REPORT NUMBER: NCAP-MGA-2006-013

NEW CAR ASSESSMENT PROGRAM
FRONTAL BARRIER IMPACT TEST

TOYOTA MOTOR CORPORATION
2007 TOYOTA FJ CRUISER 4X4
NHTSA NUMBER: M75104

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

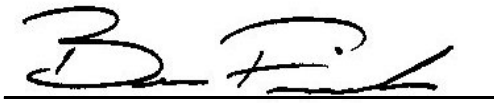
Test Date: May 23, 2006

Final Report Date: June 21, 2006

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:  Date: 6/21/06

Ben Fischer, Project Engineer

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Technical Report Documentation Page

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16. Abstract

A frontal barrier impact was conducted on a 2007 Toyota FJ Cruiser 4x4 at MGA Research Corporation on May 23, 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 56.3 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 540 mm located at the centerline of the vehicle. 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	386	444
Max. Thorax Accel. (3ms Clip)	G's	60	42	47
Left Femur Force	Newton	10009	-2083	-2070
Right Femur Force	Newton	10009	-1313	-2755

17. Key Words 56.3 km/h NCAP Frontal Barrier Impact Test New Car Assessment Program (NCAP) 2007 Toyota FJ Cruiser 4x4 NHTSA No: M75104		*18. Distribution Statement* Copies of this report are available from: National Highway Traffic Safety Admin., Technical Ref. Division, Room 5108 (NPO-230) 400 Seventh Street, S.W. Washington, D.C. 20590	
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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 DTNH22-01-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 2007 Toyota FJ Cruiser 4x4 at a velocity of 56.3 kph. The test was performed at MGA Research Corporation on May 23, 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. 066) and right-front passenger (position 2) ATD (Serial No. 065) were calibrated previous to this test. Certification details, along with instrumentation calibration data, are found in Appendix C.

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

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

The maximum static crush of the vehicle was 540 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 and steering column. 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	386	68.7	104.7	42	61.5	65.0	-30	-2083	-1313
Passenger	444	72.1	108.1	47	70.1	73.1	-29	-2070	-2755

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

TEST NOTES

There was no valid data collected for:
Top of Engine X

SECTION 2

OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1

CRASH TEST SUMMARY

Test Vehicle: 2007 Toyota FJ Cruiser 4x4 NHTSA No.: M75104
Test Program: 35mph Frontal Impact Test Date: 5/23/2006

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 was cracked.	

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	392
Center	mm	371
Right Side	mm	379
Average	mm	381

BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	920	920
Lap belt length as measured on ATD	mm	830	825
Remainder of belt on reel	mm	895	971
Total belt length for continuous webbing systems	mm	2645	2716

DATA SHEET NO. 2

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2007 Toyota FJ Cruiser 4x4 NHTSA No.: M75104
Test Program: 35mph Frontal Impact Test Date: 5/23/2006

TEST VEHICLE INFORMATION

Manufacturer	Toyota
Model	FJ Cruiser
Body Style	SUV
NHTSA No.	M75104
VIN	JTEBU11F270014509
Color	White/Yellow
Delivery Date	5/16/06
Odometer Reading (mile)	35
Dealer	Don Jacobs Toyota
Transmission	Automatic
Final Drive	4WD
Number of Cylinders	6
Engine Displacement (L)	4.0
Engine Placement	Longitudinal
Automatic Door Lock (ADL)	No
Owners Manual Details Instructions on Disabling ADLs	N/A
Bucket Seats	Yes

TEST VEHICLE OPTIONS

Front Airbag	Yes
Driver Side Curtain Airbag	No
Driver Side Torso Airbag	No
Rear Passenger Side Curtain Airbag	No
Rear Passenger Side Torso Airbag	No
Force Limiter	Yes
Pretensioner	Yes
Power Steering	Yes
Power Door Locks	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	04/06

GVWR (kg)	2525
GAWR Front (kg)	1180
GAWR Rear (kg)	1380

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Split Bench		
Number of Occupants	2	3		5
Capacity Wt. (VCW) (kg)				540
Cargo Wt. (RCLW) (kg)				200

DATA SHEET NO. 2... (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2007 Toyota FJ Cruiser 4x4 NHTSA No.: M75104
Test Program: 35mph Frontal Impact Test Date: 5/23/2006

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	546.1	453.2		595.1	575.2	
Right	kg	494.4	437.7		495.4	551.1	
Ratio	%	53.9	46.1		49.2	50.8	
Totals	kg	1040.5	890.9	1931.4	1090.5	1126.3	2216.8

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1931.4
Weight of 2 P572E ATDs	kg	156.0
Rated Cargo/Luggage Weight (RCLW)	kg	136.1
Calculated Vehicle Target Weight (TVTW)	kg	2223.5

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	879	886	926	945	1241
As Tested	mm	874	885	896	901	1367
Post Test	mm	910	888	884	862	

Vehicle Wheelbase (mm): 2690

Weight of Ballast secured in cargo area (kg): 90.7

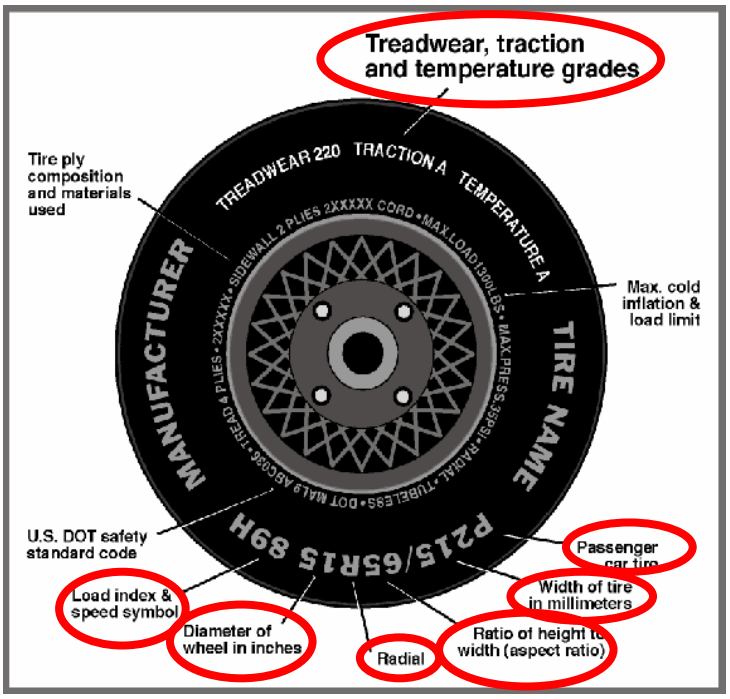
Vehicle Components Removed: Jack and tools, rear cargo carpet

Ballast weight does not include instrumentation and data acquisition system.

DATA SHEET NO. 3

TEST VEHICLE TIRE INFORMATION

Test Vehicle:	2007 Toyota FJ Cruiser 4x4	NHTSA No.:	M75104
Test Program:	35mph Frontal Impact	Test Date:	5/23/2006



DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (max)	220	220
Recommended Tire Size	P265/70R17	P265/70R17
Tire size on Vehicle	P265/70R17	P265/70R17
Tire Manufacturer	Bridgestone	Bridgestone
Tire Name	Dueller H/T	Dueller H/T
Tire Type	P	P
Tire Width (mm)	265	265
Ratio of Height to Width (aspect ratio)	70	70
Radial	R	R
Wheel Diameter	17	17
Load Index & Speed Symbol	840	840
Treadwear	300	300
Traction Grade	B	B
Temperature Grade	B	B

DATA SHEET NO. 4

TEST VEHICLE INFORMATION

Test Vehicle:	2007 Toyota FJ Cruiser 4x4	NHTSA No.:	M75104
Test Program:	35mph Frontal Impact	Test Date:	5/23/2006

NORMAL DESIGN RIDING POSITION

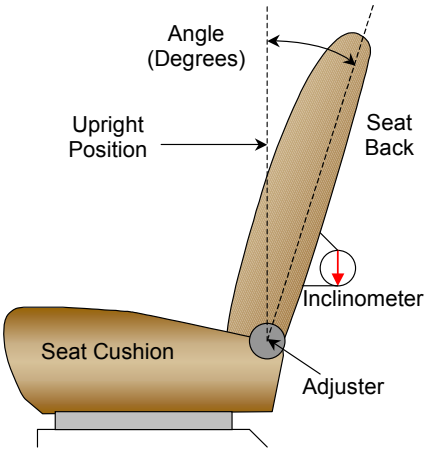
The driver and passenger seat back is positioned to the manufacturer's designated angle. The procedure is as follows: The driver seatback is placed in the 4th detent, forward-most detent defined as zero. The passenger seatback is placed in the 5th detent, forward-most detent defined as zero.

Driver seat back angle: 4th detent, 1st as zero

Passenger seat back angle: 5h detent, 1st as zero

SEAT FORE/AFT POSITIONING

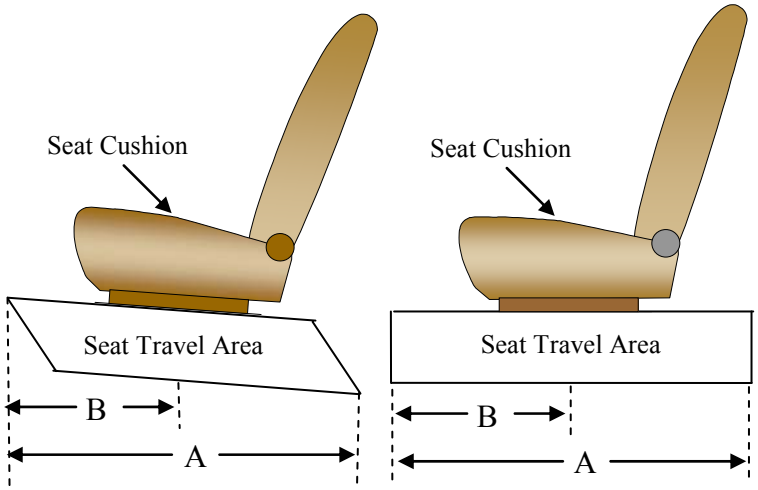
	Total Fore/Aft Travel	Placed in Position #
Driver Seat	17 detents	7th detent, 1st as zero
Passenger Seat	17 detents	8th detent, 1st as zero



FRONT SEAT ASSEMBLY

ADJUSTABLE D-RING POSITION

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



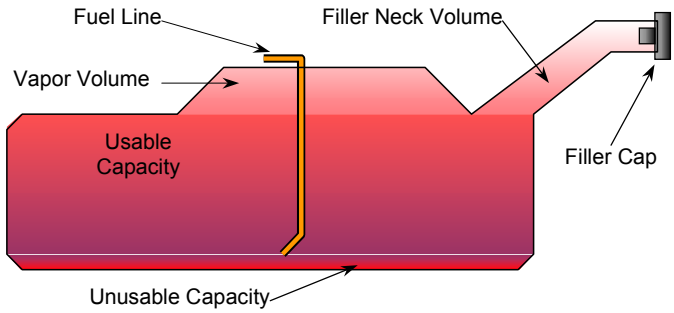
DATA SHEET NO. 4…(CONTINUED)
TEST VEHICLE INFORMATION

Test Vehicle: 2007 Toyota FJ Cruiser 4x4 NHTSA No.: M75104
Test Program: 35mph Frontal Impact Test Date: 5/23/2006

FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank"	71.9
Usable Capacity of "Optional" Tank	
92-94% of Usable Capacity	66.1 – 67.6
Actual Amount of Solvent used	67.4
1/3 of Usable Capacity	24.0

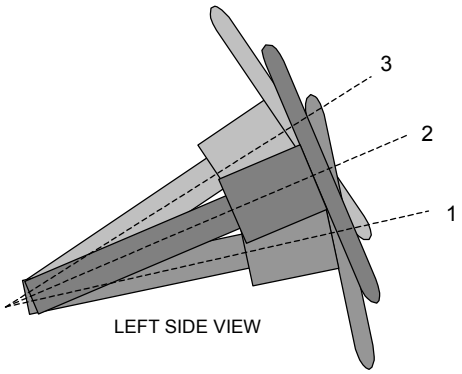
The test vehicle is equipped with an electric fuel pump. Pump will run when the engine is running.



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

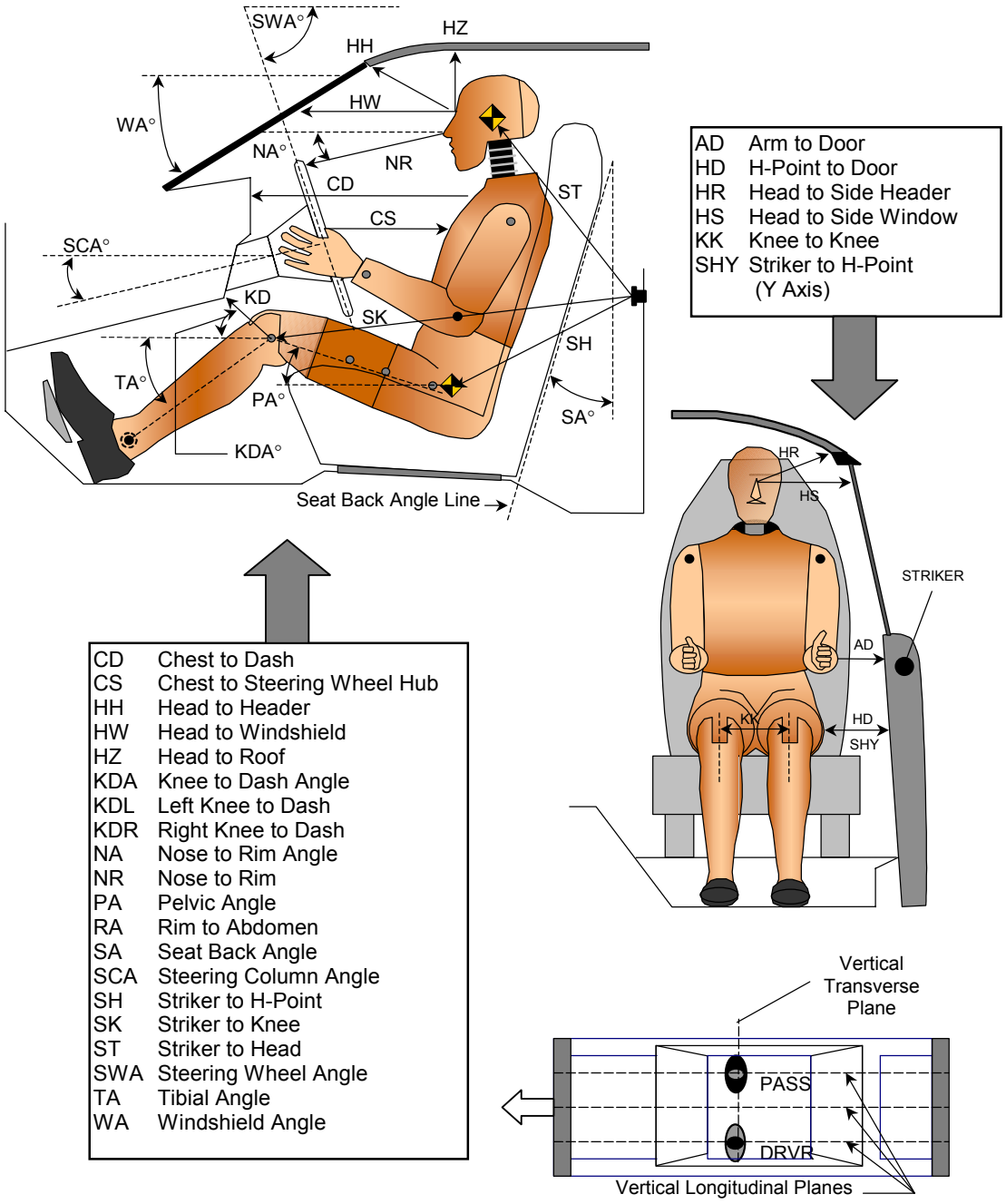
	Fore/Aft Position (mm)	Degrees
Lowermost position No. 1		21.0
Geometric center position No. 2		27.2
Uppermost position No. 3		36.0

DATA SHEET NO. 5

DUMMY POSITIONING IN VEHICLE

Test Vehicle:	2007 Toyota FJ Cruiser 4x4	NHTSA No.:	M75104
Test Program:	35mph Frontal Impact	Test Date:	5/23/2006

DUMMY MEASUREMENTS FOR FRONT SEAT OCCUPANTS



DATA SHEET NO. 5... (CONTINUED)

DUMMY POSITIONING IN VEHICLE

Test Vehicle: 2007 Toyota FJ Cruiser 4x4 NHTSA No.: M75104
Test Program: 35mph Frontal Impact Test Date: 5/23/2006

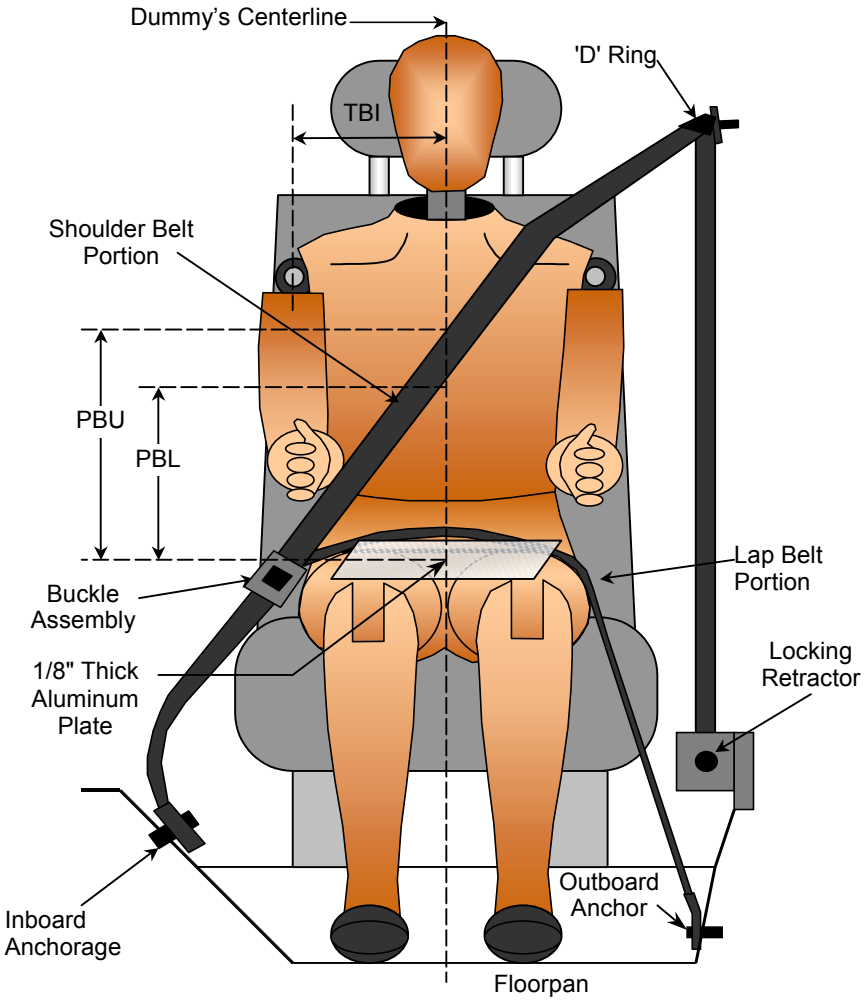
TEST DUMMY POSITION MEASUREMENTS

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA	Windshield Angle		58.9		
SWA	Steering Wheel Angle		62.8		
SCA	Steering Column Angle		27.2		
SA	Seat Back Angle (headrest post)		2.3		3.3
HZ	Head to Roof (Z)	255	90	227	90
HH	Head to Header	744	12.2	739	11.8
HW	Head to Windshield	836	0	822	0
HR	Head to Side Header (Y)	249		222	
NR	Nose to Rim	412	14.8		
CD	Chest to Dash	504		524	
CS	Chest to Steering Hub	321	7.1		
RA	Rim to Abdomen	178	0		
KDL	Left Knee to Dash	120	39.5	119	
KDR	Right Knee to Dash	115		123	33.4
PA	Pelvic Angle		22.7		21.7
TA	Tibia Angle		41.0		41.1
KK	Knee to Knee (Y)	340		272	
SK	Striker to Knee	663	101.3	629	95.4
ST	Striker to Head	487	20.2	522	22.0
SH	Striker to H-Point	349	119.2	339	123.1
SHY	Striker to H-Point (Y)	264		264	
HS	Head to Side Window	365		354	
HD	H-Point to Door (Y)	138		150	
AD	Arm to Door (Y)	132		135	
AA	Ankle to Ankle	330		238	

DATA SHEET NO. 6

SEAT BELT POSITIONING DATA

Test Vehicle:	2007 Toyota FJ Cruiser 4x4	NHTSA No.:	M75104
Test Program:	35mph Frontal Impact	Test Date:	5/23/2006



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	330	
PBL - To surface of reference to belt lower edge	mm	260	

DATA SHEET NO. 7

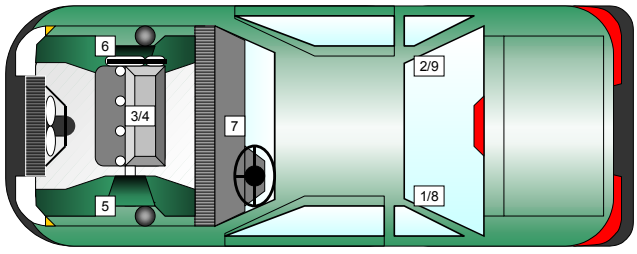
VEHICLE ACCELEROMETER LOCATIONS

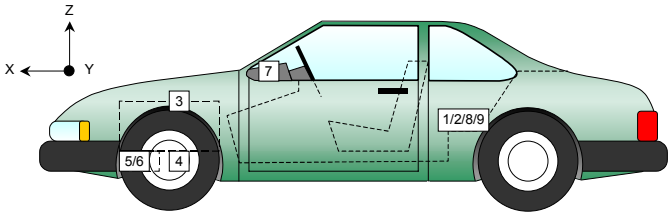
Test Vehicle: 2007 Toyota FJ Cruiser 4x4 NHTSA No.: M75104
Test Program: 35mph Frontal Impact Test Date: 5/23/2006

VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear X-Member X	1600	-280	696
2	Right Rear X-Member X	1600	280	698
3	Engine Top X	3784	-54	1082
4	Engine Bottom X	3725	60	270
5	Left Brake Caliper X	3465	-678	285
6	Right Brake Caliper X	3465	678	287
7	Instrument Panel X			
8	Left Rear X-Member Z	1600	-280	696
9	Right Rear X-Member Z	1600	280	698

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 Toyota FJ Cruiser 4x4 NHTSA No.: M75104
Test Program: 35mph Frontal Impact Test Date: 5/23/2006

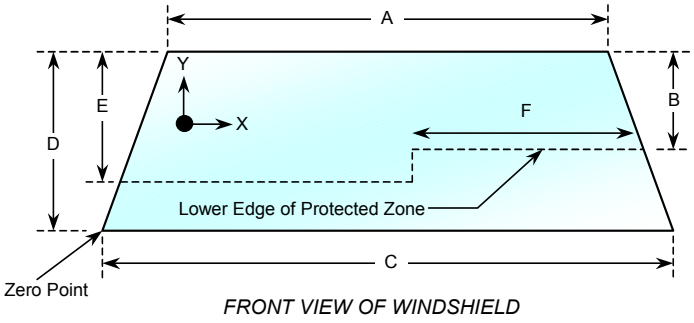
Windshield Mounting Details:
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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	1887	1887	100
Right Side	1887	1887	100
Total	3774	3774	100



FRONT VIEW OF WINDSHIELD

Item	Units	Value
A	mm	1334
B	mm	298
C	mm	1590
D	mm	425
E	mm	312
F	mm	595

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 Toyota FJ Cruiser 4x4 NHTSA No.: M75104
Test Program: 35mph Frontal Impact Test Date: 5/23/2006

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21° C Test Time: 11:47 am

Stoddard Solvent Spillage Measurements

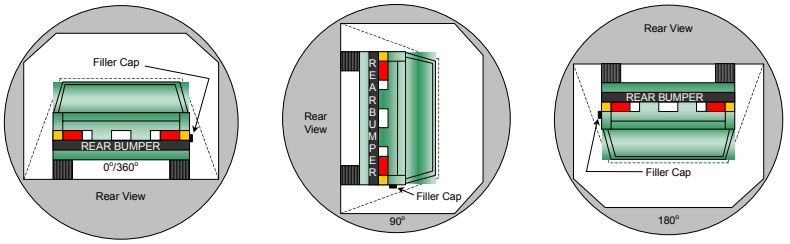
A. From impact until vehicle motion ceases: 0 oz.
(Maximum Allowable = 1 ounce)

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

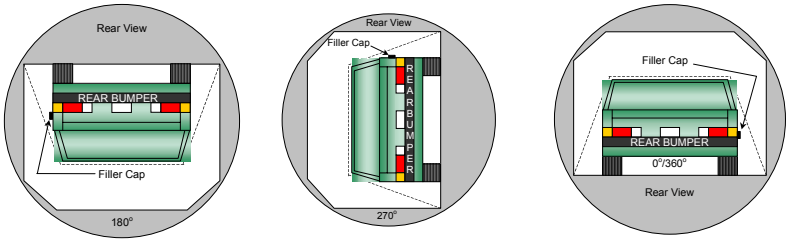
C. For the following 25 minutes: 0 oz.
(Maximum Allowable = 1 oz. /minute)

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°	120	300	0
90° to 180°	117	300	0
180° to 270°	108	300	0
270° to 360°	114	300	0

DATA SHEET NO. 10

VEHICLE MEASUREMENTS

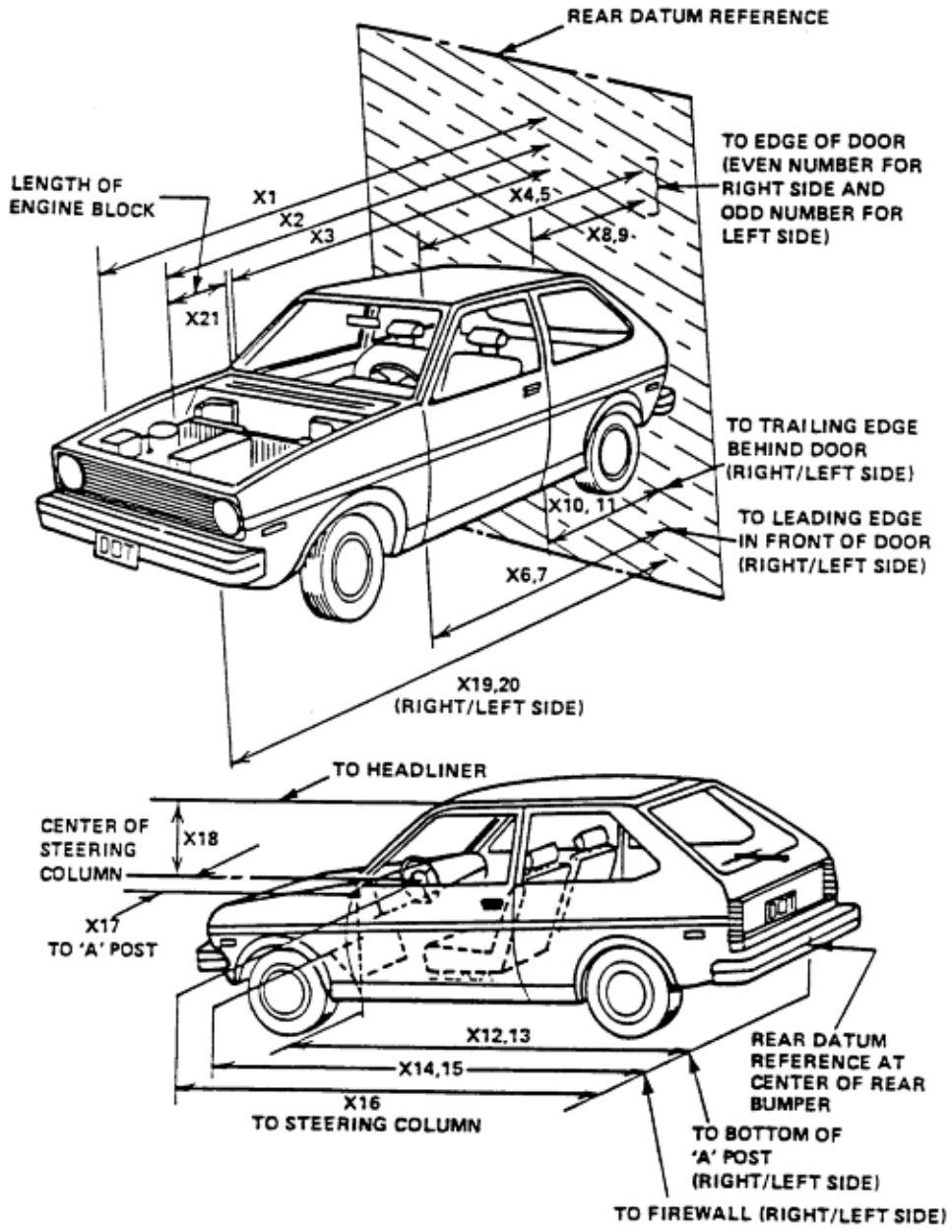
Test Vehicle: 2007 Toyota FJ Cruiser 4x4 NHTSA No.: M75104
Test Program: 35mph Frontal Impact Test Date: 5/23/2006

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total length of vehicle at centerline	mm	4546	4006	540
2	RSOV to front of engine	mm	3774	3696	78
3	RSOV to firewall centerline	mm	3220	3356	-136
4	RSOV to leading edge of right door	mm	3031	3082	-51
5	RSOV to leading edge of left door	mm	3021	3078	-57
6	RSOV to lower leading edge of right door	mm	3024	3040	-16
7	RSOV to lower leading edge of left door	mm	3020	3044	-24
8	RSOV to upper leading edge of right door	mm	1919	1969	-50
9	RSOV to upper leading edge of left door	mm	1912	1973	-61
10	RSOV to lower trailing edge of right door	mm	1920	1934	-14
11	RSOV to lower trailing edge of left door	mm	1918	1941	-23
12	RSOV to bottom of right 'A' pillar	mm	2965	2965	0
13	RSOV to bottom of left 'A' pillar	mm	2960	2955	5
14	RSOV to firewall on right side	mm	3386	3427	-41
15	RSOV to firewall on left side	mm	3381	3426	-45
16	RSOV to steering column	mm	2608	2657	-49
17	Center of steering column to left 'A' pillar	mm	395	426	-31
18	Center of steering column to headlining	mm	520	549	-29
19	RSOV to right side of front bumper	mm	4458	3981	477
20	RSOV to left side of front bumper	mm	4458	3978	480
21	Length of engine block	mm	470	470	0
RD	RSOV to right side of dash panel	mm	2875	2920	-45
CD	RSOV to center of dash panel	mm	2833	2860	-27
LD	RSOV to left side of dash panel	mm	2873	2921	-48

DATA SHEET NO. 10... (continued)

VEHICLE MEASUREMENTS

Test Vehicle:	2007 Toyota FJ Cruiser 4x4	NHTSA No.:	M75104
Test Program:	35mph Frontal Impact	Test Date:	5/23/2006



DATA SHEET NO. 10... (continued)

VEHICLE MEASUREMENTS

Test Vehicle: 2007 Toyota FJ Cruiser 4x4 NHTSA No.: M75104
Test Program: 35mph Frontal Impact Test Date: 5/23/2006

Target Vehicle Structural Measurement

	Elements	Pre-Test (mm)
1	Total Length	4546
2	Total Width	1856
3	Bumper Top Height	797
4	Bumper Bottom Height	485
5	Longitudinal Member Top Height	579
6	Distance between Longitudinal Members	871
7	Longitudinal Member Width	55
8	Engine Top Height	1165
9	Engine Bottom Height	422
10	Engine and gearbox width	630
11	Front bumper-engine distance	645
12	Front shock absorber fixing height	859
13	Bonnet leading edge height	1063
14	Front shock absorber fixing width	1034
15	Front bumper – front axle distance	653
16	Front axle – a pillar distance	644
17	A-pillar – B-pillar distance	1025
18	B-Pillar – rear axle distance	1045
19	B-pillar – C-pillar distance	603
20	Roof sill bottom height	1685
21	Roof sill top height	1756
22	Floor sill bottom height	442
23	Floor sill top height	533

DATA SHEET NO. 11

CAMERA LOCATIONS

Test Vehicle: 2007 Toyota FJ Cruiser 4x4 NHTSA No.: M75104
Test Program: 35mph Frontal Impact Test Date: 5/23/2006

No.	Camera View	Location (mm) *			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Side View				13	24
2	Left Front View	1035	-5395	1500	25	1000
3	Steering Column Top	1425	-5050	1475	25	1000
4	Steering Column Bottom	1425	-5015	1025	25	1000
5	Driver Close-up	1610	-5710	1435	35	1000
6	Driver Angle	6305	-5050	2025	50	1000
7	On board Driver Side					
8	On board Passenger Side					
9	Right Overall	2025	6750	1440	19	1000
10	Right Passenger Half	1130	5300	1500	24	1000
11	Right Close-up	1510	5890	1445	35	1000
12	Right Angle	6520	5115	1965	50	1000
13	Windshield	-285	0	2370	19	1000
14	Top Driver	-45	-395	2205	24	1000
15	Top Passenger	-55	470	2215	24	1000
16	Pit Front	1220	0	-3150	24	1000
17	Pit Rear	3440	0	-3150	24	1000

*COORDINATES:

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

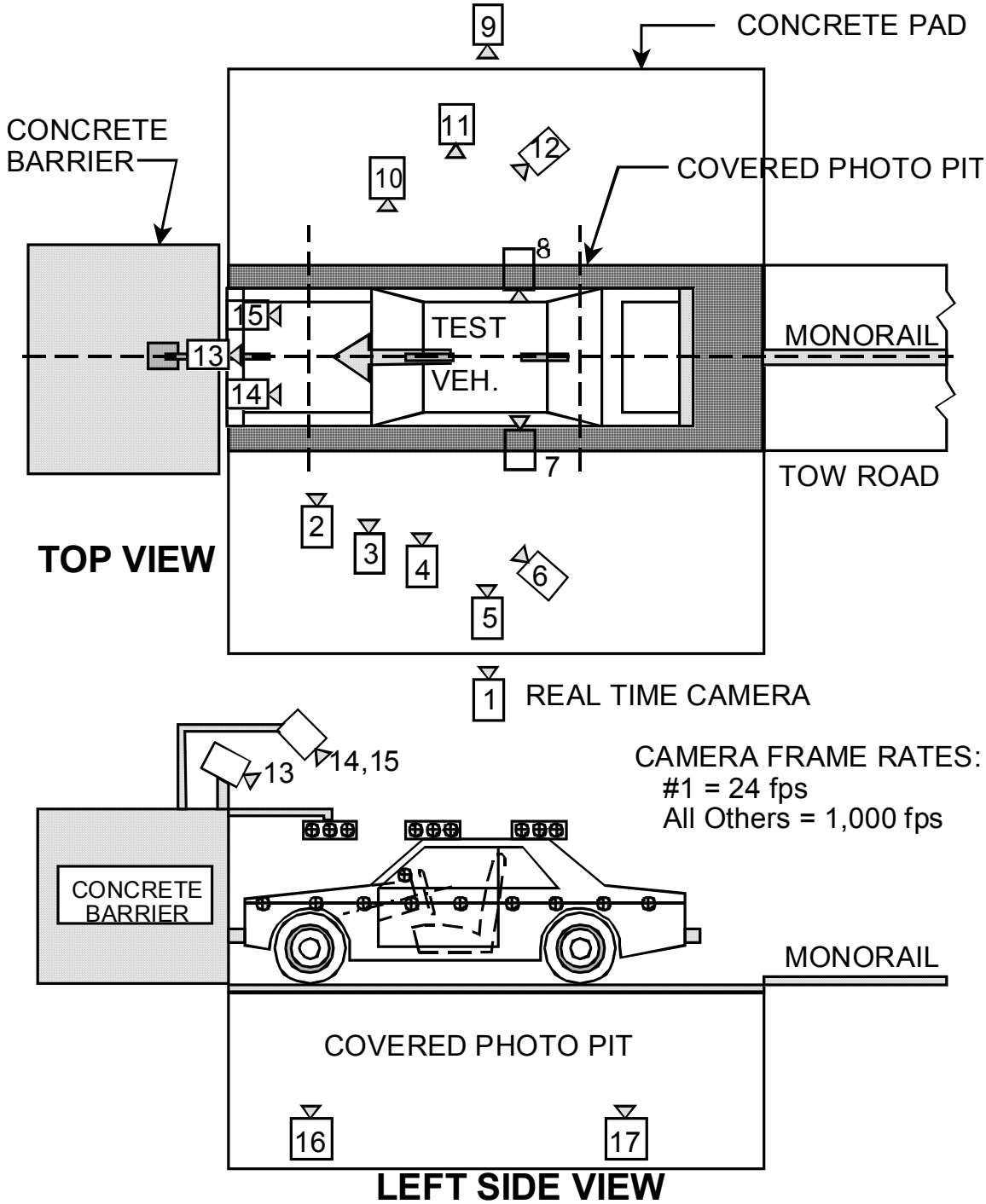
Note: Cameras 7 and 8 were not used for this test.

DATA SHEET NO. 11... (continued)

CAMERA LOCATIONS

Test Vehicle:	2007 Toyota FJ Cruiser 4x4	NHTSA No.:	M75104
Test Program:	35mph Frontal Impact	Test Date:	5/23/2006

CAMERA POSITIONS FOR FRONTAL IMPACTS

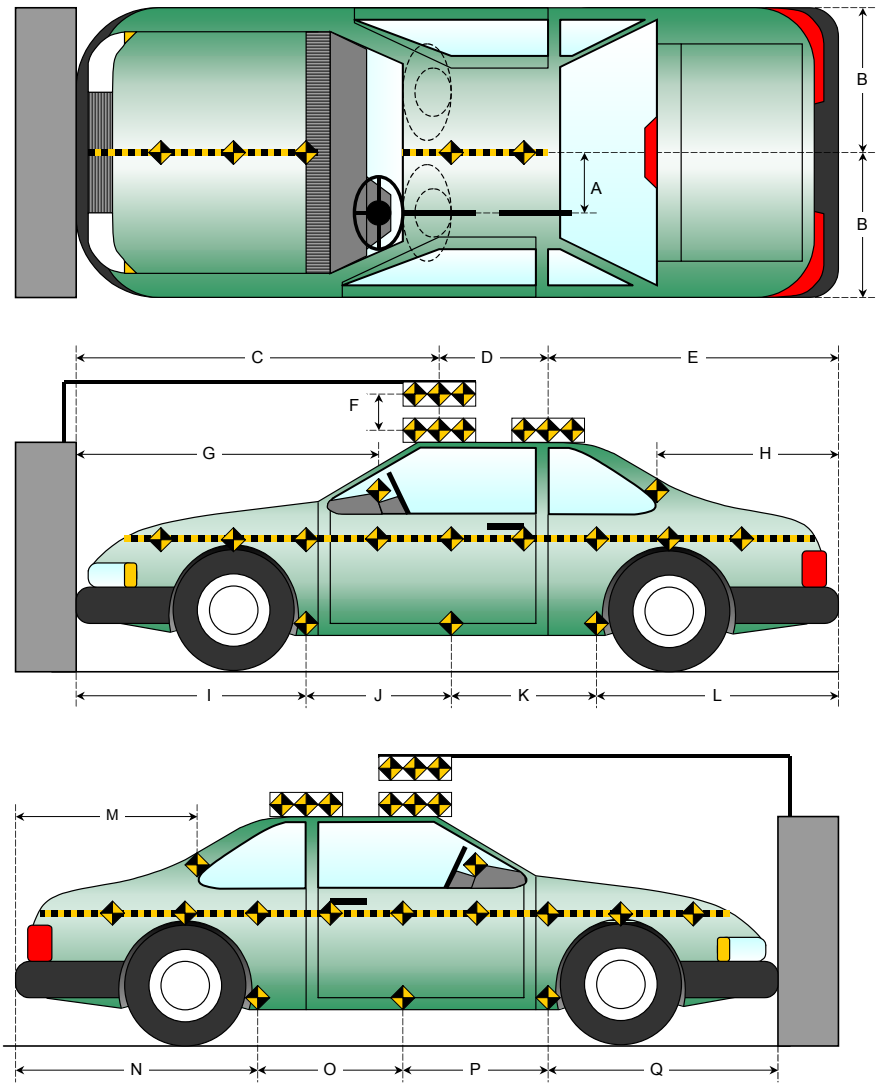


DATA SHEET NO. 12

PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2007 Toyota FJ Cruiser 4x4 NHTSA No.: M75104
Test Program: 35mph Frontal Impact Test Date: 5/23/2006

Item	Value
A	552
B	928
C	2384
D	610
E	1552
F	1895
G	
H	1096
I	1469
J	773
K	783
L	1521
M	1124
N	1514
O	770
P	776
Q	1486



DATA SHEET NO. 13

VEHICLE INTRUSION MEASUREMENTS

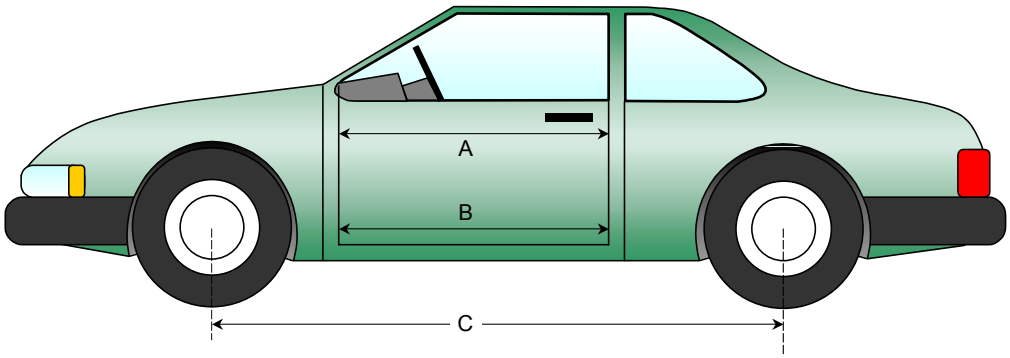
Test Vehicle: 2007 Toyota FJ Cruiser 4x4 NHTSA No.: M75104
Test Program: 35mph Frontal Impact Test Date: 5/23/2006

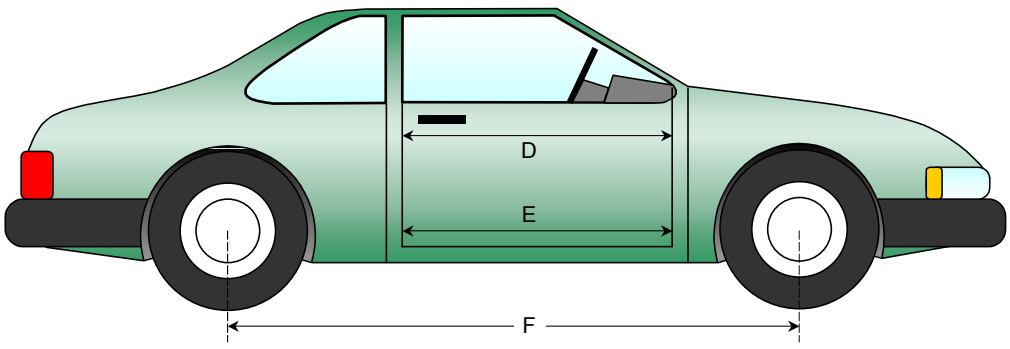
DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1042	1035	7
B	Left Side Lower	mm	908	902	6
D	Right Side Upper	mm	1045	1042	3
E	Right Side Lower	mm	916	918	-2

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2690	2636	54
F	Right Side Wheelbase	mm	2690	2656	34





DATA SHEET NO. 13... (continued)

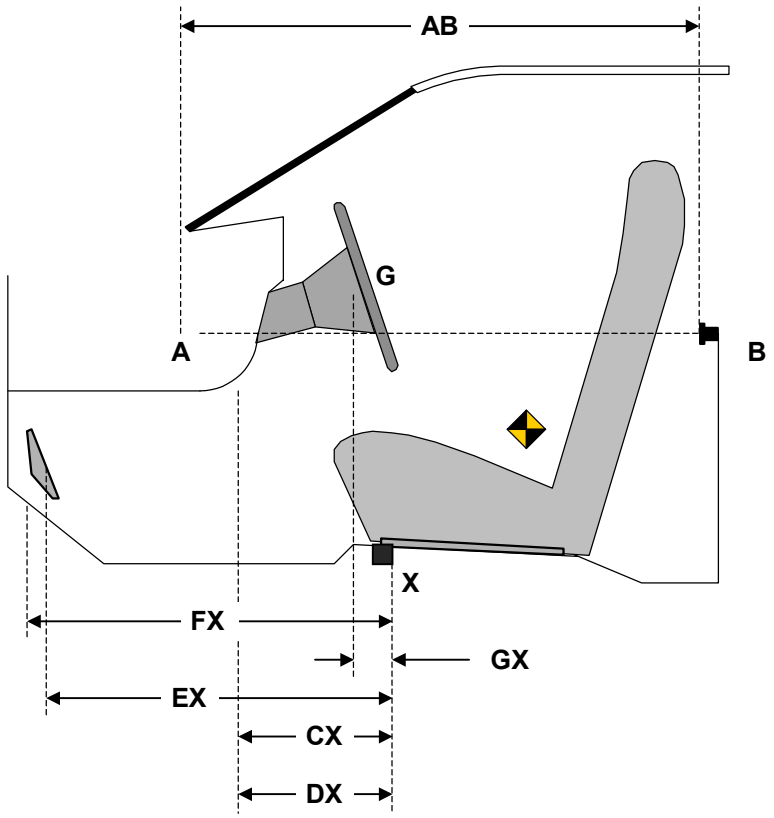
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2007 Toyota FJ Cruiser 4x4 NHTSA No.: M75104
Test Program: 35mph Frontal Impact Test Date: 5/23/2006

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside window jam)	mm	862	862	0
CX	Left Knee Bolster to X	mm	204	243	-39
DX	Right Knee Bolster to X	mm	206	242	-36
EX	Brake Pedal to X	mm	554	570	-16
FX	Foot Rest to X	mm	580	580	0
GX	Center of Steering Column Wheel Hub to X	mm	45	97	-52

X = Front of Seat Track (stationary)

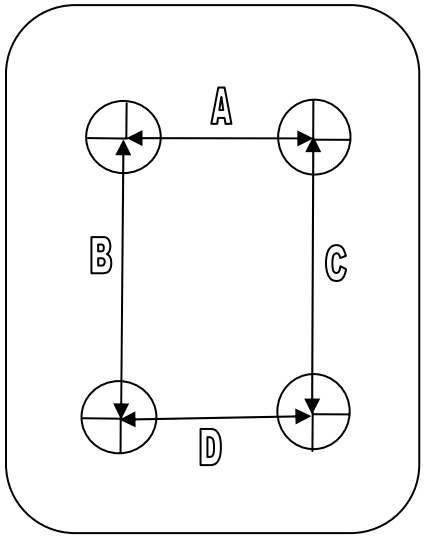


DRIVER COMPARTMENT

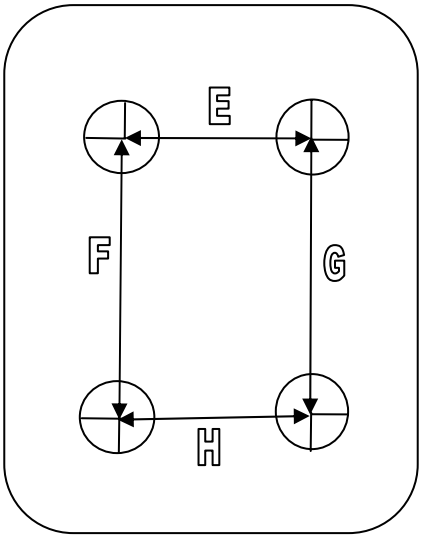
DATA SHEET NO. 13... (continued)

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2007 Toyota FJ Cruiser 4x4 NHTSA No.: M75104
Test Program: 35mph Frontal Impact Test Date: 5/23/2006



Driver



Passenger

UNDERBODY FLOORBOARD DEFORMATION

Measurement	Pre-Test	Post-Test	Difference
A	330	330	0
B	367	367	0
C	373	373	0
D	330	330	0
E	330	330	0
F	373	373	0
G	368	365	3
H	330	330	0

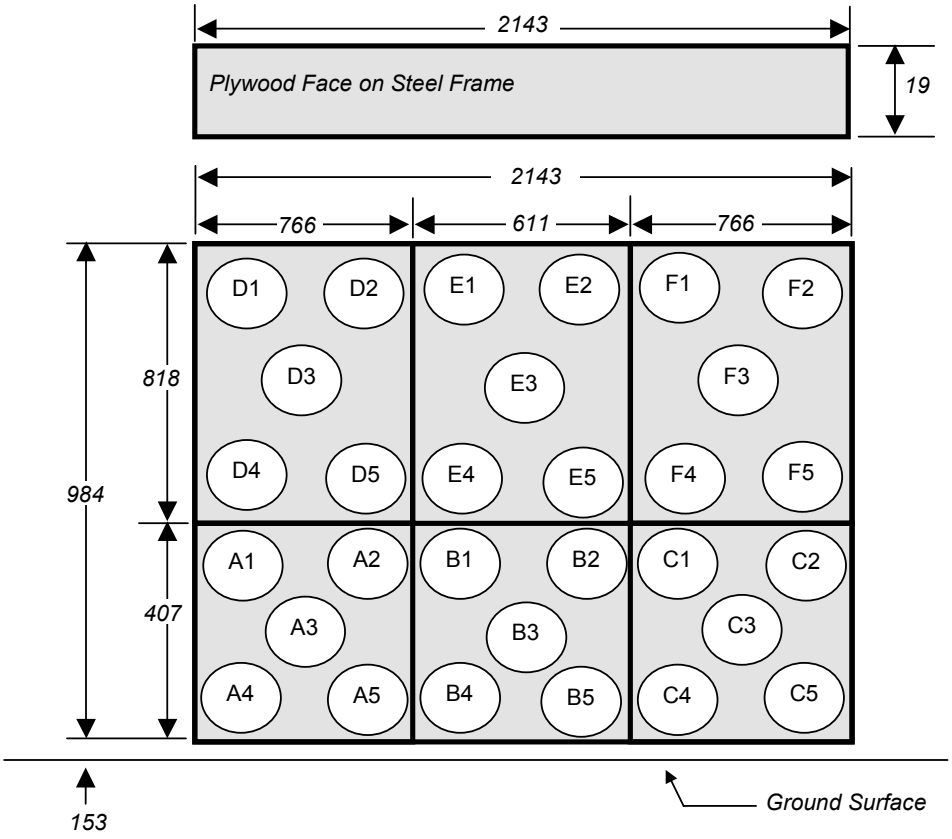
DATA SHEET NO. 14

LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle:	2007 Toyota FJ Cruiser 4x4	NHTSA No.:	M75104
Test Program:	35mph Frontal Impact	Test Date:	5/23/2006

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 Toyota FJ Cruiser 4x4 NHTSA No.: M75104
Test Program: 35mph Frontal Impact Test Date: 5/23/2006

VEHICLE INFORMATION

VIN: JTEBU11F270014509 Wheelbase (mm) : 2690
Vehicle Size Category: MPV Test Weight (kg) : 2216.8

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): 63.1 Time of Separation (msec): 114

CRUSH PROFILE

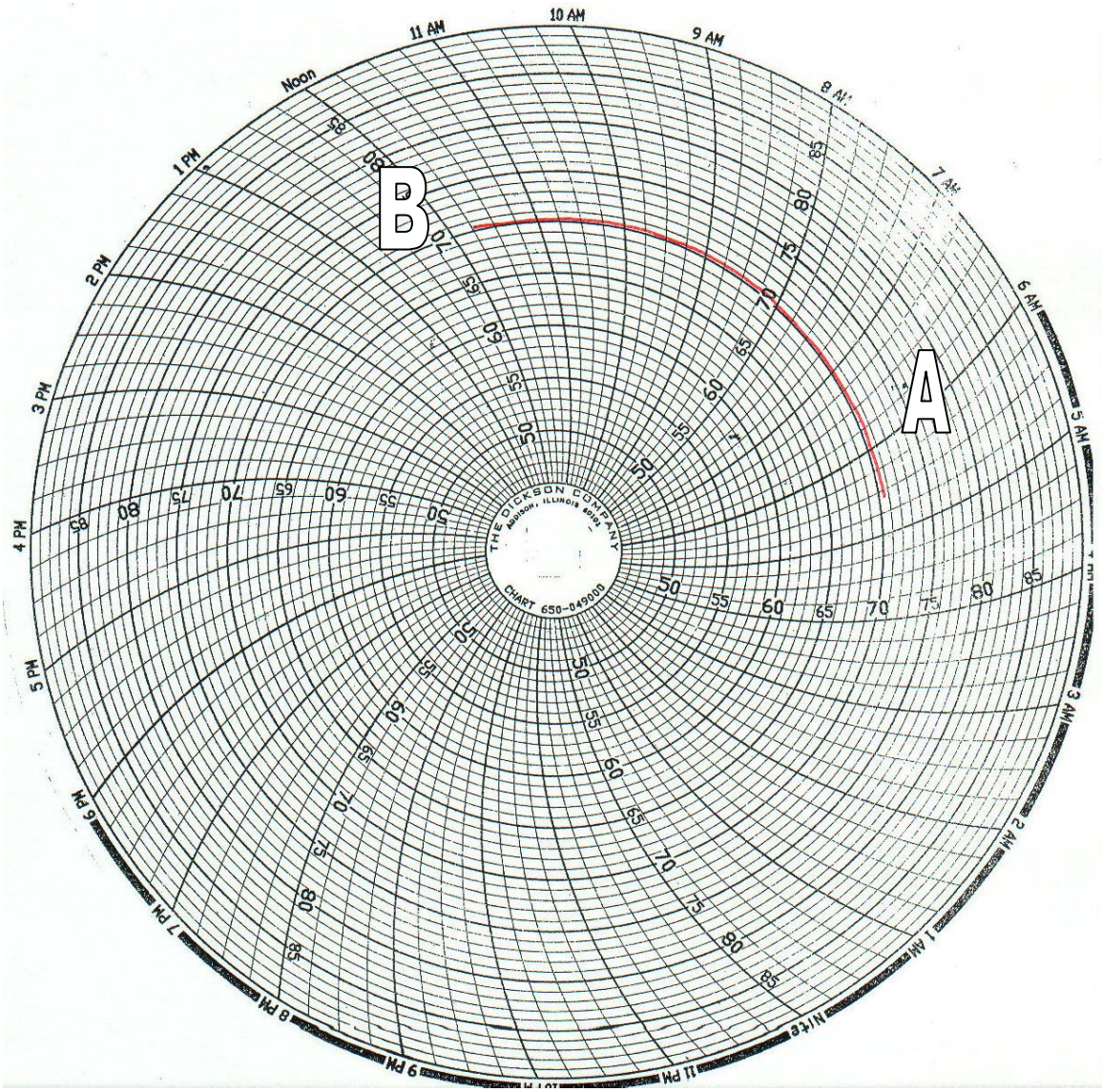
Collision Deformation Classification: Frontal Midpoint of Damage: Centerline
Damage Region Length (mm): 1074 Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4458	3978	480
C2	Crush zone 2 at left side	mm	4480	3992	488
C3	Crush zone 3 at left side	mm	4488	4001	487
C4	Crush zone 4 at right side	mm	4489	4005	484
C5	Crush zone 5 at right side	mm	4480	4004	476
C6	Crush zone 6 at right side	mm	4458	3981	477
L	C1 TO C6	mm	1074	1060	14

DATA SHEET NO. 16

DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART

Test Vehicle:	2007 Toyota FJ Cruiser 4x4	NHTSA No.:	M75104
Test Program:	35mph Frontal Impact	Test Date:	5/23/2006



A = Dummies installed in vehicle at 6:00 am

B = Test conducted at 11:47 am

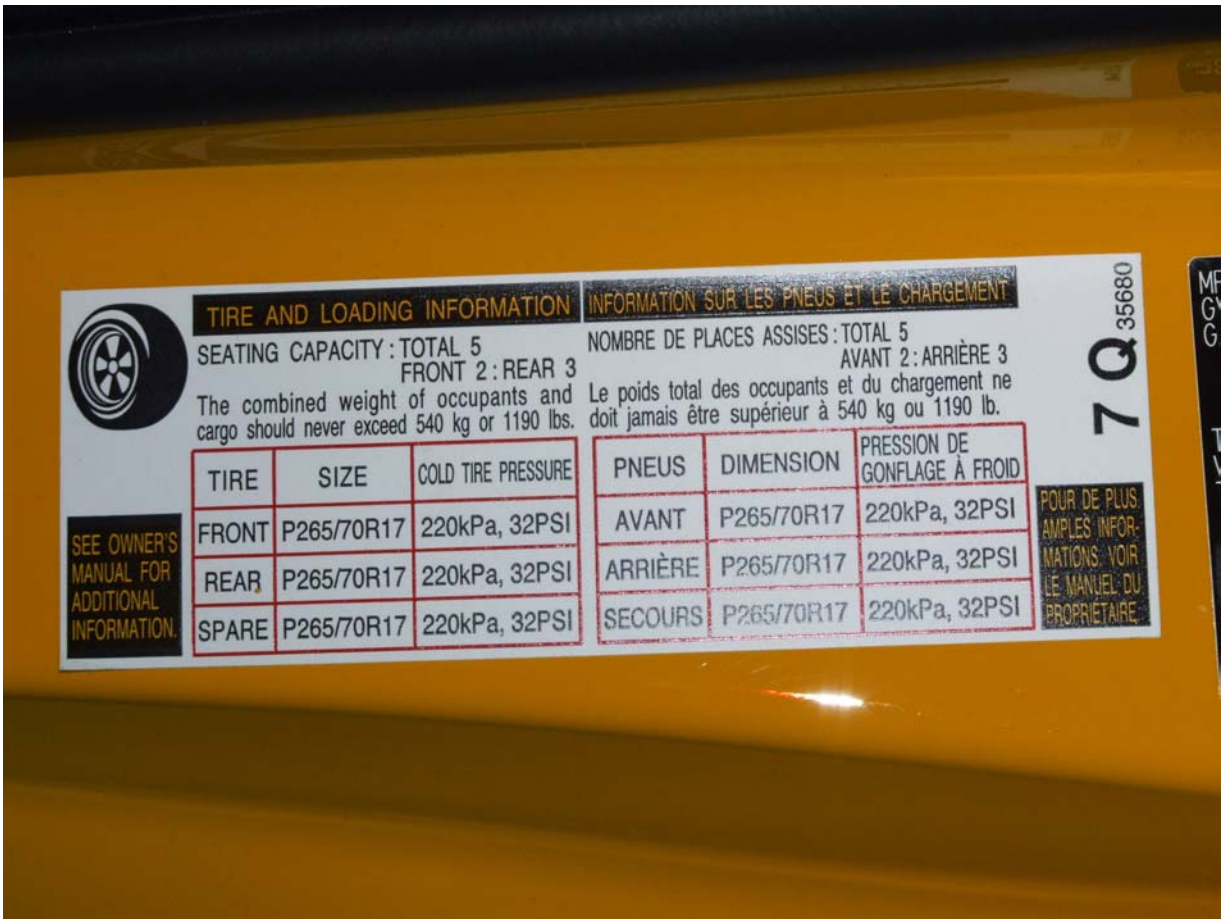
APPENDIX A

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

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

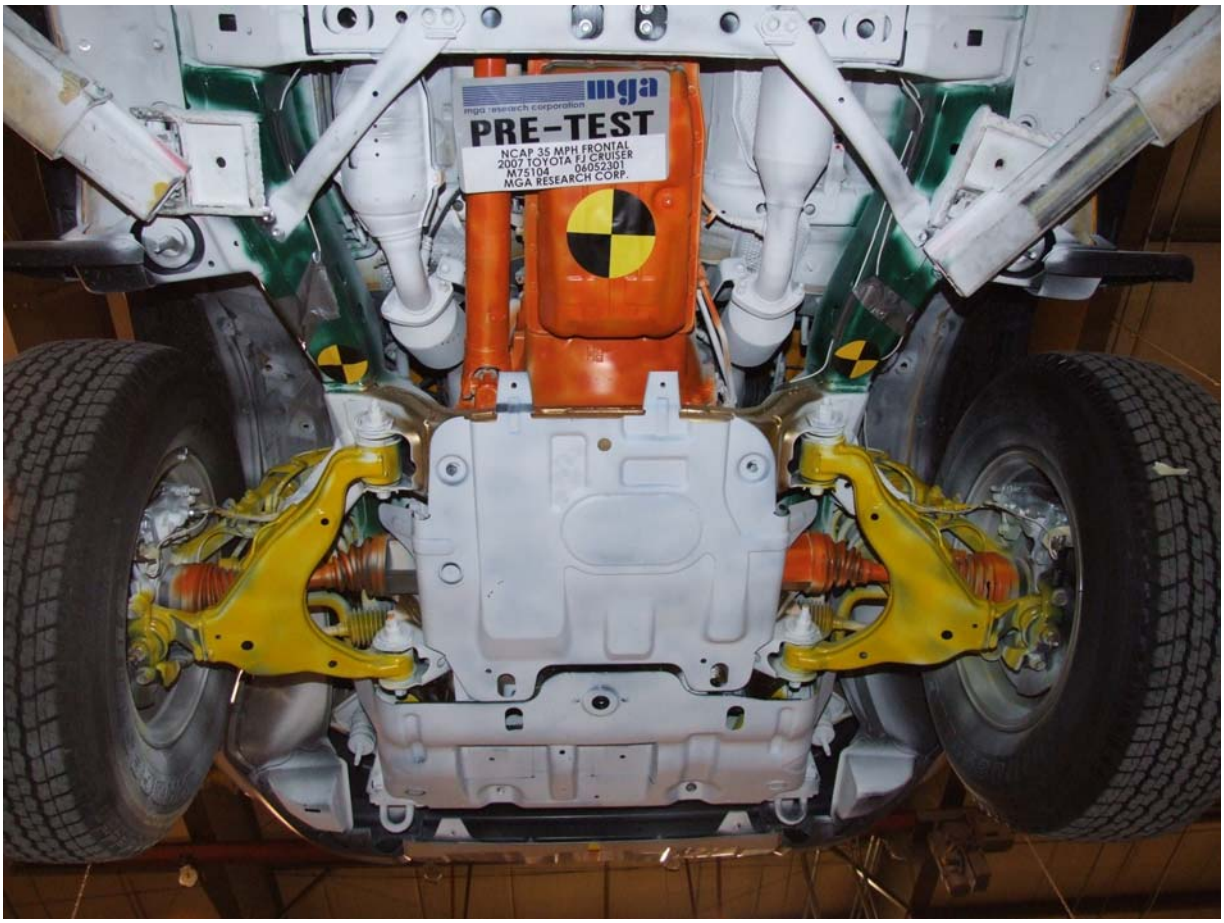
Post-Test Windshield View

Pre-Test Engine Compartment View

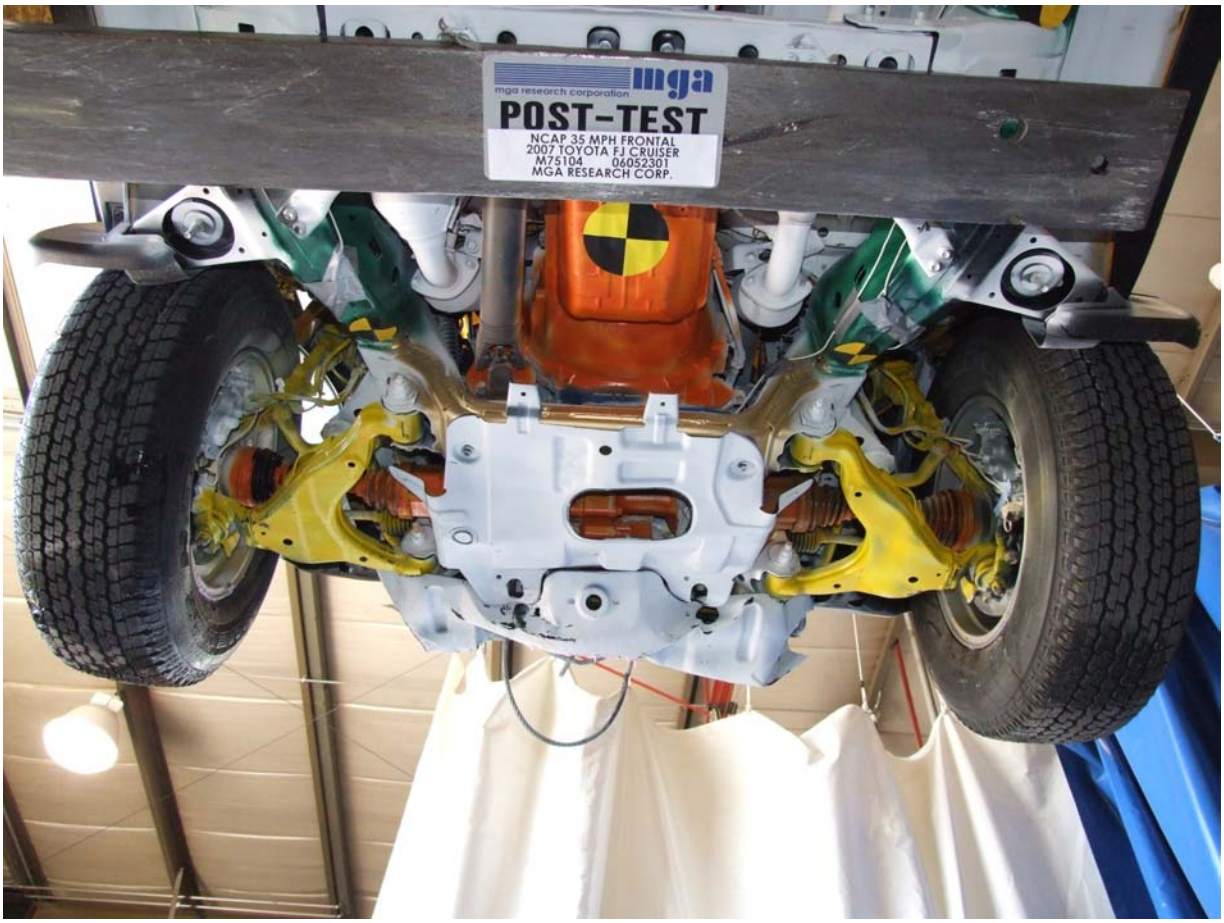
Post-Test Engine Compartment View

Pre-Test Fuel Cap View

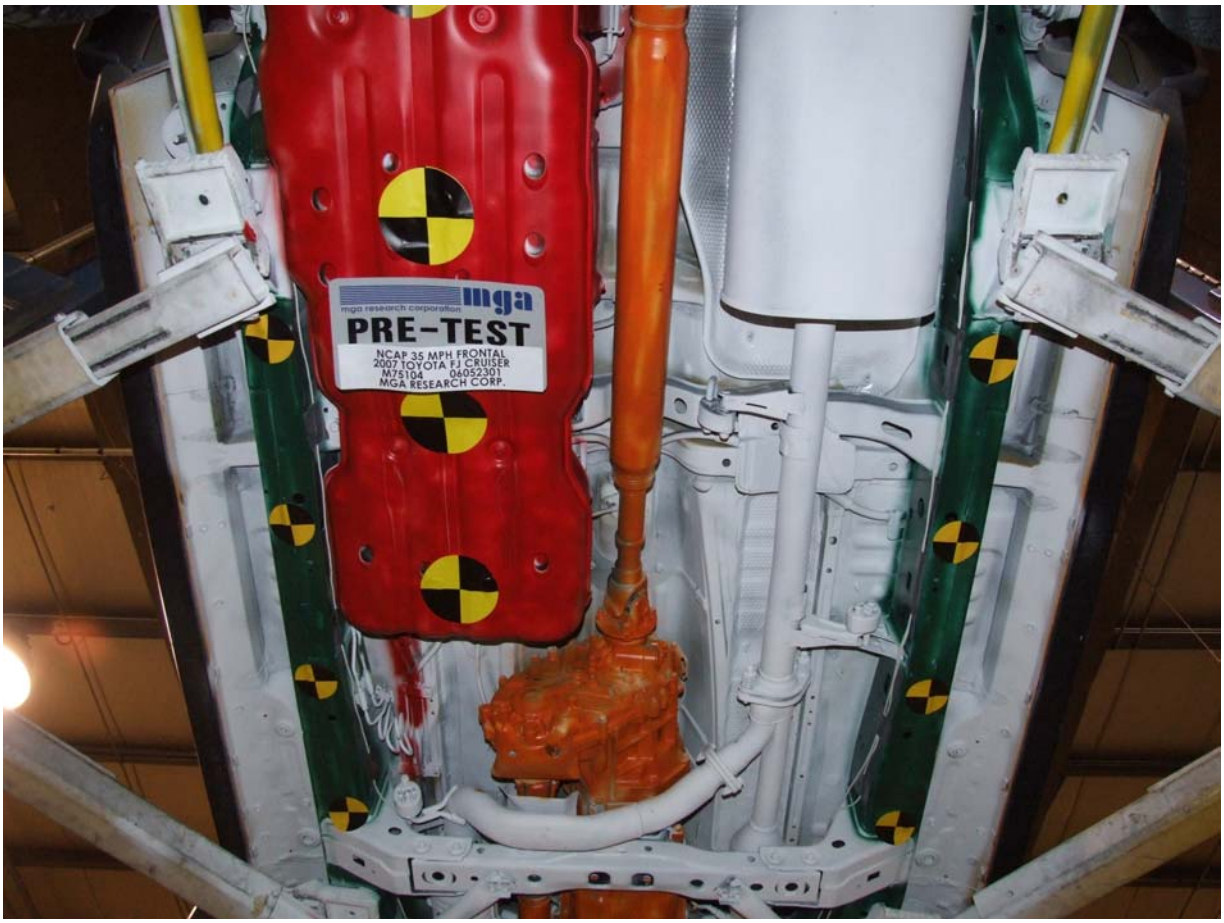
Post-Test Fuel Cap View



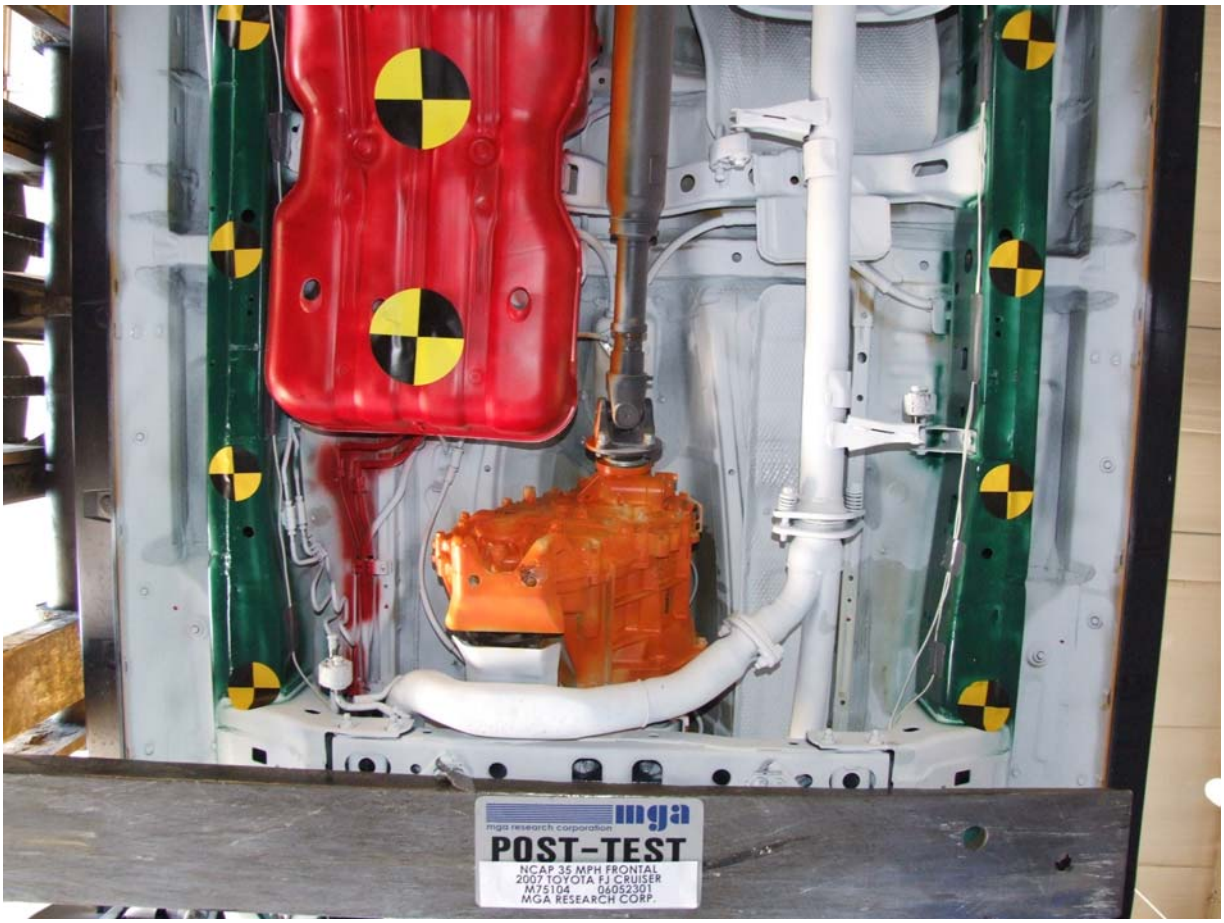
Pre-Test Front Underbody View



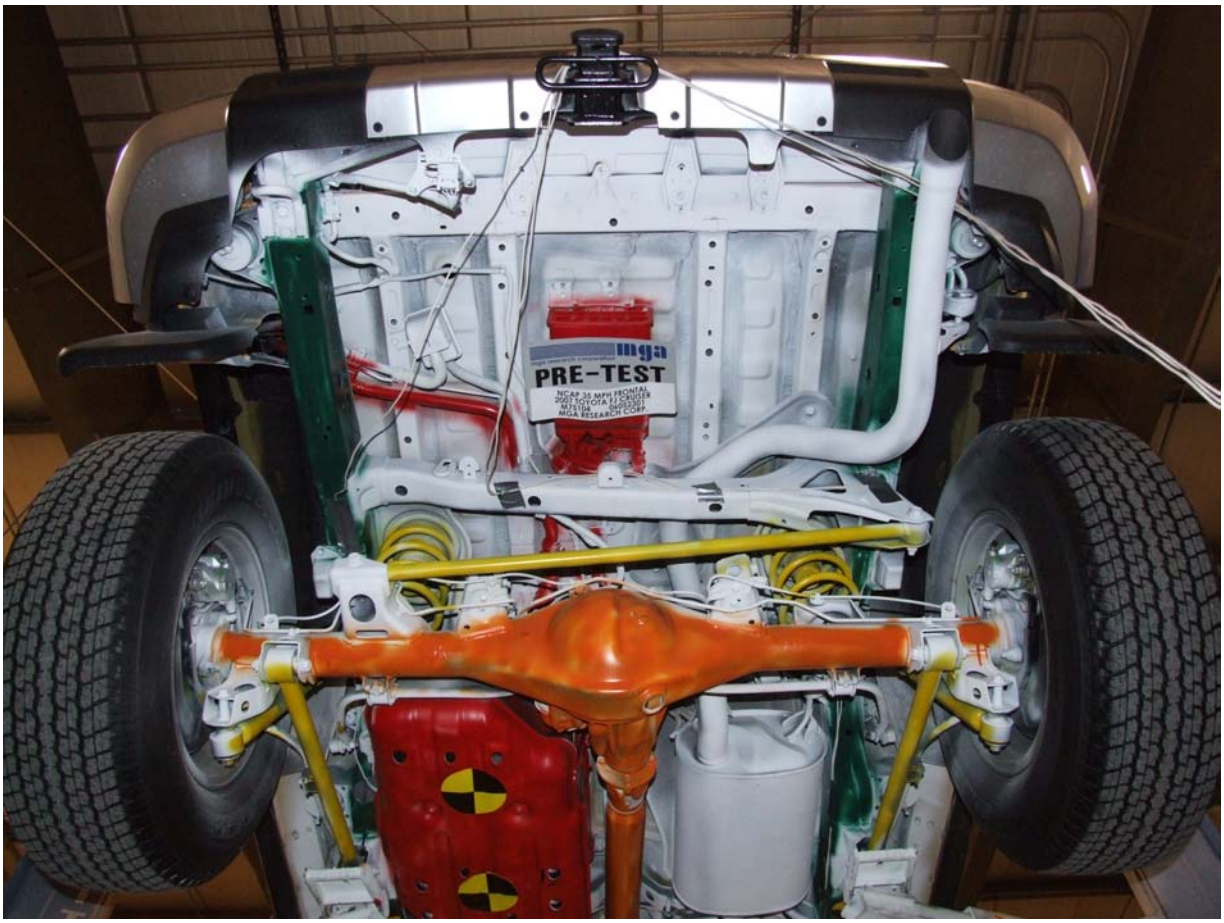
Post-Test Front Underbody View



Pre-Test Mid 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)

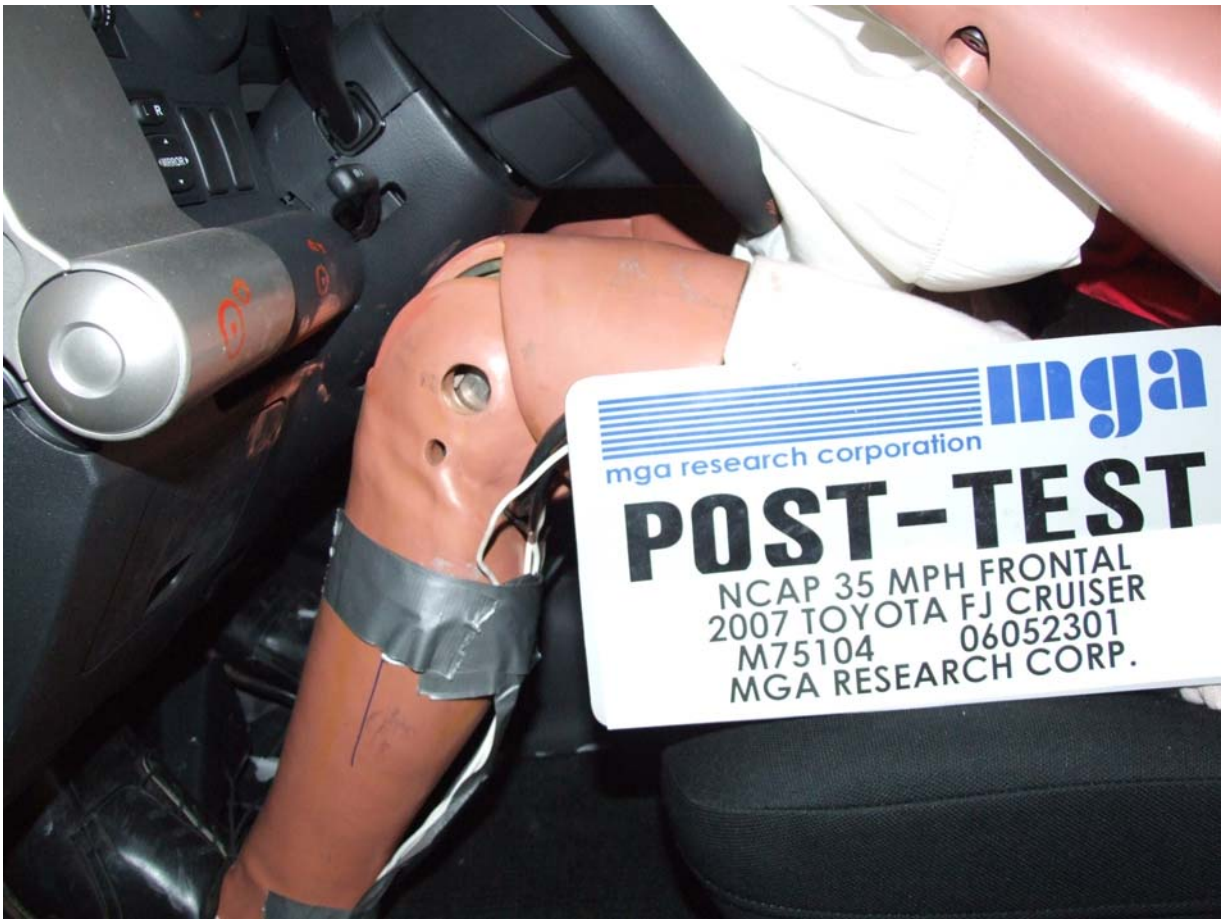
Pre-Test Driver Dummy (Door Open)

Post-Test Driver Dummy (Door Open)

Pre-Test Driver Dummy Feet

Post-Test Driver Dummy Feet

Pre-Test Driver Side Knee Bolster

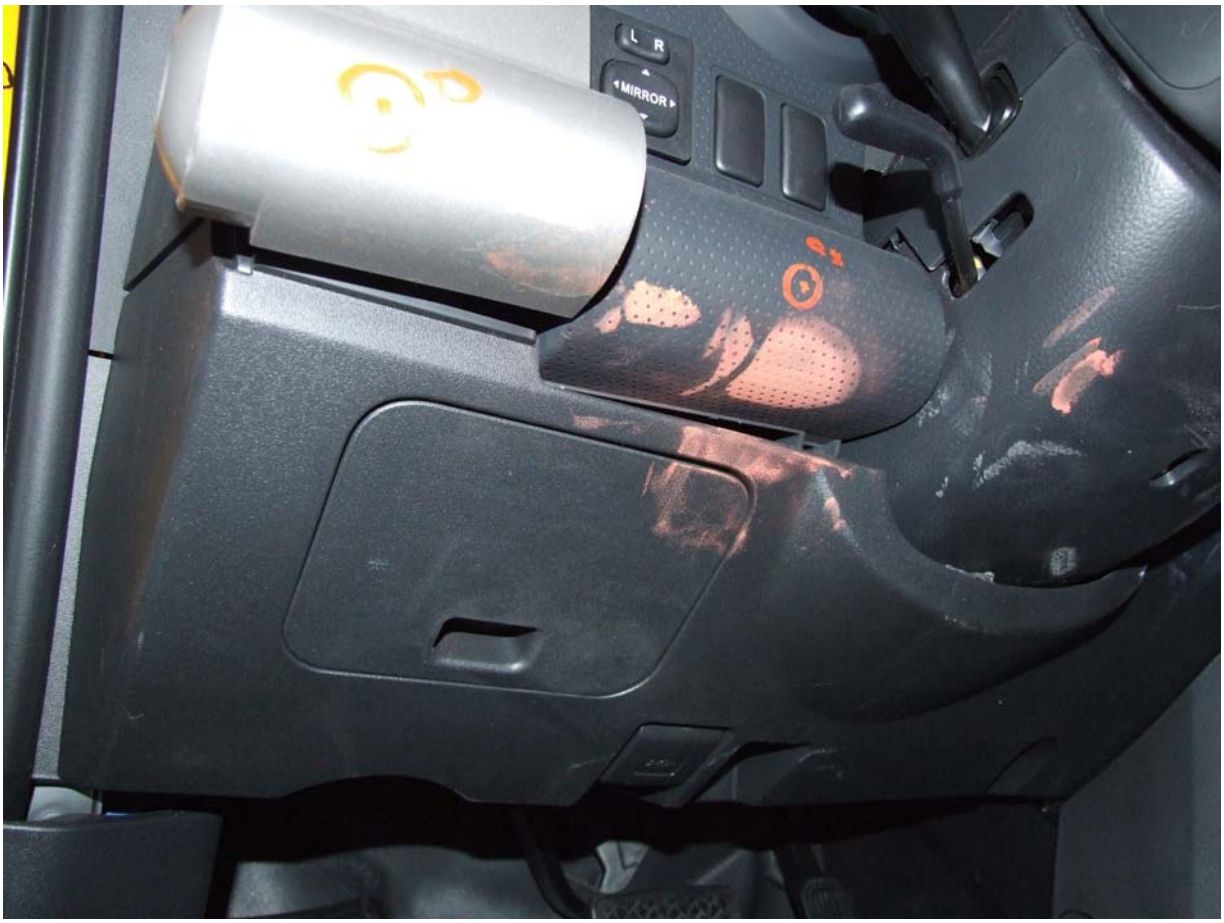


Post-Test Driver Side Knee Bolster

Pre-Test Driver Side Floor Pan

Post-Test Driver Side Floor Pan

Post-Test Driver Dummy Head Contact



Post-Test Driver Dummy Left Knee Contact

Post-Test Driver Dummy Right 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

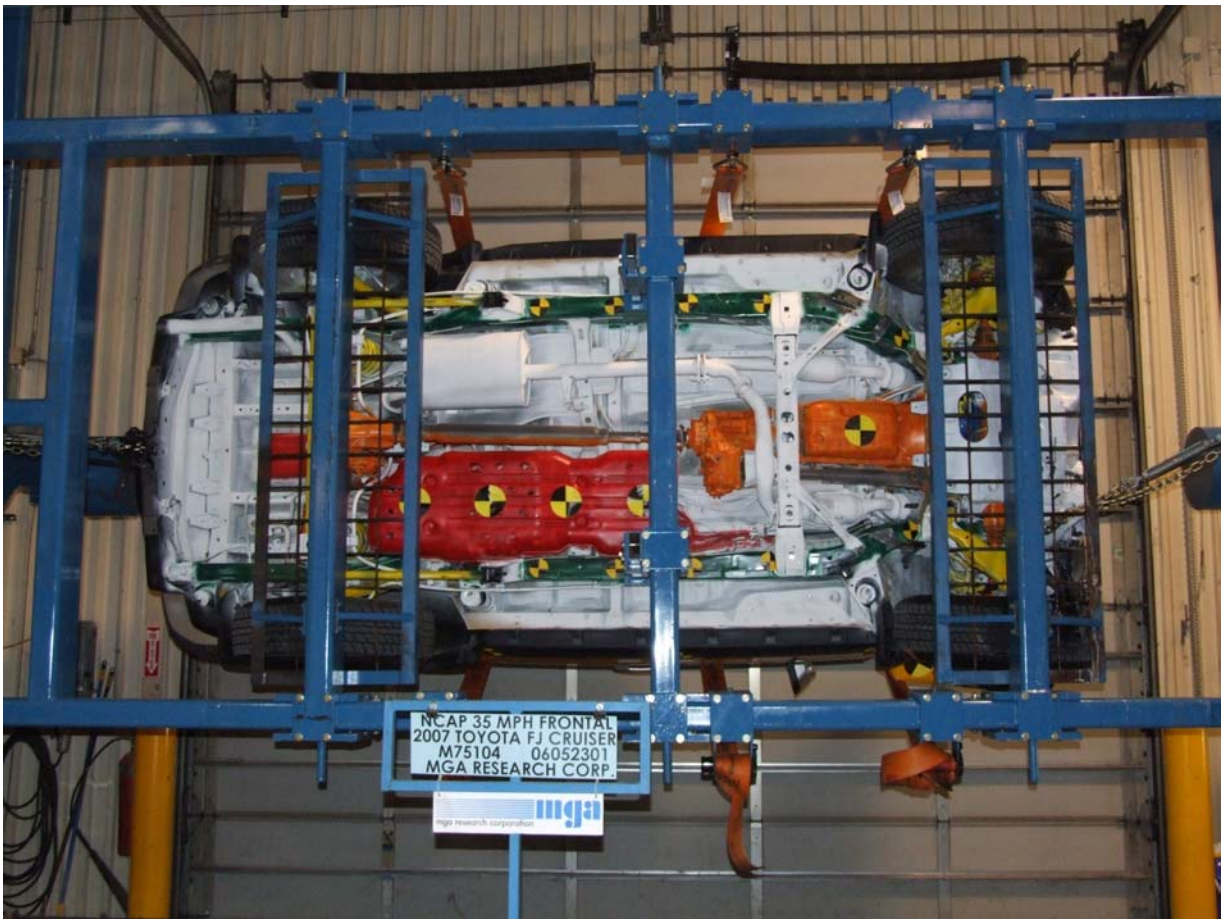
Pre-Test Passenger Side Floor Pan

Post-Test Passenger Side Floor Pan

Post-Test Passenger Dummy Head Contact


Post-Test Passenger Dummy Knee Contact

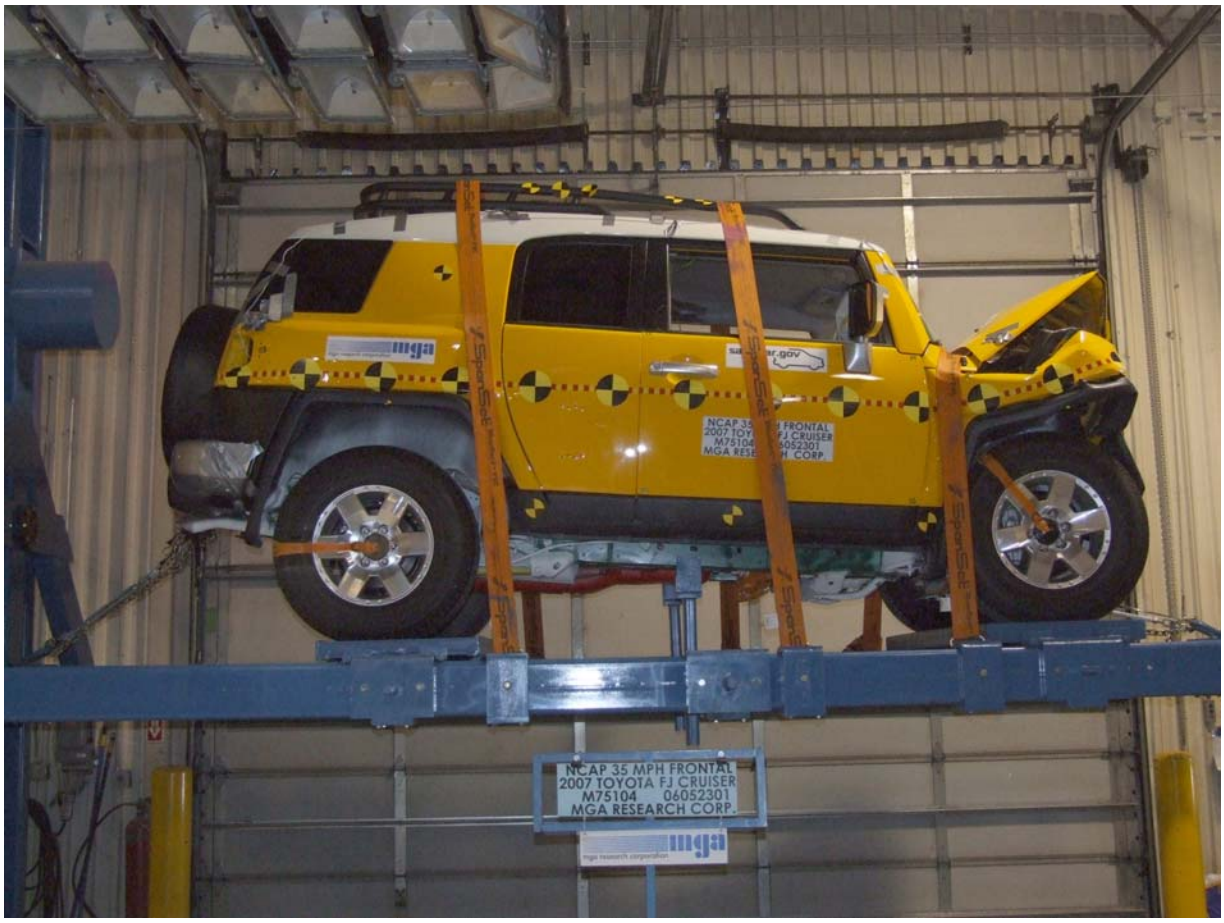
Post-Test Passenger Dummy Airbag Contact



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

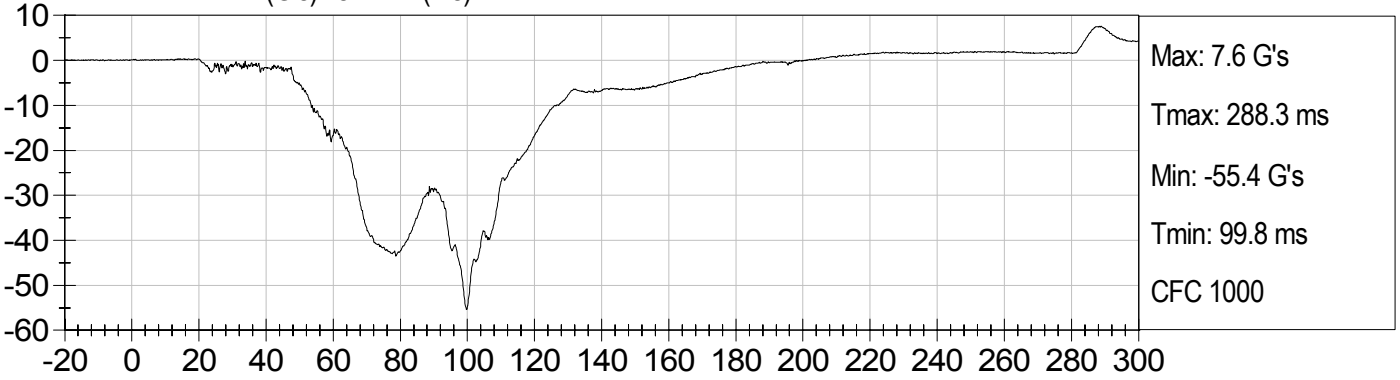
Vehicle Left Brake Caliper X

Vehicle Right Brake Caliper X

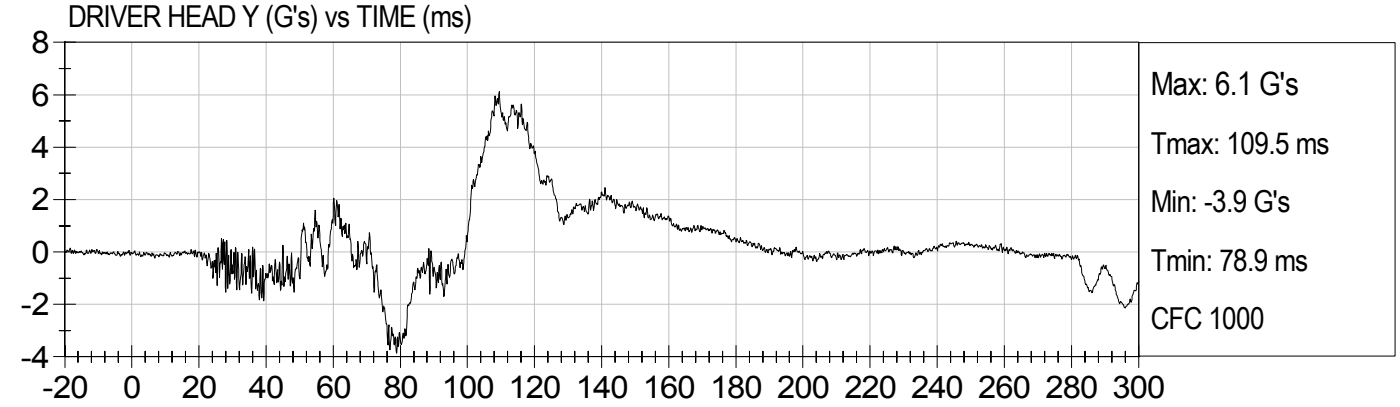
NCAP 35 MPH FRONTAL
2007 TOYOTA FJ CRUISER

Test Date: 05/23/2006
Speed: 35.0 mph (56.3 km/h)

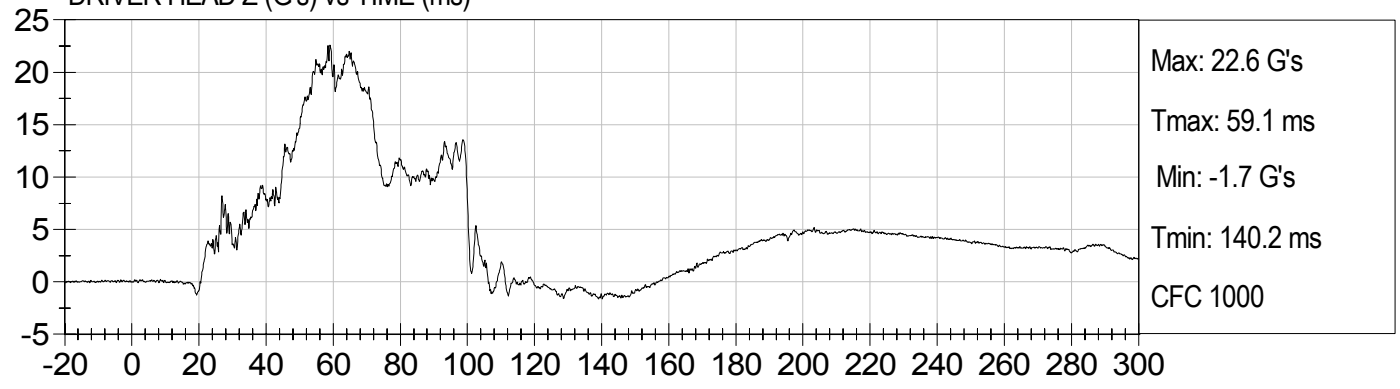
DRIVER HEAD X (G's) vs TIME (ms)



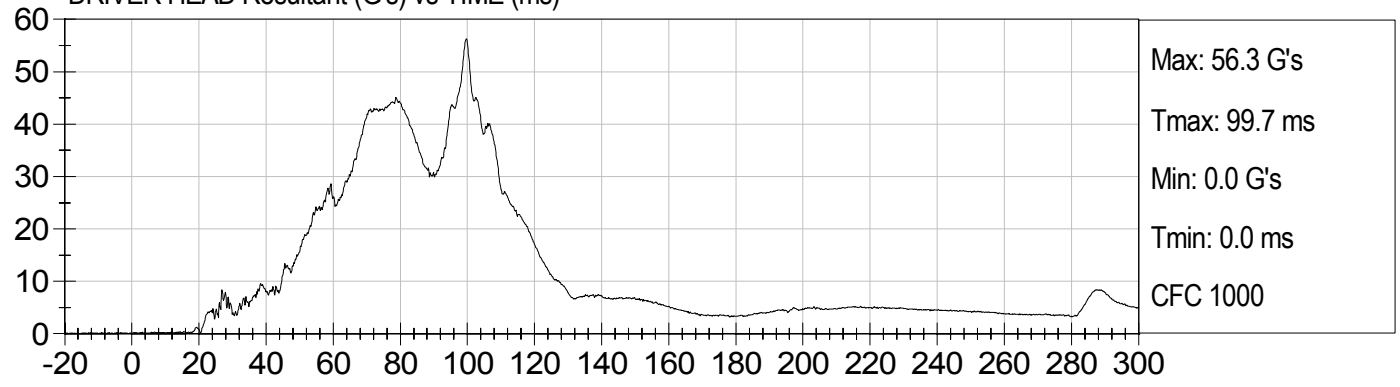
DRIVER HEAD Y (G's) vs TIME (ms)

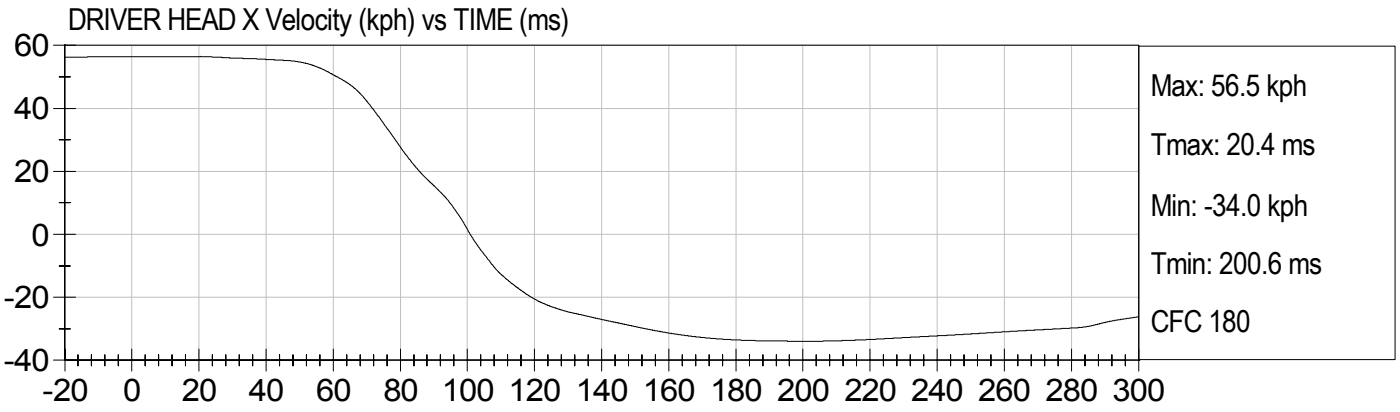


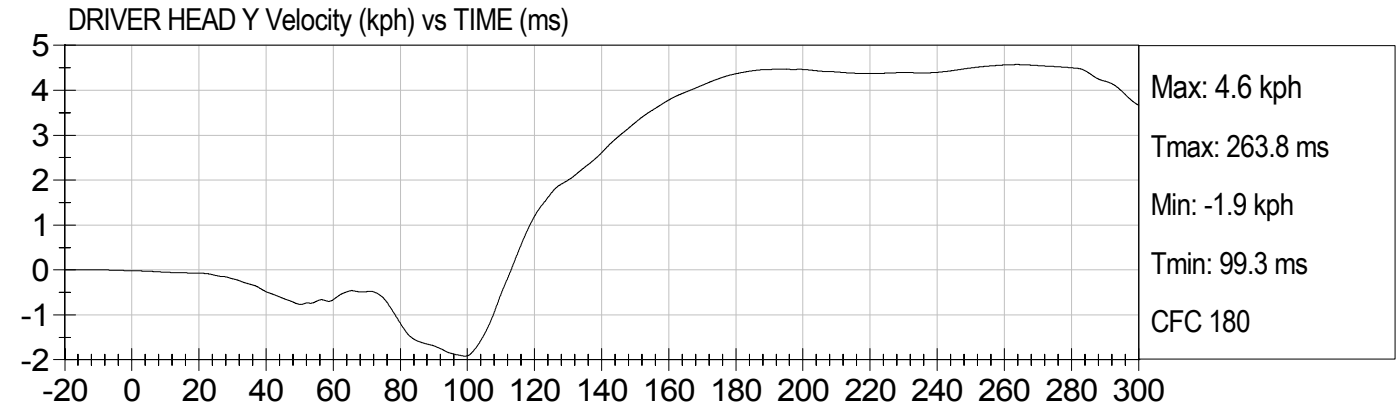
DRIVER HEAD Z (G's) vs TIME (ms)

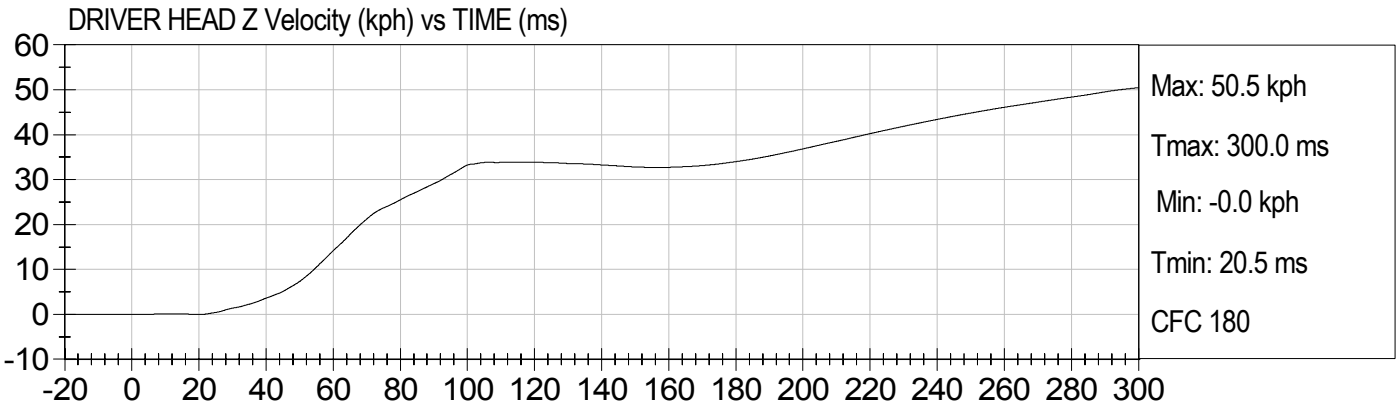


DRIVER HEAD Resultant (G's) vs TIME (ms)




DRIVER 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: 20.4 ms
Min: -34.0 kph
Tmin: 200.6 ms
CFC 180

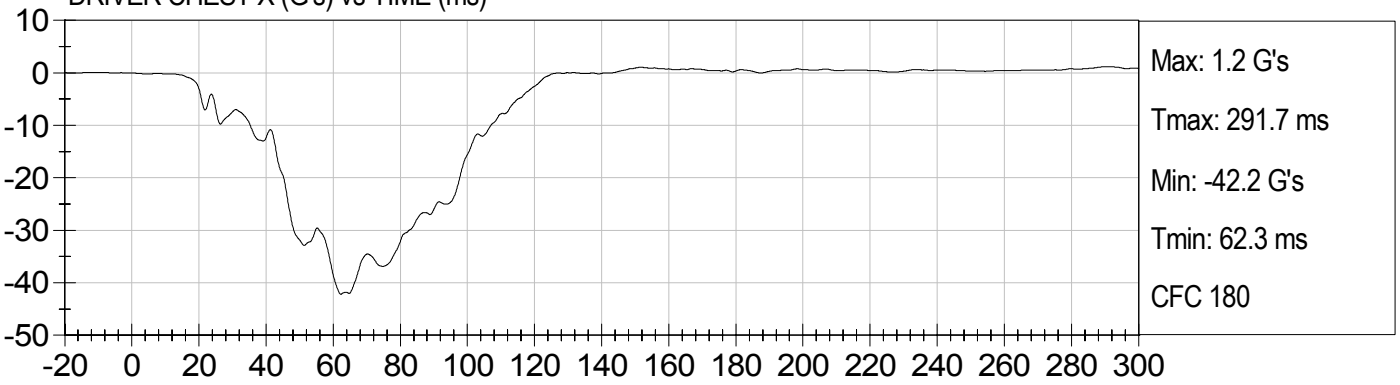

DRIVER HEAD Y Velocity (kph) vs TIME (ms)
5
4
3
2
1
0
-1
-2
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 4.6 kph
Tmax: 263.8 ms
Min: -1.9 kph
Tmin: 99.3 ms
CFC 180


DRIVER HEAD Z Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 50.5 kph
Tmax: 300.0 ms
Min: -0.0 kph
Tmin: 20.5 ms
CFC 180

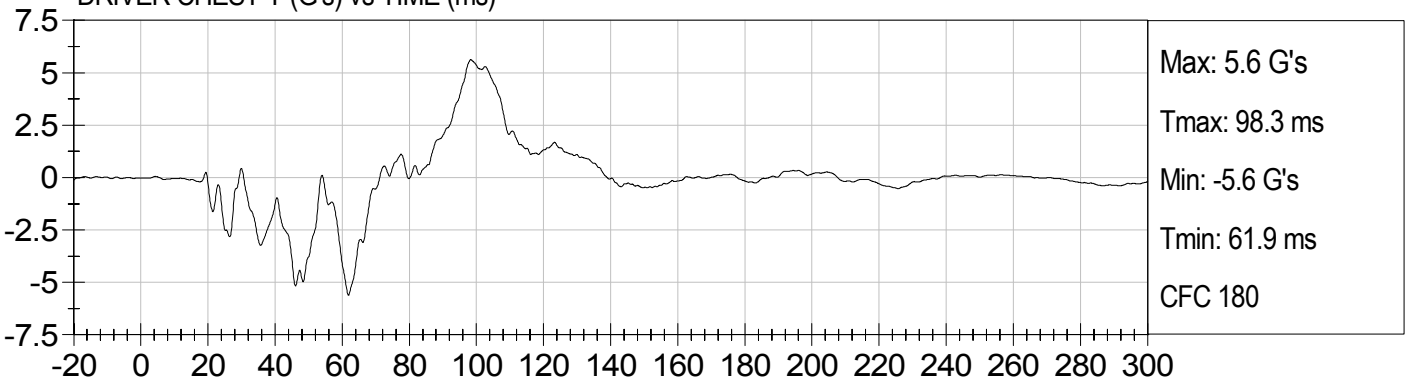
NCAP 35 MPH FRONTAL
2007 TOYOTA FJ CRUISER

Test Date: 05/23/2006
Speed: 35.0 mph (56.3 km/h)

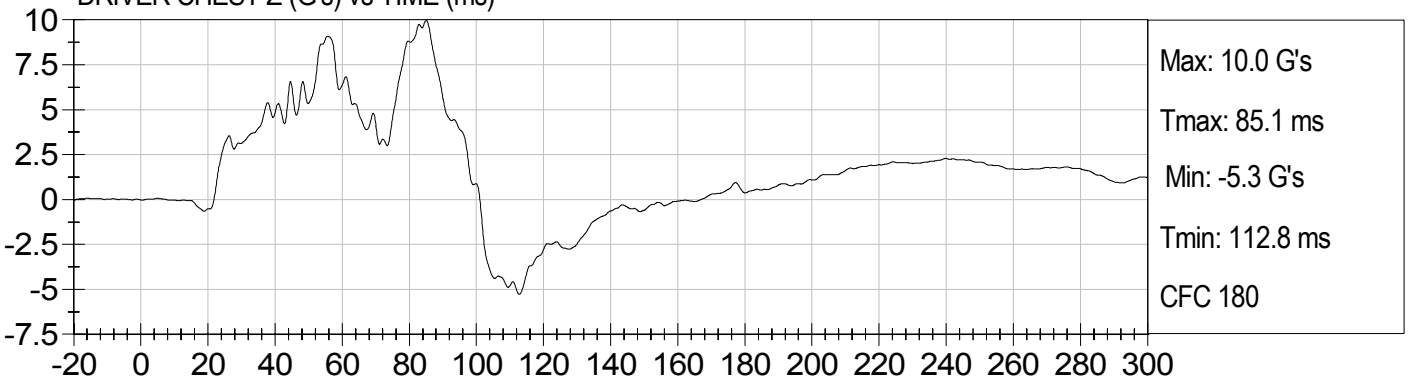
DRIVER CHEST X (G's) vs TIME (ms)



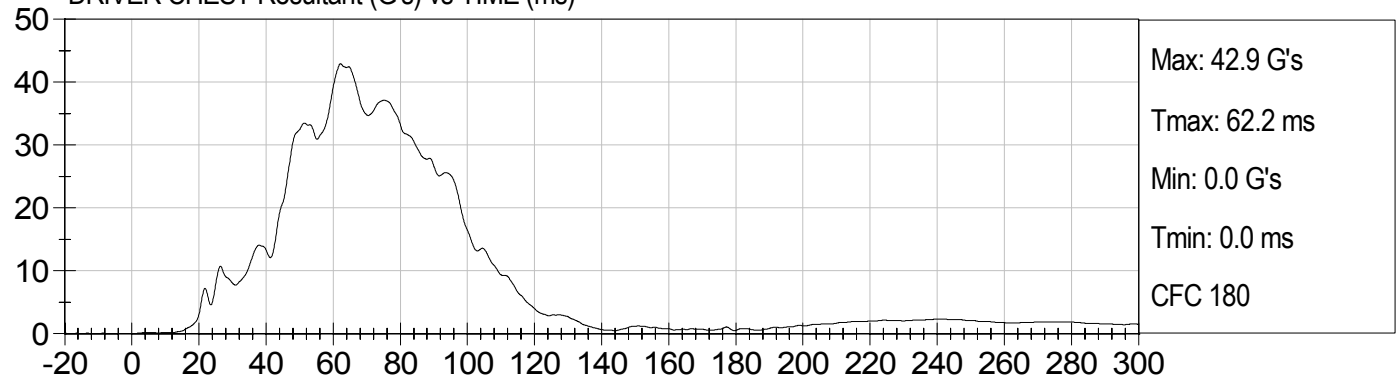
DRIVER CHEST Y (G's) vs TIME (ms)

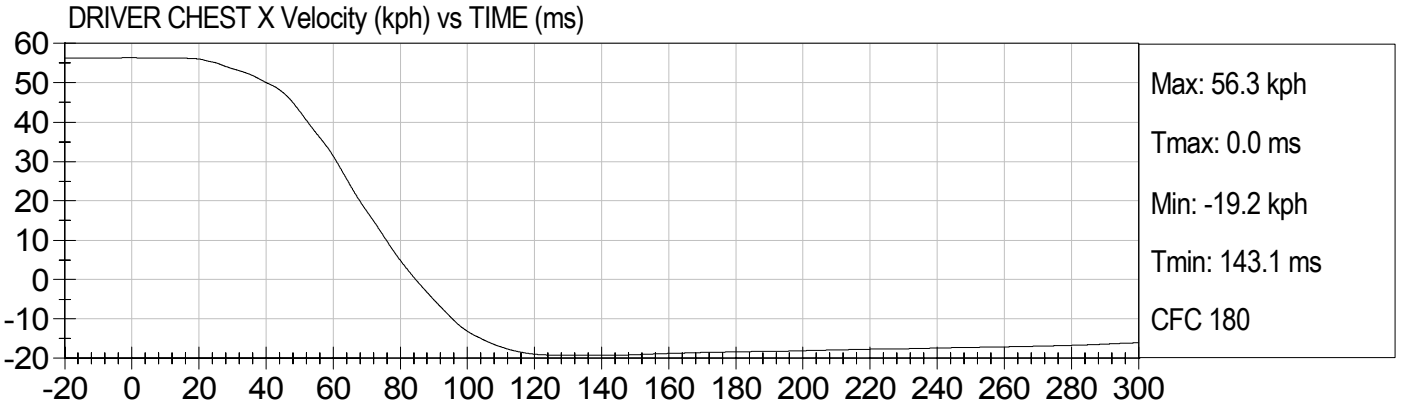


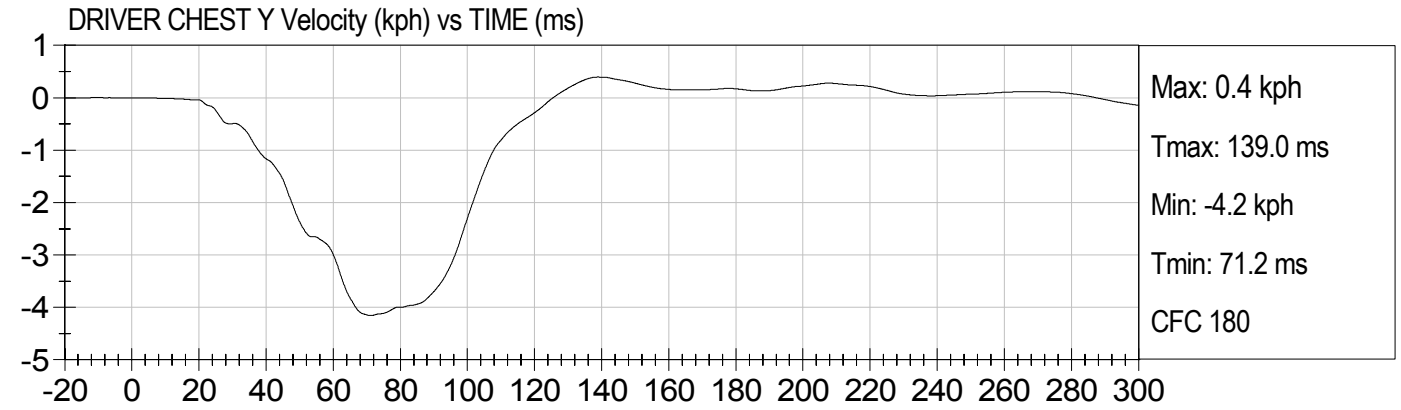
DRIVER CHEST Z (G's) vs TIME (ms)

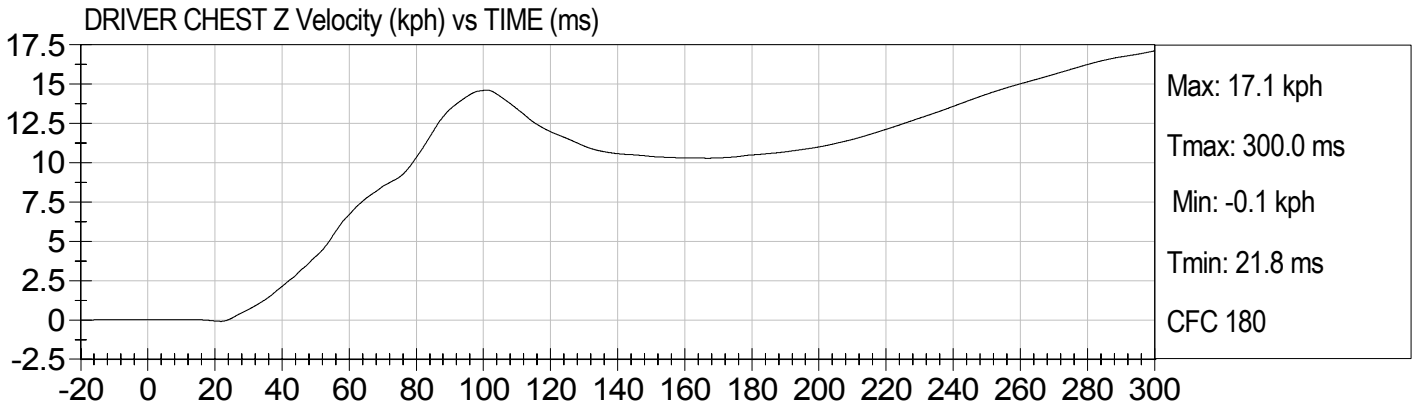


DRIVER CHEST Resultant (G's) vs TIME (ms)



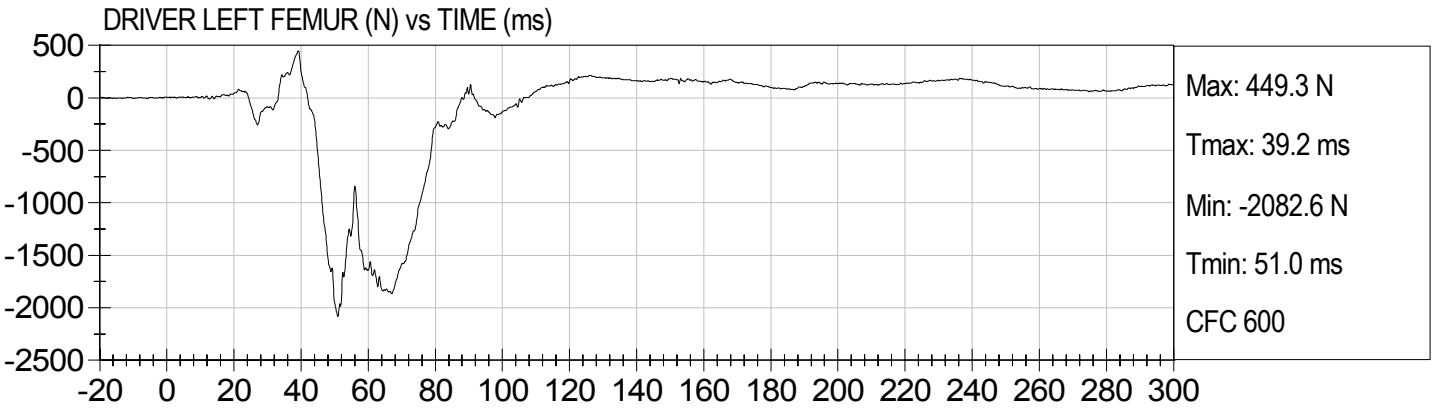

DRIVER CHEST X Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 56.3 kph
Tmax: 0.0 ms
Min: -19.2 kph
Tmin: 143.1 ms
CFC 180

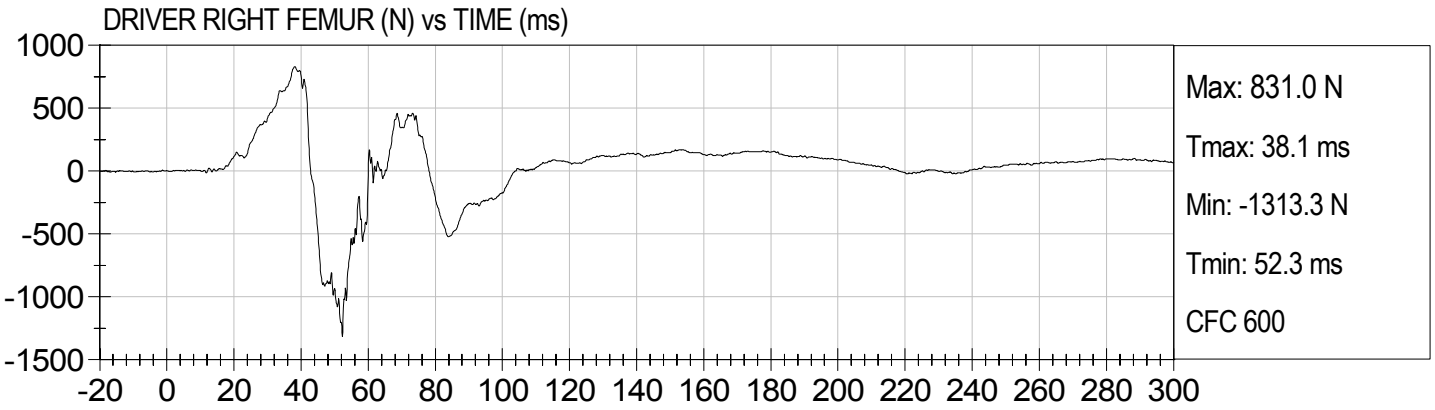

DRIVER CHEST Y Velocity (kph) vs TIME (ms)
1
0
-1
-2
-3
-4
-5
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 0.4 kph
Tmax: 139.0 ms
Min: -4.2 kph
Tmin: 71.2 ms
CFC 180


DRIVER 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: 17.1 kph
Tmax: 300.0 ms
Min: -0.1 kph
Tmin: 21.8 ms
CFC 180

NCAP 35 MPH FRONTAL
2007 TOYOTA FJ CRUISER

Test Date: 05/23/2006
Speed: 35.0 mph (56.3 km/h)

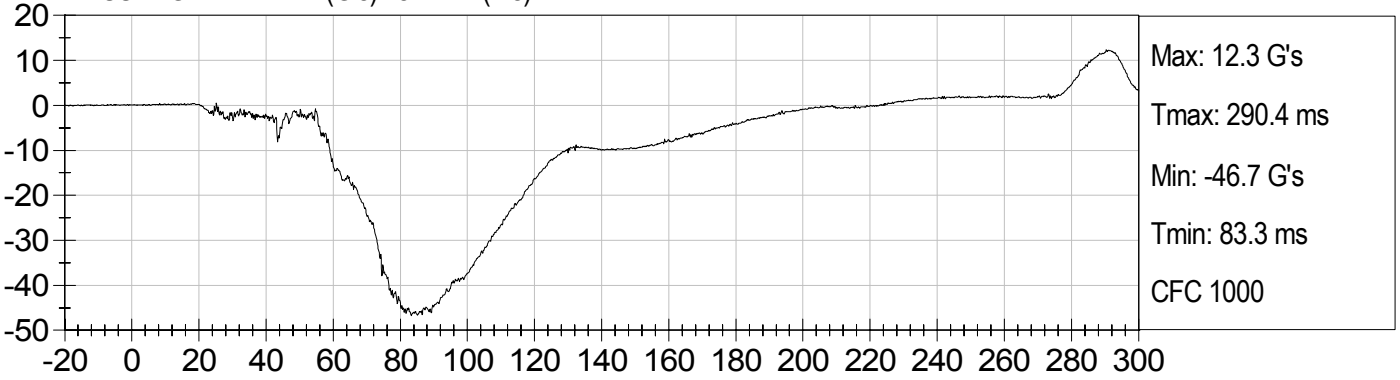




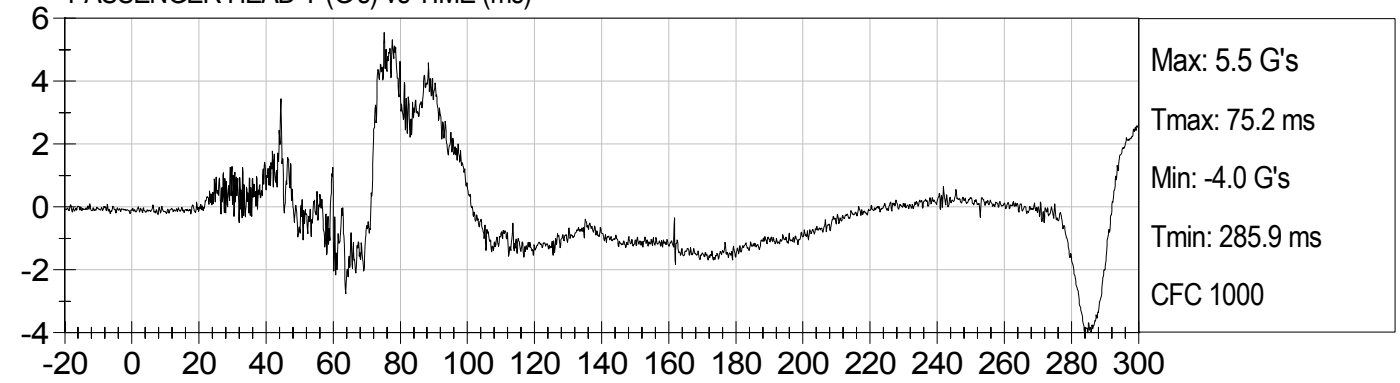
NCAP 35 MPH FRONTAL
2007 TOYOTA FJ CRUISER

Test Date: 05/23/2006
Speed: 35.0 mph (56.3 km/h)

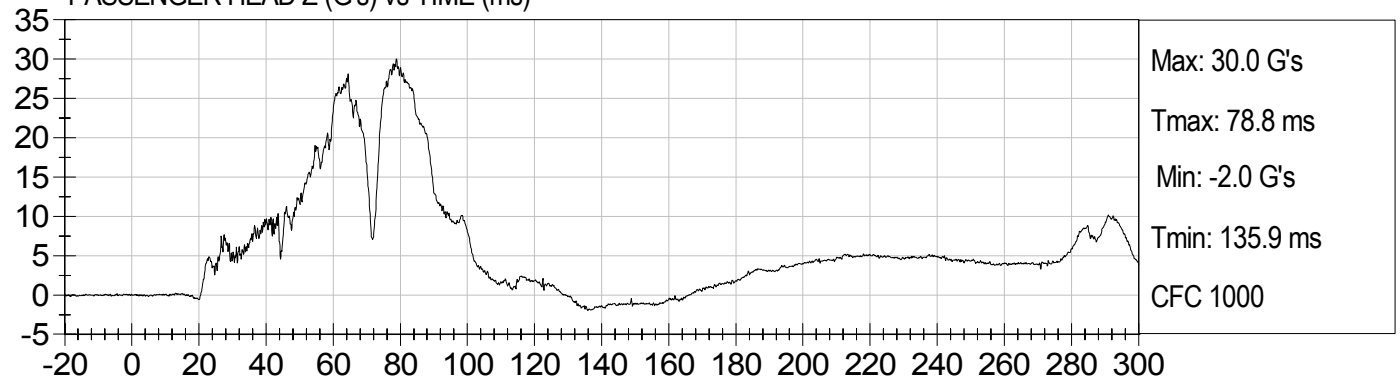
PASSENGER HEAD X (G's) vs TIME (ms)



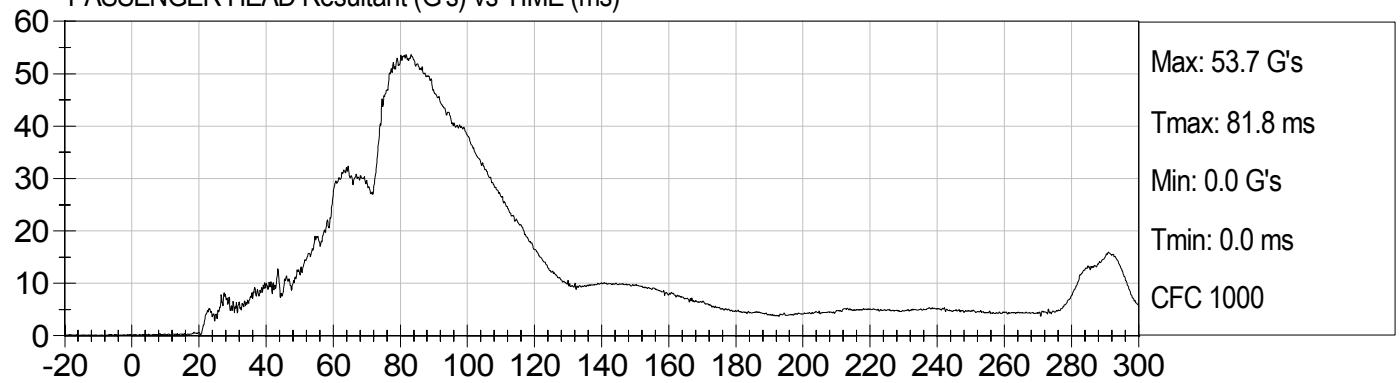
PASSENGER HEAD Y (G's) vs TIME (ms)

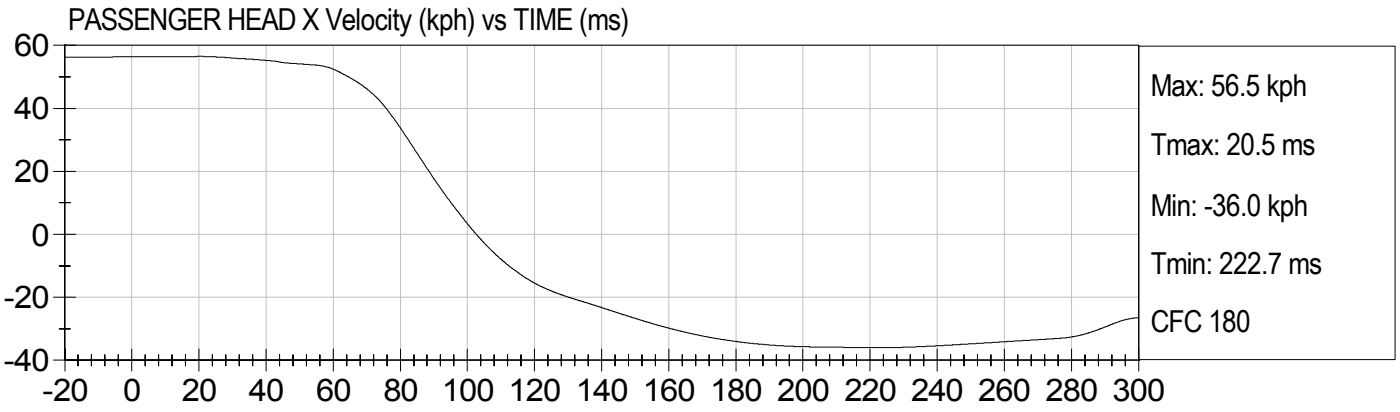


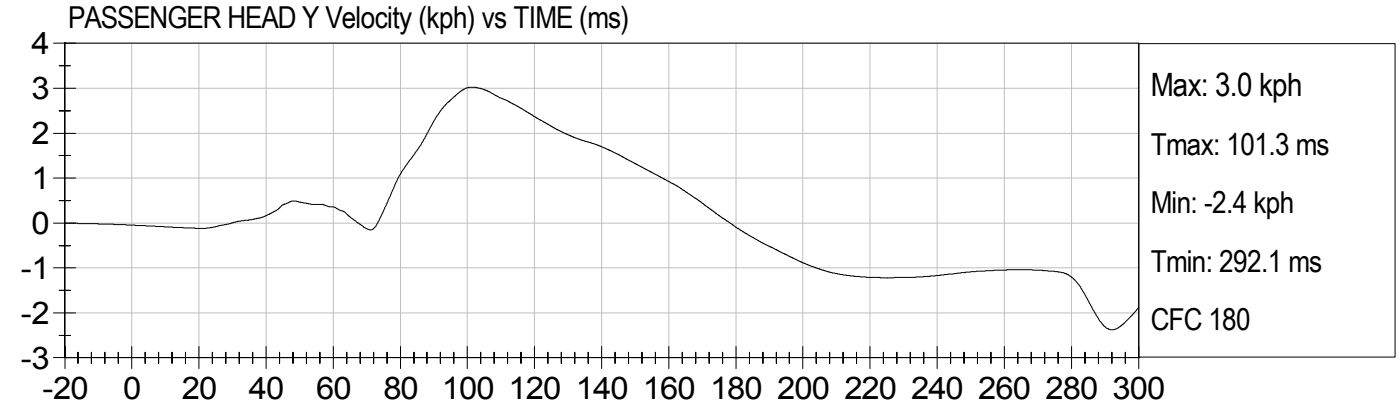
PASSENGER HEAD Z (G's) vs TIME (ms)

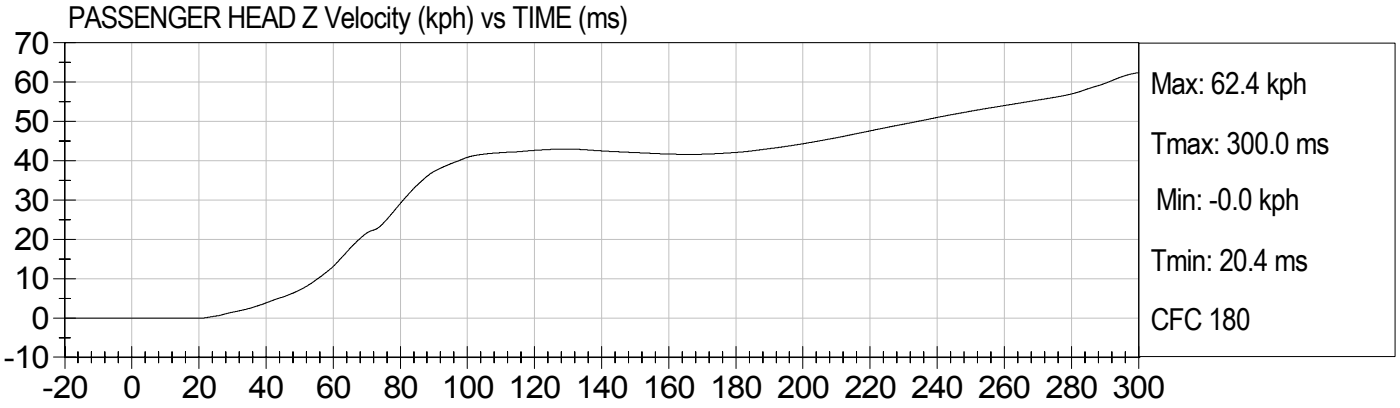


PASSENGER HEAD Resultant (G's) vs TIME (ms)




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: 20.5 ms
Min: -36.0 kph
Tmin: 222.7 ms
CFC 180

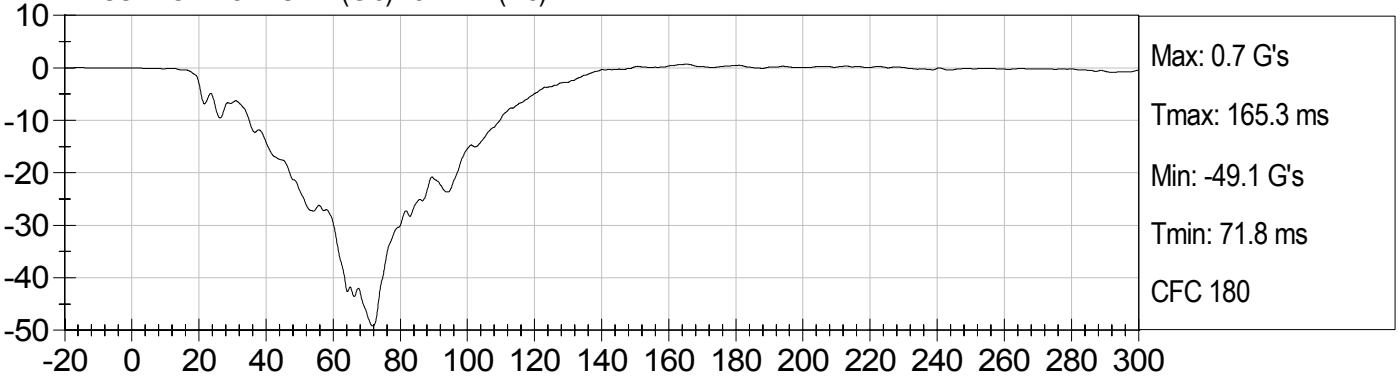

PASSENGER HEAD Y Velocity (kph) vs TIME (ms)
4
3
2
1
0
-1
-2
-3
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 3.0 kph
Tmax: 101.3 ms
Min: -2.4 kph
Tmin: 292.1 ms
CFC 180


PASSENGER HEAD Z Velocity (kph) vs TIME (ms)
70
60
50
40
30
20
10
0
-10
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 62.4 kph
Tmax: 300.0 ms
Min: -0.0 kph
Tmin: 20.4 ms
CFC 180

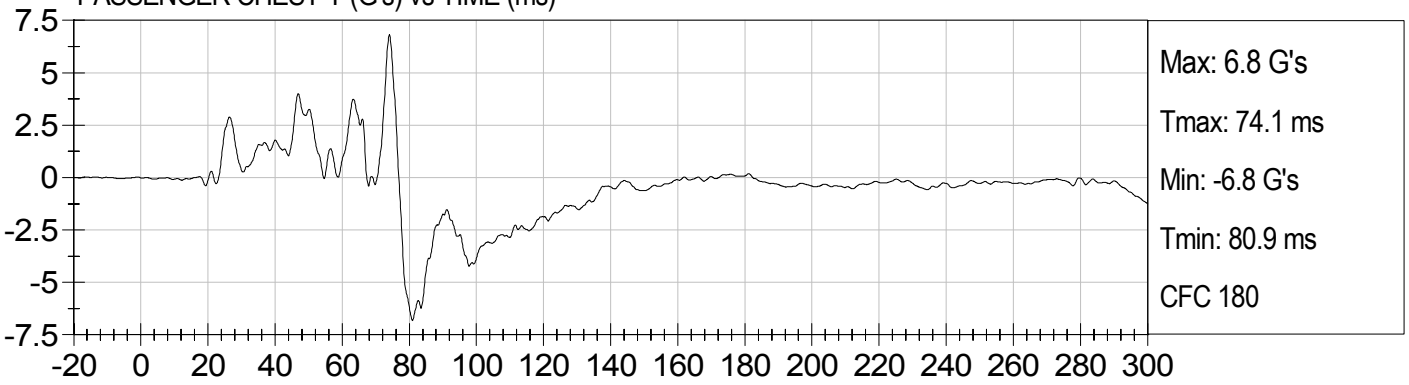
NCAP 35 MPH FRONTAL
2007 TOYOTA FJ CRUISER

Test Date: 05/23/2006
Speed: 35.0 mph (56.3 km/h)

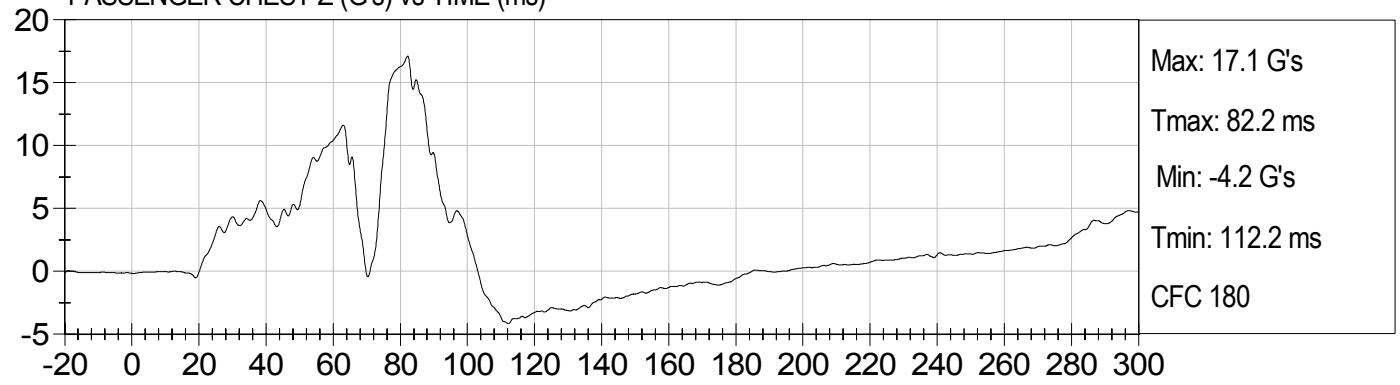
PASSENGER CHEST X (G's) vs TIME (ms)



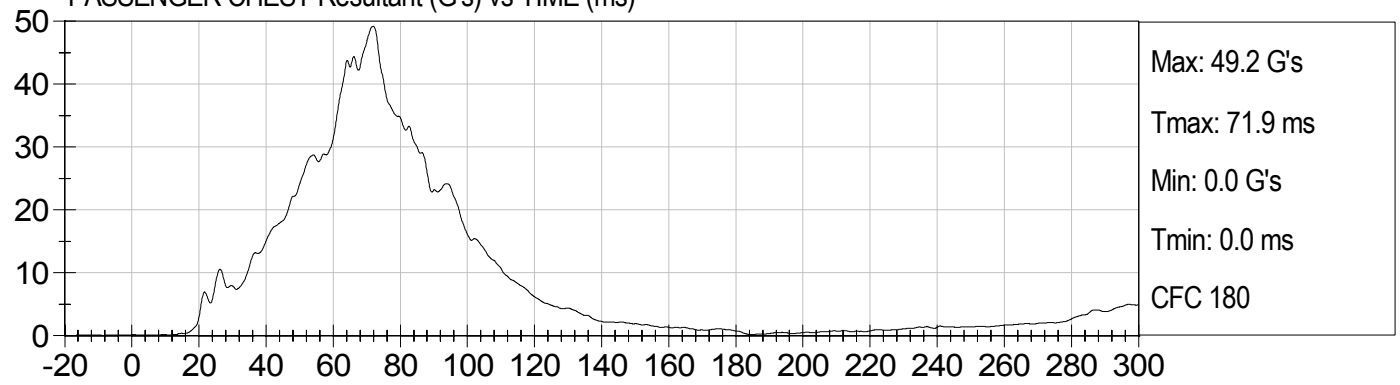
PASSENGER CHEST Y (G's) vs TIME (ms)



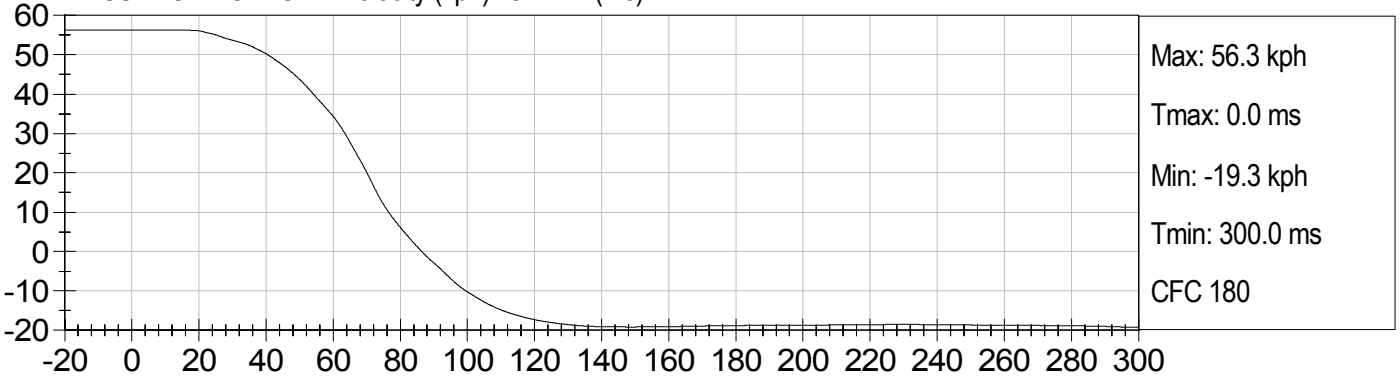
PASSENGER CHEST Z (G's) vs TIME (ms)



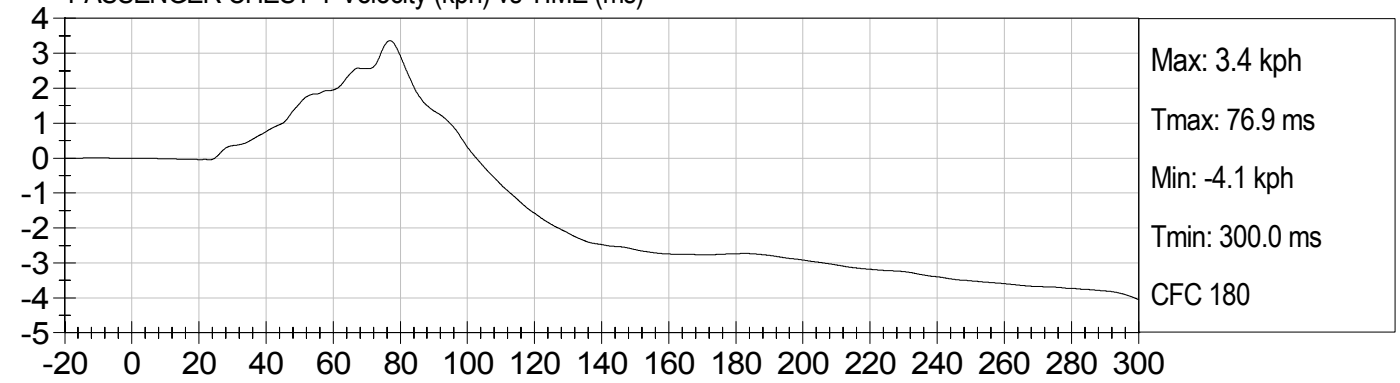
PASSENGER CHEST Resultant (G's) vs TIME (ms)



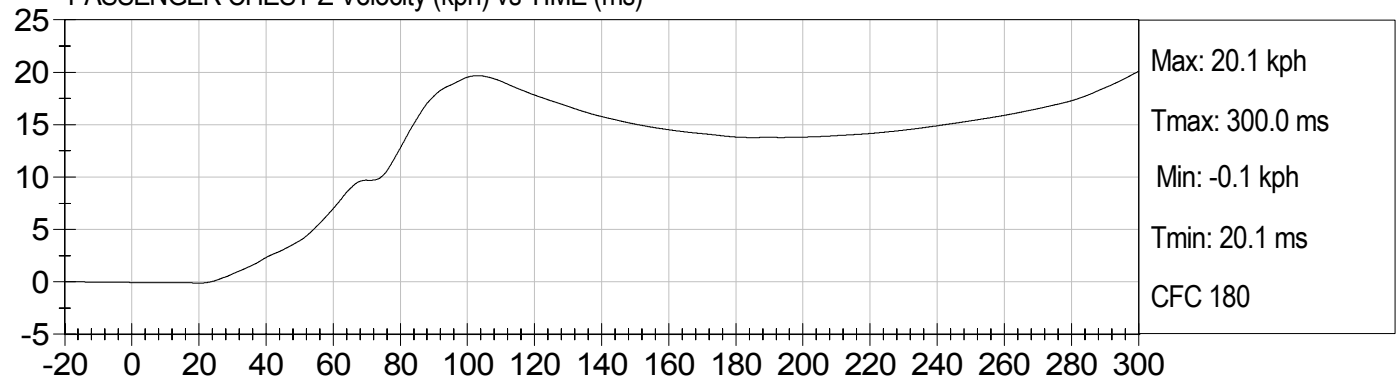
PASSENGER CHEST X Velocity (kph) vs TIME (ms)

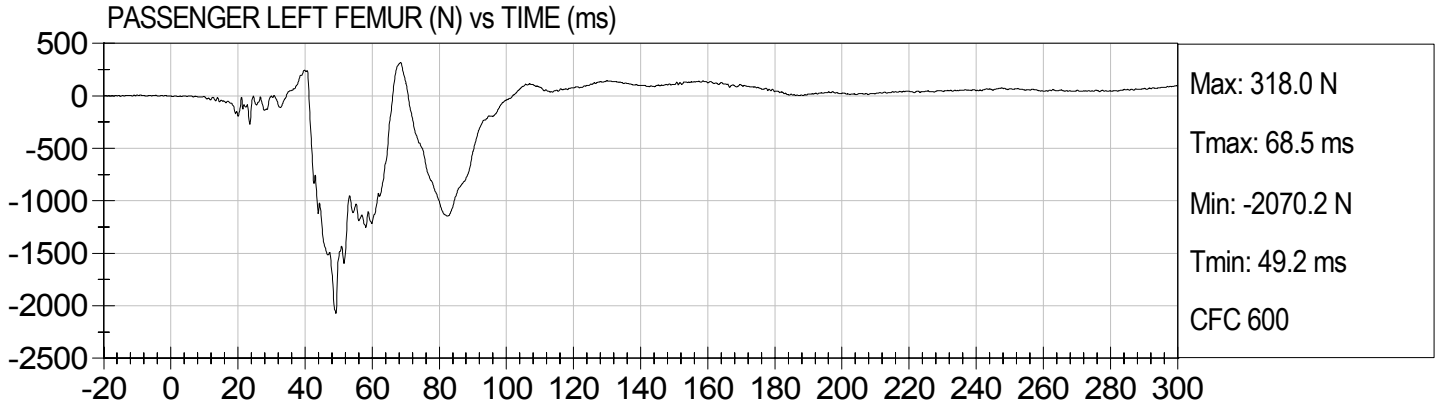


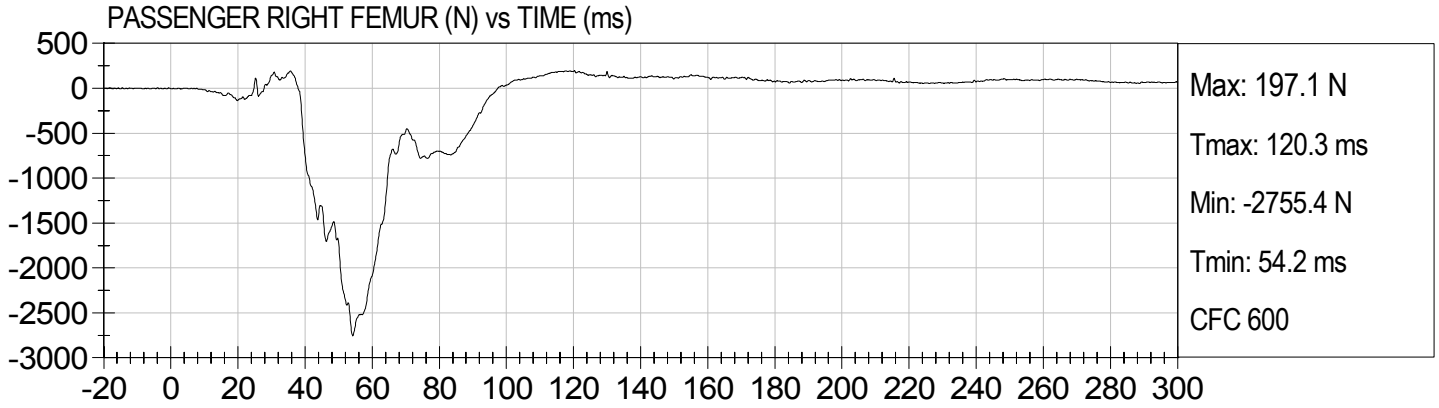
PASSENGER CHEST Y Velocity (kph) vs TIME (ms)



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




PASSENGER LEFT FEMUR (N) vs TIME (ms)
500
0
-500
-1000
-1500
-2000
-2500
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 318.0 N
Tmax: 68.5 ms
Min: -2070.2 N
Tmin: 49.2 ms
CFC 600


PASSENGER RIGHT FEMUR (N) vs TIME (ms)
500
0
-500
-1000
-1500
-2000
-2500
-3000
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 197.1 N
Tmax: 120.3 ms
Min: -2755.4 N
Tmin: 54.2 ms
CFC 600

APPENDIX C

DUMMY CALIBRATION DATA

MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066 **Test ID:** D061421

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	42	Pass
Peak Resultant Acceleration	G's	225 - 275	234	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-12.3	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Laboratory Technician

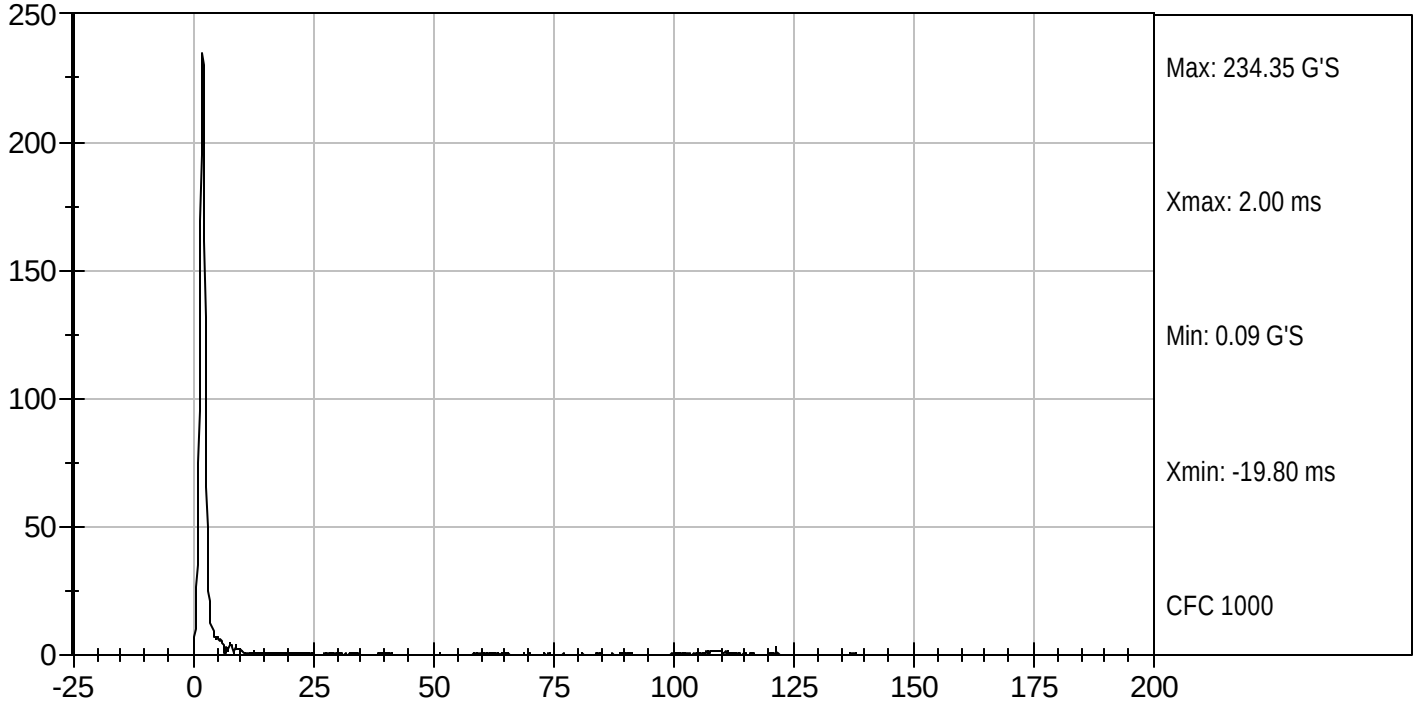
05/18/2006
Test Date

Approved By

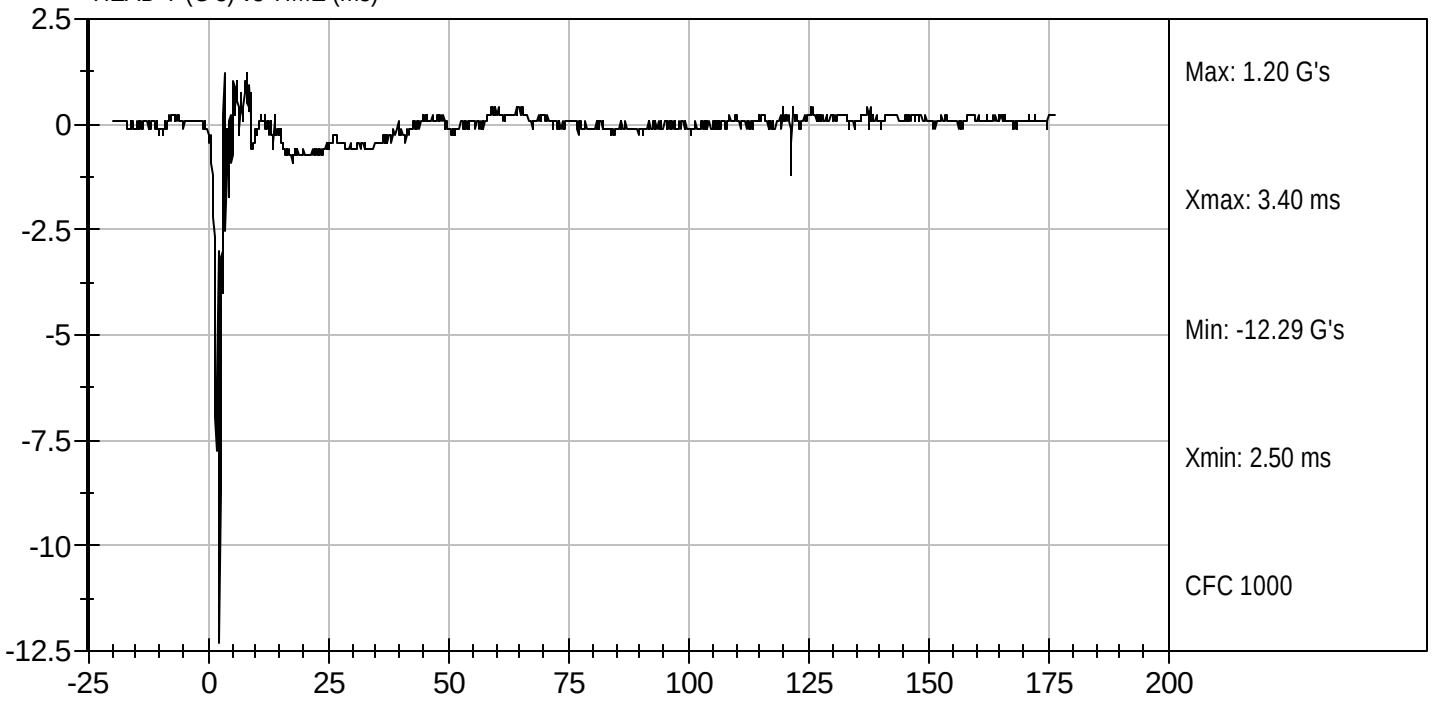
Test Desc: Head Drop
Componet ID: D061421

Test Date: 05/18/2006
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:** D061422

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	37	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.01	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	24.13	Pass
	20 msec	G's	17.60 to 22.60	19.45	Pass
	30 msec	G's	12.50 to 18.50	15.08	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	15.03	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	39.4	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	69.5	Pass
	Time	msec	57.0 to 64.0	61.9	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	113.9	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	88.2	Pass
	Time	msec	47.0 to 58.0	51.1	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	101.5	Pass
			Overall Test Results		Pass

Laboratory Technician

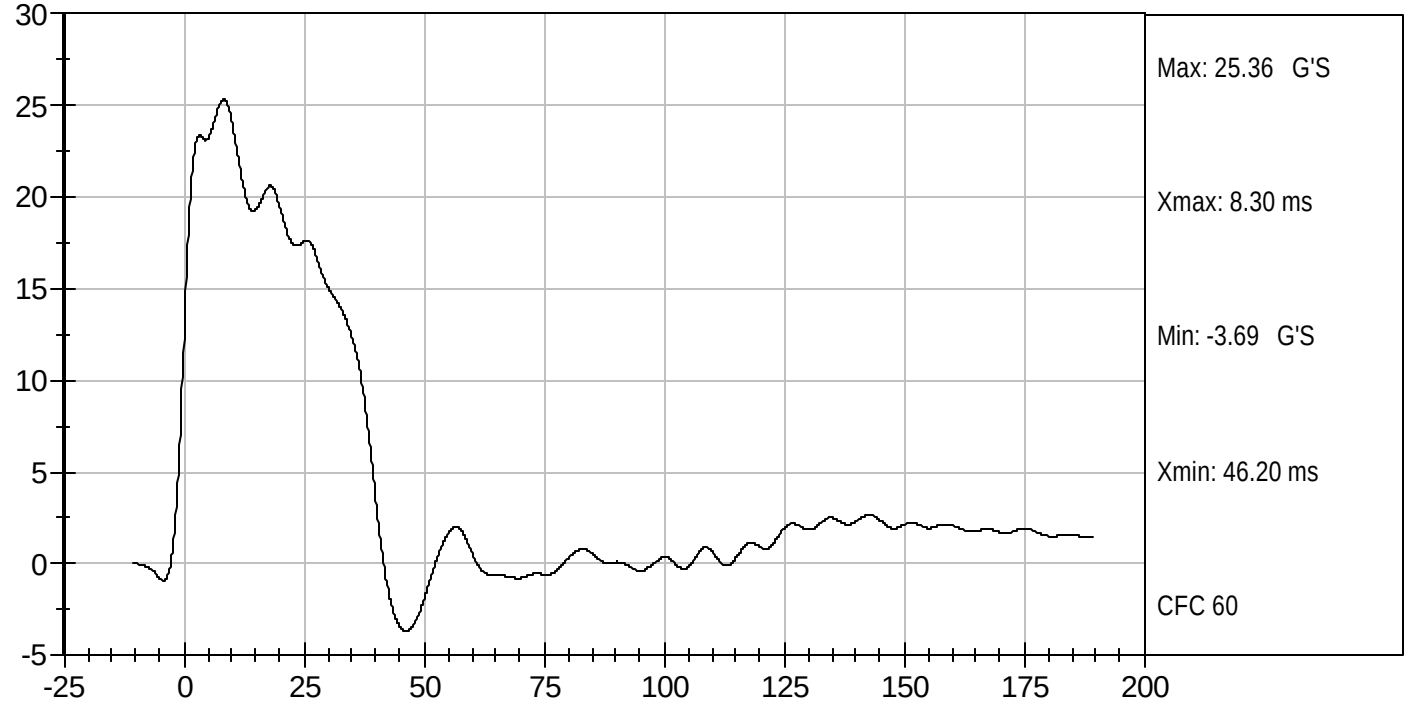
05/18/2006
Test Date

David Winkelbauer
Approved By

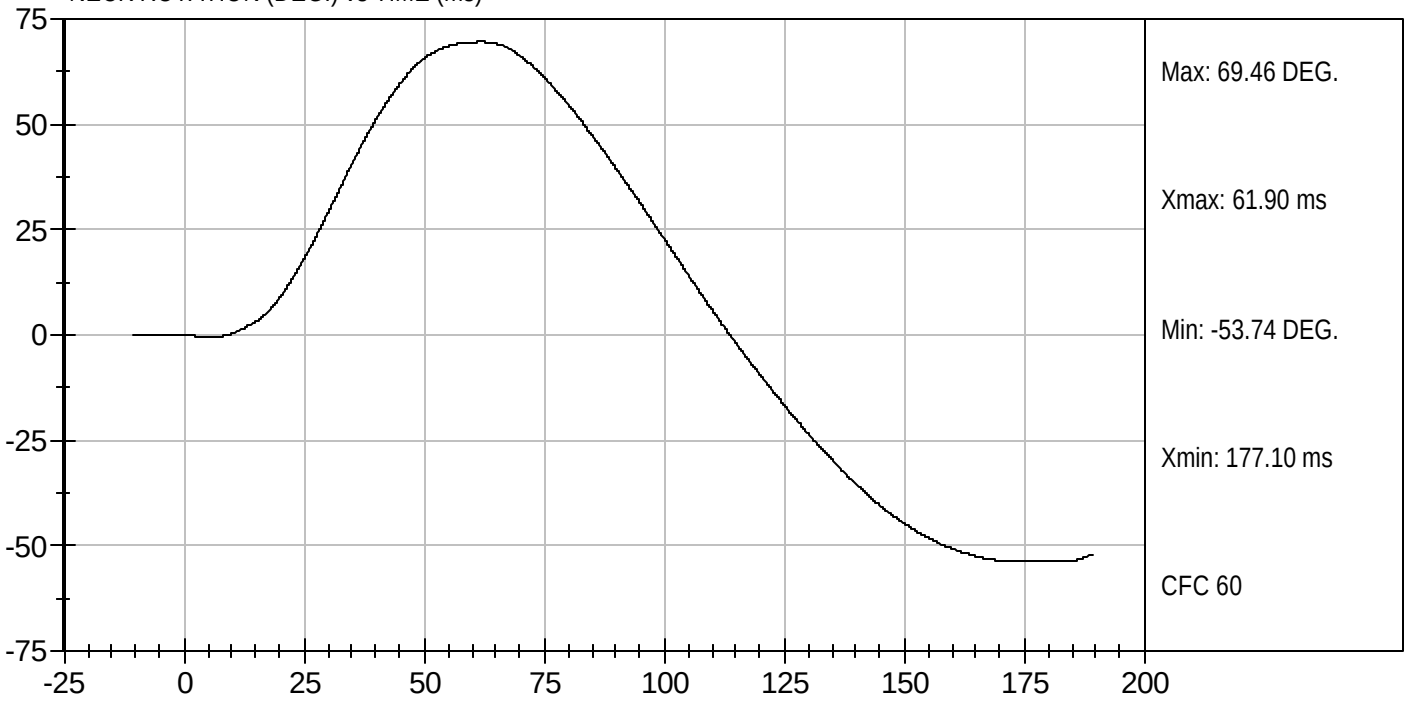
Test Desc: Neck Flexion
Componet ID: D061422

Test Date: 05/18/2006
Velocity: 23.01 ft/s, 7.01 m/s

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

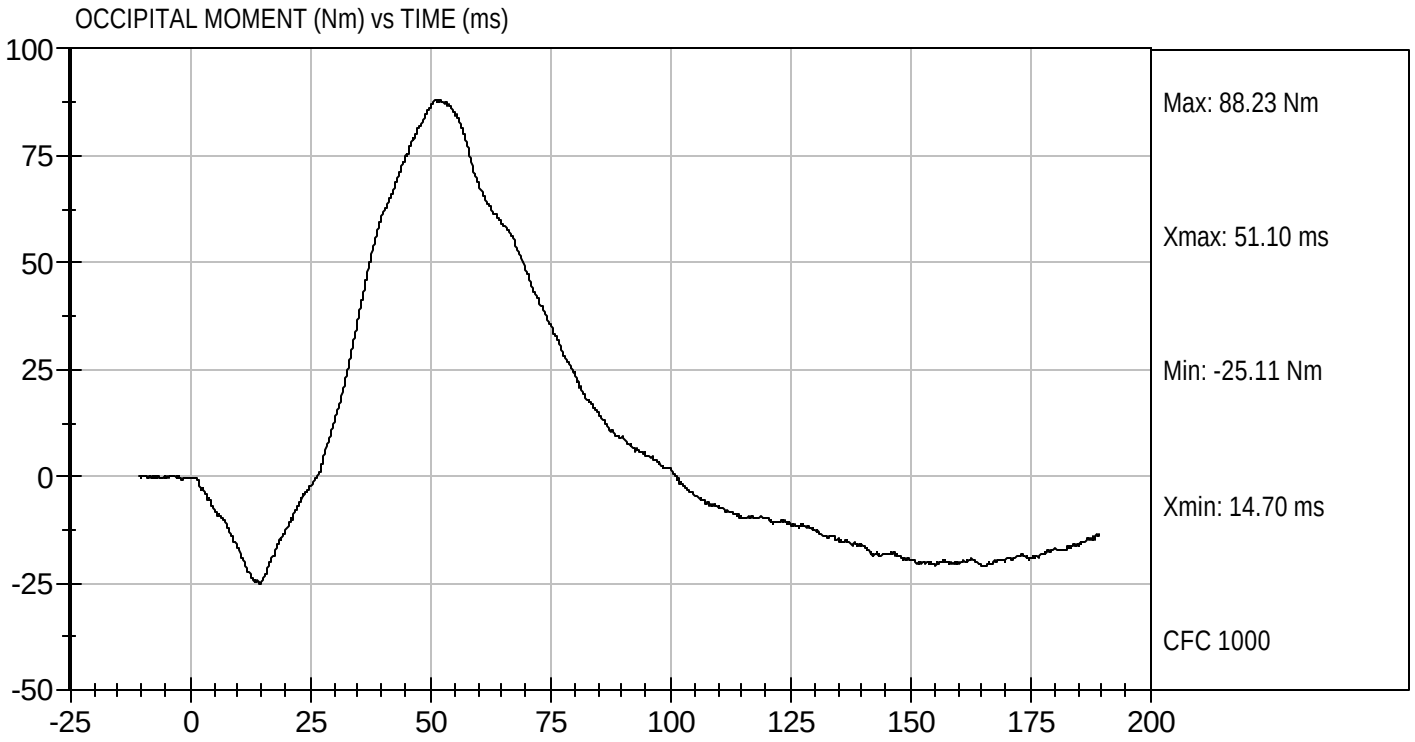


NECK ROTATION (DEG.) vs TIME (ms)



Test Desc: Neck Flexion
Componet ID: D061422

Test Date: 05/18/2006
Velocity: 23.01 ft/s, 7.01 m/s



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066 **Test I.D:** D061423

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity		%	10 to 70	37	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.10	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	18.30	Pass
	20 msec	G's	14.00 to 19.00	16.62	Pass
	30 msec	G's	11.00 to 16.00	14.16	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	14.12	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	42.8	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	99.0	Pass
	Time	msec	72.0 to 82.0	82.0	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	-65.5	Pass
	Time	msec	65.0 to 79.0	73.9	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	144.6	Pass
			Overall Test Results		Pass

Laboratory Technician

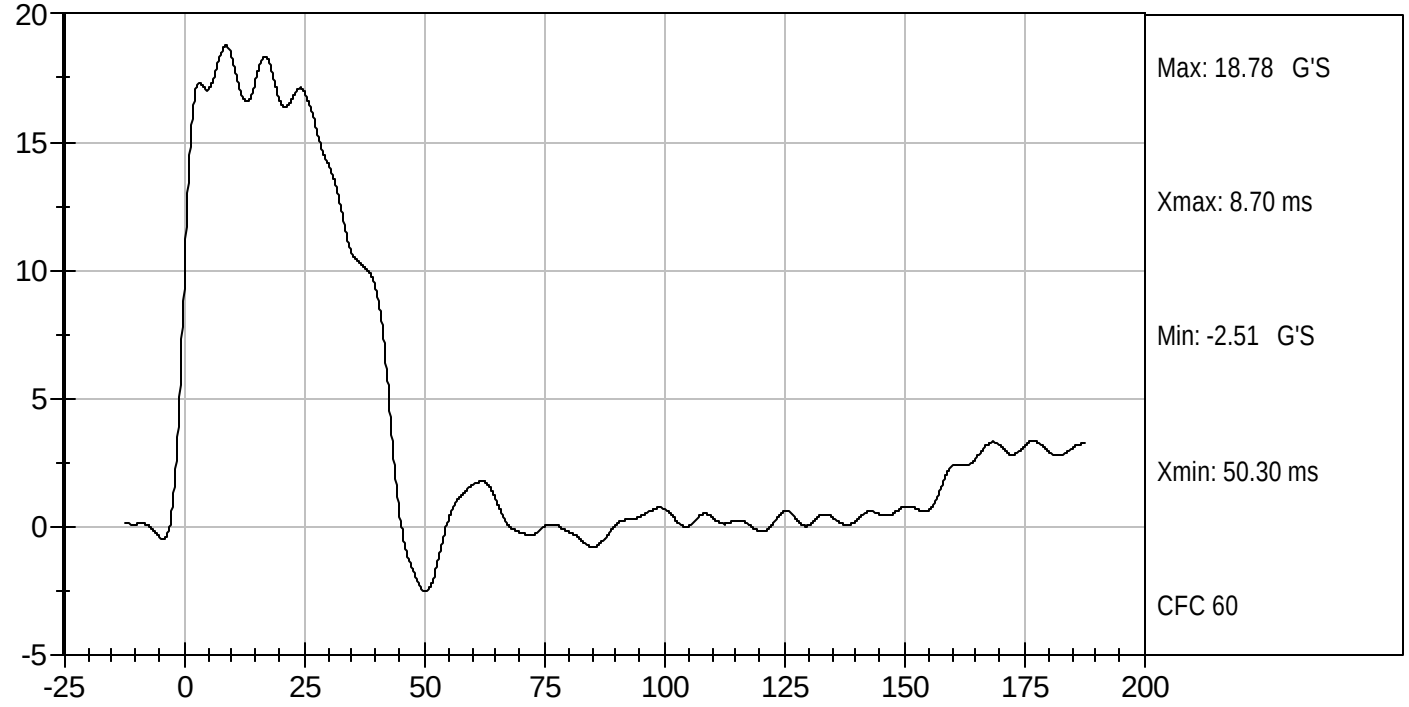
05/18/2006
Test Date

Approved By

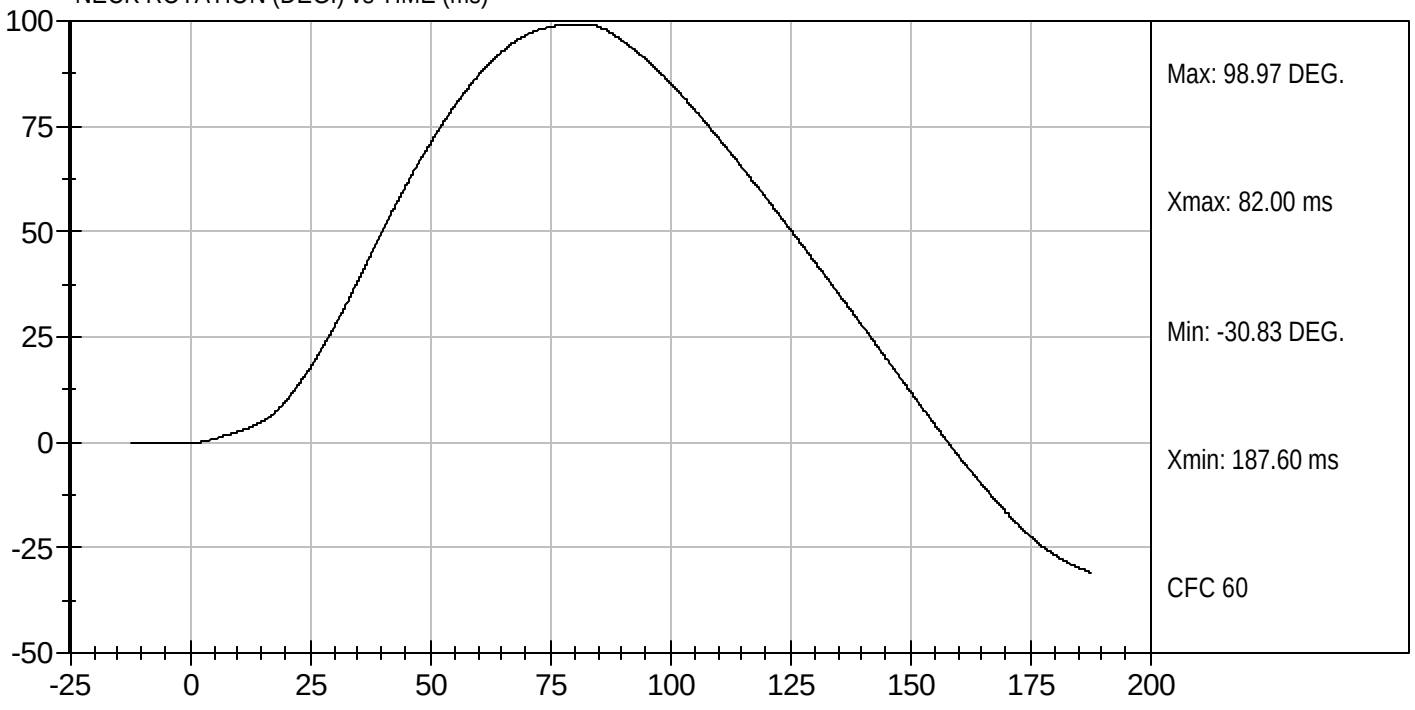
Test Desc: Neck Extension
Componet ID: D061423

Test Date: 05/18/2006
Velocity: 20.02 ft/s, 6.10 m/s

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

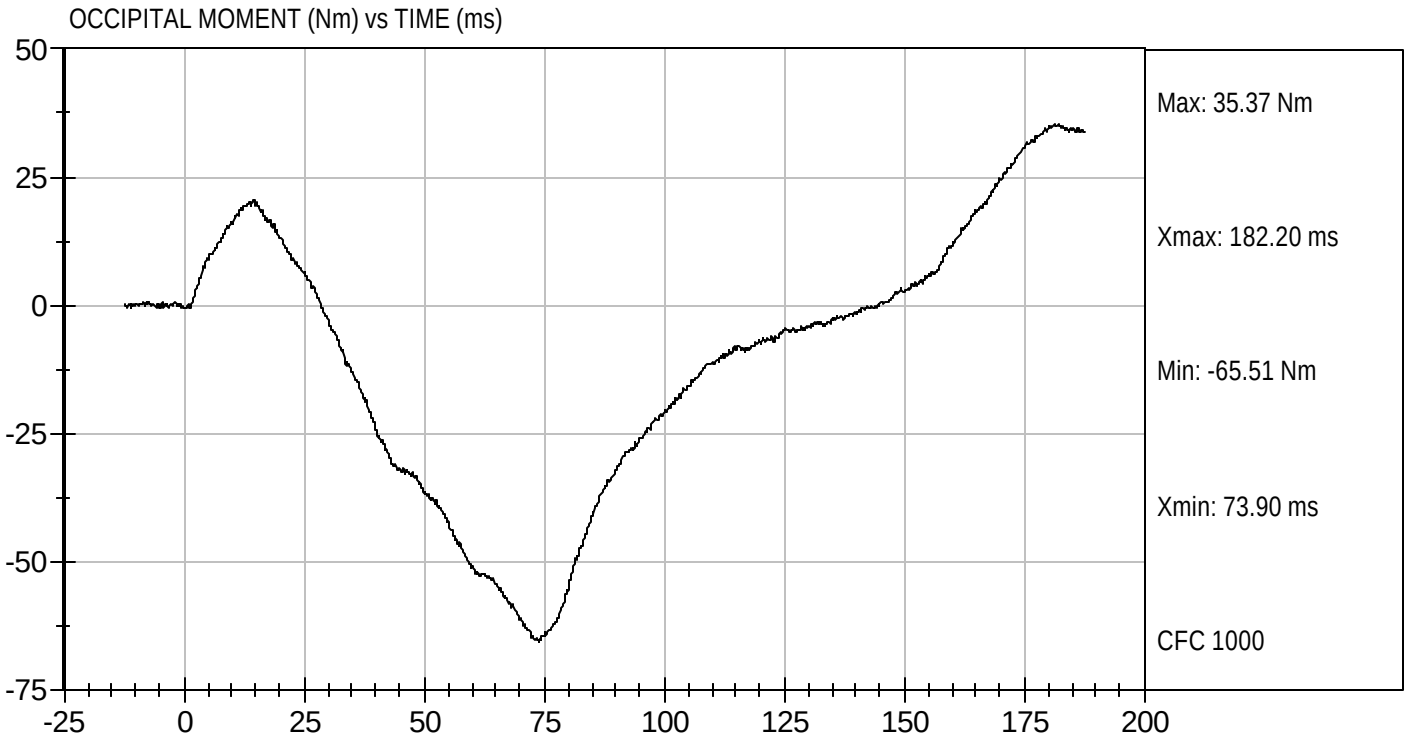


NECK ROTATION (DEG.) vs TIME (ms)



Test Desc: Neck Extension
Componet ID: D061423

Test Date: 05/18/2006
Velocity: 20.02 ft/s, 6.10 m/s



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066 **Test I.D:** D061424

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	34	Pass
Probe Velocity	m/s	6.58 to 6.82	6.61	Pass
Peak Probe Force	N	5159 to 5893	5,565	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.88	Pass
Internal Hysteresis	%	69 to 85	70	Pass
		Overall Test Results		Pass

Laboratory Technician

05/19/2006

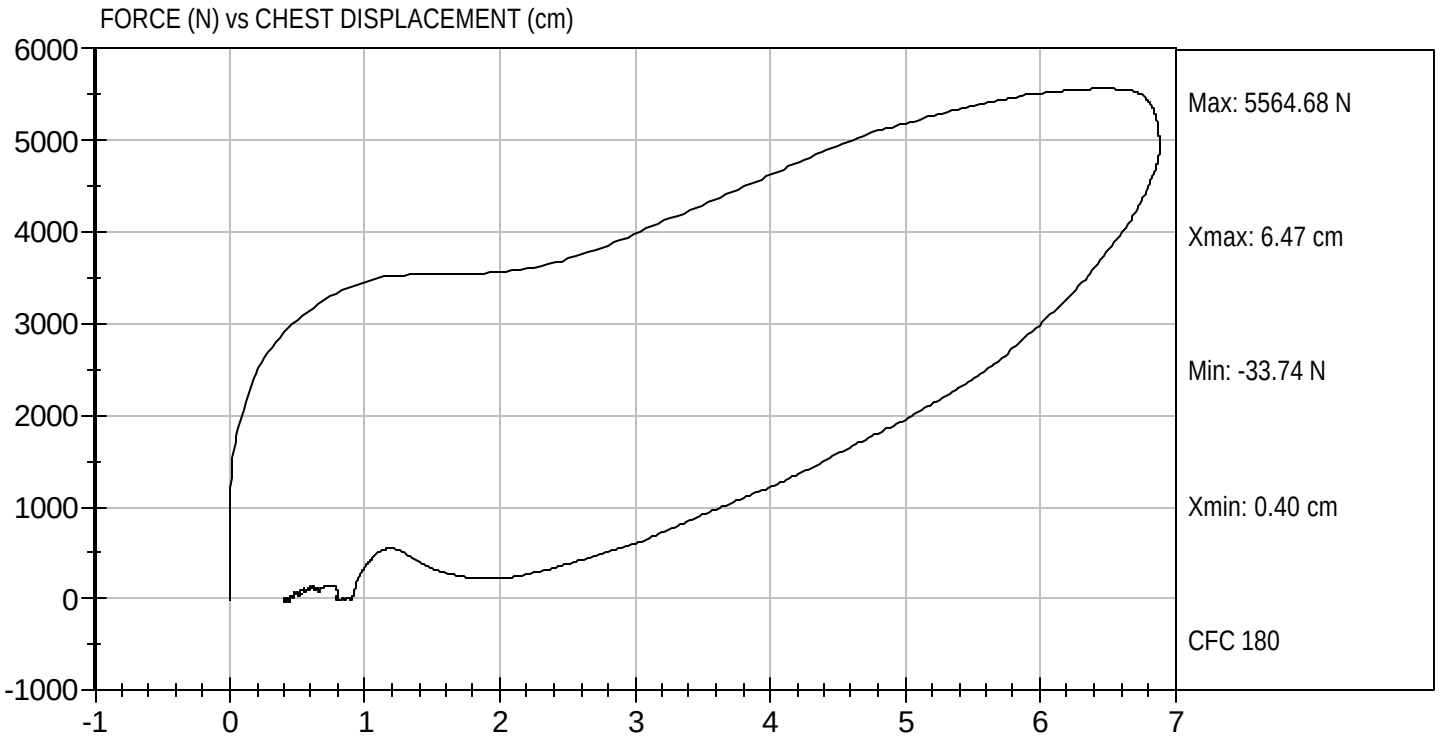
Test Date

David Winkelbauer

Approved By

Test Desc: Thorax Impact
Componet ID: D061424

Test Date: 05/19/2006
Velocity: 21.68 ft/s, 6.61 m/s



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066 **Test I.D:** D061425

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	36	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	5,447	Pass
		Overall Test Results		Pass

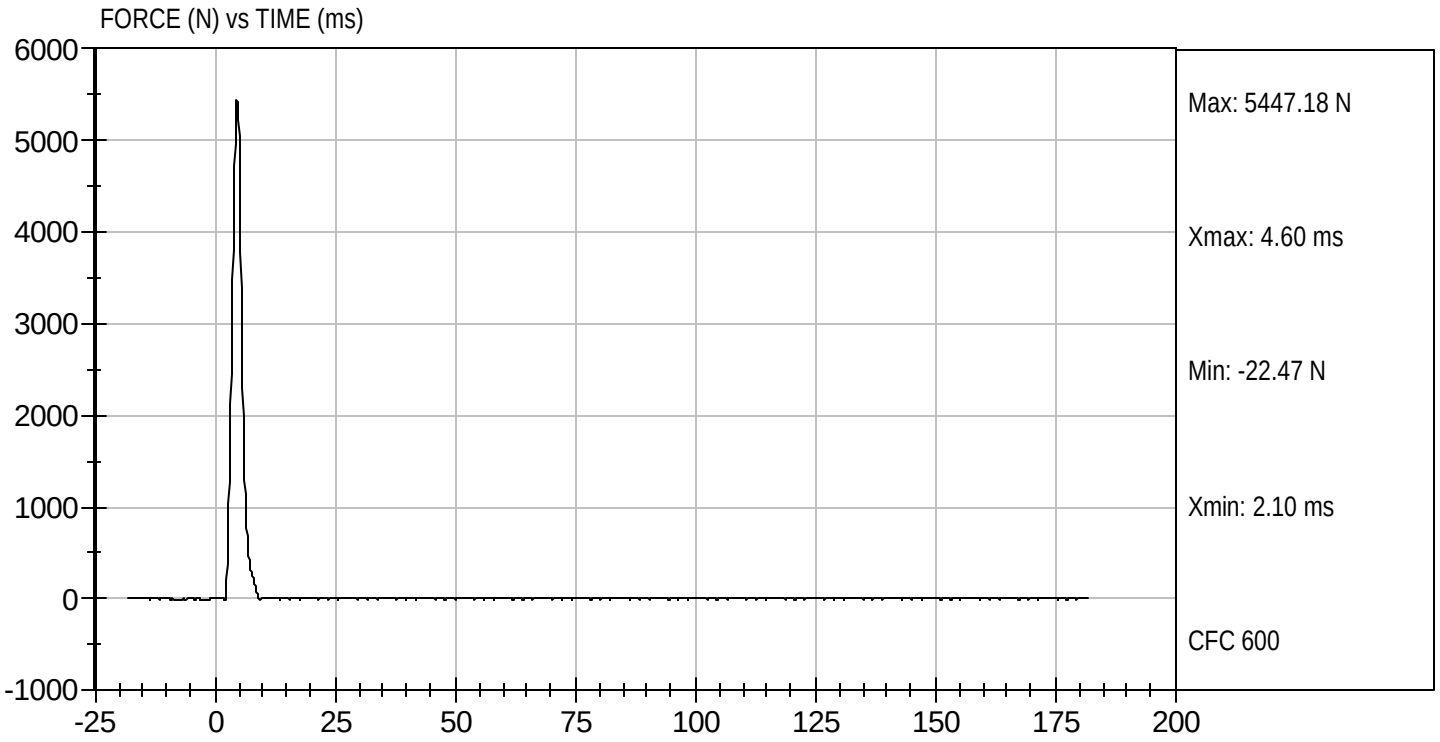
Laboratory Technician

05/18/2006
Test Date

David Winkelbauer
Approved By

Test Desc: Right Knee
Componet ID: D061425

Test Date: 05/18/2006
Velocity: 6.91 ft/s, 2.11 m/s



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066 **Test I.D:** D061426

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	36	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	5,213	Pass
		Overall Test Results		Pass

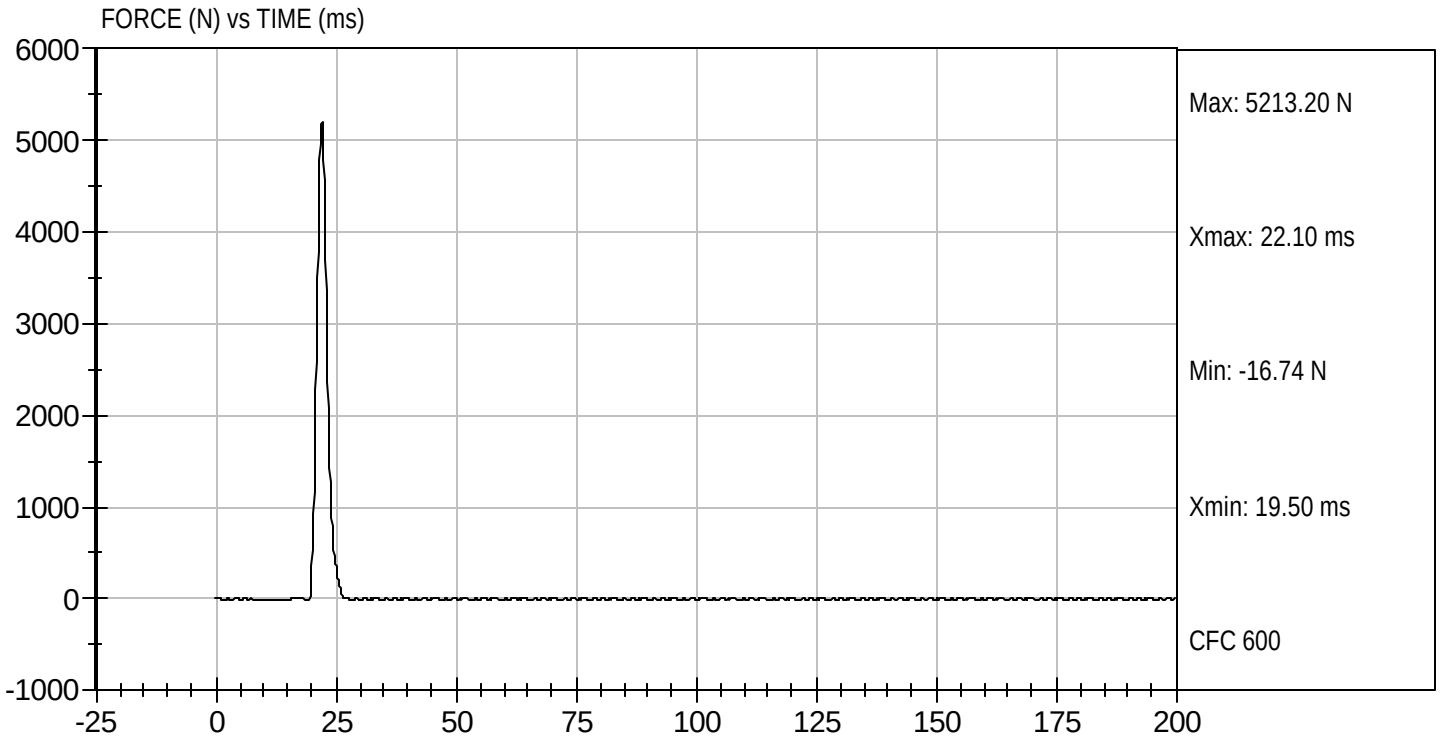
Tim Brady
Laboratory Technician

05/18/2006
Test Date

David Winkelbauer
Approved By

Test Desc: Left Knee
Componet ID: D061426

Test Date: 05/18/2006
Velocity: 6.92 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:** D061420

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	37	37	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	92.8	82.7	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	42	41	Pass
		Overall Test Results			Pass

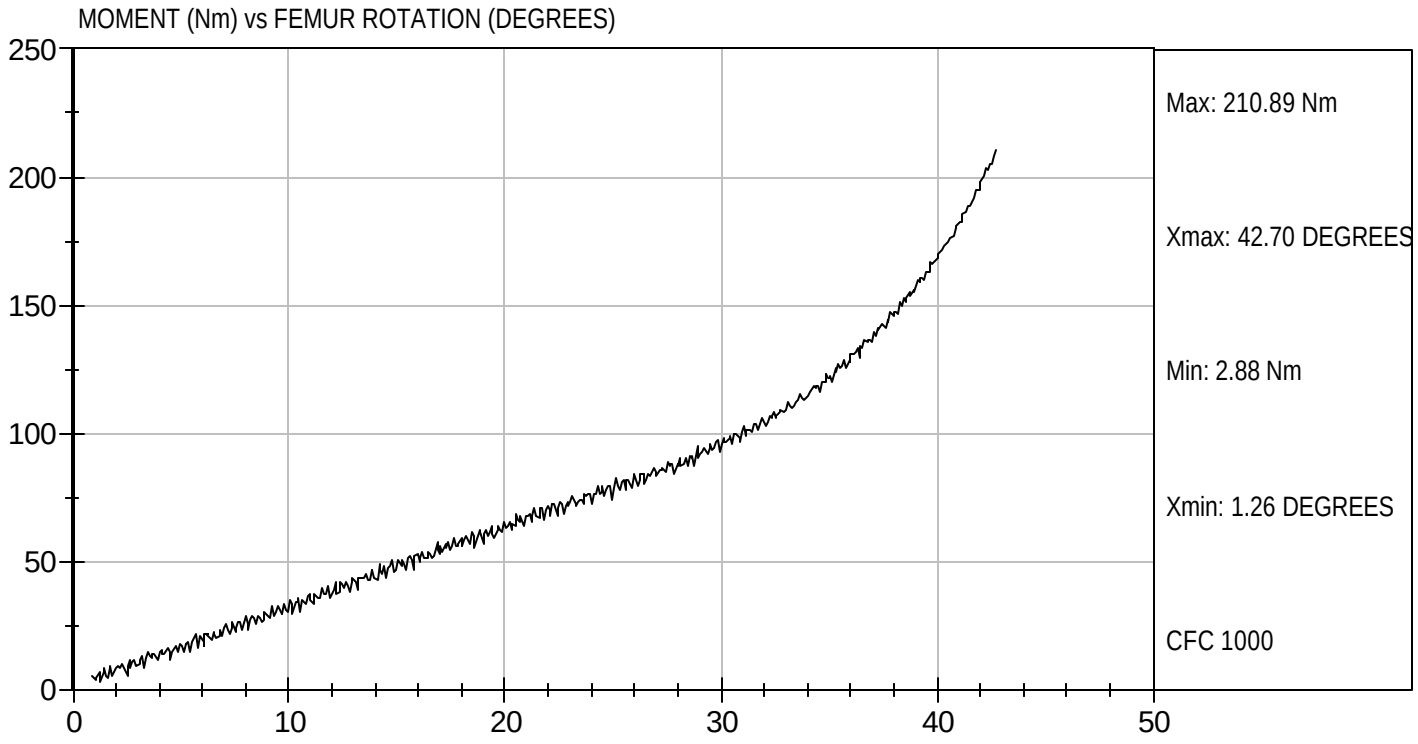
Laboratory Technician

05/18/2006
Test Date

David Winkelbauer
Approved By

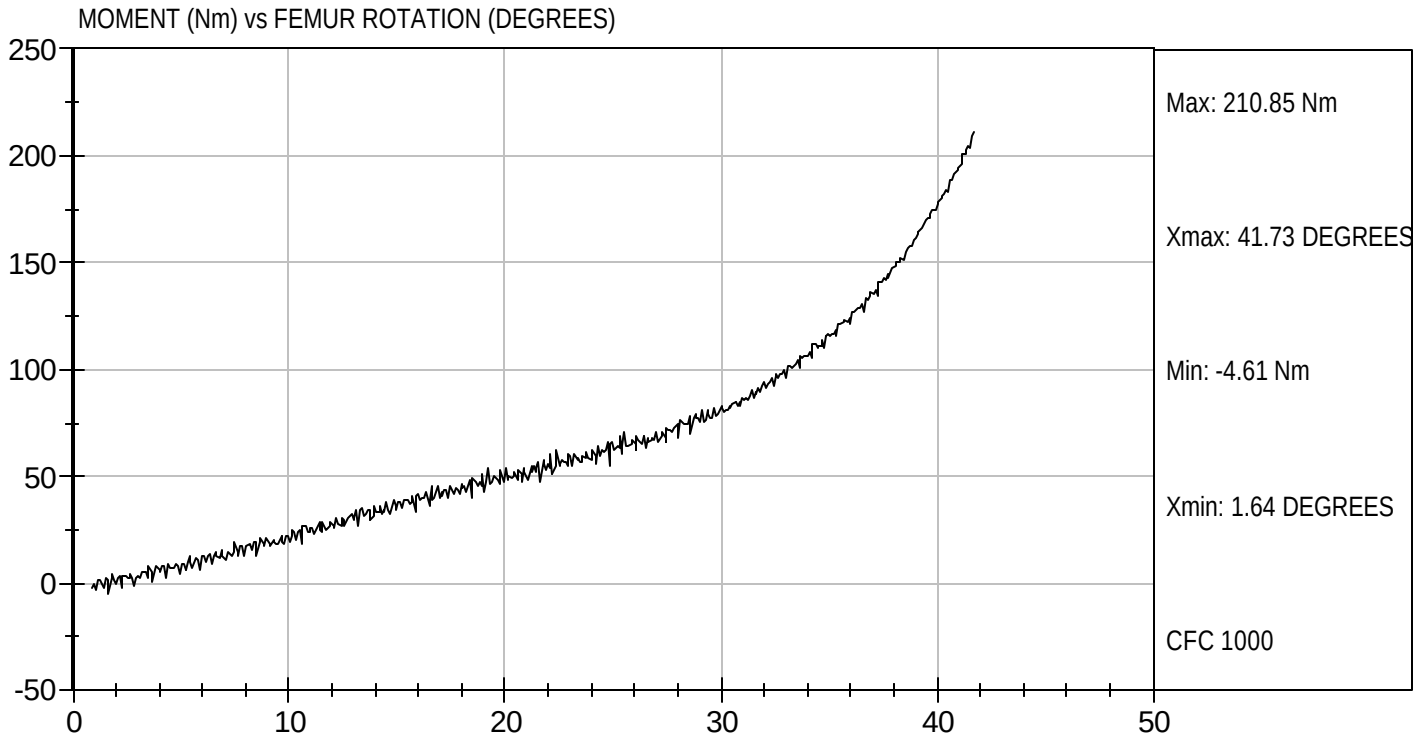
Test Desc: Hip Femur Flexion
Componet ID: D061429

Test Date: 05/18/2006
Velocity: 0 ft/s, 0.00 m/s



Test Desc: Hip Femur Flexion
Componet ID: D061420

Test Date: 05/18/2006
Velocity: 0 ft/s, 0.00 m/s



MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065 **Test ID:** D061411

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	42	Pass
Peak Resultant Acceleration	G's	225 - 275	227	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-5.7	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Laboratory Technician

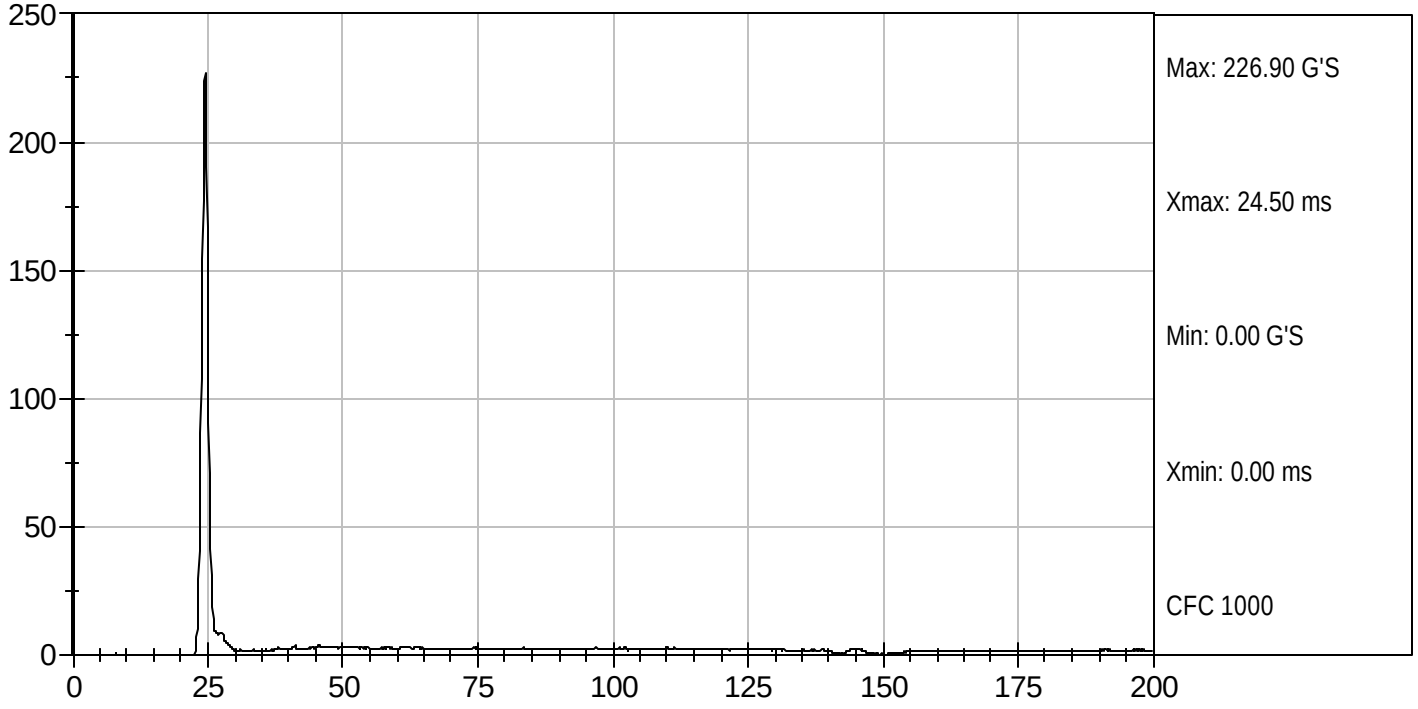
05/18/2006
Test Date

David Winkelbauer
Approved By

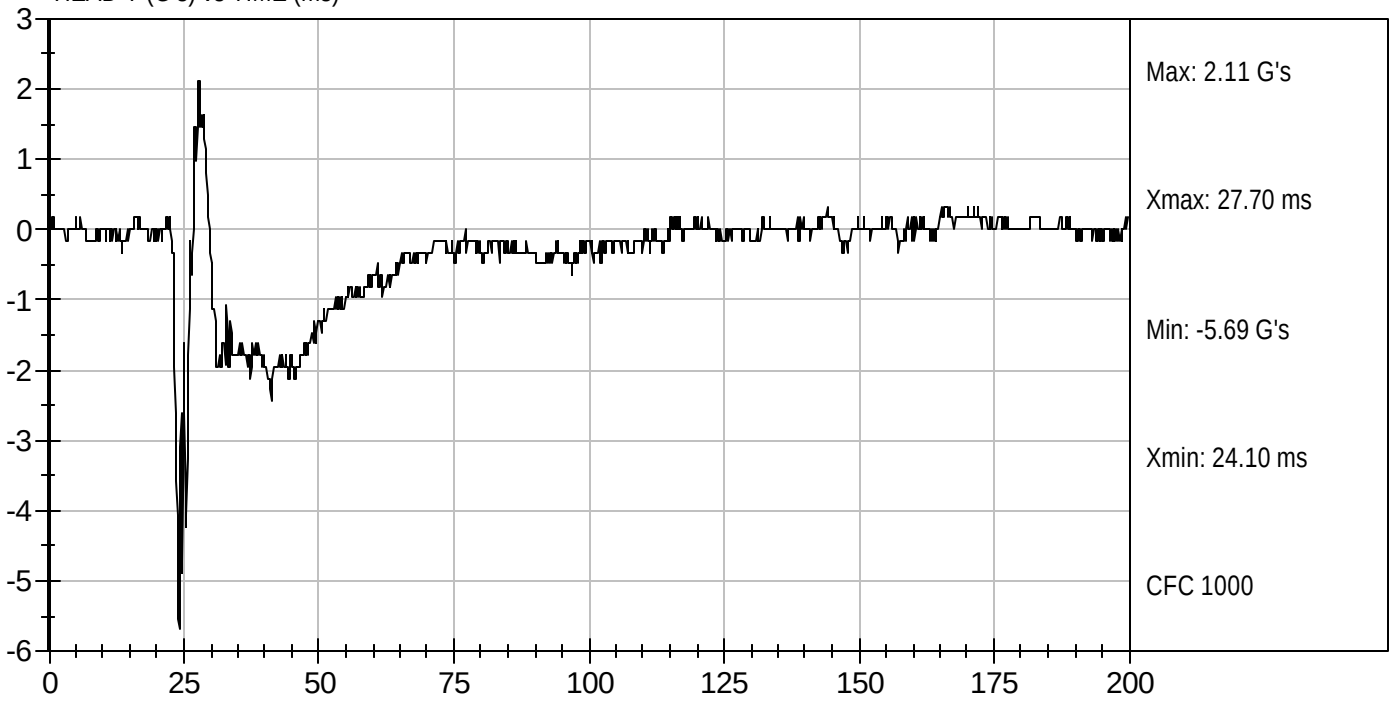
Test Desc: Head Drop
Componet ID: D061411

Test Date: 05/18/2006
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:** D061412

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity		%	10 to 70	42	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.98	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	23.02	Pass
	20 msec	G's	17.60 to 22.60	19.94	Pass
	30 msec	G's	12.50 to 18.50	13.56	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	13.81	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	39.7	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	72.3	Pass
	Time	msec	57.0 to 64.0	59.4	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	115.8	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	90.3	Pass
	Time	msec	47.0 to 58.0	52.3	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	103.4	Pass
			Overall Test Results		Pass

Laboratory Technician

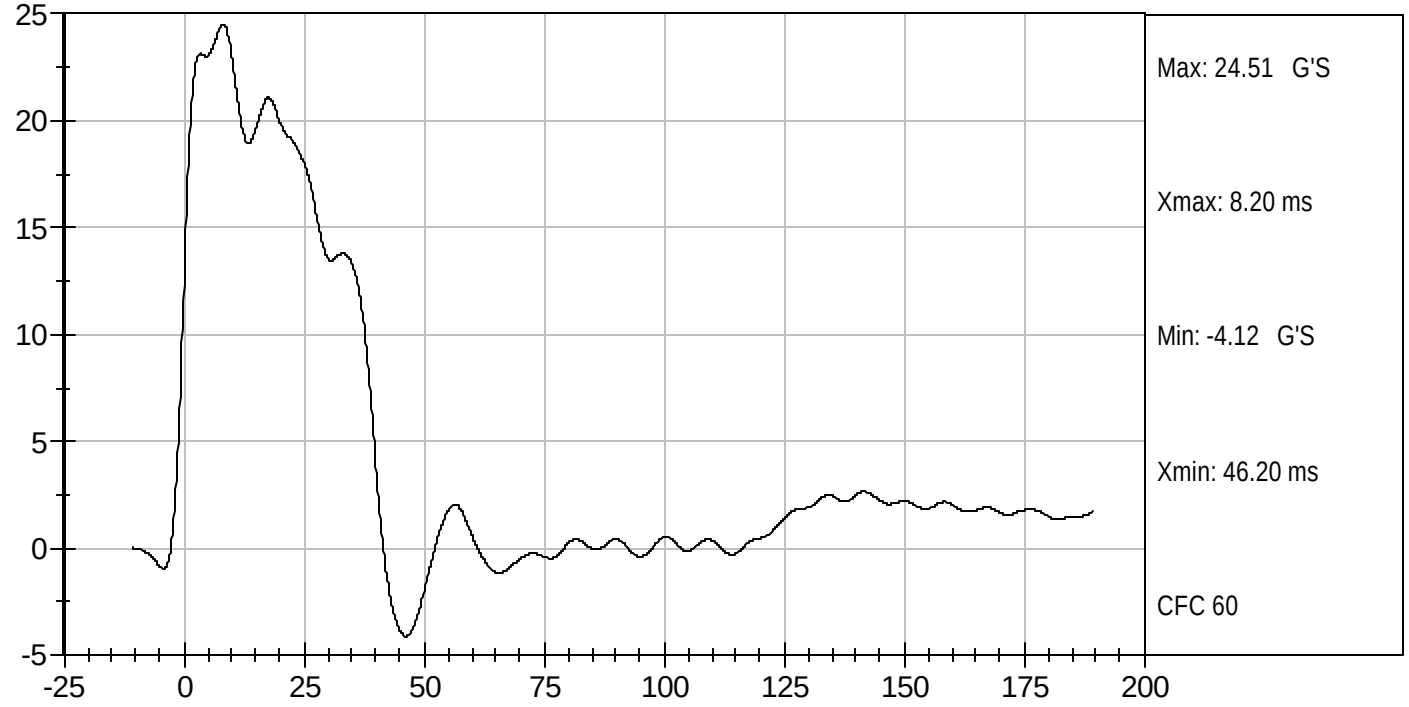
05/18/2006
Test Date

David Winkelbauer
Approved By

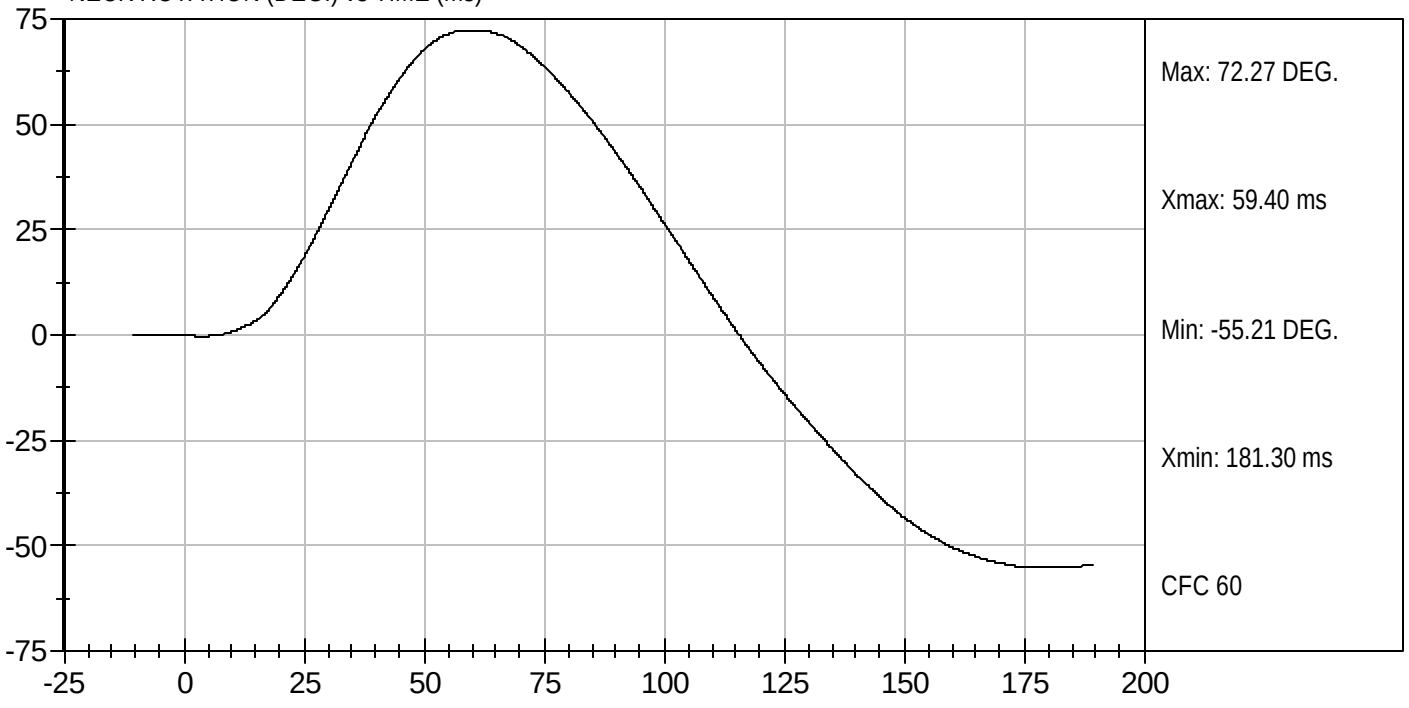
Test Desc: Neck Flexion
Componet ID: D061412

Test Date: 05/18/2006
Velocity: 22.9 ft/s, 6.98 m/s

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

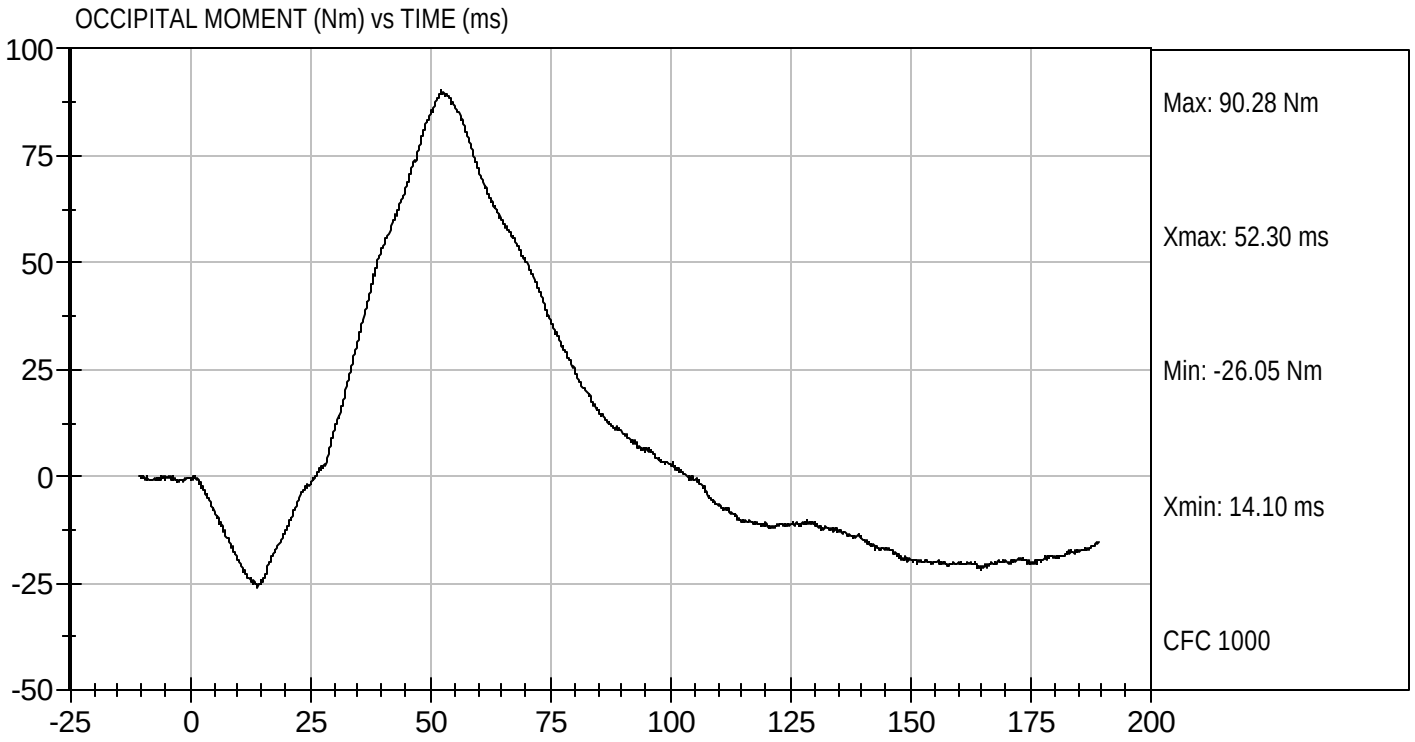


NECK ROTATION (DEG.) vs TIME (ms)



Test Desc: Neck Flexion
Componet ID: D061412

Test Date: 05/18/2006
Velocity: 22.9 ft/s, 6.98 m/s



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065 **Test I.D:** D061413

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	40	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.14	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	19.20	Pass
	20 msec	G's	14.00 to 19.00	17.35	Pass
	30 msec	G's	11.00 to 16.00	14.06	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	14.21	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	40.5	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	102.2	Pass
	Time	msec	72.0 to 82.0	78.7	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	158.5	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-71.8	Pass
	Time	msec	65.0 to 79.0	72.7	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	142.2	Pass
			Overall Test Results		Pass

Laboratory Technician

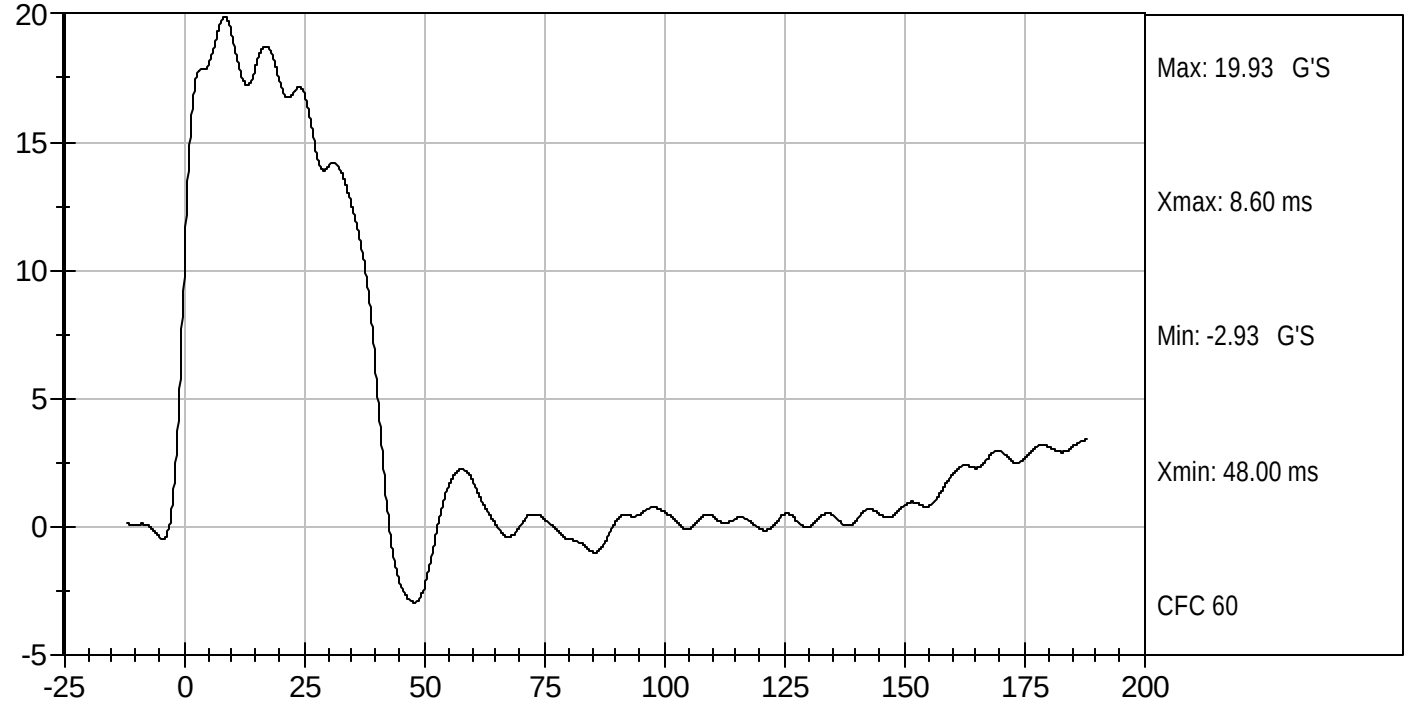
05/18/2006
Test Date

David Winkelbauer
Approved By

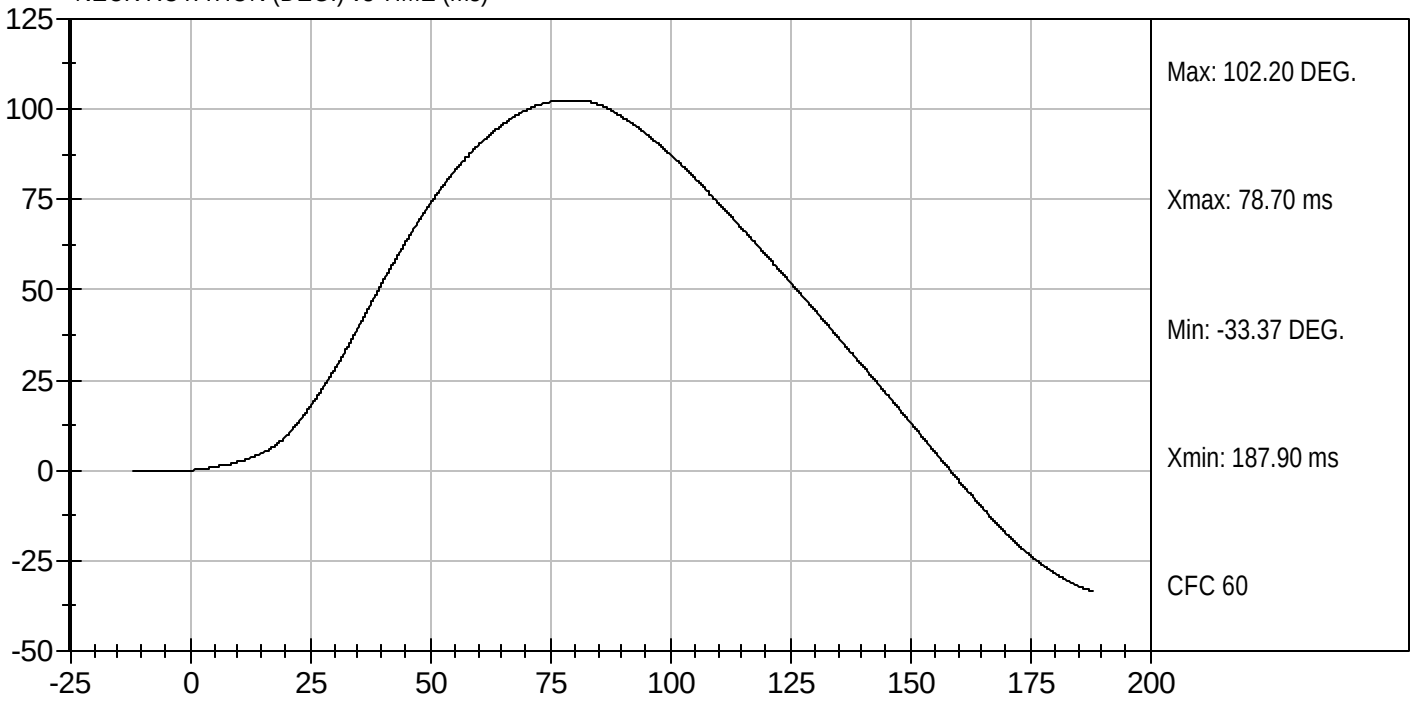
Test Desc: Neck Extension
Componet ID: D061413

Test Date: 05/18/2006
Velocity: 20.13 ft/s, 6.14 m/s

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

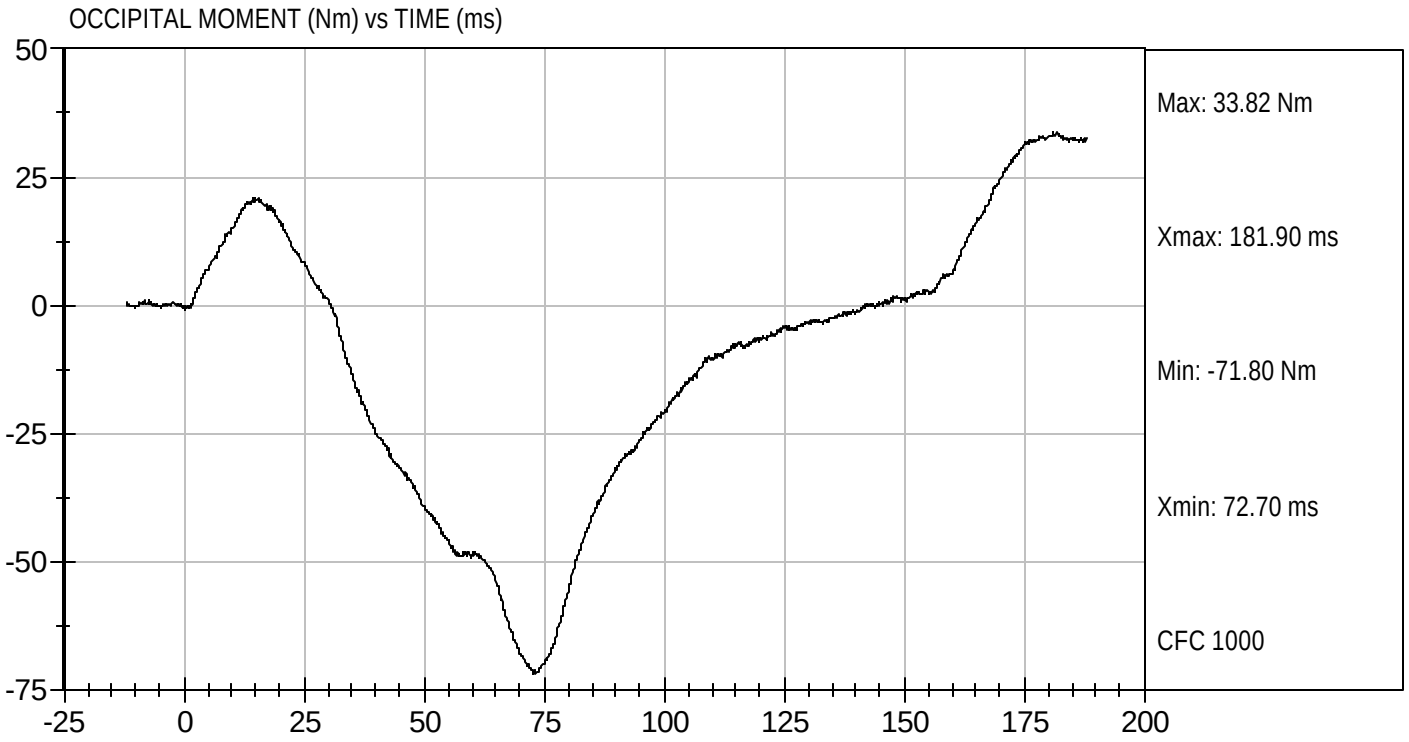


NECK ROTATION (DEG.) vs TIME (ms)



Test Desc: Neck Extension
Componet ID: D061413

Test Date: 05/18/2006
Velocity: 20.13 ft/s, 6.14 m/s



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065 **Test I.D:** D061414

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	34	Pass
Probe Velocity	m/s	6.58 to 6.82	6.60	Pass
Peak Probe Force	N	5159 to 5893	5,567	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.95	Pass
Internal Hysteresis	%	69 to 85	72	Pass
		Overall Test Results		Pass

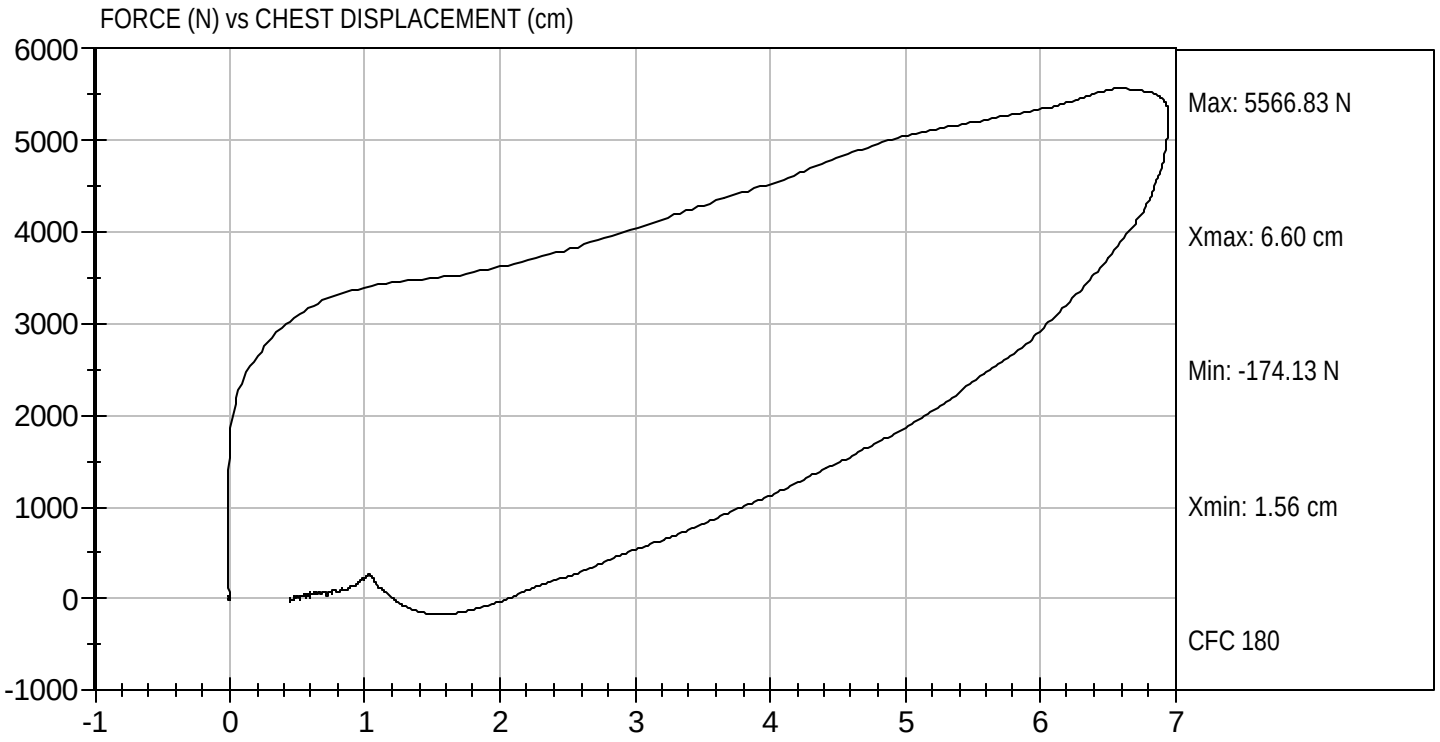
Tim Brady
Laboratory Technician

05/19/2006
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Impact
Componet ID: D061414

Test Date: 05/19/2006
Velocity: 21.66 ft/s, 6.60 m/s



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065 **Test I.D:** D061415

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	36	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	5,293	Pass
		Overall Test Results		Pass

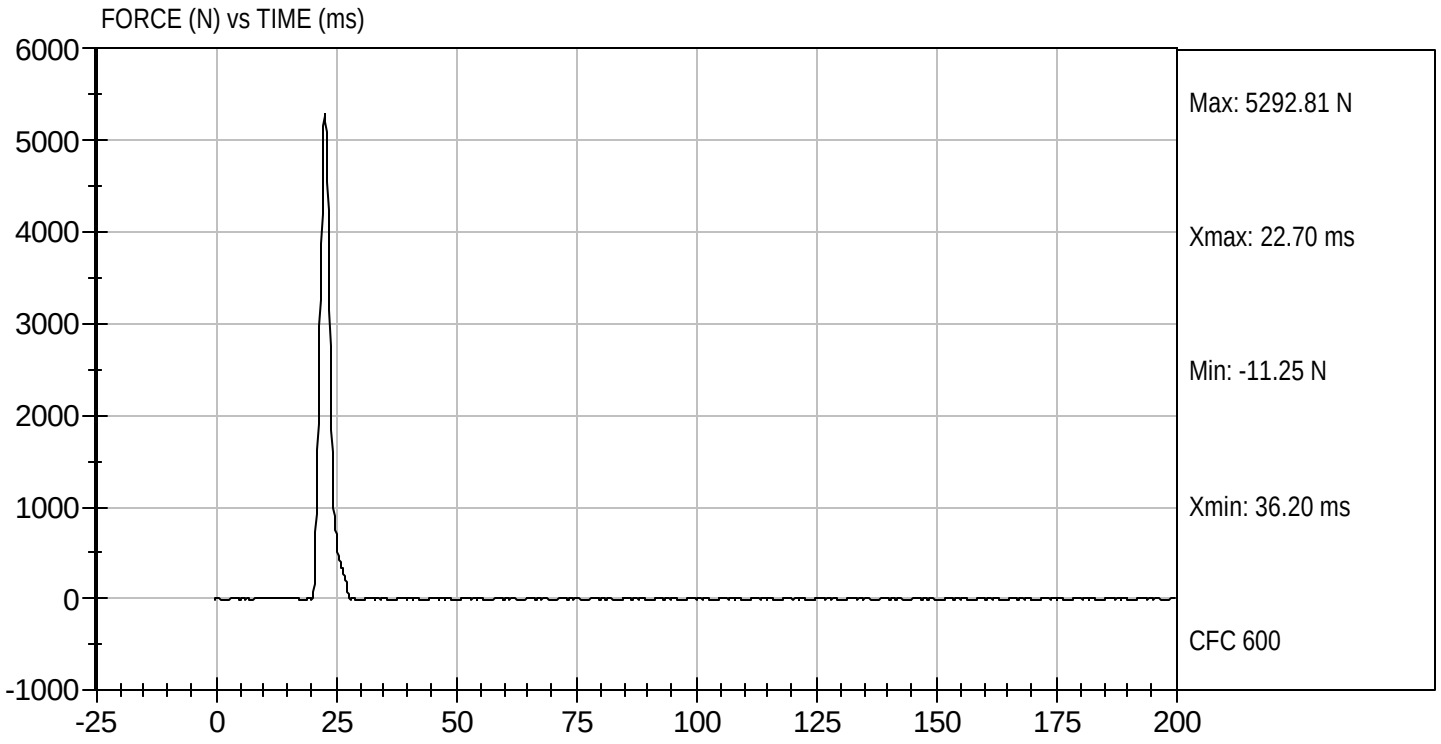
Laboratory Technician

05/18/2006
Test Date

David Winkelbauer
Approved By

Test Desc: Left Knee
Componet ID: D061415

Test Date: 05/18/2006
Velocity: 6.91 ft/s, 2.11 m/s



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065 **Test I.D:** D061416

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	37	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	5,183	Pass
		Overall Test Results		Pass

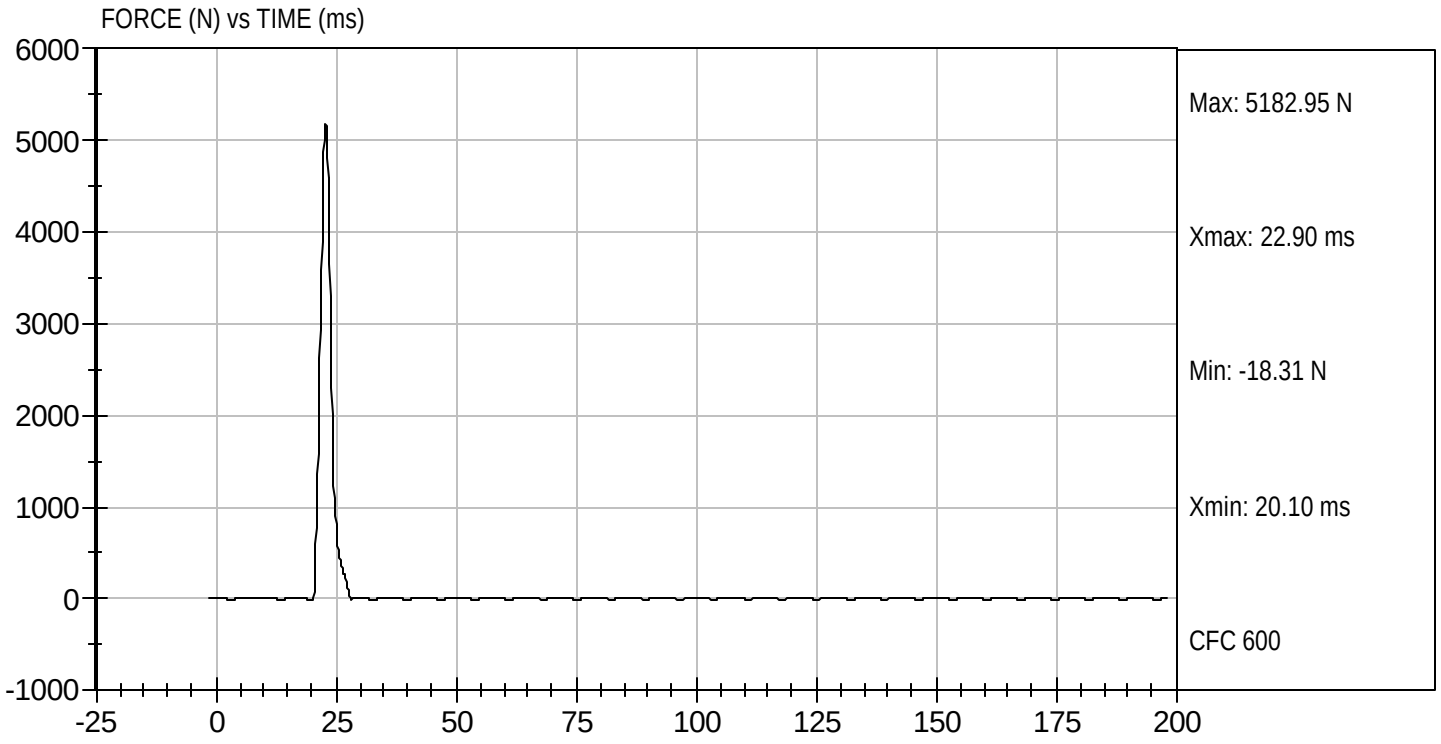
Tim Brady
Laboratory Technician

05/18/2006
Test Date

David Winkelbauer
Approved By

Test Desc: Right Knee
Componet ID: D061416

Test Date: 05/18/2006
Velocity: 6.91 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:** D061410

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	37	37	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	87.8	82.5	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	43	43	Pass
		Overall Test Results			Pass

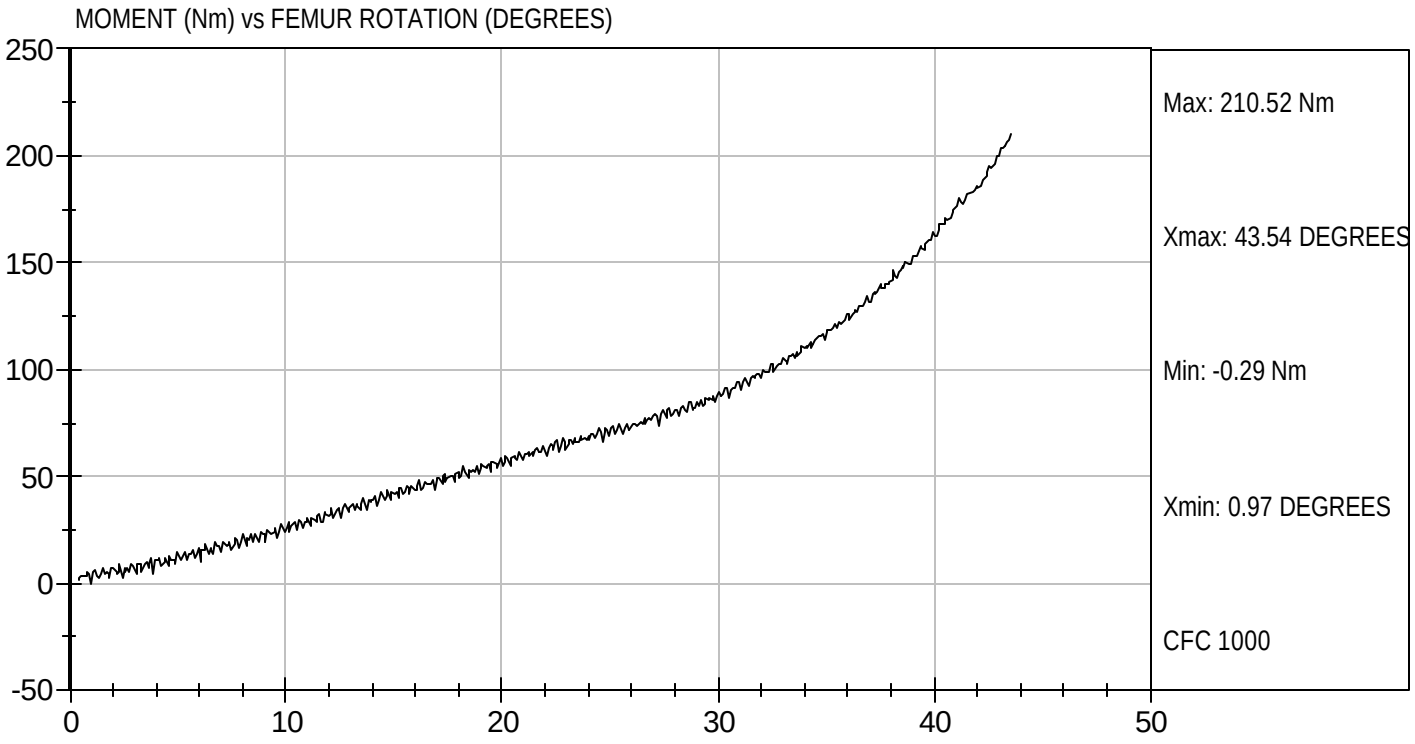
Laboratory Technician

05/18/2006
Test Date

David Winkelbauer
Approved By

Test Desc: Hip Femur Flexion
Componet ID: D061419

Test Date: 05/18/2006
Velocity: 0 ft/s, 0.00 m/s



Test Desc: Hip Femur Flexion
Componet ID: D061410

Test Date: 05/18/2006
Velocity: 0 ft/s, 0.00 m/s