REPORT NUMBER: NCAP-MGA-2005-006

NEW CAR ASSESSMENT PROGRAM
FRONTAL BARRIER IMPACT TEST

Ford Motor Company
2005 Ford Freestyle
NHTSA NUMBER: M50204

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

Test Date: December 6, 2004

Final Report Date: January 21, 2005

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
RULEMAKING
OFFICE OF CRASHWORTHINESS STANDARDS
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_____
Date of Acceptance

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COTR, NCAP Frontal Impact Program

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Date of Acceptance

Technical Report Documentation Page

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16. Abstract

A 35.1 mph (56.5 km/h) frontal barrier impact was conducted on a 2005 Ford Freestyle at MGA Research Corporation on December 6, 2004. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and foot well intrusion performance. The impact velocity was 56.5 km/h. The ambient temperature at the barrier face at the time of impact was 21 degrees Celsius. The vehicle's maximum post test static crush is 553 mm located at the left side of the vehicle. The test vehicle is equipped with a 3-point continuous belt system and an airbag in both front outboard seating positions. With respect to FMVSS 208 "Occupant Crash Protection", the occupant injury criteria summary is as follows:

Measurement Description	Units	Threshold	Driver ATD	Pass. ATD
Head Injury Criteria (HIC)	N/A	1000	396	277
Max. Thorax Accel. (3ms Clip)	G's	60	42	32
Left Femur Force	Newton	10009	-4135	-3389
Right Femur Force	Newton	10009	-2933	-2780

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SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

This 56.3 km/h frontal barrier impact test is part of the Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under contract number DTNH22-01-D-12005. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for an impact in excess of the current 48.3 kph requirements.

SUMMARY

A load cell barrier consisting of 30 load cells was impacted by a 2005 Ford Freestyle at a velocity of 56.5 kph. The test was performed at MGA Research Corporation on December 6, 2004. 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. 066) and right-front passenger (position 2) ATD (Serial No. 065) were calibrated previous to this test. Certification details, along with instrumentation calibration data, are found in Appendix C.

The 153 channels of data were recorded on an on-board data acquisition system. Appendix B contains the vehicle 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 553 mm and both the driver and passenger side doors remained closed and latched during the impact event and were operable after the impact.

The driver’s head, chest, and abdomen contacted the airbag. The driver’s head also contacted the head rest. The driver’s knees contacted the bolster. The passenger’s head, chest and abdomen contacted the airbag. The passenger's head contacted the visor and head liner. 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)
Driver	395.6	41.5	-28.4	-4135	-2933
Passenger	277.2	32.2	-23.6	-3389	-2780

TEST NOTES

The following channels did not collect any data:

Driver Pelvis Y after 85ms
Driver Pelvis Z after 80ms
Passenger Left Ankle X after 50ms
Passenger Right Lower Moment X collected questionable data
Right Rear Seat Cross Member Z after 80ms

SECTION 2

OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

Test Vehicle: 2005 Ford Freestyle
Test Program: 35mph Frontal Impact

NHTSA No.: M50204
Test Date: 12/06/04

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: 2005 Ford Freestyle
Test Program: 35mph Frontal Impact
NHTSA No.: M50204
Test Date: 12/06/04

PRIMARY IMPACT DATA

Measured Parameter	Units	Value
Velocity at Impact	km/hr	56.5
Test Weight	kg	2129.6
Average Rebound	mm	617
Maximum Static Crush	mm	553
Impact Angle	degrees	0.0

DOOR OPENING AND SEAT TRACK INFORMATION

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

TEST DUMMY INFORMATION

Description	Driver	Passenger
Dummy Type / Serial No.	HIII 50th / 066	HIII 50th / 065
Head Contact	Airbag, Head Rest	Airbag, Visor, Window Trim
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	46
Belt Assessment Sensors	7
Vehicle Structure Accelerometers	9
Total	104

DATA SHEET NO. 2

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2005 Ford Freestyle
Test Program: 35mph Frontal Impact

NHTSA No.: M50204
Test Date: 12/06/04

TEST VEHICLE INFORMATION

Manufacturer	Ford Motor Company
Model	Freestyle
Body Style	MPV
NHTSA No.	M50204
VIN	1FMZK04175GA11446
Color	Red
Delivery Date	11/23/04
Odometer Reading (mile)	6.2
Dealer	Ricart Ford
Transmission	Automatic
Final Drive	AWD
Number of Cylinders	6
Engine Displacement (L)	3.0
Engine Placement	Lateral
Automatic Door Lock (ADL)	Yes
Owner's Manual Details Instructions on Disabling ADLs	Yes

TEST VEHICLE OPTIONS

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

DATA FROM CERTIFICATION LABEL

Manufactured By	Ford Motor Company
Date of Manufacture	11/04

GVWR (kg)	2503
GAWR Front (kg)	1236
GAWR Rear (kg)	1315

DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	220	235
Recommended Tire Size	P215/65R17	P215/65R17
Tire Size on Vehicle	P215/65R17	P215/65R17
Tire Manufacturer	Continental	Continental

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bucket	Bench	
Number Of Occupants	2	2	2	6
Capacity Wt. (VCW) (kg)				521
Cargo Wt. (RCLW) (kg)				113.4

DATA SHEET NO. 2... (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2005 Ford Freestyle NHTSA No.: M50204
Test Program: 35mph Frontal Impact Test Date: 12/06/04

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	519.8	414.5		547.0	516.2	
Right	kg	522.1	408.5		543.4	523.0	
Ratio	%	55.9	44.1		51.2	48.8	
Totals	kg	1041.9	823.0	1864.9	1090.4	1039.2	2129.6

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1864.9
Weight of 2 P572E ATDs	kg	156.0
Rated Cargo/Luggage Weight (RCLW)	kg	113.4
Calculated Vehicle Target Weight (TVTW)	kg	2134.3

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG(aft of front axle)
As Delivered	mm	781	787	798	801	1262
As Tested	mm	771	779	774	777	1396
Post Test	mm	793	819	765	730	

Vehicle Wheelbase (mm): 2860

Weight of Ballast secured in cargo area (kg): 34

Vehicle Components Removed: third row seat, exhaust system, spare tire, Trunk interior (carpet, plastic trim)

Ballast weight does not include instrumentation and data acquisition system.

FUEL SYSTEM DATA

Fuel System Capacity From Owner's Manual (L): 71.9

Usable Capacity Figure Furnished by COTR (L): 71.9

Actual Test Volume (L): 67.6

Test Fluid Type: Stoddard Solvent; Specific Gravity: 0.77

Is Vehicle Fuel Pump Electric or Mechanical? Electric

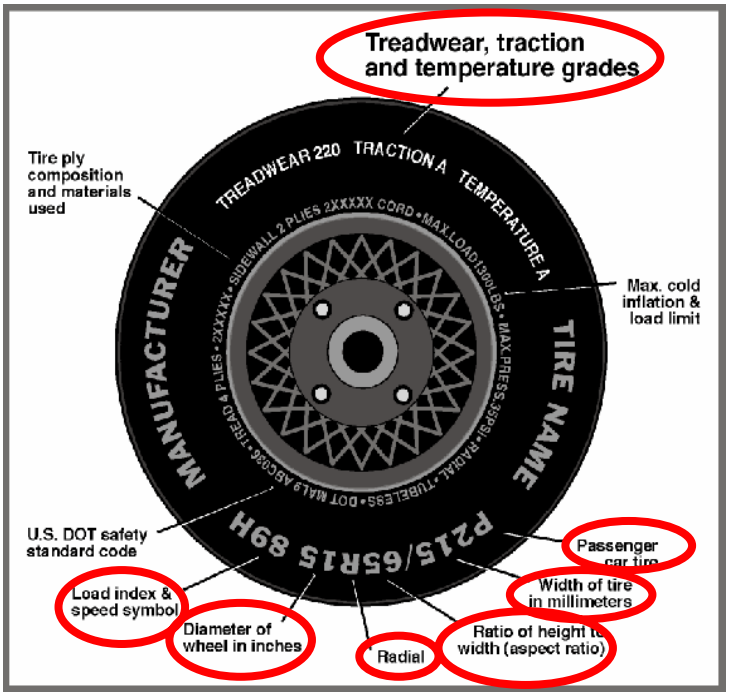
If electric, does pump operate with ignition switch "ON" & engine "OFF"? Yes

DATA SHEET NO. 3

TEST VEHICLE TIRE INFORMATION

Test Vehicle: 2005 Ford Freestyle NHTSA No.: M50204
Test Program: 35mph Frontal Impact Test Date: 12/06/04

Vehicle Year	2005	Vehicle Make	Ford
VIN	1FMZK04175GA11446	Vehicle Model	Freestyle



	Front	Rear
Tire Manufacturer	Continental	Continental
Tire Name	Conti Touring Contact	Conti Touring Contact
Tire Type	P	P
Tire Width (mm)	215	215
Ratio of Height to Width (aspect ratio)	65	65
Radial	R	R
Wheel Diameter	17	17
Load Index & Speed Symbol	98T	98T
Treadwear	360	360
Traction Grade	A	A
Temperature Grade	A	A

DATA SHEET NO. 4

POST IMPACT DATA

Test Vehicle: 2005 Ford Freestyle
Test Program: 35mph Frontal Impact

NHTSA No.: M50204
Test Date: 12/06/04

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	55.5 – 57.1	56.5
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	4932	4414	518
Center	mm	5060	4527	533
Right Side	mm	4932	4404	528

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	530
Center	mm	570
Right Side	mm	750
Average	mm	617

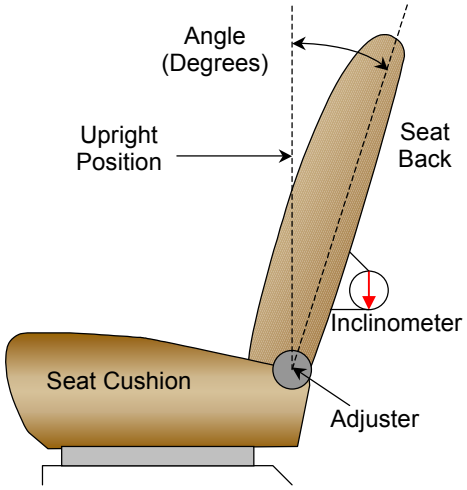
DATA SHEET NO. 5

TEST VEHICLE INFORMATION

Test Vehicle: 2005 Ford Freestyle NHTSA No.: M50204
Test Program: 35mph Frontal Impact Test Date: 12/06/04

NORMAL DESIGN RIDING POSITION

The driver and passenger seat back is positioned to the manufacturer's designated angle. The procedure is as follows: To set the front seat back angle, position the inclinometer on the rear outboard seat frame, 13 inches above the seat back pivot point. If the seat is equipped with a side airbag, do not slit the seat back trim. In case of a side airbag seat, achieve the seat back's design angle by setting the head rest post to its design angle.



FRONT SEAT ASSEMBLY

Driver seat back angle: 24.6°
Passenger seat back angle: 24.4°

SEAT FORE/AFT POSITIONS

The driver and the passenger seat were power operated.

Driver seat fore/aft total travel:	250 mm
Driver seat fore/aft position:	125 of 250 mm
Passenger seat fore/aft total travel:	240 mm
Passenger seat fore/aft position:	120 of 240 mm

DATA SHEET NO. 5... (continued)

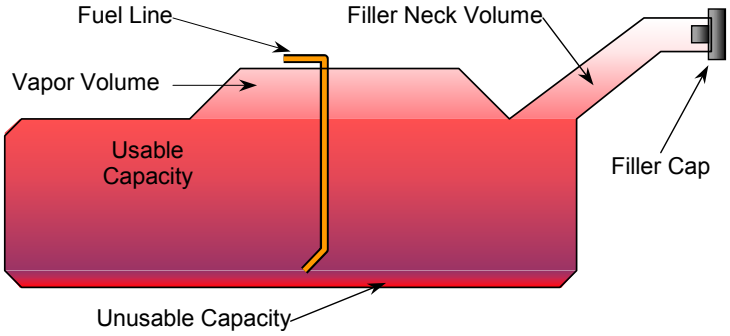
TEST VEHICLE INFORMATION

Test Vehicle: 2005 Ford Freestyle NHTSA No.: M50204
Test Program: 35mph Frontal Impact Test Date: 12/06/04

FUEL TANK CAPACITY DATA

The "Usable Capacity" of the standard equipment fuel tank is: 71.9 liters
The "Usable Capacity" of any optional equipment fuel tank is: N/A liters
The "Usable Capacity" used for certification to FMVSS 301 requirements: 71.9 liters
Actual amount of Stoddard solvent added to vehicle for certification test: 67.6 liters

Pressurizes system when keyed-on and then pumps to meet engine demand.

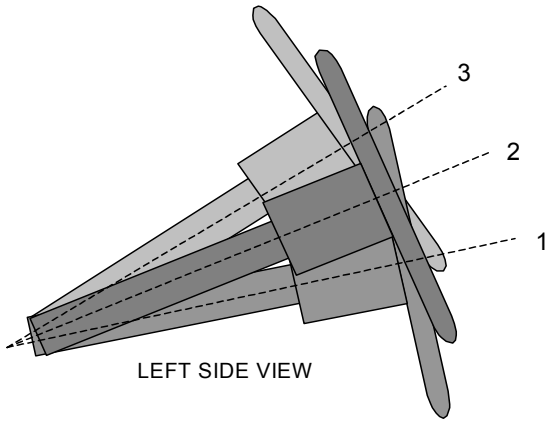


VEHICLE FUEL TANK ASSEMBLY

STEERING COLUMN ADJUSTMENT

Adjustable steering controls are made so that the steering wheel hub is at the geometric center of the locus it describes when it is moved through its full range of driving positions.

Lowermost. Position 1: 22.5°
Geometric Center, Position 2: 25.1°
Uppermost, Position 3: 27.8°



STEERING COLUMN ASSEMBLY

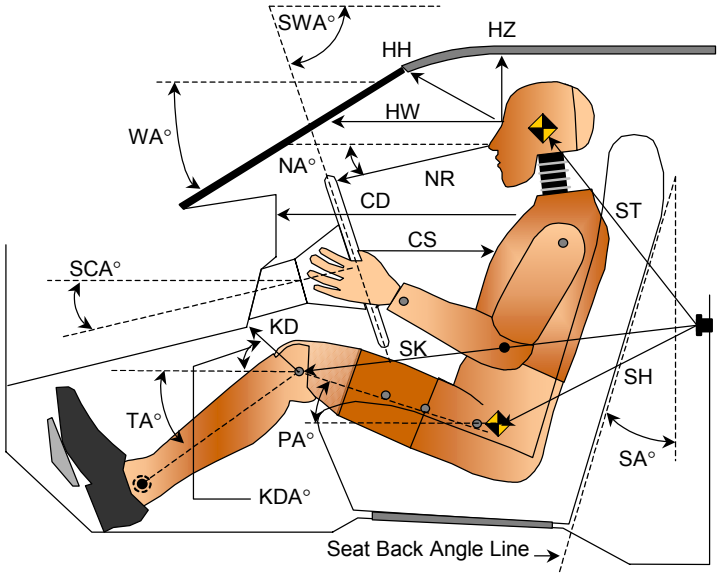
DATA SHEET NO. 6

DUMMY POSITIONING IN VEHICLE

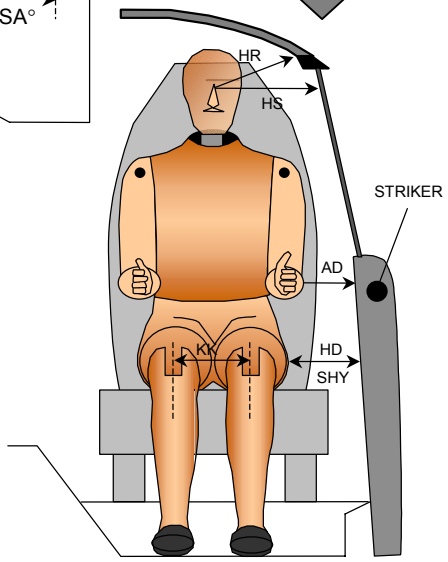
Test Vehicle: 2005 Ford Freestyle
Test Program: 35mph Frontal Impact

NHTSA No.: M50204
Test Date: 12/06/04

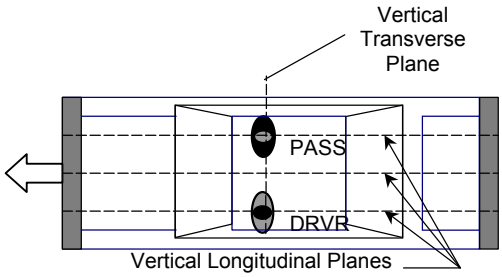
DUMMY MEASUREMENTS FOR FRONT SEAT OCCUPANTS



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



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



DATA SHEET NO. 6... (continued)

DUMMY POSITIONING IN VEHICLE

Test Vehicle: 2005 Ford Freestyle NHTSA No.: M50204
Test Program: 35mph Frontal Impact Test Date: 12/06/04

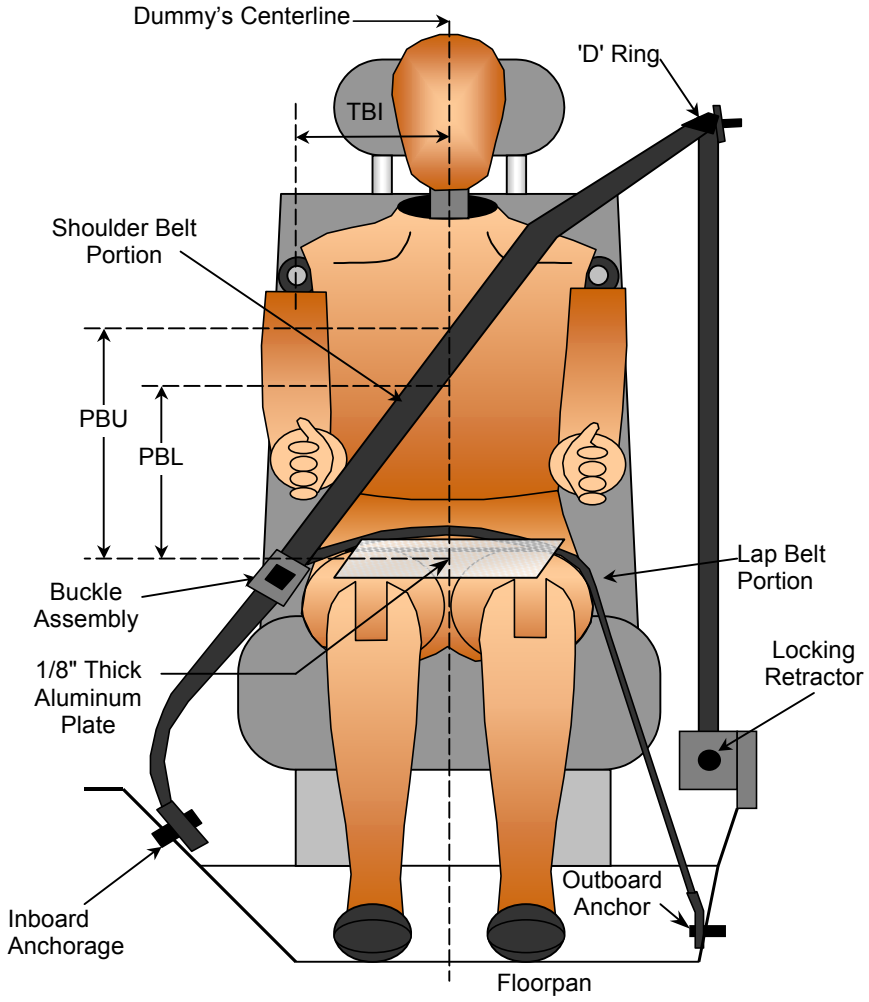
TEST DUMMY POSITION MEASUREMENTS

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA	Windshield Angle		30.9		
SWA	Steering Wheel Angle		64.7		
SCA	Steering Column Angle		25.8		
SA	Seat Back Angle		24.6		24.4
HZ	Head to Roof (Z)	204	90.0	181	90.0
HH	Head to Header	399	21.6	395	19.3
HW	Head to Windshield	669	0.0	641	0.0
HR	Head to Side Header (Y)	229		227	
NR	Nose to Rim	412	10.1		
CD	Chest to Dash	542		499	
CS	Chest to Steering Hub	319	11.1		
RA	Rim to Abdomen	187	0.0		
KDL	Left Knee to Dash	131	32.1	121	
KDR	Right Knee to Dash	124		123	26.8
PA	Pelvic Angle		23.9		23.8
TA	Tibia Angle		60.5		56.4
KK	Knee to Knee (Y)	302		221	
SK	Striker to Knee	630	91.7	634	90.4
ST	Striker to Head	525	10.1	569	12.9
SH	Striker to H-Point	273	114.0	249	110.4
SHY	Striker to H-Point (Y)	270		273	
HS	Head to Side Window	356		376	
HD	H-Point to Door (Y)	141		121	
AD	Arm to Door (Y)	124		125	
AA	Ankle to Ankle	291		143	

DATA SHEET NO. 7

SEAT BELT POSITIONING DATA

Test Vehicle: 2005 Ford Freestyle
Test Program: 35mph Frontal Impact
NHTSA No.: M50204
Test Date: 12/06/04



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	314	355
PBL - To surface of reference to belt lower edge	mm	234	276

DATA SHEET NO. 8

VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY

Test Vehicle: 2005 Ford Freestyle
Test Program: 35mph Frontal Impact

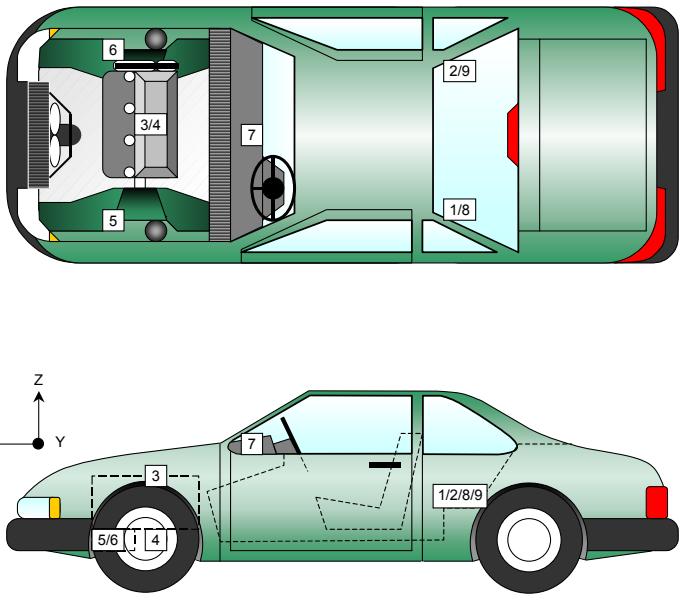
NHTSA No.: M50204
Test Date: 12/06/04

VEHICLE ACCELEROMETER PEAK DATA AND PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)			Peak Values				
		X	Y	Z	Units	Max	Time	Min	Time
1	Left Rear X-Member X	2081	-380	450	G's	1.6	117	-36.0	47
2	Right Rear X-Member X	2081	380	455	G's	2.3	300	-34.9	46
3	Engine Top X	4130	70	980	G's	31.4	44	-118.4	37
4	Engine Bottom X	4230	-30	270	G's	28.9	47	-94.1	31
5	Left Brake Caliper X	4150	-740	250	G's	16.3	78	-64.1	48
6	Right Brake Caliper X	4150	740	250	G's	28.2	76	-71.4	59
7	Instrument Panel X	3548	0	1080	G's	0.4	2	-41.1	59
8	Left Rear X-Member Z	2081	-380	450	G's	16.7	51	-11.8	81
9	Right Rear X-Member Z	2081	380	455	G's	*	*	*	*

* No valid data collected after 80ms

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: 2005 Ford Freestyle
Test Program: 35mph Frontal Impact
NHTSA No.: M50204
Test Date: 12/06/04

HEAD PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Head CG	X	G's	6.6	297	-47.1	91	3.8	287	-39.3	114
Head CG	Y	G's	3.0	31	-7.8	74	7.5	47	-10.7	124
Head CG	Z	G's	31.3	92	-0.6	22	24.3	81	-0.5	129
Head CG Resultant	N/A	G's	56.0	91			41.8	114		

CHEST PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	G's	1.1	150	-43.6	83	0.9	176	-35.7	71
Chest CG	Y	G's	4.5	100	-8.3	82	4.0	37	-5.2	71
Chest CG	Z	G's	11.7	92	-8.6	60	13.4	80	-4.5	59
Chest CG Resultant	N/A	G's	44.2	83			36.3	71		

FEMUR PEAK FORCES

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Left Femur	Z	Newtons	207	114	-4135	44	394	33	-3389	51
Right Femur	Z	Newtons	336	27	-2933	52	307	88	-2780	51

SEAT BELT SENSOR PEAK VALUES

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Lap Belt Force	N/A	Newtons	3797	55			4912	60		
Shoulder Belt Force	N/A	Newtons	3619	50			5131	46		

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	395.6	42.0	72.9	107.5	277.2	35.9	73.1	109.1

CHEST CLIP (3MSEC)

Location	Driver			Passenger		
	CLIP	T^1	T^2	CLIP	T^1	T^2
Chest CG Primary	41.5	81.1	84.1	32.2	70.0	73.0

DATA SHEET NO. 9... (continued)

HYBRID III ATD INJURY CRITERIA AND SENSOR DATA

Test Vehicle: 2005 Ford Freestyle
Test Program: 35mph Frontal Impact

NHTSA No.: M50204
Test Date: 12/06/04

PELVIC PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Pelvis	X	G's	4.2	157	-44.3	56	0.6	150	-51.3	52
Pelvis	Y	G's	*	*	*	*	4.5	56	-2.4	63
Pelvis	Z	G's	**	**	**	**	1.7	26	-24.0	57

* No Valid Data collected after 85ms **No Valid Data collected after 80ms

UPPER NECK PEAK FORCES AND MOMENTS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Neck Force	X	Newtons	373	82	-446	119	181	87	-526	112
Neck Force	Y	Newtons	100	82	-123	58	185	54	-173	64
Neck Force	Z	Newtons	1362	88	-78	137	984	80	-320	128
Neck Moment	X	N•m	5.2	137	-14.8	108	19.8	88	-4.4	143
Neck Moment	Y	N•m	32.9	102	-15.7	51	31.0	127	-32.0	104
Neck Moment	Z	N•m	12.3	92	-8.0	131	11.2	109	-2.2	173

FOOT PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Left Foot Aft	X	G's	6.2	40	-40.1	68	***	***	***	***
Left Foot Aft	Z	G's	3.1	196	-41.4	46	4.9	78	-49.8	52
Left Foot Fore	Z	G's	13.8	58	-69.6	30	25.5	56	-54.9	51
Right Foot Aft	X	G's	4.3	139	-49.3	34	10.6	68	-103.2	46
Right Foot Aft	Z	G's	6.9	79	-49.1	43	4.3	148	-76.4	45
Right Foot Fore	Z	G's	11.9	80	-77.6	42	16.0	53	-129	45

*** No Valid Data collected after 50ms

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	17.4	54	-7.7	82	12.5	89	-28.3	62
Left Lower Moment	Y	N•m	41.4	51	-11.4	90	134	49	-23.3	38
Left Lower Force	Z	Newtons	78	135	-1658	50	541	38	-1968	74
Left Upper Moment	X	N•m	25.2	63	-23.6	53	8.1	83	-19.2	63
Left Upper Moment	Y	N•m	19.1	137	-129	51	87.7	47	-20.2	56
Left Upper Force	Z	Newtons	54	128	-1631	69	280	25	-2155	64
Right Lower Moment	X	N•m	18.9	44	-52.0	69	****	****	****	****
Right Lower Moment	Y	N•m	18.6	85	-31.6	35	66.3	46	-21.5	98
Right Lower Force	Z	Newtons	195	138	-1510	53	507	77	-2571	49
Right Upper Moment	X	N•m	66.9	46	-8.6	211	32.6	49	-56.5	64
Right Upper Moment	Y	N•m	25.1	126	-76.5	61	24.9	278	-133.6	47
Right Upper Force	Z	Newtons	319	32	-1243	70	139	165	-2089	49

**** Questionable data collected

DATA SHEET NO. 9... (continued)

HYBRID III ATD INJURY CRITERIA AND SENSOR DATA

Test Vehicle: 2005 Ford Freestyle
Test Program: 35mph Frontal Impact
NHTSA No.: M50204
Test Date: 12/06/04

CHEST PEAK DISPLACEMENTS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest	X	mm			-28.4	54			-23.6	83

HEAD REDUNDANT PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Head CG	X	G's	6.5	296	-44.3	91	3.9	287	-40.0	114
Head CG	Y	G's	2.9	31	-6.1	83	9.9	54	-10.7	123
Head CG	Z	G's	30.7	92	-0.7	22	28.3	80	-1.6	126
Head CG Resultant	N/A	G's	53.4	92			46.4	80		

CHEST REDUNDANT PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	G's	1.2	148	-45.9	83	1.5	157	-33.4	71
Chest CG	Y	G's	5.1	97	-8.1	82	4.2	79	-3.2	83
Chest CG	Z	G's	11.6	90	-9.0	61	13.7	83	-3.7	59
Chest CG Resultant	N/A	G's	46.6	83			33.5	71		

REDUNDANT HEAD INJURY CRITERIA (HIC)

Location	Driver				Passenger			
	HIC	Avg.	T^1	T^2	HIC	Avg.	T^1	T^2
Head CG Primary Redundant	352.9	39.9	72.4	107.4	301.3	37.1	73.1	109.1

REDUNDANT CHEST CLIP (3MSEC)

Location	Driver			Passenger		
	CLIP	T^1	T^2	CLIP	T^1	T^2
Chest CG Primary Redundant	43.0	81.3	84.3	32.7	69.0	72.0

DATA SHEET NO. 10

SEAT BELT PERFORMANCE ASSESSMENT TEST DATA

Test Vehicle: 2005 Ford Freestyle
Test Program: 35mph Frontal Impact

NHTSA No.: M50204
Test Date: 12/06/04

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	314	355
PBL - Top surface of reference to belt lower edge	mm	234	276

BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	872	887
Lap belt length as measured on ATD	mm	616	601
Remainder of belt on reel	mm	1532	1590
Total belt length for continuous webbing systems	mm	3020	3078

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: 2005 Ford Freestyle
Test Program: 35mph Frontal Impact

NHTSA No.: M50204
Test Date: 12/06/04

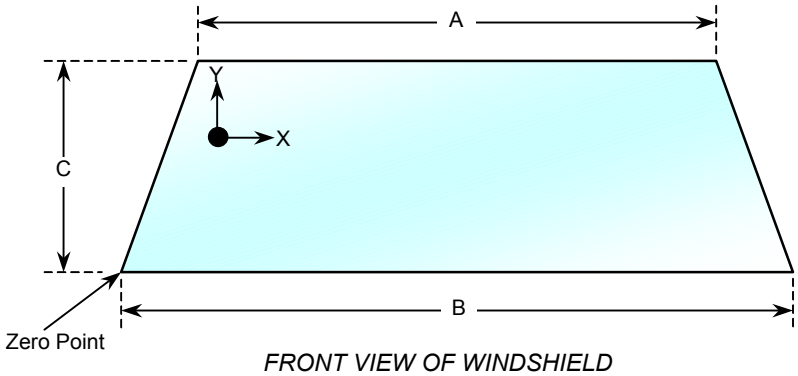
Windshield Mounting Details:
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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	2248	2248	100
Right Side	2248	2248	100
Total	4496	4496	100



FRONT VIEW OF WINDSHIELD

WINDSHIELD DIMENSIONS

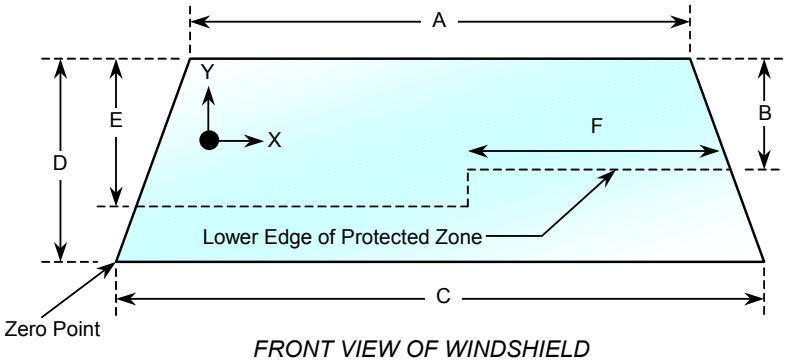
Item	Units	Segment Length	Molding Width
A	mm	1276	16
B	mm	1580	NA
C	mm	820	32

DATA SHEET NO. 12

WINDSHIELD ZONE INTRUSION FMVSS 219 (Partial) DATA

Test Vehicle: 2005 Ford Freestyle
Test Program: 35mph Frontal Impact

NHTSA No.: M50204
Test Date: 12/06/04



FRONT VIEW OF WINDSHIELD

Item	Units	Value
A	mm	1276
B	mm	560
C	mm	1580
D	mm	820
E	mm	560
F	mm	495

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: 2005 Ford Freestyle NHTSA No.: M50204
Test Program: 35mph Frontal Impact Test Date: 12/06/04

Temperature at Time of Impact: 21° C Test Time: 11:50 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)

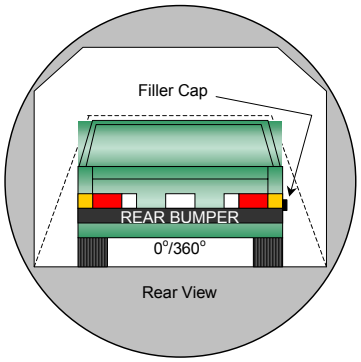
D. Spillage: None

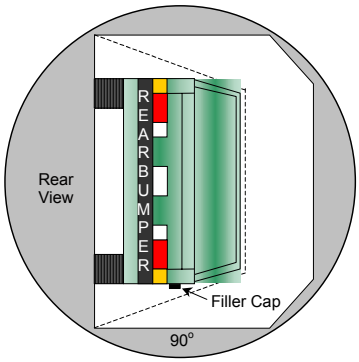
DATA SHEET NO. 14

FMVSS 301 STATIC ROLLOVER DATA

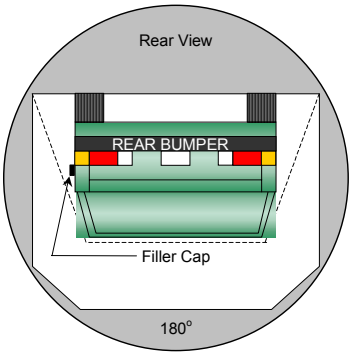
Test Vehicle: 2005 Ford Freestyle NHTSA No.: M50204
Test Program: 35mph Frontal Impact Test Date: 12/06/04

Test Time: 11:50 pm

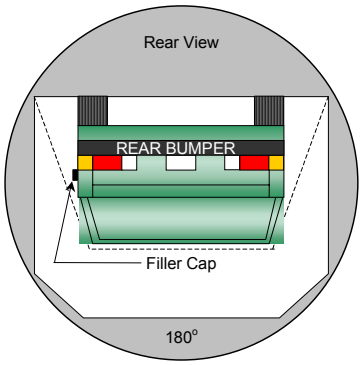




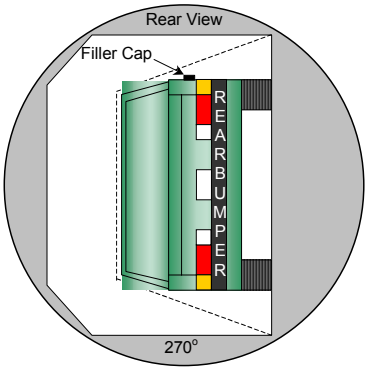
0° to 90°

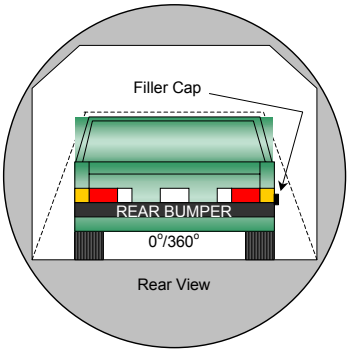


90° to 180°



180° to 270°





270° to 360°

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

Test Phase	Rotation Time (sec.)	Hold Time (sec.)	Spillage (oz.)
0° to 90°	167	300	0
90° to 180°	145	300	0
180° to 270°	134	300	0
270° to 360°	157	300	0

DATA SHEET NO. 15

VEHICLE MEASUREMENTS

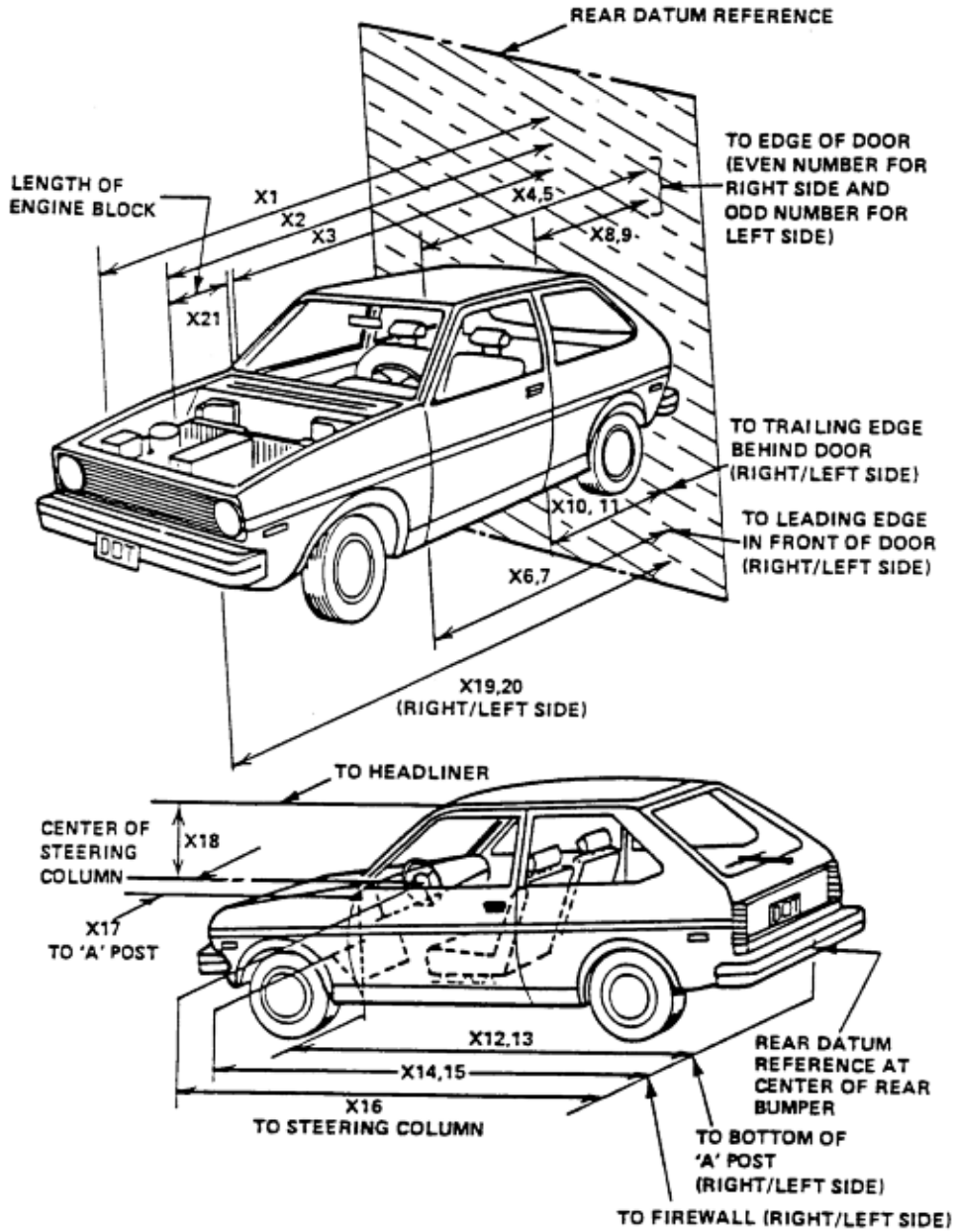
Test Vehicle: 2005 Ford Freestyle NHTSA No.: M50204
Test Program: 35mph Frontal Impact Test Date: 12/06/04

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total length of vehicle at centerline	mm	5060	4527	533
2	RSOV to front of engine	mm	4515	4332	183
3	RSOV to firewall centerline	mm	4020	3992	28
4	RSOV to leading edge of right door	mm	3498	3495	3
5	RSOV to leading edge of left door	mm	3490	3479	11
6	RSOV to lower leading edge of right door	mm	3415	3410	5
7	RSOV to lower leading edge of left door	mm	3407	3403	4
8	RSOV to upper leading edge of right door	mm	2397	2389	8
9	RSOV to upper leading edge of left door	mm	2384	2378	6
10	RSOV to lower trailing edge of right door	mm	2405	2393	12
11	RSOV to lower trailing edge of left door	mm	2395	2390	5
12	RSOV to bottom of right 'A' pillar	mm	3415	3415	0
13	RSOV to bottom of left 'A' pillar	mm	3400	3399	1
14	RSOV to firewall on right side	mm	3932	3949	-17
15	RSOV to firewall on left side	mm	3930	3904	26
16	RSOV to steering column	mm	3000	3063	-63
17	Center of steering column to left 'A' pillar	mm	395	397	-2
18	Center of steering column to headlining	mm	440	457	-17
19	RSOV to right side of front bumper	mm	4932	4404	528
20	RSOV to left side of front bumper	mm	4932	4414	518
21	Length of engine block	mm	470	470	0
RD	RSOV to right side of dash panel	mm	3276	3250	26
CD	RSOV to center of dash panel	mm	3360	3339	21
LD	RSOV to left side of dash panel	mm	3264	3251	13

DATA SHEET NO. 15... (continued)

VEHICLE MEASUREMENTS

Test Vehicle: 2005 Ford Freestyle NHTSA No.: M50204
Test Program: 35mph Frontal Impact Test Date: 12/06/04



DATA SHEET NO. 15... (continued)

VEHICLE MEASUREMENTS

Test Vehicle: 2005 Ford Freestyle NHTSA No.: M50204
Test Program: 35mph Frontal Impact Test Date: 12/06/04

Target Vehicle Structural Measurement

	Elements	Pre-Test (mm)
1	Total Length	5060
2	Total Width	1858
3	Bumper Top Height	650
4	Bumper Bottom Height	470
5	Longitudinal Member Top Height	290
6	Distance between Longitudinal Members	840
7	Longitudinal Member Width	70
8	Engine Top Height	985
9	Engine Bottom Height	240
10	Engine and gearbox width	805
11	Front bumper-engine distance	535
12	Front shock absorber fixing height	970
13	Bonnet leading edge height	890
14	Front shock absorber fixing width	1250
15	Front bumper – front axle distance	555
16	Front axle – a pillar distance	590
17	A-pillar – B-pillar distance	1035
18	B-Pillar – rear axle distance	1230
19	B-pillar – C-pillar distance	1090
20	Roof sill bottom height	1550
21	Roof sill top height	1610
22	Floor sill bottom height	225
23	Floor sill top height	285

DATA SHEET NO. 16

CAMERA LOCATIONS

Test Vehicle: 2005 Ford Freestyle
Test Program: 35mph Frontal Impact

NHTSA No.: M50204
Test Date: 12/06/04

No.	Camera View	Location (mm) *			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Side View				13	24
2	Left Front View	1055	-8855	1395	24	1000
3	Steering Column Top	2500	-5800	1580	19	1000
4	Steering Column Bottom	2490	-5775	1040	13	1000
5	Driver Close-up	1705	-9810	1480	50	1000
6	Driver Angle	6595	-5330	1990	50	1000
7	On board Driver Side				13	1000
8	On board Passenger Side				10	1000
9	Right Overall	2525	7295	1455	19	1000
10	Right Passenger Half	1185	9470	1425	25	1000
11	Right Close-up	1375	9835	1520	50	1000
12	Right Angle	6805	5300	2000	50	1000
13	Windshield	290	0	2750	14	1000
14	Top Driver	75	-460	1780	13	1000
15	Top Passenger	100	460	1740	13	1000
16	Pit Front	975	0	-3150	19	1000
17	Pit Rear	3170	0	-3150	19	1000

*COORDINATES:

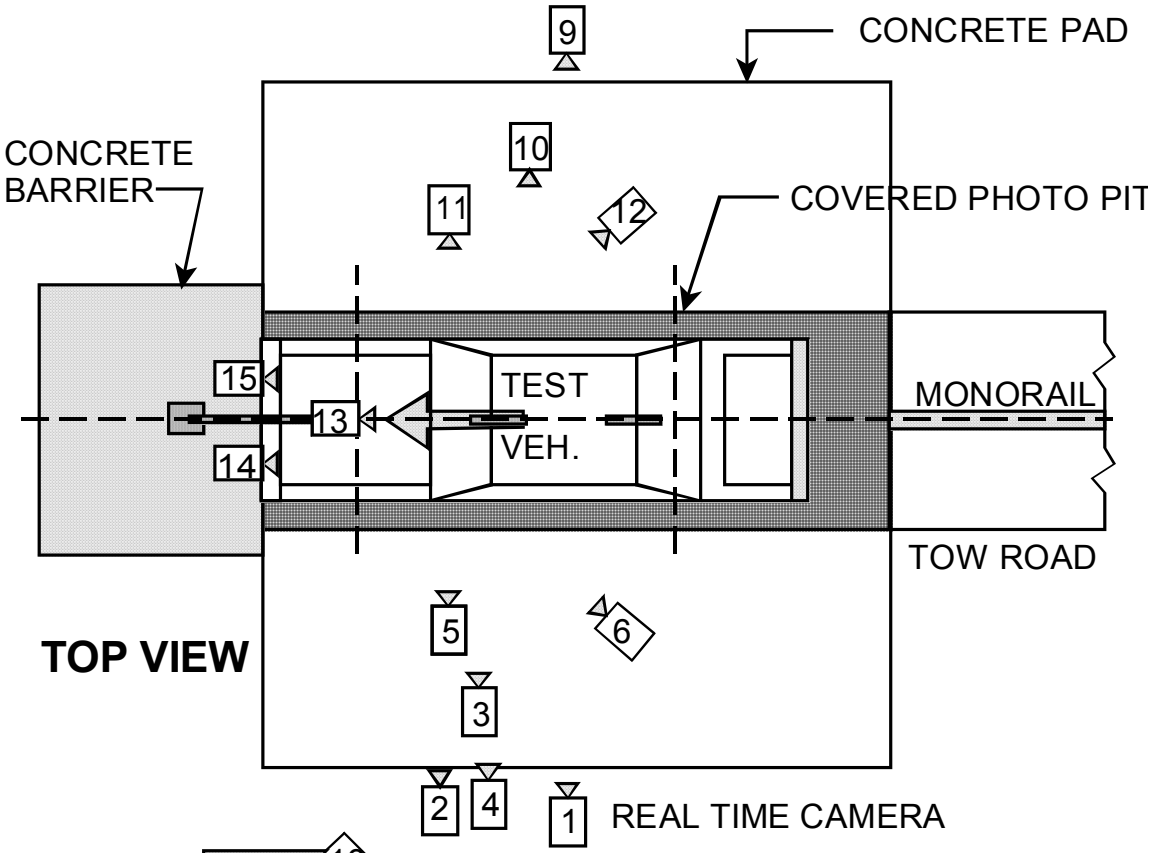
+X = forward of impact plane
+Y = right of monorail centerline
+Z = above ground level

DATA SHEET NO. 16... (continued)

CAMERA LOCATIONS

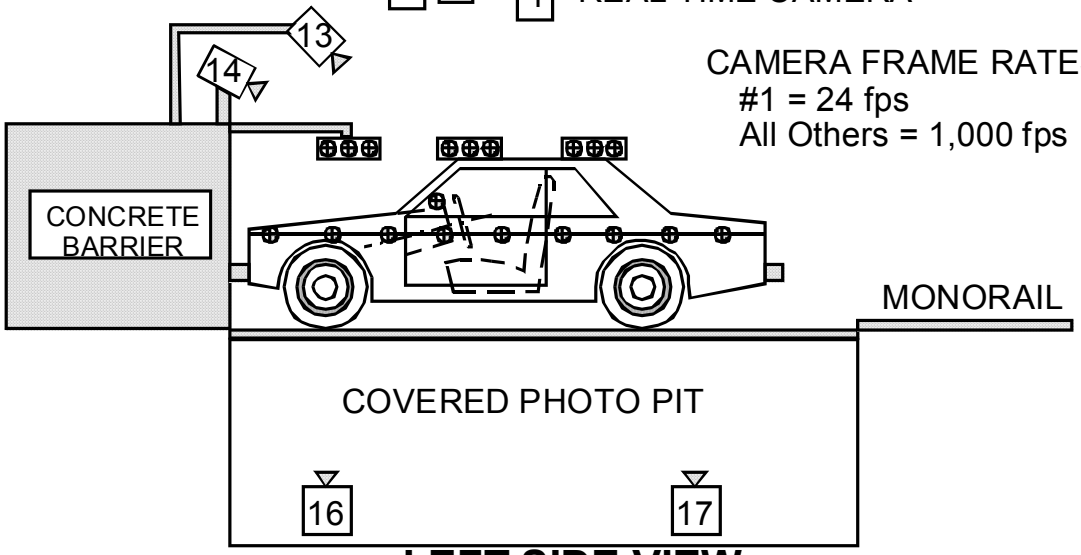
Test Vehicle: 2005 Ford Freestyle NHTSA No.: M50204
Test Program: 35mph Frontal Impact Test Date: 12/06/04

CAMERA POSITIONS FOR FRONTAL IMPACTS



TOP VIEW

CAMERA FRAME RATES:
#1 = 24 fps
All Others = 1,000 fps



LEFT SIDE VIEW

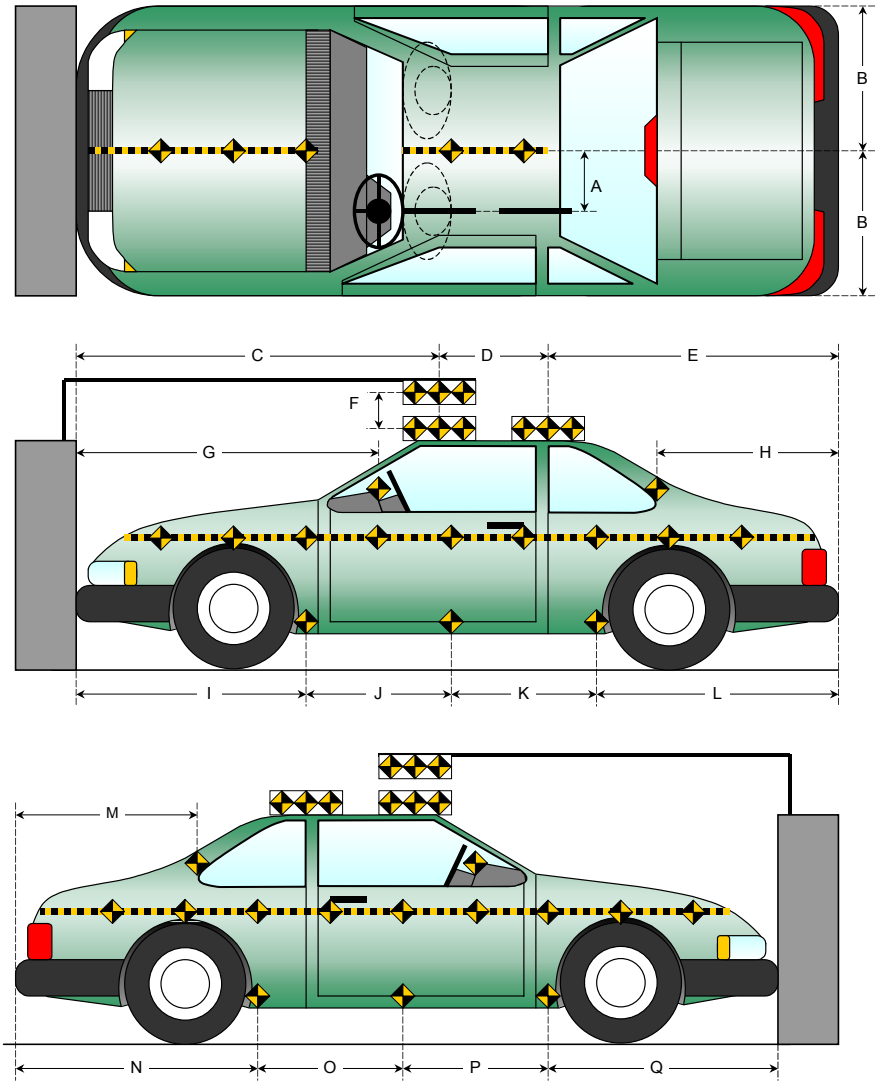
DATA SHEET NO. 17

PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2005 Ford Freestyle
Test Program: 35mph Frontal Impact

NHTSA No.: M50204
Test Date: 12/06/04

Item	Value
A	379
B	929
C	2387
D	609
E	2064
F	
G	
H	1298
I	1514
J	968
K	968
L	1610
M	1336
N	1615
O	968
P	968
Q	1509



DATA SHEET NO. 18

VEHICLE INTRUSION MEASUREMENTS

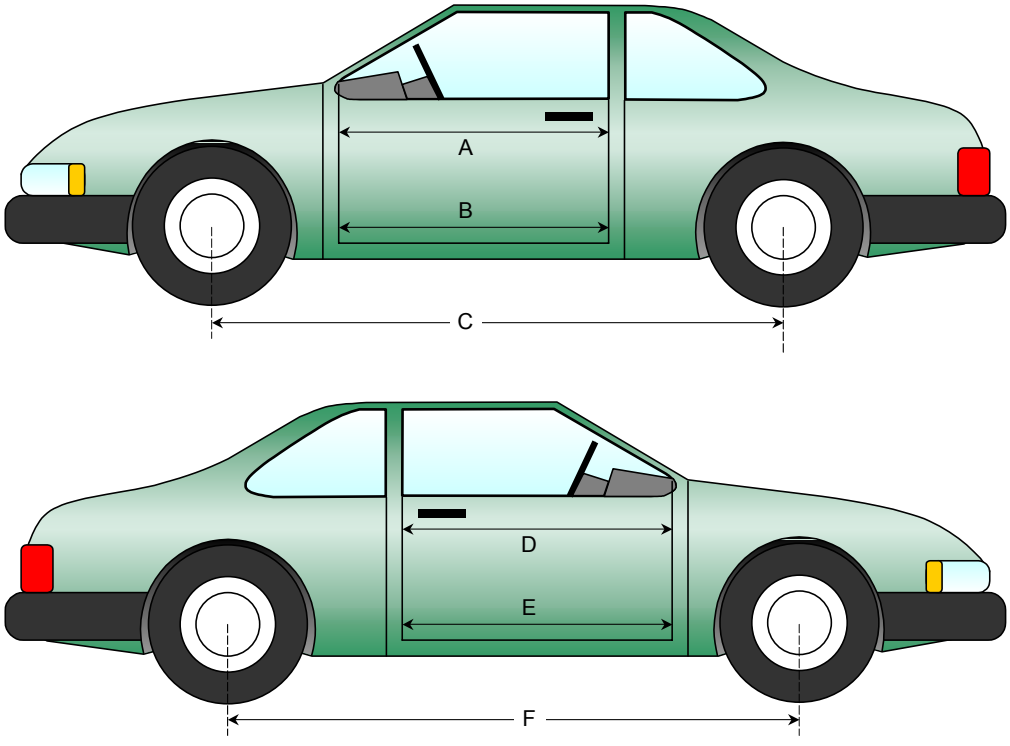
Test Vehicle: 2005 Ford Freestyle
Test Program: 35mph Frontal Impact
NHTSA No.: M50204
Test Date: 12/06/04

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	989	978	11
B	Left Side Lower	mm	808	809	-1
D	Right Side Upper	mm	992	990	2
E	Right Side Lower	mm	812	813	-1

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2860	2831	29
F	Right Side Wheelbase	mm	2860	2808	52



DATA SHEET NO. 18... (continued)

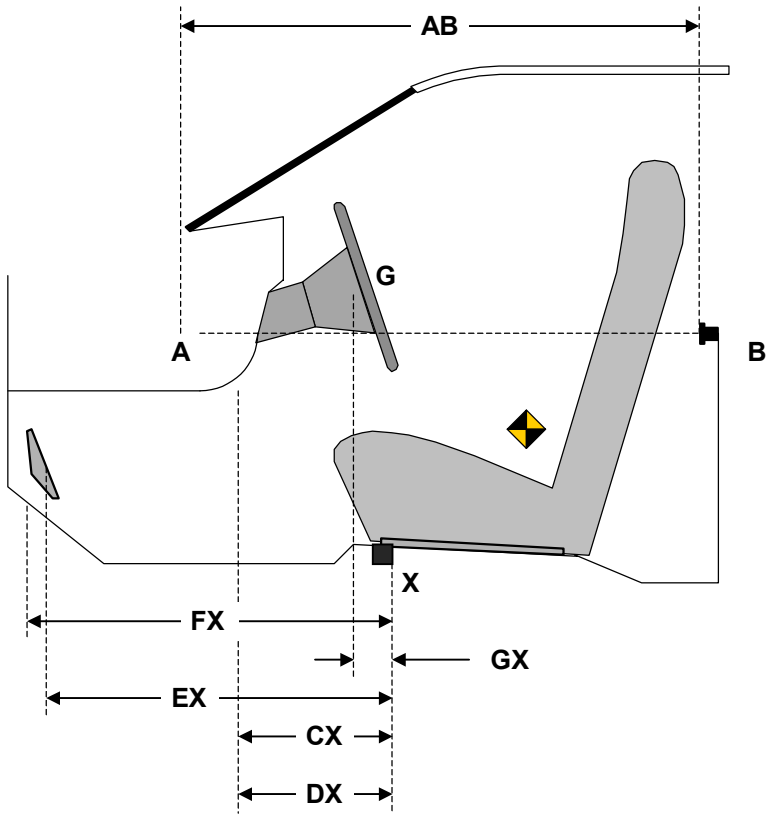
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2005 Ford Freestyle NHTSA No.: M50204
Test Program: 35mph Frontal Impact Test Date: 12/06/04

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside window jam)	mm	989	978	11
CX	Left Knee Bolster to X	mm	226	271	-45
DX	Right Knee Bolster to X	mm	223	278	-55
EX	Brake Pedal to X	mm	480	473	7
FX	Foot Rest to X	mm	574	603	-29
GX	Center of Steering Column Wheel Hub to X	mm	23	141	-118

X = Front of Seat Track (stationary)



DRIVER COMPARTMENT

DATA SHEET NO. 18... (continued)

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2005 Ford Freestyle
Test Program: 35mph Frontal Impact

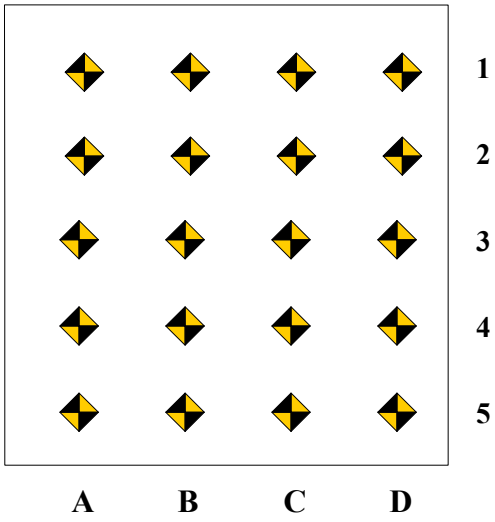
NHTSA No.: M50204
Test Date: 12/06/04

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

Columns A through D are evenly spaced.

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

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



DRIVER FLOOR PAN X-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1		653	656	657		644	648	653		9	8	4
2		585	597	610		583	594	605		2	3	5
3	515	514	513	516	522	513	509	503	-7	1	4	13
4	341	340	338	339	347	341	341	331	-6	-1	-3	8
5	157	157	156	159	165	169	160	170	-8	-12	-4	-11

DRIVER FLOOR PAN Z-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1		-80	-89	-95		-71	-79	-82		-9	-10	-13
2		-131	-125	-127		-124	-119	-110		-7	-6	-17
3	-174	-173	-169	-167	-170	-166	-151	-135	-4	-7	-18	-32
4	-173	-172	-170	-173	-169	-132	-103	-89	-4	-40	-67	-84
5	-161	-176	-168	-170	-158	-171	-125	-126	-3	-5	-43	-44

DATA SHEET NO. 18... (continued)

VEHICLE INTRUSION MEASUREMENTS

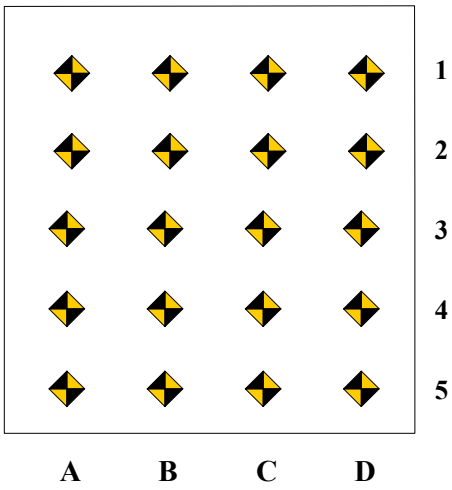
Test Vehicle: 2005 Ford Freestyle
Test Program: 35mph Frontal Impact
NHTSA No.: M50204
Test Date: 12/06/04

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

Columns A through D are evenly spaced.

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

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



PASSENGER FLOOR PAN X-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	704	683			659	656			45	27		
2	614	600	607		574	582	589		40	18	18	
3	530	518	521	525	487	498	509	518	43	20	12	7
4	408	396	404	400	400	389	400	404	8	7	4	-4
5	272	272	278	272	270	265	279	275	2	7	-1	-3

PASSENGER FLOOR PAN Z-AXIS

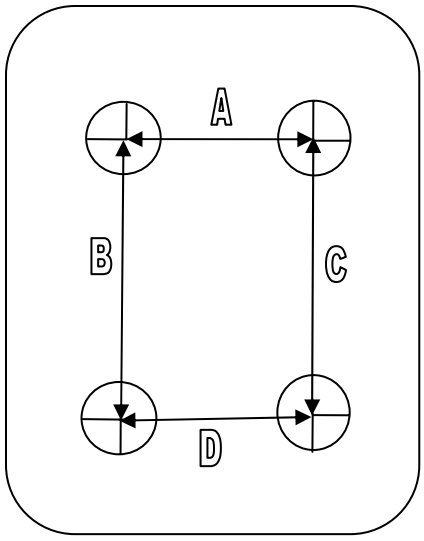
	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	-67	-52			-56	-52			-11	0		
2	-132	-114	-122		-117	-119	-124		-15	5	2	
3	-175	-172	-179	-180	-163	-174	-187	-190	-12	2	8	10
4	-180	-179	-181	-181	-87	-120	-142	-161	-93	-59	-39	-20
5	-176	-176	-176	-173	-96	-114	-167	-175	-80	-62	-9	2

DATA SHEET NO. 18... (continued)

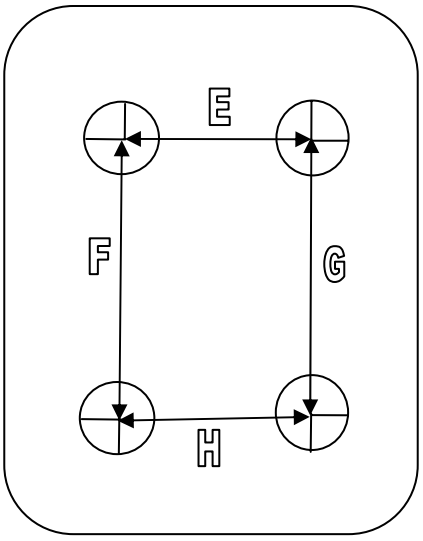
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2005 Ford Freestyle
Test Program: 35mph Frontal Impact

NHTSA No.: M50204
Test Date: 12/06/04



Driver



Passenger

UNDERBODY FLOORBOARD DEFORMATION

Measurement	Pre-Test	Post-Test	Difference
A	195	186	9
B	335	334	1
C	335	326	9
D	220	216	4
E	175	162	13
F	302	304	-2
G	310	302	8
H	200	200	0

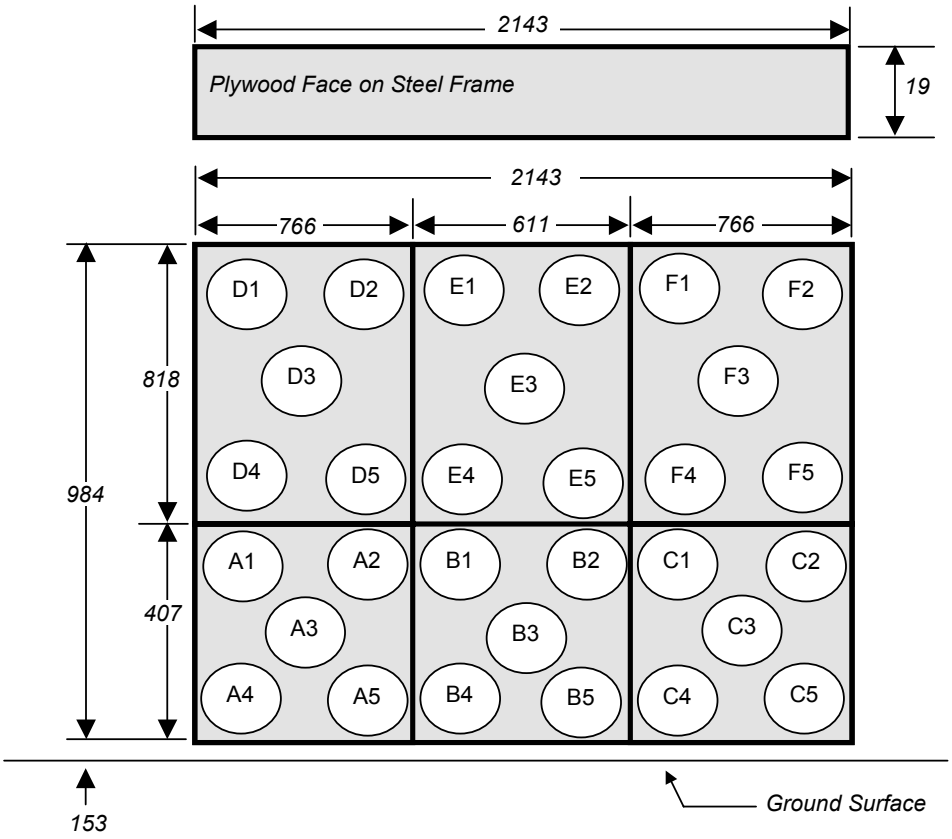
DATA SHEET NO. 19

LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2005 Ford Freestyle NHTSA No.: M50204
Test Program: 35mph Frontal Impact Test Date: 12/06/04

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: 2005 Ford Freestyle NHTSA No.: M50204
Test Program: 35mph Frontal Impact Test Date: 12/06/04

VEHICLE INFORMATION

VIN: 1FMZK04175GA11446 Wheelbase (mm) : 2860
Vehicle Size Category: MPV Test Weight (kg) : 2129.6

ACCELEROMETER DATA

Accelerometer Locations: As per measurements on Page 14
Cal. Procedure/Interval: MGA procedure / 6 month
Integration Algorithm: Trapezoidal Linearity: > 99%
Impact Velocity (km/h): 56.5
Velocity Change (km/h): 64.2 Time of Separation (msec): 110

CRUSH PROFILE

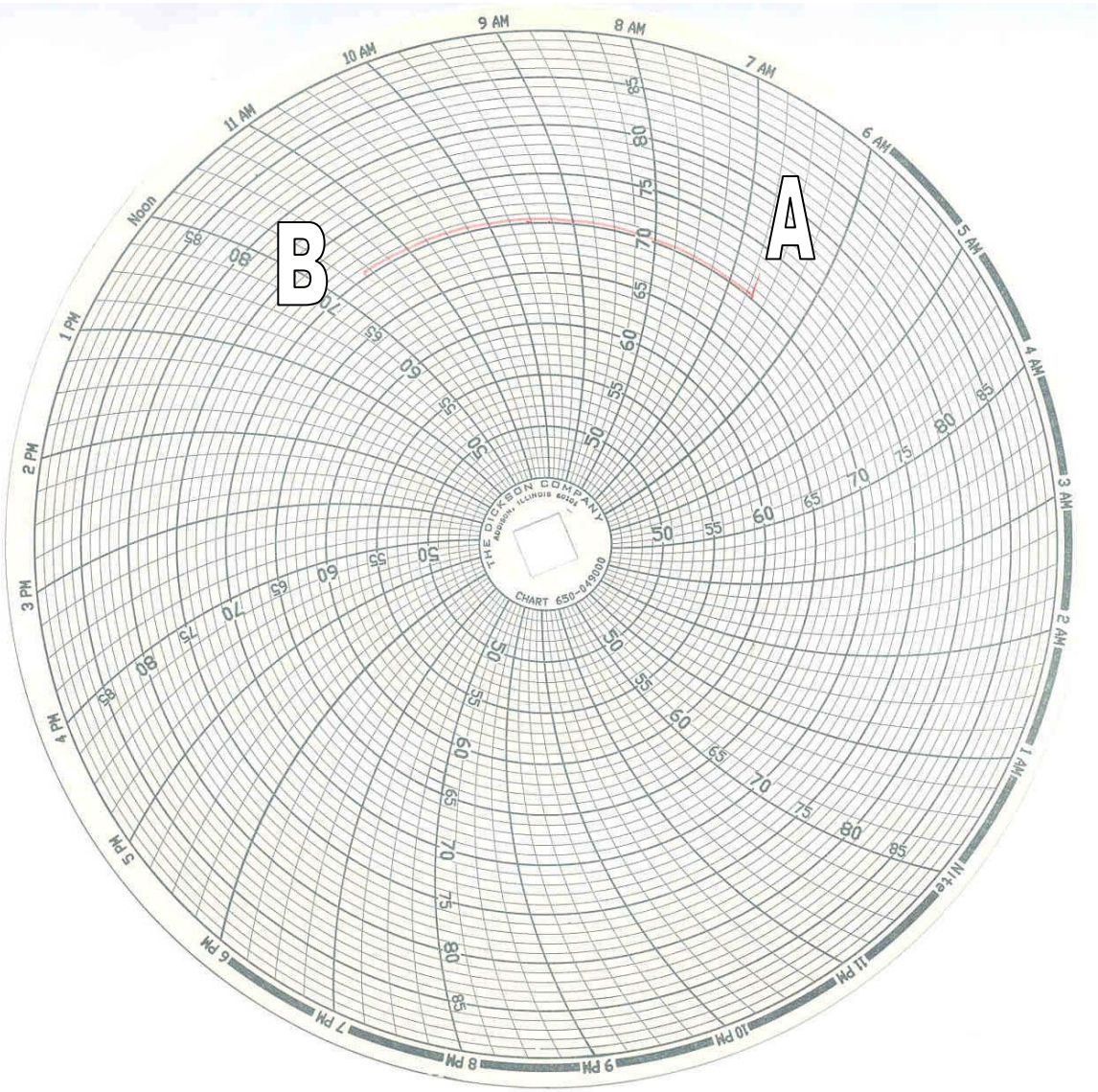
Collision Deformation Classification: Frontal Midpoint of Damage: Centerline
Damage Region Length (mm): 1375 Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4932	4414	518
C2	Crush zone 2 at left side	mm	5010	4457	553
C3	Crush zone 3 at left side	mm	5050	4506	544
C4	Crush zone 4 at right side	mm	5048	4520	528
C5	Crush zone 5 at right side	mm	5006	4484	522
C6	Crush zone 6 at right side	mm	4932	4404	528
L	C1 TO C6	mm	1375	1373	2

DATA SHEET NO. 21

DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART

Test Vehicle: 2005 Ford Freestyle NHTSA No.: M50204
Test Program: 35mph Frontal Impact Test Date: 12/06/04



A = Dummies installed in vehicle at 7:00 am

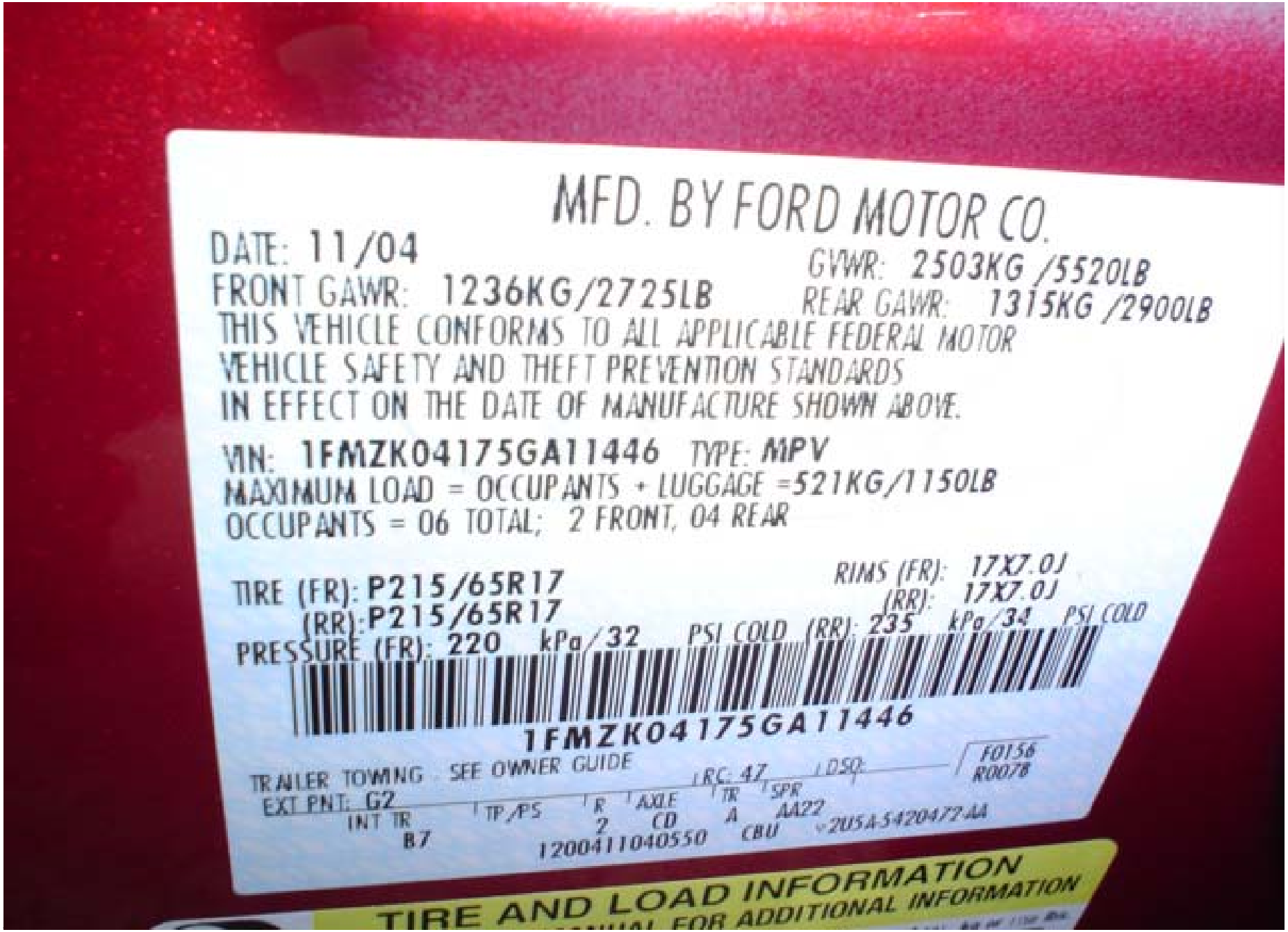
B = Test conducted at 11:50 pm

APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

Load Cell Location



Vehicle Certification Label

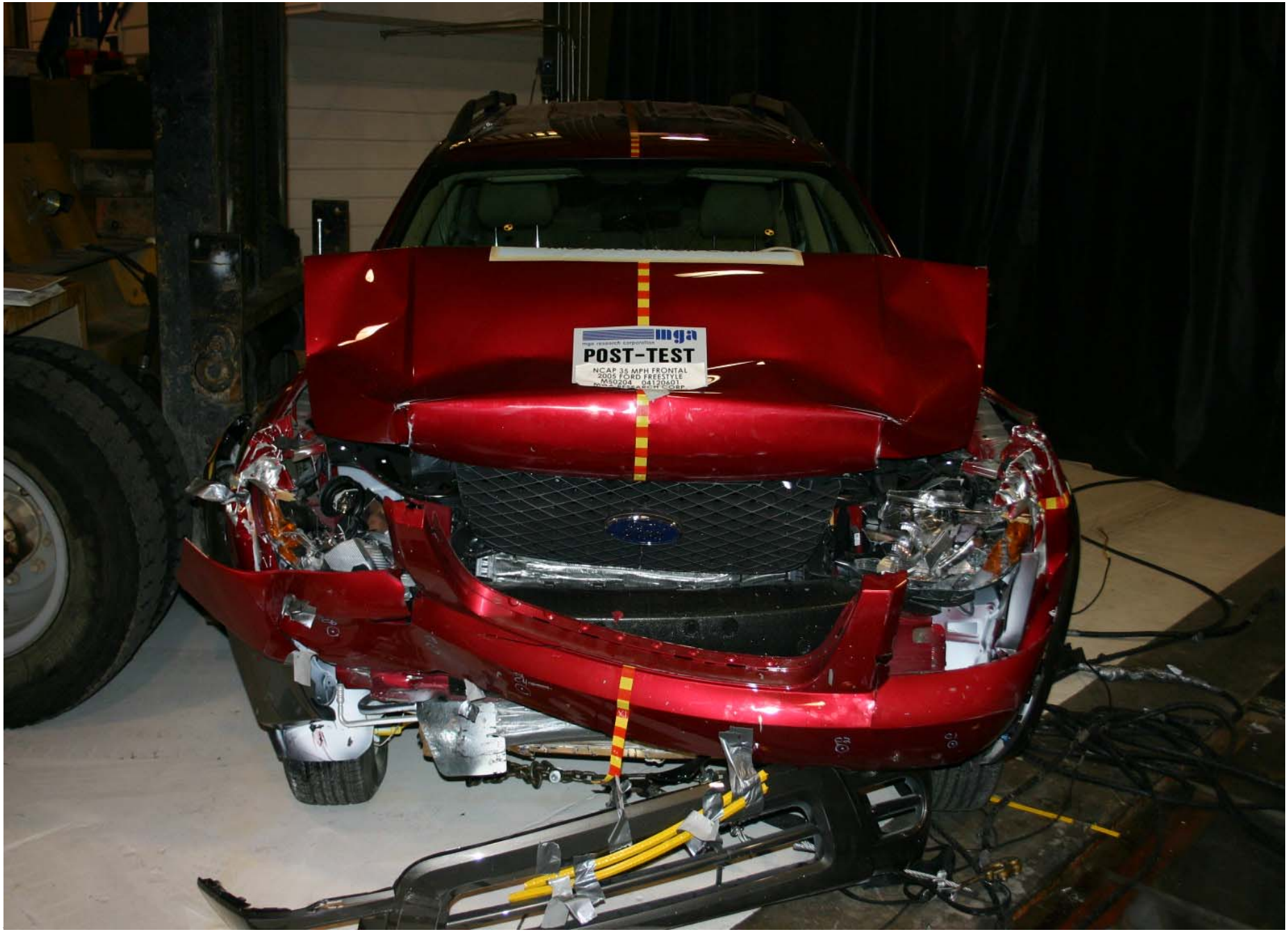
A-3.

Tire Placard

Right Front View of Test Vehicle, as received

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

Pre-Test Left Rear Three-Quarter View of Door

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

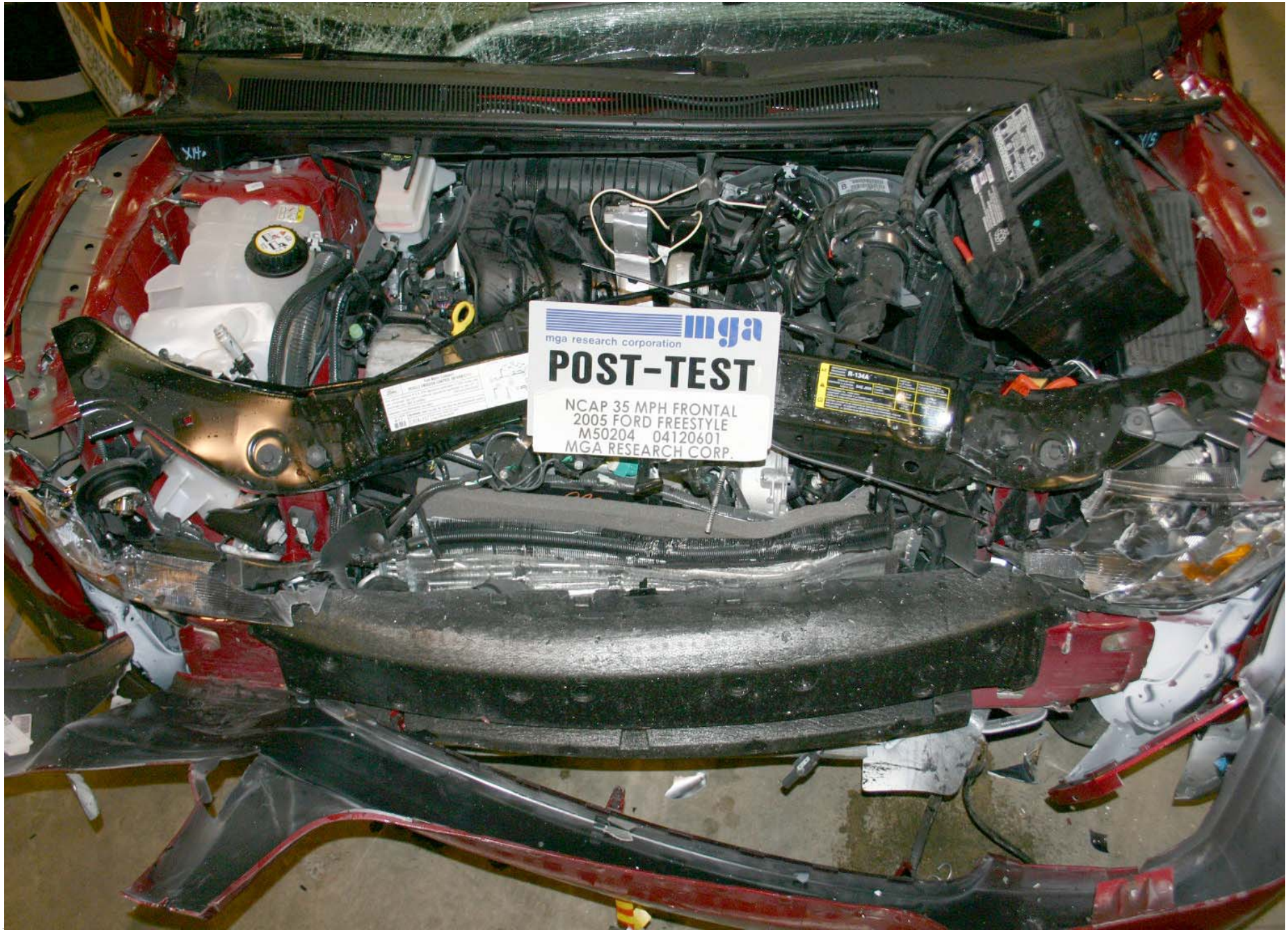
Pre-Test Right Rear Three-Quarter View of Door

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

Pre-Test Windshield View

Post-Test Windshield View

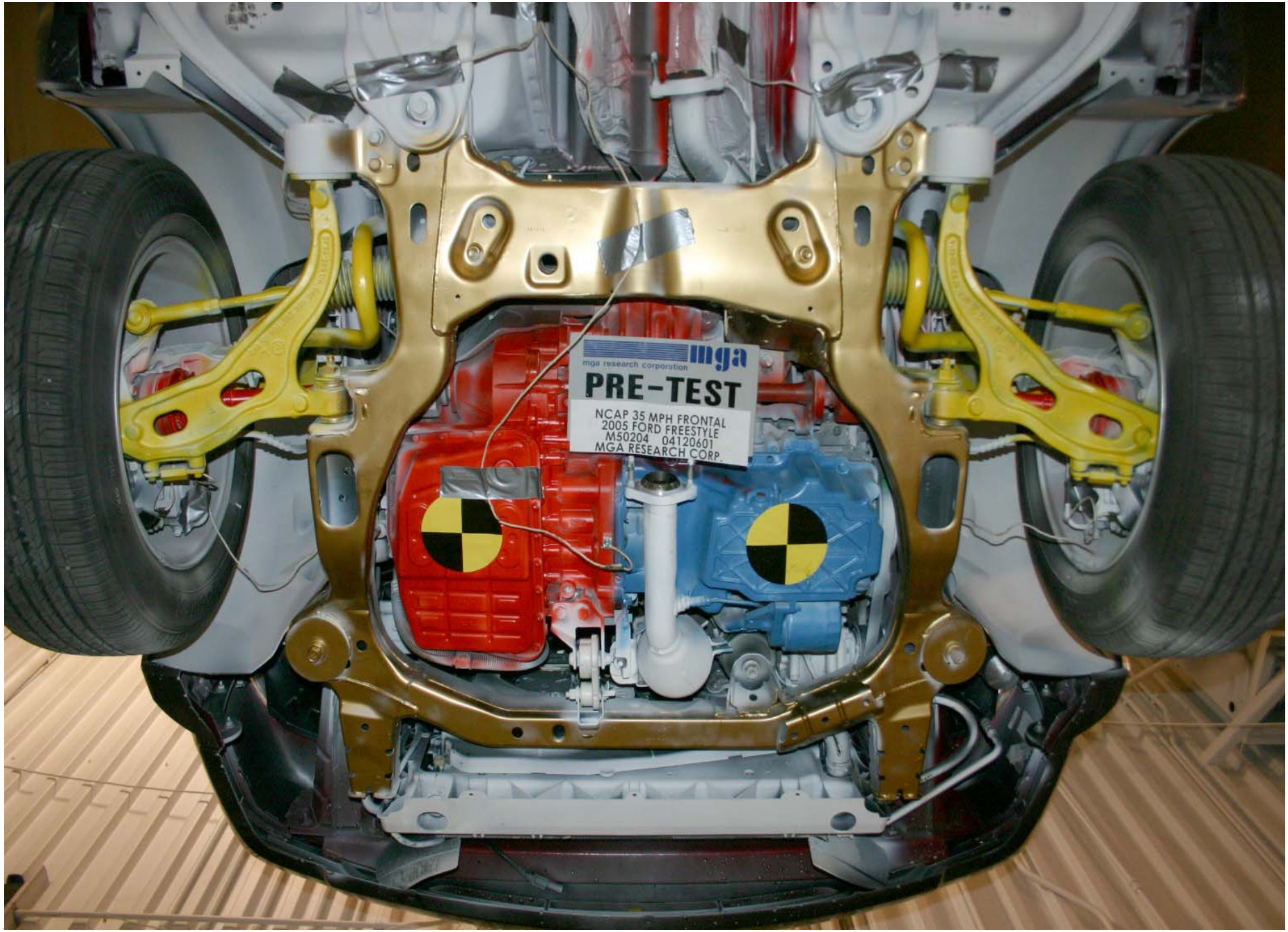
Pre-Test Engine Compartment View



Post-Test Engine Compartment View

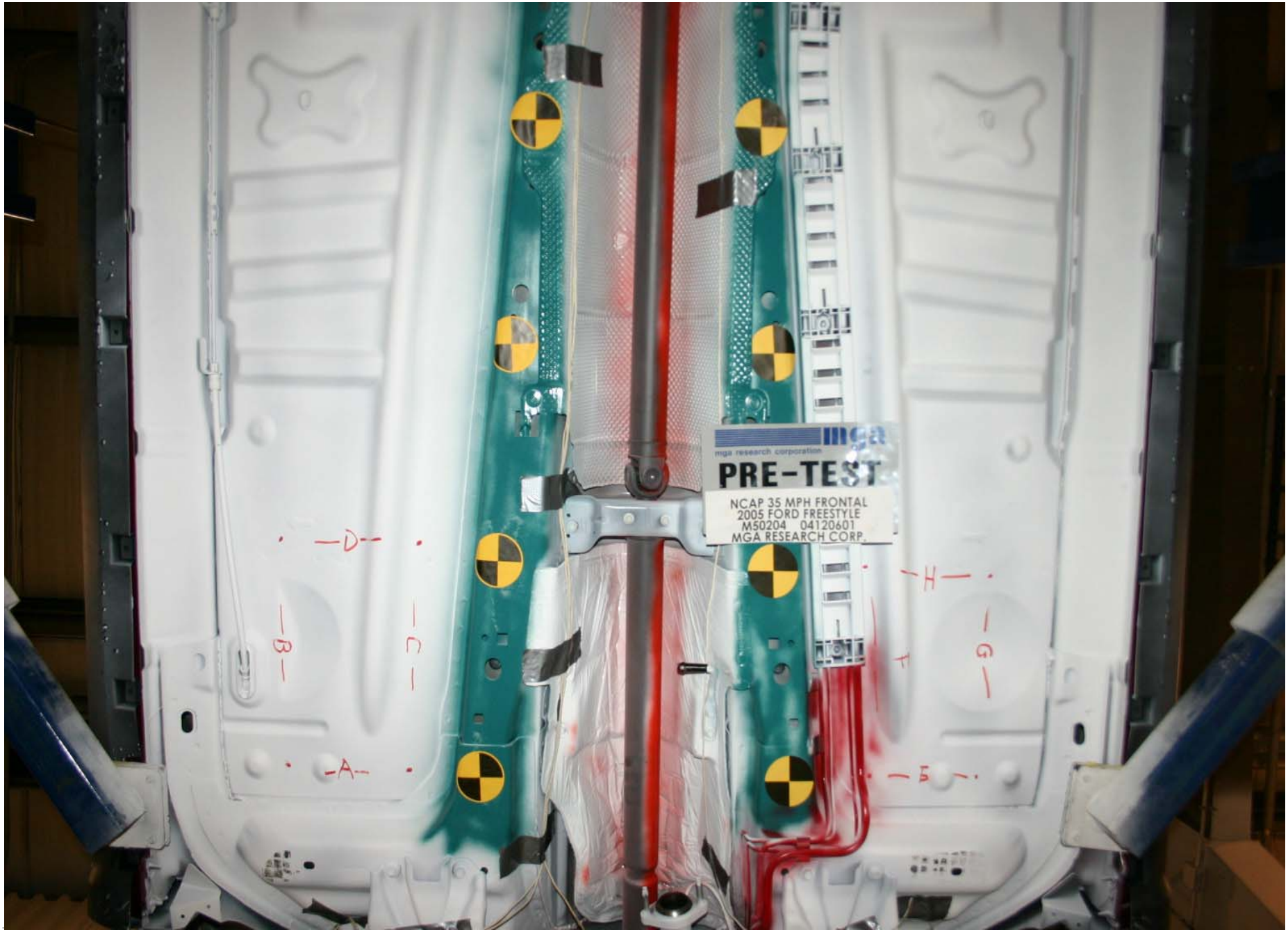
Pre-Test Fuel Filler Cap View

Post-Test Fuel Filler Cap View

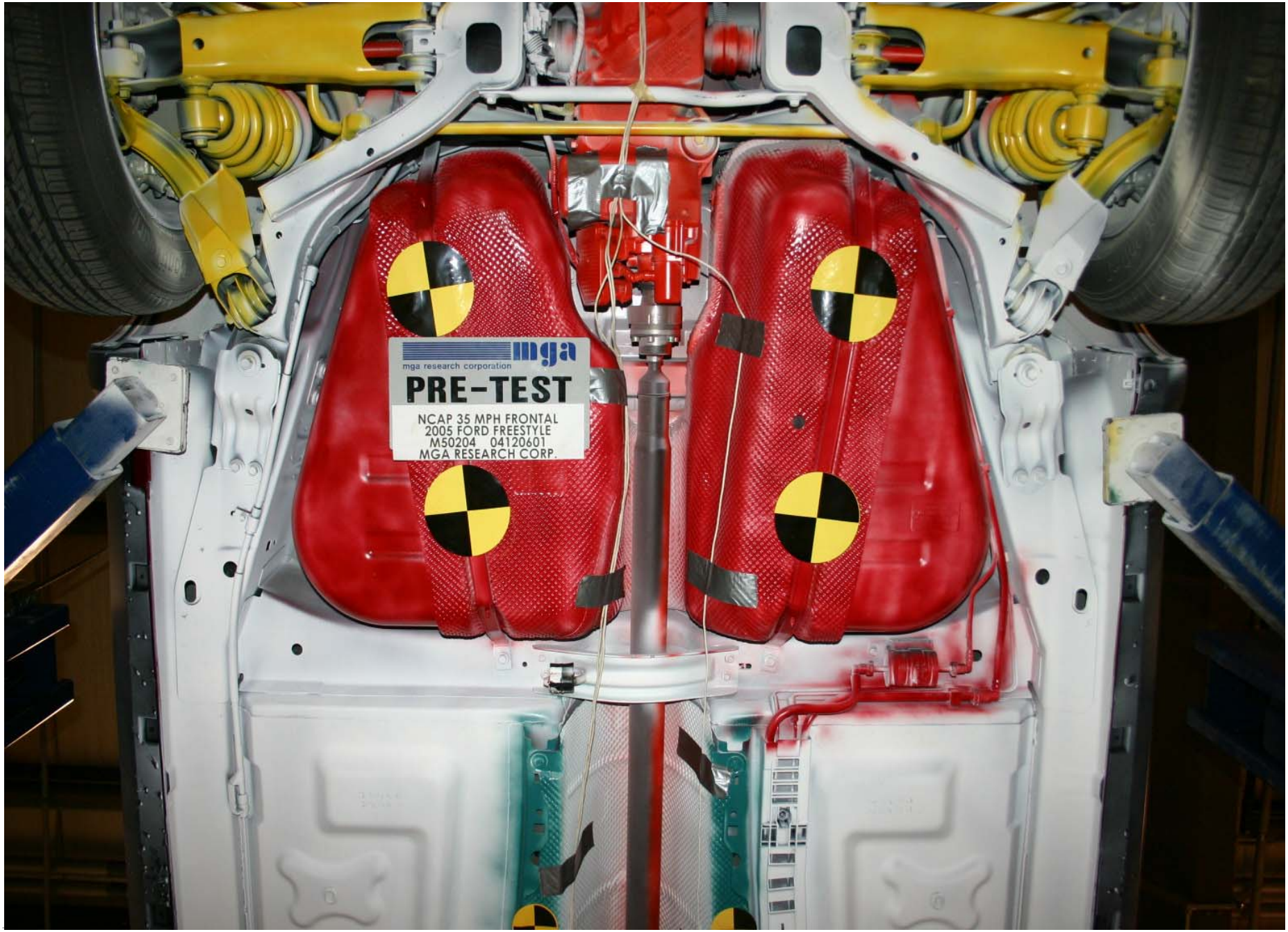


Pre-Test Front Underbody View

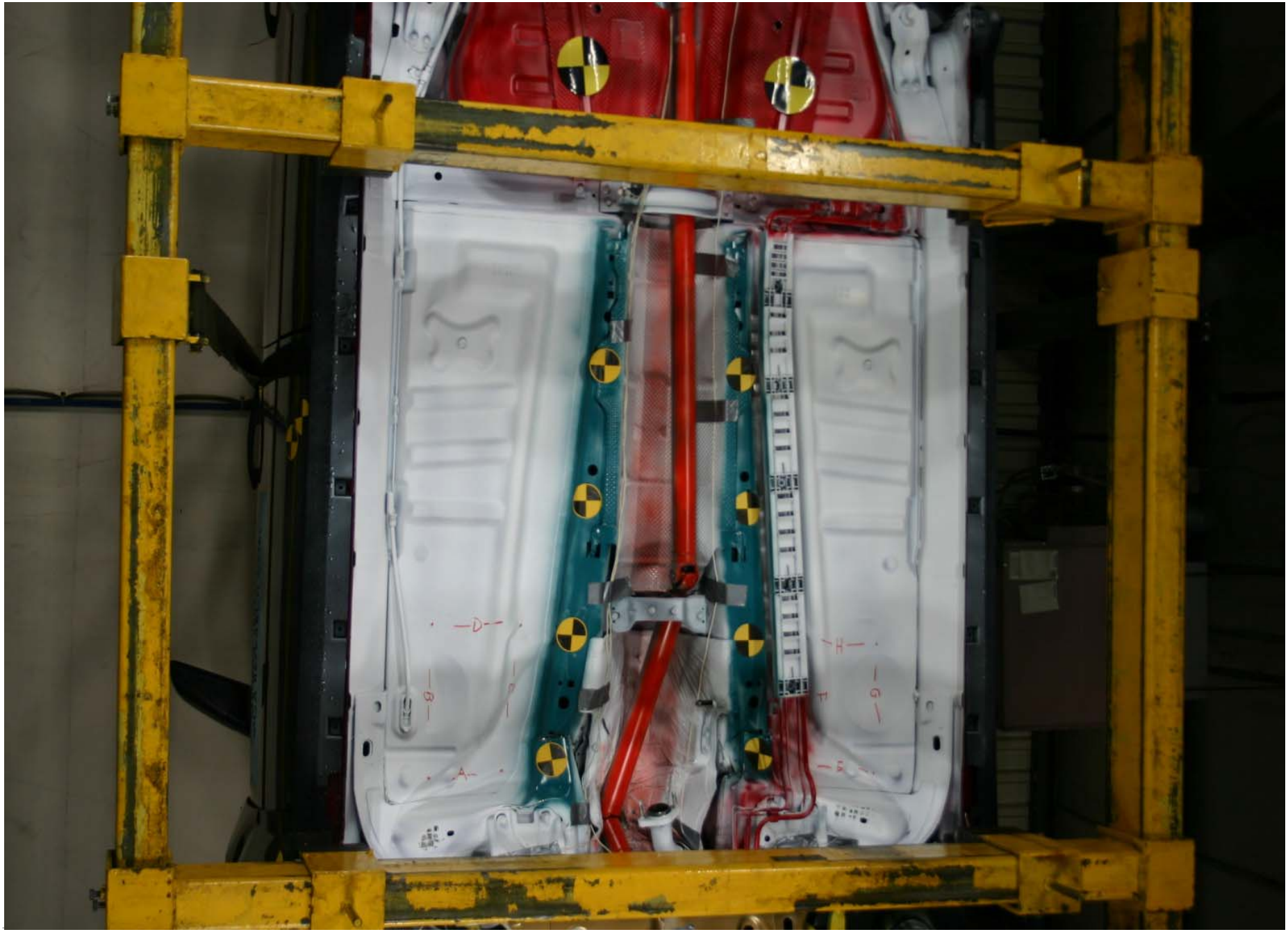
Post-Test Front Underbody View



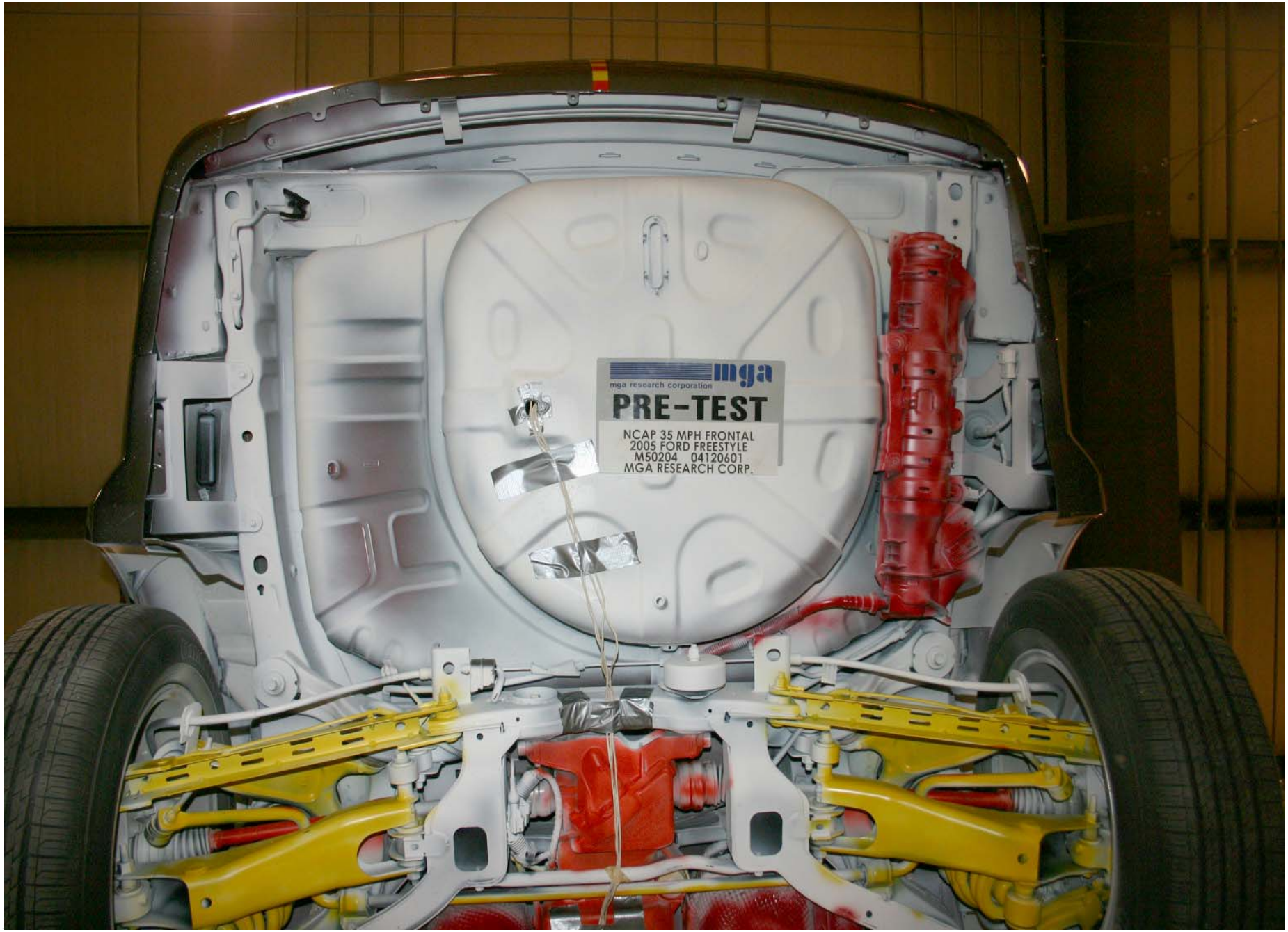
Pre-Test Front Mid Underbody



Pre-Test Rear 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 Seat Position

Post-Test Driver Dummy Seat Position

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 Seat Position

Post-Test Passenger Dummy Seat Position

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

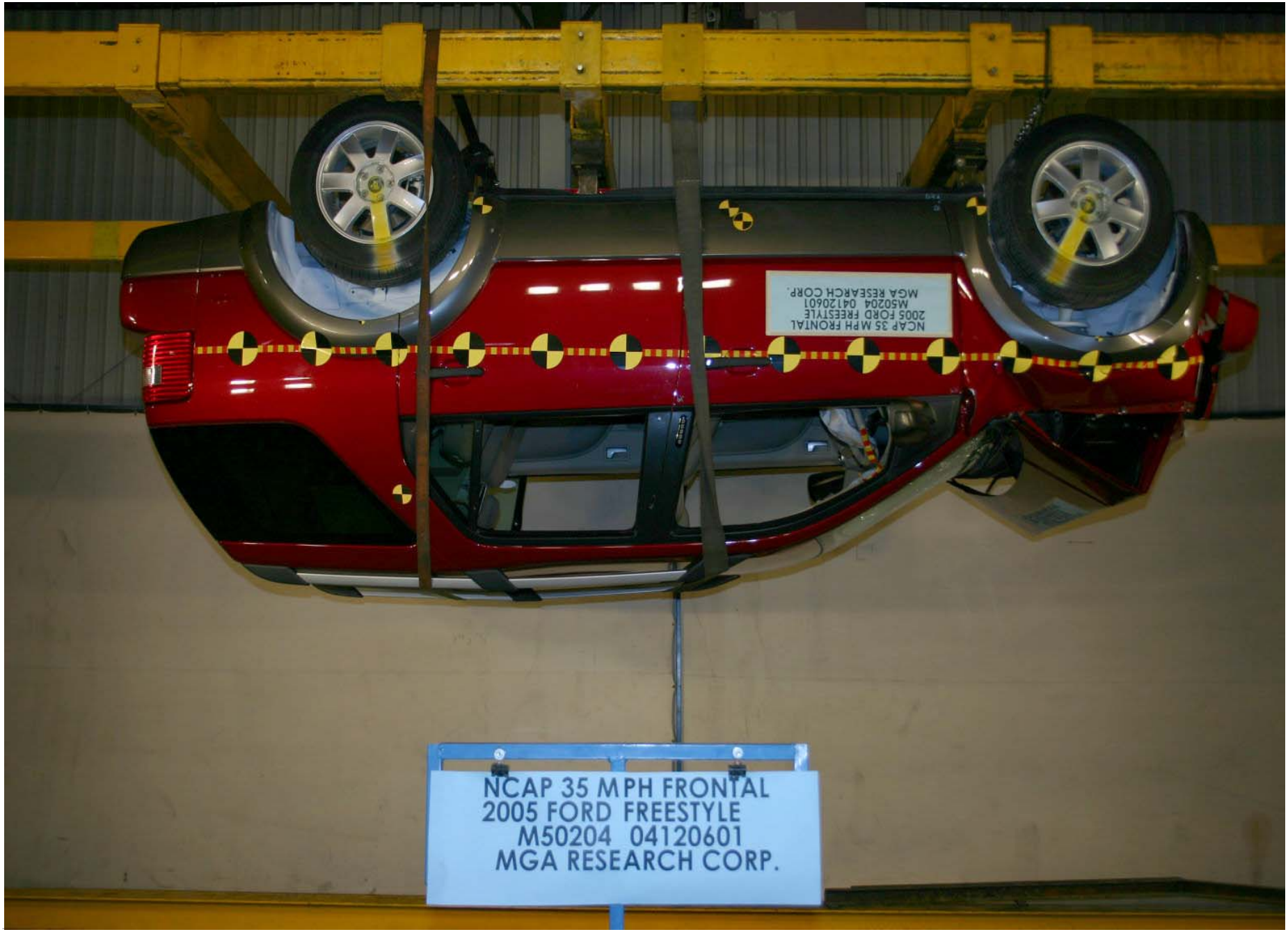
Post-Test Passenger Side Floor Pan View

Post-Test Passenger Dummy Head Contact (visor)

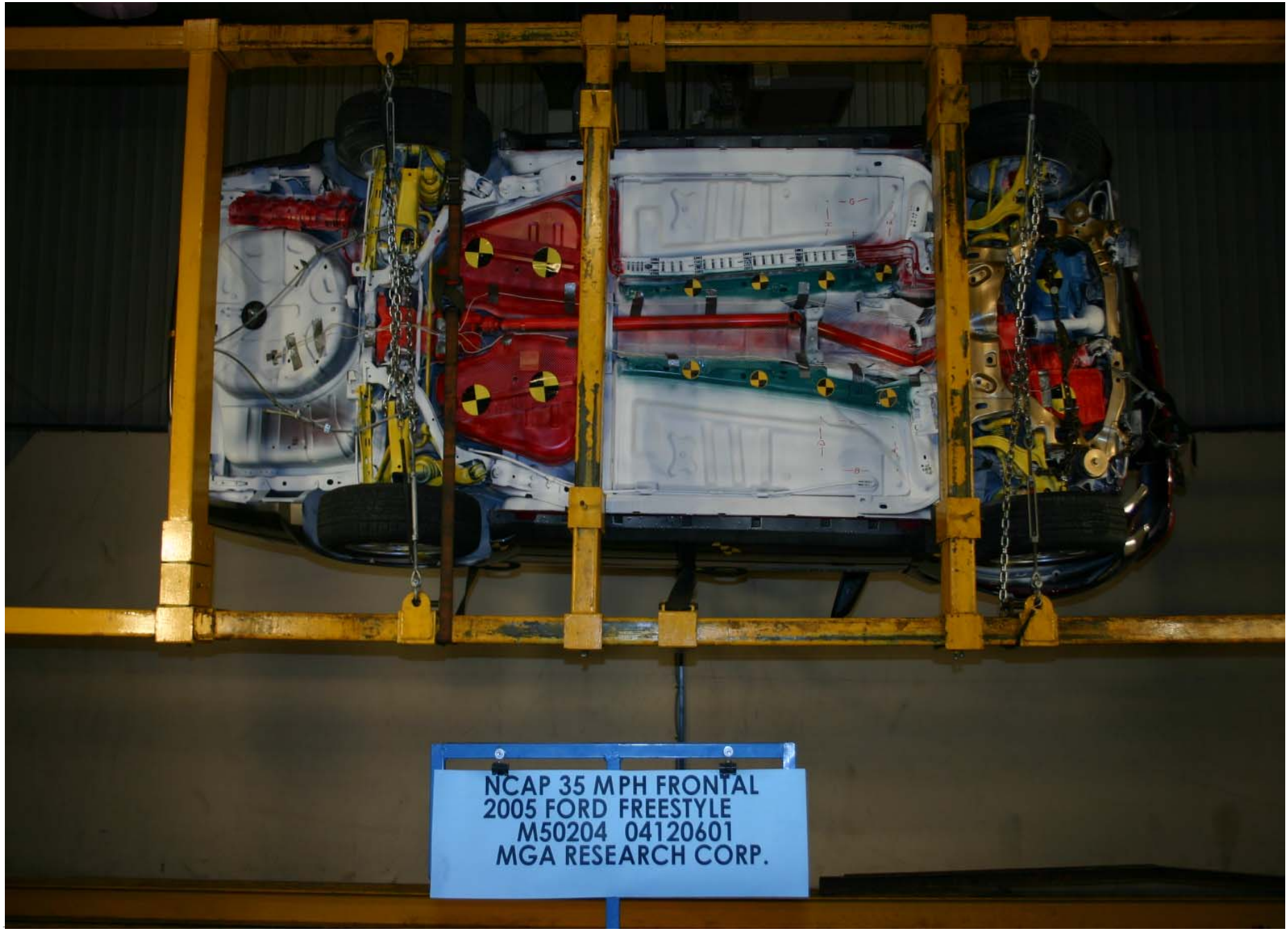
Post-Test Passenger Dummy Knee Contact

Post-Test Passenger Dummy Airbag Contact

Rollover 90 Degrees



Rollover 180 Degrees



Rollover 270 Degrees

Rollover 360 Degrees

Vehicle Impact

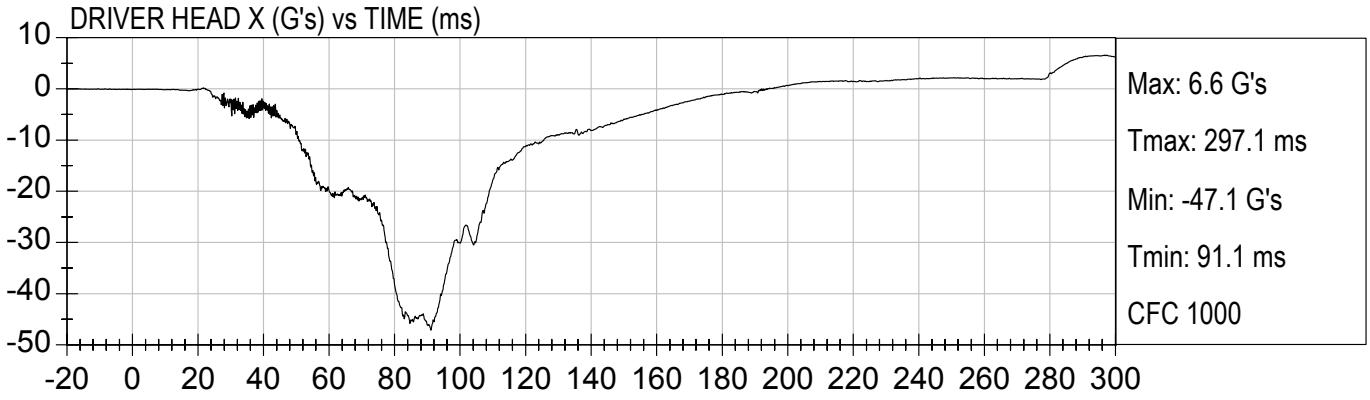
APPENDIX B

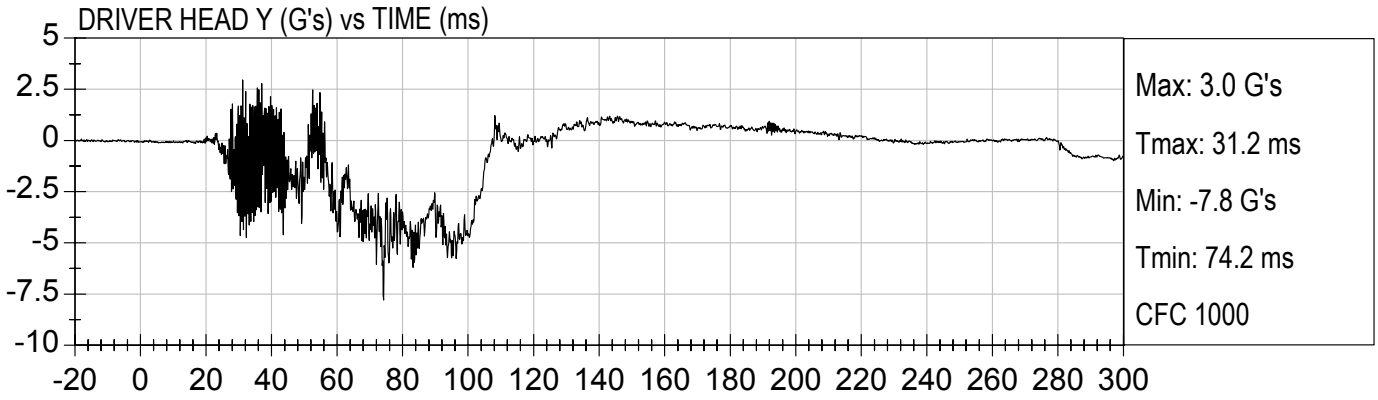
DUMMY AND VEHICLE RESPONSE DATA TRACES

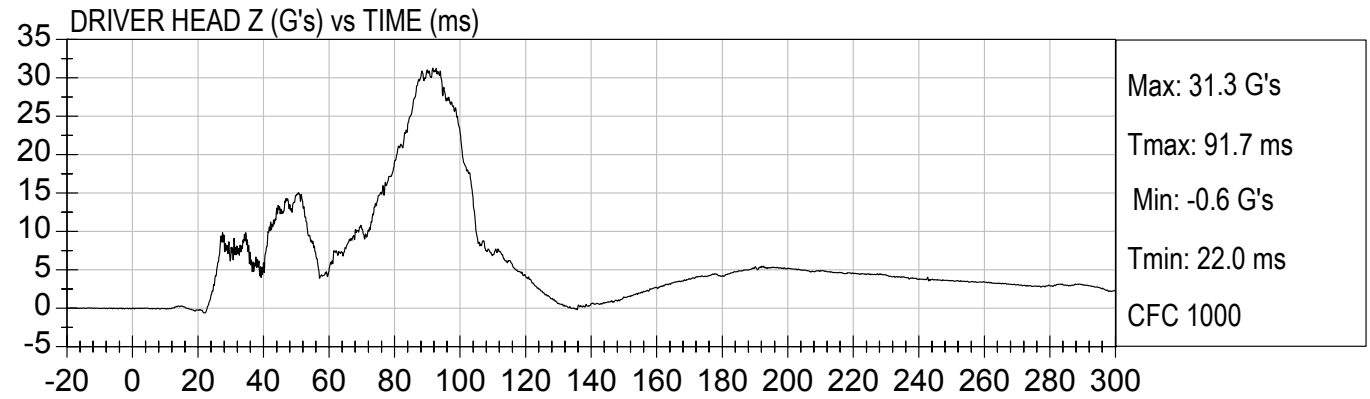
TABLE OF DATA PLOTS

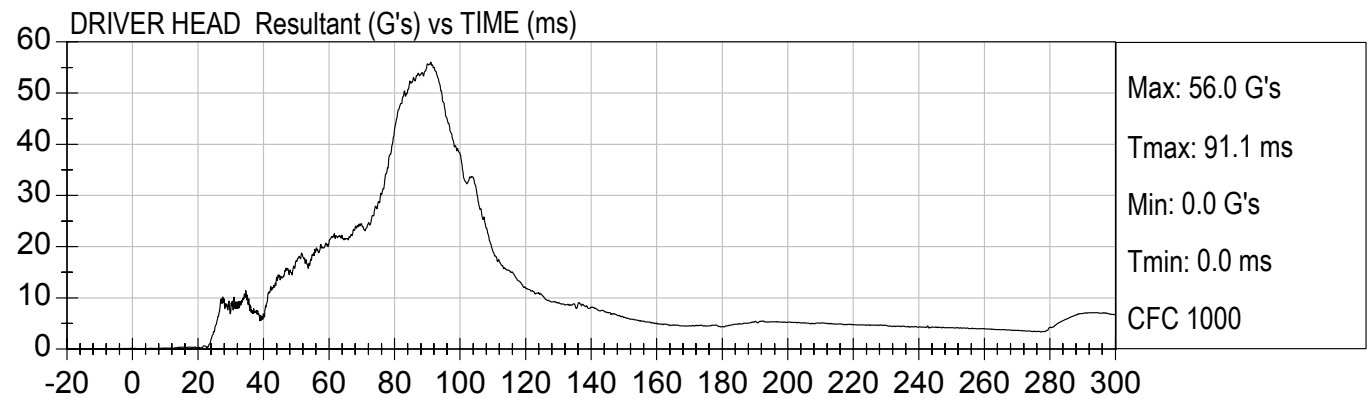
NCAP FRONTAL IMPACT
2005 FORD FREESTYLE (M50204)

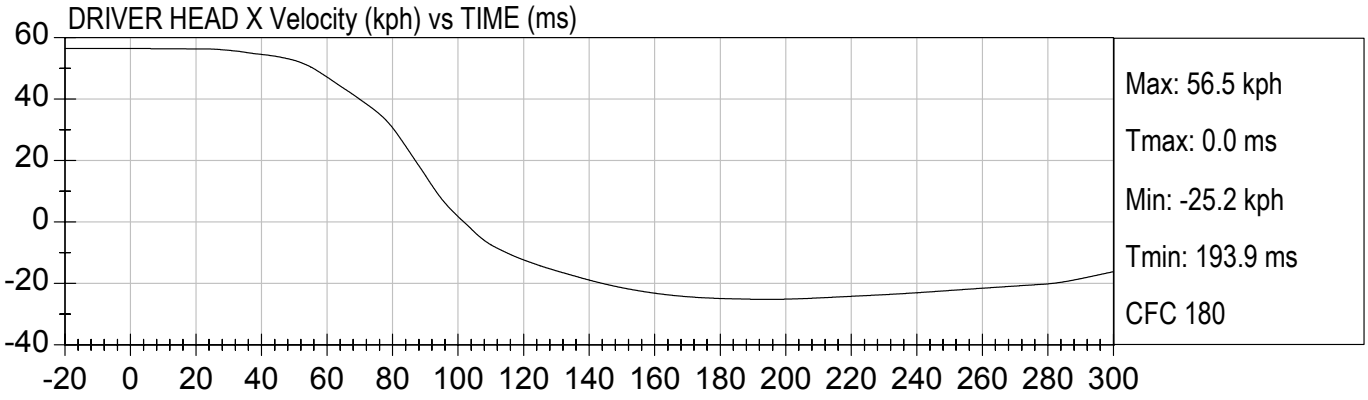
Test Date: 12/06/04
Speed: 35.1 mph (56.5 km/h)

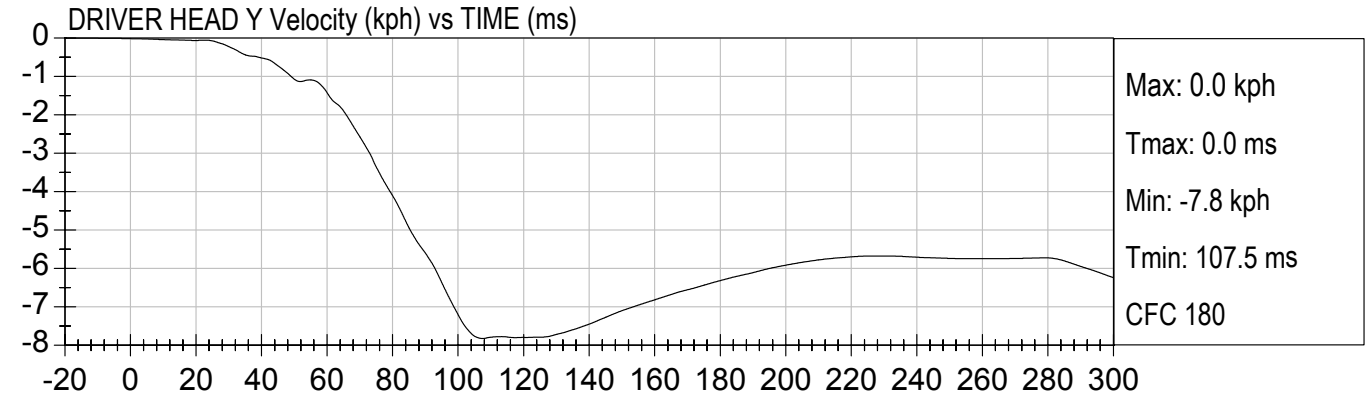


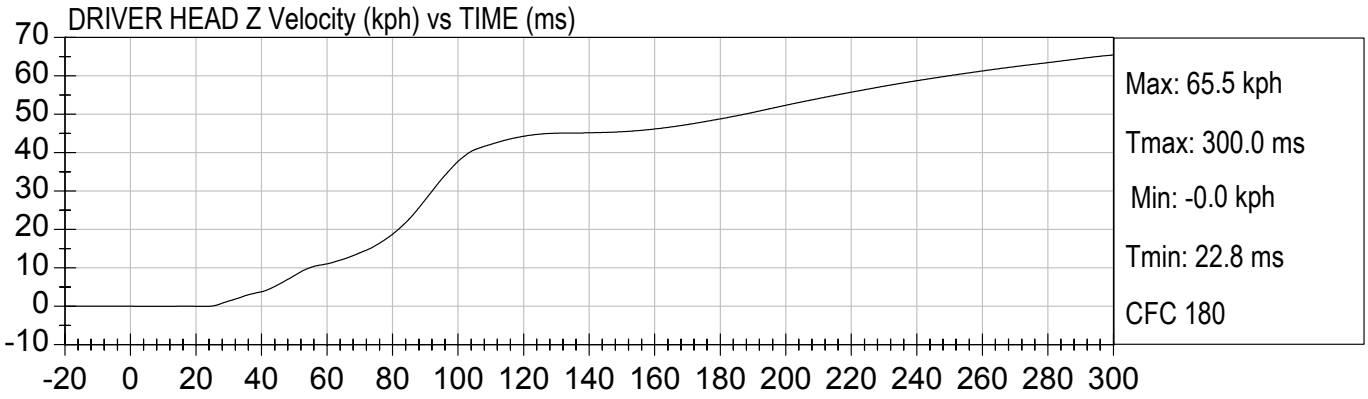






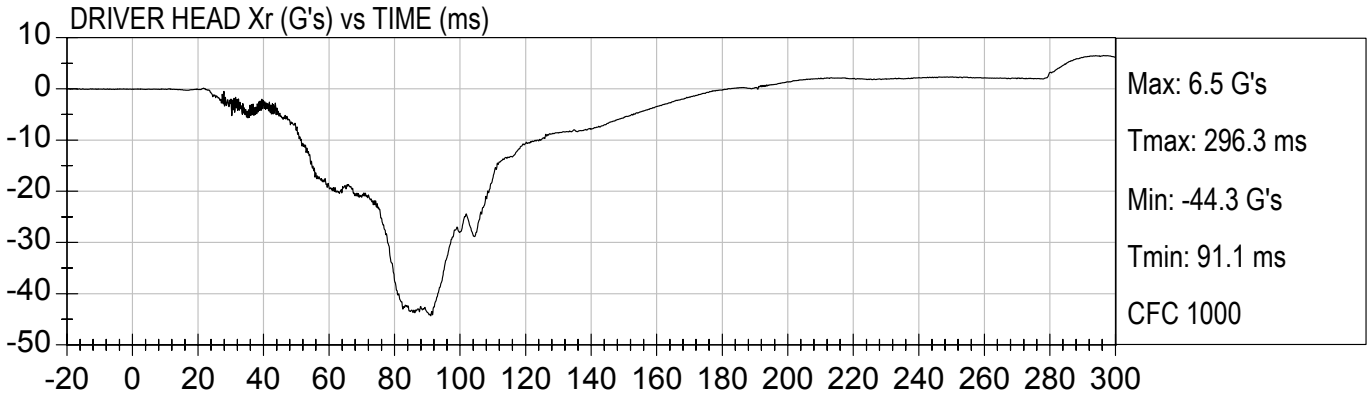

DRIVER HEAD X Velocity (kph) vs TIME (ms)
60
40
20
0
-20
-40
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 56.5 kph
Tmax: 0.0 ms
Min: -25.2 kph
Tmin: 193.9 ms
CFC 180

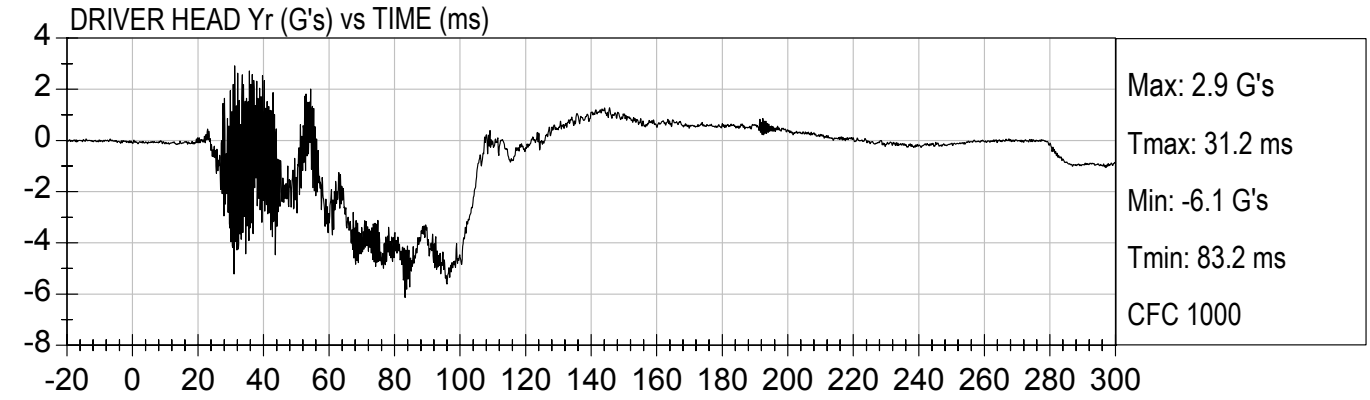

DRIVER HEAD Y Velocity (kph) vs TIME (ms)
0
-1
-2
-3
-4
-5
-6
-7
-8
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 0.0 kph
Tmax: 0.0 ms
Min: -7.8 kph
Tmin: 107.5 ms
CFC 180

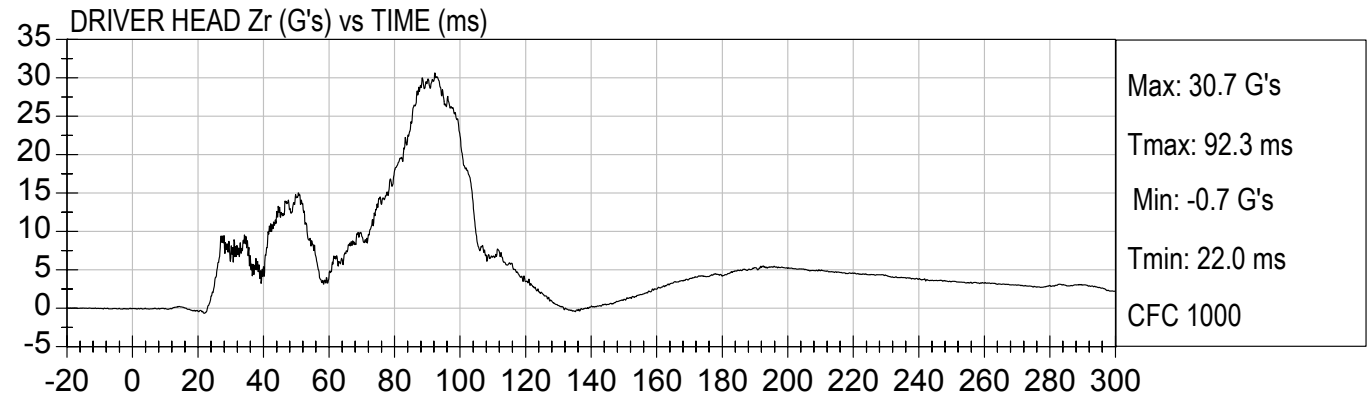

DRIVER HEAD Z Velocity (kph) vs TIME (ms)
70
60
50
40
30
20
10
0
-10
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 65.5 kph
Tmax: 300.0 ms
Min: -0.0 kph
Tmin: 22.8 ms
CFC 180

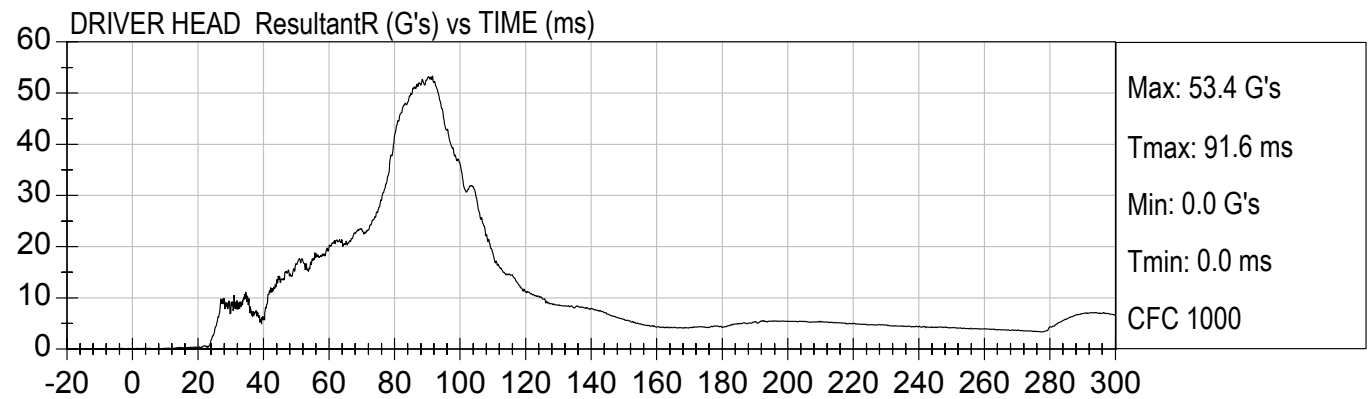
NCAP FRONTAL IMPACT
2005 FORD FREESTYLE (M50204)

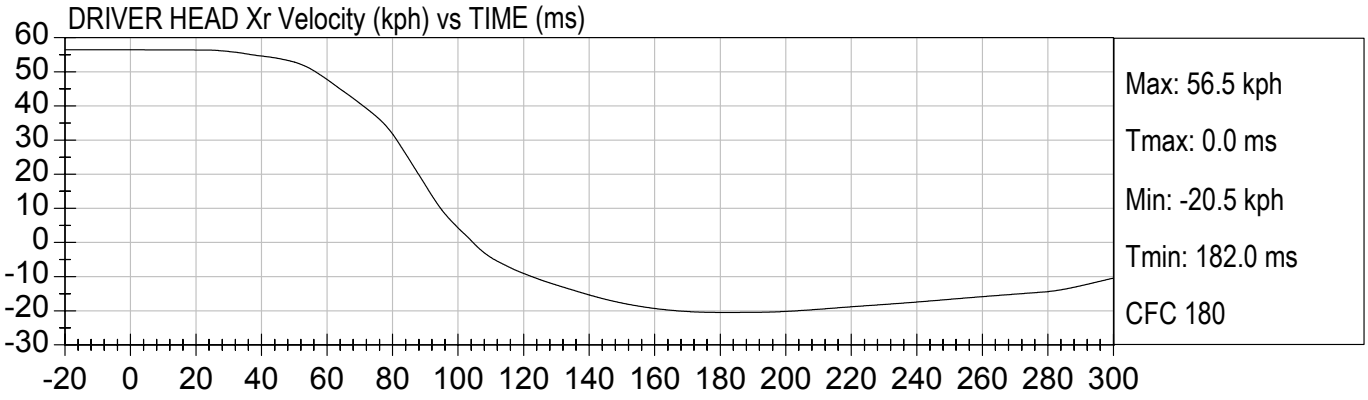
Test Date: 12/06/04
Speed: 35.1 mph (56.5 km/h)

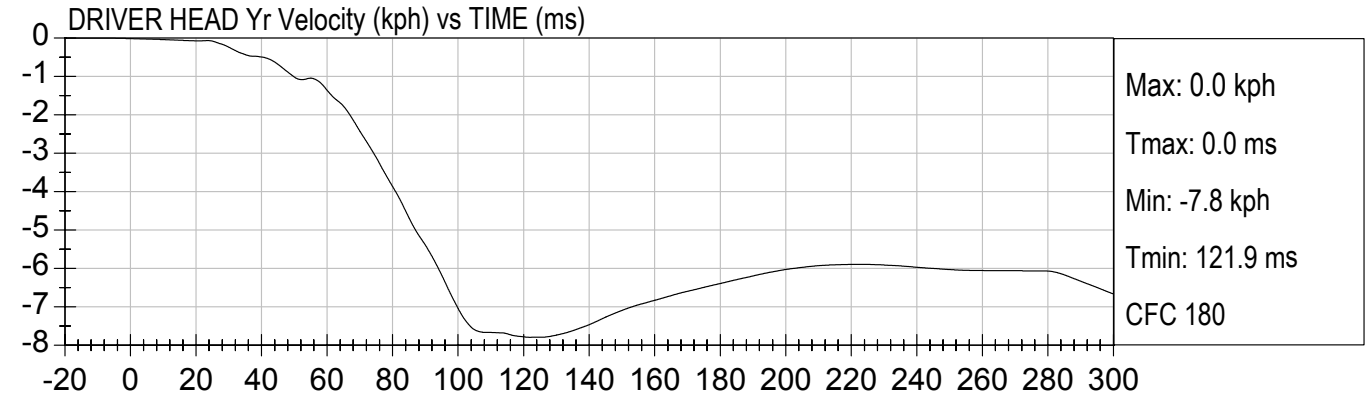


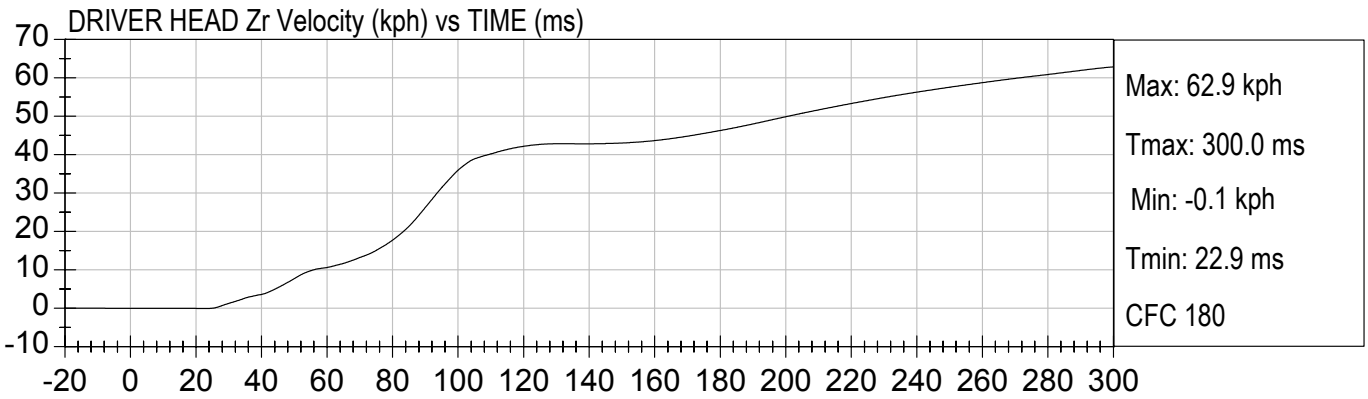






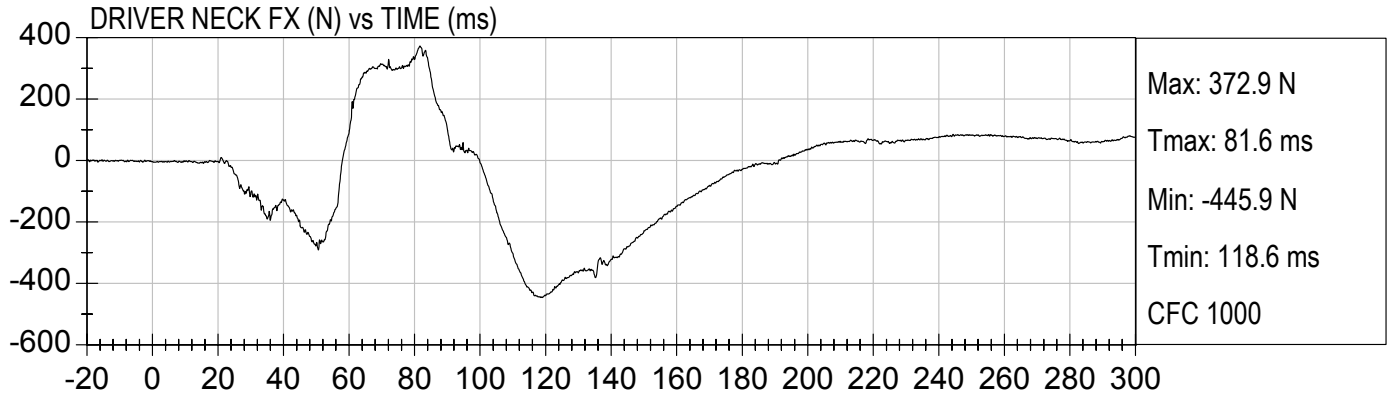

DRIVER HEAD Xr Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20
-30
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 56.5 kph
Tmax: 0.0 ms
Min: -20.5 kph
Tmin: 182.0 ms
CFC 180

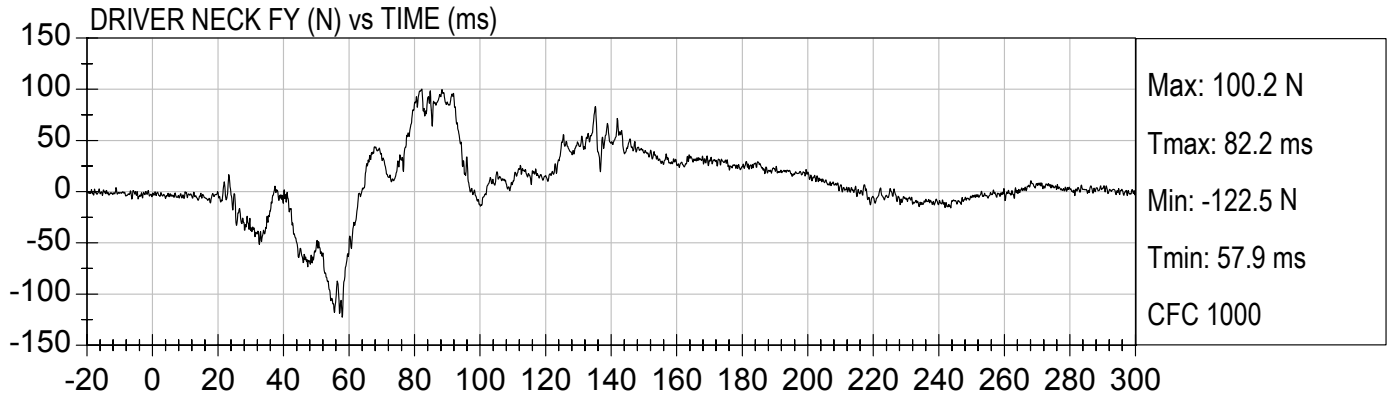

DRIVER HEAD Yr Velocity (kph) vs TIME (ms)
0
-1
-2
-3
-4
-5
-6
-7
-8
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 0.0 kph
Tmax: 0.0 ms
Min: -7.8 kph
Tmin: 121.9 ms
CFC 180

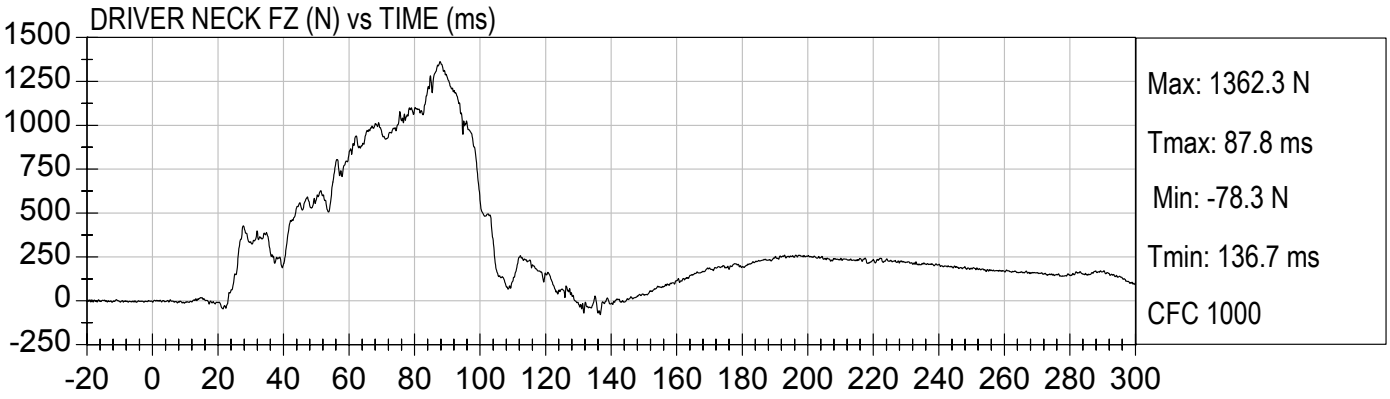

DRIVER HEAD Zr Velocity (kph) vs TIME (ms)
70
60
50
40
30
20
10
0
-10
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 62.9 kph
Tmax: 300.0 ms
Min: -0.1 kph
Tmin: 22.9 ms
CFC 180

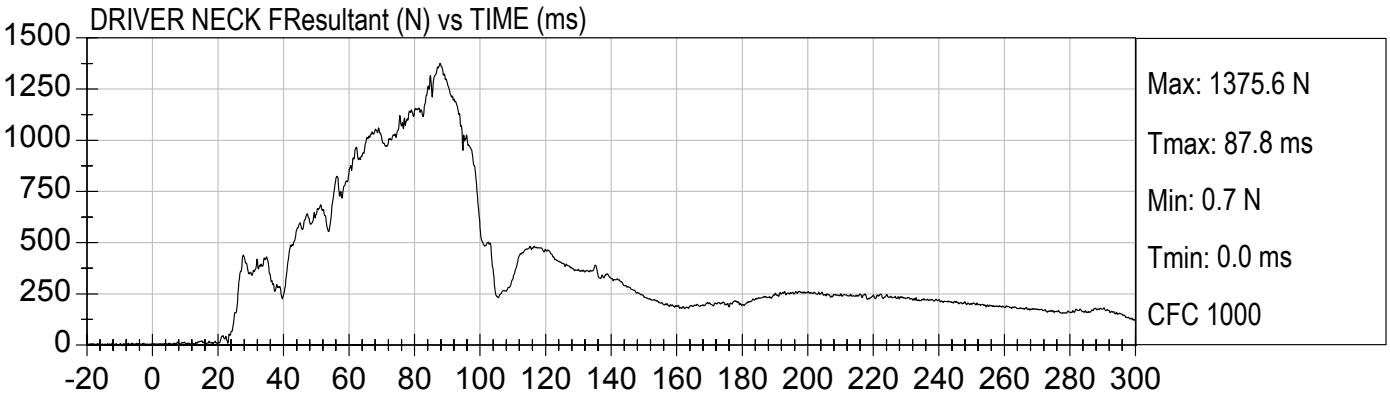
NCAP FRONTAL IMPACT
2005 FORD FREESTYLE (M50204)

Test Date: 12/06/04
Speed: 35.1 mph (56.5 km/h)



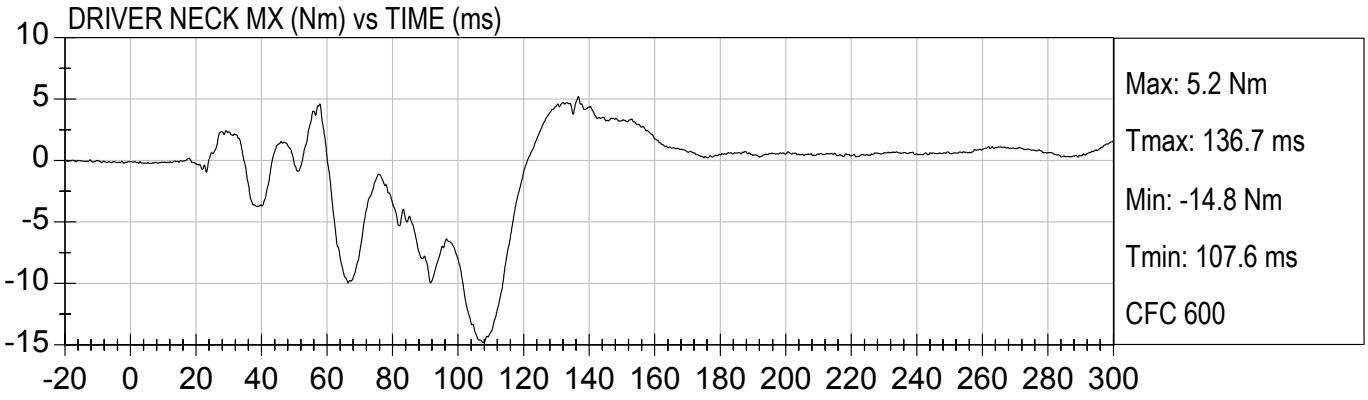


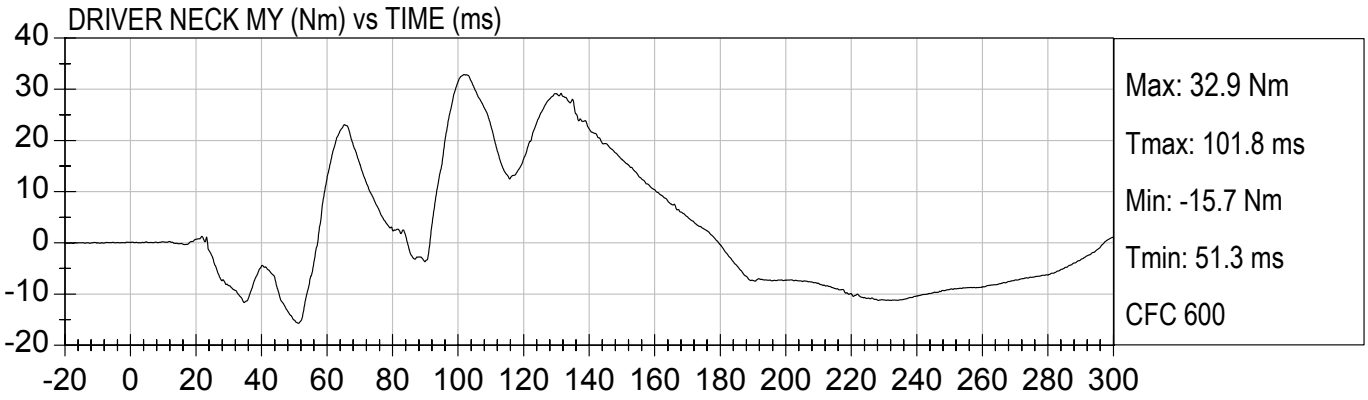


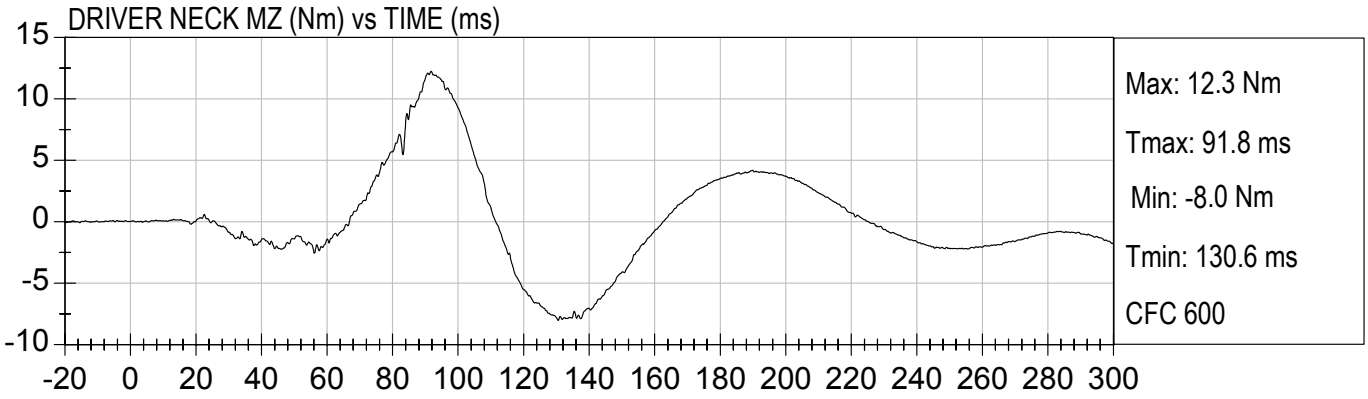


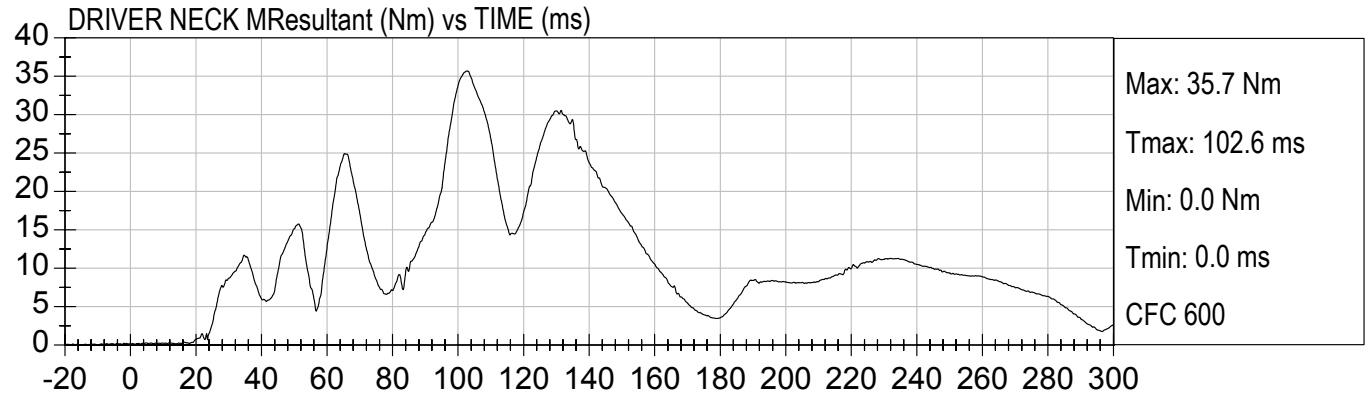
NCAP FRONTAL IMPACT
2005 FORD FREESTYLE (M50204)

Test Date: 12/06/04
Speed: 35.1 mph (56.5 km/h)



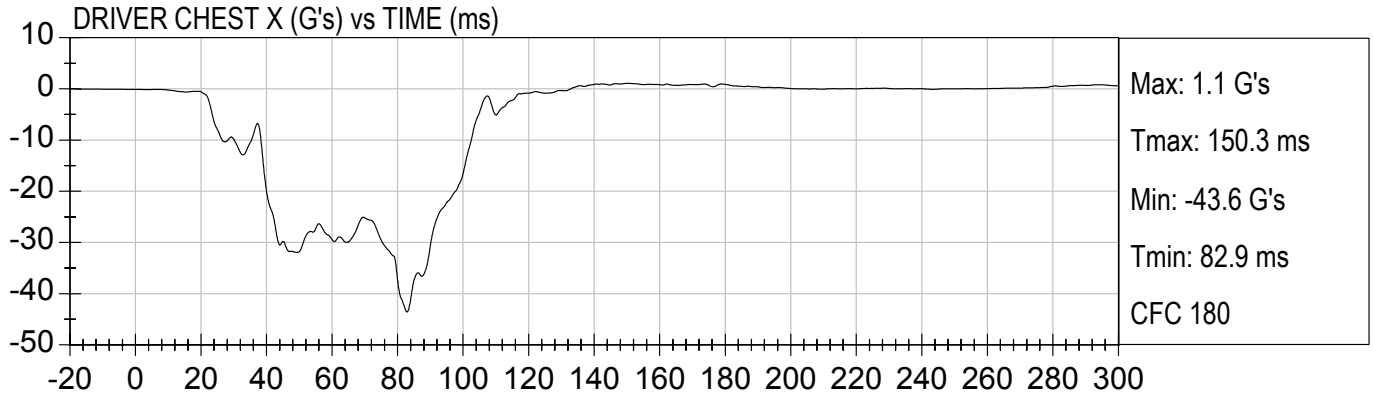


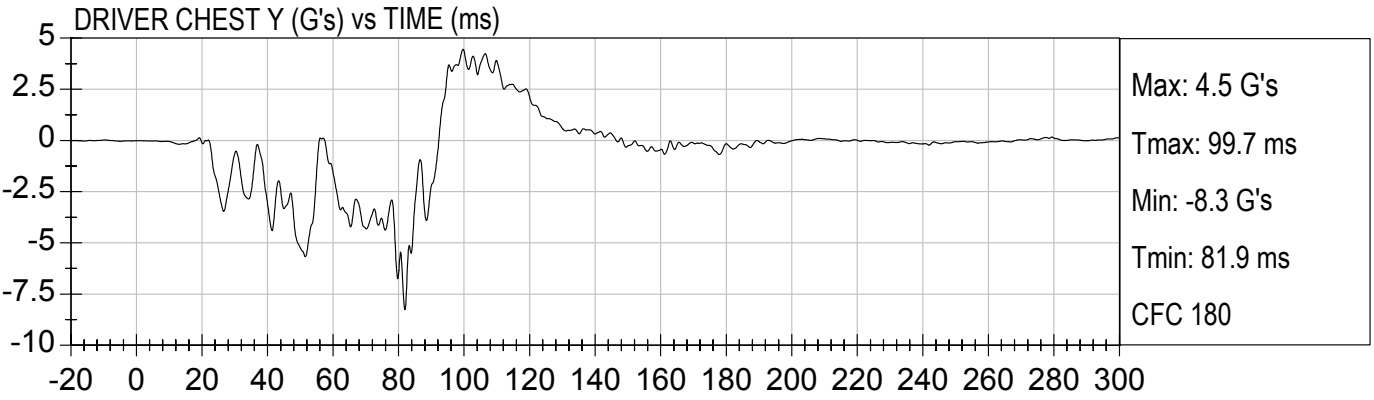


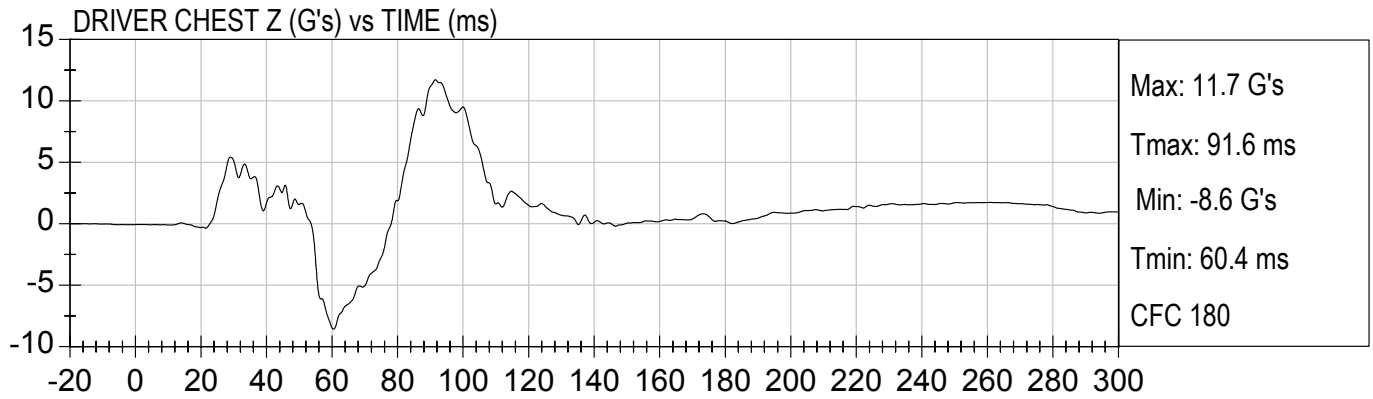


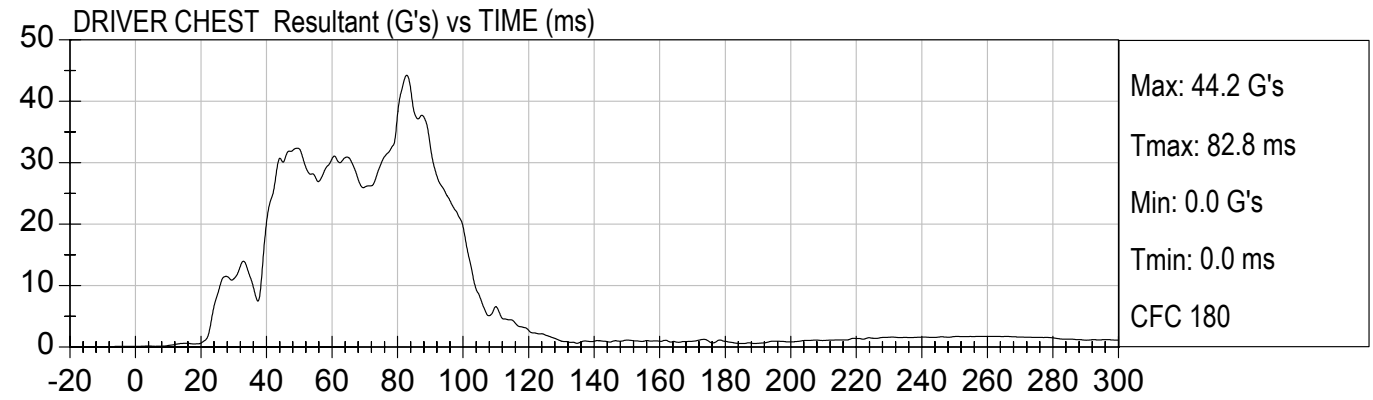
NCAP FRONTAL IMPACT
2005 FORD FREESTYLE (M50204)

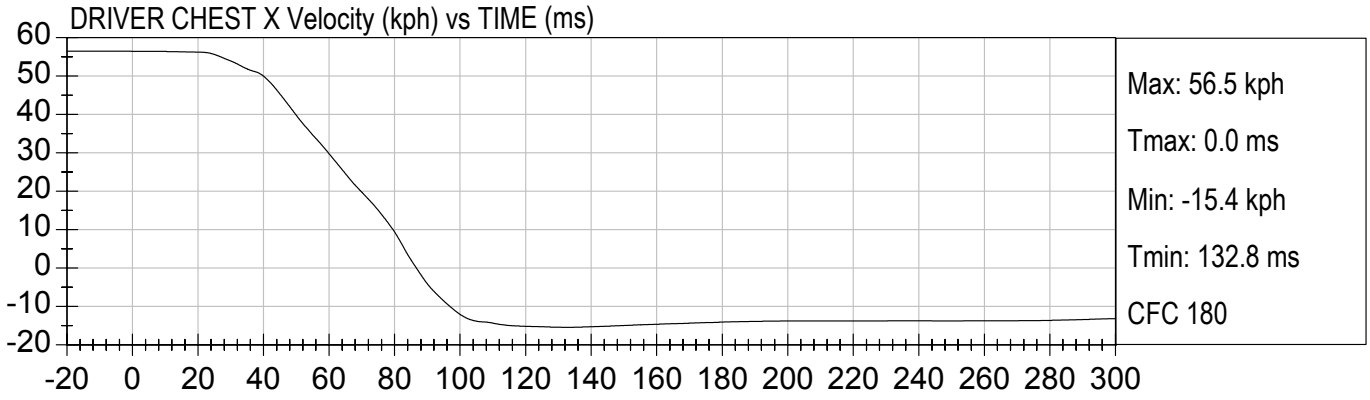
Test Date: 12/06/04
Speed: 35.1 mph (56.5 km/h)

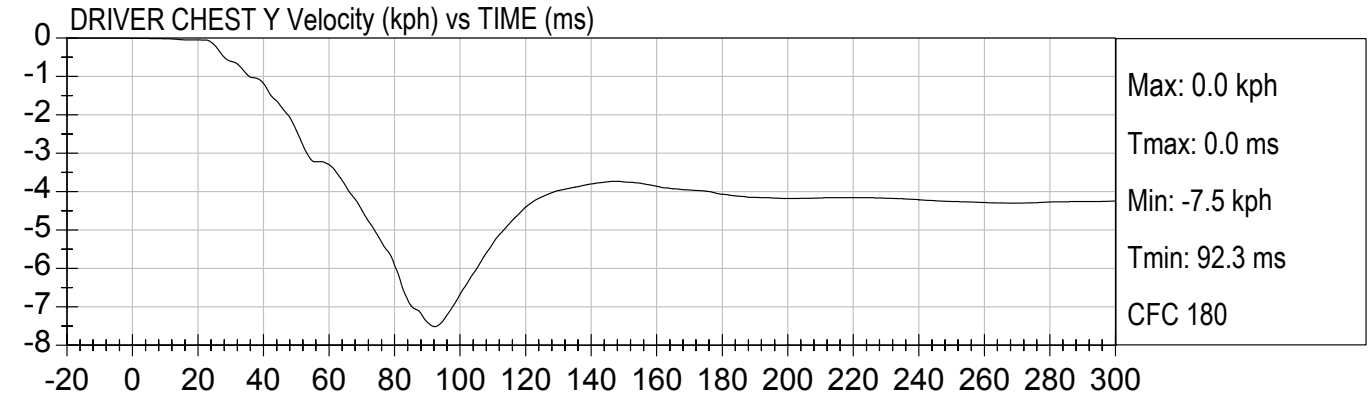


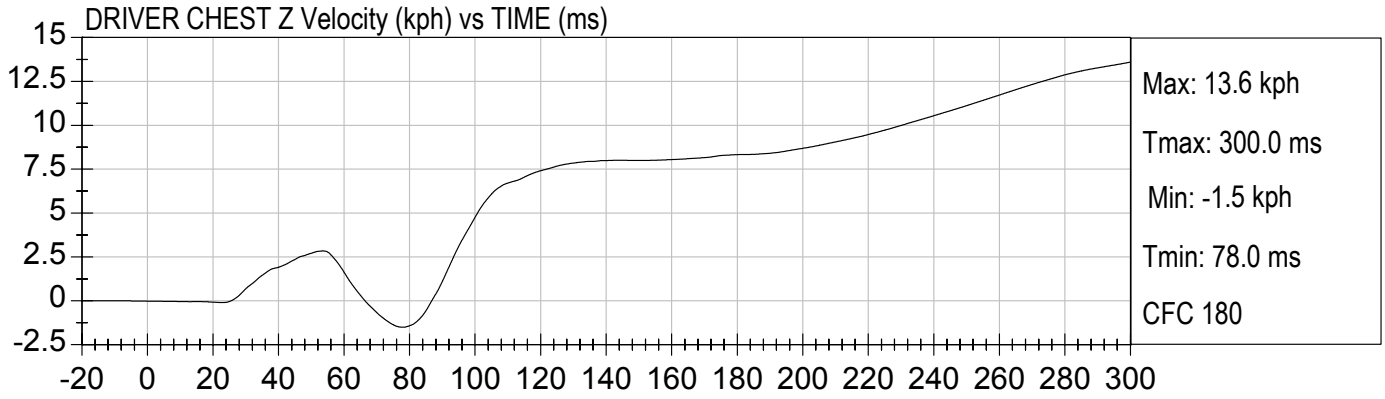


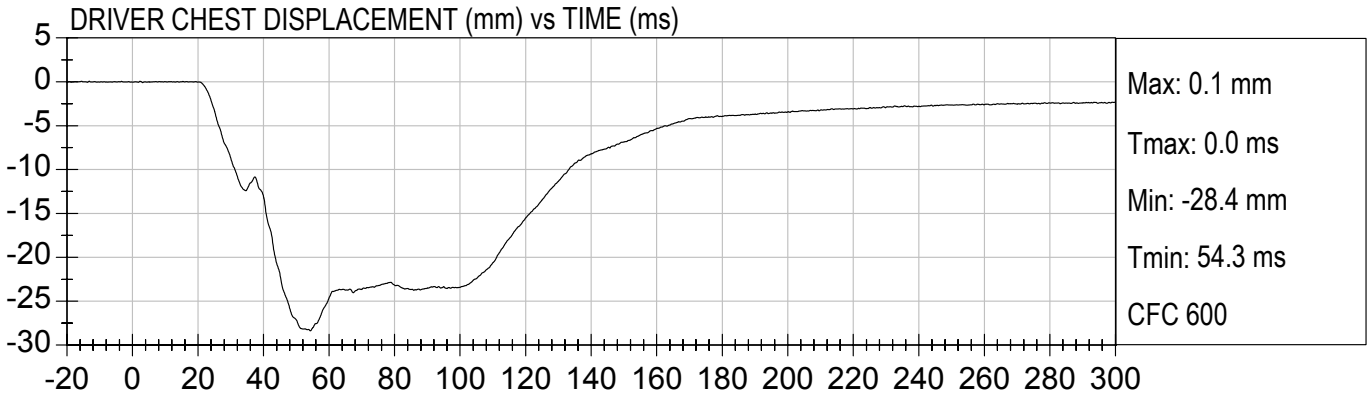





DRIVER CHEST X Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 56.5 kph
Tmax: 0.0 ms
Min: -15.4 kph
Tmin: 132.8 ms
CFC 180

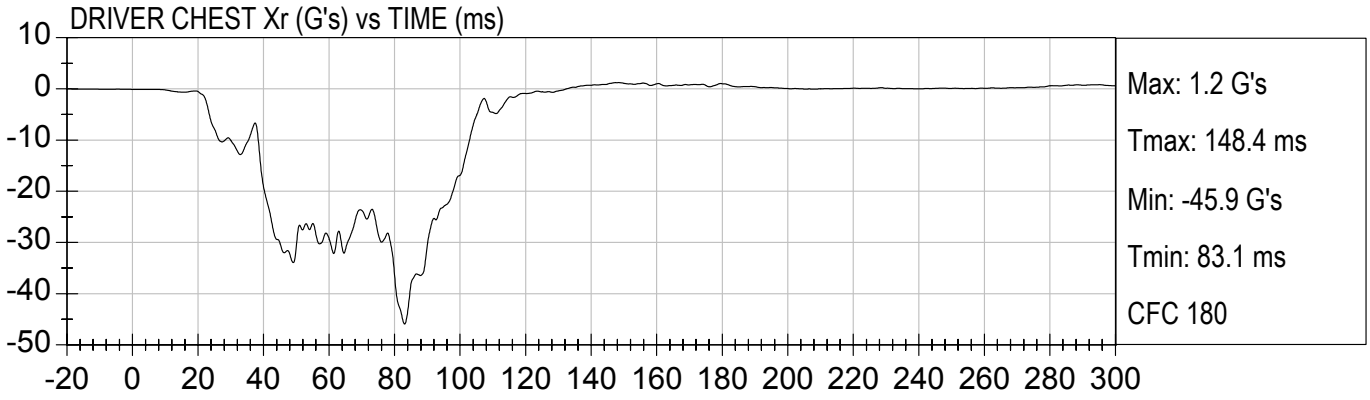

DRIVER CHEST Y Velocity (kph) vs TIME (ms)
0
-1
-2
-3
-4
-5
-6
-7
-8
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 0.0 kph
Tmax: 0.0 ms
Min: -7.5 kph
Tmin: 92.3 ms
CFC 180

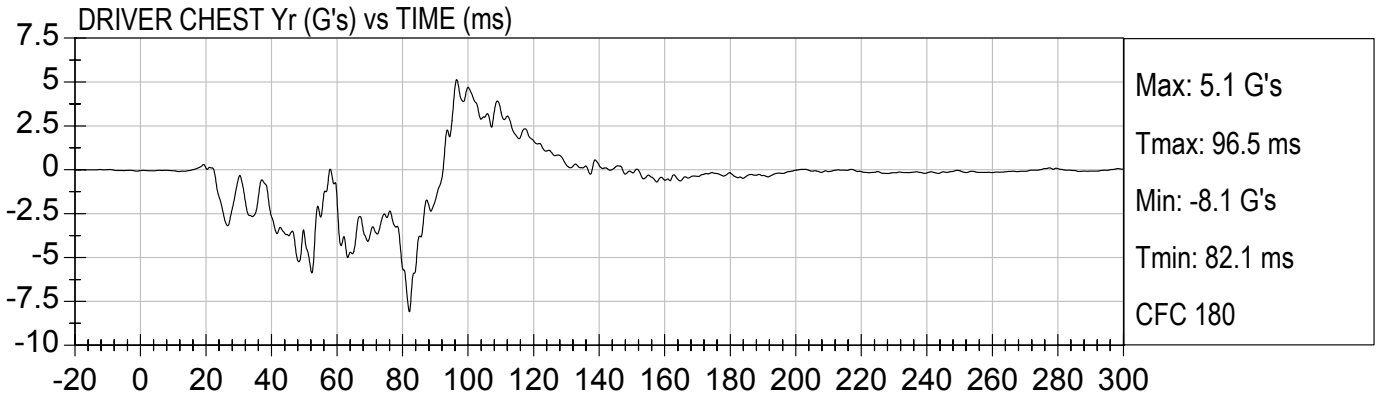

DRIVER CHEST Z Velocity (kph) vs TIME (ms)
15
12.5
10
7.5
5
2.5
0
-2.5
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 13.6 kph
Tmax: 300.0 ms
Min: -1.5 kph
Tmin: 78.0 ms
CFC 180

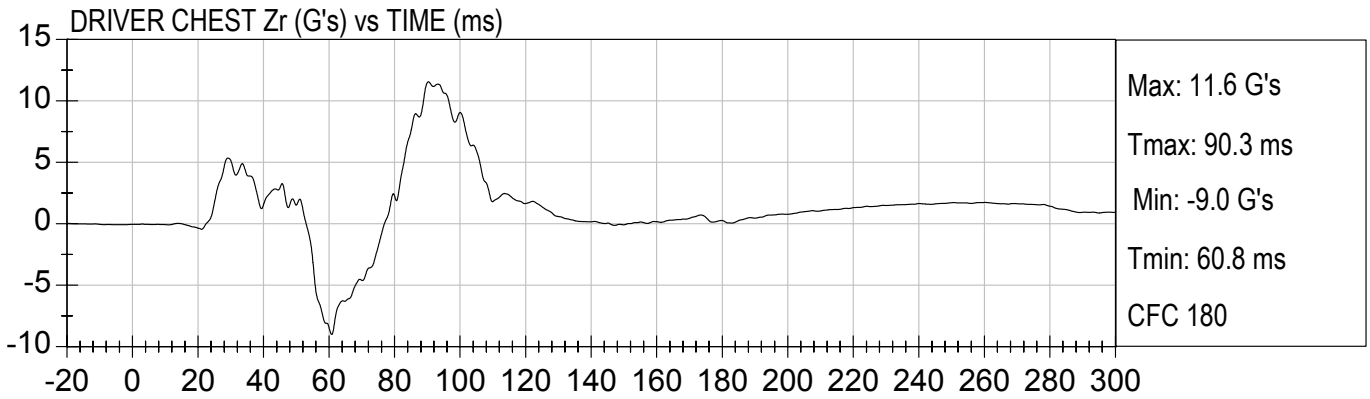

DRIVER CHEST DISPLACEMENT (mm) vs TIME (ms)
5
0
-5
-10
-15
-20
-25
-30
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 0.1 mm
Tmax: 0.0 ms
Min: -28.4 mm
Tmin: 54.3 ms
CFC 600

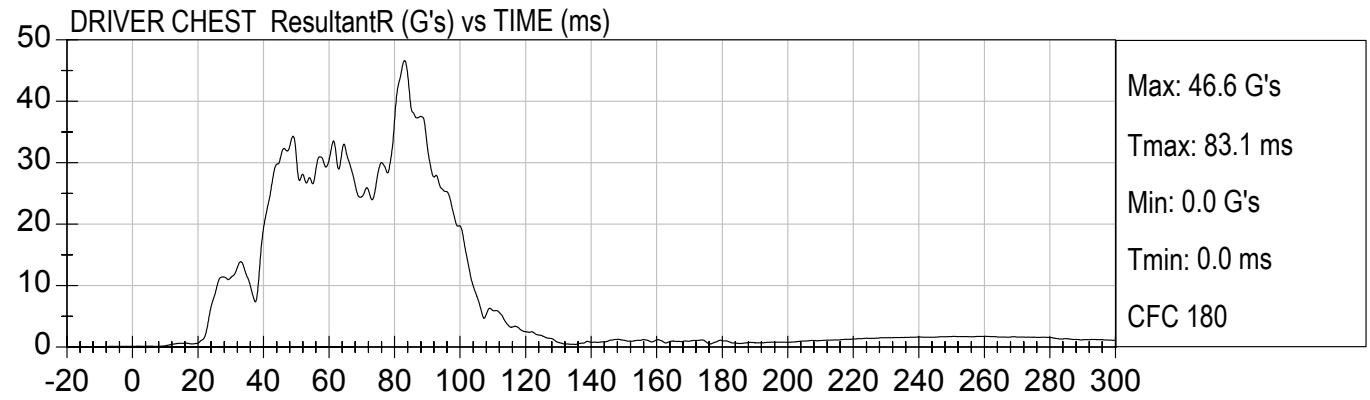
NCAP FRONTAL IMPACT
2005 FORD FREESTYLE (M50204)

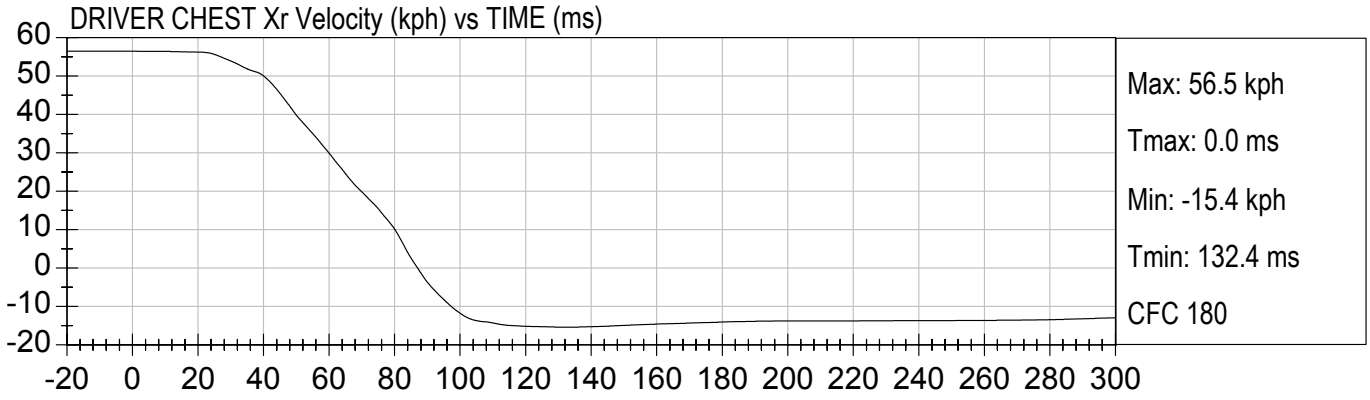
Test Date: 12/06/04
Speed: 35.1 mph (56.5 km/h)

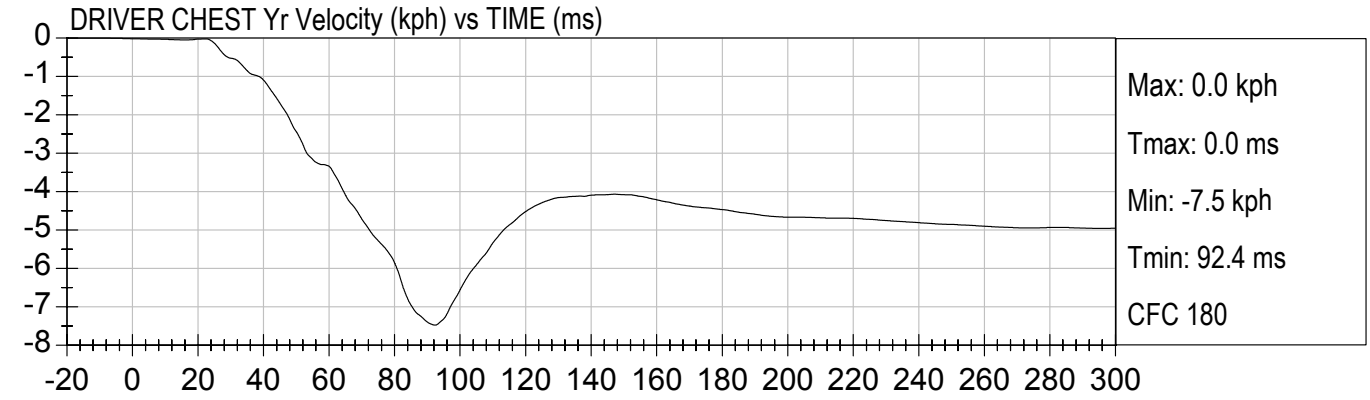


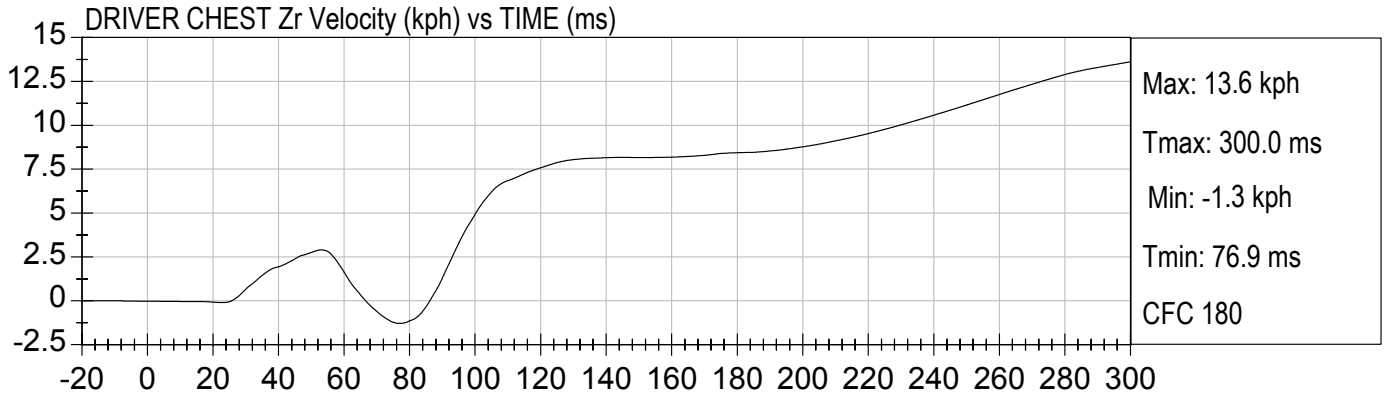






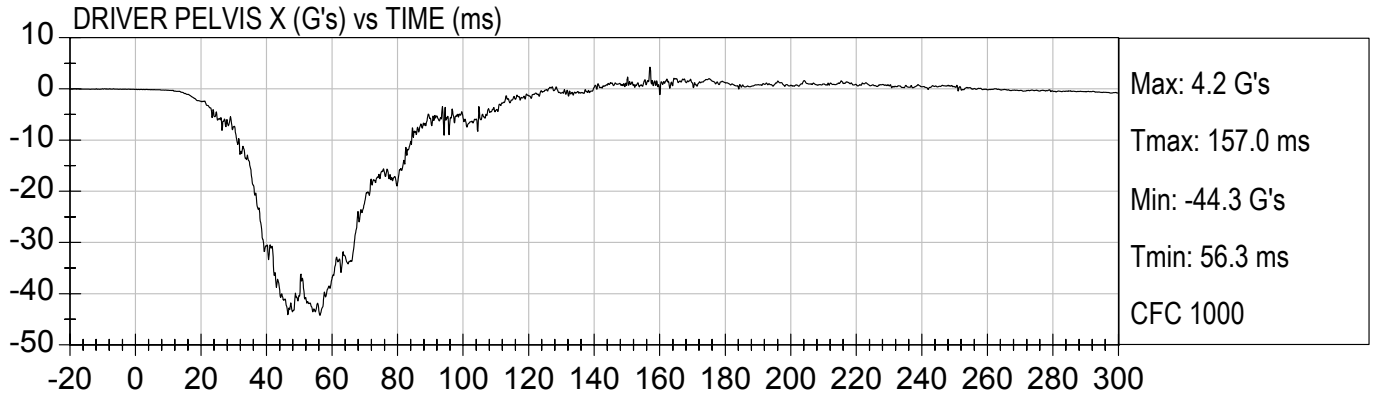

DRIVER CHEST Xr Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 56.5 kph
Tmax: 0.0 ms
Min: -15.4 kph
Tmin: 132.4 ms
CFC 180

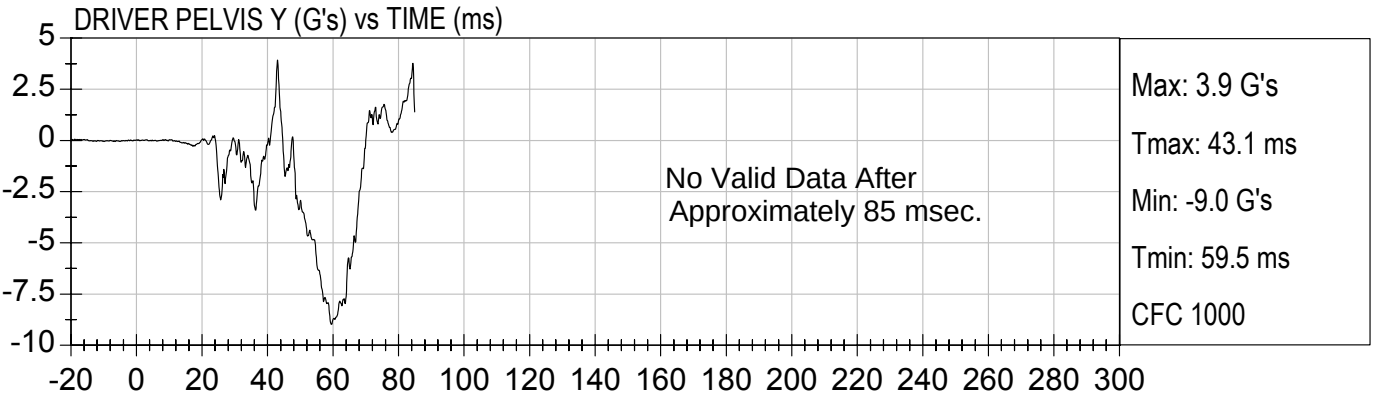

DRIVER CHEST Yr Velocity (kph) vs TIME (ms)
0
-1
-2
-3
-4
-5
-6
-7
-8
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 0.0 kph
Tmax: 0.0 ms
Min: -7.5 kph
Tmin: 92.4 ms
CFC 180

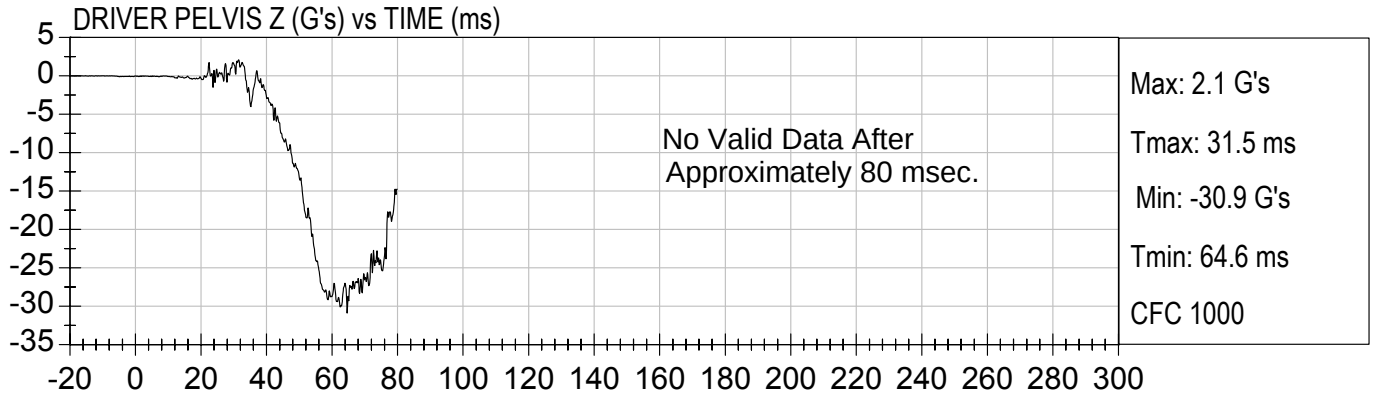

DRIVER CHEST Zr Velocity (kph) vs TIME (ms)
15
12.5
10
7.5
5
2.5
0
-2.5
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 13.6 kph
Tmax: 300.0 ms
Min: -1.3 kph
Tmin: 76.9 ms
CFC 180

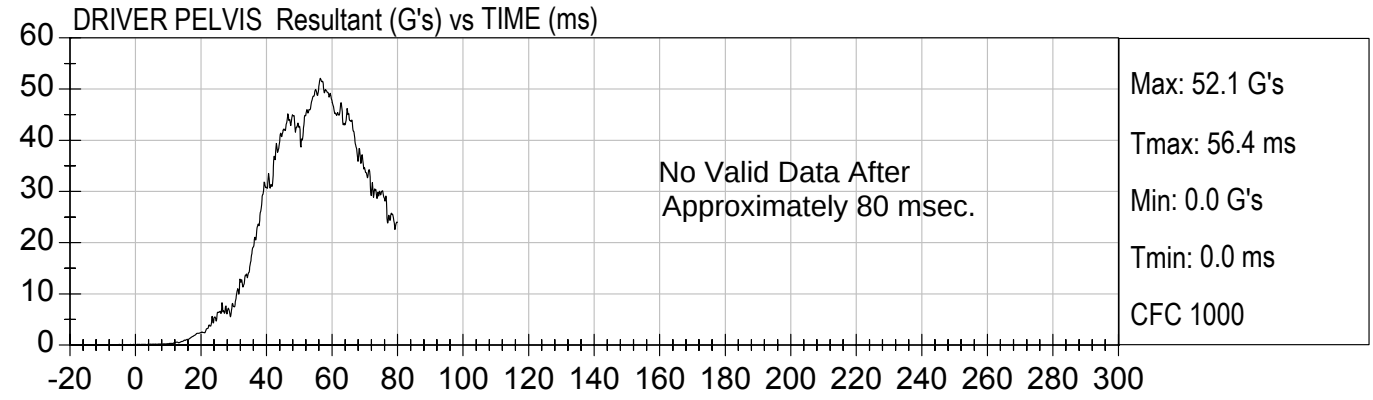
NCAP FRONTAL IMPACT
2005 FORD FREESTYLE (M50204)

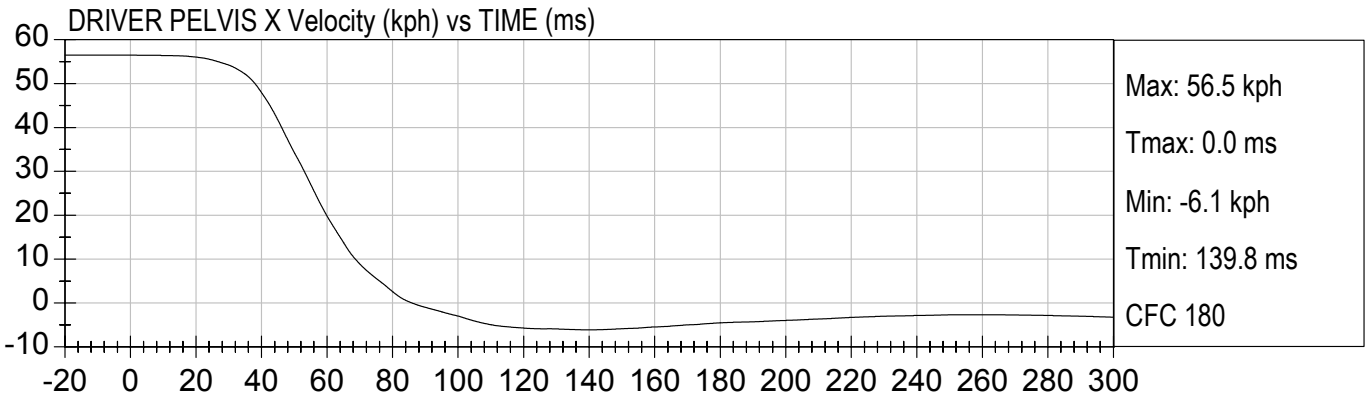
Test Date: 12/06/04
Speed: 35.1 mph (56.5 km/h)

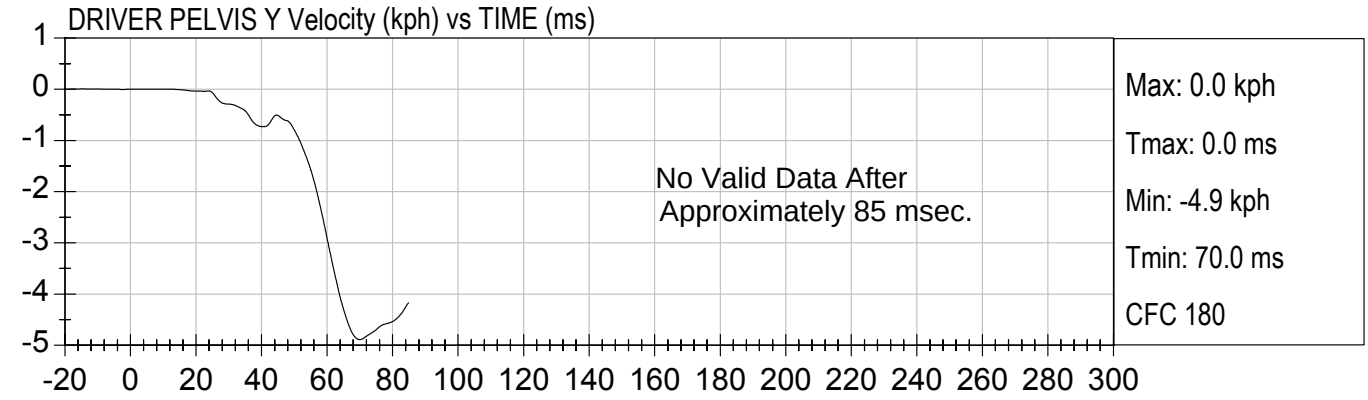


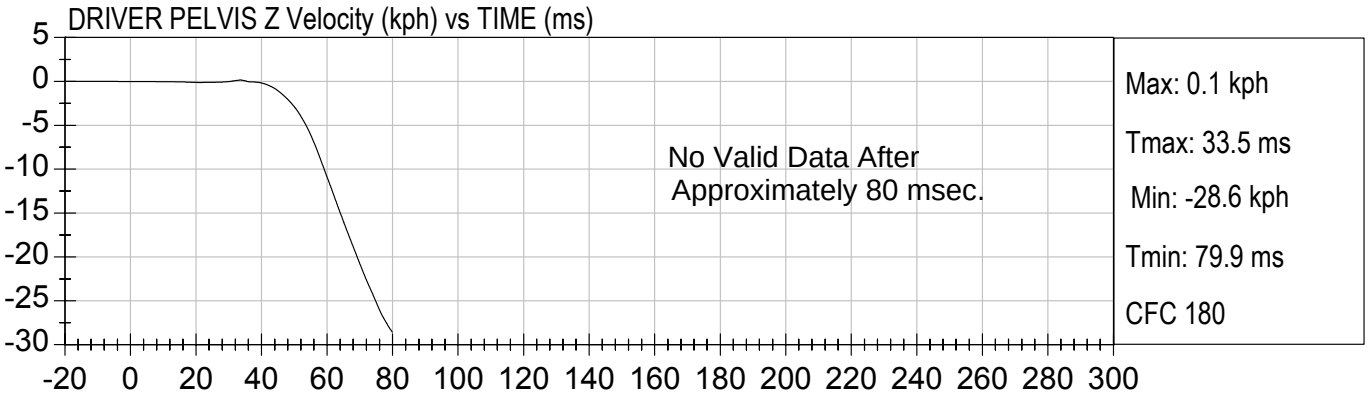






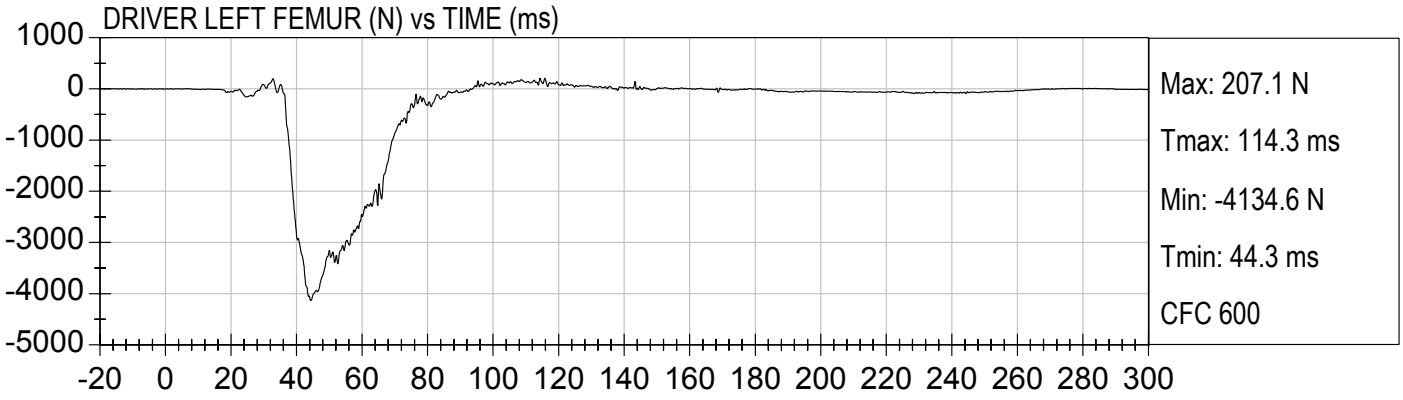

DRIVER PELVIS X Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 56.5 kph
Tmax: 0.0 ms
Min: -6.1 kph
Tmin: 139.8 ms
CFC 180

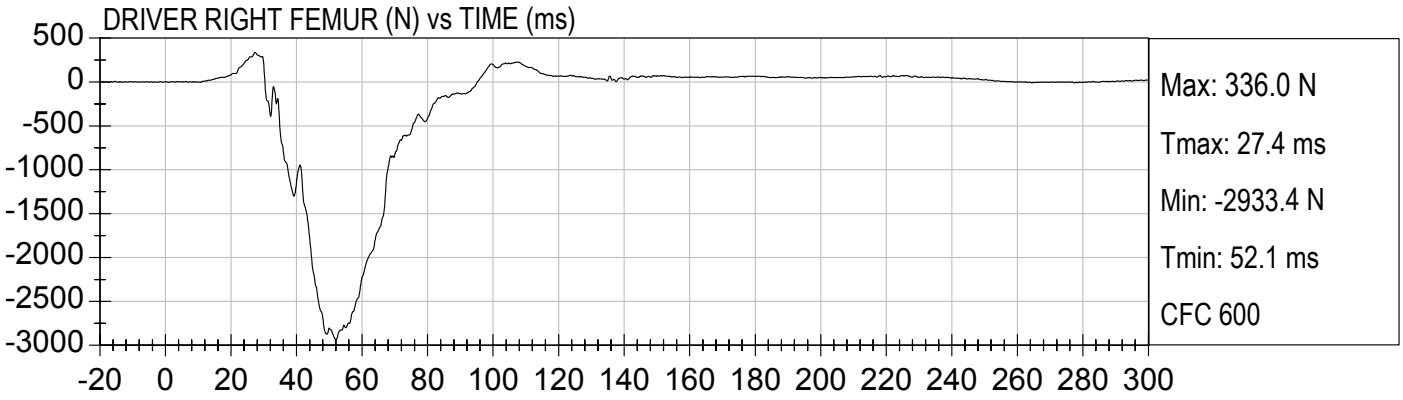

DRIVER PELVIS Y Velocity (kph) vs TIME (ms)
1
0
-1
-2
-3
-4
-5
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
No Valid Data After
Approximately 85 msec.
Max: 0.0 kph
Tmax: 0.0 ms
Min: -4.9 kph
Tmin: 70.0 ms
CFC 180

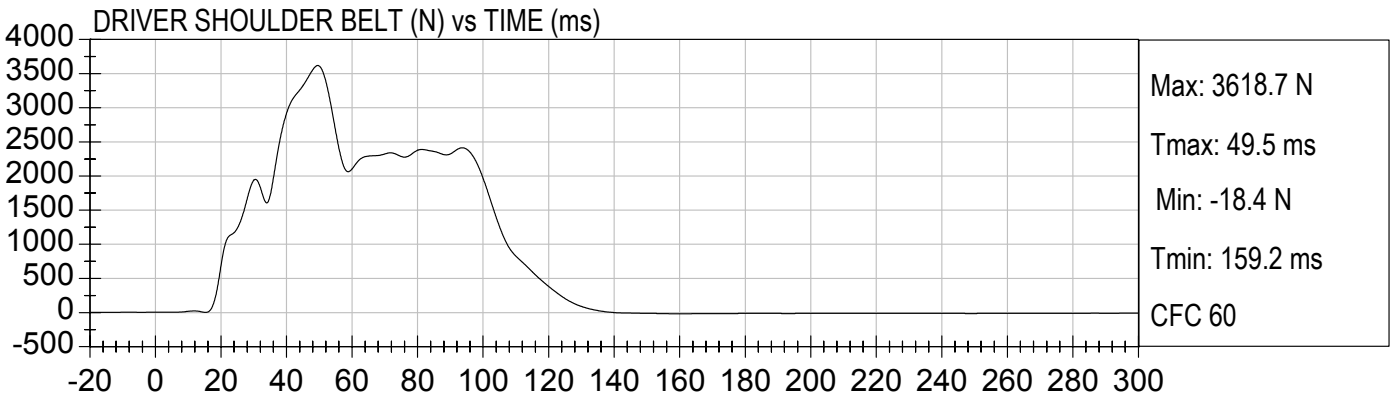

DRIVER PELVIS Z Velocity (kph) vs TIME (ms)
5
0
-5
-10
-15
-20
-25
-30
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
No Valid Data After
Approximately 80 msec.
Max: 0.1 kph
Tmax: 33.5 ms
Min: -28.6 kph
Tmin: 79.9 ms
CFC 180

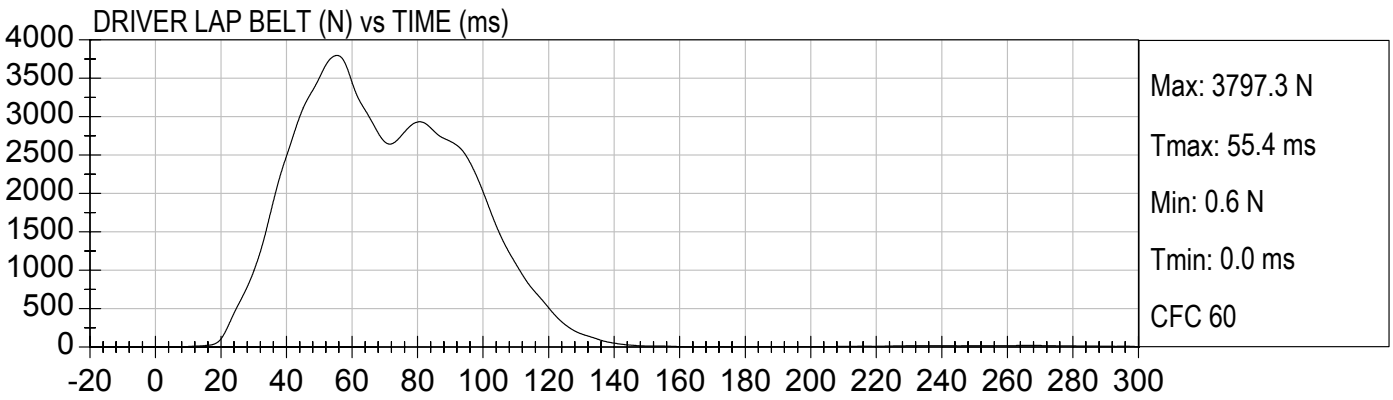
NCAP FRONTAL IMPACT
2005 FORD FREESTYLE (M50204)

Test Date: 12/06/04
Speed: 35.1 mph (56.5 km/h)



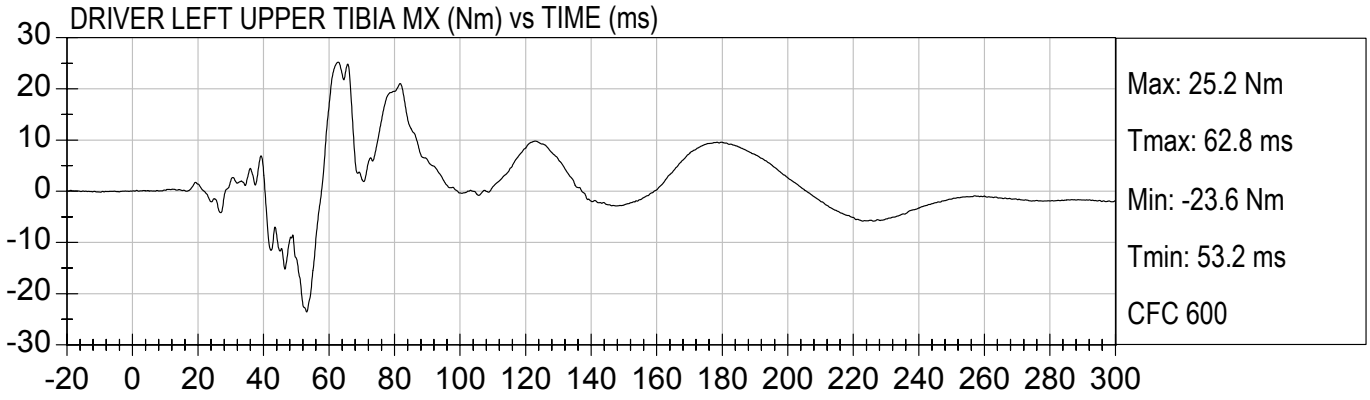


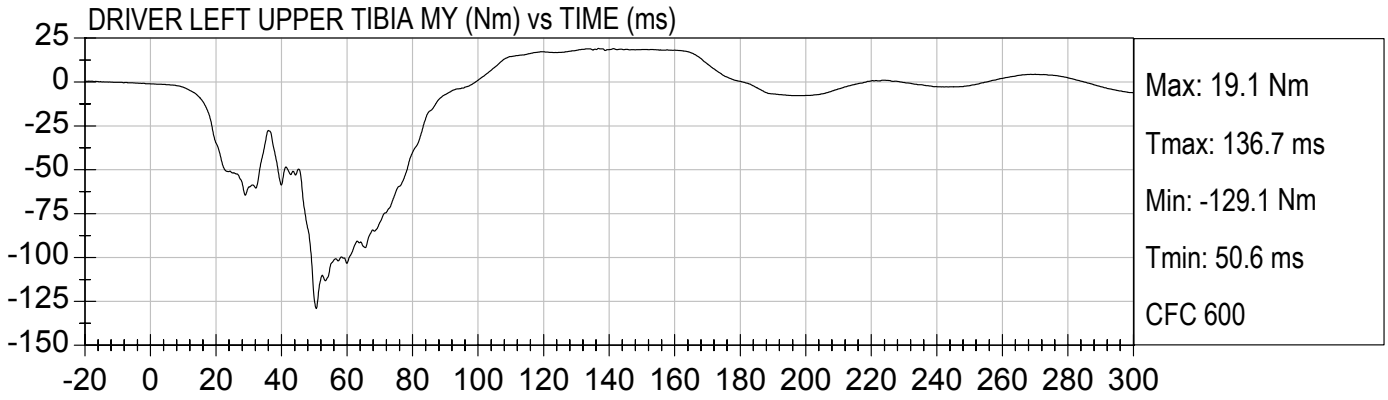


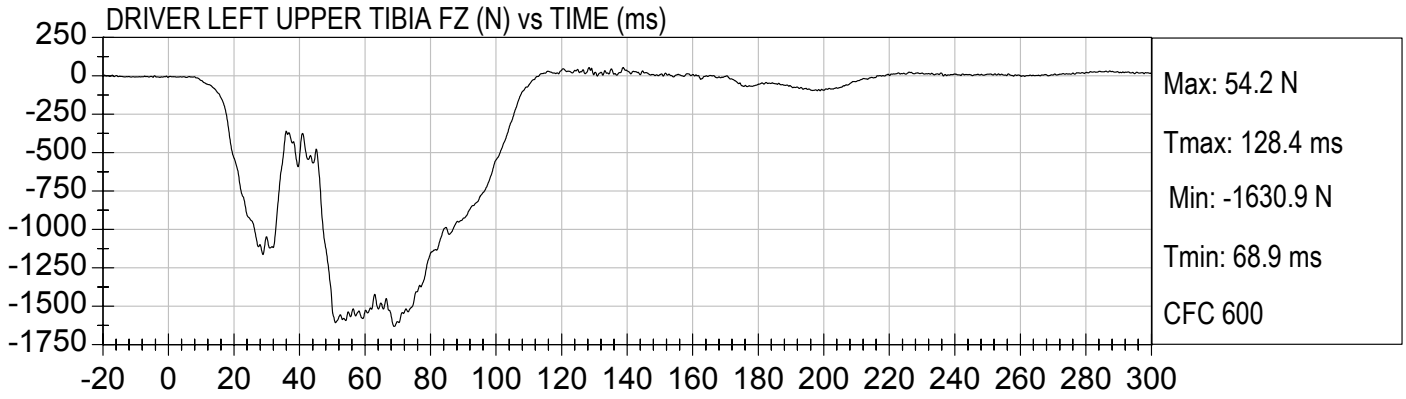


NCAP FRONTAL IMPACT
2005 FORD FREESTYLE (M50204)

Test Date: 12/06/04
Speed: 35.1 mph (56.5 km/h)

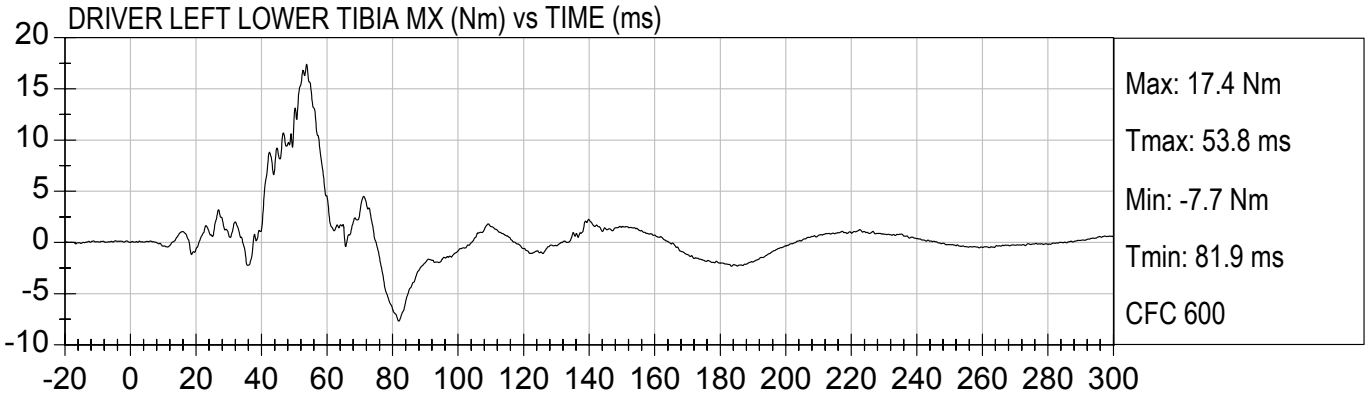


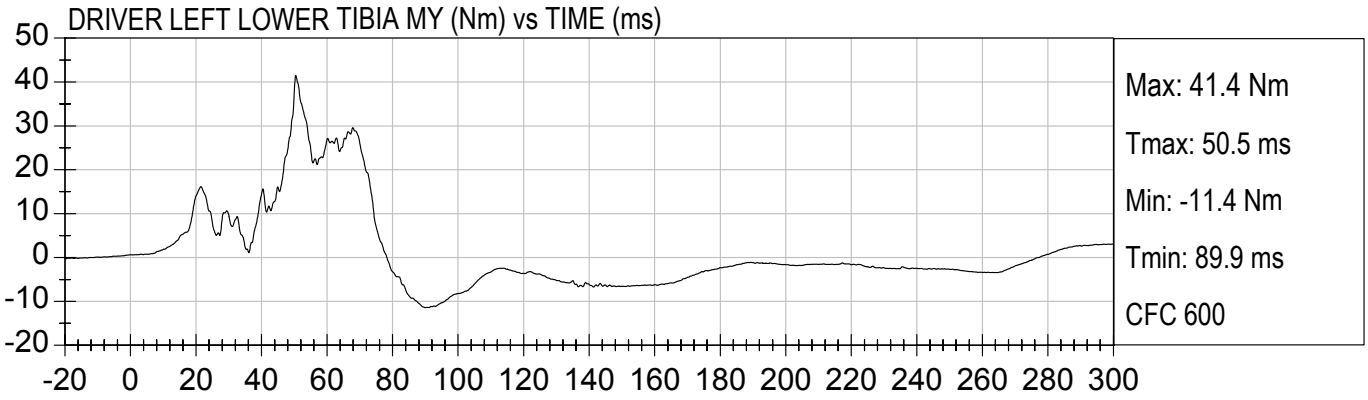


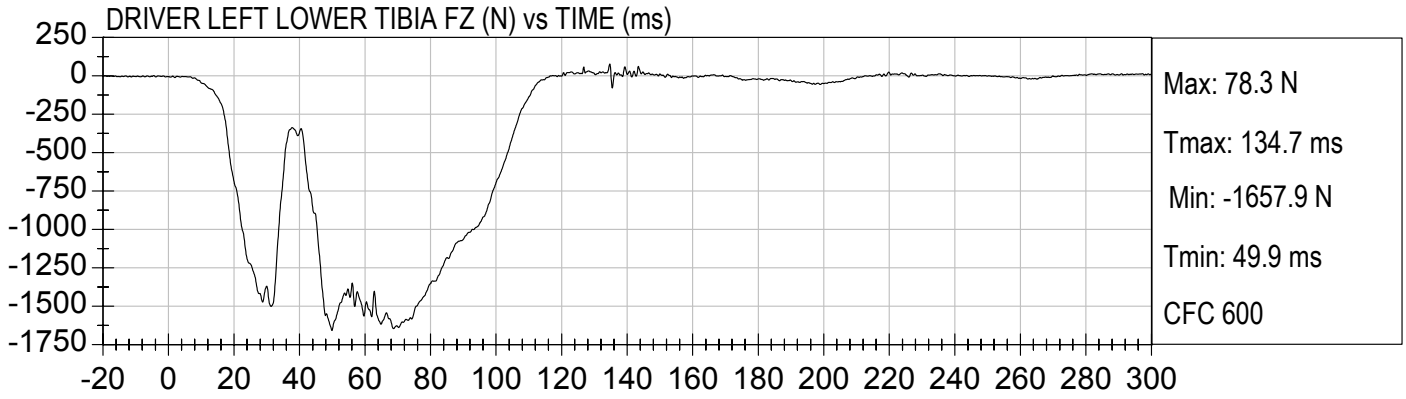


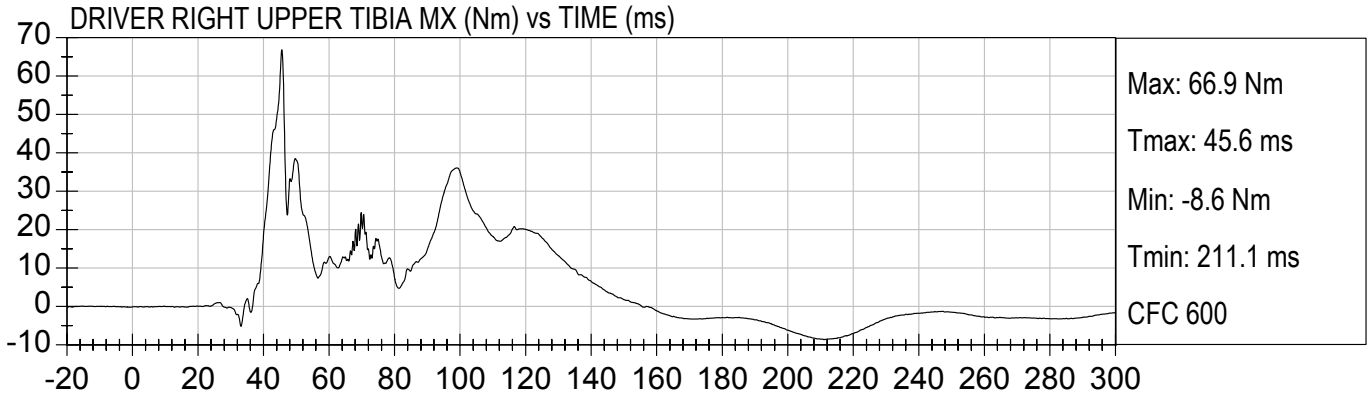
NCAP FRONTAL IMPACT
2005 FORD FREESTYLE (M50204)

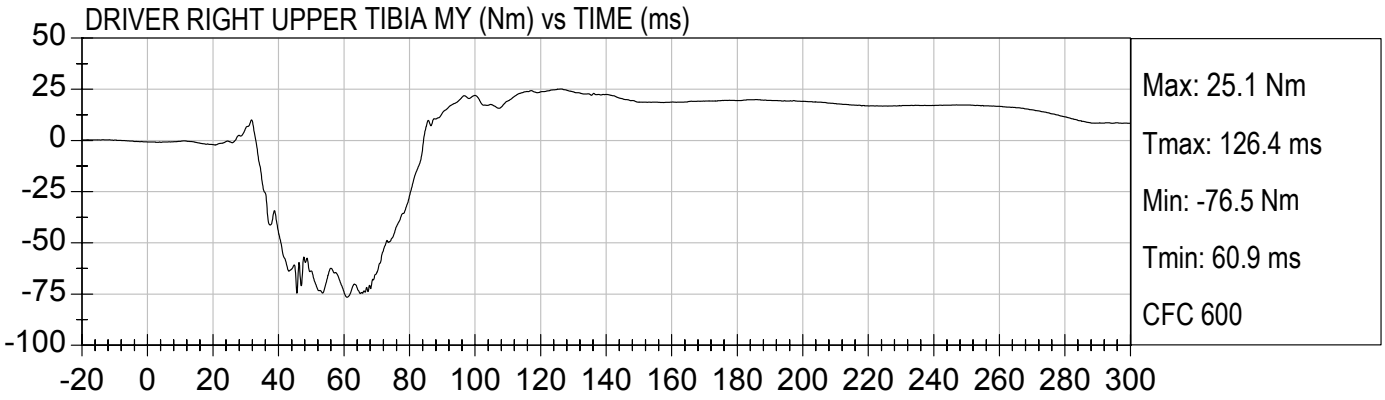
Test Date: 12/06/04
Speed: 35.1 mph (56.5 km/h)

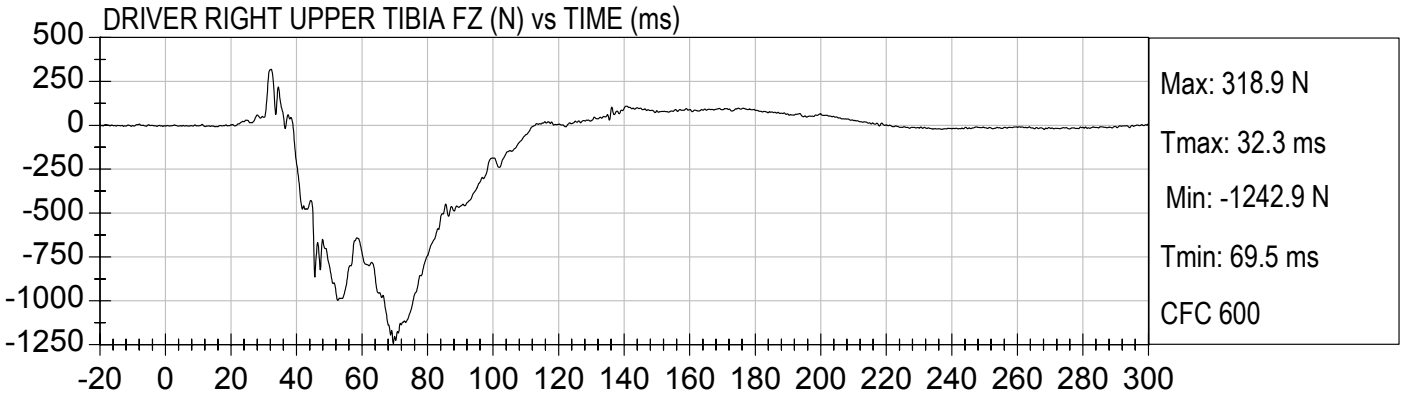






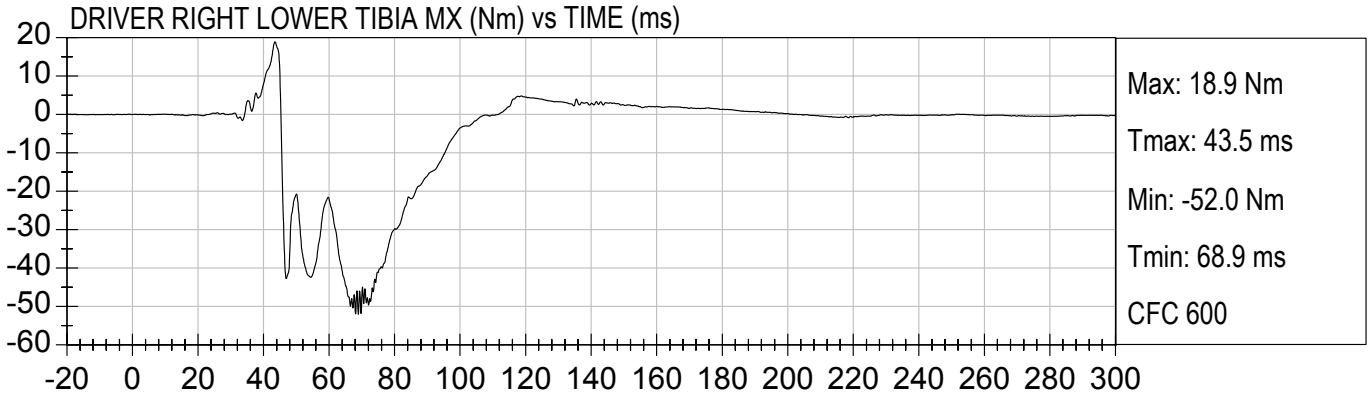

DRIVER RIGHT UPPER TIBIA MX (Nm) vs TIME (ms)
70
60
50
40
30
20
10
0
-10
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 66.9 Nm
Tmax: 45.6 ms
Min: -8.6 Nm
Tmin: 211.1 ms
CFC 600

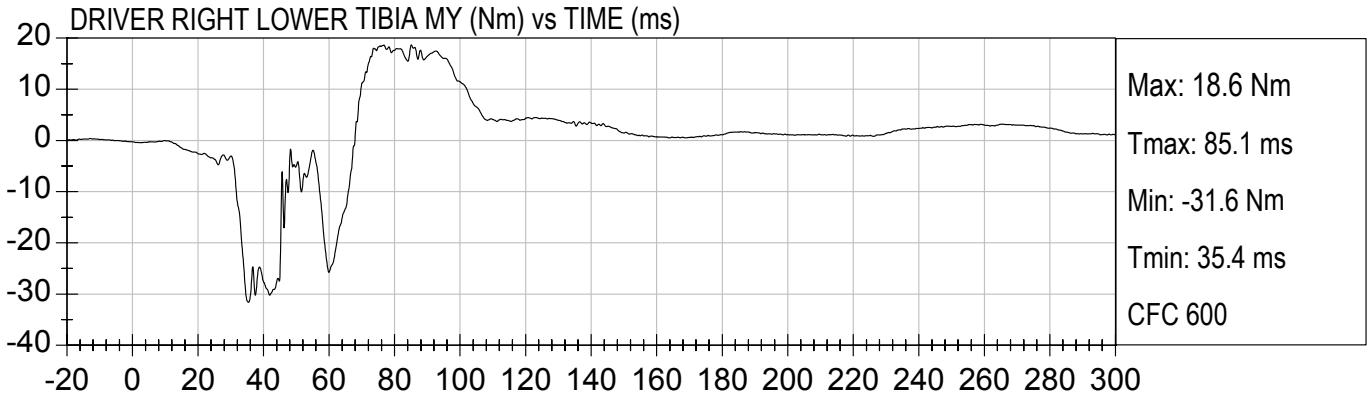

DRIVER RIGHT UPPER TIBIA MY (Nm) vs TIME (ms)
50
25
0
-25
-50
-75
-100
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 25.1 Nm
Tmax: 126.4 ms
Min: -76.5 Nm
Tmin: 60.9 ms
CFC 600

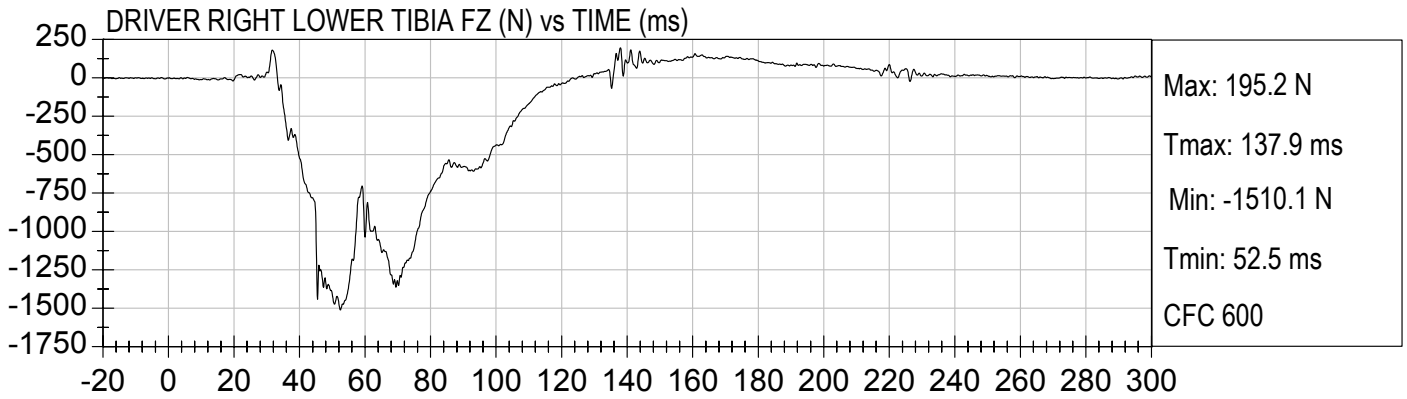

DRIVER RIGHT UPPER TIBIA FZ (N) vs TIME (ms)
500
250
0
-250
-500
-750
-1000
-1250
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 318.9 N
Tmax: 32.3 ms
Min: -1242.9 N
Tmin: 69.5 ms
CFC 600

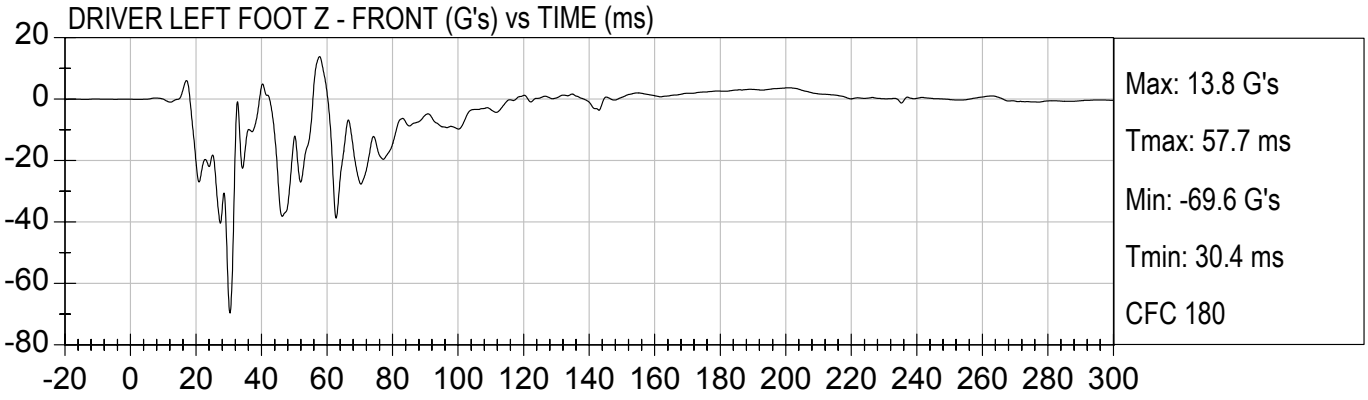
NCAP FRONTAL IMPACT
2005 FORD FREESTYLE (M50204)

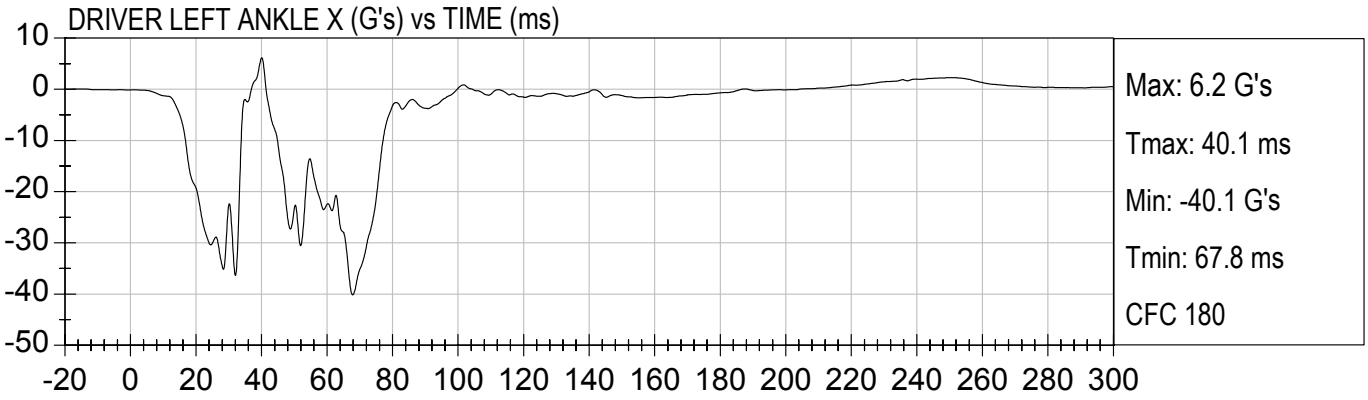
Test Date: 12/06/04
Speed: 35.1 mph (56.5 km/h)

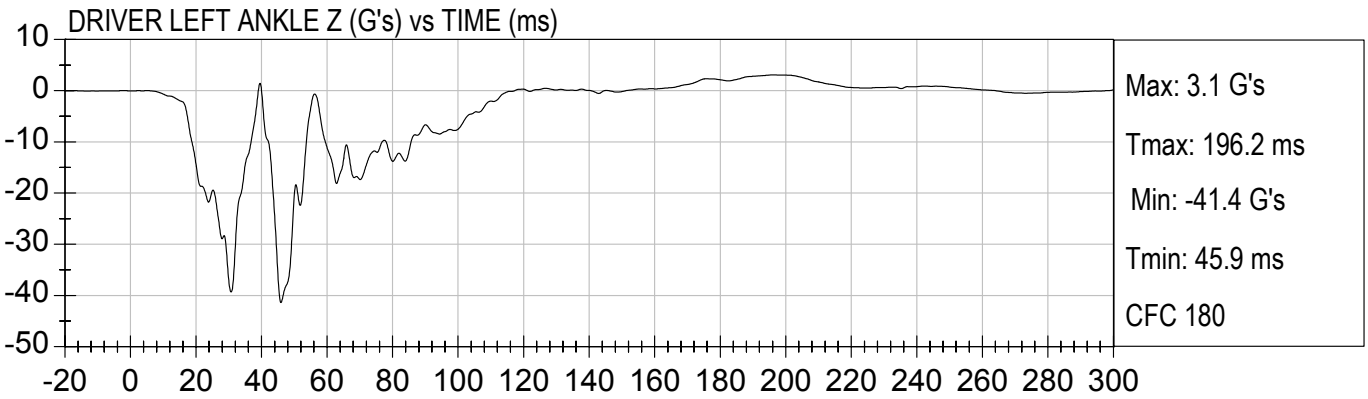






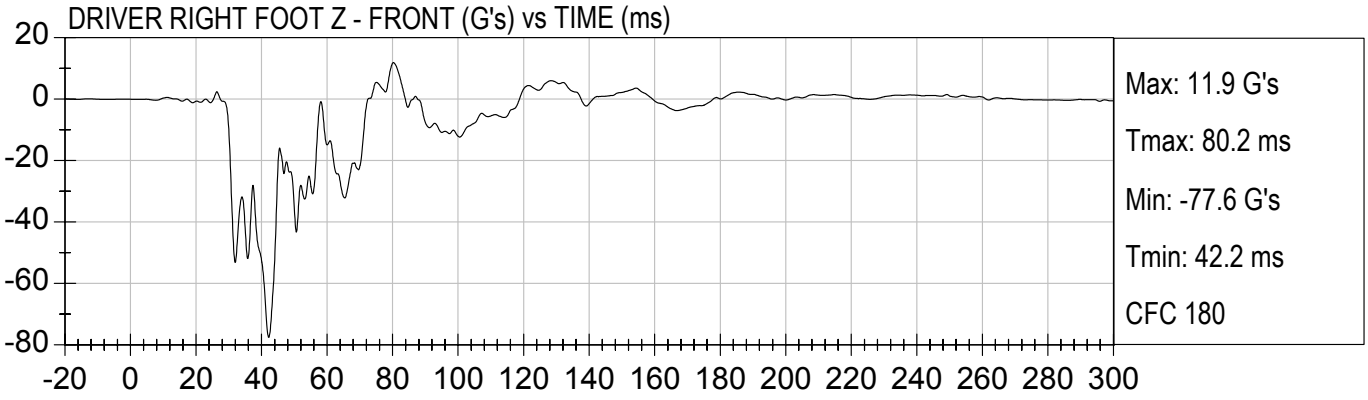

DRIVER LEFT FOOT Z - FRONT (G's) vs TIME (ms)
20
0
-20
-40
-60
-80
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 13.8 G's
Tmax: 57.7 ms
Min: -69.6 G's
Tmin: 30.4 ms
CFC 180

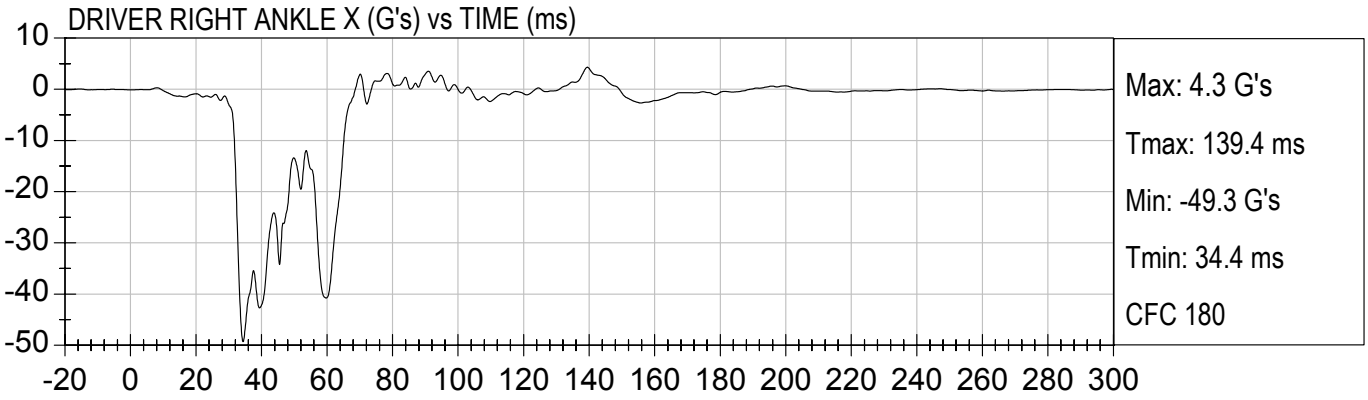

DRIVER LEFT ANKLE X (G's) vs TIME (ms)
10
0
-10
-20
-30
-40
-50
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 6.2 G's
Tmax: 40.1 ms
Min: -40.1 G's
Tmin: 67.8 ms
CFC 180

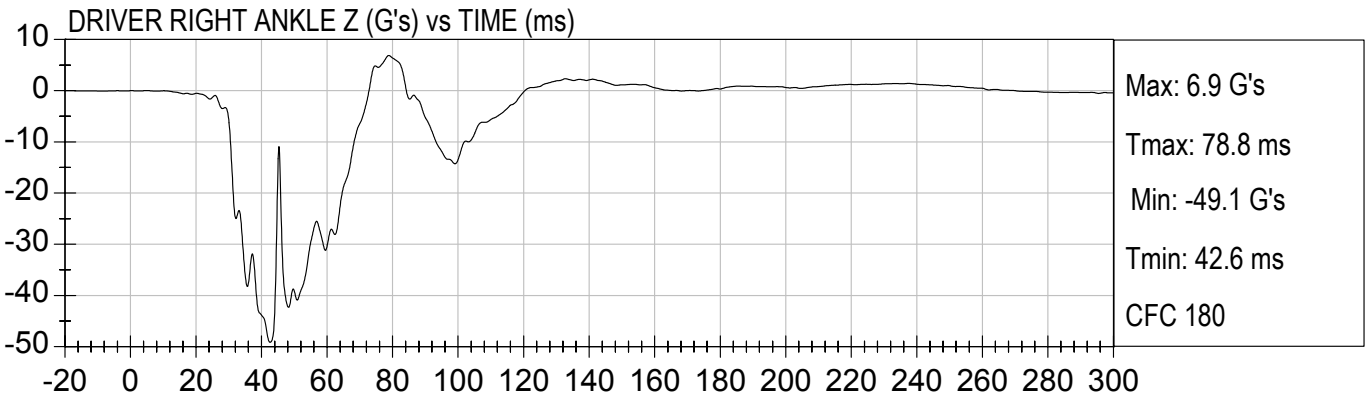

DRIVER LEFT ANKLE Z (G's) vs TIME (ms)
10
0
-10
-20
-30
-40
-50
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 3.1 G's
Tmax: 196.2 ms
Min: -41.4 G's
Tmin: 45.9 ms
CFC 180

NCAP FRONTAL IMPACT
2005 FORD FREESTYLE (M50204)

Test Date: 12/06/04
Speed: 35.1 mph (56.5 km/h)

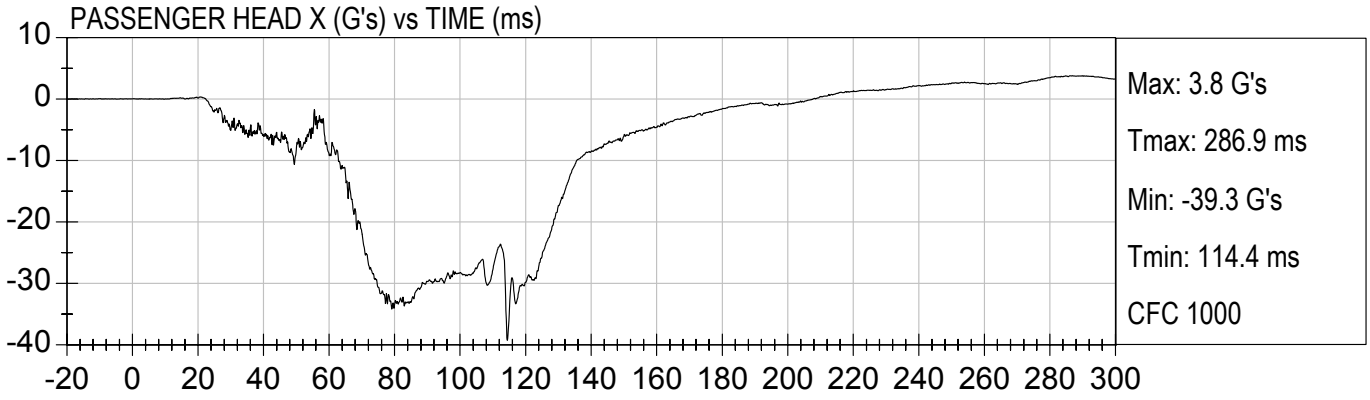


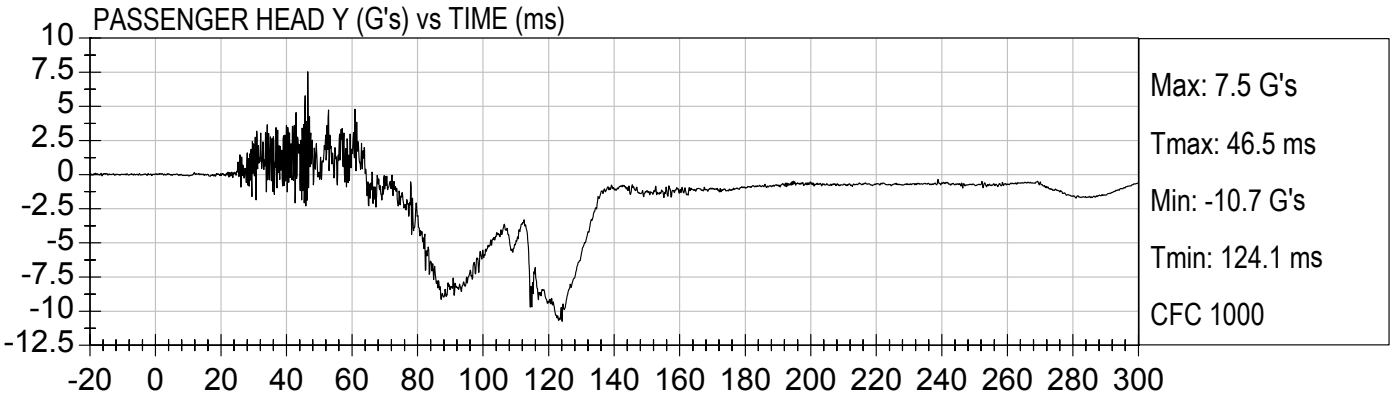


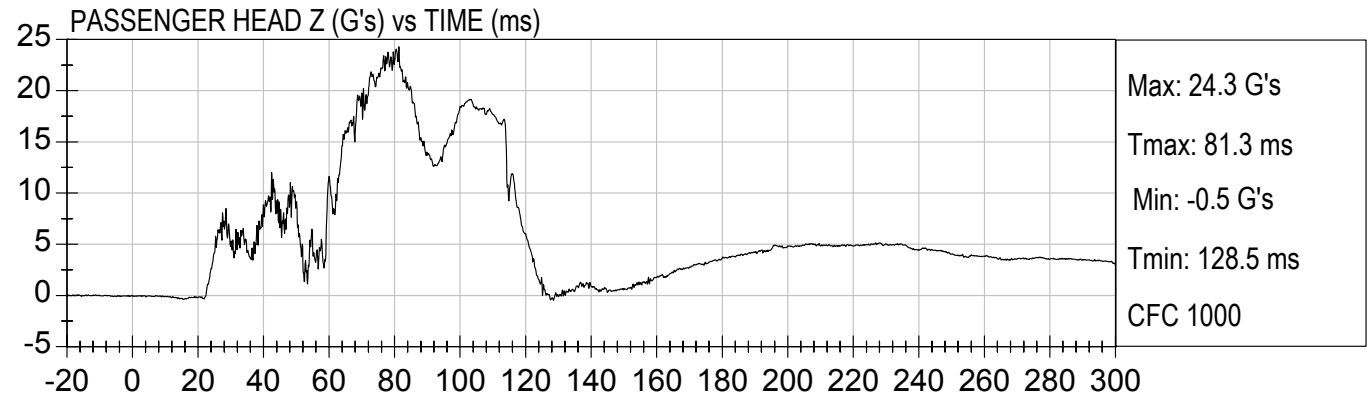


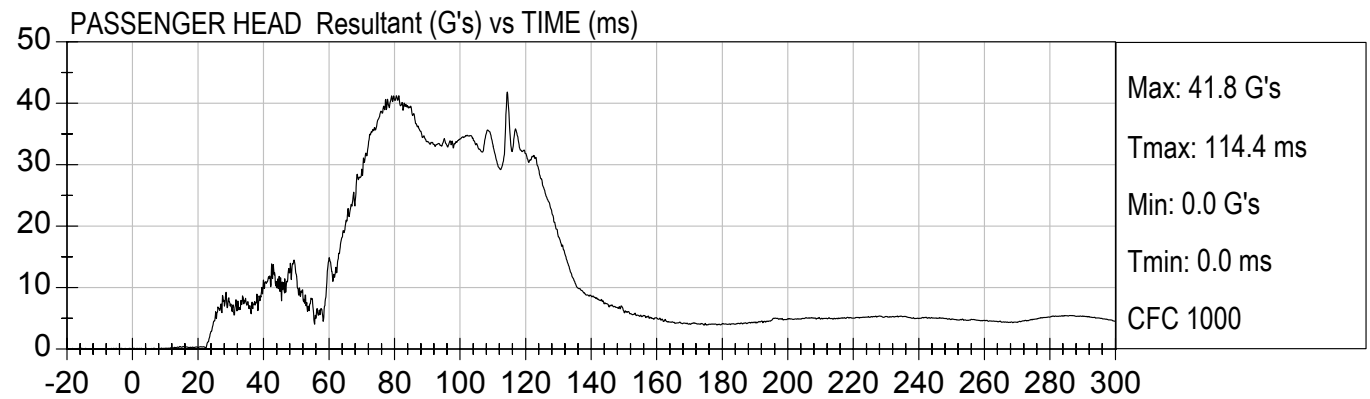
NCAP FRONTAL IMPACT
2005 FORD FREESTYLE (M50204)

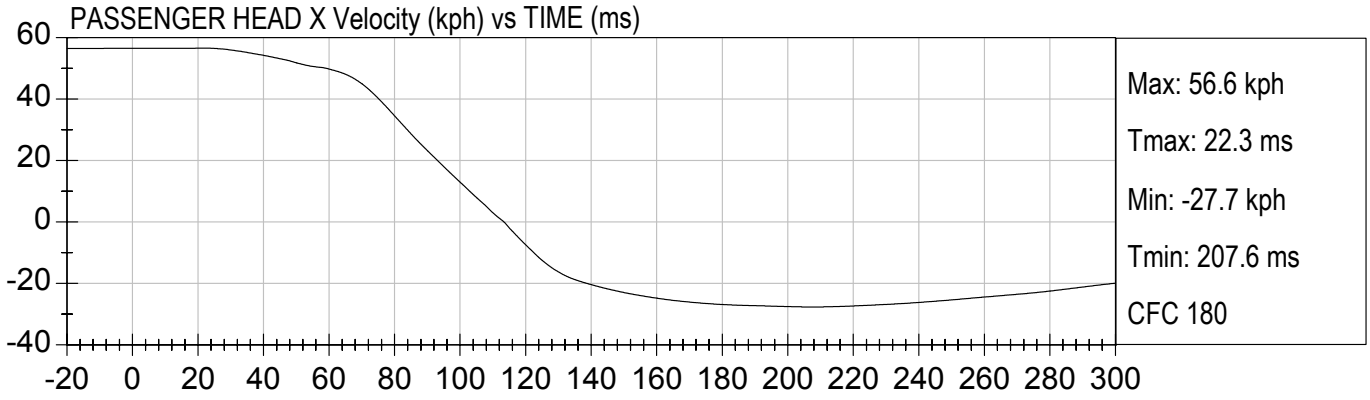
Test Date: 12/06/04
Speed: 35.1 mph (56.5 km/h)

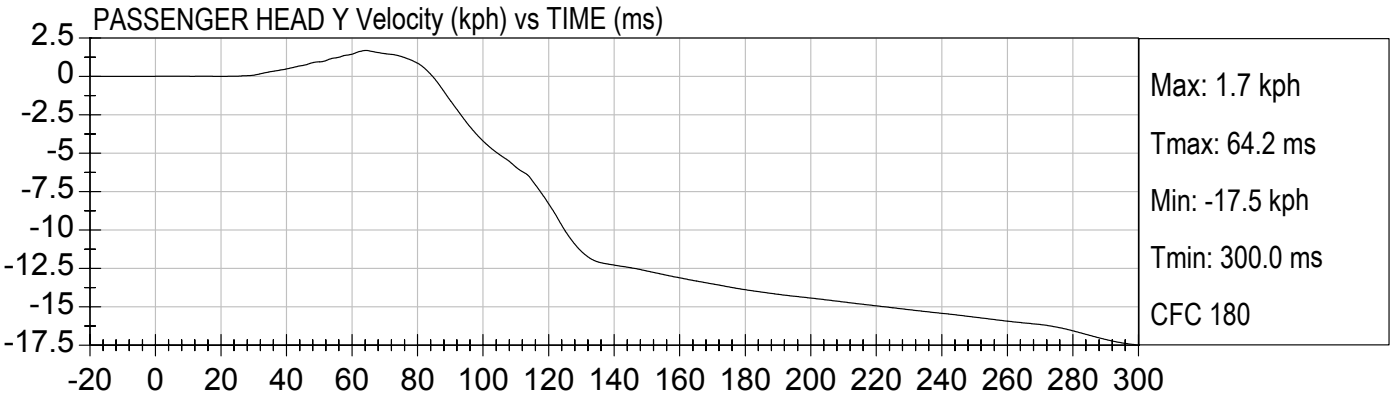


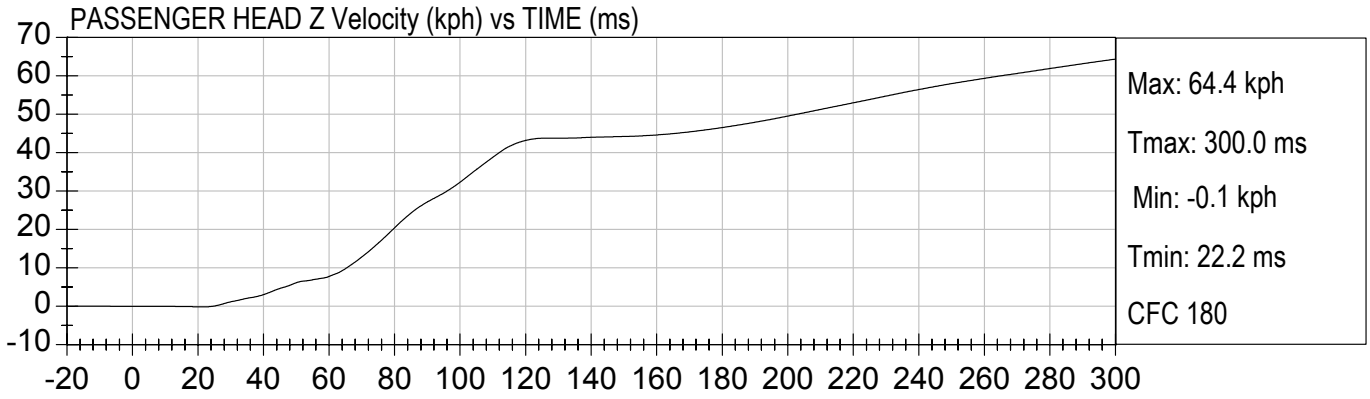






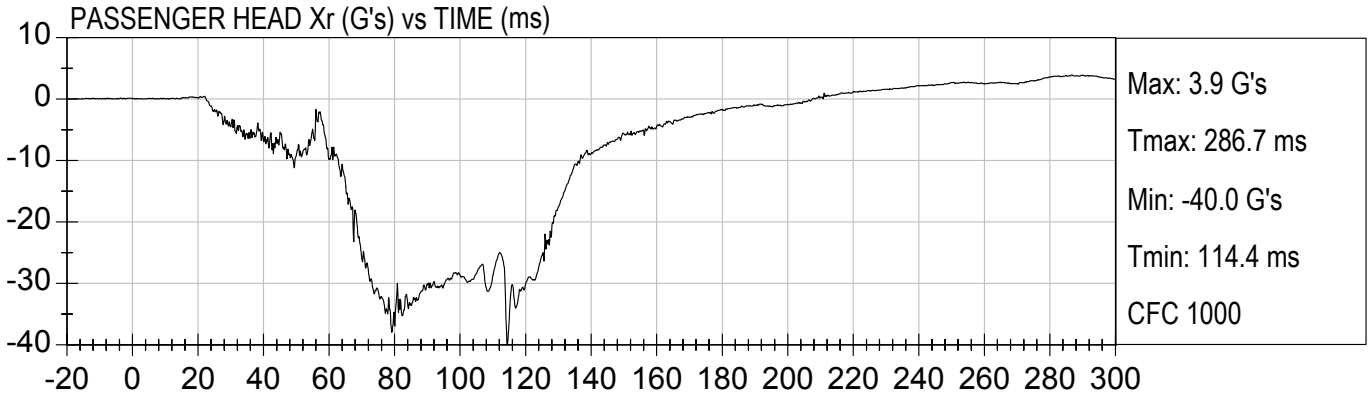

PASSENGER HEAD X Velocity (kph) vs TIME (ms)
60
40
20
0
-20
-40
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 56.6 kph
Tmax: 22.3 ms
Min: -27.7 kph
Tmin: 207.6 ms
CFC 180

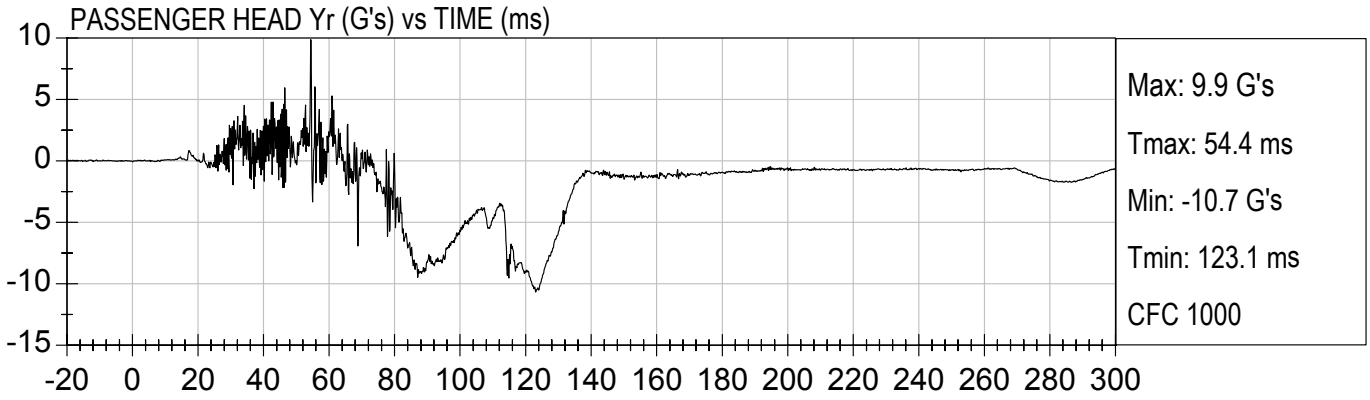

PASSENGER HEAD Y Velocity (kph) vs TIME (ms)
2.5
0
-2.5
-5
-7.5
-10
-12.5
-15
-17.5
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 1.7 kph
Tmax: 64.2 ms
Min: -17.5 kph
Tmin: 300.0 ms
CFC 180

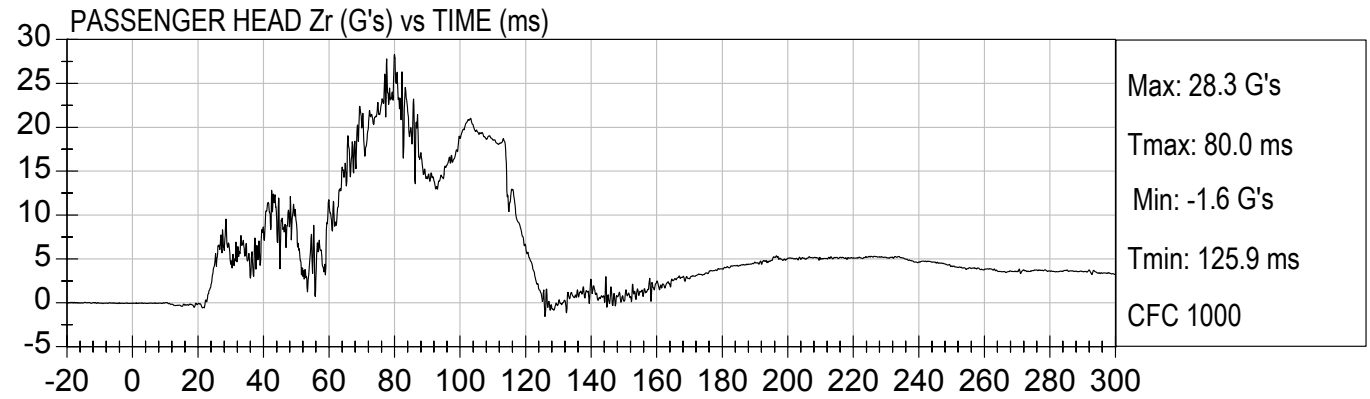

PASSENGER HEAD Z Velocity (kph) vs TIME (ms)
70
60
50
40
30
20
10
0
-10
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 64.4 kph
Tmax: 300.0 ms
Min: -0.1 kph
Tmin: 22.2 ms
CFC 180

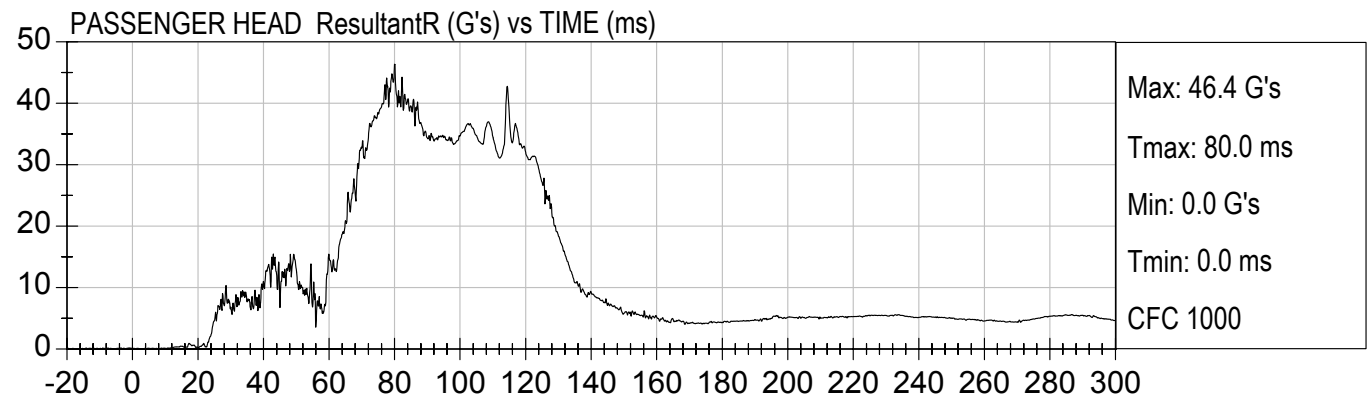
NCAP FRONTAL IMPACT
2005 FORD FREESTYLE (M50204)

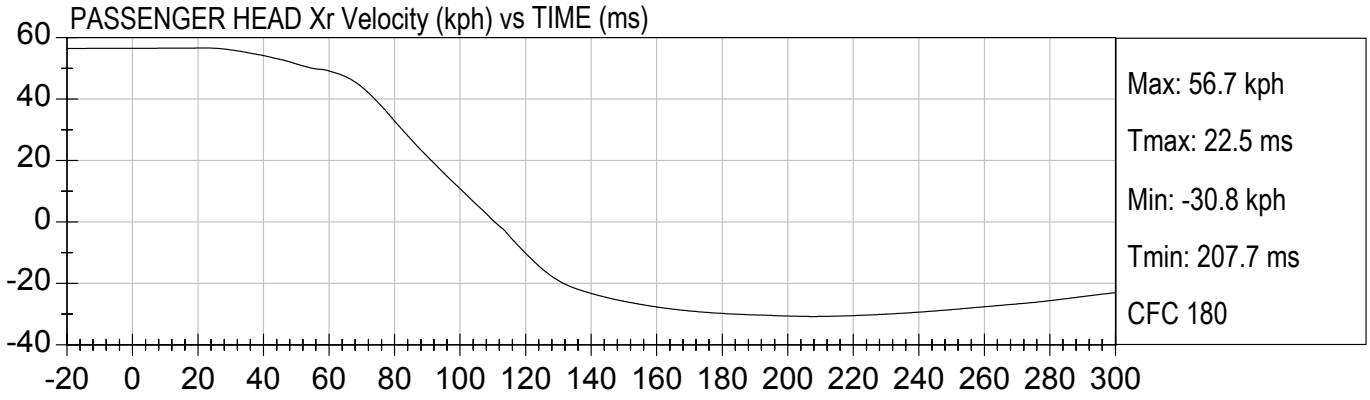
Test Date: 12/06/04
Speed: 35.1 mph (56.5 km/h)

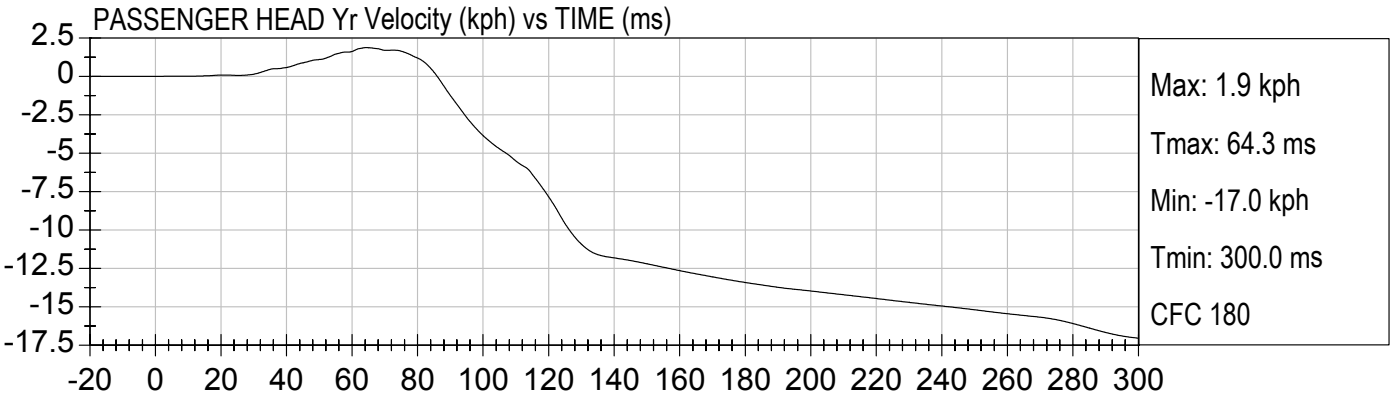


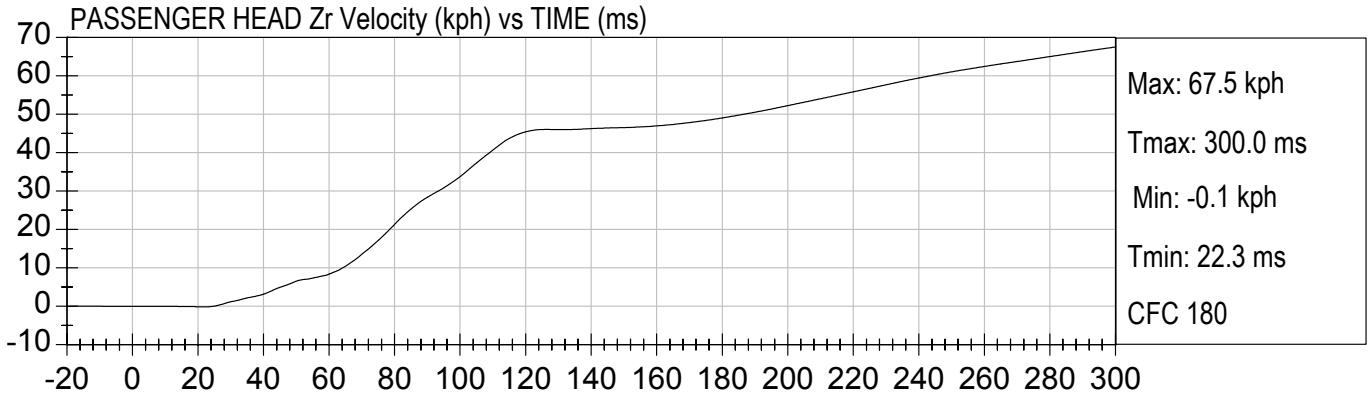






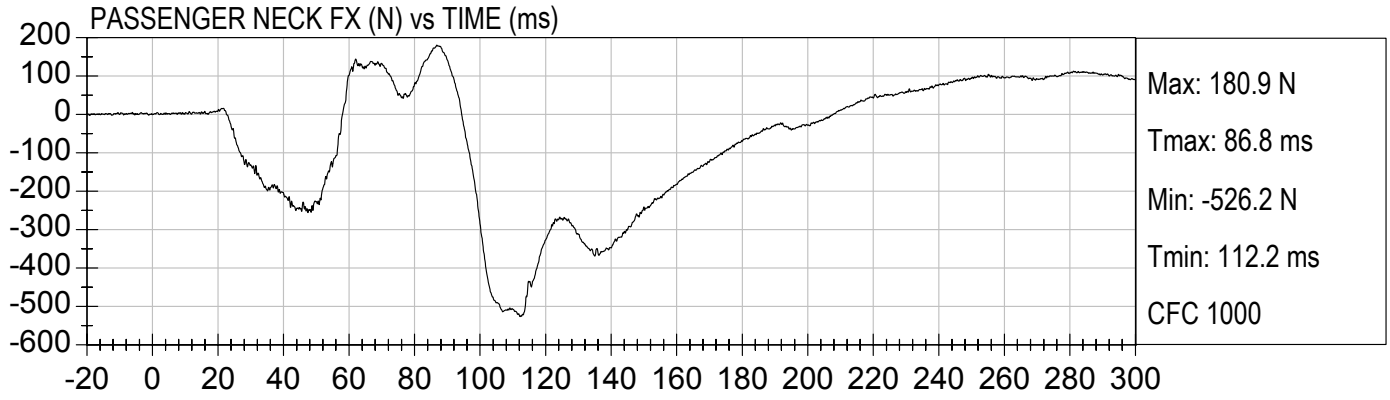

PASSENGER HEAD Xr Velocity (kph) vs TIME (ms)
60
40
20
0
-20
-40
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 56.7 kph
Tmax: 22.5 ms
Min: -30.8 kph
Tmin: 207.7 ms
CFC 180

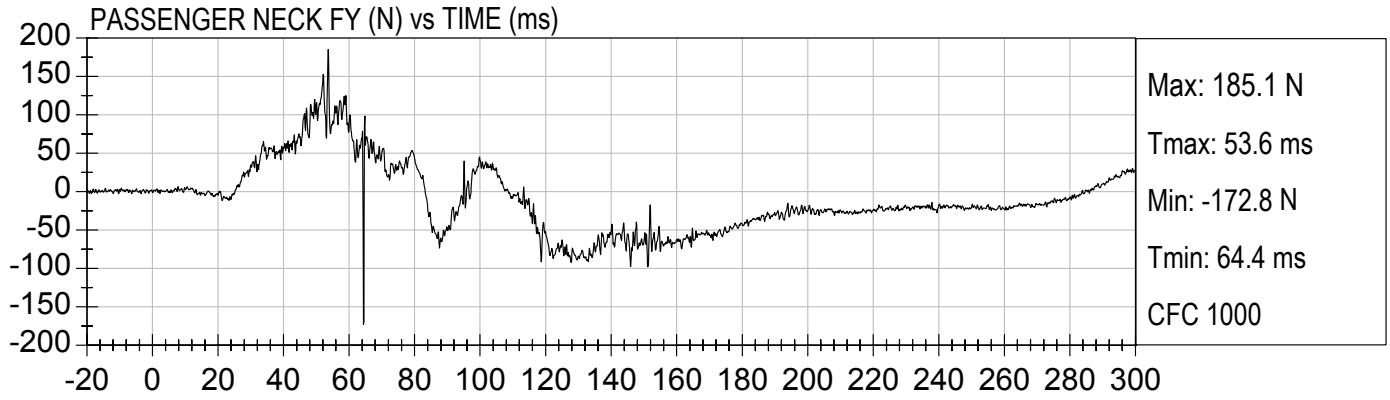

PASSENGER HEAD Yr Velocity (kph) vs TIME (ms)
2.5
0
-2.5
-5
-7.5
-10
-12.5
-15
-17.5
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 1.9 kph
Tmax: 64.3 ms
Min: -17.0 kph
Tmin: 300.0 ms
CFC 180

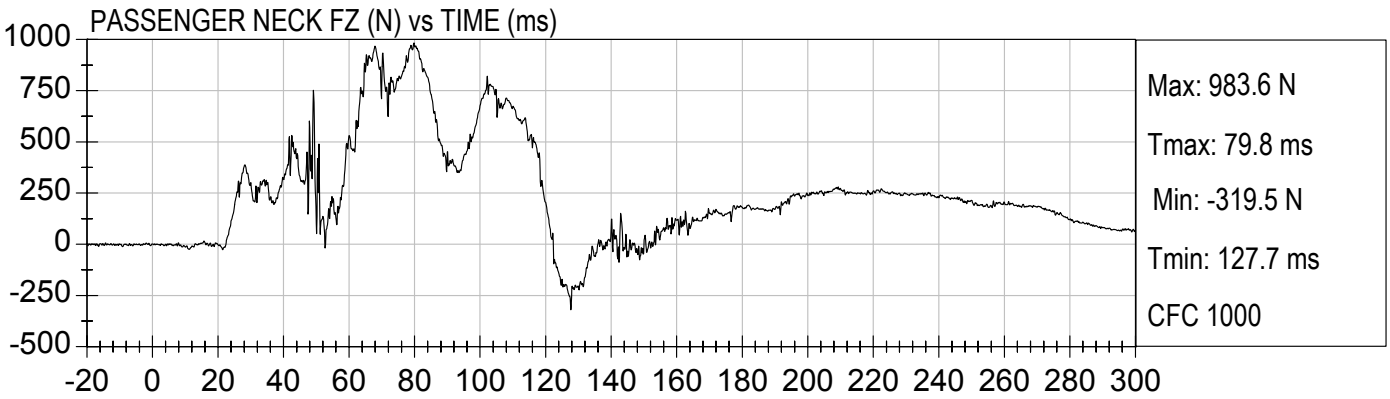

PASSENGER HEAD Zr Velocity (kph) vs TIME (ms)
70
60
50
40
30
20
10
0
-10
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 67.5 kph
Tmax: 300.0 ms
Min: -0.1 kph
Tmin: 22.3 ms
CFC 180

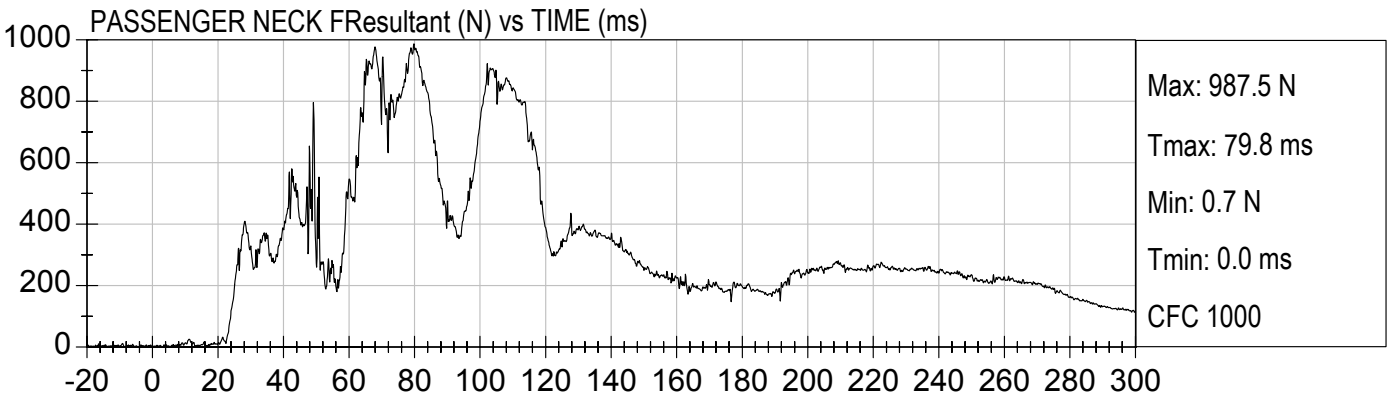
NCAP FRONTAL IMPACT
2005 FORD FREESTYLE (M50204)

Test Date: 12/06/04
Speed: 35.1 mph (56.5 km/h)



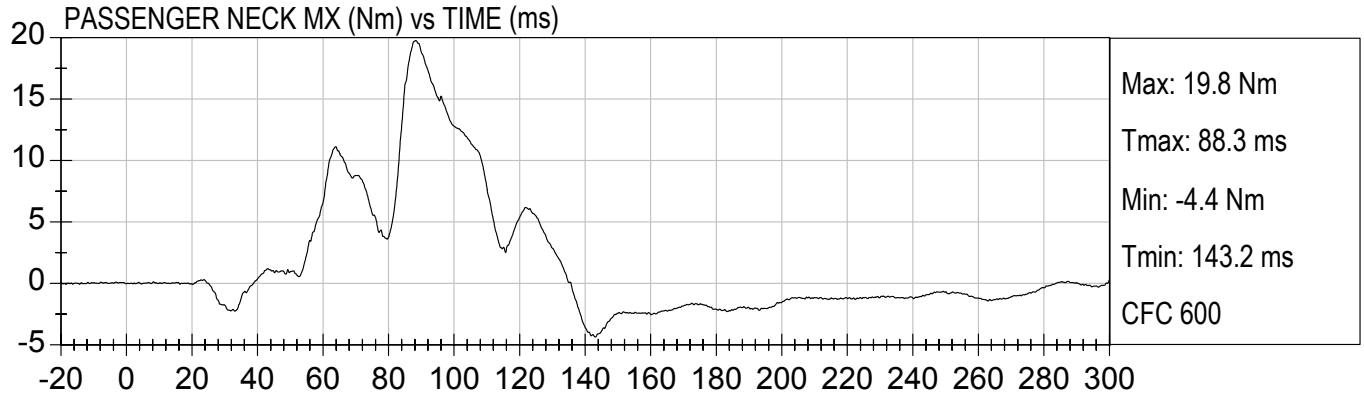


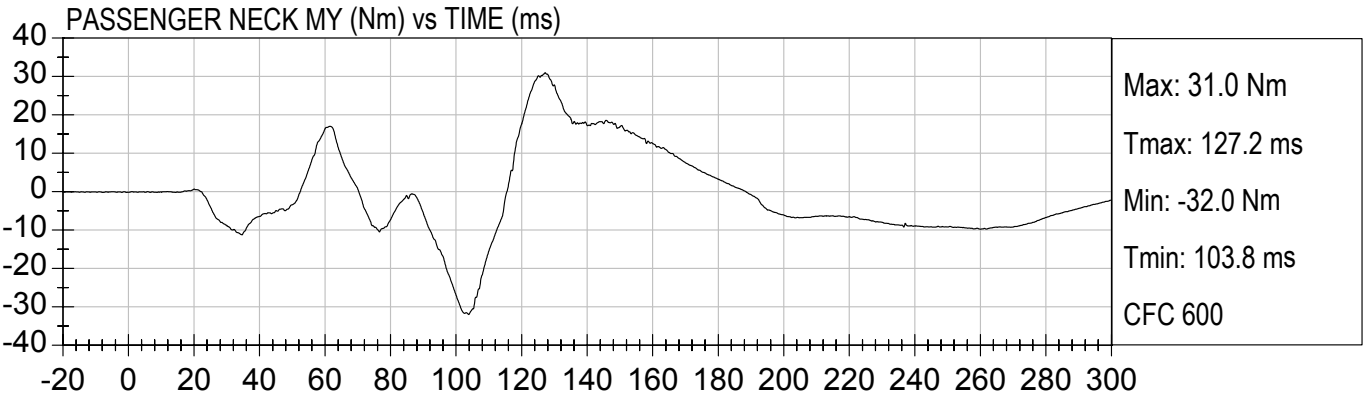


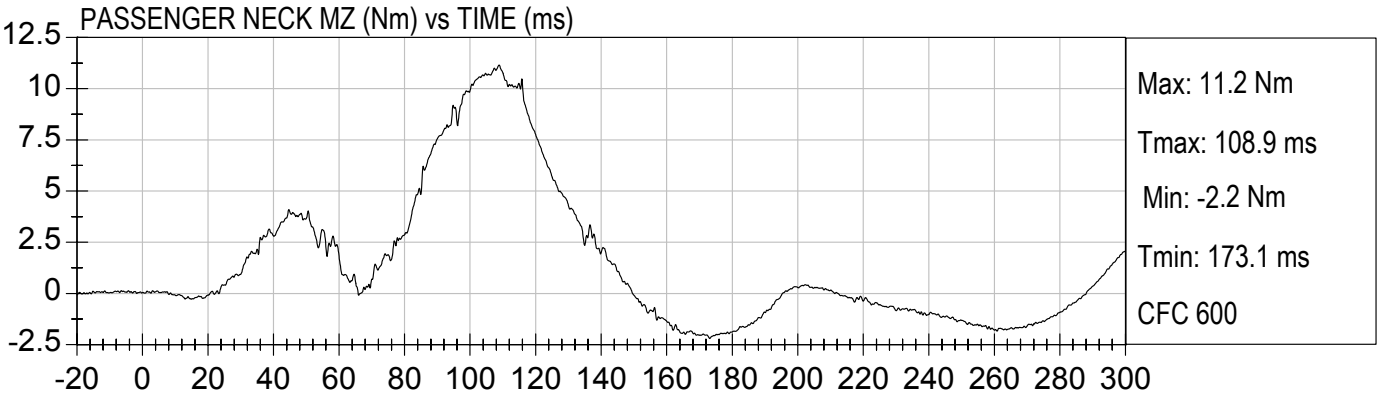


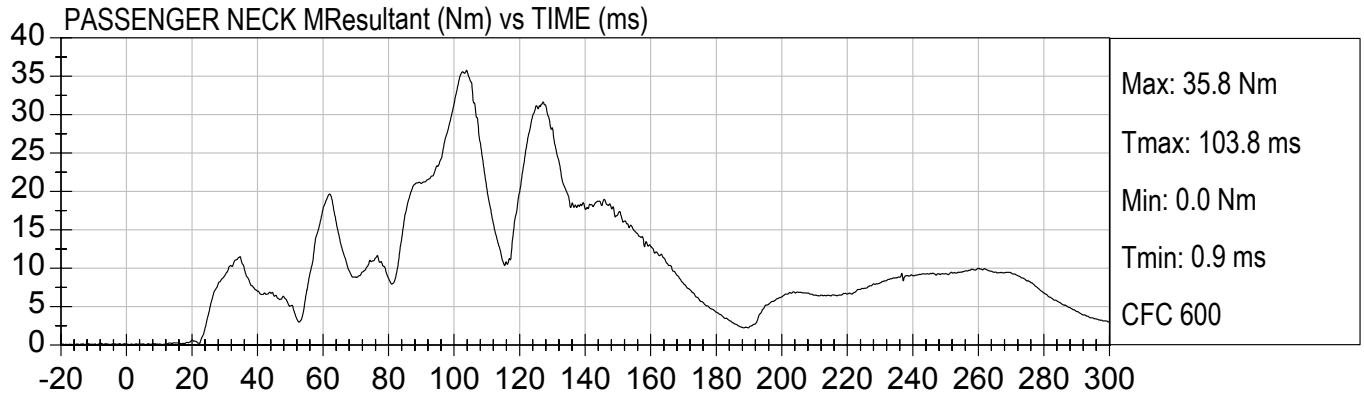
NCAP FRONTAL IMPACT
2005 FORD FREESTYLE (M50204)

Test Date: 12/06/04
Speed: 35.1 mph (56.5 km/h)



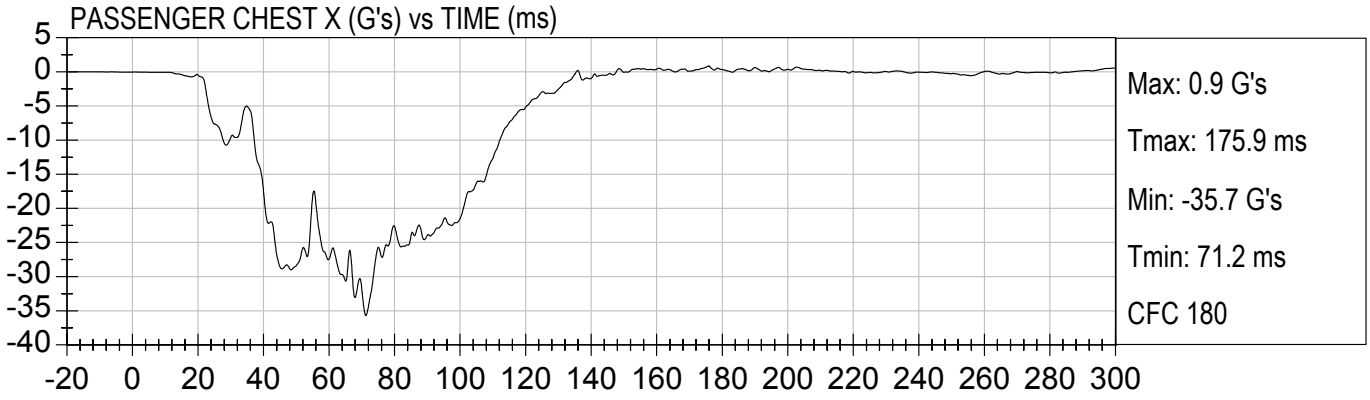


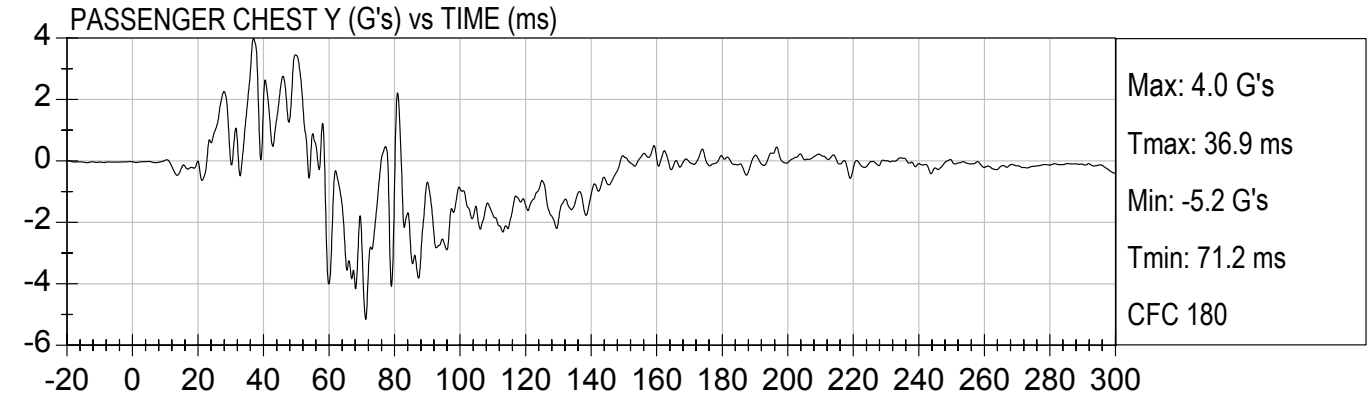


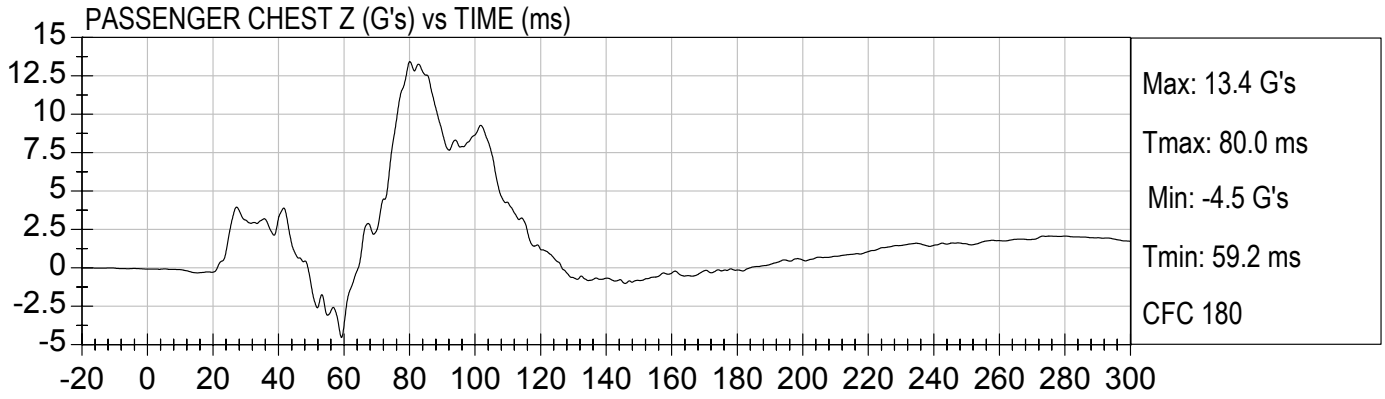


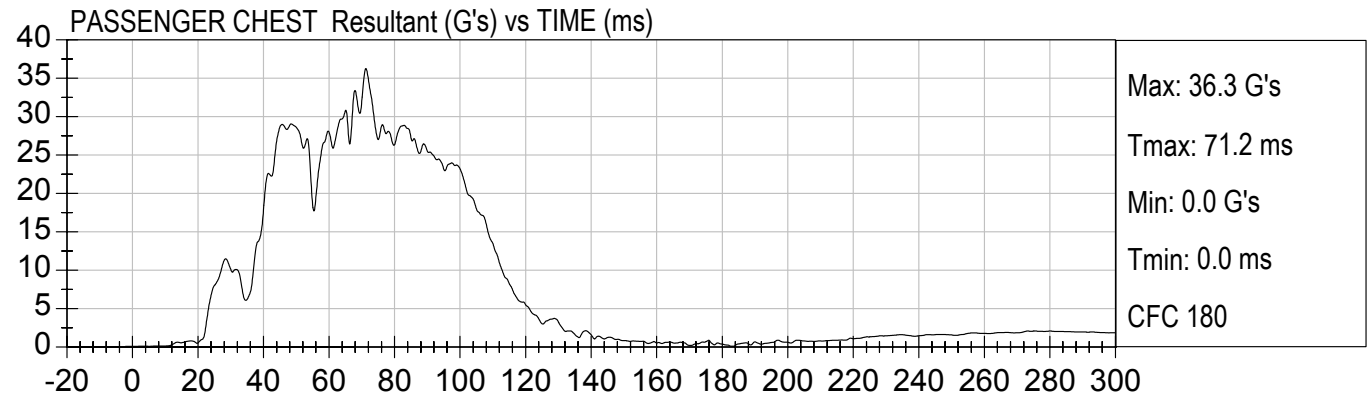
NCAP FRONTAL IMPACT
2005 FORD FREESTYLE (M50204)

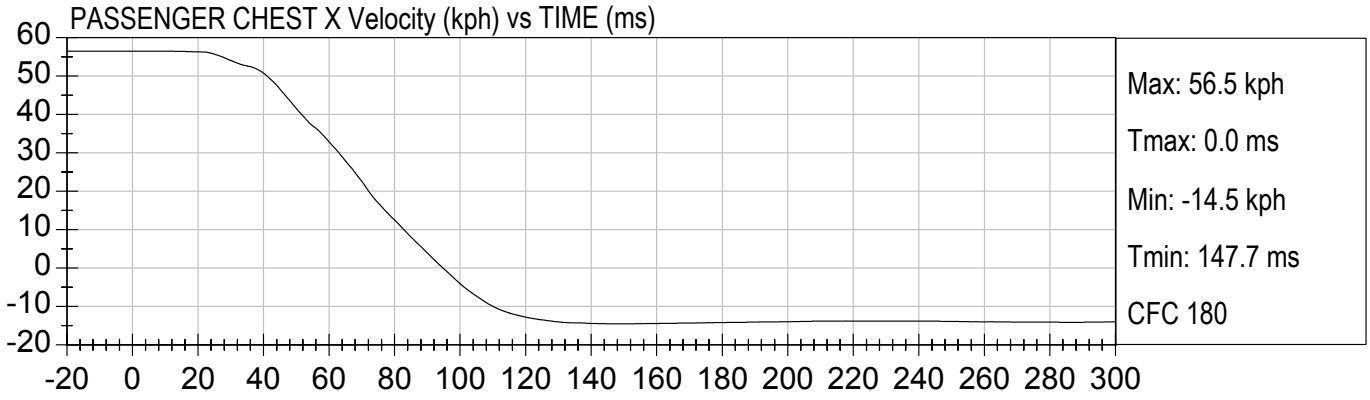
Test Date: 12/06/04
Speed: 35.1 mph (56.5 km/h)

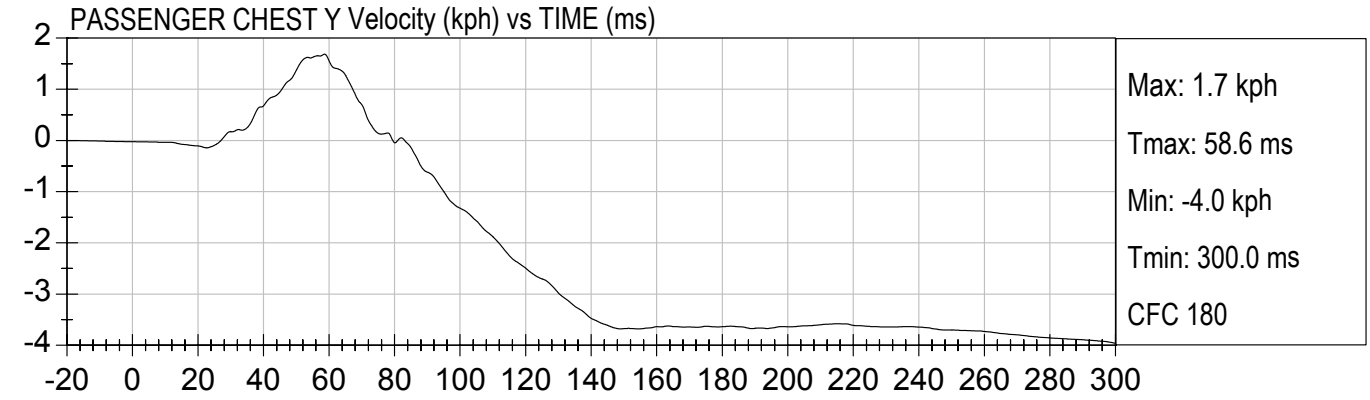


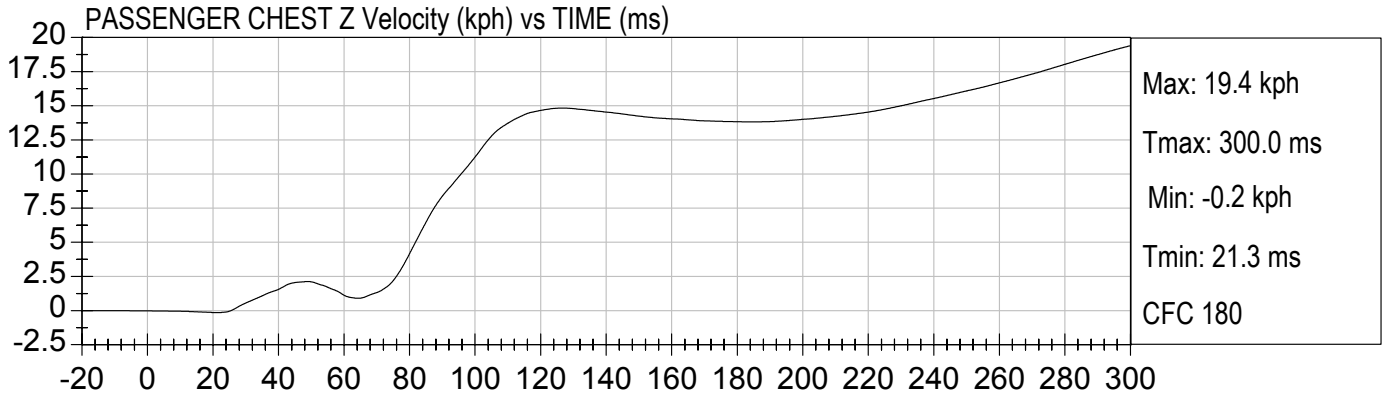


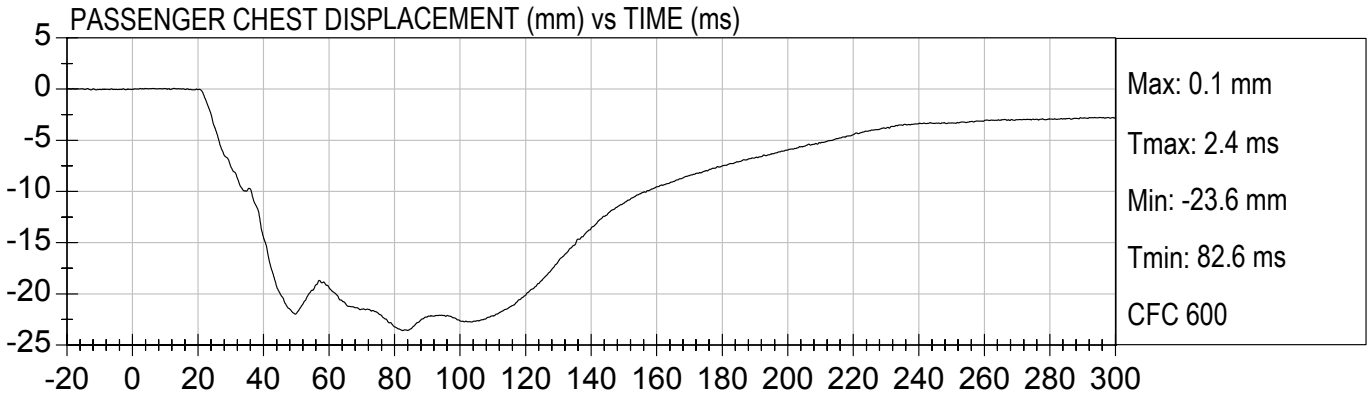





PASSENGER CHEST X Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 56.5 kph
Tmax: 0.0 ms
Min: -14.5 kph
Tmin: 147.7 ms
CFC 180

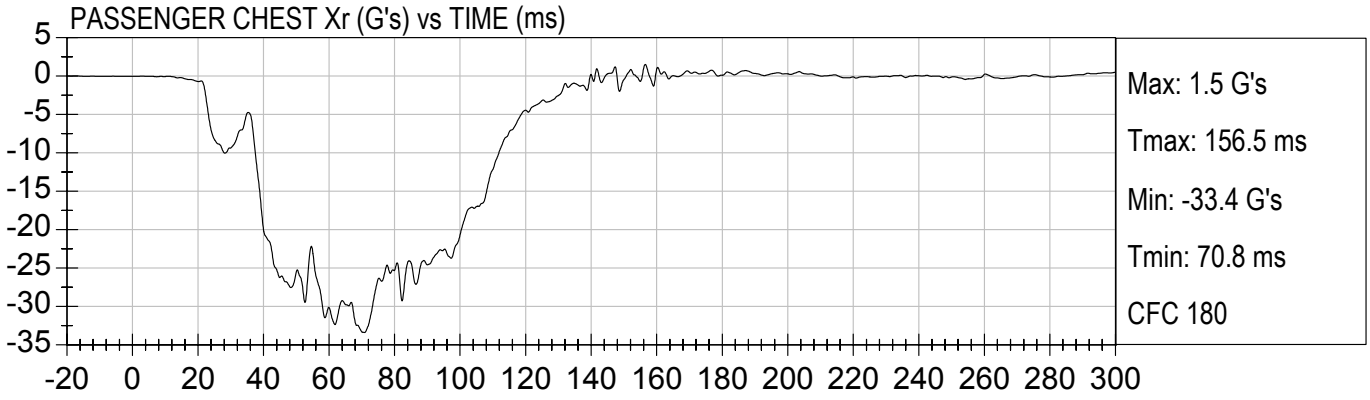

PASSENGER CHEST Y Velocity (kph) vs TIME (ms)
2
1
0
-1
-2
-3
-4
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 1.7 kph
Tmax: 58.6 ms
Min: -4.0 kph
Tmin: 300.0 ms
CFC 180

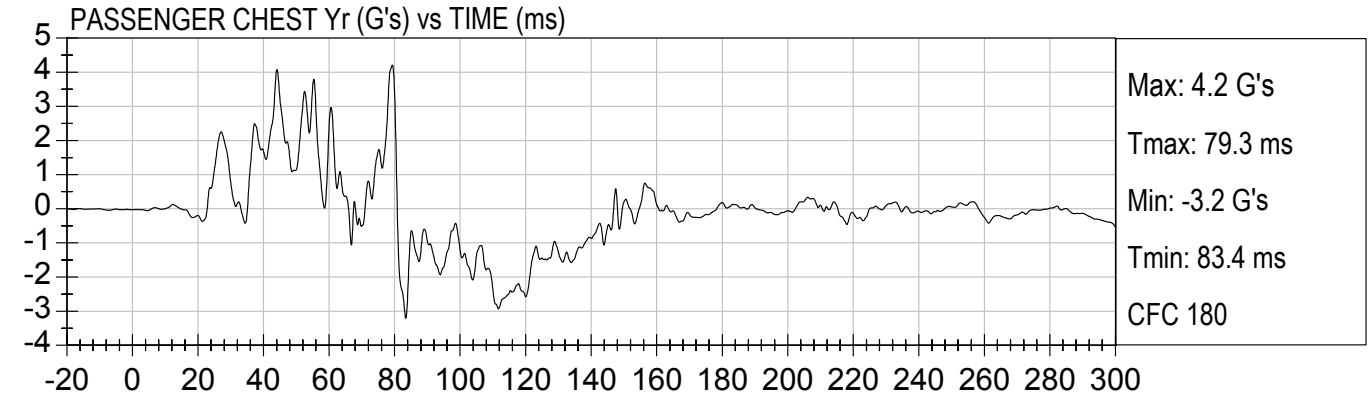

PASSENGER CHEST Z Velocity (kph) vs TIME (ms)
20
17.5
15
12.5
10
7.5
5
2.5
0
-2.5
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 19.4 kph
Tmax: 300.0 ms
Min: -0.2 kph
Tmin: 21.3 ms
CFC 180

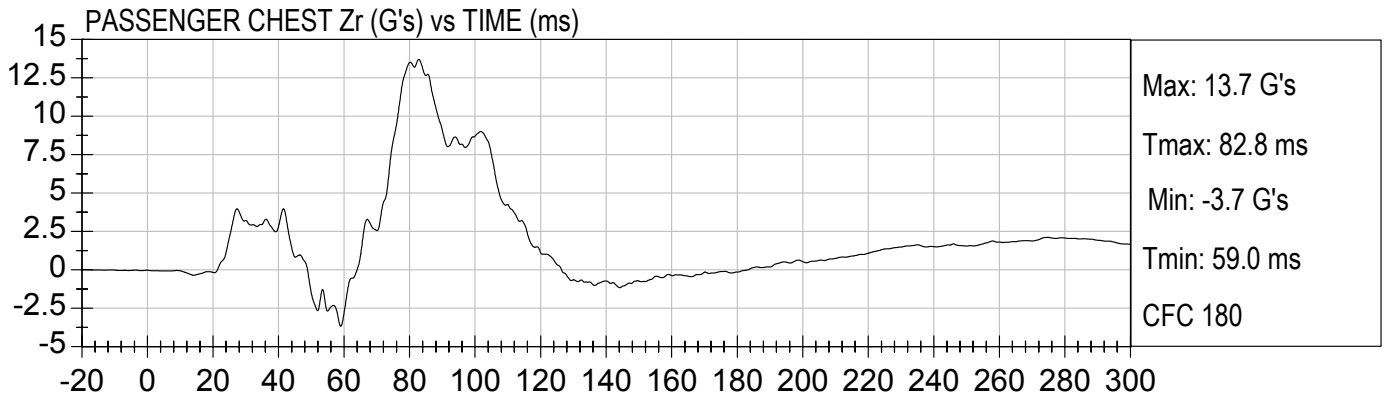

PASSENGER CHEST DISPLACEMENT (mm) vs TIME (ms)
5
0
-5
-10
-15
-20
-25
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 0.1 mm
Tmax: 2.4 ms
Min: -23.6 mm
Tmin: 82.6 ms
CFC 600

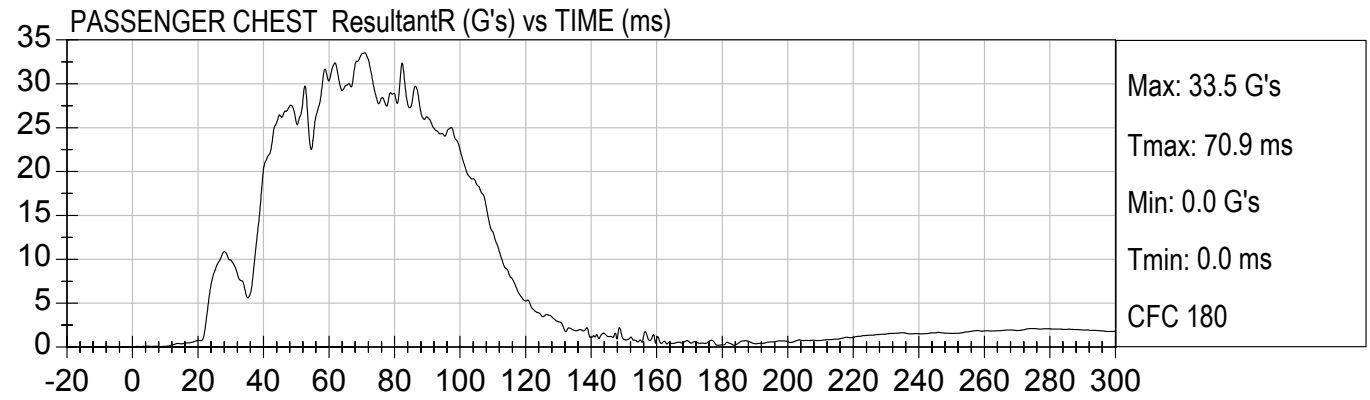
NCAP FRONTAL IMPACT
2005 FORD FREESTYLE (M50204)

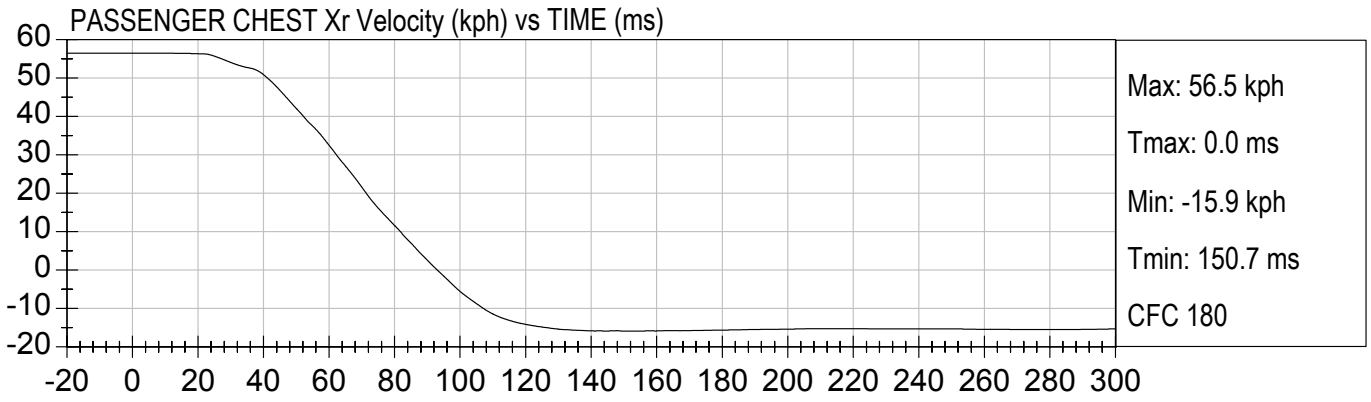
Test Date: 12/06/04
Speed: 35.1 mph (56.5 km/h)

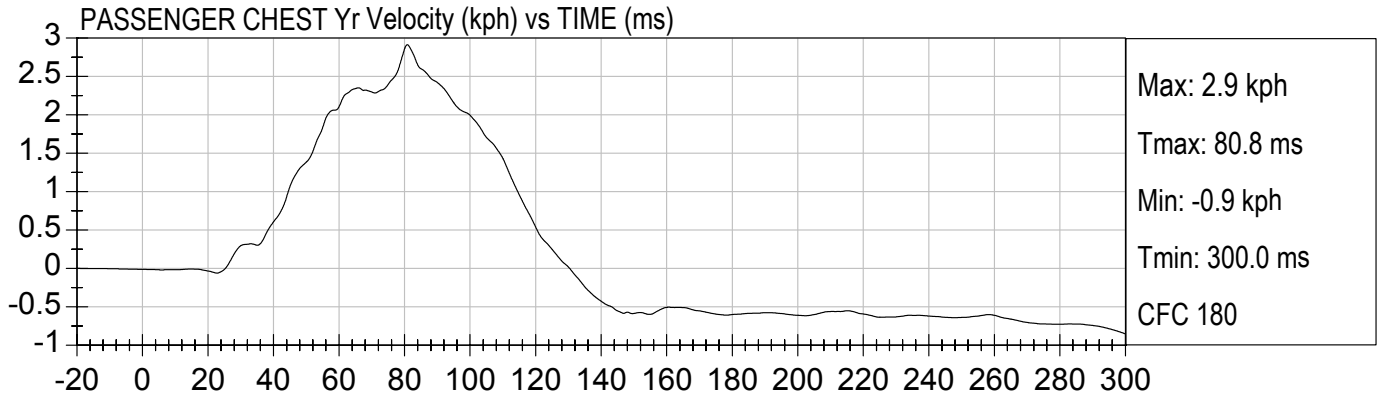


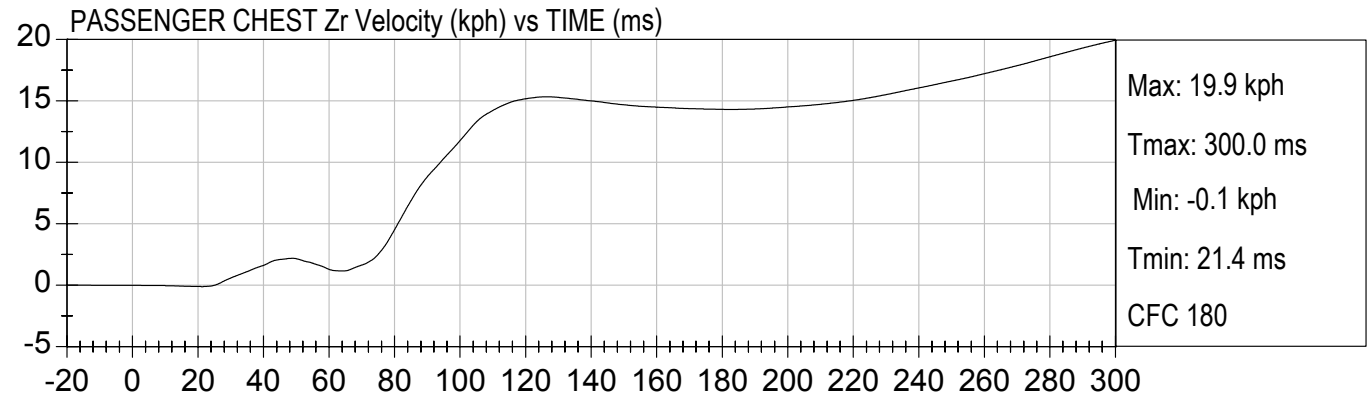






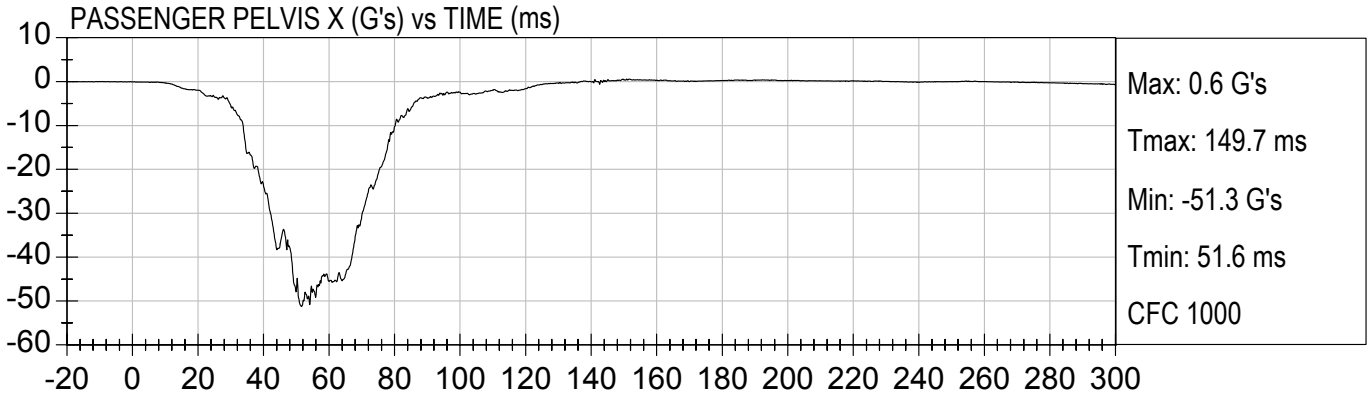

PASSENGER CHEST Xr Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 56.5 kph
Tmax: 0.0 ms
Min: -15.9 kph
Tmin: 150.7 ms
CFC 180

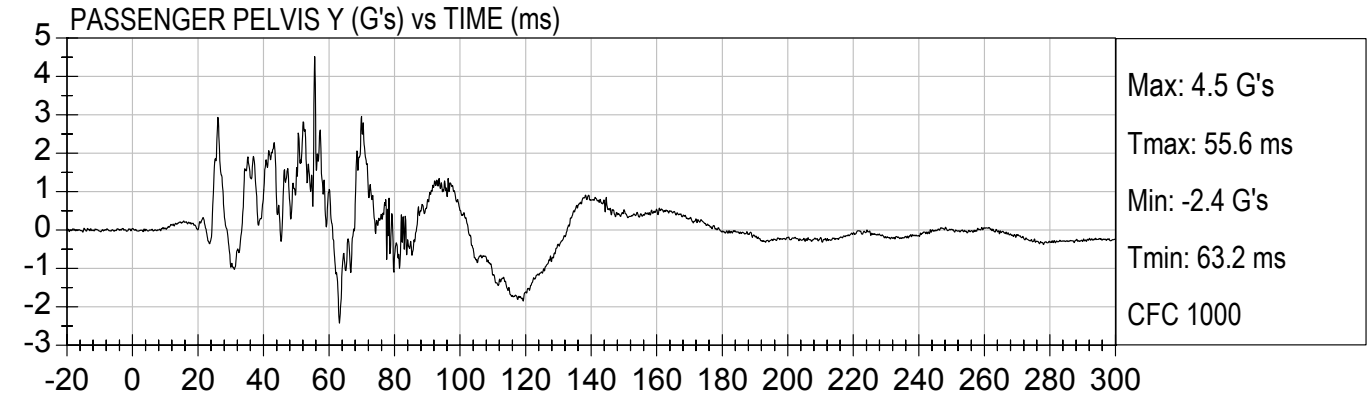

PASSENGER CHEST Yr Velocity (kph) vs TIME (ms)
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 2.9 kph
Tmax: 80.8 ms
Min: -0.9 kph
Tmin: 300.0 ms
CFC 180

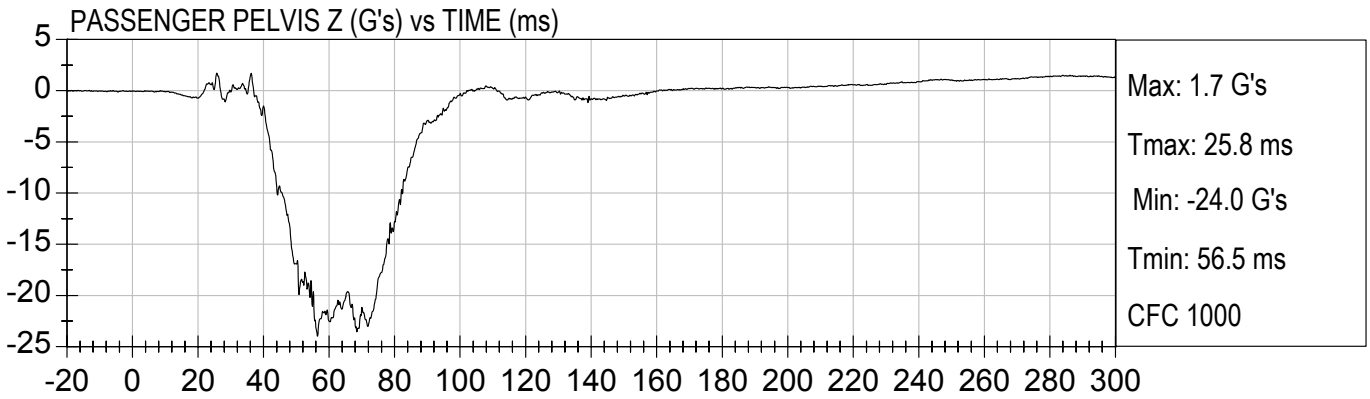

PASSENGER CHEST Zr Velocity (kph) vs TIME (ms)
20
15
10
5
0
-5
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 19.9 kph
Tmax: 300.0 ms
Min: -0.1 kph
Tmin: 21.4 ms
CFC 180

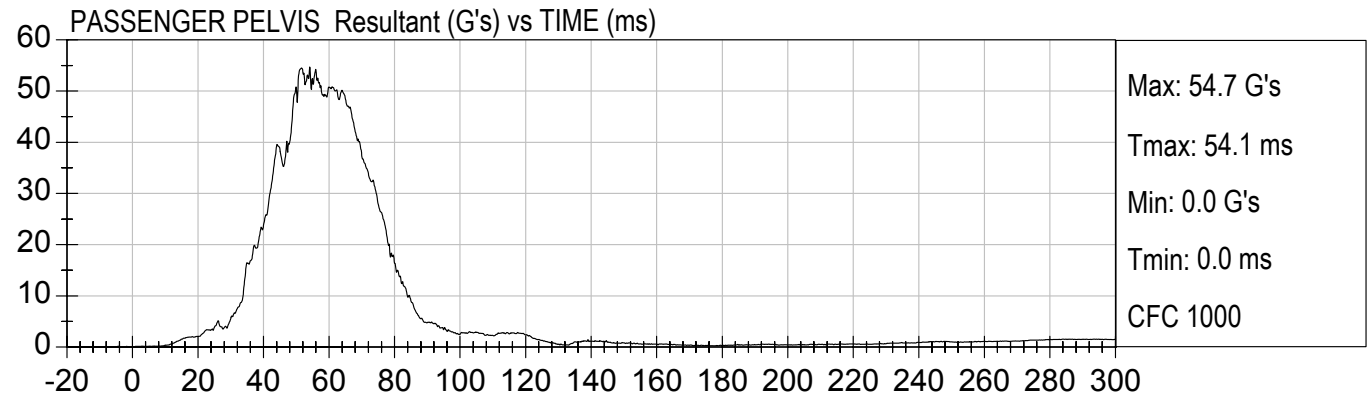
NCAP FRONTAL IMPACT
2005 FORD FREESTYLE (M50204)

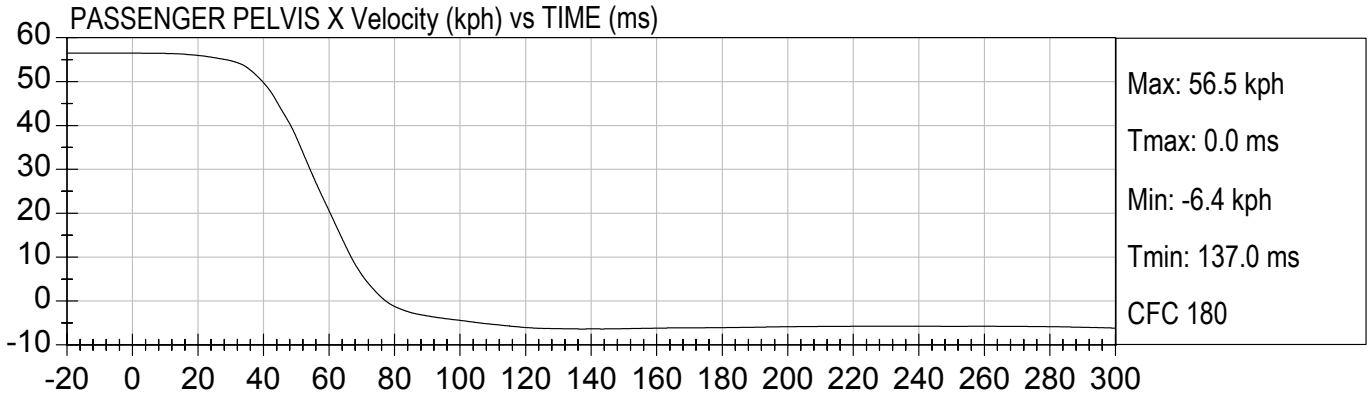
Test Date: 12/06/04
Speed: 35.1 mph (56.5 km/h)

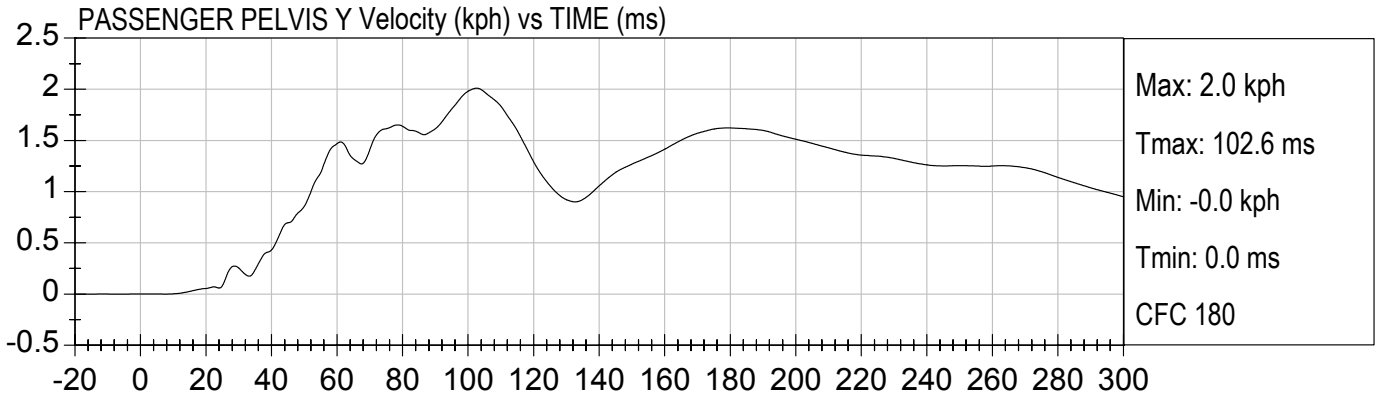


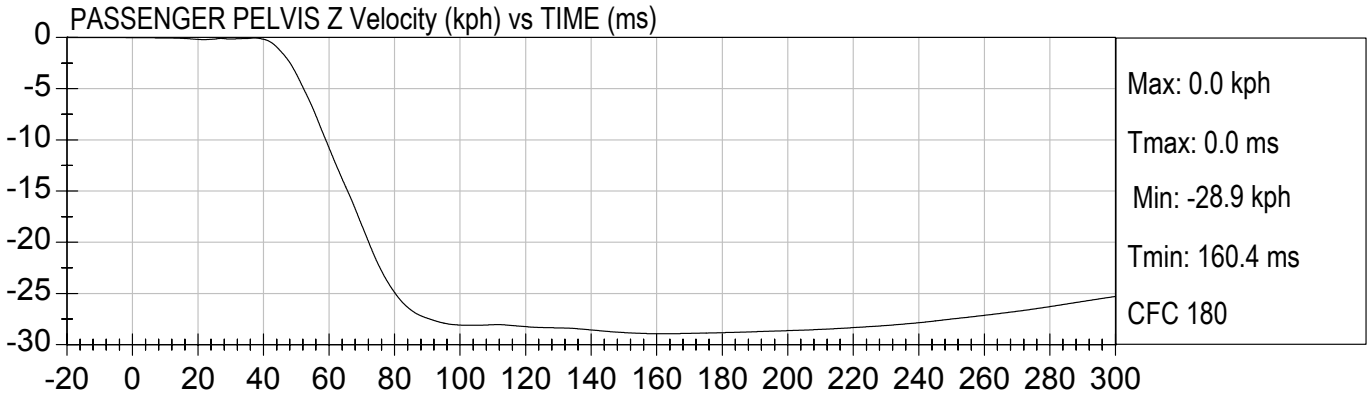






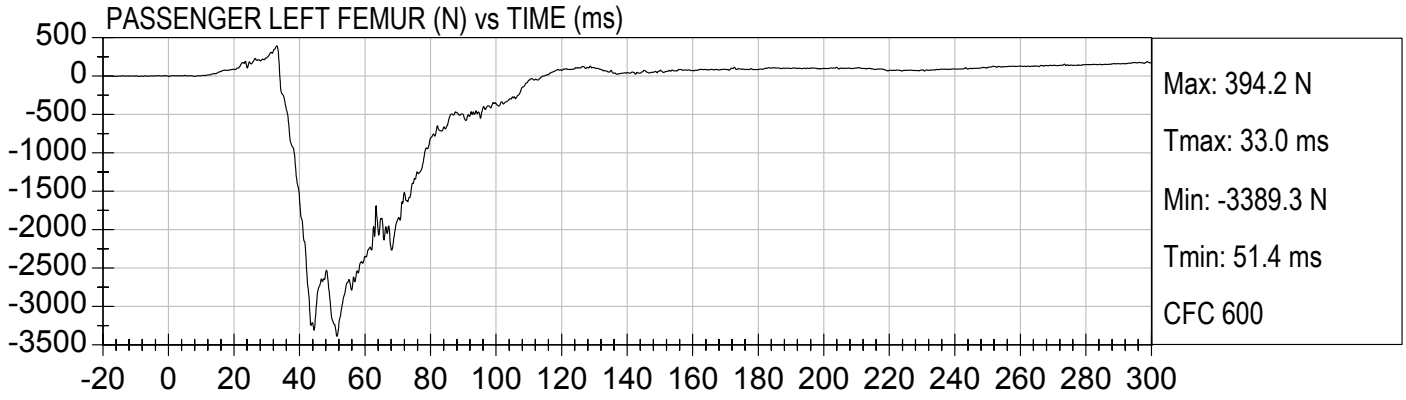

PASSENGER PELVIS X Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 56.5 kph
Tmax: 0.0 ms
Min: -6.4 kph
Tmin: 137.0 ms
CFC 180

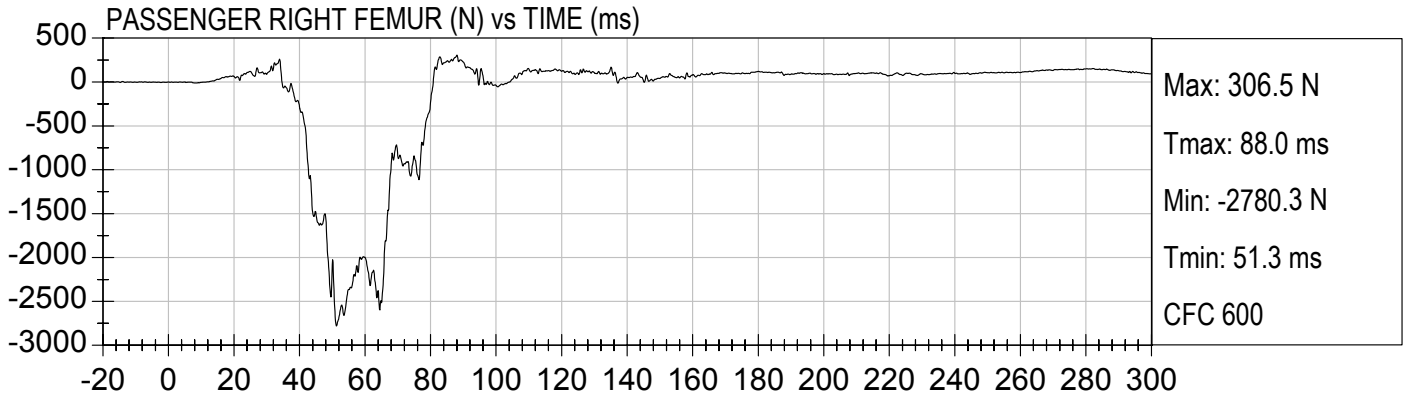

PASSENGER PELVIS Y Velocity (kph) vs TIME (ms)
2.5
2
1.5
1
0.5
0
-0.5
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 2.0 kph
Tmax: 102.6 ms
Min: -0.0 kph
Tmin: 0.0 ms
CFC 180

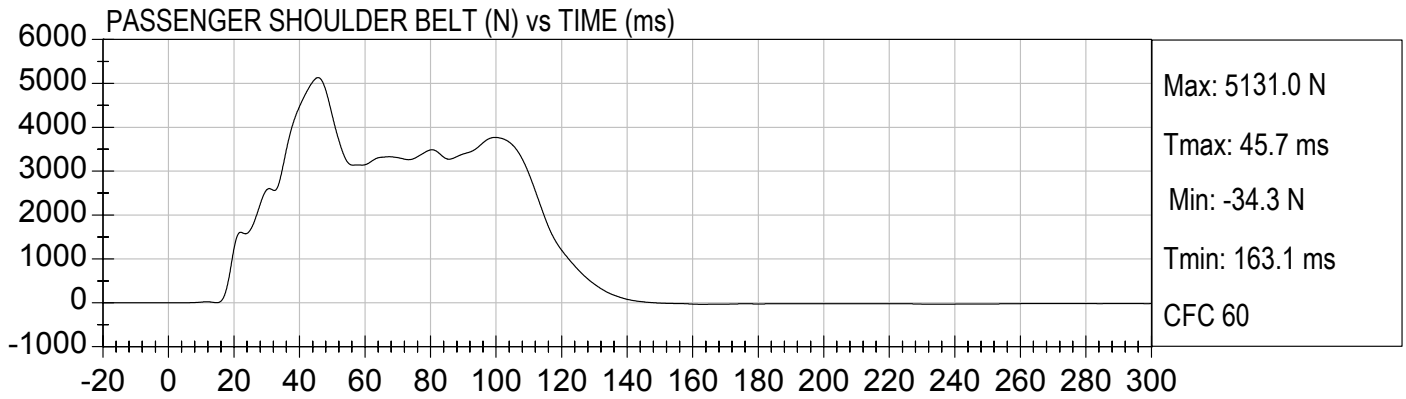

PASSENGER PELVIS Z Velocity (kph) vs TIME (ms)
0
-5
-10
-15
-20
-25
-30
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 0.0 kph
Tmax: 0.0 ms
Min: -28.9 kph
Tmin: 160.4 ms
CFC 180

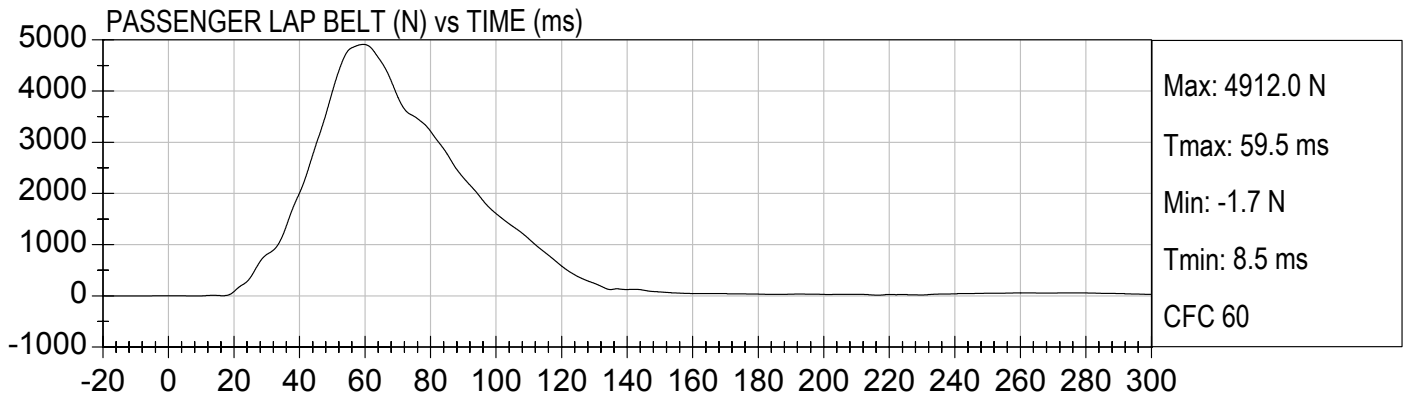
NCAP FRONTAL IMPACT
2005 FORD FREESTYLE (M50204)

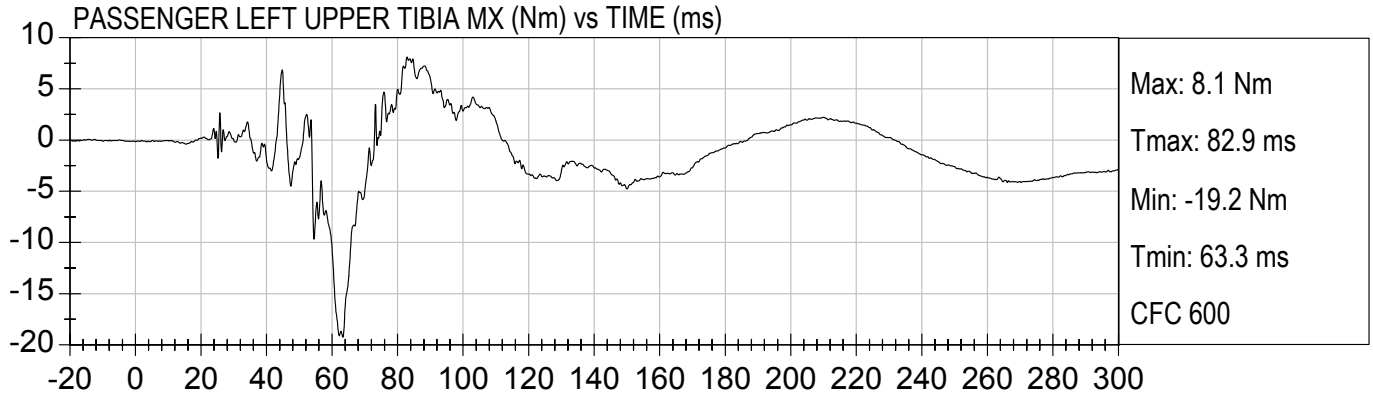
Test Date: 12/06/04
Speed: 35.1 mph (56.5 km/h)

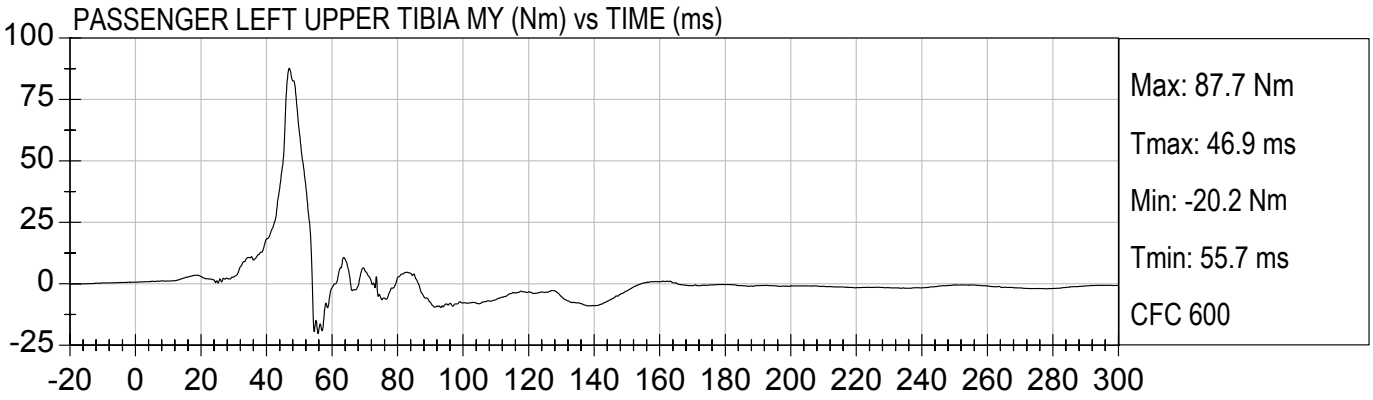


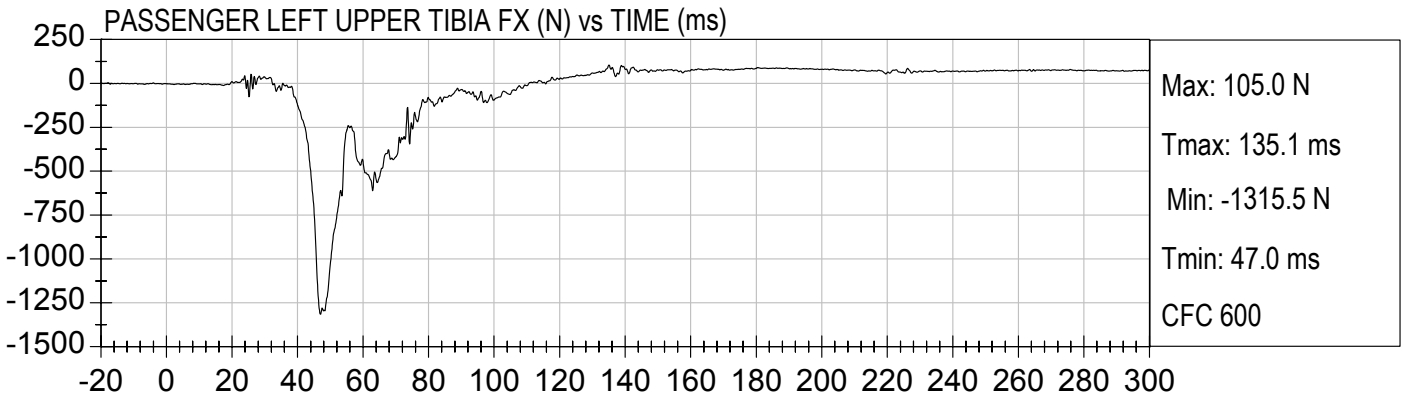


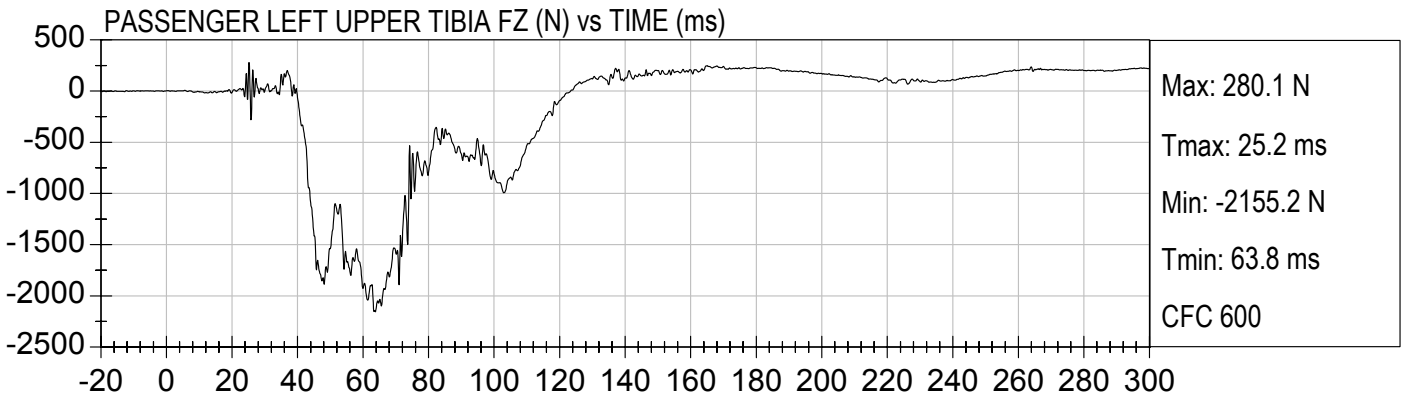


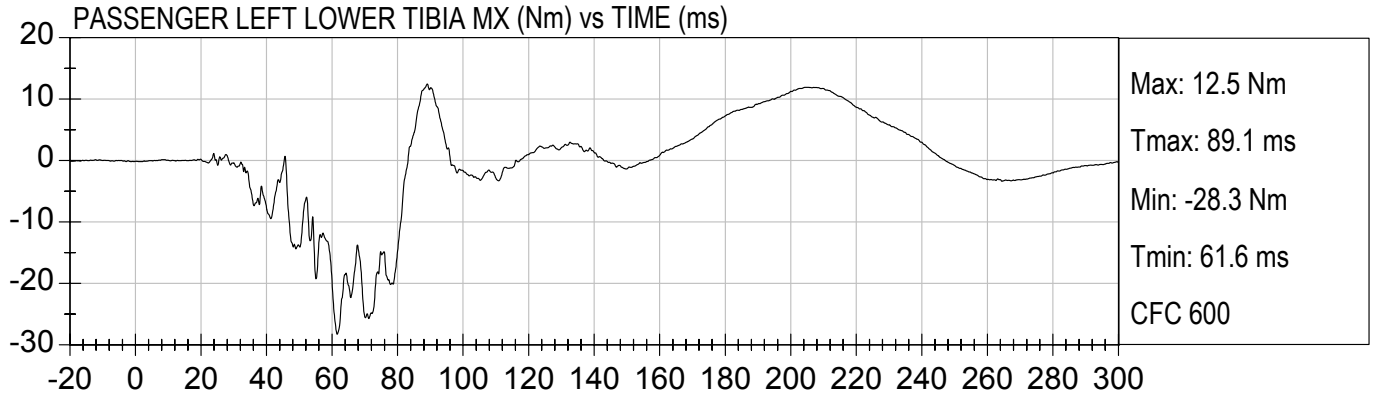


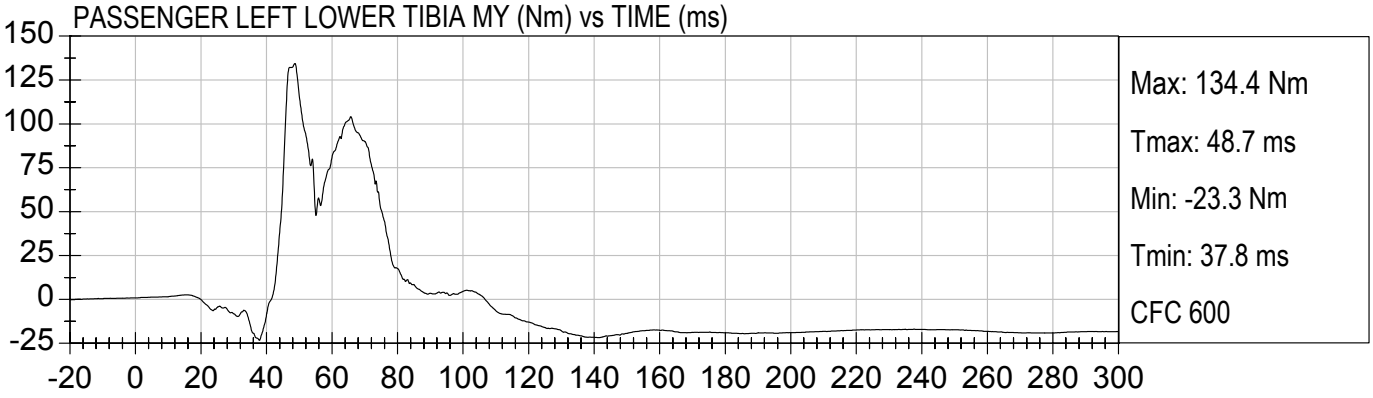

PASSENGER LEFT UPPER TIBIA MX (Nm) vs TIME (ms)
10
5
0
-5
-10
-15
-20
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 8.1 Nm
Tmax: 82.9 ms
Min: -19.2 Nm
Tmin: 63.3 ms
CFC 600

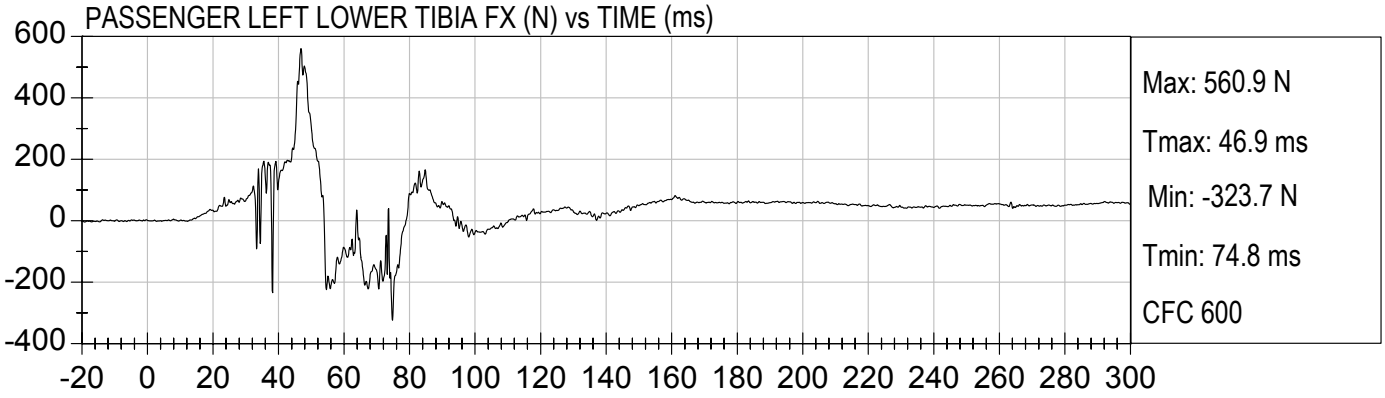

PASSENGER LEFT UPPER TIBIA MY (Nm) vs TIME (ms)
100
75
50
25
0
-25
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 87.7 Nm
Tmax: 46.9 ms
Min: -20.2 Nm
Tmin: 55.7 ms
CFC 600

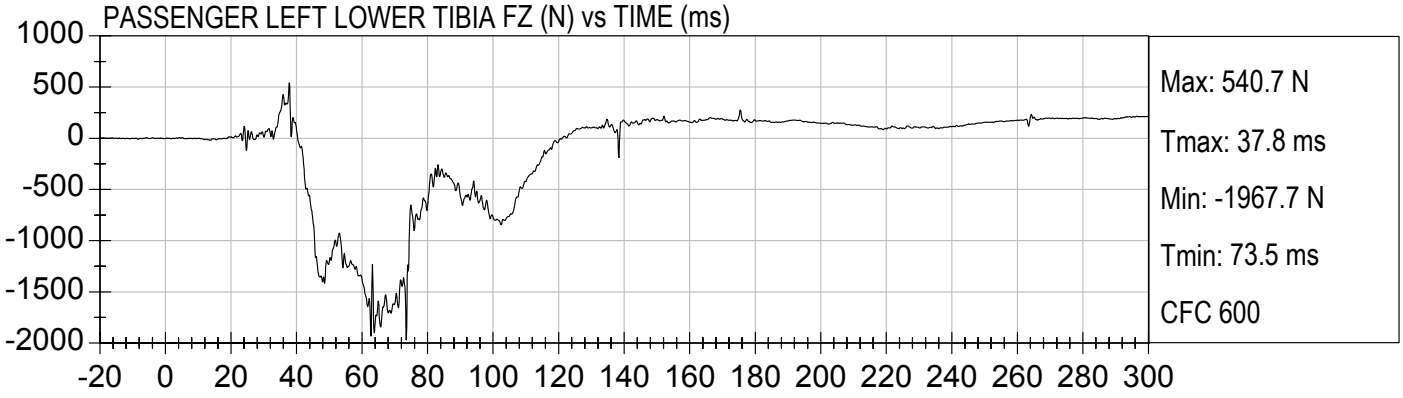

PASSENGER LEFT UPPER TIBIA FX (N) vs TIME (ms)
250
0
-250
-500
-750
-1000
-1250
-1500
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 105.0 N
Tmax: 135.1 ms
Min: -1315.5 N
Tmin: 47.0 ms
CFC 600

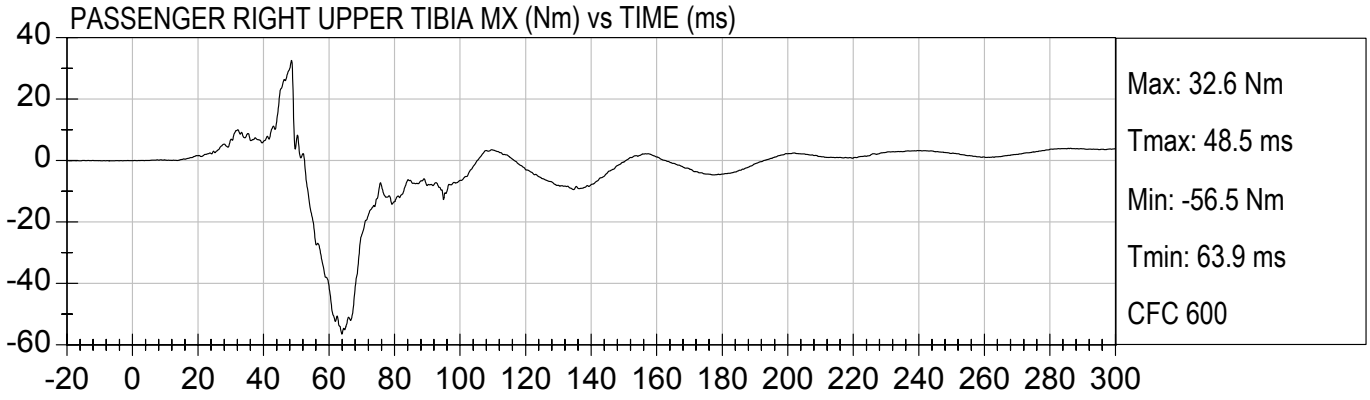

PASSENGER LEFT UPPER TIBIA FZ (N) vs TIME (ms)
500
0
-500
-1000
-1500
-2000
-2500
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 280.1 N
Tmax: 25.2 ms
Min: -2155.2 N
Tmin: 63.8 ms
CFC 600

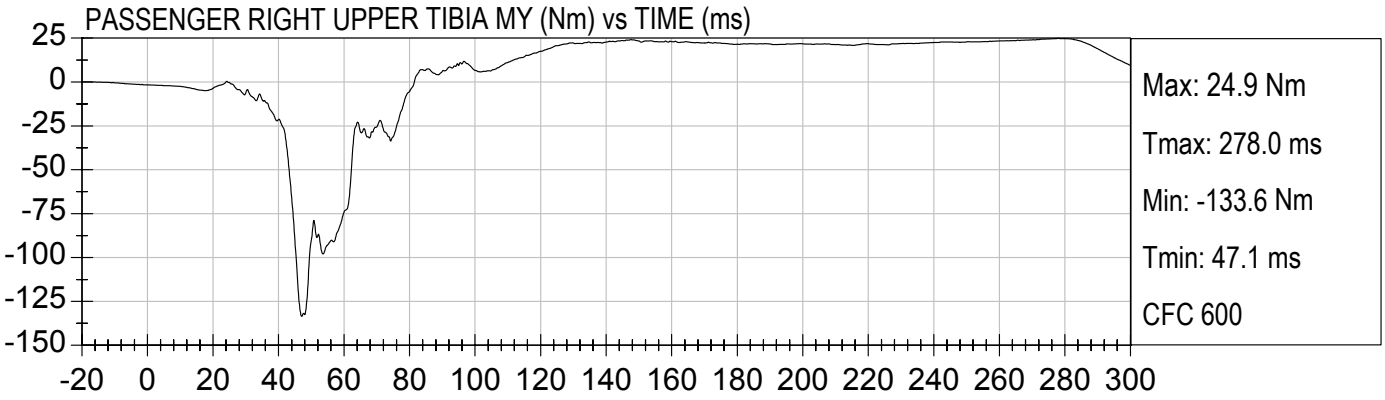

PASSENGER LEFT LOWER TIBIA MX (Nm) vs TIME (ms)
20
10
0
-10
-20
-30
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 12.5 Nm
Tmax: 89.1 ms
Min: -28.3 Nm
Tmin: 61.6 ms
CFC 600

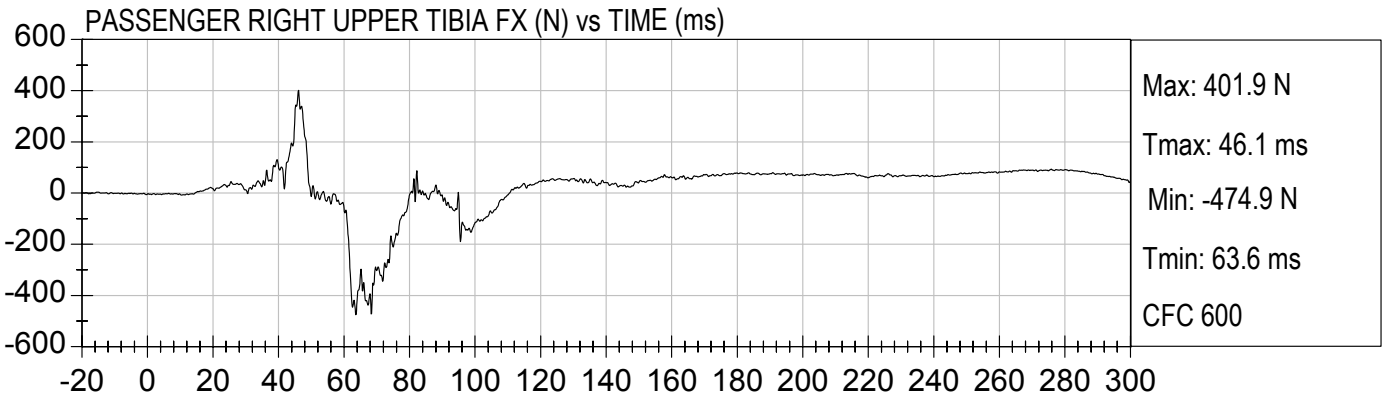

PASSENGER LEFT LOWER TIBIA MY (Nm) vs TIME (ms)
150
125
100
75
50
25
0
-25
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 134.4 Nm
Tmax: 48.7 ms
Min: -23.3 Nm
Tmin: 37.8 ms
CFC 600

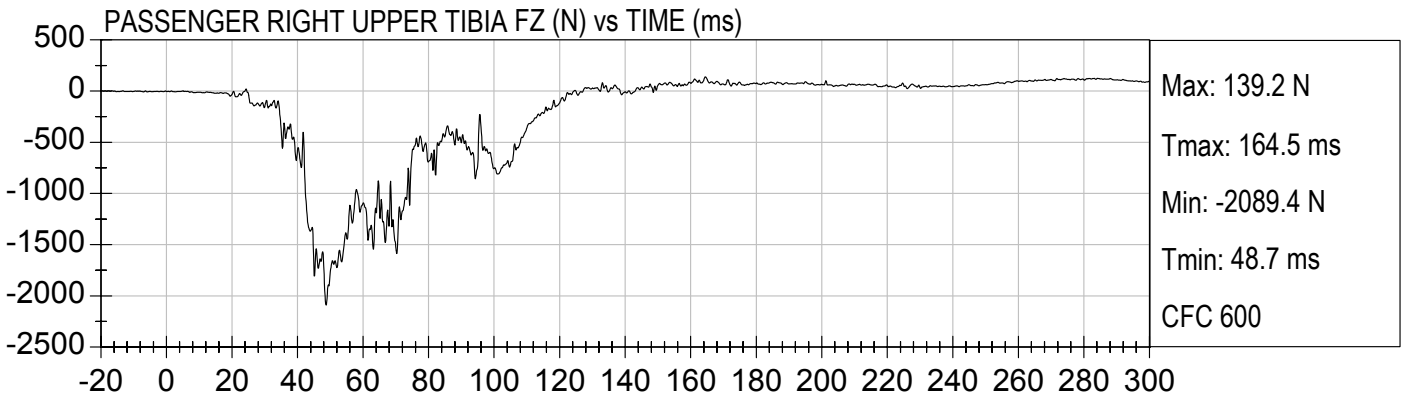

PASSENGER LEFT LOWER TIBIA FX (N) vs TIME (ms)
600
400
200
0
-200
-400
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 560.9 N
Tmax: 46.9 ms
Min: -323.7 N
Tmin: 74.8 ms
CFC 600

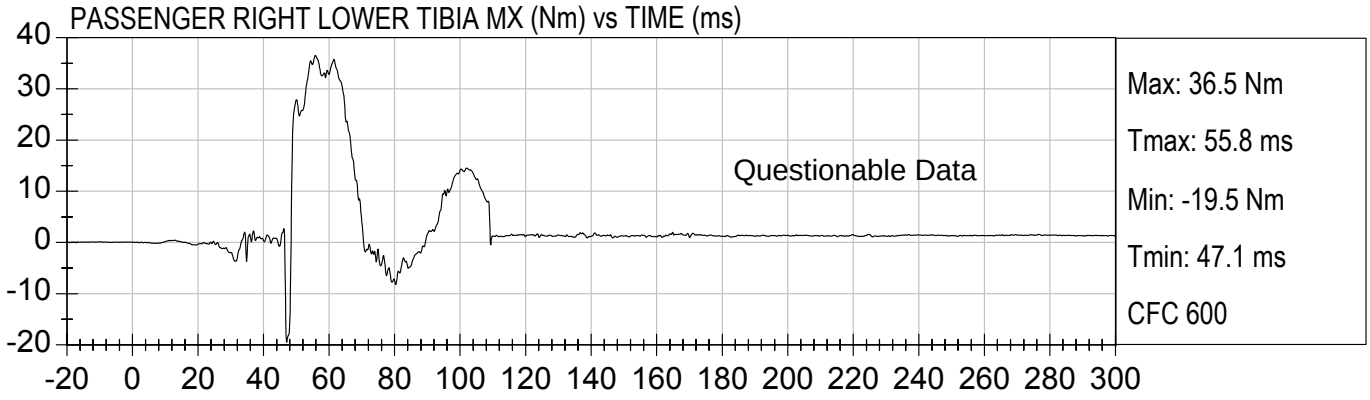

PASSENGER LEFT LOWER TIBIA FZ (N) vs TIME (ms)
1000
500
0
-500
-1000
-1500
-2000
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 540.7 N
Tmax: 37.8 ms
Min: -1967.7 N
Tmin: 73.5 ms
CFC 600

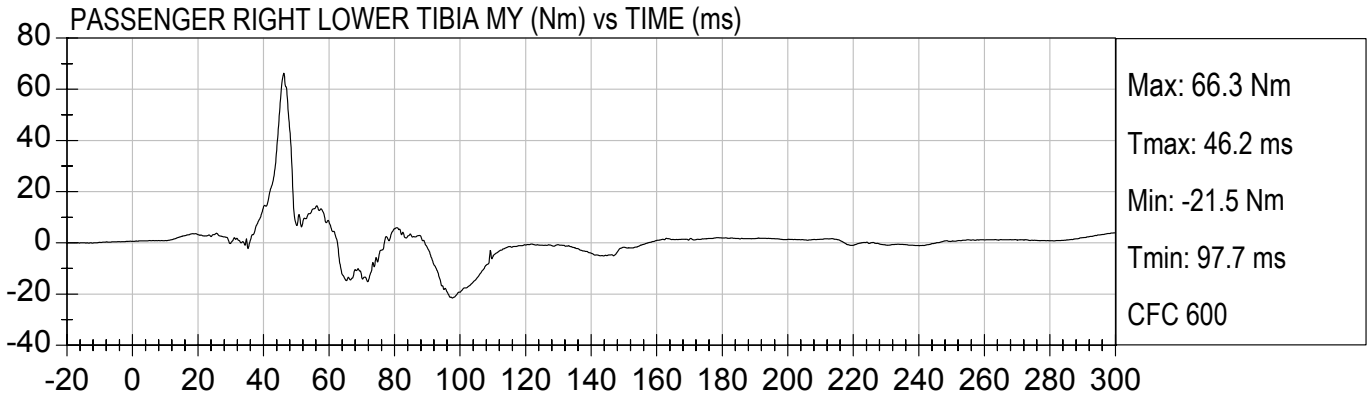

PASSENGER RIGHT UPPER TIBIA MX (Nm) vs TIME (ms)
40
20
0
-20
-40
-60
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 32.6 Nm
Tmax: 48.5 ms
Min: -56.5 Nm
Tmin: 63.9 ms
CFC 600

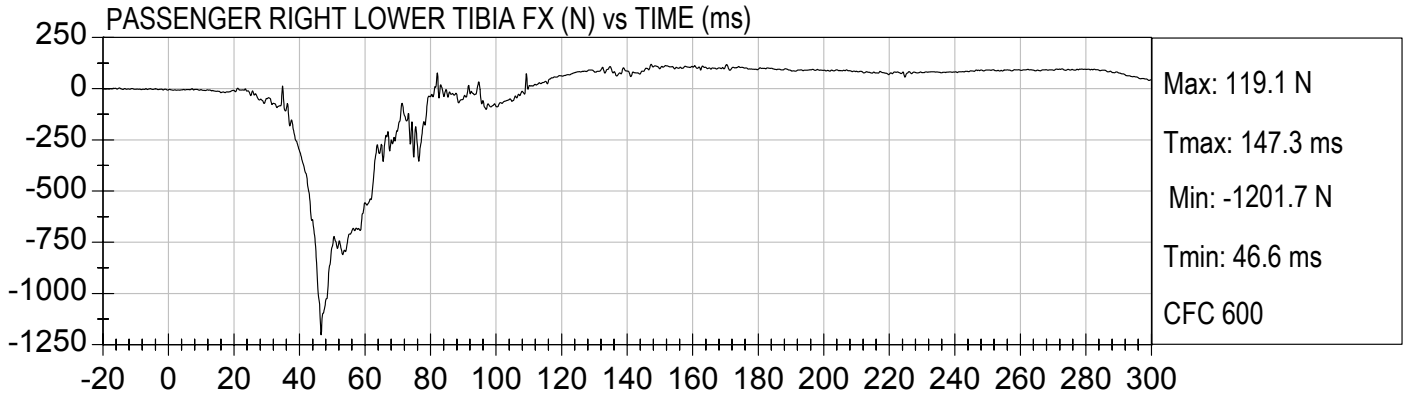

PASSENGER RIGHT UPPER TIBIA MY (Nm) vs TIME (ms)
25
0
-25
-50
-75
-100
-125
-150
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 24.9 Nm
Tmax: 278.0 ms
Min: -133.6 Nm
Tmin: 47.1 ms
CFC 600

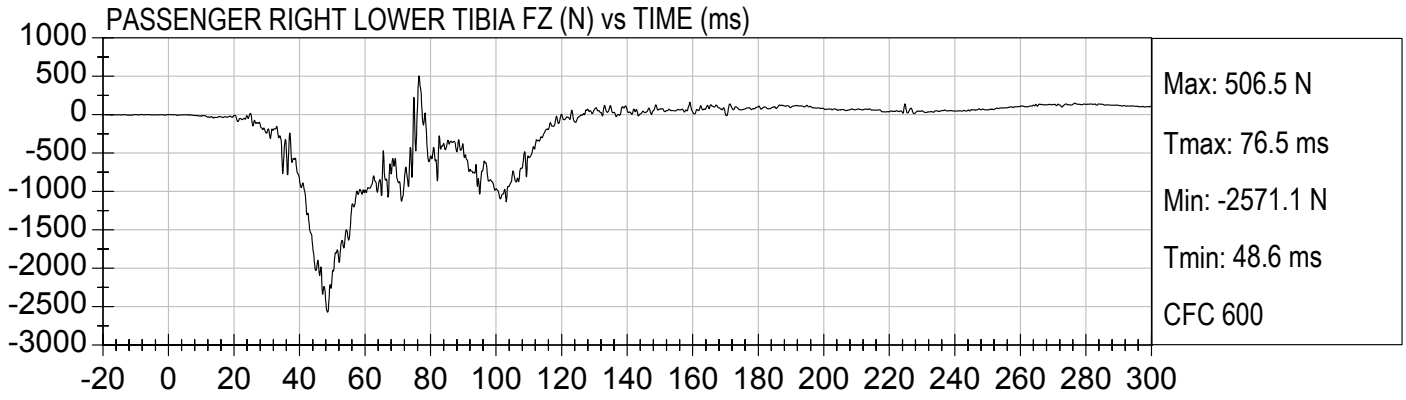

PASSENGER RIGHT UPPER TIBIA FX (N) vs TIME (ms)
600
400
200
0
-200
-400
-600
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 401.9 N
Tmax: 46.1 ms
Min: -474.9 N
Tmin: 63.6 ms
CFC 600

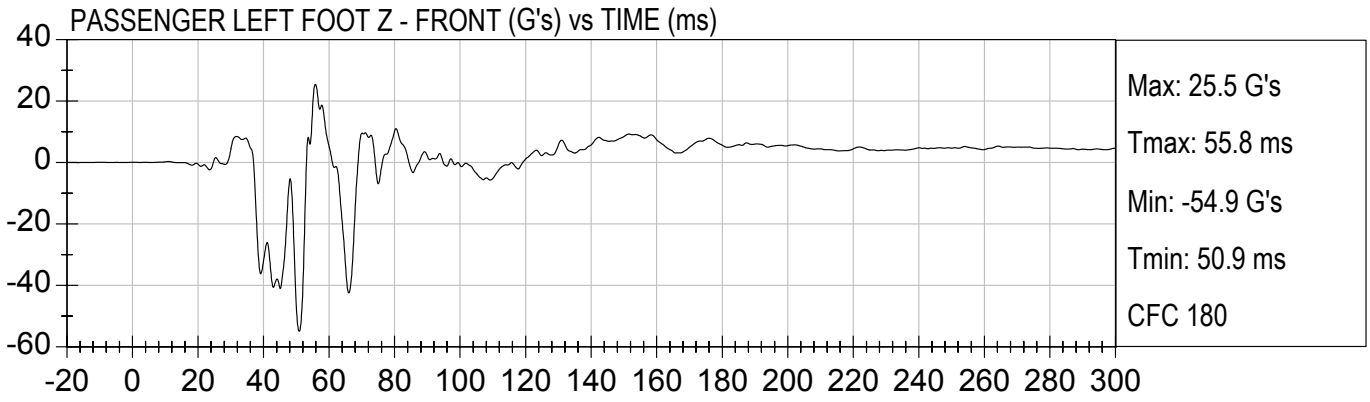

PASSENGER RIGHT UPPER TIBIA FZ (N) vs TIME (ms)
500
0
-500
-1000
-1500
-2000
-2500
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 139.2 N
Tmax: 164.5 ms
Min: -2089.4 N
Tmin: 48.7 ms
CFC 600

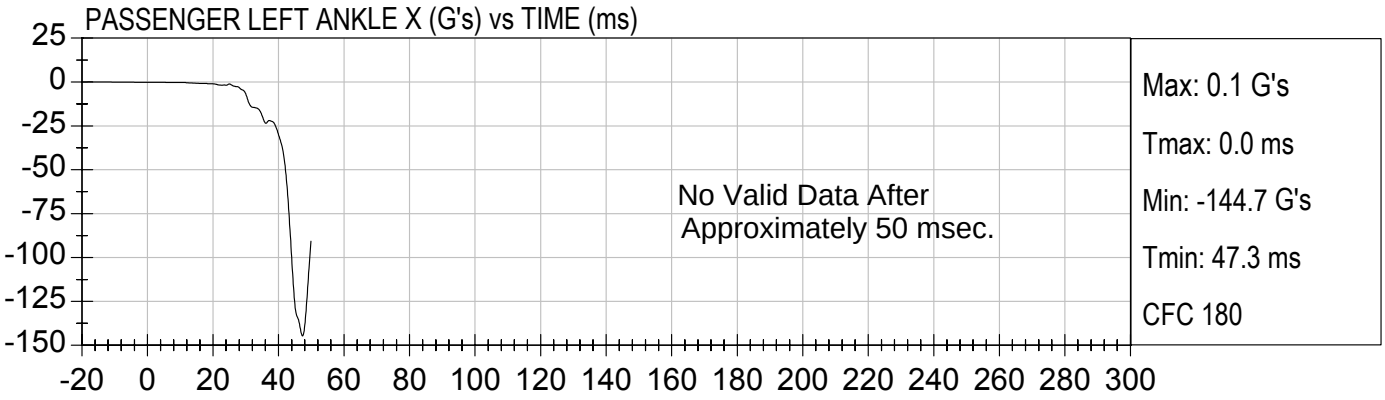

PASSENGER RIGHT LOWER TIBIA MX (Nm) vs TIME (ms)
Questionable Data
Max: 36.5 Nm
Tmax: 55.8 ms
Min: -19.5 Nm
Tmin: 47.1 ms
CFC 600

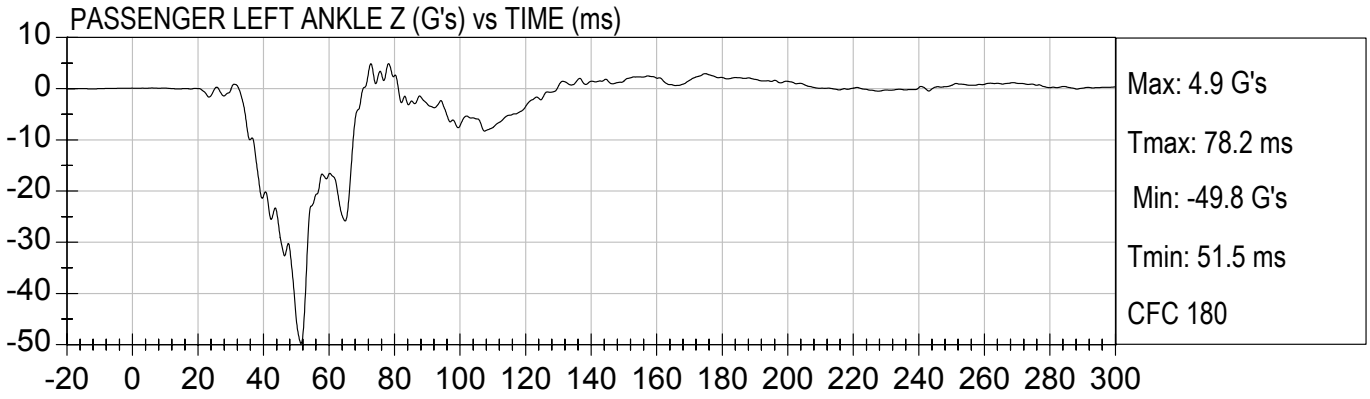

PASSENGER RIGHT LOWER TIBIA MY (Nm) vs TIME (ms)
Max: 66.3 Nm
Tmax: 46.2 ms
Min: -21.5 Nm
Tmin: 97.7 ms
CFC 600

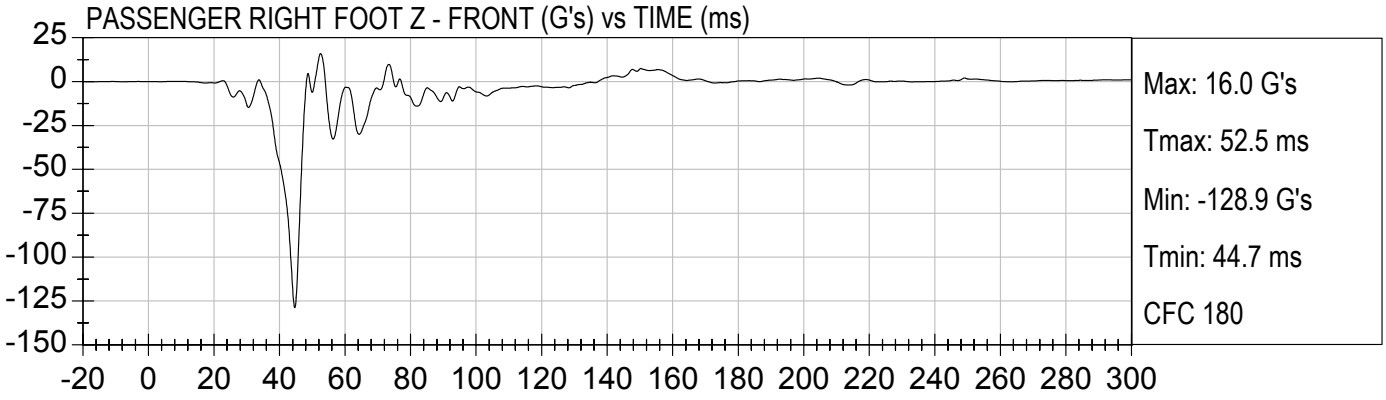

PASSENGER RIGHT LOWER TIBIA FX (N) vs TIME (ms)
Max: 119.1 N
Tmax: 147.3 ms
Min: -1201.7 N
Tmin: 46.6 ms
CFC 600

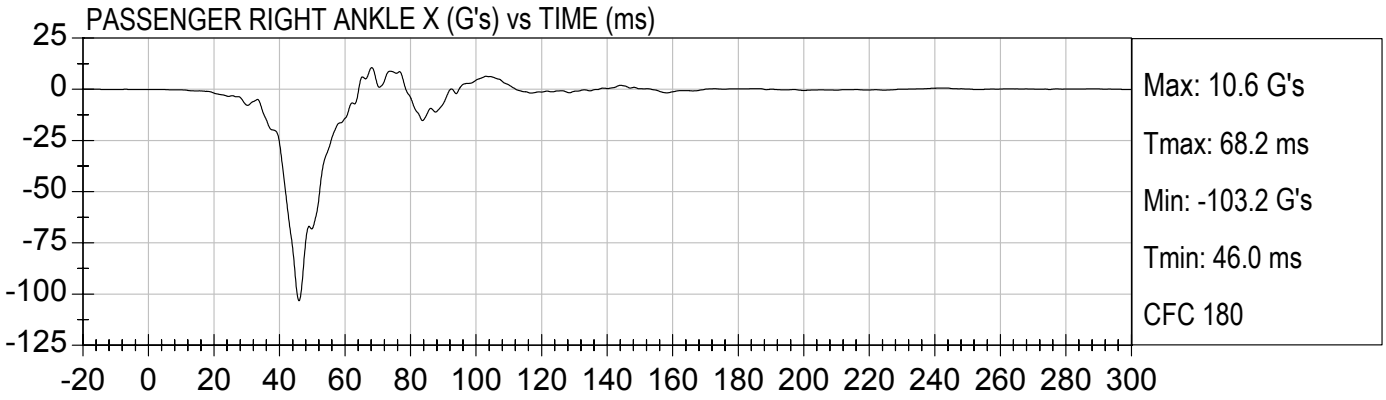

PASSENGER RIGHT LOWER TIBIA FZ (N) vs TIME (ms)
Max: 506.5 N
Tmax: 76.5 ms
Min: -2571.1 N
Tmin: 48.6 ms
CFC 600

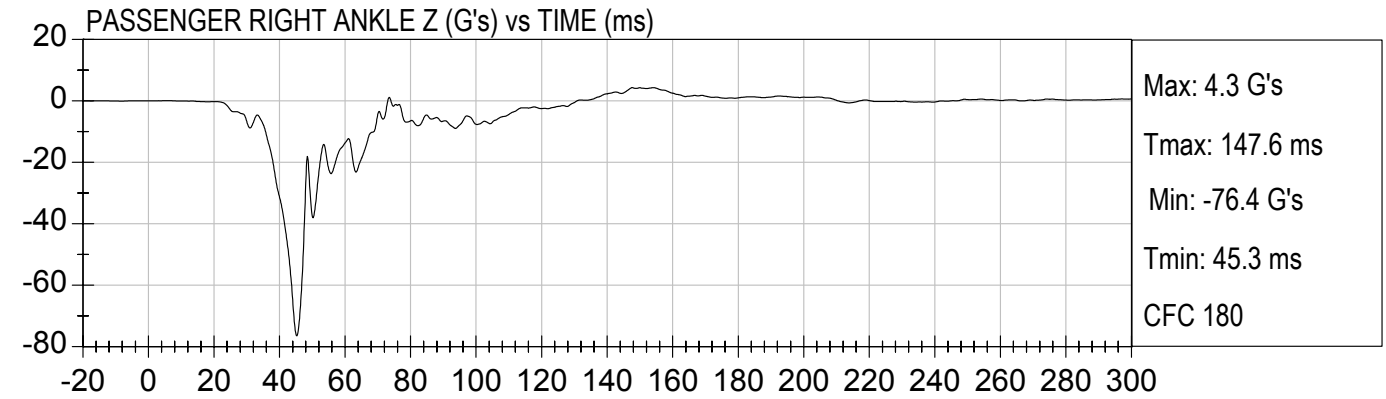

PASSENGER LEFT FOOT Z - FRONT (G's) vs TIME (ms)
40
20
0
-20
-40
-60
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 25.5 G's
Tmax: 55.8 ms
Min: -54.9 G's
Tmin: 50.9 ms
CFC 180

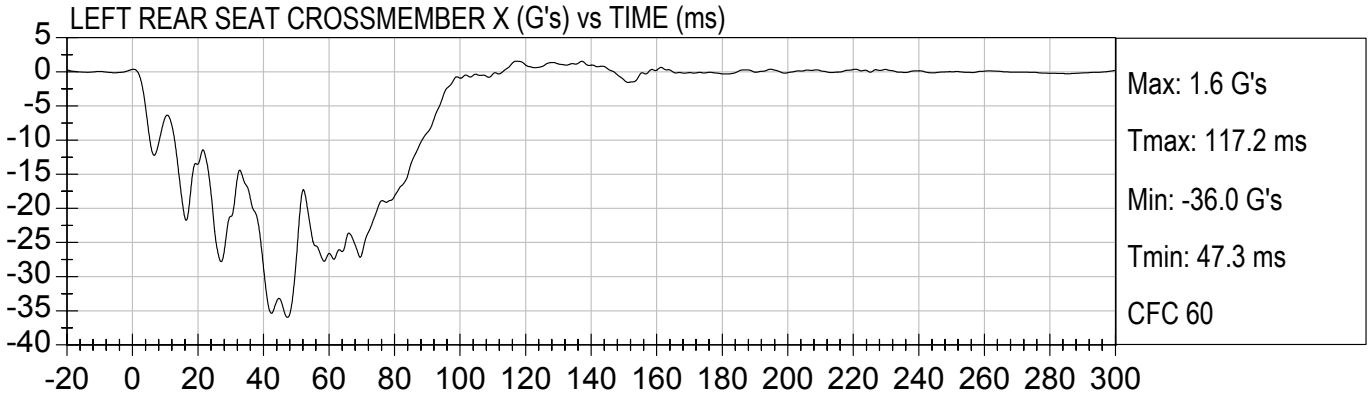

PASSENGER LEFT ANKLE X (G's) vs TIME (ms)
25
0
-25
-50
-75
-100
-125
-150
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
No Valid Data After
Approximately 50 msec.
Max: 0.1 G's
Tmax: 0.0 ms
Min: -144.7 G's
Tmin: 47.3 ms
CFC 180

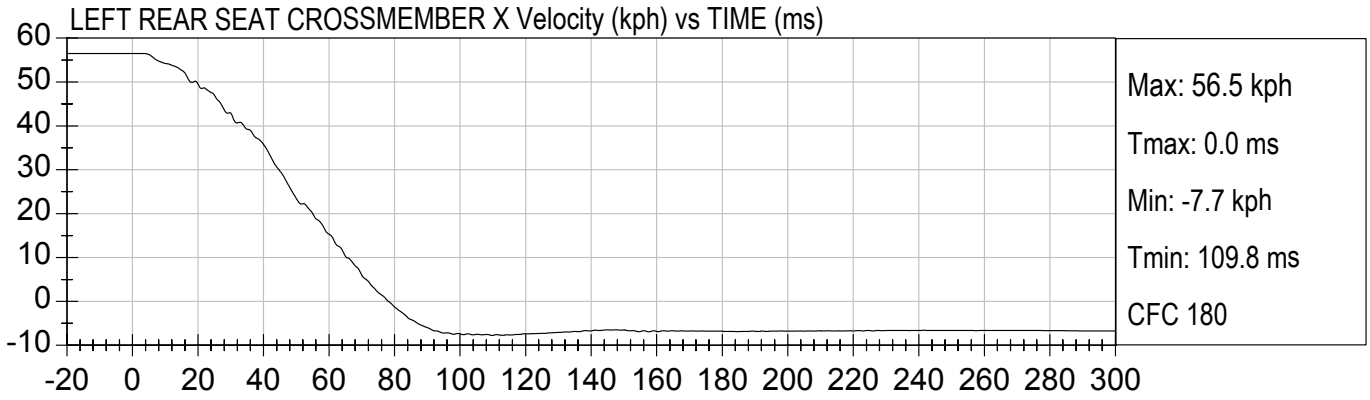

PASSENGER LEFT ANKLE Z (G's) vs TIME (ms)
10
0
-10
-20
-30
-40
-50
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 4.9 G's
Tmax: 78.2 ms
Min: -49.8 G's
Tmin: 51.5 ms
CFC 180

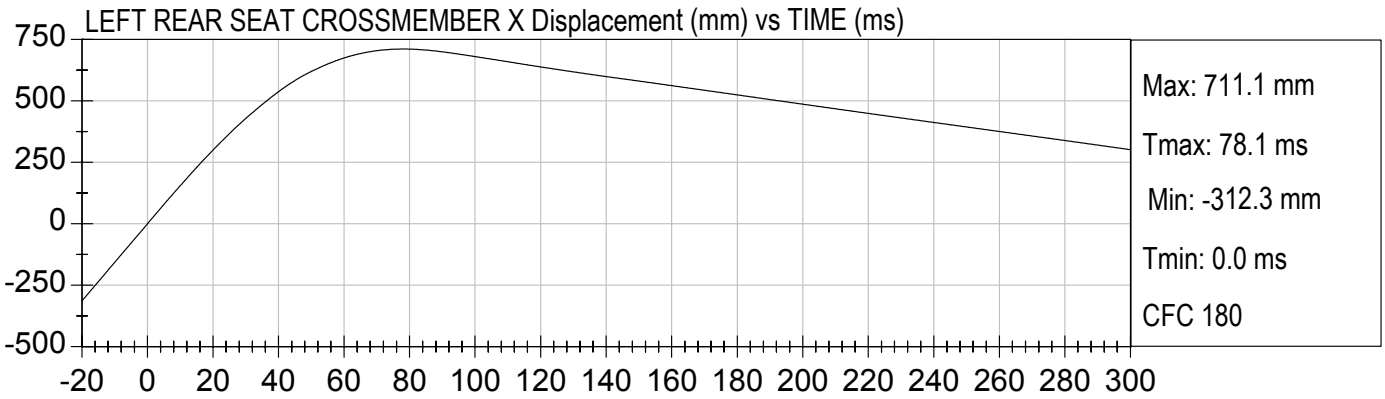

PASSENGER RIGHT FOOT Z - FRONT (G's) vs TIME (ms)
25
0
-25
-50
-75
-100
-125
-150
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 16.0 G's
Tmax: 52.5 ms
Min: -128.9 G's
Tmin: 44.7 ms
CFC 180


PASSENGER RIGHT ANKLE X (G's) vs TIME (ms)
25
0
-25
-50
-75
-100
-125
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 10.6 G's
Tmax: 68.2 ms
Min: -103.2 G's
Tmin: 46.0 ms
CFC 180


PASSENGER RIGHT ANKLE Z (G's) vs TIME (ms)
20
0
-20
-40
-60
-80
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 4.3 G's
Tmax: 147.6 ms
Min: -76.4 G's
Tmin: 45.3 ms
CFC 180

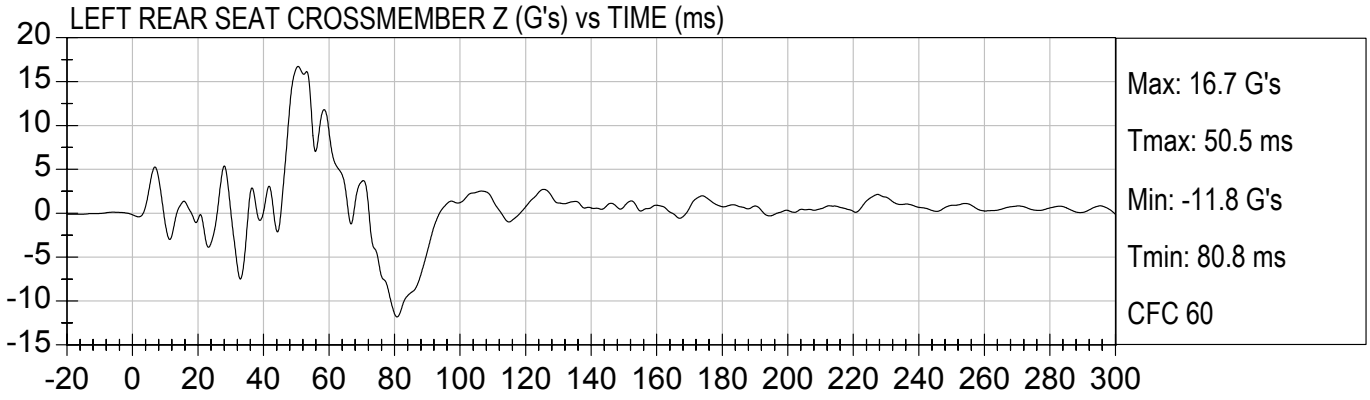

LEFT REAR SEAT CROSSMEMBER X (G's) vs TIME (ms)
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 1.6 G's
Tmax: 117.2 ms
Min: -36.0 G's
Tmin: 47.3 ms
CFC 60

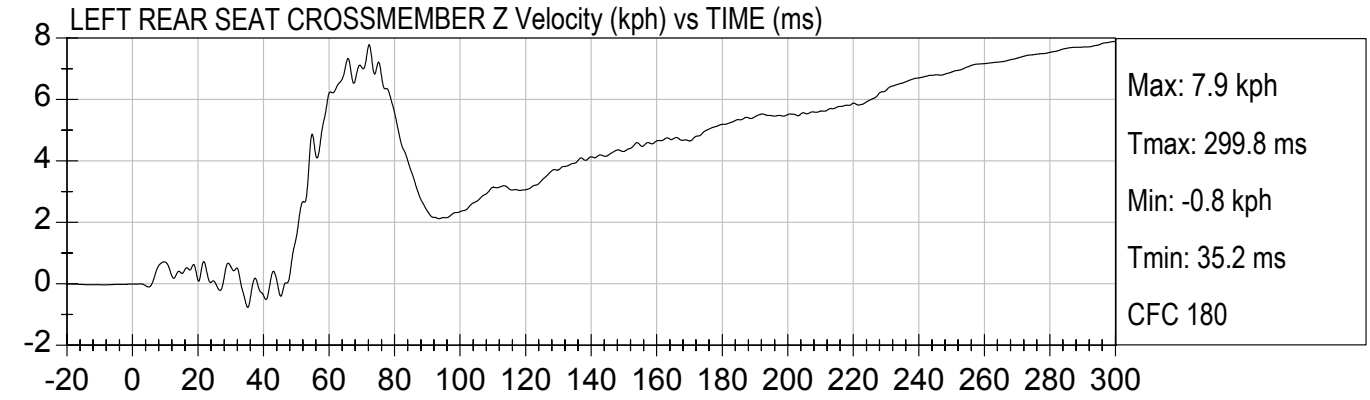

LEFT REAR SEAT CROSSMEMBER X Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 56.5 kph
Tmax: 0.0 ms
Min: -7.7 kph
Tmin: 109.8 ms
CFC 180

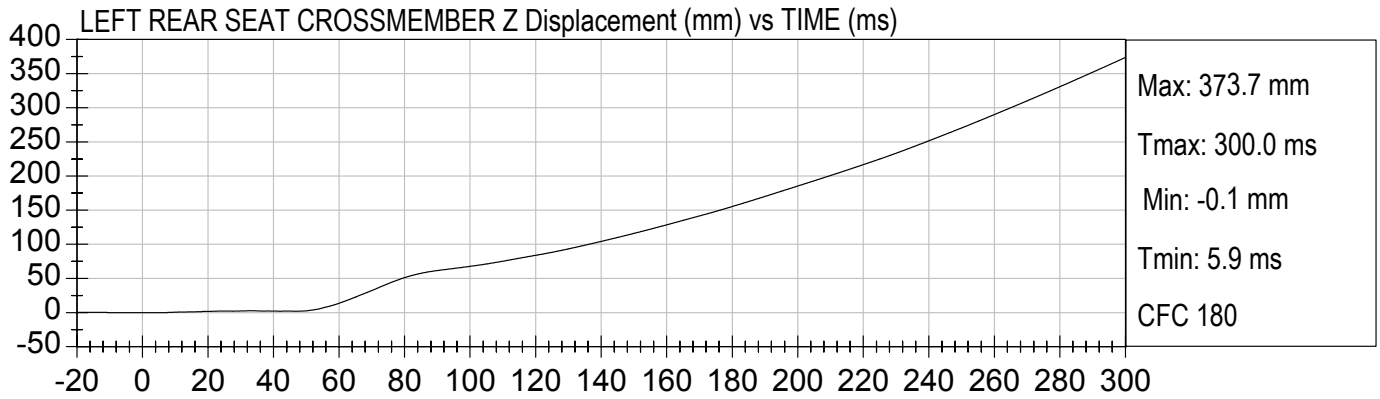

LEFT REAR SEAT CROSSMEMBER X Displacement (mm) vs TIME (ms)
750
500
250
0
-250
-500
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 711.1 mm
Tmax: 78.1 ms
Min: -312.3 mm
Tmin: 0.0 ms
CFC 180

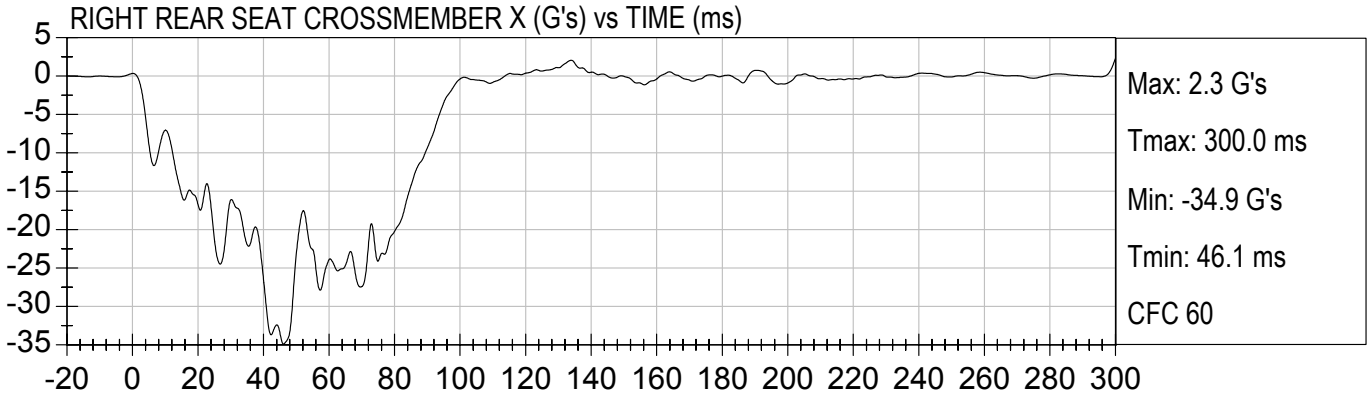
NCAP FRONTAL IMPACT
2005 FORD FREESTYLE (M50204)

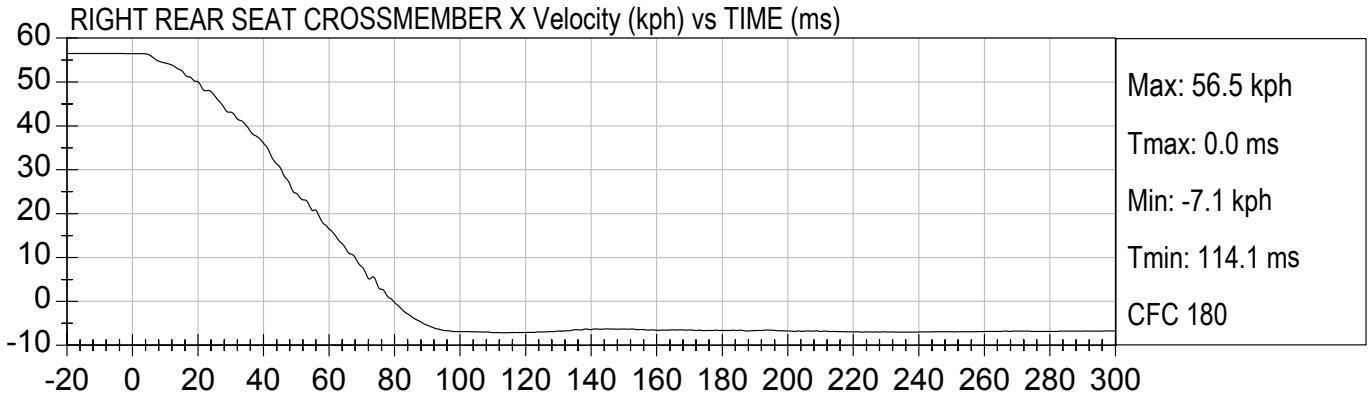
Test Date: 12/06/04
Speed: 35.1 mph (56.5 km/h)

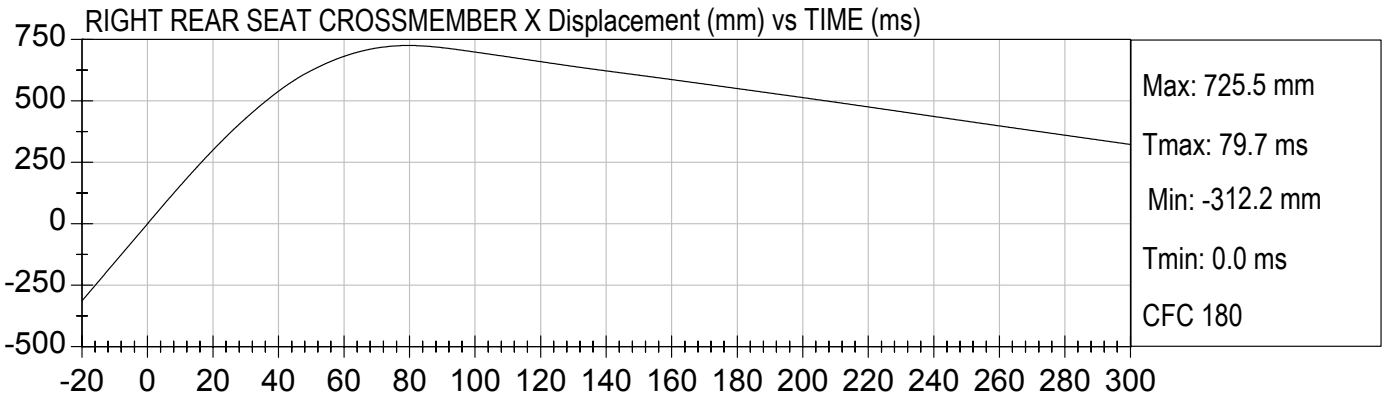


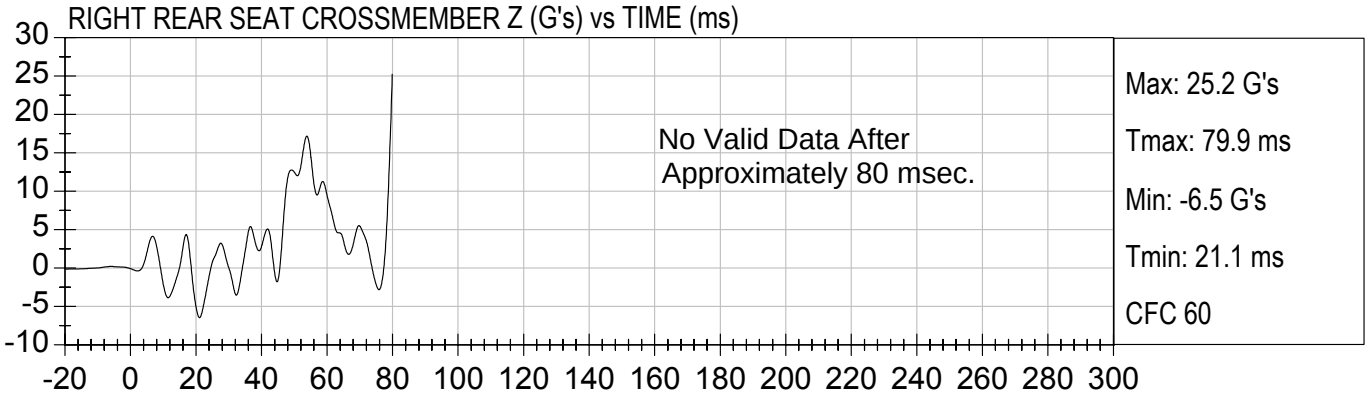


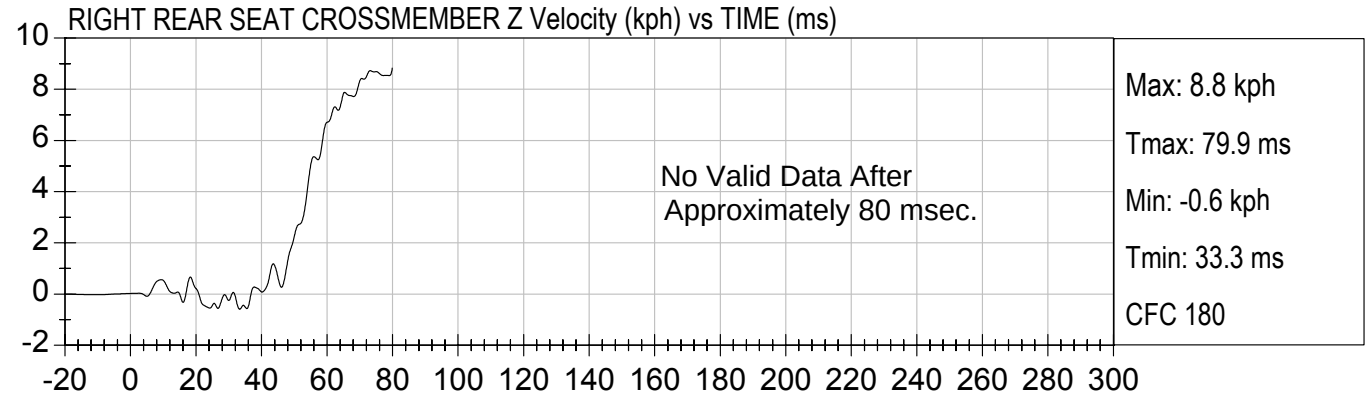


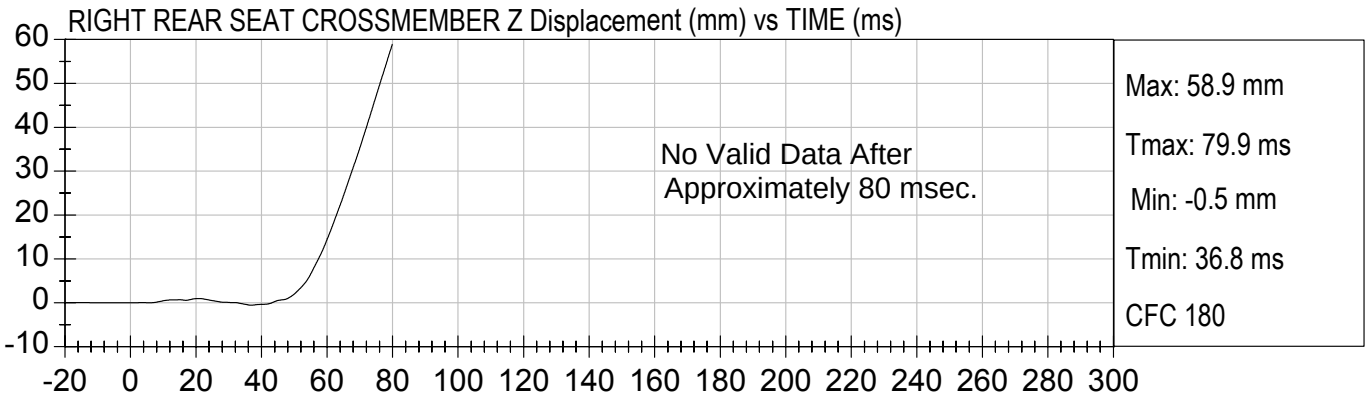

RIGHT REAR SEAT CROSSMEMBER X (G's) vs TIME (ms)
5
0
-5
-10
-15
-20
-25
-30
-35
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 2.3 G's
Tmax: 300.0 ms
Min: -34.9 G's
Tmin: 46.1 ms
CFC 60

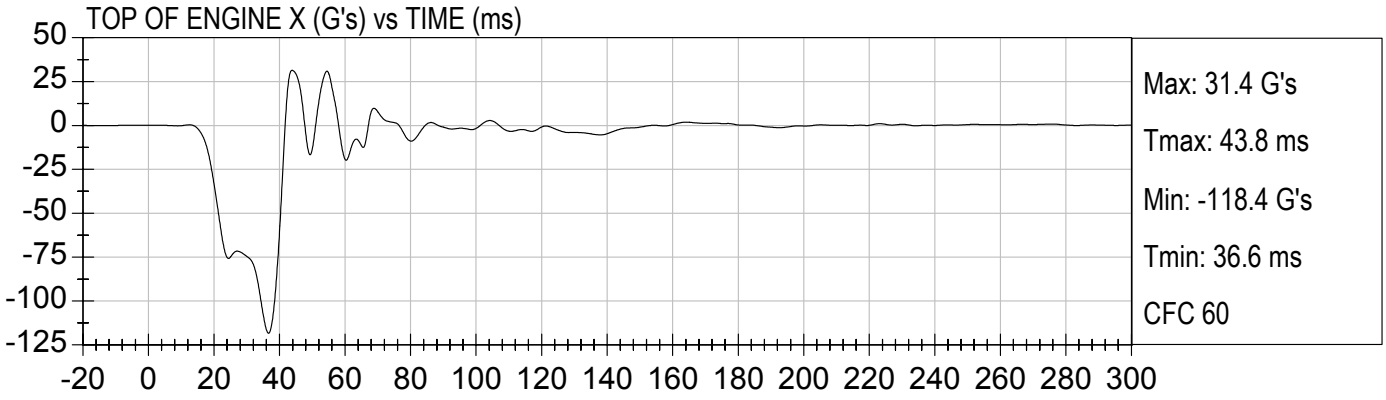

RIGHT REAR SEAT CROSSMEMBER X Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 56.5 kph
Tmax: 0.0 ms
Min: -7.1 kph
Tmin: 114.1 ms
CFC 180

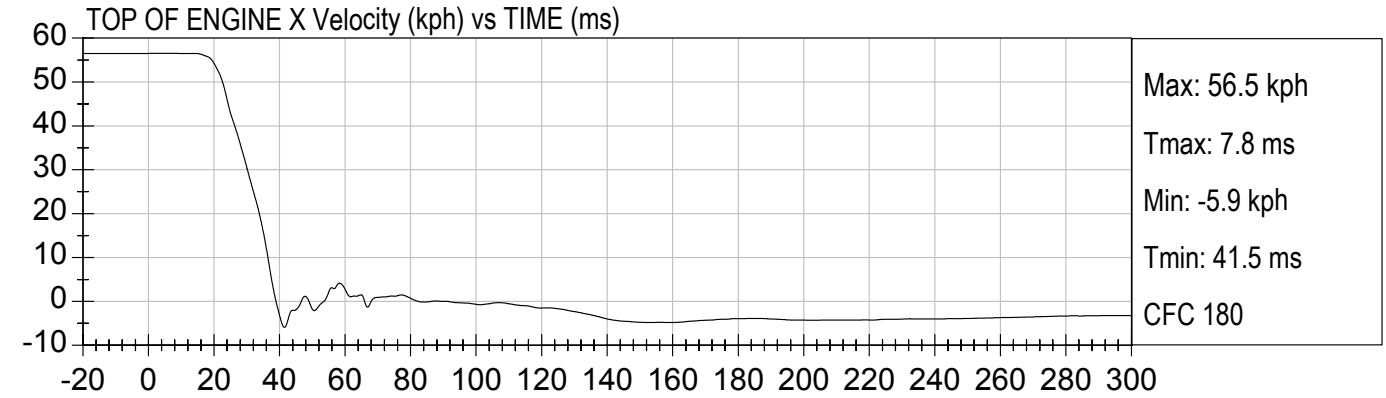

RIGHT REAR SEAT CROSSMEMBER X Displacement (mm) vs TIME (ms)
750
500
250
0
-250
-500
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 725.5 mm
Tmax: 79.7 ms
Min: -312.2 mm
Tmin: 0.0 ms
CFC 180

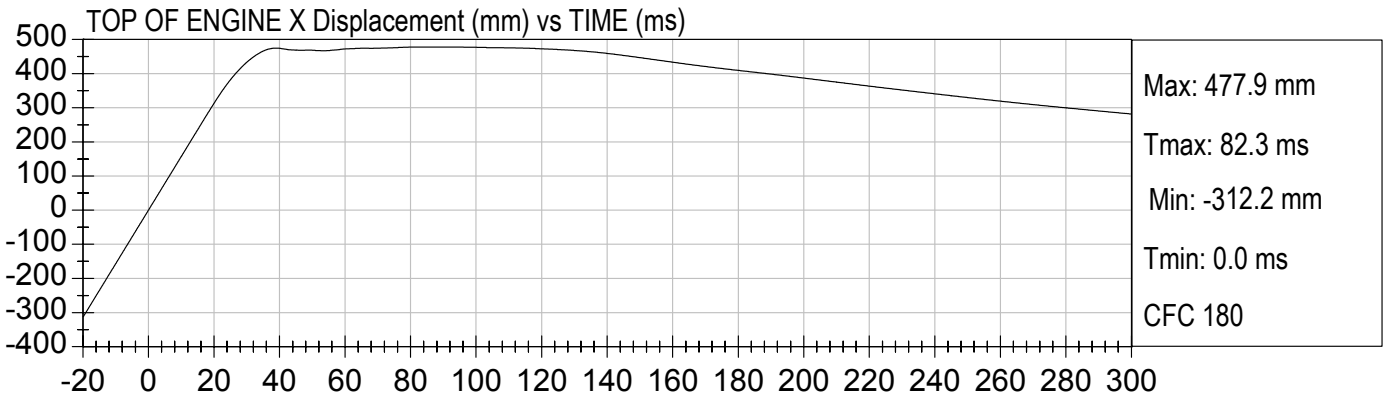

RIGHT REAR SEAT CROSSMEMBER Z (G's) vs TIME (ms)
30
25
20
15
10
5
0
-5
-10
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
No Valid Data After
Approximately 80 msec.
Max: 25.2 G's
Tmax: 79.9 ms
Min: -6.5 G's
Tmin: 21.1 ms
CFC 60

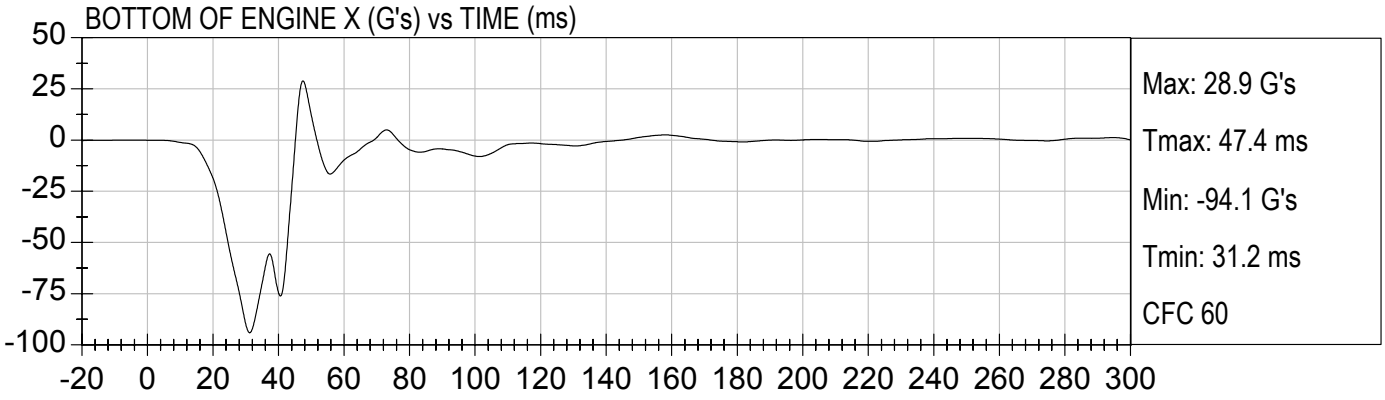

RIGHT REAR SEAT CROSSMEMBER Z Velocity (kph) vs TIME (ms)
10
8
6
4
2
0
-2
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
No Valid Data After
Approximately 80 msec.
Max: 8.8 kph
Tmax: 79.9 ms
Min: -0.6 kph
Tmin: 33.3 ms
CFC 180

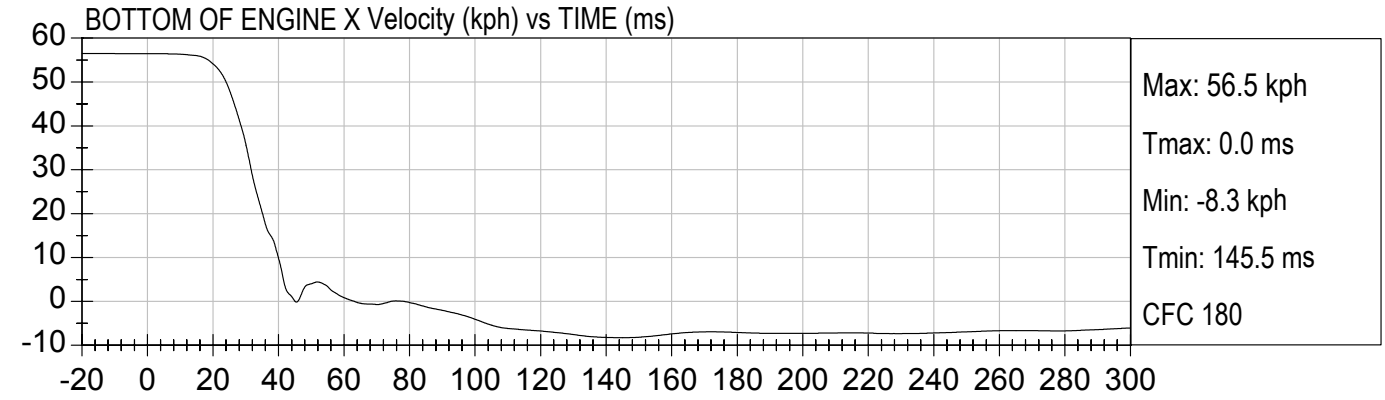

RIGHT REAR SEAT CROSSMEMBER Z Displacement (mm) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
No Valid Data After
Approximately 80 msec.
Max: 58.9 mm
Tmax: 79.9 ms
Min: -0.5 mm
Tmin: 36.8 ms
CFC 180

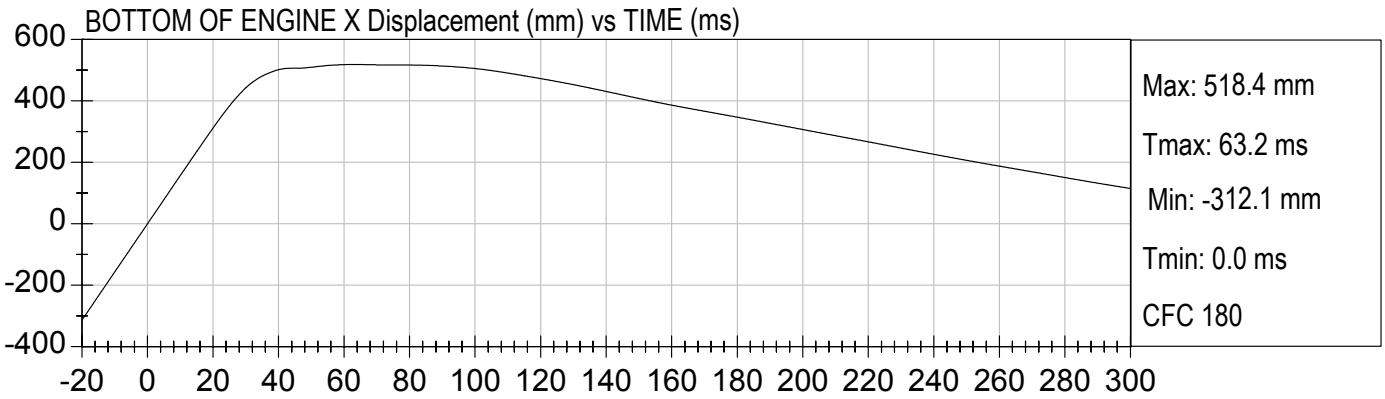

TOP OF ENGINE X (G's) vs TIME (ms)
50
25
0
-25
-50
-75
-100
-125
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 31.4 G's
Tmax: 43.8 ms
Min: -118.4 G's
Tmin: 36.6 ms
CFC 60

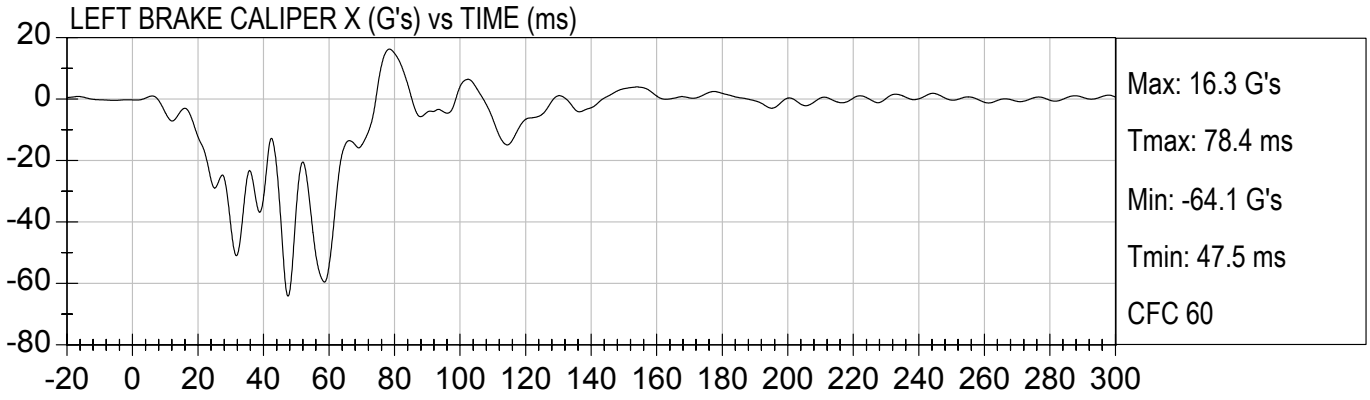

TOP OF ENGINE X Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 56.5 kph
Tmax: 7.8 ms
Min: -5.9 kph
Tmin: 41.5 ms
CFC 180

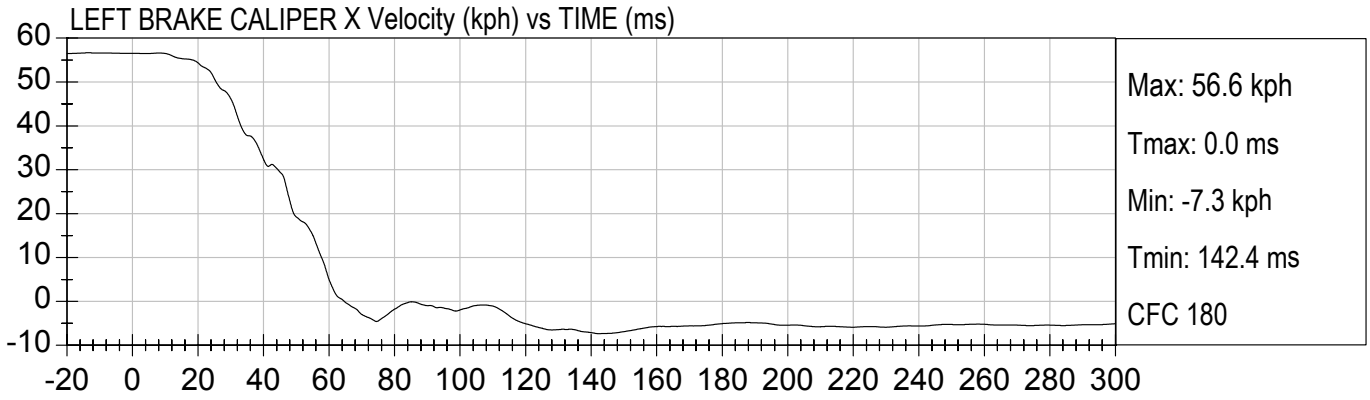

TOP OF ENGINE X Displacement (mm) vs TIME (ms)
500
400
300
200
100
0
-100
-200
-300
-400
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 477.9 mm
Tmax: 82.3 ms
Min: -312.2 mm
Tmin: 0.0 ms
CFC 180

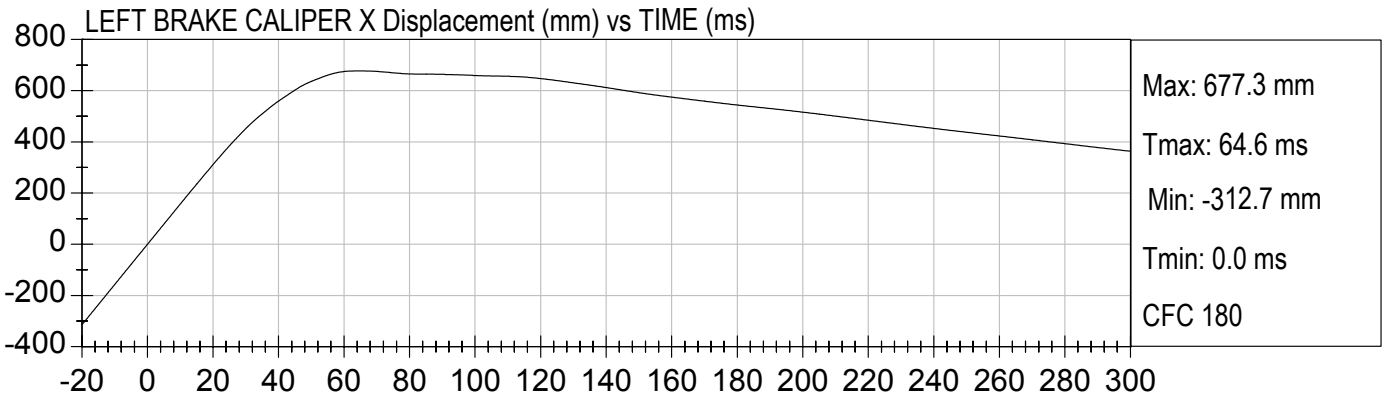

BOTTOM OF ENGINE X (G's) vs TIME (ms)
50
25
0
-25
-50
-75
-100
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 28.9 G's
Tmax: 47.4 ms
Min: -94.1 G's
Tmin: 31.2 ms
CFC 60

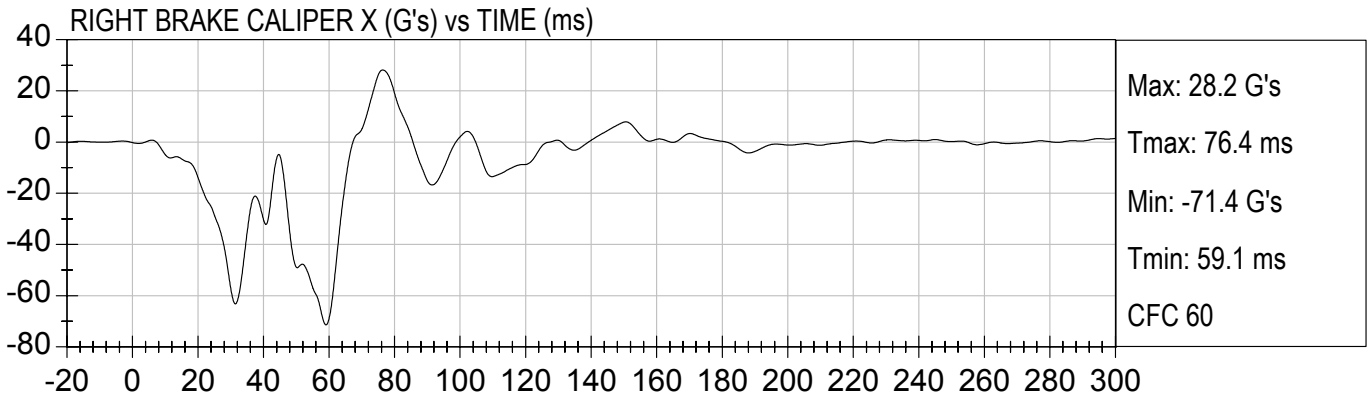

BOTTOM OF ENGINE X Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 56.5 kph
Tmax: 0.0 ms
Min: -8.3 kph
Tmin: 145.5 ms
CFC 180

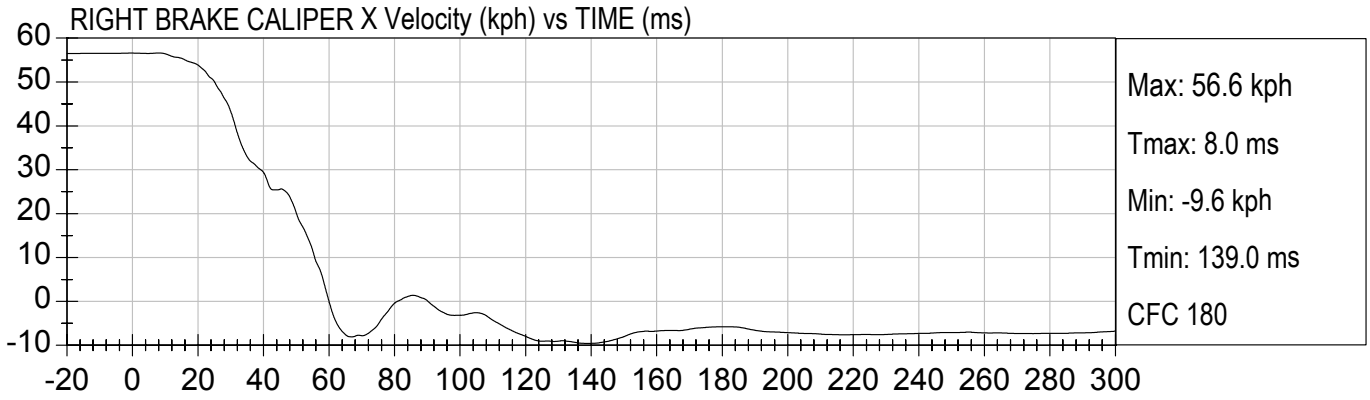

BOTTOM OF ENGINE X Displacement (mm) vs TIME (ms)
600
400
200
0
-200
-400
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 518.4 mm
Tmax: 63.2 ms
Min: -312.1 mm
Tmin: 0.0 ms
CFC 180

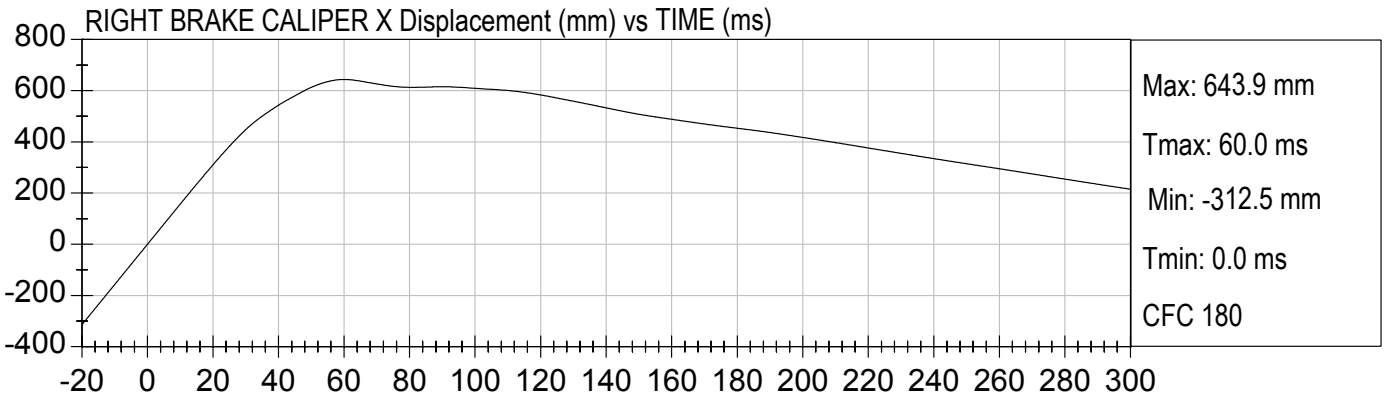

LEFT BRAKE CALIPER X (G's) vs TIME (ms)
20
0
-20
-40
-60
-80
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 16.3 G's
Tmax: 78.4 ms
Min: -64.1 G's
Tmin: 47.5 ms
CFC 60


LEFT BRAKE CALIPER X Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 56.6 kph
Tmax: 0.0 ms
Min: -7.3 kph
Tmin: 142.4 ms
CFC 180


LEFT BRAKE CALIPER X Displacement (mm) vs TIME (ms)
800
600
400
200
0
-200
-400
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 677.3 mm
Tmax: 64.6 ms
Min: -312.7 mm
Tmin: 0.0 ms
CFC 180

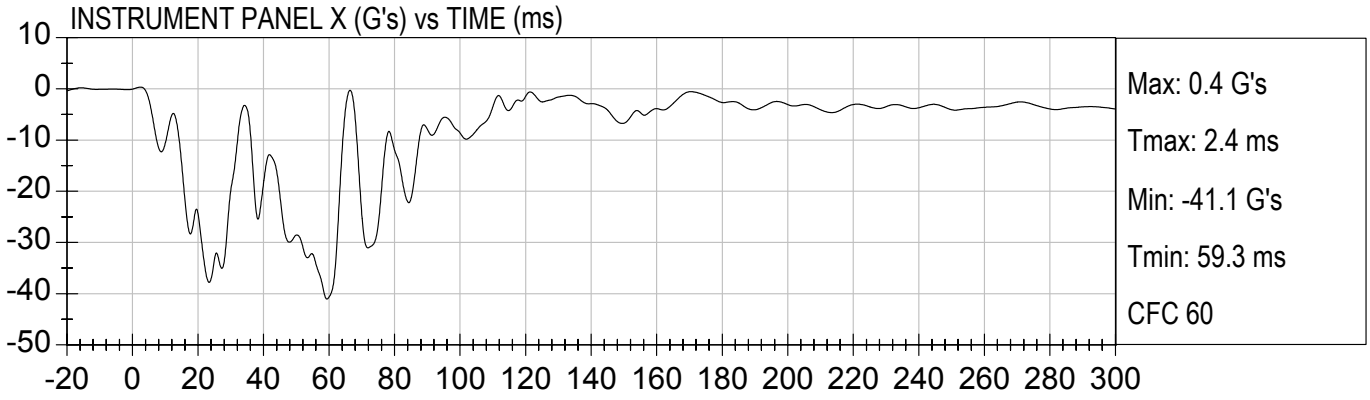

RIGHT BRAKE CALIPER X (G's) vs TIME (ms)
40
20
0
-20
-40
-60
-80
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 28.2 G's
Tmax: 76.4 ms
Min: -71.4 G's
Tmin: 59.1 ms
CFC 60

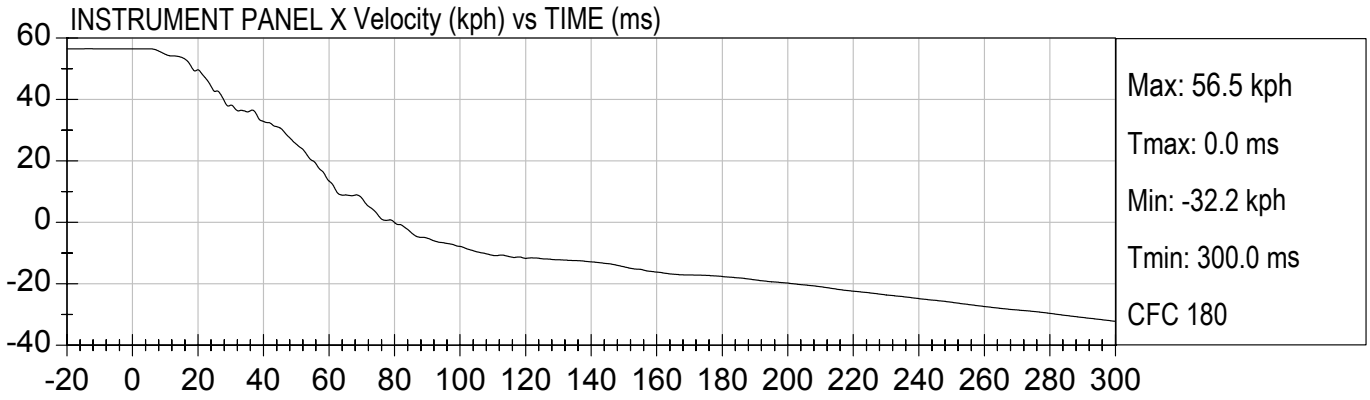

RIGHT BRAKE CALIPER X Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 56.6 kph
Tmax: 8.0 ms
Min: -9.6 kph
Tmin: 139.0 ms
CFC 180

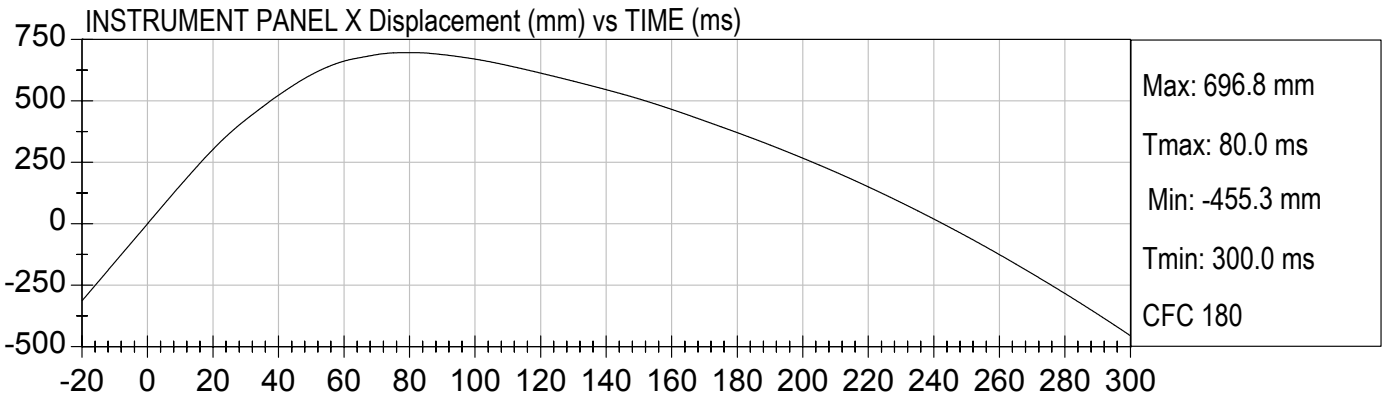

RIGHT BRAKE CALIPER X Displacement (mm) vs TIME (ms)
800
600
400
200
0
-200
-400
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 643.9 mm
Tmax: 60.0 ms
Min: -312.5 mm
Tmin: 0.0 ms
CFC 180

NCAP FRONTAL IMPACT
2005 FORD FREESTYLE (M50204)

Test Date: 12/06/04
Speed: 35.1 mph (56.5 km/h)

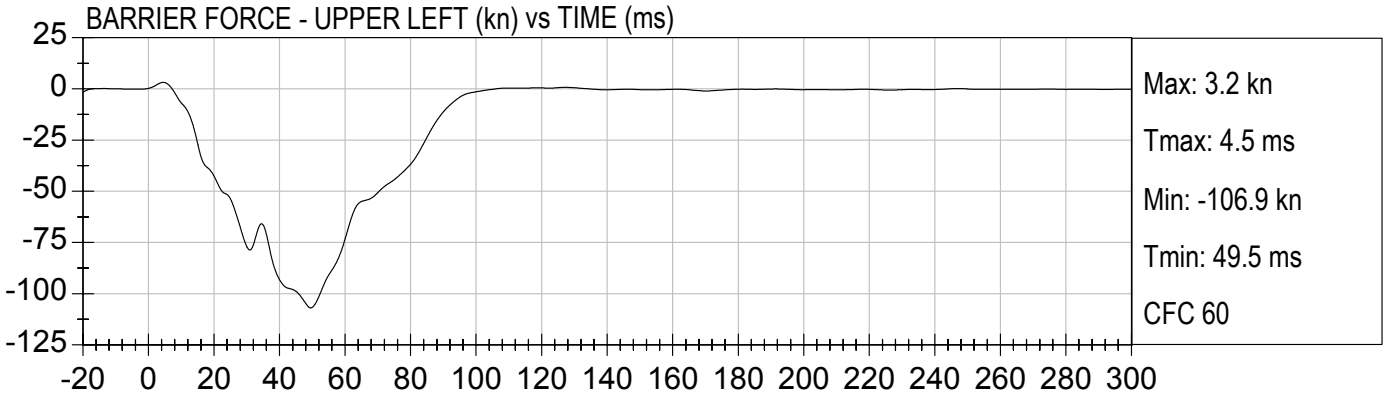


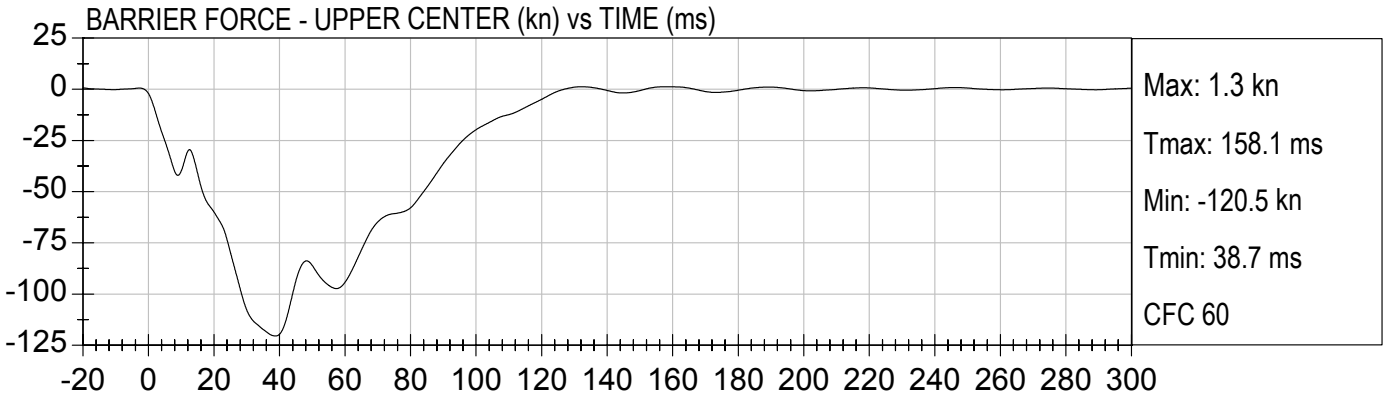


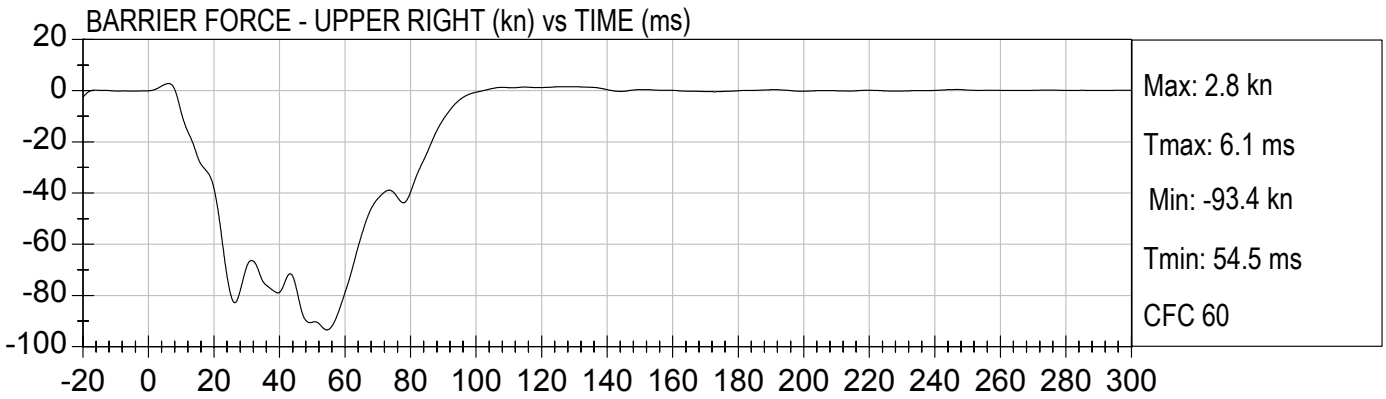


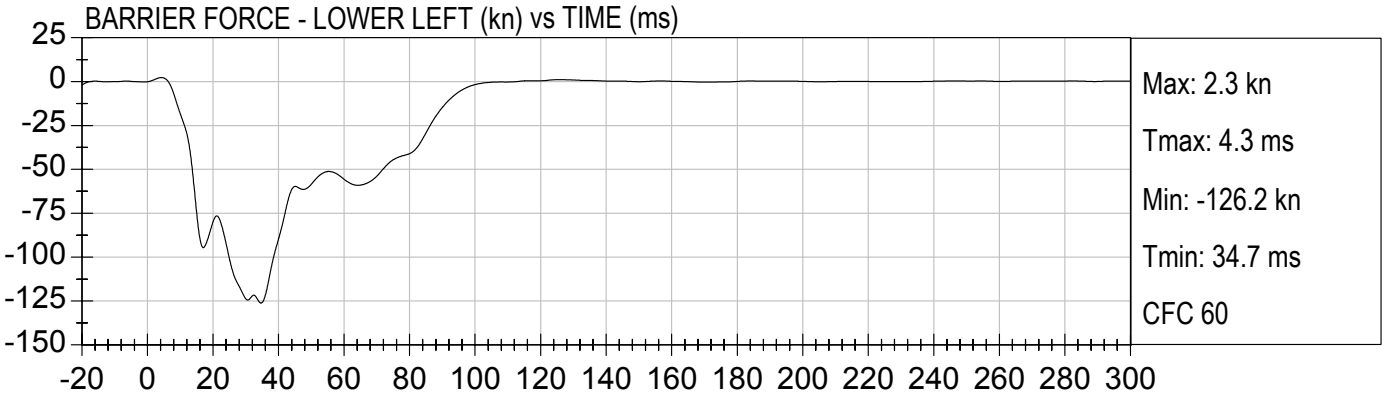
NCAP FRONTAL IMPACT
2005 FORD FREESTYLE (M50204)

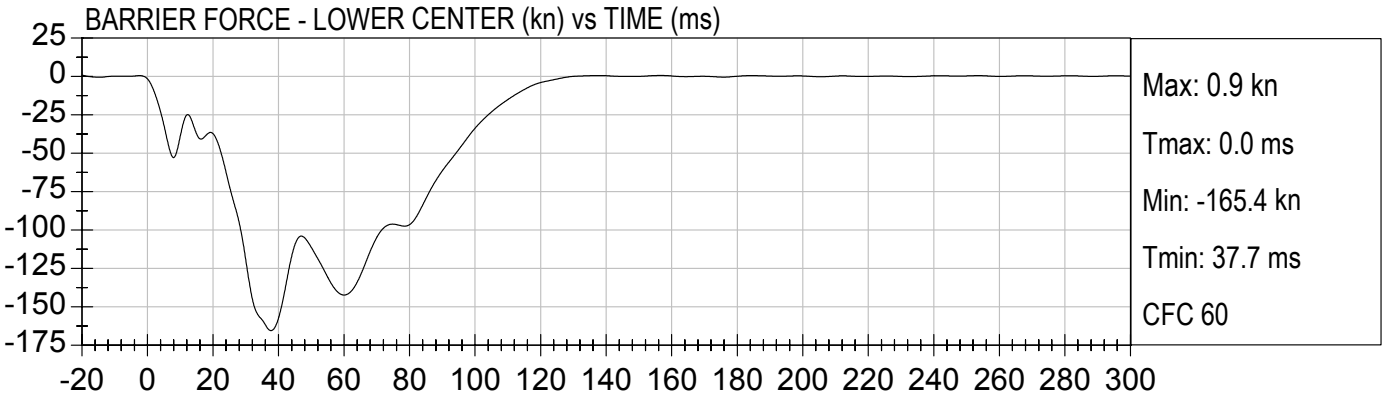
Test Date: 12/06/04
Speed: 35.1 mph (56.5 km/h)

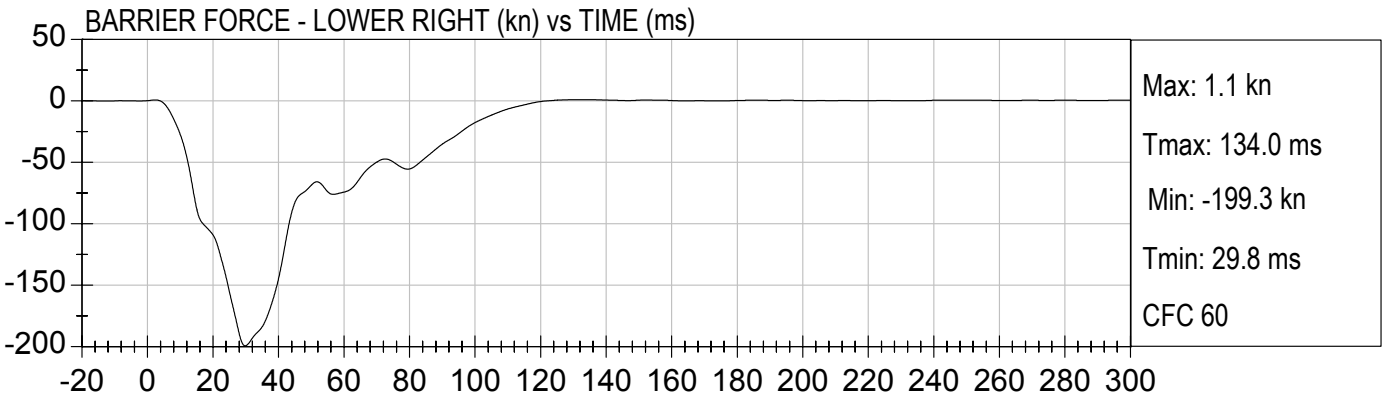






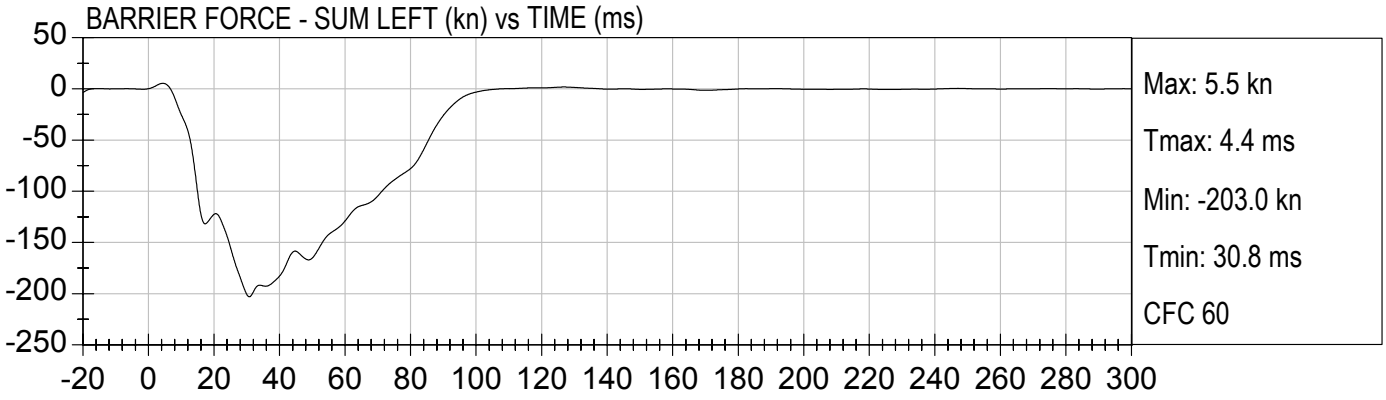

BARRIER FORCE - LOWER LEFT (kn) vs TIME (ms)
25
0
-25
-50
-75
-100
-125
-150
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 2.3 kn
Tmax: 4.3 ms
Min: -126.2 kn
Tmin: 34.7 ms
CFC 60

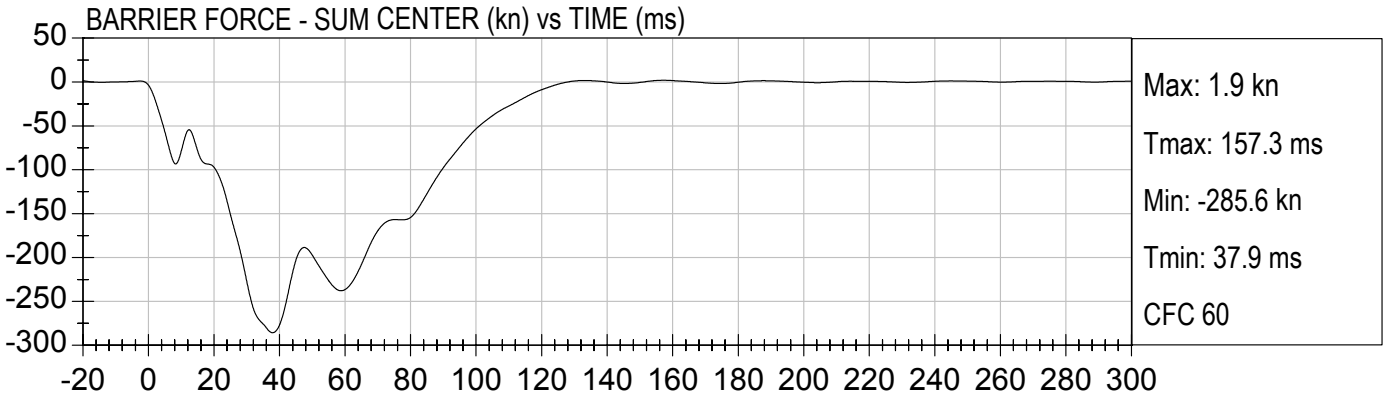

BARRIER FORCE - LOWER CENTER (kn) vs TIME (ms)
25
0
-25
-50
-75
-100
-125
-150
-175
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 0.9 kn
Tmax: 0.0 ms
Min: -165.4 kn
Tmin: 37.7 ms
CFC 60

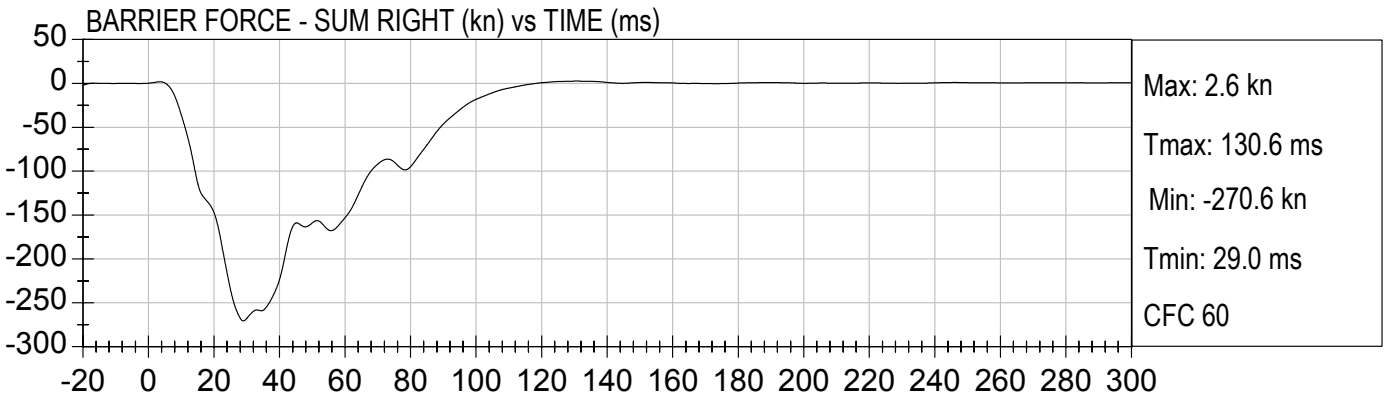

BARRIER FORCE - LOWER RIGHT (kn) vs TIME (ms)
50
0
-50
-100
-150
-200
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 1.1 kn
Tmax: 134.0 ms
Min: -199.3 kn
Tmin: 29.8 ms
CFC 60

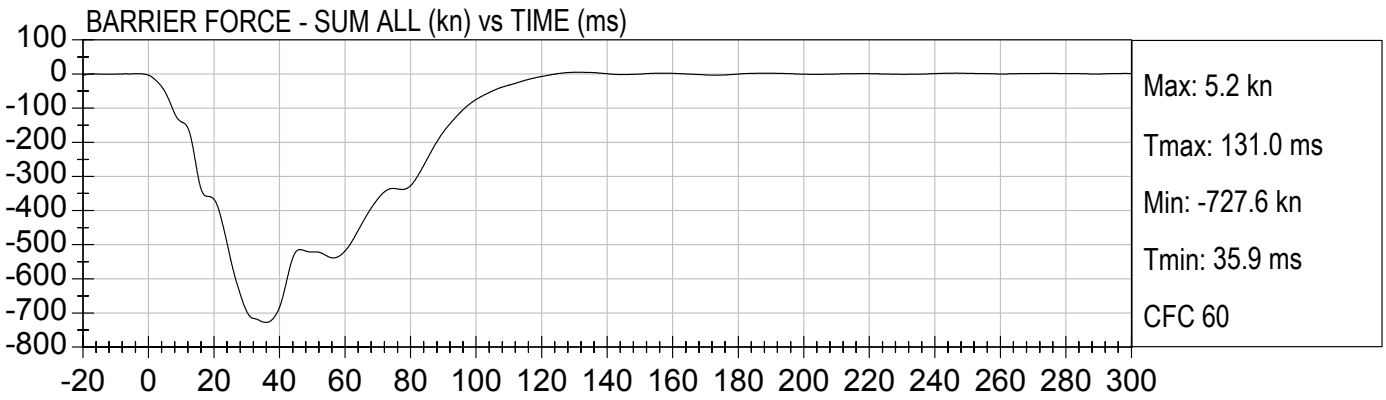
NCAP FRONTAL IMPACT
2005 FORD FREESTYLE (M50204)

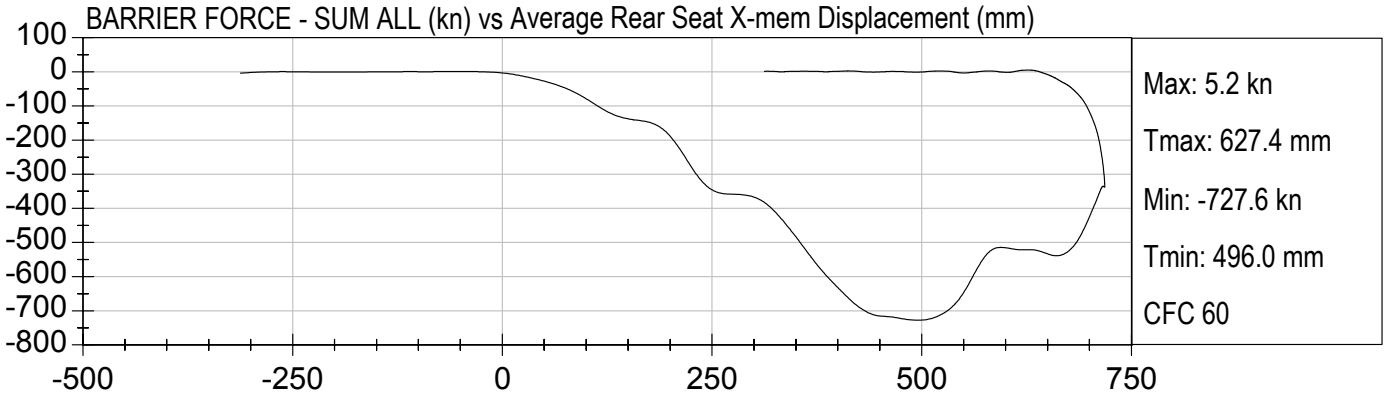
Test Date: 12/06/04
Speed: 35.1 mph (56.5 km/h)










BARRIER FORCE - SUM ALL (kn) vs Average Rear Seat X-mem Displacement (mm)
100
0
-100
-200
-300
-400
-500
-600
-700
-800
-500
-250
0
250
500
750
Max: 5.2 kn
Tmax: 627.4 mm
Min: -727.6 kn
Tmin: 496.0 mm
CFC 60

APPENDIX C

DUMMY CALIBRATION DATA TRACES AND TABLES

MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066 **Test ID:** D042721

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	20.5	Pass
Laboratory Relative Humidity	%	10 to 70	27	Pass
Peak Resultant Acceleration	G's	225 - 275	251	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-12.2	Pass
Unimodal	Yes/No	NA	Yes	Pass
Oscillations	Yes/No	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Joe Fleck

Laboratory Technician

12/01/2004

Test Date

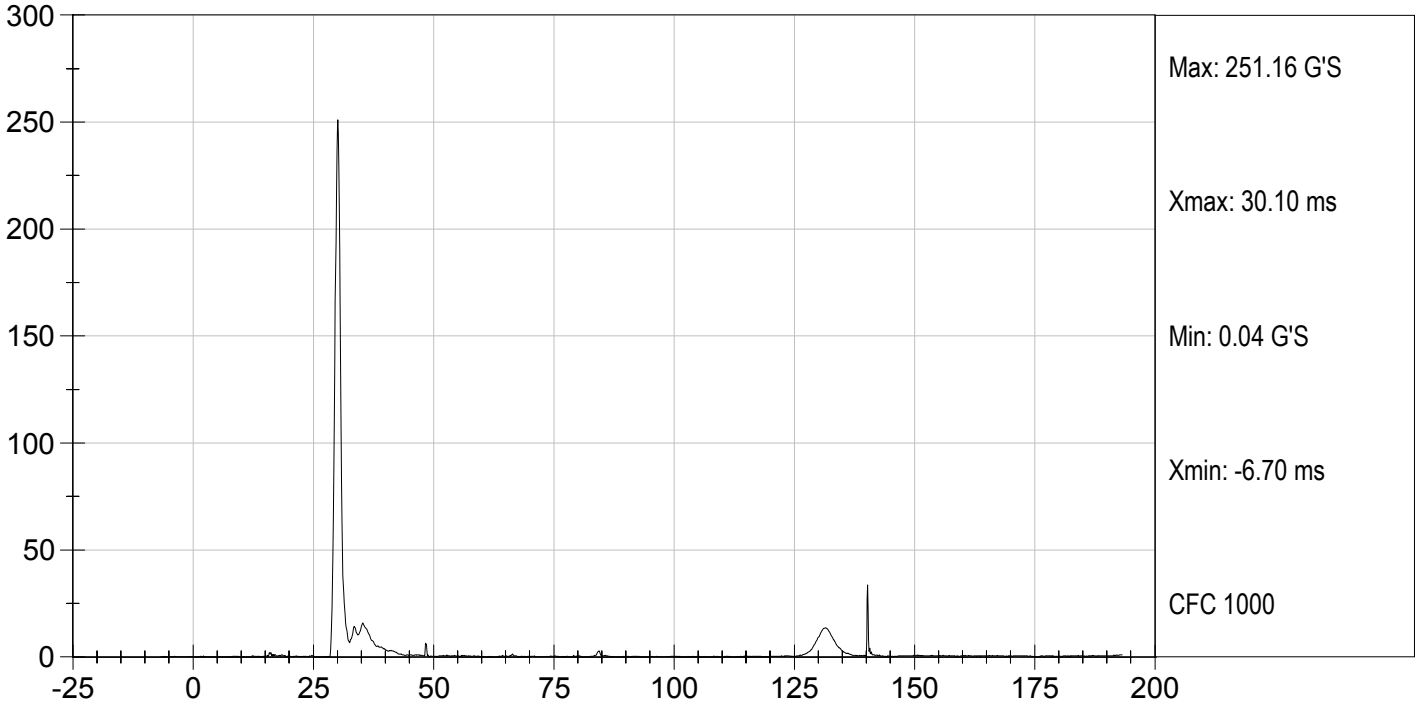
David Winkelbauer

Approved By

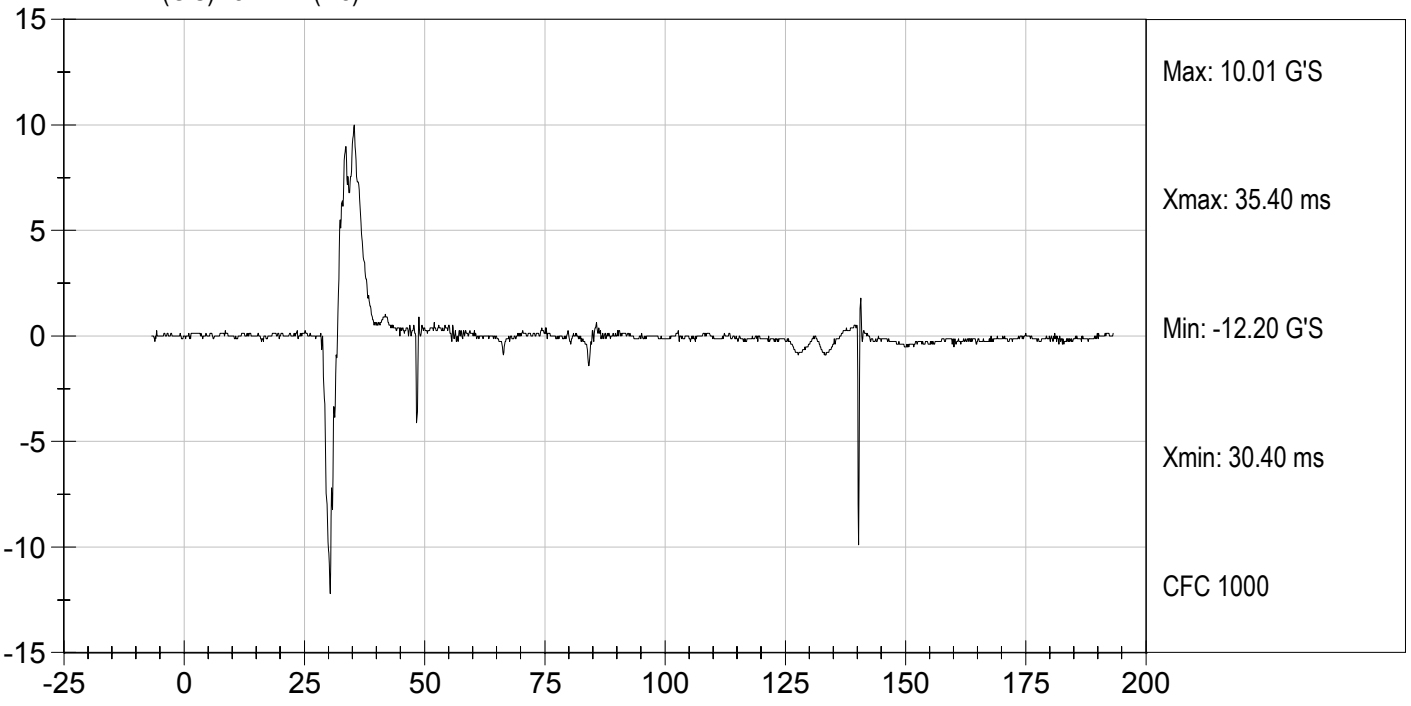
Test Desc: Head Drop
Componet ID: D042721

Test Date: 12/01/2004
Velocity: 0 ft/s, 0.00 m/s

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



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



MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066 **Test I.D:** D042722

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.8	Pass
Laboratory Relative Humidity		%	10 to 70	27	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.00	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	24.12	Pass
	20 msec	G's	17.60 to 22.60	20.41	Pass
	30 msec	G's	12.50 to 18.50	14.59	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	14.50	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	39.6	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	71.3	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	113.6	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	95.3	Pass
	Time	msec	47.0 to 58.0	52.3	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	101.4	Pass
			Overall Test Results		Pass

Joe Fleck

Laboratory Technician

12/01/2004

Test Date

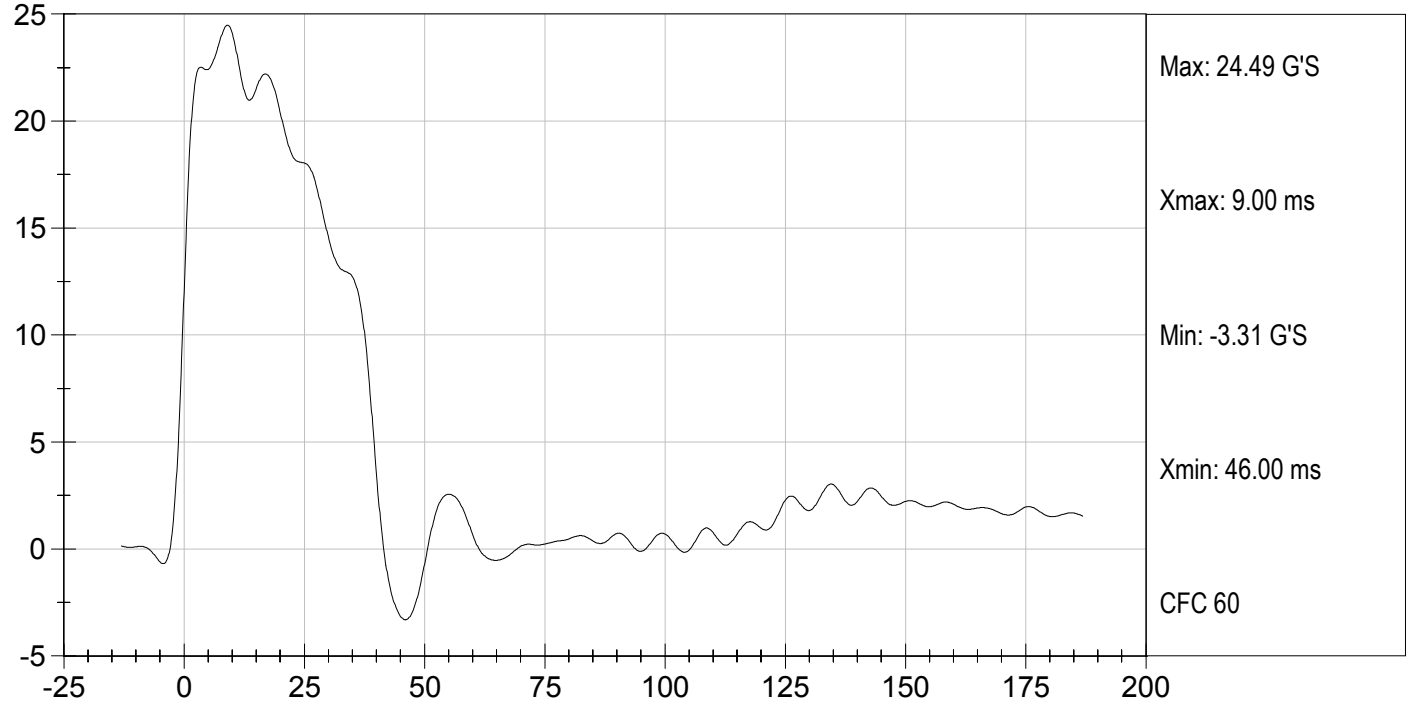
David Winkelbauer

Approved By

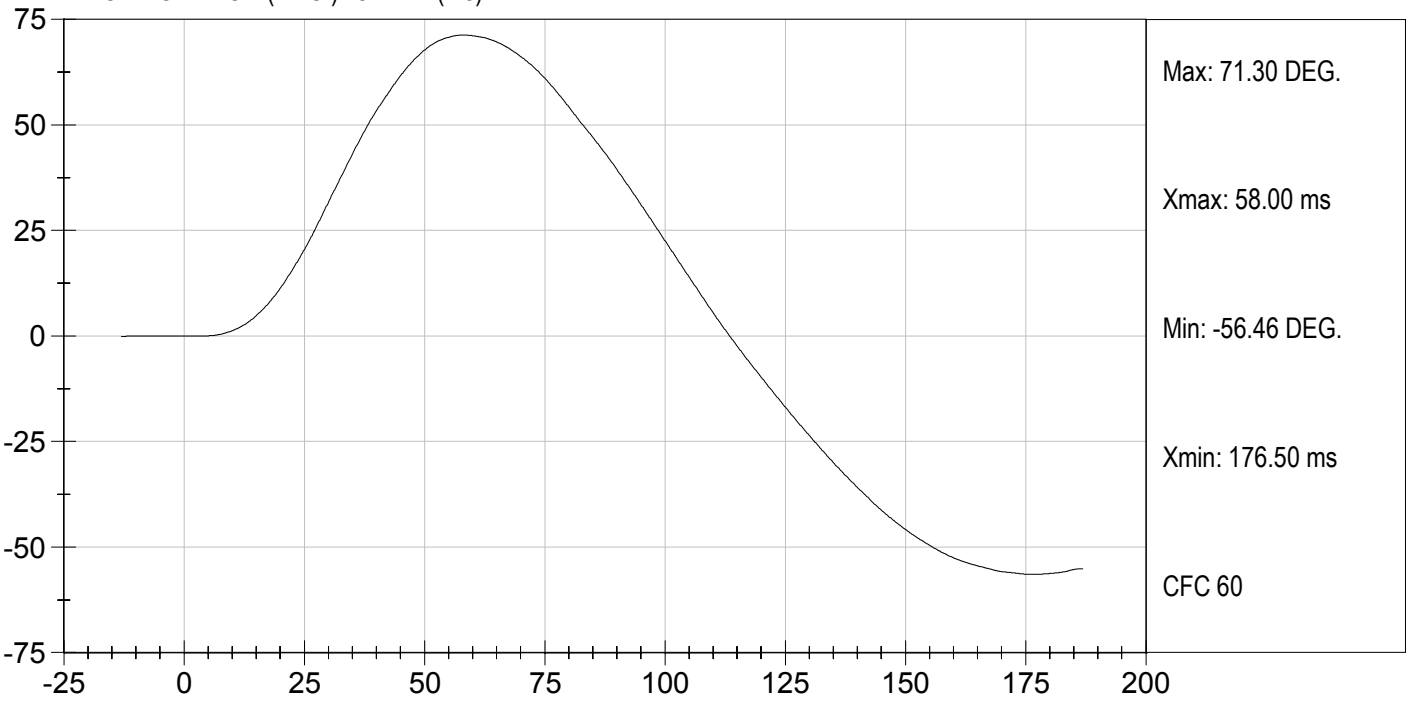
Test Desc: Neck Flexion
Componet ID: D042722

Test Date: 12/01/2004
Velocity: 22.97 ft/s, 7.00 m/s

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

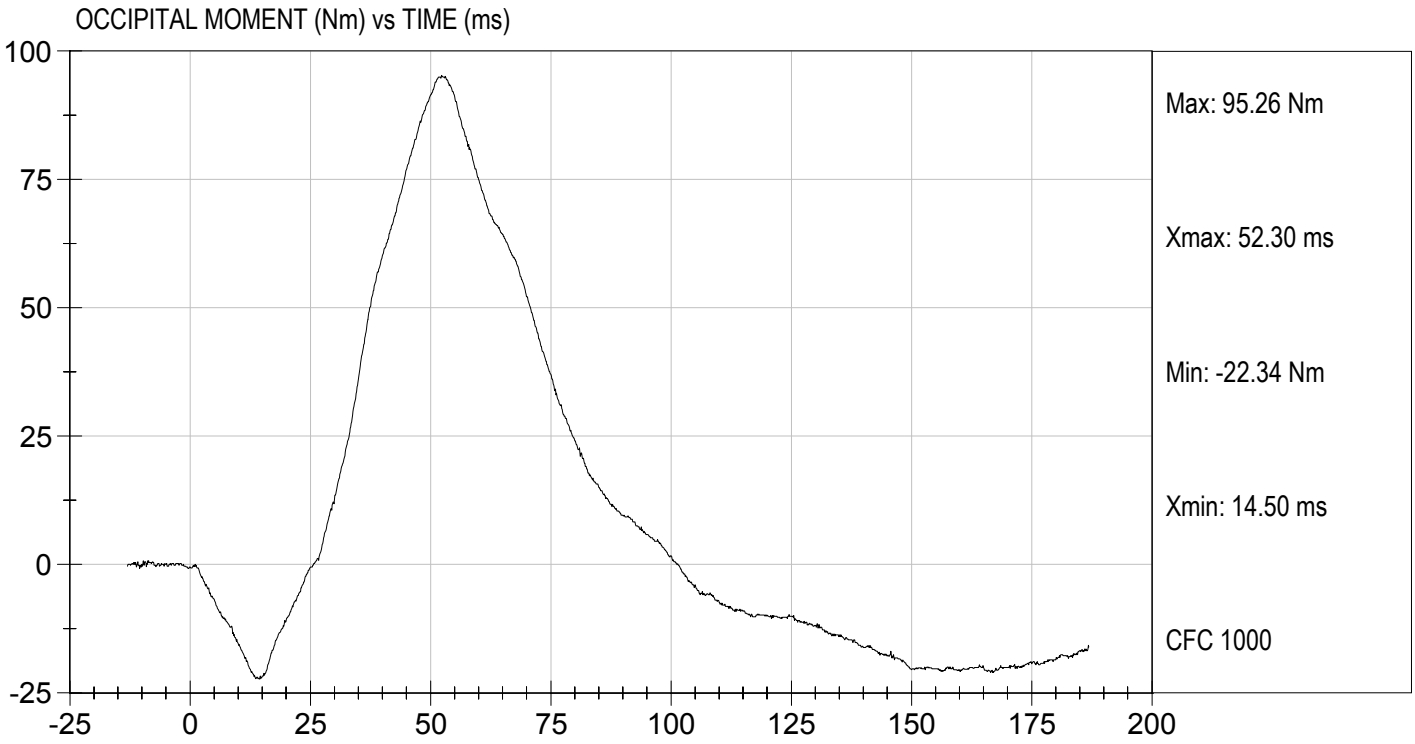


NECK ROTATION (DEG.) vs TIME (ms)



Test Desc: Neck Flexion
Componet ID: D042722

Test Date: 12/01/2004
Velocity: 22.97 ft/s, 7.00 m/s



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066 **Test I.D:** D042723

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	26	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.07	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	20.12	Pass
	20 msec	G's	14.00 to 19.00	15.95	Pass
	30 msec	G's	11.00 to 16.00	12.55	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	12.48	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	42.2	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	100.9	Pass
	Time	msec	72.0 to 82.0	79.0	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	157.4	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-67.7	Pass
	Time	msec	65.0 to 79.0	73.9	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	145.6	Pass
			Overall Test Results		Pass

Joe Fleck

Laboratory Technician

12/01/2004

Test Date

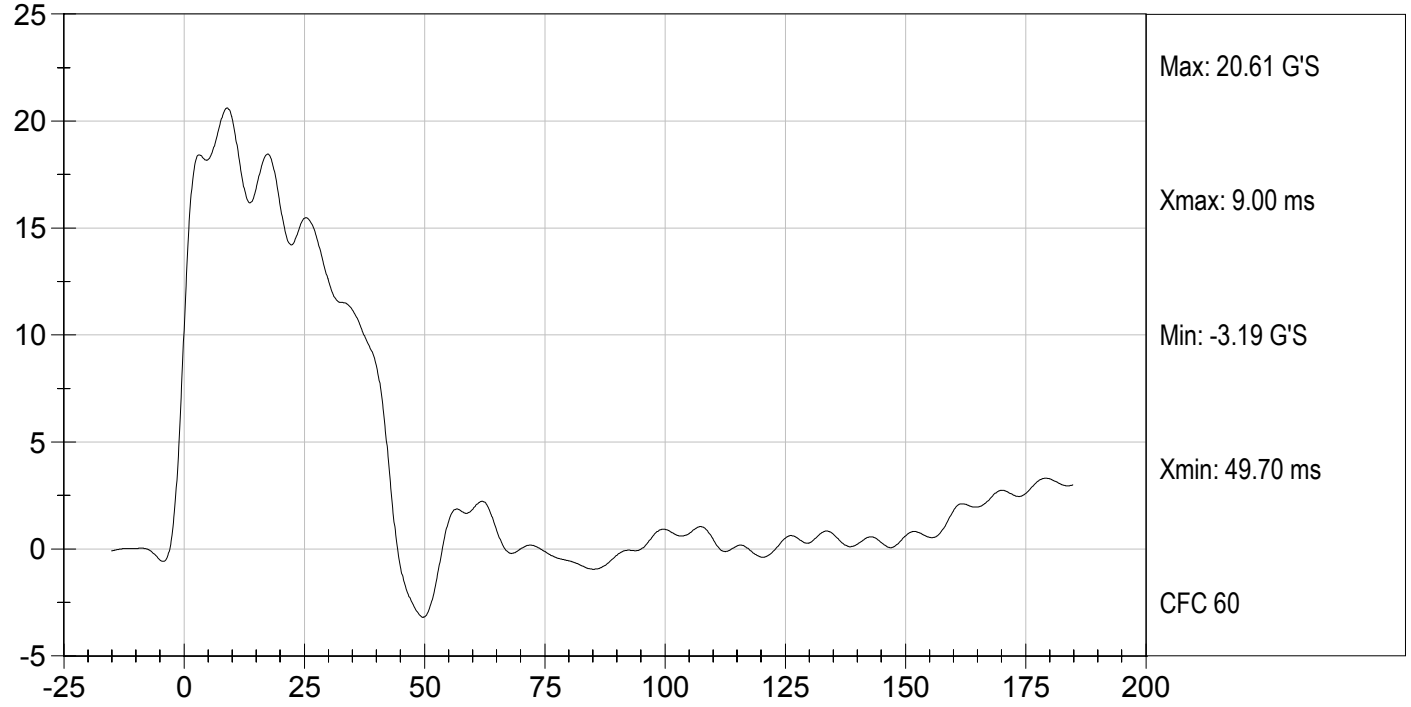
David Winkelbauer

Approved By

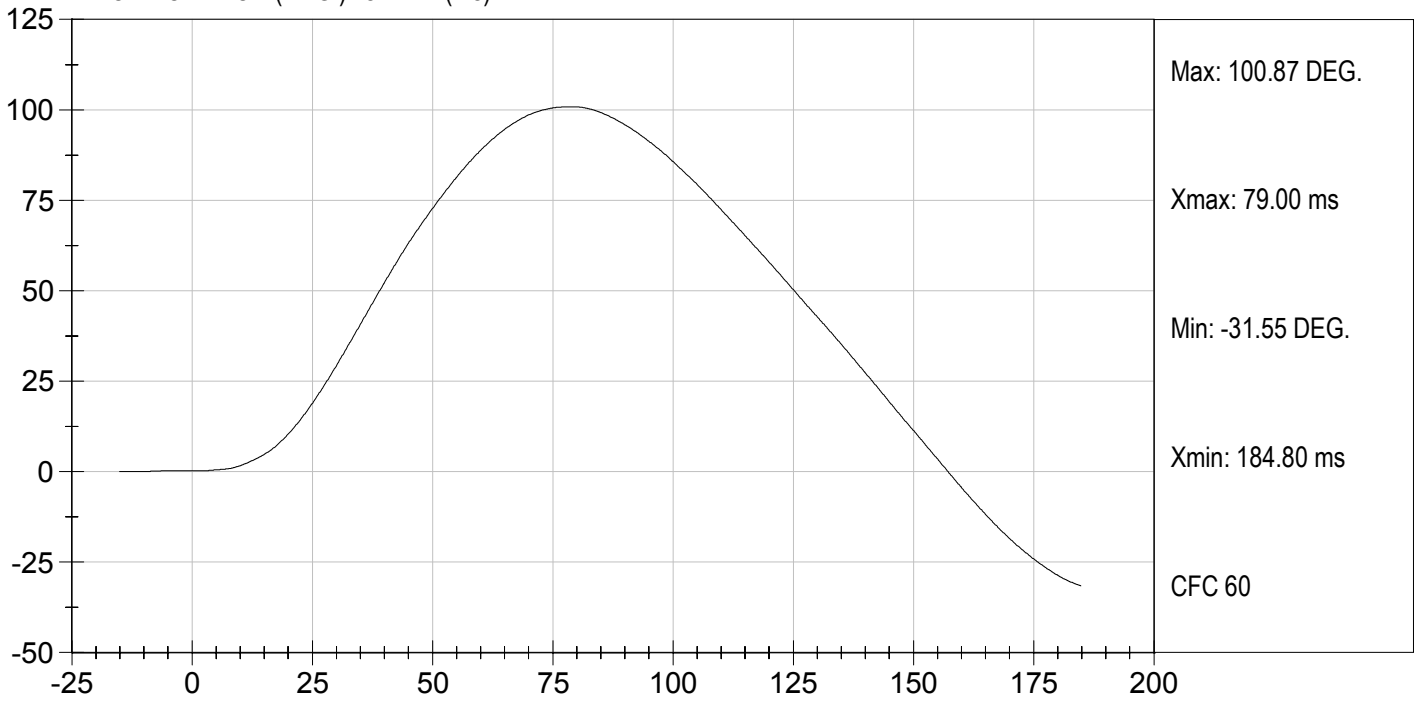
Test Desc: Neck Extension
Componet ID: D042723

Test Date: 12/01/2004
Velocity: 19.91 ft/s, 6.07 m/s

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

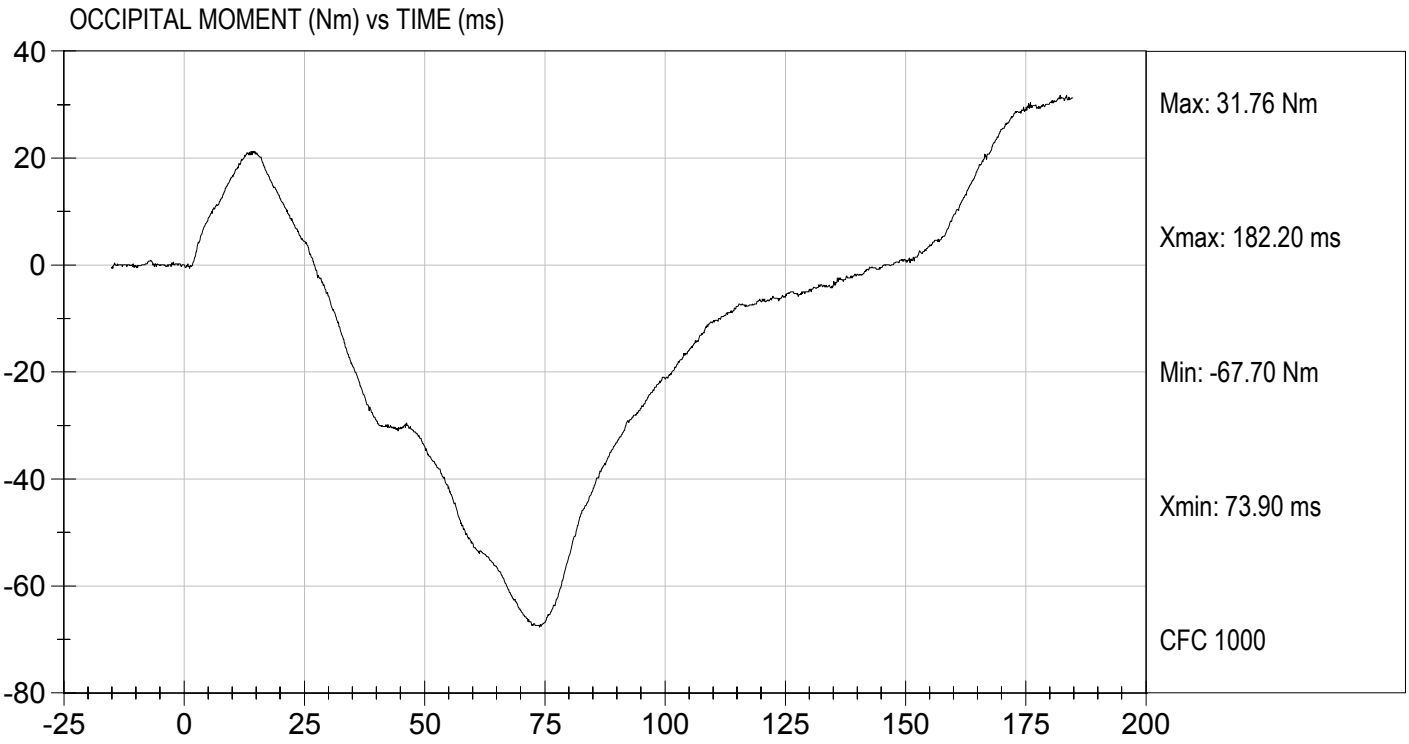


NECK ROTATION (DEG.) vs TIME (ms)



Test Desc: Neck Extension
Componet ID: D042723

Test Date: 12/01/2004
Velocity: 19.91 ft/s, 6.07 m/s



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066 **Test I.D:** D042724

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	26	Pass
Probe Velocity	m/s	6.58 to 6.82	6.72	Pass
Peak Probe Force	N	5159 to 5893	5,873	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.67	Pass
Internal Hysteresis	%	69 to 85	71	Pass
		Overall Test Results		Pass

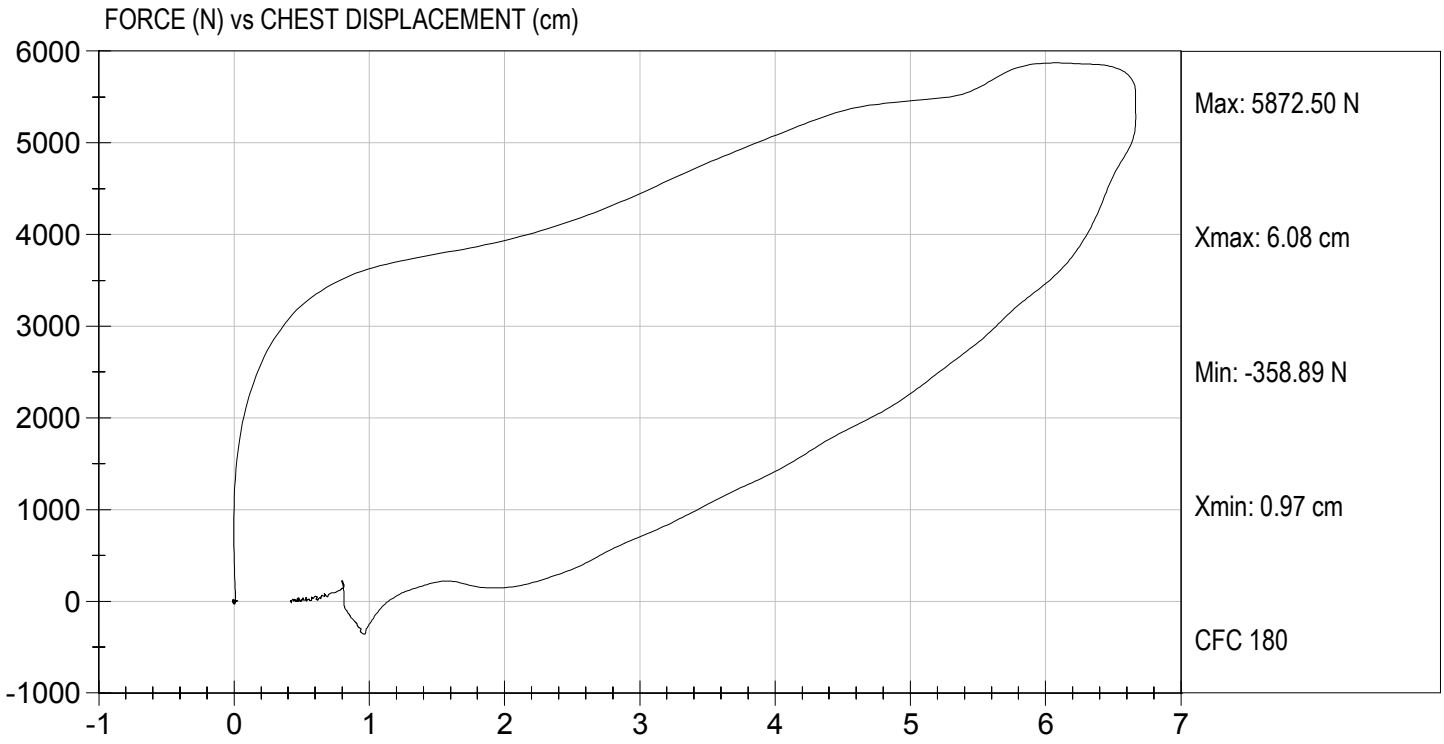
Jim Carney
Laboratory Technician

12/01/2004
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Impact
Componet ID: D042724

Test Date: 12/01/2004
Velocity: 22.04 ft/s, 6.72 m/s



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 66, **Test I.D:** D042725

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	4,879	Pass
		Overall Test Results		Pass

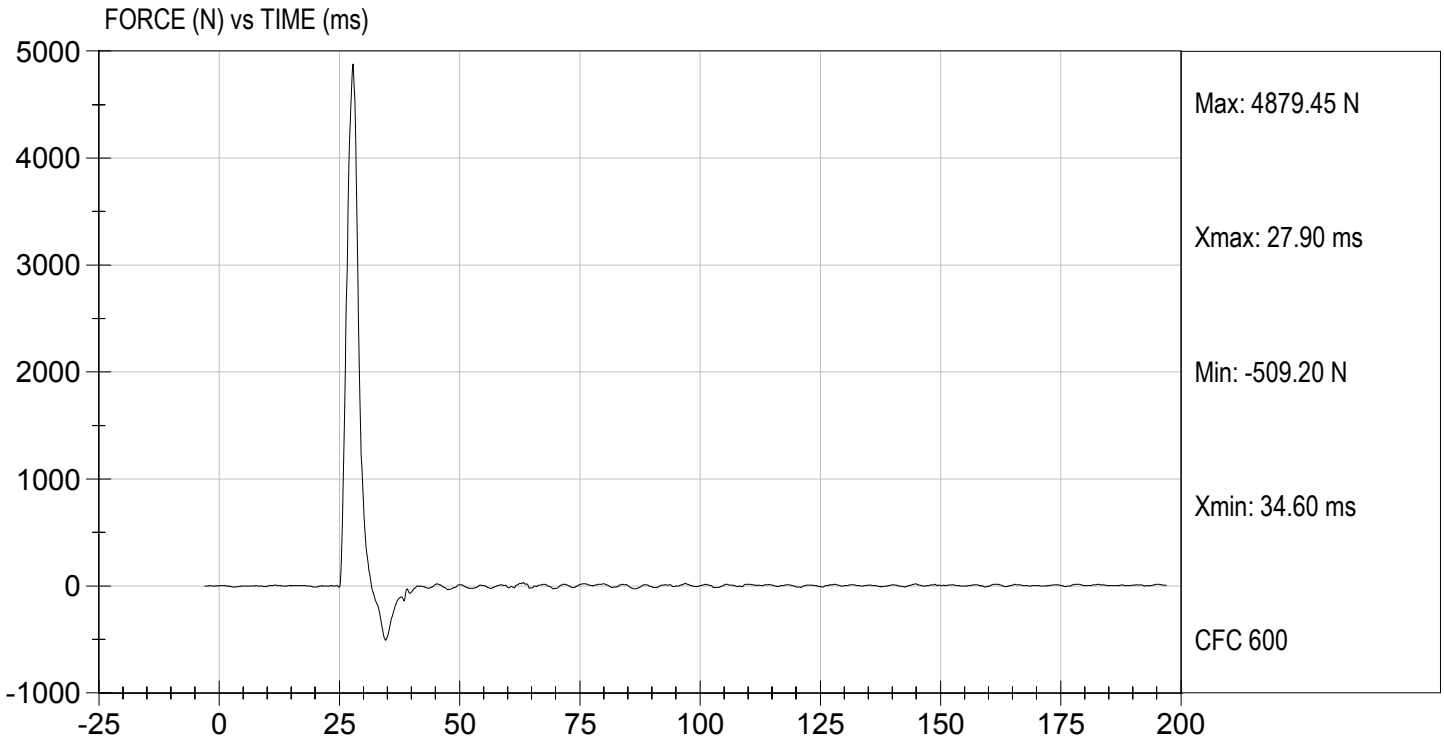
Jessica Hall
Laboratory Technician

12/01/2004
Test Date

David Winkelbauer
Approved By

Test Desc: Right Knee
Componet ID: D042725

Test Date: 12/01/2004
Velocity: 6.93 ft/s, 2.11 m/s



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 66, **Test I.D:** D042726

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	5,150	Pass
		Overall Test Results		Pass

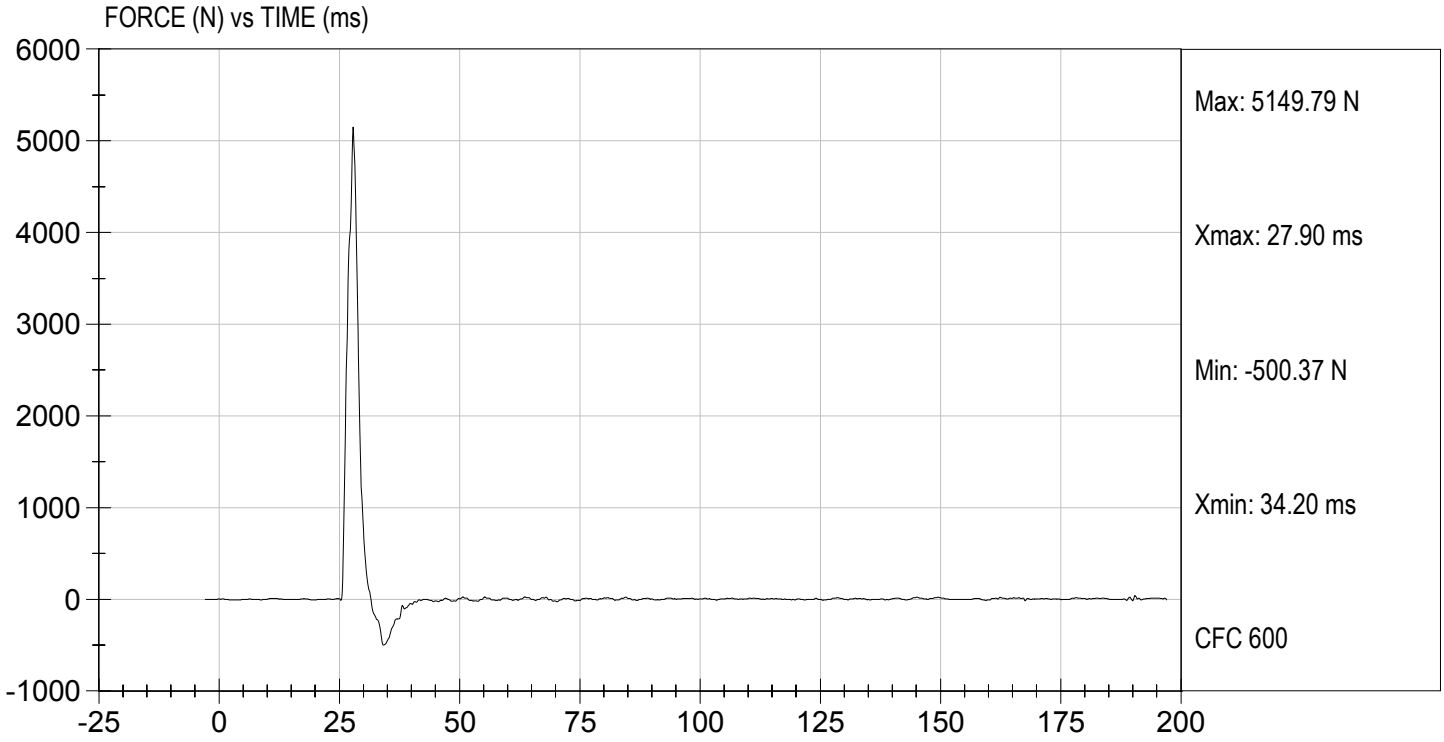
Jessica Hall
Laboratory Technician

12/01/2004
Test Date

David Winkelbauer
Approved By

Test Desc: Left Knee
Componet ID: D042726

Test Date: 12/01/2004
Velocity: 6.9 ft/s, 2.10 m/s



MGA RESEARCH CORPORATION

HIP-FEMUR FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066 **Test I.D:** D042720

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	20.4	20.4	Pass
Laboratory Relative Humidity	%	10 to 70	27	27	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	83.3	79.2	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	42	40	Pass
		Overall Test Results			Pass

Jim Carney
Laboratory Technician

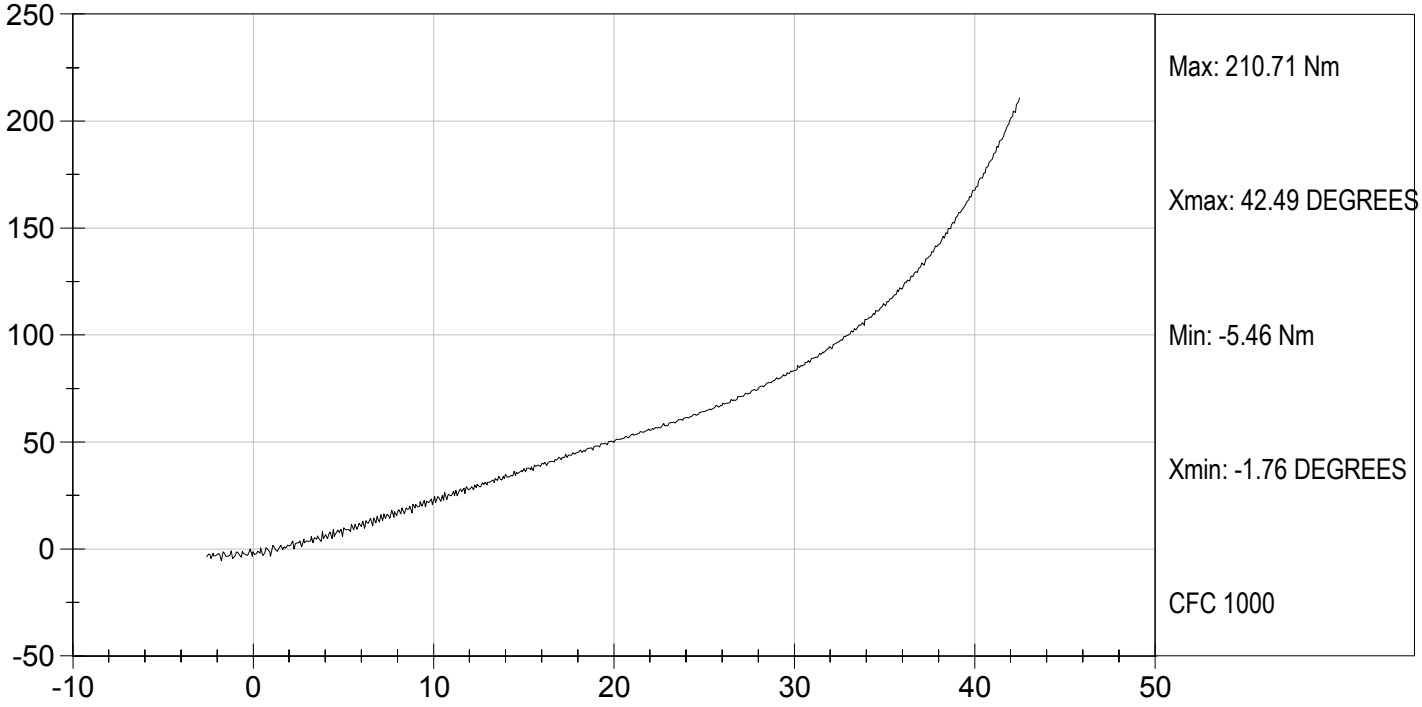
12/01/2004
Test Date

David Winkelbauer
Approved By

Test Desc: Hip Femur Flexion
Componet ID: D042729

Test Date: 12/01/2004
Velocity: 0 ft/s, 0.00 m/s

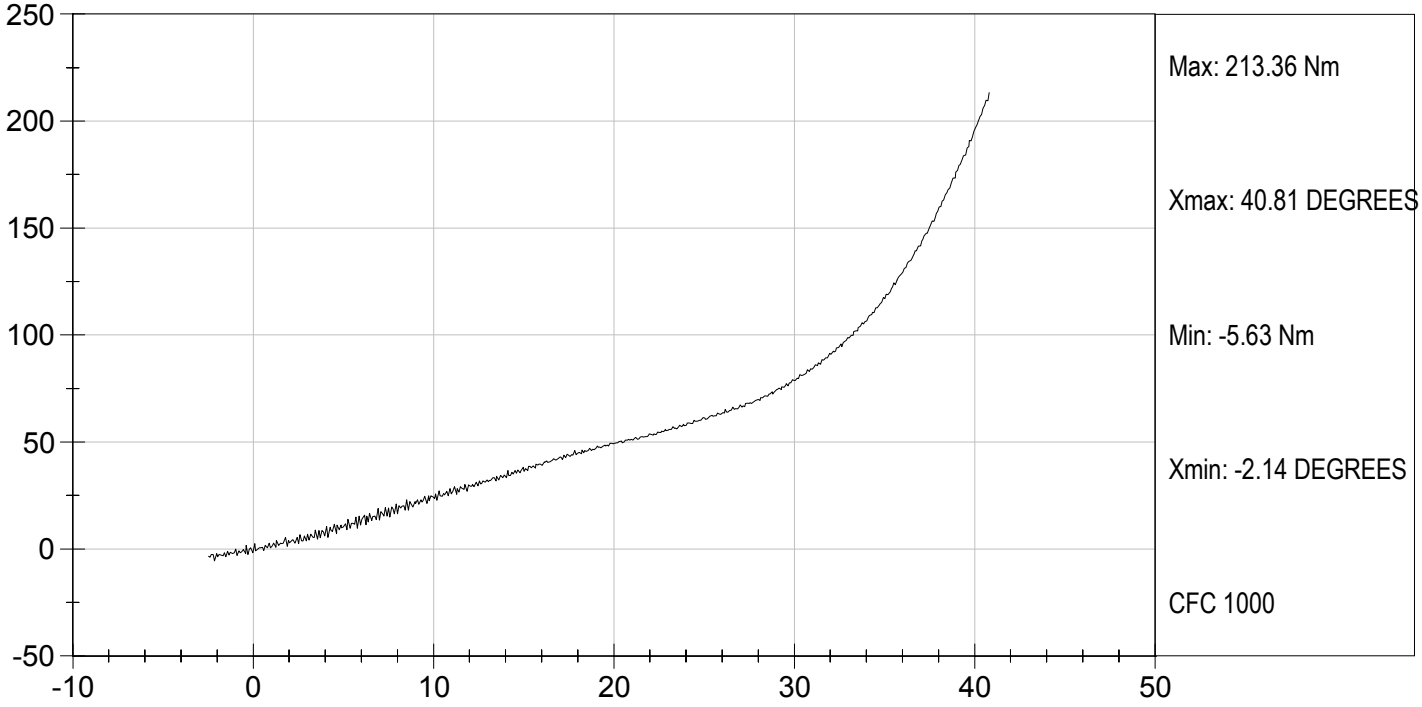
MOMENT (Nm) vs FEMUR ROTATION (DEGREES)



Test Desc: Hip Femur Flexion
Componet ID: D042720

Test Date: 12/01/2004
Velocity: 0 ft/s, 0.00 m/s

MOMENT (Nm) vs FEMUR ROTATION (DEGREES)



MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065 **Test ID:** D042711

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
Peak Resultant Acceleration	G's	225 - 275	272	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-11.9	Pass
Unimodal	Yes/No	NA	Yes	Pass
Oscillations	Yes/No	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Joe Fleck

Laboratory Technician

12/01/2004

Test Date

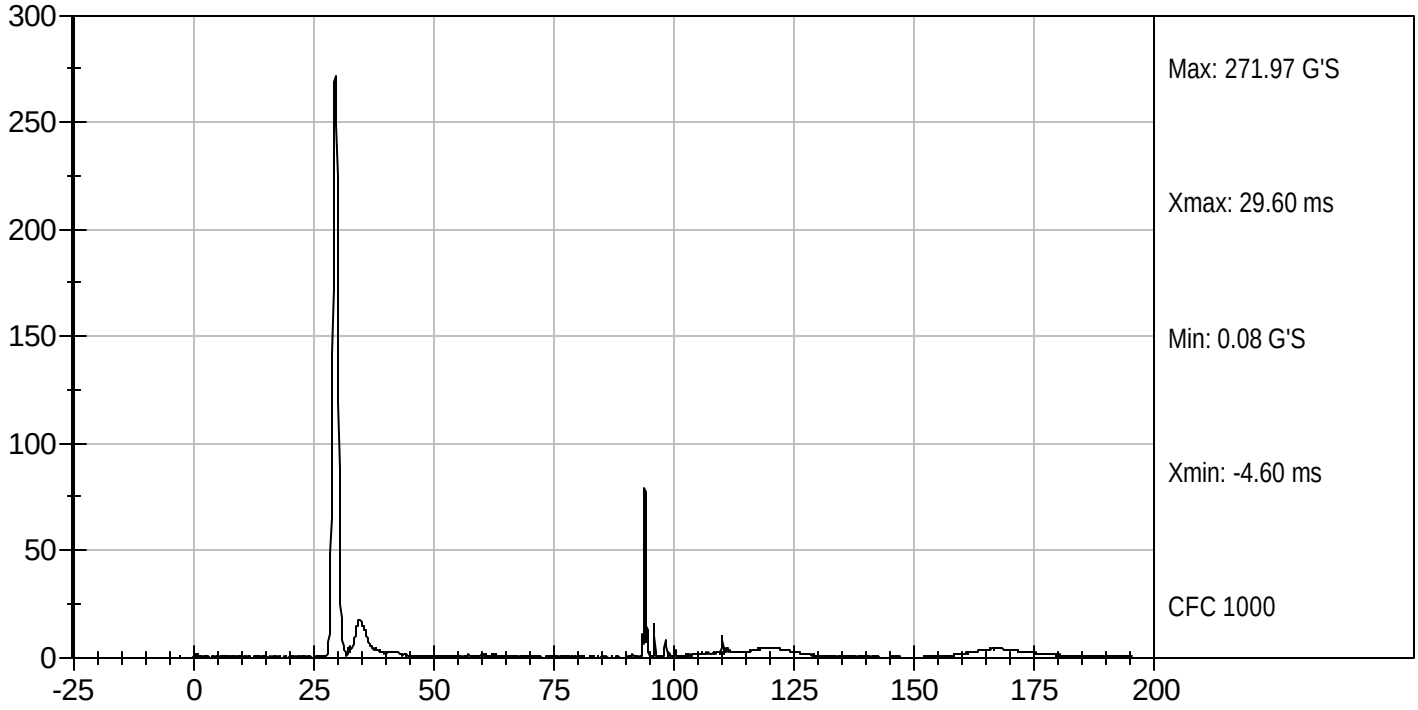
David Winkelbauer

Approved By

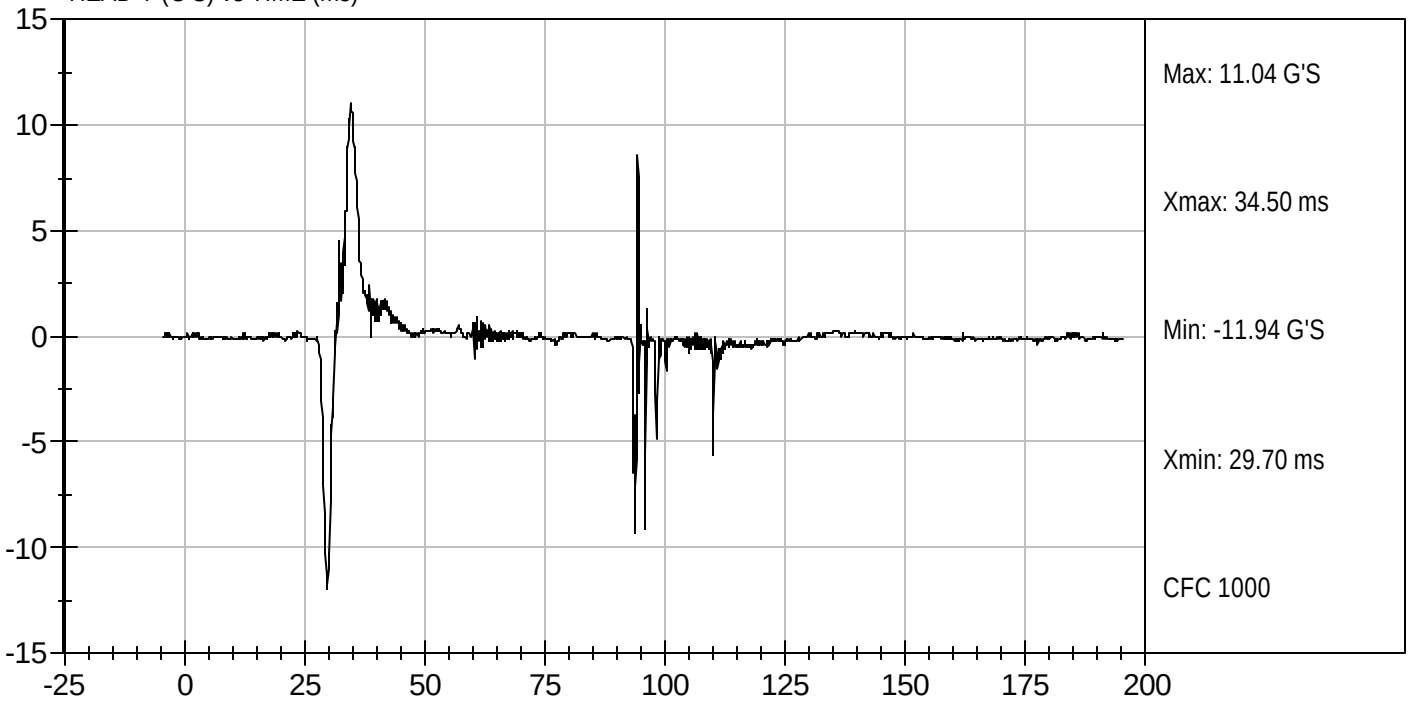
Test Desc: Head Drop
Componet ID: D042711

Test Date: 12/01/2004
Velocity: 0 ft/s, 0.00 m/s

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



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



MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065 **Test I.D:** D042712

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.8	Pass
Laboratory Relative Humidity		%	10 to 70	27	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.91	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	24.27	Pass
	20 msec	G's	17.60 to 22.60	20.57	Pass
	30 msec	G's	12.50 to 18.50	16.32	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	16.27	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	37.4	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	75.4	Pass
	Time	msec	57.0 to 64.0	58.7	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	114.2	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	99.8	Pass
	Time	msec	47.0 to 58.0	49.9	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	104.2	Pass
			Overall Test Results		Pass

Joe Fleck

Laboratory Technician

12/01/2004

Test Date

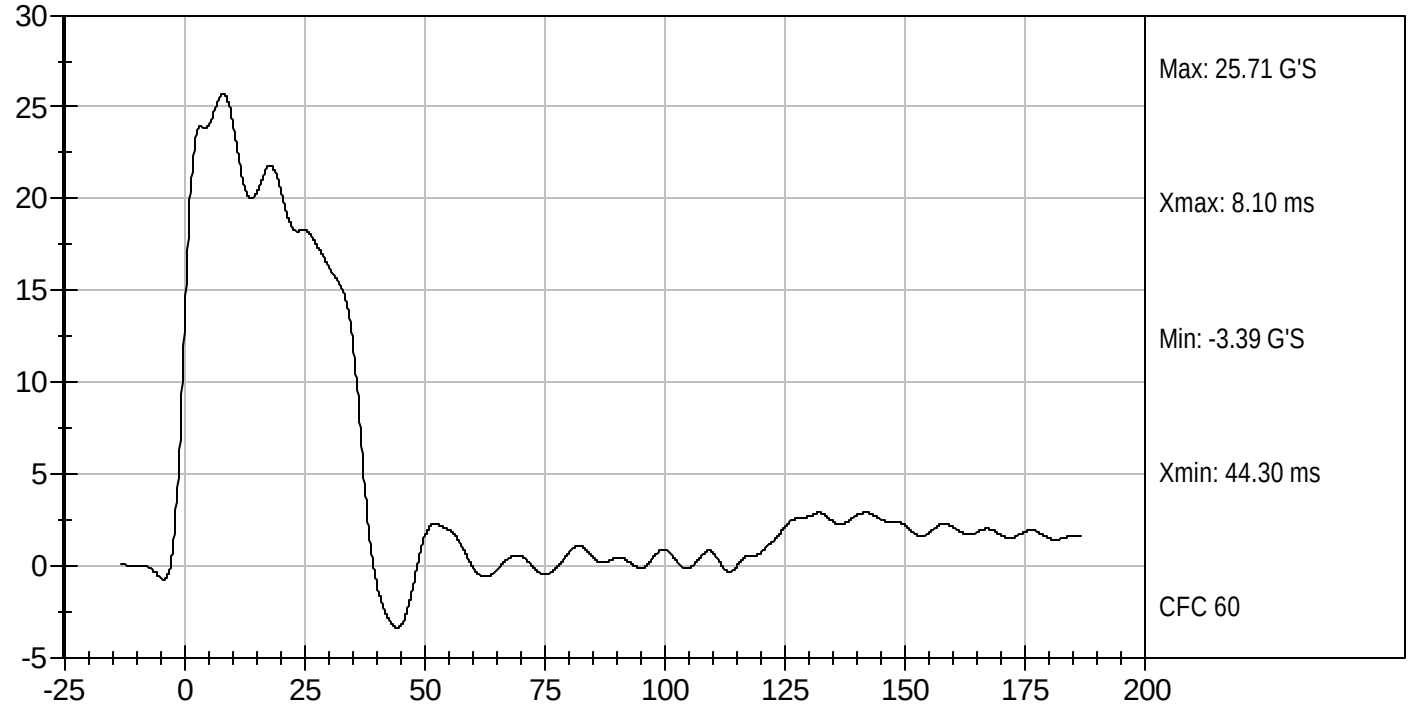
David Winkelbauer

Approved By

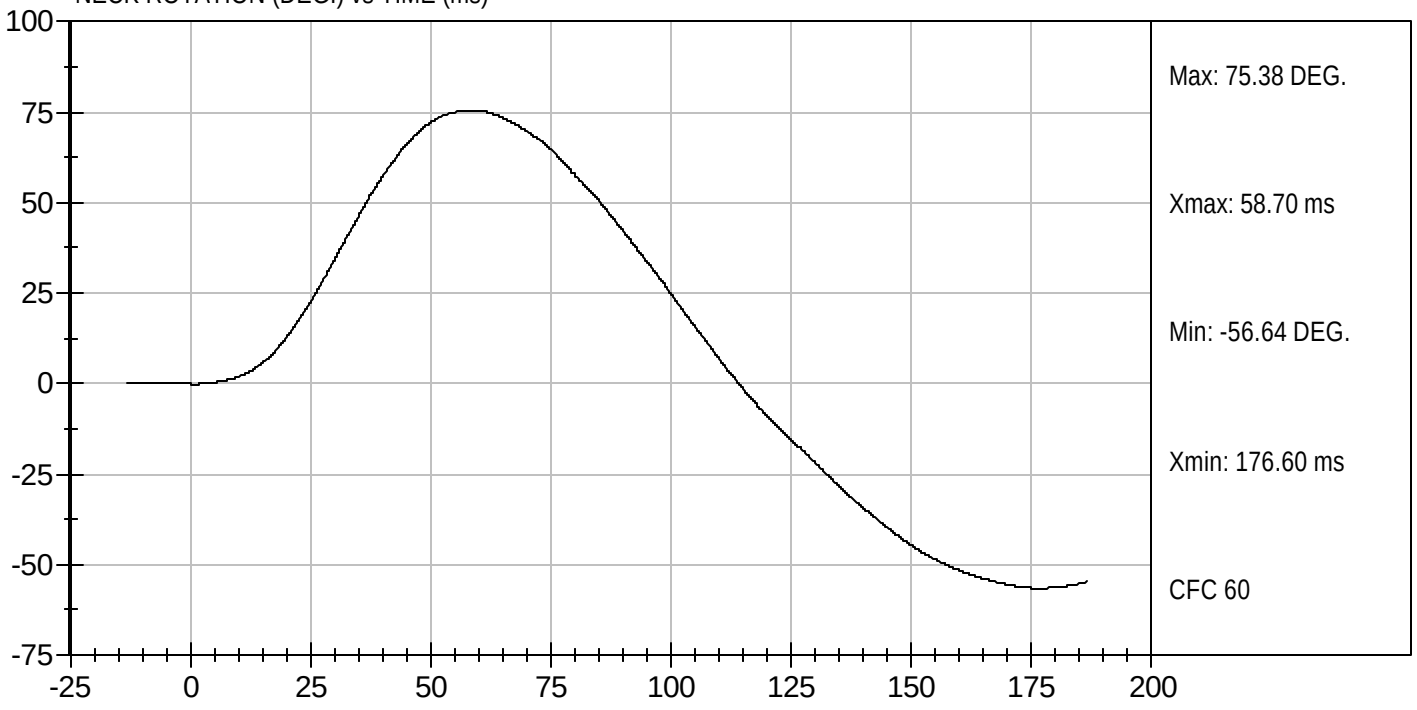
Test Desc: Neck Flexion
Componet ID: D042712

Test Date: 12/01/2004
Velocity: 22.67 ft/s, 6.91 m/s

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

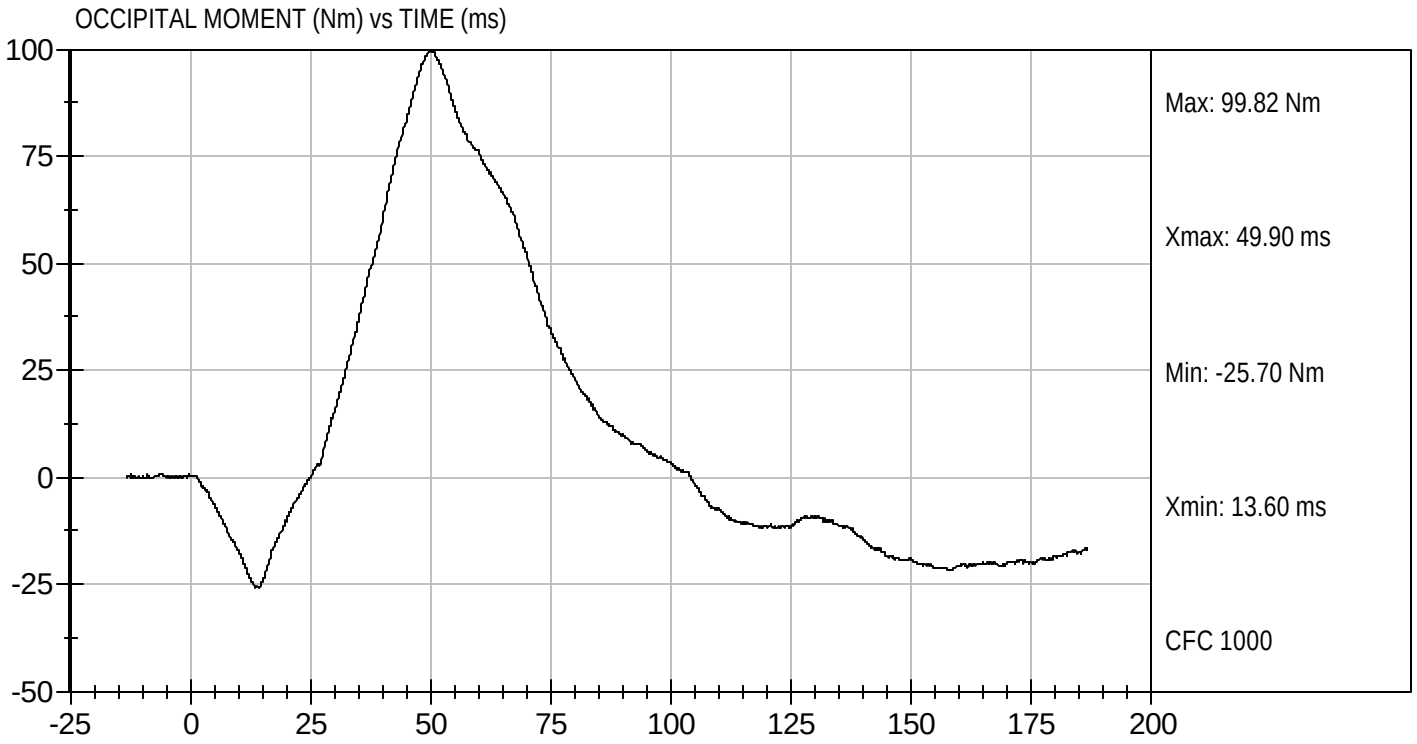


NECK ROTATION (DEG.) vs TIME (ms)



Test Desc: Neck Flexion
Componet ID: D042712

Test Date: 12/01/2004
Velocity: 22.67 ft/s, 6.91 m/s



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065 **Test I.D:** D042713

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.8	Pass
Laboratory Relative Humidity		%	10 to 70	27	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.07	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	19.58	Pass
	20 msec	G's	14.00 to 19.00	17.00	Pass
	30 msec	G's	11.00 to 16.00	12.43	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	12.38	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	42.1	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	100.1	Pass
	Time	msec	72.0 to 82.0	78.2	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	158.2	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-66.6	Pass
	Time	msec	65.0 to 79.0	73.7	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	144.4	Pass
			Overall Test Results		Pass

Joe Fleck

Laboratory Technician

12/01/2004

Test Date

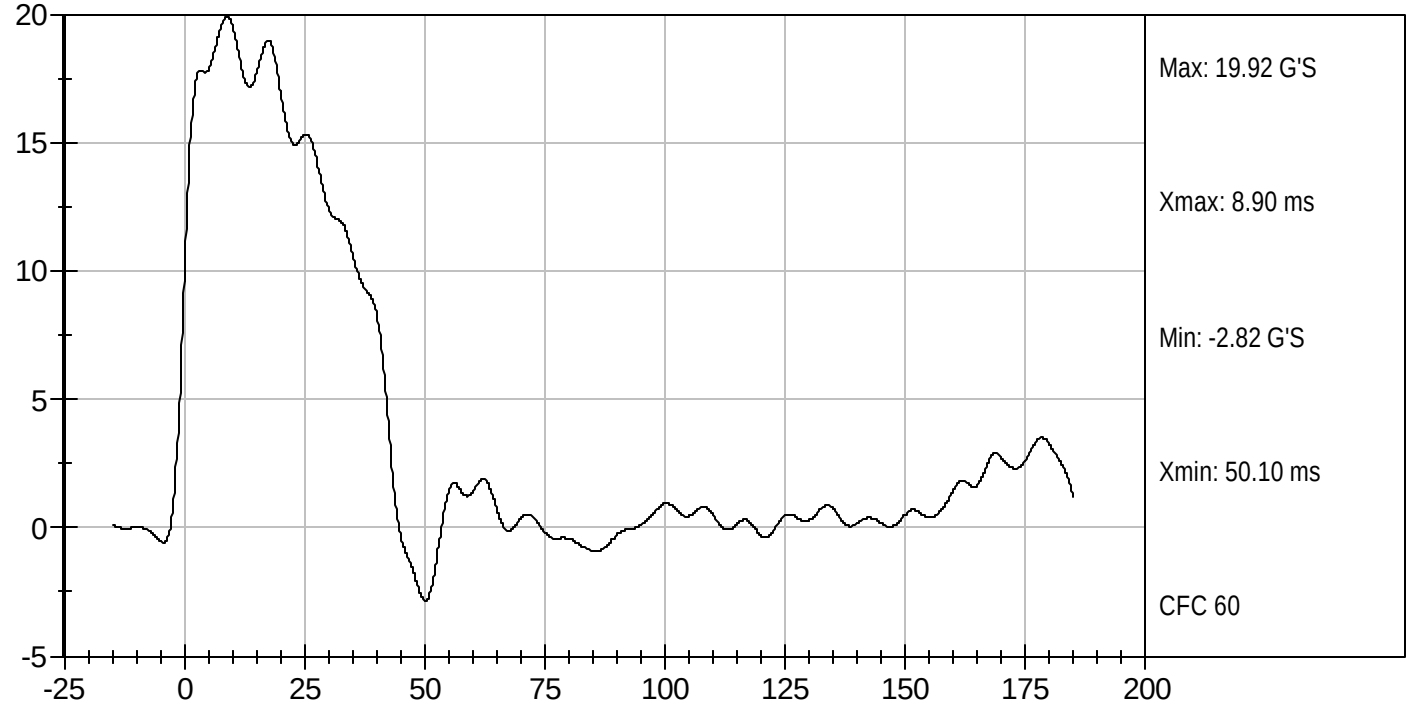
David Winkelbauer

Approved By

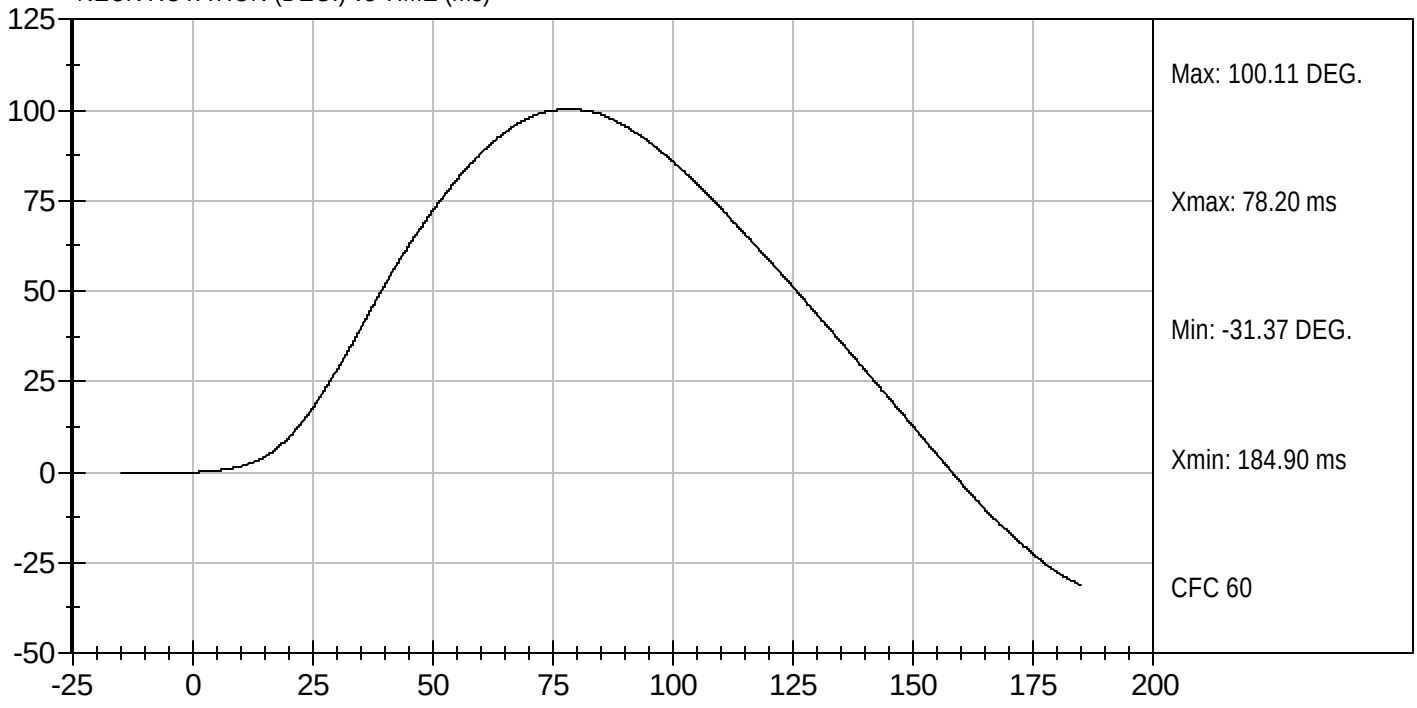
Test Desc: Neck Extension
Componet ID: D042713

Test Date: 12/01/2004
Velocity: 19.91 ft/s, 6.07 m/s

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



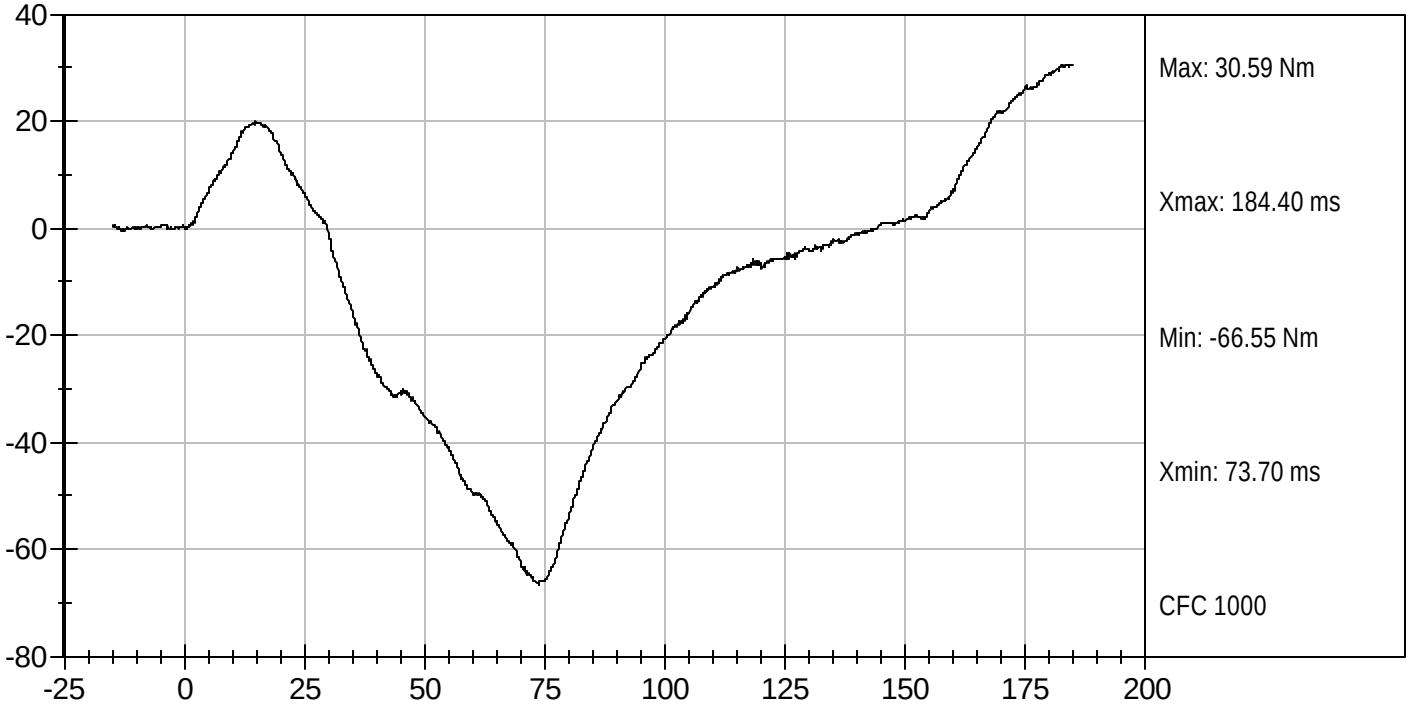
NECK ROTATION (DEG.) vs TIME (ms)



Test Desc: Neck Extension
Componet ID: D042713

Test Date: 12/01/2004
Velocity: 19.91 ft/s, 6.07 m/s

OCCIPITAL MOMENT (Nm) vs TIME (ms)



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065 **Test I.D:** D042714

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	26	Pass
Probe Velocity	m/s	6.58 to 6.82	6.69	Pass
Peak Probe Force	N	5159 to 5893	5,747	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.62	Pass
Internal Hysteresis	%	69 to 85	74	Pass
		Overall Test Results		Pass

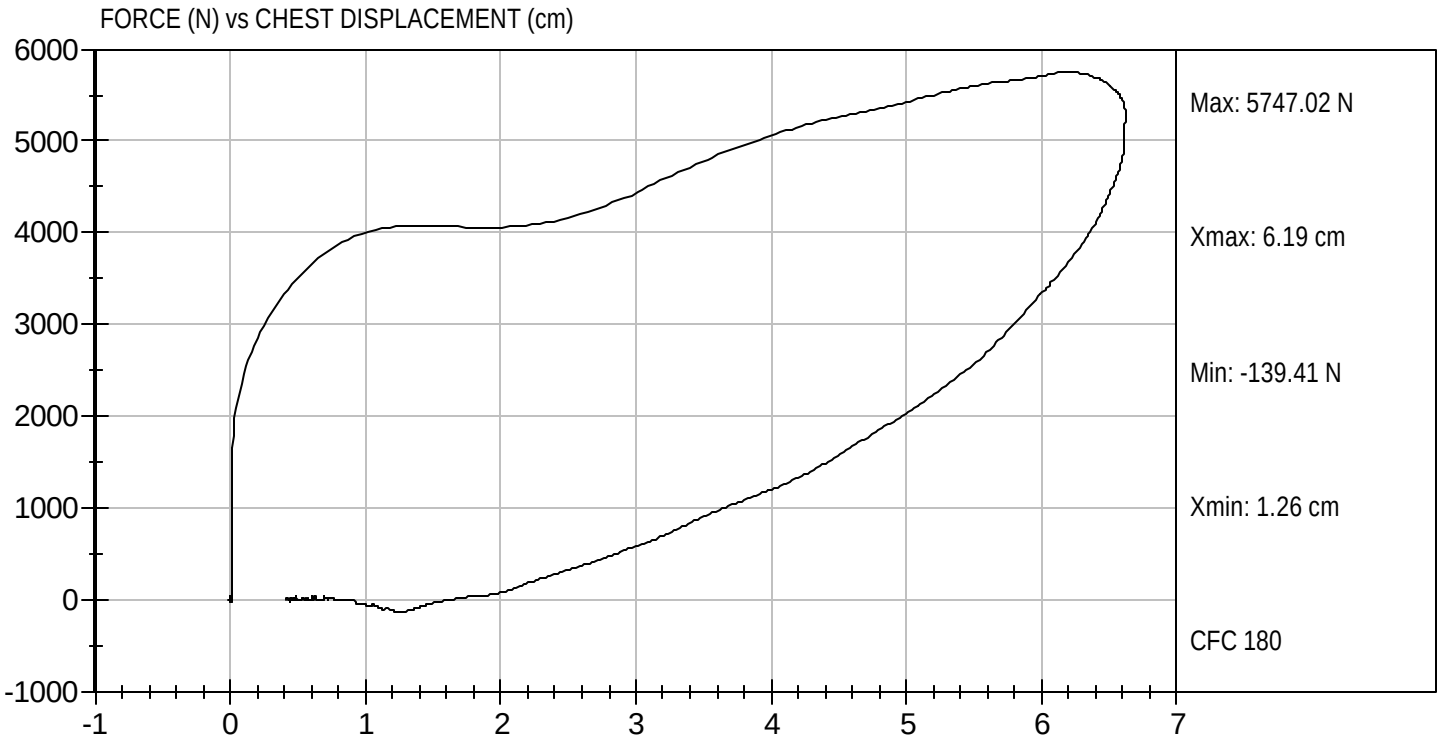
Laboratory Technician

12/01/2004
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Impact
Componet ID: D042714

Test Date: 12/01/2004
Velocity: 21.94 ft/s, 6.69 m/s



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065 **Test I.D:** D042715

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	27	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	5,165	Pass
		Overall Test Results		Pass

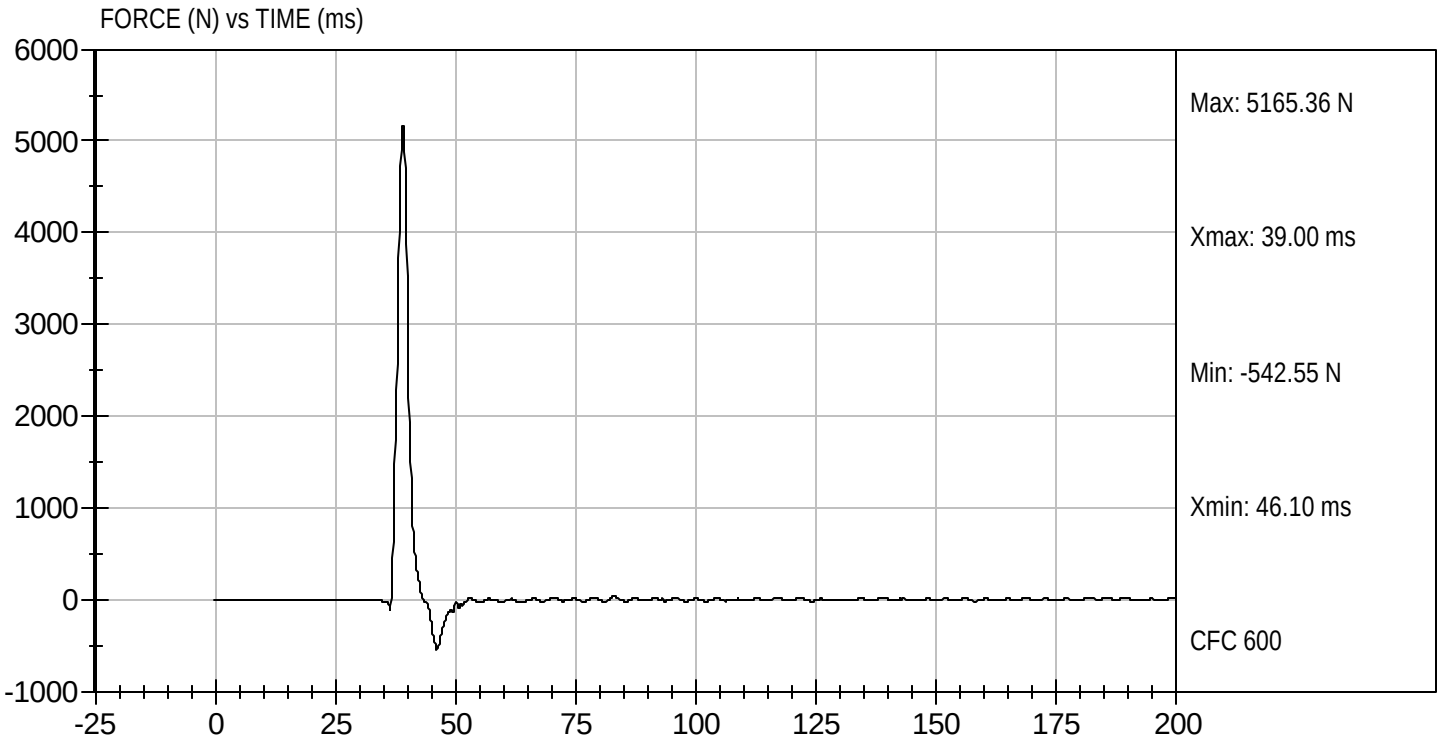
Jessica Hall
Laboratory Technician

12/01/2004
Test Date

David Winkelbauer
Approved By

Test Desc: Right Knee
Componet ID: D042715

Test Date: 12/01/2004
Velocity: 6.9 ft/s, 2.10 m/s



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065 **Test I.D:** D042716

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.09	Pass
Peak Probe Force	Newtons	4715 to 5782	5,579	Pass
		Overall Test Results		Pass

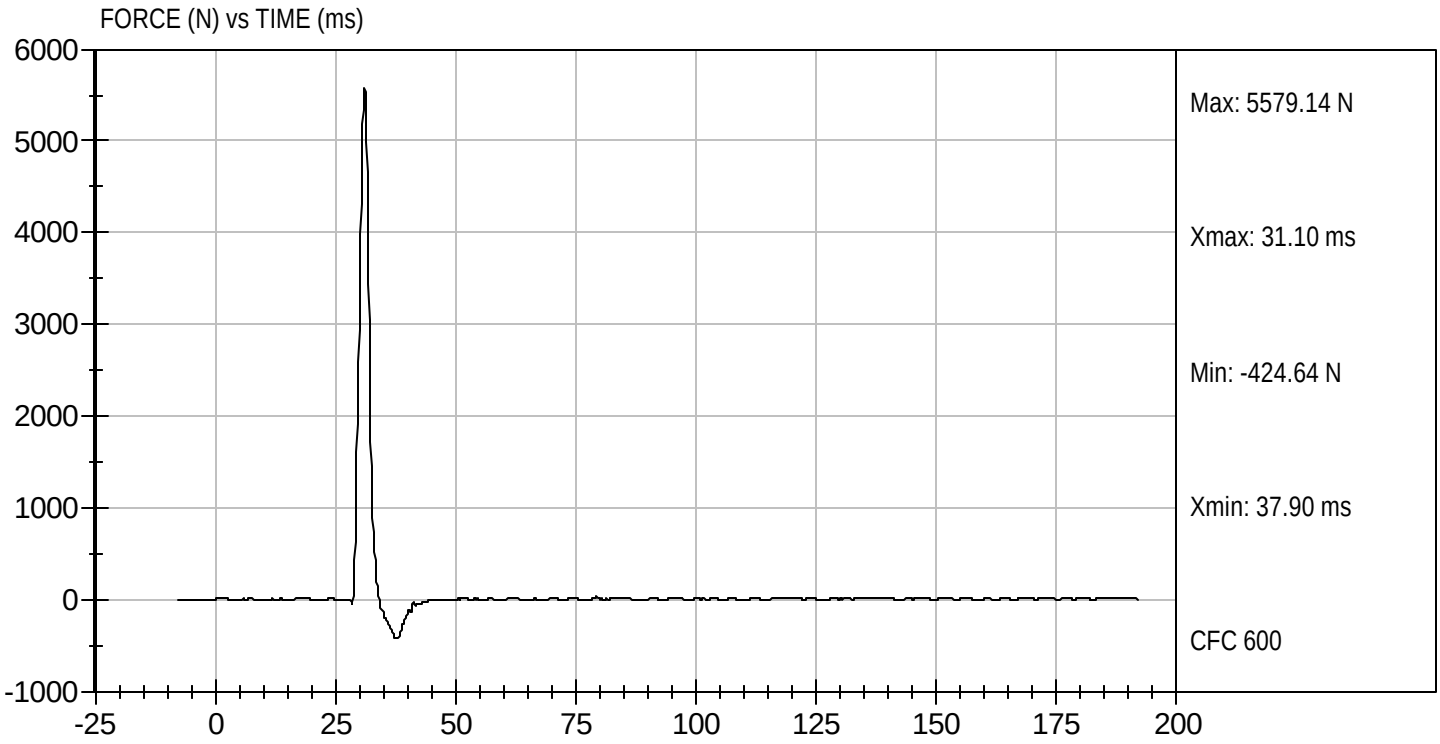
Jessica Hall
Laboratory Technician

12/01/2004
Test Date

David Winkelbauer
Approved By

Test Desc: Left Knee
Componet ID: D042716

Test Date: 12/01/2004
Velocity: 6.87 ft/s, 2.09 m/s



MGA RESEARCH CORPORATION

HIP-FEMUR FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065 **Test I.D:** D042710

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.0	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	27	27	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	70.4	69.7	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	44	44	Pass
		Overall Test Results			Pass

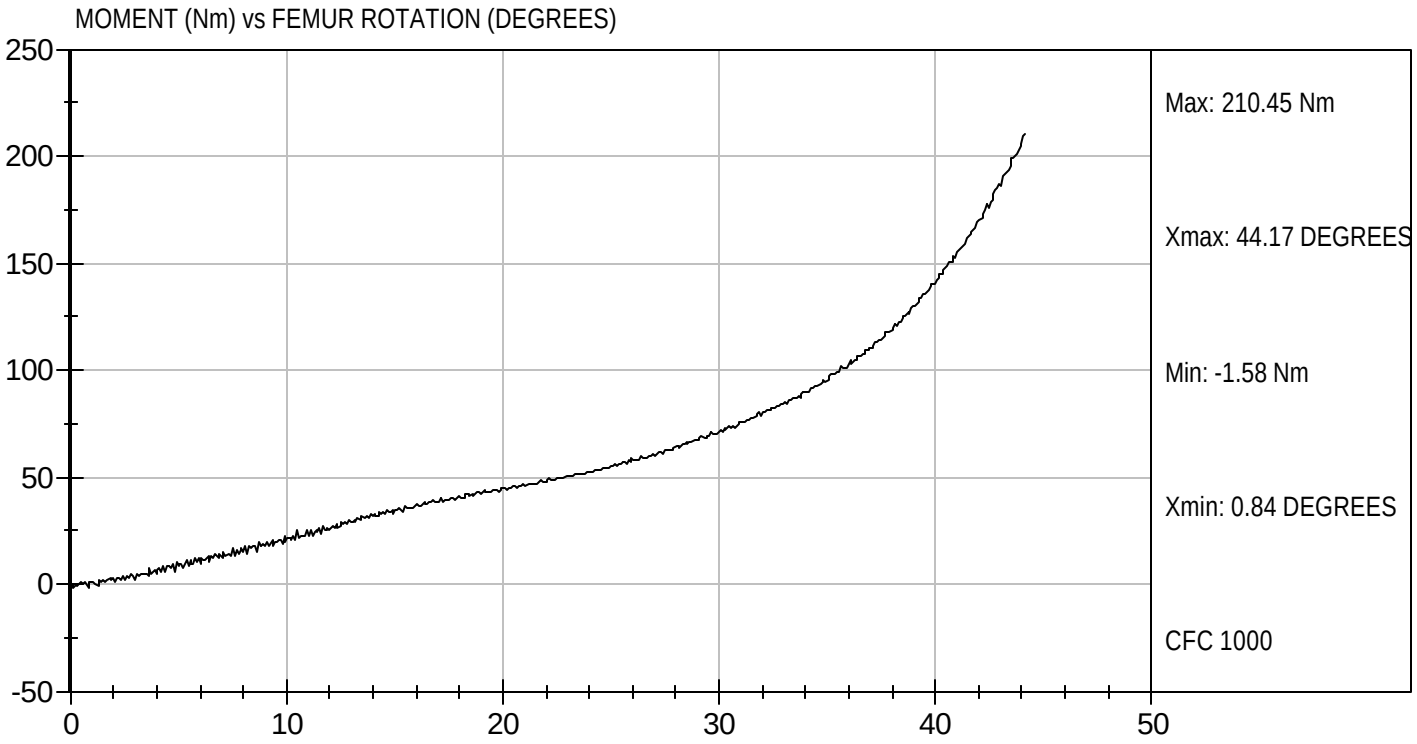
Laboratory Technician

12/01/2004
Test Date

Approved By

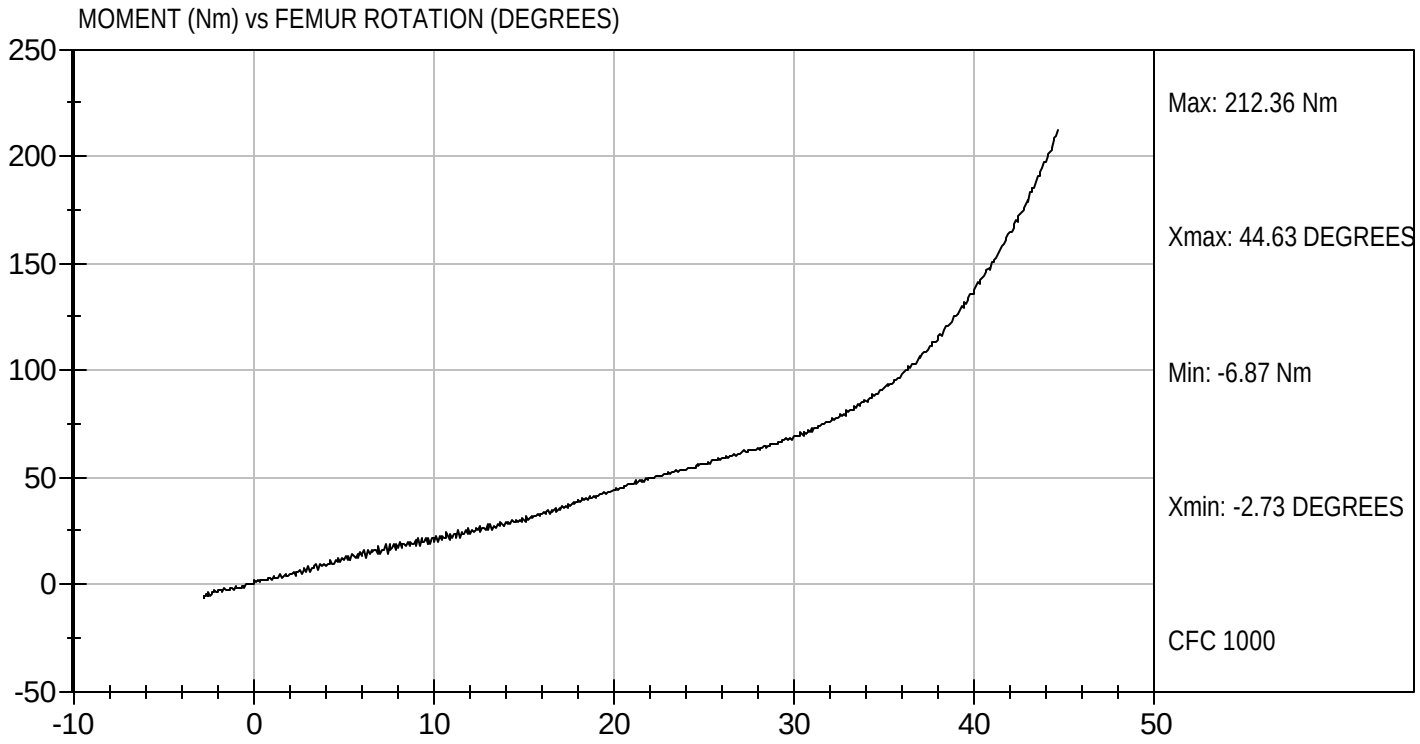
Test Desc: Hip Femur Flexion
Componet ID: D042719

Test Date: 12/01/2004
Velocity: 0 ft/s, 0.00 m/s



Test Desc: Hip Femur Flexion
Componet ID: D042710

Test Date: 12/01/2004
Velocity: 0 ft/s, 0.00 m/s



APPENDIX D

TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION

INSTRUMENTS FOR DRIVER DUMMY NO. 066

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X	A28-H01	Entran	9/17/04
Head Y	J13535	Endevco	10/25/04
Head Z	A28-H02	Entran	9/17/04
Head X Redundant	A27-Z12	Entran	9/17/04
Head Y Redundant	AH097	Endevco	10/25/04
Head Z Redundant	L17-Z14	Entran	9/17/04
Neck Load Cell	442	Denton	7/20/04
Chest X	P22086	Endevco	8/04/04
Chest Y	AJ9D2	Endevco	8/04/04
Chest Z	P24265	Endevco	8/04/04
Chest Deflection Gauge	066	Servo	8/03/04
Chest X Redundant	P22652	Endevco	8/04/04
Chest Y Redundant	AJ417	Endevco	8/04/04
Chest Z Redundant	P22150	Endevco	8/04/04
Pelvis X	J13851	Endevco	8/02/04
Pelvis Y	AJ808	Endevco	8/02/04
Pelvis Z	AH0F0	Endevco	8/02/04
Left Femur Load Cell	259	Denton	7/20/04
Right Femur Load Cell	256	Denton	7/20/04
Left Upper Tibia Load Cell	107	Denton	7/22/04
Left Lower Tibia Load Cell	136	Denton	7/22/04
Right Upper Tibia Load Cell	103	Denton	7/22/04
Right Lower Tibia Load Cell	133	Denton	7/22/04
Left Foot Z – Front	A05-A20	Entran	8/04/04
Left Ankle X	A05-A21	Entran	8/04/04
Left Ankle Z	A07-J01	Entran	8/04/04
Right Foot Z – Front	ANBP7	Endevco	7/23/04
Right Ankle X	L30-Z18	Entran	8/04/04
Right Ankle Z	A12-A11	Entran	8/04/04
Shoulder Belt Load Cell	158	Denton	6/08/04
Lap Belt Load Cell	166	Denton	6/08/04

INSTRUMENTS FOR PASSENGER DUMMY NO. 065

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X	P27020	Endevco	8/04/04
Head Y	P27025	Endevco	8/04/04
Head Z	P22692	Endevco	8/04/04
Head X Redundant	J10431	Endevco	8/04/04
Head Y Redundant	P26986	Endevco	8/04/04
Head Z Redundant	AN9E3	Endevco	8/04/04
Neck Load Cell	443	Denton	7/20/04
Chest X	AMT78	Endevco	8/04/04
Chest Y	AP1Y8	Endevco	8/04/04
Chest Z	J11361	Endevco	8/04/04
Chest Deflection Gauge	065	Servo	8/03/04
Chest X Redundant	ALFP5	Endevco	8/04/04
Chest Y Redundant	AP138	Endevco	8/04/04
Chest Z Redundant	AJ9Y3	Endevco	8/04/04
Pelvis X	C29-N11	Entran	7/01/04
Pelvis Y	C23-M12	Entran	7/01/04
Pelvis Z	C12-R01	Entran	7/01/04
Left Femur Load Cell	262	Denton	7/20/04
Right Femur Load Cell	261	Denton	7/20/04
Left Upper Tibia Load Cell	266	Denton	7/22/04
Left Lower Tibia Load Cell	179	Denton	7/22/04
Right Upper Tibia Load Cell	263	Denton	7/22/04
Right Lower Tibia Load Cell	174	Denton	7/22/04
Left Foot Z – Front	AMTL6	Endevco	9/17/04
Left Ankle X	AMTG3	Endevco	9/17/04
Left Ankle Z	ALC37	Endevco	9/17/04
Right Foot Z – Front	J21970	Endevco	9/17/04
Right Ankle X	J22033	Endevco	9/17/04
Right Ankle Z	J21691	Endevco	9/17/04
Shoulder Belt Load Cell	157	Denton	8/18/04
Lap Belt Load Cell	194	Denton	6/08/04

INSTRUMENTS FOR VEHICLE

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Left Rear Seat Crossmember X	H21-J06	Entran	10/27/04
Left Rear Seat Crossmember Z	K21-N27	Entran	8/24/04
Right Rear Seat Crossmember X	A29-F09	Entran	9/13/04
Right Rear Seat Crossmember Z	K20-J07	Entran	7/26/04
Top of Engine X	D07-N13	Entran	9/13/04
Bottom of Engine X	L23-A02	Entran	9/30/04
Left Brake Caliper X	K07-R20	Entran	9/24/04
Right Brake Caliper X	C17-J04	Entran	9/30/04
Instrument Panel X	A08-M05	Entran	9/30/04