

REPORT NUMBER: NCAP-MGA-2004-003

**NEW CAR ASSESSMENT PROGRAM
FRONTAL BARRIER IMPACT TEST**

**Ford Motor Company
2004 Ford Freestar SES
NHTSA NUMBER: F40200**

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



Test Date: November 12, 2003

Report Date: December 16, 2003

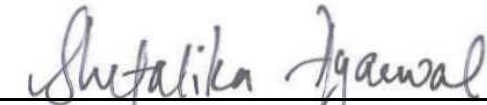
FINAL REPORT

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

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

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Date of Acceptance

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Date of Acceptance

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16. <i>Abstract</i> A 35.2 mph (56.6 km/h) frontal barrier impact was conducted on a 2004 Ford Freestar SES at MGA Research Corporation on November 12, 2003. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and foot well intrusion performance. The impact velocity was 56.6 km/h. The ambient temperature at the barrier face at the time of impact was 21 degrees Celsius. The vehicle's maximum post test static crush is 497 mm located at the vehicle left side. The test vehicle is equipped with a 3-point continuous belt system and an airbag in both front outboard seating positions. With respect to FMVSS 208 "Occupant Crash Protection", the occupant injury criteria summary is as follows: <table style="width: 100%; margin-top: 10px;"> <thead> <tr> <th style="text-align: left;"><u>Measurement Description</u></th> <th style="text-align: left;"><u>Units</u></th> <th style="text-align: left;"><u>Threshold</u></th> <th style="text-align: left;"><u>Driver ATD</u></th> <th style="text-align: left;"><u>Pass. ATD</u></th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC)</td> <td>N/A</td> <td>1000</td> <td>217</td> <td>429</td> </tr> <tr> <td>Max. Thorax Accel. (3msec Clip)</td> <td>G's</td> <td>60</td> <td>34</td> <td>31</td> </tr> <tr> <td>Left Femur force</td> <td>Newton</td> <td>10009</td> <td>-2053</td> <td>-958</td> </tr> <tr> <td>Right Femur force</td> <td>Newton</td> <td>10009</td> <td>-2132*</td> <td>-2286</td> </tr> </tbody> </table> * No valid data after 98 msec				<u>Measurement Description</u>	<u>Units</u>	<u>Threshold</u>	<u>Driver ATD</u>	<u>Pass. ATD</u>	Head Injury Criteria (HIC)	N/A	1000	217	429	Max. Thorax Accel. (3msec Clip)	G's	60	34	31	Left Femur force	Newton	10009	-2053	-958	Right Femur force	Newton	10009	-2132*	-2286
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TABLE OF CONTENTS

<u>Section</u>		<u>Page No</u>
1	Purpose and Summary of the Test	1
2	Occupant and Vehicle Information / Data Sheets	3
<u>Data Sheet No.</u>		<u>Page No.</u>
1	Crash Test Summary	4
2	General Test and Vehicle Parameter Data	5
3	Test Vehicle Tire Information	7
4	Post Impact Data	8
5	Test Vehicle Information	9
6	Dummy Positioning in Vehicle	11
7	Seat Belt Positioning Data	13
8	Vehicle Accelerometer Location and Data Summary	14
9	Hybrid III ATD Injury Criteria and Sensor Data	15
10	Seat Belt Performance Assessment Test Data	18
11	Summary of FMVSS 212 Data	19
12	Windshield Zone Intrusion FMVSS 219 Data	20
13	FMVSS 301 Fuel System Integrity Post Impact Data	21
14	FMVSS 301 Static Rollover Data	22
15	Vehicle Measurements	23
16	Camera Locations	26
17	Photographic Reference Target Locations	28
18	Vehicle Intrusion Measurements	29
19	Load Cell Locations on Fixed Barrier	34
20	Accident Investigation Division Data	35
21	Dummy/Vehicle Temperature Stabilization Chart	36
<u>Appendix</u>		
A	Photographs	A
B	Dummy and Vehicle Response Data Traces	B
C	Dummy Calibration Data Traces and Tables	C
D	Test Equipment and Instrumentation Calibration	D

SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

This 56.6 kph frontal barrier impact test is part of the Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under contract number DTNH22-01-D-12005. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for an impact in excess of the current 48.3 kph requirements.

SUMMARY

A load cell barrier consisting of 30 load cells was impacted by a 2004 Ford Freestar SES at a velocity of 56.6 kph. The test was performed at MGA Research Corporation on November 12, 2003. Pre-and post-test photographs of the vehicle and dummies can be found in Appendix A.

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

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

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

The 149 channels of data were recorded on an on-board data acquisition system. Appendix B contains the vehicle, load cell barrier and dummy response data traces.

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

The maximum static crush of the vehicle was 497 mm and both the driver and passenger side doors remained closed and latched during the impact event and were operable after the impact.

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

The occupant data is summarized below:

ATD position	HIC	Clip (g)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)	Belt Spool (mm)
Driver	217	34	-26.6	-2053	-2132*	**
Passenger	429	31	-19.5	-958	-2286	**

* No valid data after 98 msec

** Not recorded

SECTION 2
OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

Test Vehicle: 2004 Ford Freestar SES
 Test Program: 35mph Frontal Impact

NHTSA No.: F40200
 Test Date: 11/12/03

CONVERSION FACTORS USED IN THIS REPORT*

Quantity	Typical Application	English 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 Pressure	lbf/in ²	kPa	7.0
Volume	Liquid	gal	liter	3.785
Temperature	General Use	°F	°C	=(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 Ford Freestar SES
Test Program: 35mph Frontal Impact

NHTSA No.: F40200
Test Date: 11/12/03

PRIMARY IMPACT DATA

Measured Parameter	Units	Value
Velocity at Impact	km/hr	56.6
Test Weight	kg	2184.6
Average Rebound	mm	1355
Maximum Static Crush	mm	497
Impact Angle	degrees	0

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Passenger
Front Door Opening	Door remained closed and latched; Door opened without tools	Door remained closed and latched; Door opened without tools
Rear Door Opening	Door remained closed and latched; Door opened without tools	Door remained closed and latched; Door opened without tools
Seat Track Shift (mm)	0	0
Seat Back Failure	None	None

TEST DUMMY INFORMATION

Description	Driver	Passenger
Dummy Type / Serial No.	H III 50 th / 065	H III 50 th / 066
Head Contact	Airbag, Headrest	Airbag, Headrest
Chest Contact	Airbag	Airbag
Abdomen Contact	Airbag	Airbag
Left Knee Contact	Knee Bolster	Glove Box
Right Knee Contact	Knee Bolster	Glove Box

16mm MOVIE COVERAGE

High Speed	16
Real Time	1
Total	17

Driver ATD Sensors	42
Passenger ATD Sensors	42
Belt Assessment Sensors	4
Vehicle Structure Accelerometers	9
Rigid Barrier Load Cells	6
Total	103

DATA SHEET NO. 2**GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2004 Ford Freestar SES
 Test Program: 35mph Frontal Impact

NHTSA No.: F40200
 Test Date: 11/12/03

TEST VEHICLE INFORMATION

Manufacturer	Ford
Model	Freestar
Body Style	Minivan
NHTSA No.	F40200
VIN	2FMZA57634BA09495
Color	Red
Delivery Date	11/7/03
Odometer Reading (mile)	29
Dealer	Miller Motors
Transmission	Automatic
Final Drive	Front
Number of Cylinders	6
Engine Displacement (L)	3.9
Engine Placement	Lateral

TEST VEHICLE OPTIONS

Driver Airbag	Yes
Passenger Airbag	Yes
Force Limiter	Yes
Pretensioner	Yes
Power Windows	Yes
Power Steering	Yes
Power Door Locks	Yes
Tilt Wheel	Yes
Air Conditioning	Yes
Power Brakes	Yes
Disc Brakes, Front	Yes
Disc Brakes, Rear	Yes
Anti-lock Brakes	Yes
AM/FM/Cassette	Yes
Anti-theft System	Yes
Cruise Control	Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Ford Motor Co.	GVWR (kg)	2567
Date of Manufacture	09/03	GAWR Front (kg)	1322
		GAWR Rear (kg)	1251

DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	280	280
Cold Pressure (kPa)	240	240
Recommended Tire Size	P235/60R16	P235/60R16
Tire Size on Vehicle	P235/60R16	P235/60R16
Tire Manufacturer	Goodyear	Goodyear

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench	Bench	
Number Of Occupants	2	2	3	7
Capacity Wt. (VCW) (kg)				544
Cargo Wt. (RCLW) (kg)				68

DATA SHEET NO. 2... (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2004 Ford Freestar SES
 Test Program: 35mph Frontal Impact

NHTSA No.: F40200
 Test Date: 11/12/03

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	590.1	398.7		644.6	463.1	
Right	kg	572.0	404.2		612.4	464.5	
Ratio	%	59.1	40.9		57.5	42.5	
Totals	kg	1162.1	802.9	1965.0	1257.0	927.6	2184.6

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1965.0
Weight of 2 P572E ATDs	kg	156.0
Rated Cargo/Luggage Weight (RCLW)	kg	68.0
Calculated Vehicle Target Weight (TVTW)	kg	2189.0

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG(aft of front axle)
As Delivered	mm	745	751	764	769	1309
As Tested	mm	732	740	738	747	1310
Post Test	mm	823	812	745	725	

Vehicle Wheelbase (mm): 3084

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

Vehicle Components Removed: Rear taillights, sliding door windows, and third seat.

Ballast weight does not include cameras, instrumentation, and data acquisition system.

FUEL SYSTEM DATA

Fuel System Capacity From Owner's Manual (L): 98.4

Usable Capacity Figure Furnished by COTR (L): N/A

Actual Test Volume (L): 90.8

Test Fluid Type: Stoddard Solvent ; Specific Gravity: 0.77

Is Vehicle Fuel Pump Electric or Mechanical? Electric

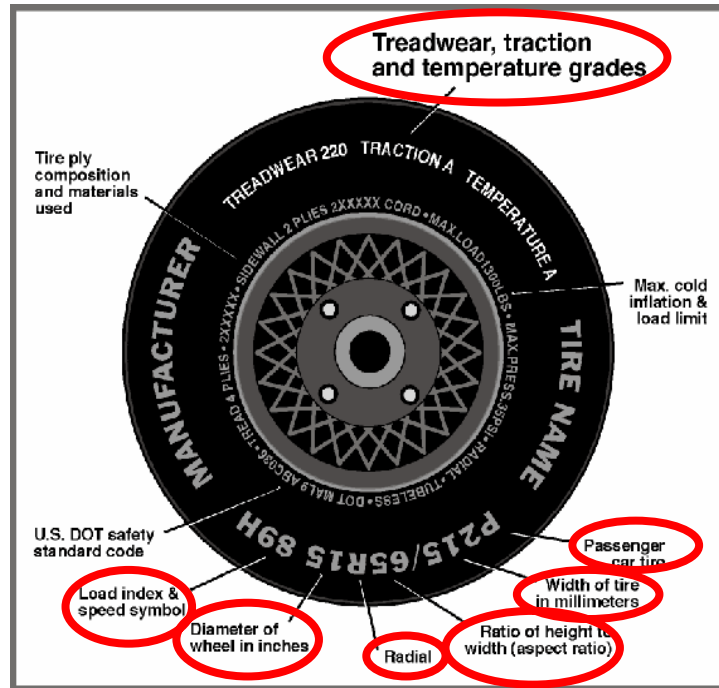
If electric, does pump operate with ignition switch "ON" & engine "OFF"? Yes

DATA SHEET NO. 3
TEST VEHICLE TIRE INFORMATION

Test Vehicle: 2004 Ford Freestar SES
 Test Program: 35mph Frontal Impact

NHTSA No.: F40200
 Test Date: 11/12/03

Vehicle Year	2004	Vehicle Make	Ford
VIN	2FMZA57634BA09495	Vehicle Model	Freestar SES



	Front	Rear
Tire Manufacturer	Goodyear	Goodyear
Tire Name	Integrity	Integrity
Tire Type	Touring	Touring
Tire Width (mm)	235	235
Ratio of Height to Width (aspect ratio)	60	60
Radial	Yes	Yes
Wheel Diameter	16	16
Load Index & Speed Symbol	99S	99S
Treadwear	460	460
Traction Grade	B	B
Temperature Grade	B	B

DATA SHEET NO. 4
POST IMPACT DATA

Test Vehicle: 2004 Ford Freestar SES
Test Program: 35mph Frontal Impact

NHTSA No.: F40200
Test Date: 11/12/03

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	55.5 – 57.1	56.6
Trap No. 1 Entry Distance	mm	<1524	1300
Trap No. 1 Exit Distance	mm	<1524	300
Trap No. 2 Velocity (Redundant)	km/h	55.5 – 57.1	56.5
Trap No. 2 Entry Distance	mm	<1524	1425
Trap No. 2 Exit Distance	mm	<1524	425

VEHICLE STATIC CRUSH

Measured Parameter	Units	Pre-Test	Post-Test	Difference
Left Side	mm	4879	4466	413
Center	mm	5061	4642	419
Right Side	mm	4886	4565	321

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	1348
Center	mm	1320
Right Side	mm	1396
Average	mm	1355

DATA SHEET NO. 5
TEST VEHICLE INFORMATION

Test Vehicle: 2004 Ford Freestar SES
Test Program: 35mph Frontal Impact

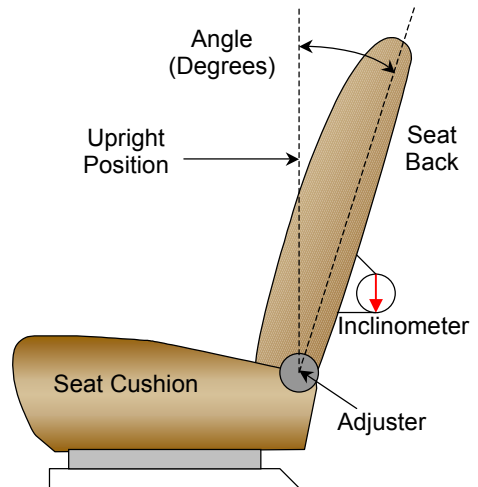
NHTSA No.: F40200
Test Date: 11/12/03

NORMAL DESIGN RIDING POSITION

The driver and passenger seat back is positioned to the manufacturer's designated angle. The procedure is as follows: The seat back angle is measured relative to the rocker sill. Remove the seat back panel and position inclinometer as shown in the drawing 13 inches above the back pivot point on the rear outboard seat frame. Avoid taking measurement on reinforcement plates. The designated seat back angle is 18 degrees.

Driver seat back angle: 18°

Passenger seat back angle: 18°



FRONT SEAT ASSEMBLY

SEAT FORE/AFT POSITIONS

Position the seat in the mid position. The driver seat is power adjustable and the passenger seat is manually adjustable.

Driver seat fore/aft total travel: 185 mm

Passenger seat fore/aft total travel: 19 notches

Driver seat fore/aft position: 93 mm

Passenger seat fore/aft position: 10th notch

SEAT BELT UPPER ANCHORAGE

The front outboard D-rings were adjusted to the mid track position.

DATA SHEET NO. 5... (continued)

TEST VEHICLE INFORMATION

Test Vehicle: 2004 Ford Freestar SES
Test Program: 35mph Frontal Impact

NHTSA No.: F40200
Test Date: 11/12/03

FUEL TANK CAPACITY DATA

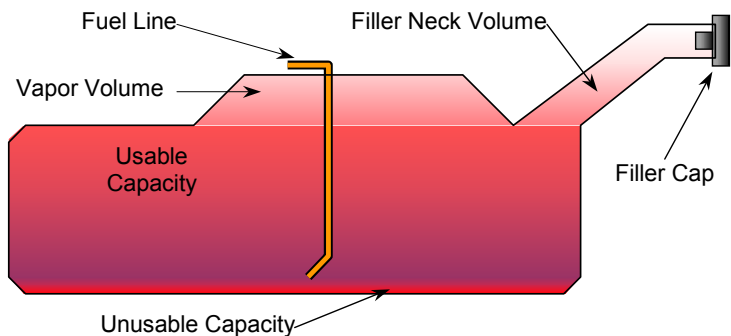
The "Usable Capacity" of the standard equipment fuel tank is: 98.4 liters

The "Usable Capacity" of any optional equipment fuel tank is: N/A liters

The "Usable Capacity" used for certification to FMVSS 301 requirements: 98.4 liters

Actual amount of Stoddard solvent added to vehicle for certification test: 90.8 liters

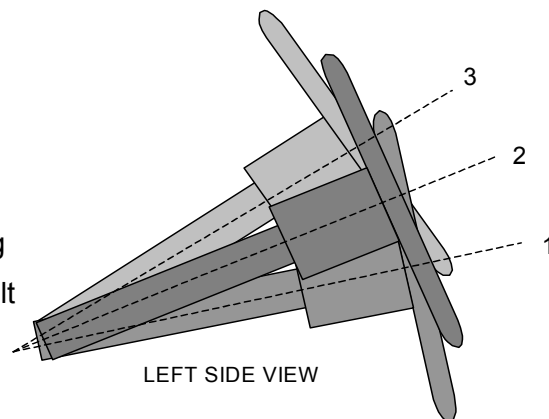
The electric fuel pump operates for 2 seconds to pressurize the fuel system following the actuation of the ignition. If no attempt has been made to start the engine within 2 seconds following ignition actuation, the fuel pump will shut off.



VEHICLE FUEL TANK ASSEMBLY

STEERING COLUMN ADJUSTMENT

Adjustable steering controls are adjusted so that the steering wheel hub is located at the geometric center of the locus it describes when it is moved through its full range of driving positions. The vehicle contained a 5 position tilt column. The column was placed in the mid position.



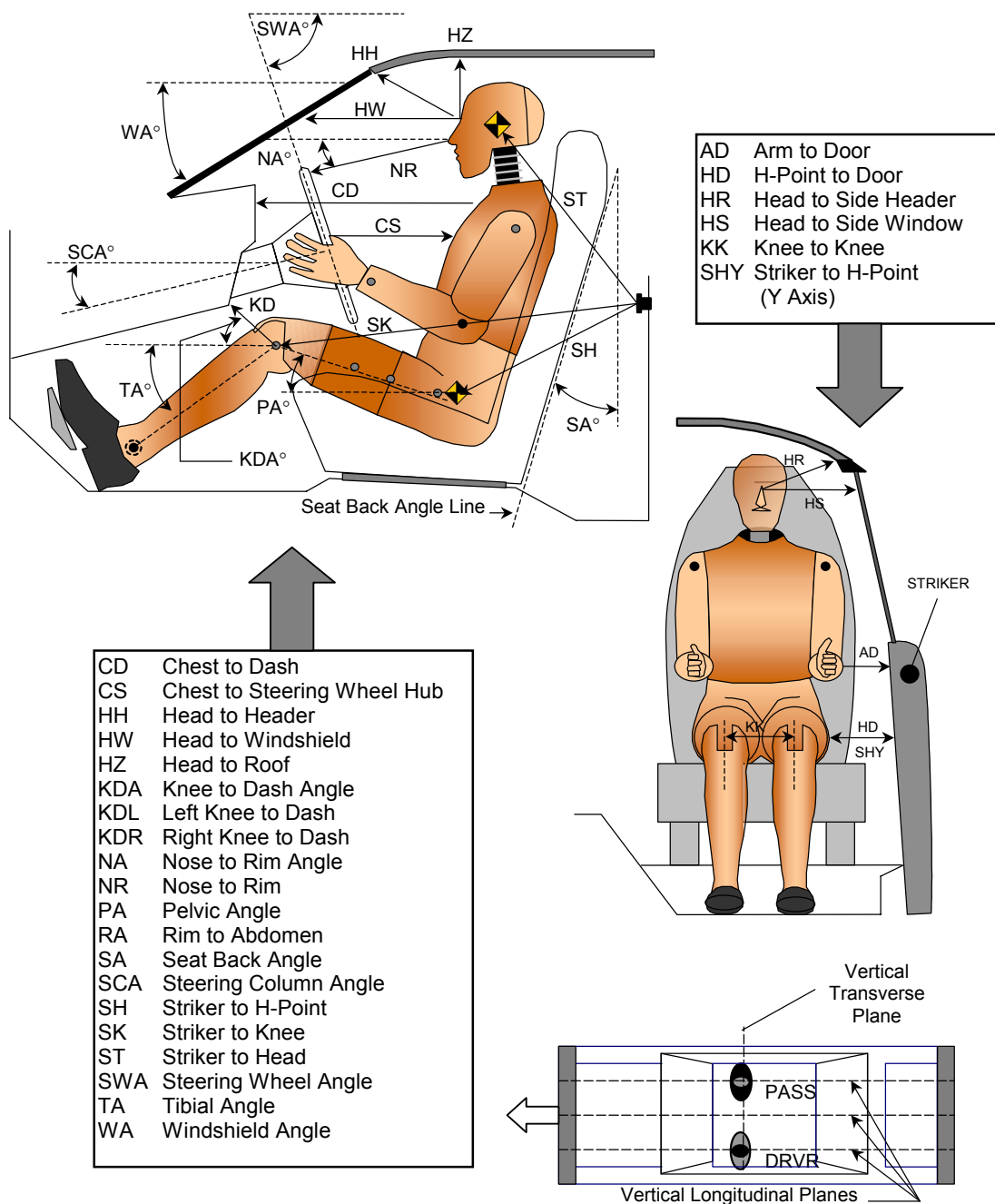
STEERING COLUMN ASSEMBLY

DATA SHEET NO. 6 **DUMMY POSITIONING IN VEHICLE**

Test Vehicle: 2004 Ford Freestar SES
 Test Program: 35mph Frontal Impact

NHTSA No.: F40200
 Test Date: 11/12/03

DUMMY MEASUREMENTS FOR FRONT SEAT OCCUPANTS



DATA SHEET NO. 6... (continued)
DUMMY POSITIONING IN VEHICLE

Test Vehicle: 2004 Ford Freestar SES
 Test Program: 35mph Frontal Impact

NHTSA No.: F40200
 Test Date: 11/12/03

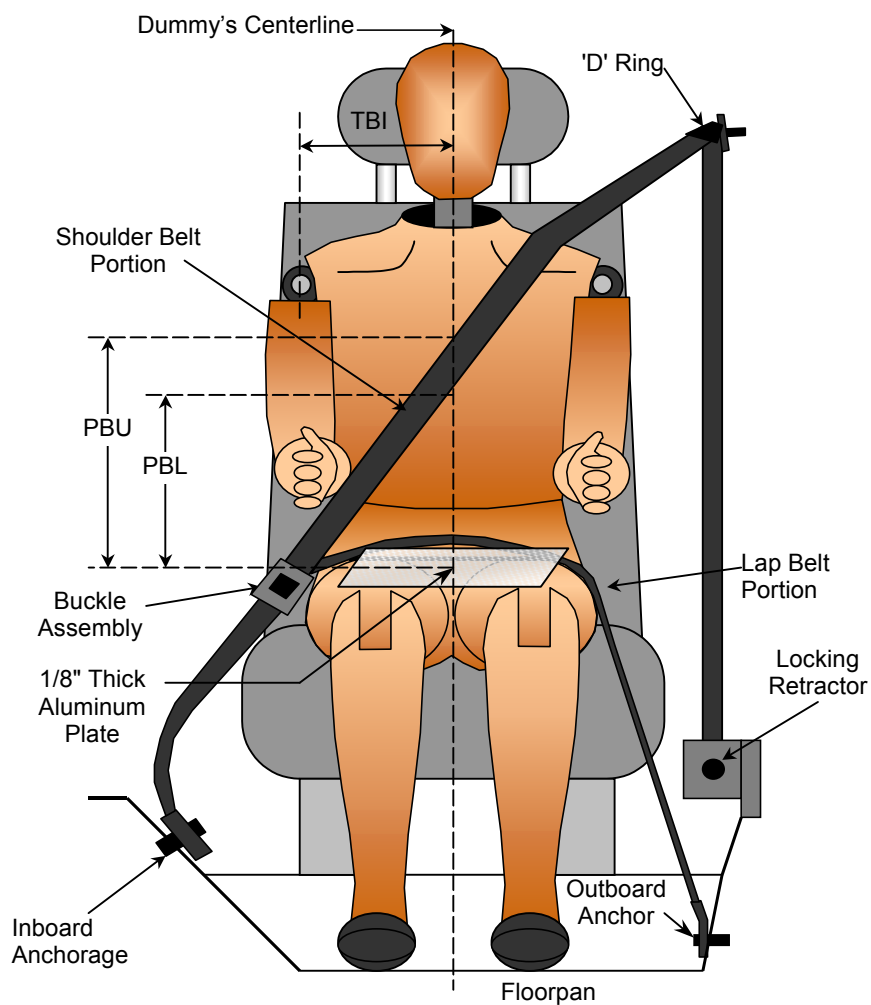
TEST DUMMY POSITION MEASUREMENTS

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA	Windshield Angle		31		
SWA	Steering Wheel Angle		64		
SCA	Steering Column Angle		27		
SA	Seat Back Angle		18		18
HZ	Head to Roof (Z)	212	90	184	90
HH	Head to Header	442	16	398	21
HW	Head to Windshield	684	0	605	0
HR	Head to Side Header (Y)	223		176	
NR	Nose to Rim	466	11		
CD	Chest to Dash	569		533	
CS	Chest to Steering Hub	370	9		
RA	Rim to Abdomen	244	0		
KDL	Left Knee to Dash	214	0	146	
KDR	Right Knee to Dash	202		182	2
PA	Pelvic Angle		23.0		23.9
TA	Tibia Angle		50		44
KK	Knee to Knee (Y)	280		210	
SK	Striker to Knee	582	88	624	87
ST	Striker to Head	610	8	624	9
SH	Striker to H-Point	193	102	206	100
SHY	Striker to H-Point (Y)	252		240	
HS	Head to Side Window	308		274	
HD	H-Point to Door (Y)	181		191	
AD	Arm to Door (Y)	132		109	
AA	Ankle to Ankle	296		181	

DATA SHEET NO. 7 **SEAT BELT POSITIONING DATA**

Test Vehicle: 2004 Ford Freestar SES
 Test Program: 35mph Frontal Impact

NHTSA No.: F40200
 Test Date: 11/12/03



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
TBI - Dummy centerline to shoulder bolt	mm	170	170
PBU - Top surface of reference to belt upper edge	mm	325	356
PBL - To surface of reference to belt lower edge	mm	242	271

DATA SHEET NO. 8

VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY

Test Vehicle: 2004 Ford Freestar SES
 Test Program: 35mph Frontal Impact

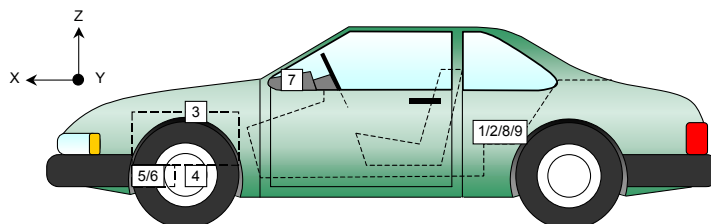
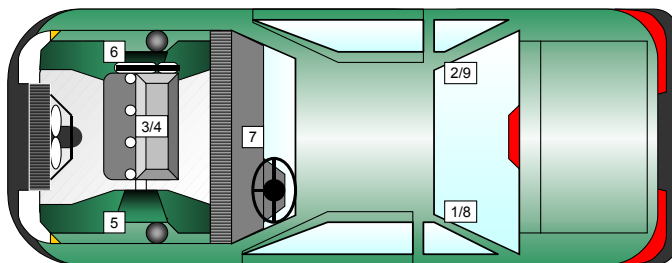
NHTSA No.: F40200
 Test Date: 11/12/03

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 X	1776	-615	400	G's	2.3	193	-28.5	39
2	Right Rear X-Member X	1748	630	405	G's	2.5	200	-27.6	52
3	Engine Top X	4329	-60	980	G's	41.2	56	-184.8	32
4	Engine Bottom X	4358	0	239	G's	*	*	*	*
5	Left Brake Caliper X	4169	-720	255	G's	25.6	66	-114.9	46
6	Right Brake Caliper X	4167	720	255	G's	63.9	63	-120.4	42
7	Instrument Panel X	3292	0	1052	G's	17.8	52	-49.7	43
8	Left Rear X-Member Z	1776	-615	400	G's	8.3	68	-10.2	25
9	Right Rear X-Member Z	1748	630	405	G's	8.9	29	-12.7	25

* No valid data after 60 msec.

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



DATA SHEET NO. 9
HYBRID III ATD INJURY CRITERIA AND SENSOR DATA

Test Vehicle: 2004 Ford Freestar SES
 Test Program: 35mph Frontal Impact

NHTSA No.: F40200
 Test Date: 11/12/03

HEAD PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Head CG	X	G's	0.8	28	-35.7	75	2.4	27	-45.0	85
Head CG	Y	G's	1.5	58	-8.2	94	2.4	55	-15.5	93
Head CG	Z	G's	17.5	85	-0.5	28	27.7	81	-1.7	26
Head CG Resultant	N/A	G's	38.1	76			53.2	85		

CHEST PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	G's	1.0	142	-33.8	73	0.7	199	-31.2	78
Chest CG	Y	G's	1.2	123	-5.2	93	4.3	83	-1.7	65
Chest CG	Z	G's	7.1	113	-11.0	61	16.4	105	-4.6	49
Chest CG Resultant	N/A	G's	34.0	73			31.9	78		

FEMUR PEAK FORCES

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Left Femur	Z	Newtons	529	46	-2053	68	635	93	-958	52
Right Femur	Z	Newtons	299	52	-2132	66	451	41	-2286	49

* Driver Right Femur - No valid data after 98 msec

SEAT BELT SENSOR PEAK VALUES

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Lap Belt Force	N/A	Newtons	3127	58			3658	60		
Shoulder Belt Force	N/A	Newtons	4465	101			*	*		

* No valid data after 70 msec

HEAD INJURY CRITERIA (HIC)

Location	Driver				Passenger			
	HIC	Avg G's	T ¹	T ²	HIC	Avg G's	T ¹	T ²
Head CG Primary	217	32.5	60.1	96.1	429	42.7	73.0	109.0

CHEST CLIP (3MSEC)

Location	Driver			Passenger		
	CLIP	T ¹	T ²	CLIP	T ¹	T ²
Chest CG Primary	34	71.9	74.9	31	77.2	80.2

DATA SHEET NO. 9... (continued)
HYBRID III ATD INJURY CRITERIA AND SENSOR DATA

Test Vehicle: 2004 Ford Freestar SES
 Test Program: 35mph Frontal Impact

NHTSA No.: F40200
 Test Date: 11/12/03

PELVIC PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Pelvis	X	G's	0.8	185	-44.4	66	1.4	149	-47.5	58
Pelvis	Y	G's	3.4	94	-5.3	63	5.5	75	-3.1	85
Pelvis	Z	G's	2.9	122	-21.4	58	5.5	108	-17.5	71

UPPER NECK PEAK FORCES AND MOMENTS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Neck Force	X	Newtons	570	70	-415	113	138	93	-390	108
Neck Force	Y	Newtons	164	79	-92	110	105	60	-42	171
Neck Force	Z	Newtons	1069	80	-73	154	926	80	-75	18
Neck Moment	X	N•m	3.4	40	-13.9	117	21.5	99	-4.3	137
Neck Moment	Y	N•m	54.7	69	-26.8	107	19.3	161	-34.0	108
Neck Moment	Z	N•m	9.9	97	-4.6	164	20.9	91	-10.9	155

FOOT PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Left Foot Aft	X	G's	4.5	40	-39.1	70	17.6	51	-51.0	30
Left Foot Aft	Z	G's	2.9	104	-43.1	32	21.5	51	-69.0	33
Left Foot Fore	Z	G's	12.1	79	-39.1	36	48.3	62	-95.2	28
Right Foot Aft	X	G's	15.6	32	-63.6	45	4.0	53	-48.9	63
Right Foot Aft	Z	G's	11.0	72	-48.6	37	26.9	51	-69.3	33
Right Foot Fore	Z	G's	47.7	71	-132.8	39	19.2	62	-80.3	32

UPPER AND LOWER TIBIA PEAK FORCES AND MOMENTS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Left Lower Moment	X	N•m	90.9	41	-22.4	32	24.6	35	-46.8	41
Left Lower Moment	Y	N•m	19.8	39	-28.7	56	20.1	55	-27.0	34
Left Lower Force	Z	Newtons	66	156	-1987	39	90	60	-3824	33
Left Upper Moment	X	N•m	33.3	36	-43.0	33	29.2	41	-28.0	35
Left Upper Moment	Y	N•m	61.5	73	-55.0	55	15.6	176	-81.5	32
Left Upper Force	Z	Newtons	39	134	-1645	39	35	0	-2655	33
Right Lower Moment	X	N•m	71.4	49	-17.2	36	42.4	52	-8.2	78
Right Lower Moment	Y	N•m	45.8	66	-30.7	46	36.1	68	-32.3	34
Right Lower Force	Z	Newtons	47	160	-2504	80	28	0	-3773	33
Right Upper Moment	X	N•m	48.1	61	-30.2	38	16.7	81	-40.2	52
Right Upper Moment	Y	N•m	38.1	59	-88.2	48	17.3	156	-82.0	69
Right Upper Force	Z	Newtons	34	162	-2450	71	15	0	-2893	33

DATA SHEET NO. 9... (continued)

HYBRID III ATD INJURY CRITERIA AND SENSOR DATA

Test Vehicle: 2004 Ford Freestar SES
 Test Program: 35mph Frontal Impact

NHTSA No.: F40200
 Test Date: 11/12/03

CHEST PEAK DISPLACEMENTS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	mm			-26.6	110			-19.5	107

HEAD REDUNDANT PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Head CG	X	G's	0.9	28	-34.7	75	2.1	27	-44.2	85
Head CG	Y	G's	1.6	51	-7.2	103	2.1	54	-16.3	93
Head CG	Z	G's	17.6	77	-0.9	28	28.1	85	-2.8	29
Head CG Resultant	N/A	G's	38.5	77			52.9	85		

CHEST REDUNDANT PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	G's	0.8	158	-33.3	73	0.8	166	-31.0	79
Chest CG	Y	G's	1.3	123	-4.7	93	5.1	92	-1.4	65
Chest CG	Z	G's	7.3	107	-11.3	61	16.4	104	-4.7	52
Chest CG Resultant	N/A	G's	33.5	73			32.1	79		

REDUNDANT HEAD INJURY CRITERIA (HIC)

Location	Driver				Passenger			
	HIC	Avg G's	T ¹	T ²	HIC	Avg	T ¹	T ²
Head CG Primary Redundant	212	32.2	60.0	96.0	420	42.3	72.9	108.9

REDUNDANT CHEST CLIP (3MSEC)

Location	Driver			Passenger		
	CLIP	T ¹	T ²	CLIP	T ¹	T ²
Chest CG Primary Redundant	33	72.0	75.0	31	77.6	80.6

DATA SHEET NO. 10**SEAT BELT PERFORMANCE ASSESSMENT TEST DATA**

Test Vehicle: 2004 Ford Freestar SES
Test Program: 35mph Frontal Impact

NHTSA No.: F40200
Test Date: 11/12/03

SEAT BELT PLACEMENT MEASUREMENTS

Measurement Description	Units	Driver	Passenger
TBI - Dummy centerline to shoulder bolt	mm	170	170
PBU - Top surface of reference to belt upper edge	mm	325	356
PBL - Top surface of reference to belt lower edge	mm	242	271

BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Retractor reel to "D" ring	mm	144	128
Shoulder belt length as measured on ATD	mm	791	816
Lap belt length as measured on ATD	mm	839	765
Remainder of belt on reel	mm	1234	1283
Total belt length for continuous webbing systems	mm	3008	2992

SHOULDER BELT SPOOL-OUT DATA

Measurement Description	Units	Driver	Passenger
As determined mechanically	mm	Not Recorded	
As determined electronically	mm	Not Recorded	

DATA SHEET NO. 11
SUMMARY OF FMVSS 212 DATA

Test Vehicle: 2004 Ford Freestar SES
 Test Program: 35mph Frontal Impact

NHTSA No.: F40200
 Test Date: 11/12/03

Windshield Mounting Details:

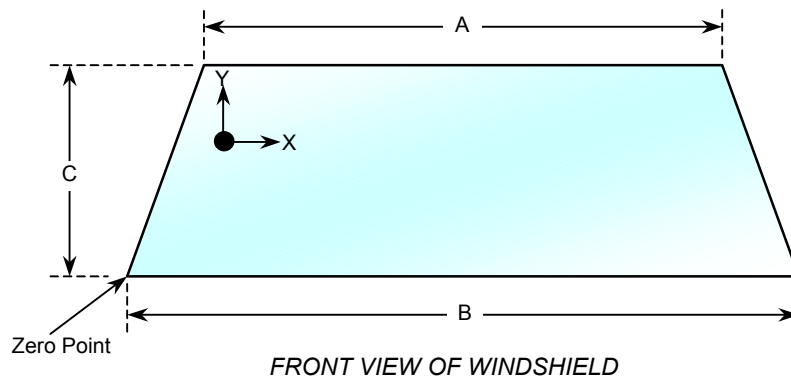
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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

Temperature of windshield molding during test: 21 °C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2358	2358	100
Right Side	2358	2358	100
Total	4716	4716	100



WINDSHIELD DIMENSIONS

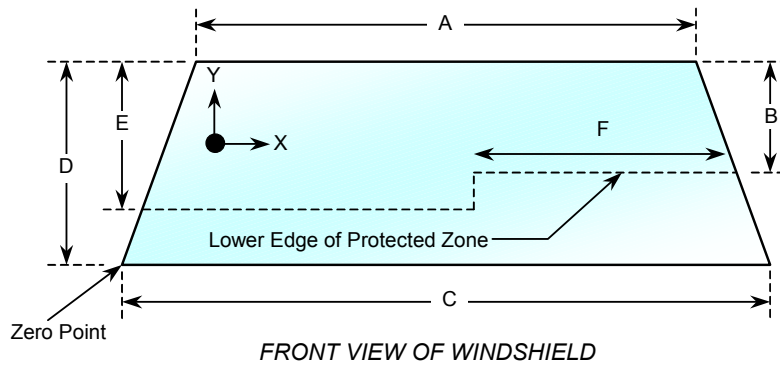
Item	Units	Segment Length	Molding Width
A	mm	1285	23
B	mm	1720	17
C	mm	855	24

DATA SHEET NO. 12

WINDSHIELD ZONE INTRUSION FMVSS 219 (Partial) DATA

Test Vehicle: 2004 Ford Freestar SES
 Test Program: 35mph Frontal Impact

NHTSA No.: F40200
 Test Date: 11/12/03



Item	Units	Value
A	mm	1285
B	mm	515
C	mm	1720
D	mm	855
E	mm	520
F	mm	411

AREA OF PROTECTED ZONE FAILURES - NONE

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

X	Y

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

X	Y

DATA SHEET NO. 13

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Test Vehicle: 2004 Ford Freestar SES
Test Program: 35mph Frontal Impact

NHTSA No.: F40200
Test Date: 11/12/03

Temperature at Time of Impact: 21° C Test Time: 2:37 pm

Stoddard Solvent Spillage Measurements

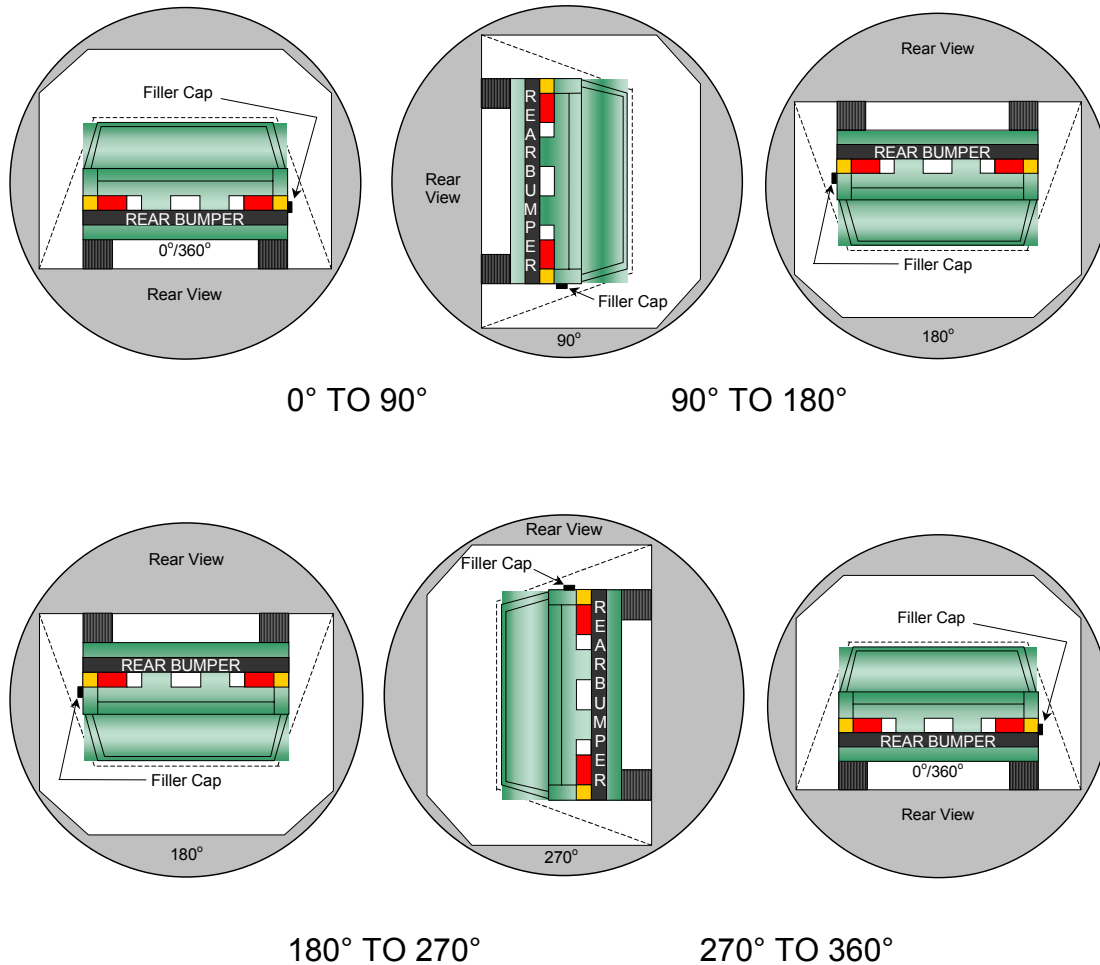
- A. From impact until vehicle motion ceases: 0 oz.
 (Maximum Allowable = 1 ounce)
- B. For the 5 minute period after motion ceases: 0 oz.
 (Maximum Allowable = 5 ounces)
- C. For the following 25 minutes: 0 oz.
 (Maximum Allowable = 1 oz./minute)
- D. Spillage : None

DATA SHEET NO. 14
FMVSS 301 STATIC ROLLOVER DATA

Test Vehicle: 2004 Ford Freestar SES
 Test Program: 35mph Frontal Impact

NHTSA No.: F40200
 Test Date: 11/12/03

Test Time: 2:37 pm



1. The specified fixture rollover rate for each 90° of rotation is 60 to 180 seconds.
2. The position hold time at each position is 300 seconds (minimum).
3. Details of Stoddard Solvent spillage locations: None

Test Phase	Rotation Time (sec.)	Hold Time (sec.)	Spillage (oz.)
0° TO 90°	163	300	0
90° TO 180°	148	300	0
180° TO 270°	156	300	0
270° TO 360°	167	300	0

DATA SHEET NO. 15
VEHICLE MEASUREMENTS

Test Vehicle: 2004 Ford Freestar SES
Test Program: 35mph Frontal Impact

NHTSA No.: F40200
Test Date: 11/12/03

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total length of vehicle at centerline	mm	5061	4642	419
2	RSOV to front of engine	mm	4558	4361	197
3	RSOV to firewall centerline	mm	3893	3868	25
4	RSOV to leading edge of right door	mm	3613	3603	10
5	RSOV to leading edge of left door	mm	3624	3618	6
6	RSOV to lower leading edge of right door	mm	3522	3525	-3
7	RSOV to lower leading edge of left door	mm	3530	3533	-3
8	RSOV to upper leading edge of right door	mm	2446	2432	14
9	RSOV to upper leading edge of left door	mm	2438	2442	-4
10	RSOV to lower trailing edge of right door	mm	2460	2466	-6
11	RSOV to lower trailing edge of left door	mm	2465	2470	-5
12	RSOV to bottom of right 'A' pillar	mm	3532	3530	2
13	RSOV to bottom of left 'A' pillar	mm	3531	3530	1
14	RSOV to firewall on right side	mm	4153	4136	17
15	RSOV to firewall on left side	mm	4158	4159	-1
16	RSOV to steering column	mm	3144	3125	19
17	Center of steering column to left 'A' pillar	mm	360	339	21
18	Center of steering column to headlining	mm	435	428	7
19	RSOV to right side of front bumper	mm	4886	4565	321
20	RSOV to left side of front bumper	mm	4879	4466	413
21	Length of engine block	mm	396	396	0
RD	RSOV to right side of dash panel	mm	3294	3283	11
CD	RSOV to center of dash panel	mm	3312	3310	2
LD	RSOV to left side of dash panel	mm	3312	3310	2

DATA SHEET NO. 15...(continued)

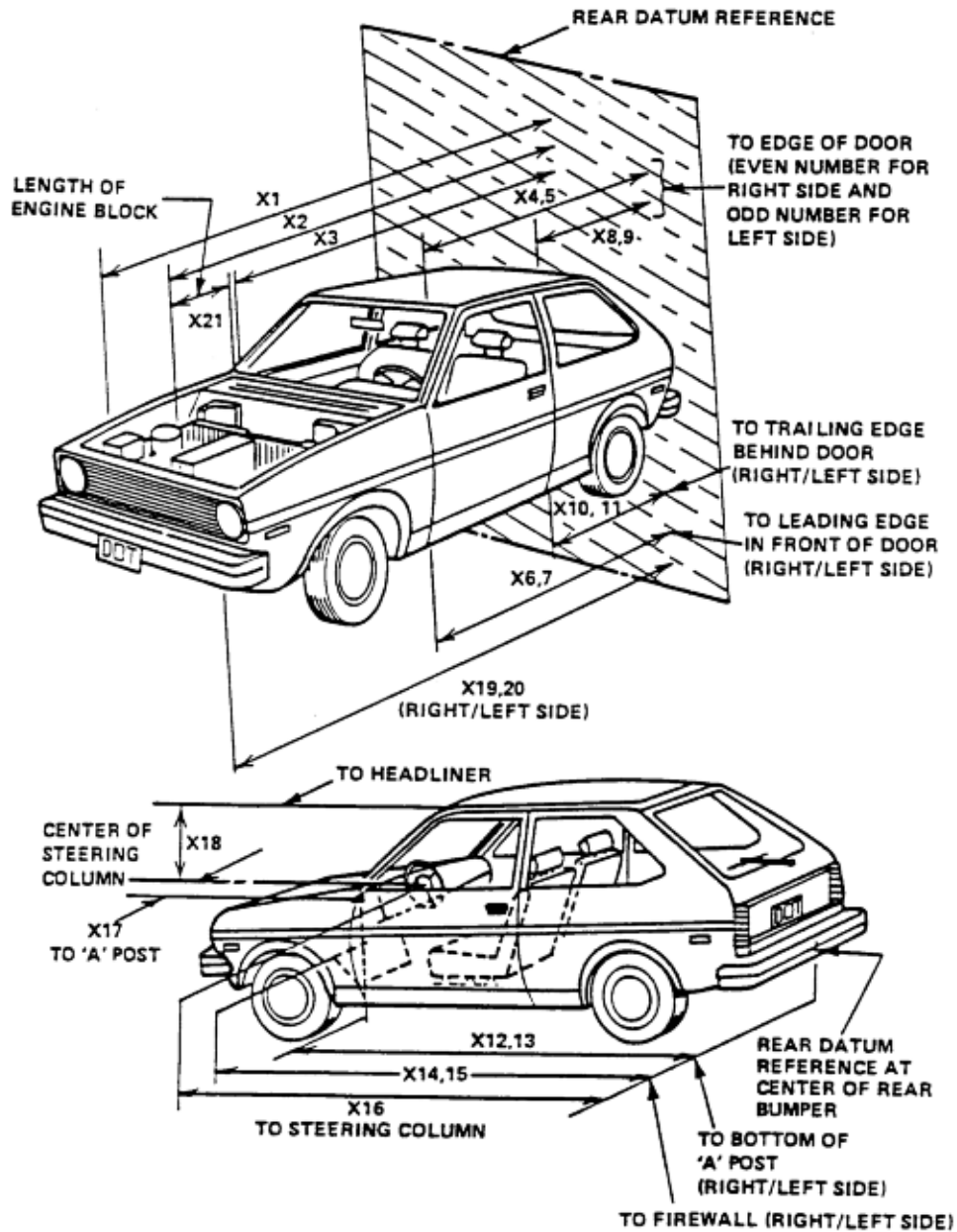
VEHICLE MEASUREMENTS

Test Vehicle: 2004 Ford Freestar SES

Test Program: 35mph Frontal Impact

NHTSA No.: F40200

Test Date: 11/12/03



DATA SHEET NO. 15... (continued)**VEHICLE MEASUREMENTS**Test Vehicle: 2004 Ford Freestar SESNHTSA No.: F40200Test Program: 35mph Frontal ImpactTest Date: 11/12/03**Target Vehicle Structural Measurement**

	Elements	Pre-Test (mm)
1	Total Length	5061
2	Total Width	1933
3	Bumper Top Height	595
4	Bumper Bottom Height	410
5	Longitudinal Member Top Height	260
6	Distance between Longitudinal Members	800
7	Longitudinal Member Width	95
8	Engine Top Height	985
9	Engine Bottom Height	215
10	Engine and gearbox width	580
11	Front bumper-engine distance	400
12	Front shock absorber fixing height	950
13	Bonnet leading edge height	845
14	Front shock absorber fixing width	1190
15	Front bumper – front axle distance	1040
16	Front axle – a pillar distance	535
17	A-pillar – B-pillar distance	1075
18	B-Pillar – rear axle distance	1473
19	B-pillar – C-pillar distance	970
20	Roof sill bottom height	1650
21	Roof sill top height	1690
22	Floor sill bottom height	267
23	Floor sill top height	330

DATA SHEET NO. 16
CAMERA LOCATIONS

Test Vehicle: 2004 Ford Freestar SES
Test Program: 35mph Frontal Impact

NHTSA No.: F40200
Test Date: 11/12/03

No.	Camera View	Location (mm) *			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Side View				13	24
2	Left Front View	940	-8120	1570	25	1010
3	Steering Column Top	2000	-8280	1570	25	1005
4	Steering Column Bottom	2000	-8280	1030	25	1036
5	Driver Close-up	1490	-8950	1410	50	1005
6	Driver Angle	4800	-5100	2020	50	1176
7	Left Rear				13	510
8	Right Rear				13	526
9	Right Overall	2050	7530	1660	13	1000
10	Right Passenger Half	1110	8250	1640	25	1020
11	Right Close-up	1550	10130	1610	75	1143
12	Right Angle	4800	5560	2100	50	**
13	Windshield	320	0	2920	13	1031
14	Top Driver	-120	-485	2300	13	1015
15	Top Passenger	-120	510	2300	13	1010
16	Pit Front	1150	0	-3150	13	1015
17	Pit Rear	2910	0	-3150	13	1005

*COORDINATES:

+X = film plane rearward of barrier

** No timing marks

+Y = film plane to right of monorail centerline

+Z = film plane above ground level

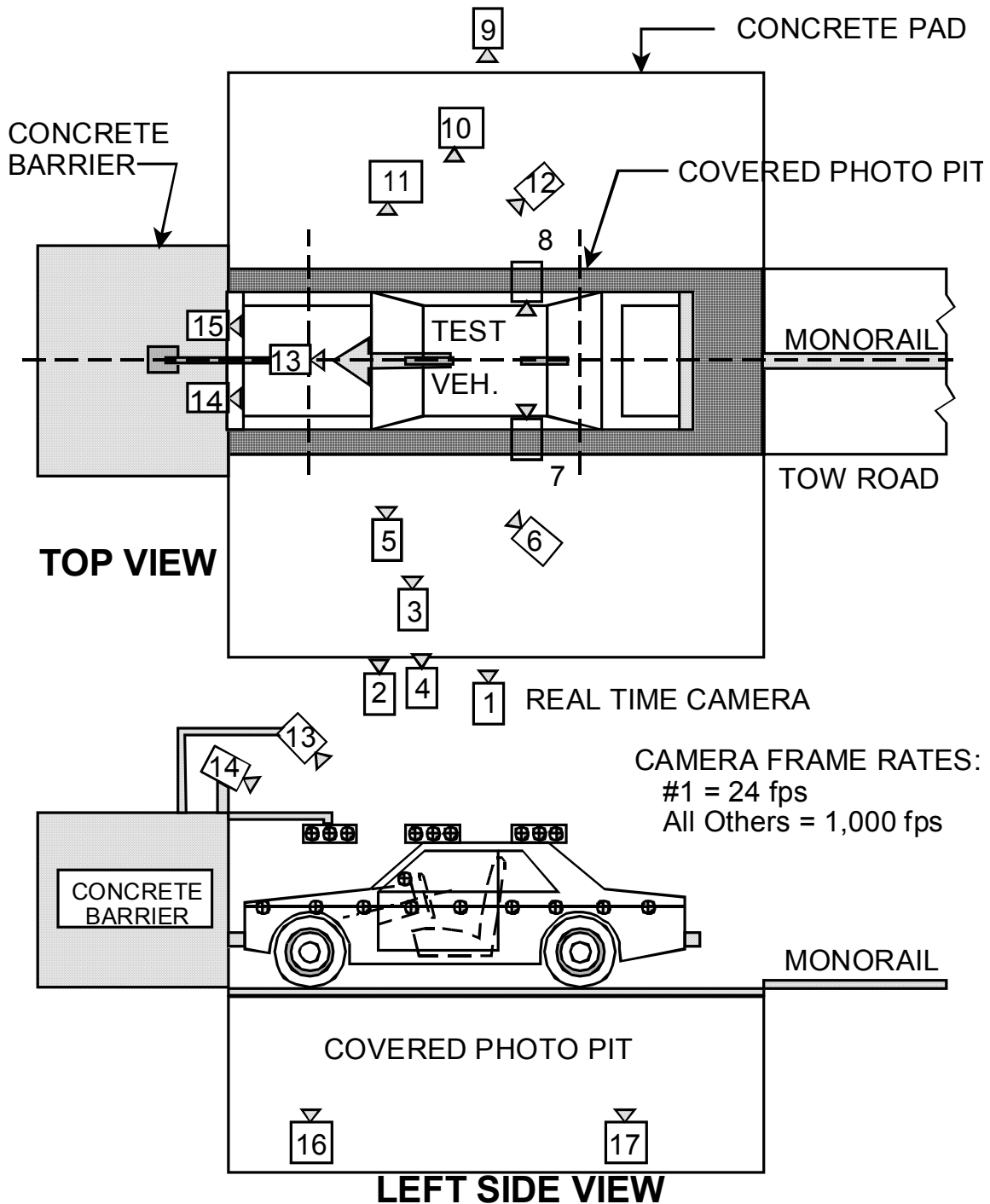
DATA SHEET NO. 16... (continued)

CAMERA LOCATIONS

Test Vehicle: 2004 Ford Freestar SES
Test Program: 35mph Frontal Impact

NHTSA No.: F40200
Test Date: 11/12/03

CAMERA POSITIONS FOR FRONTAL IMPACTS



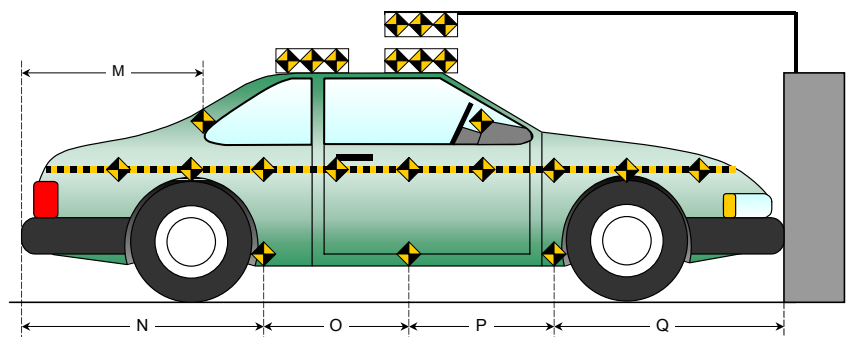
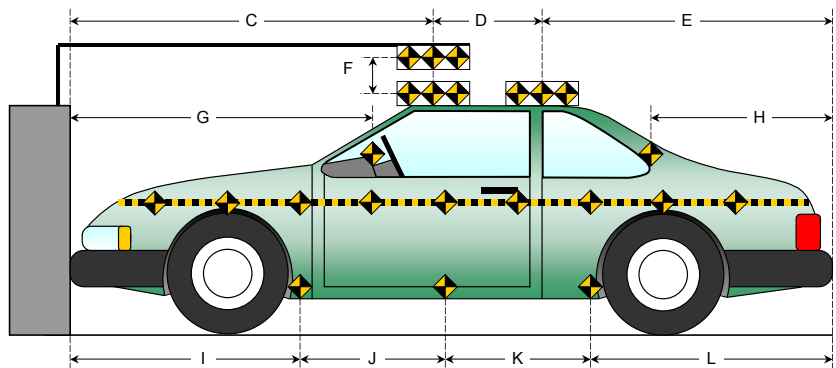
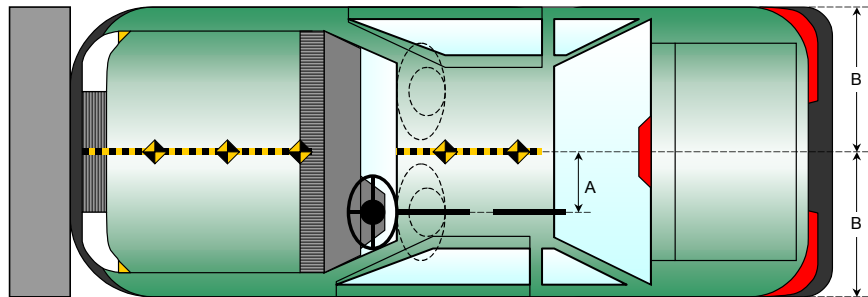
DATA SHEET NO. 17

PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2004 Ford Freestar SES
 Test Program: 35mph Frontal Impact

NHTSA No.: F40200
 Test Date: 11/12/03

Item	Value
A	411
B	967
C	2388
D	605
E	2068
F	254
G	NA
H	1377
I	1444
J	1089
K	1089
L	1439
M	1260
N	1433
O	1091
P	1085
Q	1452



DATA SHEET NO. 18
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2004 Ford Freestar SES
 Test Program: 35mph Frontal Impact

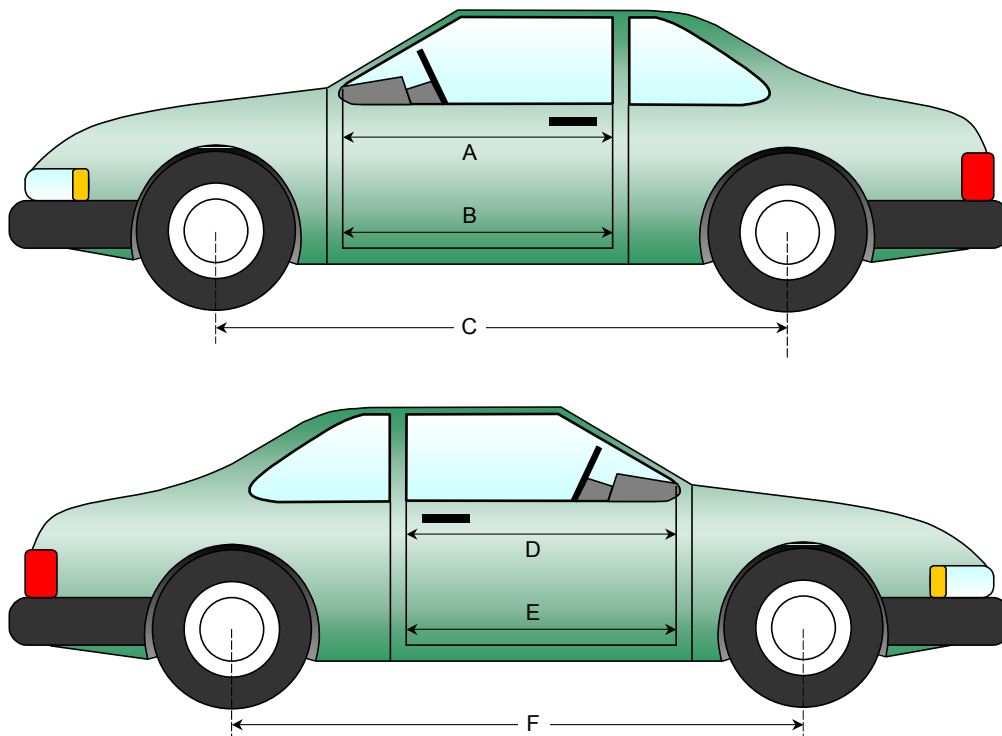
NHTSA No.: F40200
 Test Date: 11/12/03

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1063	1060	3
B	Left Side Lower	mm	845	845	0
D	Right Side Upper	mm	1063	1051	12
E	Right Side Lower	mm	840	840	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	3084	2943	141
F	Right Side Wheelbase	mm	3084	2913	171



DATA SHEET NO. 18... (continued)
VEHICLE INTRUSION MEASUREMENTS

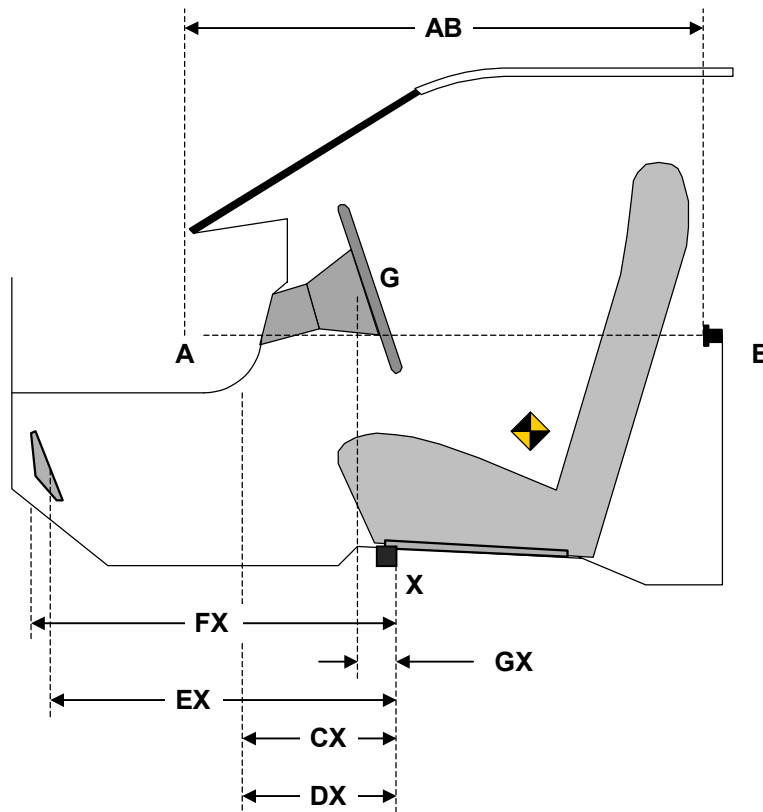
Test Vehicle: 2004 Ford Freestar SES
 Test Program: 35mph Frontal Impact

NHTSA No.: F40200
 Test Date: 11/12/03

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside window jam)	mm	1063	1060	3
CX	Left Knee Bolster to X	mm	337	346	-9
DX	Right Knee Bolster to X	mm	330	352	-22
EX	Brake Pedal to X	mm	553	531	22
FX	Foot Rest to X	mm	584	576	8
GX	Center of Steering Column Wheel Hub to X	mm	115	113	2

X = Left Front Seat Front Outboard Anchor Bolt Head



DRIVER COMPARTMENT

DATA SHEET NO. 18... (continued)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2004 Ford Freestar SES
 Test Program: 35mph Frontal Impact

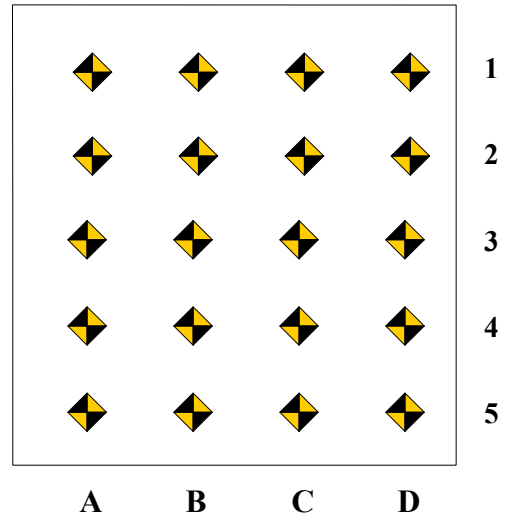
NHTSA No.: F40200
 Test Date: 11/12/03

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		745	749	748		735	729	711		10	20	37
2		610	606	611		603	596	596		7	10	15
3	464	469	469	465	459	461	461	459	5	8	8	6
4	319	318	319	318	309	311	311	311	10	7	8	7
5	165	167	170	168	159	161	161	159	6	6	9	9

DRIVER FLOOR PAN Z-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1		-65	-71	-71		-5	0	0		-60	-71	-71
2		-140	-160	-159		-81	-72	-75		-59	-88	-84
3	-190	-185	-185	-189	-131	-126	-129	-136	-59	-59	-56	-53
4	-178	-184	-175	-176	-121	-130	-128	-138	-57	-54	-47	-38
5	-171	-175	-168	-166	-114	-116	-121	-130	-57	-59	-47	-36

DATA SHEET NO. 18...(continued)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2004 Ford Freestar SES
 Test Program: 35mph Frontal Impact

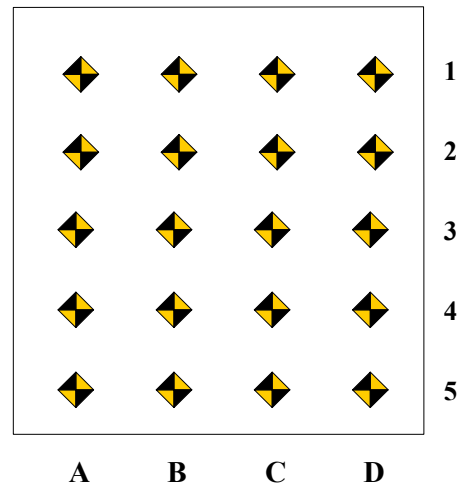
NHTSA No.: F40200
 Test Date: 11/12/03

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	732	733	735	700	678	680	710	686	54	53	25	14
2	612	612	617	608	580	602	611	600	32	10	6	8
3	476	480	480	480	460	469	471	477	16	11	9	3
4	380	380	380	380	365	368	372	379	15	12	8	1
5	280	280	280	280	265	269	272	279	15	11	8	1

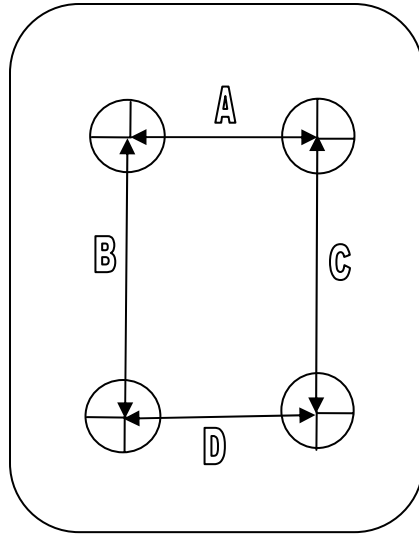
PASSENGER FLOOR PAN Z-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	-12	-8	-5	34	56	58	59	84	-68	-66	-64	-50
2	-95	-100	-100	-96	-58	-74	-67	-55	-37	-26	-33	-41
3	-176	-170	-159	-174	-148	-143	-134	-138	-28	-27	-25	-36
4	-171	-164	-171	-167	-148	-143	-139	-136	-23	-21	-32	-31
5	-174	-157	-161	-167	-154	-140	-138	-136	-20	-17	-23	-31

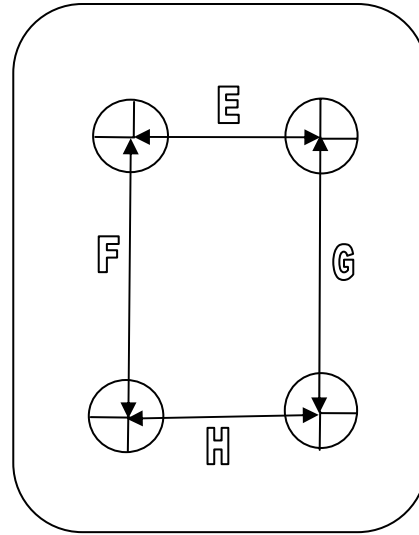
DATA SHEET NO. 18...(continued)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2004 Ford Freestar SES
 Test Program: 35mph Frontal Impact

NHTSA No.: F40200
 Test Date: 11/12/03



Driver



Passenger

UNDERBODY FLOORBOARD DEFORMATION

Measurement	Pre-Test	Post-Test	Difference
A	222	222	0
B	502	502	0
C	492	492	0
D	179	179	0
E	222	222	0
F	493	493	0
G	506	506	0
H	177	177	0

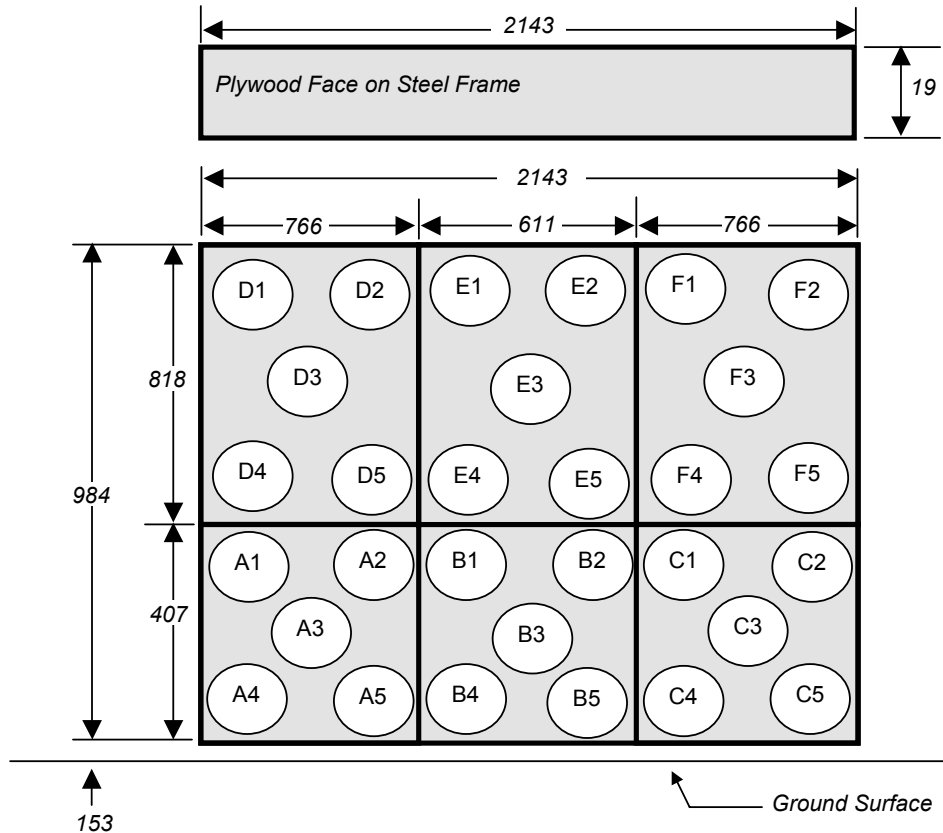
DATA SHEET NO. 19

LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2004 Ford Freestar SES
Test Program: 35mph Frontal Impact

NHTSA No.: F40200
Test Date: 11/12/03

30 Load Cell Rigid Barrier Load Cell Locations on Fixed Barrier



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

6 Groups of 5 Load Cells Each

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

1. Sum data from 6 groupings shown above (5 cells/group)
2. Sum of left 2 groupings, center 2 groupings and right 2 groupings.
3. Total or sum of all 30 individual load cells.
4. Total versus average rear seat cross member displacement.

DATA SHEET NO. 20**ACCIDENT INVESTIGATION DIVISION DATA**

Test Vehicle: 2004 Ford Freestar SES
Test Program: 35mph Frontal Impact

NHTSA No.: F40200
Test Date: 11/12/03

VEHICLE INFORMATION

VIN: 2FMZA57634BA09495 Wheelbase (mm) : 3084
Vehicle Size Category: Minivan Test Weight (kg) : 2184.6

ACCELEROMETER DATA

Accelerometer Locations: As per measurements on Page 13
Cal. Procedure/Interval: MGA procedure / 6 month
Integration Algorithm: Trapezoidal Linearity: > 99%
Impact Velocity (km/h): 56.6
Velocity Change (km/h): 67.0 Time of Separation (msec): 141

CRUSH PROFILE

Collision Deformation Classification: Frontal Midpoint of Damage: Centerline
Damage Region Length (mm): 1600 Impact Mode: Frontal

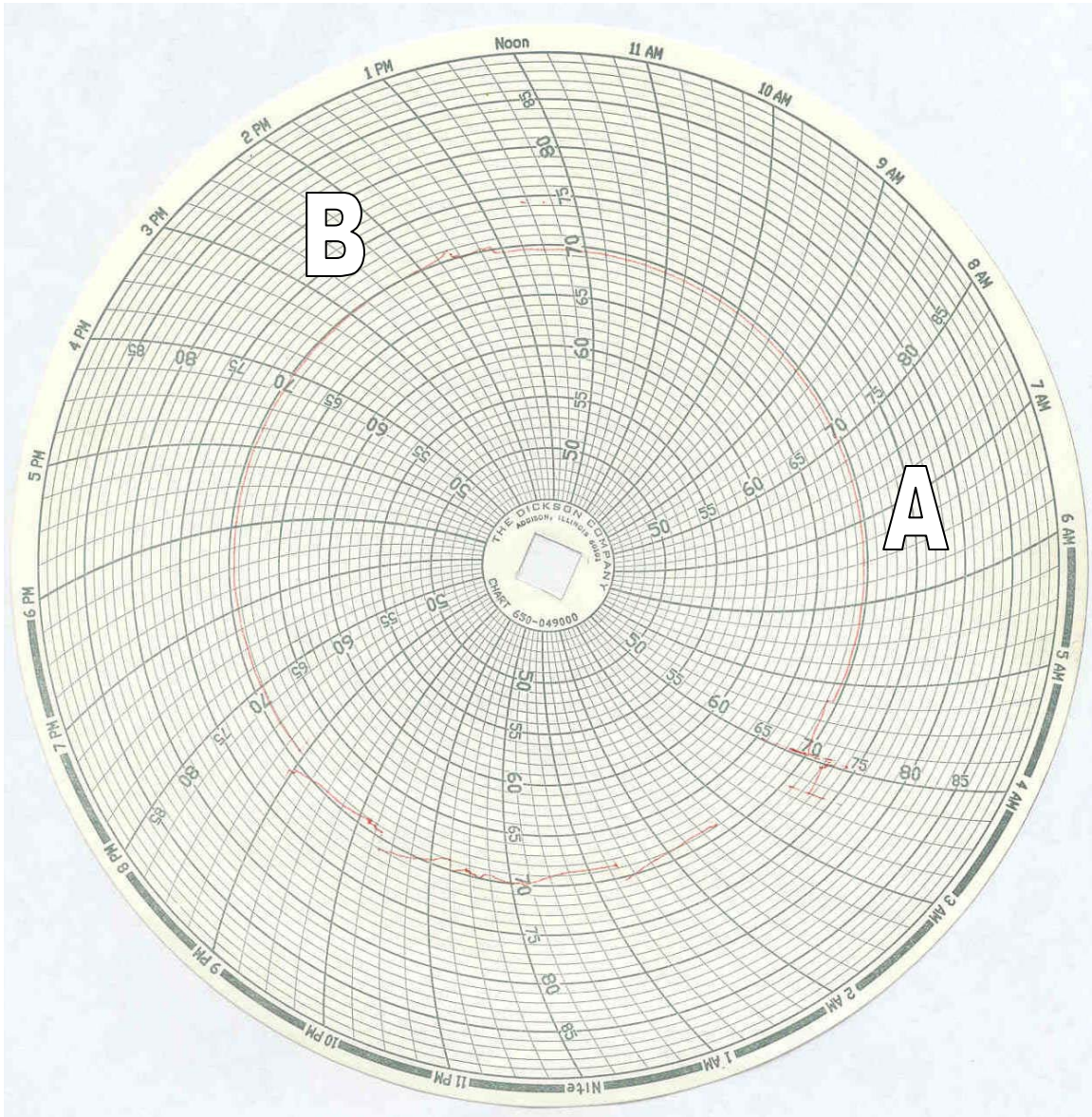
No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4886	4466	420
C2	Crush zone 2 at left side	mm	5021	4587	434
C3	Crush zone 3 at left side	mm	5056	4614	442
C4	Crush zone 4 at right side	mm	5056	4560	496
C5	Crush zone 5 at right side	mm	5018	4521	497
C6	Crush zone 6 at right side	mm	4886	4565	321
L	C1 TO C6	mm	1600	1541	59

DATA SHEET NO. 21

DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART

Test Vehicle: 2004 Ford Freestar SES
Test Program: 35mph Frontal Impact

NHTSA No.: F40200
Test Date: 11/12/03



A = Dummies installed in vehicle at 7:00 a.m.

B = Test conducted at 2:37 p.m

APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

Page No.

Photo No. 1.	Load Cell Location	A-1
Photo No. 2.	Vehicle Certification Label/Tire Placard	A-2
Photo No. 3.	Right Front View of Test Vehicle, as received	A-3
Photo No. 4.	Left Rear View of Test Vehicle, as received	A-4
Photo No. 5.	Pre-Test Front View of Test Vehicle	A-5
Photo No. 6.	Post-Test Front View of Test Vehicle	A-6
Photo No. 7.	Pre-Test Left Side View of Test Vehicle	A-7
Photo No. 8.	Post-Test Left Side View of Test Vehicle	A-8
Photo No. 9.	Pre-Test Right Side View of Test Vehicle	A-9
Photo No. 10.	Post-Test Right Side View of Test Vehicle	A-10
Photo No. 11.	Pre-Test Right Front Three-Quarter View of Test Vehicle	A-11
Photo No. 12.	Post-Test Right Front Three-Quarter View of Test Vehicle	A-12
Photo No. 13.	Pre-Test Left Rear Three-Quarter View of Test Vehicle	A-13
Photo No. 14.	Post-Test Left Rear Three-Quarter View of Test Vehicle	A-14
Photo No. 15.	Post-Test Left Rear Three-Quarter View of Door After Impact	A-15
Photo No. 16.	Post-Test Right Rear Three-Quarter View of Door After Impact	A-16
Photo No. 17.	Pre-Test Windshield View	A-17
Photo No. 18.	Post-Test Windshield View	A-18
Photo No. 19.	Pre-Test Engine Compartment View	A-19
Photo No. 20.	Post-Test Engine Compartment View	A-20
Photo No. 21.	Pre-Test Fuel Filler Cap View	A-21
Photo No. 22.	Post-Test Fuel Filler Cap View	A-22
Photo No. 23.	Pre-Test Front Underbody View	A-23
Photo No. 24.	Post-Test Front Underbody View	A-24
Photo No. 25.	Pre-Test Mid Underbody	A-25
Photo No. 26.	Pre-Test Mid Underbody	A-26
Photo No. 27.	Post-Test Mid Underbody	A-27
Photo No. 28.	Pre-Test Rear Underbody View	A-28

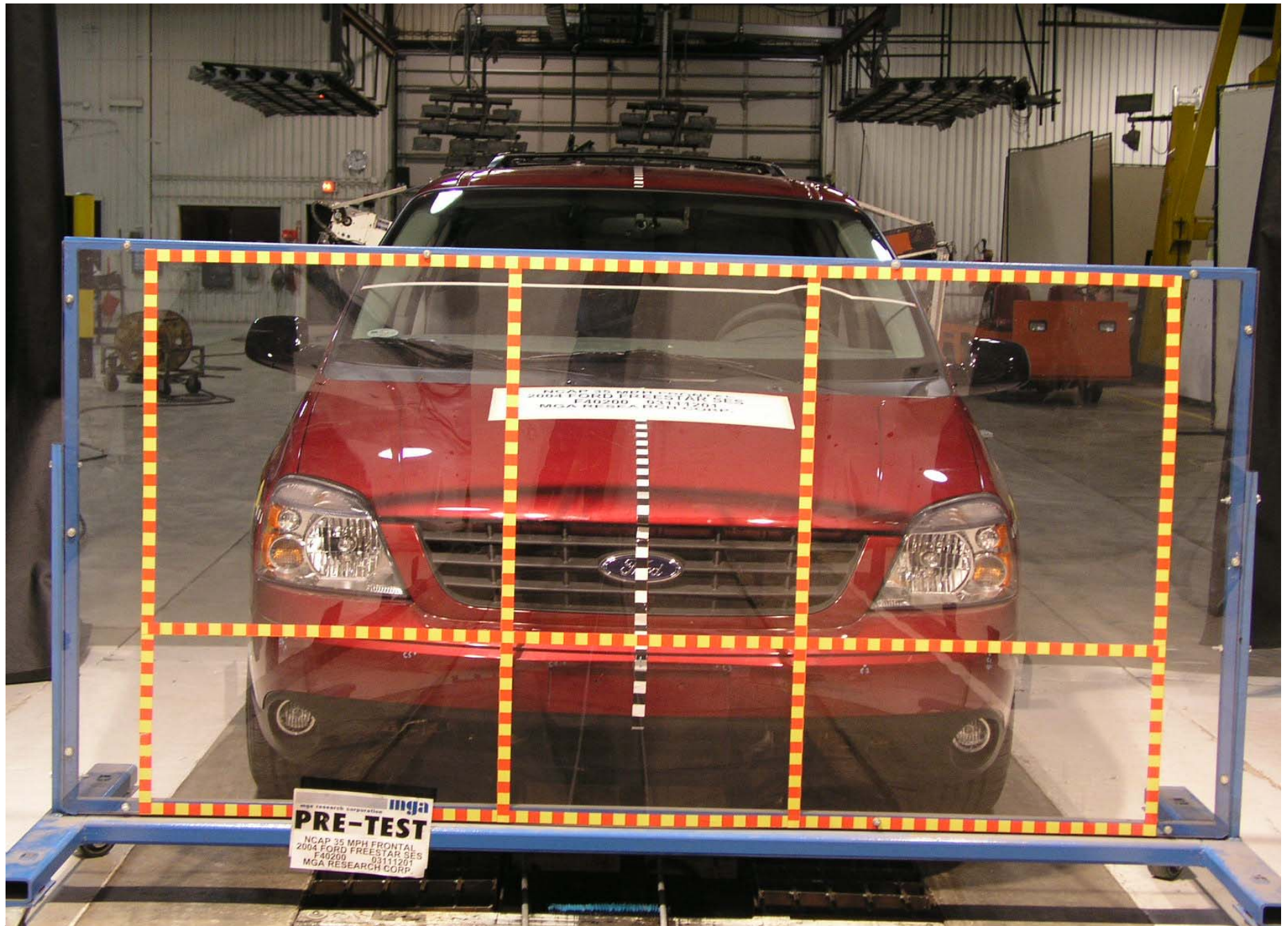
Page No.

Photo No. 29.	Post-Test Rear Underbody View	A-29
Photo No. 30.	Pre-Test Driver Dummy Front View (head position)	A-30
Photo No. 31.	Post-Test Driver Dummy Front View (head position)	A-31
Photo No. 32.	Pre-Test Driver Dummy Position Left Side View	A-32
Photo No. 33.	Post-Test Driver Dummy Position Left Side View	A-33
Photo No. 34.	Pre-Test Driver Dummy Position Left Side View (Door Open)	A-34
Photo No. 35.	Post-Test Driver Dummy Position Left Side View (Door Open)	A-35
Photo No. 36.	Pre-Test Driver Dummy Feet Position	A-36
Photo No. 37.	Post-Test Driver Dummy Feet Position	A-37
Photo No. 38.	Pre-Test Driver Side Knee Bolster View	A-38
Photo No. 39.	Post-Test Driver Side Knee Bolster View	A-39
Photo No. 40.	Pre-Test Driver Side Floor Pan View	A-40
Photo No. 41.	Post-Test Driver Side Floor Pan View	A-41
Photo No. 42.	Post-Test Driver Dummy Head Contact	A-42
Photo No. 43.	Post-Test Driver Dummy Knee Contact	A-43
Photo No. 44.	Post-Test Driver Dummy Airbag Contact	A-44
Photo No. 45.	Pre-Test Passenger Dummy Front View (head position)	A-45
Photo No. 46.	Post-Test Passenger Dummy Front View (head position)	A-46
Photo No. 47.	Pre-Test Passenger Dummy Position Right Side View	A-47
Photo No. 48.	Post-Test Passenger Dummy Position Right Side View	A-48
Photo No. 49.	Pre-Test Passenger Dummy Position Right Side View (Door Open)	A-49
Photo No. 50.	Post-Test Passenger Dummy Position Right Side View (Door Open)	A-40
Photo No. 51.	Pre-Test Passenger Dummy Feet Position	A-51
Photo No. 52.	Post-Test Passenger Dummy Feet Position	A-52
Photo No. 53.	Pre-Test Passenger Side Knee Bolster View	A-53
Photo No. 54.	Post-Test Passenger Side Knee Bolster View	A-54
Photo No. 55.	Pre-Test Passenger Side Floor Pan View	A-55
Photo No. 56.	Post-Test Passenger Side Floor Pan View	A-56
Photo No. 57.	Post-Test Passenger Dummy Head Contact	A-57
Photo No. 58.	Post-Test Passenger Dummy Knee Contact	A-58

Page No.

Photo No. 59.	Post-Test Passenger Dummy Airbag Contact	A-59
Photo No. 60.	Rollover 90 Degrees	A-60
Photo No. 61.	Rollover 180 Degrees	A-61
Photo No. 62.	Rollover 270 Degrees	A-62
Photo No. 63.	Rollover 360 Degrees	A-63
Photo No. 64.	Vehicle Impact	A-64

A-1.



Load Cell Location

MFD. BY FORD MOTOR CO.

DATE: 09/03

GVWR: 2567KG/5660LB

FRONT GAWR: 1322KG/2915LB

REAR GAWR: 1251KG/2760LB

THIS VEHICLE CONFORMS TO ALL APPLICABLE FEDERAL MOTOR
VEHICLE SAFETY AND THEFT PREVENTION STANDARDS
IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE.

VIN: 2FMZA57634BA09495 TYPE: MPV

MAXIMUM LOAD = OCCUPANTS + LUGGAGE = 544KG/1200LB

OCCUPANTS = 7 TOTAL;

2 FRONT, 2 2ND, 3 REAR

TIRE: P235/60R16

PRESSURE(FR): 240 kPa/35 PSI COLD

PRESSURE(RR): 240 kPa/35 PSI COLD



2FMZA57634BA09495

TRAILER TOWING - SEE OWNER GUIDE

EXT PNT: DT

RC: 41

DSO:

BRK

INT TR

TP/PS

R

AXLE

TR

SPR

F0034

T0099

D

D6

K

24

N

AG

MADE IN CANADA

CBU

▽2U5A-5420472-AA



Right Front View of Test Vehicle, as received

A-4.



Left Rear View of Test Vehicle, as received



Pre-Test Front View of Test Vehicle



Post-Test Front View of Test Vehicle



Pre-Test Left Side View of Test Vehicle



Post-Test Left Side View of Test Vehicle



Pre-Test Right Side View of Test Vehicle



Post-Test Right Side View of Test Vehicle



Pre-Test Right Front Three-Quarter View of Test Vehicle



Post-Test Right Front Three-Quarter View of Test Vehicle



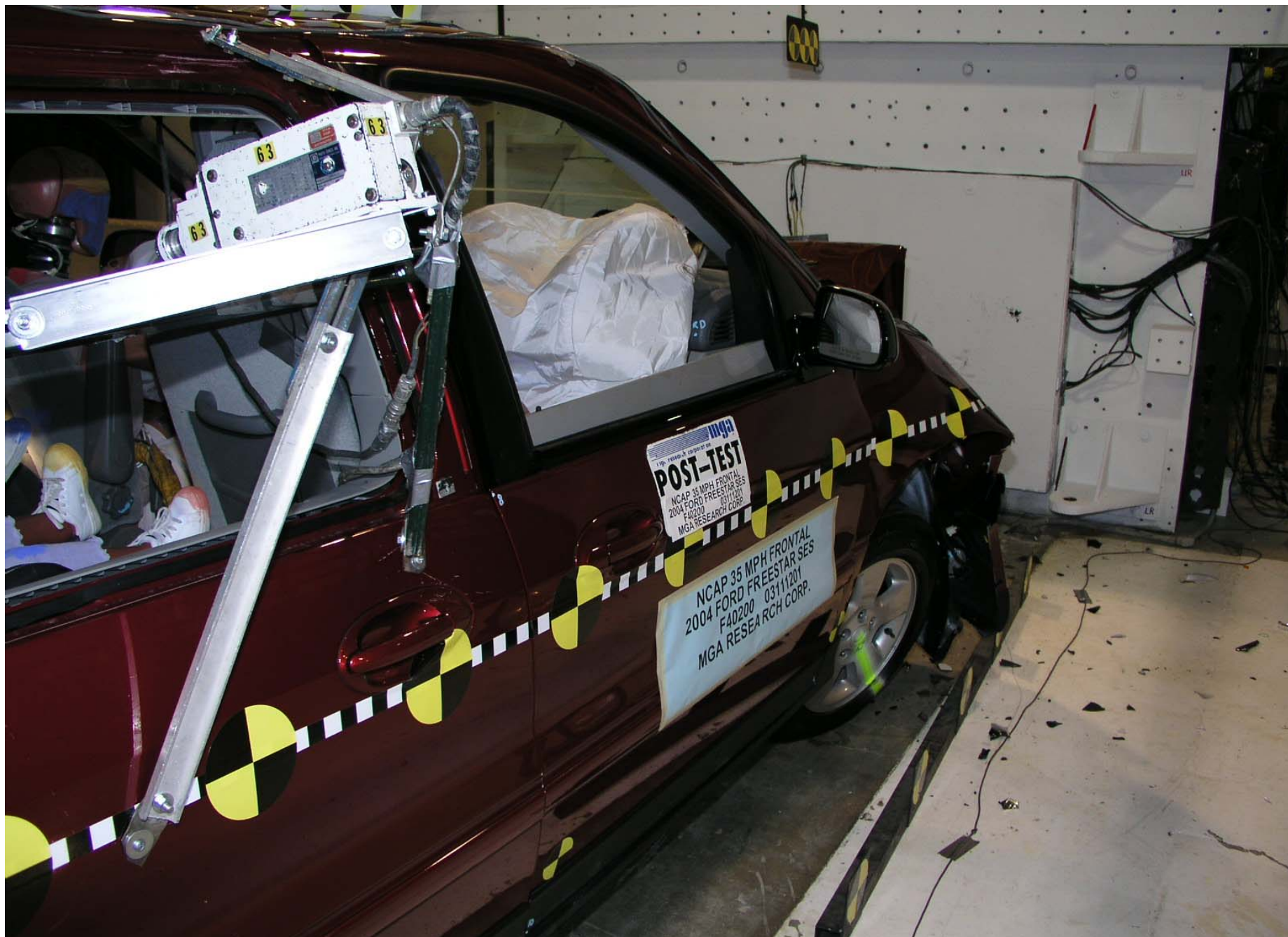
Pre-Test Left Rear Three-Quarter View of Test Vehicle



Post-Test Left Rear Three-Quarter View of Test Vehicle



Post-Test Left Rear Three-Quarter View of Door After Impact



Post-Test Right Rear Three-Quarter View of Door After Impact



mga
mga research corporation
PRE-TEST
NCAP 35 MPH FRONTAL
2004 FORD FREESTAR SES
F40200 03111201
MGA RESEARCH CORP.

**NCAP 35 MPH FRONTAL
2004 FORD FREESTAR SES
F40200 03111201
MGA RESEARCH CORP.**

Pre-Test Windshield View



Post-Test Windshield View



Pre-Test Engine Compartment View



Post-Test Engine Compartment View



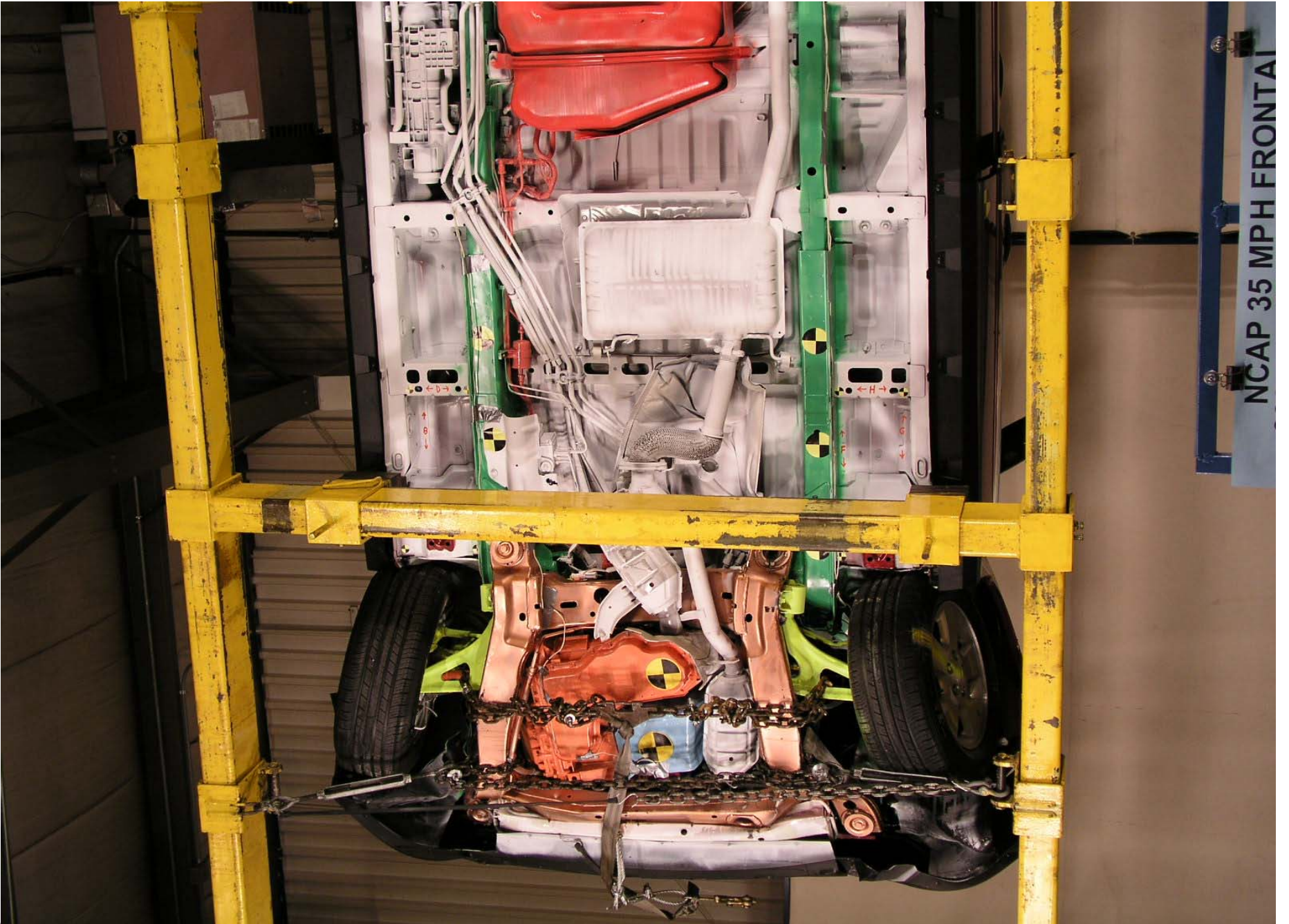
Pre-Test Fuel Filler Cap View



Post-Test Fuel Filler Cap View



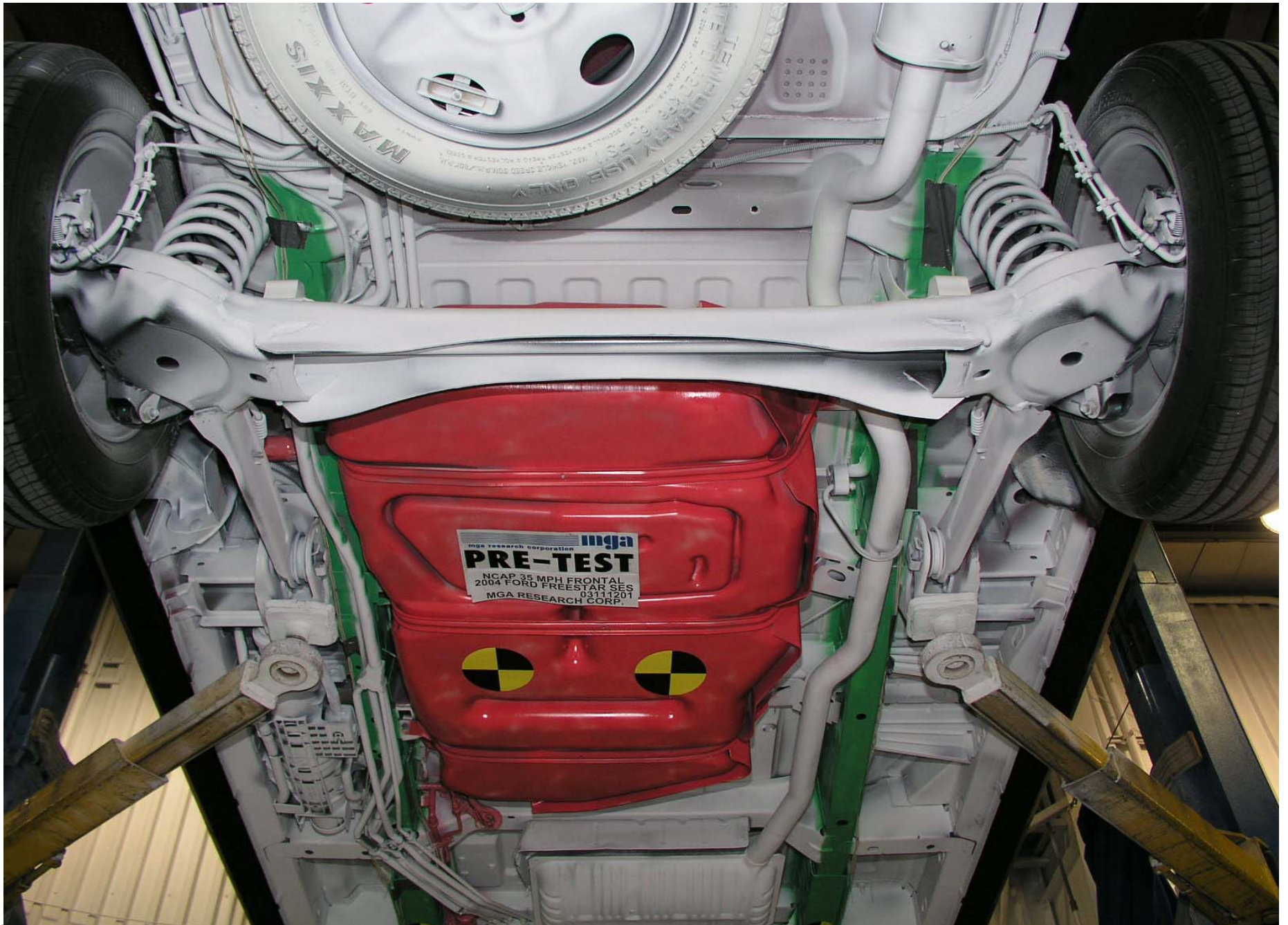
Pre-Test Front Underbody View



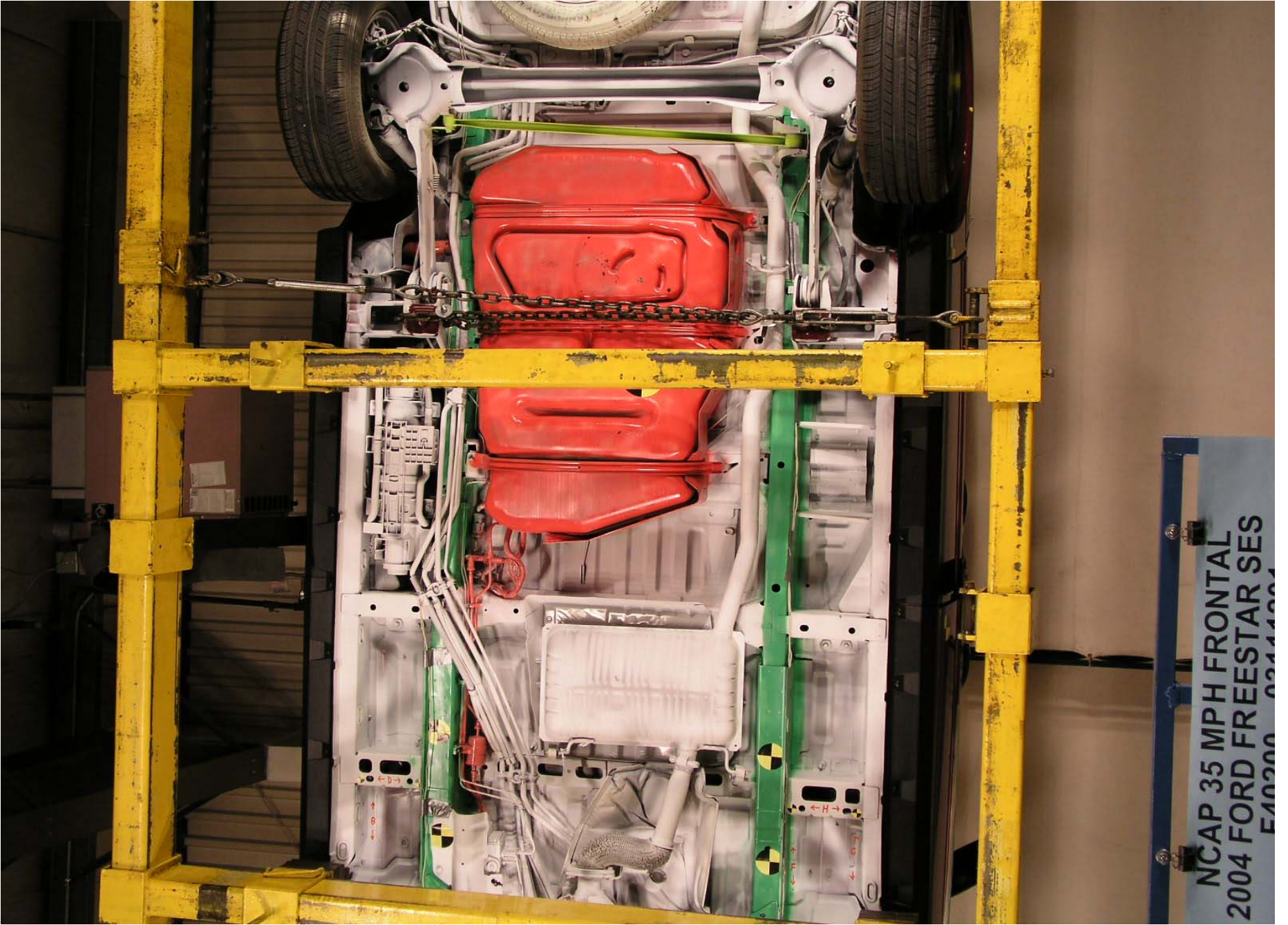
Post-Test Front Underbody View



Pre-Test Mid Underbody



Pre-Test Mid Underbody



Post-Test Mid Underbody



Pre-Test Rear Underbody View



Post-Test Rear Underbody View



Pre-Test Driver Dummy Front View (head position)



Post-Test Driver Dummy Front View (head position)



Pre-Test Driver Dummy Position Left Side View



Post-Test Driver Dummy Position Left Side View



Pre-Test Driver Dummy Position Left Side View (Door Open)



Post-Test Driver Dummy Position Left Side View (Door Open)



Pre-Test Driver Dummy Feet Position



Post-Test Driver Dummy Feet Position



Pre-Test Driver Side Knee Bolster View



Post-Test Driver Side Knee Bolster View



Pre-Test Driver Side Floor Pan View



Post-Test Driver Side Floor Pan View



Post-Test Driver Dummy Head Contact

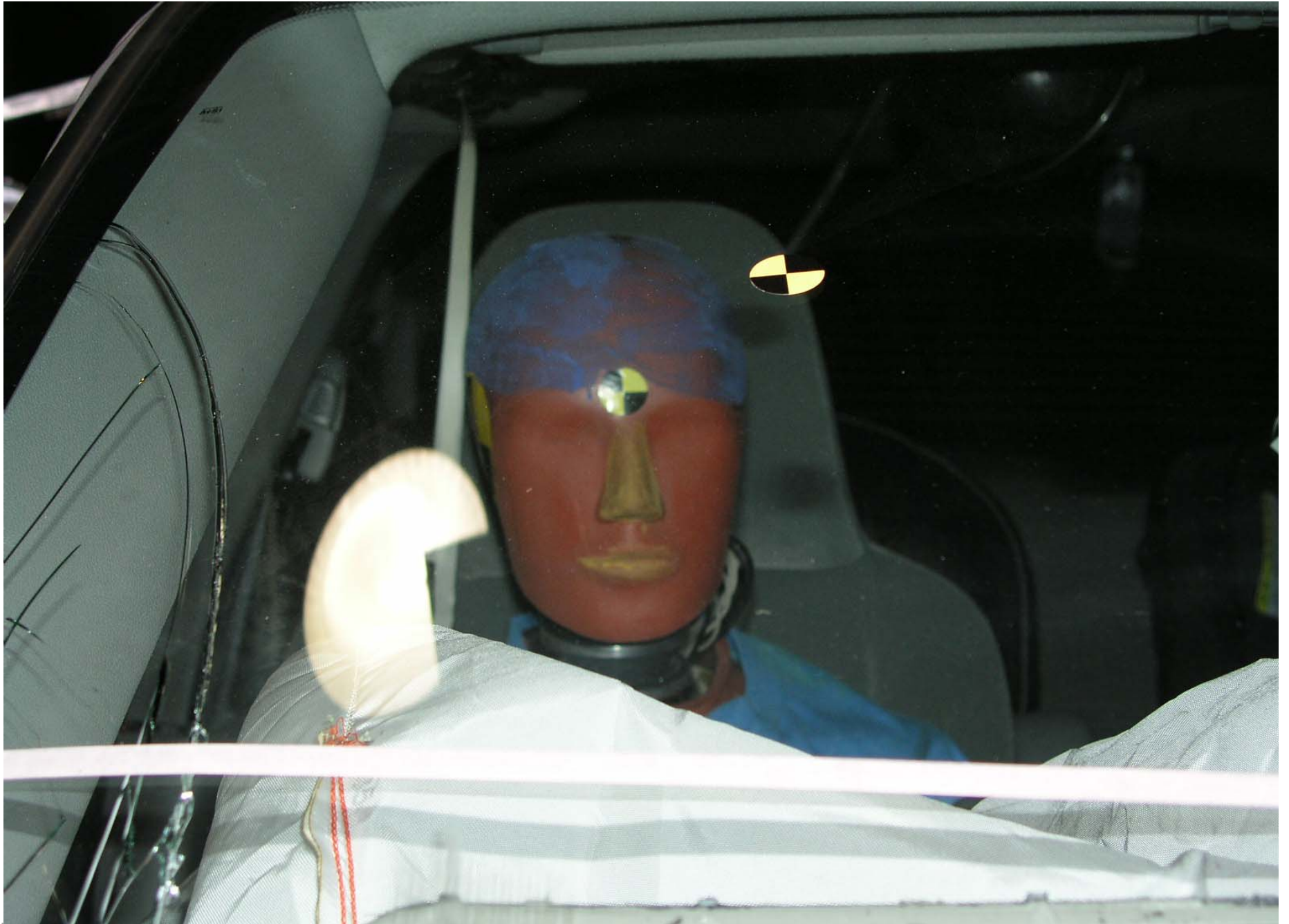
Post-Test Driver Dummy Knee Contact



Post-Test Driver Dummy Airbag Contact



Pre-Test Passenger Dummy Front View (head position)



Post-Test Passenger Dummy Front View (head position)



Pre-Test Passenger Dummy Position Right Side View



Post-Test Passenger Dummy Position Right Side View

Pre-Test Passenger Dummy Position Right Side View (Door Open)



Post-Test Passenger Dummy Position Right Side View (Door Open)



Pre-Test Passenger Dummy Feet Position



Post-Test Passenger Dummy Feet Position



Pre-Test Passenger Side Knee Bolster View



Post-Test Passenger Side Knee Bolster View



Pre-Test Passenger Side Floor Pan View



Post-Test Passenger Side Floor Pan View



Post-Test Passenger Dummy Head Contact



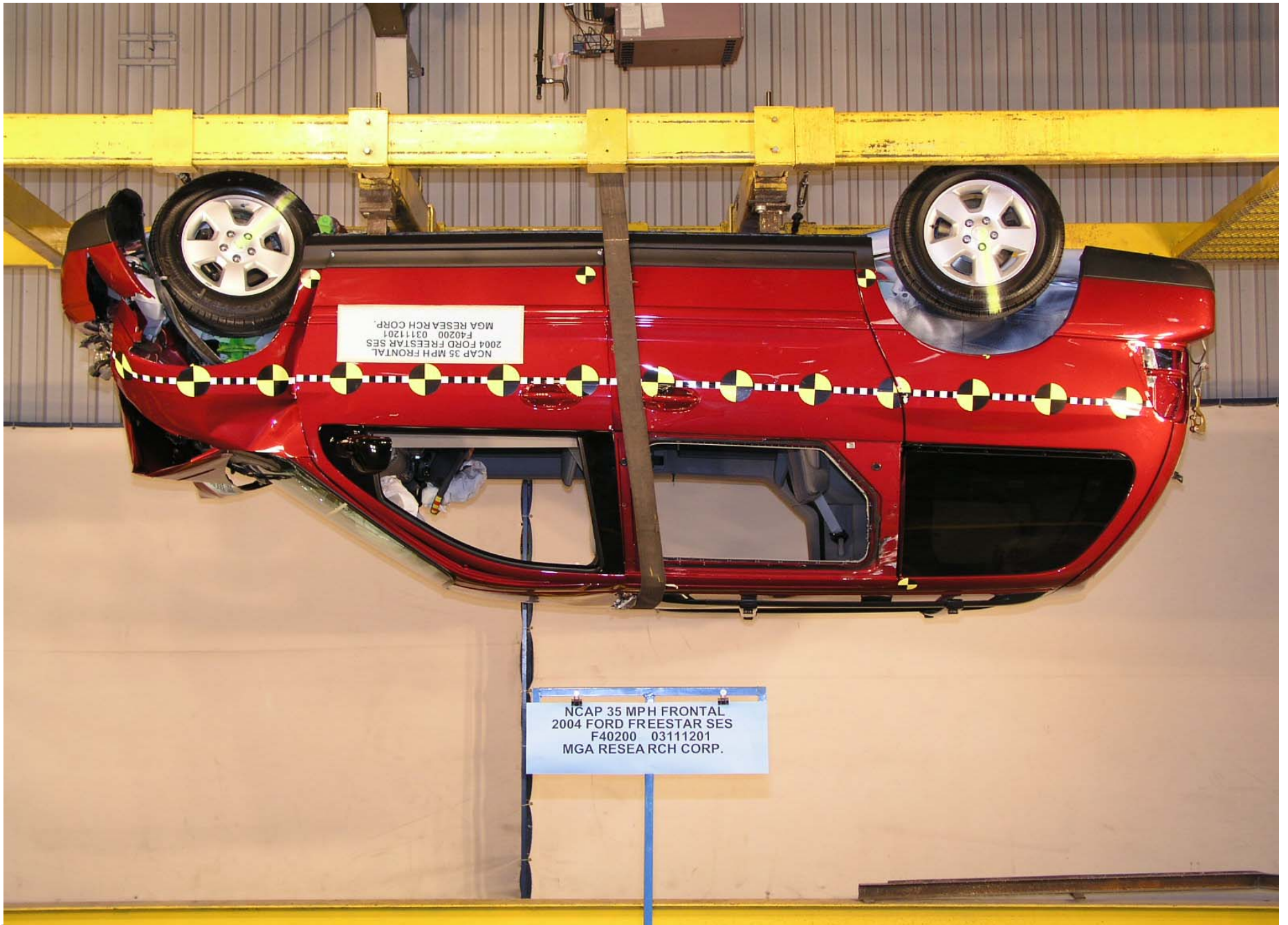
Post-Test Passenger Dummy Knee Contact



Post-Test Passenger Dummy Airbag Contact

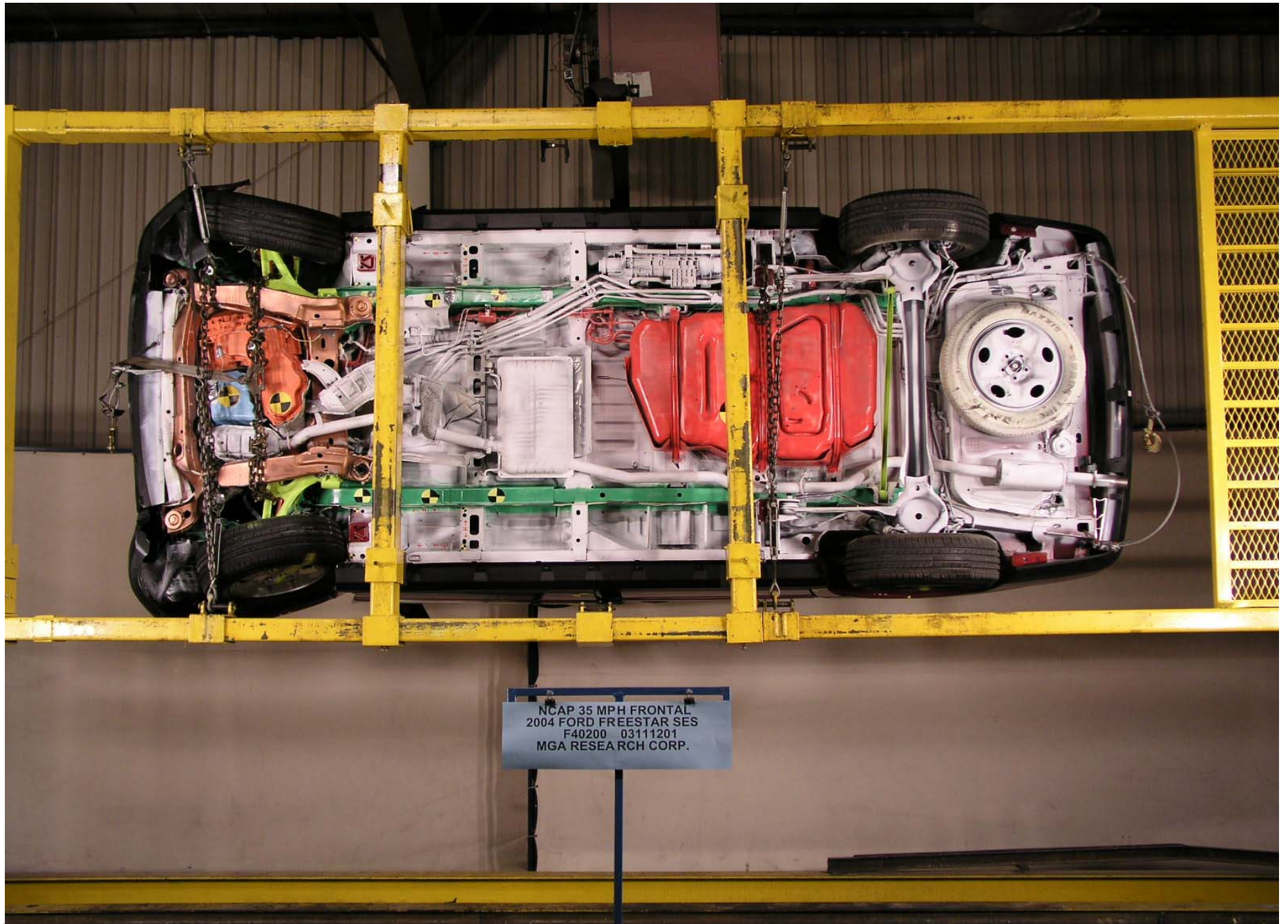


Rollover 90 Degrees



Rollover 180 Degrees

A-62.



Rollover 270 Degrees



Rollover 360 Degrees



Vehicle Impact

APPENDIX B

DUMMY AND VEHICLE RESPONSE DATA TRACES

TABLE OF DATA PLOTS

		<u>Page No.</u>
Figure No. 1.	Driver Head X Acceleration vs. Time	B-1
Figure No. 2.	Driver Head Y Acceleration vs. Time	B-1
Figure No. 3.	Driver Head Z Acceleration vs. Time	B-1
Figure No. 4.	Driver Head Resultant Acceleration vs. Time	B-1
Figure No. 5.	Driver Head X Velocity vs. Time	B-2
Figure No. 6.	Driver Head Y Velocity vs. Time	B-2
Figure No. 7.	Driver Head Z Velocity vs. Time	B-2
Figure No. 8.	Driver Head X Redundant Acceleration vs. Time	B-3
Figure No. 9.	Driver Head Y Redundant Acceleration vs. Time	B-3
Figure No. 10.	Driver Head Z Redundant Acceleration vs. Time	B-3
Figure No. 11.	Driver Head Resultant Redundant Acceleration vs. Time	B-3
Figure No. 12.	Driver Head X Redundant Velocity vs. Time	B-4
Figure No. 13.	Driver Head Y Redundant Velocity vs. Time	B-4
Figure No. 14.	Driver Head Z Redundant Velocity vs. Time	B-4
Figure No. 15.	Driver Neck Force X vs. Time	B-5
Figure No. 16.	Driver Neck Force Y vs. Time	B-5
Figure No. 17.	Driver Neck Force Z vs. Time	B-5
Figure No. 18.	Driver Neck Force Resultant vs. Time	B-5
Figure No. 19.	Driver Neck Moment X vs. Time	B-6
Figure No. 20.	Driver Neck Moment Y vs. Time	B-6
Figure No. 21.	Driver Neck Moment Z vs. Time	B-6
Figure No. 22.	Driver Neck Moment Resultant vs. Time	B-6
Figure No. 23.	Driver Chest X Acceleration vs. Time	B-7
Figure No. 24.	Driver Chest Y Acceleration vs. Time	B-7
Figure No. 25.	Driver Chest Z Acceleration vs. Time	B-7
Figure No. 26.	Driver Chest Resultant Acceleration vs. Time	B-7
Figure No. 27.	Driver Chest X Velocity vs. Time	B-8
Figure No. 28.	Driver Chest Y Velocity vs. Time	B-8
Figure No. 29.	Driver Chest Z Velocity vs. Time	B-8

		<u>Page No.</u>
Figure No. 30.	Driver Chest Displacement vs. Time	B-8
Figure No. 31.	Driver Chest X Redundant Acceleration vs. Time	B-9
Figure No. 32.	Driver Chest Y Redundant Acceleration vs. Time	B-9
Figure No. 33.	Driver Chest Z Redundant Acceleration vs. Time	B-9
Figure No. 34.	Driver Chest Resultant Redundant Acceleration vs. Time	B-9
Figure No. 35.	Driver Chest X Redundant Velocity vs. Time	B-10
Figure No. 36.	Driver Chest Y Redundant Velocity vs. Time	B-10
Figure No. 37.	Driver Chest Z Redundant Velocity vs. Time	B-10
Figure No. 38.	Driver Pelvis X Acceleration vs. Time	B-11
Figure No. 39.	Driver Pelvis Y Acceleration vs. Time	B-11
Figure No. 40.	Driver Pelvis Z Acceleration vs. Time	B-11
Figure No. 41.	Driver Pelvis Resultant Acceleration vs. Time	B-11
Figure No. 42.	Driver Pelvis X Velocity vs. Time	B-12
Figure No. 43.	Driver Pelvis Y Velocity vs. Time	B-12
Figure No. 44.	Driver Pelvis Z Velocity vs. Time	B-12
Figure No. 45.	Driver Left Femur Force vs. Time	B-13
Figure No. 46.	Driver Right Femur Force vs. Time	B-13
Figure No. 47.	Driver Shoulder Belt Force vs. Time	B-13
Figure No. 48.	Driver Lap Belt Force vs. Time	B-13
Figure No. 49.	Driver Left Upper Tibia Moment X vs. Time	B-14
Figure No. 50.	Driver Left Upper Tibia Moment Y vs. Time	B-14
Figure No. 51.	Driver Left Upper Tibia Force Z vs. Time	B-14
Figure No. 52.	Driver Left Lower Tibia Moment X vs. Time	B-15
Figure No. 53.	Driver Left Lower Tibia Moment Y vs. Time	B-15
Figure No. 54.	Driver Left Lower Tibia Force Z vs. Time	B-15
Figure No. 55.	Driver Right Upper Tibia Moment X vs. Time	B-16
Figure No. 56.	Driver Right Upper Tibia Moment Y vs. Time	B-16
Figure No. 57.	Driver Right Upper Tibia Force Z vs. Time	B-16
Figure No. 58.	Driver Right Lower Tibia Moment X vs. Time	B-17
Figure No. 59.	Driver Right Lower Tibia Moment Y vs. Time	B-17

		<u>Page No.</u>
Figure No. 60.	Driver Right Lower Tibia Force Z vs. Time	B-17
Figure No. 61.	Driver Left Foot Z – Front Acceleration vs. Time	B-18
Figure No. 62.	Driver Left Ankle X Acceleration vs. Time	B-18
Figure No. 63.	Driver Left Ankle Z Acceleration vs. Time	B-18
Figure No. 64.	Driver Right Foot Z – Front Acceleration vs. Time	B-19
Figure No. 65.	Driver Right Ankle X Acceleration vs. Time	B-19
Figure No. 66.	Driver Right Ankle Z Acceleration vs. Time	B-19
Figure No. 67.	Passenger Head X Acceleration vs. Time	B-20
Figure No. 68.	Passenger Head Y Acceleration vs. Time	B-20
Figure No. 69.	Passenger Head Z Acceleration vs. Time	B-20
Figure No. 70.	Passenger Head Resultant Acceleration vs. Time	B-20
Figure No. 71.	Passenger Head X Velocity vs. Time	B-21
Figure No. 72.	Passenger Head Y Velocity vs. Time	B-21
Figure No. 73.	Passenger Head Z Velocity vs. Time	B-21
Figure No. 74.	Passenger Head X Redundant Acceleration vs. Time	B-22
Figure No. 75.	Passenger Head Y Redundant Acceleration vs. Time	B-22
Figure No. 76.	Passenger Head Z Redundant Acceleration vs. Time	B-22
Figure No. 77.	Passenger Head Resultant Redundant Acceleration vs. Time	B-22
Figure No. 78.	Passenger Head X Redundant Velocity vs. Time	B-23
Figure No. 79.	Passenger Head Y Redundant Velocity vs. Time	B-23
Figure No. 80.	Passenger Head Z Redundant Velocity vs. Time	B-23
Figure No. 81.	Passenger Neck Force X vs. Time	B-24
Figure No. 82.	Passenger Neck Force Y vs. Time	B-24
Figure No. 83.	Passenger Neck Force Z vs. Time	B-24
Figure No. 84.	Passenger Neck Force Resultant vs. Time	B-24
Figure No. 85.	Passenger Neck Moment X vs. Time	B-25
Figure No. 86.	Passenger Neck Moment Y vs. Time	B-25
Figure No. 87.	Passenger Neck Moment Z vs. Time	B-25
Figure No. 88.	Passenger Neck Moment Resultant vs. Time	B-25
Figure No. 89.	Passenger Chest X Acceleration vs. Time	B-26

		<u>Page No.</u>
Figure No. 90.	Passenger Chest Y Acceleration vs. Time	B-26
Figure No. 91.	Passenger Chest Z Acceleration vs. Time	B-26
Figure No. 92.	Passenger Chest Resultant Acceleration vs. Time	B-26
Figure No. 93.	Passenger Chest X Velocity vs. Time	B-27
Figure No. 94.	Passenger Chest Y Velocity vs. Time	B-27
Figure No. 95.	Passenger Chest Z Velocity vs. Time	B-27
Figure No. 96.	Passenger Chest Displacement vs. Time	B-27
Figure No. 97.	Passenger Chest X Redundant Acceleration vs. Time	B-28
Figure No. 98.	Passenger Chest Y Redundant Acceleration vs. Time	B-28
Figure No. 99.	Passenger Chest Z Redundant Acceleration vs. Time	B-28
Figure No. 100.	Passenger Chest Resultant Redundant Acceleration vs. Time	B-28
Figure No. 101.	Passenger Chest X Redundant Velocity vs. Time	B-29
Figure No. 102.	Passenger Chest Y Redundant Velocity vs. Time	B-29
Figure No. 103.	Passenger Chest Z Redundant Velocity vs. Time	B-29
Figure No. 104.	Passenger Pelvis X Acceleration vs. Time	B-30
Figure No. 105.	Passenger Pelvis Y Acceleration vs. Time	B-30
Figure No. 106.	Passenger Pelvis Z Acceleration vs. Time	B-30
Figure No. 107.	Passenger Pelvis Resultant Acceleration vs. Time	B-30
Figure No. 108.	Passenger Pelvis X Velocity vs. Time	B-31
Figure No. 109.	Passenger Pelvis Y Velocity vs. Time	B-31
Figure No. 110.	Passenger Pelvis Z Velocity vs. Time	B-31
Figure No. 111.	Passenger Left Femur Force vs. Time	B-32
Figure No. 112.	Passenger Right Femur Force vs. Time	B-32
Figure No. 113.	Passenger Shoulder Belt Force vs. Time	B-32
Figure No. 114.	Passenger Lap Belt Force vs. Time	B-32
Figure No. 115.	Passenger Left Upper Tibia Moment X vs. Time	B-33
Figure No. 116.	Passenger Left Upper Tibia Moment Y vs. Time	B-33
Figure No. 117.	Passenger Left Upper Tibia Force Z vs. Time	B-33
Figure No. 118.	Passenger Left Lower Tibia Moment X vs. Time	B-34
Figure No. 119.	Passenger Left Lower Tibia Moment Y vs. Time	B-34

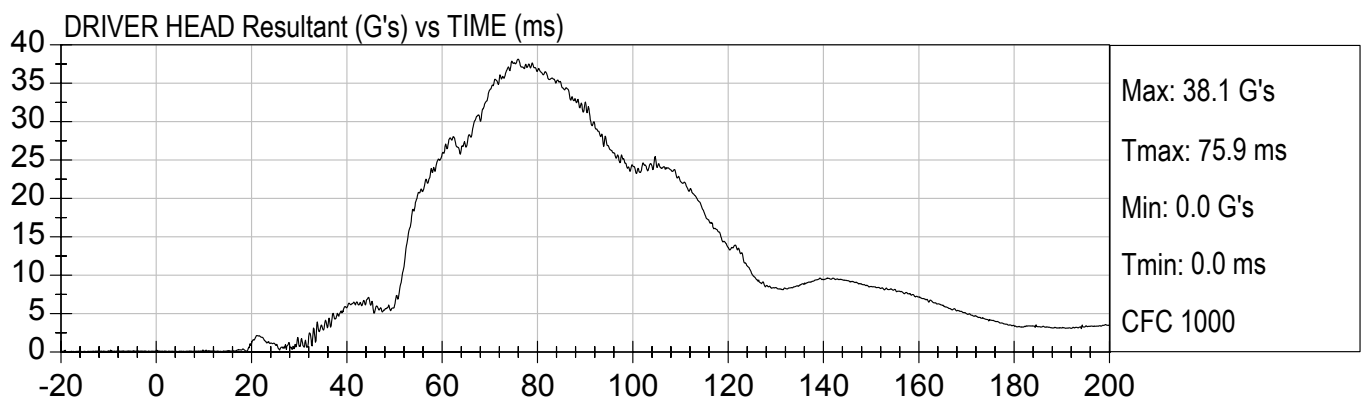
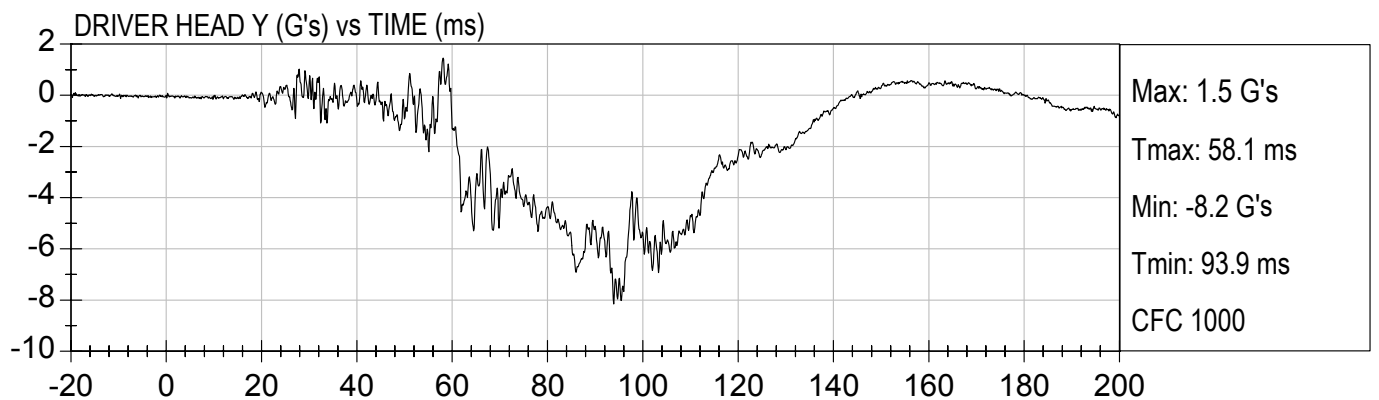
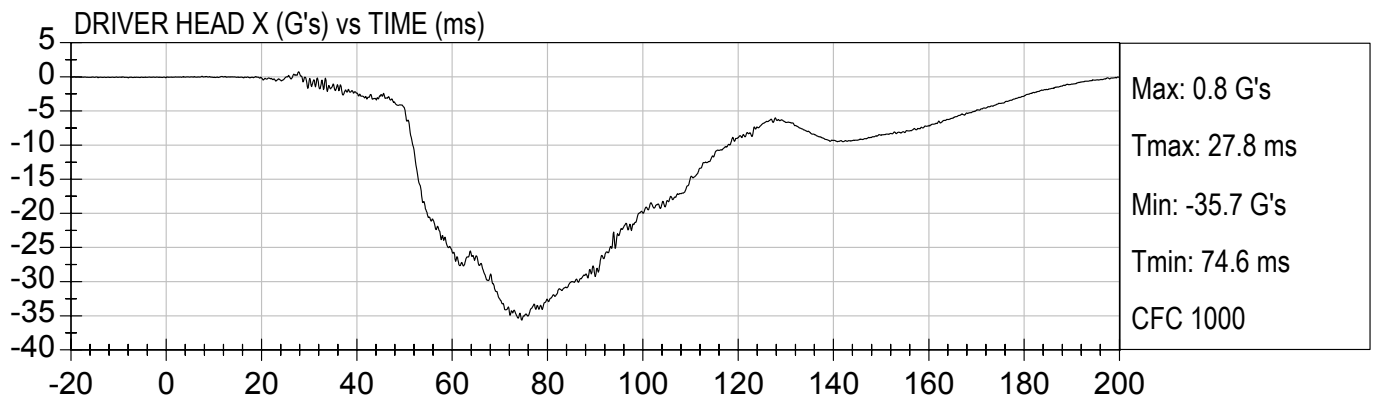
	<u>Page No.</u>
Figure No. 120. Passenger Left Lower Tibia Force Z vs. Time	B-34
Figure No. 121. Passenger Right Upper Tibia Moment X vs. Time	B-35
Figure No. 122. Passenger Right Upper Tibia Moment Y vs. Time	B-35
Figure No. 123. Passenger Right Upper Tibia Force Z vs. Time	B-35
Figure No. 124. Passenger Right Lower Tibia Moment X vs. Time	B-36
Figure No. 125. Passenger Right Lower Tibia Moment Y vs. Time	B-36
Figure No. 126. Passenger Right Lower Tibia Force Z vs. Time	B-36
Figure No. 127. Passenger Left Foot Z – Front Acceleration vs. Time	B-37
Figure No. 128. Passenger Left Ankle X Acceleration vs. Time	B-37
Figure No. 129. Passenger Left Ankle Z Acceleration vs. Time	B-37
Figure No. 130. Passenger Right Foot Z – Front Acceleration vs. Time	B-38
Figure No. 131. Passenger Right Ankle X Acceleration vs. Time	B-38
Figure No. 132. Passenger Right Ankle Z Acceleration vs. Time	B-38
Figure No. 133. Left Rear Seat Crossmember X Acceleration vs. Time	B-39
Figure No. 134. Left Rear Seat Crossmember X Velocity vs. Time	B-39
Figure No. 135. Left Rear Seat Crossmember X Displacement vs. Time	B-39
Figure No. 136. Left Rear Seat Crossmember Z Acceleration vs. Time	B-40
Figure No. 137. Left Rear Seat Crossmember Z Velocity vs. Time	B-40
Figure No. 138. Left Rear Seat Crossmember Z Displacement vs. Time	B-40
Figure No. 139. Right Rear Seat Crossmember X Acceleration vs. Time	B-41
Figure No. 140. Right Rear Seat Crossmember X Velocity vs. Time	B-41
Figure No. 141. Right Rear Seat Crossmember X Displacement vs. Time	B-41
Figure No. 142. Right Rear Seat Crossmember Z Acceleration vs. Time	B-42
Figure No. 143. Right Rear Seat Crossmember Z Velocity vs. Time	B-42
Figure No. 144. Right Rear Seat Crossmember Z Displacement vs. Time	B-42
Figure No. 145. Top of Engine X Acceleration vs. Time	B-43
Figure No. 146. Top of Engine X Velocity vs. Time	B-43
Figure No. 147. Top of Engine X Displacement vs. Time	B-43
Figure No. 148. Bottom of Engine X Acceleration vs. Time	B-44
Figure No. 149. Bottom of Engine X Velocity vs. Time	B-44

		<u>Page No.</u>
Figure No. 150.	Bottom of Engine X Displacement vs. Time	B-44
Figure No. 151.	Left Brake Caliper X Acceleration vs. Time	B-45
Figure No. 152.	Left Brake Caliper X Velocity vs. Time	B-45
Figure No. 153.	Left Brake Caliper X Displacement vs. Time	B-45
Figure No. 154.	Right Brake Caliper X Acceleration vs. Time	B-46
Figure No. 155.	Right Brake Caliper X Velocity vs. Time	B-46
Figure No. 156.	Right Brake Caliper X Displacement vs. Time	B-46
Figure No. 157.	Instrument Panel X Acceleration vs. Time	B-47
Figure No. 158.	Instrument Panel X Velocity vs. Time	B-47
Figure No. 159.	Instrument Panel X Displacement vs. Time	B-47
Figure No. 160.	Barrier Force – Upper Left vs. Time	B-48
Figure No. 161.	Barrier Force – Upper Center vs. Time	B-48
Figure No. 162.	Barrier Force – Upper Right vs. Time	B-48
Figure No. 163.	Barrier Force – Lower Left vs. Time	B-49
Figure No. 164.	Barrier Force – Lower Center vs. Time	B-49
Figure No. 165.	Barrier Force – Lower Right vs. Time	B-49
Figure No. 166.	Barrier Force – Sum Left vs. Time	B-50
Figure No. 167.	Barrier Force – Sum Center vs. Time	B-50
Figure No. 168.	Barrier Force – Sum Right vs. Time	B-50
Figure No. 169.	Barrier Force – Sum All vs. Time	B-50
Figure No. 170.	Barrier Force – Sum All vs. Average Seat X-member Displacement	B-51



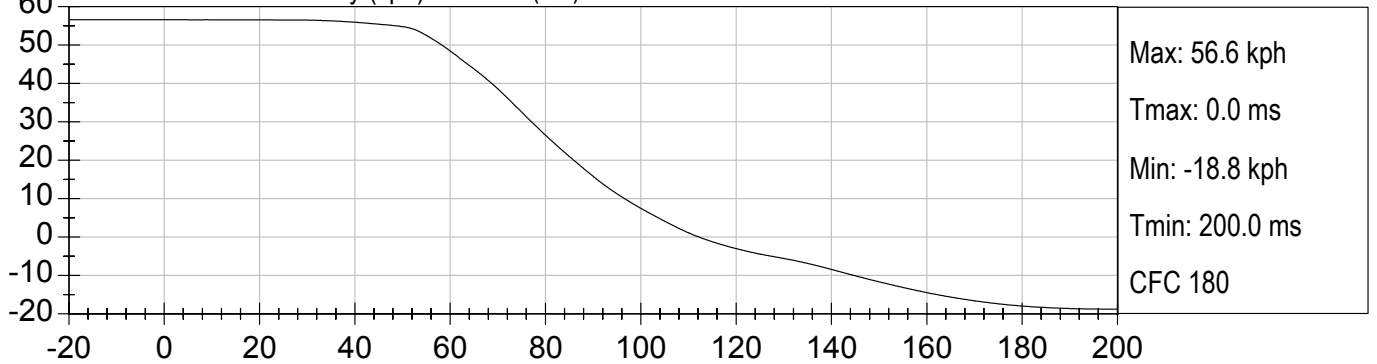
35MPH NCAP FRONTAL
2004 FORD FREESTAR

Test Date: 11/12/2003
Speed: 35.2 mph (56.6 km/h)

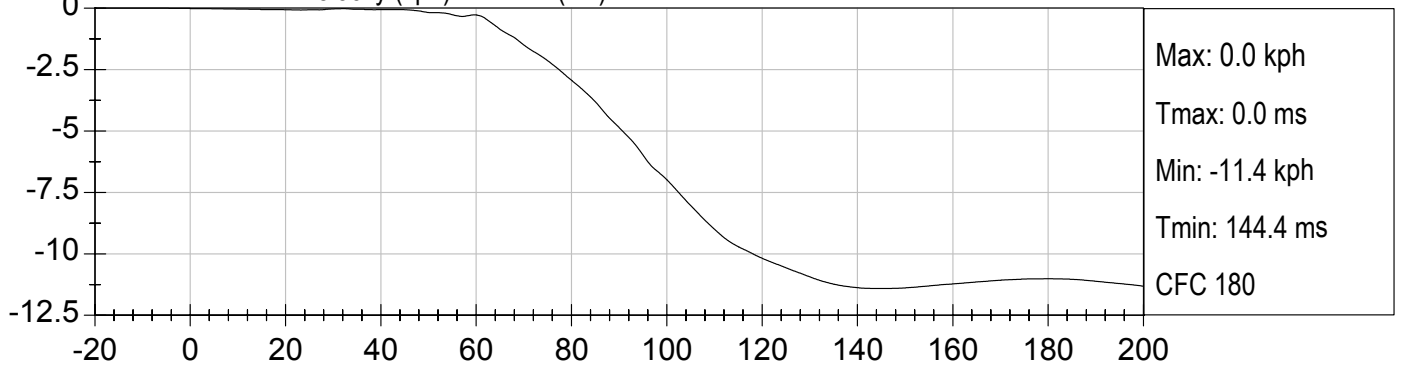




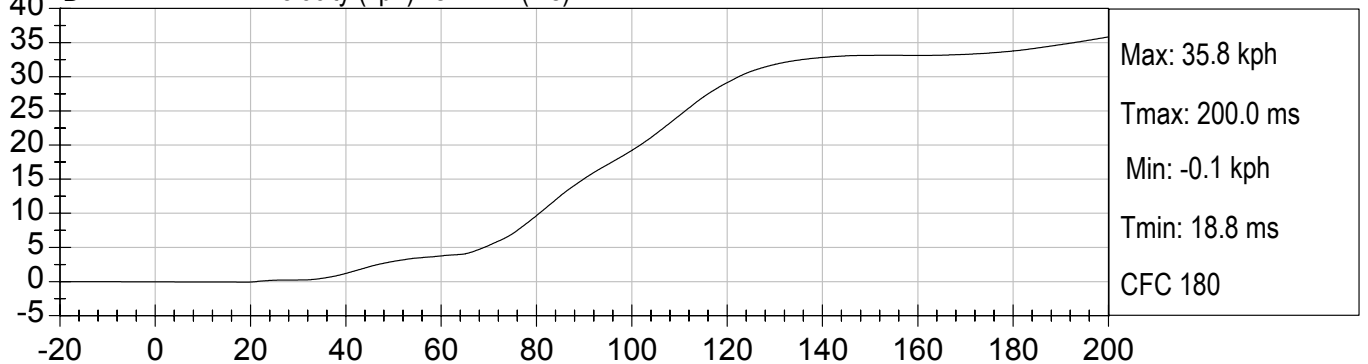
DRIVER HEAD X Velocity (kph) vs TIME (ms)



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



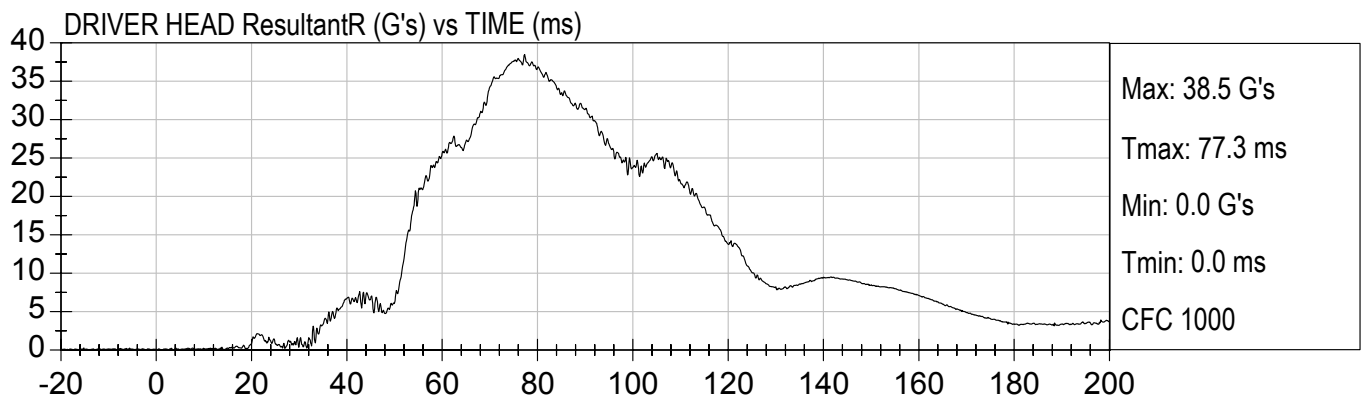
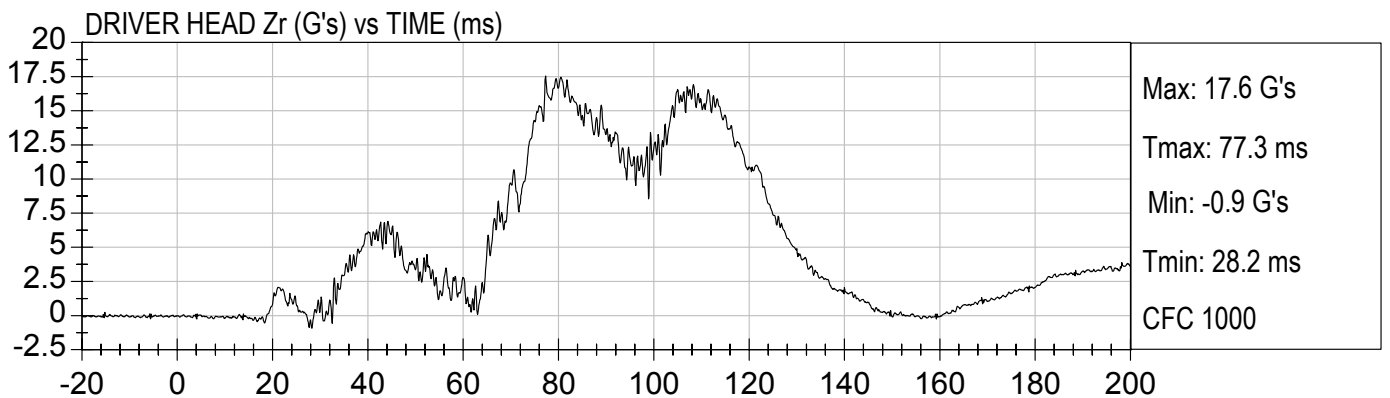
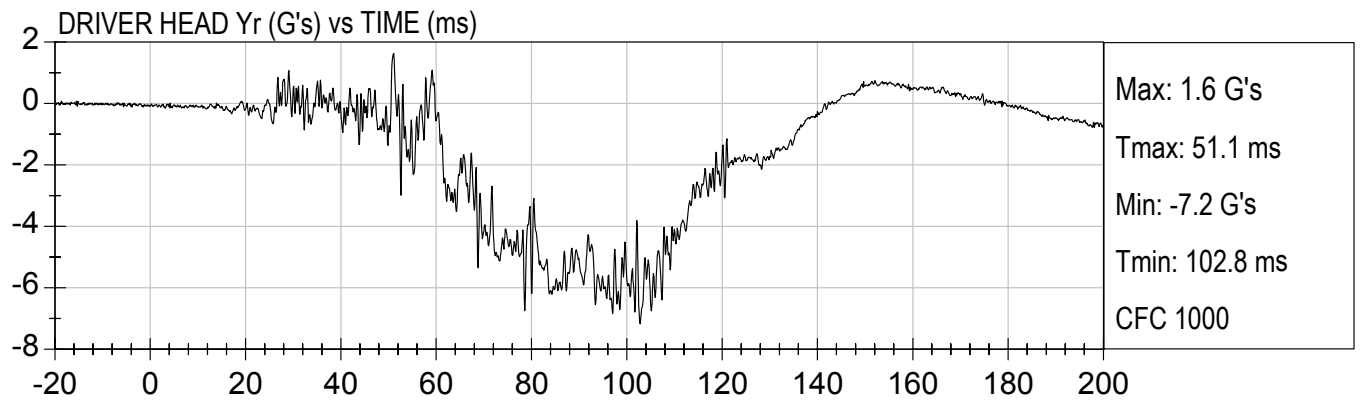
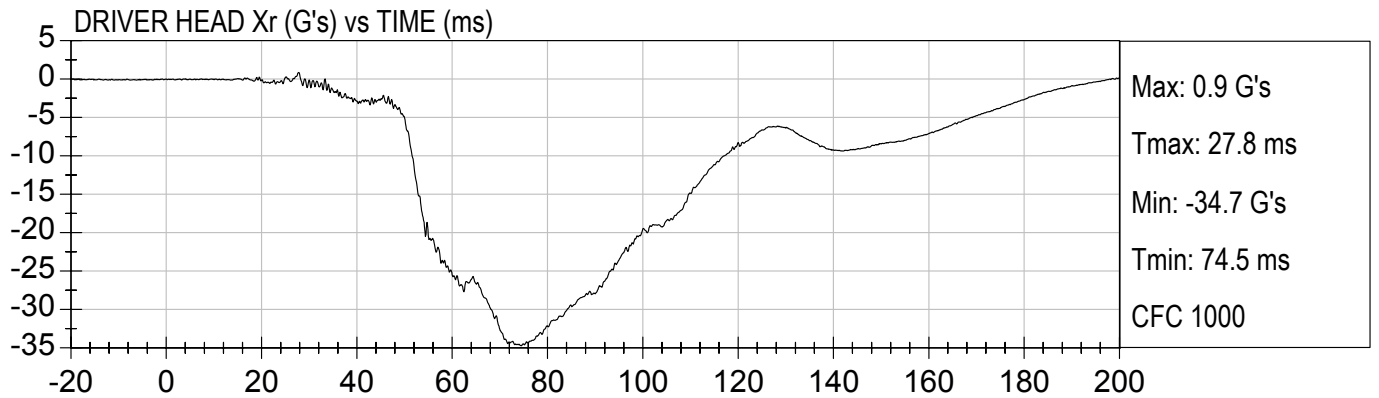
DRIVER HEAD Z Velocity (kph) vs TIME (ms)





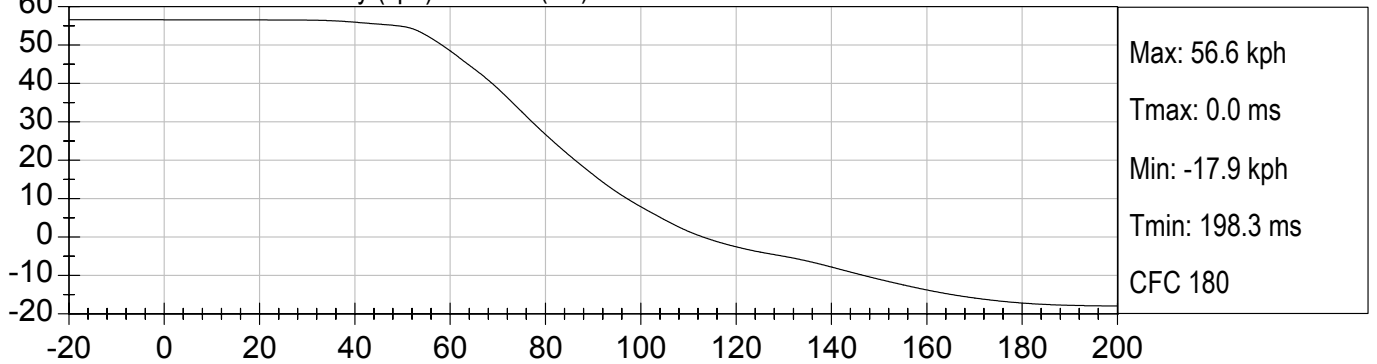
35MPH NCAP FRONTAL
2004 FORD FREESTAR

Test Date: 11/12/2003
Speed: 35.2 mph (56.6 km/h)

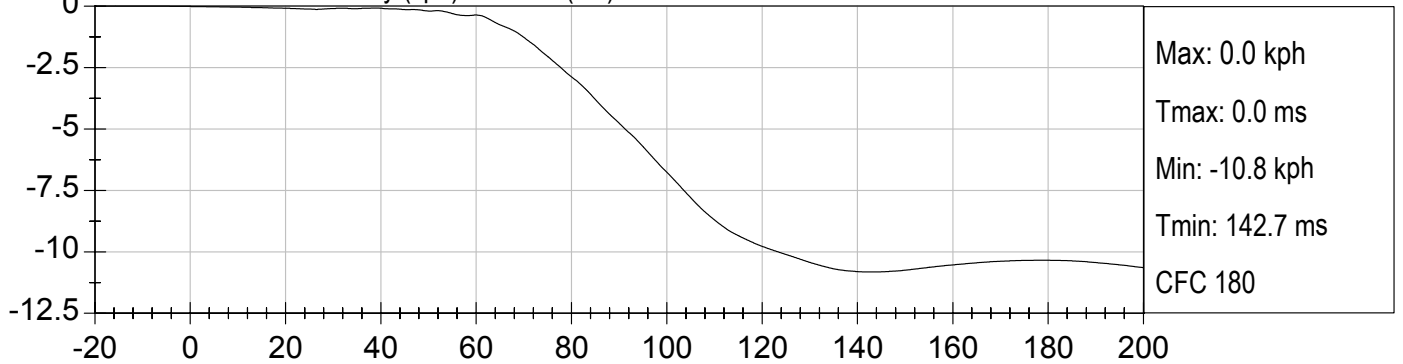




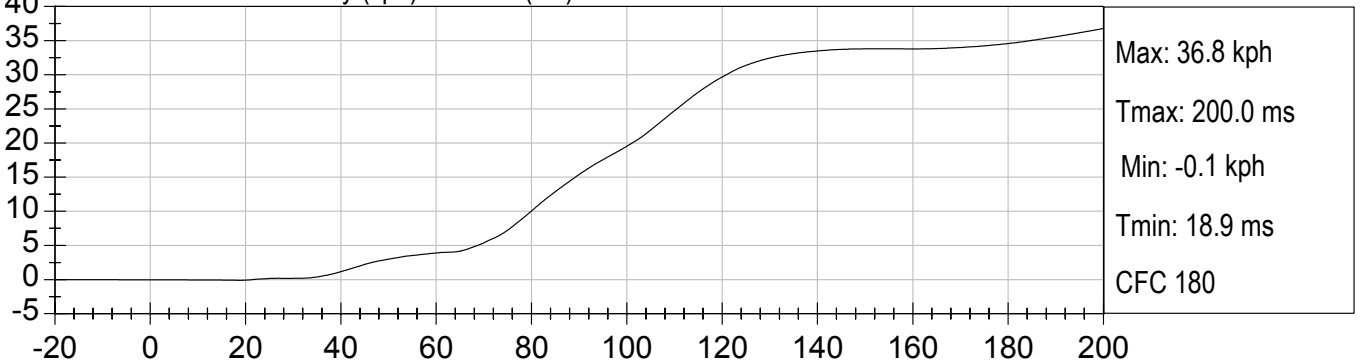
DRIVER HEAD Xr Velocity (kph) vs TIME (ms)



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



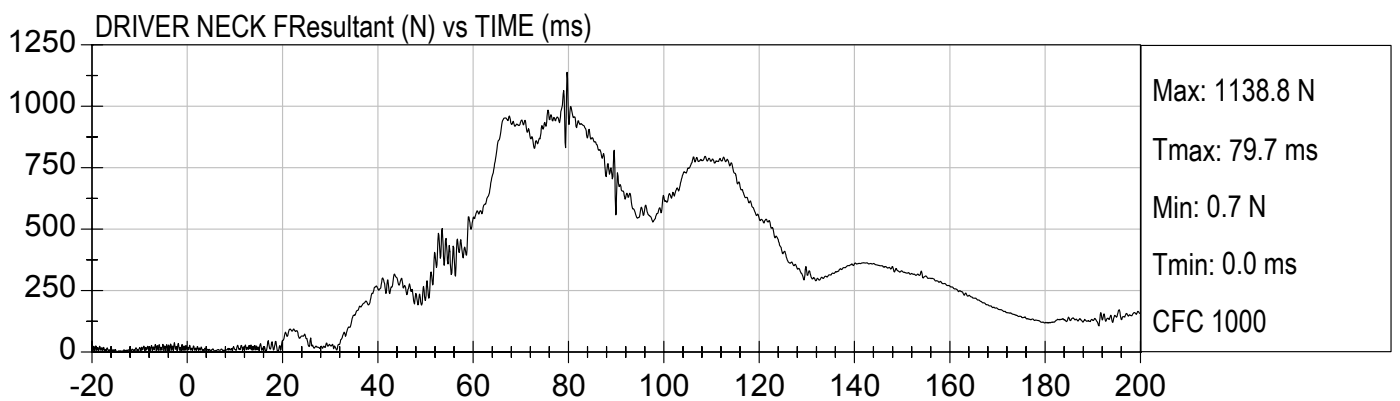
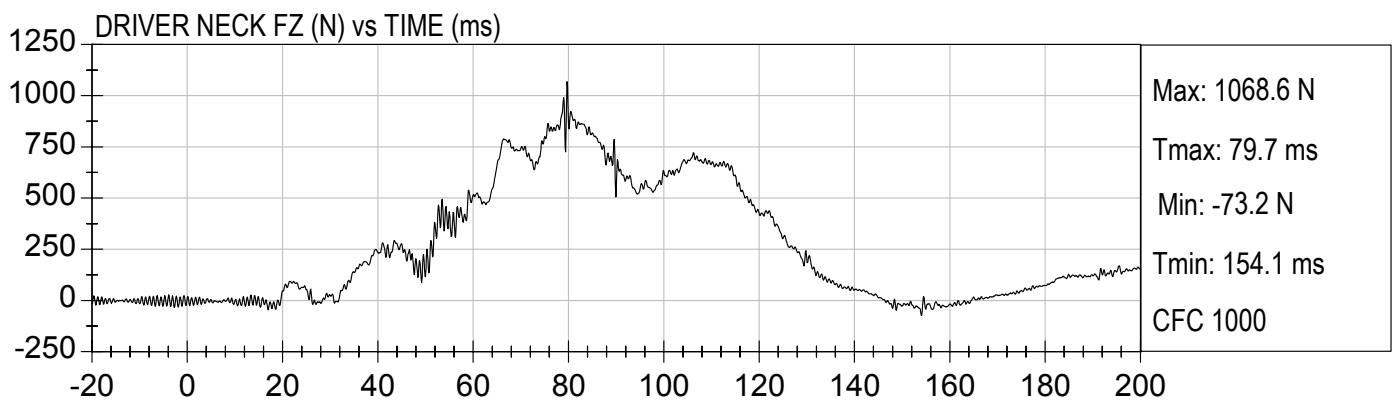
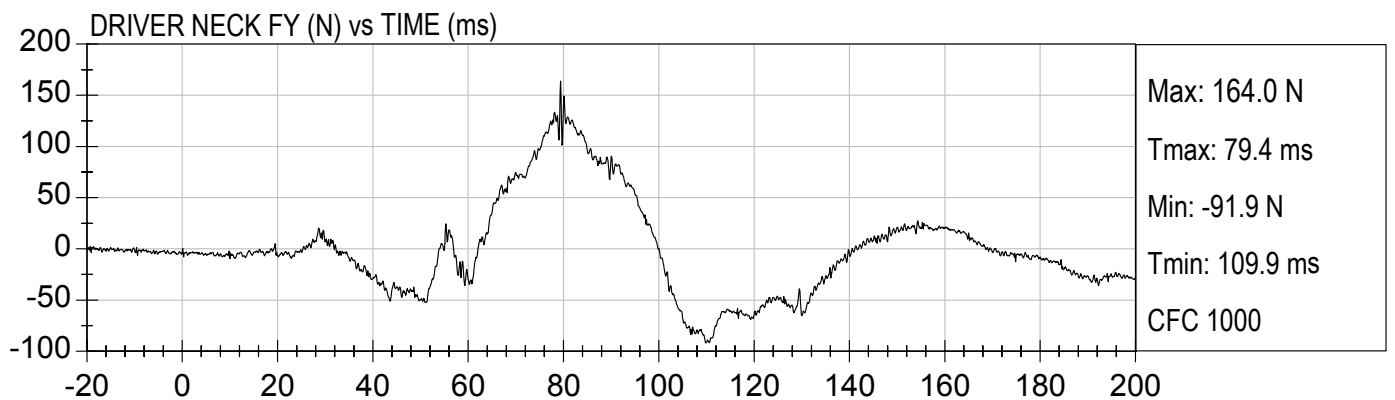
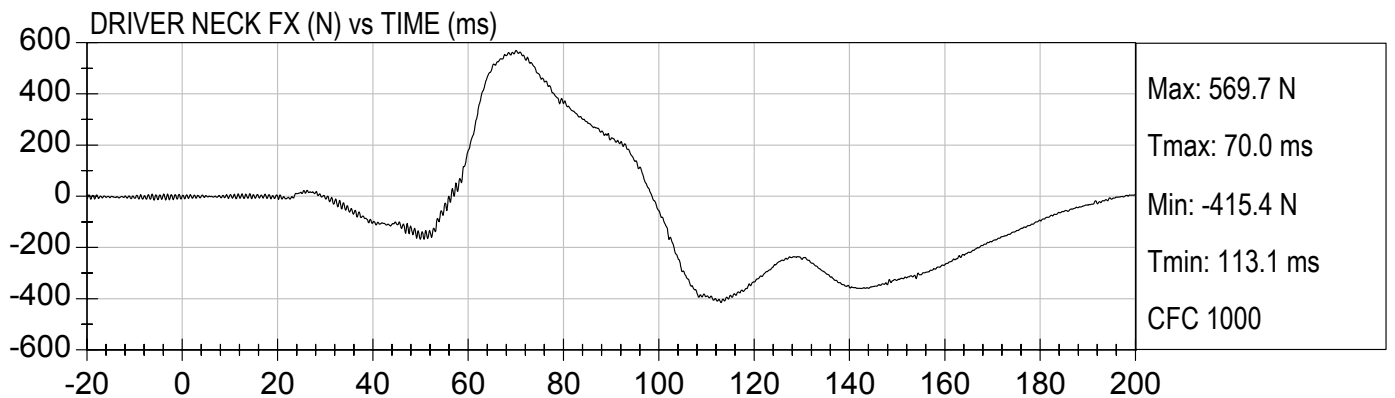
DRIVER HEAD Zr Velocity (kph) vs TIME (ms)





35MPH NCAP FRONTAL
2004 FORD FREESTAR

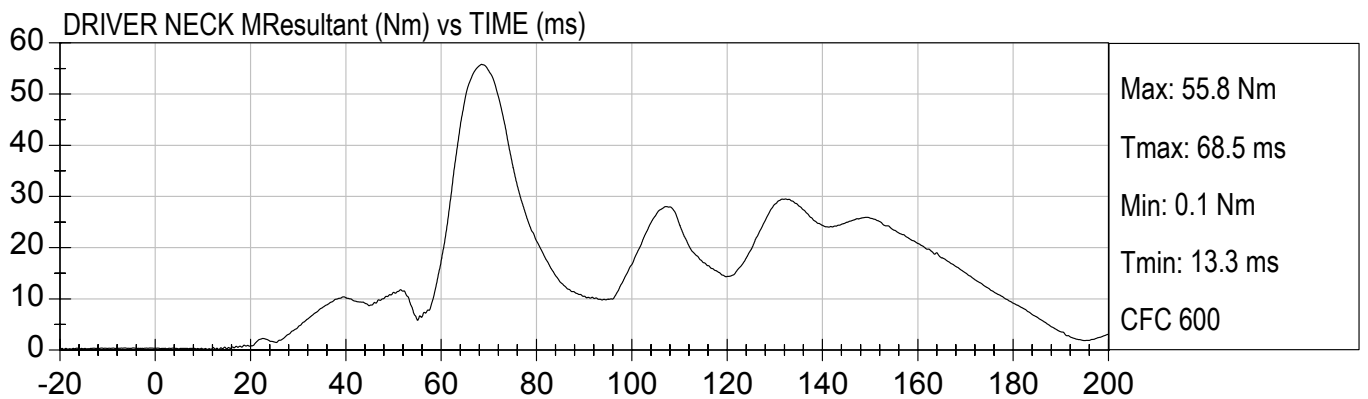
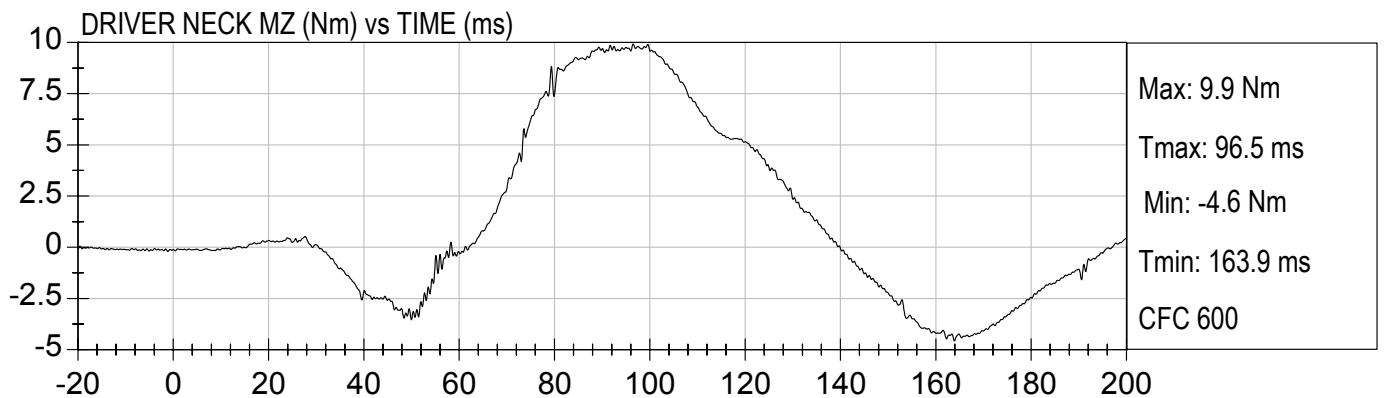
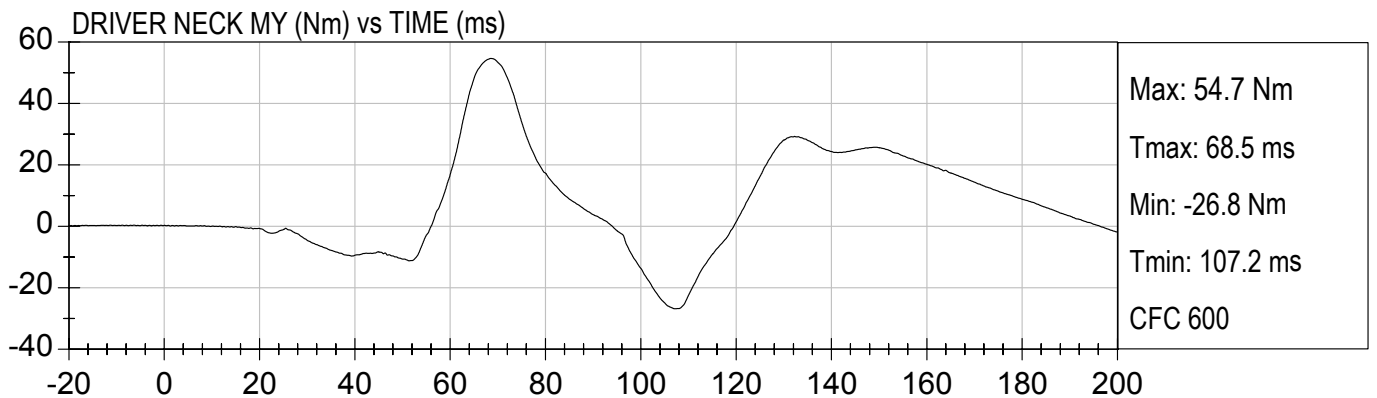
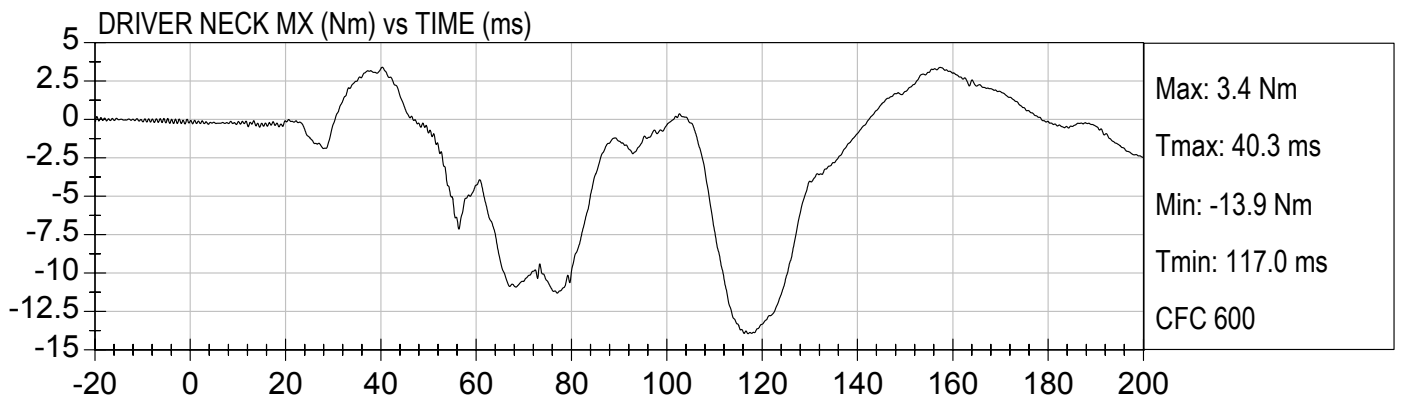
Test Date: 11/12/2003
Speed: 35.2 mph (56.6 km/h)





35MPH NCAP FRONTAL
2004 FORD FREESTAR

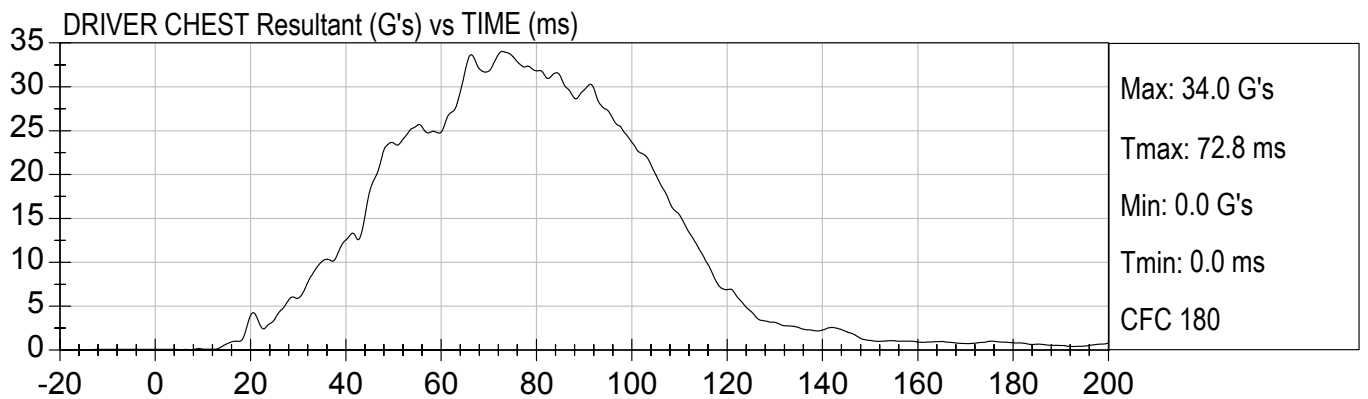
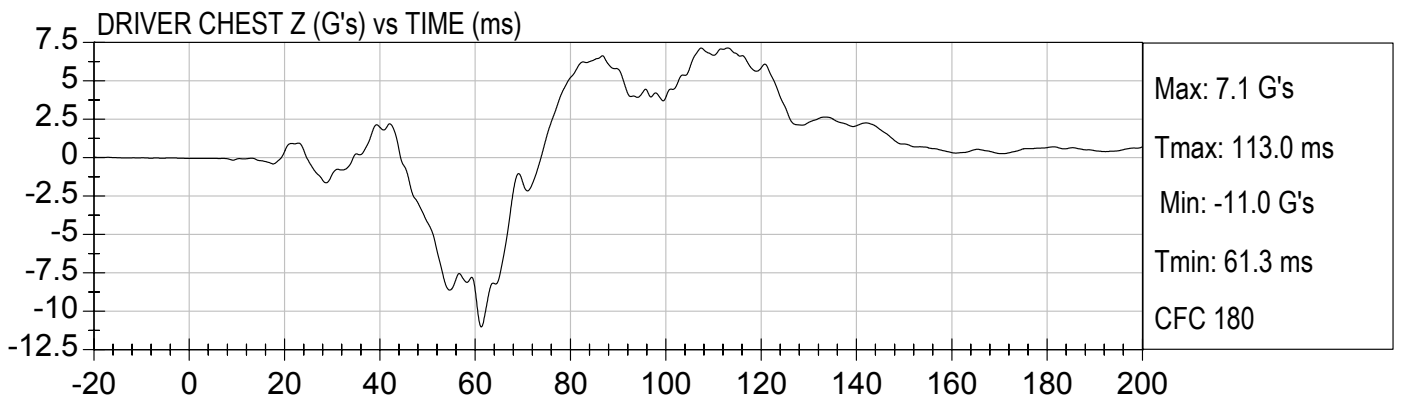
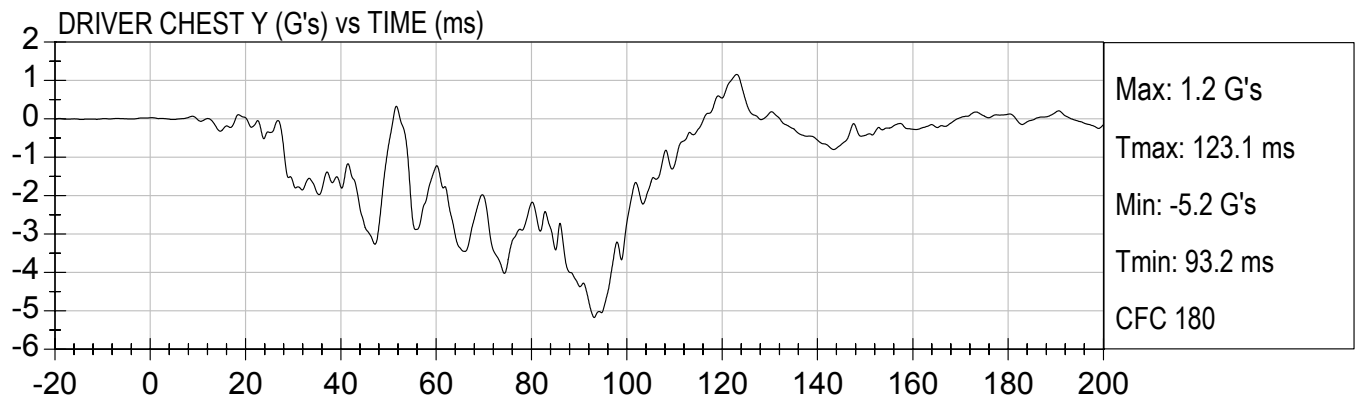
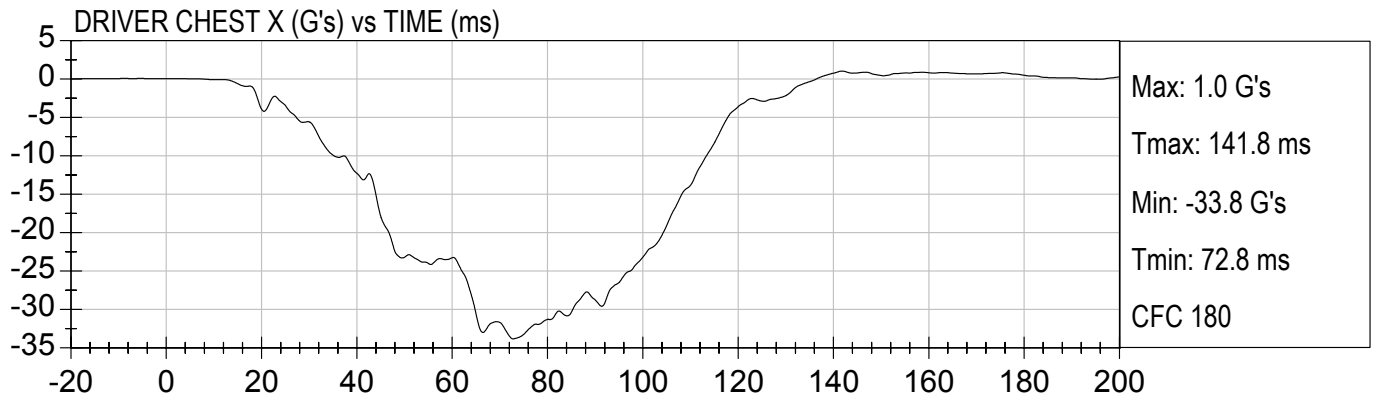
Test Date: 11/12/2003
Speed: 35.2 mph (56.6 km/h)





35MPH NCAP FRONTAL
2004 FORD FREESTAR

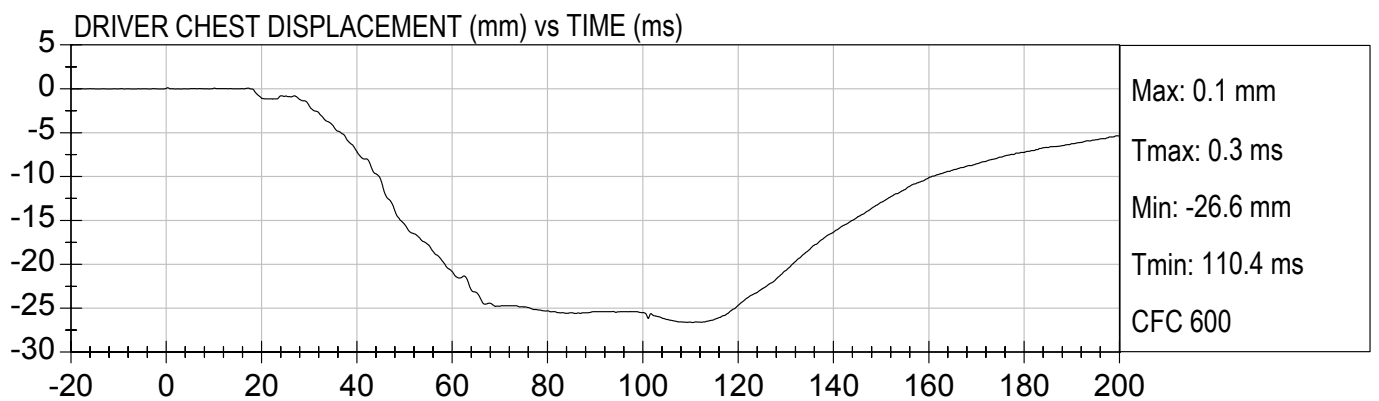
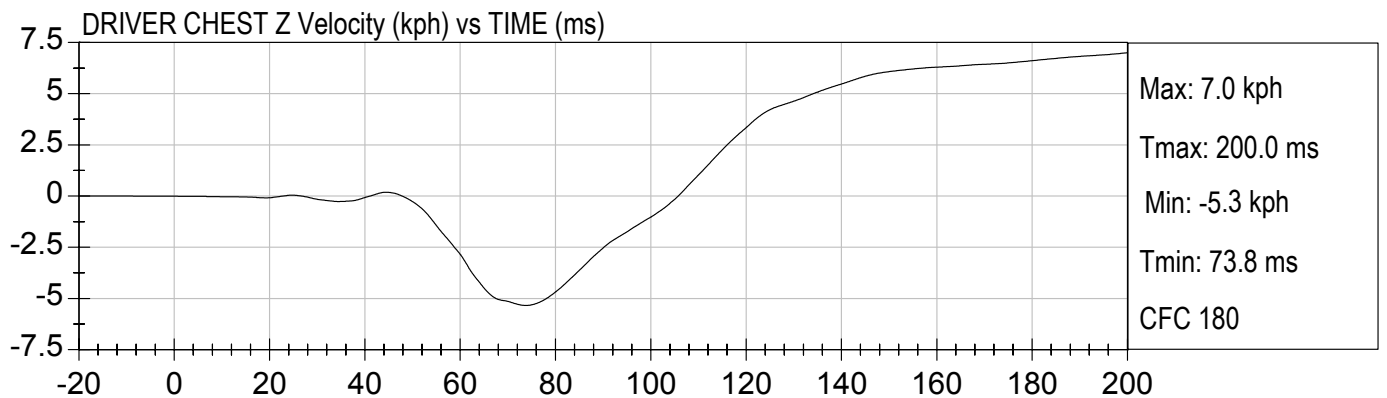
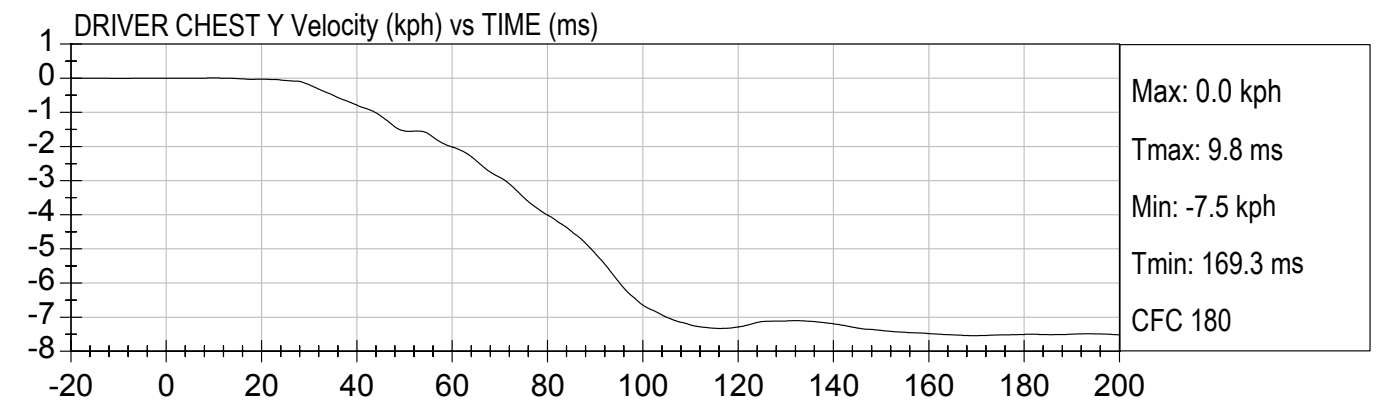
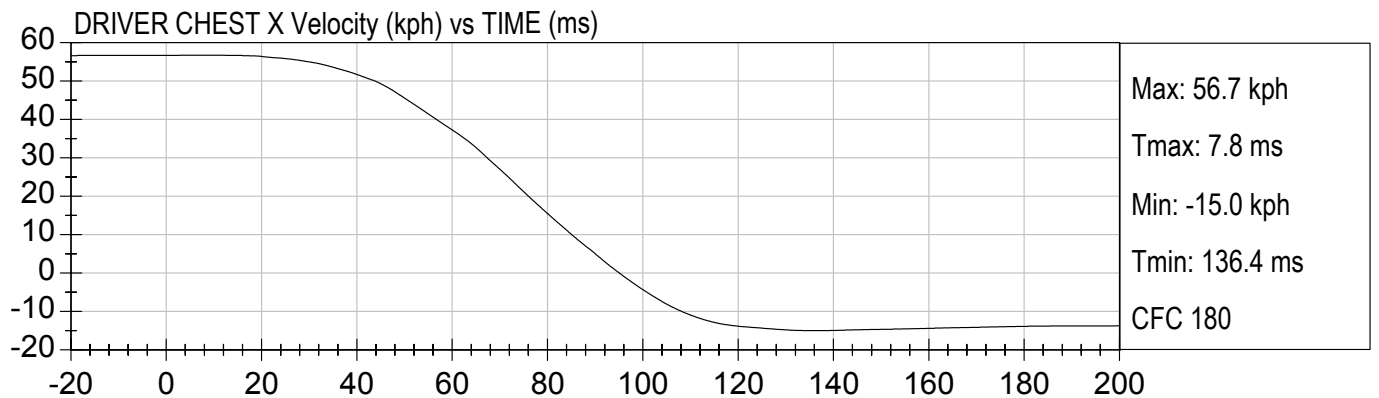
Test Date: 11/12/2003
Speed: 35.2 mph (56.6 km/h)





35MPH NCAP FRONTAL
2004 FORD FREESTAR

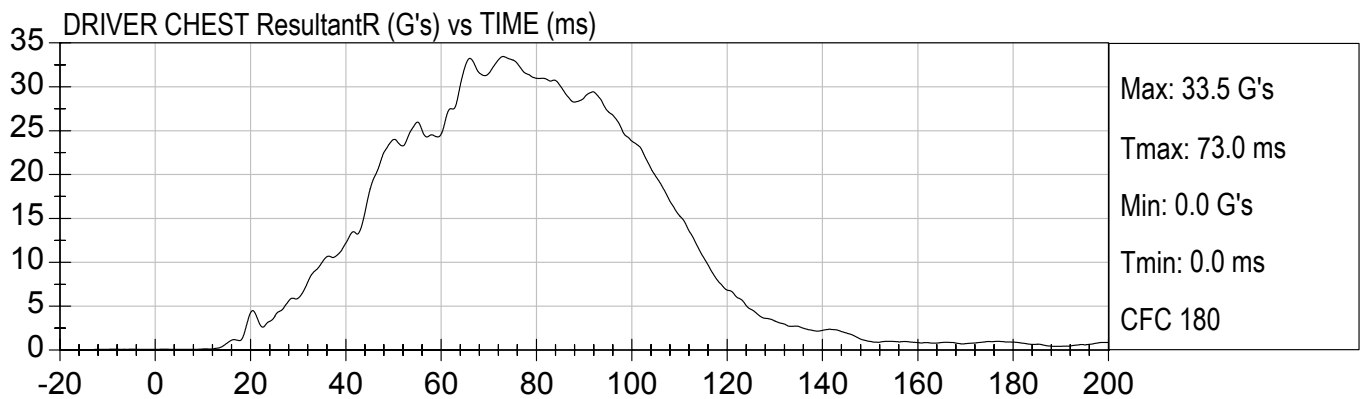
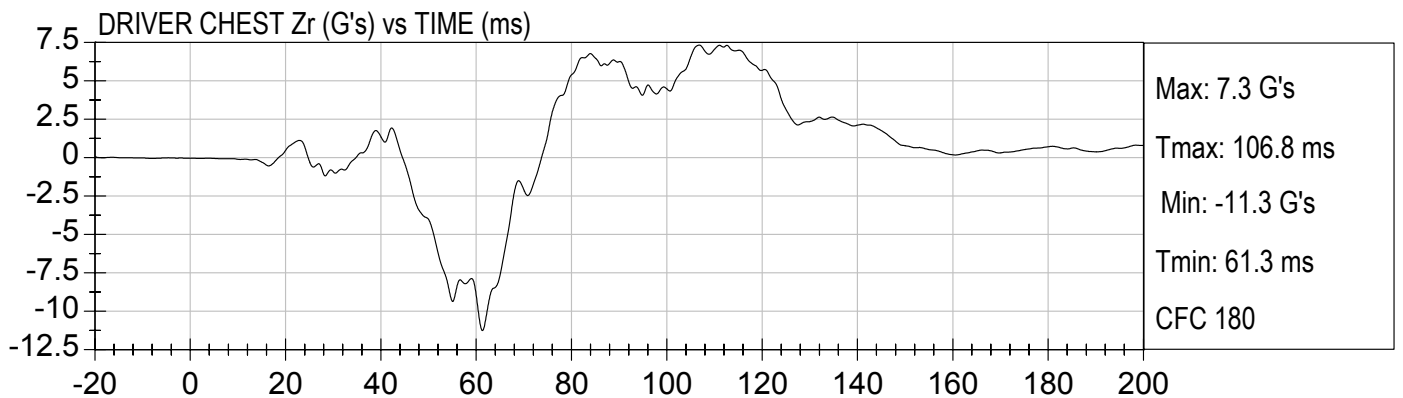
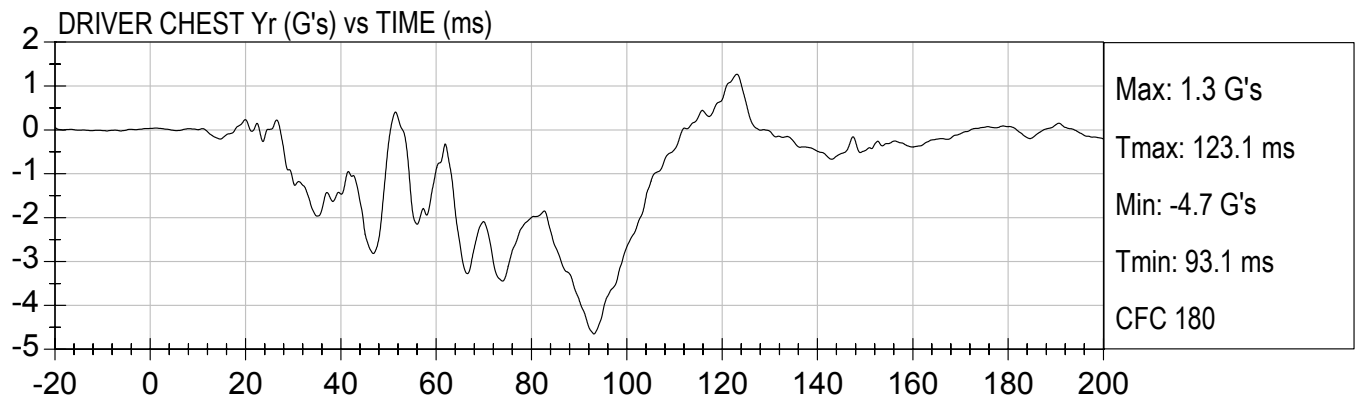
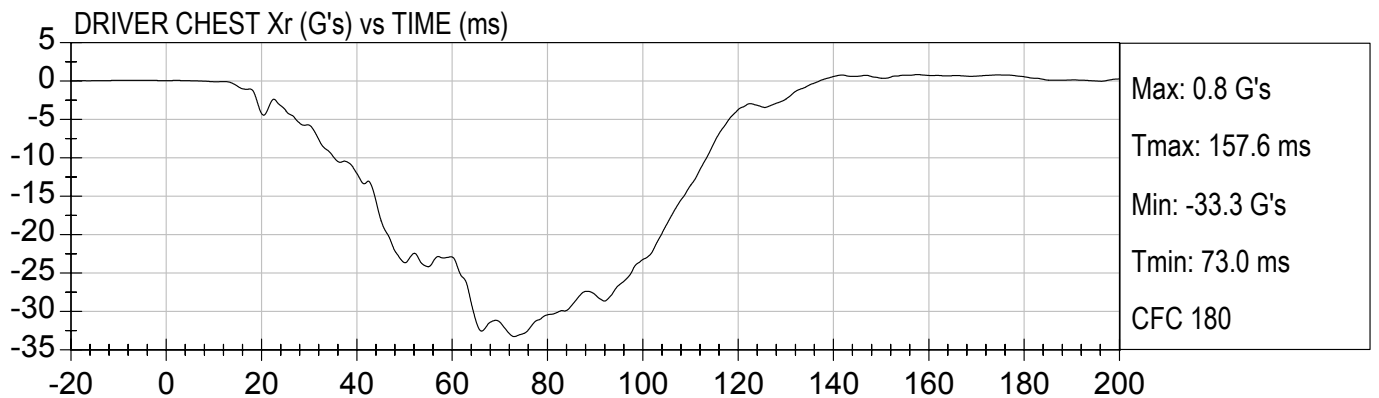
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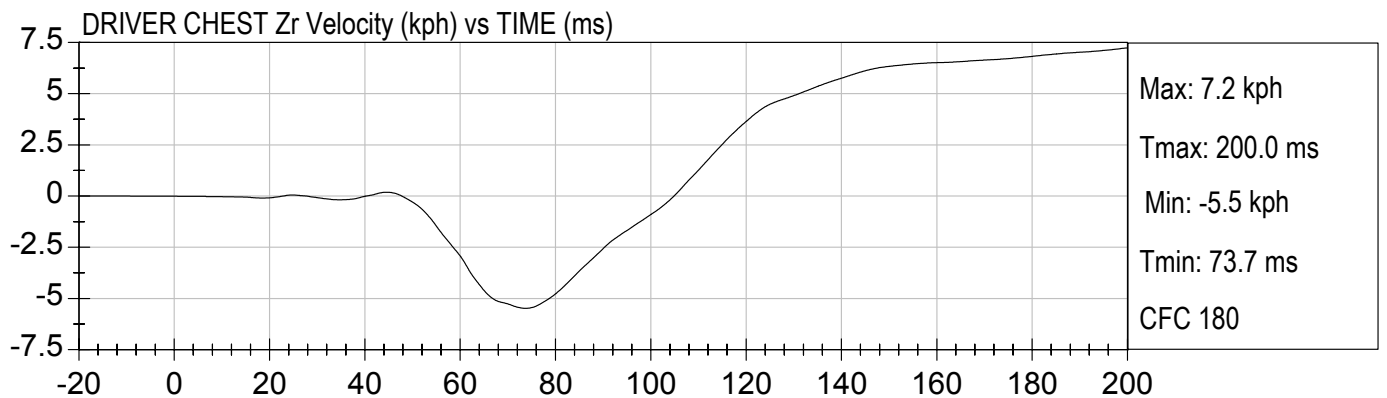
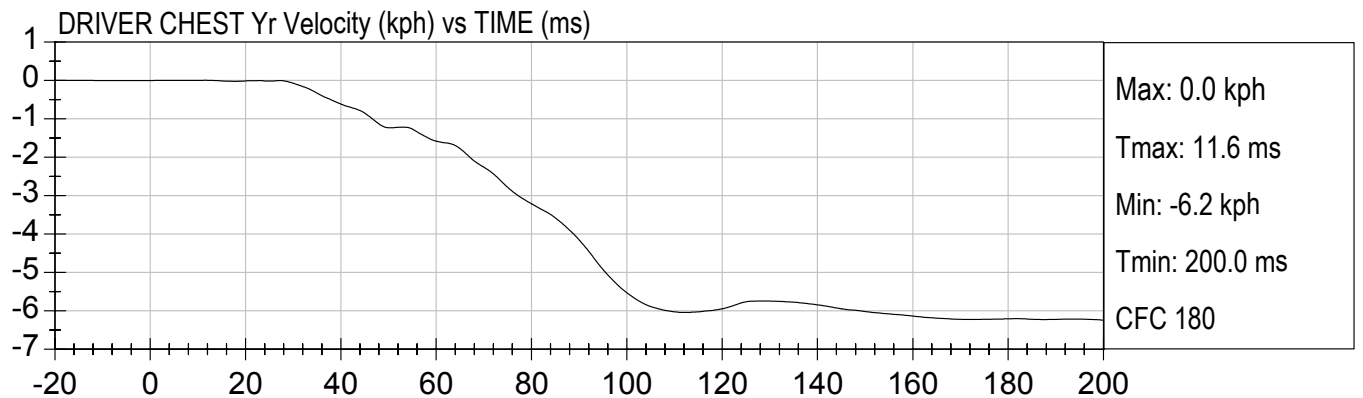
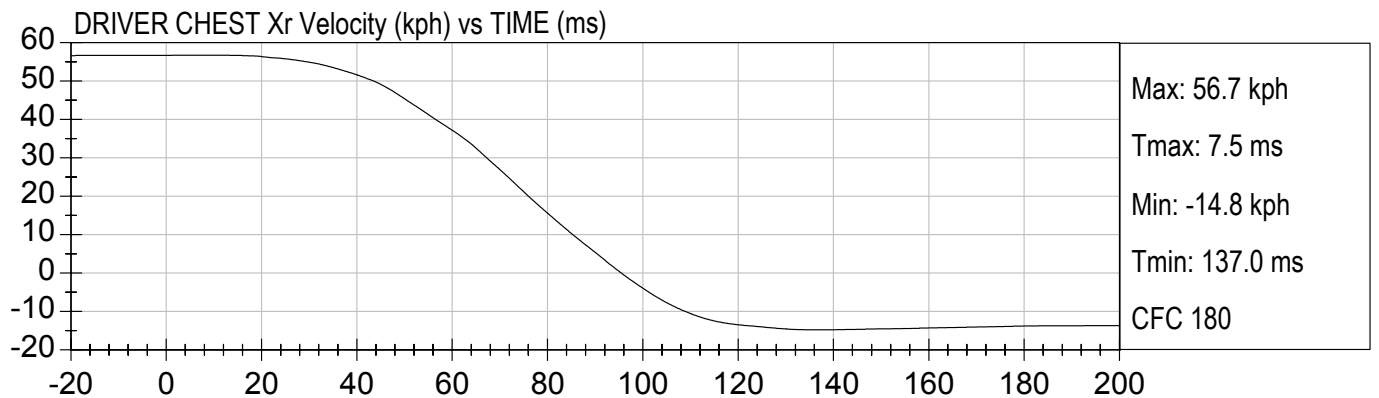




35MPH NCAP FRONTAL
2004 FORD FREESTAR

Test Date: 11/12/2003
Speed: 35.2 mph (56.6 km/h)

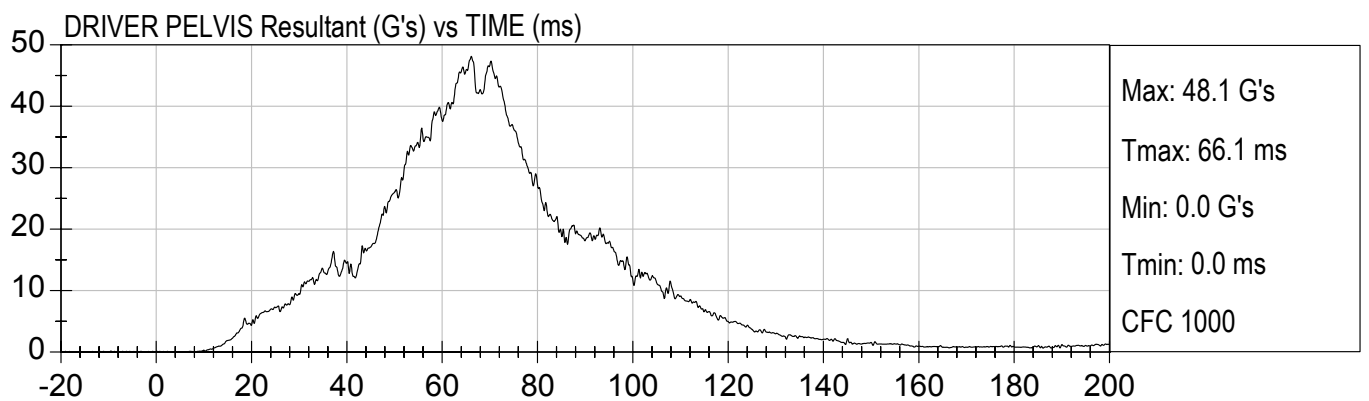
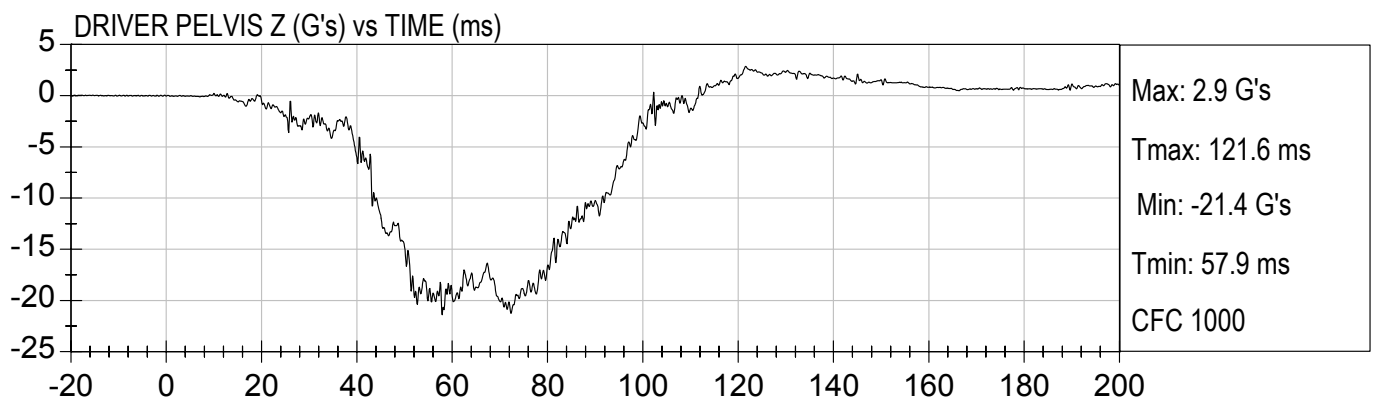
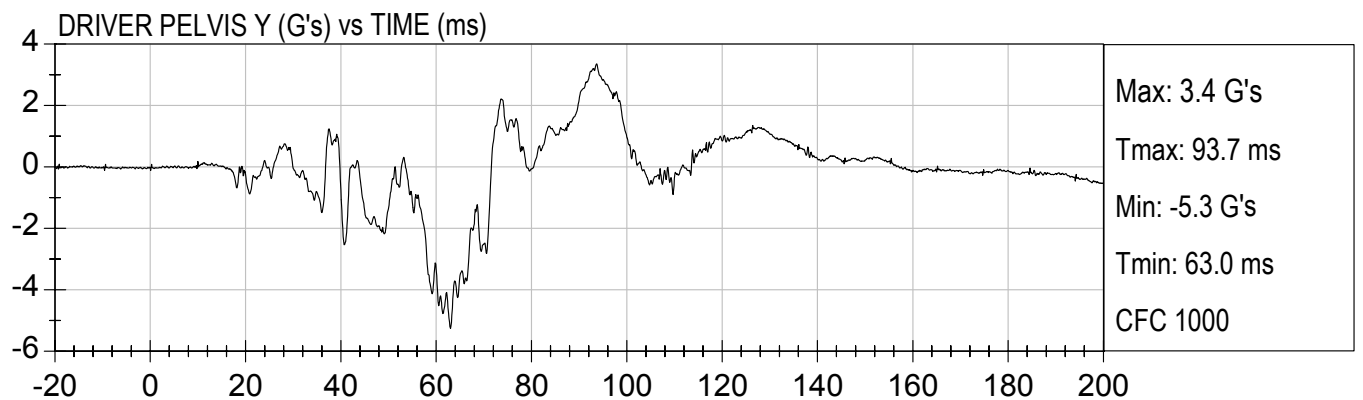
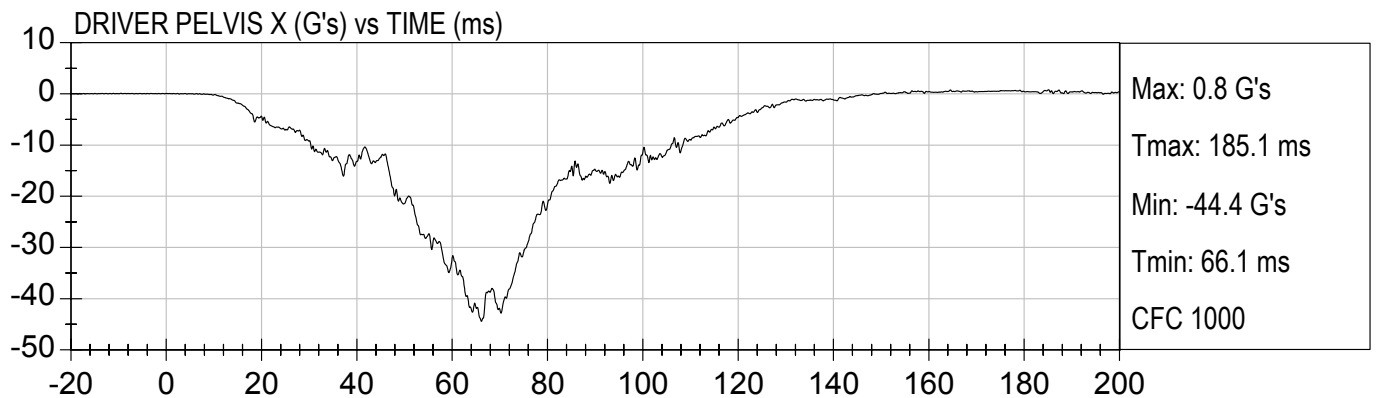


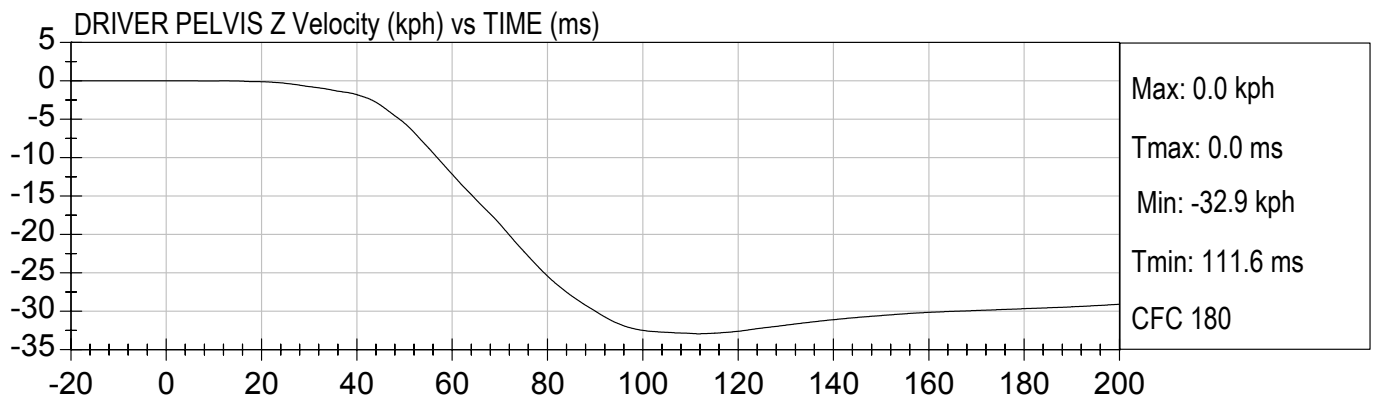
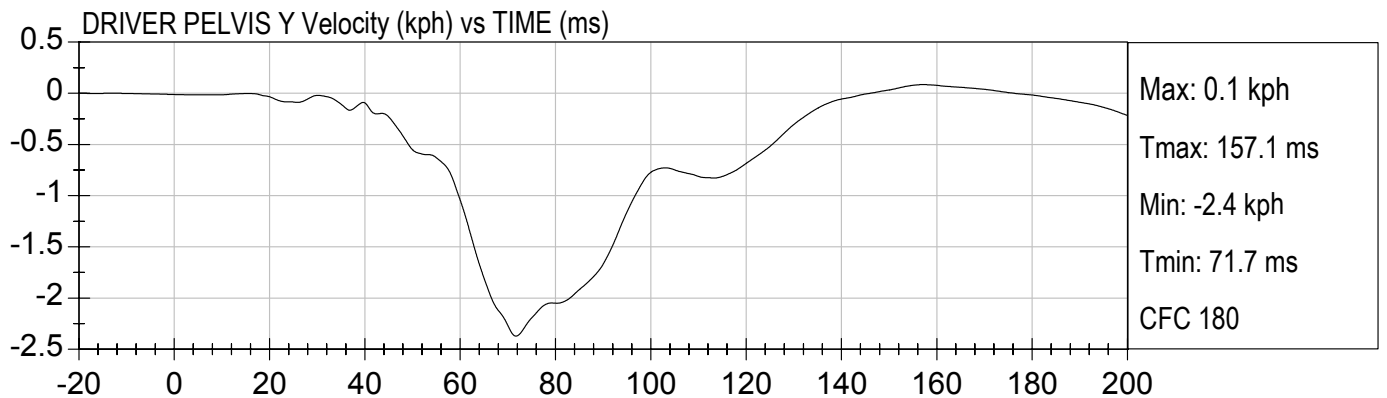
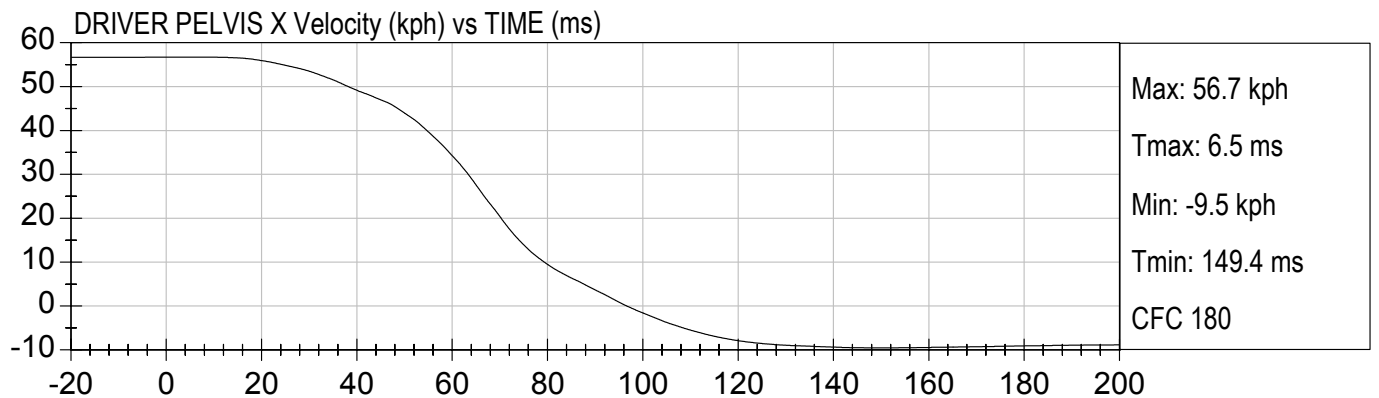




35MPH NCAP FRONTAL
2004 FORD FREESTAR

Test Date: 11/12/2003
Speed: 35.2 mph (56.6 km/h)

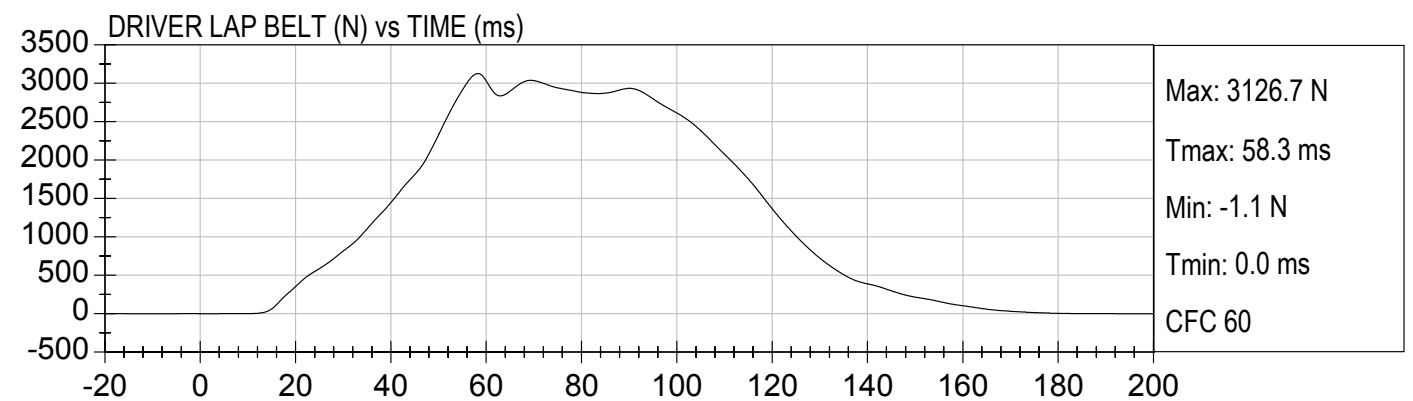
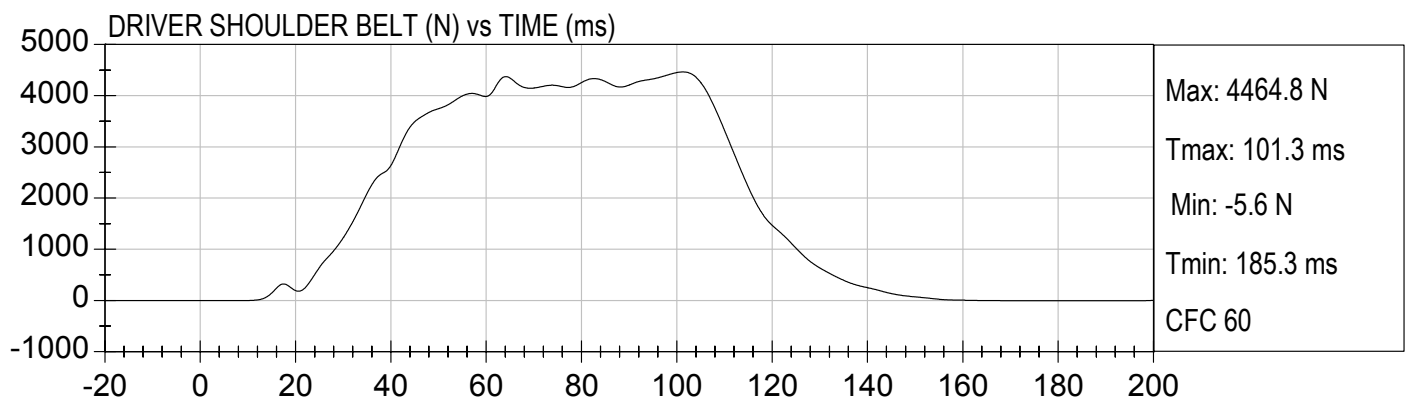
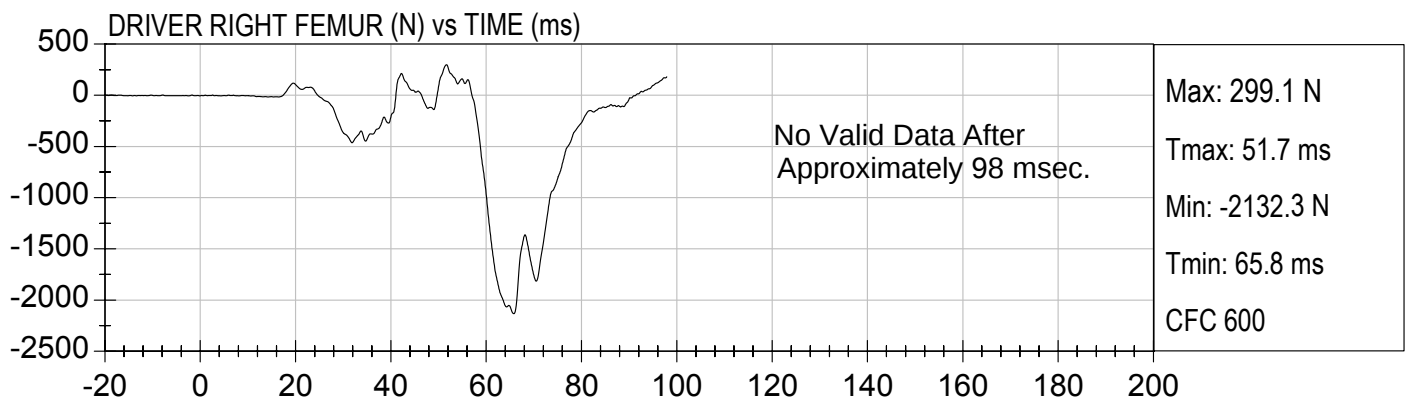
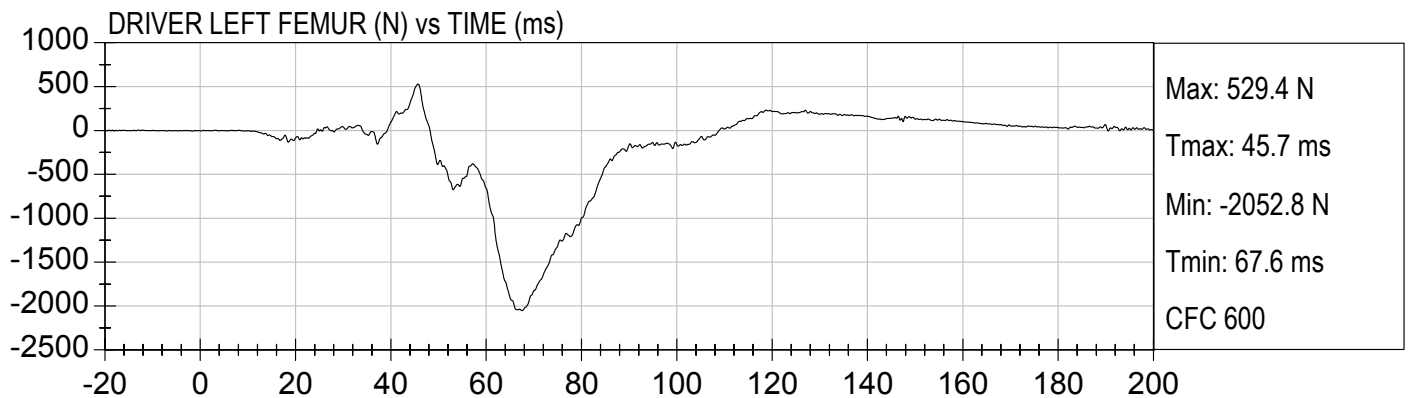






35MPH NCAP FRONTAL
2004 FORD FREESTAR

Test Date: 11/12/2003
Speed: 35.2 mph (56.6 km/h)

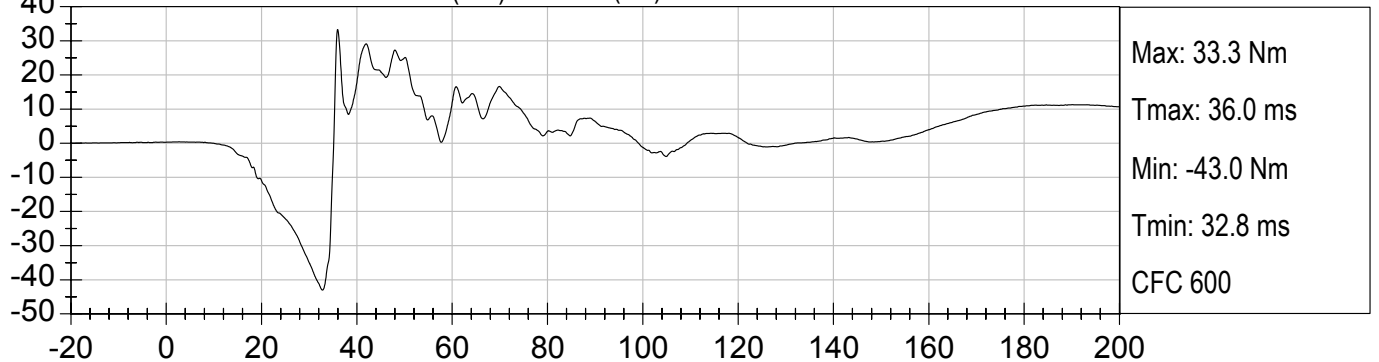




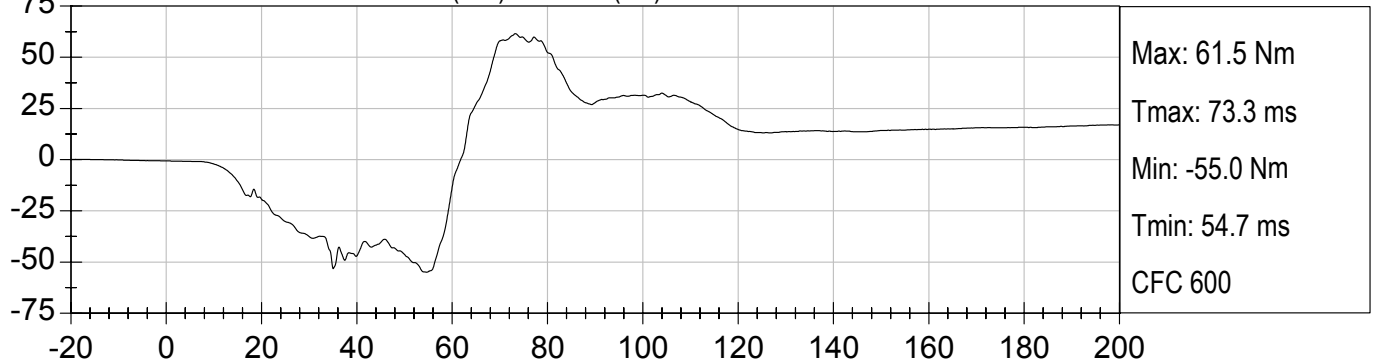
35MPH NCAP FRONTAL
2004 FORD FREESTAR

Test Date: 11/12/2003
Speed: 35.2 mph (56.6 km/h)

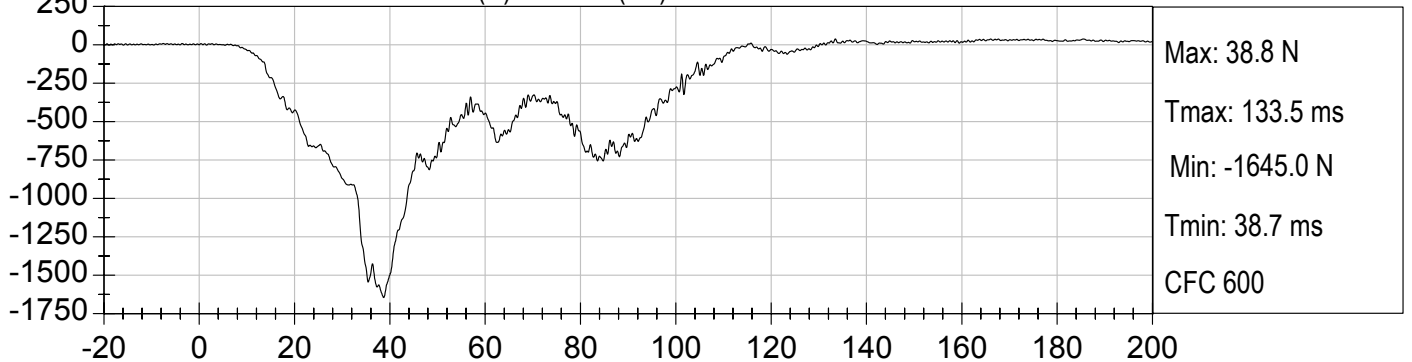
DRIVER LEFT UPPER TIBIA MX (Nm) vs TIME (ms)



DRIVER LEFT UPPER TIBIA MY (Nm) vs TIME (ms)

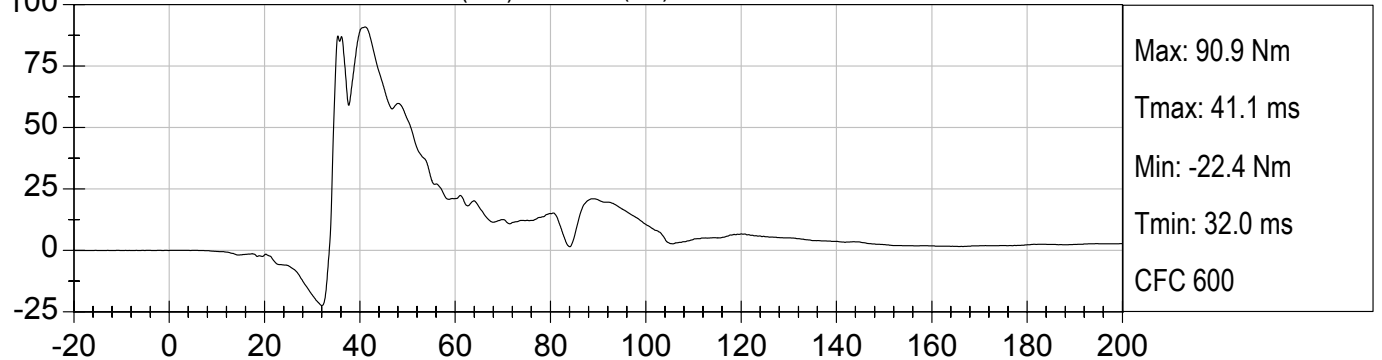


DRIVER LEFT UPPER TIBIA FZ (N) vs TIME (ms)

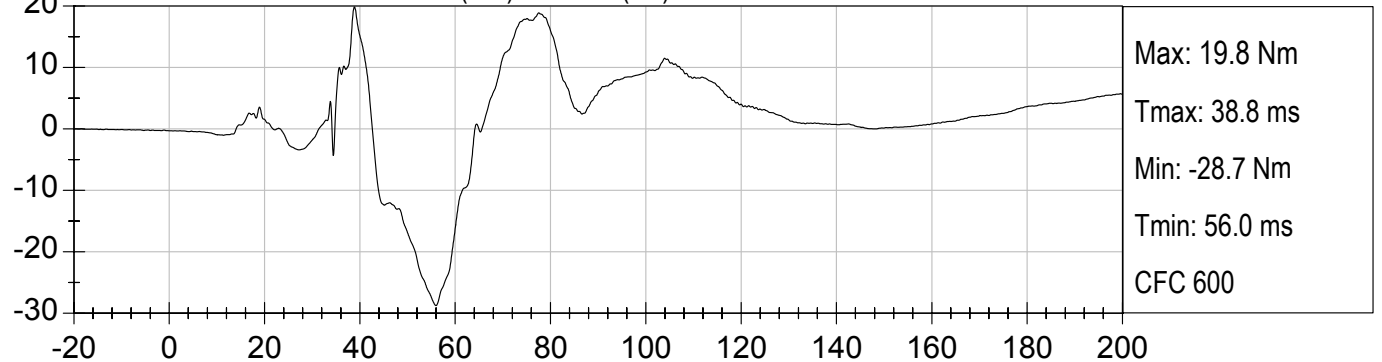




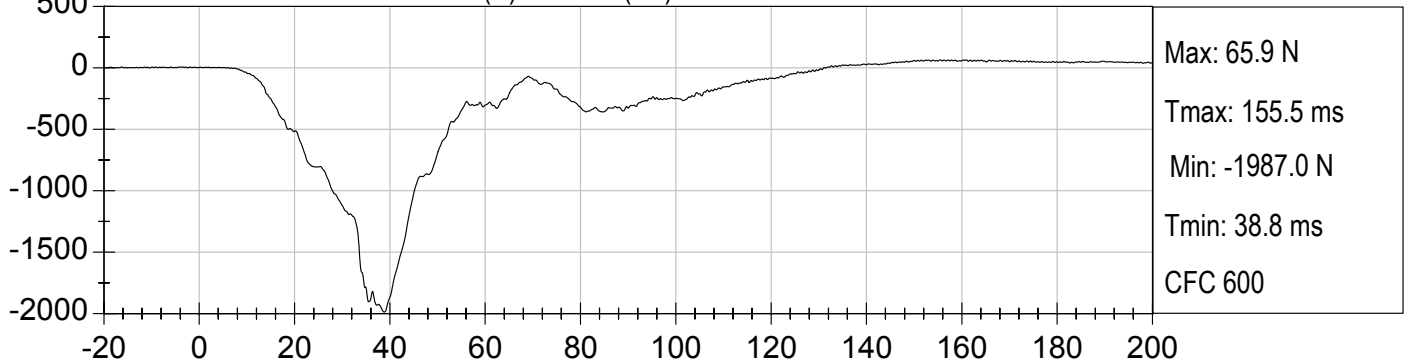
DRIVER LEFT LOWER TIBIA MX (Nm) vs TIME (ms)



DRIVER LEFT LOWER TIBIA MY (Nm) vs TIME (ms)



DRIVER LEFT LOWER TIBIA FZ (N) vs TIME (ms)

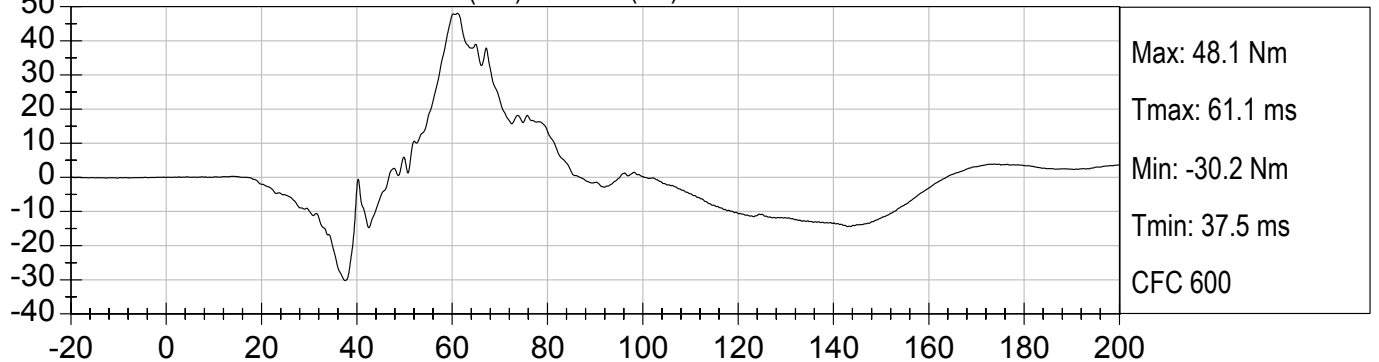




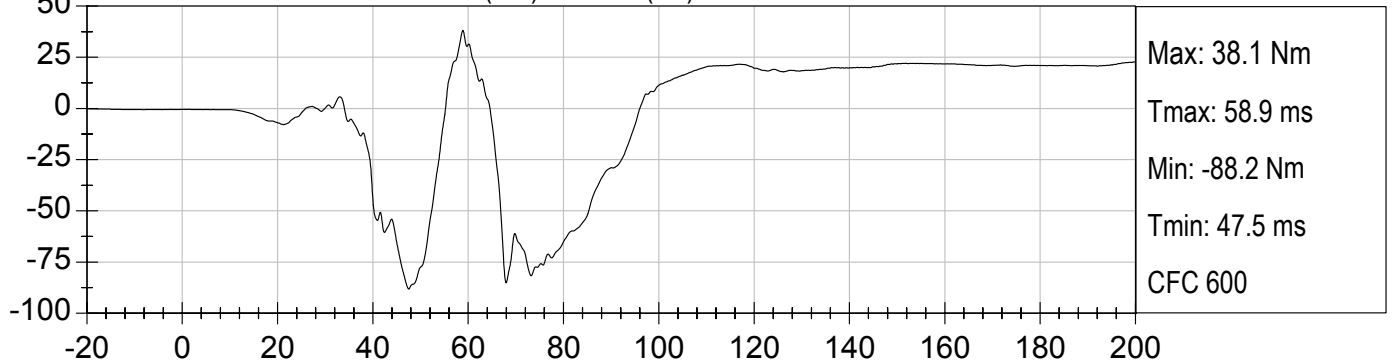
35MPH NCAP FRONTAL
2004 FORD FREESTAR

Test Date: 11/12/2003
Speed: 35.2 mph (56.6 km/h)

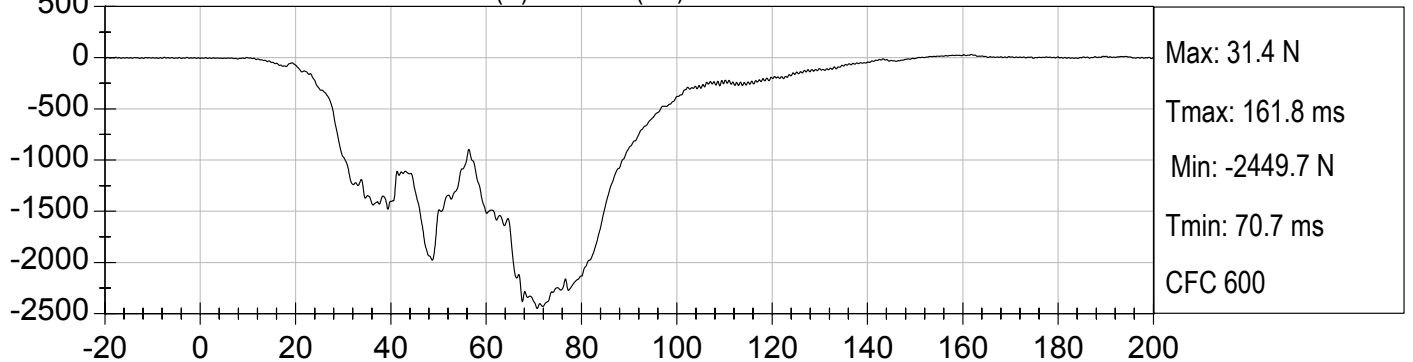
DRIVER RIGHT UPPER TIBIA MX (Nm) vs TIME (ms)



DRIVER RIGHT UPPER TIBIA MY (Nm) vs TIME (ms)

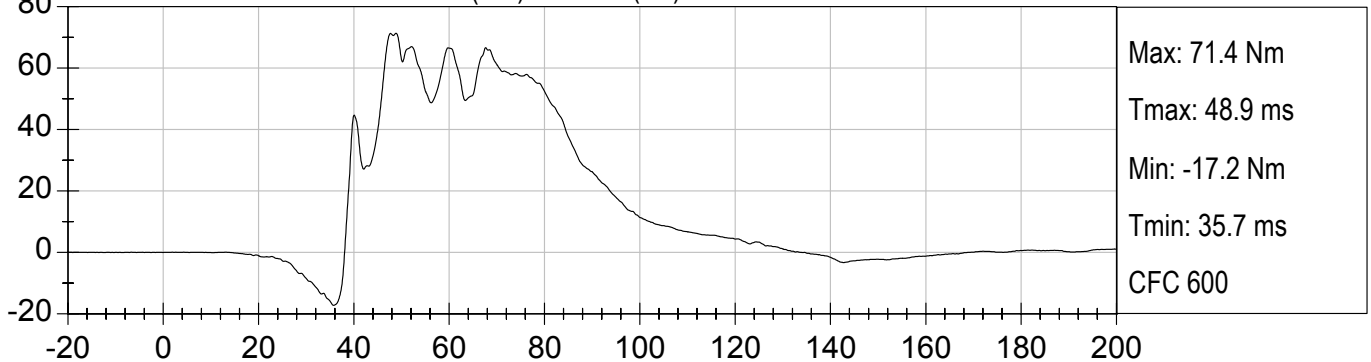


DRIVER RIGHT UPPER TIBIA FZ (N) vs TIME (ms)

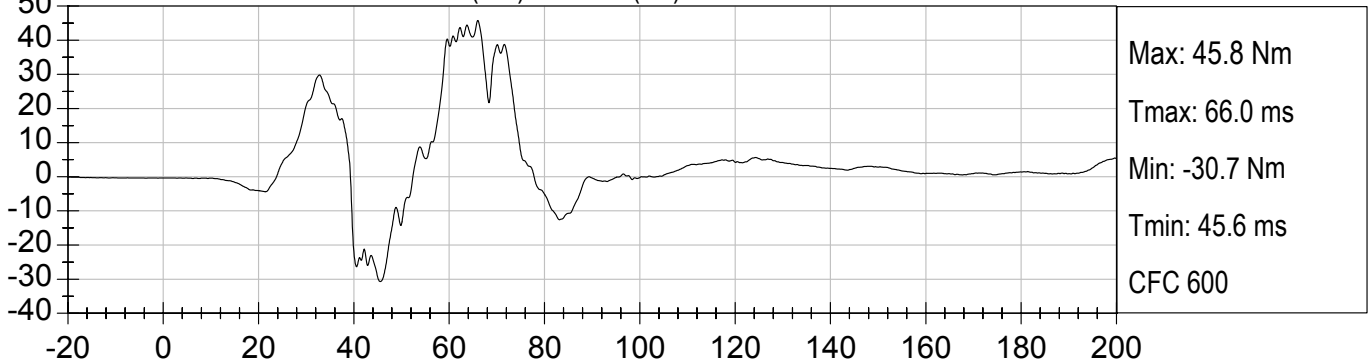




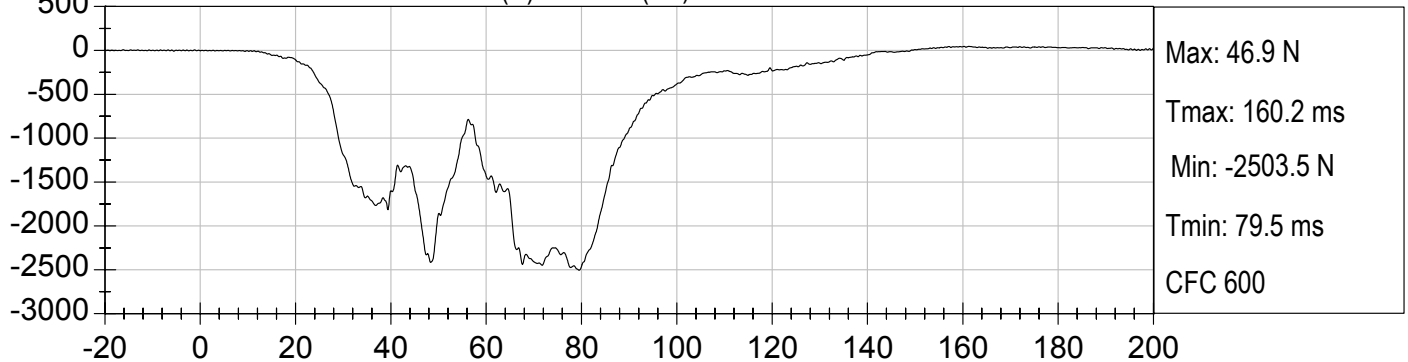
DRIVER RIGHT LOWER TIBIA MX (Nm) vs TIME (ms)



DRIVER RIGHT LOWER TIBIA MY (Nm) vs TIME (ms)



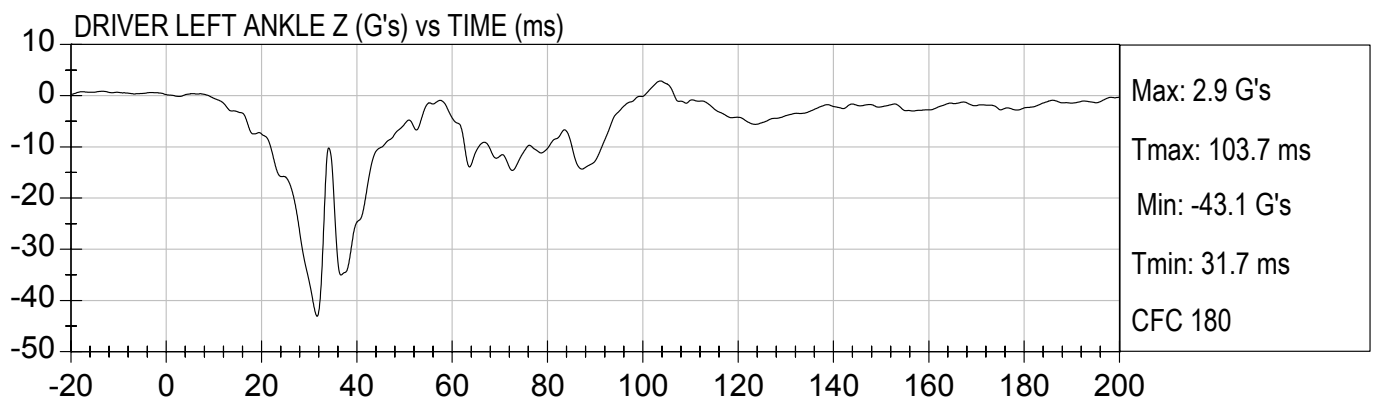
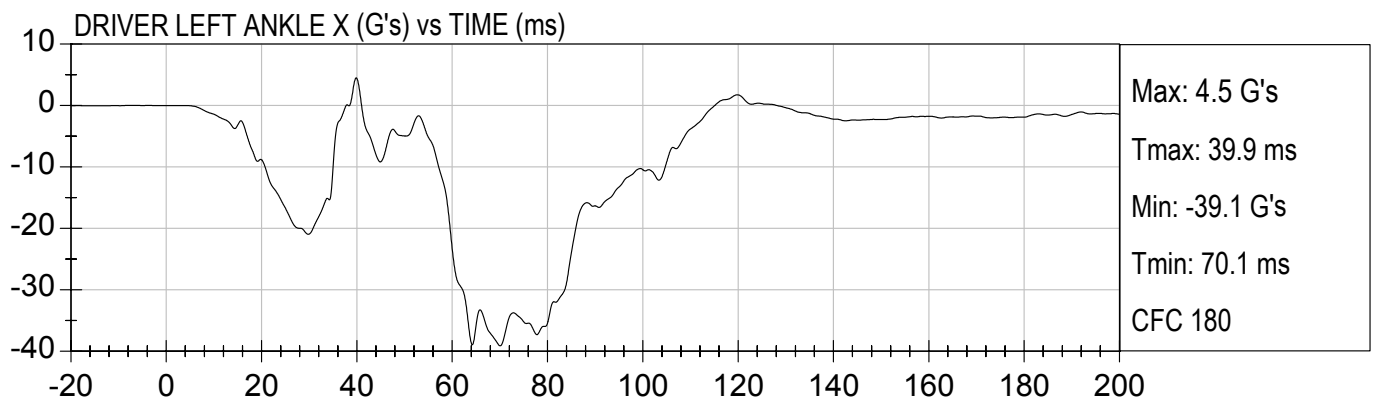
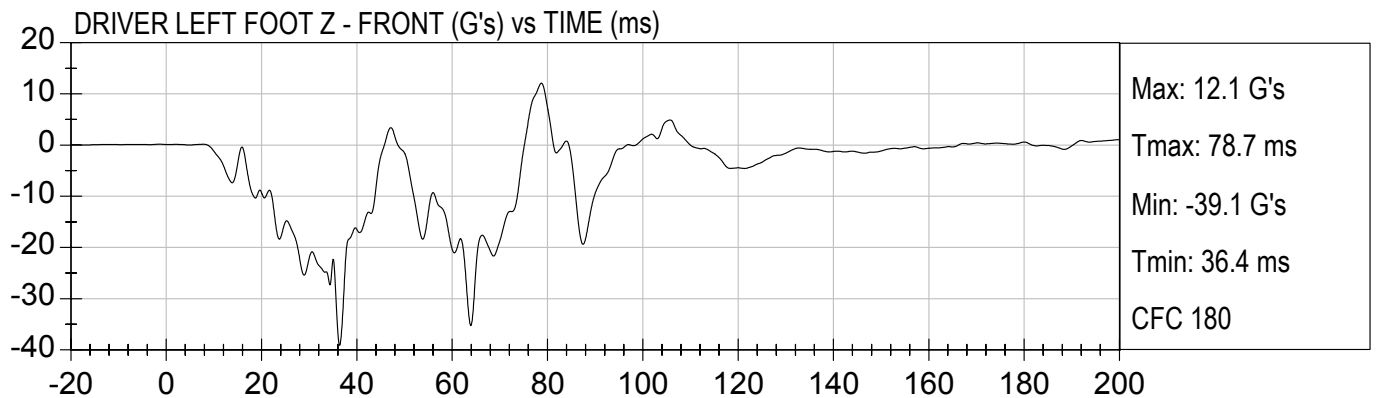
DRIVER RIGHT LOWER TIBIA FZ (N) vs TIME (ms)

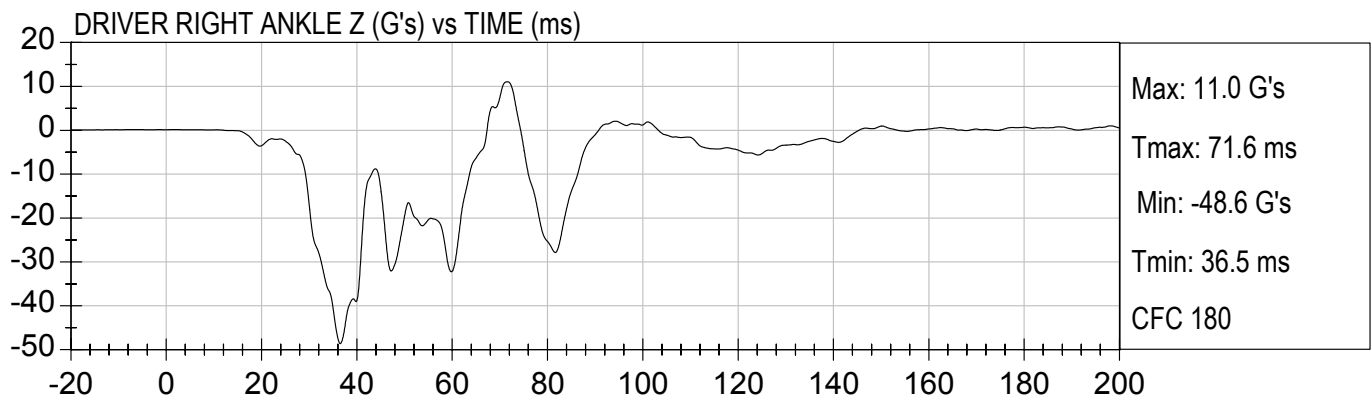
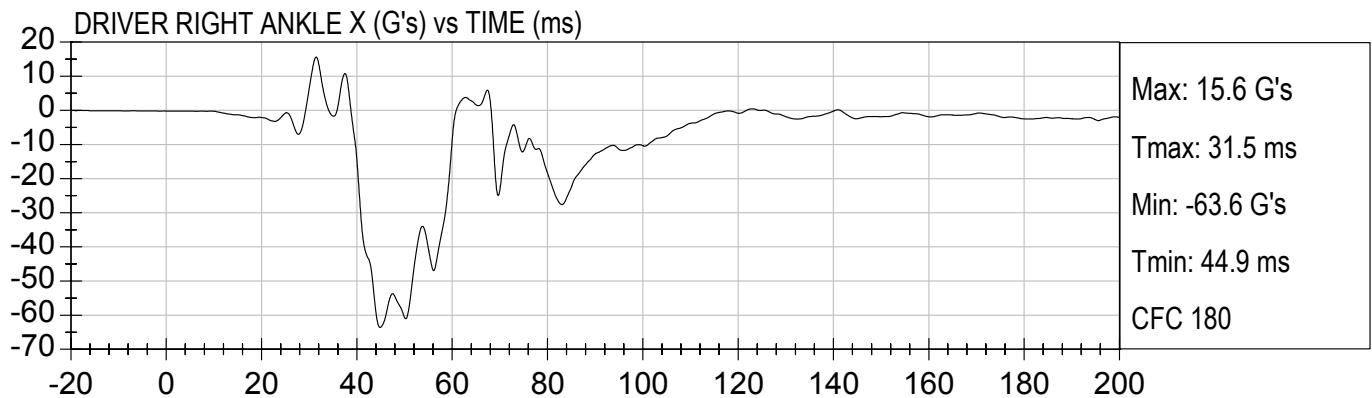
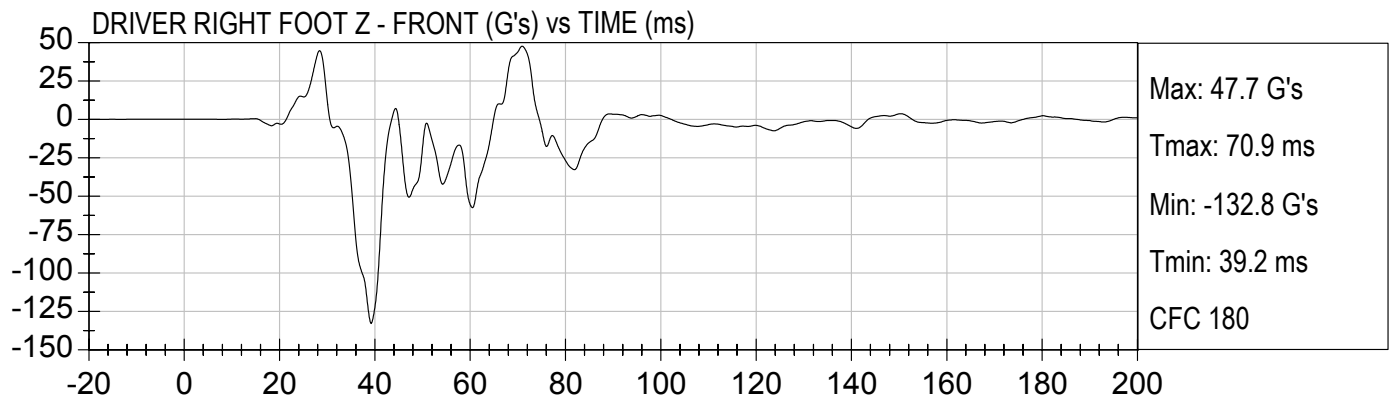




35MPH NCAP FRONTAL
2004 FORD FREESTAR

Test Date: 11/12/2003
Speed: 35.2 mph (56.6 km/h)



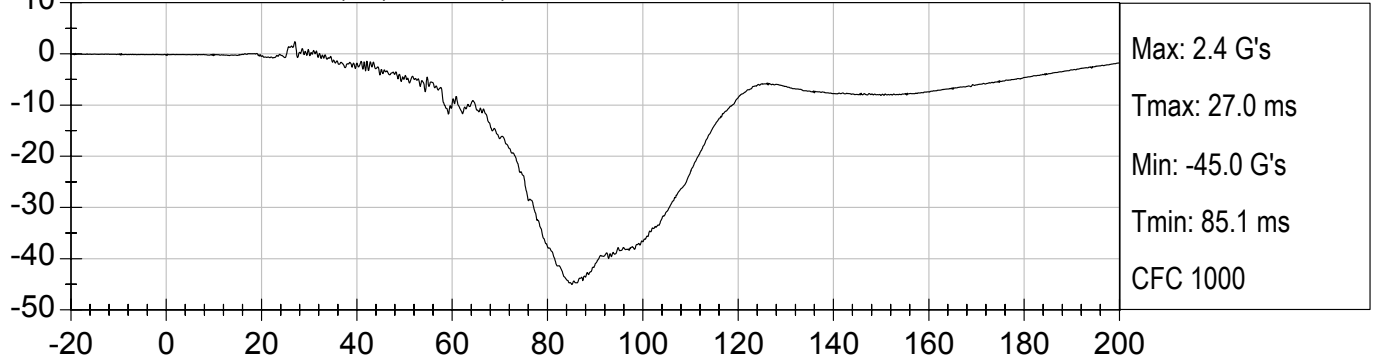




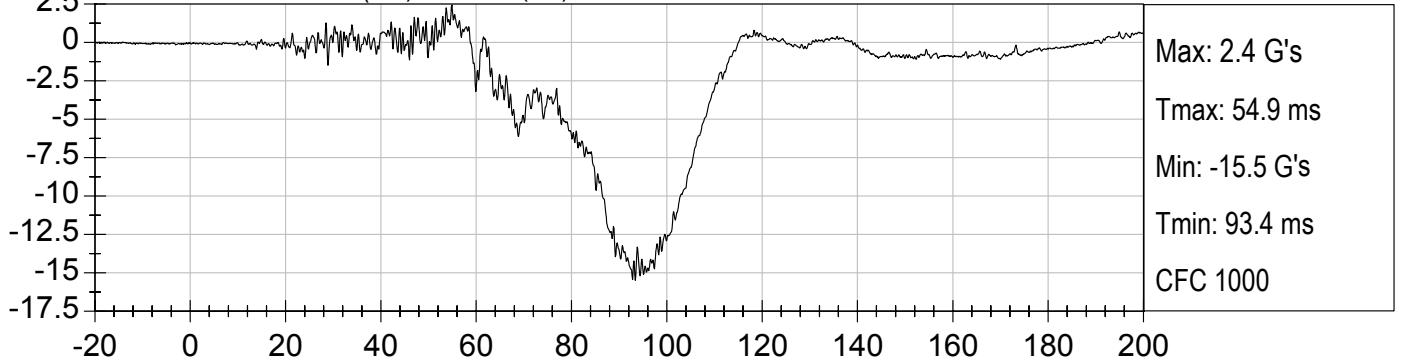
35MPH NCAP FRONTAL
2004 FORD FREESTAR

Test Date: 11/12/2003
Speed: 35.2 mph (56.6 km/h)

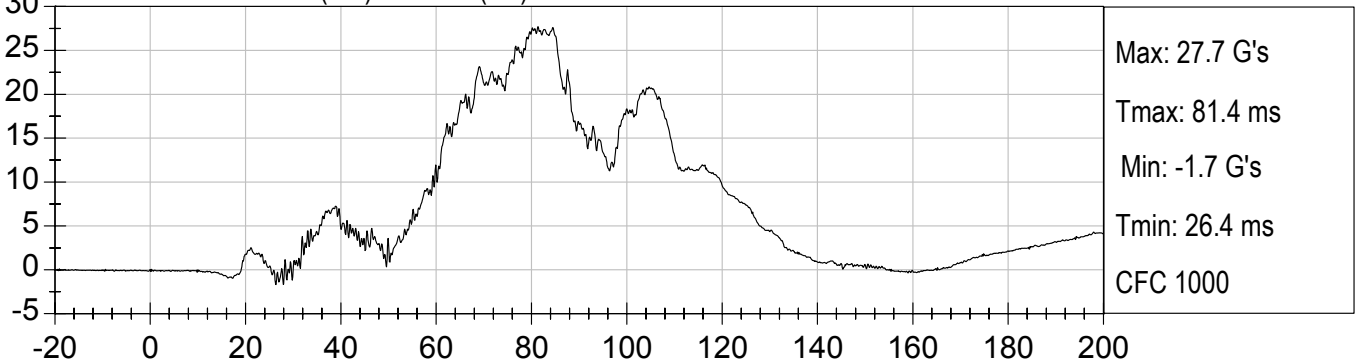
PASSENGER HEAD X (G's) vs TIME (ms)



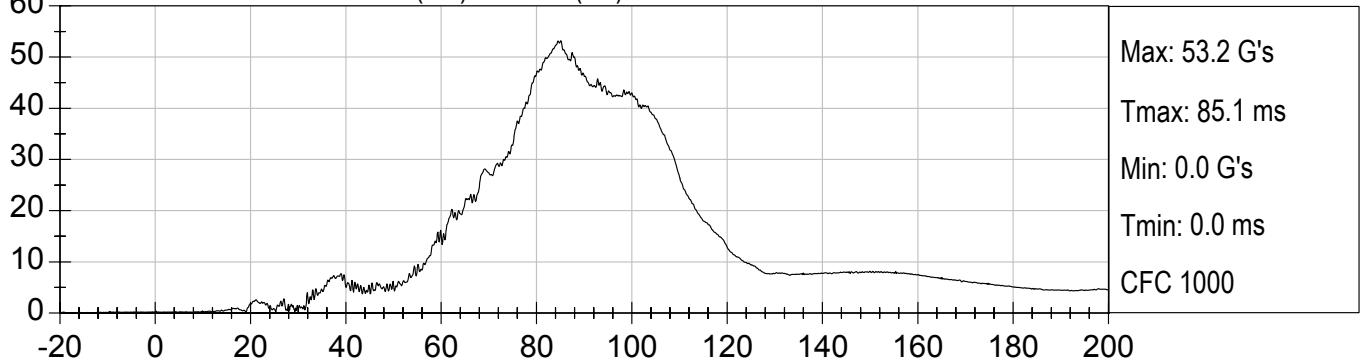
PASSENGER HEAD Y (G's) vs TIME (ms)



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

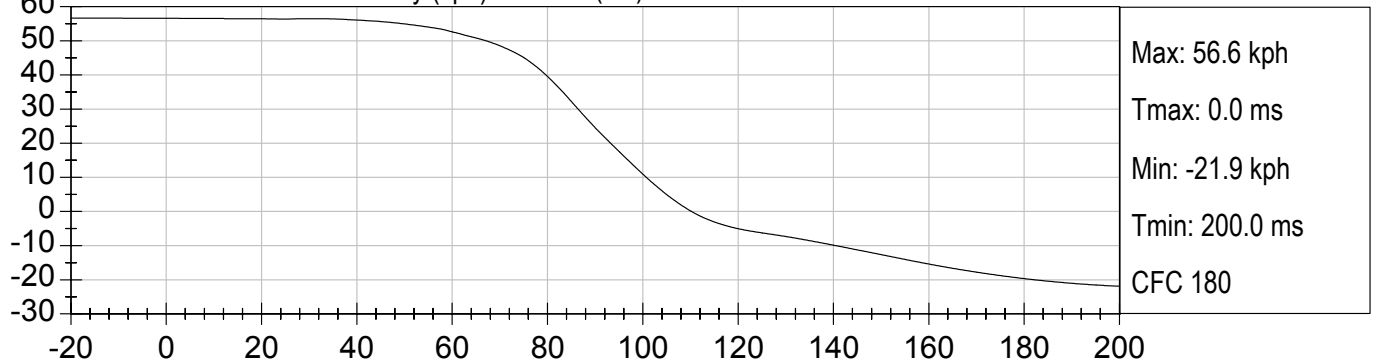


PASSENGER HEAD Resultant (G's) vs TIME (ms)

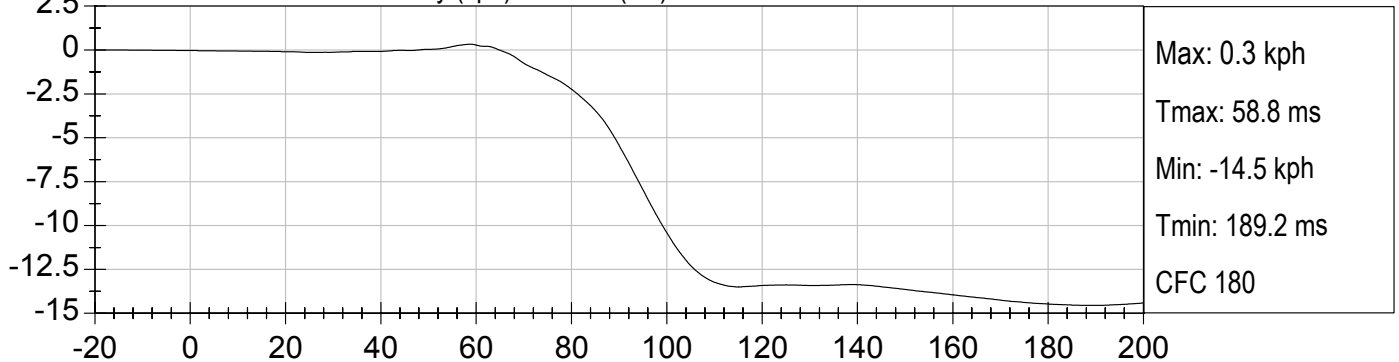




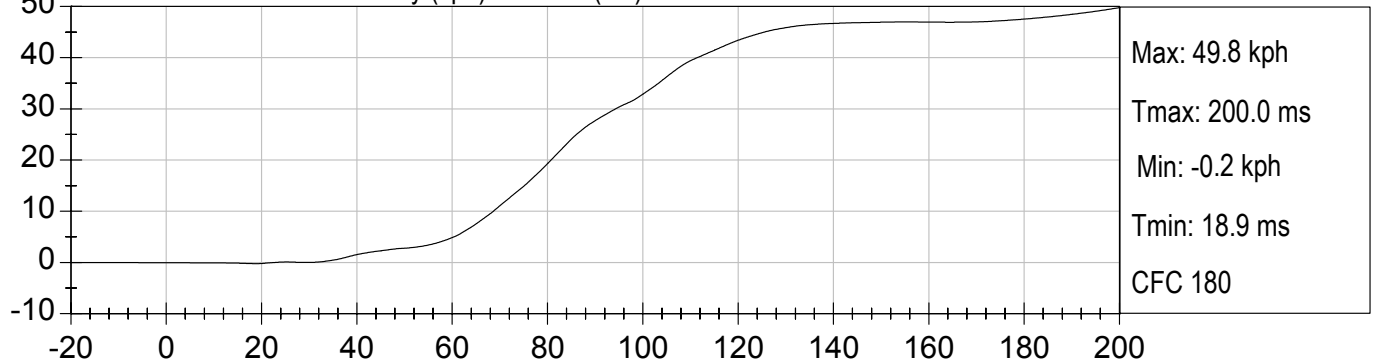
PASSENGER HEAD X Velocity (kph) vs TIME (ms)



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



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

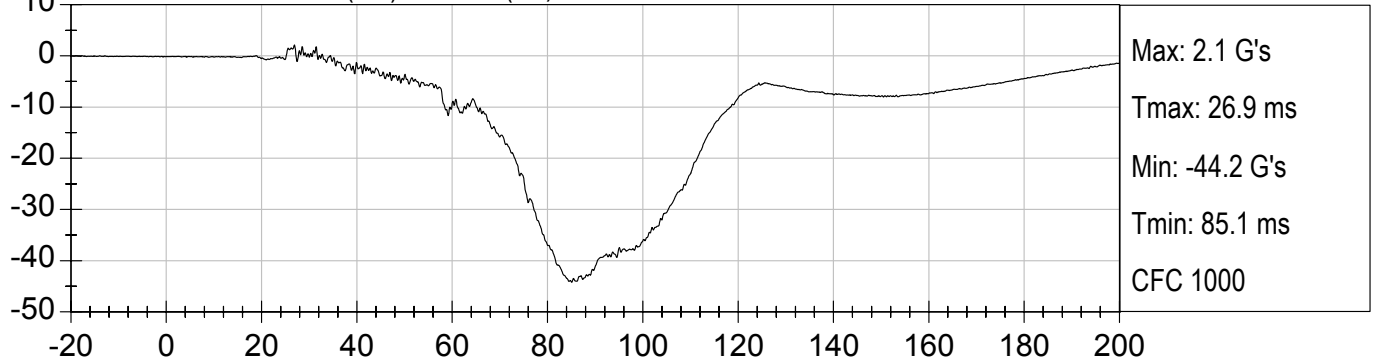




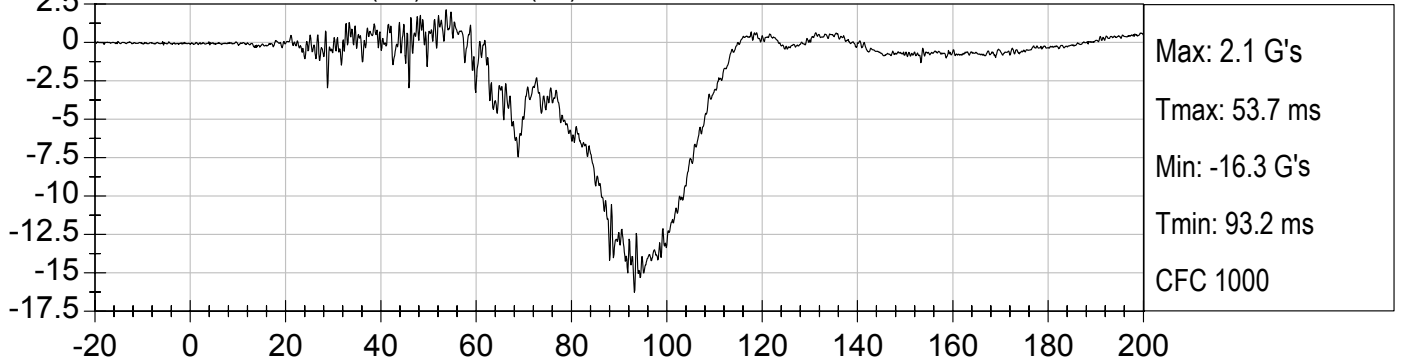
35MPH NCAP FRONTAL
2004 FORD FREESTAR

Test Date: 11/12/2003
Speed: 35.2 mph (56.6 km/h)

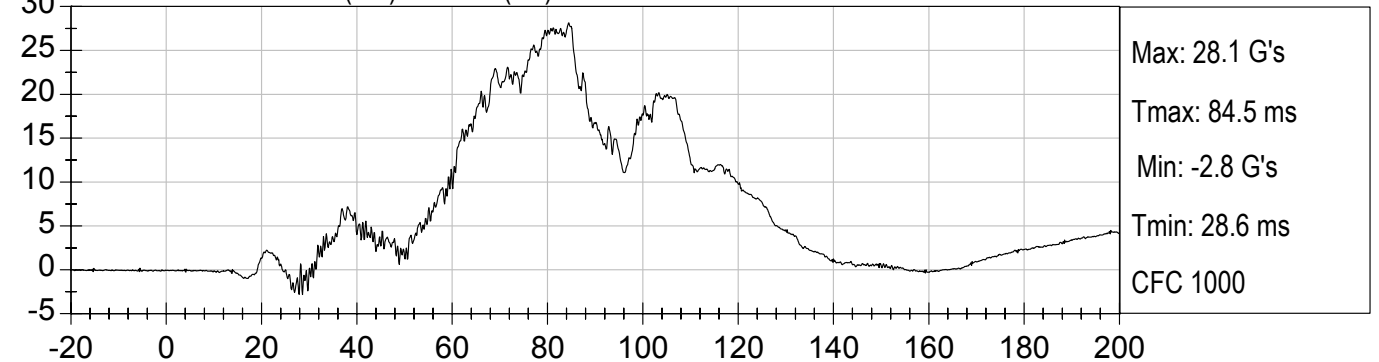
PASSENGER HEAD Xr (G's) vs TIME (ms)



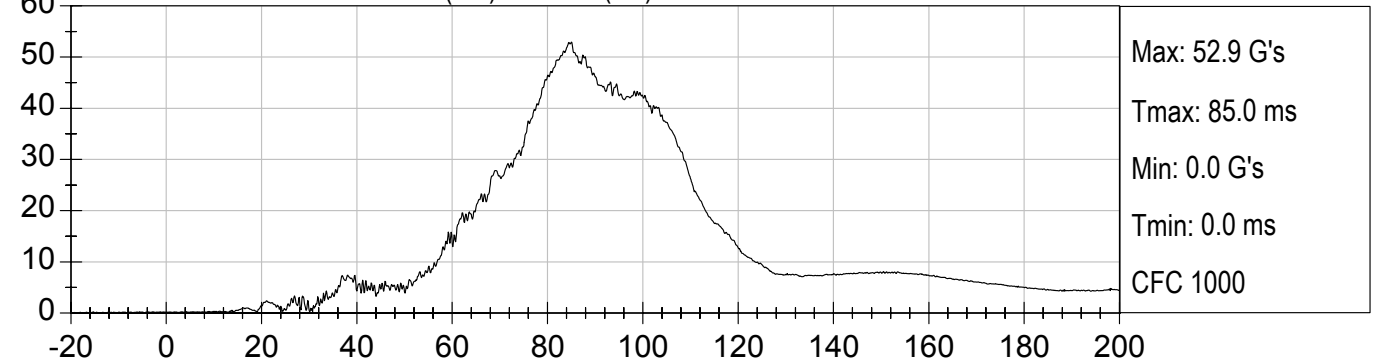
PASSENGER HEAD Yr (G's) vs TIME (ms)

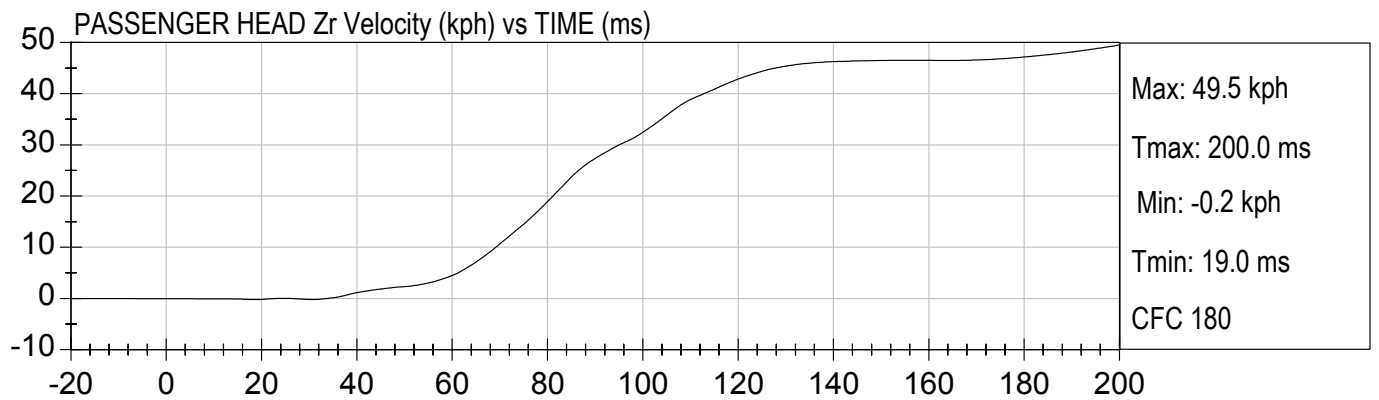
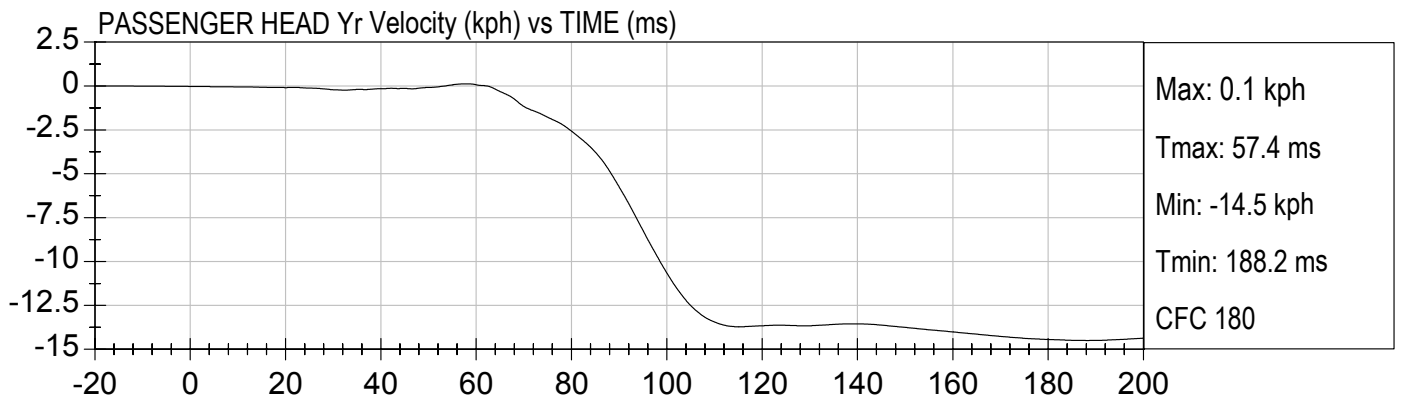
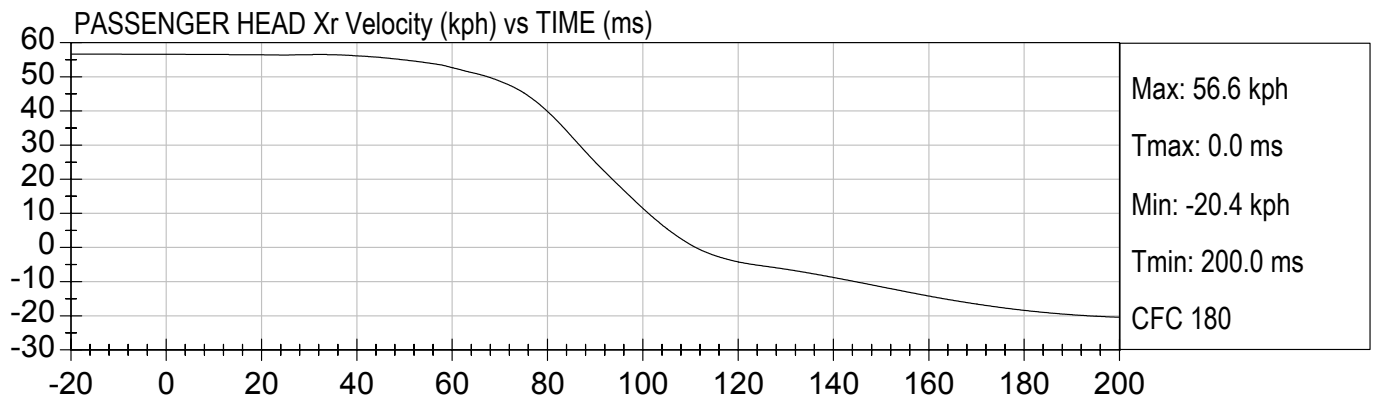


PASSENGER HEAD Zr (G's) vs TIME (ms)



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

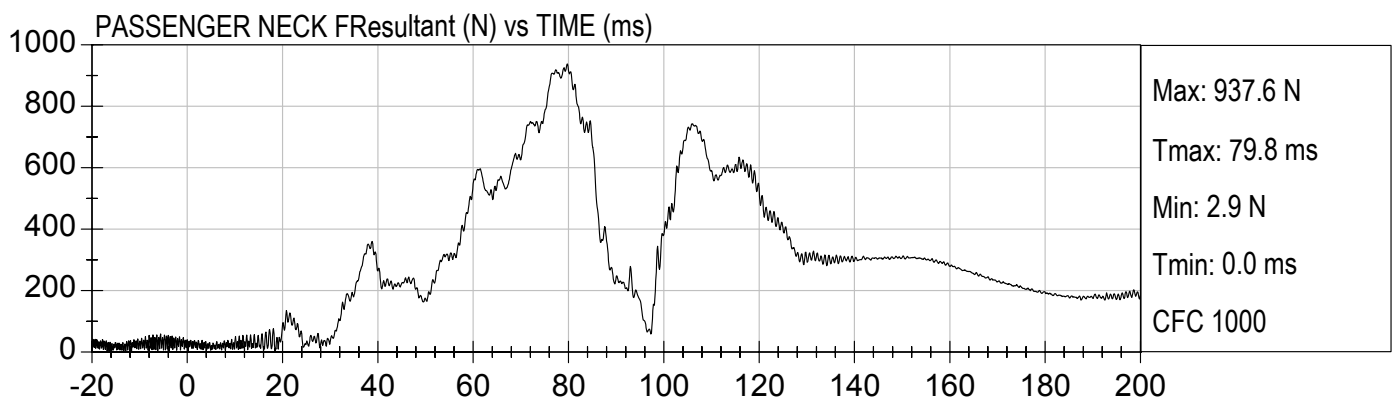
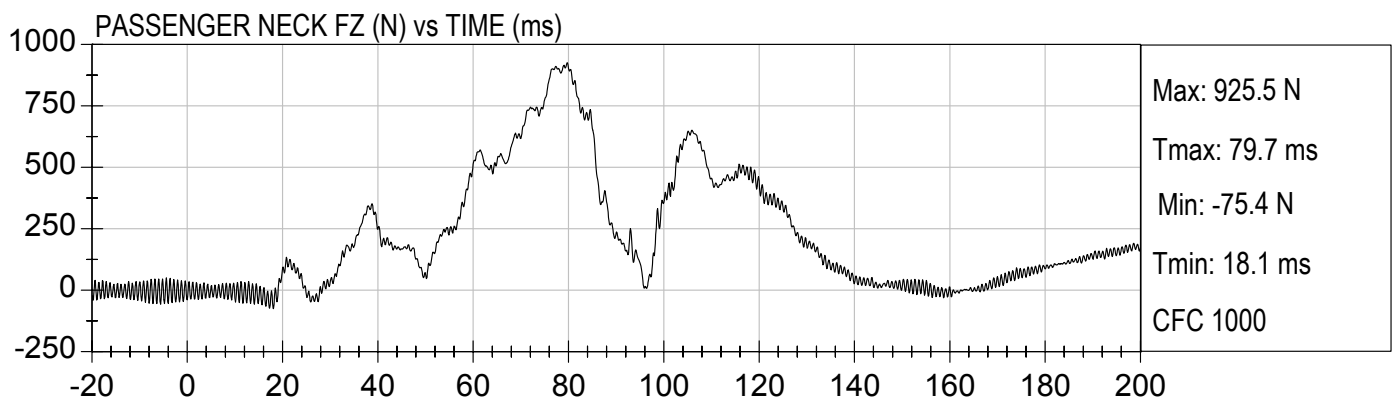
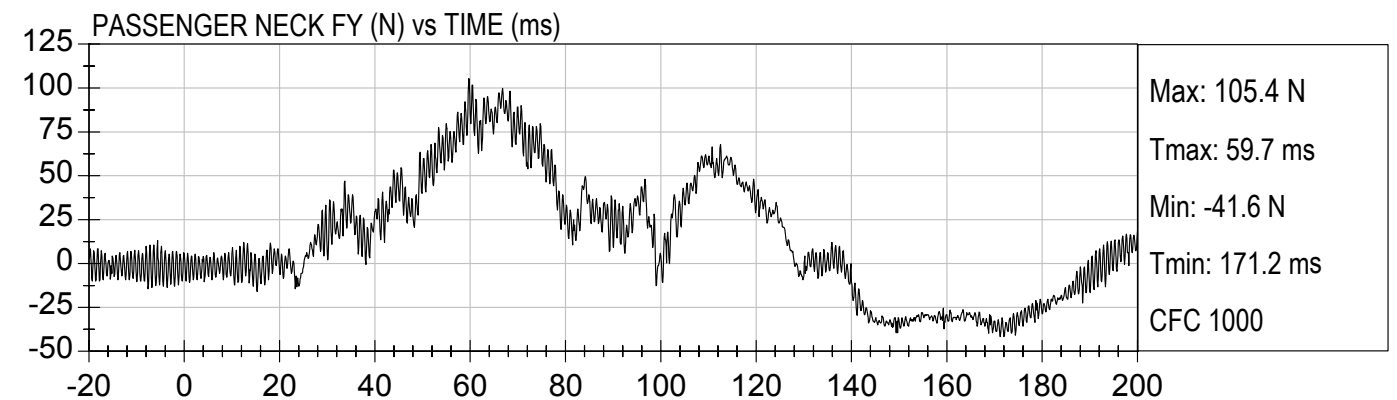
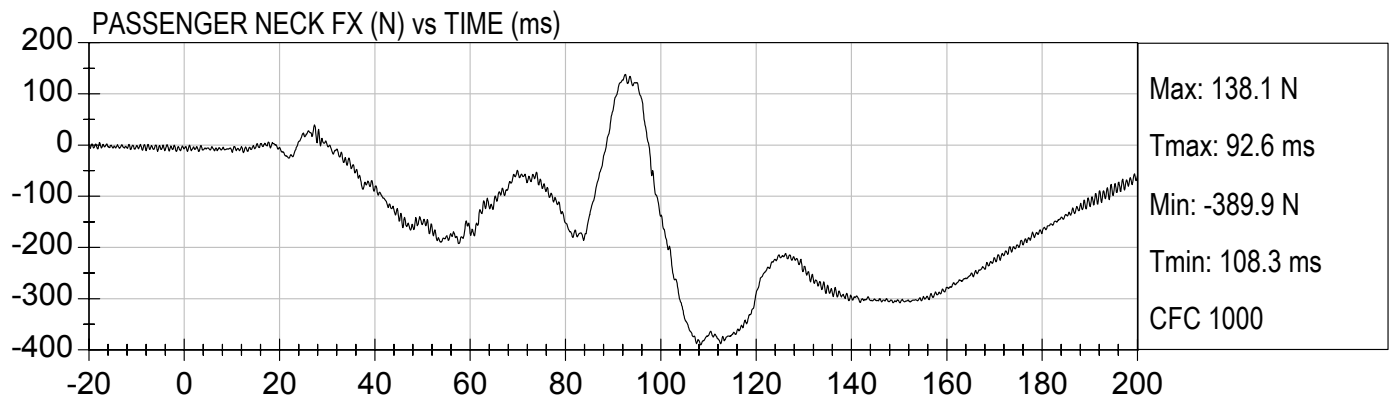






35MPH NCAP FRONTAL
2004 FORD FREESTAR

Test Date: 11/12/2003
Speed: 35.2 mph (56.6 km/h)

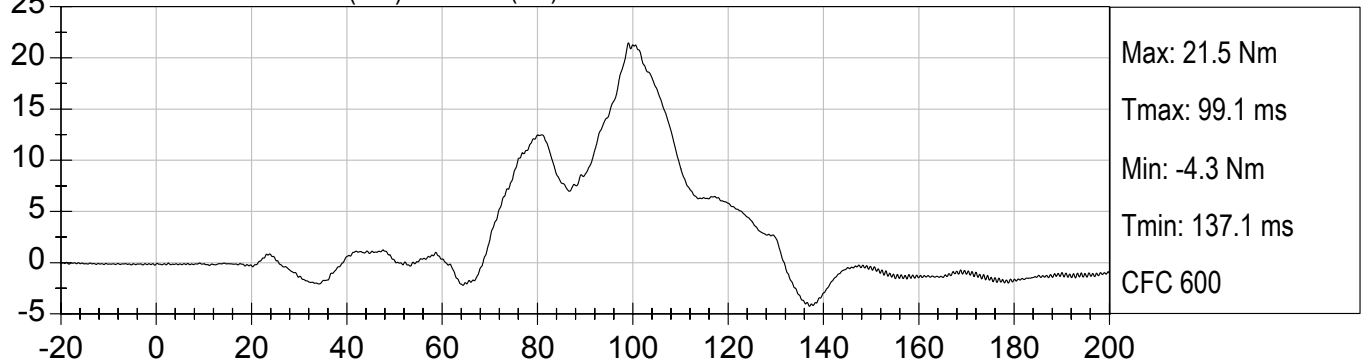




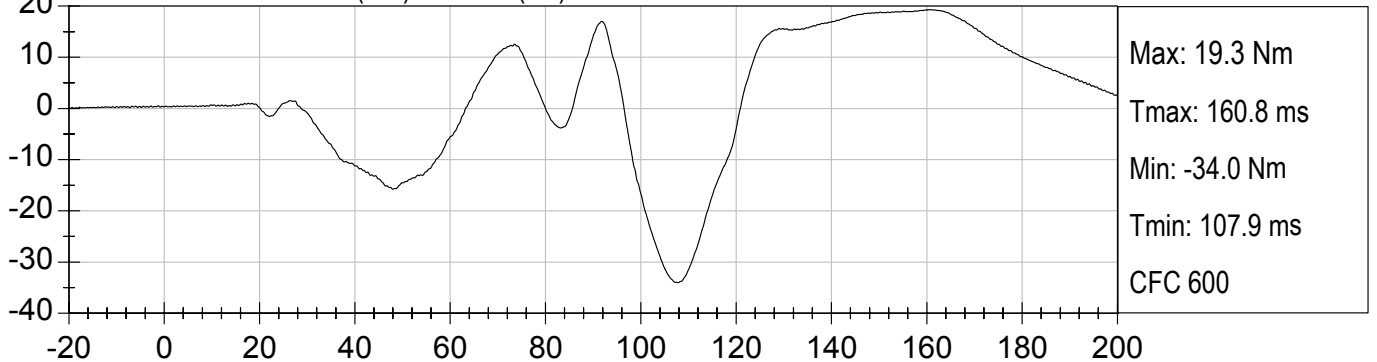
35MPH NCAP FRONTAL
2004 FORD FREESTAR

Test Date: 11/12/2003
Speed: 35.2 mph (56.6 km/h)

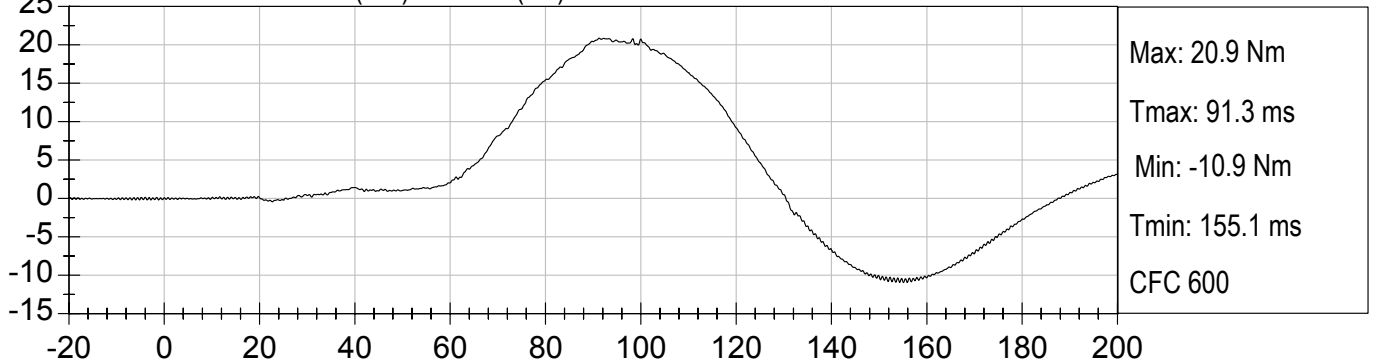
PASSENGER NECK MX (Nm) vs TIME (ms)



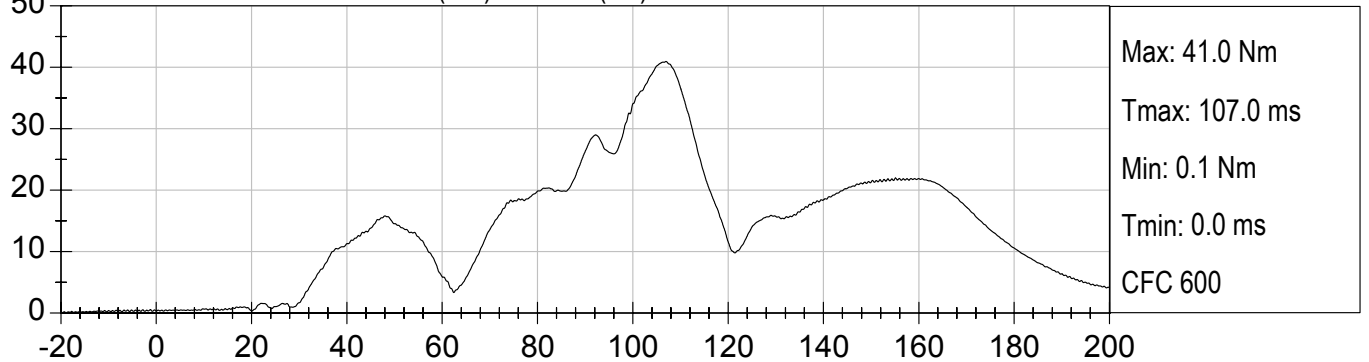
PASSENGER NECK MY (Nm) vs TIME (ms)



PASSENGER NECK MZ (Nm) vs TIME (ms)



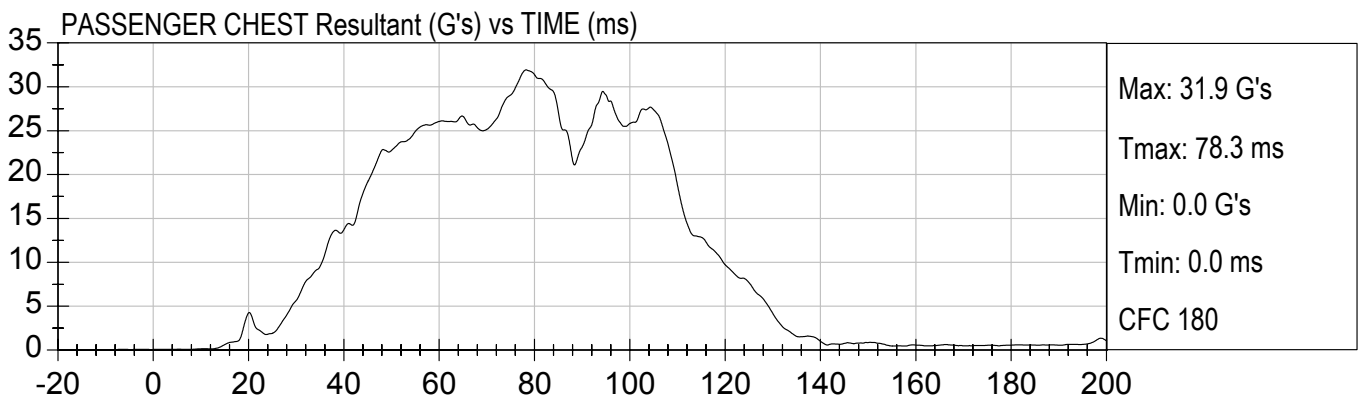
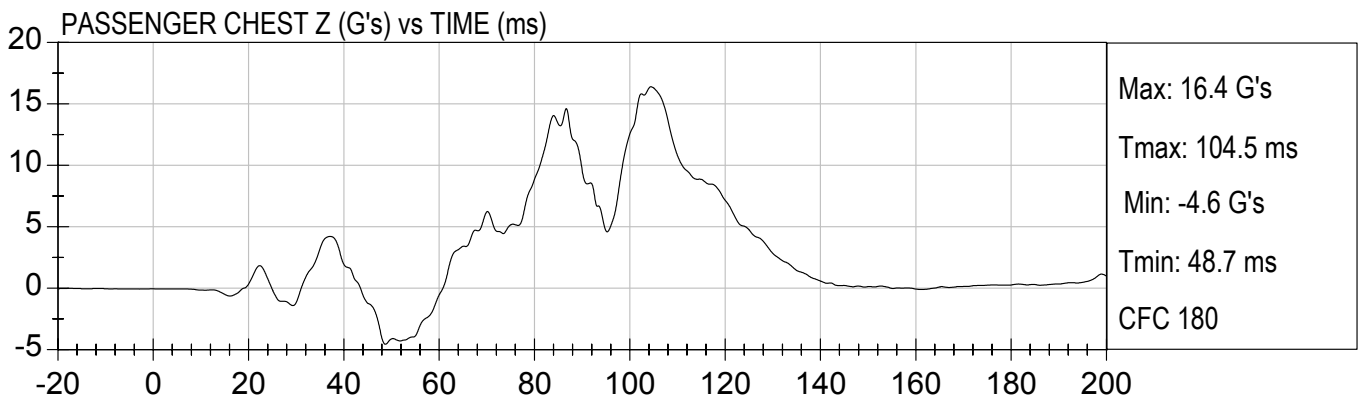
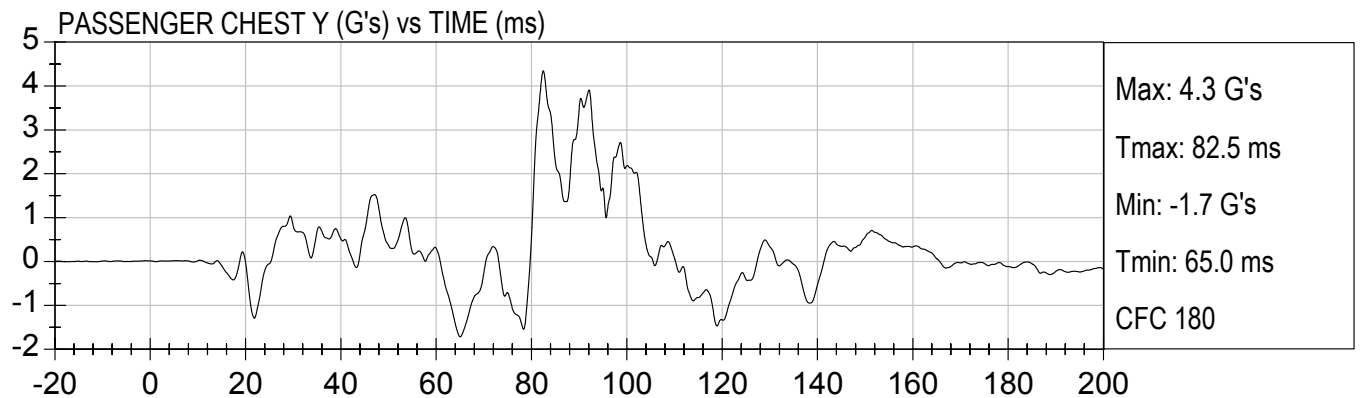
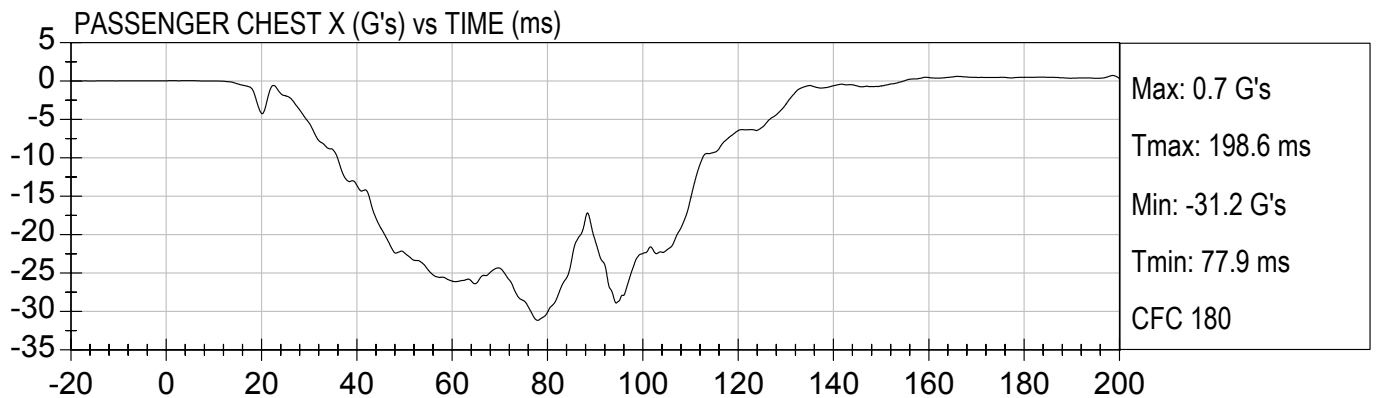
PASSENGER NECK MResultant (Nm) vs TIME (ms)





35MPH NCAP FRONTAL
2004 FORD FREESTAR

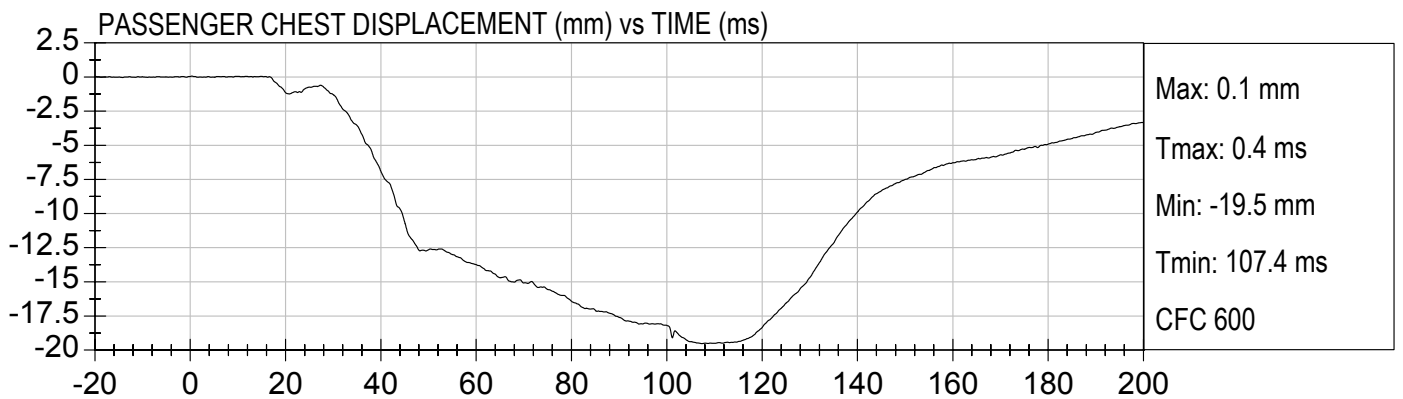
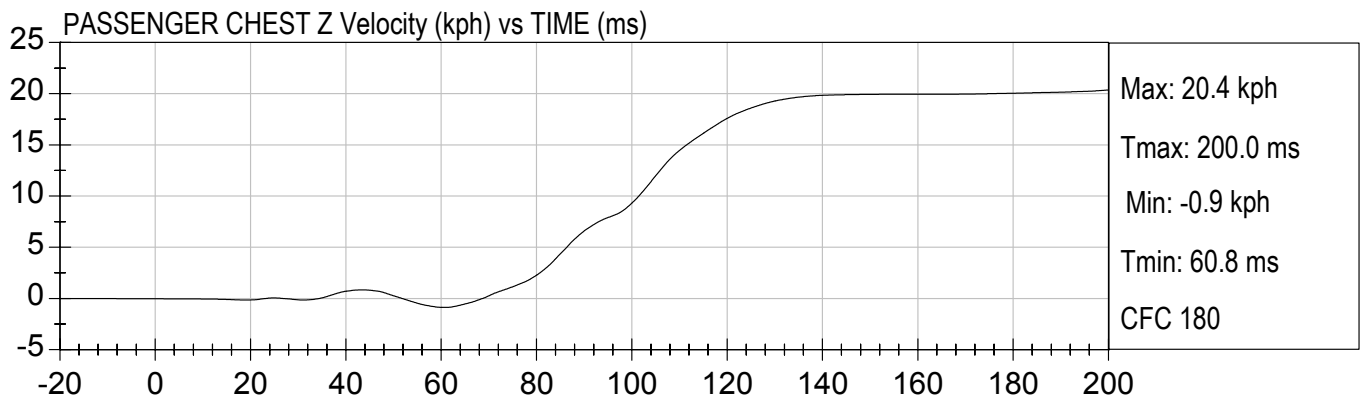
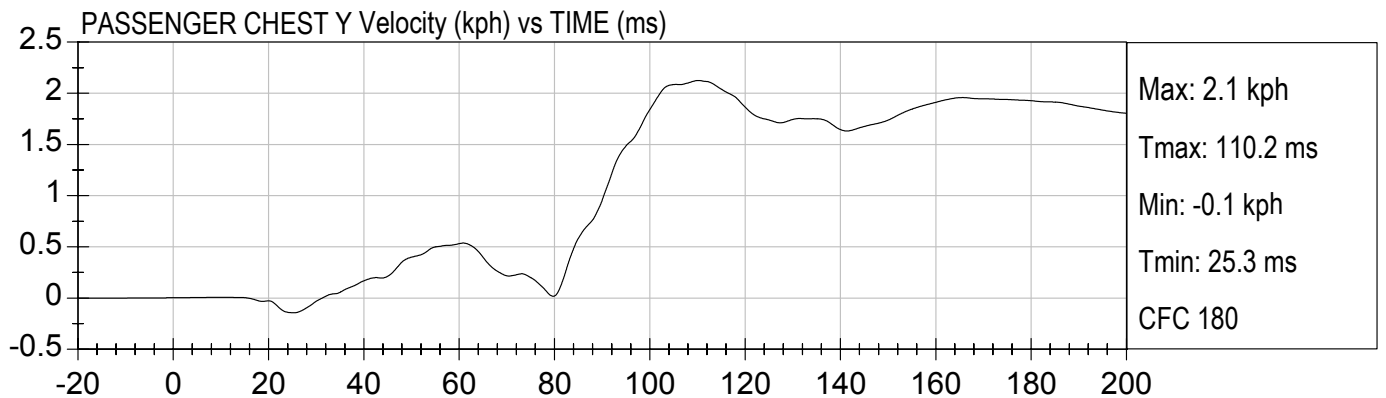
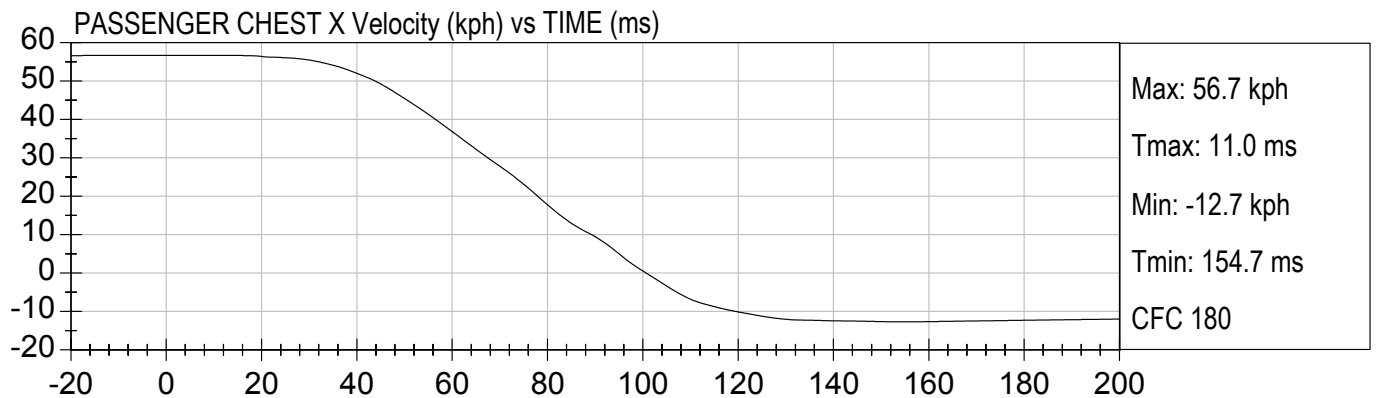
Test Date: 11/12/2003
Speed: 35.2 mph (56.6 km/h)





35MPH NCAP FRONTAL
2004 FORD FREESTAR

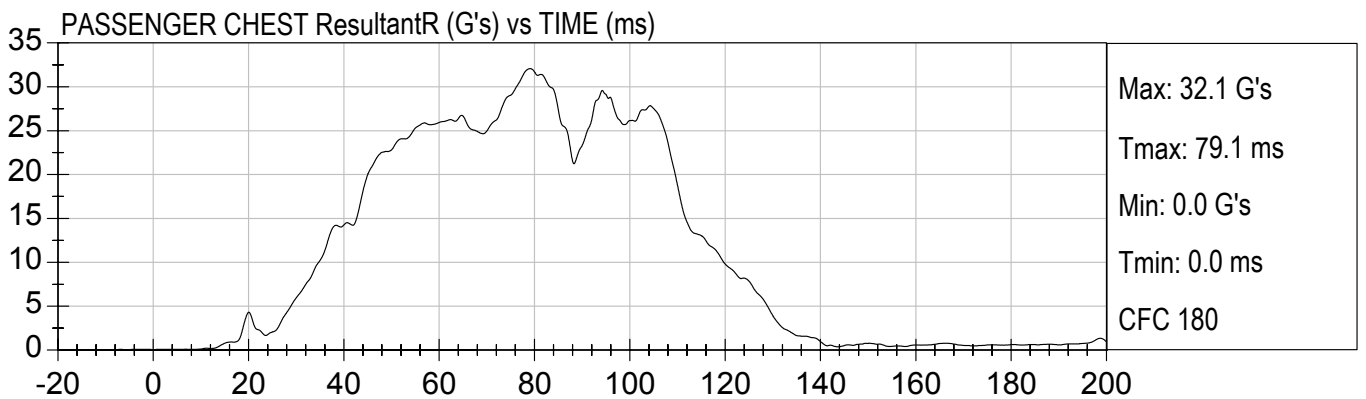
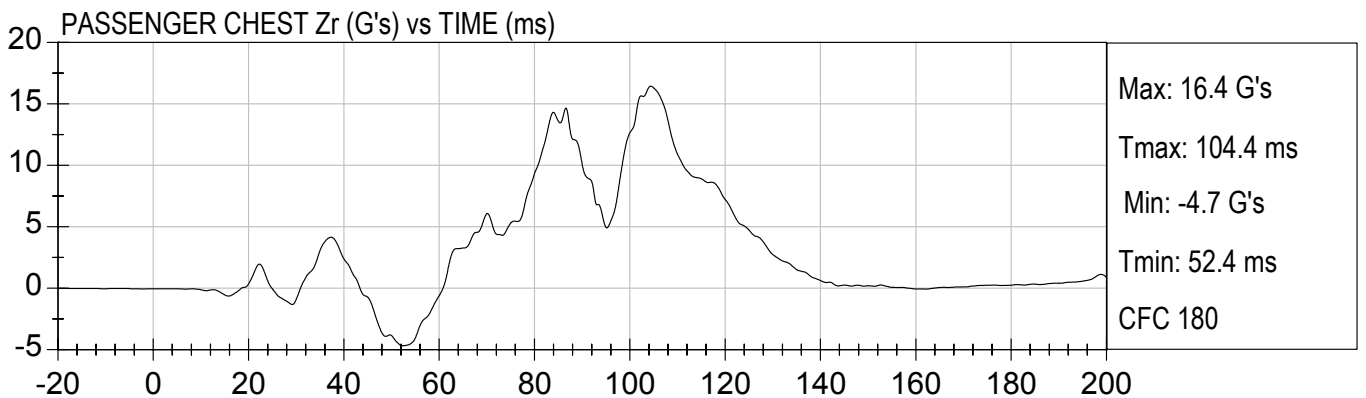
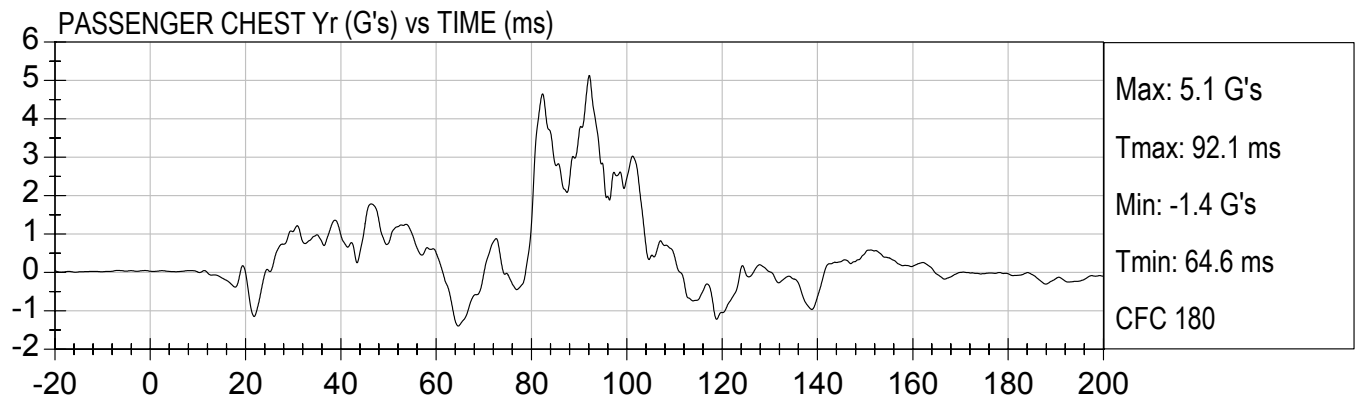
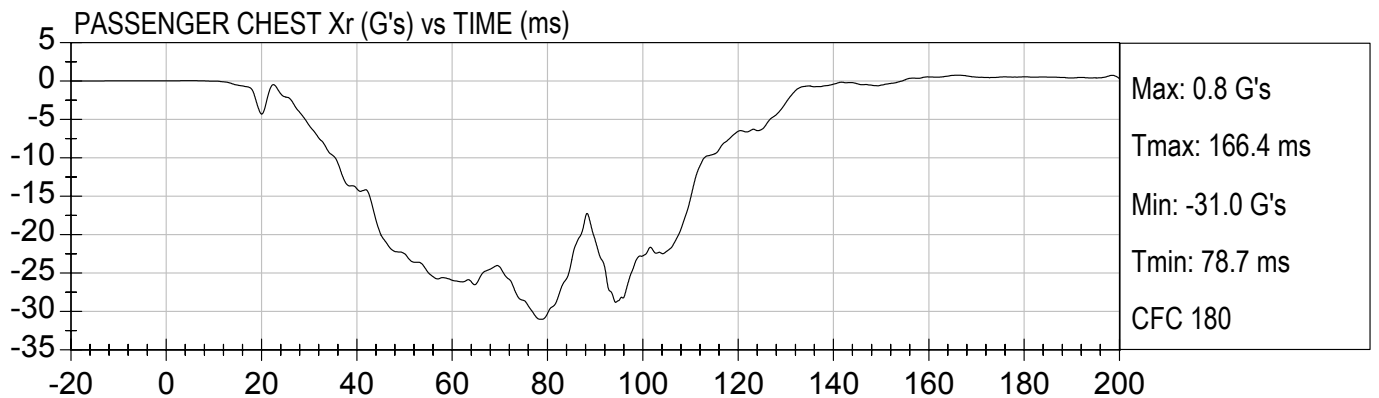
Test Date: 11/12/2003
Speed: 35.2 mph (56.6 km/h)

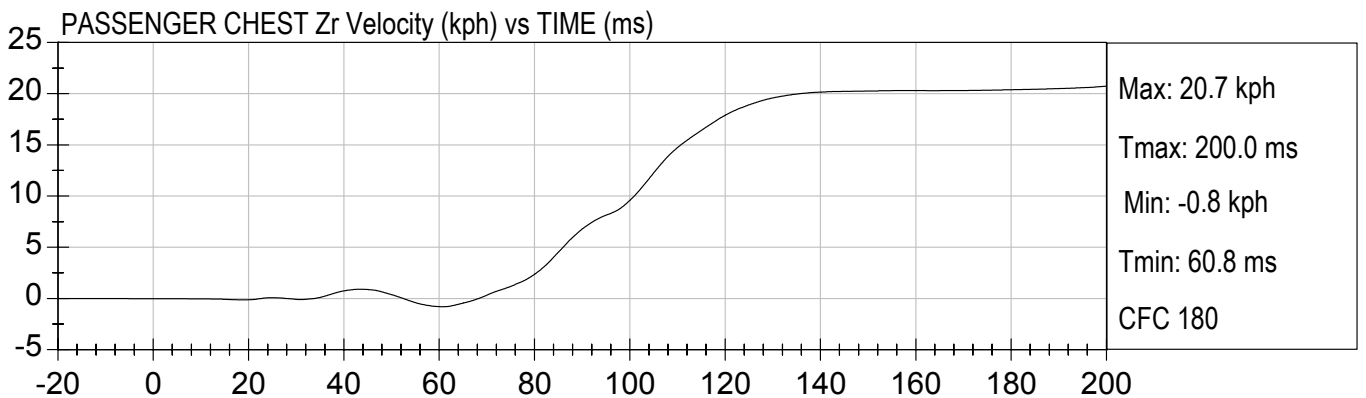
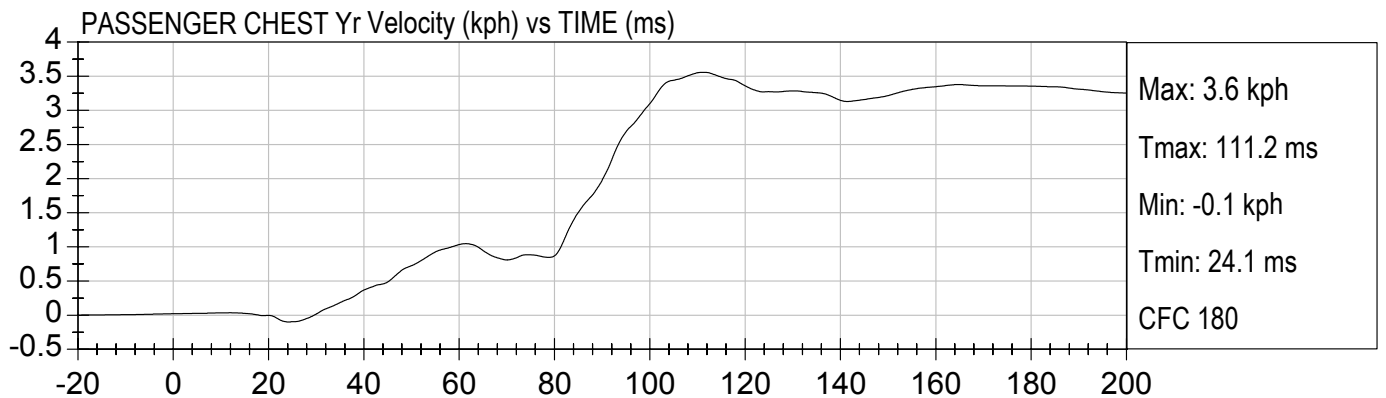
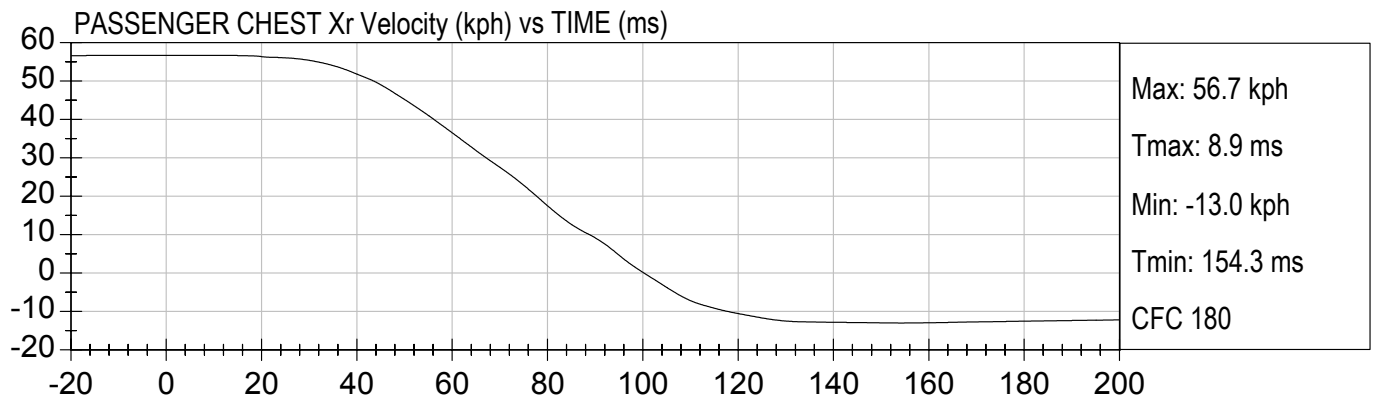




35MPH NCAP FRONTAL
2004 FORD FREESTAR

Test Date: 11/12/2003
Speed: 35.2 mph (56.6 km/h)

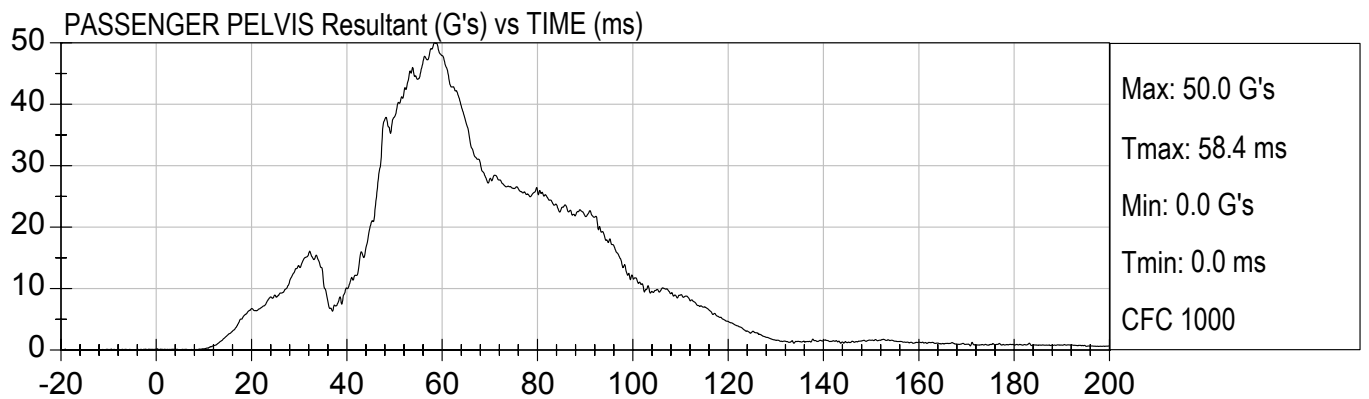
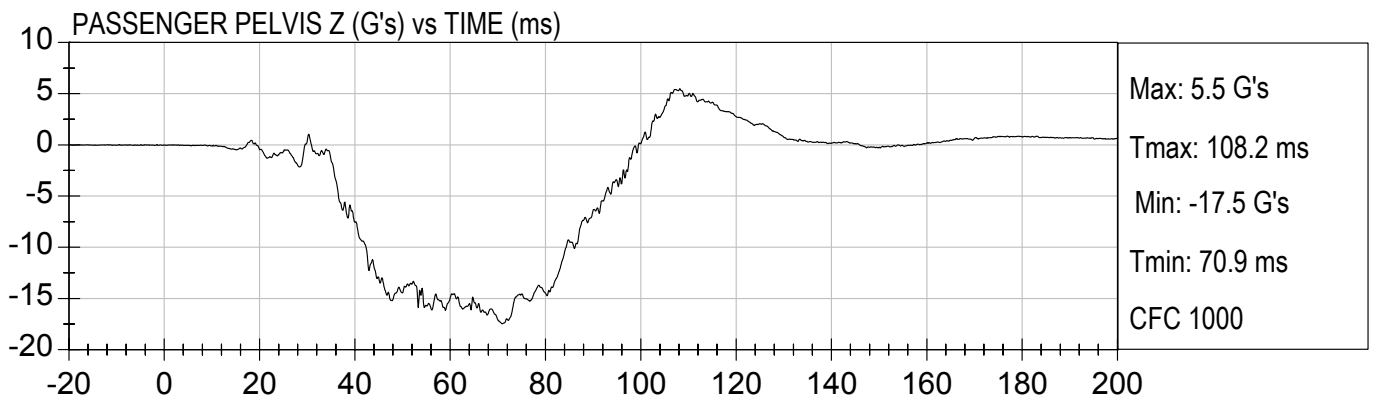
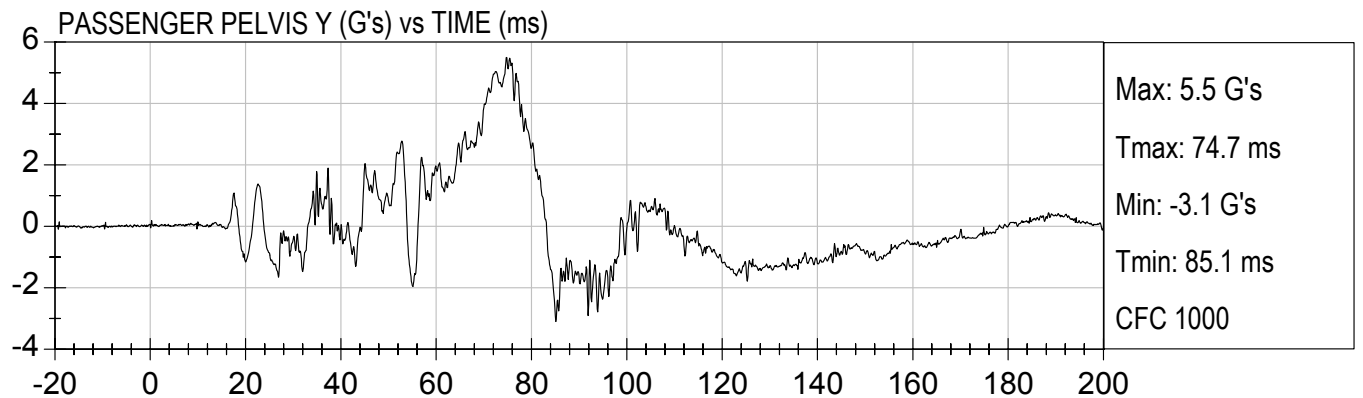
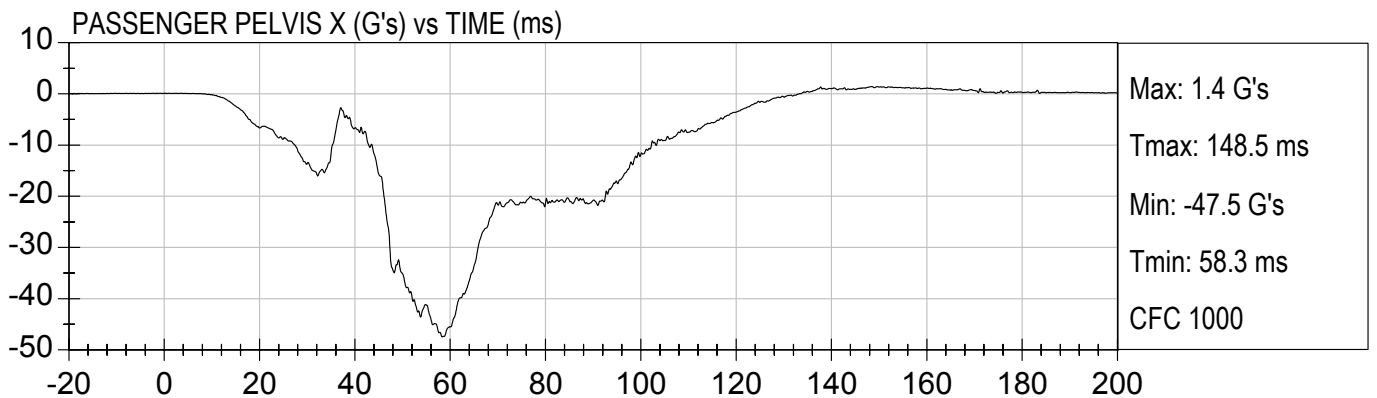






35MPH NCAP FRONTAL
2004 FORD FREESTAR

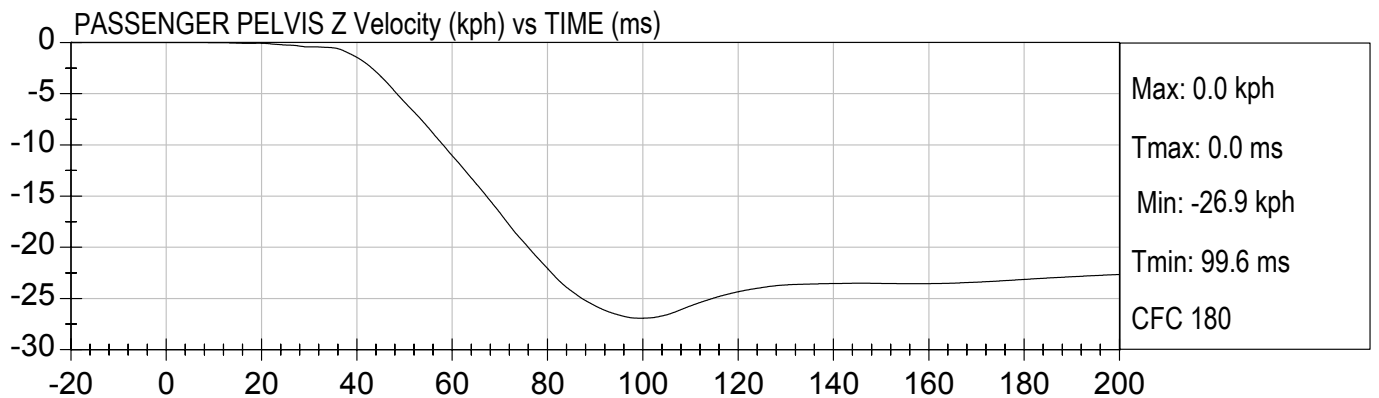
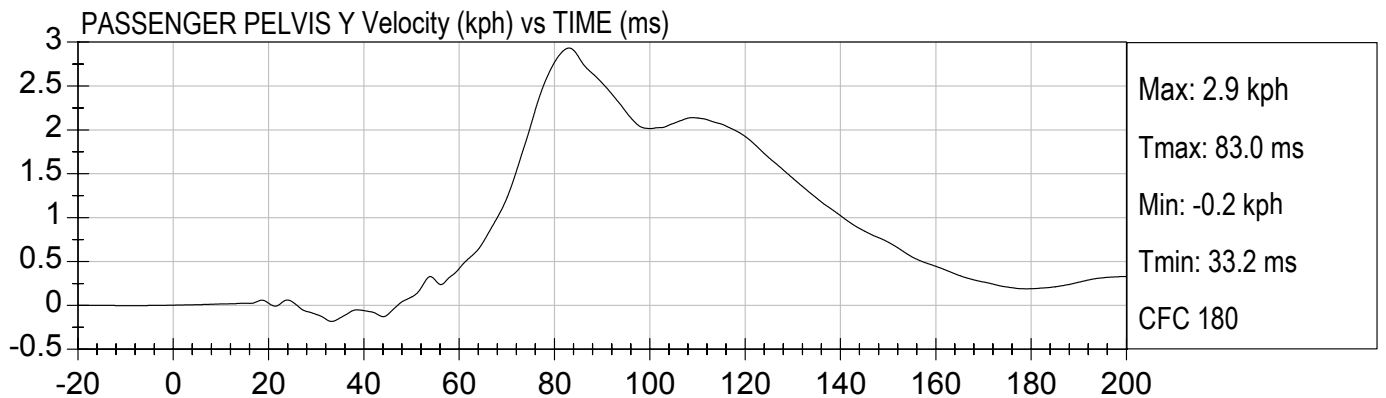
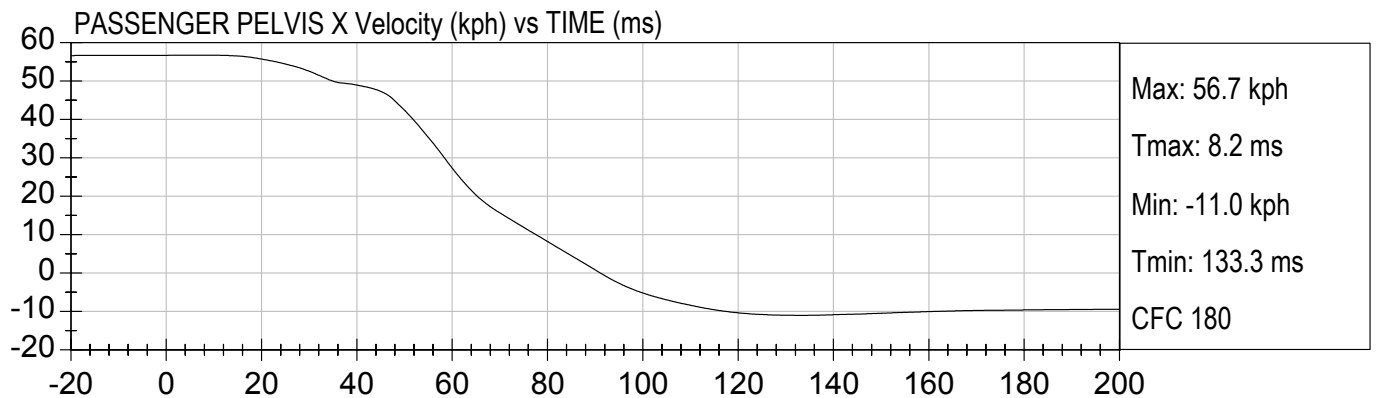
Test Date: 11/12/2003
Speed: 35.2 mph (56.6 km/h)





35MPH NCAP FRONTAL
2004 FORD FREESTAR

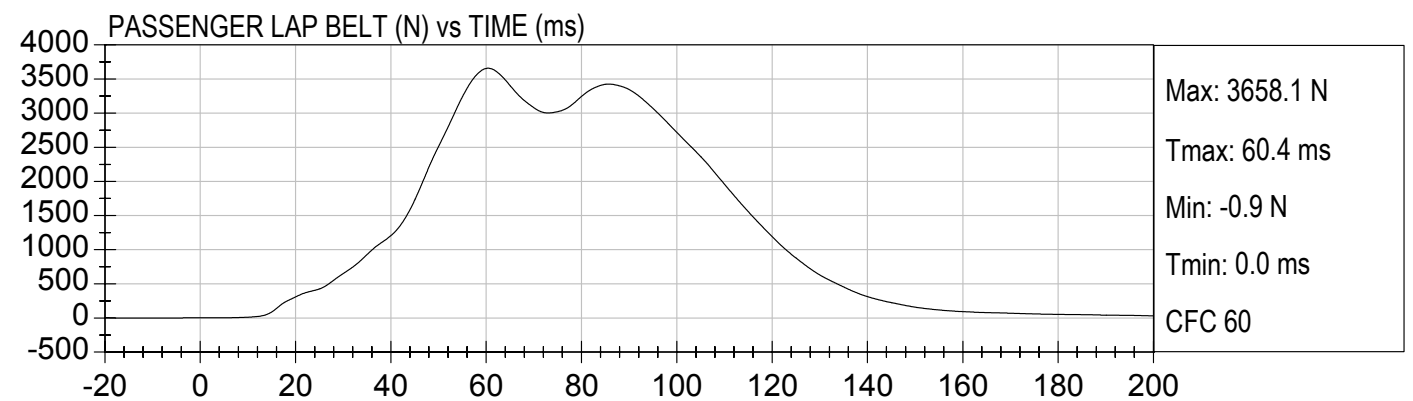
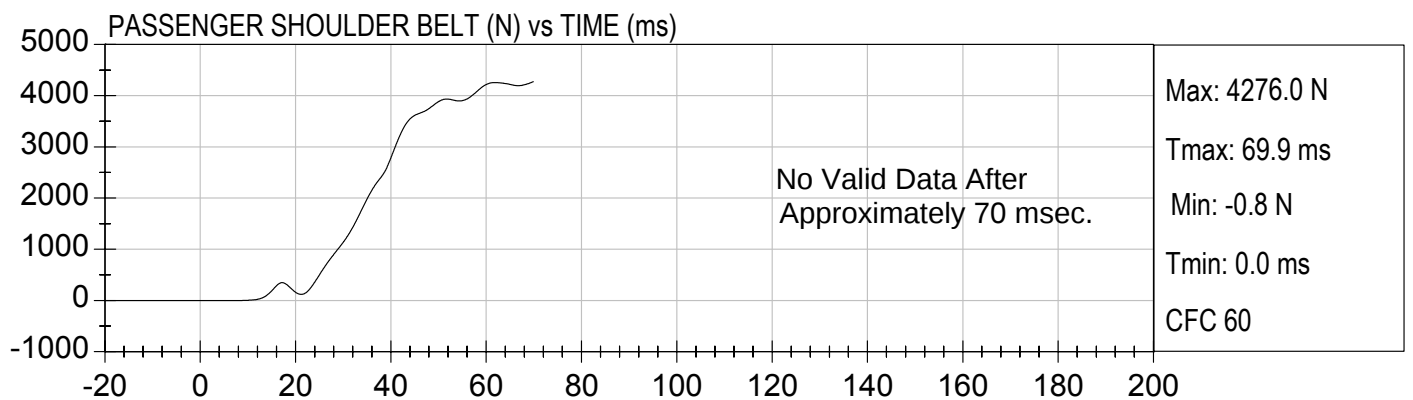
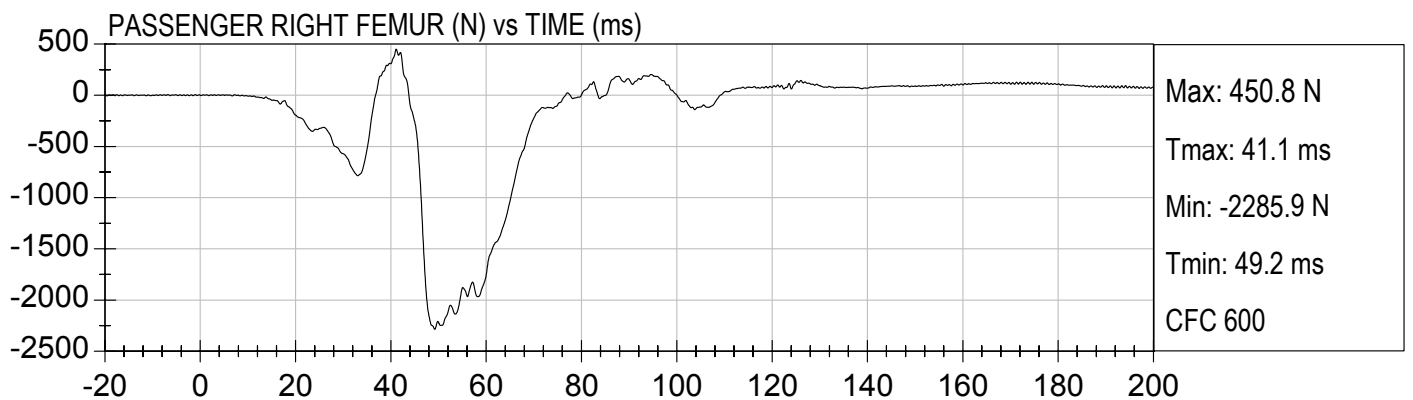
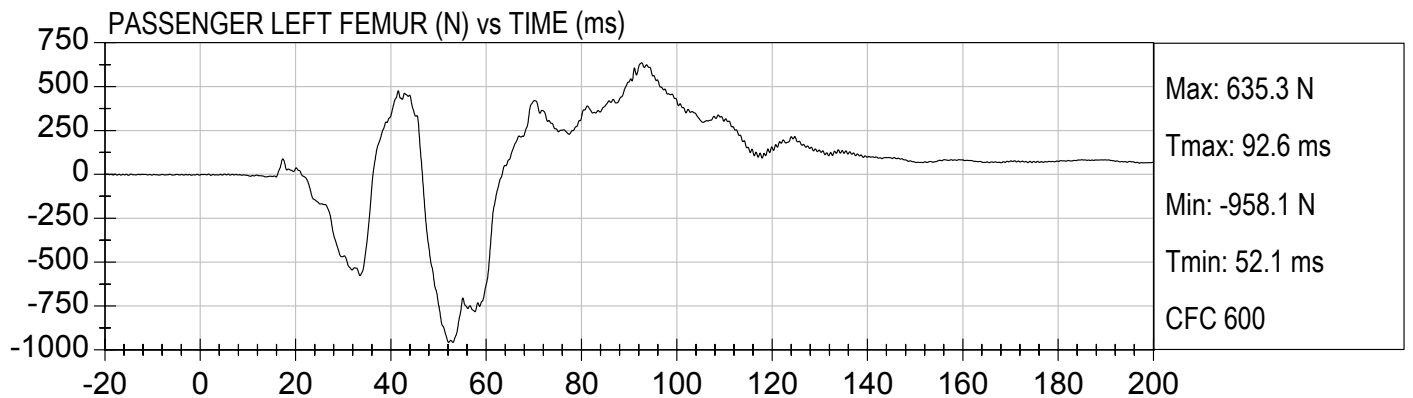
Test Date: 11/12/2003
Speed: 35.2 mph (56.6 km/h)





35MPH NCAP FRONTAL
2004 FORD FREESTAR

Test Date: 11/12/2003
Speed: 35.2 mph (56.6 km/h)

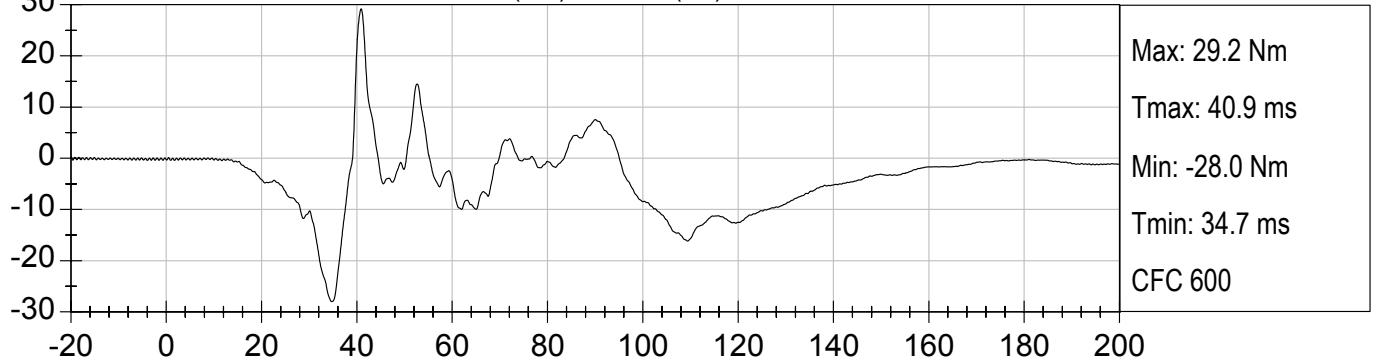




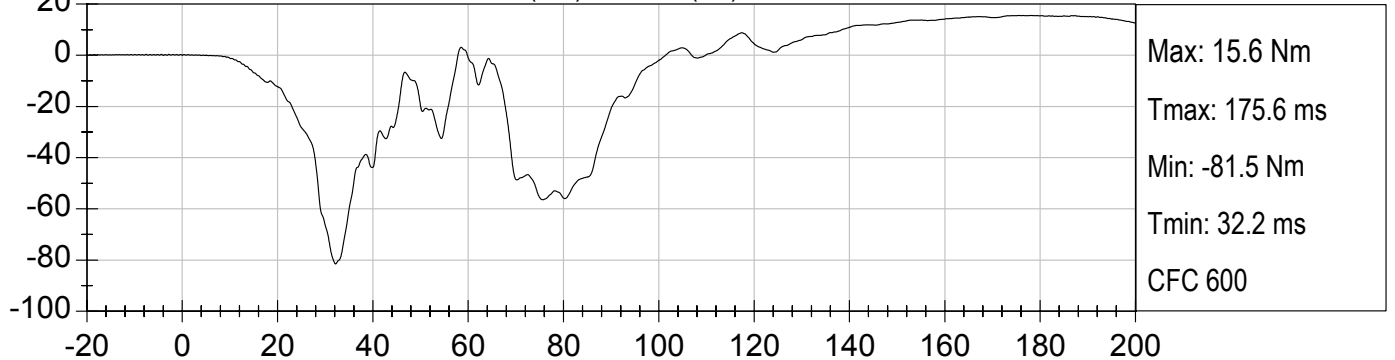
35MPH NCAP FRONTAL
2004 FORD FREESTAR

Test Date: 11/12/2003
Speed: 35.2 mph (56.6 km/h)

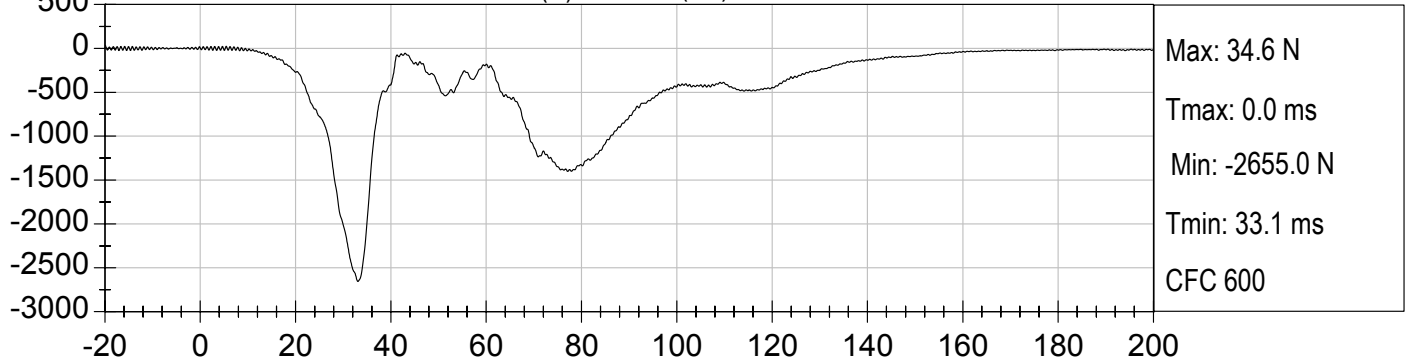
PASSENGER LEFT UPPER TIBIA MX (Nm) vs TIME (ms)



PASSENGER LEFT UPPER TIBIA MY (Nm) vs TIME (ms)

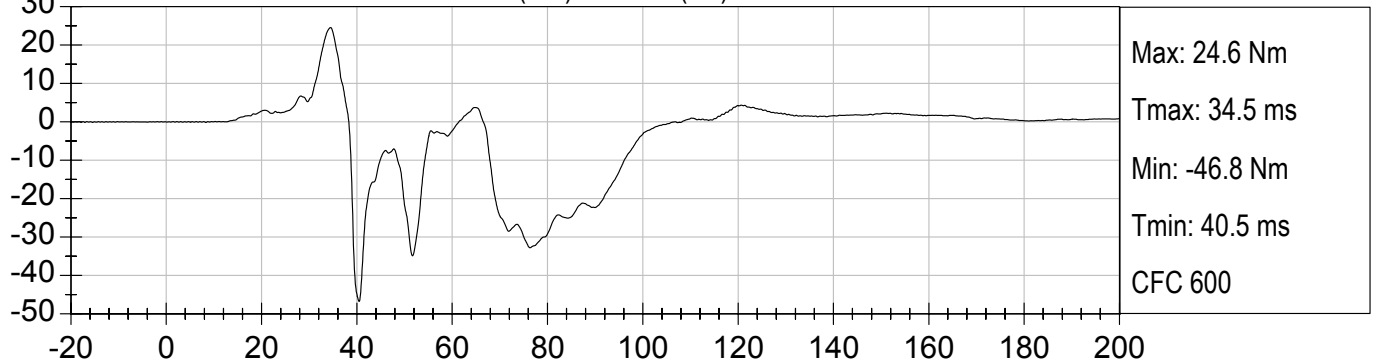


PASSENGER LEFT UPPER TIBIA FZ (N) vs TIME (ms)

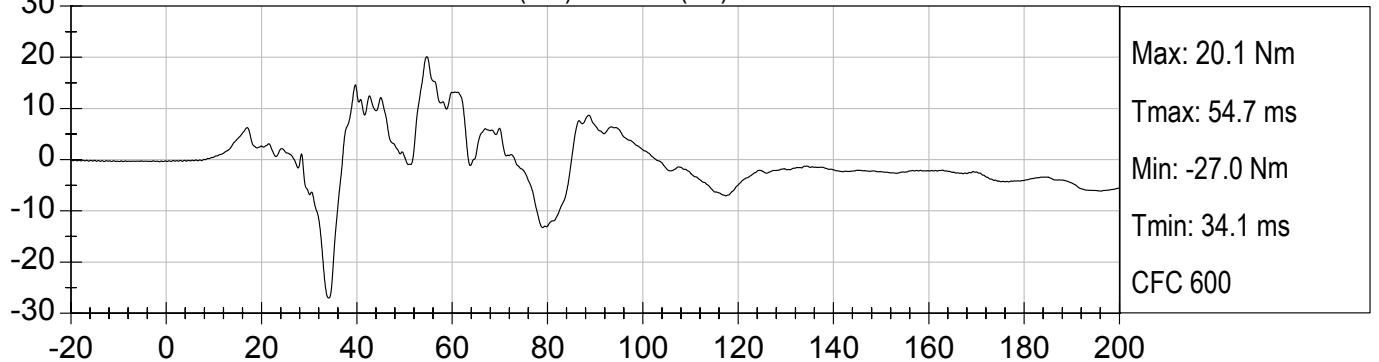




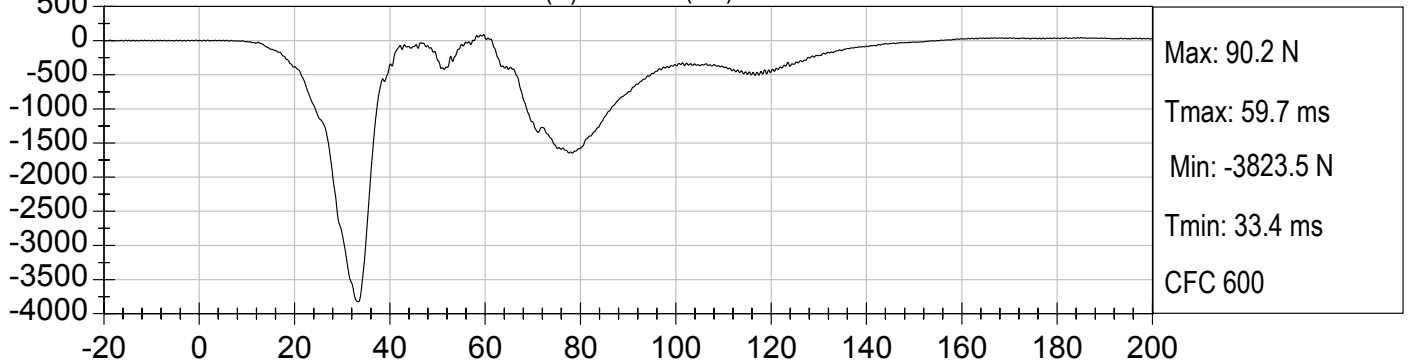
PASSENGER LEFT LOWER TIBIA MX (Nm) vs TIME (ms)



PASSENGER LEFT LOWER TIBIA MY (Nm) vs TIME (ms)



PASSENGER LEFT LOWER TIBIA FZ (N) vs TIME (ms)

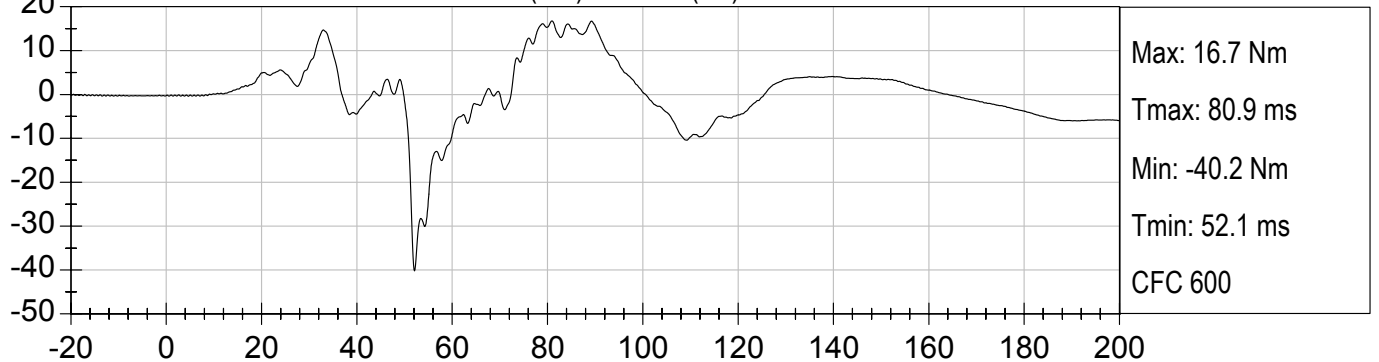




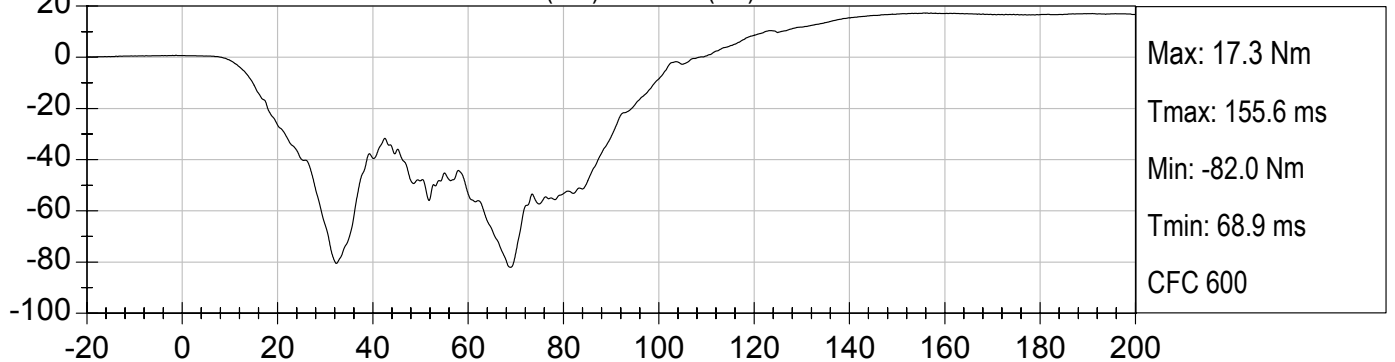
35MPH NCAP FRONTAL
2004 FORD FREESTAR

Test Date: 11/12/2003
Speed: 35.2 mph (56.6 km/h)

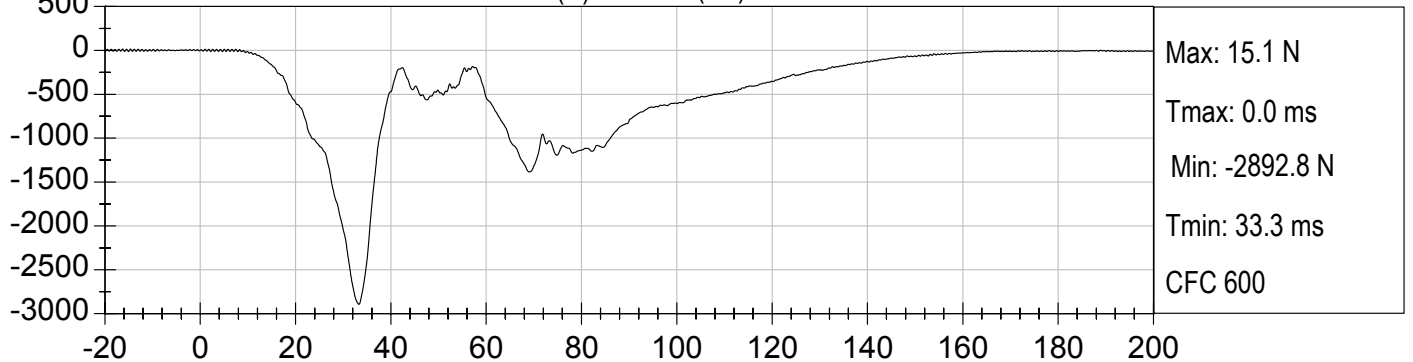
PASSENGER RIGHT UPPER TIBIA MX (Nm) vs TIME (ms)



PASSENGER RIGHT UPPER TIBIA MY (Nm) vs TIME (ms)

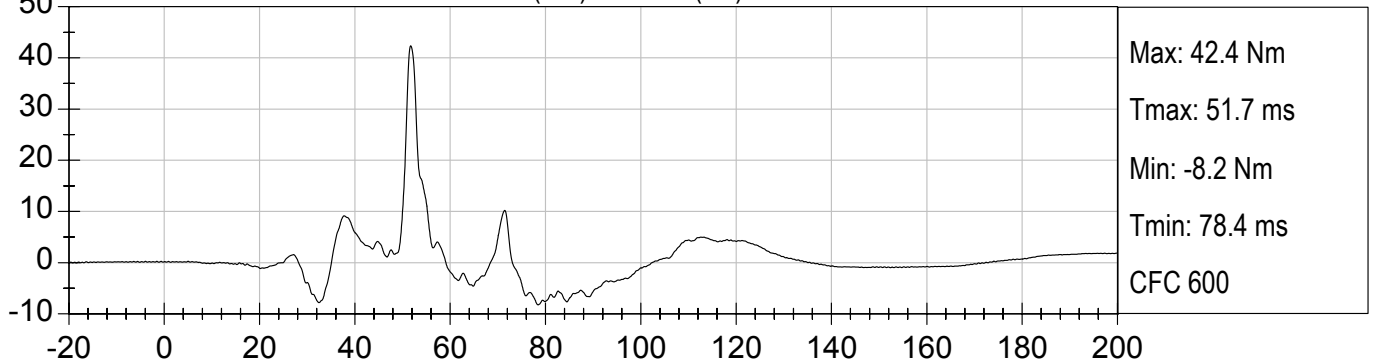


PASSENGER RIGHT UPPER TIBIA FZ (N) vs TIME (ms)

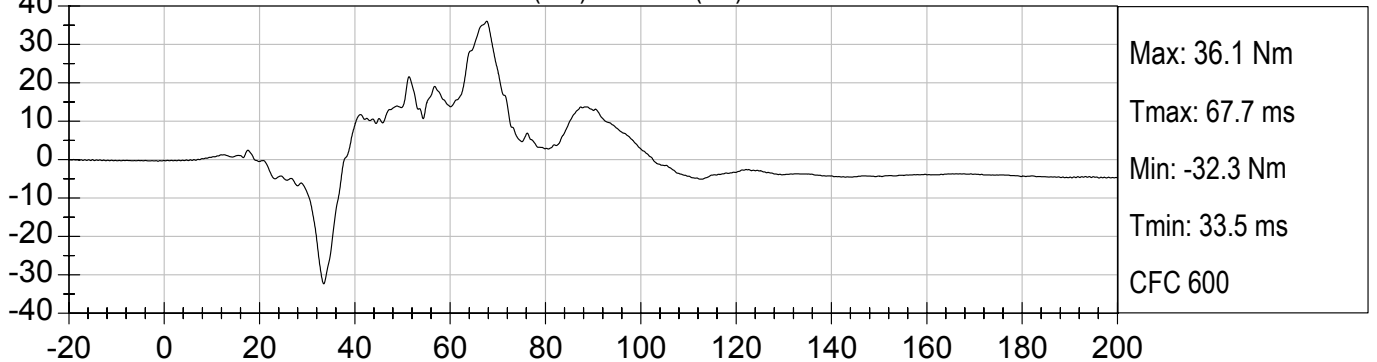




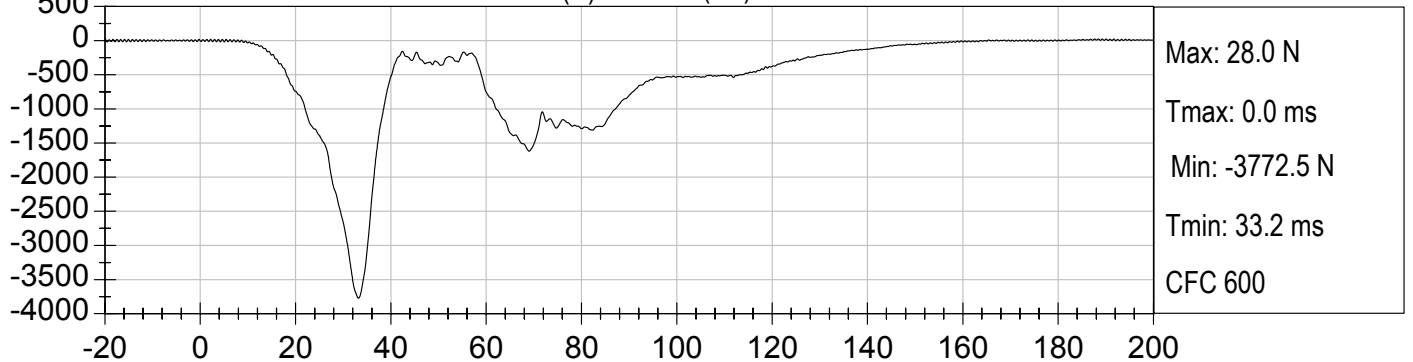
PASSENGER RIGHT LOWER TIBIA MX (Nm) vs TIME (ms)



PASSENGER RIGHT LOWER TIBIA MY (Nm) vs TIME (ms)



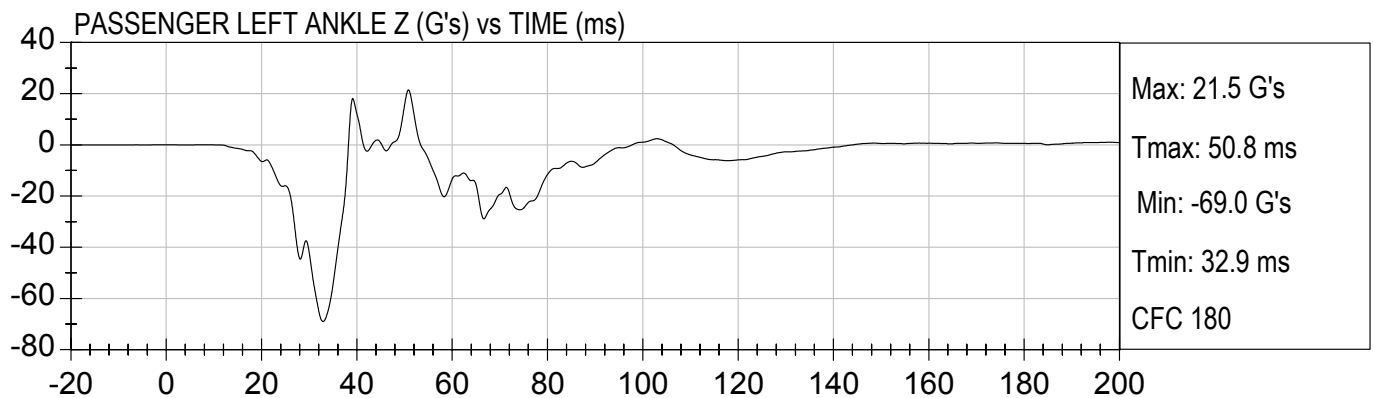
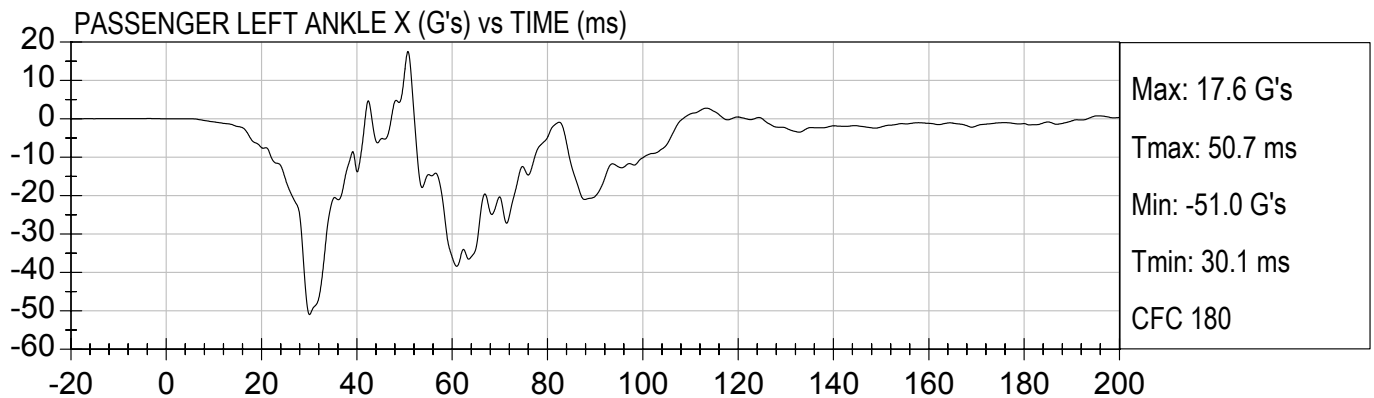
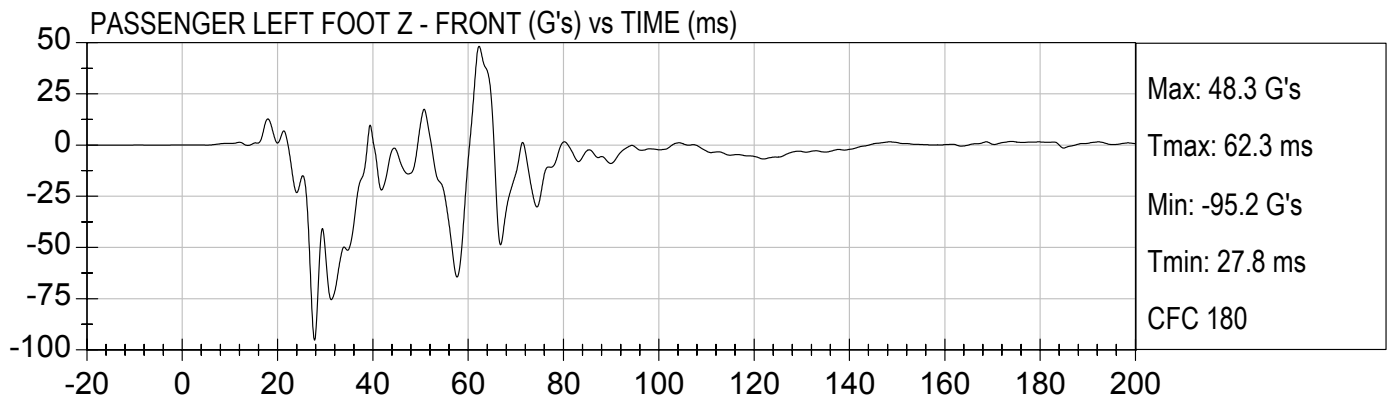
PASSENGER RIGHT LOWER TIBIA FZ (N) vs TIME (ms)

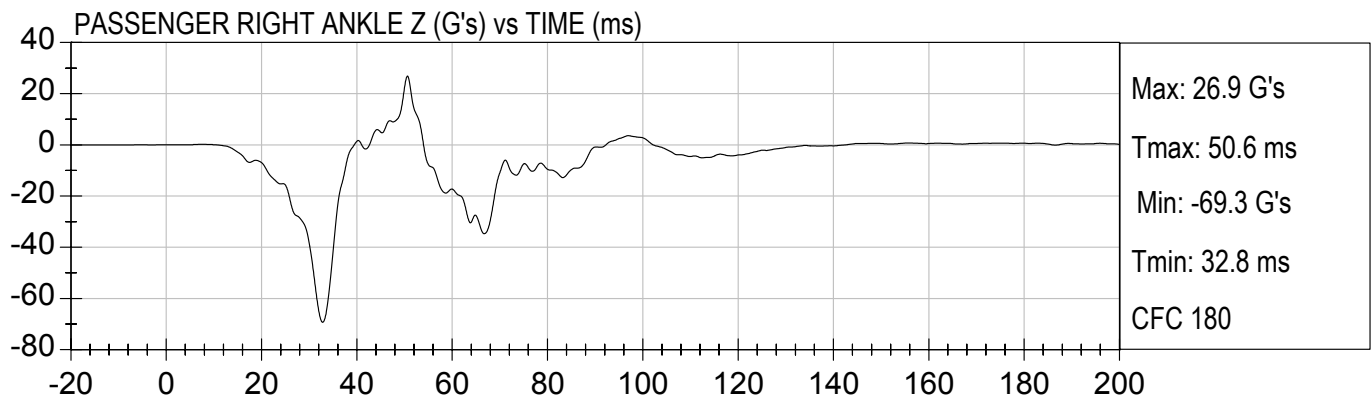
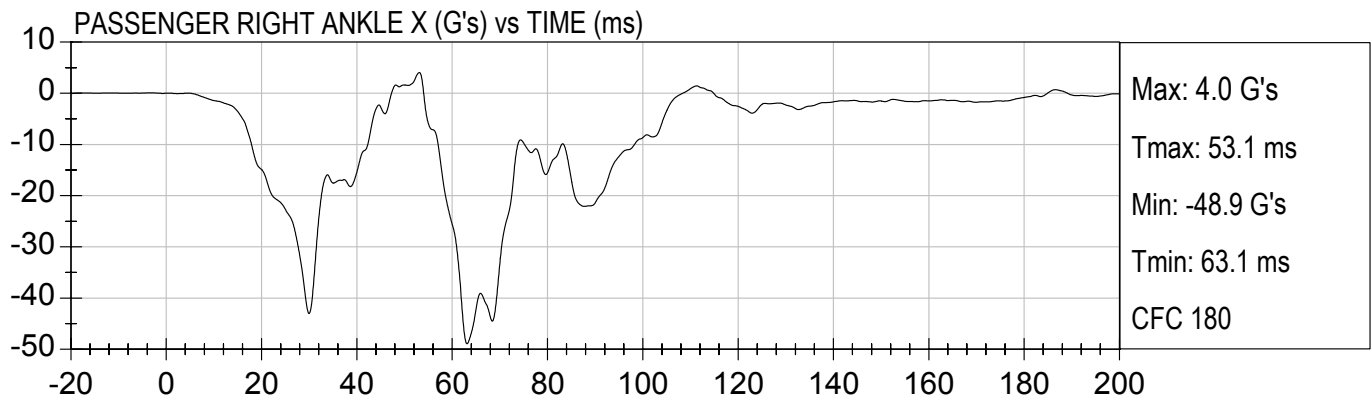
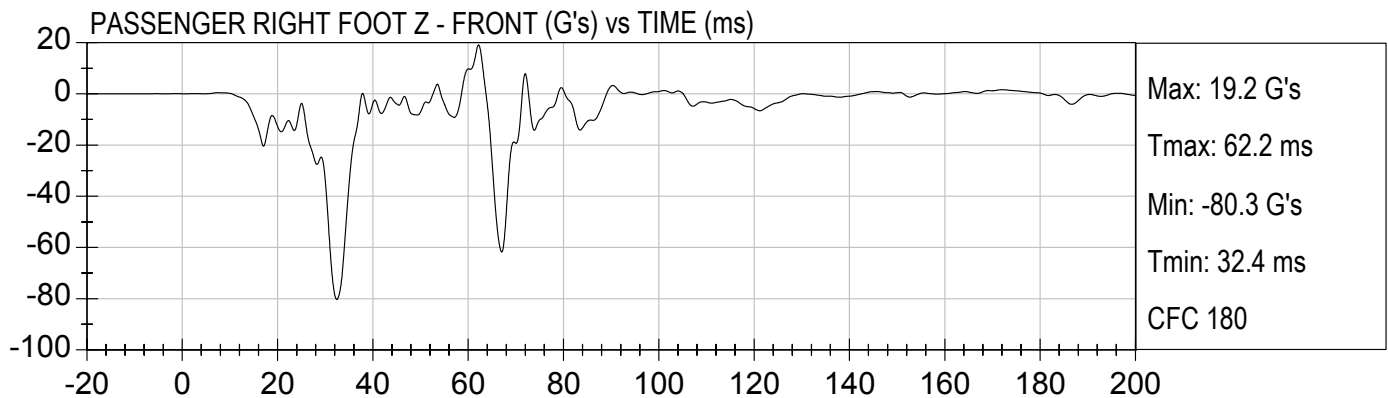


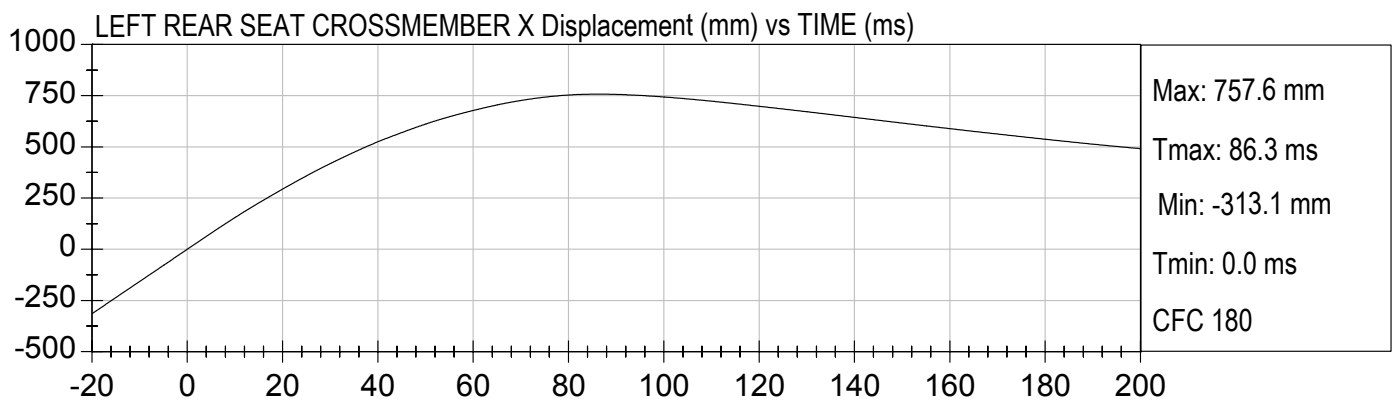
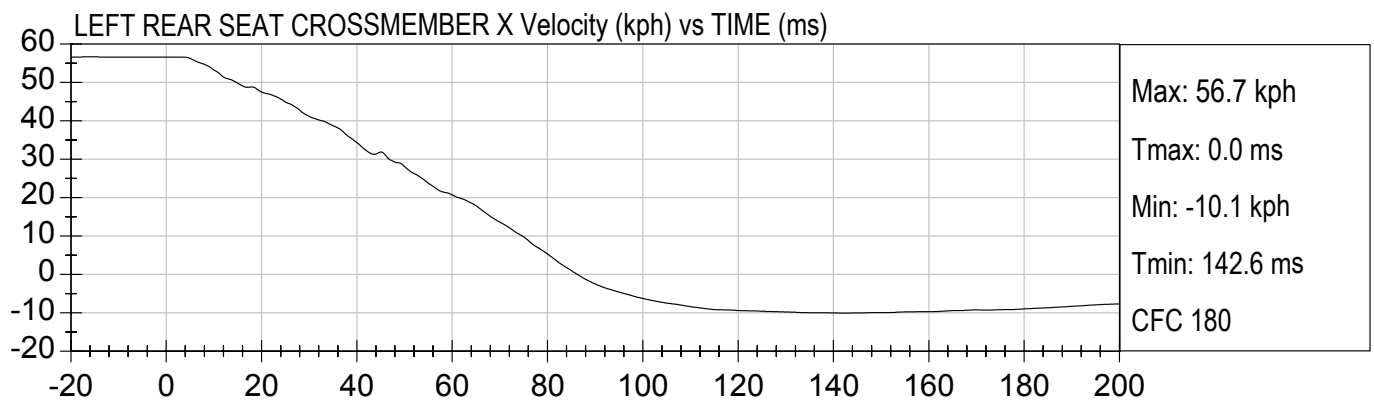
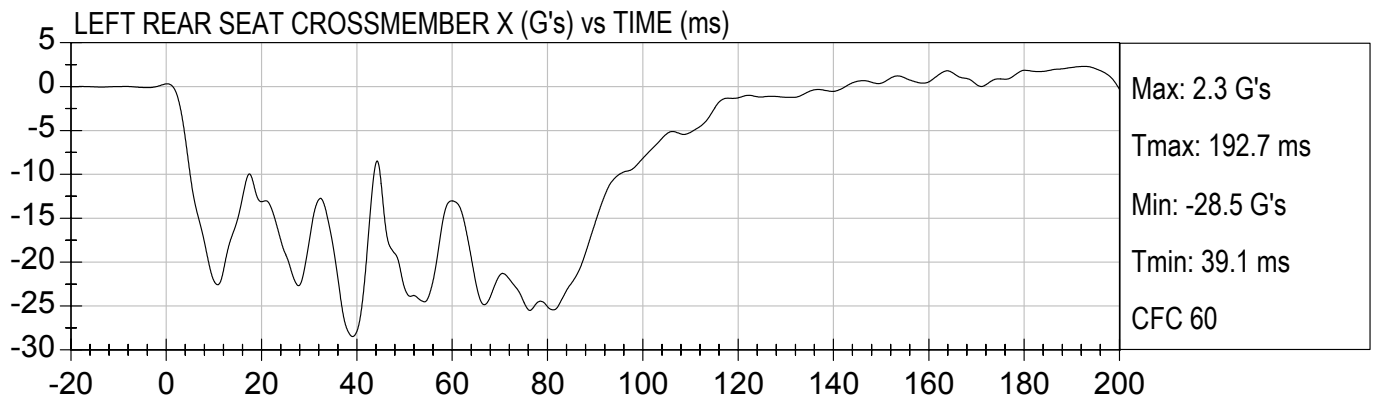


35MPH NCAP FRONTAL
2004 FORD FREESTAR

Test Date: 11/12/2003
Speed: 35.2 mph (56.6 km/h)



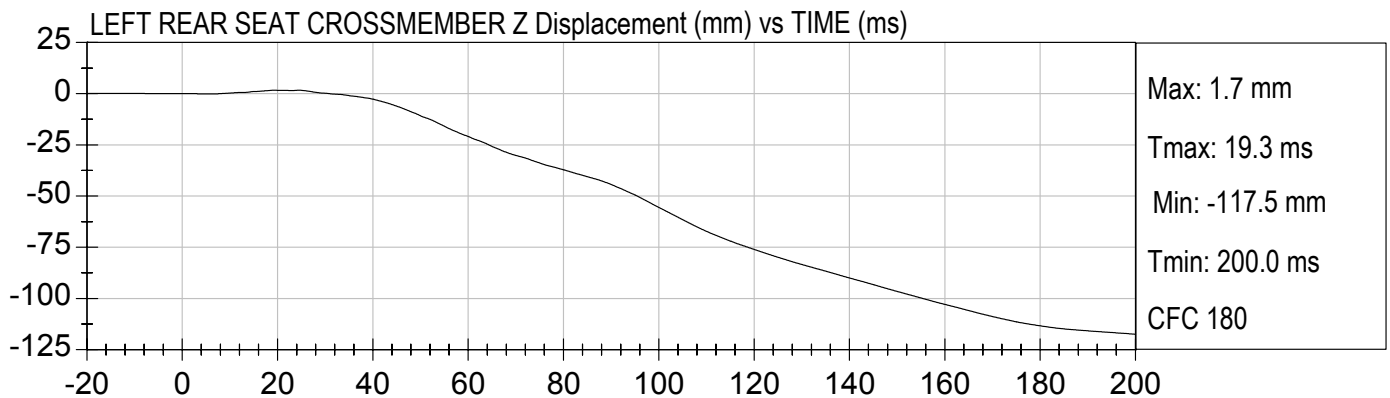
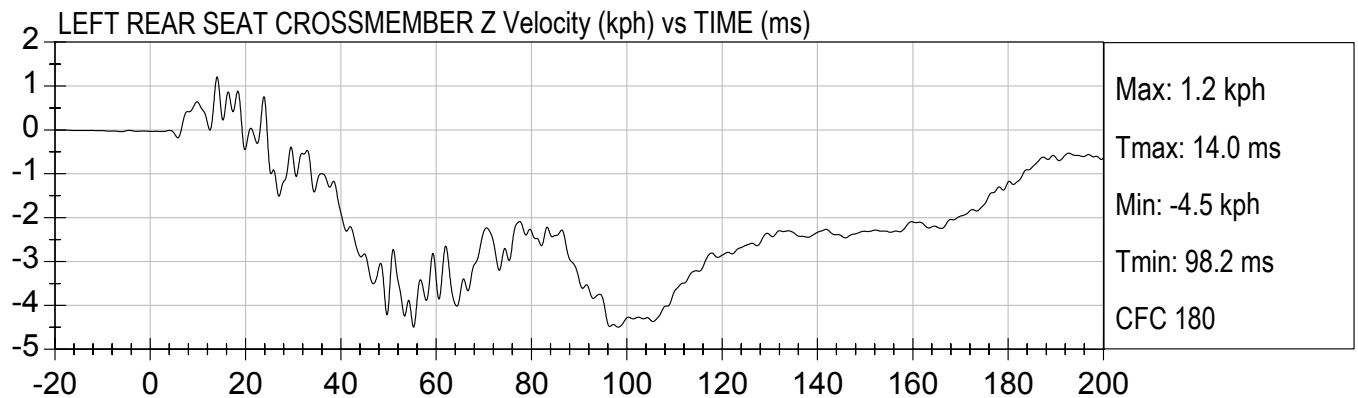
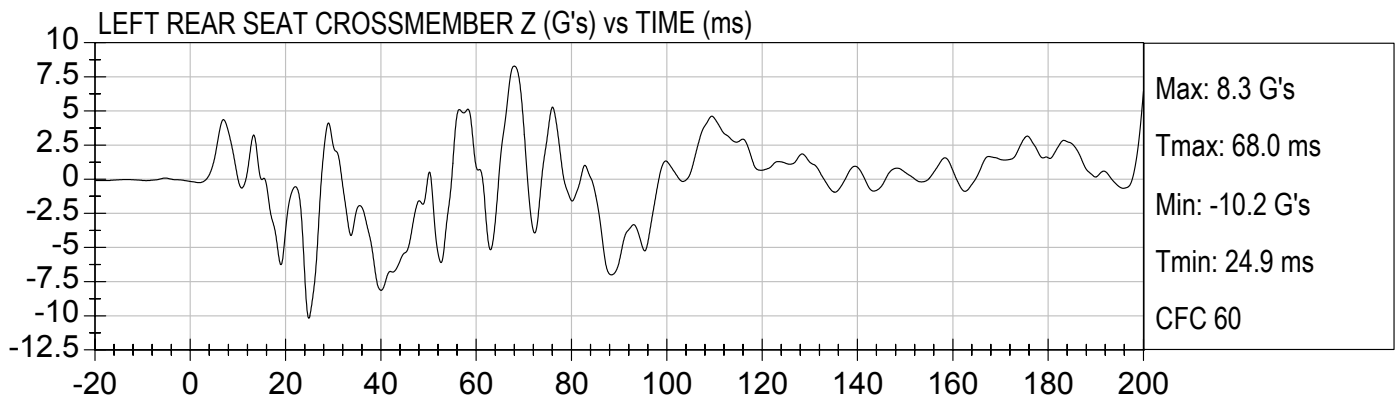


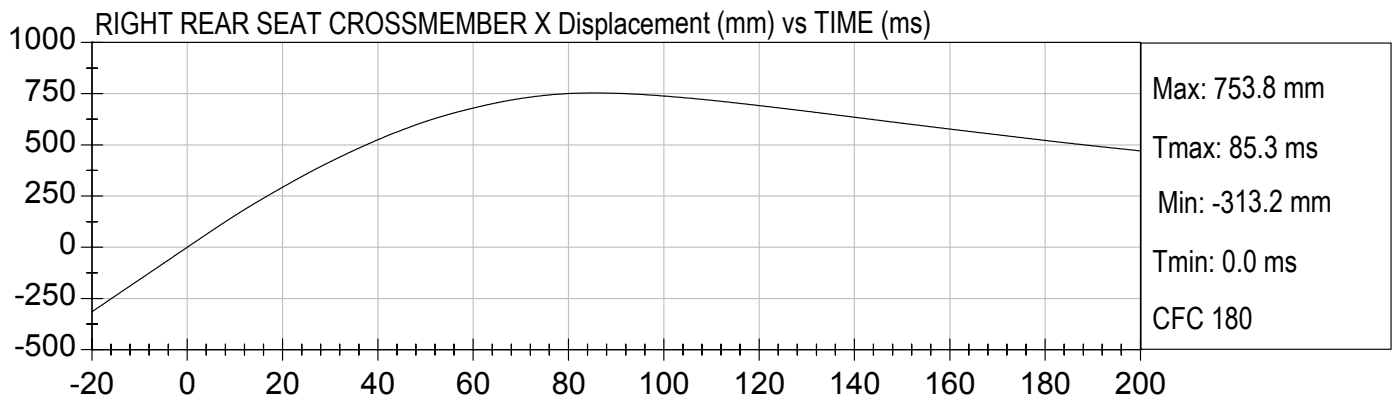
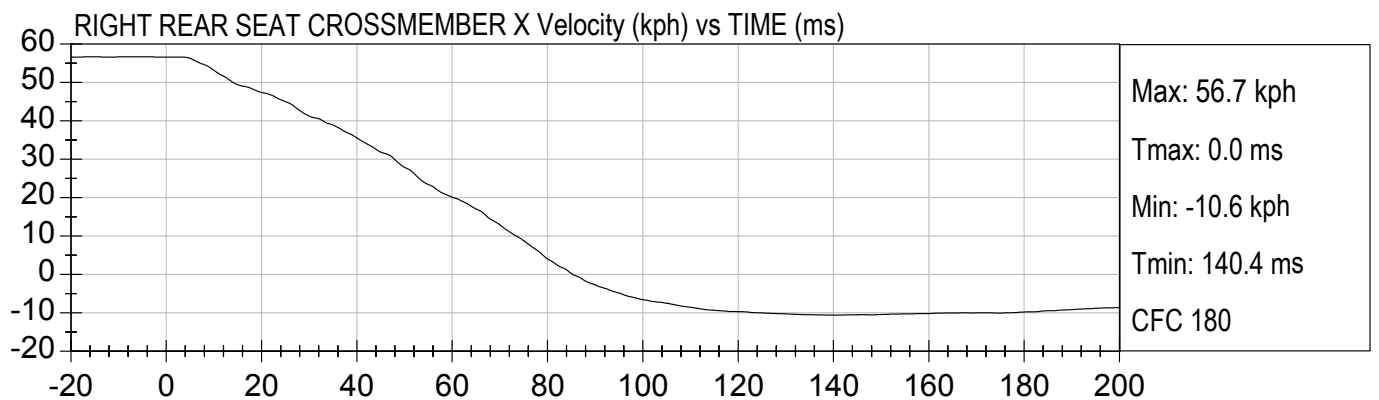
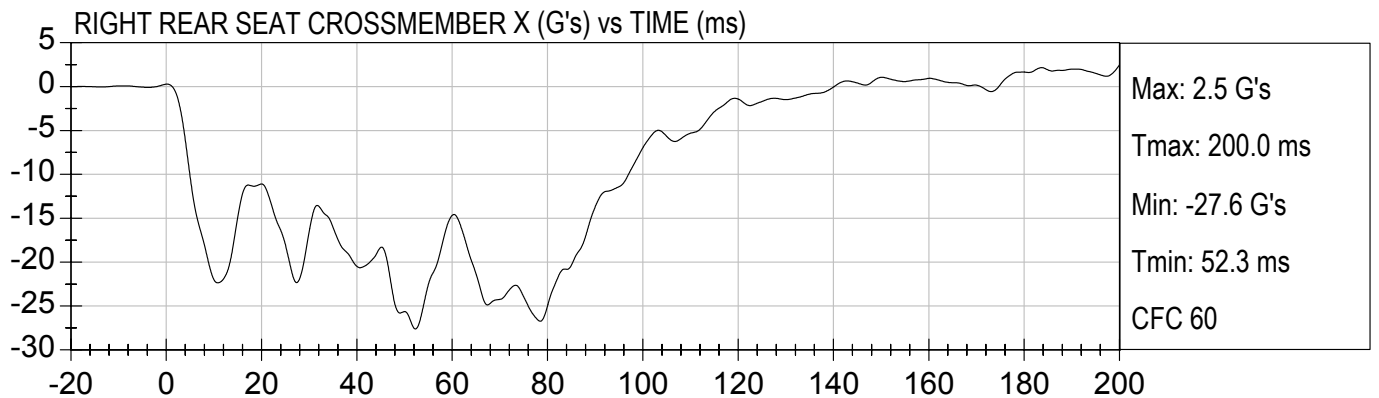




35MPH NCAP FRONTAL
2004 FORD FREESTAR

Test Date: 11/12/2003
Speed: 35.2 mph (56.6 km/h)

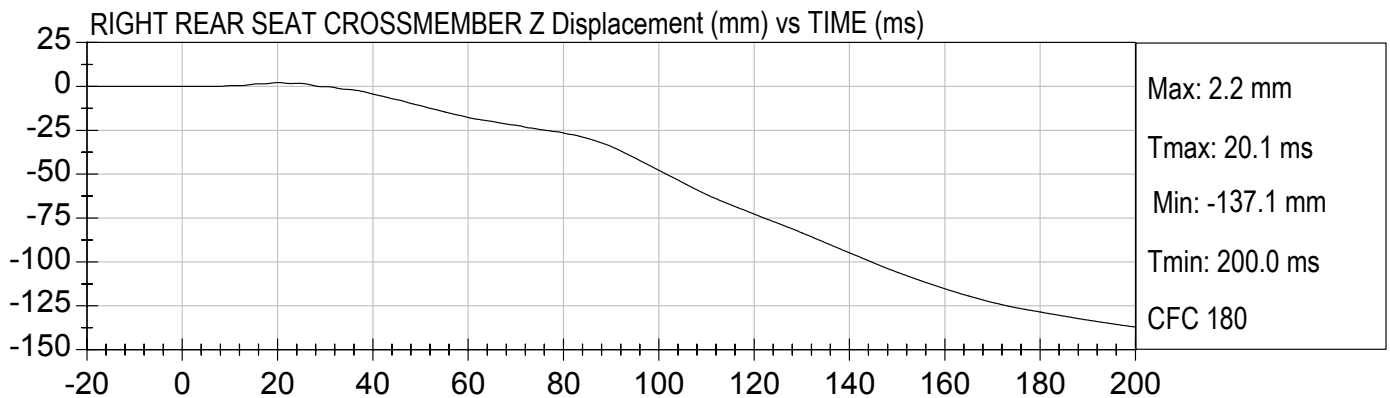
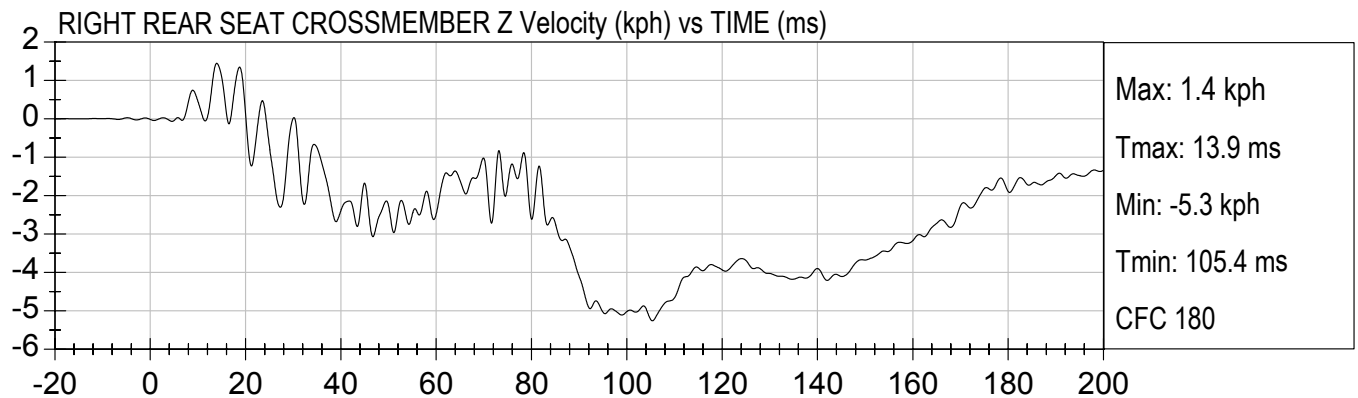
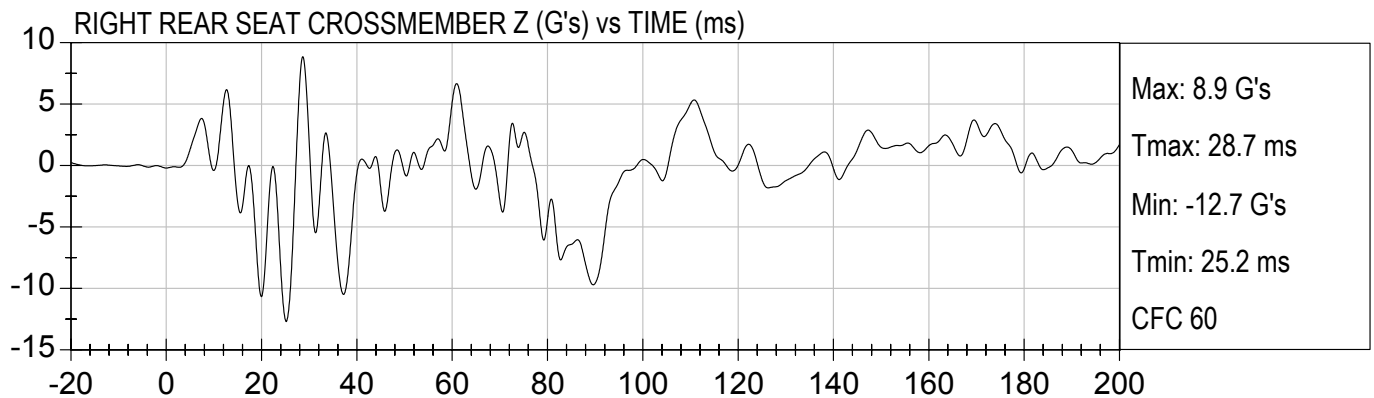






35MPH NCAP FRONTAL
2004 FORD FREESTAR

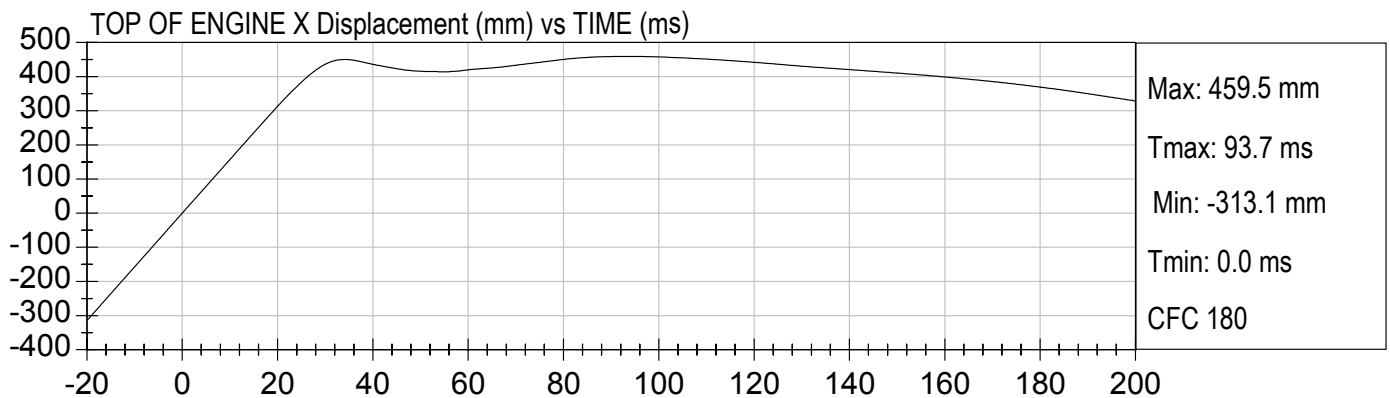
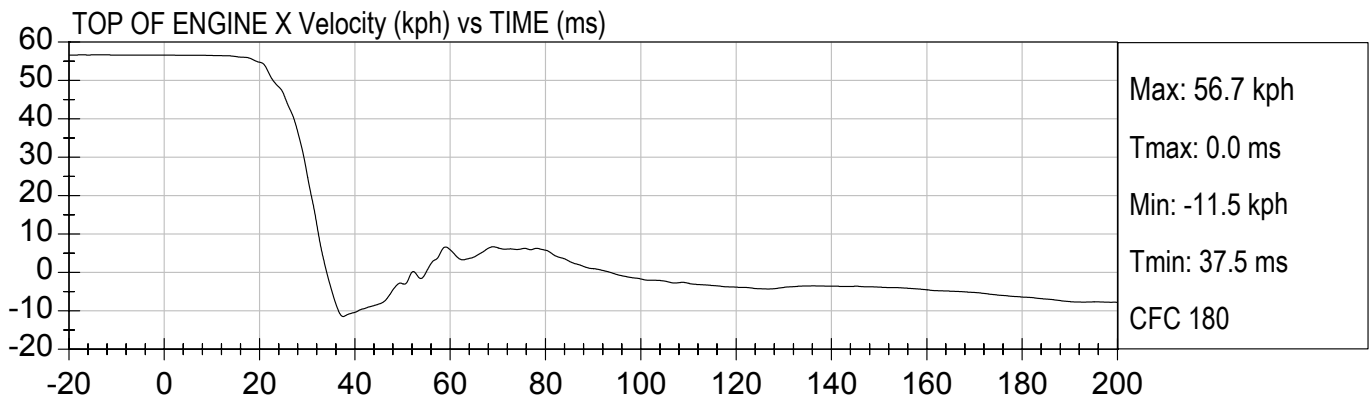
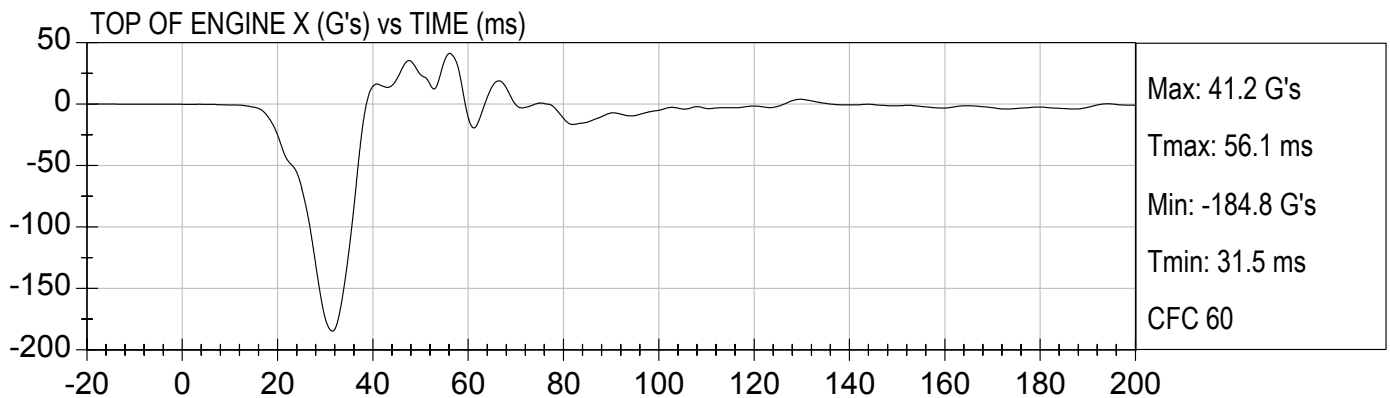
Test Date: 11/12/2003
Speed: 35.2 mph (56.6 km/h)

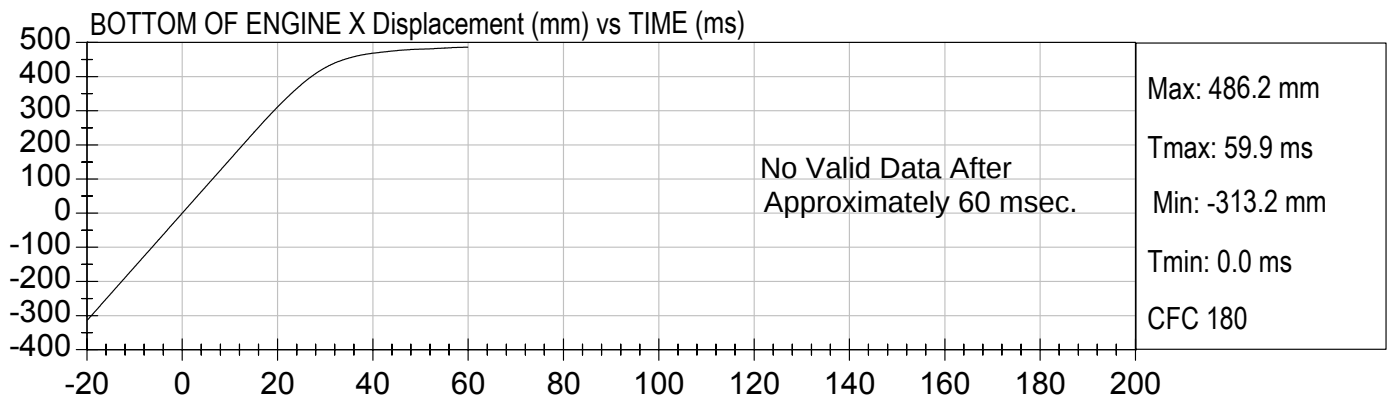
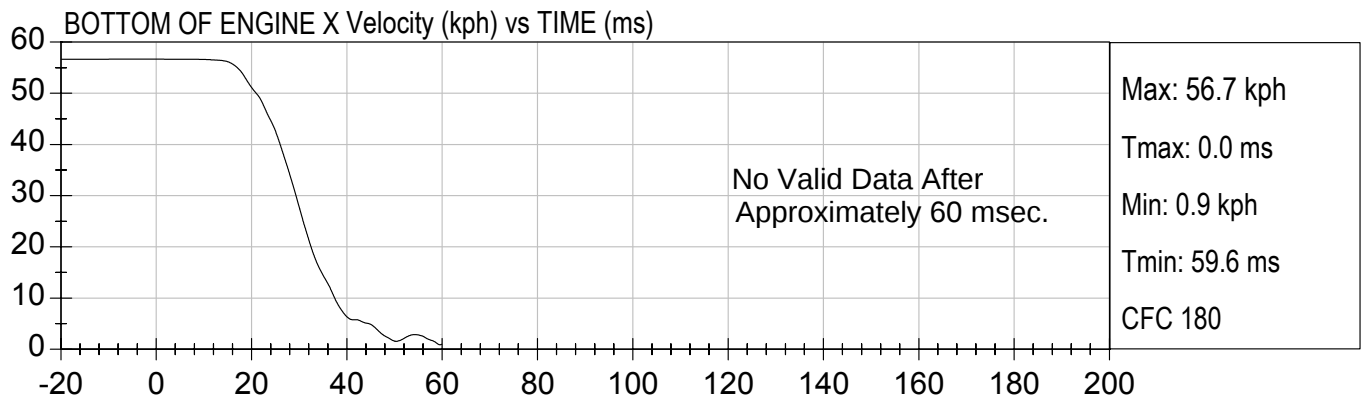
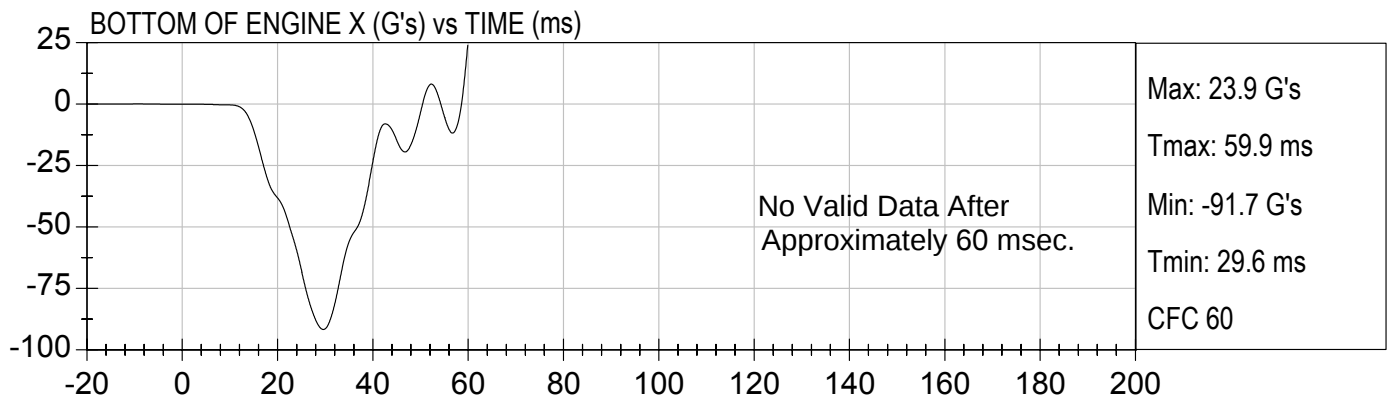




35MPH NCAP FRONTAL
2004 FORD FREESTAR

Test Date: 11/12/2003
Speed: 35.2 mph (56.6 km/h)

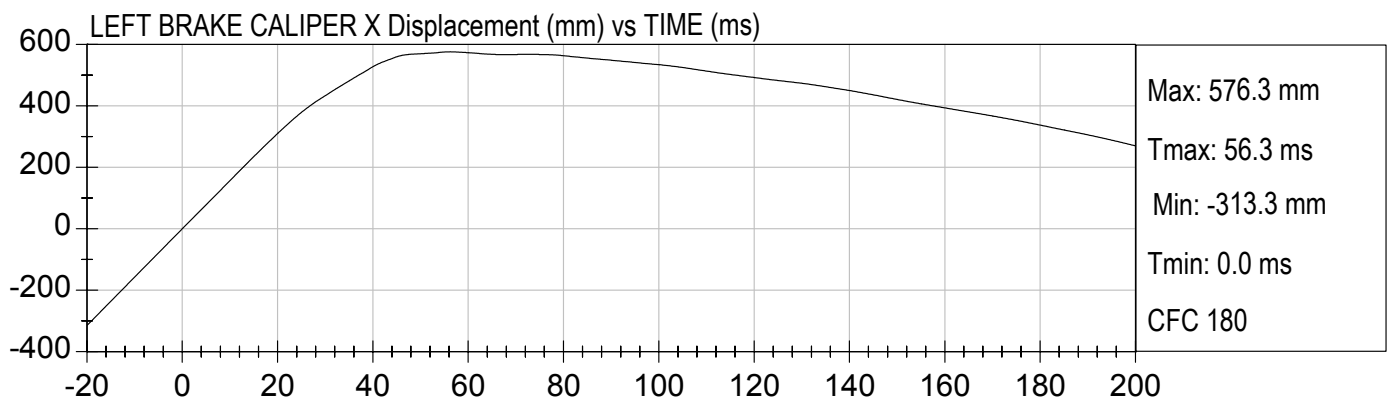
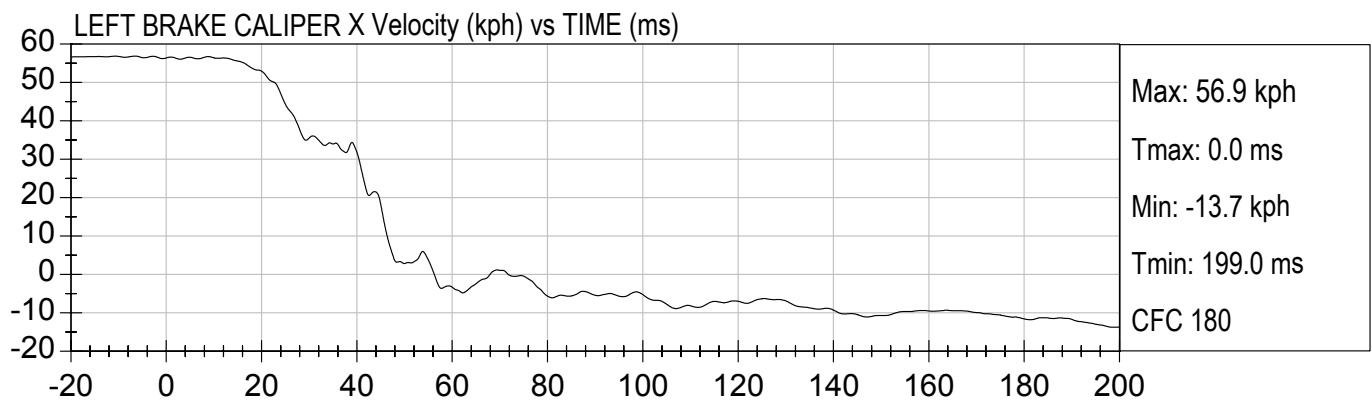
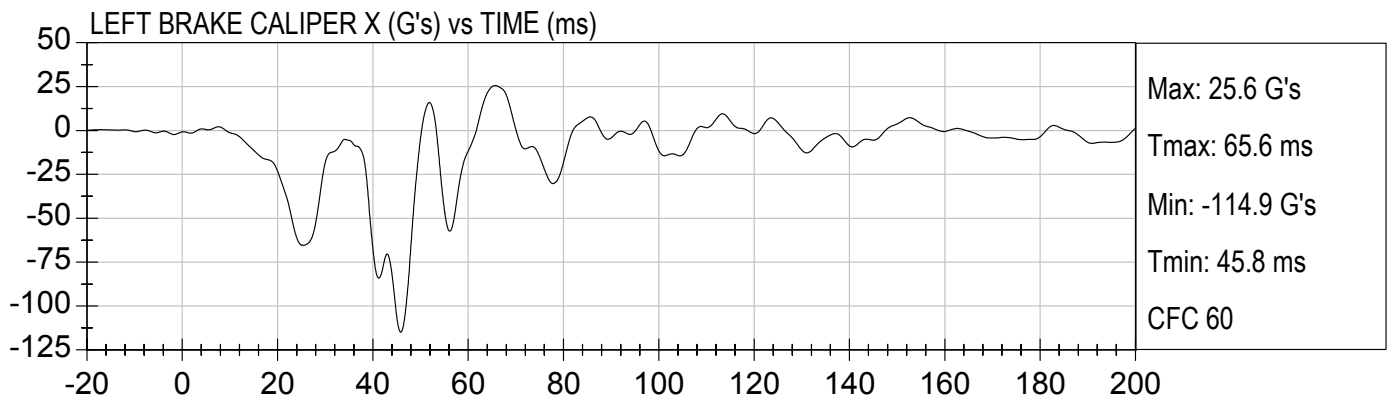


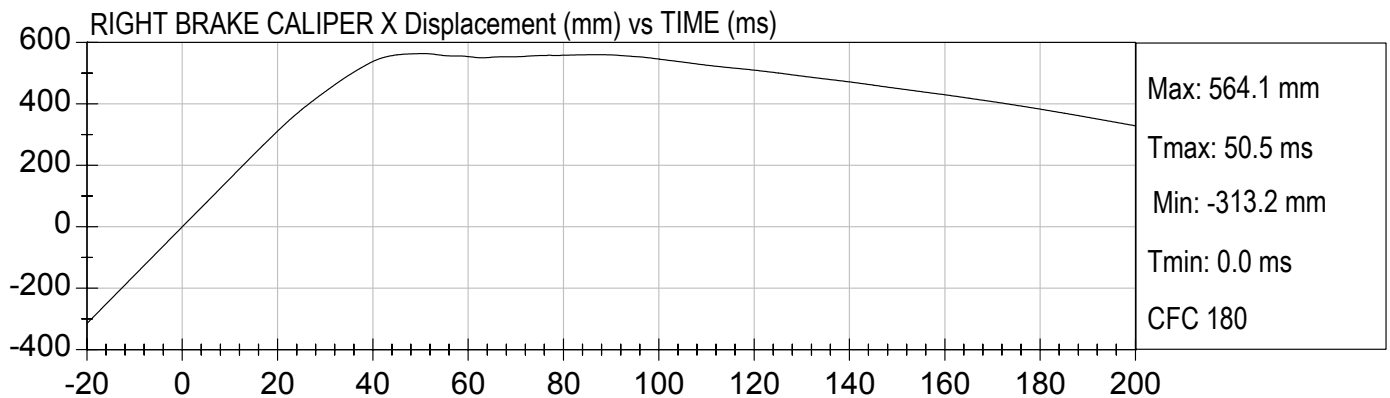
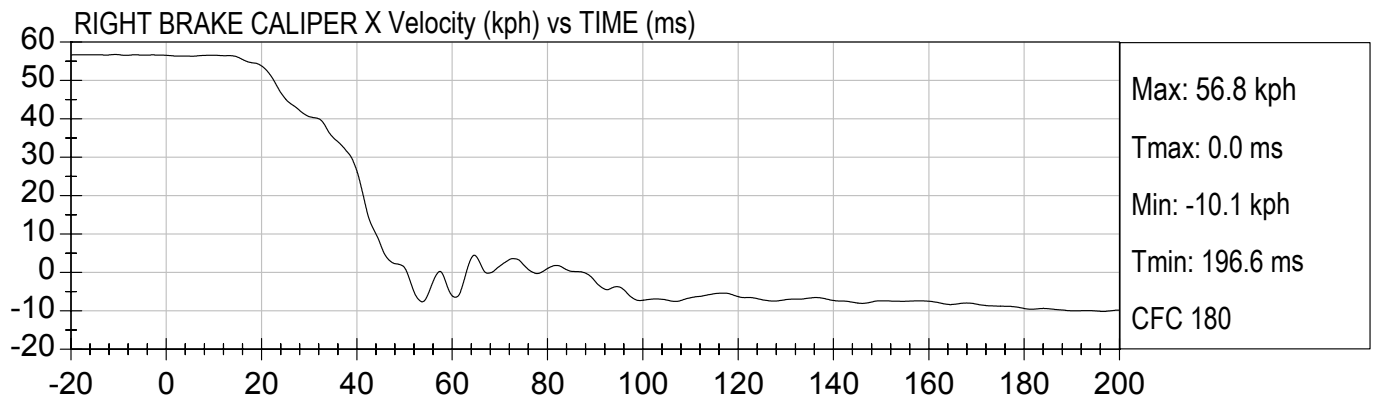
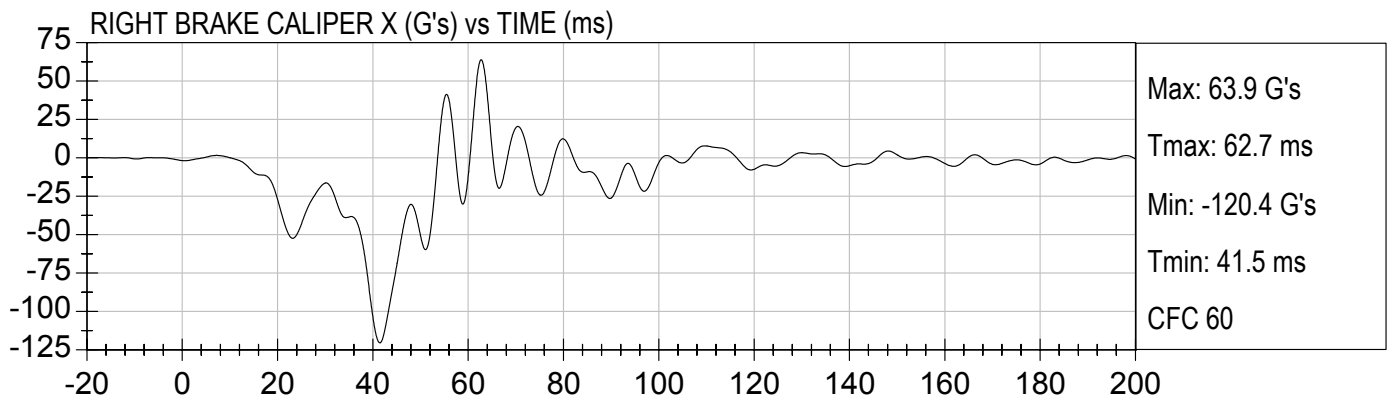




35MPH NCAP FRONTAL
2004 FORD FREESTAR

Test Date: 11/12/2003
Speed: 35.2 mph (56.6 km/h)

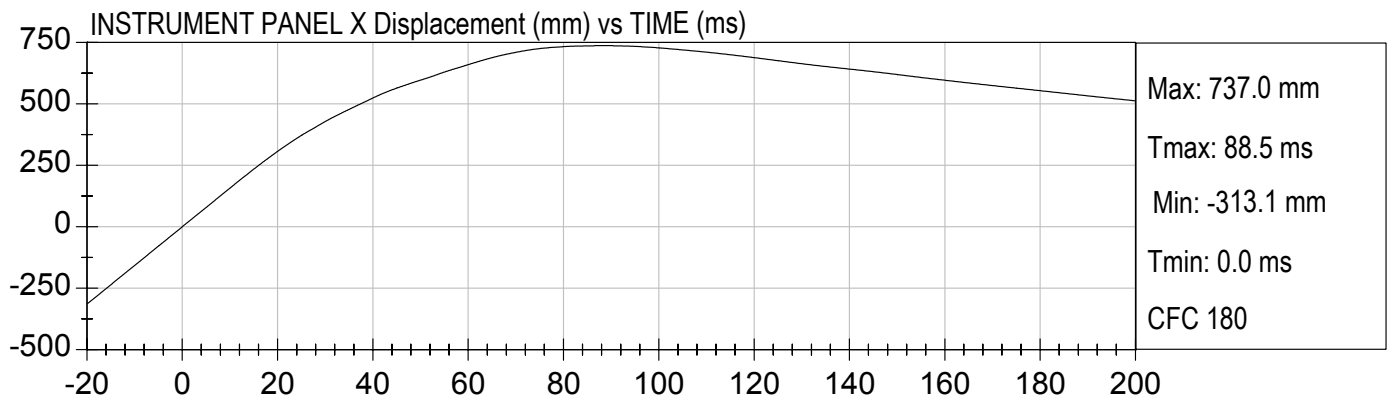
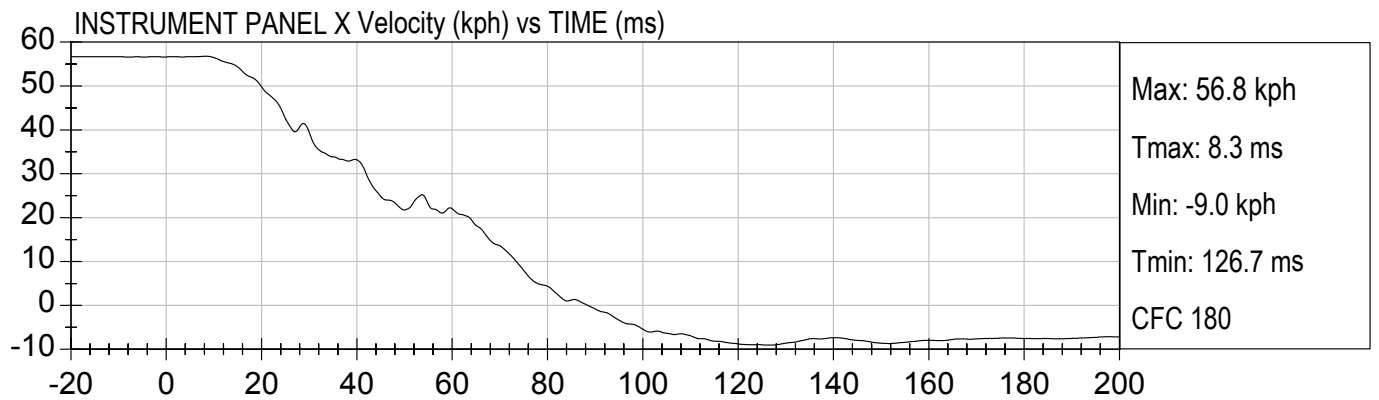
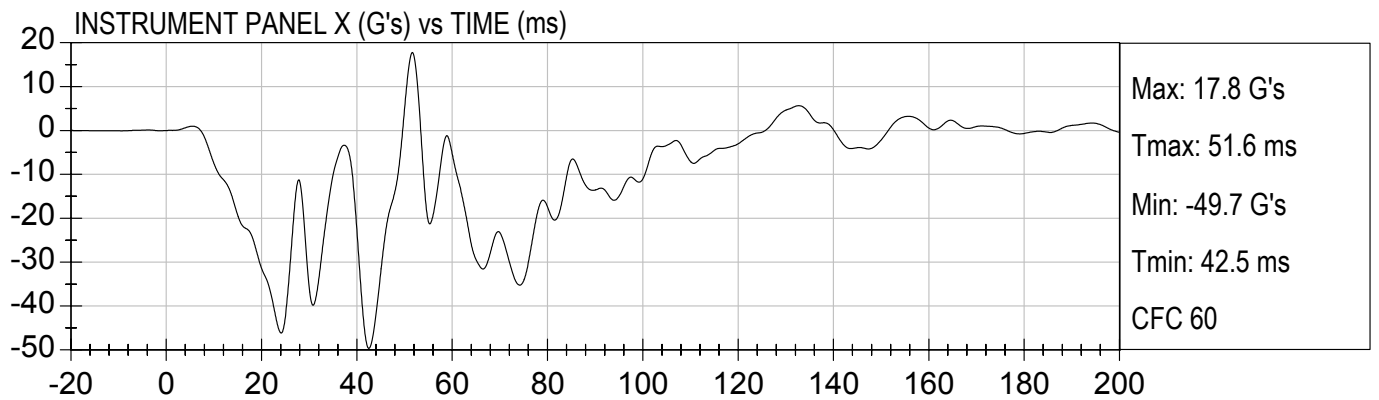






35MPH NCAP FRONTAL
2004 FORD FREESTAR

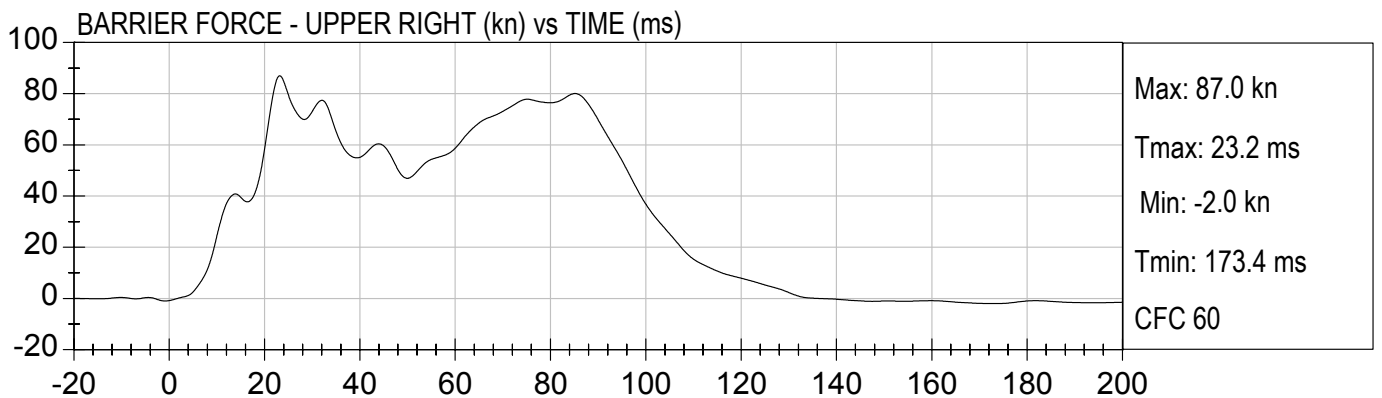
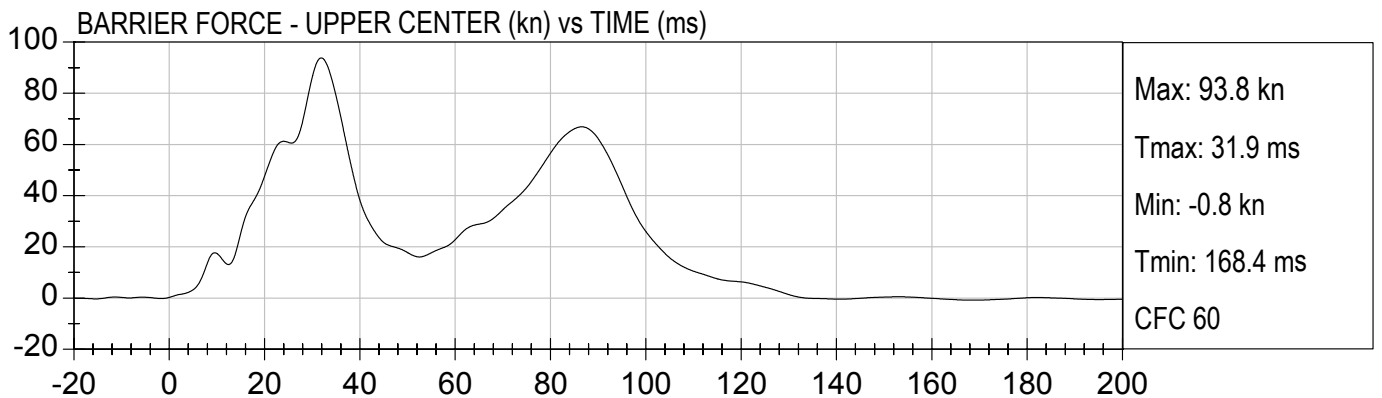
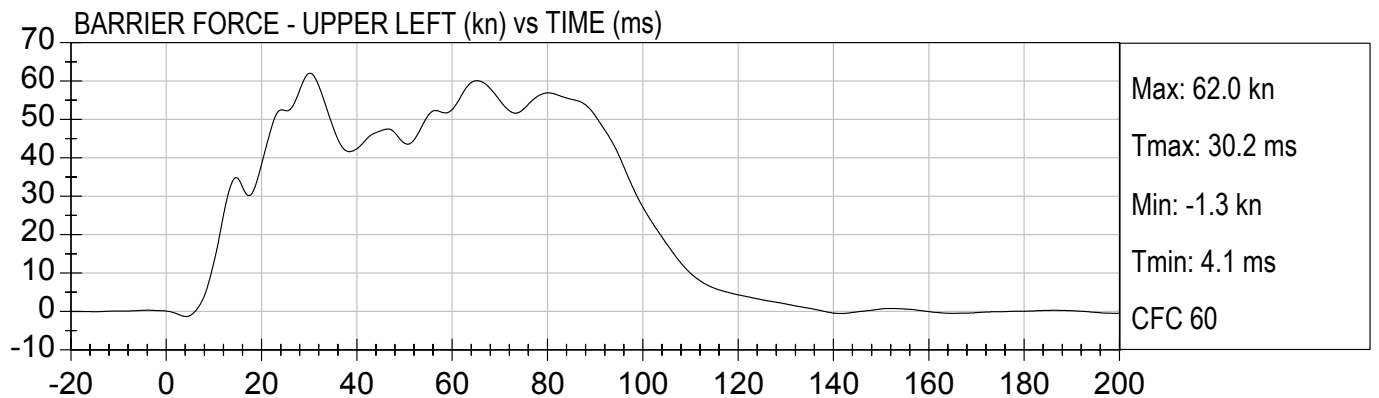
Test Date: 11/12/2003
Speed: 35.2 mph (56.6 km/h)





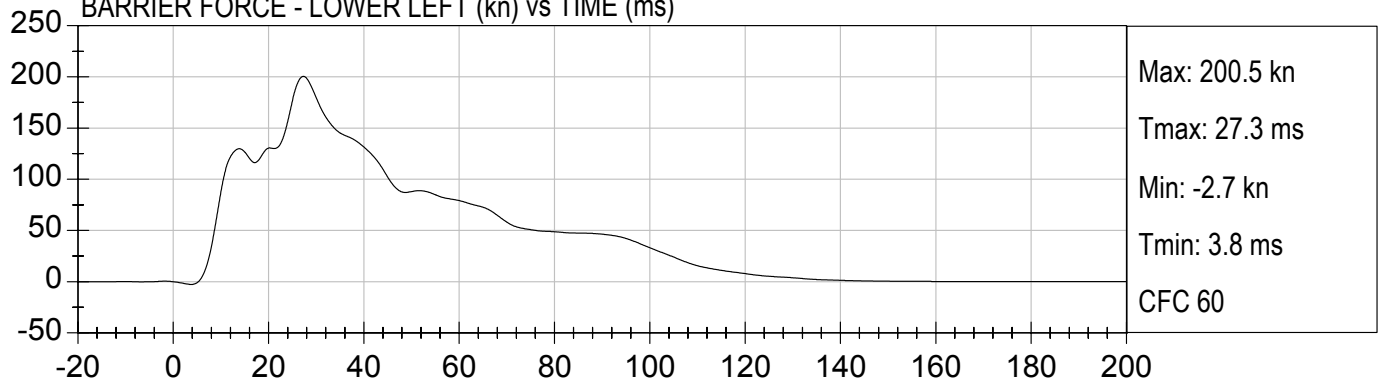
35MPH NCAP FRONTAL
2004 FORD FREESTAR

Test Date: 11/12/2003
Speed: 35.2 mph (56.6 km/h)

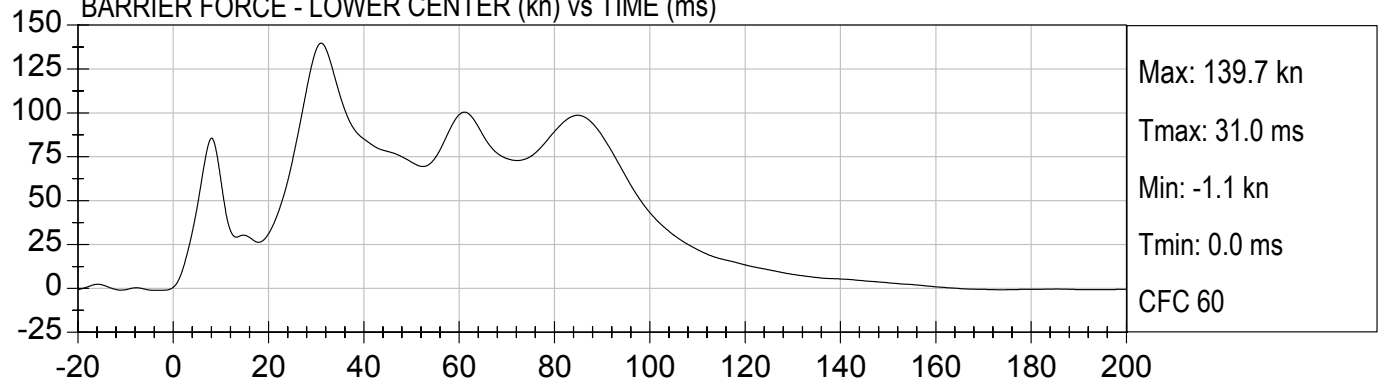




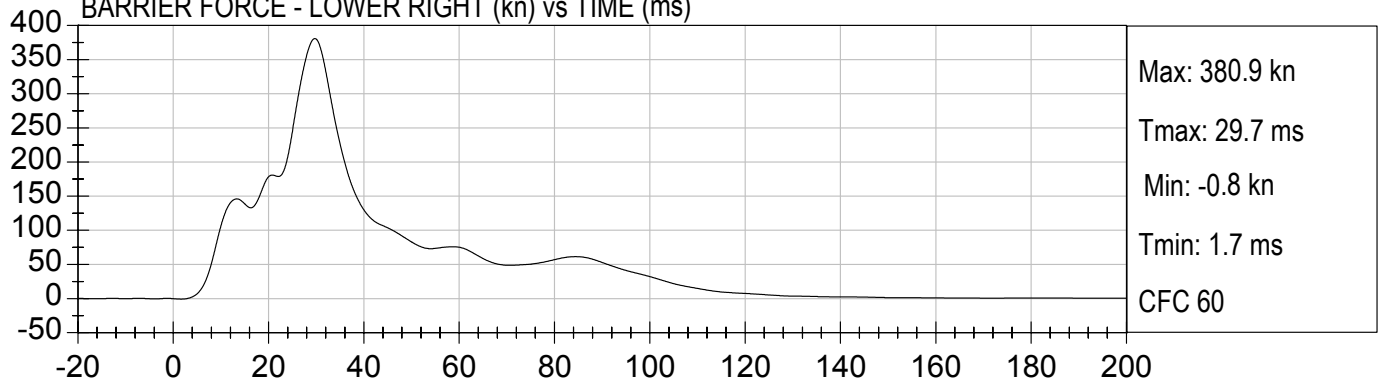
BARRIER FORCE - LOWER LEFT (kn) vs TIME (ms)



BARRIER FORCE - LOWER CENTER (kn) vs TIME (ms)



BARRIER FORCE - LOWER RIGHT (kn) vs TIME (ms)

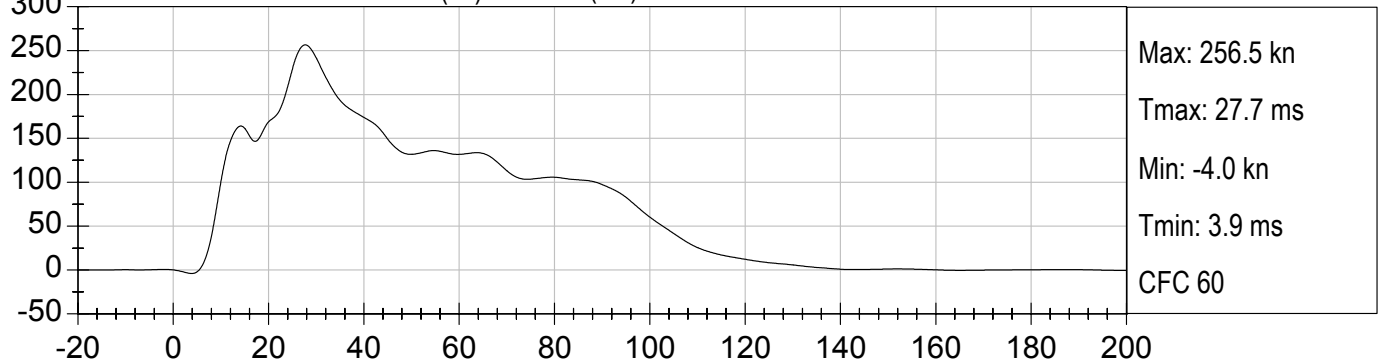




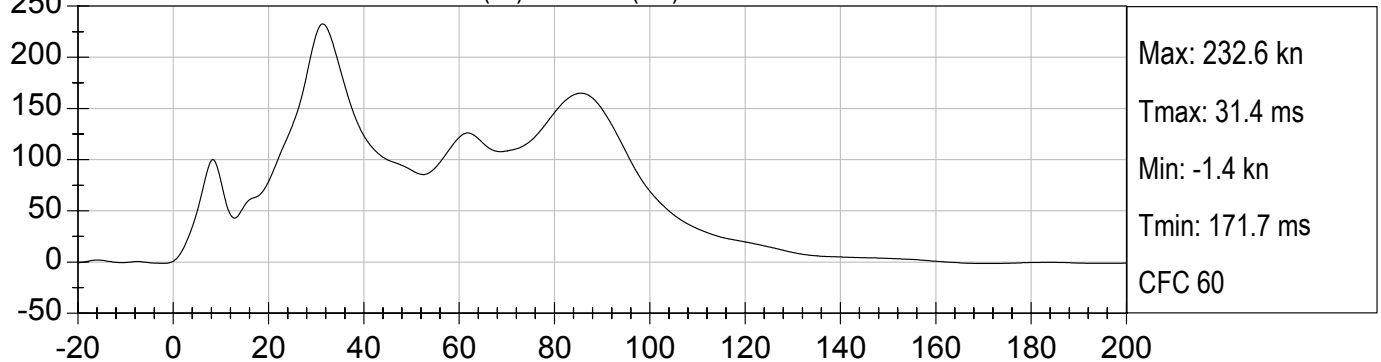
35MPH NCAP FRONTAL
2004 FORD FREESTAR

Test Date: 11/12/2003
Speed: 35.2 mph (56.6 km/h)

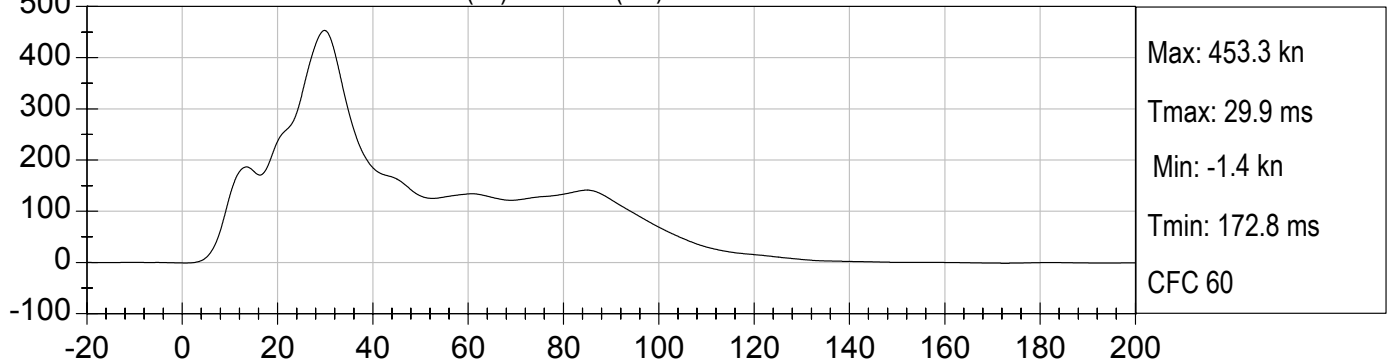
BARRIER FORCE - SUM LEFT (kn) vs TIME (ms)



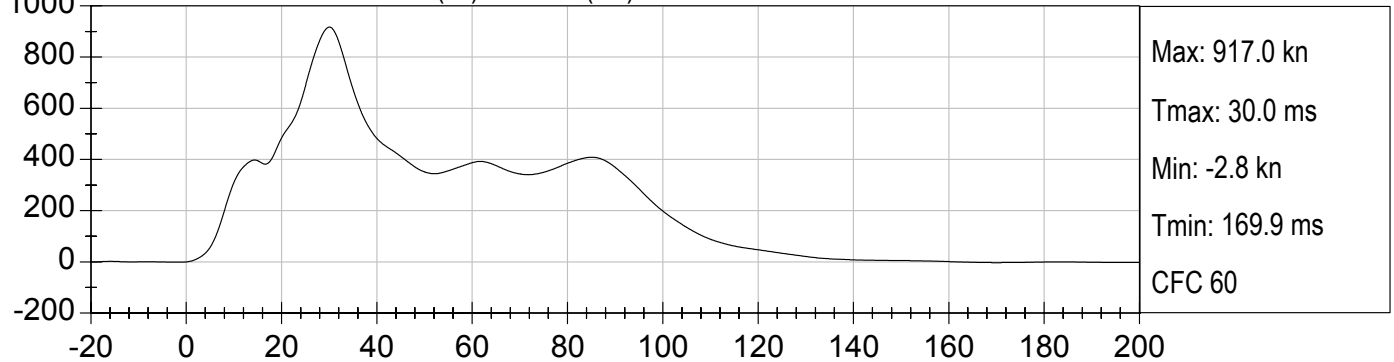
BARRIER FORCE - SUM CENTER (kn) vs TIME (ms)



BARRIER FORCE - SUM RIGHT (kn) vs TIME (ms)



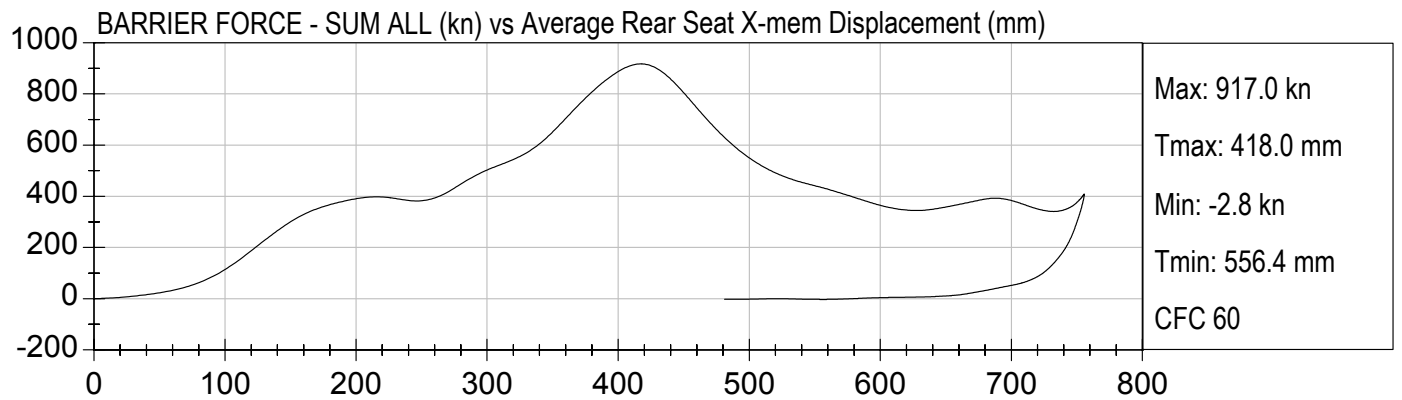
BARRIER FORCE - SUM ALL (kn) vs TIME (ms)





35MPH NCAP FRONTAL
2004 FORD FREESTAR

Test Date: 11/12/2003
Speed: 35.2 mph (56.6 km/h)



APPENDIX C
DUMMY CALIBRATION DATA TRACES AND TABLES

CERTIFICATION DATA

Dummy Serial Number: 065

Calibration Test Results Summary

Dummy Serial Number: 065

Calibration

External Dimensions:	The dummy passed all external dimension requirements.
Head Drop Test:	The head passed all drop test requirements.
Neck Flexion Test:	The neck passed all flexion test requirements.
Neck Extension Test:	The neck passed all extension test requirements.
Thorax Impact Test:	The thorax passed all impact test requirements.
Knee Impact Tests:	Both knees passed all impact test requirements.
Hip-Femur Flexion Tests:	Both femurs passed all flexion test requirements.

HYBRID III DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

Dummy Serial Number: 065

Date of Verification: 9/29/03

Test Number: D03167

DESCRIPTION	SPECIFICATION	TEST RESULTS
Temperature (°F)	20.6 – 22.2	21.1
Relative Humidity	10 – 70 %	30
AA - Location for Chest Circumference	429.3 – 434.3 mm	431.8
BB - Location for Waist Circumference	226.1 – 231.1 mm	228.6
A - Total Sitting Height	878.8 – 889.0 mm	882.7
B – Shoulder Pivot Height	505.5 – 520.7 mm	508.0
C – H Point Height	82.9 – 88.9 mm	88.9
D – H Point from Seat Back	134.7 – 139.7 mm	139.7
E – Shoulder Pivot From Backline	84.8 – 94.0 mm	94.0
F – Thigh Clearance	139.7 – 154.9 mm	146.1
G – Back of Elbow to Wrist Pivot	289.6 – 304.8 mm	292.1
H – Skull Cap Skin to Backline	40.7 – 45.7 mm	44.5
I – Shoulder Elbow Length	330.2 – 345.4 mm	330.2
J – Elbow Rest Height	190.5 – 210.9 mm	196.9
K – Buttock Knee Length	579.1 – 604.5 mm	603.3
L – Popliteal Height	429.3 – 454.7 mm	444.5
M – Knee Pivot Height	485.2 – 500.4 mm	488.2
N – Buttock Popliteal Length	452.1 – 477.5 mm	469.9
O – Chest Depth at 3 rd Rib	213.4 – 228.6 mm	215.9
P – Foot Length	251.5 – 266.7 mm	254.0
V – Shoulder Breadth	421.7 – 436.9 mm	434.3
W – Foot Breadth	91.5 – 106.7 mm	98.4
Y – Chest Circumference	970.3 – 1000.7 mm	977.9
Z – Waist Circumference	835.7 – 866.1 mm	844.6

Technician: Jessica Hall

Approved By: Shafika Gaural

Hybrid III Calibration Data Sheet

50th Percentile Male

Head Drop Calibration

ATD Serial No: 065

Test I.D: D031671

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Peak Resultant Acceleration	G's	225.0 to 275.0	234.9	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	10.9	Pass
Is Acceleration Unimodal?	Yes/No	< 10% Peak	Yes	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

Shafalika Gaurwal
Approved By

09/29/2003
Test Date



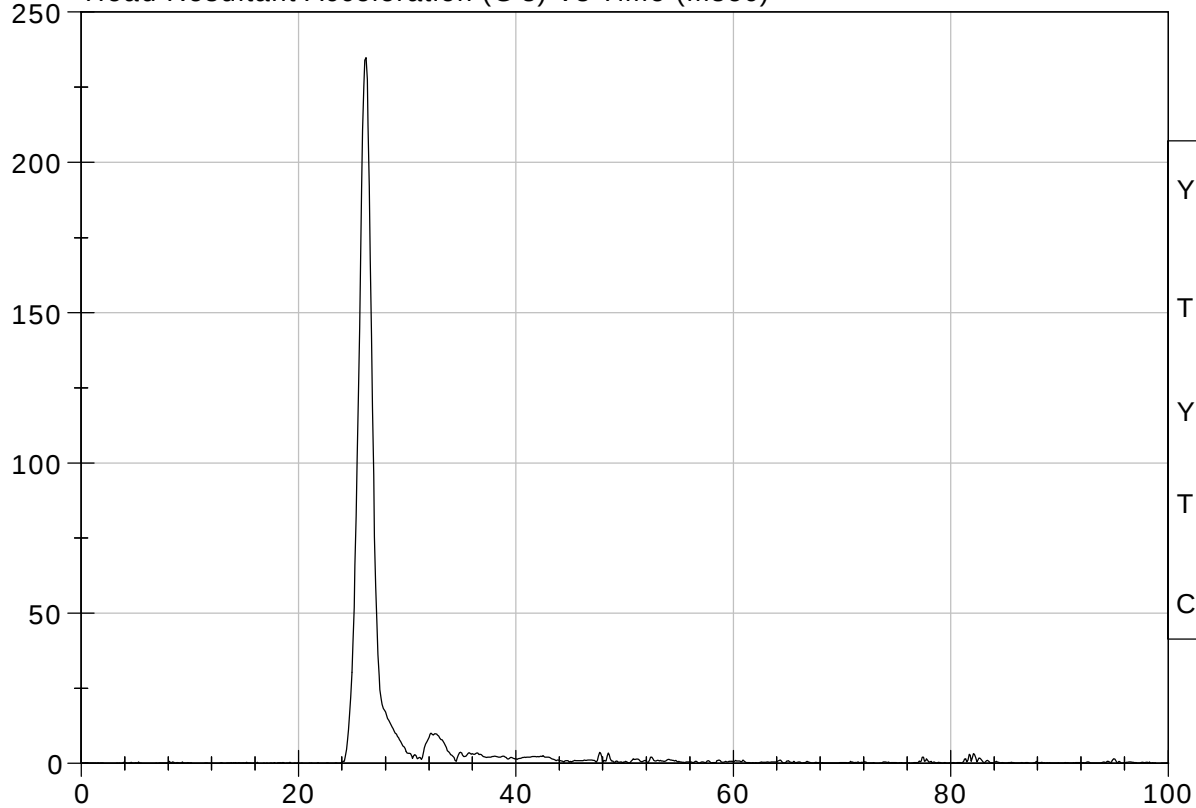
Test Description: Head Drop

Test Date: 09/29/2003

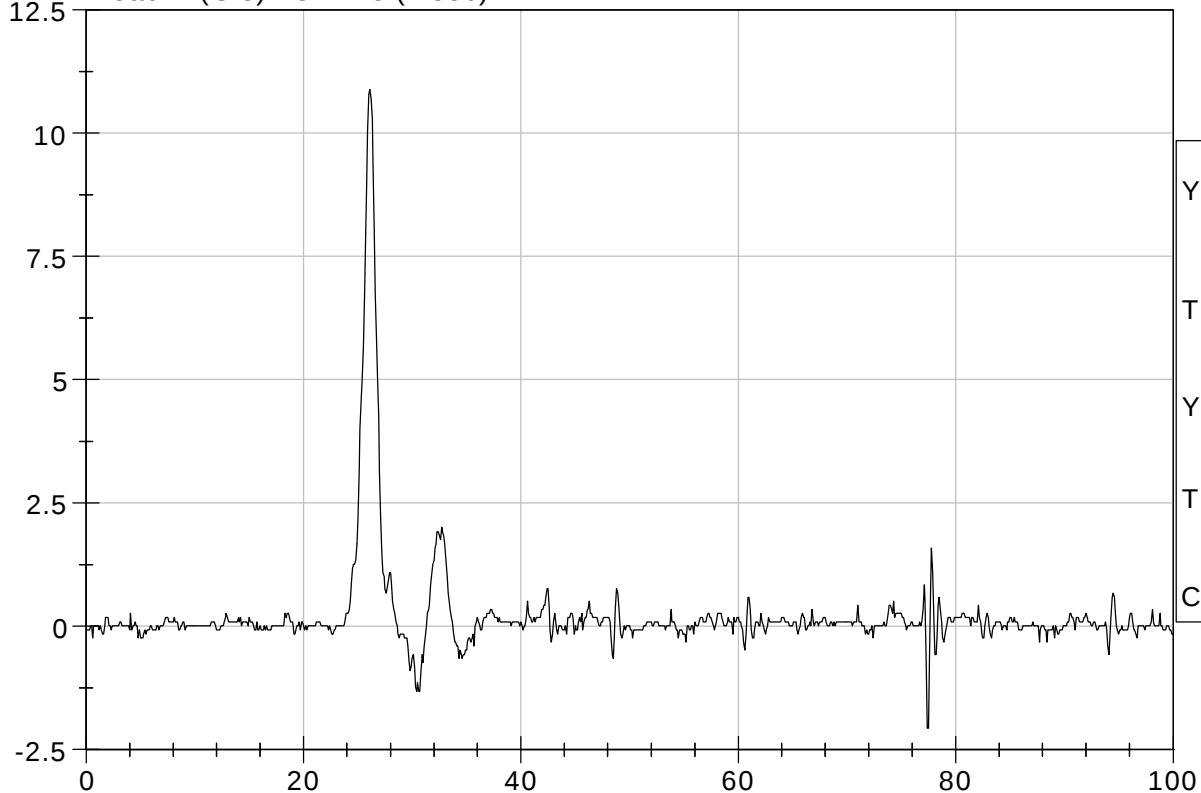
Component: D031671

Speed: 0 ft/s, 0.00 m/s

Head Resultant Acceleration (G's) Vs Time (msec)



Head Y (G's) Vs Time (msec)



Hybrid III Calibration Data Sheet

50th Percentile Male

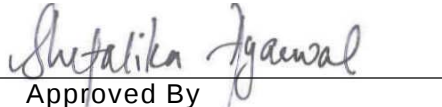
Neck Flexion Test

ATD Serial No: 065

Test I.D: D031672

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	26	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.89	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	23.94	Pass
	20 msec	G's	17.60 to 22.60	20.02	Pass
	30 msec	G's	12.50 to 18.50	13.89	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	13.89	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	36.7	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	74.3	Pass
	Time	msec	57.0 to 64.0	58.4	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	113.4	Pass
Moment About Occipital Condyle	Maximum	N m	84.1 to 108.5	95.6	Pass
	Time	msec	47.0 to 58.0	49.4	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	102.2	Pass
Overall Test Results					Pass


Laboratory Technician


Approved By

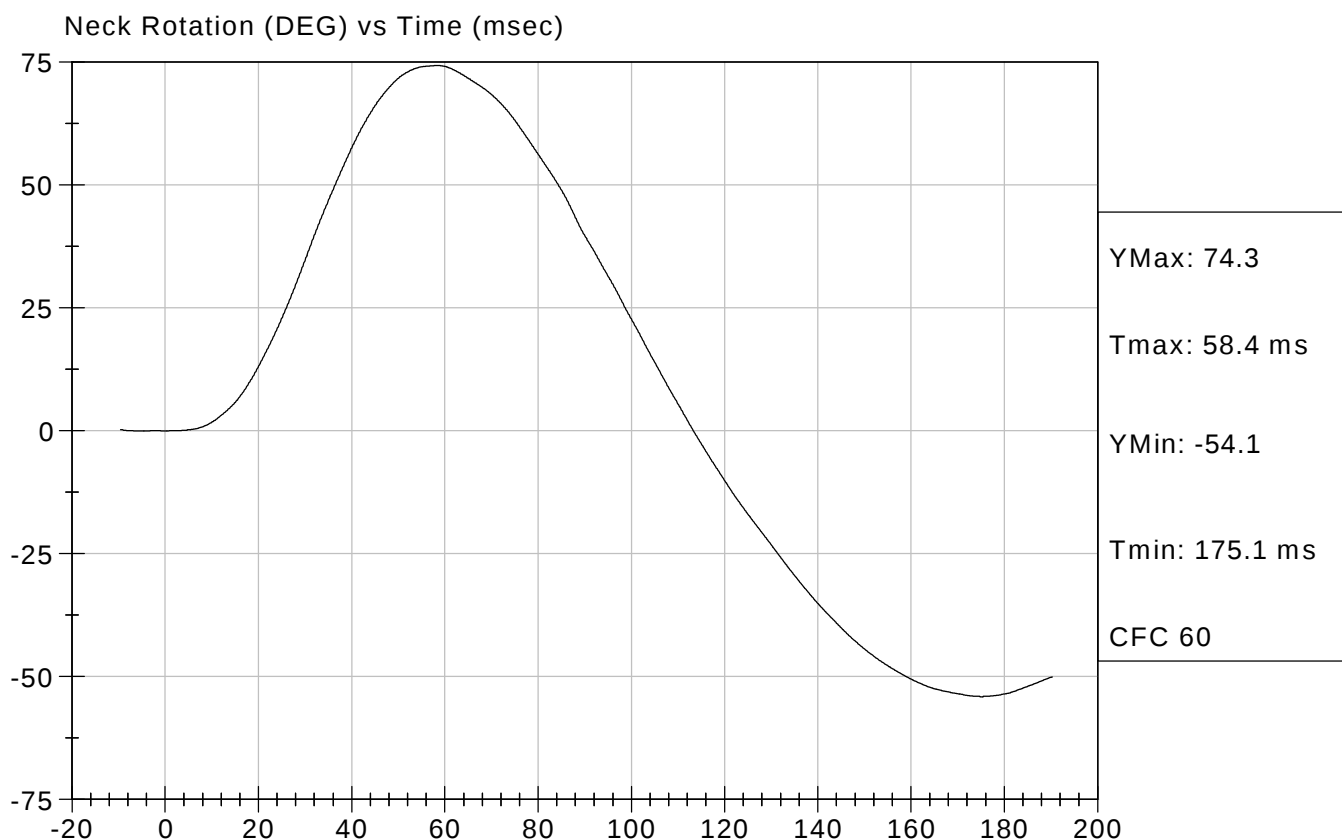
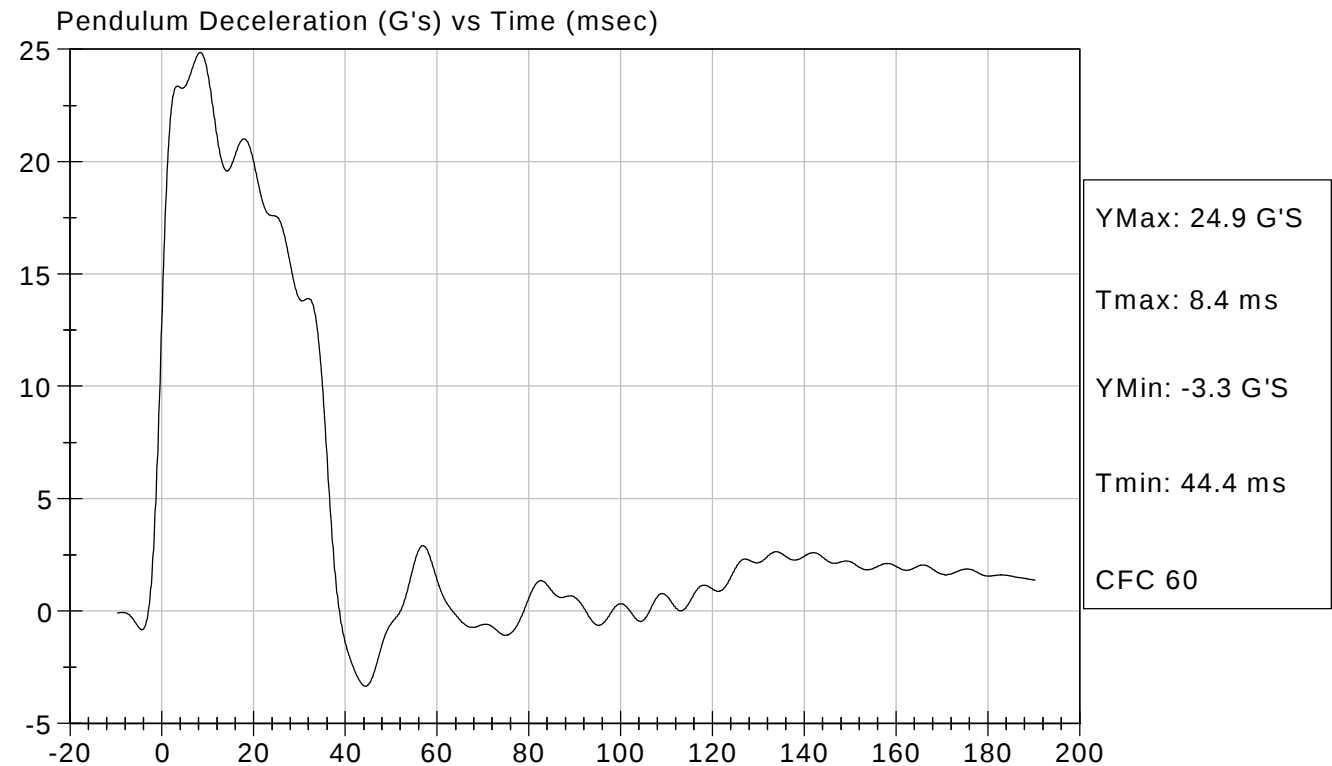
09/30/2003

Test Date



Test Desc: Neck Flexion
Component ID: D031672

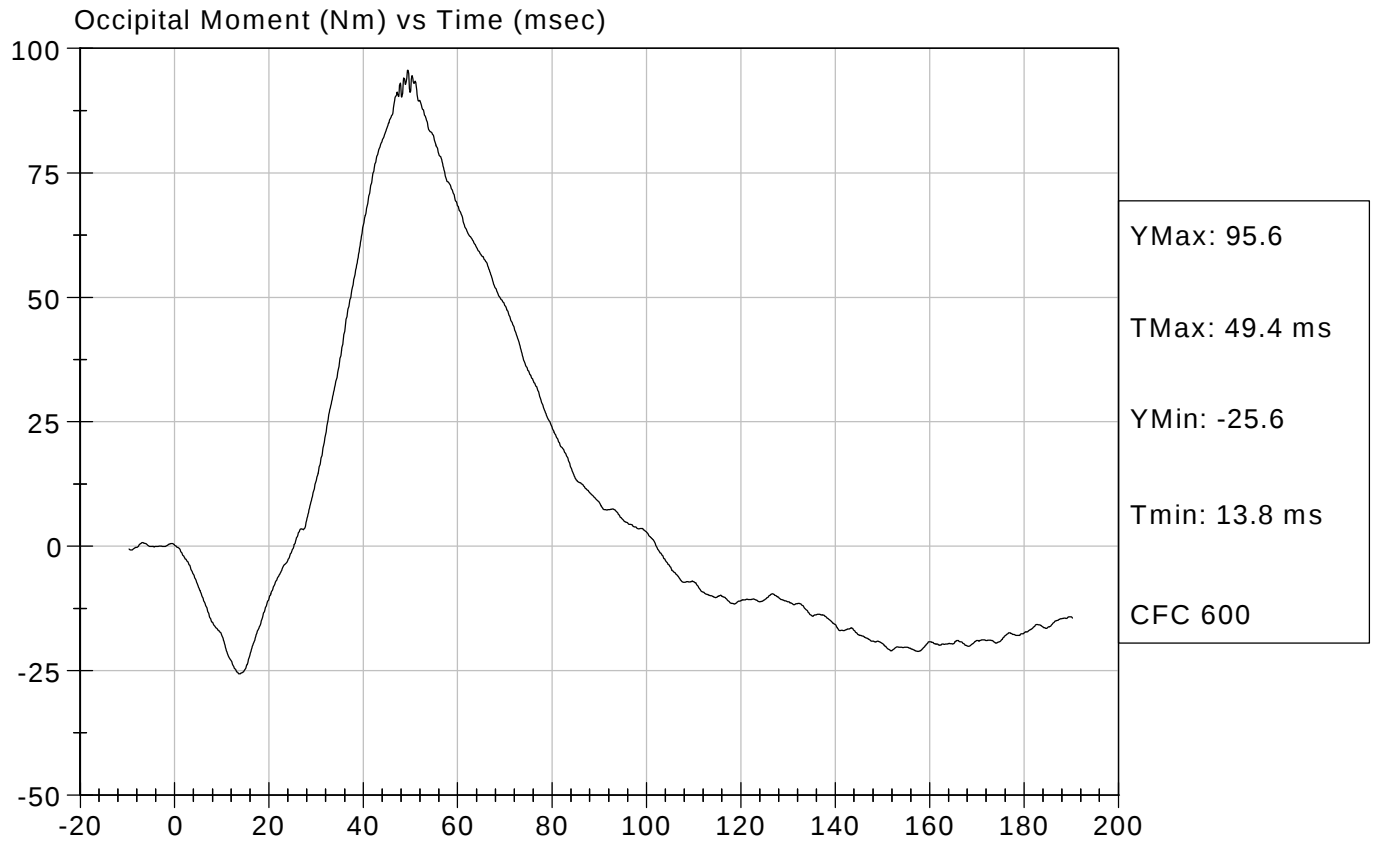
Test Date: 09/30/2003
Speed: 22.61 ft/sec, 6.89 m/sec





Test Desc: Neck Flexion
Component ID: D031672

Test Date: 09/30/2003
Speed: 22.61 ft/sec, 6.89 m/sec



Hybrid III Calibration Data Sheet

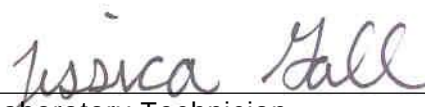
50th Percentile Male

Neck Extension Test

ATD Serial No: 065

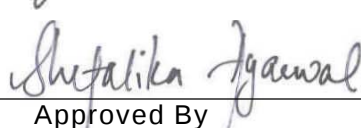
Test I.D: D031673

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity		%	10 to 70	26	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.01	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	18.87	Pass
	20 msec	G's	14.00 to 19.00	17.13	Pass
	30 msec	G's	11.00 to 16.00	12.61	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	13.1	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	39.5	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	100.0	Pass
	Time	msec	72.0 to 82.0	75.9	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	155.4	Pass
Moment About Occipital Condyle	Minimum	N m	-52.9 to -79.9	-65.5	Pass
	Time	msec	65.0 to 79.0	72.1	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	141.1	Pass
Overall Test Results					Pass


Laboratory Technician

09/30/2003

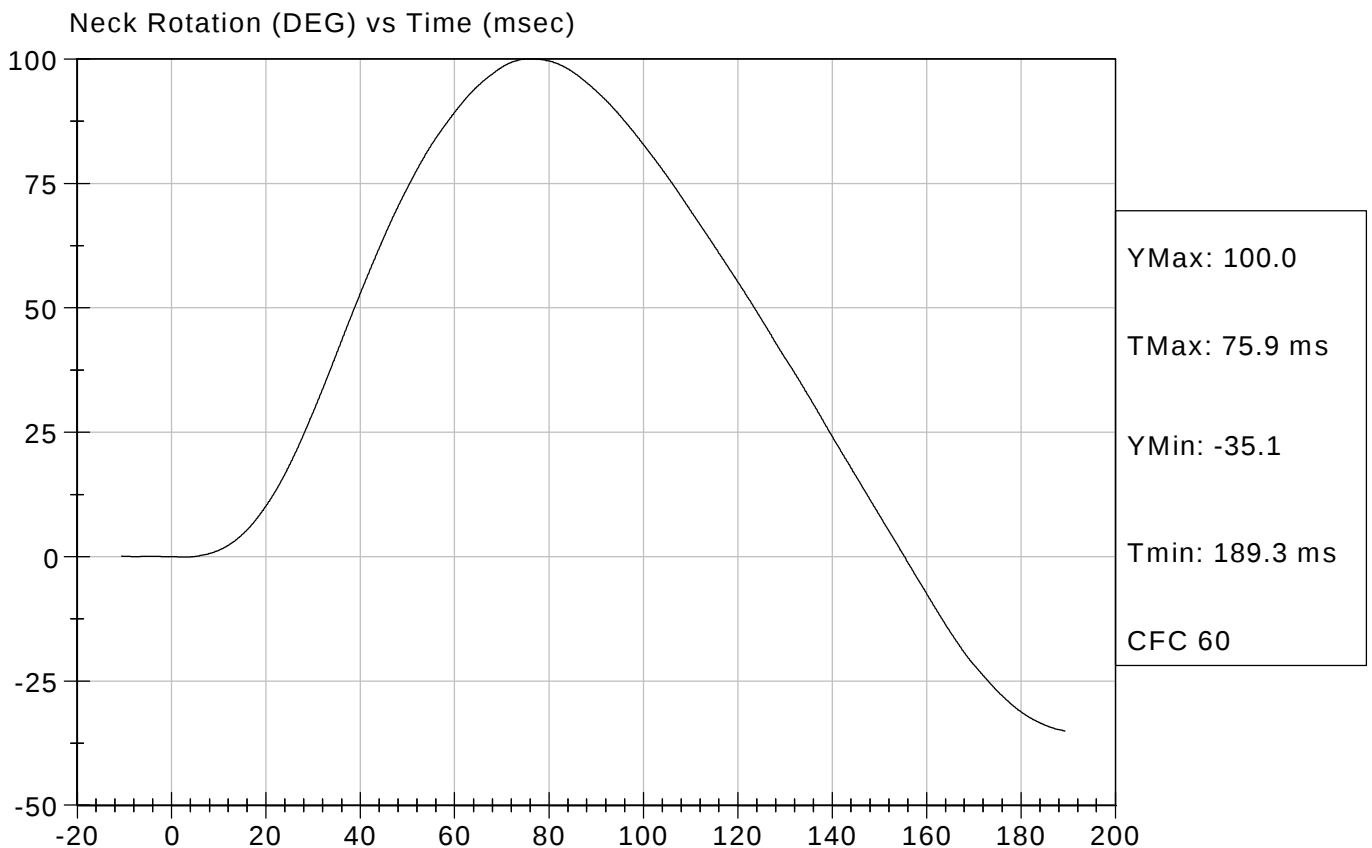
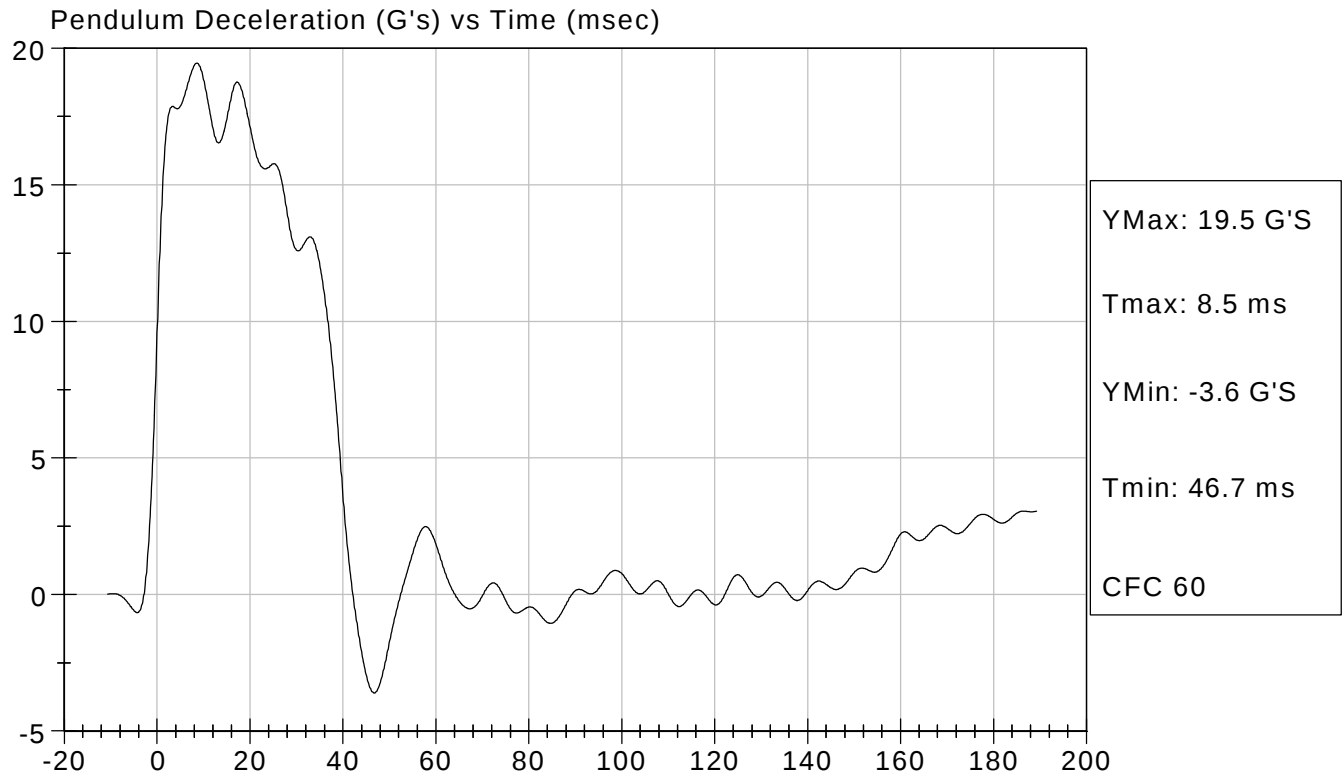
Test Date


Approved By



Test Desc: Neck Extension
Component ID: D031673

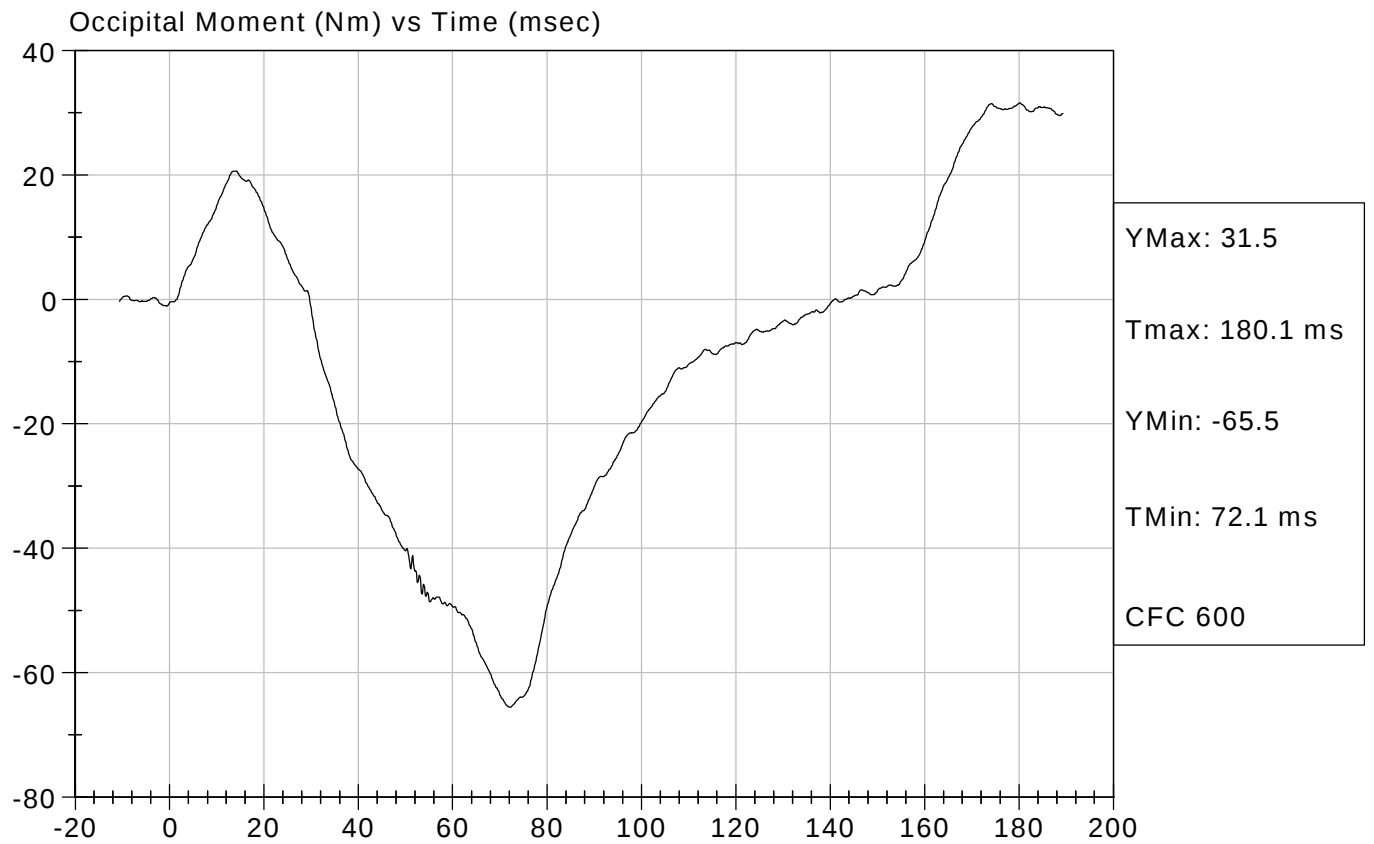
Test Date: 09/30/2003
Speed: 19.72 ft/sec, 6.01 m/sec





Test Desc: Neck Extension
Component ID: D031673

Test Date: 09/30/2003
Speed: 19.72 ft/sec, 6.01 m/sec



Hybrid III Calibration Data Sheet

50th Percentile Male

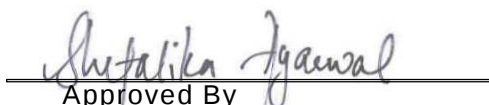
Thorax Impact Test

ATD Serial No: 065

Test I.D: D031674

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Probe Velocity	m/s	6.58 to 6.82	6.73	Pass
Peak Probe Force	Newtons	5159 to 5893	5,536	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.85	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Overall Test Results				Pass


Laboratory Technician


Approved By

10/02/2003

Test Date

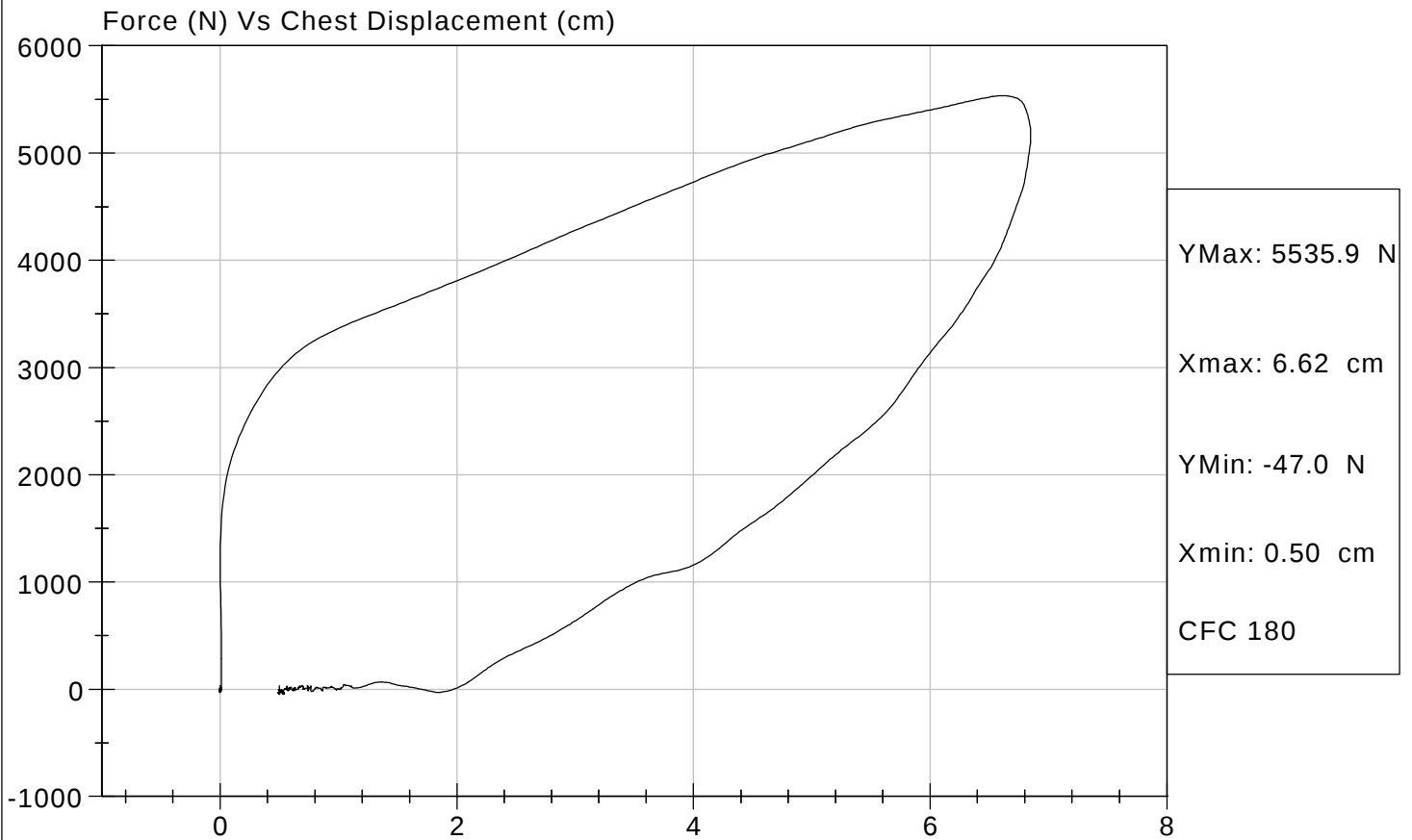


Test Description: Thorax Impact

Test Date: 10/02/2003

Component: D031674

Speed: 22.07 ft/sec, 6.73 m/sec



Hybrid III Calibration Data Sheet

50th Percentile Male

Right Knee Impact Test

ATD Serial No: 065

Test I.D: D031675

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	Newtons	4715 to 5782	5,401	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

Shitalika Jaiswal
Approved By

09/30/2003
Test Date

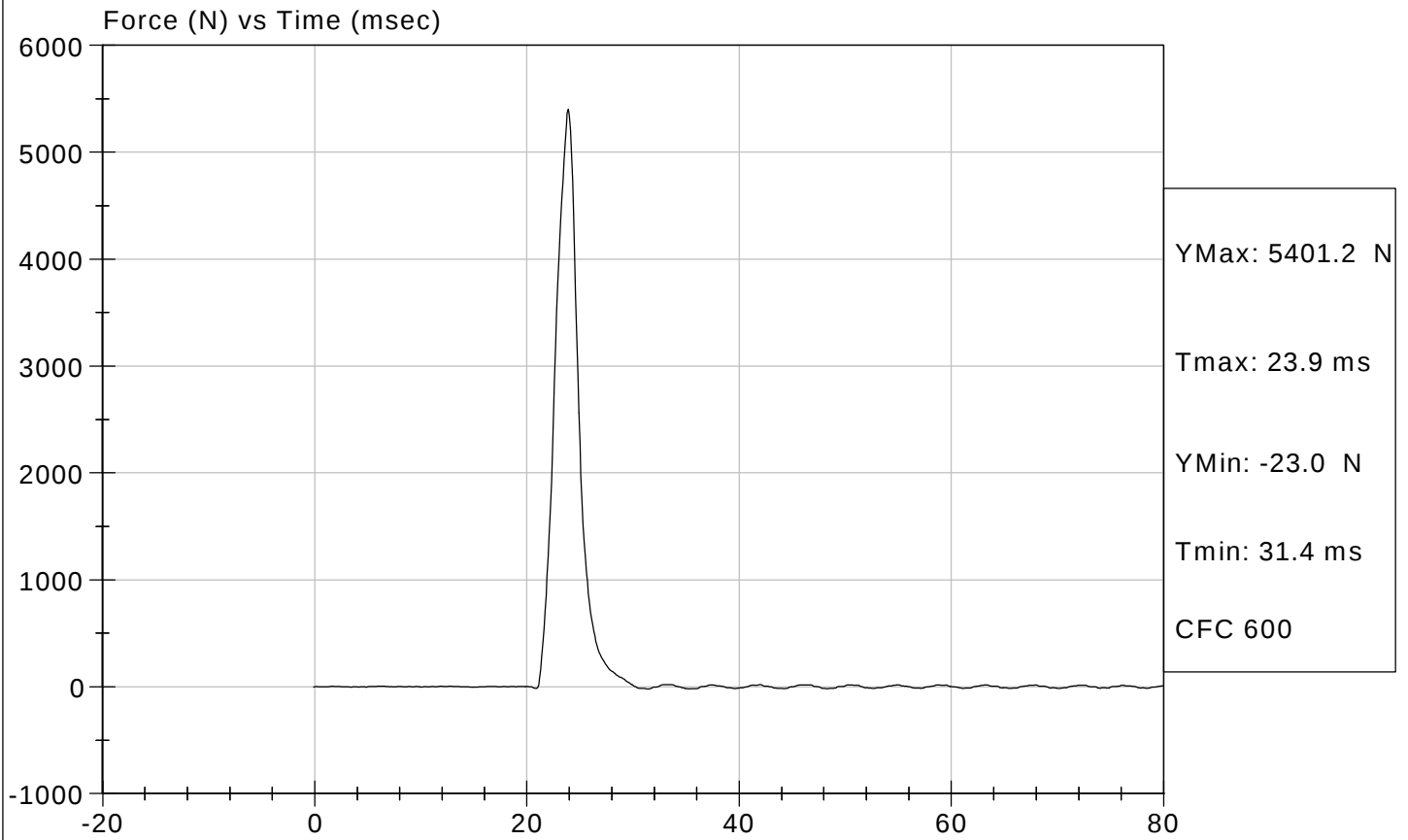


Test Description: Right Knee

Test Date: 09/30/2003

Component: D031675

Speed: 6.96 ft/sec, 2.121 m/sec



Hybrid III Calibration Data Sheet

50th Percentile Male

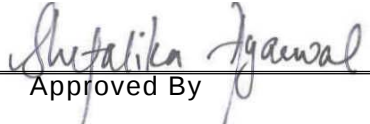
Left Knee Impact Test

ATD Serial No: 065

Test I.D: D031676

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Probe Velocity	m/s	2.07 to 2.13	2.08	Pass
Peak Probe Force	Newtons	4715 to 5782	5,234	Pass
Overall Test Results				Pass


Laboratory Technician


Approved By

09/30/2003

Test Date

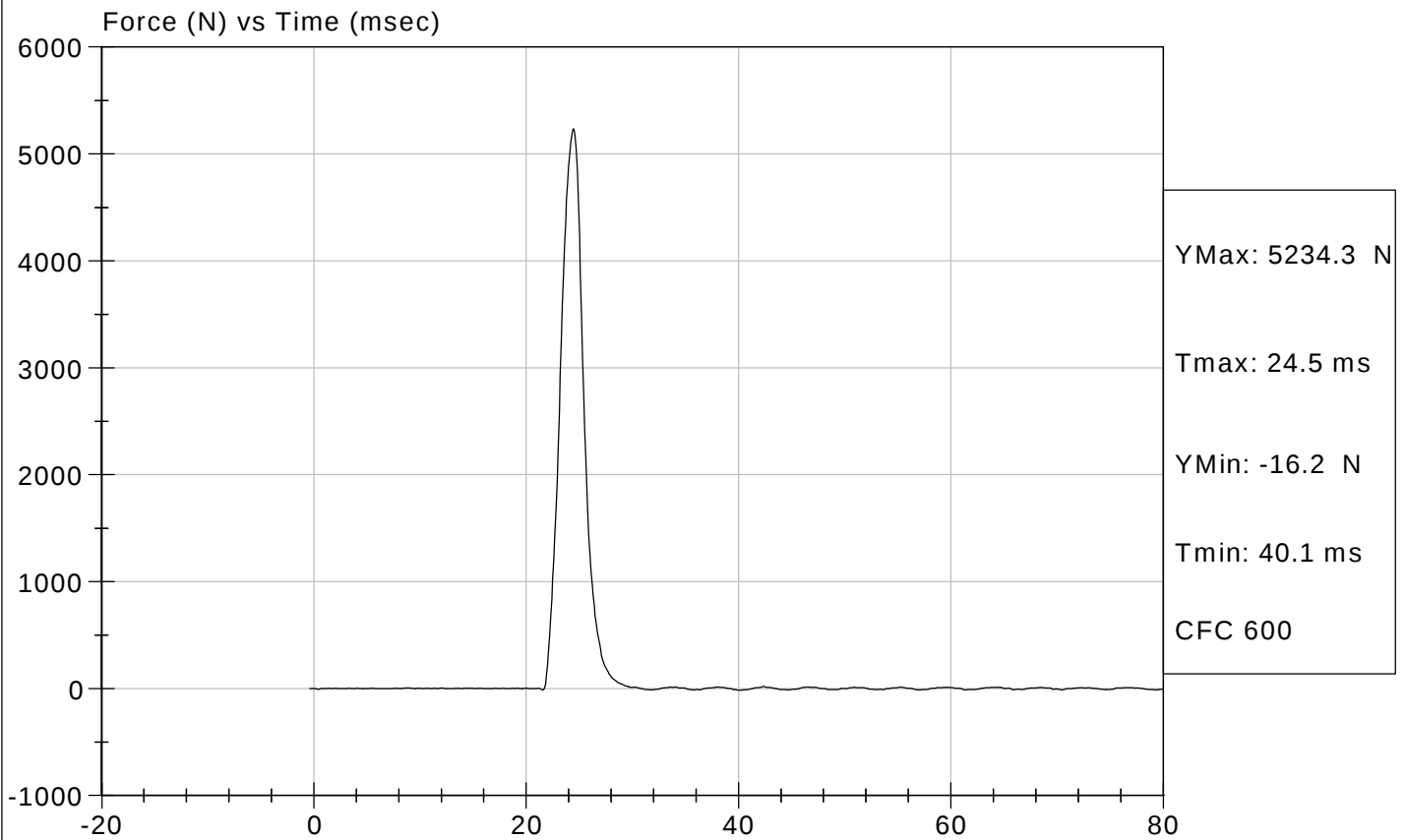


Test Description: Left Knee

Test Date: 09/30/2003

Component: D031676

Speed: 6.83 ft/sec, 2.082 m/sec



Hybrid III Calibration Data Sheet

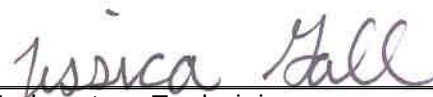
50th Percentile Male

Hip-Femur Flexion Test

ATD Serial No: 065

Test I.D: D031670

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.1	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	26	26	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	69.2	68.5	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	44	44	Pass
Overall Test Results					Pass


Laboratory Technician


Approved By

09/30/2003
Test Date

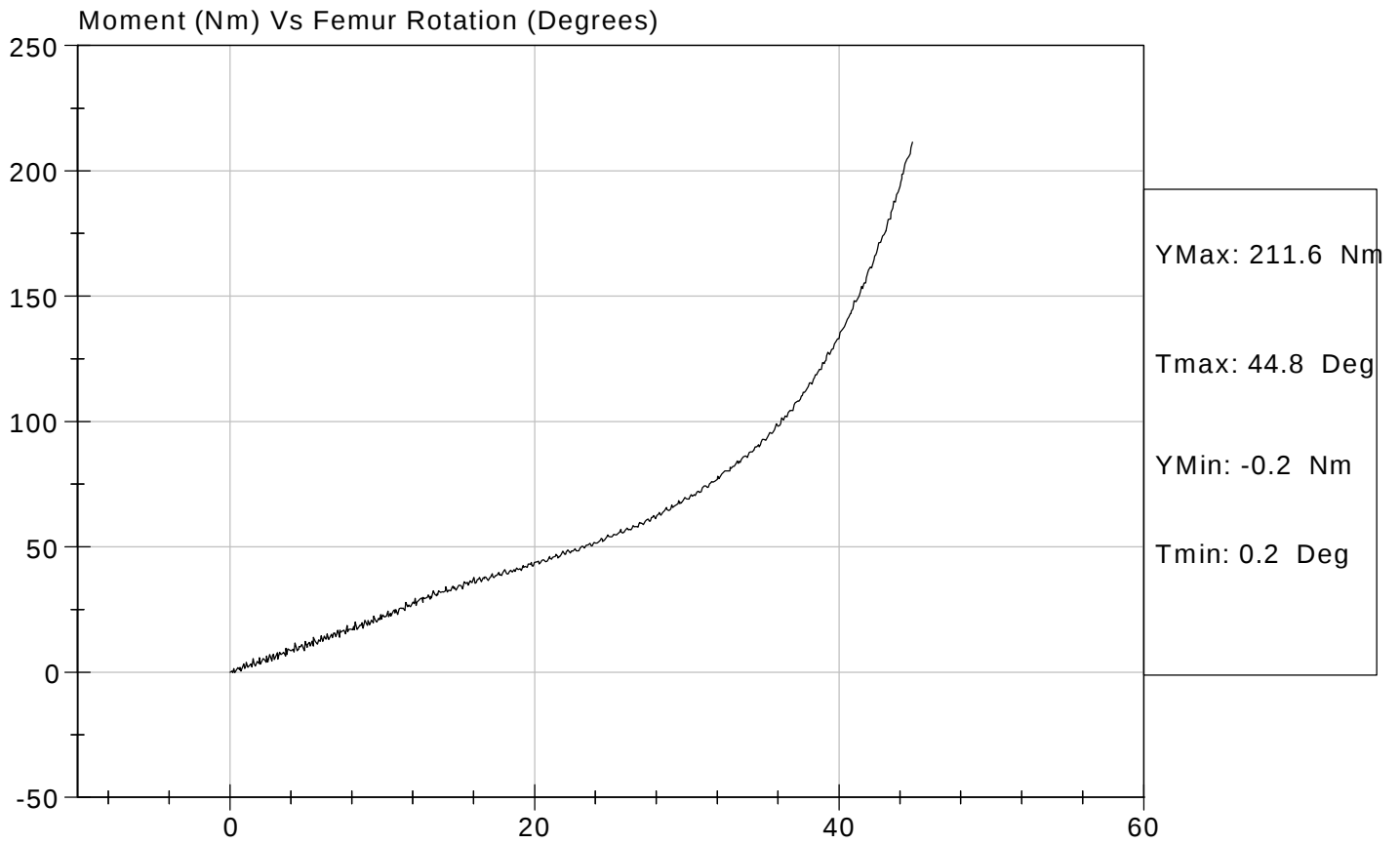


Test Description: Hip Femur Flexion

Test Date: 09/30/2003

Component: D031679

Speed: 0 ft/sec, 0.00 m/sec



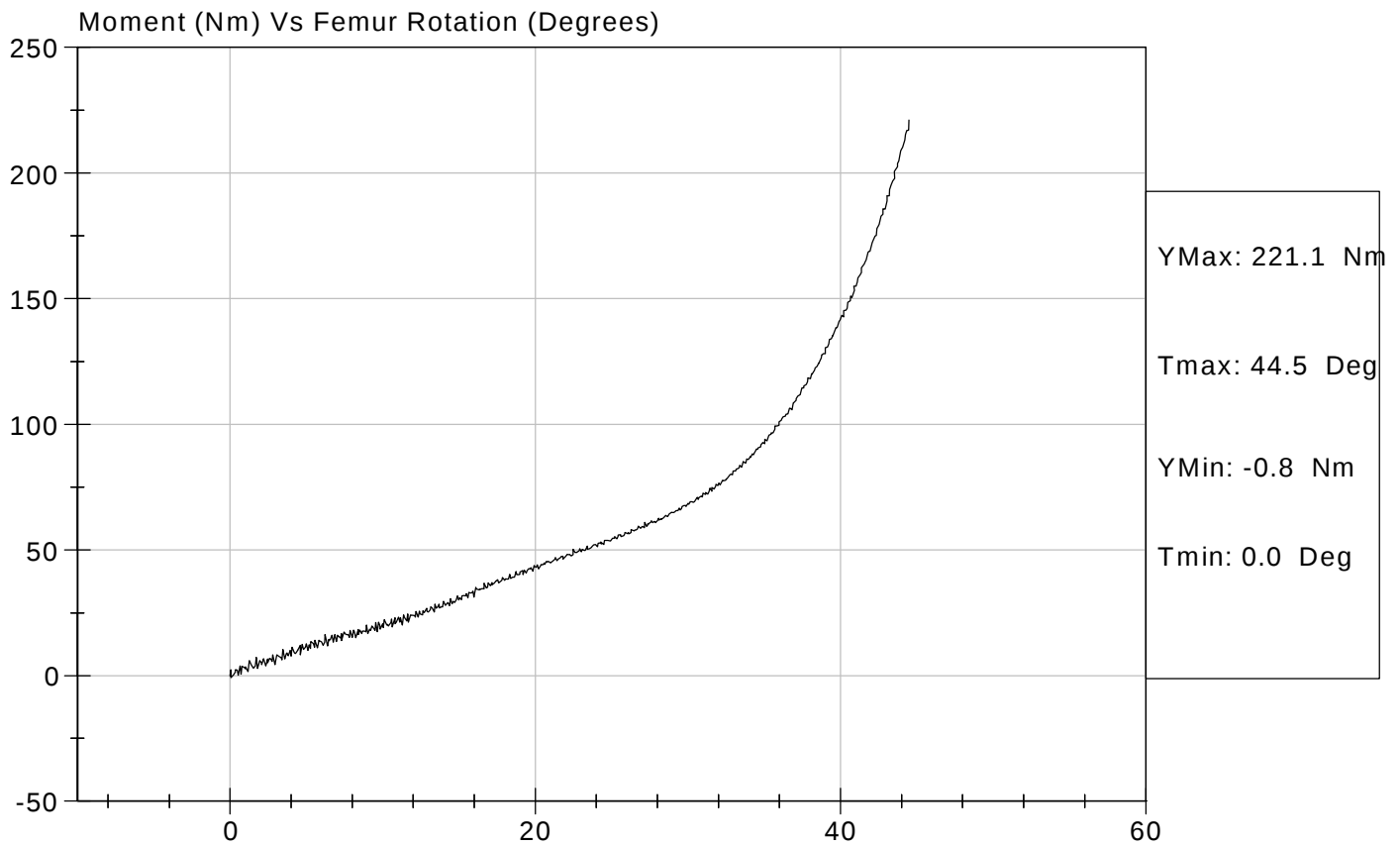


Test Description: Hip Femur Flexion

Test Date: 09/30/2003

Component: D031670

Speed: 0 ft/sec, 0.00 m/sec



DUMMY INSPECTION CHECKLIST

Type: Hybrid III

Dummy Serial Number: 065

Inspected By: Tim Michnay

Date: 10/2/03

<u>Part</u>	<u>Items Checked</u>	<u>Comments</u>
Skin	visual inspection	OK
Head	visual, ballast, accelerometer mount	OK
Neck	visual, cable torque, nodding blocks	OK
Clavicles	visual, bumpers, range of motion	OK
Arms/Hands	visual, bumpers, range of motion	OK
Spine box	visual, ballast, weldment, accelerometer mount	OK
Rib cage	visual, measure, stiffeners	OK
Sternum	visual, bumpers	OK
Lumbar spine	visual, cable torque	OK
Abdomen	visual	OK
Pelvis	visual, palpate, accelerometer mount	OK
Upper legs	visual, load cell bolts	OK
Knees	visual, stops, inserts, sliders	OK
Lower legs	visual, range of motion	OK
Ankles	visual, range of motion	OK
Feet	visual, range of motion	OK
Joints	1 to 2 g range	OK
Other		

Notes (include component/problem/action/reason):

CERTIFICATION DATA

Dummy Serial Number: 066

Calibration Test Results Summary

Dummy Serial Number: 066

Calibration

External Dimensions:	The dummy passed all external dimension requirements.
Head Drop Test:	The head passed all drop test requirements.
Neck Flexion Test:	The neck passed all flexion test requirements.
Neck Extension Test:	The neck passed all extension test requirements.
Thorax Impact Test:	The thorax passed all impact test requirements.
Knee Impact Tests:	Both knees passed all impact test requirements.
Hip-Femur Flexion Tests:	Both femurs passed all flexion test requirements.

HYBRID III DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

Dummy Serial Number: 066

Date of Verification: 9/29/03

Test Number: D03168

DESCRIPTION	SPECIFICATION	TEST RESULTS
Temperature (°F)	20.6 – 22.2	21.7
Relative Humidity	10 – 70 %	29
AA - Location for Chest Circumference	429.3 – 434.3 mm	431.8
BB - Location for Waist Circumference	226.1 – 231.1 mm	228.6
A - Total Sitting Height	878.8 – 889.0 mm	879.5
B – Shoulder Pivot Height	505.5 – 520.7 mm	514.4
C – H Point Height	82.9 – 88.9 mm	88.9
D – H Point from Seat Back	134.7 – 139.7 mm	136.5
E – Shoulder Pivot From Backline	84.8 – 94.0 mm	94.0
F – Thigh Clearance	139.7 – 154.9 mm	146.1
G – Back of Elbow to Wrist Pivot	289.6 – 304.8 mm	292.1
H – Skull Cap Skin to Backline	40.7 – 45.7 mm	44.5
I – Shoulder Elbow Length	330.2 – 345.4 mm	330.2
J – Elbow Rest Height	190.5 – 210.9 mm	205.7
K – Buttock Knee Length	579.1 – 604.5 mm	596.9
L – Popliteal Height	429.3 – 454.7 mm	438.2
M – Knee Pivot Height	485.2 – 500.4 mm	495.3
N – Buttock Popliteal Length	452.1 – 477.5 mm	463.6
O – Chest Depth at 3 rd Rib	213.4 – 228.6 mm	215.9
P – Foot Length	251.5 – 266.7 mm	260.4
V – Shoulder Breadth	421.7 – 436.9 mm	436.9
W – Foot Breadth	91.5 – 106.7 mm	101.6
Y – Chest Circumference	970.3 – 1000.7 mm	984.3
Z – Waist Circumference	835.7 – 866.1 mm	866.1

Technician: Jessica Hall

Approved By: Shefalika Gaurav

Hybrid III Calibration Data Sheet

50th Percentile Male Head Drop Calibration

ATD Serial No: 066

Test I.D: D031681

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Peak Resultant Acceleration	G's	225.0 to 275.0	253.1	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	12.7	Pass
Is Acceleration Unimodal?	Yes/No	< 10% Peak	Yes	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

Shitalika Gaurwal
Approved By

09/29/2003
Test Date



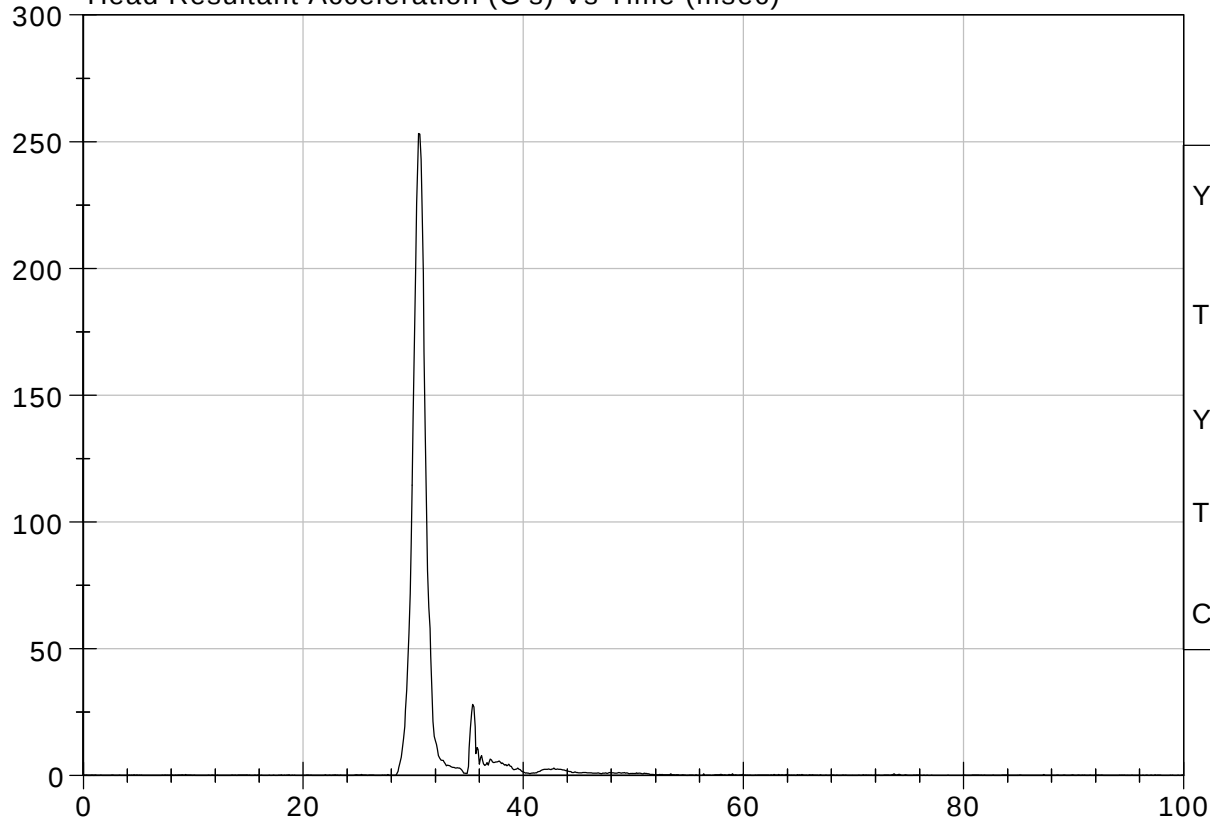
Test Description: Head Drop

Test Date: 09/29/2003

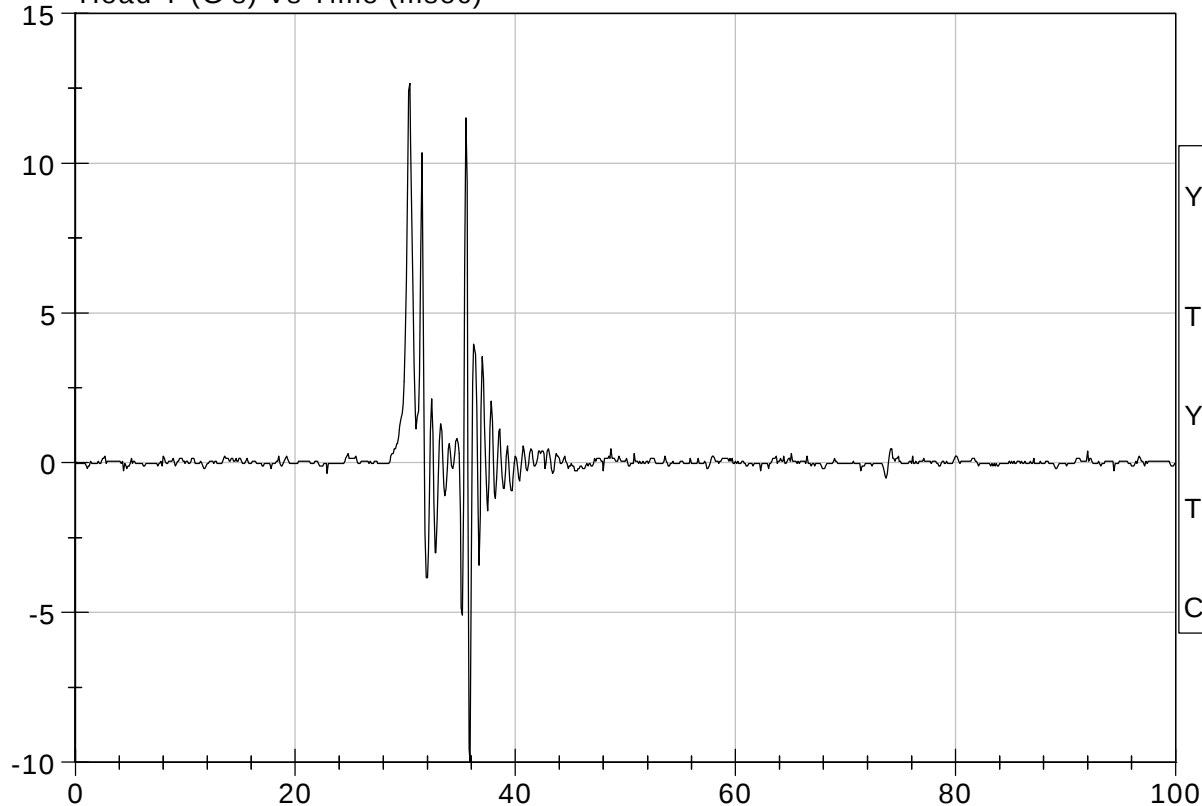
Component: D031681

Speed: 0 ft/s, 0.00 m/s

Head Resultant Acceleration (G's) Vs Time (msec)



Head Y (G's) Vs Time (msec)



Hybrid III Calibration Data Sheet

50th Percentile Male

Neck Flexion Test

ATD Serial No: 066

Test I.D: D031682

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity		%	10 to 70	27	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.98	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	23.03	Pass
	20 msec	G's	17.60 to 22.60	20.05	Pass
	30 msec	G's	12.50 to 18.50	15.09	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	15.09	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	37.2	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	72.3	Pass
	Time	msec	57.0 to 64.0	58.0	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	115.2	Pass
Moment About Occipital Condyle	Maximum	N m	84.1 to 108.5	94.5	Pass
	Time	msec	47.0 to 58.0	49.2	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	100.7	Pass
Overall Test Results					Pass

Jessica Hall
Laboratory Technician

09/30/2003

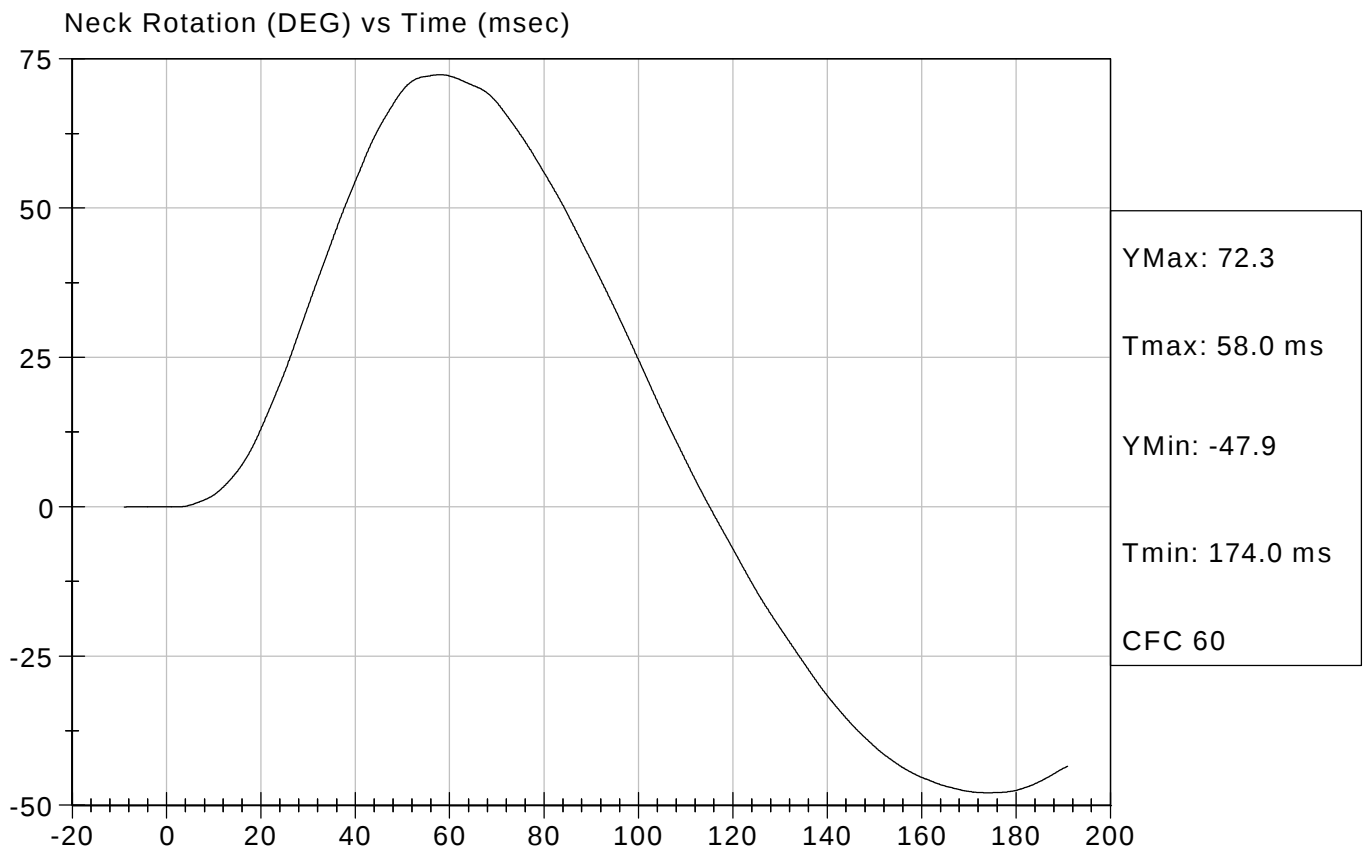
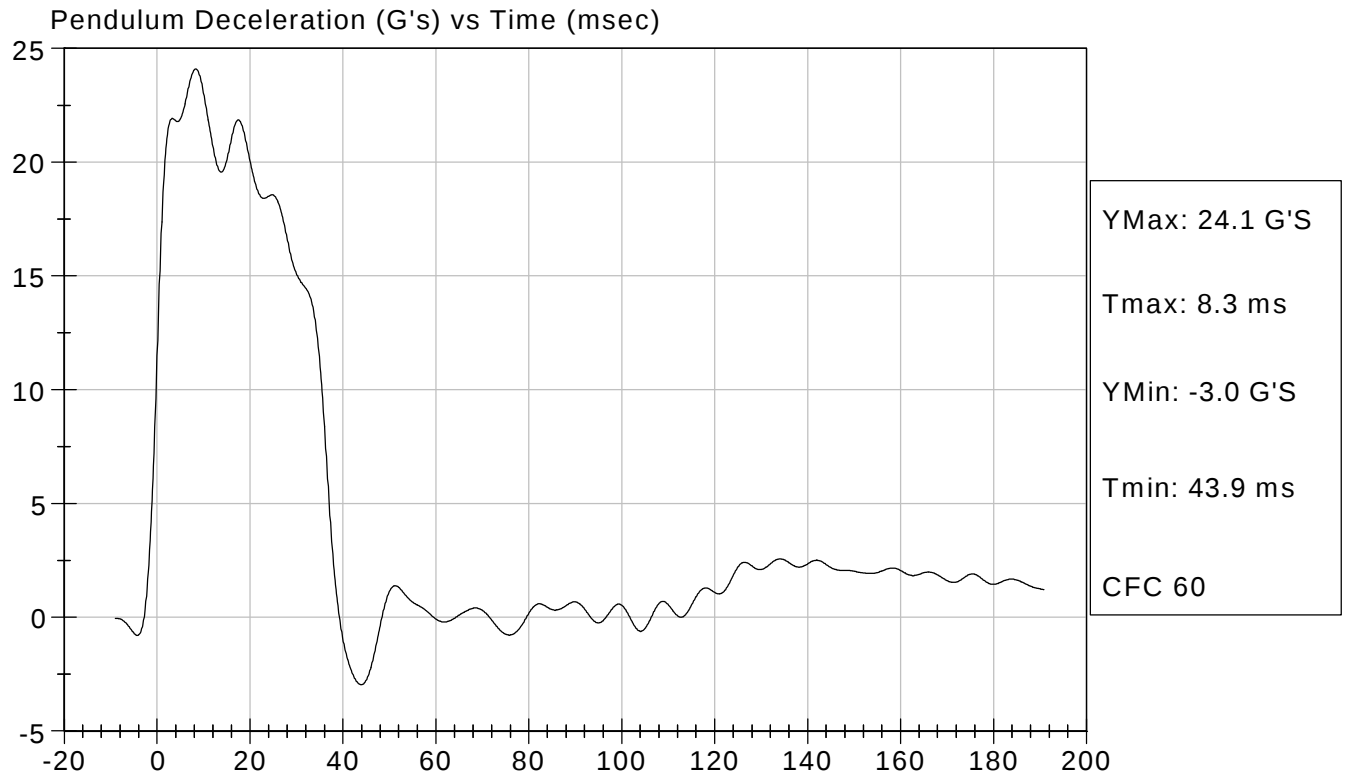
Test Date

Shefalika Jaiswal
Approved By



Test Desc: Neck Flexion
Component ID: D031682

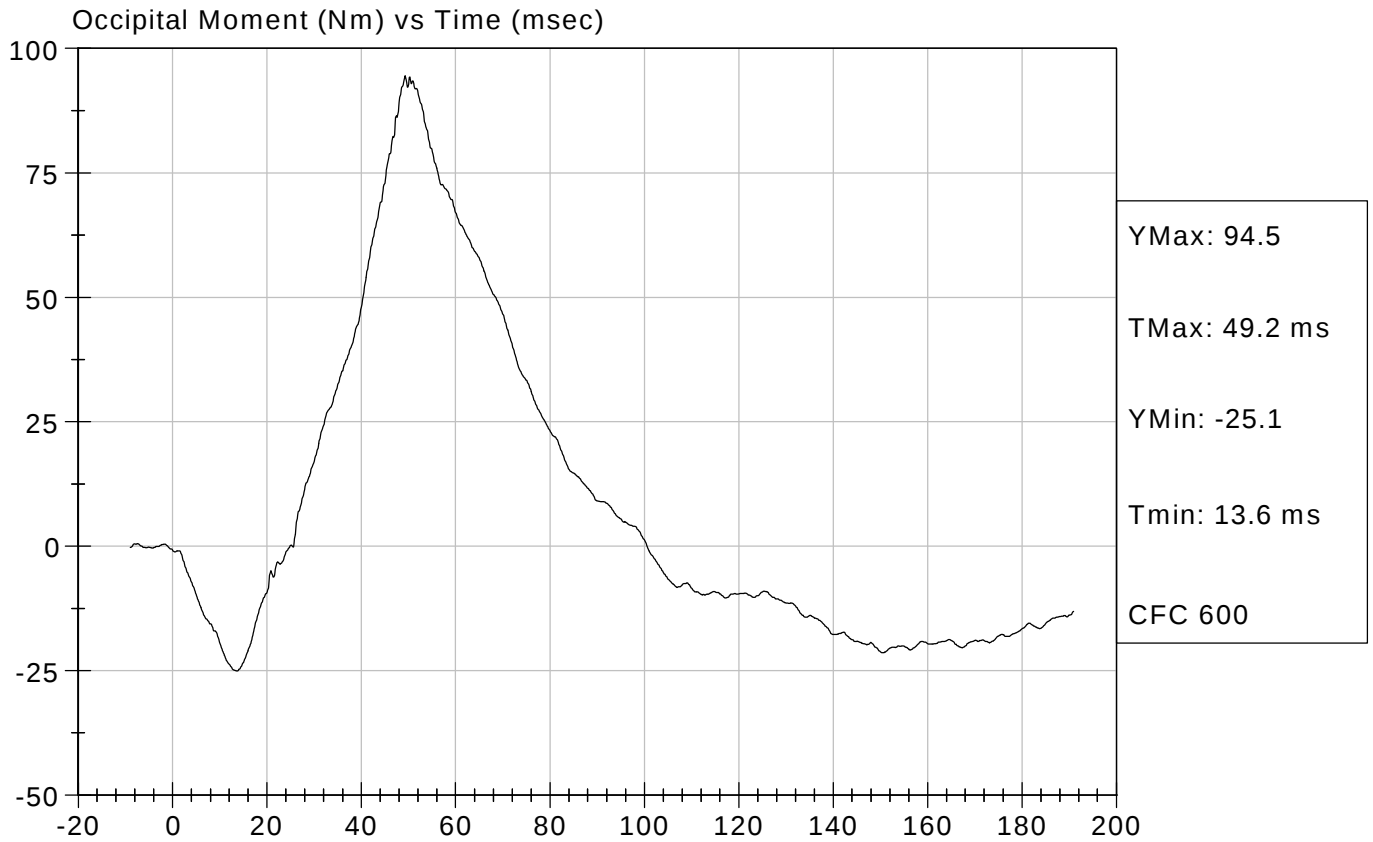
Test Date: 09/30/2003
Speed: 22.89 ft/sec, 6.98 m/sec





Test Desc: Neck Flexion
Component ID: D031682

Test Date: 09/30/2003
Speed: 22.89 ft/sec, 6.98 m/sec



Hybrid III Calibration Data Sheet

50th Percentile Male

Neck Extension Test

ATD Serial No: 066

Test I.D: D031683

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.9	Pass
Laboratory Relative Humidity		%	10 to 70	24	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	17.85	Pass
	20 msec	G's	14.00 to 19.00	15.19	Pass
	30 msec	G's	11.00 to 16.00	12.45	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	13.1	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	43.3	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	97.2	Pass
	Time	msec	72.0 to 82.0	78.0	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	155.4	Pass
Moment About Occipital Condyle	Minimum	N m	-52.9 to -79.9	-64.1	Pass
	Time	msec	65.0 to 79.0	73.4	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	143.5	Pass
Overall Test Results					Pass

Jessica Hall
Laboratory Technician

Shafika Jauwal
Approved By

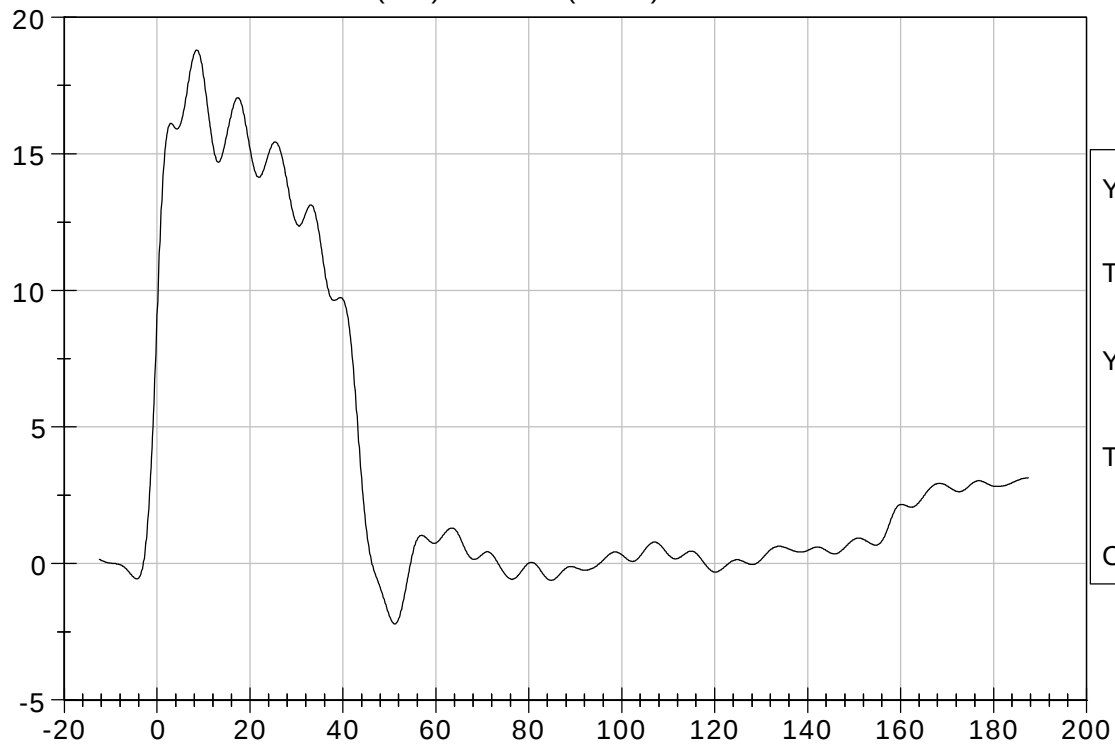
10/01/2003
Test Date



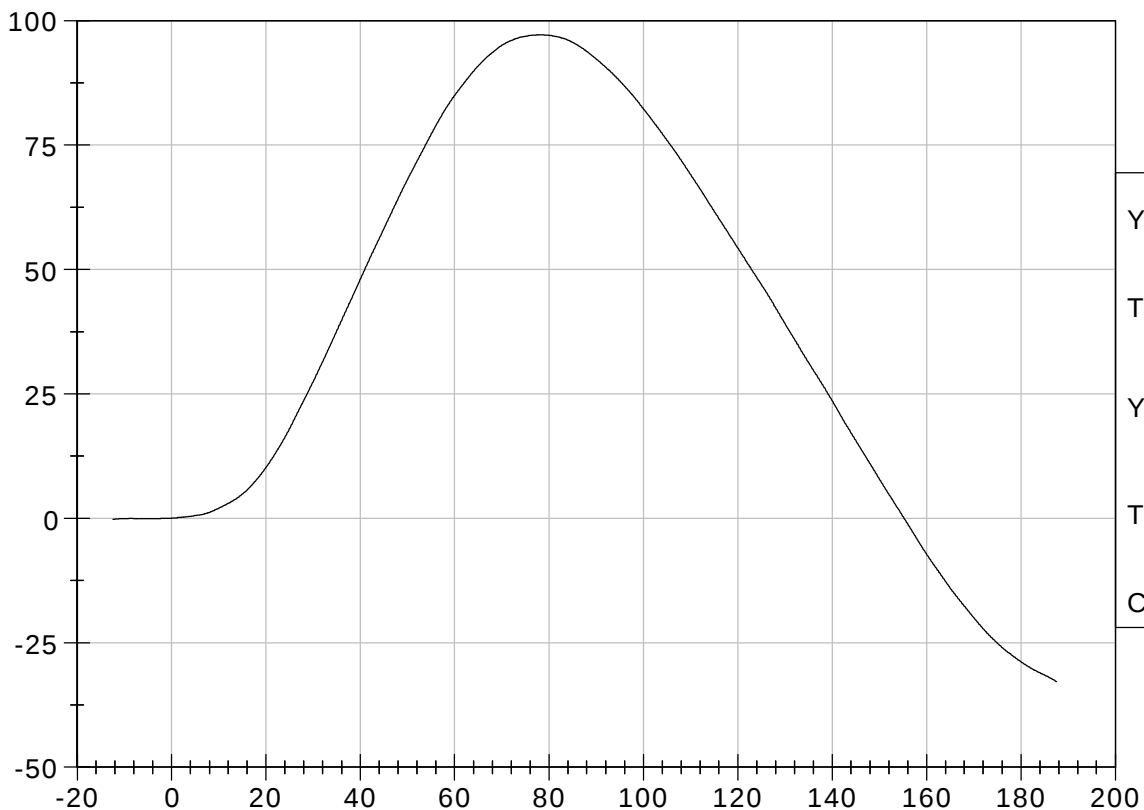
Test Desc: Neck Extension
Component ID: D031683

Test Date: 10/01/2003
Speed: 20.08 ft/sec, 6.12 m/sec

Pendulum Deceleration (G's) vs Time (msec)



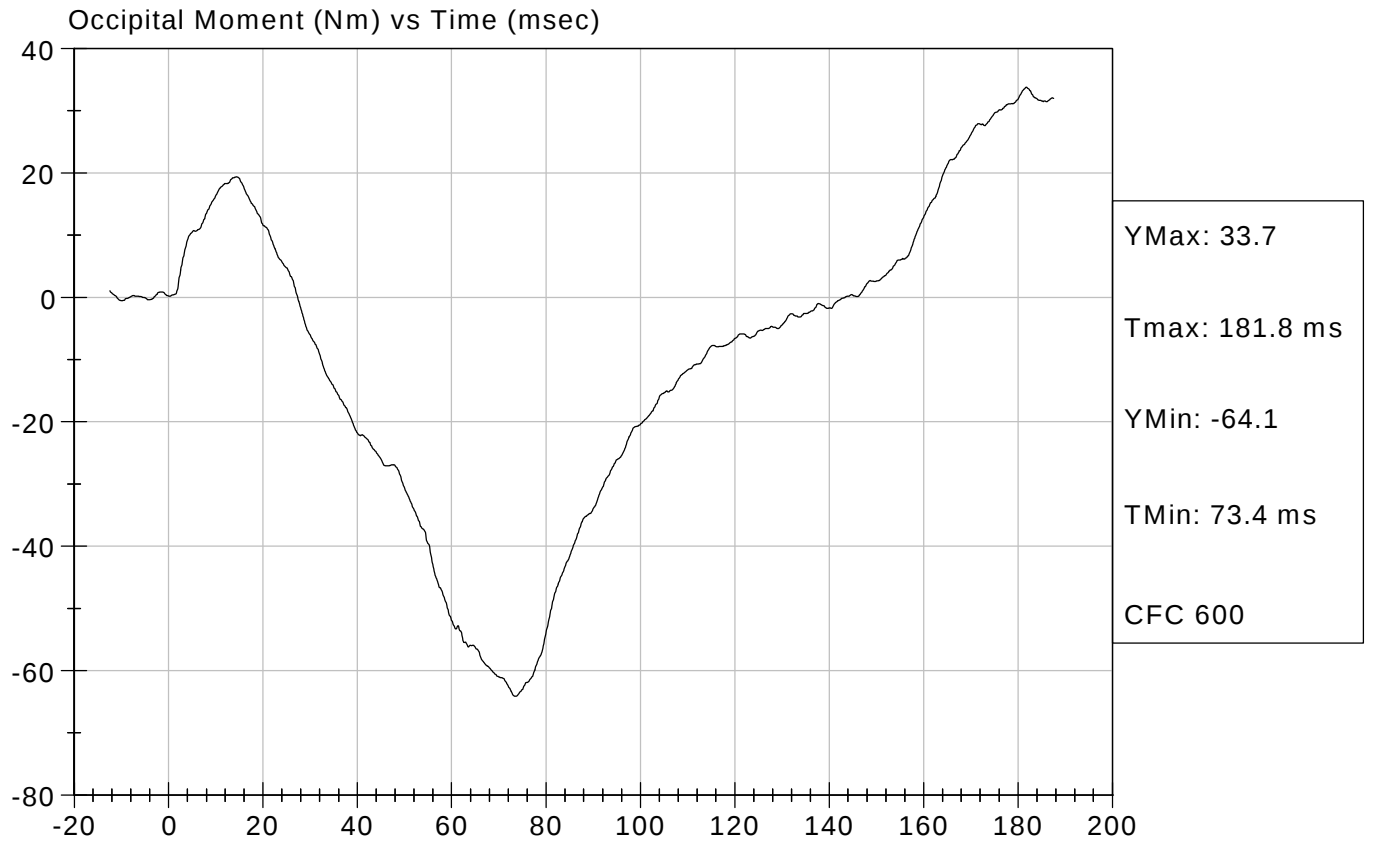
Neck Rotation (DEG) vs Time (msec)





Test Desc: Neck Extension
Component ID: D031683

Test Date: 10/01/2003
Speed: 20.08 ft/sec, 6.12 m/sec



Hybrid III Calibration Data Sheet

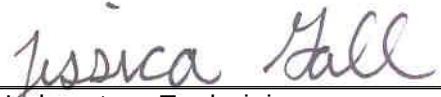
50th Percentile Male

Thorax Impact Test

ATD Serial No: 066

Test I.D: D031684

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Probe Velocity	m/s	6.58 to 6.82	6.73	Pass
Peak Probe Force	Newtons	5159 to 5893	5,471	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.42	Pass
Internal Hysteresis	%	69 to 85	72	Pass
Overall Test Results				Pass


Laboratory Technician


Approved By

10/02/2003
Test Date

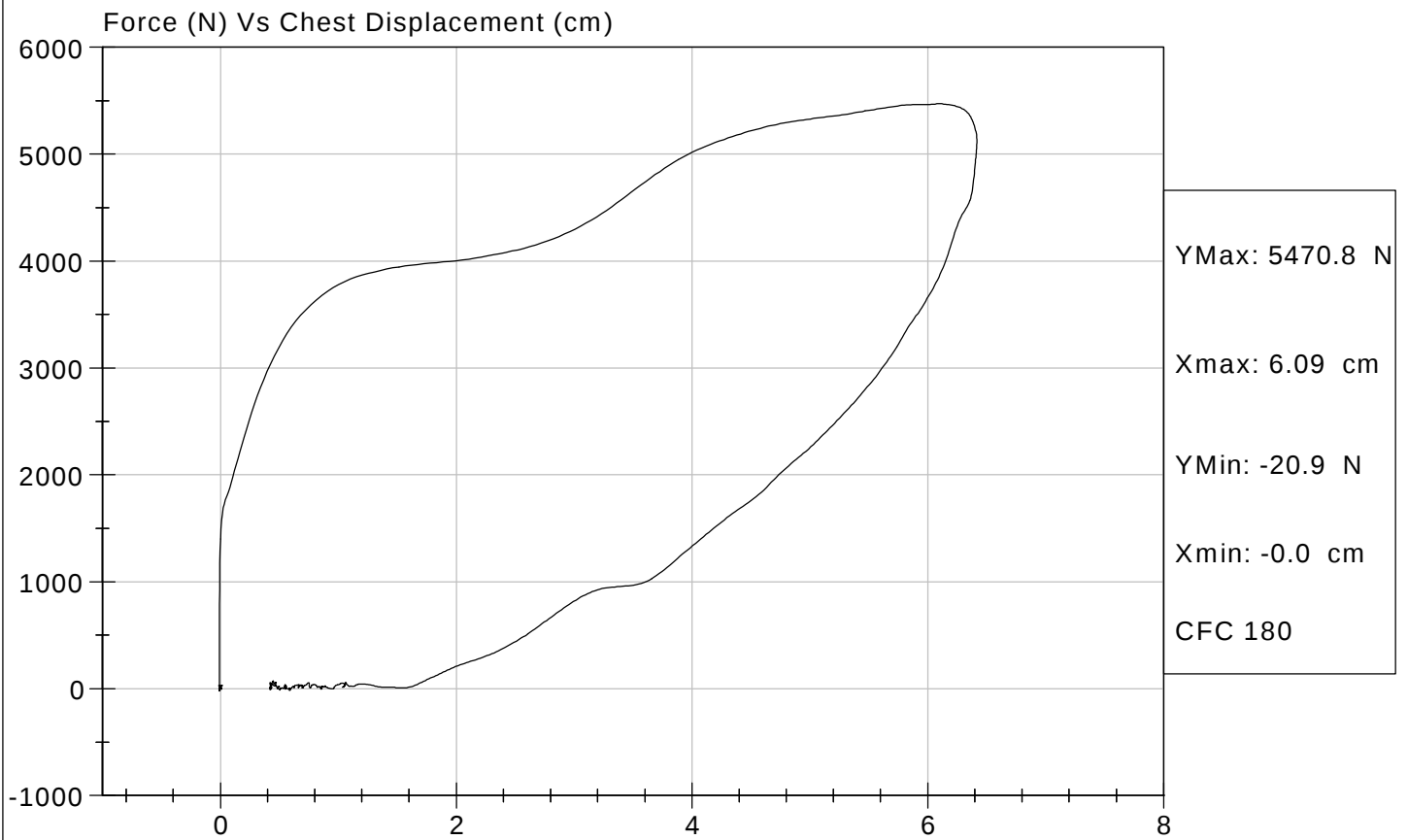


Test Description: Thorax Impact

Test Date: 10/02/2003

Component: D031684

Speed: 22.07 ft/sec, 6.73 m/sec



Hybrid III Calibration Data Sheet

50th Percentile Male

Right Knee Impact Test

ATD Serial No: 066

Test I.D: D031685

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Probe Velocity	m/s	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	4,832	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

Shitalika Gaural
Approved By

09/30/2003
Test Date

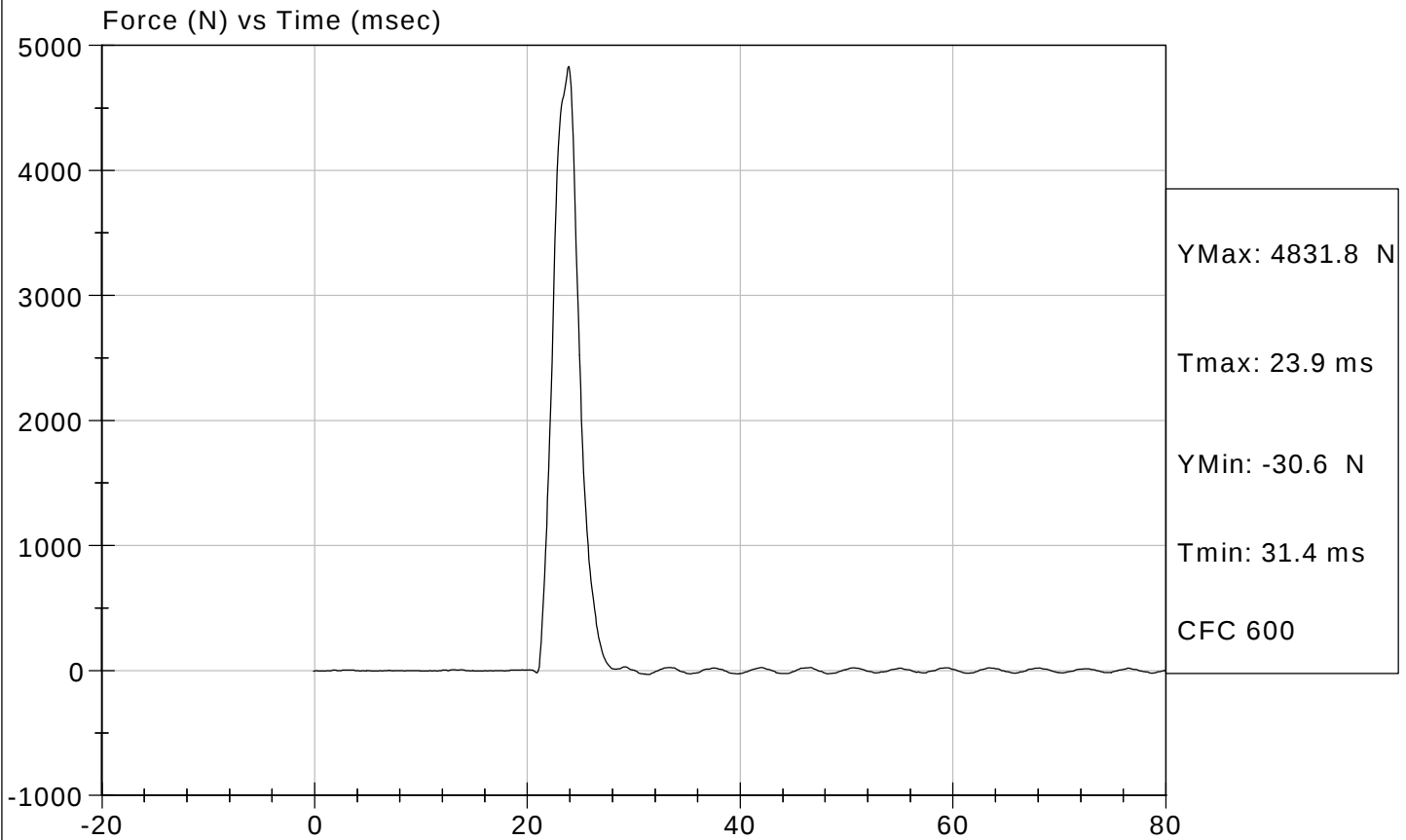


Test Description: Right Knee

Test Date: 09/30/2003

Component: D031685

Speed: 6.89 ft/sec, 2.100 m/sec



Hybrid III Calibration Data Sheet

50th Percentile Male

Left Knee Impact Test

ATD Serial No: 066

Test I.D: D031686

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Probe Velocity	m/s	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	5,740	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

Shitalika Gaurwal
Approved By

09/30/2003
Test Date

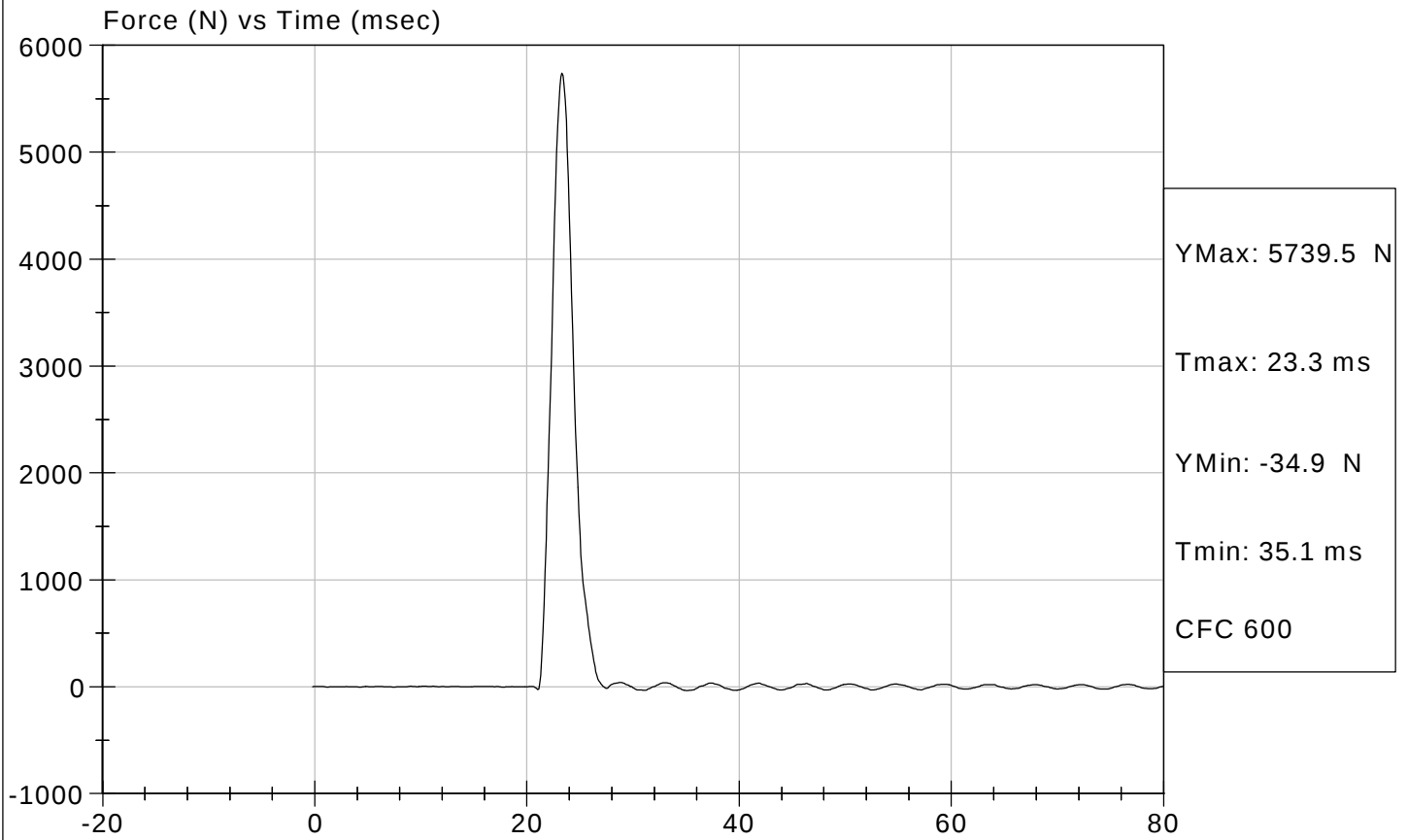


Test Description: Left Knee

Test Date: 09/30/2003

Component: D031686

Speed: 6.91 ft/sec, 2.106 m/sec



Hybrid III Calibration Data Sheet

50th Percentile Male

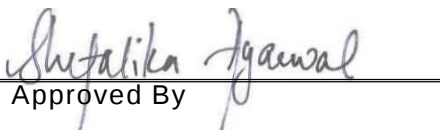
Hip-Femur Flexion Test

ATD Serial No: 066

Test I.D: D031680

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.3	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	26	26	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	84.8	82.6	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	43	40	Pass
Overall Test Results					Pass


Laboratory Technician


Approved By

09/30/2003
Test Date

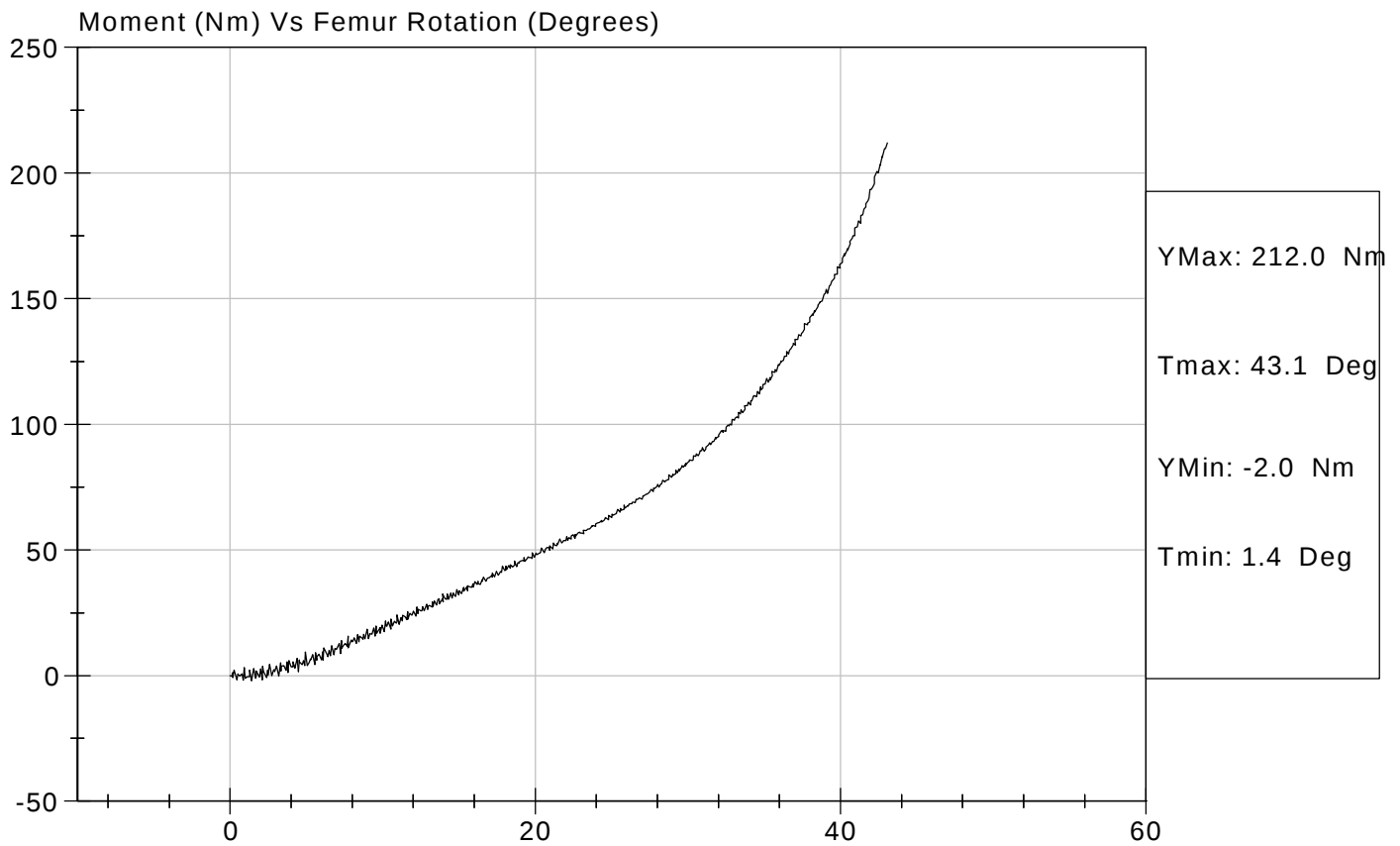


Test Description: Hip Femur Flexion

Test Date: 09/30/2003

Component: D031689

Speed: 0 ft/sec, 0.00 m/sec



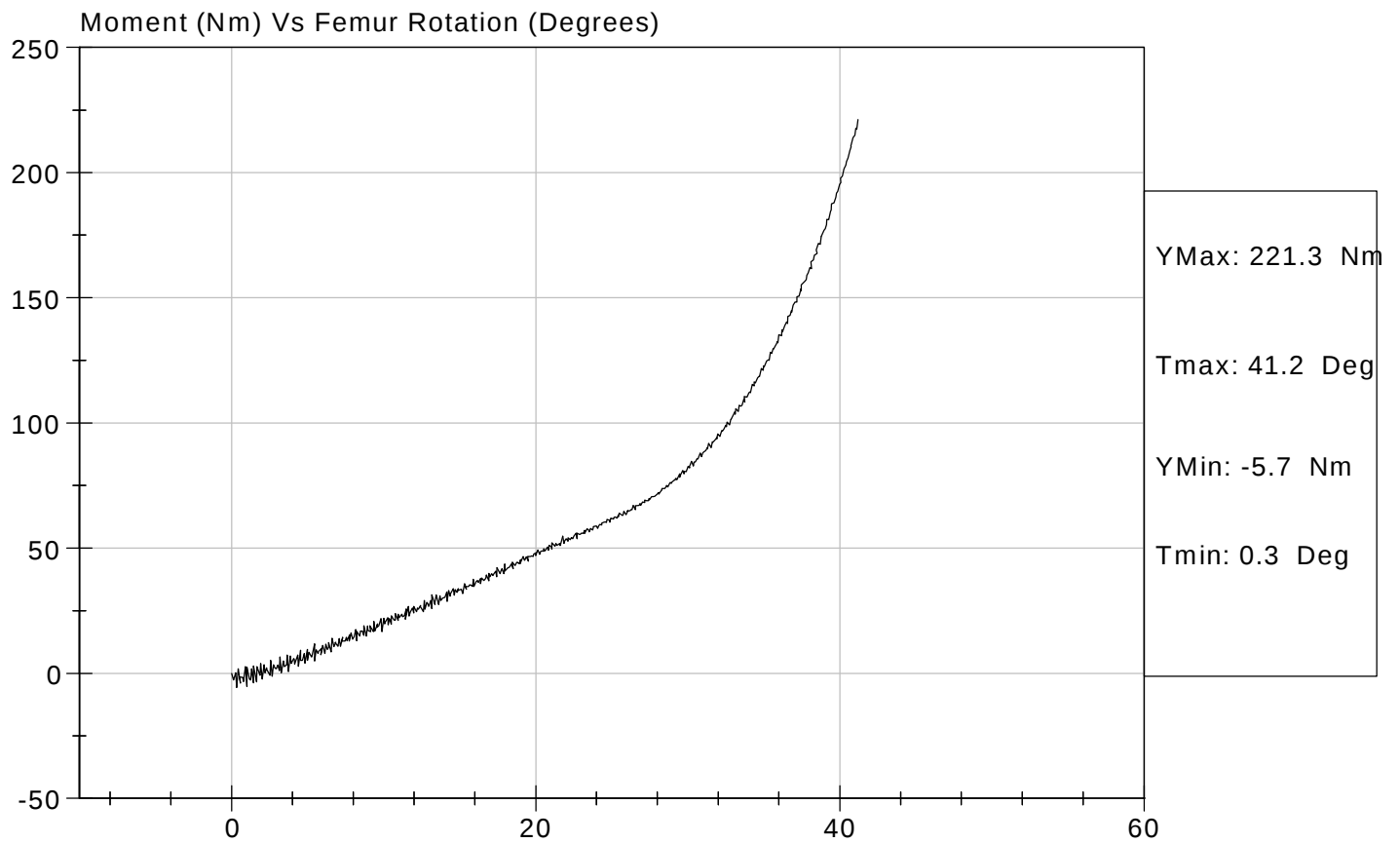


Test Description: Hip Femur Flexion

Test Date: 09/30/2003

Component: D031680

Speed: 0 ft/sec, 0.00 m/sec



DUMMY INSPECTION CHECKLIST

Type: Hybrid III

Dummy Serial Number: 066

Inspected By: Tim Michnay

Date: 10/2/03

<u>Part</u>	<u>Items Checked</u>	<u>Comments</u>
Skin	visual inspection	OK
Head	visual, ballast, accelerometer mount	OK
Neck	visual, cable torque, nodding blocks	OK
Clavicles	visual, bumpers, range of motion	OK
Arms/Hands	visual, bumpers, range of motion	OK
Spine box	visual, ballast, weldment, accelerometer mount	OK
Rib cage	visual, measure, stiffeners	OK
Sternum	visual, bumpers	OK
Lumbar spine	visual, cable torque	OK
Abdomen	visual	OK
Pelvis	visual, palpate, accelerometer mount	OK
Upper legs	visual, load cell bolts	OK
Knees	visual, stops, inserts, sliders	OK
Lower legs	visual, range of motion	OK
Ankles	visual, range of motion	OK
Feet	visual, range of motion	OK
Joints	1 to 2 g range	OK
Other		

Notes (include component/problem/action/reason):

APPENDIX D

TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION

INSTRUMENTS FOR DRIVER DUMMY NO. 065

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X	ACCY6	Endevco	10/3/03
Head Y	J13941	Endevco	10/6/03
Head Z	AAMW5	Endevco	10/3/03
Head X Redundant	J18724	Endevco	10/6/03
Head Y Redundant	J14235	Endevco	10/8/03
Head Z Redundant	AJ5R0	Endevco	10/3/03
Neck Load Cell	442	Denton	8/20/03
Chest X	ACC78	Endevco	10/3/03
Chest Y	ACCE6	Endevco	10/3/03
Chest Z	ACCY3	Endevco	10/3/03
Chest Deflection Gauge	065	Servo	9/30/03
Chest X Redundant	J19927	Endevco	10/3/03
Chest Y Redundant	J20580	Endevco	10/3/03
Chest Z Redundant	J23914	Endevco	10/3/03
Pelvis X	AHTN3	Endevco	10/3/03
Pelvis Y	AH0C3	Endevco	10/3/03
Pelvis Z	AHT12	Endevco	10/3/03
Left Femur Load Cell	259	Denton	8/20/03
Right Femur Load Cell	256	Denton	8/20/03
Left Upper Tibia Load Cell	105	Denton	8/20/03
Left Lower Tibia Load Cell	133	Denton	8/19/03
Right Upper Tibia Load Cell	103	Denton	8/19/03
Right Lower Tibia Load Cell	134	Denton	8/20/03
Left Foot Z – Front	J14120	Endevco	10/8/03
Left Ankle X	J23774	Endevco	10/6/03
Left Ankle Z	APYY3	Endevco	10/8/03
Right Foot Z – Front	J18736	Endevco	10/6/03
Right Ankle X	J23946	Endevco	10/6/03
Right Ankle Z	J27513	Endevco	10/6/03
Lap Belt Load Cell	197	Denton	7/8/03
Shoulder Belt Load Cell	160	Denton	9/18/03

INSTRUMENTS FOR PASSENGER DUMMY NO. 066

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X	AAMN8	Endevco	10/3/03
Head Y	ACC61	Endevco	10/3/03
Head Z	ACCW9	Endevco	10/3/03
Head X Redundant	J19884	Endevco	10/3/03
Head Y Redundant	J21988	Endevco	10/3/03
Head Z Redundant	J28986	Endevco	10/3/03
Neck Load Cell	443	Denton	8/20/03
Chest X	ACCY1	Endevco	10/6/03
Chest Y	ACCC8	Endevco	10/6/03
Chest Z	ACCT7	Endevco	10/6/03
Chest Deflection Gauge	066	Servo	9/30/03
Chest X Redundant	J13541	Endevco	10/6/03
Chest Y Redundant	J20093	Endevco	10/6/03
Chest Z Redundant	J19440	Endevco	10/6/03
Pelvis X	J22033	Endevco	10/3/03
Pelvis Y	J21691	Endevco	10/3/03
Pelvis Z	J21970	Endevco	10/3/03
Left Femur Load Cell	262	Denton	8/20/03
Right Femur Load Cell	261	Denton	8/20/03
Left Upper Tibia Load Cell	109	Denton	8/19/03
Left Lower Tibia Load Cell	138	Denton	8/19/03
Right Upper Tibia Load Cell	106	Denton	8/20/03
Right Lower Tibia Load Cell	135	Denton	8/20/03
Left Foot Z – Front	J28988	Endevco	10/3/03
Left Ankle X	J22036	Endevco	10/3/03
Left Ankle Z	J20569	Endevco	10/3/03
Right Foot Z – Front	J20382	Endevco	8/7/03
Right Ankle X	J20165	Endevco	8/7/03
Right Ankle Z	J28708	Endevco	8/7/03
Lap Belt Load Cell	190	Denton	7/8/03
Shoulder Belt Load Cell	159	Denton	9/18/03

INSTRUMENTS FOR VEHICLE AND LABORATORY

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Left Rear Seat Crossmember X	C12-M02	Entran	10/1/03
Left Rear Seat Crossmember Z	A27-R08	Entran	10/1/03
Right Rear Seat Crossmember X	F04-N04	Entran	10/8/03
Right Rear Seat Crossmember Z	G03-N13	Entran	10/8/03
Top of Engine X	H01-N10	Entran	10/1/03
Bottom of Engine X	I12-F01	Entran	6/2/03
Left Brake Caliper X	A08-A11	Entran	6/2/03
Right Brake Caliper X	F04-N08	Entran	6/2/03
Instrument Panel X	H14-N03	Entran	10/1/03

Note: All Endevco accelerometers are Model No. 7264-2000
All Entran accelerometers are Model No. EGE-72