REPORT NUMBER TR-P24001-14-NC

NEW CAR ASSESSMENT PROGRAM
FRONTAL BARRIER IMPACT TEST

TOYOTA MOTOR CORPORATION
2004 TOYOTA HIGHLANDER
SUV

NHTSA NUMBER: M45109

PREPARED BY:
KARCO ENGINEERING, LLC
9270 HOLLY ROAD
ADELANTO, CALIFORNIA 92301

2/18/04

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
RULEMAKING
OFFICE OF CRASHWORTHINESS STANDARDS
MAIL CODE: NVS-111
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-02005.

This publication is distributed by the U.S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings and conclusions expressed in this publication are those of the author(s) and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof. If trade or manufacturers' names or products are mentioned, it is only because they are considered essential to the object of the publication and should not be construed as an endorsement. The United States Government does not endorse products or manufacturers.

Prepared by: _____ Date: February 23, 2004
Mr. James E. Gorth, Project Engineer
KARCO Engineering, LLC

Reviewed by: _____ Date: February 23, 2004
Mr. Jerry L. Kratzke, Director of Operations
KARCO Engineering, LLC

Approved by: _____ Date: February 23, 2004
Mr. Frank D. Richardson, Program Manager
KARCO Engineering, LLC

FINAL REPORT ACCEPTED BY:

_____
Manager, New Car Assessment Program

_____
Date of Acceptance

_____
COTR, NCAP Frontal Impact Program

_____
Date of Acceptance

Technical Report Documentation Page

1. Report No. TR-P24001-14-NC	**2. Government Accession No.**	**3. Recipients Catalog No.**
4. Title and Subtitle Final Report of New Car Assessment Program Testing of a 2004 Toyota Highlander LTD 4WD SUV NHTSA No. M45109		**5. Report Date** February 23, 2004 **6. Performing Organization Code**
7. Authors Mr. James E. Gorth, Project Engineer, Karco Mr. Frank Richardson, Program Manager, Karco		**8. Performing Organization Report No.** TR-P24001-14-NC
9. Performing Organization Name and Address Karco Engineering, LLC 9270 Holly Rd. Adelanto, CA, 92301		**10. Work Unit No.** **11. Contract or Grant No.** DTNH22-01-D-02005
12. Sponsoring Agency Name and Address U. S. Department of Transportation National Highway Traffic Safety Administration Rulemaking Office of Crashworthiness Standards Mail Code NPS-111 400 Seventh Street, SW, Room 5311 Washington, D.C 20590		**13. Type of Report and Period Covered** Final Test Report Option Year 3 **14. Sponsoring Agency Code** DOT/NHTSA/NRM/OCS

15. Supplementary Notes

16. Abstract

A 35 mph (56.3 km/h) frontal barrier impact was conducted on a 2004 Toyota Highlander LTD 4WD SUV at Karco Engineering, LLC on 2/18/04. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and footwell intrusion performance. The impact velocity is 55.71 km/h. The ambient temperature at the barrier face at the time of impact is 12.8 degrees Celcius. The vehicle's maximum post test static crush is 462 mm located to the left of the vehicle centerline.The test vehicle is equipped with a 3-point continuous belt system and second generation supplemental airbags 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	Passenger ATD
Head Injury Criteria (HIC)	N/A	1000	437.2	397.5
Max. Chest Accel. (3 msec Clip)	G's	60	39.4	44.8
Left Femur Force	Newtons	10008	-3027.5	-2531.0
Right Femur Force	Newtons	10008	-5684.3	-3204.4

17. Key Words 56.3 km/h NCAP Frontal Barrier Impact Test New Car Assessment Program (NCAP) 2004 Toyota Highlander LTD 4WD SUV NHTSA No. M45109		**18. Distribution of Statement** Copies of this report available from: NHTSA Technical Reference Division National Highway Traffic Safety Admin. 400 Seventh St., SW, Room 5108 Washington, D.C. 20590	
19. Security Classification (this report) Unclassified	**20. Security Classification (this page)** Unclassified	**21. No. of Pages** 286	**22. Price**

Form DOT F1700.7 (8-72)

TABLE OF CONTENTS

SECTION 1

PURPOSE AND SUMMARY OF TEST M45109

1.1 PURPOSE

This 35 mph (56.3 km/h) frontal barrier impact test is part of the New Car Assessment Program (NCAP) sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-01-D-02005. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for an impact speed in excess of the current 30 mph (48.3 km/h) requirements.

The 35 mph (56.3 km/h) frontal barrier impact test was conducted in accordance with the Office of Crashworthiness Standards Laboratory Test Procedure.

1.2 SUMMARY

A load cell barrier consisting of 36 load cells was impacted by a 2004 Toyota Highlander SUV at a velocity of 55.71 km/h. The test was performed at Karco Engineering, LLC on February 18, 2004

One real-time and 17 (seventeen) 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 nine accelerometer array head, chest and pelvis triaxial accelerometers, chest displacement potentiometers, six-axis upper neck transducers, right/left femur load cells, and lower leg instrumentation. Seat belt load cells were also placed on the driver's and passenger's lap and shoulder belts to measure dummy torso and pelvic section loading. The driver (position 1) ATD (Serial No. 35) and the right-front passenger (position 2) ATD (Serial No. 34) were calibrated one test prior to this test.

One Hundred and Nine (109) channels of data were recorded using an on-board data acquisition system. Appendix A contains Pre and Post-Test Photographs, Appendix B contains the vehicle and dummy response data traces. Appendix C contains Load Cell Barrier information. Appendix D contains the Instrumentation Data Channel assignments. Appendix E contains the Dummy Calibration data and Appendix F contains the Child Restraint System (CRS). Appendix G contains the Nine Accelerometer Array Head data.

There was 100 percent windshield retention and no intrusion into the protected zone of the windshield during the impact 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 462 mm and both the driver and the passenger side doors remained closed during the impact event and were operable after the impact.

The driver's visible contact points were as follows: The driver ATD head and chest contacted the airbag. The abdomen had no contact. Both knees contacted the steering column/knee bolster.

The passenger's visible contact points were as follows: The passenger ATD head and chest contacted the airbag. The abdomen had no contact. Both knees contacted the glove box.

Occupant injury data is contained in table below.

OCCUPANT DATA SUMMARY

ATD Position	HIC	Clip (g)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)	Belt Spool (mm)
Driver	437.2	39.4	-29.4	-3027.5	-5684.3	217.7
Passenger	397.5	44.8	-30.7	-2531.0	-3204.4	239.4

SECTION 2
OCCUPANT AND VEHICLE INFORMATION/DATA SHEETS

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109

Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04

CONVERSION FACTORS USED IN THIS REPORT*

Quantity	Typical Application	Std Units	Metric Unit	Multiply By
Mass	Vehicle Weight	lb	kg	0.4536
Linear Velocity	Impact Velocity	mile/h	km/h	1.609
Length or Distance	Measurements	in	mm	25.4
Volume	Fuel Systems	gal	liter	3.785
Volume	Small Fluids	oz	mL	29.573
Pressure	Tire Pressures	lbf/in^2	kPa	7.0
Volume	Liquid	gal	liter	3.785
Temperature	General Use	^oF	^oC	=(tf -32)/1.8
Force	Dynamic Forces	lbf	N	4.448
Moment	Torque	lbf/ft	Nm	1.355

* Based on the Recommended Practice in SAE J916, May 85

DATA SHEET NO. 1
CRASH TEST SUMMARY

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109
Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04

PRIMARY IMPACT DATA

Measured Parameter	Units	Value
Velocity at Impact	km/h	55.71
Test Weight	kg	2047
Impact Angle	degrees	0
Average Rebound	mm	704
Maximum Static Crush	mm	462

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Passenger
Front Door opening	Remained closed, opened w/o tools	Remained closed, opened w/o tools
Rear Door Opening	Remained closed, opened w/o tools	Remained closed, opened w/o tools
Seat Track Shift (mm)	None	None
Seat Back Failure	None	None

TEST DUMMY INFORMATION

Description	Driver	Passenger
Dummy Type/ Serial No.	50% Male Hybrid III No. 35	50% Male Hybrid III No. 34
Head Contact	Airbag	Airbag
Chest Contact	Airbag	Airbag
Abdomen Contact	None	None
Left Knee Contact	Steering Column/Bolster	Glovebox
Right Knee Contact	Steering Column/Bolster	Glovebox

16mm MOVIE COVERAGE

High Speed	17
Real Time	1
Total	18

DATA CHANNELS

Driver ATD Sensors	46
Passenger ATD Sensors	46
Belt Assessment Sensors	8
Vehicle Structure Accelerometers	9
Rigid Barrier Load Cells	36
Total	145

DATA SHEET NO. 2
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109
Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	M45109	Anti-Lock Brakes	Yes
Make	Toyota	All Wheel Drive	Yes
Model	Highlander	Power Steering	Yes
Body Style	4 Door SUV	Driver Front Airbag	Yes
Vin No.	JTEEP21AX40001209	Driver Side Airbag	Yes
Color	Blue	Driver Head Airbag	No
Delivery Date	2/13/2004	Driver Curtain Airbag	Yes
Odometer	118 mi.	Pass. Front Airbag	Yes
Dealer	Toyota of Glendale	Pass. Side Airbag	Yes
Transmission	4 Speed Automatic	Pass. Head Airbag	No
Final Drive	4wd	Pass. Curtain Airbag	Yes
Type/No. Cyl.	V-6	Pre-Tensioners	Yes
Engine Disp. (L)	3.3	Load Limiters	Yes
Engine Placement	Transverse	Bucket Seats	Yes
Roof Rack	Yes	Air. Cond.	Yes
Sunroof/T-Top	Yes	AM/FM Cassette	Yes
Tinted Glass	Yes	Tilt Steering	Yes
Traction Control	Yes	Automatic Door Locks	Yes
Power Brakes	Yes	Power Windows	Yes
Front Disc	Yes	Power Seats	Yes
Rear Disc	Yes	Other	None

Does Owners Manual provide instructions to turn off automatic door locks. Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Toyota Motor Corporation	GVWR (kg)	2431
Date of Manufacture	Aug-03	GAWR Front (kg)	1300
		GAWR Rear (kg)	1340

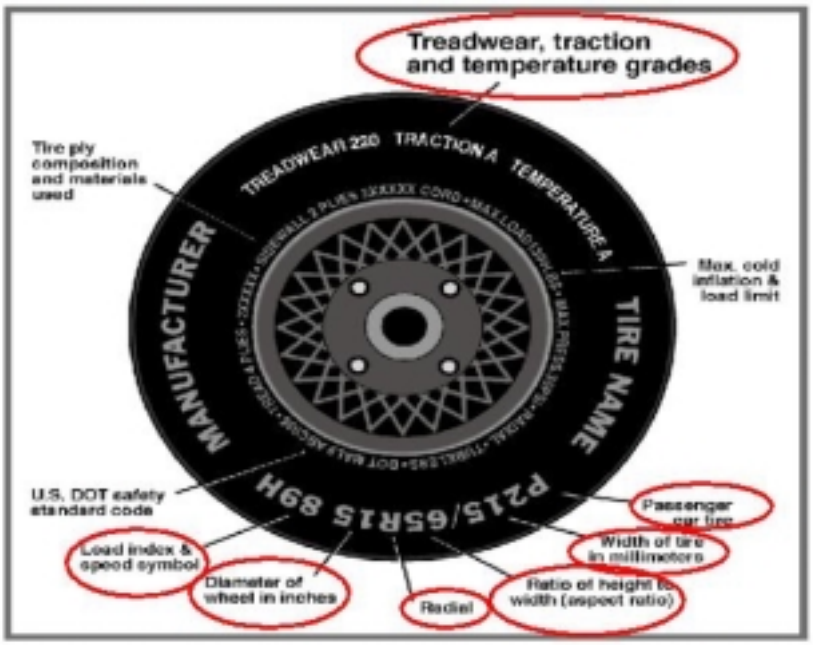
VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench	Bench	
Number of Occupants	2	3	2	7
Capacity Weight (VCW) (kg)				526
Cargo Weight (RCLW) (kg)				49

DATA SHEET NO. 2…..(CONTINUED)
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109
Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04

Collect year, make, model, VIN, items circled in red, and tire manufacturer and tire name.



TIRE INFORMATION

Measured Parameter	Front	Rear
Max. Tire Pressure (kpa)	310	310
Cold Pressure (kpa)	210	210
Recommened Tire Size	P225/65R17	P225/65R17
Tire Size on Vehicle	P225/65R17	P225/65R17
Tire Manufacturer	Goodyear	Goodyear
Treadwear	460	460
Traction	A	A
Temperature Grades	B	B
Tire Plies Sidewall	2	2
Tire Plies Body	5	5
Load Index/Speed Symbol	101 S	101 S
Tire Material	Polyester/Steel/Polymide	Polyester/Steel/Polymide
DOT Safety Code Right	V4F5M04R3303	V4F5M04R3303
DOT Safety Code Left	V4F5M20R3303	V4F5M19R3303

DATA SHEET N. 2…..(CONTINUED)
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109
Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04

TEST VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	525	423		558	488	
Right	kg	512	390		547	454	
Ratio	%	56.1	43.9		54.0	46.0	
Totals	kg	1037	813	1850	1105	942	2047

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1850
Weight of 2 P572 ATD's	kg	152
Rated Cargo/Luggage Wt. (RCLW)	kg	49
Calculated Vehicle Target Wt. (TVTW)	kg	2051

TEST VEHICLE ATTITUDE AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	800	805	813	810	1199
As Tested	mm	793	798	796	801	1255

Vehicle Wheel Base (mm): 2728

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

Vehicle Components Removed: Rear bumper and taillights, rear windows and door panels, rear hatch, spare tire and 3rd row seats.

* Ballast weight does not include cameras, instrumentation and brake abort system.

FUEL SYSTEM DATA

Fuel System Capacity From Owners Manual (L): 72.68

Usable Capacity Furnished by COTR (L): 72.68

Actual Test Volume with entire fuel System Filled (L): 67.57

1/3 of Usable Capacity (L): 24.22

Test Fluid Type: Stoddard Solvent

Kinematic Viscosity: as per ASTM Standard D484-71 Purple

Is Vehicle Fuel Pump Electric or Mechanical? Electric

If electric, does pump operate with ignition switch "On" & engine "OFF" Yes

Fuel System Particulars: Key operated w/automatic shutoff.

DATA SHET NO. 3
POST TEST IMPACT DATA

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109
Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04

SPEED TRAP DATA

Measured Parameter	Units	Requirement	Value
Trap No.1 Velocity (Primary)	km/h	55.51 to 57.12	55.71
Trap No. 1 Entry Distance	mm	<1524	1524
Trap No.1 Exit Distance	mm	<1524	305
Trap No.2 Velocity (Redun.)	km/h	55.51 to 57.12	55.73
Trap No.2 Entry Distance	mm	<1524	1524
Trap No.2 Exit Distance	mm	<1524	305

VEHICLE STATIC CRUSH

Measured Parameter	Units	Pre-Test	Post-Test	Difference
Left Side	mm	4589	4199	-390
Center	mm	4689	4259	-430
Right Side	mm	4589	4221	-368

VEHICLE REBOUND FROM BARRIER

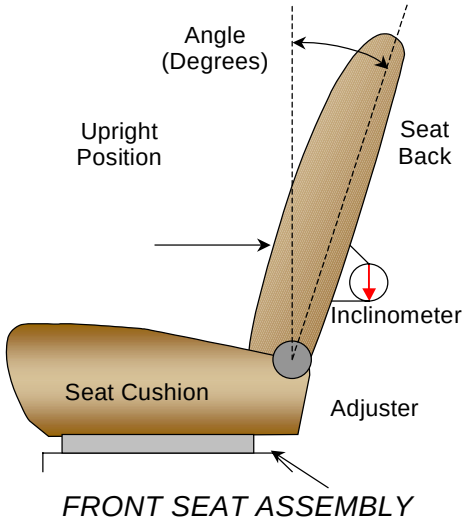
Measured Parameter	Units	Value
Left Side	mm	718
Center	mm	695
Right Side	mm	698
Average	mm	704

DATA SHEET NO. 4
TEST VEHICLE INFORMATION

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109
Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04

NOMINAL DESIGN RIDING POSITION

The driver and passenger seat backs are positioned to the manufacturers designated angle. The procedure is as follows: A special application tool with pointed probes is inserted through the fabric to make contact with the rigid portion of the lower seat frame assembly, approximately 13 inches above the pivot point of the seat back. An inclinometer is placed against the flat surface of the tool and the seat back angle is measured directly from the dial face.



SEAT BACK ANGLES

	Deg.
Driver w/seated dummy	3.0
Passenger w/seated Dummy	3.0

SEAT FORE/AFT POSITIONS

The first or forward most position is counted as number one (1). The fore/aft position is set aft of the middle position for both the driver and passenger.

SEAT FORE/AFT POSITIONING

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	240 mm	120 mm
Passenger Seat	240 mm	120 mm

SEAT BELT UPPER ANCHORAGE

Position number one (1) is the uppermost position.

SEAT BELT UPPER ANCHORAGE

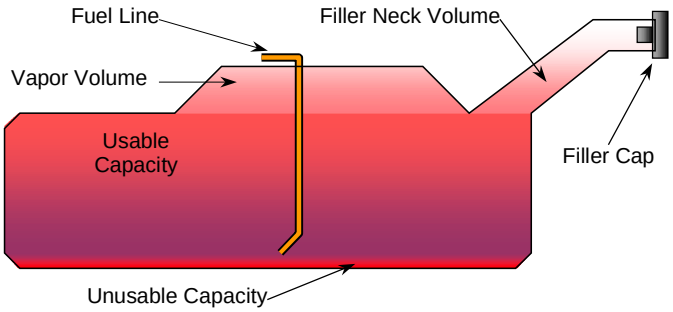
	Total # of Positions	Placed in Position #
Driver Seat	5	3
Passenger Seat	5	3

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109
Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04

FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank"	72.68
Usable Capacity of "Optional" Tank	N/A
Usable Capacity used for FMVSS 301	66.86 to 68.31
Actual Amount of Solvent used	67.57
1/3 of Usable Capacity	24.22

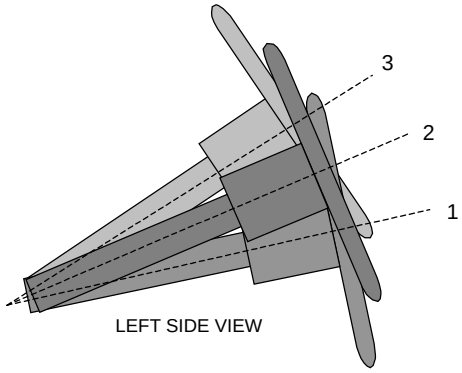
The test vehicle is equipped with an electric fuel pump. The fuel pump operates for approximately two seconds after the ignition is placed in the “ON” position, after which the fuel pump automatically shuts off. The fuel filler door is located on the left rear fender. The standard fuel tank occupies the area under the rear seat.



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

	Degrees
Lowermost positon No. 1	26.4
Geometric center position No. 2	27.7
Uppermost position No. 3	29.8

DATA SHEET NO. 5
DUMMY POSITIONING IN VEHICLE

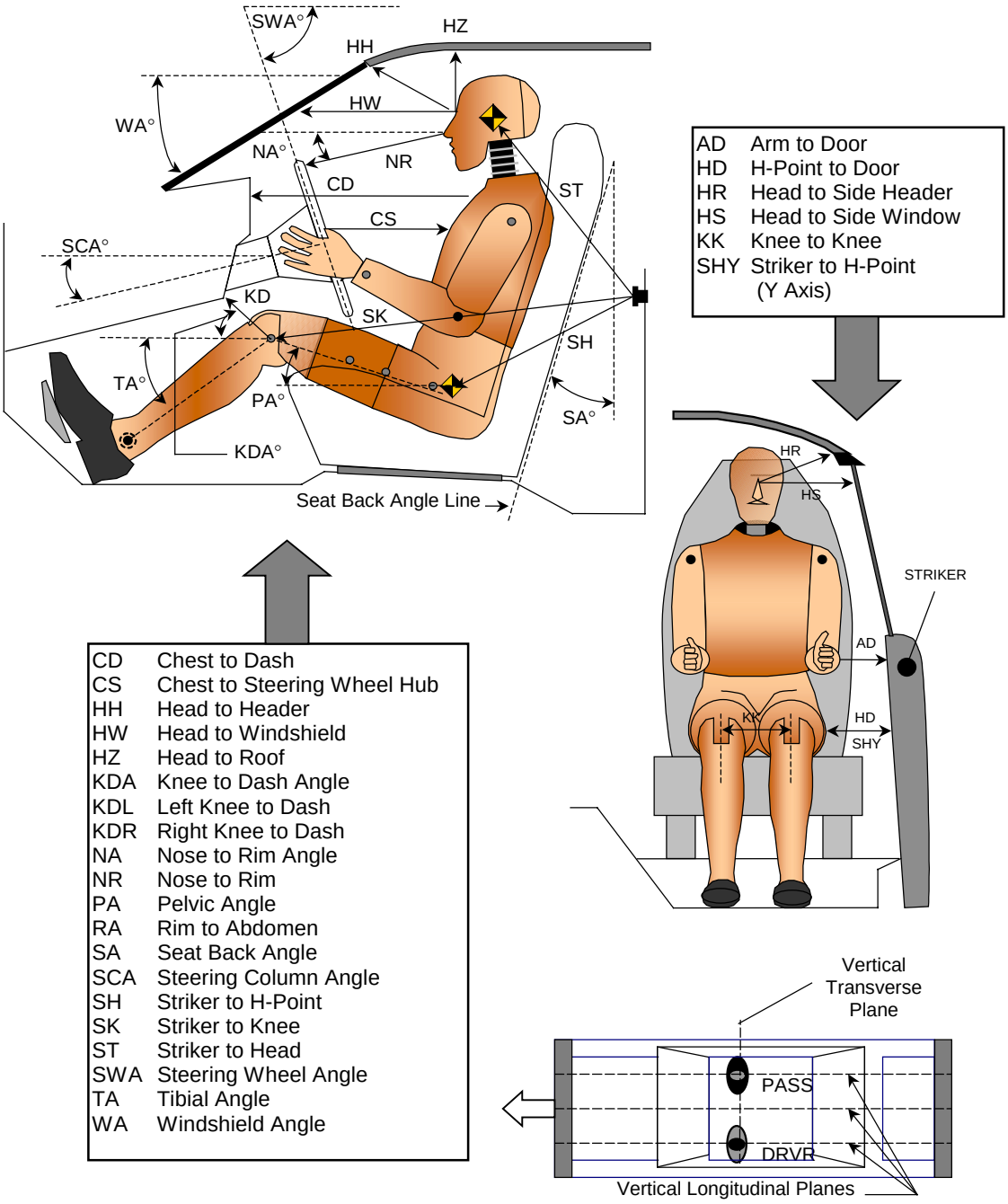
Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109
Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04

TEST DUMMY POSITION MEASUREMENTS

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (deg)	Length (mm)	Angle (deg)
WA	Windshield Angle		60		
SWA	Steering Wheel Angle		62.3		
SCA	Steering Column Angle		27.7		
SA	Seat Back Angle		3.0		3.0
HZ	Head to Roof (Z)	217	90	200	90
HH	Head to Header	393		388	
HW	Head to Windshield	628		590	
HR	Head to Side Header (Y)	255		255	
NR	Nose to Rim	420	12		
CD	Chest to Dash	543		610	
CS	Chest to Steering Hub	305			
RA	Rim to Abdomen	185			
KDL	Left Knee to Dash	142	35	145	
KDR	Right Knee to Dash	150		135	26
PA	Pelvic Angle		25		21
TA	Tibia Angle		50		46
KK	Knee to Knee (Y)	310		295	
SK	Striker to Knee	607	6	552	10
ST	Striker to Head	513	83	630	81
SH	Striker to H-Point	265	34	255	28
SHY	Striker to H-Point (Y)	250		252	
HS	Head to Side Window	330		325	
HD	H-Point to Door (Y)	185		185	
AD	Arm to Door (Y)	95		45	

DATA SHEET NO. 5…(CONTINUED
DUMMY POSITIONING IN VEHICLE

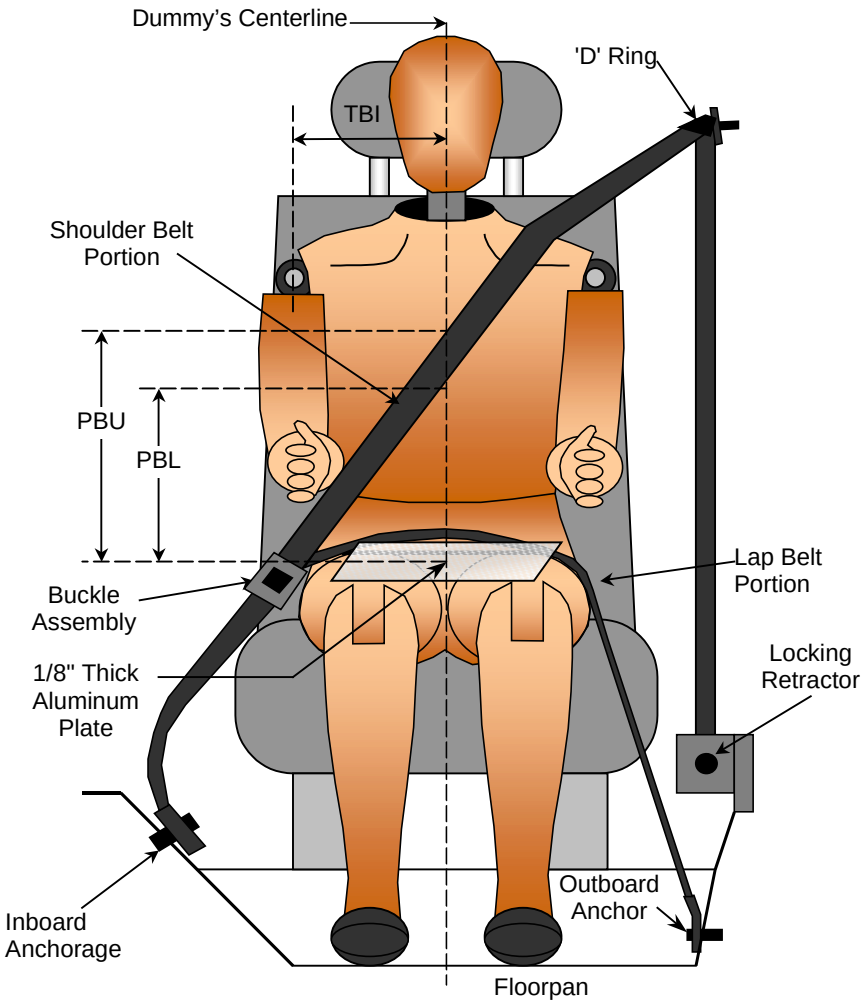
Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109
Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04



DUMMY MEASUREMENTS FOR FRONT SEAT OCCUPANTS

DATA SHEET NO. 6
SEAT BELT POSITIONING DATA

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109
Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04



SEAT BELT POSITIONING MEASUREMENTS

Measured Parameter	Units	Driver	Passenger
TBI -Dummy C/L to Lap/Shoulder Belt Intersect	mm	225	230
PBU - Top Surface of reference to belt upper edge	mm	335	325
PBL - Top Surface of reference to belt lower edge	mm	255	245
Lap Belt Tension	Newtons	10	10
Shoulder Belt Tension	N/A	Retractor	Retractor

DATA SHEET NO. 7 - VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109

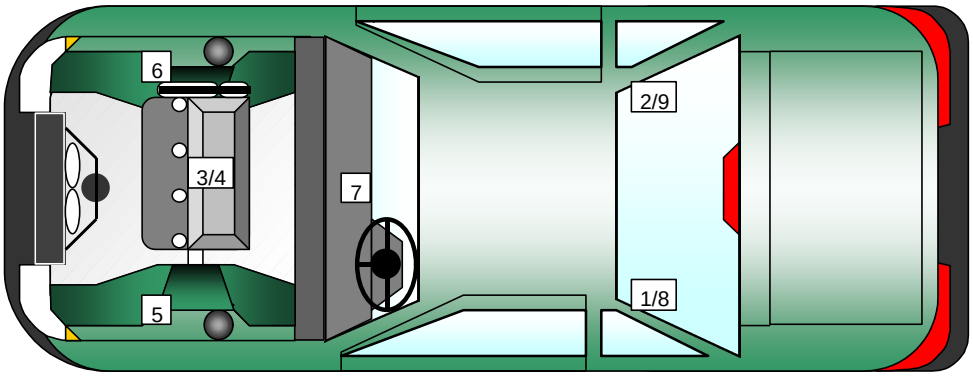
Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04

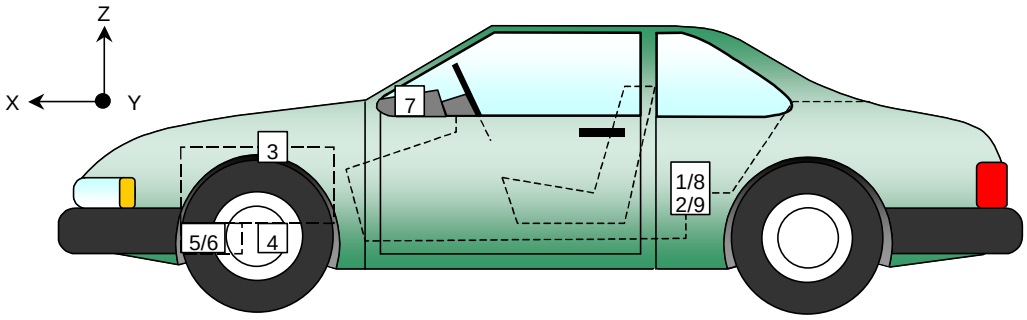
VEHICLE ACCELEROMETER PEAK DATA AND PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)			Peak Values				
		X	Y	Z	Units	Max	Time	Min	Time
1	Left Rear X-Member	1950	-730	450	G's	2.3	102.9	-55.3	43.1
2	Right Rear X-Member	1950	730	450	G's	2.9	100.9	-56.9	43.8
3	Engine Top	4140	40	820	G's	41.1	42.7	-149.1	29.9
4	Engine Bottom	4020	200	210	G's	22.4	38.1	-121.6	28.5
5	Left Brake Caliper	3920	-690	280	G's	40.4	36.8	-103.0	42.5
6	Right Brake Caliper	3920	690	280	G's	40.0	37.4	-103.5	44.9
7	Instrument Panel	3120	0	1200	G's	12.4	52.5	-76.7	65.5 [1]
8	Left Rear X-Member (Z-Axis)	1880	-730	450	G's	8.4	21.1	-12.7	64.0
9	Right Rear X-Member (Z-Axis)	1880	730	450	G's	10.5	27.4	-14.9	65.6

Reference Planes: X=From Rear Surface of Vehicle, Y=Vehicle Centerline, Z=Ground Plane

1.) Channel failed at 69.8 msec.





DATA SHEET NO. 8 - HYBRID III ATD INJURY CRITERIA AND SENSOR DATA

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109

Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04

HEAD PRIMARY PEAK ACCELERATIONS

			Driver				Passenger			
Location	Axis	Units	Max	Time	Min	Time	Max	Time	Min	Time
Head CG	X	G's	0.8	199.8	-58.7	81.6	20.4	196.7	-56.0	81.7
Head CG	Y	G's	4.7	96.3	-5.2	78.4	3.5	34.0	-6.2	71.4
Head CG	Z	G's	24.8	58.3	-11.7	95.7	30.7	79.4	-0.9	11.9
Head CG Resultant	N/A	G's	59.0	81.6			63.2	80.5		

CHEST PRIMARY PEAK ACCELERATIONS

			Driver				Passenger			
Location	Axis	Units	Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	G's	2.5	144.0	-41.7	55.8	1.6	97.6	-50.6	73.5
Chest CG	Y	G's	6.9	80.4	-3.3	17.0	5.0	43.4	-7.5	67.1
Chest CG	Z	G's	17.3	46.5	-15.7	94.6	11.2	58.0	-10.4	104.7
Chest CG Resultant	N/A	G's	42.5	55.9			51.1	73.5		

FEMUR PEAK FORCES

			Driver				Passenger			
Location	Axis	Units	Max	Time	Min	Time	Max	Time	Min	Time
Left Femur	Z	Newtons	1224.0	46.4	-3027.5	54.5	2014.5	46.4	-2531.0	42.9
Right Femur	Z	Newtons	1757.4	44.5	-5684.3	55.0	1673.9	63.0	-3204.4	45.6

SEAT BELT SENSOR PEAK VALUES

			Driver				Passenger			
Location	Axis	Units	Max	Time	Min	Time	Max	Time	Min	Time
Shoulder Belt Pullout	N/A	MM	217.7	101.0	-53.3	46.0	239.4	89.4	-55.0	34.4
Shoulder Belt Stretch	N/A	MM/CM	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0 [1]
Lap Belt Force	N/A	Newtons	8749.9	54.5	-97.8	104.1	8821.0	57.0	-146.3	111.5
Shoulder Belt Force	N/A	Newtons	5638.4	41.8	-47.2	5.0	5144.8	40.7	-49.9	5.0

1.) Not used with pre-tensioners

PRIMARY HEAD INJURY CRITERA (HIC)

	Driver				Passenger			
Location	HIC	T^1	T^2	Avg G	HIC	T^1	T^2	Avg G
Head CG Primary	437.2	63.5	93.2	46.4	397.5	58.7	94.7	41.4

PRIMARY CHEST CLIP (3MSEC)

	Driver			Passenger		
Location	CLIP	T^1	T^2	CLIP	T^1	T^2
Chest CG Primary	39.4	72.6	75.6	44.8	72.5	75.5

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109

Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04

PELVIC PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Pelvis	X	G's	8.9	102.8	-86.9	54.3	5.8	111.9	-66.9	53.7
Pelvis	Y	G's	11.5	69.2	-11.9	54.4	5.7	15.5	-9.9	76.3
Pelvis	Z	G's	1.9	35.4	-30.0	54.5	3.0	37.5	-28.8	73.0
Pelvis Resultant	N/A	G's	92.3	54.3			68.9	53.8		

UPPER NECK PEAK FORCES AND MOMENTS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Neck Force	X	Newtons	441.4	74.5	-504.8	136.1	342.3	65.4	-632.0	112.0
Neck Force	Y	Newtons	147.7	60.7	-85.6	36.7	74.1	98.5	-167.0	74.5
Neck Force	Z	Newtons	1253.1	58.5	-306.1	96.4	1325.2	79.4	-490.5	200.0
Neck Force Resultant	N/A	Newtons	1268.3	73.3			1346.3	79.4		
Neck Moment	X	N•m	12.1	109.9	-13.5	92.1	16.7	104.7	-9.2	146.6
Neck Moment	Y	N•m	46.0	138.9	-14.3	194.4	41.6	134.7	-31.0	81.2
Neck Moment	Z	N•m	5.0	66.3	-7.9	91.1	6.4	110.5	-4.9	156.3
Neck Moment Resultant	N/A	N•m	46.7	138.9			42.2	134.7		

FOOT PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Left Foot Aft	X	G's	21.8	87.9	-57.1	52.8	64.4	51.4	-287.6	43.3
Left Foot Aft	Z	G's	3.3	151.2	-41.2	32.4	46.0	57.0	-105.5	44.4
Left Foot Fore	Z	G's	4.9	90.8	-69.6	49.7	155.8	55.4	-282.7	43.3
Right Foot Aft	X	G's	29.7	56.3	-144.1	44.1	15.7	70.9	-111.0	46.5
Right Foot Aft	Z	G's	22.2	51.8	-106.4	43.7	6.2	62.0	-55.0	47.6
Right Foot Fore	Z	G's	47.9	63.5	-176.4	43.0	34.6	40.9	-84.3	32.4

UPPER AND LOWER TIBIA PEAK FORCES AND MOMENTS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Left Upper Moment	X	N•m	36.7	55.5	-18.1	84.9	52.5	71.2	-32.4	62.3
Left Upper Moment	Y	N•m	16.2	107.6	-125.0	59.5	0.0	0.0	0.0	0.0[1]
Right Upper Moment	X	N•m	71.0	52.0	-57.8	55.3	21.2	45.9	-31.1	90.0
Right Upper Moment	Y	N•m	22.1	26.8	-169.8	45.0	109.7	43.1	-87.7	52.6
Left Lower Moment	X	N•m	15.8	49.5	-39.3	72.2	19.5	42.8	-61.8	56.4
Left Lower Moment	Y	N•m	51.1	87.6	-47.3	50.9	106.1	56.5	-127.1	43.4
Left Lower Force	Z	Newtons	90.5	133.8	-1554.7	83.7	330.7	36.3	-3095.9	52.9
Right Lower Moment	X	N•m	34.6	45.4	-115.6	61.0	11.0	36.6	-53.3	52.5
Right Lower Moment	Y	N•m	105.3	60.5	-107.6	45.3	45.3	43.6	-38.8	34.1
Right Lower Force	Z	Newtons	237.3	139.7	-3426.9	61.5	58.0	12.3	-2521.3	80.2

1.) Passenger channel failed, no data

DATA SHEET NO. 8…(continued)

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109

Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04

CHEST PEAK DISPLACEMENTS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest	X	MM	0.0	5.9	-29.4	59.9	0.0	3.5	-30.7	61.8

HEAD REDUNDANT PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Head CG	X	G's	0.9	200.0	-58.9	82.0	21.3	196.7	-56.0	81.7
Head CG	Y	G's	5.5	94.3	-5.4	79.0	3.0	34.1	-5.4	71.5
Head CG	Z	G's	25.1	58.3	-11.9	95.7	30.7	80.1	-0.7	11.9
Head CG Resultant	N/A	G's	59.1	82.0			63.6	80.6		

CHEST REDUNDANT PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	G's	2.6	144.2	-41.6	55.8	1.6	97.7	-50.3	73.5
Chest CG	Y	G's	7.2	81.3	-3.2	17.1	4.9	43.4	-7.6	69.4
Chest CG	Z	G's	17.1	46.6	-15.5	94.7	11.1	47.6	-10.4	105.6
Chest CG Resultant	N/A	G's	42.5	55.9			50.8	73.5		

REDUNDANT HEAD INJURY CRITERA (HIC)

Location	Driver				Passenger			
	HIC	T^1	T^2	Avg G	HIC	T^1	T^2	Avg G
Head CG Redundant	444.2	63.3	93.6	46.3	400.2	58.8	94.8	41.5

REDUNDANT CHEST CLIP (3MSEC)

Location	Driver			Passenger		
	CLIP	T^1	T^2	CLIP	T^1	T^2
Chest CG Redundant	39.7	72.6	75.6	45.1	72.6	75.6

DATA SHEET NO. 9
SEATBELT ASSESSMENT TEST DATA

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109
Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
TBI -Dummy C/L to Lap/Shoulder Belt Intersect	mm	225	230
PBU - Top Surface of reference to belt upper edge	mm	335	325
PBL - Top Surface of reference to belt lower edge	mm	255	245
Lap Belt Tension	Newtons	10	10
Shoulder Belt Tension	N/A	Retractor	Retractor

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
Retractor Reel to "D" ring	mm	750	750
Shoulder Belt length as measured on ATD	mm	855	880
Lap Belt length as measured on ATD	mm	890	945
Remainder of belt on reel	mm	665	860
Total belt length for continuous webbing systems	mm	3160	3435

SHOULDER BELT SPOOL-OFF DATA

Measurement Description	Units	Driver	Passenger
As determined mechanically	mm	135.0	174.0
As determined electronically	mm	217.7	239.4

BELT STRETCH DATA

Measuerment Description	Units	Driver	Passenger
Electronically between belt load cell and "D" ring	mm/cm	*	*
Mechanically	mm/cm	N/A	N/A

* Not used with shoulder belt pre-tensioner systems

DATA SHEET NO. 10
SUMMARY OF FMVSS 212 DATA

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109
Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04

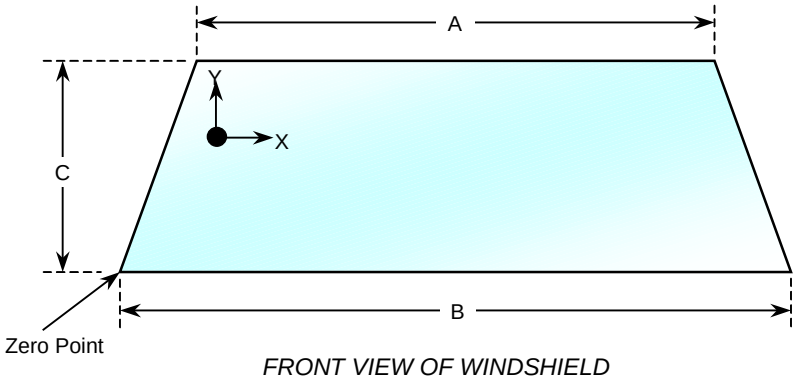
Windshield Mounting Details: Windshield glass is secured to the vehicle frame with a rubber type adhesive. No molding covers the windshield periphery at any point.

The standard requires that the posttest 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 that are equipped with occupant passive restraints.

Temperature of windshield molding during test: 21.1 °C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test(mm)	Post-Test(mm)	% of Retention
Left Side	2125.0	2125.0	100.0
Right Side	2125.0	2125.0	100.0
Total	4250.0	4250.0	100.0



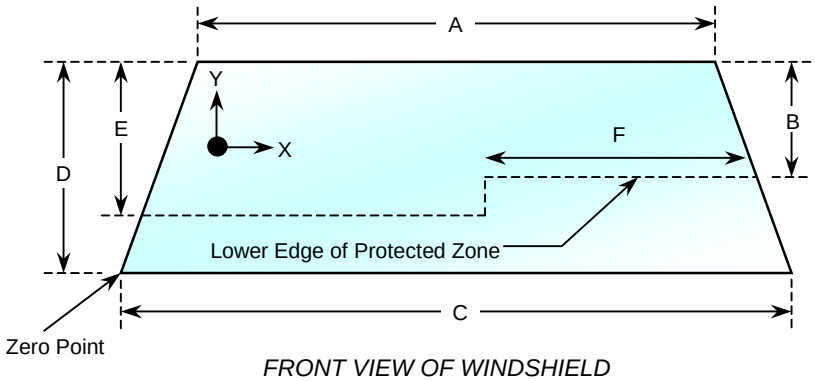
FRONT VIEW OF WINDSHIELD

WINDSHIELD DIMENSIONS

Item	Units	Segment Length	Molding Width
A	mm	1215.0	15.0
B	mm	1505.0	10.0
C-Left	mm	765.0	20.0
C-Right	mm	765.0	20.0

DATA SHEET NO. 11
WINDSHIELD ZONE INTRUSION FMVSS 219 DATA (PARTIAL)

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109
Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04



FRONT VIEW OF WINDSHIELD

WINDSHIELD AND PROTECTED ZONE

Item	Units	Value
A	mm	1215
B	mm	461
C	mm	1505
D	mm	765
E	mm	447
F	mm	499

AREA OF PROTECTED ZONE FAILURES

A. Provide coordinates of the area that the protected zone was penetrated more than 0.25 in. by a vehicle component other than one that is normally in contact with the windshield.

X	Y
N/A	N/A
N/A	N/A
N/A	N/A
N/A	N/A

B. Provide coordinates of the area beneath the protected zone that the inner surface of the windshield was penetrated by a vehicle component.

X	Y
N/A	N/A
N/A	N/A
N/A	N/A
N/A	N/A

DATA SHEET NO. 12
FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109
Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04

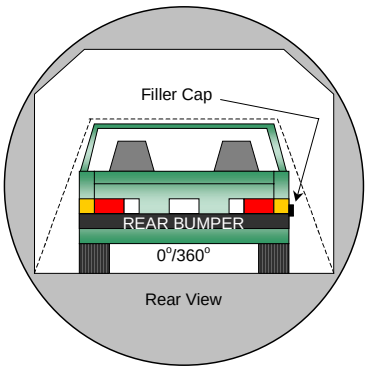
Test Time: 1:15 PM Temperature: 12.8 Deg. C.

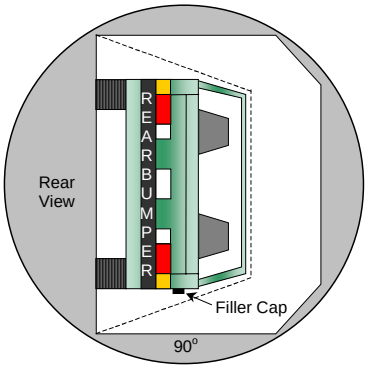
STODDARD SOLVENT SPILLAGE MEASUREMENTS

A. From impact until vehicle motion ceases: 0.0 oz.
(Maximum Allowable = 1 ounce)
B. For the 5 minute period after motion ceases: 0.0 oz.
(Maximum Allowable = 5 ounces)
C. For the following 25 minutes: 0.0 oz.
(Maximum Allowable = 1 oz./minute)
D. Spillage Location Details: No leakage occurred

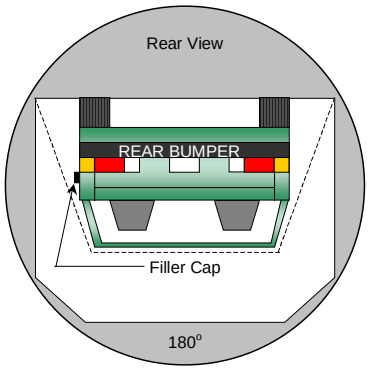
DATA SHEET NO. 13
FMVSS 301 STATIC ROLLOVER DATA

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109
Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04

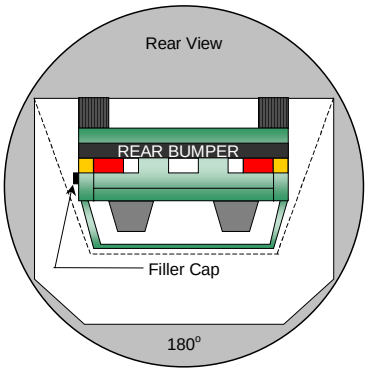




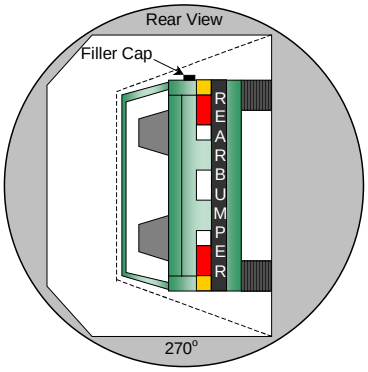
0° to 90°

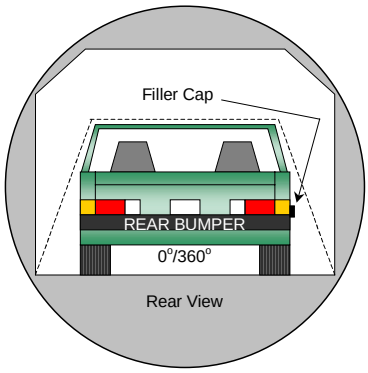


90° to 180°



180° to 270°





270° to 360°

1. The specified fixture rollover rate for each 90° of rotation is 60 to 120 seconds.
2. The position hold time at each position is 300 seconds (minimum).
3. No solvent leakage occurred during rollover.
4. **Please note rollover was done the day after actual test due to inclement weather.**

DATA SHEET NO. 13….(CONTINUED)
FMVSS 301 STATIC ROLLOVER DATA

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109
Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04

SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	87	300	387
90° to 180°	81	300	381
180° to 270°	79	300	379
270° to 360°	81	300	381

FMVSS 301 SPILLAGE TABLE REQUIREMENT (oz.)

First 5 Minutes	5.0
Sixth Minute	1.0
Seventh Minute	1.0
Eighth Minute	1.0

ACTUAL TEST VEHICLE SOLVENT SPILLAGE TABLE (oz.)

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

SOLVENT SPILLAGE LOCATION TABLE

Test Phase	Spillage Location
0° to 90°	None
90° to 180°	None
180° to 270°	None
270° to 360°	None

DATA SHEET NO. 14
VEHICLE MEASUREMENTS

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109
Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04

VEHICLE MEASUREMENT TABLE

No.	Measurement Description	Units	Pre-Test	Post-Test	Diff.
1	Total length of vehicle at centerline	mm	4689	4259	-430
2	RSOV to front of engine	mm	4186	3944	-242
3	RSOV to firewall centerline	mm	3634	3539	-95
4	RSOV to leading edge of right door	mm	3222	3235	13
5	RSOV to leading edge of left door	mm	3222	3233	11
6	RSOV to lower leading edge of right door	mm	3187	3177	-10
7	RSOV to lower leading edge of left door	mm	3190	3178	-12
8	RSOV to upper trailing edge of right door	mm	2209	2220	11
9	RSOV to upper trailing edge of left door	mm	2209	2216	7
10	RSOV to lower trailing edge of right door	mm	2184	2180	-4
11	RSOV to lower trailing edge of left door	mm	2192	2178	-14
12	RSOV to bottom of right 'A' pillar	mm	3188	3191	3
13	RSOV to bottom of left 'A' pillar	mm	3188	3193	5
14	RSOV to firewall on right side	mm	3559	3549	-10
15	RSOV to firewall on left side	mm	3559	3519	-40
16	RSOV to steering column	mm	2810	2810	0
17	Center of steering column to left 'A' pillar	mm	369	375	6
18	Center of steering column to headlining	mm	499	505	6
19	RSOV to right side of front bumper	mm	4589	4221	-368
20	RSOV to left side of front bumper	mm	4589	4199	-390
21	Length of engine block	mm	570	570	0
RD	RSOV to right side of dash panel	mm	2981	2993	12
CD	RSOV to center of dash panel	mm	3065	3030	-35
LD	RSOV to left side of dash panel	mm	2981	2985	4

All measurements in millimeters

DATA SHEET NO. 14…..(CONTINUED)
VEHICLE STRUCTURAL MEASUREMENTS

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109
Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04

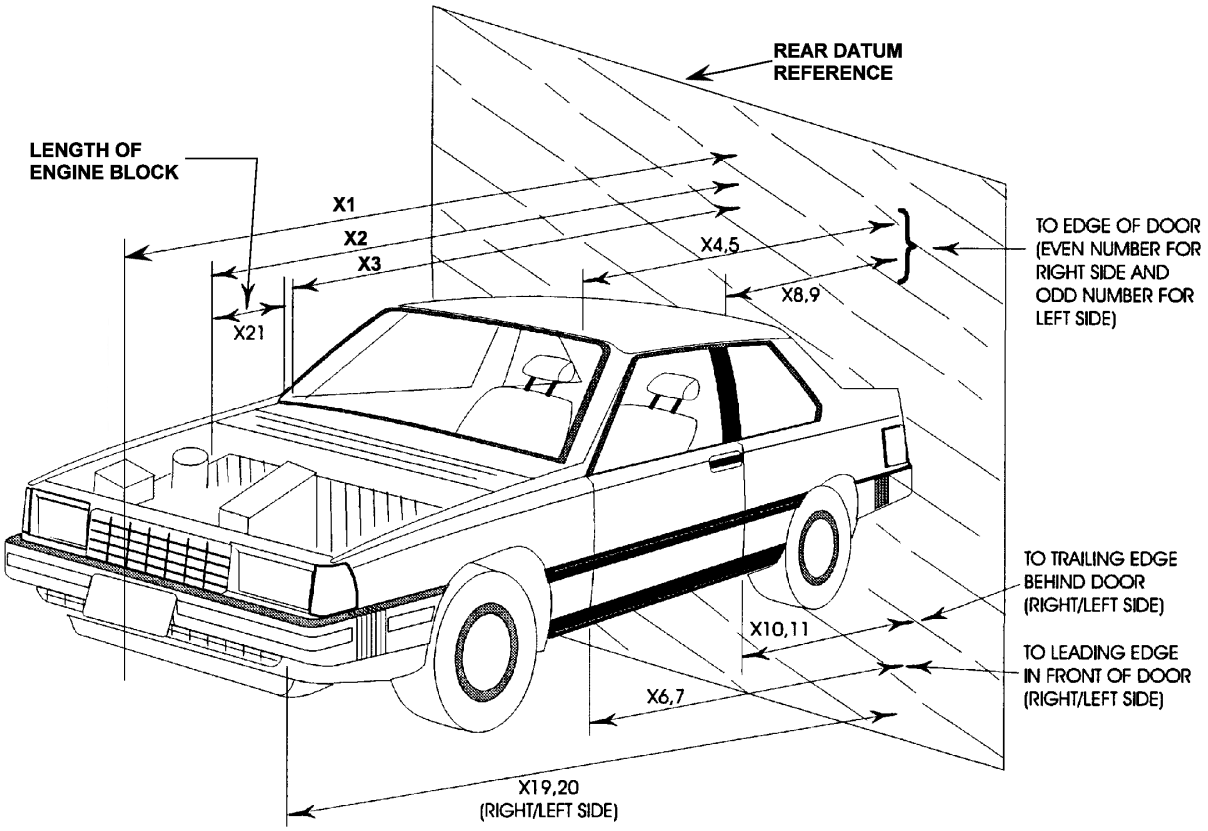
VEHICLE STRUCTURAL MEASUREMENT TABLE

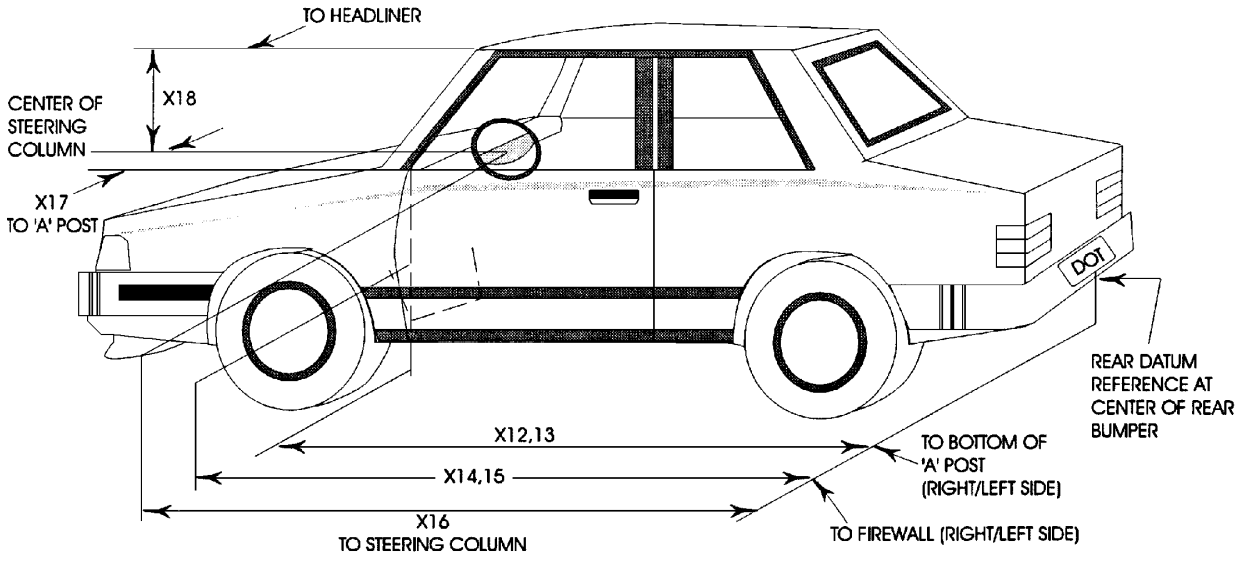
No.	Measurement Description	Units	Pre-Test	Post-Test	Diff.
1	Total length	mm	4689	4259	-430
2	Total width	mm	1820	1820	0
3	Bumper top height	mm	728	725	-3
4	Bumper bottom height	mm	422	470	48
5	Longitudinal member top height	mm	596	695	99
6	Longitudinal member bottom height	mm	519	514	-5
7	Distance between longitudinal members	mm	935	920	-15
8	Longitudunal member width	mm	85	80	-5
9	Engine top height	mm	880	860	-20
10	Engine bottom height	mm	224	224	0
11	Engine and gear box width	mm	565	565	0
12	Front bumper to engine distance	mm	512	315	-197
13	Front shock absorber fixing width	mm	1005	1020	15
14	Bonnet leading edge height	mm	915	965	50
15	Front shock absorber fixing width	mm	1205	1135	-70
16	Front bumper to front axle distance	mm	945	500	-445
17	Front axle to 'A' pillar distance	mm	509	540	31
18	'A' pillar to 'B' pillar distance	mm	1040	1034	-6
19	'B' pillar to rear axle distance	mm	1140	1160	20
20	'B' pillar to 'C' pillar distance	mm	1000	1000	0
21	Roof sill bottom height	mm	1552	1556	4
22	Roof sill top height	mm	1633	1639	6
23	Floor sill bottom height	mm	249	230	-19
24	Floor sill top height	mm	445	430	-15

All measurements in millimeters

DATA SHEET NO. 14…(CONTINUED)
VEHICLE MEASUREMENTS

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109
Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04





DATA SHEET NO. 15
CAMERA LOCATIONS

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109
Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04

VEHICLE CAMERA MEASUREMENT TABLE

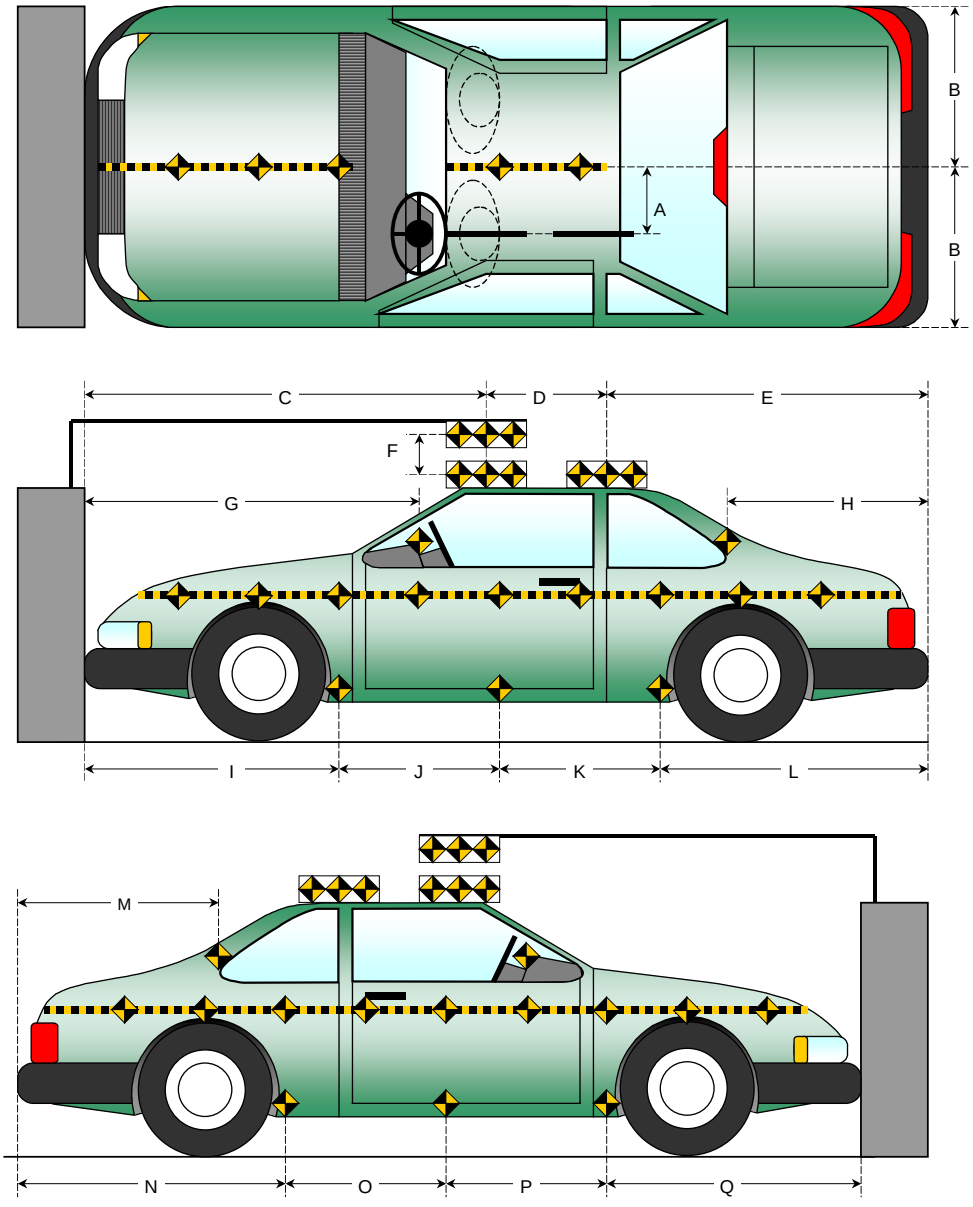
No.	Camera View	Location (mm)			Angle (deg.)	Film Plane to Head	Lens (mm)	Speed (fps)
		X	Y	Z				
1	Real Time	18288	-22860	2540	10	N/A	17-70	24
2	Driver Overall	1930	8357	1321	4	7779	13	1030
2B	Driver Overall	1626	8230	1092	4	7675	17	NTM
3	Driver Close-Up	1626	8230	1600	4	7673	35	1020
3B	Driver Close-Up	1930	8230	1600	4	7655	35	1000
4	3/4 Driver	6477	10185	4648	13	10995	105	1020
5	Steering Column	1524	8230	2997	16	7849	19	930
6	Steering Column	1524	8230	3404	20	7943	19	1000
7	Driver Side Child	2946	-737	1549	20	1239	8.5	1000
8	Passenger Overall	2286	-8230	1524	6	7647	13	DNR
9	Passenger Close-Up	1219	-6096	1524	4	5606	35	970
10	3/4 Passenger	8026	-8941	2997	9	10296	80	930
11	Passenger Door	1626	-8836	1702	4	8281	50	1010
12	Passenger Side Child	2946	737	1549	20	1239	8.5	1000
13	Overhead	610	0	6172	90	N/A	13	990
14	Driver Front	-610	406	2743	40	N/A	13	1070
15	Passenger Front	-610	406	2743	40	N/A	13	NTM
16	Pit Engine	762	0	-1499	90	N/A	9	NTM
17	Pit Fuel Tank	3658	0	-1499	90	N/A	6	NTM

X = Barrier Face Y = Monorail Centerline Z = Ground DNR = Did Not Run NTM = No Timing Marks

DATA SHEET NO. 16
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109
Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04

All Dimensions in (mm)	
Item	Value
A	N/A
B	910
C	N/A
D	N/A
E	N/A
F	N/A
G	1275
H	528
I	1545
J	820
K	820
L	1525
M	529
N	1527
O	822
P	822
Q	1546



DATA SHEET NO. 17
VEHICLE INTRUSION MEASUREMENTS

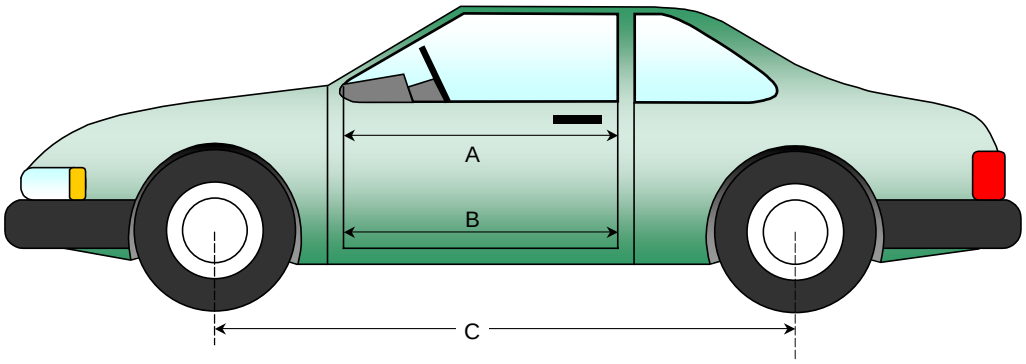
Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109
Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04

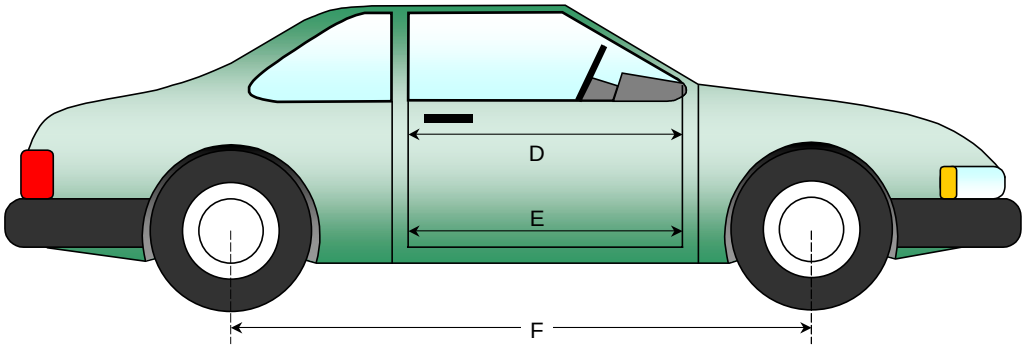
DOOR OPENING WIDTH TABLE

Item	Description	Units	Pre-Test	Post-Test	Diff.
A	Left Side Upper	mm	941	939	-2
B	Left Side Lower	mm	866	864	-2
D	Right Side Upper	mm	944	942	-2
E	Right Side Lower	mm	890	887	-3

WHEELBASE MEASUREMENT TABLE

Item	Description	Units	Pre-Test	Post-Test	Diff.
C	Left Side Wheel Base	mm	2728	2700	-28
F	Right Side Wheel Base	mm	2728	2703	-25





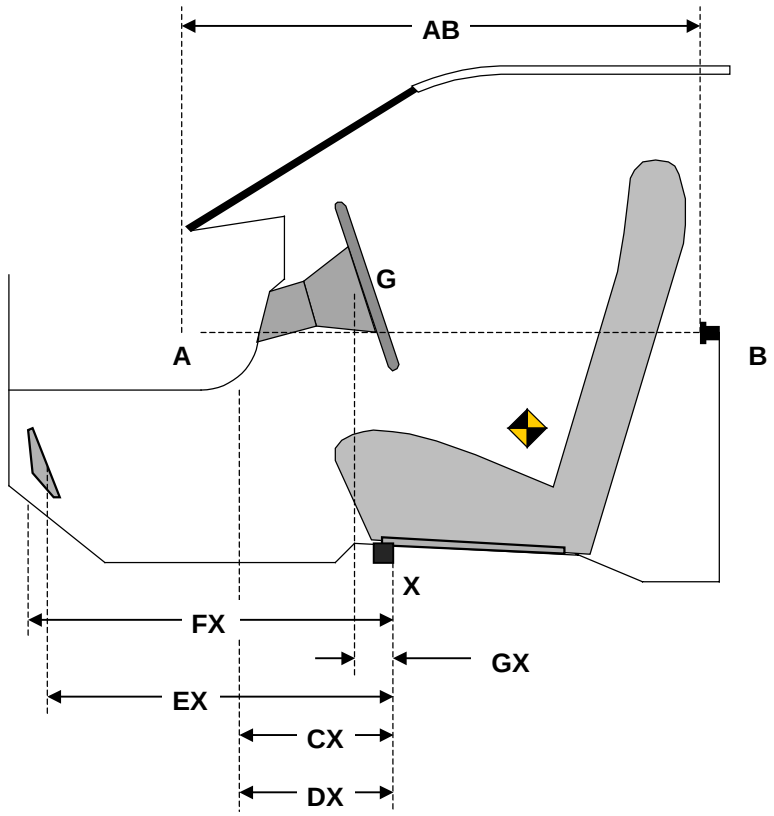
DATA SHEET NO. 17…(CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109
Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04

DRIVER COMPARTMENT INTRUSION TABLE

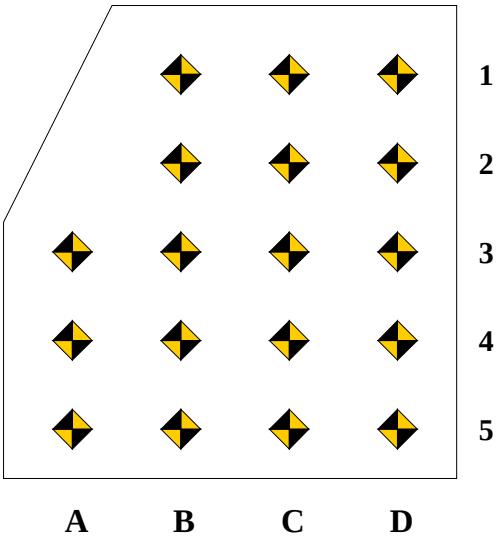
Item	Description	Units	Pre-Test	Post-Test	Diff.
AB	Door Opening (Inside window jam)	mm	941	939	-2
CX	Left Knee Bolster to X	mm	250	244	-6
DX	Right Knee Bolster to X	mm	265	305	40
EX	Brake Pedal to X	mm	551	599	48
FX	Foot Rest to X	mm	528	526	-2
GX	Center of Steering Wheel Hub to X	mm	75	110	35

X = Left Front Seat Outboard Anchor Bolt Head



DATA SHEET NO. 17…(CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109
Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04



Measurement reference point for X and Z-axis is the forward outboard seat mounting bolt.

Columns A through D are evenly spaced.

Rows 1 and 2 are on the toe kick portion of the floor pan. Rows 3, 4 and 5 are located on the most level portion of the floor pan.

Row 3 will be at the intersection of the toe kick and the level sections of the floor pan.

DRIVER FLOOR PAN X-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1		632	631	643		619	610	633		-13	-21	-10
2		531	536	545		511	519	526		-20	-17	-19
3	416	427	436	447	399	409	420	433	-17	-18	-16	-14
4	317	327	337	349	301	310	320	333	-16	-17	-17	-16
5	213	226	236	247	201	209	220	232	-12	-17	-16	-15

DRIVER FLOOR PAN Z-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1		-41	-22	-38		-21	-6	-40		20	16	-2
2		-65	-47	-60		-54	-41	-41		11	6	19
3	-66	-69	-51	-65	-66	-59	-47	-70	0	10	4	-5
4	-79	-72	-52	-64	-87	-65	-51	-71	-8	7	1	-7
5	-87	-75	-51	-65	-99	-71	-56	-78	-12	4	-5	-13

DATA SHEET NO. 17…(CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

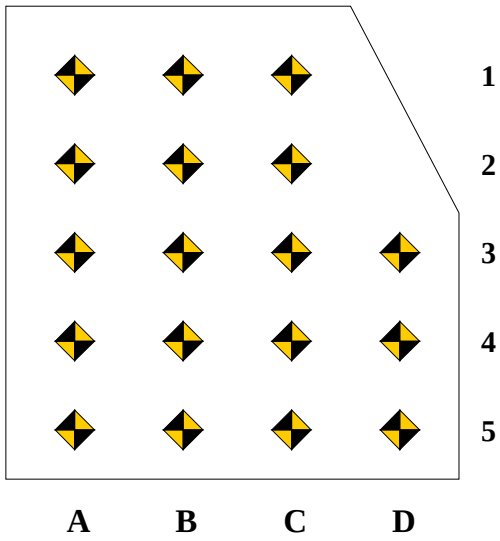
Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109
Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04

Measurement reference point for X and Z axis is the forward outboard seat mounting bolt.

Columns A through D are evenly spaced.

Rows 1 and 2 are on the toe kick portion of the floor pan. Rows 3, 4 and 5 are located on the most level portion of the floor pan.

Row 3 will be at the intersection of the toe kick and the level sections of the floor pan.



PASSENGER FLOOR PAN X-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	747	758	765		701	713	721		-46	-45	-44	
2	700	698	683		661	662	655		-39	-36	-28	
3	614	611	605	609	577	577	575	582	-37	-34	-30	-27
4	515	517	509	506	477	481	481	484	-38	-36	-28	-22
5	416	417	413	413	380	384	382	389	-36	-33	-31	-24

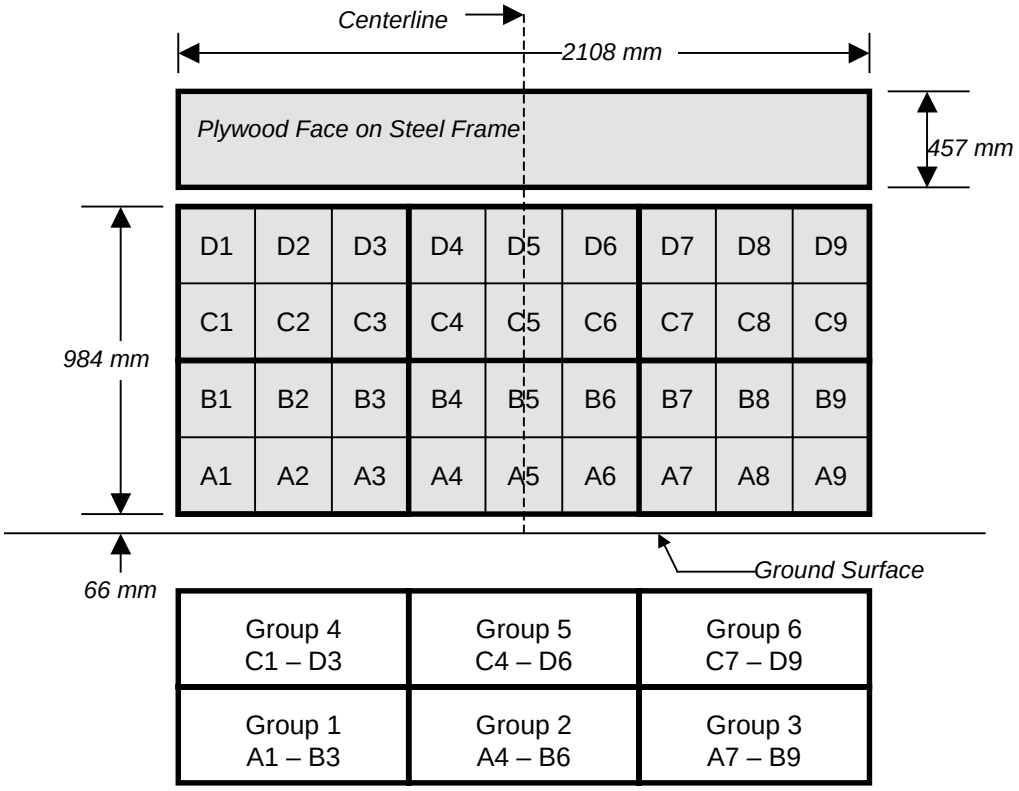
PASSENGER FLOOR PAN Z-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	82	80	71		86	89	84		4	9	13	
2	-2	-4	14		-4	-2	25		-2	2	11	
3	-57	-61	-43	-61	-61	-60	-37	-51	-4	1	6	10
4	-68	-67	-53	-64	-76	-68	-50	-57	-8	-1	3	7
5	-66	-69	-54	-70	-77	3	-53	-64	-11	72	1	6

DATA SHEET NO. 18
FIXED BARRIER LOAD CELL LOCATIONS

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109
Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04

36 Load Cell Rigid Barrier (NHTSA Standard)
Load Cell Locations on Fixed Barrier



6 Groups of 6 Load Cells Each

The Data is presented in Appendix C with the following requirements:

1.) Data from 36 individual load cells

2.) Sum data from 6 groupings shown above (6 cells/group)

3.) Total or sum of all 36 individual load cells

4.) Sum of all 36 individual load cells vs. vehicle dynamic crush

DATA SHEET NO. 19
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109
Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04

VEHICLE INFORMATION

VIN: JTEEP21AX40001209 Wheel base (mm): 2728
Vehicle Size Category: 4 Door SUV Test Weight (kg): 2047

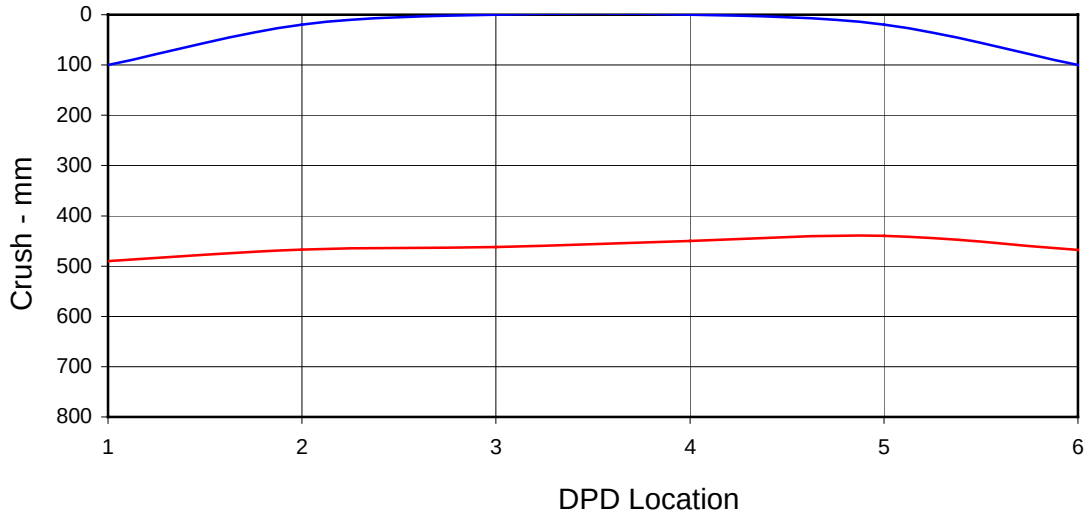
ACCELEROMETER DATA

Accelerometer Location: Left rear floor pan
Cal. Procedure/Interval: 6 months / drop test
Integration Algorithm: NHTSA Standard Linearity: Good
Impact Velocity (km/h): 55.71
Velocity Change (km/h): 61.88 Time of Separation (msec): 65.9

CRUSH PROFILE

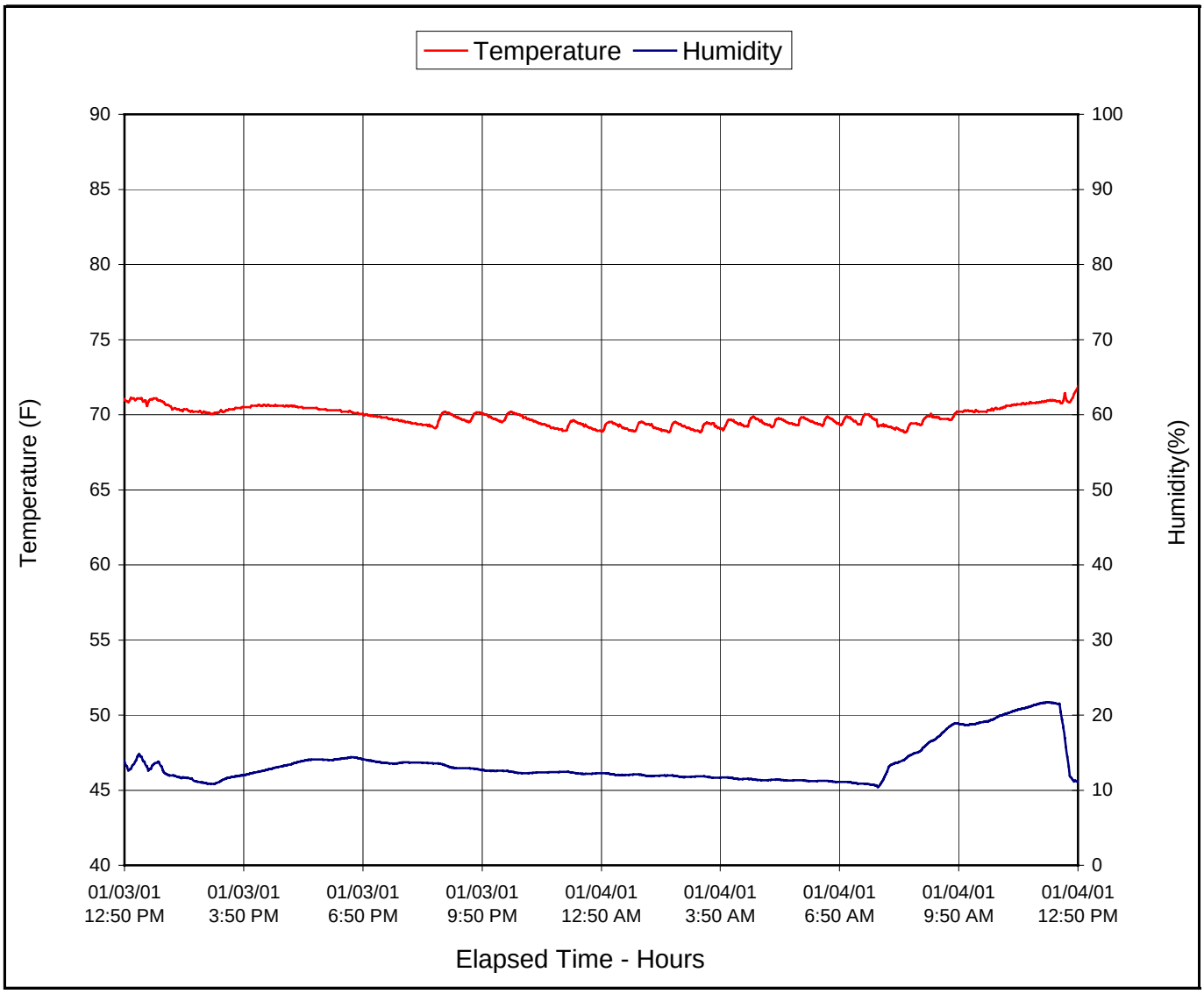
Collision Deformation Classification: 12FDEW6 Midpoint of Damage: Vehicle Centerline
Damage Region Length (mm): 1255 Impact Mode: Full Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	100	490	-390
C2	Crush zone 2 on left side	mm	20	467	-447
C3	Crush zone 3 on left side	mm	0	462	-462
C4	Crush zone 4 on right side	mm	0	450	-450
C5	Crush zone 5 on right side	mm	20	440	-420
C6	Crush zone 6 at right side	mm	100	468	-368



DATA SHEET NO. 20
DUMMY/VEHICLE TEMPERATURE STABILIZATION

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109
Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04



APPENDIX A

PHOTOGRAPHS

LIST OF PHOTOGRAPHS

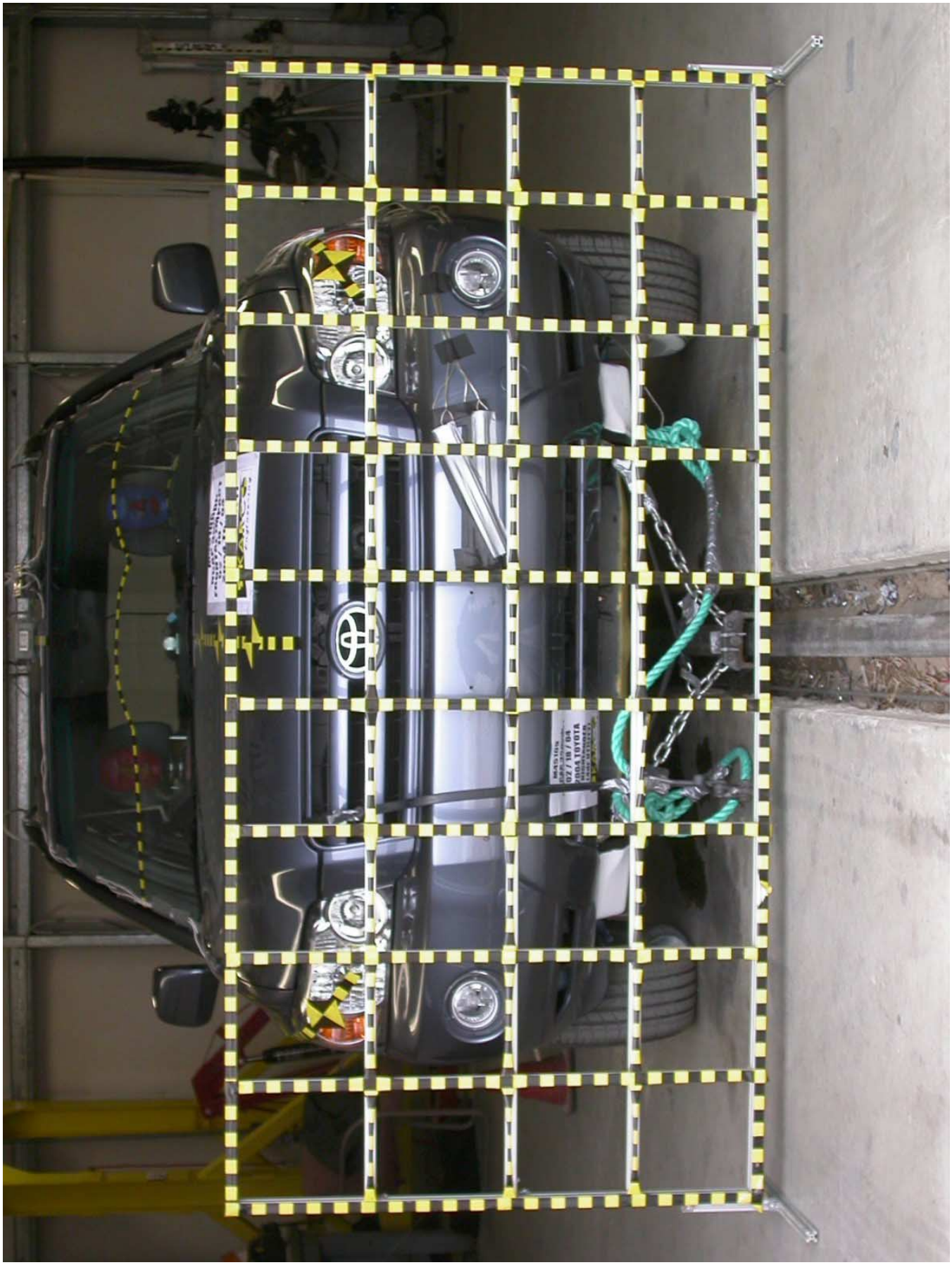


Figure A-1: Load Cell Location

Figure A-2: Vehicle Certification Label

Figure A-3: Vehicle Tire Label

Figure A-4: Right Front ¾ View, As Received

Figure A-5: Left Rear ¾ View, as Received

Figure A-6: Pre-Test Front View

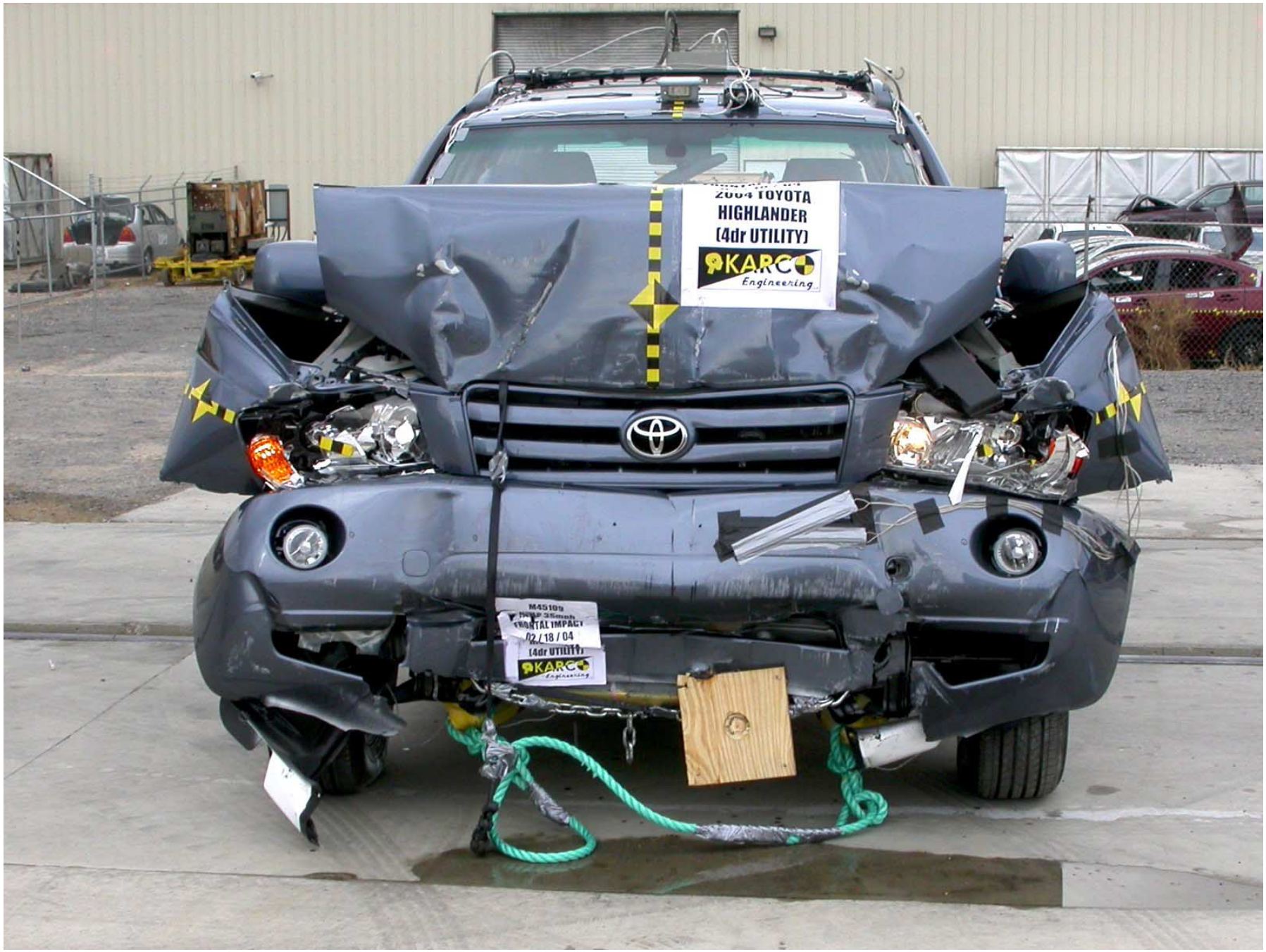


Figure A-7: Post-Test Front View (Vehicle Moved)

Figure A-8: Pre-Test Left Side View

Figure A-9: Post-Test Left Side View

Figure A-10: Pre-Test Right Side View

Figure A-11: Post-Test Right Side View

Figure A-12: Pre-Test Right Front ¾ View

Figure A-13: Post-Test Right Front ¾ View (Vehicle Moved)

Figure A-14: Pre-Test Left Rear ¾ View

Figure A-15: Post-Test Left Rear ¾ View

Figure A-16: Left Rear ¾ View of Doors After Impact

Figure A-17: Right Rear ¾ View of Doors After Impact

Figure A-18: Pre-Test Windshield View

Figure A-19: Post-Test Windshield View

Figure A-20: Pre-Test Engine Compartment

Figure A-21: Post-Test Engine Compartment (Vehicle Moved)

Figure A-22: Pre-Test Fuel Cap

Figure A-23: Post-Test Fuel Cap

Figure A-24: Pre-Test Front Underbody View

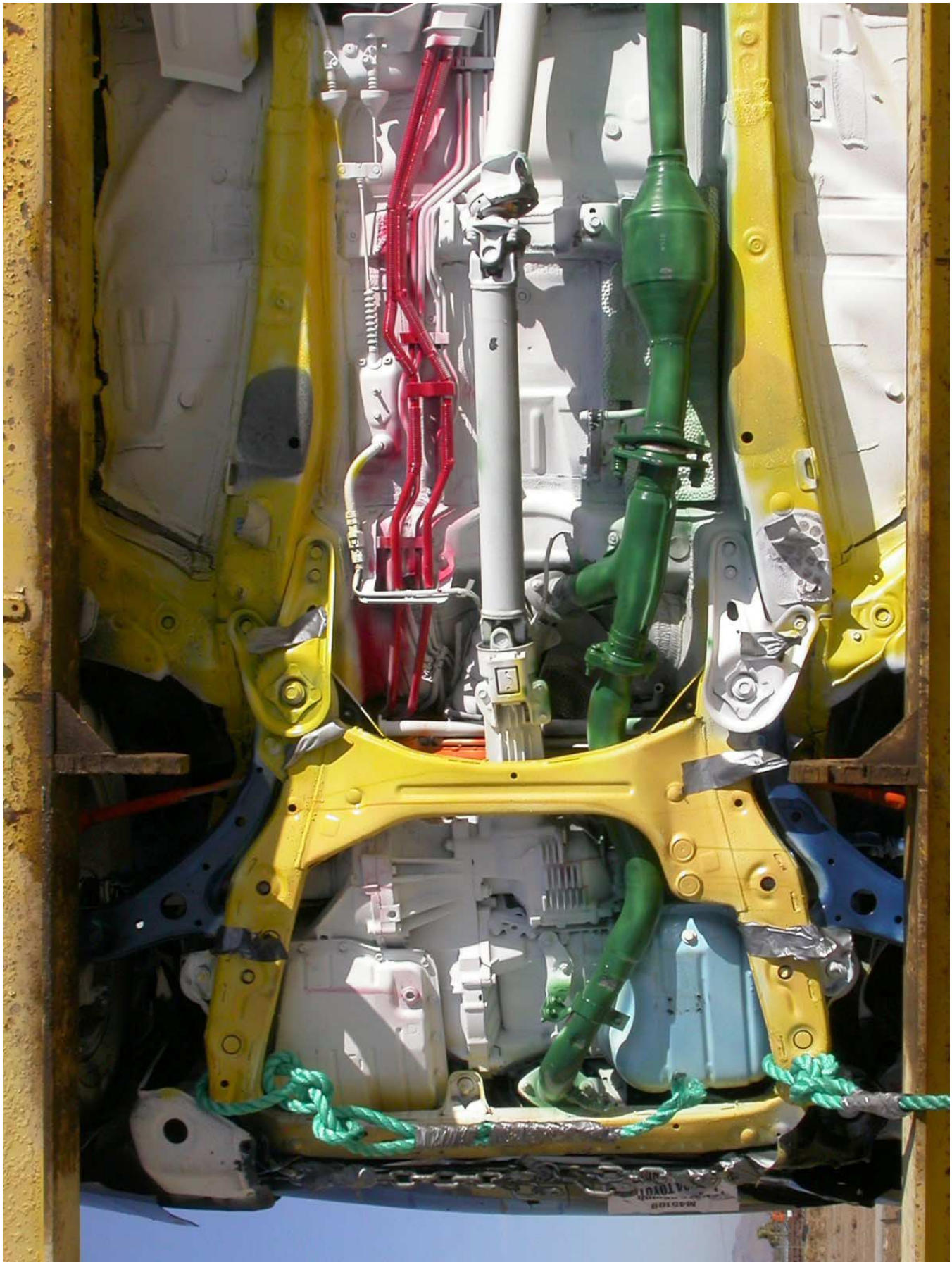


Figure A-25: Post-Test Front Underbody View

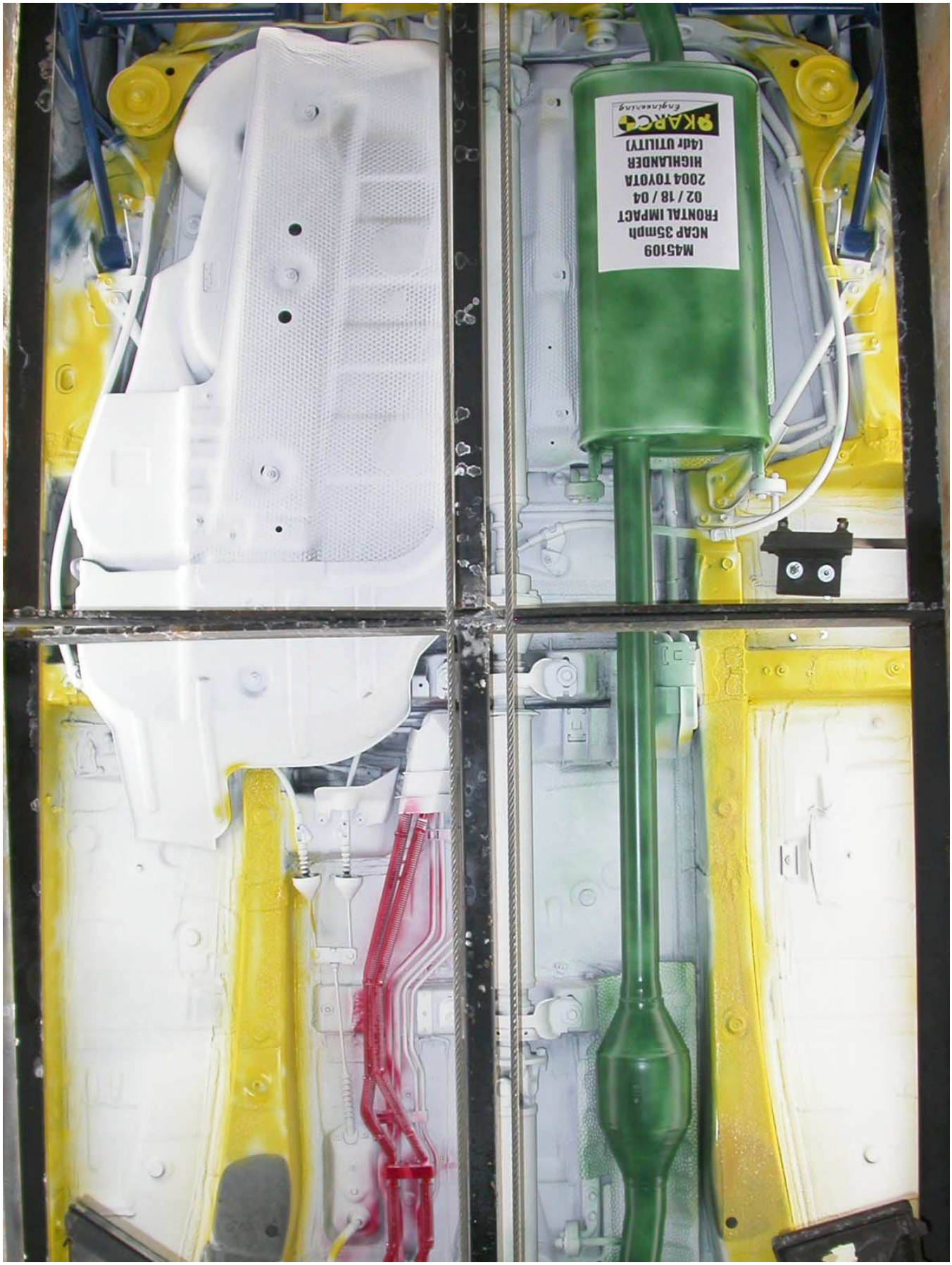


Figure A-26: Pre-Test Mid Underbody View

Figure A-27: Post-Test Mid Underbody View

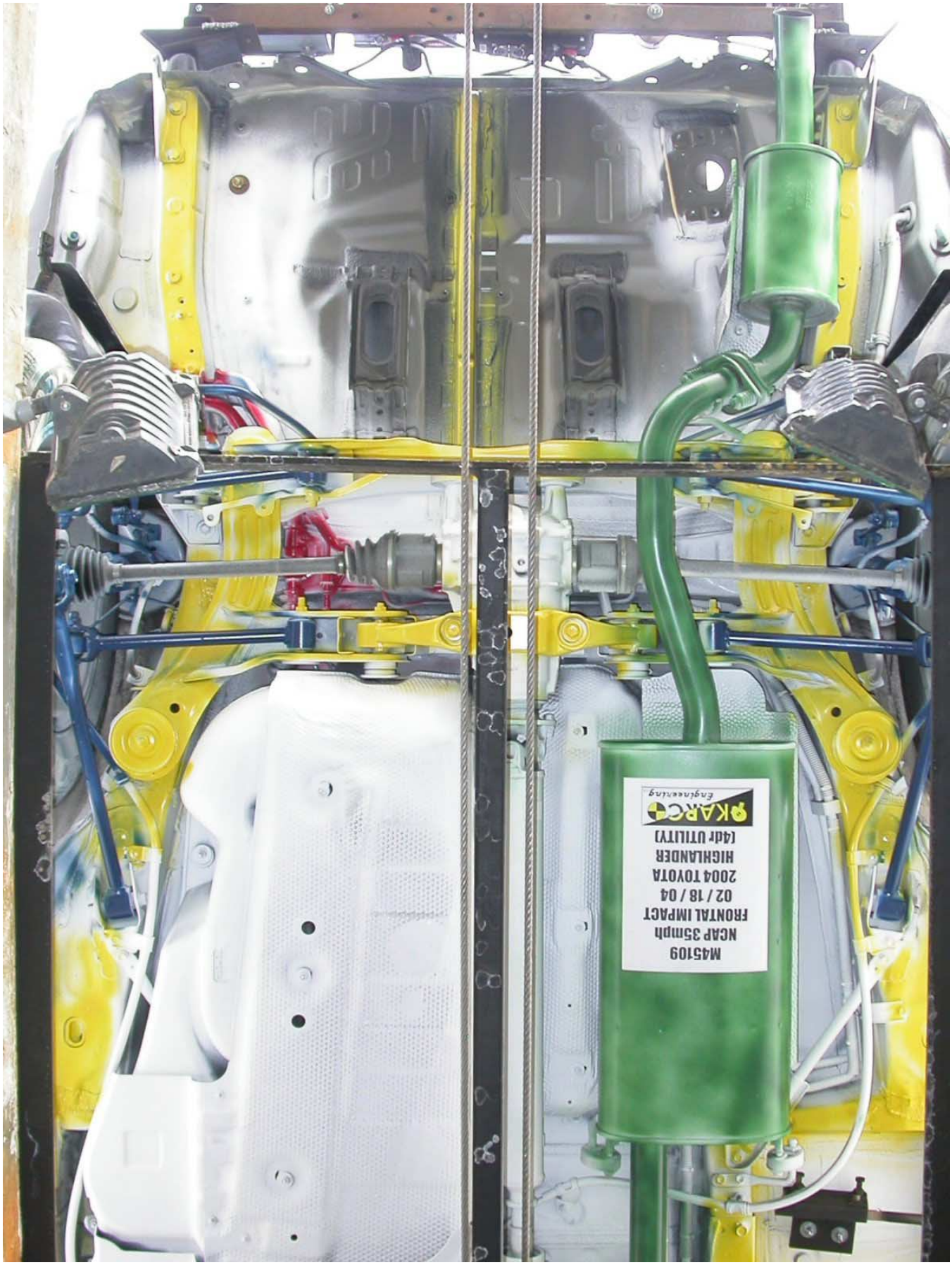


Figure A-28: Pre-Test Rear Underbody View

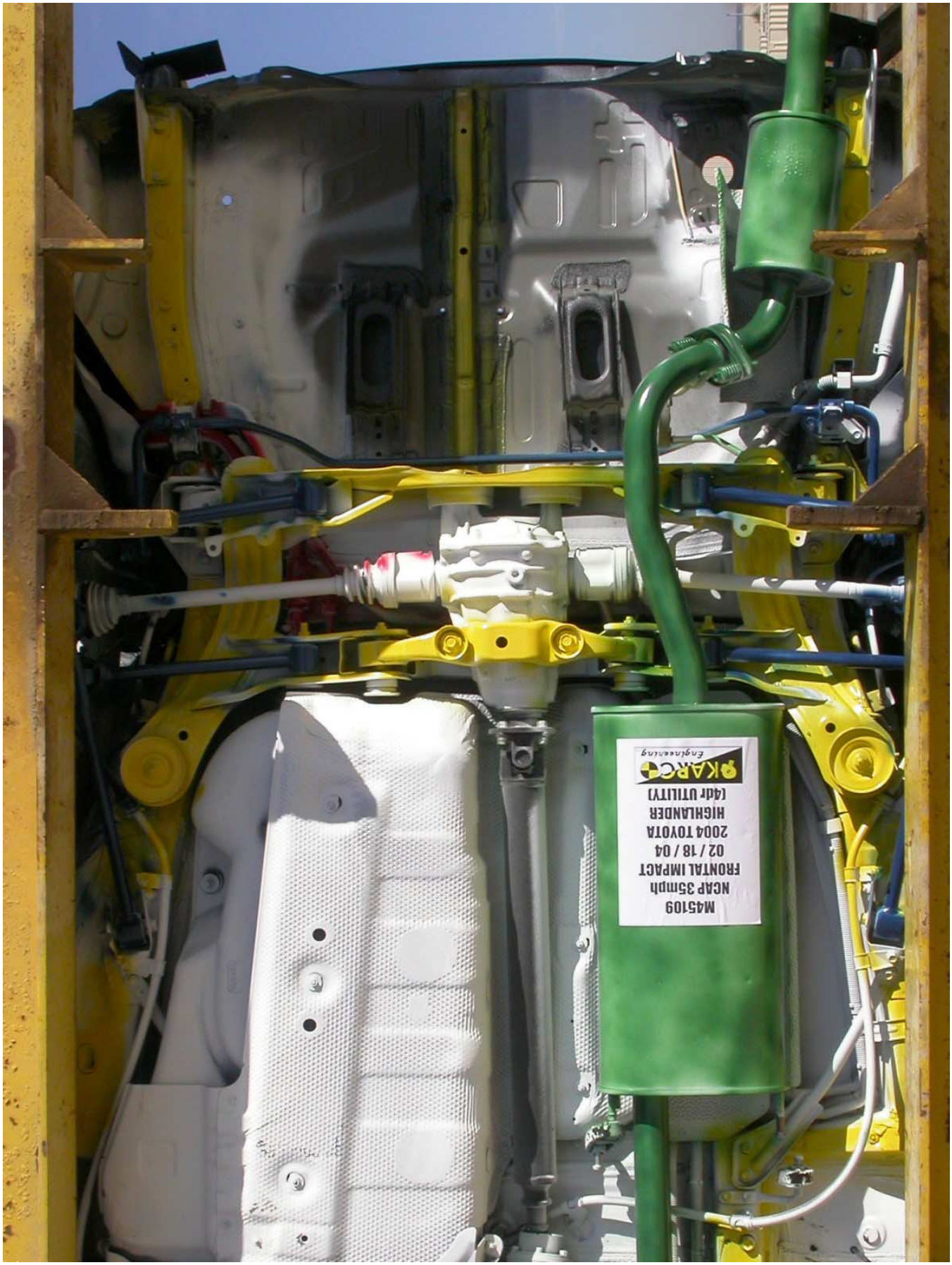


Figure A-29: Post-Test Rear Underbody View

Figure A-30: Pre-Test Driver Dummy Front View (Head Position)

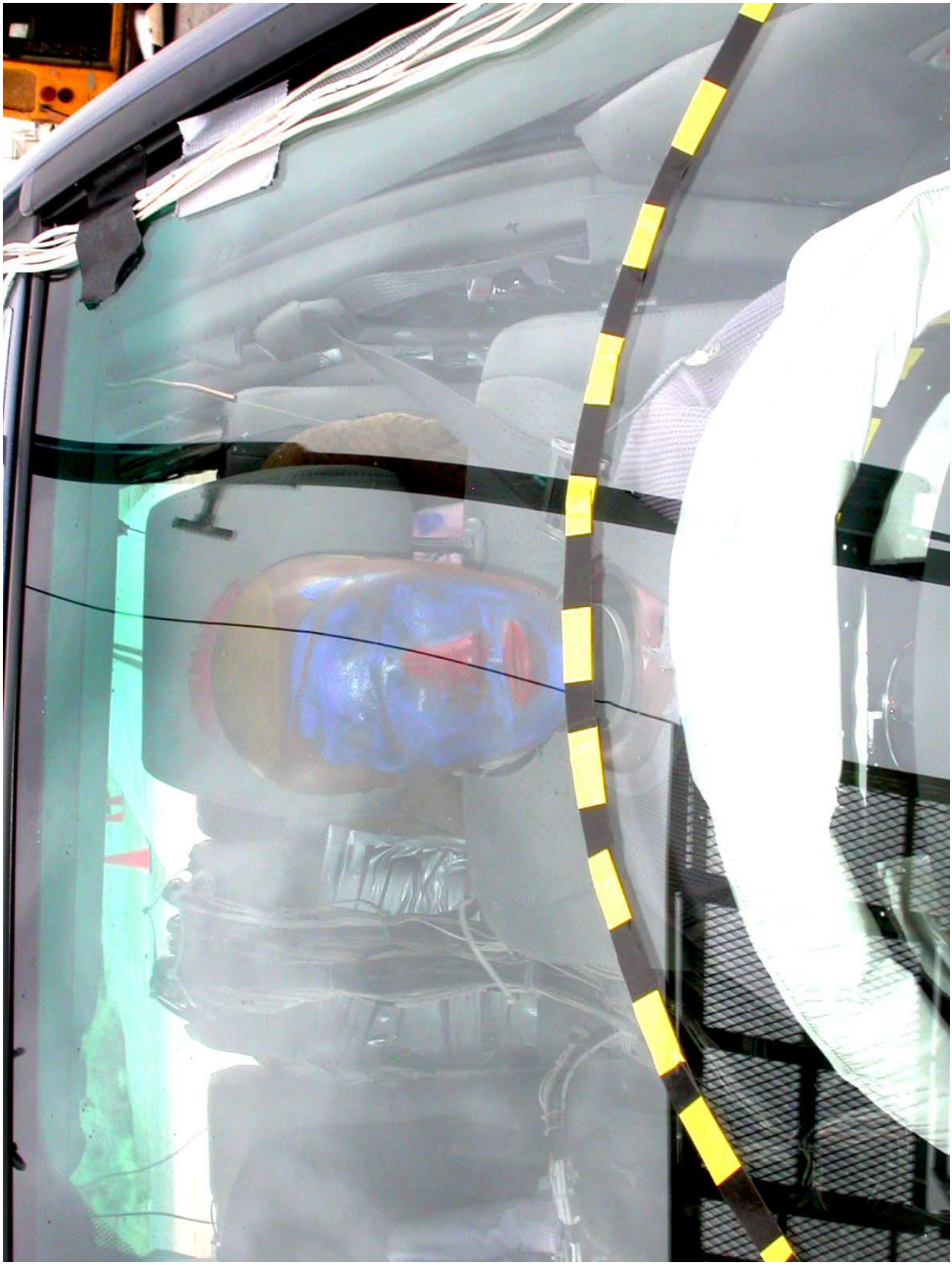


Figure A-31: Post-Test Driver Dummy Front View (Head Position)

Figure A-32: Pre-Test Driver Dummy Front Through Window

Figure A-33: Post-Test Driver Dummy Front Through Window

Figure A-34: Pre-Test Driver Dummy Door Open

Figure A-35: Post-Test Driver Dummy Door Open

Figure A-36: Pre-Test Driver Dummy Feet

Figure A-37: Post-Test Driver Dummy Feet

Figure A-38: Pre-Test Driver Side Knee Bolster

Figure A-39: Post-Test Driver Side Knee Bolster

Figure A-40: Pre-Test Driver Side Floor Pan

Figure A-41: Post-Test Driver Side Floor Pan

Figure A-42: Post-Test Driver Dummy Head

Figure A-43: Post-Test Driver Dummy Contact to Air Bag

Figure A-44: Pre-Test Passenger Dummy Front View (Head Position)

Figure A-45: Post-Test Passenger Dummy Front View (Head Position)

Figure A-46: Pre-Test Passenger Dummy Front Through Window

Figure A-47: Post-Test Passenger Dummy Front Through Window

Figure A-48: Pre-Test Passenger Dummy Door Open

Figure A-49: Post-Test Passenger Dummy Door Open

Figure A-50: Pre-Test Passenger Dummy Feet

Figure A-51: Post-Test Passenger Dummy Feet

Figure A-52: Pre-Test Passenger Side Knee Bolster

Figure A-53: Post-Test Passenger Side Knee Bolster

Figure A-54: Pre-Test Passenger Side Floor Pan

Figure A-55: Post-Test Passenger Side Floor Pan

Figure A-56: Post-Test Passenger Dummy Head

Figure A-57: Post-Test Passenger Dummy Contact to Air Bag

Figure A-58: Vehicle on Rollover Device

Figure A-59: Vehicle on Rollover Device

Figure A-60: Vehicle on Rollover Device

Figure A-61: Vehicle on Rollover Device

Figure A-62: Vehicle During Impact

Figure A-63: Rear Seat Movement Between Child Seats

Figure A-64: Driver Side Floor Pan Separation (Inside View)

Figure A-65: Driver Side Floor Pan Separation (Underside View)

APPENDIX B

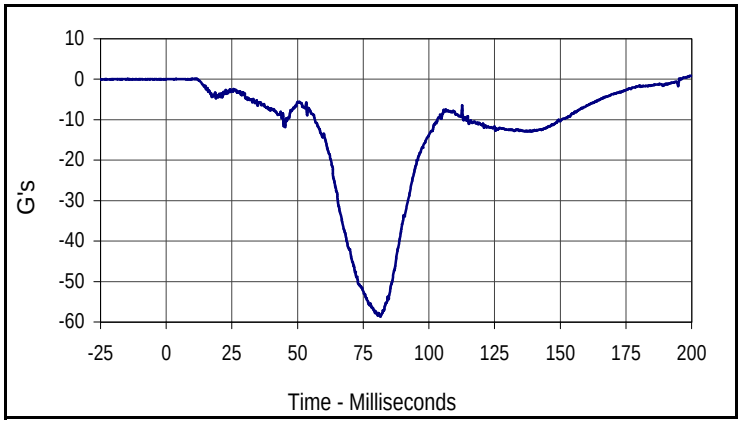
DATA PLOTS

LIST OF DATA PLOTS

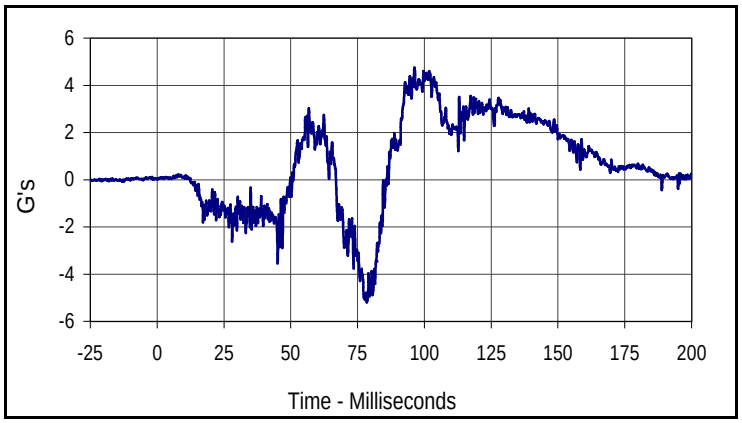
LIST OF DATA PLOTS…(Continued)

LIST OF DATA PLOTS…(Continued)

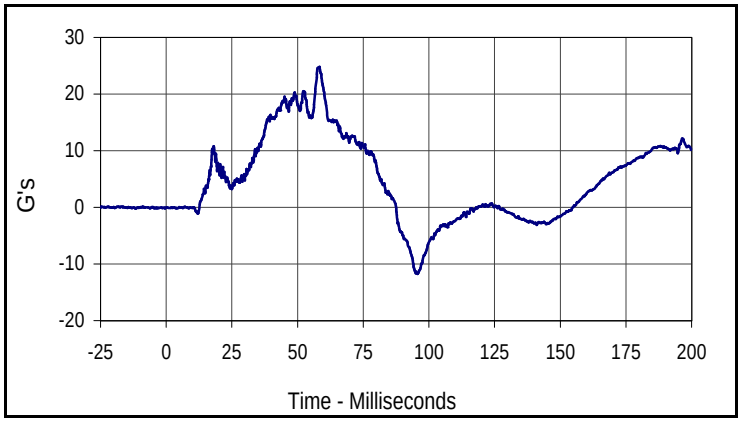
Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



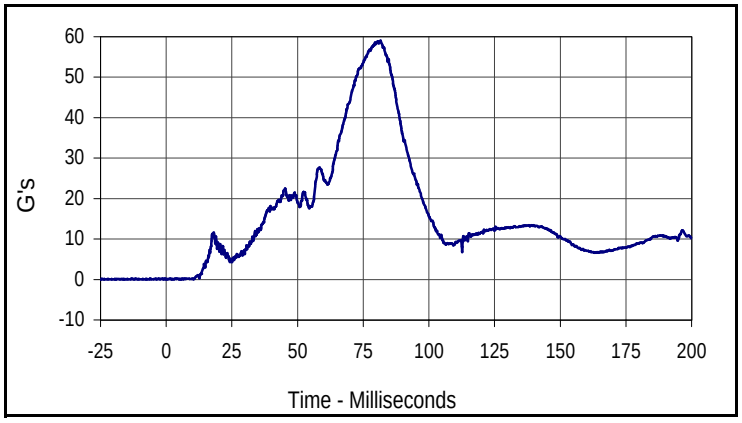
Curve Description			
Driver Head Primary X			
CURNO	Type	SAE Class	Units
001	FIL	1000	G's
Max	Time	Min	Time
0.8	199.8	-58.7	81.6



Curve Description			
Driver Head Primary Y			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
4.7	96.3	-5.2	78.4

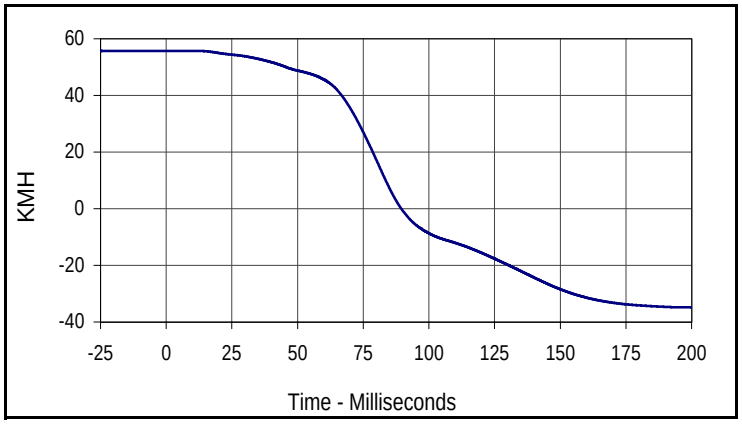


Curve Description			
Driver Head Primary Z			
CURNO	Type	SAE Class	Units
003	FIL	1000	G's
Max	Time	Min	Time
24.8	58.3	-11.7	95.7

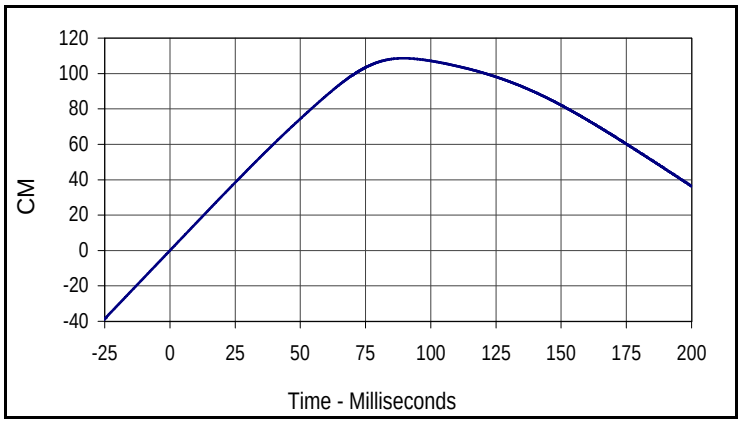


Curve Description			
Driver Head Resultant Primary			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
59.0	81.6	0.0	0.4

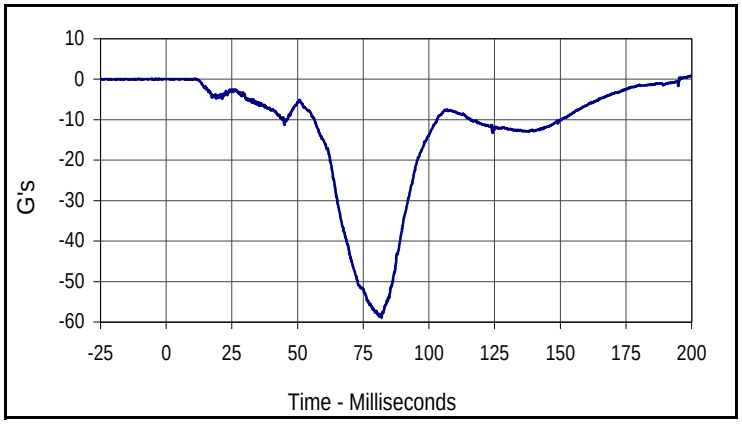
Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



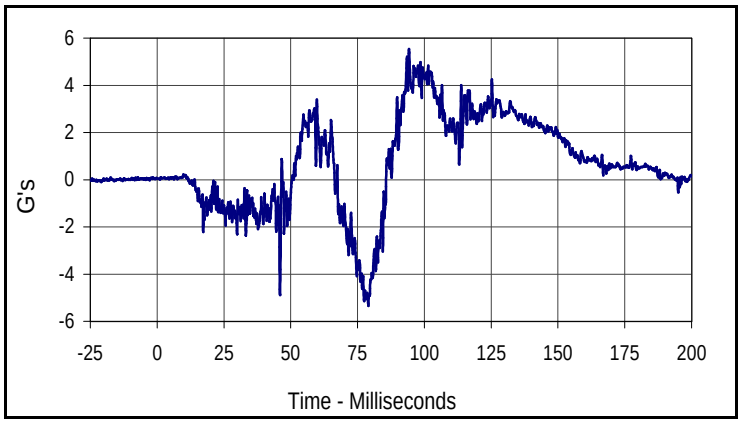
Curve Description			
Driver Head Primary X Velocity			
CURNO	Type	SAE Class	Units
001	IN1	180	KMH
Max	Time	Min	Time
55.7	11.8	-34.8	195.9



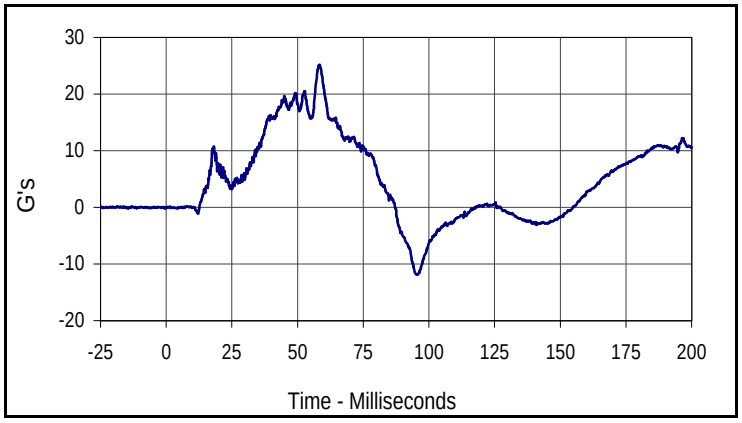
Curve Description			
Driver Head Primary X Displacement			
CURNO	Type	SAE Class	Units
001	IN2	180	CM
Max	Time	Min	Time
108.6	89.5	0.0	0.0



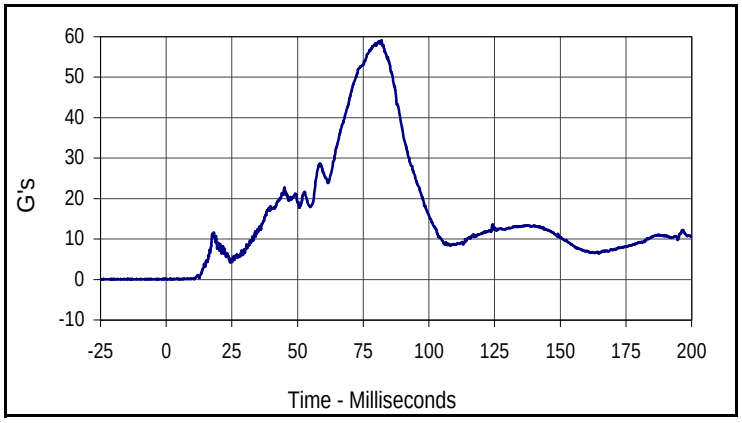
Curve Description			
Driver Head Redundant X			
CURNO	Type	SAE Class	Units
004	FIL	1000	G's
Max	Time	Min	Time
0.9	200.0	-58.9	82.0



Curve Description			
Driver Head Redundant Y			
CURNO	Type	SAE Class	Units
005	FIL	1000	G's
Max	Time	Min	Time
5.5	94.3	-5.4	79.0

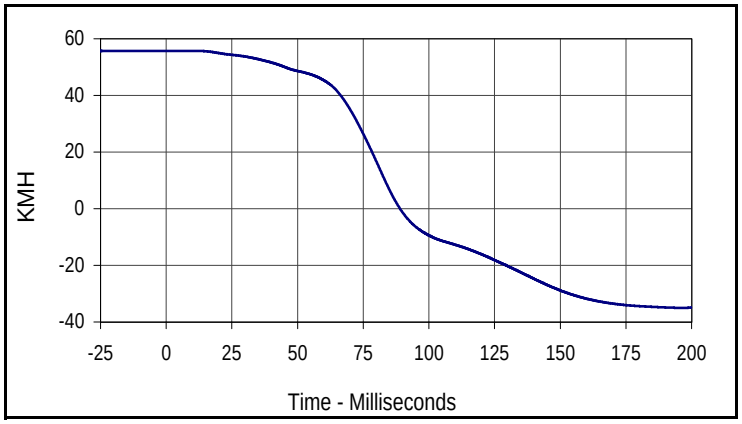


Curve Description			
Driver Head Redundant Z			
CURNO	Type	SAE Class	Units
006	FIL	1000	G's
Max	Time	Min	Time
25.1	58.3	-11.9	95.7

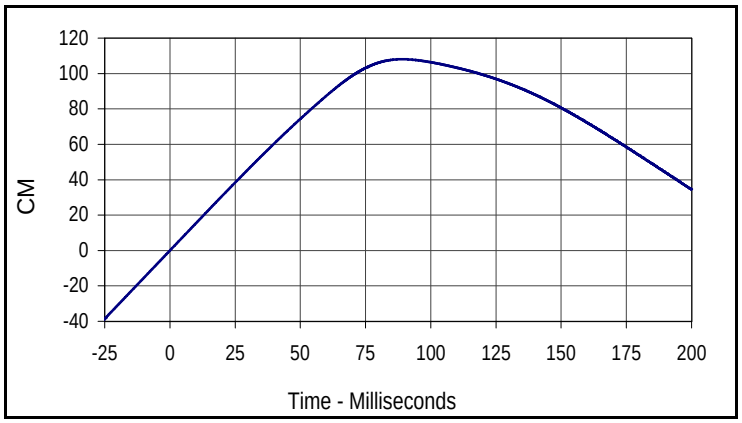


Curve Description			
Driver Head Resultant Redundant			
CURNO	Type	SAE Class	Units
004	RES	1000	G's
Max	Time	Min	Time
59.1	82.0	0.0	0.8

Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109

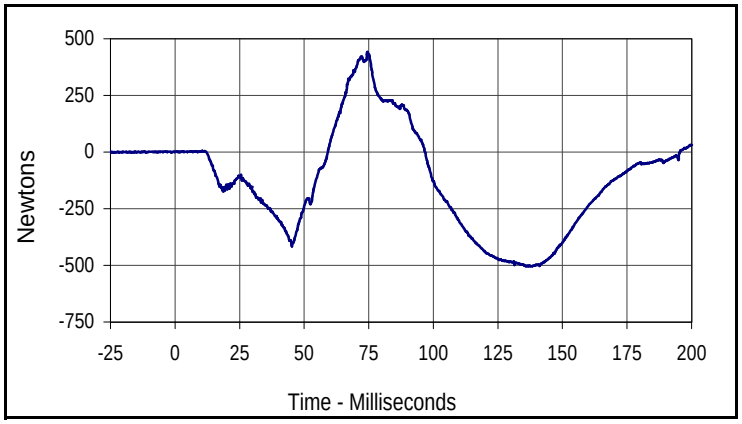


Curve Description			
Driver Head Redundant X Velocity			
CURNO	Type	SAE Class	Units
004	IN1	180	KMH
Max	Time	Min	Time
55.7	11.5	-35.0	195.7

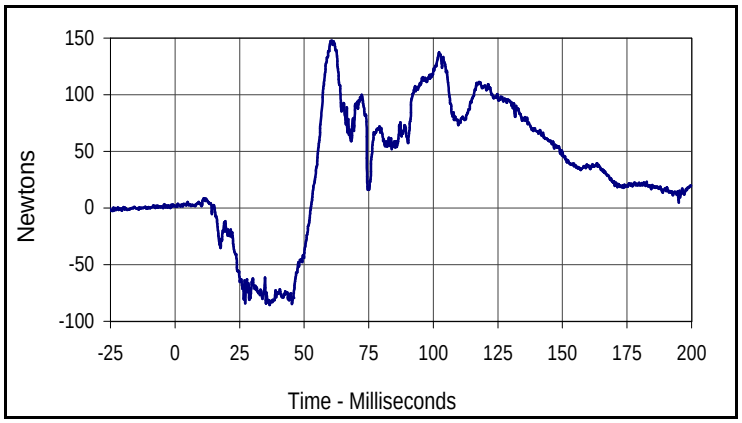


Curve Description			
Driver Head Redundant X Displacement			
CURNO	Type	SAE Class	Units
004	IN2	180	CM
Max	Time	Min	Time
108.1	89.0	0.0	0.0

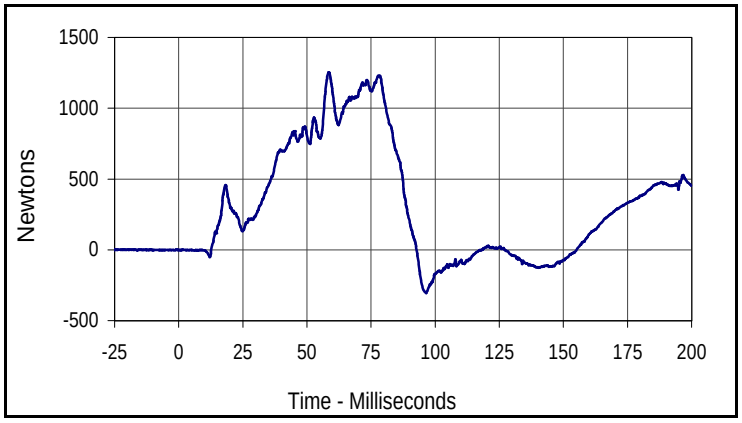
Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



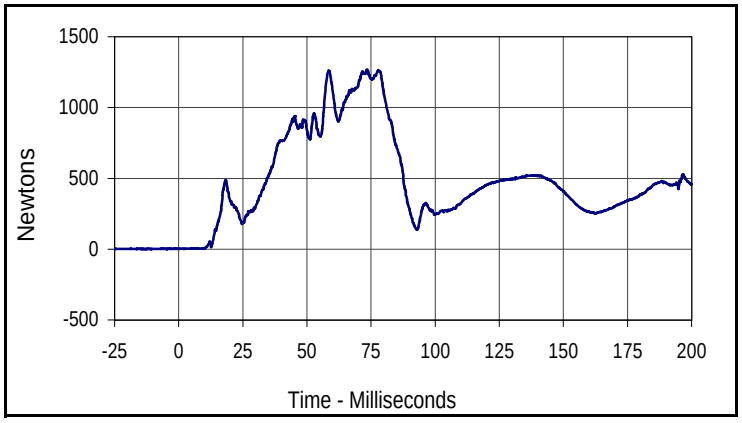
Curve Description			
Driver Upper Neck Force X			
CURNO	Type	SAE Class	Units
007	FIL	1000	Newtons
Max	Time	Min	Time
441.4	74.5	-504.8	136.1



Curve Description			
Driver Upper Neck Force Y			
CURNO	Type	SAE Class	Units
008	FIL	1000	Newtons
Max	Time	Min	Time
147.7	60.7	-85.6	36.7

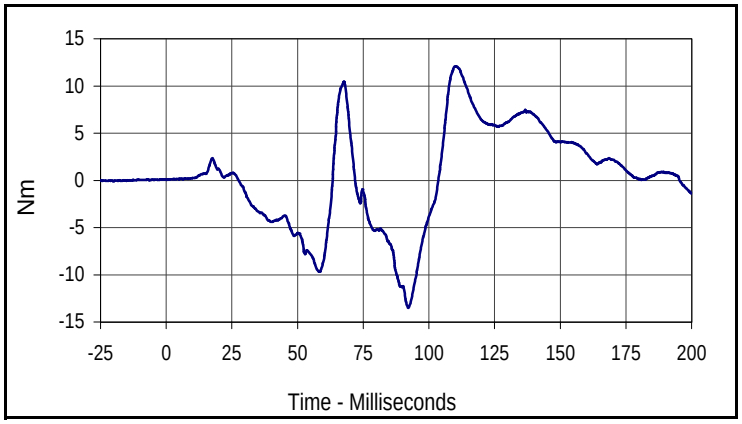


Curve Description			
Driver Upper Neck Force Z			
CURNO	Type	SAE Class	Units
009	FIL	1000	Newtons
Max	Time	Min	Time
1253.1	58.5	-306.1	96.4

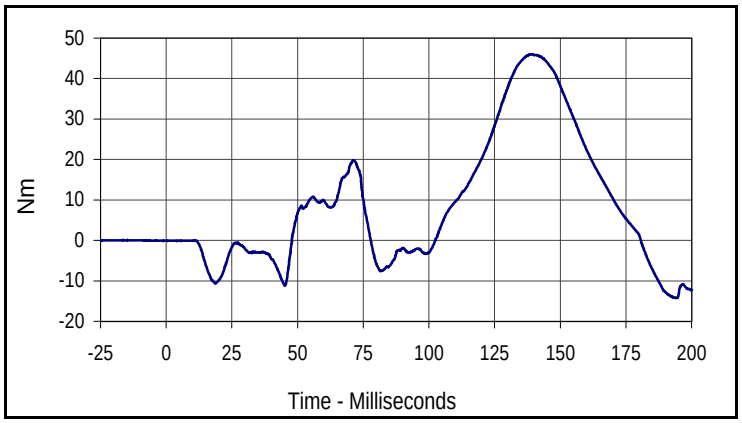


Curve Description			
Driver Upper Neck Force Res.			
CURNO	Type	SAE Class	Units
007	RES	1000	Newtons
Max	Time	Min	Time
1268.3	73.3	1.7	0.0

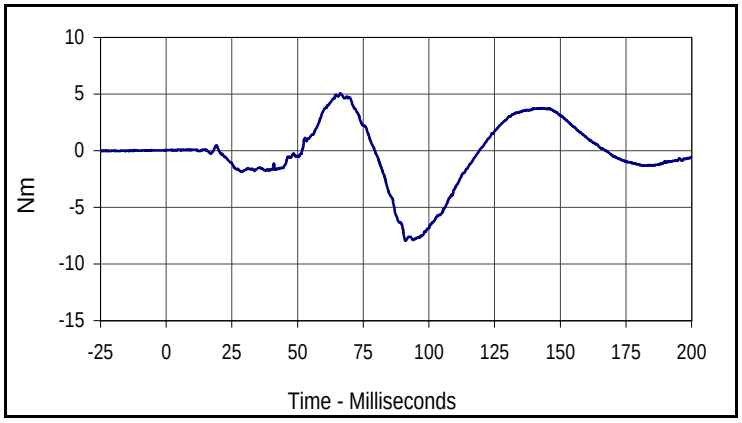
Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



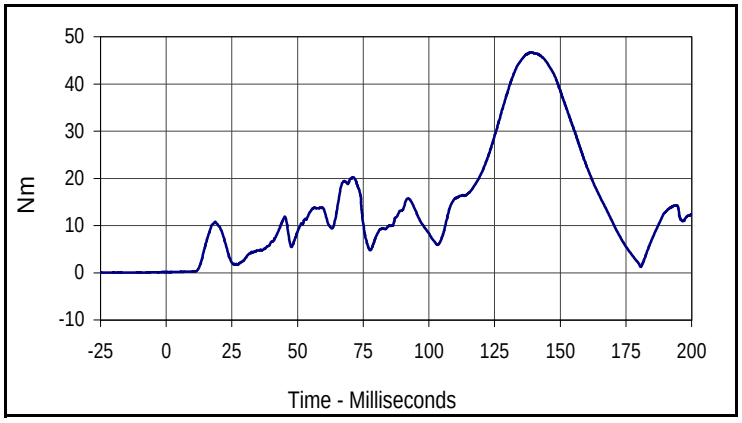
Curve Description			
Driver Upper Neck Moment X			
CURNO	Type	SAE Class	Units
010	FIL	600	Nm
Max	Time	Min	Time
12.1	109.9	-13.5	92.1



Curve Description			
Driver Upper Neck Moment Y			
CURNO	Type	SAE Class	Units
011	FIL	600	Nm
Max	Time	Min	Time
46.0	138.9	-14.3	194.4

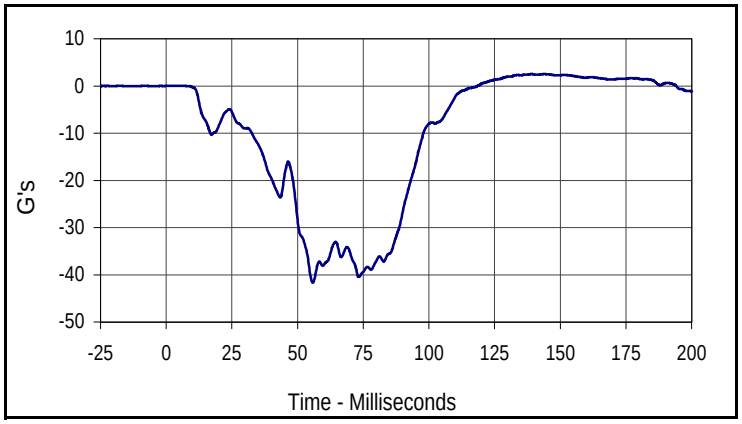


Curve Description			
Driver Upper Neck Moment Z			
CURNO	Type	SAE Class	Units
012	FIL	600	Nm
Max	Time	Min	Time
5.0	66.3	-7.9	91.1

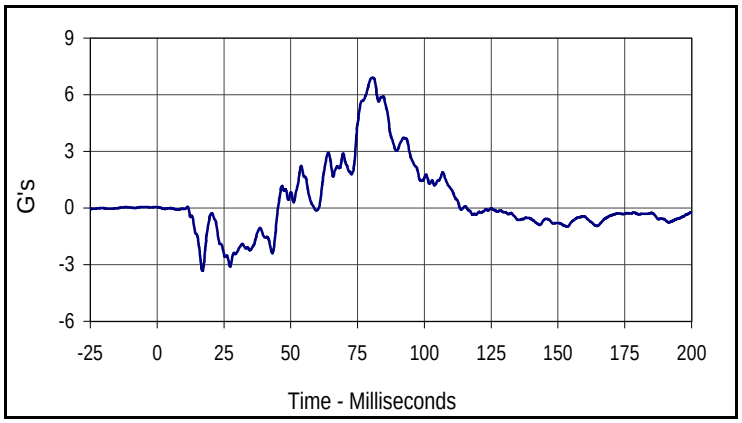


Curve Description			
Driver Upper Neck Moment Res.			
CURNO	Type	SAE Class	Units
010	RES	600	Nm
Max	Time	Min	Time
46.7	138.9	0.1	1.1

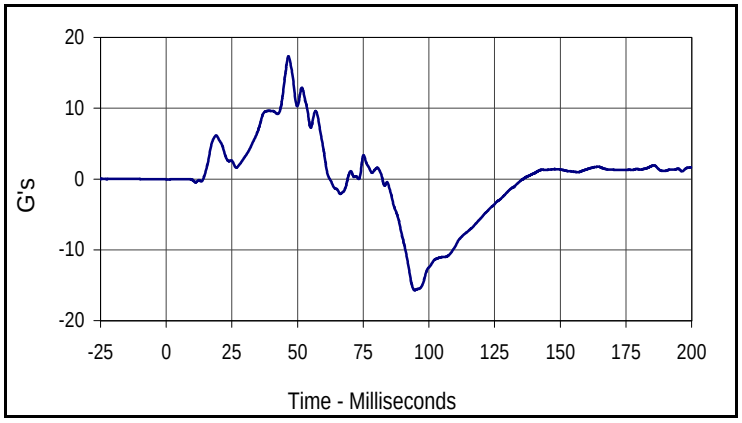
Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



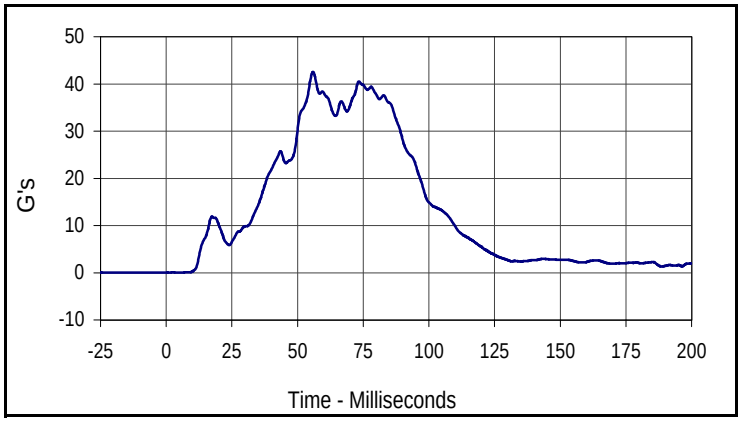
Curve Description			
Driver Chest Primary X			
CURNO	Type	SAE Class	Units
013	FIL	180	G's
Max	Time	Min	Time
2.5	144.0	-41.7	55.8



Curve Description			
Driver Chest Primary Y			
CURNO	Type	SAE Class	Units
014	FIL	180	G's
Max	Time	Min	Time
6.9	80.4	-3.3	17.0

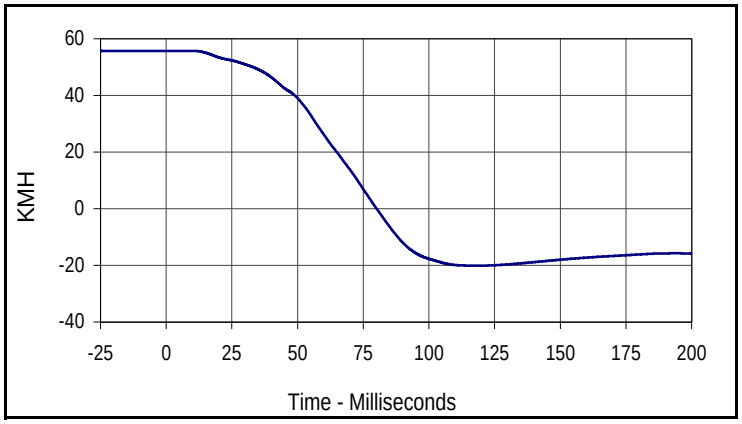


Curve Description			
Driver Chest Primary Z			
CURNO	Type	SAE Class	Units
015	FIL	180	G's
Max	Time	Min	Time
17.3	46.5	-15.7	94.6

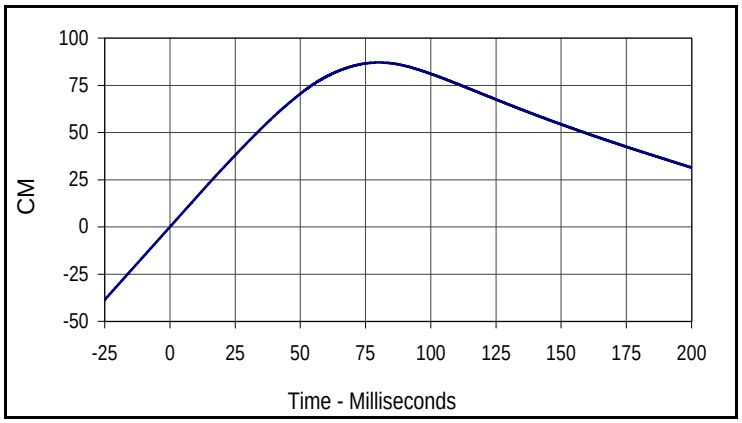


Curve Description			
Driver Chest Resultant Primary			
CURNO	Type	SAE Class	Units
013	RES	180	G's
Max	Time	Min	Time
42.5	55.9	0.0	4.0

Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109

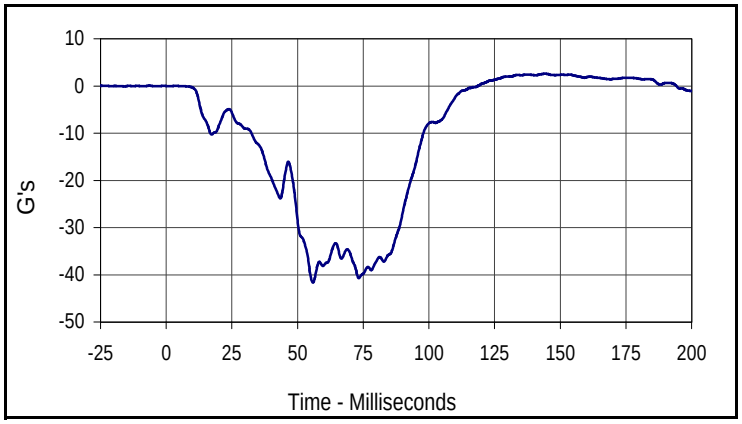


Curve Description			
Driver Chest Primary X Velocity			
CURNO	Type	SAE Class	Units
013	IN1	180	KMH
Max	Time	Min	Time
55.7	7.4	-20.1	118.5

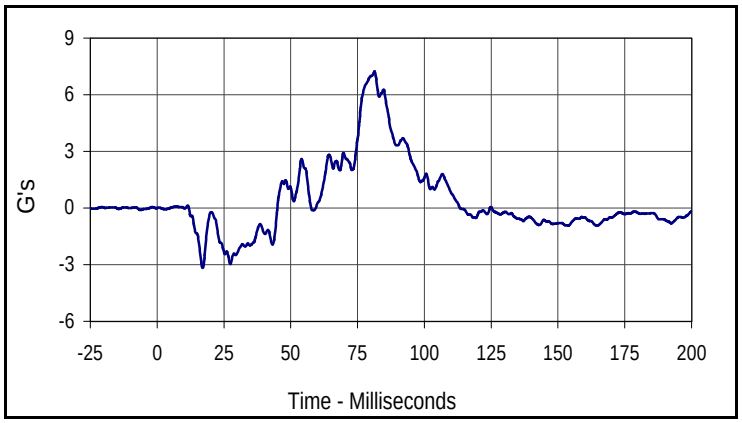


Curve Description			
Driver Chest Primary X Displacement			
CURNO	Type	SAE Class	Units
013	IN2	180	CM
Max	Time	Min	Time
87.1	80.1	0.0	0.0

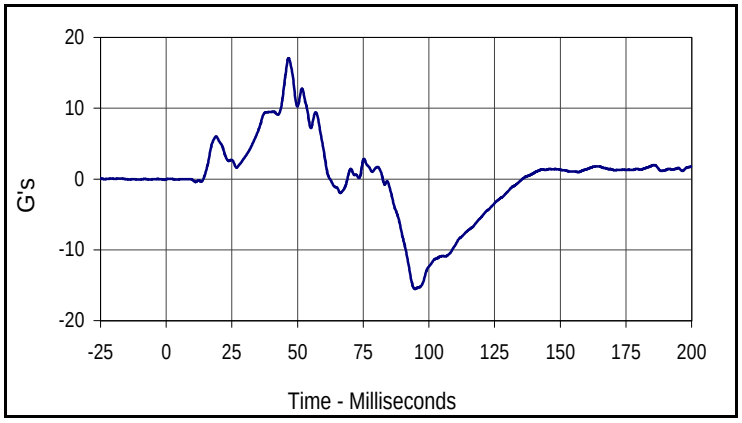
Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



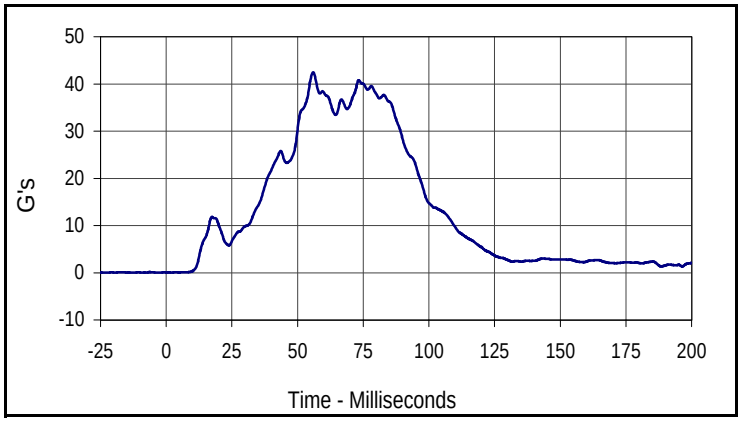
Curve Description			
Driver Chest Redundant X			
CURNO	Type	SAE Class	Units
016	FIL	180	G's
Max	Time	Min	Time
2.6	144.2	-41.6	55.8



Curve Description			
Driver Chest Redundant Y			
CURNO	Type	SAE Class	Units
017	FIL	180	G's
Max	Time	Min	Time
7.2	81.3	-3.2	17.1

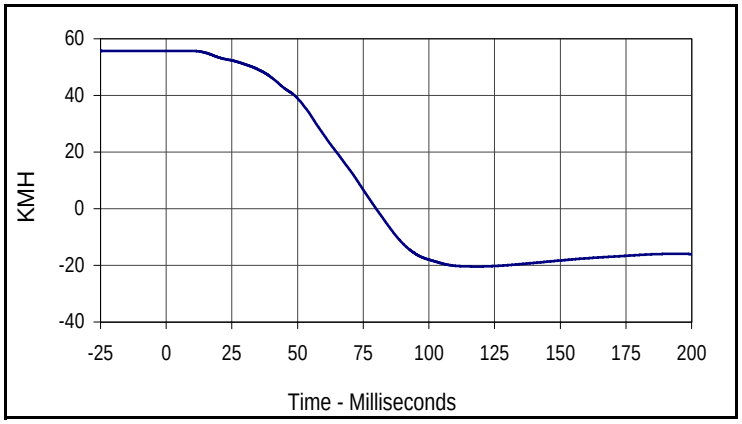


Curve Description			
Driver Chest Redundant Z			
CURNO	Type	SAE Class	Units
018	FIL	180	G's
Max	Time	Min	Time
17.1	46.6	-15.5	94.7

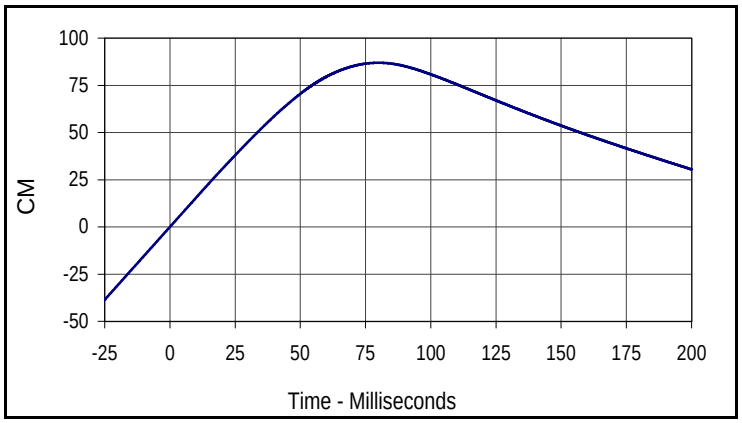


Curve Description			
Driver Chest Resultant Redundant			
CURNO	Type	SAE Class	Units
016	RES	180	G's
Max	Time	Min	Time
42.5	55.9	0.0	0.1

Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109

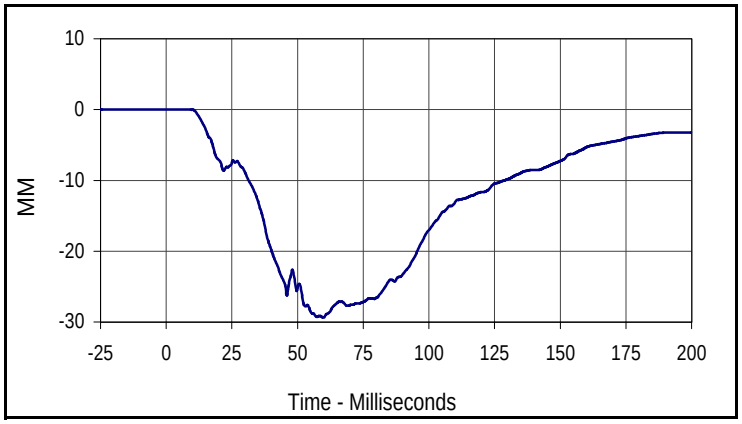


Curve Description			
Driver Chest Redundant X Velocity			
CURNO	Type	SAE Class	Units
016	IN1	180	KMH
Max	Time	Min	Time
55.7	0.0	-20.4	118.6



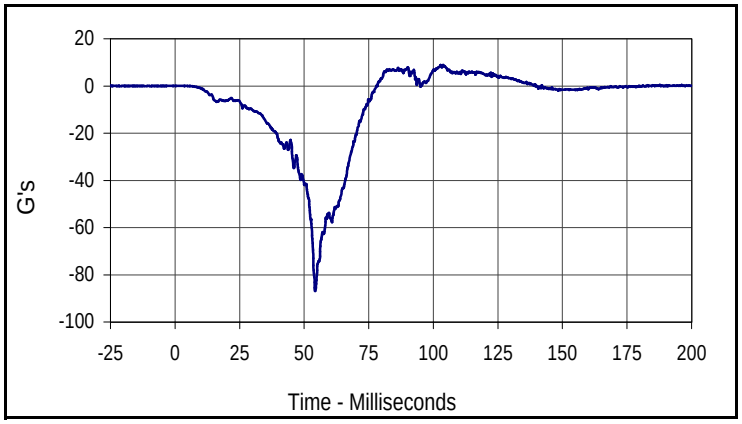
Curve Description			
Driver Chest Redundant X Displacement			
CURNO	Type	SAE Class	Units
016	IN2	180	CM
Max	Time	Min	Time
86.9	79.9	0.0	0.0

Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109

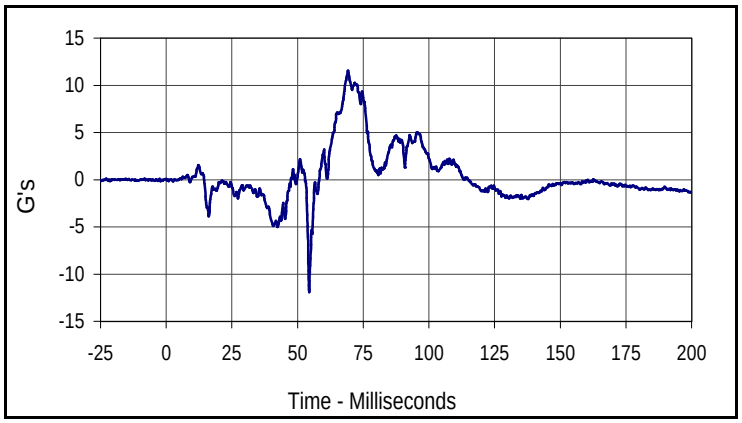


Curve Description			
Driver Chest Displacement			
CURNO	Type	SAE Class	Units
019	FIL	600	MM
Max	Time	Min	Time
0.0	5.9	-29.4	59.9

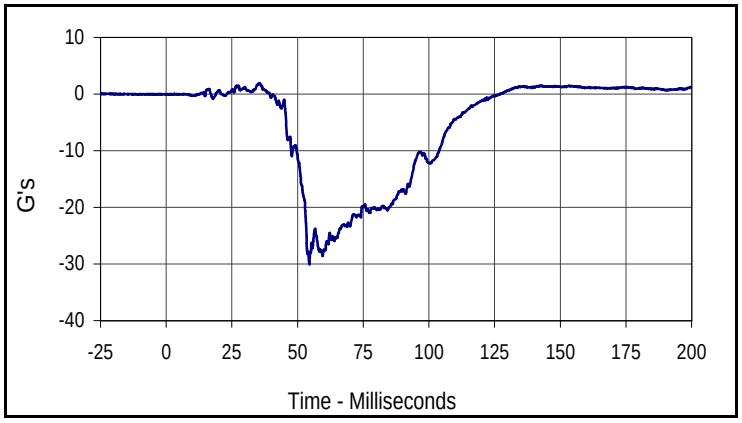
Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



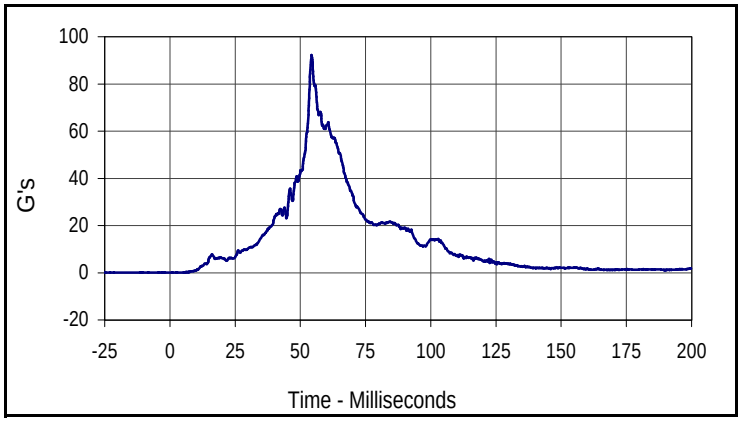
Curve Description			
Driver Pelvis X			
CURNO	Type	SAE Class	Units
020	FIL	1000	G's
Max	Time	Min	Time
8.9	102.8	-86.9	54.3



Curve Description			
Driver Pelvis Y			
CURNO	Type	SAE Class	Units
021	FIL	1000	G's
Max	Time	Min	Time
11.5	69.2	-11.9	54.4

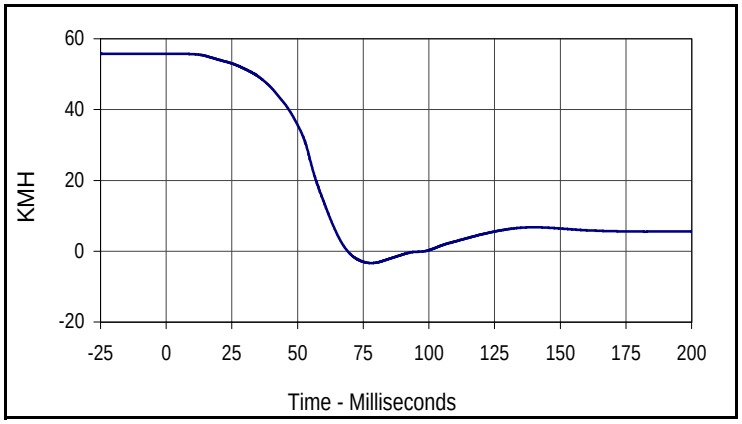


Curve Description			
Driver Pelvis Z			
CURNO	Type	SAE Class	Units
022	FIL	1000	G's
Max	Time	Min	Time
1.9	35.4	-30.0	54.5

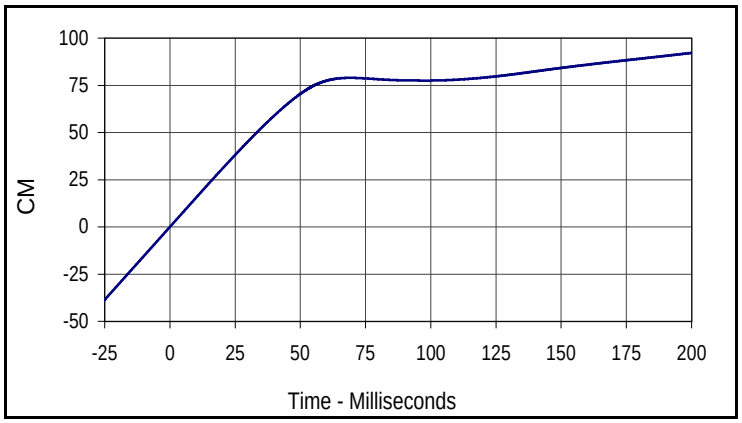


Curve Description			
Driver Pelvis Resultant			
CURNO	Type	SAE Class	Units
020	RES	1000	G's
Max	Time	Min	Time
92.3	54.3	0.0	1.8

Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109

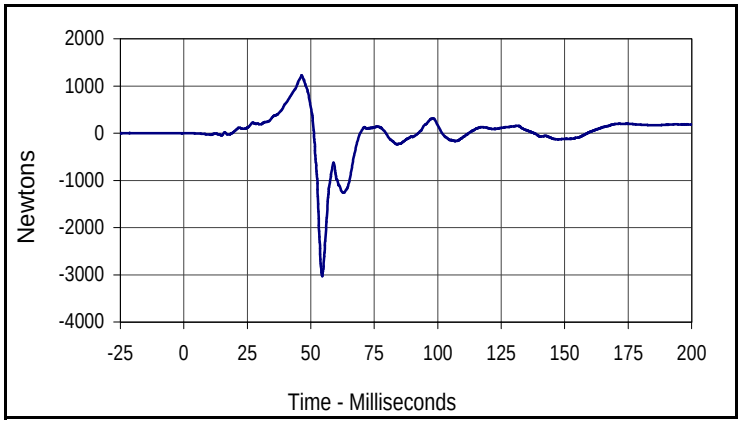


Curve Description			
Driver Pelvis X Velocity			
CURNO	Type	SAE Class	Units
020	IN1	180	KMH
Max	Time	Min	Time
55.7	5.1	-3.3	78.1

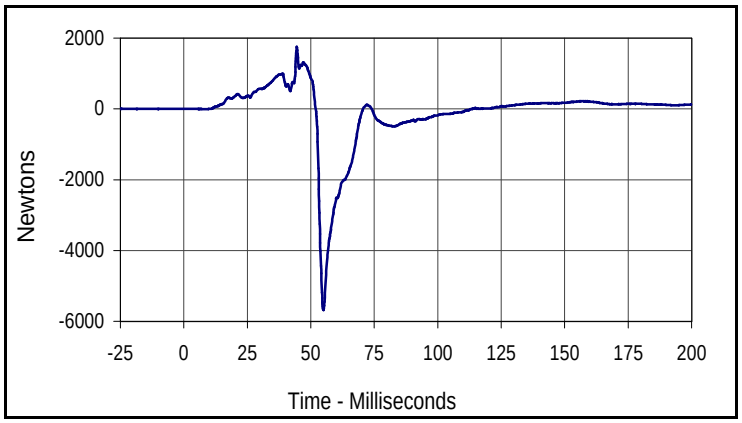


Curve Description			
Driver Pelvis X Displacement			
CURNO	Type	SAE Class	Units
020	IN2	180	CM
Max	Time	Min	Time
92.1	200.0	0.0	0.0

Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109

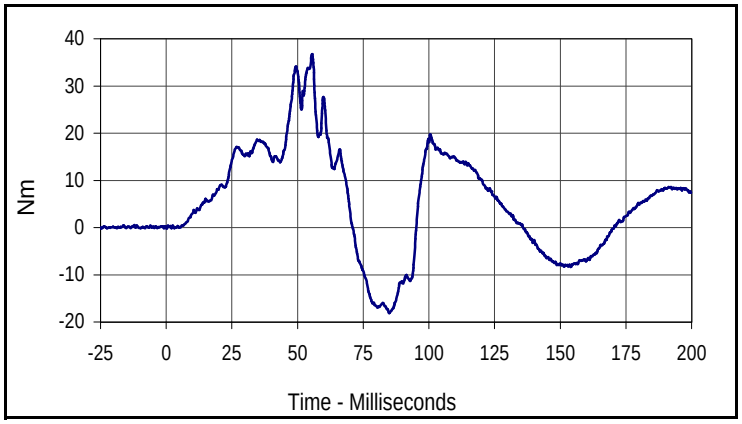


Curve Description			
Driver Left Femur Force			
CURNO	Type	SAE Class	Units
023	FIL	600	Newtons
Max	Time	Min	Time
1224.0	46.4	-3027.5	54.5

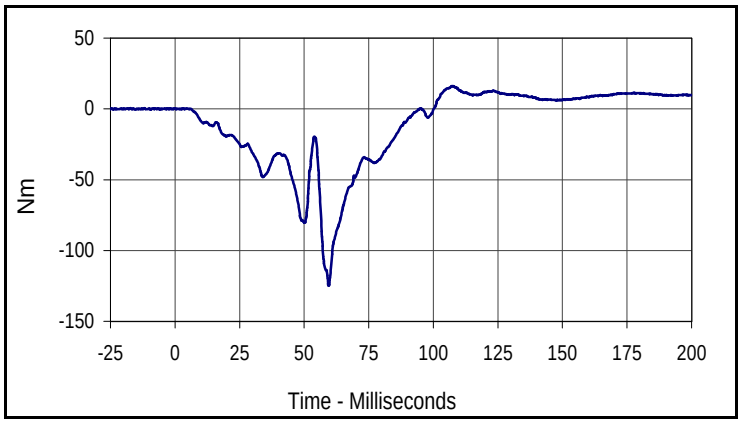


Curve Description			
Driver Right Femur Force			
CURNO	Type	SAE Class	Units
024	FIL	600	Newtons
Max	Time	Min	Time
1757.4	44.5	-5684.3	55.0

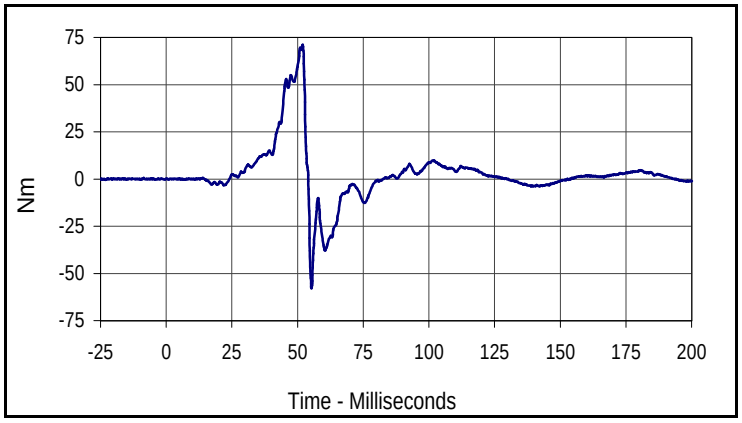
Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



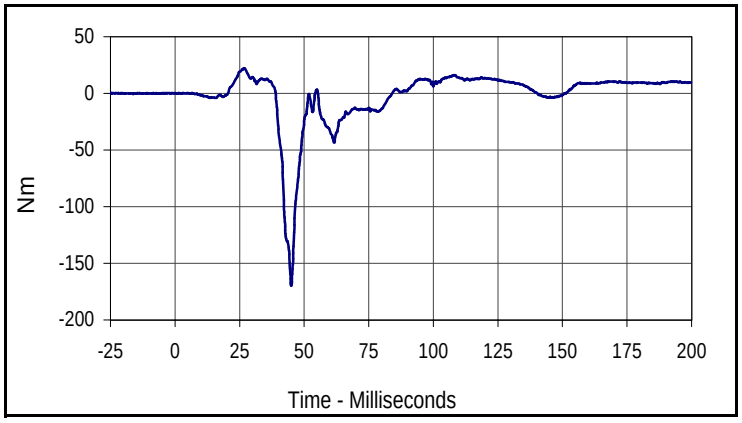
Curve Description			
Driver Left Upper Tibia Moment X			
CURNO	Type	SAE Class	Units
025	FIL	600	Nm
Max	Time	Min	Time
36.7	55.5	-18.1	84.9



Curve Description			
Driver Left Upper Tibia Moment Y			
CURNO	Type	SAE Class	Units
026	FIL	600	Nm
Max	Time	Min	Time
16.2	107.6	-125.0	59.5

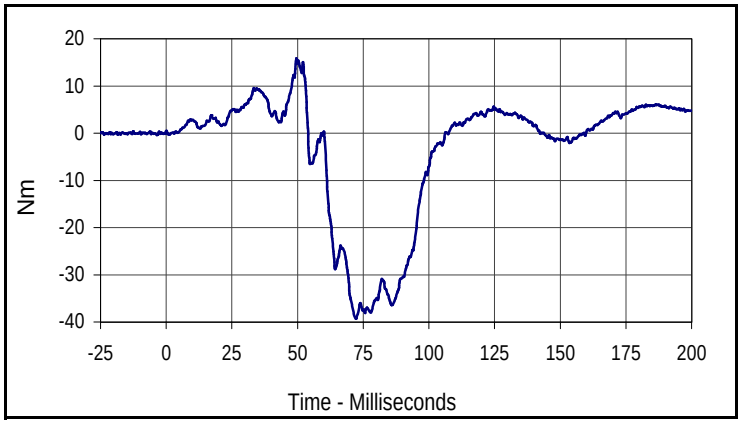


Curve Description			
Driver Right Upper Tibia Moment X			
CURNO	Type	SAE Class	Units
027	FIL	600	Nm
Max	Time	Min	Time
71.0	52.0	-57.8	55.3

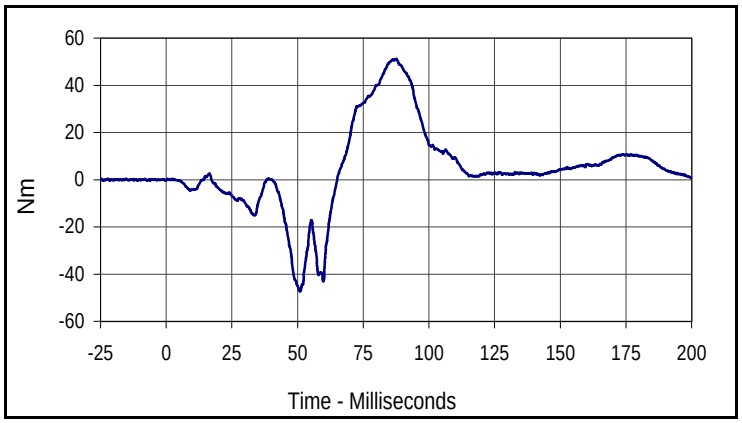


Curve Description			
Driver Right Upper Tibia Moment Y			
CURNO	Type	SAE Class	Units
028	FIL	600	Nm
Max	Time	Min	Time
22.1	26.8	-169.8	45.0

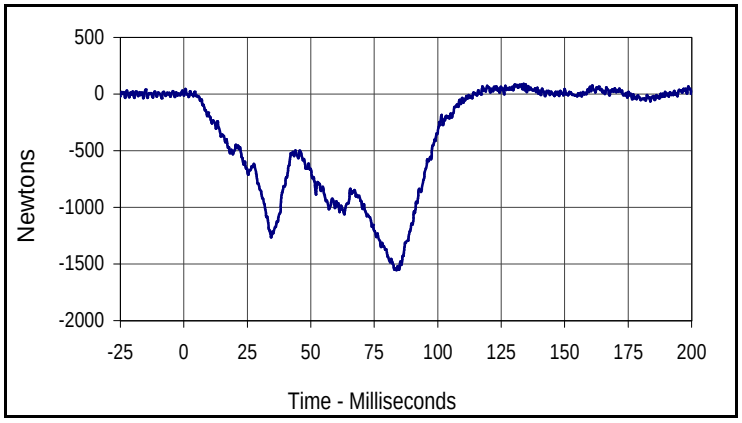
Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



Curve Description			
Driver Left Lower Tibia Moment X			
CURNO	Type	SAE Class	Units
029	FIL	600	Nm
Max	Time	Min	Time
15.8	49.5	-39.3	72.2

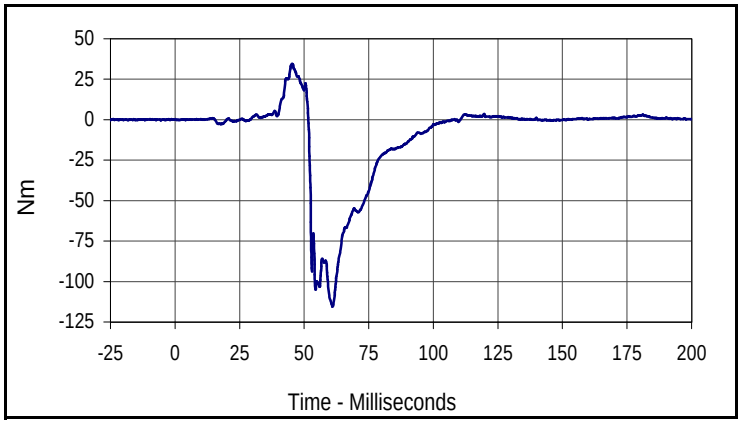


Curve Description			
Driver Left Lower Tibia Moment Y			
CURNO	Type	SAE Class	Units
030	FIL	600	Nm
Max	Time	Min	Time
51.1	87.6	-47.3	50.9

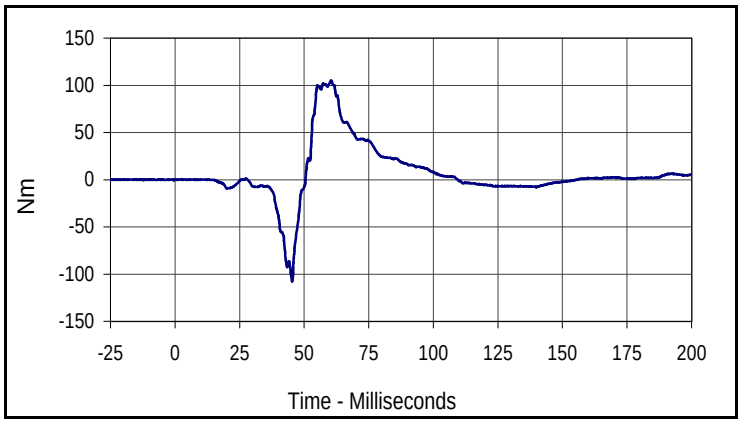


Curve Description			
Driver Left Lower Tibia Force Z			
CURNO	Type	SAE Class	Units
031	FIL	600	Newtons
Max	Time	Min	Time
90.5	133.8	-1554.7	83.7

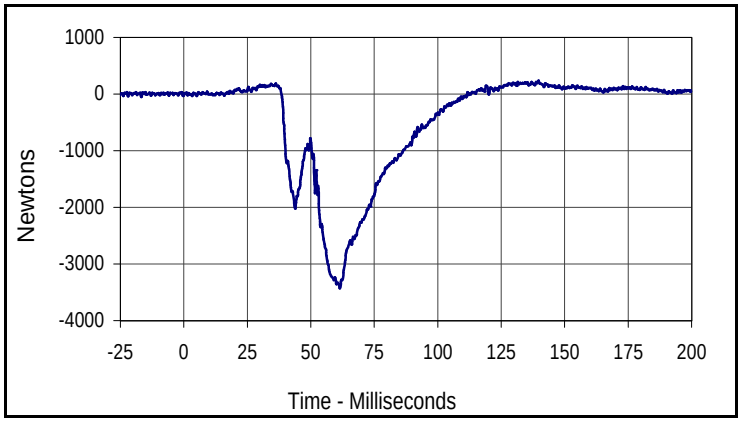
Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



Curve Description			
Driver Right Lower Tibia Moment X			
CURNO	Type	SAE Class	Units
032	FIL	600	Nm
Max	Time	Min	Time
34.6	45.4	-115.6	61.0

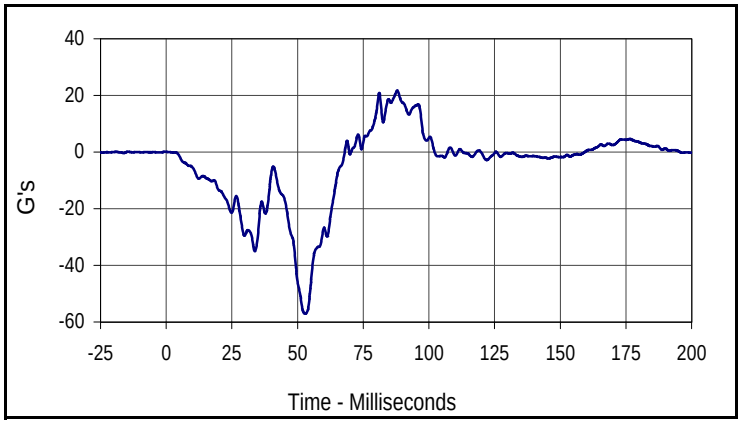


Curve Description			
Driver Right Lower Tibia Moment Y			
CURNO	Type	SAE Class	Units
033	FIL	600	Nm
Max	Time	Min	Time
105.3	60.5	-107.6	45.3

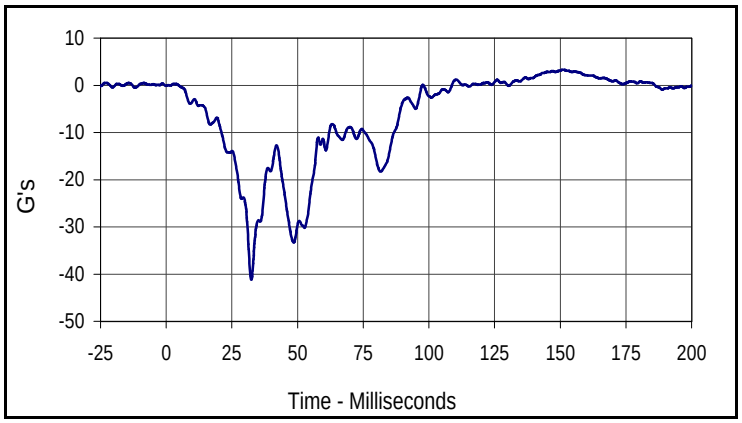


Curve Description			
Driver Right lower Tibia Force Z			
CURNO	Type	SAE Class	Units
034	FIL	600	Newtons
Max	Time	Min	Time
237.3	139.7	-3426.9	61.5

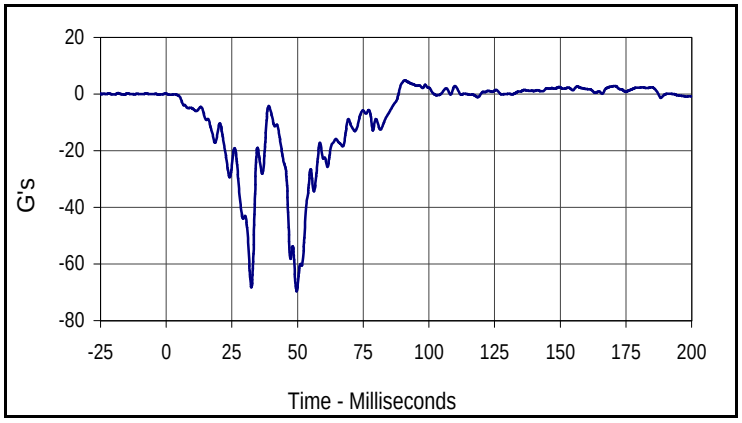
Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



Curve Description			
Driver Left Foot Aft X			
CURNO	Type	SAE Class	Units
035	FIL	180	G's
Max	Time	Min	Time
21.8	87.9	-57.1	52.8

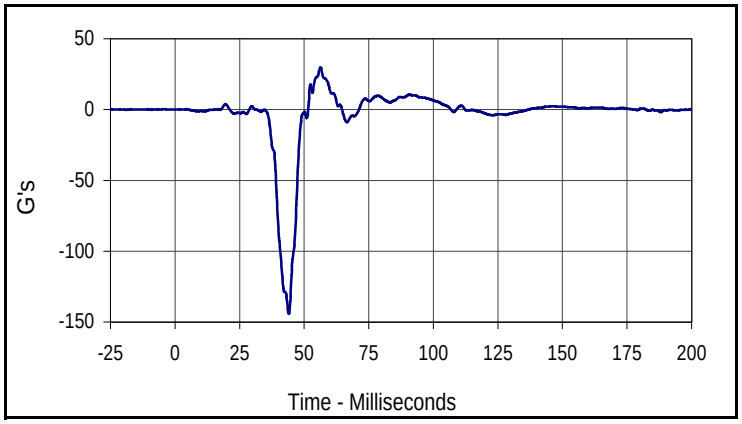


Curve Description			
Driver Left Foot Aft Z			
CURNO	Type	SAE Class	Units
036	FIL	180	G's
Max	Time	Min	Time
3.3	151.2	-41.2	32.4

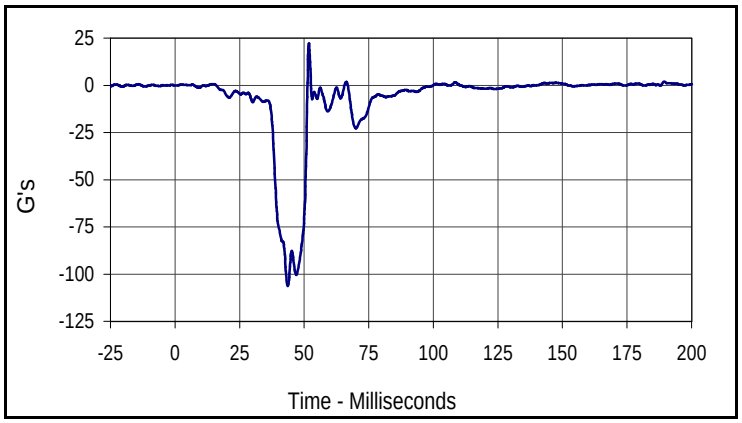


Curve Description			
Driver Left Foot Fore Z			
CURNO	Type	SAE Class	Units
037	FIL	180	G's
Max	Time	Min	Time
4.9	90.8	-69.6	49.7

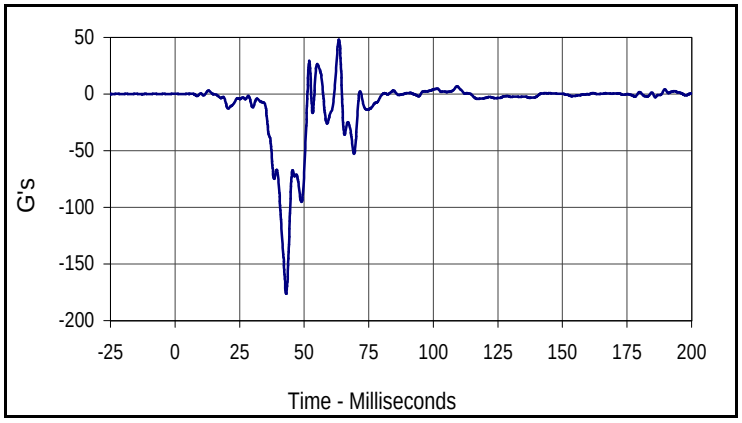
Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



Curve Description			
Driver Right Foot Aft X			
CURNO	Type	SAE Class	Units
038	FIL	180	G's
Max	Time	Min	Time
29.7	56.3	-144.1	44.1

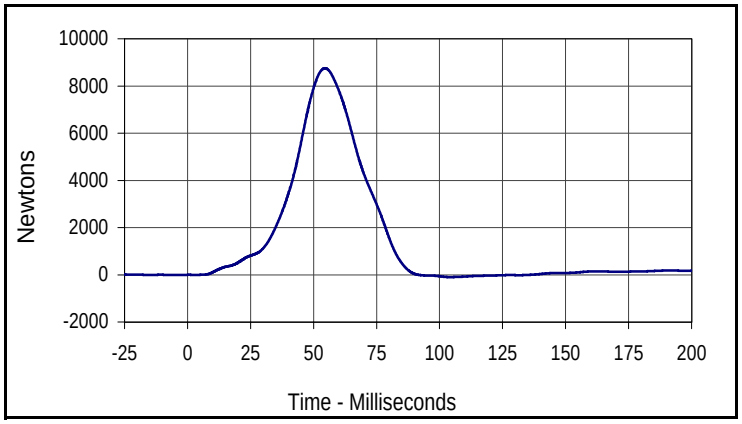


Curve Description			
Driver Right Foot Aft Z			
CURNO	Type	SAE Class	Units
039	FIL	180	G's
Max	Time	Min	Time
22.2	51.8	-106.4	43.7

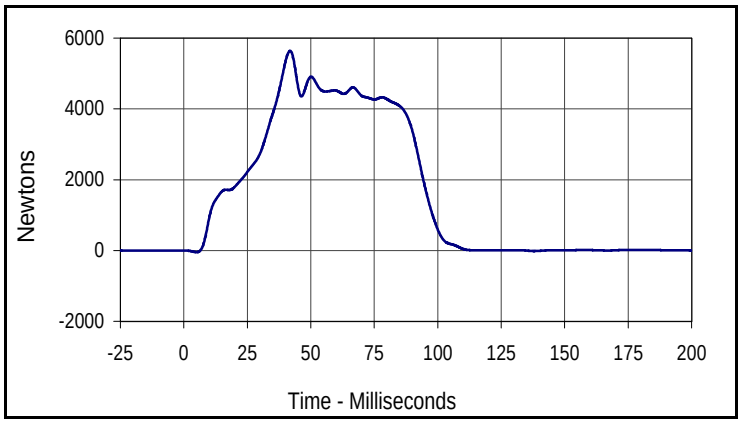


Curve Description			
Driver Right Foot Fore Z			
CURNO	Type	SAE Class	Units
040	FIL	180	G's
Max	Time	Min	Time
47.9	63.5	-176.4	43.0

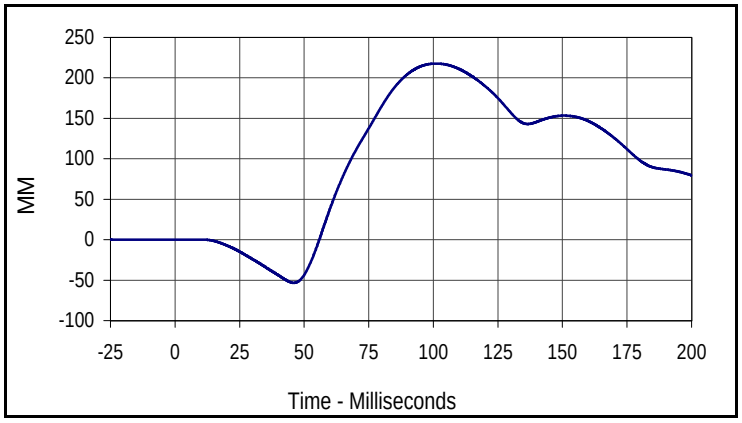
Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



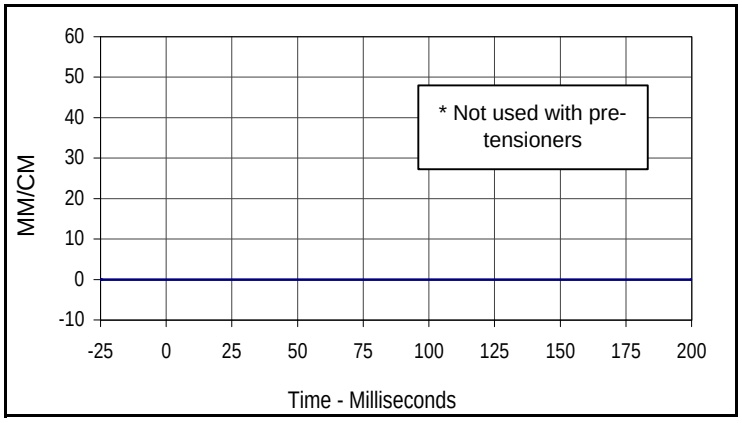
Curve Description			
Driver Lap Belt Force			
CURNO	Type	SAE Class	Units
041	FIL	60	Newtons
Max	Time	Min	Time
8749.9	54.5	-97.8	104.1



Curve Description			
Driver Shoulder Belt Force			
CURNO	Type	SAE Class	Units
042	FIL	60	Newtons
Max	Time	Min	Time
5638.4	41.8	-47.2	5.0



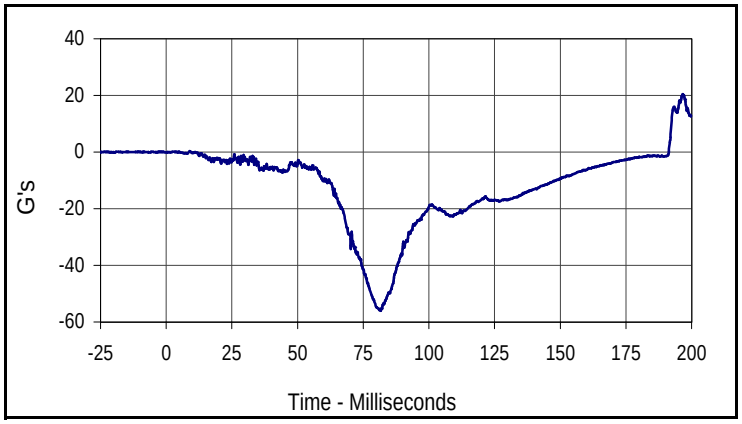
Curve Description			
Driver Shoulder Belt Pullout			
CURNO	Type	SAE Class	Units
043	FIL	60	MM
Max	Time	Min	Time
217.7	101.0	-53.3	46.0



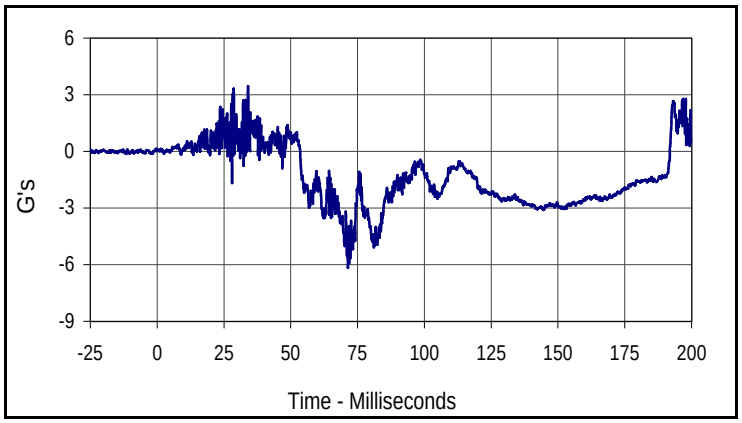
Curve Description			
Driver Shoulder Belt Elongation			
CURNO	Type	SAE Class	Units
044	FIL	60	MM/CM
Max	Time	Min	Time
0.0	0.0	0.0	0.0

* Not used with pre-tensioners

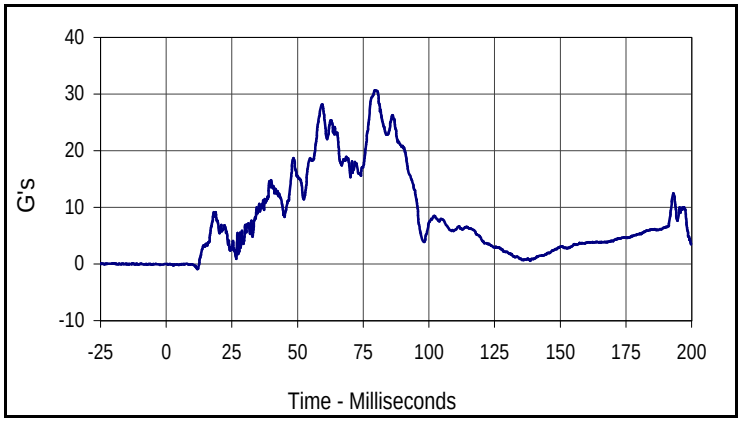
Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



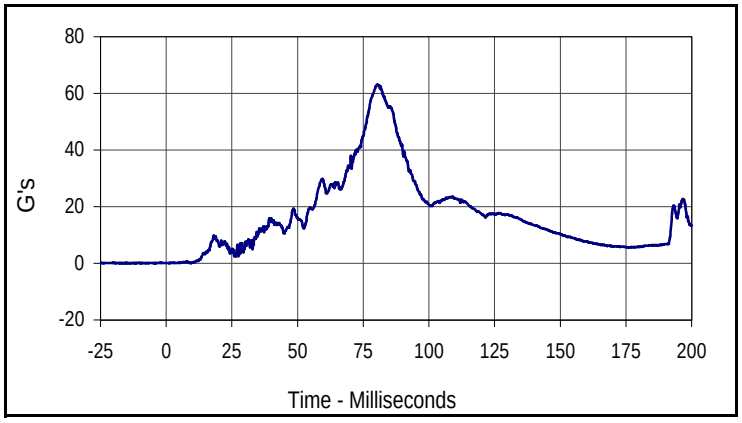
Curve Description			
Passenger Head Primary X			
CURNO	Type	SAE Class	Units
045	FIL	1000	G's
Max	Time	Min	Time
20.4	196.7	-56.0	81.7



Curve Description			
Passenger Head Primary Y			
CURNO	Type	SAE Class	Units
046	FIL	1000	G's
Max	Time	Min	Time
3.5	34.0	-6.2	71.4

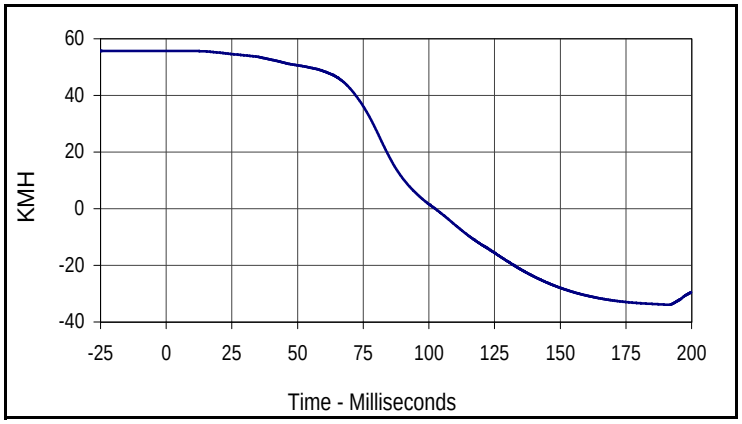


Curve Description			
Passenger Head Primary Z			
CURNO	Type	SAE Class	Units
047	FIL	1000	G's
Max	Time	Min	Time
30.7	79.4	-0.9	11.9

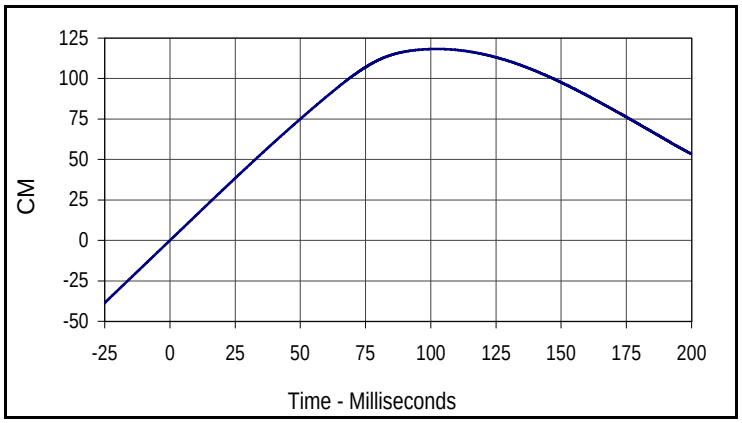


Curve Description			
Passenger Head Resultant Primary			
CURNO	Type	SAE Class	Units
045	RES	1000	G's
Max	Time	Min	Time
63.2	80.5	0.0	1.1

Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109

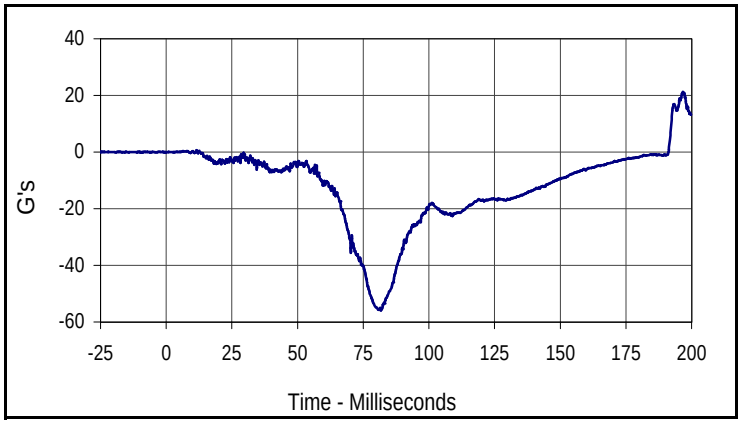


Curve Description			
Passenger Head Primary X Velocity			
CURNO	Type	SAE Class	Units
045	IN1	180	KMH
Max	Time	Min	Time
55.7	0.0	-33.9	191.1

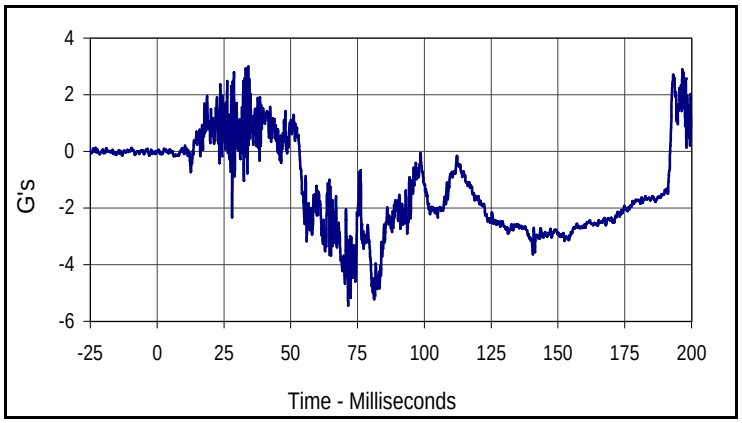


Curve Description			
Passenger Head Primary X Displacement			
CURNO	Type	SAE Class	Units
045	IN2	180	CM
Max	Time	Min	Time
118.3	102.4	0.0	0.0

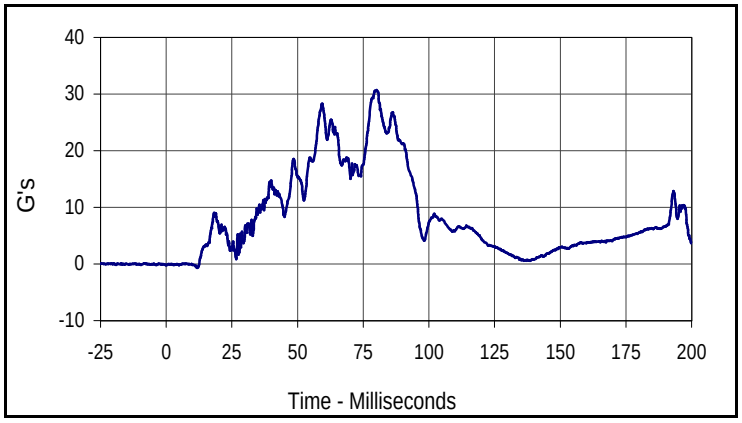
Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



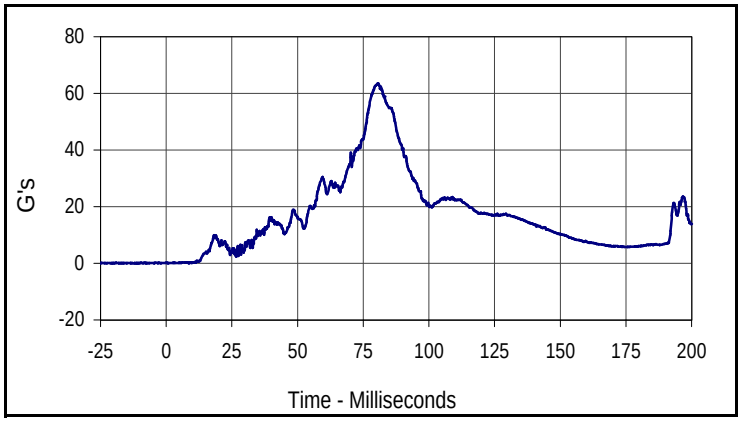
Curve Description			
Passenger Head Redundant X			
CURNO	Type	SAE Class	Units
048	FIL	1000	G's
Max	Time	Min	Time
21.3	196.7	-56.0	81.7



Curve Description			
Passenger Head Redundant Y			
CURNO	Type	SAE Class	Units
049	FIL	1000	G's
Max	Time	Min	Time
3.0	34.1	-5.4	71.5

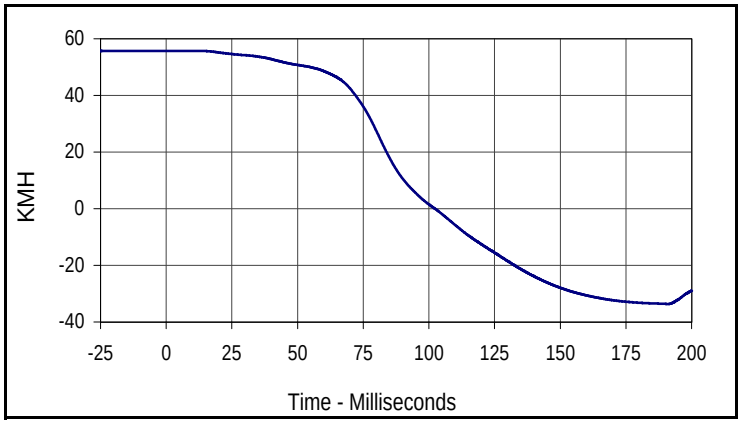


Curve Description			
Passenger Head Redundant Z			
CURNO	Type	SAE Class	Units
050	FIL	1000	G's
Max	Time	Min	Time
30.7	80.1	-0.7	11.9

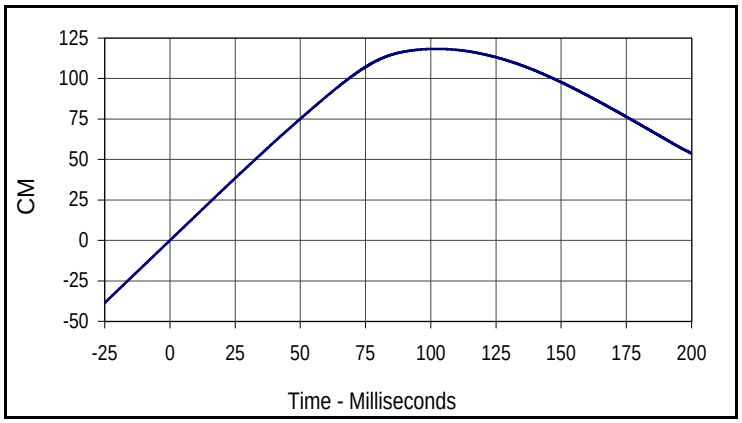


Curve Description			
Passenger Head Resultant Redundant			
CURNO	Type	SAE Class	Units
048	RES	1000	G's
Max	Time	Min	Time
63.6	80.6	0.0	8.6

Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109

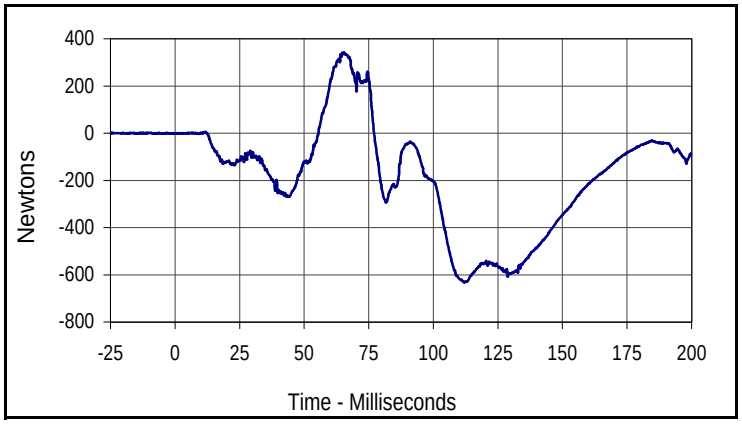


Curve Description			
Passenger Head Redundant X Velocity			
CURNO	Type	SAE Class	Units
048	IN1	180	KMH
Max	Time	Min	Time
55.7	12.8	-33.6	191.0

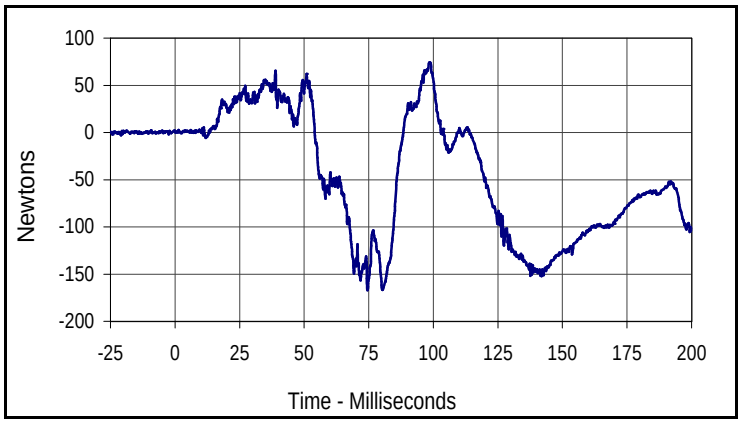


Curve Description			
Passenger Head Redundant X Displacement			
CURNO	Type	SAE Class	Units
048	IN2	180	CM
Max	Time	Min	Time
118.3	102.3	0.0	0.0

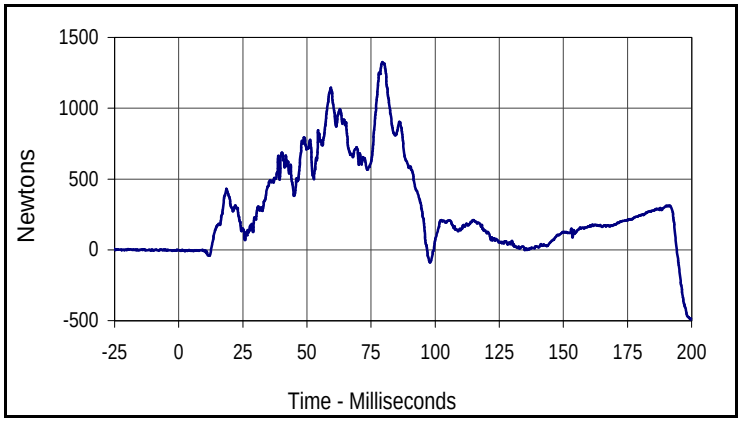
Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



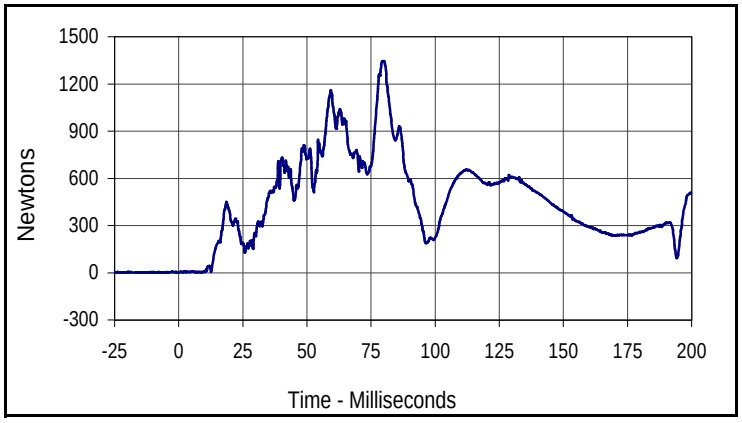
Curve Description			
Passenger Upper Neck Force X			
CURNO	Type	SAE Class	Units
051	FIL	1000	Newtons
Max	Time	Min	Time
342.3	65.4	-632.0	112.0



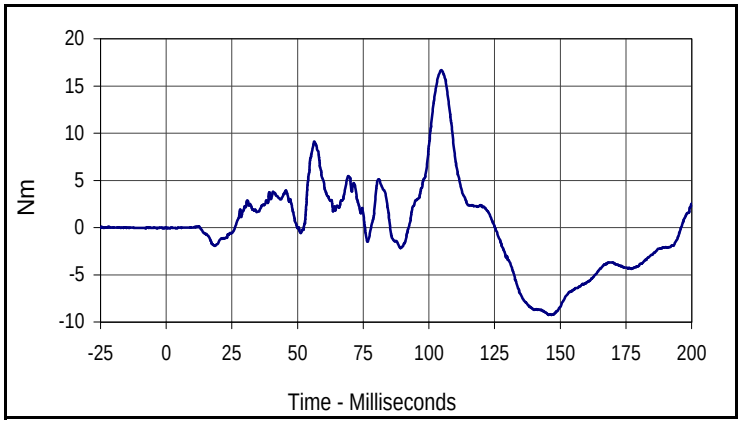
Curve Description			
Passenger Upper Neck Force Y			
CURNO	Type	SAE Class	Units
052	FIL	1000	Newtons
Max	Time	Min	Time
74.1	98.5	-167.0	74.5



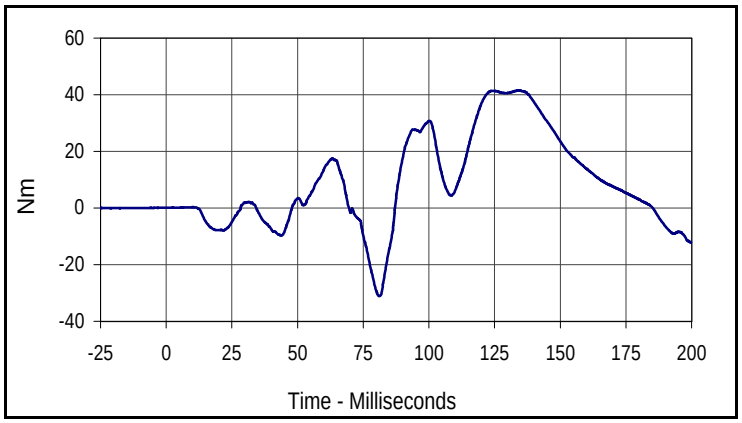
Curve Description			
Passenger Upper Neck Force Z			
CURNO	Type	SAE Class	Units
053	FIL	1000	Newtons
Max	Time	Min	Time
1325.2	79.4	-490.5	200.0



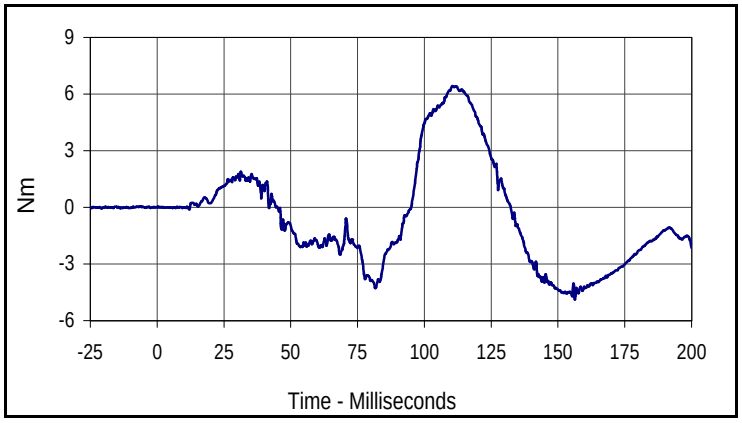
Curve Description			
Passenger Upper Neck Force Res.			
CURNO	Type	SAE Class	Units
051	RES	1000	Newtons
Max	Time	Min	Time
1346.3	79.4	2.5	0.2



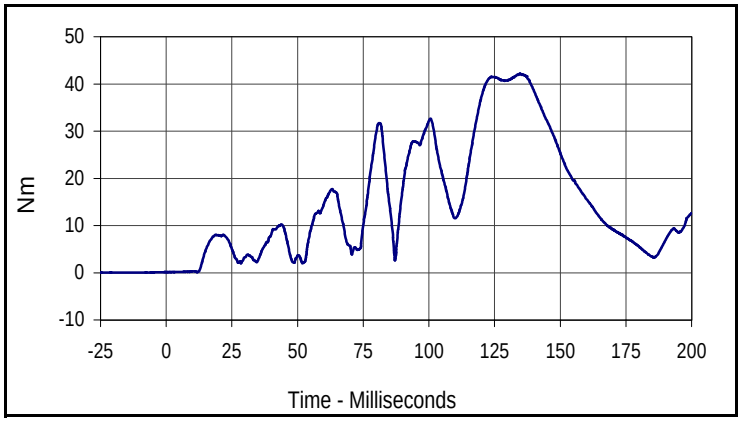
Curve Description			
Passenger Upper Neck Moment X			
CURNO	Type	SAE Class	Units
054	FIL	600	Nm
Max	Time	Min	Time
16.7	104.7	-9.2	146.6



Curve Description			
Passenger Upper Neck Moment Y			
CURNO	Type	SAE Class	Units
055	FIL	600	Nm
Max	Time	Min	Time
41.6	134.7	-31.0	81.2

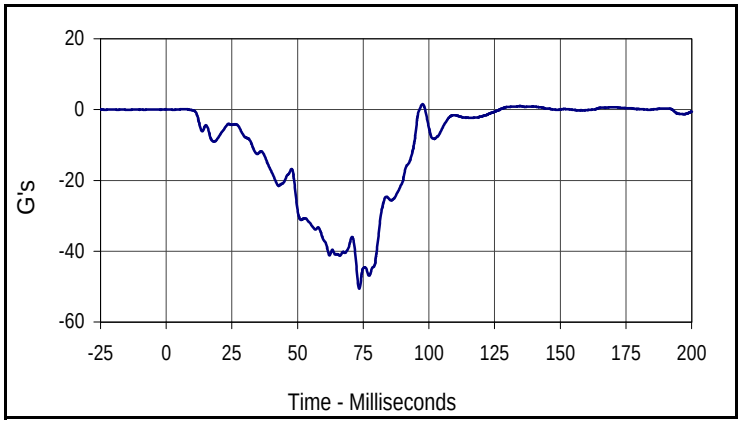


Curve Description			
Passenger Upper Neck Moment Z			
CURNO	Type	SAE Class	Units
056	FIL	600	Nm
Max	Time	Min	Time
6.4	110.5	-4.9	156.3

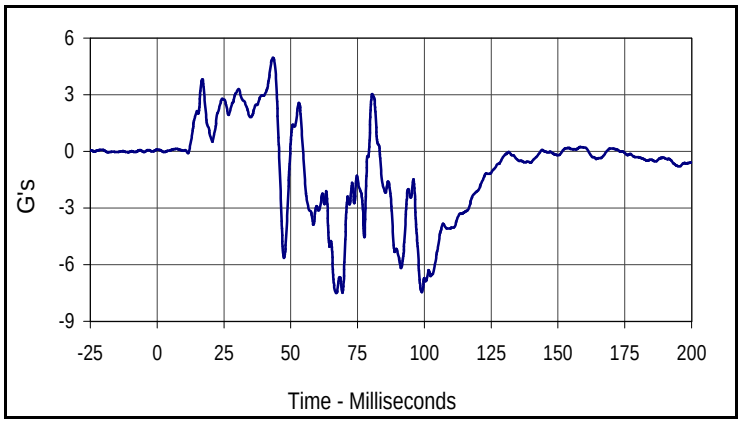


Curve Description			
Passenger Upper Neck Moment Res.			
CURNO	Type	SAE Class	Units
054	RES	600	Nm
Max	Time	Min	Time
42.2	134.7	0.1	0.7

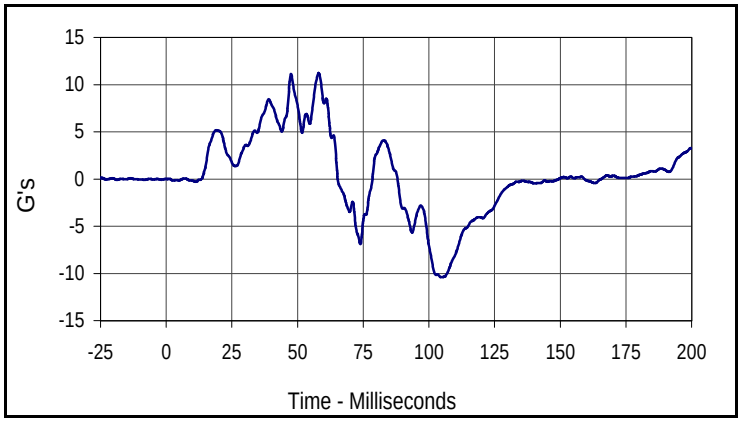
Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



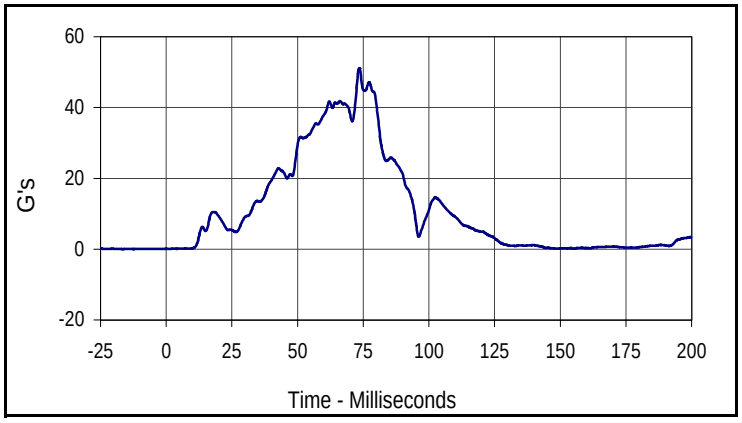
Curve Description			
Passenger Chest Primary X			
CURNO	Type	SAE Class	Units
057	FIL	180	G's
Max	Time	Min	Time
1.6	97.6	-50.6	73.5



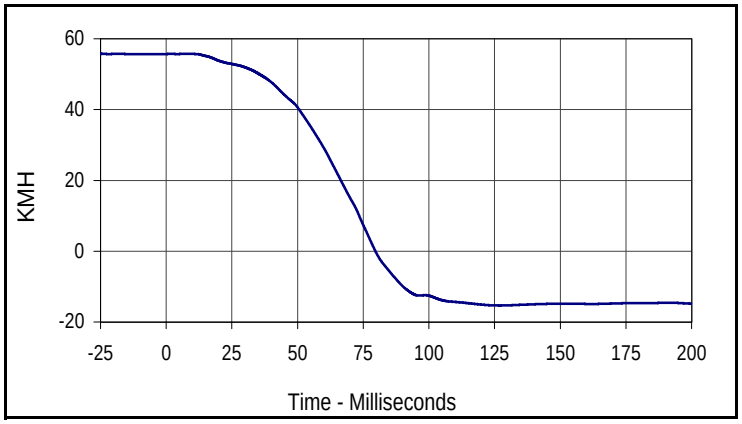
Curve Description			
Passenger Chest Primary Y			
CURNO	Type	SAE Class	Units
058	FIL	180	G's
Max	Time	Min	Time
5.0	43.4	-7.5	67.1



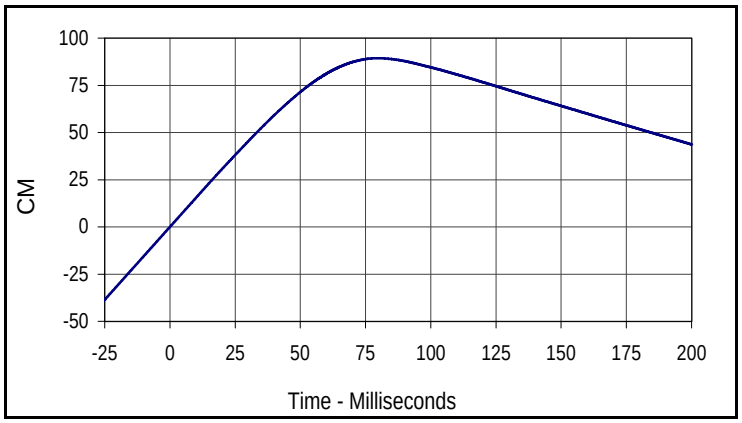
Curve Description			
Passenger Chest Primary Z			
CURNO	Type	SAE Class	Units
059	FIL	180	G's
Max	Time	Min	Time
11.2	58.0	-10.4	104.7



Curve Description			
Passenger Chest Resultant Primary			
CURNO	Type	SAE Class	Units
057	RES	180	G's
Max	Time	Min	Time
51.1	73.5	0.0	1.7

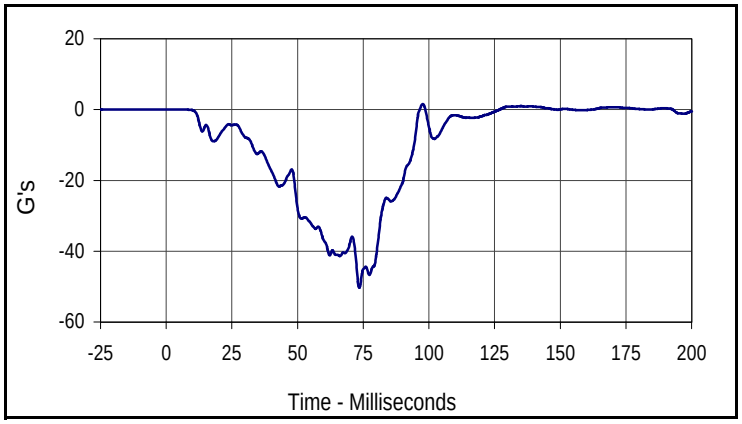


Curve Description			
Passenger Chest Primary X Velocity			
CURNO	Type	SAE Class	Units
057	IN1	180	KMH
Max	Time	Min	Time
55.7	8.6	-15.3	126.9

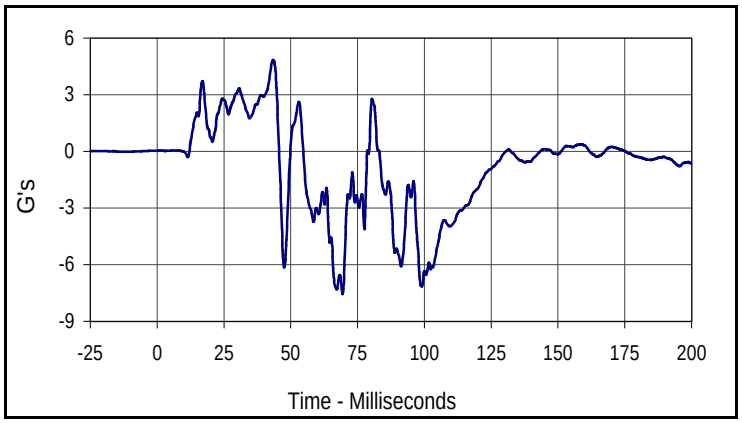


Curve Description			
Passenger Chest Primary X Displacement			
CURNO	Type	SAE Class	Units
057	IN2	180	CM
Max	Time	Min	Time
89.4	79.6	0.0	0.0

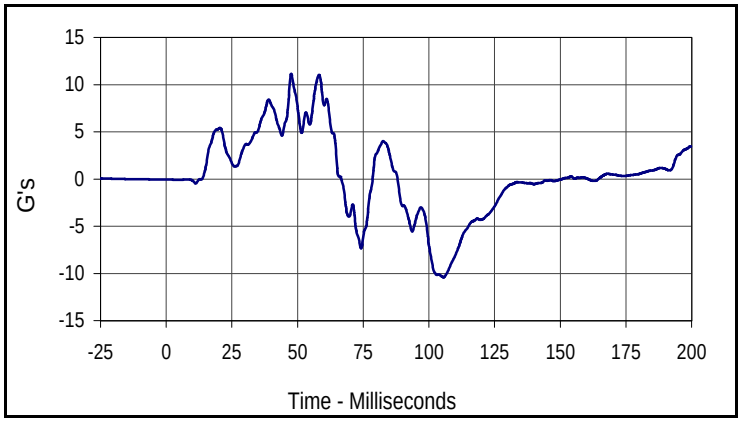
Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



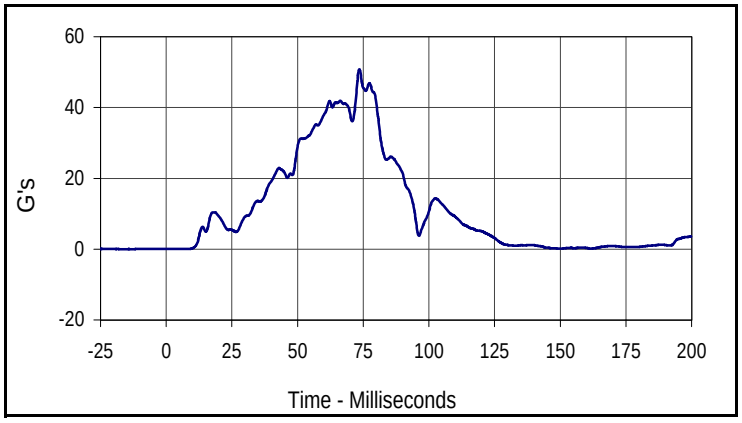
Curve Description			
Passenger Chest Redundant X			
CURNO	Type	SAE Class	Units
060	FIL	180	G's
Max	Time	Min	Time
1.6	97.7	-50.3	73.5



Curve Description			
Passenger Chest Redundant Y			
CURNO	Type	SAE Class	Units
061	FIL	180	G's
Max	Time	Min	Time
4.9	43.4	-7.6	69.4

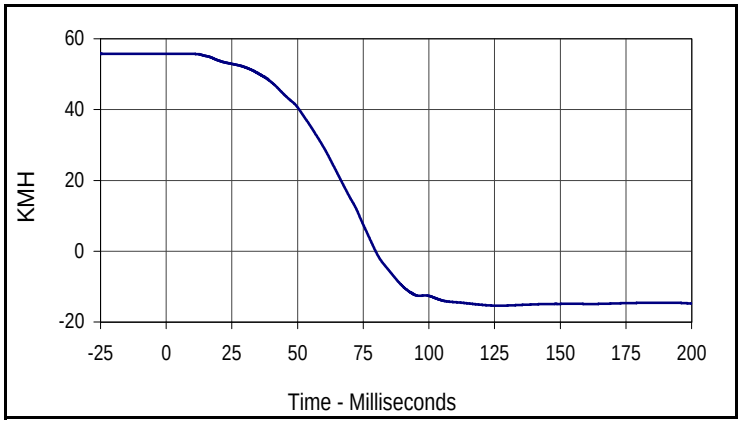


Curve Description			
Passenger Chest Redundant Z			
CURNO	Type	SAE Class	Units
062	FIL	180	G's
Max	Time	Min	Time
11.1	47.6	-10.4	105.6

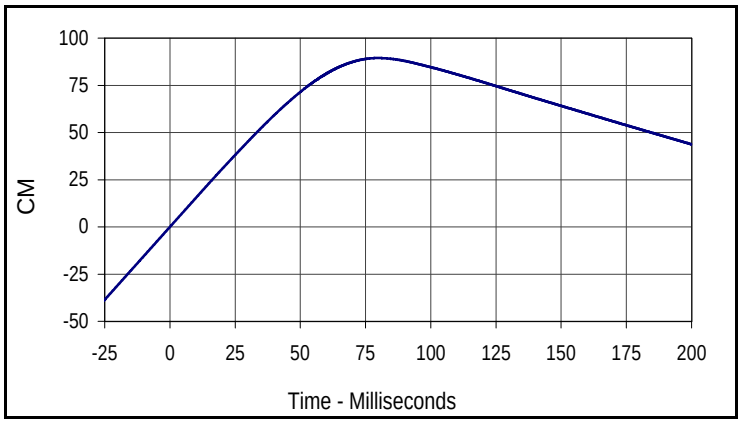


Curve Description			
Passenger Chest Resultant Redundant			
CURNO	Type	SAE Class	Units
060	RES	180	G's
Max	Time	Min	Time
50.8	73.5	0.1	8.2

Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109

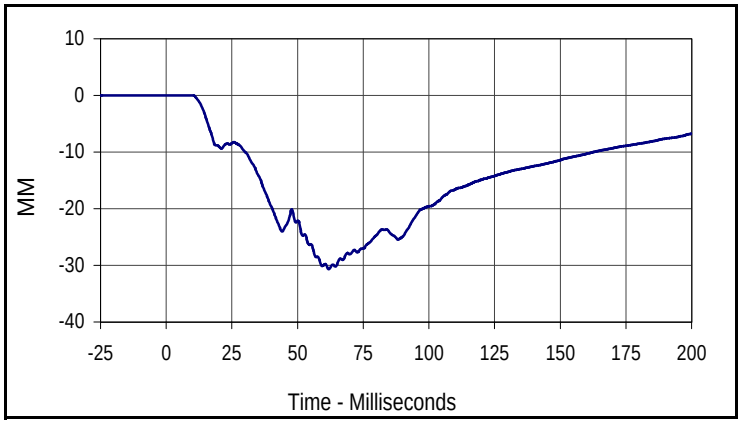


Curve Description			
Passenger Chest Redundant X Velocity			
CURNO	Type	SAE Class	Units
060	IN1	180	KMH
Max	Time	Min	Time
55.7	7.5	-15.4	126.9



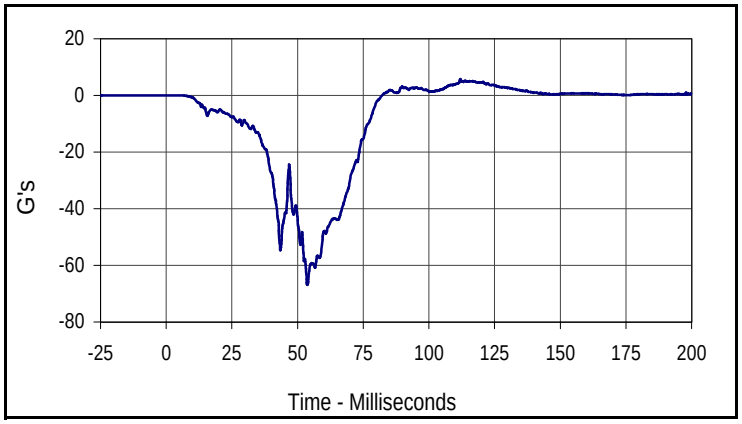
Curve Description			
Passenger Chest Redundant X Displacement			
CURNO	Type	SAE Class	Units
060	IN2	180	CM
Max	Time	Min	Time
89.5	79.7	0.0	0.0

Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109

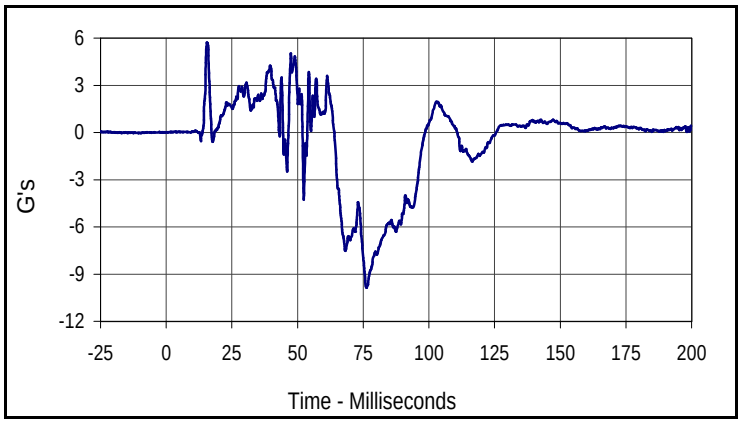


Curve Description			
Passenger Chest Displacement			
CURNO	Type	SAE Class	Units
063	FIL	600	MM
Max	Time	Min	Time
0.0	3.5	-30.7	61.8

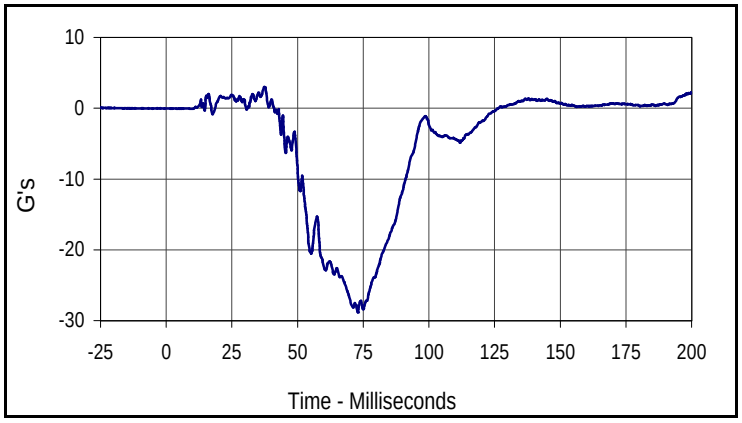
Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



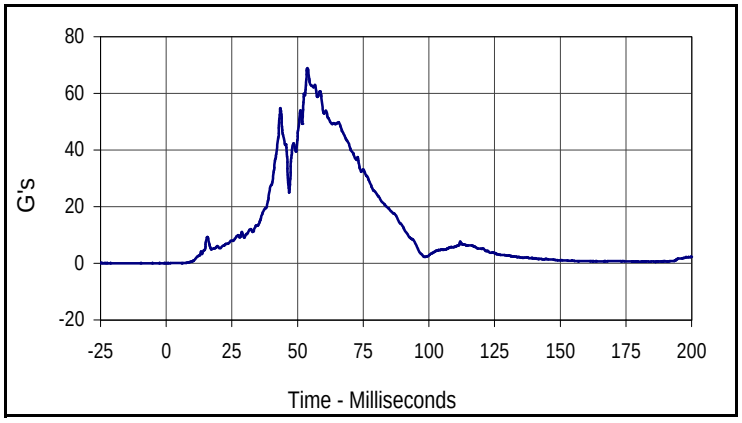
Curve Description			
Passenger Pelvis X			
CURNO	Type	SAE Class	Units
064	FIL	1000	G's
Max	Time	Min	Time
5.8	111.9	-66.9	53.7



Curve Description			
Passenger Pelvis Y			
CURNO	Type	SAE Class	Units
065	FIL	1000	G's
Max	Time	Min	Time
5.7	15.5	-9.9	76.3

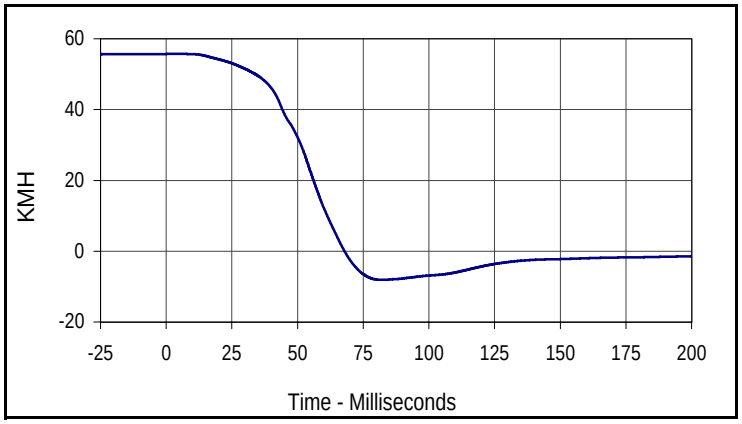


Curve Description			
Passenger Pelvis Z			
CURNO	Type	SAE Class	Units
066	FIL	1000	G's
Max	Time	Min	Time
3.0	37.5	-28.8	73.0

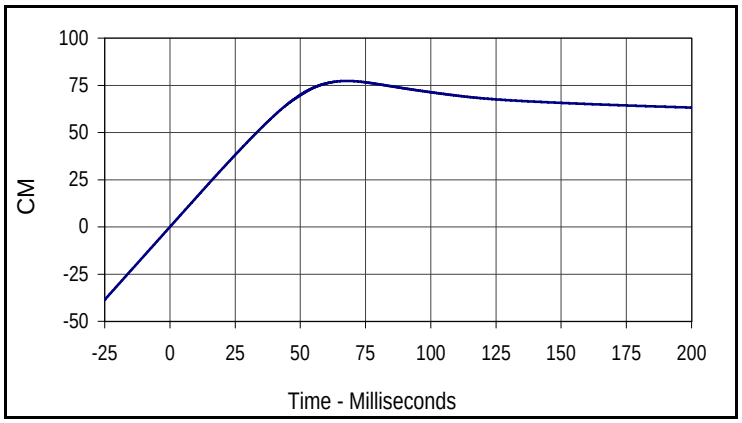


Curve Description			
Passenger Pelvis Resultant			
CURNO	Type	SAE Class	Units
064	RES	1000	G's
Max	Time	Min	Time
68.9	53.8	0.0	1.3

Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109

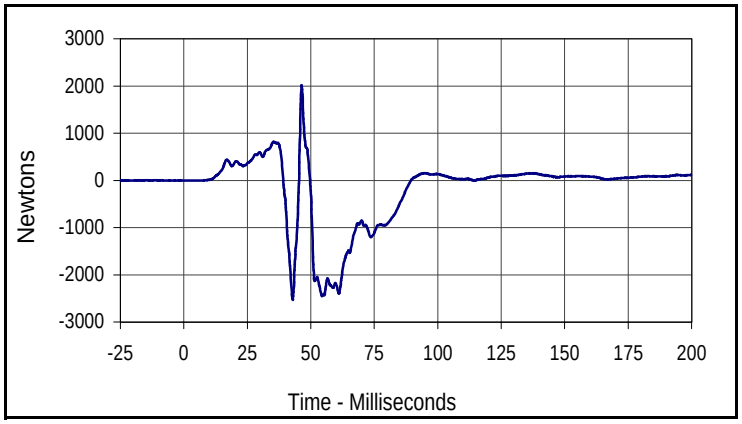


Curve Description			
Passenger Pelvis X Velocity			
CURNO	Type	SAE Class	Units
064	IN1	180	KMH
Max	Time	Min	Time
55.7	6.1	-8.1	82.2

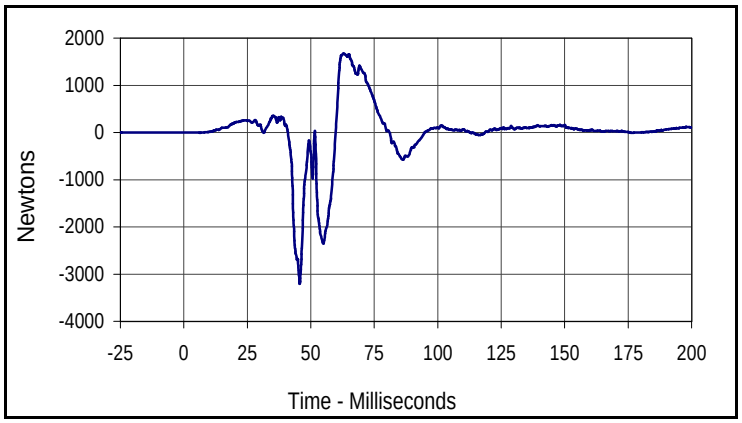


Curve Description			
Passenger Pelvis X Displacement			
CURNO	Type	SAE Class	Units
064	IN2	180	CM
Max	Time	Min	Time
77.3	67.9	0.0	0.0

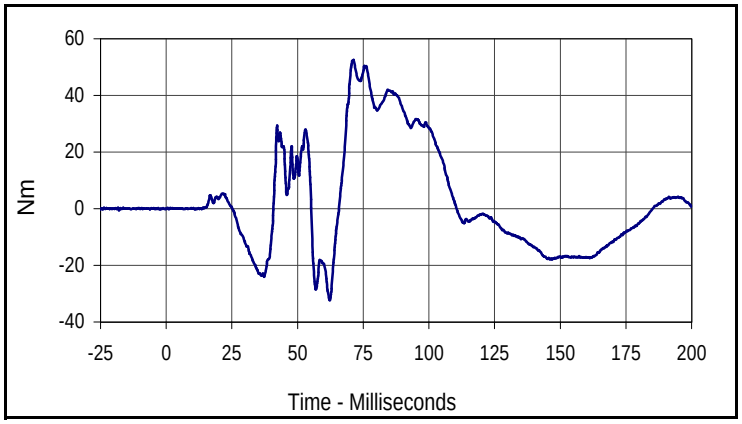
Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



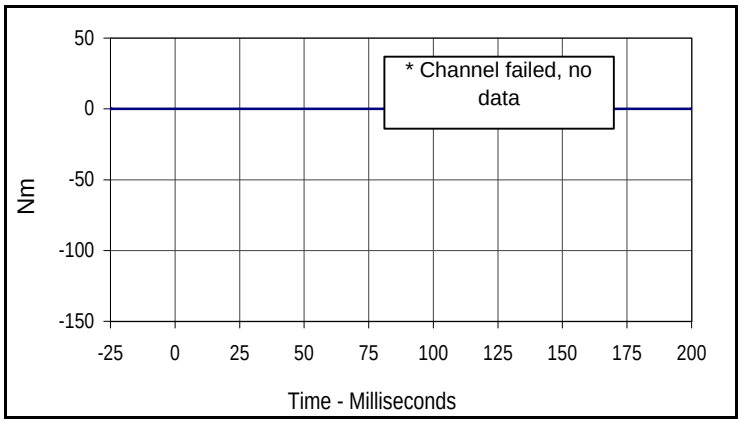
Curve Description			
Passenger Left Femur Force			
CURNO	Type	SAE Class	Units
067	FIL	600	Newtons
Max	Time	Min	Time
2014.5	46.4	-2531.0	42.9



Curve Description			
Passenger Right Femur Force			
CURNO	Type	SAE Class	Units
068	FIL	600	Newtons
Max	Time	Min	Time
1673.9	63.0	-3204.4	45.6

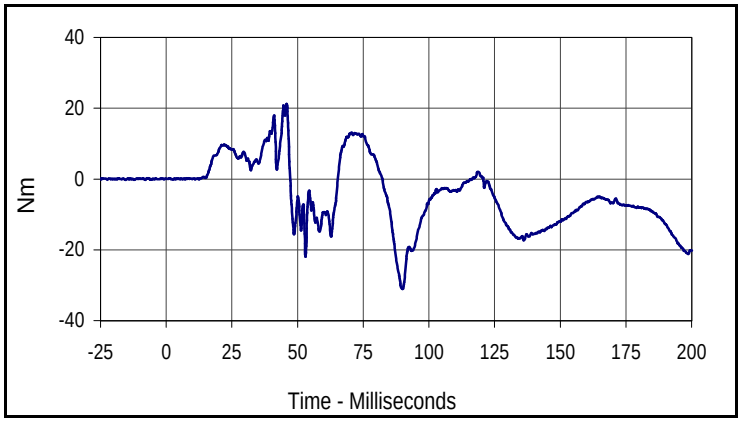


Curve Description			
Passenger Left Upper Tibia Moment X			
CURNO	Type	SAE Class	Units
069	FIL	600	Nm
Max	Time	Min	Time
52.5	71.2	-32.4	62.3

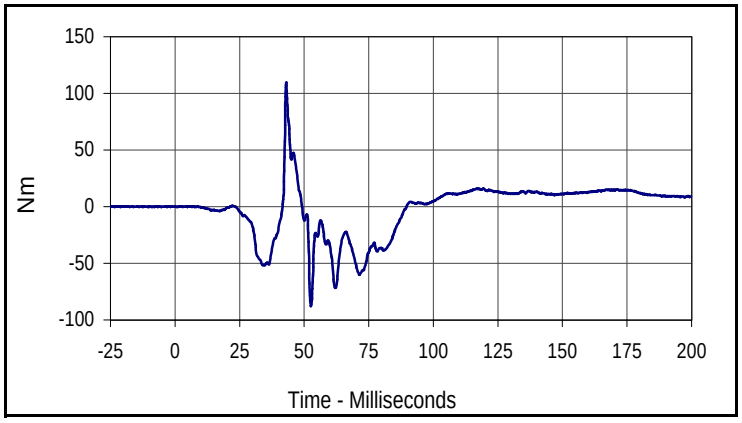


Curve Description			
Passenger Left Upper Tibia Moment Y			
CURNO	Type	SAE Class	Units
070	FIL	600	Nm
Max	Time	Min	Time
0.0	0.0	0.0	0.0

* Channel failed, no data

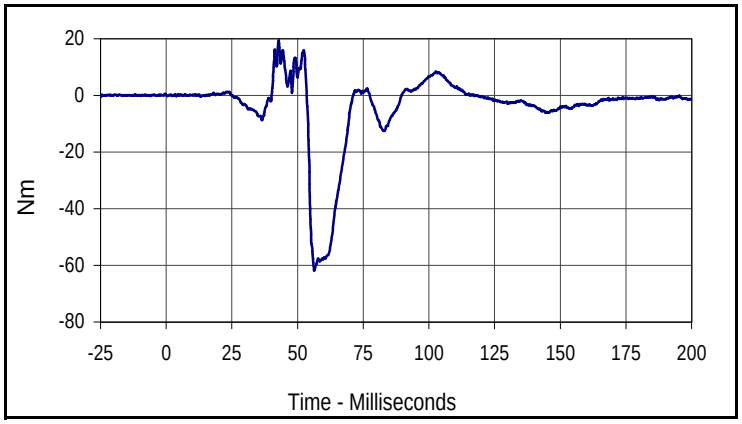


Curve Description			
Passenger Right Upper Tibia Moment X			
CURNO	Type	SAE Class	Units
071	FIL	600	Nm
Max	Time	Min	Time
21.2	45.9	-31.1	90.0

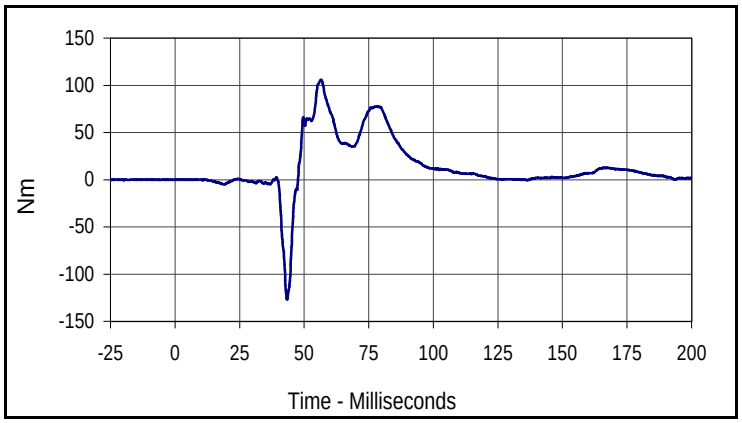


Curve Description			
Passenger Right Upper Tibia Moment Y			
CURNO	Type	SAE Class	Units
072	FIL	600	Nm
Max	Time	Min	Time
109.7	43.1	-87.7	52.6

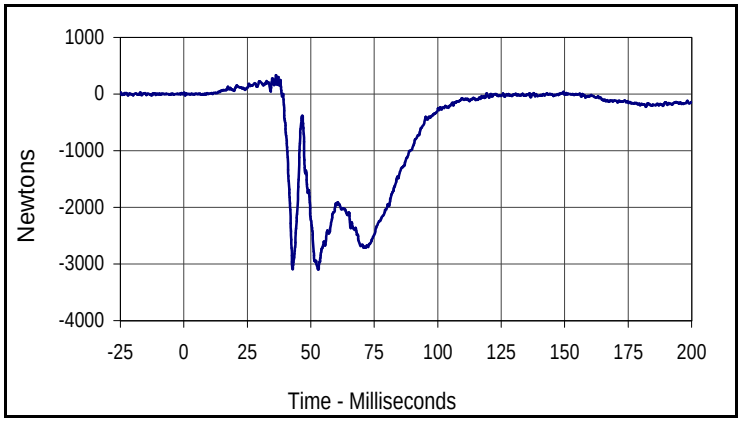
Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



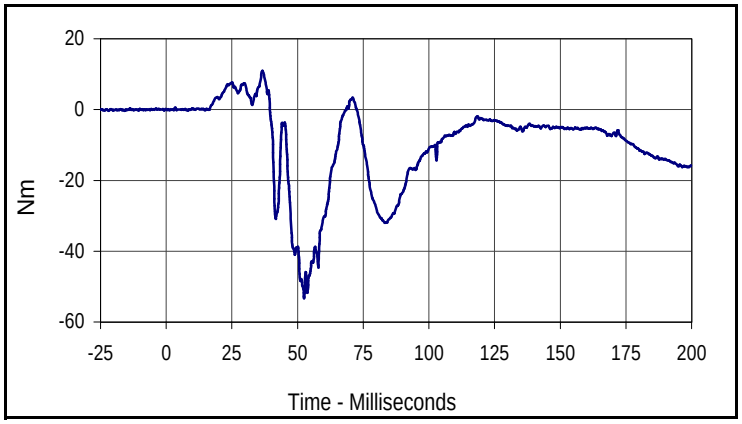
Curve Description			
Passenger Left Lower Tibia Moment X			
CURNO	Type	SAE Class	Units
073	FIL	600	Nm
Max	Time	Min	Time
19.5	42.8	-61.8	56.4



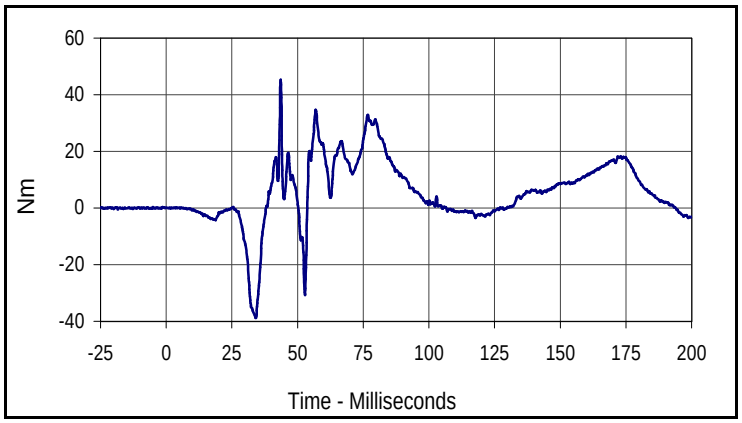
Curve Description			
Passenger Left Lower Tibia Moment Y			
CURNO	Type	SAE Class	Units
074	FIL	600	Nm
Max	Time	Min	Time
106.1	56.5	-127.1	43.4



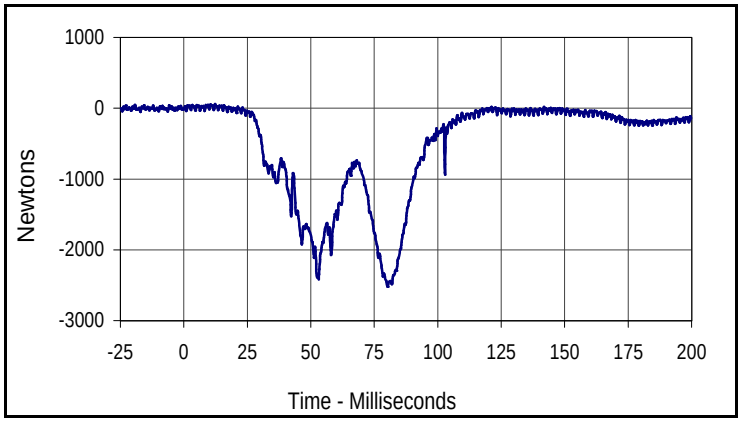
Curve Description			
Passenger Left Lower Tibia Force Z			
CURNO	Type	SAE Class	Units
075	FIL	600	Newtons
Max	Time	Min	Time
330.7	36.3	-3095.9	52.9



Curve Description			
Passenger Right Lower Tibia Moment X			
CURNO	Type	SAE Class	Units
076	FIL	600	Nm
Max	Time	Min	Time
11.0	36.6	-53.3	52.5

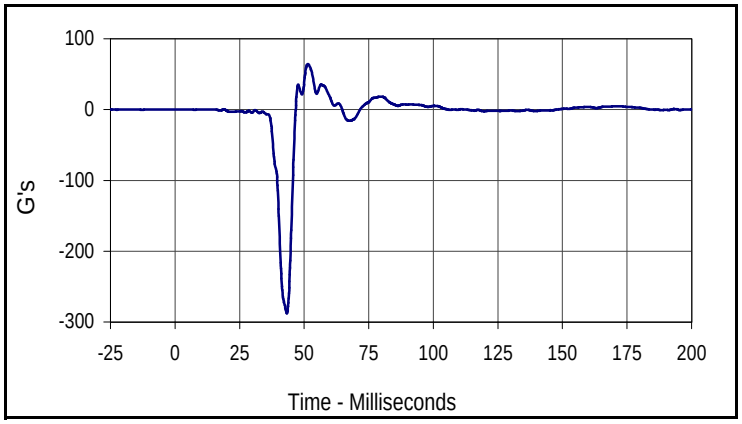


Curve Description			
Passenger Right Lower Tibia Moment Y			
CURNO	Type	SAE Class	Units
077	FIL	600	Nm
Max	Time	Min	Time
45.3	43.6	-38.8	34.1

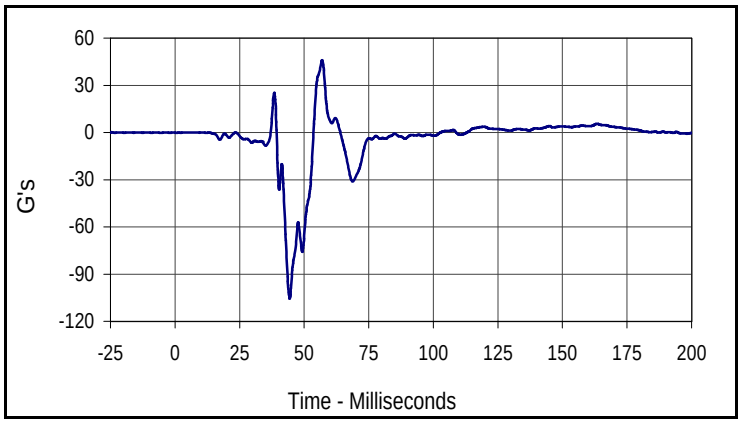


Curve Description			
Passenger Right Lower Tibia Force Z			
CURNO	Type	SAE Class	Units
078	FIL	600	Newtons
Max	Time	Min	Time
58.0	12.3	-2521.3	80.2

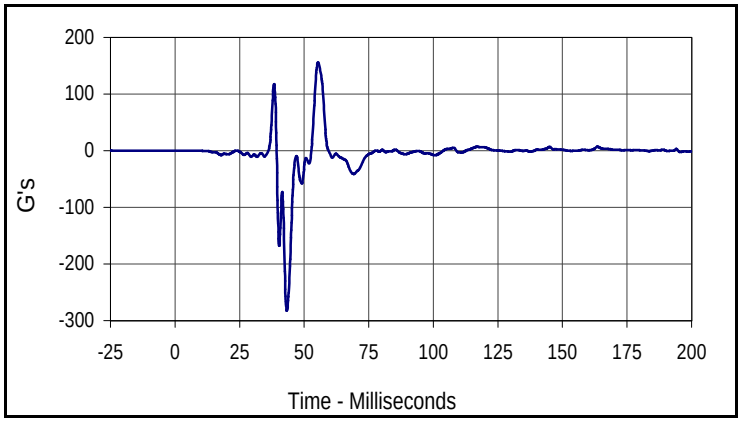
Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



Curve Description			
Passenger Left Foot Aft X			
CURNO	Type	SAE Class	Units
079	FIL	180	G's
Max	Time	Min	Time
64.4	51.4	-287.6	43.3

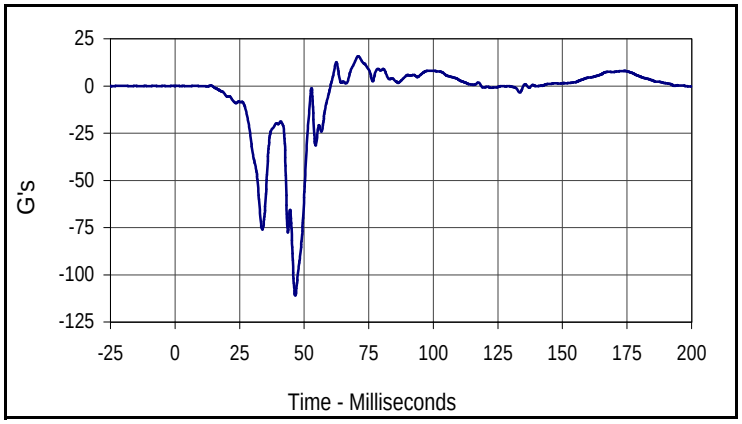


Curve Description			
Passenger Left Foot Aft Z			
CURNO	Type	SAE Class	Units
080	FIL	180	G's
Max	Time	Min	Time
46.0	57.0	-105.5	44.4

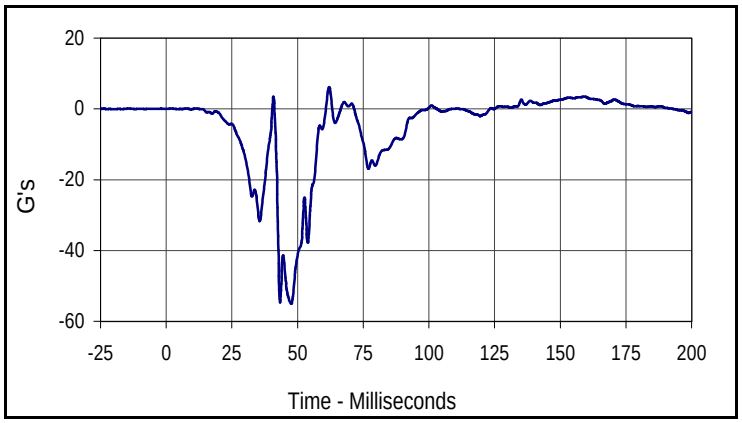


Curve Description			
Passenger Left Foot Fore Z			
CURNO	Type	SAE Class	Units
081	FIL	180	G's
Max	Time	Min	Time
155.8	55.4	-282.7	43.3

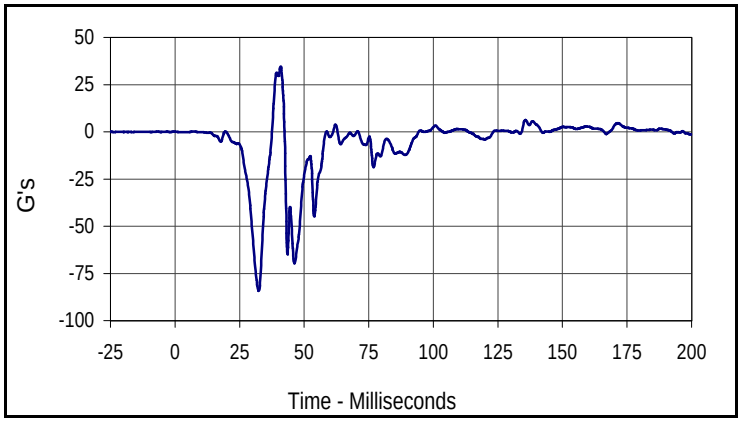
Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



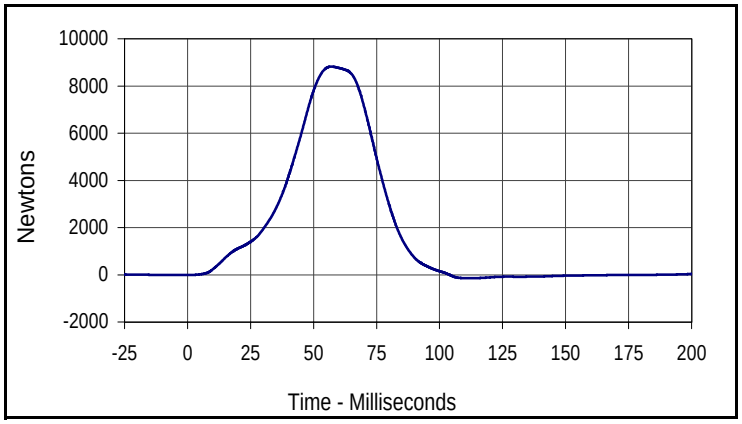
Curve Description			
Passenger Right Foot Aft X			
CURNO	Type	SAE Class	Units
082	FIL	180	G's
Max	Time	Min	Time
15.7	70.9	-111.0	46.5



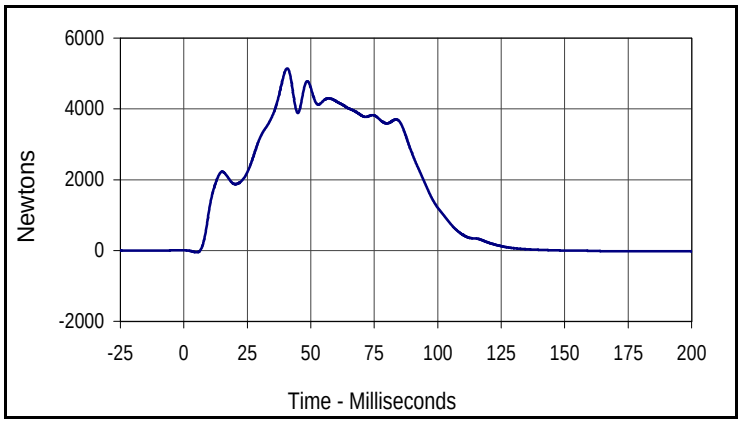
Curve Description			
Passenger Right Foot Aft Z			
CURNO	Type	SAE Class	Units
083	FIL	180	G's
Max	Time	Min	Time
6.2	62.0	-55.0	47.6



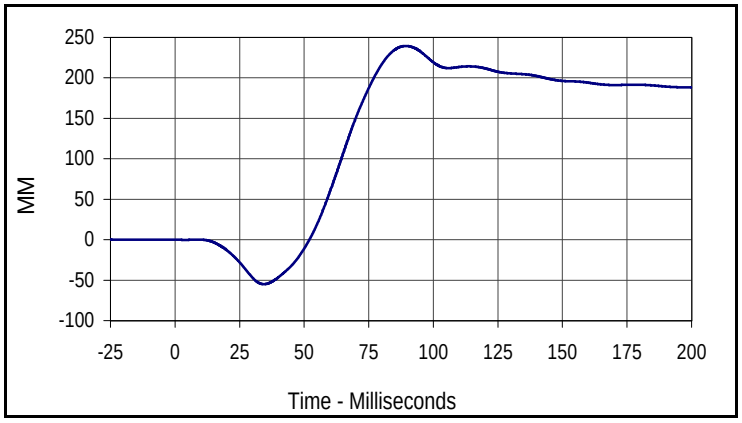
Curve Description			
Passenger Right Foot Fore Z			
CURNO	Type	SAE Class	Units
084	FIL	180	G's
Max	Time	Min	Time
34.6	40.9	-84.3	32.4



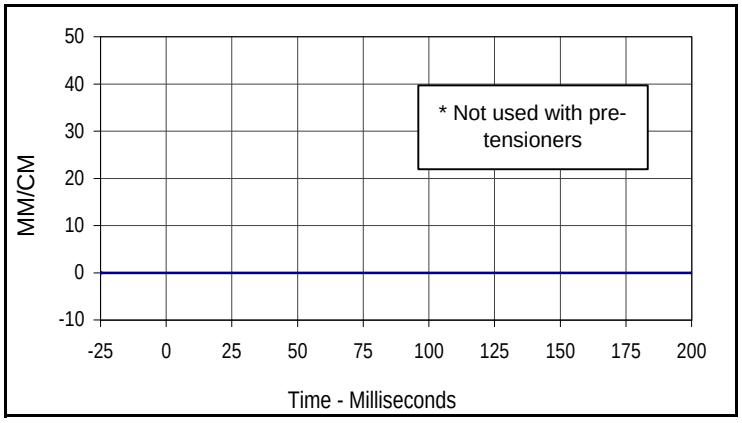
Curve Description			
Passenger Lap Belt Force			
CURNO	Type	SAE Class	Units
085	FIL	60	Newtons
Max	Time	Min	Time
8821.0	57.0	-146.3	111.5



Curve Description			
Passenger Shoulder Belt Force			
CURNO	Type	SAE Class	Units
086	FIL	60	Newtons
Max	Time	Min	Time
5144.8	40.7	-49.9	5.0



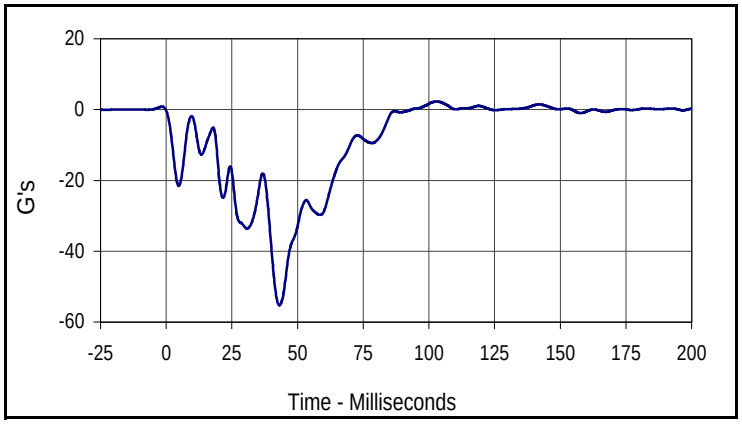
Curve Description			
Passenger Shoulder Belt Pullout			
CURNO	Type	SAE Class	Units
087	FIL	60	MM
Max	Time	Min	Time
239.4	89.4	-55.0	34.4



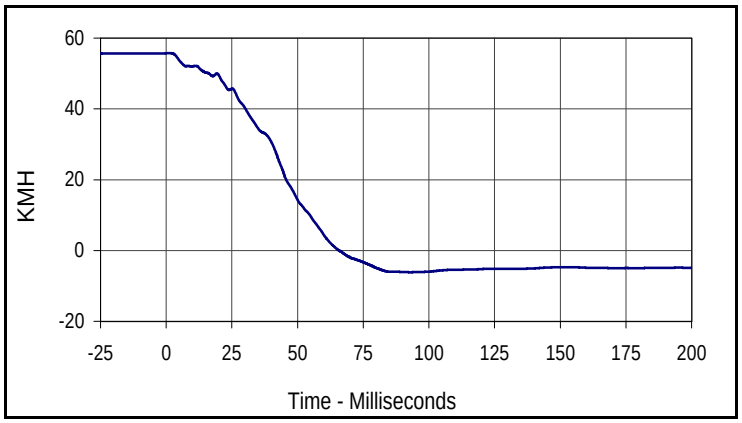
Curve Description			
Passenger Shoulder Belt Elongation			
CURNO	Type	SAE Class	Units
088	FIL	60	MM/CM
Max	Time	Min	Time
0.0	0.0	0.0	0.0

* Not used with pre-tensioners

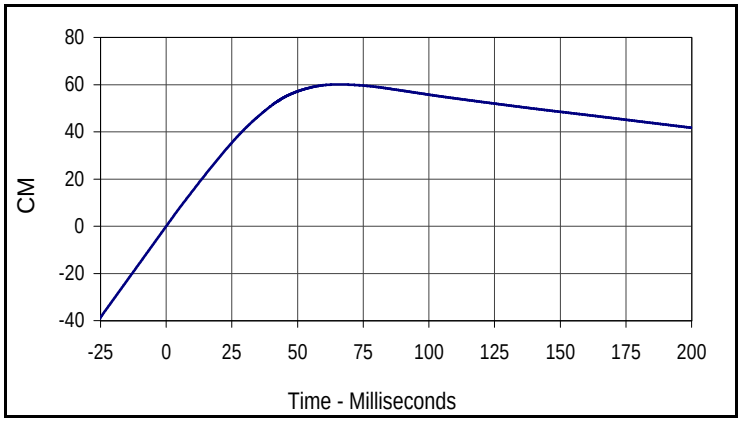
Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



Curve Description			
Vehicle Left Rear X			
CURNO	Type	SAE Class	Units
089	FIL	60	G's
Max	Time	Min	Time
2.3	102.9	-55.3	43.1

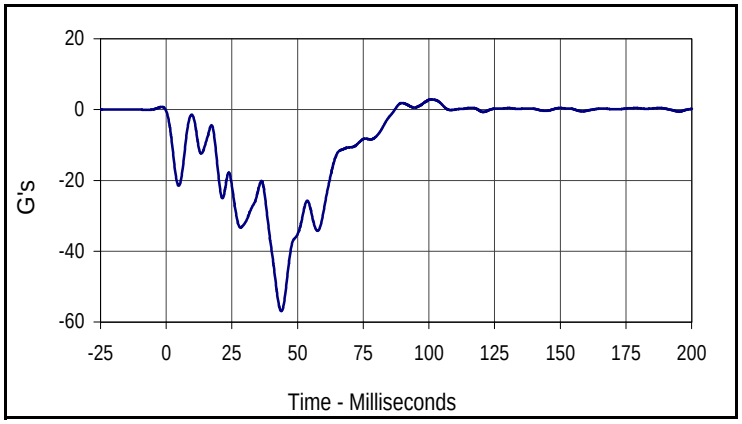


Curve Description			
Vehicle Left Rear X Velocity			
CURNO	Type	SAE Class	Units
089	IN1	180	KMH
Max	Time	Min	Time
55.7	1.5	-6.2	93.0

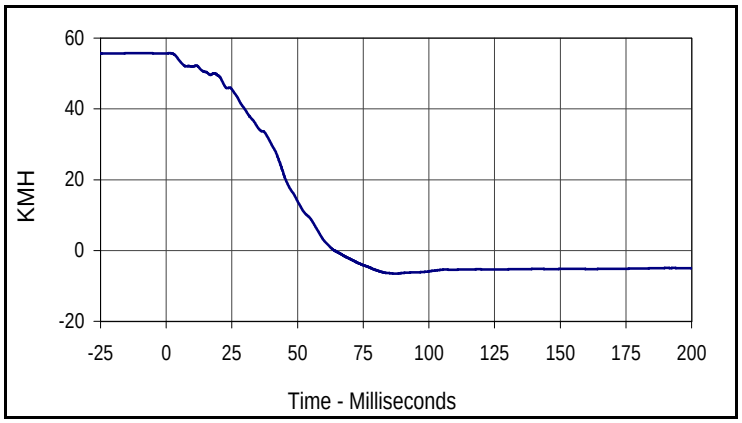


Curve Description			
Vehicle Left Rear X Displacement			
CURNO	Type	SAE Class	Units
089	IN2	180	CM
Max	Time	Min	Time
60.1	65.8	0.0	0.0

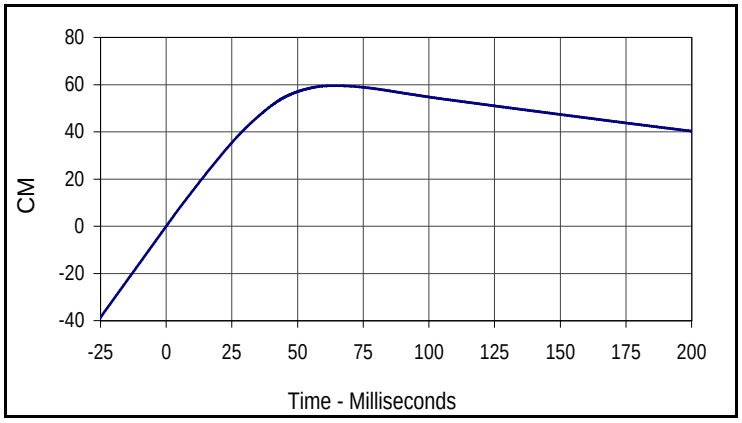
Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



Curve Description			
Vehicle Right Rear X			
CURNO	Type	SAE Class	Units
090	FIL	60	G's
Max	Time	Min	Time
2.9	100.9	-56.9	43.8

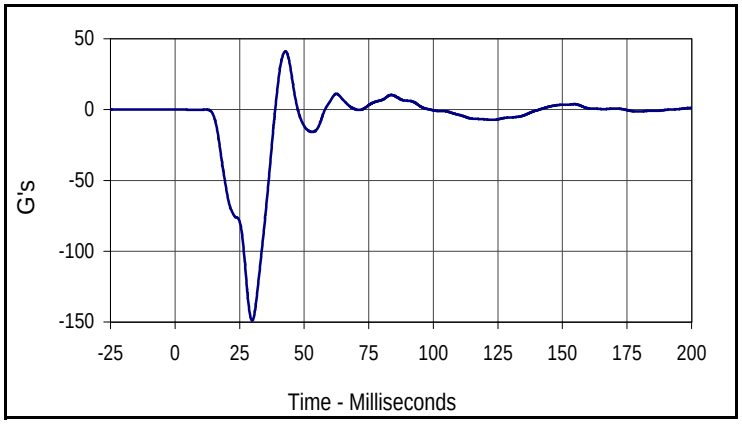


Curve Description			
Vehicle Right Rear X Velocity			
CURNO	Type	SAE Class	Units
090	IN1	180	KMH
Max	Time	Min	Time
55.7	1.5	-6.5	87.1

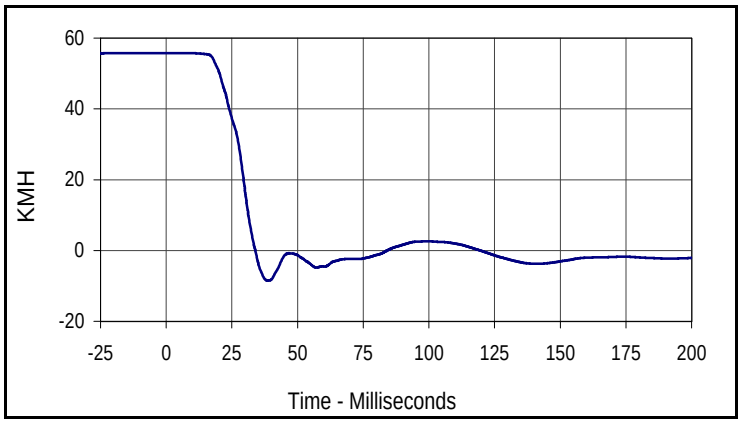


Curve Description			
Vehicle Right Rear X Displacement			
CURNO	Type	SAE Class	Units
090	IN2	180	CM
Max	Time	Min	Time
59.5	64.0	0.0	0.0

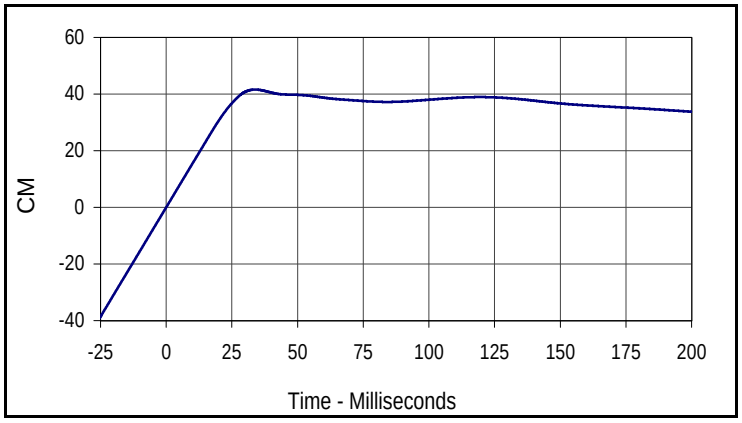
Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



Curve Description			
Vehicle Engine Top			
CURNO	Type	SAE Class	Units
091	FIL	60	G's
Max	Time	Min	Time
41.1	42.7	-149.1	29.9

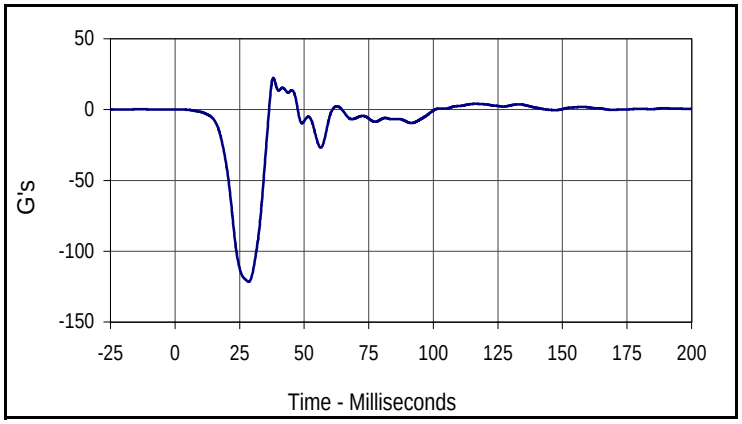


Curve Description			
Vehicle Engine Top Velocity			
CURNO	Type	SAE Class	Units
091	IN1	180	KMH
Max	Time	Min	Time
55.8	4.0	-8.5	38.6

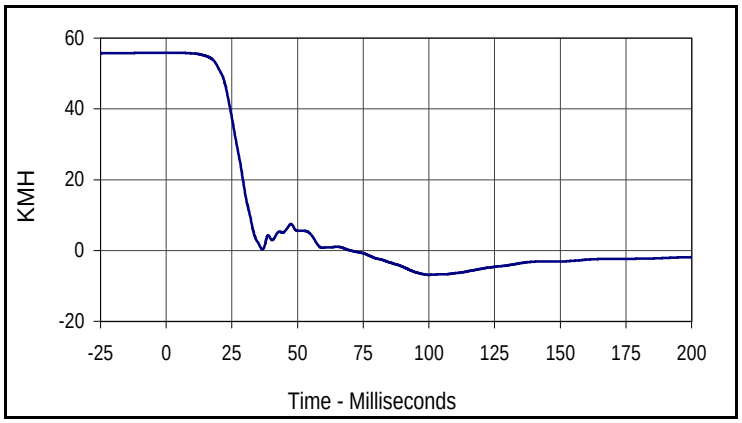


Curve Description			
Vehicle Engine Top Displacement			
CURNO	Type	SAE Class	Units
091	IN2	180	CM
Max	Time	Min	Time
41.6	33.9	0.0	0.0

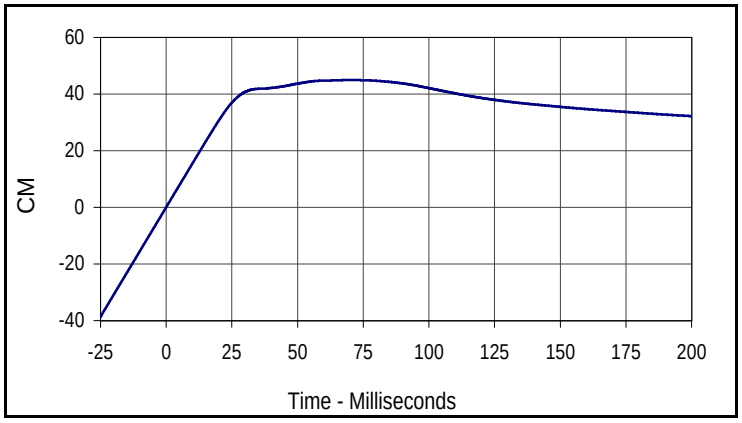
Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



Curve Description			
Vehicle Engine Bottom			
CURNO	Type	SAE Class	Units
092	FIL	60	G's
Max	Time	Min	Time
22.4	38.1	-121.6	28.5

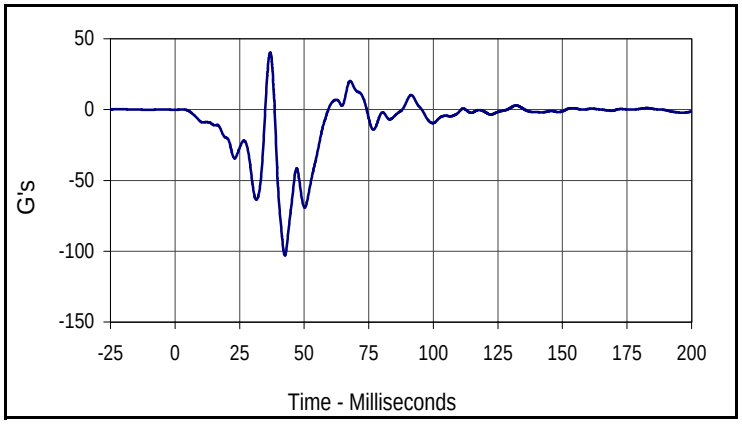


Curve Description			
Vehicle Engine Bottom Velocity			
CURNO	Type	SAE Class	Units
092	IN1	180	KMH
Max	Time	Min	Time
55.8	4.1	-6.9	99.9

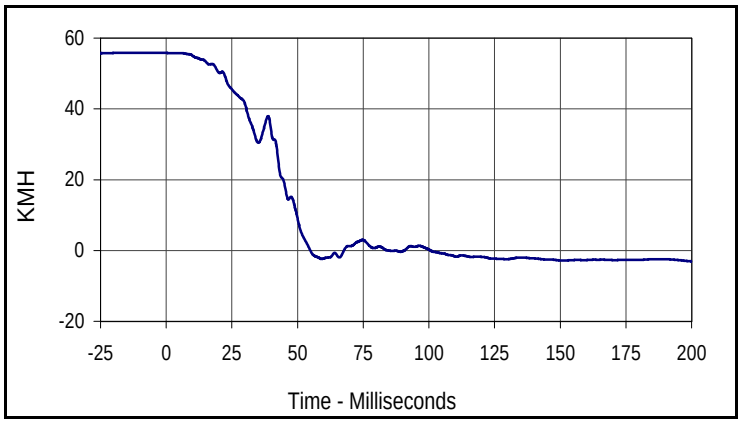


Curve Description			
Vehicle Engine Bottom Displacement			
CURNO	Type	SAE Class	Units
092	IN2	180	CM
Max	Time	Min	Time
44.9	70.2	0.1	0.0

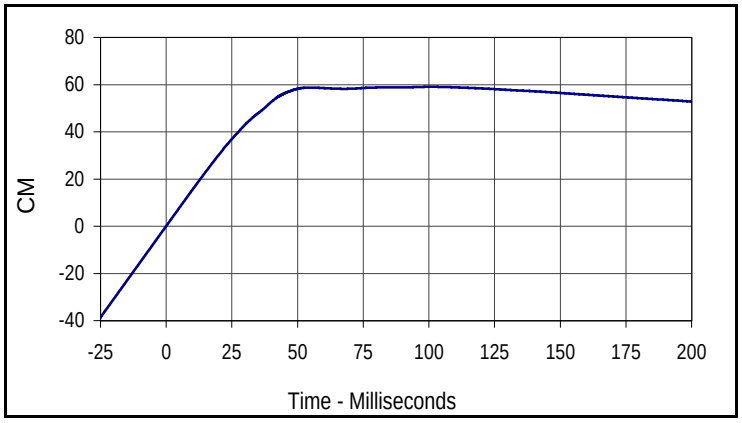
Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



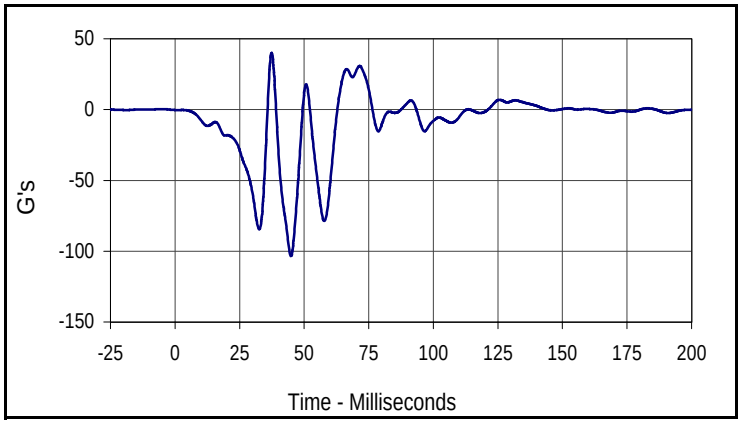
Curve Description			
Vehicle Left Brake Caliper			
CURNO	Type	SAE Class	Units
093	FIL	60	G's
Max	Time	Min	Time
40.4	36.8	-103.0	42.5



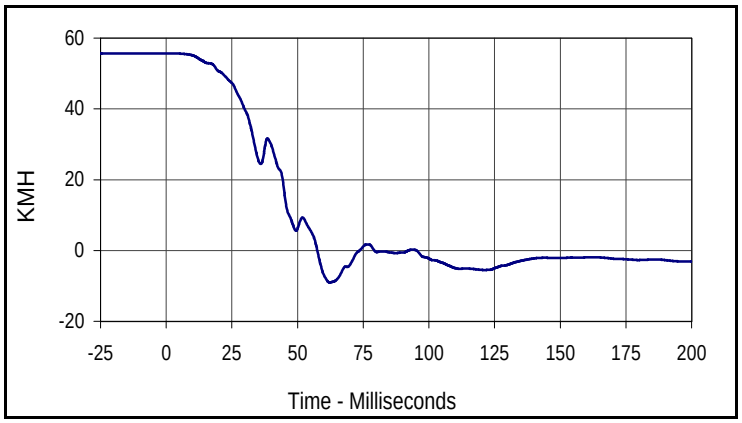
Curve Description			
Vehicle Left Brake Caliper Velocity			
CURNO	Type	SAE Class	Units
093	IN1	180	KMH
Max	Time	Min	Time
55.8	0.0	-3.1	200.0



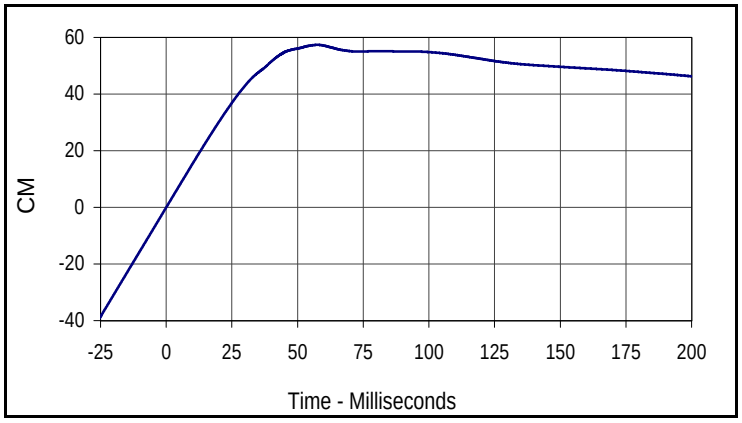
Curve Description			
Vehicle Left Brake Caliper Displacement			
CURNO	Type	SAE Class	Units
093	IN2	180	CM
Max	Time	Min	Time
59.1	100.6	0.1	0.0



Curve Description			
Vehicle Right Brake Caliper			
CURNO	Type	SAE Class	Units
094	FIL	60	G's
Max	Time	Min	Time
40.0	37.4	-103.5	44.9

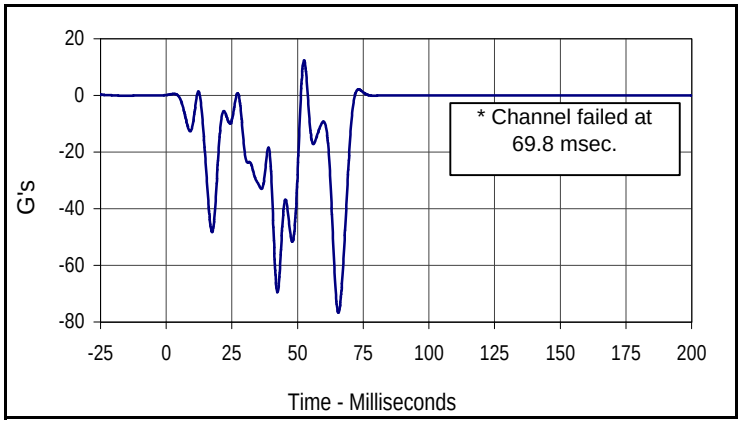


Curve Description			
Vehicle Right Brake Caliper Velocity			
CURNO	Type	SAE Class	Units
094	IN1	180	KMH
Max	Time	Min	Time
55.7	0.0	-9.1	62.2



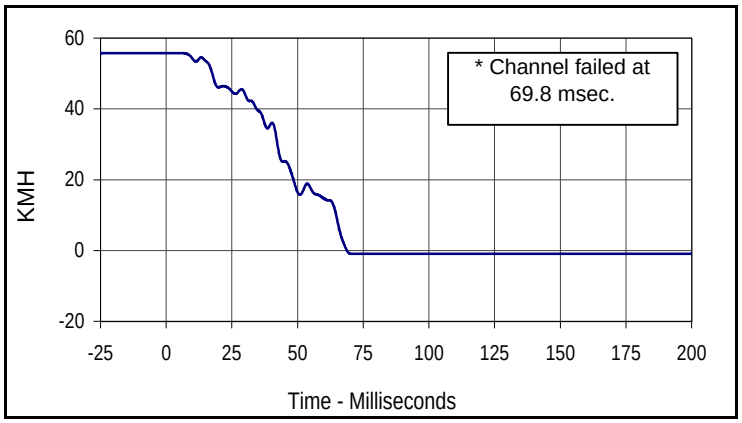
Curve Description			
Vehicle Right Brake Caliper Displacement			
CURNO	Type	SAE Class	Units
094	IN2	180	CM
Max	Time	Min	Time
57.4	57.5	0.0	0.0

Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



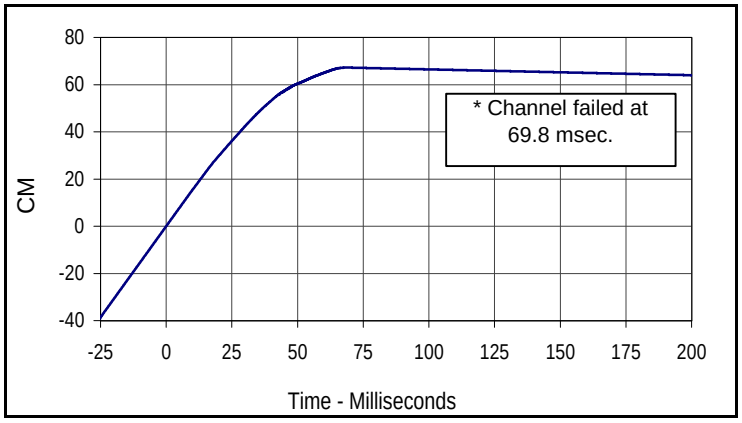
Curve Description			
Vehicle Instrument Panel			
CURNO	Type	SAE Class	Units
095	FIL	60	G's
Max	Time	Min	Time
12.4	52.5	-76.7	65.5

* Channel failed at 69.8 msec.



Curve Description			
Vehicle Instrument Panel Velocity			
CURNO	Type	SAE Class	Units
095	IN1	180	KMH
Max	Time	Min	Time
55.7	5.6	-0.9	70.3

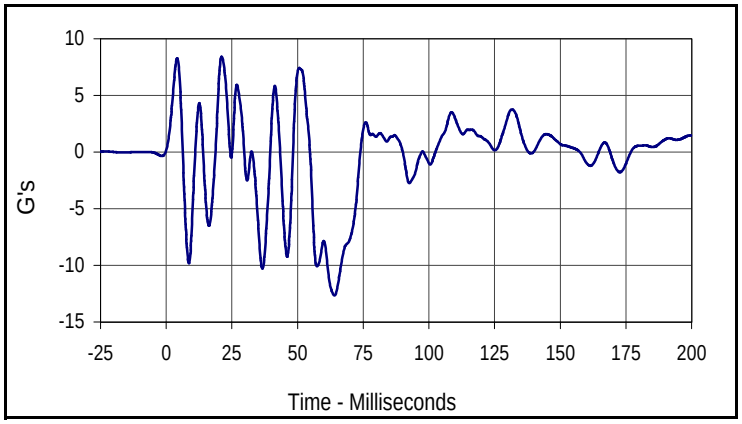
* Channel failed at 69.8 msec.



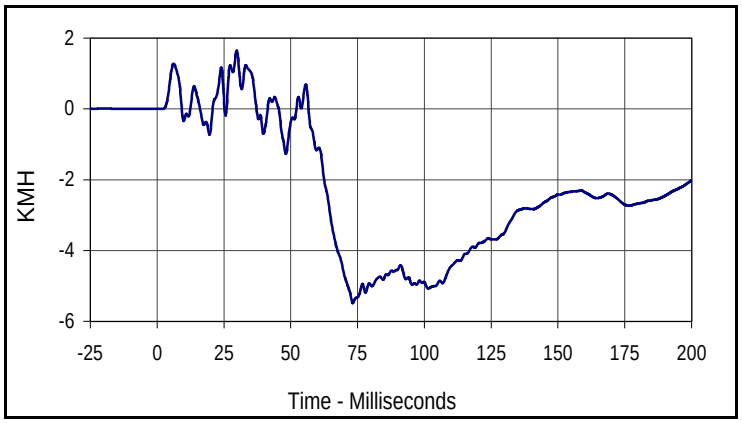
Curve Description			
Vehicle Instrument Panel Displacement			
CURNO	Type	SAE Class	Units
095	IN2	180	CM
Max	Time	Min	Time
67.2	68.8	0.0	0.0

* Channel failed at 69.8 msec.

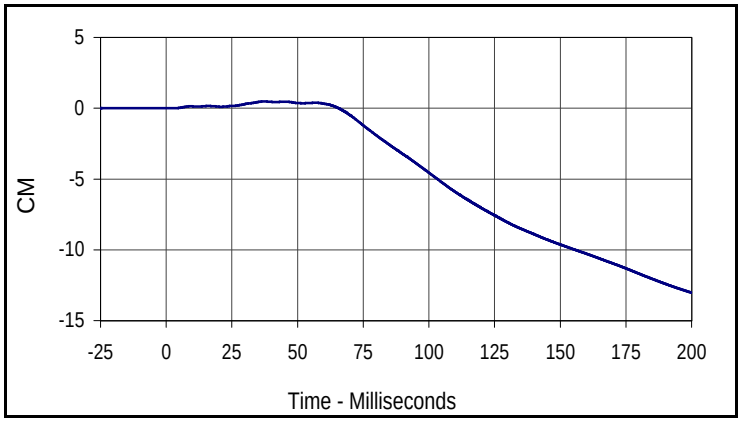
Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



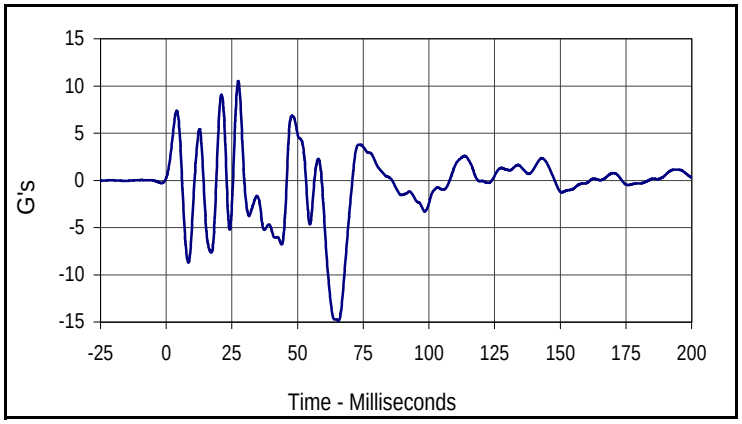
Curve Description			
Vehicle Left Rear Z			
CURNO	Type	SAE Class	Units
096	FIL	60	G's
Max	Time	Min	Time
8.4	21.1	-12.7	64.0



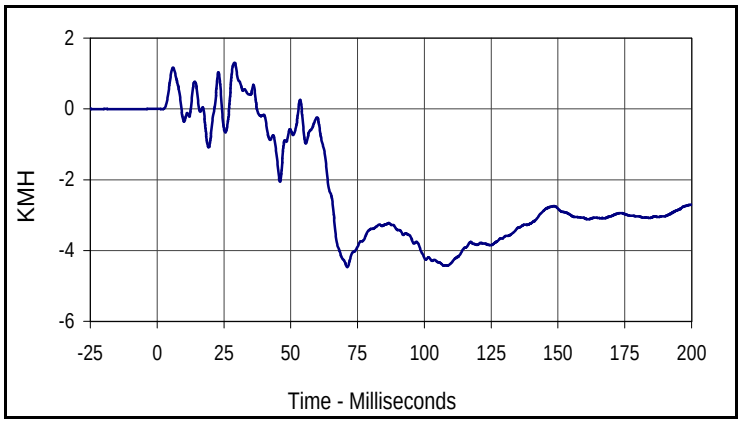
Curve Description			
Vehicle Left Rear Z Velocity			
CURNO	Type	SAE Class	Units
096	IN1	180	KMH
Max	Time	Min	Time
1.6	29.8	-5.5	73.2



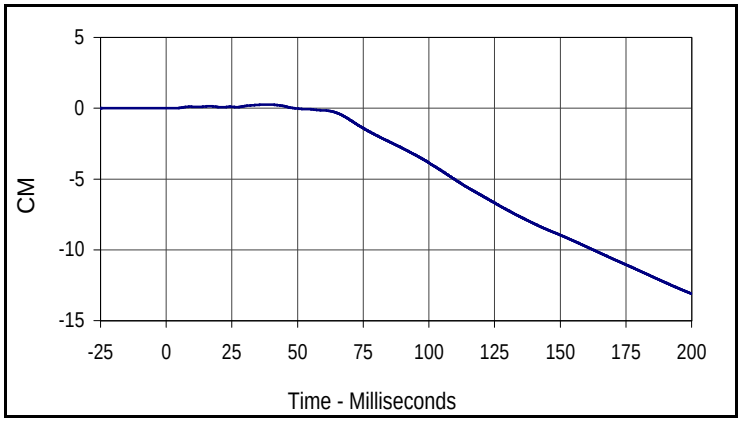
Curve Description			
Vehicle Left Rear Z Displacement			
CURNO	Type	SAE Class	Units
096	IN2	180	CM
Max	Time	Min	Time
0.5	37.2	-13.0	200.0



Curve Description			
Vehicle Right Rear Z			
CURNO	Type	SAE Class	Units
097	FIL	60	G's
Max	Time	Min	Time
10.5	27.4	-14.9	65.6



Curve Description			
Vehicle Right Rear Z Velocity			
CURNO	Type	SAE Class	Units
097	IN1	180	KMH
Max	Time	Min	Time
1.3	29.0	-4.5	71.1

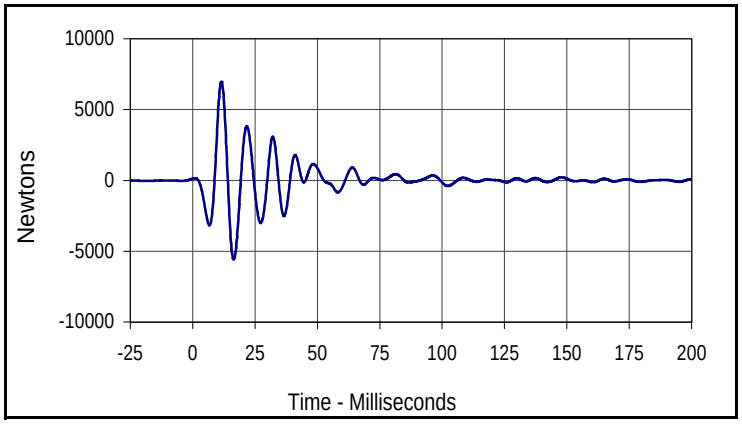


Curve Description			
Vehicle Right Rear Z Displacement			
CURNO	Type	SAE Class	Units
097	IN2	180	CM
Max	Time	Min	Time
0.3	37.4	-13.1	200.0

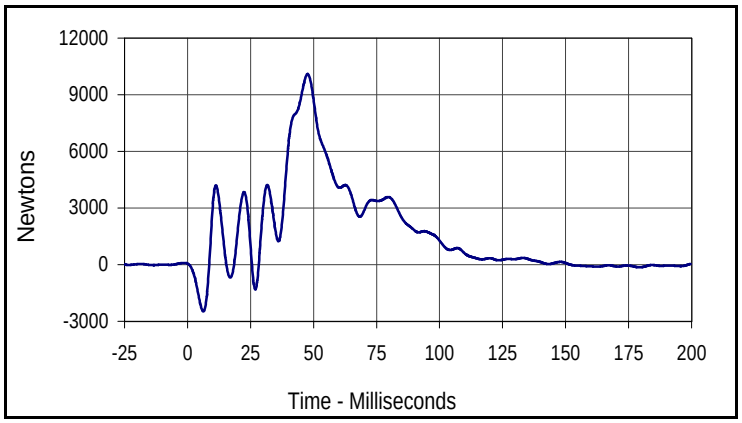
APPENDIX C

LOAD CELL BARRIER DATA PLOTS

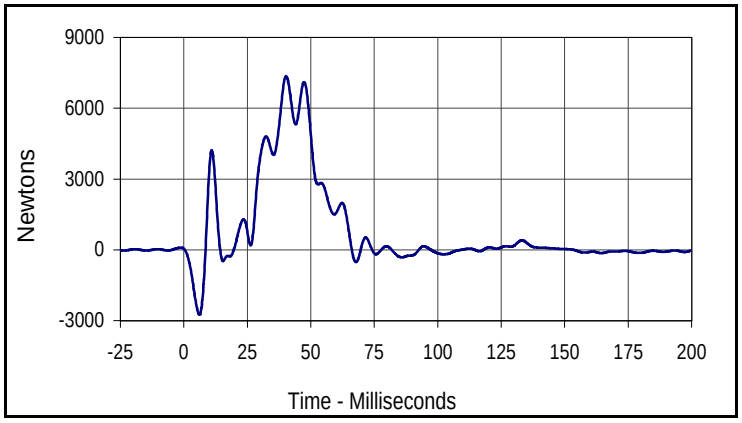
Test Vehicle:	2004 Toyota Highlander	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



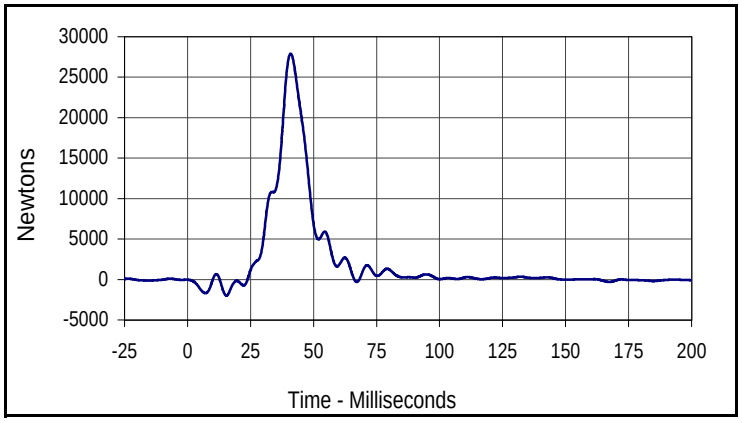
Curve Description			
Barrier Force A1			
CURNO	Type	SAE Class	Units
098	FIL	60	Newtons
Max	Time	Min	Time
6959.6	11.5	-5592.8	16.4



Curve Description			
Barrier Force B1			
CURNO	Type	SAE Class	Units
107	FIL	60	Newtons
Max	Time	Min	Time
10094.0	47.6	-2481.5	6.3

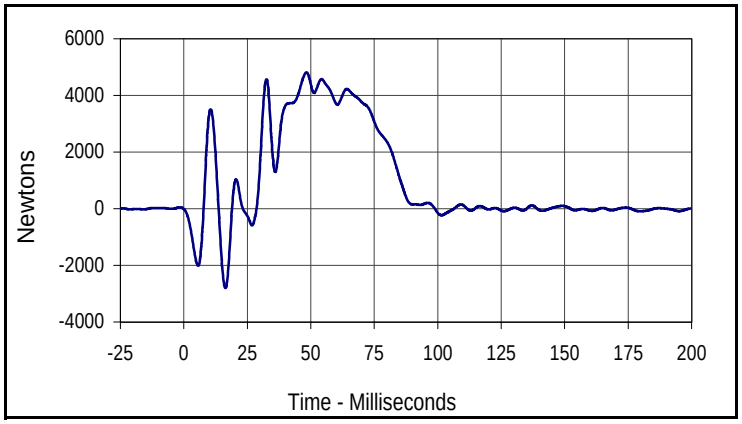


Curve Description			
Barrier Force C1			
CURNO	Type	SAE Class	Units
116	FIL	60	Newtons
Max	Time	Min	Time
7356.3	40.3	-2737.7	6.1

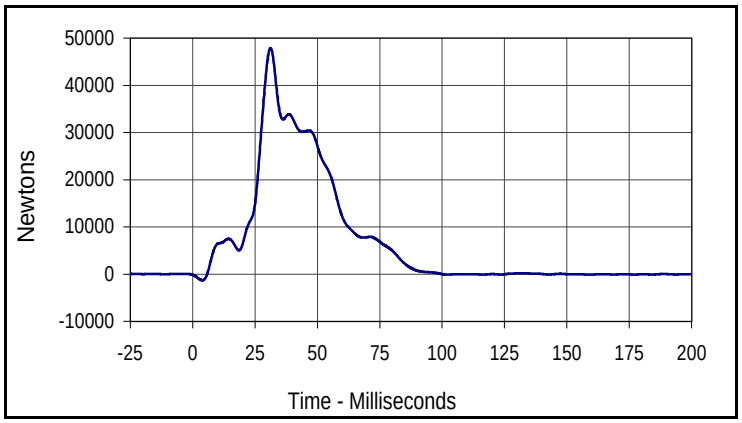


Curve Description			
Barrier Force D1			
CURNO	Type	SAE Class	Units
125	FIL	60	Newtons
Max	Time	Min	Time
27894.4	40.9	-1986.1	15.5

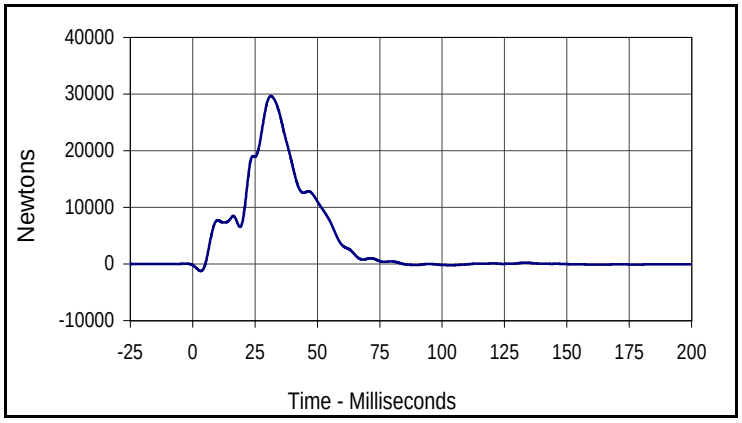
Test Vehicle:	2004 Toyota Highlander	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



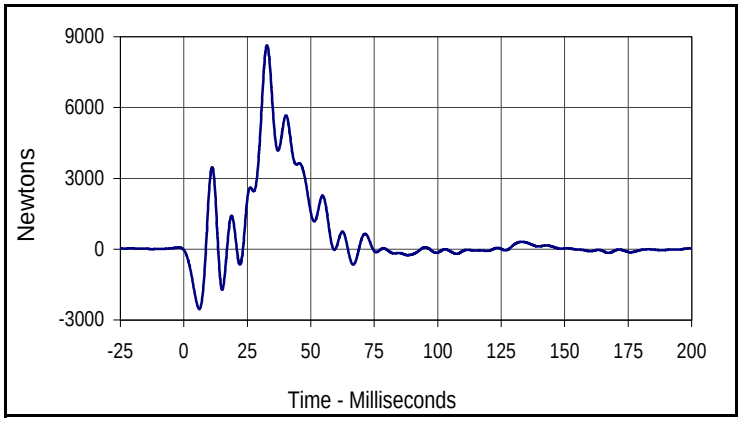
Curve Description			
Barrier Force A2			
CURNO	Type	SAE Class	Units
099	FIL	60	Newtons
Max	Time	Min	Time
4816.3	48.3	-2802.5	16.4



Curve Description			
Barrier Force B2			
CURNO	Type	SAE Class	Units
108	FIL	60	Newtons
Max	Time	Min	Time
47909.4	31.2	-1311.0	3.9

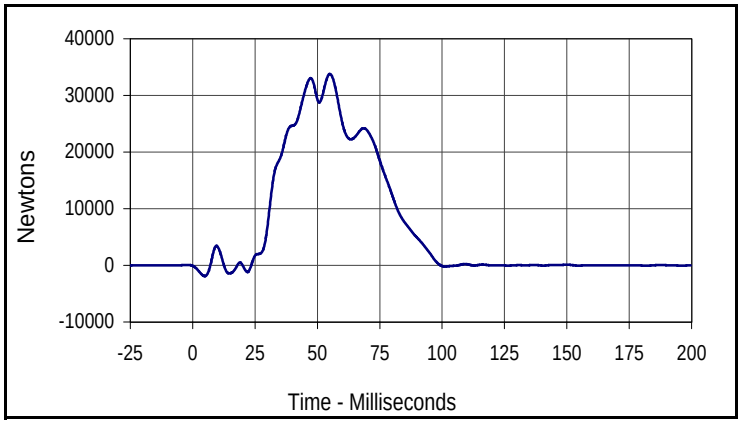


Curve Description			
Barrier Force C2			
CURNO	Type	SAE Class	Units
117	FIL	60	Newtons
Max	Time	Min	Time
29650.0	31.4	-1242.4	3.3

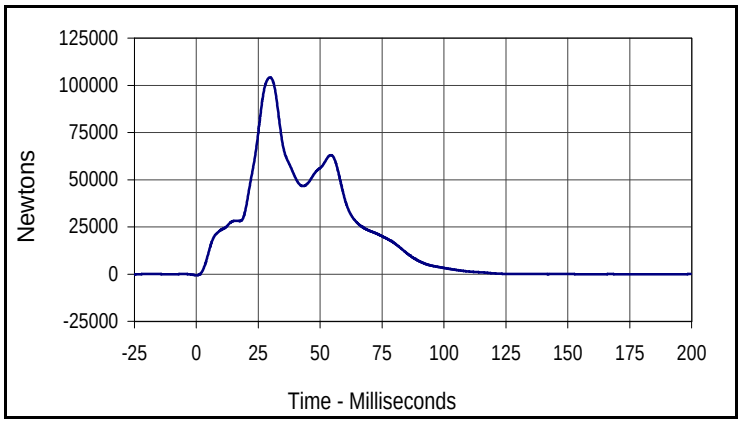


Curve Description			
Barrier Force D2			
CURNO	Type	SAE Class	Units
126	FIL	60	Newtons
Max	Time	Min	Time
8635.7	32.8	-2535.4	6.1

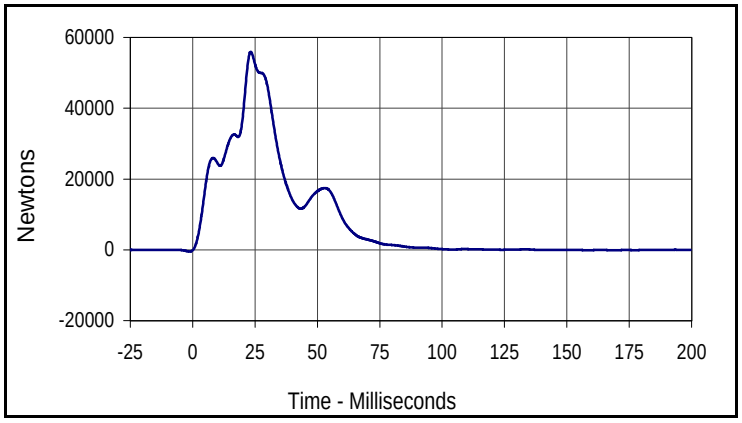
Test Vehicle:	2004 Toyota Highlander	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



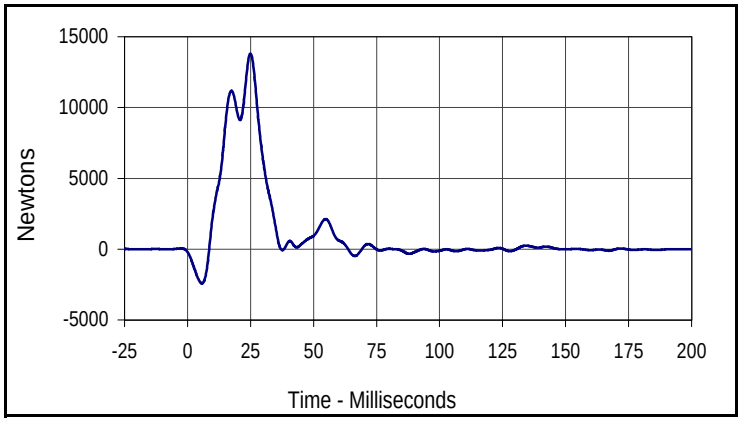
Curve Description			
Barrier Force A3			
CURNO	Type	SAE Class	Units
100	FIL	60	Newtons
Max	Time	Min	Time
33778.9	55.0	-1906.1	4.9



Curve Description			
Barrier Force B3			
CURNO	Type	SAE Class	Units
109	FIL	60	Newtons
Max	Time	Min	Time
104225.5	29.7	-571.7	0.1

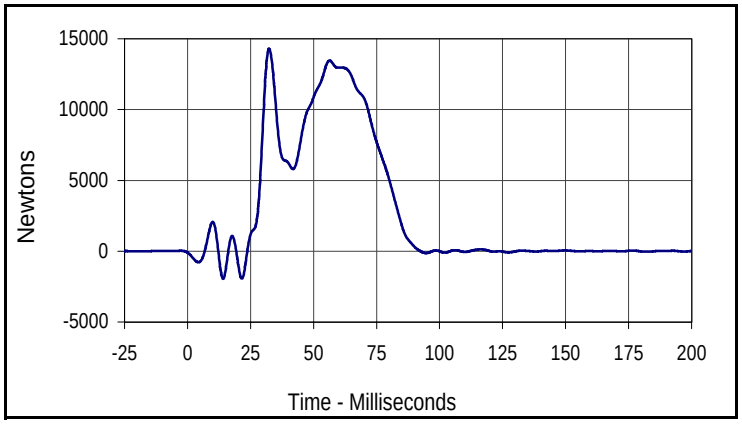


Curve Description			
Barrier Force C3			
CURNO	Type	SAE Class	Units
118	FIL	60	Newtons
Max	Time	Min	Time
55951.6	23.3	-134.5	0.0

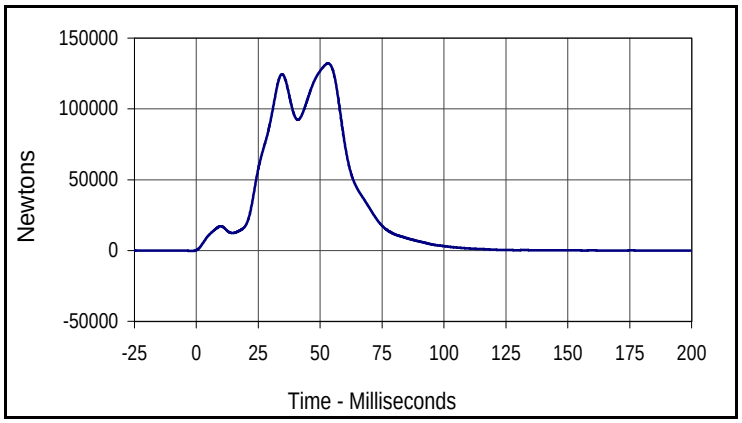


Curve Description			
Barrier Force D3			
CURNO	Type	SAE Class	Units
127	FIL	60	Newtons
Max	Time	Min	Time
13809.5	24.9	-2414.8	5.7

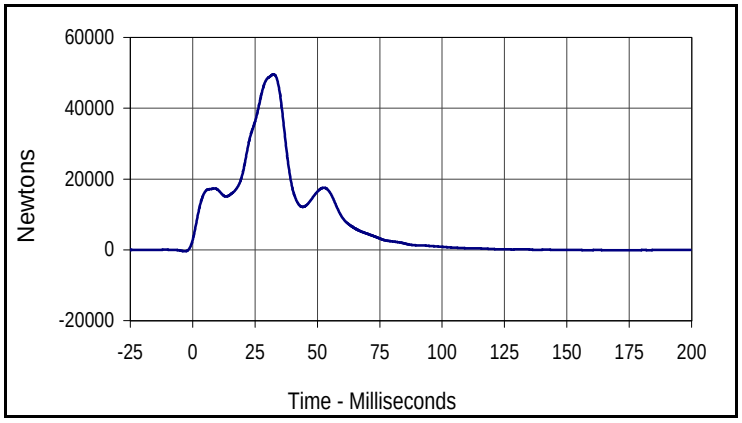
Test Vehicle:	2004 Toyota Highlander	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



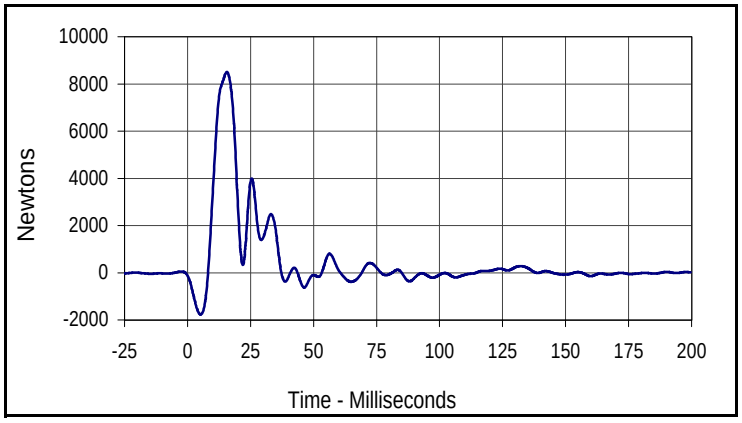
Curve Description			
Barrier Force A4			
CURNO	Type	SAE Class	Units
101	FIL	60	Newtons
Max	Time	Min	Time
14292.1	32.3	-1957.2	14.1



Curve Description			
Barrier Force B4			
CURNO	Type	SAE Class	Units
110	FIL	60	Newtons
Max	Time	Min	Time
132117.9	53.2	-40.1	197.6

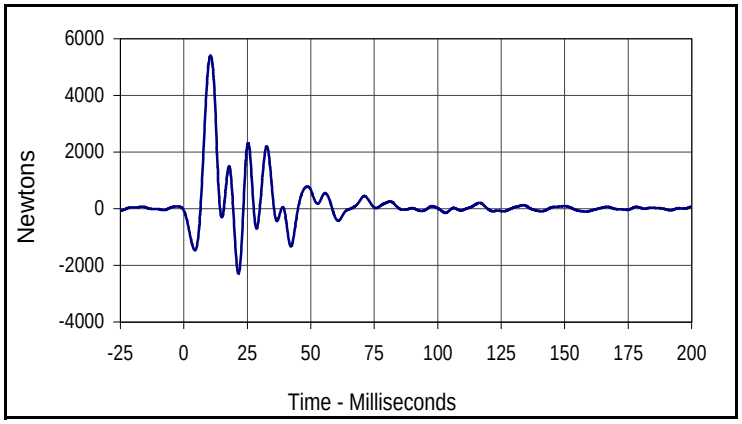


Curve Description			
Barrier Force C4			
CURNO	Type	SAE Class	Units
119	FIL	60	Newtons
Max	Time	Min	Time
49573.2	32.4	-94.5	176.8

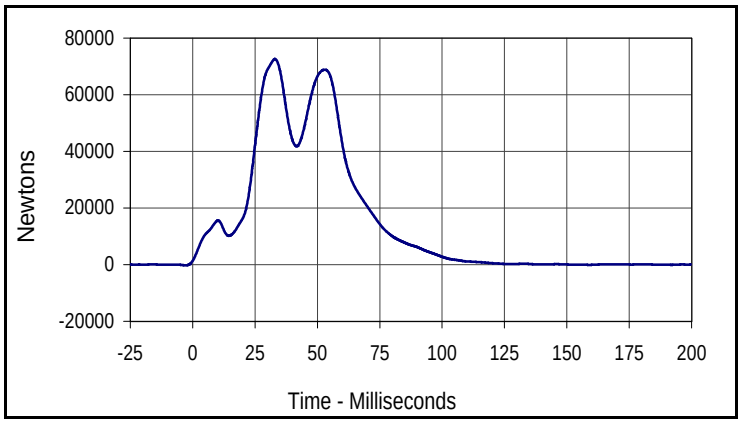


Curve Description			
Barrier Force D4			
CURNO	Type	SAE Class	Units
128	FIL	60	Newtons
Max	Time	Min	Time
8509.4	15.6	-1764.3	5.2

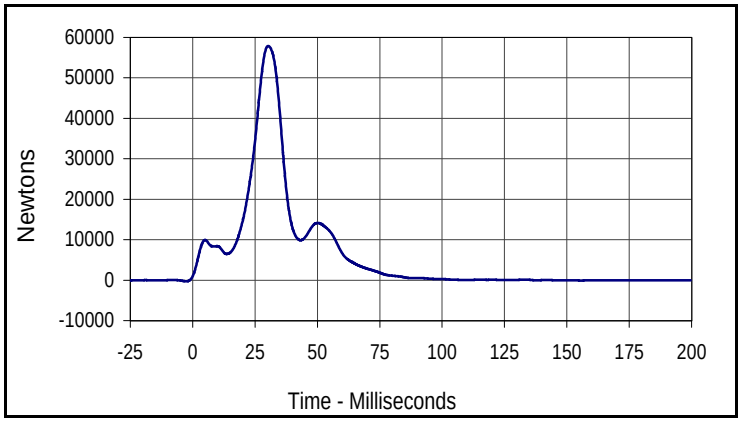
Test Vehicle:	2004 Toyota Highlander	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



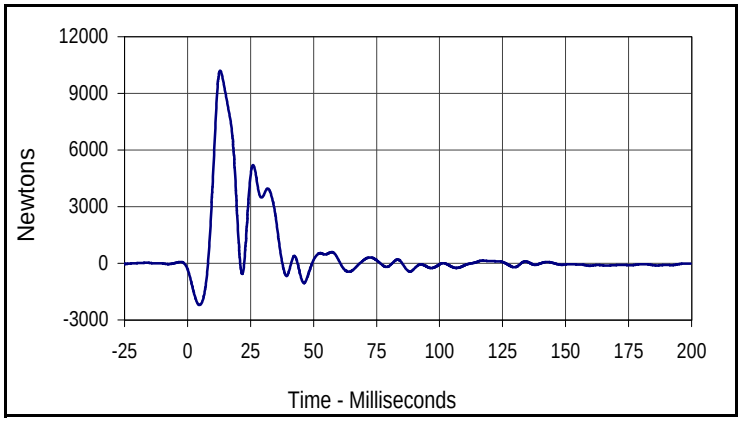
Curve Description			
Barrier Force A5			
CURNO	Type	SAE Class	Units
102	FIL	60	Newtons
Max	Time	Min	Time
5406.2	10.5	-2296.8	21.5



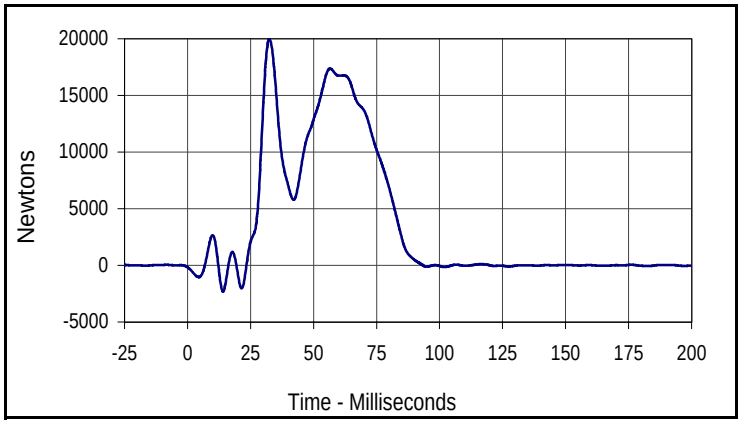
Curve Description			
Barrier Force B5			
CURNO	Type	SAE Class	Units
111	FIL	60	Newtons
Max	Time	Min	Time
72603.3	33.0	-65.8	159.1



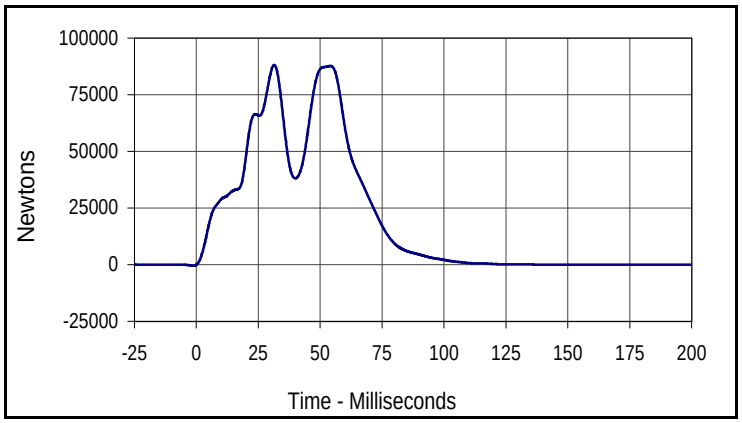
Curve Description			
Barrier Force C5			
CURNO	Type	SAE Class	Units
120	FIL	60	Newtons
Max	Time	Min	Time
57903.5	30.3	-82.3	155.8



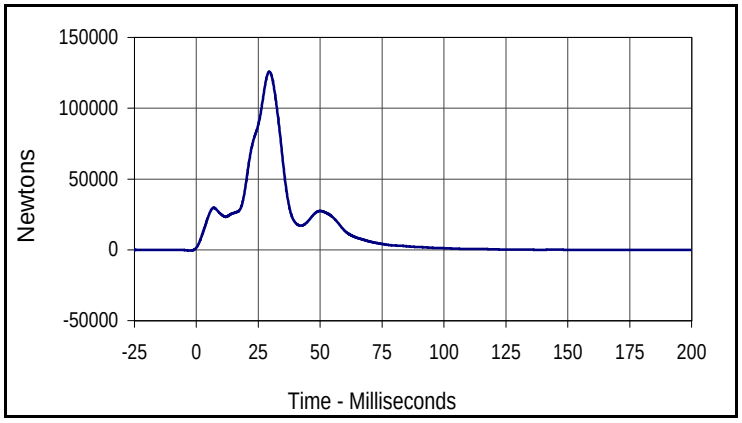
Curve Description			
Barrier Force D5			
CURNO	Type	SAE Class	Units
129	FIL	60	Newtons
Max	Time	Min	Time
10202.6	13.0	-2203.6	4.7



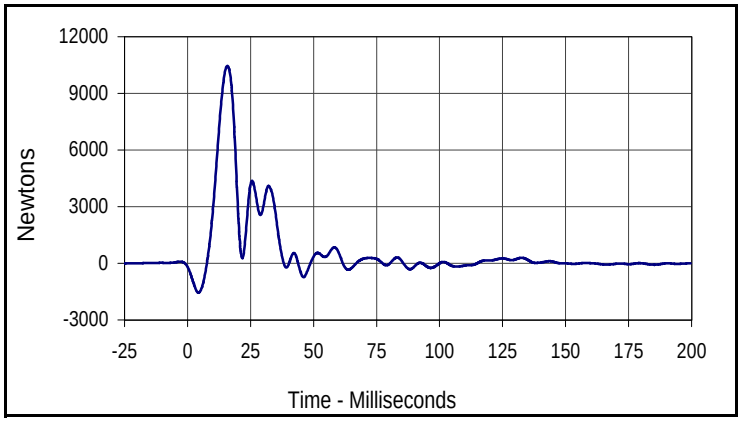
Curve Description			
Barrier Force A6			
CURNO	Type	SAE Class	Units
103	FIL	60	Newtons
Max	Time	Min	Time
19953.1	32.5	-2304.7	14.1



Curve Description			
Barrier Force B6			
CURNO	Type	SAE Class	Units
112	FIL	60	Newtons
Max	Time	Min	Time
88198.1	31.4	-69.7	0.0

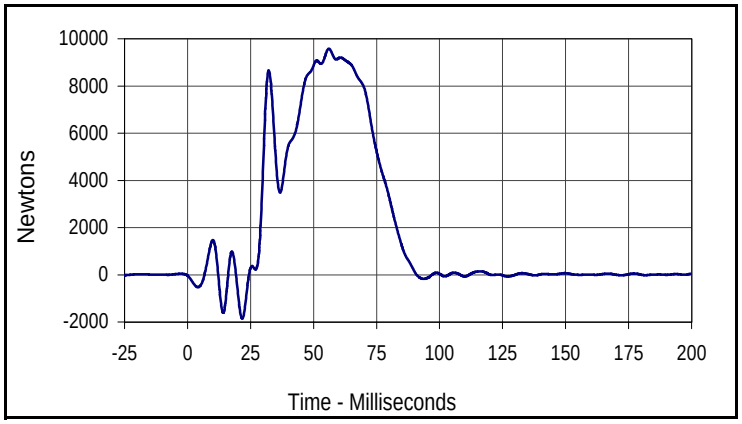


Curve Description			
Barrier Force C6			
CURNO	Type	SAE Class	Units
121	FIL	60	Newtons
Max	Time	Min	Time
125783.7	29.5	-41.7	164.5

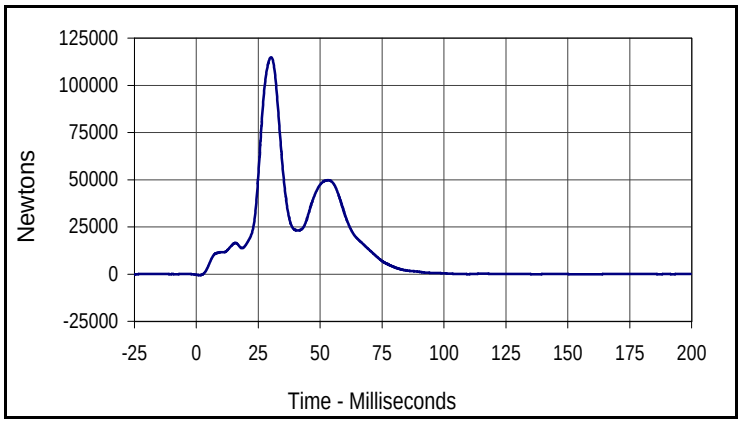


Curve Description			
Barrier Force D6			
CURNO	Type	SAE Class	Units
130	FIL	60	Newtons
Max	Time	Min	Time
10453.6	15.8	-1553.3	4.3

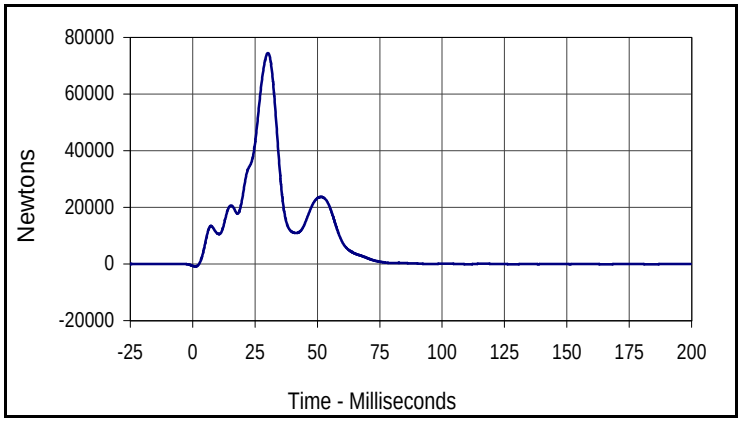
Test Vehicle:	2004 Toyota Highlander	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



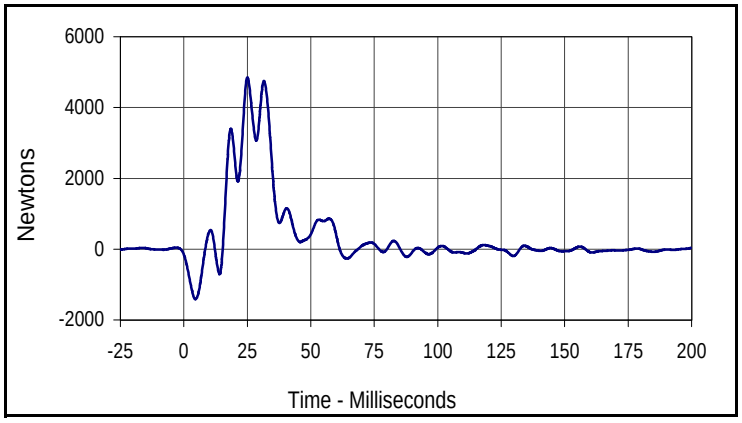
Curve Description			
Barrier Force A7			
CURNO	Type	SAE Class	Units
104	FIL	60	Newtons
Max	Time	Min	Time
9583.3	56.1	-1847.6	21.7



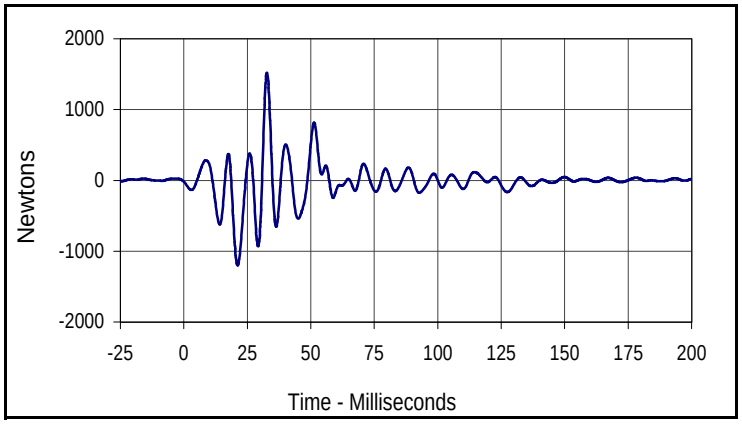
Curve Description			
Barrier Force B7			
CURNO	Type	SAE Class	Units
113	FIL	60	Newtons
Max	Time	Min	Time
114876.6	30.2	-571.5	1.3



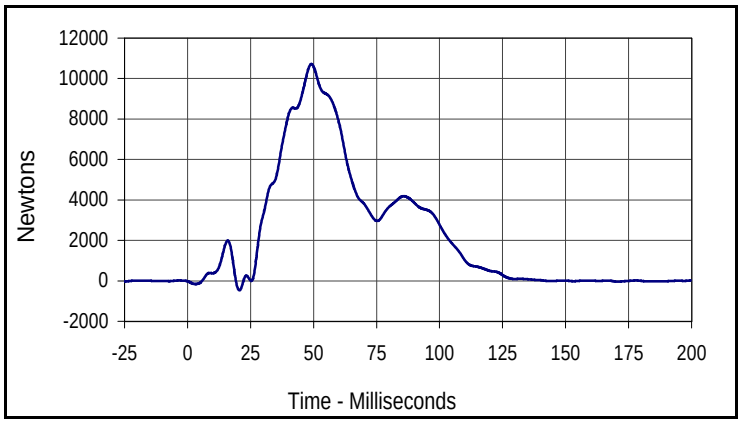
Curve Description			
Barrier Force C7			
CURNO	Type	SAE Class	Units
122	FIL	60	Newtons
Max	Time	Min	Time
74513.8	30.2	-868.5	1.1



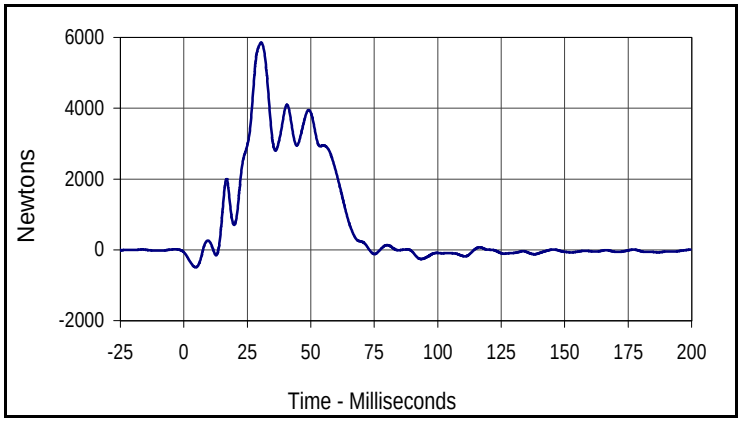
Curve Description			
Barrier Force D7			
CURNO	Type	SAE Class	Units
131	FIL	60	Newtons
Max	Time	Min	Time
4850.6	25.0	-1408.4	4.6



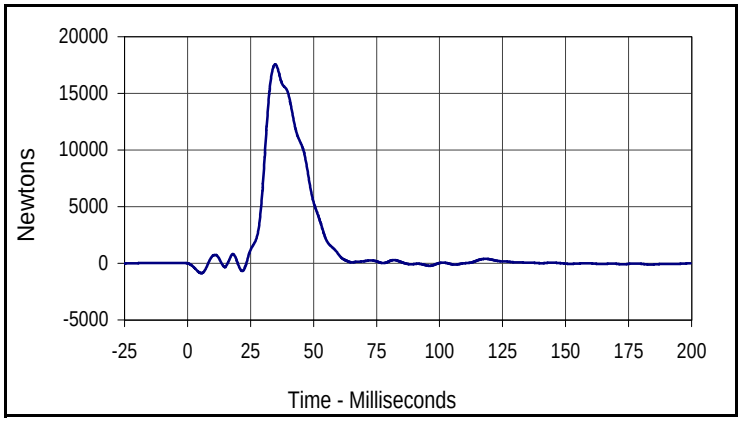
Curve Description			
Barrier Force A8			
CURNO	Type	SAE Class	Units
105	FIL	60	Newtons
Max	Time	Min	Time
1521.9	32.7	-1199.1	21.2



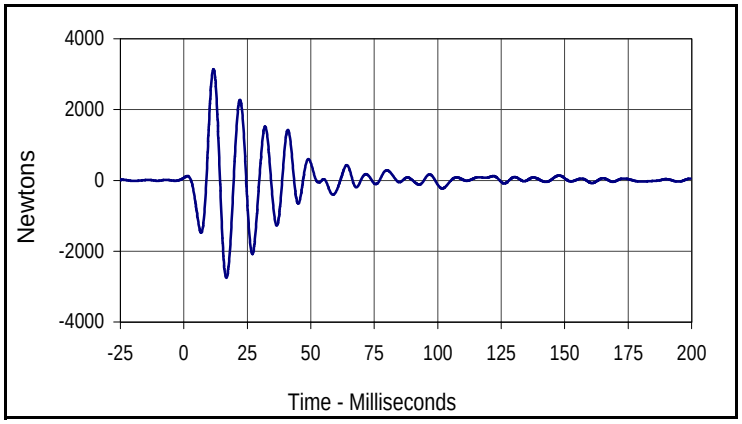
Curve Description			
Barrier Force B8			
CURNO	Type	SAE Class	Units
114	FIL	60	Newtons
Max	Time	Min	Time
10720.2	49.1	-472.5	20.6



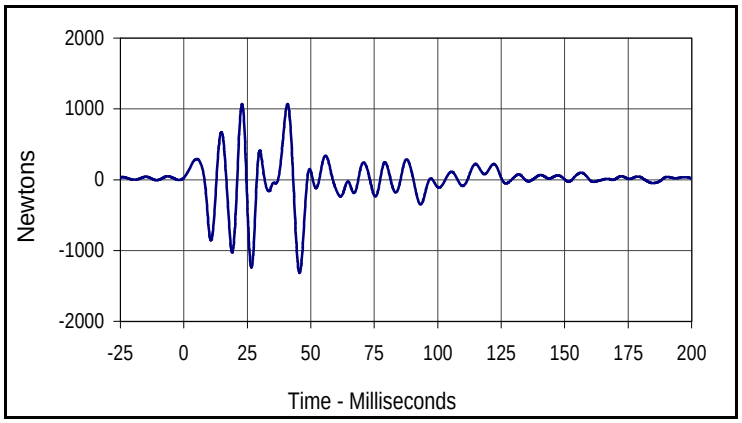
Curve Description			
Barrier Force C8			
CURNO	Type	SAE Class	Units
123	FIL	60	Newtons
Max	Time	Min	Time
5854.2	30.4	-489.5	4.8



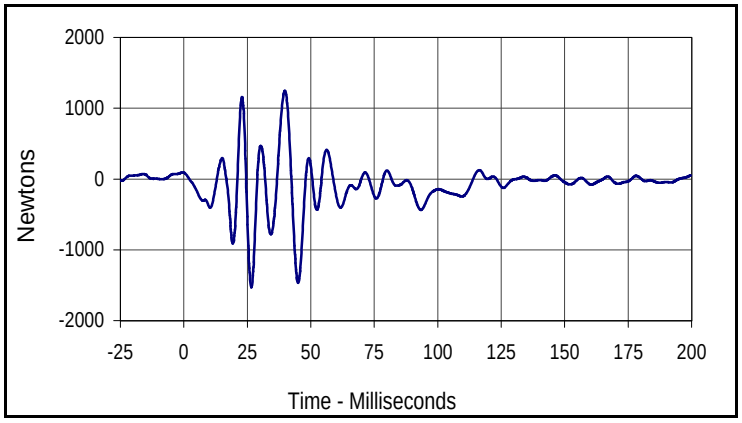
Curve Description			
Barrier Force D8			
CURNO	Type	SAE Class	Units
132	FIL	60	Newtons
Max	Time	Min	Time
17558.5	34.8	-866.6	5.5



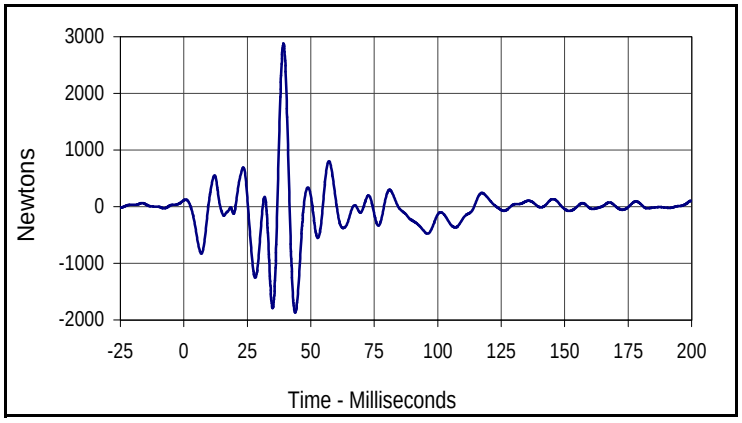
Curve Description			
Barrier Force A9			
CURNO	Type	SAE Class	Units
106	FIL	60	Newtons
Max	Time	Min	Time
3138.8	11.7	-2752.8	16.7



Curve Description			
Barrier Force B9			
CURNO	Type	SAE Class	Units
115	FIL	60	Newtons
Max	Time	Min	Time
1068.3	40.8	-1318.8	45.6



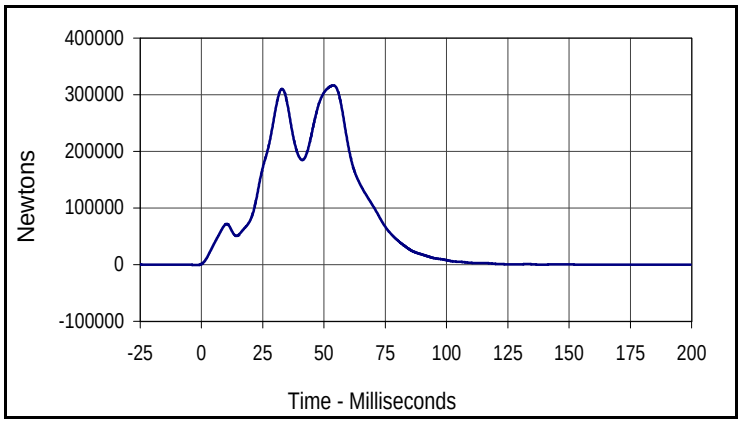
Curve Description			
Barrier Force C9			
CURNO	Type	SAE Class	Units
124	FIL	60	Newtons
Max	Time	Min	Time
1246.3	39.8	-1528.5	26.6



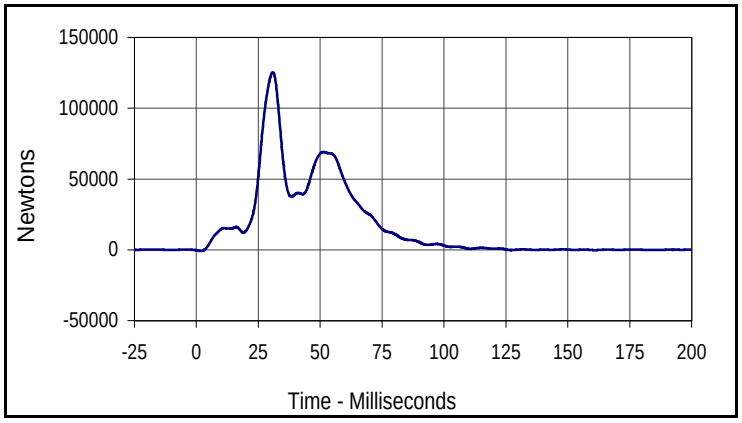
Curve Description			
Barrier Force D9			
CURNO	Type	SAE Class	Units
133	FIL	60	Newtons
Max	Time	Min	Time
2880.1	39.2	-1870.4	43.9

Test Vehicle:	2004 Toyota Highlander	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109

Curve Description			
Barrier Force Sum Group 1			
CURNO	Type	SAE Class	Units
001	SUM	60	Newtons
Max	Time	Min	Time
170718.1	31.4	-1514.7	2.1

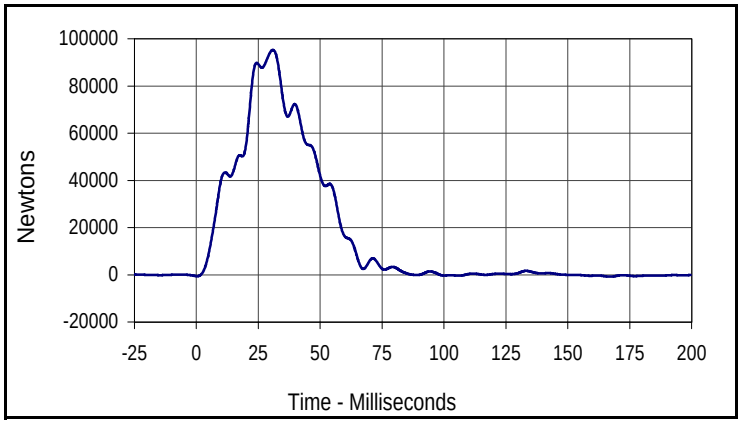


Curve Description			
Barrier Force Sum Group 2			
CURNO	Type	SAE Class	Units
002	SUM	60	Newtons
Max	Time	Min	Time
316530.9	53.8	-129.7	156.7

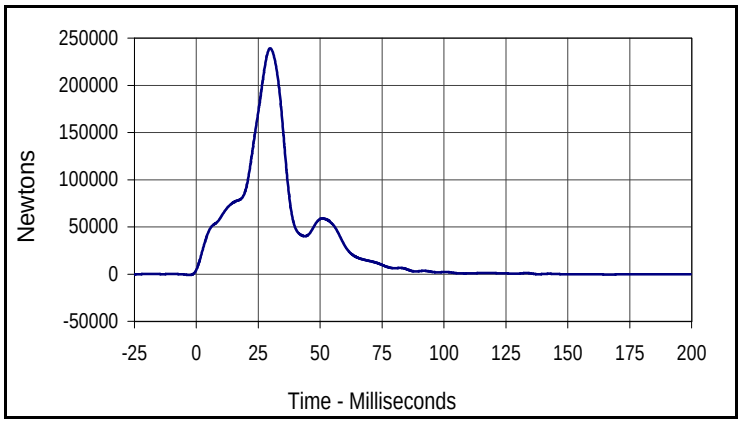


Curve Description			
Barrier Force Sum Group 3			
CURNO	Type	SAE Class	Units
003	SUM	60	Newtons
Max	Time	Min	Time
125362.2	30.8	-788.2	1.8

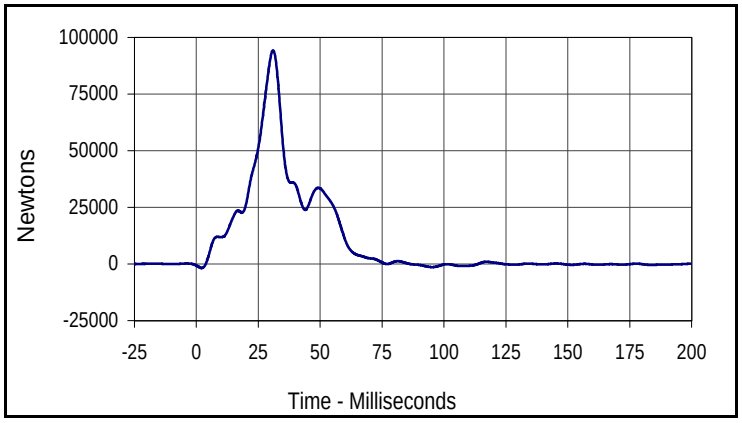
Test Vehicle:	2004 Toyota Highlander	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



Curve Description			
Barrier Force Sum Group 4			
CURNO	Type	SAE Class	Units
004	SUM	60	Newtons
Max	Time	Min	Time
95237.7	30.9	-808.0	167.1

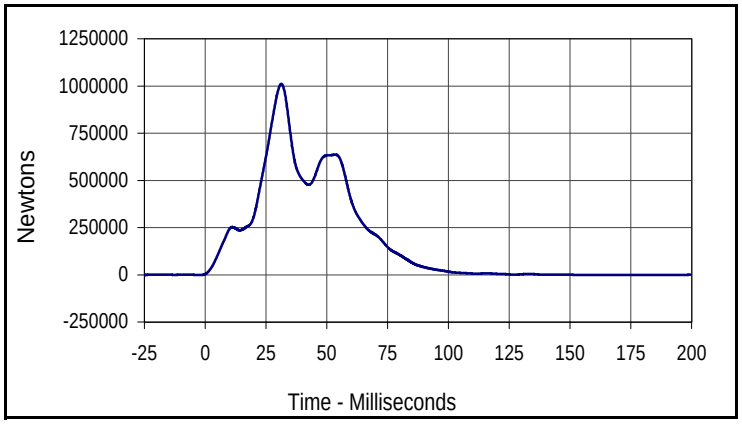


Curve Description			
Barrier Force Sum Group 5			
CURNO	Type	SAE Class	Units
005	SUM	60	Newtons
Max	Time	Min	Time
239194.6	29.8	-427.7	166.3

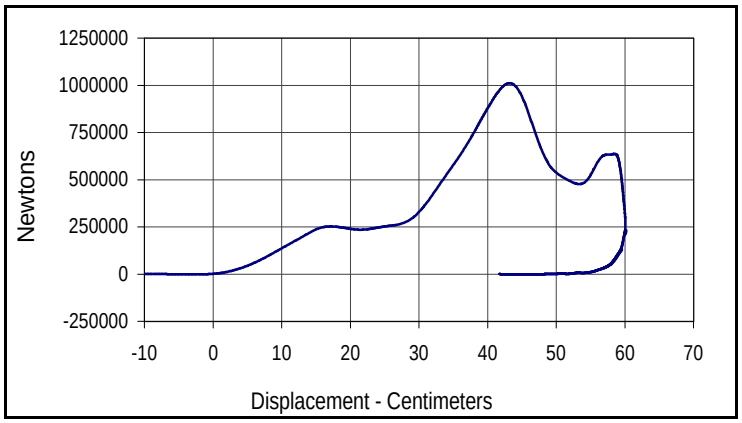


Curve Description			
Barrier Force Sum Group 6			
CURNO	Type	SAE Class	Units
006	SUM	60	Newtons
Max	Time	Min	Time
94345.5	30.9	-1775.3	2.1

Test Vehicle:	2004 Toyota Highlander	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



Curve Description			
Barrier Force Total Sum			
CURNO	Type	SAE Class	Units
007	SUM	60	Newtons
Max	Time	Min	Time
1011407.2	31.3	-1557.6	160.3



Curve Description			
Barrier Force Total Sum vs. Displ.			
CURNO	Type	SAE Class	Units
001	XVY	60	Newtons
Max	CM	Min	CM
1011407.2	43.2	-1557.6	47.1

BARRIER LOAD CELL SUMMARY DATA

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109

Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04

Location	Units	Max	Time	Min	Time
Barrier Force A1	Newtons	6959.6	11.5	-5592.8	16.4
Barrier Force A2	Newtons	4816.3	48.3	-2802.5	16.4
Barrier Force A3	Newtons	33778.9	55.0	-1906.1	4.9
Barrier Force A4	Newtons	14292.1	32.3	-1957.2	14.1
Barrier Force A5	Newtons	5406.2	10.5	-2296.8	21.5
Barrier Force A6	Newtons	19953.1	32.5	-2304.7	14.1
Barrier Force A7	Newtons	9583.3	56.1	-1847.6	21.7
Barrier Force A8	Newtons	1521.9	32.7	-1199.1	21.2
Barrier Force A9	Newtons	3138.8	11.7	-2752.8	16.7
Barrier Force B1	Newtons	10094.0	47.6	-2481.5	6.3
Barrier Force B2	Newtons	47909.4	31.2	-1311.0	3.9
Barrier Force B3	Newtons	104225.5	29.7	-571.7	0.1
Barrier Force B4	Newtons	132117.9	53.2	-40.1	197.6
Barrier Force B5	Newtons	72603.3	33.0	-65.8	159.1
Barrier Force B6	Newtons	88198.1	31.4	-69.7	0.0
Barrier Force B7	Newtons	114876.6	30.2	-571.5	1.3
Barrier Force B8	Newtons	10720.2	49.1	-472.5	20.6
Barrier Force B9	Newtons	1068.3	40.8	-1318.8	45.6
Barrier Force C1	Newtons	7356.3	40.3	-2737.7	6.1
Barrier Force C2	Newtons	29650.0	31.4	-1242.4	3.3
Barrier Force C3	Newtons	55951.6	23.3	-134.5	0.0
Barrier Force C4	Newtons	49573.2	32.4	-94.5	176.8
Barrier Force C5	Newtons	57903.5	30.3	-82.3	155.8
Barrier Force C6	Newtons	125783.7	29.5	-41.7	164.5
Barrier Force C7	Newtons	74513.8	30.2	-868.5	1.1
Barrier Force C8	Newtons	5854.2	30.4	-489.5	4.8
Barrier Force C9	Newtons	1246.3	39.8	-1528.5	26.6
Barrier Force D1	Newtons	27894.4	40.9	-1986.1	15.5
Barrier Force D2	Newtons	8635.7	32.8	-2535.4	6.1
Barrier Force D3	Newtons	13809.5	24.9	-2414.8	5.7
Barrier Force D4	Newtons	8509.4	15.6	-1764.3	5.2
Barrier Force D5	Newtons	10202.6	13.0	-2203.6	4.7
Barrier Force D6	Newtons	10453.6	15.8	-1553.3	4.3
Barrier Force D7	Newtons	4850.6	25.0	-1408.4	4.6
Barrier Force D8	Newtons	17558.5	34.8	-866.6	5.5
Barrier Force D9	Newtons	2880.1	39.2	-1870.4	43.9
Barrier Force Sum Group 1	Newtons	170718.1	31.4	-1514.7	2.1
Barrier Force Sum Group 2	Newtons	316530.9	53.8	-129.7	156.7
Barrier Force Sum Group 3	Newtons	125362.2	30.8	-788.2	1.8
Barrier Force Sum Group 4	Newtons	95237.7	30.9	-808.0	167.1
Barrier Force Sum Group 5	Newtons	239194.6	29.8	-427.7	166.3
Barrier Force Sum Group 6	Newtons	94345.5	30.9	-1775.3	2.1
Barrier Force Total Sum	Newtons	1011407.2	31.3	-1557.6	160.3

APPENDIX D

INSTRUMENTATION DATA CHANNEL ASSIGNMENTS

2004 NHTSA 35mph NCAP
Instrumentation Data Channel Assignments
Driver A.T.D. Serial Number 35
2/18/04
2004 Toyota Highlander SUV

CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
1	HEAD, PRIMARY	X	GPAC027	Accel., 1/2 bridge	Endevco	7264-2000	G
2	HEAD, PRIMARY	Y	GPAC002	Accel., 1/2 bridge	Endevco	7264-2000	G
3	HEAD, PRIMARY	Z	GPAC003	Accel., 1/2 bridge	Endevco	7264-2000	G
4	HEAD, REDUNDANT	X	GPAC032	Accel., 1/2 bridge	Endevco	7264-2000	G
5	HEAD, REDUNDANT	Y	GPAC021	Accel., 1/2 bridge	Endevco	7264-2000	G
6	HEAD, REDUNDANT	Z	GPAC026	Accel., 1/2 bridge	Endevco	7264-2000	G
7	NECK FORCE	X	GPUN01FX	Load cell, six axis neck	R. A. Denton	1716A	N
8	NECK FORCE	Y	GPUN01FY	Load cell, six axis neck	R. A. Denton	1716A	N
9	NECK FORCE	Z	GPUN01FZ	Load cell, six axis neck	R. A. Denton	1716A	N
10	NECK MOMENT	X	GPUN01MX	Load cell, six axis neck	R. A. Denton	1716A	Nm
11	NECK MOMENT	Y	GPUN01MY	Load cell, six axis neck	R. A. Denton	1716A	Nm
12	NECK MOMENT	Z	GPUN01MZ	Load cell, six axis neck	R. A. Denton	1716A	Nm
13	CHEST , PRIMARY	X	GPAC005	Accel., 1/2 bridge	Endevco	7264-2000	G
14	CHEST , PRIMARY	Y	GPAC011	Accel., 1/2 bridge	Endevco	7264-2000	G
15	CHEST , PRIMARY	Z	GPAC010	Accel., 1/2 bridge	Endevco	7264-2000	G
16	CHEST , REDUNDANT	X	GPAC034	Accel., 1/2 bridge	Endevco	7264-2000	G
17	CHEST , REDUNDANT	Y	GPAC023	Accel., 1/2 bridge	Endevco	7264-2000	G
18	CHEST , REDUNDANT	Z	GPAC020	Accel., 1/2 bridge	Endevco	7264-2000	G
19	CHEST DISPLACEMENT	X	GPCP002	Rotary Pot Chest	Servo	14CBI	MM
20	PELVIS, PRIMARY	X	GPAC025	Accel., 1/2 bridge	Endevco	7264-2000	G
21	PELVIS, PRIMARY	Y	GPAC022	Accel., 1/2 bridge	Endevco	7264-2000	G
22	PELVIS, PRIMARY	Z	GPAC019	Accel., 1/2 bridge	Endevco	7264-2000	G
23	LEFT FEMUR FORCE	Z	KEFF003	Load cell, Femur	R.A. Denton	2121	N
24	RIGHT FEMUR FORCE	Z	KEFF004	Load cell, Femur	R.A. Denton	2121	N

2004 NHTSA 35mph NCAP
Instrumentation Data Channel Assignments
Driver A.T.D. Serial Number 35
2/18/04
2004 Toyota Highlander SUV

CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
25	UP. TIBIA LEFT MOM.	X	GPUT09MX	2 ch., Upper tibia gage	R. A. Denton	1583	Nm
26	UP. TIBIA LEFT MOM.	Y	GPUT09MY	2 ch., Upper tibia gage	R. A. Denton	1583	Nm
27	UP. TIBIA RIGHT MOM.	X	GPUT09MX	2 ch., Upper tibia gage	R. A. Denton	1583	Nm
28	UP. TIBIA RIGHT MOM.	Y	GPUT09MY	2 ch., Upper tibia gage	R. A. Denton	1583	Nm
29	LWR. TIBIA LEFT MOM.	X	GPLT09MX	3 ch., lower tibia gage	R. A. Denton	3093	Nm
30	LWR. TIBIA LEFT MOM.	Y	GPLT09MY	3 ch., lower tibia gage	R. A. Denton	3093	Nm
31	LWR. TIBIA LEFT FORCE	Z	GPLT09FZ	3 ch., lower tibia gage	R. A. Denton	3093	N
32	LWR. TIBIA RIGHT MOM.	X	GPLT09MX	3 ch., lower tibia gage	R. A. Denton	3093	Nm
33	LWR. TIBIA RIGHT MOM.	Y	GPLT09MY	3 ch., lower tibia gage	R. A. Denton	3093	Nm
34	LWR. TIBIA RIGHT FORCE	Z	GPLT09FZ	3 ch., lower tibia gage	R. A. Denton	3093	N
35	FOOT LEFT, AFT	X	KEIC002X	Accel., Foot Triax	I.C. Sensor	3031-500	G
36	FOOT LEFT, AFT	Z	KEIC002Y	Accel., Foot Triax	I.C. Sensor	3031-500	G
37	FOOT LEFT, FORE	Z	KEIC002Z	Accel., Foot Triax	I.C. Sensor	3031-500	G
38	FOOT RIGHT, AFT	X	KEIC001X	Accel., Foot Triax	I.C. Sensor	3031-500	G
39	FOOT RIGHT, AFT	Z	KEIC001Y	Accel., Foot Triax	I.C. Sensor	3031-500	G
40	FOOT RIGHT, FORE	Z	KEIC001Z	Accel., Foot Triax	I.C. Sensor	3031-500	G
41	LAP BELT FORCE	X	BL134	Load cell, Seat belt	FGP	FN4060	N
42	SHOULDER BELT FORCE	X	BL135	Load cell, Seat belt	FGP	FN4060	N
43	SHOULDER BELT SPOOL	X	KEPP001	Pullout pot	Celesco	PTX101-0030	MM
44	SHOULDER BELT ELONG.	X	KEEP001	Linear pot., belt stretch	E.T.I.	LCP8-10 10K	MM/CM

2004 NHTSA 35mph NCAP
Instrumentation Data Channel Assignments
Passenger A.T.D. Serial Number 34
2/18/04
2004 Toyota Highlander SUV

CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
45	HEAD, PRIMARY	X	KEAC039	Accel.,1/2 bridge	Endevco	7264-2000	G
46	HEAD, PRIMARY	Y	KEAC038	Accel.,1/2 bridge	Endevco	7264-2000	G
47	HEAD, PRIMARY	Z	KEAC027	Accel.,1/2 bridge	Endevco	7264-2000	G
48	HEAD, REDUNDANT	X	KEAC031	Accel.,1/2 bridge	Endevco	7264-2000	G
49	HEAD, REDUNDANT	Y	KEAC032	Accel.,1/2 bridge	Endevco	7264-2000	G
50	HEAD, REDUNDANT	Z	KEAC026	Accel.,1/2 bridge	Endevco	7264-2000	G
51	NECK FORCE	X	GPUN02FX	Load cell, six axis neck	R. A. Denton	1716A	N
52	NECK FORCE	Y	GPUN02FY	Load cell, six axis neck	R. A. Denton	1716A	N
53	NECK FORCE	Z	GPUN02FZ	Load cell, six axis neck	R. A. Denton	1716A	N
54	NECK MOMENT	X	GPUN02MX	Load cell, six axis neck	R. A. Denton	1716A	Nm
55	NECK MOMENT	Y	GPUN02MY	Load cell, six axis neck	R. A. Denton	1716A	Nm
56	NECK MOMENT	Z	GPUN02MZ	Load cell, six axis neck	R. A. Denton	1716A	Nm
57	CHEST , PRIMARY	X	GPAC031	Accel., 1/2 bridge	Endevco	7264-2000	G
58	CHEST , PRIMARY	Y	GPAC024	Accel., 1/2 bridge	Endevco	7264-2000	G
59	CHEST , PRIMARY	Z	GPAC029	Accel., 1/2 bridge	Endevco	7264-2000	G
60	CHEST , REDUNDANT	X	KEAC023	Accel.,1/2 bridge	Endevco	7264-200	G
61	CHEST , REDUNDANT	Y	KEAC022	Accel.,1/2 bridge	Endevco	7264-200	G
62	CHEST , REDUNDANT	Z	KEAC024	Accel.,1/2 bridge	Endevco	7264-200	G
63	CHEST DISPLACEMENT	X	GPCP001	Rotary Pot Chest	Servo	14CBI	MM
64	PELVIS, PRIMARY	X	KEAC019	Accel.,1/2 bridge	Endevco	7264-200	G
65	PELVIS, PRIMARY	Y	KEAC020	Accel.,1/2 bridge	Endevco	7264-200	G
66	PELVIS, PRIMARY	Z	KEAC021	Accel.,1/2 bridge	Endevco	7264-200	G
67	LEFT FEMUR FORCE	Z	KEFF001	Load cell, Femur	R.A. Denton	2121	N
68	RIGHT FEMUR FORCE	Z	KEFF002	Load cell, Femur	R.A. Denton	2121	N

2004 NHTSA 35mph NCAP
Instrumentation Data Channel Assignments
Passenger A.T.D. Serial Number 34
2/18/04
2004 Toyota Highlander SUV

CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
69	UP. TIBIA LEFT MOM.	X	GPUT09MX	2 ch., Upper tibia gage	R. A. Denton	1583	Nm
70	UP. TIBIA LEFT MOM.	Y	GPUT09MY	2 ch., Upper tibia gage	R. A. Denton	1583	Nm
71	UP. TIBIA RIGHT MOM.	X	GPUT09MX	2 ch., Upper tibia gage	R. A. Denton	1583	Nm
72	UP. TIBIA RIGHT MOM.	Y	GPUT09MY	2 ch., Upper tibia gage	R. A. Denton	1583	Nm
73	LWR. TIBIA LEFT MOM.	X	GPLT09MX	3 ch., lower tibia gage	R. A. Denton	3093	Nm
74	LWR. TIBIA LEFT MOM.	Y	GPLT09MY	3 ch., lower tibia gage	R. A. Denton	3093	Nm
75	LWR. TIBIA LEFT FORCE	Z	GPLT09FZ	3 ch., lower tibia gage	R. A. Denton	3093	N
76	LWR. TIBIA RIGHT MOM.	X	GPLT09MX	3 ch., lower tibia gage	R. A. Denton	3093	Nm
77	LWR. TIBIA RIGHT MOM.	Y	GPLT09MY	3 ch., lower tibia gage	R. A. Denton	3093	Nm
78	LWR. TIBIA RIGHT FORCE	Z	GPLT09FZ	3 ch., lower tibia gage	R. A. Denton	3093	N
79	FOOT LEFT, AFT	X	KEIC003X	Accel., Foot Triax	I.C. Sensor	3031-500	G
80	FOOT LEFT, AFT	Z	KEIC003Y	Accel., Foot Triax	I.C. Sensor	3031-500	G
81	FOOT LEFT, FORE	Z	KEIC003Z	Accel., Foot Triax	I.C. Sensor	3031-500	G
82	FOOT RIGHT, AFT	X	KEIC004X	Accel., Foot Triax	I.C. Sensor	3031-500	G
83	FOOT RIGHT, AFT	Z	KEIC004Y	Accel., Foot Triax	I.C. Sensor	3031-500	G
84	FOOT RIGHT, FORE	Z	KEIC004Z	Accel., Foot Triax	I.C. Sensor	3031-500	G
85	LAP BELT FORCE	X	BL168	Load cell, Seat belt	First Tech	IF-964	N
86	SHOULDER BELT FORCE	X	BL169	Load cell, Seat belt	First Tech	IF-964	N
87	SHOULDER BELT SPOOL	X	KEPP001	Pullout pot	Celesco	PTX101-0030	MM
88	SHOULDER BELT ELONG.	X	KEEP001	Linear pot., belt stretch	E.T.I.	LCP8-10 10K	MM/CM

2004 NHTSA 35mph NCAP
Instrumentation Data Channel Assignments
Vehicle Accelerometers
2/18/04
2004 Toyota Highlander SUV

CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
89	LEFT REAR	X	KEVA002	Accel., Pre-Amp	I.C.S/Karco	3031-500	G
90	RIGHT REAR	X	KEVA006	Accel., Vehicle block	I.C. Sensor	3031-200	G
91	ENGINE TOP	X	KEVA009	Accel., Vehicle block	I.C. Sensor	3031-500	G
92	ENGINE BOTTOM	X	KEVA007	Accel., Vehicle block	I.C. Sensor	3031-500	G
93	LEFT BRAKE CALIPER	X	KEVA008	Accel., Vehicle block	I.C. Sensor	3031-500	G
94	RIGHT BRAKE CALIPER	X	KEVA012	Accel., Vehicle block	I.C. Sensor	3031-500	G
95	INSTRUMENT PANEL	X	KEVA011	Accel., Vehicle block	I.C. Sensor	3031-200	G
96	LEFT REAR	Z	KEVA001	Accel., Vehicle block	I.C. Sensor	3031-500	G
97	RIGHT REAR	Z	KEVA010	Accel., Vehicle block	I.C. Sensor	3031-200	G

2004 NHTSA 35mph NCAP
Instrumentation Data Channel Assignments
Rigid Load Cell Barrier
2/18/04
2004 Toyota Highlander SUV

CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
98	BARRIER FORCE A1	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
99	BARRIER FORCE A2	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
100	BARRIER FORCE A3	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
101	BARRIER FORCE A4	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
102	BARRIER FORCE A5	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
103	BARRIER FORCE A6	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
104	BARRIER FORCE A7	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
105	BARRIER FORCE A8	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
106	BARRIER FORCE A9	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
107	BARRIER FORCE B1	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
108	BARRIER FORCE B2	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
109	BARRIER FORCE B3	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
110	BARRIER FORCE B4	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
111	BARRIER FORCE B5	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
112	BARRIER FORCE B6	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
113	BARRIER FORCE B7	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
114	BARRIER FORCE B8	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
115	BARRIER FORCE B9	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N

2004 NHTSA 35mph NCAP
Instrumentation Data Channel Assignments
Rigid Load Cell Barrier
2/18/04
2004 Toyota Highlander SUV

CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
116	BARRIER FORCE C1	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
117	BARRIER FORCE C2	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
118	BARRIER FORCE C3	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
119	BARRIER FORCE C4	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
120	BARRIER FORCE C5	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
121	BARRIER FORCE C6	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
122	BARRIER FORCE C7	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
123	BARRIER FORCE C8	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
124	BARRIER FORCE C9	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
125	BARRIER FORCE D1	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
126	BARRIER FORCE D2	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
127	BARRIER FORCE D3	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
128	BARRIER FORCE D4	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
129	BARRIER FORCE D5	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
130	BARRIER FORCE D6	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
131	BARRIER FORCE D7	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
132	BARRIER FORCE D8	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
133	BARRIER FORCE D9	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N

2004 NHTSA 35mph NCAP
Instrumentation Data Channel Assignments
Nine Accelerometer Array Head
2/18/04
2004 Toyota Highlander SUV

CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
186	DRIVER X-ARM	Y	GPAC012	Accel., 1/2 bridge	Endevco	7264-2000	G
187	DRIVER X-ARM	Z	GPAC001	Accel., 1/2 bridge	Endevco	7264-2000	G
188	DRIVER Y-ARM	X	GPAC036	Accel., 1/2 bridge	Endevco	7264-2000	G
189	DRIVER Y-ARM	Z	GPAC014	Accel., 1/2 bridge	Endevco	7264-2000	G
190	DRIVER Z-ARM	X	GPAC030	Accel., 1/2 bridge	Endevco	7264-2000	G
191	DRIVER Z-ARM	Y	GPAC037	Accel., 1/2 bridge	Endevco	7264-2000	G
192	PASS. X-ARM	Y	GPAC016	Accel., 1/2 bridge	Endevco	7264-2000	G
193	PASS. X-ARM	Z	GPAC015	Accel., 1/2 bridge	Endevco	7264-2000	G
194	PASS. Y-ARM	X	GPAC004	Accel., 1/2 bridge	Endevco	7264-2000	G
195	PASS. Y-ARM	Z	GPAC018	Accel., 1/2 bridge	Endevco	7264-2000	G
196	PASS. Z-ARM	X	GPAC006	Accel., 1/2 bridge	Endevco	7264-2000	G
197	PASS. Z-ARM	Y	GPAC007	Accel., 1/2 bridge	Endevco	7264-2000	G

APPENDIX E

DUMMY CALIBRATION DATA

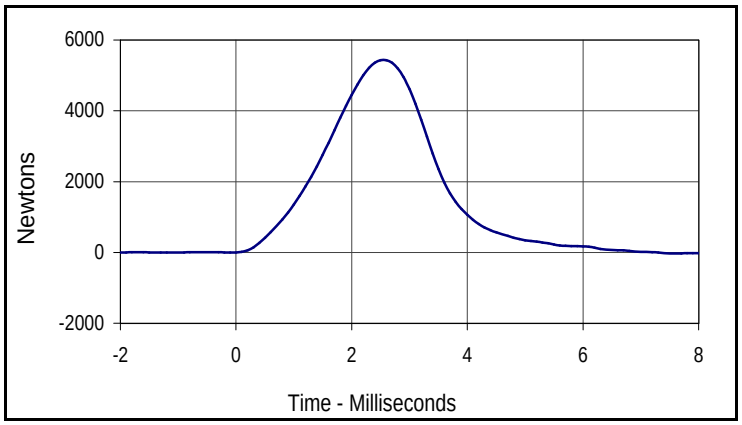
Test Program:	Hybrid III 50th Percentile Male Knee Impact Test	Test Date:	2/7/04
ATD Serial No.:	034	Test I.D.:	LK04A , RK04a

Left Knee

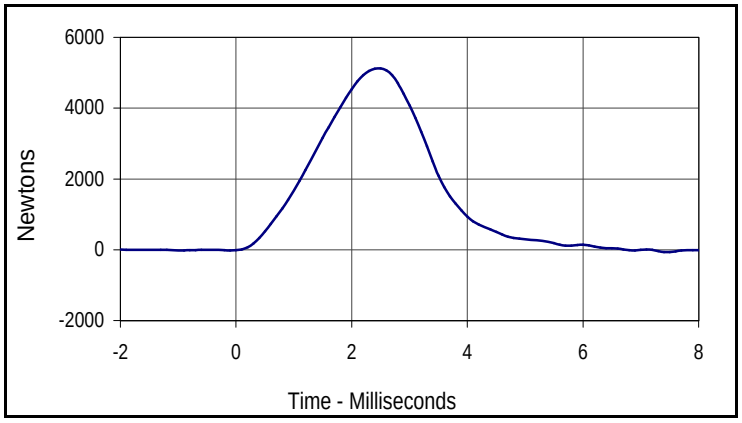
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity at T=0	m/sec	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	5431	Pass
		Overall Test Results		Pass

Right Knee

Pendulum Velocity at T=0	m/sec	2.07 to 2.13	2.13	Pass
Peak Probe Force	Newtons	4715 to 5782	5125	Pass
		Overall Test Results		Pass



Curve Description			
Left Knee Probe Force			
CURNO	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
5431.0	2.6	-39.2	8.3

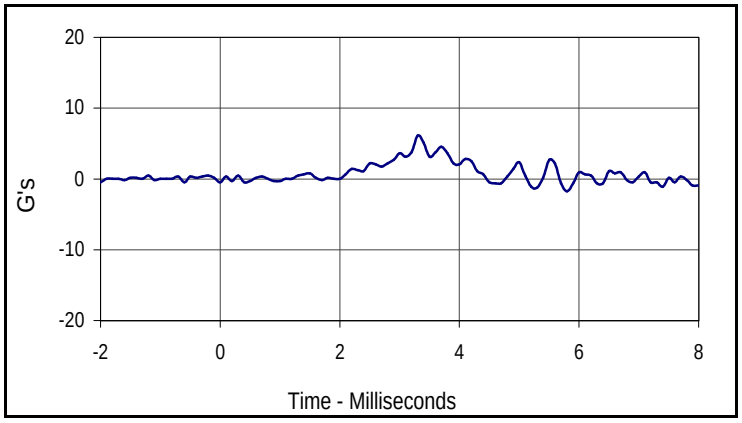


Curve Description			
Right Knee Probe Force			
CURNO	Type	SAE Class	Units
002	FIL	600	Newtons
Max	Time	Min	Time
5125.2	2.5	-65.5	7.5

Test Program:	Hybrid III 50th Percentile Male Head Drop Test	Test Date:	2/7/04
ATD Serial No.:	034	Test I.D.:	HD04A

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Peak Resultant Acceleration	G's	225.0 to 275.0	231.8	Pass
Peak Lateral Acceleration	G's	≤15.0	6.1	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
		Overall Test Results		Pass

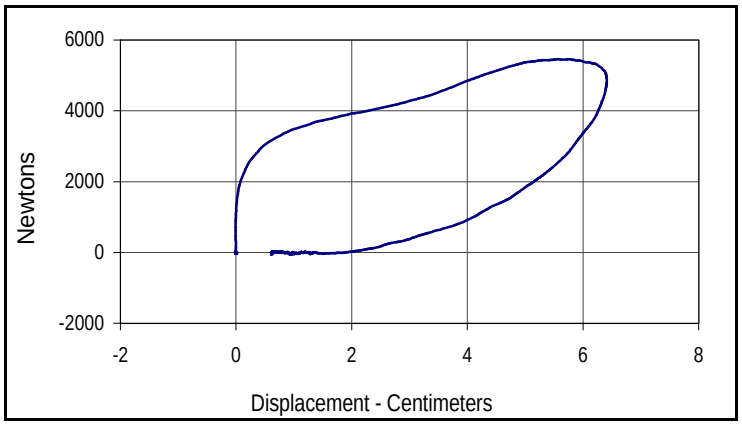
Curve Description			
Head Resultant			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
231.8	2.6	0.3	-0.4



Curve Description			
Head Y			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
6.1	3.3	-1.7	5.8

Test Program:	Hybrid III 50th Percentile Male Thorax Impact Test	Test Date:	2/8/04
ATD Serial No.:	034	Test I.D.:	CH04A

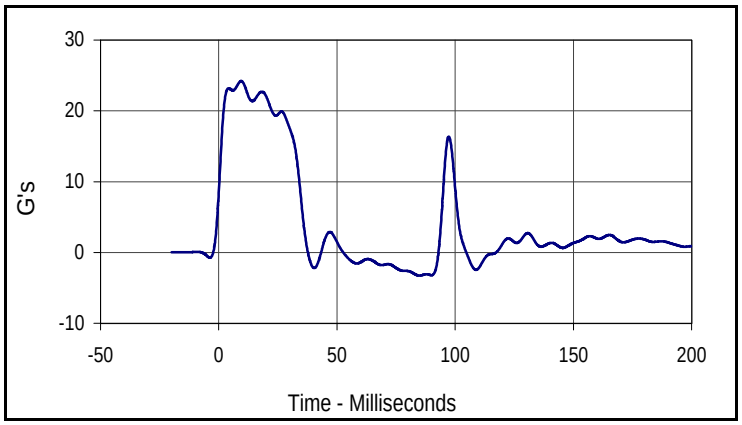
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	6.58 to 6.82	6.61	Pass
Peak Probe Force	Newtons	5159 to 5893	5455	Pass
Peak Sternum Displacement	CM	6.35 to 7.26	6.41	Pass
Internal Hysterysis	%	69 to 85	77.6	Pass
		Overall Test Results		Pass



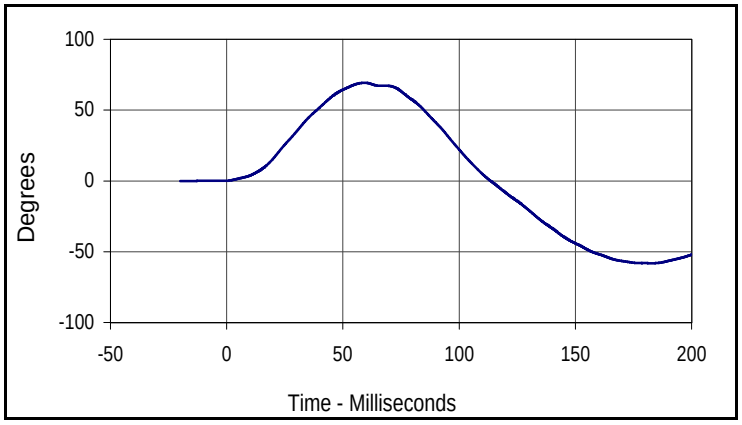
Curve Description			
Probe Force vs. Chest Displacement			
CURNO	Type	SAE Class	Hysterysis
001	FIL	180	77.6
Peak Probe Force		Peak Chest Displ.	
5455.4		6.41	

Test Program:	Hybrid III 50th Percentile Male Neck Flexion Test	Test Date:	2/7/04
ATD Serial No.:	034	Test I.D.:	NF04A

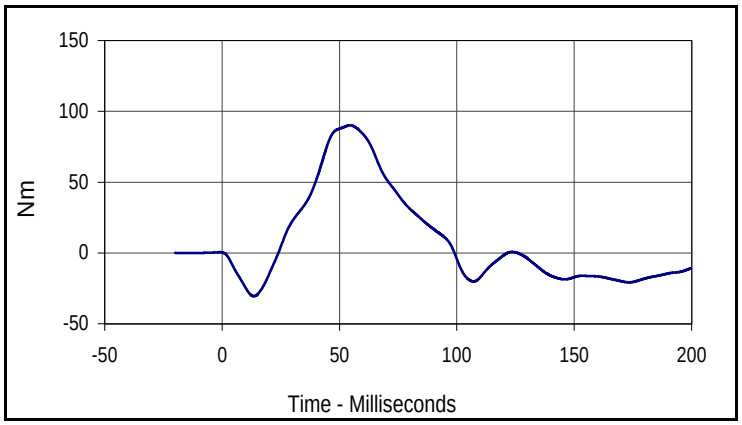
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.03	Pass
Pendulum Deceleration	10 Msec.	G's	22.5 to 27.5	24.1	Pass
	20 Msec.	G's	17.6 to 22.6	22.1	Pass
	30 Msec.	G's	12.5 to 18.5	17.5	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 29.0	17.5	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	34.0 to 42.0	35.6	Pass
Maximum "D" Plane Rotation	Max	Degrees	64.0 to 78.0	69.3	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	113.6	Pass
Moment About Occ. Condyle	Max	Nm	84.1 to 108.5	90.2	Pass
	Time	Msec.	47.0 to 58.0	54.6	Pass
Positive Moment Decay, Time To Zero Crossing		Msec.	97.0 to 107.0	99.0	Pass
			Overall Test Results		Pass



Curve Description			
Pendulum Deceleration			
CURNO	Type	SAE Class	Units
001	FIL	60	G's
Max	Time	Min	Time
24.2	9.5	-3.3	84.8



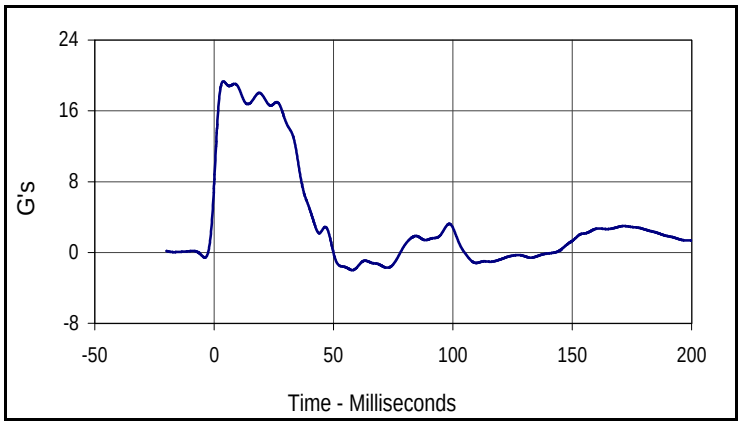
Curve Description			
"D" Plane Rotation			
CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
69.3	59.4	-58.1	183.0



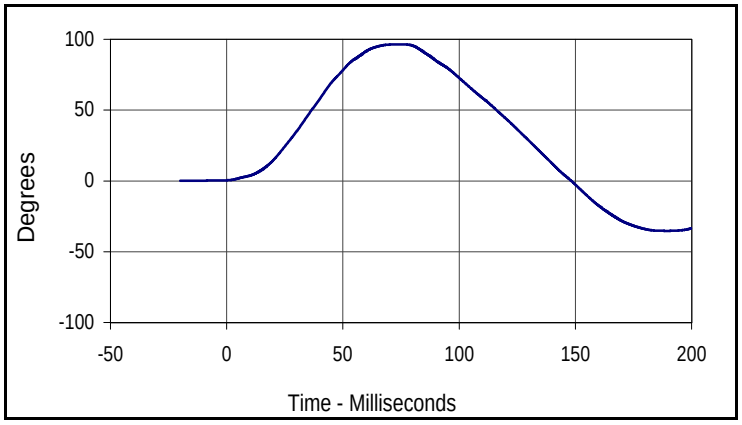
Curve Description			
Moment About Occipital Condyle			
CURNO	Type	SAE Class	Units
004	FIL	60	Nm
Max	Time	Min	Time
90.2	54.6	-30.5	13.5

Test Program:	Hybrid III 50th Percentile Male Neck Extension Test	Test Date:	2/7/04
ATD Serial No.:	034	Test I.D.:	NE04A

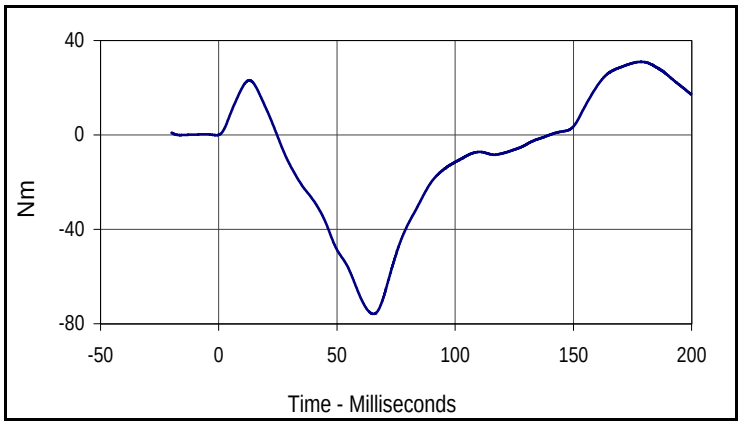
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	5.94 to 6.19	6.08	Pass
Pendulum Deceleration	10 Msec.	G's	17.2 to 21.2	18.7	Pass
	20 Msec.	G's	14.0 to 19.0	17.9	Pass
	30 Msec.	G's	11.0 to 16.0	14.8	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 22.0	14.8	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	38.0 to 46.0	40.0	Pass
Maximum "D" Plane Rotation	Max	Degrees	81.0 to 106.0	96.4	Pass
	Time	Msec.	72.0 to 82.0	75.2	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	147.0 to 174.0	148.3	Pass
Moment About Occ. Condyle	Max	Nm	-52.9 to- 79.9	-75.8	Pass
	Time	Msec.	65.0 to 79.0	65.4	Pass
Positive Moment Decay, Time To Zero Crossing		Msec.	120.0 to 148.0	139.9	Pass
			Overall Test Results		Pass



Curve Description			
Pendulum Deceleration			
CURNO	Type	SAE Class	Units
001	FIL	60	G's
Max	Time	Min	Time
19.3	3.8	-2.0	57.9



Curve Description			
"D" Plane Rotation			
CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
96.4	75.2	-35.3	189.8



Curve Description			
Moment About Occipital Condyle			
CURNO	Type	SAE Class	Units
004	FIL	60	Nm
Max	Time	Min	Time
31.0	178.6	-75.8	65.4

Test Program:	Hybrid III 50th Percentile Male External Measurements	Test Date:	2/8/04
ATD Serial No.:	034	Test I.D.:	N/A

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
A - Total sitting height	mm	879 to 889	885	Pass
B - Shoulder pivot height	mm	505 to 521	520	Pass
C - "H" point height	mm	84 to 89	85	Pass
D - "H" point from seat back	mm	135 to 140	135	Pass
E - Shoulder pivot from back	mm	84 to 94	90	Pass
F - Thigh clearance	mm	140 to 155	154	Pass
G - Elbow back to wrist pivot	mm	290 to 305	295	Pass
H - Skull cap to back line	mm	41 to 46	45	Pass
I - Shoulder to elbow length	mm	330 to 345	340	Pass
J - Elbow rest height	mm	190 to 211	200	Pass
K - Buttock to knee length	mm	579 to 604	585	Pass
L - Poplipteal length	mm	429 to 455	450	Pass
M - Knee pivot height	mm	485 to 500	495	Pass
N - Buttock poplipteal length	mm	452 to 477	475	Pass
O - Chest depth	mm	213 to 229	225	Pass
P - Foot length	mm	251 to 267	255	Pass
V - Shoulder breadth	mm	422 to 437	430	Pass
W - Foot breadth	mm	91 to 107	105	Pass
Y - Chest circumference	mm	970 to 1001	990	Pass
Z - Waist circumference	mm	836 to 866	860	Pass
AA - Location for chest circumference	mm	429 to 434	430	Pass
BB - Location for waist circumference	mm	226 to 231	230	Pass
		Overall Test Results		Pass

Test Program:	Hybrid III 50th Percentile Male Knee Impact Test	Test Date:	2/7/04
ATD Serial No.:	035	Test I.D.:	LK04B , RK04B

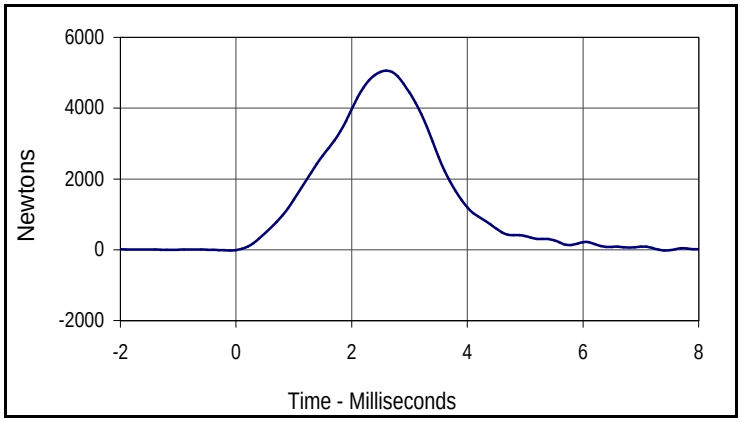
Left Knee

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity at T=0	m/sec	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	5005	Pass
		Overall Test Results		Pass

Right Knee

Pendulum Velocity at T=0	m/sec	2.07 to 2.13	2.09	Pass
Peak Probe Force	Newtons	4715 to 5782	5061	Pass
		Overall Test Results		Pass

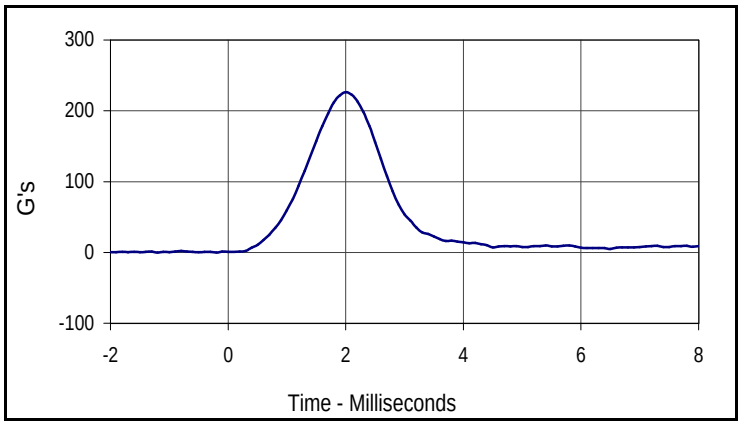
Curve Description			
Left Knee Probe Force			
CURNO	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
5004.6	2.4	-43.4	8.3



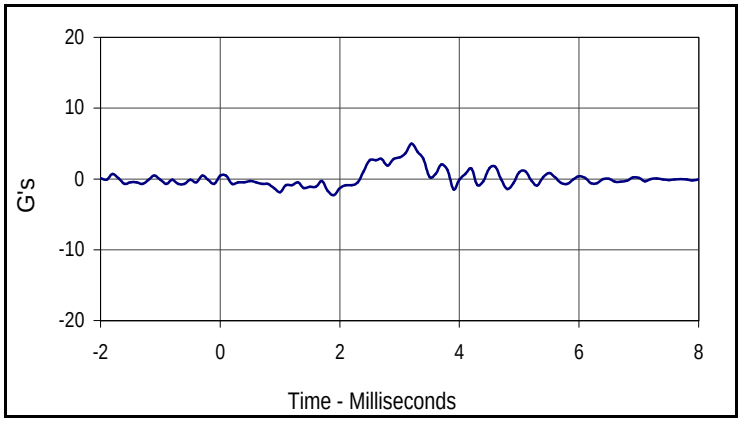
Curve Description			
Right Knee Probe Force			
CURNO	Type	SAE Class	Units
002	FIL	600	Newtons
Max	Time	Min	Time
5061.2	2.6	-62.6	8.5

Test Program:	Hybrid III 50th Percentile Male Head Drop Test	Test Date:	2/7/04
ATD Serial No.:	035	Test I.D.:	HD04B

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Peak Resultant Acceleration	G's	225.0 to 275.0	226.1	Pass
Peak Lateral Acceleration	G's	≤15.0	5.0	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
		Overall Test Results		Pass



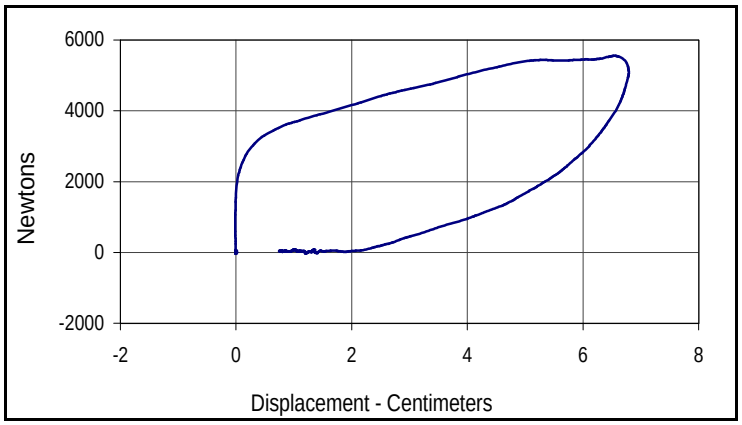
Curve Description			
Head Resultant			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
226.1	2.0	0.1	-1.2



Curve Description			
Head Y			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
5.0	3.2	-2.3	1.9

Test Program:	Hybrid III 50th Percentile Male Thorax Impact Test	Test Date:	2/8/04
ATD Serial No.:	035	Test I.D.:	CH04B

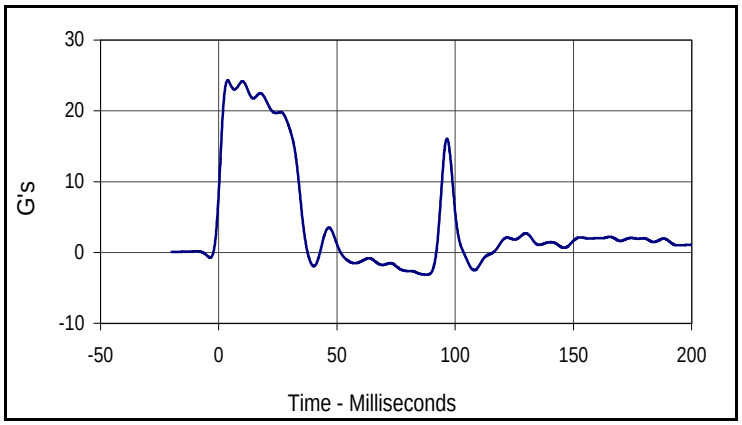
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	6.58 to 6.82	6.74	Pass
Peak Probe Force	Newtons	5159 to 5893	5557	Pass
Peak Sternum Displacement	CM	6.35 to 7.26	6.79	Pass
Internal Hysterysis	%	69 to 85	76.6	Pass
		Overall Test Results		Pass



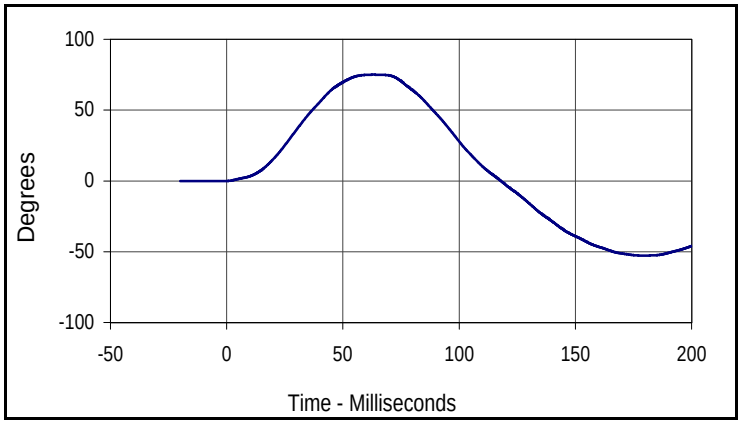
Curve Description			
Probe Force vs. Chest Displacement			
CURNO	Type	SAE Class	Hysterysis
001	FIL	180	76.6
Peak Probe Force		Peak Chest Displ.	
5556.6		6.79	

Test Program:	Hybrid III 50th Percentile Male Neck Flexion Test	Test Date:	2/7/04
ATD Serial No.:	035	Test I.D.:	NF04B

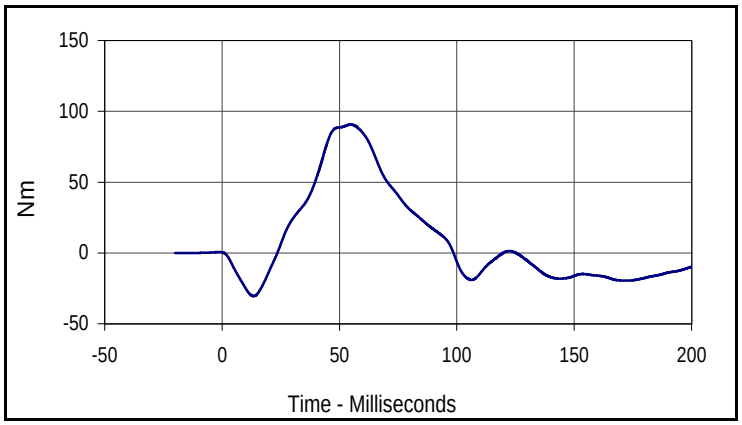
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.11	Pass
Pendulum Deceleration	10 Msec.	G's	22.5 to 27.5	24.2	Pass
	20 Msec.	G's	17.6 to 22.6	21.5	Pass
	30 Msec.	G's	12.5 to 18.5	17.5	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 29.0	17.5	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	34.0 to 42.0	35.4	Pass
Maximum "D" Plane Rotation	Max	Degrees	64.0 to 78.0	75.0	Pass
	Time	Msec.	57.0 to 64.0	63.1	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	113.0 to 128.0	118	Pass
Moment About Occ. Condyle	Max	Nm	84.1 to 108.5	90.7	Pass
	Time	Msec.	47.0 to 58.0	54.8	Pass
Positive Moment Decay, Time To Zero Crossing		Msec.	97.0 to 107.0	98.6	Pass
			Overall Test Results		Pass



Curve Description			
Pendulum Deceleration			
CURNO	Type	SAE Class	Units
001	FIL	60	G's
Max	Time	Min	Time
24.3	3.8	-3.1	87.8



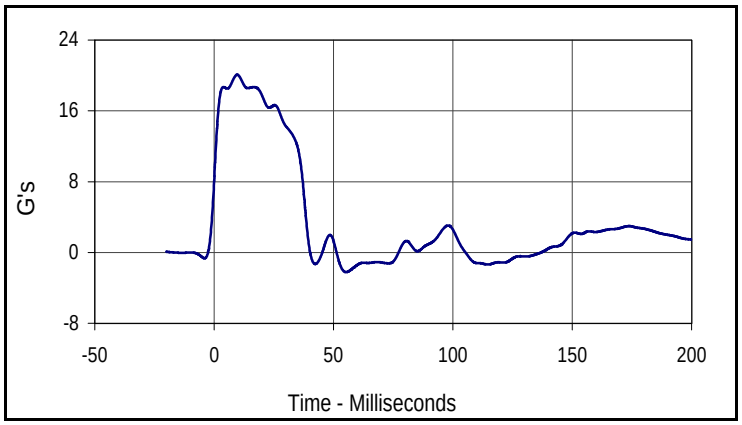
Curve Description			
"D" Plane Rotation			
CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
75.0	63.1	-52.7	178.7



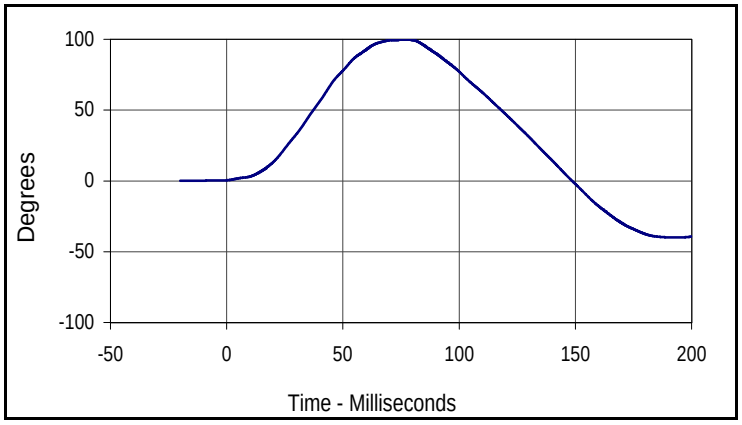
Curve Description			
Moment About Occipital Condyle			
CURNO	Type	SAE Class	Units
004	FIL	60	Nm
Max	Time	Min	Time
90.7	54.8	-30.5	13.4

Test Program:	Hybrid III 50th Percentile Male Neck Extension Test	Test Date:	2/7/04
ATD Serial No.:	035	Test I.D.:	NE04B

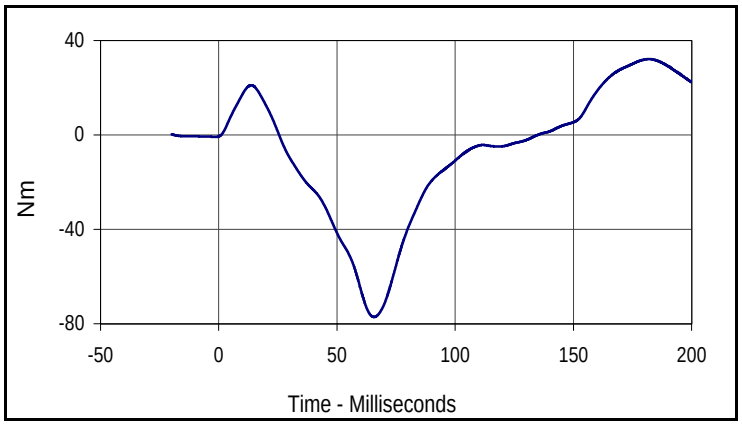
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	5.94 to 6.19	6.01	Pass
Pendulum Deceleration	10 Msec.	G's	17.2 to 21.2	20.1	Pass
	20 Msec.	G's	14.0 to 19.0	17.8	Pass
	30 Msec.	G's	11.0 to 16.0	14.3	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 22.0	14.3	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	38.0 to 46.0	38.2	Pass
Maximum "D" Plane Rotation	Max	Degrees	81.0 to 106.0	99.8	Pass
	Time	Msec.	72.0 to 82.0	77.2	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	147.0 to 174.0	148.7	Pass
Moment About Occ. Condyle	Max	Nm	-52.9 to- 79.9	-77.1	Pass
	Time	Msec.	65.0 to 79.0	65.7	Pass
Positive Moment Decay, Time To Zero Crossing		Msec.	120.0 to 148.0	134.9	Pass
			Overall Test Results		Pass



Curve Description			
Pendulum Deceleration			
CURNO	Type	SAE Class	Units
001	FIL	60	G's
Max	Time	Min	Time
20.1	9.6	-2.2	55.2



Curve Description			
"D" Plane Rotation			
CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
99.8	77.2	-40.0	192.6



Curve Description			
Moment About Occipital Condyle			
CURNO	Type	SAE Class	Units
004	FIL	60	Nm
Max	Time	Min	Time
32.1	182.0	-77.1	65.7

Test Program:	Hybrid III 50th Percentile Male External Measurements	Test Date:	2/8/04
ATD Serial No.:	035	Test I.D.:	N/A

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
A - Total sitting height	mm	879 to 889	880	Pass
B - Shoulder pivot height	mm	505 to 521	515	Pass
C - "H" point height	mm	84 to 89	85	Pass
D - "H" point from seat back	mm	135 to 140	135	Pass
E - Shoulder pivot from back	mm	84 to 94	90	Pass
F - Thigh clearance	mm	140 to 155	145	Pass
G - Elbow back to wrist pivot	mm	290 to 305	300	Pass
H - Skull cap to back line	mm	41 to 46	45	Pass
I - Shoulder to elbow length	mm	330 to 345	335	Pass
J - Elbow rest height	mm	190 to 211	195	Pass
K - Buttock to knee length	mm	579 to 604	600	Pass
L - Poplipteal length	mm	429 to 455	435	Pass
M - Knee pivot height	mm	485 to 500	490	Pass
N - Buttock poplipteal length	mm	452 to 477	455	Pass
O - Chest depth	mm	213 to 229	228	Pass
P - Foot length	mm	251 to 267	265	Pass
V - Shoulder breadth	mm	422 to 437	425	Pass
W - Foot breadth	mm	91 to 107	105	Pass
Y - Chest circumference	mm	970 to 1001	985	Pass
Z - Waist circumference	mm	836 to 866	860	Pass
AA - Location for chest circumference	mm	429 to 434	430	Pass
BB - Location for waist circumference	mm	226 to 231	230	Pass
		Overall Test Results		Pass

APPENDIX F

CHILD RESTRAINT SYSTEM

REPORT NUMBER TR-P24001-14-NC

NEW CAR ASSESSMENT PROGRAM
FRONTAL BARRIER IMPACT TEST

TOYOTA MOTOR CORPORATION
2004 TOYOTA HIGHLANDER
SUV

NHTSA NUMBER: M45109

PREPARED BY:
KARCO ENGINEERING, LLC
9270 HOLLY ROAD
ADELANTO, CALIFORNIA 92301

2/18/04

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
RULEMAKING
OFFICE OF CRASHWORTHINESS STANDARDS
MAIL CODE: NVS-111
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-02005.

This publication is distributed by the U.S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings and conclusions expressed in this publication are those of the author(s) and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof. If trade or manufacturers' names or products are mentioned, it is only because they are considered essential to the object of the publication and should not be construed as an endorsement. The United States Government does not endorse products or manufacturers.

Prepared by: _____ Date: February 25, 2004
Mr. James E. Gorth, Project Engineer
KARCO Engineering, LLC

Reviewed by: _____ Date: February 25, 2004
Mr. Jerry L. Kratzke, Director of Operations
KARCO Engineering, LLC

Approved by: _____ Date: February 25, 2004
Mr. Frank D. Richardson, Program Manager
KARCO Engineering, LLC

FINAL REPORT ACCEPTED BY:

_____
Manager, New Car Assessment Program

_____
Date of Acceptance

_____
COTR, NCAP Frontal Impact Program

_____
Date of Acceptance

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipients Catalog No.
TR-P24001-14-NC		

4. Title and Subtitle	5. Report Date
Final Report of a Evenflo Vanguard 5 Convertible Final Report of a Britax Roundabout Convertible NHTSA No. M45109	February 25, 2004 **6. Performing Organization Code**

7. Authors	8. Performing Organization Report No.
Mr. James E. Gorth, Project Engineer, Karco Mr. Frank Richardson, Program Manager, Karco	TR-P24001-14-NC

9. Performing Organization Name and Address	10. Work Unit No.
Karco Engineering, LLC 9270 Holly Rd. Adelanto, CA, 92301	**11. Contract or Grant No.** DTNH22-01-D-02005

12. Sponsoring Agency Name and Address	13. Type of Report and Period Covered
U. S. Department of Transportation National Highway Traffic Safety Administration Rulemaking Office of Crashworthiness Standards Mail Code NPS-111 400 Seventh Street, SW, Room 5311 Washington, D.C 20590	Final Test Report Option Year 3 **14. Sponsoring Agency Code** DOT/NHTSA/NRM/OCS

15. Supplementary Notes

16. Abstract

A frontal test was conducted on the subject CRS's Evenflo Vanguard 5 Convertible and a Britax Roundabout Convertible in conjunction with frontal NCAP testing on a 2004 Toyota Highlander SUV and in accordance with the specifications of the Office of Crashworthiness Standards Test Procedure for the determination of CRS crashworthiness. This test was conducted at Karco Engineering, LLC on February 18, 2004.

Measurement Description	Units		Left Rear	Right Rear
Head Injury Criteria (HIC) 36	N/A		1106.5	999.6
Head Injury Criteria (HIC) 15	N/A		641.9	613.7
3 msec. Chest Clip	G's		56.5	64.3
Peak Chest Displacement	mm		-17.8	-13.8

17. Key Words	18. Distribution of Statement
56.3 km/h NCAP Frontal Barrier Impact Test New Car Assessment Program (NCAP) Final Report of a Evenflo Vanguard 5 Convertible Final Report of a Britax Roundabout Convertible NHTSA No. M45109	Copies of this report available from: NHTSA Technical Reference Division National Highway Traffic Safety Admin. 400 Seventh St., SW, Room 5108 Washington, D.C. 20590

19. Security Classification (this report)	20. Security Classification (this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	148	

Form DOT F1700.7 (8-72)

TABLE OF CONTENTS

SECTION F-1

PURPOSE AND SUMMARY OF TEST M45109

The purpose of this test is to obtain CRS performance data during an NCAP (35mph) frontal impact test.

The 56.71 km/h NCAP frontal impact test was conducted in accordance with the Office of Crashworthiness Standards (OCS) NCAP Laboratory Test Procedure.

SUMMARY

Two three year old child dummies were instrumented with head, chest, and pelvic triaxial accelerometers. In addition chest displacement and upper and lower six axial neck force and moment load cell sensors were utilized. Triaxial accelerometers were installed on the CRS.

The right rear (Position 3) child dummy (Serial No. 139) and the left rear (Position 4) child dummy (Serial No. 082) were calibrated prior to this test. Child dummy certification information is found in Section F-5.

CHILD DUMMY VALUES

Location	HIC 36 Values	HIC 15 Values	3 Msec. Chest Clip	Peak Chest Disp.
Right Rear Child	999.6	613.7	64.3	-13.8
Left Rear Child	1106.5	641.9	56.5	-17.8

SECTION F-1

DATA SHEET NO.1…..CRASH TEST SUMMARY

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109

Test Program 2004 NHTSA 35mph NCAP Test Date: 2/18/04

CHILD RESTRAINT SYSTEM INFORMATION

Description	Position # 3 CRS	Position #4 CRS
Manufacturer	Evenflo	Britax
Model Name	Vanguard 5	Roundabout
Serial No.	3691261P1	G9L02400649
Type	Convertible	Convertible
Forward/Rearward	Forward	Forward

VISIBLE DUMMY CONTACT POINTS

Description	Position #3 CRS	Position #4 CRS
Head Contact	Chin to Retainer	See Note
Chest Contact	Head	None
Abdomen Contact	None	None
Left Knee Contact	None	None
Right Knee Contact	None	None
Left Toe Contact	Seatback	Seatback
Right Toe Contact	Seatback	Seatback
Ret. Clip Movement	Yes	Yes
Harness Stretch	None	None
Movement Amount	70mm	93mm

Note: Position P4 face skin came off dummy head, giving impression head contacted chest. No actual contact.

POST TEST DOOR OPENINGS

Description	Position #3 CRS	Position #4 CRS
Left Side Doors	Remained closed/latched, opened w/o aid of tools	Remained closed/latched, opened w/o aid of tools
Right Side Doors	Remained closed/latched, opened w/o aid of tools	Remained closed/latched, opened w/o aid of tools
Hatch/Other Door	None	None

POST TEST SEAT DATA

Location	Seat Movement (mm)	Seat Back Failure
Left Front	None	None
Right Front	None	None
Left Rear	None	None
Right Rear	None	None

CAMERA COVERAGE

High Speed	2
Real Time	1
Total	3

SECTION F-1

DATA SHEET NO.2…..CRS PARAMETER DATA

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109

Test Program 2004 NHTSA 35mph NCAP Test Date: 2/18/04

TEST VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	525	423		558	488	
Right	kg	512	390		547	454	
Ratio	%	56.1	43.9		54.0	46.0	
Totals	kg	1037	813	1850	1105	942	2047

TARGET TEST WEIGHT CALCULATION

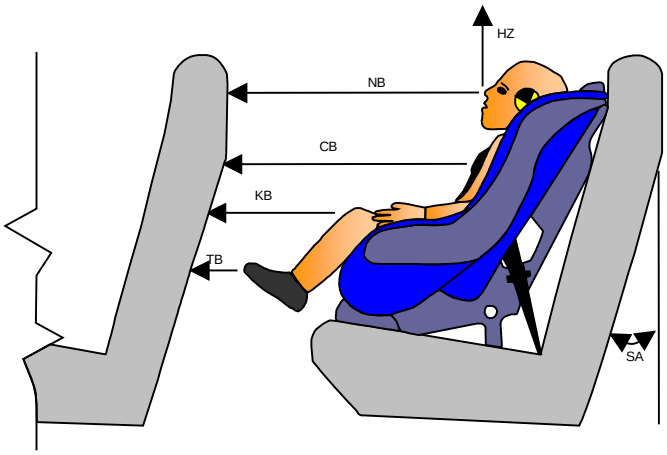
Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1850
Weight of 2 P572 ATD's	kg	152
Rated Cargo/Luggage Wt. (RCLW)	kg	49
Calculated Vehicle Target Wt. (TVTW)	kg	2051

SECTION F-1

DATA SHEET NO.3…..CHILD DUMMY POSITIONING IN VEHICLE

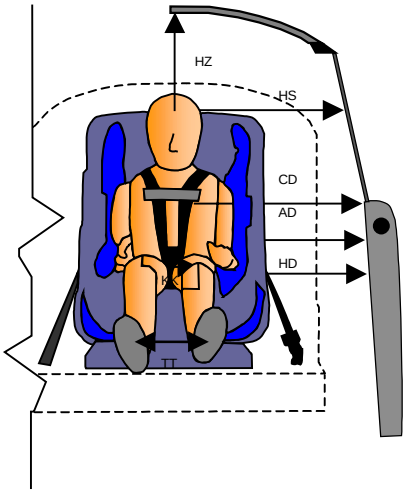
Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109

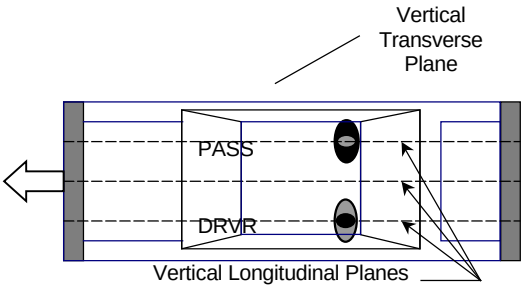
Test Program 2004 NHTSA 35mph NCAP Test Date: 2/18/04



AD	Arm to Door
CD	Chest to Door
HD	H-Point to Door
HS	Head to Side Window
KK	Knee to Knee
TT	Toe to Toe

CB	Chest to Seat Back
HZ	Head to Roof
KB	Knee to Seat Back
NB	Nose to Seat Back
SA	Seat Back Angle
TB	Toe to Seat Back





DUMMY MEASUREMENTS FOR REAR SEAT OCCUPANTS

SECTION F-1

DATA SHEET NO.3…..CHILD DUMMY POSITIONING IN VEHICLE…(continued)

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109

Test Program 2004 NHTSA 35mph NCAP Test Date: 2/18/04

CHILD DUMMY POSITION MEASUREMENTS

Code	Measurement	Units	P3 CRS Serial No. 139			P4 CRS Serial No. 082		
			Pre-Test	Post-Test	Diff.	Pre-Test	Post-Test	Diff.
SA	Seat Back Angle	deg.	24	24		24	24	
HZ	Head to Roof (Z)	mm	372	345	-27	305	305	0
CD	Chest to Door	mm	410	380	-30	385	380	-5
KK	Knee to Knee (Y)	mm	210	195	-15	215	215	0
HS	Head to Side Window	mm	425	370	-55	375	370	-5
HD	H-Point to Door (Y)	mm	320	297	-23	290	295	5
AD	Arm to Door	mm	260	238	-22	245	230	-15
NB	Nose to Seat Back	mm	562	572	10	560	570	10
CB	Chest to Seat Back	mm	555	562	7	525	507	-18
FF	Foot to Foot	mm	210	205	-5	200	235	35
KB-Left	Knee to Seat Back	mm	325	365	40	325	305	-20
KB-Right	Knee to Seat Back	mm	335	365	30	300	265	-35
TB-Left	Toe to Seat Back	mm	100	105	5	110	78	-32
TB-Right	Toe to Seat Back	mm	95	88	-7	125	85	-40
CCA	Car Cushion Angle	deg.	77			77		
BA	Back Angle	deg.	32			26		
SCA	Seat Cushion Angle	deg.	68			67		

DATA SHEET NO. 4 - 3 YEAR OLD HYBRID III ATD INJURY CRITERIA AND SENSOR DATA

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109

Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04

HEAD PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	Left Rear (3 Yr.)				Right Rear (3 Yr.)			
			Max	Time	Min	Time	Max	Time	Min	Time
Head CG	X	G's	68.0	199.4	-49.7	103.0	53.2	180.5	-50.5	101.6
Head CG	Y	G's	37.7	97.8	-12.1	100.9	7.7	74.4	-21.0	101.4
Head CG	Z	G's	70.9	84.7	-8.8	50.3	72.5	83.8	-4.5	35.7
Head CG Resultant	N/A	G's	75.5	84.4			75.7	83.8		

PRIMARY HEAD INJURY CRITERAS (HIC)

Location	Left Rear (3 Yr.)				Right Rear (3 Yr.)			
	HIC	T^1	T^2	Avg G	HIC	T^1	T^2	Avg G
Head CG Primary (HIC36)	1106.5	71.2	107.2	62.3	999.6	71.2	107.2	59.9
Head CG Primary (HIC15)	641.9	77.6	92.6	71.2	613.7	77.5	92.5	69.9

CHEST PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	Left Rear (3 Yr.)				Right Rear (3 Yr.)			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	G's	6.9	183.1	-44.7	63.9	5.3	192.9	-50.1	65.4
Chest CG	Y	G's	3.9	125.6	-11.4	71.2	7.3	63.4	-3.6	136.2
Chest CG	Z	G's	18.5	89.9	-36.4	63.8	21.0	92.6	-48.4	66.4
Chest CG Resultant	N/A	G's	58.2	64.0			69.2	65.5		

PRIMARY CHEST CLIP (3MSEC)

Location	Left Rear (3 Yr.)			Right Rear (3 Yr.)		
	CLIP	T^1	T^2	CLIP	T^1	T^2
Chest CG Primary	56.5	62.7	65.7	64.3	64.5	67.5

CHEST PEAK DISPLACEMENTS

Location	Axis	Units	Left Rear (3 Yr.)				Right Rear (3 Yr.)			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest	X	MM	0.0	21.8	-17.8	102.0	0.0	0.3	-13.8	66.6

PELVIC PEAK ACCELERATIONS

Location	Axis	Units	Left Rear (3 Yr.)				Right Rear (3 Yr.)			
			Max	Time	Min	Time	Max	Time	Min	Time
Pelvis	X	G's	10.6	184.6	-58.8	63.9	6.2	112.1	-64.1	58.7
Pelvis	Y	G's	4.5	107.3	-13.6	57.5	6.4	64.1	-9.7	102.6
Pelvis	Z	G's	15.6	90.8	-34.6	64.1	17.0	95.2	-42.3	58.9
Pelvis Resultant	N/A	G's	68.4	63.9			76.1	58.8		

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109

Test Program: 2004 NHTSA 35mph NCAP Test Date: 2/18/04

UPPER NECK PEAK FORCES AND MOMENTS

			Left Rear (3 Yr.)				Right Rear (3 Yr.)			
Location	Axis	Units	Max	Time	Min	Time	Max	Time	Min	Time
Neck Force	X	Newtons	2.3	9.0	-1023.2	104.3	25.4	163.0	-1039.0	104.8
Neck Force	Y	Newtons	31.2	164.5	-189.9	74.5	89.9	77.4	-98.6	169.1
Neck Force	Z	Newtons	1913.3	84.5	-248.4	50.5	1886.0	84.9	-116.8	35.4
Neck Force Resultant	N/A	Newtons	1997.6	84.5			1964.2	84.9		
Neck Moment	X	Nm	16.0	188.0	-10.1	84.9	7.7	81.6	-5.0	175.0
Neck Moment	Y	Nm	10.0	96.0	-10.3	81.7	1.0	94.2	-13.3	190.3
Neck Moment	Z	Nm	9.5	118.5	-2.6	147.9	2.4	149.7	-1.7	176.7
Neck Moment Resultant	N/A	Nm	18.9	188.0			13.7	190.4		

LOWER NECK PEAK FORCES AND MOMENTS

			Left Rear (3 Yr.)				Right Rear (3 Yr.)			
Location	Axis	Units	Max	Time	Min	Time	Max	Time	Min	Time
Neck Force	X	Newtons	227.0	199.5	-1280.2	88.0	214.7	181.5	-774.8	106.7
Neck Force	Y	Newtons	105.3	105.3	-167.9	77.5	41.6	86.2	-195.5	71.1
Neck Force	Z	Newtons	1651.9	80.8	-296.9	53.0	1480.3	85.1	-642.4	62.8
Neck Force Resultant	N/A	Newtons	1985.8	83.4			1641.3	85.0		
Neck Moment	X	Nm	14.9	185.1	-30.8	83.5	20.1	80.4	-14.0	170.3
Neck Moment	Y	Nm	140.8	104.3	-14.1	198.6	130.0	103.5	-15.5	181.5
Neck Moment	Z	Nm	13.2	121.0	-5.9	78.2	11.7	78.7	-8.9	109.1
Neck Moment Resultant	N/A	Nm	141.0	104.3			130.1	103.5		

CHILD SEAT TETHER BELT SENSOR PEAK VALUES

			Left Rear (3 Yr.)				Right Rear (3 Yr.)			
Location	Axis	Units	Max	Time	Min	Time	Max	Time	Min	Time
Car Seat Upper Tether Force	N/A	Newtons	906.8	64.1	-13.3	200.0	1075.7	73.3	-47.3	154.4

CHILD SEAT ACCELEROMETER PEAK VALUES

			Left Rear (3 Yr.)				Right Rear (3 Yr.)			
Location	Axis	Units	Max	Time	Min	Time	Max	Time	Min	Time
Child Seat	X	G's	17.3	158.2	-52.6	68.3	12.0	137.2	-68.0	56.0
Child Seat	Y	G's	10.8	68.8	-10.6	59.7	6.1	65.7	-4.8	92.0
Child Seat	Z	G's	16.1	146.7	-14.8	70.4	24.5	153.9	-16.1	56.8
Child Seat Resultant	N/A	G's	54.7	68.6			69.7	56.1		

SECTION F-1

DATA SHEET NO.5 …..CRS PERFORMANCE DATA

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109

Test Program 2004 NHTSA 35mph NCAP Test Date: 2/18/04

CRS PERFORMANCE DATA

Location	P3 CRS Serial No. 139		P4 CRS Serial No. 082	
	Damage	Post-Test	Damage	Post-Test
Upper Tether Strap	No	None	No	None
Upper Tether Buckle	No	None	No	None
Upper Tether Hook	No	None	No	None
Veh. Upper Tether Anchor	No	None	No	None
Lower Anchor Strap	No	None	No	None
Lower Anchor Buckle	No	None	No	None
Lower Anchor Hooks	No	None	No	None
Veh. Lower CRS Anchors	No	None	No	None
5 Point Harness Connections	No	None	No	None
Cracks on CRS	No	None	No	None
Fabric Tears on CRS	No	None	No	None
Vehicle Seat Structure	Yes	Seat Rotated	Yes	Seat Rotated
Vehicle Seat Fabric Tears	No	None	No	None
Child Dummy	No	None	Yes	None

SECTION F-1

DATA SHEET NO.6 …..CRS CAMERA DATA

Test Vehicle: 2004 Toyota Highlander SUV NHTSA No.: M45109

Test Program 2004 NHTSA 35mph NCAP Test Date: 2/18/04

CAMERA LOCATIONS

No.	Camera View	Location(mm)			Angle (Deg.)	Film Plane to Head	Lens (mm)	Speed (fps)
		X	Y	Z				
1	Driver Side Child Dummy	2946	-737	1549	20	1239	8.5	1000
2	Passenger Side Child Dummy	2946	737	1549	20	1239	8.5	1000
5								
6								

X = Barrier Face Y = Monorail Centerline Z = Ground DNR = Did Not Run NTM = No Time Marks

SECTION F-2

PHOTOGRAPHS

LIST OF PHOTOGRAPHS CRS #3

LIST OF PHOTOGRAPHS CRS #4

Figure F2-1: Close-up View Position 3 CRS Label

Figure F2-2: Pre-Test Frontal View of Position 3 CRS

Figure F2-3: Post-Test Frontal View of Position 3 CRS

Figure F2-4: Pre-Test Rear View of Position 3 CRS

Figure F2-5: Post-Test Rear View of Position 3 CRS

Figure F2-6: Pre-Test Left Side View of Position 3 CRS

Figure F2-7: Post-Test Left Side View of Position 3 CRS

Figure F2-8: Pre-Test Right Side View of Position 3 CRS

Figure F2-9: Post-Test Right Side View of Position 3 CRS

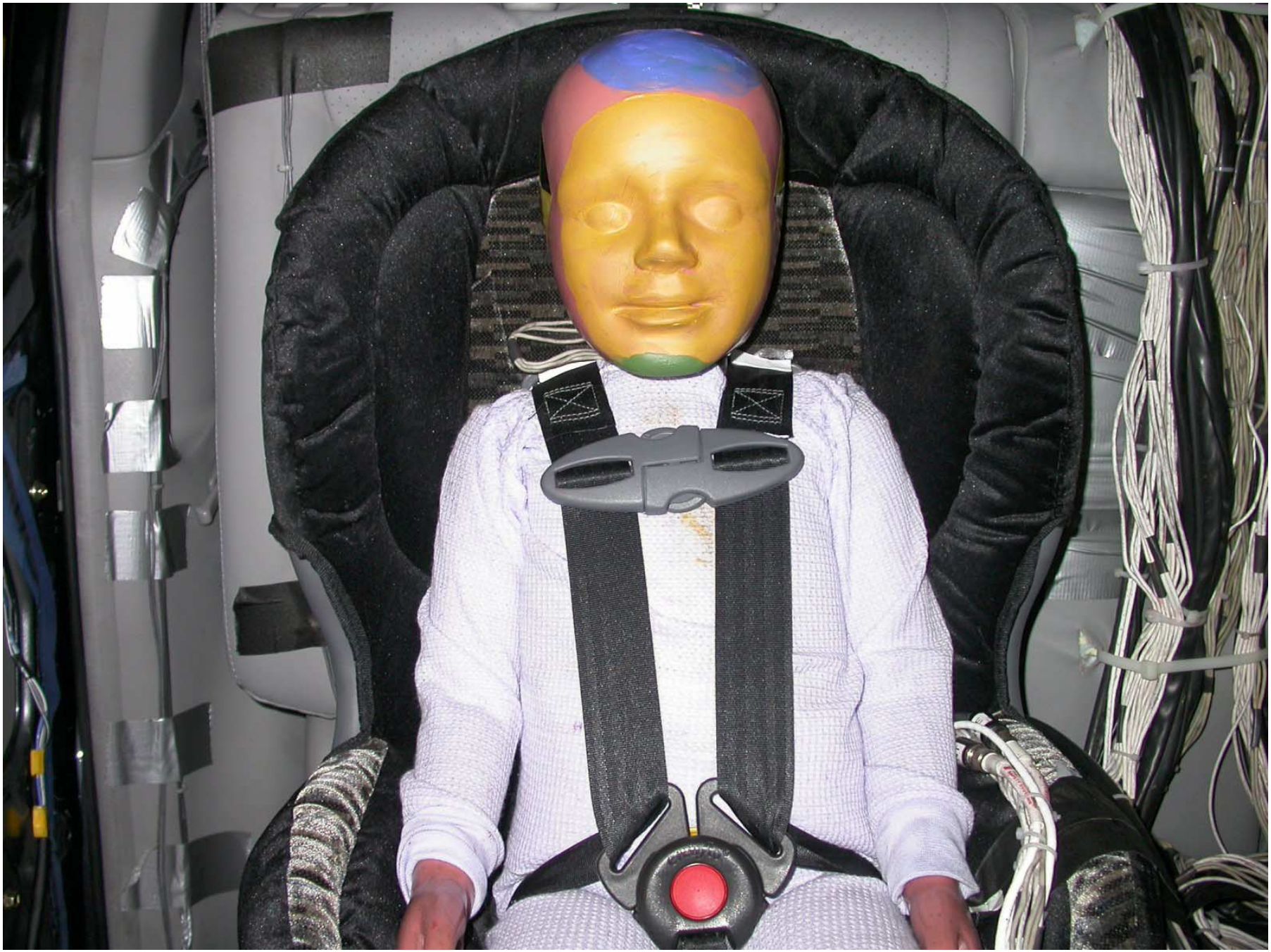


Figure F2-10: Pre-Test Position 3 Front View

Figure F2-11: Post-Test Position 3 Front View

Figure F2-12: Pre-Test Position 3 Left Side View

Figure F2-13: Post-Test Position 3 Left Side View

Figure F2-14: Pre-Test Position 3 Right Side View

Figure F2-15: Post-Test Position 3 Right Side View

Figure F2-16: Post-Test Position 3 Contact Point (Back of Right Front Seat)

Figure F2-17: Close-up View Position 4 CRS Label

Figure F2-18: Pre-Test Frontal View of Position 4 CRS

Figure F2-19: Post-Test Front View of Position 4 CRS

Figure F2-20: Pre-Test Rear View of Position 4 CRS

Figure F2-21: Post-Test Rear View of Position 4 CRS

Figure F2-22: Pre-Test Left Side View of Position 4 CRS

Figure F2-23: Post-Test Left Side View of Position 4 CRS

Figure F2-24: Pre-Test Right Side View of Position 4 CRS

Figure F2-25: Post-Test Right Side View of Position 4 CRS

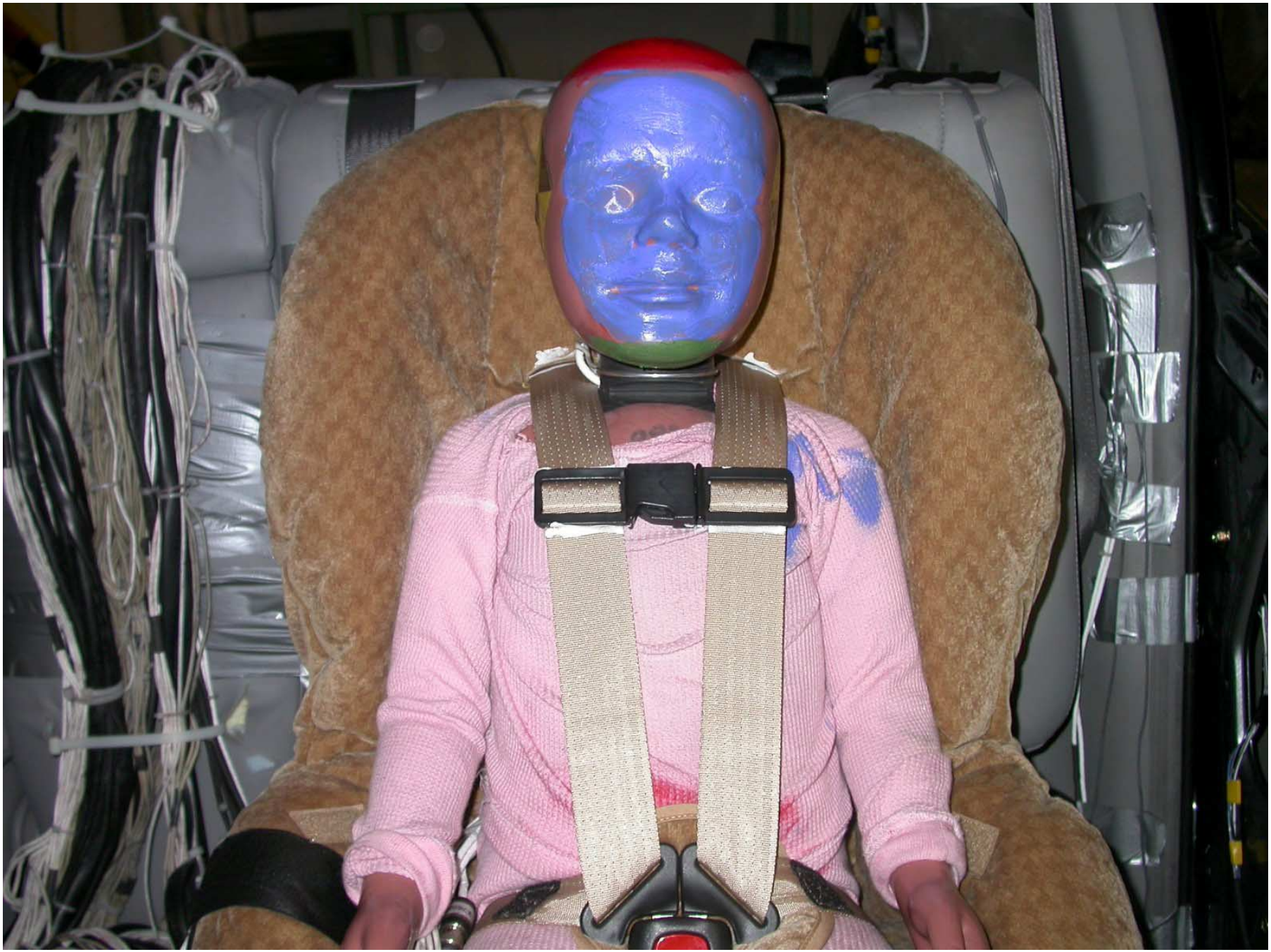


Figure F2-26: Pre-Test Position 4 Front View

Figure F2-27: Post-Test Position 4 Front View

Figure F2-28: Pre-Test Position 4 Left Side View

Figure F2-29: Post-Test Position 4 Left Side View

Figure F2-30: Pre-Test Position 4 Right Side View

Figure F2-31: Post-Test Position 4 Right Side View

Figure F2-32: Post-Test Position 4 Contact Point (Back of Left Front Seat)

SECTION F-3

CHILD DUMMY RESPONSE AND CRS DATA TRACES

LIST OF DATA PLOTS #4

LIST OF DATA PLOTS #3

SECTION F-4

CHILD DUMMY INSTRUMENTATION INFORMATION

2004 NHTSA 35mph NCAP
Instrumentation Data Channel Assignments
Left Rear Child A.T.D. Serial Number 082
2/18/04
2004 Toyota Highlander SUV

CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
134	HEAD CG	X	GPAC050	Accel.,1/2 bridge	Endevco	7264-2000	G
135	HEAD CG	Y	GPAC051	Accel.,1/2 bridge	Endevco	7264-2000	G
136	HEAD CG	Z	GPAC052	Accel.,1/2 bridge	Endevco	7264-2000	G
137	UPPER NECK FORCE	X	082UNFX	Load cell, six axis neck	R. A. Denton	IF-234	N
138	UPPER NECK FORCE	Y	082UNFY	Load cell, six axis neck	R. A. Denton	IF-234	N
139	UPPER NECK FORCE	Z	082UNFZ	Load cell, six axis neck	R. A. Denton	IF-234	N
140	UPPER NECK MOMENT	X	082UNMX	Load cell, six axis neck	R. A. Denton	IF-234	Nm
141	UPPER NECK MOMENT	Y	082UNMY	Load cell, six axis neck	R. A. Denton	IF-234	Nm
142	UPPER NECK MOMENT	Z	082UNMZ	Load cell, six axis neck	R. A. Denton	IF-234	Nm
143	LOWER NECK FORCE	X	082LNFX	Load cell, six axis neck	R. A. Denton	3303	N
144	LOWER NECK FORCE	Y	082LNFY	Load cell, six axis neck	R. A. Denton	3303	N
145	LOWER NECK FORCE	Z	082LNFZ	Load cell, six axis neck	R. A. Denton	3303	N
146	LOWER NECK MOMENT	X	082LNMX	Load cell, six axis neck	R. A. Denton	3303	Nm
147	LOWER NECK MOMENT	Y	082LNMY	Load cell, six axis neck	R. A. Denton	3303	Nm
148	LOWER NECK MOMENT	Z	082LNMZ	Load cell, six axis neck	R. A. Denton	3303	Nm
149	CHEST CG	X	2116-A11	Accel., Full Bridge	Entran	2000JF	G
150	CHEST CG	Y	2116-A14	Accel., Full Bridge	Entran	2000JF	G
151	CHEST CG	Z	2116-A23	Accel., Full Bridge	Entran	2000JF	G
152	CHEST DISPLACEMENT	X	082CP	Rotary Pot Chest	Servo	14CBI	MM
153	PELVIS	X	2116-A12	Accel., Full Bridge	Entran	2000JF	G
154	PELVIS	Y	2116-A19	Accel., Full Bridge	Entran	2000JF	G
155	PELVIS	Z	2116-A17	Accel., Full Bridge	Entran	2000JF	G
156	CAR SEAT UPPER TETHER FORCE	X	BL112	Load cell, Seat belt	FGP	FN4060	N
157	CAR SEAT	X	KETX1A	Accel.,1/2 bridge	Endevco	7264-200	G
158	CAR SEAT	Y	KETX1B	Accel.,1/2 bridge	Endevco	7264-200	G
159	CAR SEAT	Z	KETX1C	Accel.,1/2 bridge	Endevco	7264-200	G

2004 NHTSA 35mph NCAP
Instrumentation Data Channel Assignments
Right Rear Child A.T.D. Serial Number 139
2/18/04
2004 Toyota Highlander SUV

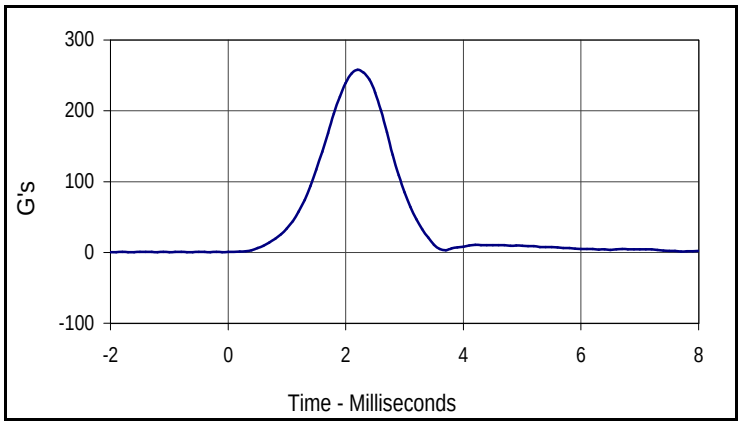
CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
160	HEAD CG	X	GPAC047	Accel.,1/2 bridge	Endevco	7264-2000	G
161	HEAD CG	Y	GPAC048	Accel.,1/2 bridge	Endevco	7264-2000	G
162	HEAD CG	Z	GPAC049	Accel.,1/2 bridge	Endevco	7264-2000	G
163	UPPER NECK FORCE	X	139UNFX	Load cell, six axis neck	R. A. Denton	IF-234	N
164	UPPER NECK FORCE	Y	139UNFY	Load cell, six axis neck	R. A. Denton	IF-234	N
165	UPPER NECK FORCE	Z	139UNFZ	Load cell, six axis neck	R. A. Denton	IF-234	N
166	UPPER NECK MOMENT	X	139UNMX	Load cell, six axis neck	R. A. Denton	IF-234	Nm
167	UPPER NECK MOMENT	Y	139UNMY	Load cell, six axis neck	R. A. Denton	IF-234	Nm
168	UPPER NECK MOMENT	Z	139UNMZ	Load cell, six axis neck	R. A. Denton	IF-234	Nm
169	LOWER NECK FORCE	X	139LNFX	Load cell, six axis neck	R. A. Denton	3303	N
170	LOWER NECK FORCE	Y	139LNFY	Load cell, six axis neck	R. A. Denton	3303	N
171	LOWER NECK FORCE	Z	139LNFZ	Load cell, six axis neck	R. A. Denton	3303	N
172	LOWER NECK MOMENT	X	139LNMX	Load cell, six axis neck	R. A. Denton	3303	Nm
173	LOWER NECK MOMENT	Y	139LNMY	Load cell, six axis neck	R. A. Denton	3303	Nm
174	LOWER NECK MOMENT	Z	139LNMZ	Load cell, six axis neck	R. A. Denton	3303	Nm
175	CHEST CG	X	2116-A01	Accel., Full Bridge	Entran	2000JF	G
176	CHEST CG	Y	2116-A06	Accel., Full Bridge	Entran	2000JF	G
177	CHEST CG	Z	2116-A07	Accel., Full Bridge	Entran	2000JF	G
178	CHEST DISPLACEMENT	X	139CP	Rotary Pot Chest	Servo	14CBI	MM
179	PELVIS	X	2116-N07	Accel., Full Bridge	Entran	2000JF	G
180	PELVIS	Y	2116-A03	Accel., Full Bridge	Entran	2000JF	G
181	PELVIS	Z	2116-A17	Accel., Full Bridge	Entran	2000JF	G
182	CAR SEAT UPPER TETHER FORCE	X	BL113	Load cell, Seat belt	FGP	FN4060	N
183	CAR SEAT	X	KETX4A	Accel.,1/2 bridge	Endevco	7264-200	G
184	CAR SEAT	Y	KETX4B	Accel.,1/2 bridge	Endevco	7264-200	G
185	CAR SEAT	Z	KETX4C	Accel.,1/2 bridge	Endevco	7264-200	G

SECTION F-5

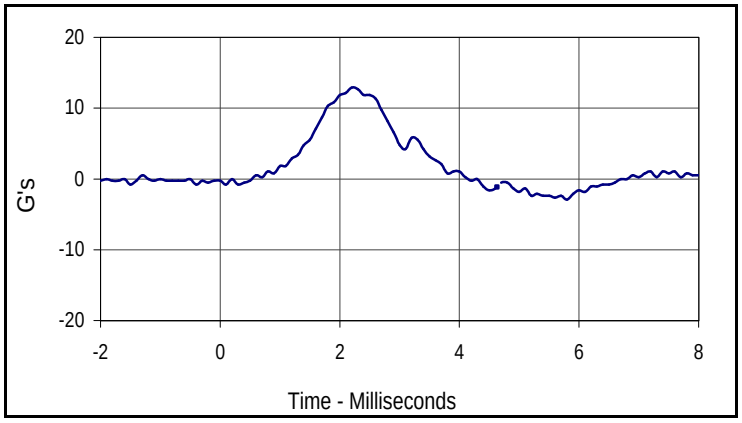
CHILD DUMMY CALIBRATION INFORMATION

Test Program:	Hybrid III 3 Year Old Head Drop Test	Test Date:	2/11/04
ATD Serial No.:	082	Test I.D.:	HD04H

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Peak Resultant Acceleration	G's	250.0 to 280.0	257.8	Pass
Peak Lateral Acceleration	G's	≤15.0	12.9	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
Oscillations After Main Pulse	%	<10	4.1	Pass
		Overall Test Results		Pass



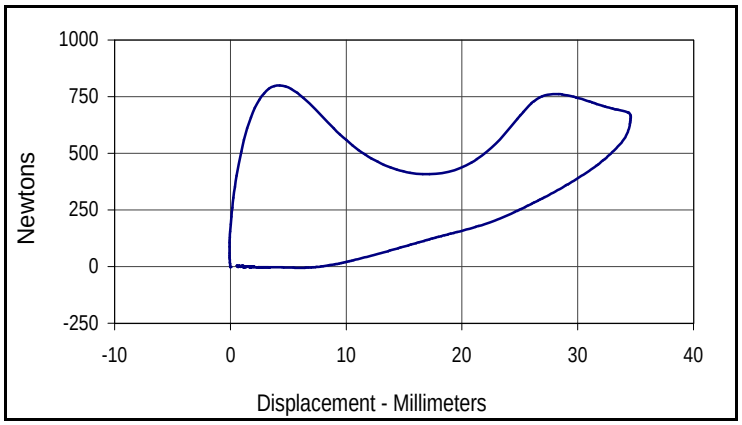
Curve Description			
Head Resultant			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
257.8	2.2	0.3	-1.9



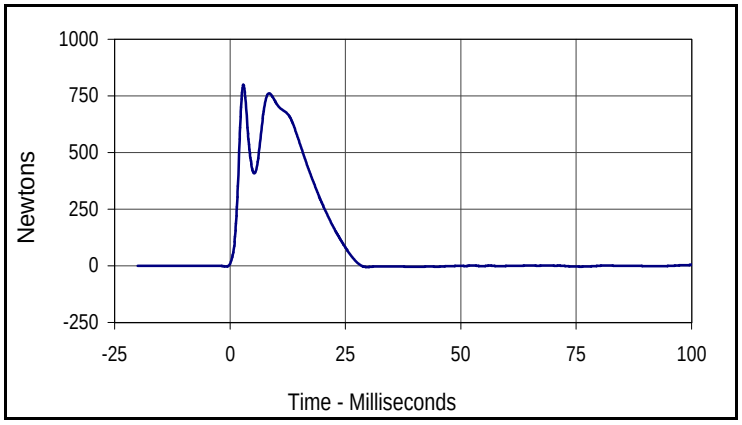
Curve Description			
Head Y			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
12.9	2.2	-2.9	5.8

Test Program:	Hybrid III 3 Year Old Thorax Impact Test	Test Date:	2/12/04
ATD Serial No.:	082	Test I.D.:	CH12D

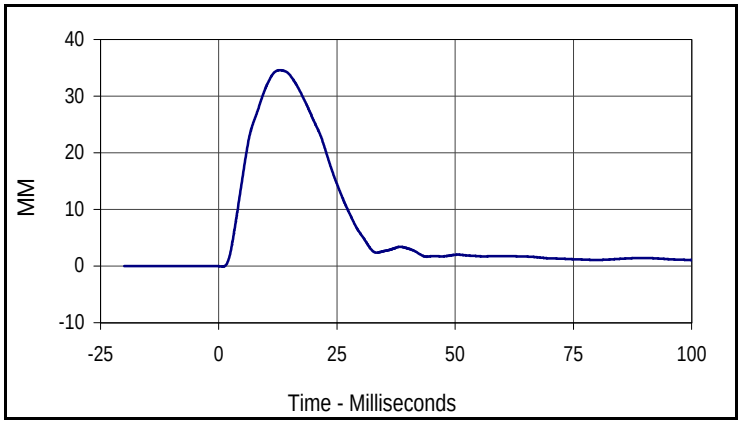
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	5.9 to 6.1	6.10	Pass
Peak Chest Compression	MM	32 to 38	34.6	Pass
Peak Force Between 32 and 38 MM	Newtons	680 to 810	693.6	Pass
Peak Force Between 12.5 and 32 MM	Newtons	≤860	761.4	Pass
Internal Hysterysis	%	65 to 85	72.6	Pass
		Overall Test Results		Pass



Curve Description			
Probe Force vs. Chest Displacement			
CURNO	Type	SAE Class	Hysterysis
004	FIL	180/600	72.6
Peak Probe Force		Peak Chest Displ.	
799.5		34.6	



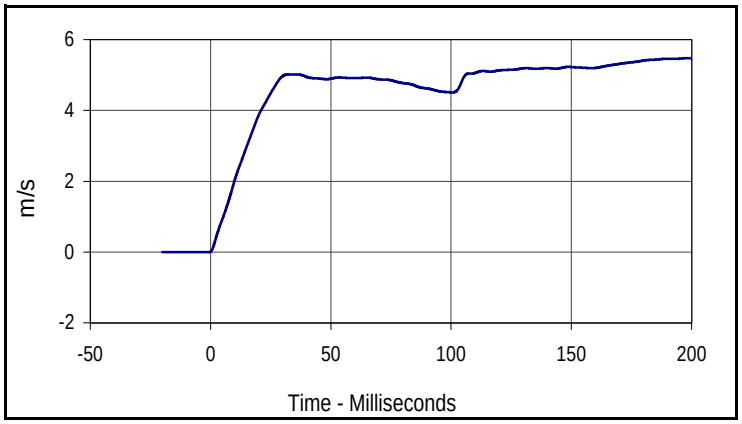
Curve Description			
Probe Force			
CURNO	Type	SAE Class	Units
003	FIL	180	Newtons
Max	Time	Min	Time
799.5	2.9	-5.4	29.7



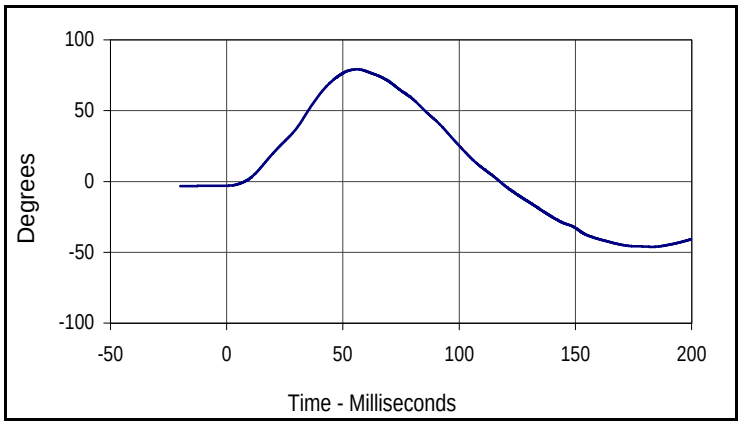
Curve Description			
Chest Compression			
CURNO	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
34.6	12.9	-0.1	0.8

Test Program:	3 Year Old Hybrid III Neck Flexion Test	Test Date:	2/11/04
ATD Serial No.:	082	Test I.D.:	NF04J

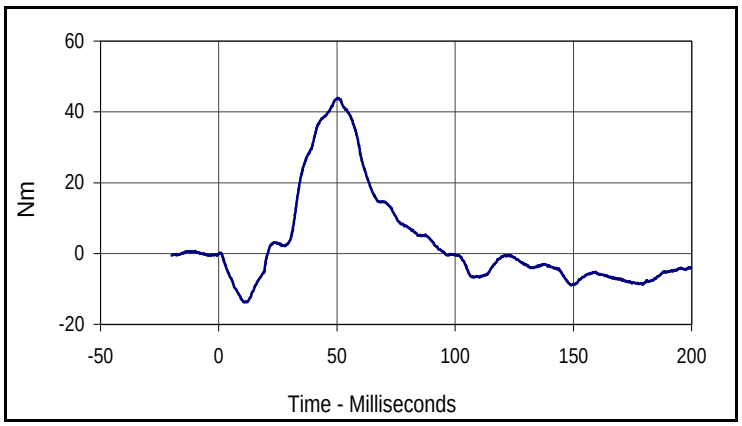
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	5.40 to 5.60	5.43	Pass
Pendulum Deceleration	10 Msec.	m/s	2.0 to 2.7	2.0	Pass
	20 Msec.	m/s	3.0 to 4.0	3.9	Pass
	30 Msec.	m/s	4.0 to 5.1	5.0	Pass
"D" Plane Rotation	Max	Degrees	70.0 to 82.0	79.2	Pass
Peak Moment in Rotation	Max	Nm	42.0 to 53.0	43.9	Pass
Positive Moment Decay, Time To 10Nm		Msec.	60.0 to 80.0	75.2	Pass
			Overall Test Results		Pass



Curve Description			
Pendulum Velocity			
CURNO	Type	SAE Class	Units
001	FIL	180	m/s
Max	Time	Min	Time
5.5	198.6	0.0	-0.7



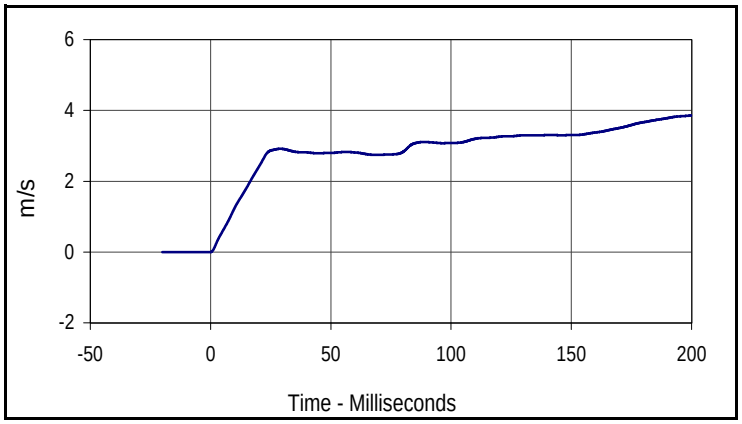
Curve Description			
"D" Plane Rotation			
CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
79.2	56.0	-46.2	183.1



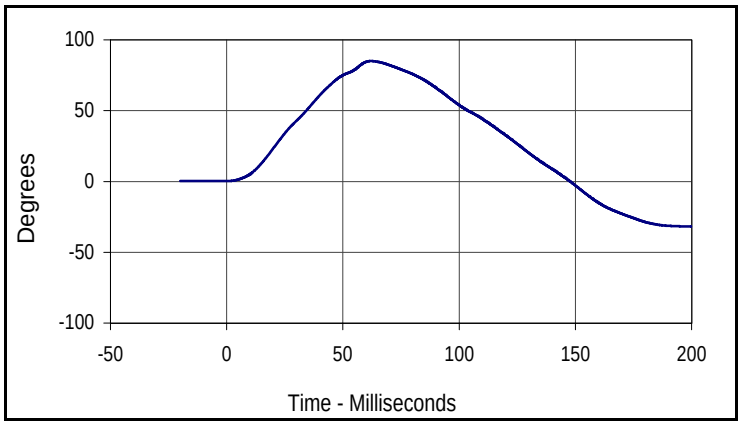
Curve Description			
Neck Moment Y			
CURNO	Type	SAE Class	Units
002	FIL	600	Nm
Max	Time	Min	Time
43.9	50.7	-13.8	12.0

Test Program:	3 Year Old Hybrid III Neck Extension Test	Test Date:	2/11/04
ATD Serial No.:	082	Test I.D.:	NE04J

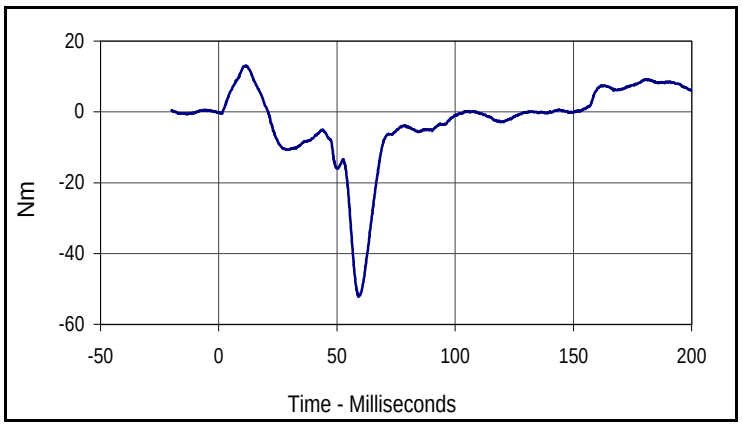
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	3.55 to 3.75	3.60	Pass
Pendulum Deceleration	10 Msec.	m/s	1.0 to 1.4	1.2	Pass
	20 Msec.	m/s	1.9 to 2.5	2.4	Pass
	30 Msec.	m/s	2.8 to 3.5	2.9	Pass
"D" Plane Rotation	Max	Degrees	83.0 to 93.0	85.0	Pass
Peak Moment in Rotation	Max	Nm	-43.7 to -53.3	-52.1	Pass
Positive Moment Decay, Time To 10Nm		Msec.	60.0 to 80.0	69.1	Pass
			Overall Test Results		Pass



Curve Description			
Pendulum Velocity			
CURNO	Type	SAE Class	Units
001	FIL	180	m/s
Max	Time	Min	Time
4.0	220.0	0.0	-0.3



Curve Description			
"D" Plane Rotation			
CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
85.0	62.1	-32.2	205.7



Curve Description			
Neck Moment Y			
CURNO	Type	SAE Class	Units
002	FIL	600	Nm
Max	Time	Min	Time
13.0	11.5	-52.1	59.1

Test Program:	Hybrid III 3 Year Old Torso Flexion Test	Test Date:	2/12/04
ATD Serial No.:	082	Test I.D.:	TF04G

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Initial reference plane angle	Degrees	≤15.0	3.2	Pass
Peak Force at 45 +/-0.5 degrees	Newtons	130.0 to 180.0	167.9	Pass
Torso rotation rate	deg/sec	0.5 to 1.5	1.1	Pass
Final reference plane angle	Degrees	+/-10	3.2	Pass
		Overall Test Results		Pass

Test Program:	Hybrid III 3 Year Old External Measurements	Test Date:	2/12/04
ATD Serial No.:	082	Test I.D.:	N/A

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
A - Total sitting height	mm	539 to 554	545	Pass
B - Shoulder pivot height	mm	307 to 323	310	Pass
C - "H" point height	mm	34 to 45	35	Pass
D - "H" point from backline	mm	57 to 67	65	Pass
E - Shoulder pivot from back	mm	61 to 71	65	Pass
F - Thigh clearance	mm	81 to 91	84	Pass
G - Elbow back to wrist pivot	mm	247 to 263	255	Pass
H - Skull cap to back line	mm	48 to 58	55	Pass
I - Shoulder to elbow length	mm	185 to 201	200	Pass
J - Elbow rest height	mm	134 to 149	145	Pass
K - Buttock to knee length	mm	285 to 300	295	Pass
L - Poplipteal length	mm	219 to 234	225	Pass
M - Knee pivot height	mm	242 to 257	255	Pass
N - Buttock poplipteal length	mm	218 to 233	225	Pass
O - Chest depth with jacket	mm	139 to 154	150	Pass
P - Foot length	mm	138 to 148	145	Pass
R - Buttock to knee pivot length	mm	251 to 262	260	Pass
S - Head Breadth	mm	128 to 144	135	Pass
T - Head Depth	mm	167 to 183	180	Pass
U - Hip breadth	mm	201 to 216	215	Pass
V - Shoulder breadth	mm	237 to 252	245	Pass
W - Foot breadth	mm	54 to 64	60	Pass
X - Head circumference	mm	500 to 516	515	Pass
Y - Chest circumference with jacket	mm	527 to 553	529	Pass
Z - Waist circumference	mm	527 to 553	546	Pass
AA - Location for chest circumference	mm	249 to 259	253	Pass
BB - Location for waist circumference	mm	160 to 170	166	Pass
		Overall Test Results		Pass

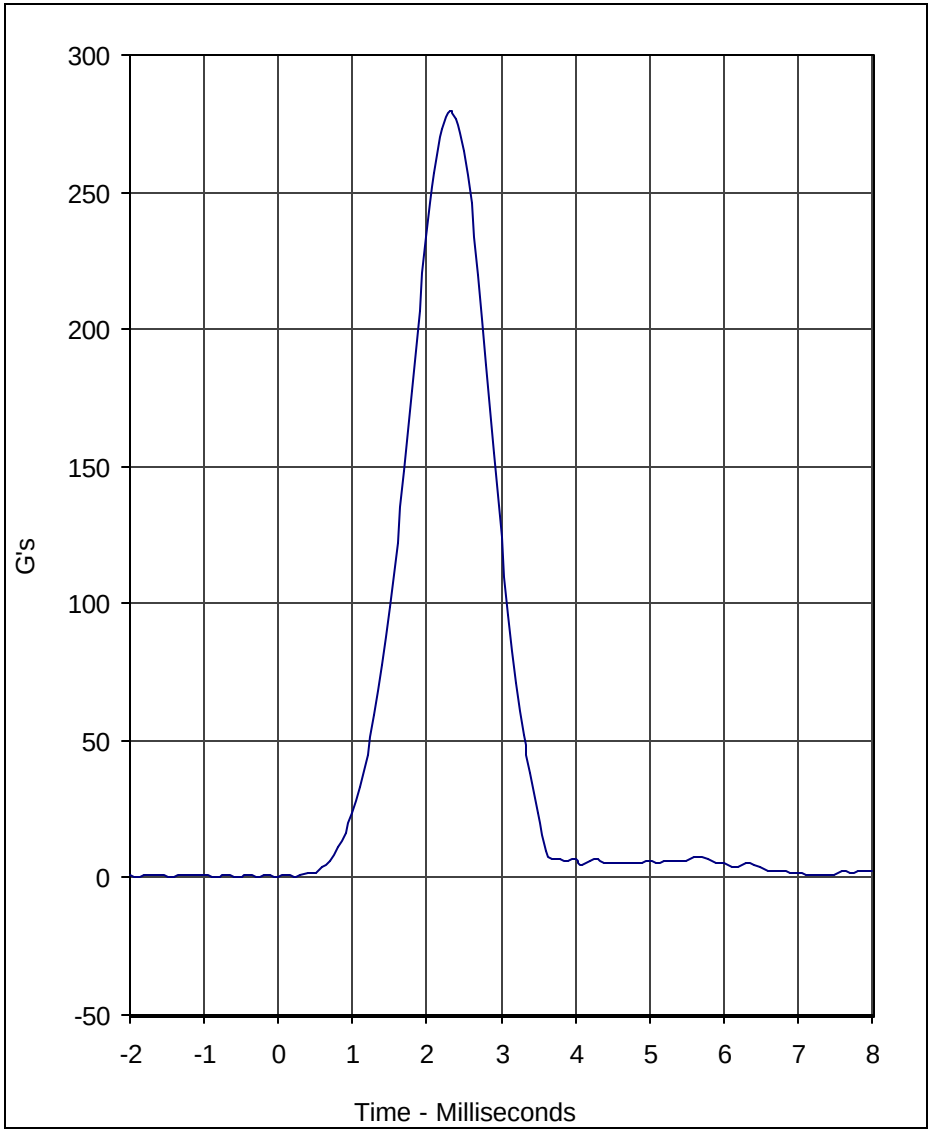
Calibration Data Sheet
Hybrid III 3 Year Old
Head Drop Test

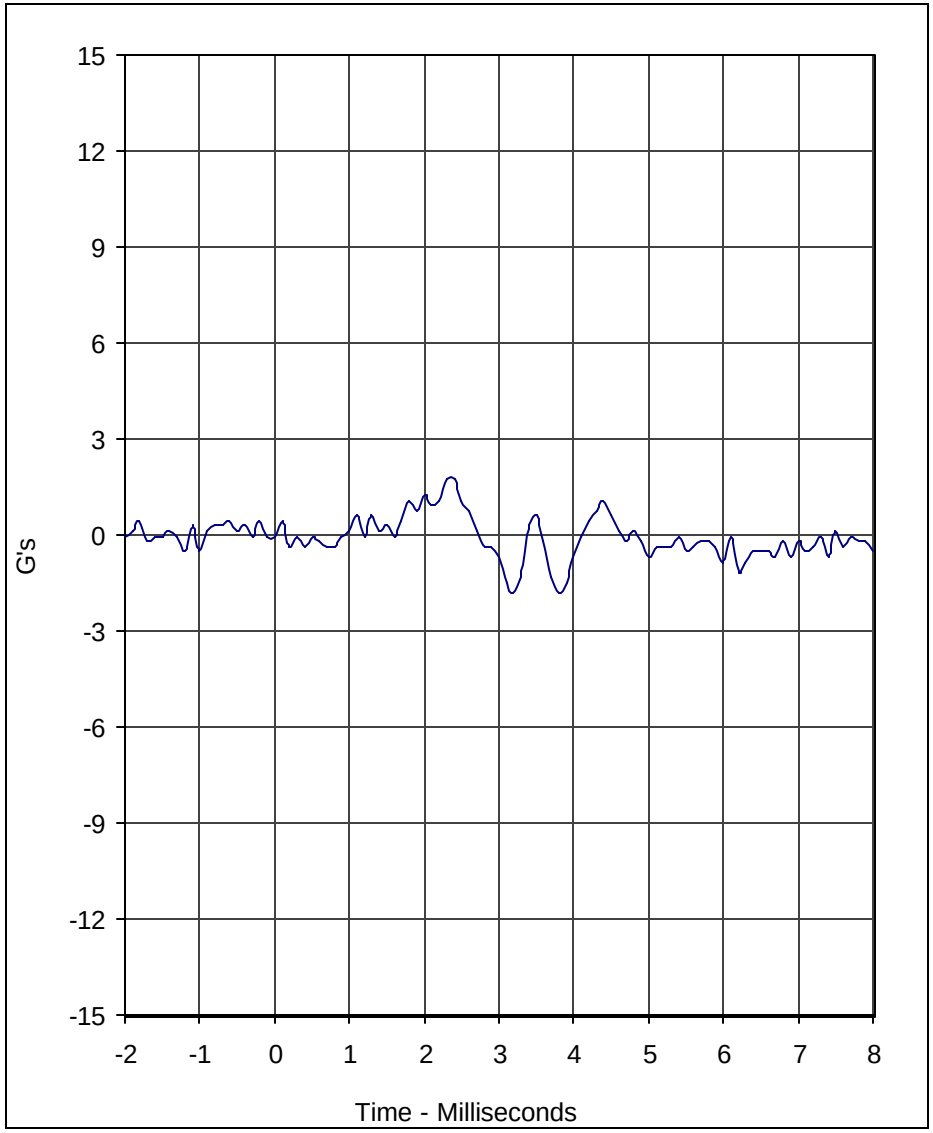
ATD Serial No.: 139 Test I.D.: HD02B

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Peak Resultant Acceleration	G's	250.0 to 280.0	279.3	Pass
Peak Lateral Acceleration	G's	≤15.0	1.8	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
Oscillations After Main Pulse	%	<10	2.8	Pass
		Overall Test Results		Pass

Laboratory Technician

January 7, 2004
Test Date





Curve Description	CURNO	Type
Head Resultant	001	RES

Units	Max	Time	Min	Time	SAE Class
G's	279.3	2.3	0.2	-1.4	1000

Curve Description	CURNO	Type
Head Y	002	FIL

Units	Max	Time	Min	Time	SAE Class
G's	1.7	2.3	-1.8	3.2	1000

Test Program: Hybrid III 3 Year Old Head Drop Test

Test Date: 1/7/04

A.T.D. Serial No.: 139

Test I.D.: HD02B

KARCO Engineering

F5-8

TR-P24001-14-NC

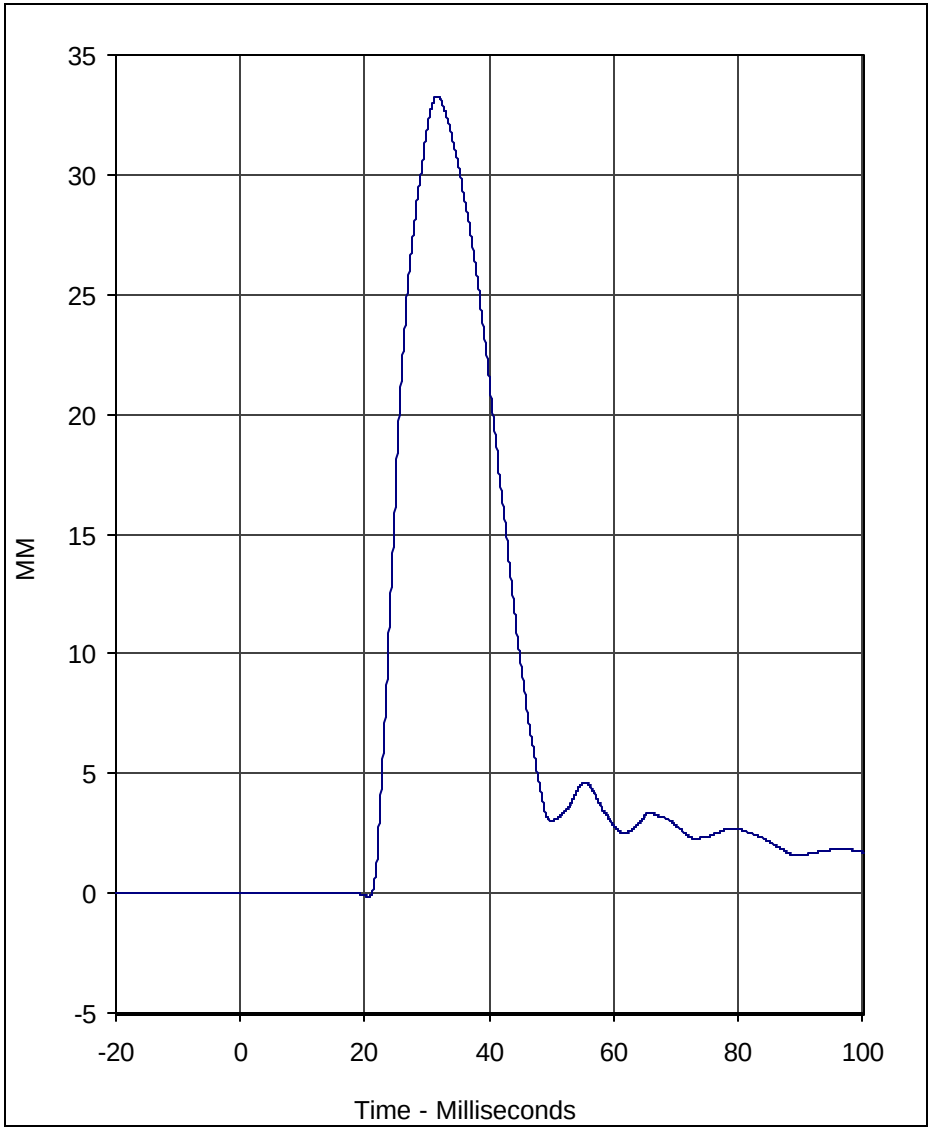
Calibration Data Sheet
Hybrid III 3 Year Old
Thorax Impact Test

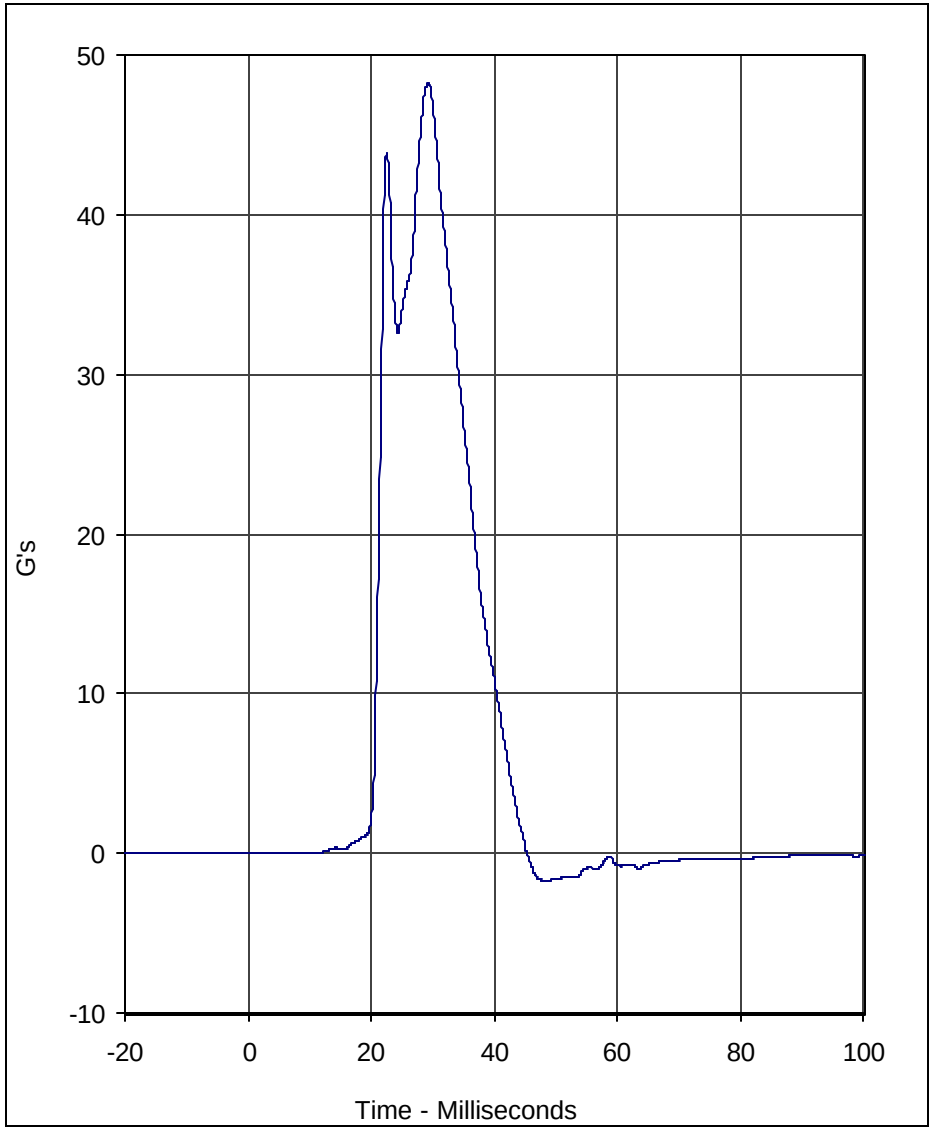
ATD Serial No.: 139 Test I.D.: CH02B

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	5.9 to 6.1	5.96	Pass
Peak Chest Compression	MM	32 to 38	33.3	Pass
Peak Probe Force Between 32 and 38 MM	Newtons	680 to 810	742.3	Pass
Peak Probe Force Between 12.5 and 32 MM	Newtons	≤860	750.3	Pass
Internal Hysterysis	%	65 to 85	75.9	Pass
		Overall Test Results		Pass

Laboratory Technician

January 7, 2004
Test Date





Curve Description	CURNO	Type
Chest Compression	001	FIL

Units	Max	Time	Min	Time	SAE Class
MM	33.3	32.2	-0.1	21.1	600

Curve Description	CURNO	Type
Probe Acceleration	002	FIL

Units	Max	Time	Min	Time	SAE Class
G's	48.2	29.8	-1.7	48.8	180

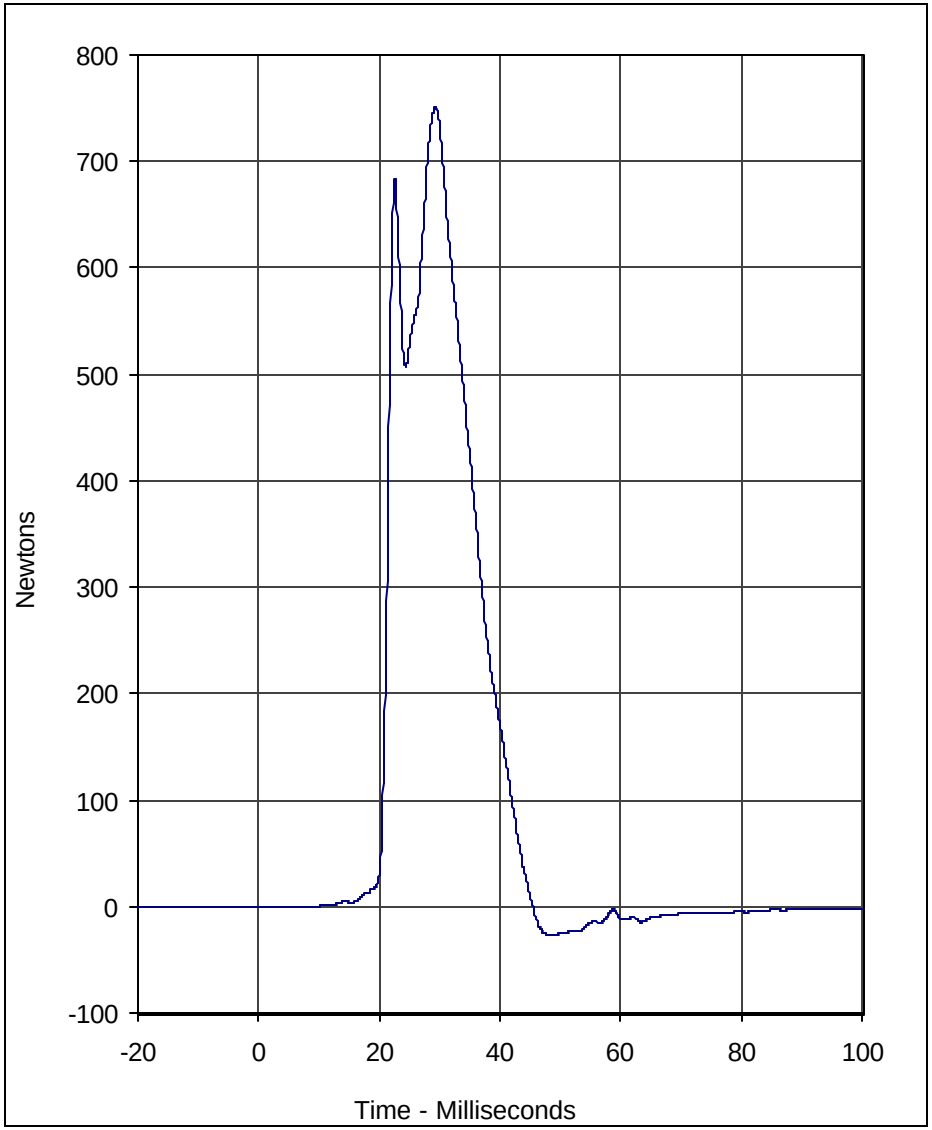
Test Program: Hybrid III 3 Year Old Thorax Impact

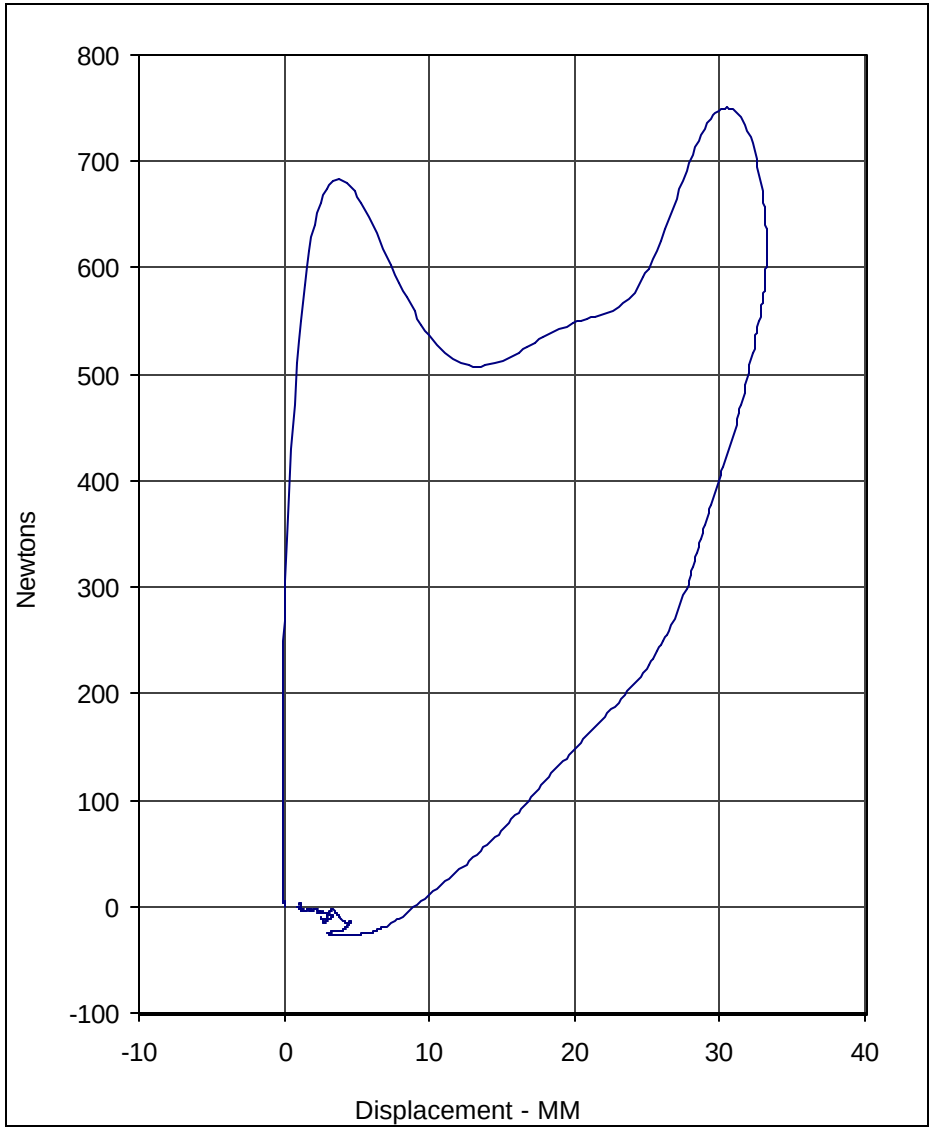
Test Date: 1/7/04

A.T.D. Serial No.: 139

Test I.D.: CH02B

KARCO Engineering





Curve Description	CURNO	Type
Probe Force	003	FIL

Units	Max	Time	Min	Time	SAE Class
Newtons	750.3	29.3	-26.5	48.3	180

Curve Description	CURNO	Type
Probe Force vs. Chest Compression	004	FIL

Units	Hysterysis	SAE Class
%	75.9	180/600

Test Program: Hybrid III 3 Year Old Thorax Impact

Test Date: 1/7/04

A.T.D. Serial No.: 139

Test I.D.: CH02B

KARCO Engineering

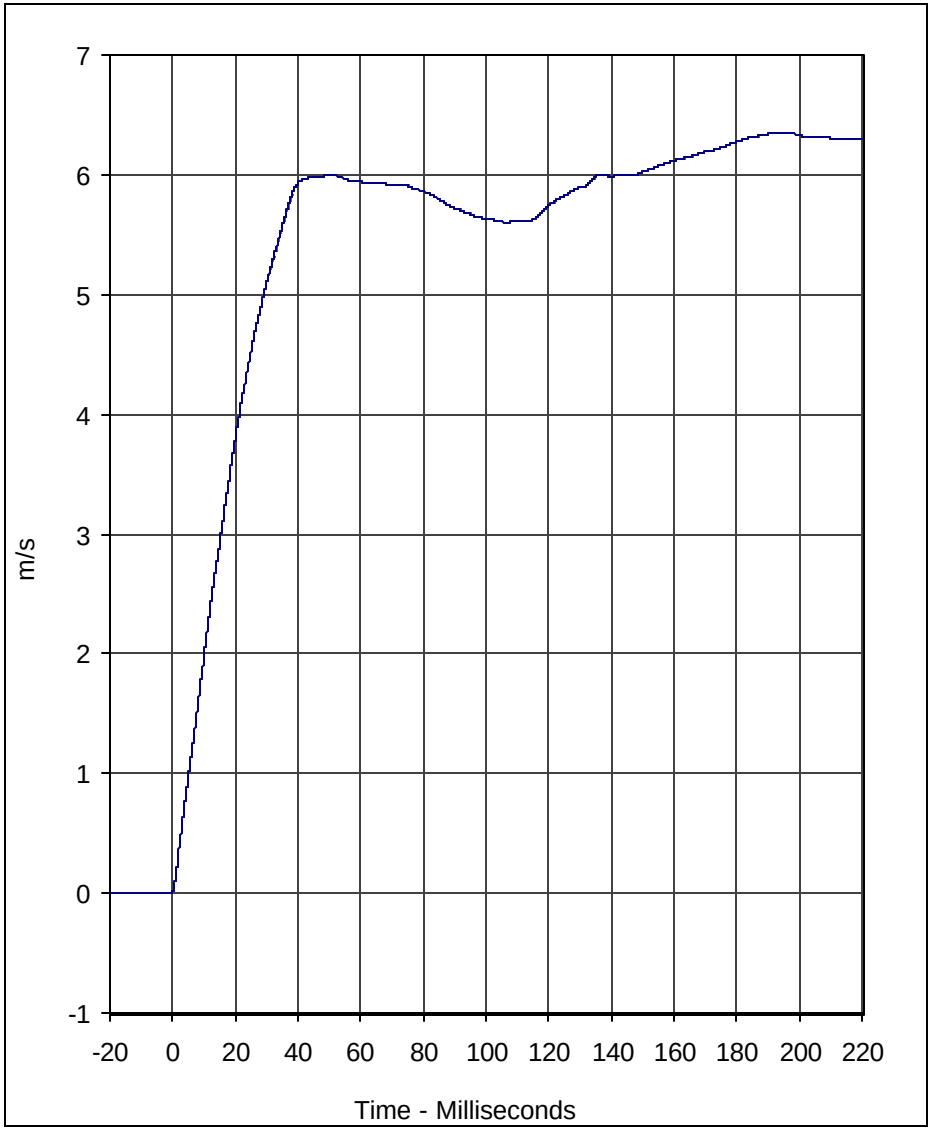
Calibration Data Sheet
Hybrid III 3 Year Old
Neck Flexion Test

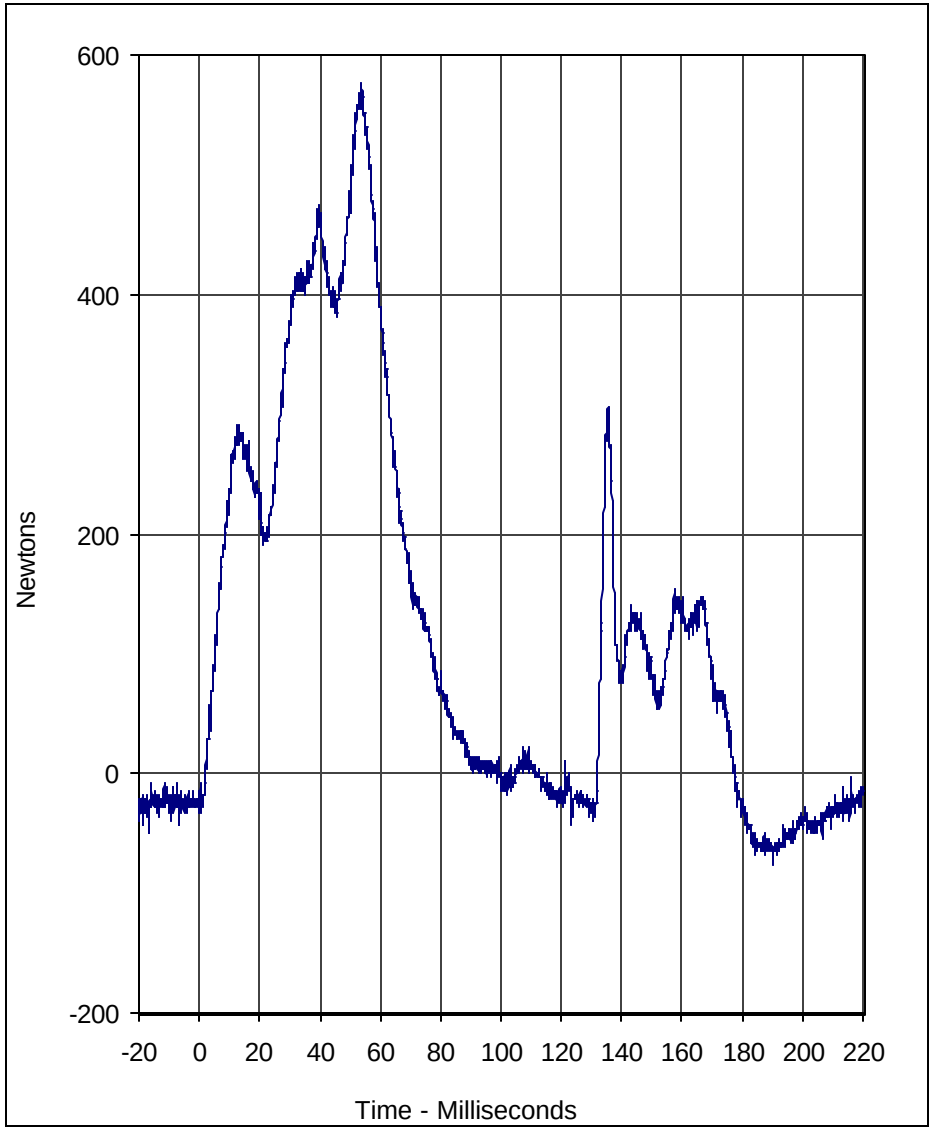
ATD Serial No.: 139 Test I.D.: NF02B

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	5.40 to 5.60	5.47	Pass
Pendulum Deceleration	10 Msec.	m/s	2.0 to 2.7	2.0	Pass
	20 Msec.	m/s	3.0 to 4.0	3.8	Pass
	30 Msec.	m/s	4.0 to 5.1	5.1	Pass
"D" Plane Rotation	Maximum	Degrees	70.0 to 82.0	76.9	Pass
Peak Moment in Rotation	Maximum	Nm	42.0 to 53.0	48.9	Pass
Positive Moment Decay, Time to 10Nm		Msec.	60.0 to 80.0	78.8	Pass
			Overall Test Results		Pass

Laboratory Technician

January 7, 2004
Test Date





Curve Description	CURNO	Type
Pendulum Velocity	001	FIL

Units	Max	Time	Min	Time	SAE Class
m/s	6.4	196.2	0.0	-0.7	180

Curve Description	CURNO	Type
Neck Force X	002	FIL

Units	Max	Time	Min	Time	SAE Class
Newtons	576.0	53.4	-75.6	190.3	1000

Test Program: 3 Year Old Hybrid III Neck Flexion Test

Test Date: 1/7/04

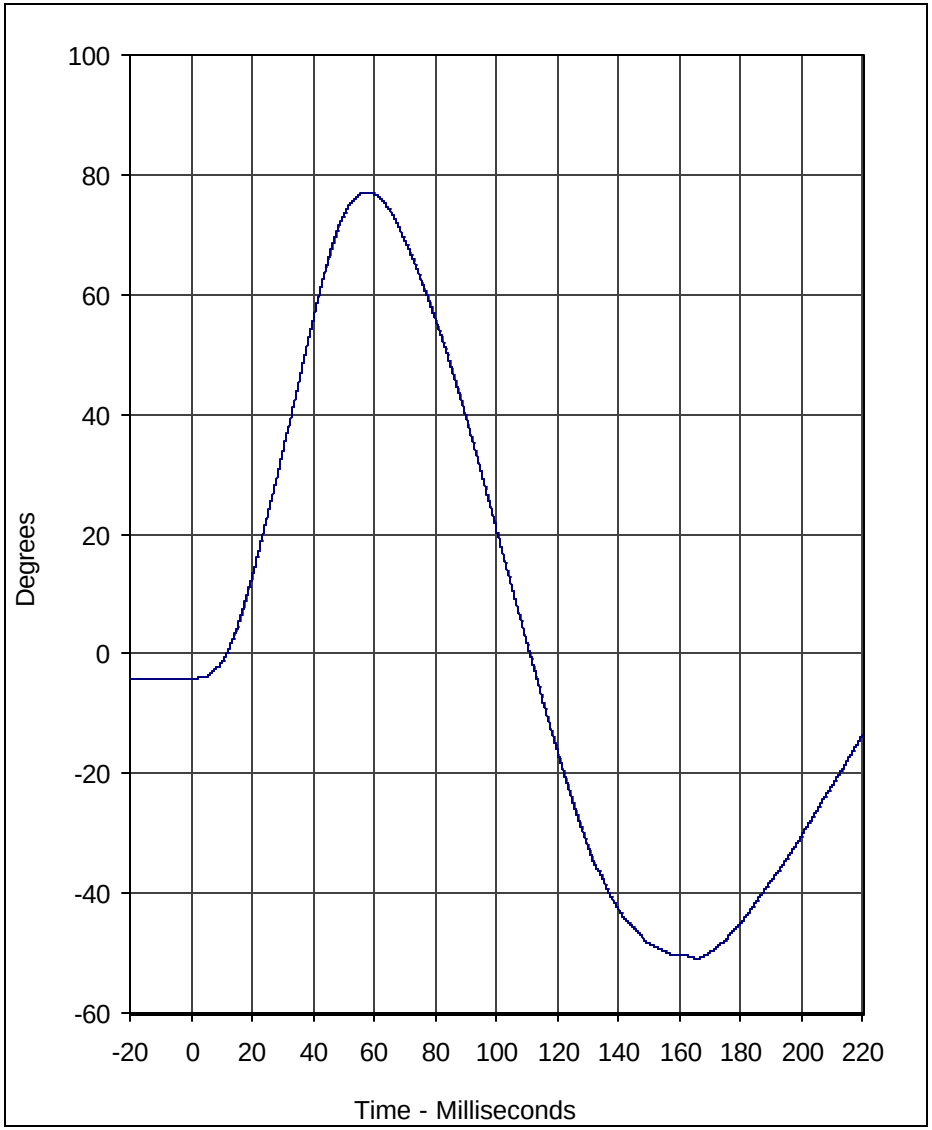
A.T.D. Serial No.: 139

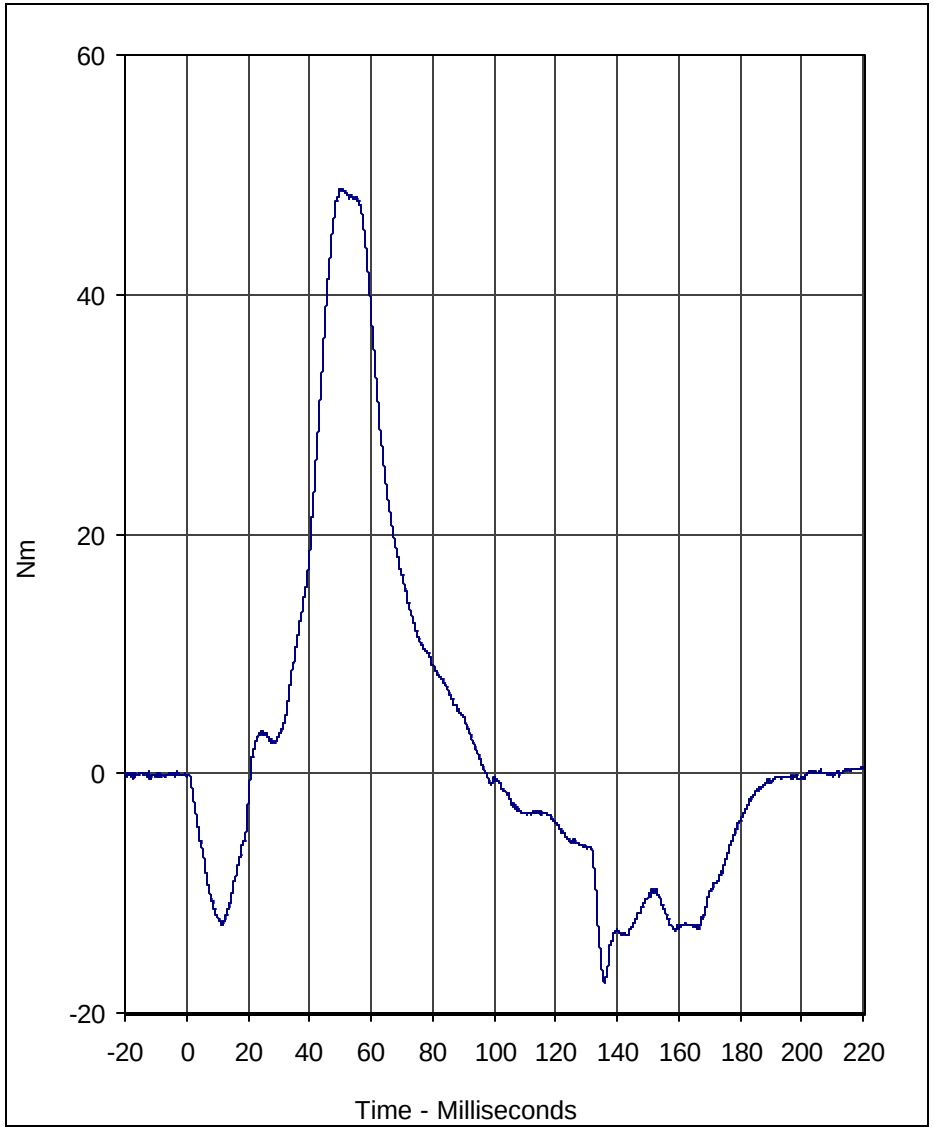
Test I.D.: NF02B

KARCO Engineering

F5-13

TR-P24001-14-NC





Curve Description	CURNO	Type
"D" Plane Rotation	003	FIL

Units	Max	Time	Min	Time	SAE Class
Degrees	76.9	56.8	-51.0	166.0	180

Curve Description	CURNO	Type
Neck Moment Y	002	FIL

Units	Max	Time	Min	Time	SAE Class
Nm	48.9	50.0	-17.4	136.0	600

Test Program: 3 Year Old Hybrid III Neck Flexion Test

Test Date: 1/7/04

A.T.D. Serial No.: 139

Test I.D.: NF02B

KARCO Engineering

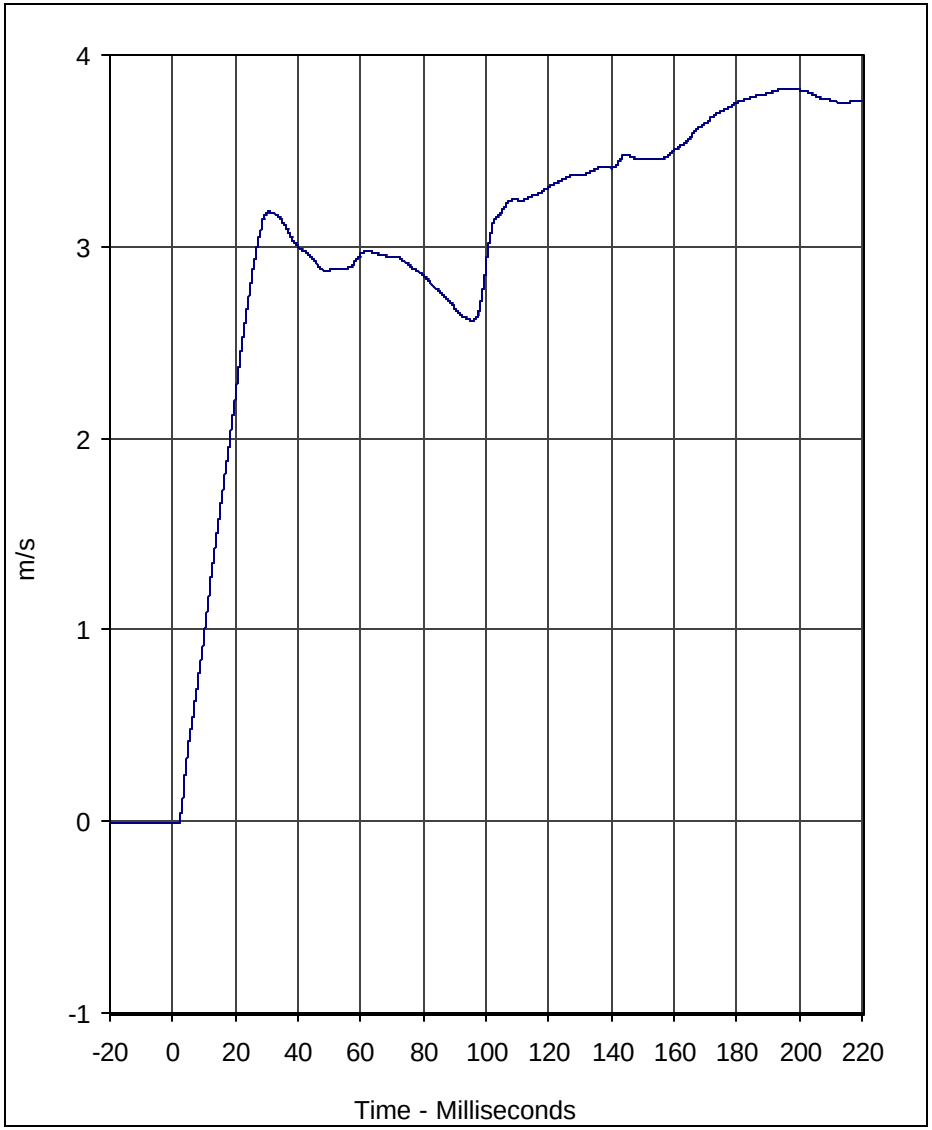
Calibration Data Sheet
Hybrid III 3 Year Old
Neck Extension Test

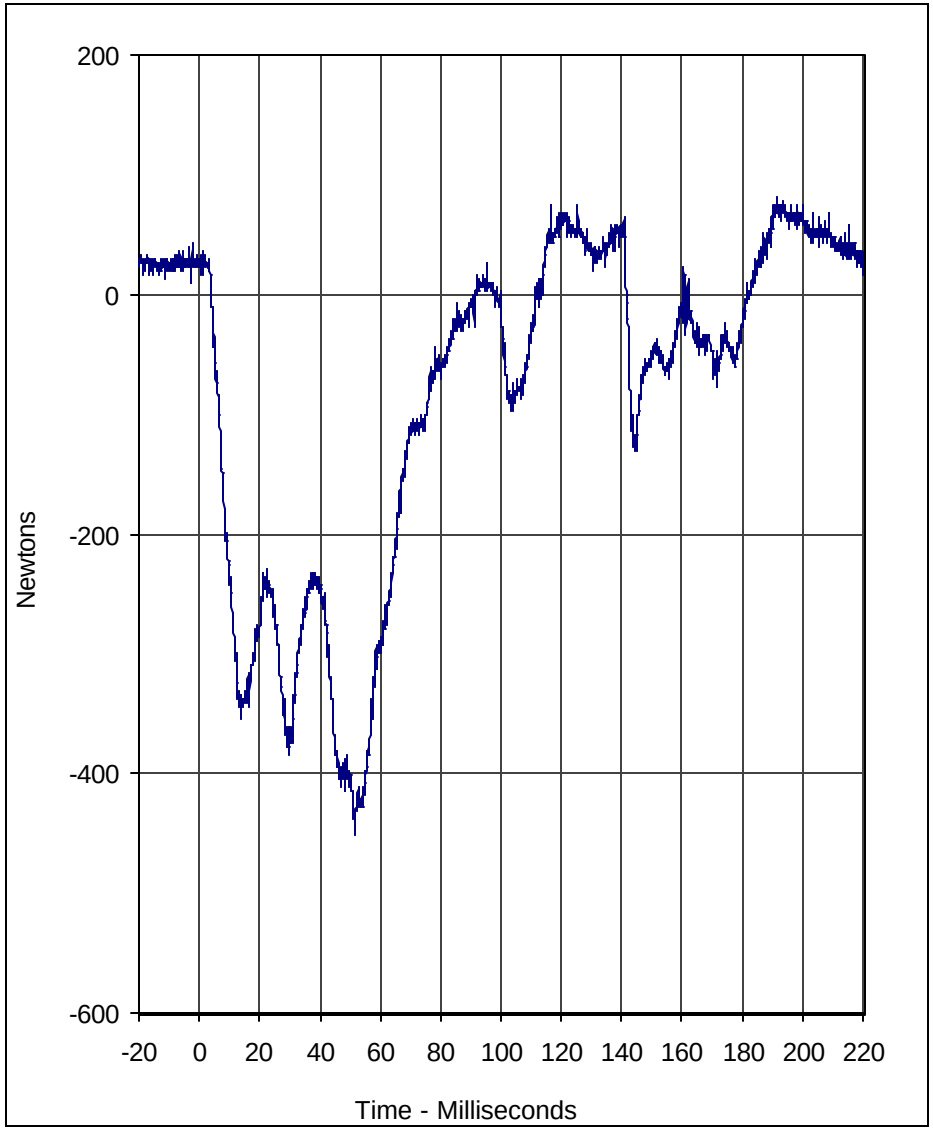
ATD Serial No.: 139 Test I.D.: NE02B

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	3.55 to 3.75	3.63	Pass
Pendulum Deceleration	10 Msec.	m/s	1.0 to 1.4	1.1	Pass
	20 Msec.	m/s	1.9 to 2.5	2.2	Pass
	30 Msec.	m/s	2.8 to 3.5	3.2	Pass
"D" Plane Rotation	Maximum	Degrees	83.0 to 93.0	84.2	Pass
Peak Moment in Rotation	Maximum	Nm	-43.7 to -53.3	-47.0	Pass
Positive Moment Decay, Time to 10Nm		Msec.	60.0 to 80.0	79.9	Pass
			Overall Test Results		Pass

Laboratory Technician

January 7, 2004
Test Date





Curve Description	CURNO	Type
Pendulum Velocity	001	FIL

Units	Max	Time	Min	Time	SAE Class
m/s	3.8	196.2	0.0	1.6	180

Curve Description	CURNO	Type
Neck Force X	002	FIL

Units	Max	Time	Min	Time	SAE Class
Newtons	80.9	191.6	-451.7	51.5	1000

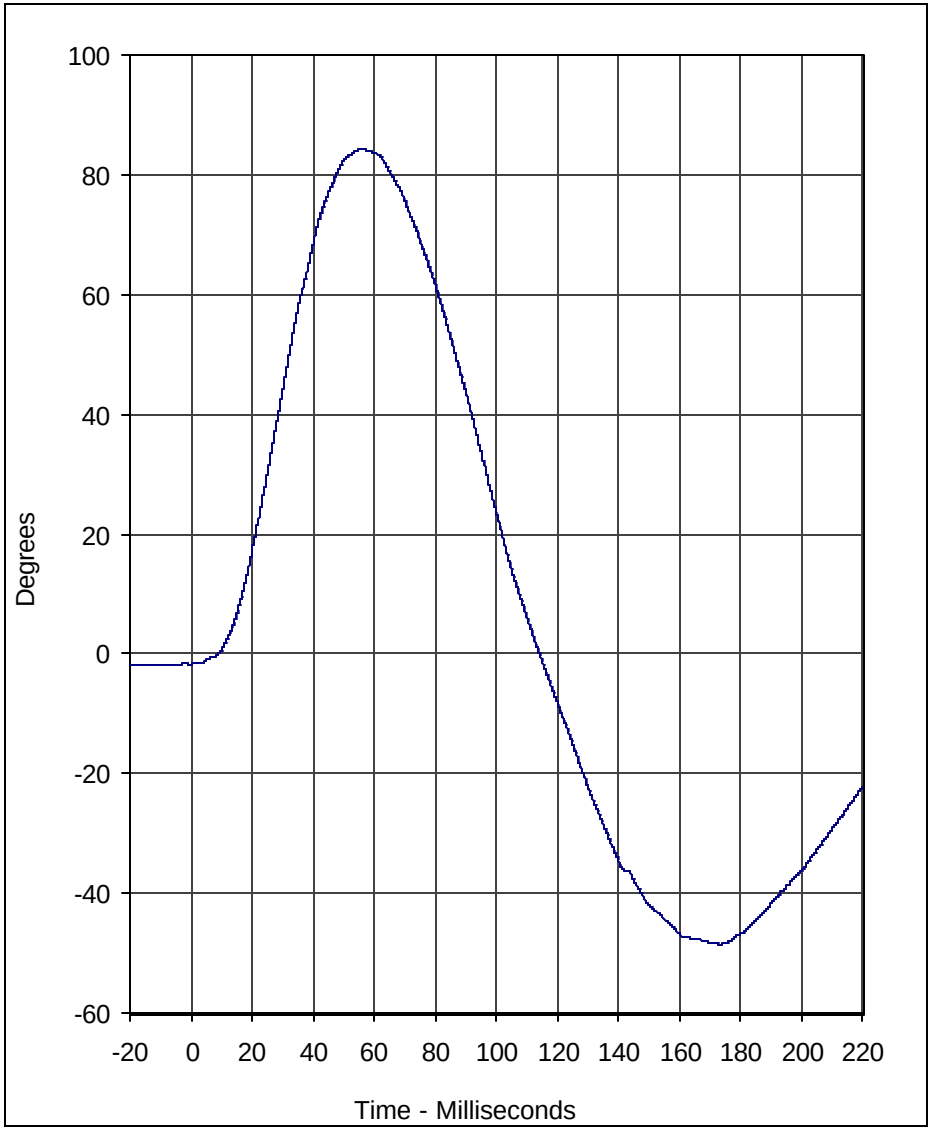
Test Program: 3 Year Old Hybrid III Neck Extension Test

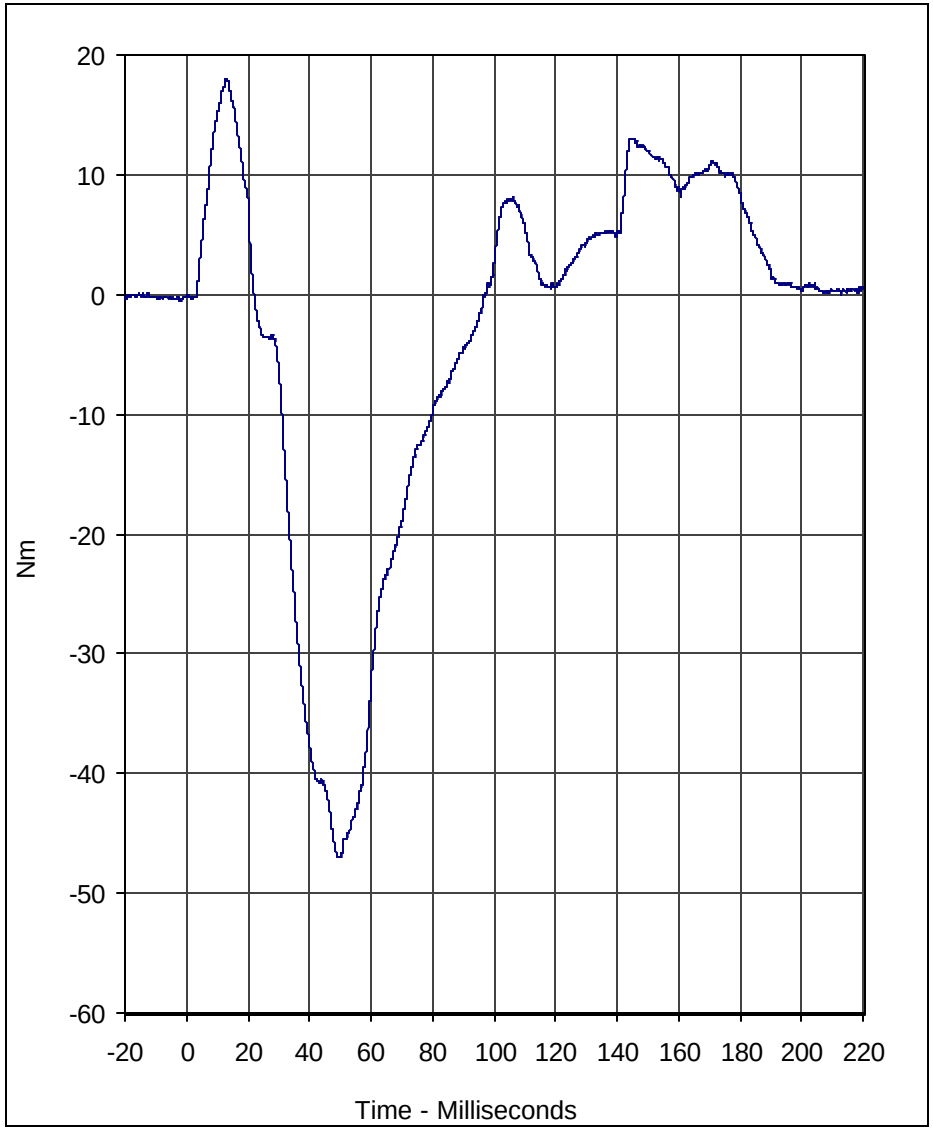
Test Date: 1/7/04

A.T.D. Serial No.: 139

Test I.D.: NE02B

KARCO Engineering





Curve Description	CURNO	Type
"D" Plane Rotation	003	FIL

Units	Max	Time	Min	Time	SAE Class
Degrees	84.2	55.9	-48.6	173.5	180

Curve Description	CURNO	Type
Neck Moment Y	002	FIL

Units	Max	Time	Min	Time	SAE Class
Nm	18.0	12.8	-47.0	49.3	600

Test Program: 3 Year Old Hybrid III Neck Extension Test

Test Date: 1/7/04

A.T.D. Serial No.: 139

Test I.D.: NE02B

KARCO Engineering

Calibration Data Sheet
Hybrid III 3 Year Old
Torso Flexion Test

ATD Serial No.: 139 Test I.D.: TF02B

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Initial reference plane angle	Degrees	≤15.0	3.8	Pass
Peak Force at 45 +/-0.5 degrees	Newtons	130.0 to 180.0	178.5	Pass
Torso rotation rate	deg/sec	0.5 to 1.5	0.7	Pass
Final reference plane angle	Degrees	+/-10	2.6	Pass
		Overall Test Results		Pass

Laboratory Technician

January 7, 2004
Test Date

Calibration Data Sheet
Hybrid III 3 Year Old
External Measurements

ATD Serial No.: 139

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
A - Total sitting height	mm	539 to 554	545	Pass
B - Shoulder pivot height	mm	307 to 323	320	Pass
C - "H" point height	mm	34 to 45	35	Pass
D - "H" point from backline	mm	57 to 67	65	Pass
E - Shoulder pivot from back	mm	61 to 71	67	Pass
F - Thigh clearance	mm	81 to 91	84	Pass
G - Elbow back to wrist pivot	mm	247 to 263	252	Pass
H - Skull cap to back line	mm	48 to 58	50	Pass
I - Shoulder to elbow length	mm	185 to 201	194	Pass
J - Elbow rest height	mm	134 to 149	140	Pass
K - Buttock to knee length	mm	285 to 300	296	Pass
L - Poplipteal length	mm	219 to 234	225	Pass
M - Knee pivot height	mm	242 to 257	245	Pass
N - Buttock poplipteal length	mm	218 to 233	223	Pass
O - Chest depth with jacket	mm	139 to 154	150	Pass
P - Foot length	mm	138 to 148	145	Pass
R - Buttock to knee pivot length	mm	251 to 262	260	Pass
S - Head Breadth	mm	128 to 144	140	Pass
T - Head Depth	mm	167 to 183	175	Pass
U - Hip breadth	mm	201 to 216	212	Pass
V - Shoulder breadth	mm	237 to 252	243	Pass
W - Foot breadth	mm	54 to 64	56	Pass
X - Head circumference	mm	500 to 516	512	Pass
Y - Chest circumference with jacket	mm	527 to 553	535	Pass
Z - Waist circumference	mm	527 to 553	542	Pass
AA - Location for chest circumference	mm	249 to 259	254	Pass
BB - Location for waist circumference	mm	160 to 170	164	Pass
		Overall Test Results		Pass

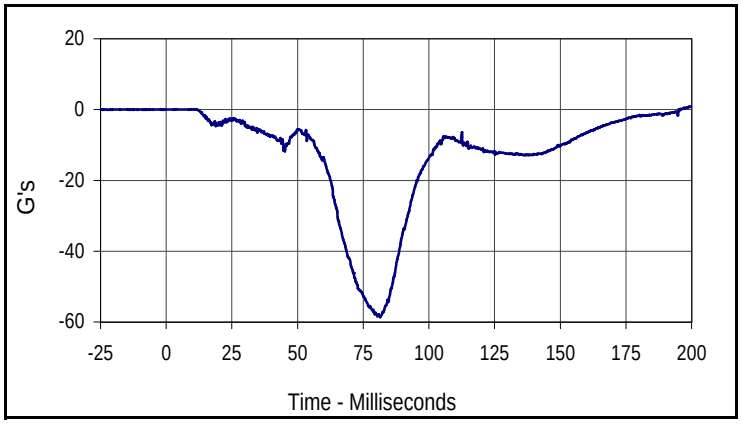
Laboratory Technician

January 7, 2004
Test Date

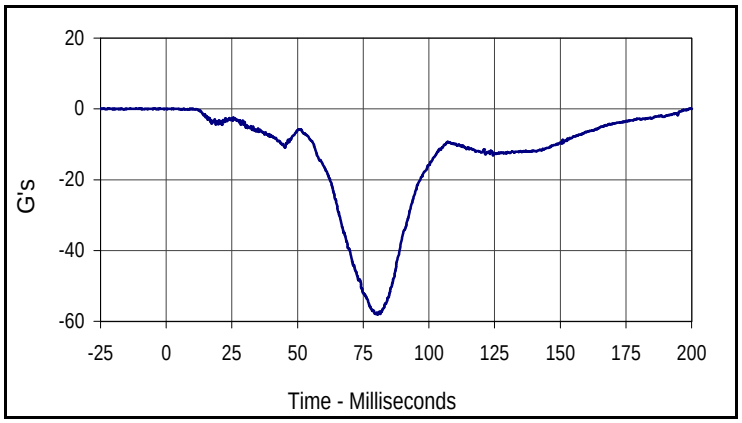
APPENDIX G

NINE ACCELEROMETER ARRAY HEAD

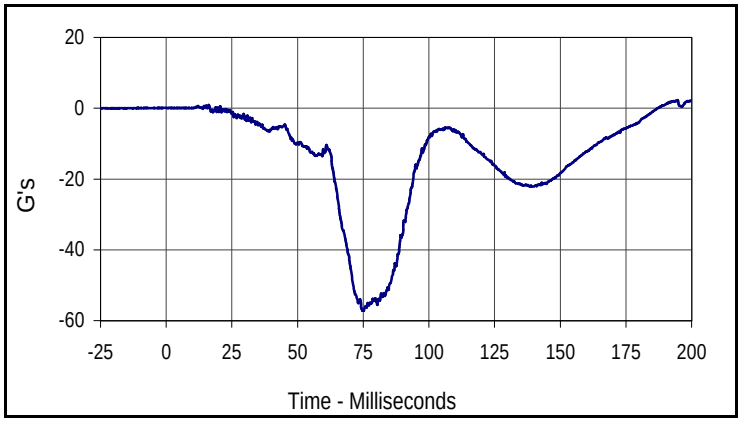
Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



Curve Description			
Driver Head Primary X			
CURNO	Type	SAE Class	Units
001	FIL	1000	G's
Max	Time	Min	Time
0.8	199.7	-58.7	81.5

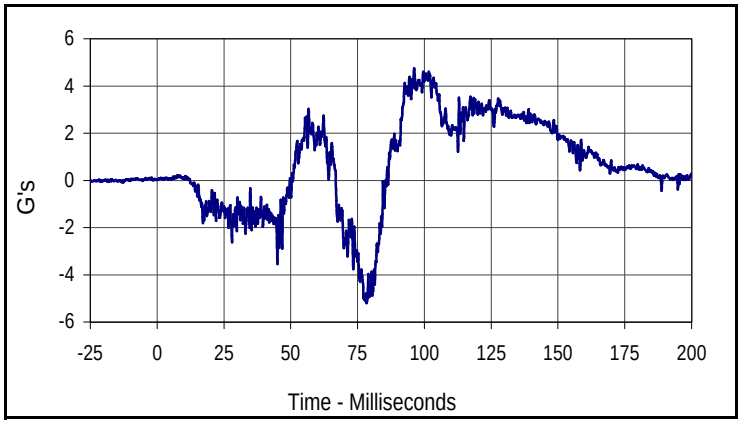


Curve Description			
Driver NAAH Yarm-X			
CURNO	Type	SAE Class	Units
188	FIL	1000	G's
Max	Time	Min	Time
0.1	2.5	-58.1	80.5

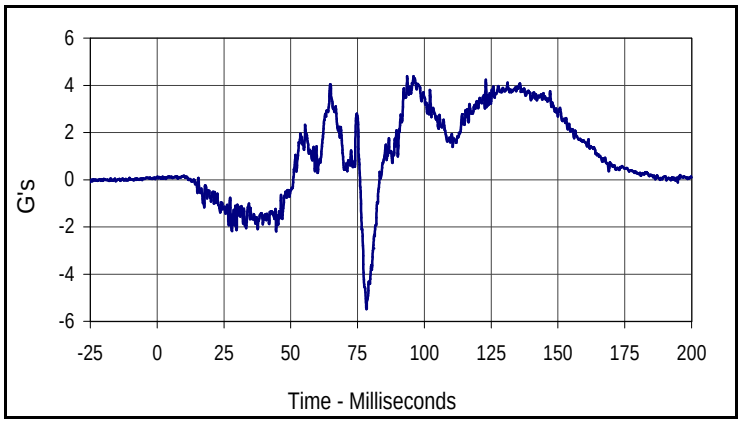


Curve Description			
Driver NAAH Zarm-X			
CURNO	Type	SAE Class	Units
190	FIL	1000	G's
Max	Time	Min	Time
2.3	194.8	-57.2	75.2

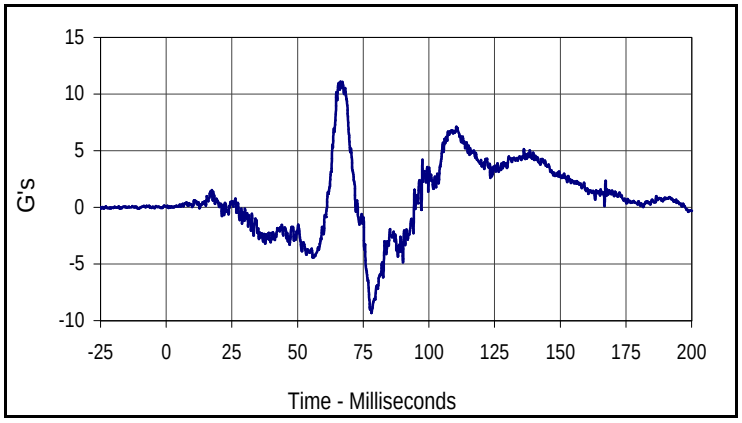
Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



Curve Description			
Driver Head Primary Y			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
4.7	96.2	-5.2	78.3

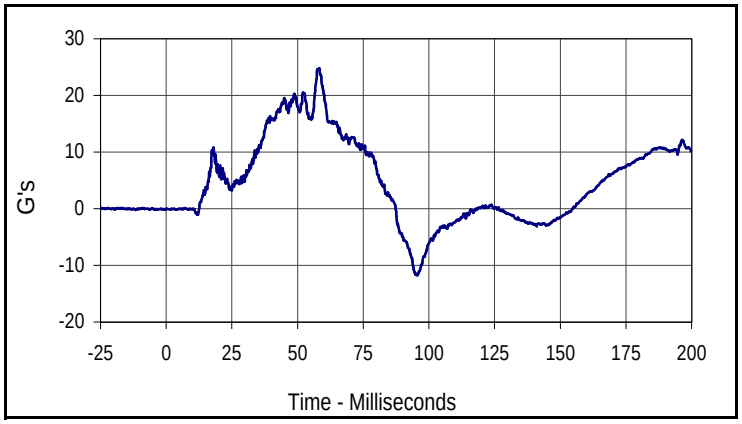


Curve Description			
Driver NAAH Xarm-Y			
CURNO	Type	SAE Class	Units
186	FIL	1000	G's
Max	Time	Min	Time
4.4	93.6	-5.5	78.3

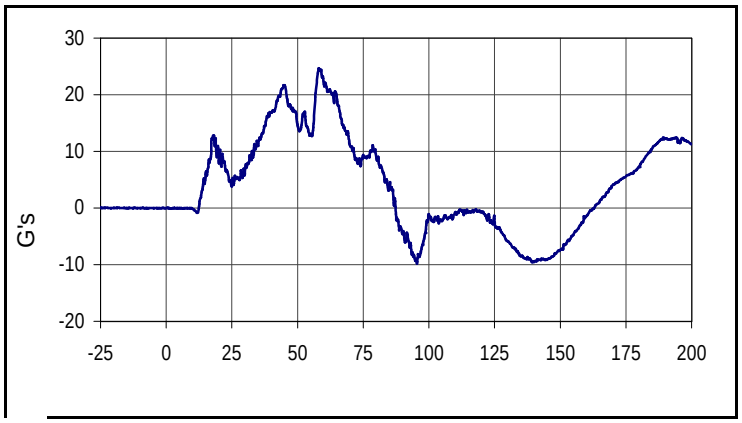


Curve Description			
Driver NAAH Zarm-Y			
CURNO	Type	SAE Class	Units
191	FIL	1000	G's
Max	Time	Min	Time
11.1	66.4	-9.3	78.1

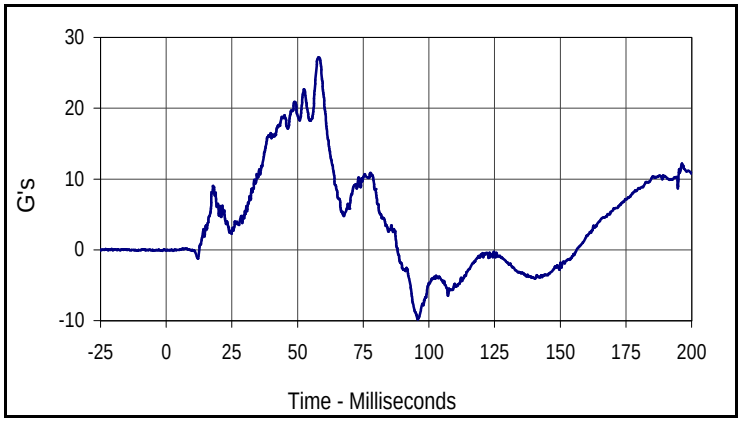
Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



Curve Description			
Driver Head Primary Z			
CURNO	Type	SAE Class	Units
003	FIL	1000	G's
Max	Time	Min	Time
24.8	58.2	-11.7	95.6

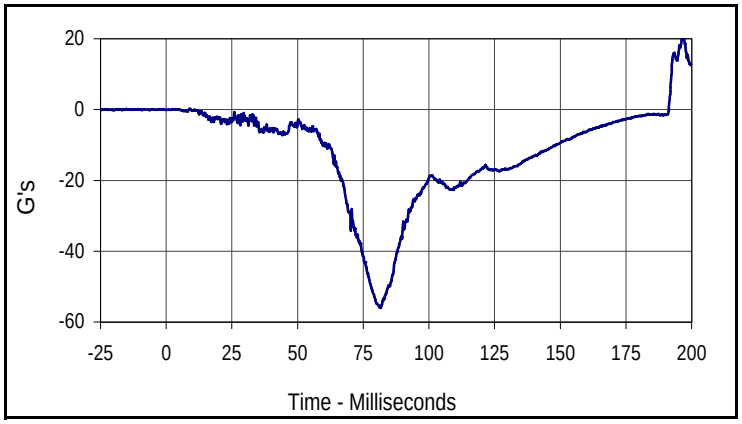


Curve Description			
Driver NAAH Xarm-Z			
CURNO	Type	SAE Class	Units
187	FIL	1000	G's
Max	Time	Min	Time
24.7	58.1	-9.8	95.5

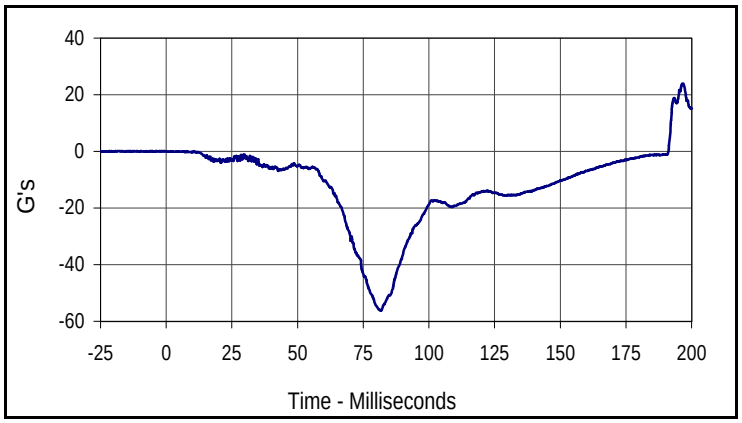


Curve Description			
Driver NAAH Yarm-Z			
CURNO	Type	SAE Class	Units
189	FIL	1000	G's
Max	Time	Min	Time
27.2	57.9	-9.8	95.7

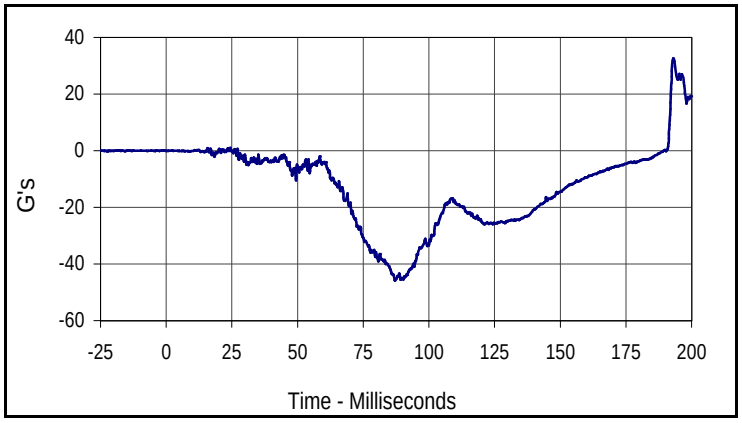
Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



Curve Description			
Passenger Head Primary X			
CURNO	Type	SAE Class	Units
045	FIL	1000	G's
Max	Time	Min	Time
20.4	196.7	-56.0	81.7

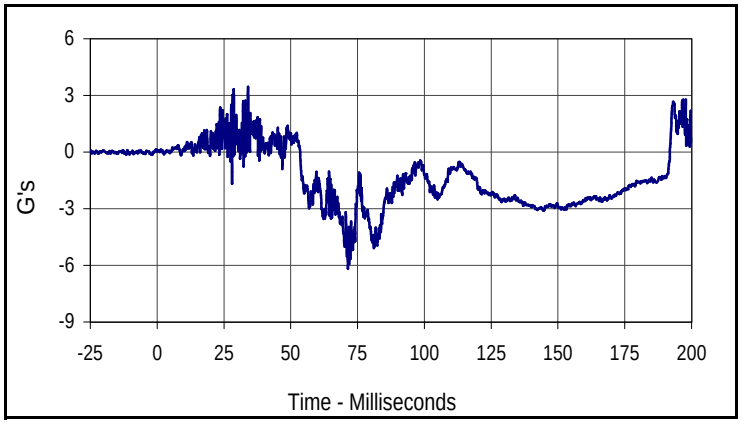


Curve Description			
Passenger NAAH Yarm-X			
CURNO	Type	SAE Class	Units
194	FIL	1000	G's
Max	Time	Min	Time
24.0	196.6	-56.3	81.6

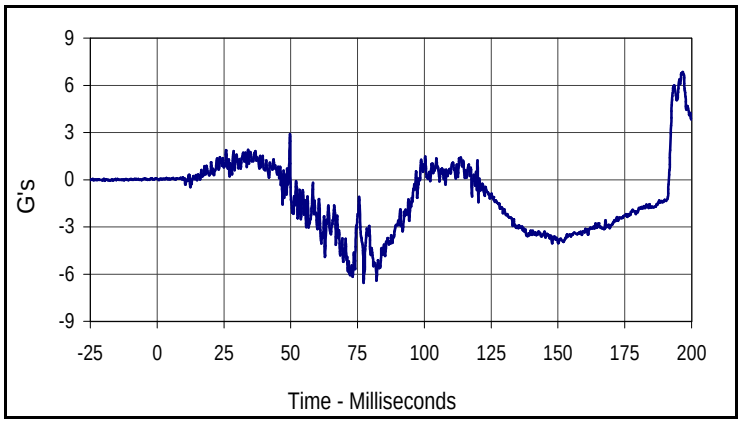


Curve Description			
Passenger NAAH Zarm-X			
CURNO	Type	SAE Class	Units
196	FIL	1000	G's
Max	Time	Min	Time
32.6	193.1	-45.9	87.1

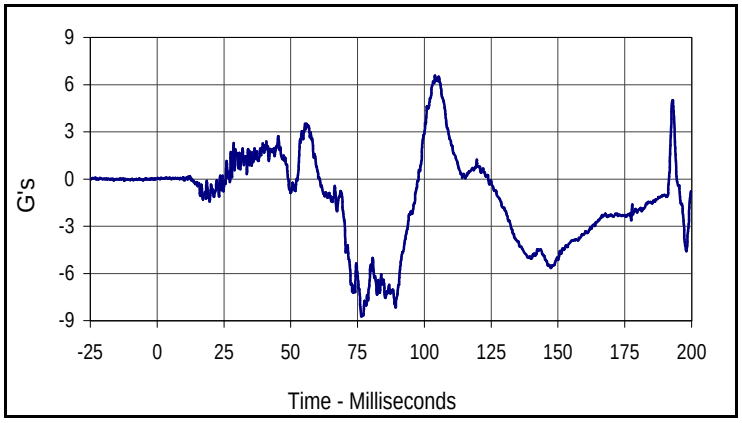
Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



Curve Description			
Passenger Head Primary Y			
CURNO	Type	SAE Class	Units
046	FIL	1000	G's
Max	Time	Min	Time
3.5	34.0	-6.2	71.4

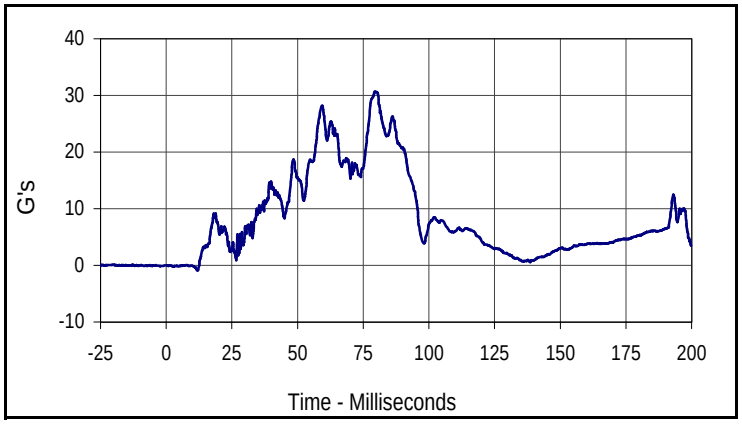


Curve Description			
Passenger NAAH Xarm-Y			
CURNO	Type	SAE Class	Units
192	FIL	1000	G's
Max	Time	Min	Time
6.8	196.7	-6.6	77.3

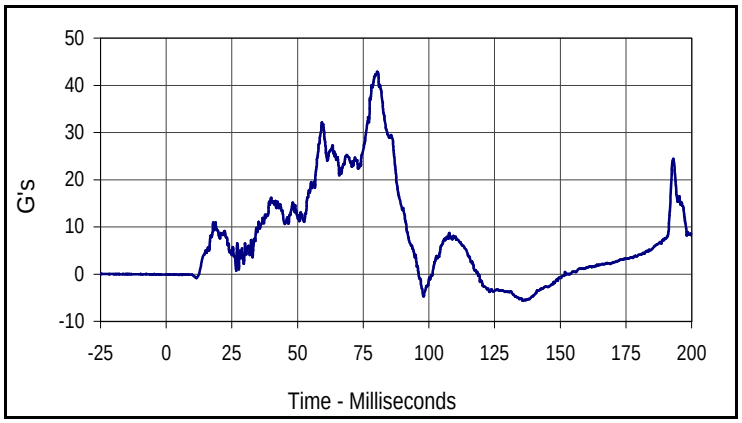


Curve Description			
Passenger NAAH Zarm-Y			
CURNO	Type	SAE Class	Units
197	FIL	1000	G's
Max	Time	Min	Time
6.6	104.0	-8.7	76.4

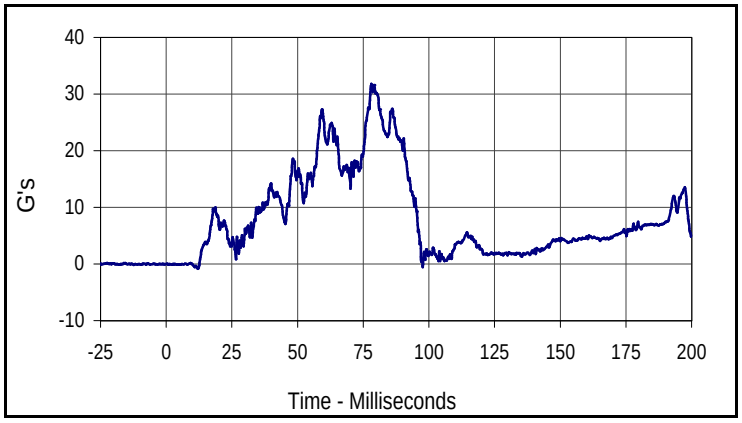
Test Vehicle:	2004 Toyota Highlander SUV	Test Date:	2/18/04
Test Program:	2004 NHTSA 35mph NCAP	NHTSA No.:	M45109



Curve Description			
Passenger Head Primary Z			
CURNO	Type	SAE Class	Units
047	FIL	1000	G's
Max	Time	Min	Time
30.7	79.4	-0.9	11.9



Curve Description			
Passenger NAAH Xarm-Z			
CURNO	Type	SAE Class	Units
193	FIL	1000	G's
Max	Time	Min	Time
42.9	80.4	-5.6	135.7



Curve Description			
Passenger NAAH Yarm-Z			
CURNO	Type	SAE Class	Units
195	FIL	1000	G's
Max	Time	Min	Time
31.8	78.1	-0.9	12.0