REPORT NUMBER: NCAP-MGA-2003-002

NEW CAR ASSESSMENT PROGRAM
FRONTAL BARRIER IMPACT TEST

2003 FORD ESCORT ZX2 2 DOOR
NHTSA NUMBER: M30206

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

Test Date: December 11, 2002

Report Date: December 20, 2002

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
RULEMAKING
OFFICE OF CRASHWORTHINESS STANDARDS
400 SEVENTH STREET, SW, ROOM 5313
WASHINGTON, D.C. 20590

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

Prepared by: _____ Date: _____
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Reviewed by: _____ Date: _____
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FINAL REPORT ACCEPTED BY:

_____
Manager, New Car Assessment Program

_____
Date of Acceptance

_____
COTR, NCAP Frontal Impact Program

_____
Date of Acceptance

Technical Report Documentation Page

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16. Abstract

A 35 mph (56.3 km/h) frontal barrier impact was conducted on a 2003 Ford Escort ZX2 2 Door at MGA Research Corporation on December 11, 2002. 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 21.1 degrees Celsius. The vehicle's maximum post test static crush is 403 mm located to the right of the vehicle centerline. The test vehicle is equipped with a 3-point continuous belt system and an airbag in both front outboard seating positions. With respect to FMVSS 208 "Occupant Crash Protection", the occupant injury criteria summary is as follows:

Measurement Description	Units	Threshold	Driver ATD	Pass. ATD
Head Injury Criteria (HIC)	N/A	1000	638	622
Max. Thorax Accel. (3msec Clip)	G's	60	49	53
Left Femur force	Newtons	10009	-4231	-3716
Right Femur force	Newtons	10009	-4849	-1771

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PURPOSE AND SUMMARY OF TEST

PURPOSE

This 56.5 kph frontal barrier impact test is part of the Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under contract number DTNH22-01-D-12005. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for an impact in excess of the current 48.3 kph requirements.

SUMMARY

A load cell barrier consisting of 30 load cells was impacted by a 2003 Ford Escort ZX2 2 door at a velocity of 56.5 kph. The test was performed at MGA Research Corporation on December 11, 2002. Pre-and post-test photographs of the vehicle and dummies can be found in Appendix A.

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

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

Both ATDs were fully instrumented with head, chest and pelvis triaxial 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 145 channels of data were recorded on an on-board data acquisition system. Appendix B contains the vehicle, load cell barrier and dummy response data traces.

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

The maximum static crush of the vehicle was 403 mm and both the driver and passenger side doors remained closed and latched during the impact event and were operable after the impact.

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

The occupant data is summarized below:

ATD position	HIC	Clip(g)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)	Belt Spool (mm)
Driver	638	49.1	-28.2	-4231	-4849	*
Passenger	622	53.1	-27.8	-3716	-1771	*

* Not recorded at vehicle manufacturer's request.

The following channels have questionable data:

Driver Head X Redundant (No valid data)
Driver Head Y Redundant
Driver Head Z Redundant
Driver Chest X Redundant
Driver Chest Y Redundant
Driver Chest Z Redundant
Passenger Head X Redundant
Passenger Head Y Redundant
Passenger Head Z Redundant
Passenger Neck Force X
Passenger Neck Force Y
Passenger Neck Force Z
Passenger Neck Moment X
Passenger Neck Moment Y (Overrange at 40 msec)
Passenger Neck Moment Z
Passenger Chest X Redundant
Passenger Chest Y Redundant
Passenger Chest Z Redundant
Top of Engine X
Bottom of Engine X
Instrument Panel X
Right Rear Seat Crossmember X
Right Rear Seat Crossmember Z
Left Rear Seat Crossmember X
Left Rear Seat Crossmember Z
Right Brake Caliper X (No valid data after 55 msec)
Left Brake Caliper X

Note: These channels were recorded on a data acquisition system that suffered a blown excitation control integrated circuit at approximately 41 msec. The cause of this problem was a static discharge injected on the Passenger Head X Redundant Acceleration.

The Driver Pelvis Y Acceleration had no valid data collected due to a poor wire routing.

The Passenger Right Femur Force is questionable.

SECTION 2

OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

Test Vehicle: 2003 Ford Escort ZX2 2 Door
Test Program: 35mph Frontal Impact
NHTSA No.: M30206
Test Date: 12/11/2002

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: 2003 Ford Escort ZX2 2 Door
Test Program: 35mph Frontal Impact
NHTSA No.: M30206
Test Date: 12/11/2002

PRIMARY IMPACT DATA

Measured Parameter	Units	Value
Velocity at Impact	km/hr	56.5
Test Weight	kg	1340.0
Average Rebound	mm	615
Maximum Static Crush	mm	403
Impact Angle	degrees	0.2

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Passenger
Front Door Opening	Door remained closed and latched; Door opened without tools	Door remained closed and latched; Door opened without tools
Rear Door Opening	Not applicable	Not applicable
Seat Track Shift (mm)	0	0
Seat Back Failure	None	None

TEST DUMMY INFORMATION

Description	Driver	Passenger
Dummy Type / Serial No.	66	65
Head Contact	Airbag, Head rest	Airbag, Head rest
Chest Contact	Airbag	Airbag
Abdomen Contact	None	None
Left Knee Contact	Bolster and Steering column	Glove box
Right Knee Contact	Bolster and Steering column	Glove box

16mm MOVIE COVERAGE

High Speed	17
Real Time	1
Total	18

Driver ATD Sensors	42
Passenger ATD Sensors	42
Belt Assessment Sensors	0
Vehicle Structure Accelerometers	9
Rigid Barrier Load Cells	6
Total	99

DATA SHEET NO. 2

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2003 Ford Escort ZX2 2 Door
Test Program: 35mph Frontal Impact
NHTSA No.: M30206
Test Date: 12/11/2002

TEST VEHICLE INFORMATION

Manufacturer	Ford Motor Company
Model	Escort ZX2
Body Style	2 Door Coupe
NHTSA No.	M30206
VIN	3FAFP11333R113861
Color	Blue
Delivery Date	11/27/02
Odometer Reading (mile)	63
Dealer	Gordie Boucher
Transmission	Automatic
Final Drive	Front Wheel
Number of Cylinders	4
Engine Displacement (L)	2.0
Engine Placement	Transverse

TEST VEHICLE OPTIONS

Driver Airbag	Yes
Passenger Airbag	Yes
Force Limiter	No
Pretensioner	No
Power Windows	No
Power Steering	Yes
Power Door Locks	Yes
Tilt Wheel	Yes
Air Conditioning	Yes
Power Brakes	Yes
Disc Brakes, Front	Yes
Disc Brakes, Rear	No
Anti-lock Brakes	No
AM/FM/Cassette	Yes
Anti-theft System	No
Cruise Control	No

DATA FROM CERTIFICATION LABEL

Manufactured By	Ford Motor Company
Date of Manufacture	11/02

GVWR (kg)	1530
GAWR Front (kg)	874
GAWR Rear (kg)	658

DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	221	241
Recommended Tire Size	P185/60R15	P185/60R15
Tire Size on Vehicle	P185/60R15	P185/60R15
Tire Manufacturer	Goodyear	Goodyear

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bucket	NA	
Number Of Occupants	2	2	NA	4
Capacity Wt. (VCW) (kg)				308
Cargo Wt. (RCLW) (kg)				36.3

DATA SHEET NO. 2...(continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2003 Ford Escort ZX2 2 Door NHTSA No.: M30206
Test Program: 35mph Frontal Impact Test Date: 12/11/2002

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	372.4	206.4		425.5	250.8	
Right	kg	371.5	204.1		416.0	247.7	
Ratio	%	64.4	35.6		62.8	37.2	
Totals	kg	743.9	410.5	1154.4	841.5	498.5	1340.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1154.4
Weight of 2 P572E ATDs	kg	156.0
Rated Cargo/Luggage Weight (RCLW)	kg	36.3
Calculated Vehicle Target Weight (TVTW)	kg	1346.7

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG(aft of front axle)
As Delivered	mm	668	671	674	673	889
As Tested	mm	651	654	653	655	930
Post Test	mm	656	649	637	627	

Vehicle Wheelbase (mm): 2500

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

Vehicle Components Removed: Trunk lid, rear bumper, spare tire, jack, outside mirrors and all cargo area interior.

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

FUEL SYSTEM DATA

Fuel System Capacity From Owner's Manual (L): 48.1

Usable Capacity Figure Furnished by COTR (L): 48.1

Actual Test Volume (L): 22.7

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"? no

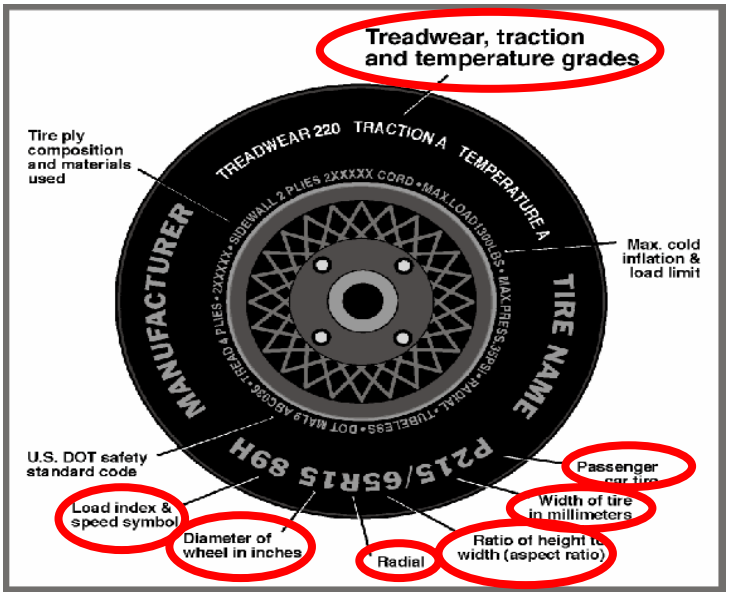
DATA SHEET NO. 3

TEST VEHICLE TIRE INFORMATION

Test Vehicle: 2003 Ford Escort ZX2 2 Door
Test Program: 35mph Frontal Impact

NHTSA No.: M30206
Test Date: 12/11/2002

Vehicle Year	2003	Vehicle Make	Ford
VIN	3FAFP11333R113861	Vehicle Model	Escort ZX2



	Front	Rear
Tire Manufacturer	Goodyear	Goodyear
Tire Name	Eagle – RSA	Eagle – RSA
Tire Type	P	P
Tire Width (mm)	185	185
Ratio of Height to Width (aspect ratio)	60	60
Radial	Y	Y
Wheel Diameter	15	15
Load Index & Speed Symbol	84T	84T
Treadwear	260	260
Traction Grade	A	A
Temperature Grade	B	B

DATA SHEET NO. 4

POST IMPACT DATA

Test Vehicle: 2003 Ford Escort ZX2 2 Door
Test Program: 35mph Frontal Impact

NHTSA No.: M30206
Test Date: 12/11/2002

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	4135	3909	226
Center	mm	4407	4024	383
Right Side	mm	4135	3878	257

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	649
Center	mm	558
Right Side	mm	639
Average	mm	615

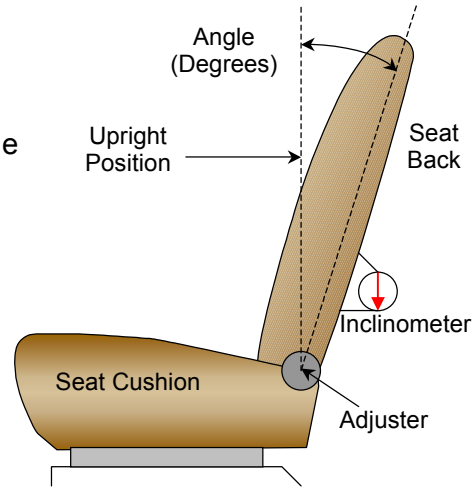
DATA SHEET NO. 5

TEST VEHICLE INFORMATION

Test Vehicle: 2003 Ford Escort ZX2 2 Door NHTSA No.: M30206
Test Program: 35mph Frontal Impact Test Date: 12/11/2002

NORMAL DESIGN RIDING POSITION

The driver and passenger seat back is positioned to the manufacturer's designated angle. The procedure is as follows: The seat back angle is measured along rear edge of outer seat back frame. Adjust the seat back to the 5th latch from the first indent as (0).



FRONT SEAT ASSEMBLY

Driver seat back angle: 21 deg
Passenger seat back angle: 20.9 deg

SEAT FORE/AFT POSITIONS

The driver and the passenger seat are manually operated. The total travel on the driver and the passenger seat is 23 seat positions. The fore/aft position is set at the middle position for both driver and passenger.

Driver seat fore/aft total travel: 23 notches
Passenger seat fore/aft total travel: 23 notches
Driver seat fore/aft position: 12 of 23 notches
Passenger seat fore/aft position: 12 of 23 notches

SEAT BELT UPPER ANCHORAGE

The front outboard D-rings were non adjustable.

DATA SHEET NO. 5...(continued)

TEST VEHICLE INFORMATION

Test Vehicle: 2003 Ford Escort ZX2 2 Door
Test Program: 35mph Frontal Impact

NHTSA No.: M30206
Test Date: 12/11/2002

FUEL TANK CAPACITY DATA

The "Usable Capacity" of the standard equipment fuel tank is: 48.1 liters

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

The "Usable Capacity" used for certification to FMVSS 301 requirements: 48.1 liters

Actual amount of Stoddard solvent added to vehicle for certification test: 22.7 liters

The test vehicle is equipped with an electric fuel pump. The fuel filler door is located on the left rear fender.

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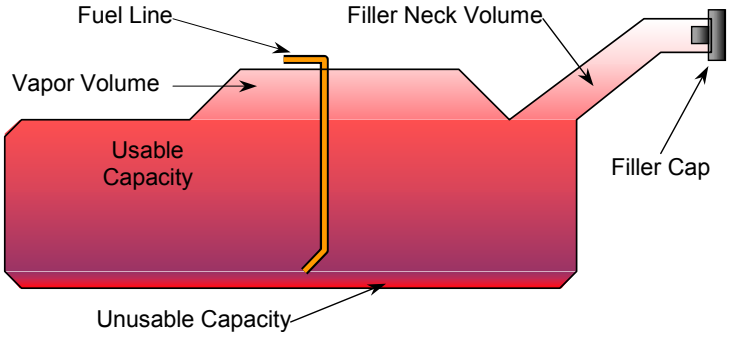
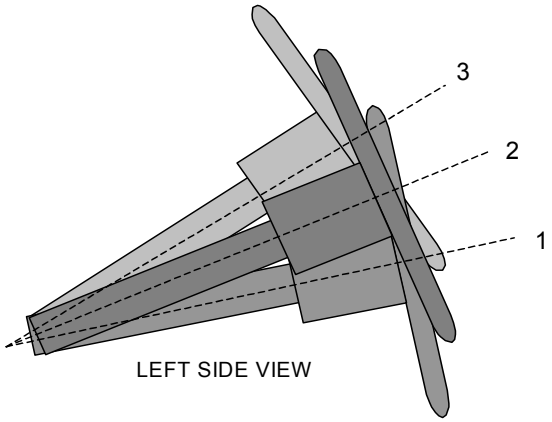


VEHICLE FUEL TANK ASSEMBLY

STEERING COLUMN ADJUSTMENT

The steering column was not adjustable.



STEERING COLUMN ASSEMBLY

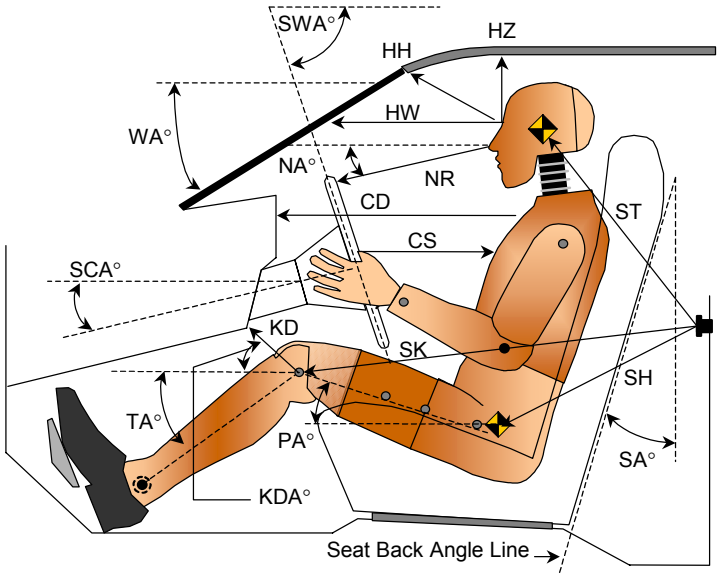
DATA SHEET NO. 6

DUMMY POSITIONING IN VEHICLE

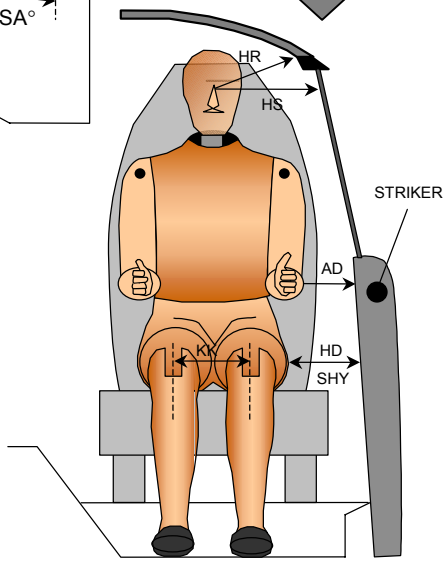
Test Vehicle: 2003 Ford Escort ZX2 2 Door
Test Program: 35mph Frontal Impact

NHTSA No.: M30206
Test Date: 12/11/2002

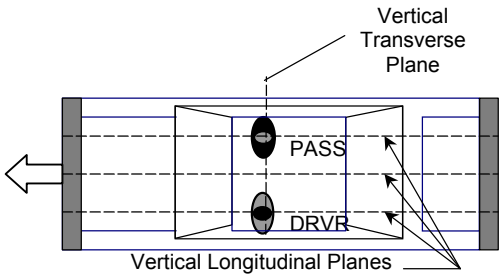
DUMMY MEASUREMENTS FOR FRONT SEAT OCCUPANTS



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: 2003 Ford Escort ZX2 2 Door
Test Program: 35mph Frontal Impact

NHTSA No.: M30206
Test Date: 12/11/2002

TEST DUMMY POSITION MEASUREMENTS

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA	Windshield Angle		30.2		
SWA	Steering Wheel Angle		65.5		
SCA	Steering Column Angle		24.1		
SA	Seat Back Angle		21.0		20.9
HZ	Head to Roof (Z)	185	90	165	90
HH	Head to Header	318	25.3	305	21.0
HW	Head to Windshield	559	0	522	0
HR	Head to Side Header (Y)	189		177	
NR	Nose to Rim	410	11.6		
CD	Chest to Dash	528		531	
CS	Chest to Steering Hub	329	7.5		
RA	Rim to Abdomen	194	0		
KDL	Left Knee to Dash	215	0	154	
KDR	Right Knee to Dash	210		195	0
PA	Pelvic Angle		24.0		24.0
TA	Tibia Angle		39.5		41.5
KK	Knee to Knee (Y)	310		216	
SK	Striker to Knee	215	91.5	839	92.7
ST	Striker to Head	578	31.6	584	32.7
SH	Striker to H-Point	456	109.1	461	111.7
SHY	Striker to H-Point (Y)	269		254	
HS	Head to Side Window	304		271	
HD	H-Point to Door (Y)	150		129	
AD	Arm to Door (Y)	79		99	
AA	Ankle to Ankle	310		190	

DATA SHEET NO. 7

SEAT BELT POSITIONING DATA

Test Vehicle: 2003 Ford Escort ZX2 2 Door
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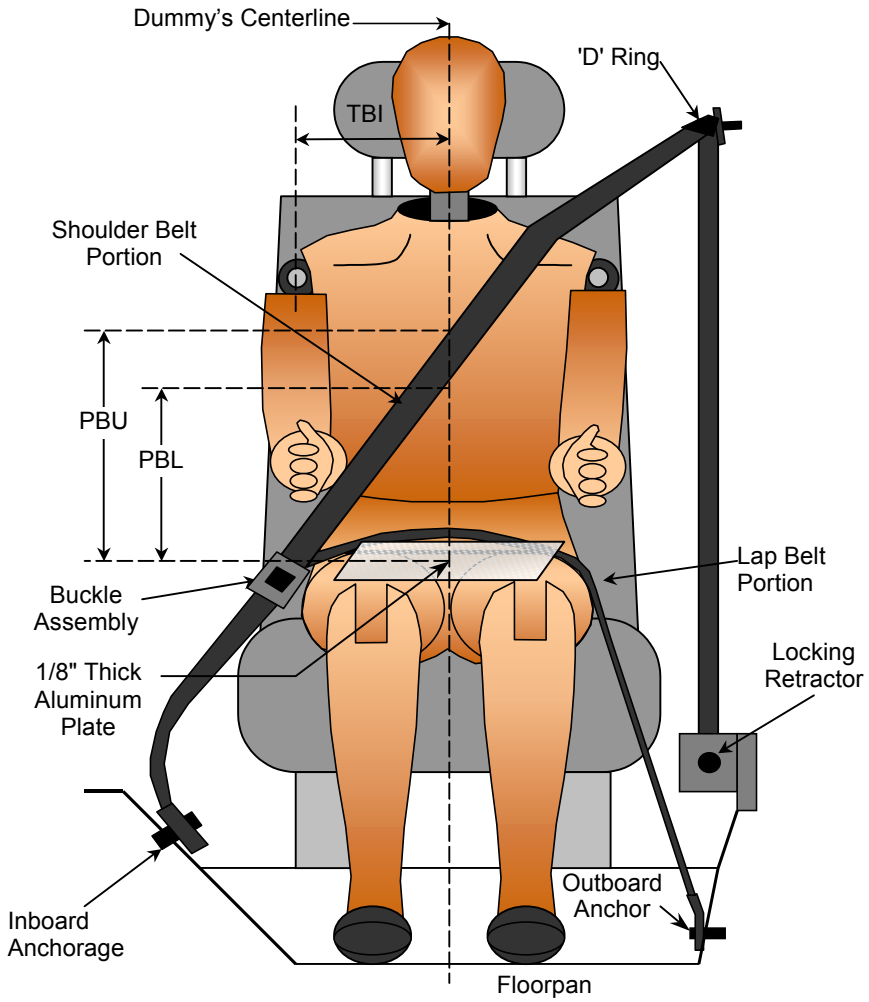
NHTSA No.: M30206
Test Date: 12/11/2002



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	345	340
PBL - To surface of reference to belt lower edge	mm	270	265

DATA SHEET NO. 8

VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY

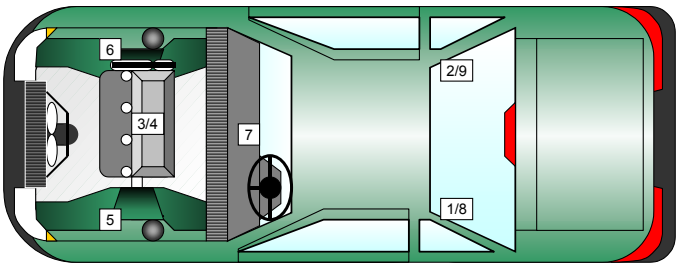
Test Vehicle: 2003 Ford Escort ZX2 2 Door
Test Program: 35mph Frontal Impact
NHTSA No.: M30206
Test Date: 12/11/2002

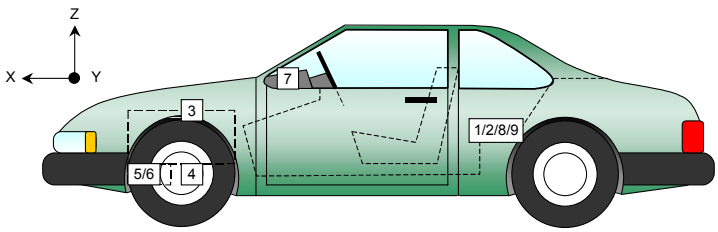
VEHICLE ACCELEROMETER PEAK DATA AND PRE-TEST LOCATIONS

*** Questionable data – see note on page 2**

No.	Accelerometer Location	Measurements (mm)			Peak Values				
		X	Y	Z	Units	Max	Time	Min	Time
1	Left Rear X-Member X	1644	-560	375	G's	*	*	*	*
2	Right Rear X-Member X	1644	560	375	G's	*	*	*	*
3	Engine Top X	3660	0	830	G's	*	*	*	*
4	Engine Bottom X	3580	210	185	G's	*	*	*	*
5	Left Brake Caliper X	3540	-632	210	G's	*	*	*	*
6	Right Brake Caliper X	3540	632	210	G's	*	*	*	*
7	Instrument Panel X	2755	0	190	G's	*	*	*	*
8	Left Rear X-Member Z	1644	-560	375	G's	*	*	*	*
9	Right Rear X-Member Z	1644	560	375	G's	*	*	*	*

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: 2003 Ford Escort ZX2 2 Door
Test Program: 35mph Frontal Impact
NHTSA No.: M30206
Test Date: 12/11/2002

HEAD PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Head CG	X	G's	3.7	200	-60.0	80	1.5	200	-47.4	79
Head CG	Y	G's	10.1	83	-1.7	46	8.0	54	-33.2	84
Head CG	Z	G's	31.7	75	-3.0	29	35.6	83	-1.5	29
Head CG Resultant	N/A	G's	67.2	81			64.2	83		

CHEST PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	G's	2.2	169	-50.2	71	2.2	159	-53.7	82
Chest CG	Y	G's	6.6	94	-8.1	56	5.2	69	-5.5	96
Chest CG	Z	G's	9.6	53	-11.7	62	9.2	48	-10.1	84
Chest CG Resultant	N/A	G's	50.5	71			54.5	82		

FEMUR PEAK FORCES

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Left Femur	Z	Newtons	1069.5	52	-4231.2	63	606.7	94	-3715.9	56
Right Femur	Z	Newtons	1441.4	53	-4848.5	62	*	*	*	*

* Questionable data

SEAT BELT SENSOR PEAK VALUES

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Lap Belt Force	N/A	Newtons	*	*			*	*		
Shoulder Belt Force	N/A	Newtons	*	*			*	*		

* - not recorded at vehicle manufacturer's request.

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	637.5	51.3	63.1	96.9	622.1	50.2	62.7	97.5

CHEST CLIP (3MSEC)

Location	Driver			Passenger		
	CLIP	T^1	T^2	CLIP	T^1	T^2
Chest CG Primary	49.1	69.4	72.4	53.1	80.7	83.7

DATA SHEET NO. 9... (continued)

HYBRID III ATD INJURY CRITERIA AND SENSOR DATA

Test Vehicle: 2003 Ford Escort ZX2 2 Door
Test Program: 35mph Frontal Impact
NHTSA No.: M30206
Test Date: 12/11/2002

PELVIC PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Pelvis	X	G's	8.2	52	-84.6	61	4.4	118	-72.4	42
Pelvis	Y	G's	*	*	*	*	12.5	54	-7.1	93
Pelvis	Z	G's	3.1	48	-35.8	78	7.2	46	-34.8	82

* No valid data collected

UPPER NECK PEAK FORCES AND MOMENTS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Neck Force	X	Newtons	72	199	-637	103	*	*	*	*
Neck Force	Y	Newtons	162	75	-48	46	*	*	*	*
Neck Force	Z	Newtons	1657	75	-217	117	*	*	*	*
Neck Moment	X	N•m	8.6	117	-8.7	55	*	*	*	*
Neck Moment	Y	N•m	34.4	118	-30.4	55	*	*	*	*
Neck Moment	Z	N•m	1.9	149	-14.0	99	*	*	*	*

* Questionable data- see note on page 2

FOOT PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Left Foot Aft	X	G's	8.8	100	-54.8	51	46.0	54	-164.7	46
Left Foot Aft	Z	G's	17.0	62	-83.6	38	40.6	66	-143.9	46
Left Foot Fore	Z	G's	15.7	72	-100.3	50	78.3	56	-204.5	43
Right Foot Aft	X	G's	30.2	56	-273.8	46	17.7	88	-145.5	45
Right Foot Aft	Z	G's	103.6	58	-234.4	47	24.0	74	-132.6	45
Right Foot Fore	Z	G's	92.4	62	-394.3	44	57.6	74	-114.2	44

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	179.8	46	-29.1	38	48.8	47	-99.8	56
Left Lower Moment	Y	N•m	70.9	42	-28.6	76	219.3	56	-40.6	47
Left Lower Force	Z	Newtons	78	188	-5058	42	79	123	-5401	46
Left Upper Moment	X	N•m	103.5	75	-47.7	40	54.0	47	-67.6	63
Left Upper Moment	Y	N•m	11.6	196	-130.8	52	55.7	61	-185.1	47
Left Upper Force	Z	Newtons	177	133	-3650	43	91	123	-4087	45
Right Lower Moment	X	N•m	196.8	51	-129.5	48	12.4	76	-31.2	56
Right Lower Moment	Y	N•m	131.3	69	-79.5	46	72.7	75	-13.1	38
Right Lower Force	Z	Newtons	114	134	-10691	48	97	155	-7492	46
Right Upper Moment	X	N•m	106.7	61	-139.0	48	15.6	94	-100.9	59
Right Upper Moment	Y	N•m	31.6	144	-345.4	47	91.1	61	-200.3	46
Right Upper Force	Z	Newtons	123	125	-7668	48	94	89	-6074	46

DATA SHEET NO. 9...(continued)

HYBRID III ATD INJURY CRITERIA AND SENSOR DATA

Test Vehicle: 2003 Ford Escort ZX2 2 Door
Test Program: 35mph Frontal Impact
NHTSA No.: M30206
Test Date: 12/11/2002

CHEST PEAK DISPLACEMENTS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	mm			-28.2	82			-27.8	83.3

HEAD REDUNDANT PEAK ACCELERATIONS

Location	Axis	Units	Driver*				Passenger*			
			Max	Time	Min	Time	Max	Time	Min	Time
Head CG	X	G's	*	*	*	*	**	**	**	**
Head CG	Y	G's	*	*	*	*	*	*	*	*
Head CG	Z	G's	*	*	*	*	*	*	*	*
Head CG	N/A	G's	*	*						

* Questionable data- see note on page 2 ** No valid data collected

CHEST REDUNDANT PEAK ACCELERATIONS

Location	Axis	Units	Driver*				Passenger*			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	G's	*	*	*	*	*	*	*	*
Chest CG	Y	G's	*	*	*	*	*	*	*	*
Chest CG	Z	G's	*	*	*	*	*	*	*	*
Chest CG	N/A	G's	*	*			*	*		

* Questionable data- see note on page 2

REDUNDANT 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 Redundant	*	*	*	*				

* Questionable data- see note on page 2

REDUNDANT CHEST CLIP (3MSEC)

Location	Driver			Passenger		
	CLIP	T^1	T^2	CLIP	T^1	T^2
Chest CG Primary Redundant	*	*	*	*	*	*

* Questionable data- see note on page 2

DATA SHEET NO. 10

SEAT BELT PERFORMANCE ASSESSMENT TEST DATA

Test Vehicle: 2003 Ford Escort ZX2 2 Door
Test Program: 35mph Frontal Impact
NHTSA No.: M30206
Test Date: 12/11/2002

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	345	340
PBL - Top surface of reference to belt lower edge	mm	270	265

BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Retractor reel to "D" ring	mm	85	79
Shoulder belt length as measured on ATD	mm	952	944
Lap belt length as measured on ATD	mm	775	797
Remainder of belt on reel	mm	1320	1322
Total belt length for continuous webbing systems	mm	3132	3142

SHOULDER BELT SPOOL-OUT DATA

Measurement Description	Units	Driver	Passenger
As determined mechanically	mm	*	*
As determined electronically	mm	*	*

* Not recorded at vehicle manufacturer's request.

DATA SHEET NO. 11

SUMMARY OF FMVSS 212 DATA

Test Vehicle: 2003 Ford Escort ZX2 2 Door
Test Program: 35mph Frontal Impact
NHTSA No.: M30206
Test Date: 12/11/2002

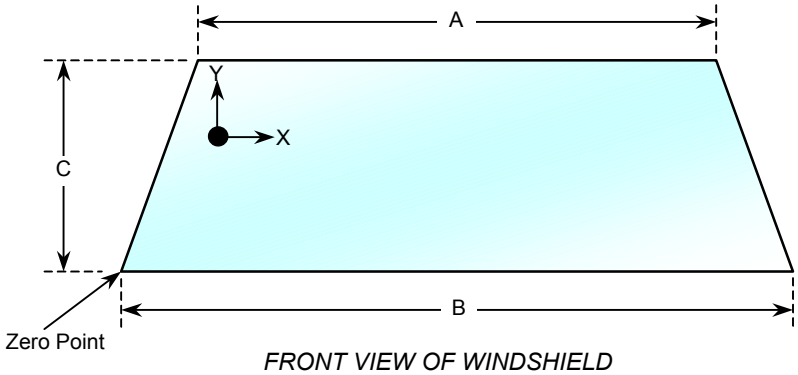
Windshield Mounting Details:
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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	1930	1930	100
Right Side	1946	1946	100
Total	3876	3876	100



FRONT VIEW OF WINDSHIELD

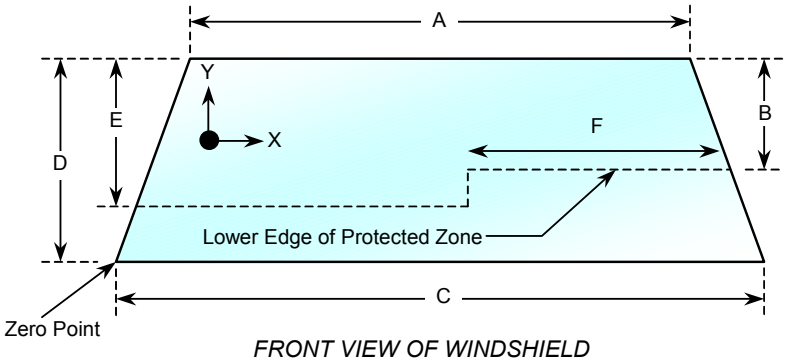
WINDSHIELD DIMENSIONS

Item	Units	Segment Length	Molding Width
A	mm	1075	15
B	mm	1462	15
C	mm	672	15

DATA SHEET NO. 12

WINDSHIELD ZONE INTRUSION FMVSS 219 (Partial) DATA

Test Vehicle: 2003 Ford Escort ZX2 2 Door
Test Program: 35mph Frontal Impact
NHTSA No.: M30206
Test Date: 12/11/2002



FRONT VIEW OF WINDSHIELD

Item	Units	Value
A	mm	1078
B	mm	377
C	mm	1462
D	mm	672
E	mm	437
F	mm	734

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: 2003 Ford Escort ZX2 2 Door NHTSA No.: M30206
Test Program: 35mph Frontal Impact Test Date: 12/11/2002

Temperature at Time of Impact: 21.1° C Test Time: 1:58 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)

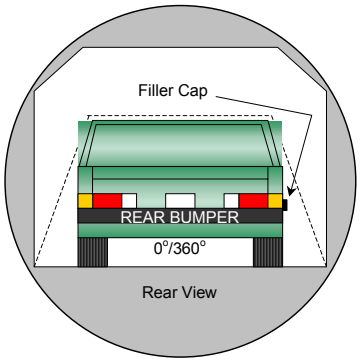
D. Spillage : None

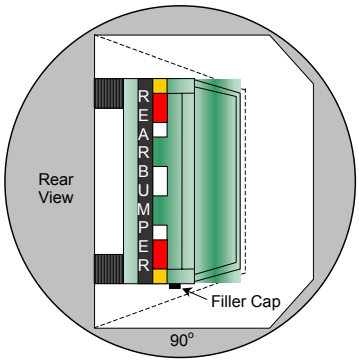
DATA SHEET NO. 14

FMVSS 301 STATIC ROLLOVER DATA

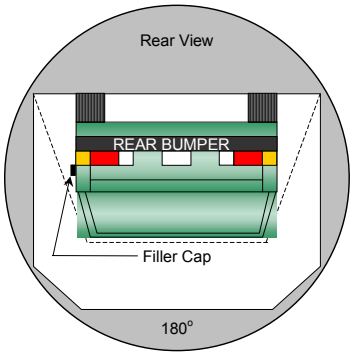
Test Vehicle: 2003 Ford Escort ZX2 2 Door NHTSA No.: M30206
Test Program: 35mph Frontal Impact Test Date: 12/11/2002

Test Time: 1:58 pm

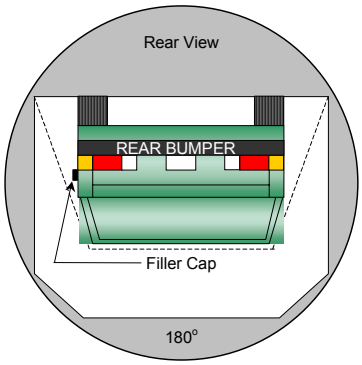




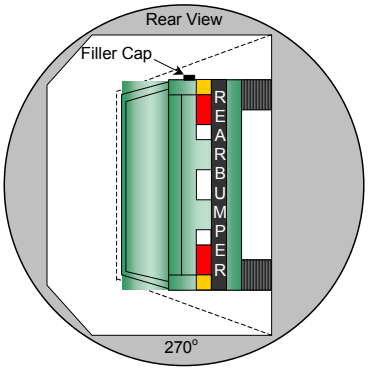
0° TO 90°

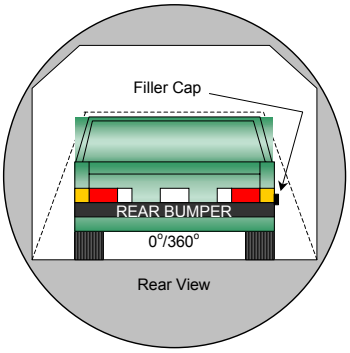


90° TO 180°



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°	164	300	0
90° TO 180°	150	300	0
180° TO 270°	139	300	0
270° TO 360°	162	300	0

DATA SHEET NO. 15

VEHICLE MEASUREMENTS

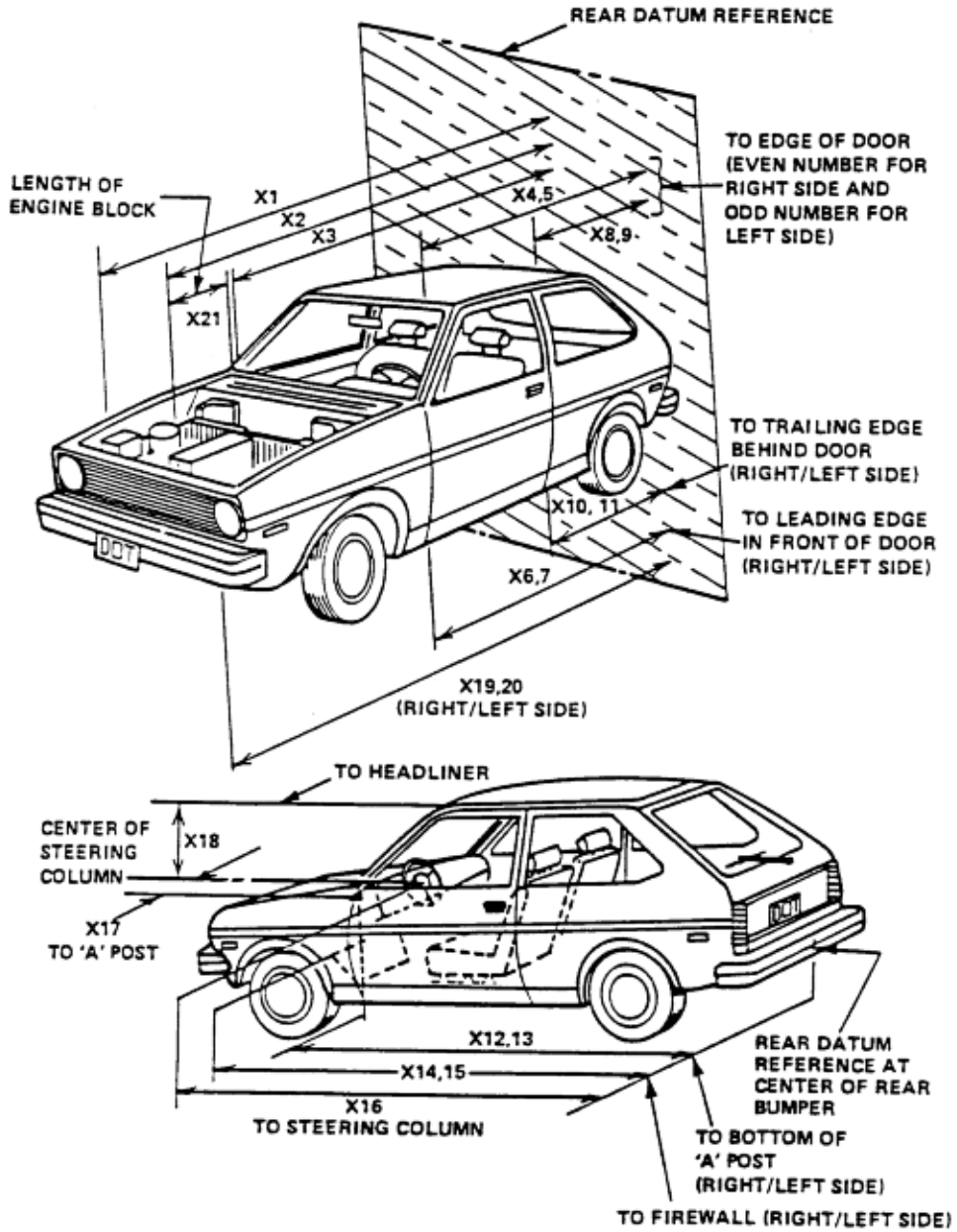
Test Vehicle: 2003 Ford Escort ZX2 2 Door NHTSA No.: M30206
Test Program: 35mph Frontal Impact Test Date: 12/11/2002

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total length of vehicle at centerline	mm	4407	4024	383
2	RSOV to front of engine	mm	3792	3647	145
3	RSOV to firewall centerline	mm	3272	3242	30
4	RSOV to leading edge of right door	mm	2937	2931	6
5	RSOV to leading edge of left door	mm	2926	2930	-4
6	RSOV to lower leading edge of right door	mm	2967	2962	5
7	RSOV to lower leading edge of left door	mm	2963	2965	-2
8	RSOV to upper leading edge of right door	mm	1717	1723	-6
9	RSOV to upper leading edge of left door	mm	1713	1718	-5
10	RSOV to lower trailing edge of right door	mm	1694	1689	5
11	RSOV to lower trailing edge of left door	mm	1688	1691	-3
12	RSOV to bottom of right 'A' pillar	mm	2947	2949	-2
13	RSOV to bottom of left 'A' pillar	mm	2937	2943	-6
14	RSOV to firewall on right side	mm	3223	3221	2
15	RSOV to firewall on left side	mm	3209	3188	21
16	RSOV to steering column	mm	2487	2512	-25
17	Center of steering column to left 'A' pillar	mm	396	550	-154
18	Center of steering column to headlining	mm	433	597	-164
19	RSOV to right side of front bumper	mm	4135	3878	257
20	RSOV to left side of front bumper	mm	4135	3909	226
21	Length of engine block	mm	475	475	0
RD	RSOV to right side of dash panel	mm	2778	2788	-10
CD	RSOV to center of dash panel	mm	2716	2679	37
LD	RSOV to left side of dash panel	mm	2732	2727	5

DATA SHEET NO. 15...(continued)

VEHICLE MEASUREMENTS

Test Vehicle: 2003 Ford Escort ZX2 2 Door NHTSA No.: M30206
Test Program: 35mph Frontal Impact Test Date: 12/11/2002



DATA SHEET NO. 15... (continued)

VEHICLE MEASUREMENTS

Test Vehicle: 2003 Ford Escort ZX2 2 Door NHTSA No.: M30206
Test Program: 35mph Frontal Impact Test Date: 12/11/2002

Target Vehicle Structural Measurement

	Elements	Pre-Test (mm)
1	Total Length	4407
2	Total Width	1690
3	Bumper Top Height	530
4	Bumper Bottom Height	415
5	Longitudinal Member Top Height	535
6	Distance between Longitudinal Members	405
7	Longitudinal Member Width	1033
8	Engine Top Height	748
9	Engine Bottom Height	170
10	Engine and gearbox width	765
11	Front bumper-engine distance	593
12	Front shock absorber fixing height	808
13	Bonnet leading edge height	665
14	Front shock absorber fixing width	1090
15	Front bumper – front axle distance	972
16	Front axle – a pillar distance	378
17	A-pillar – B-pillar distance	1355
18	B-Pillar – rear axle distance	749
19	B-pillar – C-pillar distance	585
20	Roof sill bottom height	1213
21	Roof sill top height	1314
22	Floor sill bottom height	207
23	Floor sill top height	304

DATA SHEET NO. 16

CAMERA LOCATIONS

Test Vehicle: 2003 Ford Escort ZX2 2 Door
Test Program: 35mph Frontal Impact
NHTSA No.: M30206
Test Date: 12/11/2002

No.	Camera View	Location (mm) *			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Side View				18	32
2	Left Front View	1000	-8270	1520	25	1036
3	Steering Column Top	1860	-7540	1550	25	1053
4	Steering Column Bottom	1860	-7540	1030	25	1026
5	Driver Close-up	1330	-9240	1450	75	1053
6	Driver Angle	4540	-5160	2000	50	1064
7	Left Child Offboard	2520	-7950	1620	50	Did not run
8	Right Child Offboard	2950	7200	1670	50	1000
9	Right Overall	1840	6450	1540	13	1064
10	Right Passenger Half	1000	7950	1410	25	1020
11	Right Close-up	1420	10000	1460	75	1010
12	Right Angle	4740	5500	2110	50	1142
13	Windshield	700	0	2650	13	1020
14	Top Driver	-90	-430	1570	13	1042
15	Top Passenger	-90	460	1570	13	1020
16	Pit Front	1080	0	-3220	13	1031
17	Pit Rear	2870	0	-3220	13	1015
18	Left Overall	380	-8480	1440	25	500

*COORDINATES:

+X = film plane rearward of barrier

+Y = film plane to right of monorail centerline

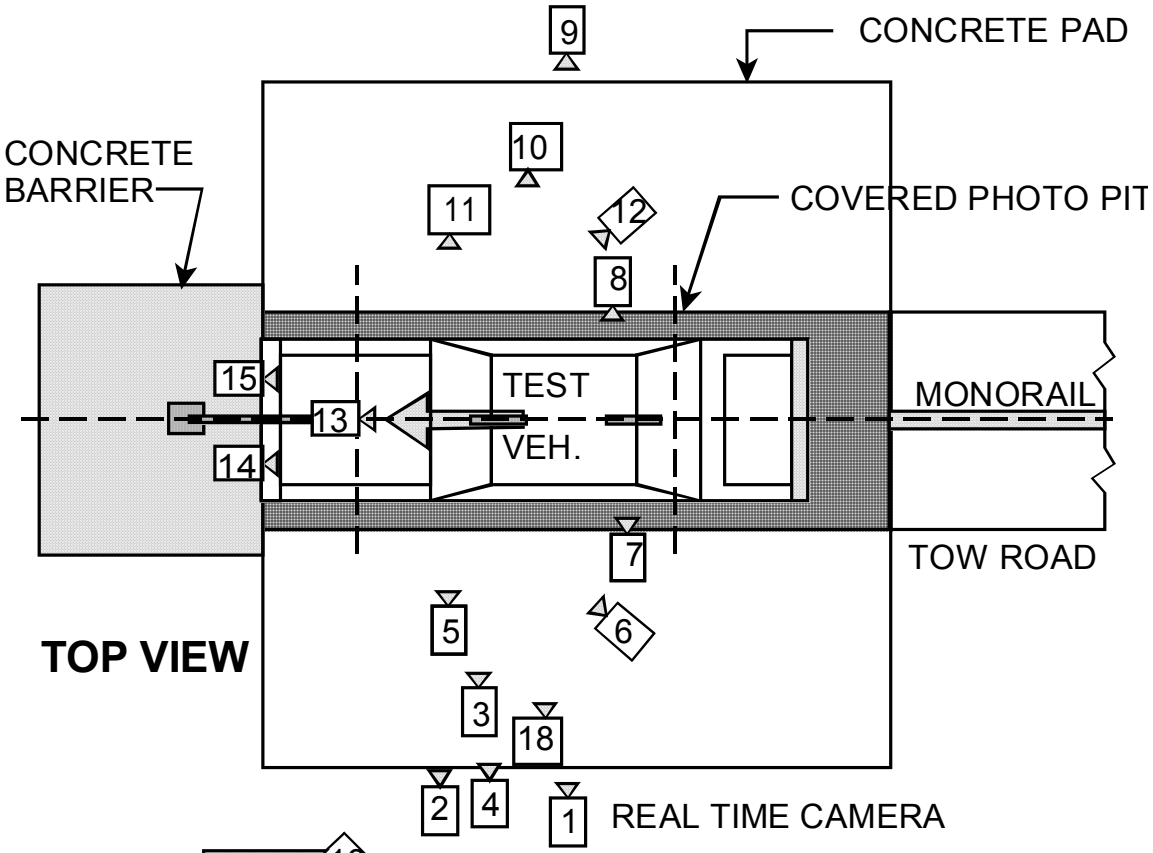
+Z = film plane above ground level

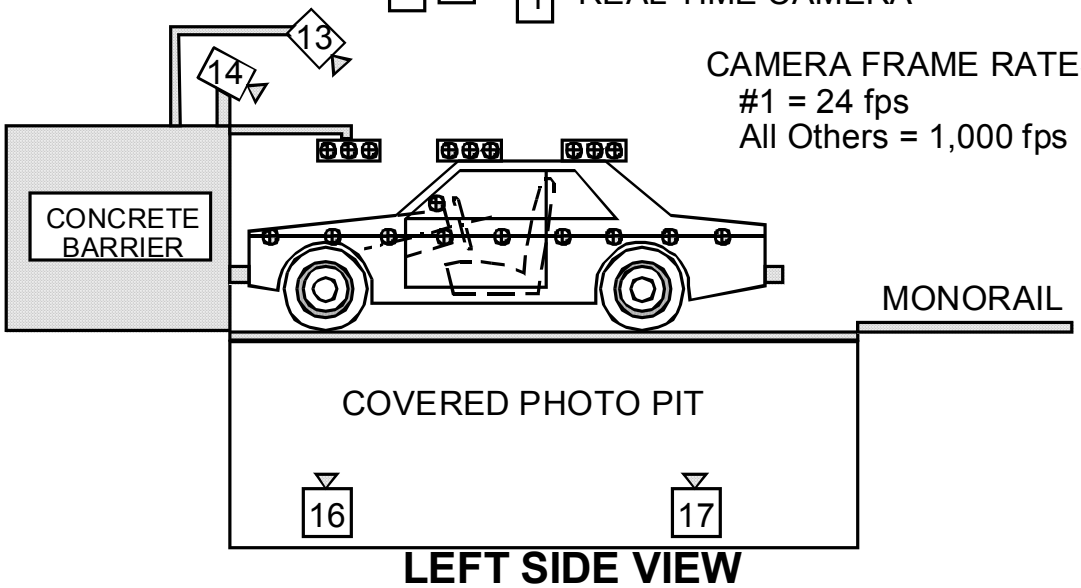
DATA SHEET NO. 16... (continued)

CAMERA LOCATIONS

Test Vehicle: 2003 Ford Escort ZX2 2 Door NHTSA No.: M30206
Test Program: 35mph Frontal Impact Test Date: 12/11/2002

CAMERA POSITIONS FOR FRONTAL IMPACTS





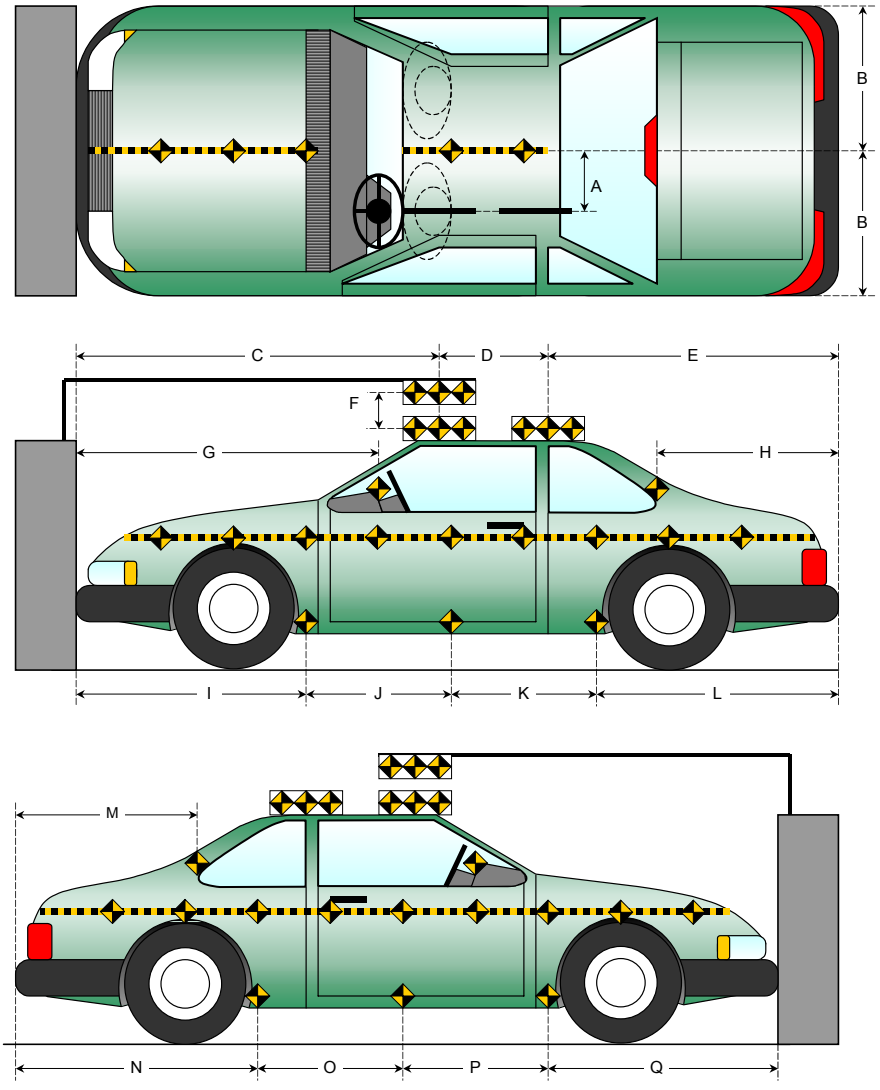
DATA SHEET NO. 17

PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2003 Ford Escort ZX2 2 Door
Test Program: 35mph Frontal Impact

NHTSA No.: M30206
Test Date: 12/11/2002

Item	Value
A	348
B	845
C	2341
D	610
E	1456
F	155
G	*
H	1300
I	1431
J	828
K	821
L	1327
M	1279
N	1374
O	823
P	827
Q	1383



* Steering Column target removed.

DATA SHEET NO. 18

VEHICLE INTRUSION MEASUREMENTS

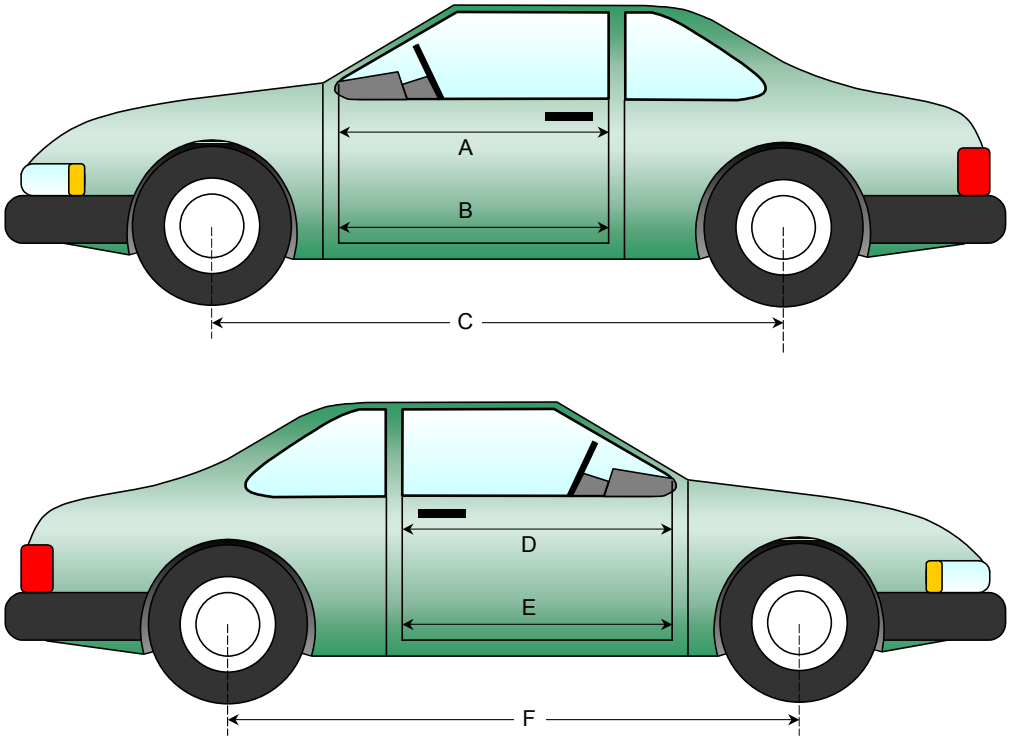
Test Vehicle: 2003 Ford Escort ZX2 2 Door
Test Program: 35mph Frontal Impact
NHTSA No.: M30206
Test Date: 12/11/2002

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1193	1191	2
B	Left Side Lower	mm	1170	1170	0
D	Right Side Upper	mm	1197	1194	3
E	Right Side Lower	mm	1162	1162	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2500	2379	121
F	Right Side Wheelbase	mm	2500	2385	115



DATA SHEET NO. 18... (continued)

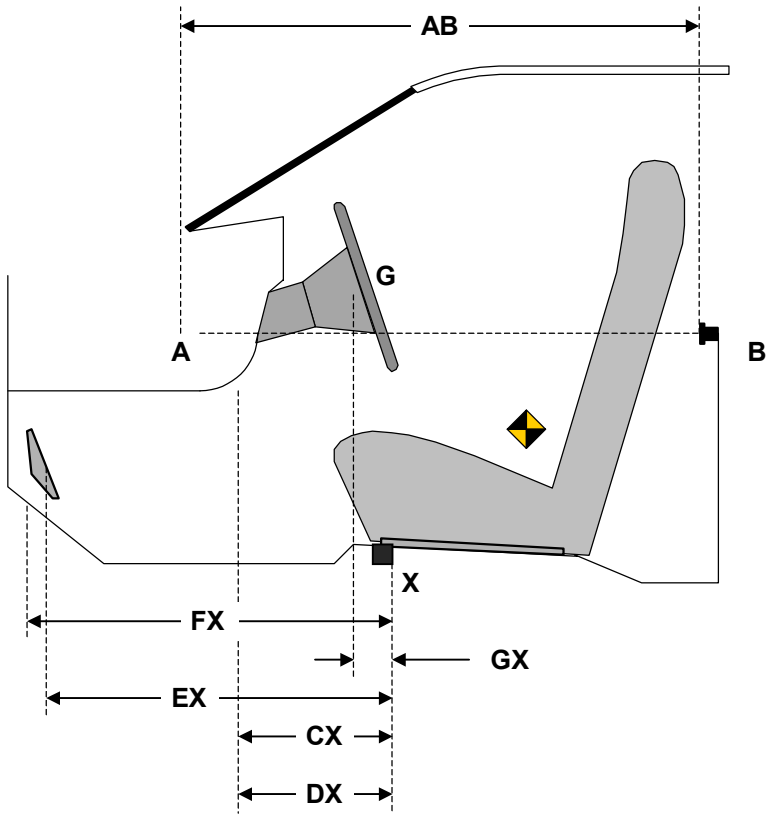
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2003 Ford Escort ZX2 2 Door
Test Program: 35mph Frontal Impact
NHTSA No.: M30206
Test Date: 12/11/2002

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside window jam)	mm	976	976	0
CX	Left Knee Bolster to X	mm	389	298	91
DX	Right Knee Bolster to X	mm	380	370	10
EX	Brake Pedal to X	mm	518	463	55
FX	Foot Rest to X	mm	N/A	N/A	N/A
GX	Center of Steering Column Wheel Hub to X	mm	38	0	38

X = Left Front Seat Front Outboard Anchor Bolt Head



DRIVER COMPARTMENT

DATA SHEET NO. 18... (continued)

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2003 Ford Escort ZX2 2 Door
Test Program: 35mph Frontal Impact

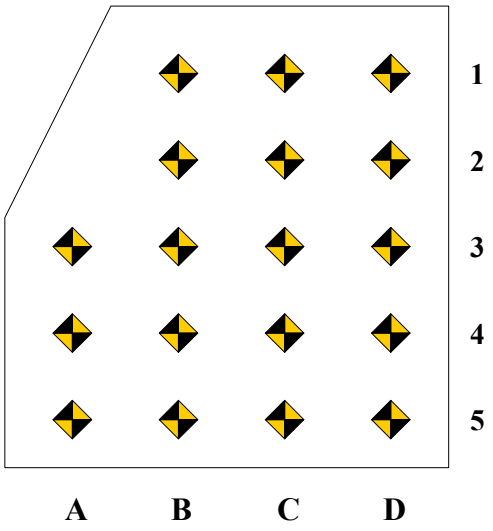
NHTSA No.: M30206
Test Date: 12/11/2002

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		696	696	700		580	555	552		116	141	148
2		565	560	565		438	448	494		127	112	71
3	465	465	465	465	405	410	418	420	60	55	47	45
4	355	355	355	355	355	355	355	355	0	0	0	0
5	235	235	235	235	235	235	235	235	0	0	0	0

DRIVER FLOOR PAN Z-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1		60	60	45		85	91	93		-25	-31	-48
2		-59	-58	-73		-3	-37	-83		-56	-21	10
3	-58	-62	-62	-64	-71	-70	-70	-56	13	8	8	-8
4	-55	-60	-54	-59	-73	-80	-78	-62	18	20	24	3
5	-53	-55	-49	-54	-59	-67	-63	-63	6	12	14	9

DATA SHEET NO. 18...(continued)

VEHICLE INTRUSION MEASUREMENTS

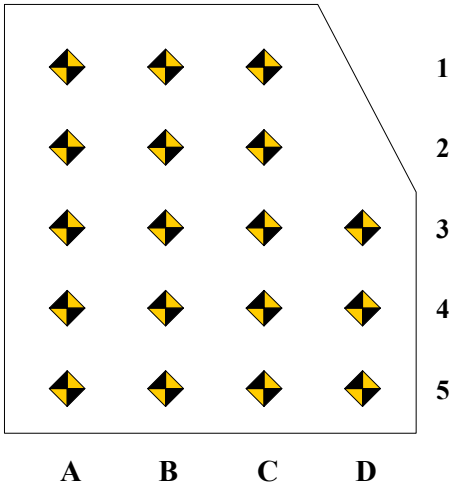
Test Vehicle: 2003 Ford Escort ZX2 2 Door
Test Program: 35mph Frontal Impact
NHTSA No.: M30206
Test Date: 12/11/2002

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	705	700	700		559	557	595		146	143	105	
2	560	560	560		524	466	476		36	94	84	
3	460	460	460	460	430	430	454	448	30	30	6	12
4	350	350	350	350	355	356	357	356	-5	-6	-7	-6
5	230	230	230	230	235	235	235	235	-5	-5	-5	-5

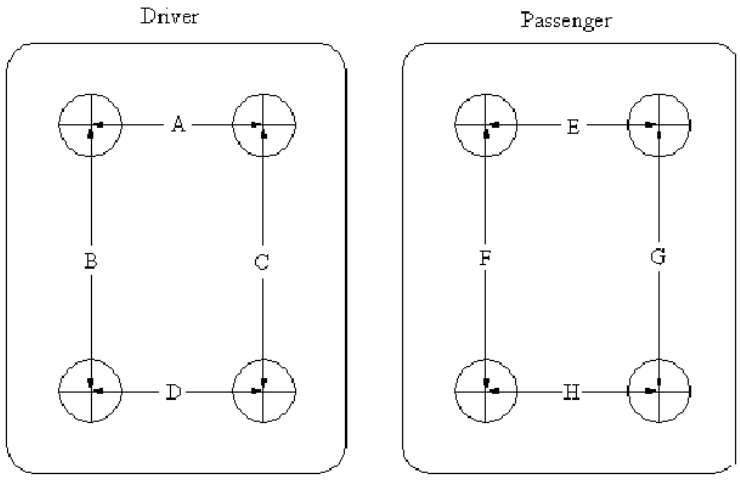
PASSENGER FLOOR PAN Z-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	50	45	42		74	84	77		-24	-39	-35	
2	-69	-58	-64		-87	-48	-28		18	-10	-36	
3	-60	-60	-64	-64	-55	-70	-57	-43	-5	10	-7	-21
4	-55	-52	-59	-59	-67	-71	-77	-70	12	19	18	11
5	-49	-44	-52	-55	-58	-50	-57	-55	9	6	5	0

DATA SHEET NO. 18...(continued)

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2003 Ford Escort ZX2 2 Door
Test Program: 35mph Frontal Impact
NHTSA No.: M30206
Test Date: 12/11/2002



UNDERBODY FLOORBOARD DEFORMATION

Measurement	Pre-Test	Post-Test	Difference
A	308	304	4
B	262	192	70
C	254	202	52
D	274	274	0
E	238	237	1
F	248	206	42
G	249	212	37
H	245	248	-3

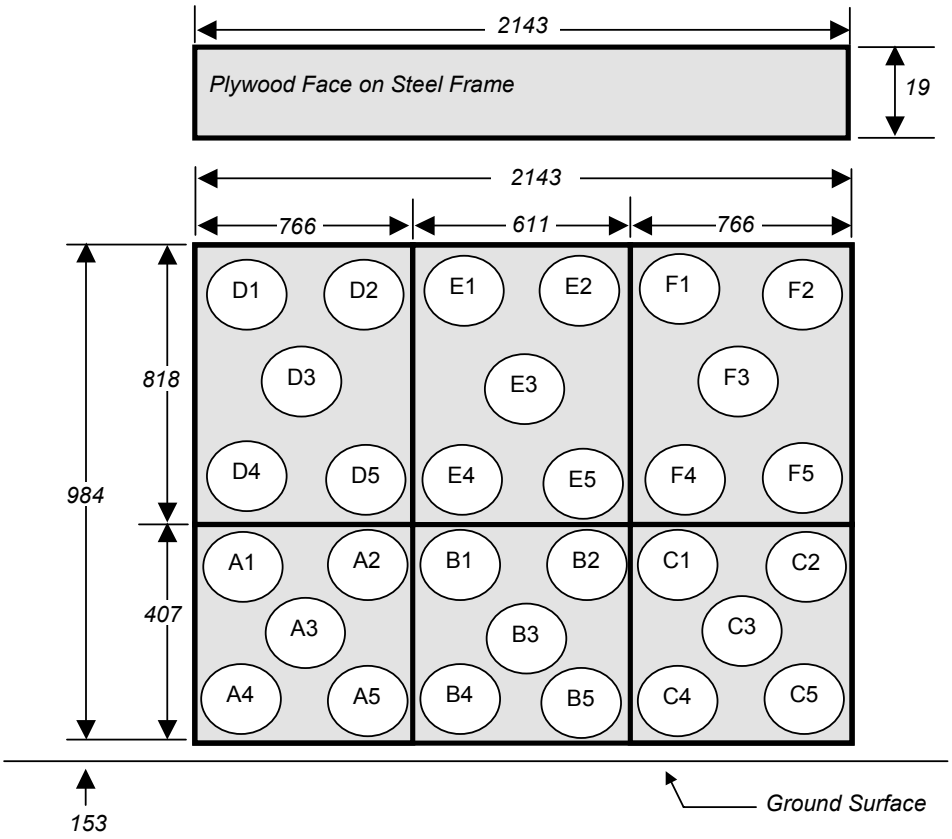
DATA SHEET NO. 19

LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2003 Ford Escort ZX2 2 Door NHTSA No.: M30206
Test Program: 35mph Frontal Impact Test Date: 12/11/2002

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 crossmember displacement.

DATA SHEET NO. 20

ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2003 Ford Escort ZX2 2 Door NHTSA No.: M30206
Test Program: 35mph Frontal Impact Test Date: 12/11/2002

VEHICLE INFORMATION

VIN: 3FAFP11333R113861 Wheelbase (mm) : 2500
Vehicle Size Category: Coupe Test Weight (kg) : 1340

ACCELEROMETER DATA

Accelerometer Locations: As per measurements on Page 13
Cal. Procedure/Interval: MGA procedure / 6 month
Integration Algorithm: Trapezoidal Linearity: > 99%
Impact Velocity (km/h): 56.5
Velocity Change (km/h): 61.3 Time of Separation (msec): 99

CRUSH PROFILE

Collision Deformation Classification: Frontal Midpoint of Damage: Centerline
Damage Region Length (mm): 1440 Impact Mode: Frontal

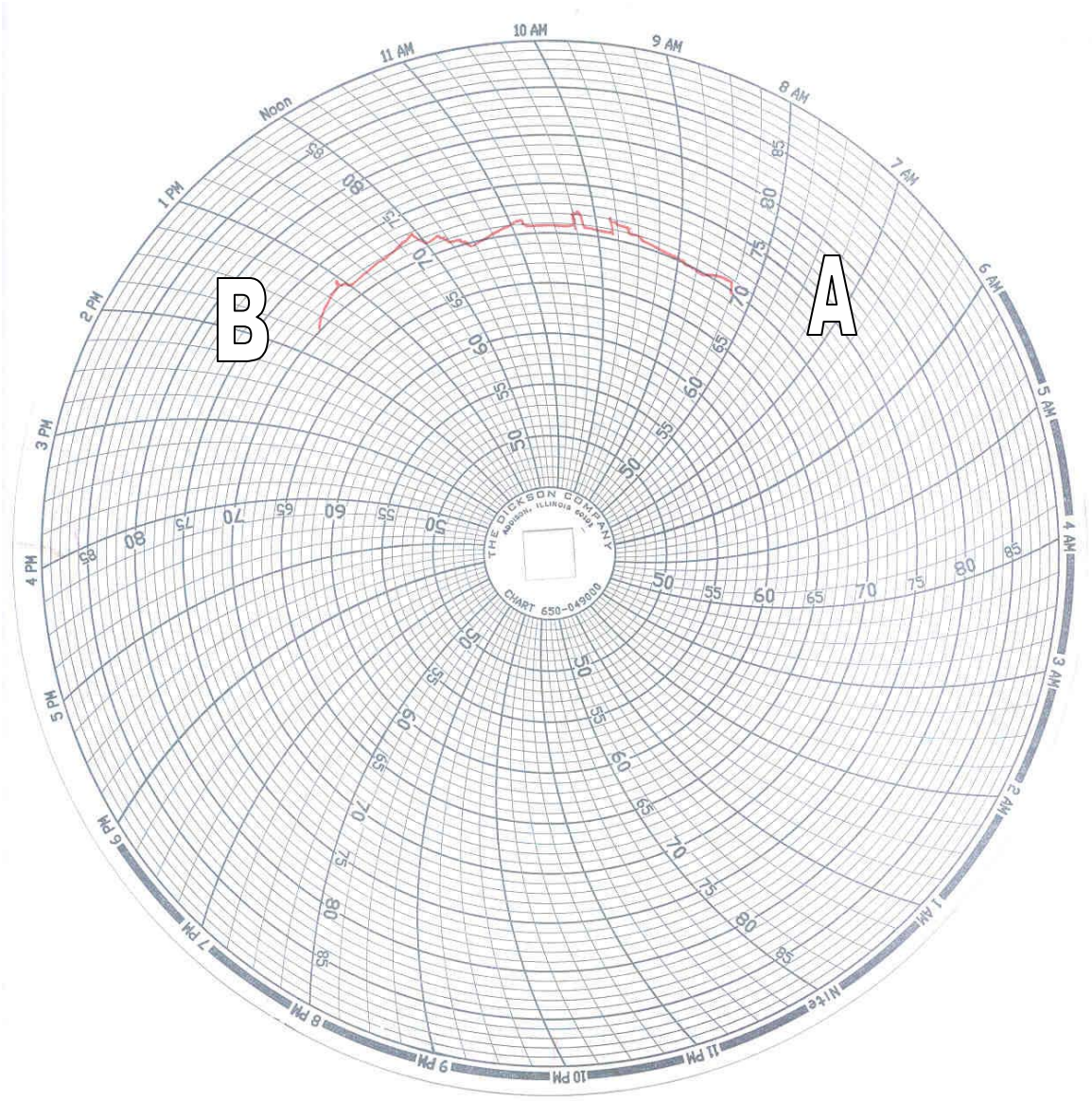
No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4135	3909	226
C2	Crush zone 2 at left side	mm	4305	3998	307
C3	Crush zone 3 at left side	mm	4384	4033	351
C4	Crush zone 4 at right side	mm	4382	3979	403
C5	Crush zone 5 at right side	mm	4308	3956	352
C6	Crush zone 6 at right side	mm	4135	3878	257
L	C1 TO C6	mm	1440		

DATA SHEET NO. 21

DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART

Test Vehicle: 2003 Ford Escort ZX2 2 Door
Test Program: 35mph Frontal Impact

NHTSA No.: M30206
Test Date: 12/11/2002



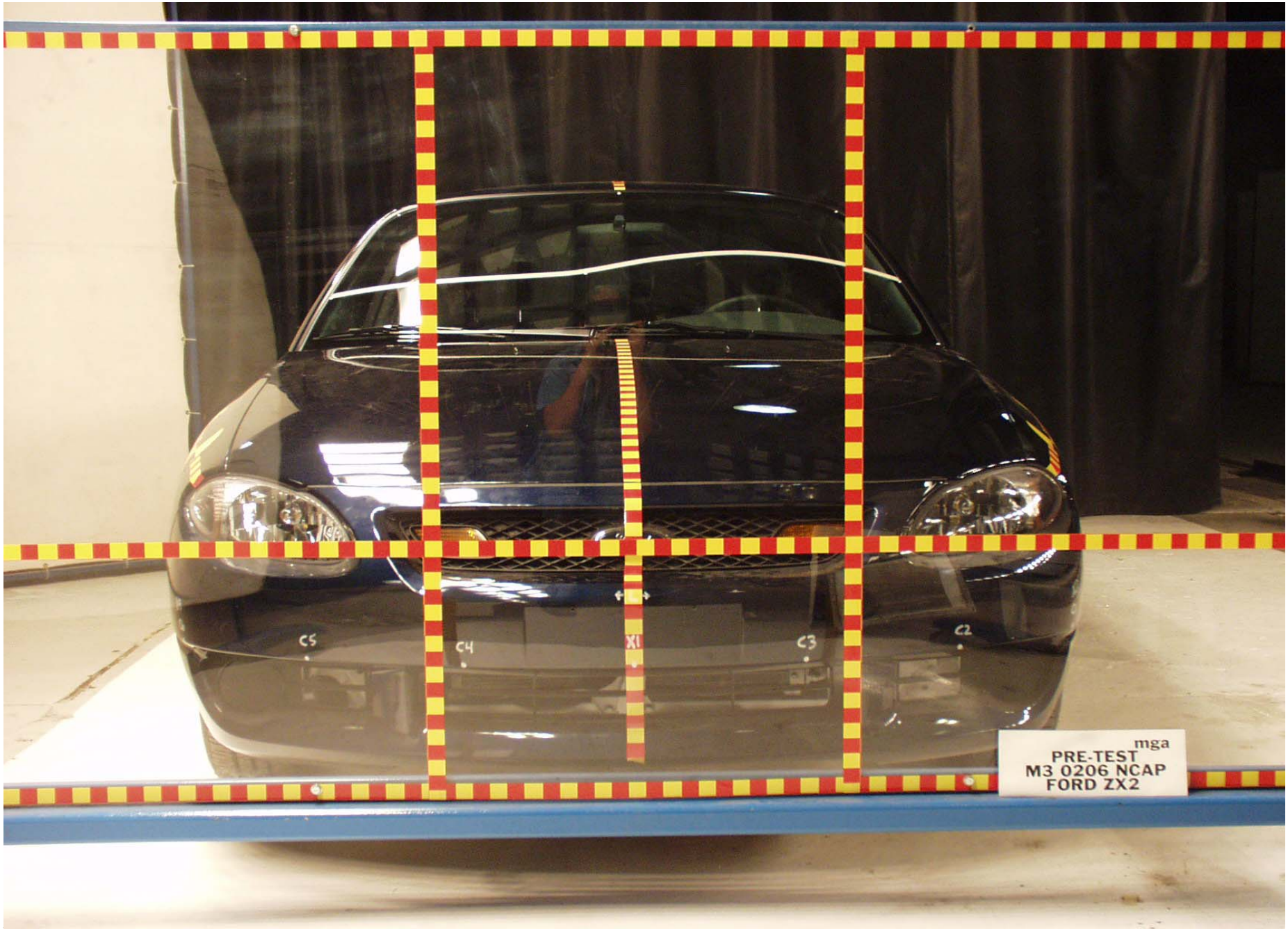
A = Dummies installed in vehicle at 8:00 a.m.

B = Test conducted at 1:58 p.m.

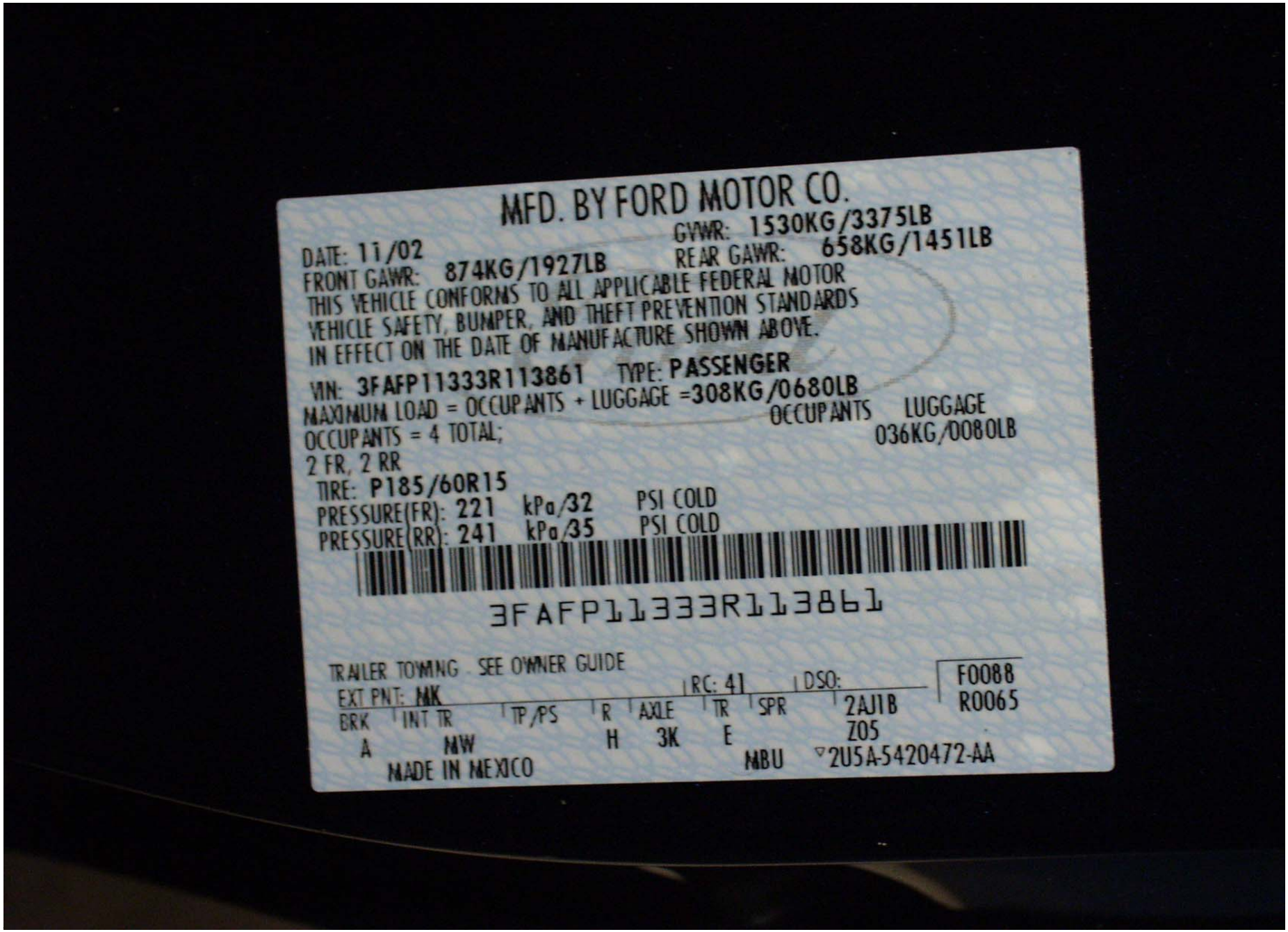
APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS



Load Cell Location



Vehicle Certification Label/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

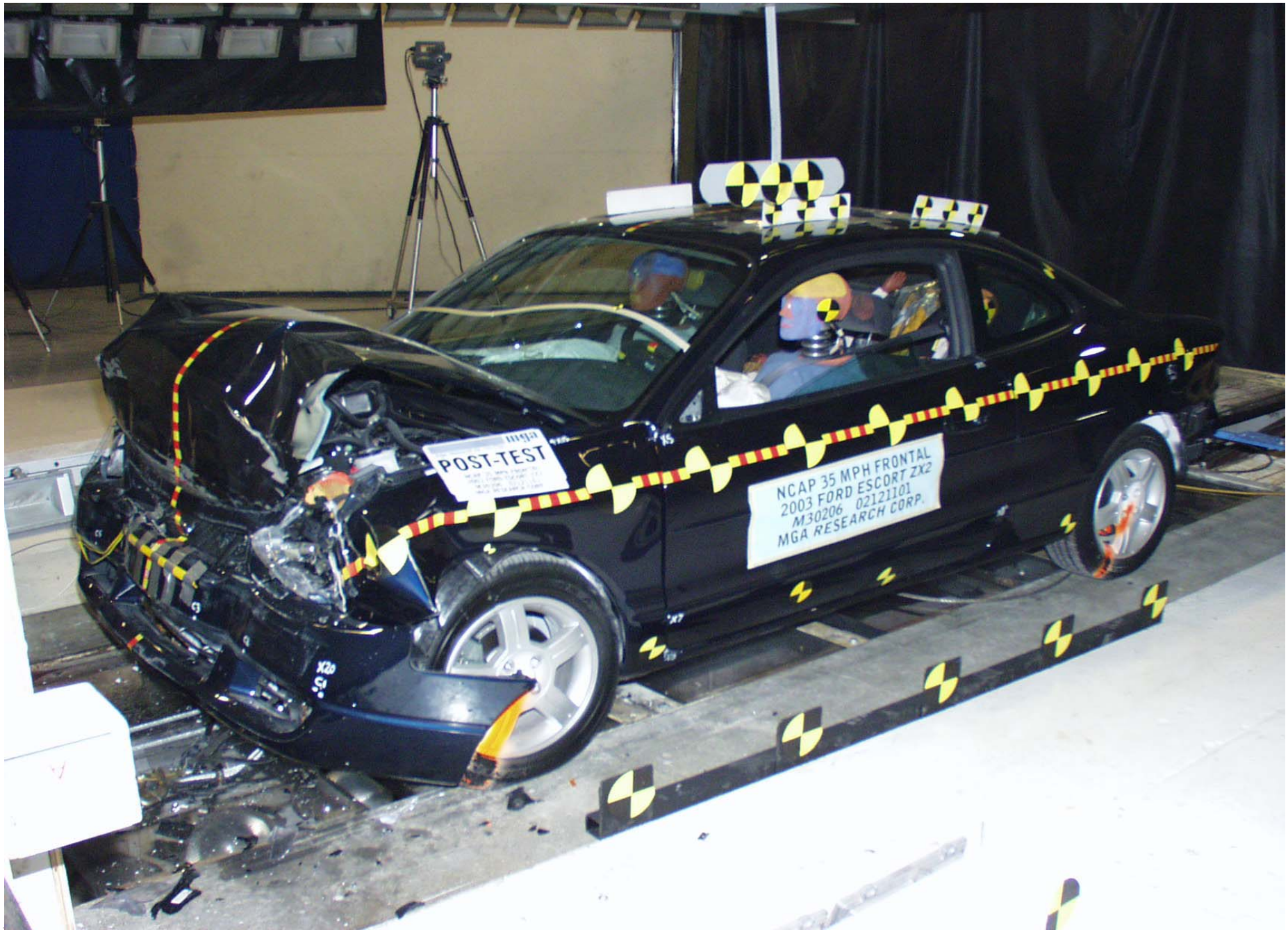
Pre-Test Left Side View of Test Vehicle

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 Left Front Three-Quarter View of Test Vehicle



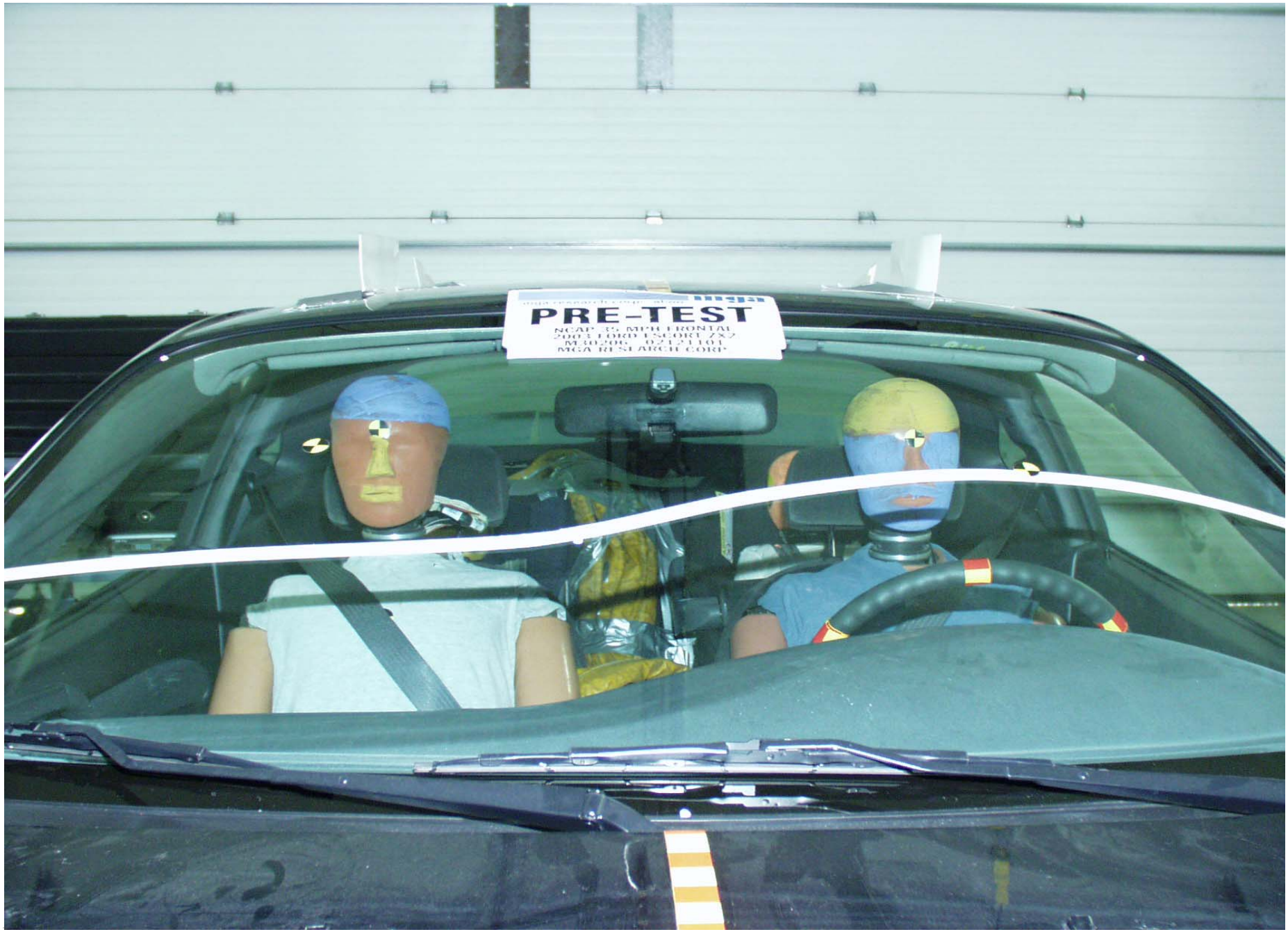
Post-Test Left Front Three-Quarter View of Test Vehicle

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

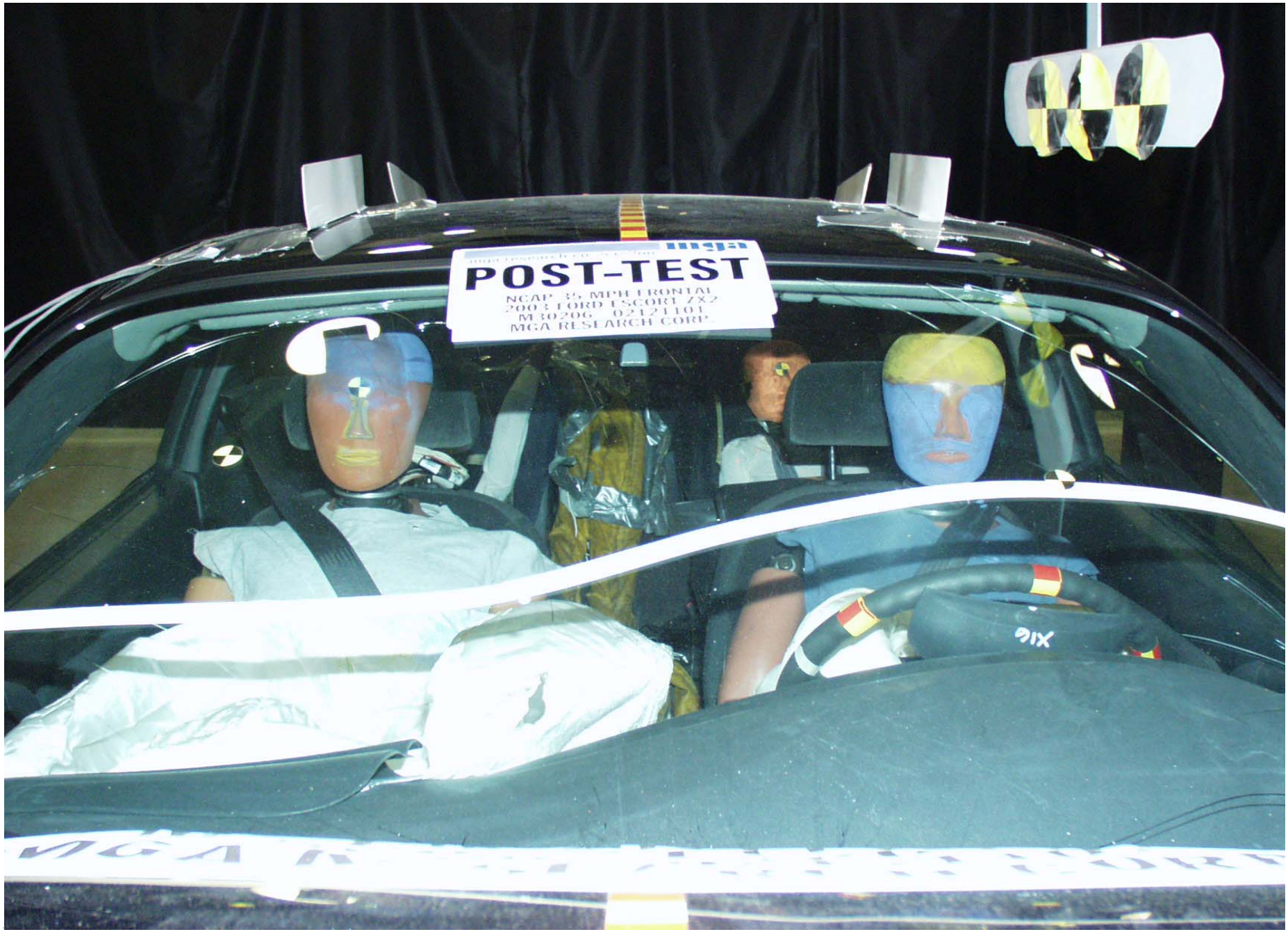
Post-Test Right Rear Three-Quarter View of Test Vehicle

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

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



Pre-Test Windshield View



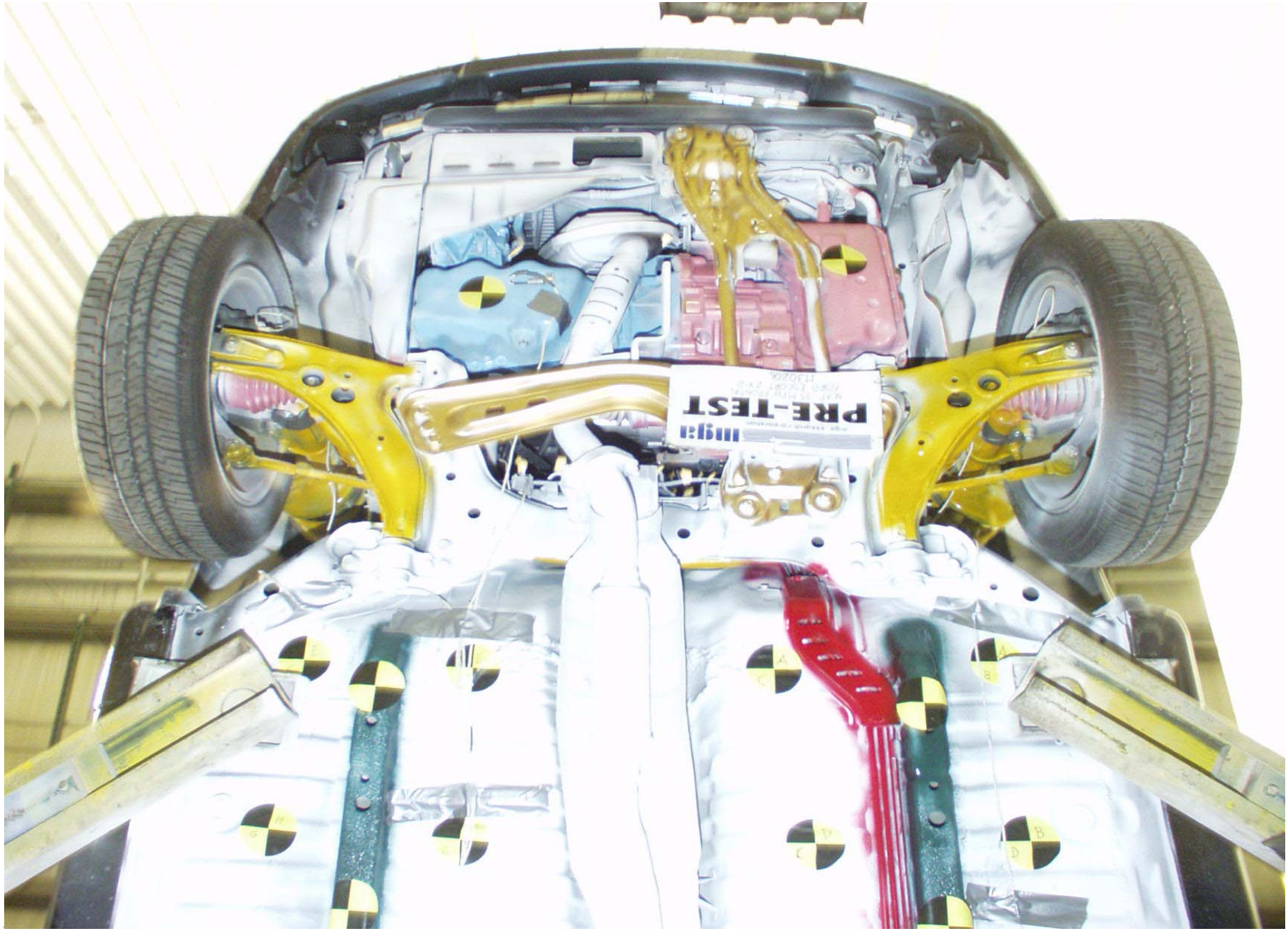
Post-Test Windshield View

Pre-Test Engine Compartment View

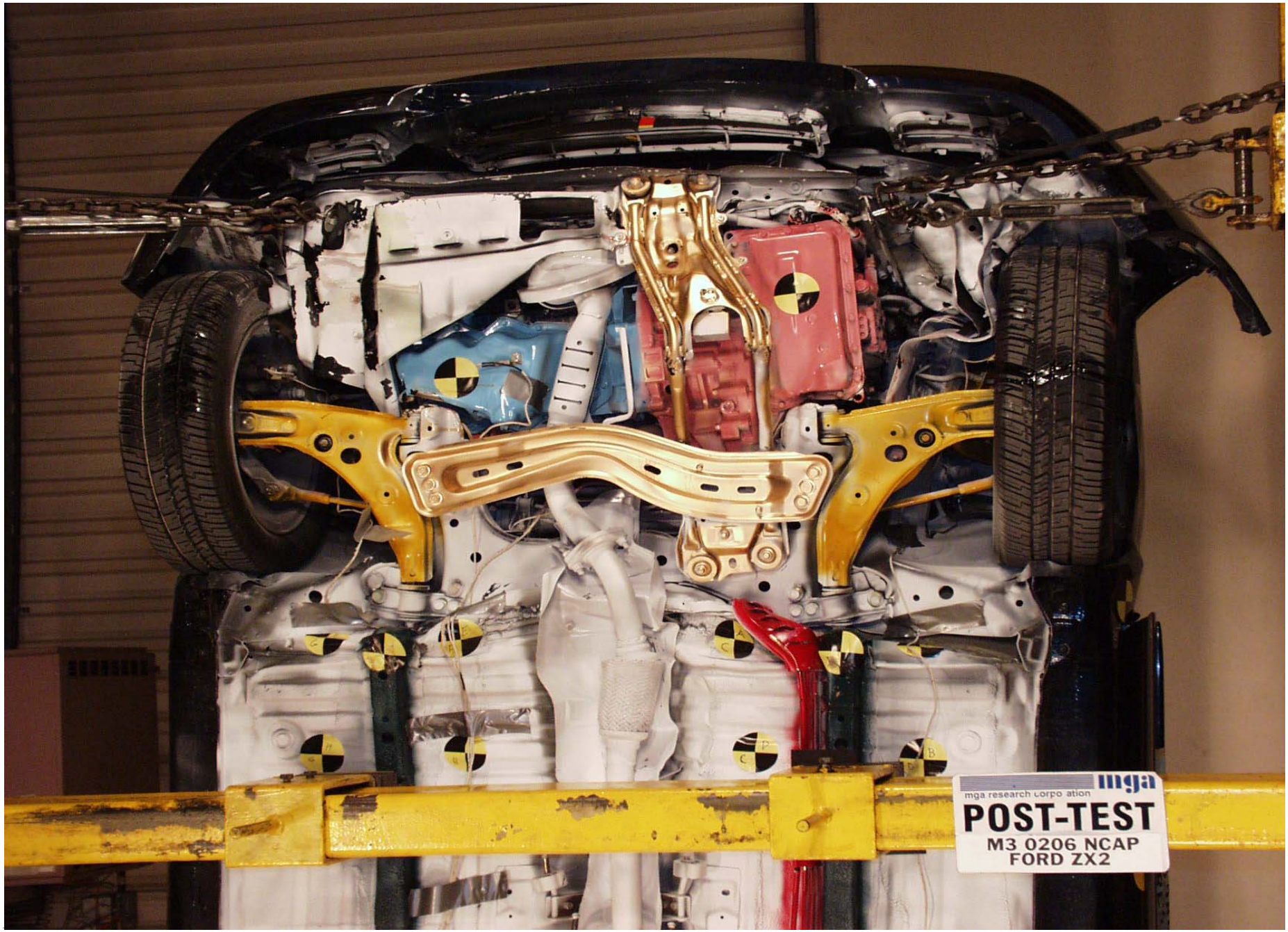
Post-Test Engine Compartment View

Pre-Test Fuel Filler Cap View

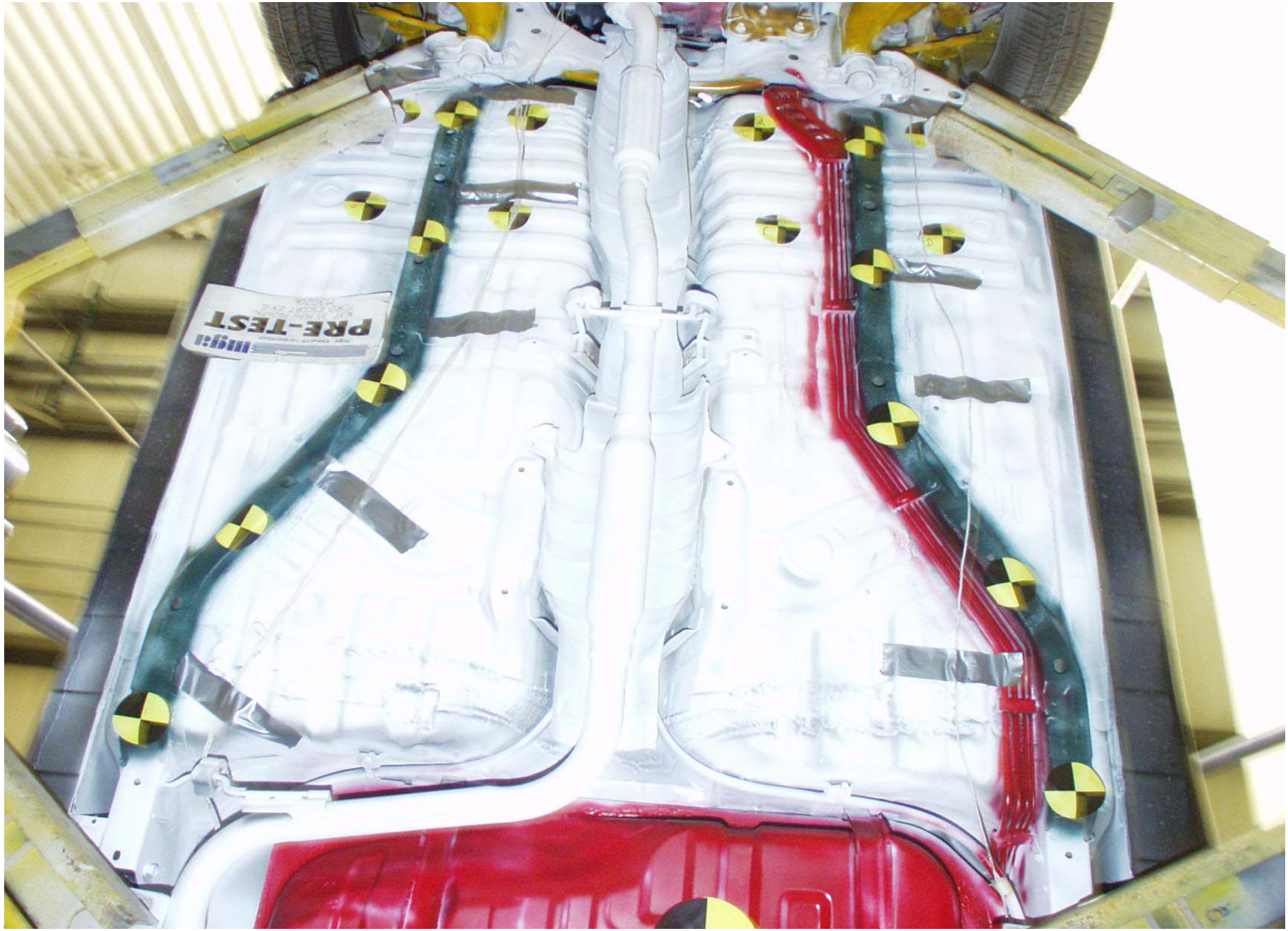
Post-Test Fuel Filler Cap View



Pre-Test Front Underbody View

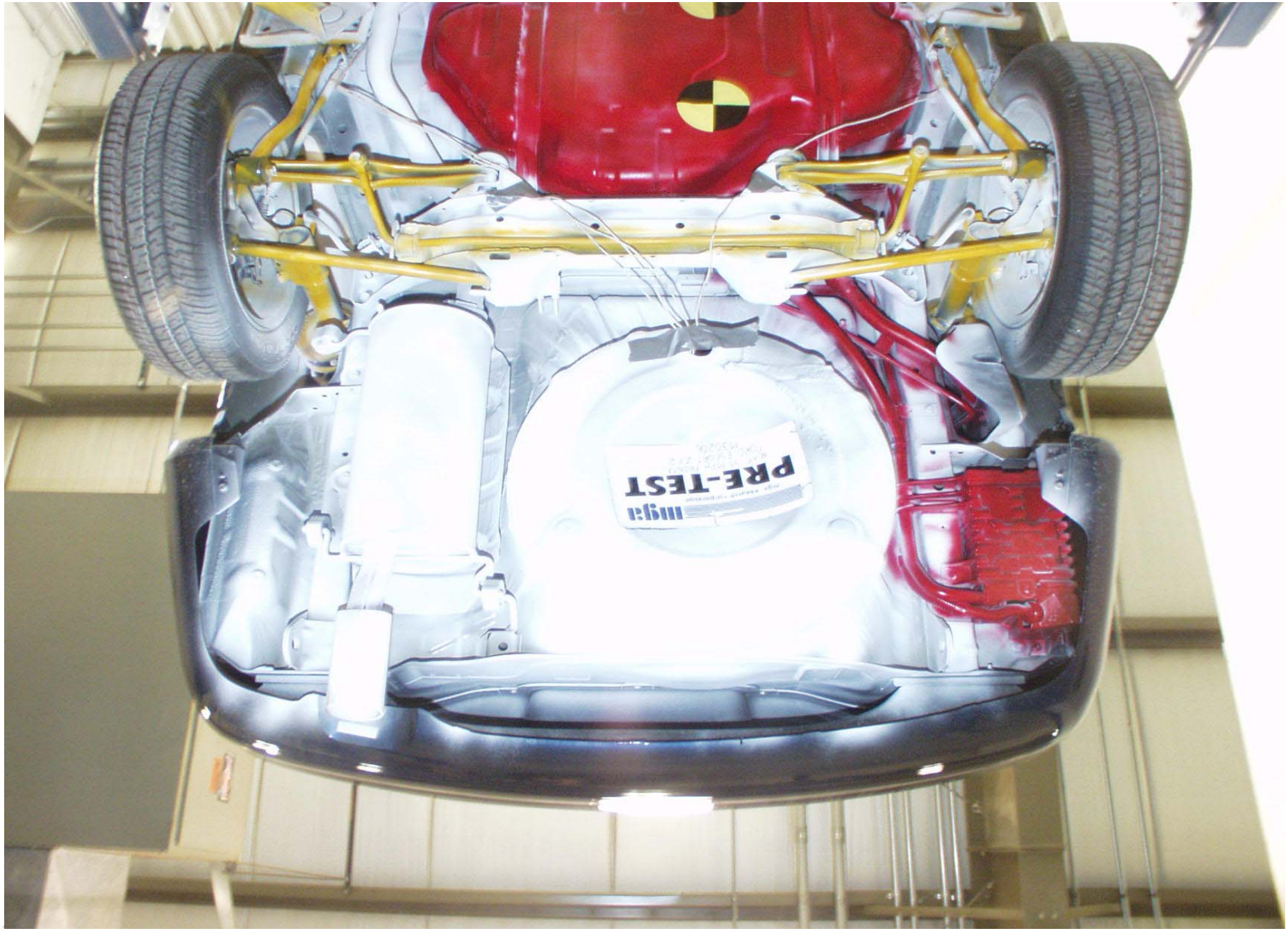


Post-Test Front Underbody View

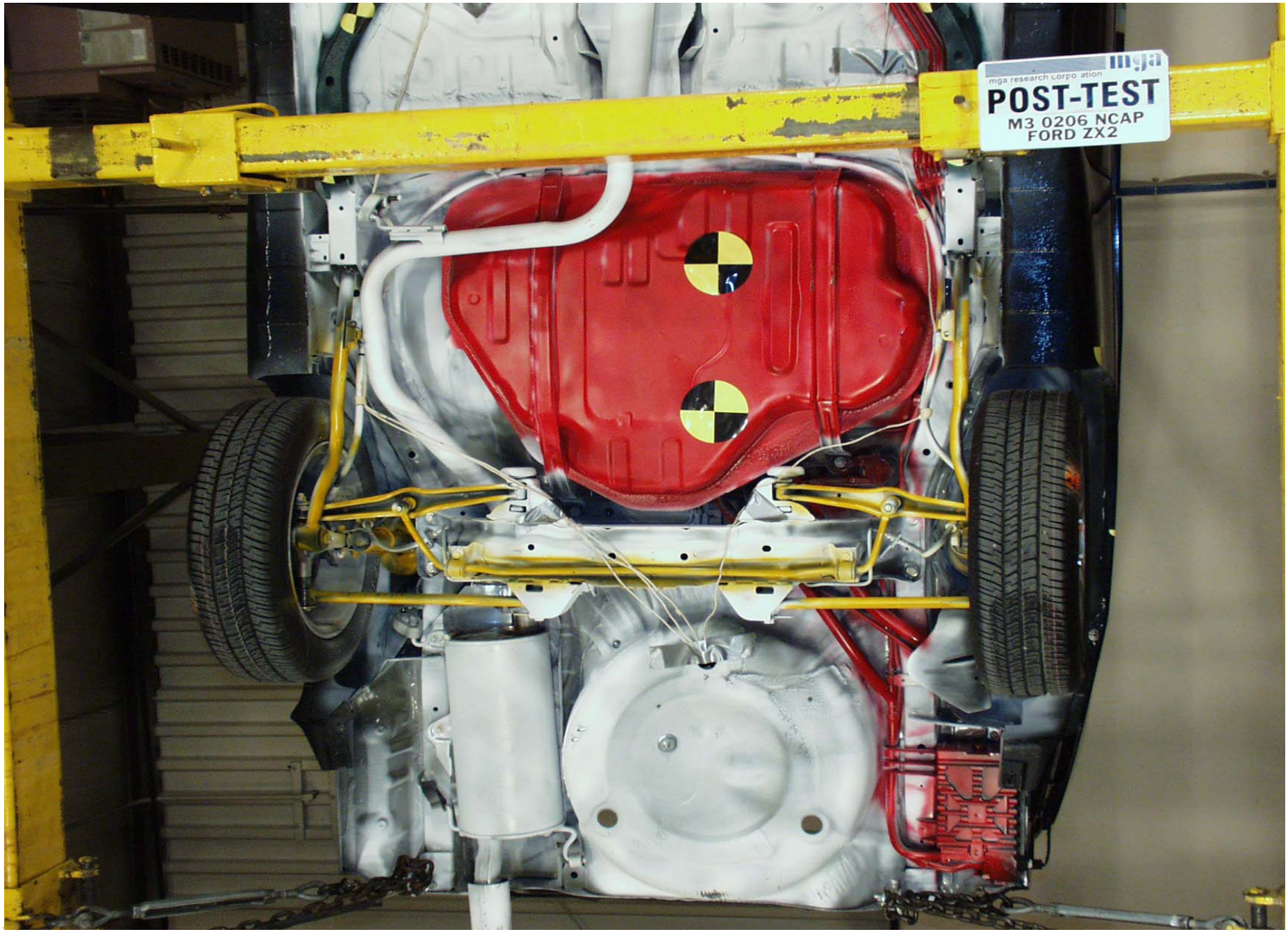


Pre-Test Mid Underbody

Post-Test Mid Underbody

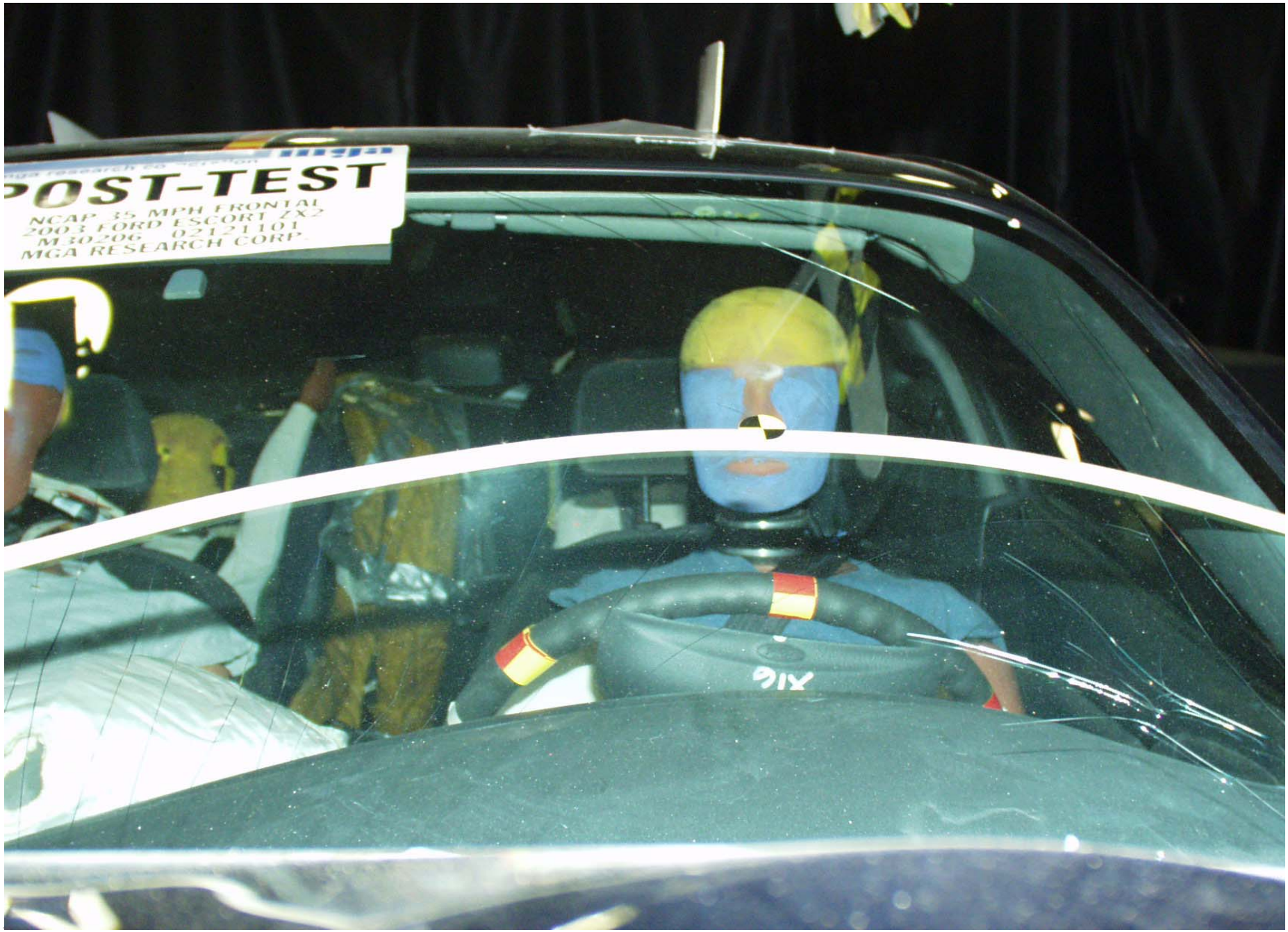


Pre-Test Rear Underbody View



Post-Test Rear Underbody View

Pre-Test Driver Dummy Front View (head position)



Post-Test Driver Dummy Front View (head position)

Pre-Test Driver Dummy Position Left Side View

Post-Test Driver Dummy Position Left Side View

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

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

Pre-Test Driver Dummy Feet Position

Post-Test Driver Dummy Feet Position

Pre-Test Driver Side Knee Bolster View

Post-Test Driver Side Knee Bolster View

Pre-Test Driver Side Floor Pan View

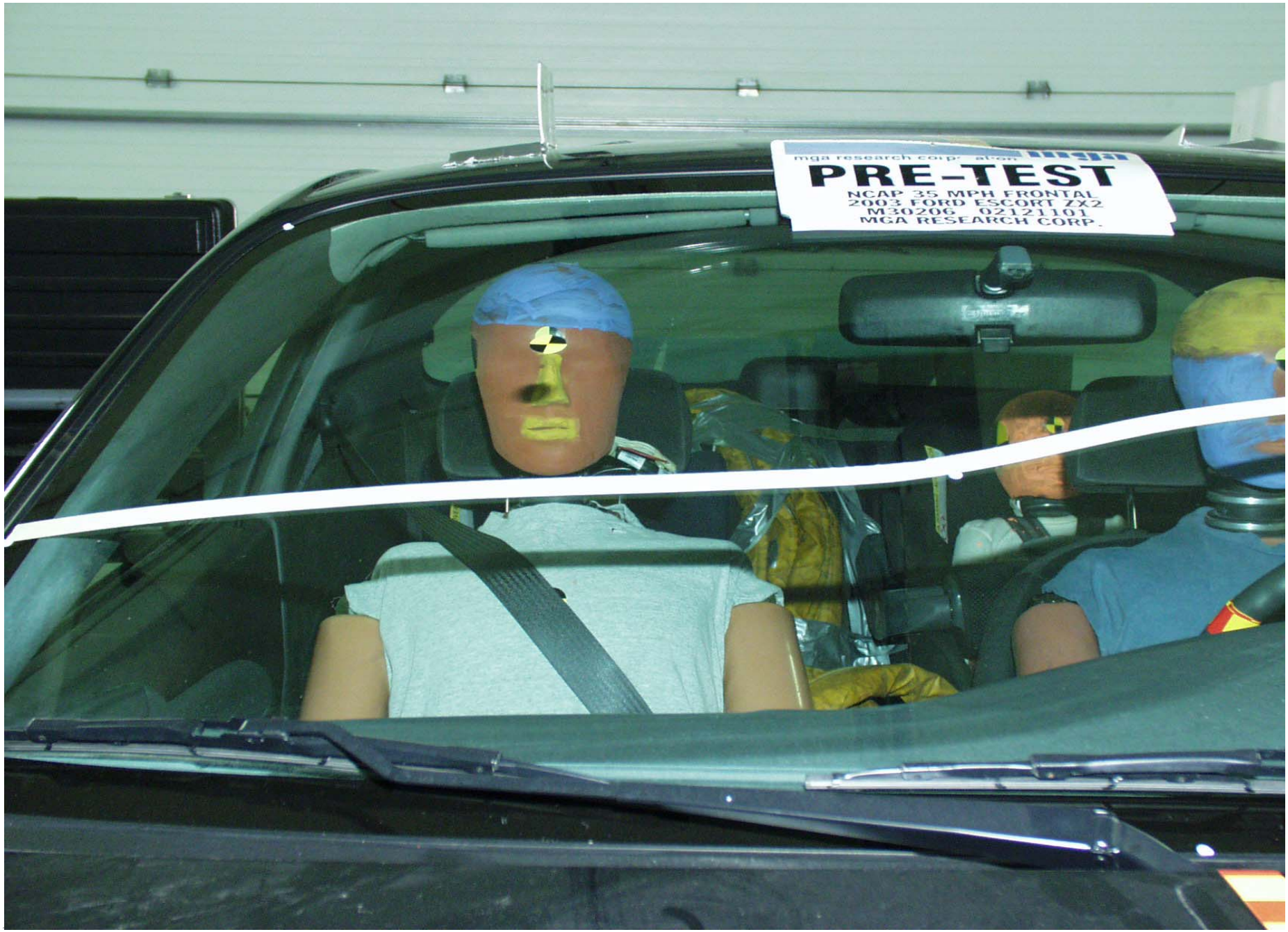
Post-Test Driver Side Floor Pan View

Post-Test Driver Dummy Head

Post-Test Driver Dummy Airbag Contact

Post-Test Driver Dummy Head Contact

Post-Test Driver Dummy Knee Contact



Pre-Test Passenger Dummy Front View (head position)

Post-Test Passenger Dummy Front View (head position)

Pre-Test Passenger Dummy Position Right Side View

Post-Test Passenger Dummy Position Right Side View

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

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

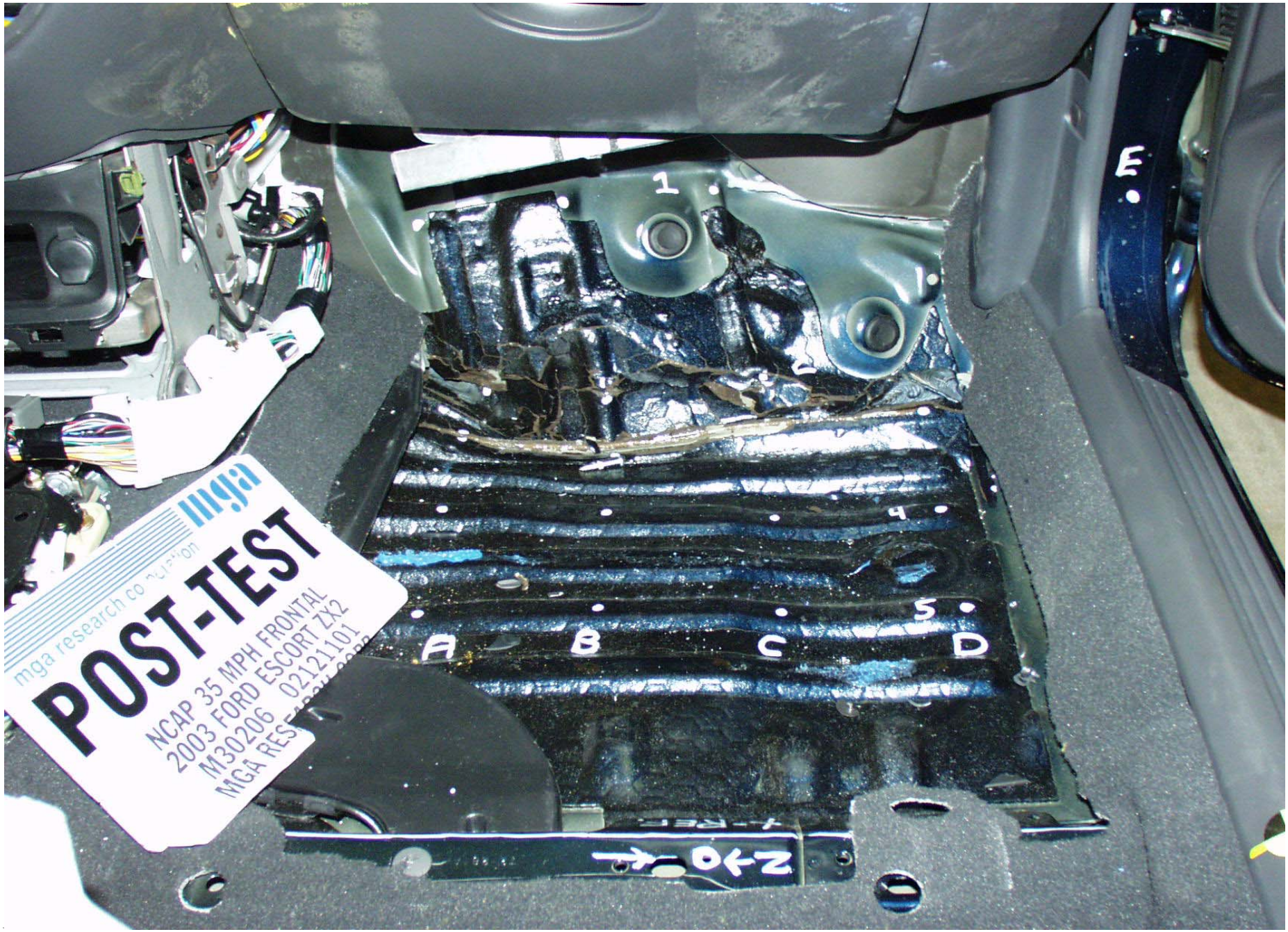
Pre-Test Passenger Dummy Feet Position

Post-Test Passenger Dummy Feet Position

Pre-Test Passenger Side Knee Bolster View

Post-Test Passenger Side Knee Bolster View

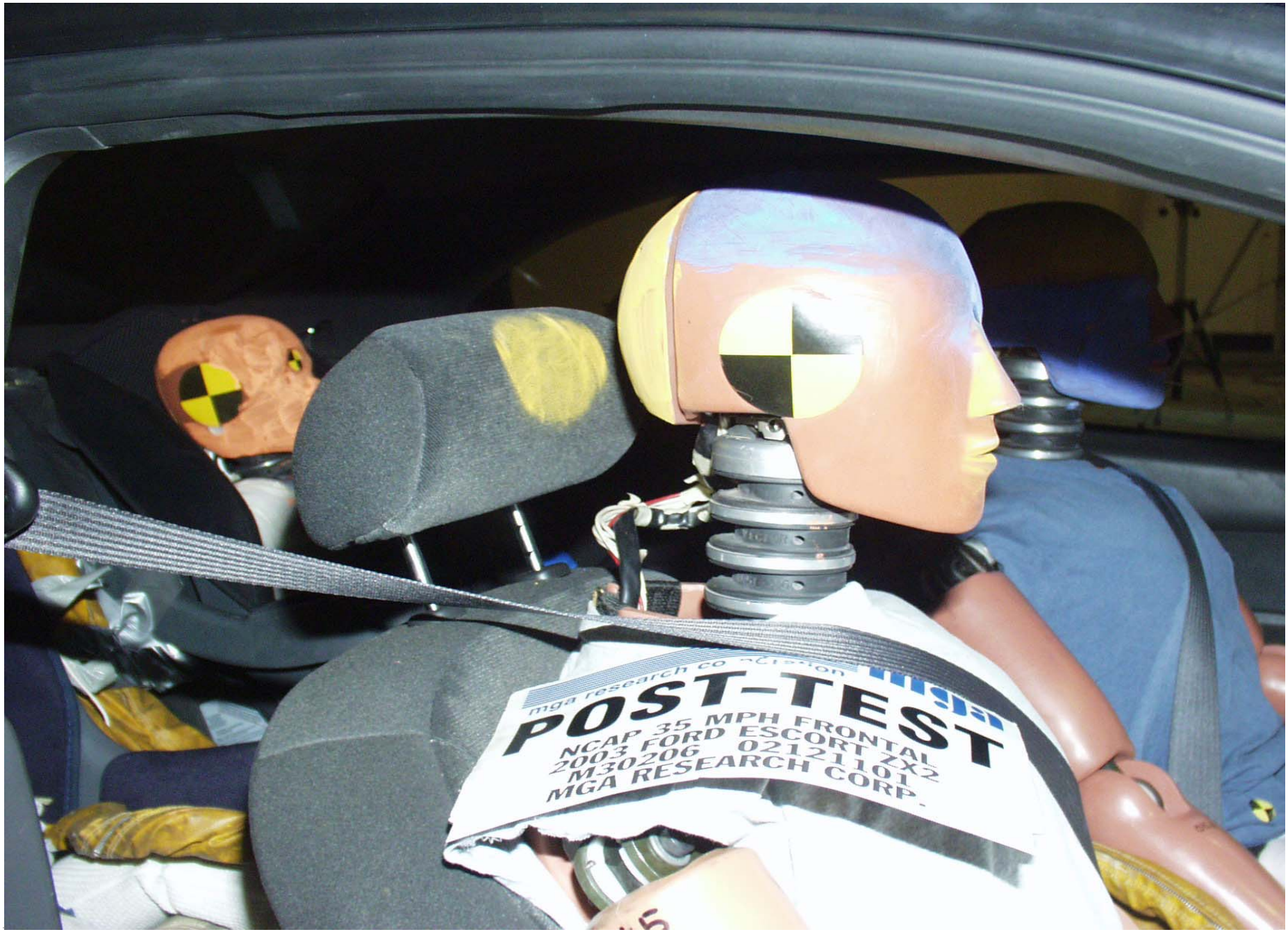
Pre-Test Passenger Side Floor Pan View



Post-Test Passenger Side Floor Pan View

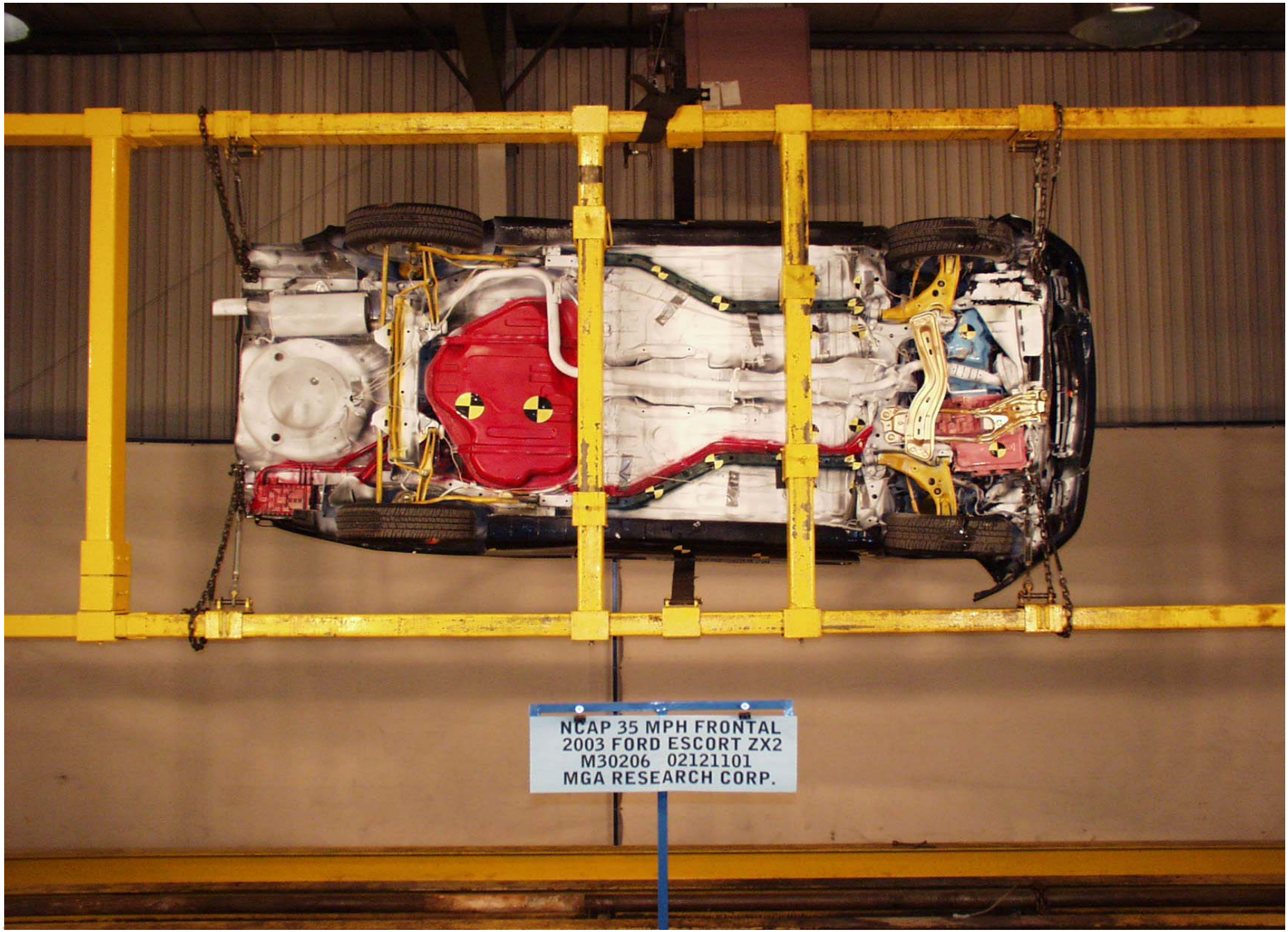
Post-Test Passenger Dummy Head

Post-Test Passenger Dummy Airbag Contact



Post-Test Passenger Dummy Head Contact

Post-Test Passenger Dummy Knee Contact

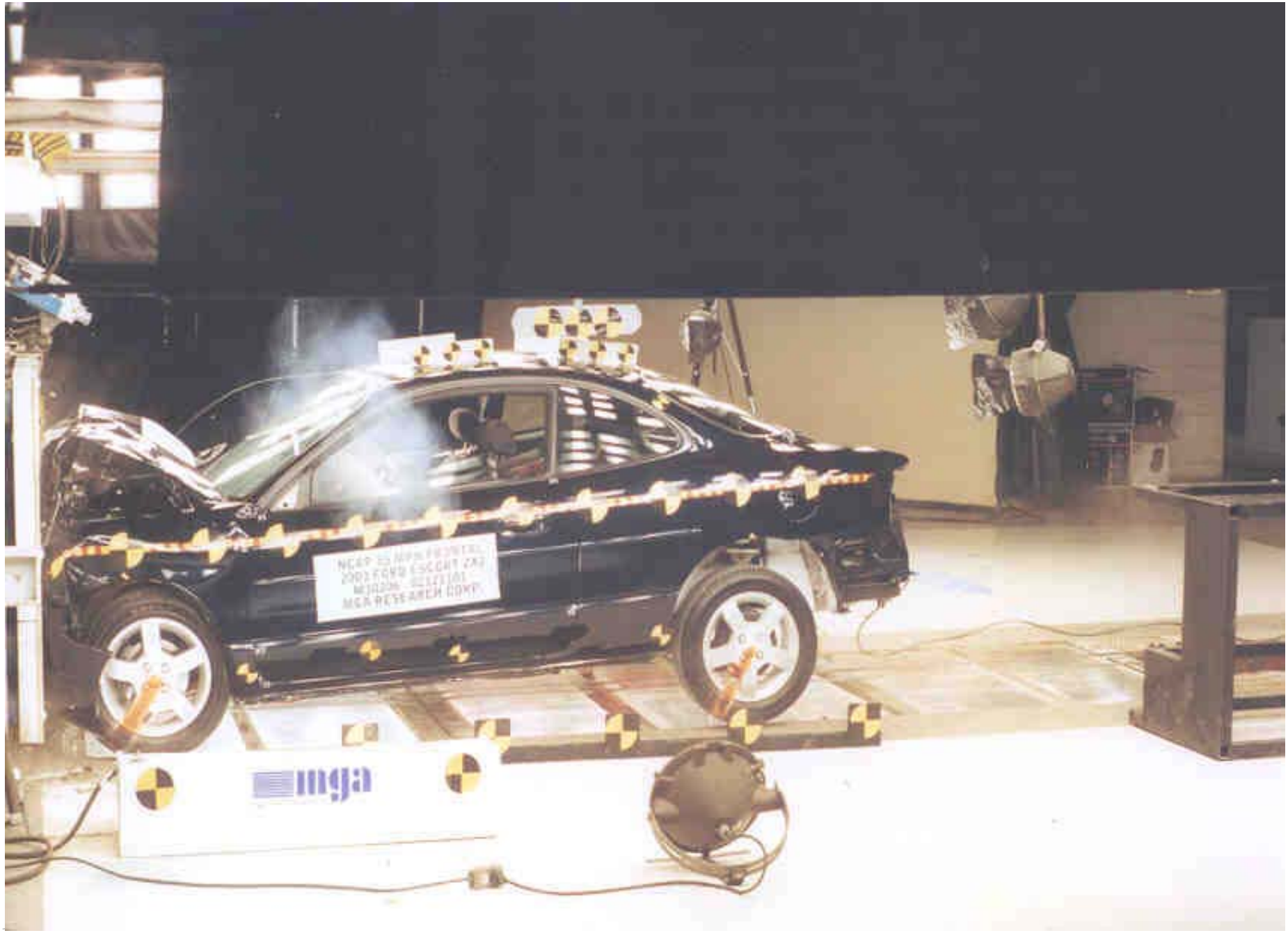


Rollover 90 Degrees

Rollover 180 Degrees

Rollover 270 Degrees

Rollover 360 Degrees



Vehicle Impact

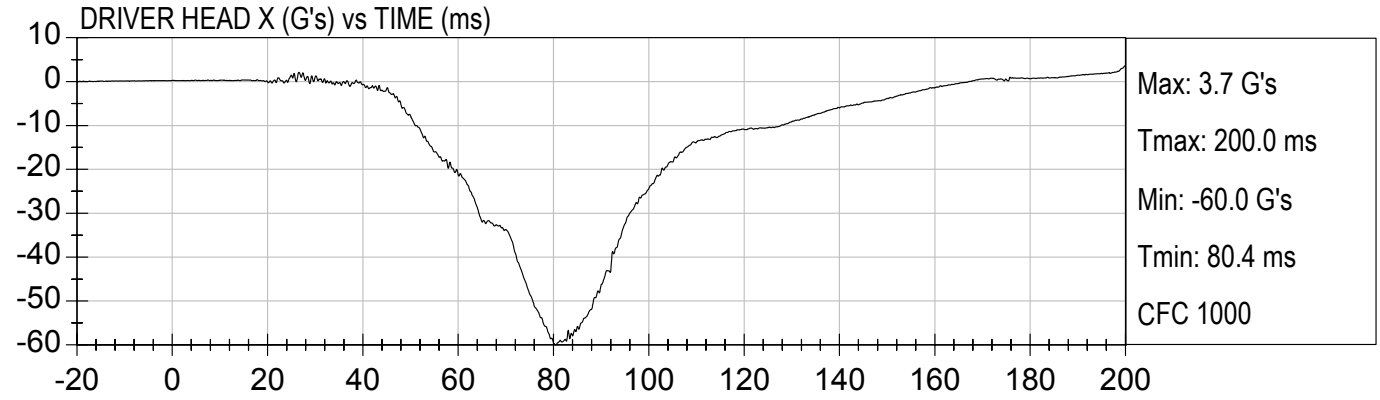
APPENDIX B

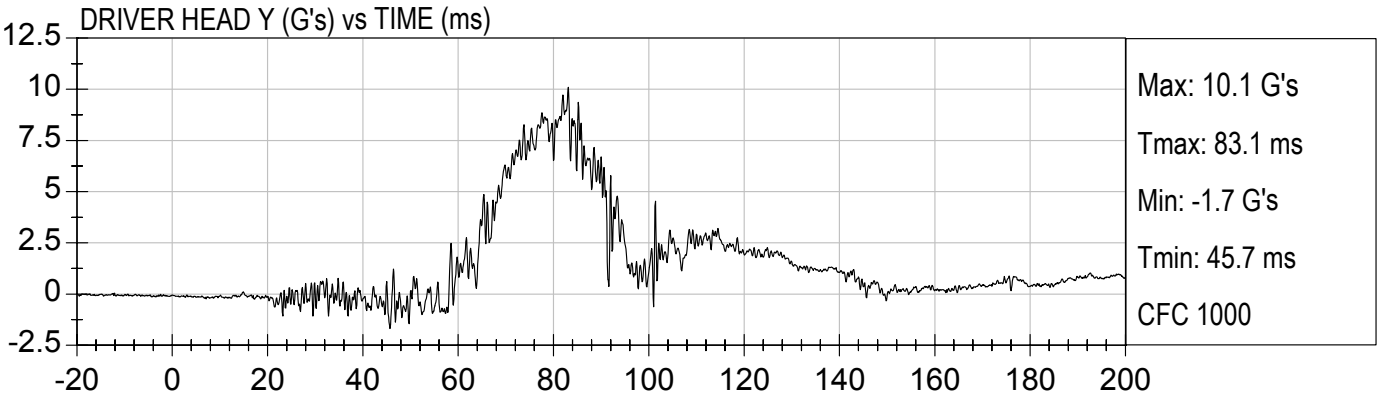
DUMMY AND VEHICLE RESPONSE DATA TRACES

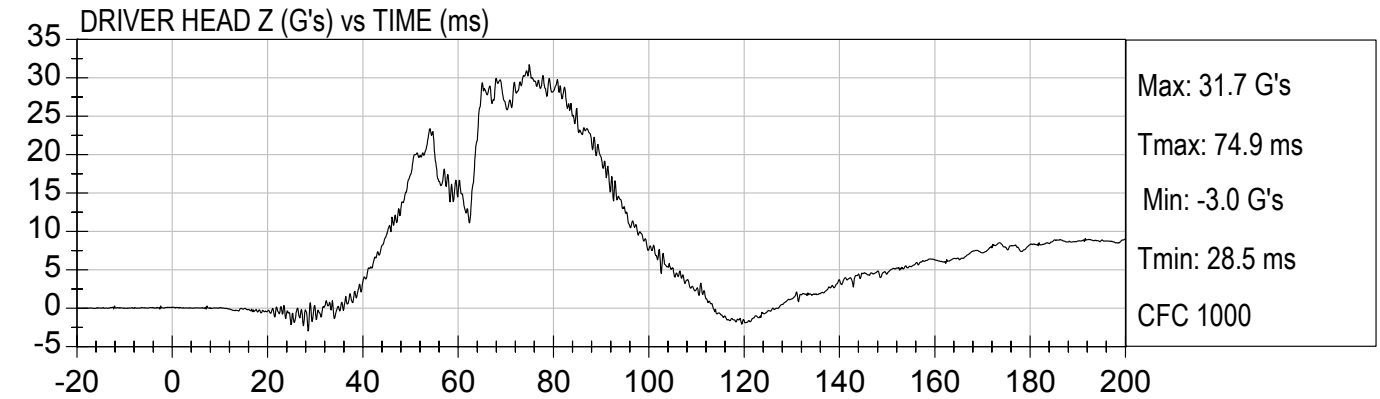
TABLE OF DATA PLOTS

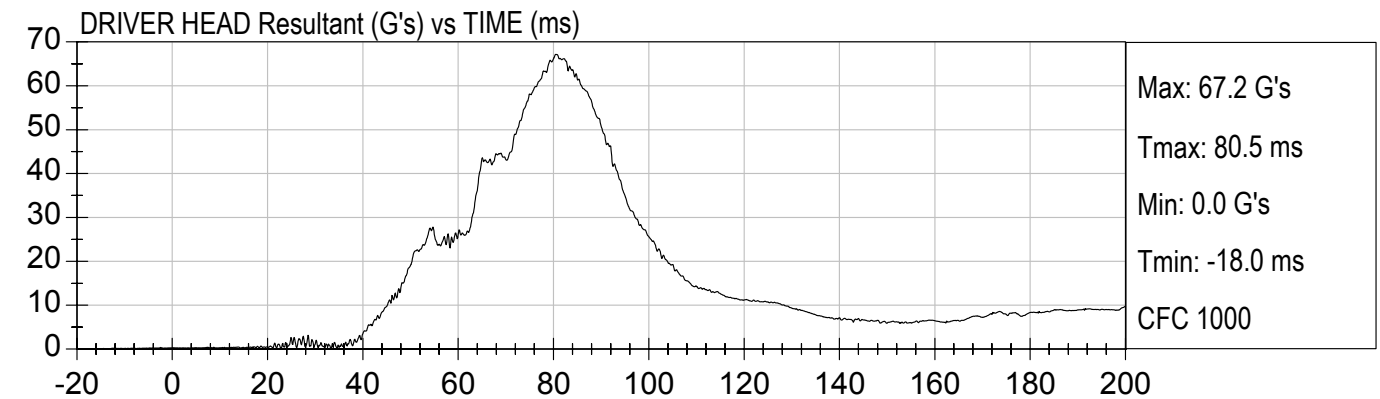
35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

Test Date: 12/11/2002
Speed: 35.1 mph (56.5 km/h)



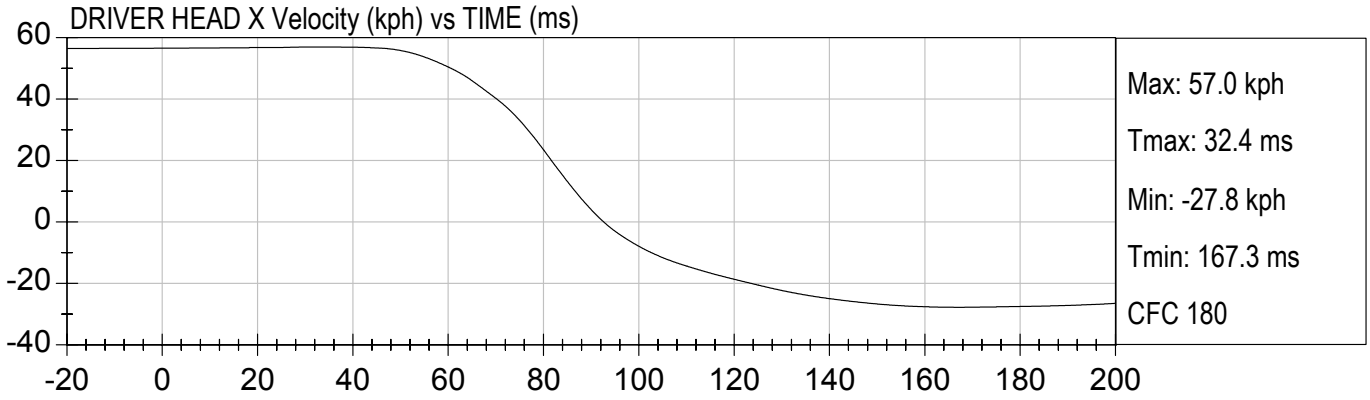


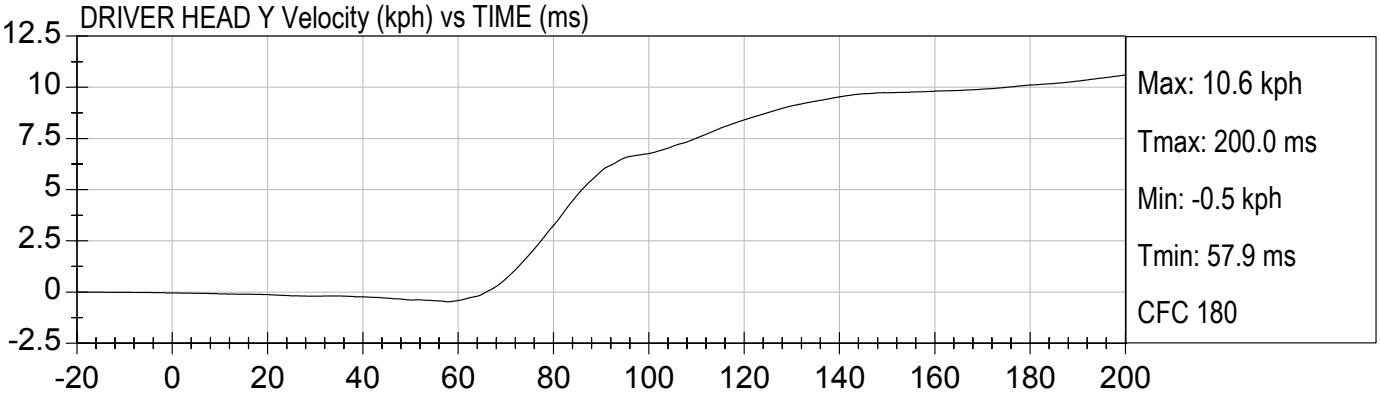


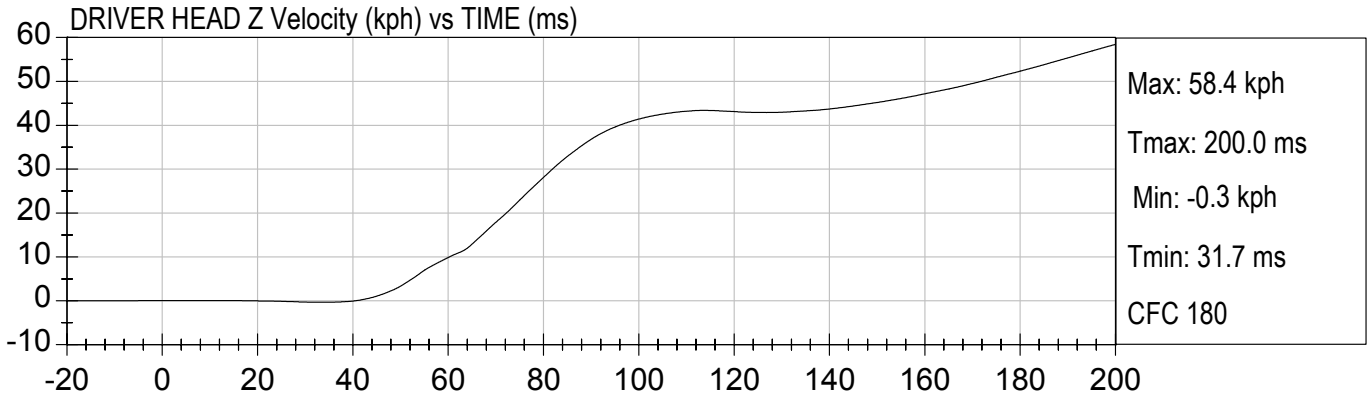


35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

Test Date: 12/11/2002
Speed: 35.1 mph (56.5 km/h)

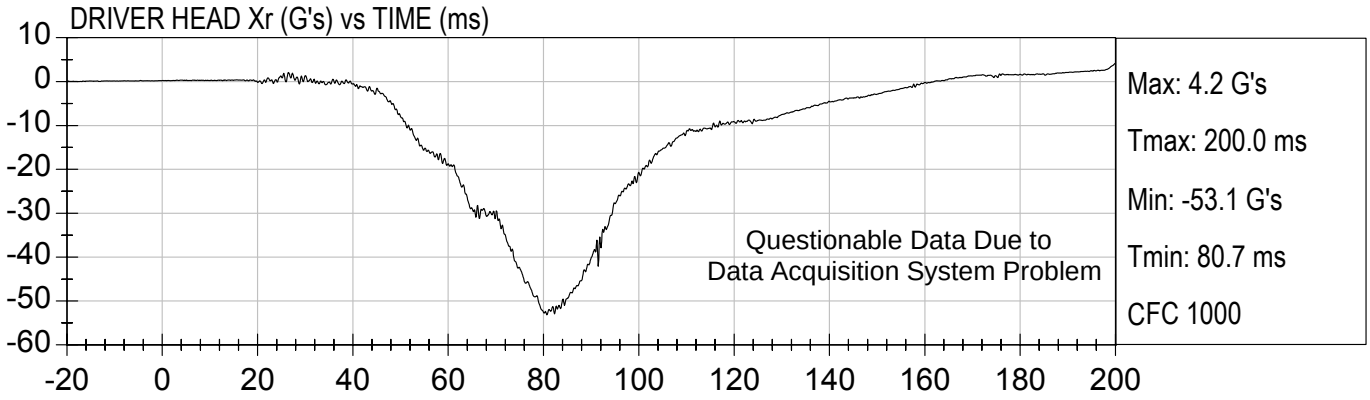


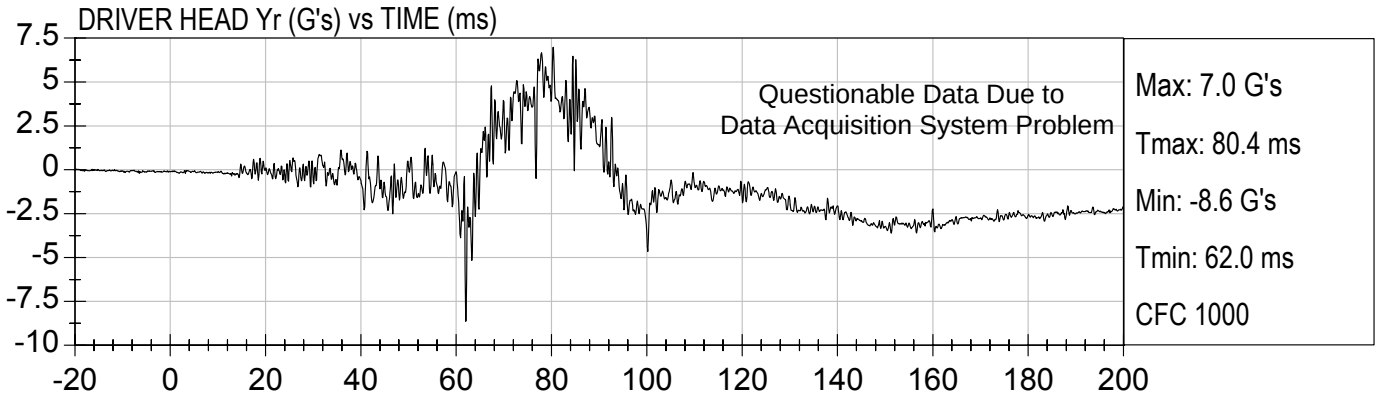


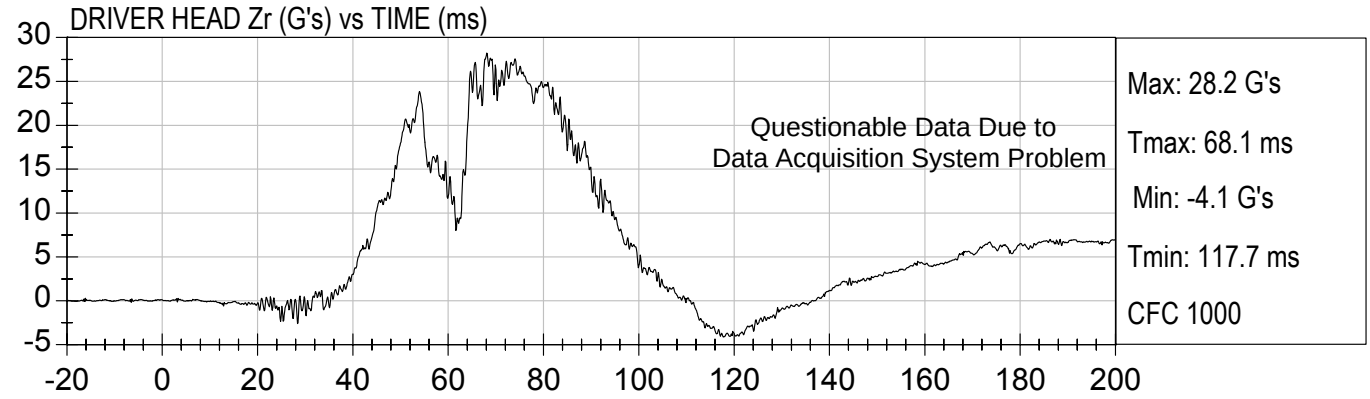


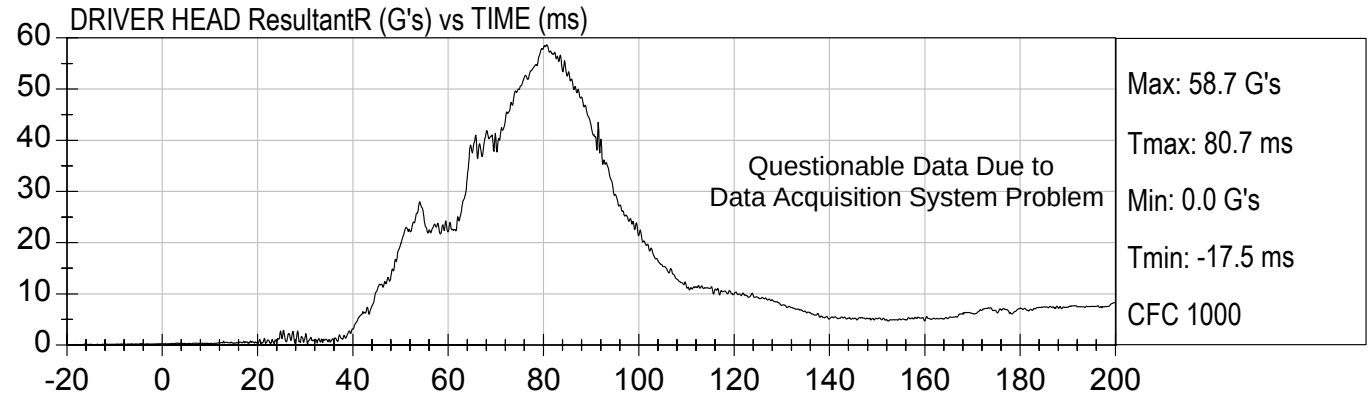
35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

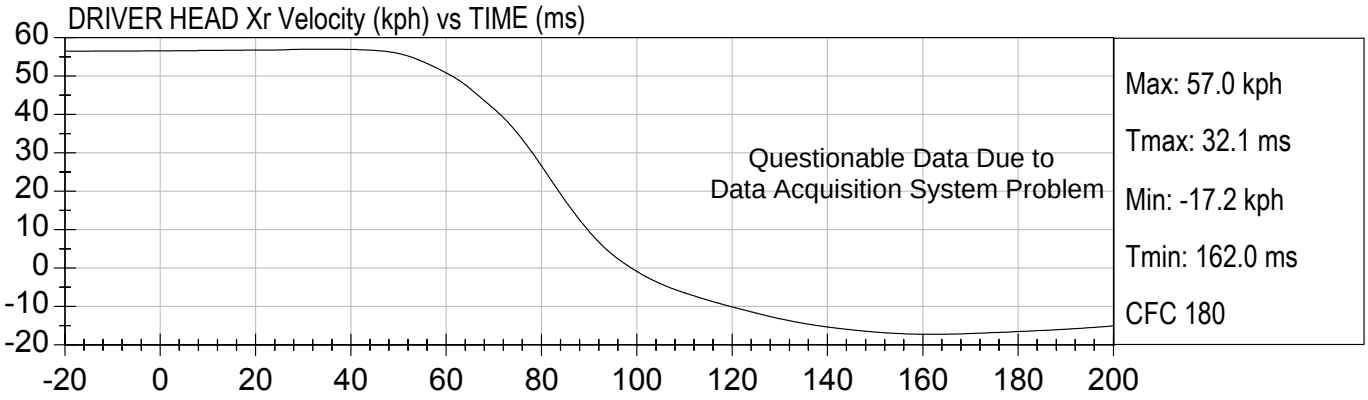
Test Date: 12/11/2002
Speed: 35.1 mph (56.5 km/h)

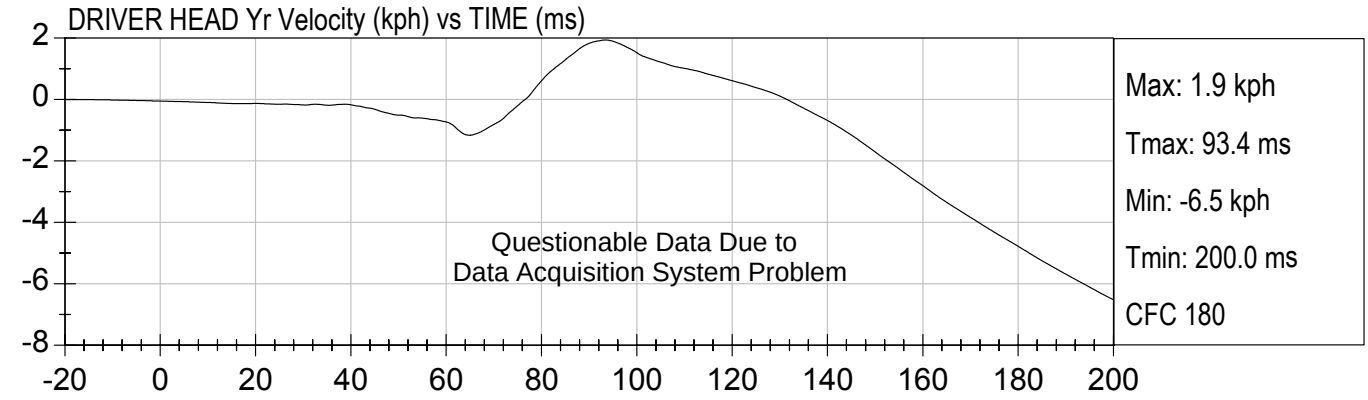


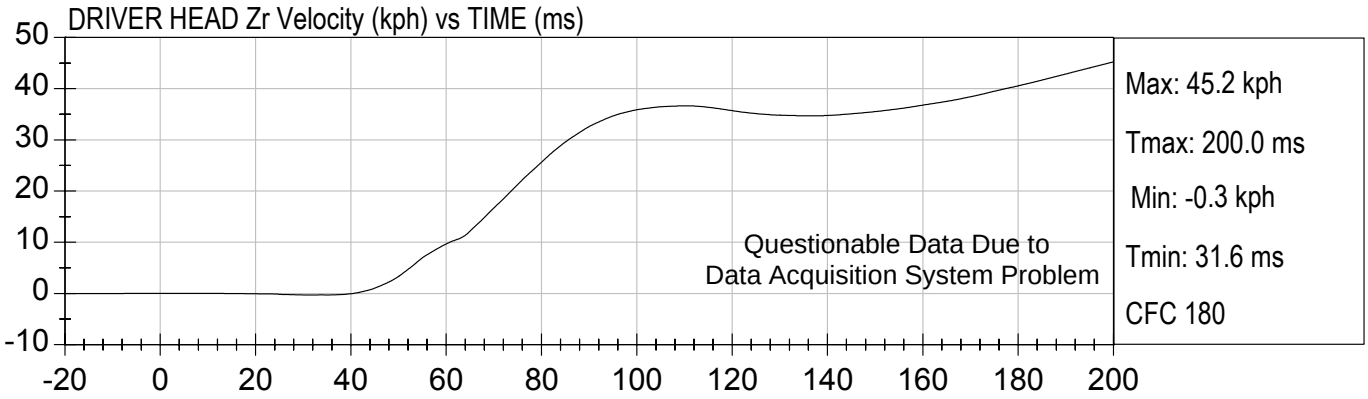






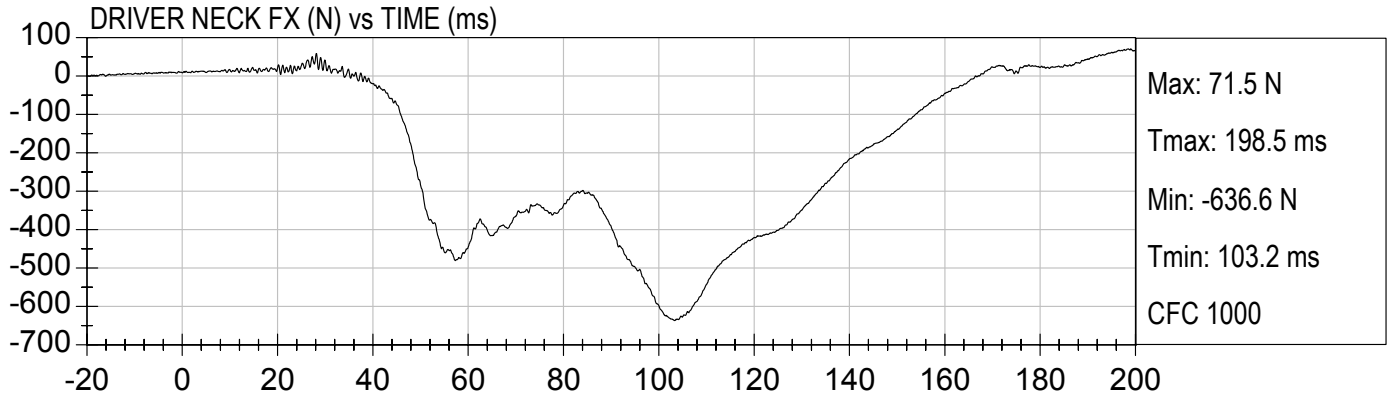

DRIVER HEAD Xr Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20
-20 0 20 40 60 80 100 120 140 160 180 200
Questionable Data Due to
Data Acquisition System Problem
Max: 57.0 kph
Tmax: 32.1 ms
Min: -17.2 kph
Tmin: 162.0 ms
CFC 180

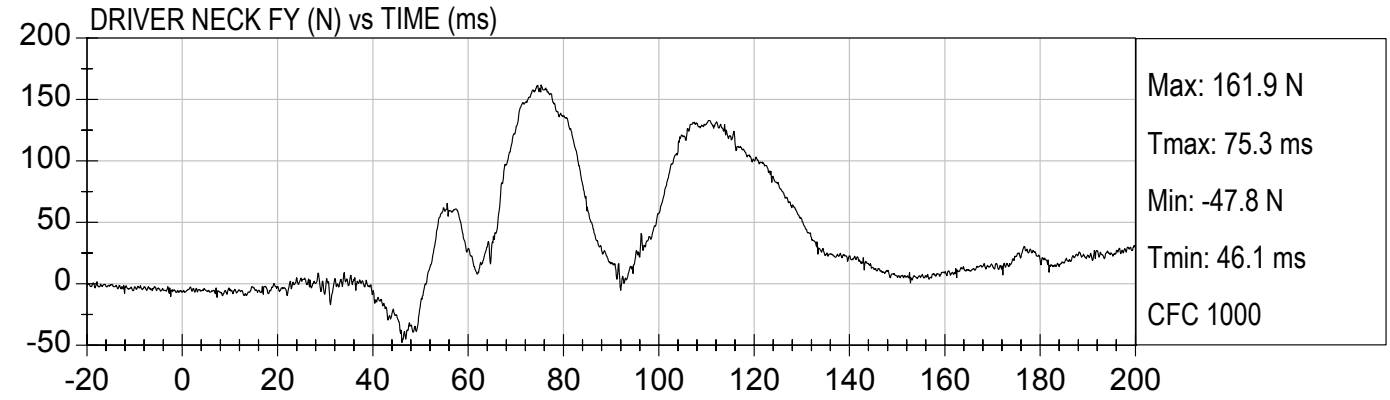

DRIVER HEAD Yr Velocity (kph) vs TIME (ms)
2
0
-2
-4
-6
-8
-20 0 20 40 60 80 100 120 140 160 180 200
Questionable Data Due to
Data Acquisition System Problem
Max: 1.9 kph
Tmax: 93.4 ms
Min: -6.5 kph
Tmin: 200.0 ms
CFC 180

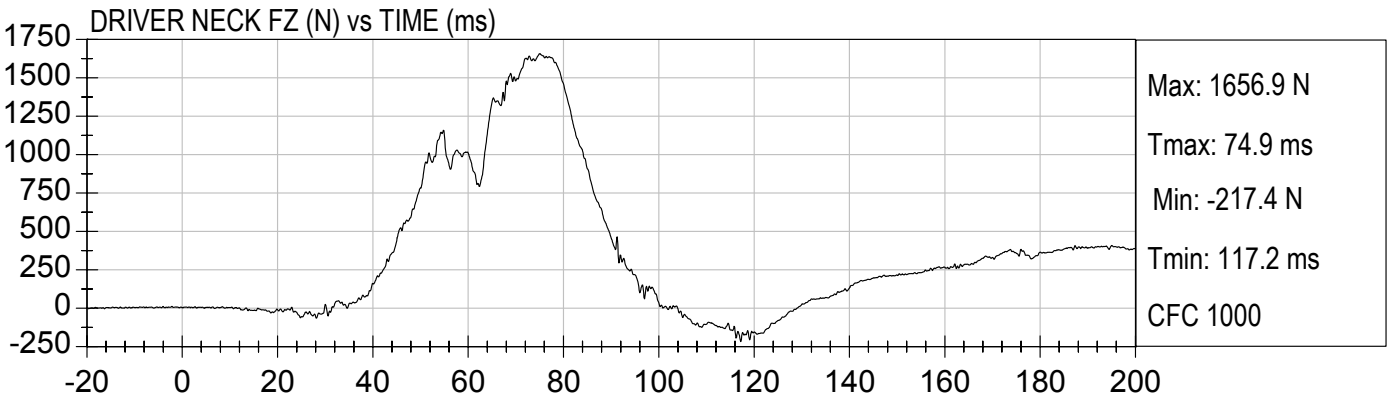

DRIVER HEAD Zr Velocity (kph) vs TIME (ms)
50
40
30
20
10
0
-10
-20 0 20 40 60 80 100 120 140 160 180 200
Questionable Data Due to
Data Acquisition System Problem
Max: 45.2 kph
Tmax: 200.0 ms
Min: -0.3 kph
Tmin: 31.6 ms
CFC 180

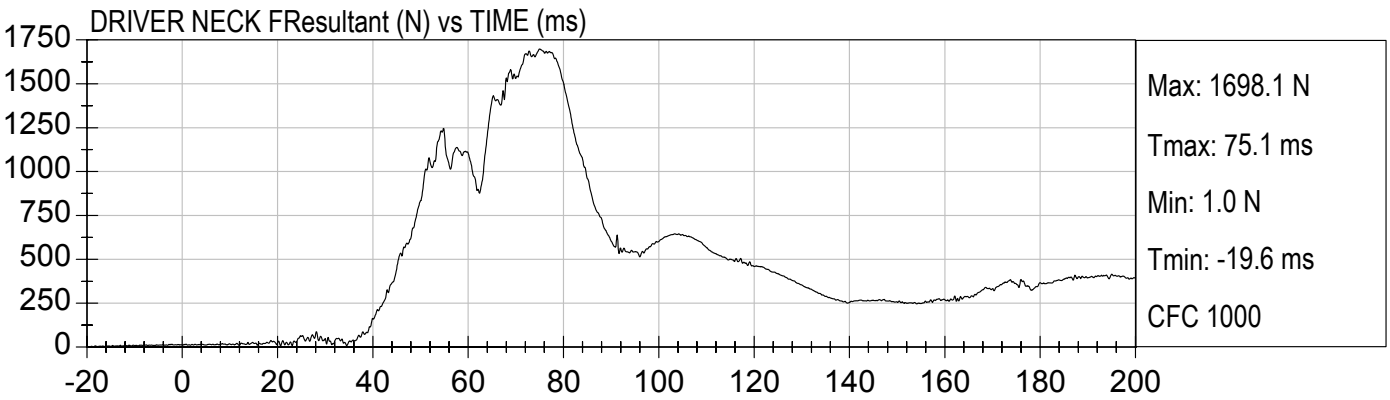
35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

Test Date: 12/11/2002
Speed: 35.1 mph (56.5 km/h)



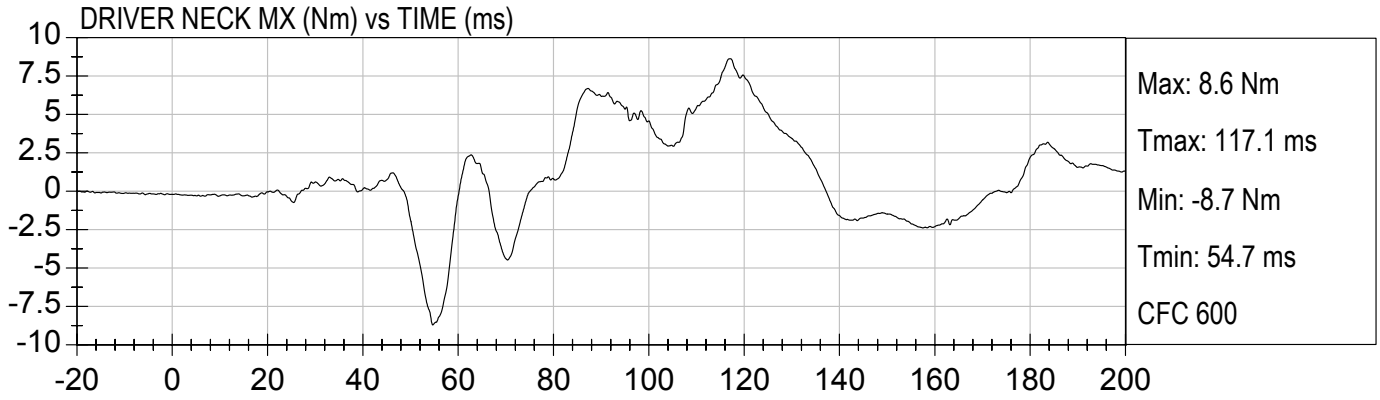


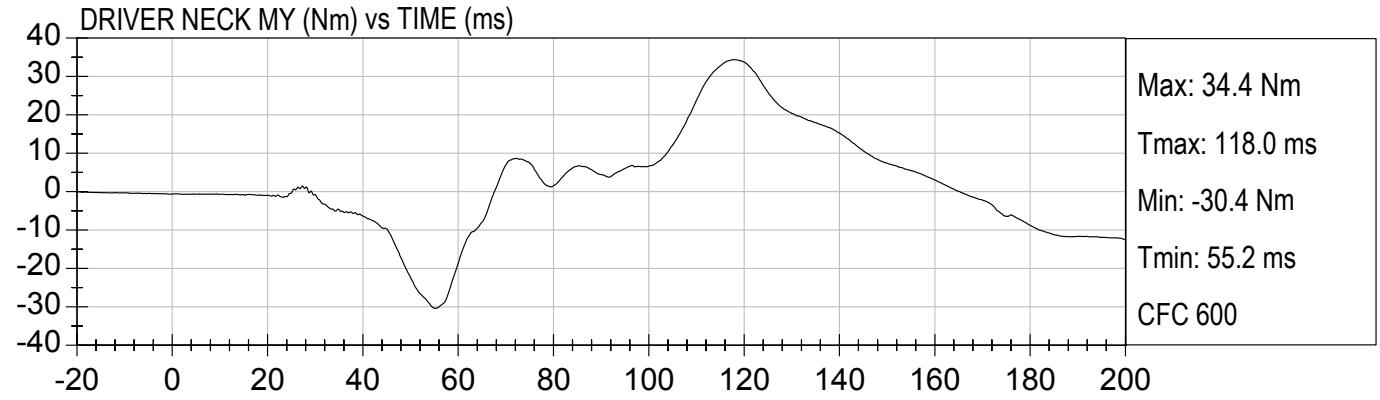


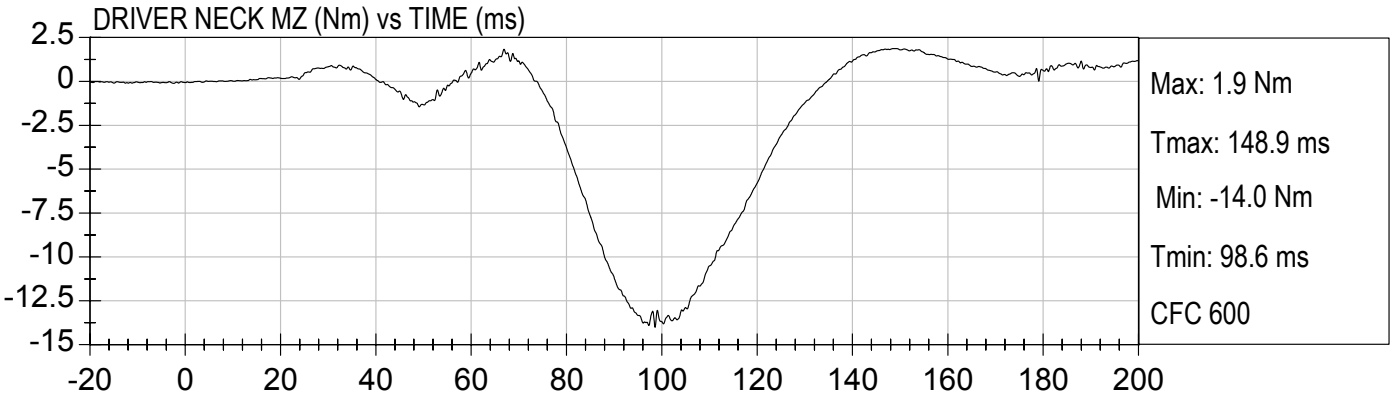


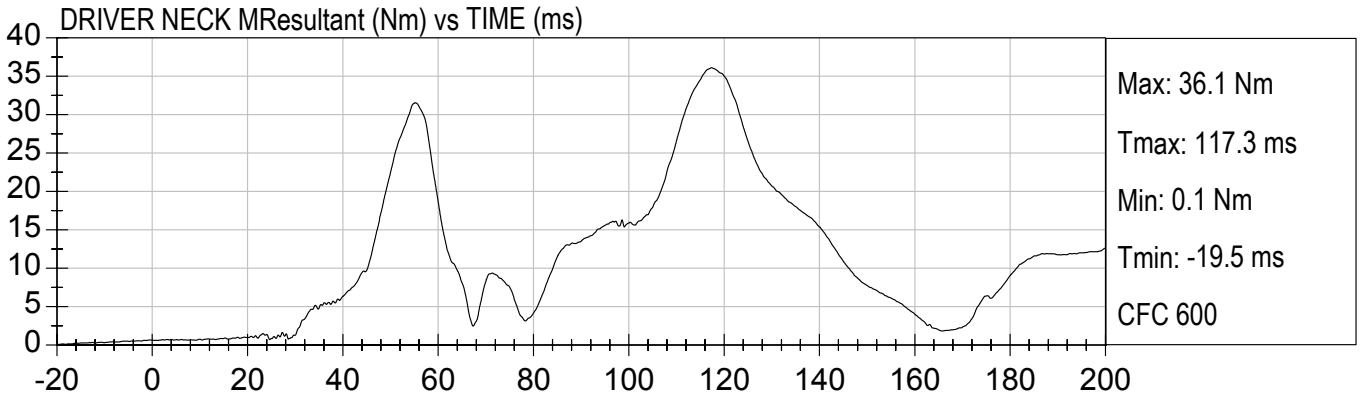
35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

Test Date: 12/11/2002
Speed: 35.1 mph (56.5 km/h)



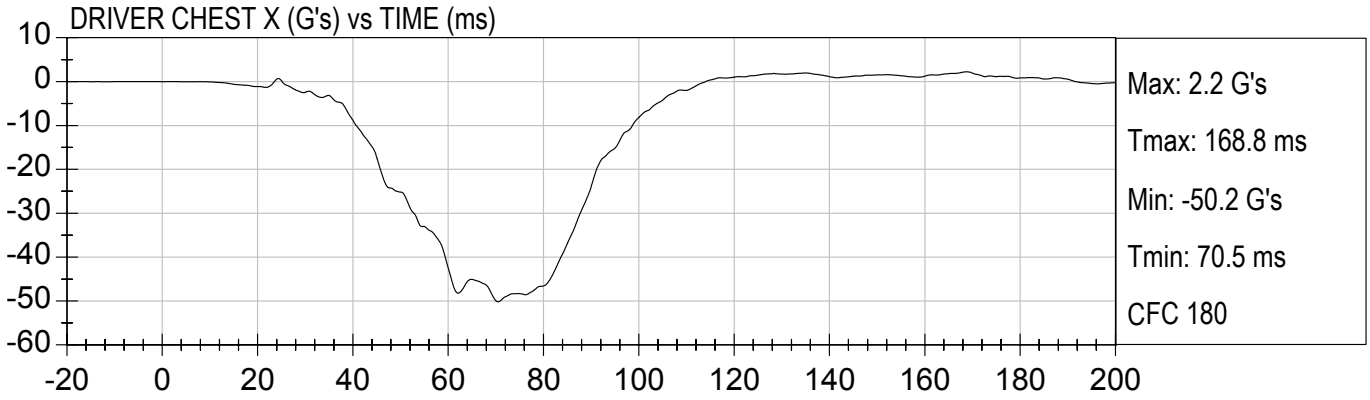


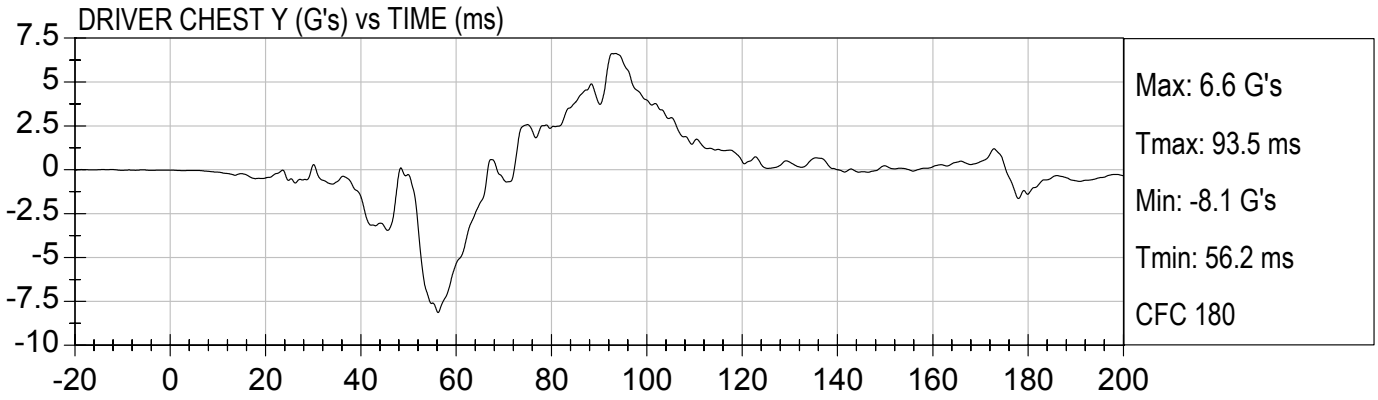


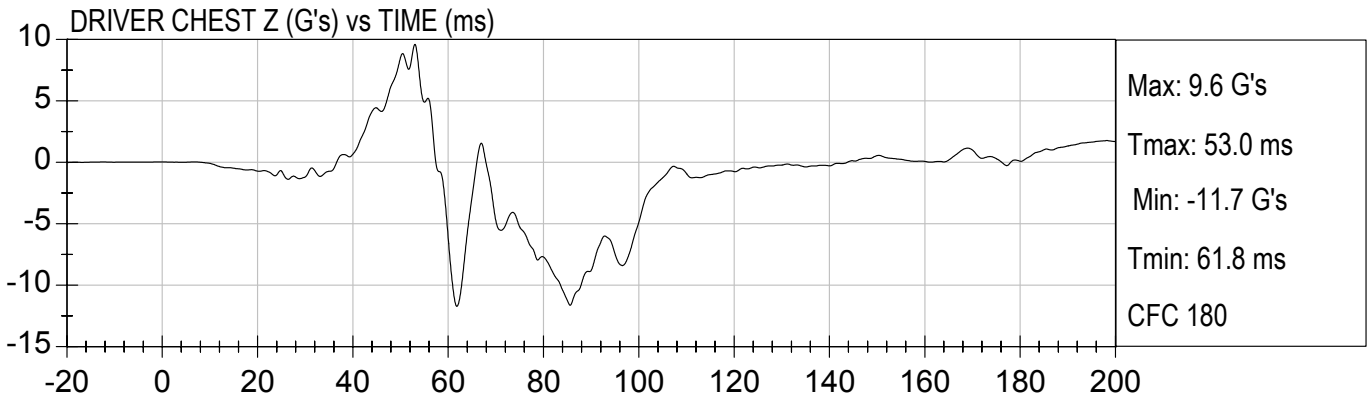


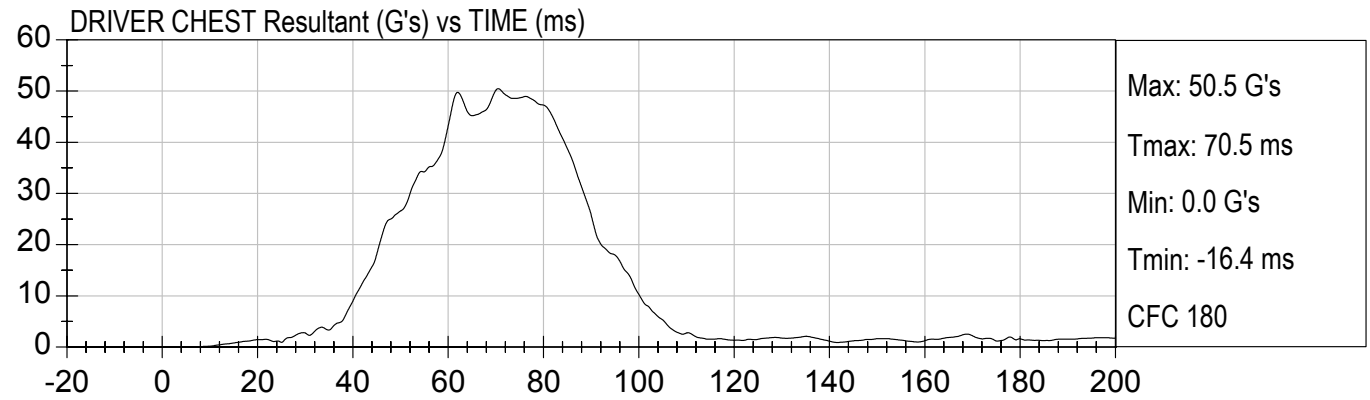
35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

Test Date: 12/11/2002
Speed: 35.1 mph (56.5 km/h)



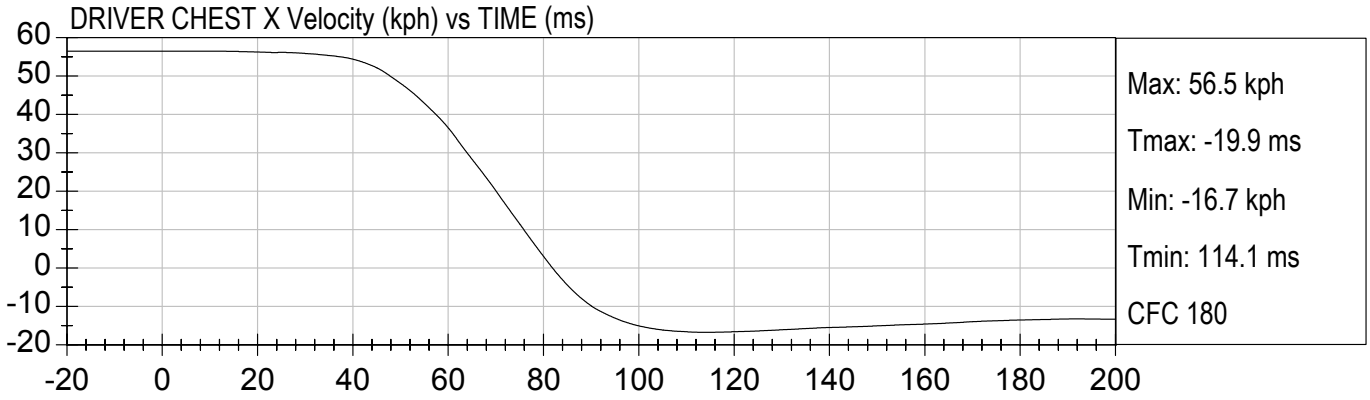


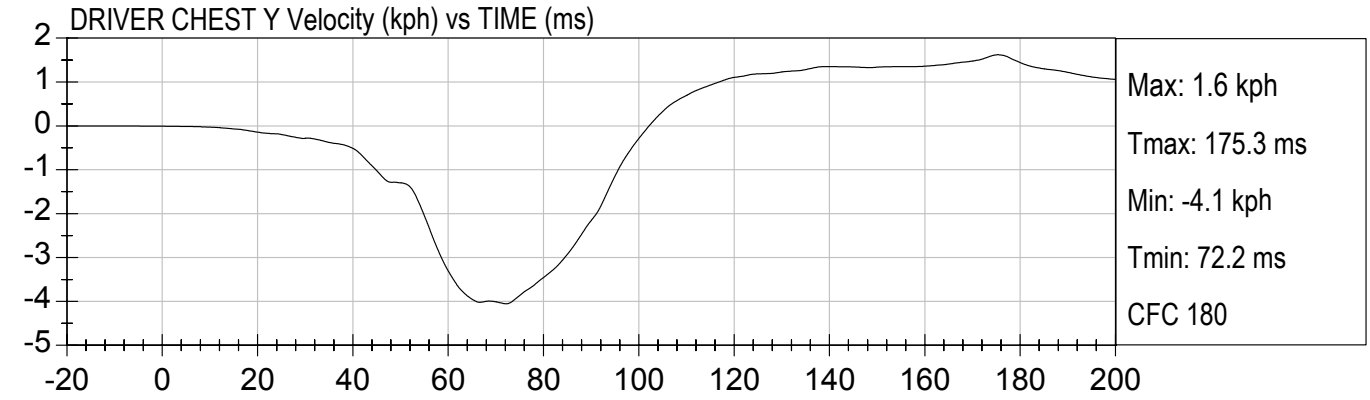


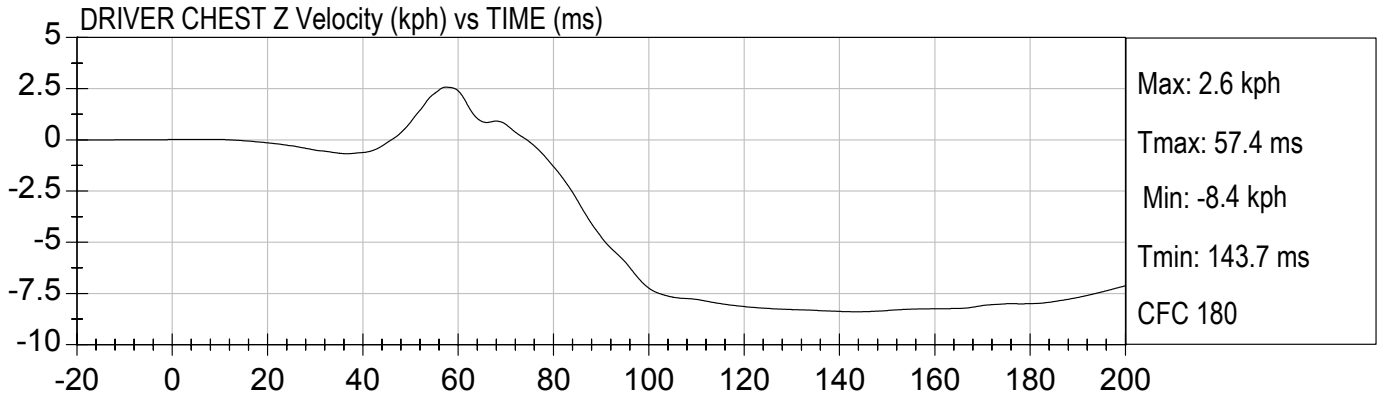


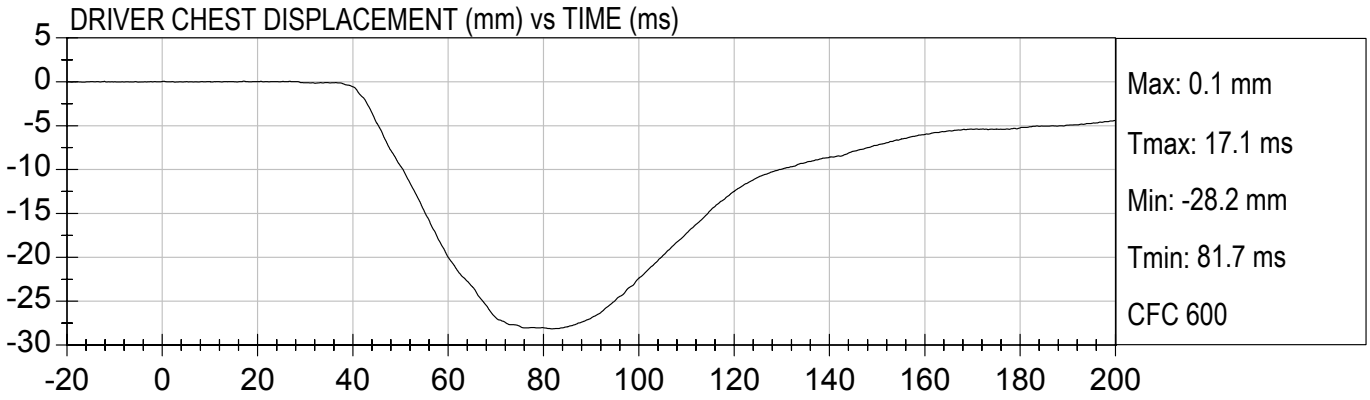
35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

Test Date: 12/11/2002
Speed: 35.1 mph (56.5 km/h)



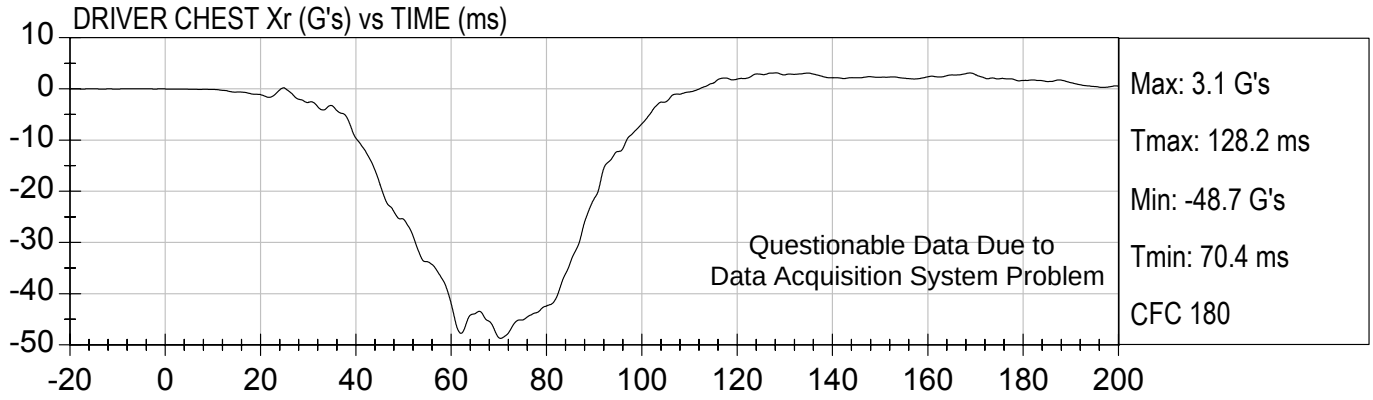


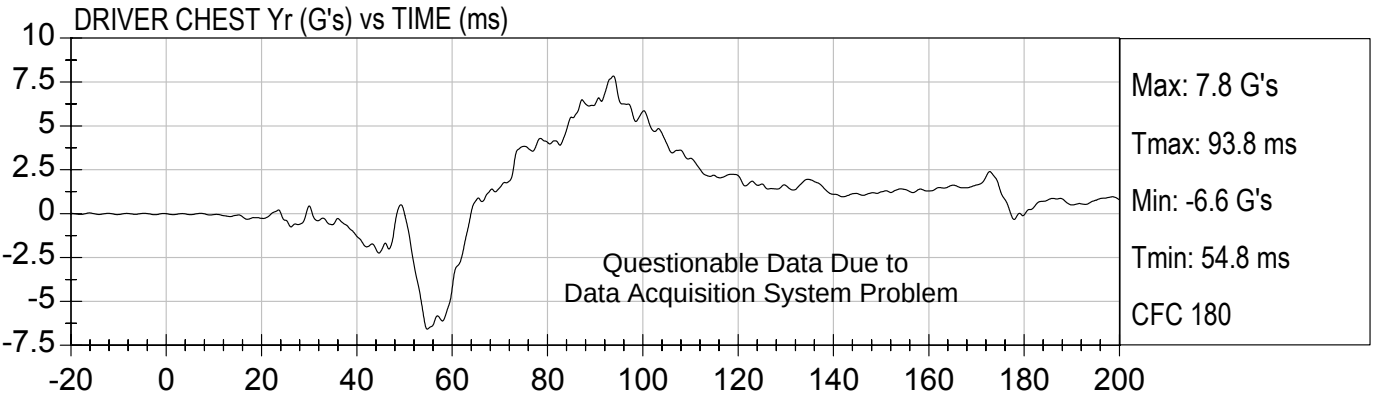


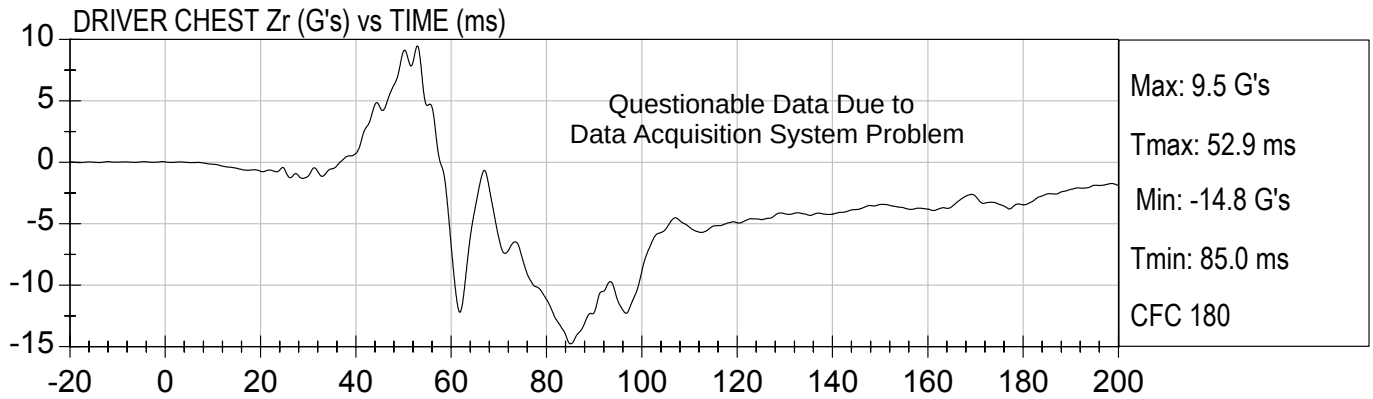


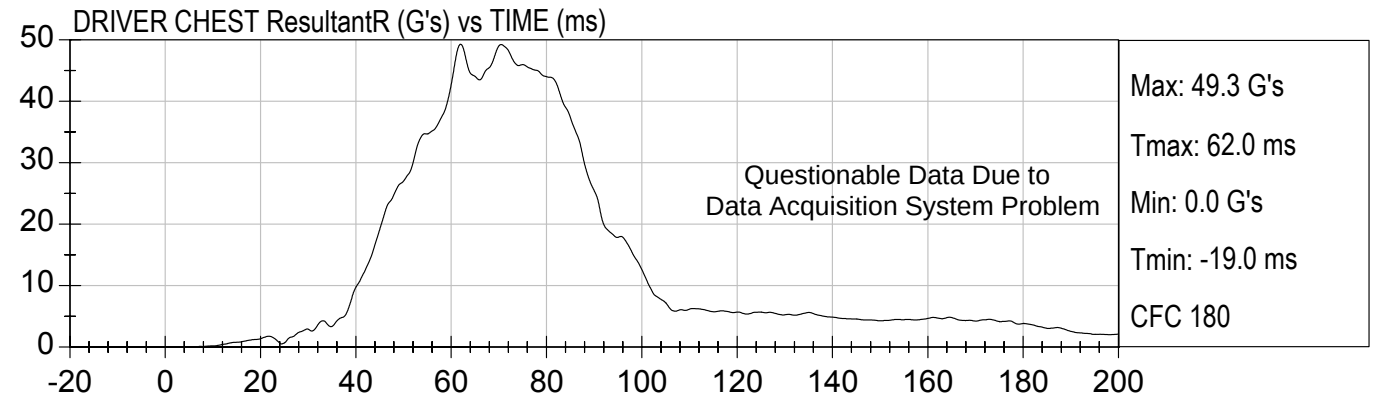
35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

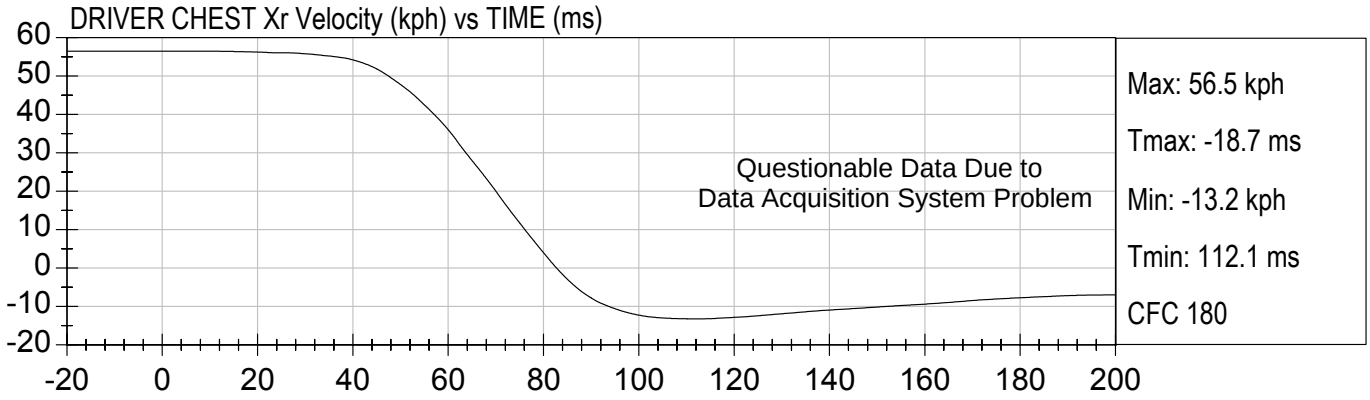
Test Date: 12/11/2002
Speed: 35.1 mph (56.5 km/h)

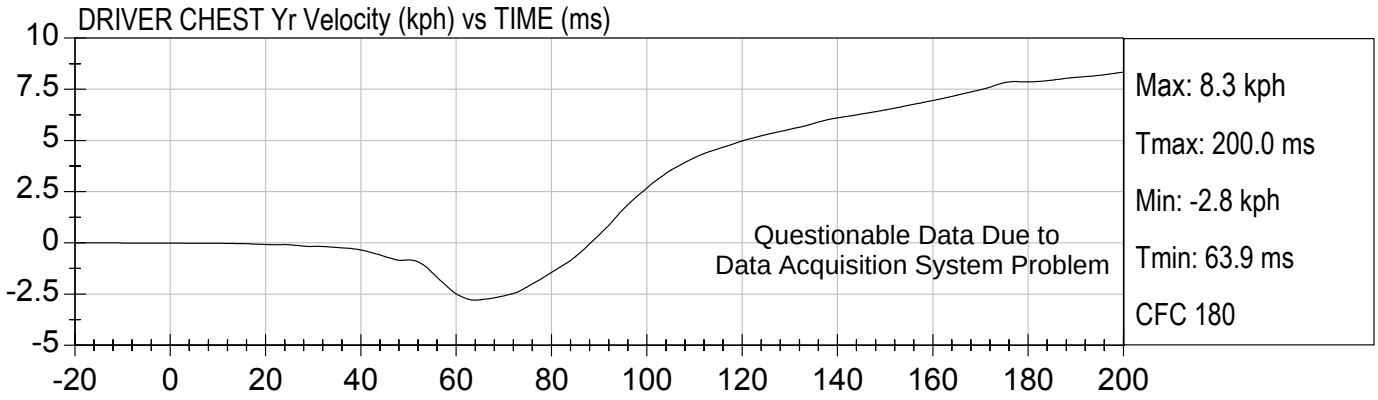


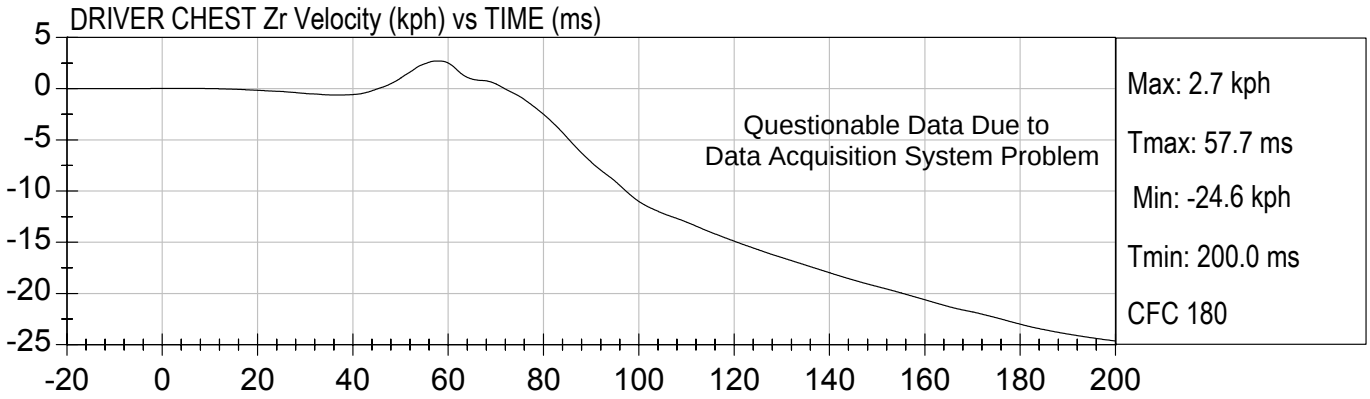






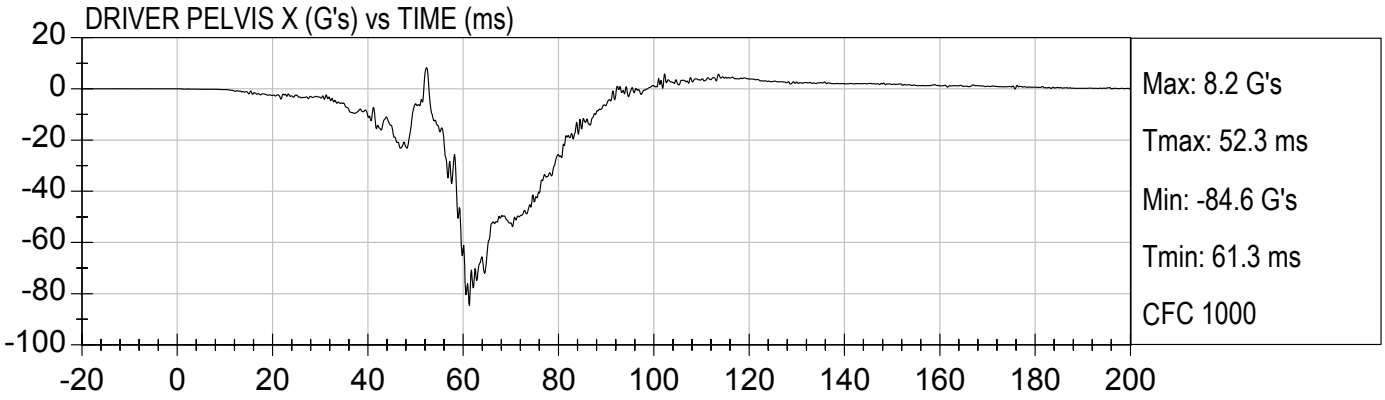

DRIVER CHEST Xr Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20
-20 0 20 40 60 80 100 120 140 160 180 200
Questionable Data Due to
Data Acquisition System Problem
Max: 56.5 kph
Tmax: -18.7 ms
Min: -13.2 kph
Tmin: 112.1 ms
CFC 180

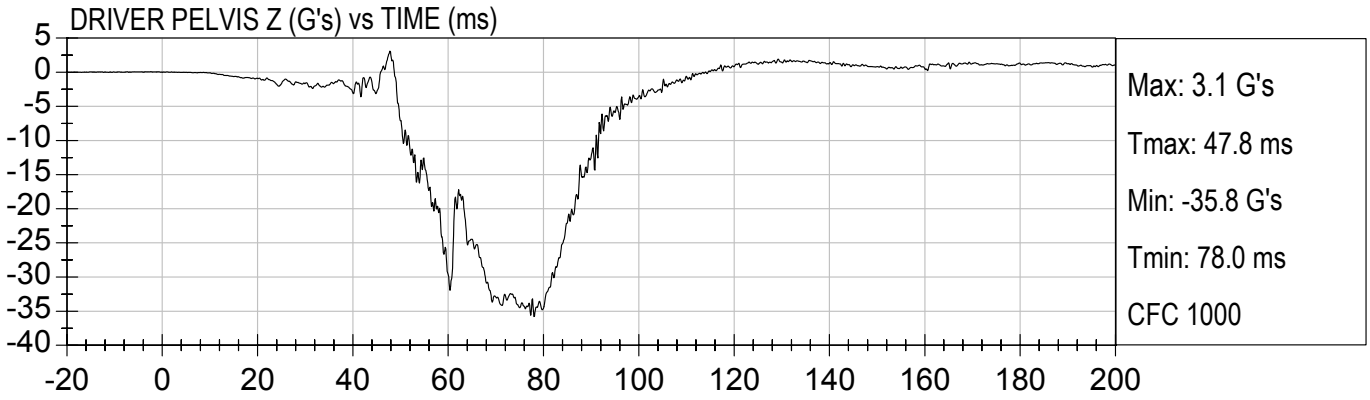

DRIVER CHEST Yr Velocity (kph) vs TIME (ms)
10
7.5
5
2.5
0
-2.5
-5
-20 0 20 40 60 80 100 120 140 160 180 200
Questionable Data Due to
Data Acquisition System Problem
Max: 8.3 kph
Tmax: 200.0 ms
Min: -2.8 kph
Tmin: 63.9 ms
CFC 180

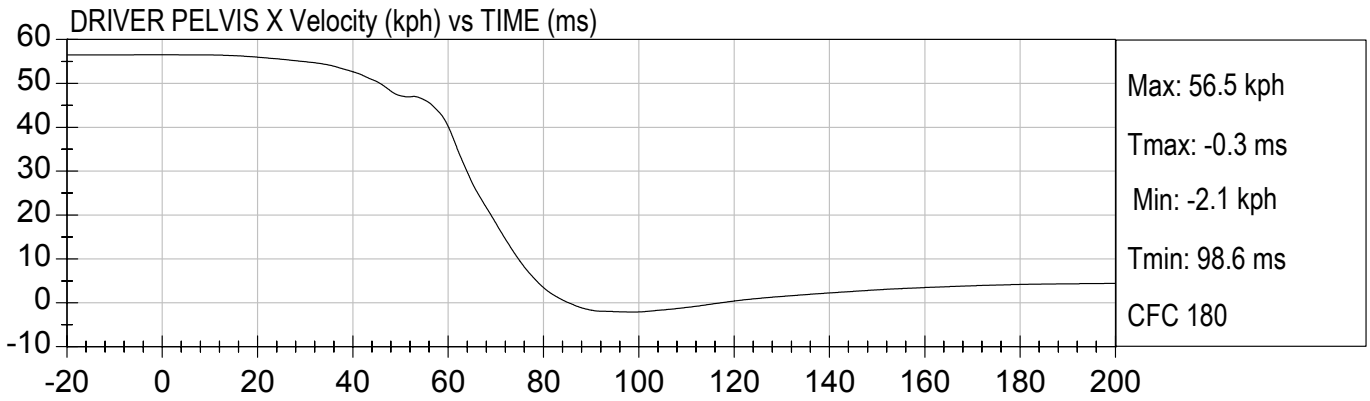

DRIVER CHEST Zr Velocity (kph) vs TIME (ms)
5
0
-5
-10
-15
-20
-25
-20 0 20 40 60 80 100 120 140 160 180 200
Questionable Data Due to
Data Acquisition System Problem
Max: 2.7 kph
Tmax: 57.7 ms
Min: -24.6 kph
Tmin: 200.0 ms
CFC 180

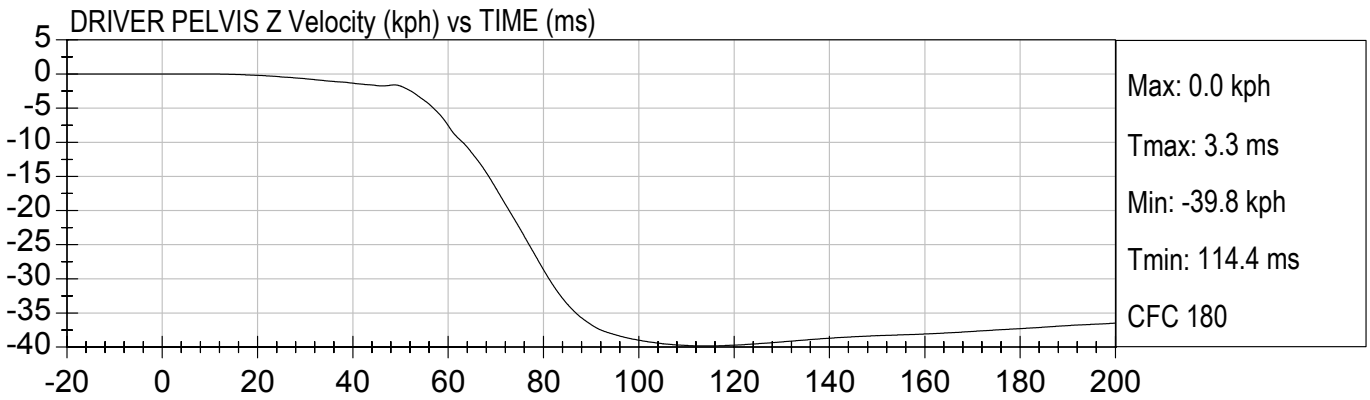
35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

Test Date: 12/11/2002
Speed: 35.1 mph (56.5 km/h)



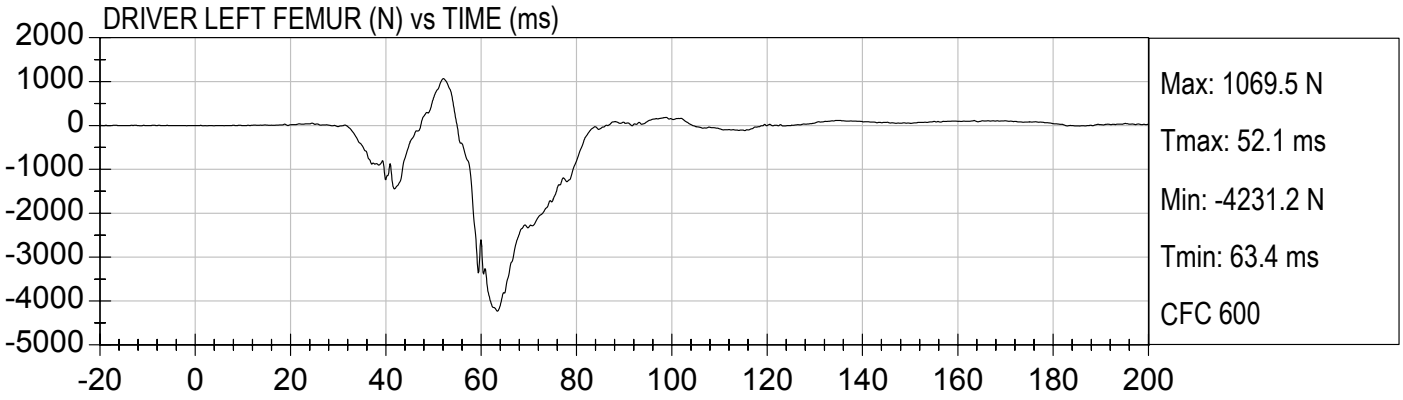


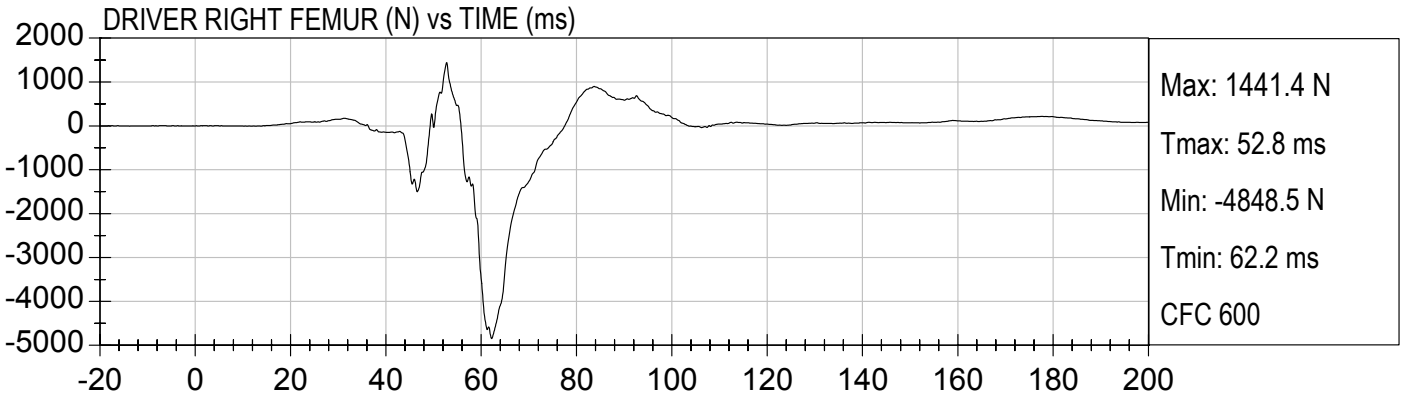




35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

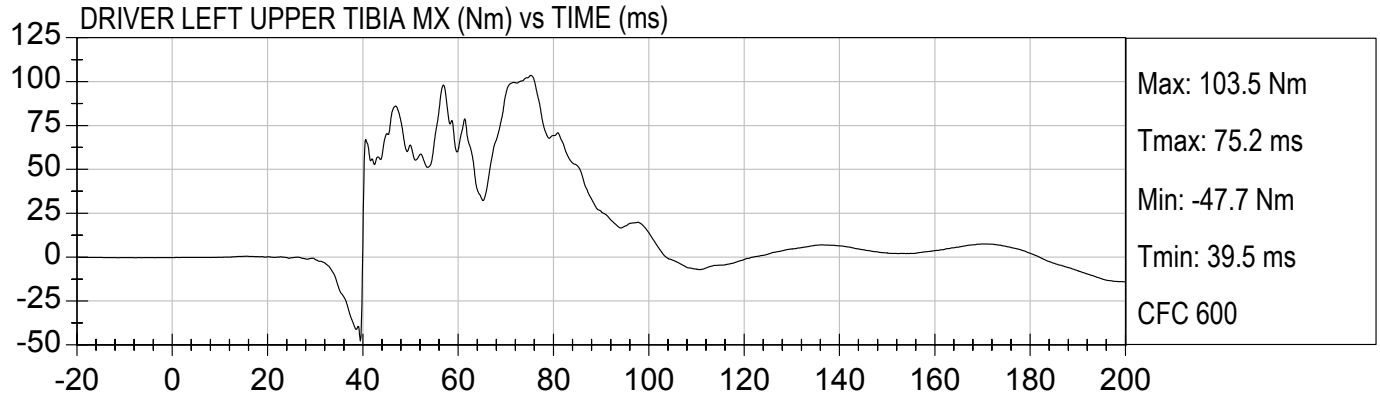
Test Date: 12/11/2002
Speed: 35.1 mph (56.5 km/h)

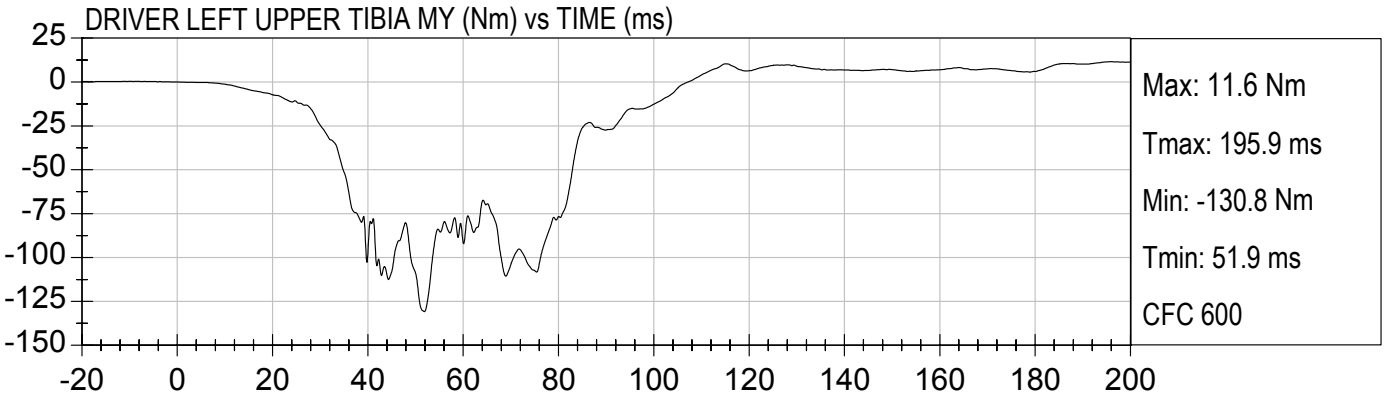


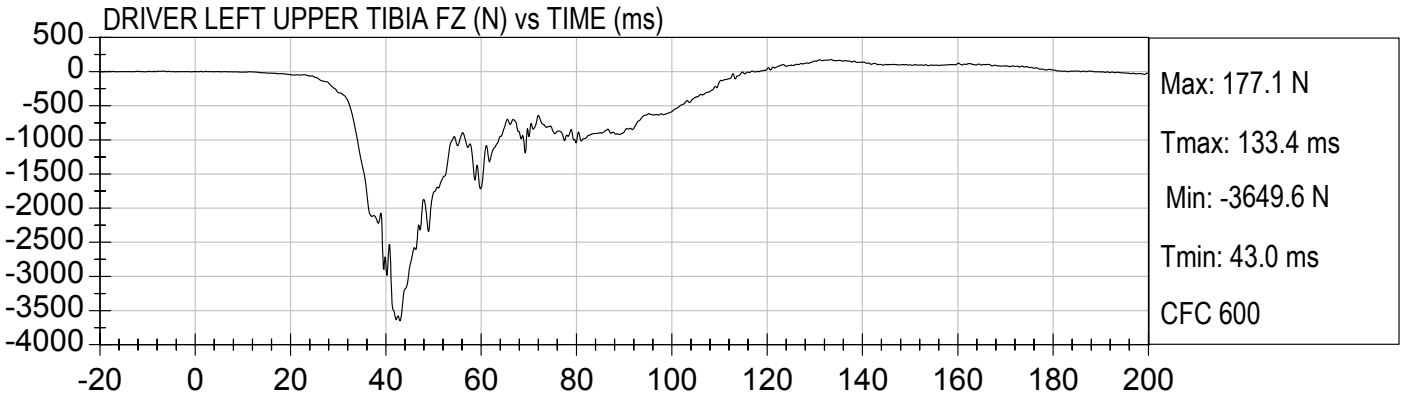


35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

Test Date: 12/11/2002
Speed: 35.1 mph (56.5 km/h)

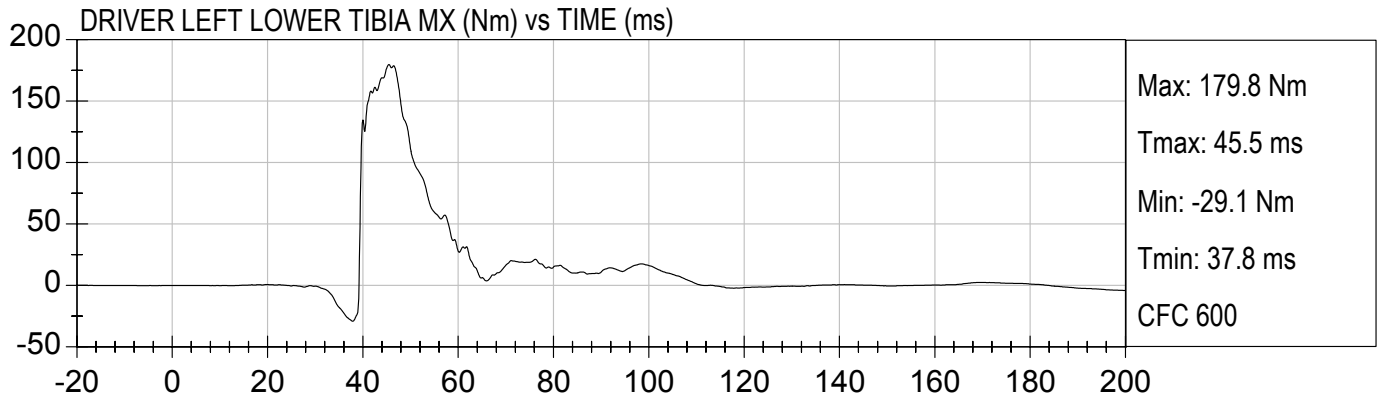


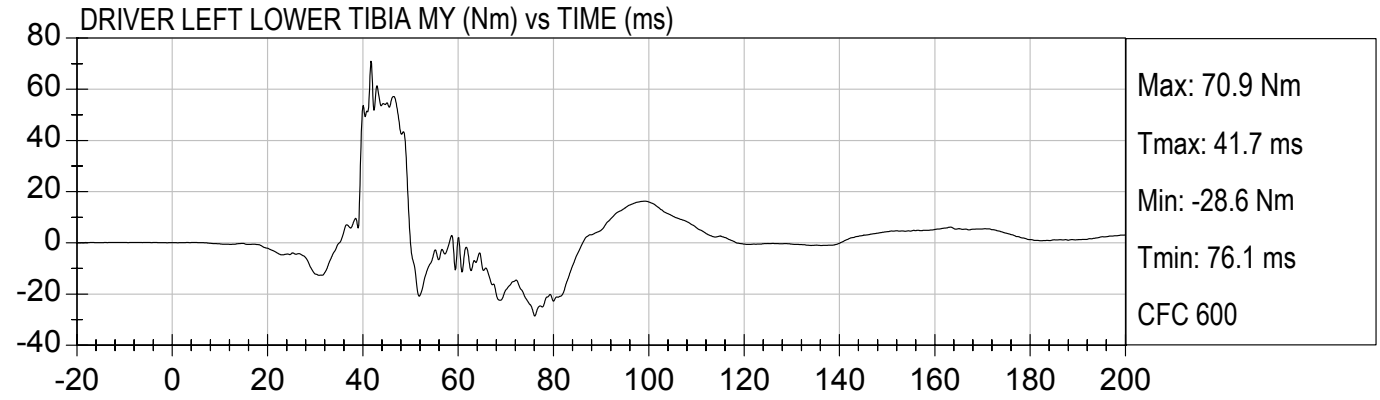


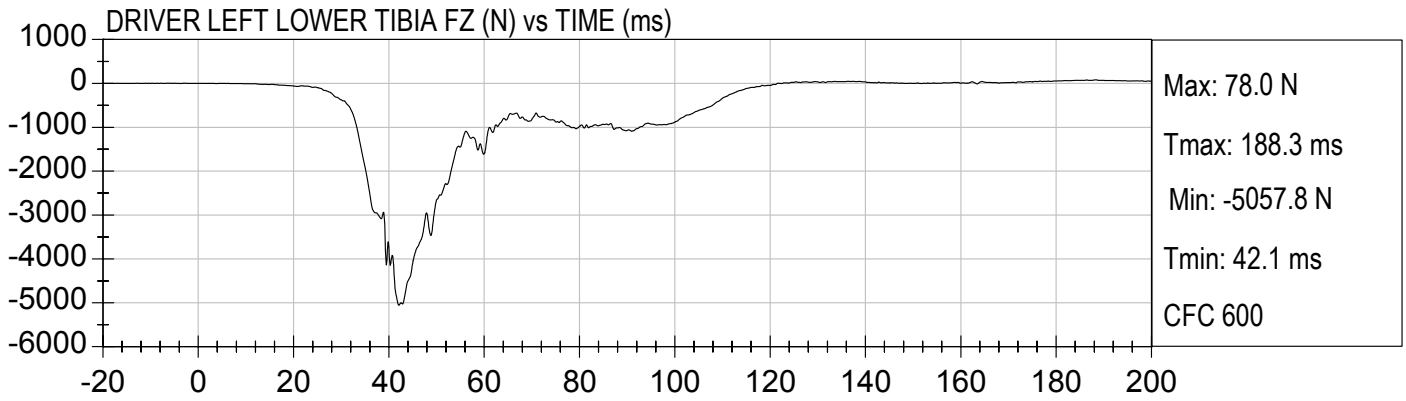


35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

Test Date: 12/11/2002
Speed: 35.1 mph (56.5 km/h)

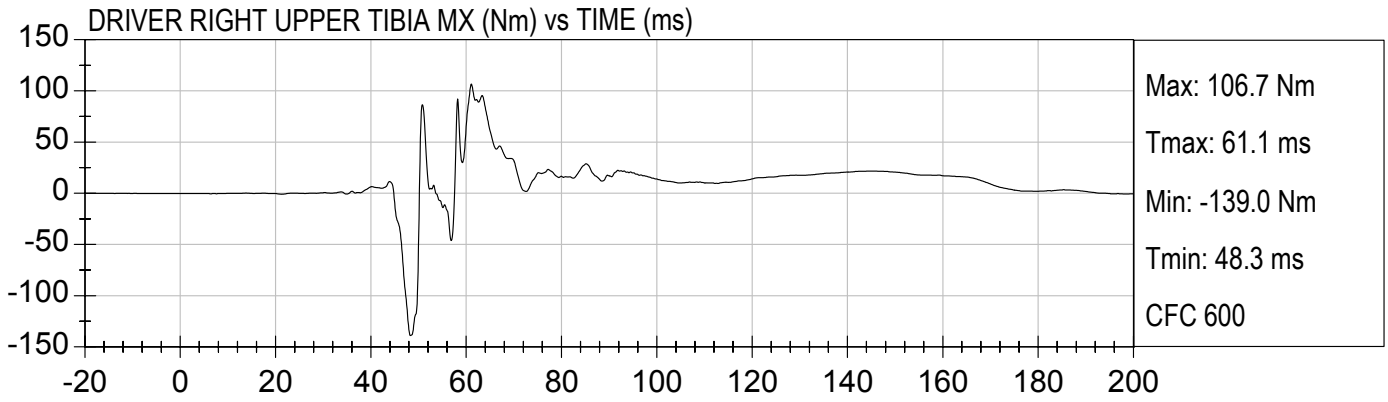


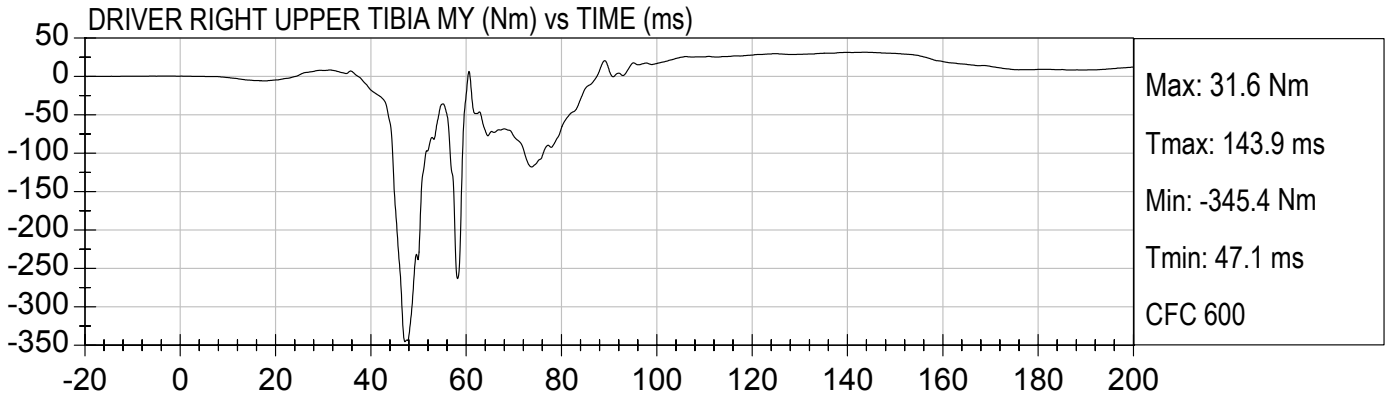


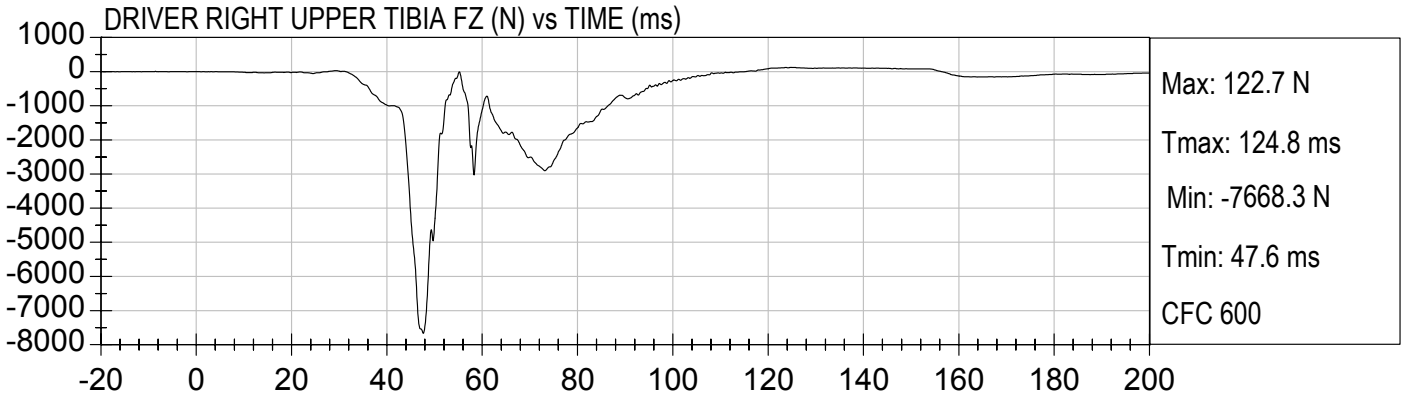


35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

Test Date: 12/11/2002
Speed: 35.1 mph (56.5 km/h)

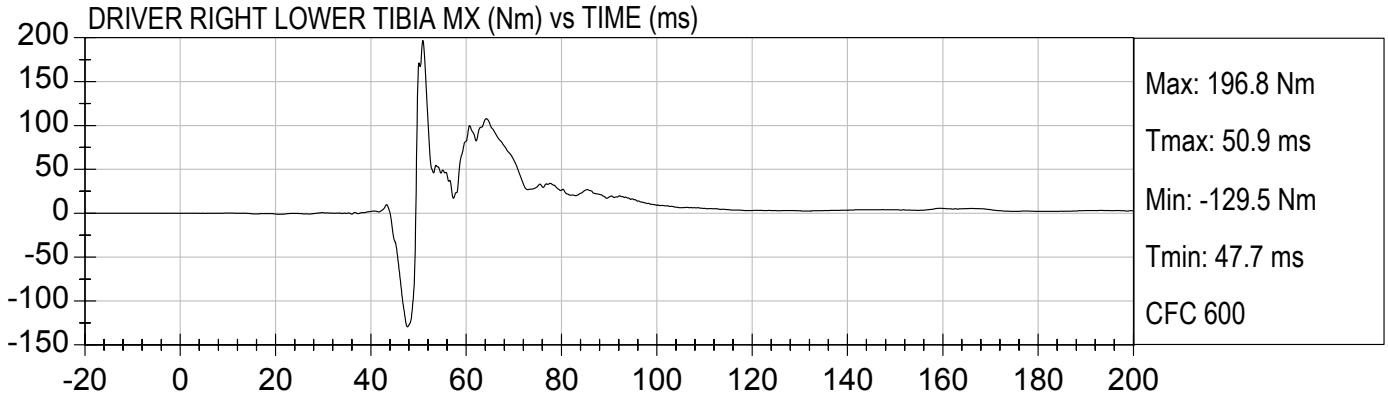


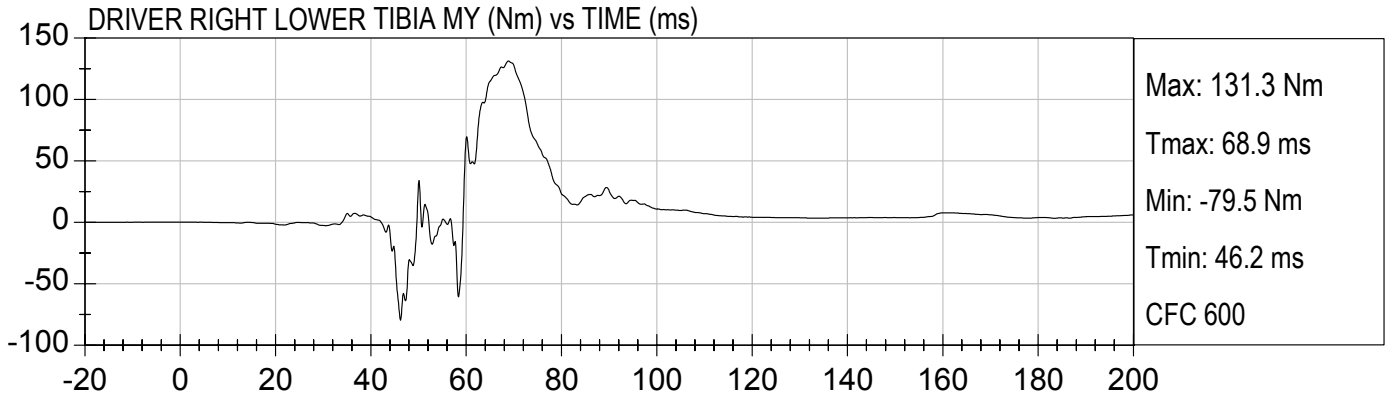


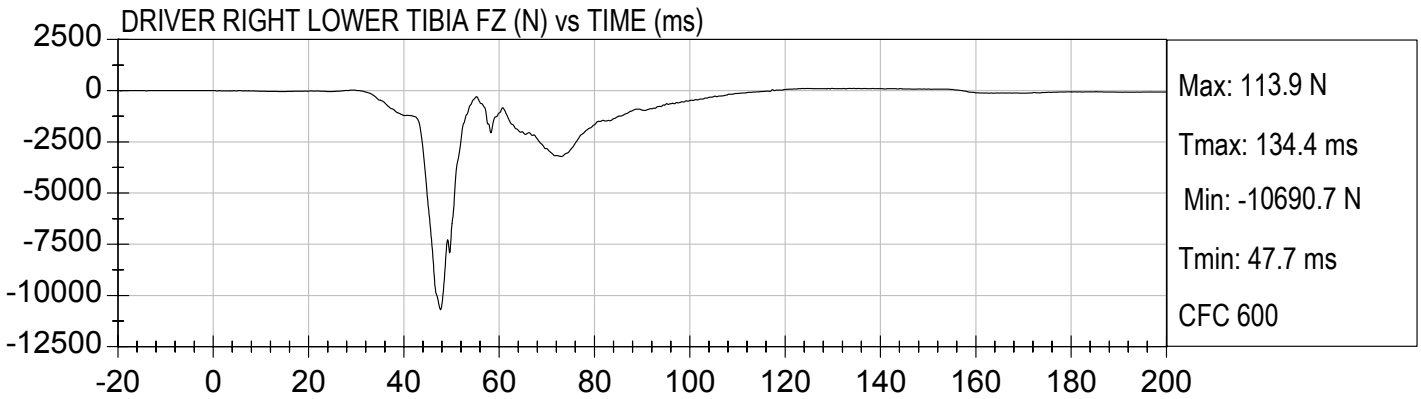


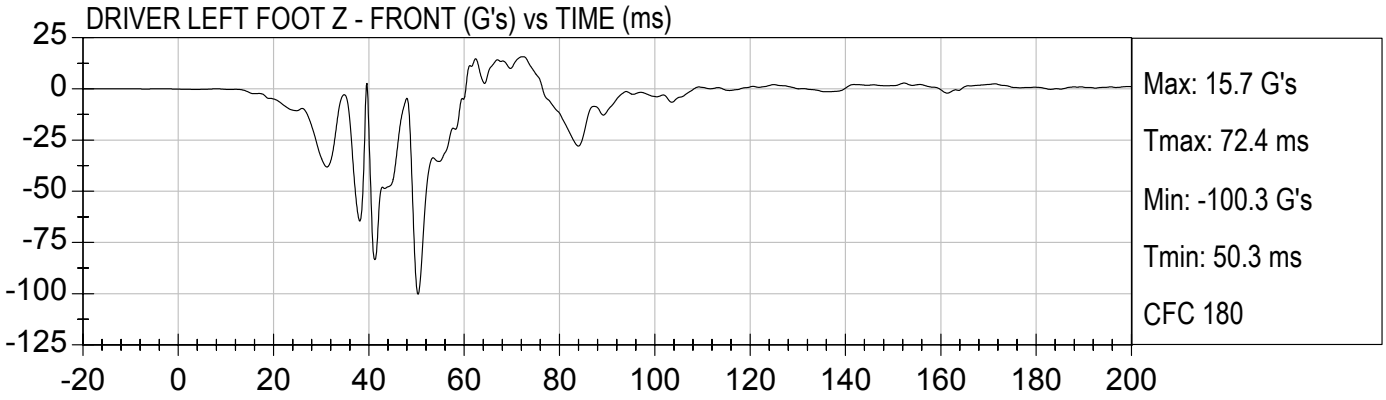
35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

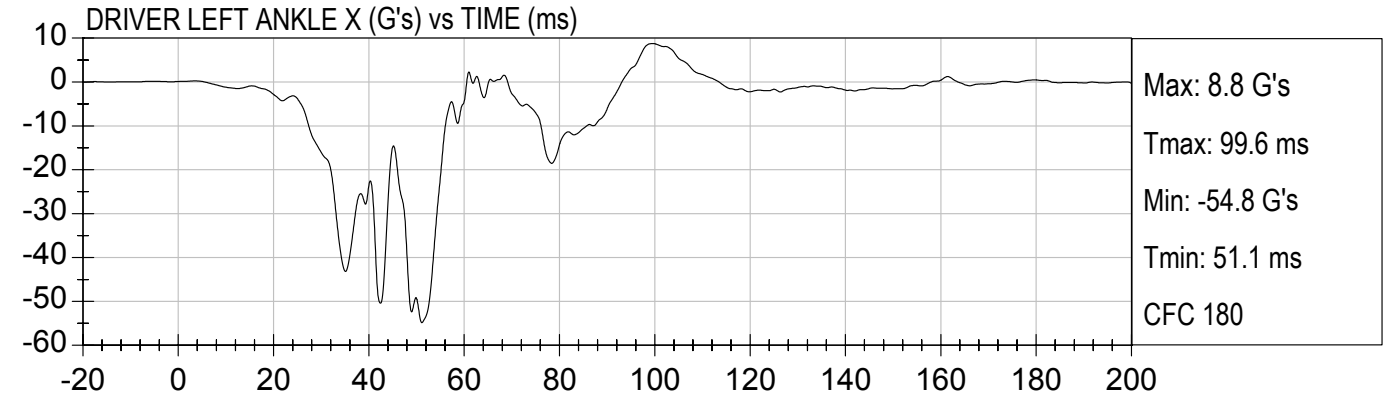
Test Date: 12/11/2002
Speed: 35.1 mph (56.5 km/h)

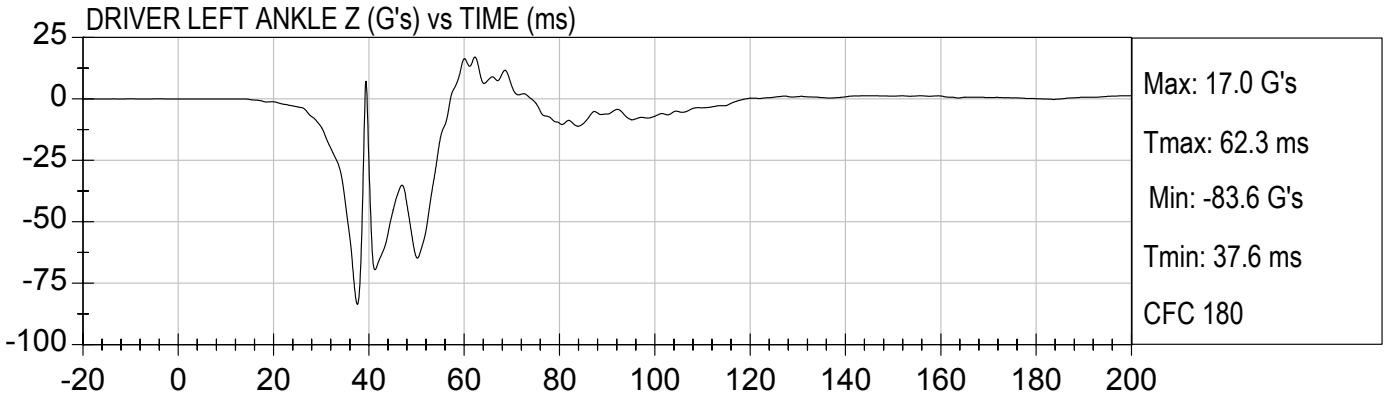






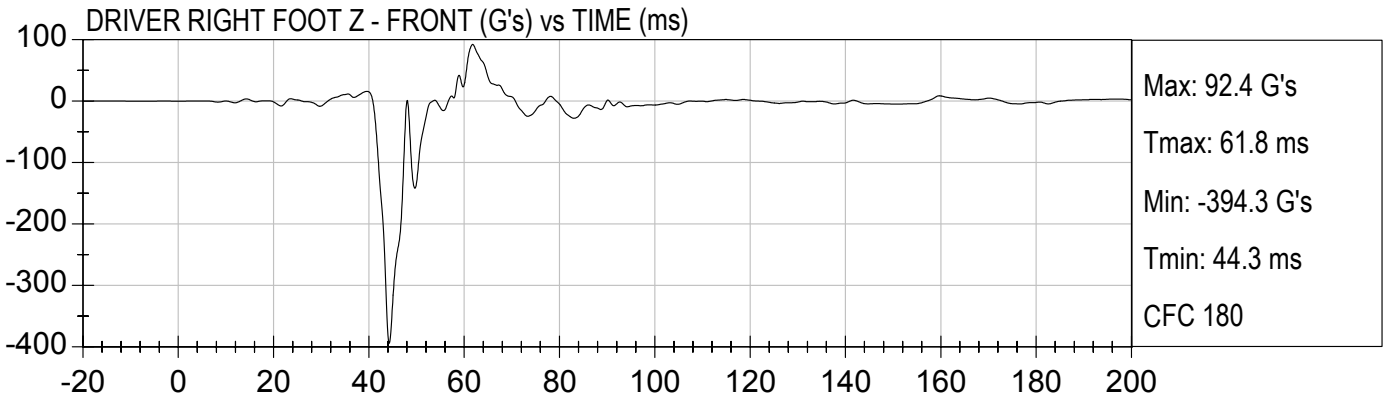

DRIVER LEFT FOOT Z - FRONT (G's) vs TIME (ms)
25
0
-25
-50
-75
-100
-125
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 15.7 G's
Tmax: 72.4 ms
Min: -100.3 G's
Tmin: 50.3 ms
CFC 180

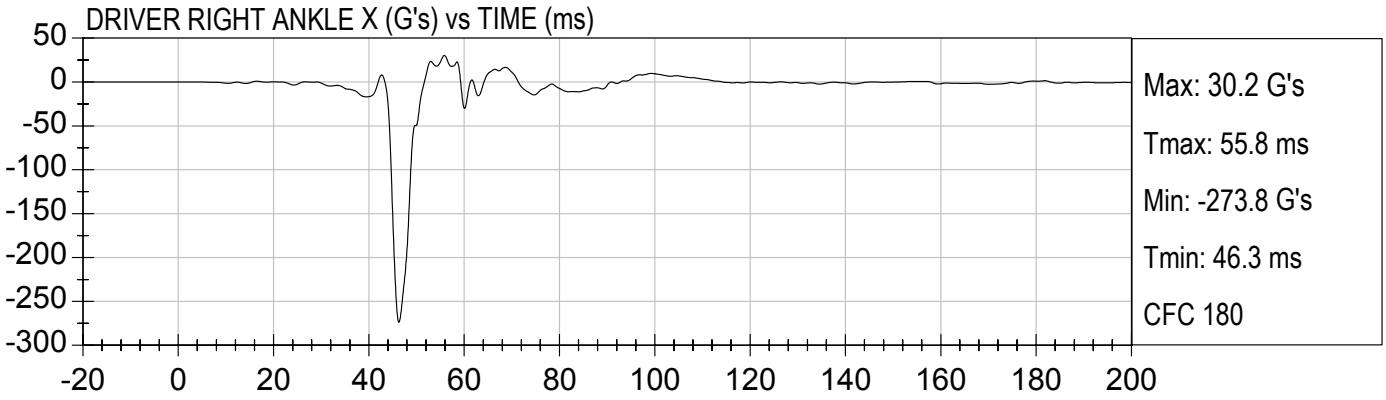

DRIVER LEFT ANKLE X (G's) vs TIME (ms)
10
0
-10
-20
-30
-40
-50
-60
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 8.8 G's
Tmax: 99.6 ms
Min: -54.8 G's
Tmin: 51.1 ms
CFC 180

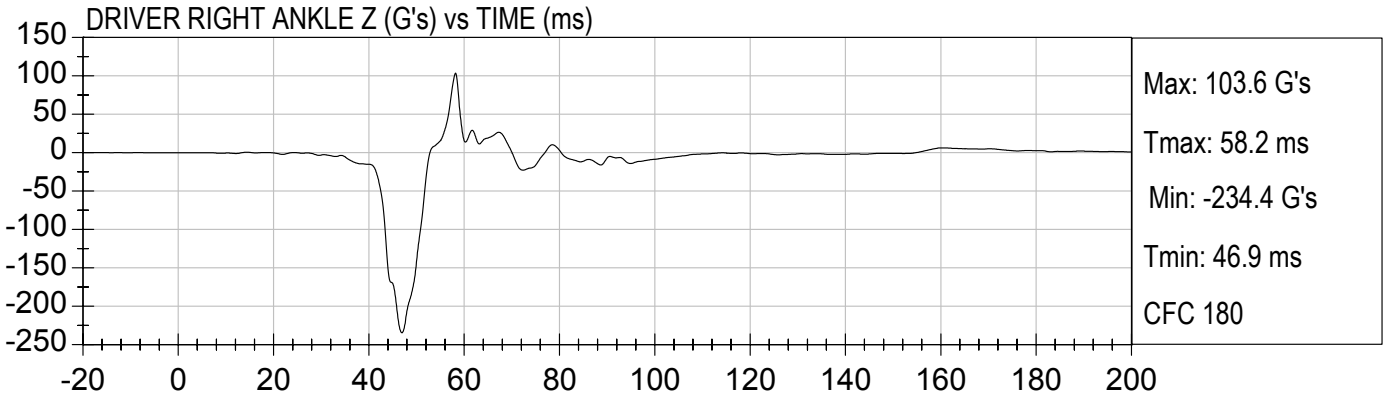

DRIVER LEFT ANKLE Z (G's) vs TIME (ms)
25
0
-25
-50
-75
-100
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 17.0 G's
Tmax: 62.3 ms
Min: -83.6 G's
Tmin: 37.6 ms
CFC 180

35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

Test Date: 12/11/2002
Speed: 35.1 mph (56.5 km/h)

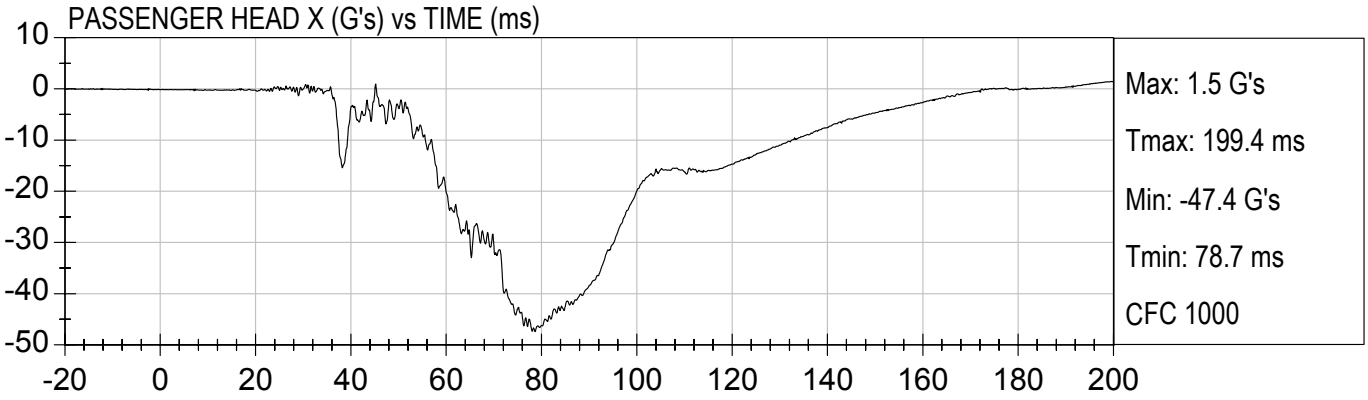


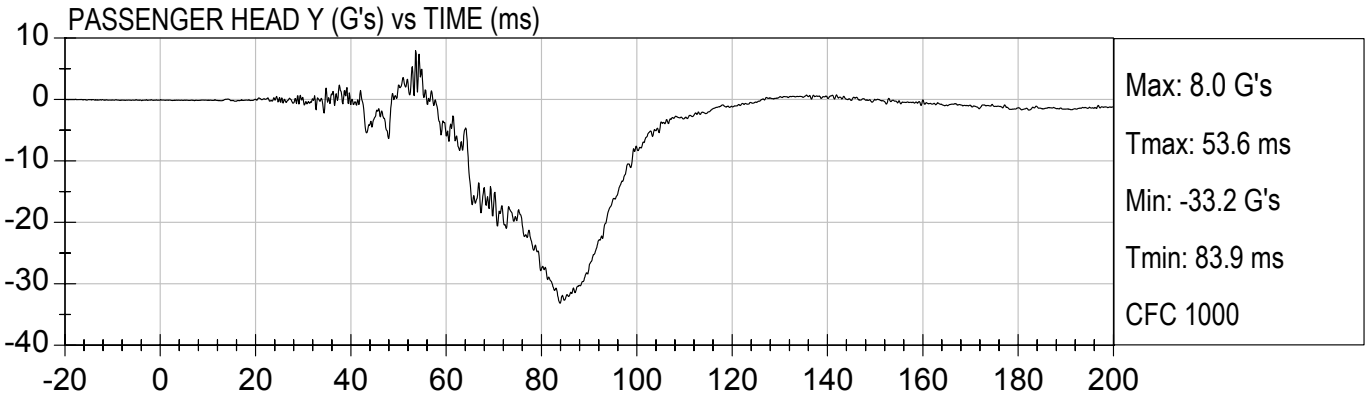


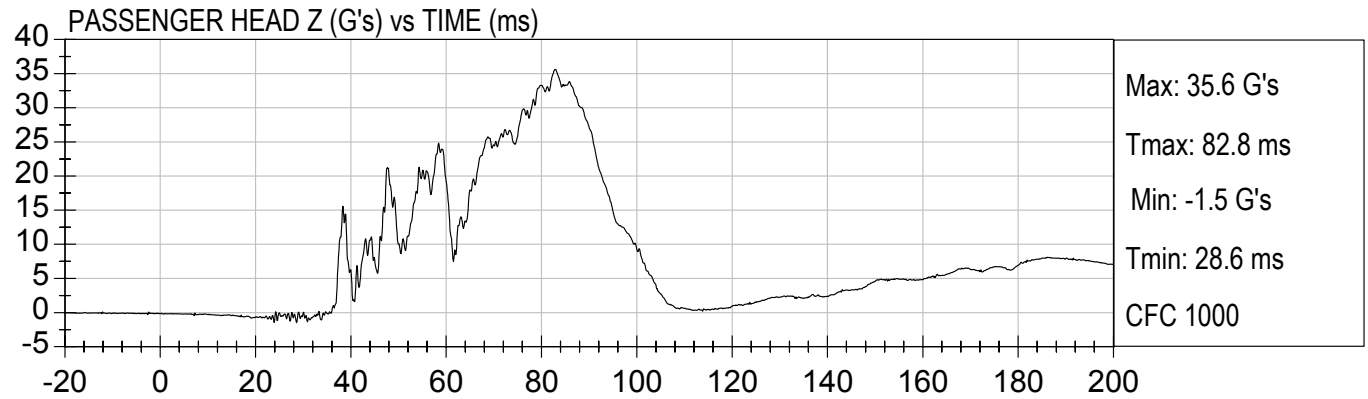


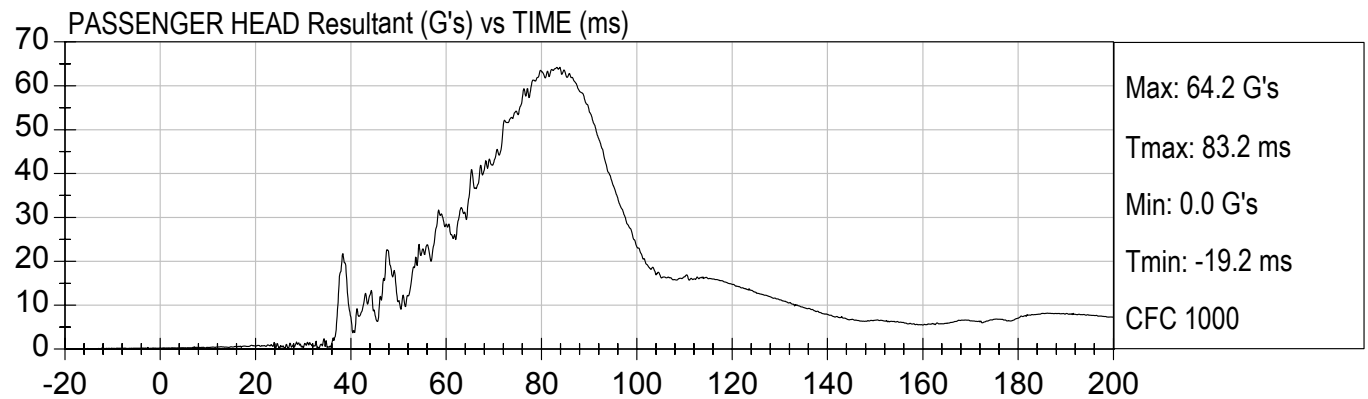
35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

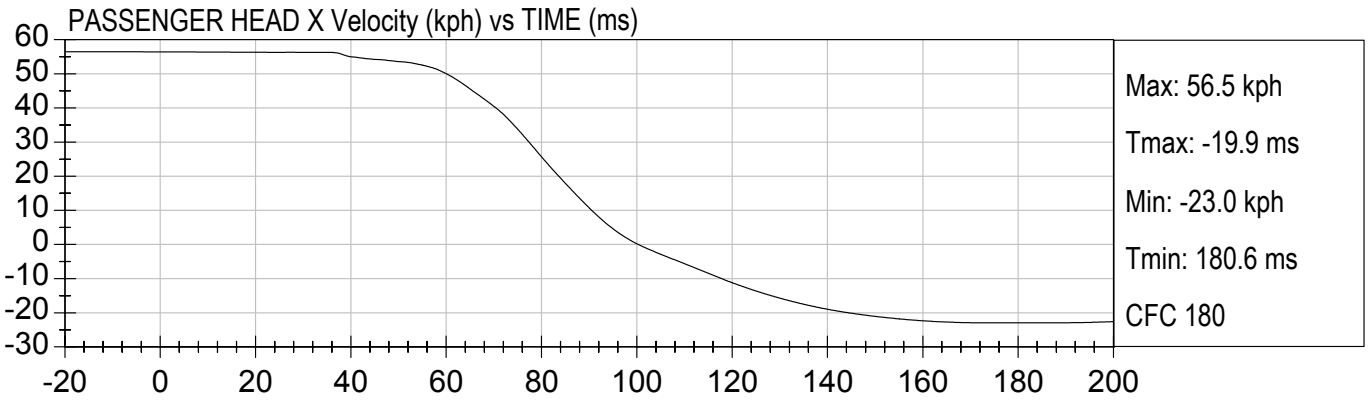
Test Date: 12/11/2002
Speed: 35.1 mph (56.5 km/h)

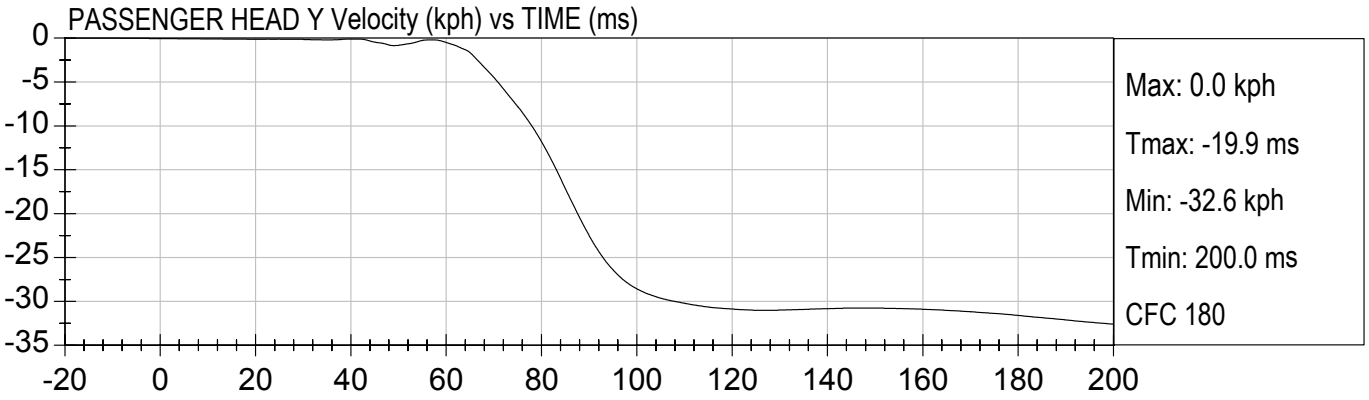


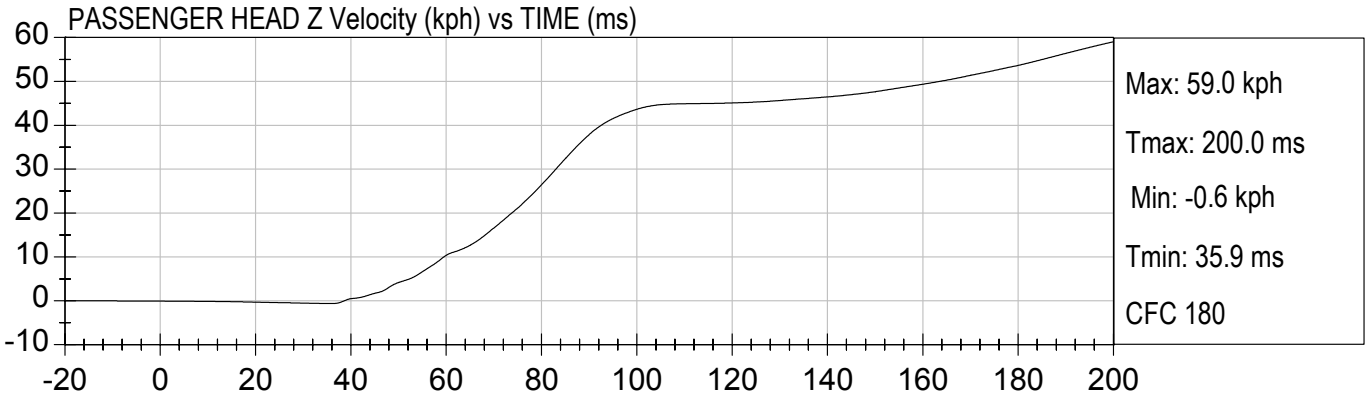






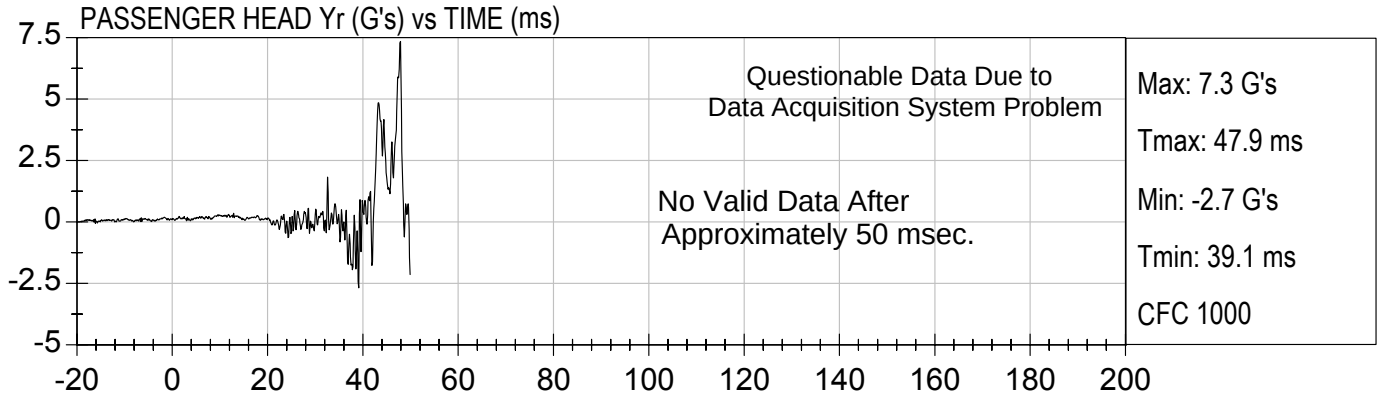

PASSENGER HEAD X Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20
-30
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 56.5 kph
Tmax: -19.9 ms
Min: -23.0 kph
Tmin: 180.6 ms
CFC 180

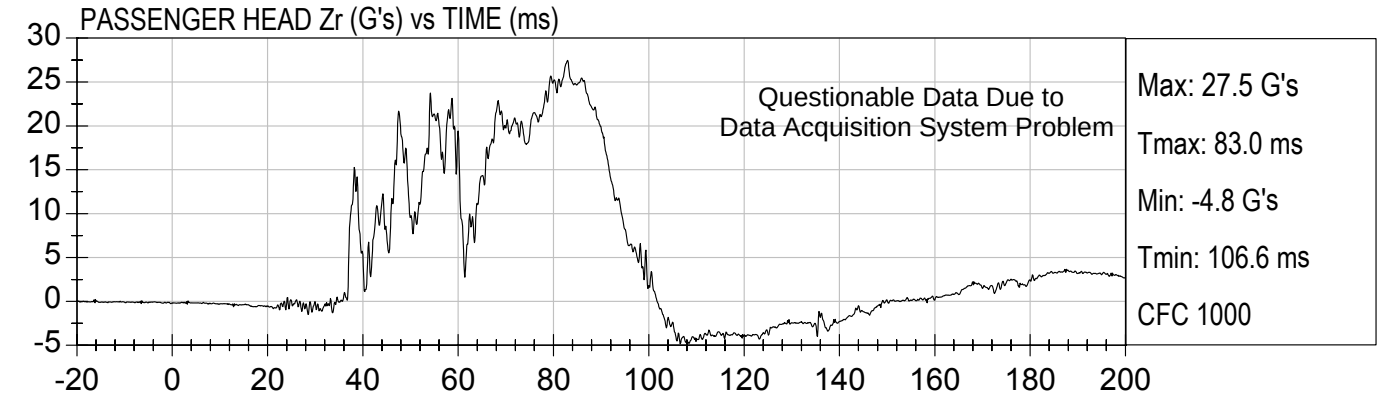

PASSENGER HEAD Y Velocity (kph) vs TIME (ms)
0
-5
-10
-15
-20
-25
-30
-35
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 0.0 kph
Tmax: -19.9 ms
Min: -32.6 kph
Tmin: 200.0 ms
CFC 180

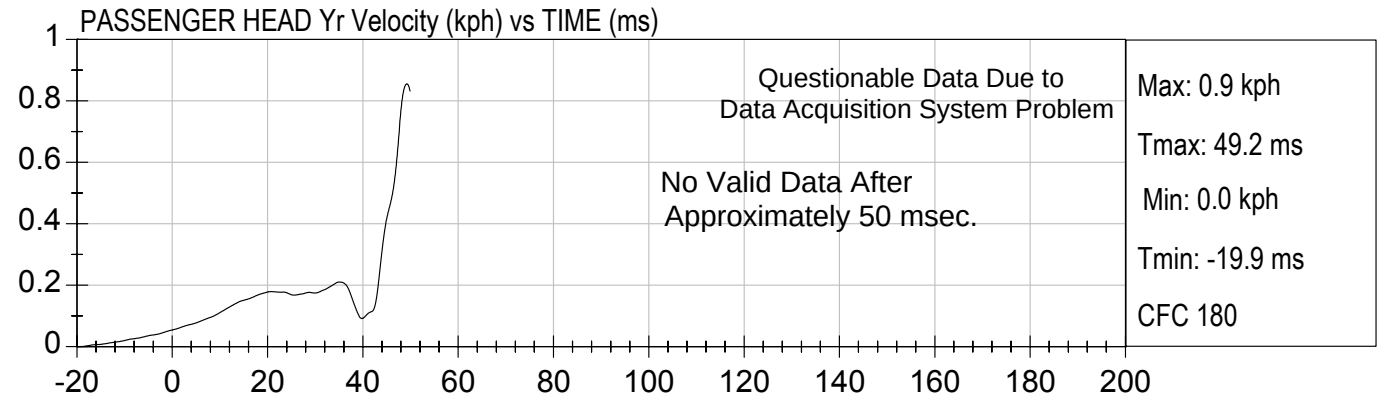

PASSENGER HEAD Z Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 59.0 kph
Tmax: 200.0 ms
Min: -0.6 kph
Tmin: 35.9 ms
CFC 180

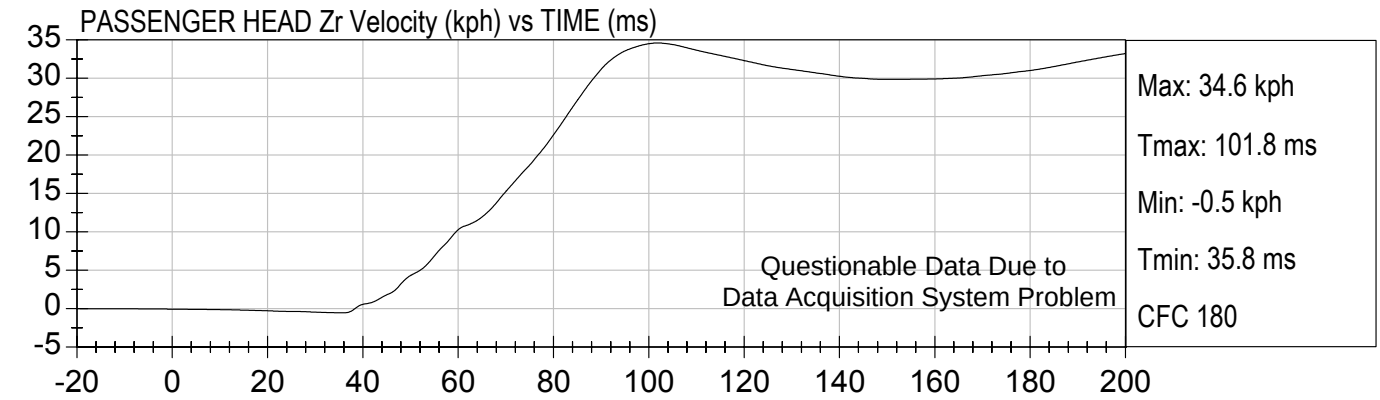
35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

Test Date: 12/11/2002
Speed: 35.1 mph (56.5 km/h)



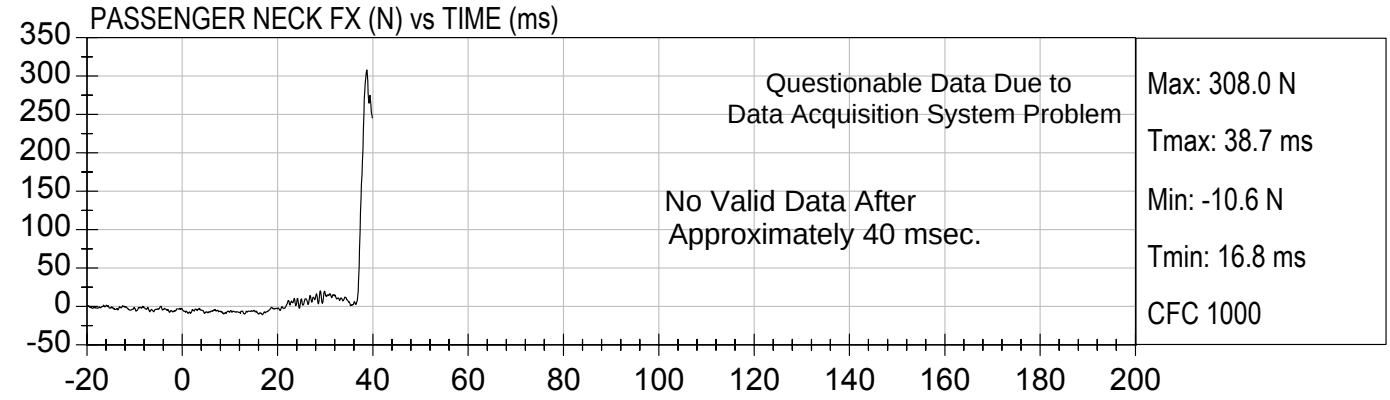


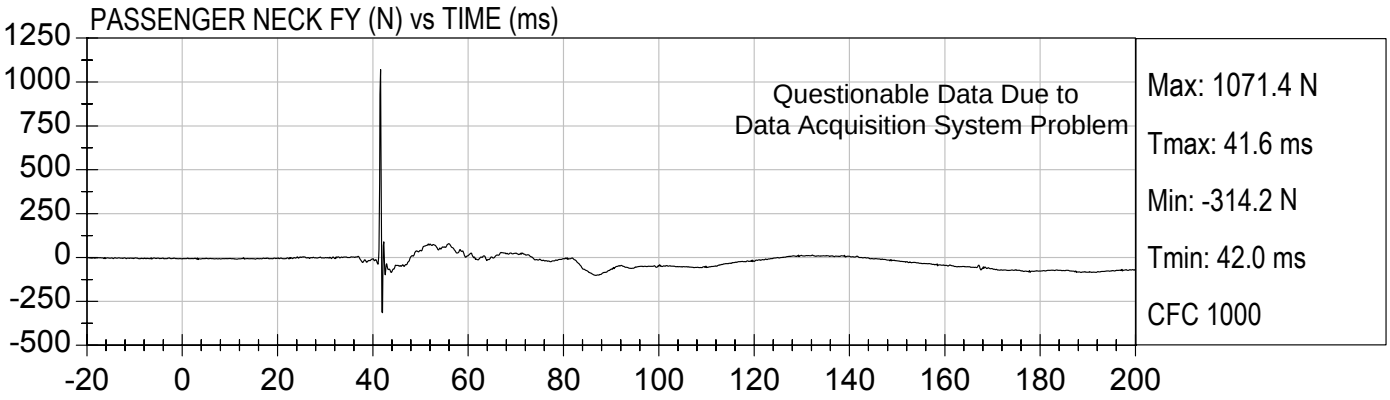


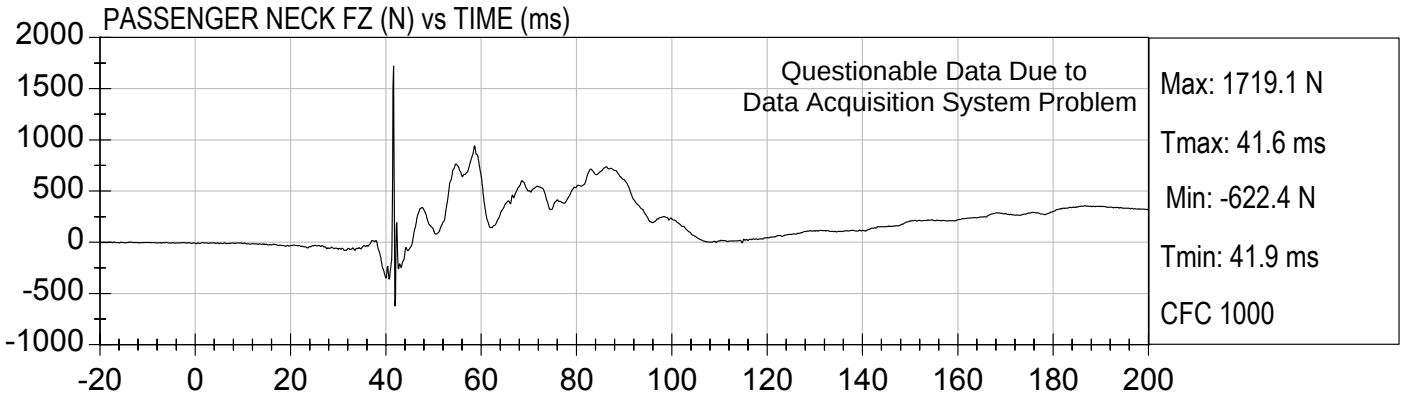


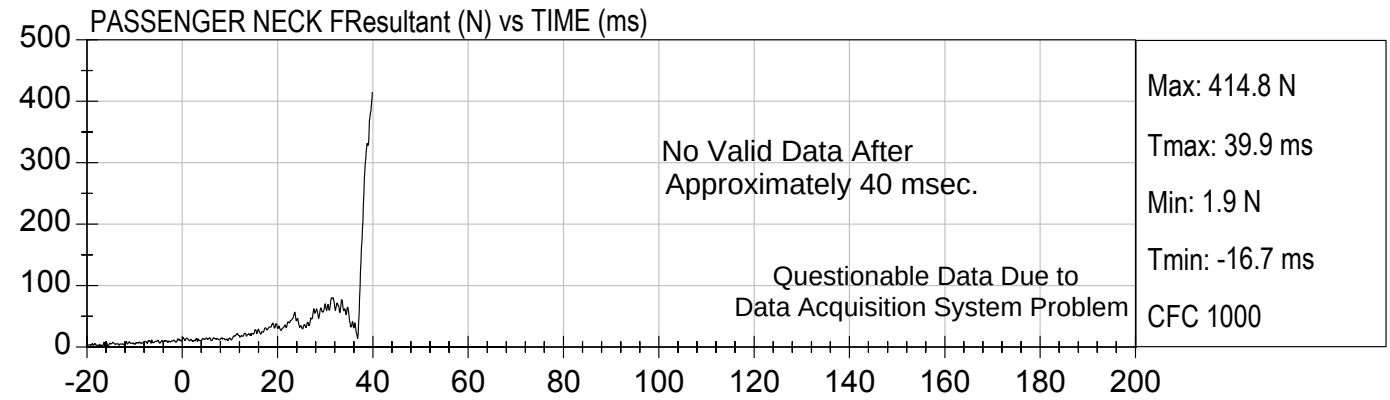
35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

Test Date: 12/11/2002
Speed: 35.1 mph (56.5 km/h)



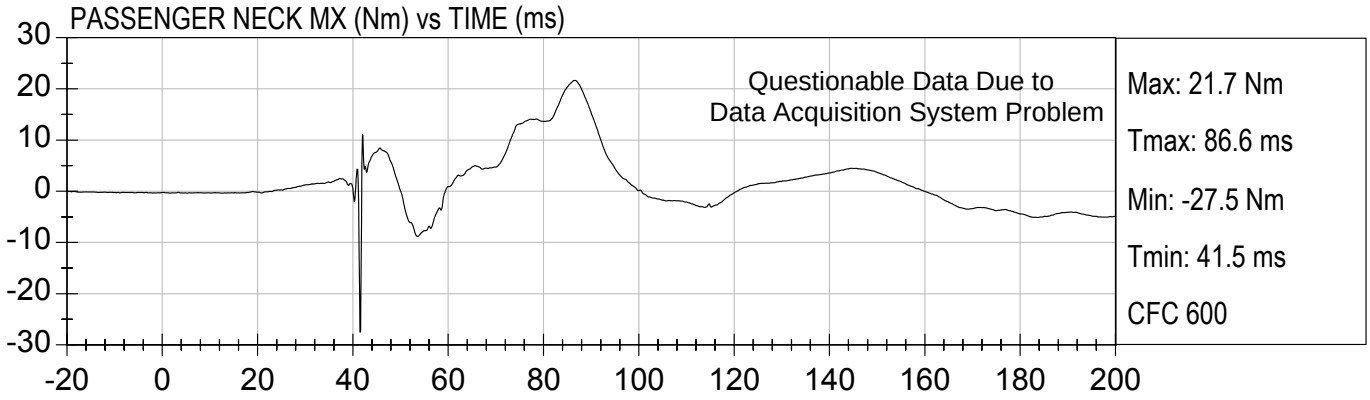


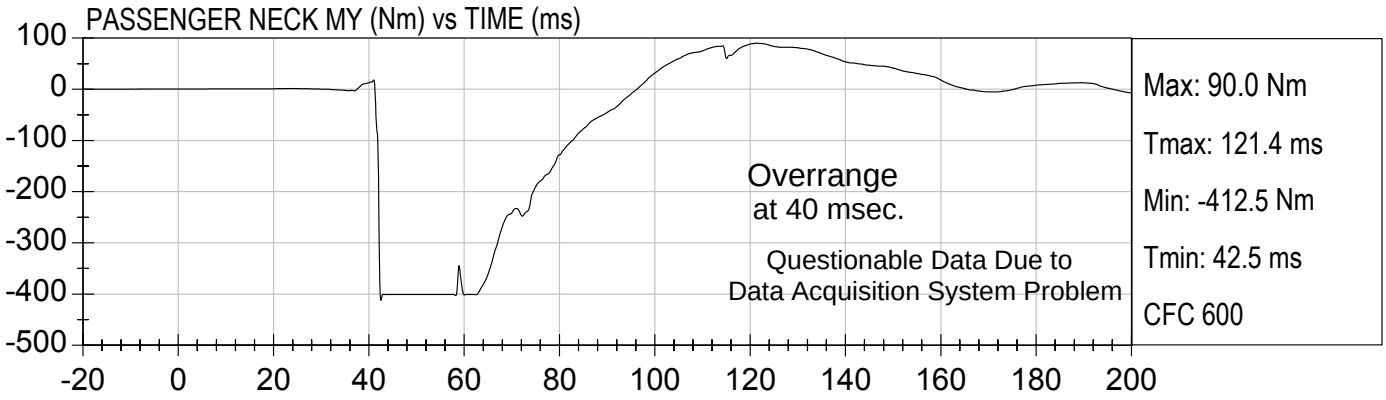


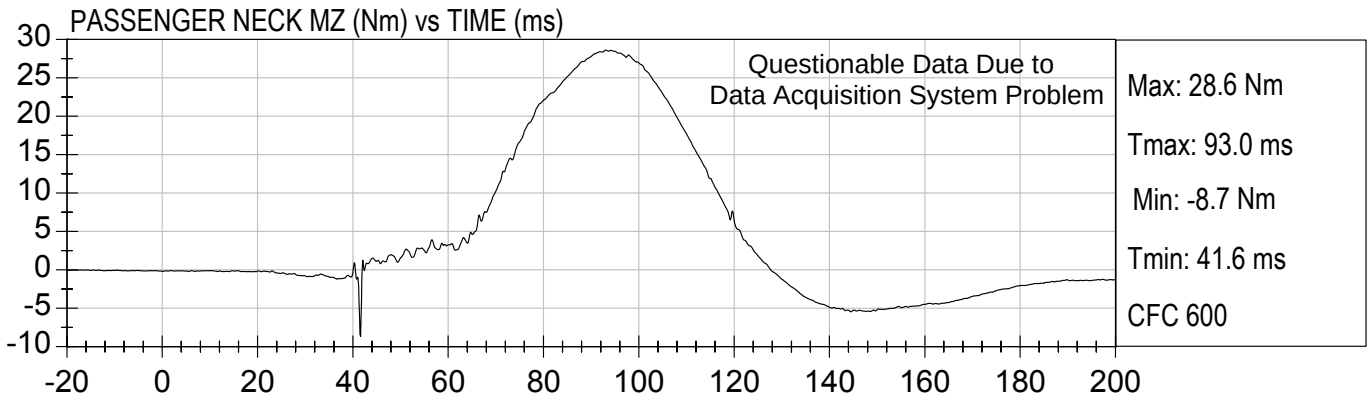


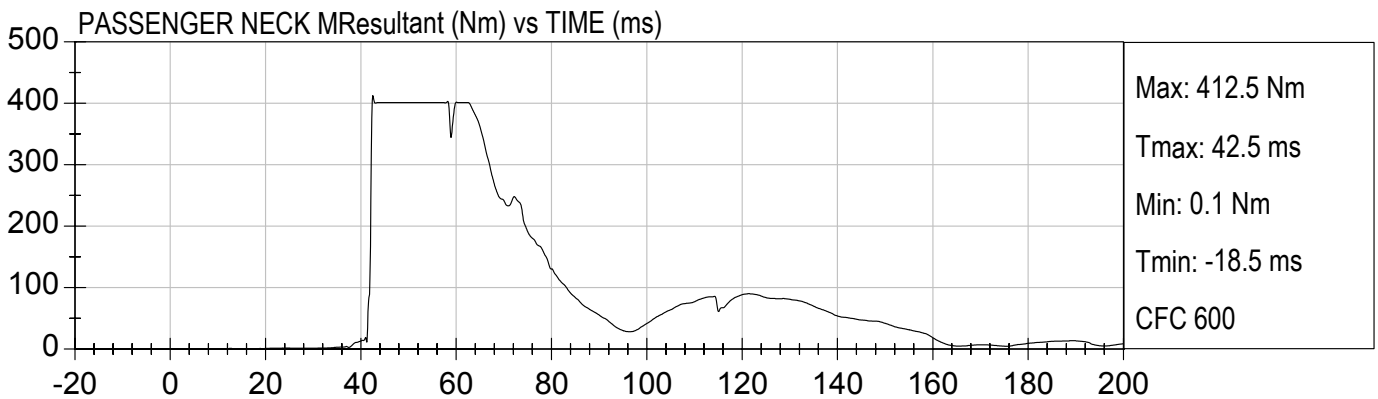
35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

Test Date: 12/11/2002
Speed: 35.1 mph (56.5 km/h)



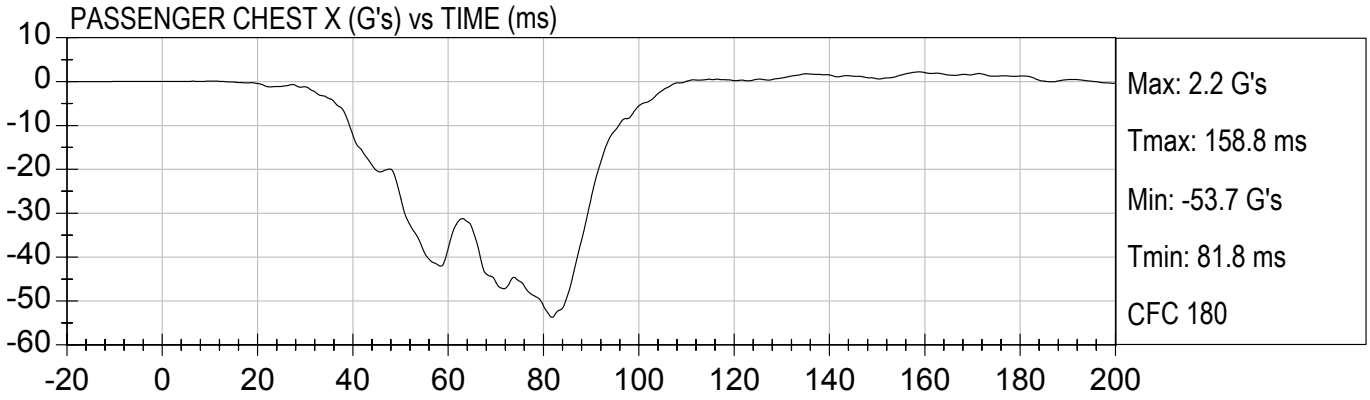


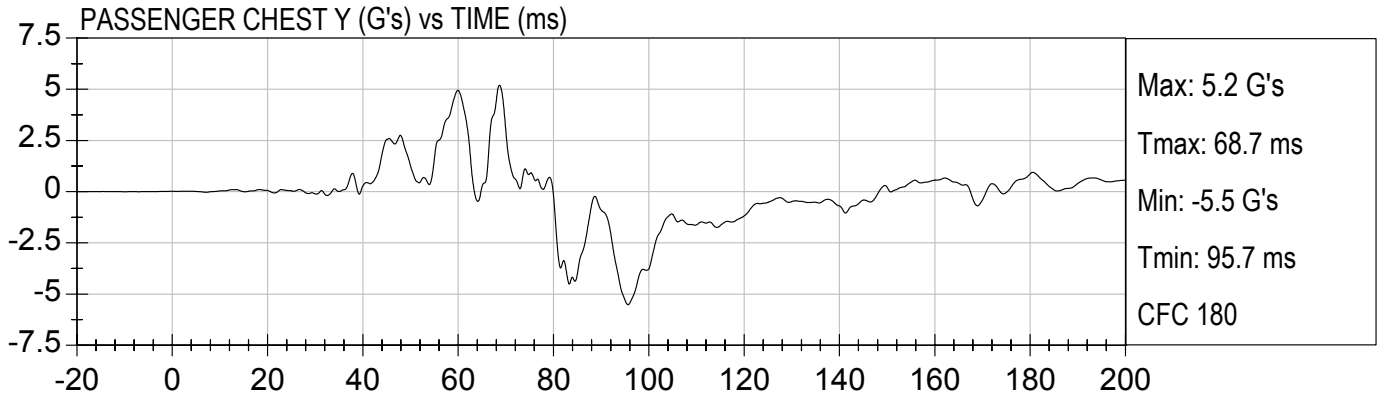


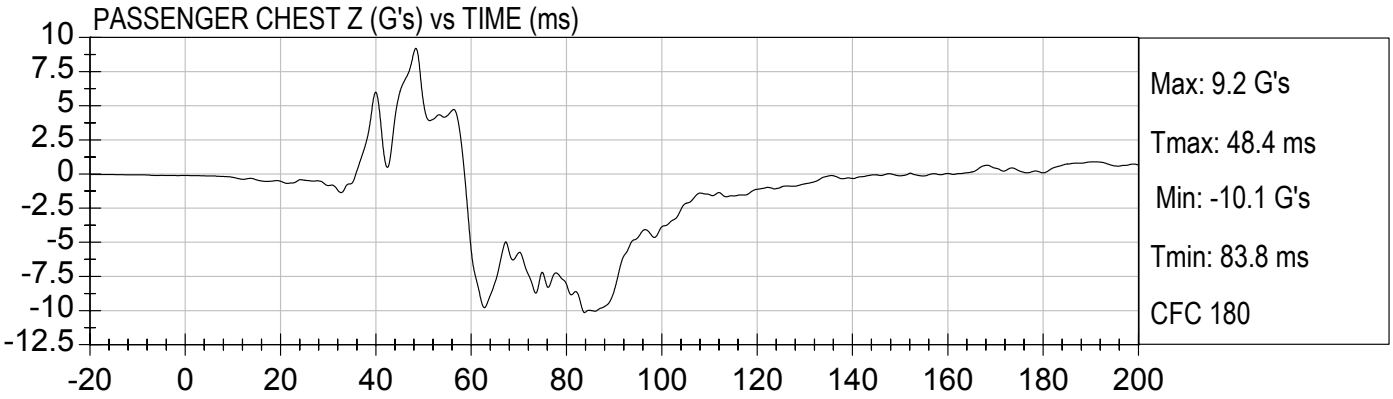


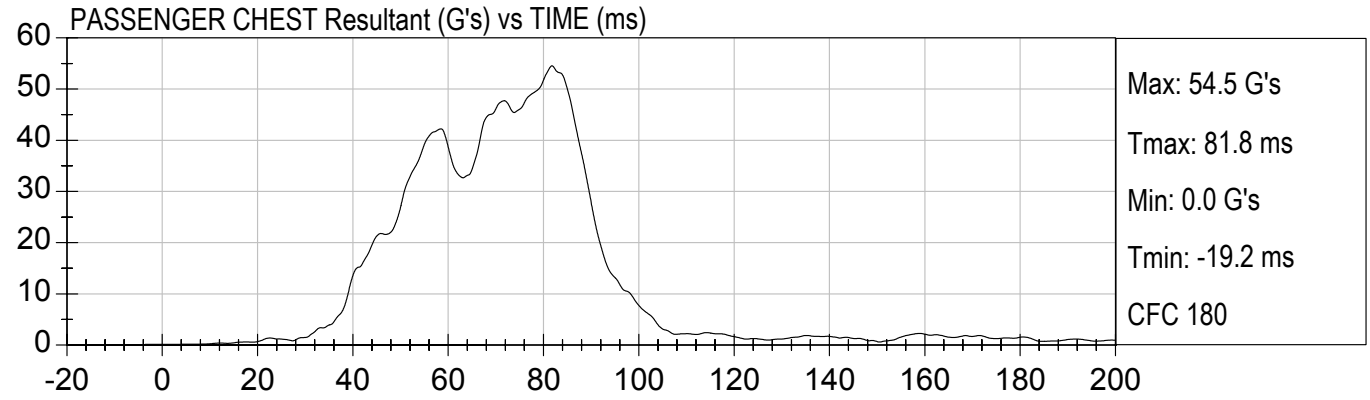
35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

Test Date: 12/11/2002
Speed: 35.1 mph (56.5 km/h)



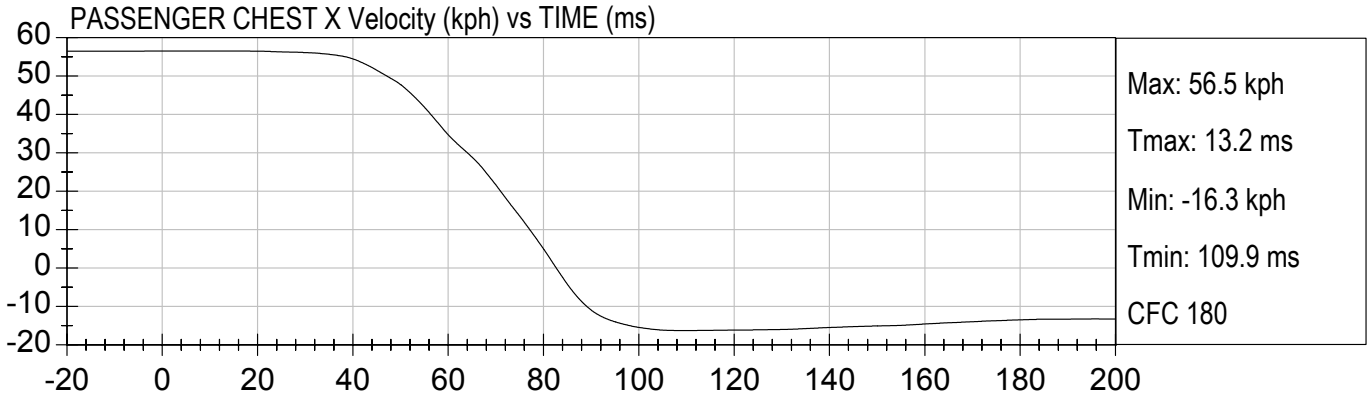


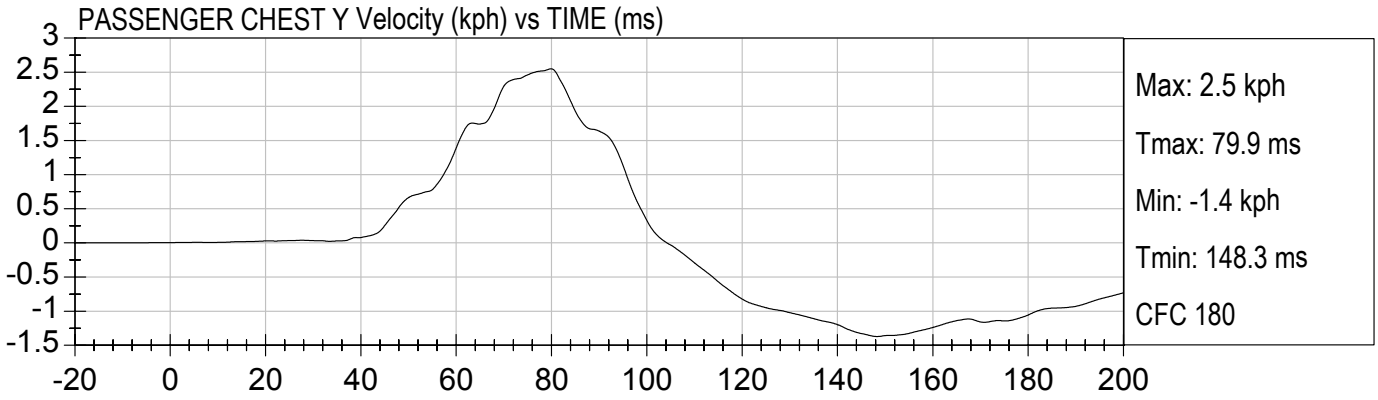


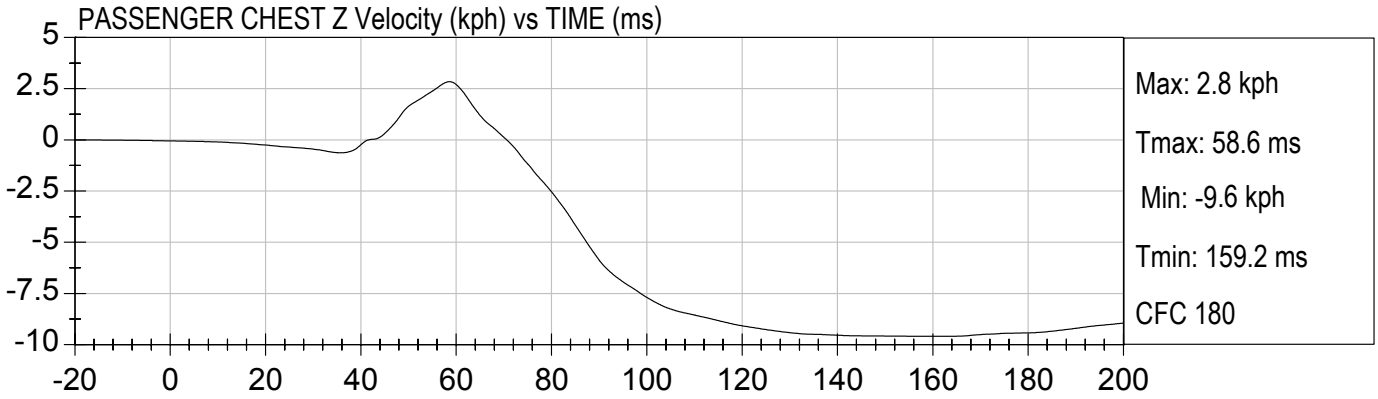


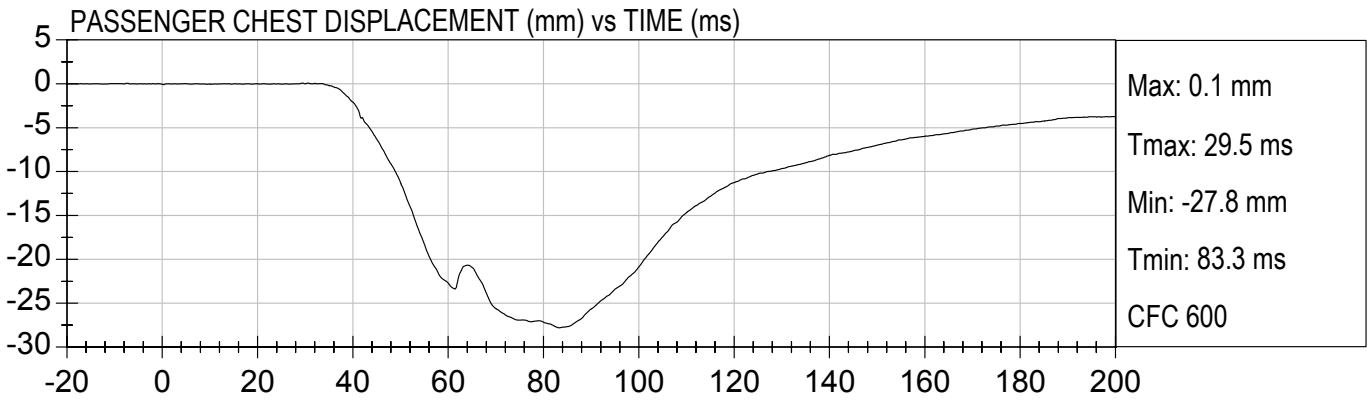
35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

Test Date: 12/11/2002
Speed: 35.1 mph (56.5 km/h)



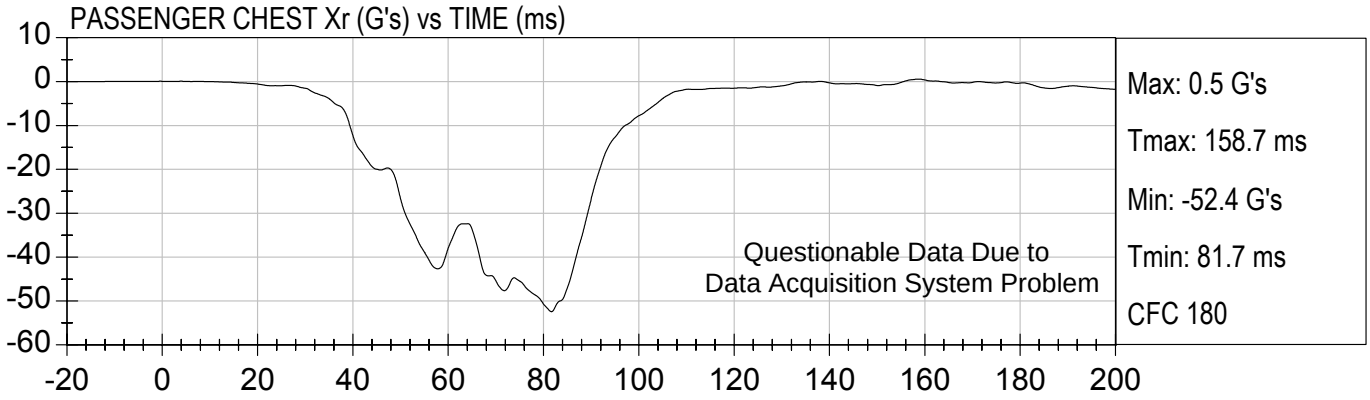


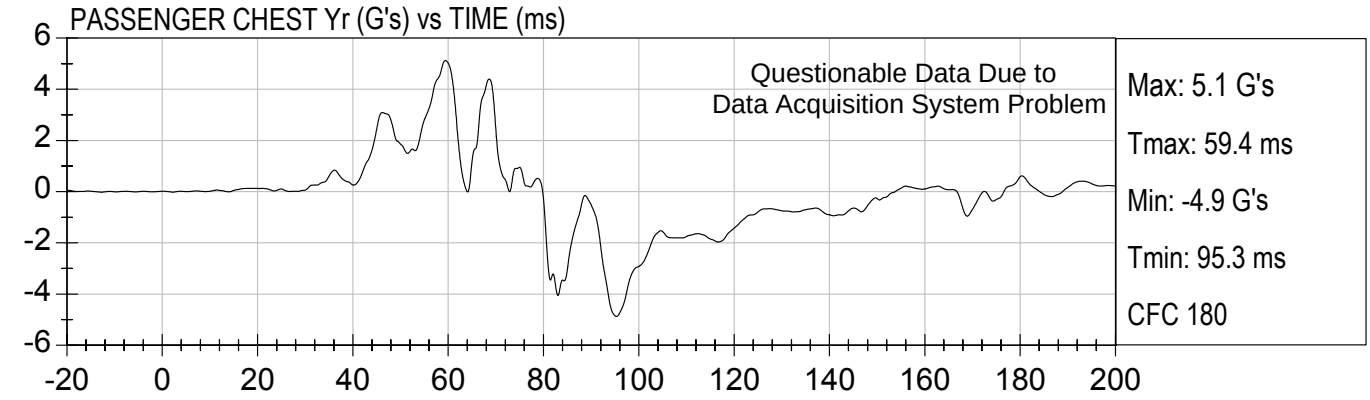


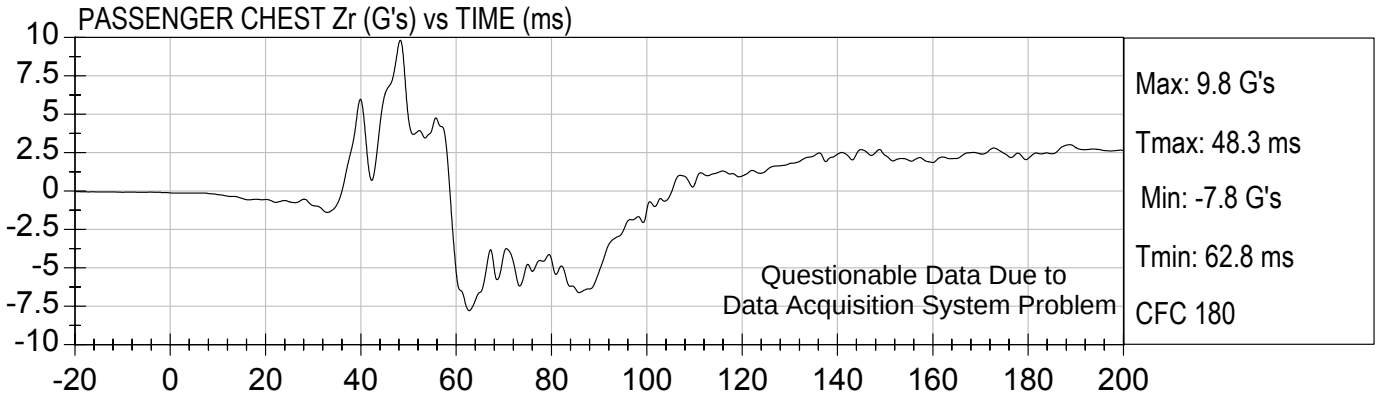


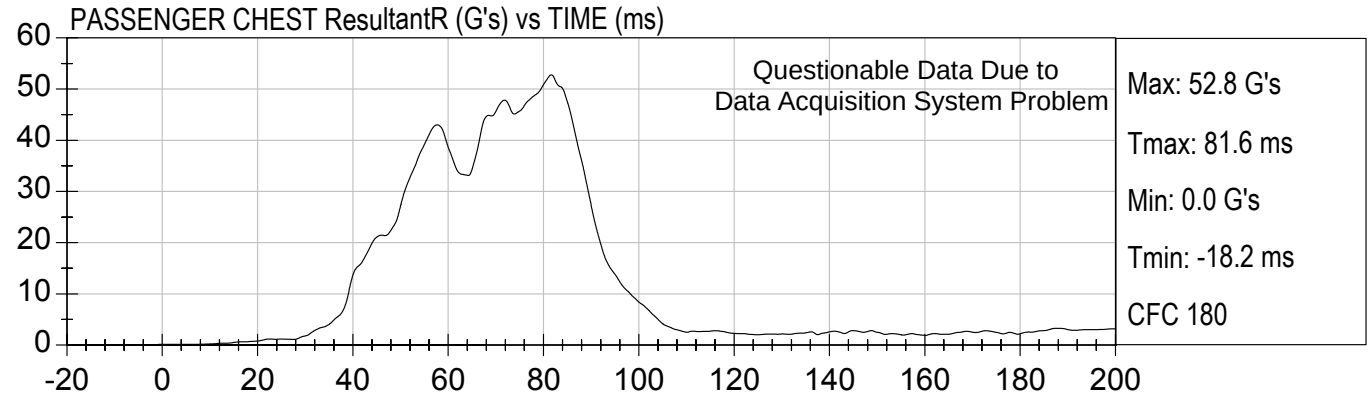
35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

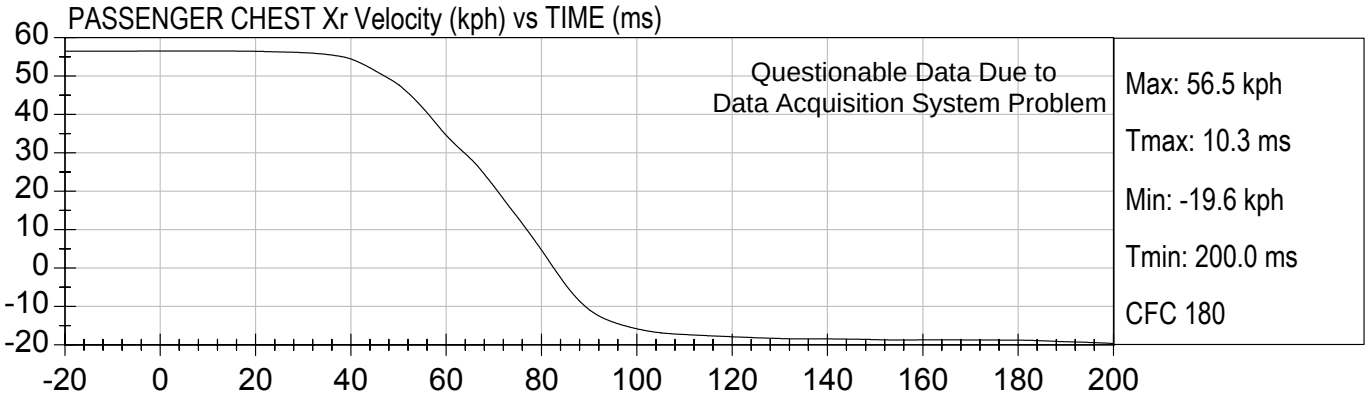
Test Date: 12/11/2002
Speed: 35.1 mph (56.5 km/h)

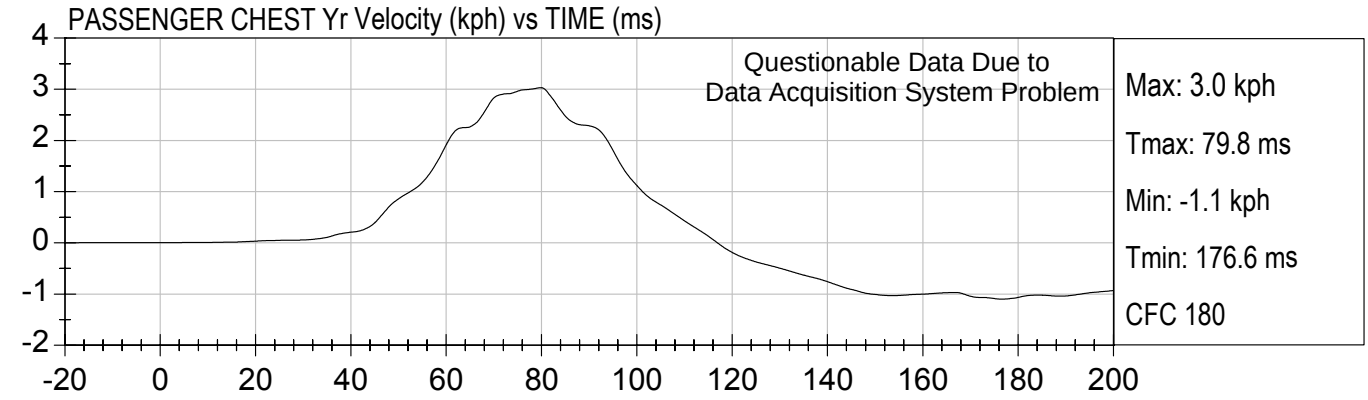


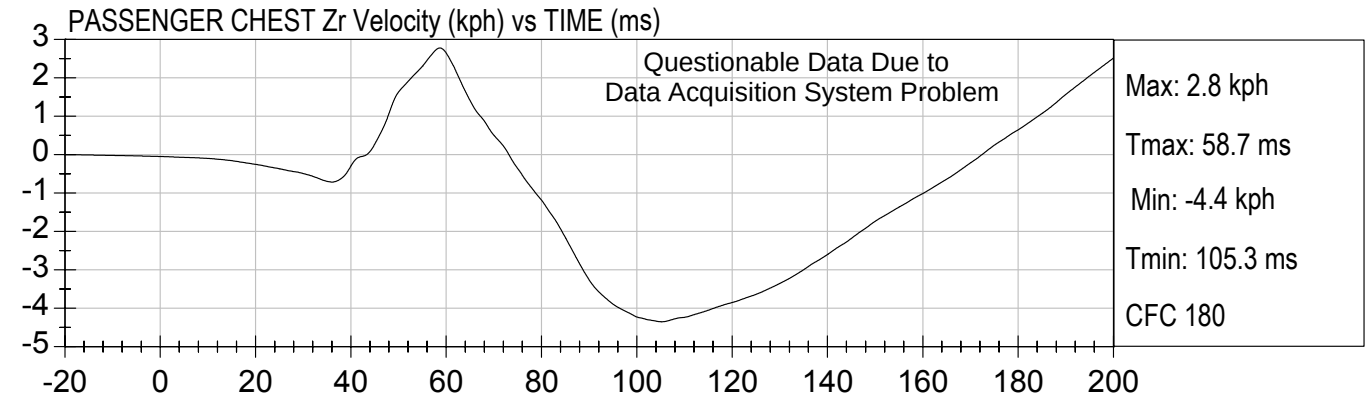






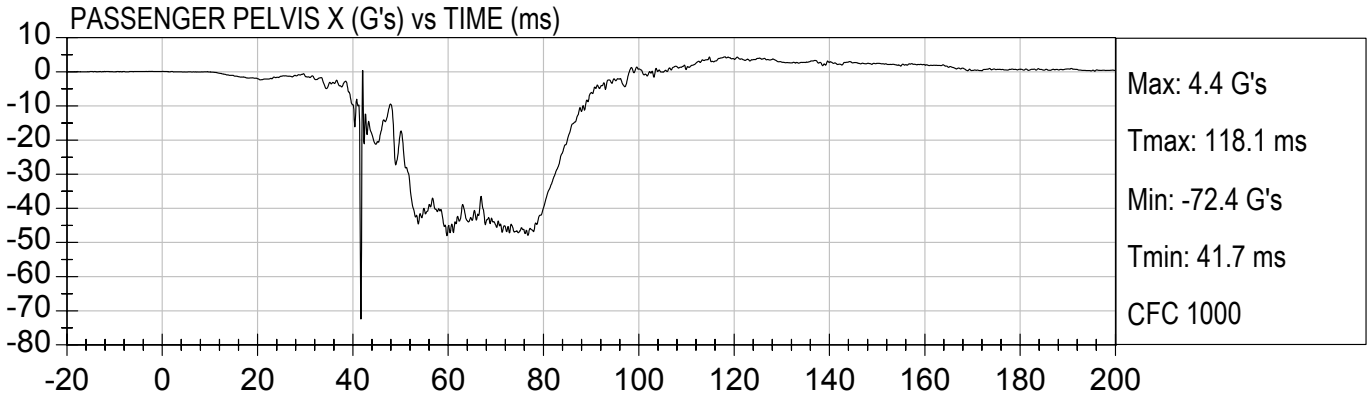

PASSENGER CHEST Xr Velocity (kph) vs TIME (ms)
Questionable Data Due to
Data Acquisition System Problem
Max: 56.5 kph
Tmax: 10.3 ms
Min: -19.6 kph
Tmin: 200.0 ms
CFC 180

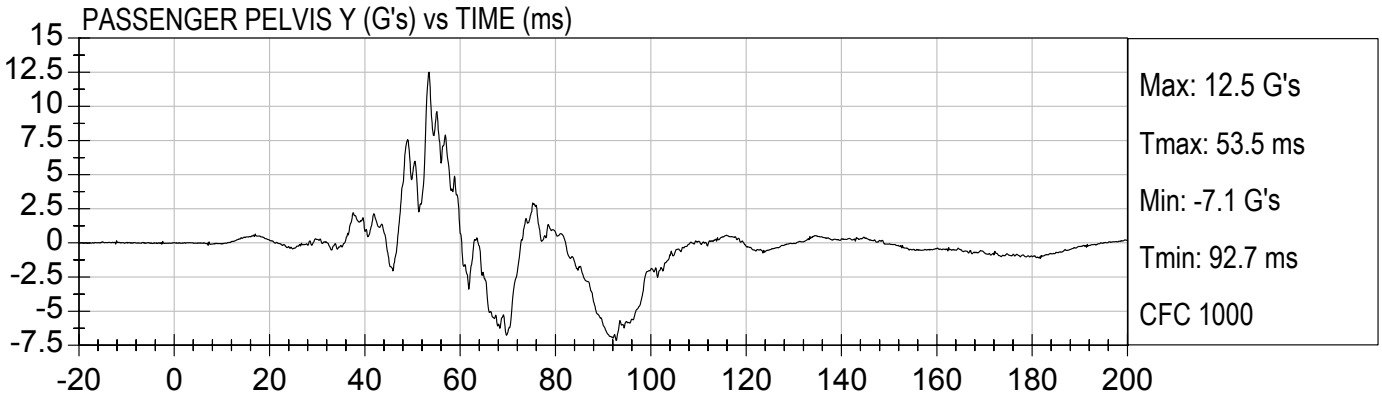

PASSENGER CHEST Yr Velocity (kph) vs TIME (ms)
Questionable Data Due to
Data Acquisition System Problem
Max: 3.0 kph
Tmax: 79.8 ms
Min: -1.1 kph
Tmin: 176.6 ms
CFC 180

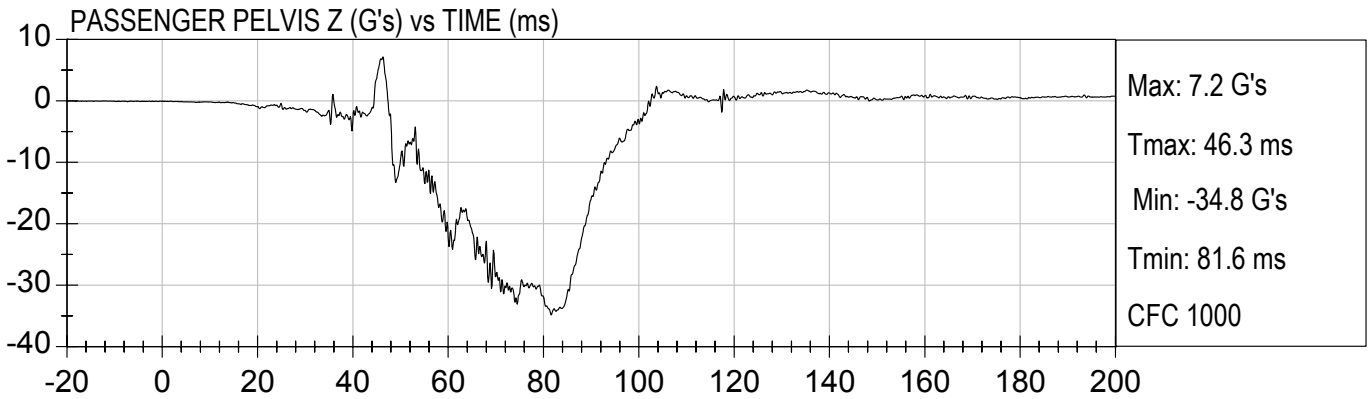

PASSENGER CHEST Zr Velocity (kph) vs TIME (ms)
Questionable Data Due to
Data Acquisition System Problem
Max: 2.8 kph
Tmax: 58.7 ms
Min: -4.4 kph
Tmin: 105.3 ms
CFC 180

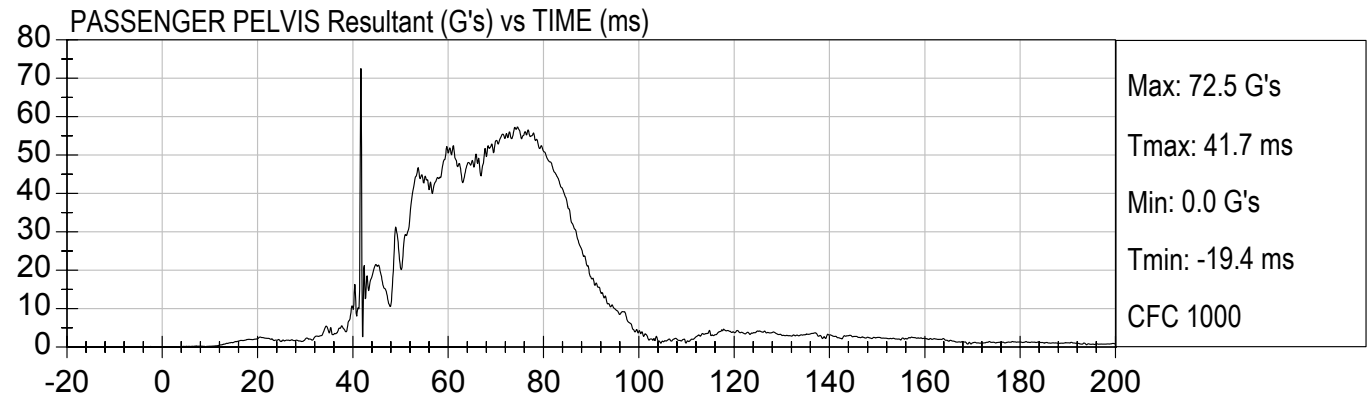
35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

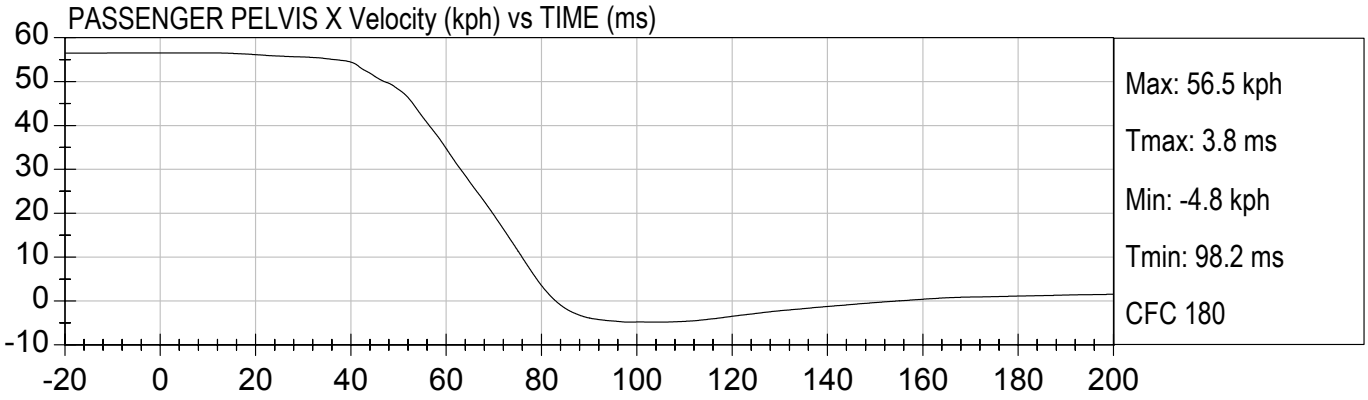
Test Date: 12/11/2002
Speed: 35.1 mph (56.5 km/h)

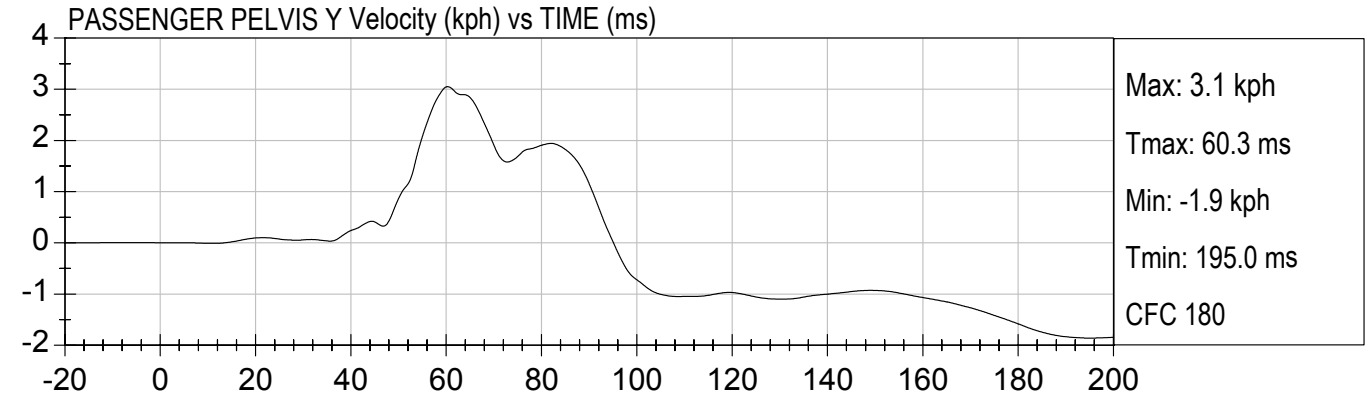


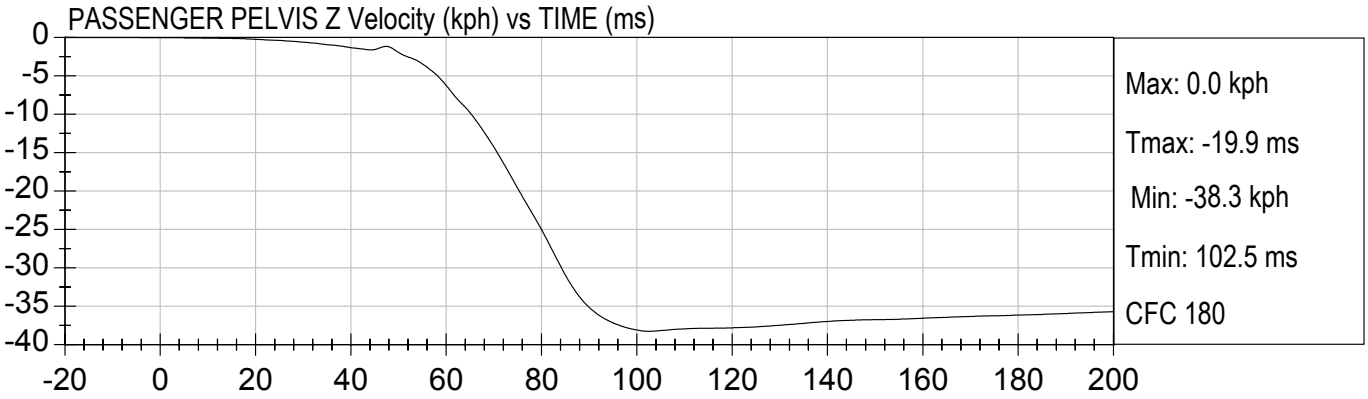






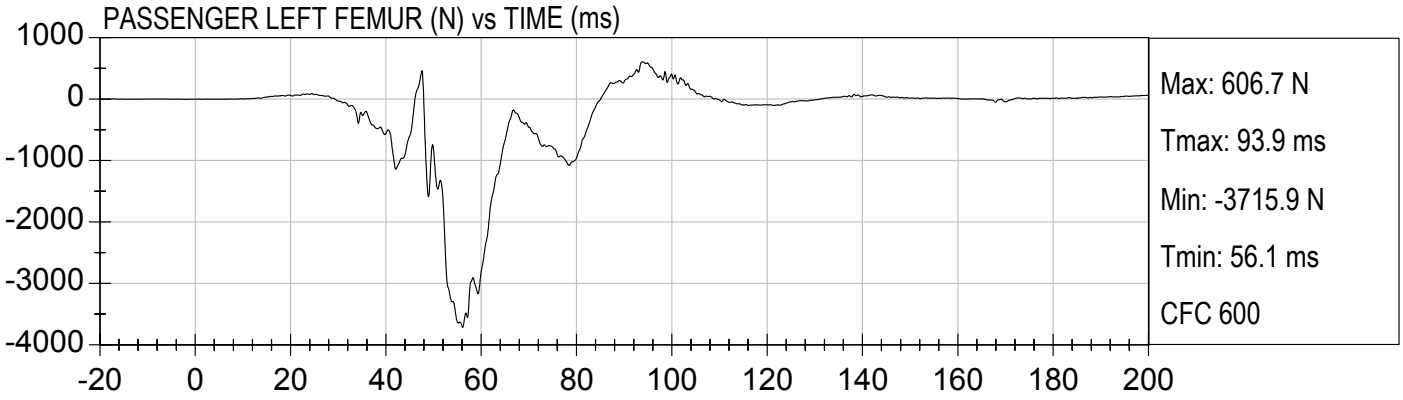

PASSENGER PELVIS X Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20 0 20 40 60 80 100 120 140 160 180 200
Max: 56.5 kph
Tmax: 3.8 ms
Min: -4.8 kph
Tmin: 98.2 ms
CFC 180

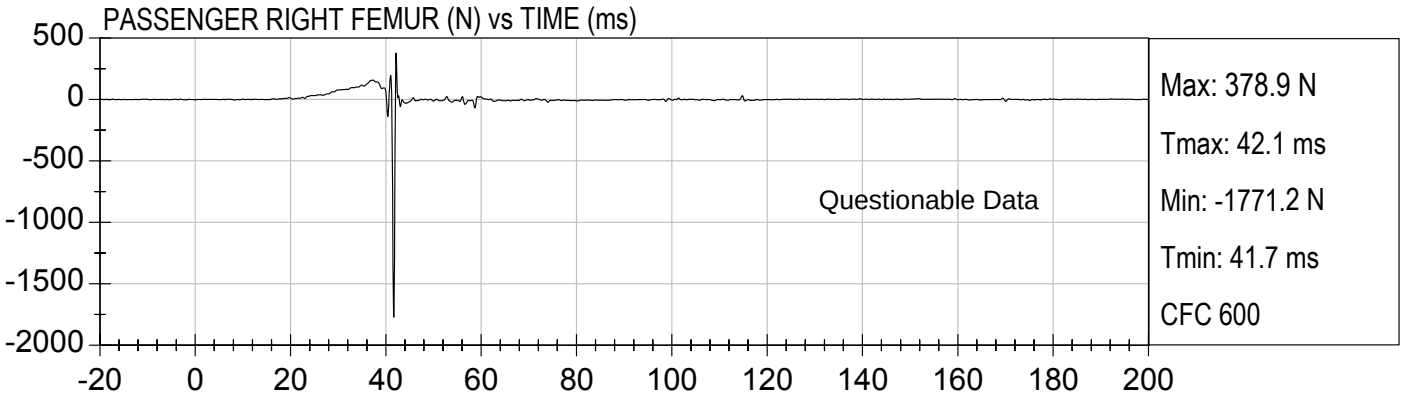

PASSENGER PELVIS Y Velocity (kph) vs TIME (ms)
4
3
2
1
0
-1
-2
-20 0 20 40 60 80 100 120 140 160 180 200
Max: 3.1 kph
Tmax: 60.3 ms
Min: -1.9 kph
Tmin: 195.0 ms
CFC 180

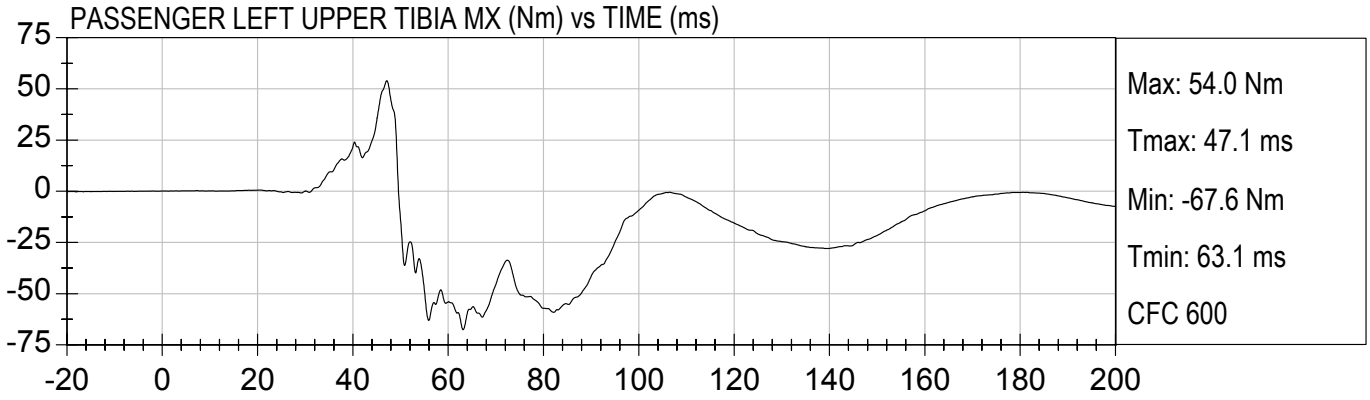

PASSENGER PELVIS Z Velocity (kph) vs TIME (ms)
0
-5
-10
-15
-20
-25
-30
-35
-40
-20 0 20 40 60 80 100 120 140 160 180 200
Max: 0.0 kph
Tmax: -19.9 ms
Min: -38.3 kph
Tmin: 102.5 ms
CFC 180

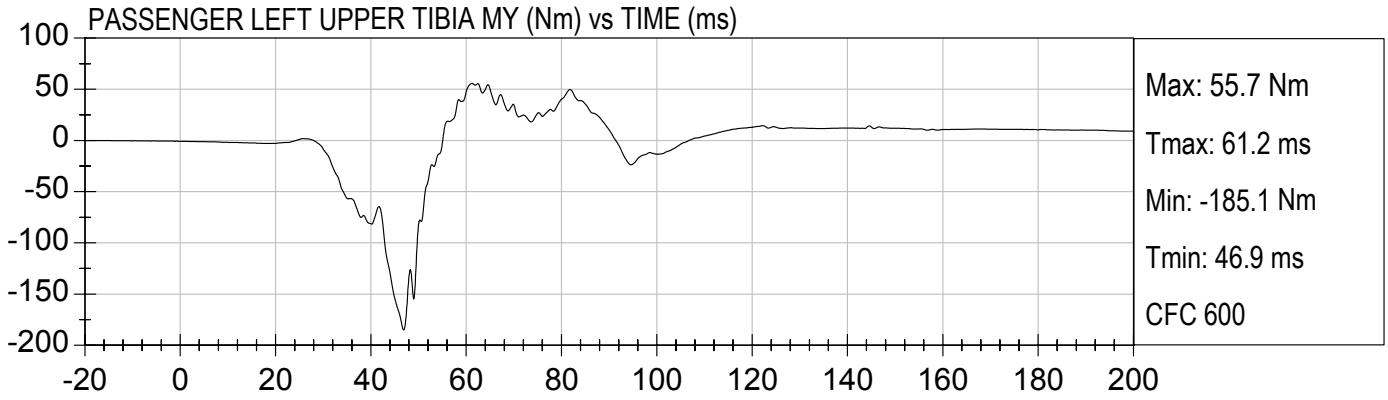
35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

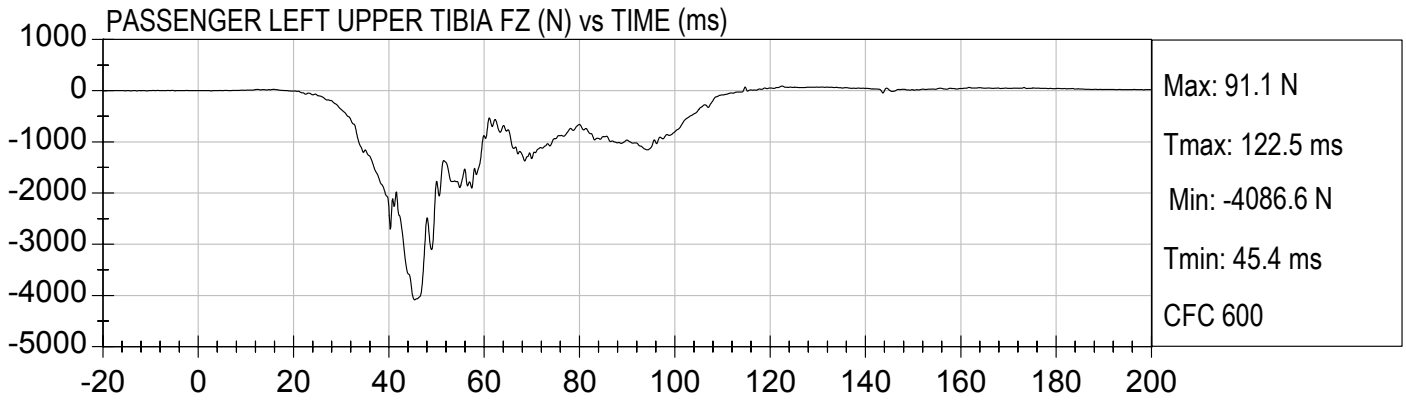
Test Date: 12/11/2002
Speed: 35.1 mph (56.5 km/h)

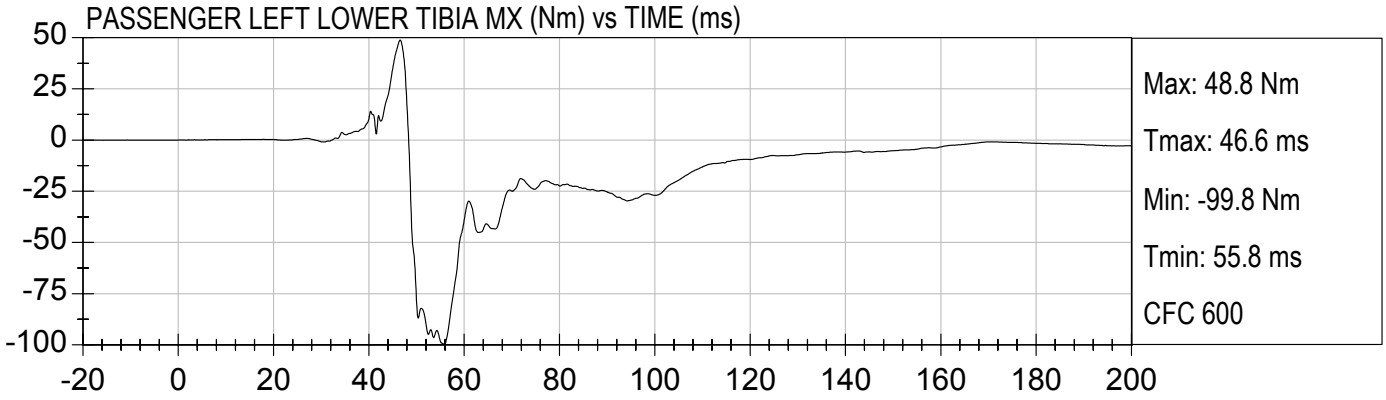


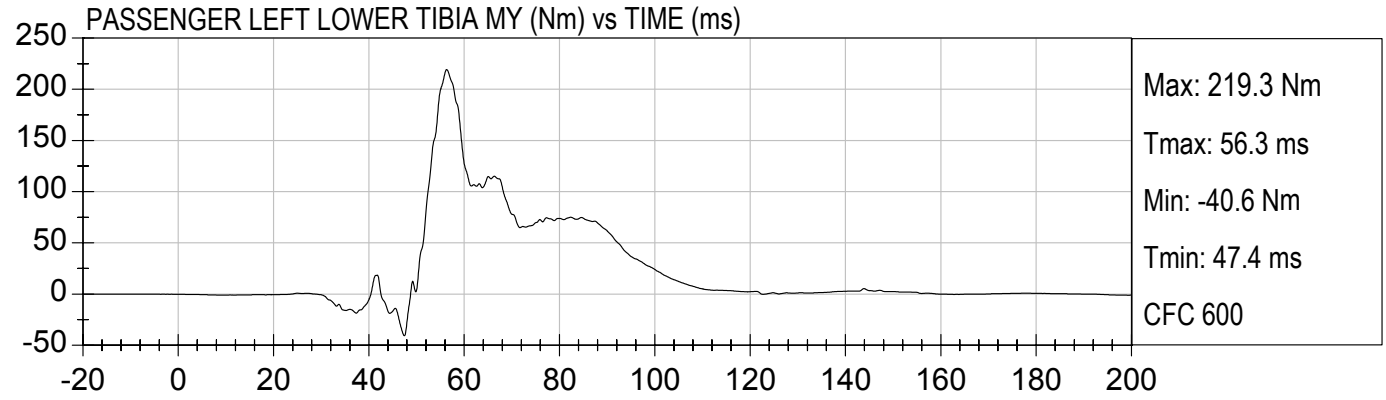


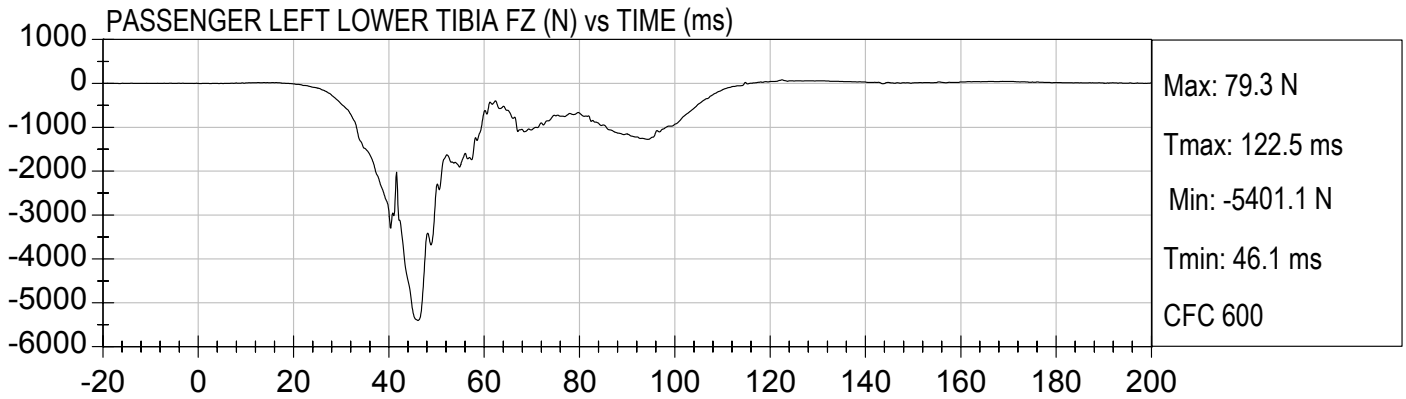

PASSENGER LEFT UPPER TIBIA MX (Nm) vs TIME (ms)
75
50
25
0
-25
-50
-75
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 54.0 Nm
Tmax: 47.1 ms
Min: -67.6 Nm
Tmin: 63.1 ms
CFC 600


PASSENGER LEFT UPPER TIBIA MY (Nm) vs TIME (ms)
100
50
0
-50
-100
-150
-200
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 55.7 Nm
Tmax: 61.2 ms
Min: -185.1 Nm
Tmin: 46.9 ms
CFC 600


PASSENGER LEFT UPPER TIBIA FZ (N) vs TIME (ms)
1000
0
-1000
-2000
-3000
-4000
-5000
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 91.1 N
Tmax: 122.5 ms
Min: -4086.6 N
Tmin: 45.4 ms
CFC 600

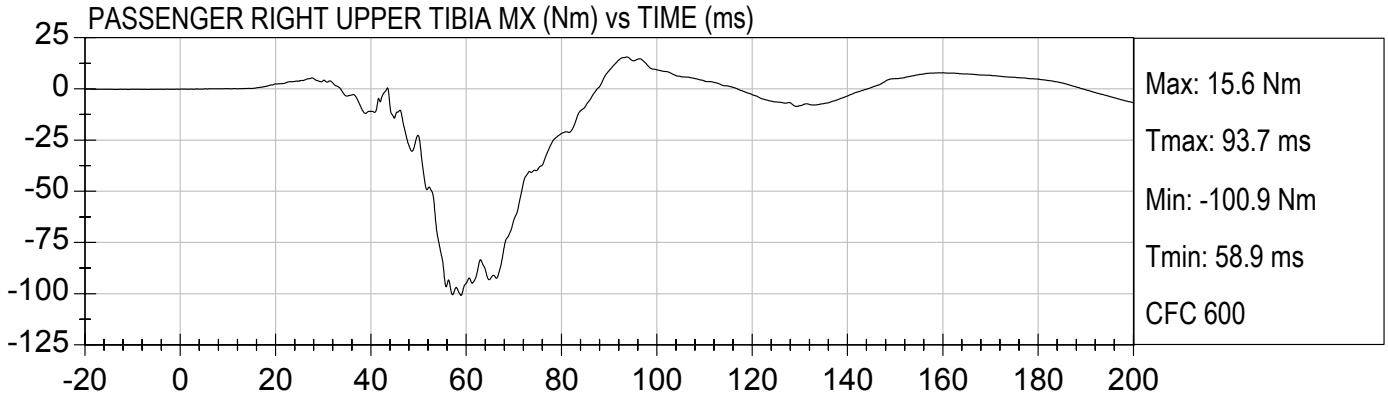

PASSENGER LEFT LOWER TIBIA MX (Nm) vs TIME (ms)
50
25
0
-25
-50
-75
-100
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 48.8 Nm
Tmax: 46.6 ms
Min: -99.8 Nm
Tmin: 55.8 ms
CFC 600

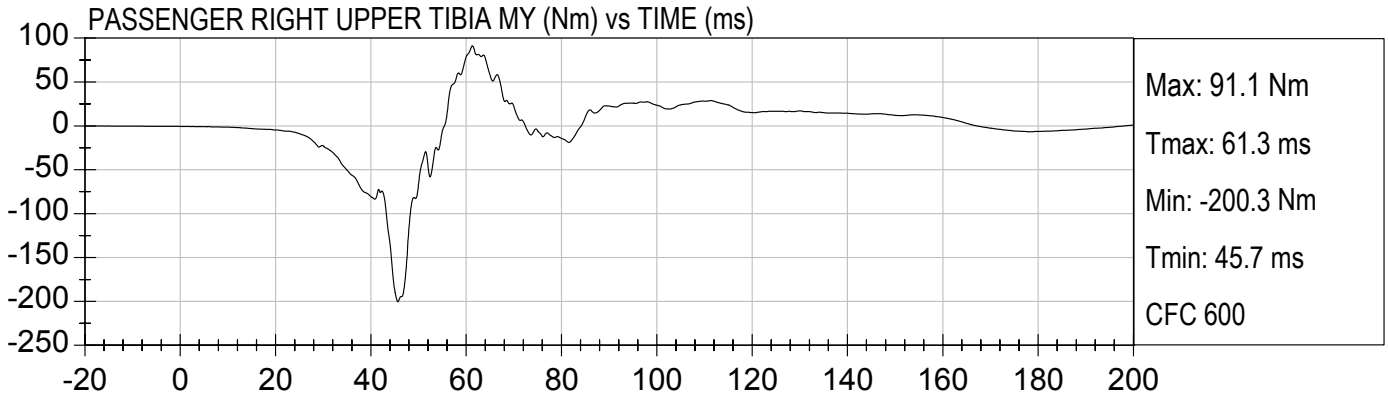

PASSENGER LEFT LOWER TIBIA MY (Nm) vs TIME (ms)
250
200
150
100
50
0
-50
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 219.3 Nm
Tmax: 56.3 ms
Min: -40.6 Nm
Tmin: 47.4 ms
CFC 600

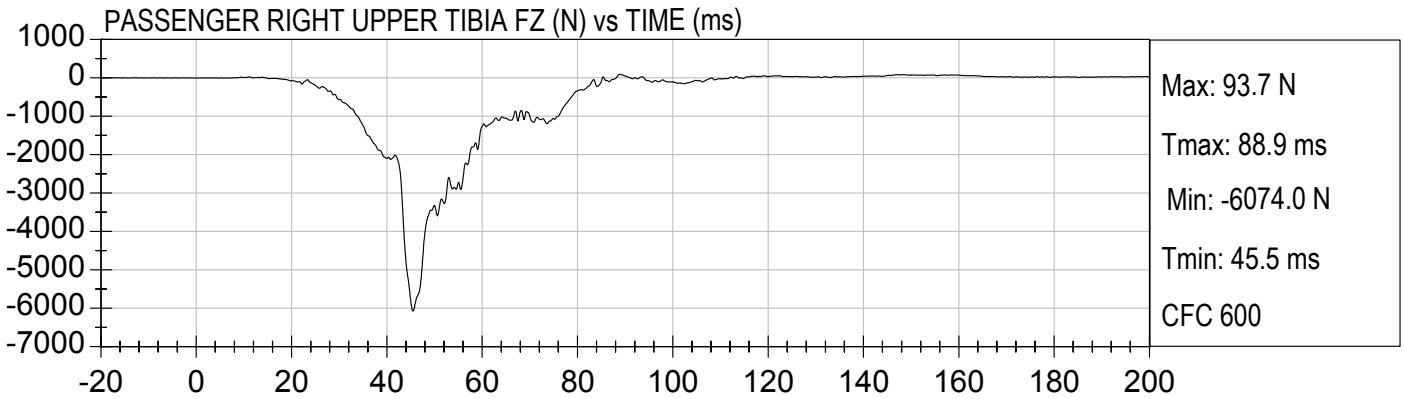

PASSENGER LEFT LOWER TIBIA FZ (N) vs TIME (ms)
1000
0
-1000
-2000
-3000
-4000
-5000
-6000
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 79.3 N
Tmax: 122.5 ms
Min: -5401.1 N
Tmin: 46.1 ms
CFC 600

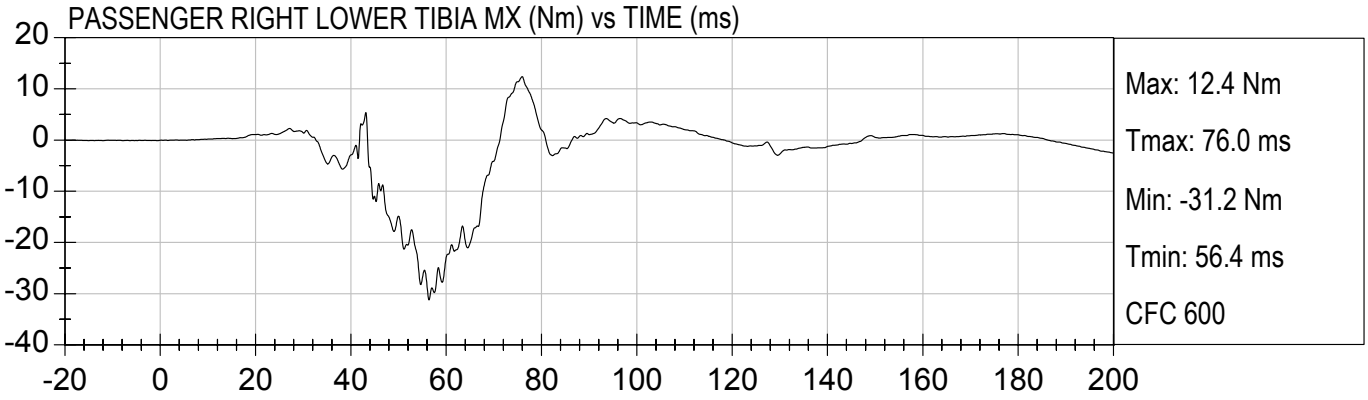
35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

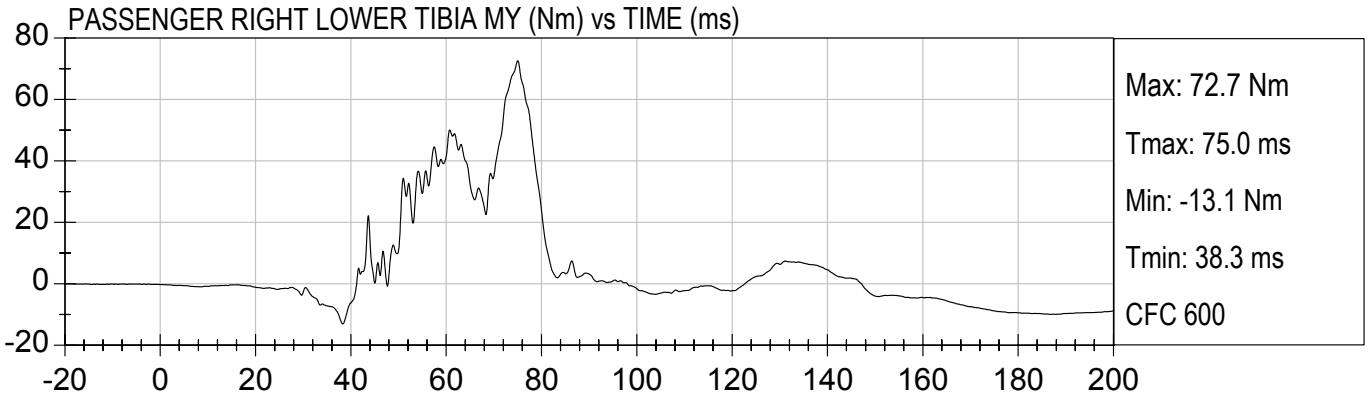
Test Date: 12/11/2002
Speed: 35.1 mph (56.5 km/h)

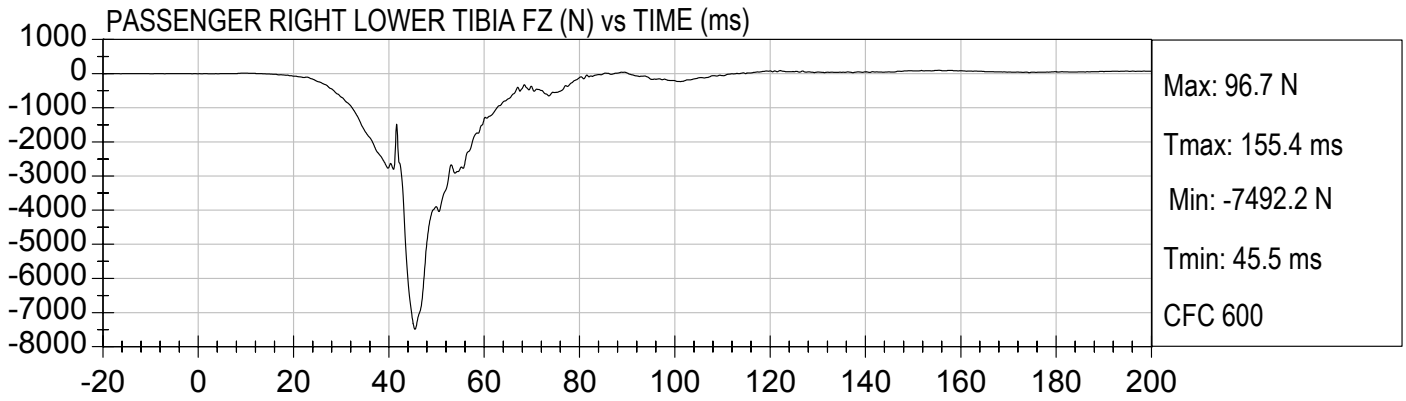






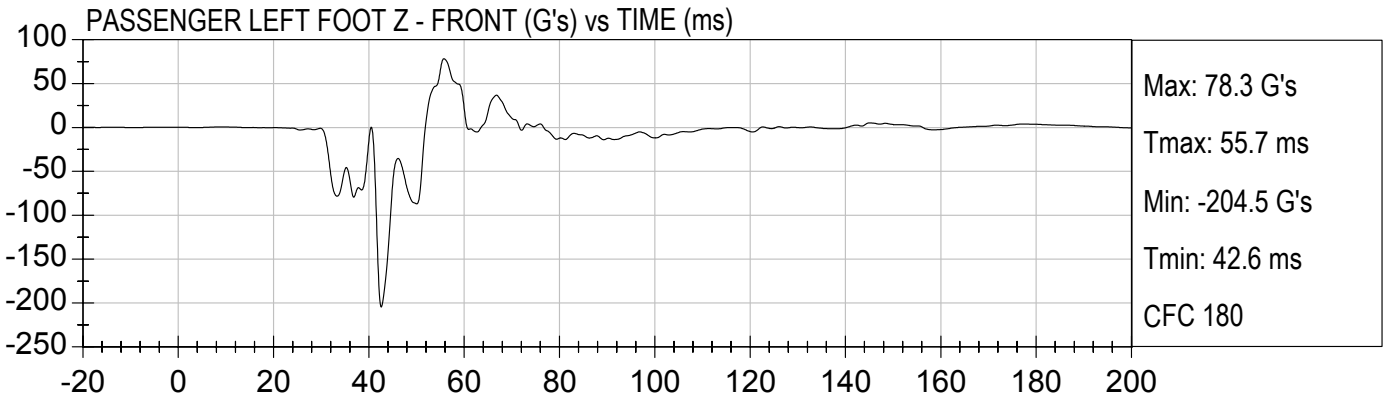

PASSENGER RIGHT LOWER TIBIA MX (Nm) vs TIME (ms)
20
10
0
-10
-20
-30
-40
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 12.4 Nm
Tmax: 76.0 ms
Min: -31.2 Nm
Tmin: 56.4 ms
CFC 600

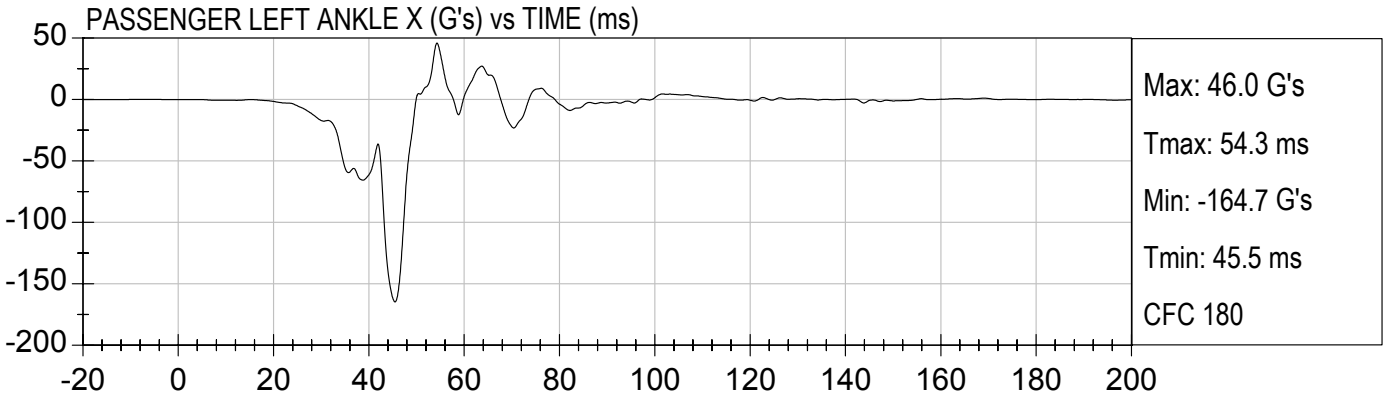

PASSENGER RIGHT LOWER TIBIA MY (Nm) vs TIME (ms)
80
60
40
20
0
-20
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 72.7 Nm
Tmax: 75.0 ms
Min: -13.1 Nm
Tmin: 38.3 ms
CFC 600

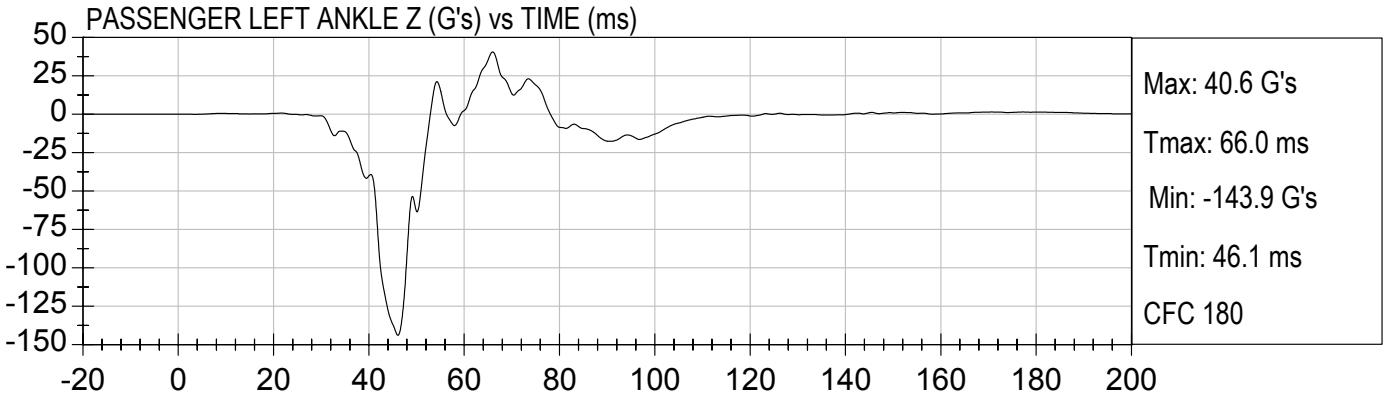

PASSENGER RIGHT LOWER TIBIA FZ (N) vs TIME (ms)
1000
0
-1000
-2000
-3000
-4000
-5000
-6000
-7000
-8000
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 96.7 N
Tmax: 155.4 ms
Min: -7492.2 N
Tmin: 45.5 ms
CFC 600

35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

Test Date: 12/11/2002
Speed: 35.1 mph (56.5 km/h)

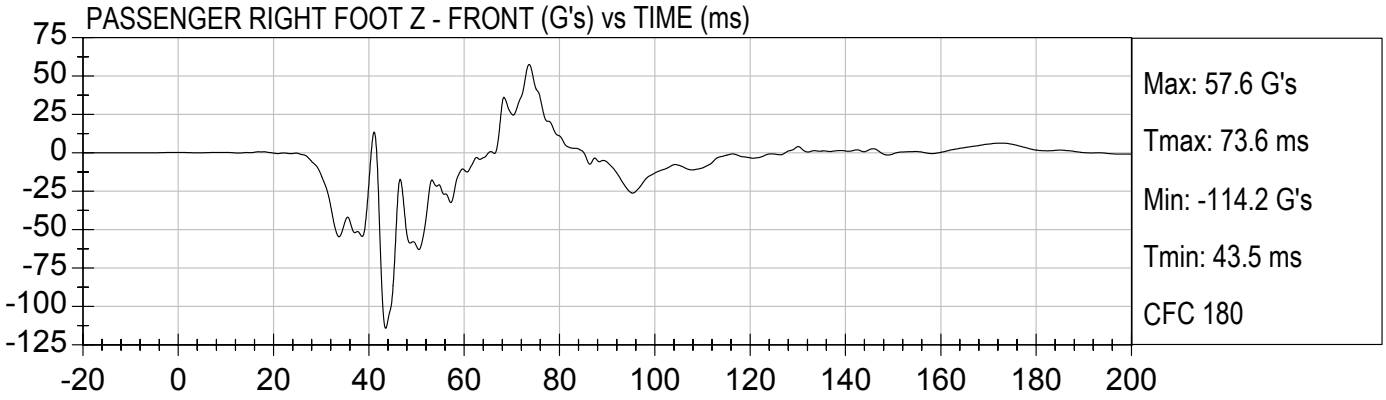


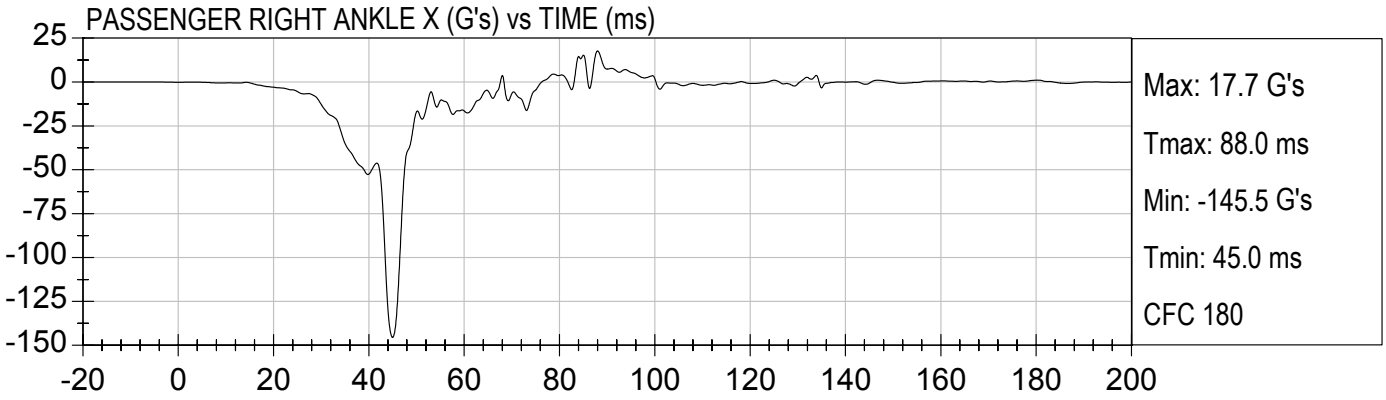


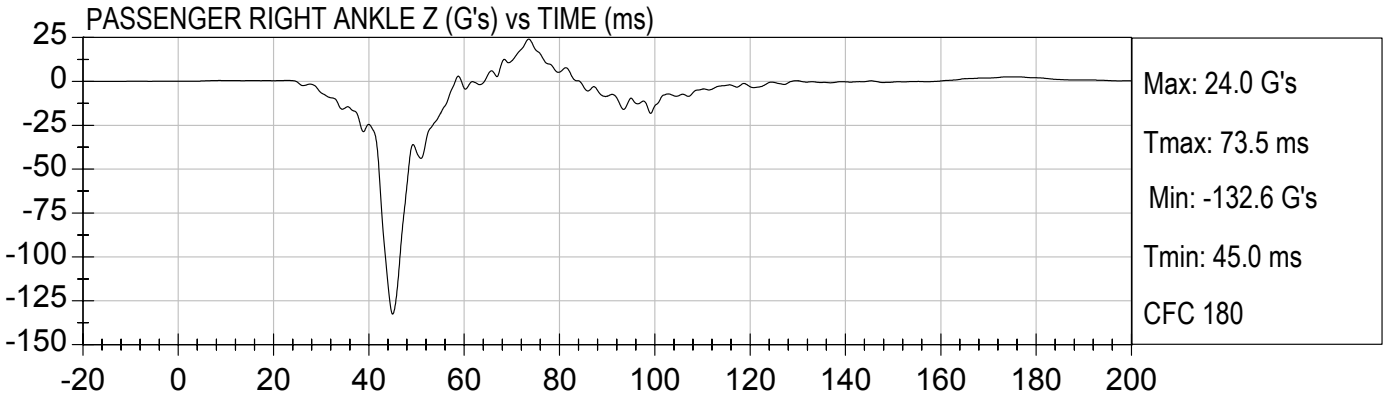


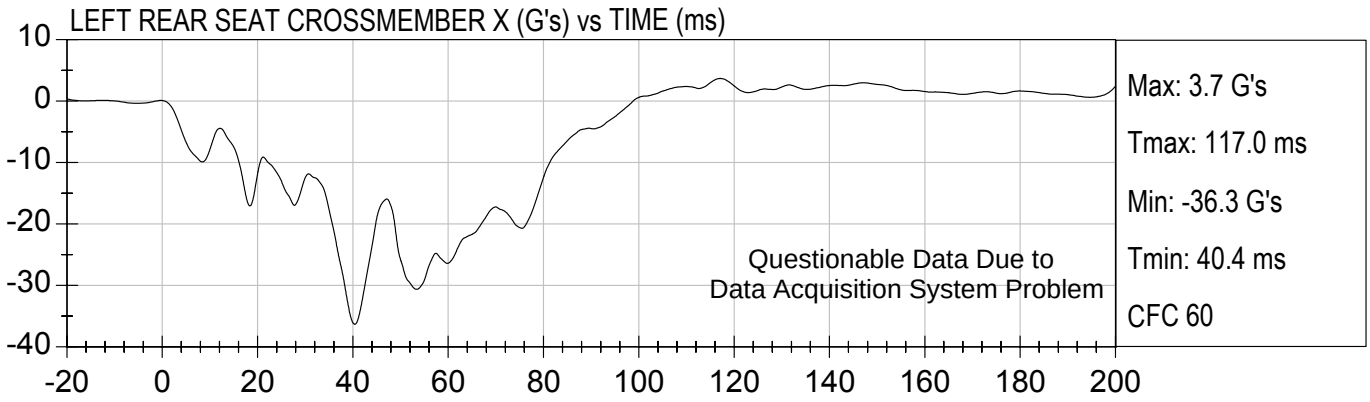
35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

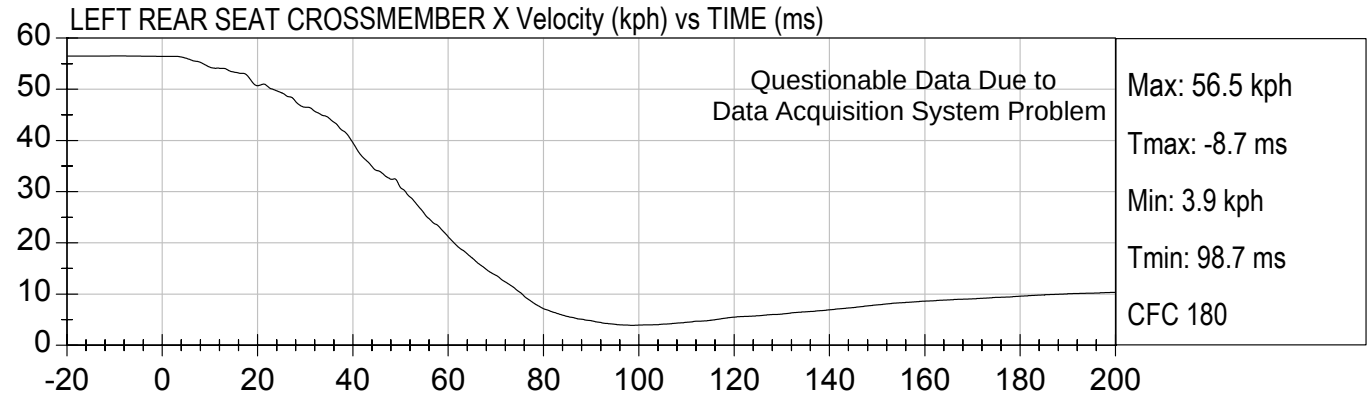
Test Date: 12/11/2002
Speed: 35.1 mph (56.5 km/h)

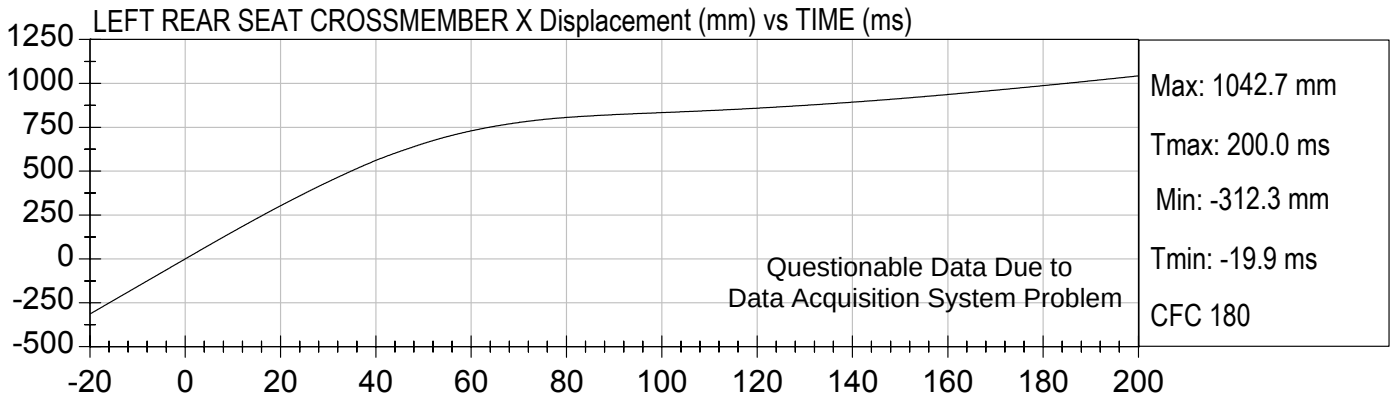






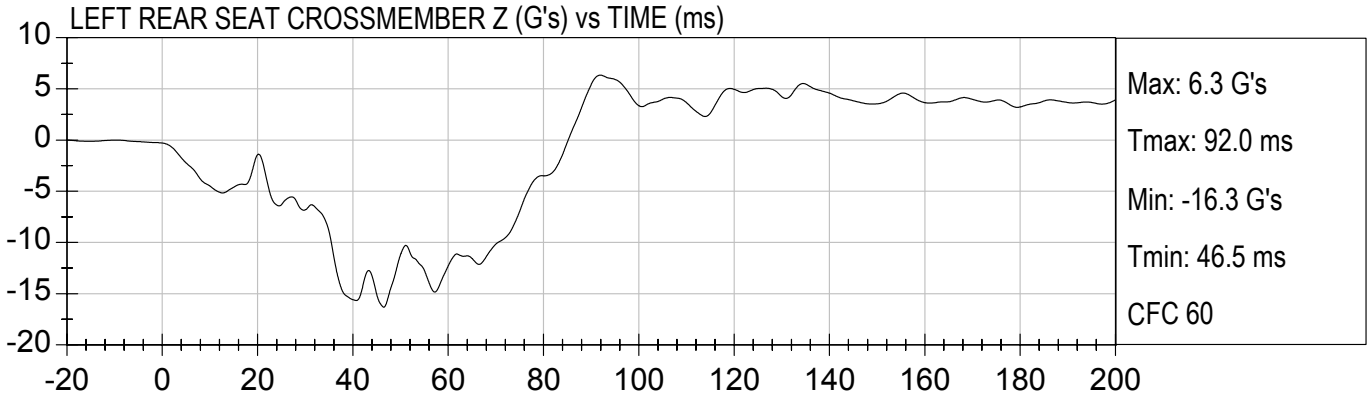

LEFT REAR SEAT CROSSMEMBER X (G's) vs TIME (ms)
10
0
-10
-20
-30
-40
-20 0 20 40 60 80 100 120 140 160 180 200
Questionable Data Due to
Data Acquisition System Problem
Max: 3.7 G's
Tmax: 117.0 ms
Min: -36.3 G's
Tmin: 40.4 ms
CFC 60

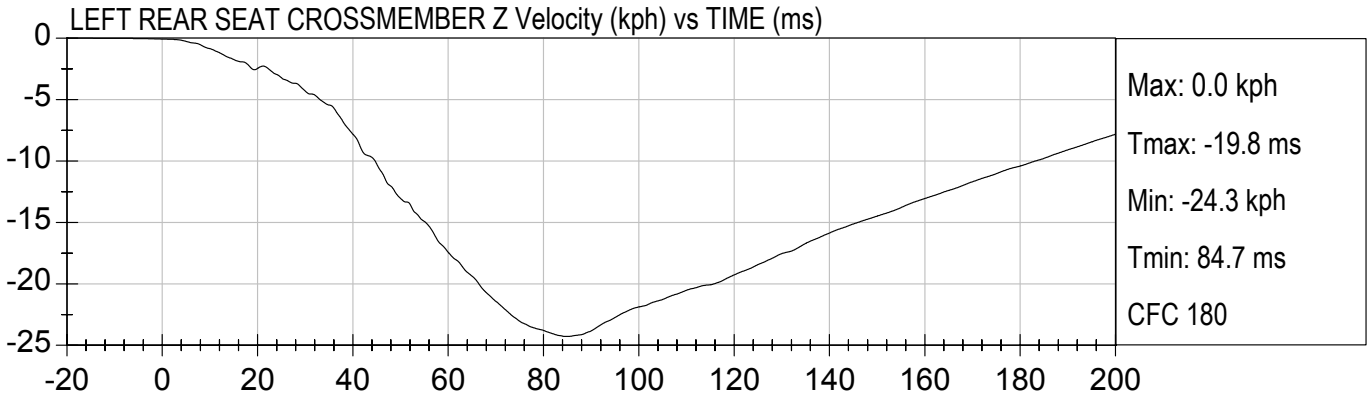

LEFT REAR SEAT CROSSMEMBER X Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-20 0 20 40 60 80 100 120 140 160 180 200
Questionable Data Due to
Data Acquisition System Problem
Max: 56.5 kph
Tmax: -8.7 ms
Min: 3.9 kph
Tmin: 98.7 ms
CFC 180

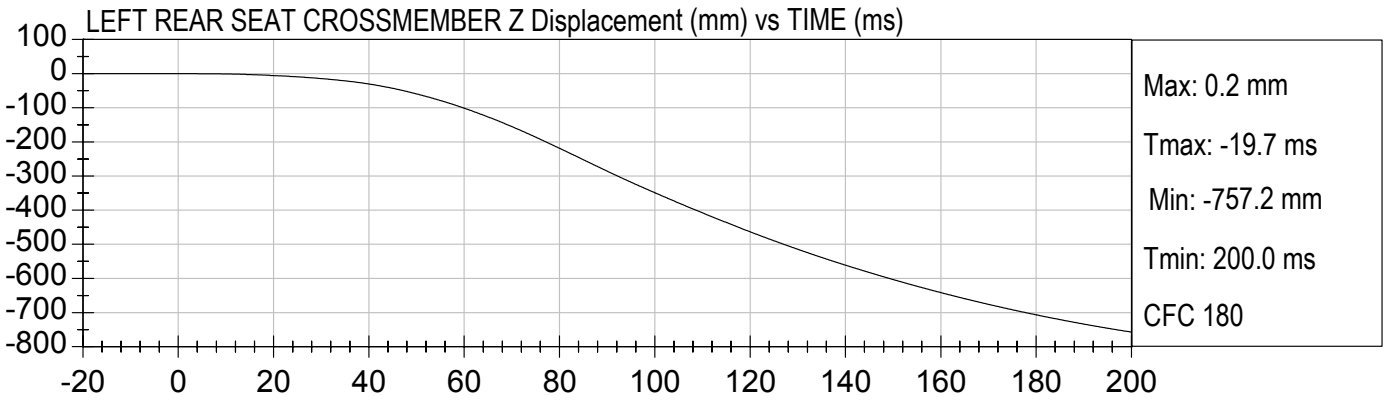

LEFT REAR SEAT CROSSMEMBER X Displacement (mm) vs TIME (ms)
1250
1000
750
500
250
0
-250
-500
-20 0 20 40 60 80 100 120 140 160 180 200
Questionable Data Due to
Data Acquisition System Problem
Max: 1042.7 mm
Tmax: 200.0 ms
Min: -312.3 mm
Tmin: -19.9 ms
CFC 180

35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

Test Date: 12/11/2002
Speed: 35.1 mph (56.5 km/h)

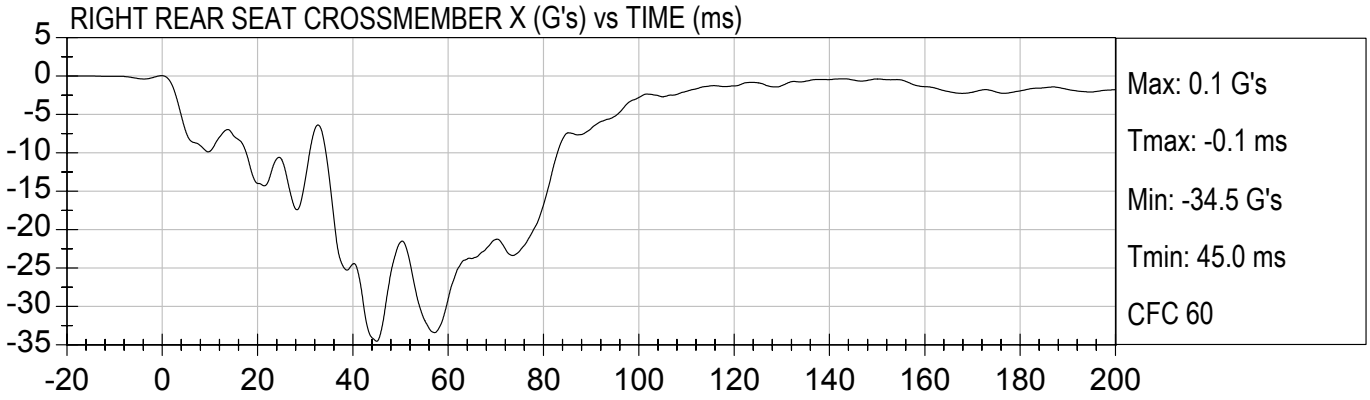


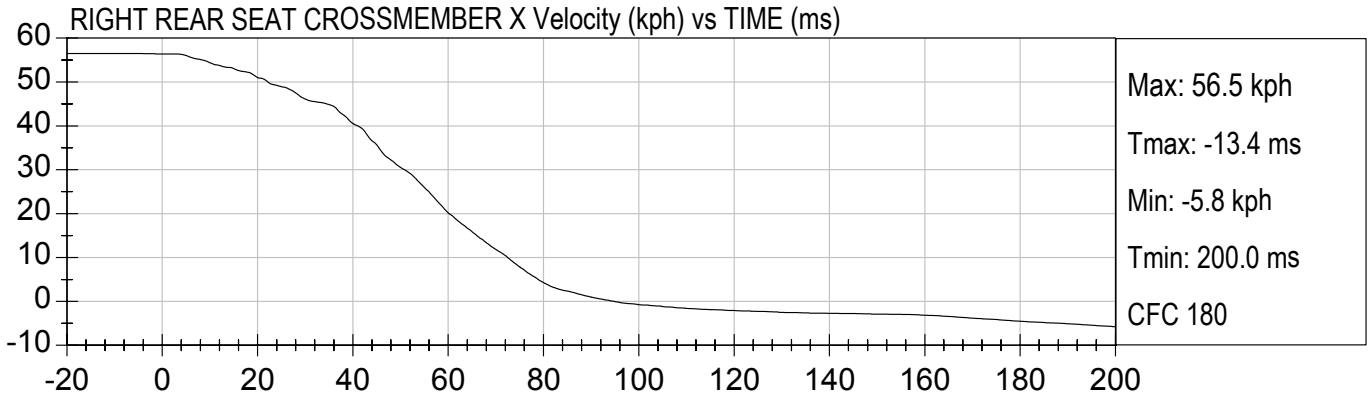


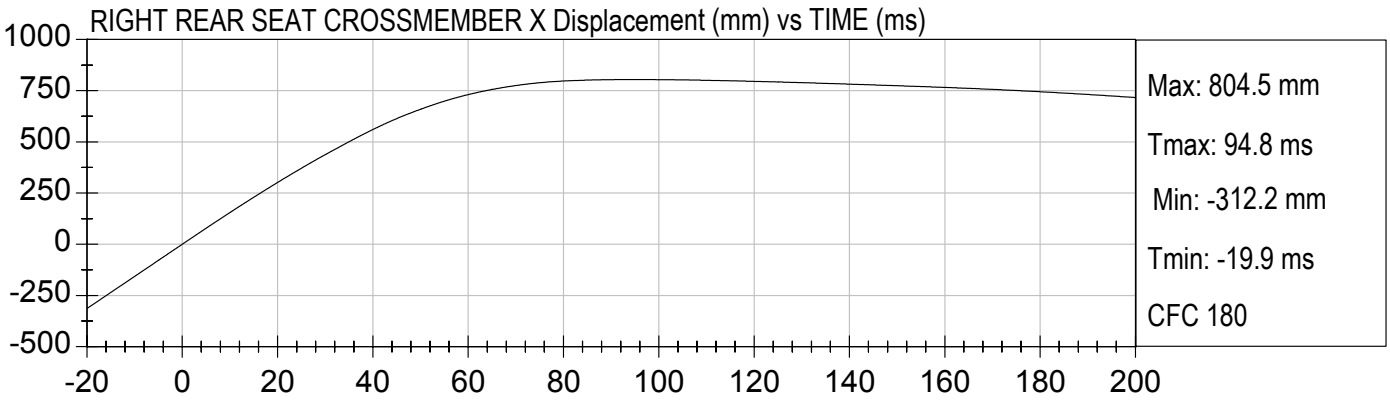


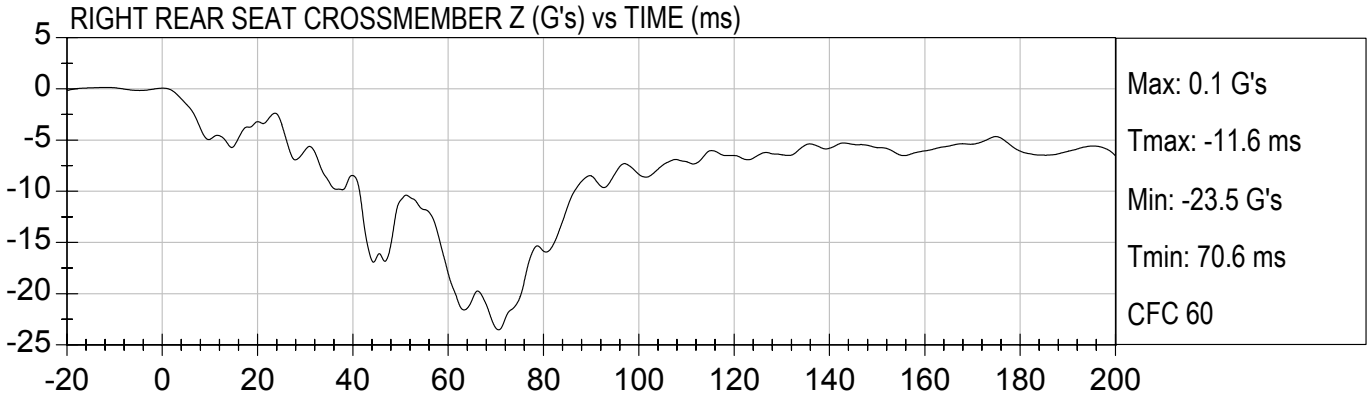
35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

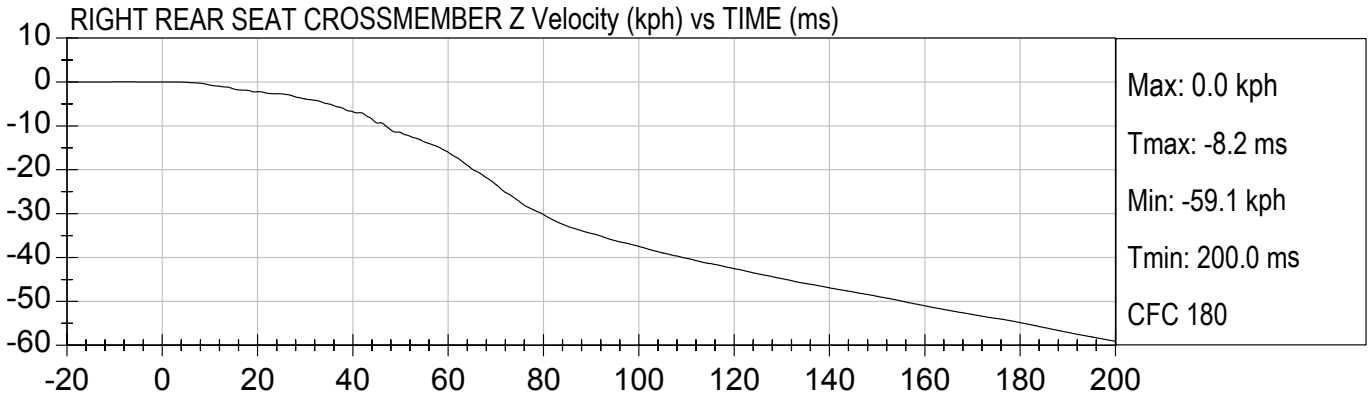
Test Date: 12/11/2002
Speed: 35.1 mph (56.5 km/h)

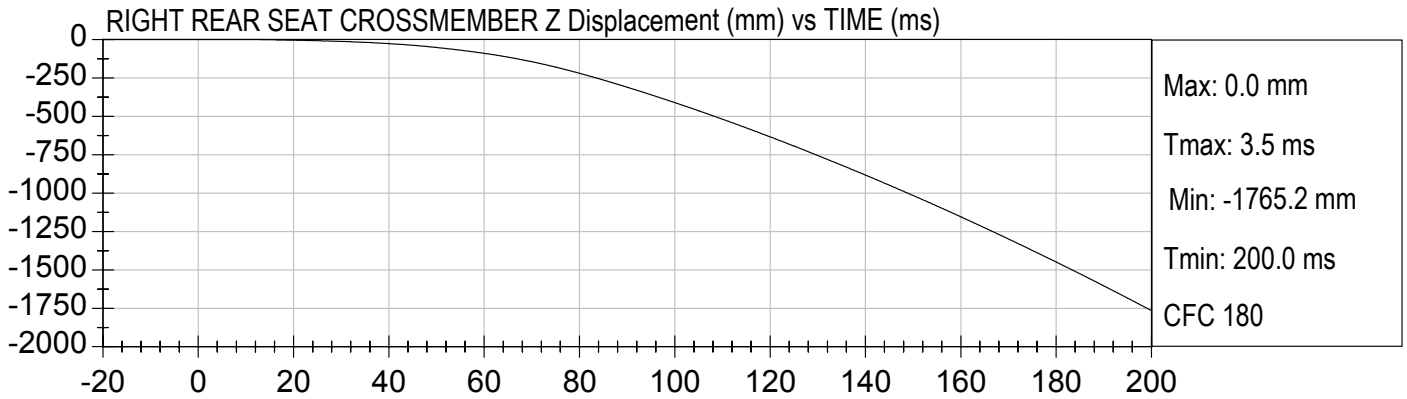






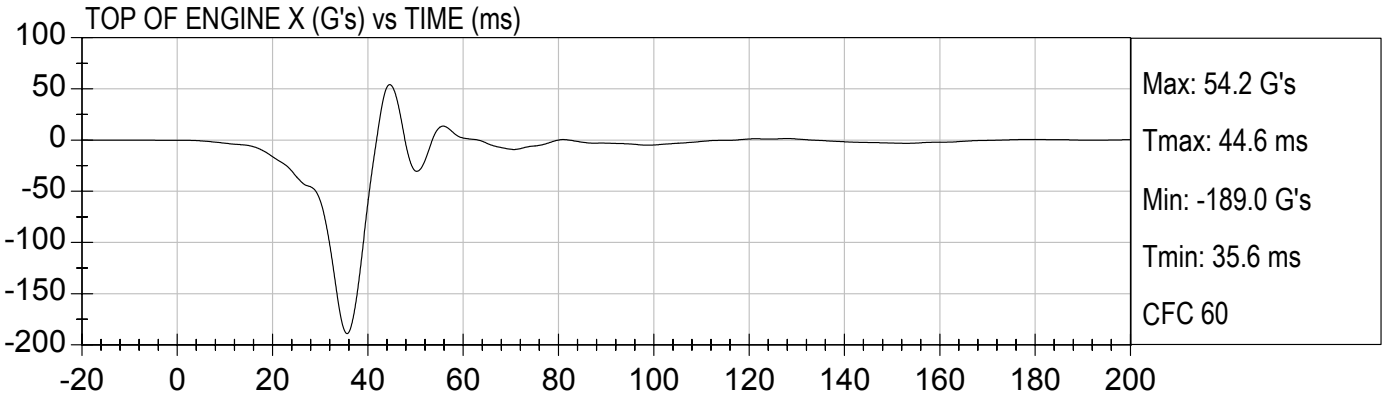

RIGHT REAR SEAT CROSSMEMBER Z (G's) vs TIME (ms)
5
0
-5
-10
-15
-20
-25
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 0.1 G's
Tmax: -11.6 ms
Min: -23.5 G's
Tmin: 70.6 ms
CFC 60

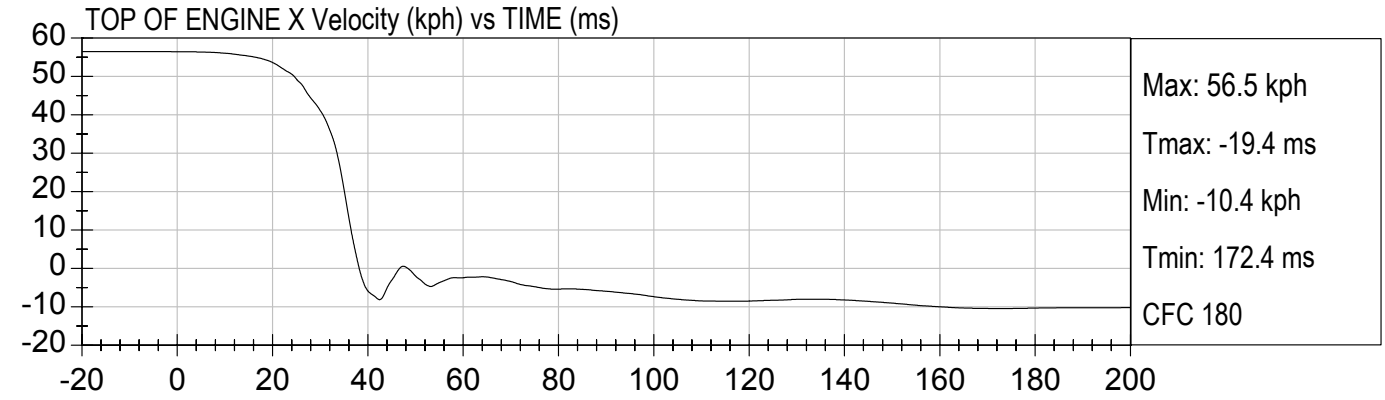

RIGHT REAR SEAT CROSSMEMBER Z Velocity (kph) vs TIME (ms)
10
0
-10
-20
-30
-40
-50
-60
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 0.0 kph
Tmax: -8.2 ms
Min: -59.1 kph
Tmin: 200.0 ms
CFC 180

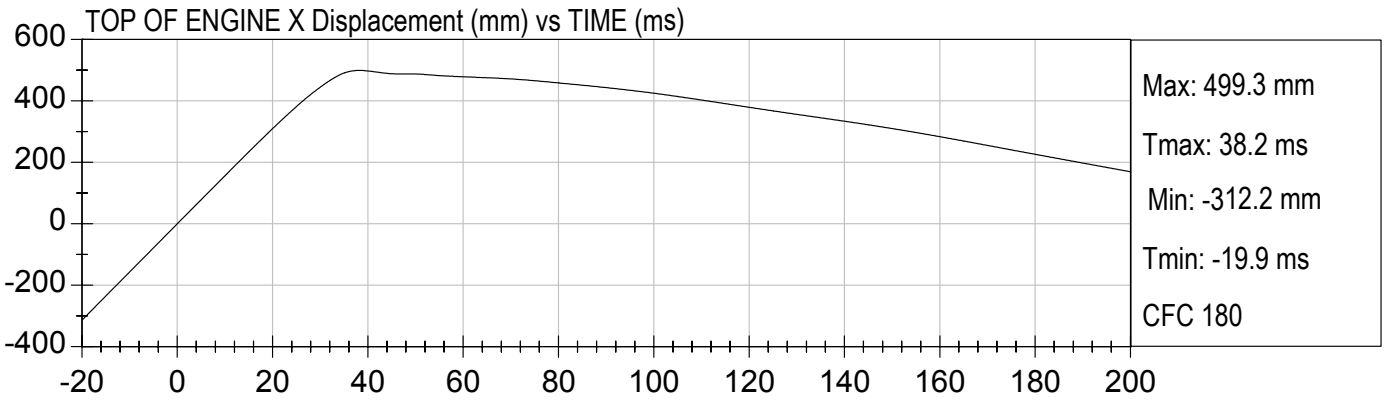

RIGHT REAR SEAT CROSSMEMBER Z Displacement (mm) vs TIME (ms)
0
-250
-500
-750
-1000
-1250
-1500
-1750
-2000
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 0.0 mm
Tmax: 3.5 ms
Min: -1765.2 mm
Tmin: 200.0 ms
CFC 180

35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

Test Date: 12/11/2002
Speed: 35.1 mph (56.5 km/h)

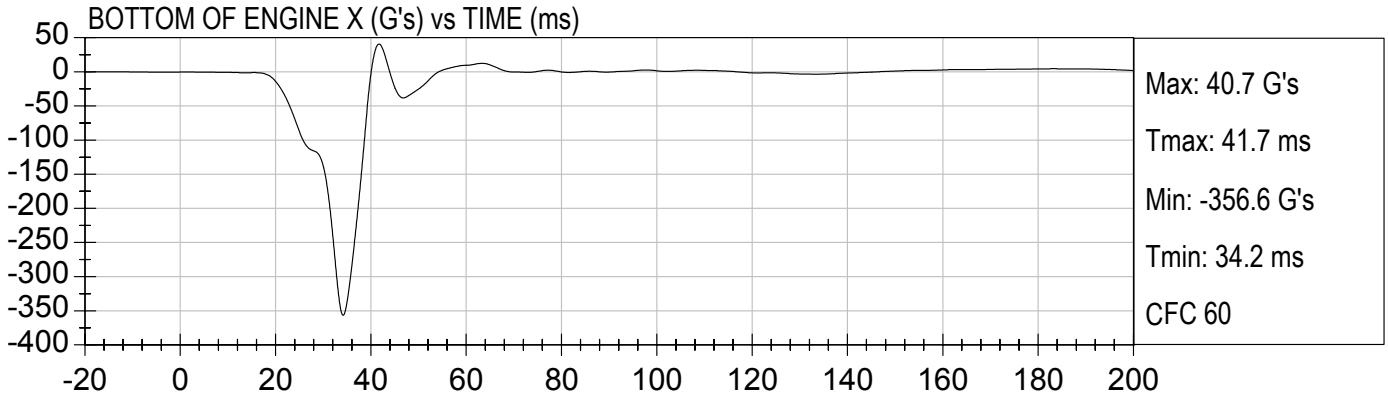


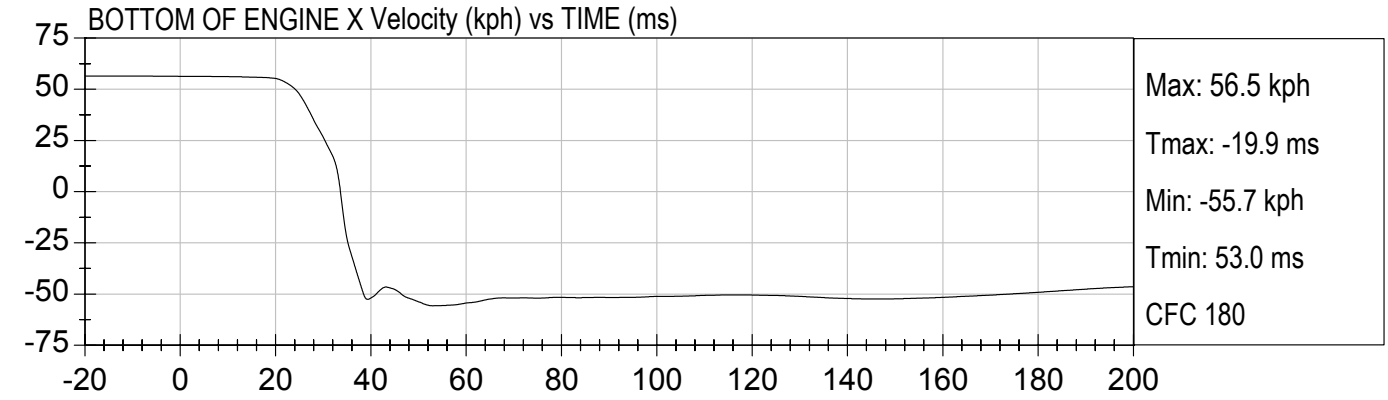


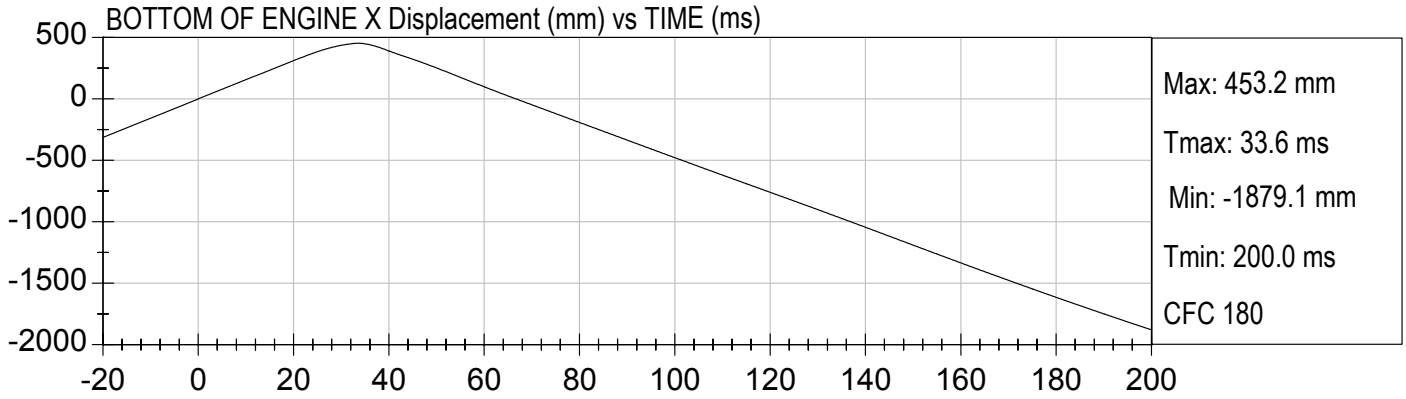


35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

Test Date: 12/11/2002
Speed: 35.1 mph (56.5 km/h)

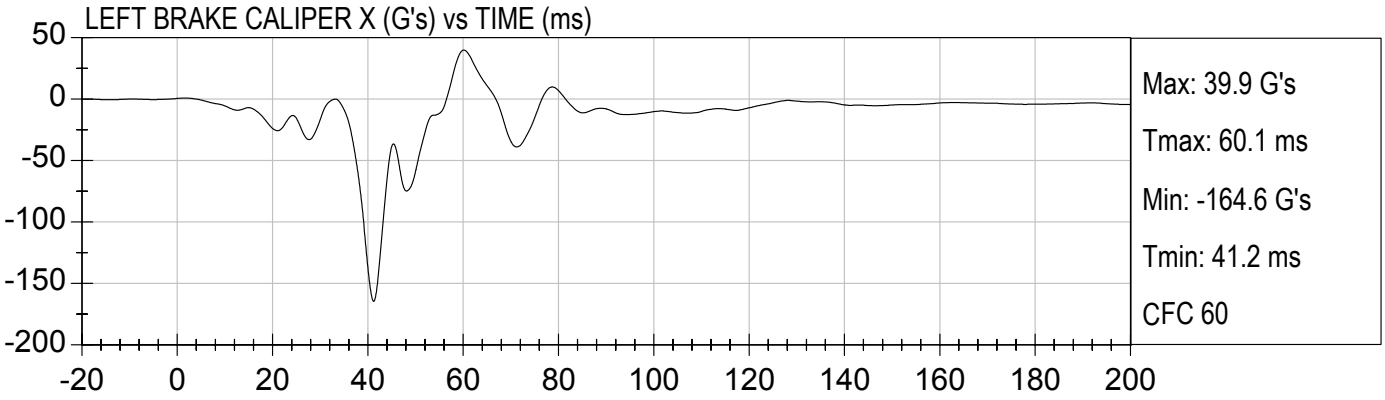


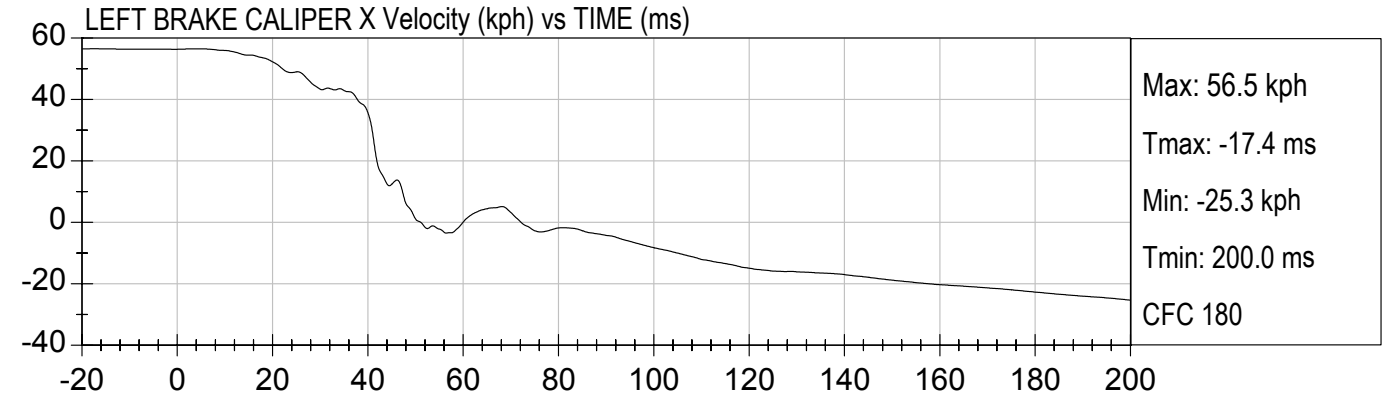


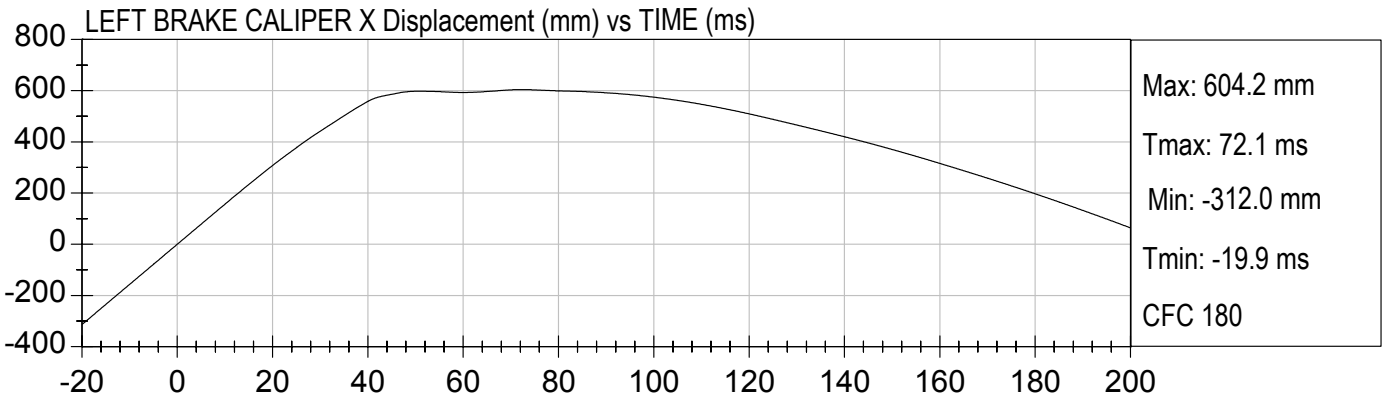


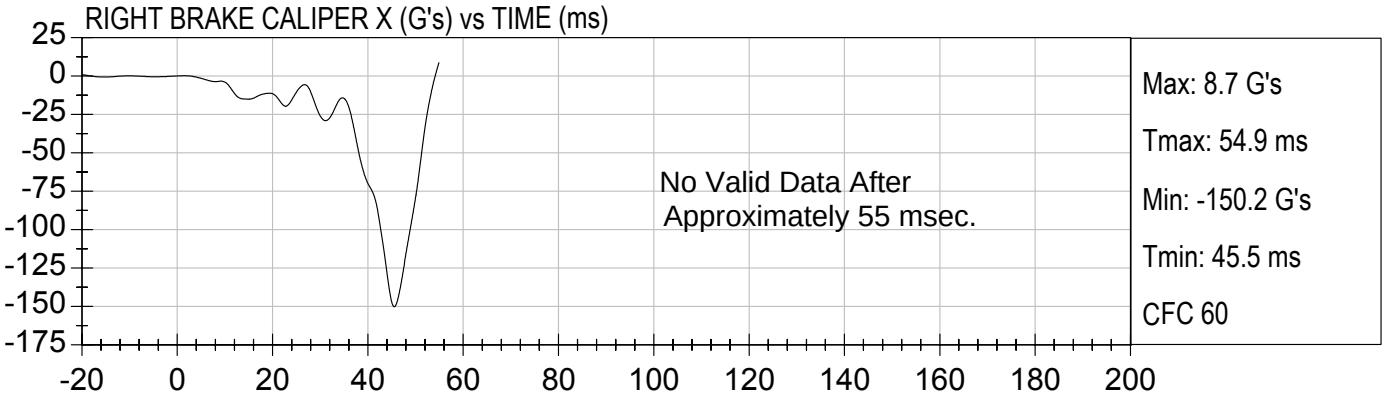
35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

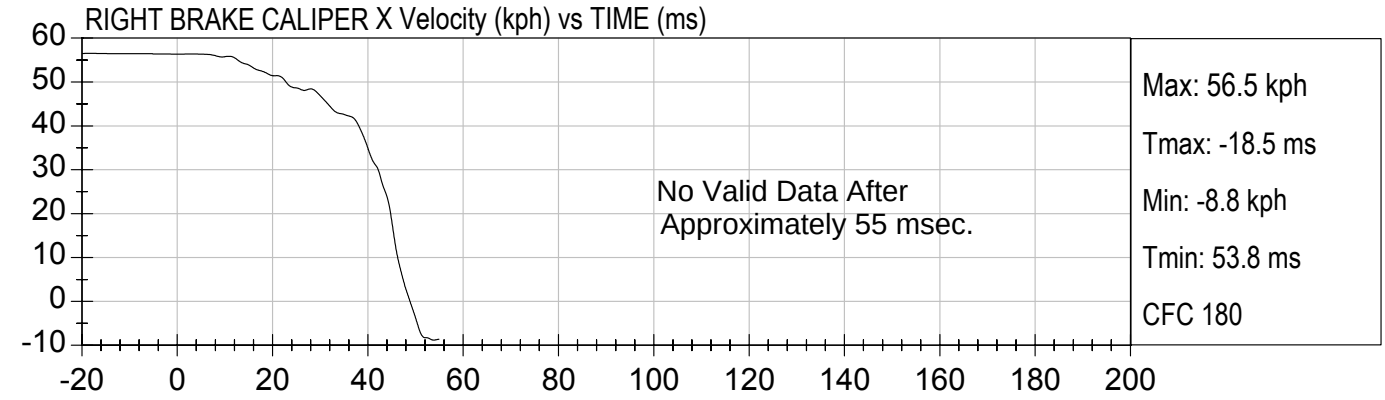
Test Date: 12/11/2002
Speed: 35.1 mph (56.5 km/h)

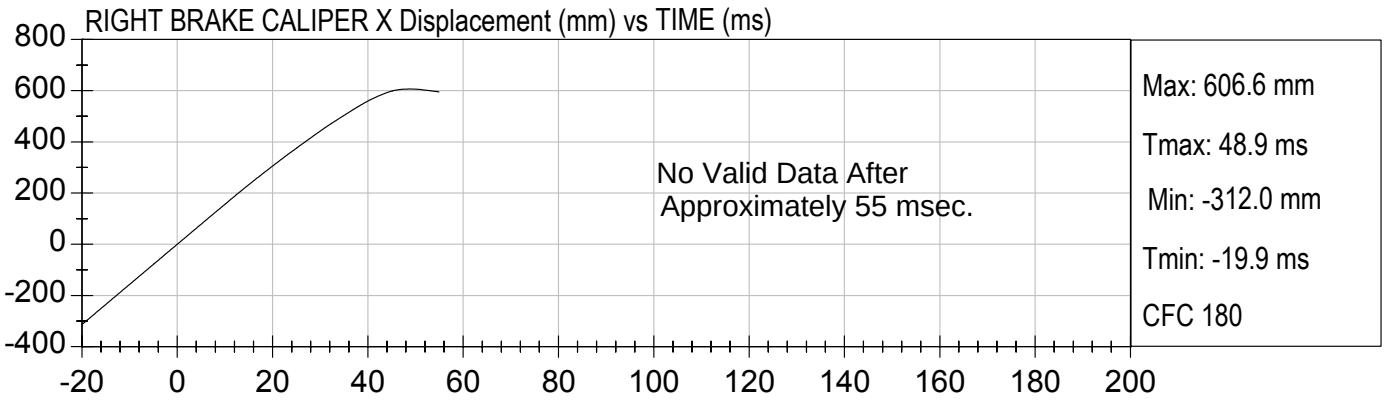






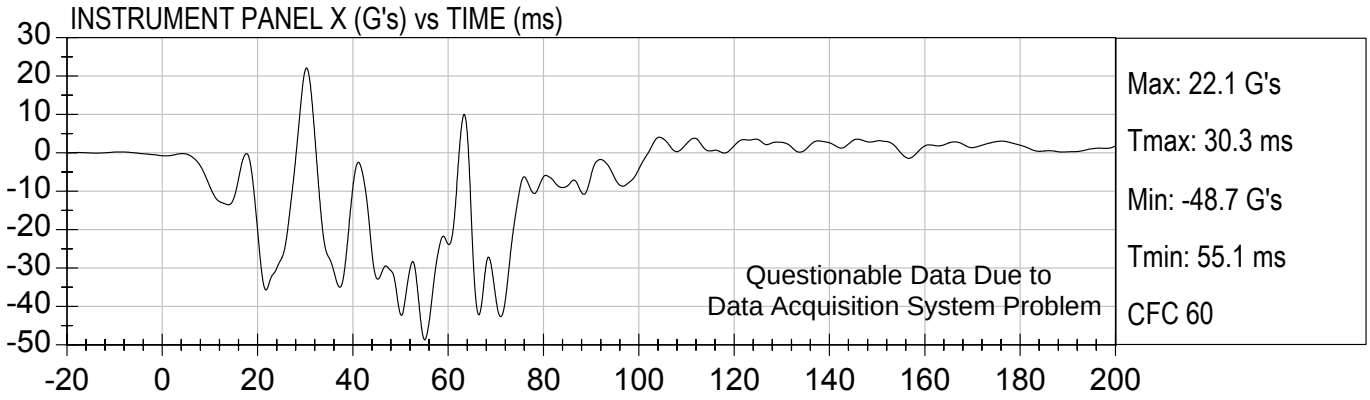

RIGHT BRAKE CALIPER X (G's) vs TIME (ms)
25
0
-25
-50
-75
-100
-125
-150
-175
-20
0
20
40
60
80
100
120
140
160
180
200
No Valid Data After
Approximately 55 msec.
Max: 8.7 G's
Tmax: 54.9 ms
Min: -150.2 G's
Tmin: 45.5 ms
CFC 60

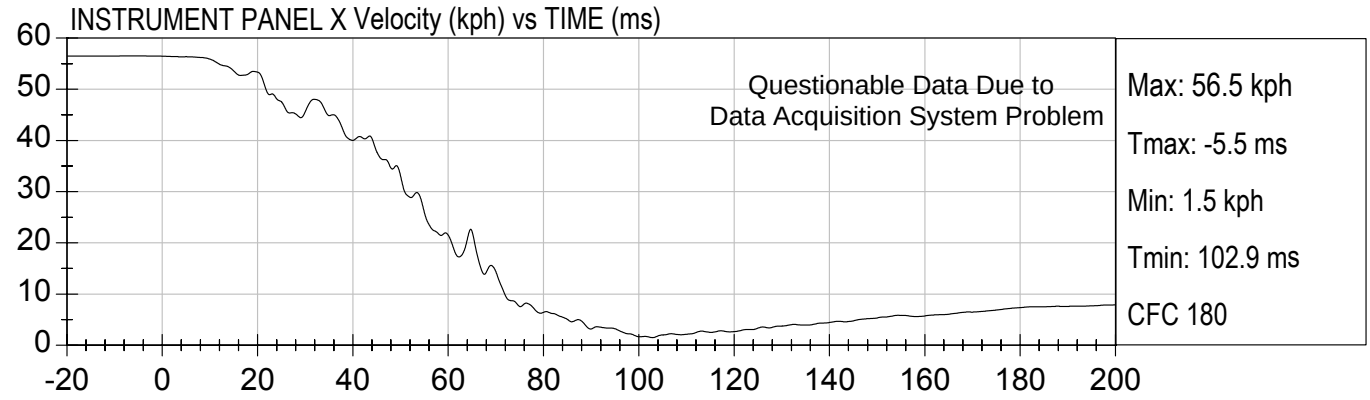

RIGHT BRAKE CALIPER X Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20
0
20
40
60
80
100
120
140
160
180
200
No Valid Data After
Approximately 55 msec.
Max: 56.5 kph
Tmax: -18.5 ms
Min: -8.8 kph
Tmin: 53.8 ms
CFC 180

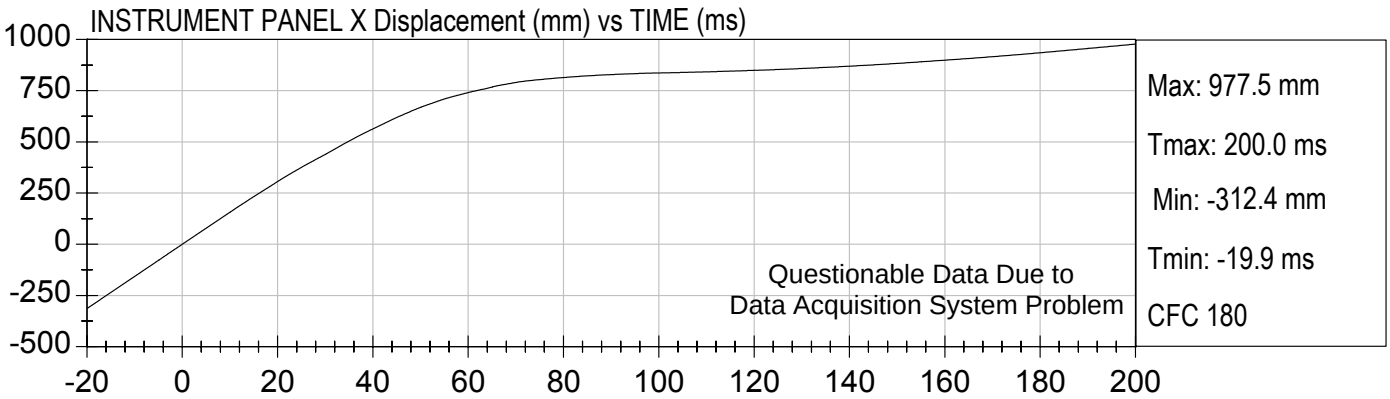

RIGHT BRAKE CALIPER X Displacement (mm) vs TIME (ms)
800
600
400
200
0
-200
-400
-20
0
20
40
60
80
100
120
140
160
180
200
No Valid Data After
Approximately 55 msec.
Max: 606.6 mm
Tmax: 48.9 ms
Min: -312.0 mm
Tmin: -19.9 ms
CFC 180

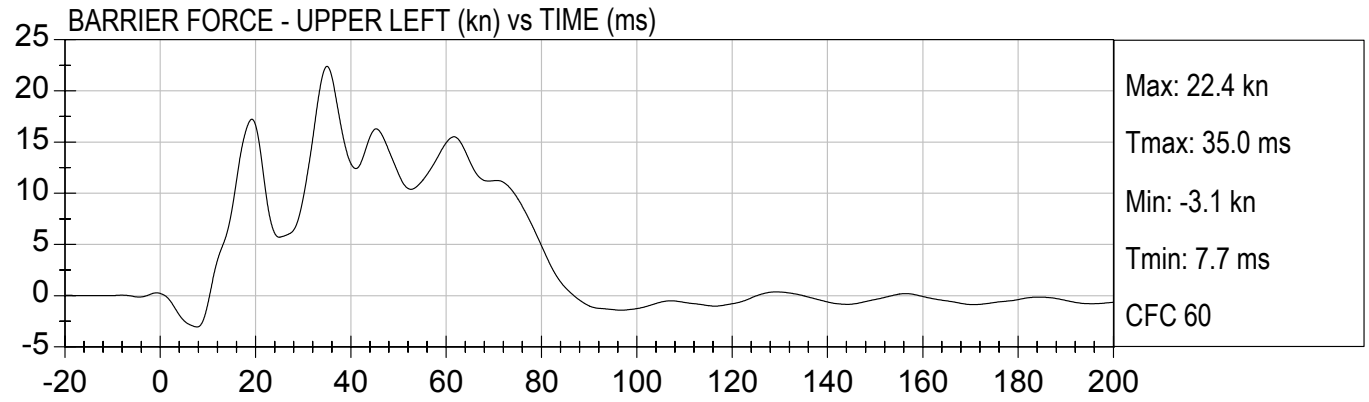
35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

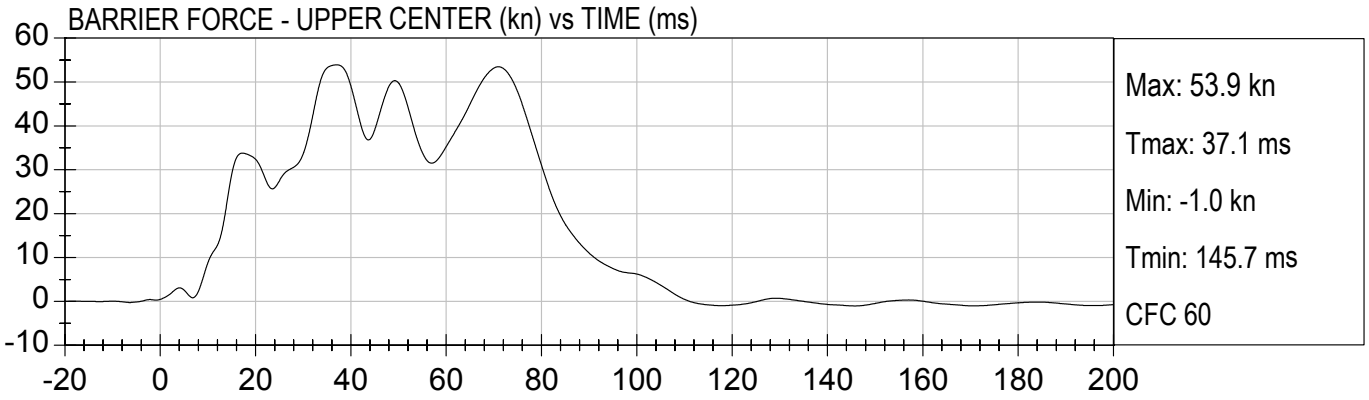
Test Date: 12/11/2002
Speed: 35.1 mph (56.5 km/h)

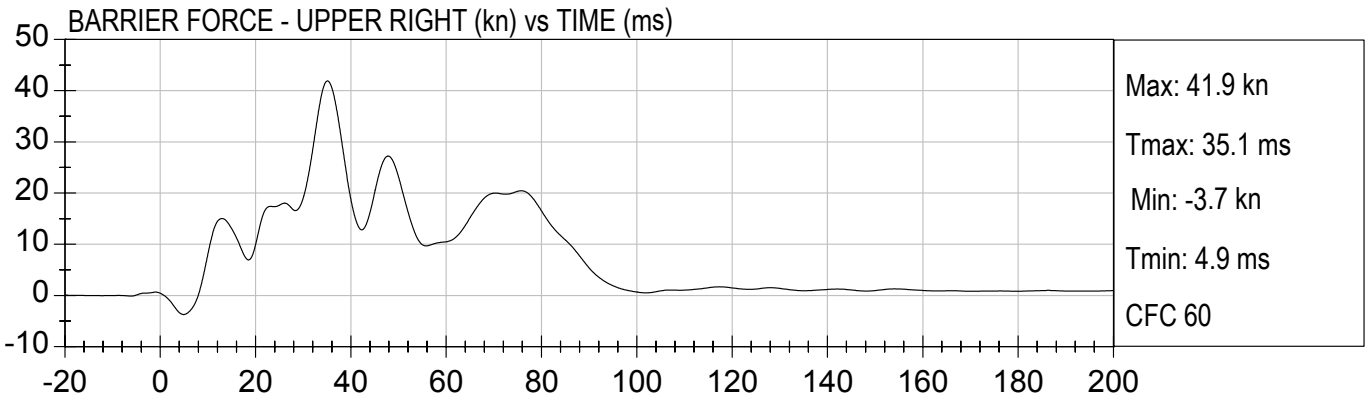






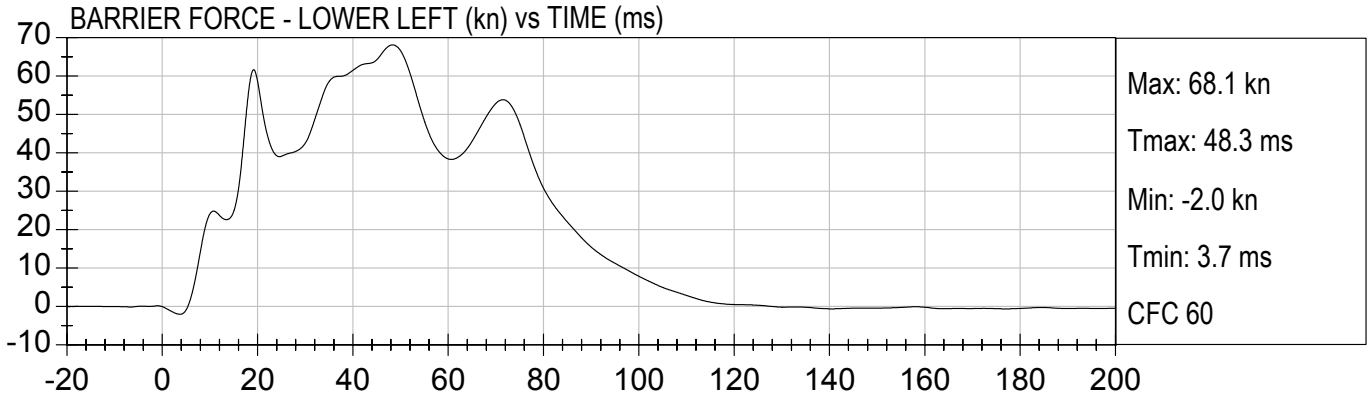

BARRIER FORCE - UPPER LEFT (kn) vs TIME (ms)
25
20
15
10
5
0
-5
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 22.4 kn
Tmax: 35.0 ms
Min: -3.1 kn
Tmin: 7.7 ms
CFC 60

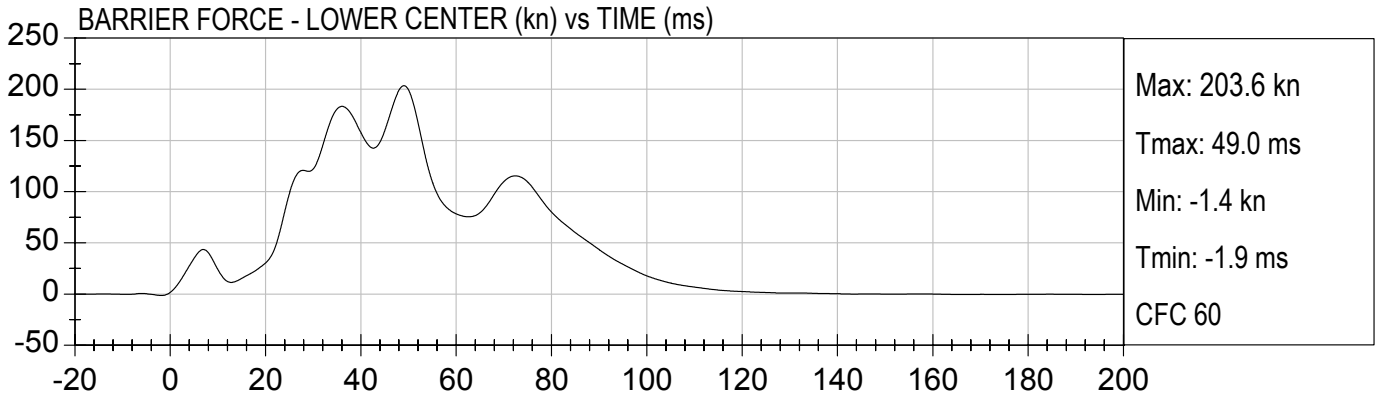

BARRIER FORCE - UPPER CENTER (kn) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 53.9 kn
Tmax: 37.1 ms
Min: -1.0 kn
Tmin: 145.7 ms
CFC 60

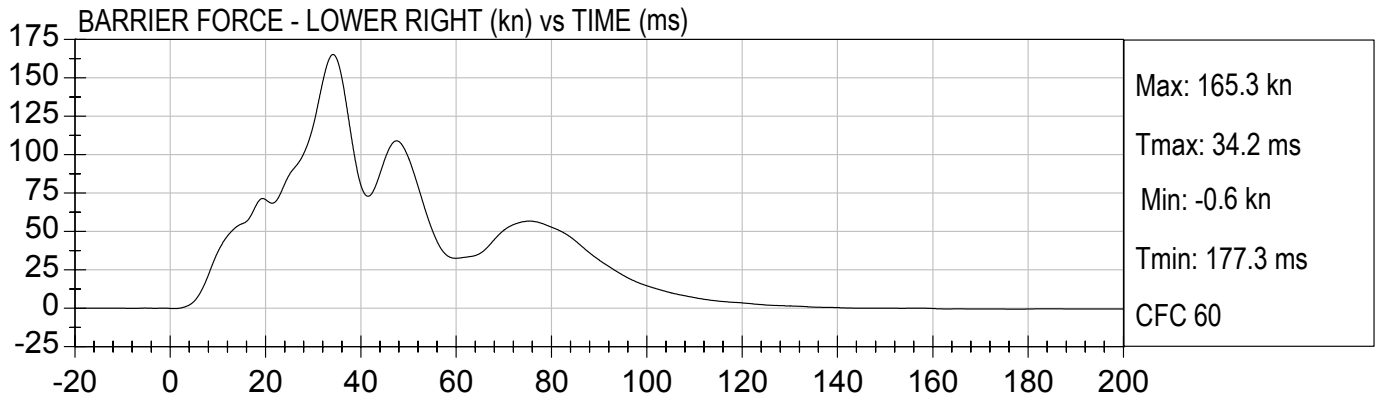

BARRIER FORCE - UPPER RIGHT (kn) vs TIME (ms)
50
40
30
20
10
0
-10
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 41.9 kn
Tmax: 35.1 ms
Min: -3.7 kn
Tmin: 4.9 ms
CFC 60

35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

Test Date: 12/11/2002
Speed: 35.1 mph (56.5 km/h)

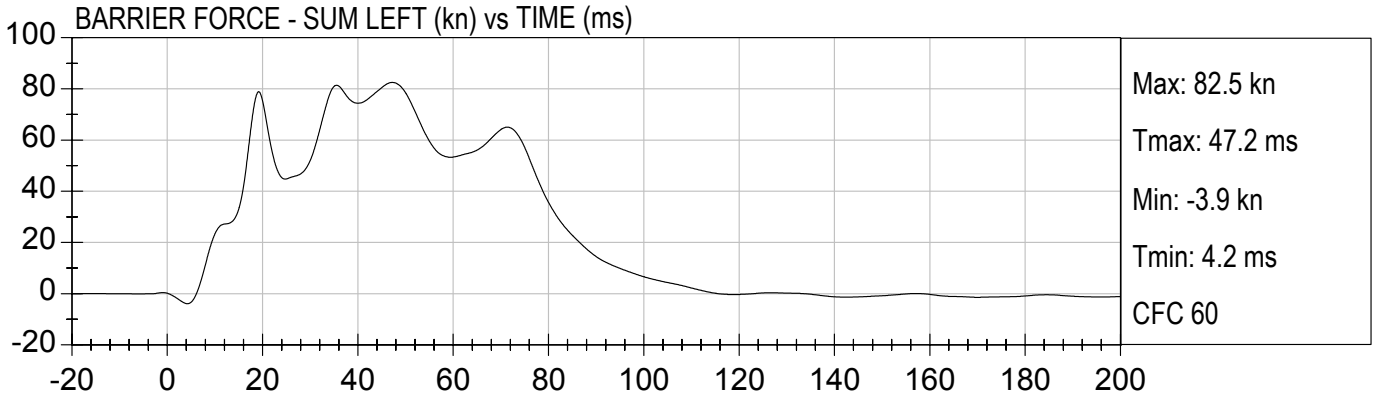


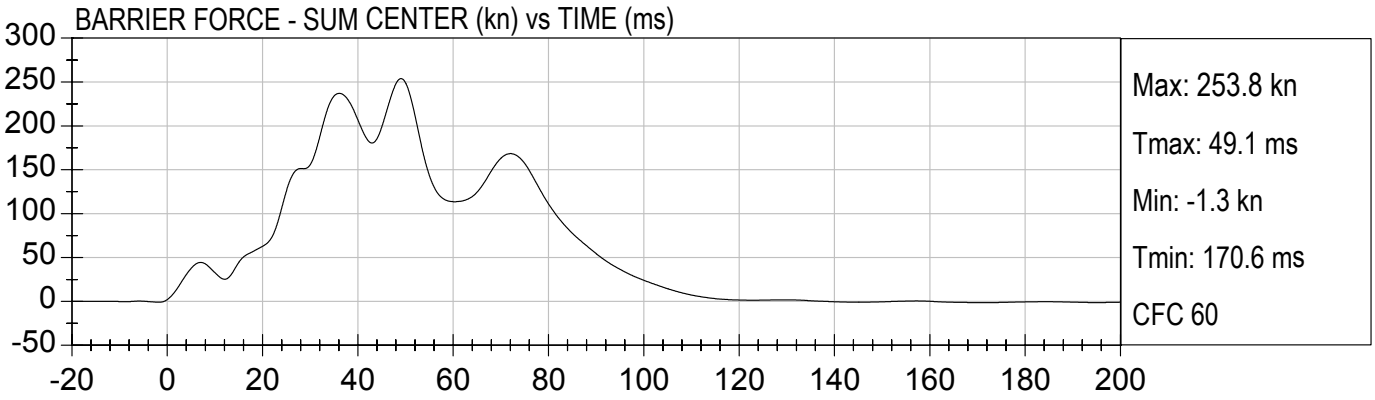


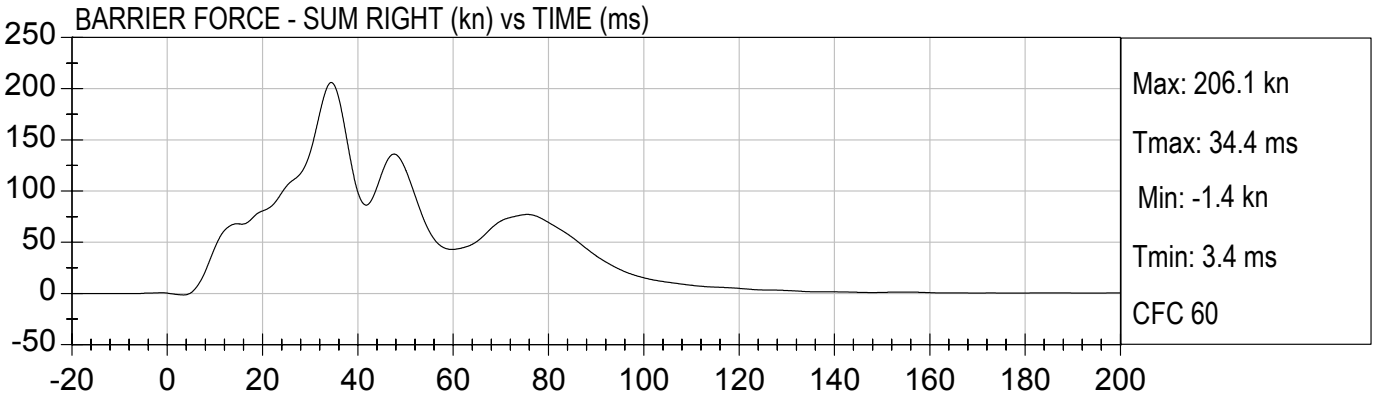


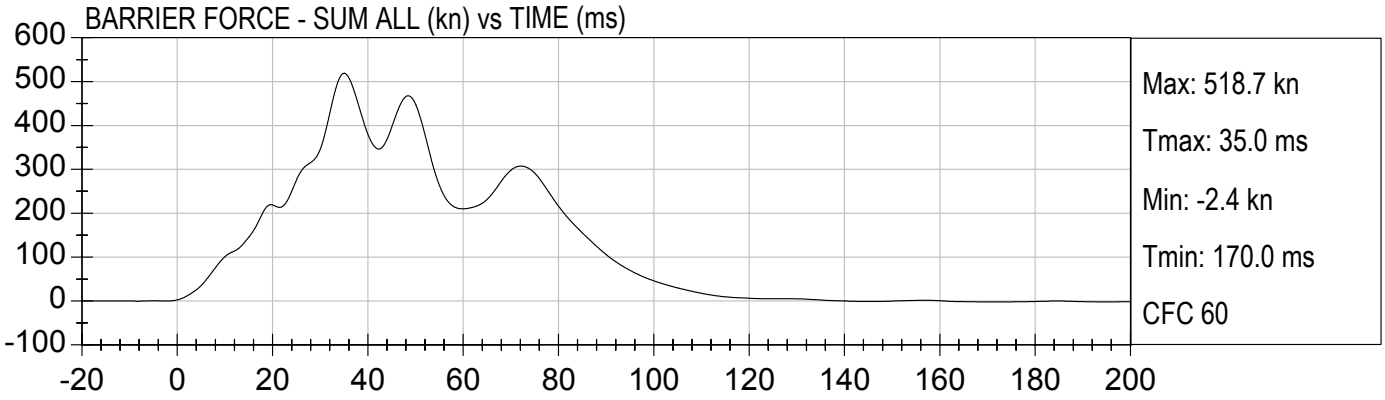
35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

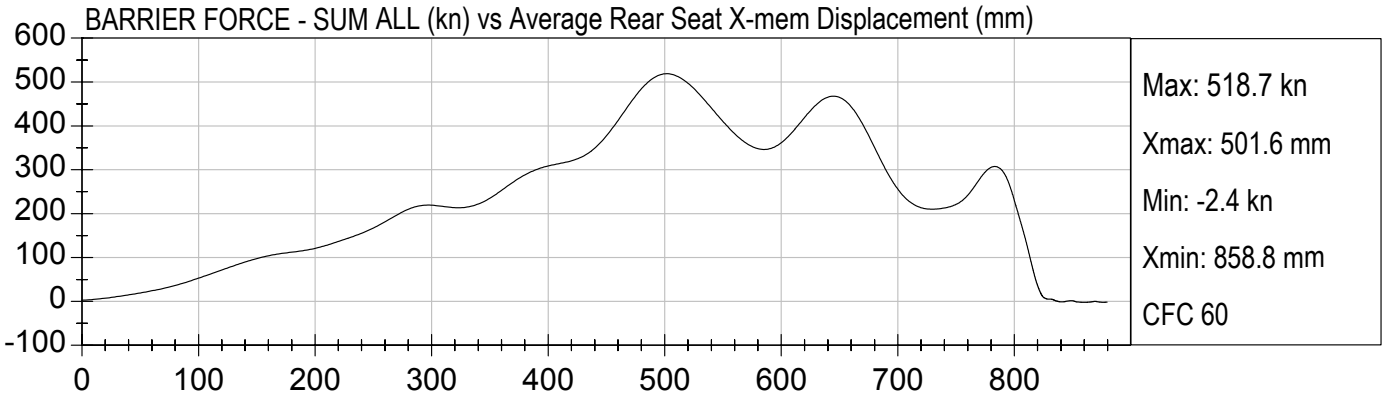
Test Date: 12/11/2002
Speed: 35.1 mph (56.5 km/h)








BARRIER FORCE - SUM ALL (kn) vs TIME (ms)
600
500
400
300
200
100
0
-100
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 518.7 kn
Tmax: 35.0 ms
Min: -2.4 kn
Tmin: 170.0 ms
CFC 60


BARRIER FORCE - SUM ALL (kn) vs Average Rear Seat X-mem Displacement (mm)
600
500
400
300
200
100
0
-100
0
100
200
300
400
500
600
700
800
Max: 518.7 kn
Xmax: 501.6 mm
Min: -2.4 kn
Xmin: 858.8 mm
CFC 60

APPENDIX C

DUMMY CALIBRATION DATA TRACES AND TABLES

Hybrid III Calibration Data Sheet

50th Percentile Male

Head Drop Calibration

ATD Serial No: 066 **Test I.D:** D021441

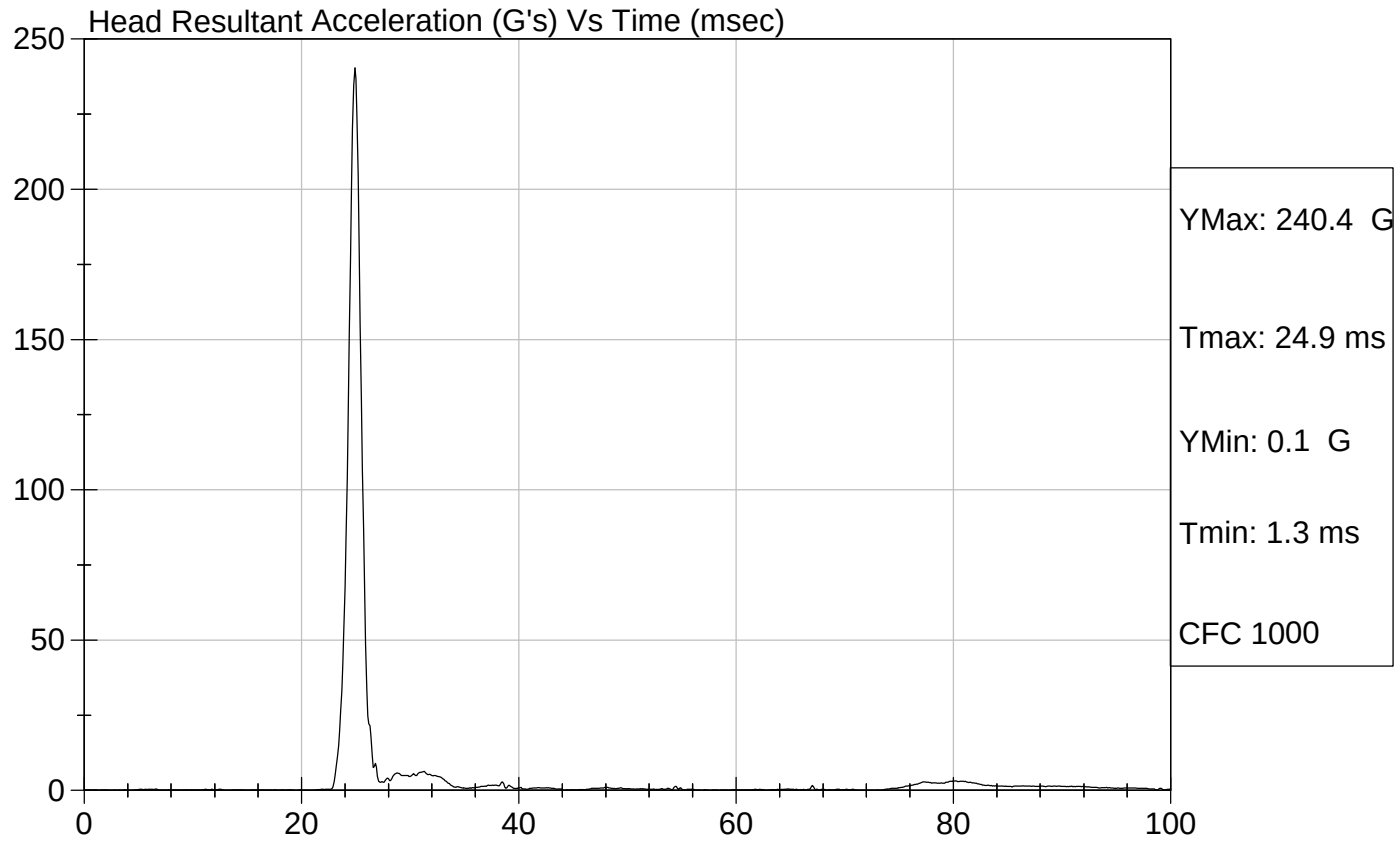
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Peak Resultant Acceleration	G's	225.0 to 275.0	240.4	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	14.9	Pass
Is Acceleration Unimodal?	Yes/No	< 10% Peak	Yes	Pass
		Overall Test Results		Pass

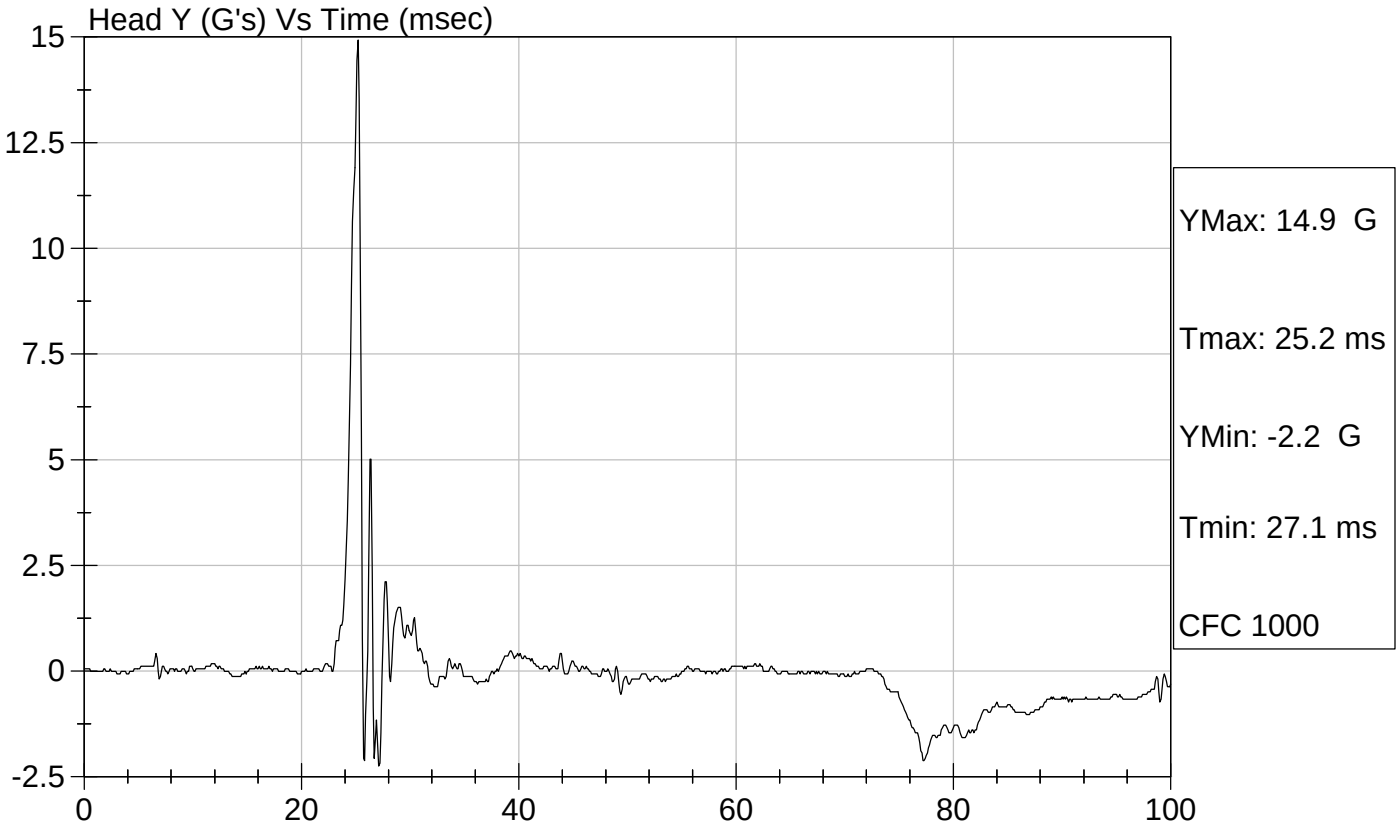
Laboratory Technician

11/08/2002
Test Date

Approved By

	Test Description: Head Drop	Test Date: 11/08/2002
	Component: D021441	Speed: 0 ft/s, 0.00 m/s





Hybrid III Calibration Data Sheet

50th Percentile Male

Neck Flexion Test

ATD Serial No: 066 **Test I.D:** D021442

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	31	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.05	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	23.86	Pass
	20 msec	G's	17.60 to 22.60	20.08	Pass
	30 msec	G's	12.50 to 18.50	16.34	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	16.34	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	35.4	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	71.9	Pass
	Time	msec	57.0 to 64.0	57.3	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	84.1 to 108.5	95.7	Pass
	Time	msec	47.0 to 58.0	48.8	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	99.6	Pass
			Overall Test Results		Pass

Laboratory Technician

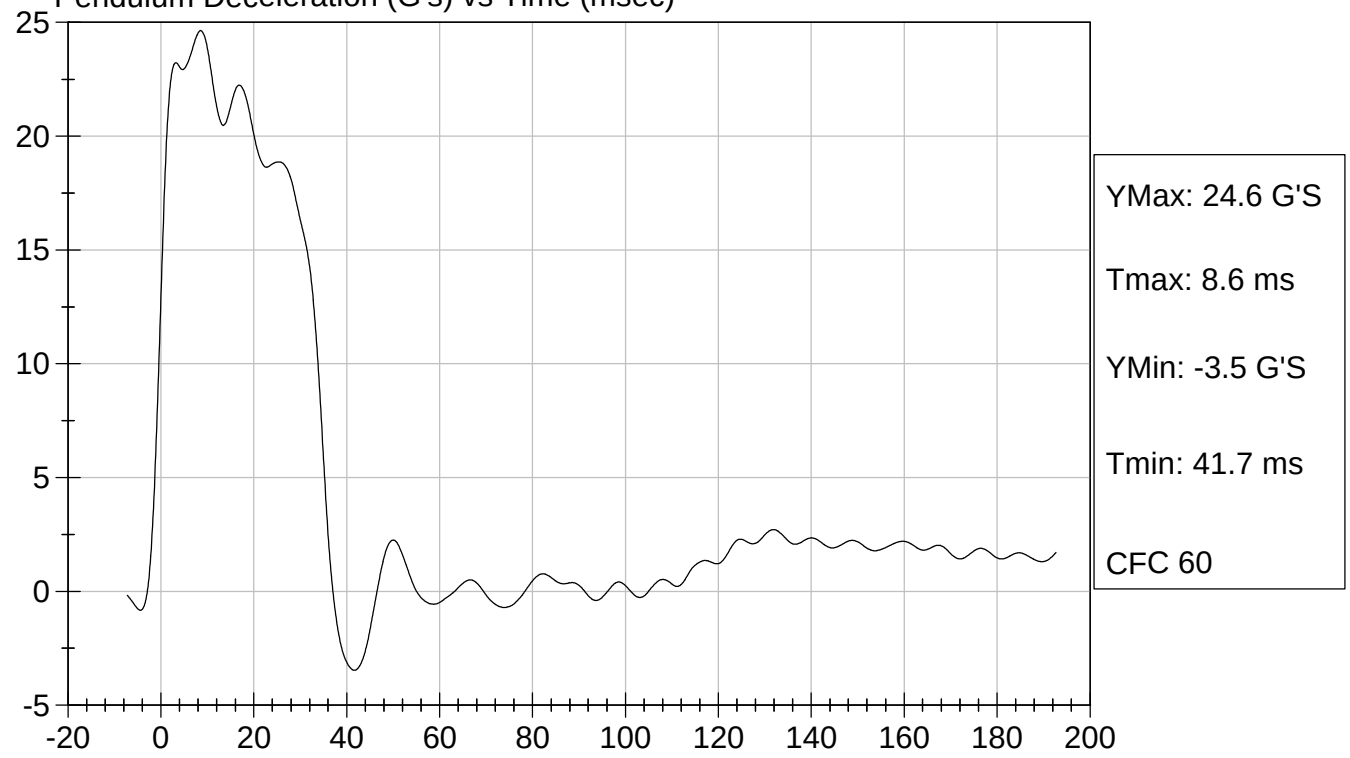
11/08/2002
Test Date

Approved By

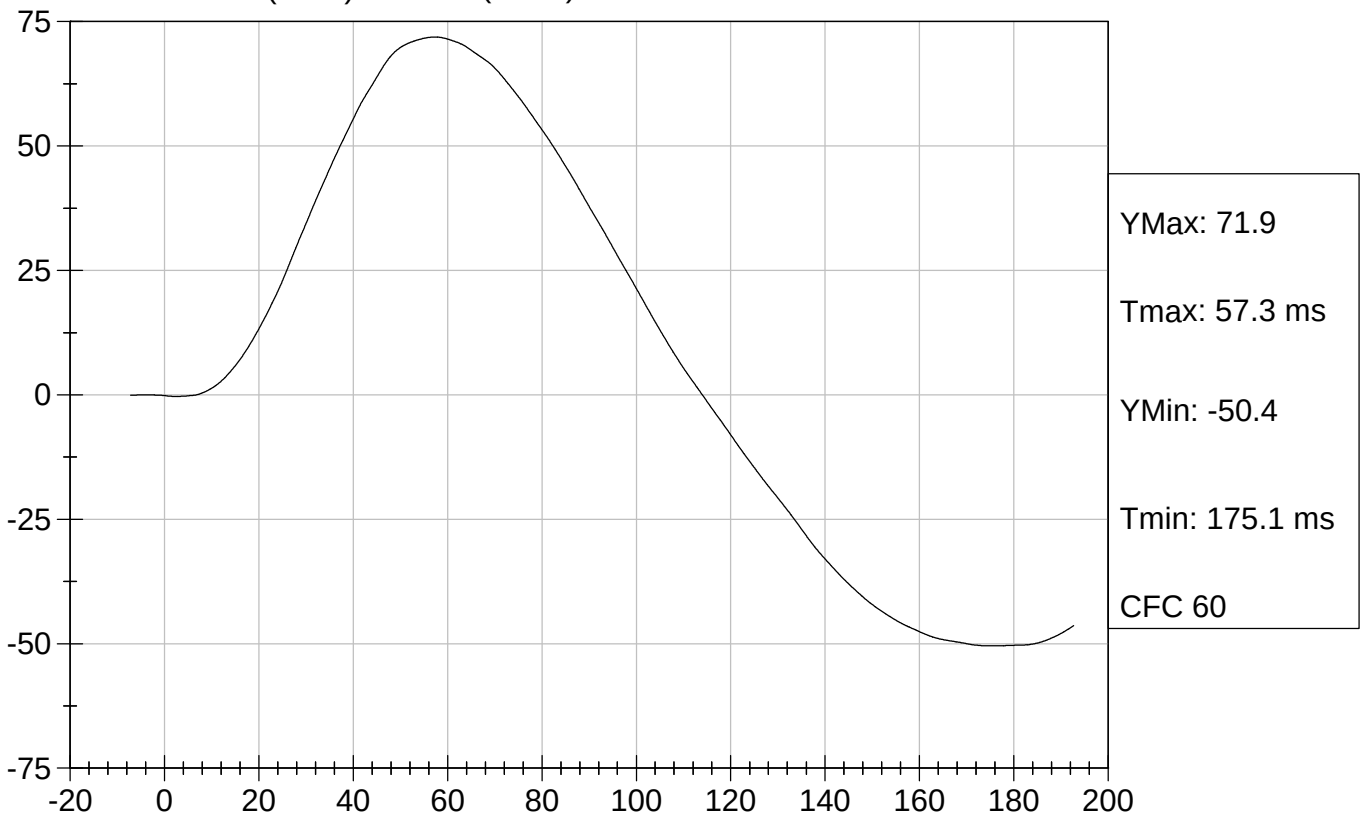
Test Desc: Neck Flexion
Component ID: D021442

Test Date: 11/08/2002
Speed: 23.12 ft/sec, 7.05 m/sec

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

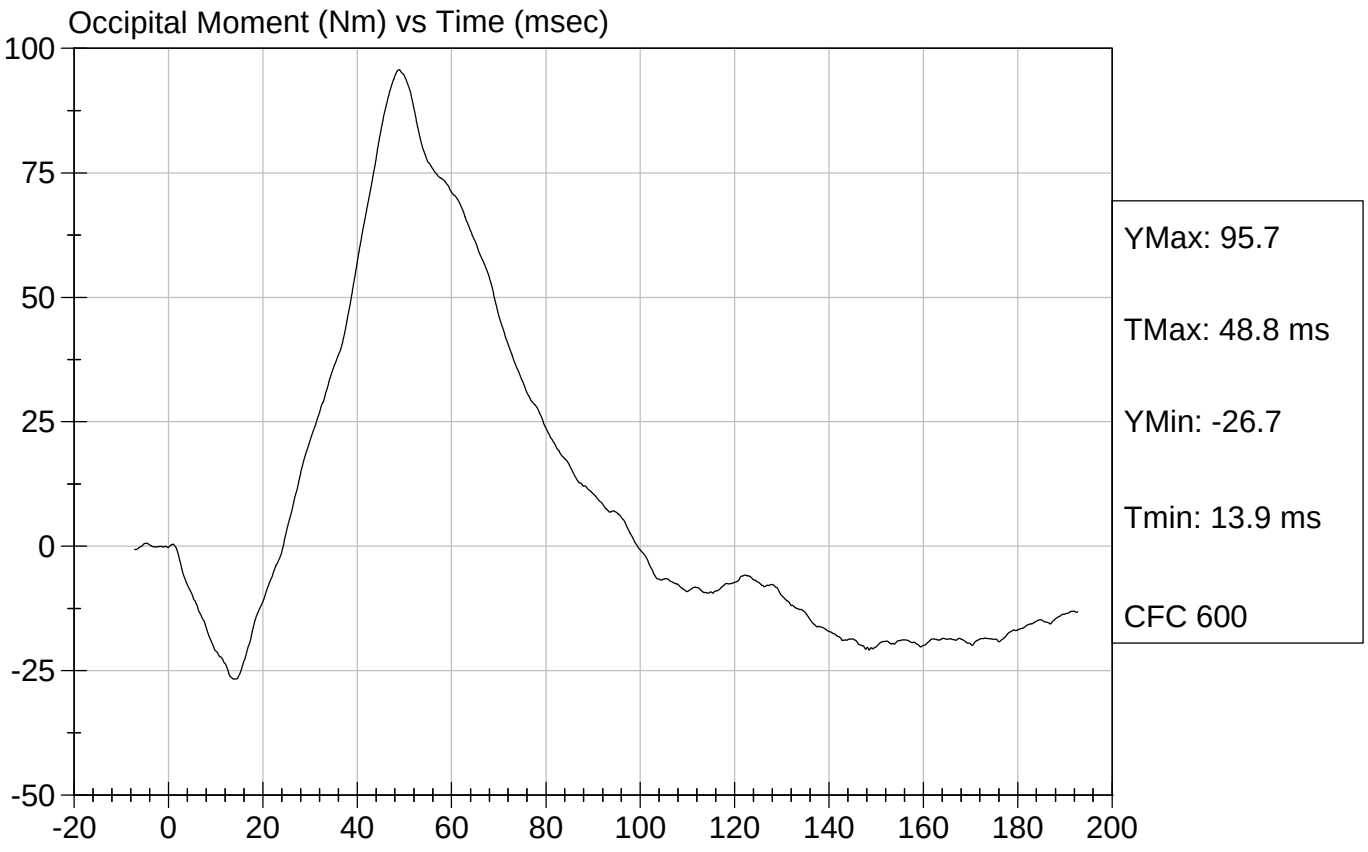


Neck Rotation (DEG) vs Time (msec)



Test Desc: Neck Flexion
Component ID: D021442

Test Date: 11/08/2002
Speed: 23.12 ft/sec, 7.05 m/sec



Hybrid III Calibration Data Sheet

50th Percentile Male

Neck Extension Test

ATD Serial No: 066 **Test I.D:** D021443

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	31	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.13	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	19.93	Pass
	20 msec	G's	14.00 to 19.00	16.75	Pass
	30 msec	G's	11.00 to 16.00	13.36	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	13.4	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	38.4	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	98.9	Pass
	Time	msec	72.0 to 82.0	78.0	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	154.0	Pass
Moment About Occipital Condyle	Minimum	N m	-52.9 to -79.9	-70.8	Pass
	Time	msec	65.0 to 79.0	70.7	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	142.6	Pass
			Overall Test Results		Pass

Laboratory Technician

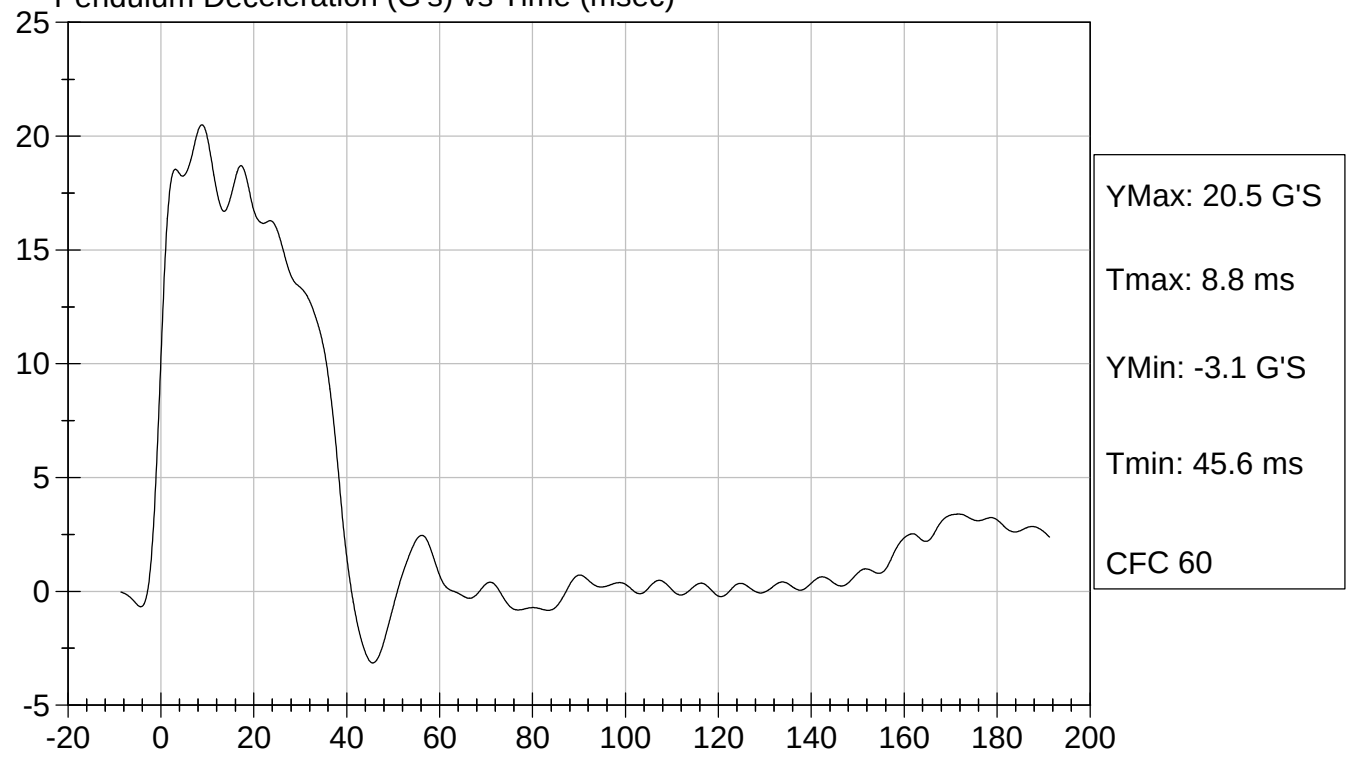
11/08/2002
Test Date

Approved By

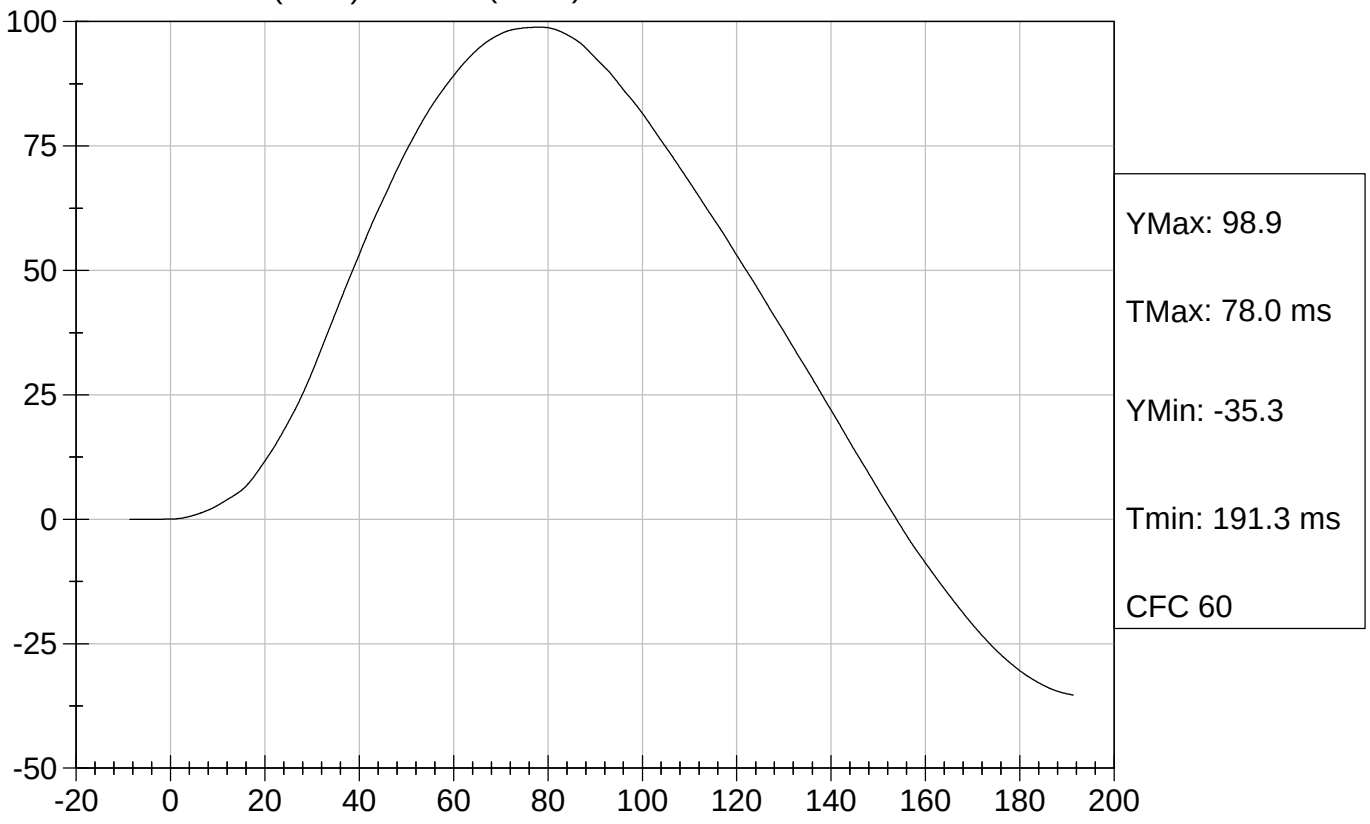
Test Desc: Neck Extension
Component ID: D021443

Test Date: 11/08/2002
Speed: 20.11 ft/sec, 6.13 m/sec

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

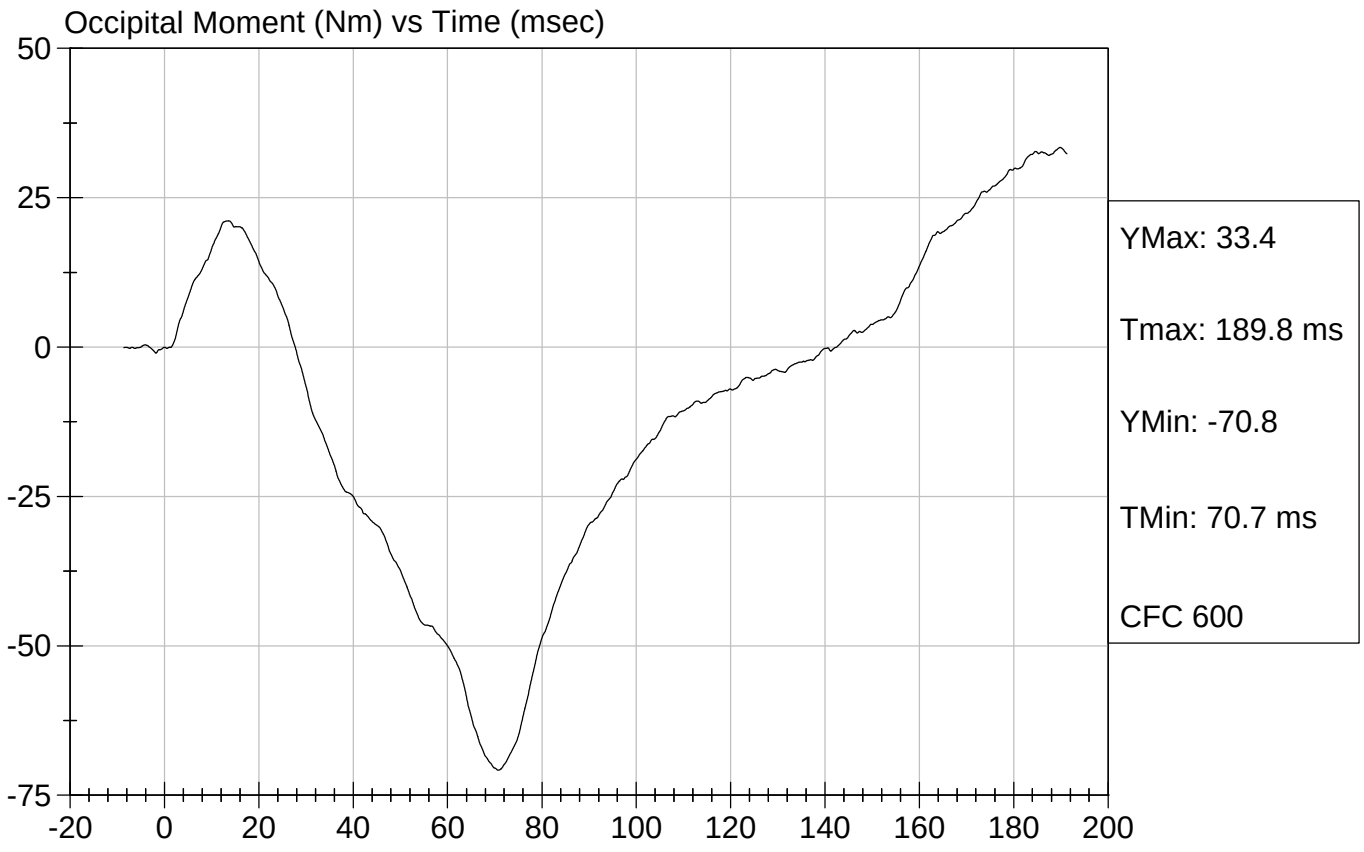


Neck Rotation (DEG) vs Time (msec)



Test Desc: Neck Extension
Component ID: D021443

Test Date: 11/08/2002
Speed: 20.11 ft/sec, 6.13 m/sec



Hybrid III Calibration Data Sheet

50th Percentile Male

Thorax Impact Test

ATD Serial No: 066 **Test I.D:** D021444

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Probe Velocity	m/s	6.58 to 6.82	6.76	Pass
Peak Probe Force	Newtons	5159 to 5893	5,556	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.47	Pass
Internal Hysteresis	%	69 to 85	77	Pass
		Overall Test Results		Pass

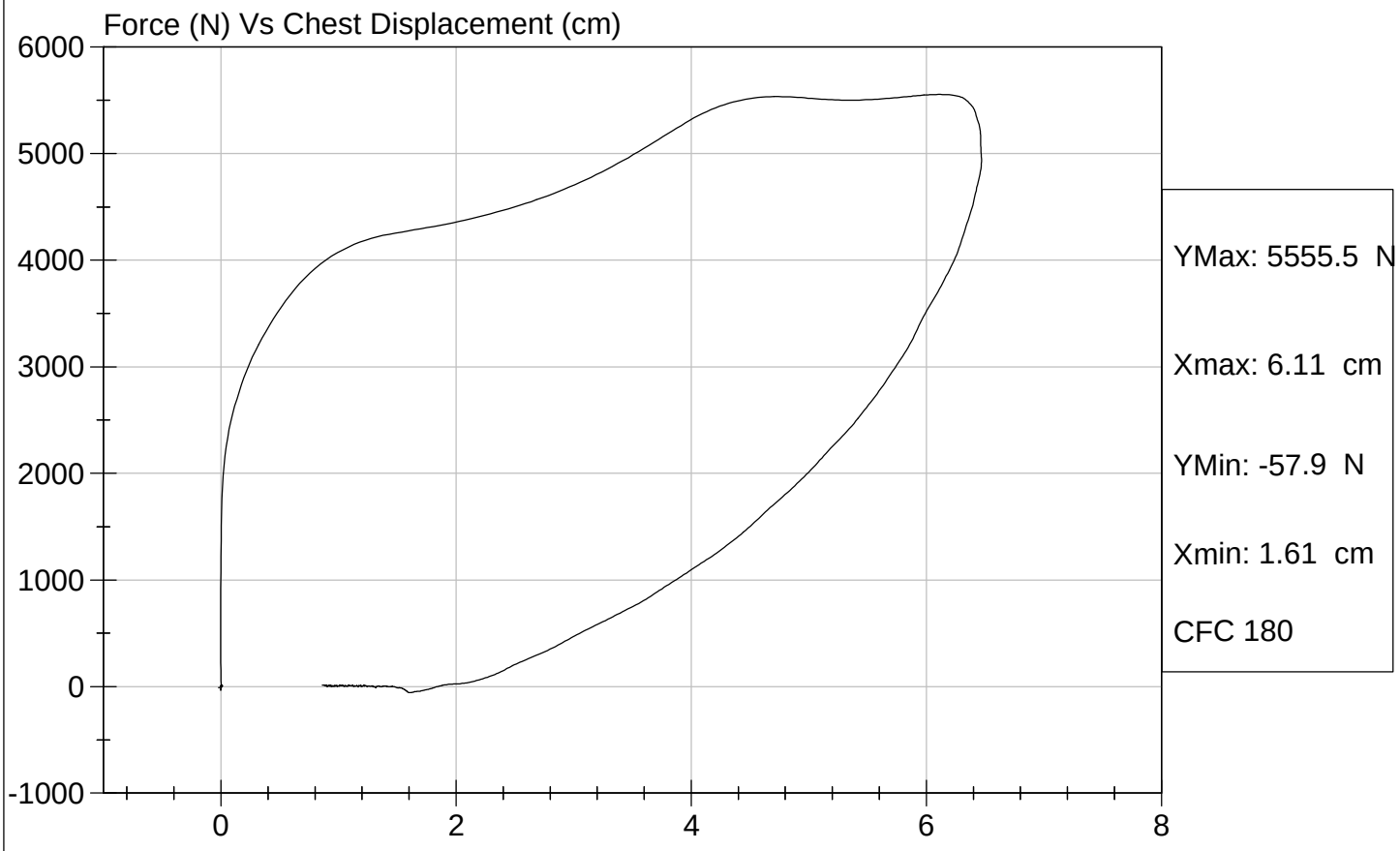
Laboratory Technician

11/12/2002
Test Date

Approved By

Test Description: Thorax Impact | Test Date: 11/12/2002

Component: D021444 | Speed: 22.18 ft/sec, 6.76 m/sec



Hybrid III Calibration Data Sheet

50th Percentile Male

Right Knee Impact Test

ATD Serial No: 066 **Test I.D:** D021445

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	32	Pass
Probe Velocity	m/s	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	4,769	Pass
		Overall Test Results		Pass

Laboratory Technician

11/08/2002
Test Date

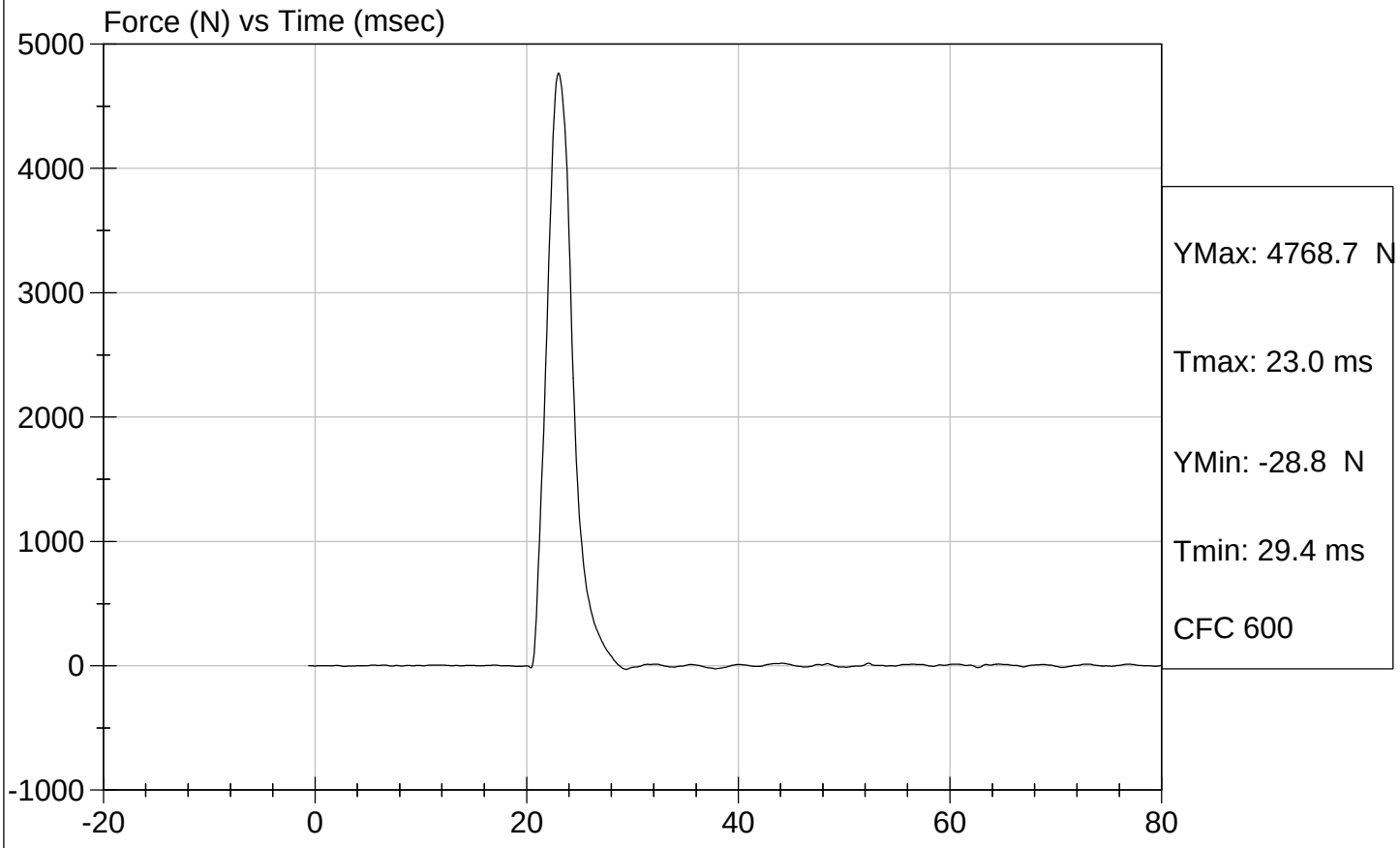
Approved By

Test Description: Right Knee

Test Date: 11/08/2002

Component: D021445

Speed: 6.92 ft/sec, 2.11 m/sec



Hybrid III Calibration Data Sheet

50th Percentile Male

Left Knee Impact Test

ATD Serial No: 066 **Test I.D:** D021446

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	32	Pass
Probe Velocity	m/s	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	5,071	Pass
		Overall Test Results		Pass

Laboratory Technician

11/08/2002
Test Date

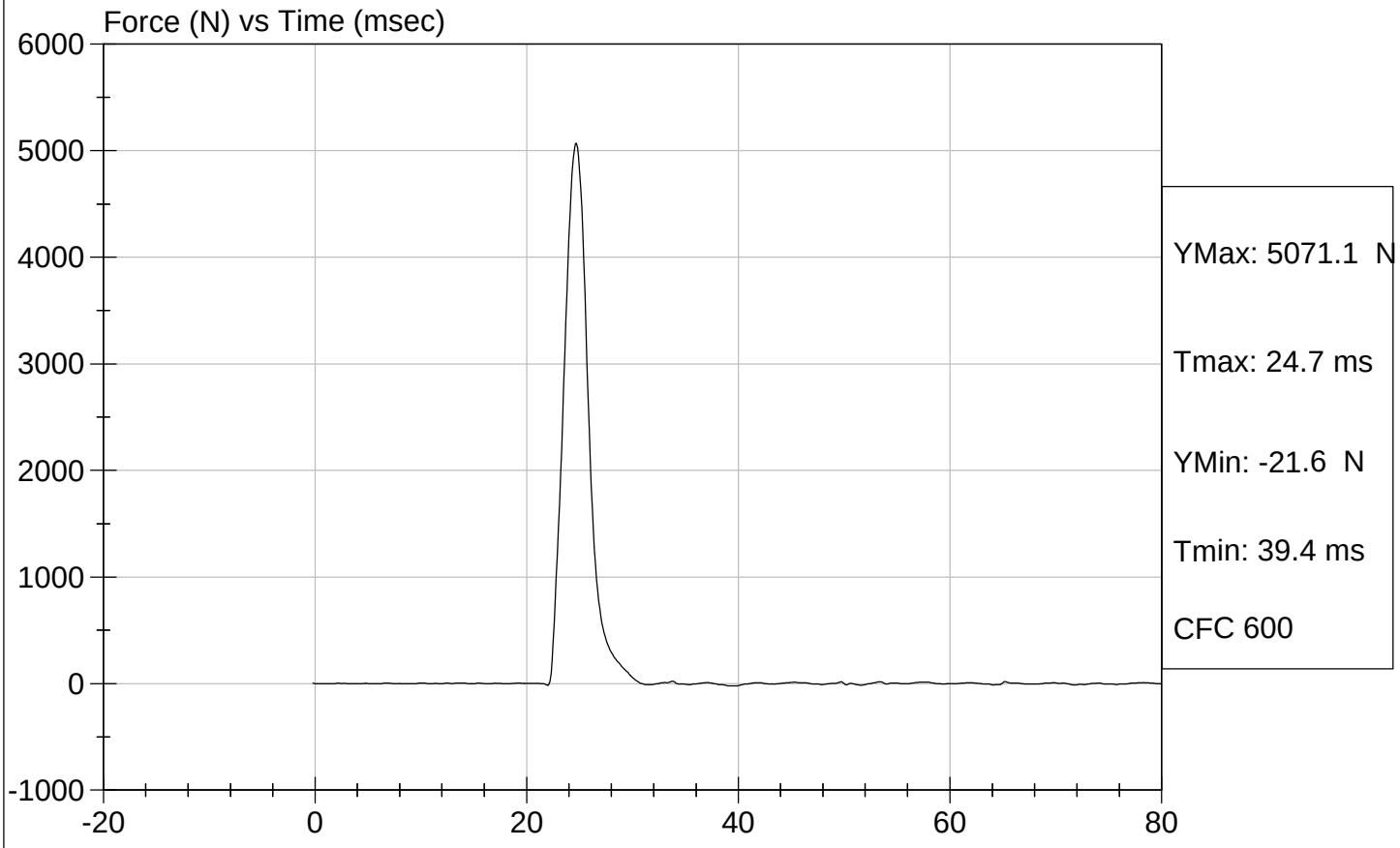
Approved By

Test Description: Left Knee

Test Date: 11/08/2002

Component: D021446

Speed: 6.93 ft/sec, 2.11 m/sec



Hybrid III Calibration Data Sheet

50th Percentile Male

Hip-Femur Flexion Test

ATD Serial No: 066 **Test I.D:** D021449/0

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	22.1	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	31	31	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	78.3	79.0	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	44	41	Pass
		Overall Test Results			Pass

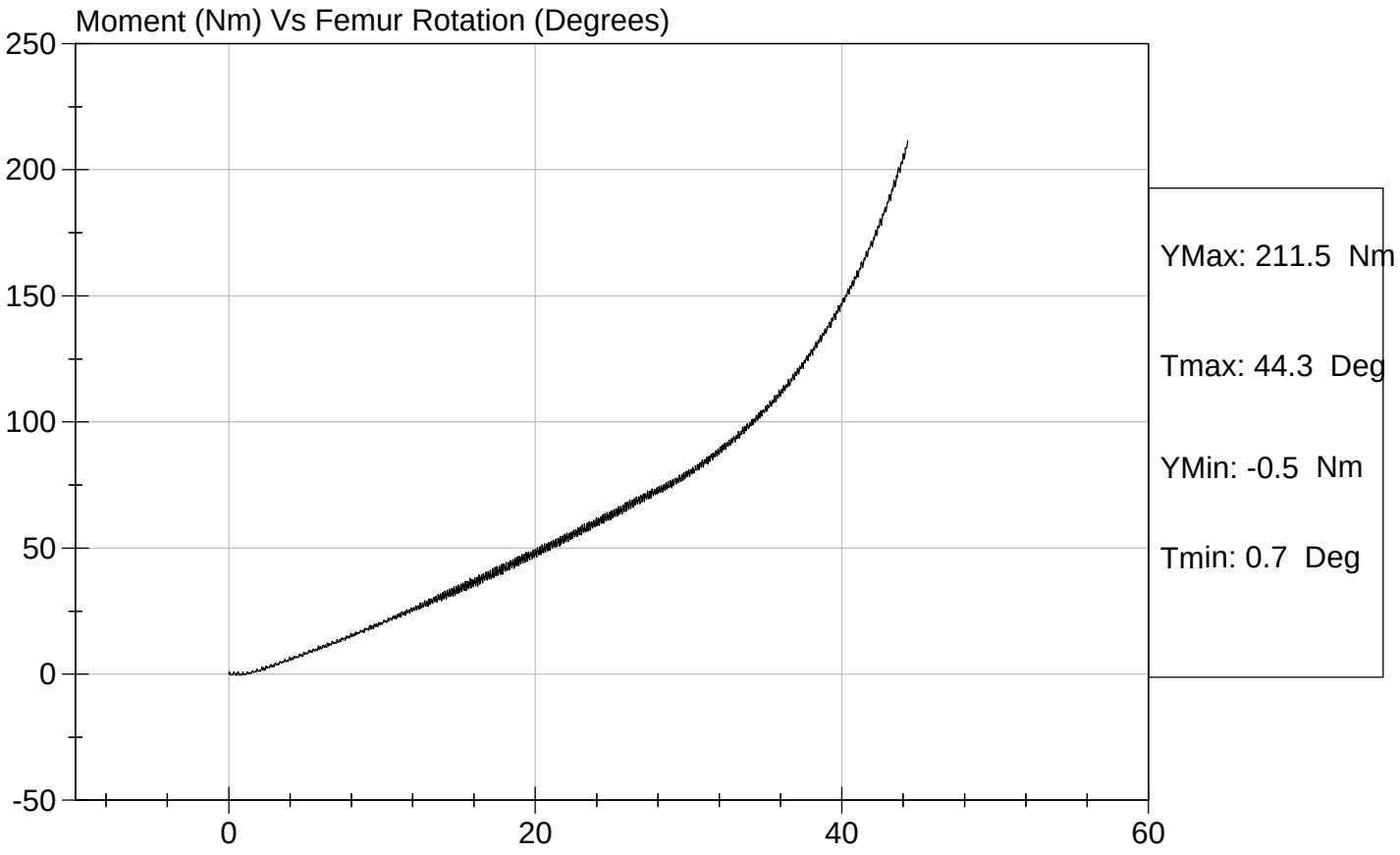
Laboratory Technician

11/12/2002
Test Date

Approved By

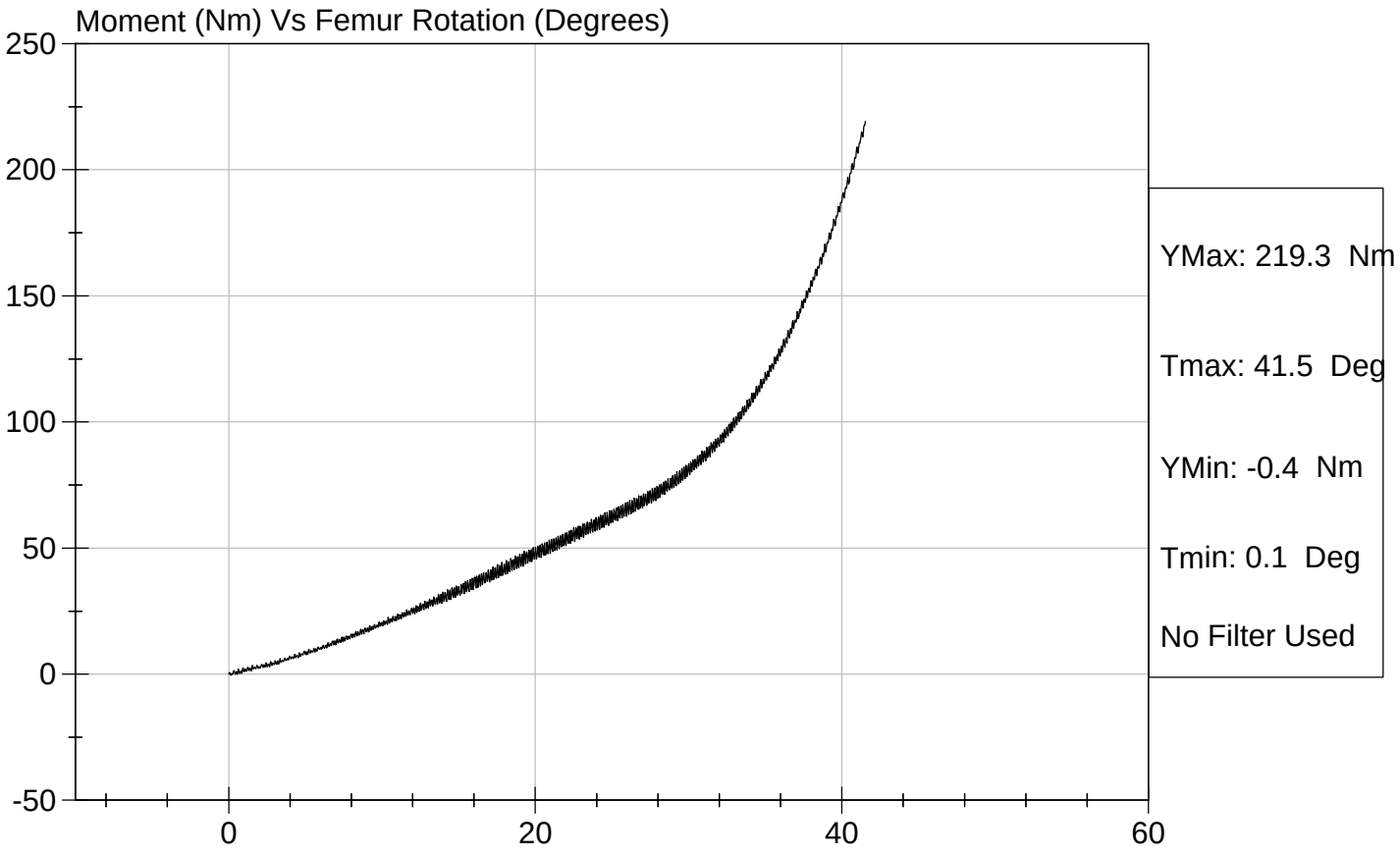
Test Description: Hip Femur Flexion | Test Date: 11/12/2002

Component: D021449 | Speed: 0 ft/sec, 0.00 m/sec



Test Description: Hip Femur Flexion | Test Date: 11/12/2002

Component: D021440 | Speed: 0 ft/sec, 0.00 m/sec



Hybrid III Calibration Data Sheet

50th Percentile Male

Head Drop Calibration

ATD Serial No: 065 **Test I.D:** D021431

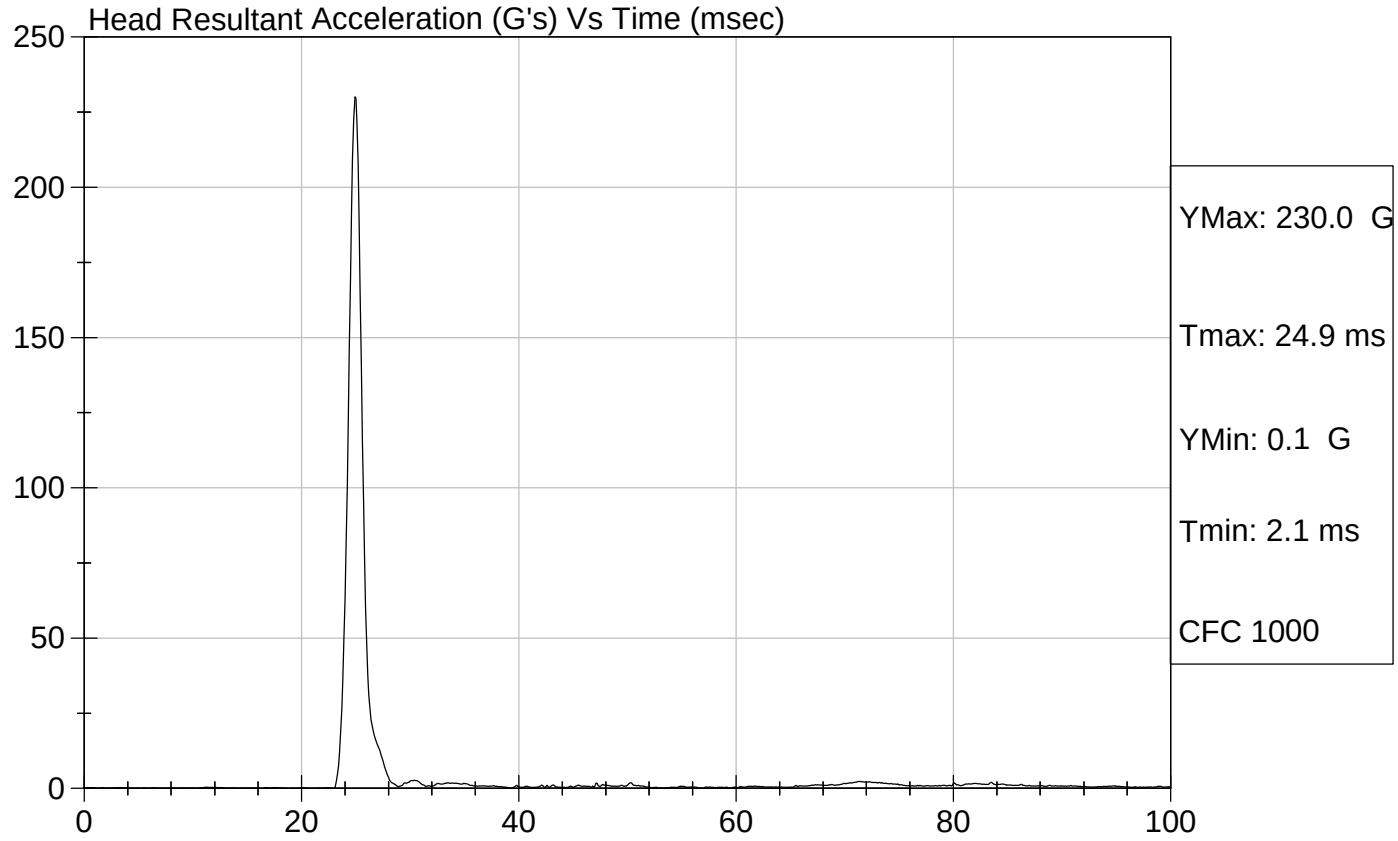
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Peak Resultant Acceleration	G's	225.0 to 275.0	230.0	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	12.9	Pass
Is Acceleration Unimodal?	Yes/No	< 10% Peak	Yes	Pass
		Overall Test Results		Pass

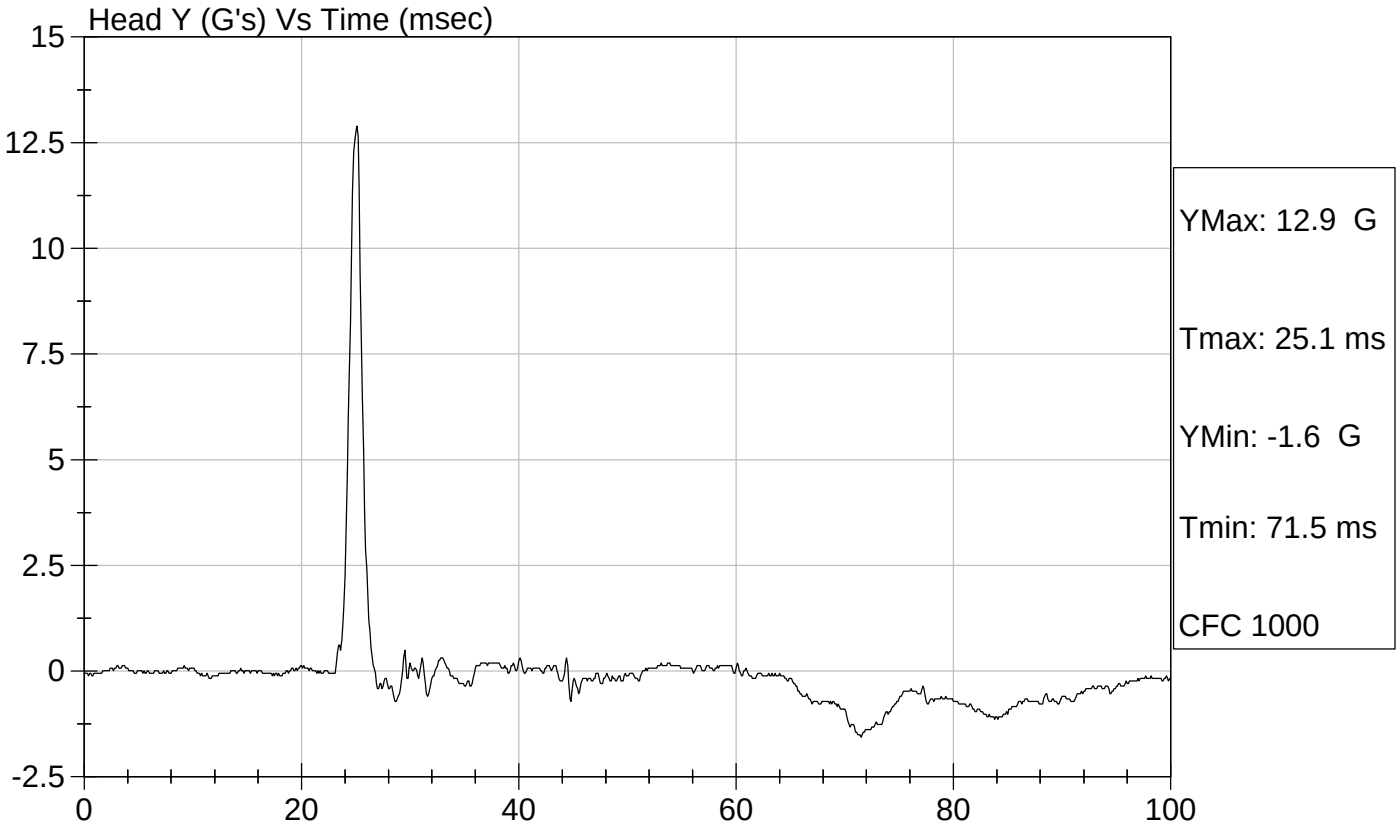
Laboratory Technician

11/08/2002
Test Date

Approved By

	Test Description: Head Drop	Test Date: 11/08/2002
	Component: D021431	Speed: 0 ft/s, 0.00 m/s





Hybrid III Calibration Data Sheet

50th Percentile Male

Neck Flexion Test

ATD Serial No: 065 **Test I.D:** D021432

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.04	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	23.50	Pass
	20 msec	G's	17.60 to 22.60	19.41	Pass
	30 msec	G's	12.50 to 18.50	14.04	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	14.04	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	38.1	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	72.1	Pass
	Time	msec	57.0 to 64.0	57.1	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	113.9	Pass
Moment About Occipital Condyle	Maximum	N m	84.1 to 108.5	91.1	Pass
	Time	msec	47.0 to 58.0	50.4	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	101.5	Pass
			Overall Test Results		Pass

Laboratory Technician

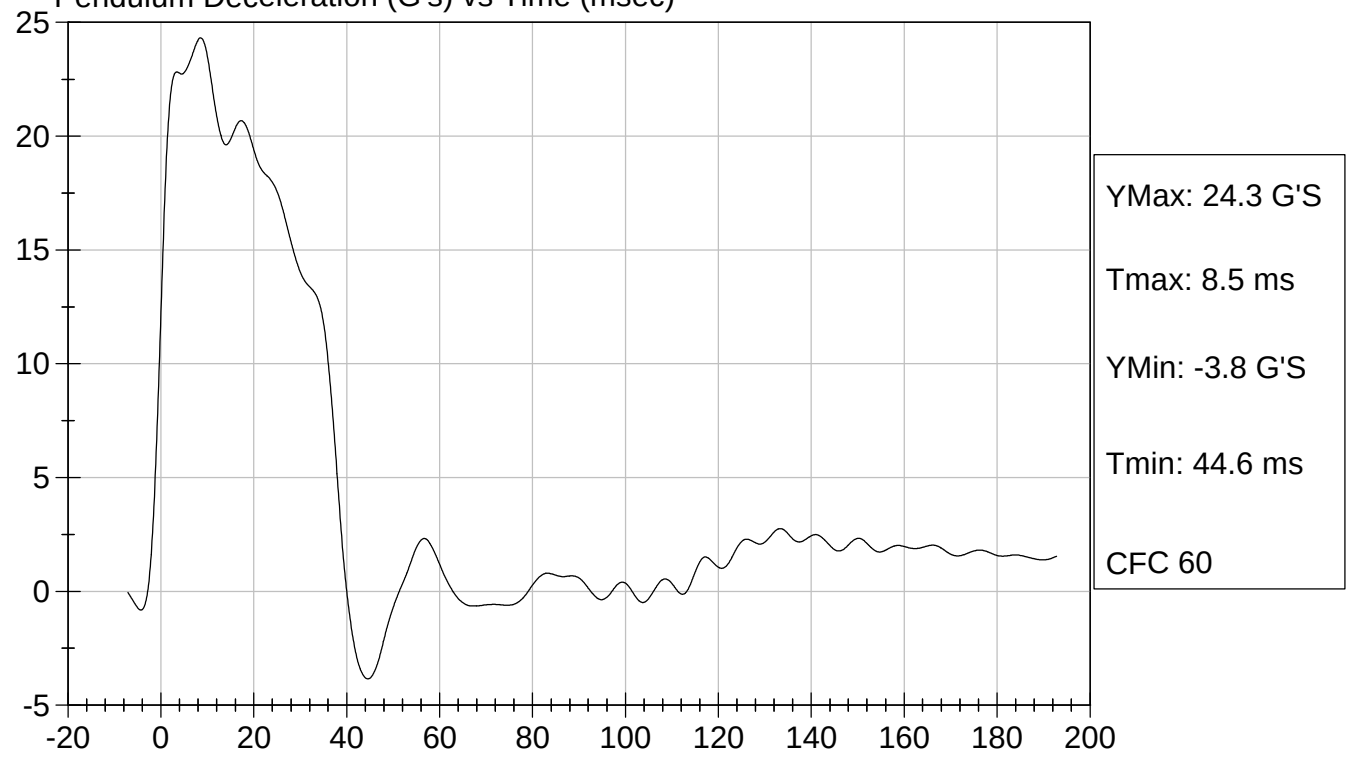
11/08/2002
Test Date

Approved By

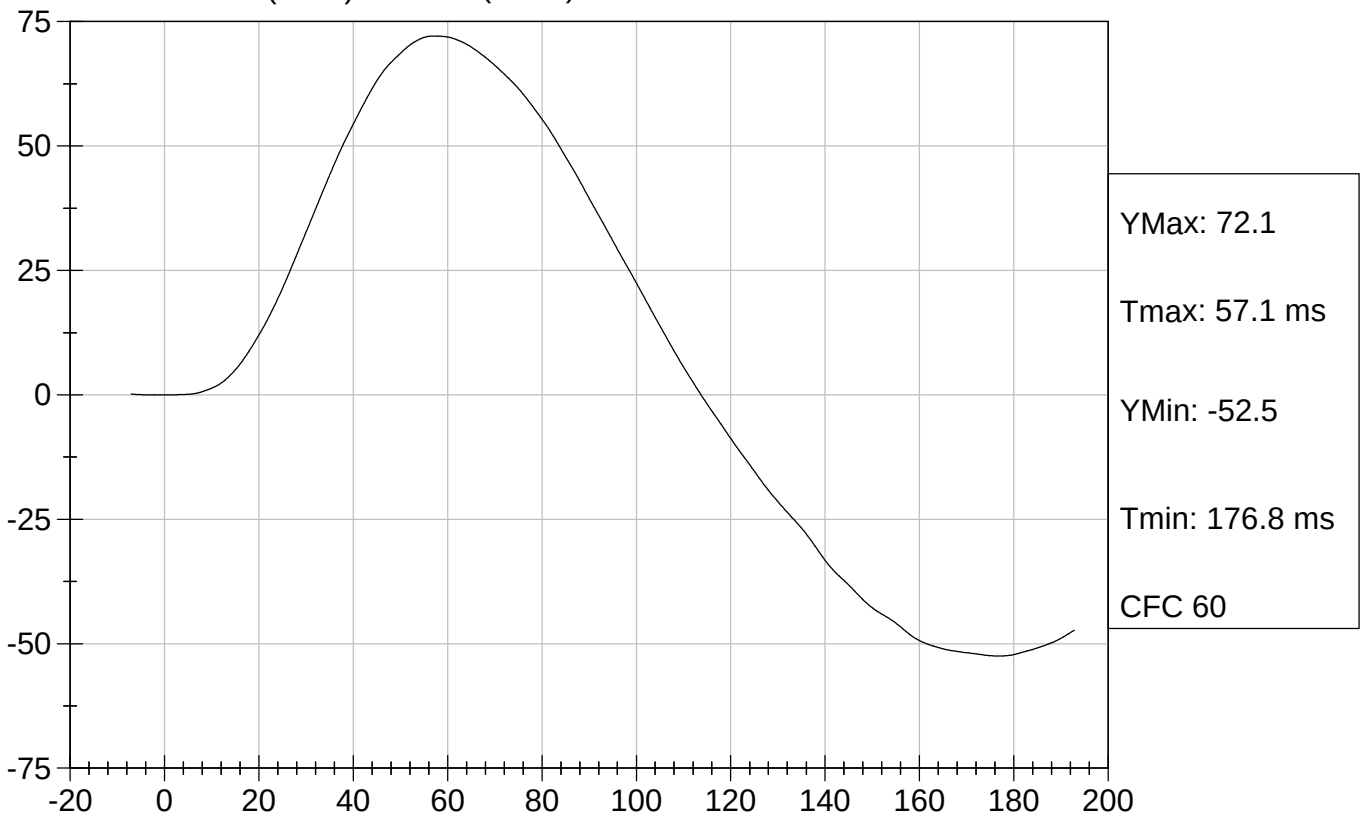
Test Desc: Neck Flexion
Component ID: D021432

Test Date: 11/08/2002
Speed: 23.1 ft/sec, 7.04 m/sec

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

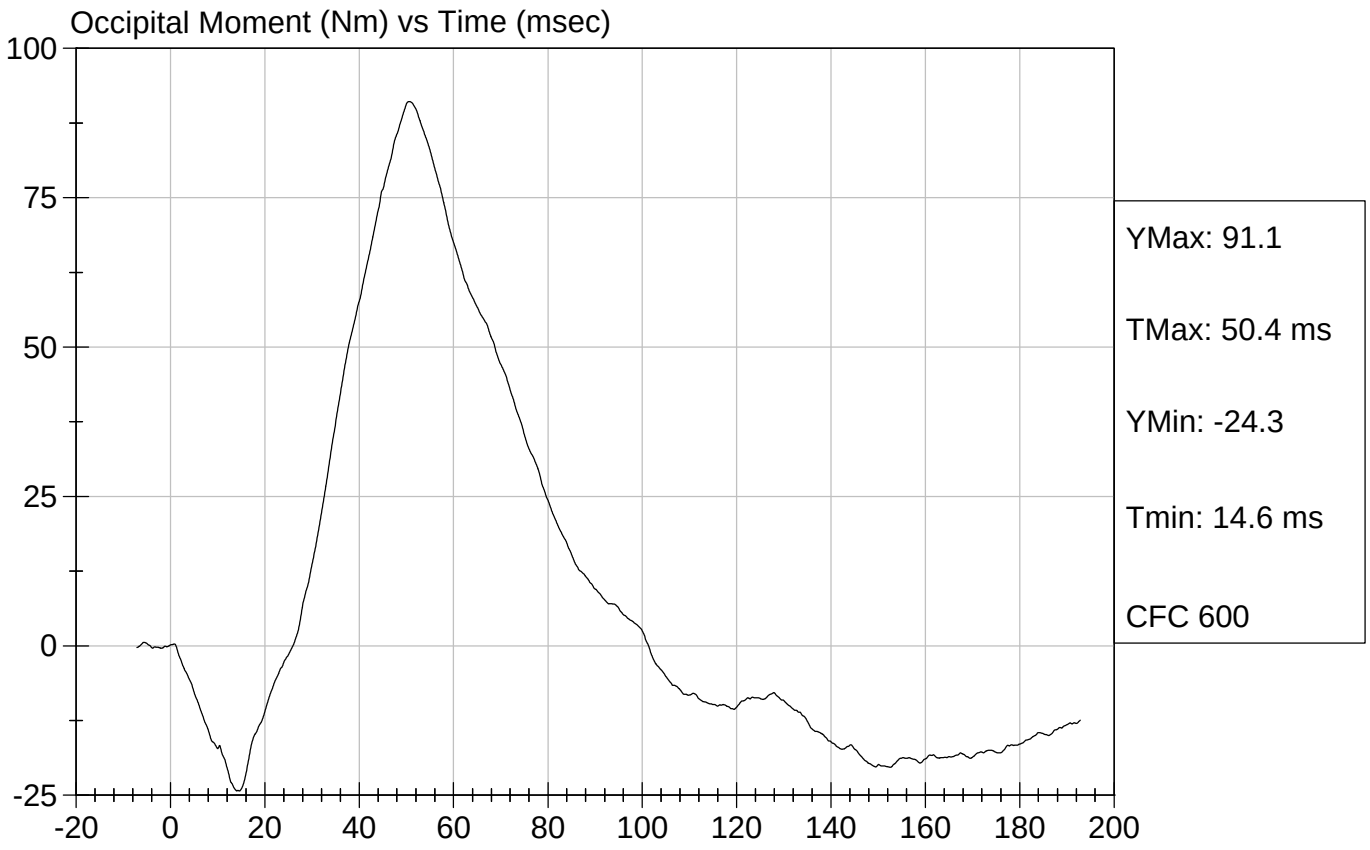


Neck Rotation (DEG) vs Time (msec)



Test Desc: Neck Flexion
Component ID: D021432

Test Date: 11/08/2002
Speed: 23.1 ft/sec, 7.04 m/sec



Hybrid III Calibration Data Sheet

50th Percentile Male

Neck Extension Test

ATD Serial No: 065 **Test I.D:** D021433

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.13	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	18.88	Pass
	20 msec	G's	14.00 to 19.00	15.86	Pass
	30 msec	G's	11.00 to 16.00	12.62	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	12.6	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	40.1	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	100.1	Pass
	Time	msec	72.0 to 82.0	77.2	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	155.2	Pass
Moment About Occipital Condyle	Minimum	N m	-52.9 to -79.9	-63.5	Pass
	Time	msec	65.0 to 79.0	72.5	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	141.4	Pass
			Overall Test Results		Pass

Laboratory Technician

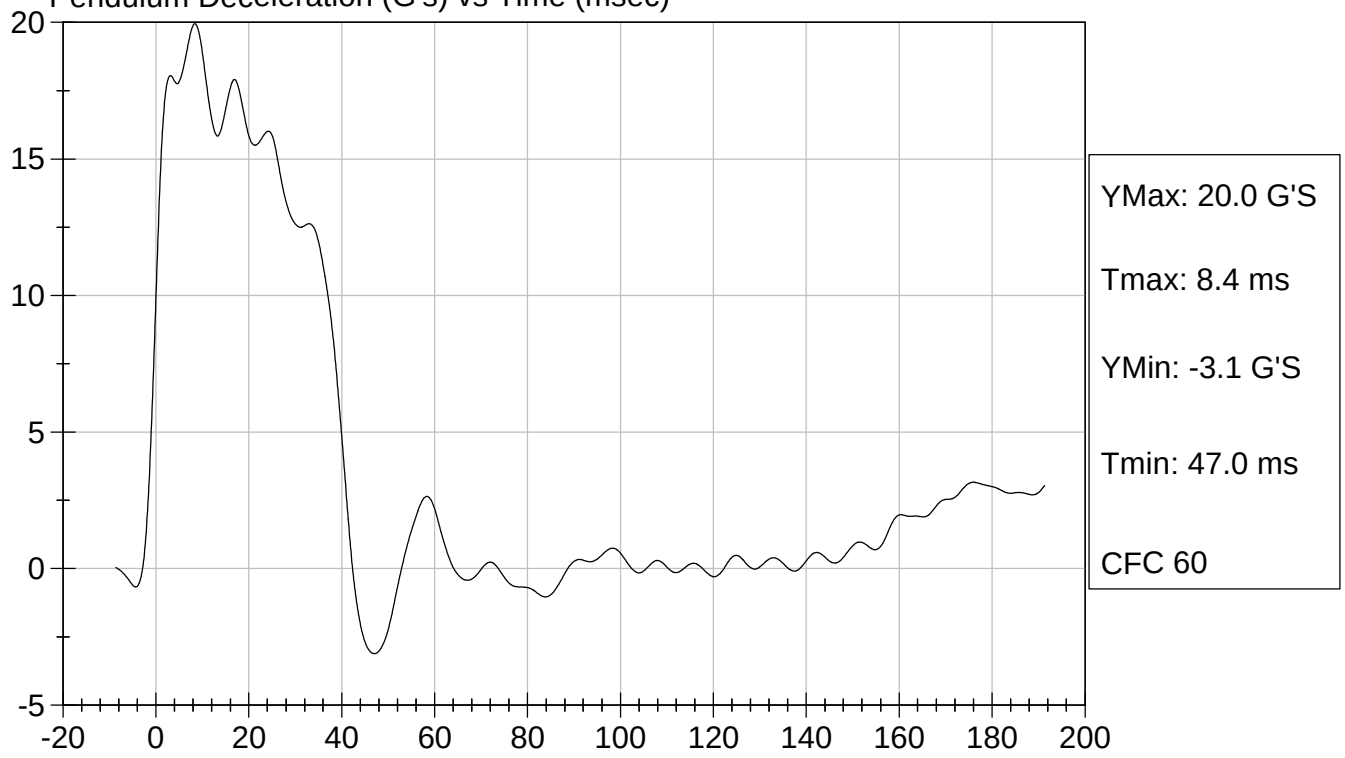
11/08/2002
Test Date

Approved By

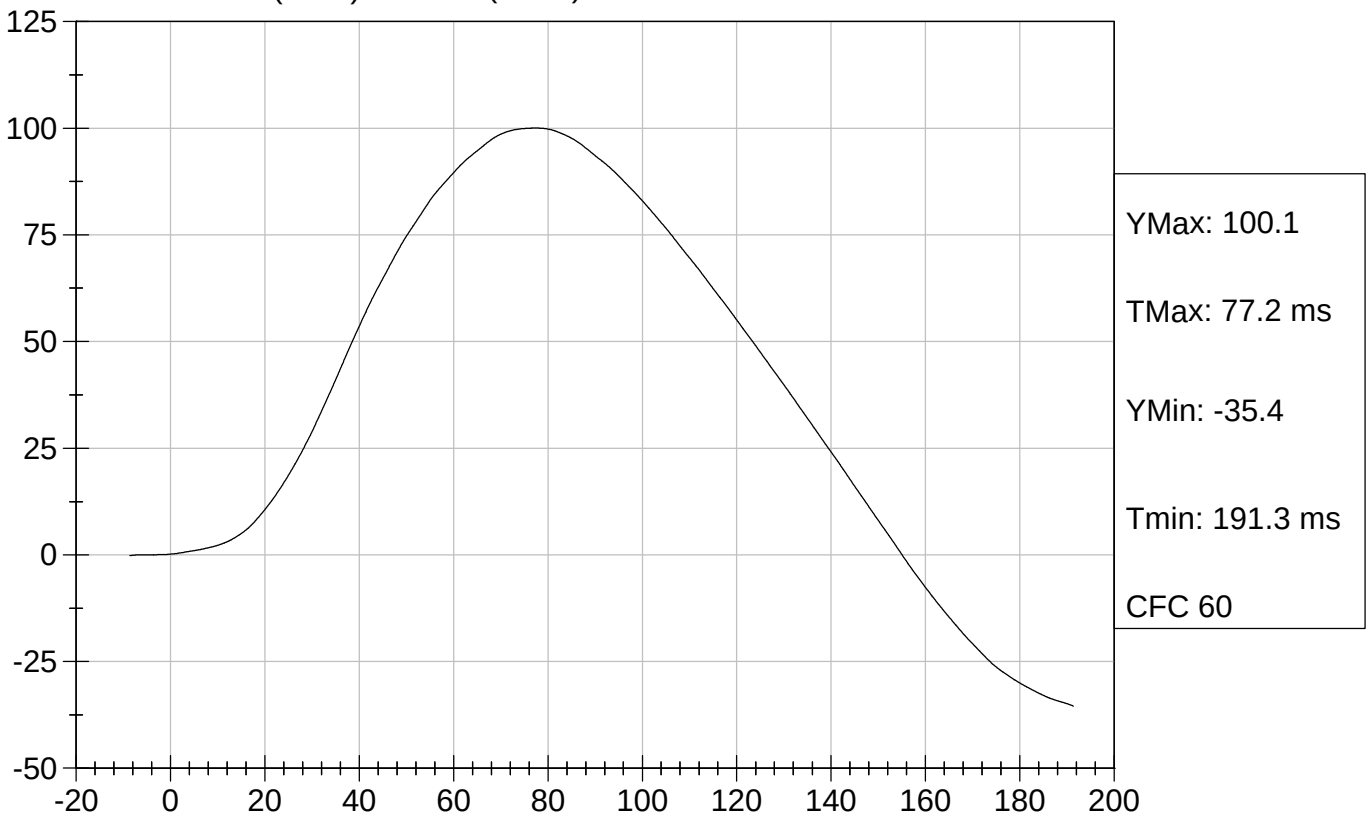
Test Desc: Neck Extension
Component ID: D021433

Test Date: 11/08/2002
Speed: 20.1 ft/sec, 6.13 m/sec

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

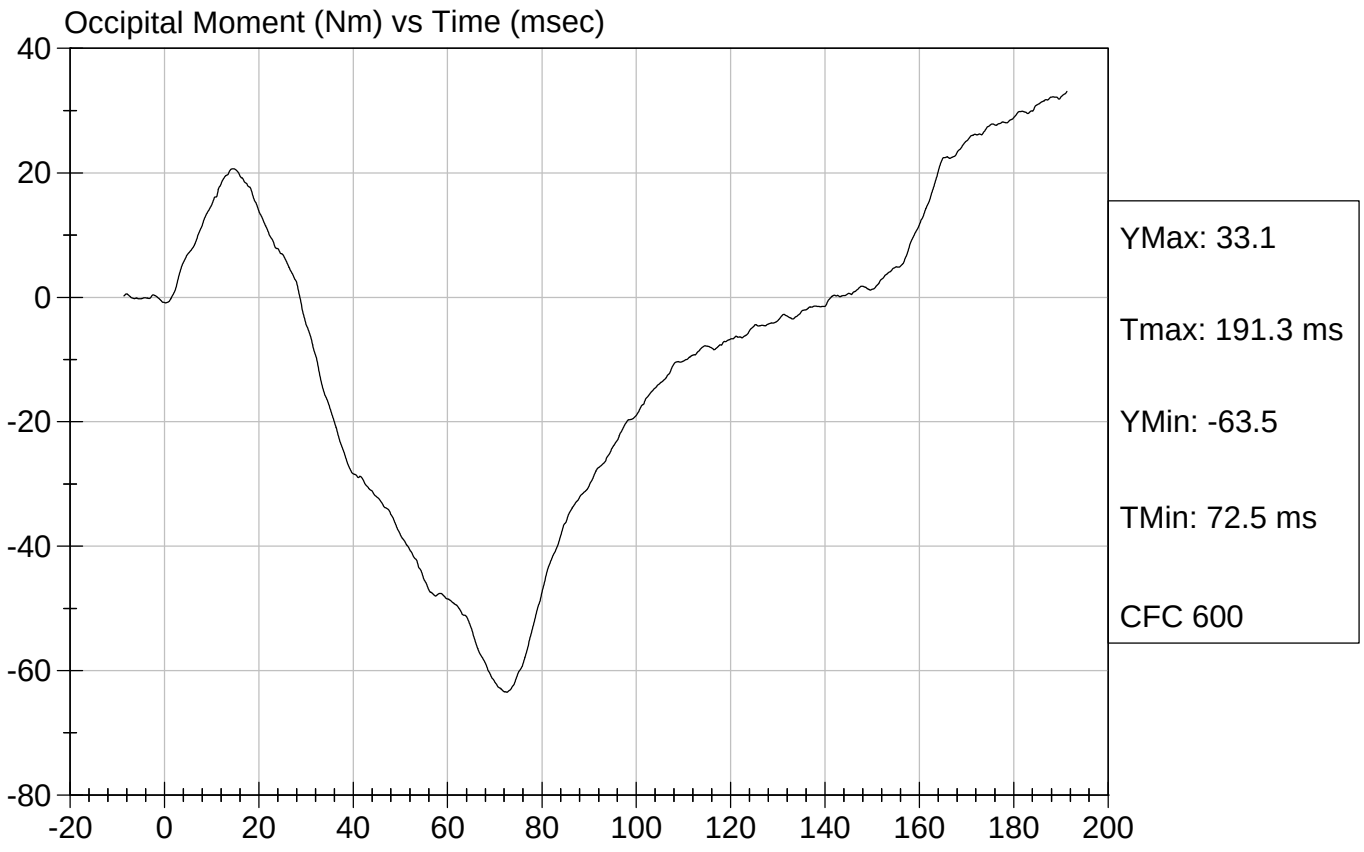


Neck Rotation (DEG) vs Time (msec)



Test Desc: Neck Extension
Component ID: D021433

Test Date: 11/08/2002
Speed: 20.1 ft/sec, 6.13 m/sec



Hybrid III Calibration Data Sheet

50th Percentile Male

Thorax Impact Test

ATD Serial No: 065 **Test I.D:** D021434

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Probe Velocity	m/s	6.58 to 6.82	6.76	Pass
Peak Probe Force	Newtons	5159 to 5893	5,738	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	7.03	Pass
Internal Hysteresis	%	69 to 85	70	Pass
		Overall Test Results		Pass

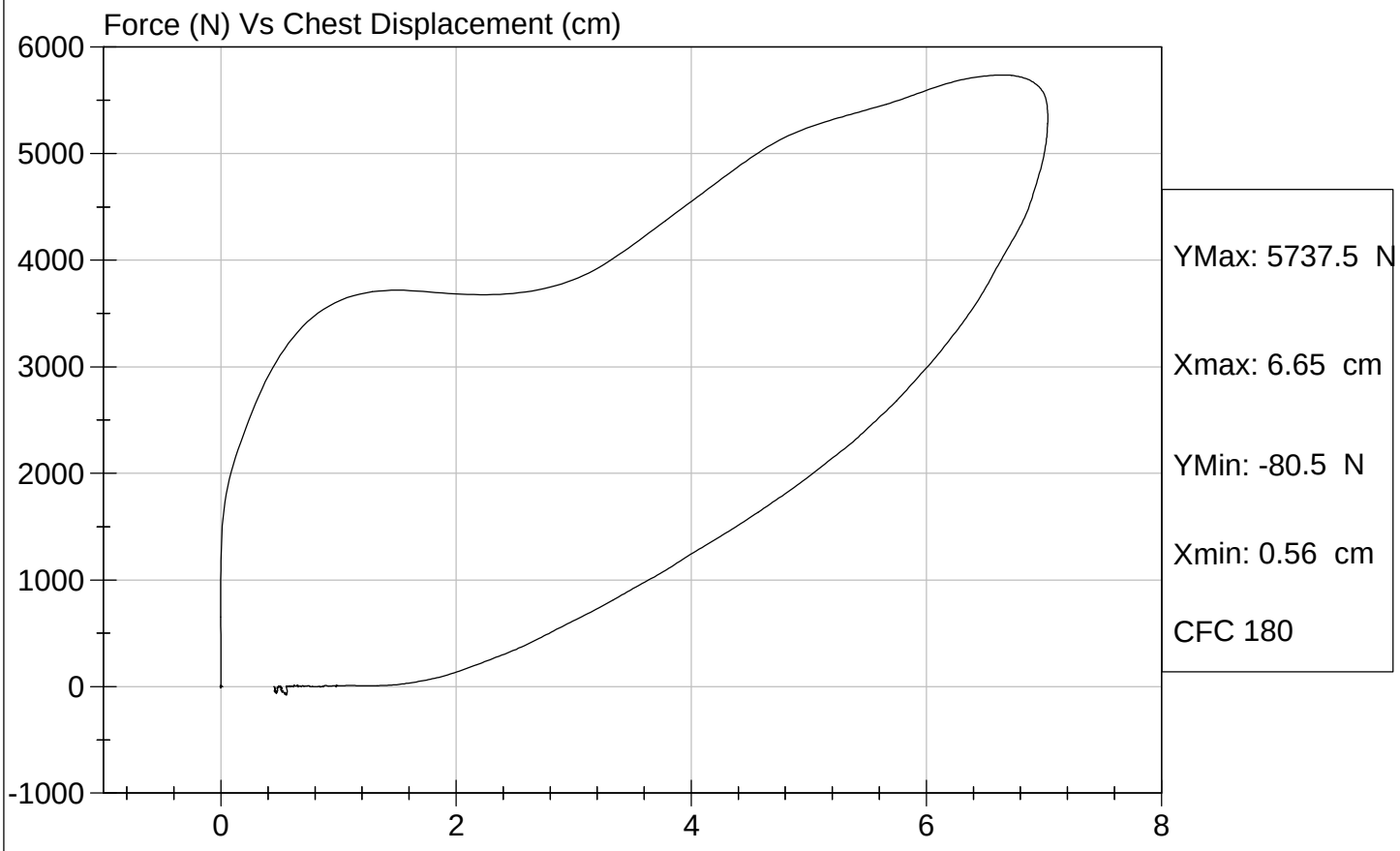
Laboratory Technician

11/12/2002
Test Date

Approved By

Test Description: Thorax Impact | Test Date: 11/12/2002

Component: D021434 | Speed: 22.18 ft/sec, 6.76 m/sec



Hybrid III Calibration Data Sheet

50th Percentile Male

Right Knee Impact Test

ATD Serial No: 065 **Test I.D:** D021435

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	32	Pass
Probe Velocity	m/s	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	4,923	Pass
		Overall Test Results		Pass

Laboratory Technician

11/08/2002
Test Date

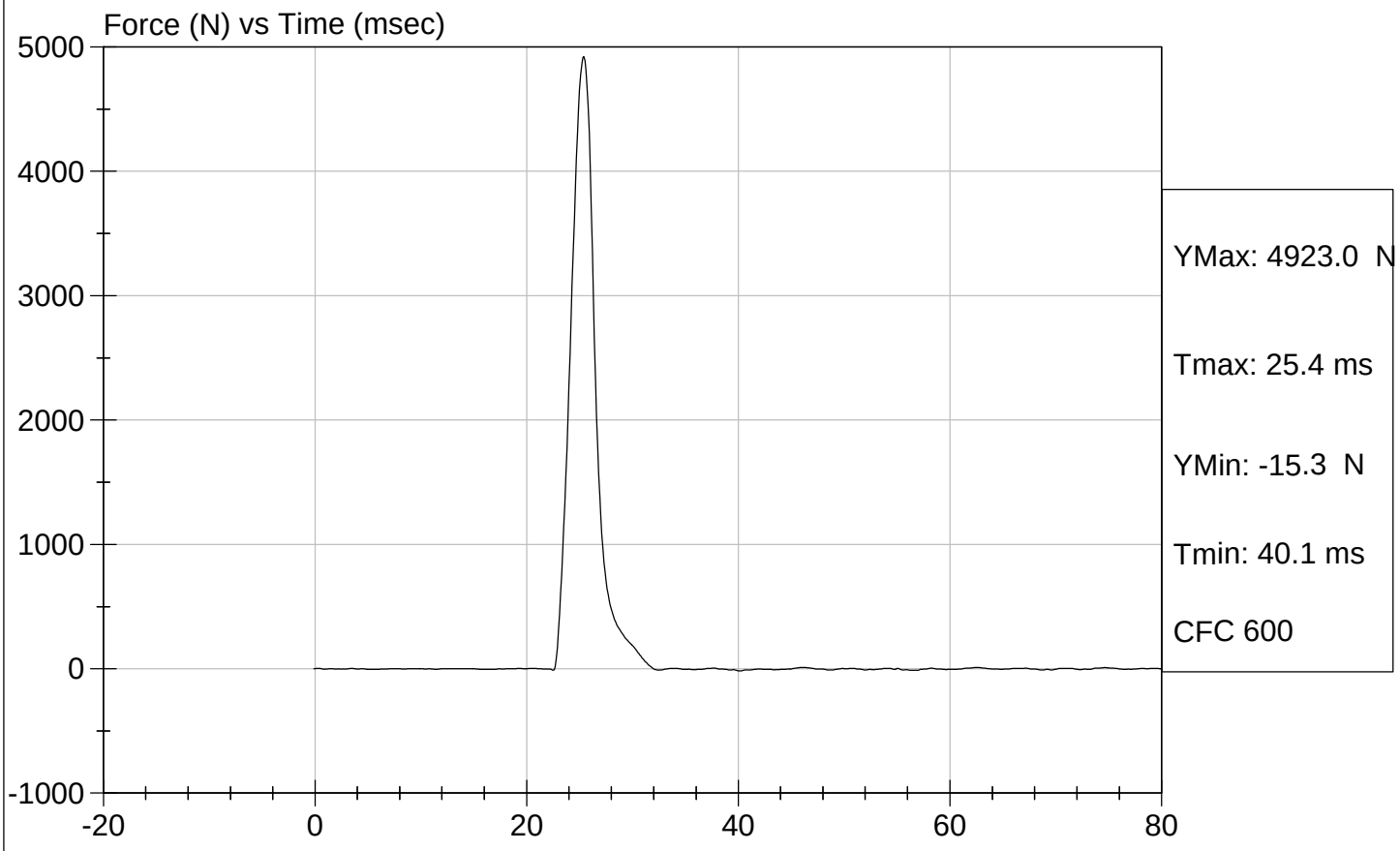
Approved By

Test Description: Right Knee

Test Date: 11/08/2002

Component: D021435

Speed: 6.9 ft/sec, 2.10 m/sec



Hybrid III Calibration Data Sheet

50th Percentile Male

Left Knee Impact Test

ATD Serial No: 065 **Test I.D:** D021436

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	32	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	Newtons	4715 to 5782	5,139	Pass
		Overall Test Results		Pass

Laboratory Technician

11/08/2002
Test Date

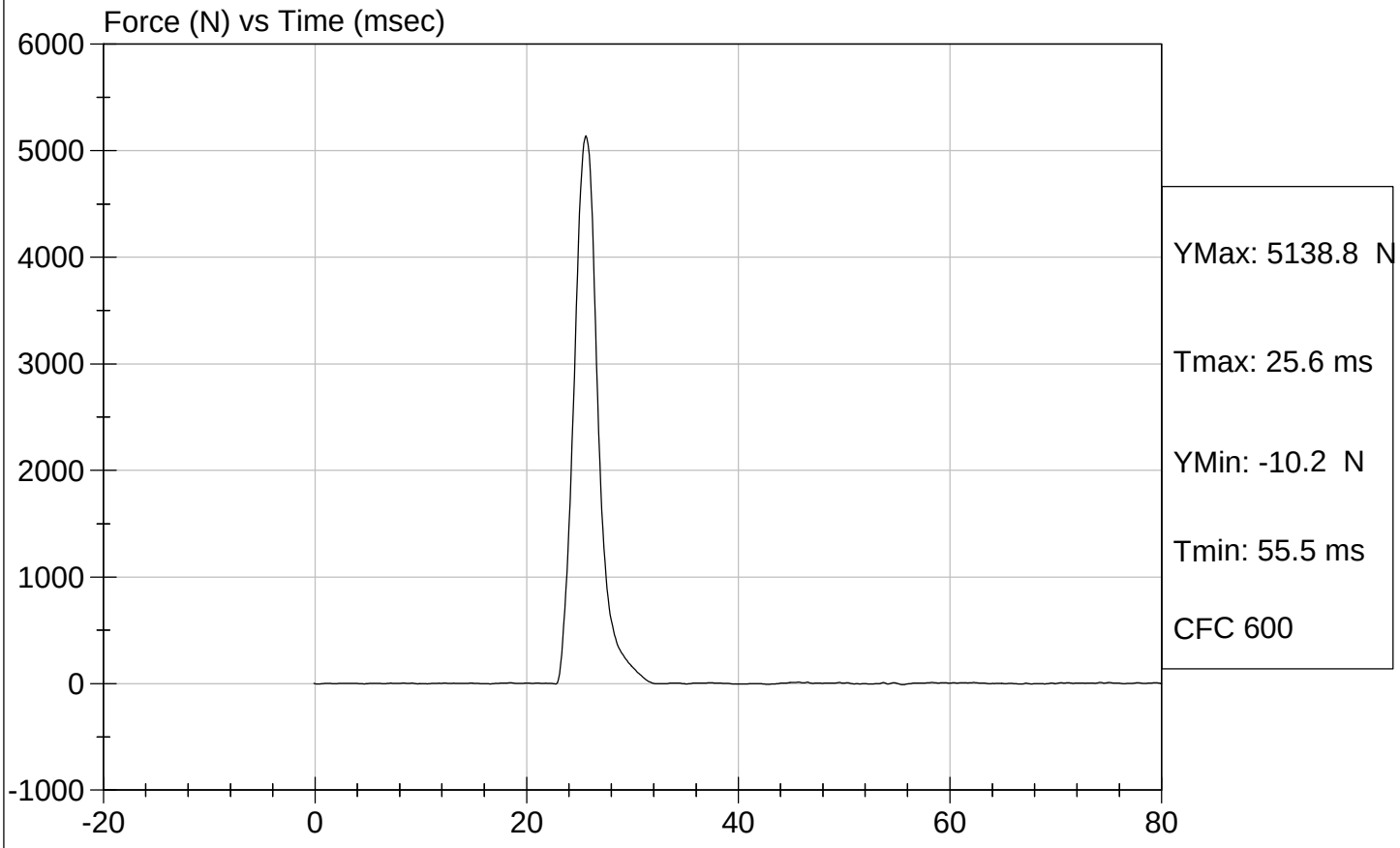
Approved By

Test Description: Left Knee

Test Date: 11/08/2002

Component: D021436

Speed: 6.95 ft/sec, 2.12 m/sec



Hybrid III Calibration Data Sheet

50th Percentile Male

Hip-Femur Flexion Test

ATD Serial No: 065 **Test I.D:** D021439/0

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	20.9	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	33	33	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	64.1	70.5	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	46	45	Pass
		Overall Test Results			Pass

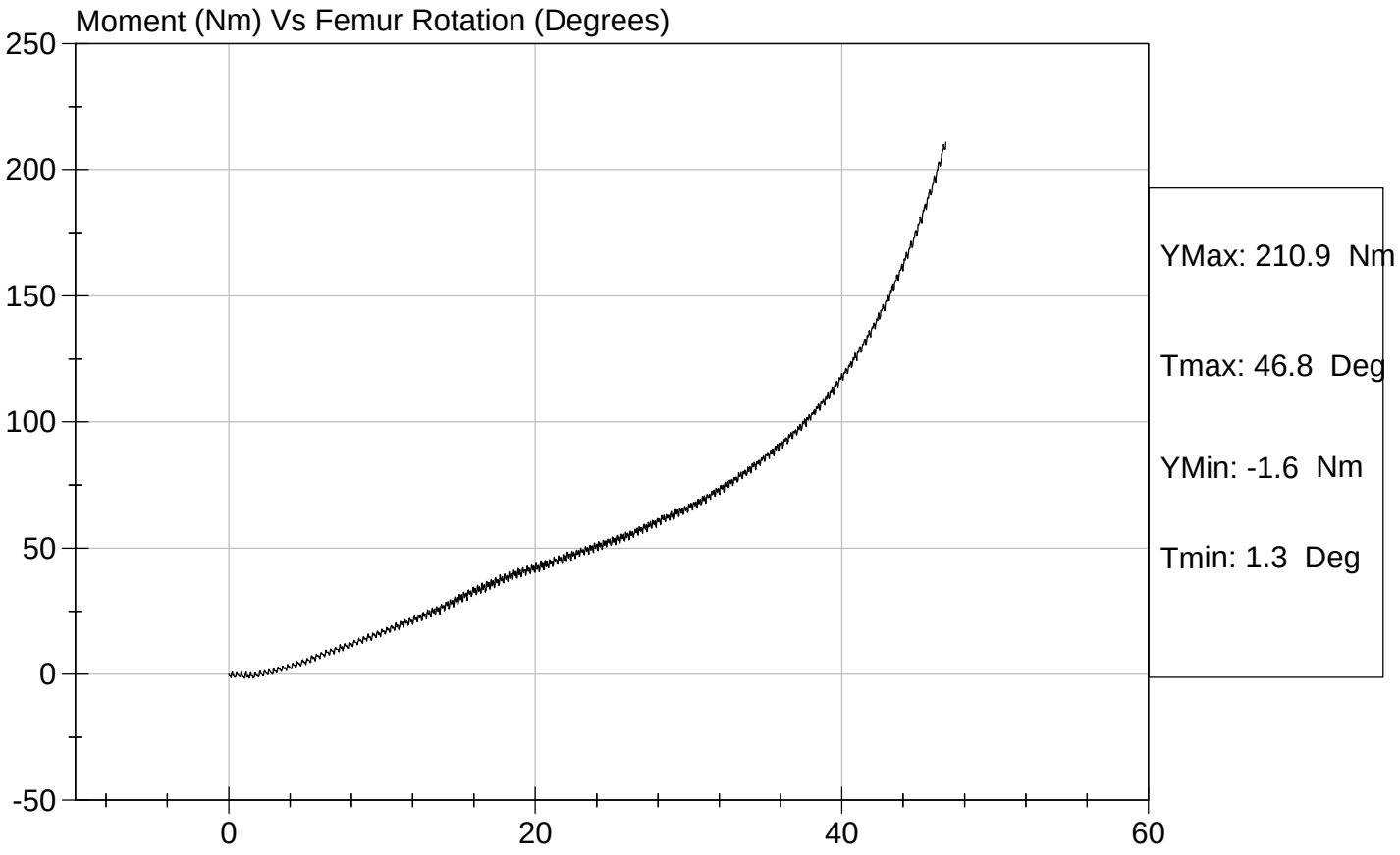
Laboratory Technician

11/12/2002
Test Date

Approved By

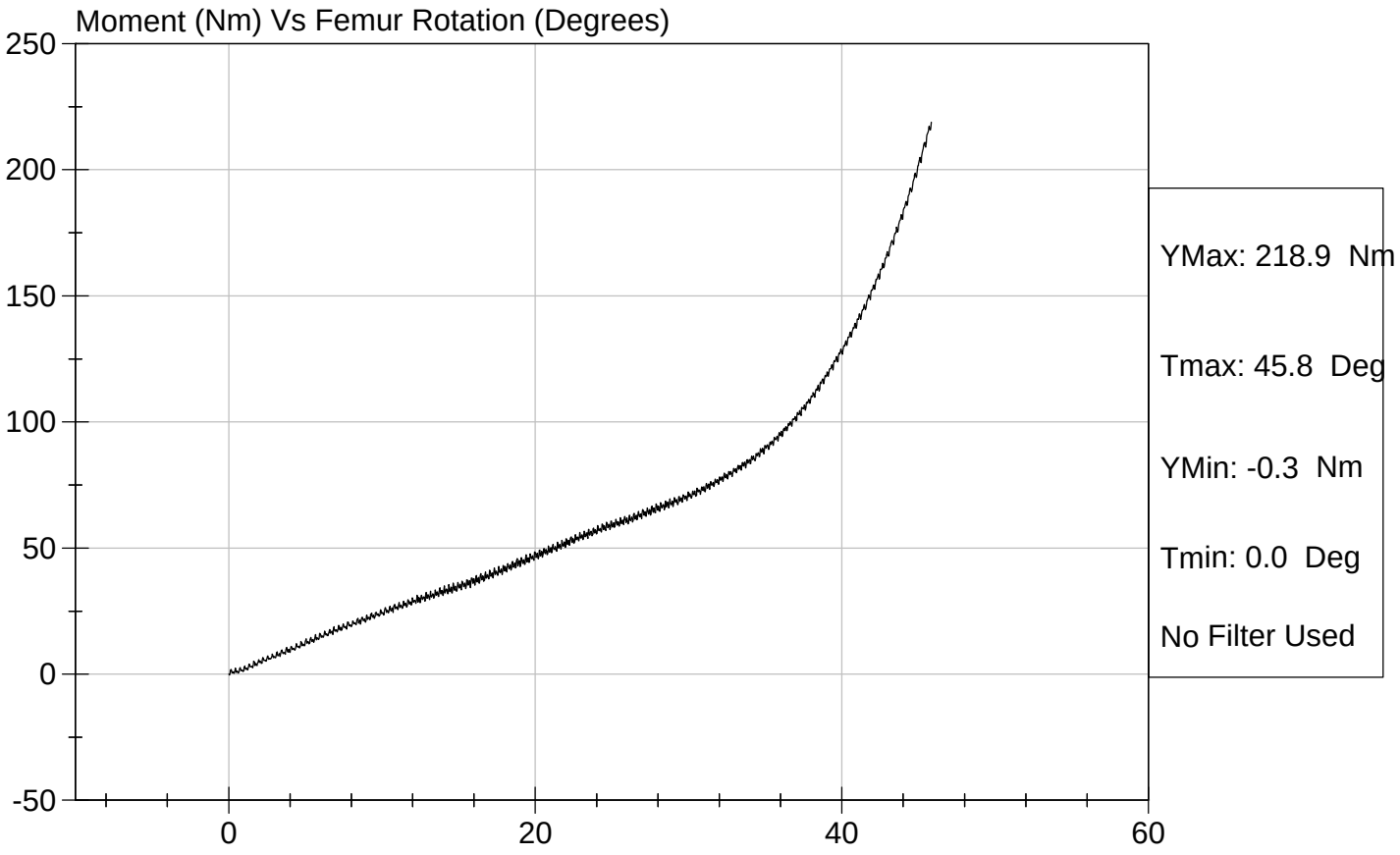
Test Description: Hip Femur Flexion | Test Date: 11/12/2002

Component: D021439 | Speed: 0 ft/sec, 0.00 m/sec



Test Description: Hip Femur Flexion | Test Date: 11/12/2002

Component: D021430 | Speed: 0 ft/sec, 0.00 m/sec



APPENDIX D

TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION

INSTRUMENTS FOR DRIVER DUMMY NO. 066

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X	AAMN8	Endevco	10/14/02
Head Y	ACC61	Endevco	10/14/02
Head Z	ACCW9	Endevco	10/14/02
Head X Redundant	J19884	Endevco	10/14/02
Head Y Redundant	J21988	Endevco	10/14/02
Head Z Redundant	J28986	Endevco	10/14/02
Neck Load Cell	443	Denton	9/18/02
Chest X	ACCY1	Endevco	10/14/02
Chest Y	ACCC8	Endevco	10/14/02
Chest Z	ACCT7	Endevco	10/14/02
Chest Deflection Gauge	66	Servo	11/12/02
Chest X Redundant	J13541	Endevco	10/14/02
Chest Y Redundant	J20093	Endevco	10/14/02
Chest Z Redundant	J19440	Endevco	10/14/02
Pelvis X	J22033	Endevco	10/16/02
Pelvis Y	J21691	Endevco	10/16/02
Pelvis Z	J21970	Endevco	10/16/02
Left Femur Load Cell	262	Denton	11/21/02
Right Femur Load Cell	261	Denton	11/21/02
Left Upper Tibia Load Cell	109	Denton	9/18/02
Left Lower Tibia Load Cell	138	Denton	9/18/02
Right Upper Tibia Load Cell	106	Denton	9/18/02
Right Lower Tibia Load Cell	135	Denton	9/18/02
Left Foot Z – Front	J20382	Endevco	10/14/02
Left Ankle X	J20165	Endevco	10/14/02
Left Ankle Z	J28708	Endevco	10/14/02
Right Foot Z – Front	J28988	Endevco	10/14/02
Right Ankle X	J22036	Endevco	10/14/02
Right Ankle Z	J20569	Endevco	10/14/02

INSTRUMENTS FOR PASSENGER DUMMY NO. 065

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X	ACCY6	Endevco	10/14/02
Head Y	J13941	Endevco	10/14/02
Head Z	AAMW5	Endevco	10/14/02
Head X Redundant	J18724	Endevco	10/14/02
Head Y Redundant	J14235	Endevco	10/14/02
Head Z Redundant	AJ5R0	Endevco	10/14/02
Neck Load Cell	442	Denton	10/9/02
Chest X	ACC78	Endevco	10/14/02
Chest Y	ACCE6	Endevco	10/14/02
Chest Z	ACCY3	Endevco	10/14/02
Chest Deflection Gauge	65	Servo	11/12/02
Chest X Redundant	J19927	Endevco	10/14/02
Chest Y Redundant	J20580	Endevco	10/14/02
Chest Z Redundant	J23914	Endevco	10/14/02
Pelvis X	AHTN3	Endevco	10/9/02
Pelvis Y	AH0C3	Endevco	10/9/02
Pelvis Z	AHT12	Endevco	10/9/02
Left Femur Load Cell	259	Denton	11/21/02
Right Femur Load Cell	256	Denton	11/21/02
Left Upper Tibia Load Cell	105	Denton	9/18/02
Left Lower Tibia Load Cell	133	Denton	9/18/02
Right Upper Tibia Load Cell	103	Denton	9/18/02
Right Lower Tibia Load Cell	134	Denton	9/18/02
Left Foot Z – Front	J14120	Endevco	6/25/02
Left Ankle X	J23774	Endevco	10/14/02
Left Ankle Z	J14120	Endevco	10/14/02
Right Foot Z – Front	J18736	Endevco	10/14/02
Right Ankle X	J23946	Endevco	10/14/02
Right Ankle Z	J27513	Endevco	10/14/02

INSTRUMENTS FOR VEHICLE AND LABORATORY

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Left Rear Seat Crossmember X	G01-N14	Entran	7/14/02
Left Rear Seat Crossmember Z	G01-N02	Entran	7/31/02
Right Rear Seat Crossmember X	G01-N20	Entran	7/31/02
Right Rear Seat Crossmember Z	H05-F09	Entran	10/31/02
Top of Engine X	D11-F14	Entran	11/19/02
Bottom of Engine X	J10-E03	Entran	10/8/02
Left Brake Caliper X	G03-N12	Entran	10/7/02
Right Brake Caliper X	E03-H06	Entran	11/19/02
Instrument Panel X	G03-N10	Entran	10/7/02

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