REPORT NUMBER: NCAP-MGA-2006-001

NEW CAR ASSESSMENT PROGRAM
FRONTAL BARRIER IMPACT TEST

TOYOTA MOTOR CORPORATION
2006 TOYOTA SCION XB
NHTSA NUMBER: M65102

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

Test Date: September 15, 2005

Final Report Date: October 7, 2005

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

This final test report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, in response to Contract Number DTNH22-01-D-12005.

Prepared by: Kristin L. Ebert Date: 10/07/05
Kristin Ebert, Project Engineer

Reviewed by: David Winkelbauer Date: 10/07/05
David Winkelbauer, Facility Director

Technical Report Documentation Page

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15. Supplementary Notes			

16. Abstract

A 35.0 mph (56.3 km/h) frontal barrier impact was conducted on a 2006 Toyota Scion XB at MGA Research Corporation on September 15, 2005. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and foot well intrusion performance. The impact velocity was 56.3 km/h. The ambient temperature at the barrier face at the time of impact was 21 degrees Celsius. The vehicle's maximum post test static crush is 493 mm located to the left of the vehicle's centerline. The test vehicle is equipped with a 3-point continuous belt system and an airbag in both front outboard seating positions. With respect to FMVSS 208 "Occupant Crash Protection", the occupant injury criteria summary is as follows:

Measurement Description	Units	Threshold	Driver ATD	Pass. ATD
Head Injury Criteria (HIC)	N/A	1000	725.5	681.1
Max. Thorax Accel. (3ms Clip)	G's	60	50.9	44.6
Left Femur Force	Newton	10009	-4261	-2785
Right Femur Force	Newton	10009	-6346	-2330

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PURPOSE AND SUMMARY OF TEST

PURPOSE

This 56.3 km/h 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 DTNH22-01-D-12005. 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 2006 Toyota Scion XB at a velocity of 56.3 kph. The test was performed at MGA Research Corporation on September 15, 2005. 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 104 channels of data were recorded on an on-board data acquisition system. Appendix B contains the dummy head, chest, and femur response data traces.

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

The maximum static crush of the vehicle was 493 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, chest, and abdomen 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	725.5	61.4	96.1	50.9	79.2	82.2	-27.6	-4261	-6346
Passenger	681.1	68.2	104.2	44.6	67.3	70.3	-29.6	-2785	-2330

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

TEST NOTES

No valid data was collected for the following:

Passenger Head Zr – after 140msec
Bottom of Engine – after 24msec
Right Brake Caliper – after 36msec

SECTION 2

OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1

CRASH TEST SUMMARY

Test Vehicle: 2006 Toyota Scion XB
Test Program: 35mph Frontal Impact
NHTSA No.: M65102
Test Date: 9/15/2005

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	1127
Center	mm	1008
Right Side	mm	1077
Average	mm	1071

BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	880	885
Lap belt length as measured on ATD	mm	993	1011
Remainder of belt on reel	mm	1310	1310
Total belt length for continuous webbing systems	mm	3183	3206

DATA SHEET NO. 2

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2006 Toyota Scion XB
Test Program: 35mph Frontal Impact
NHTSA No.: M65102
Test Date: 9/15/2005

TEST VEHICLE INFORMATION

Manufacturer	Toyota Motor Corporation
Model	Scion XB
Body Style	MPV
NHTSA No.	M65102
VIN	JTLKT324564032028
Color	Black Sand Pearl
Delivery Date	9/2/05
Odometer Reading (mile)	43
Dealer	Wilde Toyota
Transmission	Automatic
Final Drive	Front
Number of Cylinders	4
Engine Displacement (L)	1.5
Engine Placement	Lateral
Automatic Door Lock (ADL)	No
Owners Manual Details Instructions on Disabling ADLs	NA
Bucket Seats	Yes

TEST VEHICLE OPTIONS

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

DATA FROM CERTIFICATION LABEL

Manufactured By	Toyota Motor Corporation
Date of Manufacture	07/05

GVWR (kg)	1530
GAWR Front (kg)	780
GAWR Rear (kg)	760

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Split Bench		
Number of Occupants	2	3		5
Capacity Wt. (VCW) (kg)				375
Cargo Wt. (RCLW) (kg)				34

DATA SHEET NO. 2... (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2006 Toyota Scion XB NHTSA No.: M65102
Test Program: 35mph Frontal Impact Test Date: 9/15/2005

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	334.5	233.0		379.0	284.5	
Right	kg	328.5	217.5		373.0	261.5	
Ratio	%	59.5	40.5		57.9	42.1	
Totals	kg	663.0	450.5	1113.5	752.0	546.0	1298.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1113.5
Weight of 2 P572E ATDs	kg	156.0
Rated Cargo/Luggage Weight (RCLW)	kg	34.0
Calculated Vehicle Target Weight (TVTW)	kg	1303.5

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG(aft of front axle)
As Delivered	mm	667	667	674	688	1013
As Tested	mm	652	653	651	656	1053
Post Test	mm	664	648	656	631	

Vehicle Wheelbase (mm): 2504

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

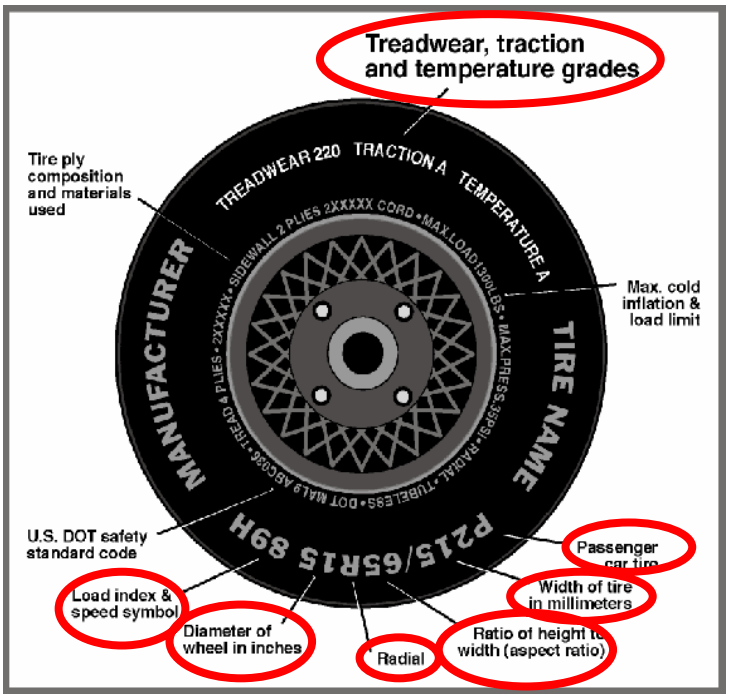
Vehicle Components Removed: None

Ballast weight does not include instrumentation and data acquisition system.

DATA SHEET NO. 3

TEST VEHICLE TIRE INFORMATION

Test Vehicle: 2006 Toyota Scion XB
Test Program: 35mph Frontal Impact
NHTSA No.: M65102
Test Date: 9/15/2005



DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (max)	200	200
Recommended Tire Size	185/60R15	185/60R15
Tire size on Vehicle	185/60R15	185/60R15
Tire Manufacturer	Goodyear	Goodyear
Tire Name	Eagle LS	Eagle LS
Tire Type	M+S	M+S
Tire Width (mm)	185	185
Ratio of Height to Width (aspect ratio)	60	60
Radial	R	R
Wheel Diameter	15	15
Load Index & Speed Symbol	84T	84T
Treadwear	360	360
Traction Grade	A	A
Temperature Grade	B	B

DATA SHEET NO. 4

TEST VEHICLE INFORMATION

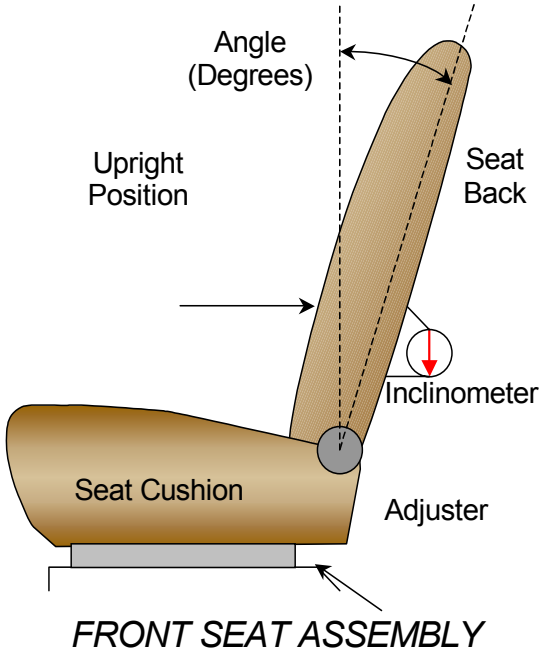
Test Vehicle: 2006 Toyota Scion XB NHTSA No.: M65102
Test Program: 35mph Frontal Impact Test Date: 9/15/2005

NORMAL DESIGN RIDING POSITION

The driver and passenger seat back is positioned to the manufacturer's designated angle. The procedure is as follows: Measure from head rest bar to rocker sill.

Driver seat back angle: 2.1 on head rest post

Passenger seat back angle: 2.1 on head rest post



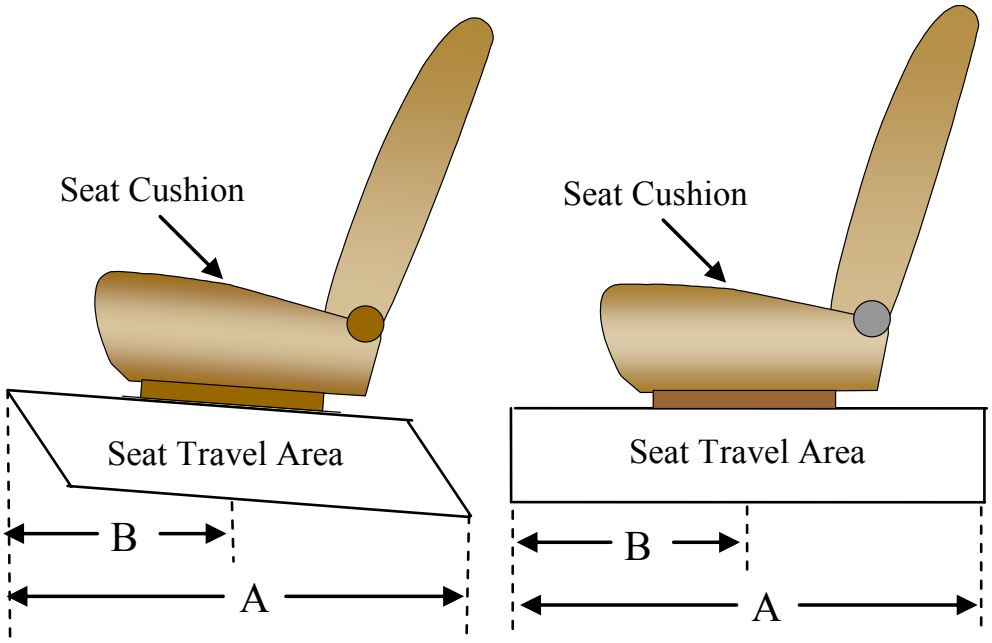
FRONT SEAT ASSEMBLY

SEAT FORE/AFT POSITIONING

	Total Fore/Aft Travel	Placed in position #
Driver Seat	16 Detents (forward most as 1)	9th Detent
Rear Seat	16 Detents (forward most as 1)	9th Detent

ADJUSTABLE D-RING POSITION

The D-Ring was placed in the second from top position.



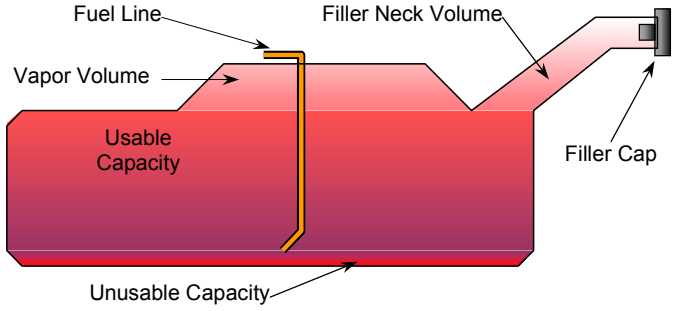
DATA SHEET NO. 4…(CONTINUED)
TEST VEHICLE INFORMATION

Test Vehicle: 2006 Toyota Scion XB NHTSA No.: M65102
Test Program: 35mph Frontal Impact Test Date: 9/15/2005

FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank"	45.0
Usable Capacity of "Optional" Tank	
92-94% of Usable Capacity	41.4 to 42.3
Actual Amount of Solvent used	41.6
1/3 of Usable Capacity	15.0

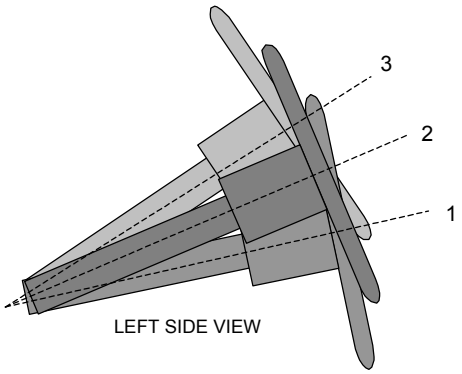
The test vehicle is equipped with an electric fuel pump.



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

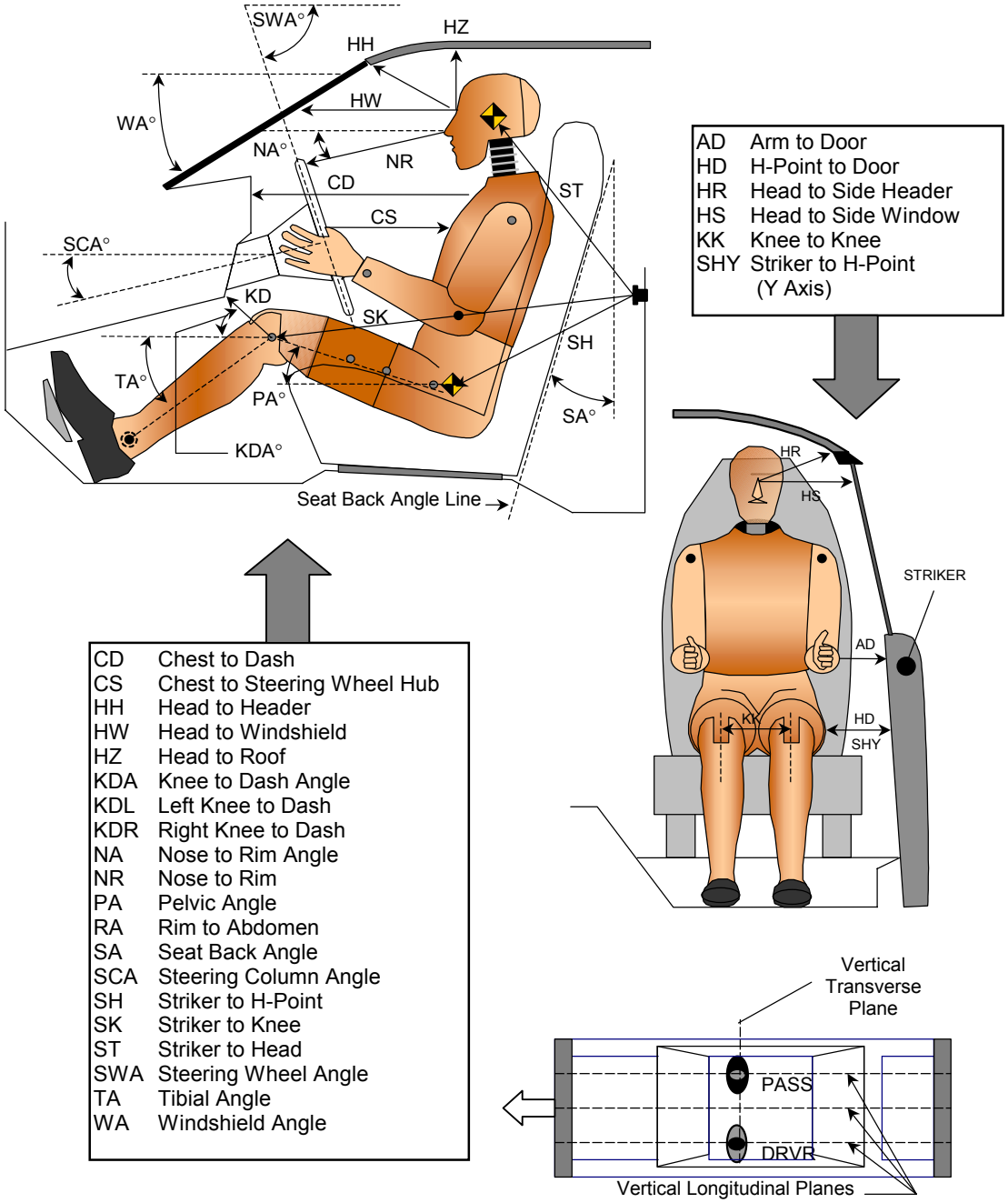
	Fore/Aft Position (mm)	Degrees
Lowermost position No. 1		31.8
Geometric center position No. 2		33.8
Uppermost position No. 3		35.8

DATA SHEET NO. 5

DUMMY POSITIONING IN VEHICLE

Test Vehicle:	2006 Toyota Scion XB	NHTSA No.:	M65102
Test Program:	35mph Frontal Impact	Test Date:	9/15/2005

DUMMY MEASUREMENTS FOR FRONT SEAT OCCUPANTS



DATA SHEET NO. 5... (CONTINUED)

DUMMY POSITIONING IN VEHICLE

Test Vehicle: 2006 Toyota Scion XB NHTSA No.: M65102
Test Program: 35mph Frontal Impact Test Date: 9/15/2005

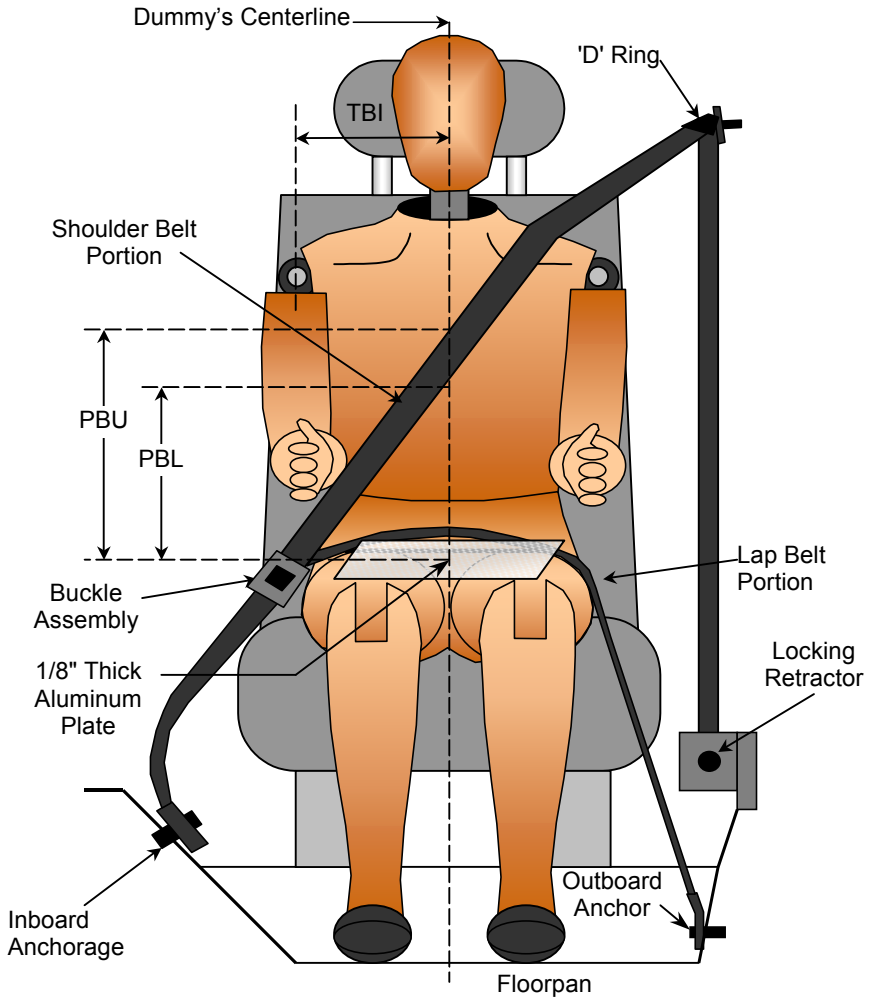
TEST DUMMY POSITION MEASUREMENTS

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA	Windshield Angle		50.2		
SWA	Steering Wheel Angle		56.2		
SCA	Steering Column Angle		33.7		
SA	Seat Back Angle (headrest post)		2.1		2.1
HZ	Head to Roof (Z)	247	90.0	266	90.0
HH	Head to Header	636	12.0	624	17.1
HW	Head to Windshield	762	0.0	761	0.0
HR	Head to Side Header (Y)	300		311	
NR	Nose to Rim	467	26.7		
CD	Chest to Dash	607		594	
CS	Chest to Steering Hub	303	0.0		
RA	Rim to Abdomen	189	0.0		
KDL	Left Knee to Dash	133	19.1	44	
KDR	Right Knee to Dash	132		118	27.2
PA	Pelvic Angle		22.6		24.5
TA	Tibia Angle		60.6		65.2
KK	Knee to Knee (Y)	338		268	
SK	Striker to Knee	653	95.1	654	91.3
ST	Striker to Head	541	15.3	530	17.5
SH	Striker to H-Point	286	118.8	286	118.2
SHY	Striker to H-Point (Y)	243		232	
HS	Head to Side Window	370		370	
HD	H-Point to Door (Y)	133		130	
AD	Arm to Door (Y)	98		106	
AA	Ankle to Ankle	342		237	

DATA SHEET NO. 6

SEAT BELT POSITIONING DATA

Test Vehicle: 2006 Toyota Scion XB
Test Program: 35mph Frontal Impact
NHTSA No.: M65102
Test Date: 9/15/2005



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
TBI - Dummy centerline to shoulder bolt	mm	225	225
PBU - Top surface of reference to belt upper edge	mm	342	330
PBL - To surface of reference to belt lower edge	mm	200	250

DATA SHEET NO. 7

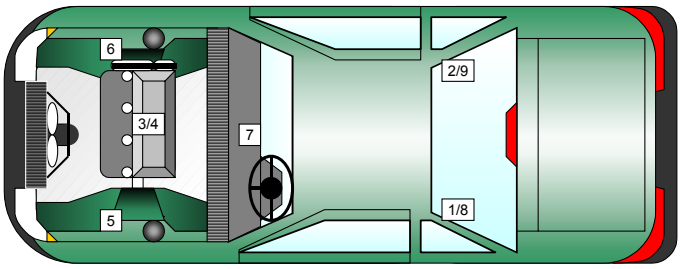
VEHICLE ACCELEROMETER LOCATIONS

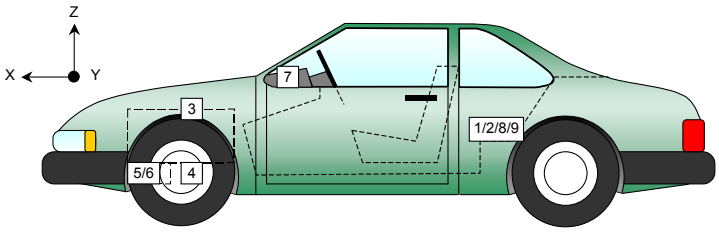
Test Vehicle: 2006 Toyota Scion XB
Test Program: 35mph Frontal Impact
NHTSA No.: M65102
Test Date: 9/15/2005

VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear X-Member X	1334	-220	443
2	Right Rear X-Member X	1328	220	442
3	Engine Top X	3337	0	791
4	Engine Bottom X	3404	20	306
5	Left Brake Caliper X	3285	-643	258
6	Right Brake Caliper X	3278	643	250
7	Instrument Panel X	2612	0	1065
8	Left Rear X-Member Z	1334	-220	443
9	Right Rear X-Member Z	1328	220	442

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: 2006 Toyota Scion XB NHTSA No.: M65102
Test Program: 35mph Frontal Impact Test Date: 9/15/2005

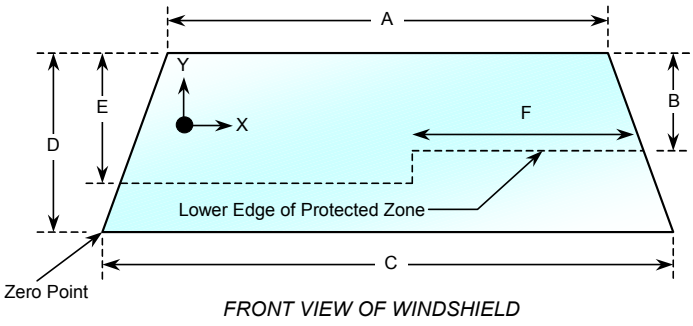
Windshield Mounting Details:
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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	2000	2000	100
Right Side	2000	2000	100
Total	4000	4000	100



FRONT VIEW OF WINDSHIELD

Item	Units	Value
A	mm	1275
B	mm	431
C	mm	1523
D	mm	600
E	mm	402
F	mm	764

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: 2006 Toyota Scion XB NHTSA No.: M65102
Test Program: 35mph Frontal Impact Test Date: 9/15/2005

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21° C Test Time: 11:38 am

Stoddard Solvent Spillage Measurements

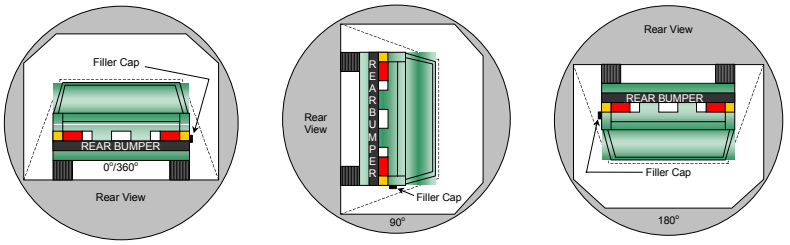
A. From impact until vehicle motion ceases: 0 oz.
(Maximum Allowable = 1 ounce)

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

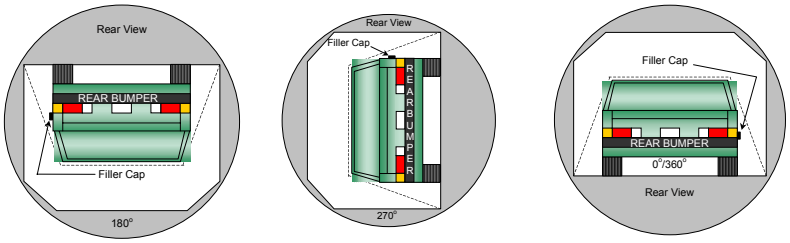
C. For the following 25 minutes: 0 oz.
(Maximum Allowable = 1 oz. /minute)

D. Spillage: None

FMVSS 301 STATIC ROLLOVER DATA



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:
None

Test Phase	Rotation Time (sec.)	Hold Time (sec.)	Spillage (oz.)
0° to 90°	155	300	0
90° to 180°	161	300	0
180° to 270°	142	300	0
270° to 360°	156	300	0

DATA SHEET NO. 10

VEHICLE MEASUREMENTS

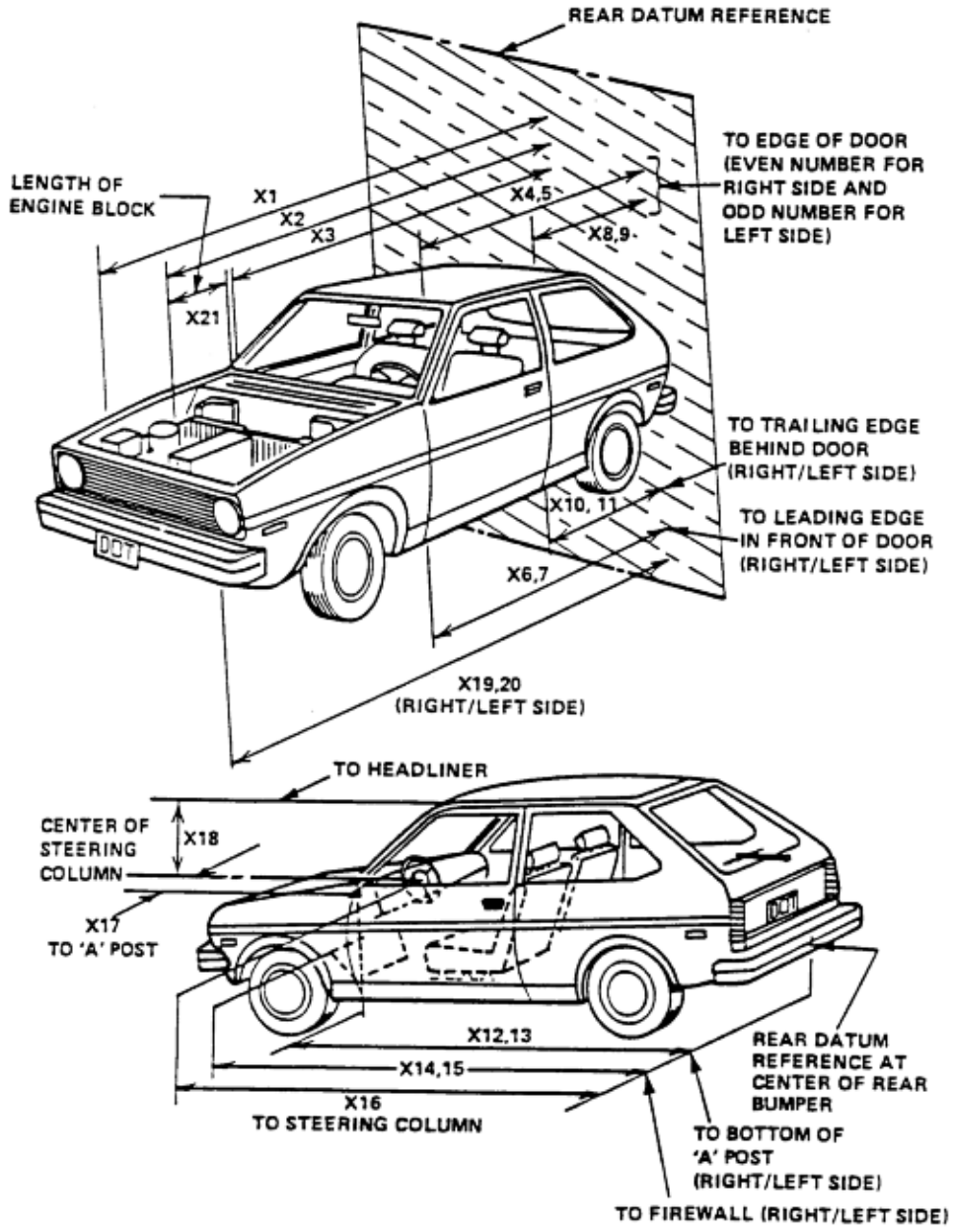
Test Vehicle: 2006 Toyota Scion XB NHTSA No.: M65102
Test Program: 35mph Frontal Impact Test Date: 9/15/2005

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total length of vehicle at centerline	mm	3923	3433	490
2	RSOV to front of engine	mm	3329	3063	266
3	RSOV to firewall centerline	mm	3148	3079	69
4	RSOV to leading edge of right door	mm	2702	2709	-7
5	RSOV to leading edge of left door	mm	2699	2704	-5
6	RSOV to lower leading edge of right door	mm	2672	2674	-2
7	RSOV to lower leading edge of left door	mm	2675	2664	11
8	RSOV to upper leading edge of right door	mm	1678	1687	-9
9	RSOV to upper leading edge of left door	mm	1679	1681	-2
10	RSOV to lower trailing edge of right door	mm	1664	1656	8
11	RSOV to lower trailing edge of left door	mm	1658	1651	7
12	RSOV to bottom of right 'A' pillar	mm	2615	2604	11
13	RSOV to bottom of left 'A' pillar	mm	2611	2613	-2
14	RSOV to firewall on right side	mm	3011	2981	30
15	RSOV to firewall on left side	mm	3012	2958	54
16	RSOV to steering column	mm	2356	2383	-27
17	Center of steering column to left 'A' pillar	mm	477	420	57
18	Center of steering column to headlining	mm	527	457	70
19	RSOV to right side of front bumper	mm	3836	3412	424
20	RSOV to left side of front bumper	mm	3834	3433	401
21	Length of engine block	mm	440	440	0
RD	RSOV to right side of dash panel	mm	2612	2634	-22
CD	RSOV to center of dash panel	mm	2558	2555	3
LD	RSOV to left side of dash panel	mm	2636	2635	1

DATA SHEET NO. 10... (continued)

VEHICLE MEASUREMENTS

Test Vehicle:	2006 Toyota Scion XB	NHTSA No.:	M65102
Test Program:	35mph Frontal Impact	Test Date:	9/15/2005



DATA SHEET NO. 10... (continued)

VEHICLE MEASUREMENTS

Test Vehicle: 2006 Toyota Scion XB NHTSA No.: M65102
Test Program: 35mph Frontal Impact Test Date: 9/15/2005

Target Vehicle Structural Measurement

	Elements	Pre-Test (mm)
1	Total Length	3923
2	Total Width	1771
3	Bumper Top Height	693
4	Bumper Bottom Height	203
5	Longitudinal Member Top Height	561
6	Distance between Longitudinal Members	1466
7	Longitudinal Member Width	55
8	Engine Top Height	816
9	Engine Bottom Height	206
10	Engine and gearbox width	780
11	Front bumper-engine distance	323
12	Front shock absorber fixing height	870
13	Bonnet leading edge height	864
14	Front shock absorber fixing width	1131
15	Front bumper – front axle distance	764
16	Front axle – a pillar distance	406
17	A-pillar – B-pillar distance	1083
18	B-Pillar – rear axle distance	1016
19	B-pillar – C-pillar distance	906
20	Roof sill bottom height	1532
21	Roof sill top height	1593
22	Floor sill bottom height	207
23	Floor sill top height	342

DATA SHEET NO. 11

CAMERA LOCATIONS

Test Vehicle: 2006 Toyota Scion XB NHTSA No.: M65102
Test Program: 35mph Frontal Impact Test Date: 9/15/2005

No.	Camera View	Location (mm) *			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Side View				13	24
2	Left Front View	950	-4970	1415	24	1000
3	Steering Column Top	1335	-5835	1485	25	1000
4	Steering Column Bottom	1330	-5870	1035	25	1000
5	Driver Close-up	1210	-6335	1415	50	1000
6	Driver Angle	6570	-4800	2075	50	1000
7	On board Driver Side					
8	On board Passenger Side					
9	Right Overall	1830	6870	1450	24	1000
10	Right Passenger Half	850	5150	1490	24	1000
11	Right Close-up	1010	6010	1440	35	1000
12	Right Angle	6650	4750	2170	50	1000
13	Windshield	-330	0	2775	19	1000
14	Top Driver	95	-395	2105	12.5	1000
15	Top Passenger	100	530	2105	12.5	1000
16	Pit Front	885	0	-3150	24	1000
17	Pit Rear	2590	0	-3150	24	1000

*COORDINATES:

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

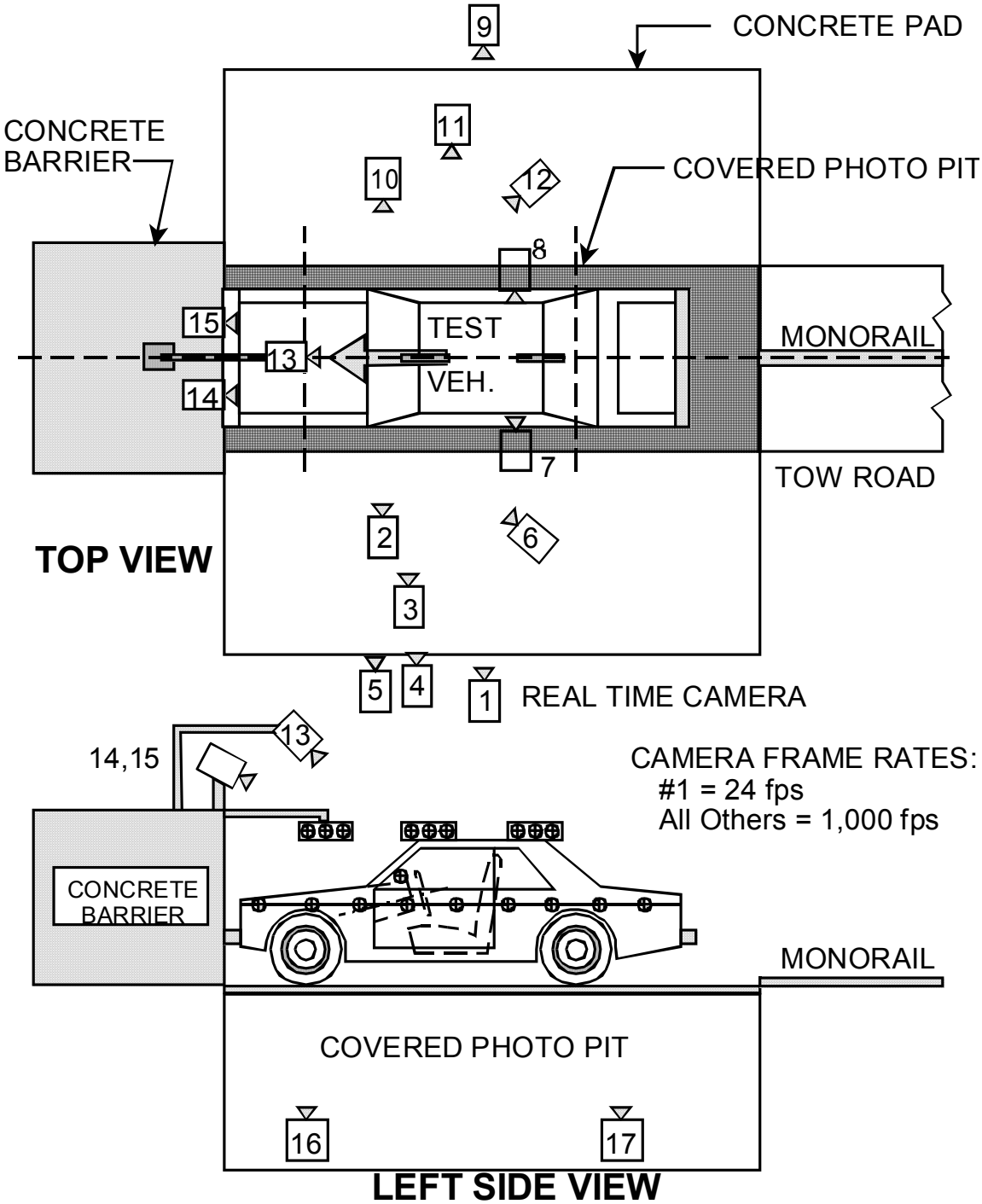
Note: Cameras 7 and 8 were not used for this test.

DATA SHEET NO. 11... (continued)

CAMERA LOCATIONS

Test Vehicle: 2006 Toyota Scion XB NHTSA No.: M65102
Test Program: 35mph Frontal Impact Test Date: 9/15/2005

CAMERA POSITIONS FOR FRONTAL IMPACTS



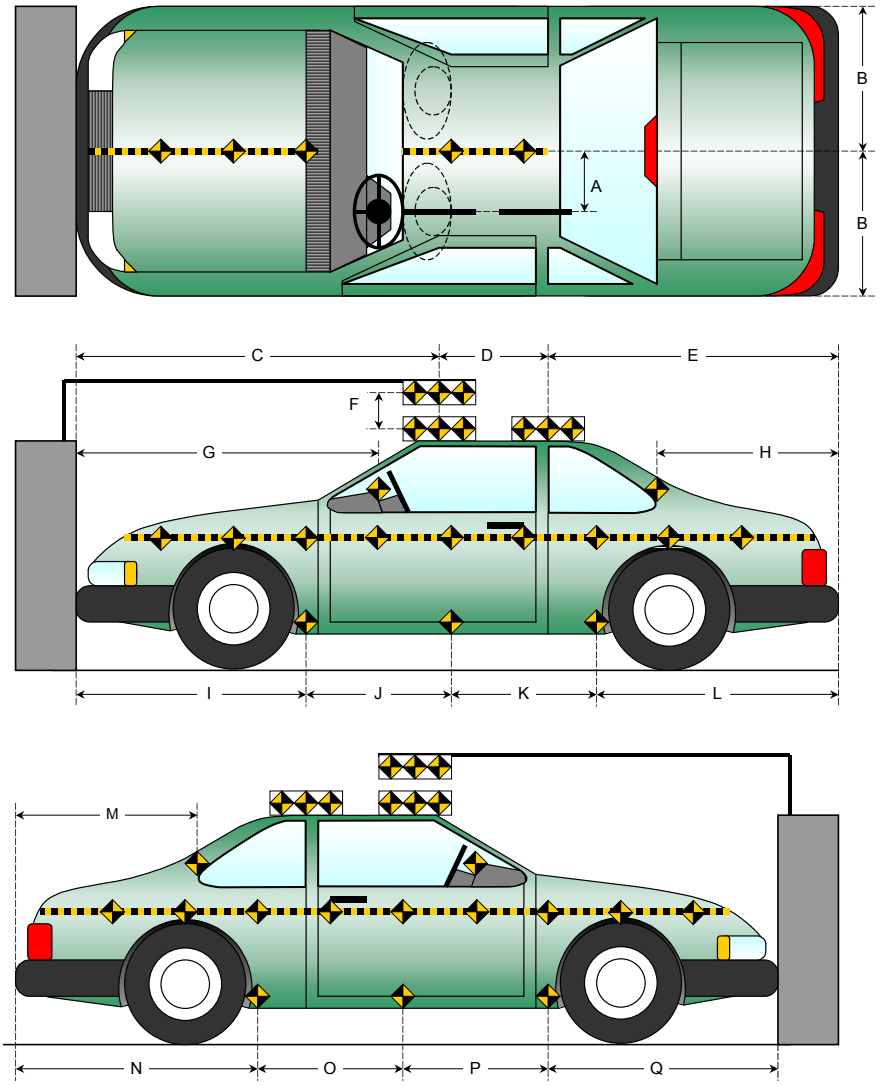
DATA SHEET NO. 12

PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2006 Toyota Scion XB
Test Program: 35mph Frontal Impact

NHTSA No.: M65102
Test Date: 9/15/2005

Item	Value
A	333
B	886
C	2068
D	609
E	1246
F	62
G	
H	729
I	1170
J	862
K	858
L	1033
M	727
N	1034
O	861
P	861
Q	1167



DATA SHEET NO. 13

VEHICLE INTRUSION MEASUREMENTS

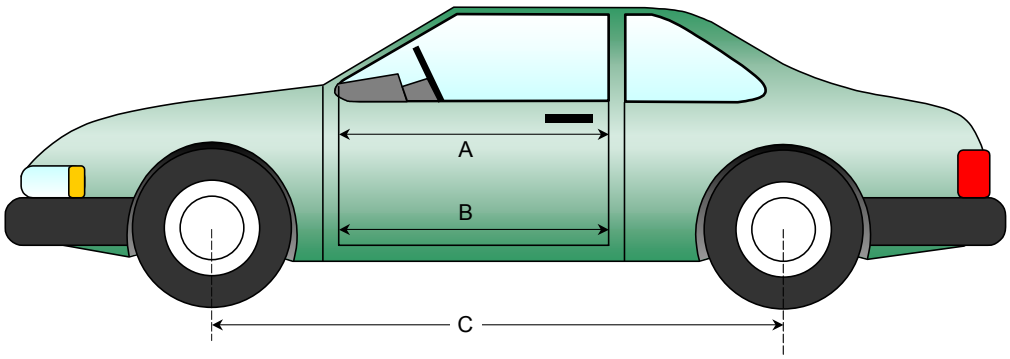
Test Vehicle: 2006 Toyota Scion XB
Test Program: 35mph Frontal Impact
NHTSA No.: M65102
Test Date: 9/15/2005

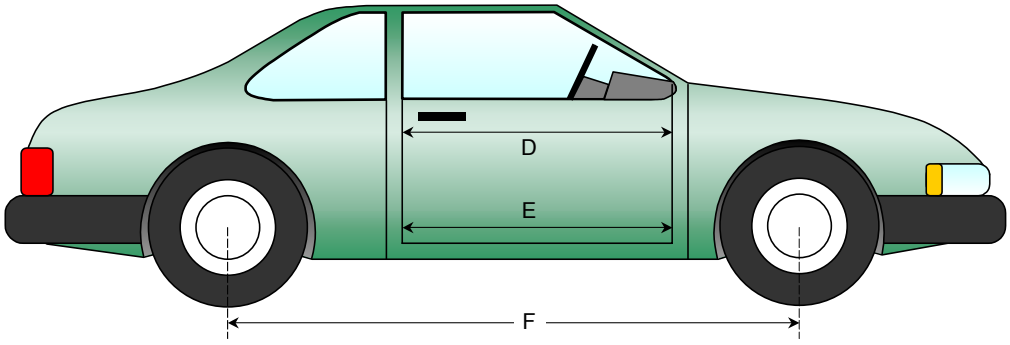
DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	966	963	3
B	Left Side Lower	mm	950	946	4
D	Right Side Upper	mm	968	967	1
E	Right Side Lower	mm	949	946	3

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2504	2444	60
F	Right Side Wheelbase	mm	2505	2450	55





DATA SHEET NO. 13... (continued)

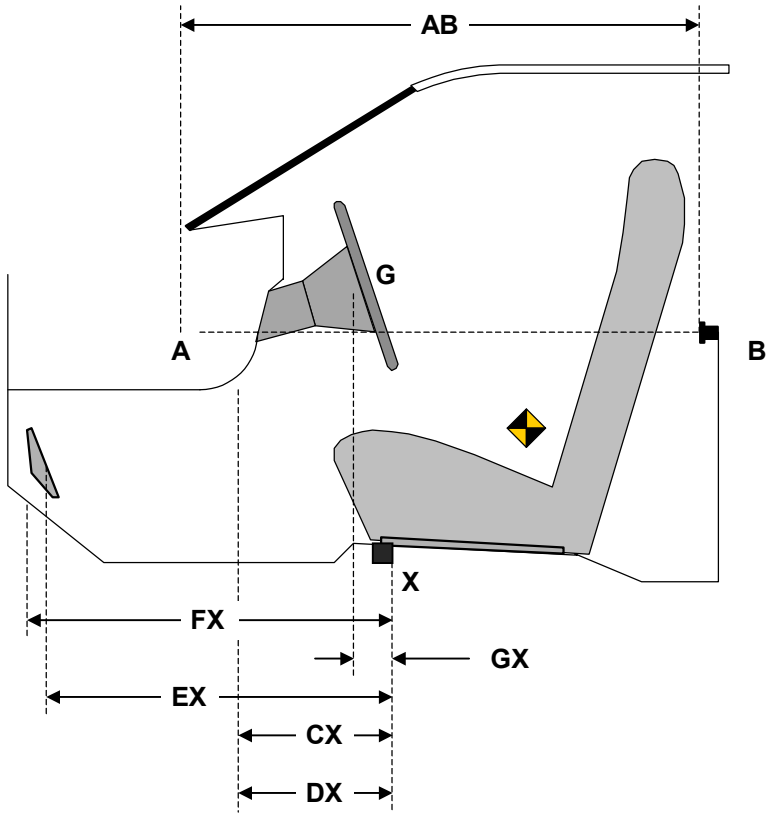
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2006 Toyota Scion XB NHTSA No.: M65102
Test Program: 35mph Frontal Impact Test Date: 9/15/2005

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside window jam)	mm	790	790	0
CX	Left Knee Bolster to X	mm	279	317	-38
DX	Right Knee Bolster to X	mm	283	276	7
EX	Brake Pedal to X	mm	515	481	34
FX	Foot Rest to X	mm	516	490	26
GX	Center of Steering Column Wheel Hub to X	mm	117	150	-33

X = Front of Seat Track (stationary)

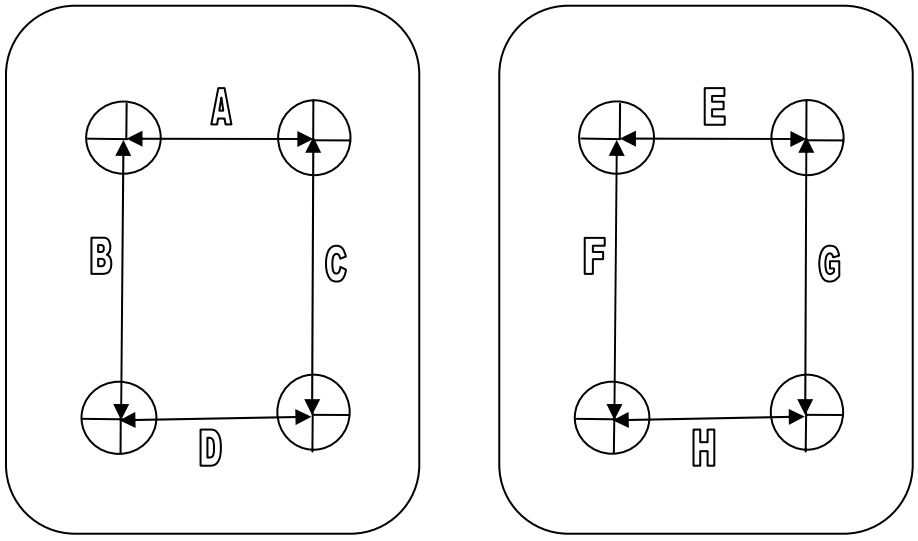


DRIVER COMPARTMENT

DATA SHEET NO. 13... (continued)

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2006 Toyota Scion XB NHTSA No.: M65102
Test Program: 35mph Frontal Impact Test Date: 9/15/2005



Driver Passenger

UNDERBODY FLOORBOARD DEFORMATION

Measurement	Pre-Test	Post-Test	Difference
A	442	432	10
B	300	300	0
C	300	300	0
D	438	434	4
E	452	452	0
F	300	300	0
G	300	300	0
H	462	462	0

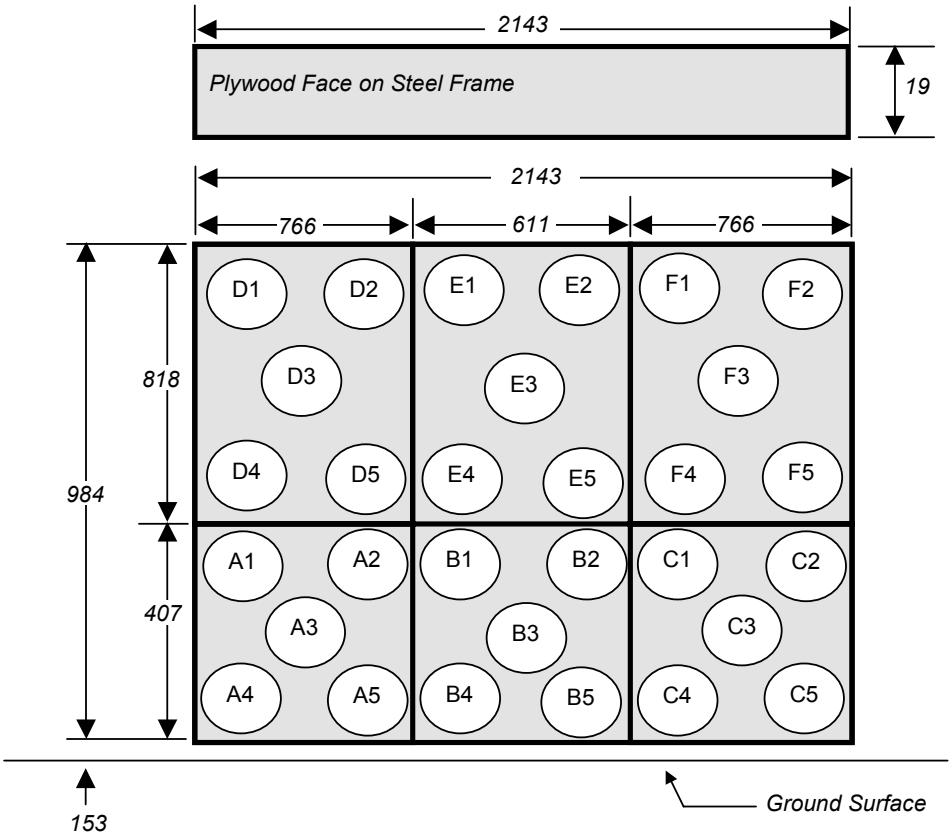
DATA SHEET NO. 14

LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2006 Toyota Scion XB NHTSA No.: M65102
Test Program: 35mph Frontal Impact Test Date: 9/15/2005

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: 2006 Toyota Scion XB NHTSA No.: M65102
Test Program: 35mph Frontal Impact Test Date: 9/15/2005

VEHICLE INFORMATION

VIN: JTLKT324564032028 Wheelbase (mm) : 2504
Vehicle Size Category: MPV Test Weight (kg) : 1298.0

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): 56.3
Velocity Change (km/h): 63.8 Time of Separation (msec): 87

CRUSH PROFILE

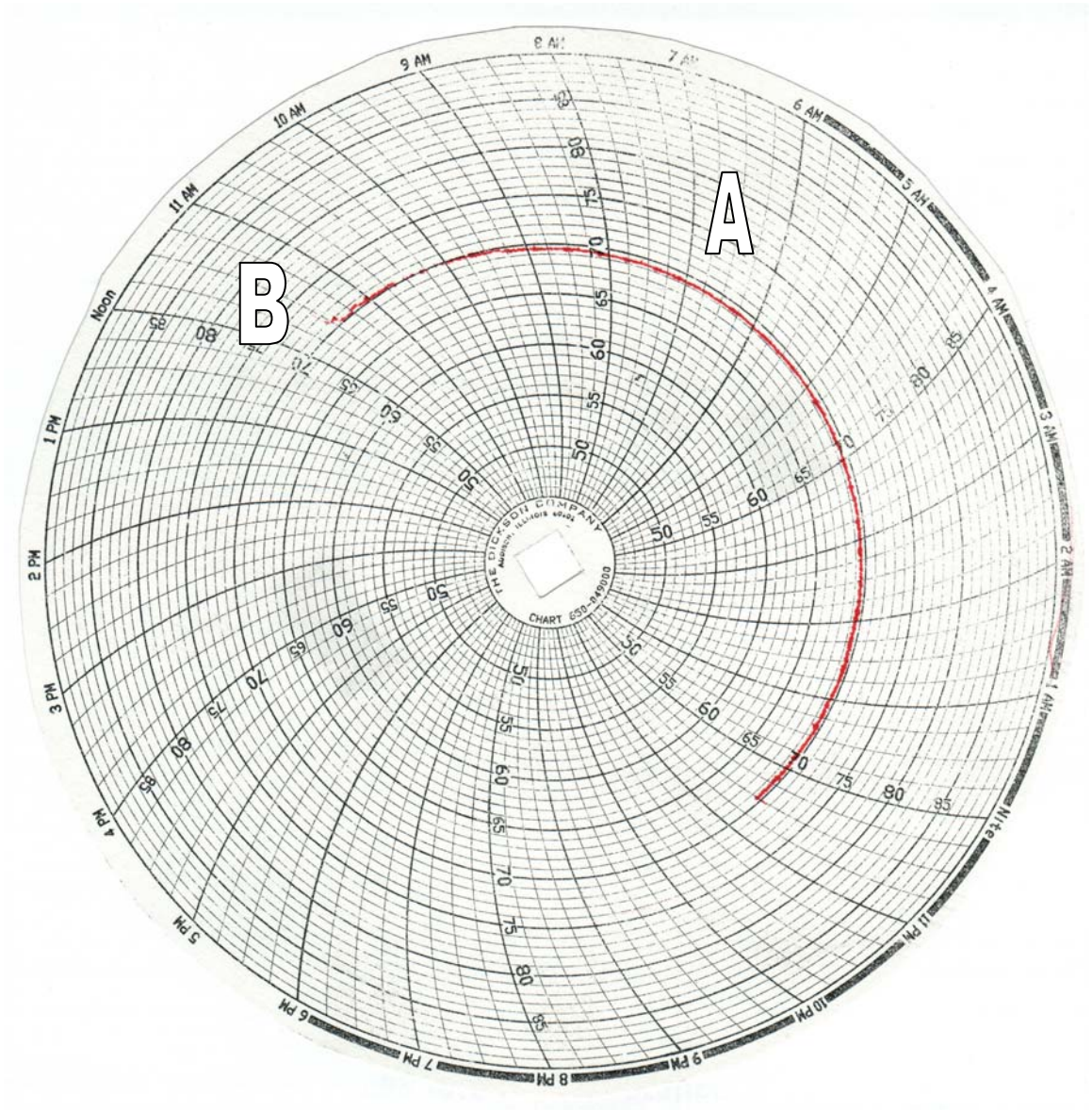
Collision Deformation Classification: Frontal Midpoint of Damage: Centerline
Damage Region Length (mm): 1200 Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	3834	3433	401
C2	Crush zone 2 at left side	mm	3884	3416	468
C3	Crush zone 3 at left side	mm	3920	3427	493
C4	Crush zone 4 at right side	mm	3916	3426	490
C5	Crush zone 5 at right side	mm	3889	3415	474
C6	Crush zone 6 at right side	mm	3836	3412	424
L	C1 TO C6	mm	1200	1170	30

DATA SHEET NO. 16

DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART

Test Vehicle:	2006 Toyota Scion XB	NHTSA No.:	M65102
Test Program:	35mph Frontal Impact	Test Date:	9/15/2005



A = Dummies installed in vehicle at 7:00 am

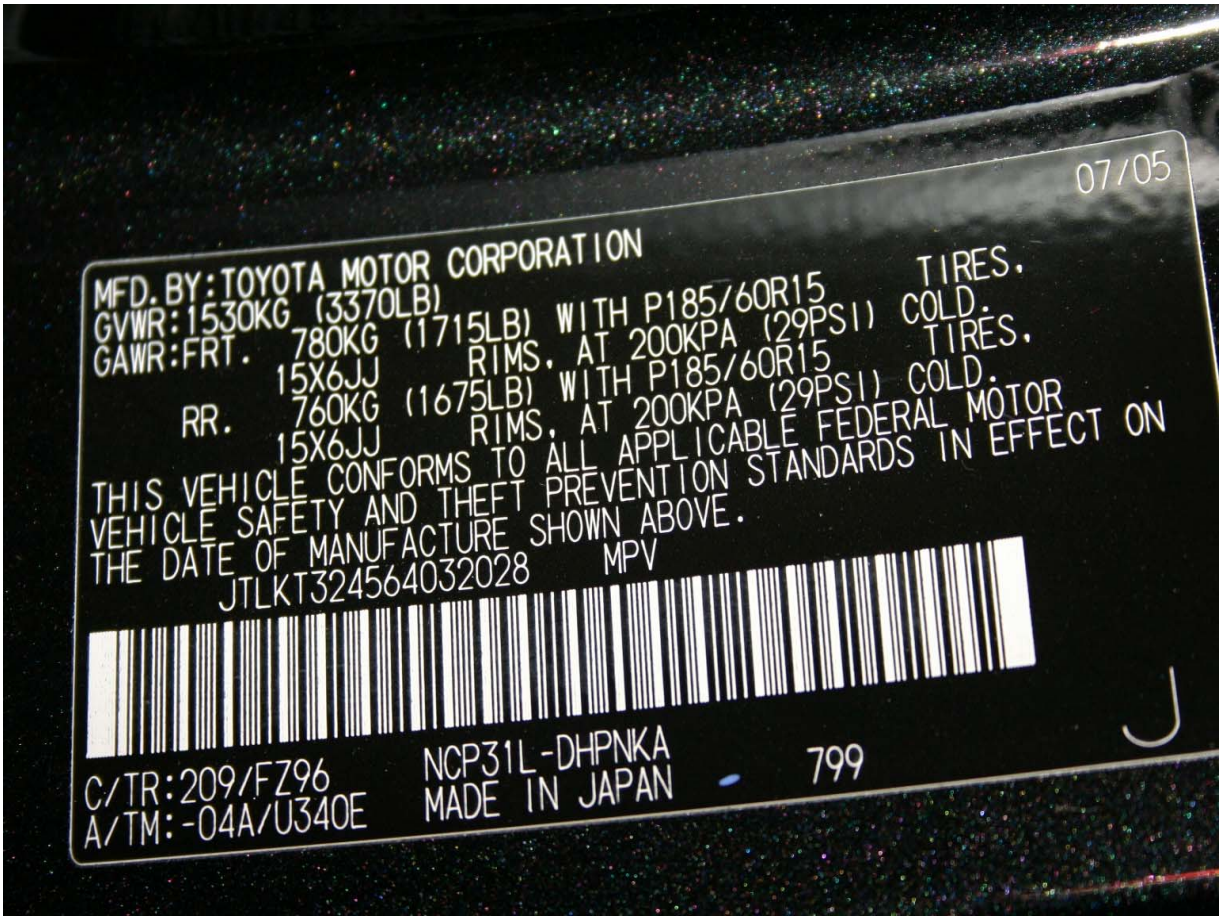
B = Test conducted at 11:38 am

APPENDIX A

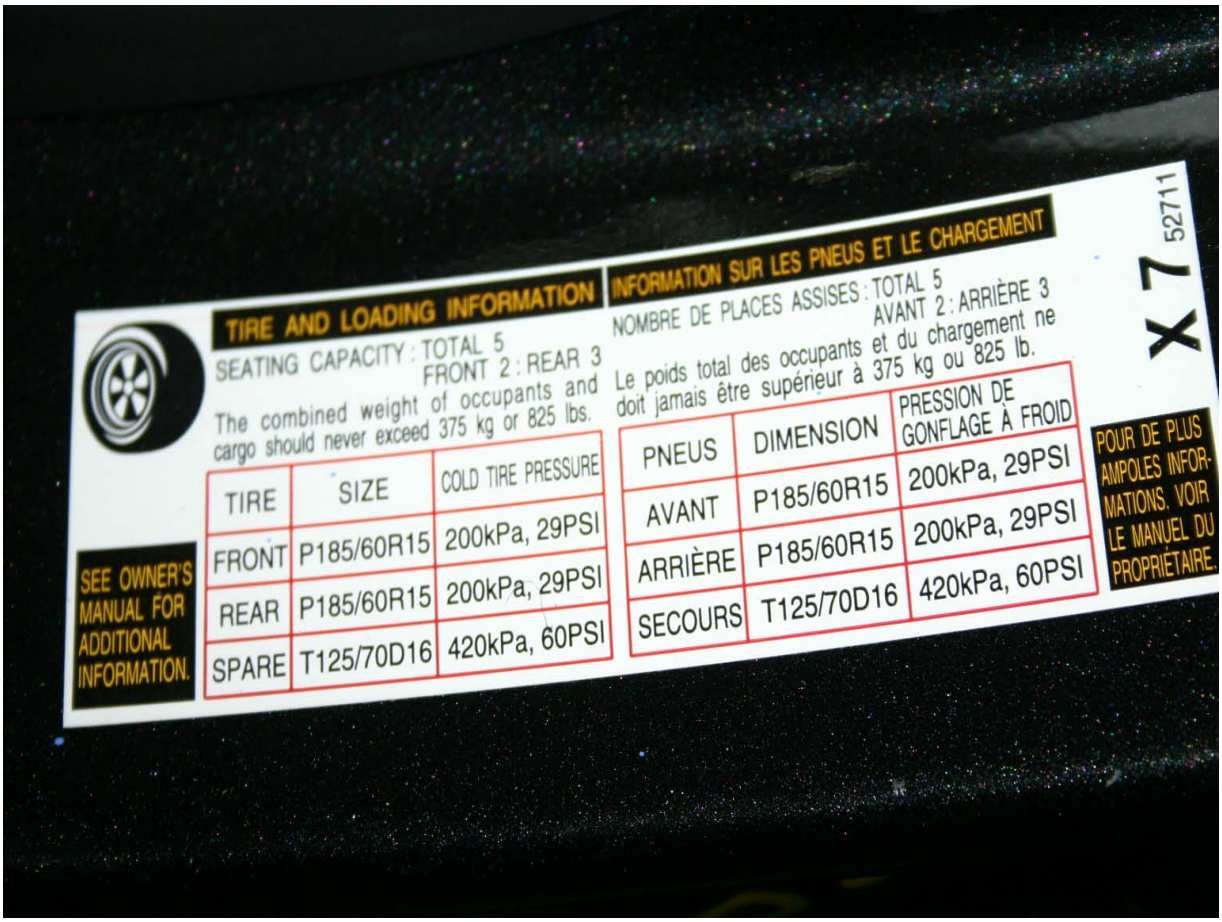
PHOTOGRAPHS

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

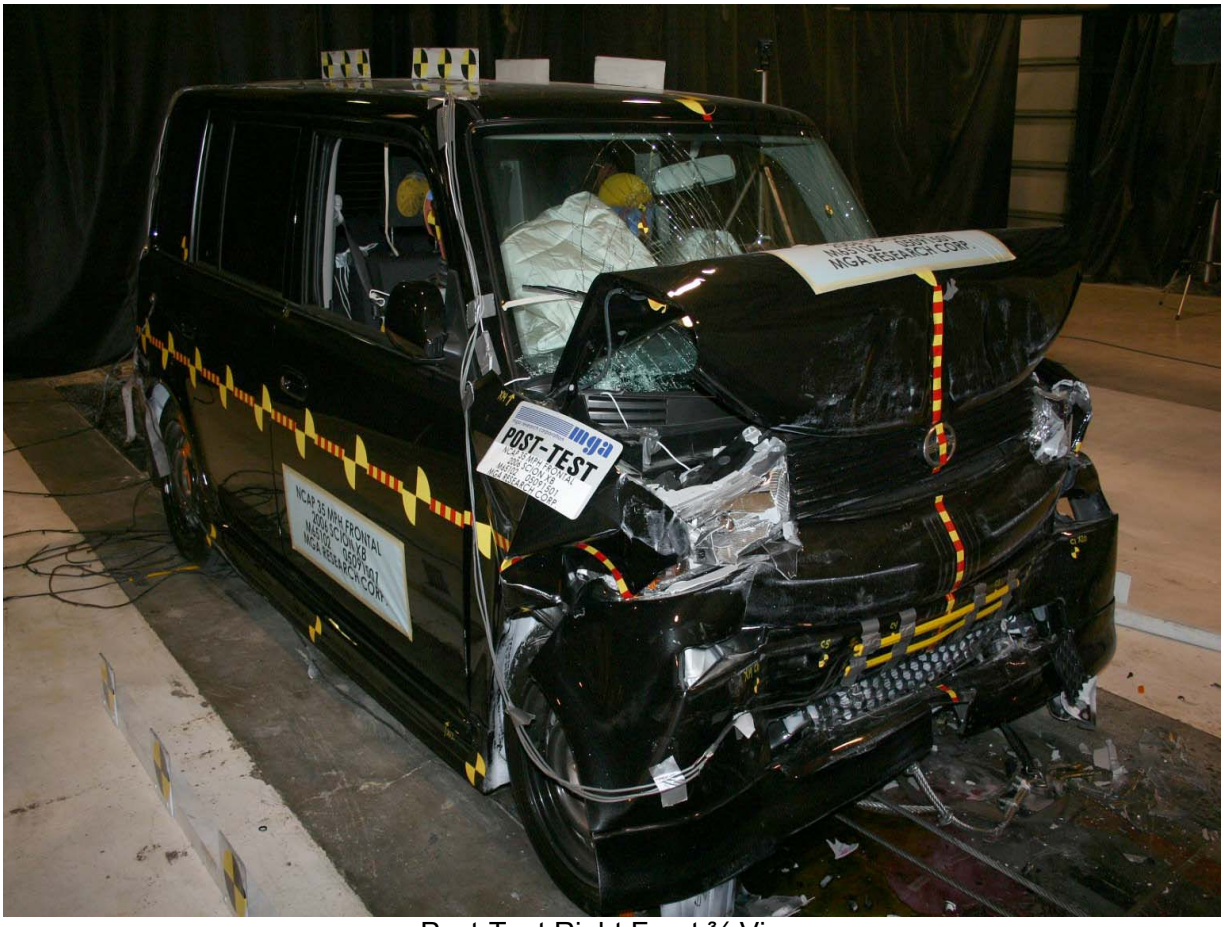
Pre-Test Left Side View

Post-Test Left Side View

Pre-Test Right Side View

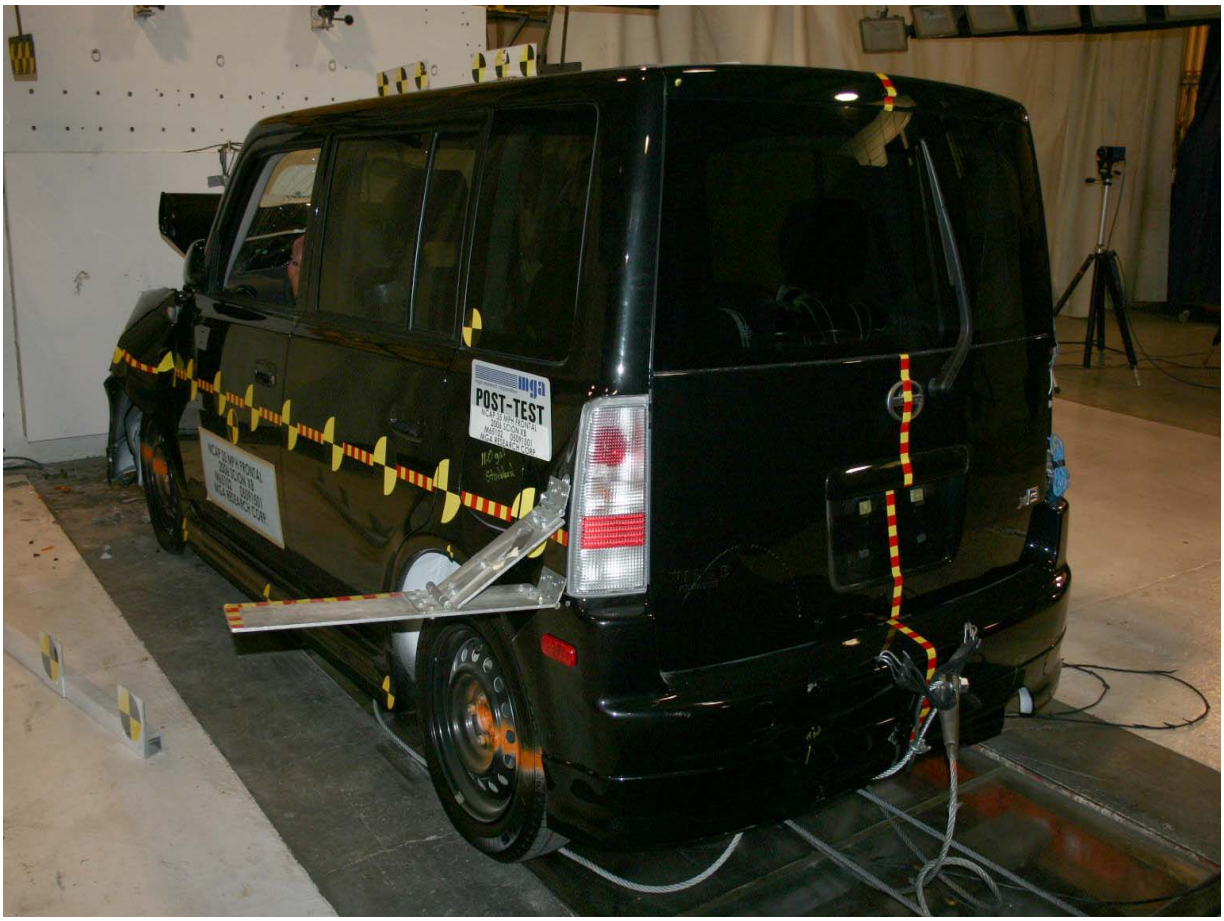
Post-Test Right Side View

Pre-Test Right Front ¾ View



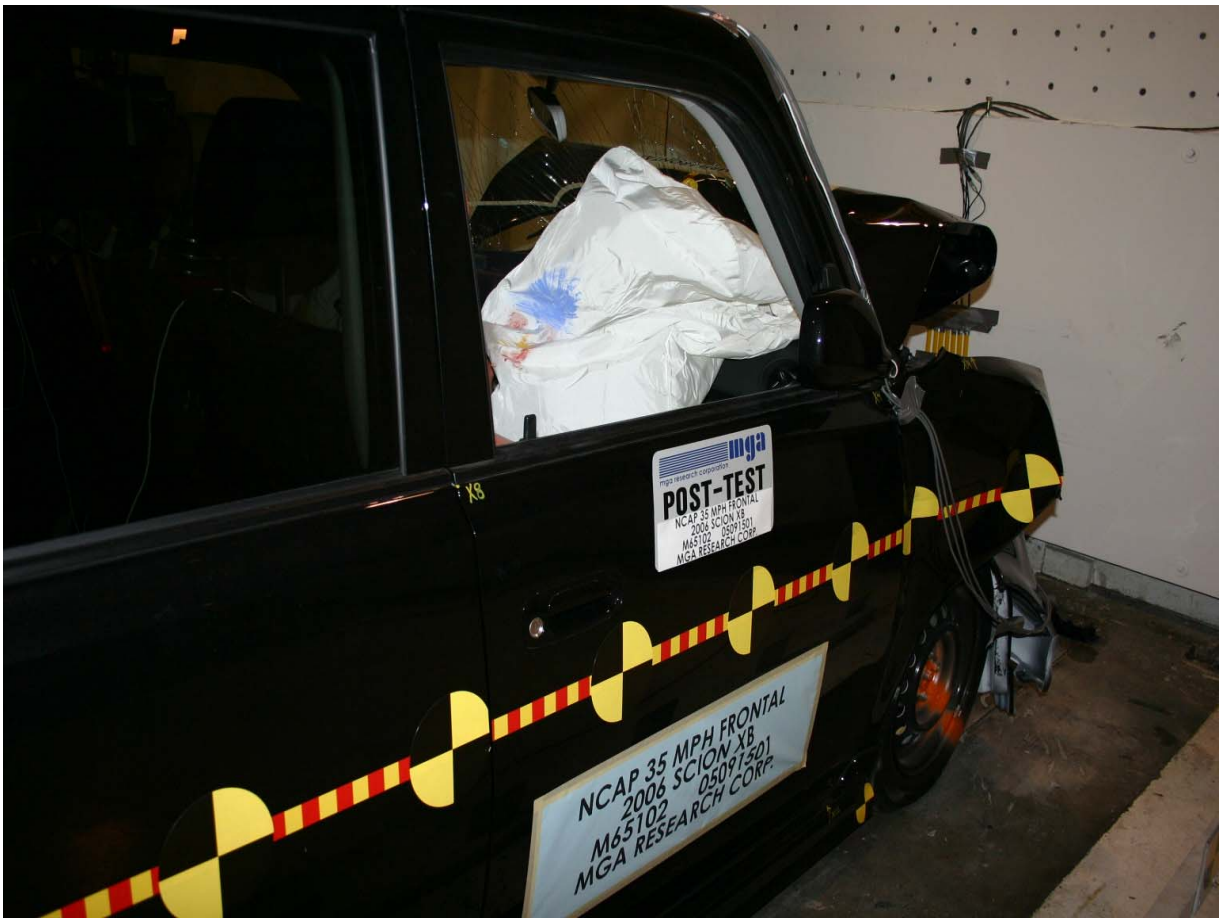
Post-Test Right Front ¾ View

Pre-Test Left Rear ¾ View



Post-Test Left Rear ¾ View

Post-Test Left Side ¾ View of Doors After Impact

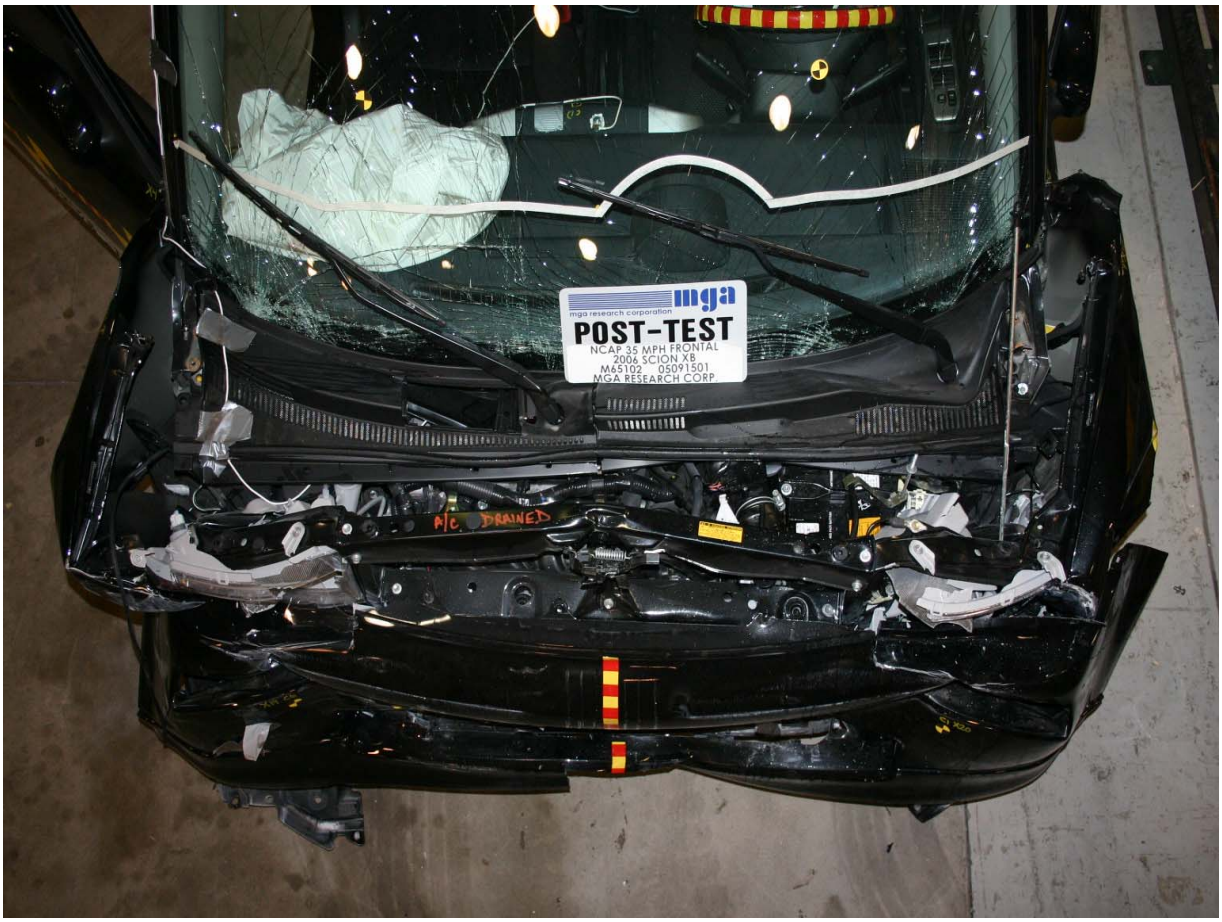


Post-Test Right Side ¾ View of Doors After Impact

Pre-Test Windshield View

Post-Test Windshield View

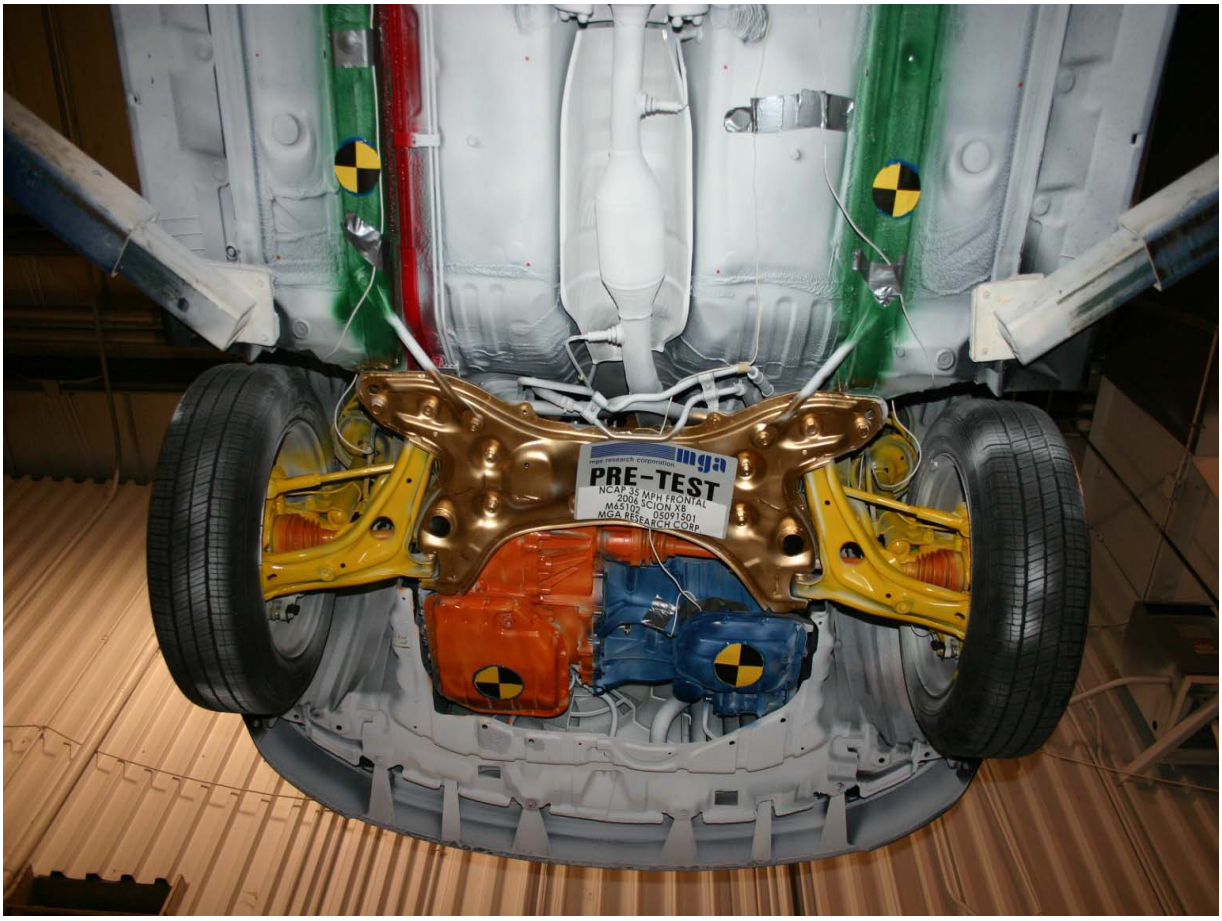
Pre-Test Engine Compartment View



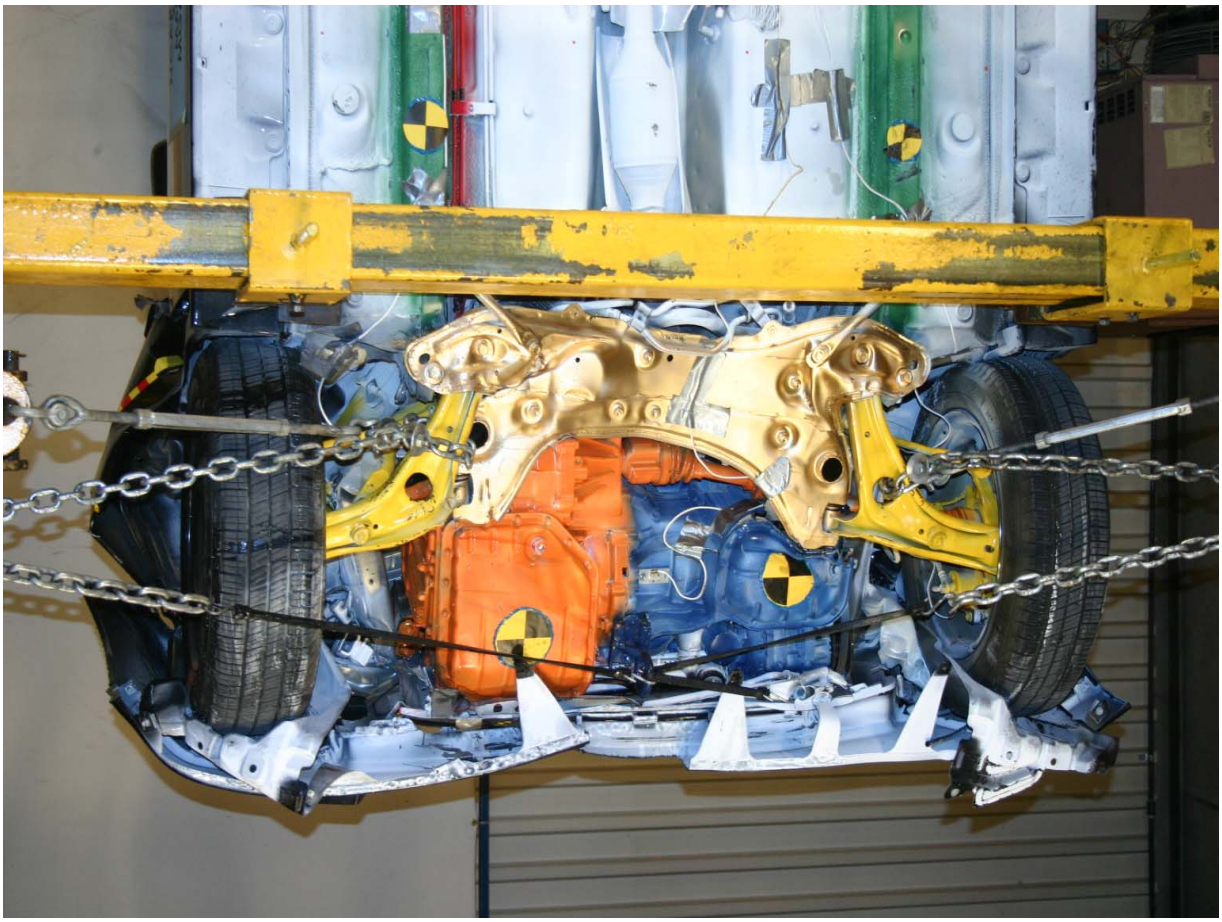
Post-Test Engine Compartment View (Vehicle Moved)

Pre-Test Fuel Cap View

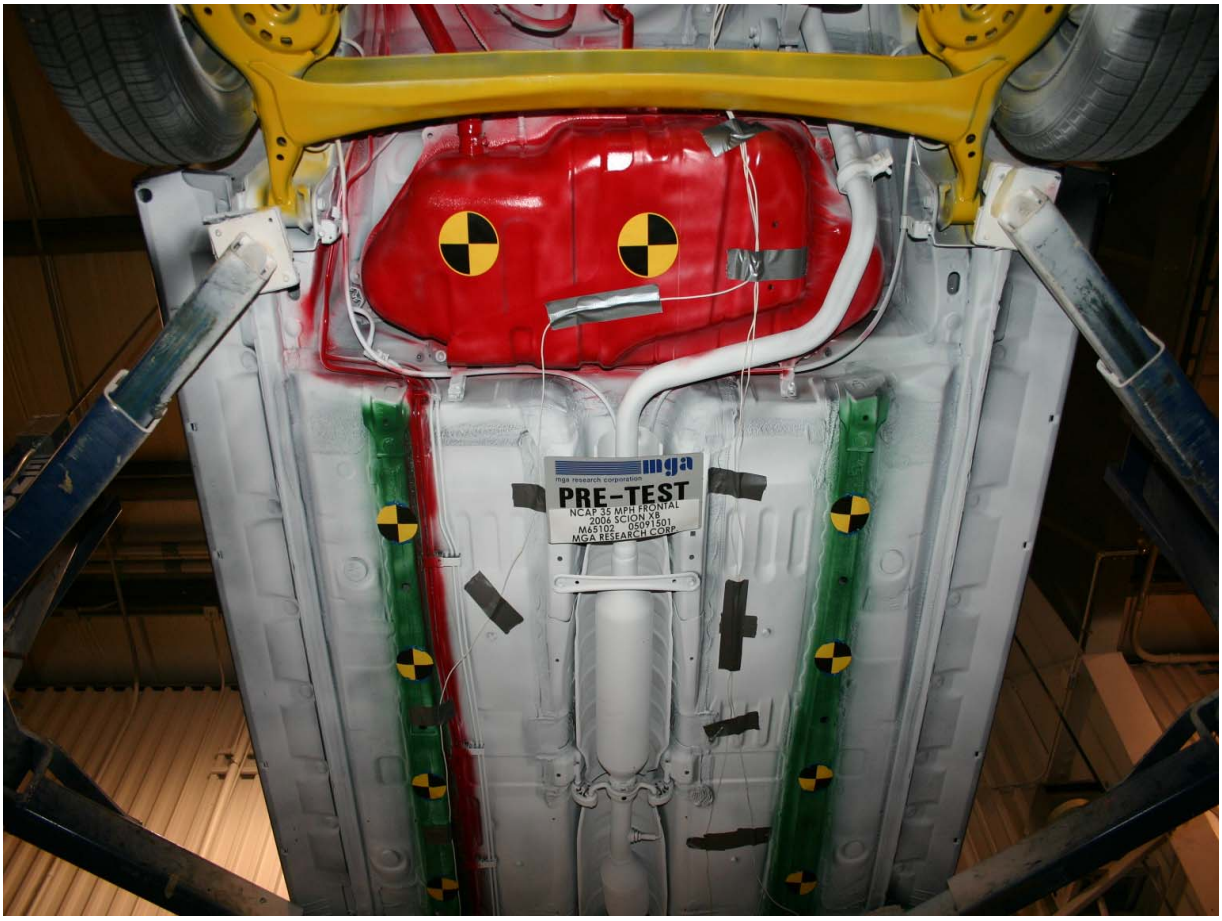
Post-Test Fuel Cap View



Pre-Test Front Underbody View

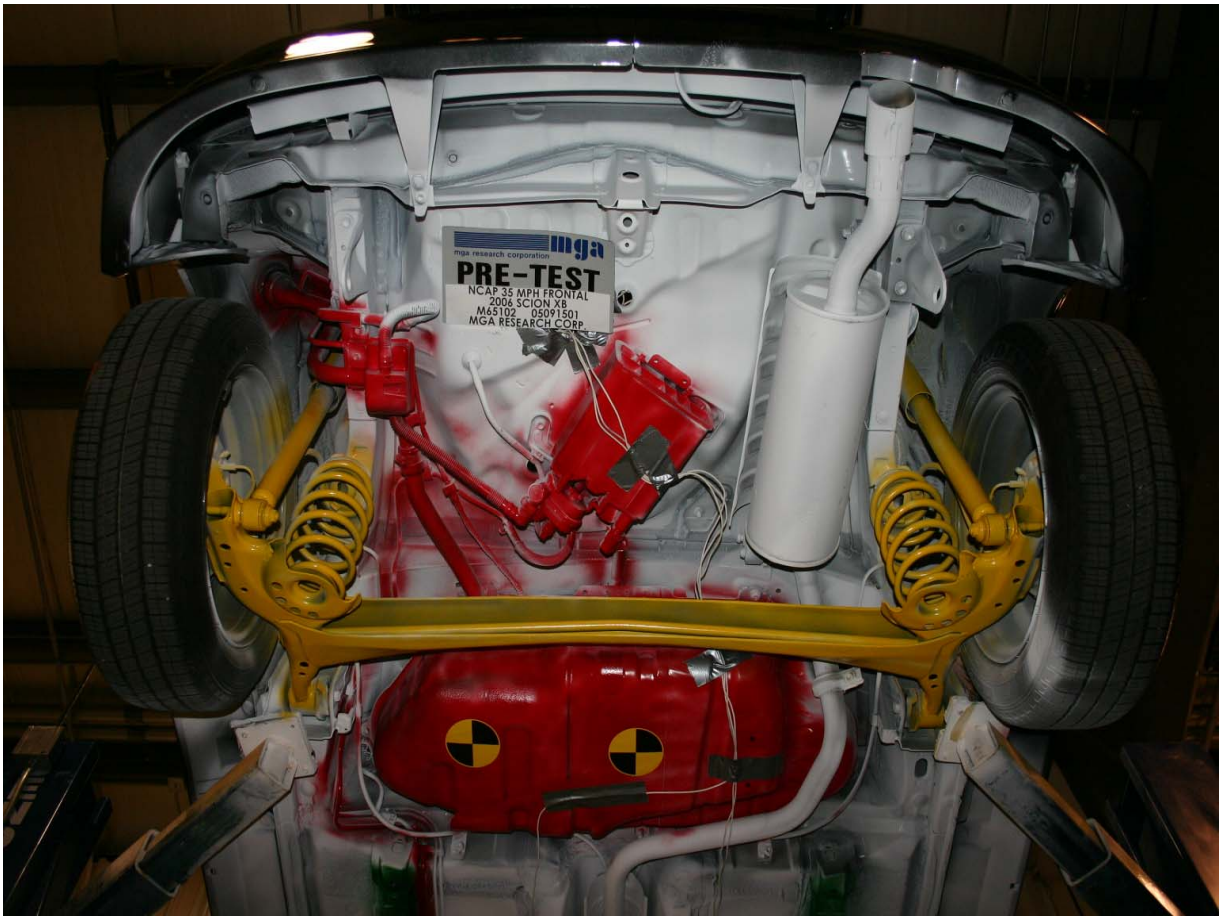


Post-Test Front Underbody View



Pre-Test Mid Underbody View


Post-Test Mid Underbody View

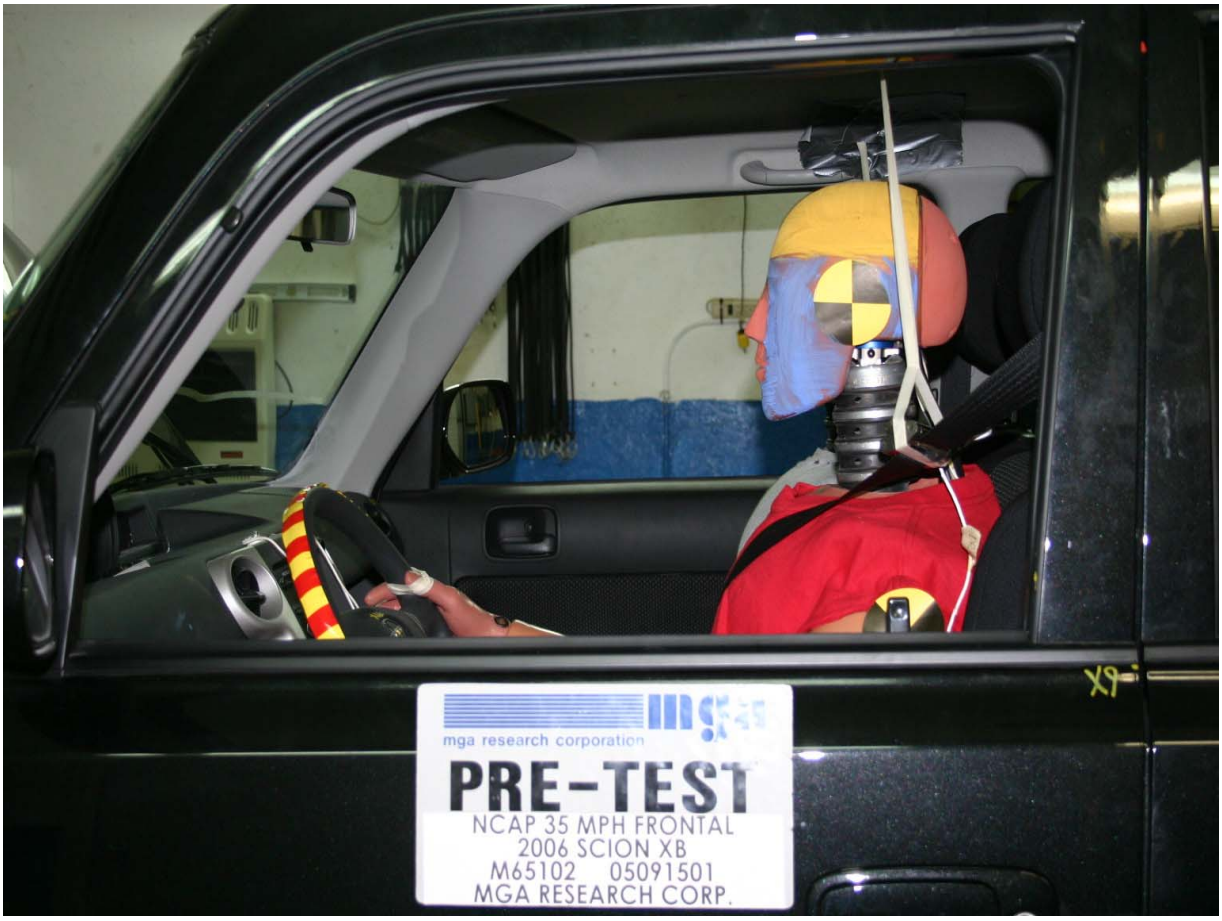


Pre-Test Rear Underbody View


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)

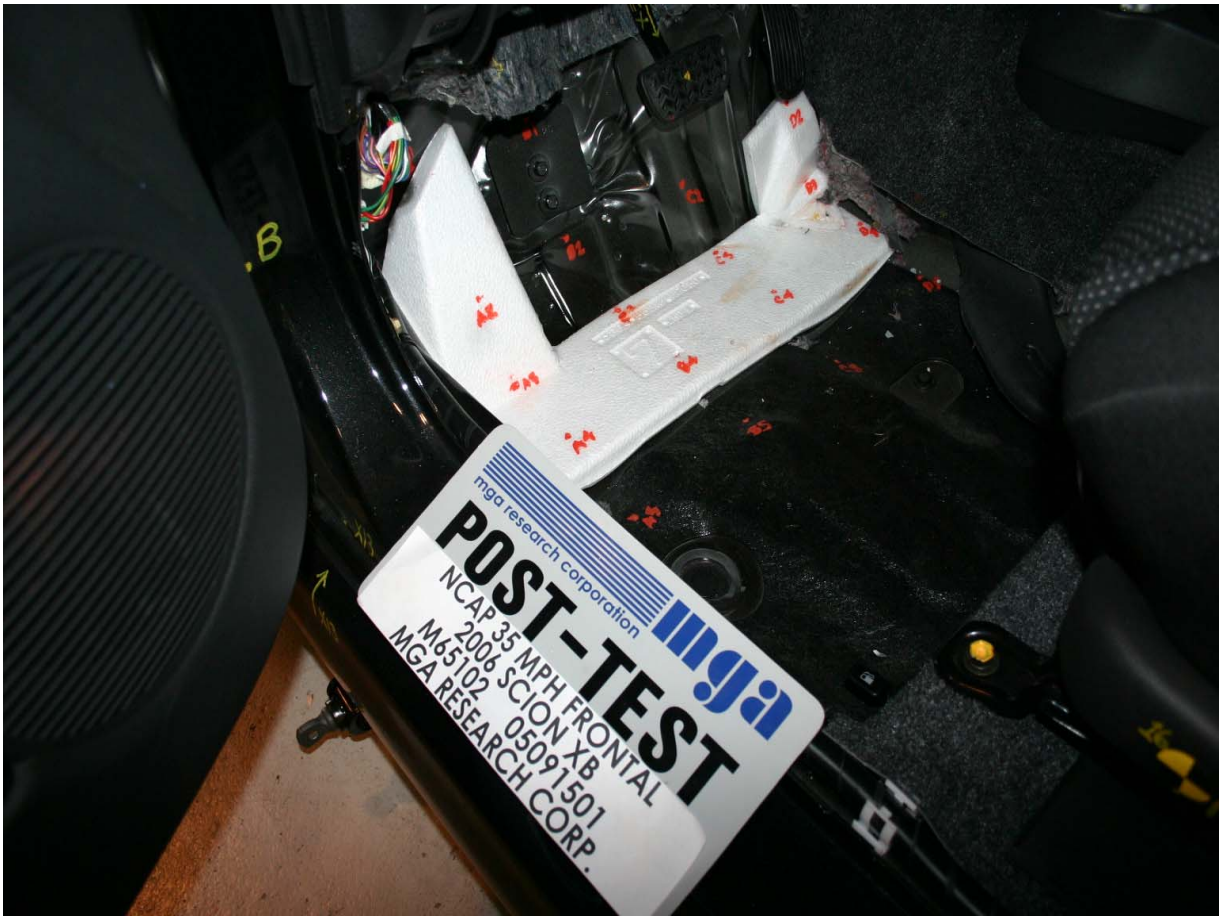
Post-Test Driver Dummy (Door Open)

Pre-Test Driver Dummy Feet

Post-Test Driver Dummy Feet

Pre-Test Driver Side Knee Bolster

Post-Test Driver Side Knee Bolster

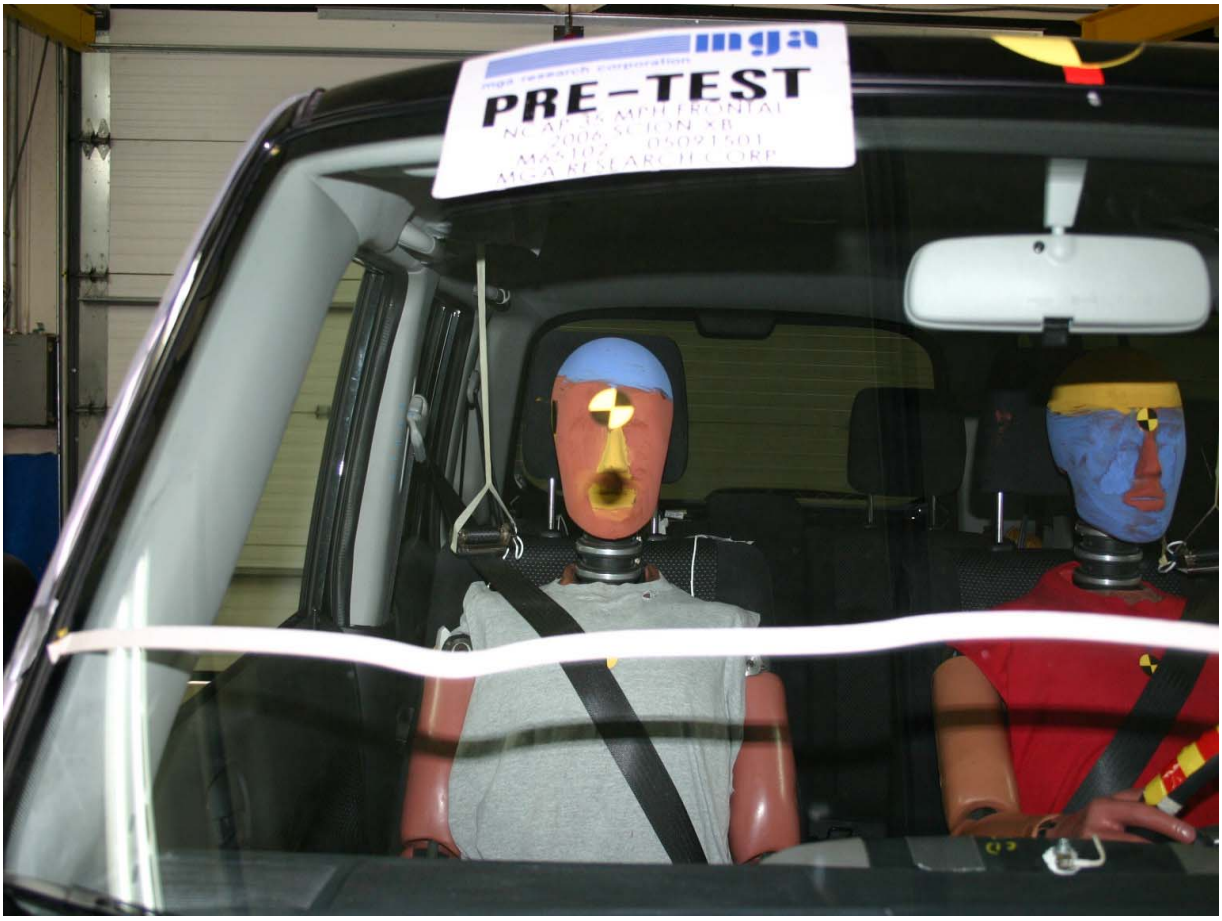


Post-Test Driver Side Floor Pan

Post-Test Driver Dummy Head Contact

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)

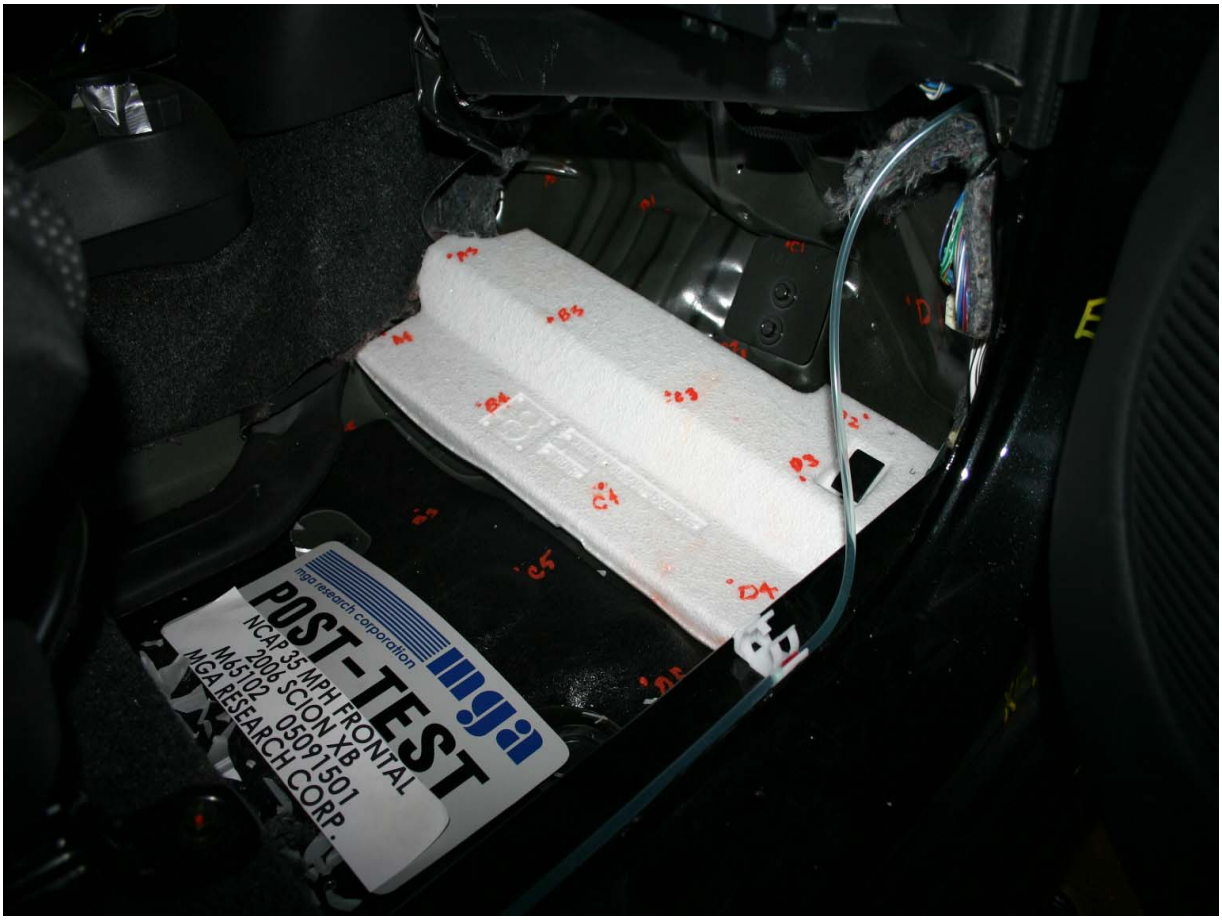
Post-Test Passenger Dummy (Door Open)

Pre-Test Passenger Dummy Feet

Post-Test Passenger Dummy Feet

Pre-Test Passenger Side Glove Box

Post-Test Passenger Side Glove Box



Post-Test Passenger Side Floor Pan

Post-Test Passenger Dummy Head Contact

Post-Test Passenger Dummy Knee Contact

Post-Test Passenger Dummy Airbag Contact

Vehicle on Rollover Device at 90 Degrees

Vehicle on Rollover Device at 180 Degrees

Vehicle on Rollover Device at 270 Degrees

Vehicle on Rollover Device at 360 Degrees

Vehicle Impact

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

Vehicle Instrument Panel X

Barrier Force – Upper Right

Barrier Force – Upper Center

Barrier Force – Upper Right

Barrier Force – Lower Right

Barrier Force – Lower Center

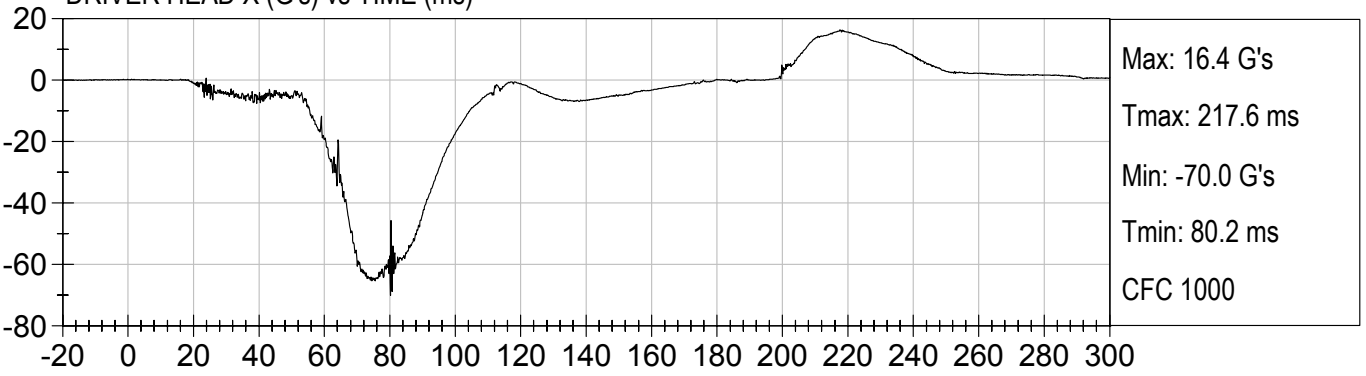
Barrier Force – Lower Right

Barrier Contact

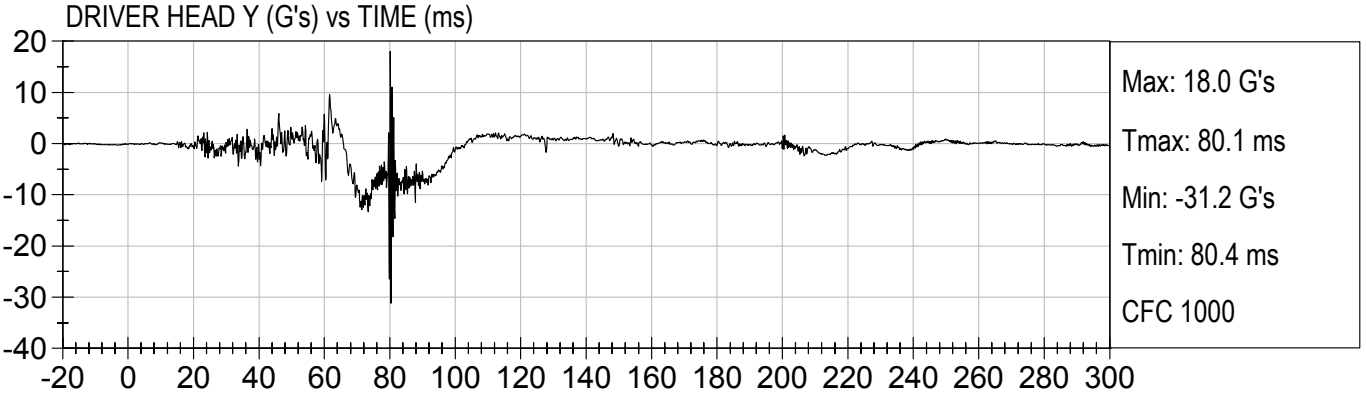
NCAP 35MPH FRONTAL
2006 TOYOTA SCION XB (M65102)

Test Date: 9/15/2005
Speed: 35.0 mph (56.3 km/h)

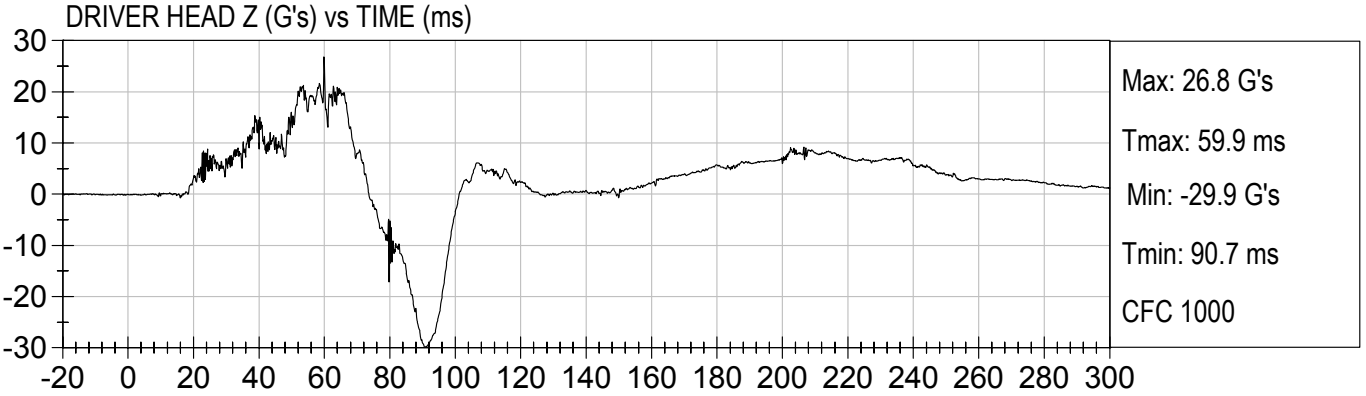
DRIVER HEAD X (G's) vs TIME (ms)



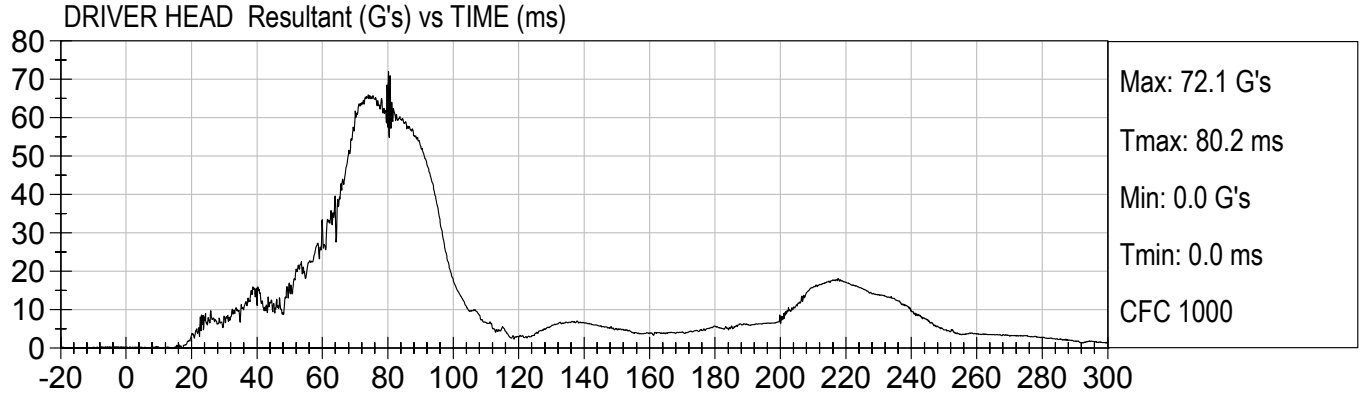
DRIVER HEAD Y (G's) vs TIME (ms)



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

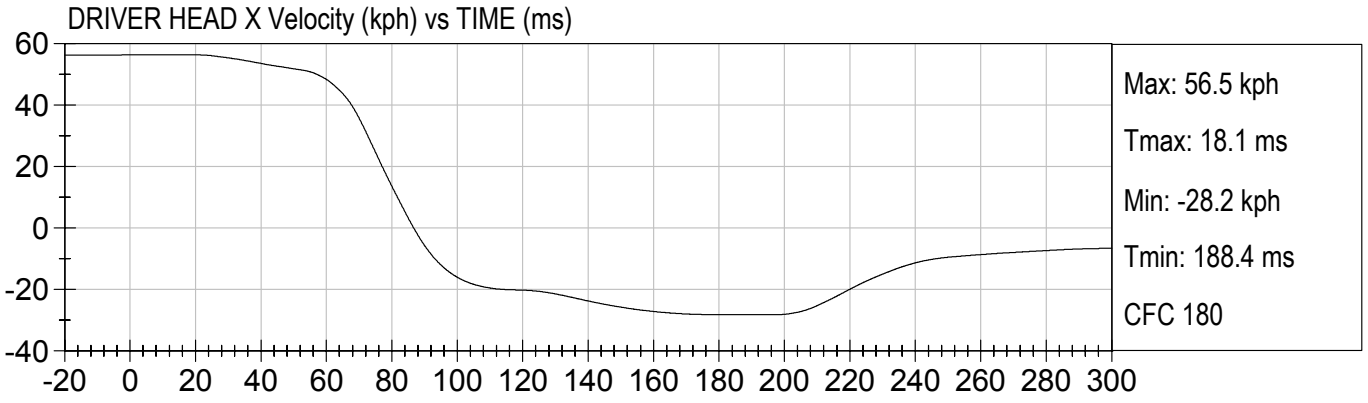


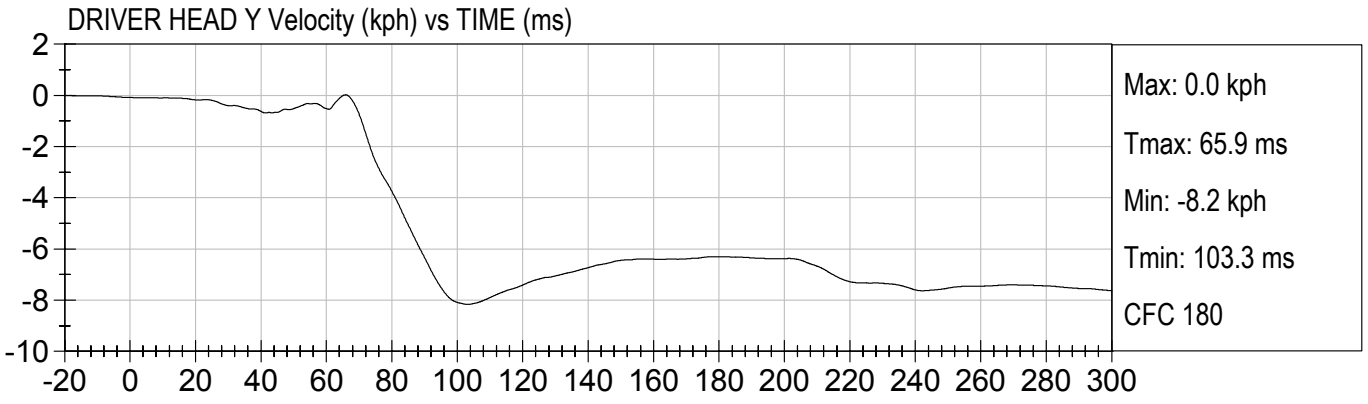
DRIVER HEAD Resultant (G's) vs TIME (ms)

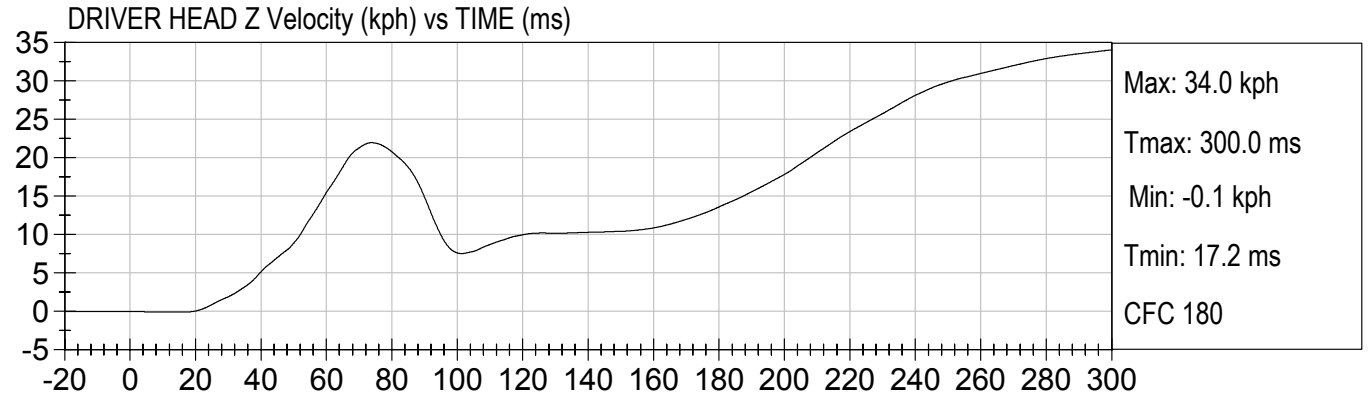


NCAP 35MPH FRONTAL
2006 TOYOTA SCION XB (M65102)

Test Date: 9/15/2005
Speed: 35.0 mph (56.3 km/h)

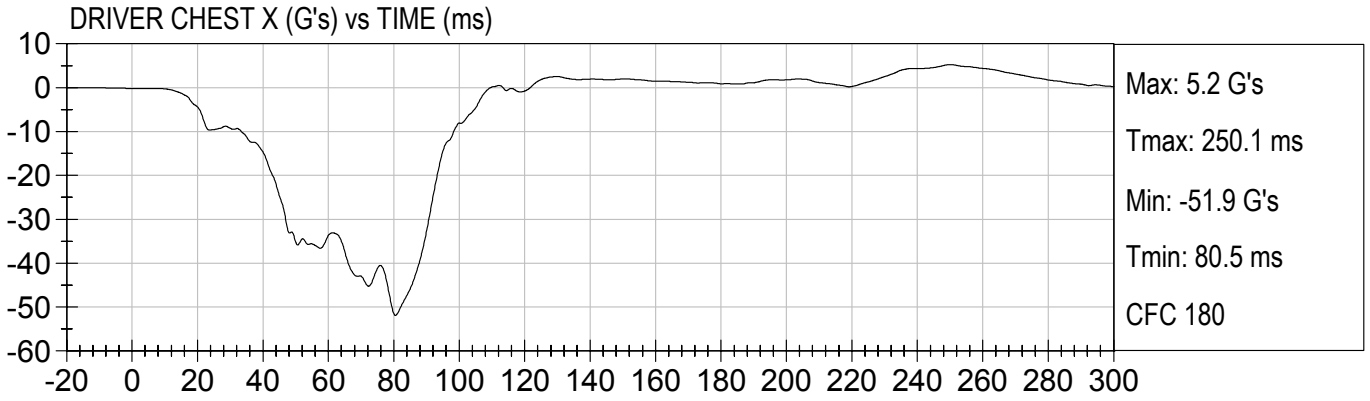


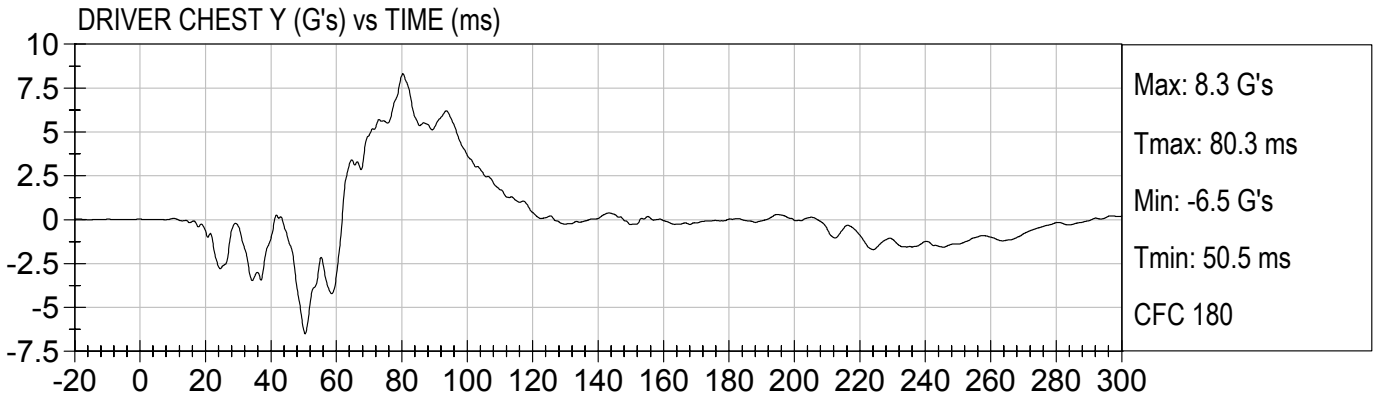


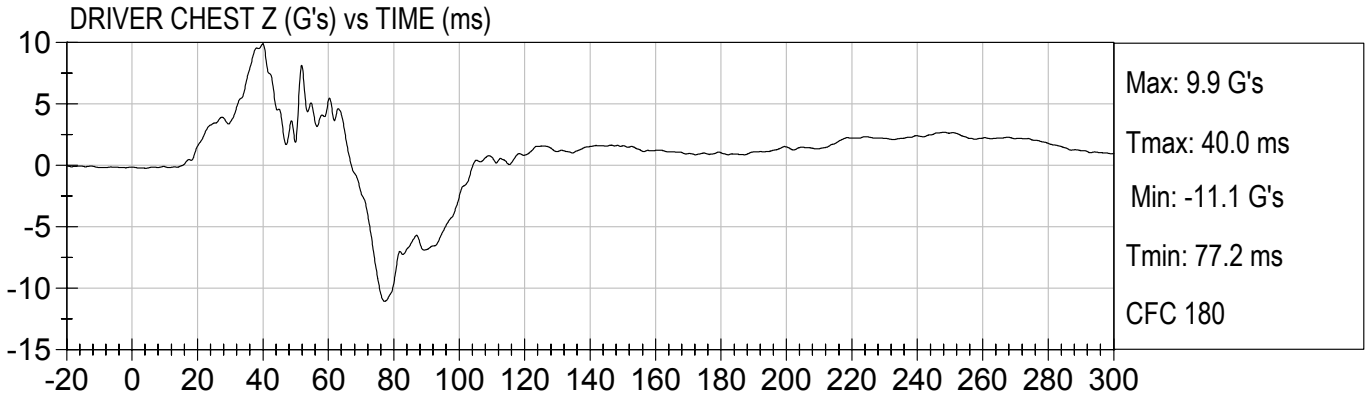


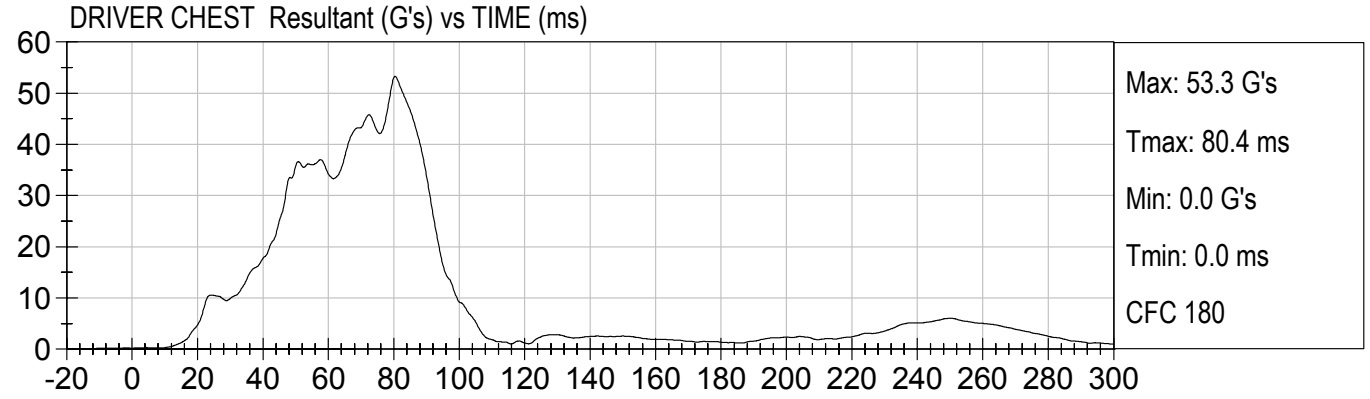
NCAP 35MPH FRONTAL
2006 TOYOTA SCION XB (M65102)

Test Date: 9/15/2005
Speed: 35.0 mph (56.3 km/h)

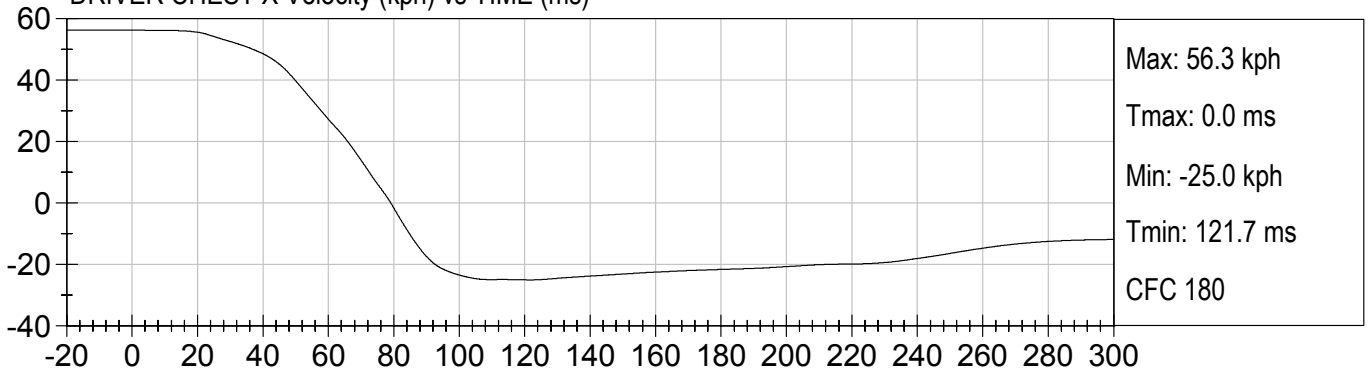




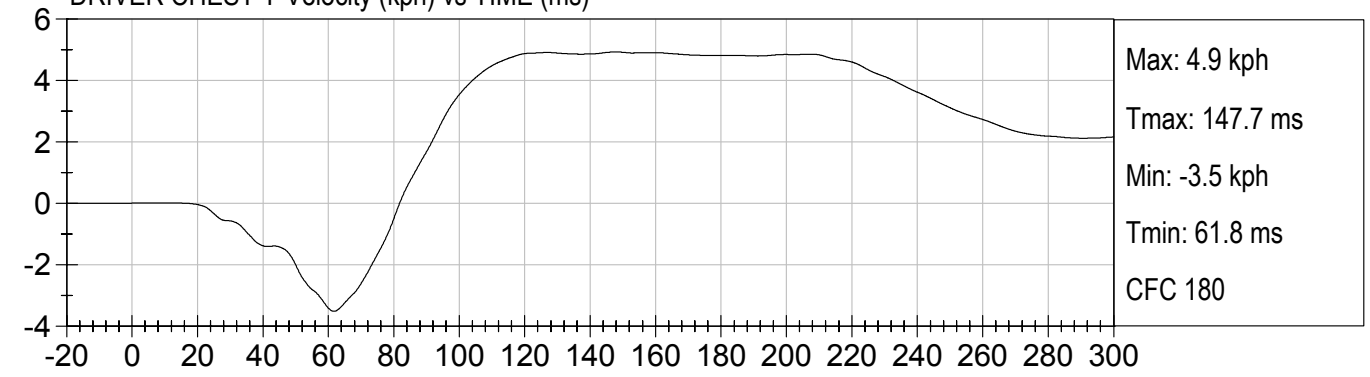




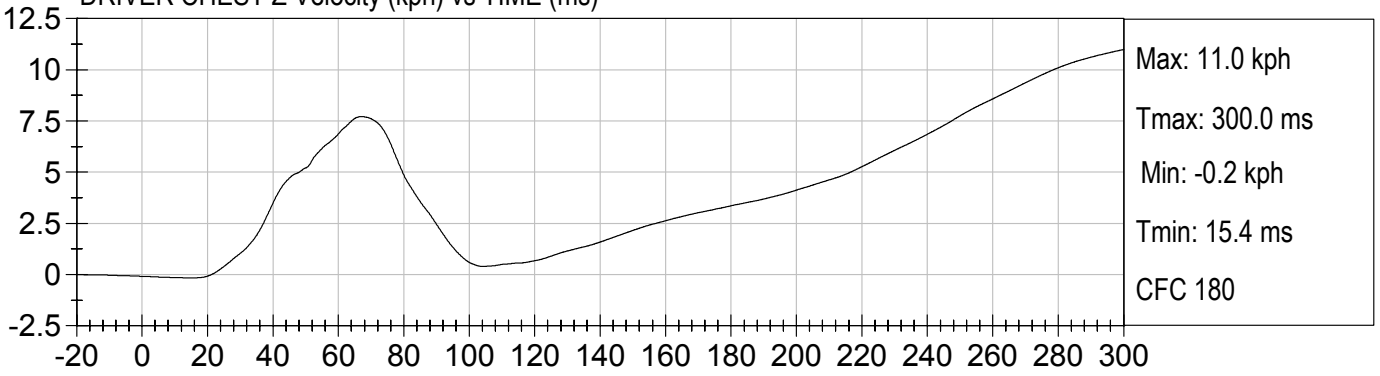
DRIVER CHEST X Velocity (kph) vs TIME (ms)



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

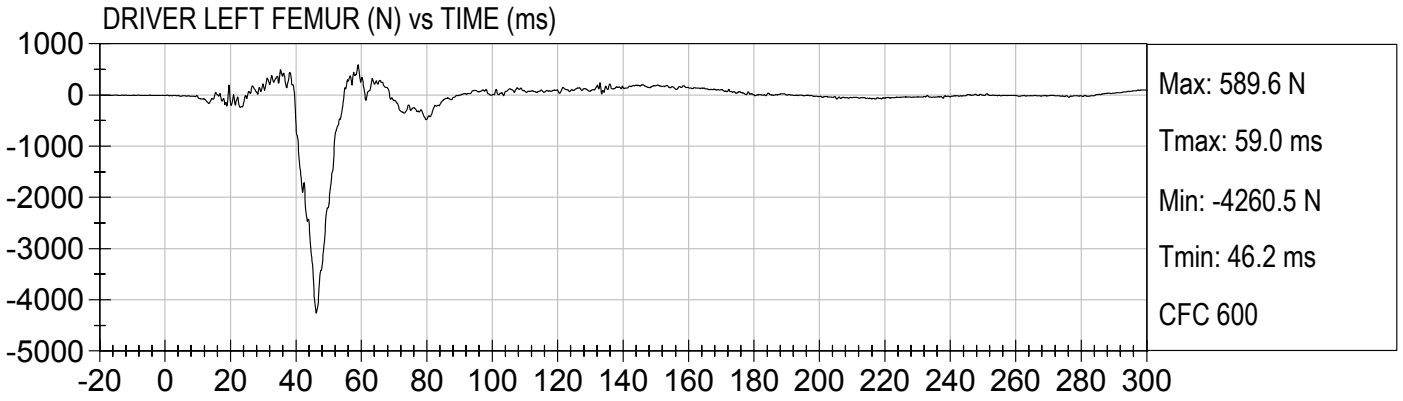


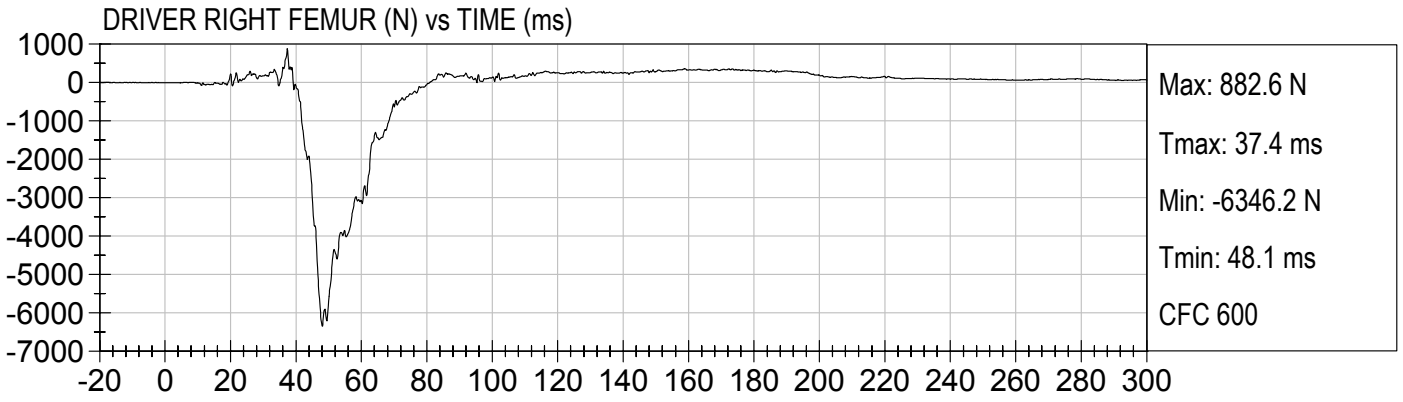
DRIVER CHEST Z Velocity (kph) vs TIME (ms)



NCAP 35MPH FRONTAL
2006 TOYOTA SCION XB (M65102)

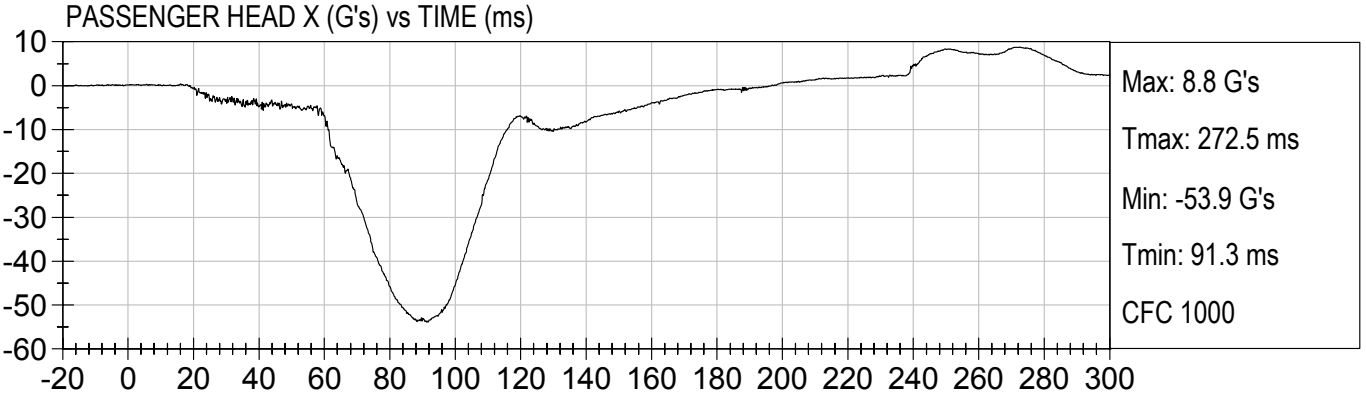
Test Date: 9/15/2005
Speed: 35.0 mph (56.3 km/h)

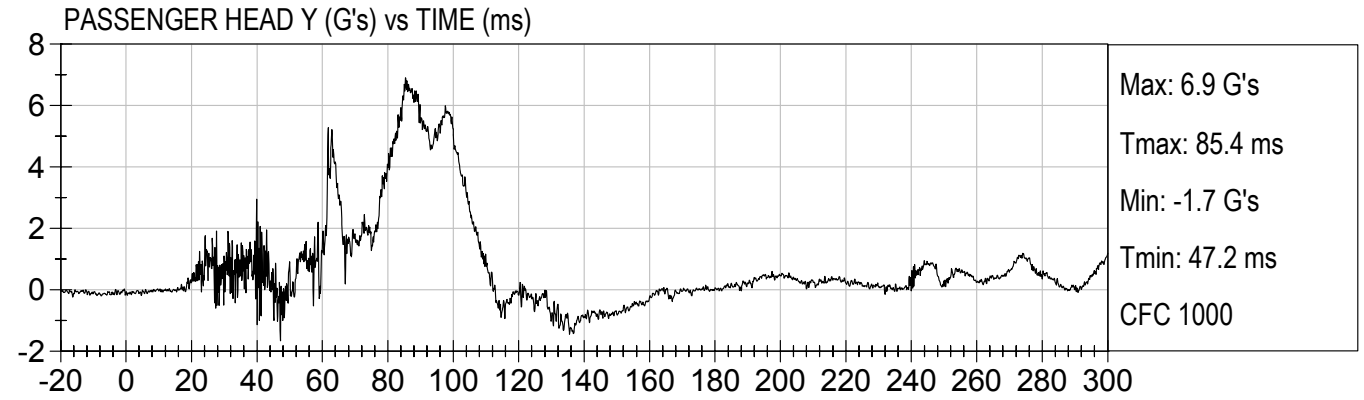


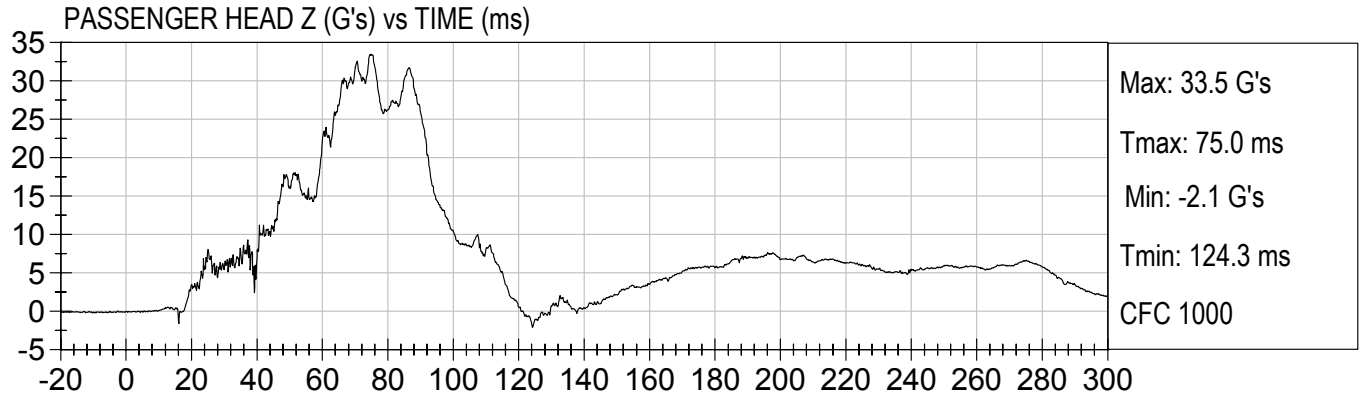


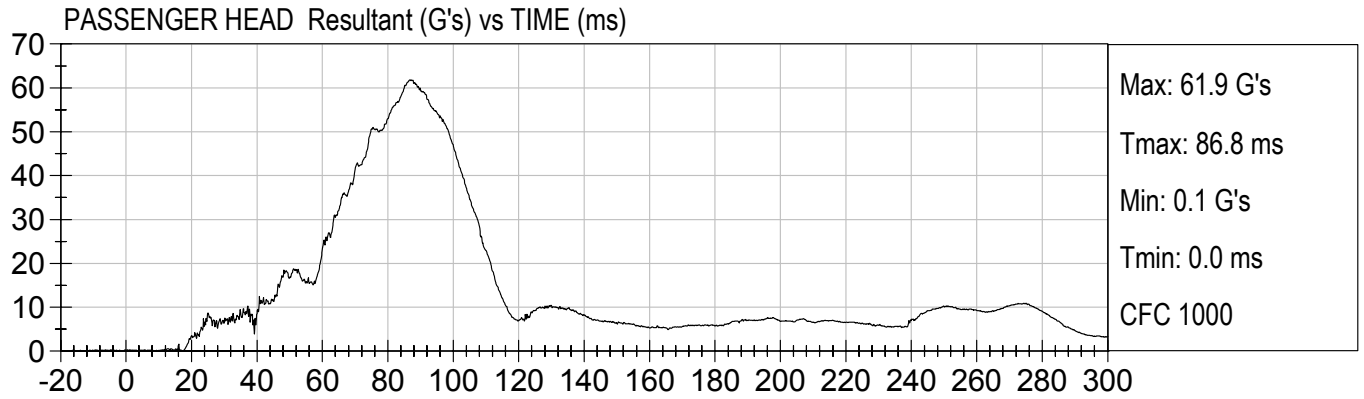
NCAP 35MPH FRONTAL
2006 TOYOTA SCION XB (M65102)

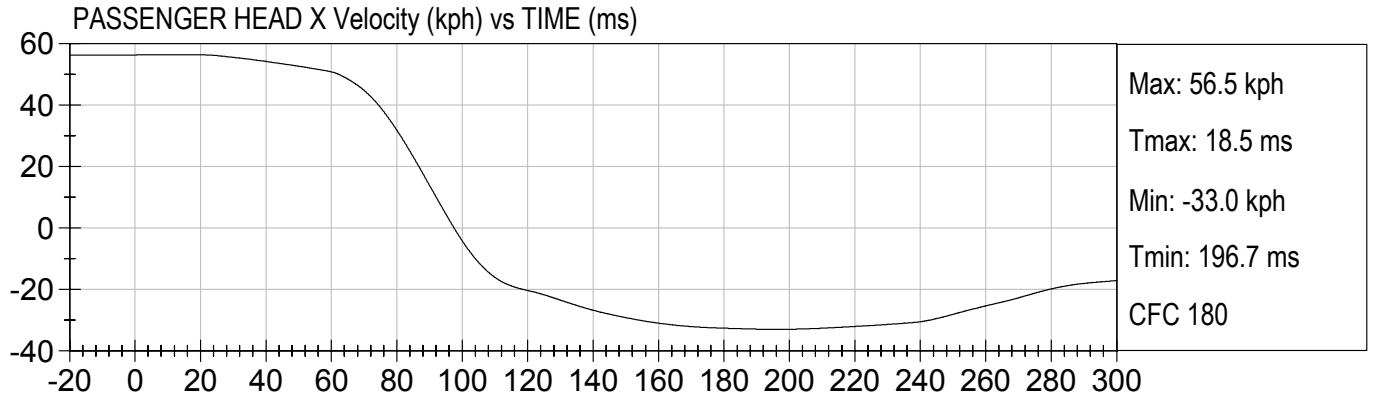
Test Date: 9/15/2005
Speed: 35.0 mph (56.3 km/h)

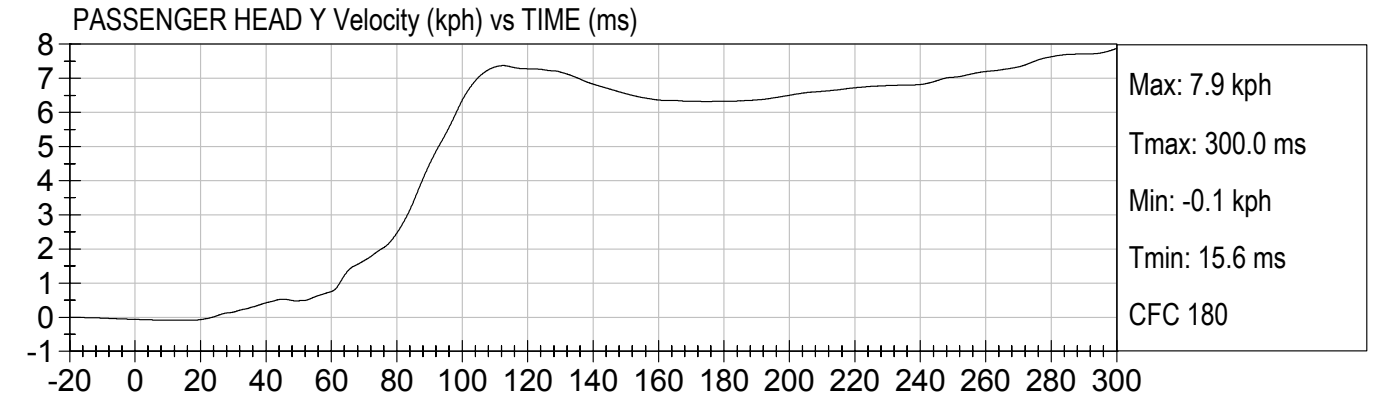


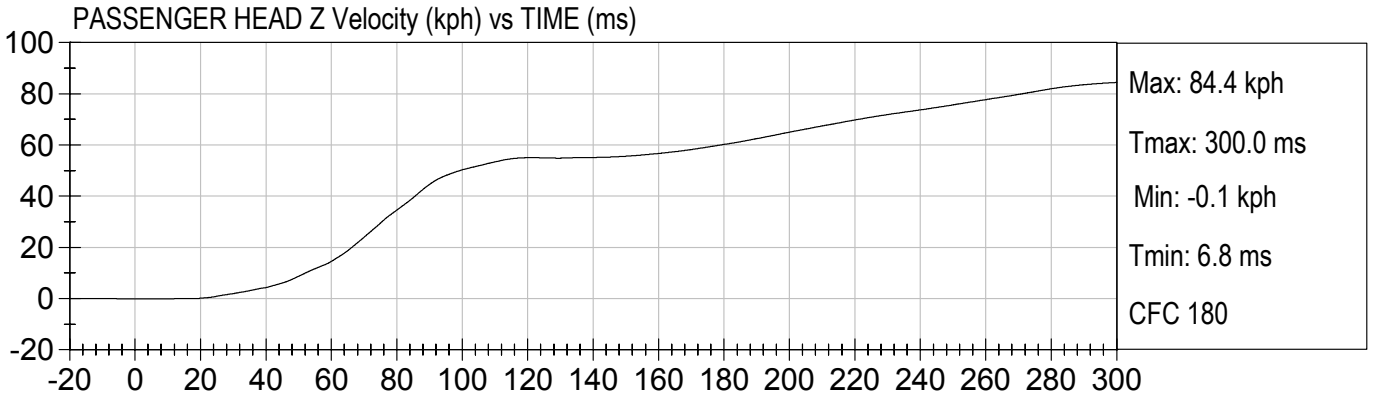






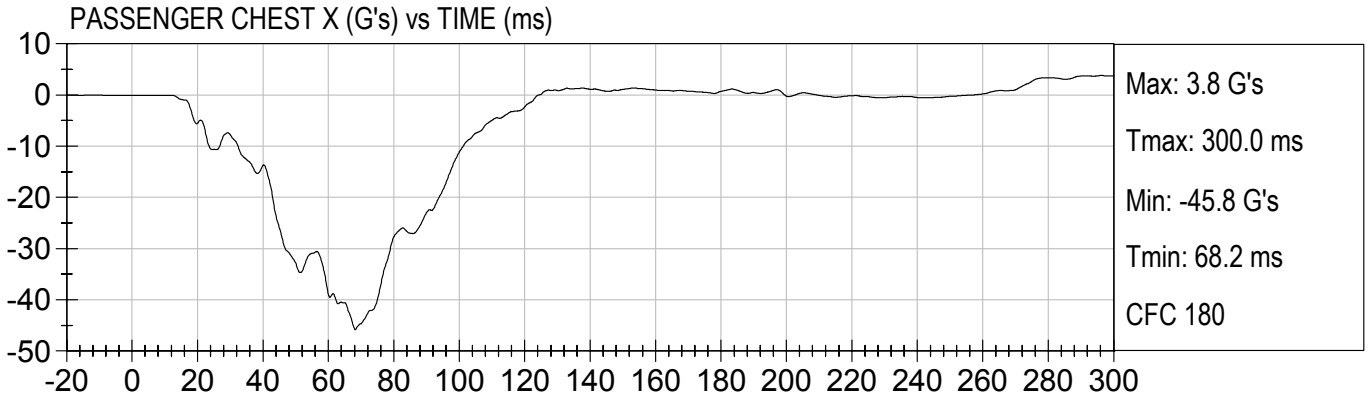

PASSENGER HEAD X Velocity (kph) vs TIME (ms)
60
40
20
0
-20
-40
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 56.5 kph
Tmax: 18.5 ms
Min: -33.0 kph
Tmin: 196.7 ms
CFC 180

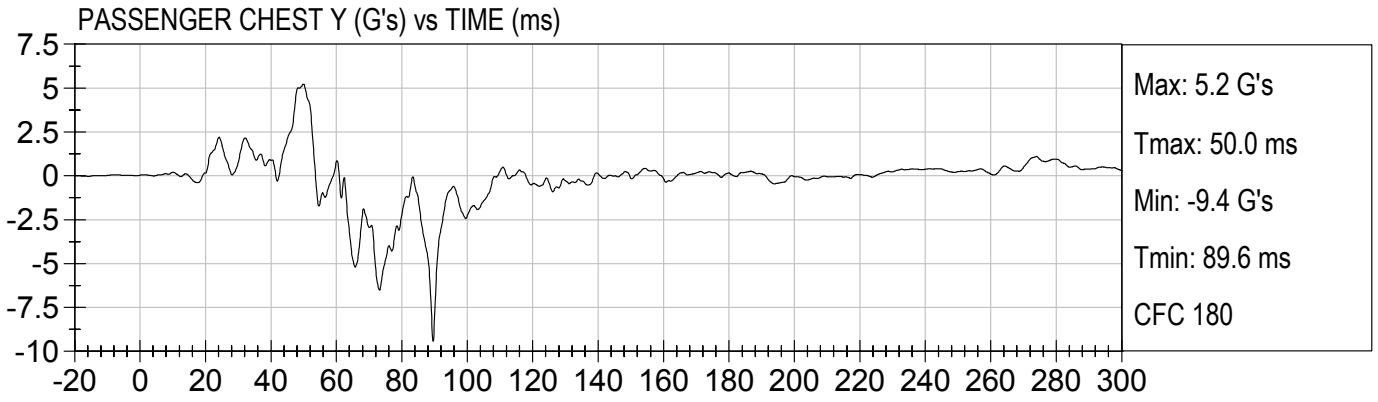

PASSENGER HEAD Y Velocity (kph) vs TIME (ms)
8
7
6
5
4
3
2
1
0
-1
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 7.9 kph
Tmax: 300.0 ms
Min: -0.1 kph
Tmin: 15.6 ms
CFC 180

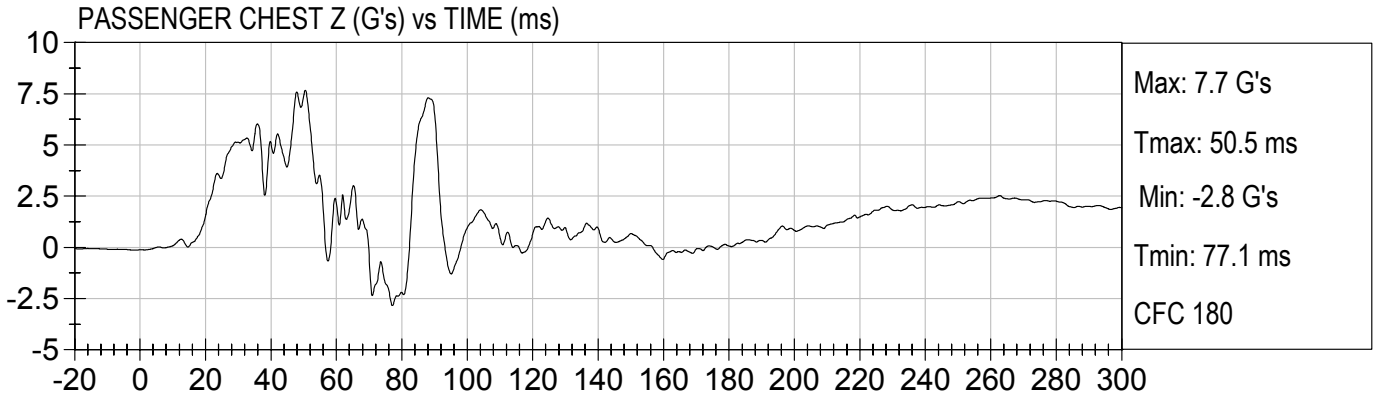

PASSENGER HEAD Z Velocity (kph) vs TIME (ms)
100
80
60
40
20
0
-20
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 84.4 kph
Tmax: 300.0 ms
Min: -0.1 kph
Tmin: 6.8 ms
CFC 180

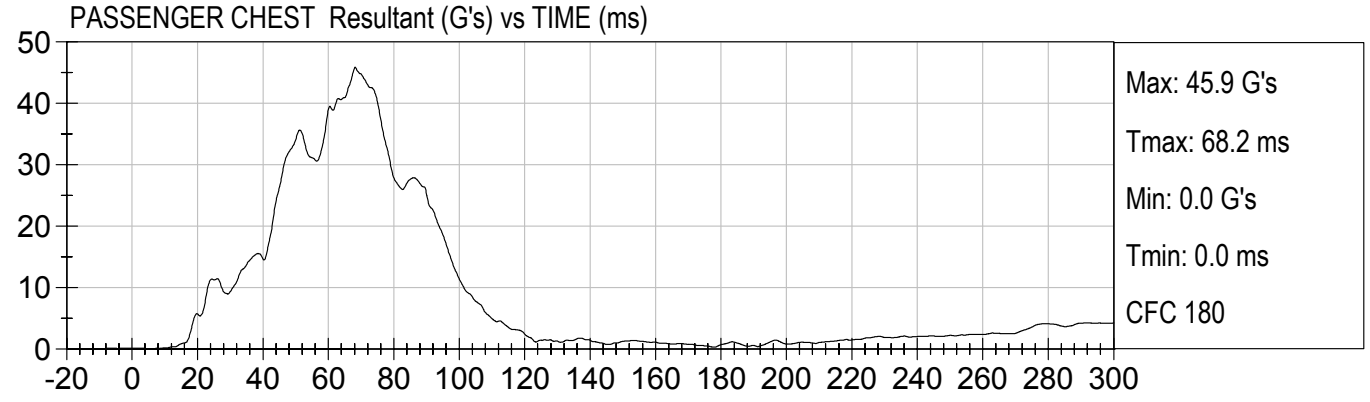
NCAP 35MPH FRONTAL
2006 TOYOTA SCION XB (M65102)

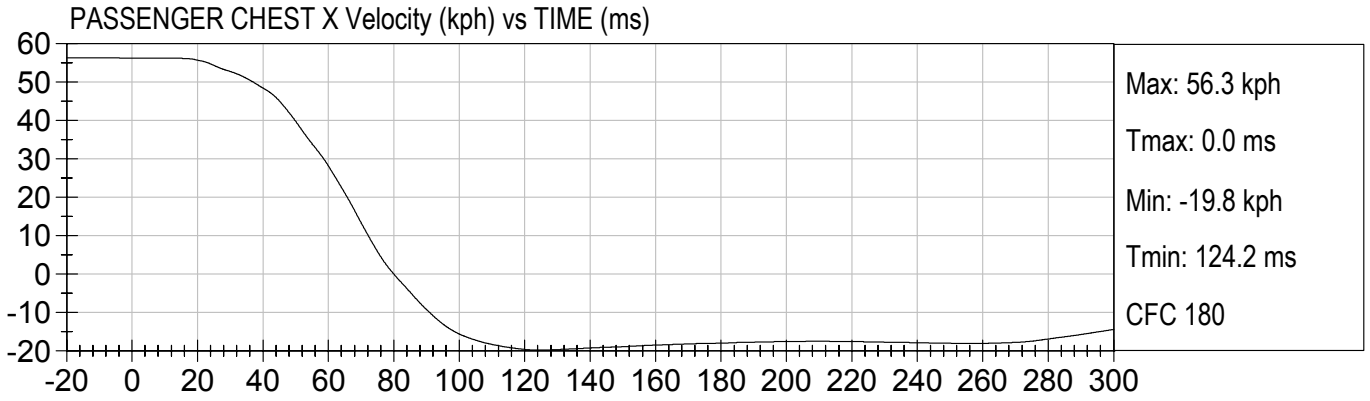
Test Date: 9/15/2005
Speed: 35.0 mph (56.3 km/h)

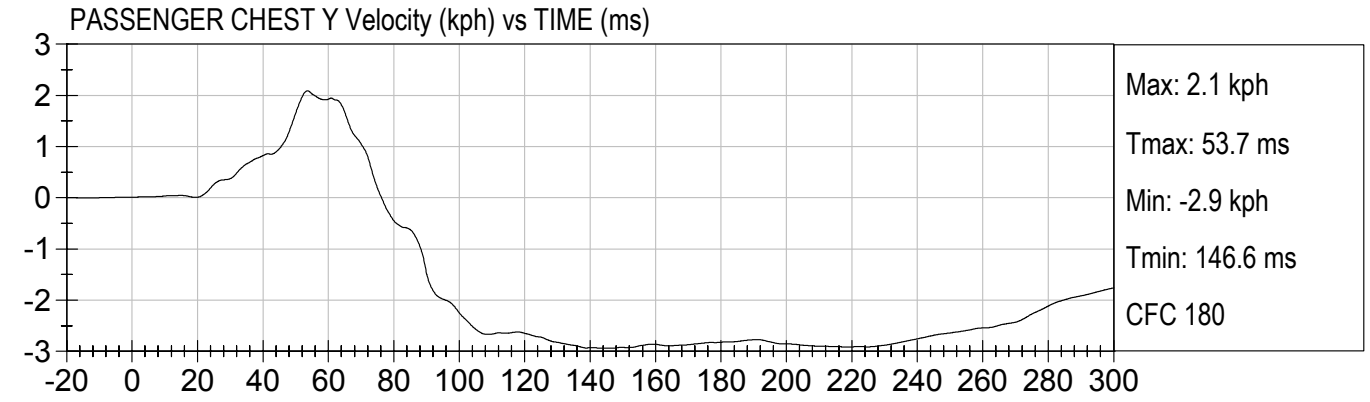


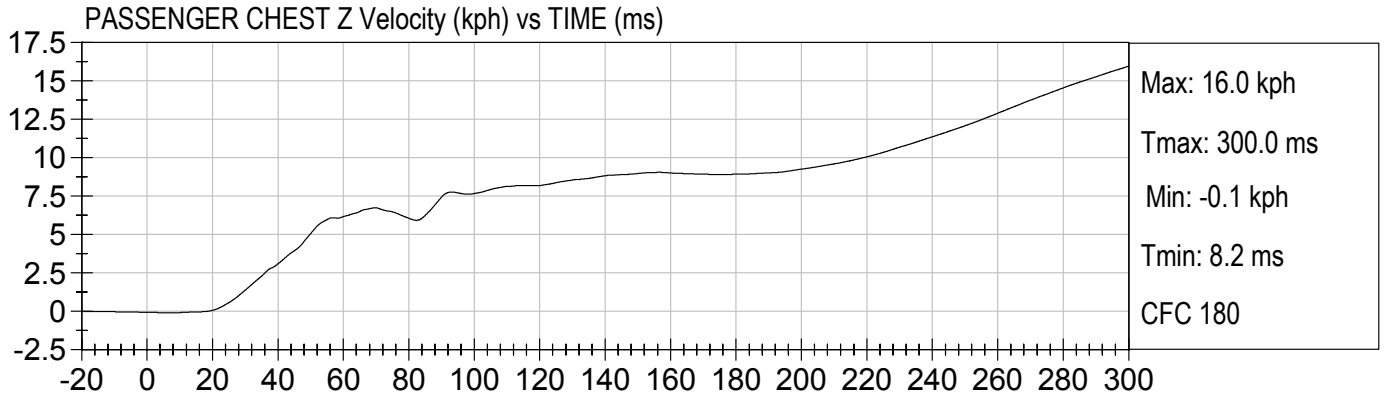






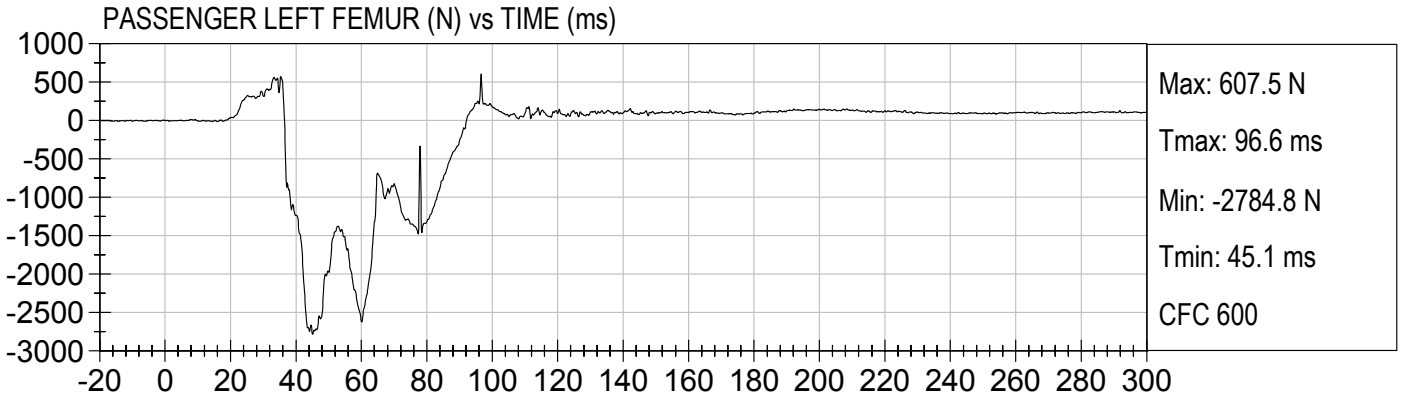

PASSENGER CHEST X Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 56.3 kph
Tmax: 0.0 ms
Min: -19.8 kph
Tmin: 124.2 ms
CFC 180

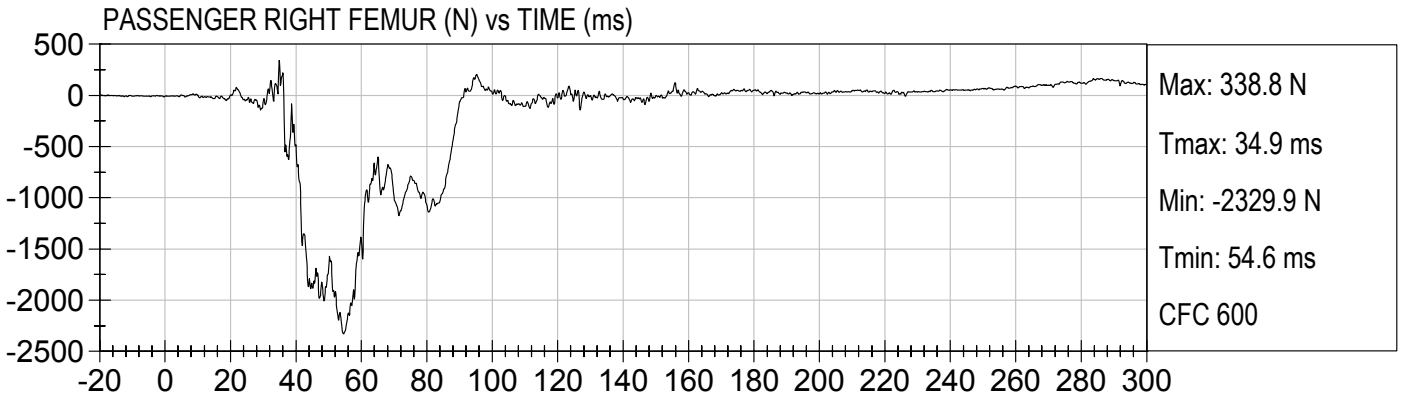

PASSENGER CHEST Y Velocity (kph) vs TIME (ms)
3
2
1
0
-1
-2
-3
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 2.1 kph
Tmax: 53.7 ms
Min: -2.9 kph
Tmin: 146.6 ms
CFC 180


PASSENGER CHEST Z Velocity (kph) vs TIME (ms)
17.5
15
12.5
10
7.5
5
2.5
0
-2.5
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 16.0 kph
Tmax: 300.0 ms
Min: -0.1 kph
Tmin: 8.2 ms
CFC 180

NCAP 35MPH FRONTAL
2006 TOYOTA SCION XB (M65102)

Test Date: 9/15/2005
Speed: 35.0 mph (56.3 km/h)





APPENDIX C

DUMMY CALIBRATION DATA

MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065 **Test ID:** D052211

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	42	Pass
Peak Resultant Acceleration	G's	225 - 275	230	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	7.9	Pass
Unimodal	Yes/No	NA	Yes	Pass
Oscillations	Yes/No	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

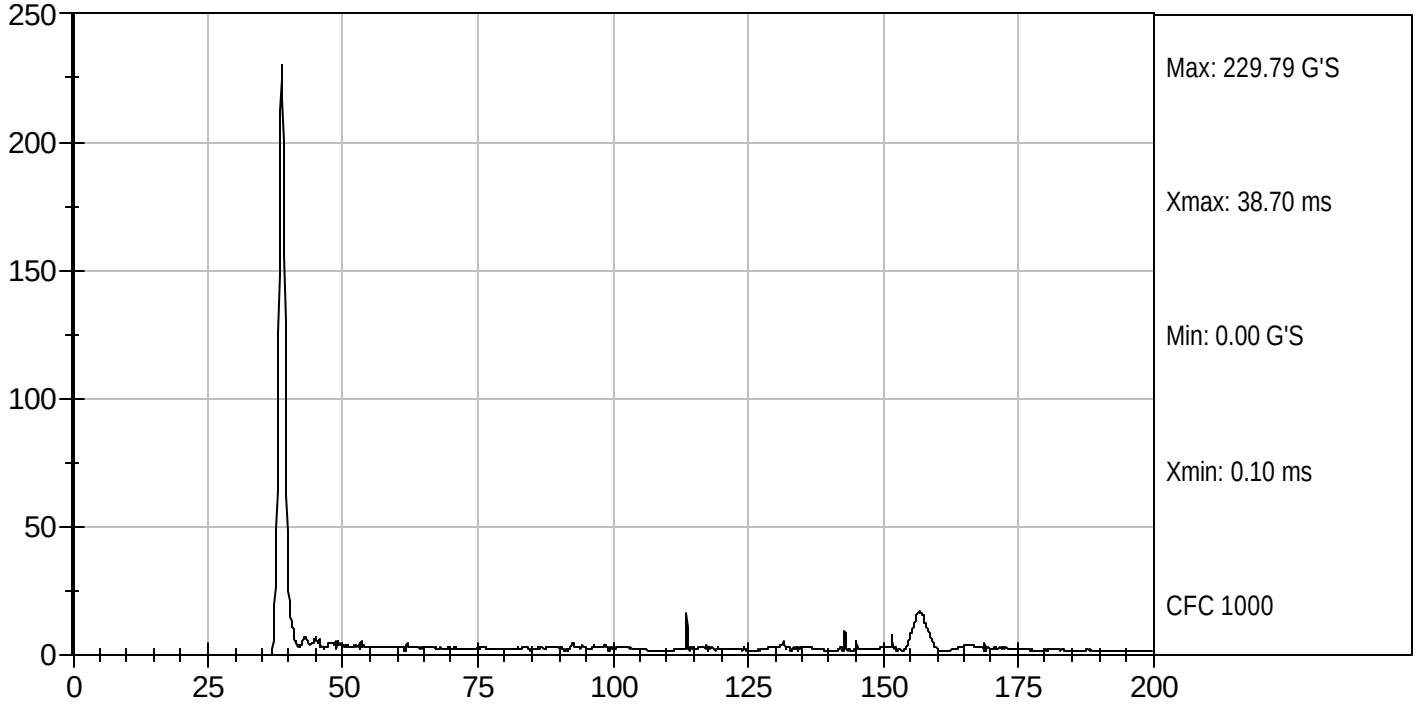
08/08/2005
Test Date

David Winkelbauer
Approved By

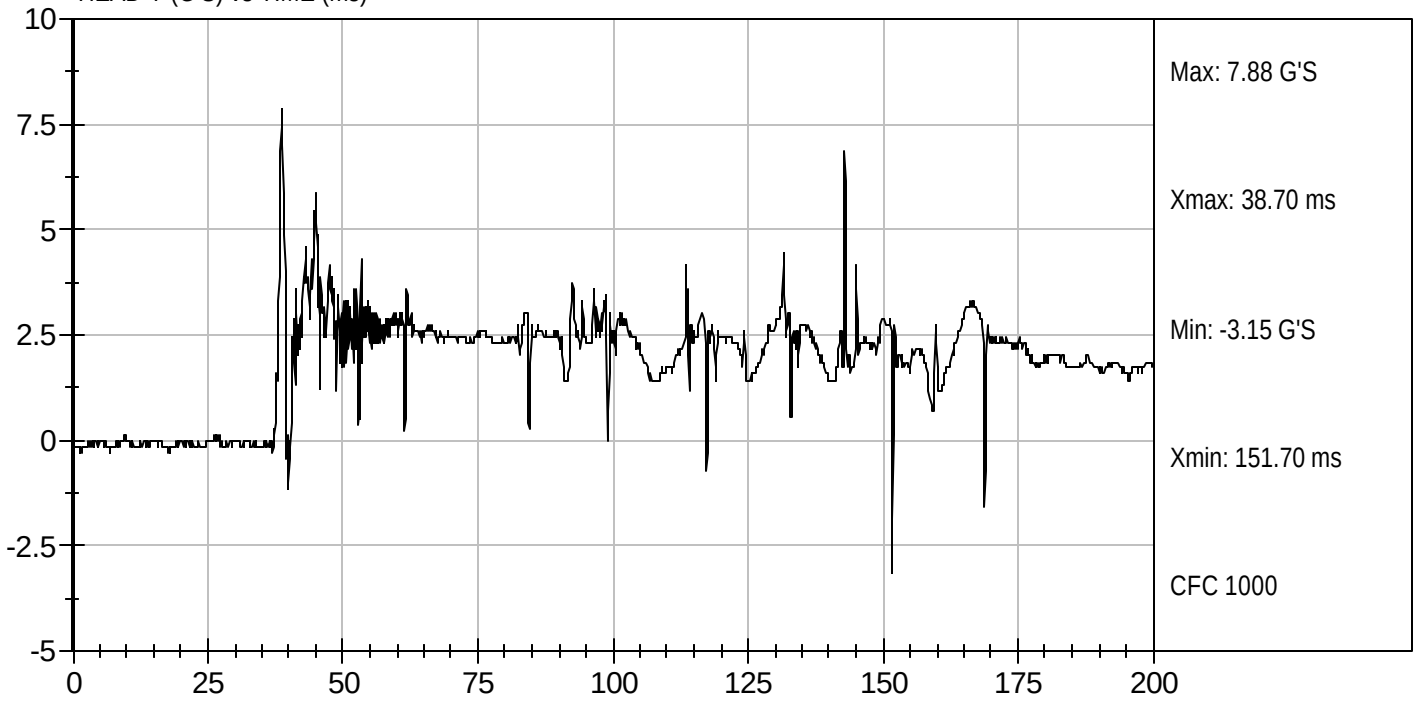
Test Desc: Head Drop
Componet ID: D052211

Test Date: 08/08/2005
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:** D052212

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.9	Pass
Laboratory Relative Humidity		%	10 to 70	42	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.04	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	25.03	Pass
	20 msec	G's	17.60 to 22.60	21.19	Pass
	30 msec	G's	12.50 to 18.50	15.87	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	15.79	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	36.5	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	74.5	Pass
	Time	msec	57.0 to 64.0	57.6	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	114.1	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	102.5	Pass
	Time	msec	47.0 to 58.0	48.3	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	103.2	Pass
			Overall Test Results		Pass

Jessica Hall
Laboratory Technician

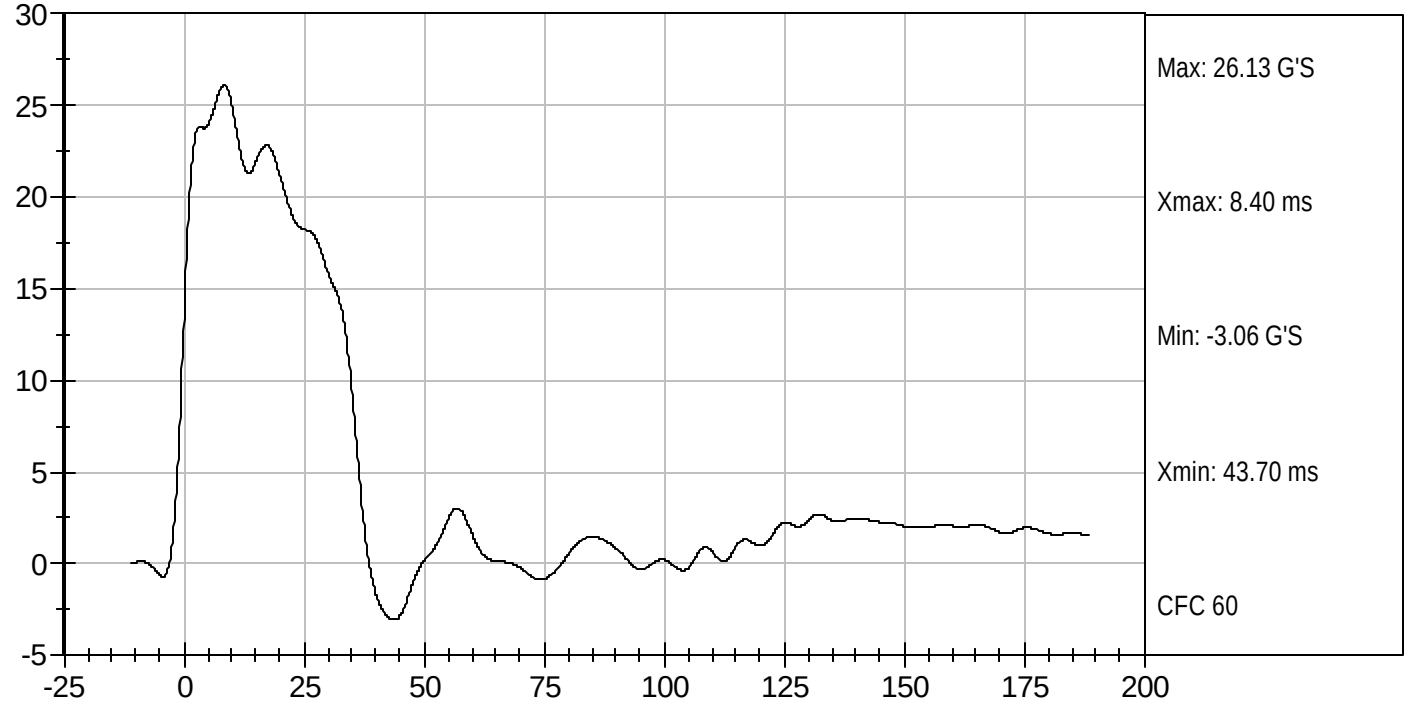
08/08/2005
Test Date

David Winkelbauer
Approved By

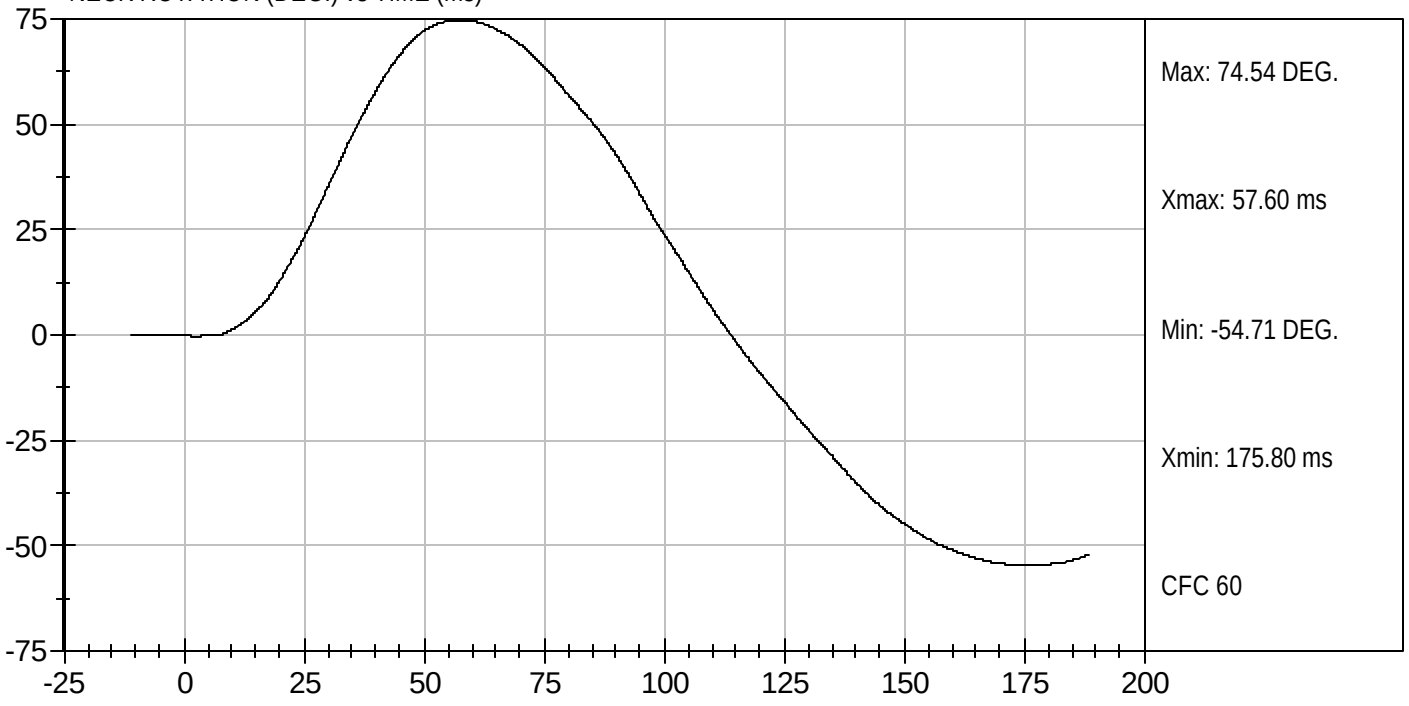
Test Desc: Neck Flexion
Componet ID: D052212

Test Date: 08/08/2005
Velocity: 23.11 ft/s, 7.04 m/s

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

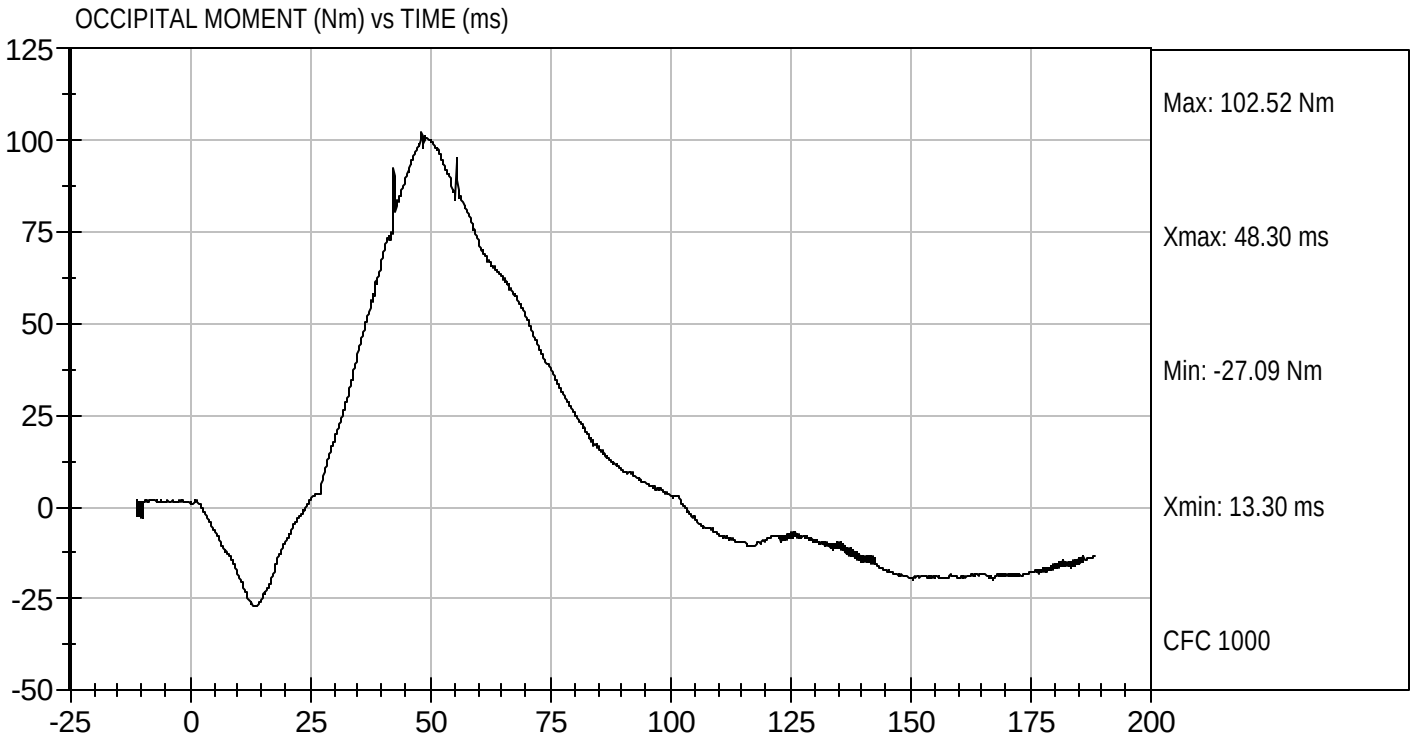


NECK ROTATION (DEG.) vs TIME (ms)



Test Desc: Neck Flexion
Componet ID: D052212

Test Date: 08/08/2005
Velocity: 23.11 ft/s, 7.04 m/s



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065 **Test I.D:** D052213

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	43	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.09	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	20.48	Pass
	20 msec	G's	14.00 to 19.00	17.03	Pass
	30 msec	G's	11.00 to 16.00	12.45	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	13.08	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	38.8	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	100.5	Pass
	Time	msec	72.0 to 82.0	76.2	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	155.2	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-72.9	Pass
	Time	msec	65.0 to 79.0	71.5	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	143.8	Pass
			Overall Test Results		Pass

Jessica Hall
Laboratory Technician

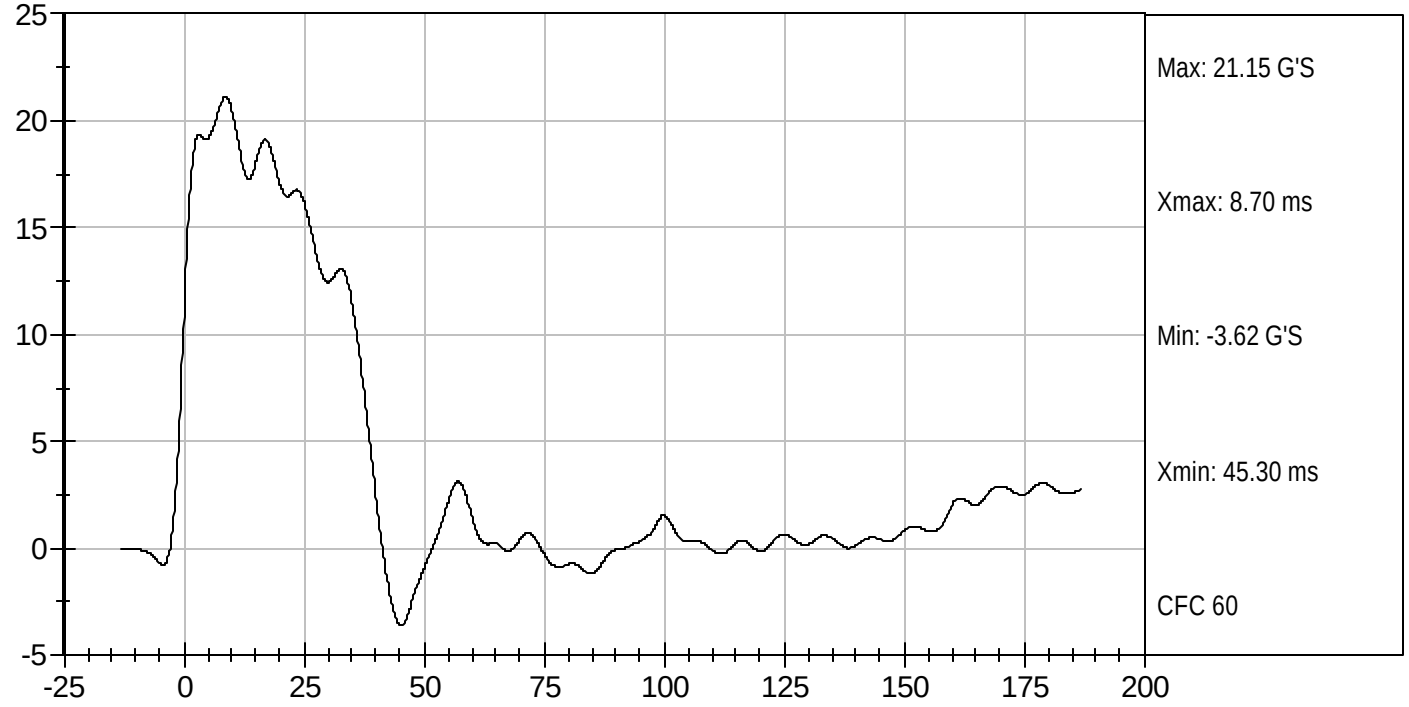
08/08/2005
Test Date

David Winkelbauer
Approved By

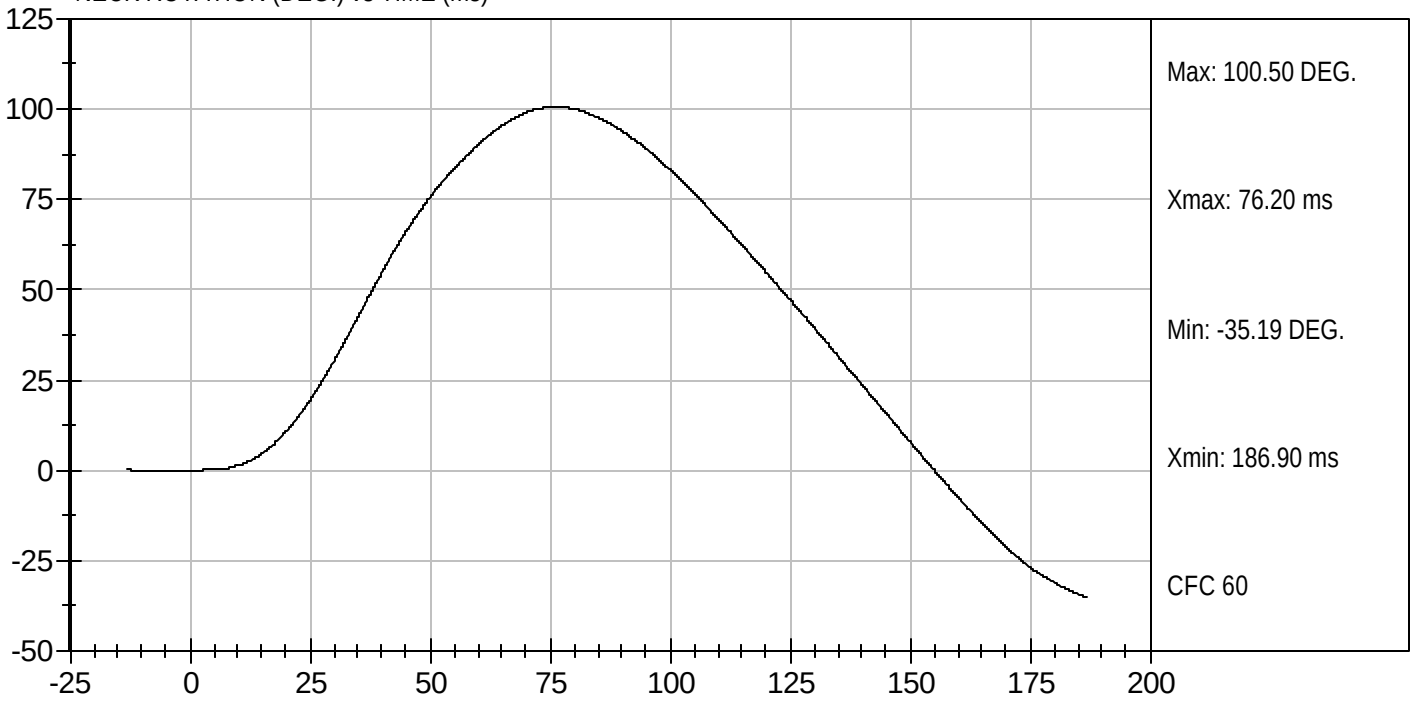
Test Desc: Neck Extension
Componet ID: D052213

Test Date: 08/08/2005
Velocity: 19.99 ft/s, 6.09 m/s

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

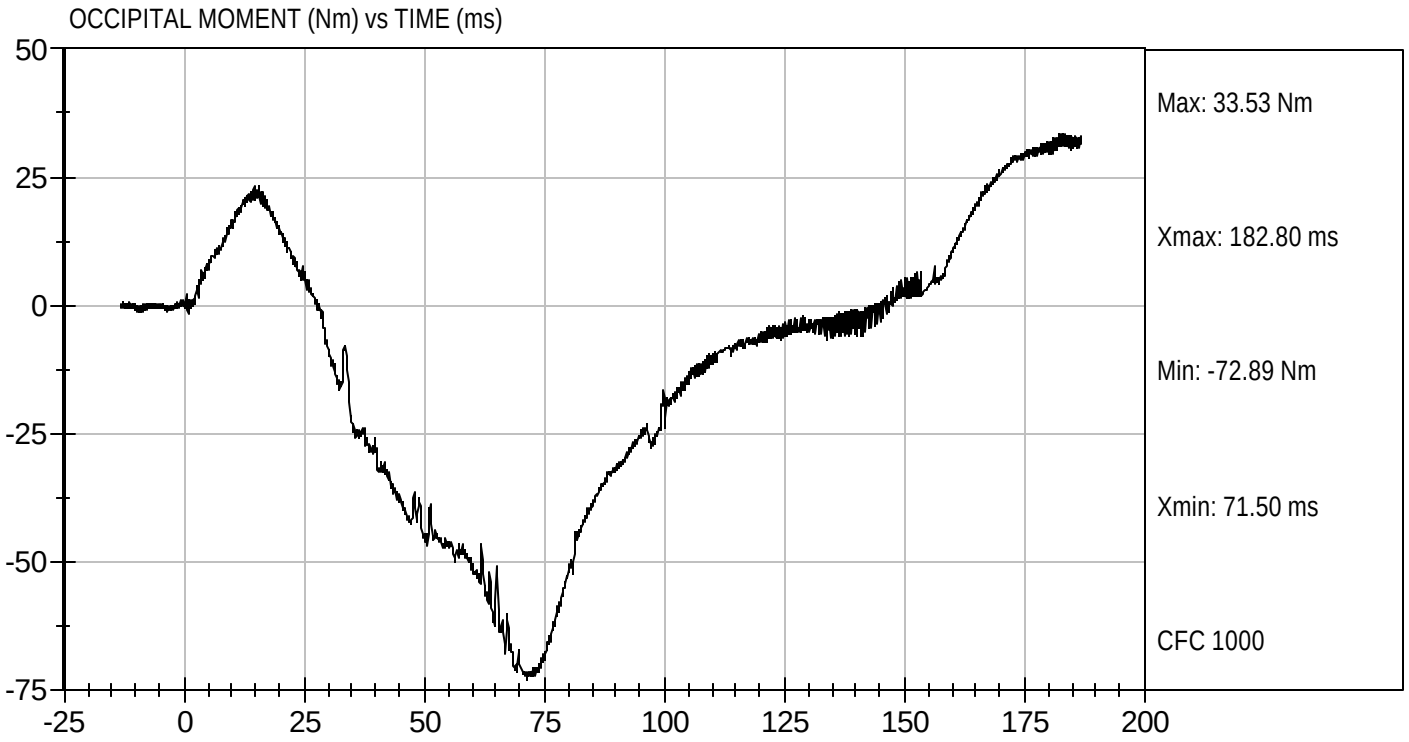


NECK ROTATION (DEG.) vs TIME (ms)



Test Desc: Neck Extension
Componet ID: D052213

Test Date: 08/08/2005
Velocity: 19.99 ft/s, 6.09 m/s



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065 **Test I.D:** D052214

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	45	Pass
Probe Velocity	m/s	6.58 to 6.82	6.63	Pass
Peak Probe Force	N	5159 to 5893	5,517	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.93	Pass
Internal Hysteresis	%	69 to 85	73	Pass
		Overall Test Results		Pass

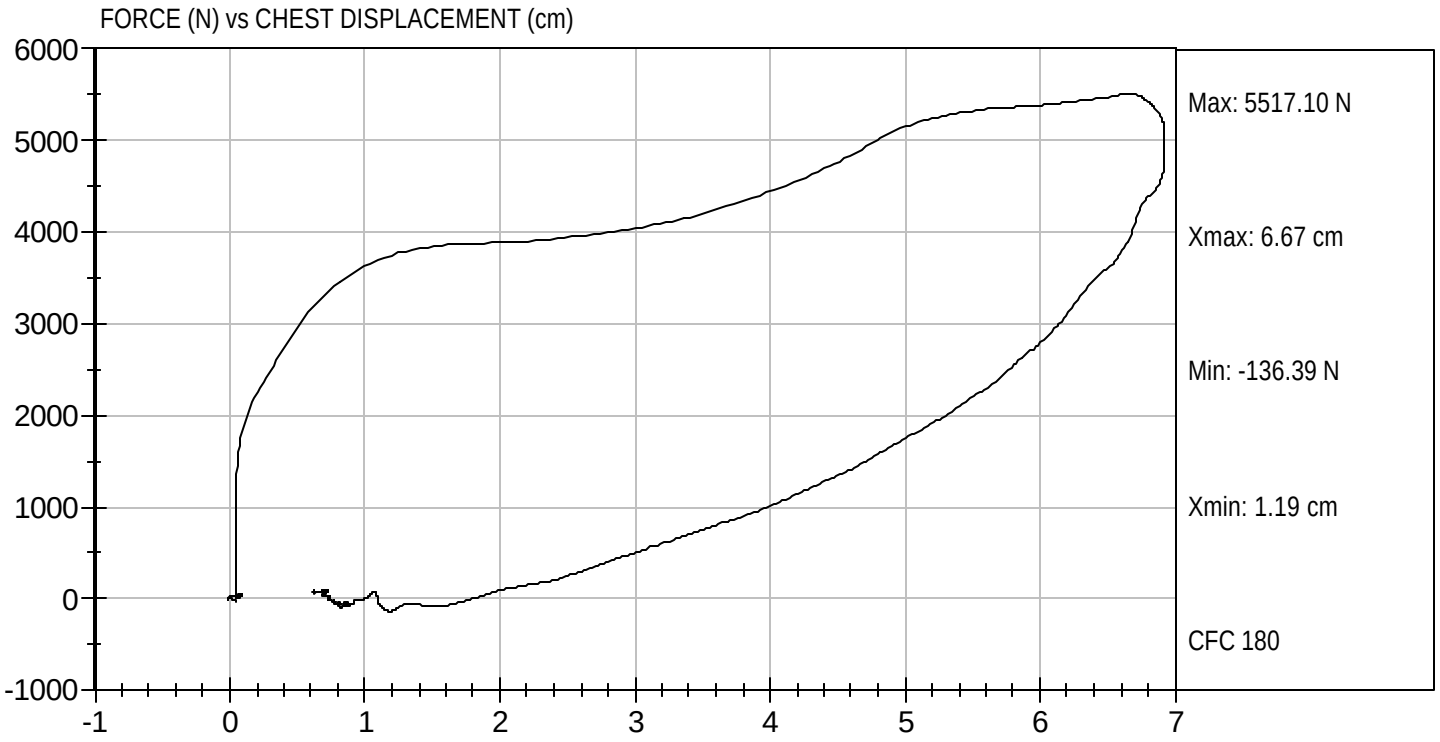
Joe Fleck
Laboratory Technician

08/09/2005
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Impact
Componet ID: D052214

Test Date: 08/09/2005
Velocity: 21.74 ft/s, 6.63 m/s



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065 **Test I.D:** D052215

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.12	Pass
Peak Probe Force	Newtons	4715 to 5782	5,186	Pass
		Overall Test Results		Pass

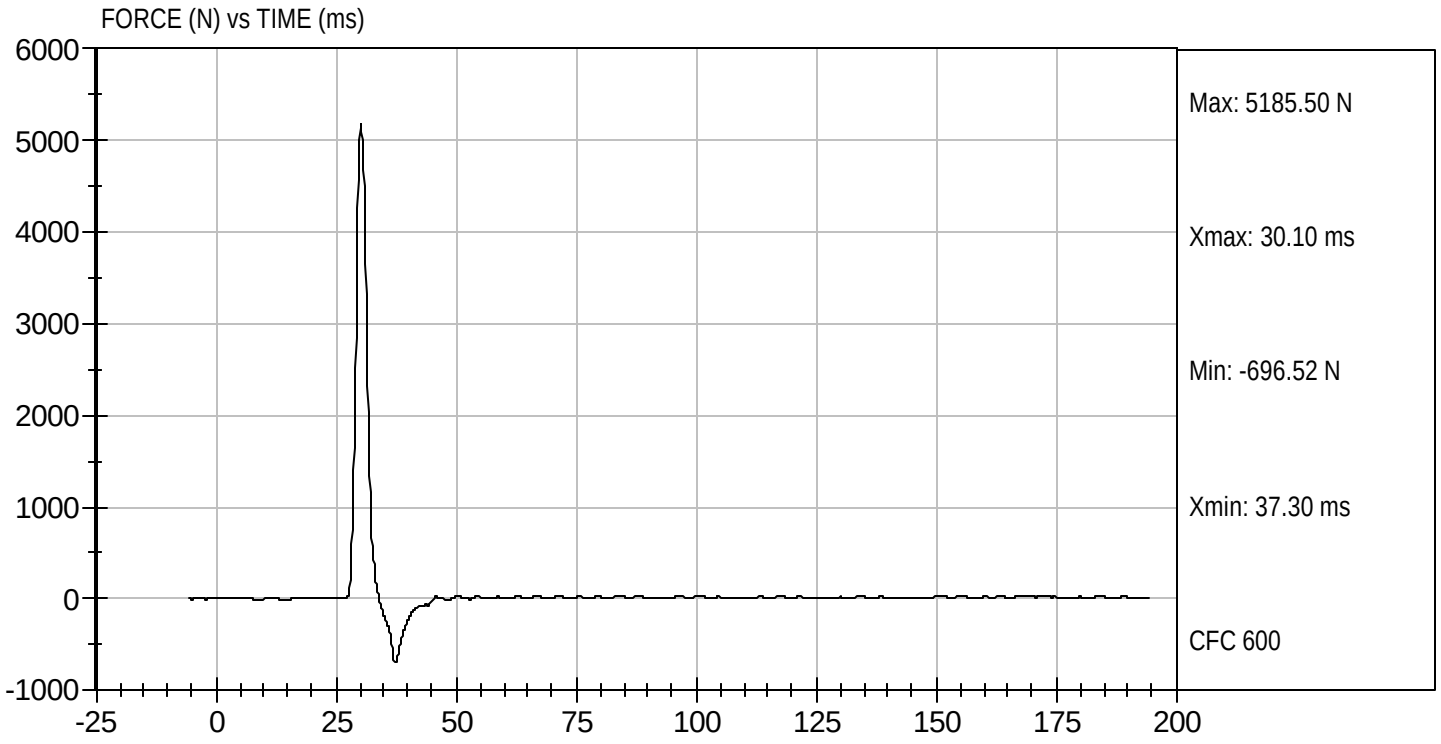
Jessica Hall
Laboratory Technician

08/09/2005
Test Date

David Winkelbauer
Approved By

Test Desc: Right Knee
Componet ID: D052215

Test Date: 08/09/2005
Velocity: 6.97 ft/s, 2.12 m/s



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065 **Test I.D:** D052216

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	4,977	Pass
		Overall Test Results		Pass

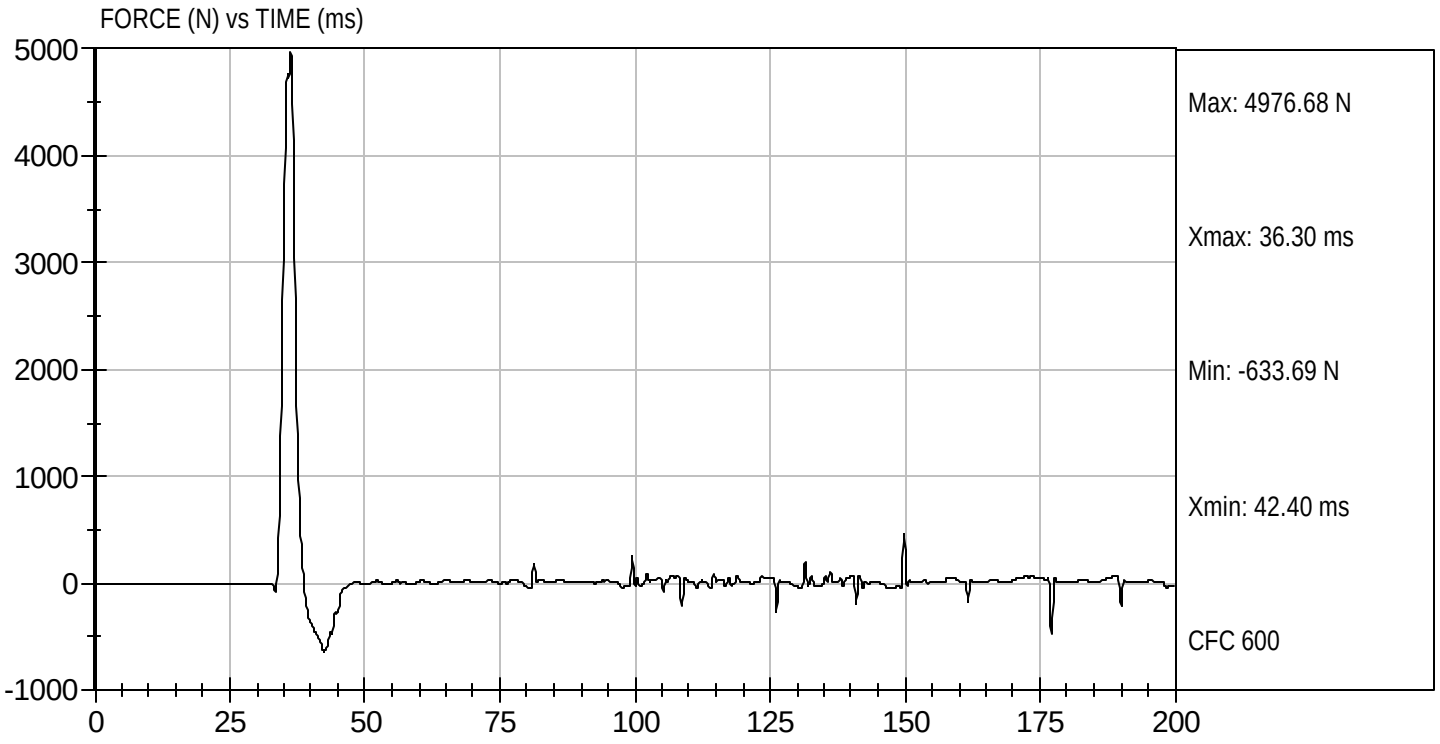
Jessica Hall
Laboratory Technician

08/09/2005
Test Date

David Winkelbauer
Approved By

Test Desc: Left Knee
Componet ID: D052216

Test Date: 08/09/2005
Velocity: 6.93 ft/s, 2.11 m/s



MGA RESEARCH CORPORATION

HIP-FEMUR FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065 **Test I.D:** D052210

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.7	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	45	45	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	84.5	67.6	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	44	44	Pass
		Overall Test Results			Pass

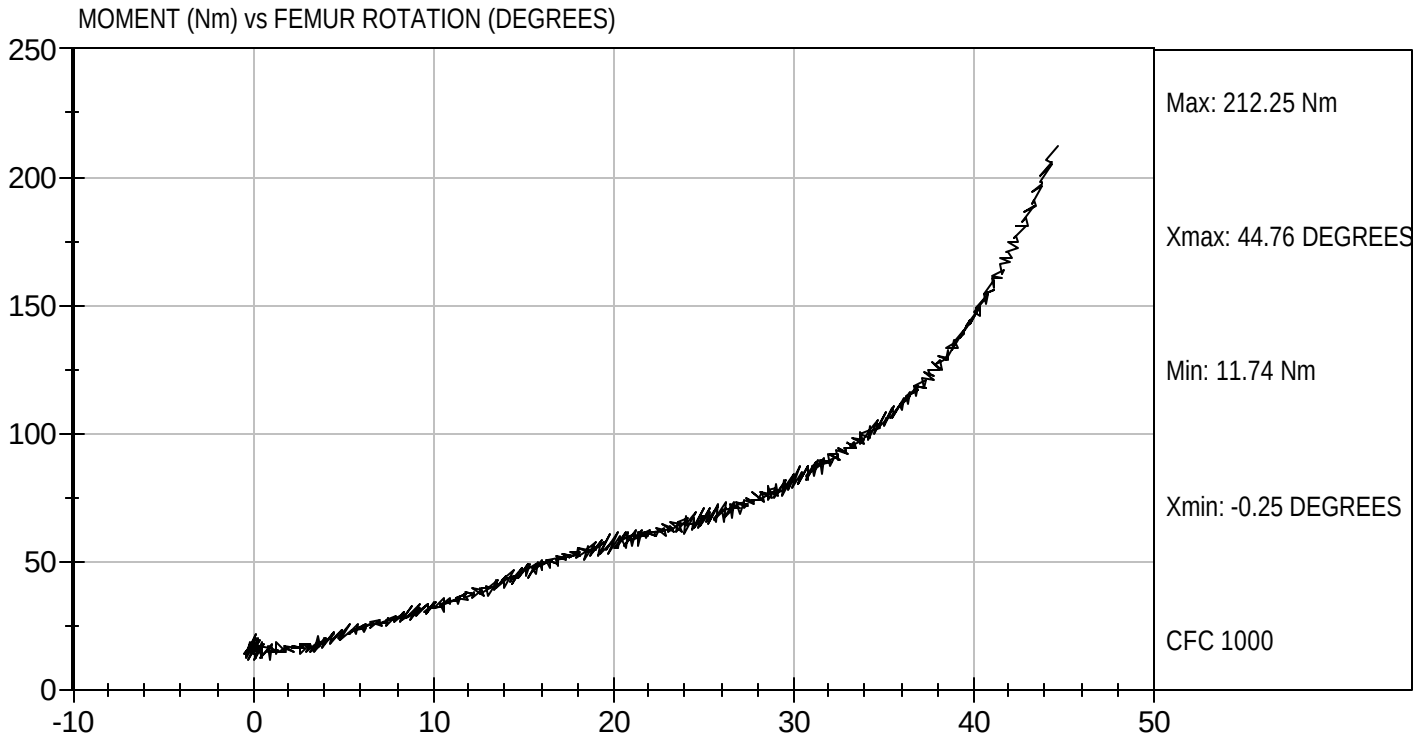
Joe Fleck
Laboratory Technician

08/09/2005
Test Date

David Winkelbauer
Approved By

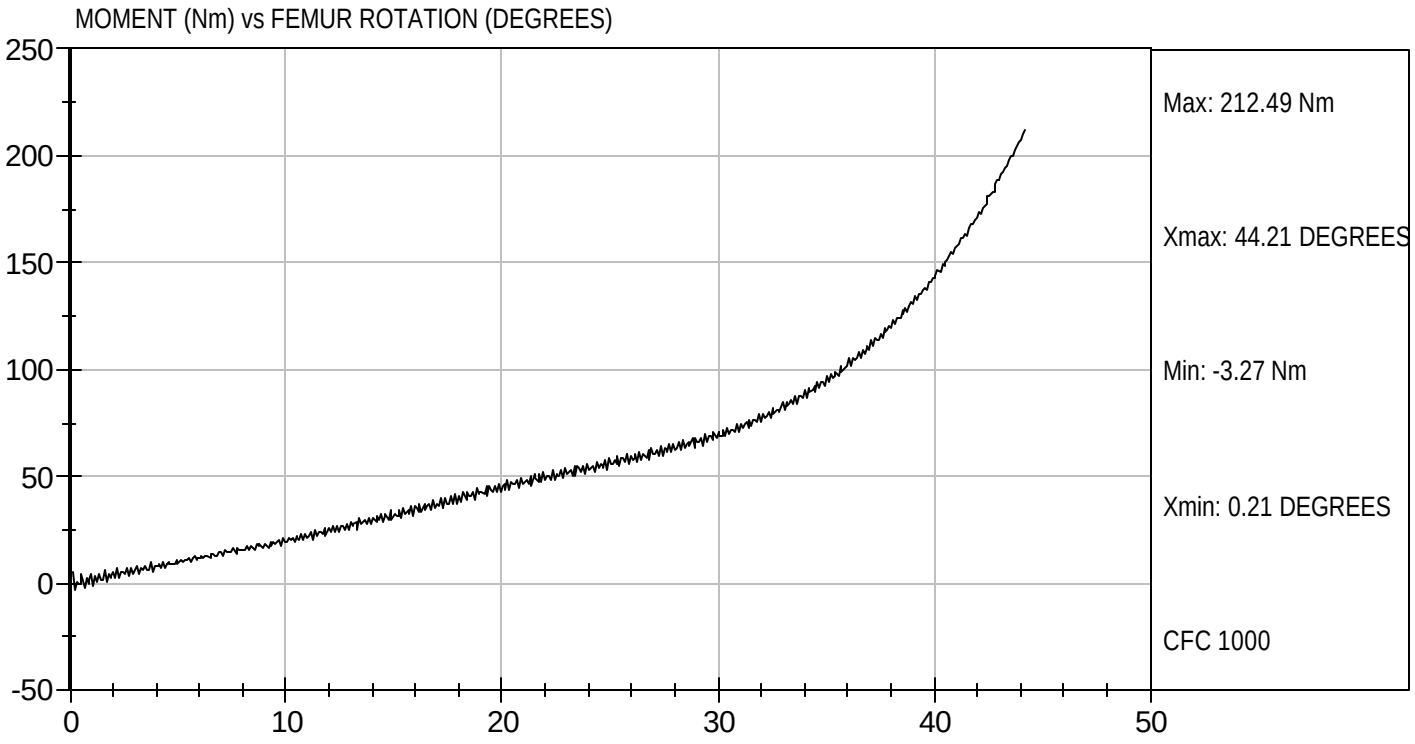
Test Desc: Hip Femur Flexion
Componet ID: D052219

Test Date: 08/09/2005
Velocity: 0 ft/s, 0.00 m/s



Test Desc: Hip Femur Flexion
Componet ID: D052210

Test Date: 08/09/2005
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:** D052221

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Peak Resultant Acceleration	G's	225 - 275	235	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	9.8	Pass
Unimodal	Yes/No	NA	Yes	Pass
Oscillations	Yes/No	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

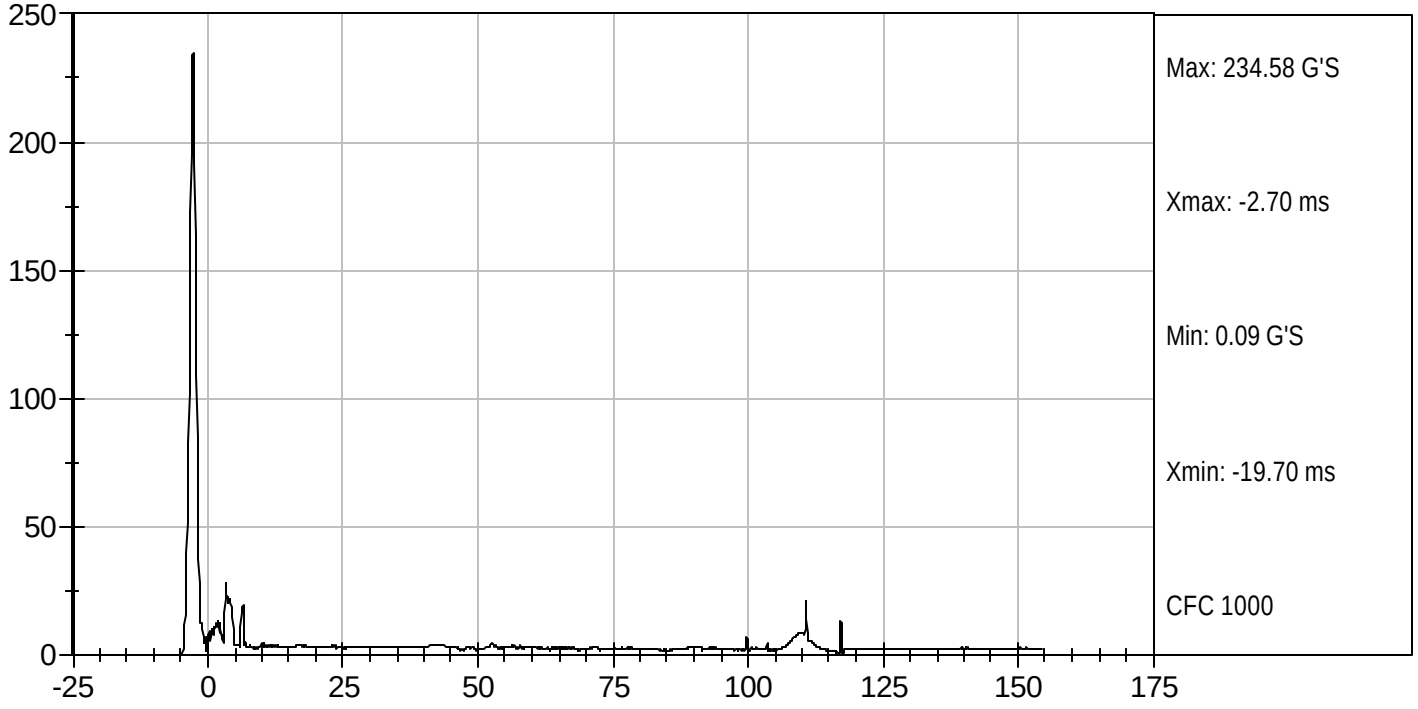
08/08/2005
Test Date

David Winkelbauer
Approved By

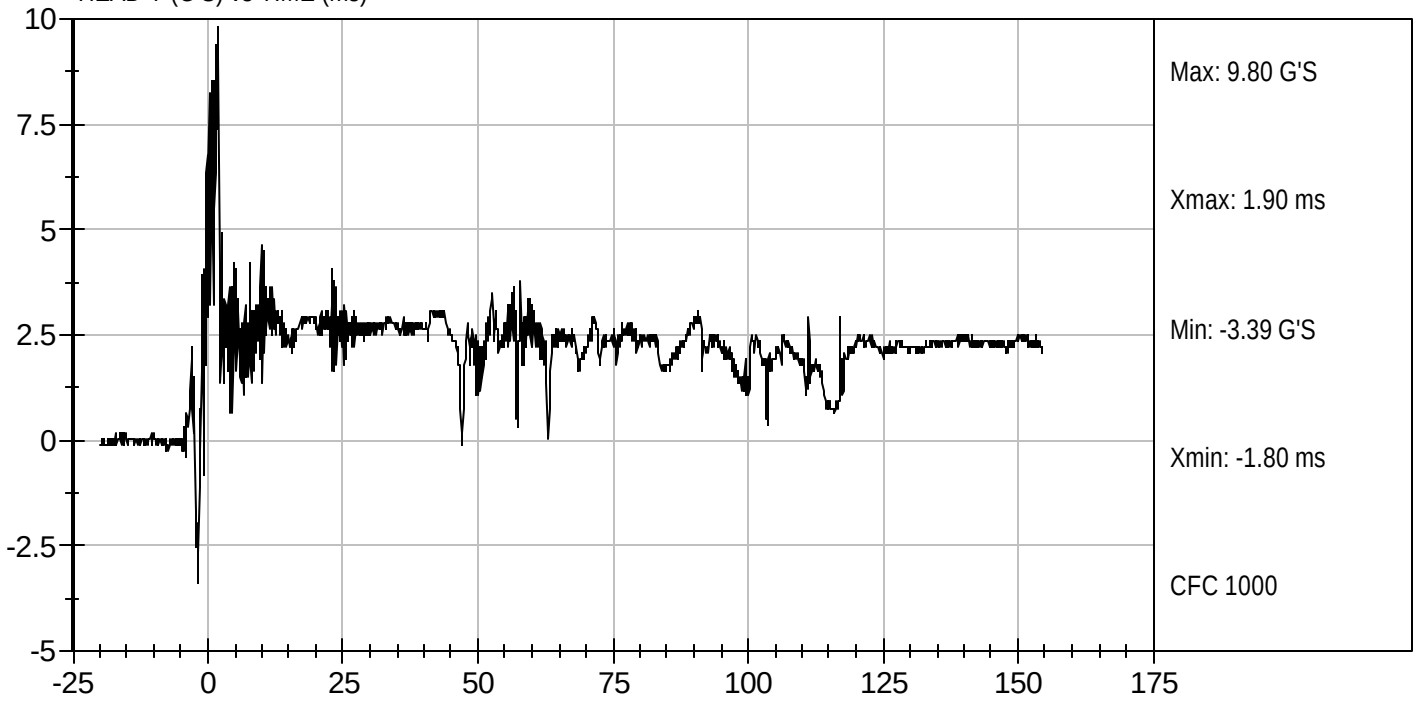
Test Desc: Head Drop
Componet ID: D052221

Test Date: 08/08/2005
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:** D052222

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22.1	Pass
Laboratory Relative Humidity		%	10 to 70	42	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.07	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	25.23	Pass
	20 msec	G's	17.60 to 22.60	21.17	Pass
	30 msec	G's	12.50 to 18.50	16.35	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	16.31	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	35.6	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	75.0	Pass
	Time	msec	57.0 to 64.0	57.1	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	113.5	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	97.1	Pass
	Time	msec	47.0 to 58.0	47.7	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	100.2	Pass
			Overall Test Results		Pass

Jessica Gall
Laboratory Technician

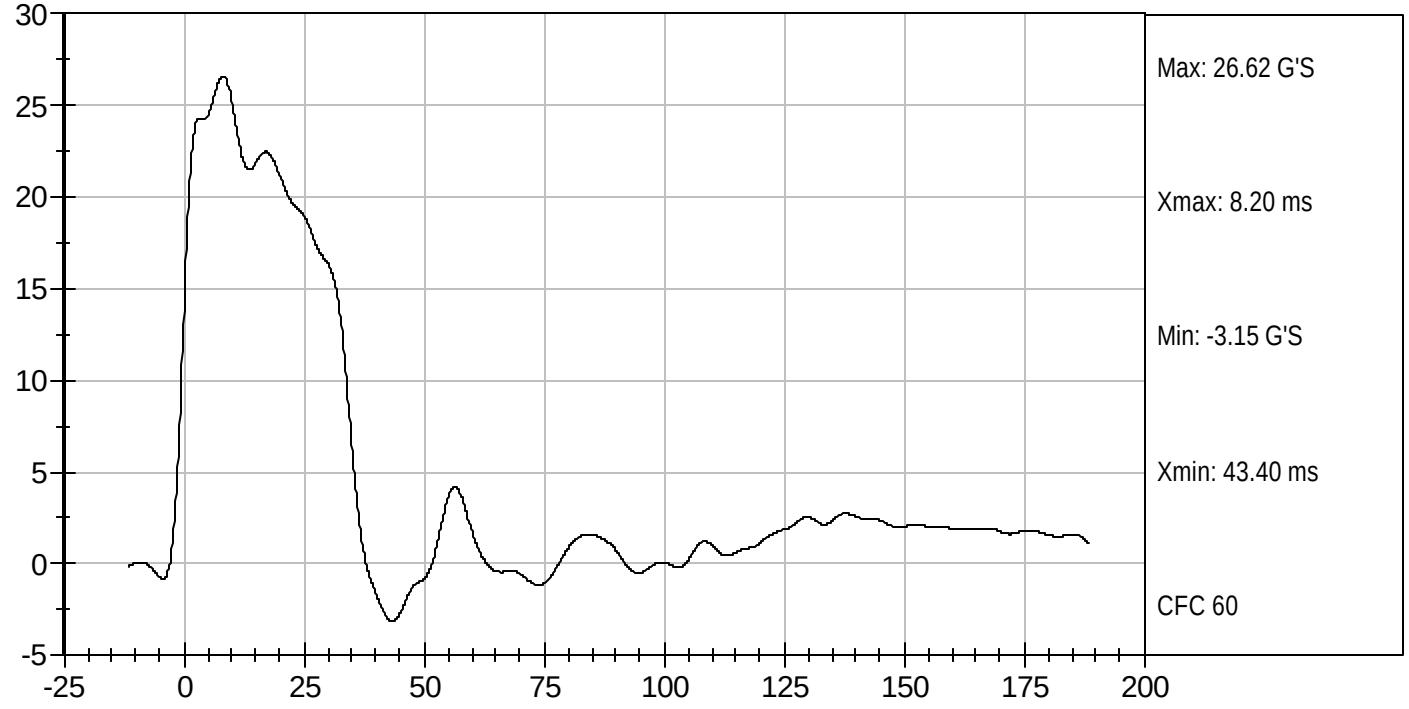
08/09/2005
Test Date

David Winkelbauer
Approved By

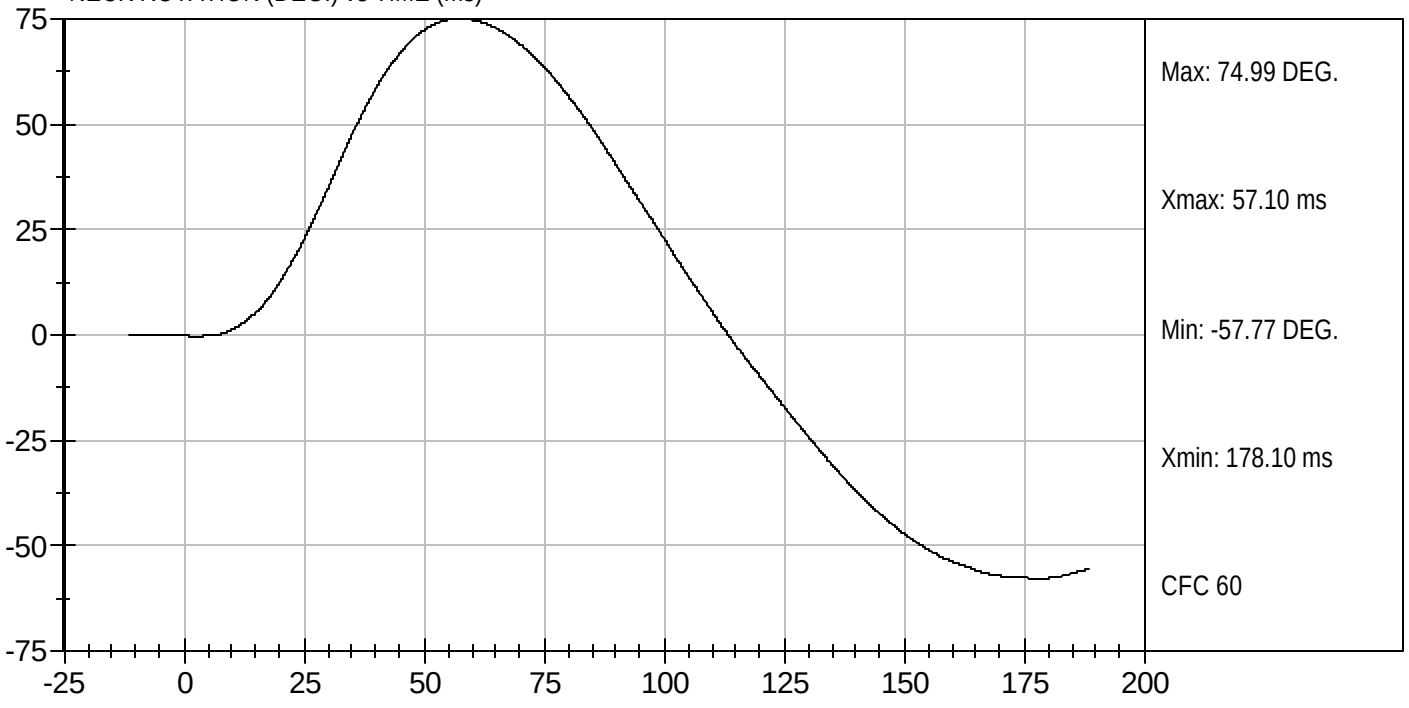
Test Desc: Neck Flexion
Componet ID: D052222

Test Date: 08/09/2005
Velocity: 23.19 ft/s, 7.07 m/s

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

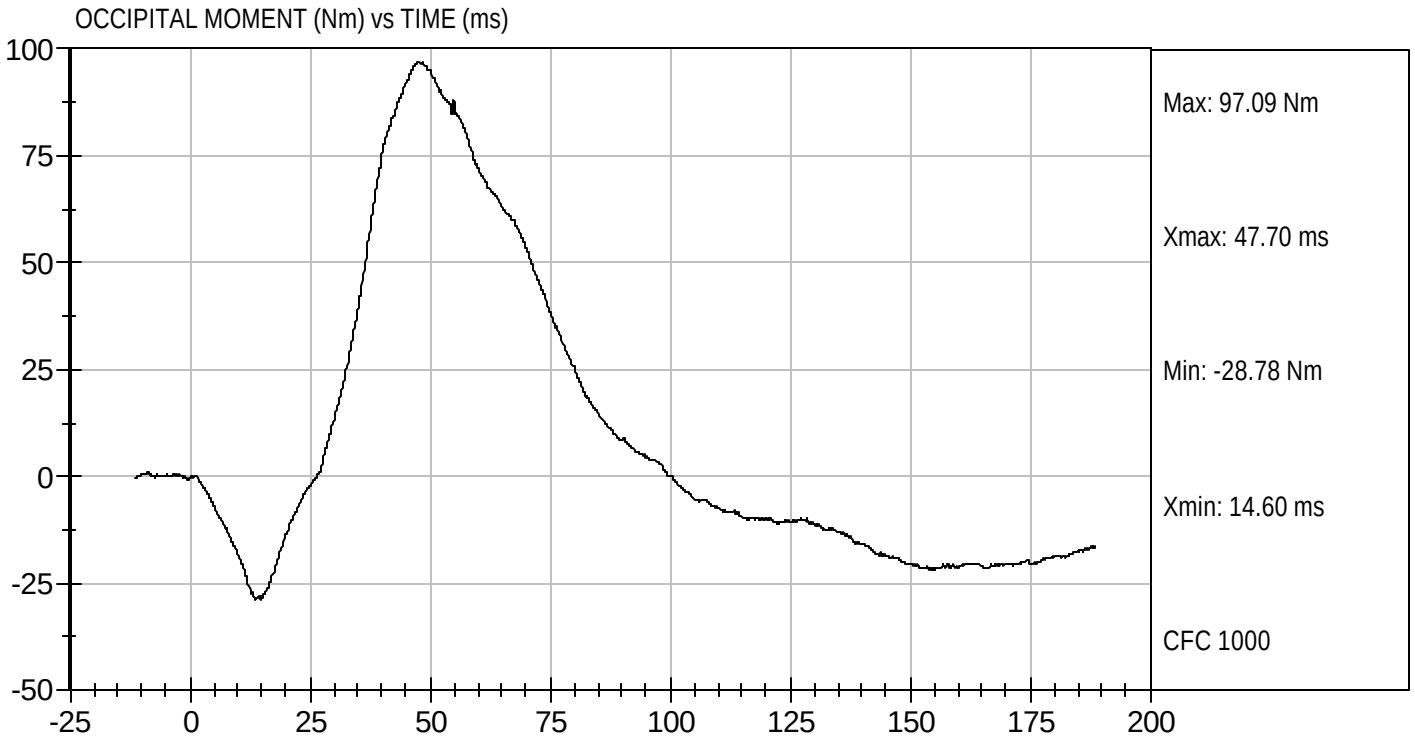


NECK ROTATION (DEG.) vs TIME (ms)



Test Desc: Neck Flexion
Componet ID: D052222

Test Date: 08/09/2005
Velocity: 23.19 ft/s, 7.07 m/s



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066 **Test I.D:** D052223

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	45	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.11	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	18.80	Pass
	20 msec	G's	14.00 to 19.00	16.15	Pass
	30 msec	G's	11.00 to 16.00	12.81	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	12.90	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	42.1	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	101.2	Pass
	Time	msec	72.0 to 82.0	79.0	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	157.7	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-67.0	Pass
	Time	msec	65.0 to 79.0	74.7	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	146.2	Pass
			Overall Test Results		Pass

Jessica Hall
Laboratory Technician

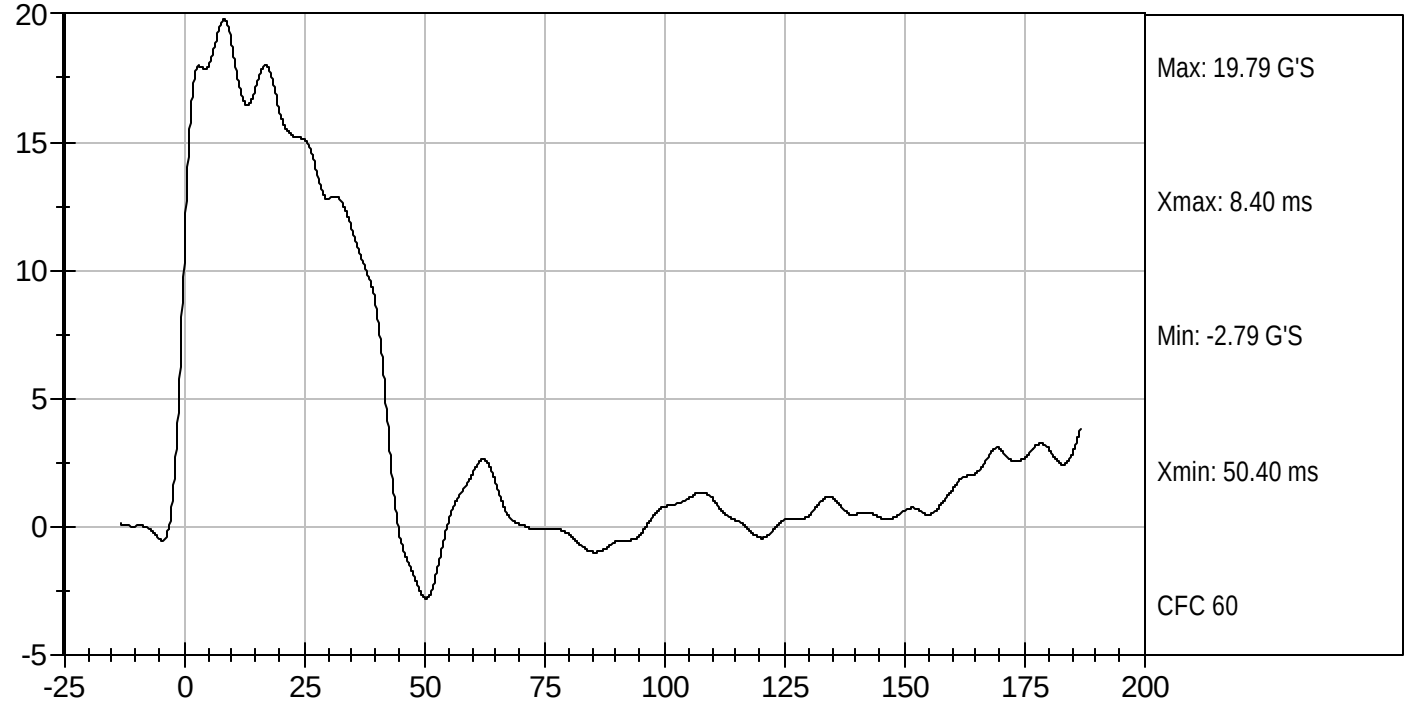
08/09/2005
Test Date

David Winkelbauer
Approved By

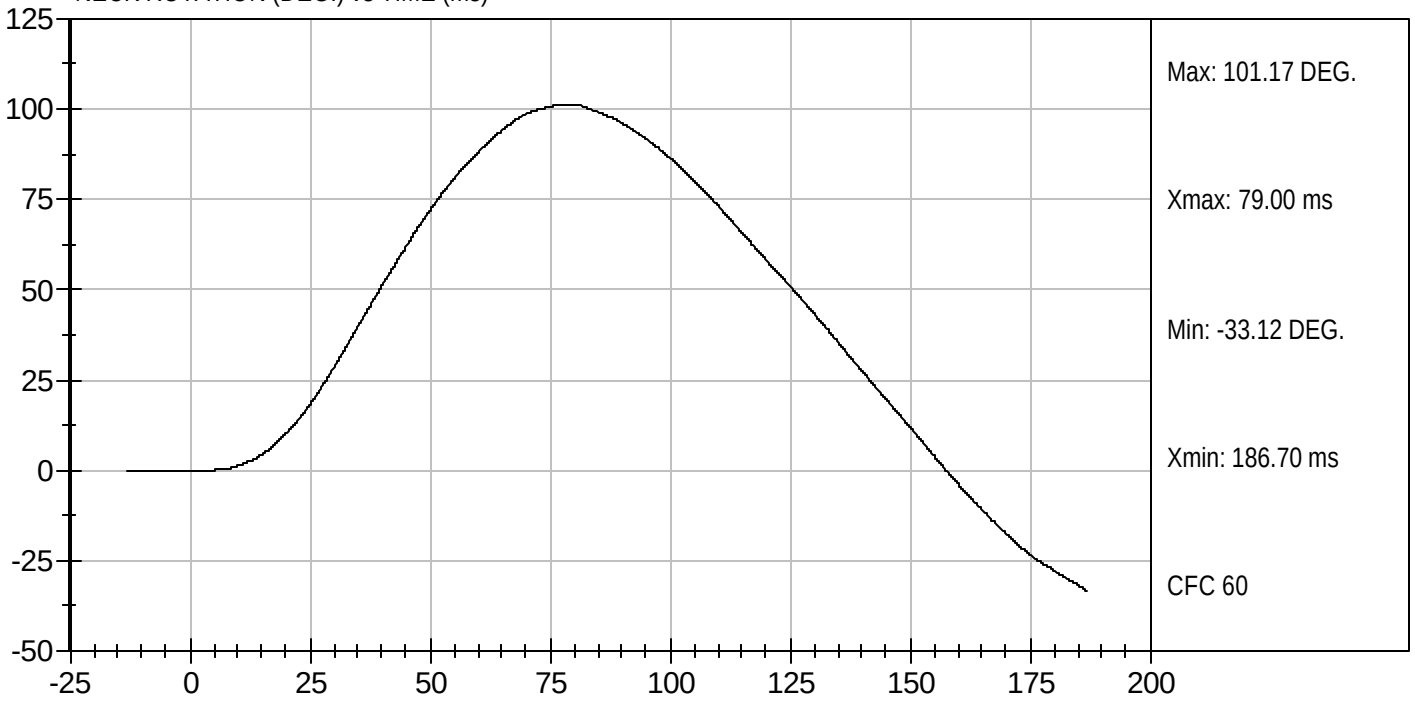
Test Desc: Neck Extension
Componet ID: D052223

Test Date: 08/09/2005
Velocity: 20.05 ft/s, 6.11 m/s

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



NECK ROTATION (DEG.) vs TIME (ms)



Test Desc: Neck Extension
Componet ID: D052223

Test Date: 08/09/2005
Velocity: 20.05 ft/s, 6.11 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:** D052224

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	45	Pass
Probe Velocity	m/s	6.58 to 6.82	6.70	Pass
Peak Probe Force	N	5159 to 5893	5,655	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.87	Pass
Internal Hysteresis	%	69 to 85	71	Pass
		Overall Test Results		Pass

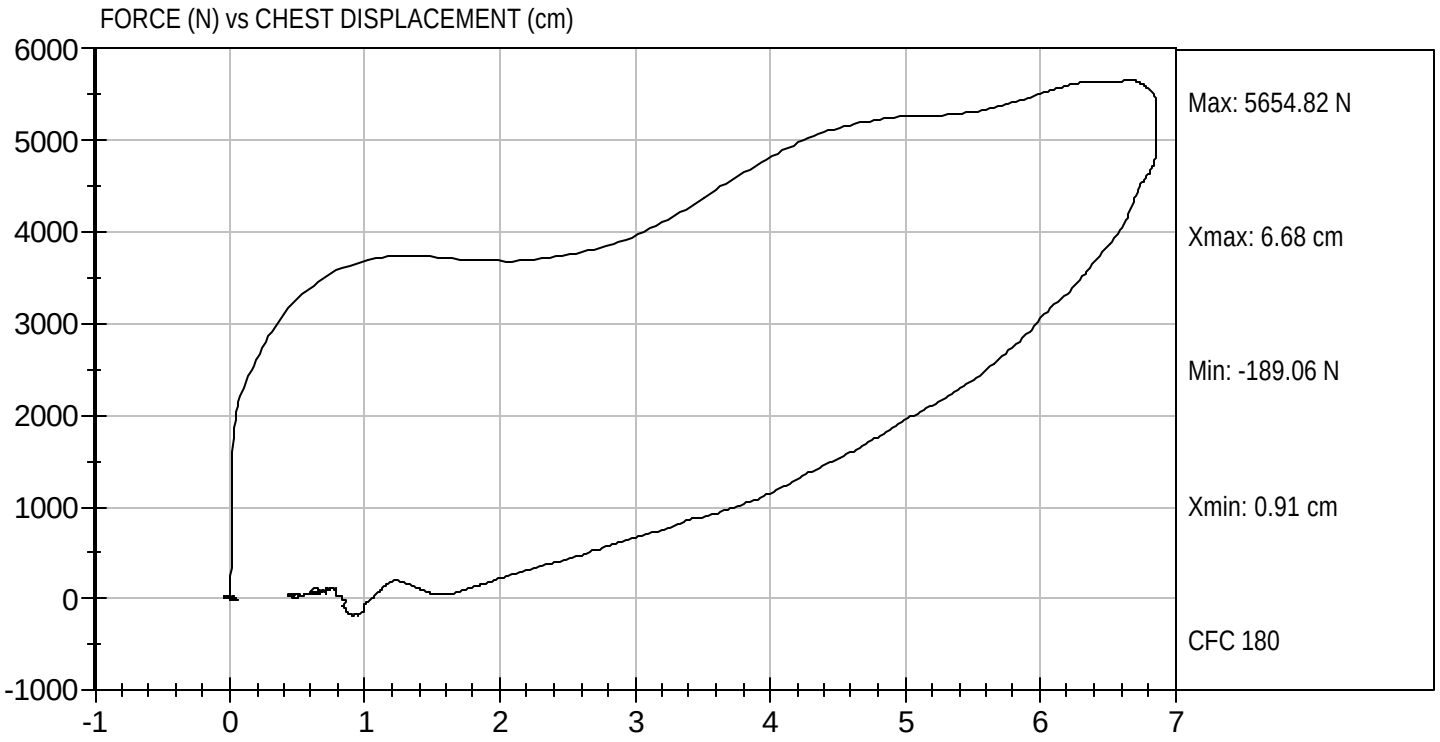
Joe Fleck
Laboratory Technician

08/09/2005
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Impact
Componet ID: D052224

Test Date: 08/09/2005
Velocity: 21.99 ft/s, 6.70 m/s



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066 **Test I.D:** D052225

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.12	Pass
Peak Probe Force	Newtons	4715 to 5782	5,205	Pass
		Overall Test Results		Pass

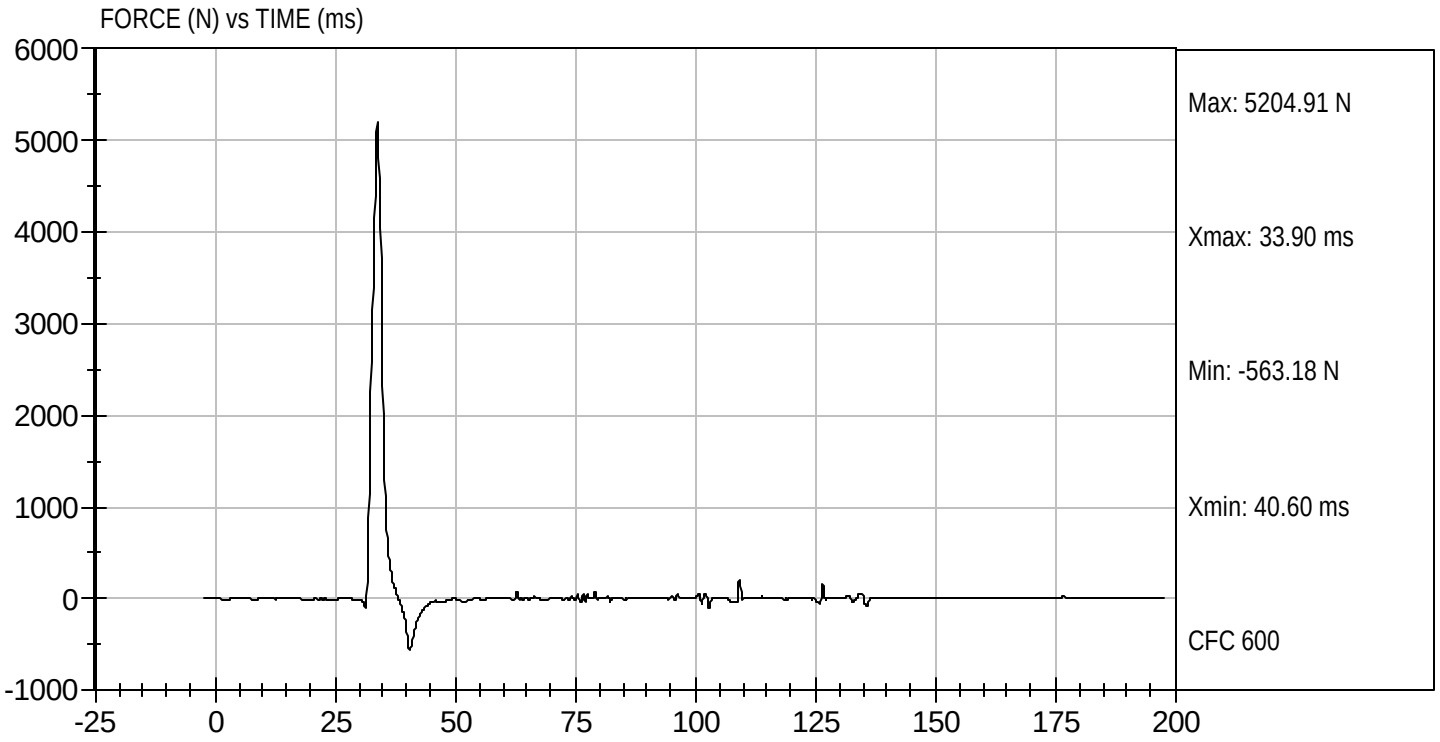
Jessica Hall
Laboratory Technician

08/09/2005
Test Date

David Winkelbauer
Approved By

Test Desc: Right Knee
Componet ID: D052225

Test Date: 08/09/2005
Velocity: 6.94 ft/s, 2.12 m/s



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066 **Test I.D:** D052226

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	45	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	5,022	Pass
		Overall Test Results		Pass

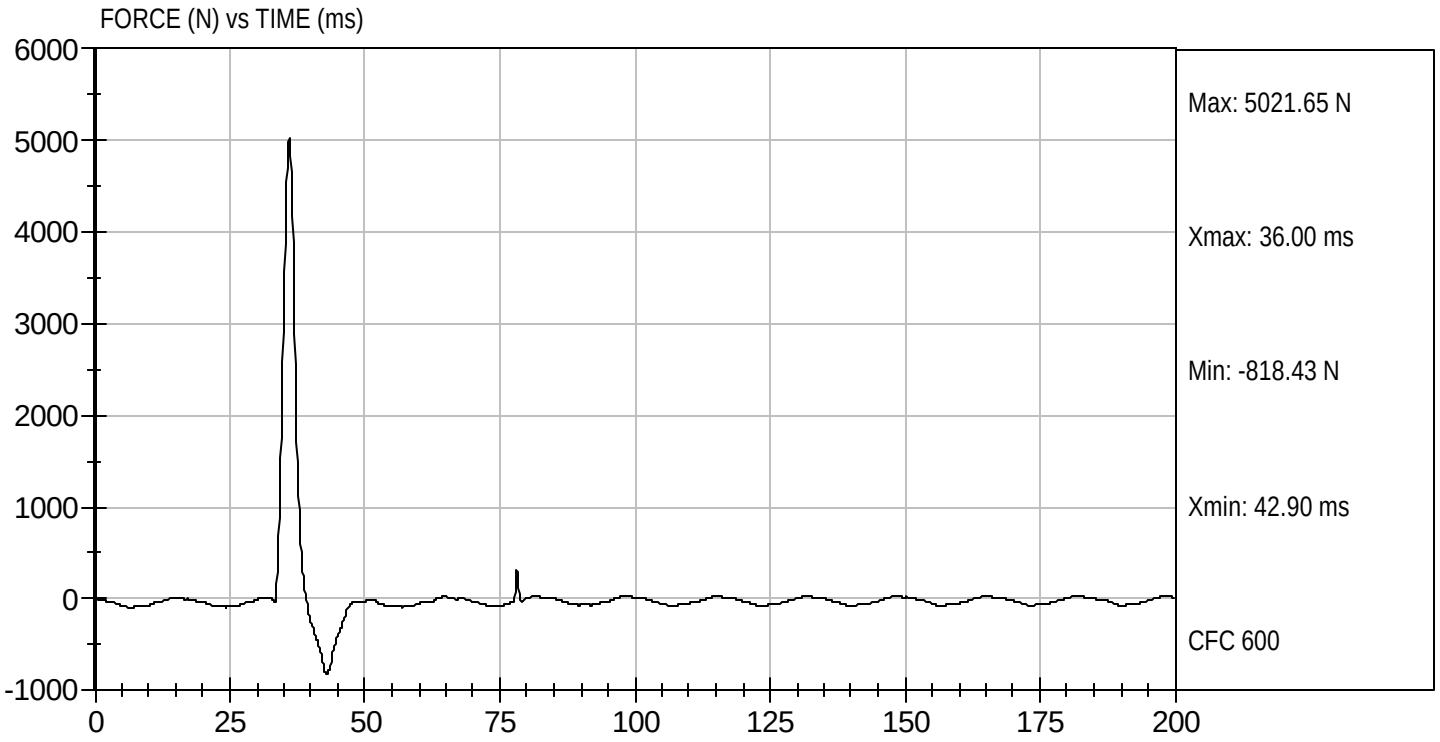
Jessica Hall
Laboratory Technician

08/09/2005
Test Date

David Winkelbauer
Approved By

Test Desc: Left Knee
Componet ID: D052226

Test Date: 08/09/2005
Velocity: 6.91 ft/s, 2.11 m/s



MGA RESEARCH CORPORATION

HIP-FEMUR FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066 **Test I.D:** D052220

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.7	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	46	46	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	87.4	72.2	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	42	40	Pass
		Overall Test Results			Pass

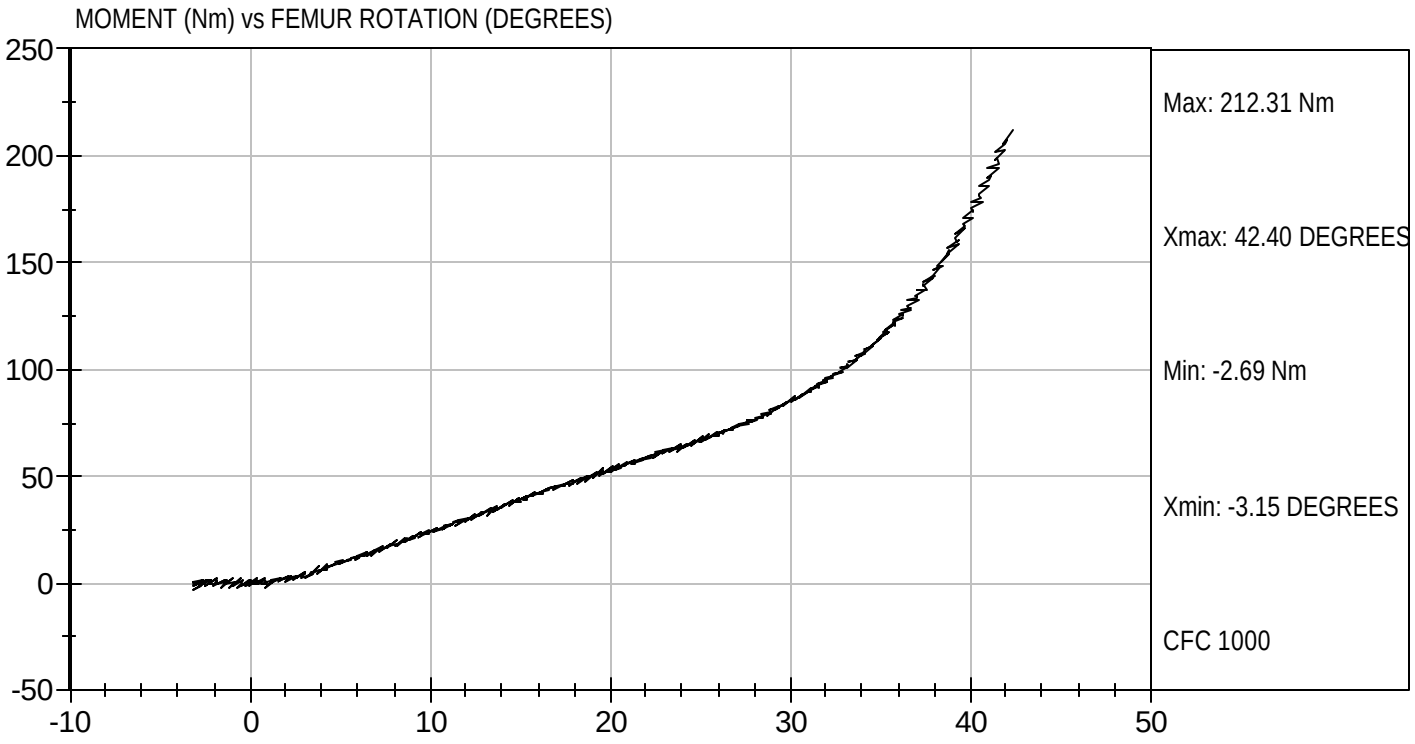
Laboratory Technician

08/09/2005
Test Date

David Winkelbauer
Approved By

Test Desc: Hip Femur Flexion
Componet ID: D052229

Test Date: 08/09/2005
Velocity: 0 ft/s, 0.00 m/s



Test Desc: Hip Femur Flexion
Componet ID: D052220

Test Date: 08/09/2005
Velocity: 0 ft/s, 0.00 m/s