

REPORT NUMBER: NCAP-MGA-2005-014

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

**TOYOTA MOTOR CORPORATION
2005 TOYOTA AVALON
NHTSA NUMBER: M55100**

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



Test Date: March 28, 2005

Final Report Date: June 7, 2005

FINAL REPORT

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

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

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

Prepared by: Shefalika Naik
Shefalika Naik, Project Engineer

Date: 6/07/05

Reviewed by: David Winkelbauer
David Winkelbauer, Facility Director

Date: 6/07/05

FINAL REPORT ACCEPTED BY:

Manager, New Car Assessment Program

Date of Acceptance

COTR, NCAP Frontal Impact Program

Date of Acceptance

Technical Report Documentation Page

1. <i>Report No.</i> NCAP-MGA-2005-014	2. <i>Government Accession No.</i>	3. <i>Recipient's Catalog No.</i>																										
4. <i>Title and Subtitle</i> Final Report of New Car Assessment Program Testing of a 2005 Toyota Avalon NHTSA No.: M55100		5. <i>Report Date</i> June 7, 2005																										
		6. <i>Performing Organization Code</i> MGA																										
7. <i>Author(s)</i> Shefalika Naik, Project Engineer		8. <i>Performing Organization Report No.</i> NCAP-MGA-2005-014																										
9. <i>Performing Organization Name and Address</i> MGA Research Corporation 5000 Warren Road Burlington, WI 53105		10. <i>Work Unit No.</i>																										
		11. <i>Contract or Grant No.</i> DTNH22-01-D-12005																										
12. <i>Sponsoring Agency Name and Address</i> U.S. Department of Transportation National Highway Traffic Safety Administration Rulemaking, Office of Crashworthiness Standards 400 Seventh Street, SW, Room 5311 Washington, D.C. 20590		13. <i>Type of Report and Period Covered</i> 3/28/05 to 6/07/05																										
		14. <i>Sponsoring Agency Code</i> NVS-111																										
15. <i>Supplementary Notes</i>																												
16. <i>Abstract</i> A 35.0 mph (56.3 km/h) frontal barrier impact was conducted on a 2005 Toyota Avalon at MGA Research Corporation on March 28, 2005. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and foot well intrusion performance. The impact velocity was 56.3 km/h. The ambient temperature at the barrier face at the time of impact was 21 degrees Celsius. The vehicle's maximum post test static crush is 525 mm located at the right of the vehicle's 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: <table style="width: 100%; margin-top: 10px;"> <thead> <tr> <th style="text-align: left;"><u>Measurement Description</u></th> <th style="text-align: left;"><u>Units</u></th> <th style="text-align: left;"><u>Threshold</u></th> <th style="text-align: left;"><u>Driver ATD</u></th> <th style="text-align: left;"><u>Pass. ATD</u></th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC)</td> <td>N/A</td> <td>1000</td> <td>342</td> <td>338</td> </tr> <tr> <td>Max. Thorax Accel. (3ms Clip)</td> <td>G's</td> <td>60</td> <td>32</td> <td>43</td> </tr> <tr> <td>Left Femur Force</td> <td>Newton</td> <td>10009</td> <td>-958</td> <td>-1822</td> </tr> <tr> <td>Right Femur Force</td> <td>Newton</td> <td>10009</td> <td>-3345</td> <td>-1930</td> </tr> </tbody> </table>				<u>Measurement Description</u>	<u>Units</u>	<u>Threshold</u>	<u>Driver ATD</u>	<u>Pass. ATD</u>	Head Injury Criteria (HIC)	N/A	1000	342	338	Max. Thorax Accel. (3ms Clip)	G's	60	32	43	Left Femur Force	Newton	10009	-958	-1822	Right Femur Force	Newton	10009	-3345	-1930
<u>Measurement Description</u>	<u>Units</u>	<u>Threshold</u>	<u>Driver ATD</u>	<u>Pass. ATD</u>																								
Head Injury Criteria (HIC)	N/A	1000	342	338																								
Max. Thorax Accel. (3ms Clip)	G's	60	32	43																								
Left Femur Force	Newton	10009	-958	-1822																								
Right Femur Force	Newton	10009	-3345	-1930																								
17. <i>Key Words</i> 56.3 km/h NCAP Frontal Barrier Impact Test New Car Assessment Program (NCAP) 2005 Toyota Avalon NHTSA No: M55100		18. <i>Distribution Statement</i> Copies of this report are available from: National Highway Traffic Safety Admin., Technical Ref. Division, Room 5108 (NPO-230) 400 Seventh Street, S.W. Washington, D.C. 20590																										
19. <i>Security Classif. (of this report)</i> Unclassified	20. <i>Security Classif. (of this page)</i> Unclassified	21. <i>No. of Pages</i> 207	22. <i>Price</i>																									

TABLE OF CONTENTS

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

SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

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

SUMMARY

An advanced load cell barrier was impacted by a 2005 Toyota Avalon at a velocity of 56.3 kph. The test was performed at MGA Research Corporation on March 28, 2005. Pre-and post-test photographs of the vehicle and dummies can be found in Appendix A.

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

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

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

The 155 channels of data were recorded on an on-board data acquisition system. Appendix B contains the vehicle and dummy response data traces.

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

The maximum static crush of the vehicle was 525 mm and both the driver and passenger side doors remained closed and latched during the impact event and were operable after the impact.

The driver's head, chest, and abdomen contacted the airbag. The driver's head also contacted the headrest. The driver's knees contacted the bolster. 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)
Driver	342.4	32.4	-20.6	-958	-3345
Passenger	338.3	42.7	-23.5	-1822	-1930

TEST NOTES

No valid data was collected for the following:

Driver Right Lower Tibia FZ

Barrier 2-7

Barrier 9-4

SECTION 2
OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

Test Vehicle: 2005 Toyota Avalon
 Test Program: 35mph Frontal Impact

NHTSA No.: M55100
 Test Date: 03/28/2005

CONVERSION FACTORS USED IN THIS REPORT*

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

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

**DATA SHEET NO. 1
CRASH TEST SUMMARY**

Test Vehicle: 2005 Toyota Avalon
Test Program: 35mph Frontal Impact

NHTSA No.: M55100
Test Date: 03/28/2005

PRIMARY IMPACT DATA

Measured Parameter	Units	Value
Velocity at Impact	km/hr	56.3
Test Weight	kg	1806.2
Average Rebound	mm	4052
Maximum Static Crush	mm	525
Impact Angle	degrees	0.0

DOOR OPENING AND SEAT TRACK INFORMATION

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

TEST DUMMY INFORMATION

Description	Driver	Passenger
Dummy Type / Serial No.	HIII 50 th / 066	HIII 50 th / 065
Head Contact	Airbag, Headrest	Airbag, Headrest
Chest Contact	Airbag	Airbag
Abdomen Contact	Airbag	None
Left Knee Contact	Knee Bolster	Glove Box
Right Knee Contact	Knee Bolster	Glove Box

16mm MOVIE COVERAGE

High Speed	16
Real Time	1
Total	17

Driver ATD Sensors	48
Passenger ATD Sensors	52
Belt Assessment Sensors	4
Vehicle Structure Accelerometers	9
Total	113

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

Test Vehicle: 2005 Toyota Avalon
 Test Program: 35mph Frontal Impact

NHTSA No: M55100
 Test Date: 03/28/2005

TEST VEHICLE INFORMATION

Manufacturer	Toyota Motor Manufacturing Kentucky, Inc.
Model	Avalon
Body Style	4 Door Sedan
NHTSA No.	M55100
VIN	4T1BK36B95U004556
Color	Beige
Delivery Date	3/2/05
Odometer Reading (mile)	77
Dealer	Wilde Toyota
Transmission	Automatic (w/ Sport Shift)
Final Drive	Front
Number of Cylinders	6
Engine Displacement (L)	3.5
Engine Placement	Lateral
Automatic Door Lock (ADL)	Yes
Owners Manual Details Instructions on Disabling ADLs	Yes

TEST VEHICLE OPTIONS

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

DATA FROM CERTIFICATION LABEL

Manufactured By	Toyota Motor Manufacturing Kentucky, Inc.
Date of Manufacture	01/05

GVWR (kg)	2071
GAWR Front (kg)	1209
GAWR Rear (kg)	1136

DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (max)	200	200
Recommended Tire Size	P215/60R16	P215/60R16
Tire size on Vehicle	P215/60R16	P215/60R16
Tire Manufacturer	Bridgestone	Bridgestone

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Split Bench		
Number of Occupants	2	3		5
Capacity Wt. (VCW) (kg)				397
Cargo Wt. (RCLW) (kg)				57

DATA SHEET NO. 2... (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2005 Toyota Avalon
 Test Program: 35mph Frontal Impact

NHTSA No.: M55100
 Test Date: 03/28/2005

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	499.4	305.7		557.9	362.4	
Right	kg	479.5	316.2		523.0	362.9	
Ratio	%	61.2	38.8		59.8	40.2	
Totals	kg	978.9	621.9	1600.8	1080.9	725.3	1806.2

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1600.8
Weight of 2 P572E ATDs	kg	156.0
Rated Cargo/Luggage Weight (RCLW)	kg	57.0
Calculated Vehicle Target Weight (TVTW)	kg	1813.8

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG(aft of front axle)
As Delivered	mm	688	690	700	700	1094
As Tested	mm	668	674	686	690	1130
Post Test	mm	720	704	669	659	

Vehicle Wheelbase (mm): 2815

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

Vehicle Components Removed: Trunk lid, Spare tire, Jack and tools, trunk carpet, exhaust system, both rear tail lights, rear bumper, outside mirrors

Ballast weight does not include instrumentation and data acquisition system.

FUEL SYSTEM DATA

Fuel System Capacity From Owner's Manual (L): 70.0

Usable Capacity Figure Furnished by COTR (L): 70.0

Actual Test Volume (L): 53.1

Test Fluid Type: Stoddard Solvent; Specific Gravity: 0.77

Is Vehicle Fuel Pump Electric or Mechanical? Electric

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

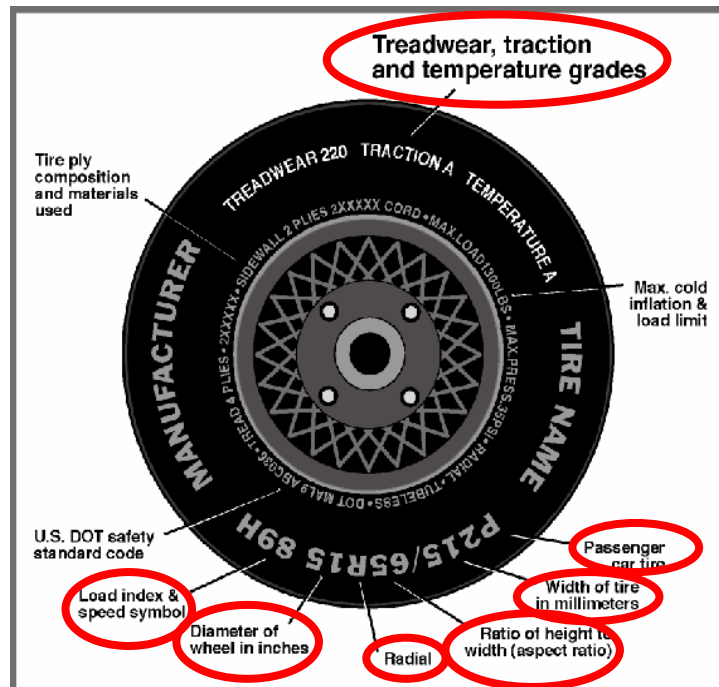
DATA SHEET NO. 3

TEST VEHICLE TIRE INFORMATION

Test Vehicle: 2005 Toyota Avalon
Test Program: 35mph Frontal Impact

NHTSA No.: M55100
Test Date: 03/28/2005

Vehicle Year	2005	Vehicle Make	Toyota
VIN	4T1BK36B95U004556	Vehicle Model	Avalon



	Front	Rear
Tire Manufacturer	Bridgestone	Bridgestone
Tire Name	Potenza RE 92	Potenza RE 92
Tire Type	P	P
Tire Width (mm)	215	215
Ratio of Height to Width (aspect ratio)	60	60
Radial	R	R
Wheel Diameter	16	16
Load Index & Speed Symbol	94V	94V
Treadwear	160	160
Traction Grade	A	A
Temperature Grade	A	A

DATA SHEET NO. 4
POST IMPACT DATA

Test Vehicle: 2005 Toyota Avalon
Test Program: 35mph Frontal Impact

NHTSA No.: M55100
Test Date: 03/28/2005

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	55.5 – 57.1	56.3
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	56.3
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	4818	4433	385
Center	mm	5000	4490	510
Right Side	mm	4818	4450	368

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	4050
Center	mm	4080
Right Side	mm	4025
Average	mm	4052

DATA SHEET NO. 5
TEST VEHICLE INFORMATION

Test Vehicle: 2005 Toyota Avalon
Test Program: 35mph Frontal Impact

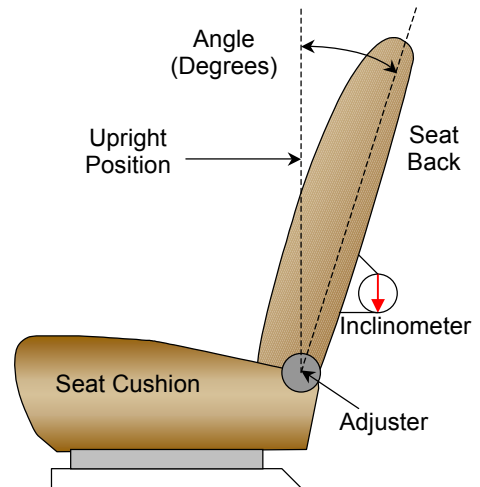
NHTSA No.: M55100
Test Date: 03/28/2005

NORMAL DESIGN RIDING POSITION

The driver and passenger seat back is positioned to the manufacturer's designated angle. The procedure is as follows: Measure from head rest bar to rocker sill.

Driver seat back angle: 3.0 on head rest post

Passenger seat back angle: 2.7 on head rest post



FRONT SEAT ASSEMBLY

SEAT FORE/AFT POSITIONS

The driver and the passenger seat were power operated.

Driver seat fore/aft total travel: 265 mm

Driver seat fore/aft position: 132 mm

Passenger seat fore/aft total travel: 17 detents (240 mm)

Passenger seat fore/aft position: 9th detent (120 mm)

ADJUSTABLE D-RING POSITION

The D-Ring was placed in the second from top position.

DATA SHEET NO. 5... (continued)

TEST VEHICLE INFORMATION

Test Vehicle: 2005 Toyota Avalon
Test Program: 35mph Frontal Impact

NHTSA No.: M55100
Test Date: 03/28/2005

FUEL TANK CAPACITY DATA

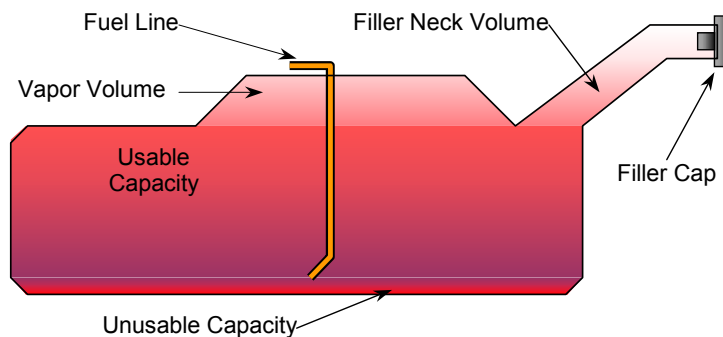
The "Usable Capacity" of the standard equipment fuel tank is: 70.0 liters

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

The "Usable Capacity" used for certification to FMVSS 301 requirements: 70.0 liters

Actual amount of Stoddard solvent added to vehicle for certification test: 53.1 liters

The fuel pump will pump fuel when the ignition is on.



VEHICLE FUEL TANK ASSEMBLY

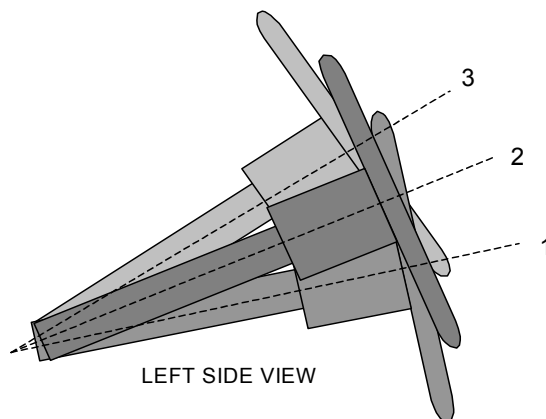
STEERING COLUMN ADJUSTMENT

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

Lowermost, Position 1: 18.6°

Geometric Center, Position 2: 25.6°

Uppermost, Position 3: 33.5°



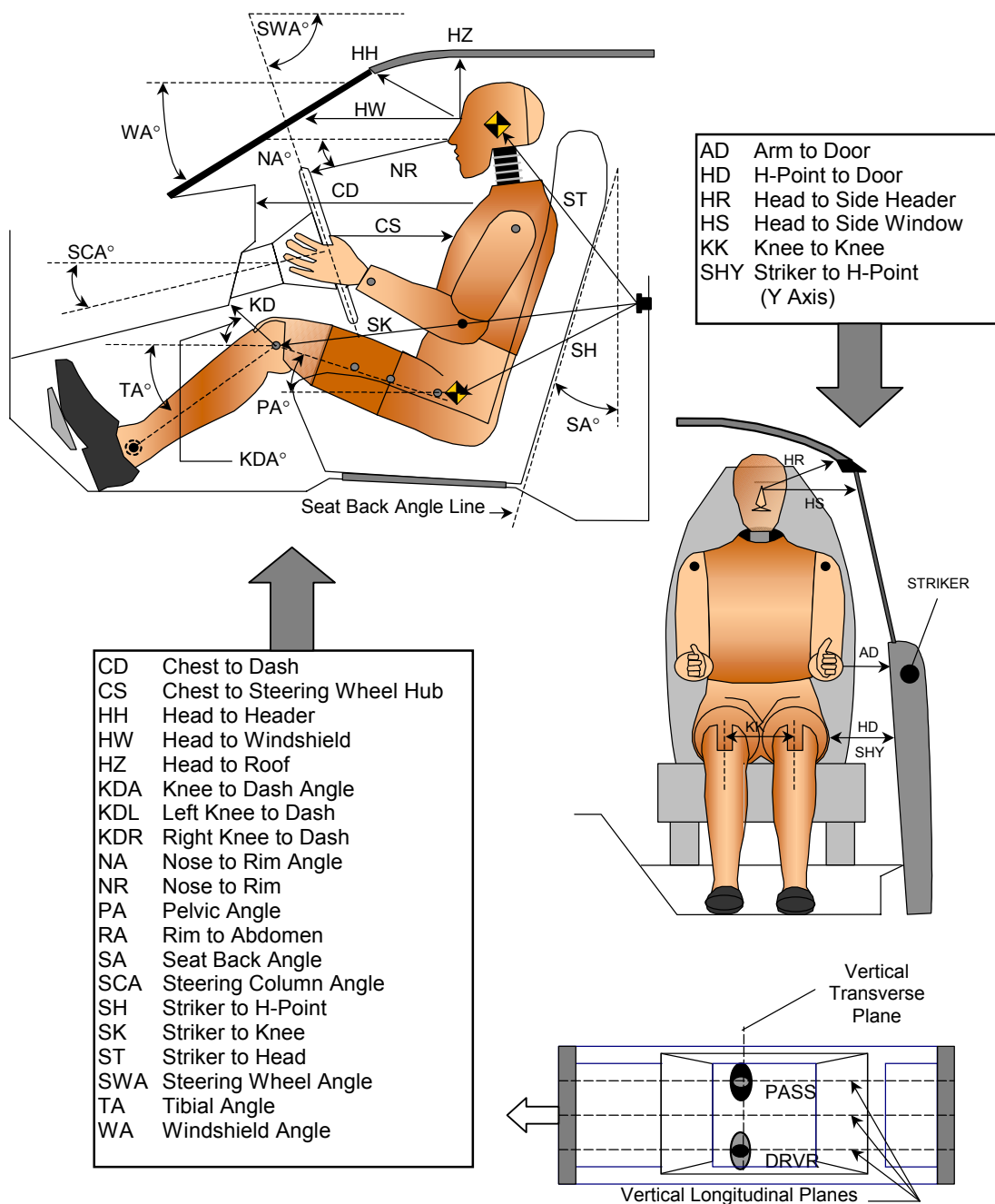
STEERING COLUMN ASSEMBLY

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

Test Vehicle: 2005 Toyota Avalon
 Test Program: 35mph Frontal Impact

NHTSA No.: M55100
 Test Date: 03/28/2005

DUMMY MEASUREMENTS FOR FRONT SEAT OCCUPANTS



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

Test Vehicle: 2005 Toyota Avalon
 Test Program: 35mph Frontal Impact

NHTSA No.: M55100
 Test Date: 03/28/2005

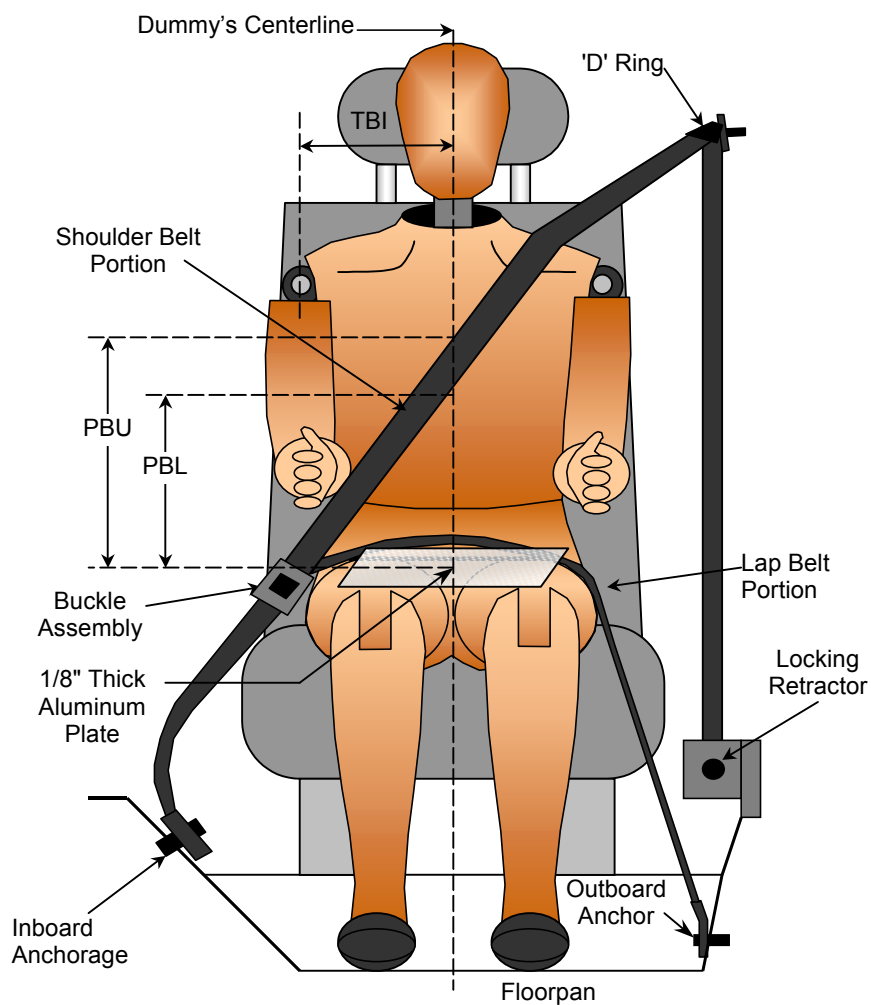
TEST DUMMY POSITION MEASUREMENTS

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA	Windshield Angle		25.2		
SWA	Steering Wheel Angle		60.8		
SCA	Steering Column Angle		25.6		
SA	Seat Back Angle (headrest post)		3.0		2.7
HZ	Head to Roof (Z)	167	90.0	150	90.0
HH	Head to Header	378	19.0	362	13.3
HW	Head to Windshield	673	0.0	598	0.0
HR	Head to Side Header (Y)	218		216	
NR	Nose to Rim	450	9.7		
CD	Chest to Dash	576		536	
CS	Chest to Steering Hub	340	8.6		
RA	Rim to Abdomen	212	0.0		
KDL	Left Knee to Dash	159	32.6	142	
KDR	Right Knee to Dash	131		145	34.9
PA	Pelvic Angle		23.8		22.8
TA	Tibia Angle		43.9		42.4
KK	Knee to Knee (Y)	307		263	
SK	Striker to Knee	615	101.5	630	98.3
ST	Striker to Head	452	11.9	504	11.1
SH	Striker to H-Point	304	129.4	283	120.9
SHY	Striker to H-Point (Y)	284		280	
HS	Head to Side Window	326		312	
HD	H-Point to Door (Y)	147		130	
AD	Arm to Door (Y)	118		127	
AA	Ankle to Ankle	311		193	

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

Test Vehicle: 2005 Toyota Avalon
 Test Program: 35mph Frontal Impact

NHTSA No.: M55100
 Test Date: 03/28/2005



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	342	327
PBL - To surface of reference to belt lower edge	mm	267	246

DATA SHEET NO. 8

VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY

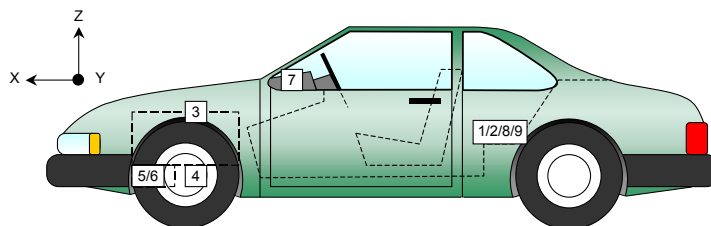
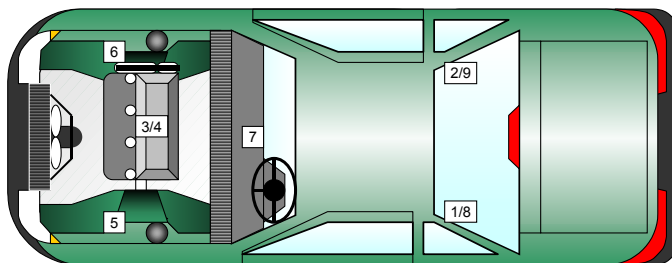
Test Vehicle: 2005 Toyota Avalon
 Test Program: 35mph Frontal Impact

NHTSA No.: M55100
 Test Date: 03/28/2005

VEHICLE ACCELEROMETER PEAK DATA AND PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)			Peak Values				
		X	Y	Z	Units	Max	Time	Min	Time
1	Left Rear X-Member X	2000	-375	420	G's	2.7	113	-37.9	46
2	Right Rear X-Member X	2000	375	420	G's	2.9	119	-38.3	45
3	Engine Top X	4282	35	780	G's	38.3	47	-147.7	33
4	Engine Bottom X	4230	-30	260	G's	57.0	45	-123.6	36
5	Left Brake Caliper X	4115	-705	245	G's	68.8	70	-81.5	54
6	Right Brake Caliper X	4116	705	245	G's	60.5	72	-88.4	57
7	Instrument Panel X	3625	105	1035	G's	21.4	18	-63.2	64
8	Left Rear X-Member Z	2000	-375	420	G's	8.4	27	-15.6	39
9	Right Rear X-Member Z	2000	375	420	G's	4.9	62	-17.0	39

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



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

Test Vehicle: 2005 Toyota Avalon
 Test Program: 35mph Frontal Impact

NHTSA No.: M55100
 Test Date: 03/28/2005

HEAD PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Head CG	X	G's	14.8	244	-49.1	77	5.8	281	-57.8	80
Head CG	Y	G's	3.1	65	-2.8	262	4.9	30	-6.2	145
Head CG	Z	G's	21.7	63	-12.7	104	21.2	63	-7.8	113
Head CG Resultant	N/A	G's	51.5	75			59.9	80		

CHEST PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	G's	3.2	170	-33.1	80	1.9	185	-44.1	74
Chest CG	Y	G's	8.8	97	-4.9	32	4.4	51	-12.2	107
Chest CG	Z	G's	8.8	65	-12.4	112	9.3	64	-13.2	117
Chest CG Resultant	N/A	G's	34.0	74			44.5	74		

FEMUR PEAK FORCES

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Left Femur	Z	Newtons	1002	58	-958	25	405	25	-1822	77
Right Femur	Z	Newtons	78	281	-3345	40	737	48	-1930	86

SEAT BELT SENSOR PEAK VALUES

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Lap Belt Force	N/A	Newtons	5339	68			6755	59		
Shoulder Belt Force	N/A	Newtons	5950	56			6292	51		

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	342.4	39.0	57.3	93.3	338.3	44.2	66.2	92.3

CHEST CLIP (3MSEC)

Location	Driver			Passenger		
	CLIP	T ¹	T ²	CLIP	T ¹	T ²
Chest CG Primary	32.4	72.8	75.8	42.7	72.1	75.1

DATA SHEET NO. 9... (continued)

HYBRID III ATD INJURY CRITERIA AND SENSOR DATA

Test Vehicle: 2005 Toyota Avalon
 Test Program: 35mph Frontal Impact

NHTSA No.: M55100
 Test Date: 03/28/2005

PELVIC PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Pelvis	X	G's	4.3	129	-40.7	73	6.1	133	-52.3	58
Pelvis	Y	G's	10.5	80	-9.6	23	9.1	59	-10.0	95
Pelvis	Z	G's	3.6	172	-16.1	99	2.5	268	-21.7	77

UPPER NECK PEAK FORCES AND MOMENTS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Neck Force	X	Newtons	371	75	-548	156	264	93	-462	153
Neck Force	Y	Newtons	216	82	-72	258	109	52	-294	150
Neck Force	Z	Newtons	1472	77	-398	109	1265	67	-450	149
Neck Moment	X	N•m	7.2	153	-18.1	80	14.4	103	-14.4	149
Neck Moment	Y	N•m	39.9	162	-29.2	271	35.7	162	-28.2	112
Neck Moment	Z	N•m	7.4	111	-6.0	300	8.1	121	-5.6	174

FOOT PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Left Foot Aft	X	G's	14.5	103	-50.5	58	28.6	56	-147.1	47
Left Foot Aft	Z	G's	4.5	199	-35.3	58	20.5	69	-72.5	51
Left Foot Fore	Z	G's	8.7	20	-64.5	36	31.1	40	-103.5	45
Right Foot Aft	X	G's	83.2	36	-130.9	47	22.1	91	-102	52
Right Foot Aft	Z	G's	19.0	76	-104.7	36	18.5	71	-40.1	37
Right Foot Fore	Z	G's	72.4	34	-290.6	36	37.8	40	-96.6	35

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	107.3	39	-6.8	127	16.4	75	-27.8	55
Left Lower Moment	Y	N•m	41.5	57	-29.6	100	28.3	124	-124.2	46
Left Lower Force	Z	Newtons	303	21	-1982	40	207	21	-3016	50
Left Upper Moment	X	N•m	25.5	144	-145.7	32	16.8	52	-40.6	84
Left Upper Moment	Y	N•m	66.6	24	-81.0	59	70.4	48	-42.9	92
Left Upper Force	Z	Newtons	189	124	-1644	39	90	170	-3623	49
Right Lower Moment	X	N•m	18.9	93	-30.6	40	9.2	52	-22.0	85
Right Lower Moment	Y	N•m	28.4	49	-79.7	36	50.9	48	-49.8	93
Right Lower Force	Z	Newtons	*	*	*	*	159	150	-3235	39
Right Upper Moment	X	N•m	58.8	27	-61.8	95	17.3	77	-28.7	54
Right Upper Moment	Y	N•m	126.2	30	-91.1	49	24.0	126	-87.0	48
Right Upper Force	Z	Newtons	140	23	-4061	40	253	117	-2288	39

* No valid data collected

DATA SHEET NO. 9... (continued)

HYBRID III ATD INJURY CRITERIA AND SENSOR DATA

Test Vehicle: 2005 Toyota Avalon
 Test Program: 35mph Frontal Impact

NHTSA No.: M55100
 Test Date: 03/28/2005

CHEST PEAK DISPLACEMENTS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest	X	mm			-20.6	73			-23.5	69

HEAD REDUNDANT PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Head CG	X	G's	15.0	242	-48.0	77	5.7	280	-57.6	80
Head CG	Y	G's	4.2	67	-3.9	96	5.4	30	-6.4	138
Head CG	Z	G's	24.5	66	-13.1	104	22.5	69	-8.0	113
Head CG Resultant	N/A	G's	49.7	77			60.0	80		

CHEST REDUNDANT PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	G's	3.1	170	-32.8	80	2.2	149	-43.7	73
Chest CG	Y	G's	8.7	97	-5.0	32	4.1	50	-12.3	106
Chest CG	Z	G's	9.4	65	-12.6	112	9.8	64	-12.9	117
Chest CG Resultant	N/A	G's	33.6	74			44.0	76		

REDUNDANT HEAD INJURY CRITERIA (HIC)

Location	Driver				Passenger			
	HIC	Avg.	T ¹	T ²	HIC	Avg.	T ¹	T ²
Head CG Primary Redundant	323.6	38.1	58.0	94.0	341.5	44.1	66.1	92.5

REDUNDANT CHEST CLIP (3MSEC)

Location	Driver			Passenger		
	CLIP	T ¹	T ²	CLIP	T ¹	T ²
Chest CG Primary Redundant	31.9	72.7	75.7	43.4	73.3	76.3

DATA SHEET NO. 10
SEAT BELT PERFORMANCE ASSESSMENT TEST DATA

Test Vehicle: 2005 Toyota Avalon
 Test Program: 35mph Frontal Impact

NHTSA No.: M55100
 Test Date: 03/28/2005

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	342	327
PBL - Top surface of reference to belt lower edge	mm	267	246

BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	882	891
Lap belt length as measured on ATD	mm	864	897
Remainder of belt on reel	mm	1391	1391
Total belt length for continuous webbing systems	mm	3137	3179

SHOULDER BELT SPOOL-OUT DATA

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

DATA SHEET NO. 11
SUMMARY OF FMVSS 212 DATA

Test Vehicle: 2005 Toyota Avalon
 Test Program: 35mph Frontal Impact

NHTSA No.: M55100
 Test Date: 03/28/2005

Windshield Mounting Details:

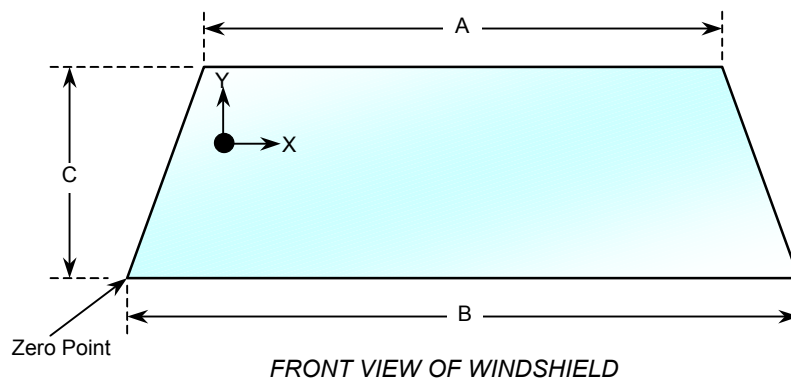
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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	2237	2237	100
Right Side	2237	2237	100
Total	4474	4474	100



WINDSHIELD DIMENSIONS

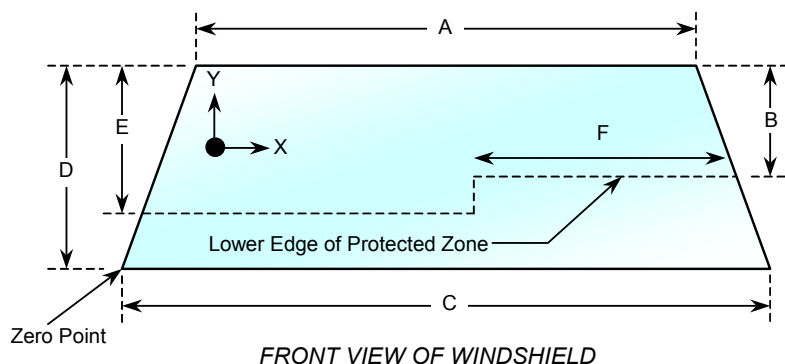
Item	Units	Segment Length	Molding Width
A	mm	1248	16
B	mm	1560	N/A
C	mm	833	12

DATA SHEET NO. 12

WINDSHIELD ZONE INTRUSION FMVSS 219 (Partial) DATA

Test Vehicle: 2005 Toyota Avalon
 Test Program: 35mph Frontal Impact

NHTSA No.: M55100
 Test Date: 03/28/2005



Item	Units	Value
A	mm	1248
B	mm	570
C	mm	1560
D	mm	833
E	mm	590
F	mm	937

AREA OF PROTECTED ZONE FAILURES - NONE

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

X	Y

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

X	Y

DATA SHEET NO. 13

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Test Vehicle: 2005 Toyota Avalon
Test Program: 35mph Frontal Impact

NHTSA No.: M55100
Test Date: 03/28/2005

Temperature at Time of Impact: 21° C Test Time: 1:02 pm

Stoddard Solvent Spillage Measurements

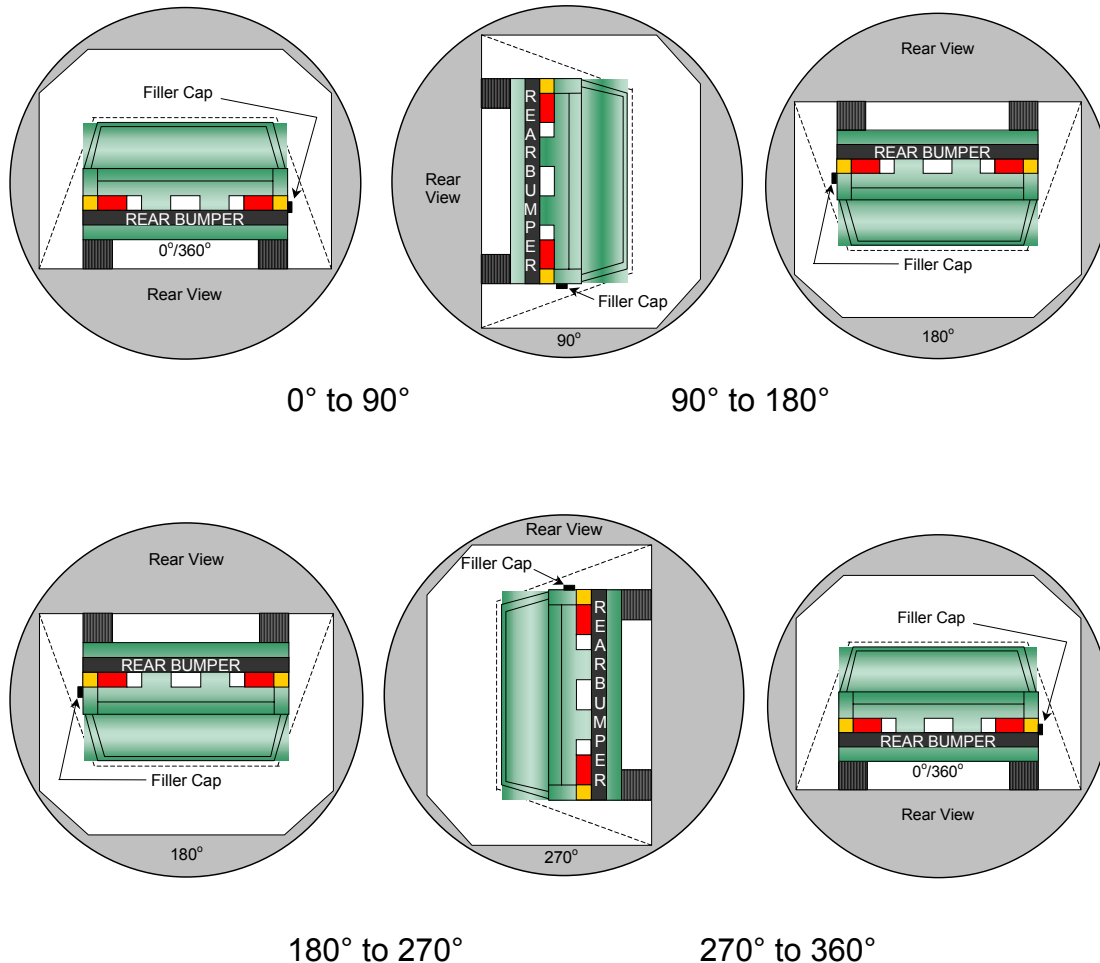
- A. From impact until vehicle motion ceases: 0 oz.
 (Maximum Allowable = 1 ounce)
- B. For the 5 minute period after motion ceases: 0 oz.
 (Maximum Allowable = 5 ounces)
- C. For the following 25 minutes: 0 oz.
 (Maximum Allowable = 1 oz. /minute)
- D. Spillage: None

DATA SHEET NO. 14
FMVSS 301 STATIC ROLLOVER DATA

Test Vehicle: 2005 Toyota Avalon
 Test Program: 35mph Frontal Impact

NHTSA No.: M55100
 Test Date: 03/28/2005

Test Time: 1:02 pm



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

Test Phase	Rotation Time (sec.)	Hold Time (sec.)	Spillage (oz.)
0° to 90°	160	300	0
90° to 180°	153	300	0
180° to 270°	136	300	0
270° to 360°	159	300	0

DATA SHEET NO. 15
VEHICLE MEASUREMENTS

Test Vehicle: 2005 Toyota Avalon
Test Program: 35mph Frontal Impact

NHTSA No.: M55100
Test Date: 03/28/2005

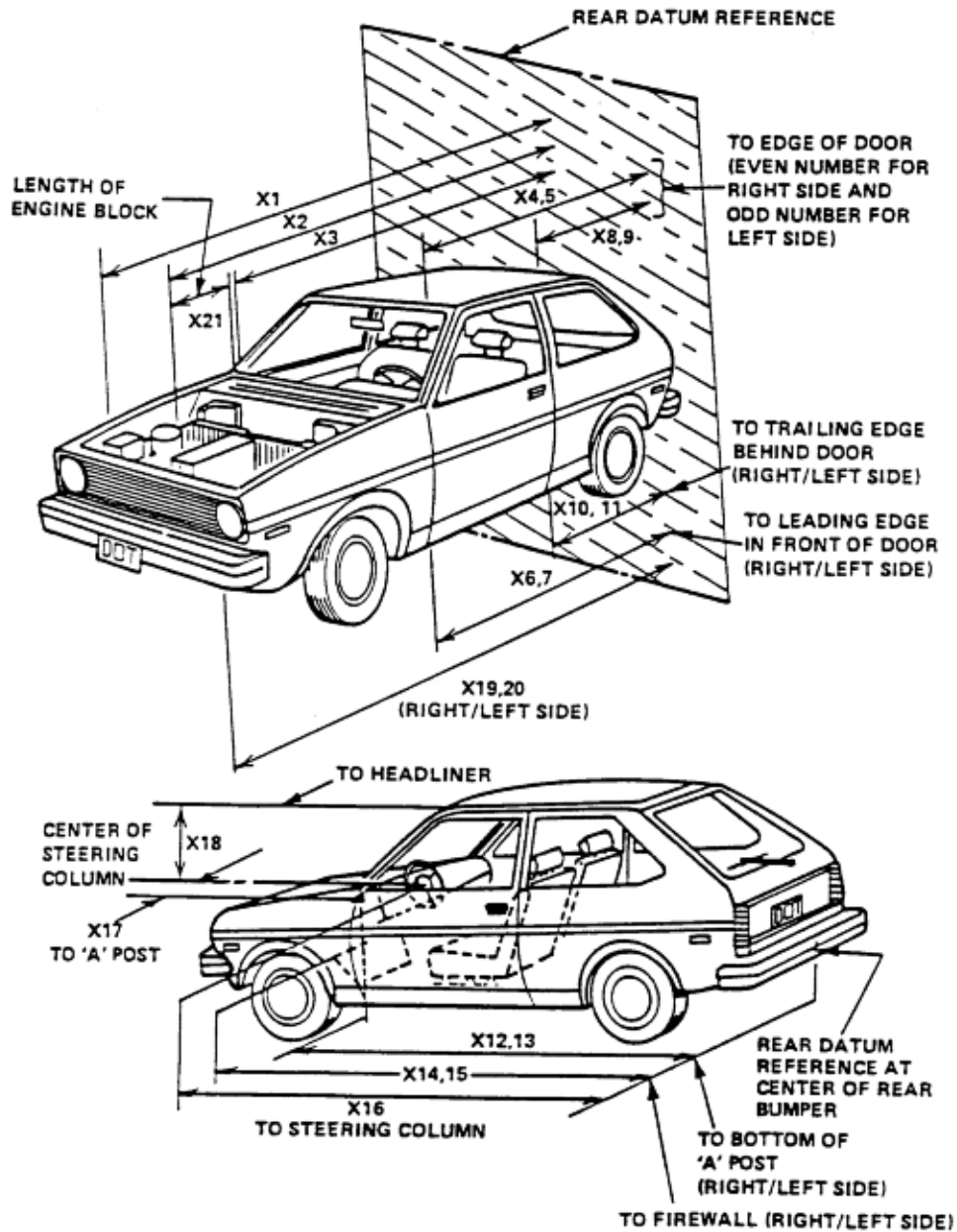
No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total length of vehicle at centerline	mm	5000	4490	510
2	RSOV to front of engine	mm	4307	3970	337
3	RSOV to firewall centerline	mm	3973	3884	89
4	RSOV to leading edge of right door	mm	3565	3570	-5
5	RSOV to leading edge of left door	mm	3558	3556	2
6	RSOV to lower leading edge of right door	mm	3542	3536	6
7	RSOV to lower leading edge of left door	mm	3539	3525	14
8	RSOV to upper leading edge of right door	mm	2406	2415	-9
9	RSOV to upper leading edge of left door	mm	2390	2406	-16
10	RSOV to lower trailing edge of right door	mm	2400	2394	6
11	RSOV to lower trailing edge of left door	mm	2398	2389	9
12	RSOV to bottom of right 'A' pillar	mm	3429	3422	7
13	RSOV to bottom of left 'A' pillar	mm	3416	3420	-4
14	RSOV to firewall on right side	mm	3865	3820	45
15	RSOV to firewall on left side	mm	3854	3789	65
16	RSOV to steering column	mm	3037	3030	7
17	Center of steering column to left 'A' pillar	mm	450	395	55
18	Center of steering column to headlining	mm	460	420	40
19	RSOV to right side of front bumper	mm	4818	4450	368
20	RSOV to left side of front bumper	mm	4818	4433	385
21	Length of engine block	mm	522	522	0
RD	RSOV to right side of dash panel	mm	3913	3873	40
CD	RSOV to center of dash panel	mm	4140	4075	65
LD	RSOV to left side of dash panel	mm	3915	3867	48

DATA SHEET NO. 15... (continued)

VEHICLE MEASUREMENTS

Test Vehicle: 2005 Toyota Avalon
Test Program: 35mph Frontal Impact

NHTSA No.: M55100
Test Date: 03/28/2005



DATA SHEET NO. 15... (continued)**VEHICLE MEASUREMENTS**

Test Vehicle: 2005 Toyota Avalon
Test Program: 35mph Frontal Impact

NHTSA No.: M55100
Test Date: 03/28/2005

Target Vehicle Structural Measurement

	Elements	Pre-Test (mm)
1	Total Length	5000
2	Total Width	1850
3	Bumper Top Height	600
4	Bumper Bottom Height	350
5	Longitudinal Member Top Height	540
6	Distance between Longitudinal Members	1081
7	Longitudinal Member Width	70
8	Engine Top Height	869
9	Engine Bottom Height	177
10	Engine and gearbox width	937
11	Front bumper-engine distance	569
12	Front shock absorber fixing height	910
13	Bonnet leading edge height	715
14	Front shock absorber fixing width	1200
15	Front bumper – front axle distance	990
16	Front axle – a pillar distance	375
17	A-pillar – B-pillar distance	1232
18	B-Pillar – rear axle distance	1198
19	B-pillar – C-pillar distance	1073
20	Roof sill bottom height	1410
21	Roof sill top height	1460
22	Floor sill bottom height	215
23	Floor sill top height	305

DATA SHEET NO. 16
CAMERA LOCATIONS

Test Vehicle: 2005 Toyota Avalon
Test Program: 35mph Frontal Impact

NHTSA No.: M55100
Test Date: 03/28/2005

No.	Camera View	Location (mm) *			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Side View				13	24
2	Left Front View	745	-7795	1465	24	1000
3	Steering Column Top	2235	-5770	1555	19	1000
4	Steering Column Bottom	2160	-5690	1040	19	1000
5	Driver Close-up	1715	-8455	1325	50	1000
6	Driver Angle	6685	-5020	2175	50	1000
7	On board Driver Side				8	500
8	On board Passenger Side				8	500
9	Right Overall	2225	6715	1435	19	1000
10	Right Passenger Half	750	9345	1370	25	1000
11	Right Close-up	1705	8725	1430	50	1000
12	Right Angle	6230	5210	2245	50	1000
13	Windshield	-490	0	2750	19	1000
14	Top Driver	-15	-305	2060	24	1000
15	Top Passenger	-20	595	2110	24	1000
16	Pit Front	1025	0	-3150	24	1000
17	Pit Rear	2950	0	-3150	24	1000

***COORDINATES:**

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

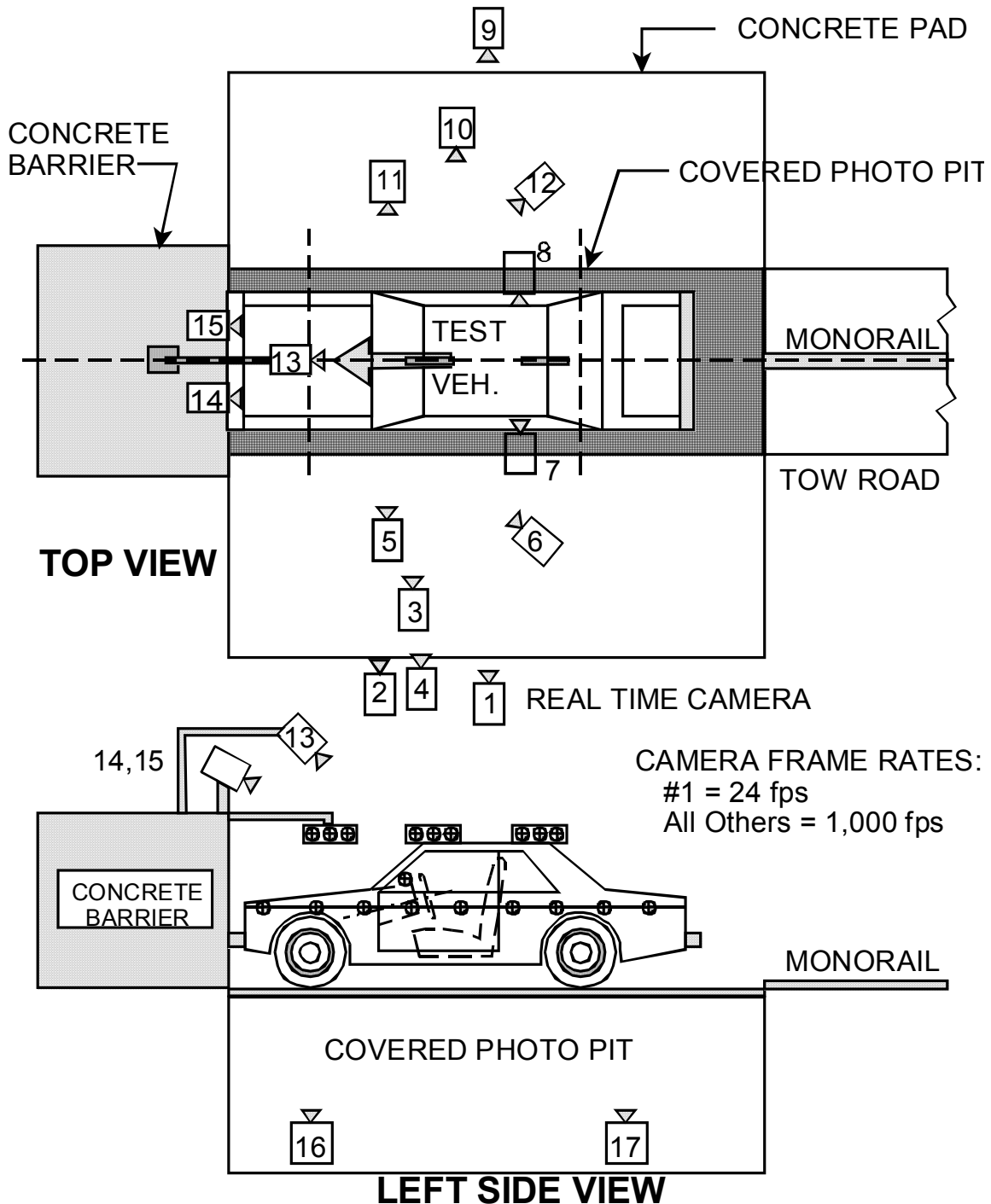
DATA SHEET NO. 16... (continued)

CAMERA LOCATIONS

Test Vehicle: 2005 Toyota Avalon
Test Program: 35mph Frontal Impact

NHTSA No.: M55100
Test Date: 03/28/2005

CAMERA POSITIONS FOR FRONTAL IMPACTS



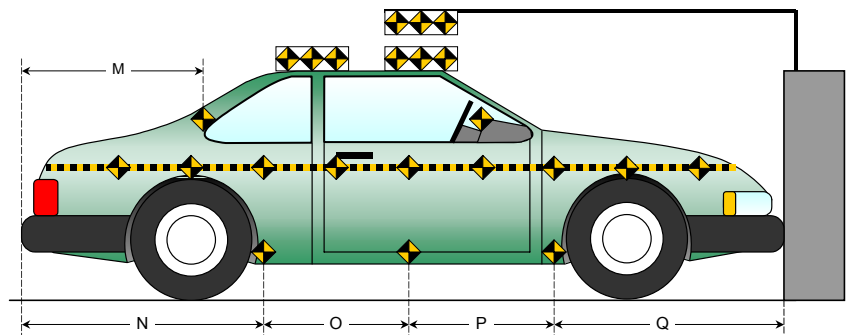
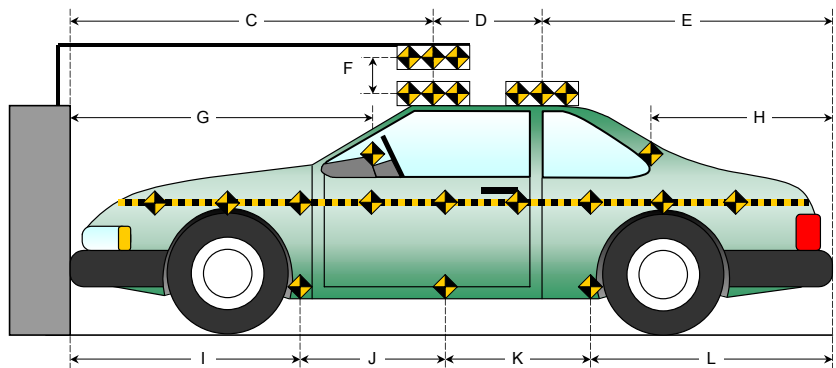
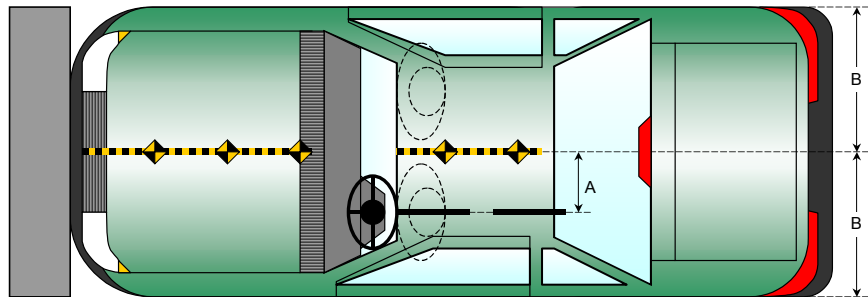
DATA SHEET NO. 17

PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2005 Toyota Avalon
 Test Program: 35mph Frontal Impact

NHTSA No.: M55100
 Test Date: 03/28/2005

Item	Value
A	402
B	925
C	2448
D	620
E	1932
F	1477
G	
H	1200
I	1428
J	975
K	990
L	1607
M	1170
N	1612
O	985
P	985
Q	1418



DATA SHEET NO. 18
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2005 Toyota Avalon
 Test Program: 35mph Frontal Impact

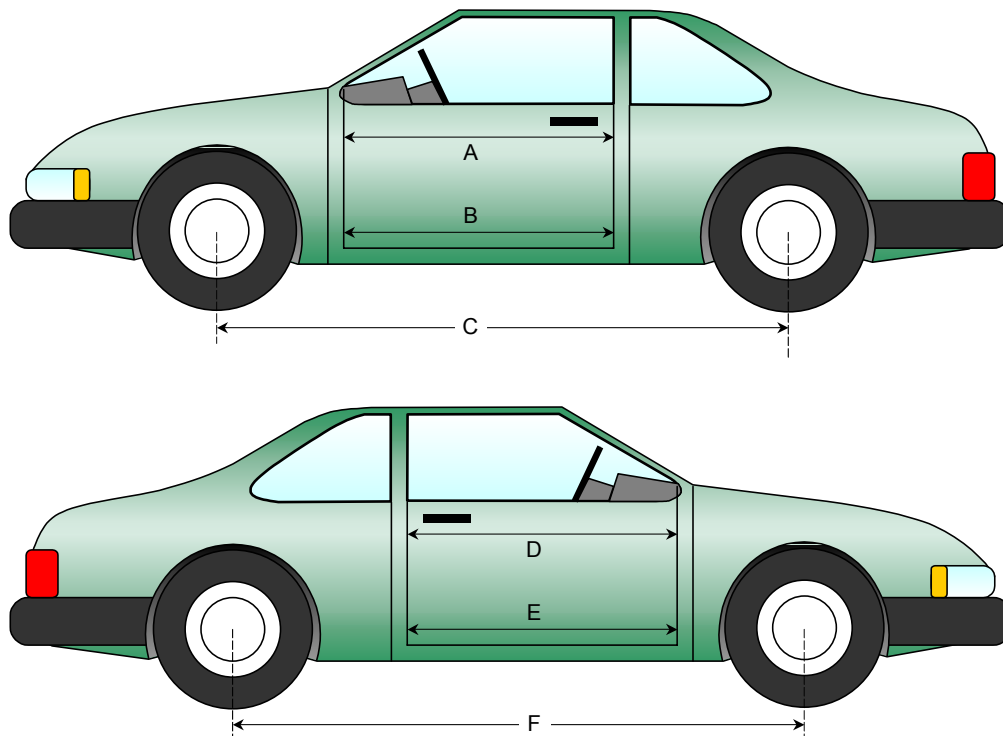
NHTSA No.: M55100
 Test Date: 03/28/2005

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1081	1080	1
B	Left Side Lower	mm	900	900	0
D	Right Side Upper	mm	1080	1076	4
E	Right Side Lower	mm	902	900	2

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2815	2735	80
F	Right Side Wheelbase	mm	2815	2732	83



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

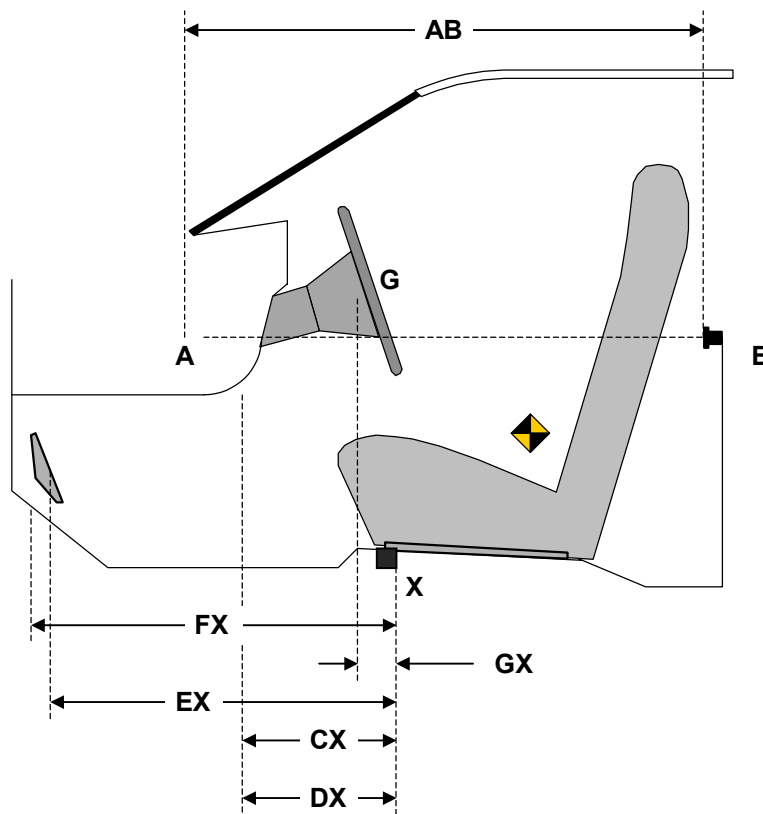
Test Vehicle: 2005 Toyota Avalon
 Test Program: 35mph Frontal Impact

NHTSA No.: M55100
 Test Date: 03/28/2005

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside window jam)	mm	864	866	-2
CX	Left Knee Bolster to X	mm	265	235	30
DX	Right Knee Bolster to X	mm	240	203	37
EX	Brake Pedal to X	mm	585	493	92
FX	Foot Rest to X	mm	660	619	41
GX	Center of Steering Column Wheel Hub to X	mm	84	55	29

X = Front of Seat Track (stationary)



DRIVER COMPARTMENT

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

Test Vehicle: 2005 Toyota Avalon
 Test Program: 35mph Frontal Impact

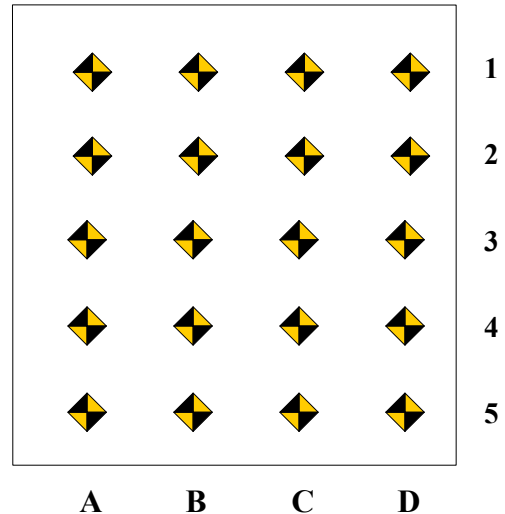
NHTSA No.: M55100
 Test Date: 03/28/2005

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		645	645	647		593	578	574		52	67	73
2		578	577	577		539	527	505		39	50	72
3	506	505	508	506	490	482	465	450	16	23	43	56
4	428	427	429	426	411	408	403	381	17	19	26	45
5	354	354	353	354	352	348	350	345	2	6	3	9

DRIVER FLOOR PAN Z-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1		17	10	9		53	50	26		-36	-40	-17
2		-30	-32	-35		-10	-7	-2		-20	-25	-33
3	-60	-58	-58	-60	-58	-51	-47	-33	-2	-7	-11	-27
4	-65	-62	-62	-62	-51	-58	-63	-67	-14	-4	1	5
5	-76	-65	-63	-76	-72	-76	-75	-94	-4	11	12	18

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

Test Vehicle: 2005 Toyota Avalon
 Test Program: 35mph Frontal Impact

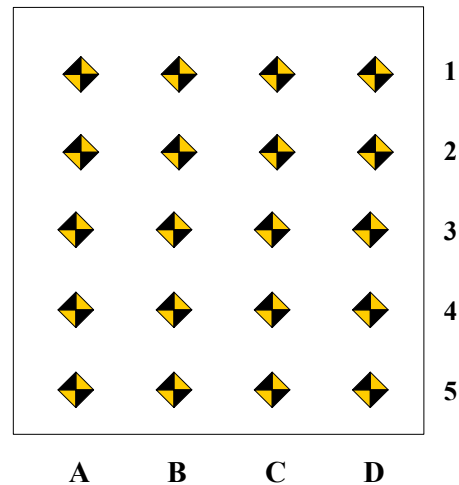
NHTSA No.: M55100
 Test Date: 03/28/2005

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	690	690	692		595	600	614		95	90	78	
2	622	625	628		546	556	567		76	69	61	
3	552	555	557	560	474	498	516	521	78	57	41	39
4	452	452	452	458	389	412	431	450	63	40	21	8
5	352	353	353	354	322	341	350	355	30	12	3	-1

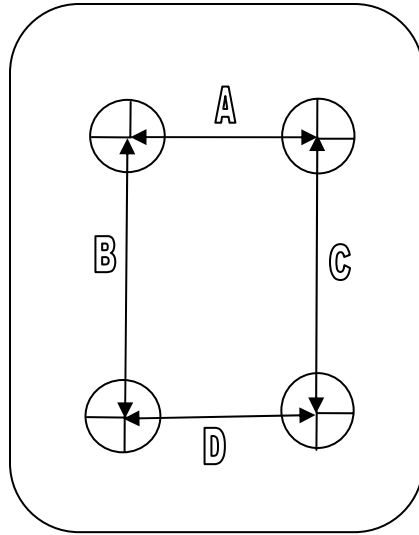
PASSENGER FLOOR PAN Z-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	34	39	42		73	95	80		-39	-56	-38	
2	-7	-3	0		25	29	27		-32	-32	-27	
3	-53	-46	-42	-48	-6	-25	-40	-45	-47	-21	-2	-3
4	-68	-65	-65	-66	-36	-71	-84	-79	-32	6	19	13
5	-82	-68	-58	-68	-56	-102	-98	-90	-26	34	40	22

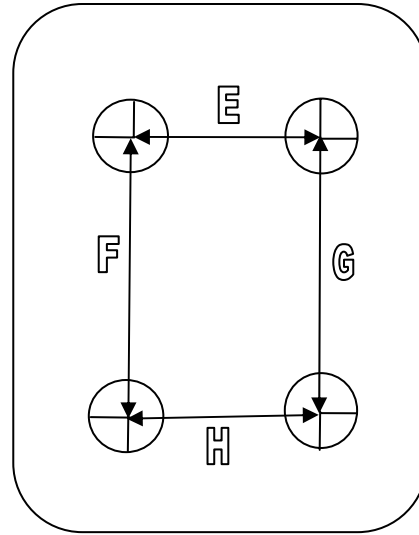
DATA SHEET NO. 18... (continued)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2005 Toyota Avalon
 Test Program: 35mph Frontal Impact

NHTSA No.: M55100
 Test Date: 03/28/2005



Driver



Passenger

UNDERBODY FLOORBOARD DEFORMATION

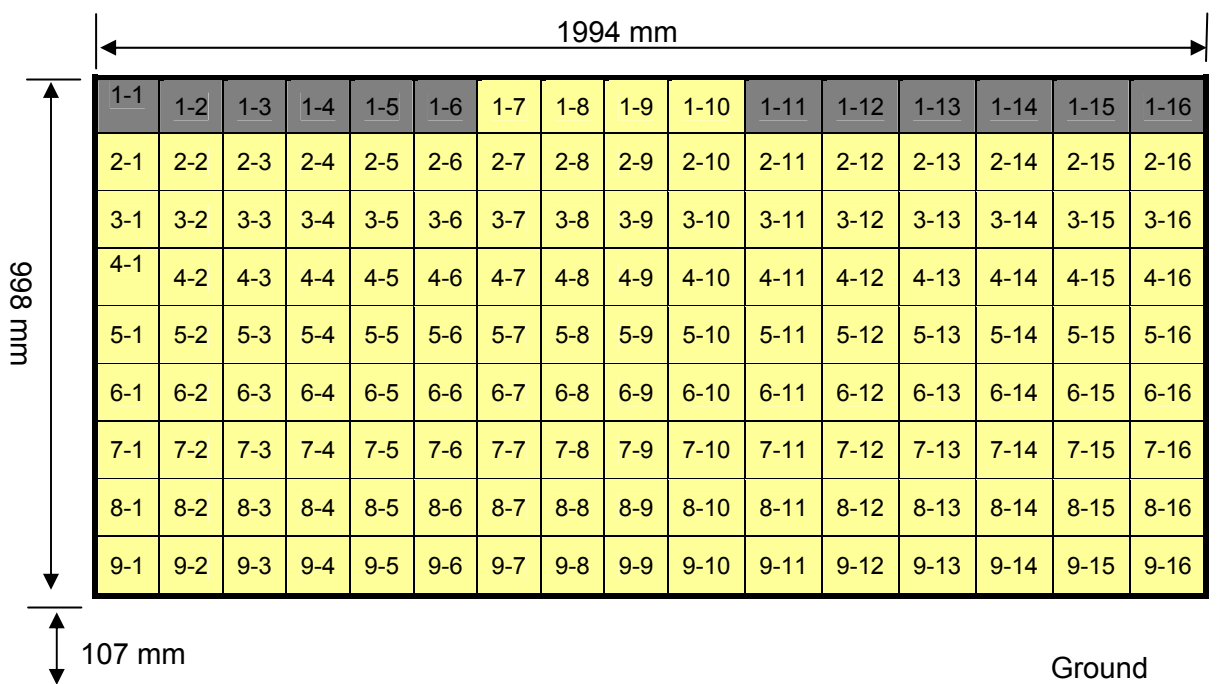
Measurement	Pre-Test	Post-Test	Difference
A	488	481	7
B	230	225	5
C	230	190	40
D	488	486	2
E	485	464	21
F	230	184	46
G	230	230	0
H	490	476	14

DATA SHEET NO. 19
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2005 Toyota Avalon
 Test Program: 35mph Frontal Impact

NHTSA No.: M55100
 Test Date: 03/28/2005

144 Load Cell Rigid Barrier
Load Cell Locations on Fixed Barrier



Load Cells are 121 mm x 121 mm with a 7 mm gap in between each load cell.

Note: 2-7 and 9-4 did not collect any valid data.

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

1. Overlay plot of summed force from each row.
2. Total force of all 9 rows (144 individual load cells).

Note: Data tape includes all individual load cell data.

DATA SHEET NO. 20
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2005 Toyota Avalon NHTSA No.: M55100
 Test Program: 35mph Frontal Impact Test Date: 03/28/2005

VEHICLE INFORMATION

VIN: 4T1BK36B95U004556 Wheelbase (mm) : 2815
 Vehicle Size Category: Sedan Test Weight (kg) : 1806.2

ACCELEROMETER DATA

Accelerometer Locations: As per measurements on Page 14
 Cal. Procedure/Interval: MGA procedure / 6 month
 Integration Algorithm: Trapezoidal Linearity: > 99%
 Impact Velocity (km/h): 56.3
 Velocity Change (km/h): 62.3 Time of Separation (msec): 108

CRUSH PROFILE

Collision Deformation Classification: Frontal Midpoint of Damage: Centerline
 Damage Region Length (mm): 1514 Impact Mode: Frontal

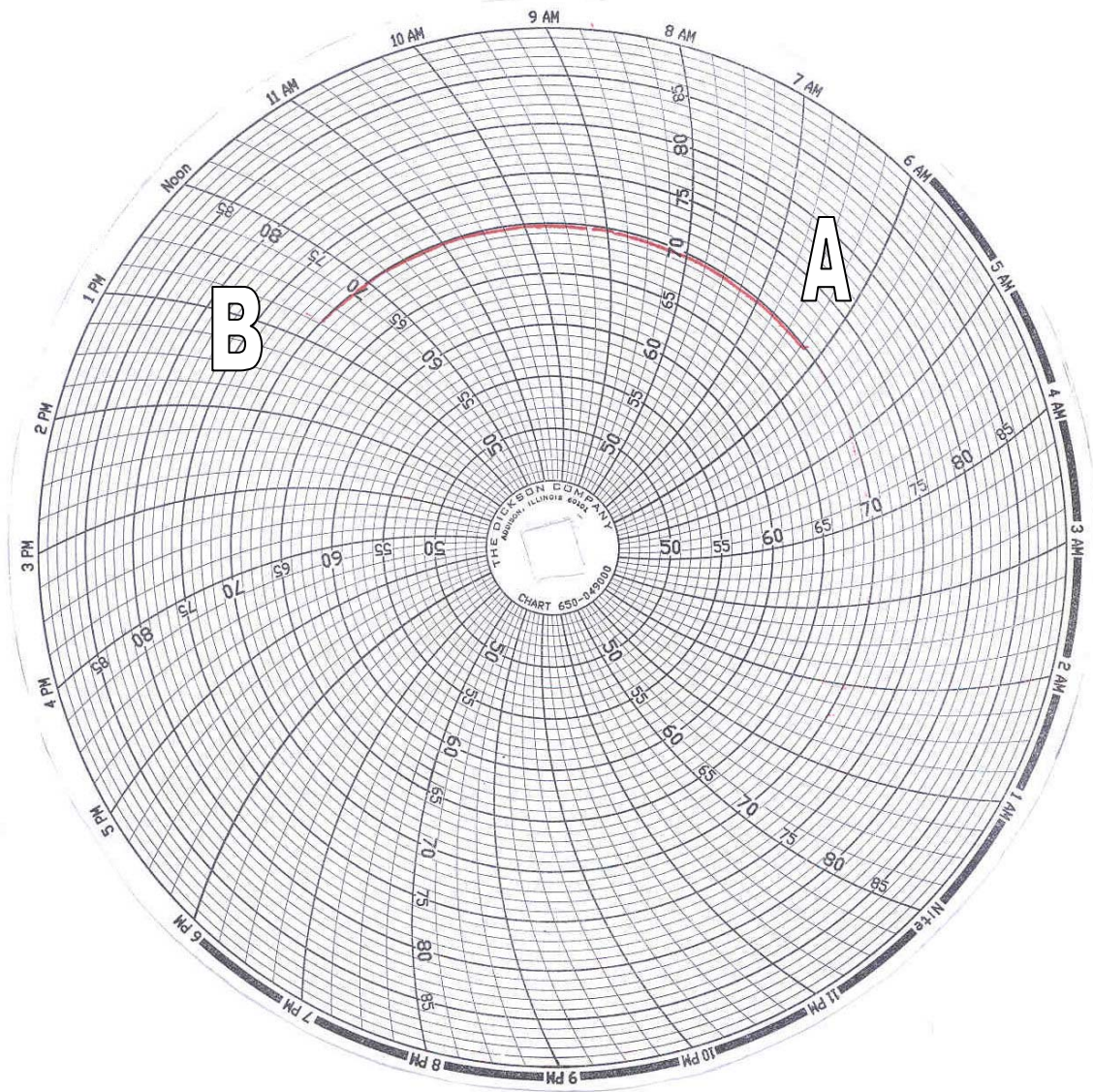
No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4818	4433	385
C2	Crush zone 2 at left side	mm	4904	4455	449
C3	Crush zone 3 at left side	mm	4979	4489	490
C4	Crush zone 4 at right side	mm	4980	4455	525
C5	Crush zone 5 at right side	mm	4905	4430	475
C6	Crush zone 6 at right side	mm	4818	4450	368
L	C1 TO C6	mm	1514	1510	4

DATA SHEET NO. 21

DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART

Test Vehicle: 2005 Toyota Avalon
Test Program: 35mph Frontal Impact

NHTSA No.: M55100
Test Date: 03/28/2005



A = Dummies installed in vehicle at 7:00 am

B = Test conducted at 1:02 pm

APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

Page No.

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

Page No.

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

Page No.

Photo No. 59.	Post-Test Passenger Side Knee Bolster View	A-59
Photo No. 60.	Pre-Test Passenger Side Floor Pan View	A-60
Photo No. 61.	Post-Test Passenger Side Floor Pan View	A-61
Photo No. 62.	Post-Test Passenger Dummy Head Contact	A-62
Photo No. 63.	Post-Test Passenger Dummy Knee Contact	A-63
Photo No. 64.	Post-Test Passenger Dummy Airbag Contact	A-64
Photo No. 65.	Rollover 90 Degrees	A-65
Photo No. 66.	Rollover 180 Degrees	A-66
Photo No. 67.	Rollover 270 Degrees	A-67
Photo No. 68.	Rollover 360 Degrees	A-68
Photo No. 69.	Vehicle Impact	A-69

A-1.



Load Cell Location

FORMATION
U VEHICULE
SEIGNEMENTS

AR
RIERE : 3
875lbs.
ou 875lbs.

RE
ID
SI
I
A1

MFD. BY: TOYOTA MOTOR MANUFACTURING,
KENTUCKY, INC. 01/05

GVWR 4565LB GAWR FR 2665LB RR 2505LB
THIS VEHICLE CONFORMS TO ALL APPLICABLE
FEDERAL MOTOR VEHICLE SAFETY BUMPER AND
THEFT PREVENTION STANDARDS IN EFFECT ON
THE DATE OF MANUFACTURE SHOWN ABOVE.
4T1BK36B95U004556 PASS. CAR



C/TR: 4Q2/FA02 GSX30L-AEANKA
A/TM: -01A/U151E

31718

A-2.

Vehicle Certification Label

TIRE AND LOADING INFORMATION
SEE OWNER'S MANUAL FOR ADDITIONAL INFORMATION
RENSEIGNEMENTS RELATIFS AUX PNEUS ET A LA CHARGE DU VEHICULE
CONSULTER LE GUIDE DU PROPRIETAIRE POUR DE PLUS AMPLES RENSEIGNEMENTS

 **SEATING CAPACITY** | **TOTAL** | **FRONT** | **REAR**
NOMBRE DE PLACES | **TOTAL : 5** | **AVANT : 2** | **ARRIERE : 3**

The combined weight of occupants and cargo should never exceed **397kg** or **875lbs**.
 La charge du véhicule (occupants et baggages) ne doit jamais dépasser **397kg** ou **875lbs**.

ORIGINAL TIRE SIZE DIMENSIONS DES PNEU D'ORIGINE		COLD TIRE INFLATION PRESSURE PRESSION DE GONFLAGE A FROID	
FRONT/AVANT	P215/60R16	FRONT/AVANT	200 kPa, 29PSI
REAR/ARRIERE	P215/60R16	REAR/ARRIERE	200 kPa, 29PSI
FULL SIZE SPARE TIRE ROUE DE SECOURS PLEINE GRANDEUR		COLD TIRE INFLATION PRESSURE PRESSION DE GONFLAGE A FROID	
P215/60R16		200 kPa, 29PSI	

42661-AC100 A1



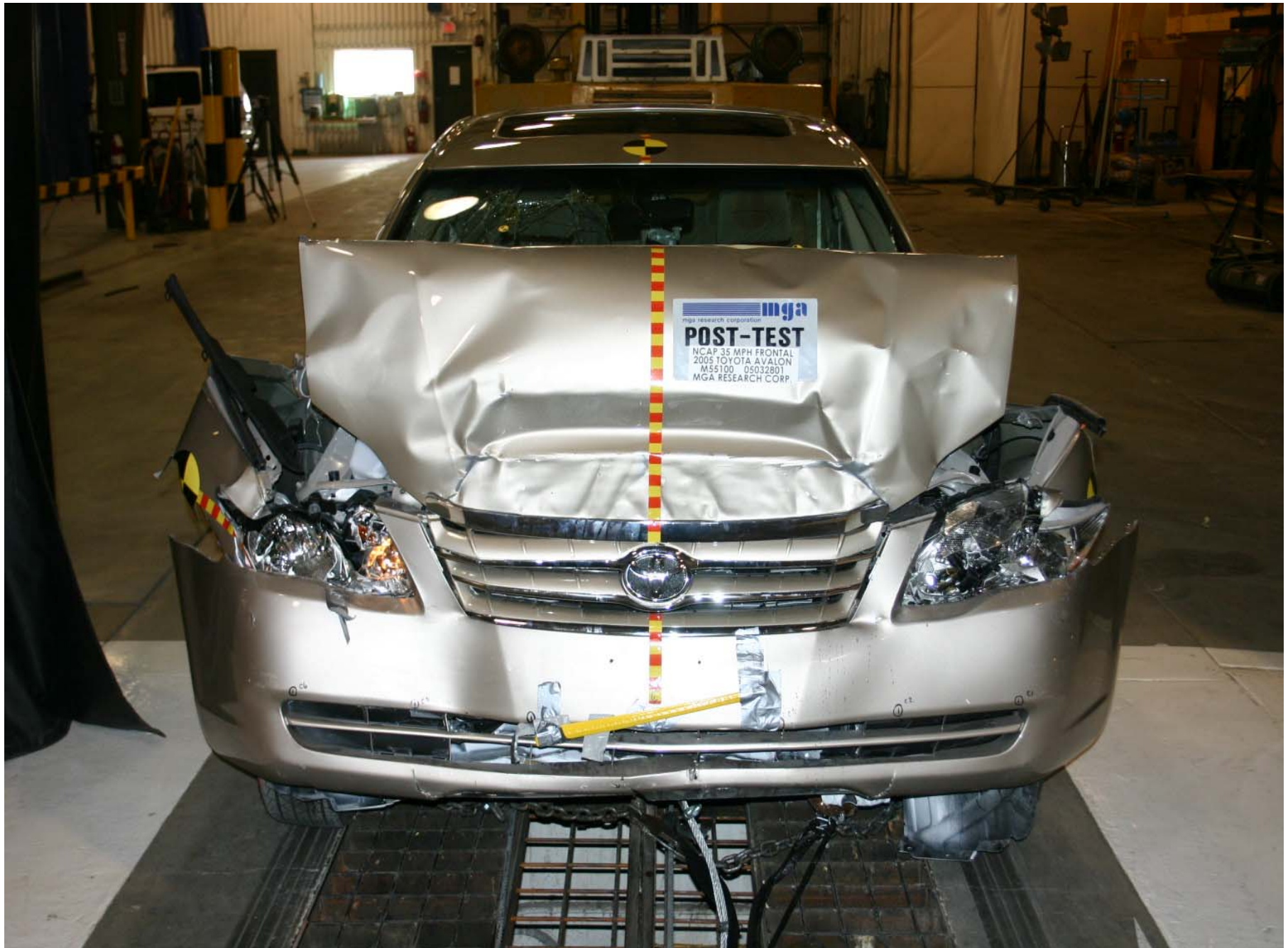
Right Front View of Test Vehicle, as received



Left Rear View of Test Vehicle, as received



Pre-Test Front View of Test Vehicle



Post-Test Front View of Test Vehicle



Pre-Test Left Side View of Test Vehicle



Post-Test Left Side View of Test Vehicle



Pre-Test Right Side View of Test Vehicle



Post-Test Right Side View of Test Vehicle



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



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



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



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



Pre-Test Left Rear Three-Quarter View of Doors



Pre-Test Right Rear Three-Quarter View of Doors



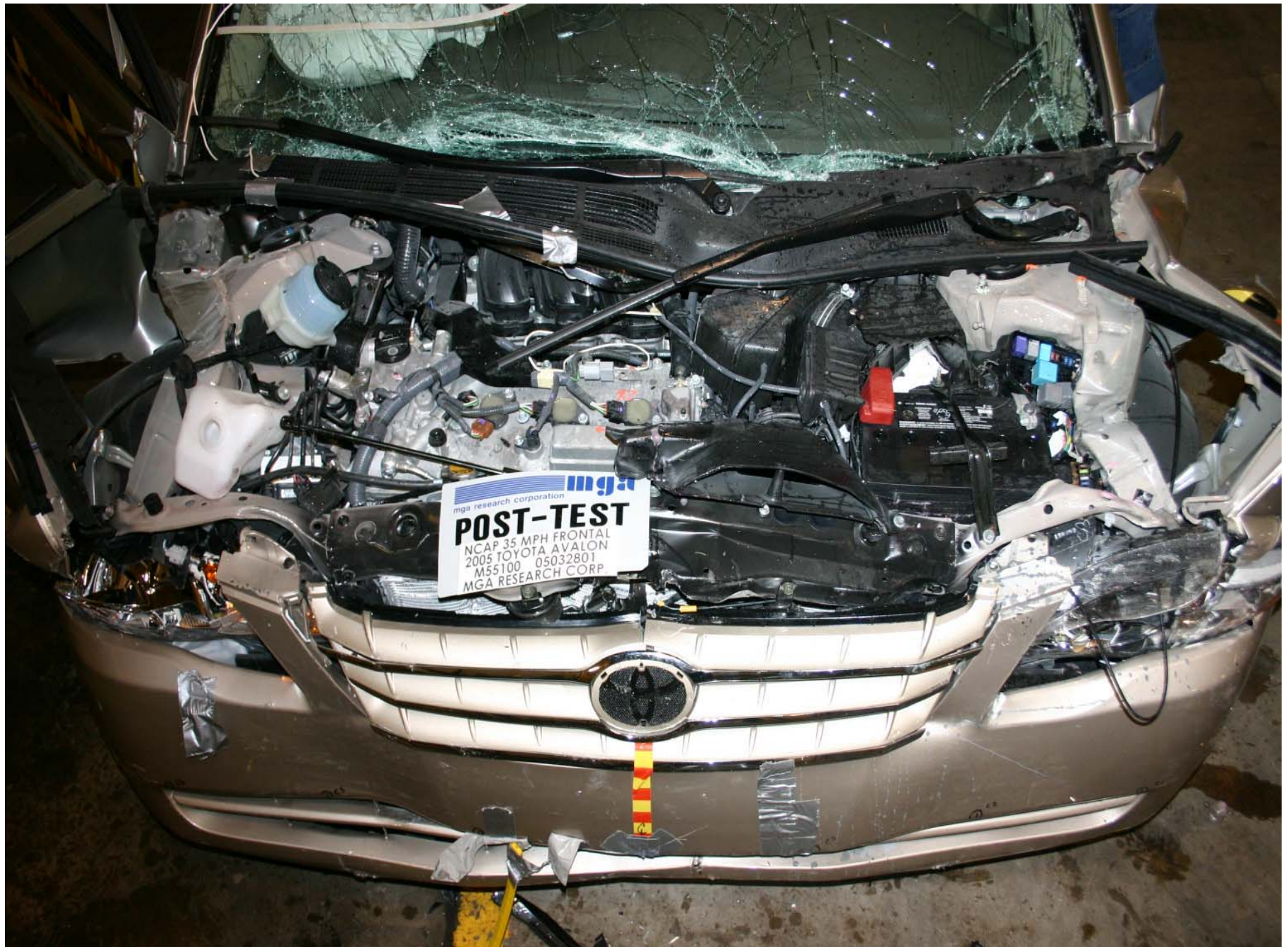
Pre-Test Windshield View



Post-Test Windshield View



Pre-Test Engine Compartment View



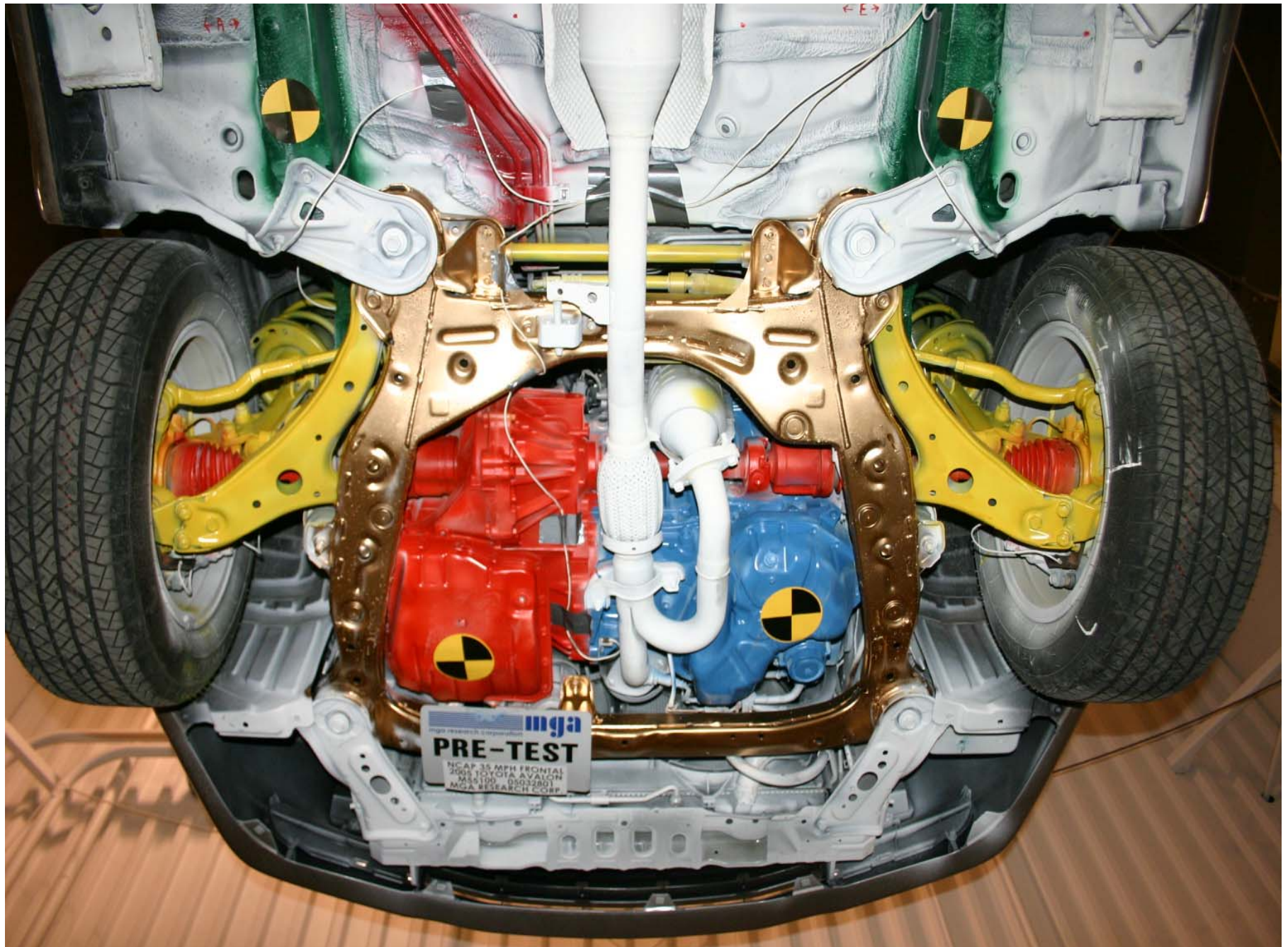
Post-Test Engine Compartment View



Pre-Test Fuel Filler Cap View



Post-Test Fuel Filler Cap View



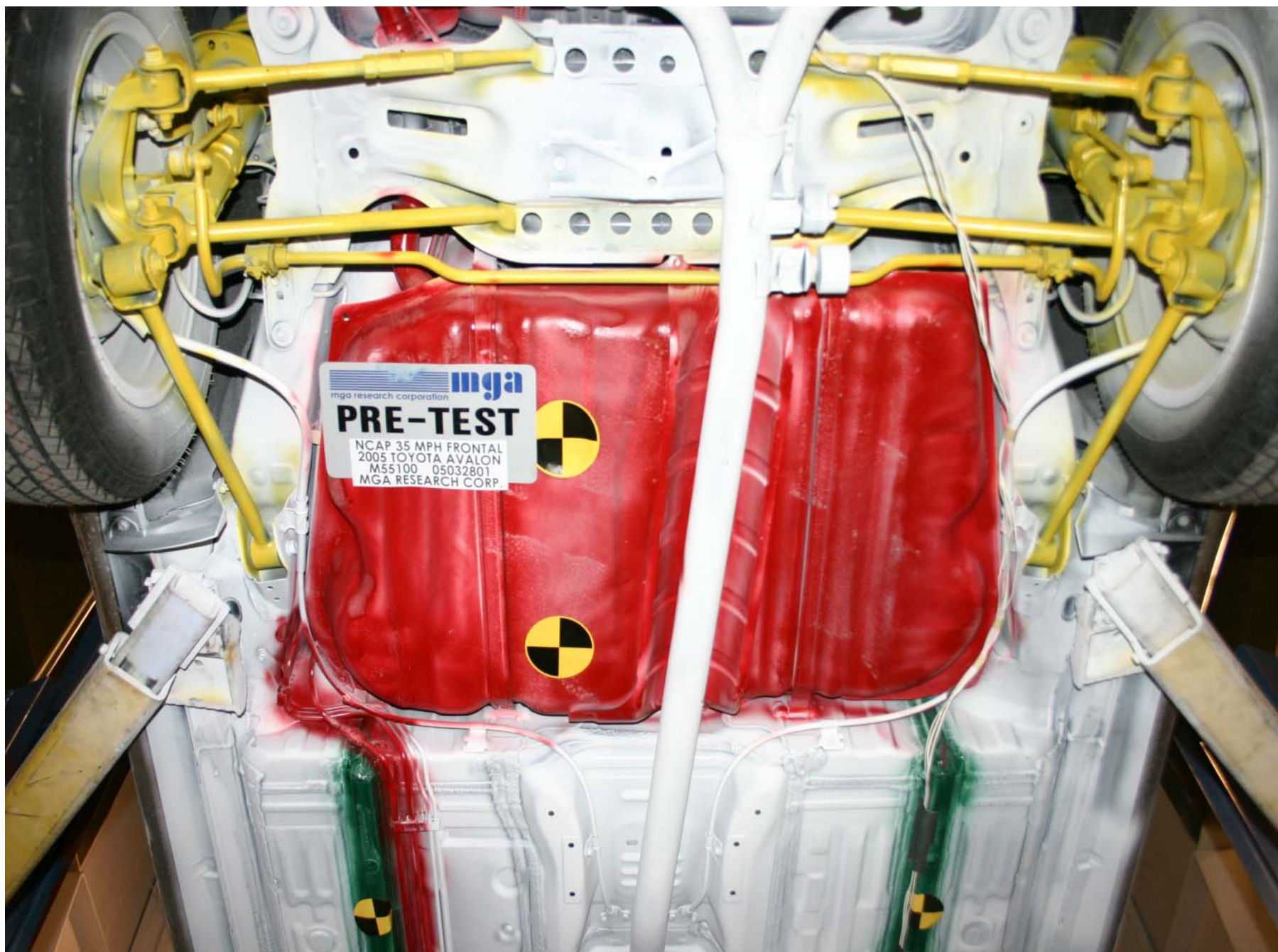
Pre-Test Front Underbody View



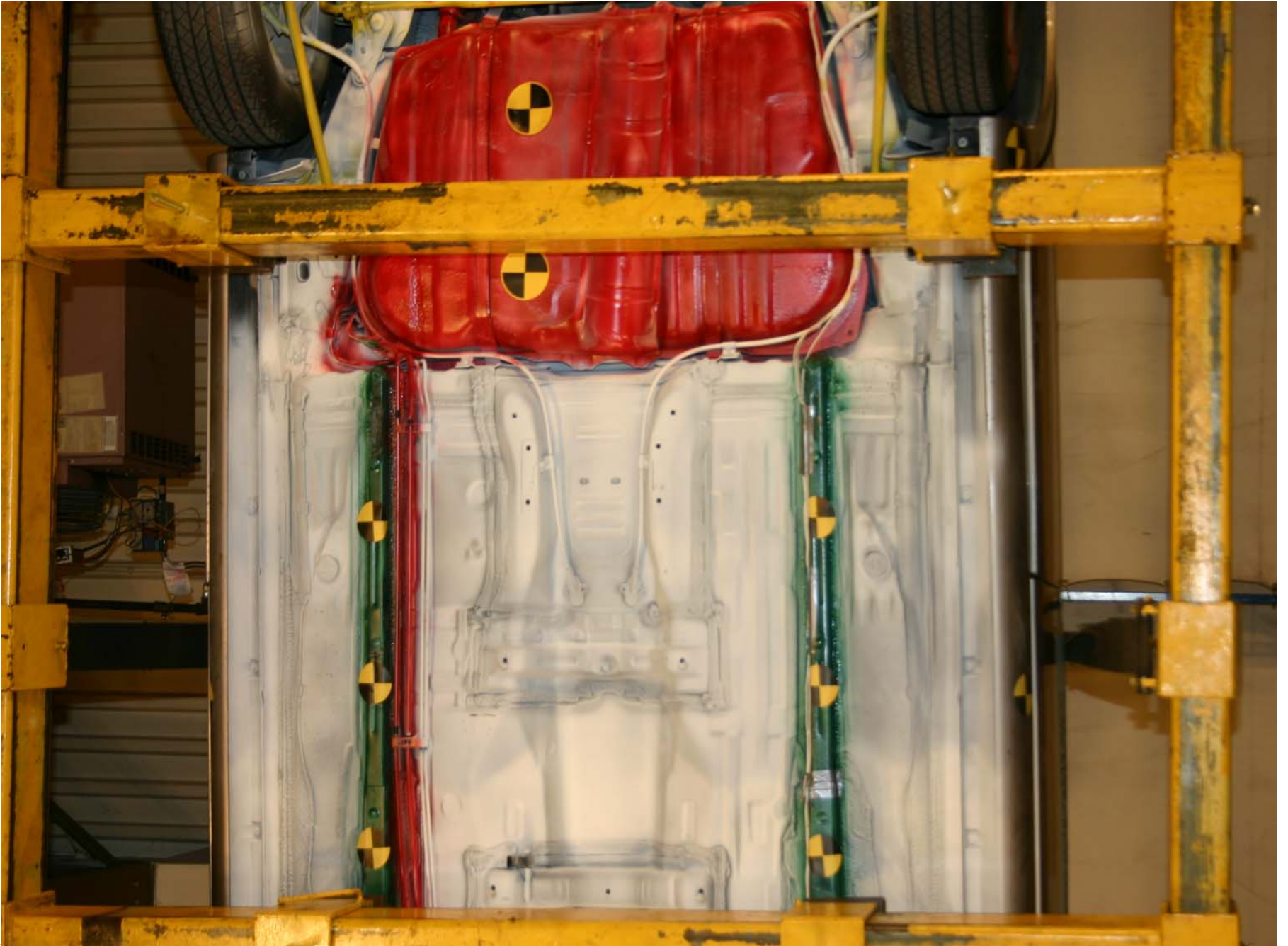
Post-Test Front Underbody View



Pre-Test Front Mid Underbody View



Pre-Test Rear Mid Underbody View



Post-Test Mid Underbody View



Pre-Test Rear Underbody View

A-30.



Post-Test Rear Underbody View



Pre-Test Driver Dummy Front View (head position)



Post-Test Driver Dummy Front View (head position)



Pre-Test Driver Dummy Position Left Side View



Post-Test Driver Dummy Position Left Side View



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



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



Pre-Test Driver Dummy Seat Position



Post-Test Driver Dummy Seat Position



Pre-Test Driver Dummy Feet Position



Post-Test Driver Dummy Feet Position



Pre-Test Driver Side Knee Bolster View



Post-Test Driver Side Knee Bolster View

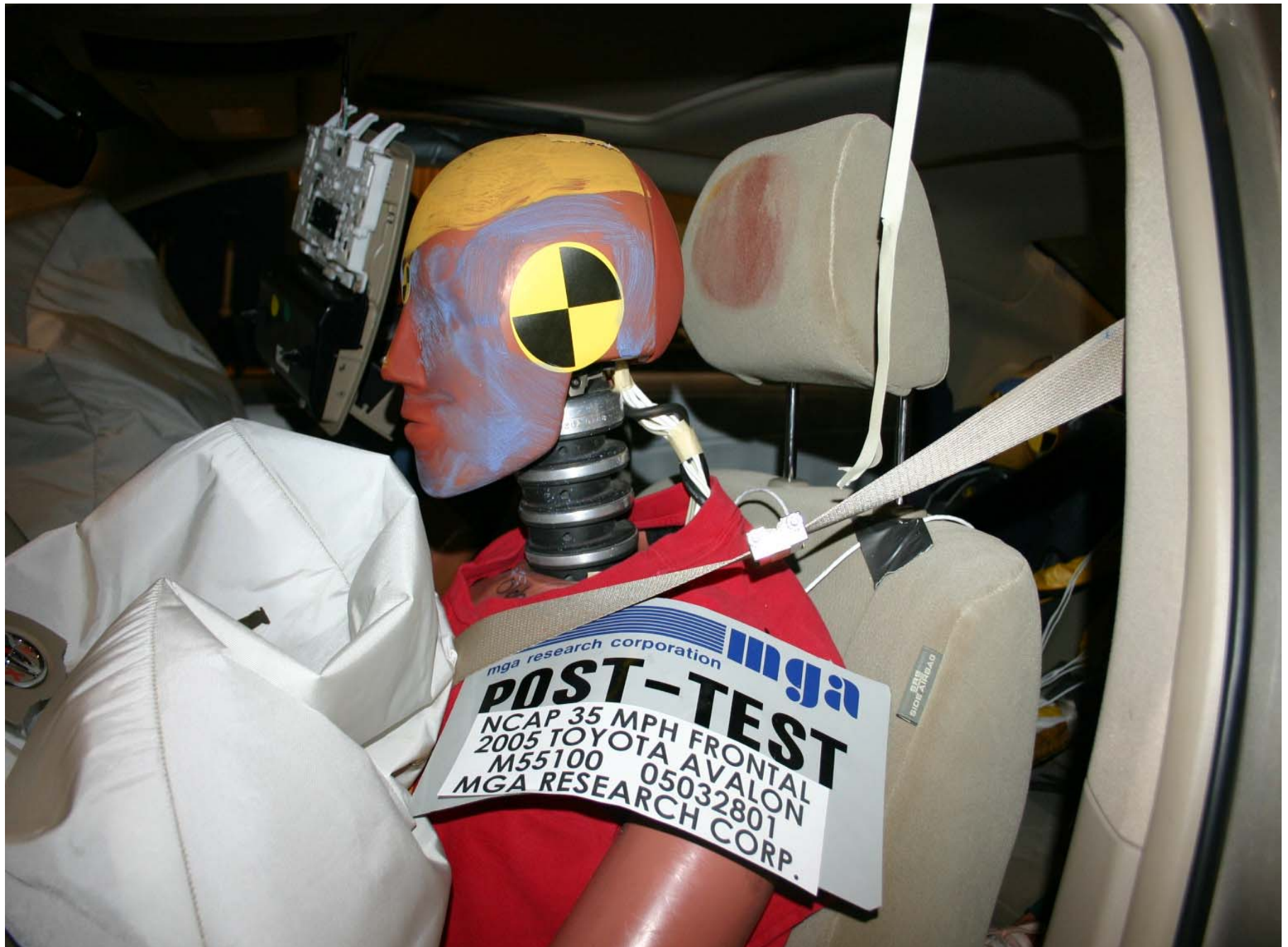


Pre-Test Driver Side Floor Pan View

A-44.



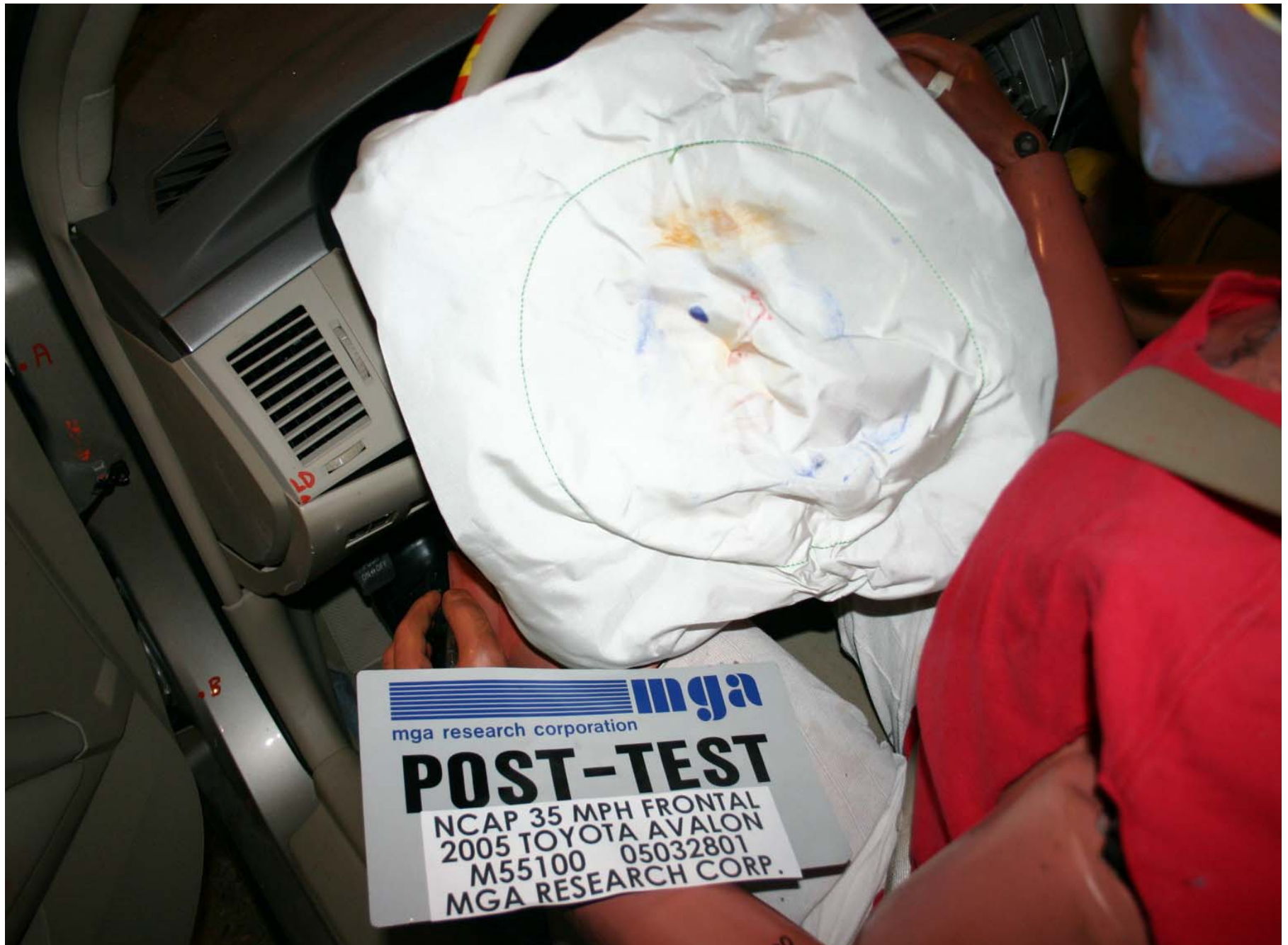
Post-Test Driver Side Floor Pan View



Post-Test Driver Dummy Head Contact



Post-Test Driver Dummy Knee Contact



Post-Test Driver Dummy Airbag Contact



Pre-Test Passenger Dummy Front View (head position)



Post-Test Passenger Dummy Front View (head position)



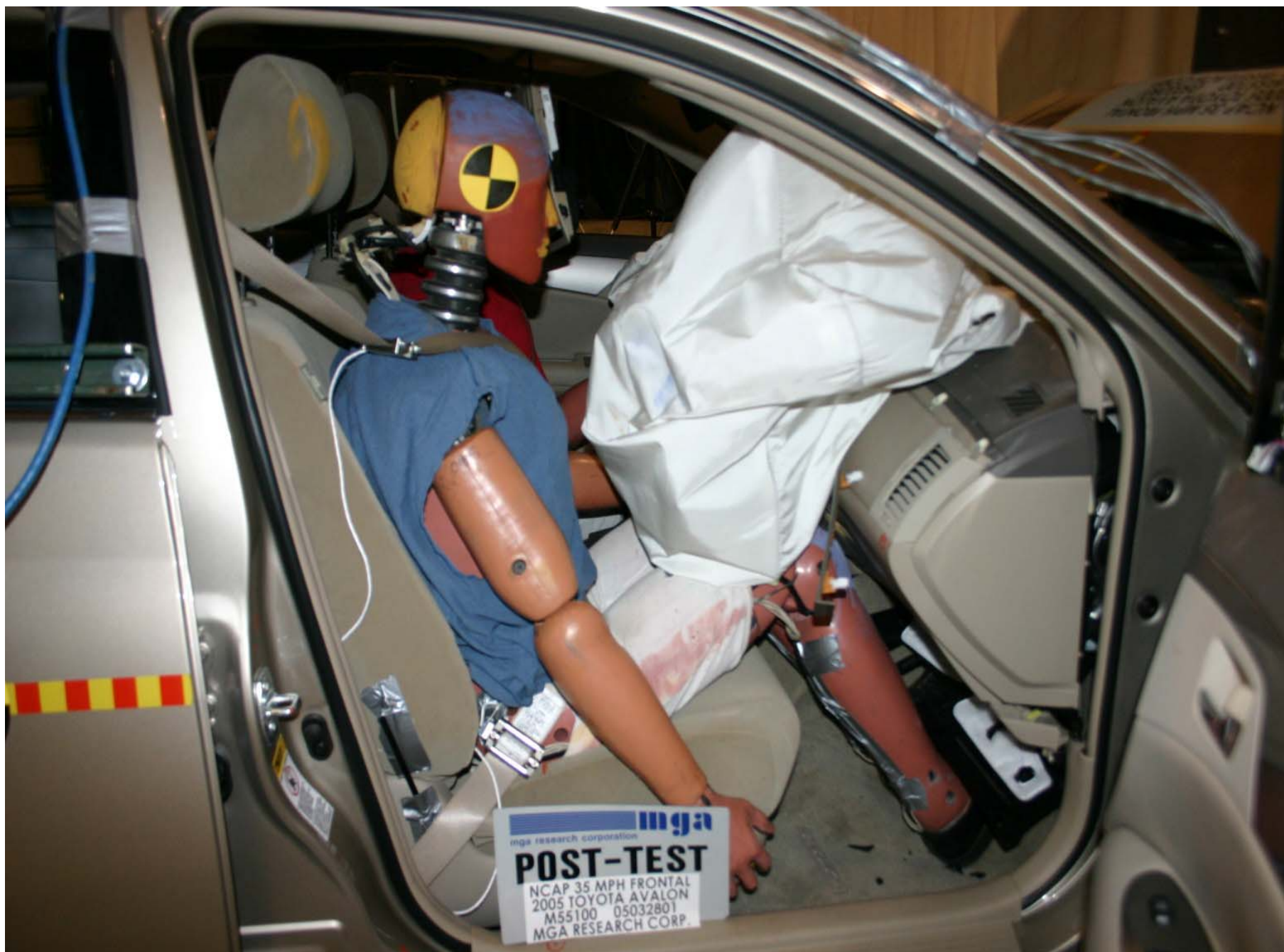
Pre-Test Passenger Dummy Position Right Side View



Post-Test Passenger Dummy Position Right Side View



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



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



Pre-Test Passenger Dummy Seat Position



Post-Test Passenger Dummy Seat Position



Pre-Test Passenger Dummy Feet Position



Post-Test Passenger Dummy Feet Position



Pre-Test Passenger Side Knee Bolster View



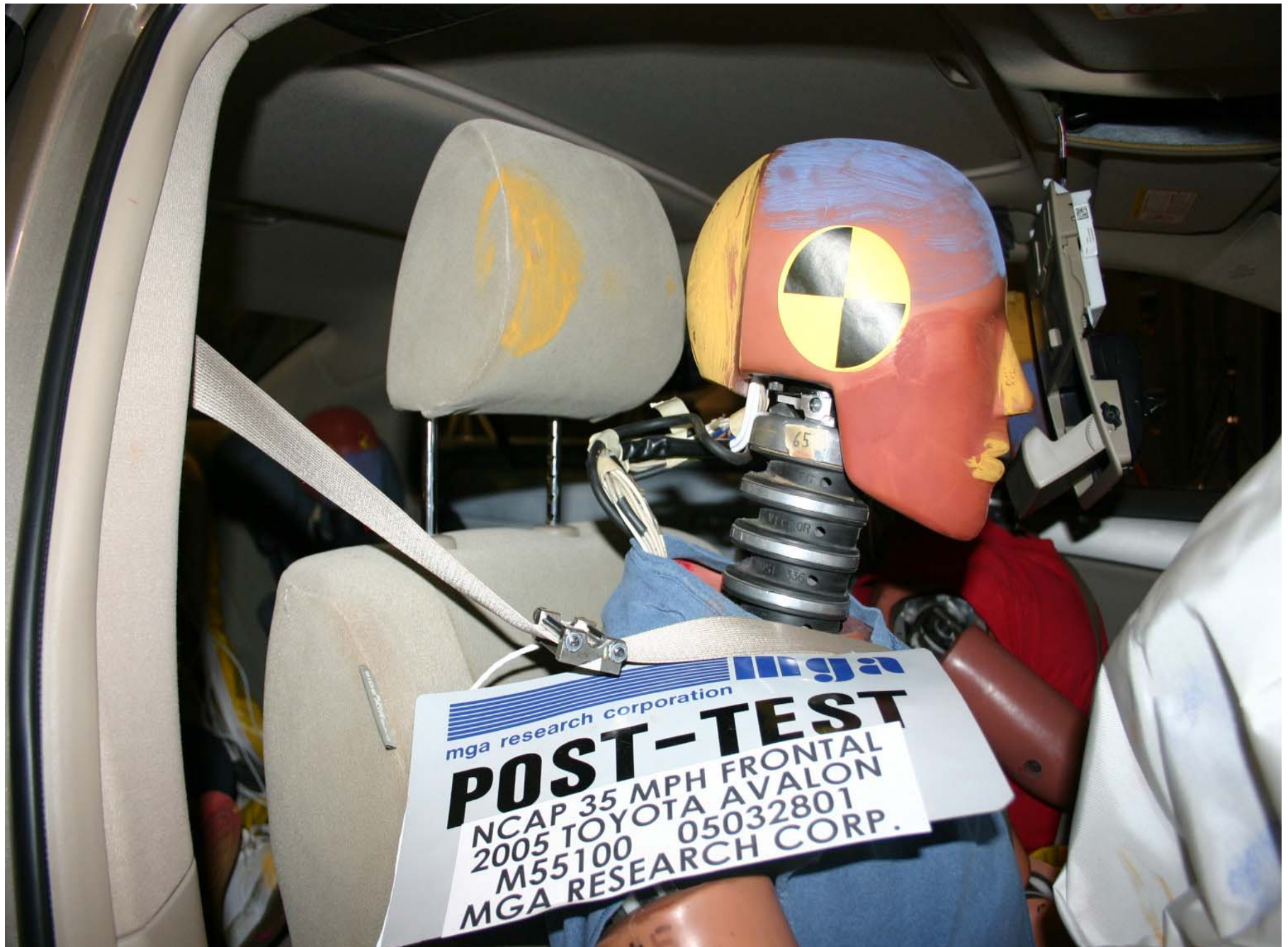
Post-Test Passenger Side Knee Bolster View



Pre-Test Passenger Side Floor Pan View



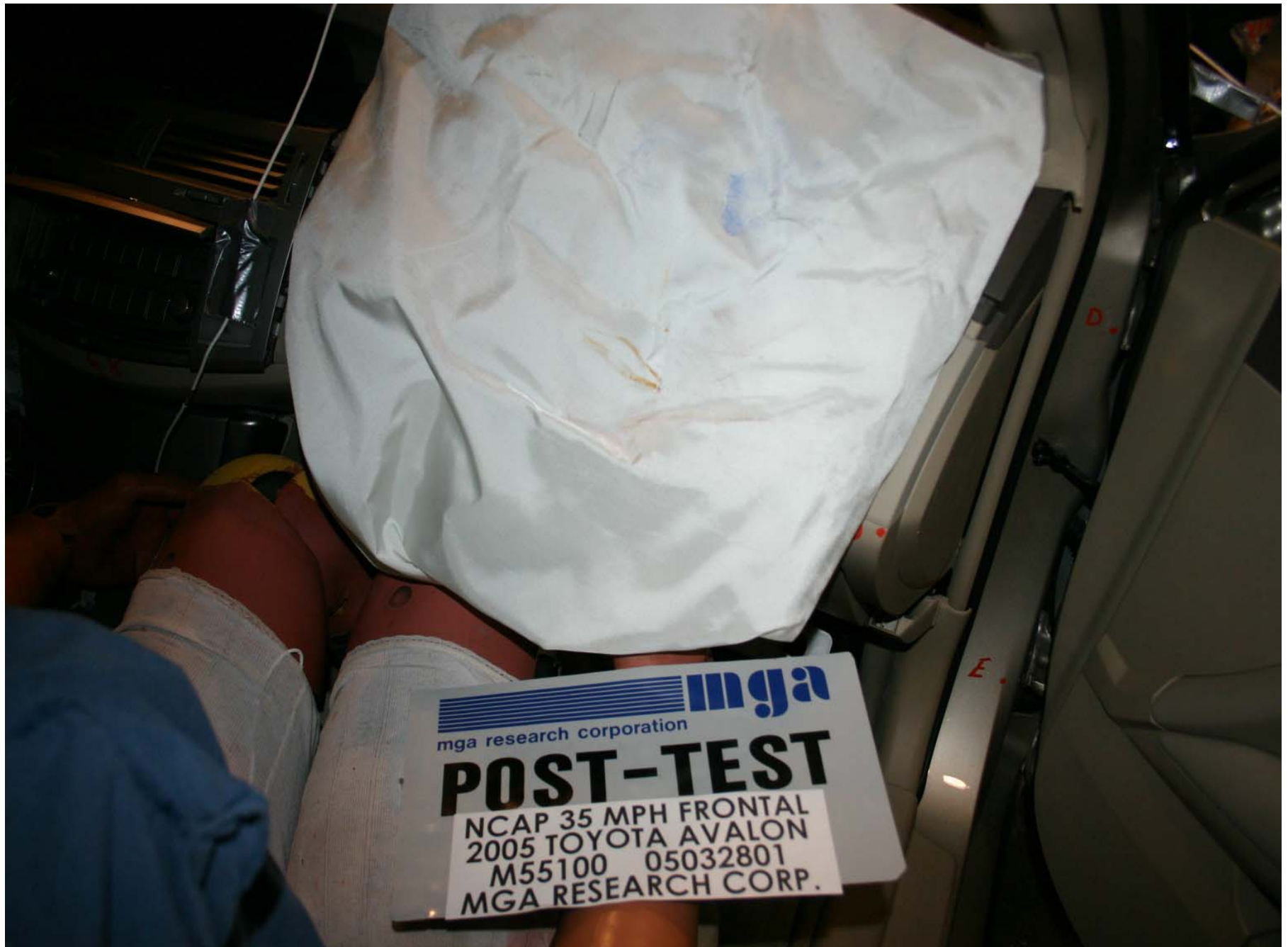
Post-Test Passenger Side Floor Pan View



Post-Test Passenger Dummy Head Contact



Post-Test Passenger Dummy Knee Contact



Post-Test Passenger Dummy Airbag Contact



Rollover 90 Degrees



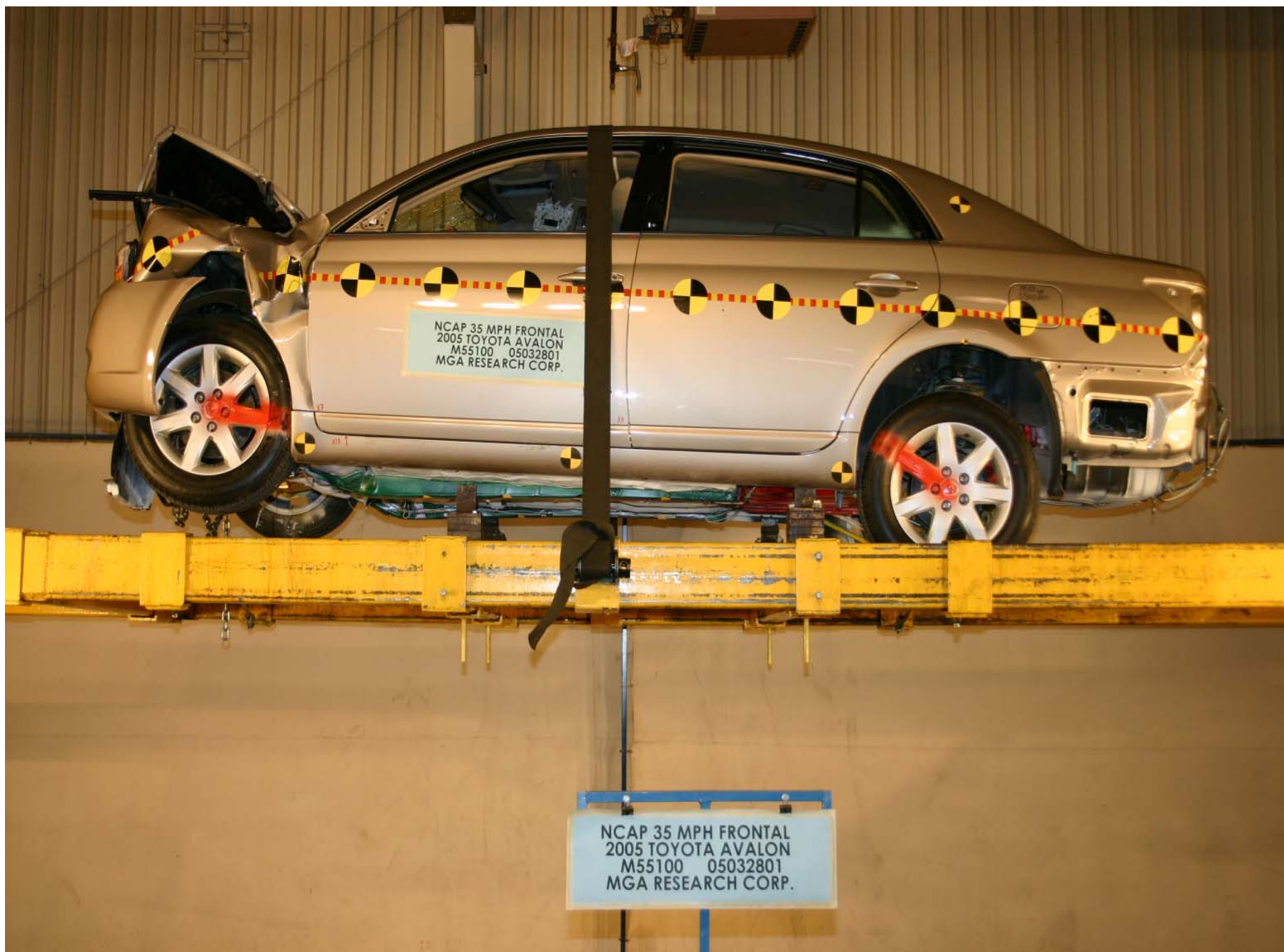
Rollover 180 Degrees

A-67.



NCAP 35 MPH FRONTAL
2005 TOYOTA AVALON
M55100 05032801
MGA RESEARCH CORP.

Rollover 270 Degrees



Rollover 360 Degrees



Vehicle Impact

APPENDIX B

DUMMY AND VEHICLE RESPONSE DATA TRACES

TABLE OF DATA PLOTS

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

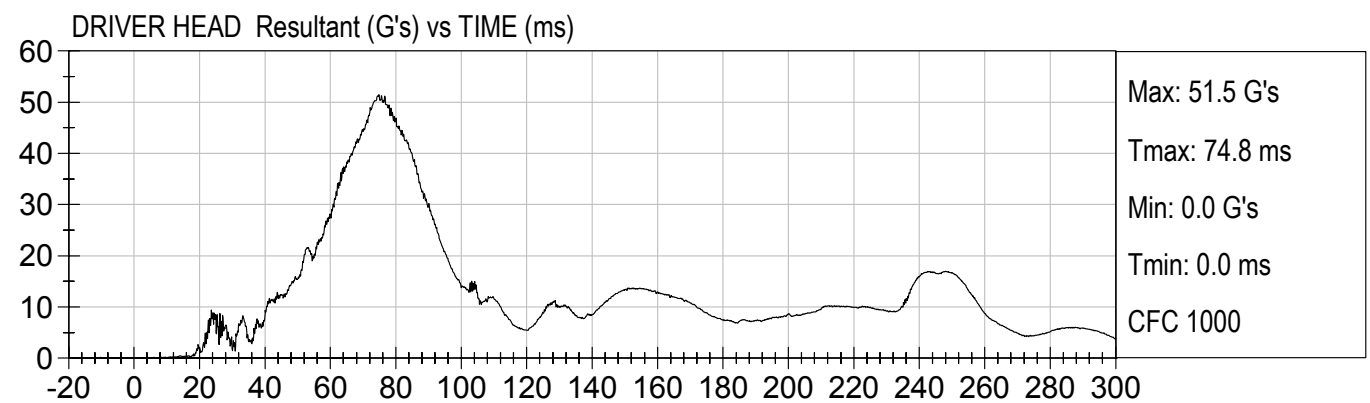
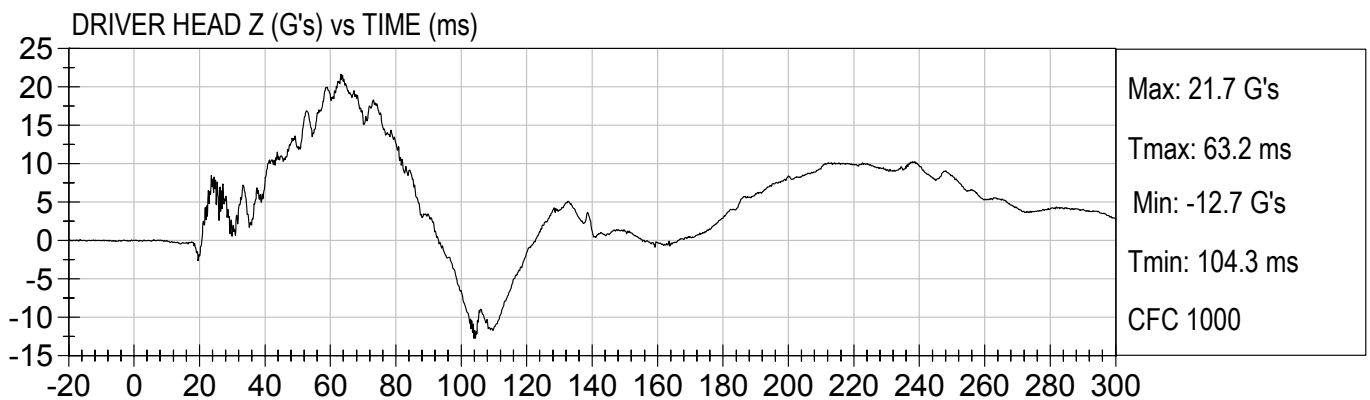
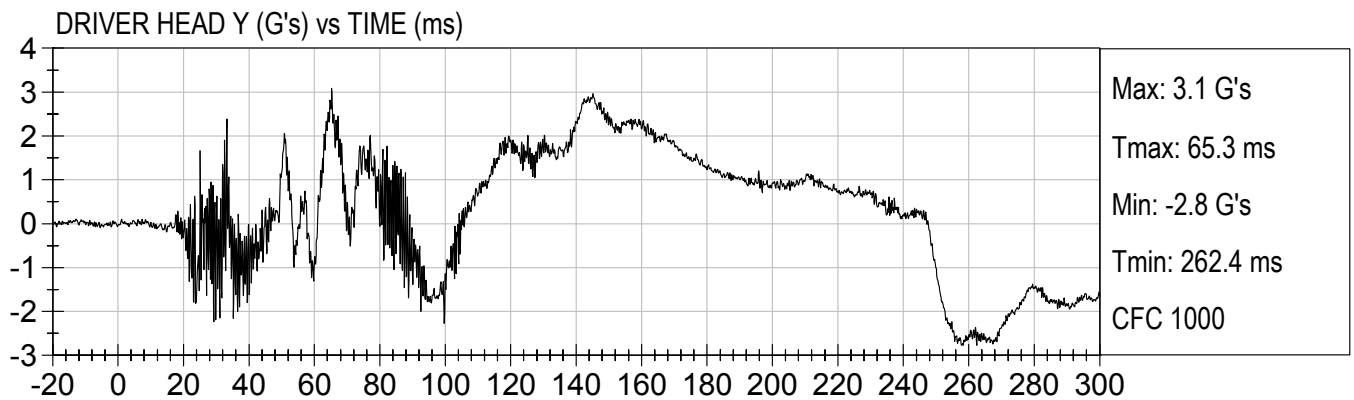
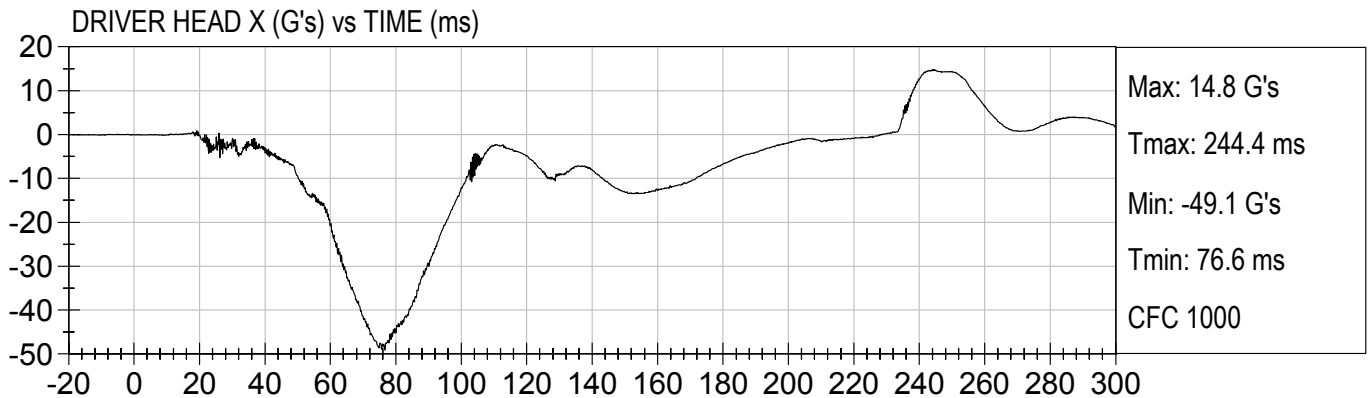
		<u>Page No.</u>
Figure No. 30.	Driver Chest Displacement vs. Time	B-8
Figure No. 31.	Driver Chest X Redundant Acceleration vs. Time	B-9
Figure No. 32.	Driver Chest Y Redundant Acceleration vs. Time	B-9
Figure No. 33.	Driver Chest Z Redundant Acceleration vs. Time	B-9
Figure No. 34.	Driver Chest Resultant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

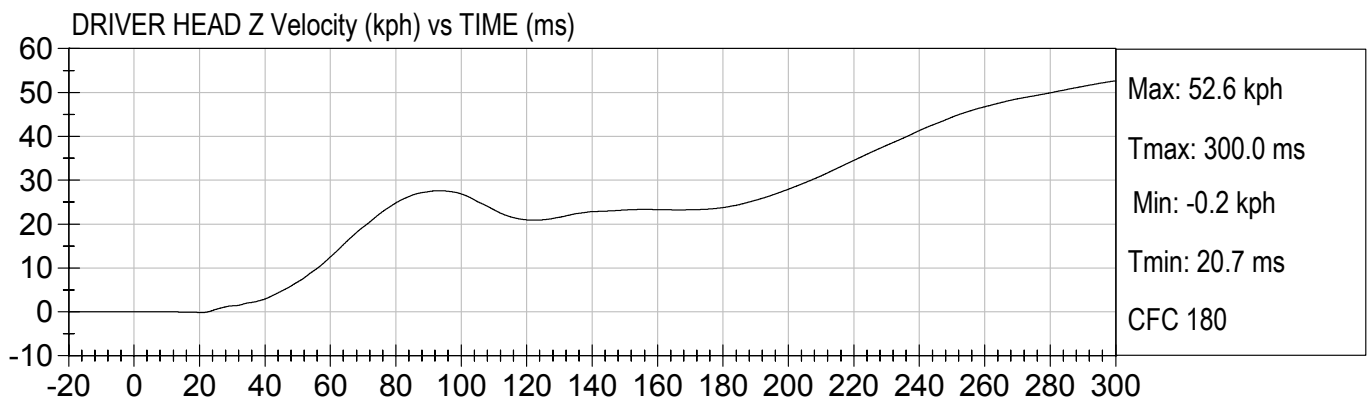
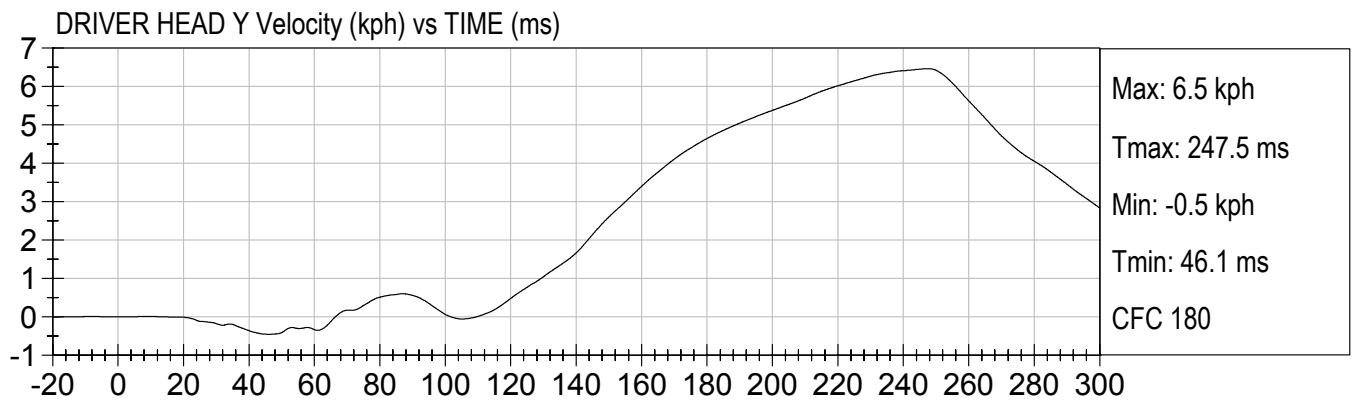
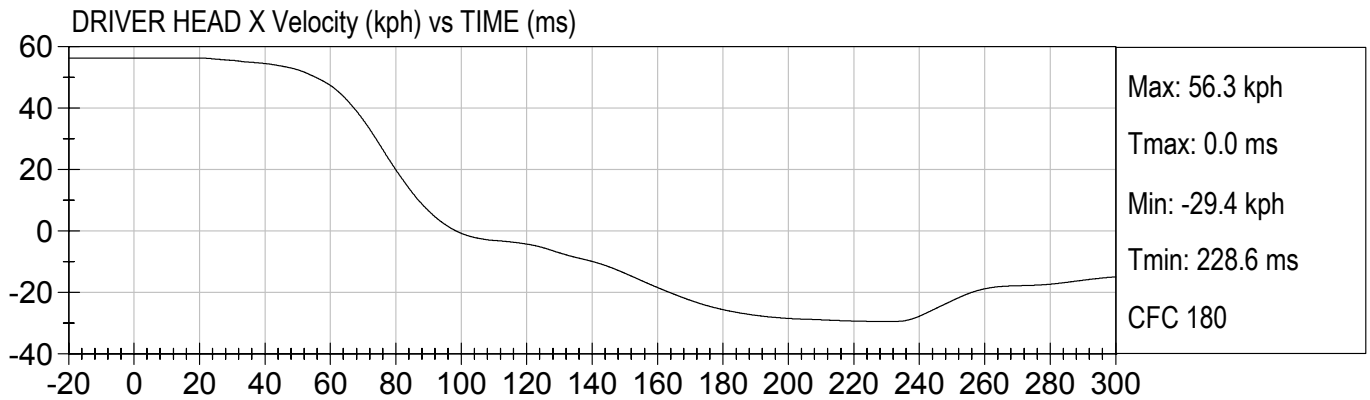
		<u>Page No.</u>
Figure No. 60.	Driver Right Lower Tibia Force Z vs. Time	B-17
Figure No. 61.	Driver Left Foot Z – Front Acceleration vs. Time	B-18
Figure No. 62.	Driver Left Ankle X Acceleration vs. Time	B-18
Figure No. 63.	Driver Left Ankle Z Acceleration vs. Time	B-18
Figure No. 64.	Driver Right Foot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

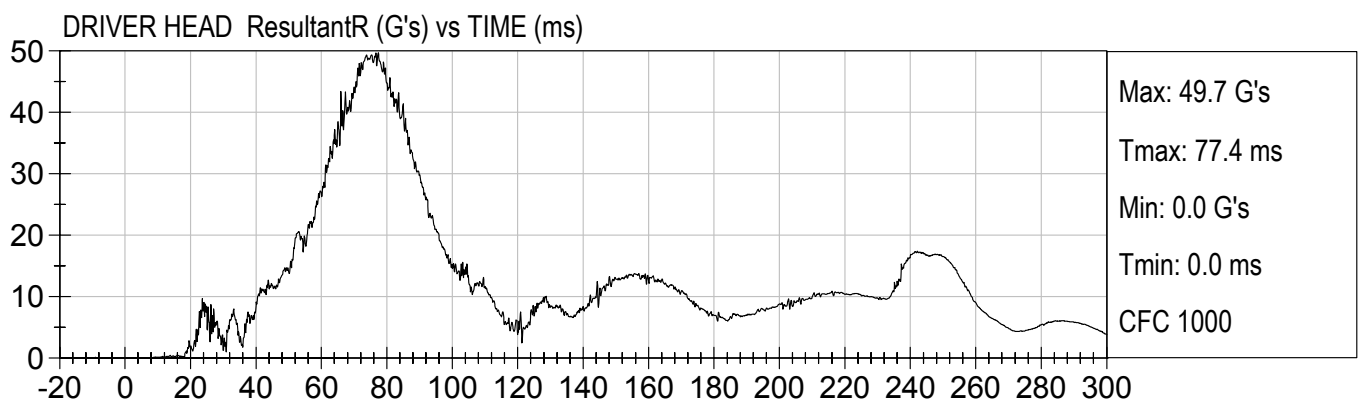
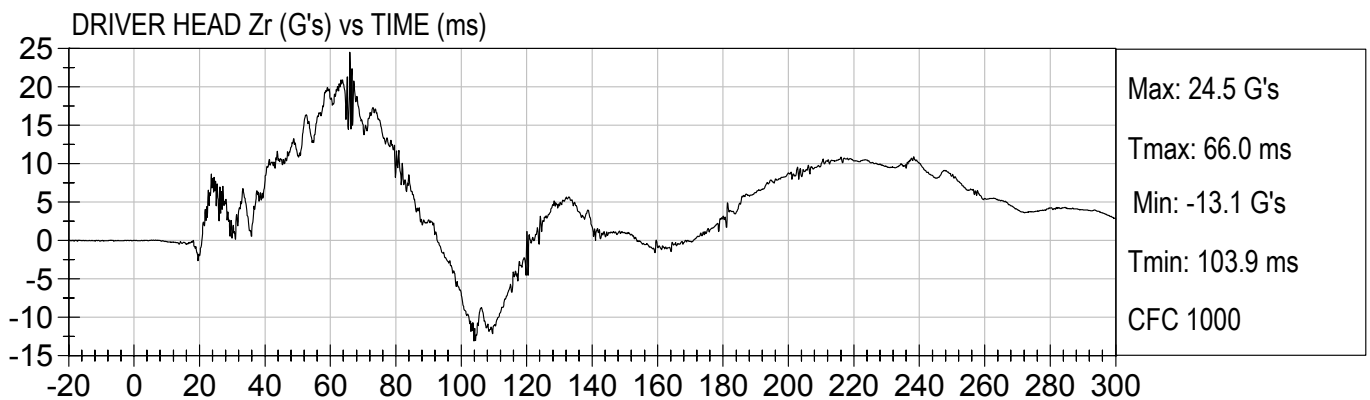
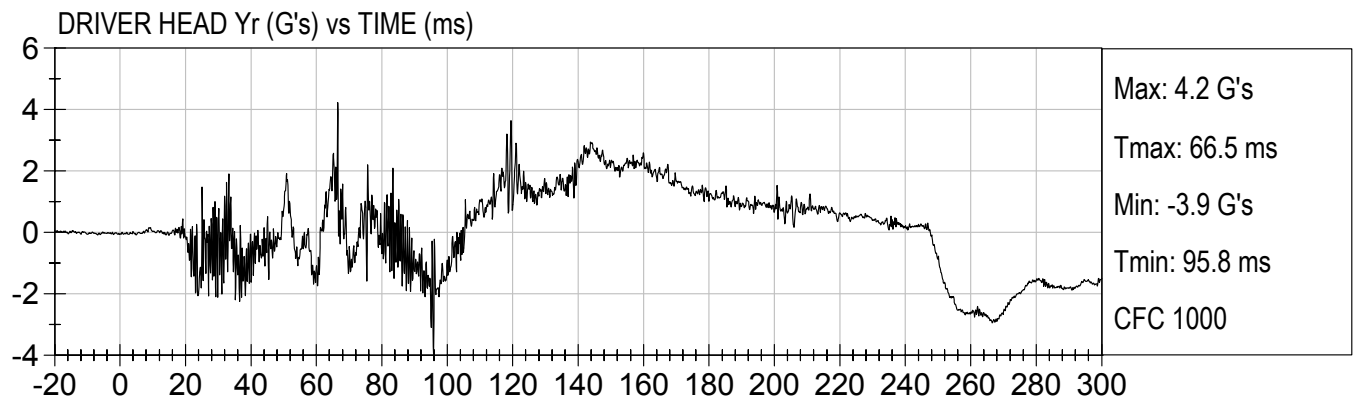
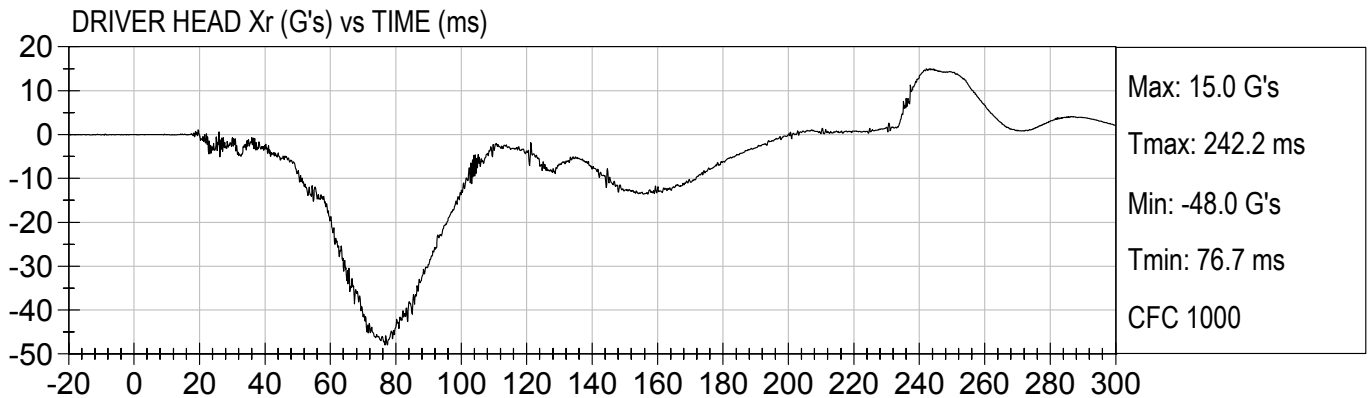
		<u>Page No.</u>
Figure No. 90.	Passenger Chest Y Acceleration vs. Time	B-26
Figure No. 91.	Passenger Chest Z Acceleration vs. Time	B-26
Figure No. 92.	Passenger Chest Resultant Acceleration vs. Time	B-26
Figure No. 93.	Passenger Chest X Velocity vs. Time	B-27
Figure No. 94.	Passenger Chest Y Velocity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

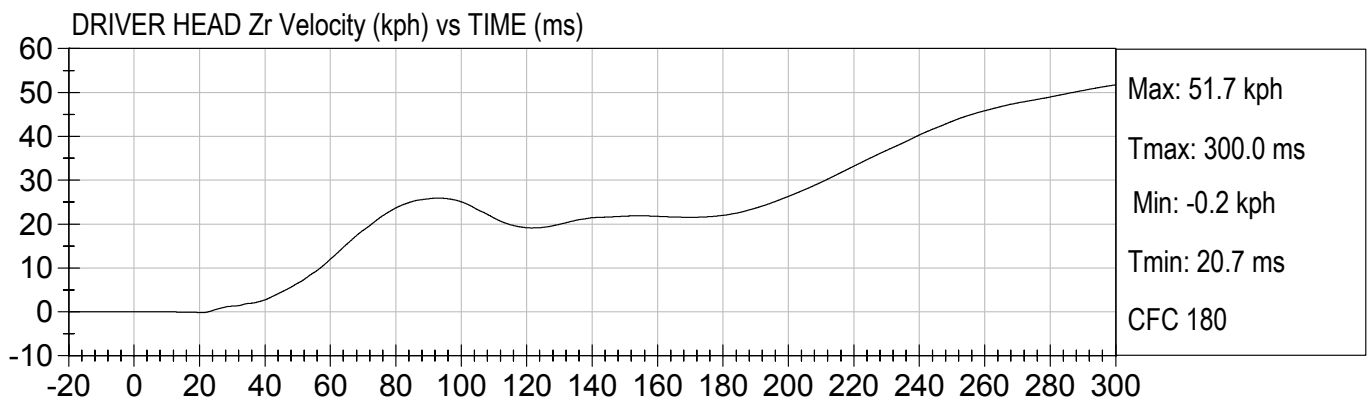
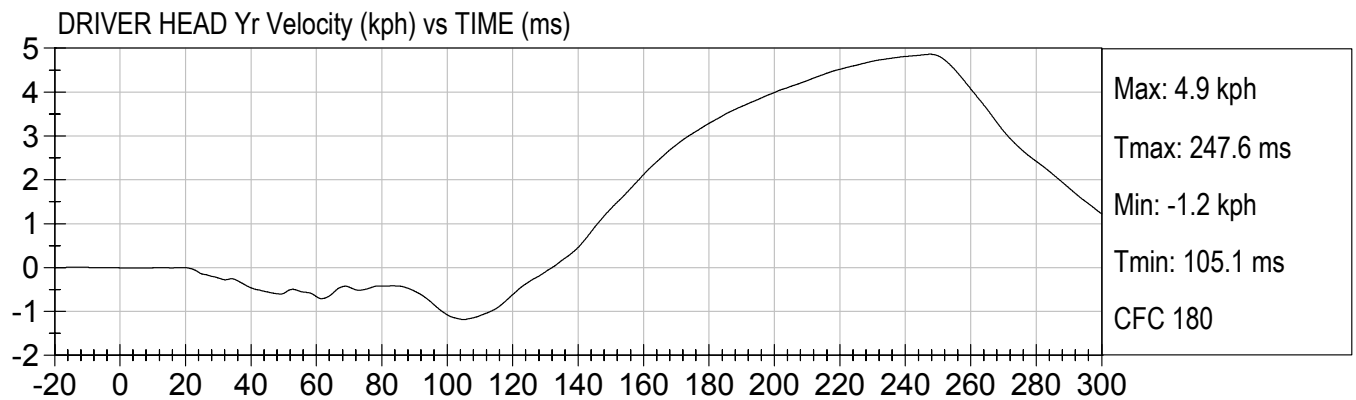
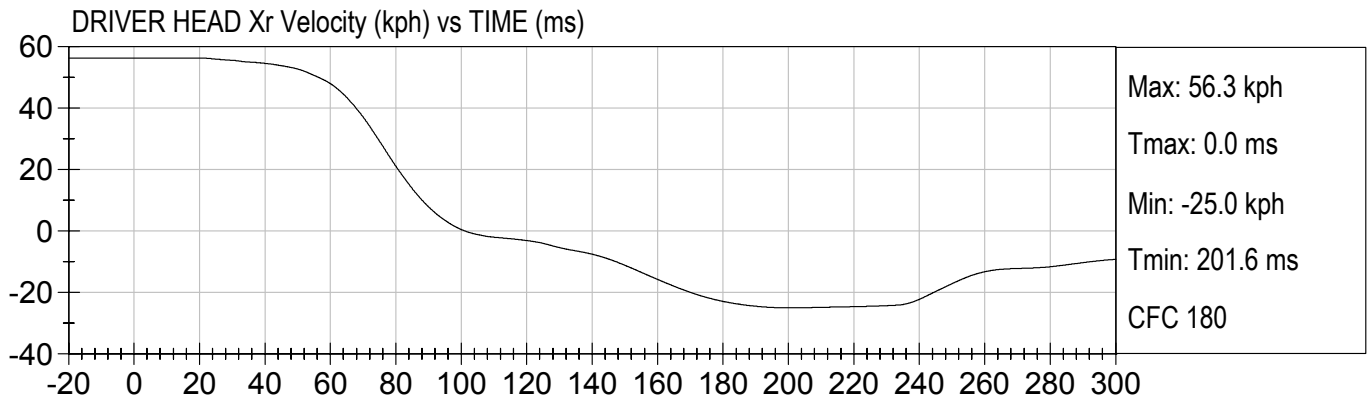
		<u>Page No.</u>
Figure No. 120.	Passenger Left Lower Tibia Moment Y vs. Time	B-34
Figure No. 121.	Passenger Left Lower Tibia Force X vs. Time	B-34
Figure No. 122.	Passenger Left Lower Tibia Force Z vs. Time	B-34
Figure No. 123.	Passenger Right Upper Tibia Moment X vs. Time	B-35
Figure No. 124.	Passenger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

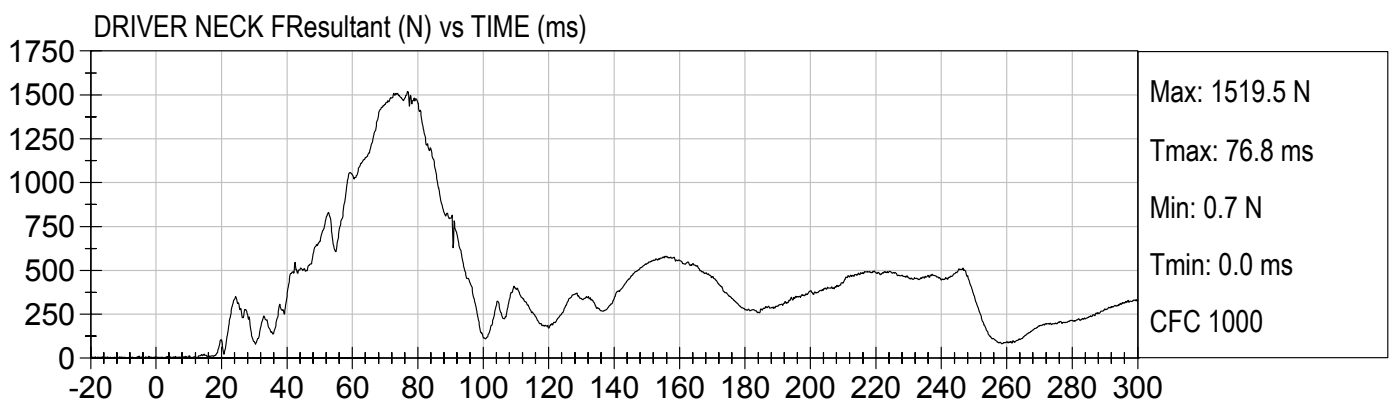
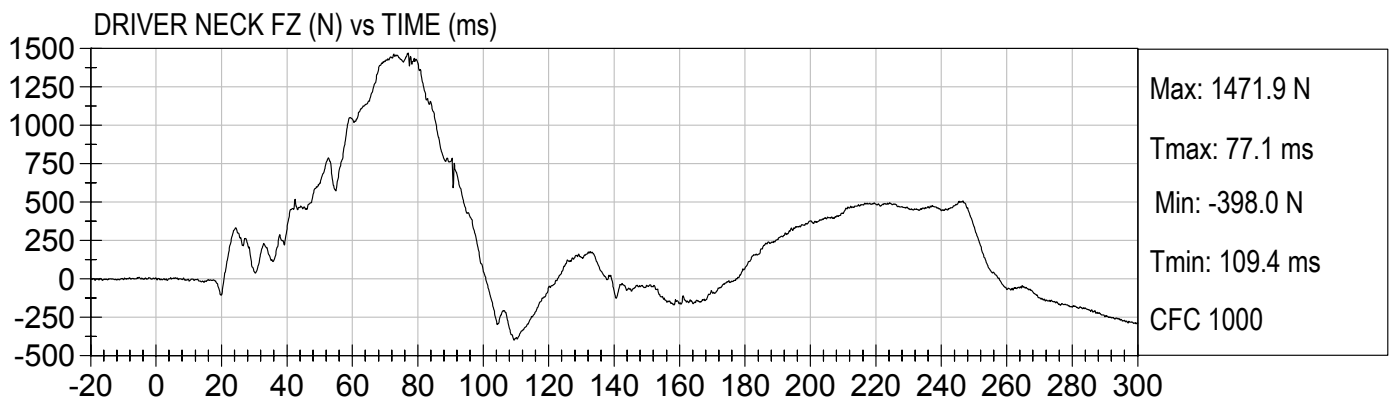
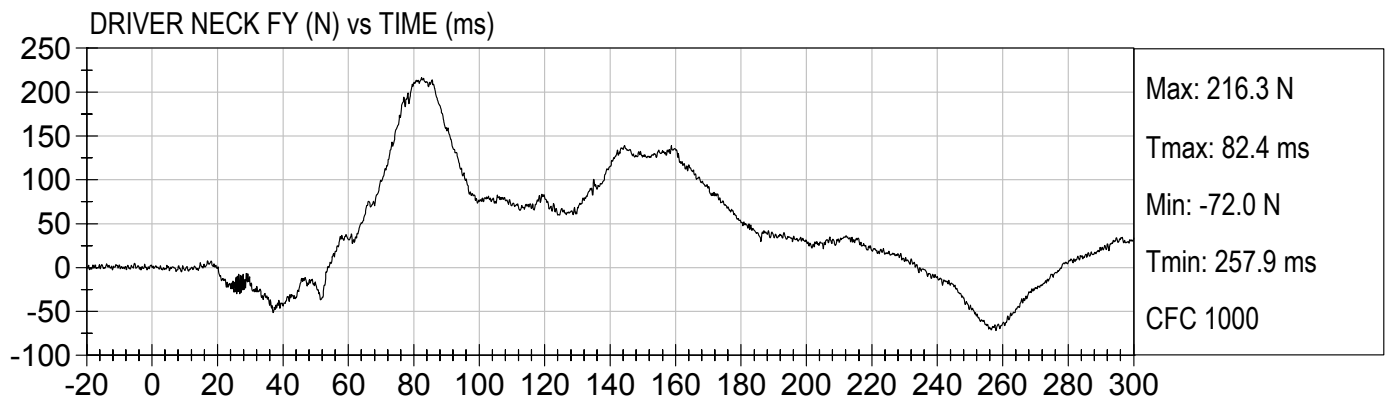
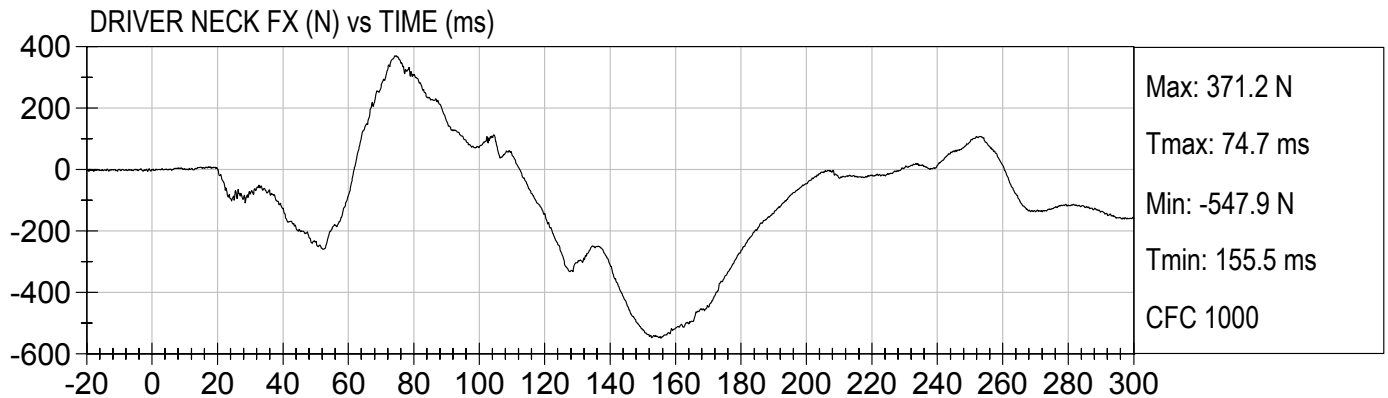
		<u>Page No.</u>
Figure No. 150.	Top of Engine X Velocity vs. Time	B-43
Figure No. 151.	Top of Engine X Displacement vs. Time	B-43
Figure No. 152.	Bottom of Engine X Acceleration vs. Time	B-44
Figure No. 153.	Bottom of Engine X Velocity vs. Time	B-44
Figure No. 154.	Bottom of Engine X Displacement vs. Time	B-44
Figure No. 155.	Left Brake Caliper X Acceleration vs. Time	B-45
Figure No. 156.	Left Brake Caliper X Velocity vs. Time	B-45
Figure No. 157.	Left Brake Caliper X Displacement vs. Time	B-45
Figure No. 158.	Right Brake Caliper X Acceleration vs. Time	B-46
Figure No. 159.	Right Brake Caliper X Velocity vs. Time	B-46
Figure No. 160.	Right Brake Caliper X Displacement vs. Time	B-46
Figure No. 161.	Instrument Panel X Acceleration vs. Time	B-47
Figure No. 162.	Instrument Panel X Velocity vs. Time	B-47
Figure No. 163.	Instrument Panel X Displacement vs. Time	B-47
Figure No. 164.	Barrier – Rows 1 to 9 Forces vs. Time	B-48
Figure No. 165.	Barrier – Total Force vs. Time	B-48

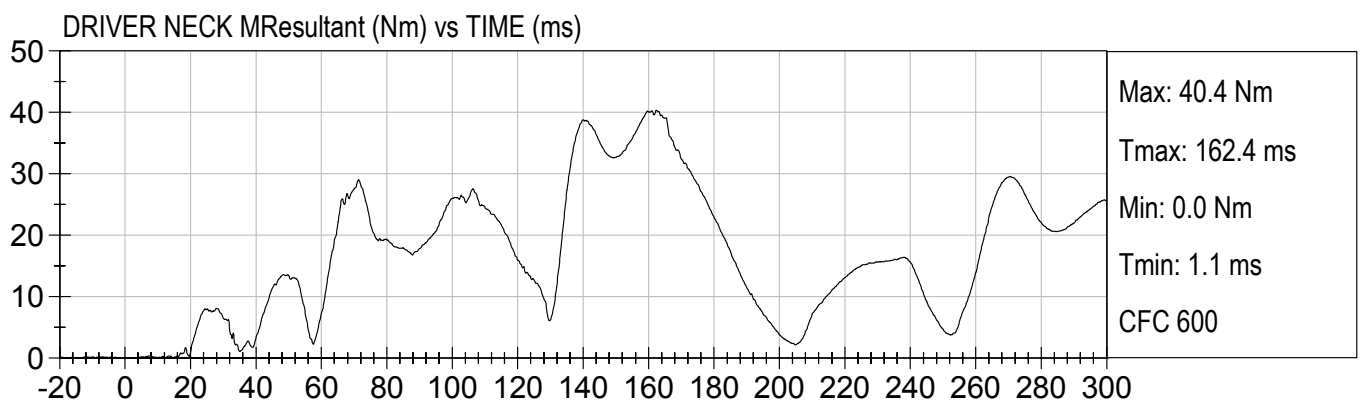
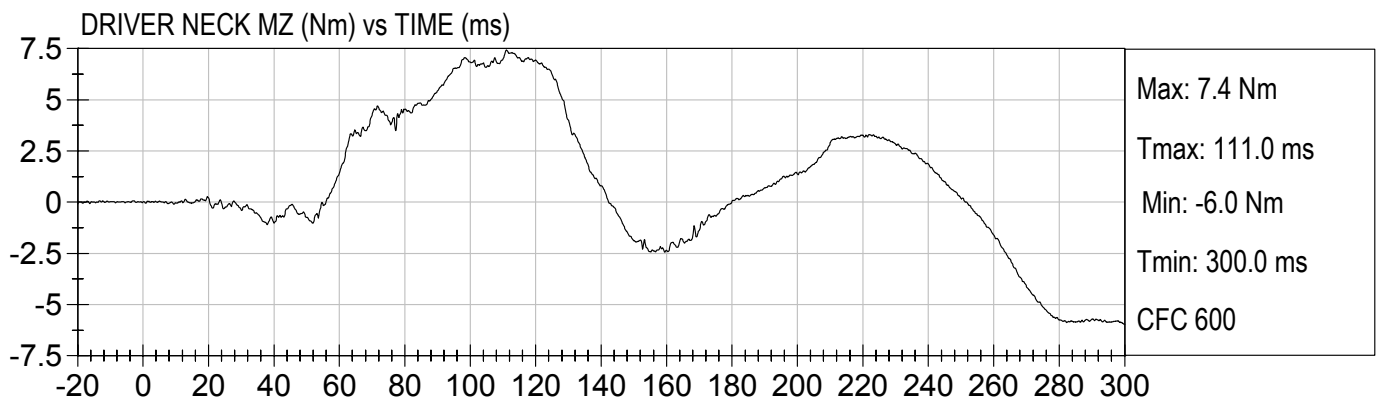
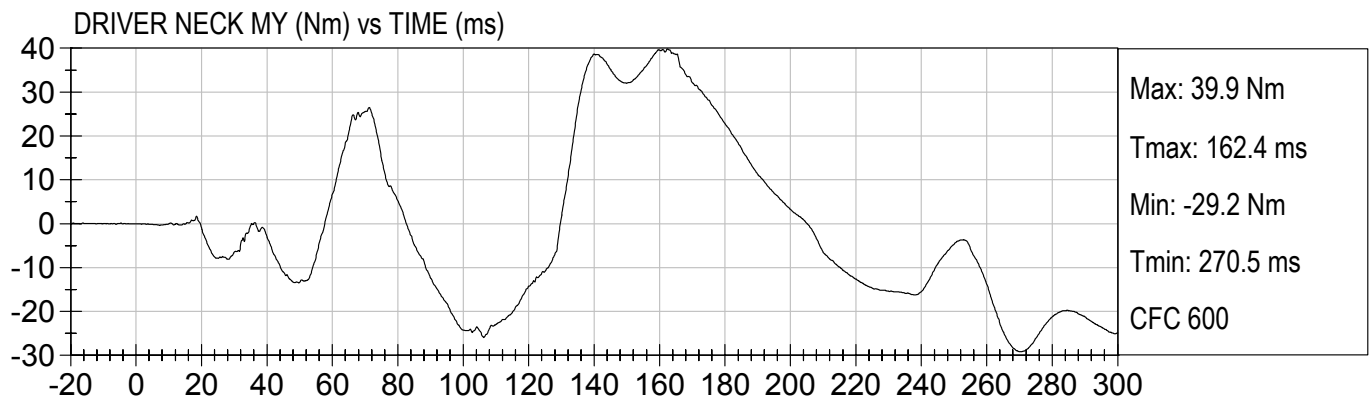
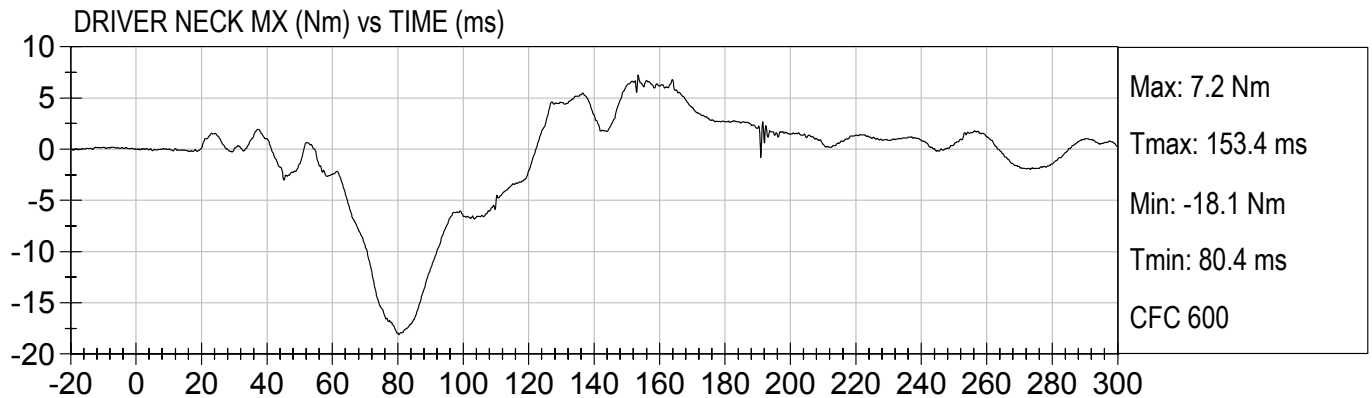


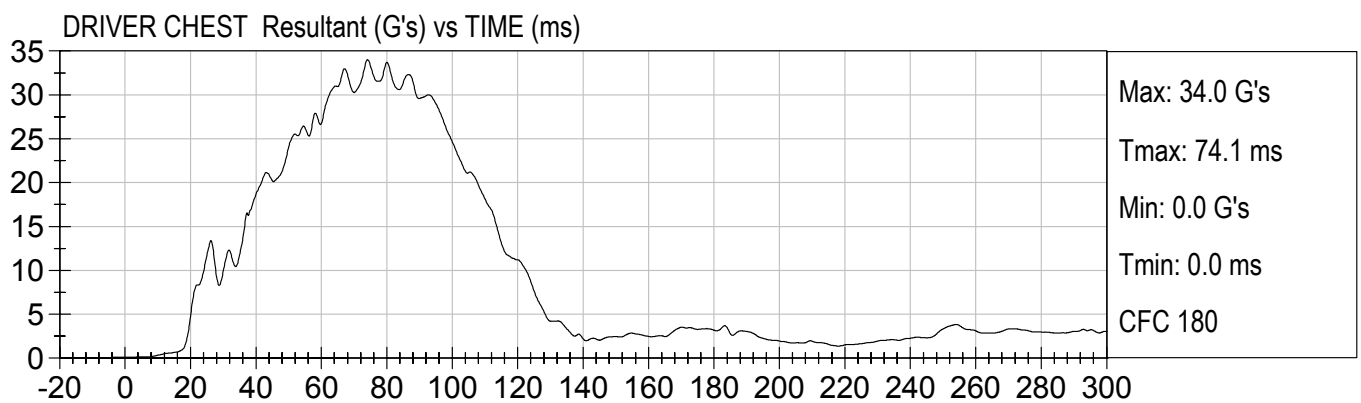
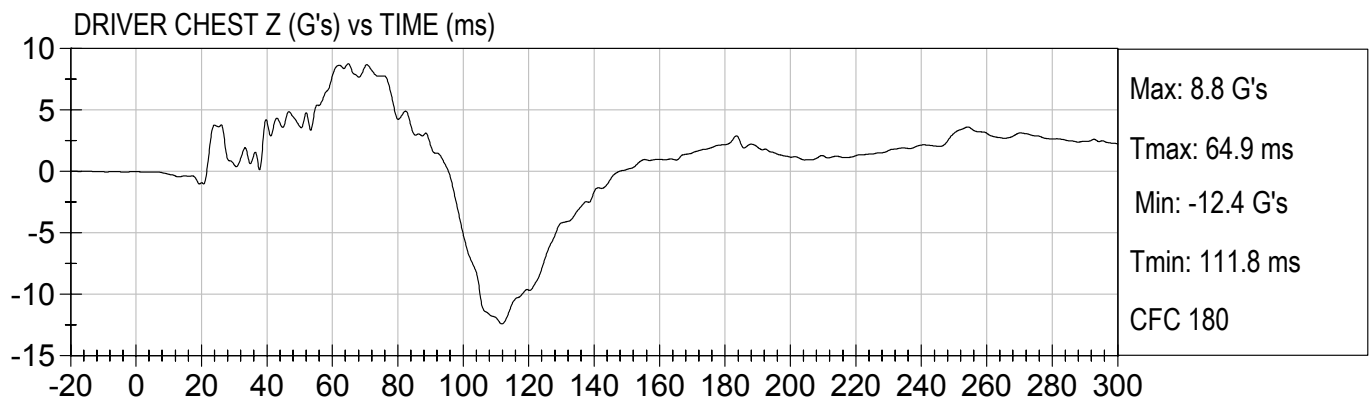
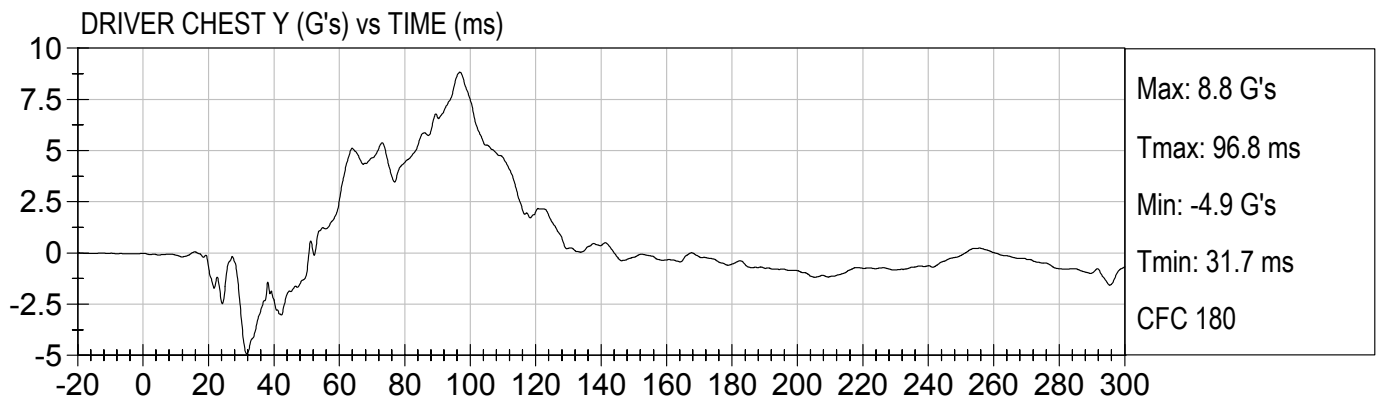
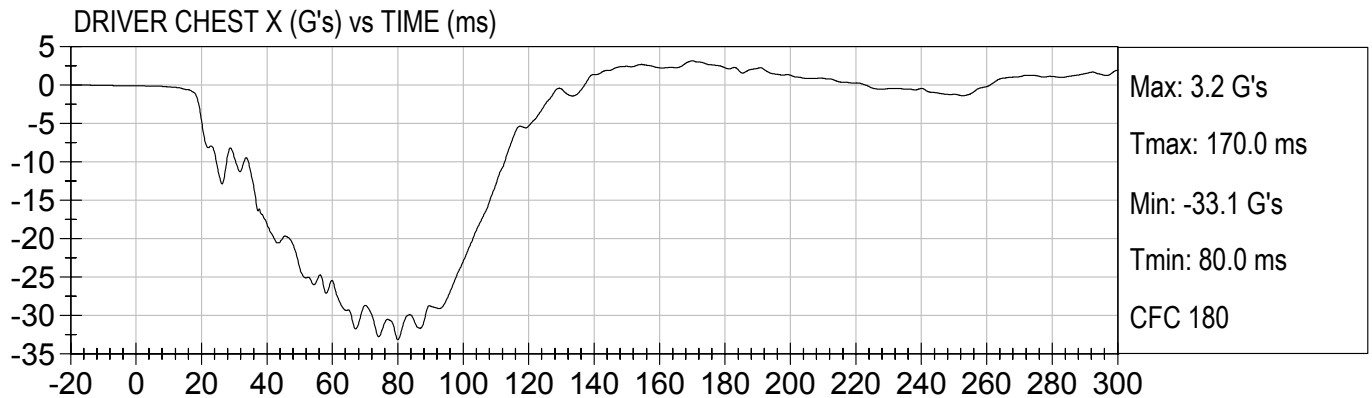


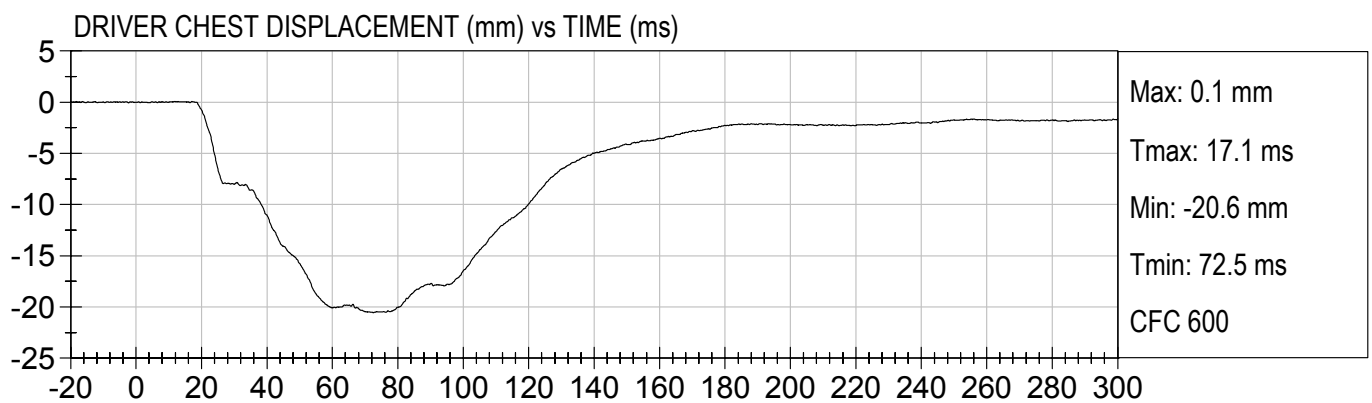
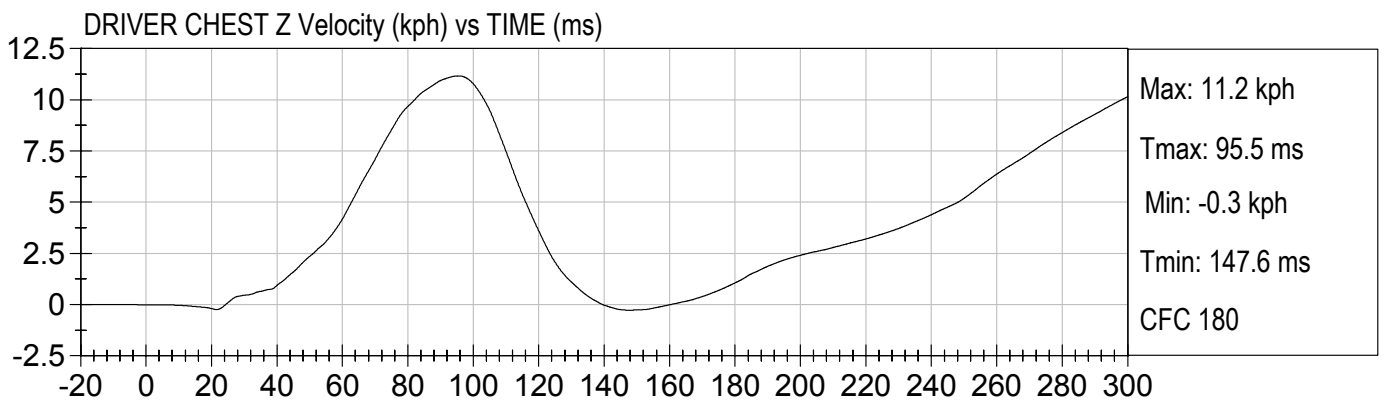
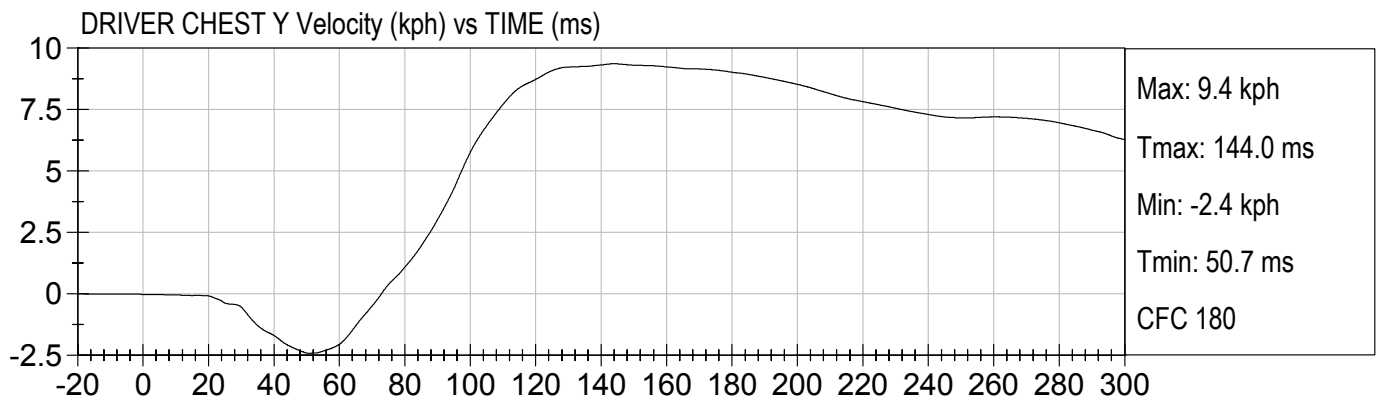
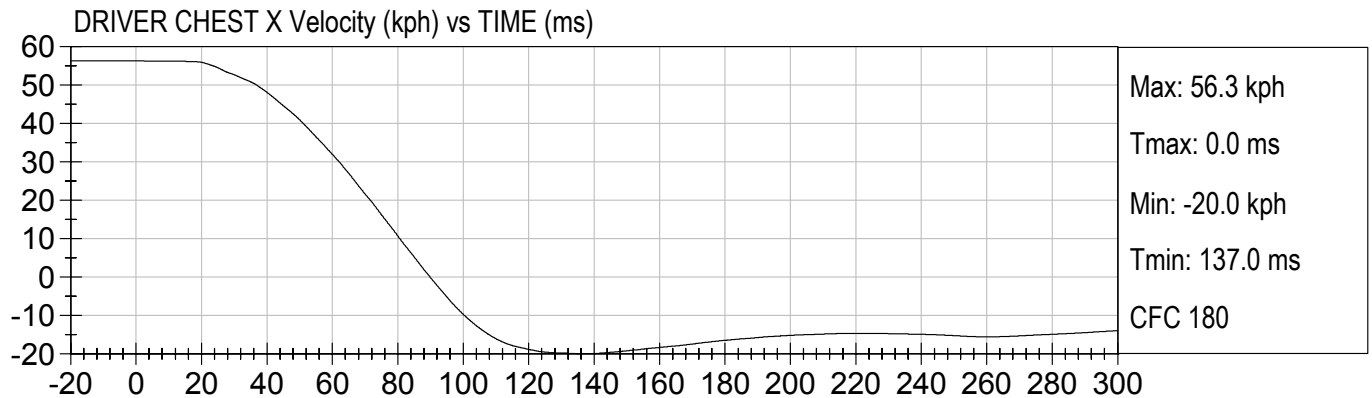


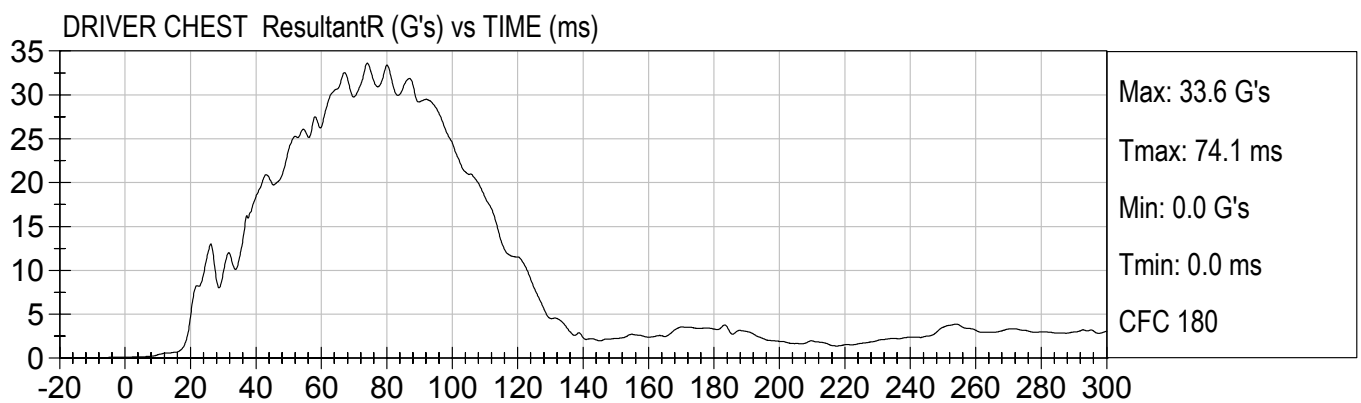
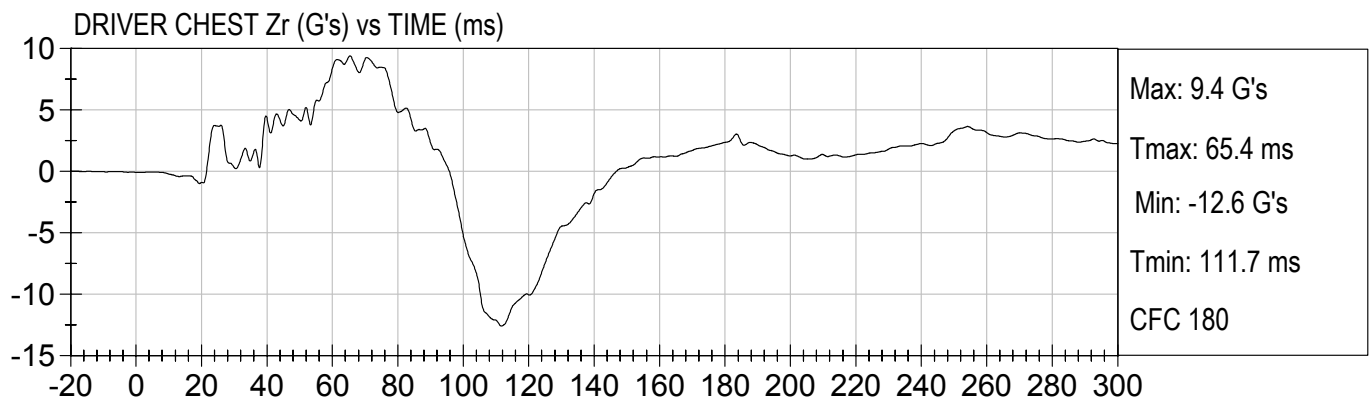
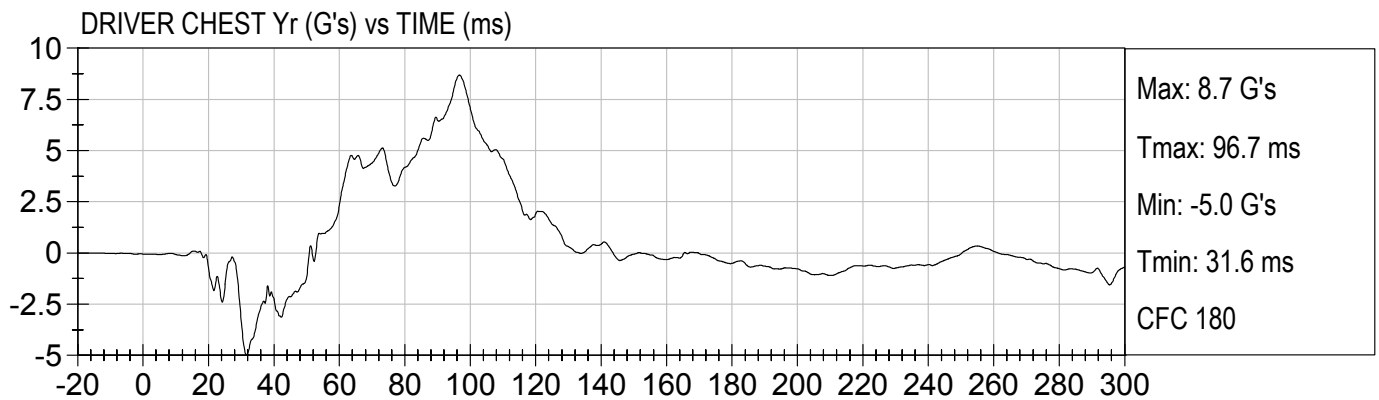
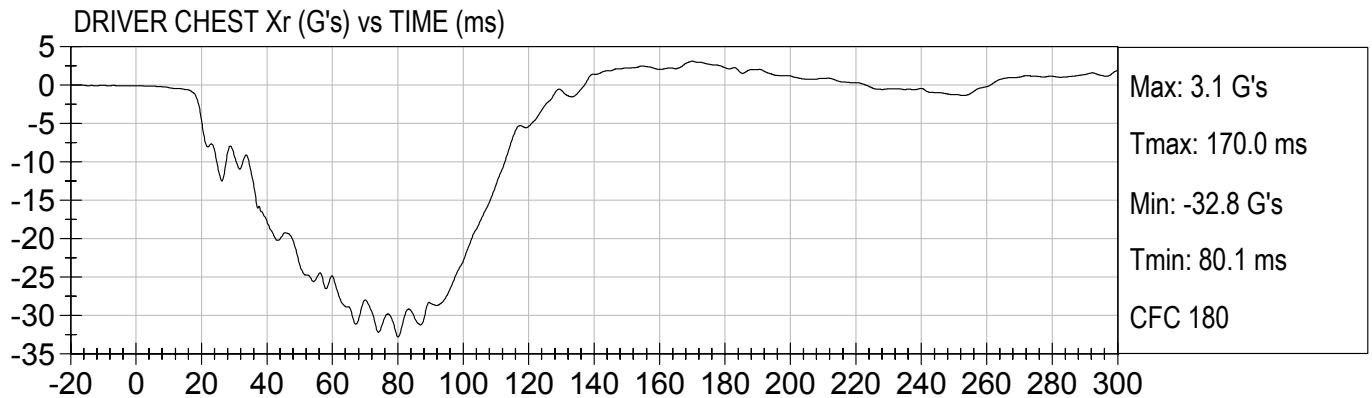


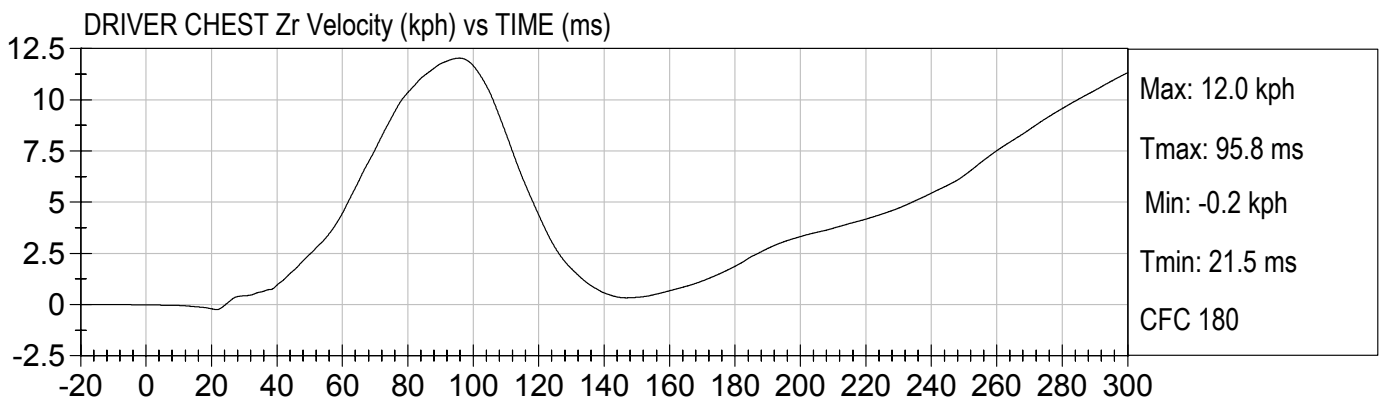
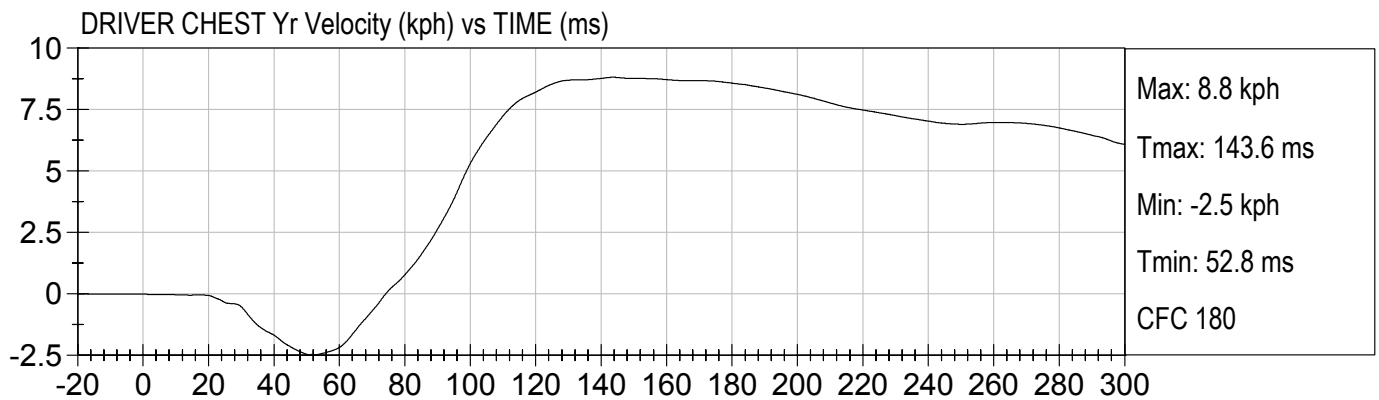
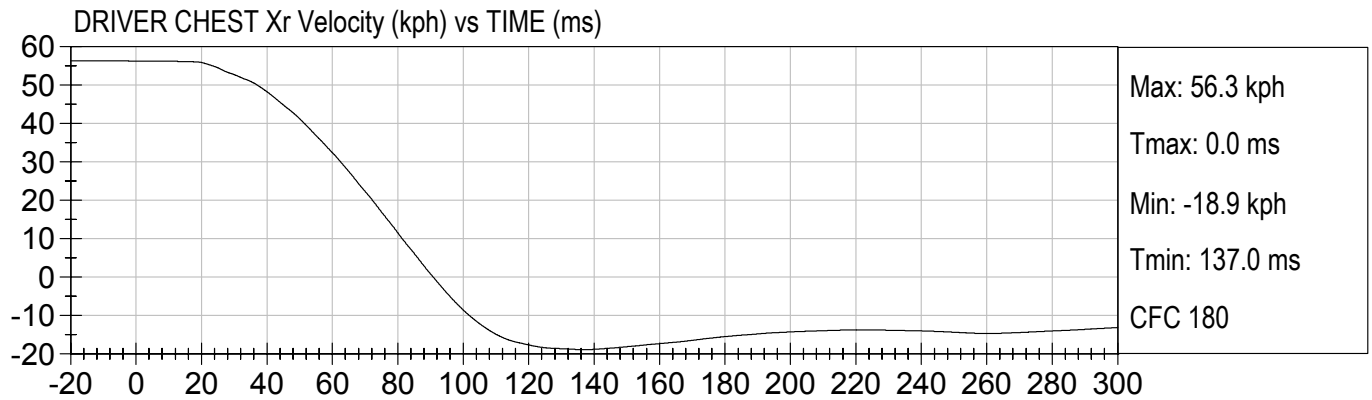


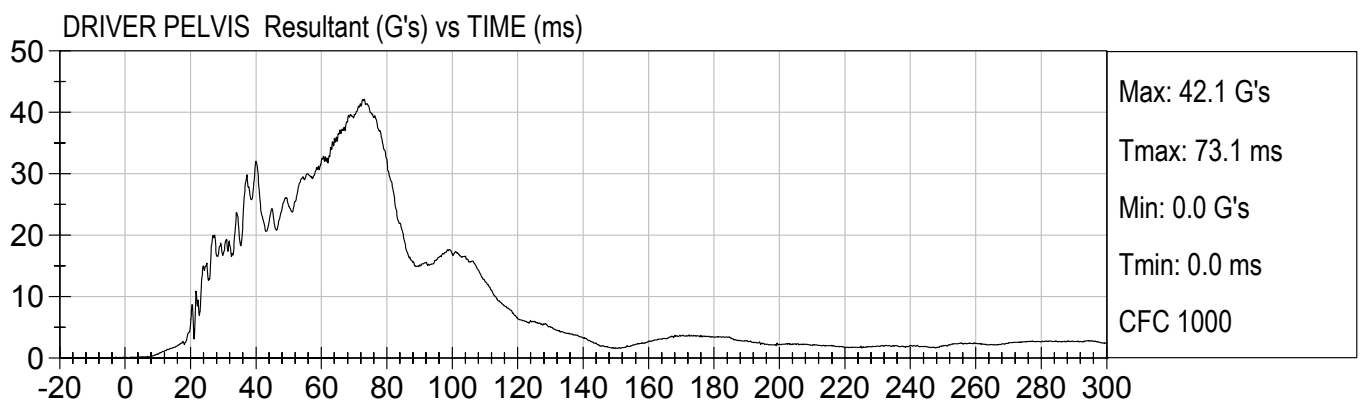
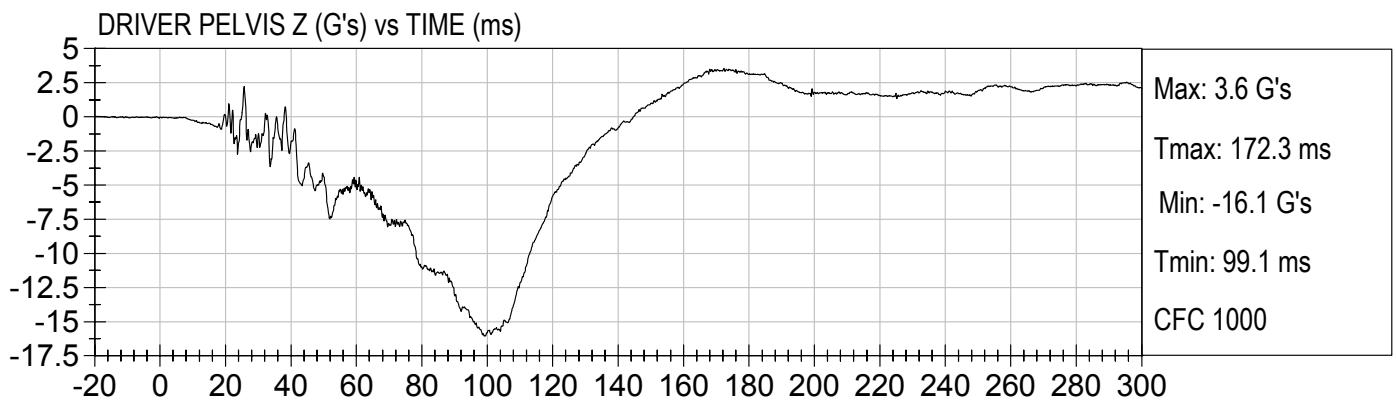
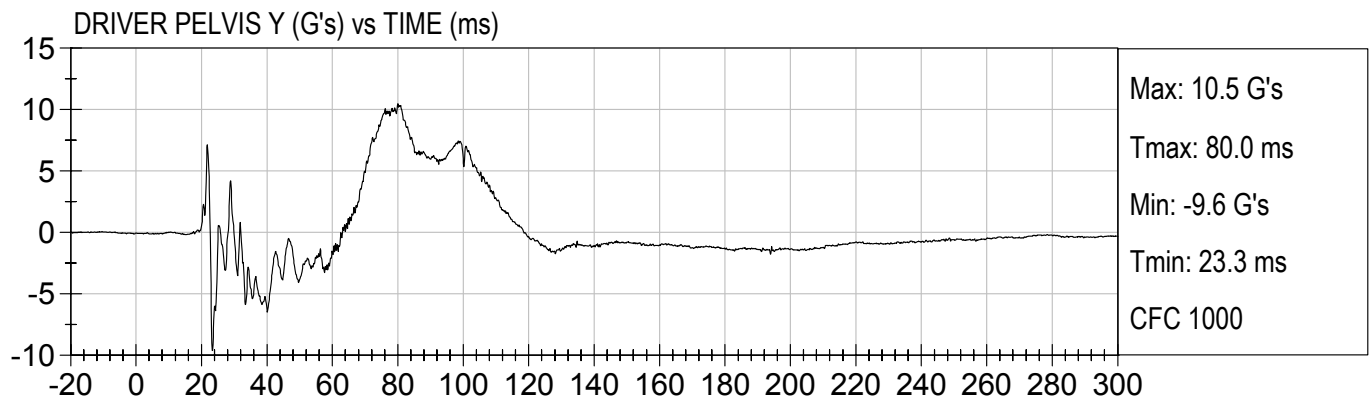
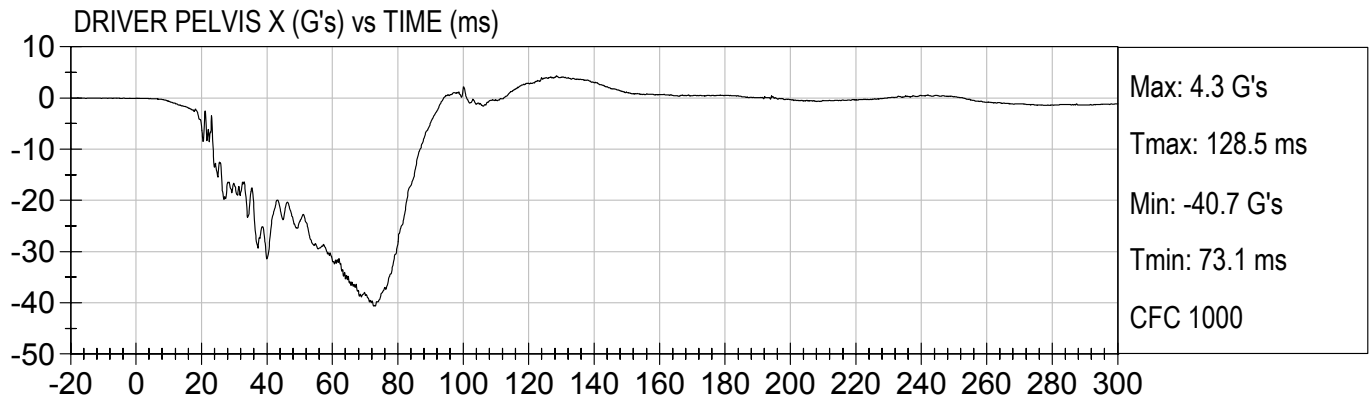


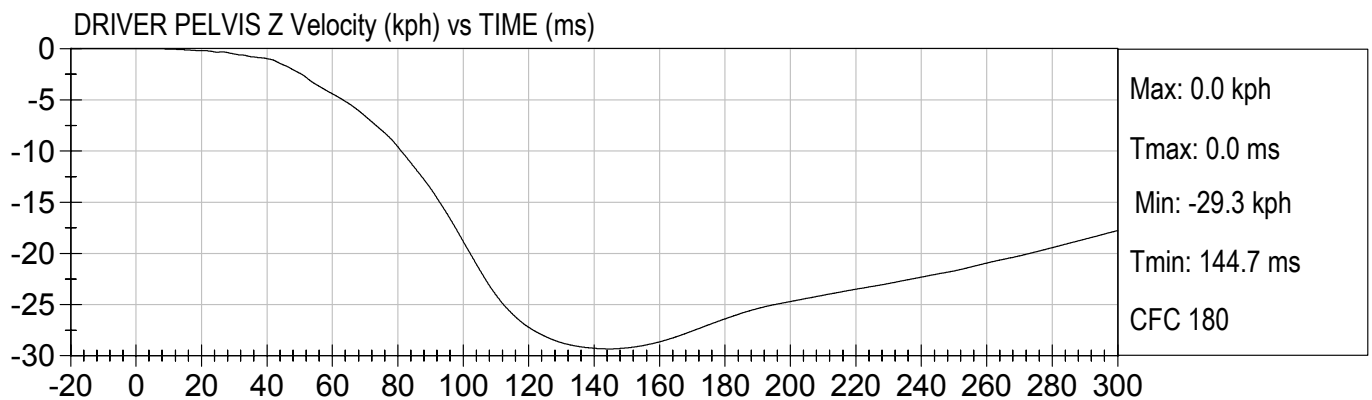
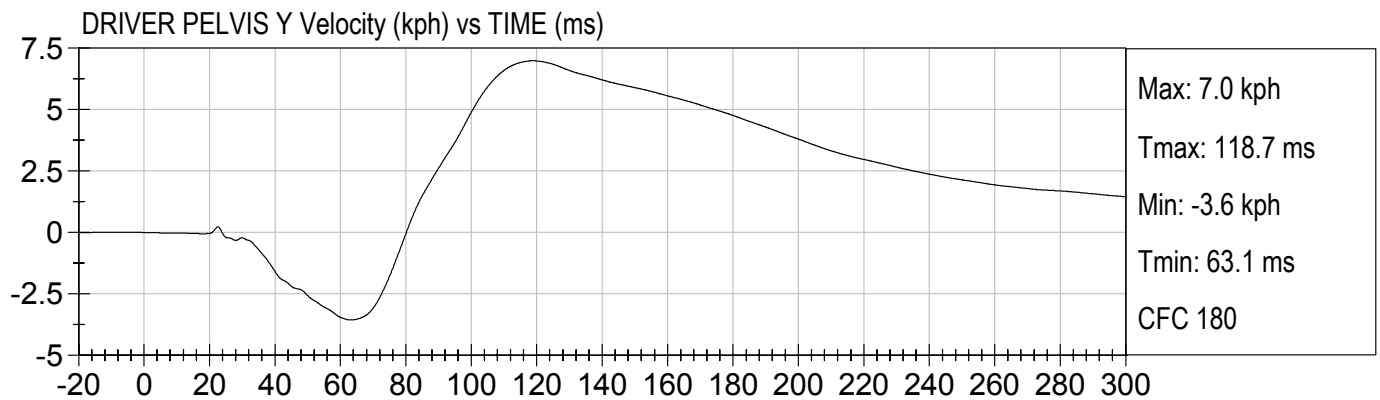
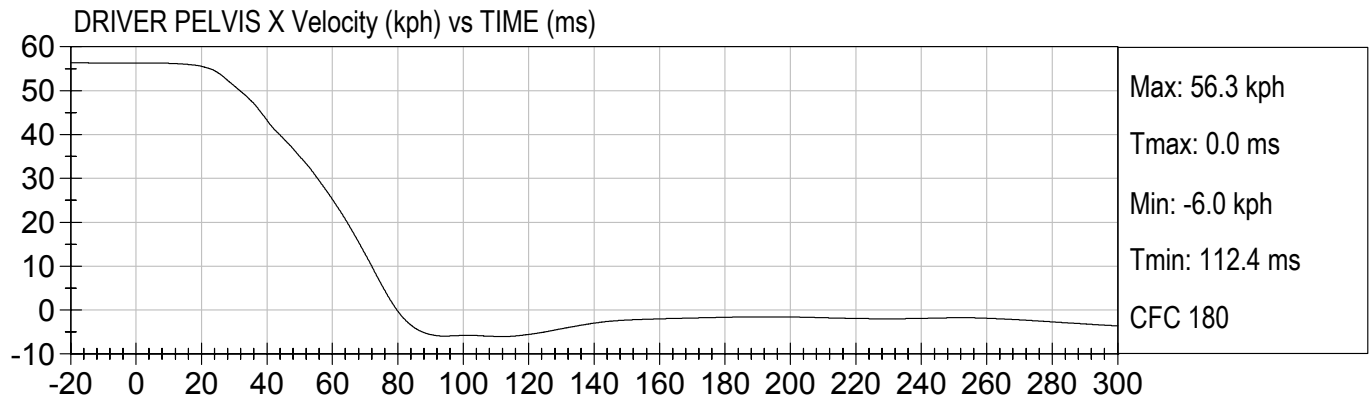


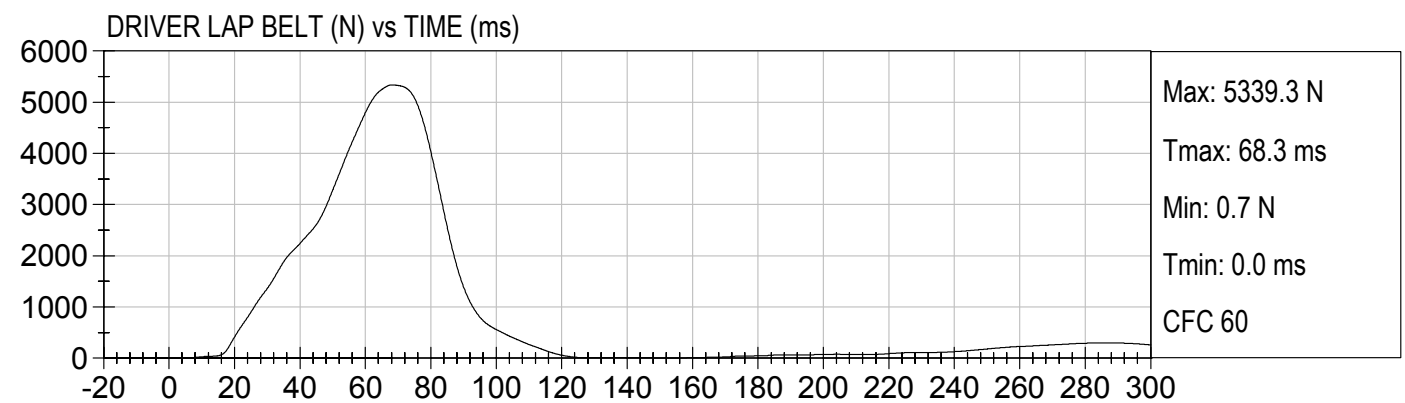
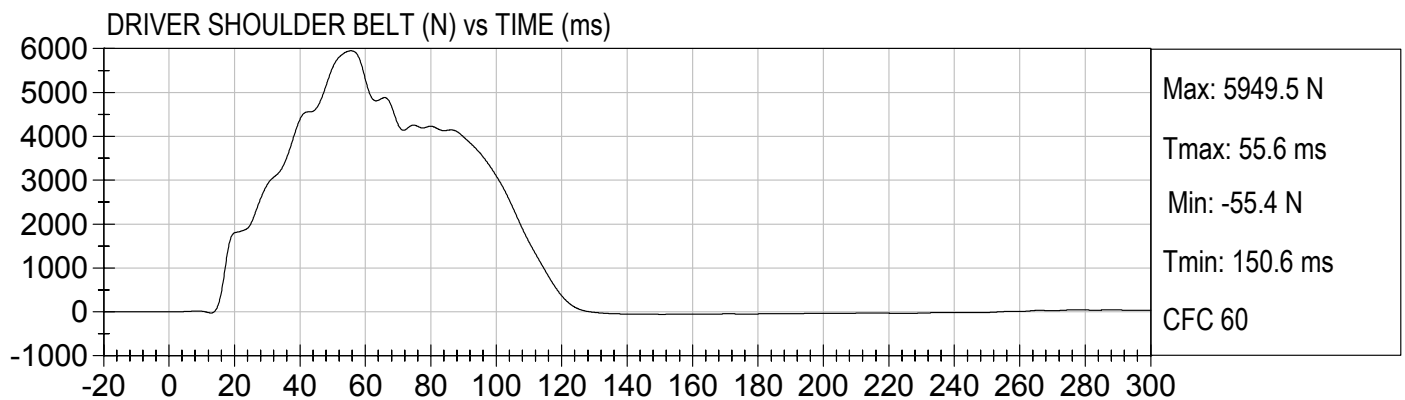
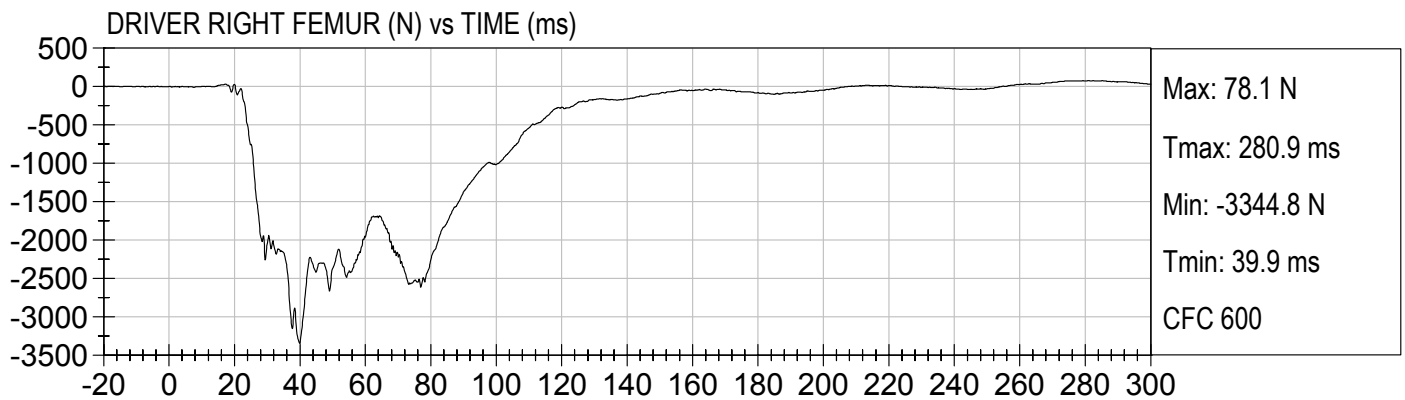
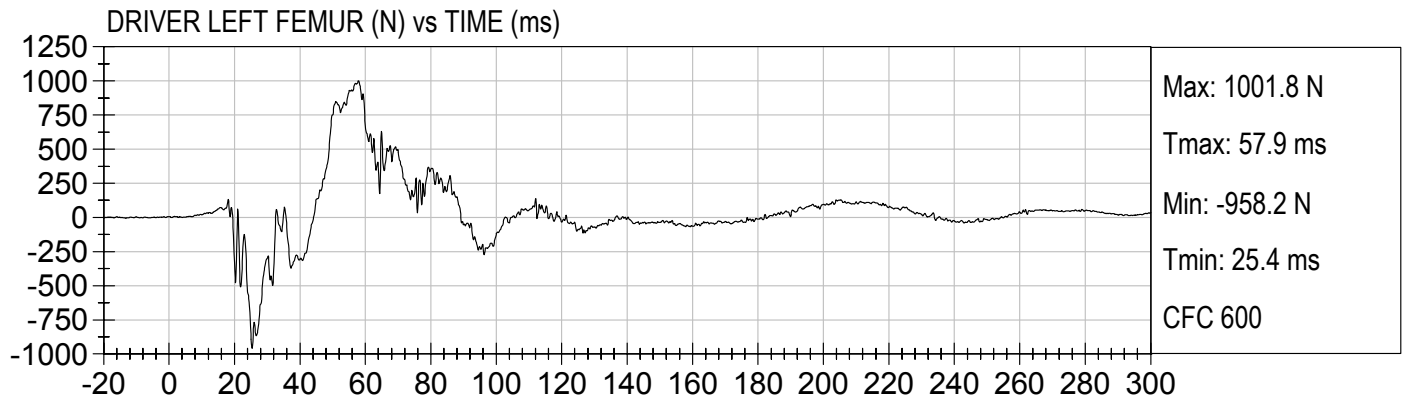


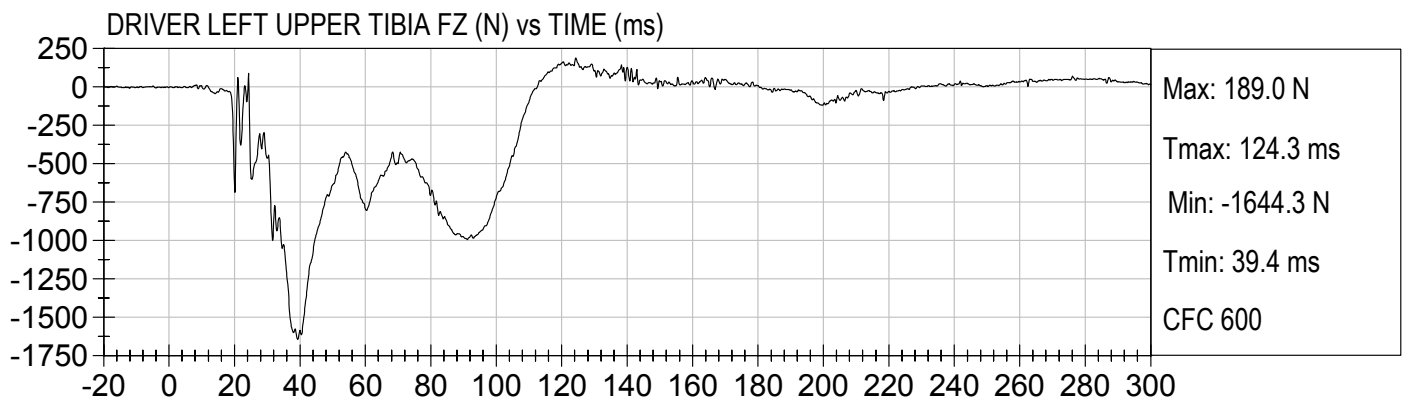
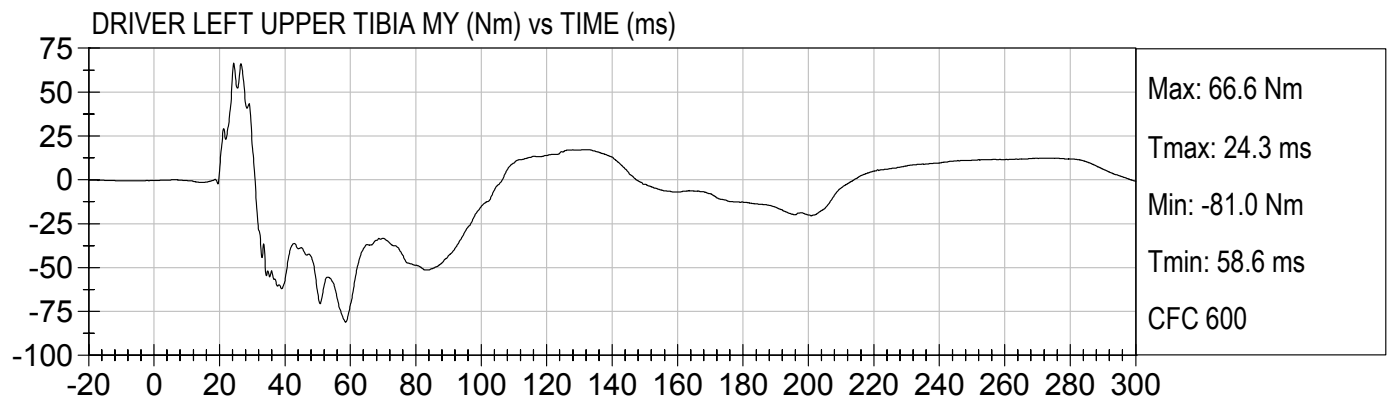
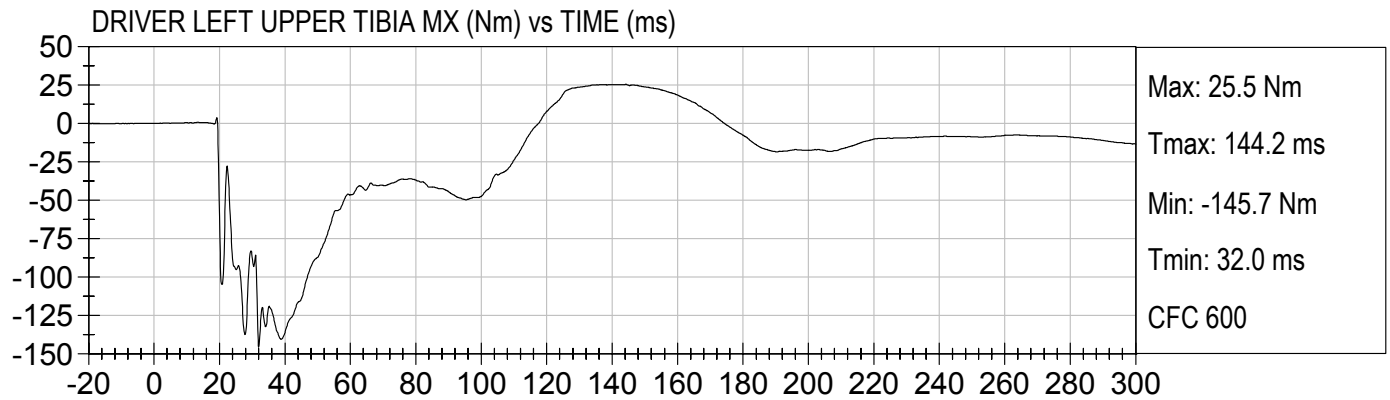






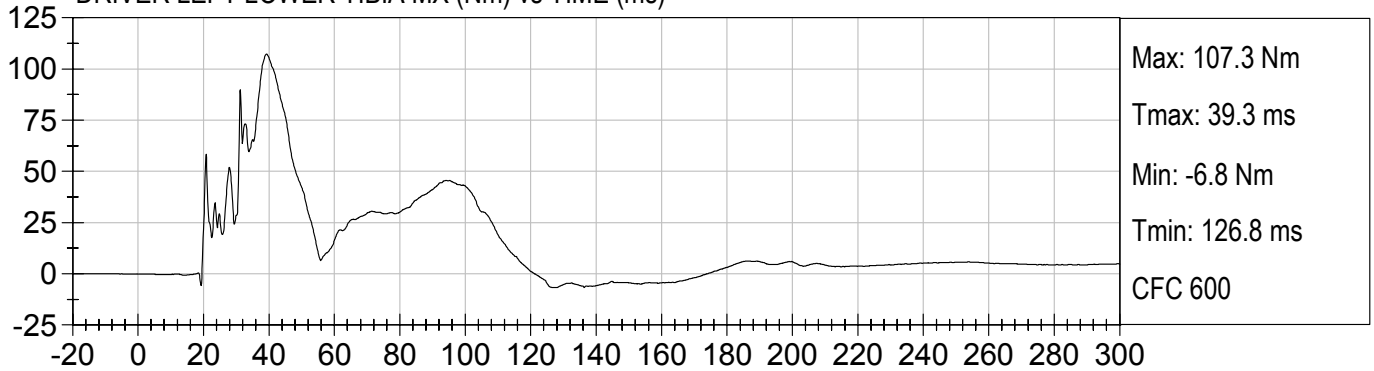




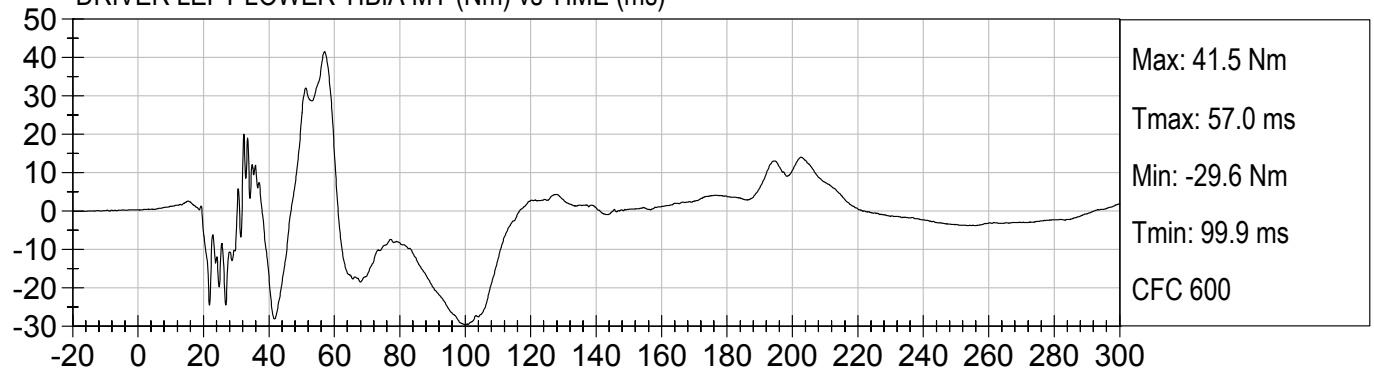




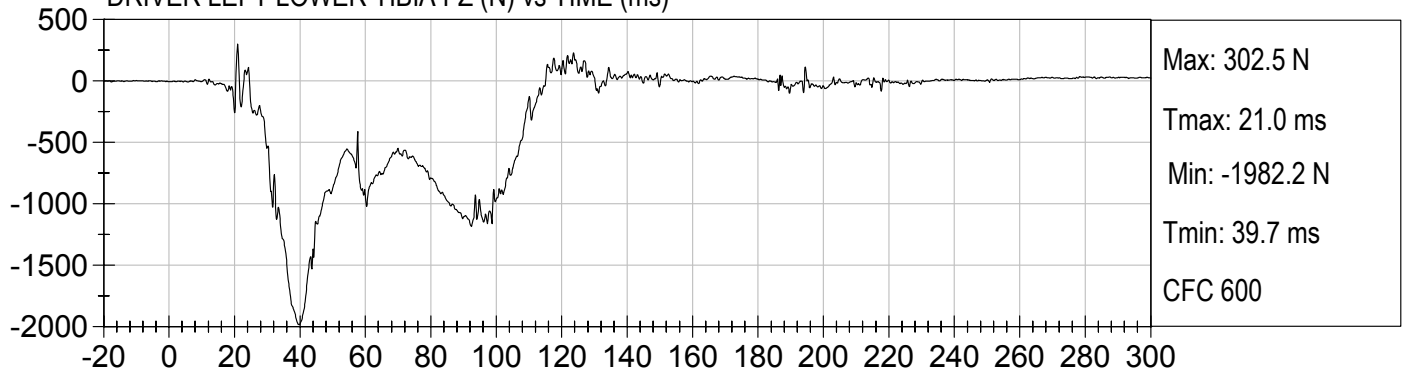
DRIVER LEFT LOWER TIBIA MX (Nm) vs TIME (ms)



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

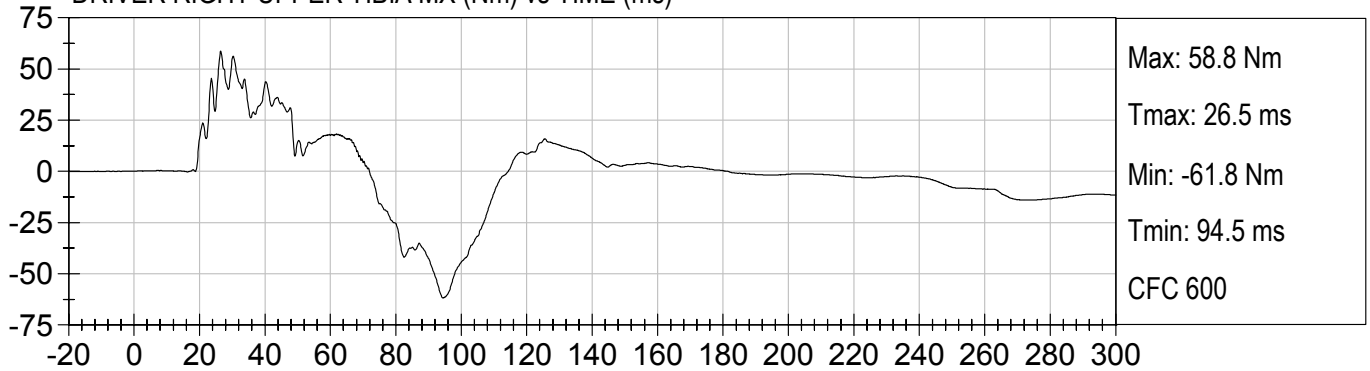


DRIVER LEFT LOWER TIBIA FZ (N) vs TIME (ms)

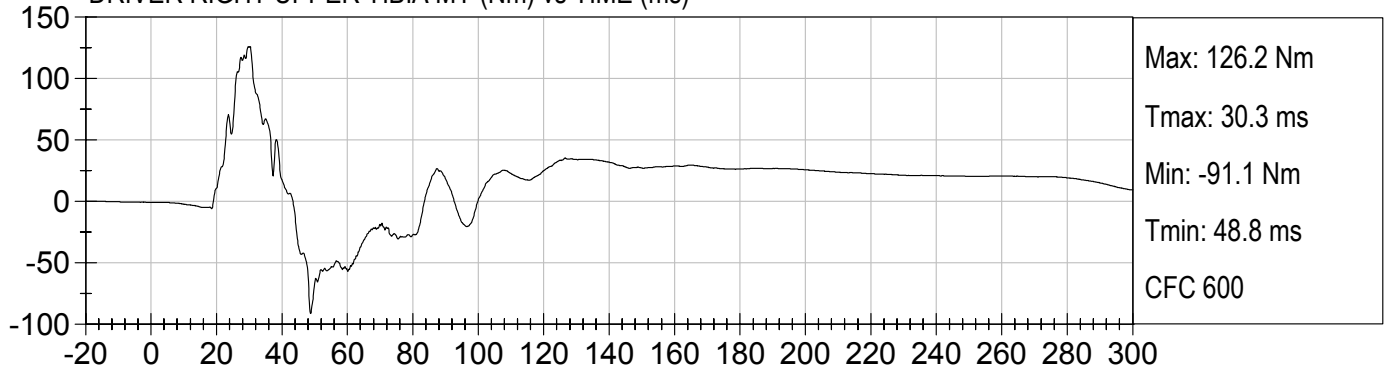




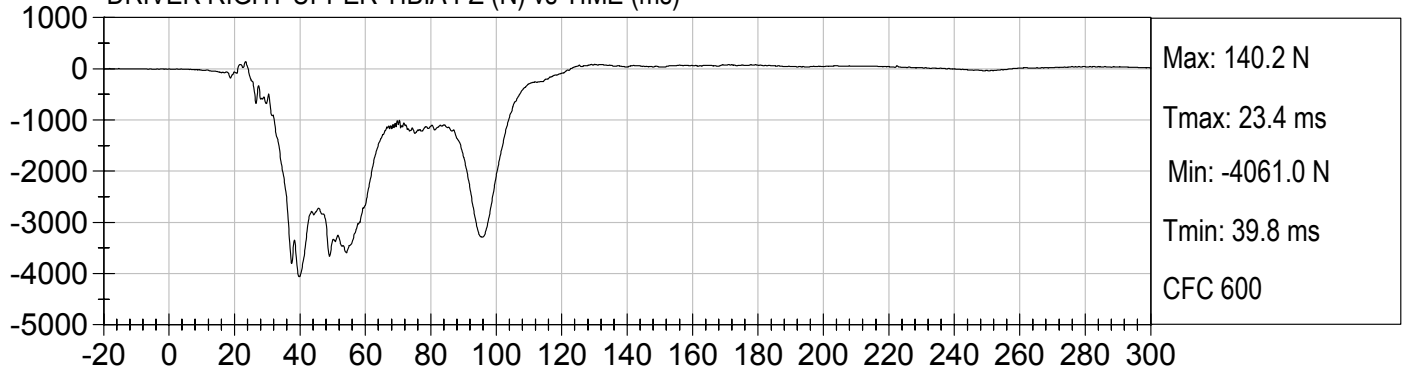
DRIVER RIGHT UPPER TIBIA MX (Nm) vs TIME (ms)



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

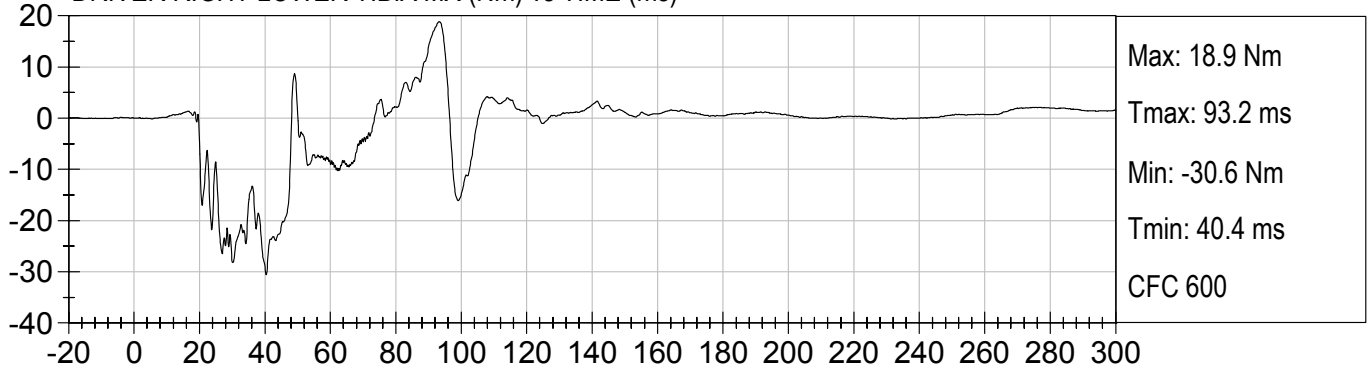


DRIVER RIGHT UPPER TIBIA FZ (N) vs TIME (ms)

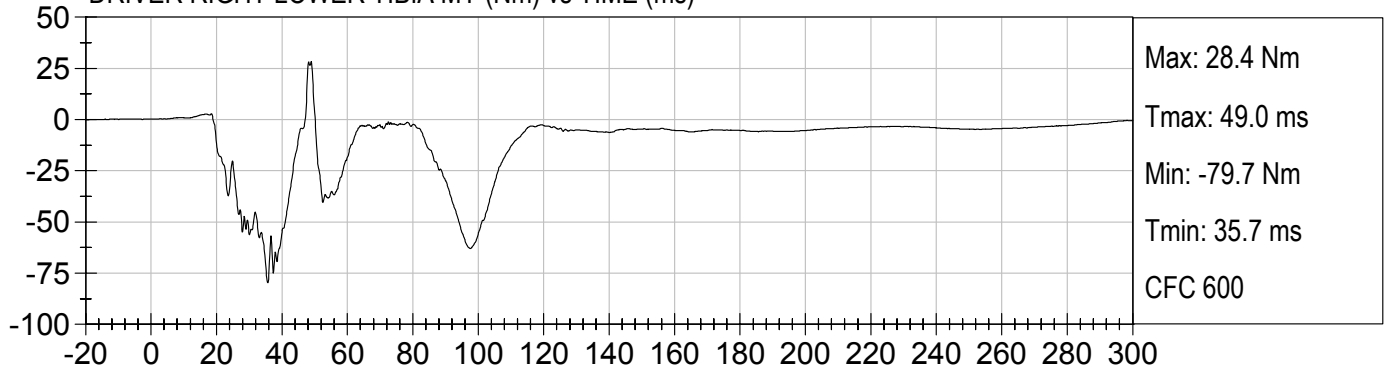




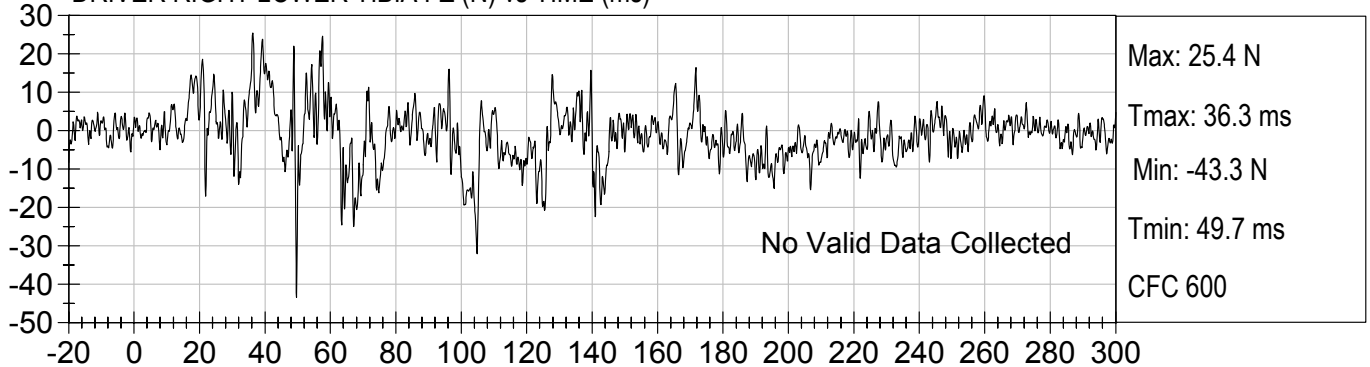
DRIVER RIGHT LOWER TIBIA MX (Nm) vs TIME (ms)

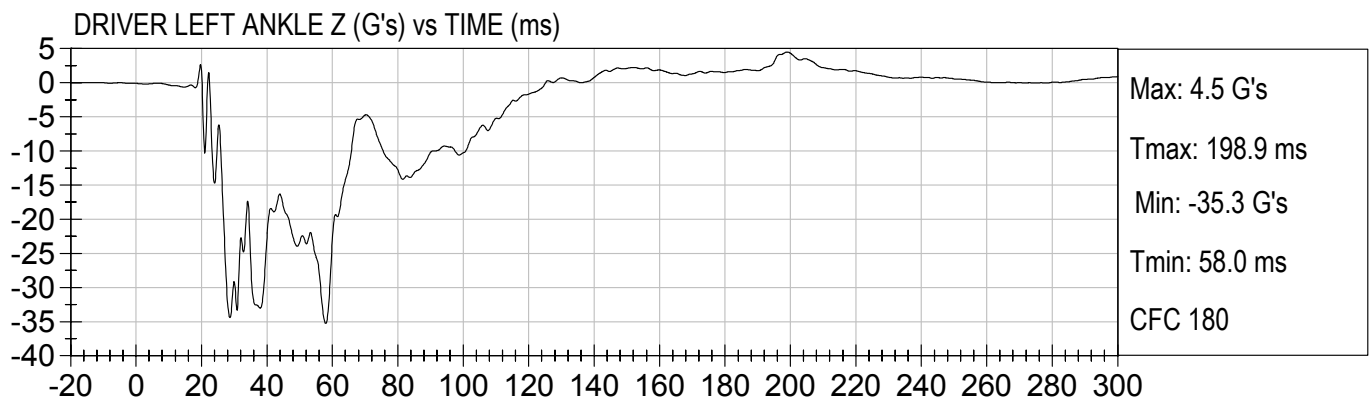
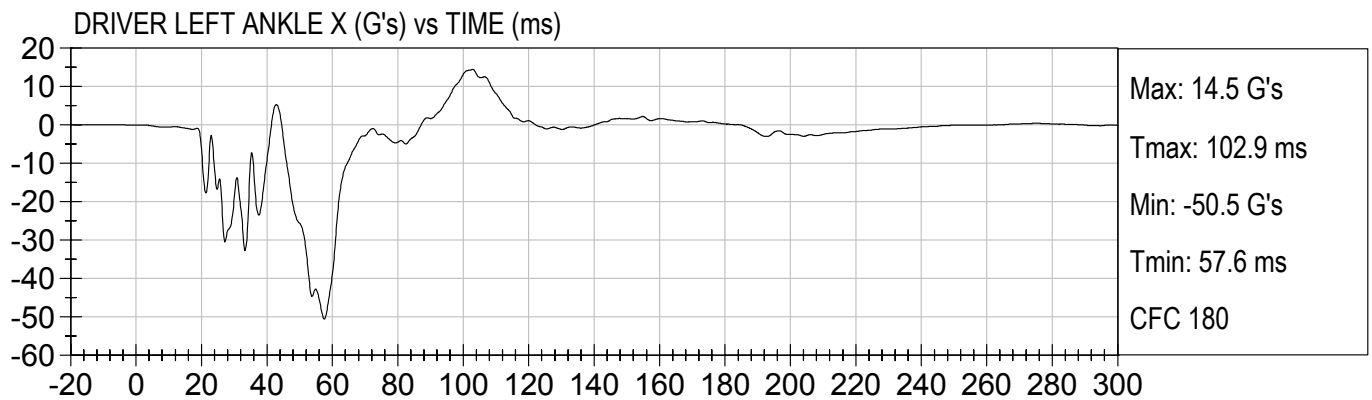
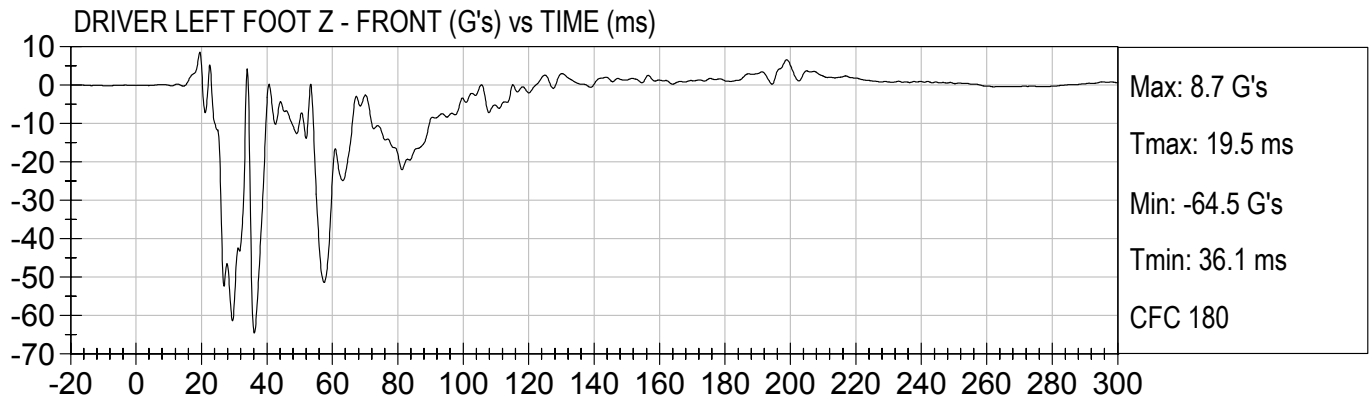


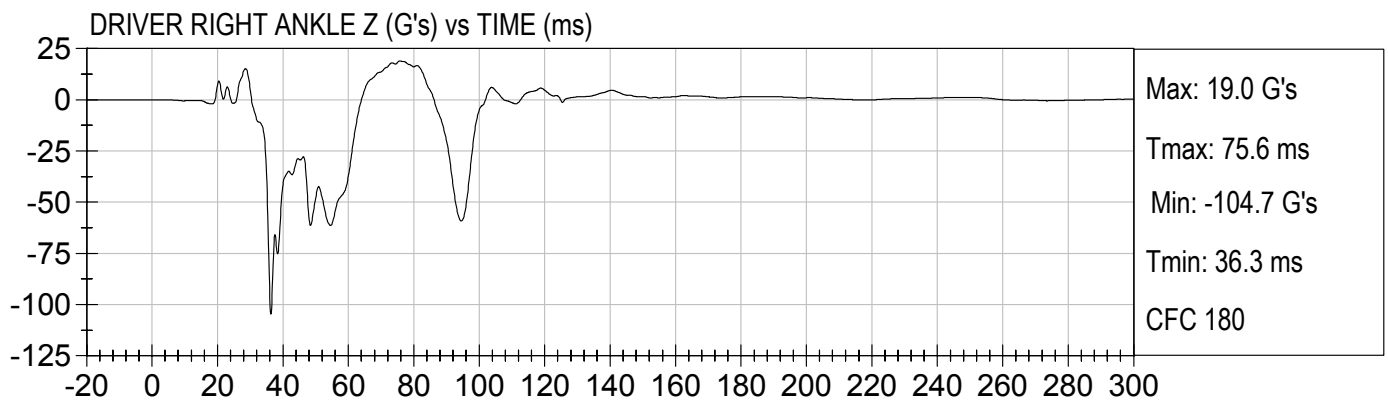
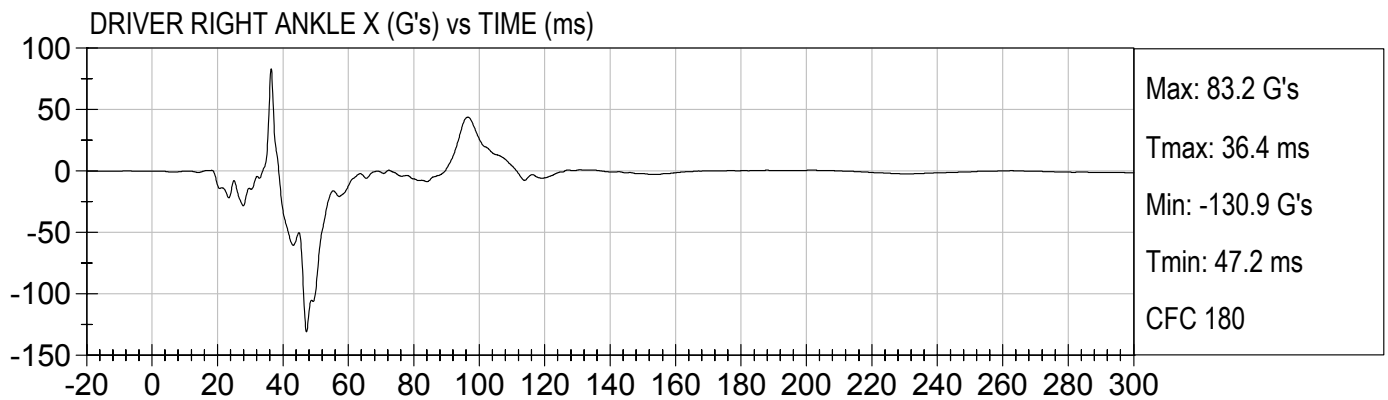
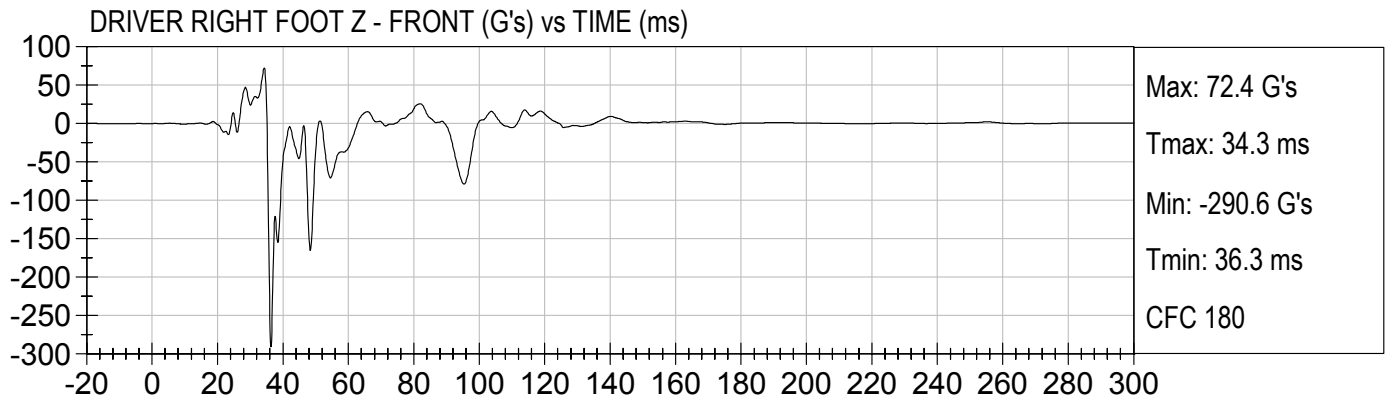
DRIVER RIGHT LOWER TIBIA MY (Nm) vs TIME (ms)

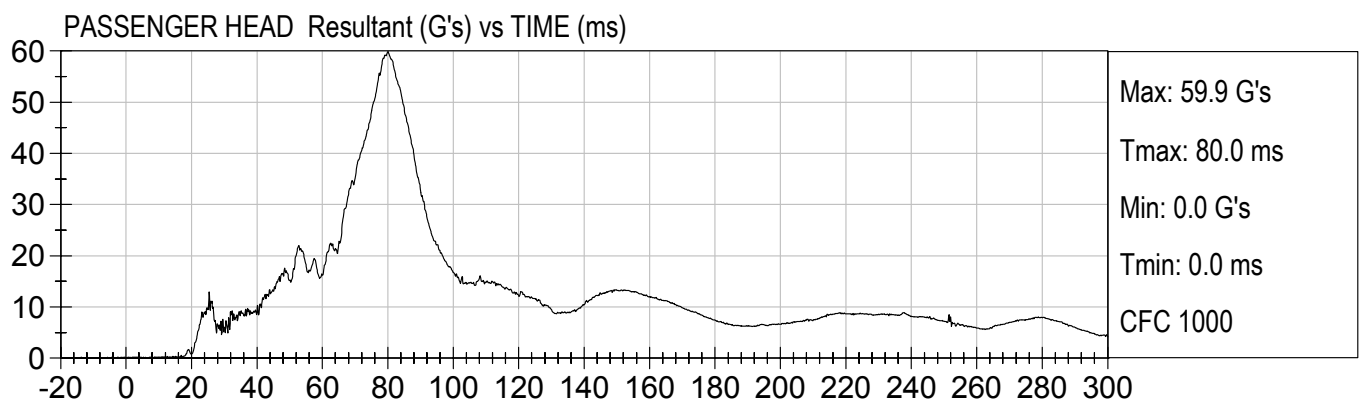
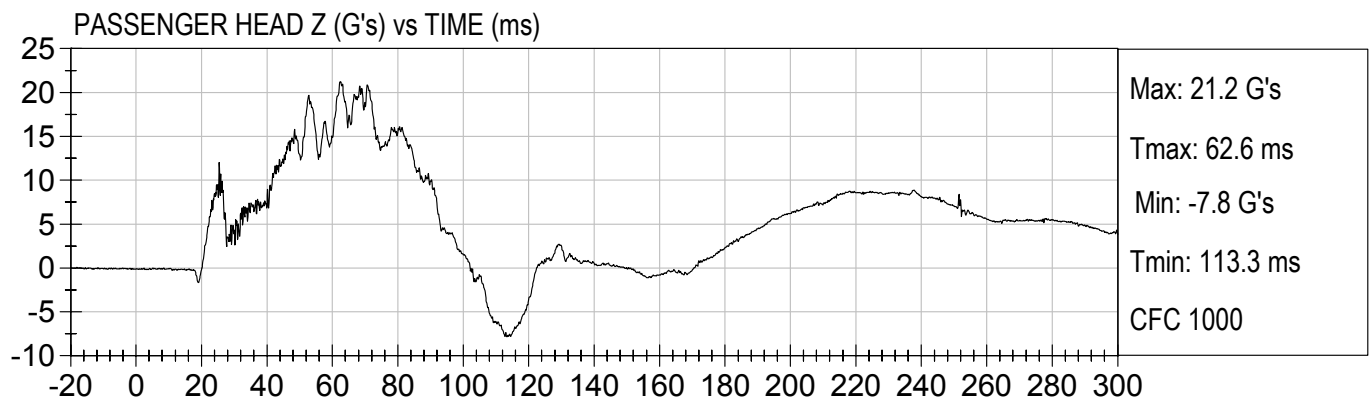
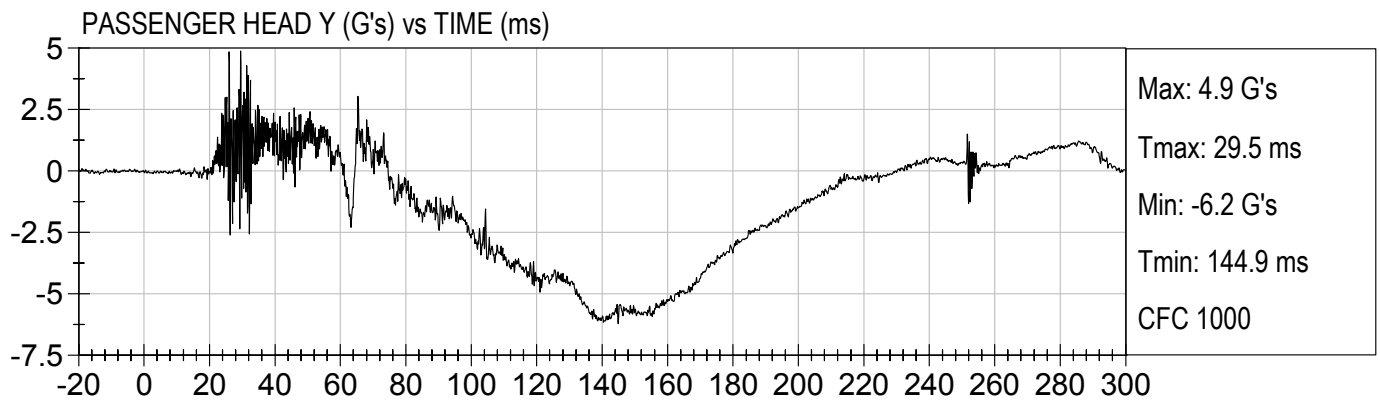
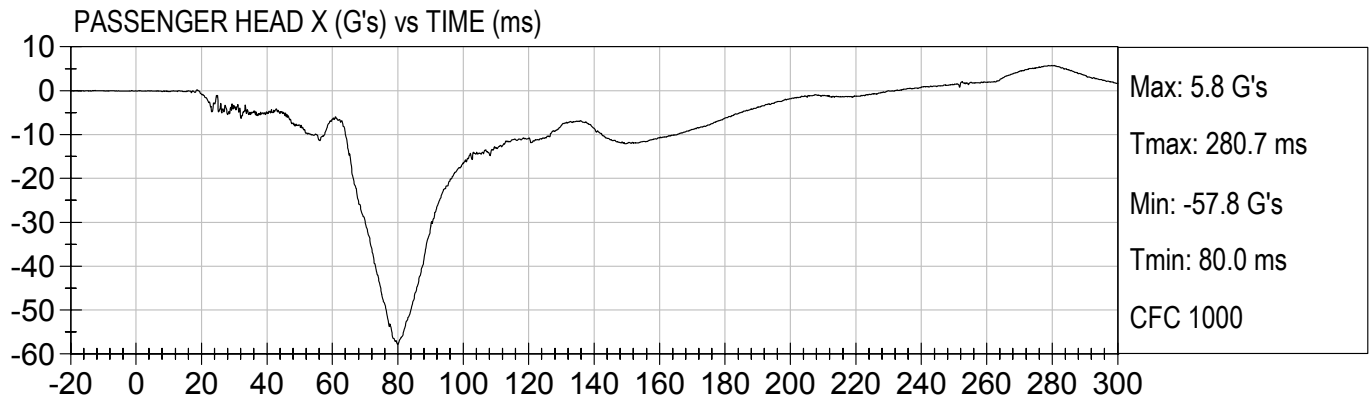


DRIVER RIGHT LOWER TIBIA FZ (N) vs TIME (ms)



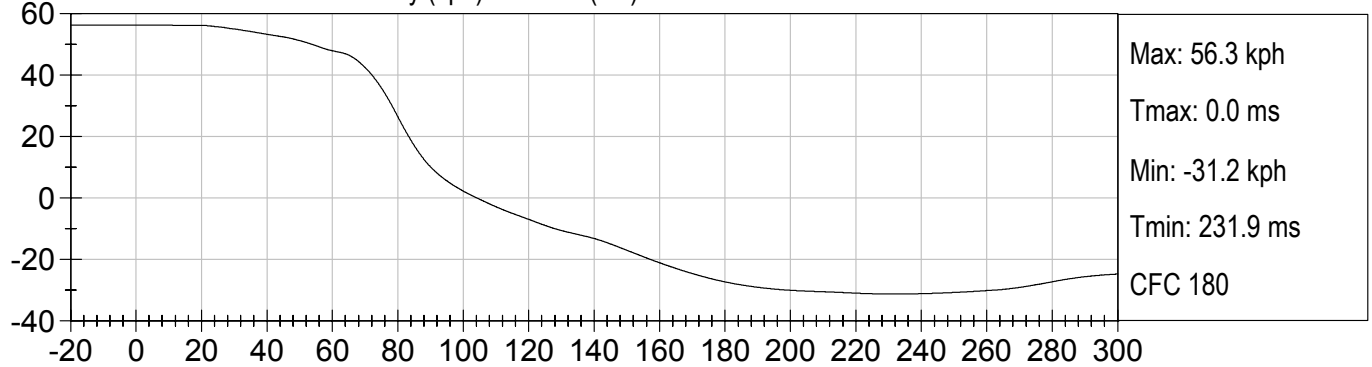




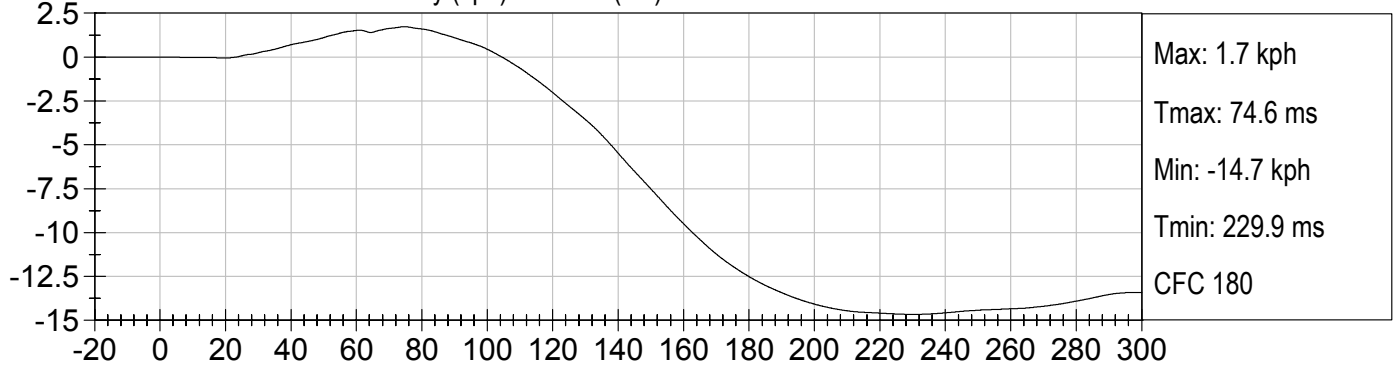




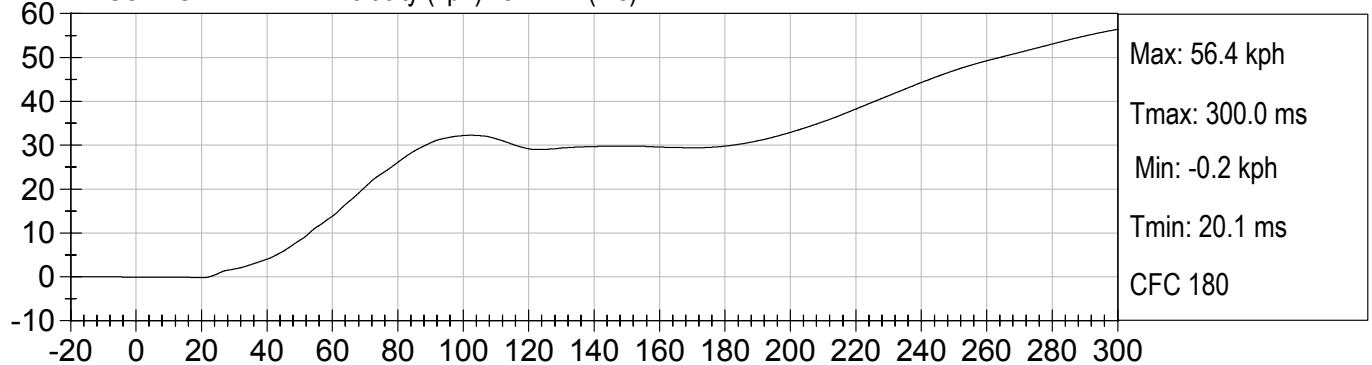
PASSENGER HEAD X Velocity (kph) vs TIME (ms)

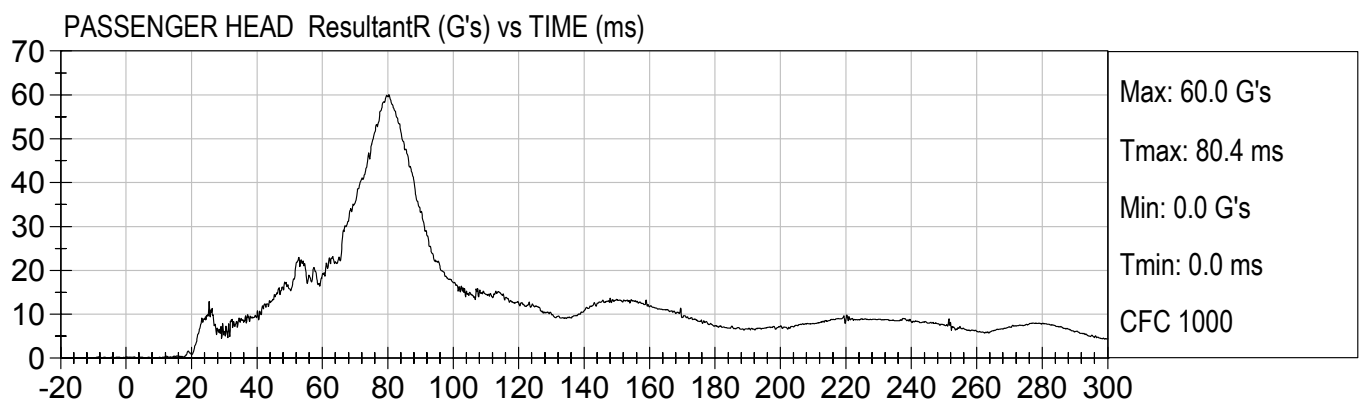
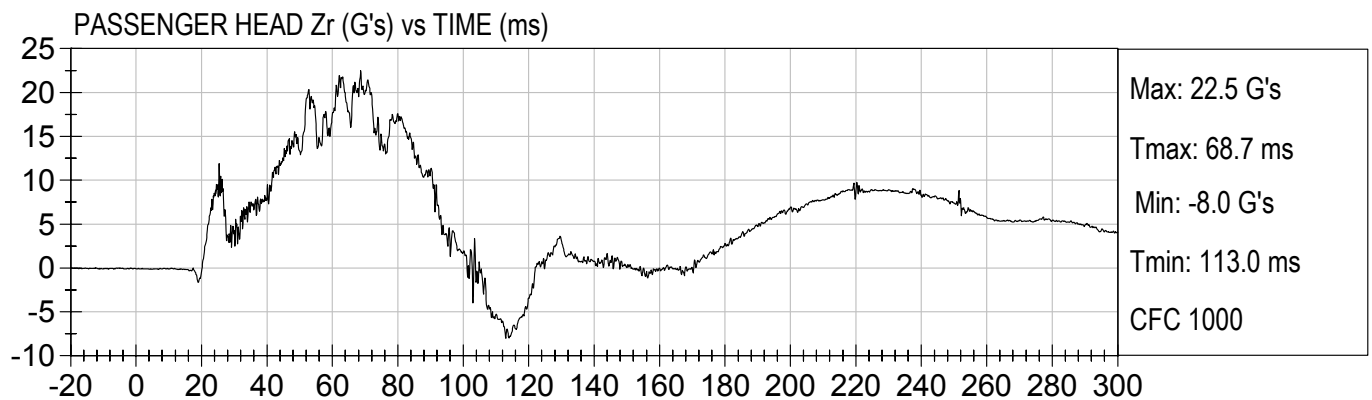
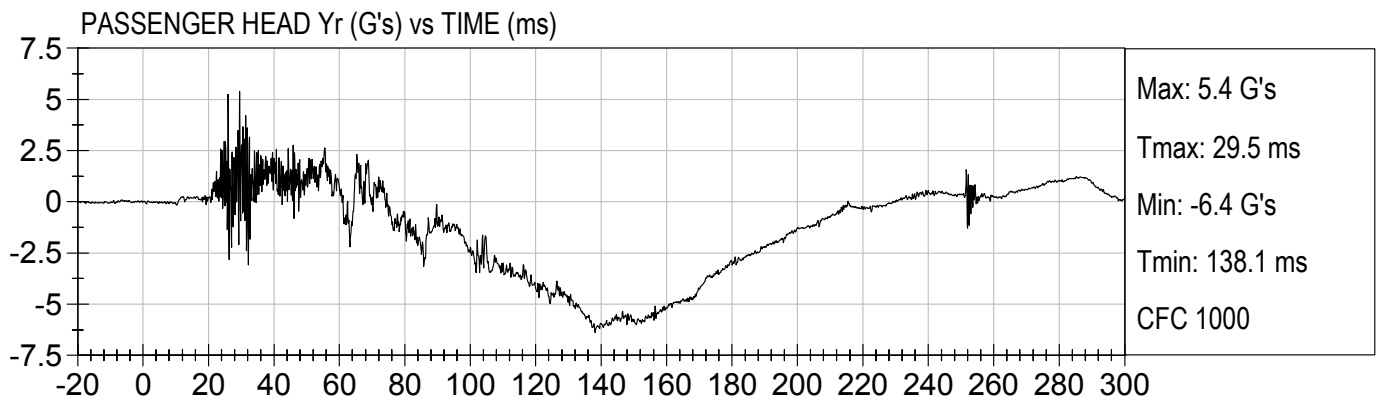
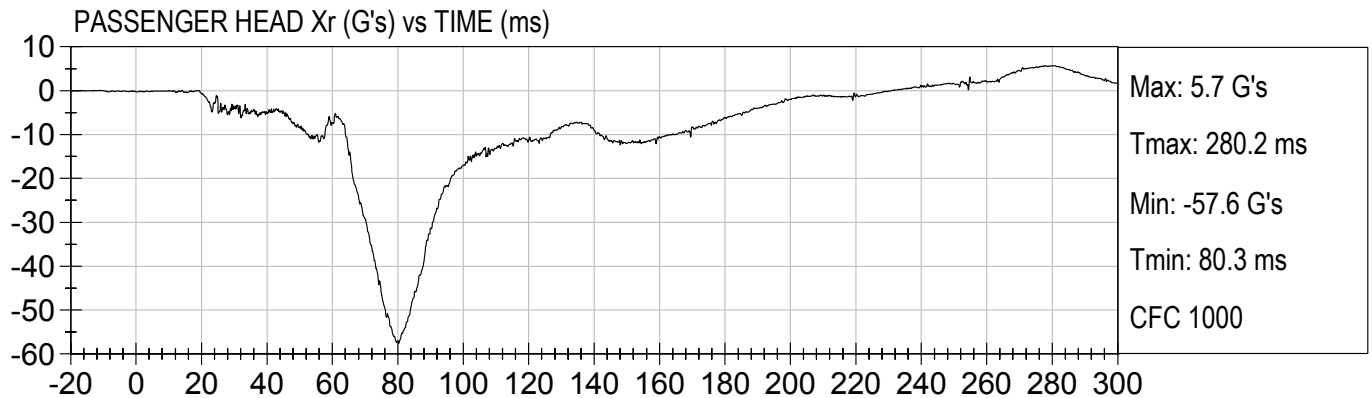


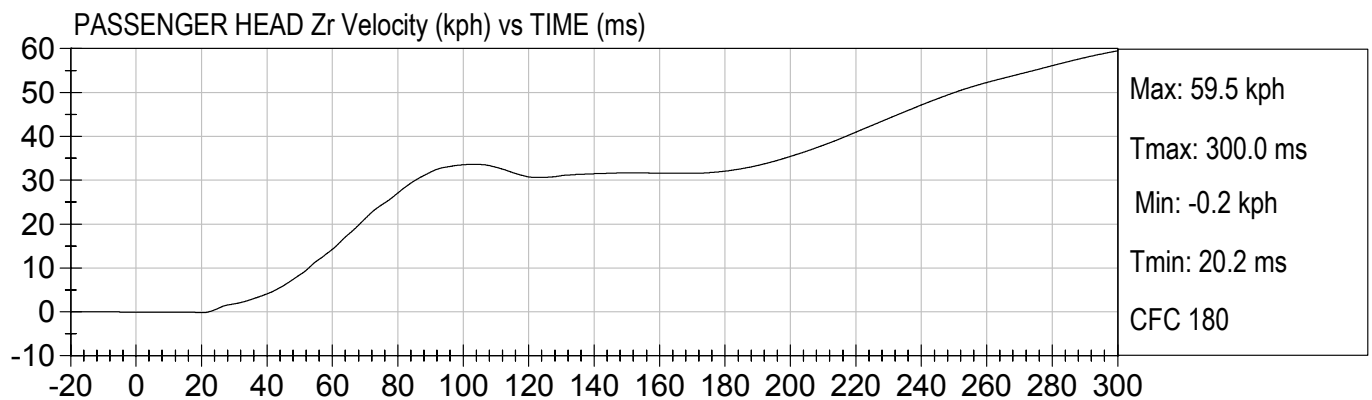
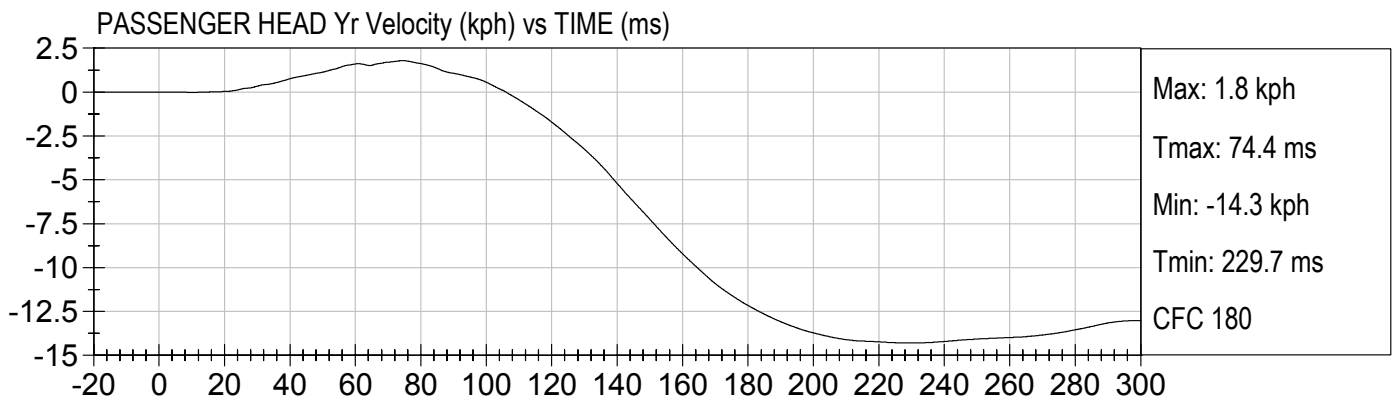
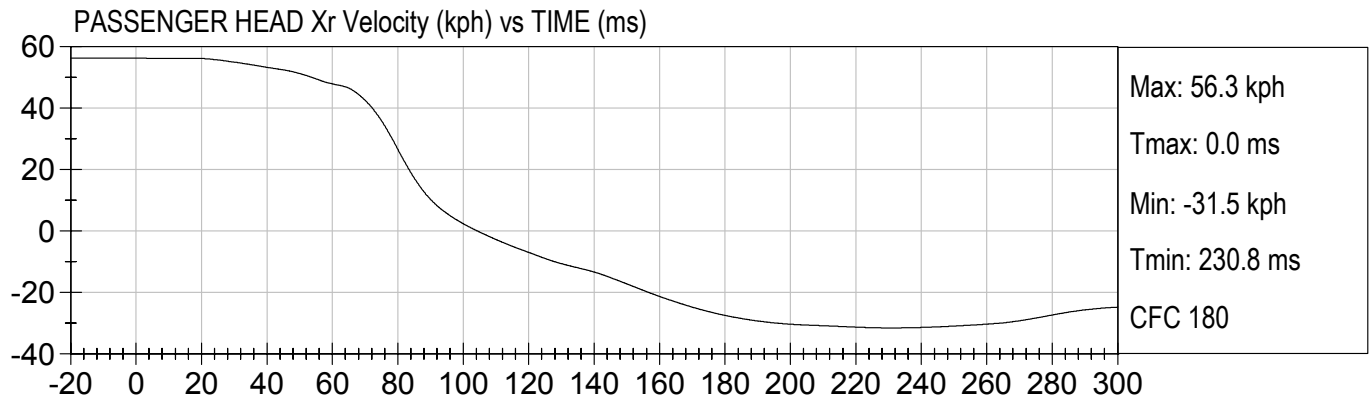
PASSENGER HEAD Y Velocity (kph) vs TIME (ms)

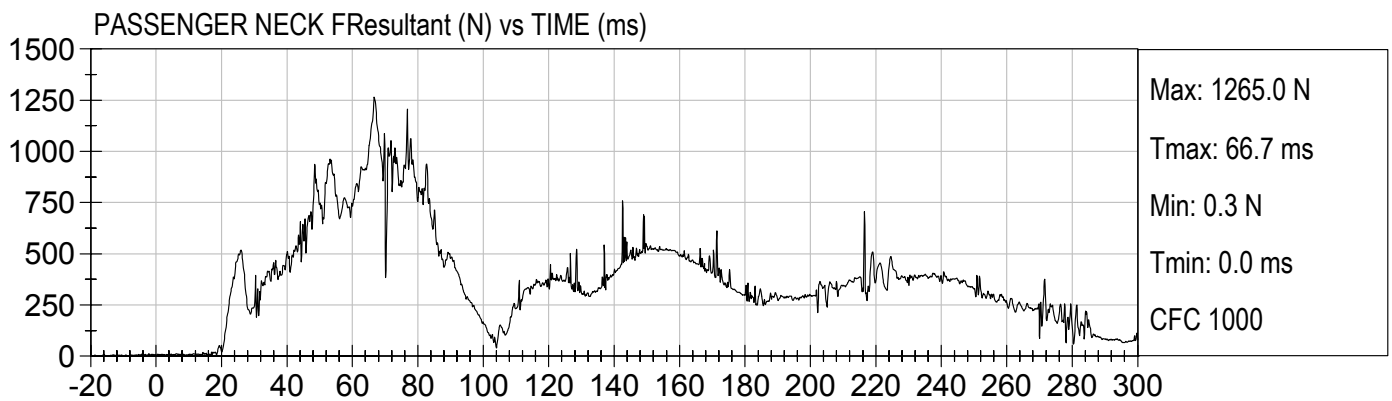
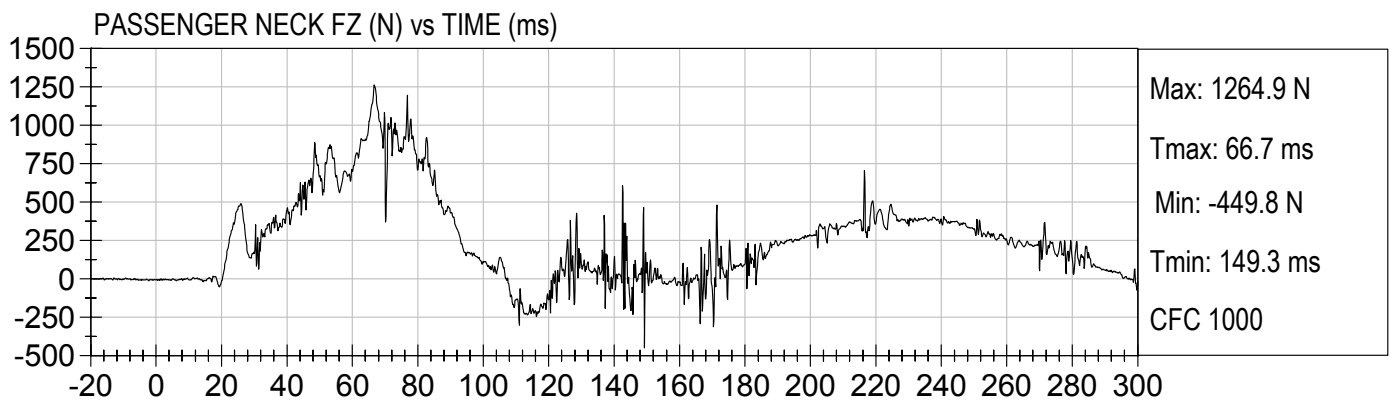
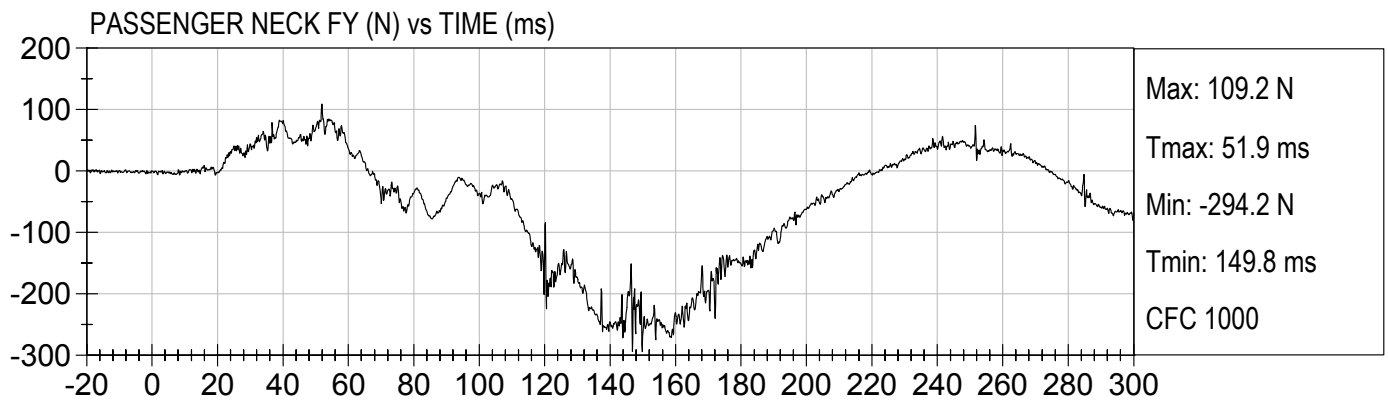
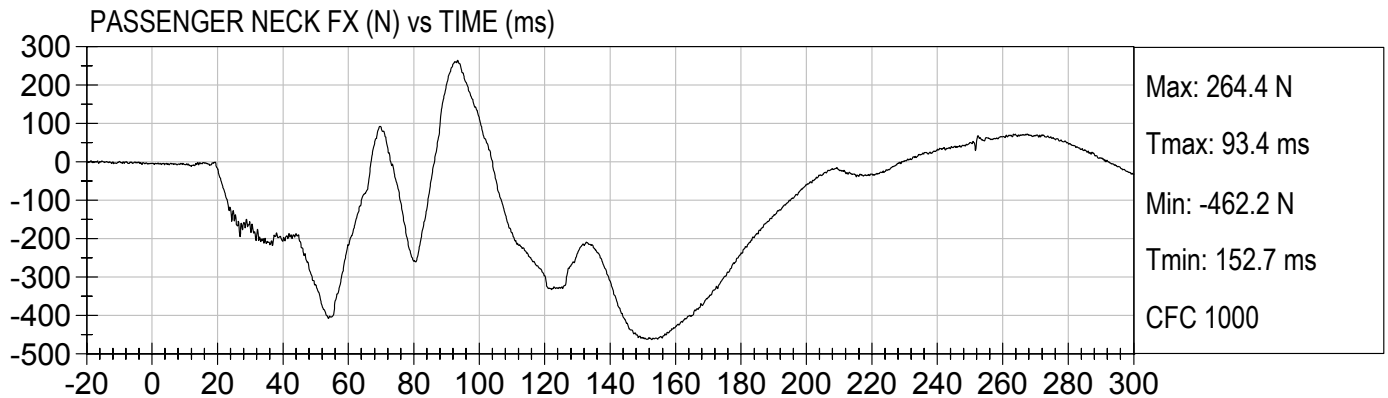


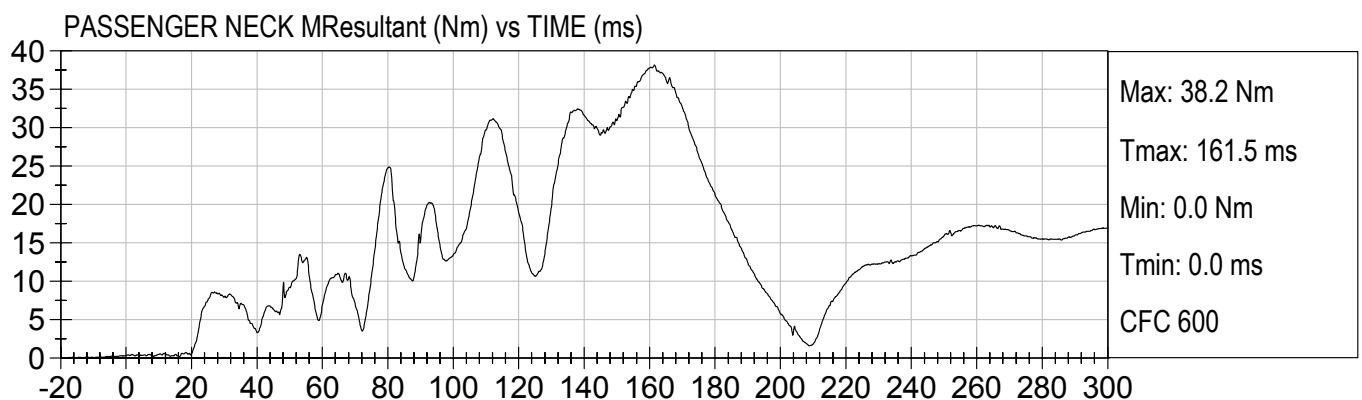
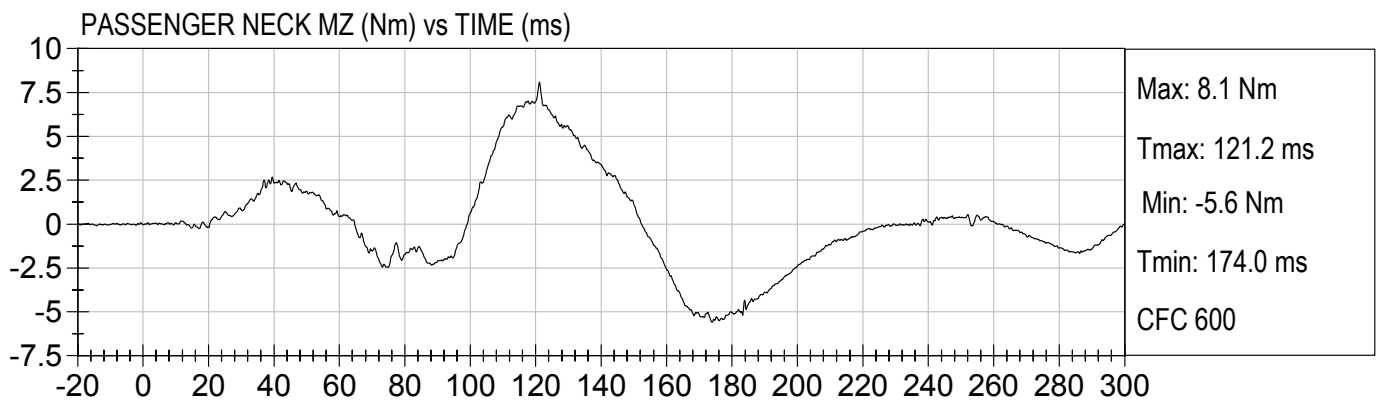
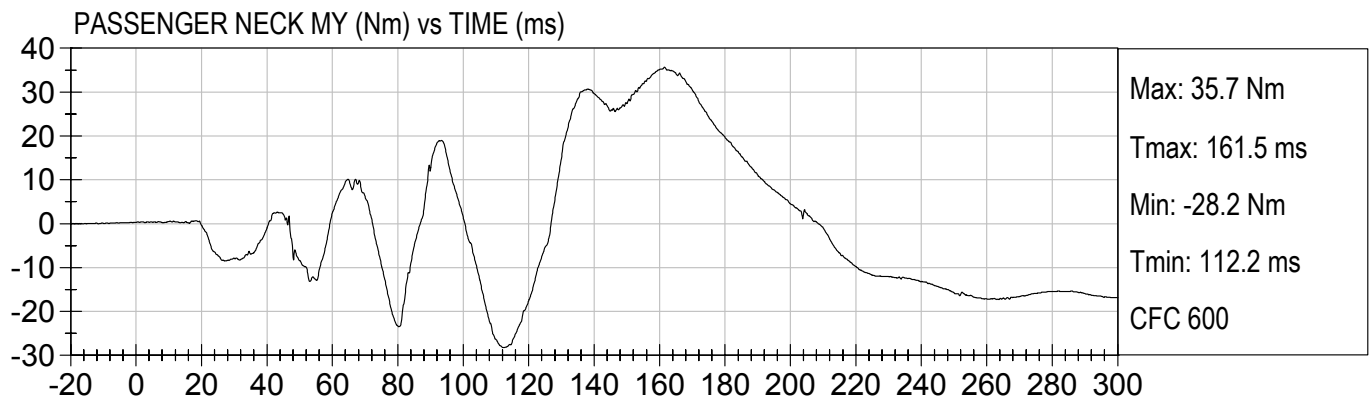
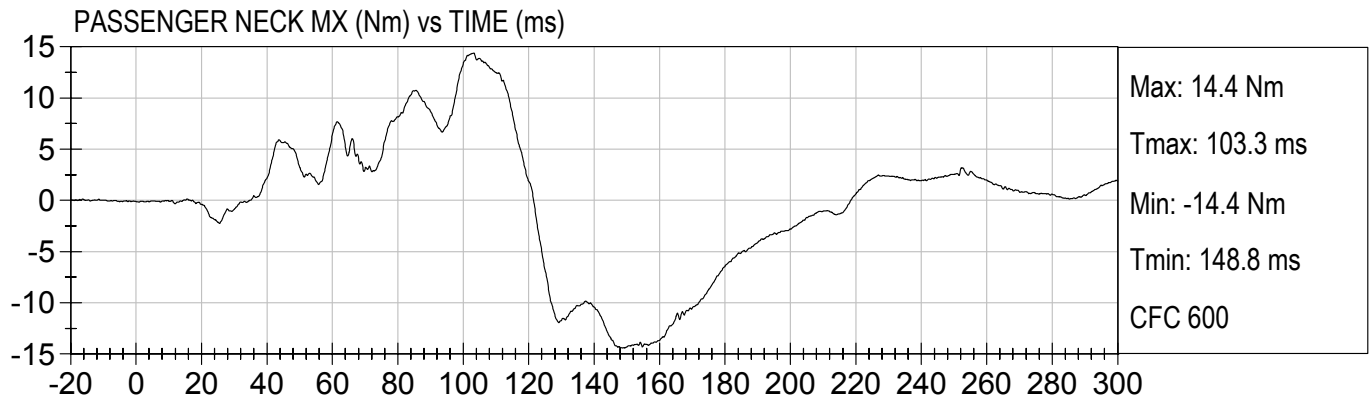
PASSENGER HEAD Z Velocity (kph) vs TIME (ms)





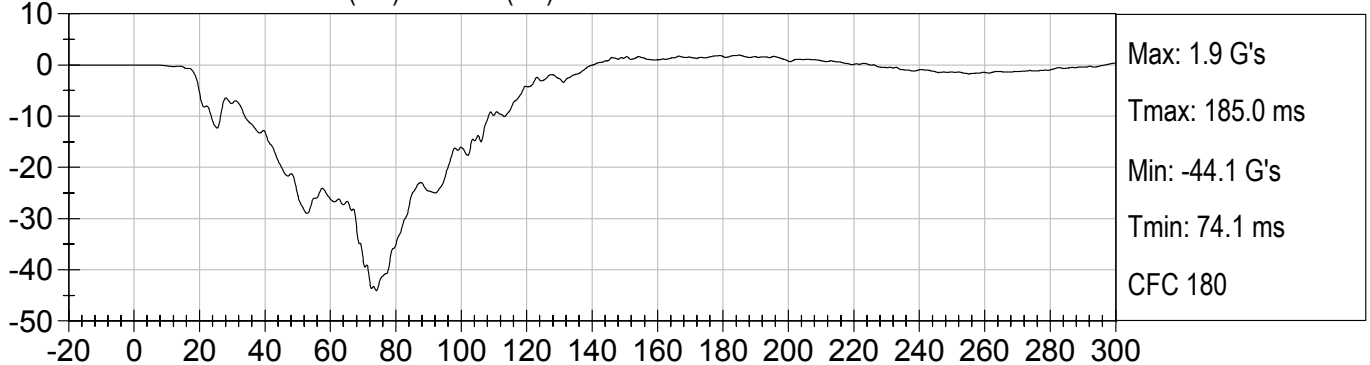




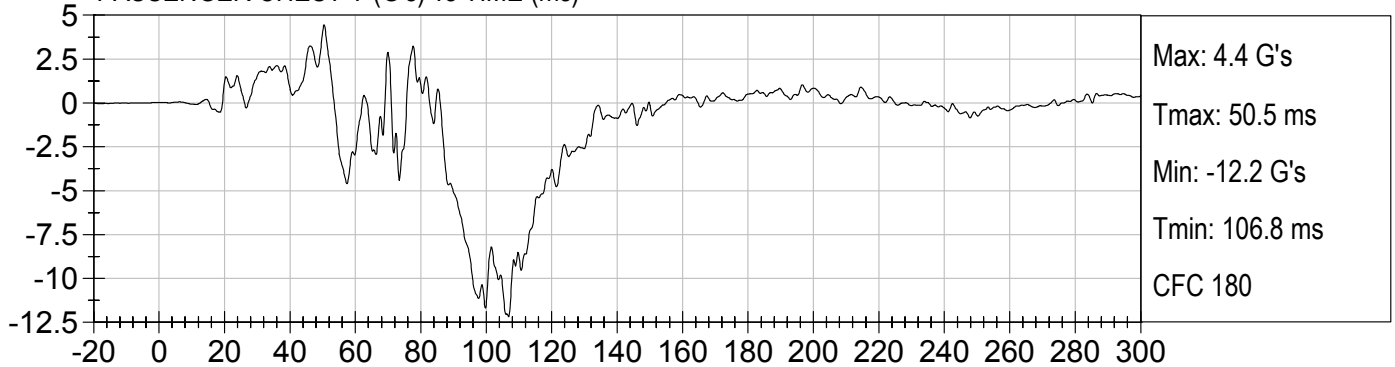




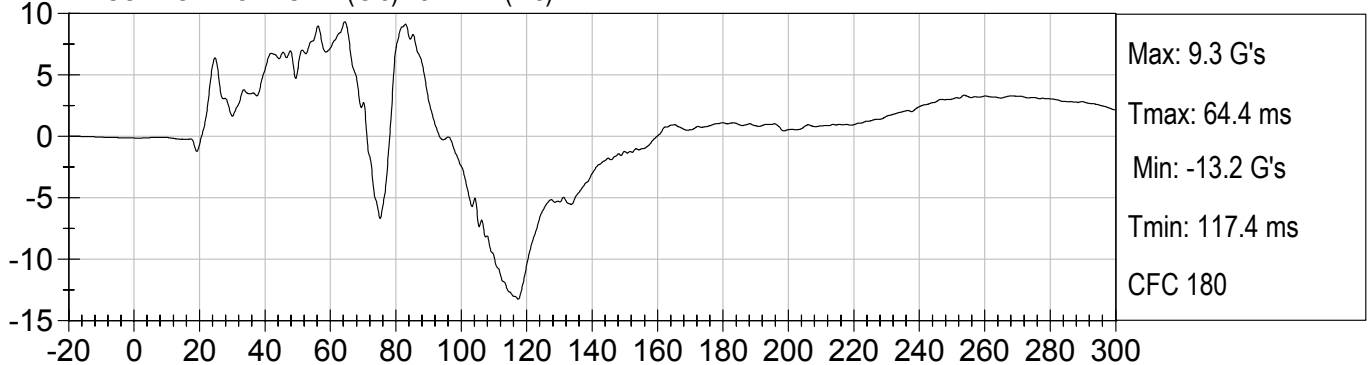
PASSENGER CHEST X (G's) vs TIME (ms)



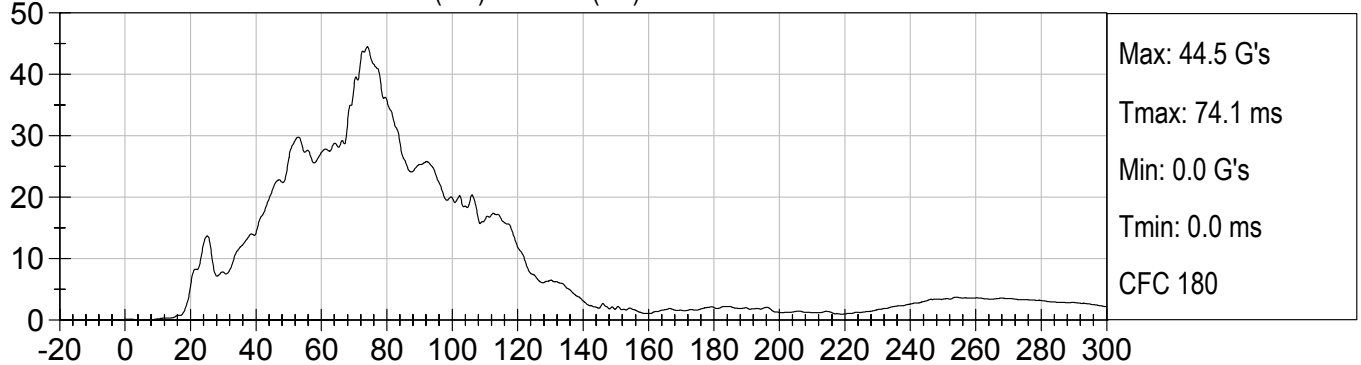
PASSENGER CHEST Y (G's) vs TIME (ms)



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

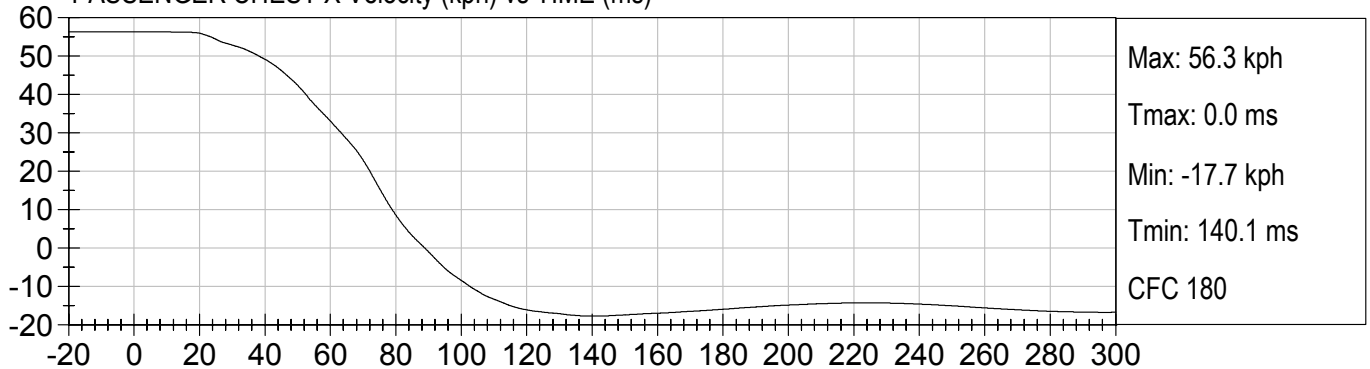


PASSENGER CHEST Resultant (G's) vs TIME (ms)

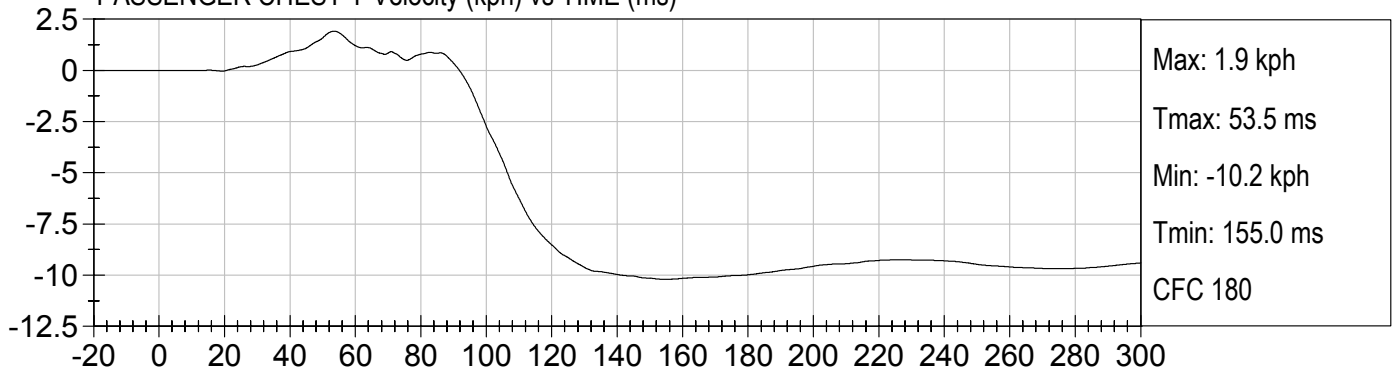




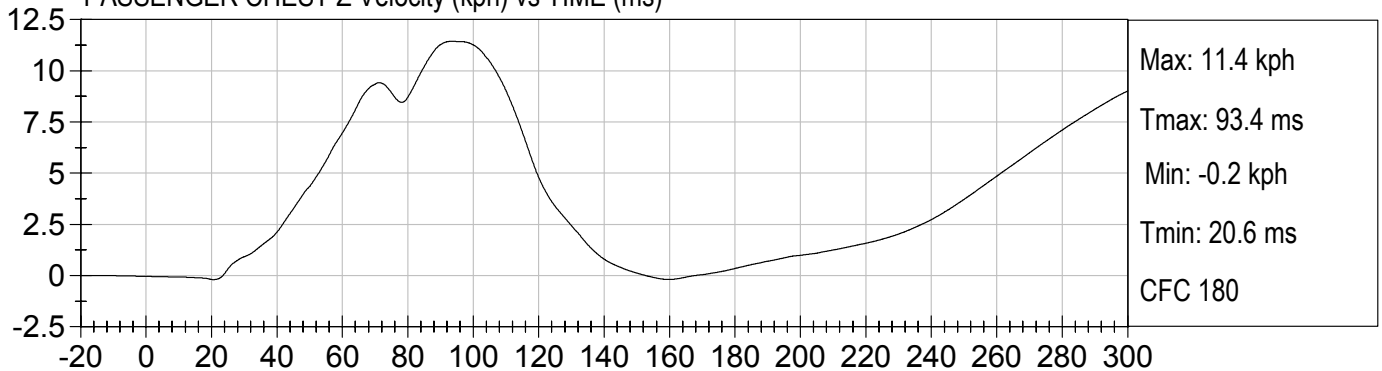
PASSENGER CHEST X Velocity (kph) vs TIME (ms)



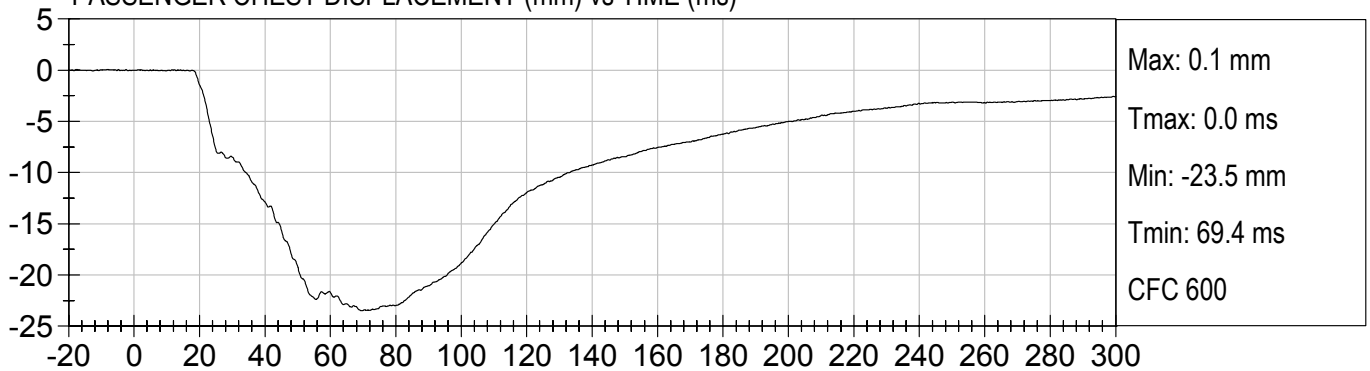
PASSENGER CHEST Y Velocity (kph) vs TIME (ms)

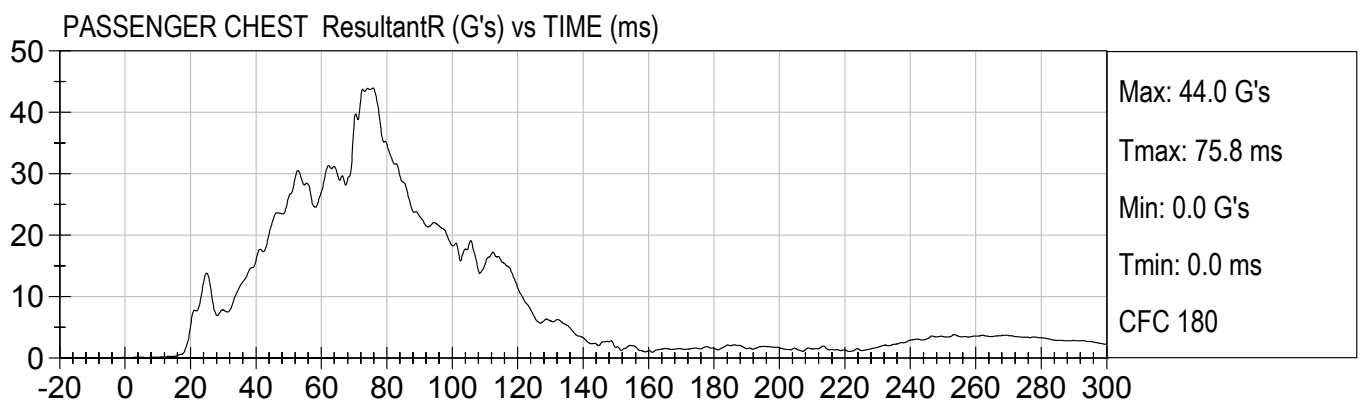
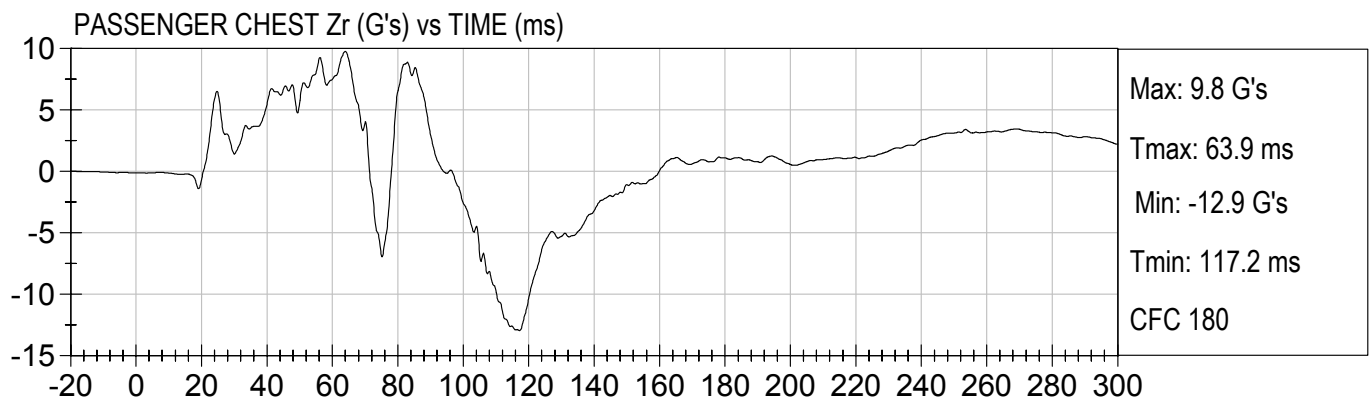
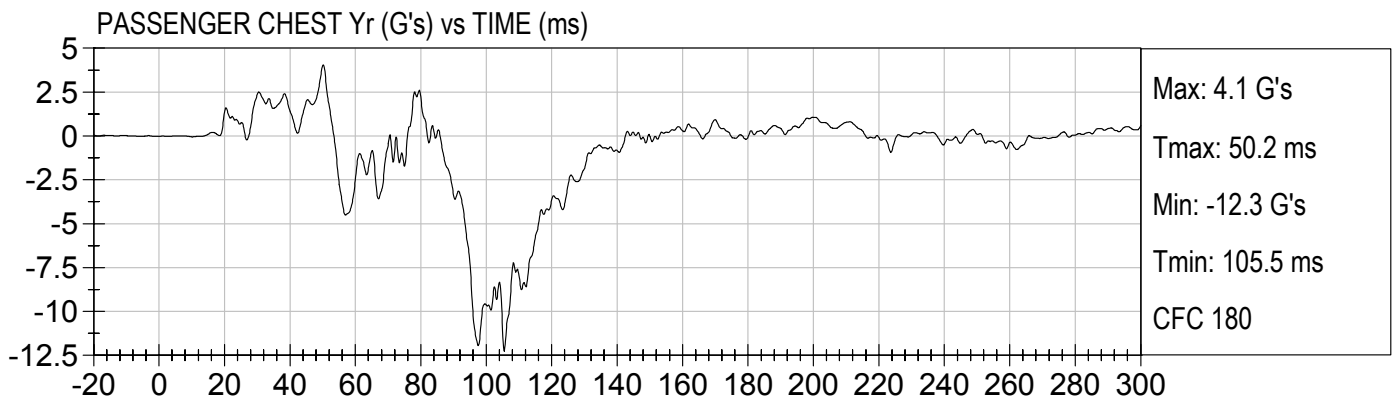
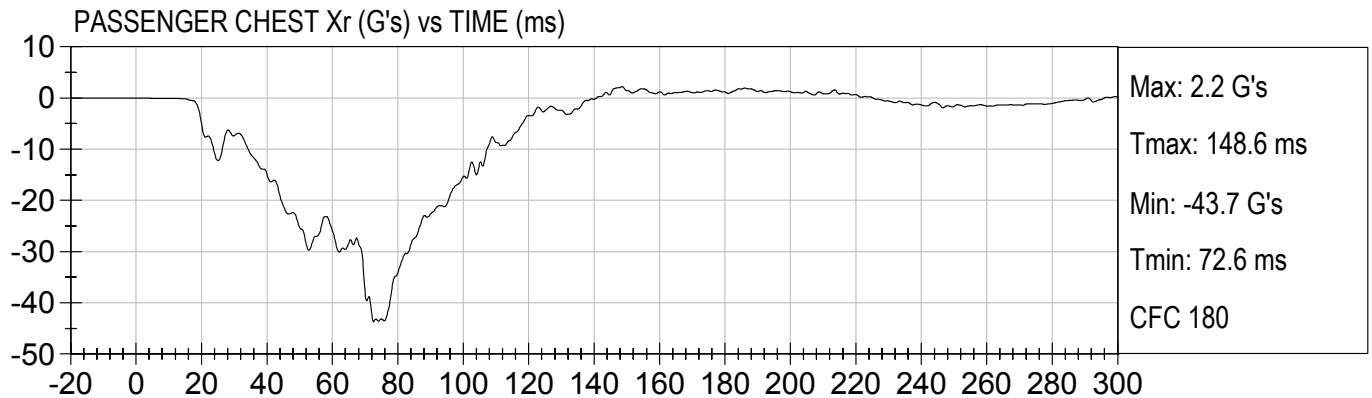


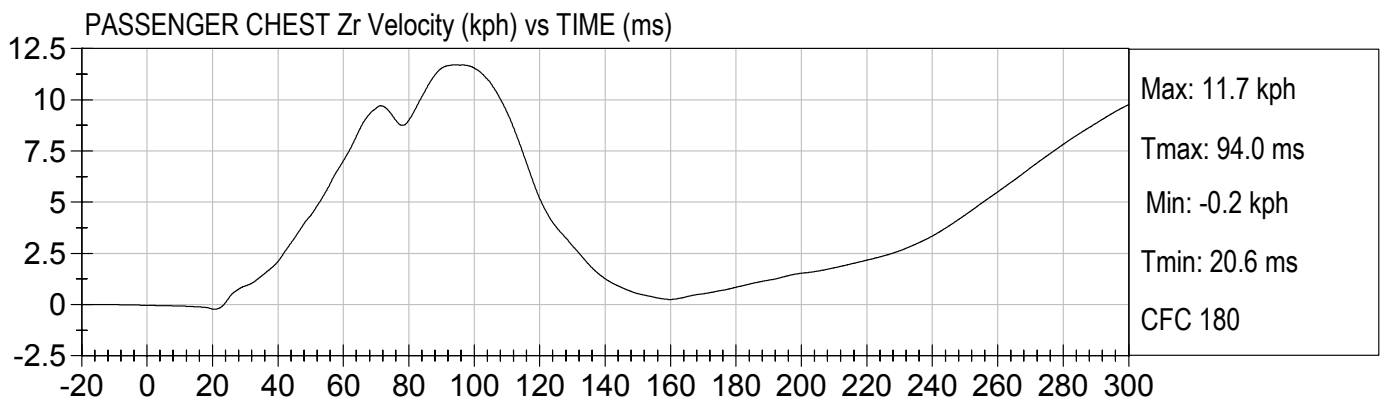
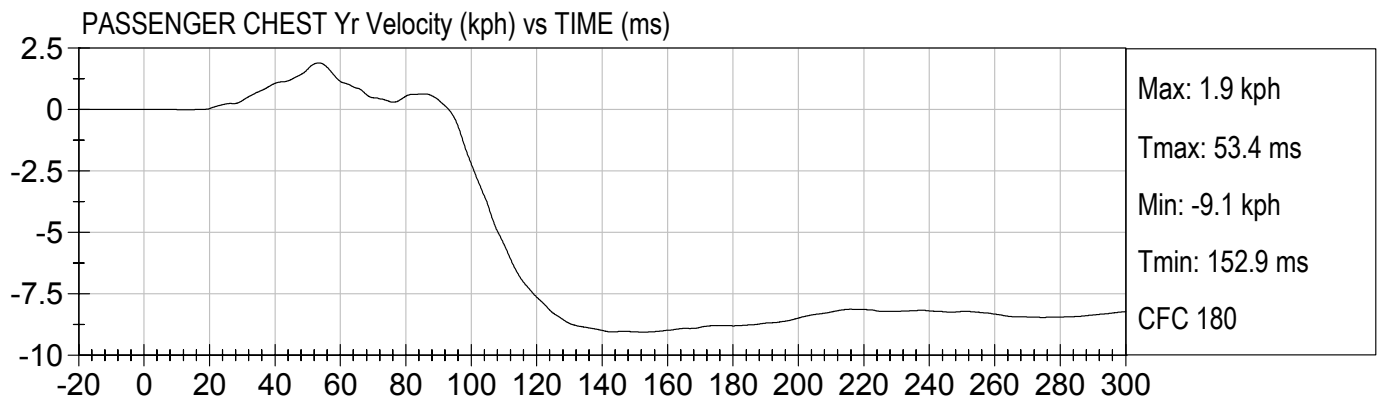
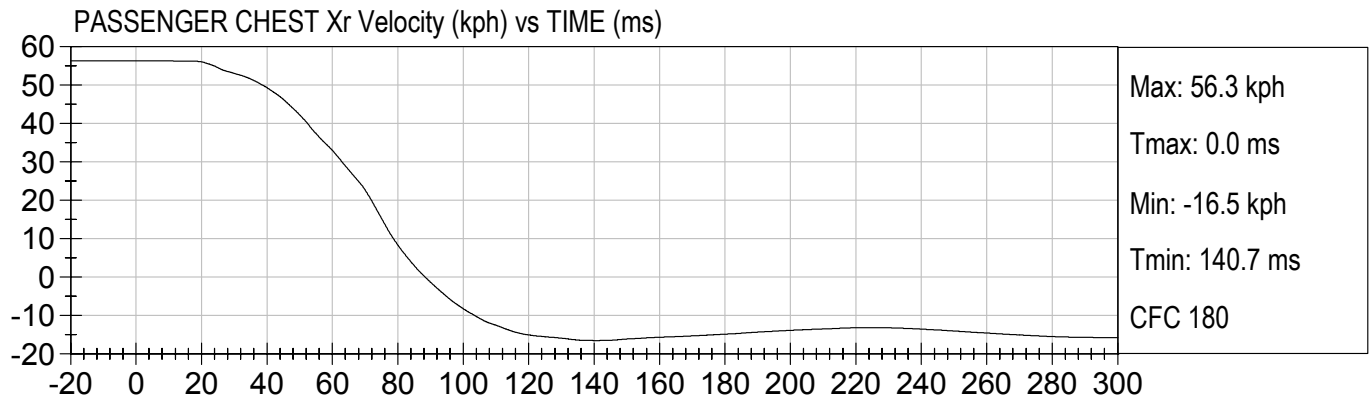
PASSENGER CHEST Z Velocity (kph) vs TIME (ms)

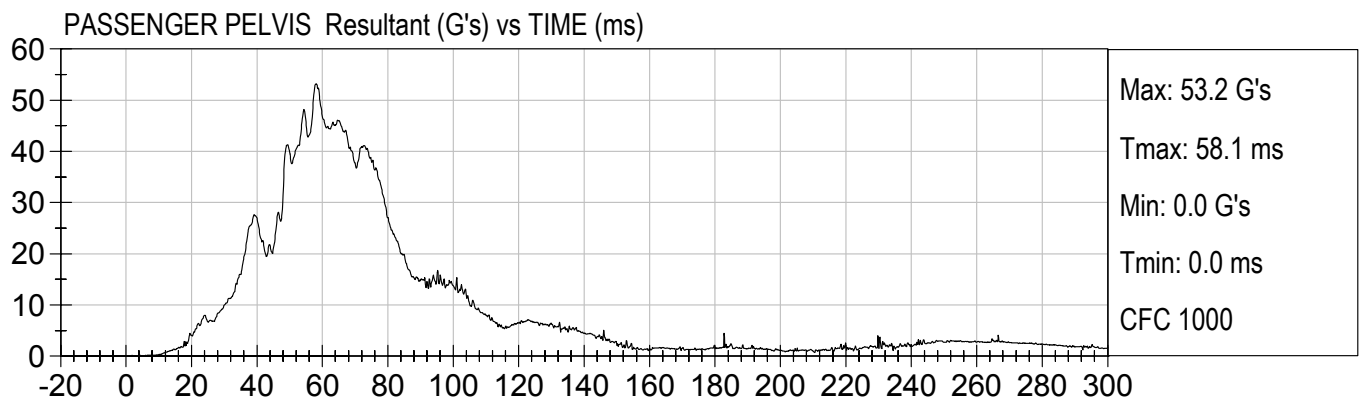
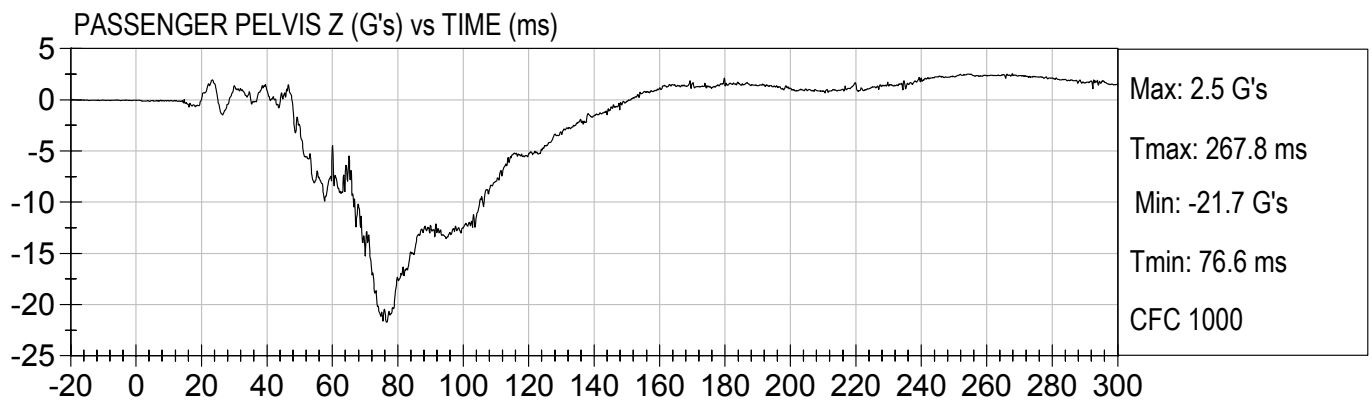
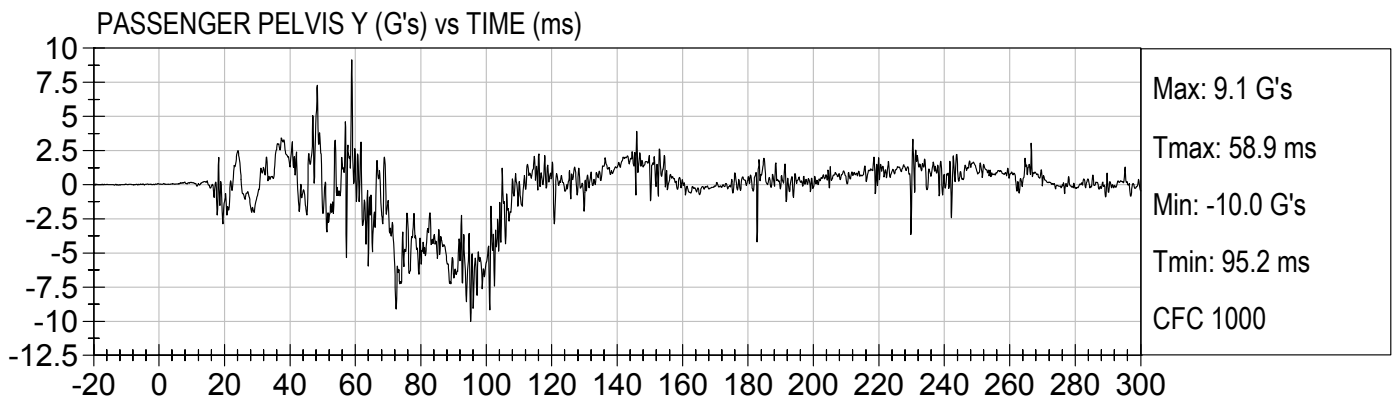
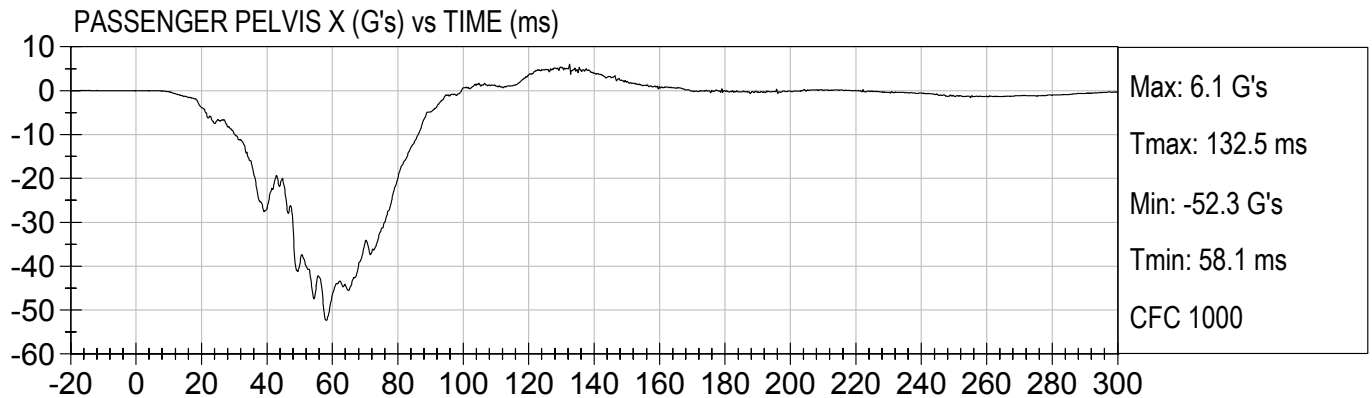


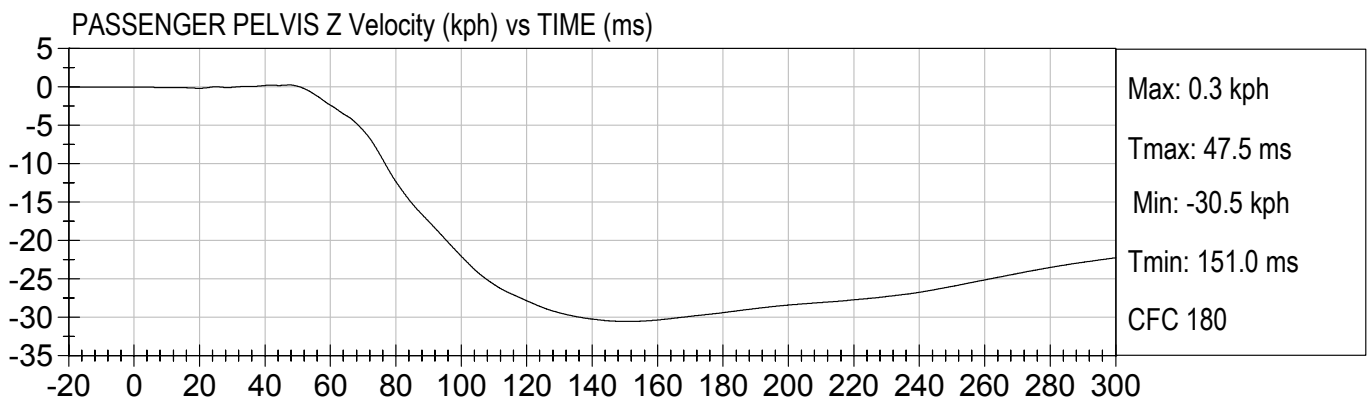
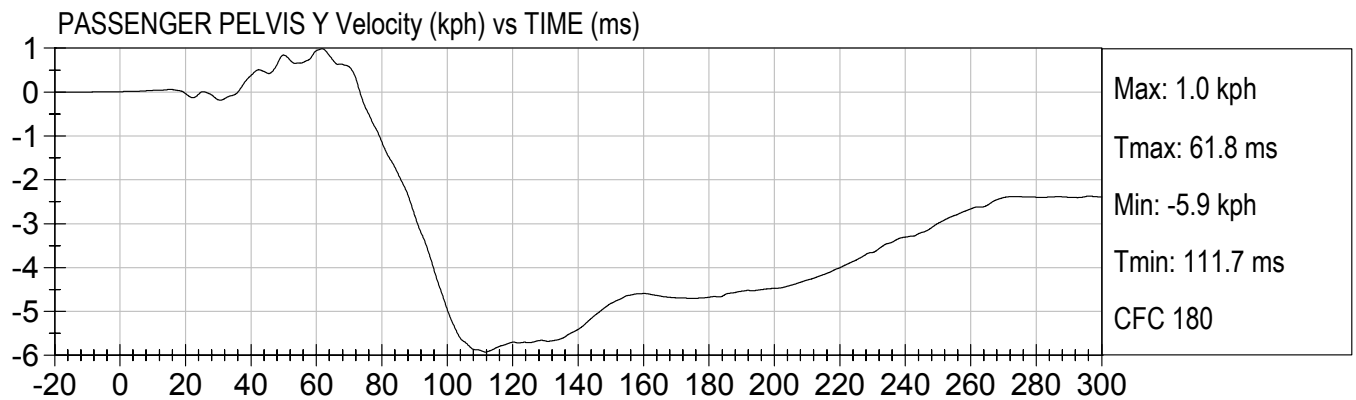
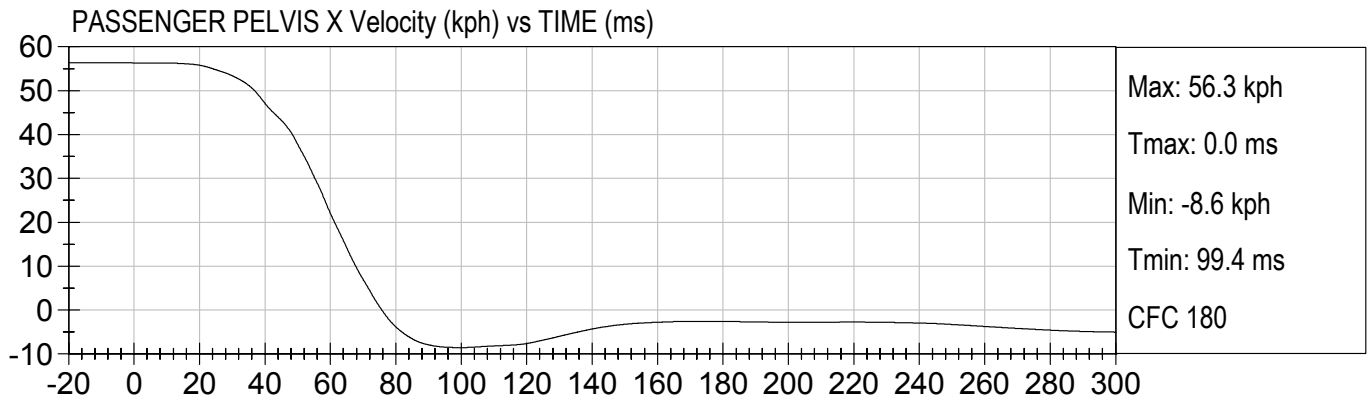
PASSENGER CHEST DISPLACEMENT (mm) vs TIME (ms)

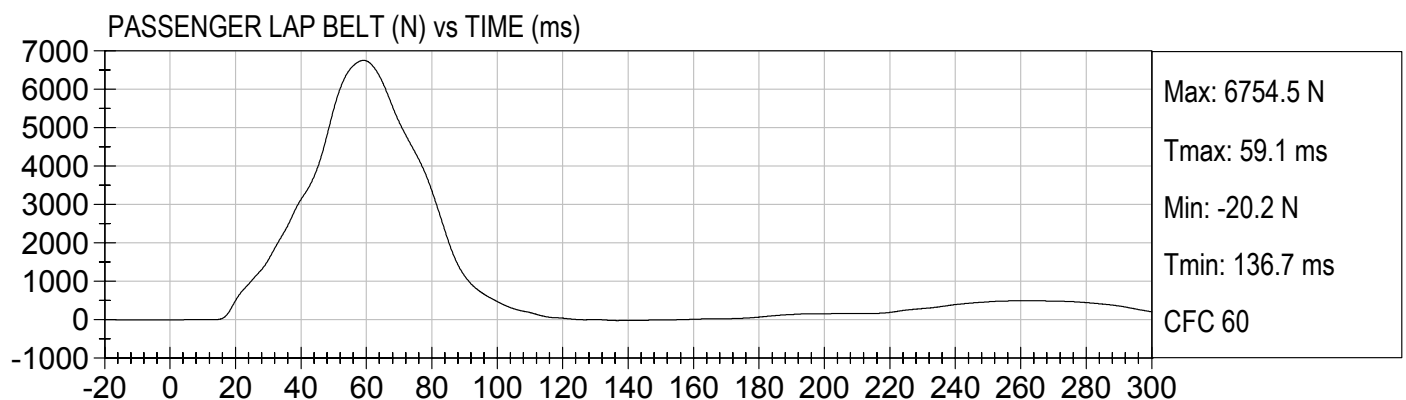
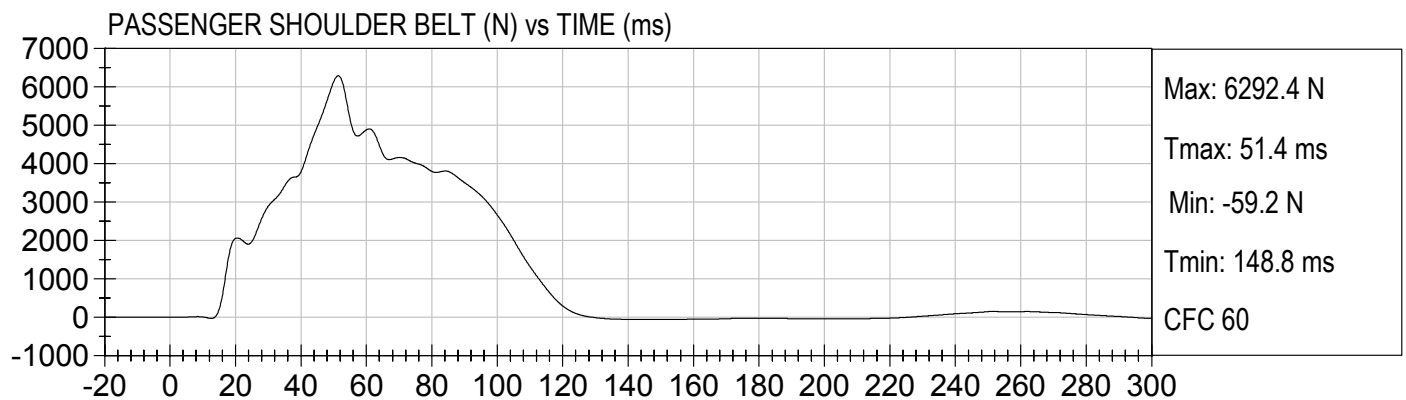
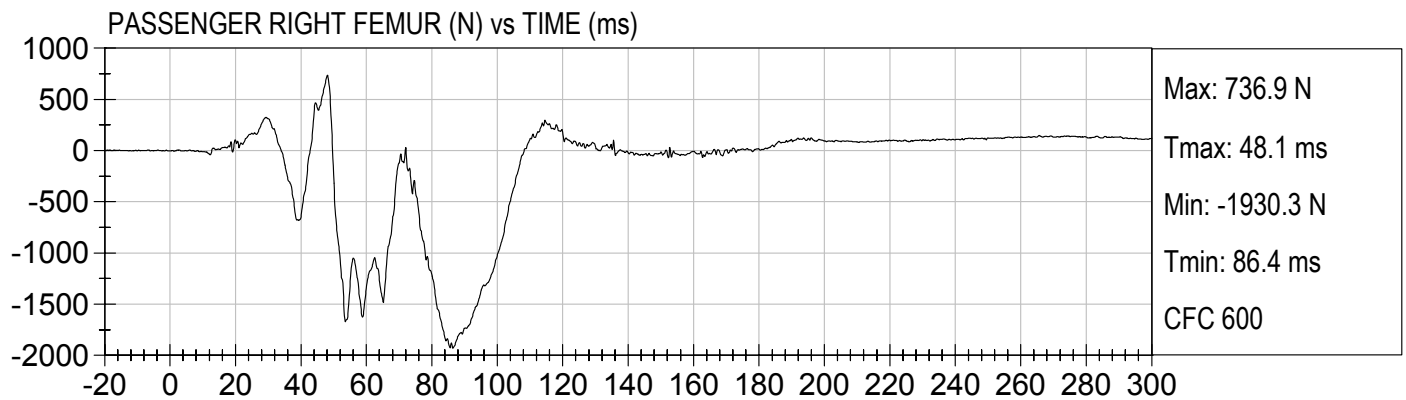
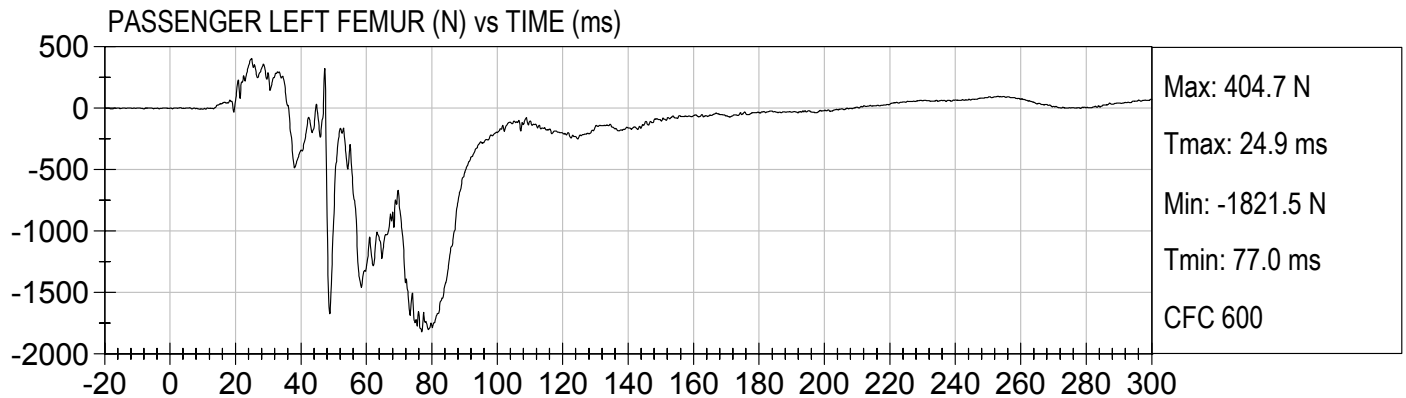






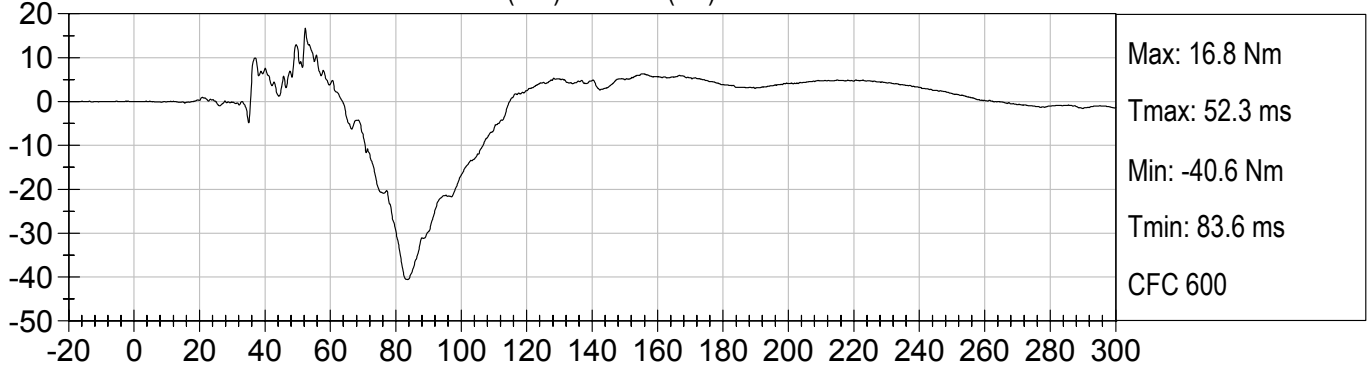




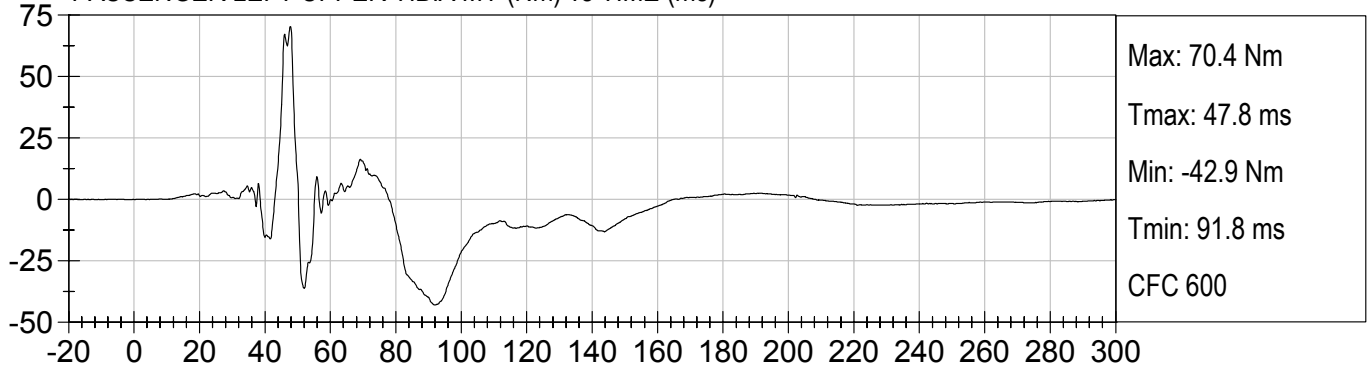




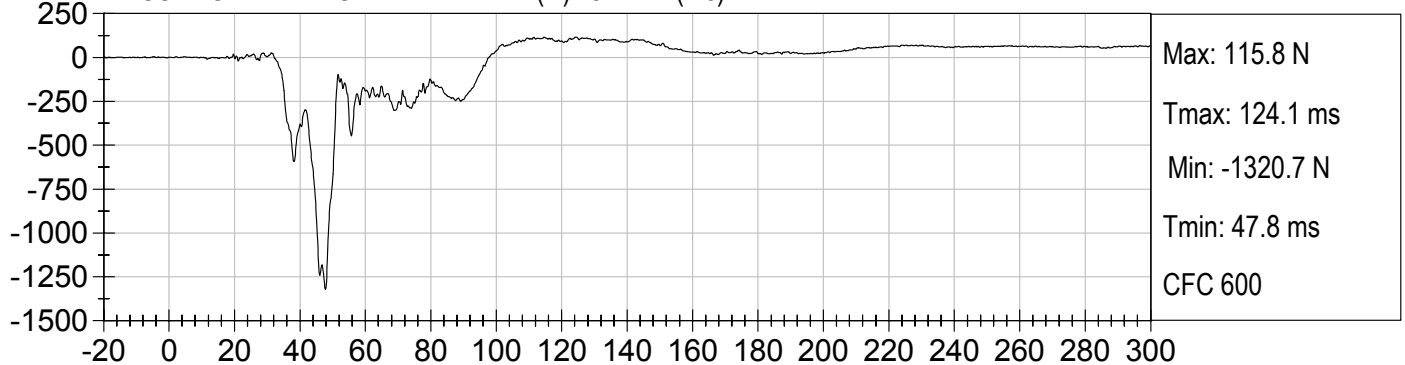
PASSENGER LEFT UPPER TIBIA MX (Nm) vs TIME (ms)



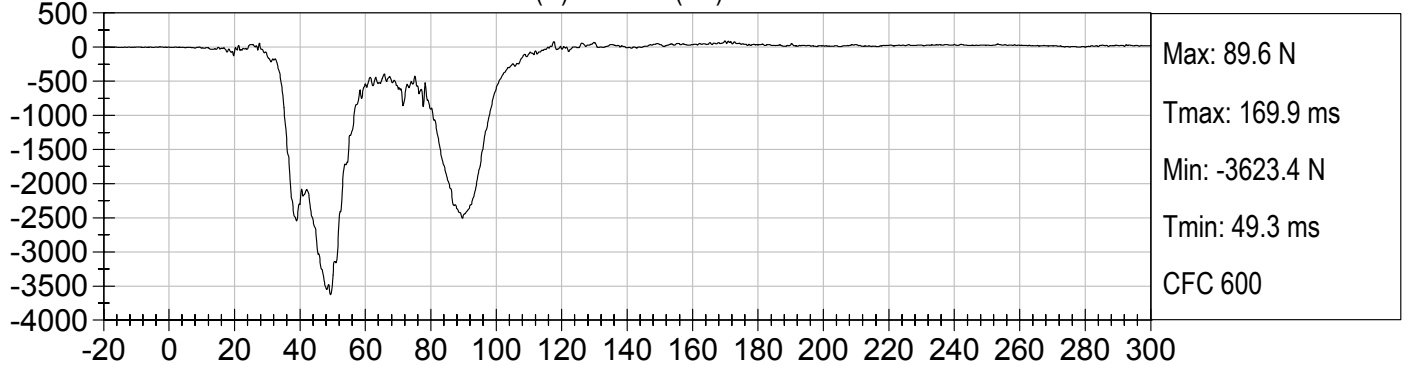
PASSENGER LEFT UPPER TIBIA MY (Nm) vs TIME (ms)



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

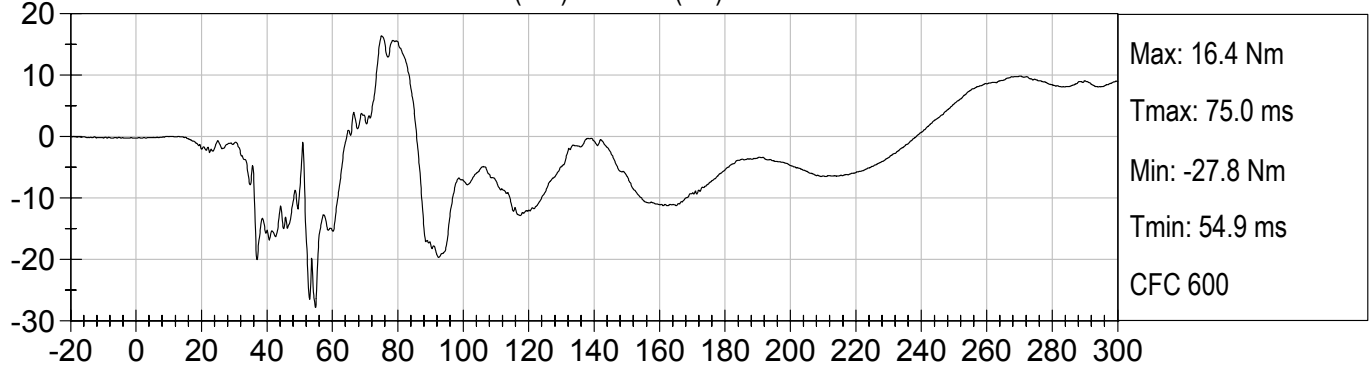


PASSENGER LEFT UPPER TIBIA FZ (N) vs TIME (ms)

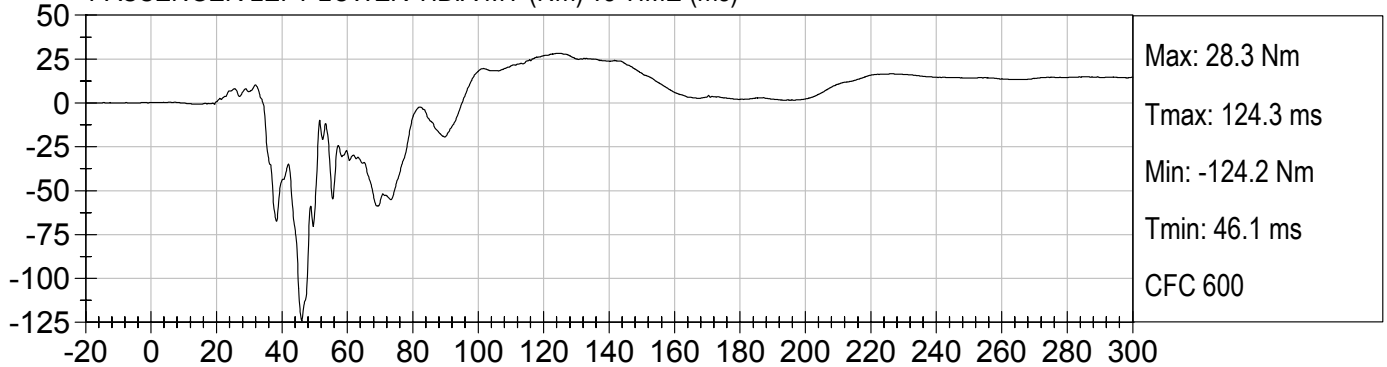




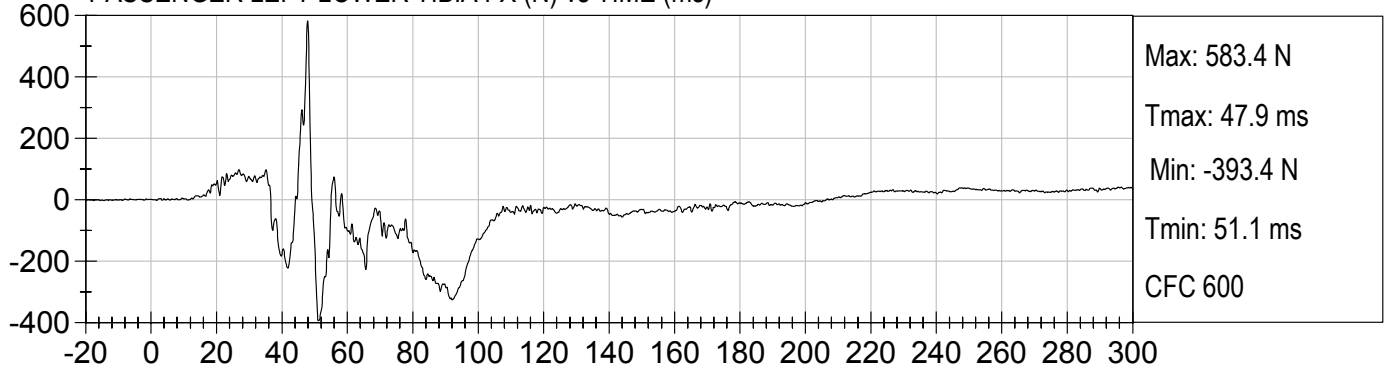
PASSENGER LEFT LOWER TIBIA MX (Nm) vs TIME (ms)



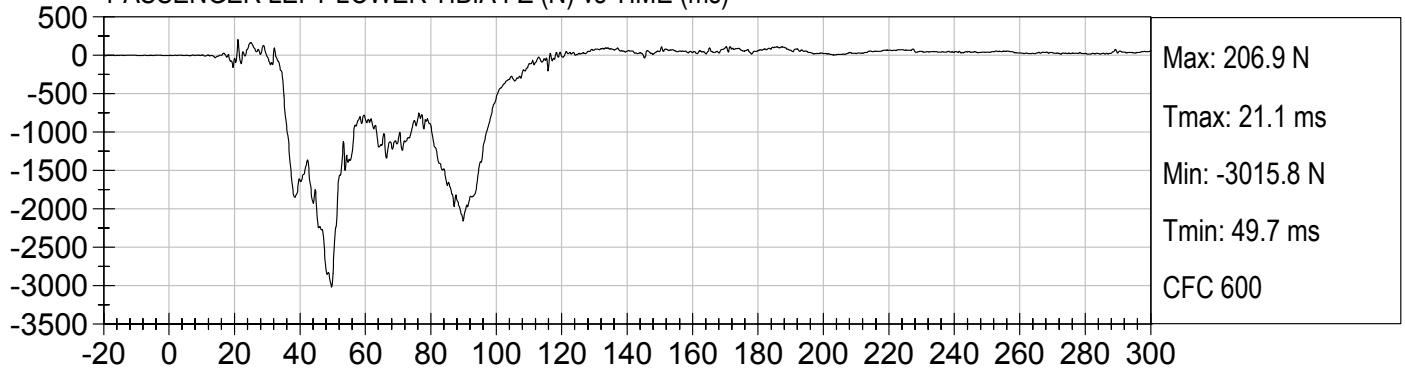
PASSENGER LEFT LOWER TIBIA MY (Nm) vs TIME (ms)



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

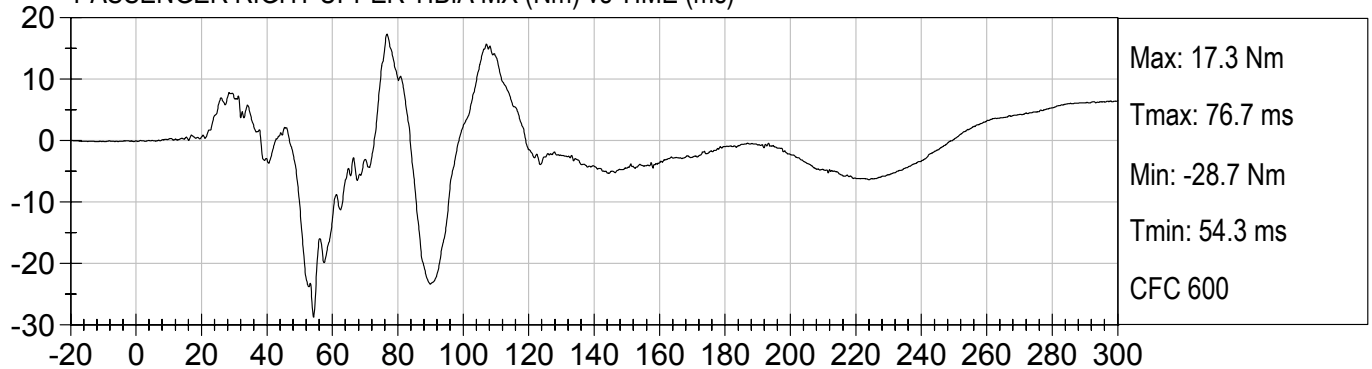


PASSENGER LEFT LOWER TIBIA FZ (N) vs TIME (ms)

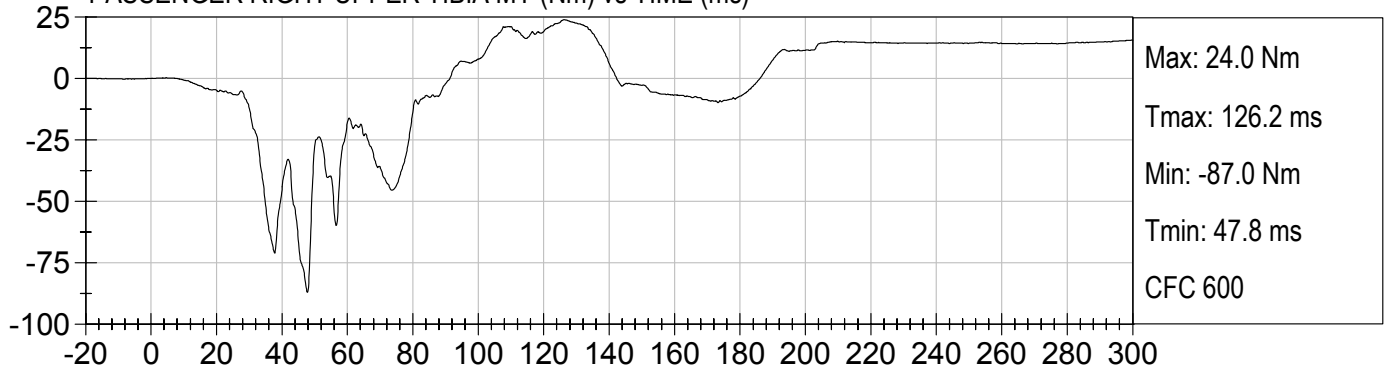




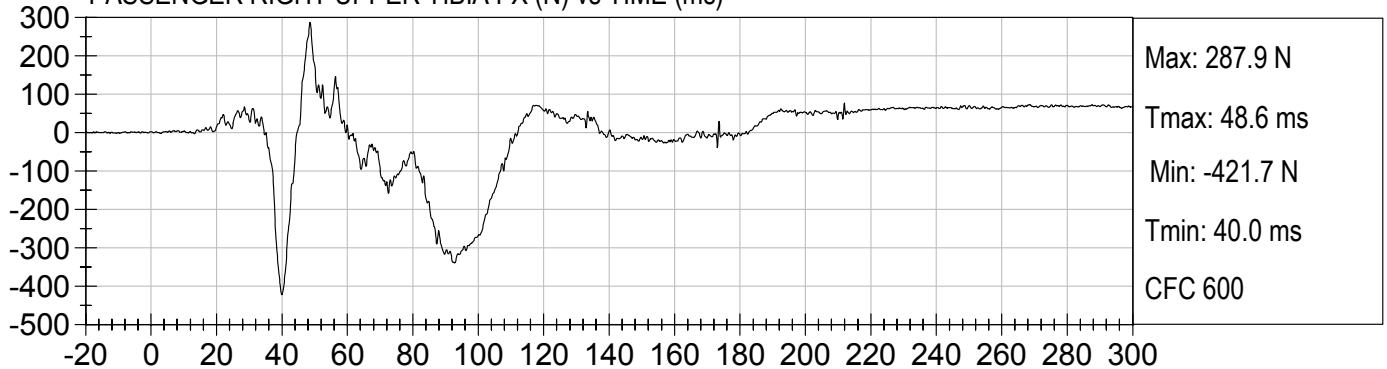
PASSENGER RIGHT UPPER TIBIA MX (Nm) vs TIME (ms)



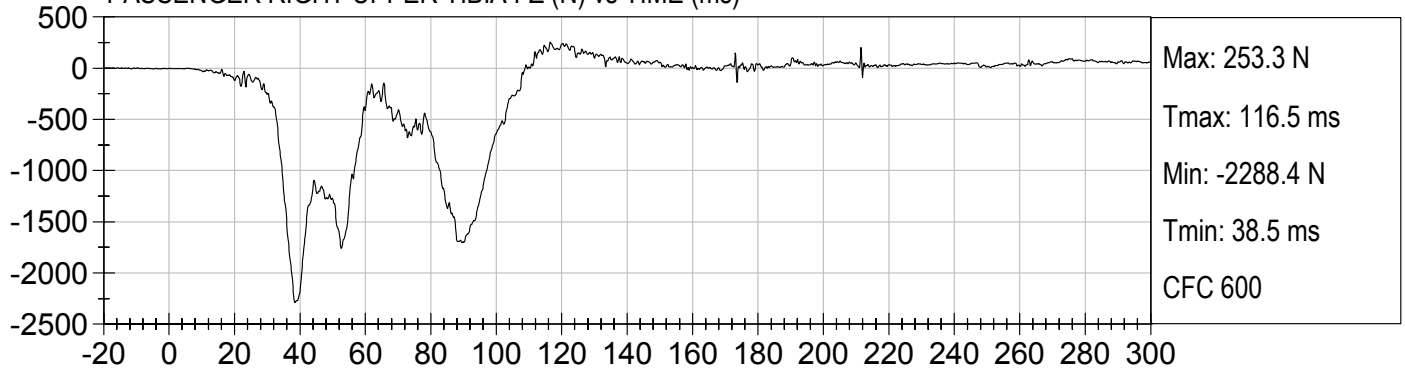
PASSENGER RIGHT UPPER TIBIA MY (Nm) vs TIME (ms)



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

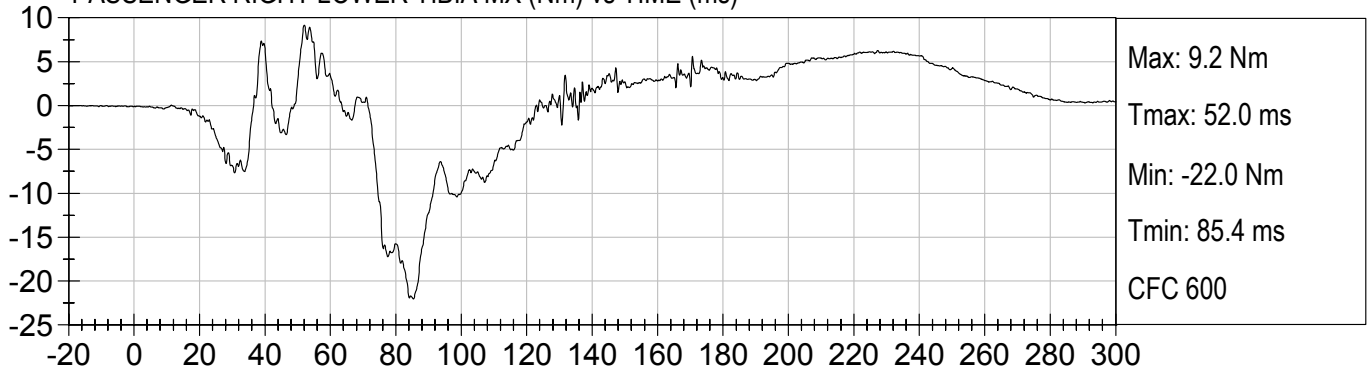


PASSENGER RIGHT UPPER TIBIA FZ (N) vs TIME (ms)

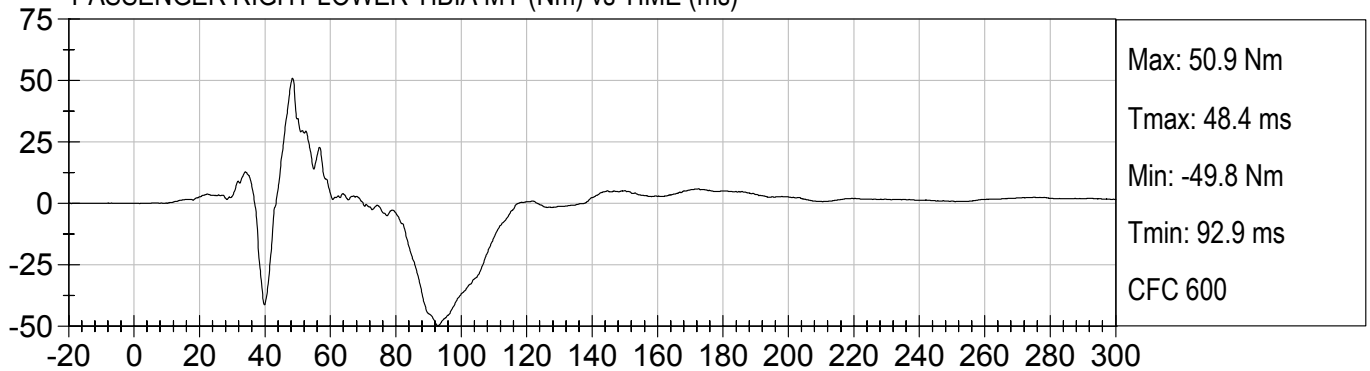




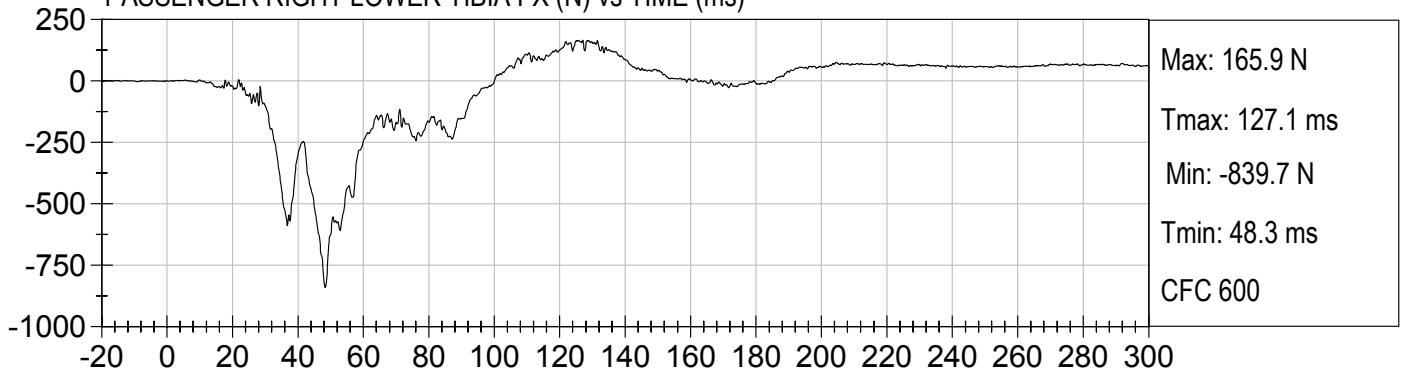
PASSENGER RIGHT LOWER TIBIA MX (Nm) vs TIME (ms)



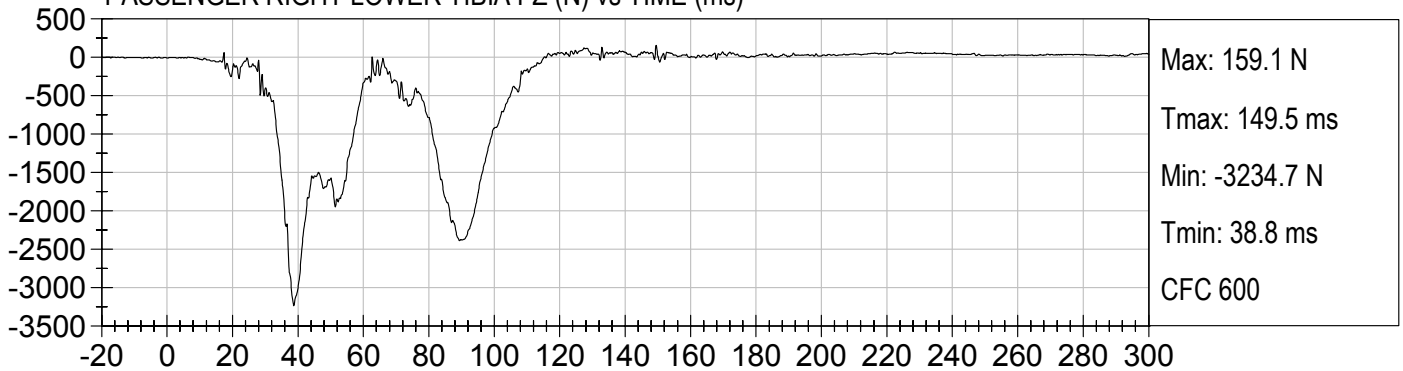
PASSENGER RIGHT LOWER TIBIA MY (Nm) vs TIME (ms)

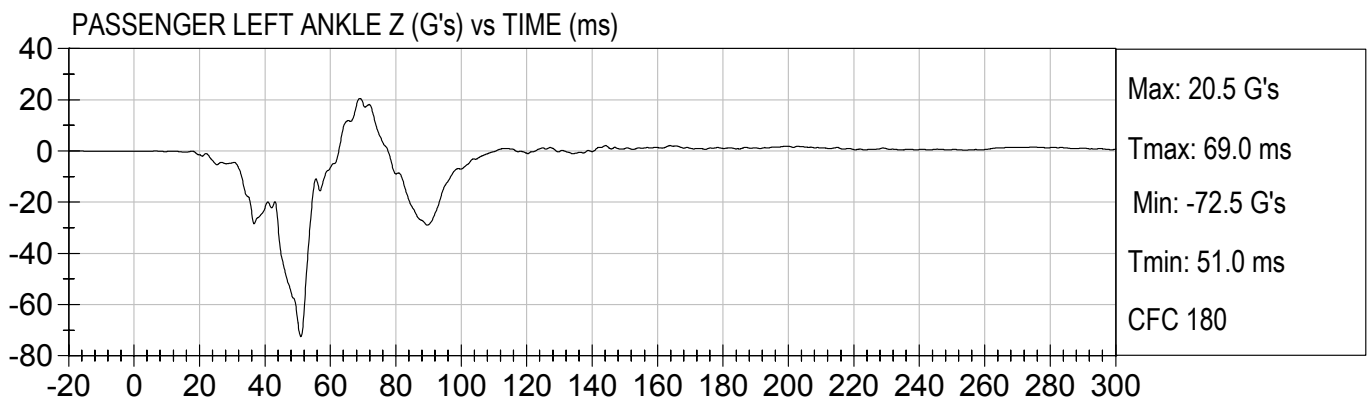
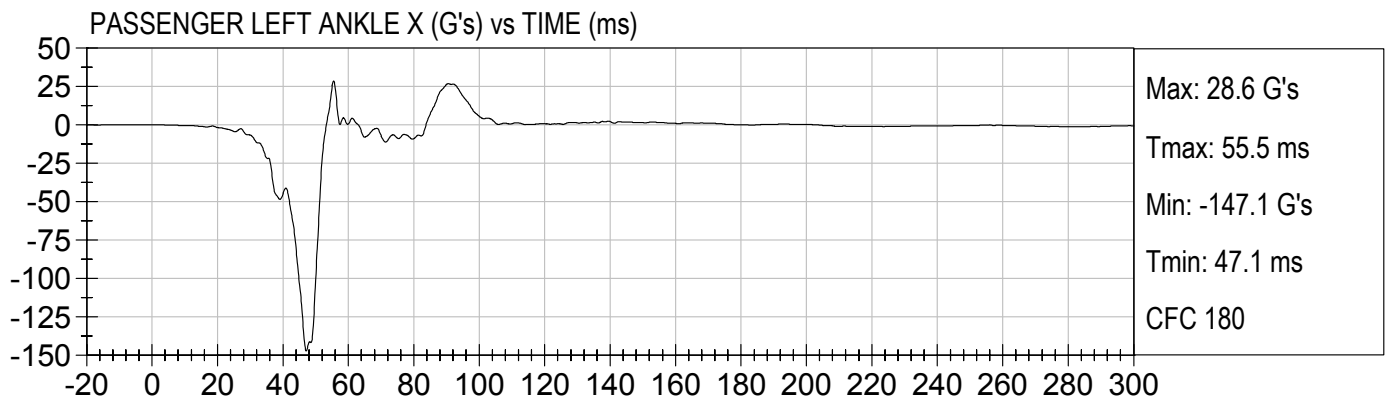
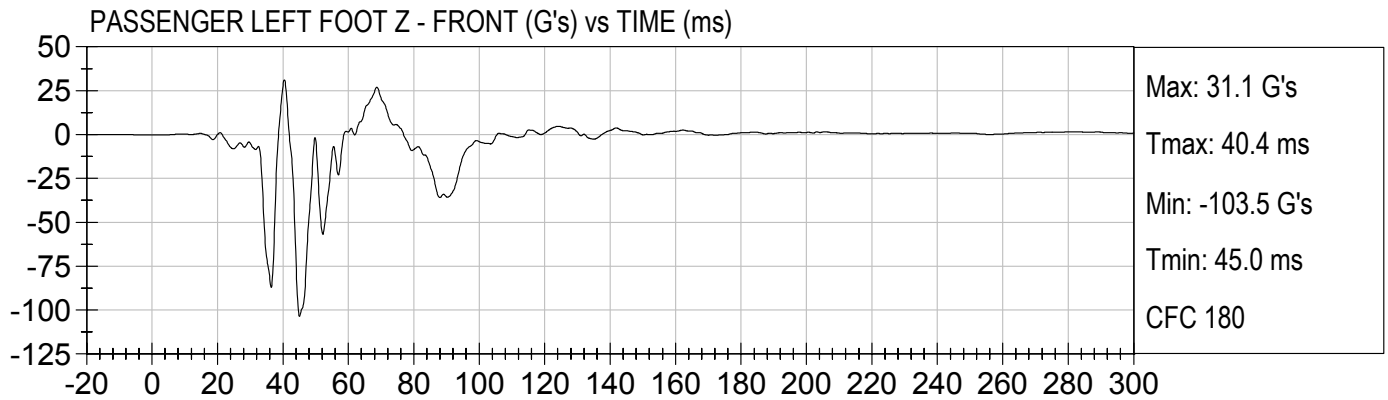


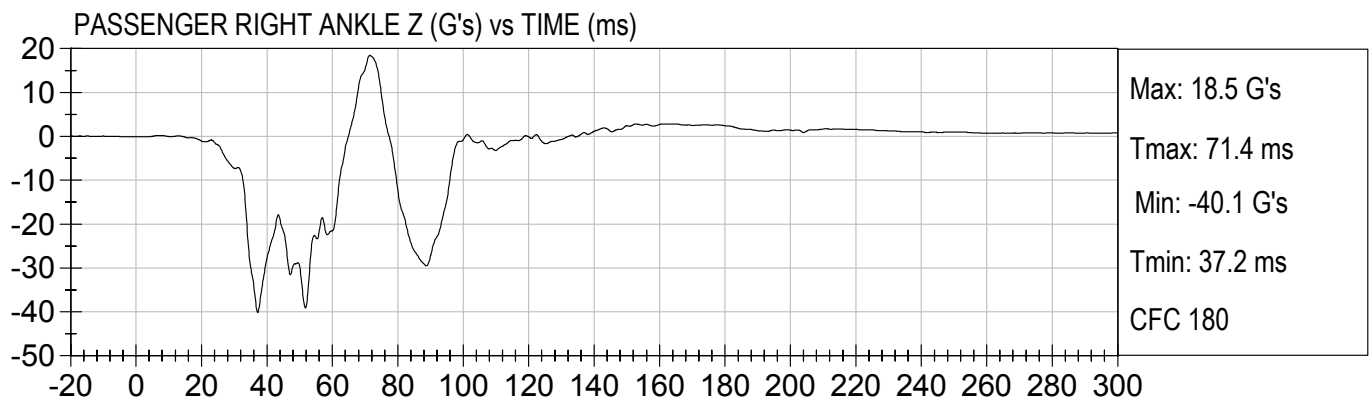
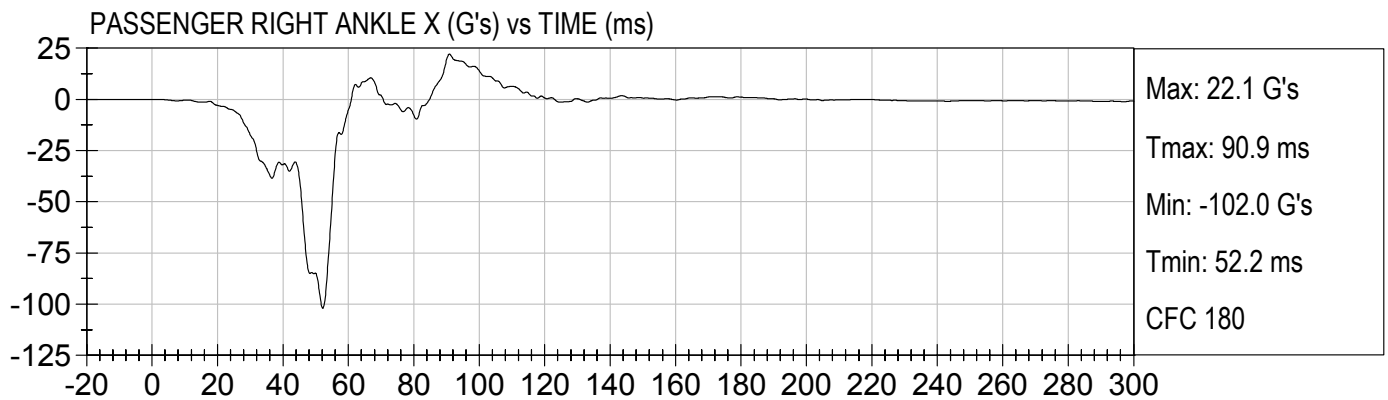
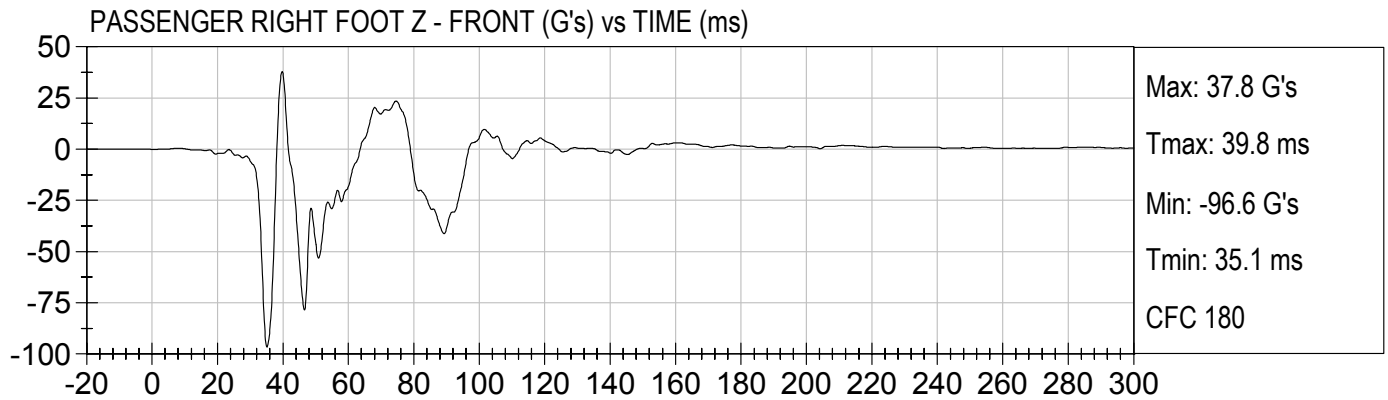
PASSENGER RIGHT LOWER TIBIA FX (N) vs TIME (ms)

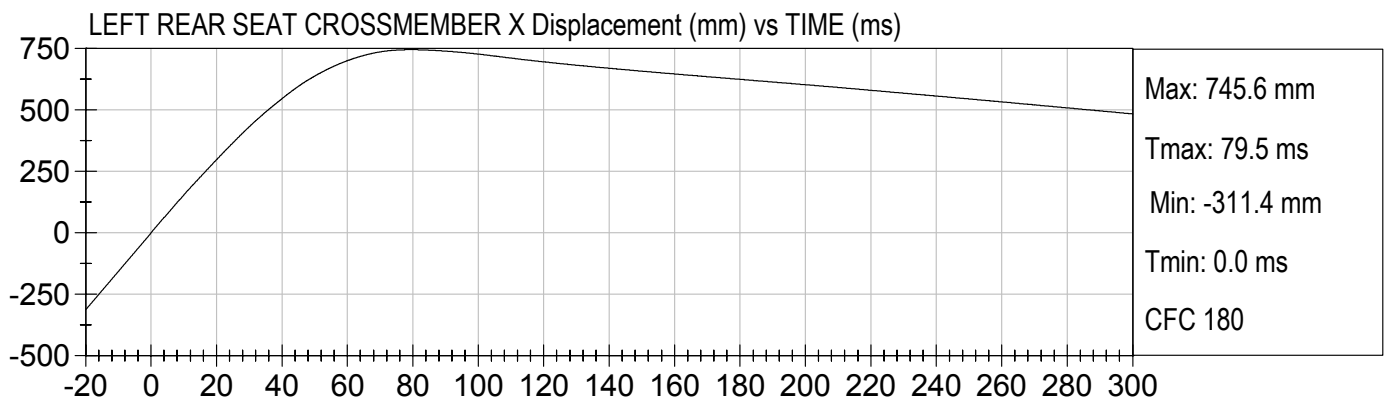
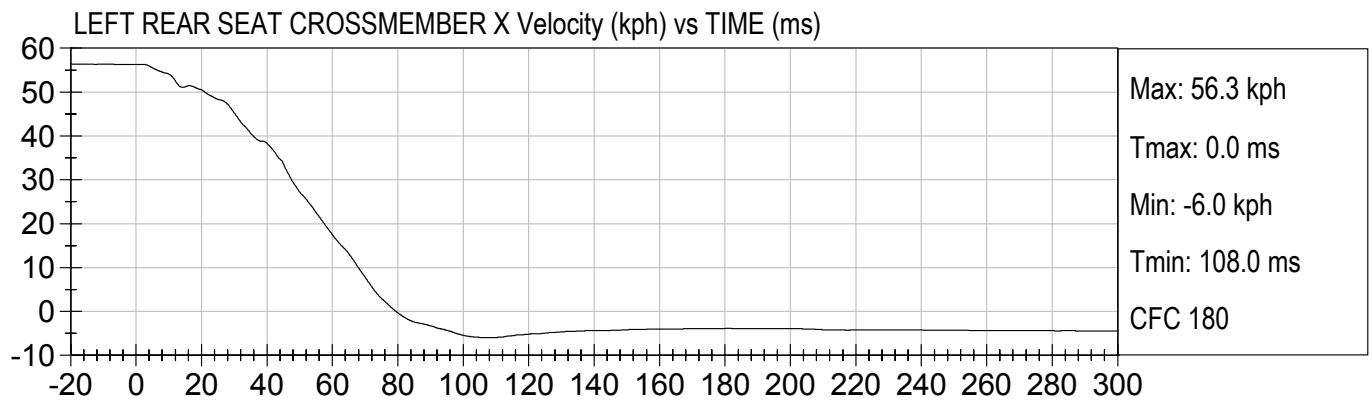
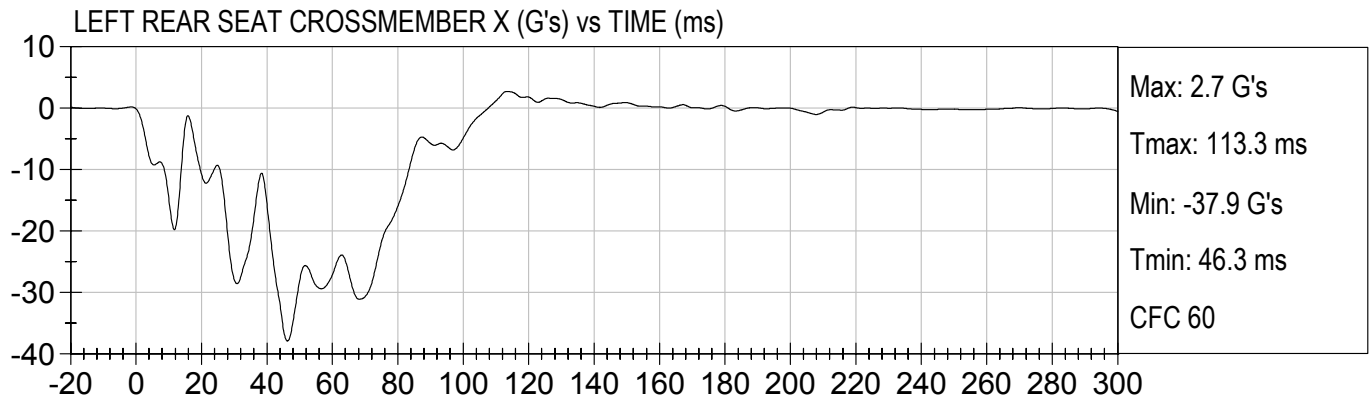


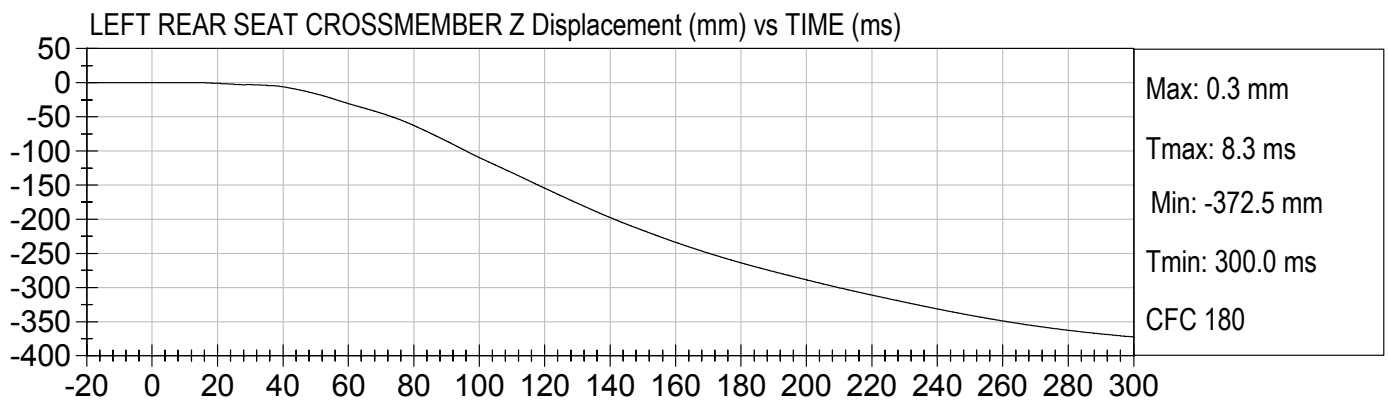
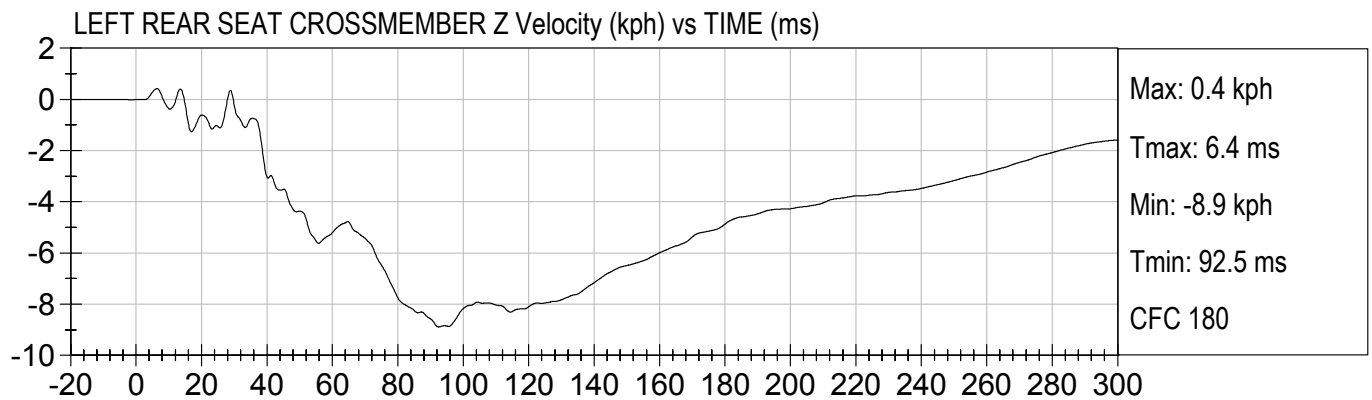
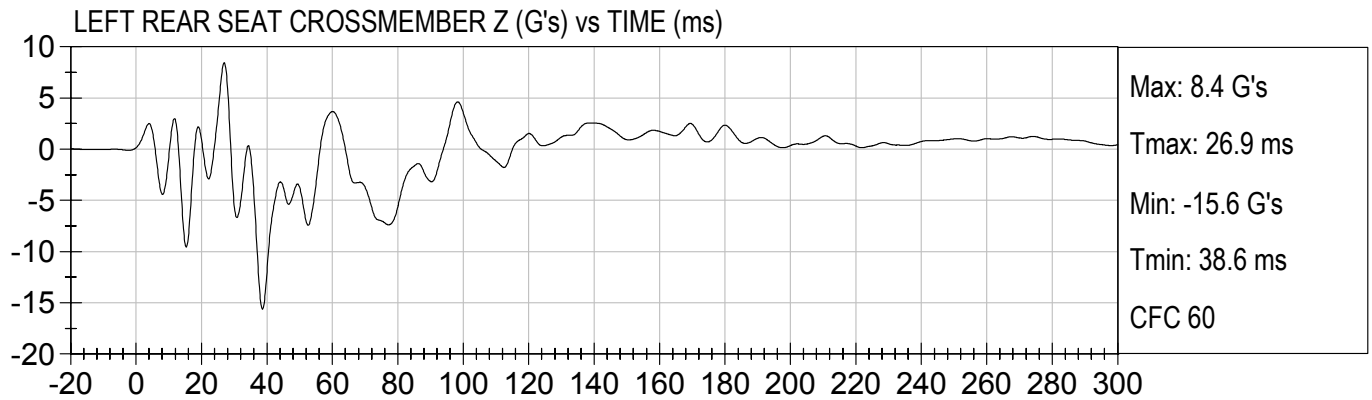
PASSENGER RIGHT LOWER TIBIA FZ (N) vs TIME (ms)

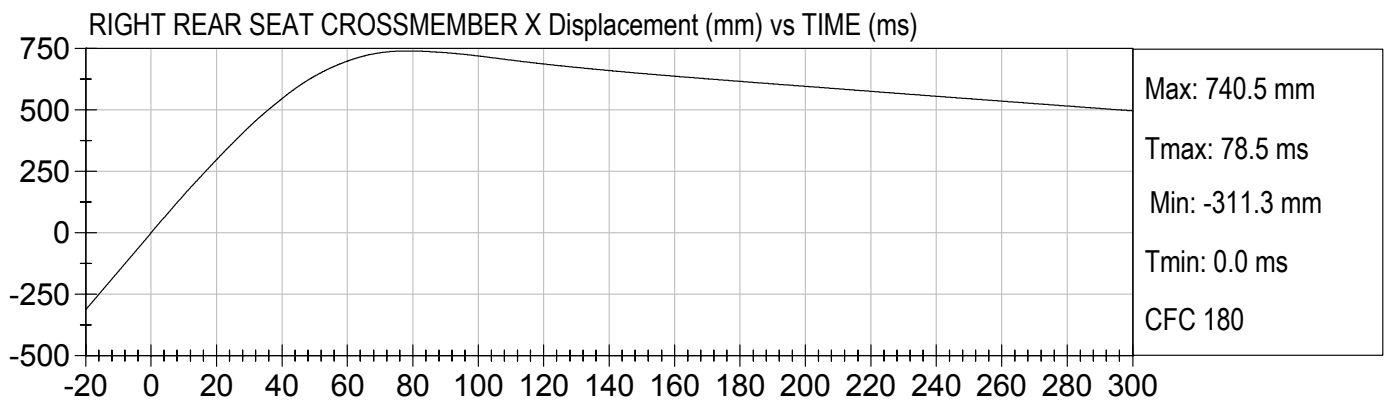
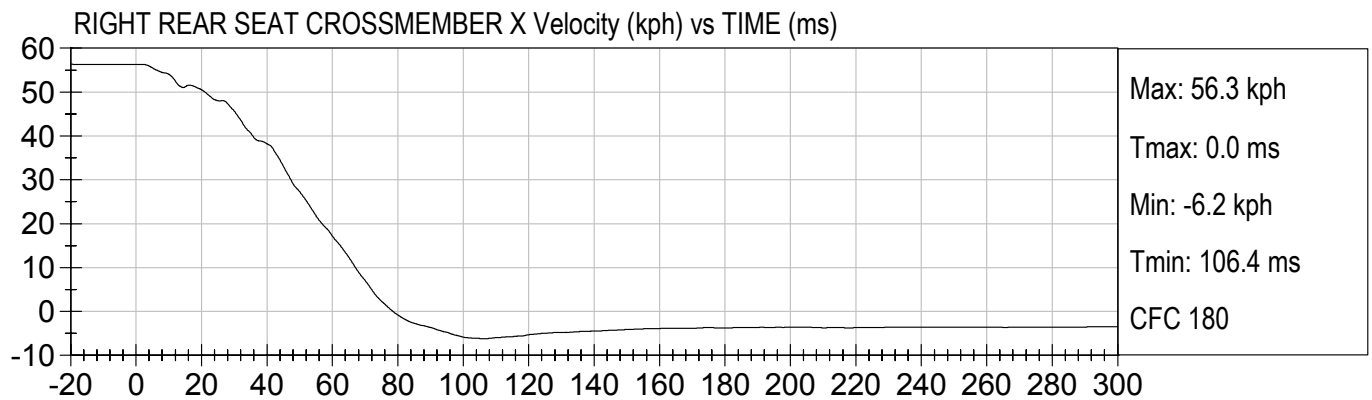
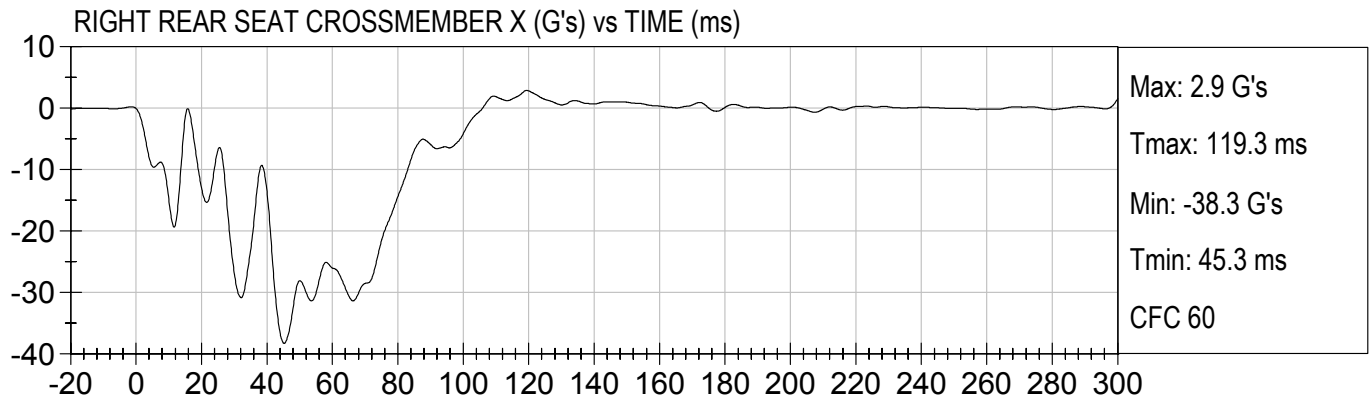


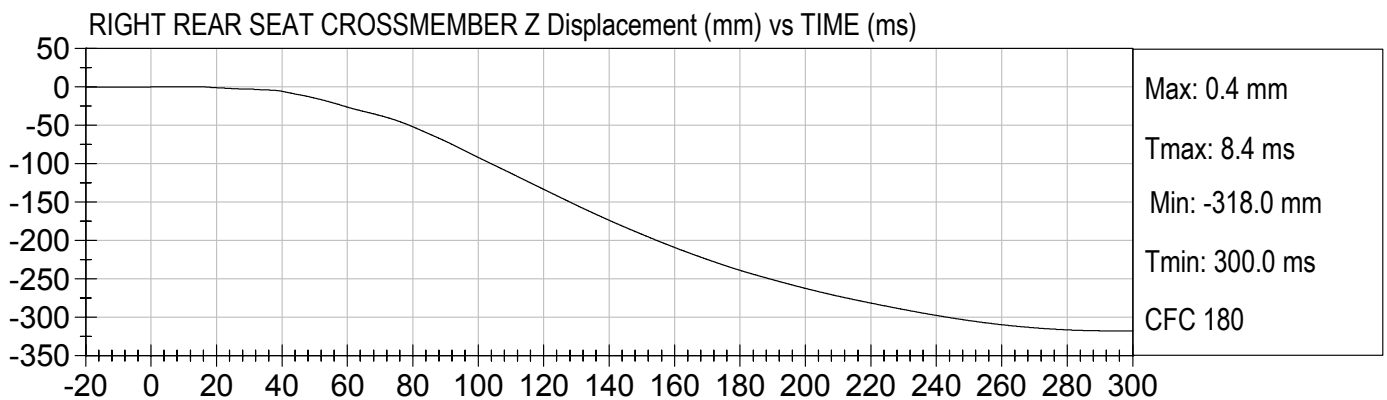
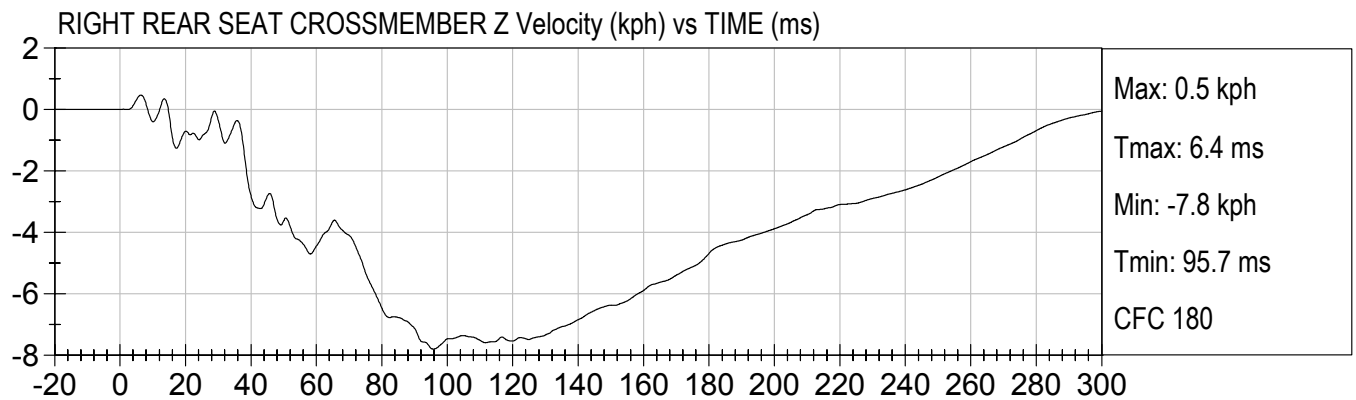
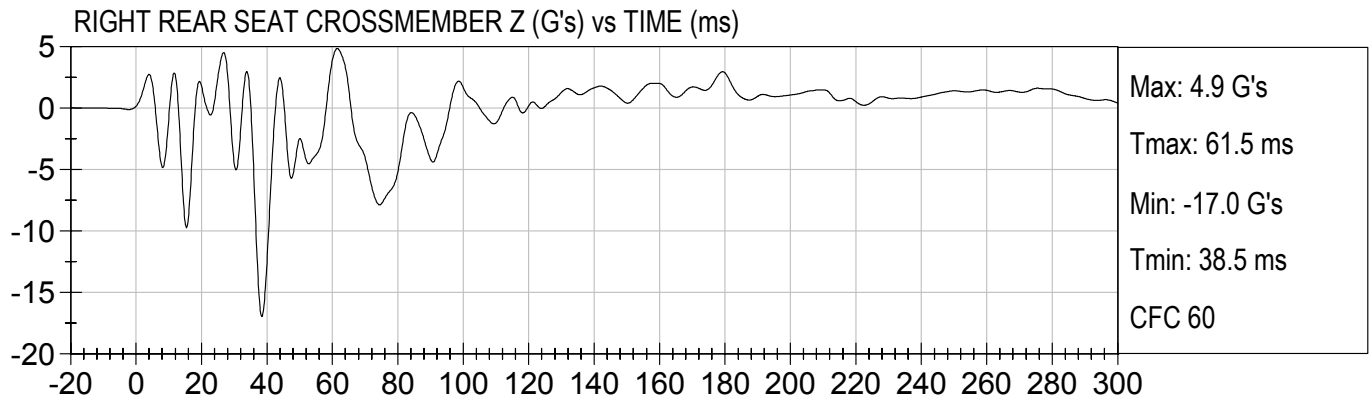


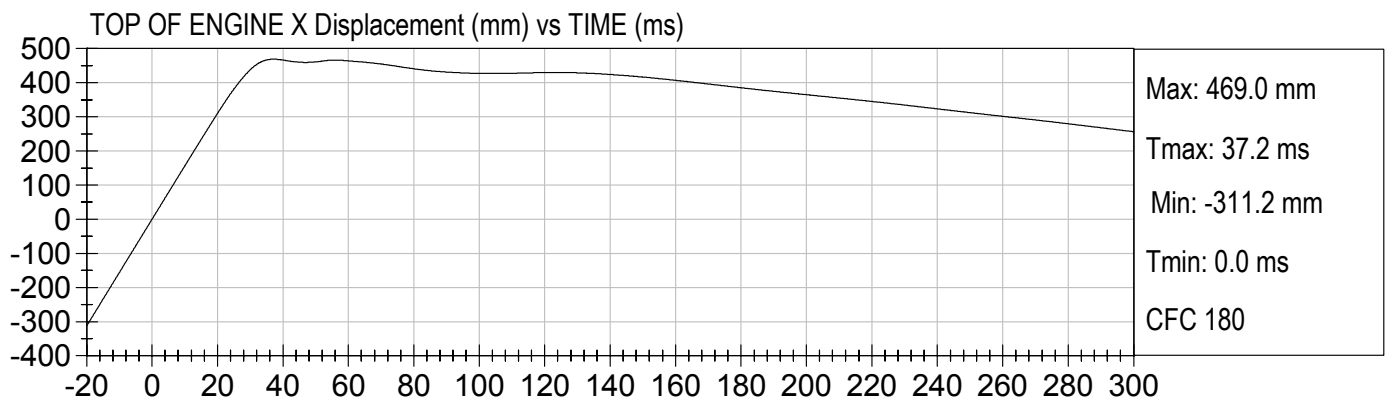
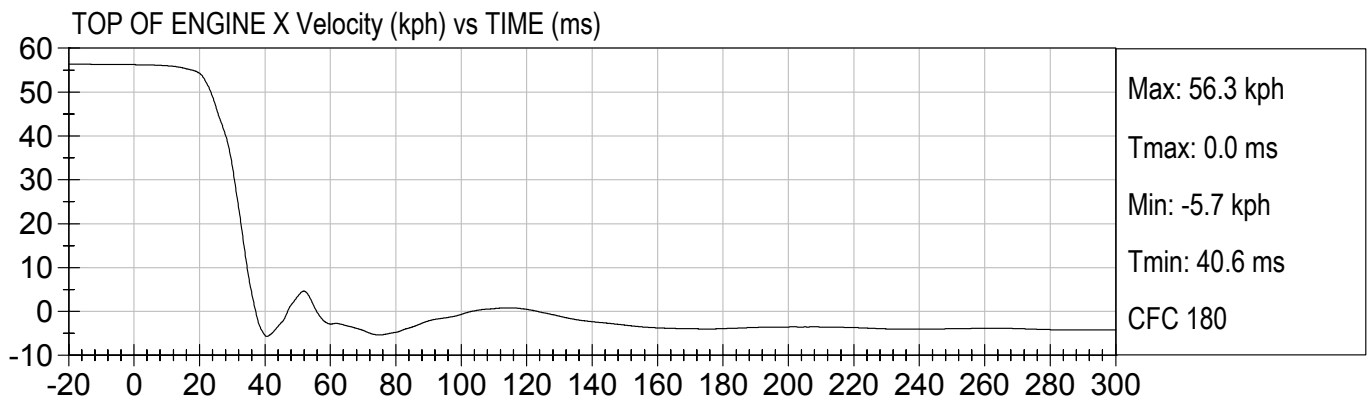
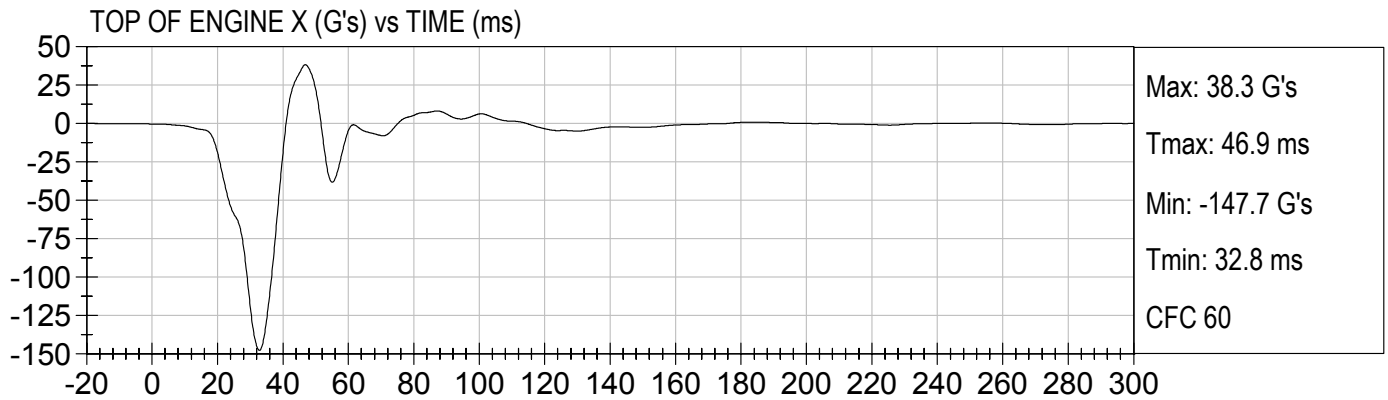


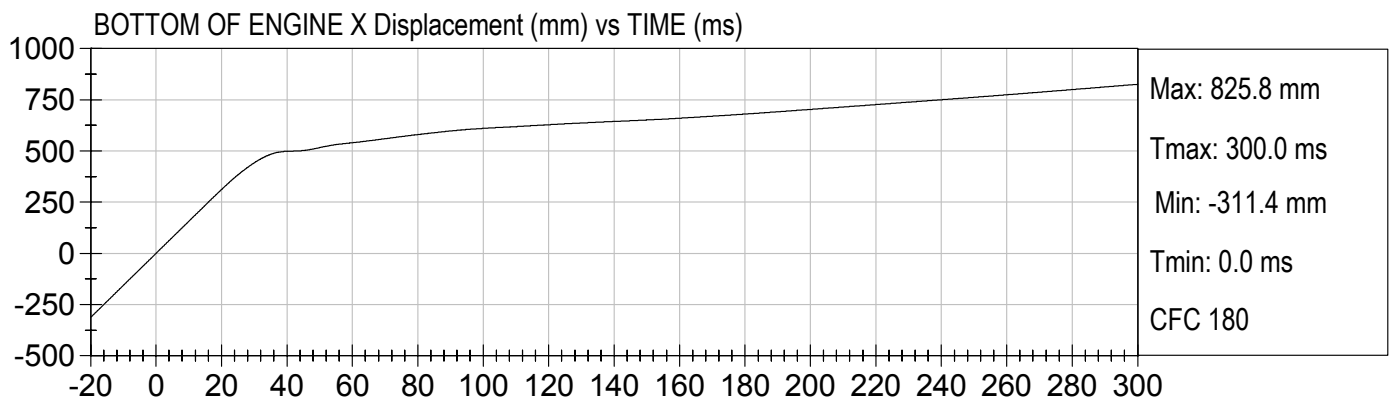
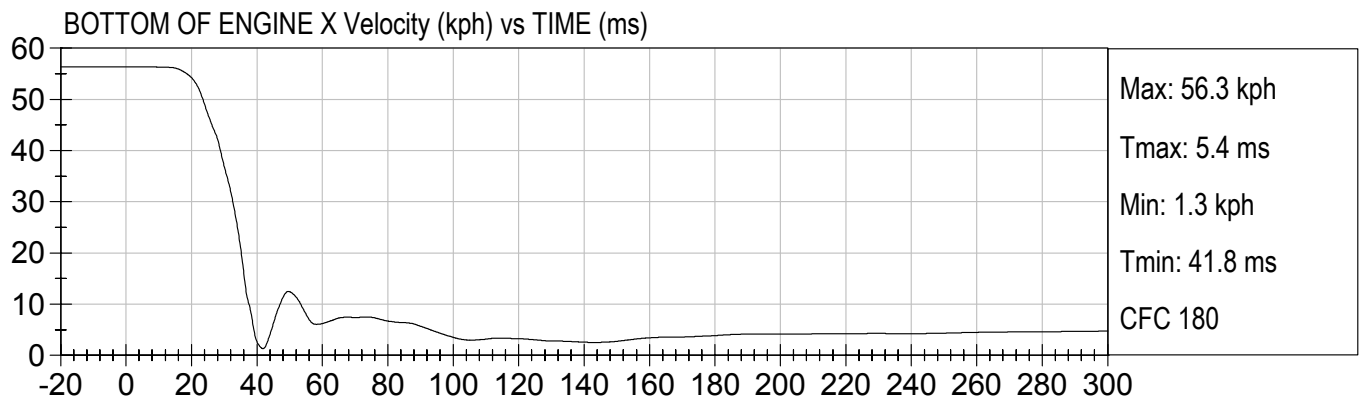
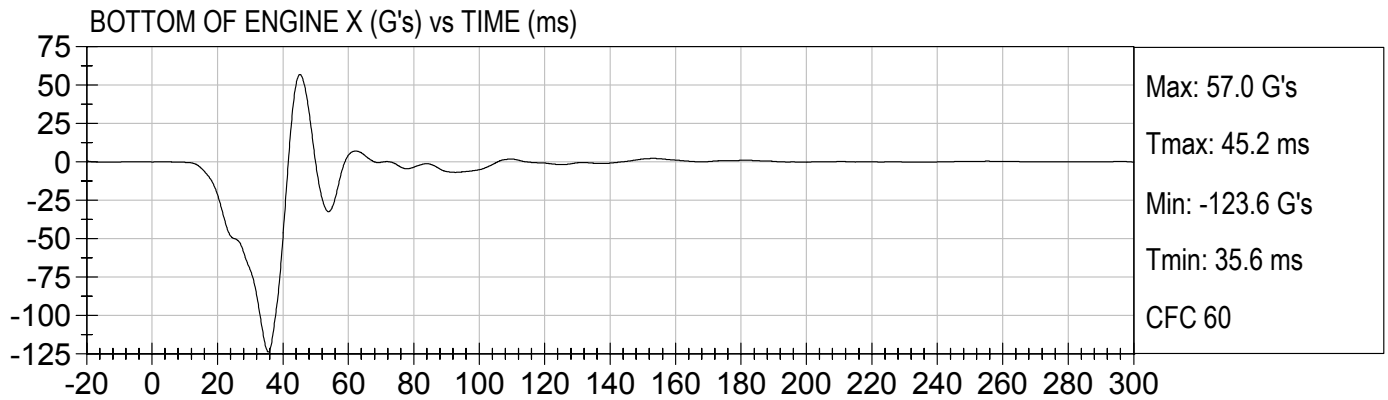


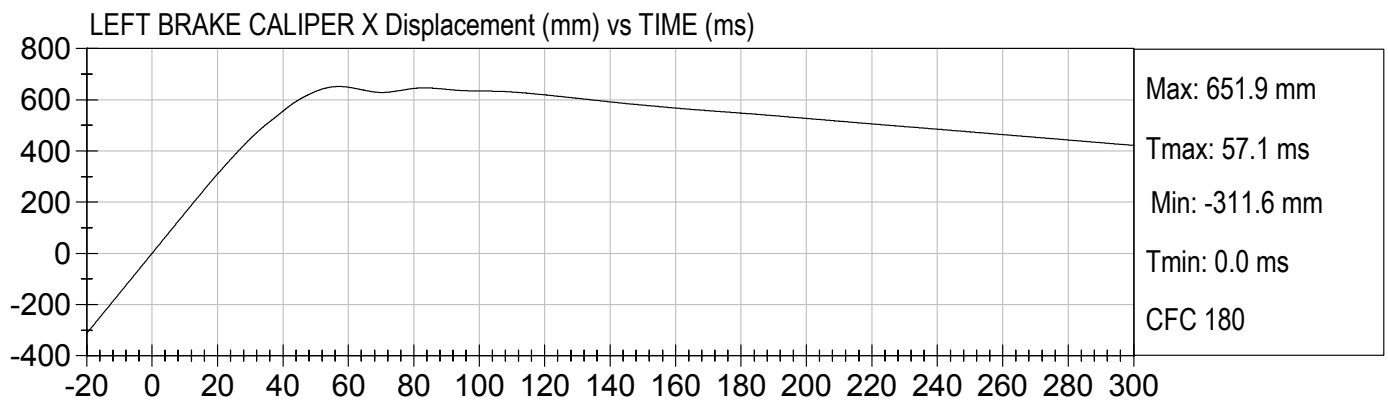
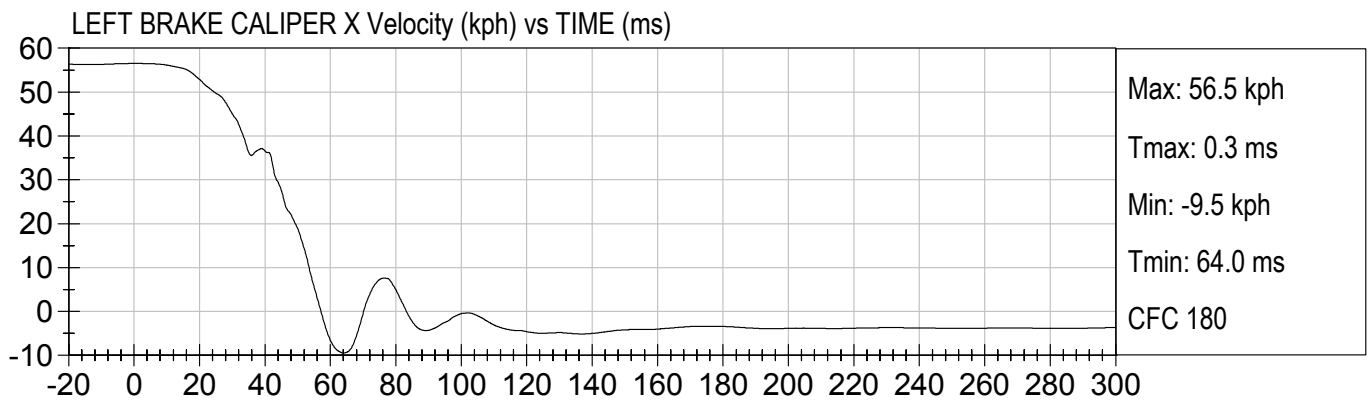
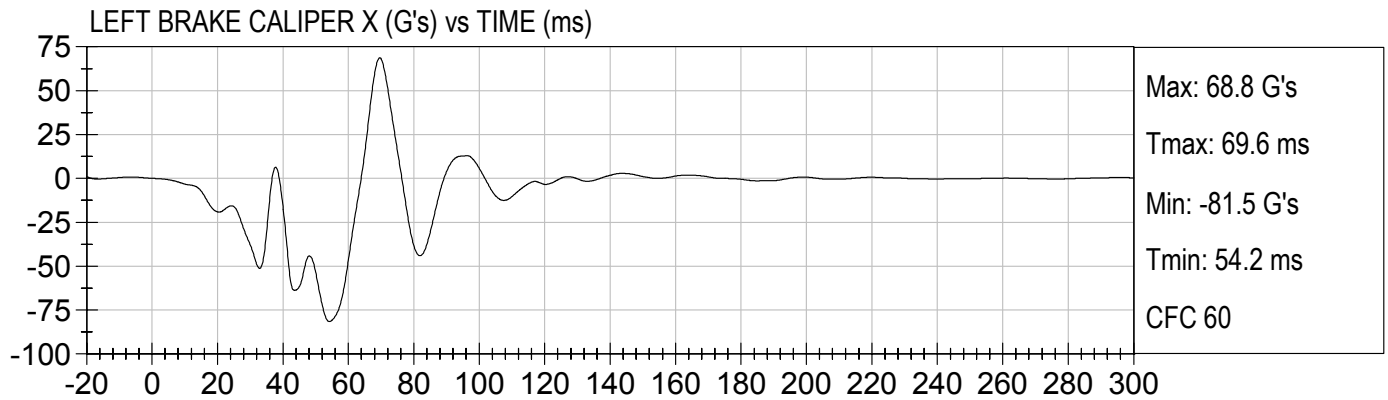


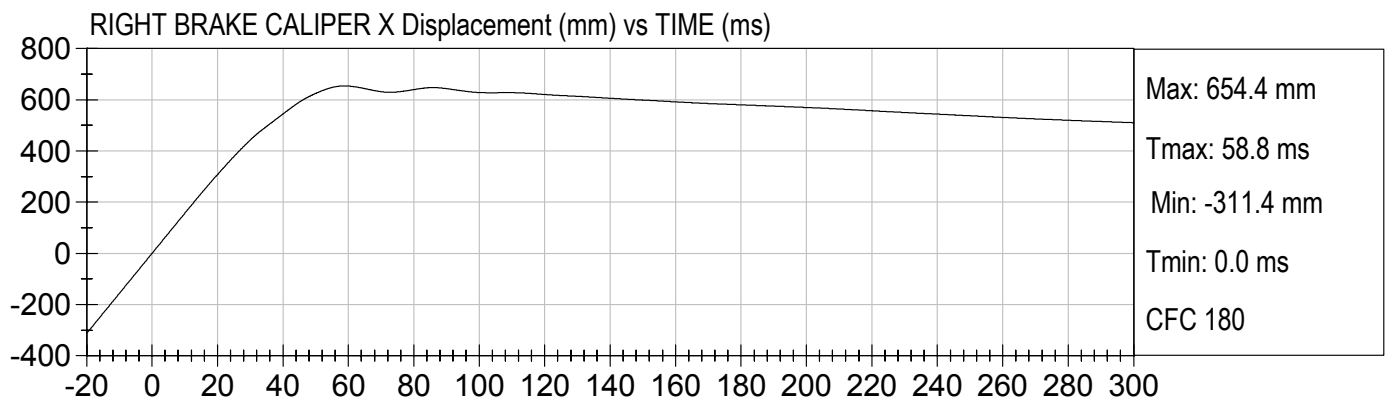
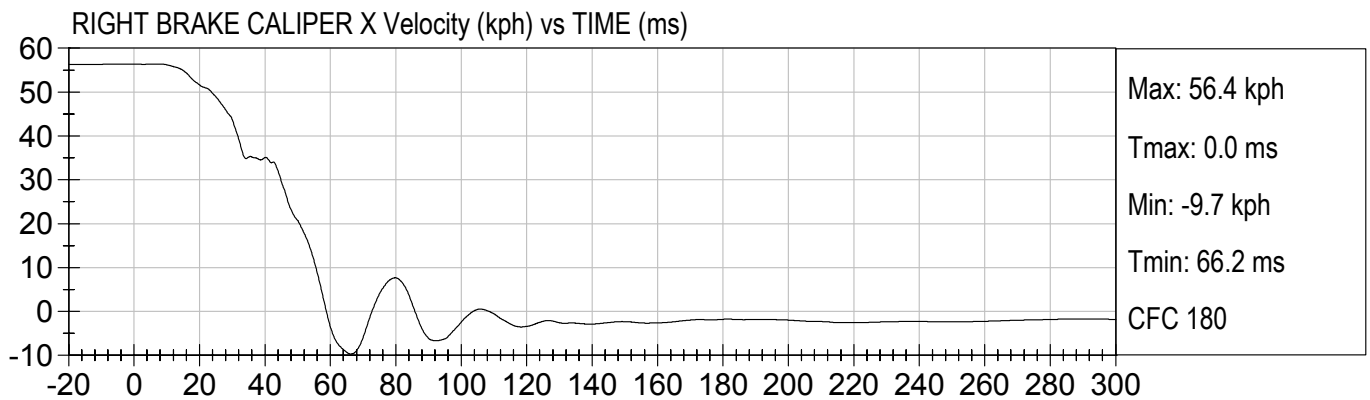
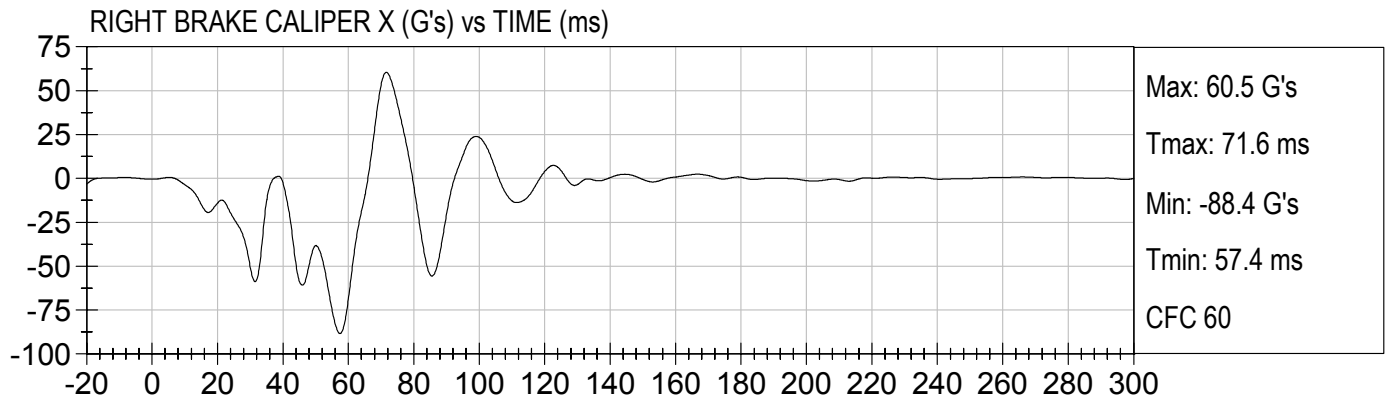


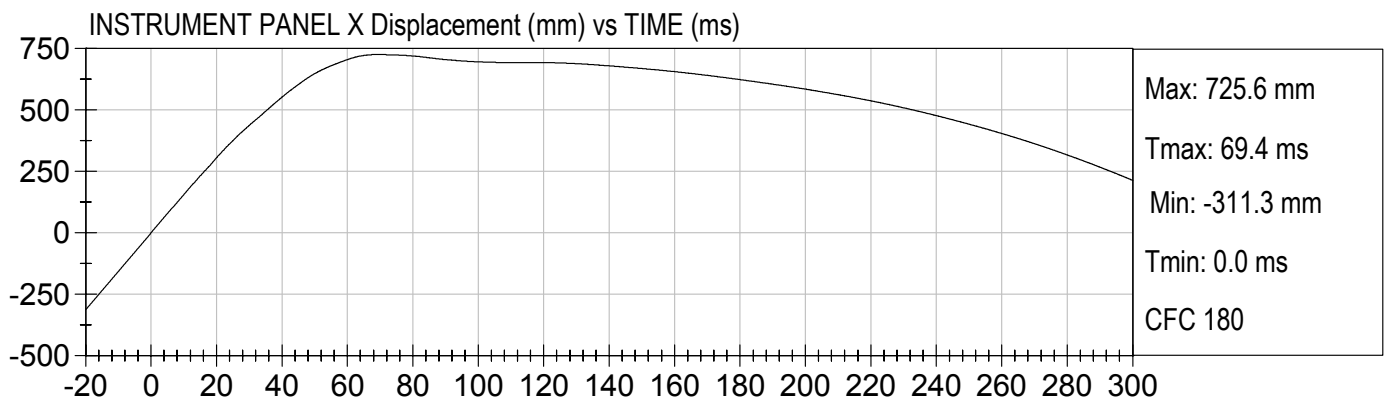
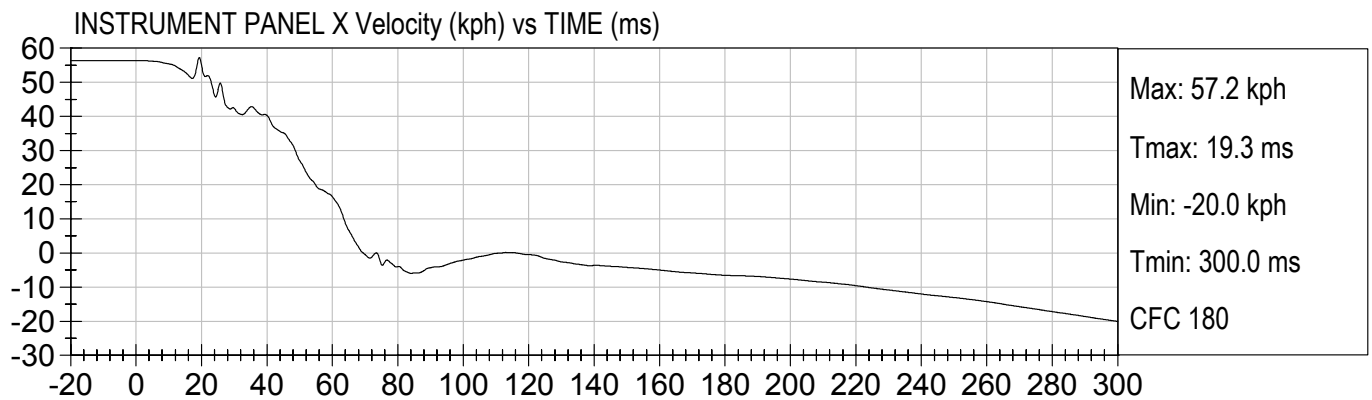
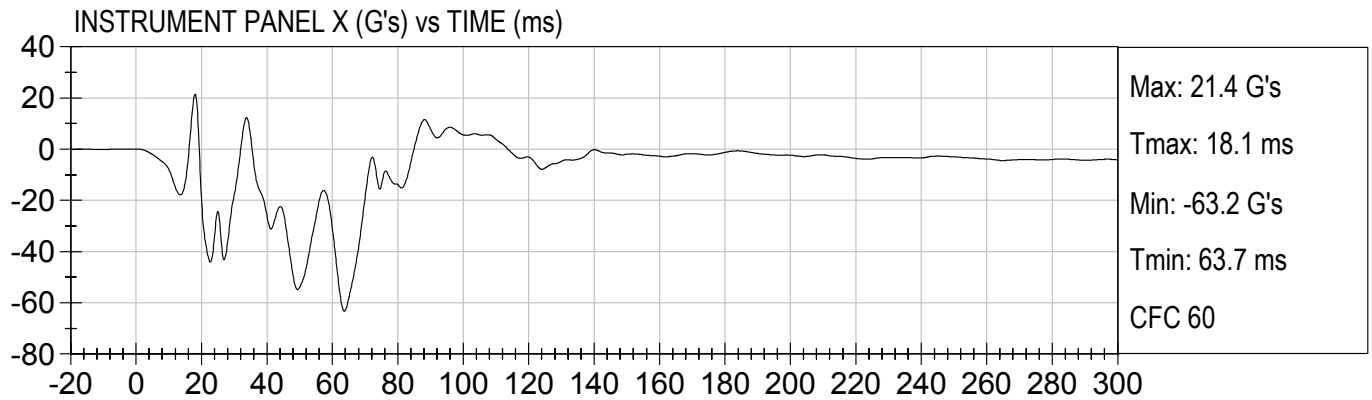


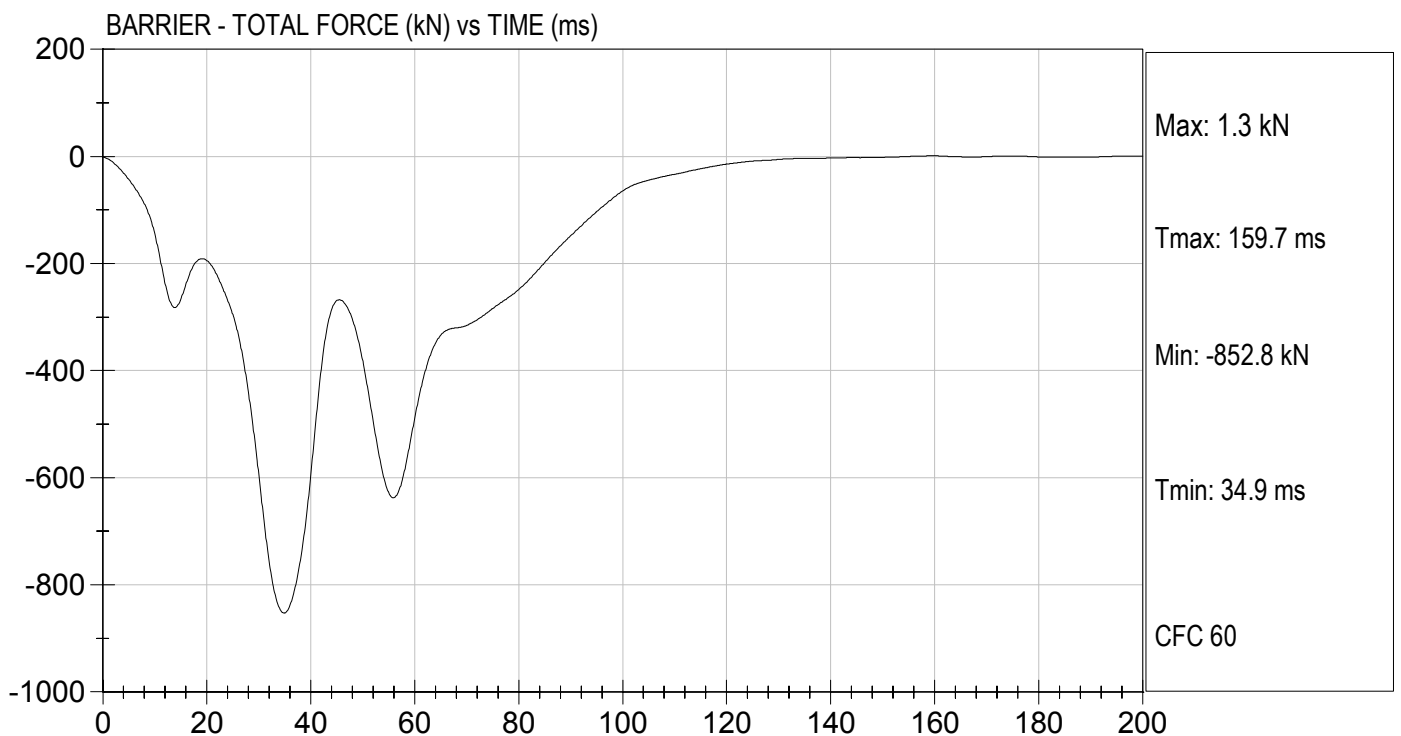
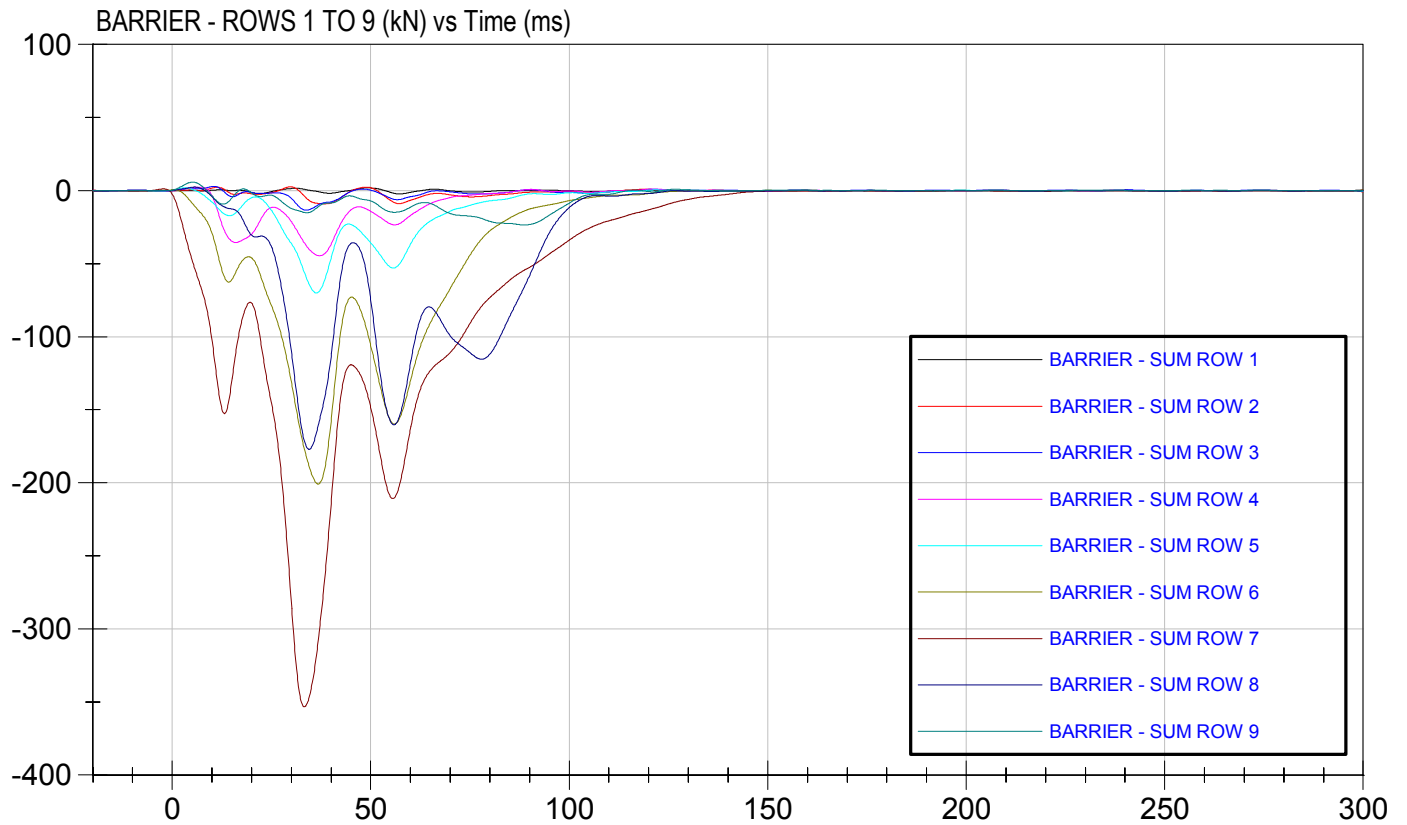












APPENDIX C
DUMMY CALIBRATION DATA TRACES AND TABLES

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066

Test ID: D05751

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	15	Pass
Peak Resultant Acceleration	G's	225 - 275	254	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-14.6	Pass
Unimodal	Yes/No	NA	Yes	Pass
Oscillations	Yes/No	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

03/14/2005

Test Date

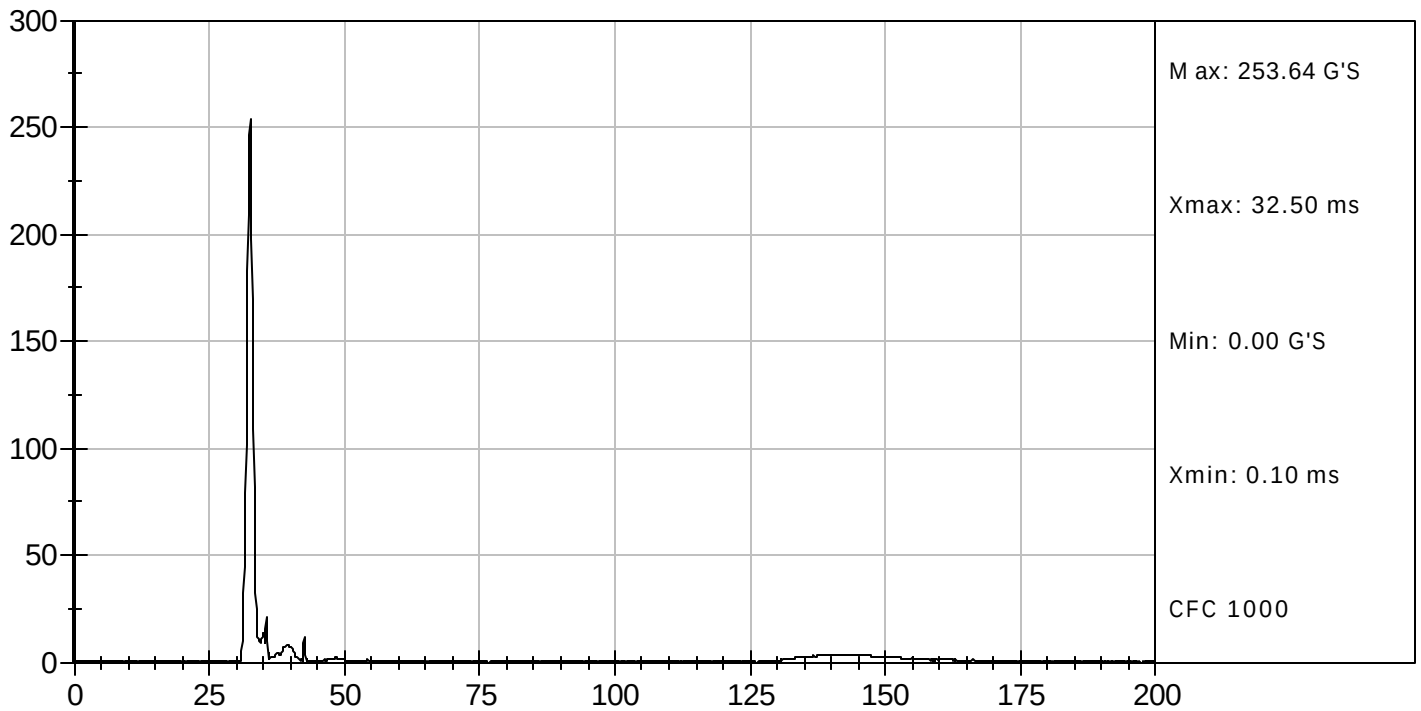

Approved By



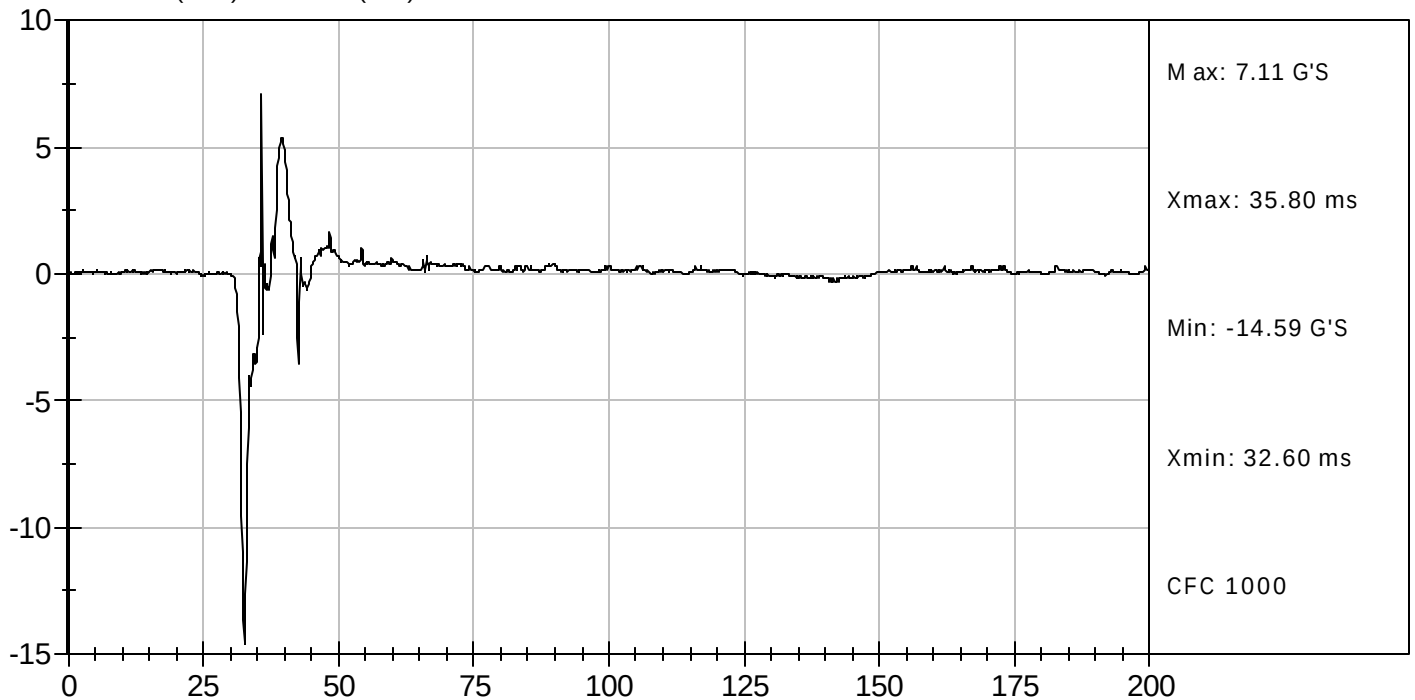
Test Desc: Head Drop
Componet ID: D05751

Test Date: 03/14/2005
Velocity: 0 ft/s, 0.00 m/s

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



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



MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066

Test I.D: D05752

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	17	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.90	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	25.34	Pass
	20 msec	G's	17.60 to 22.60	19.60	Pass
	30 msec	G's	12.50 to 18.50	14.67	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	14.64	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	37.6	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	75.4	Pass
	Time	msec	57.0 to 64.0	59.6	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	116.5	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	92.3	Pass
	Time	msec	47.0 to 58.0	50.6	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	101.7	Pass
Overall Test Results					Pass


 Laboratory Technician



Approved By

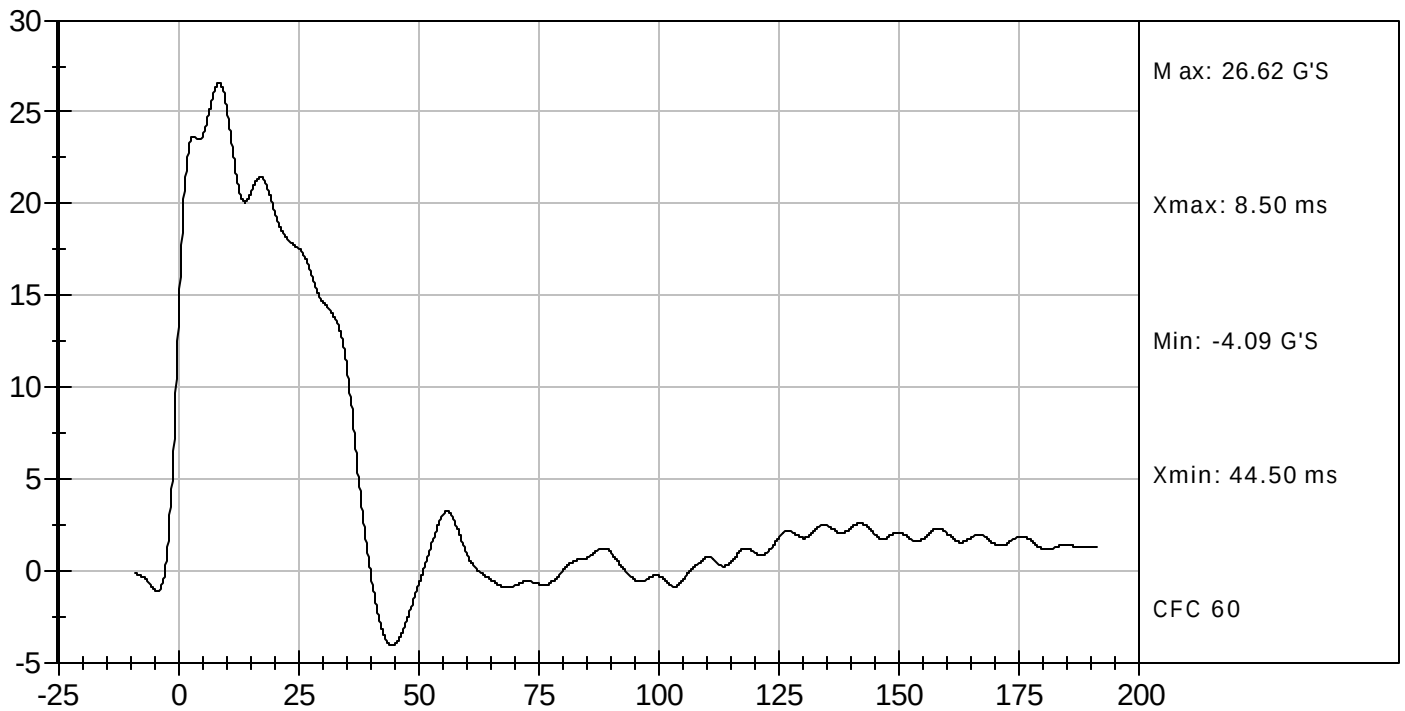
03/14/2005
 Test Date



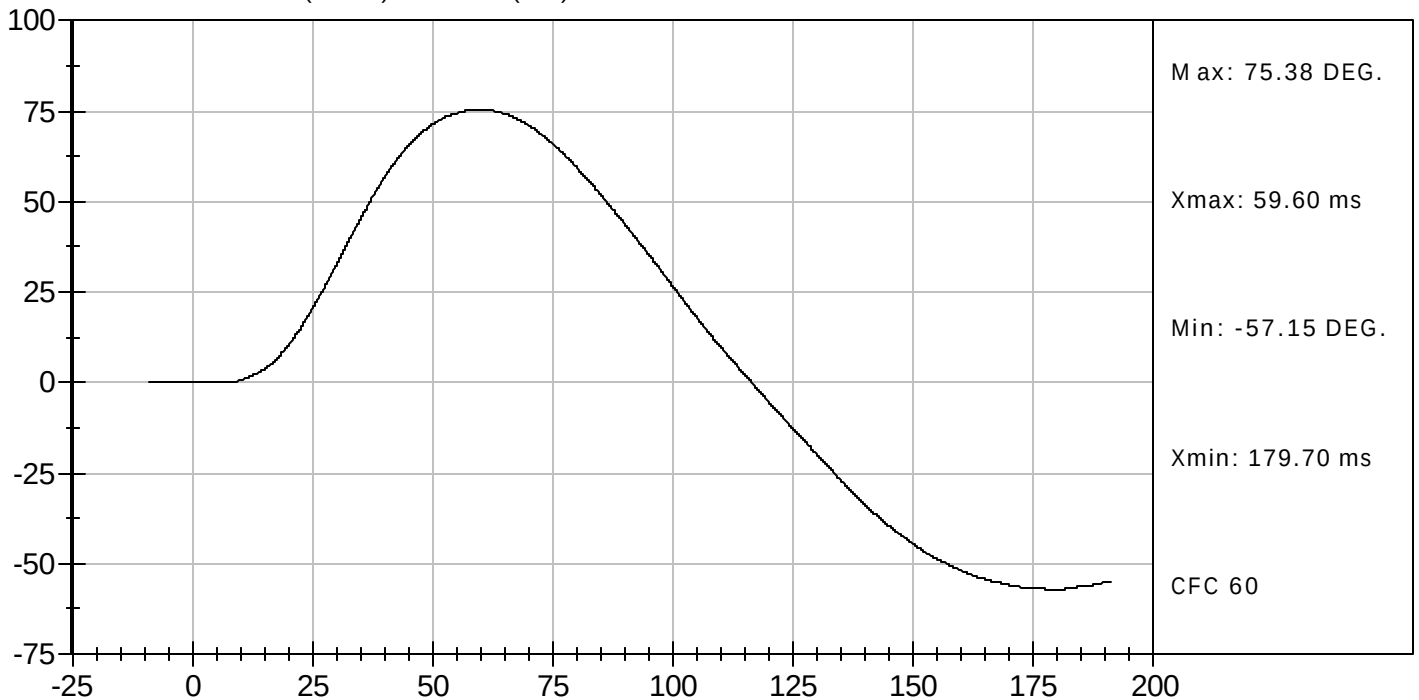
Test Desc: Neck Flexion
Componet ID: D05752

Test Date: 03/14/2005
Velocity: 22.63 ft/s, 6.90 m/s

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



NECK ROTATION (DEG.) vs TIME (ms)



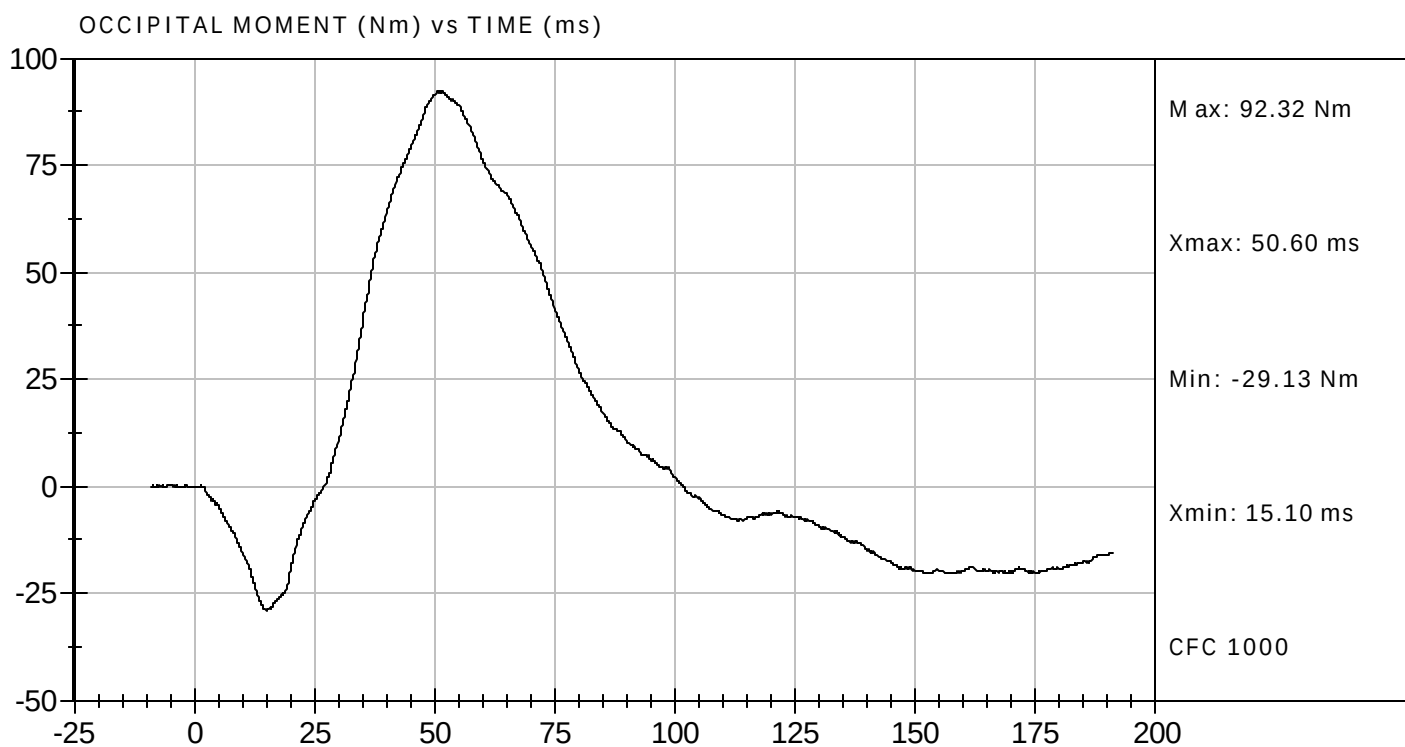


Test Desc: Neck Flexion

Componet ID: D05752

Test Date: 03/14/2005

Velocity: 22.63 ft/s, 6.90 m/s



MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066

Test I.D: D05753

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	17	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.09	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	20.83	Pass
	20 msec	G's	14.00 to 19.00	17.45	Pass
	30 msec	G's	11.00 to 16.00	13.29	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	13.32	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	39.2	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	101.3	Pass
	Time	msec	72.0 to 82.0	75.7	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	155.0	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-72.0	Pass
	Time	msec	65.0 to 79.0	72.0	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	147.0	Pass
Overall Test Results					Pass


 Laboratory Technician

03/14/2005
 Test Date


 Approved By



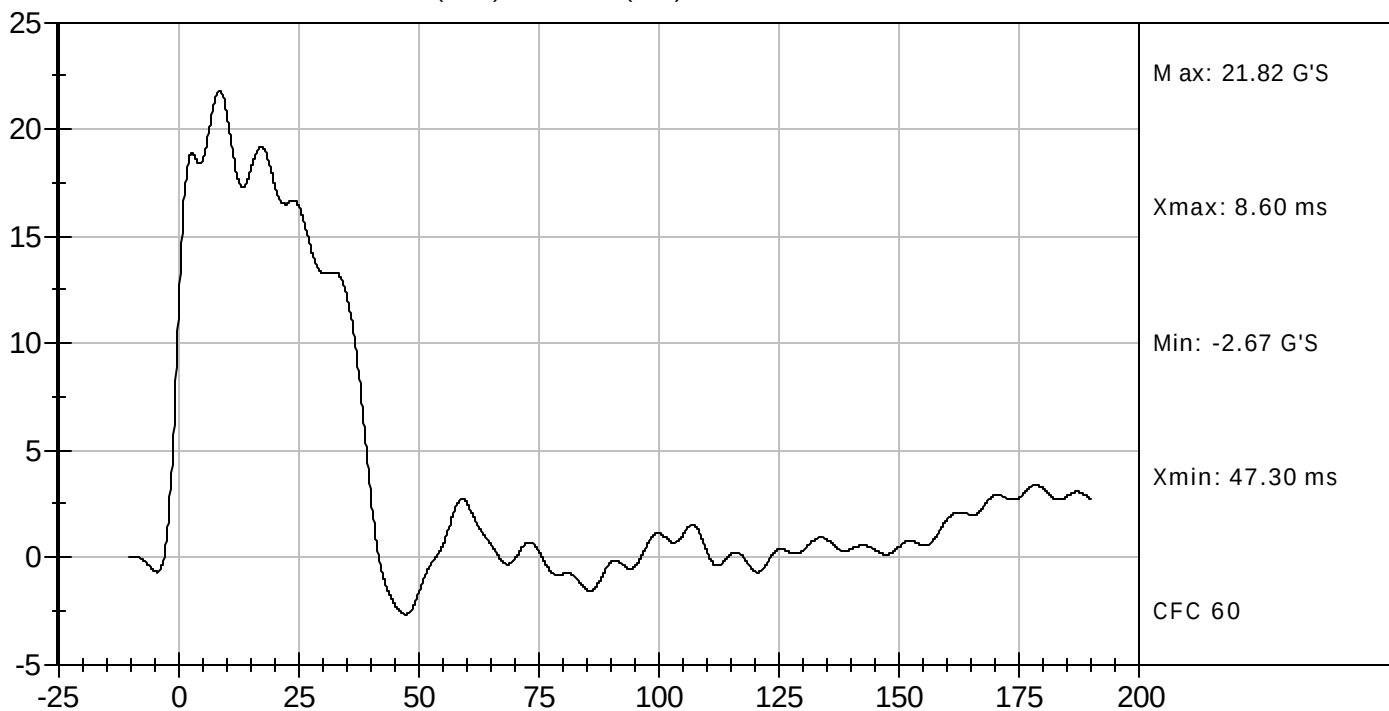
Test Desc: Neck Extension

Componet ID: D05753

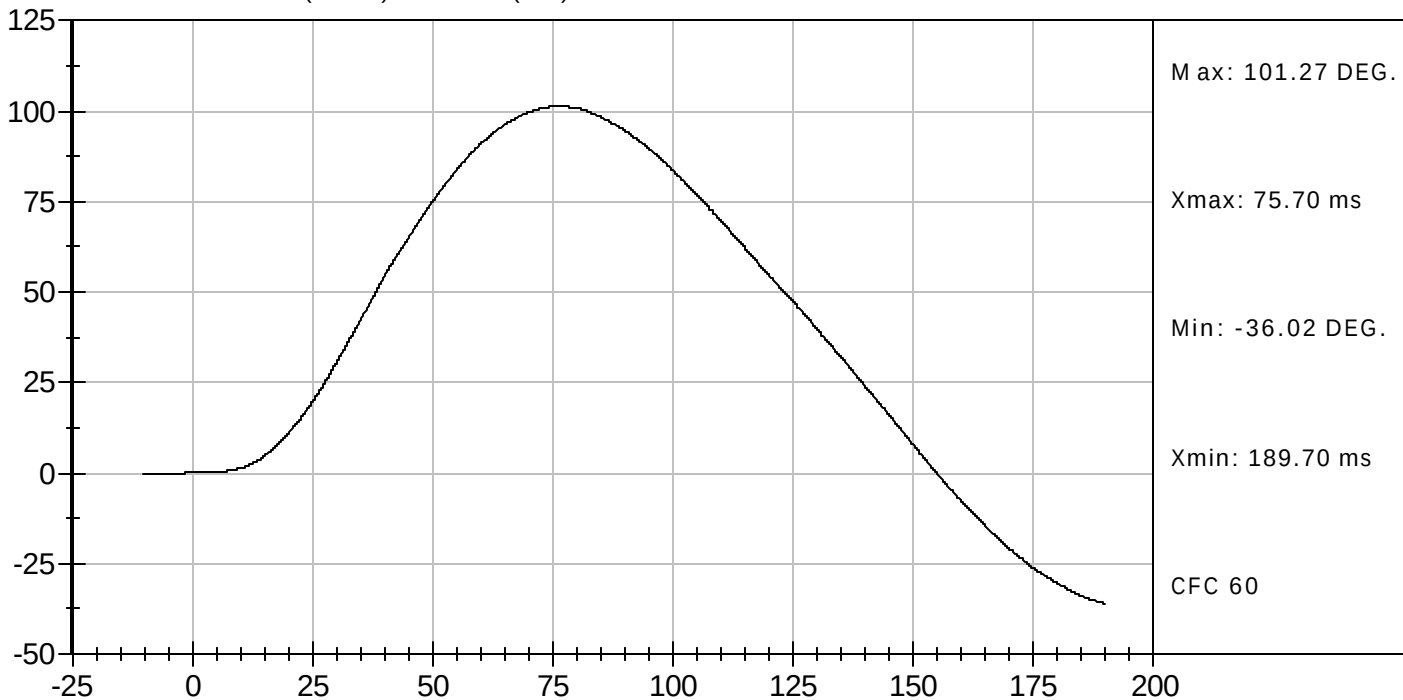
Test Date: 03/14/2005

Velocity: 19.97 ft/s, 6.09 m/s

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



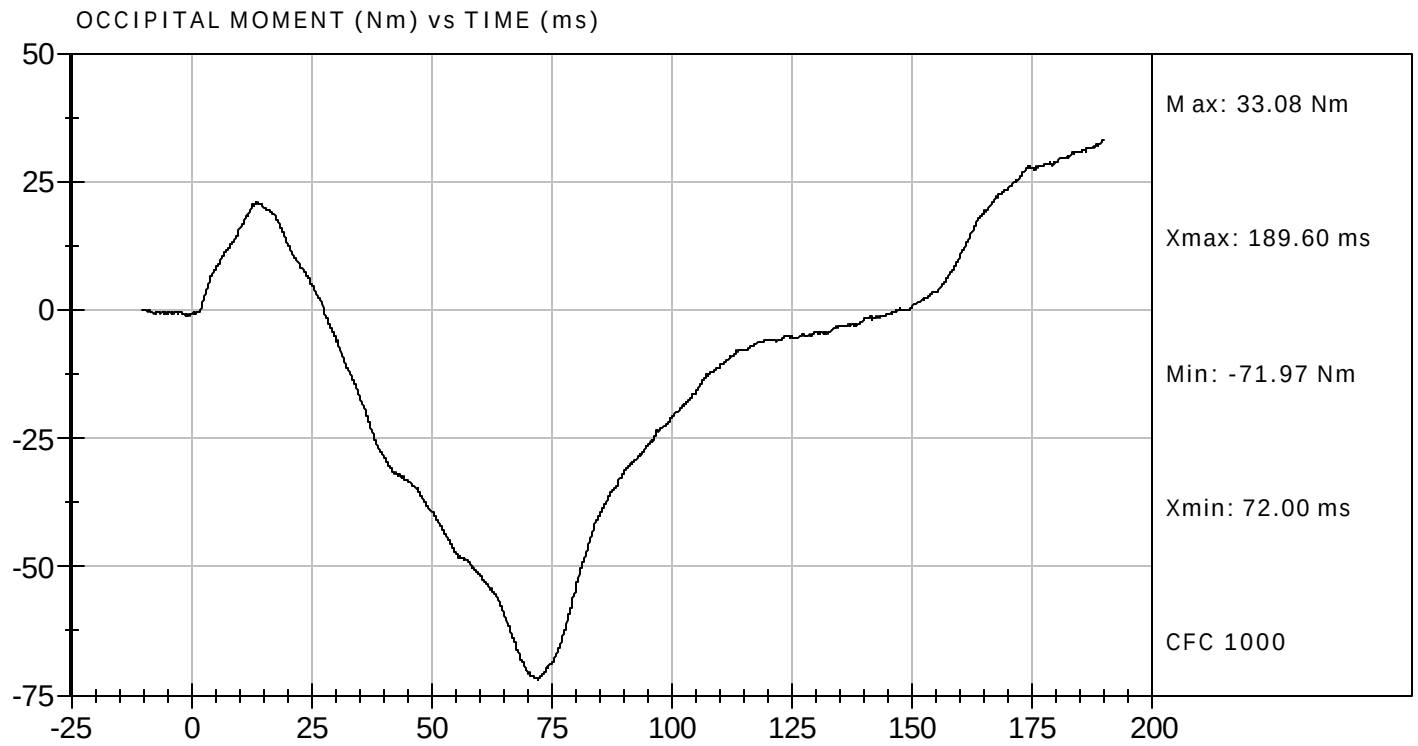
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Extension
Componet ID: D05753

Test Date: 03/14/2005
Velocity: 19.97 ft/s, 6.09 m/s



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066

Test I.D: D05754

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	17	Pass
Probe Velocity	m/s	6.58 to 6.82	6.66	Pass
Peak Probe Force	N	5159 to 5893	5,715	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.71	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Overall Test Results			Pass	


Laboratory Technician

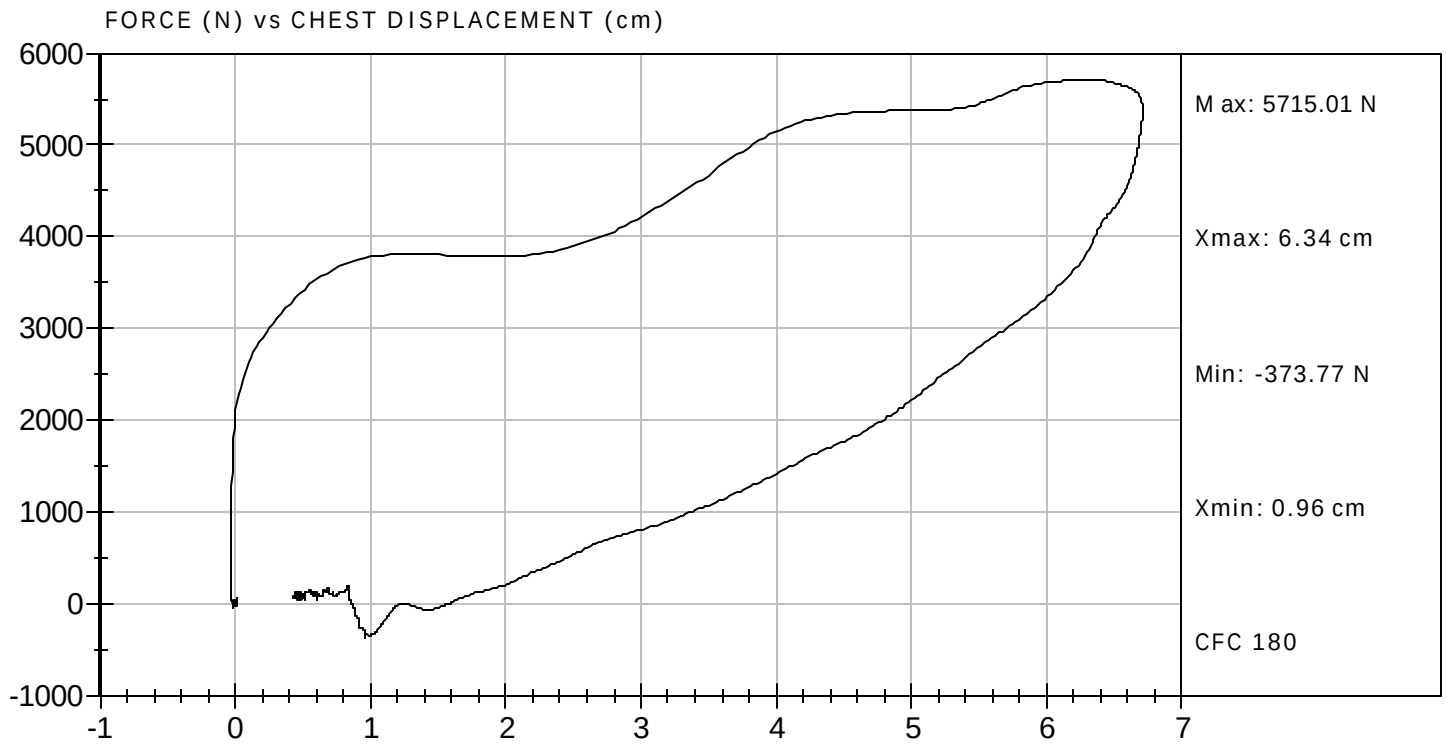

Approved By

03/15/2005
Test Date



Test Desc: Thorax Impact
Componet ID: D05754

Test Date: 03/15/2005
Velocity: 21.84 ft/s, 6.66 m/s



MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066

Test I.D: D05755

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	17	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	4,896	Pass
Overall Test Results				Pass


Laboratory Technician

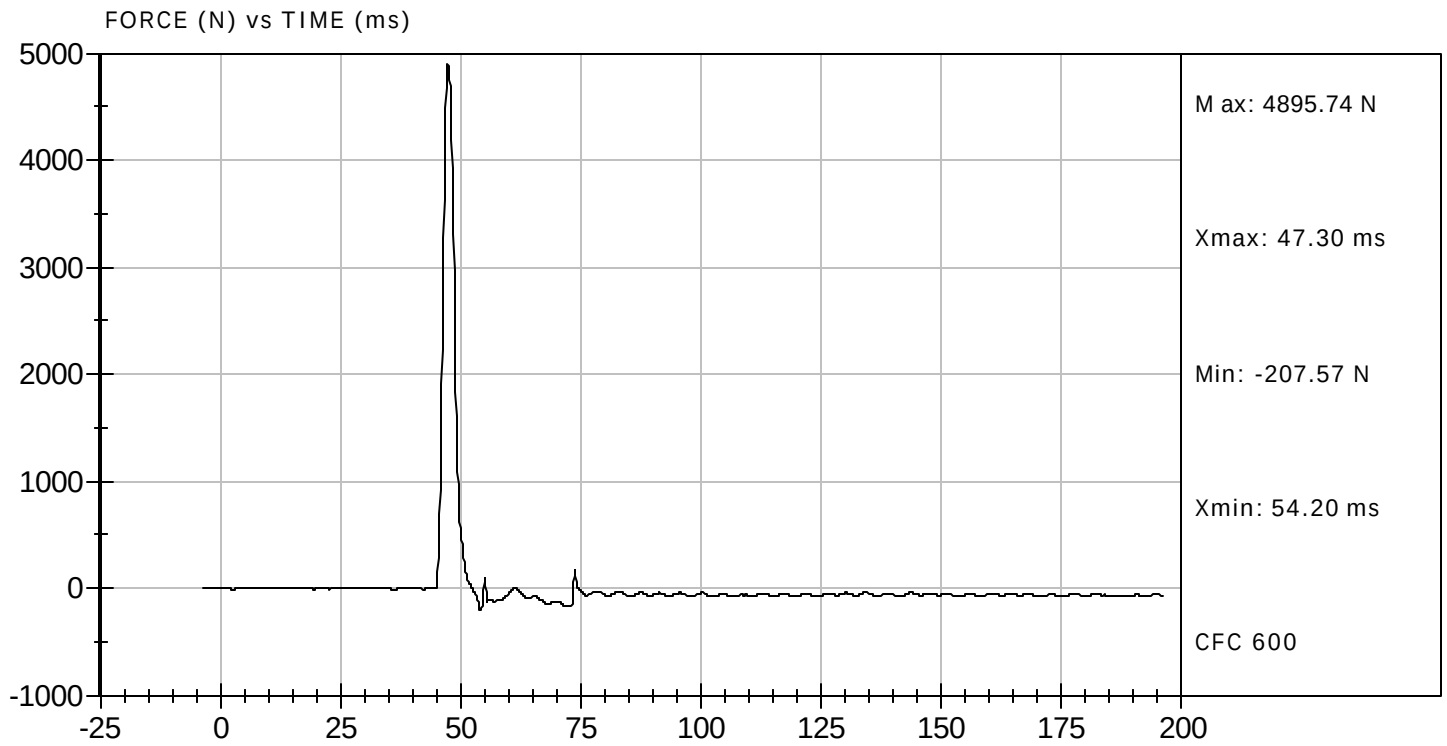

Approved By

03/14/2005
Test Date



Test Desc: Right Knee
Componet ID: D05755

Test Date: 03/14/2005
Velocity: 6.93 ft/s, 2.11 m/s



MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066

Test I.D: D05756

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	17	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	4,956	Pass
Overall Test Results				Pass


Laboratory Technician

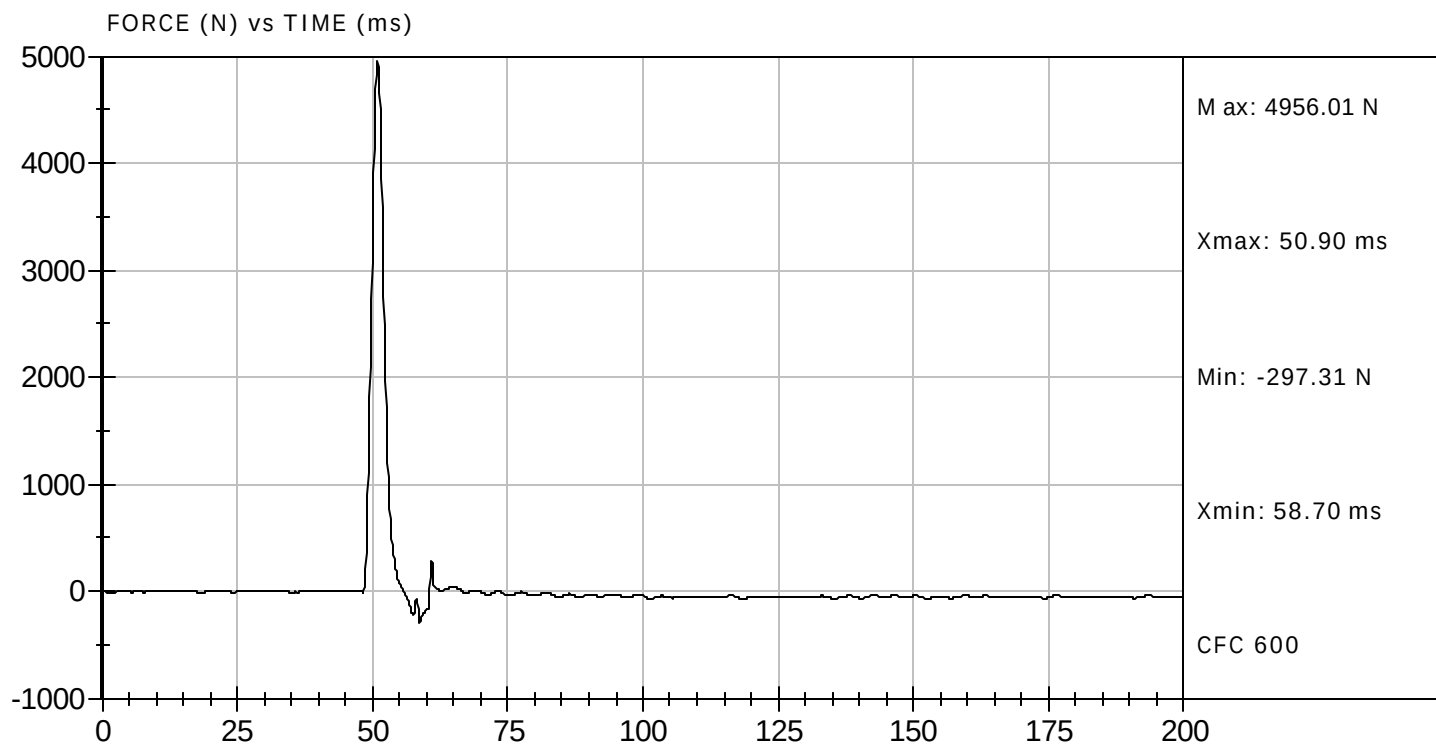

Approved By

03/14/2005
Test Date



Test Desc: Left Knee
Componet ID: D05756

Test Date: 03/14/2005
Velocity: 6.92 ft/s, 2.11 m/s



MGA RESEARCH CORPORATION
HIP-FEMUR FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066

Test I.D: D05750

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	22.0	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	17	17	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	85.0	85.0	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	42	40	Pass
Overall Test Results					Pass


Laboratory Technician

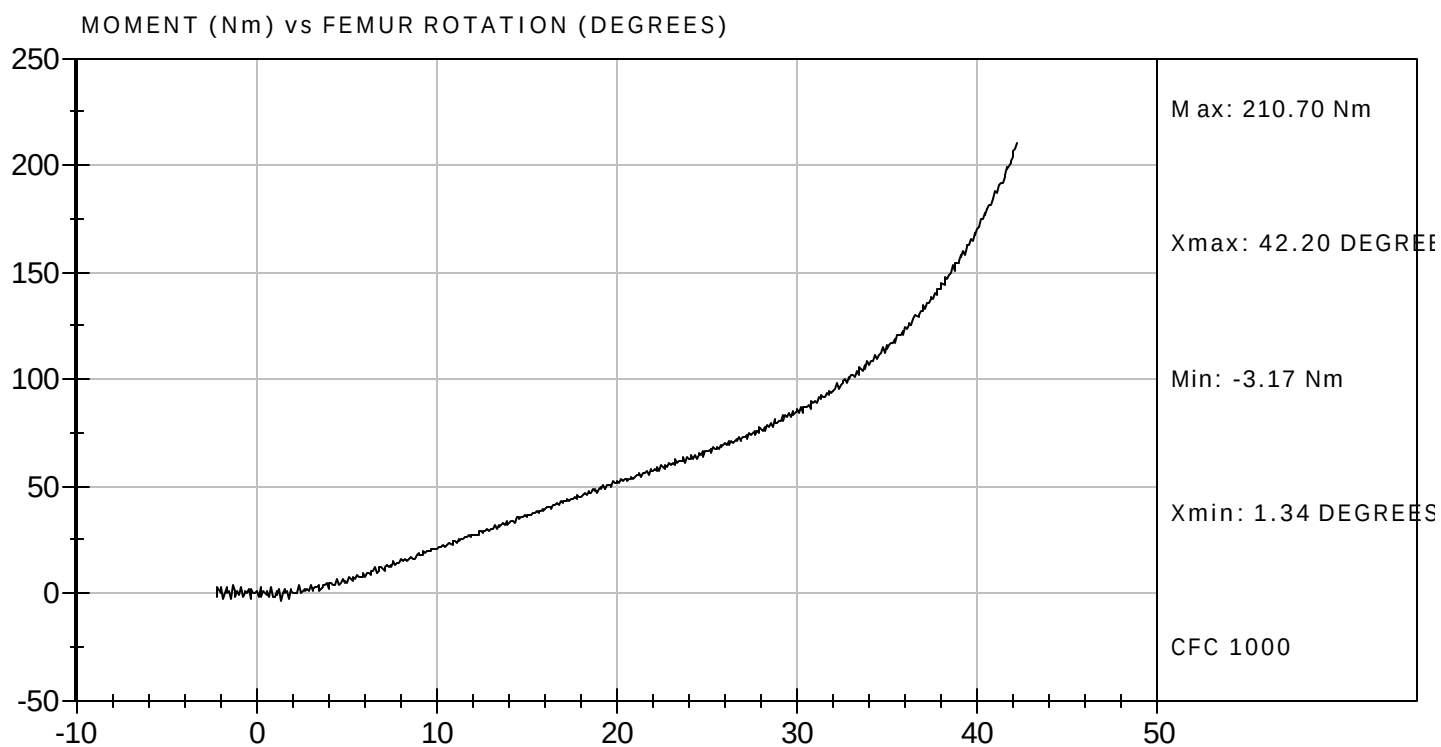

Approved By

03/14/2005
Test Date



Test Desc: Hip Femur Flexion
Componet ID: D05759

Test Date: 03/14/2005
Velocity: 0 ft/s, 0.00 m/s

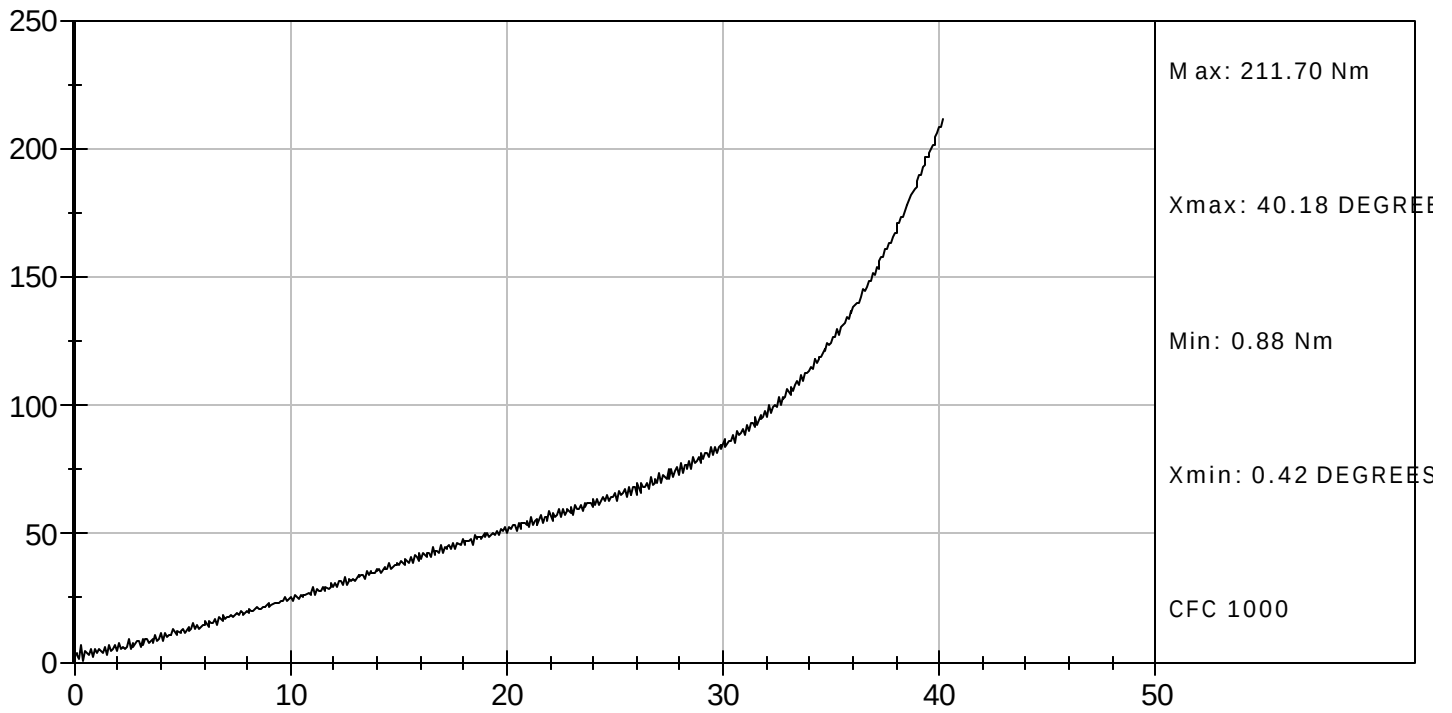




Test Desc: Hip Femur Flexion
Componet ID: D05750

Test Date: 03/14/2005
Velocity: 0 ft/s, 0.00 m/s

MOMENT (Nm) vs FEMUR ROTATION (DEGREES)



MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065

Test ID: D05741

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	15	Pass
Peak Resultant Acceleration	G's	225 - 275	260	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	12.8	Pass
Unimodal	Yes/No	NA	Yes	Pass
Oscillations	Yes/No	within 10% of peak	Yes	Pass
Overall Test Results				Pass



Laboratory Technician

03/14/2005
Test Date



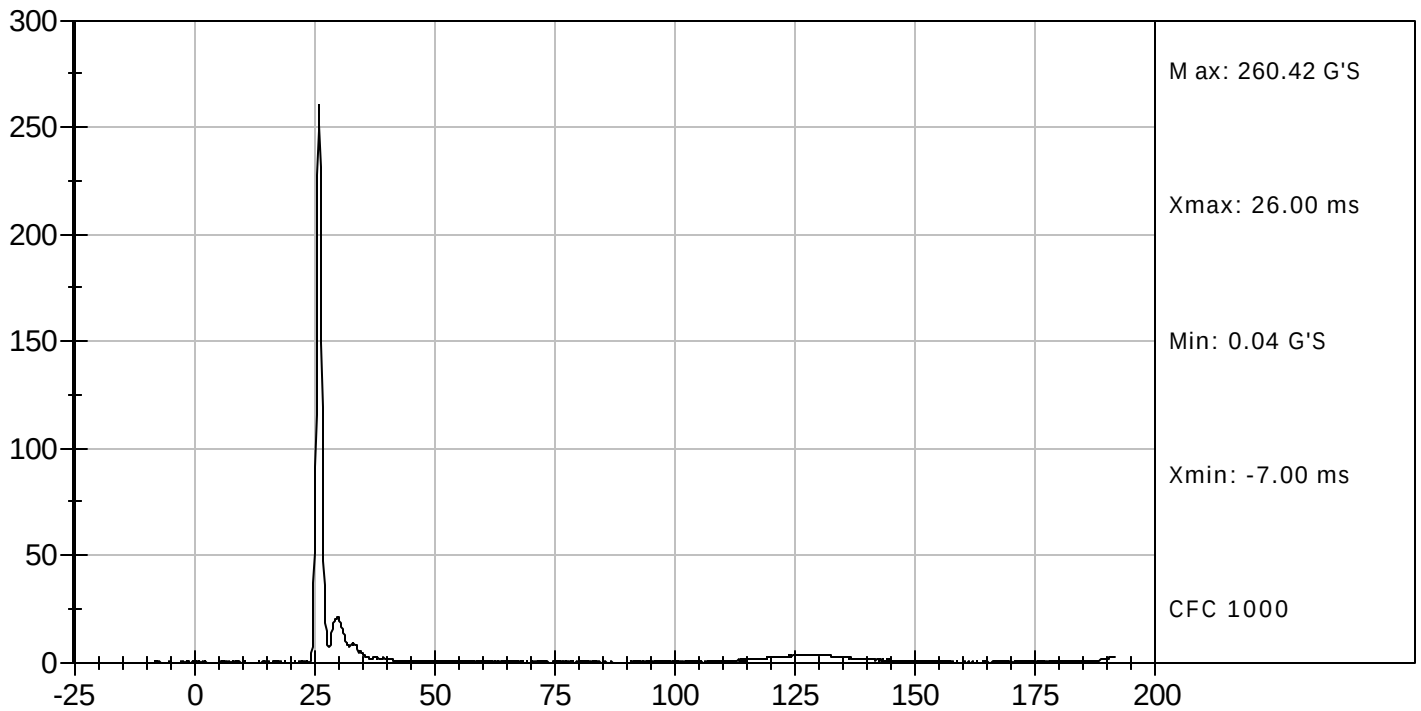
Approved By



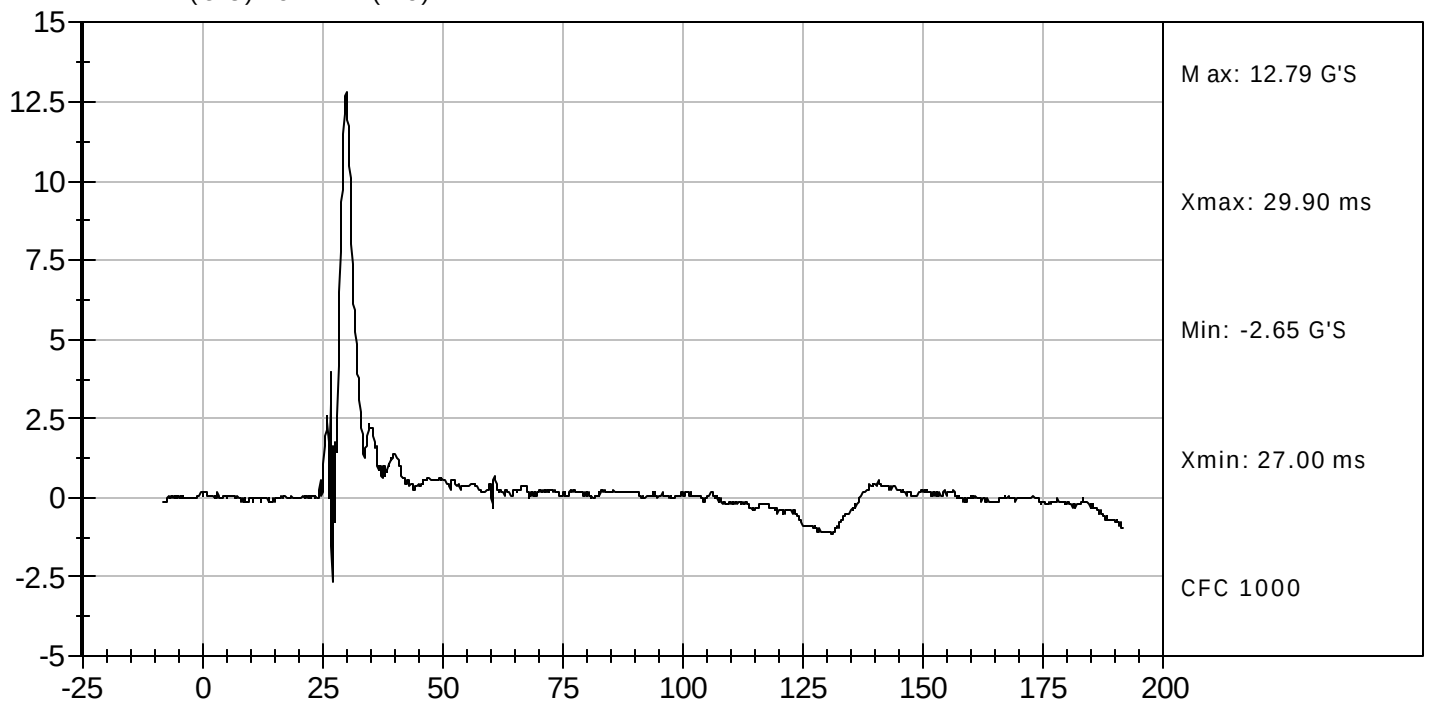
Test Desc: Head Drop
Componet ID: D05741

Test Date: 03/14/2005
Velocity: 0 ft/s, 0.00 m/s

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



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



MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065

Test I.D: D05742

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity		%	10 to 70	17	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.90	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	23.66	Pass
	20 msec	G's	17.60 to 22.60	20.20	Pass
	30 msec	G's	12.50 to 18.50	16.00	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	15.97	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	37.7	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	73.4	Pass
	Time	msec	57.0 to 64.0	59.3	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	116.8	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	92.1	Pass
	Time	msec	47.0 to 58.0	50.9	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	105.5	Pass
Overall Test Results					Pass

Jessica Hall
 Laboratory Technician

03/14/2005
 Test Date

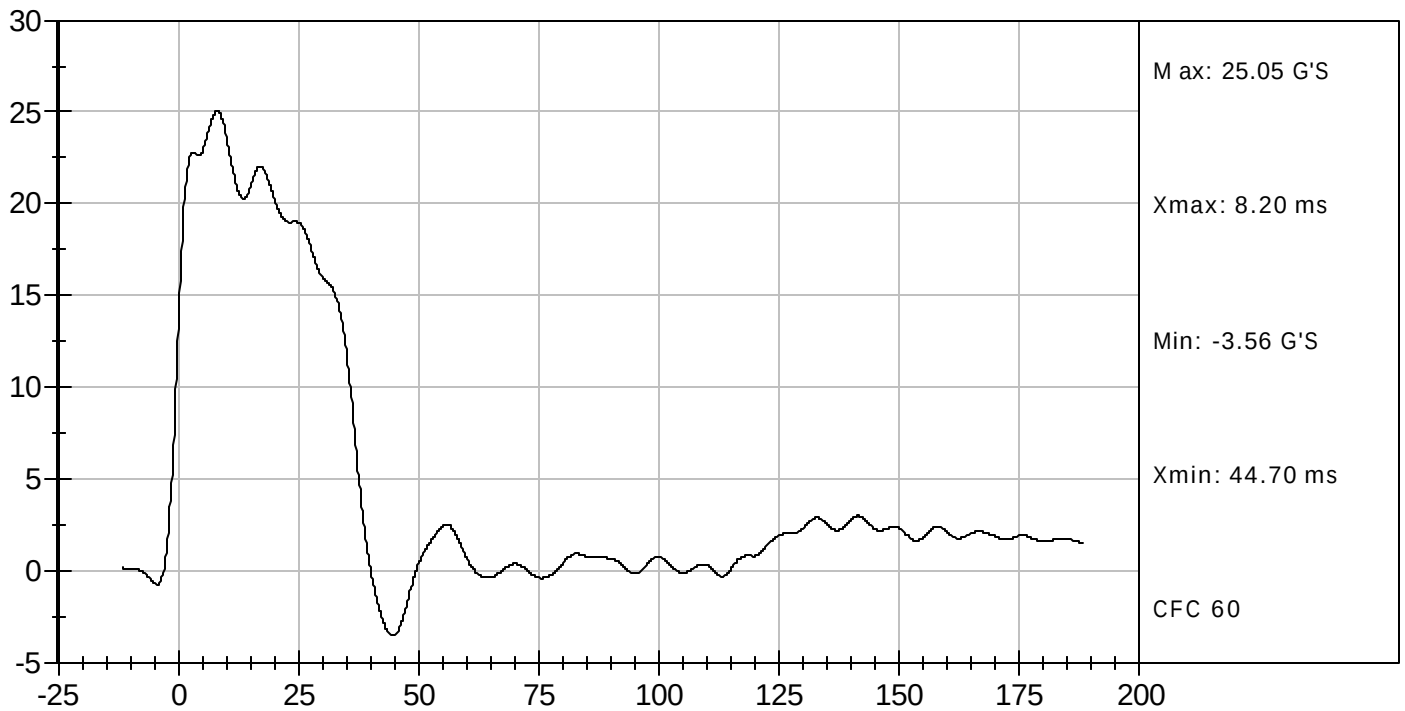
David Winkelbauer
 Approved By



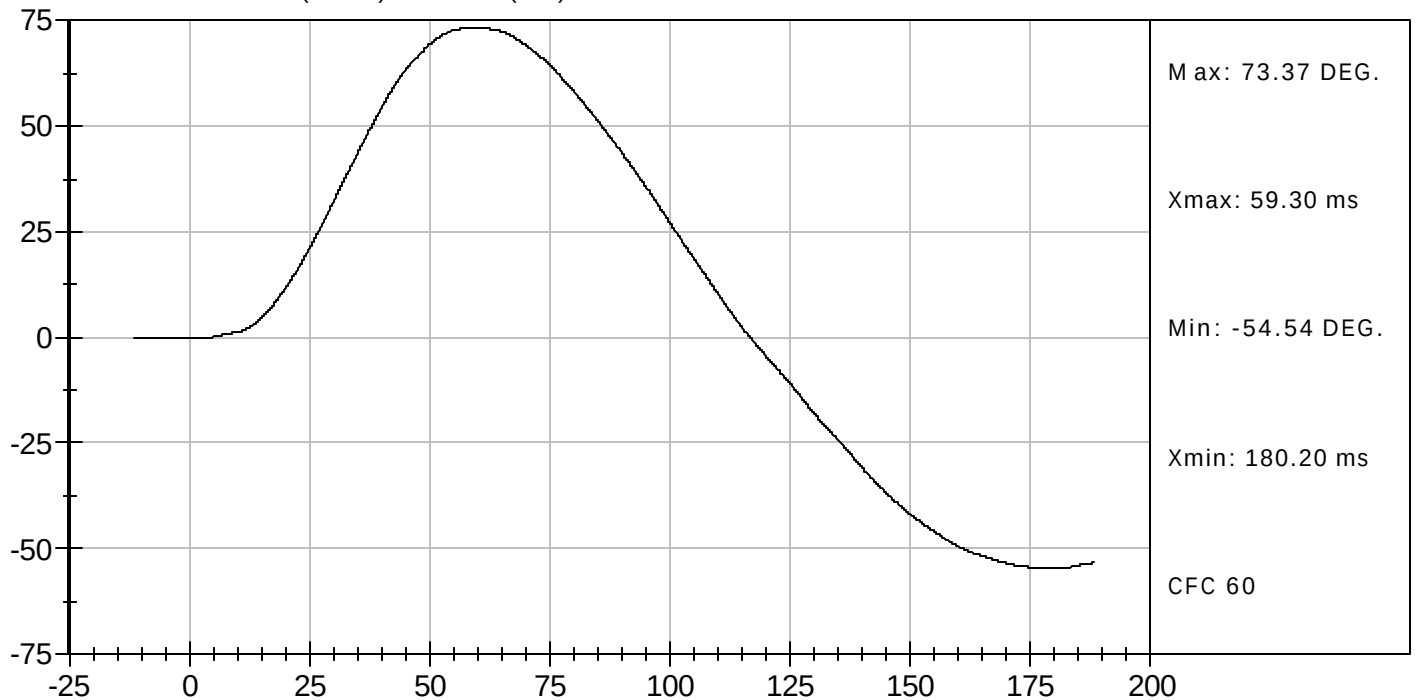
Test Desc: Neck Flexion
Componet ID: D05742

Test Date: 03/14/2005
Velocity: 22.65 ft/s, 6.90 m/s

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



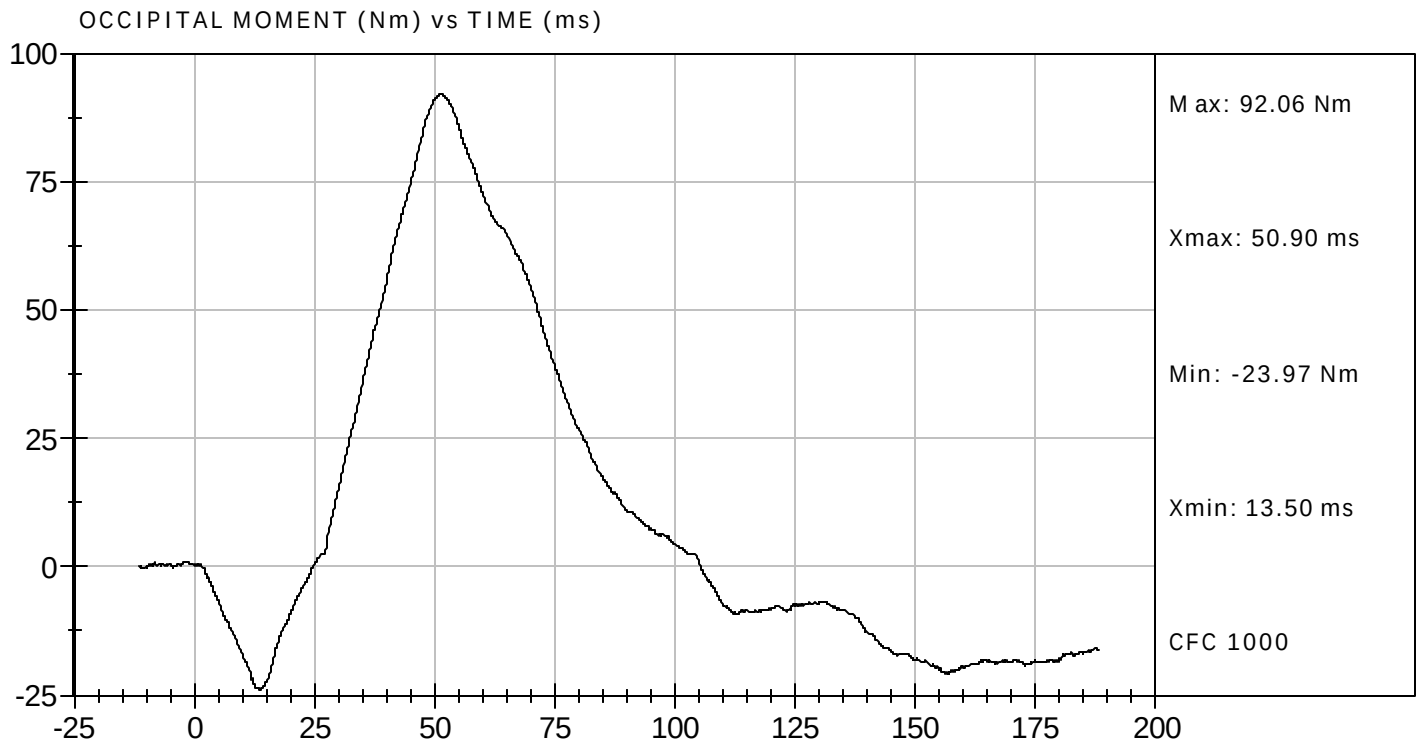
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Flexion
Componet ID: D05742

Test Date: 03/14/2005
Velocity: 22.65 ft/s, 6.90 m/s



MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065

Test I.D: D05743

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity		%	10 to 70	17	Pass
Pendulum Velocity		m/s	5.95 to 6.19	5.97	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	19.60	Pass
	20 msec	G's	14.00 to 19.00	16.18	Pass
	30 msec	G's	11.00 to 16.00	13.66	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	13.92	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	39.7	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	98.1	Pass
	Time	msec	72.0 to 82.0	76.2	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	156.6	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-66.9	Pass
	Time	msec	65.0 to 79.0	73.1	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	144.7	Pass
Overall Test Results					Pass


 Laboratory Technician

03/14/2005
 Test Date



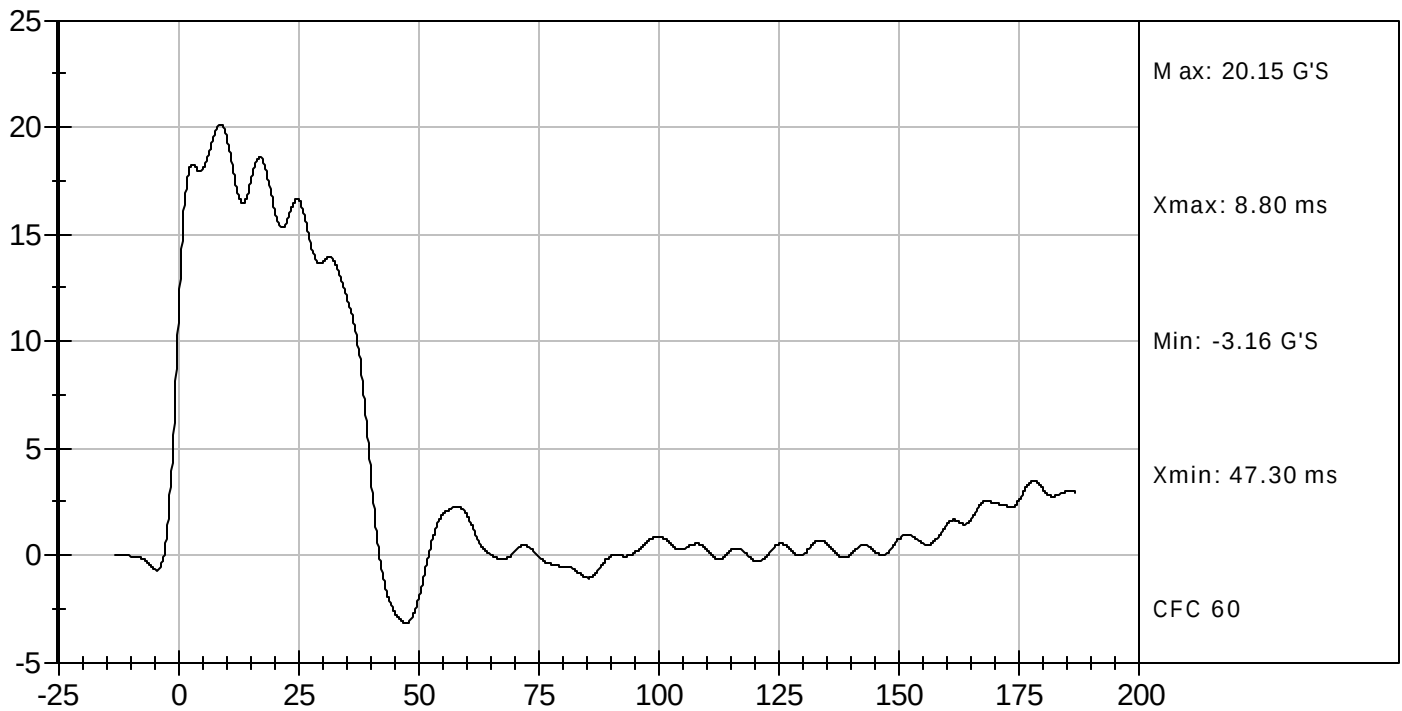
Approved By



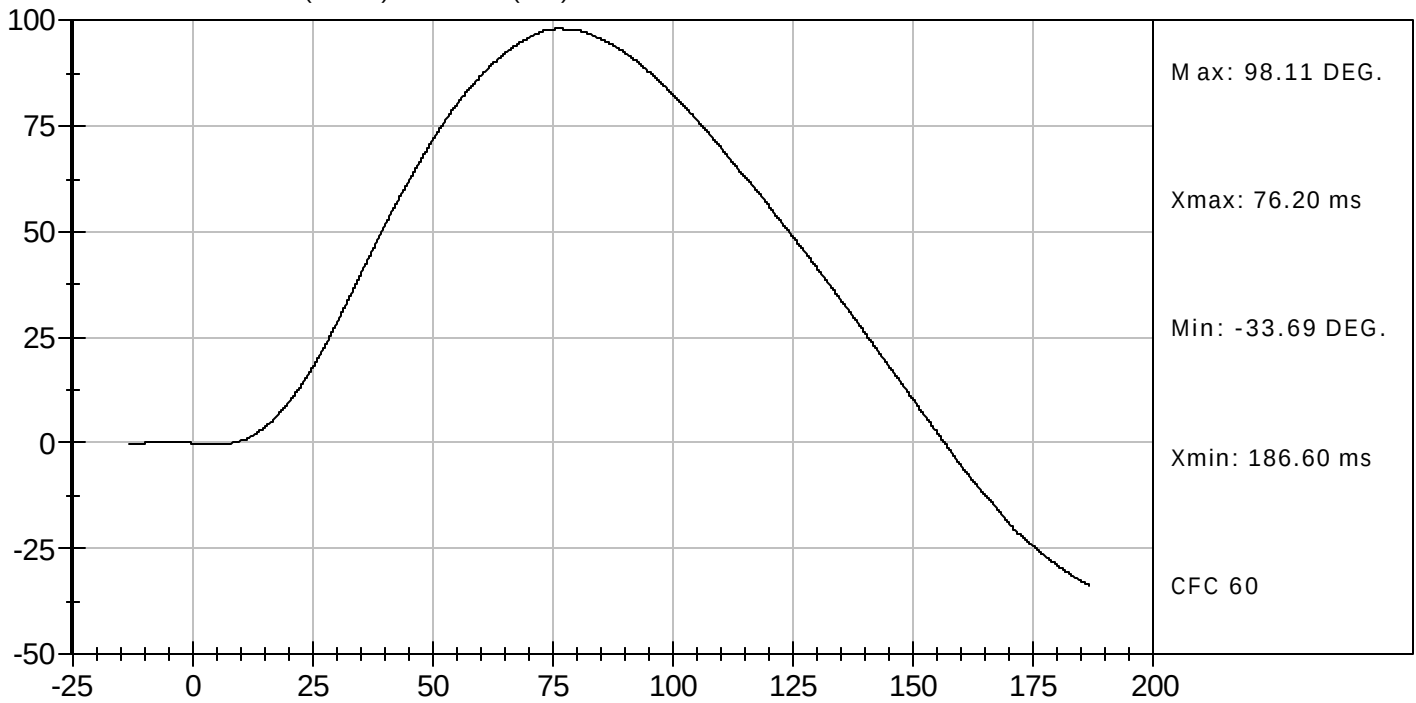
Test Desc: Neck Extension
Componet ID: D05743

Test Date: 03/14/2005
Velocity: 19.58 ft/s, 5.97 m/s

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



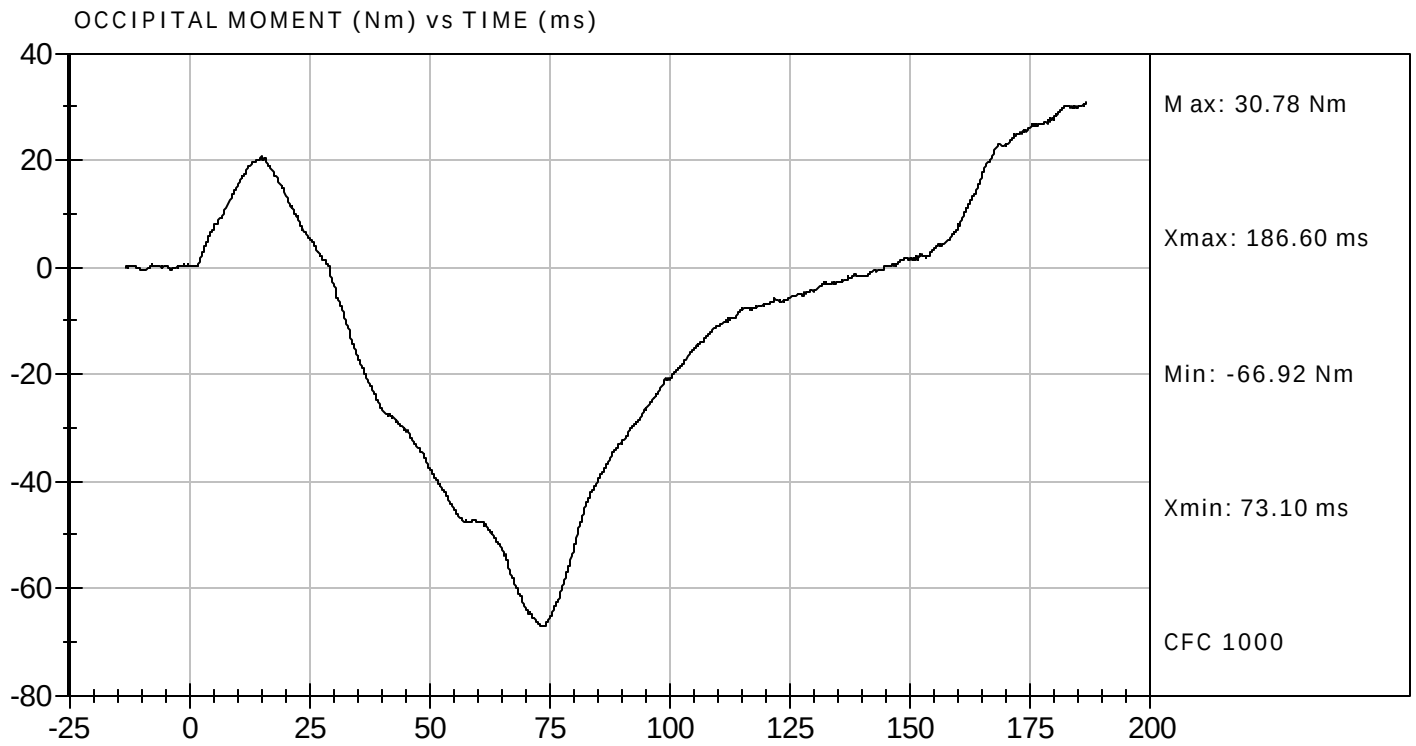
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Extension
Componet ID: D05743

Test Date: 03/14/2005
Velocity: 19.58 ft/s, 5.97 m/s



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065

Test I.D: D05744

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	17	Pass
Probe Velocity	m/s	6.58 to 6.82	6.67	Pass
Peak Probe Force	N	5159 to 5893	5,702	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.89	Pass
Internal Hysteresis	%	69 to 85	72	Pass
Overall Test Results			Pass	


Laboratory Technician


Approved By

03/15/2005
Test Date

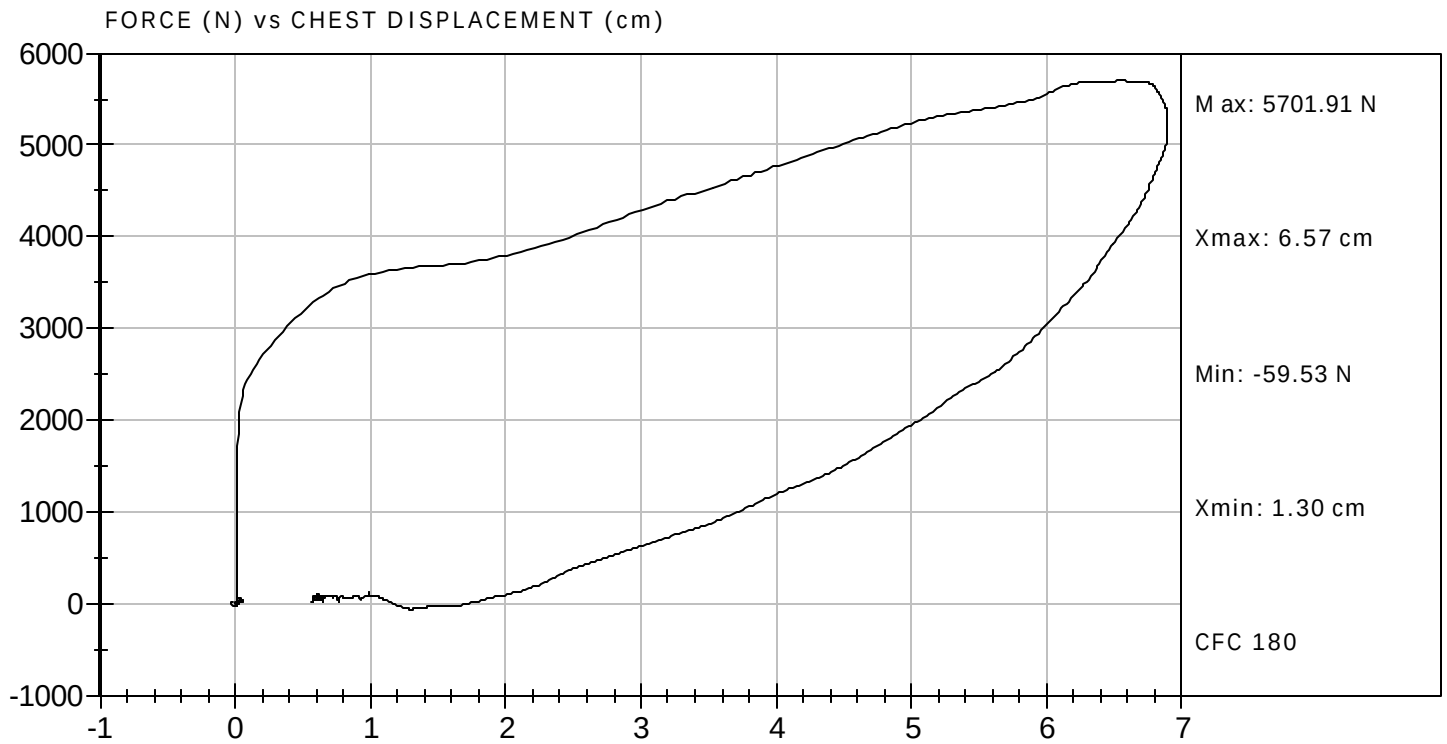


Test Desc: Thorax Impact

Componet ID: D05744

Test Date: 03/15/2005

Velocity: 21.87 ft/s, 6.67 m/s



MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065

Test I.D: D05745

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	17	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	5,324	Pass
Overall Test Results				Pass


Laboratory Technician

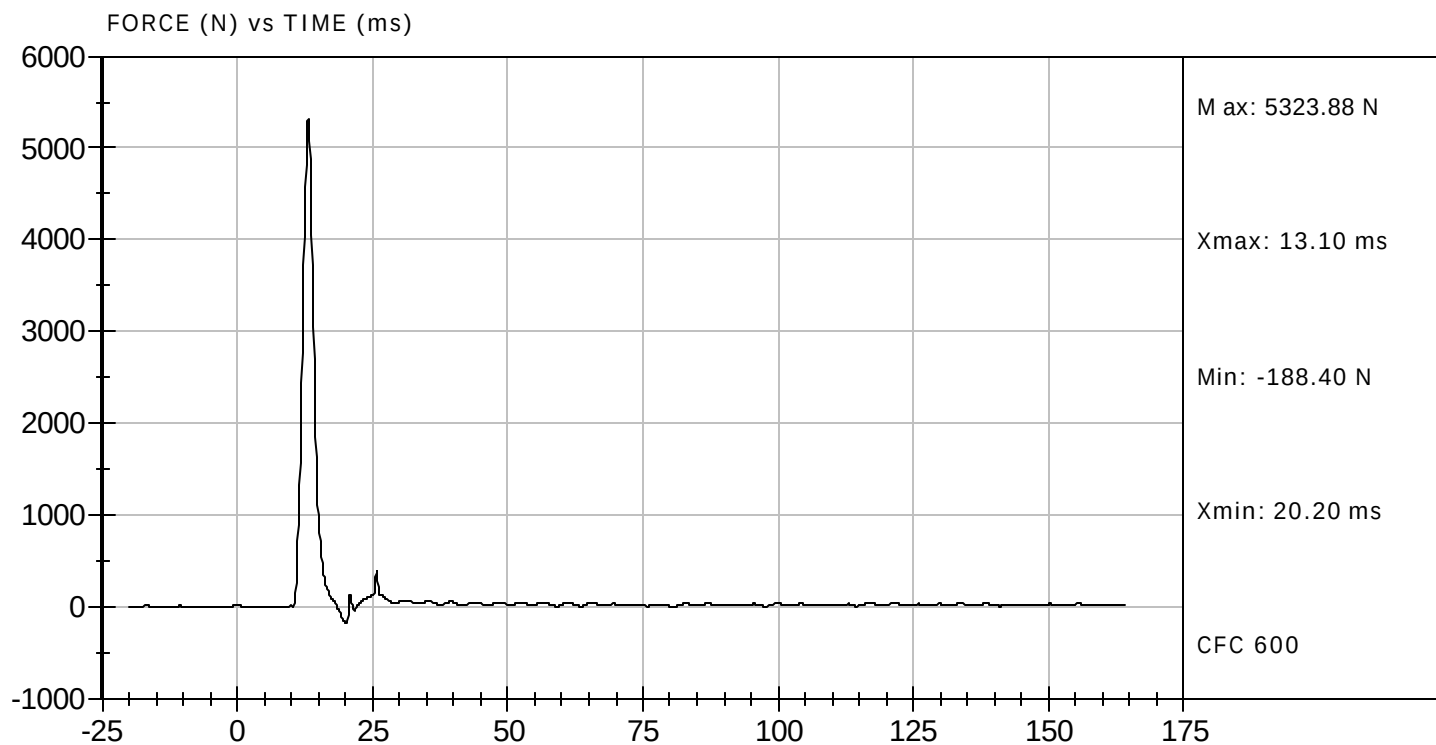

Approved By

03/14/2005
Test Date



Test Desc: Right Knee
Componet ID: D05745

Test Date: 03/14/2005
Velocity: 6.89 ft/s, 2.10 m/s



MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065

Test I.D: D05746

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	17	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	5,420	Pass
Overall Test Results				Pass


Laboratory Technician

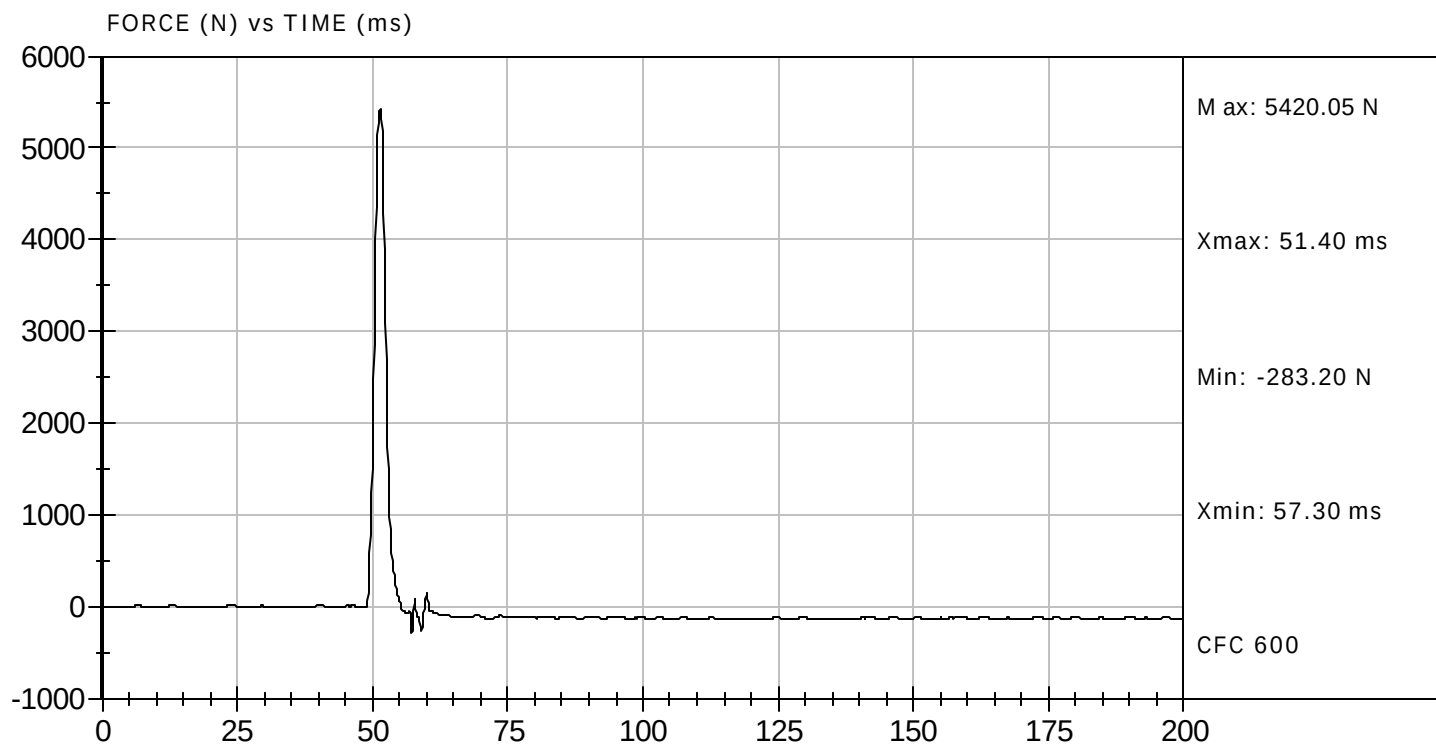

Approved By

03/14/2005
Test Date



Test Desc: Left Knee
Componet ID: D05746

Test Date: 03/14/2005
Velocity: 6.91 ft/s, 2.11 m/s



MGA RESEARCH CORPORATION
HIP-FEMUR FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065

Test I.D: D05740

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.9	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	17	17	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	84.0	77.1	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	42	42	Pass
Overall Test Results					Pass


 Laboratory Technician


 Approved By

03/14/2005
 Test Date

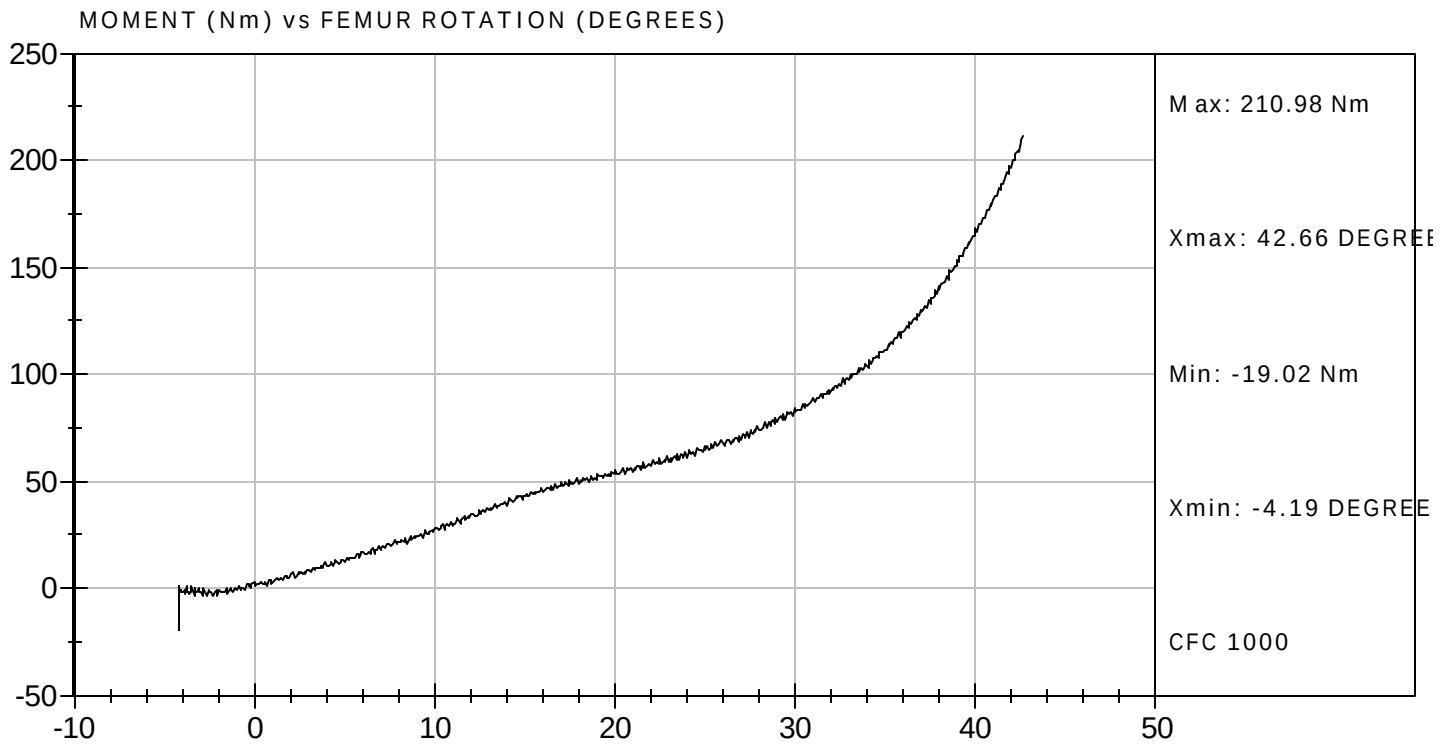


Test Desc: Hip Femur Flexion

Componet ID: D05749

Test Date: 03/14/2005

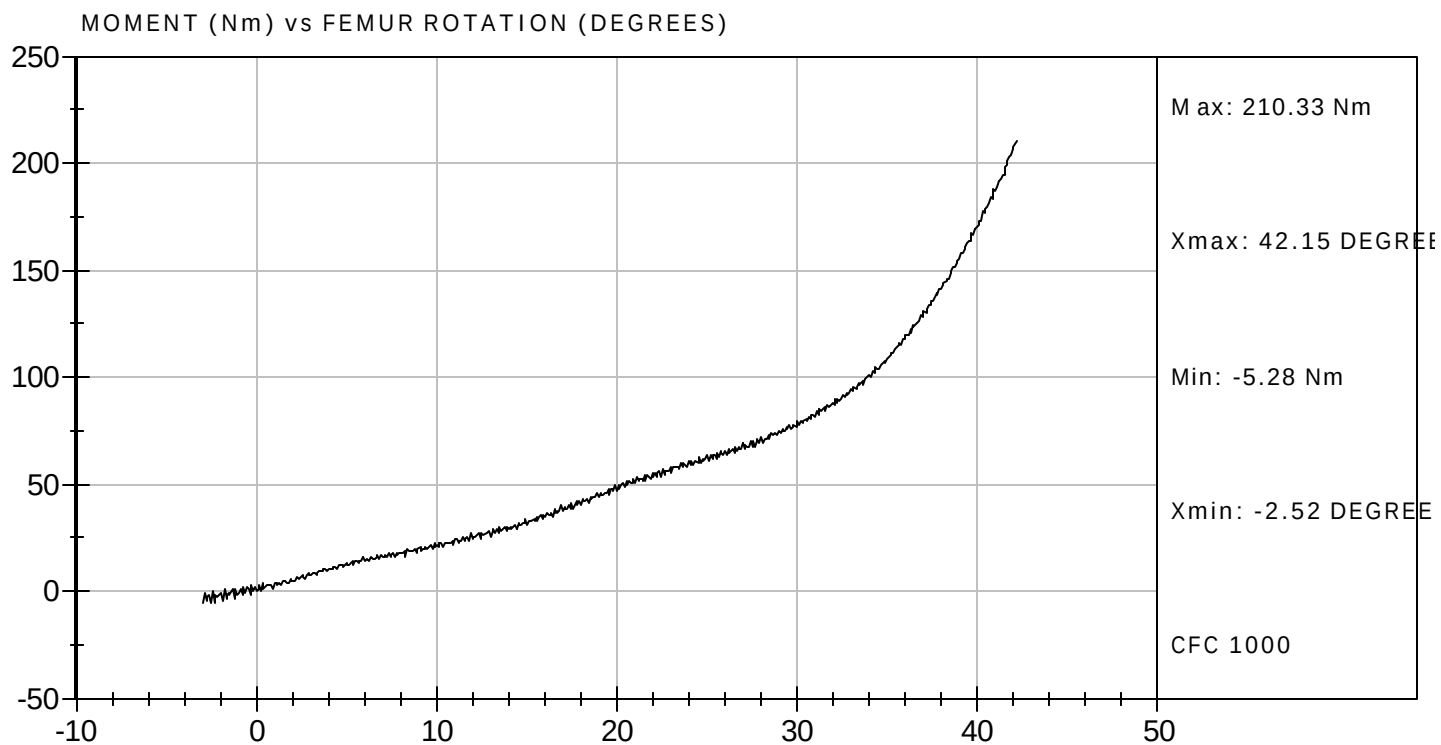
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Componet ID: D05740

Test Date: 03/14/2005
Velocity: 0 ft/s, 0.00 m/s



APPENDIX D

TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION

INSTRUMENTS FOR DRIVER DUMMY NO. 066

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X	J14-J12	Entran	03/11/05
Head Y	J14-J15	Entran	03/11/05
Head Z	J23-J05	Entran	03/11/05
Head X Redundant	AJ619	Endevco	03/11/05
Head Y Redundant	AN8L6	Endevco	03/11/05
Head Z Redundant	APY13	Endevco	03/11/05
Neck Load Cell	442	Denton	07/20/04
Chest X	J25-R13	Entran	02/01/05
Chest Y	J26-H01	Entran	02/01/05
Chest Z	J25-R15	Entran	02/01/05
Chest Deflection Gauge	066	Servo	02/01/05
Chest X Redundant	J25-R13	Entran	02/01/05
Chest Y Redundant	J26-H01	Entran	02/01/05
Chest Z Redundant	J25-R15	Entran	02/01/05
Pelvis X	J07-H14	Entran	02/01/05
Pelvis Y	J07-H23	Entran	02/01/05
Pelvis Z	I20-J10	Entran	02/01/05
Left Femur Load Cell	259	Denton	07/20/04
Right Femur Load Cell	256	Denton	07/20/04
Left Upper Tibia Load Cell	107	Denton	07/22/04
Left Lower Tibia Load Cell	136	Denton	07/22/04
Right Upper Tibia Load Cell	103	Denton	07/22/04
Right Lower Tibia Load Cell	133	Denton	07/22/04
Left Foot Z – Front	J13-A23	Entran	02/01/05
Left Ankle X	J21-Z03	Entran	02/01/05
Left Ankle Z	J14-J07	Entran	02/01/05
Right Foot Z – Front	J26-H11	Entran	02/01/05
Right Ankle X	J26-H15	Entran	02/01/05
Right Ankle Z	J26-H12	Entran	02/01/05
Shoulder Belt Load Cell	158	Denton	12/07/04
Lap Belt Load Cell	166	Denton	12/07/04

INSTRUMENTS FOR PASSENGER DUMMY NO. 065

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X	P27020	Endevco	02/02/05
Head Y	P27025	Endevco	02/02/05
Head Z	P22692	Endevco	02/02/05
Head X Redundant	J10431	Endevco	02/02/05
Head Y Redundant	P26986	Endevco	02/02/05
Head Z Redundant	AN9E3	Endevco	02/02/05
Neck Load Cell	443	Denton	07/20/04
Chest X	AMT78	Endevco	02/02/05
Chest Y	AP1Y8	Endevco	02/02/05
Chest Z	J11361	Endevco	02/02/05
Chest Deflection Gauge	065	Servo	02/01/05
Chest X Redundant	ALFP5	Endevco	02/02/05
Chest Y Redundant	AP138	Endevco	02/02/05
Chest Z Redundant	AJ9Y3	Endevco	02/02/05
Pelvis X	AJ9D8	Endevco	11/12/04
Pelvis Y	AJ4J3	Endevco	11/12/04
Pelvis Z	AF0M3	Endevco	11/12/04
Left Femur Load Cell	262	Denton	07/20/04
Right Femur Load Cell	261	Denton	07/20/04
Left Upper Tibia Load Cell	266	Denton	07/22/04
Left Lower Tibia Load Cell	179	Denton	07/22/04
Right Upper Tibia Load Cell	263	Denton	07/22/04
Right Lower Tibia Load Cell	174	Denton	07/22/04
Left Foot Z – Front	J11166	Endevco	03/11/05
Left Ankle X	J10195	Endevco	03/11/05
Left Ankle Z	AN8D2	Endevco	03/11/05
Right Foot Z – Front	AGTY6	Endevco	03/11/05
Right Ankle X	J13943	Endevco	03/11/05
Right Ankle Z	AALH1	Endevco	03/11/05
Shoulder Belt Load Cell	157	Denton	03/24/05
Lap Belt Load Cell	194	Denton	12/07/04

INSTRUMENTS FOR VEHICLE

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Left Rear Seat Crossmember X	B25-Z01	Entran	03/03/05
Left Rear Seat Crossmember Z	B19-Z11	Entran	03/03/05
Right Rear Seat Crossmember X	J23-M14	Entran	12/01/04
Right Rear Seat Crossmember Z	K03-J14	Entran	01/21/05
Top of Engine X	B28-Z12	Entran	03/17/05
Bottom of Engine X	A29-F14	Entran	11/02/04
Left Brake Caliper X	B26-Z05	Entran	03/17/05
Right Brake Caliper X	B26-Z10	Entran	03/17/05
Instrument Panel X	B19-Z01	Entran	03/03/05