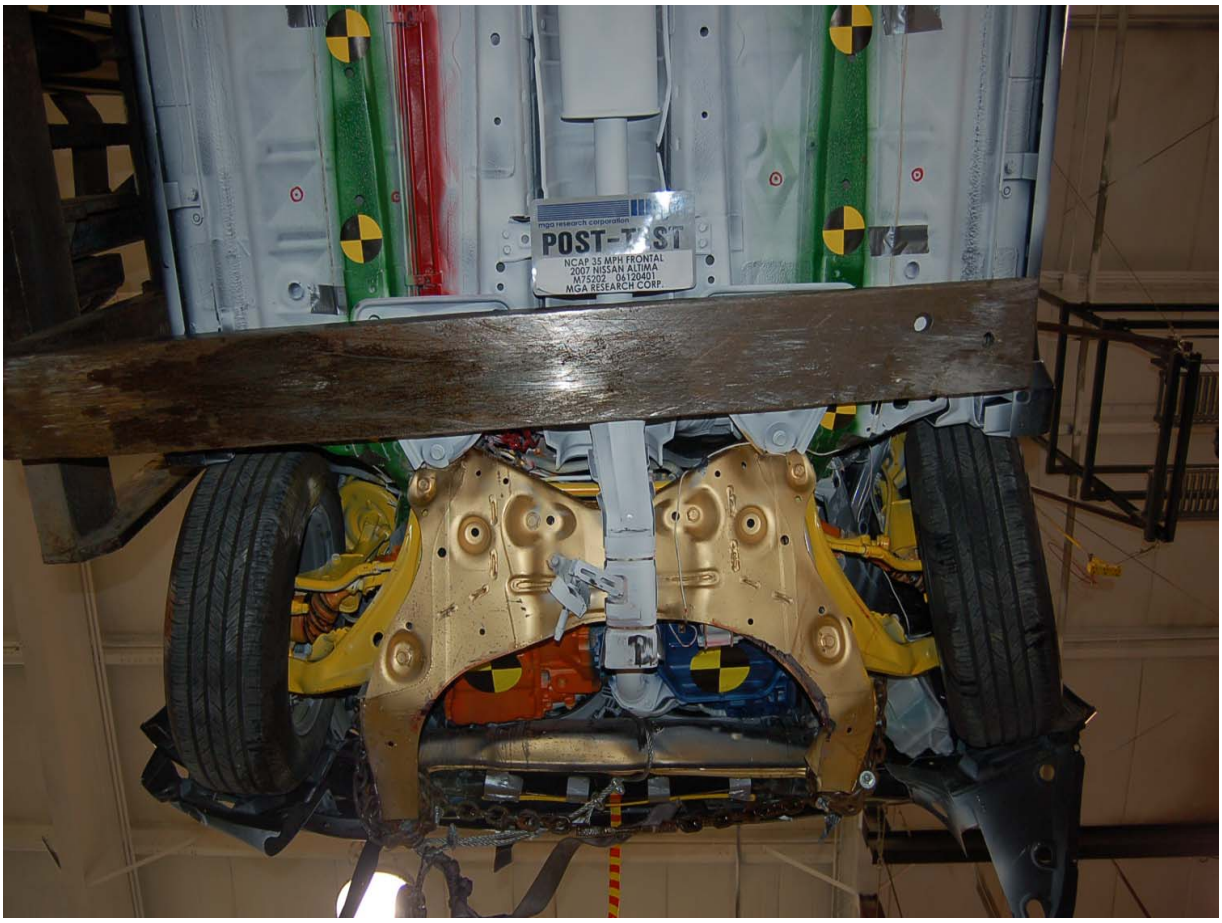
Post-Test Engine Compartment View

Pre-Test Fuel Cap View

Post-Test Fuel Cap View

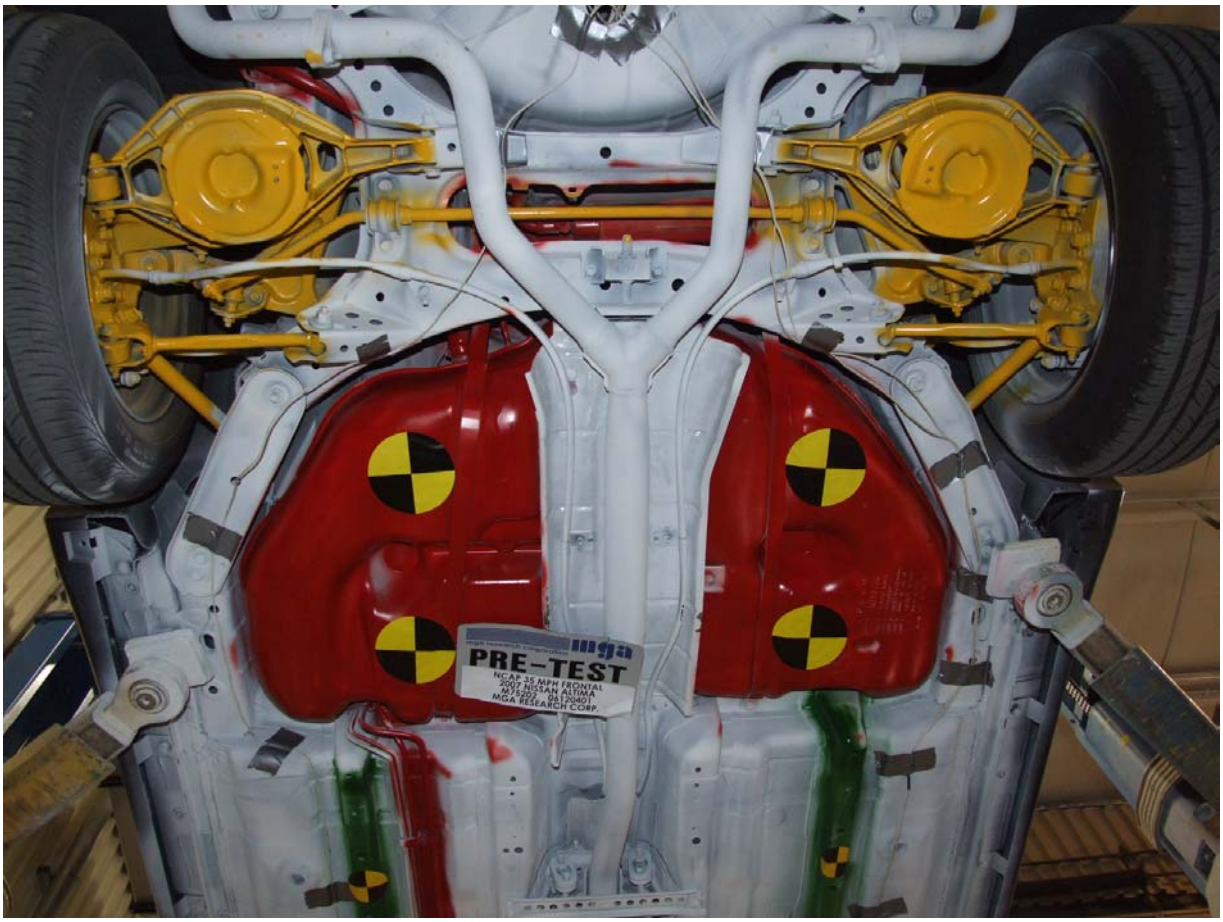


Pre-Test Front Underbody View



Post-Test Front Underbody View

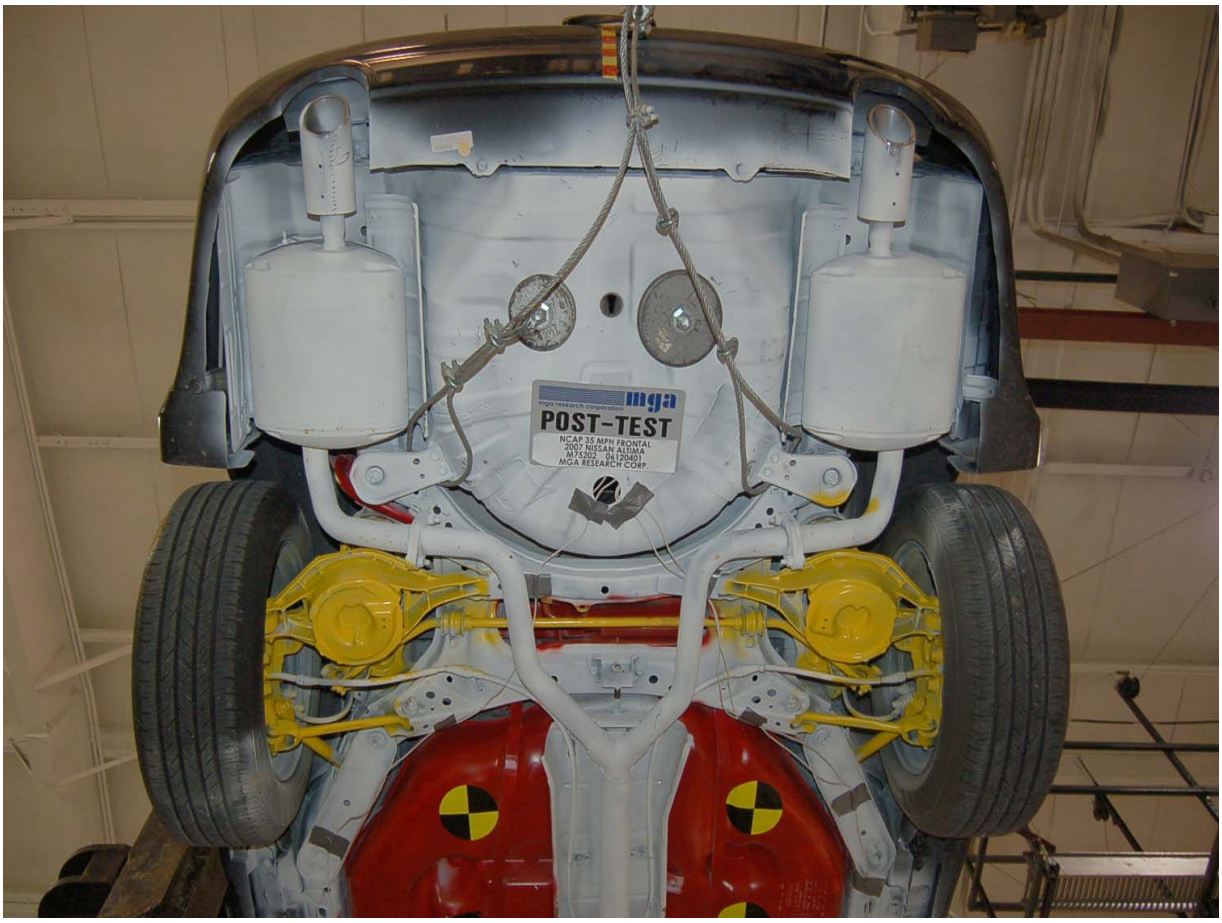
Pre-Test Mid Front Underbody View



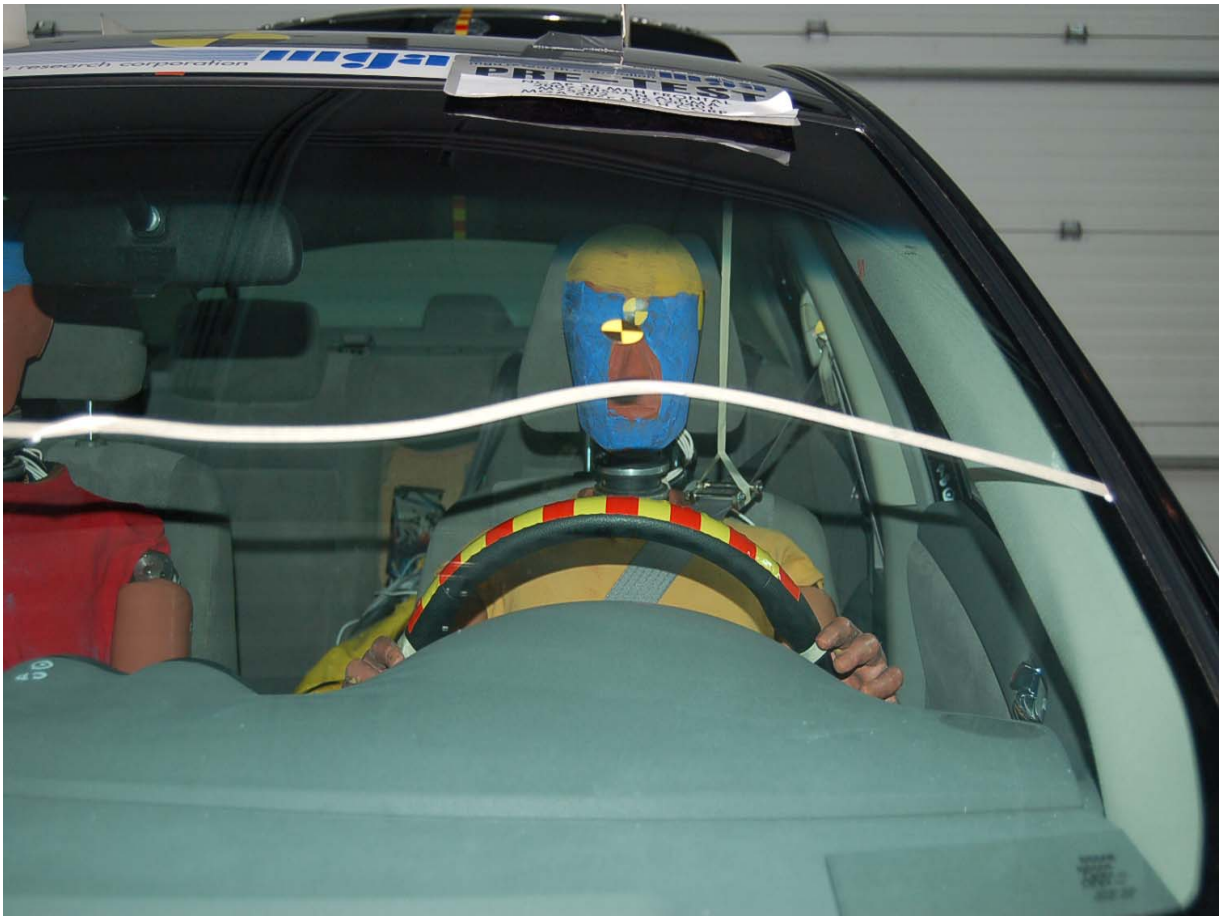
Pre-Test Mid Rear Underbody View

Post-Test Mid Underbody View

Pre-Test Rear Underbody View



Post-Test Rear Underbody View



Pre-Test Driver Dummy Front View (Head Position)

Post-Test Driver Dummy Front View (Head Position)

Pre-Test Driver Dummy (Through Window)

Post-Test Driver Dummy (Through Window)

Pre-Test Driver Dummy (Door Open)

Post-Test Driver Dummy (Door Open)

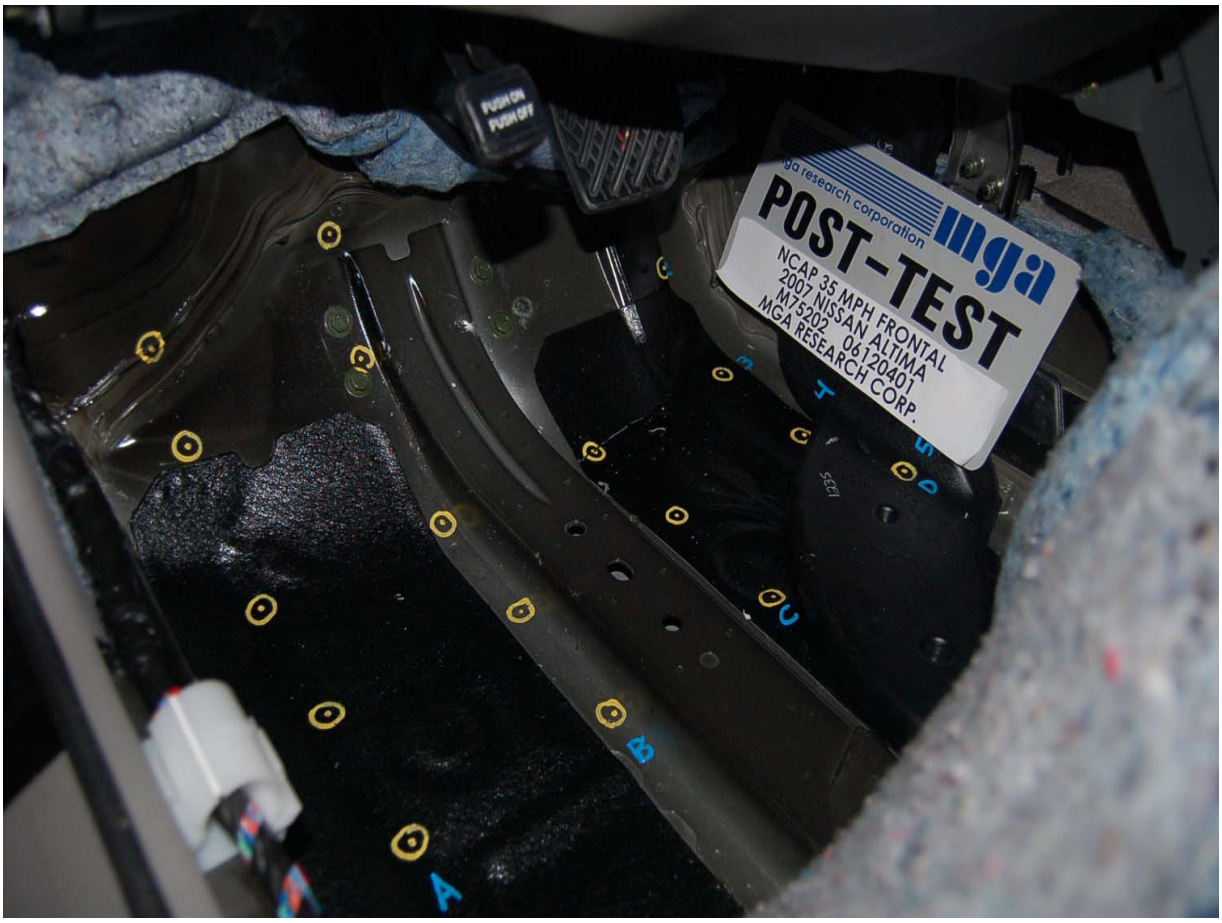
Pre-Test Driver Dummy Feet

Post-Test Driver Dummy Feet

Pre-Test Driver Side Knee Bolster

Post-Test Driver Side Knee Bolster

Pre-Test Driver Side Floor Pan

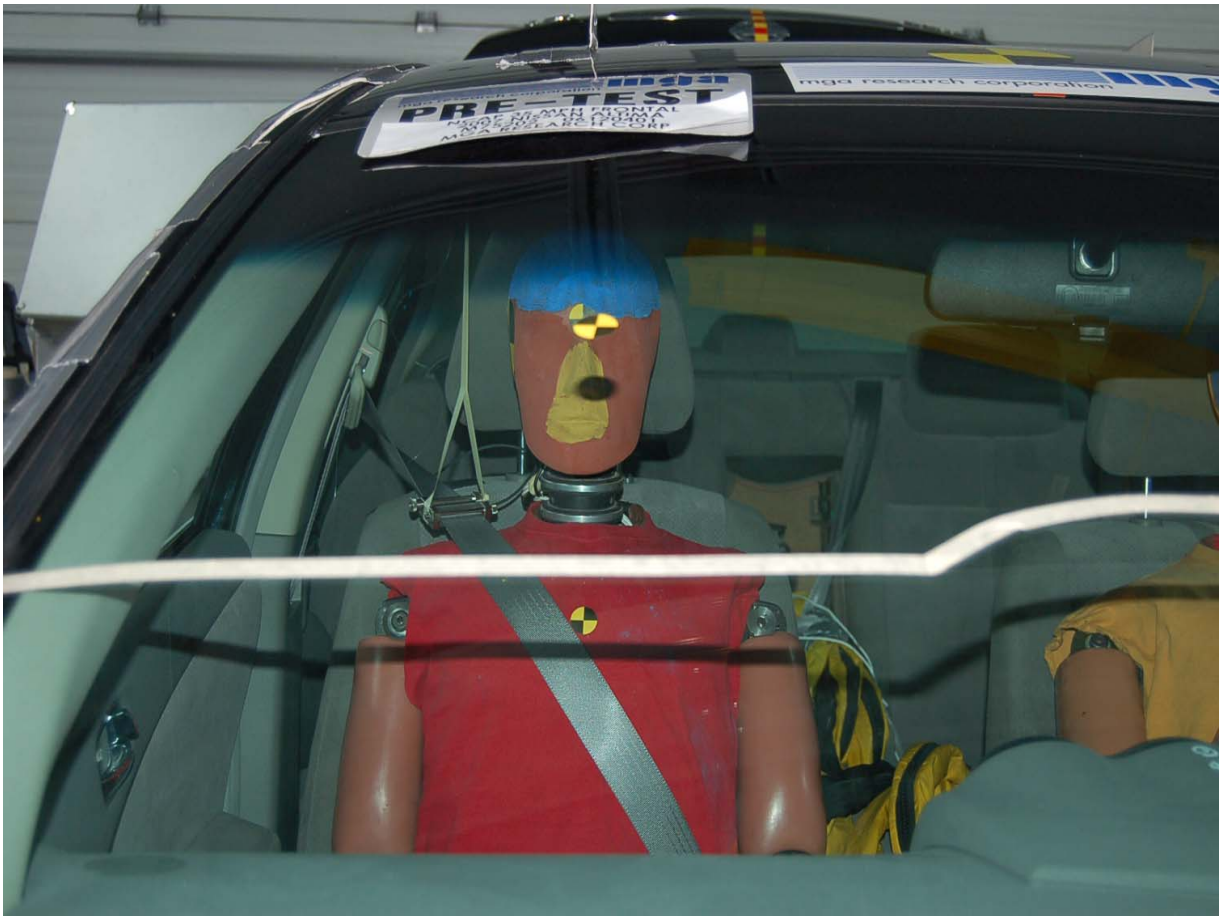


Post-Test Driver Side Floor Pan

Post-Test Driver Dummy Head Contact (headrest)

Post-Test Driver Dummy Knee Contact

Post-Test Driver Dummy Airbag Contact



Pre-Test Passenger Dummy Front View (Head Position)

Post-Test Passenger Dummy Front View (Head Position)

Pre-Test Passenger Dummy (Through Window)

Post-Test Passenger Dummy (Through Window)

Pre-Test Passenger Dummy (Door Open)

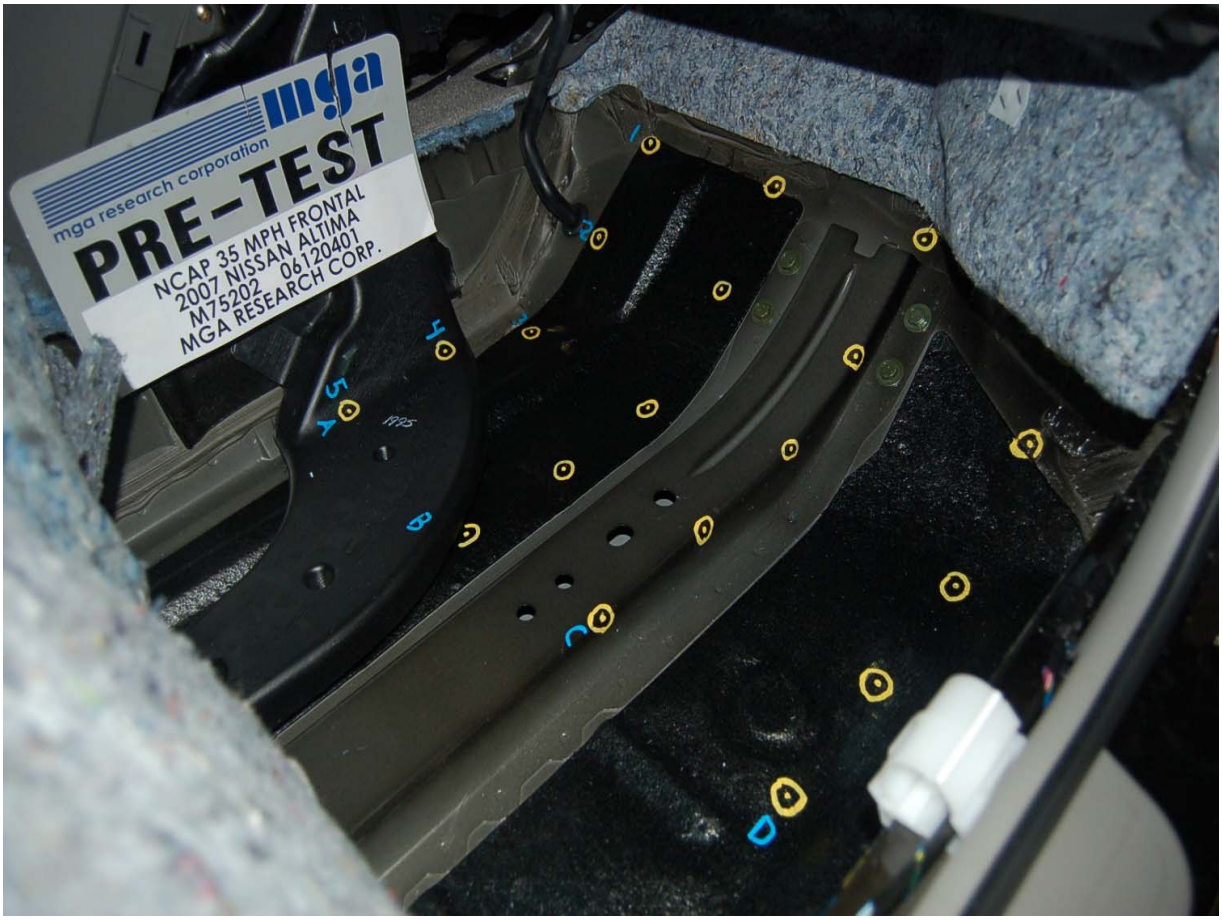
Post-Test Passenger Dummy (Door Open)

Pre-Test Passenger Dummy Feet

Post-Test Passenger Dummy Feet

Pre-Test Passenger Side Glove Box

Post-Test Passenger Side Glove Box



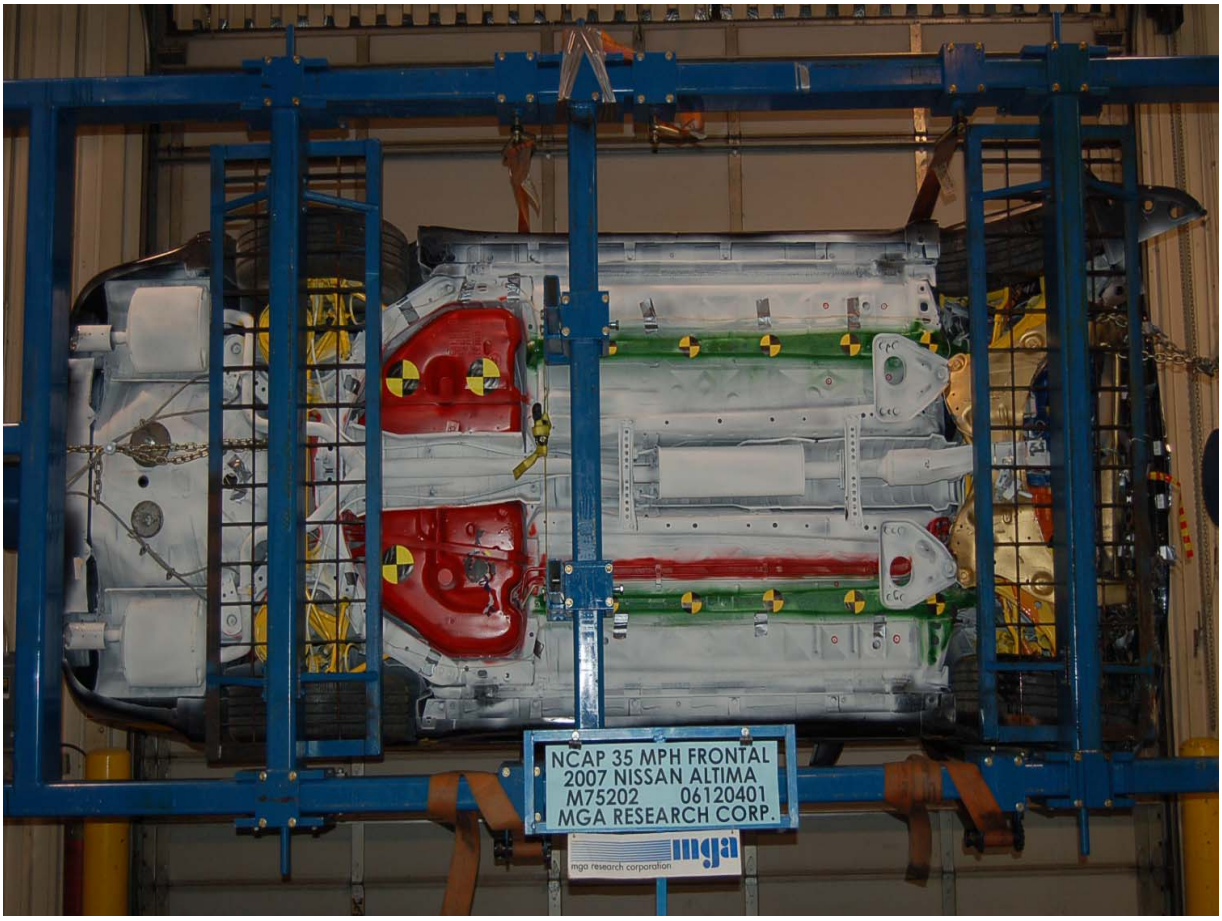
Pre-Test Passenger Side Floor Pan

Post-Test Passenger Side Floor Pan

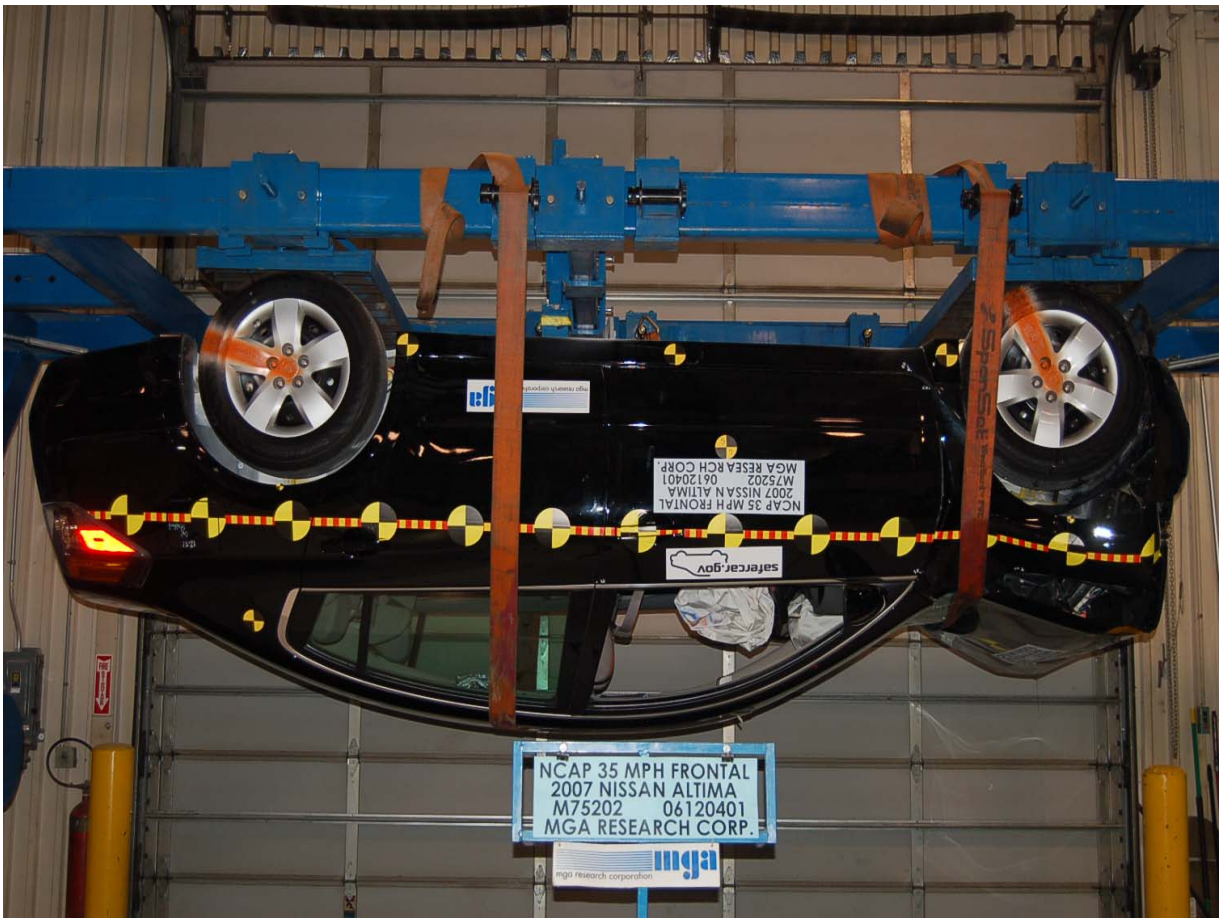
Post-Test Passenger Dummy Head Contact (headrest)

Post-Test Passenger Dummy Knee Contact

Post-Test Passenger Dummy Airbag Contact



Rollover 90 Degrees

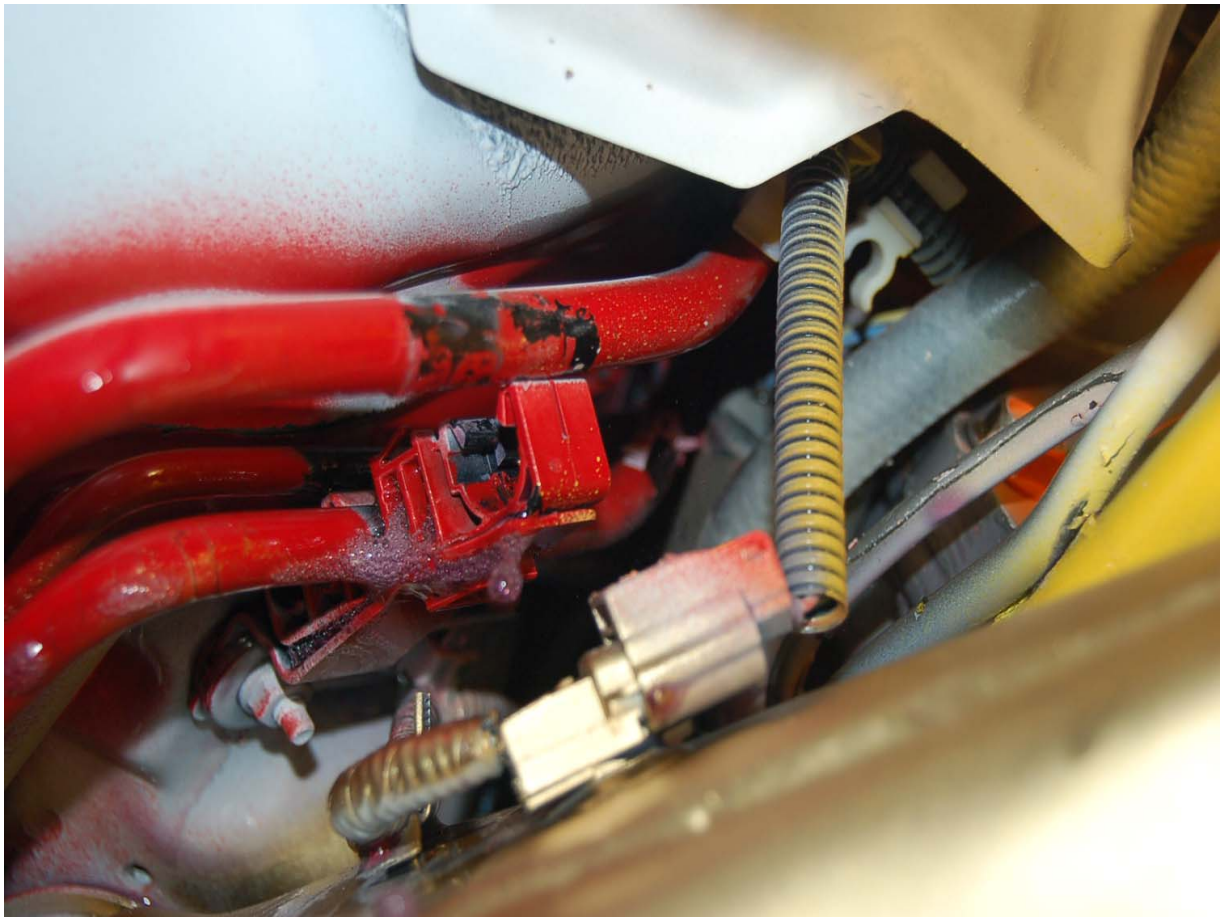


Rollover 180 Degrees

Rollover 270 Degrees

Rollover 360 Degrees

Vehicle Impact


Trace Leak in Fuel Line

APPENDIX B

DUMMY RESPONSE DATA TRACES

TABLE OF DATA PLOTS

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

Driver Head X Redundant

Driver Head Y Redundant

Driver Head Z Redundant

Driver Upper Neck Force X

Driver Upper Neck Force Y

Driver Upper Neck Force Z

Driver Upper Neck Moment X

Driver Upper Neck Moment Y

Driver Upper Neck Moment Z

Driver Chest X Redundant

Driver Chest Y Redundant

Driver Chest Z Redundant

Driver Chest Displacement

Driver Pelvis X

Driver Pelvis Y

Driver Pelvis Z

Driver Shoulder Belt Force

Driver Lap Belt Force

Driver Left Upper Tibia Moment X

Driver Left Upper Tibia Moment Y

Driver Left Upper Tibia Force Z

Driver Left Lower Tibia Moment X

Driver Left Lower Tibia Moment Y

Driver Left Lower Tibia Force Z

Driver Right Upper Tibia Moment X

Driver Right Upper Tibia Moment Y

Driver Right Upper Tibia Force Z

Driver Right Lower Tibia Moment X

Driver Right Lower Tibia Moment Y

Driver Right Lower Tibia Force Z

Driver Left Foot Fore Z

Driver Left Foot Aft X

Driver Left Foot Aft Z

Driver Right Foot Fore Z

Driver Right Foot Aft X

Driver Right Foot Aft Z

Passenger Head X Redundant

Passenger Head Y Redundant

Passenger Head Z Redundant

Passenger Upper Neck Force X

Passenger Upper Neck Force Y

Passenger Upper Neck Force Z

Passenger Upper Neck Moment X

Passenger Upper Neck Moment Y

Passenger Upper Neck Moment Z

Passenger Chest X Redundant

Passenger Chest Y Redundant

Passenger Chest Z Redundant

Passenger Chest Displacement

Passenger Pelvis X

Passenger Pelvis Y

Passenger Pelvis Z

Passenger Shoulder Belt Force

Passenger Lap Belt Force

Passenger Left Upper Tibia Moment X

Passenger Left Upper Tibia Moment Y

Passenger Left Upper Tibia Force Z

Passenger Left Lower Tibia Moment X

Passenger Left Lower Tibia Moment Y

Passenger Left Lower Tibia Force Z

Passenger Right Upper Tibia Moment X

Passenger Right Upper Tibia Moment Y

Passenger Right Upper Tibia Force Z

Passenger Right Lower Tibia Moment X

Passenger Right Lower Tibia Moment Y

Passenger Right Lower Tibia Force Z

Passenger Left Foot Fore Z

Passenger Left Foot Aft X

Passenger Left Foot Aft Z

Passenger Right Foot Fore Z

Passenger Right Foot Aft X

Passenger Right Foot Aft Z

Left Rear Seat Crossmember X

Left Rear Seat Crossmember Z

Right Rear Seat Crossmember X

Right Rear Seat Crossmember Z

Vehicle Engine Top X

Vehicle Engine Bottom X

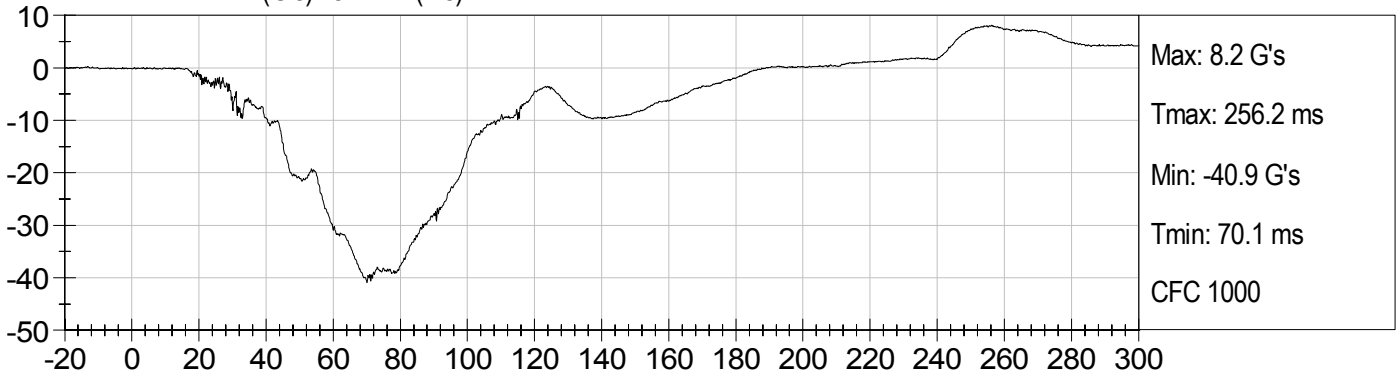
Vehicle Left Brake Caliper X

Vehicle Right Brake Caliper X

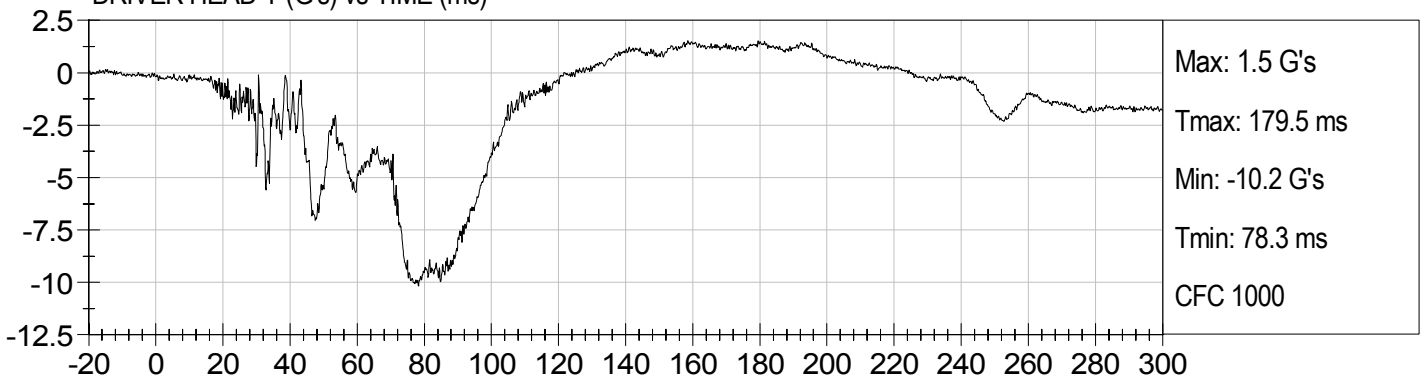
NCAP 35 MPH FRONTAL
2007 NISSAN ALTIMA

Test Date: 12/04/2006
Speed: 35.1 mph (56.5 km/h)

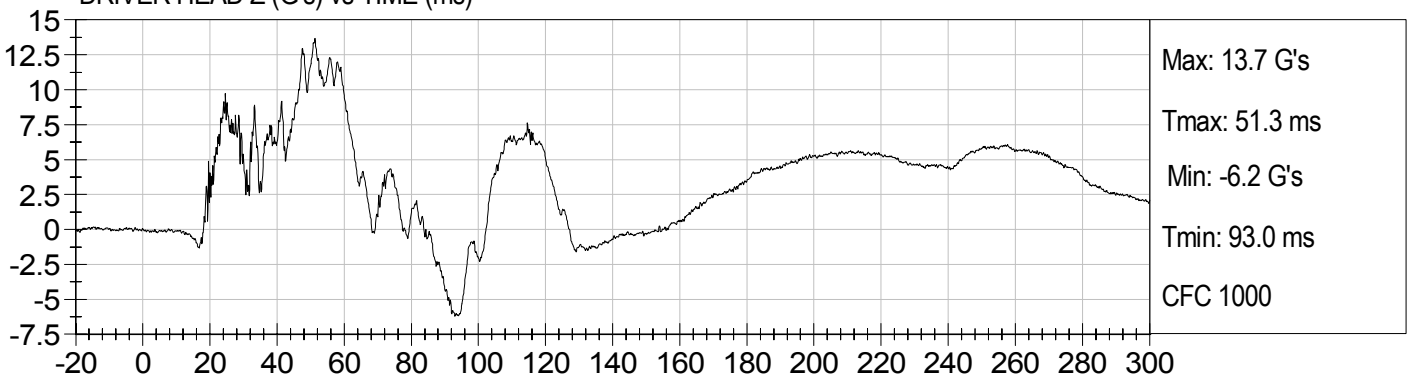
DRIVER HEAD X (G's) vs TIME (ms)



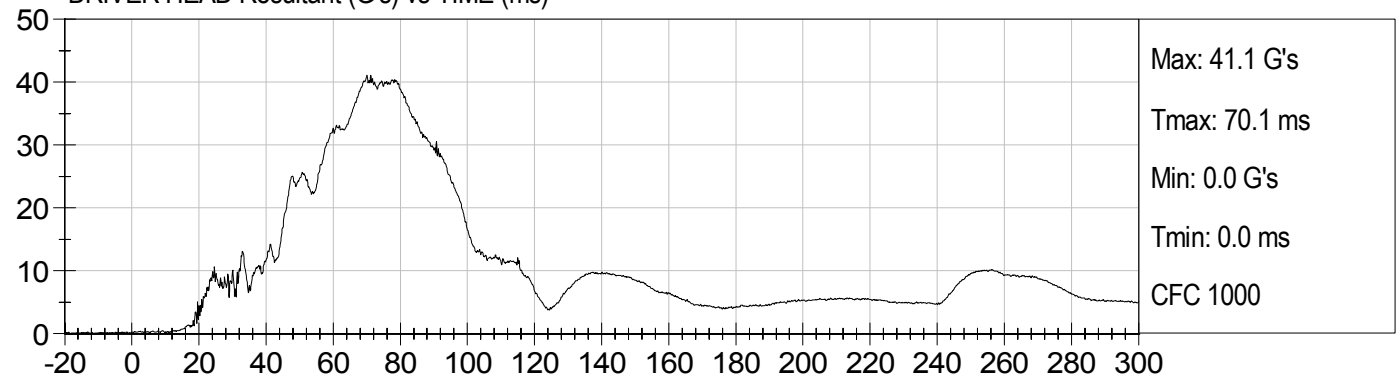
DRIVER HEAD Y (G's) vs TIME (ms)



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



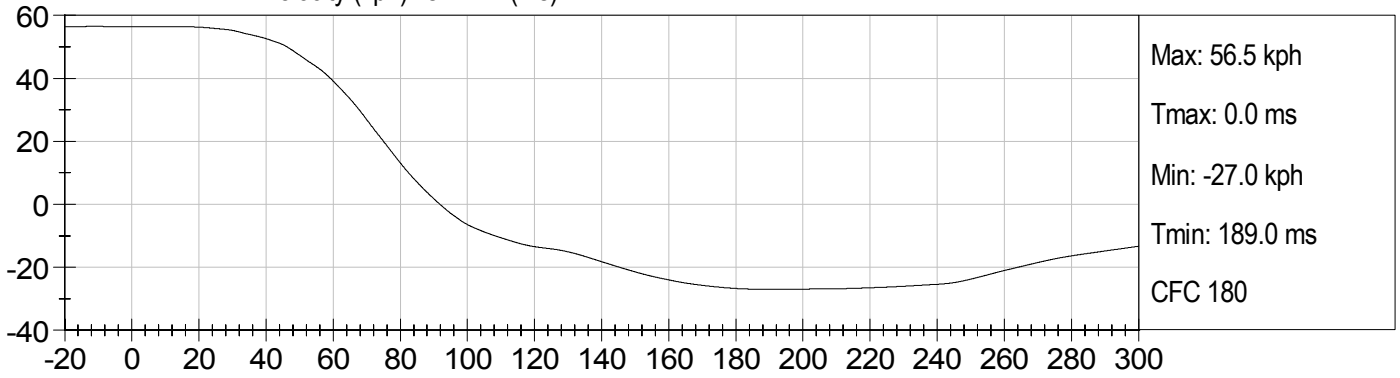
DRIVER HEAD Resultant (G's) vs TIME (ms)



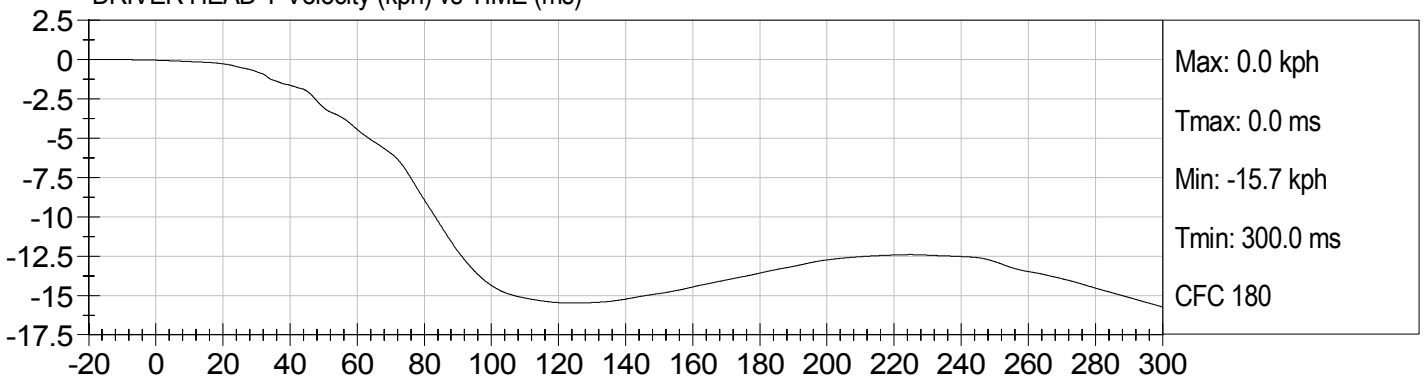
NCAP 35 MPH FRONTAL
2007 NISSAN ALTIMA

Test Date: 12/04/2006
Speed: 35.1 mph (56.5 km/h)

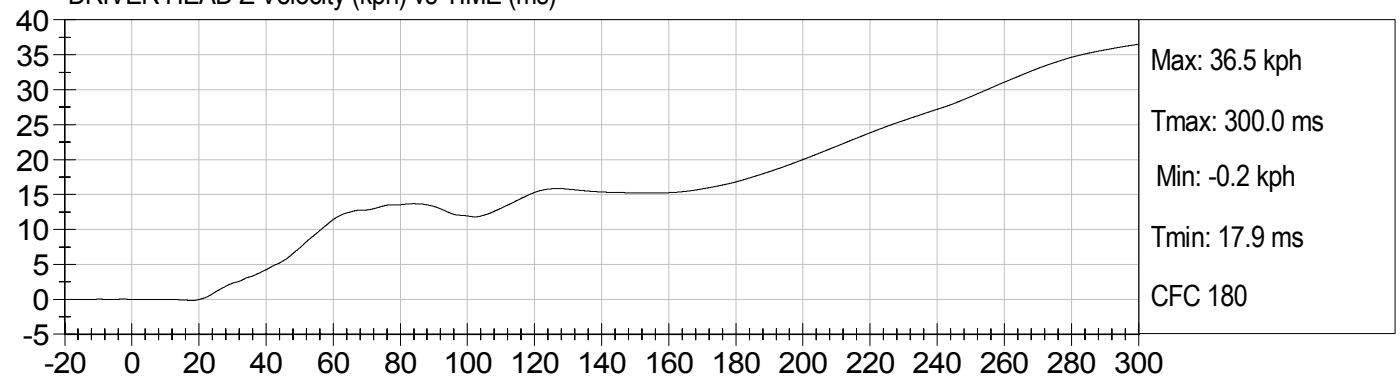
DRIVER HEAD X Velocity (kph) vs TIME (ms)



DRIVER HEAD Y Velocity (kph) vs TIME (ms)



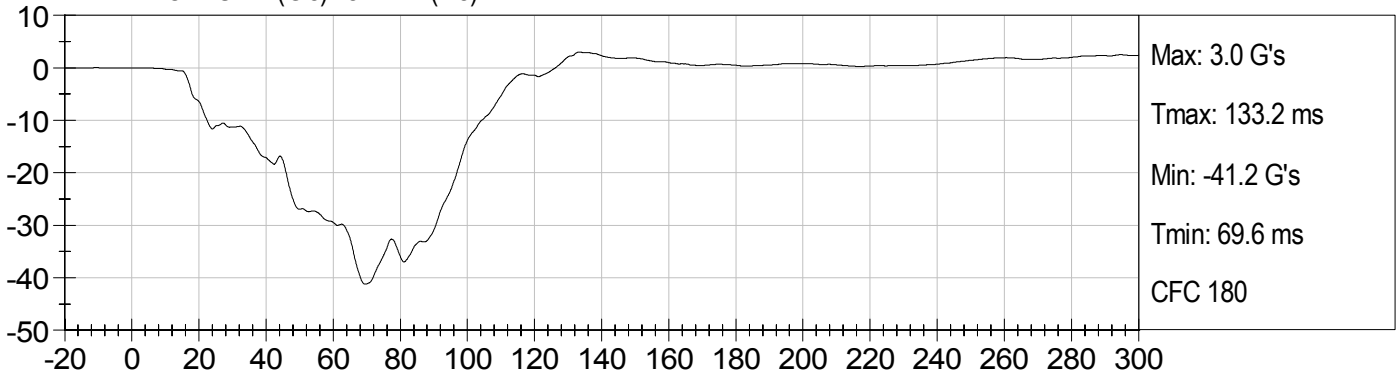
DRIVER HEAD Z Velocity (kph) vs TIME (ms)



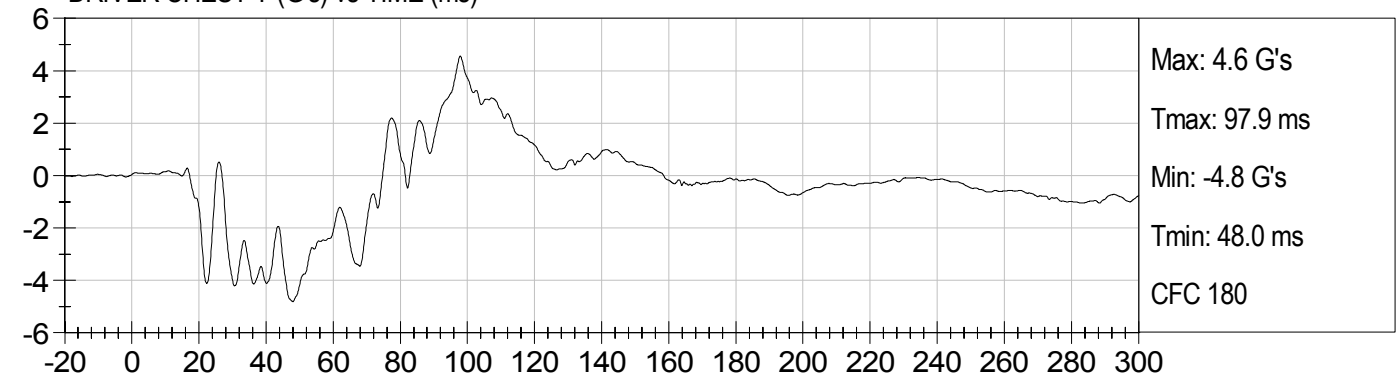
NCAP 35 MPH FRONTAL
2007 NISSAN ALTIMA

Test Date: 12/04/2006
Speed: 35.1 mph (56.5 km/h)

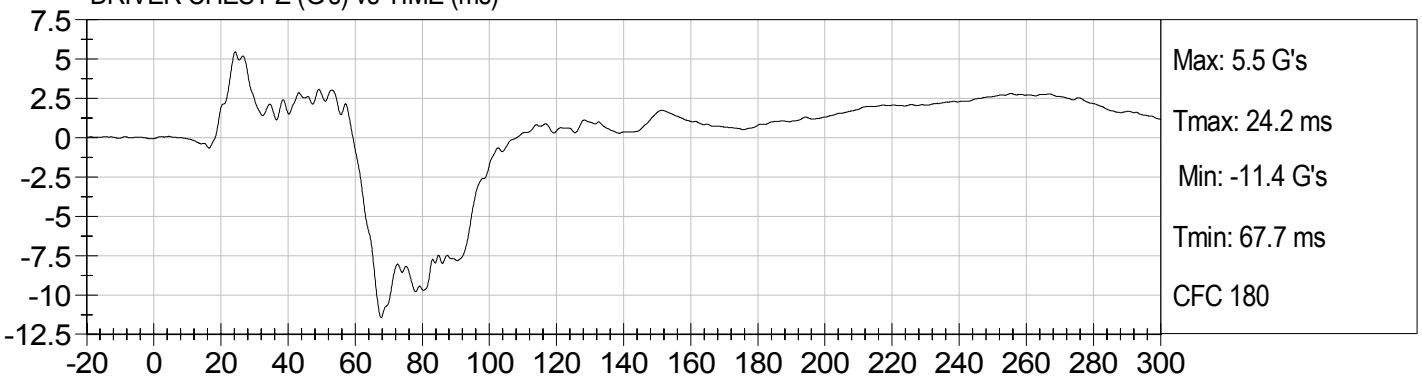
DRIVER CHEST X (G's) vs TIME (ms)



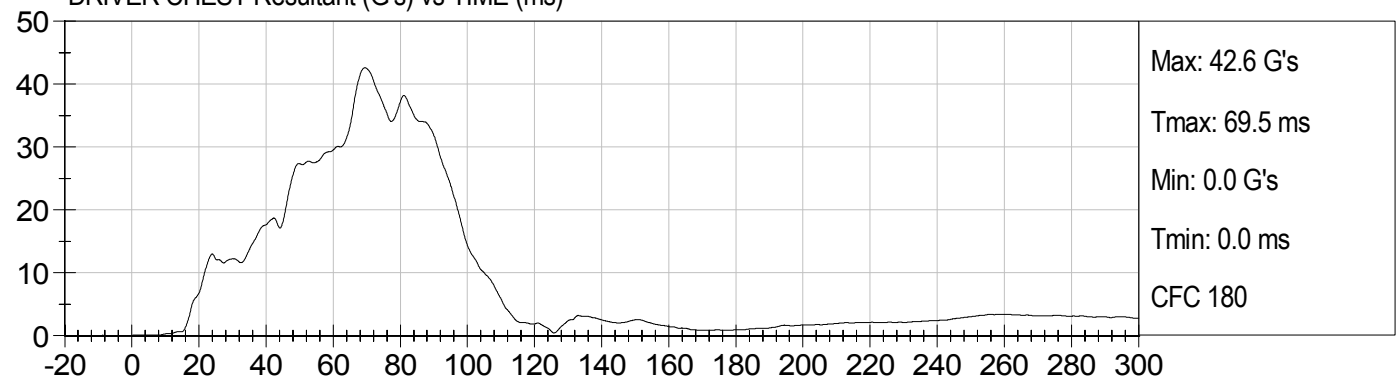
DRIVER CHEST Y (G's) vs TIME (ms)

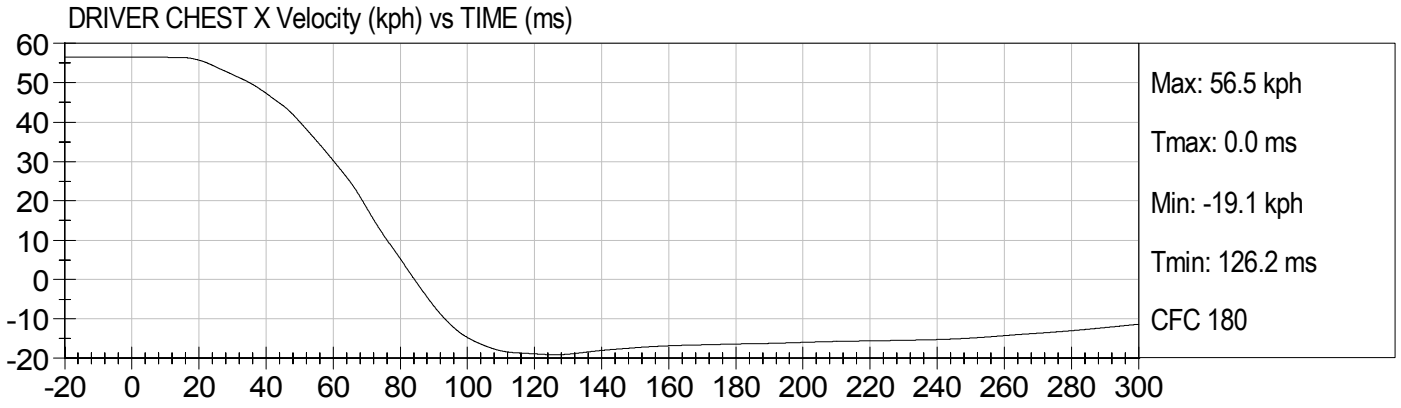


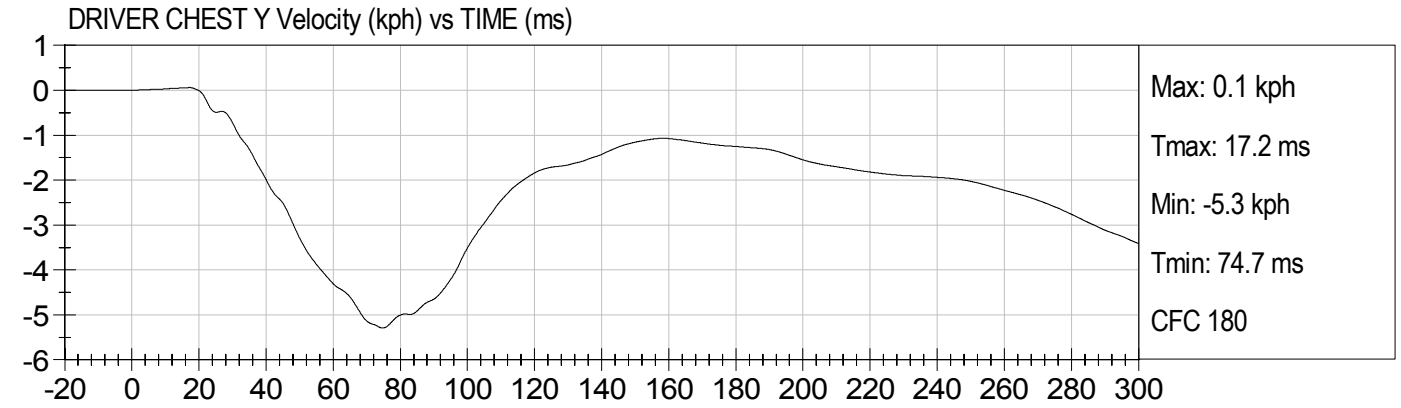
DRIVER CHEST Z (G's) vs TIME (ms)

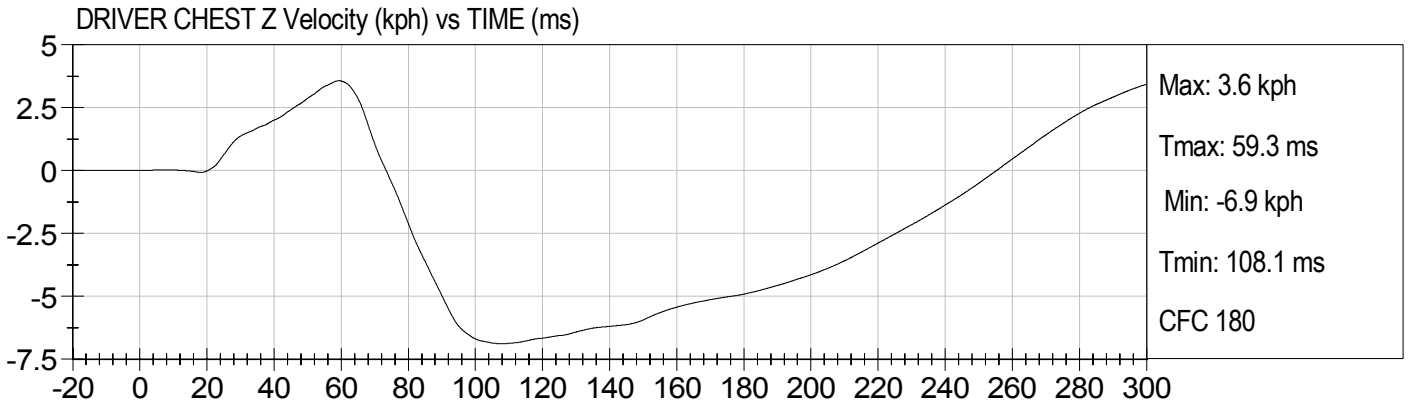


DRIVER CHEST Resultant (G's) vs TIME (ms)



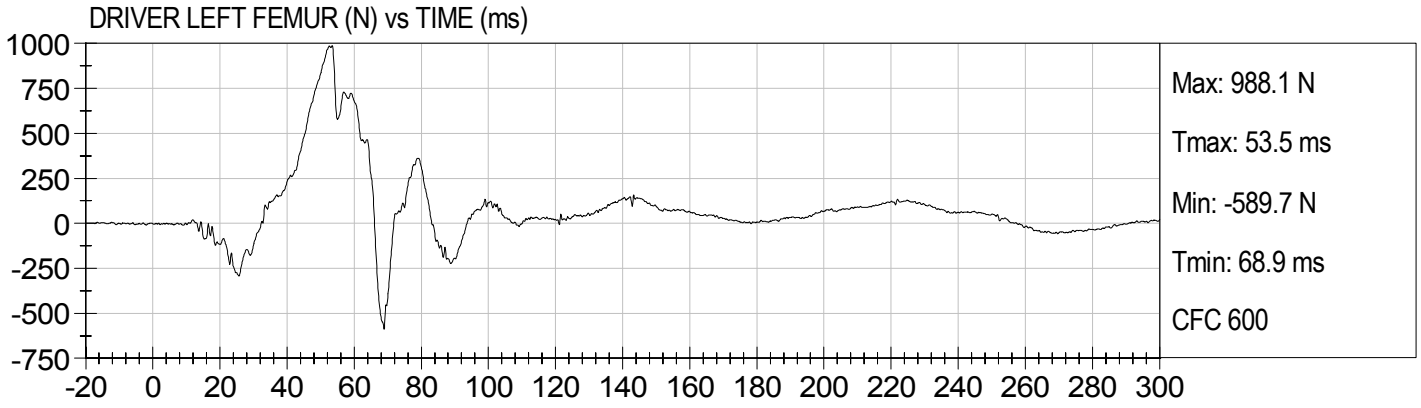

DRIVER CHEST X Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 56.5 kph
Tmax: 0.0 ms
Min: -19.1 kph
Tmin: 126.2 ms
CFC 180

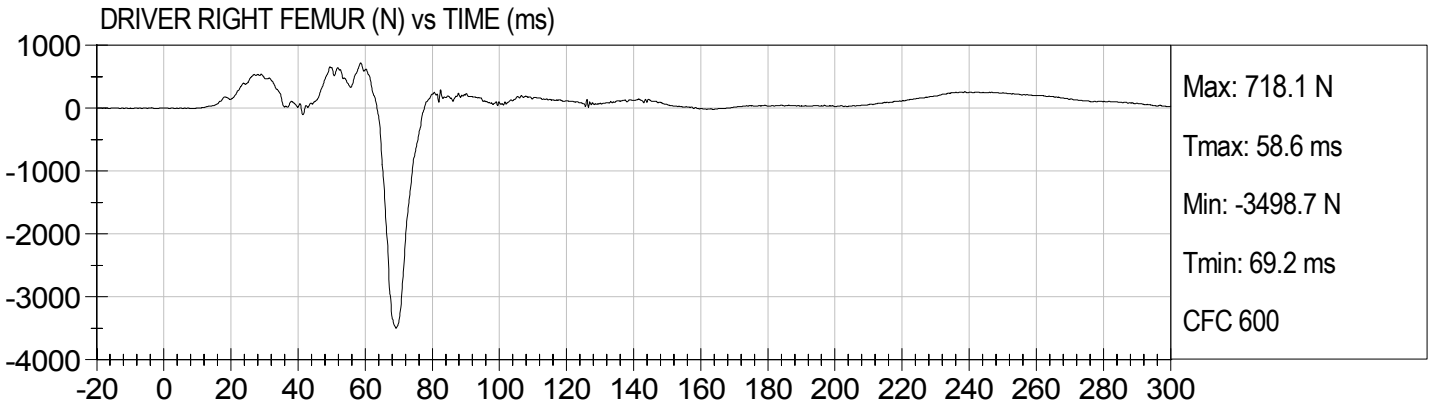

DRIVER CHEST Y Velocity (kph) vs TIME (ms)
1
0
-1
-2
-3
-4
-5
-6
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 0.1 kph
Tmax: 17.2 ms
Min: -5.3 kph
Tmin: 74.7 ms
CFC 180


DRIVER CHEST Z Velocity (kph) vs TIME (ms)
5
2.5
0
-2.5
-5
-7.5
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 3.6 kph
Tmax: 59.3 ms
Min: -6.9 kph
Tmin: 108.1 ms
CFC 180

NCAP 35 MPH FRONTAL
2007 NISSAN ALTIMA

Test Date: 12/04/2006
Speed: 35.1 mph (56.5 km/h)

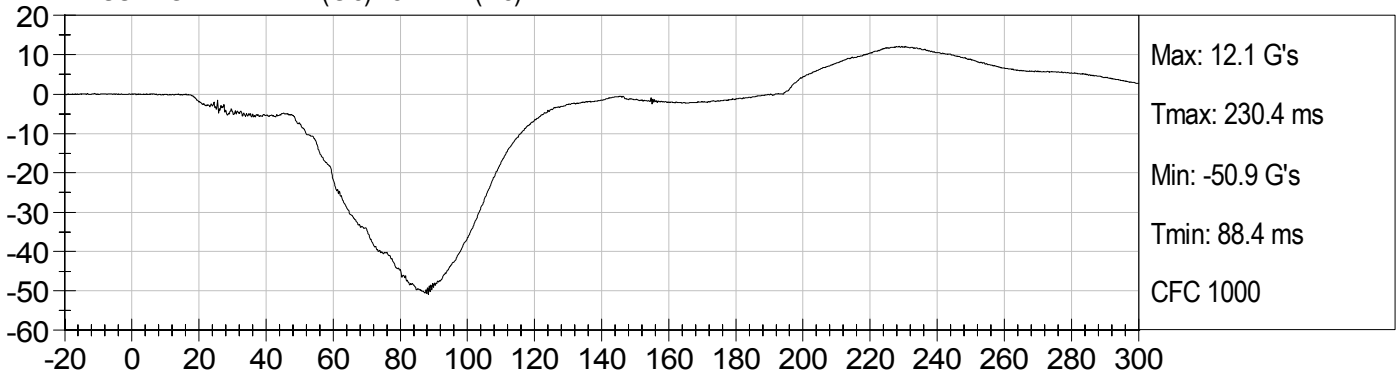




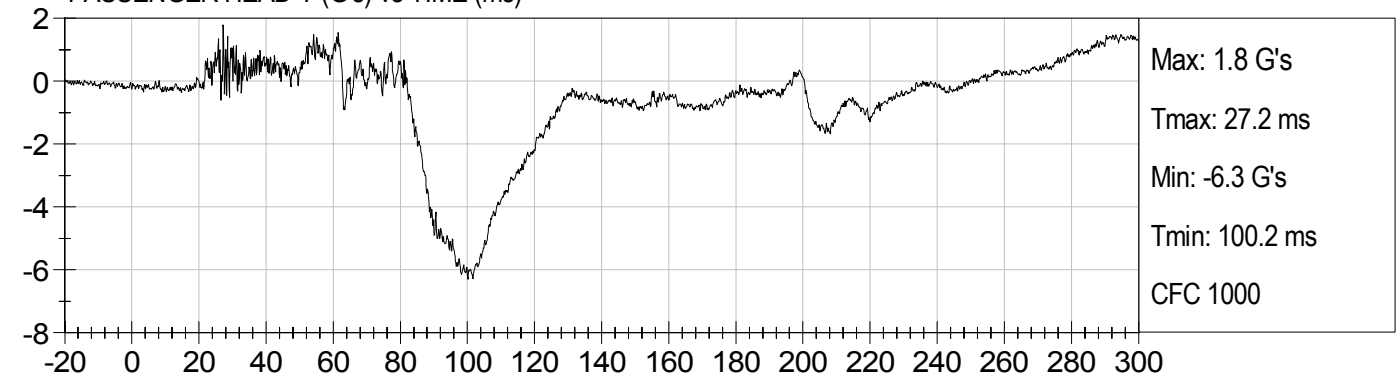
NCAP 35 MPH FRONTAL
2007 NISSAN ALTIMA

Test Date: 12/04/2006
Speed: 35.1 mph (56.5 km/h)

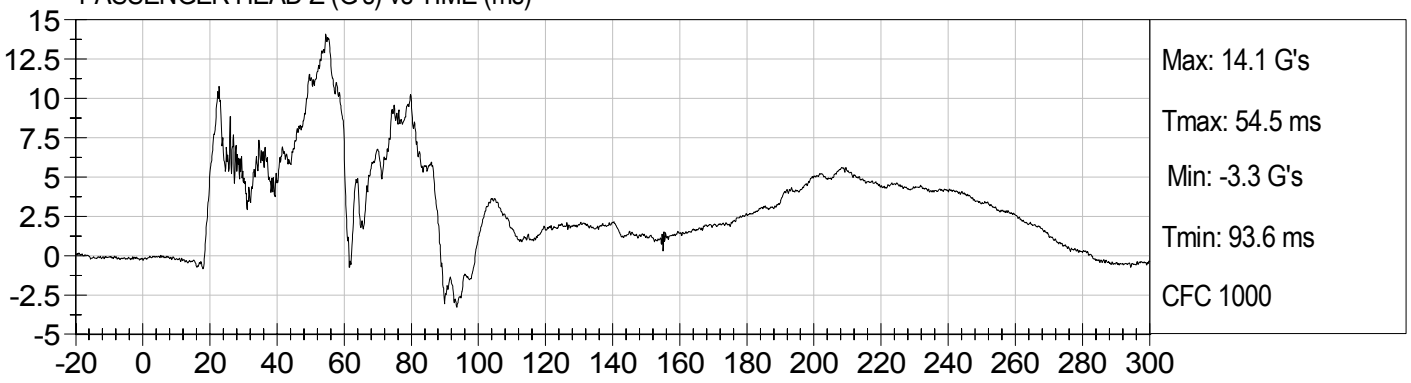
PASSENGER HEAD X (G's) vs TIME (ms)



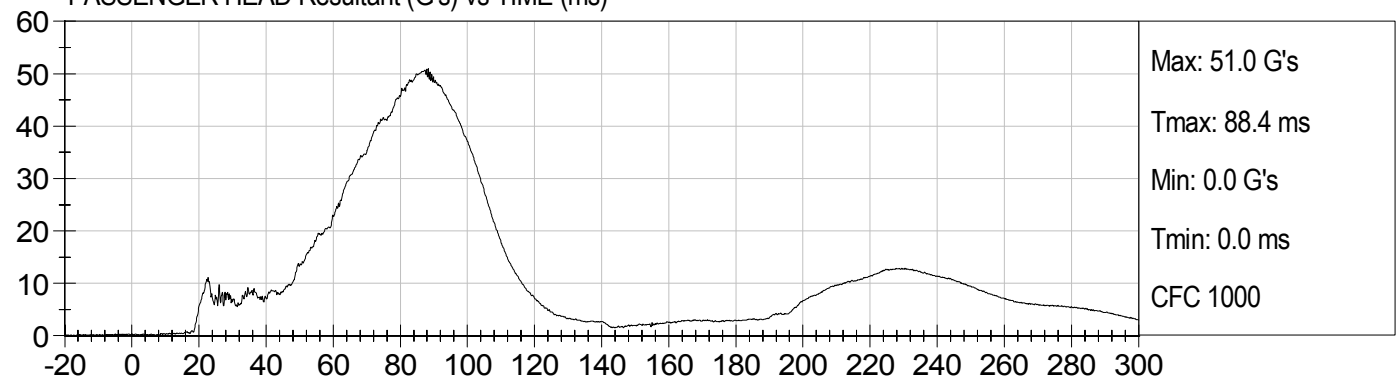
PASSENGER HEAD Y (G's) vs TIME (ms)

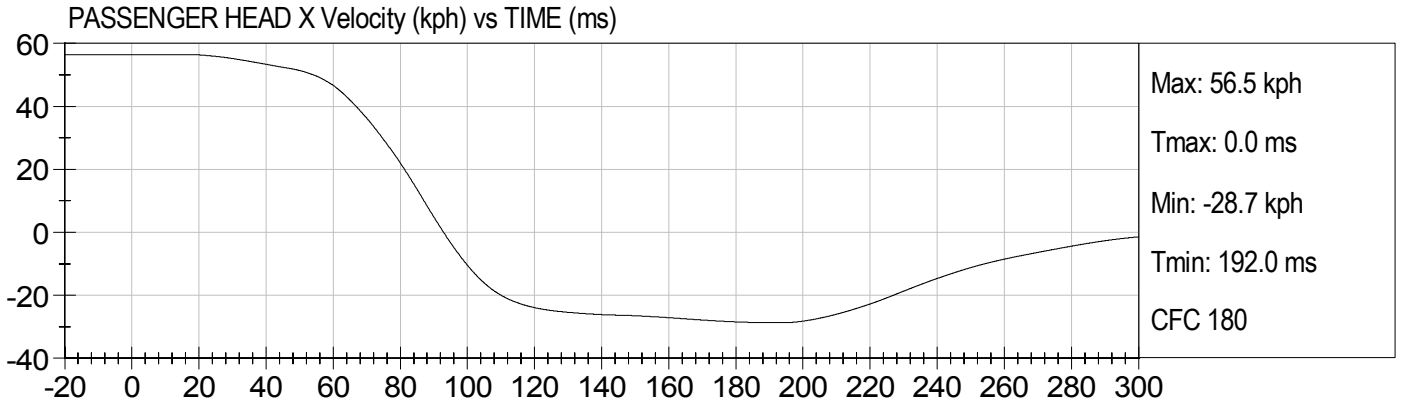


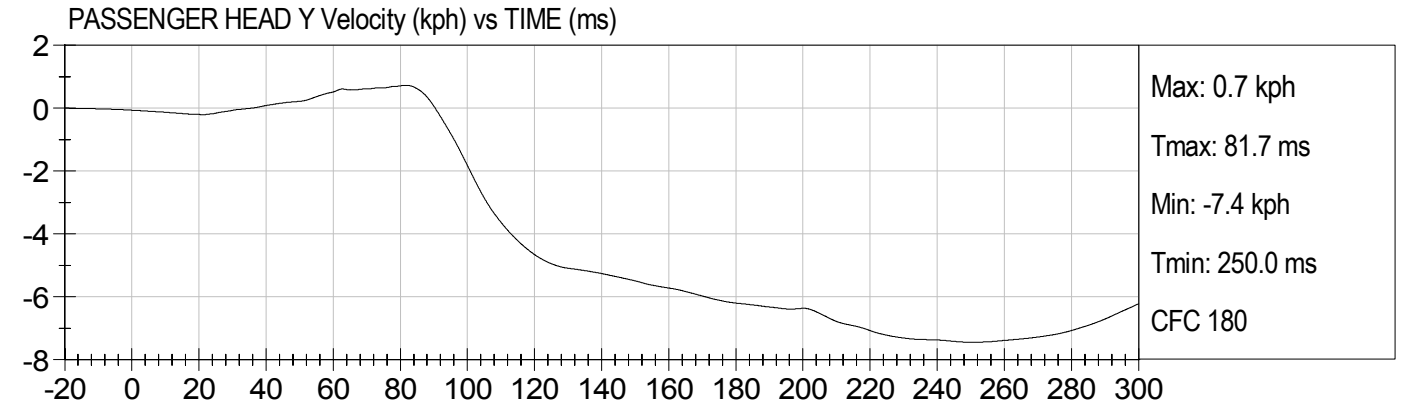
PASSENGER HEAD Z (G's) vs TIME (ms)

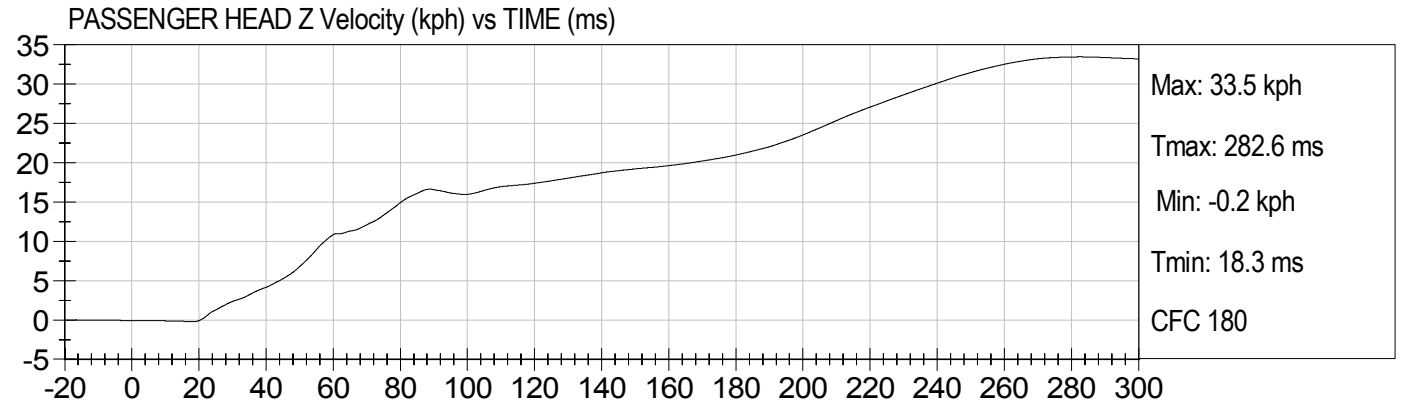


PASSENGER HEAD Resultant (G's) vs TIME (ms)




PASSENGER HEAD X Velocity (kph) vs TIME (ms)
60
40
20
0
-20
-40
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 56.5 kph
Tmax: 0.0 ms
Min: -28.7 kph
Tmin: 192.0 ms
CFC 180

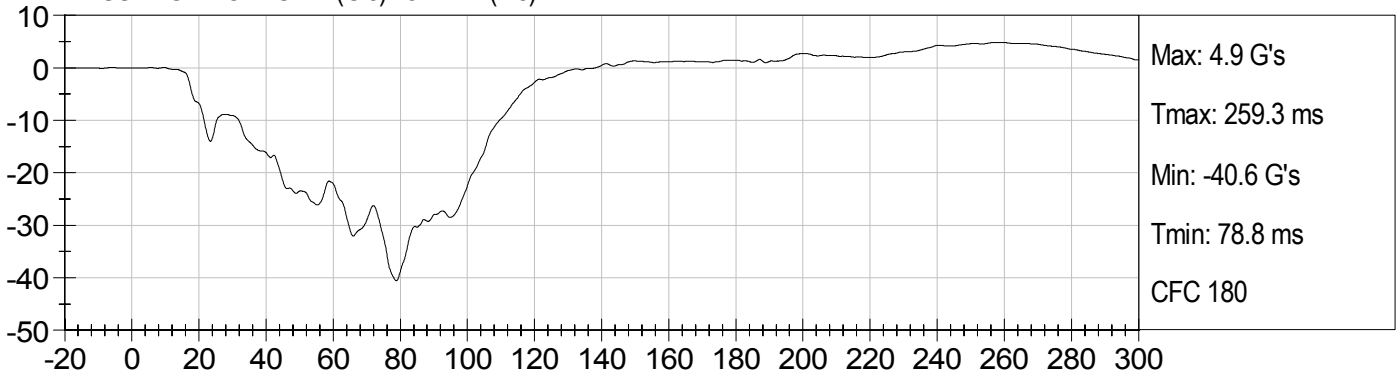

PASSENGER HEAD Y Velocity (kph) vs TIME (ms)
2
0
-2
-4
-6
-8
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 0.7 kph
Tmax: 81.7 ms
Min: -7.4 kph
Tmin: 250.0 ms
CFC 180


PASSENGER HEAD Z Velocity (kph) vs TIME (ms)
35
30
25
20
15
10
5
0
-5
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 33.5 kph
Tmax: 282.6 ms
Min: -0.2 kph
Tmin: 18.3 ms
CFC 180

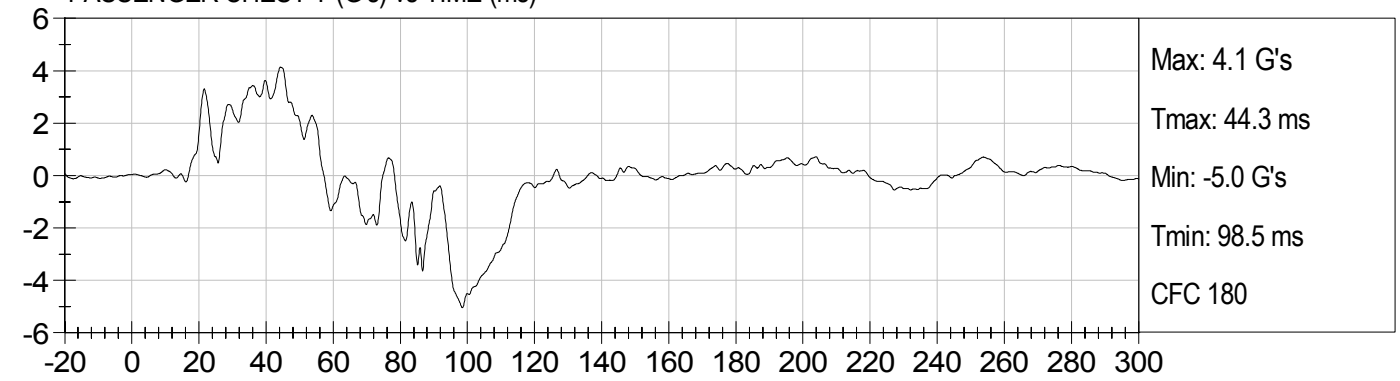
NCAP 35 MPH FRONTAL
2007 NISSAN ALTIMA

Test Date: 12/04/2006
Speed: 35.1 mph (56.5 km/h)

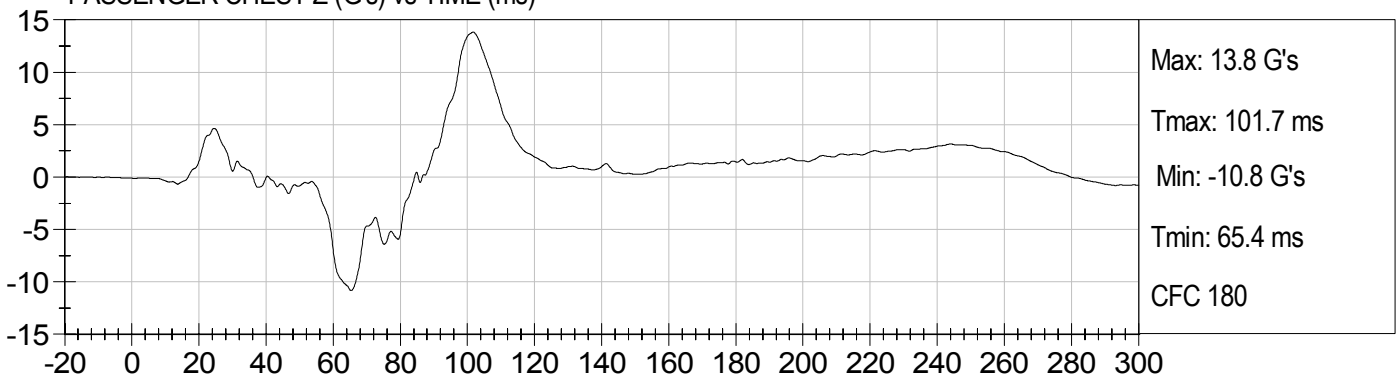
PASSENGER CHEST X (G's) vs TIME (ms)



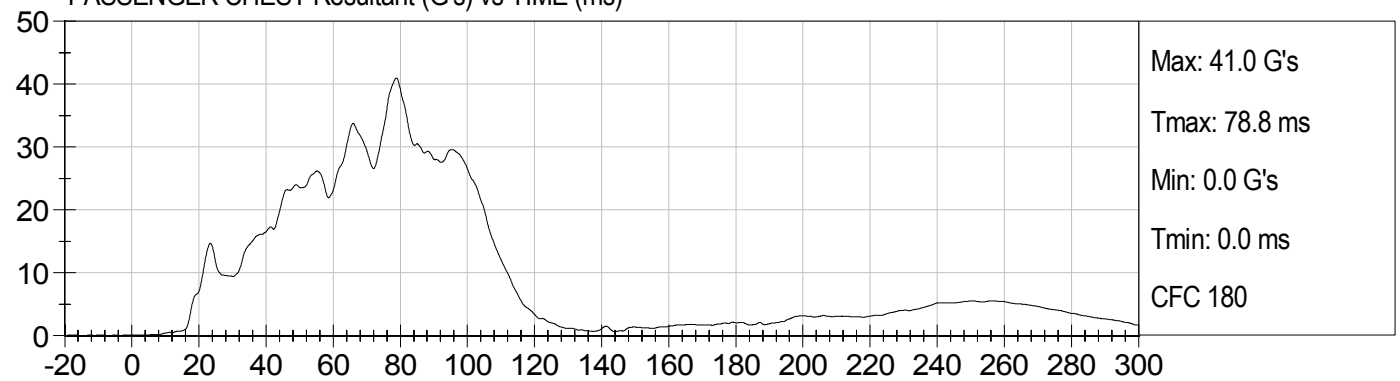
PASSENGER CHEST Y (G's) vs TIME (ms)

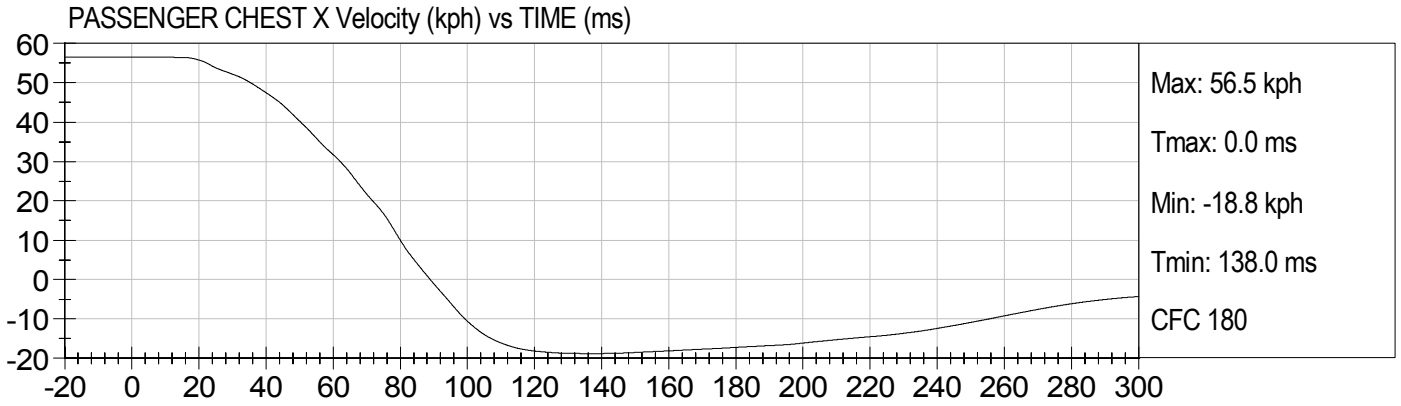


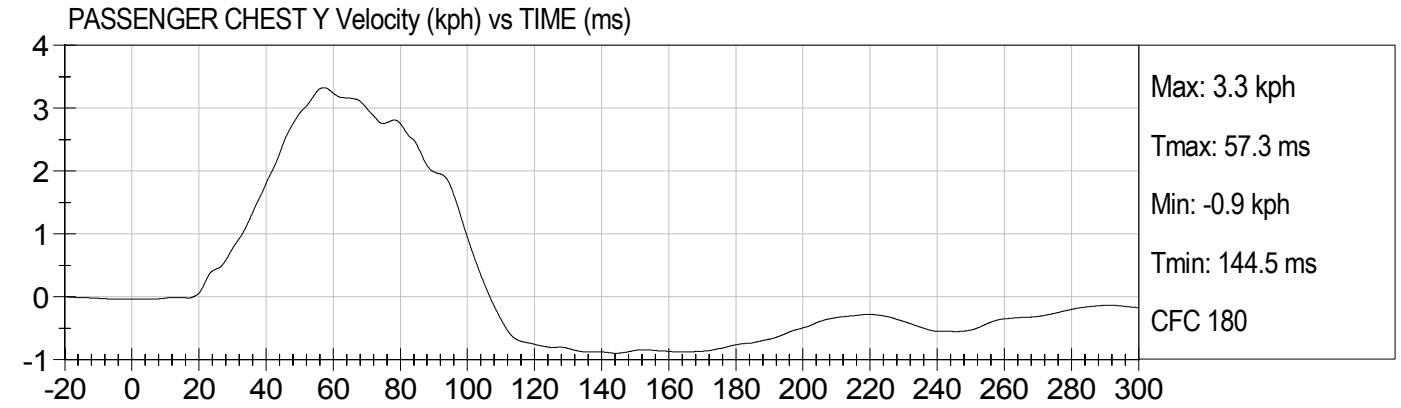
PASSENGER CHEST Z (G's) vs TIME (ms)

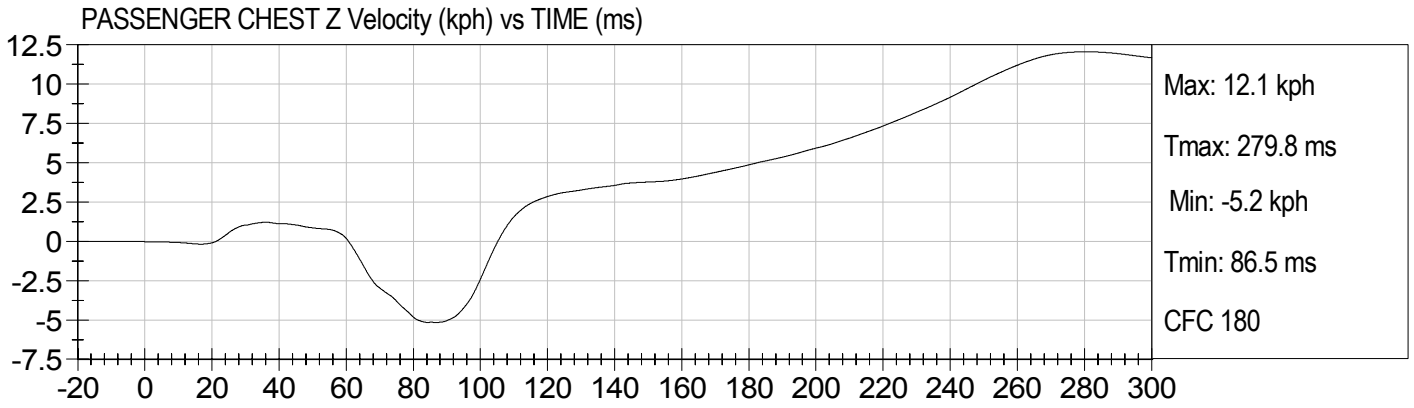


PASSENGER CHEST Resultant (G's) vs TIME (ms)




PASSENGER CHEST X Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 56.5 kph
Tmax: 0.0 ms
Min: -18.8 kph
Tmin: 138.0 ms
CFC 180

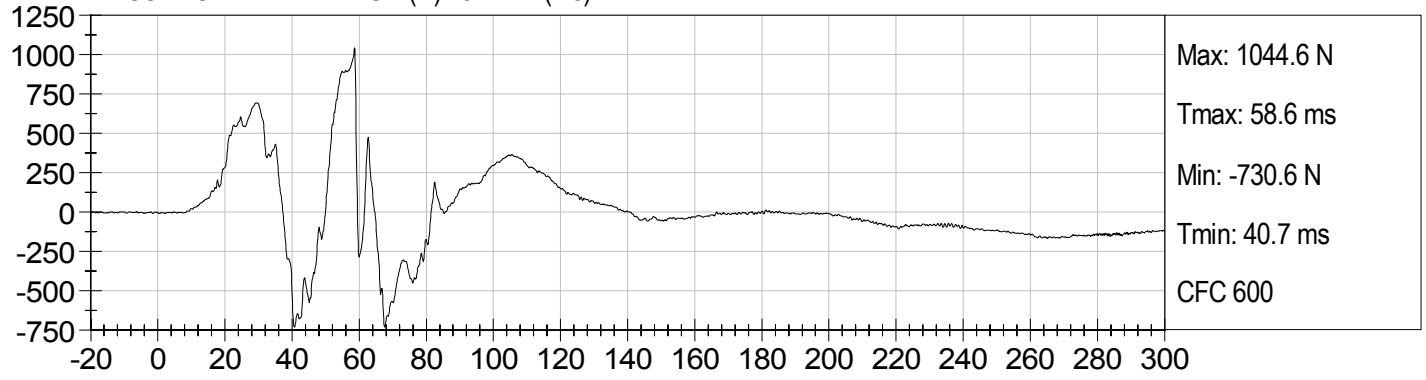

PASSENGER CHEST Y Velocity (kph) vs TIME (ms)
4
3
2
1
0
-1
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 3.3 kph
Tmax: 57.3 ms
Min: -0.9 kph
Tmin: 144.5 ms
CFC 180


PASSENGER CHEST Z Velocity (kph) vs TIME (ms)
12.5
10
7.5
5
2.5
0
-2.5
-5
-7.5
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 12.1 kph
Tmax: 279.8 ms
Min: -5.2 kph
Tmin: 86.5 ms
CFC 180

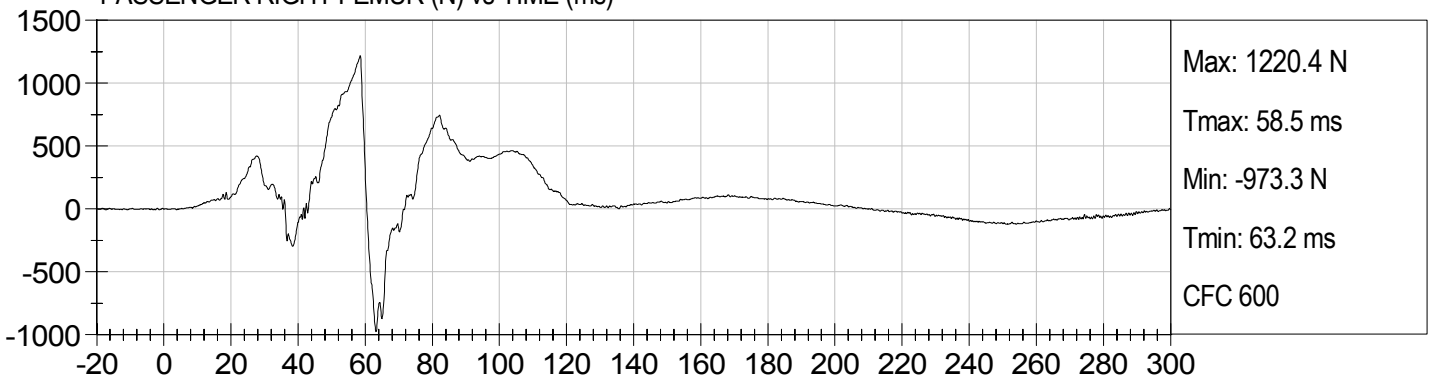
NCAP 35 MPH FRONTAL
2007 NISSAN ALTIMA

Test Date: 12/04/2006
Speed: 35.1 mph (56.5 km/h)

PASSENGER LEFT FEMUR (N) vs TIME (ms)



PASSENGER RIGHT FEMUR (N) vs TIME (ms)



APPENDIX C

DUMMY CALIBRATION DATA

MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065 **Test ID:** D063311

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Peak Resultant Acceleration	G's	225 - 275	235	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	7.5	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Laboratory Technician

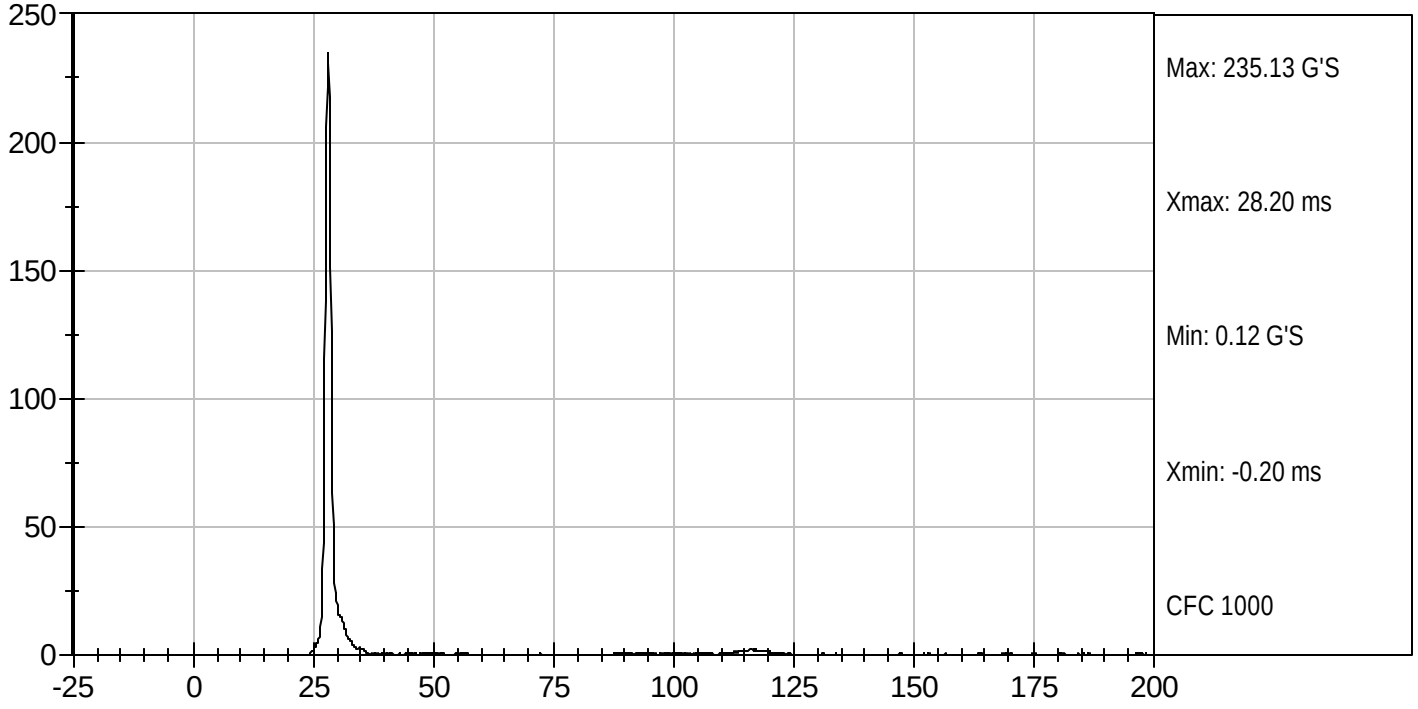
11/17/2006
Test Date

David Winkelbauer
Approved By

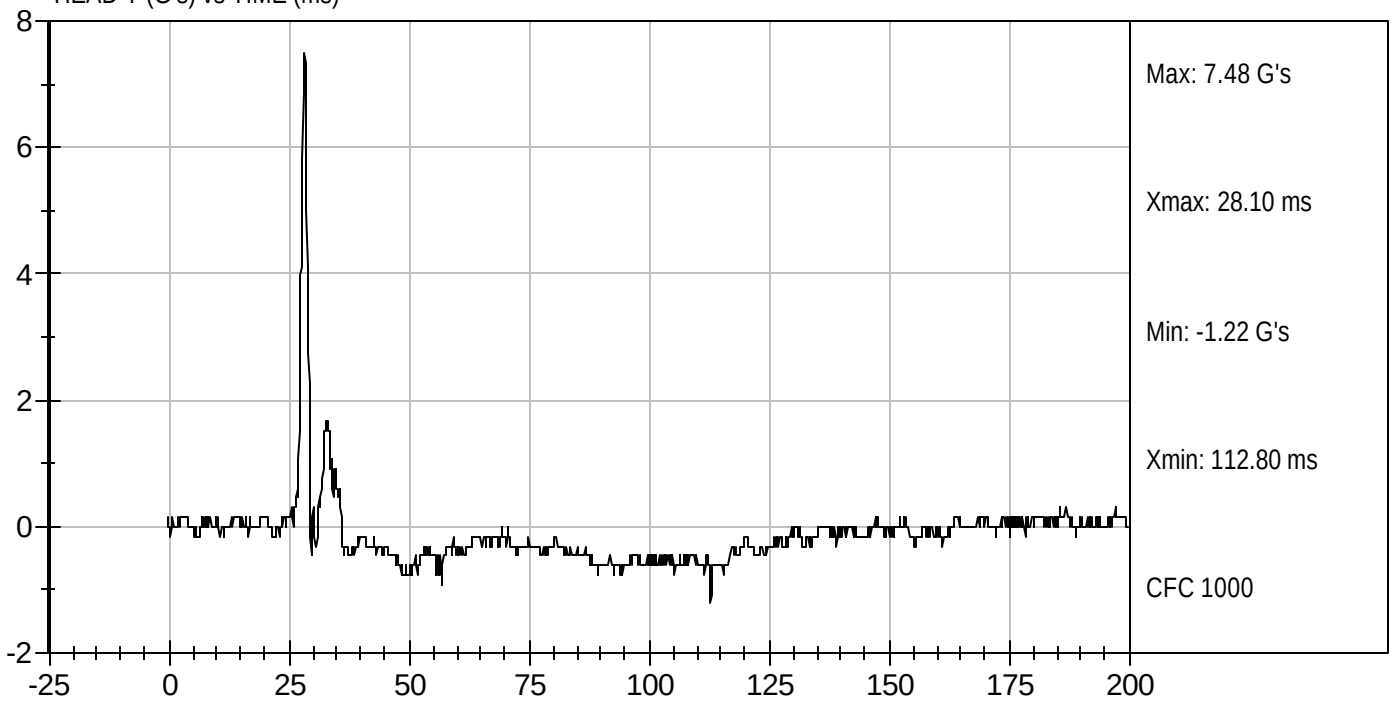
Test Desc: Head Drop
Componet ID: D063311

Test Date: 11/17/2006
Velocity: 0 ft/s, 0.00 m/s

HEAD RESULTANT ACCELERATION (G'S) vs TIME (ms)



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



MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065 **Test I.D:** D063312

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	20	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.00	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	26.27	Pass
	20 msec	G's	17.60 to 22.60	21.01	Pass
	30 msec	G's	12.50 to 18.50	15.14	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	15.06	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	34.1	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	76.5	Pass
	Time	msec	57.0 to 64.0	60.2	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	114.7	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	99.5	Pass
	Time	msec	47.0 to 58.0	47.4	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	100.8	Pass
			Overall Test Results		Pass

Tim Brady
Laboratory Technician

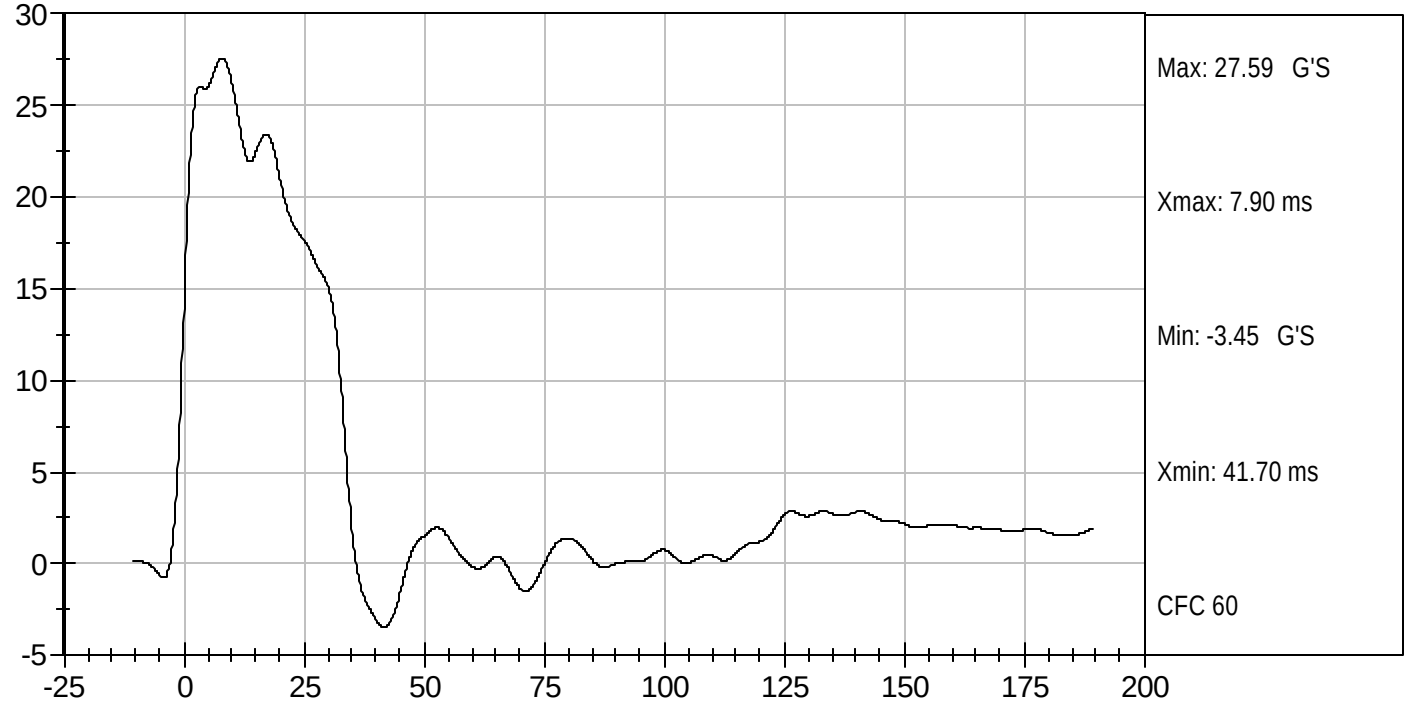
11/20/2006
Test Date

David Winkelbauer
Approved By

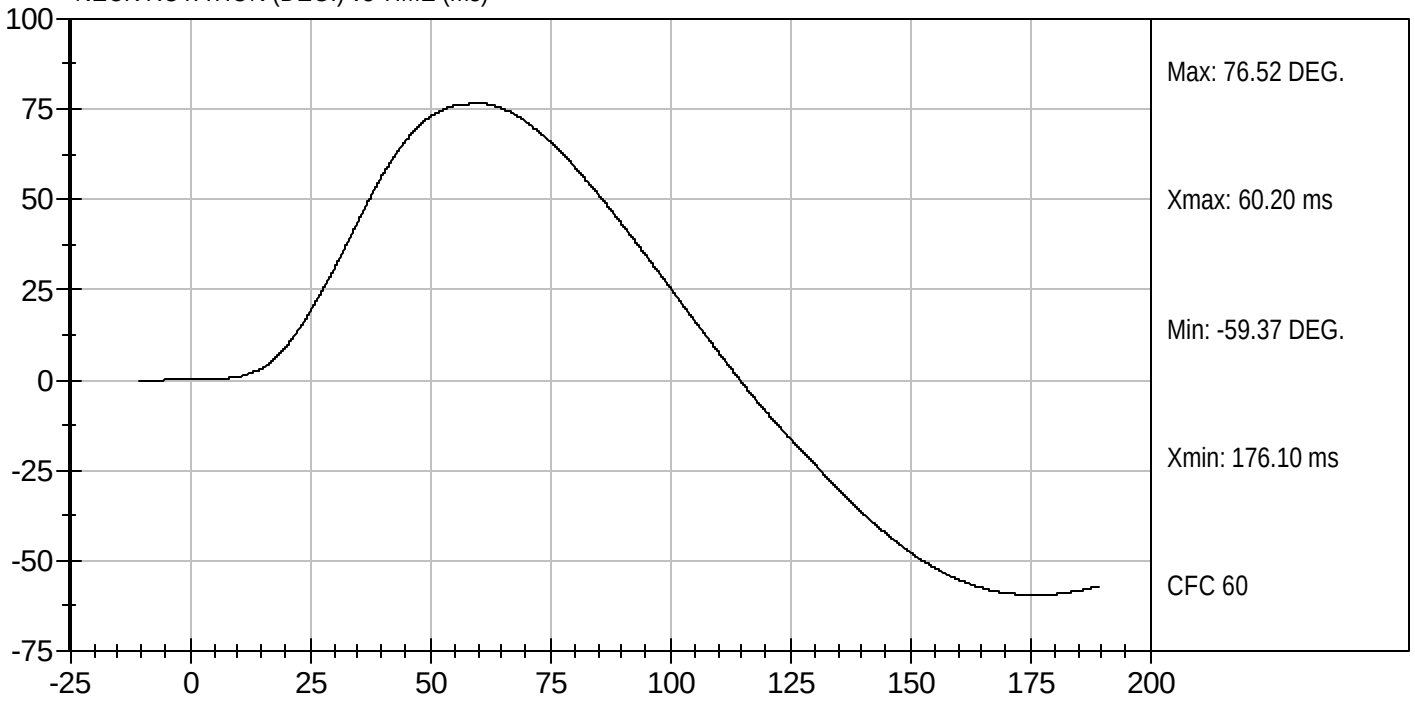
Test Desc: Neck Flexion
Componet ID: D063312

Test Date: 11/20/2006
Velocity: 22.96 ft/s, 7.00 m/s

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

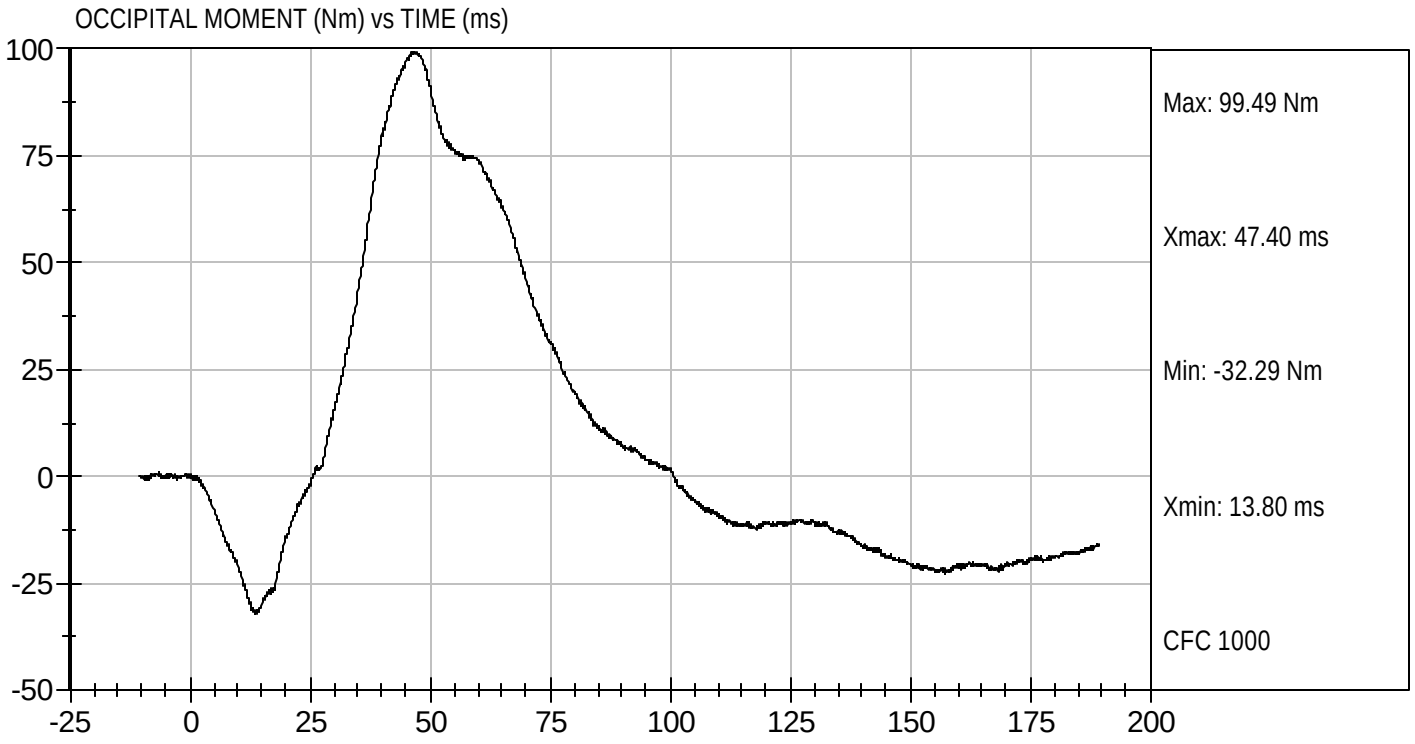


NECK ROTATION (DEG.) vs TIME (ms)



Test Desc: Neck Flexion
Componet ID: D063312

Test Date: 11/20/2006
Velocity: 22.96 ft/s, 7.00 m/s



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065 **Test I.D:** D063313

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	20	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.08	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	18.52	Pass
	20 msec	G's	14.00 to 19.00	16.43	Pass
	30 msec	G's	11.00 to 16.00	14.66	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	14.89	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	39.2	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	103.1	Pass
	Time	msec	72.0 to 82.0	78.1	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	158.1	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-72.0	Pass
	Time	msec	65.0 to 79.0	73.6	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	147.1	Pass
			Overall Test Results		Pass

Laboratory Technician

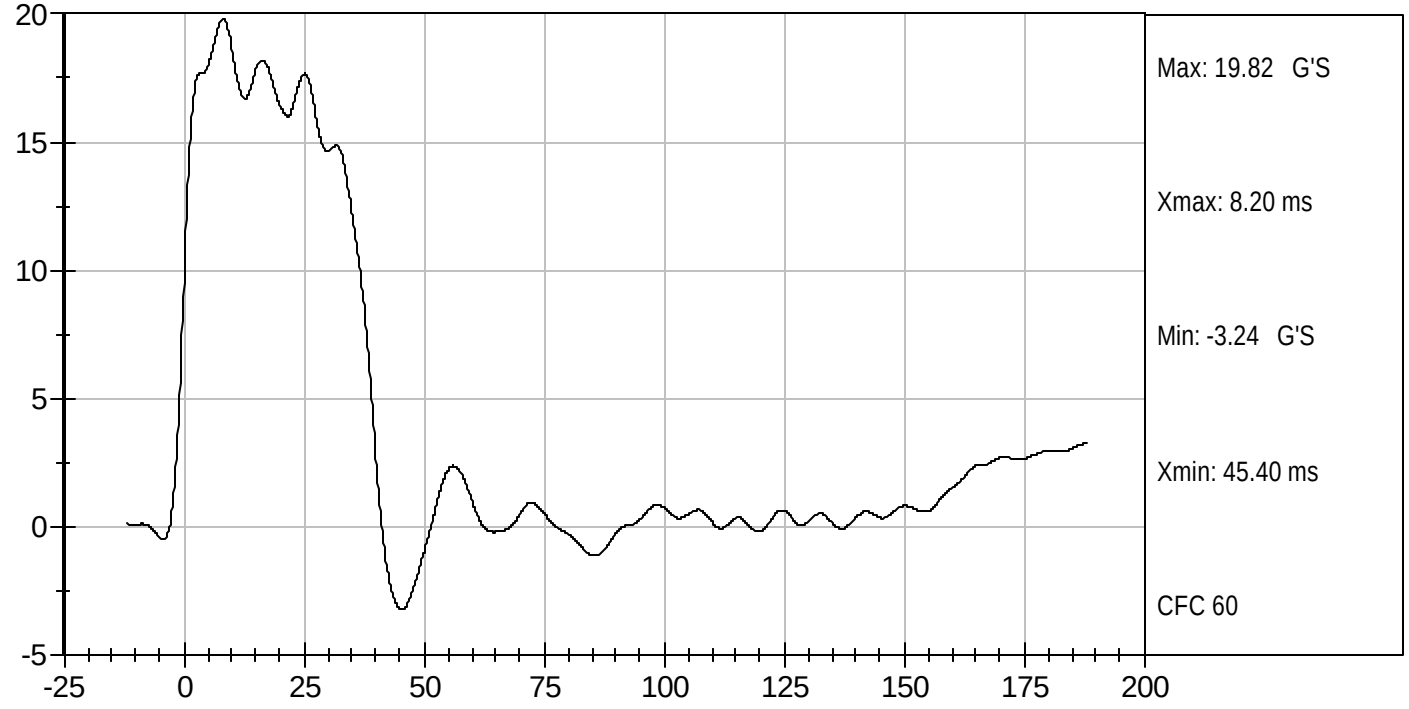
11/20/2006
Test Date

Approved By

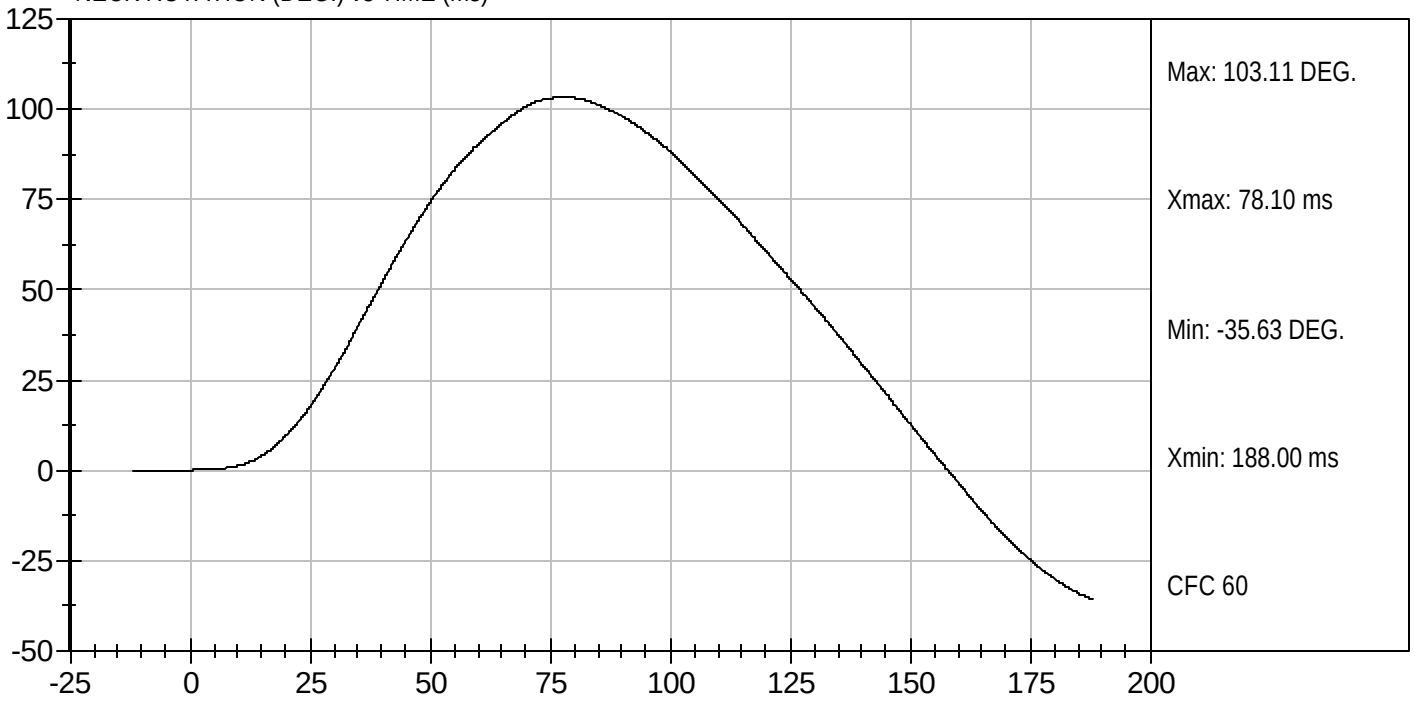
Test Desc: Neck Extension
Componet ID: D063313

Test Date: 11/20/2006
Velocity: 19.94 ft/s, 6.08 m/s

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



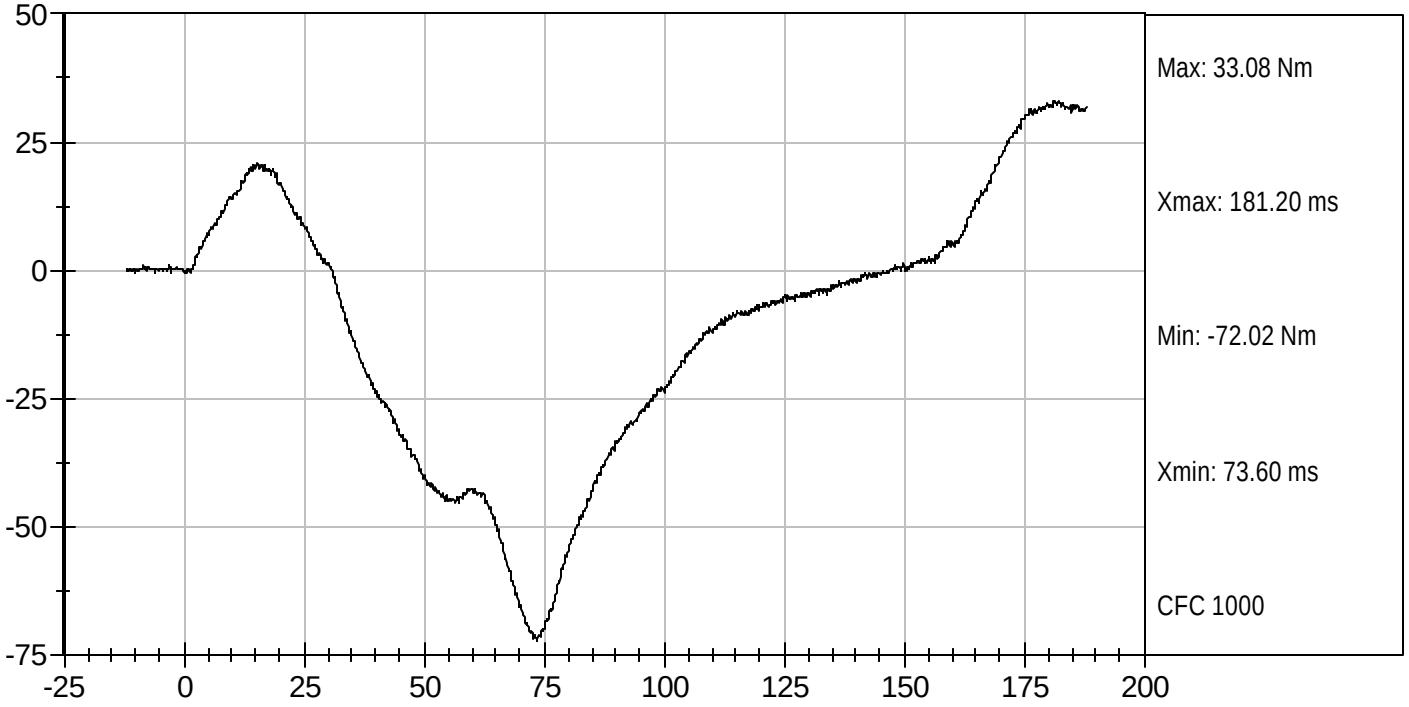
NECK ROTATION (DEG.) vs TIME (ms)



Test Desc: Neck Extension
Componet ID: D063313

Test Date: 11/20/2006
Velocity: 19.94 ft/s, 6.08 m/s

OCCIPITAL MOMENT (Nm) vs TIME (ms)



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065 **Test I.D:** D063314

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	24	Pass
Probe Velocity	m/s	6.58 to 6.82	6.65	Pass
Peak Probe Force	N	5159 to 5893	5,826	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.73	Pass
Internal Hysteresis	%	69 to 85	70	Pass
		Overall Test Results		Pass

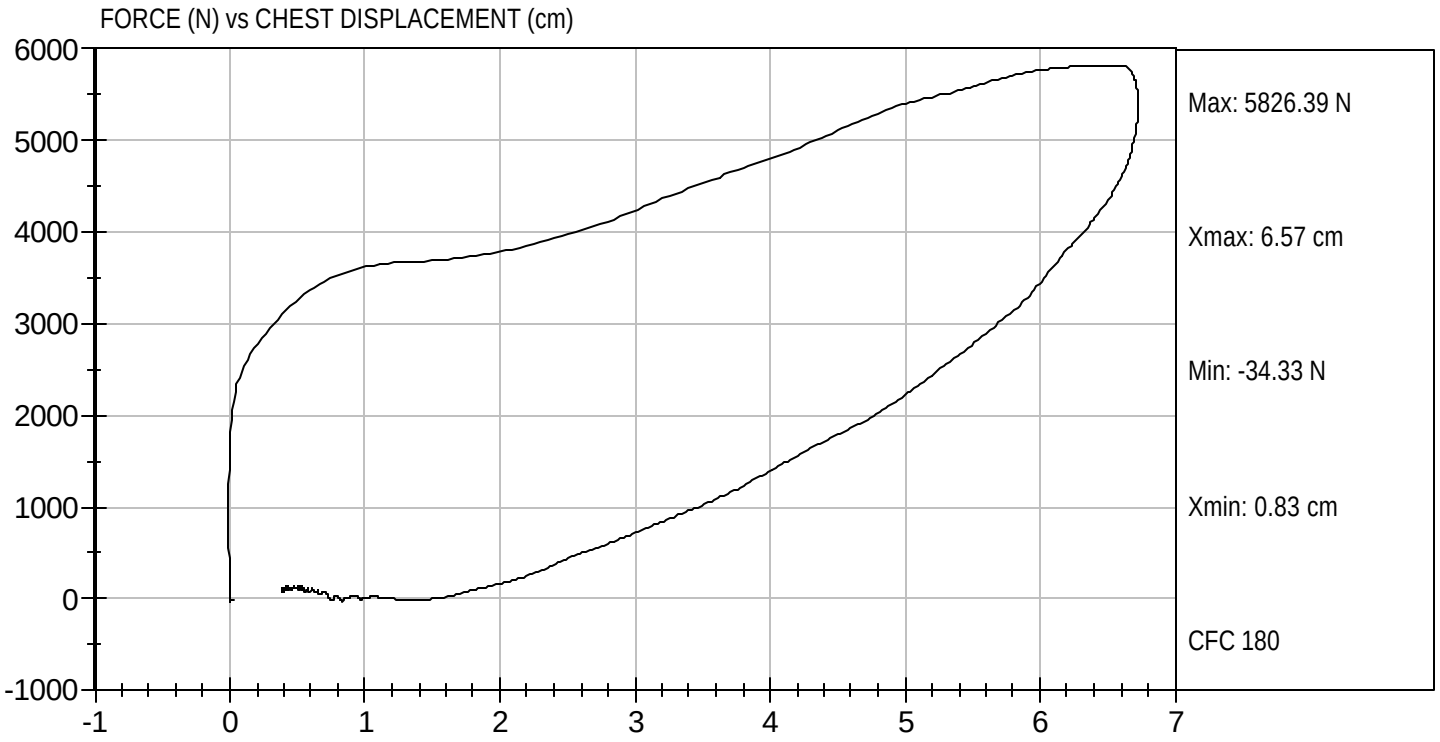
Laboratory Technician

11/17/2006
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Impact
Componet ID: D063314

Test Date: 11/17/2006
Velocity: 21.82 ft/s, 6.65 m/s



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065 **Test I.D:** D063315

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	5,238	Pass
		Overall Test Results		Pass

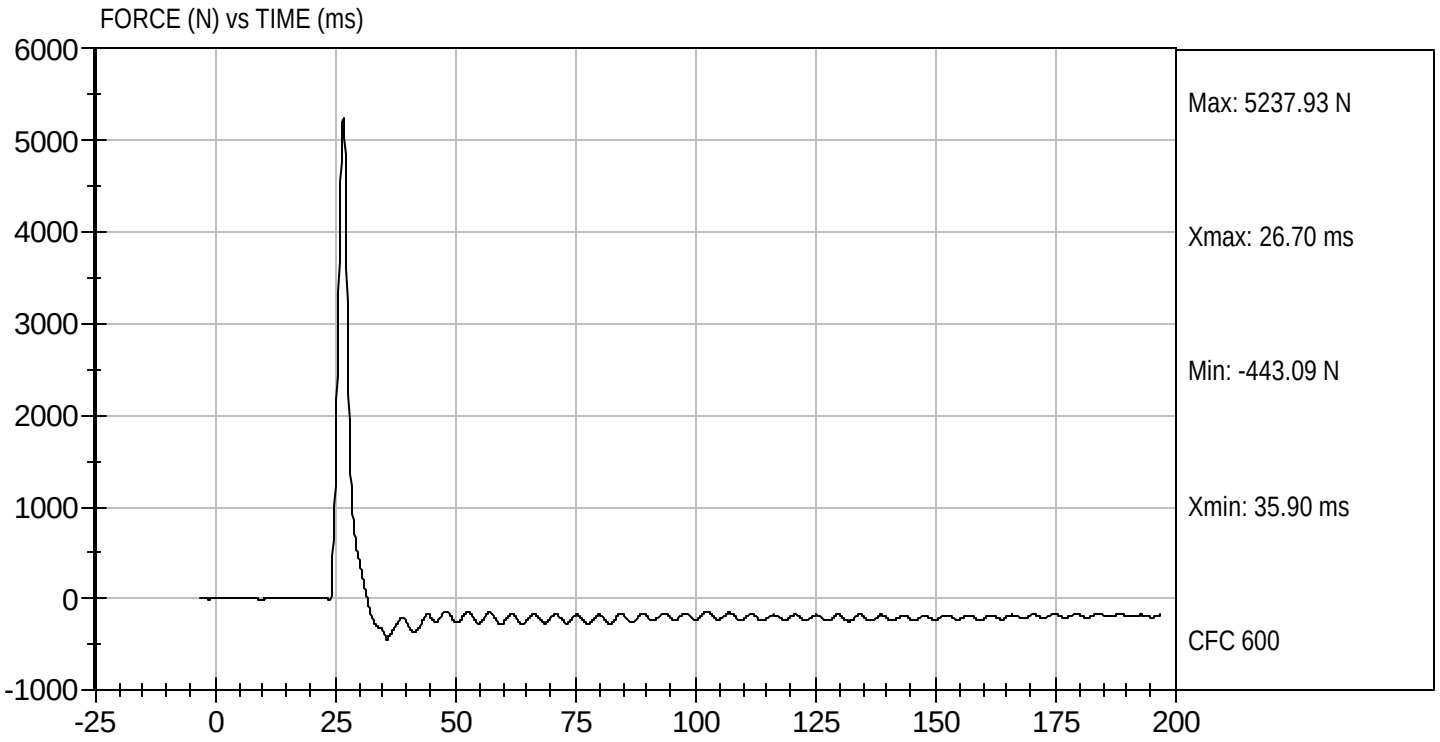
Laboratory Technician

11/20/2006
Test Date

David Winkelbauer
Approved By

Test Desc: Right Knee
Componet ID: D063315

Test Date: 11/20/2006
Velocity: 6.92 ft/s, 2.11 m/s



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065 **Test I.D:** D063316

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	5,558	Pass
		Overall Test Results		Pass

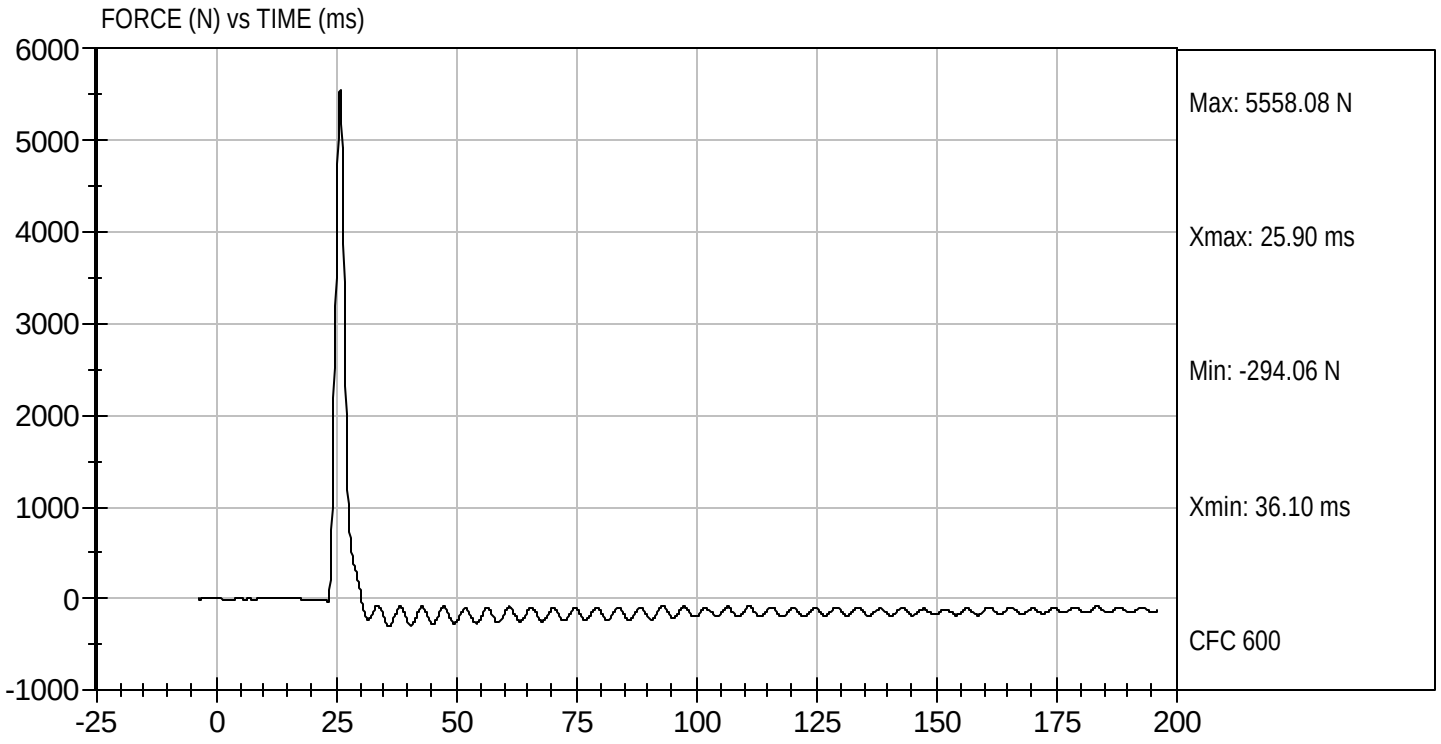
Laboratory Technician

11/20/2006
Test Date

David Winkelbauer
Approved By

Test Desc: Left Knee
Componet ID: D063316

Test Date: 11/20/2006
Velocity: 6.88 ft/s, 2.10 m/s



MGA RESEARCH CORPORATION

HIP-FEMUR FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065 **Test I.D:** D063310

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.8	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	25	25	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	92.1	83.9	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	42	41	Pass
		Overall Test Results			Pass

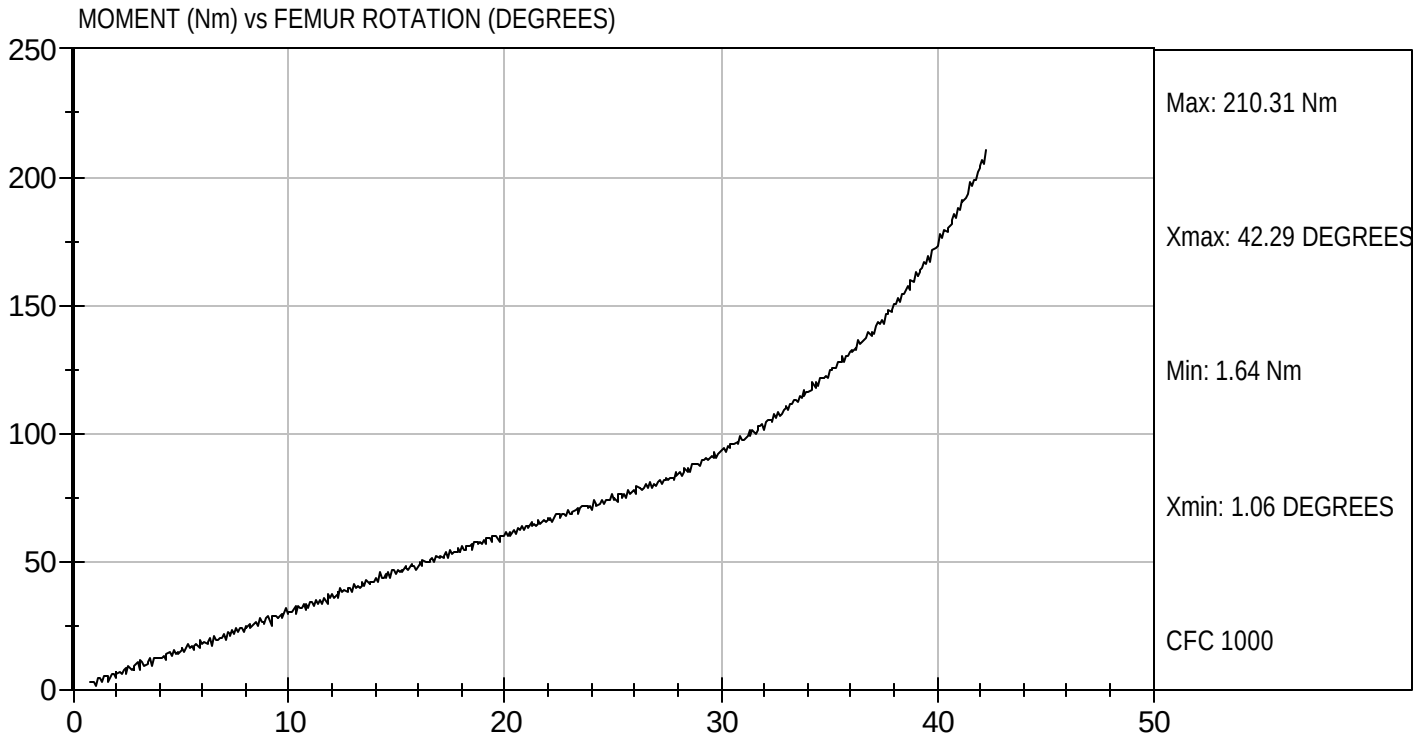
Laboratory Technician

11/17/2006
Test Date

David Winkelbauer
Approved By

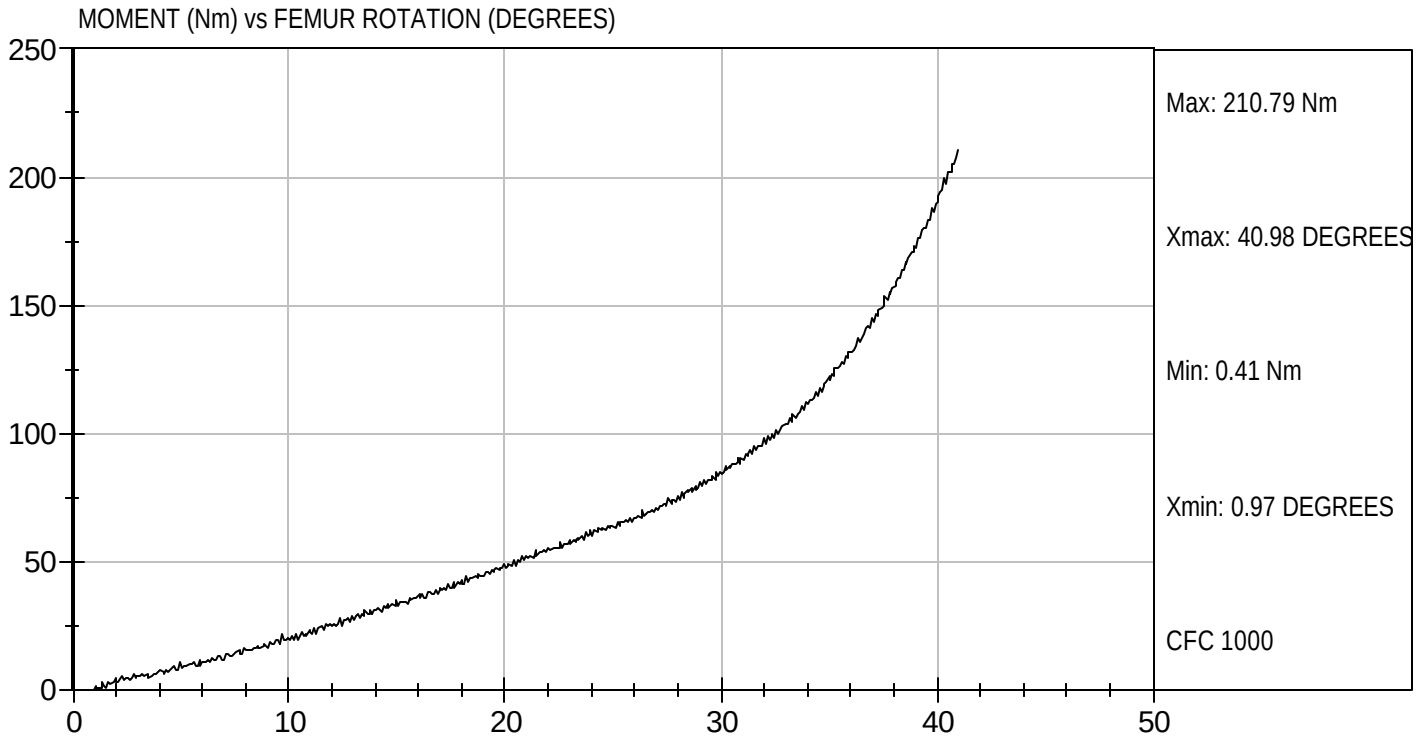
Test Desc: Hip Femur Flexion
Componet ID: D063319

Test Date: 11/17/2006
Velocity: 0 ft/s, 0.00 m/s



Test Desc: Hip Femur Flexion
Componet ID: D063310

Test Date: 11/17/2006
Velocity: 0 ft/s, 0.00 m/s



MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066 **Test ID:** D063321

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	24	Pass
Peak Resultant Acceleration	G's	225 - 275	265	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	2.7	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Laboratory Technician

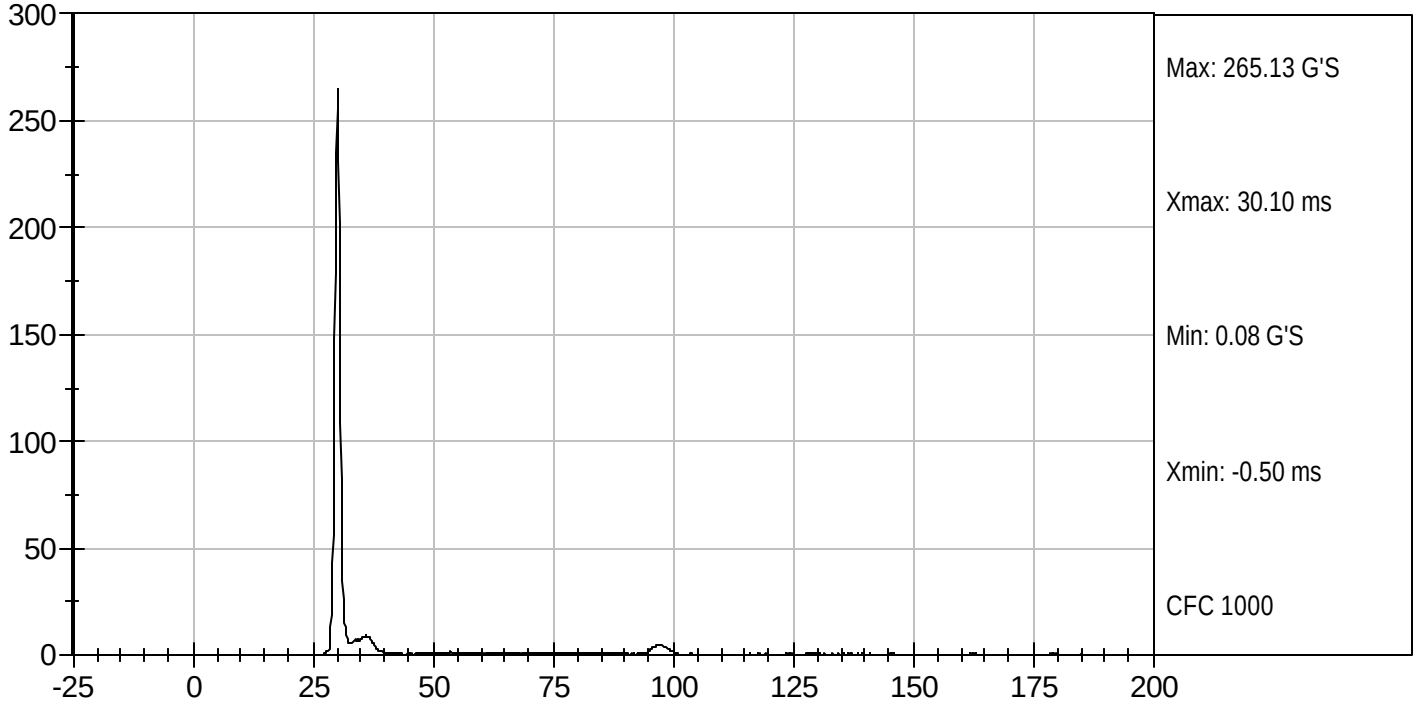
11/17/2006
Test Date

David Winkelbauer
Approved By

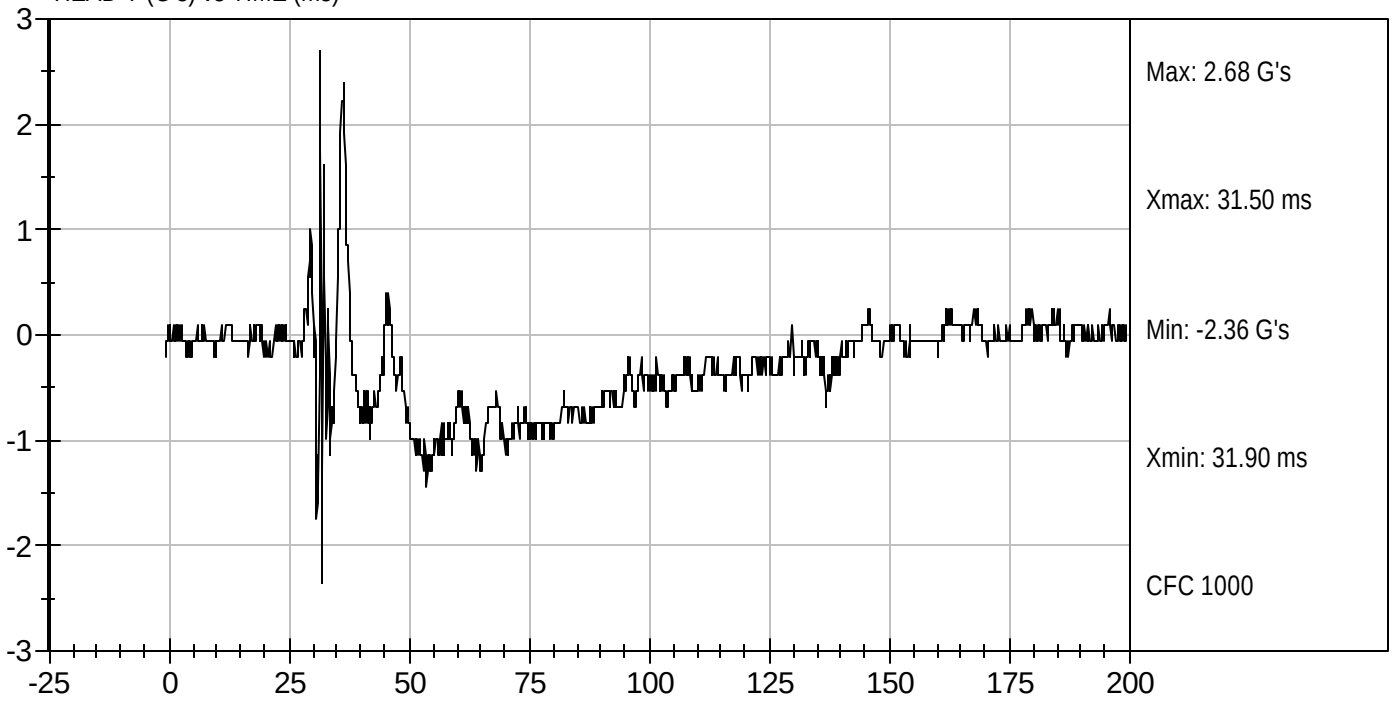
Test Desc: Head Drop
Componet ID: D063321

Test Date: 11/17/2006
Velocity: 0 ft/s, 0.00 m/s

HEAD RESULTANT ACCELERATION (G'S) vs TIME (ms)



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



MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066 **Test I.D:** D063322

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity		%	10 to 70	21	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.01	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	22.82	Pass
	20 msec	G's	17.60 to 22.60	18.11	Pass
	30 msec	G's	12.50 to 18.50	14.69	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	14.64	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	40.9	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	71.9	Pass
	Time	msec	57.0 to 64.0	60.0	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	114.5	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	92.1	Pass
	Time	msec	47.0 to 58.0	54.4	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	103.2	Pass
			Overall Test Results		Pass

Tim Brady
Laboratory Technician

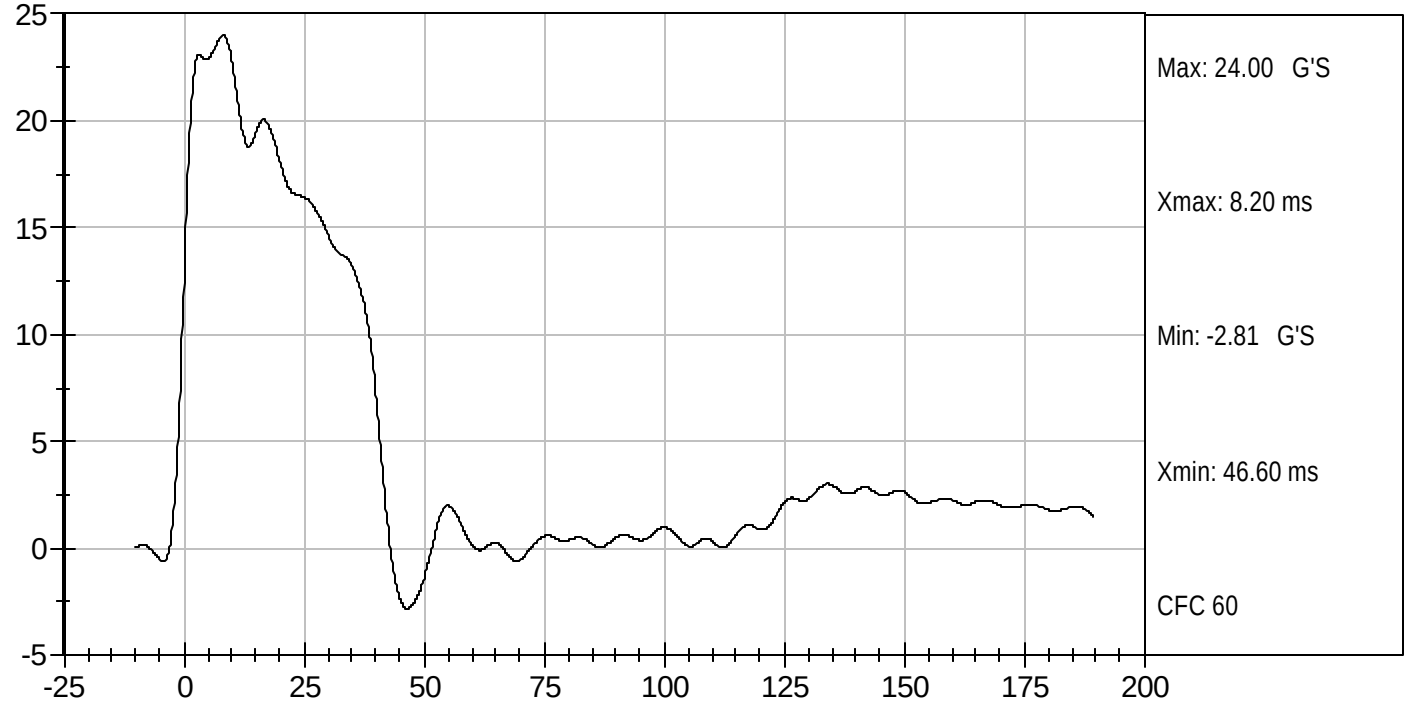
11/20/2006
Test Date

David Winkelbauer
Approved By

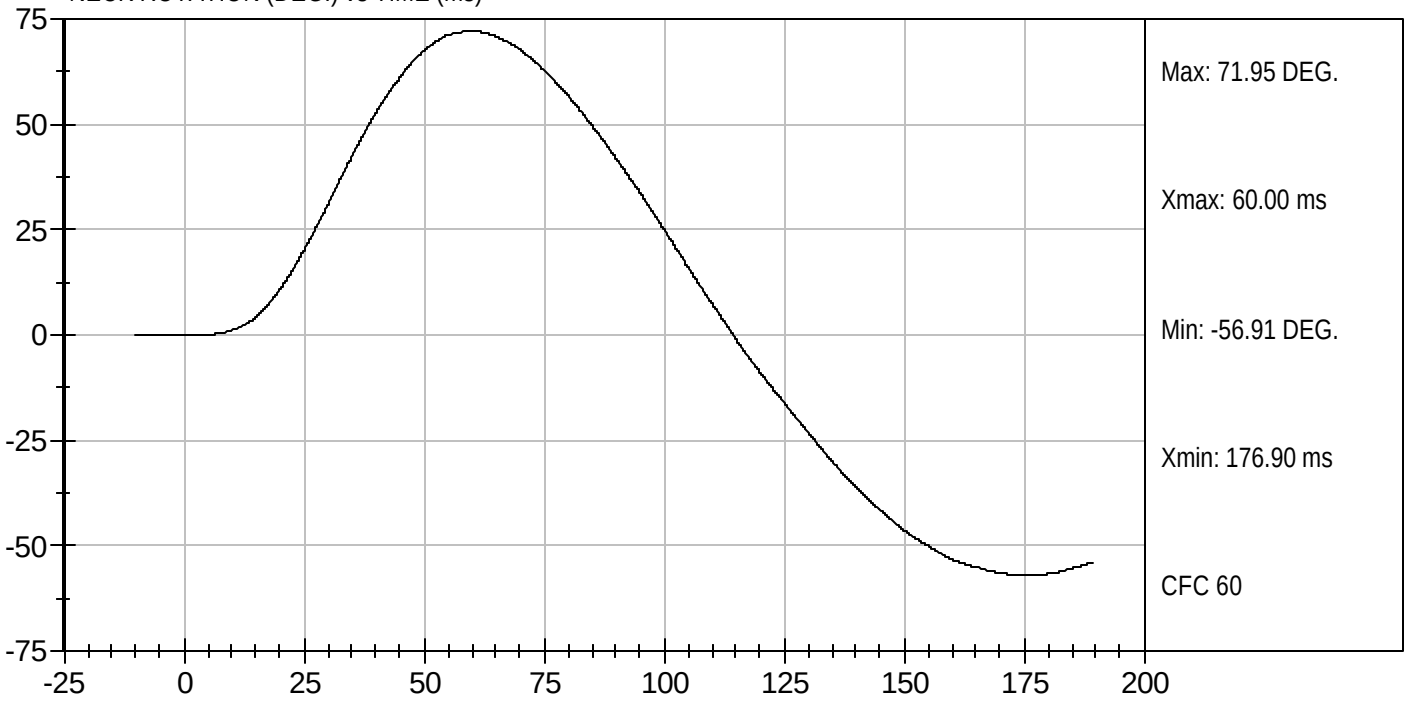
Test Desc: Neck Flexion
Componet ID: D063322

Test Date: 11/20/2006
Velocity: 22.99 ft/s, 7.01 m/s

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

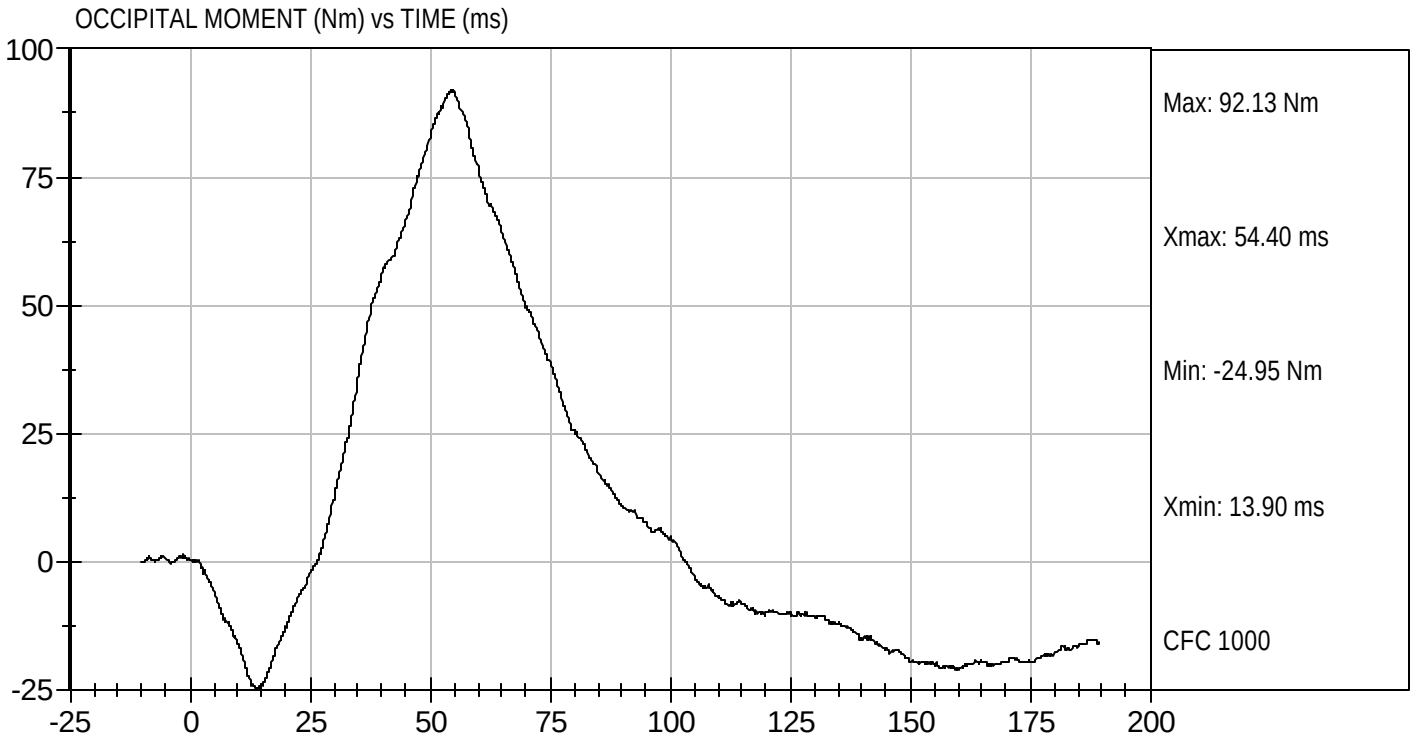


NECK ROTATION (DEG.) vs TIME (ms)



Test Desc: Neck Flexion
Componet ID: D063322

Test Date: 11/20/2006
Velocity: 22.99 ft/s, 7.01 m/s



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066 **Test I.D:** D063323

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity		%	10 to 70	21	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.07	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	17.33	Pass
	20 msec	G's	14.00 to 19.00	15.96	Pass
	30 msec	G's	11.00 to 16.00	13.17	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	13.16	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	42.0	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	101.3	Pass
	Time	msec	72.0 to 82.0	78.6	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	157.6	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-65.8	Pass
	Time	msec	65.0 to 79.0	74.9	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	147.2	Pass
			Overall Test Results		Pass

Laboratory Technician

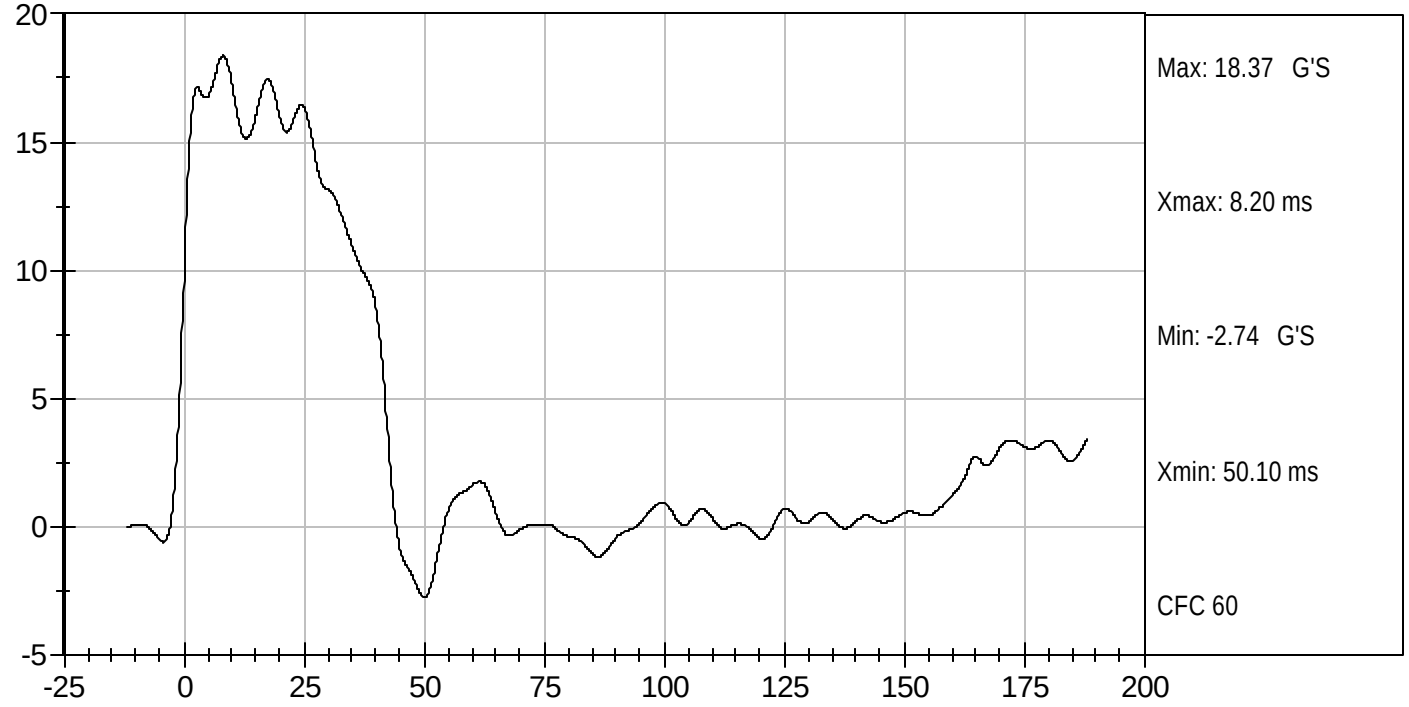
11/20/2006
Test Date

Approved By

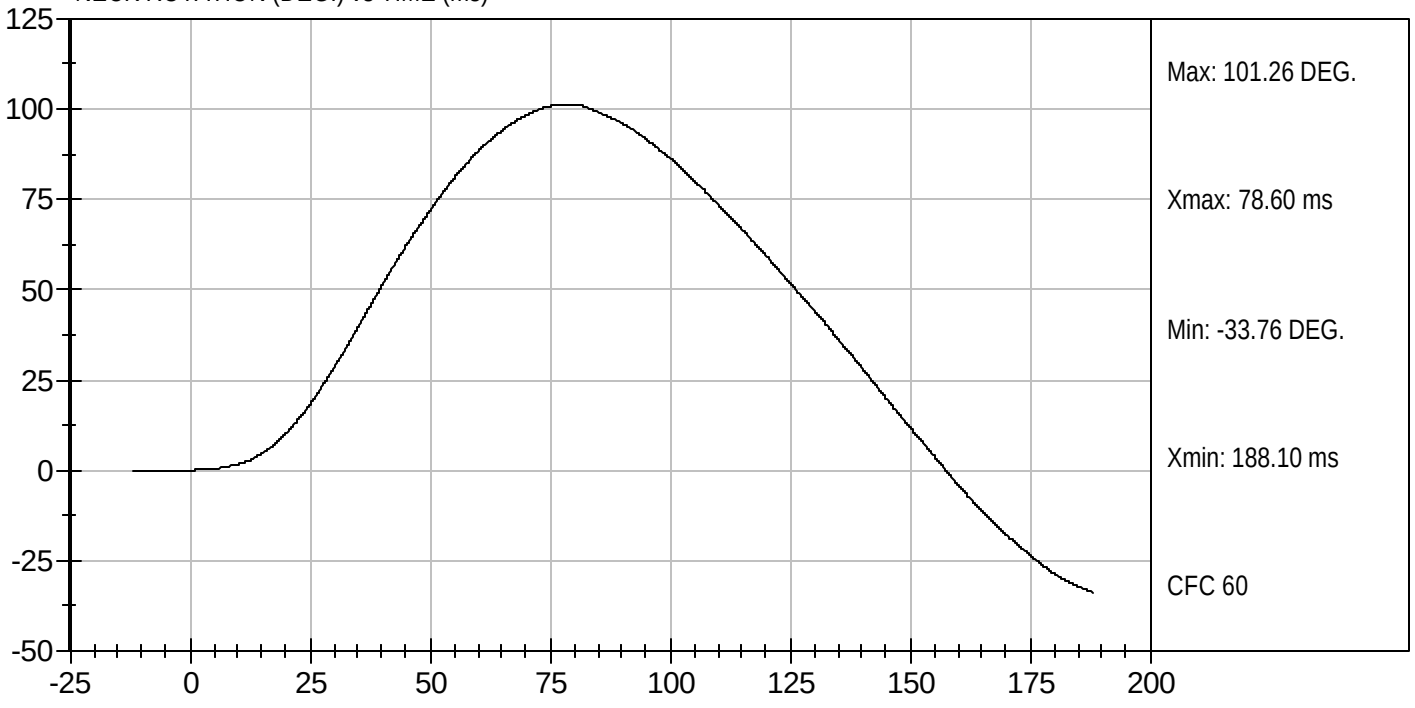
Test Desc: Neck Extension
Componet ID: D063323

Test Date: 11/20/2006
Velocity: 19.91 ft/s, 6.07 m/s

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



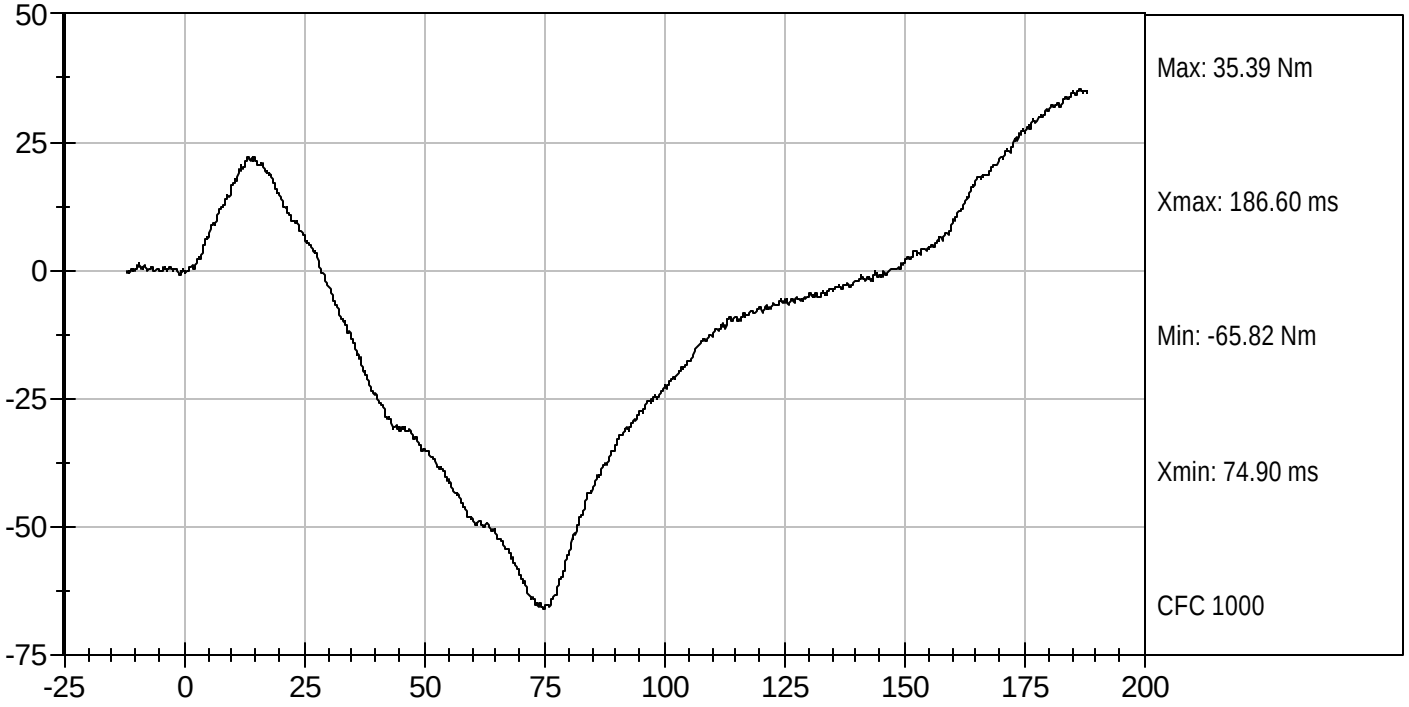
NECK ROTATION (DEG.) vs TIME (ms)



Test Desc: Neck Extension
Componet ID: D063323

Test Date: 11/20/2006
Velocity: 19.91 ft/s, 6.07 m/s

OCCIPITAL MOMENT (Nm) vs TIME (ms)



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066 **Test I.D:** D063324

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	24	Pass
Probe Velocity	m/s	6.58 to 6.82	6.66	Pass
Peak Probe Force	N	5159 to 5893	5,692	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.99	Pass
Internal Hysteresis	%	69 to 85	69	Pass
		Overall Test Results		Pass

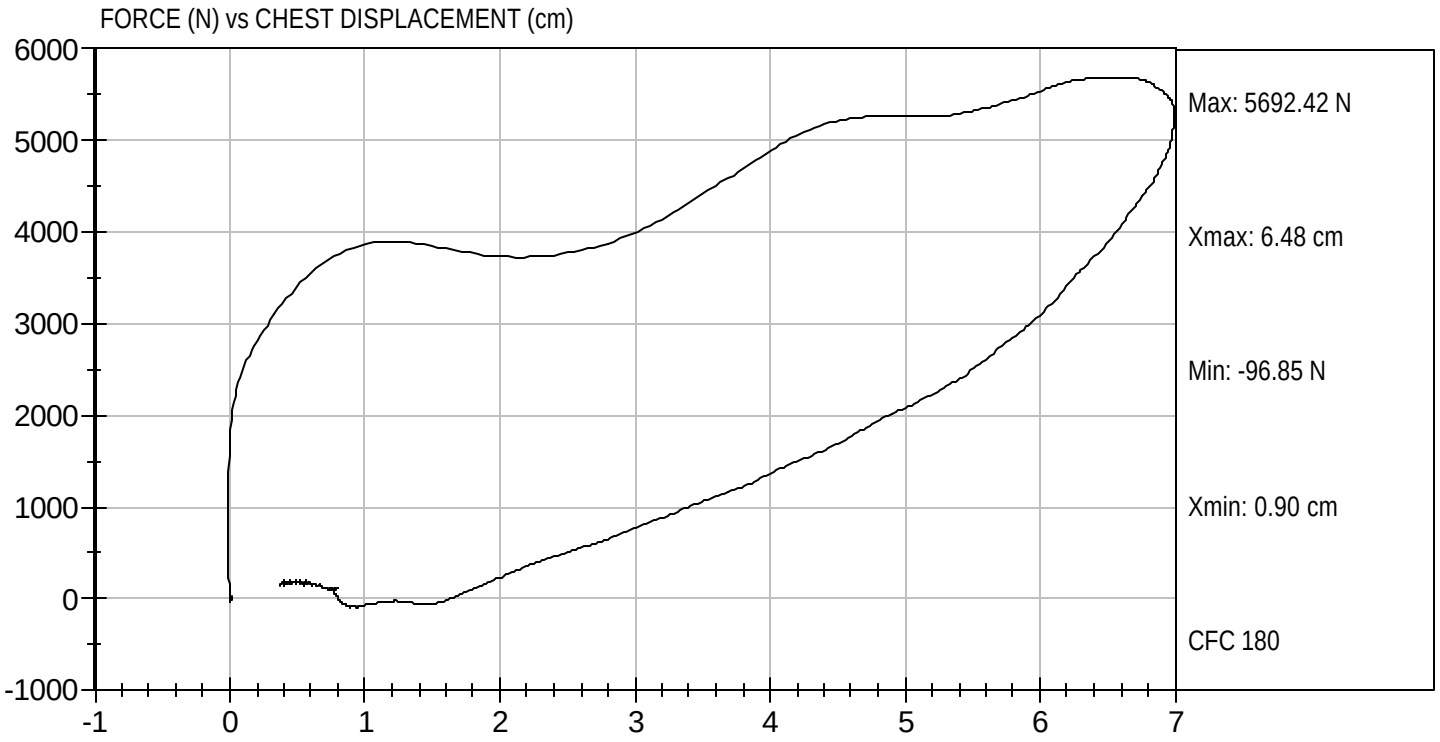
Laboratory Technician

11/17/2006
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Impact
Componet ID: D063324

Test Date: 11/17/2006
Velocity: 21.86 ft/s, 6.66 m/s



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066 **Test I.D:** D063325

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.09	Pass
Peak Probe Force	Newtons	4715 to 5782	5,463	Pass
		Overall Test Results		Pass

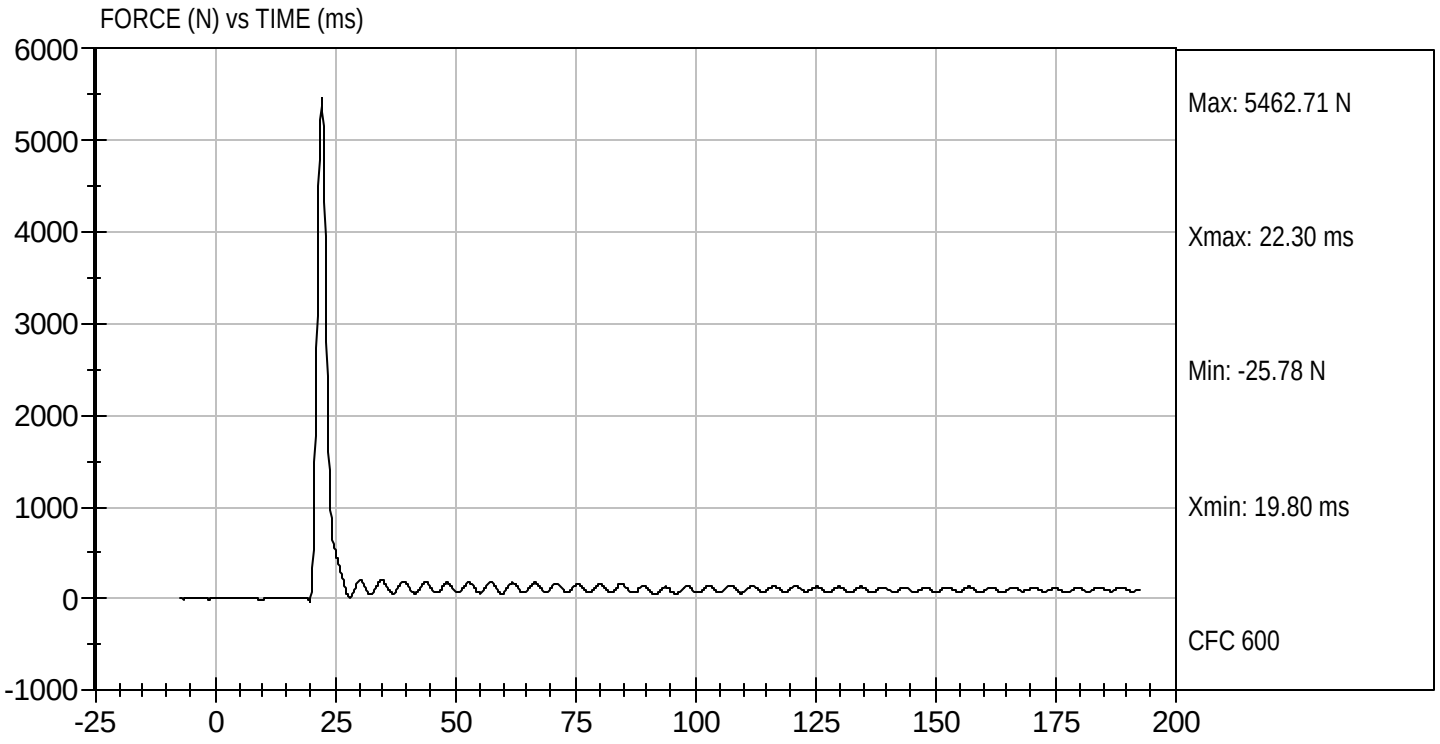
Laboratory Technician

11/20/2006
Test Date

David Winkelbauer
Approved By

Test Desc: Right Knee
Componet ID: D063325

Test Date: 11/20/2006
Velocity: 6.85 ft/s, 2.09 m/s



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066 **Test I.D:** D063326

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.09	Pass
Peak Probe Force	Newtons	4715 to 5782	5,160	Pass
		Overall Test Results		Pass

Laboratory Technician

11/20/2006

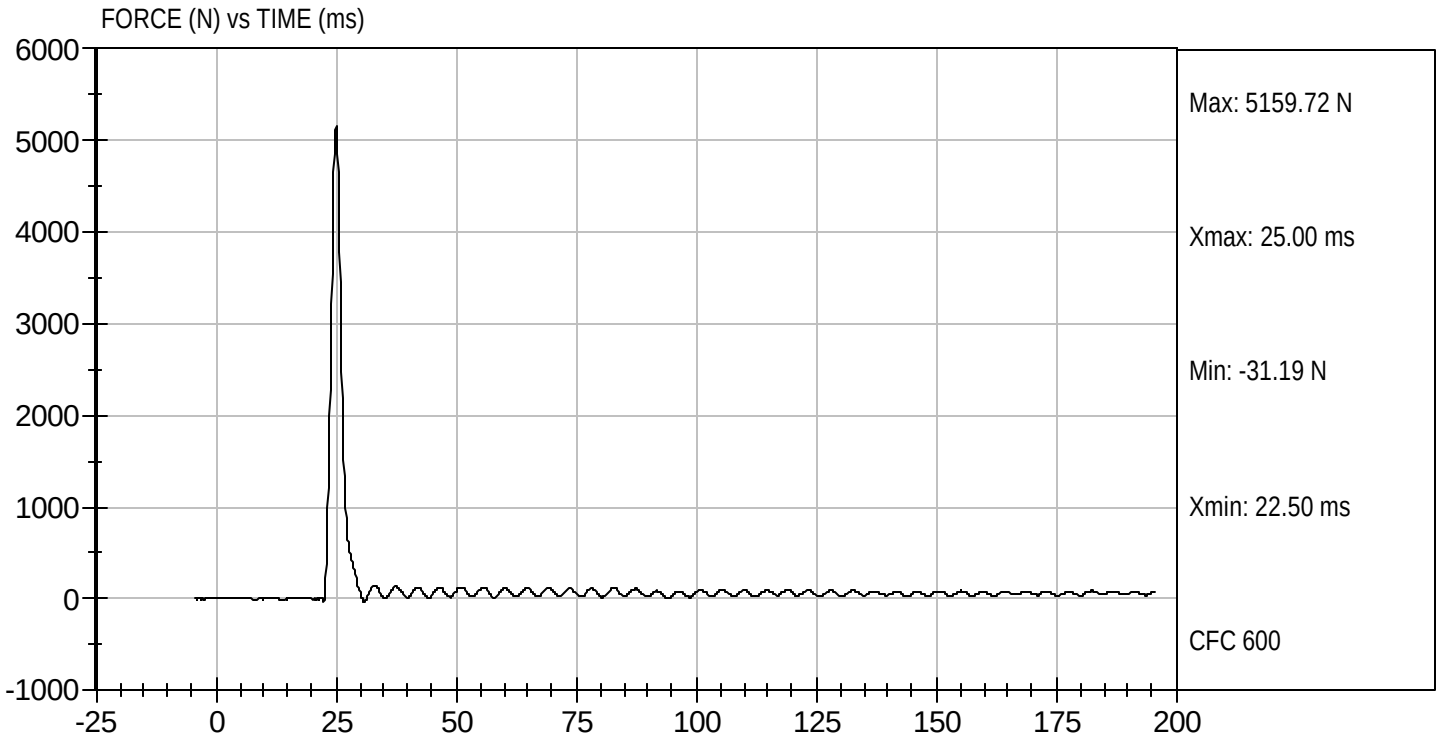
Test Date

David Winkelbauer

Approved By

Test Desc: Left Knee
Componet ID: D063326

Test Date: 11/20/2006
Velocity: 6.87 ft/s, 2.09 m/s



MGA RESEARCH CORPORATION

HIP-FEMUR FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066 **Test I.D:** D063320

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	25	25	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	88.0	84.7	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	43	40	Pass
		Overall Test Results			Pass

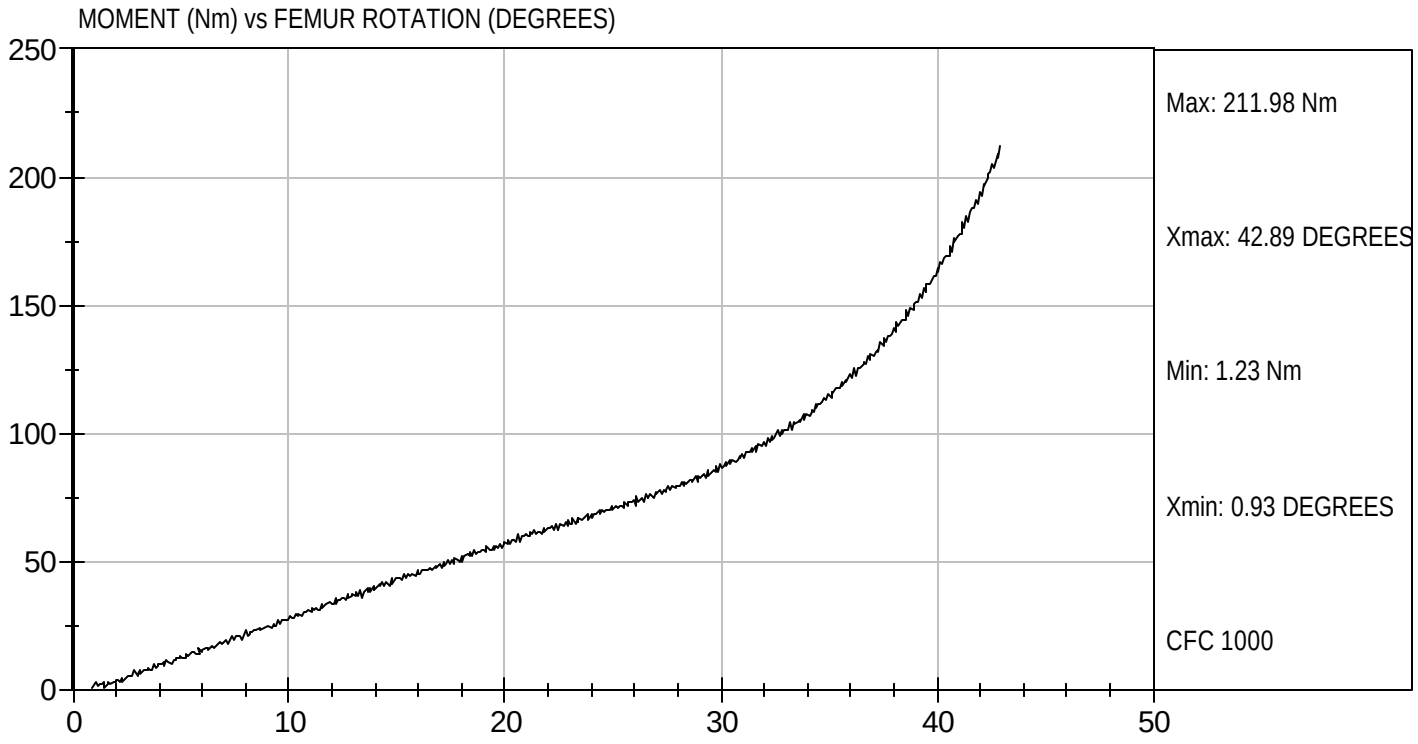
Laboratory Technician

11/17/2006
Test Date

David Winkelbauer
Approved By

Test Desc: Hip Femur Flexion
Componet ID: D063329

Test Date: 11/17/2006
Velocity: 0 ft/s, 0.00 m/s



Test Desc: Hip Femur Flexion
Componet ID: D063320

Test Date: 11/17/2006
Velocity: 0 ft/s, 0.00 m/s