REPORT NUMBER: TO12-MGA-2003-005

FULL SCALE SIDE IMPACT TESTS OF BASELINE VEHICLES
Task Order #T0008 / RFP #0012

Oblique Rigid Pole
SID IIs with Floating Rib Guides

2000 Saab 9-5
NHTSA NUMBER: RY0519

PREPARED BY:
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BURLINGTON, WI 53105

TEST DATE: March 20, 2003

FINAL REPORT SUBMITTED: August 15, 2003

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
VOLPE NATIONAL TRANSPORTATION SYSTEM CENTER
55 BROADWAY, KENDALL SQUARE
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This final test report was prepared for the U.S. Department of Transportation, Volpe National Transportation System Center, in response to Contract Number DTRS57-98-D-00041.

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SECTION 1
PURPOSE AND TEST PROCEDURE

This Side Impact test is conducted as part of Contract No. DTRS57-98-D-00041, RFP 12, task order 8, sponsored by the U.S. Department of Transportation, Volpe National Transportation System Center. The purpose of this test is to evaluate the responses of the SID IIs with floating rib guides in a 2000 Saab 9-5, when subjected to a rigid pole side impact at 285 degrees.

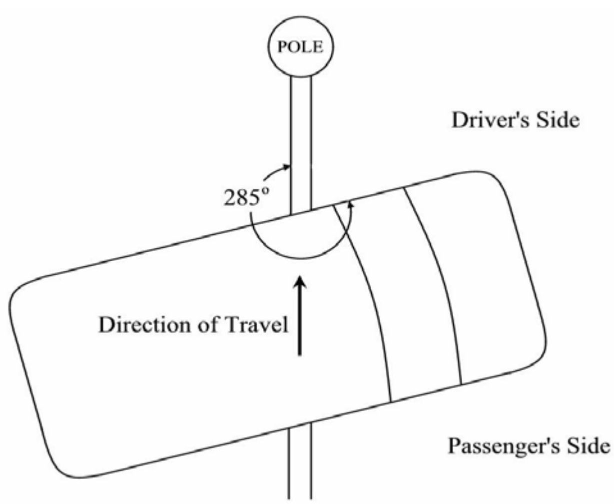
MGA does not endorse or certify products. The manufacturer's name appears solely for identification purposes.

SECTION 2
SUMMARY OF SIDE IMPACT TEST

A rigid pole side impact test at 285 degrees was performed on a 2000 Saab 9-5. The subject vehicle was towed into a rigid pole at a velocity of 32.2 km/h. The weight of the vehicle as tested was 1698.7 kg. The test was conducted at MGA Research Corporation in Burlington, Wisconsin, on March 20, 2003. Pre- and post-test photographs of the test vehicle and the dummies are included in Appendix A.

One SID IIS side impact dummy with floating rib guides was placed in the left front designated seating position according to instructions specified in the FMVSS 208 Laboratory Test Procedure (TP208-12), appendix G which is dated January 14, 2003. The side impact event was documented by ten high speed cameras. Camera locations and other pertinent camera information can be found in this report.

Appendix B contains the vehicle and dummy response data traces. A summary of the dummy configuration and performance verification test data is shown in Appendix C. Dummy and vehicle calibration data can be found in Appendix D of this report. Appendix E contains the dummy peak responses.



SECTION 2...continued

SUMMARY OF SIDE IMPACT TEST

The following table summarizes the results of the Left Side Impact Test:

Rib Deflection (mm) CFC 180	
Upper Thorax Rib	-31.7
Mid Thorax Rib	-25.0
Lower Thorax Rib	-18.0
Upper Abdominal Rib	-15.5
Lower Abdominal Rib	-29.5
Rib Deflection Rate (m/sec) CFC 180	
Upper Thorax Rib	-3.1
Mid Thorax Rib	-2.5
Lower Thorax Rib	-1.5
Upper Abdominal Rib	1.3
Lower Abdominal Rib	-3.2
Viscous Criteria CFC 180	
Upper Thorax Rib	0.5
Mid Thorax Rib	0.3
Lower Thorax Rib	0.2
Upper Abdominal Rib	0.1
Lower Abdominal Rib	0.4

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Abdominal Forces (N) CFC 600	
Left Acetabulum Force	2272
Left Ilium Crest Force	4016
Right Ilium Crest Force	999
Pubic Symphysis Force	-746
Sum of Left Acetabulum and Left Ilium	6045

		Left Front
HIC 15	T1 (msec)	60.6
	T2 (msec)	61.9
	T2 – T1 (msec)	1.3
	HIC	2233

Fir Filtered	Left Front
Upper Thorax Rib Y (g’s)	92.0
Mid Thorax Rib Y (g’s)	83.8
Lower Thorax Rib Y (g’s)	75.5
Upper Abdominal Rib Y (g's)	76.6
Lower Abdominal Rib Y (g's)	79.2
Lower Spine Y (g’s)	64.4
Pelvis Y (g’s)	65.9

TEST NOTES

The dummy and vehicle X and Y velocities presented in this report do not contain the correct initial velocity. The correct initial velocities should be:

X – Test Speed * Sine 15 Degrees
Y – Test Speed * Cosine 15 Degrees

The SID IIs was fitted with floating rib guides.

SECTION 3

SIDE IMPACT DUMMY (SID IIS) AND TEST VEHICLE DATA

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2000 Saab 9-5 4 Door   Test Date: March 20, 2003

TEST VEHICLE INFORMATION

Make	Saab
Model	9-5
Body Style	4 door
VIN	YS3EF48Z0Y3009296
Color	Painted Orange
Odometer Reading (mile)	24,545
Transmission	4 Sp Automatic
Final Drive	Front
Number of Cylinders	6
Engine Displacement (L)	3.0
Engine Placement	Lateral

TEST VEHICLE OPTIONS

Front Airbag	Yes
Side Airbags	Seat Side
Power Windows	Yes
Power Steering	Yes
Power Door Locks	Yes
Tilt Wheel	Yes
Air Conditioning	Yes
Power Brakes	Yes
Anti-lock Brakes	Yes
AM/FM/CD	Yes
Cruise Control	Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Saab Automobile AB
Date of Manufacture	9/99

GVWR (kg)	2087
GAWR Front (kg)	1134
GAWR Rear (kg)	1048

DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	273	273
Cold Pressure (kPa)	220	220
Recommended Tire Size	P215/55R16	P215/55R16
Tire Size on Vehicle	P215/55R16	P215/55R16
Tire Manufacturer	Michelin	Michelin

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench		
Number of Occupants	2	3		5
Capacity Wt. (VCW) (kg)				417.3
Cargo Wt. (RCLW) (kg)				77.1

DATA SHEET NO. 1... (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2000 Saab 9-5 4 Door Test Date: March 20, 2003

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	503.0	331.6		536.6	322.5	
Right	kg	499.9	302.1		535.2	304.4	
Ratio	%	61.3	38.7		63.1	36.9	
Totals	kg	1002.9	633.7	1636.6	1071.8	626.9	1698.7

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Vehicle Target Weight	kg	1699*

*Set To Match Previous Tests

TEST VEHICLE ATTITUDES

	Unit	As Delivered	Fully Loaded	Ready for Test
Right Door Sill Angle	Deg	0.4 ND	0.0	0.1 ND
Left Door Sill Angle	Deg	0.1 ND	0.3 BD	0.1 ND
Front Bumper Angle	Deg	0.2 LD	0.5 LD	0.2 LD
Rear Bumper Angle	Deg	0.4 LD	0.6 LD	0.4 LD

ND=Nose down, BD = Back Down, LD = Left Down, RD = Right Down

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Test Vehicle Wheel Base	mm	2702
Total Vehicle Length at Left Side	mm	3962
Total Vehicle Length at Centerline	mm	4845
Total Vehicle Length at Right Side	mm	3962
Total Vehicle Width	mm	1888
Weight of Ballast in Cargo Area	kg	0
Amount of water in Fuel Tank	liters	0

TEST VEHICLE VERTICAL IMPACT LINE DATA

Measurement Description	Units	Value
Actual Impact Point	mm	3 forward

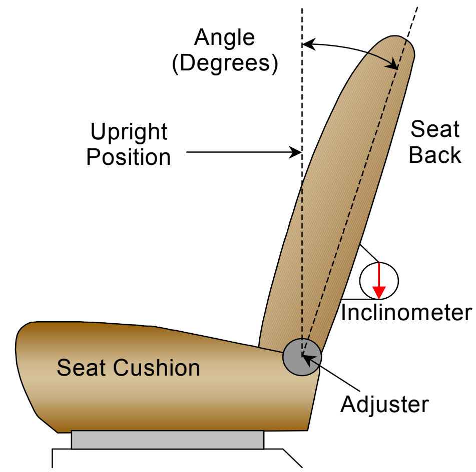
DATA SHEET NO. 1… (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2000 Saab 9-5 4 Door Test Date: March 20, 2003

NORMAL DESIGN RIDING POSITION

Driver seat back angle: 3.2 degrees on seat frame



FRONT SEAT ASSEMBLY

SEAT FORE/AFT POSITIONS

The driver's seat is electronically operated.

Driver seat fore/aft total travel: 200 mm

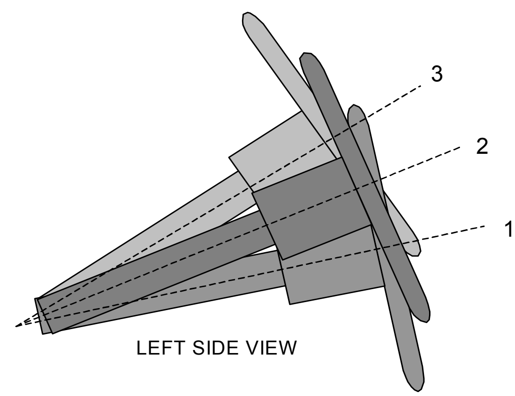
Driver seat fore/aft position: full forward

SEAT BELT UPPER ANCHORAGE

The test vehicle "D" ring anchorage for the driver's seat position was placed in the lowest position.

STEERING COLUMN ADJUSTMENT

The steering column was placed in the mid position of travel.



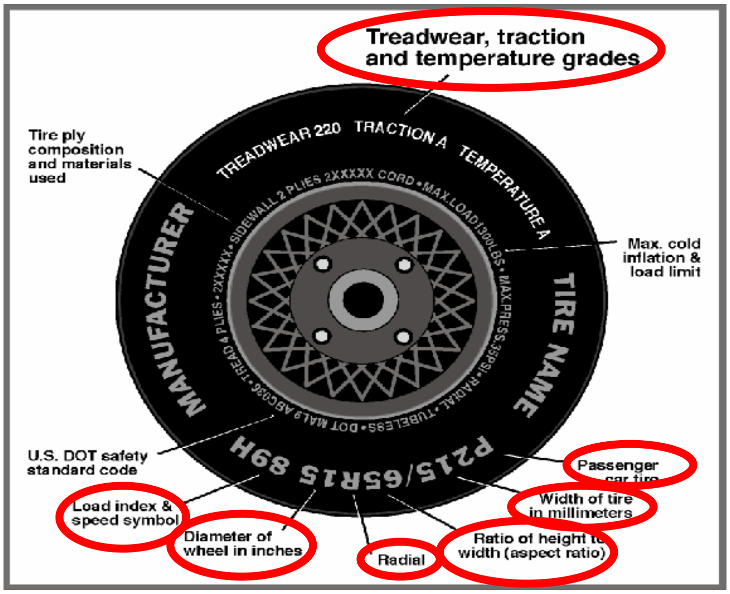
STEERING COLUMN ASSEMBLY

DATA SHEET NO. 2

TEST VEHICLE TIRE INFORMATION

Test Vehicle: 2000 Saab 9-5 4 Door Test Date: March 20, 2003

Vehicle Year	2000	Vehicle Make	Saab
Vin	YS3EF48Z0Y3009296	Vehicle Model	9-5



	Front	Rear
Tire Manufacturer	Michelin	Michelin
Tire Name	Energy MXV4	Energy MXV4
Tire Type	P	P
Tire Width (mm)	215	215
Ratio of Height to Width (aspect ratio)	55	55
Radial	R	R
Wheel Diameter	16	16
Load Index & Speed Symbol	93V	93V
Treadwear	340	340
Traction Grade	A	A
Temperature Grade	A	A

DATA SHEET NO. 3

POST TEST OBSERVATIONS

Test Vehicle: 2000 Saab 9-5 4 Door Test Date: March 20, 2003

TEST DUMMY INFORMATION AND CONTACT POINTS

Description	Left Front
Dummy Type	SID IIS/033
Head Contact	Pole, side airbag
Upper Torso Contact	Door trim panel, side airbag
Lower Torso Contact	Door trim panel, side airbag
Left Knee Contact	Lower door trim panel
Right Knee Contact	Left knee

POST TEST DOOR OPENING

Description	Left Front	Left Rear
Left Side Door Opening	Remained latched and closed	Remained latched and closed
Right Side Door Opening	Remained latched and closed	Remained latched and closed

POST TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	No failures
Sill Separation	None
Windshield Damage	Left side shattered
Window Damage	Left side windows down for test
Other Notable Effects	None

AIRBAG DEPLOYMENT

	Driver
Front	No
Side	Yes
Curtain	None

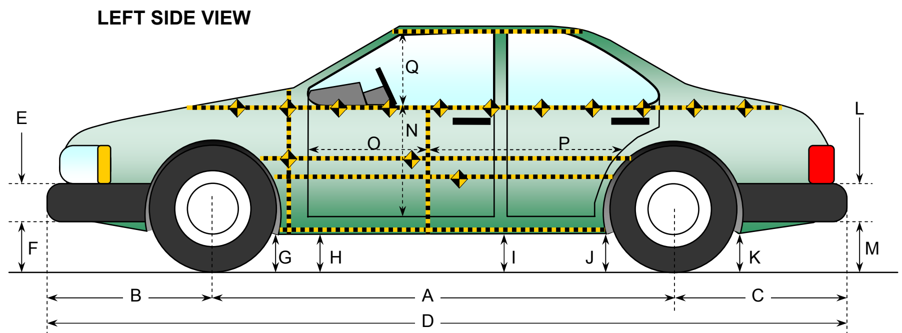
SECTION 4

OCCUPANT AND VEHICLE INFORMATION

DATA SHEET NO. 4

VEHICLE PRE-TEST AND POST-TEST MEASUREMENTS

Test Vehicle: 2000 Saab 9-5 4 Door   Test Date: March 20, 2003



All Measurements in mm

Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2702	2513	189
B	Front Axle to FSOV	1008	1006	2
C	Rear Axle to RSOV	1135	1107	28
D	Total Length at Centerline	4845	4626	219
E	Front Bumper Thickness	265	265	0
F	Front Bumper Bottom to Ground	481	540	-59
G	Sill Height at Front Wheel Well	315	290	25
H	Sill Height at Front Door Leading Edge	315	300	15
I	Sill Height at "B" Pillar	330	348	-18
J1	Sill Height at Rear Wheel Well	326	334	-8
J2	Pinch Weld Height at Rear Wheel Well	354	350	4
K	Sill Height Aft of Rear Wheel Well	334	408	-74
L	Rear Bumper Thickness	215	215	0
M	Rear Bumper Bottom to Ground	486	499	-13
N	Sill Height to Window Bottom Sill	695	678	17
O	Front Door Leading Edge to Impact CL	820	563	257
P	Rear Door Trailing Edge to Impact CL	1119	999	120
Q	Front Window Opening	467	435	32
R	Right Side Length	3962	3986	-24
S	Left Side Length	3962	3743	219
T	Vehicle Width at "B" Post	1888	1612	276

DATA SHEET NO. 5

SID IIS CLEARANCE DIMENSIONS

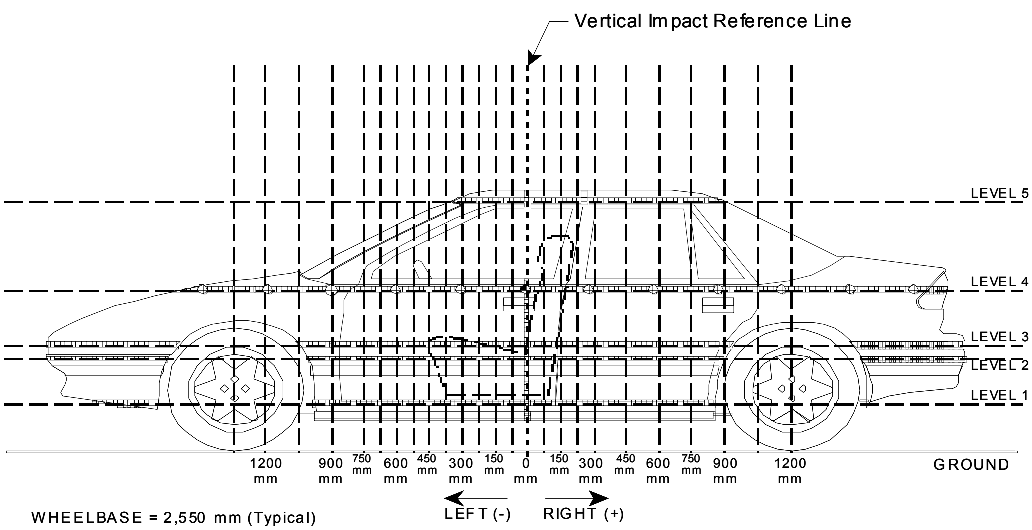
Test Vehicle: 2000 Saab 9-5 4 Door Test Date: March 20, 2003

AA	Ankle to Ankle	Taken between the center points of both ankles, after the feet are placed	236
AD	Arm to Door	Horizontal measurement taken from the center point of the elbow to the first contact point of the door panel	181
HA	Head to A pillar	Horizontal measurement taken from the center of the head's outboard CG target to the A pillar	377
HCM	Hub to Chest	Minimum horizontal distance measured from the hub to the dummy's chest	166
HD	H point to Door	Horizontal measurement taken from the H point hole to the first contact point of the door panel	188
HH	Head to Header	Taken from center point between eyes to header directly in front of dummy	256
HR	Head to Roof	Taken from the center of the outboard target to the roof edge (not the upper edge of the car door), perpendicular to the long axis of the car. If a tape measure is held from the target and extends below the roof, the point to measure is at the low edge of the roof line, which will make contact with the tape measure	222
HS	Head to Side Window	Taken from the center of the outboard target to the side window, measured horizontally and perpendicular to the long axis of the car. In cases where the window is not fully up, a flat bar should be placed across the window opening to simulate the position of the window.	301
HW	Head to Windshield	Taken from the center point between the dummy's eyes to the point on the windshield directly level with the dummy's forehead.	517
KDL	Knee to Dash Left	Taken from the knee pivot point to the point on the dash that is directly level with the center of the knee.	140
KK	Knee to Knee	With the legs in a vertical plane after the feet are placed, the measurement is taken from outside flange to outside flange.	225
NAS	Neck Angle Seated	Taken from the neck when the dummy is seated across two of the "vertebral discs" of the neck.	4.1
NR	Nose to Rim	Taken from the tip of the nose to the steering wheel rim at the 12 o'clock position.	241
PA	Pelvic Angle	Taken by placing an inclinometer on the H point bar.	20.5
RA	Rim to Abd	Taken from the point where the bottom of the chest jacket and the pelvic structure meet to the steering wheel rim at the 6 o'clock position	81
SA	Seat Back Angle	Taken from the lower left corner of the driver seat frame.	3.2
SCH	Steering Wheel to Chest	Horizontal measurement taken from the center of the steering wheel to the dummy's chest.	168
SCR	Steering Wheel to Chest	Taken from the center of the steering wheel to the top of the rib guide.	177
SHH	Striker to H point Horizontal	Taken from the H point to the driver door striker.	314
SHV	Striker to H point Vertical	Taken from the H point to the driver door striker. Value is negative if the striker is above the H point and positive if the striker is below the H point.	79
SK	Striker to Knee	Taken from the center point of the knee to the striker.	732
SKA	Striker to Knee Angle	Taken on top of the tape measure while it is extended from the center point of the knee to the striker.	1.2

DATA SHEET NO. 6
VEHICLE SIDE MEASUREMENTS

Test Vehicle: 2000 Saab 9-5 4 Door   Test Date: March 20, 2003

PRETEST AND POST TEST EXTERIOR PROFILE MEASUREMENTS



LEFT SIDE VIEW

Measurements are taken with vehicle in the as tested condition.
Measurements along the vertical 0 mm.
All measurements below in mm.

Level	Measurement Description	Height Above Ground
5	Window	1500
4	Window Sill	1014
3	Mid Door	741
2	Occupant H-Point	660
1	Sill Top	436

DATA SHEET NO. 7

VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2000 Saab 9-5 4 Door Test Date: March 20, 2003

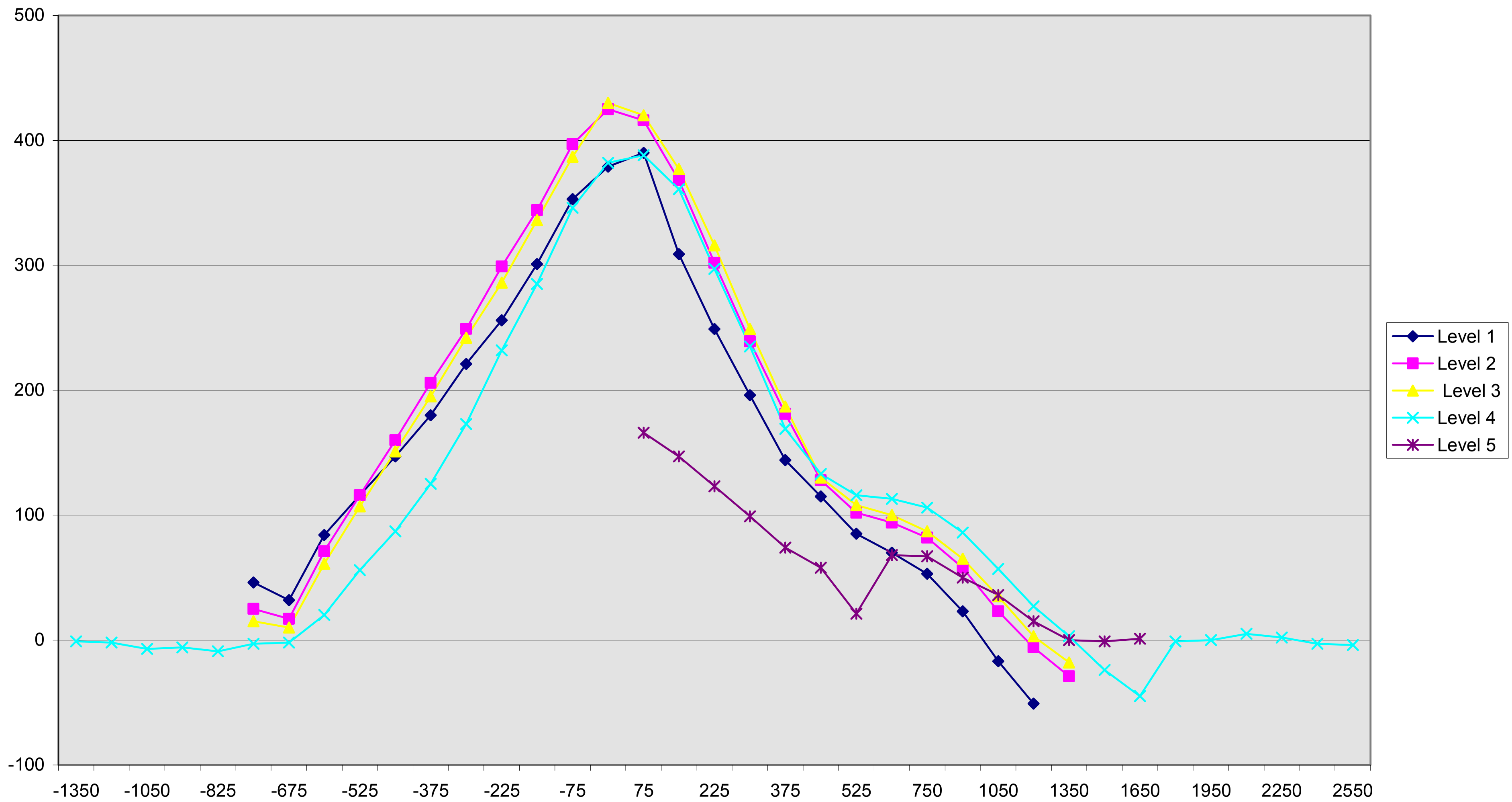
	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-1350				305					304					-1	
-1200				286					284					-2	
-1050				273					266					-7	
-900				262					256					-6	
-825				255					246					-9	
-750	240	206	206	249		286	231	221	246		46	25	15	-3	
-675	240	208	208	247		272	225	218	245		32	17	10	-2	
-600	243	212	209	245		327	283	270	265		84	71	61	20	
-525	245	211	207	243		361	327	314	297		116	116	107	56	
-450	247	210	206	244		394	370	357	331		147	160	151	87	
-375	248	209	206	243		428	415	401	368		180	206	195	125	
-300	250	209	204	242		471	458	446	415		221	249	242	173	
-225	250	208	204	242		506	507	490	474		256	299	286	232	
-150	252	207	203	241		553	551	539	526		301	344	336	285	
-75	253	207	203	240		606	604	590	586		353	397	387	346	
0	253	207	202	240		632	632	632	622		379	425	430	382	
75	254	207	201	241	482	643	623	621	629	648	390	416	420	388	166
150	255	207	201	242	480	564	575	578	603	627	309	368	377	361	147
225	256	206	201	243	477	505	508	517	540	600	249	302	316	297	123
300	256	207	201	243	478	452	446	450	478	577	196	239	249	235	99
375	256	207	201	244	478	400	388	388	413	552	144	181	187	169	74
450	257	208	203	246	479	372	336	333	379	537	115	128	130	133	58
525	256	209	204	247	480	341	311	312	363	501	85	102	108	116	21
600	256	209	204	249	482	326	303	304	362	550	70	94	100	113	68
750	255	209	205	252	482	308	291	292	358	549	53	82	87	106	67
900	254	209	205	255	484	277	267	270	341	534	23	58	65	86	50
1050	252	210	207	260	485	235	233	242	317	521	-17	23	35	57	36
1200	249	211	210	267	488	198	205	213	294	503	-51	-6	3	27	15
1350		214	213	274	491		185	195	277	491		-29	-18	3	0
1500				283	495				259	494				-24	-1
1650				293	514				248	515				-45	1
1800				306					305					-1	
1950				320					320					0	
2100				337					342					5	
2250				356					358					2	
2400				377					374					-3	
2550				400					396					-4	

Reference plane is parallel to test vehicle longitudinal centerline.
Given dimensions = Reference plane to car body. Measurements in mm.

DATA SHEET NO. 7... (continued)

VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2000 Saab 9-5 4 Door   Test Date: March 20, 2003

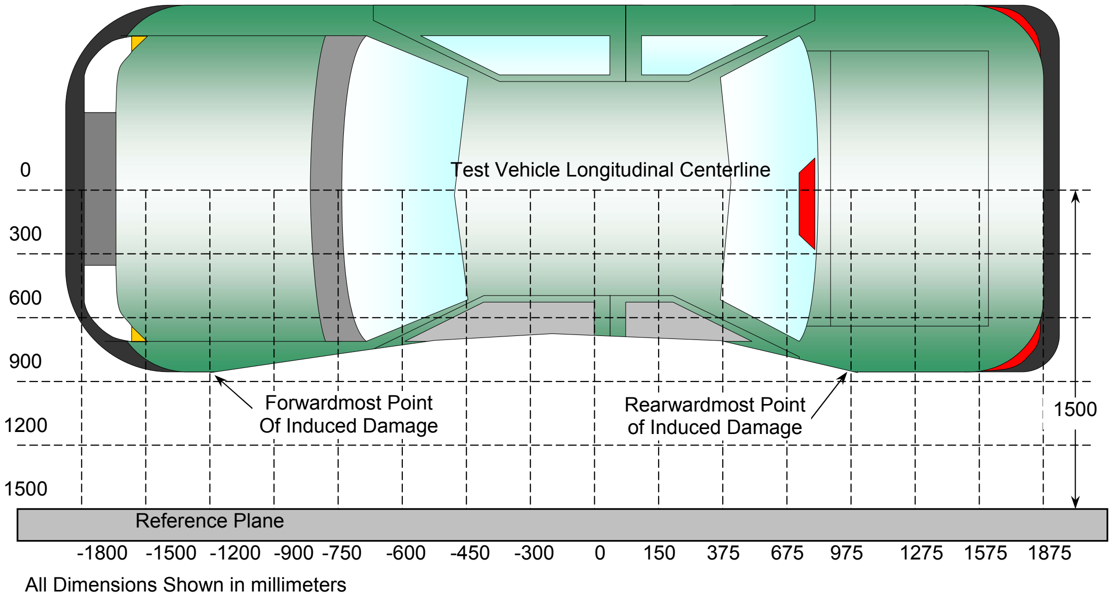


Measurement in mm.

DATA SHEET NO. 8

VEHICLE DAMAGE PROFILE DISTANCES

Test Vehicle: 2000 Saab 9-5 4 Door Test Date: March 20, 2003



TOP VIEW

Damage Profile Distances

DPD	Distance from Impact Point in mm	Level	Pre-Test (mm)	Post-Test (mm)	Max Static Crush (mm)
1	-1350 mm	4	305	304	-1
2	-618 mm	4	250	244	-6
3	210 mm	3	201	630	429
4	1100 mm	4	262	309	47
5	1810 mm	4	306	306	0
6	2550 mm	4	400	396	-4

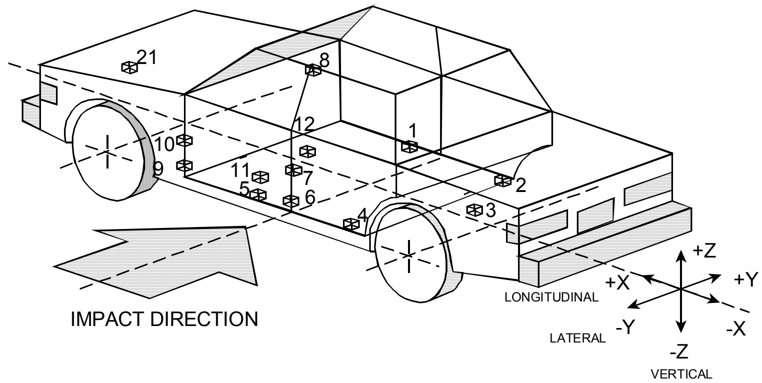
Reference plane is parallel to test vehicle longitudinal centerline.

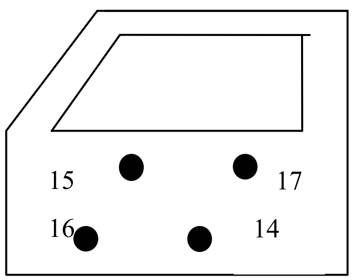
Given dimensions = Reference plane to car body.

DATA SHEET NO. 9

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

Test Vehicle: 2000 Saab 9-5 4 Door Test Date: March 20, 2003





No.	Location
1	Right Side Sill at Front Seat
2	Right Side Sill at Rear Seat
3	Rear Floorpan Above Axle
4	Left Side Sill at Rear Door
5	Left Side Sill at Front Door
6	Left Lower B-Post
7	Left Mid B-Post
8	Left Upper B-Post
9	Left Lower A-Post
10	Left Mid A-Post
11	Driver Seat Track

No.	Location
12	Vehicle CG
13	Left A-Pillar @ Roof
14	Left Front Door @ Pelvis
15	Left Front Door @ Arm
16	Left Front Door @ Knee
17	Left Front Door @ Rib
19	Left Driver Seat Frame
20	Right Driver Seat Frame
21	Lower Center Radiator Support

DATA SHEET NO. 9... (continued)

VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY

Test Vehicle: 2000 Saab 9-5 4 Door   Test Date: March 20, 2003

VEHICLE ACCELEROMETER PEAK DATA AND PRE-TEST LOCATIONS

Loc. No.	Accelerometer Location	Long (X) Maximums (g's) (CFC 60)		Lat. (Y) Maximums (g's) (CFC 60)		Vert. (Z) Maximums (g's) (CFC 60)		Resultant (g's) (CFC 60)
		Pos.	Neg.	Pos.	Neg.	Pos.	Neg.	Max.
1	Right Side Sill at Front Seat	2.7	2.1	12.5	0.1	**	**	
2	Right Side Sill at Rear Seat	2.1	2.5	10.7	0.1	3.6	2.5	11.0
3	Rear Floorpan Above Axle	1.8	3.6	11.9	0.2	3.2	3.6	12.4
4	Left Side Sill at Rear Door			15.9	0.0			
5	Left Side Sill at Front Door ***			54.0	19.8			
6	Left Lower B-Post			36.6	2.0			
7	Left Mid B-Post			27.1	7.8			
8	Left Upper B-Post			54.1	35.3			
9	Left Lower A-Post			20.6	4.7			
10	Left Mid A-Post			18.5	2.4			
11	Driver Left Seat Track			85.1	16.9			
12	Vehicle CG	1.8	4.8	21.3	3.2	19.9	9.3	24.8
13	Left A-Post at Roof			70.4	6.4			
14	Left Front Door at Pelvis*							
15	Left Front Door at Arm*							
16	Left Front Door at Knee*							
17	Left Front Door at Rib*							
19	Left Driver Seat Frame*							
20	Right Driver Seat Frame*							
21	Lower Center Radiator Support	2.4	7.2	10.2	1.1	3.8	7.2	10.7

Sign Convention   X - + forward
Y - + to right
Z - + down

*= Not used to avoid interference with restraint system.

**=No valid data collected

***= No valid data collected after 80 msec

DATA SHEET NO. 9... (continued)

VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY

Test Vehicle: 2000 Saab 9-5 4 Door Test Date: March 20, 2003

VEHICLE ACCELEROMETER COORDINATES

Loc. No.	Description	Coordinates (mm)		
		X	Y	Z
1	Right Side Sill at Front Seat	2492	675	227
2	Right Side Sill at Rear Seat	1872	675	244
3	Rear Floorpan Above Axle	1097	10	544
4	Left Side Sill at Rear Door	1488	-675	236
5	Left Side Sill at Front Door	2724	-675	219
6	Left Lower B-Post	2178	-657	332
7	Left Mid B-Post	2158	-548	758
8	Left Upper B-Post	2129	-516	1384
9	Left Lower A-Post	3267	-704	273
10	Left Mid A-Post	3317	-788	903
11	Driver Left Seat Track	2333	-549	339
12	Vehicle CG	2817	90	339
13	Left A-Pillar @ Roof	2707	-567	1275
14	Left Door @ Pelvis	*	*	*
15	Left Door @ Arm	*	*	*
16	Left Door @ Knee	*	*	*
17	Left Door @ Rib	*	*	*
19	Left Driver Seat Frame	*	*	*
20	Right Driver Seat Frame	*	*	*
21	Lower Center Radiator Support	4372	0	213

Sign Convention X – Rear Bumper (+ forward)

Y – Vehicle Centerline (+ to right)

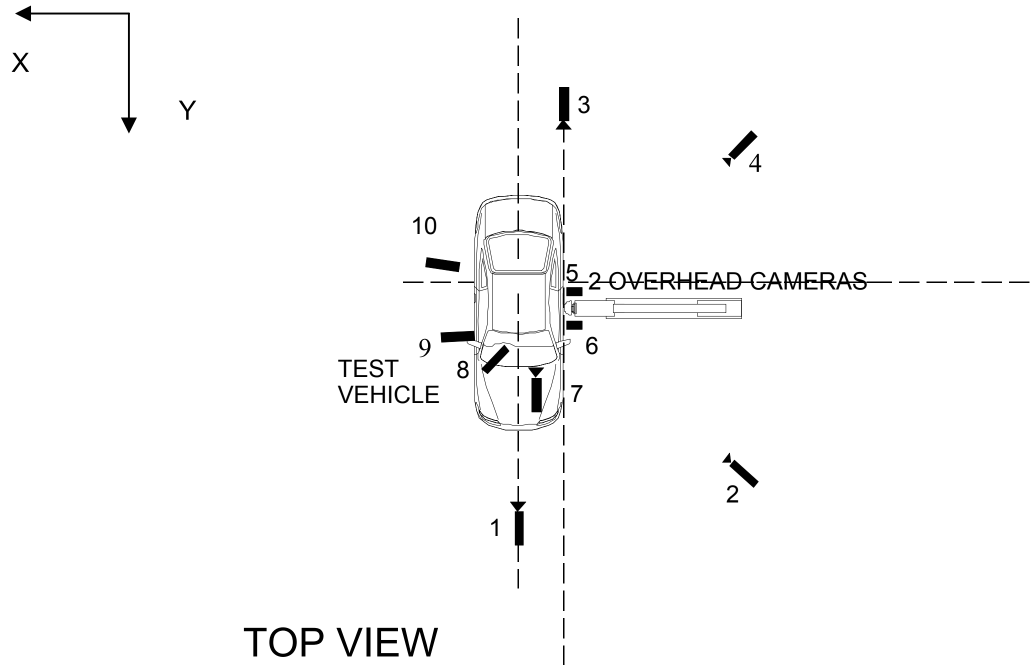
Z – Ground Plane (+ up)

* = Not used to avoid interference with restraint system.

DATA SHEET NO. 10

HIGH SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2000 Saab 9-5 4 Door Test Date: March 20, 2003



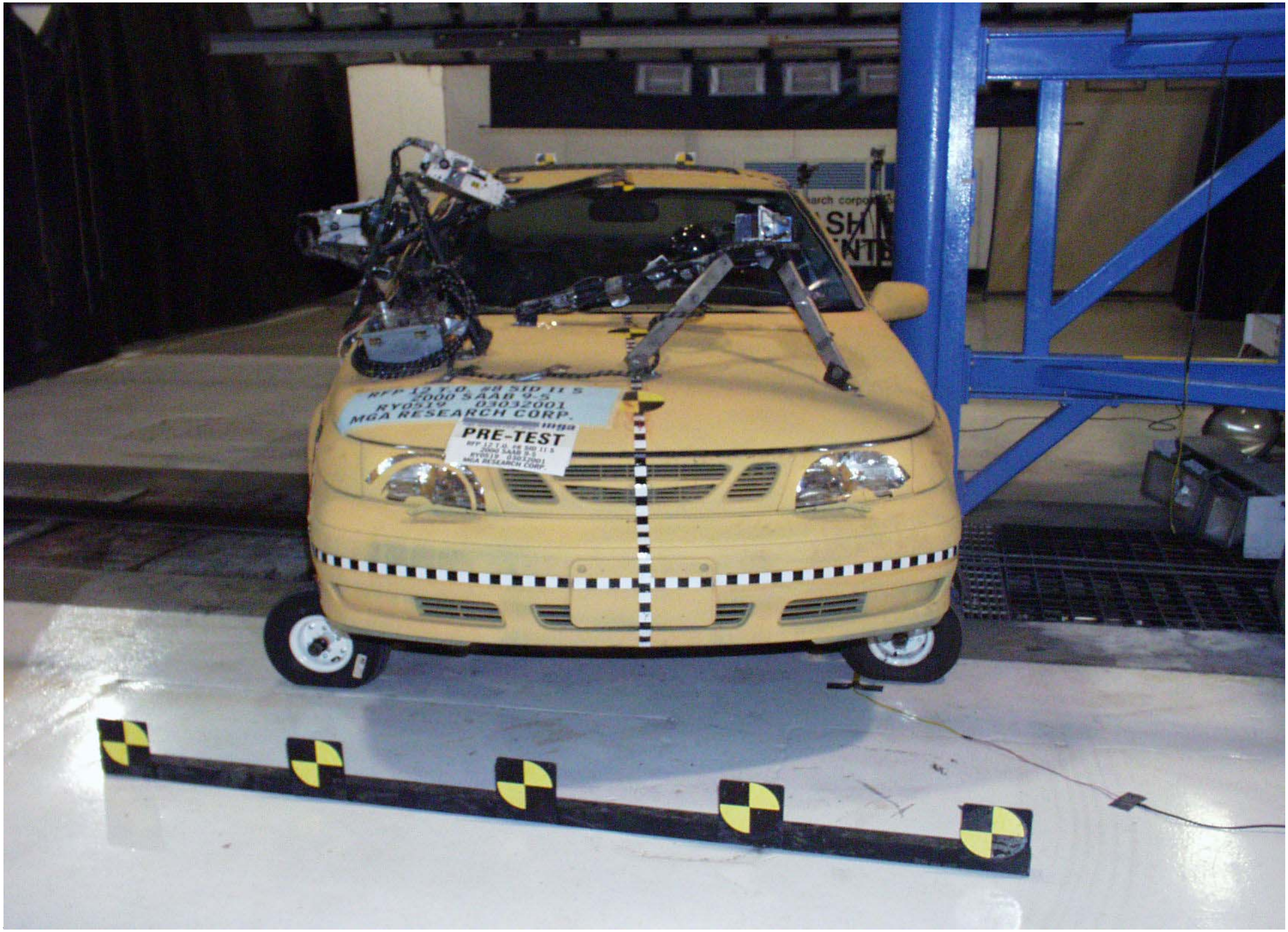
No.	Camera View	Location (mm)			Lens (mm)	Film Speed (fps)
		X	Y	Z		
1	Front Ground Level	650	8610	1570	25	800
2	Front Angle	-2540	3400	1310	35	1020
3	Rear Ground Level	400	-9000	1600	25	957
4	Rear Angle	-2450	-5300	130	35	1036
5	Overhead View	800	0	5000	8	1042
6	Overhead View, Close-up	0	0	5000	13	1026
7	Onboard Hood				13	526
8	Onboard Hip				13	513
9	Onboard Perp.				13	513
10	Onboard B-Post				13	524

Reference Points X - + Forward of Impact
Y - + Right of Impact
Z - + Up from Ground

APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS



Pre-Test Front View of Test Vehicle

Post-Test Front View of Test Vehicle

Pre-Test Rear View of Test Vehicle

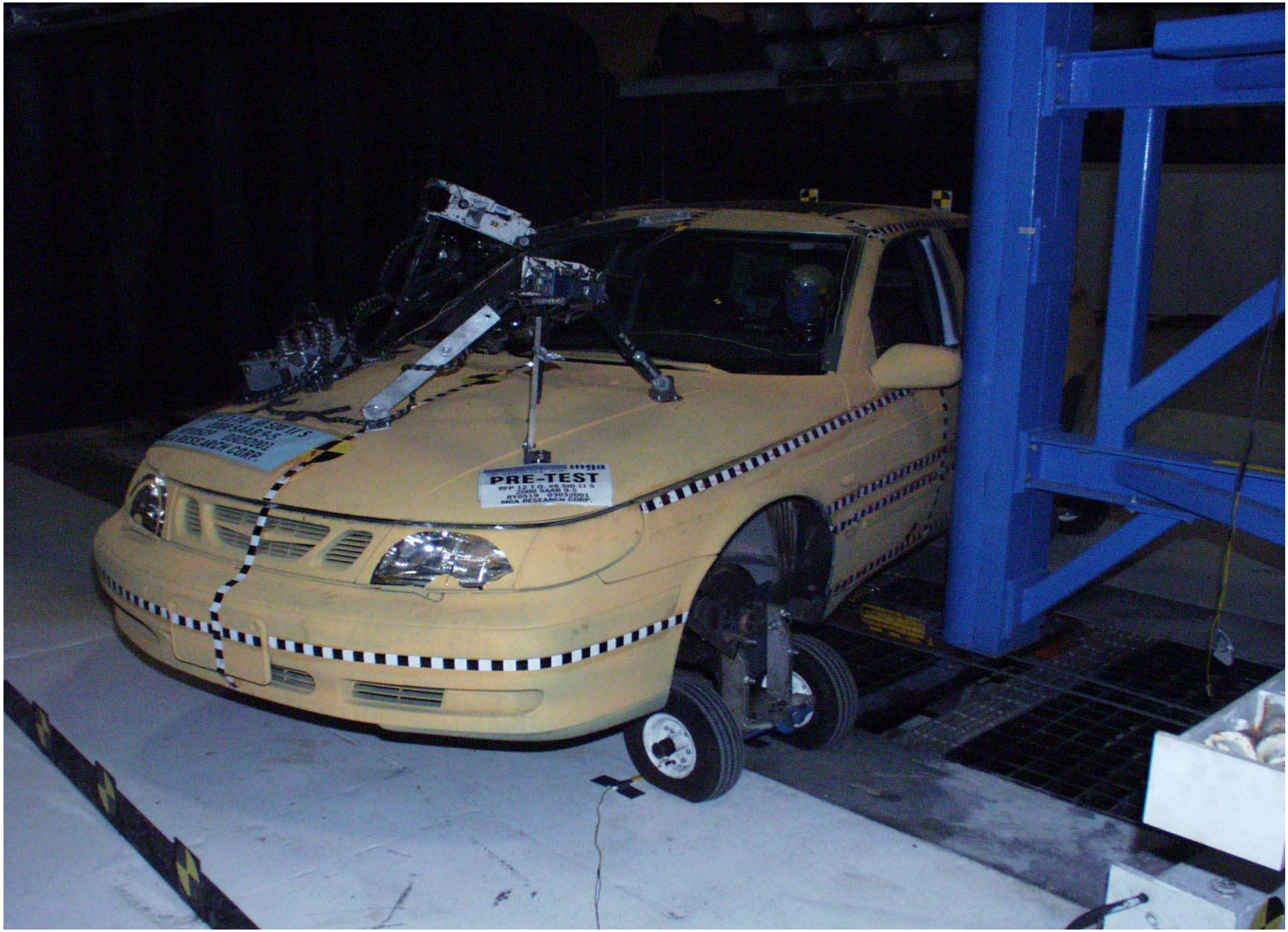
Post-Test Rear View of Test Vehicle

Pre-Test Left Side View of Test Vehicle

Post-Test Left Side View of Test Vehicle

Pre-Test Left ¾ Front View of Test Vehicle

Pre-Test Left ¾ Rear View of Test Vehicle

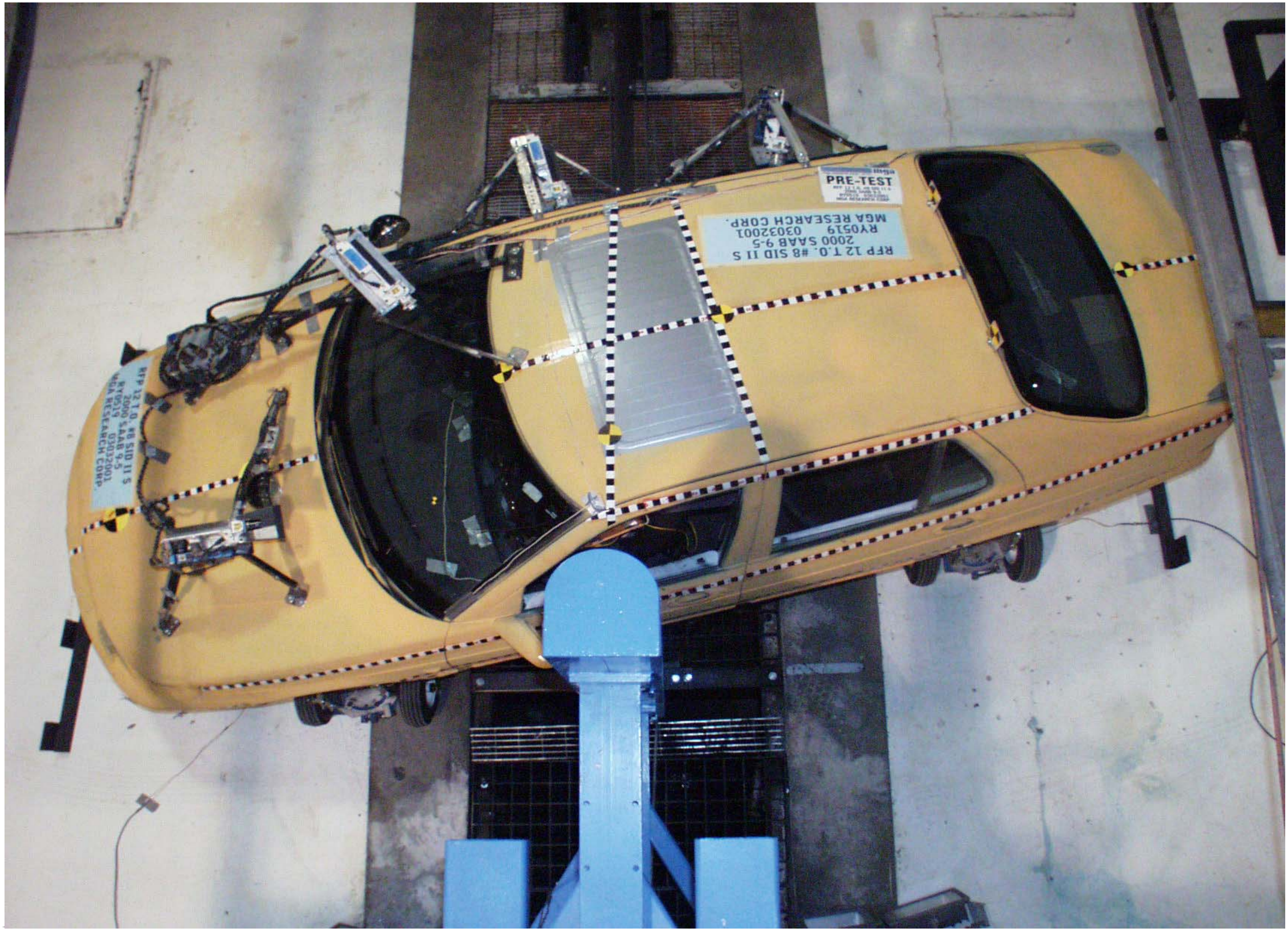


Pre-Test Vehicle Positioned Against Pole (left side)

Post-Test Pole and Vehicle (left side)

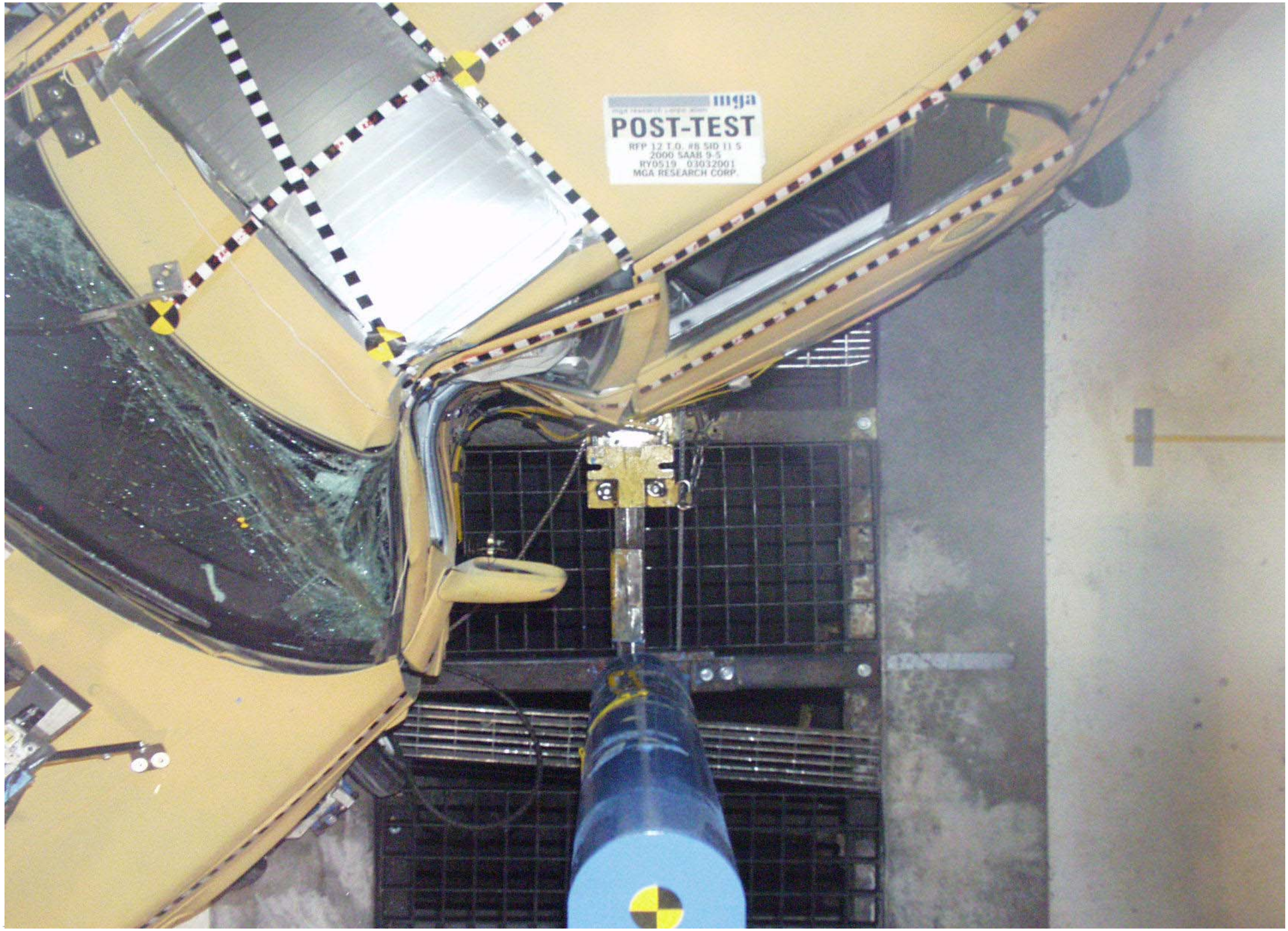
Pre-Test Vehicle Positioned Against Pole (right side)

Post-Test Pole and Vehicle (right side)



Pre-Test Vehicle Positioned Against Pole Overhead View

Post-Test Pole and Vehicle Overhead View



Post-Test Pole and Vehicle Overhead View (Close-up)

Pre-Test Driver Seat Position

Pre-Test Driver Dummy Left Side View (Door open)

Pre-Test Driver Dummy Left side View

Post-Test Driver Dummy Left Side View

Pre-Test Driver Dummy Right Side View

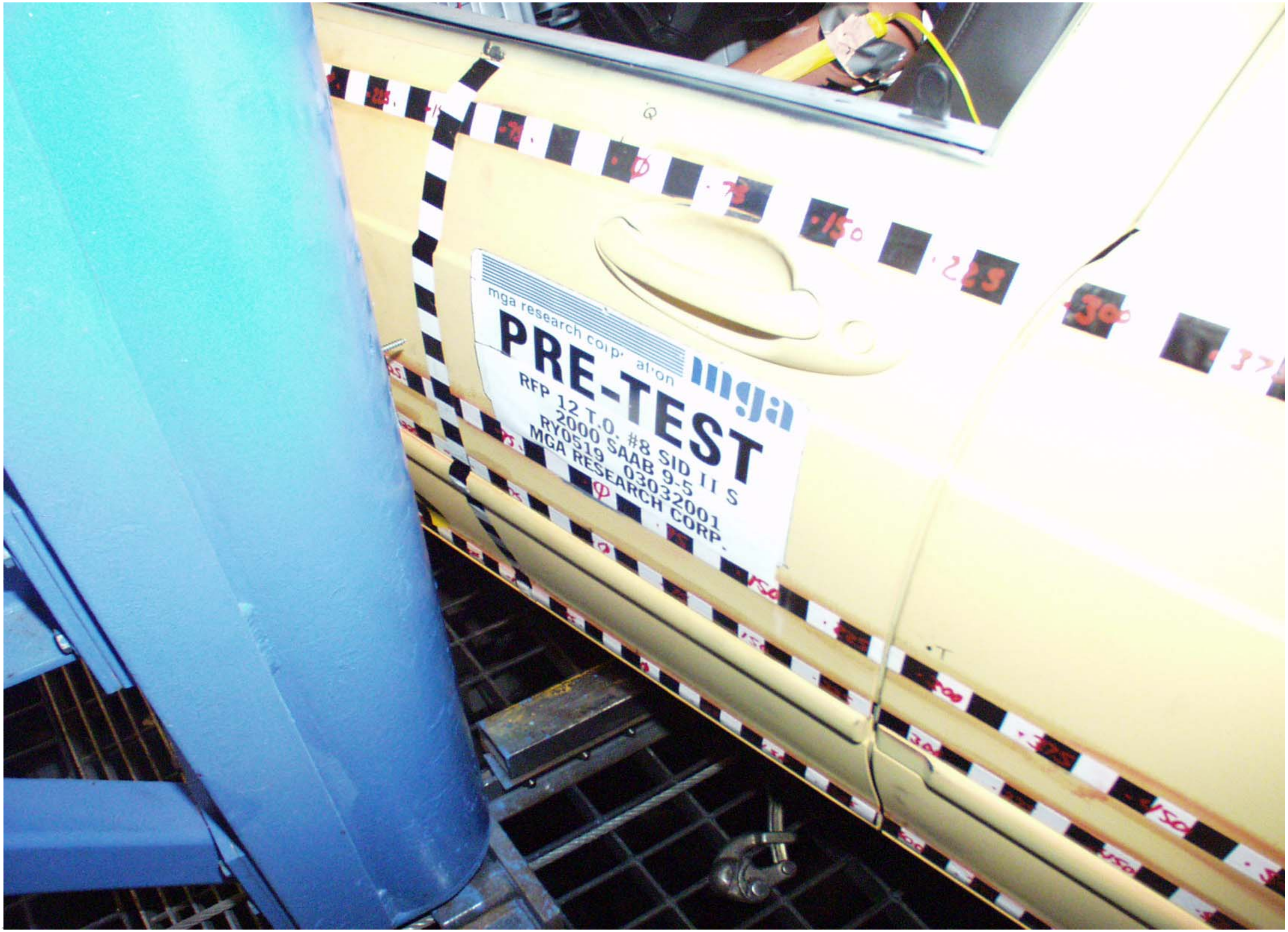
Post-Test Driver Dummy Right Side View

Pre-Test Driver Shoulder and Door Top View

Post-Test Driver Shoulder and Door Top View

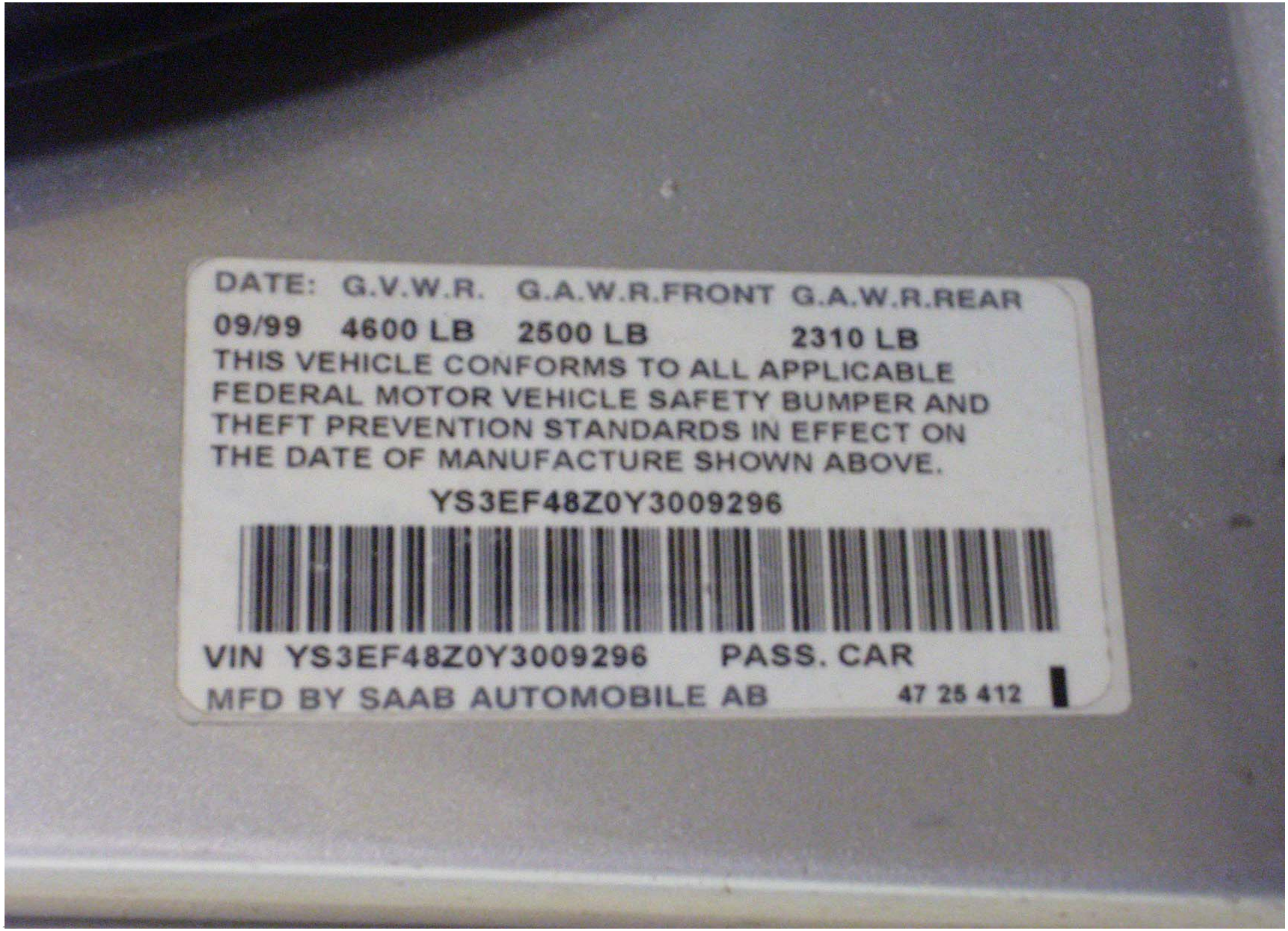
Post-Test Driver Dummy Contact

Post-Test Driver Dummy Lower Body Contact

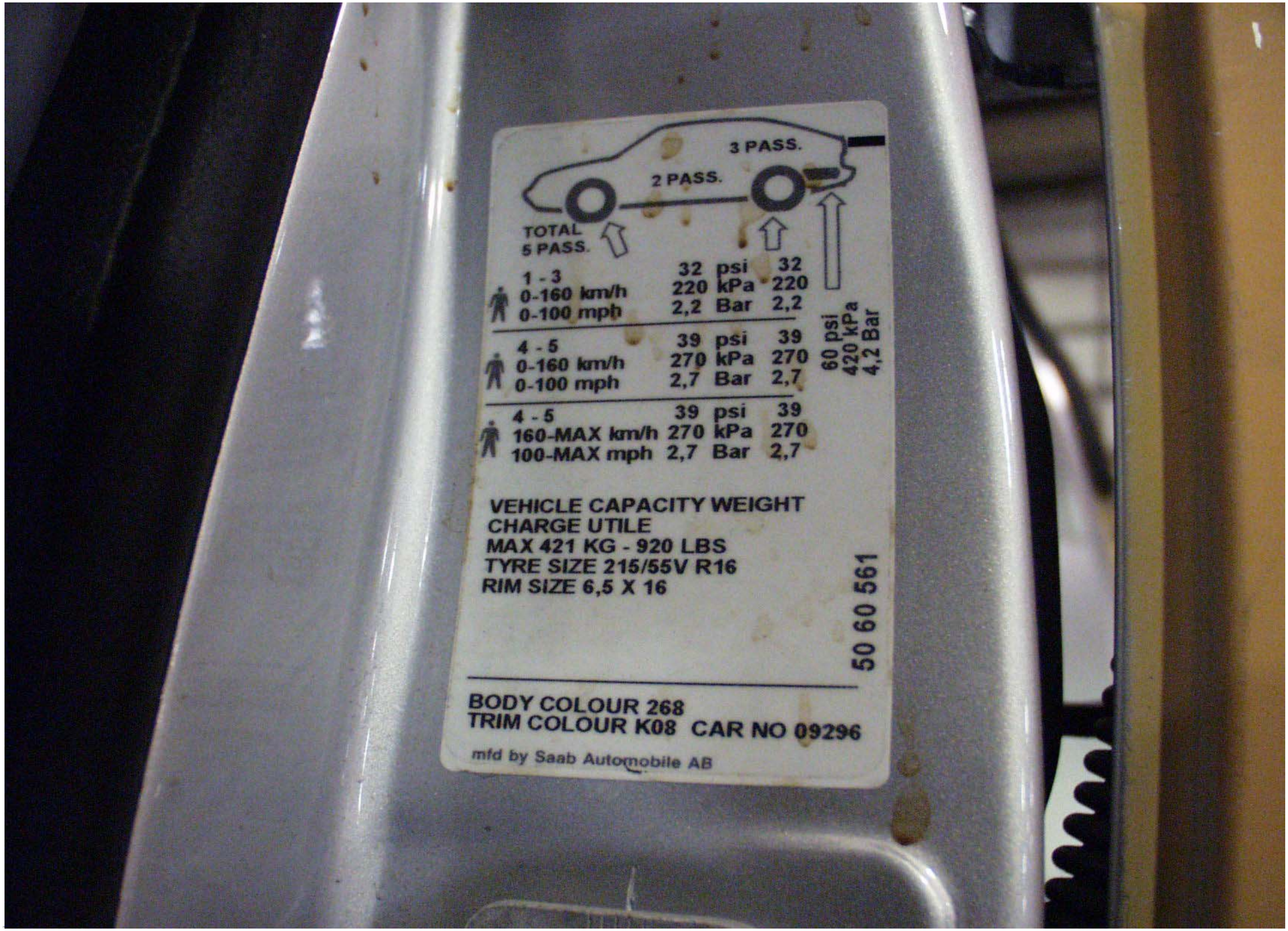


Pre-Test Impact Point on Vehicle

Post-Test Impact Point on Vehicle



Vehicle Certification Label



Tire Placard

Impact

APPENDIX B

VEHICLE AND DUMMY RESPONSE DATA TRACES

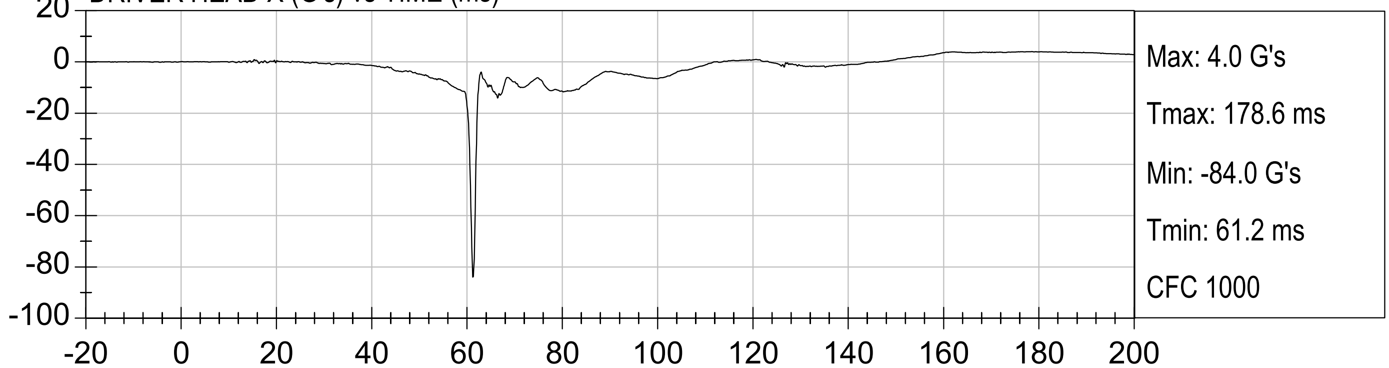
TABLE OF DATA PLOTS

The dummy and vehicle X and Y velocities presented in this report do not contain the correct initial velocity. The correct initial velocities should be:
X – Test Speed * Sine 15 Degrees
Y – Test Speed * Cosine 15 Degrees

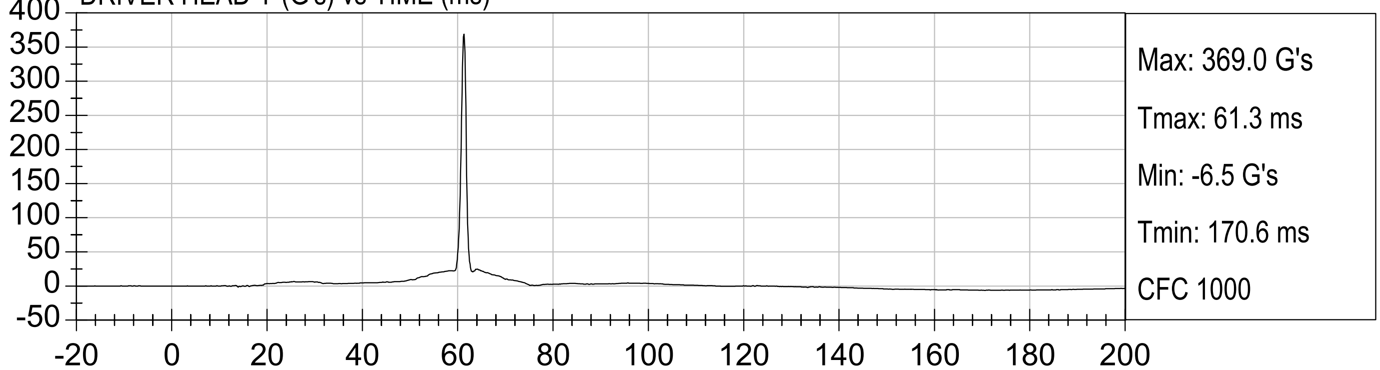
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)

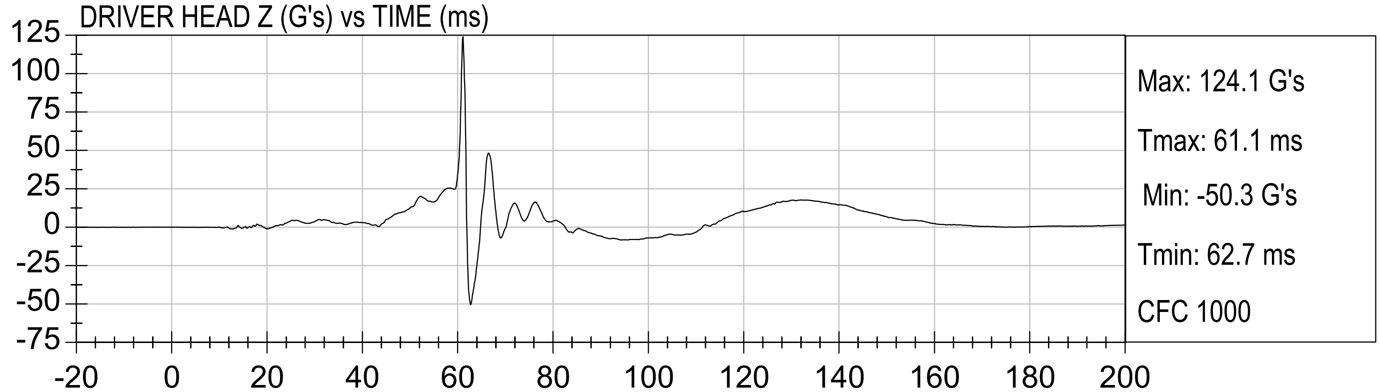
DRIVER HEAD X (G's) vs TIME (ms)



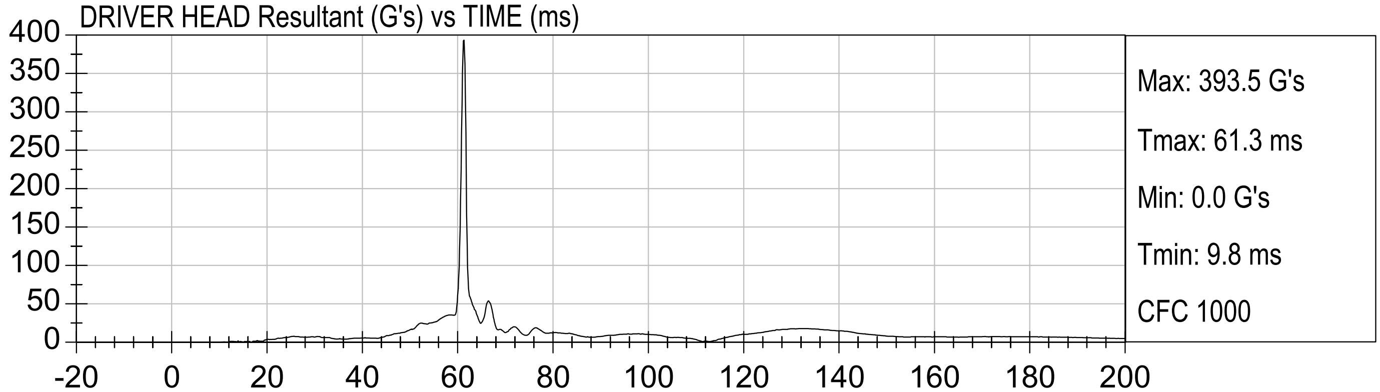
DRIVER HEAD Y (G's) vs TIME (ms)

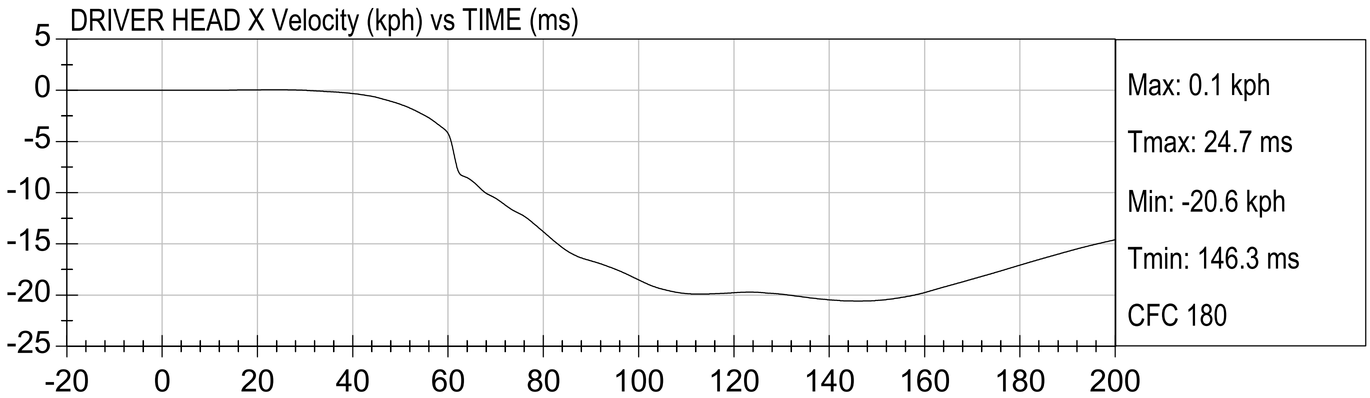


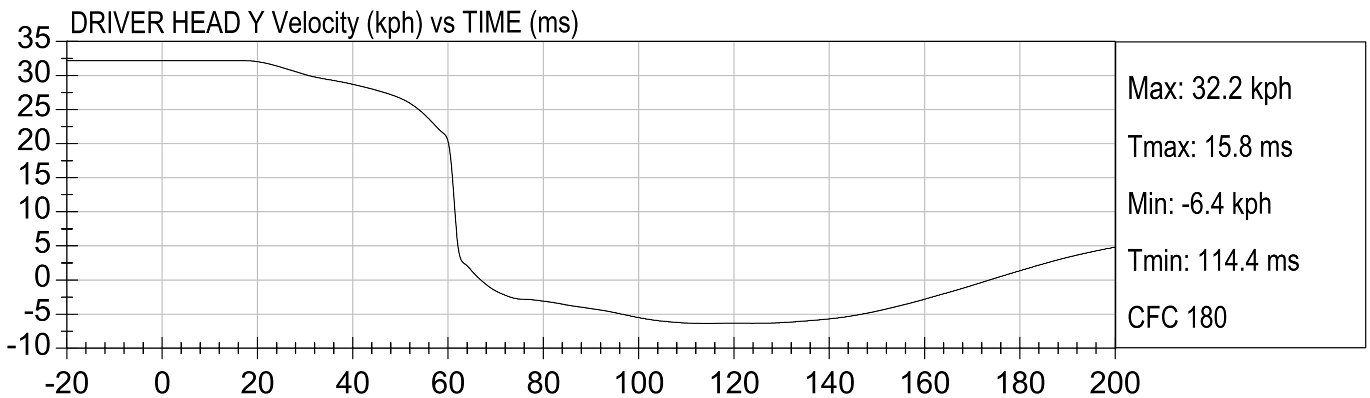
DRIVER HEAD Z (G's) vs TIME (ms)

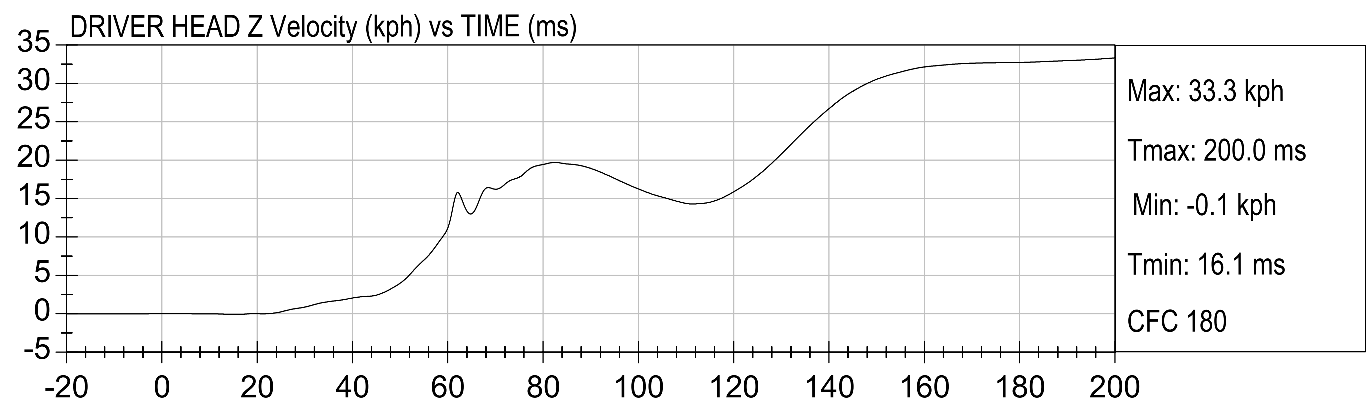


DRIVER HEAD Resultant (G's) vs TIME (ms)



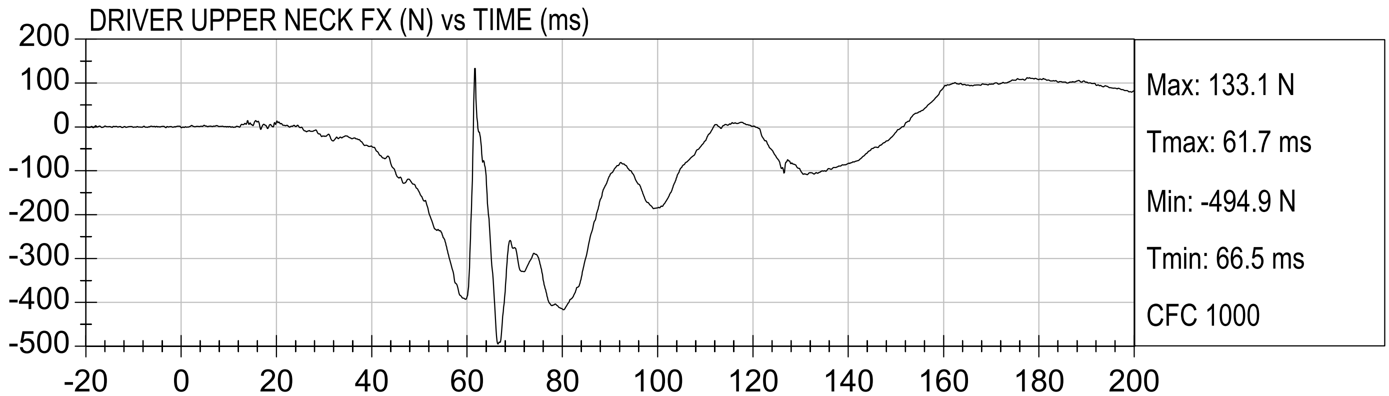

DRIVER HEAD X Velocity (kph) vs TIME (ms)
Max: 0.1 kph
Tmax: 24.7 ms
Min: -20.6 kph
Tmin: 146.3 ms
CFC 180

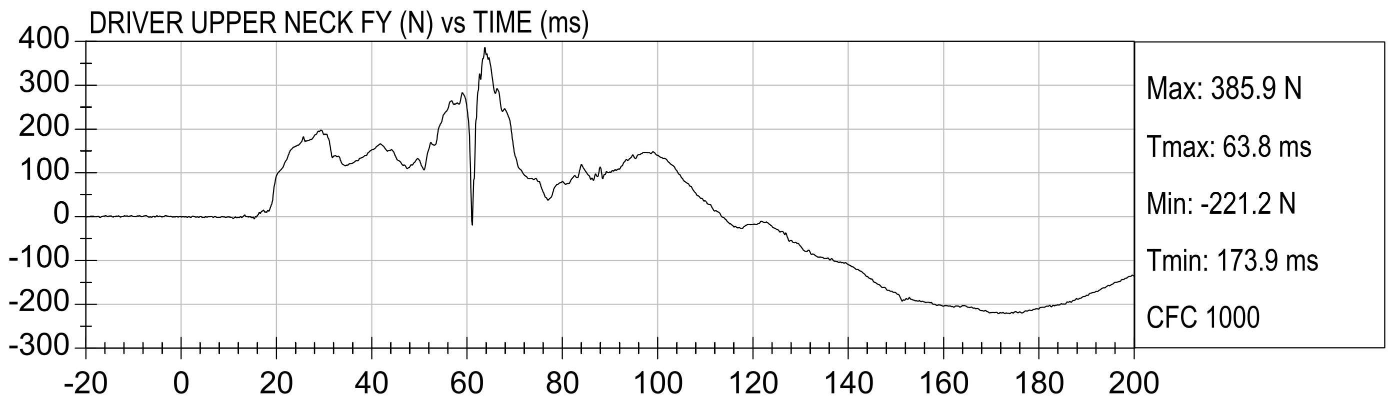

DRIVER HEAD Y Velocity (kph) vs TIME (ms)
Max: 32.2 kph
Tmax: 15.8 ms
Min: -6.4 kph
Tmin: 114.4 ms
CFC 180

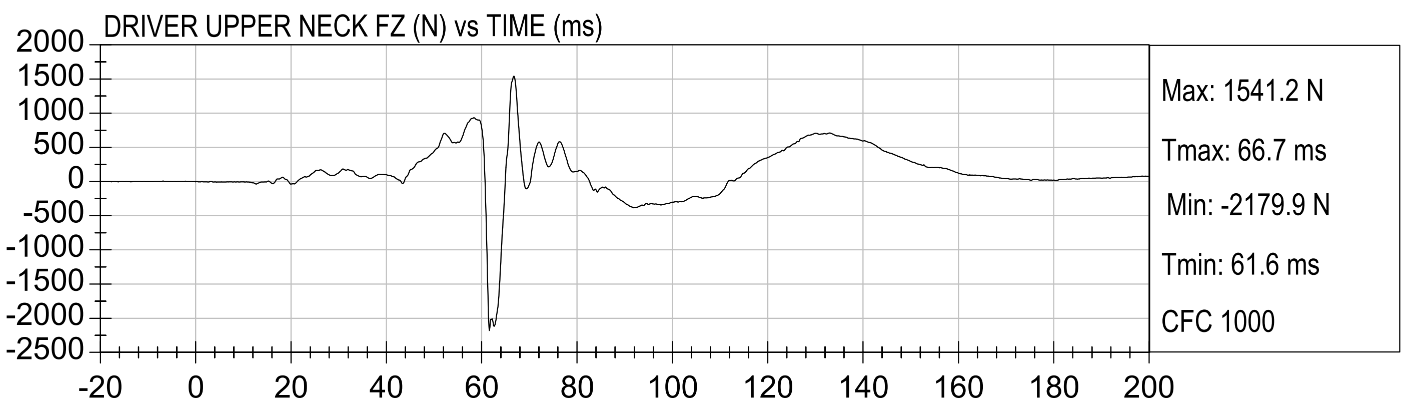

DRIVER HEAD Z Velocity (kph) vs TIME (ms)
Max: 33.3 kph
Tmax: 200.0 ms
Min: -0.1 kph
Tmin: 16.1 ms
CFC 180

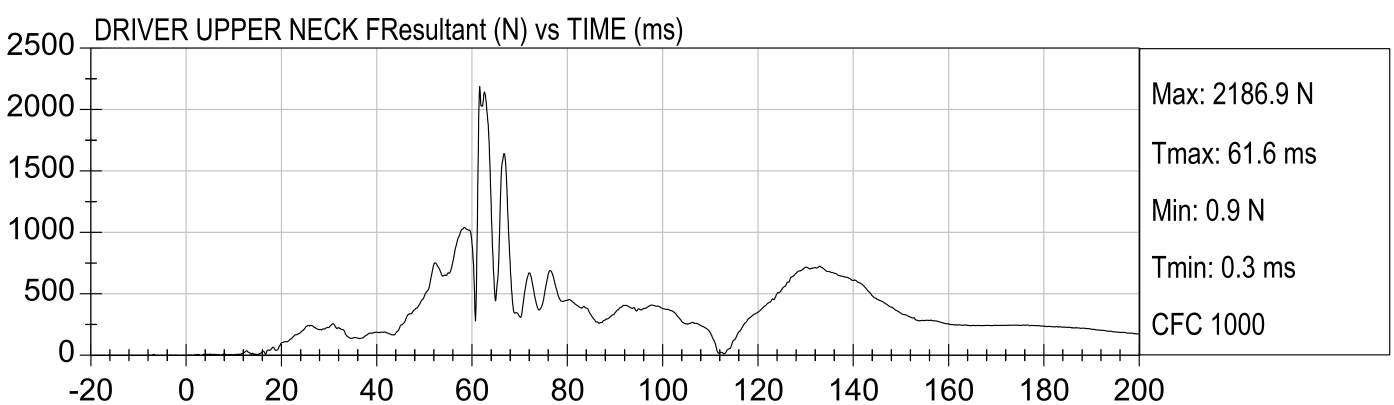
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

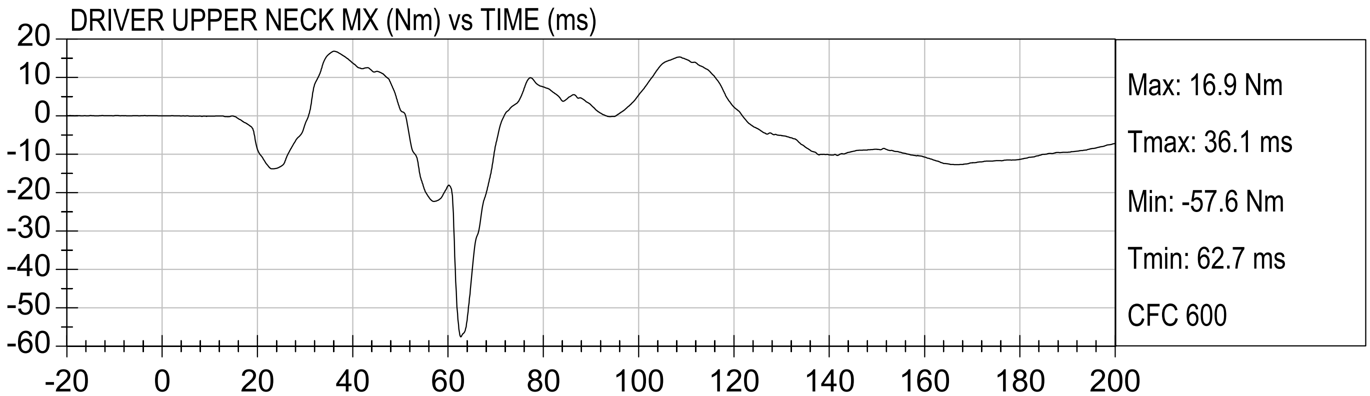
Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)

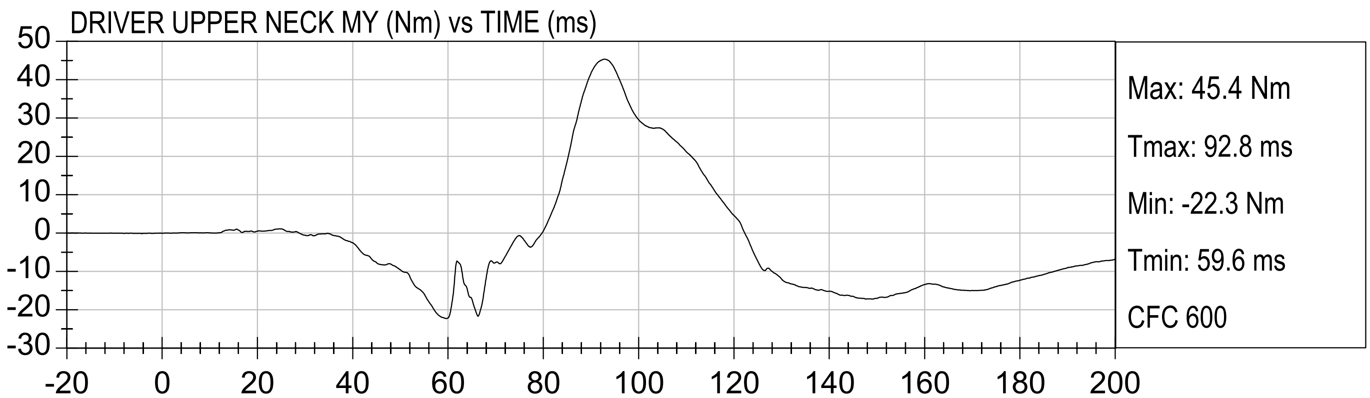


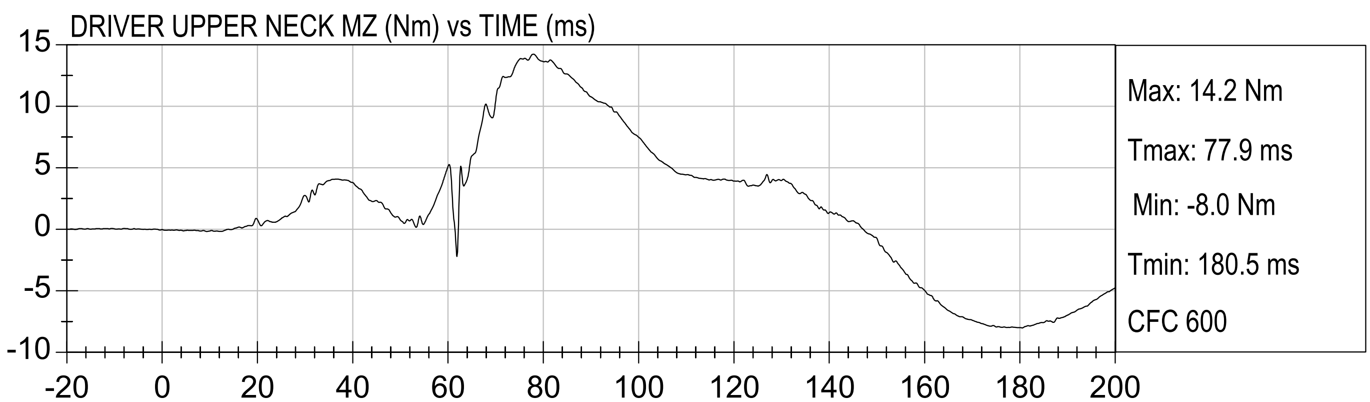


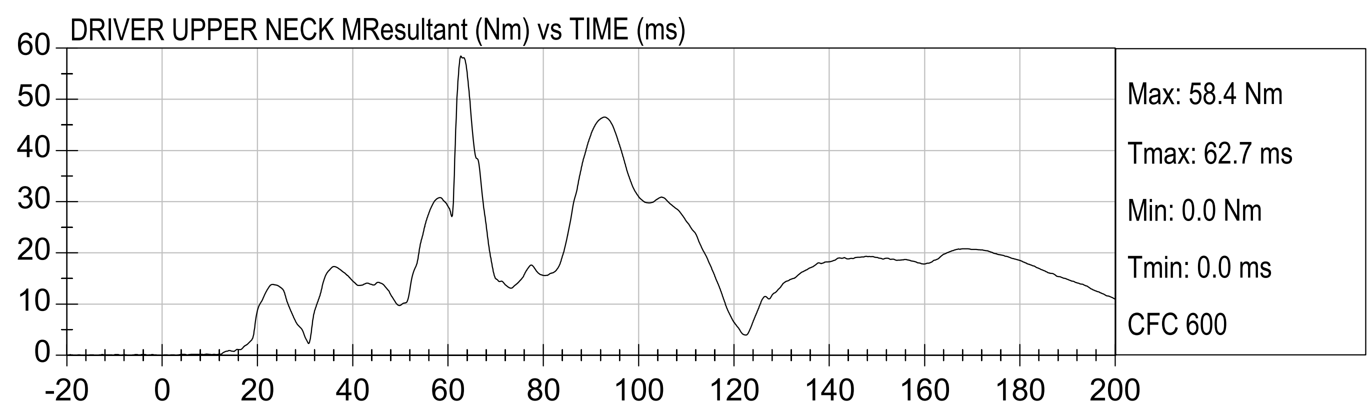





DRIVER UPPER NECK MX (Nm) vs TIME (ms)
Max: 16.9 Nm
Tmax: 36.1 ms
Min: -57.6 Nm
Tmin: 62.7 ms
CFC 600

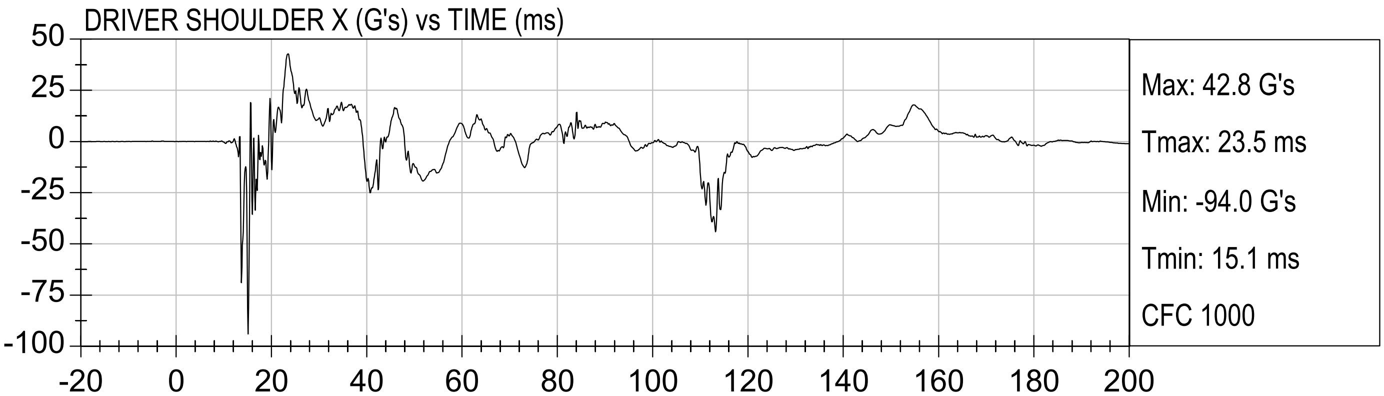

DRIVER UPPER NECK MY (Nm) vs TIME (ms)
Max: 45.4 Nm
Tmax: 92.8 ms
Min: -22.3 Nm
Tmin: 59.6 ms
CFC 600

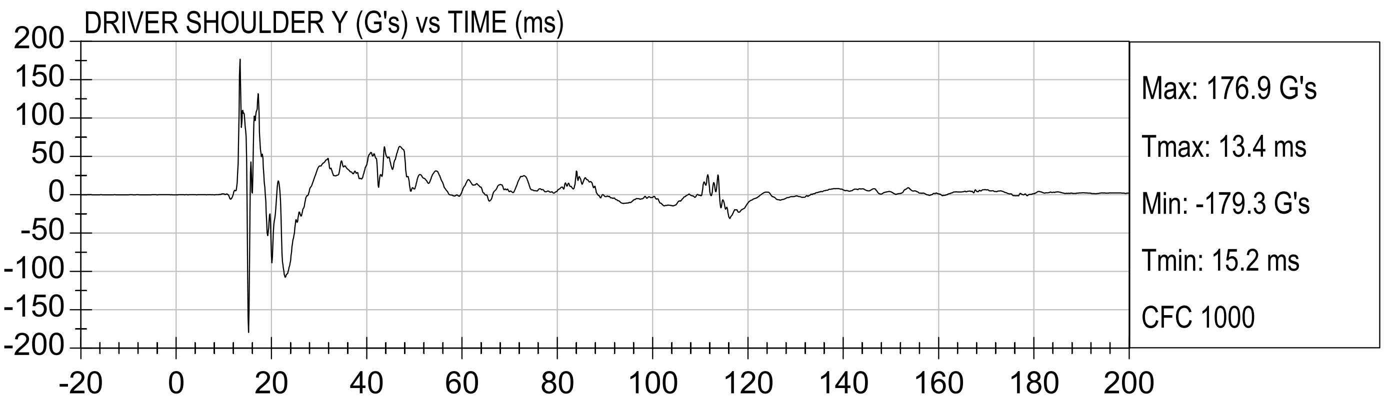

DRIVER UPPER NECK MZ (Nm) vs TIME (ms)
Max: 14.2 Nm
Tmax: 77.9 ms
Min: -8.0 Nm
Tmin: 180.5 ms
CFC 600

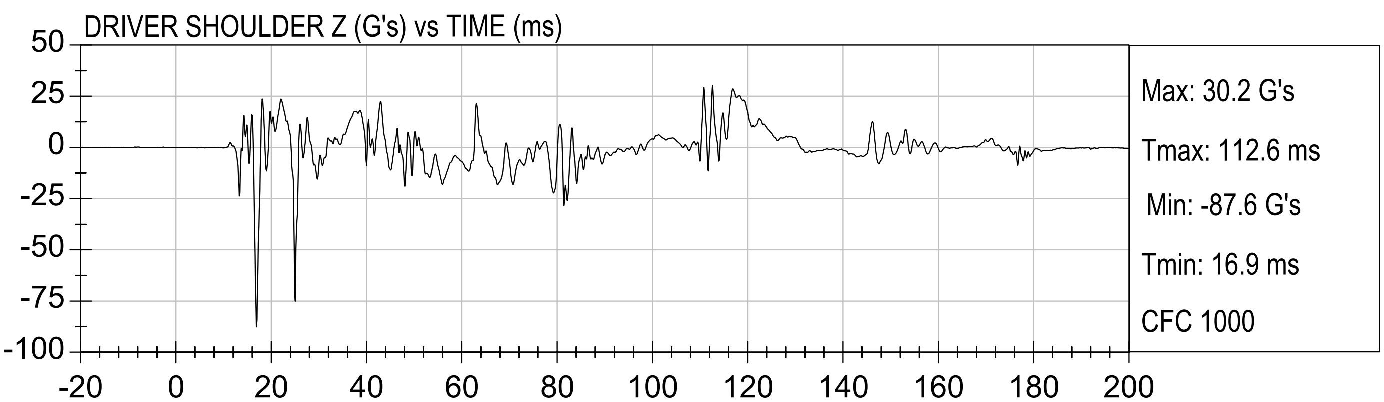

DRIVER UPPER NECK MResultant (Nm) vs TIME (ms)
Max: 58.4 Nm
Tmax: 62.7 ms
Min: 0.0 Nm
Tmin: 0.0 ms
CFC 600

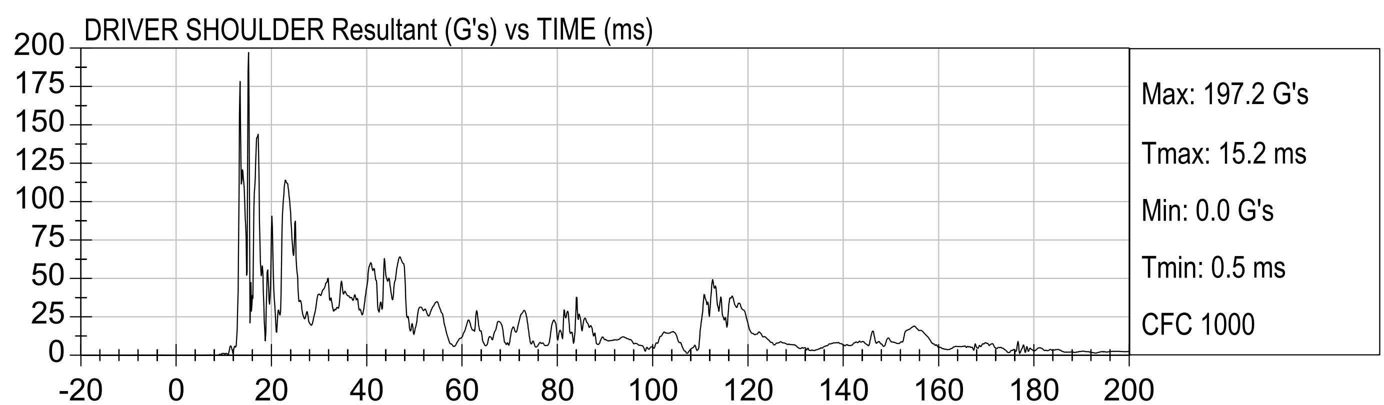
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)

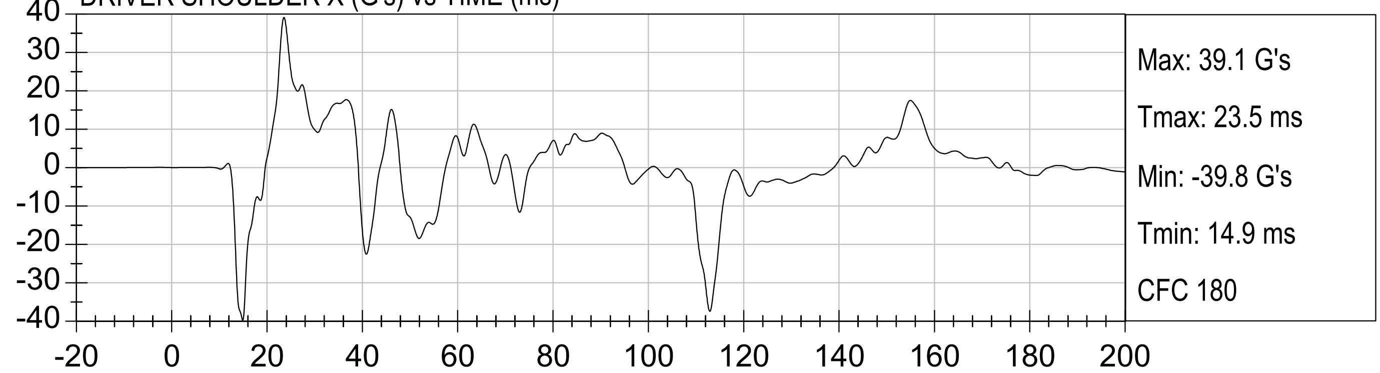




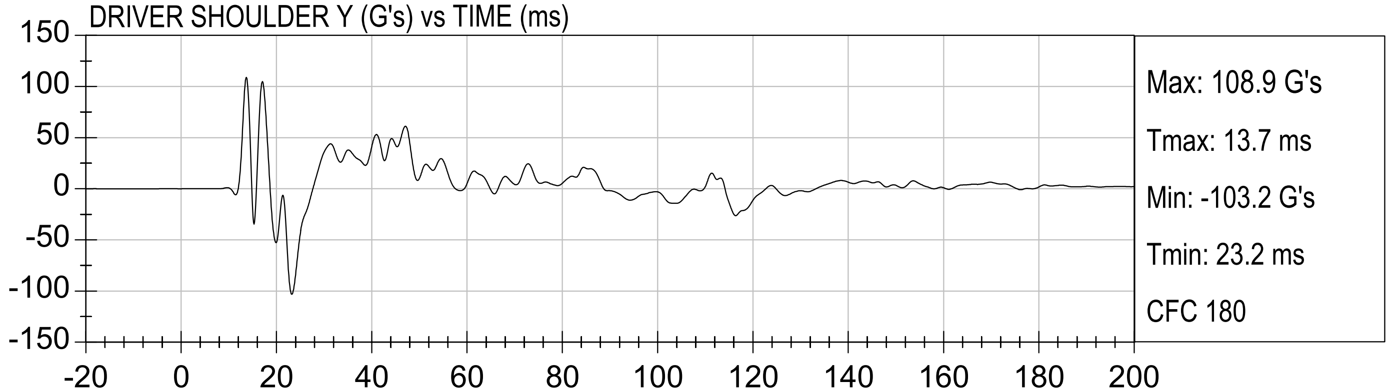




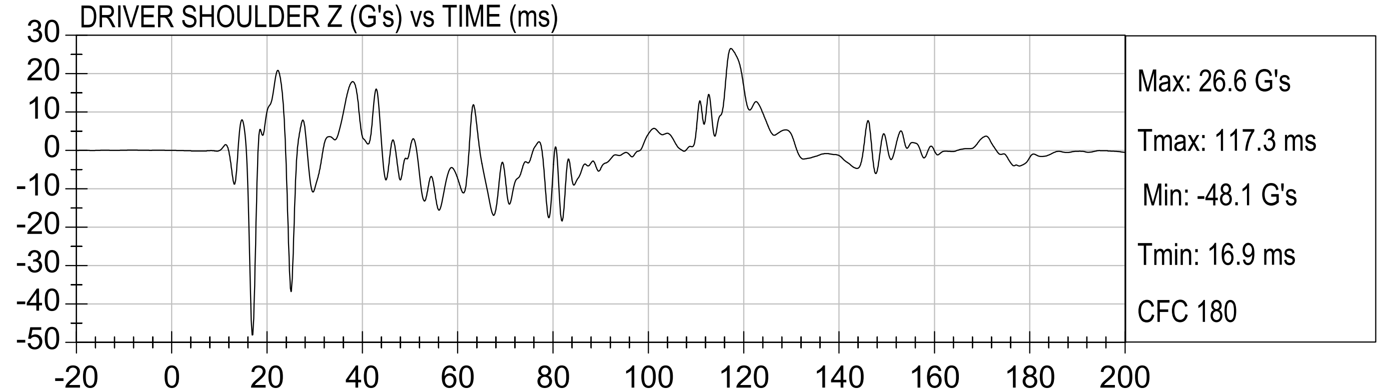
DRIVER SHOULDER X (G's) vs TIME (ms)



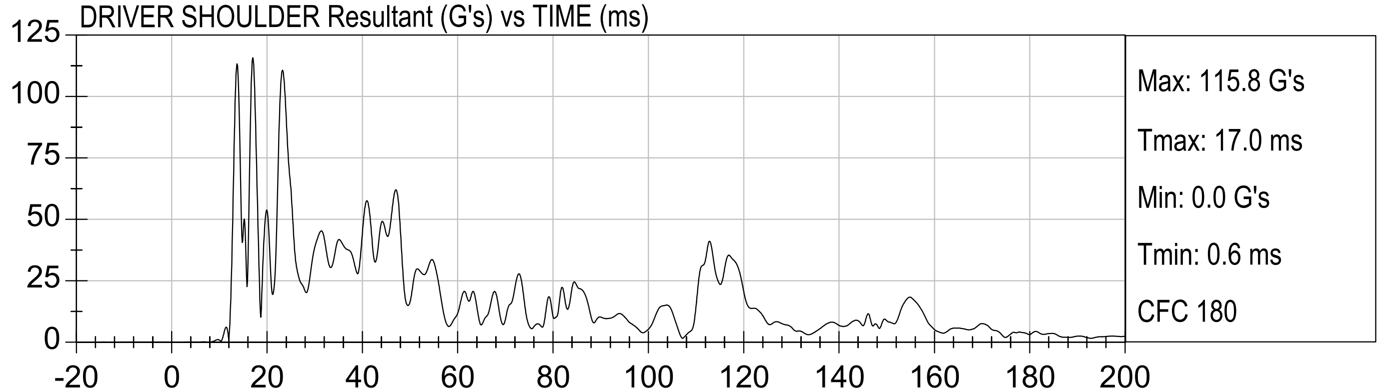
DRIVER SHOULDER Y (G's) vs TIME (ms)

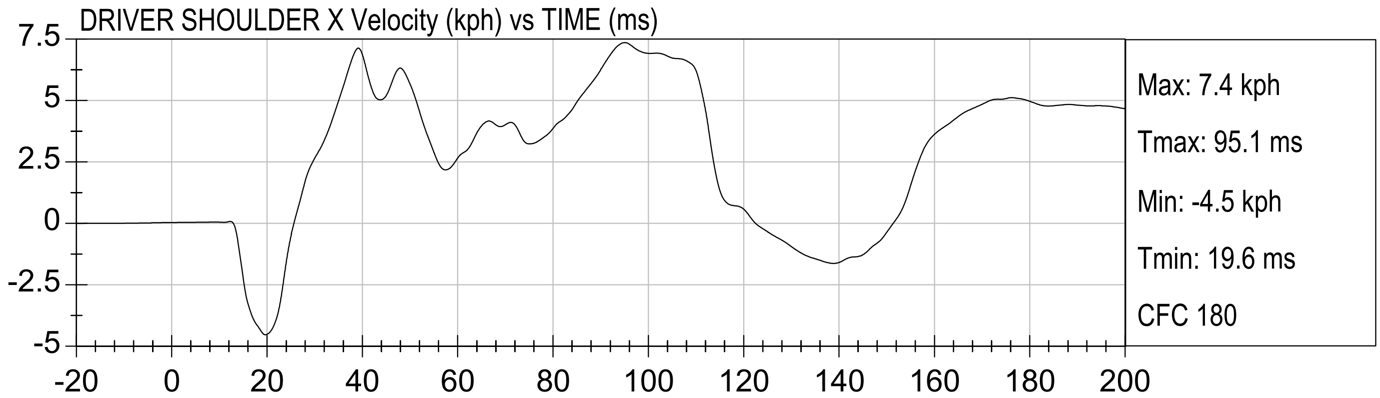


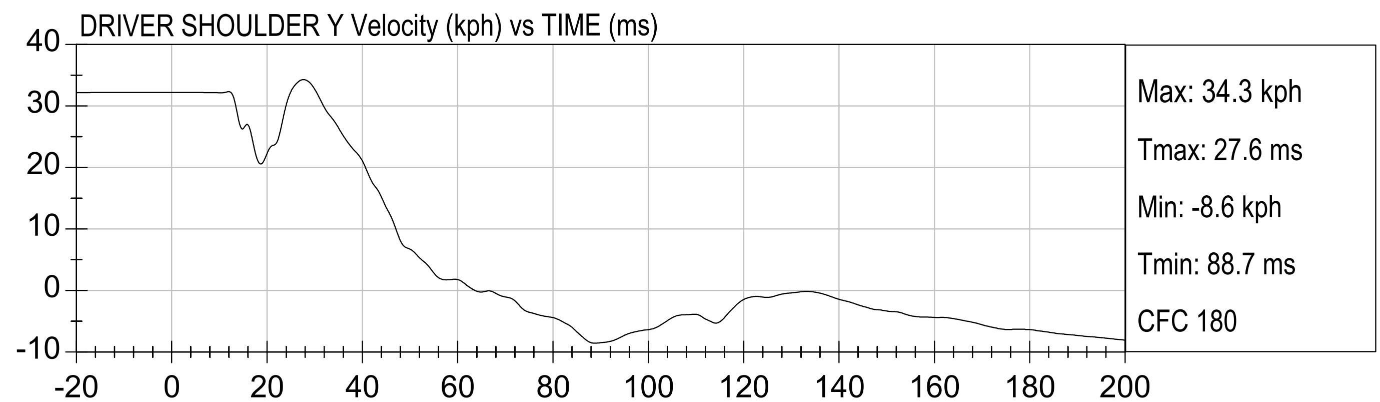
DRIVER SHOULDER Z (G's) vs TIME (ms)

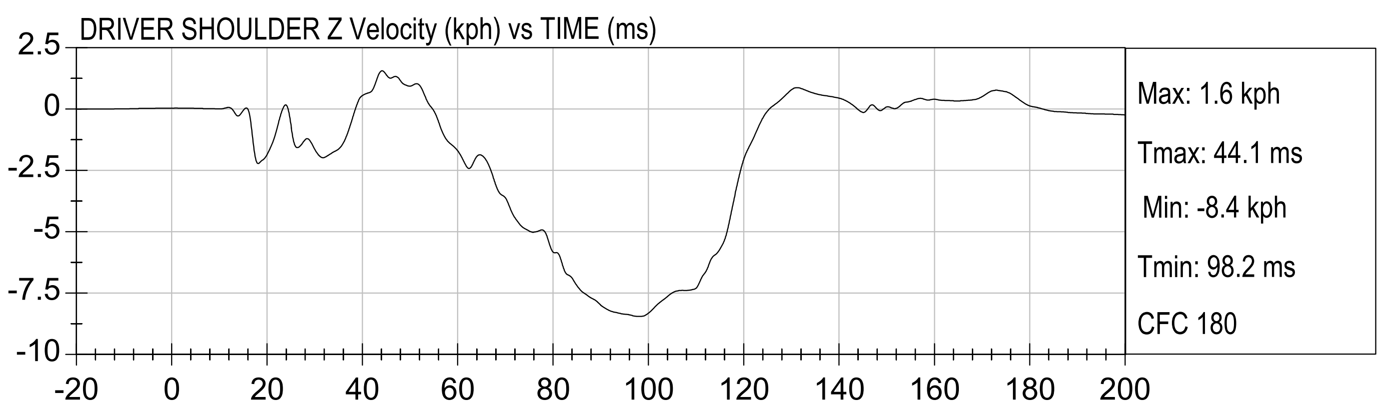


DRIVER SHOULDER Resultant (G's) vs TIME (ms)



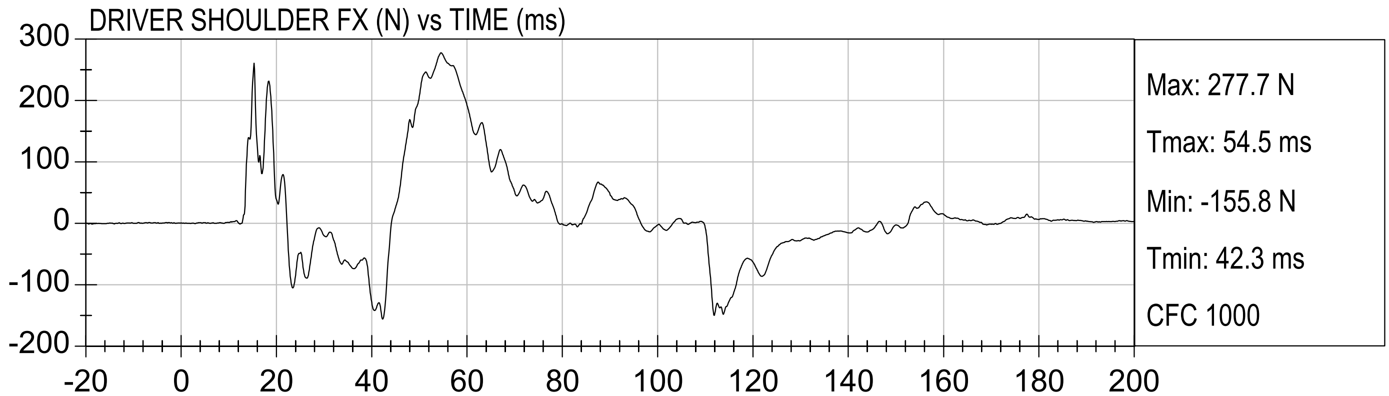

DRIVER SHOULDER X Velocity (kph) vs TIME (ms)
7.5
5
2.5
0
-2.5
-5
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 7.4 kph
Tmax: 95.1 ms
Min: -4.5 kph
Tmin: 19.6 ms
CFC 180

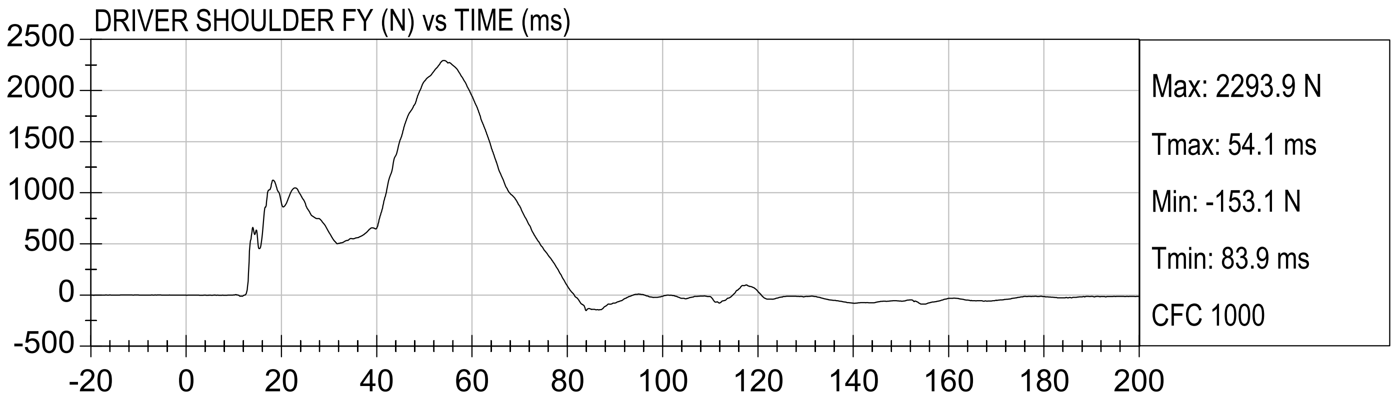

DRIVER SHOULDER Y Velocity (kph) vs TIME (ms)
40
30
20
10
0
-10
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 34.3 kph
Tmax: 27.6 ms
Min: -8.6 kph
Tmin: 88.7 ms
CFC 180

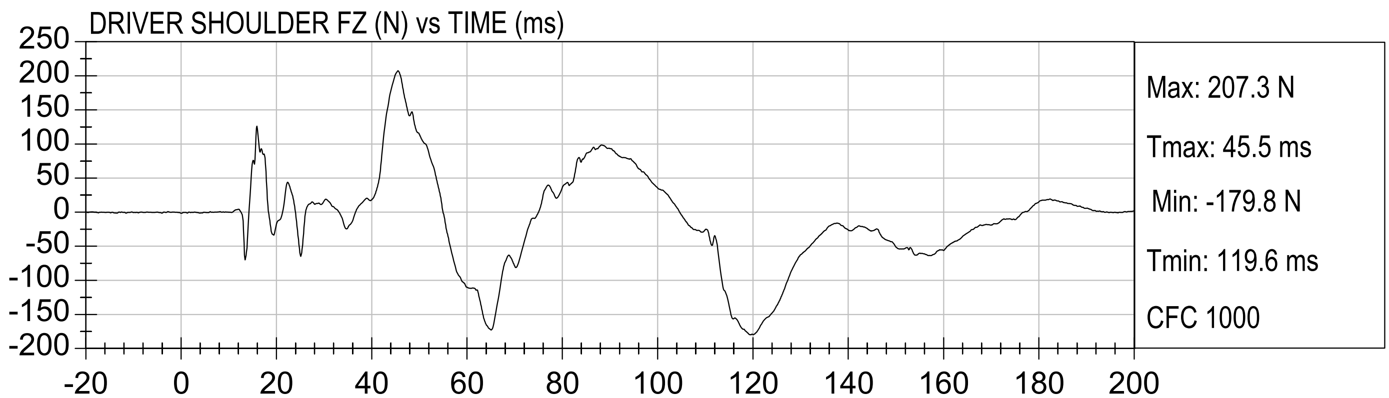

DRIVER SHOULDER Z Velocity (kph) vs TIME (ms)
2.5
0
-2.5
-5
-7.5
-10
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 1.6 kph
Tmax: 44.1 ms
Min: -8.4 kph
Tmin: 98.2 ms
CFC 180

OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)

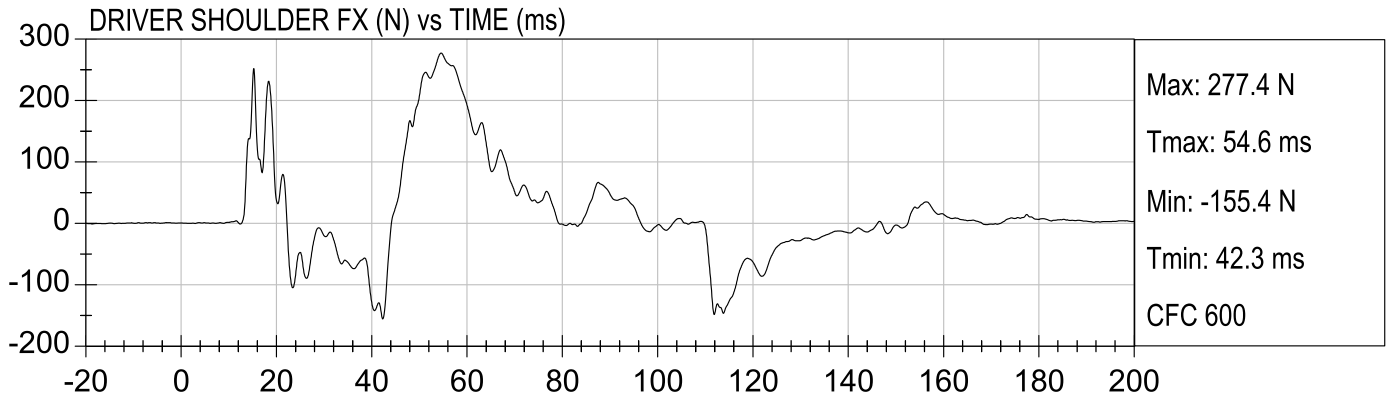


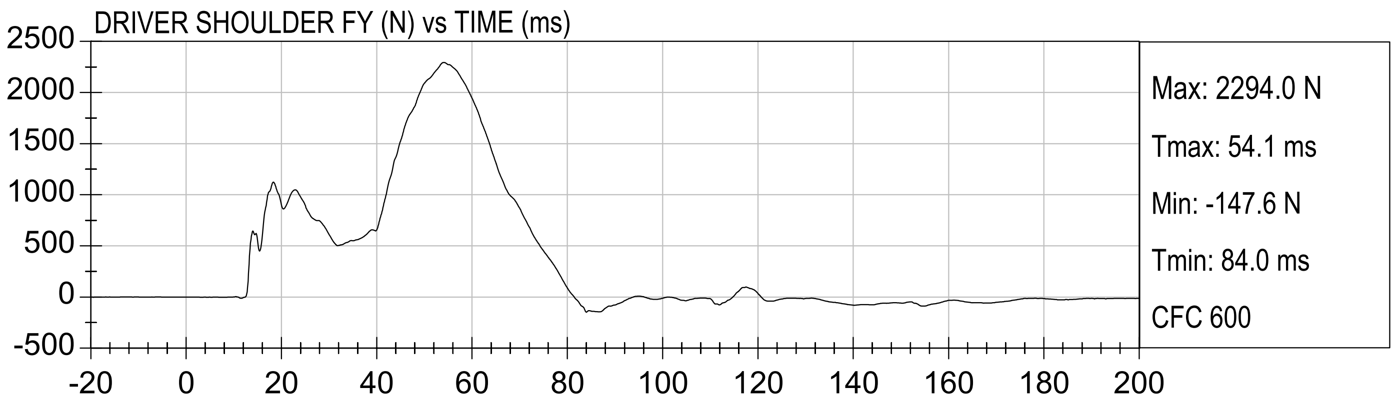


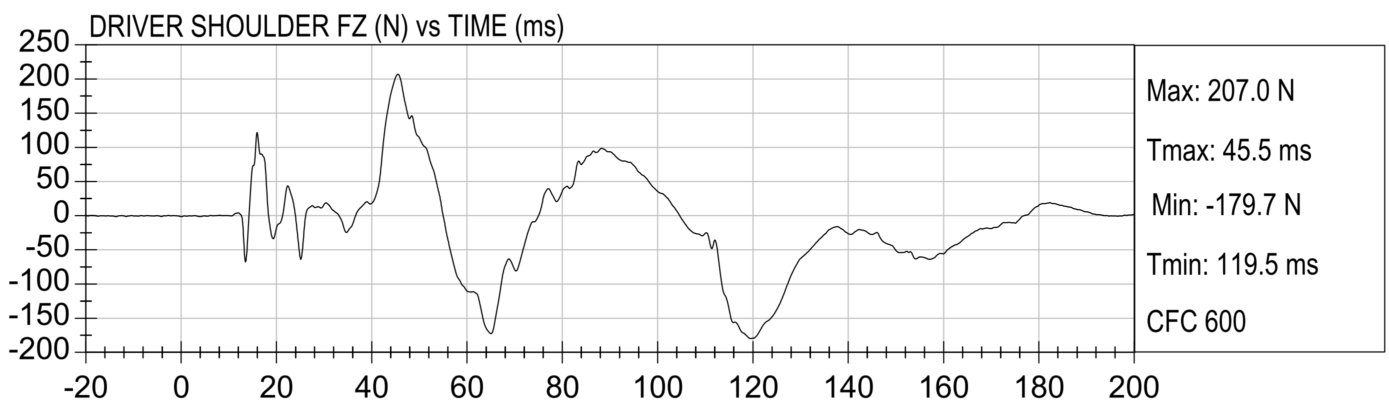


OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)



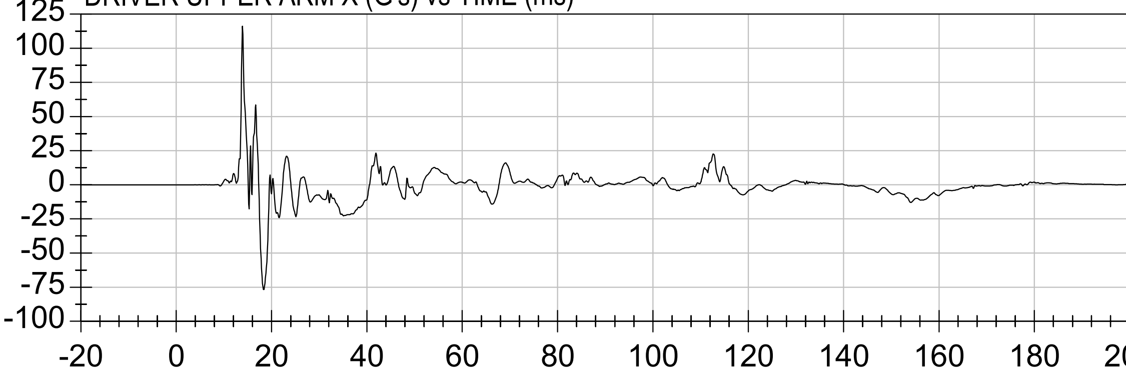




OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

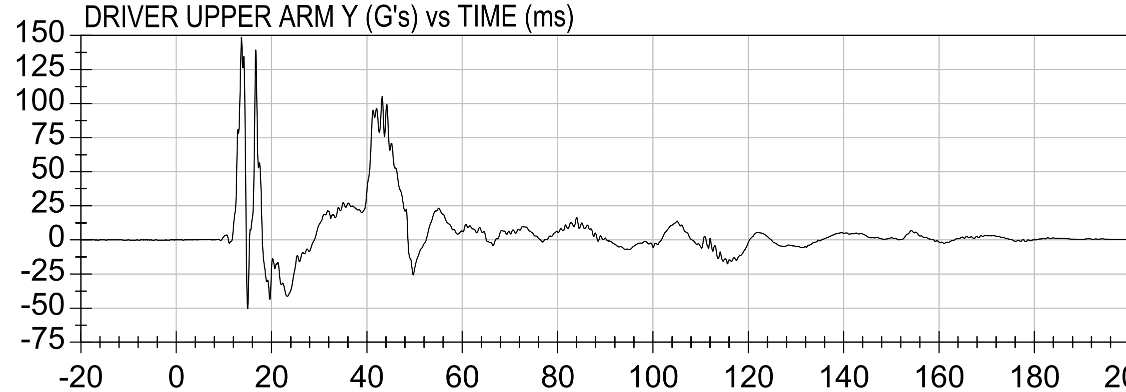
Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)

DRIVER UPPER ARM X (G's) vs TIME (ms)



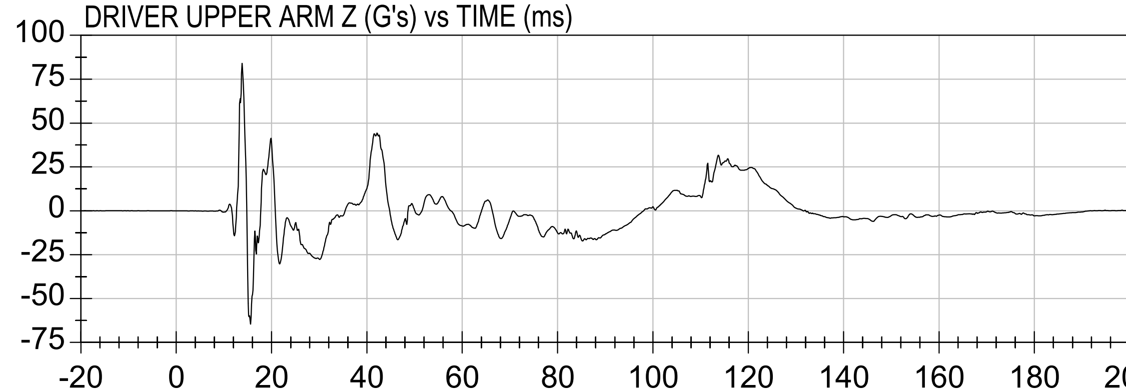
Max: 116.3 G's
Tmax: 13.9 ms
Min: -76.7 G's
Tmin: 18.4 ms
CFC 1000

DRIVER UPPER ARM Y (G's) vs TIME (ms)



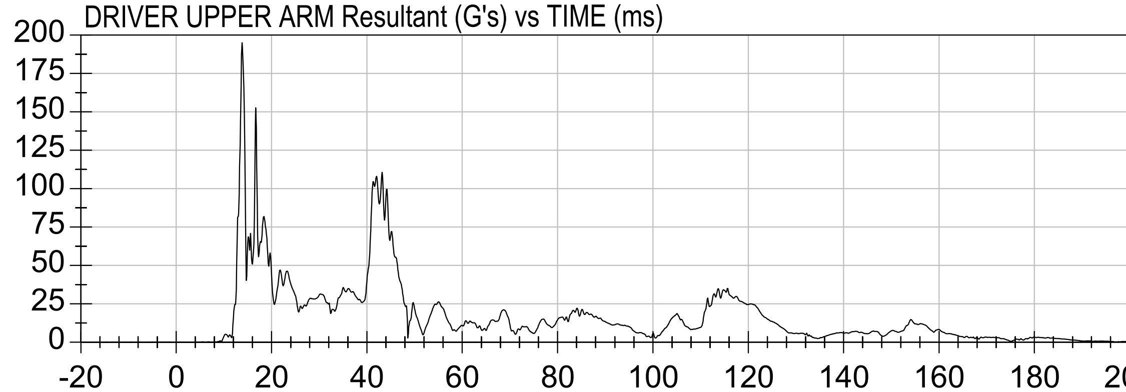
Max: 148.7 G's
Tmax: 13.7 ms
Min: -50.5 G's
Tmin: 15.0 ms
CFC 1000

DRIVER UPPER ARM Z (G's) vs TIME (ms)



Max: 83.9 G's
Tmax: 13.8 ms
Min: -64.5 G's
Tmin: 15.6 ms
CFC 1000

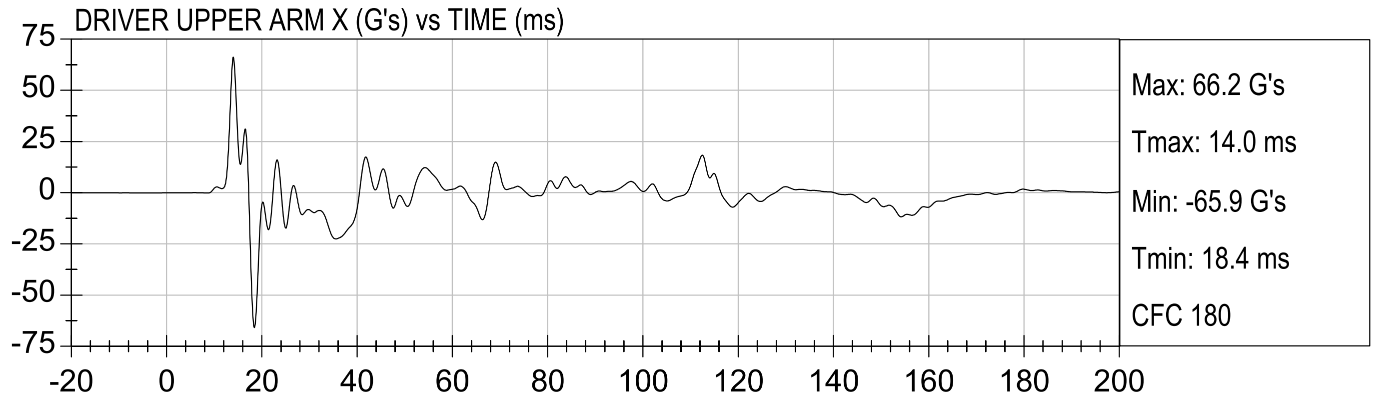
DRIVER UPPER ARM Resultant (G's) vs TIME (ms)

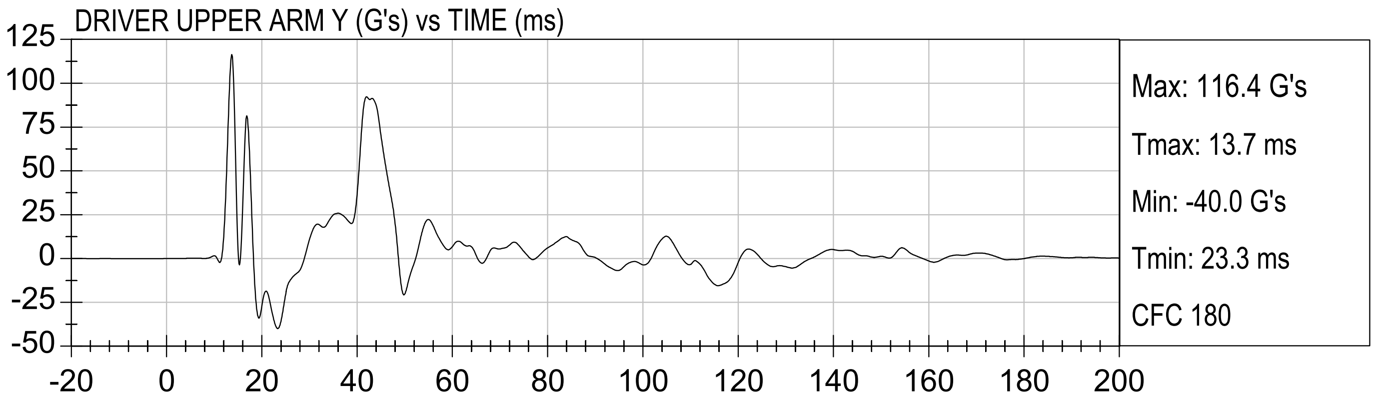


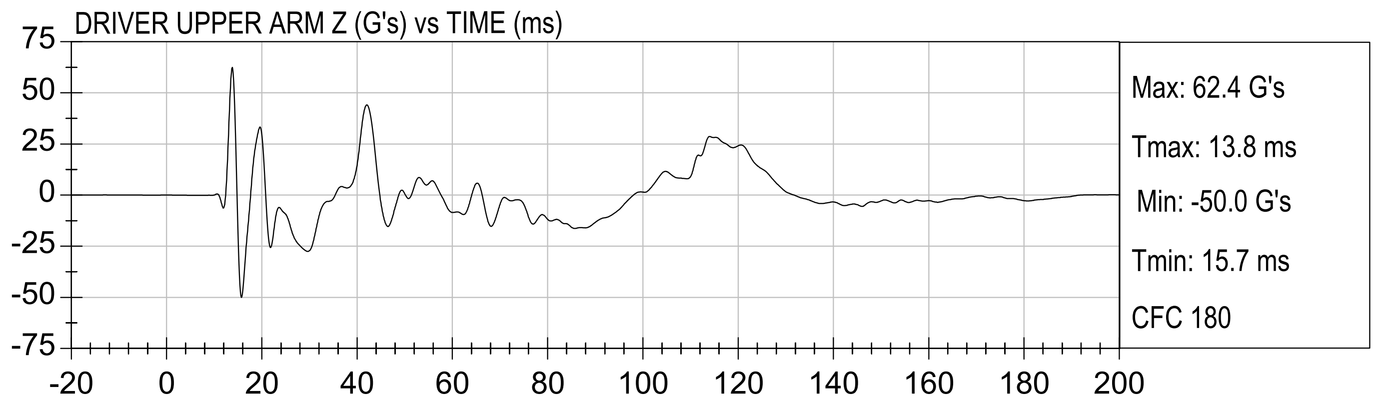
Max: 195.1 G's
Tmax: 13.8 ms
Min: 0.0 G's
Tmin: 1.8 ms
CFC 1000

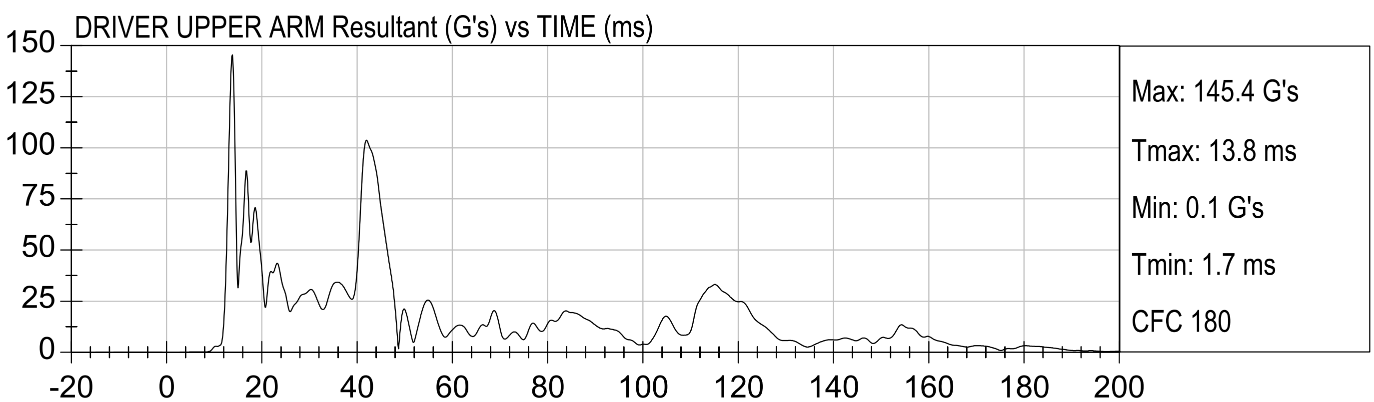
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

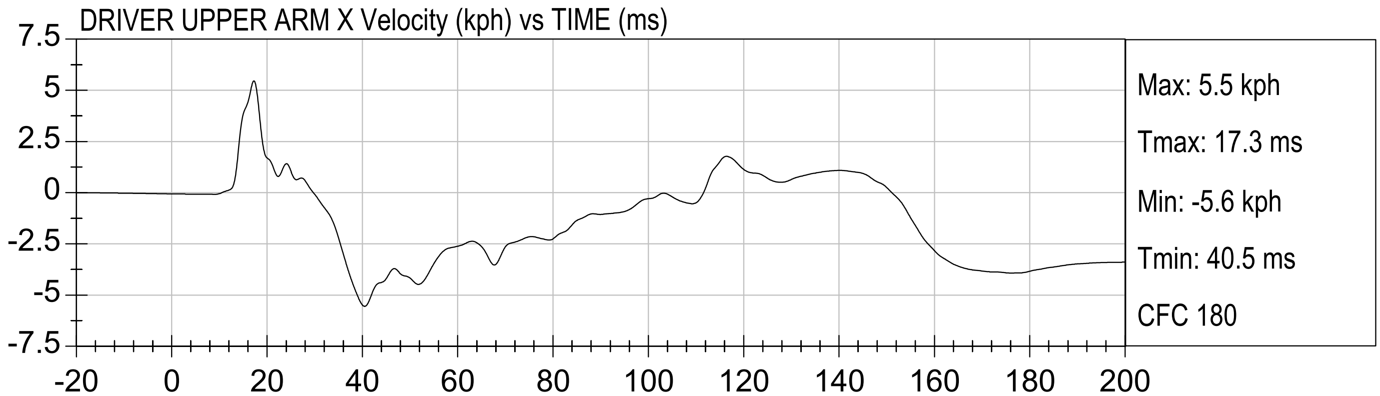
Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)

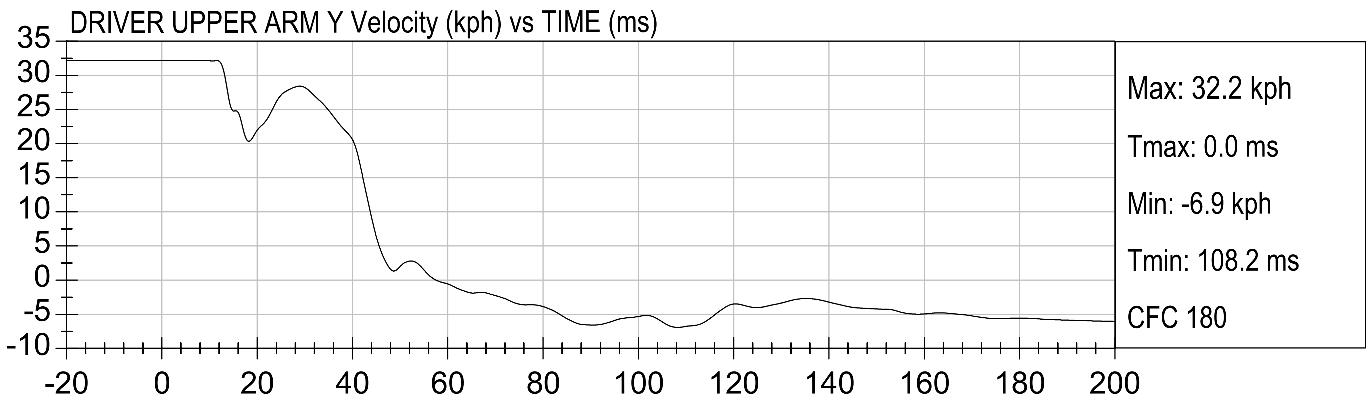


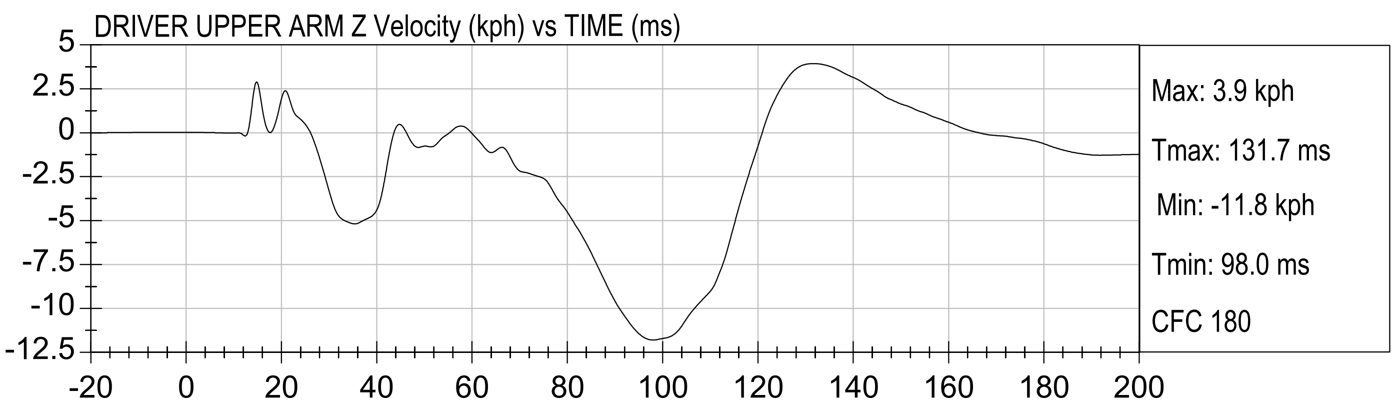


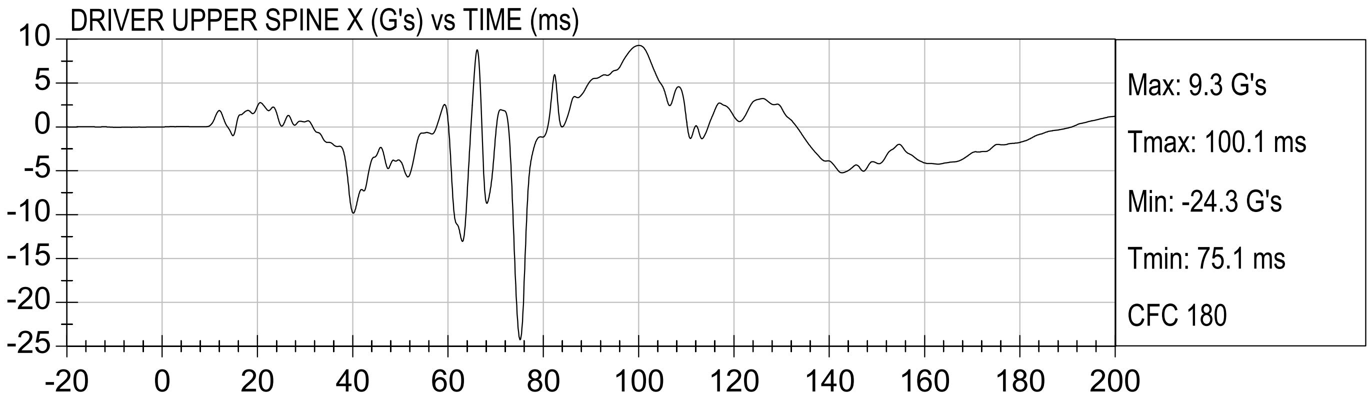


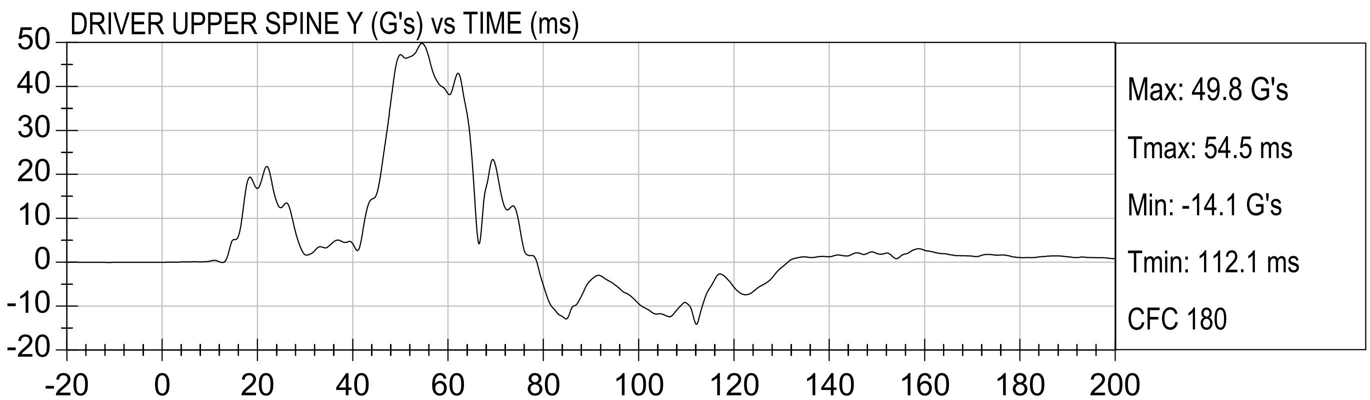


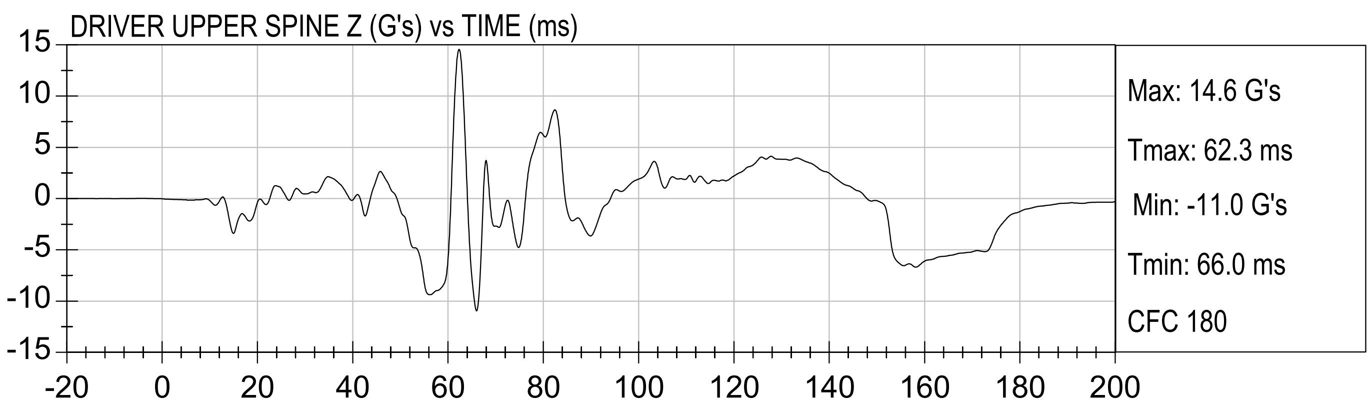

DRIVER UPPER ARM X Velocity (kph) vs TIME (ms)
Max: 5.5 kph
Tmax: 17.3 ms
Min: -5.6 kph
Tmin: 40.5 ms
CFC 180

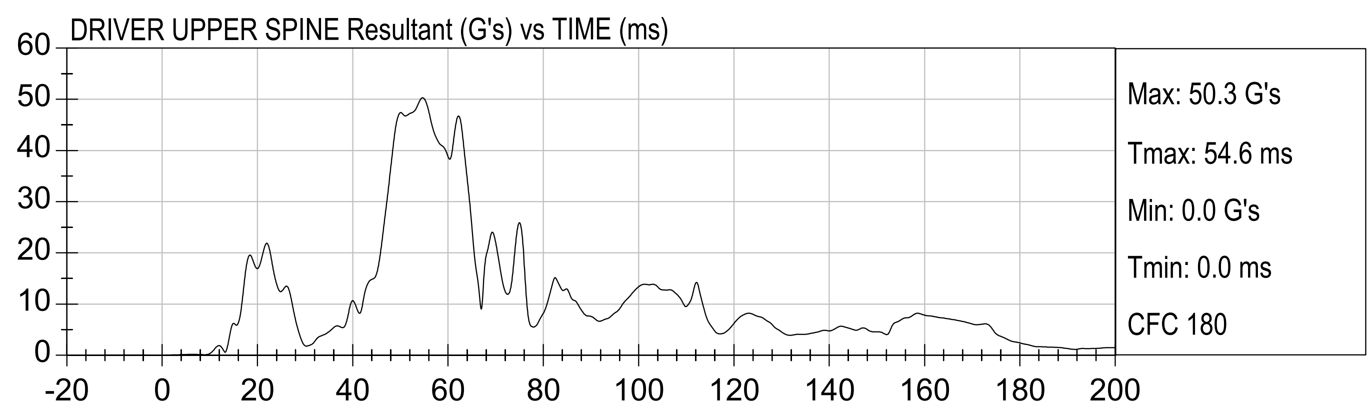

DRIVER UPPER ARM Y Velocity (kph) vs TIME (ms)
Max: 32.2 kph
Tmax: 0.0 ms
Min: -6.9 kph
Tmin: 108.2 ms
CFC 180

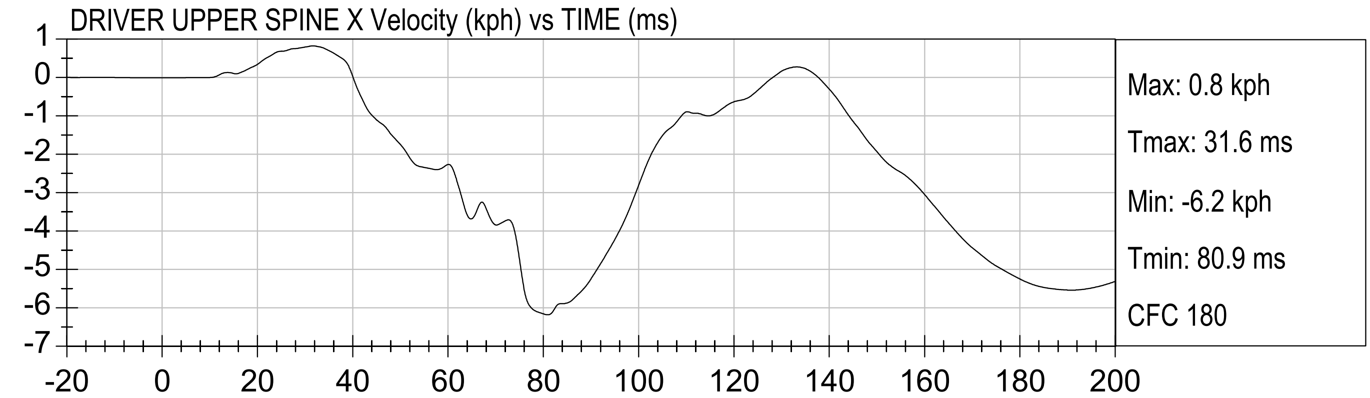

DRIVER UPPER ARM Z Velocity (kph) vs TIME (ms)
Max: 3.9 kph
Tmax: 131.7 ms
Min: -11.8 kph
Tmin: 98.0 ms
CFC 180

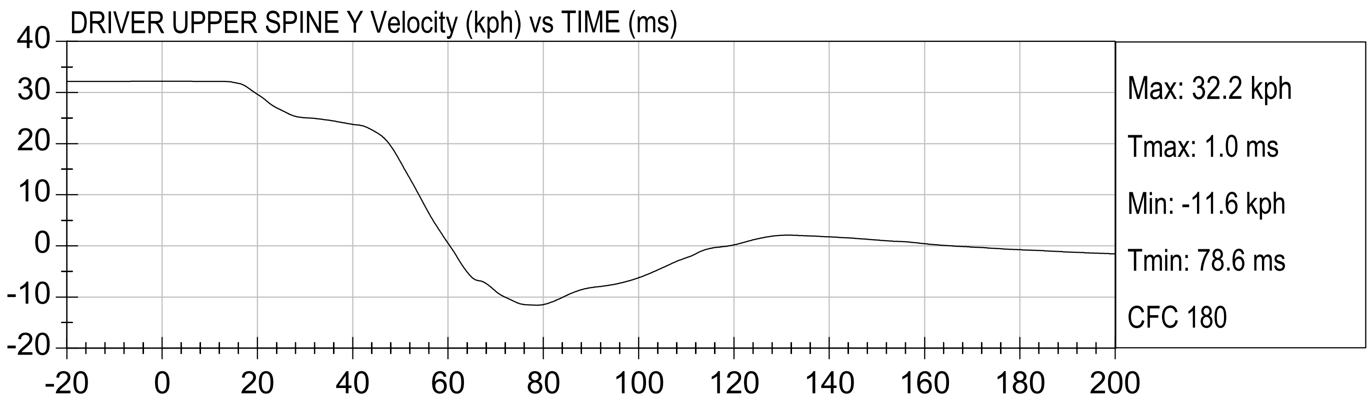

DRIVER UPPER SPINE X (G's) vs TIME (ms)
Max: 9.3 G's
Tmax: 100.1 ms
Min: -24.3 G's
Tmin: 75.1 ms
CFC 180

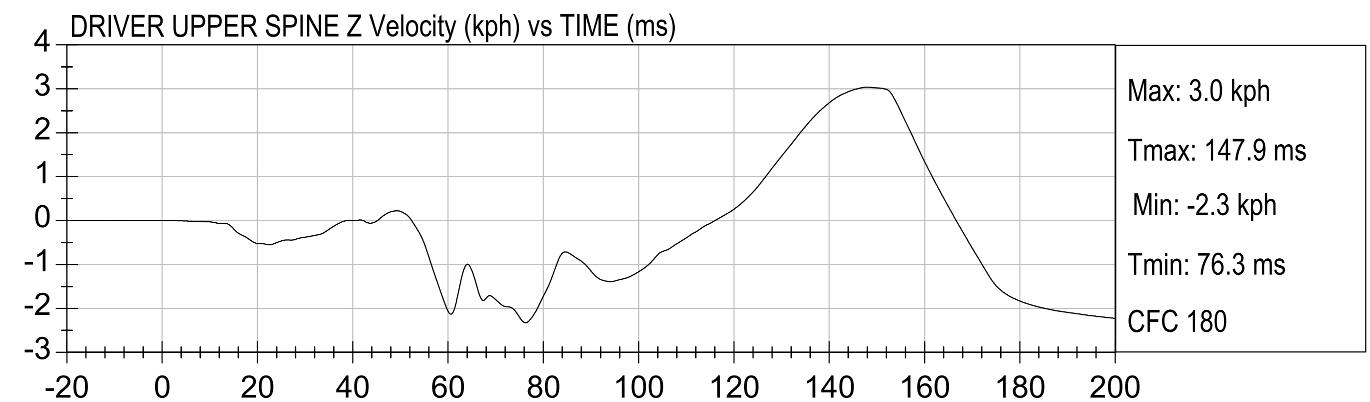

DRIVER UPPER SPINE Y (G's) vs TIME (ms)
Max: 49.8 G's
Tmax: 54.5 ms
Min: -14.1 G's
Tmin: 112.1 ms
CFC 180


DRIVER UPPER SPINE Z (G's) vs TIME (ms)
Max: 14.6 G's
Tmax: 62.3 ms
Min: -11.0 G's
Tmin: 66.0 ms
CFC 180


DRIVER UPPER SPINE Resultant (G's) vs TIME (ms)
Max: 50.3 G's
Tmax: 54.6 ms
Min: 0.0 G's
Tmin: 0.0 ms
CFC 180

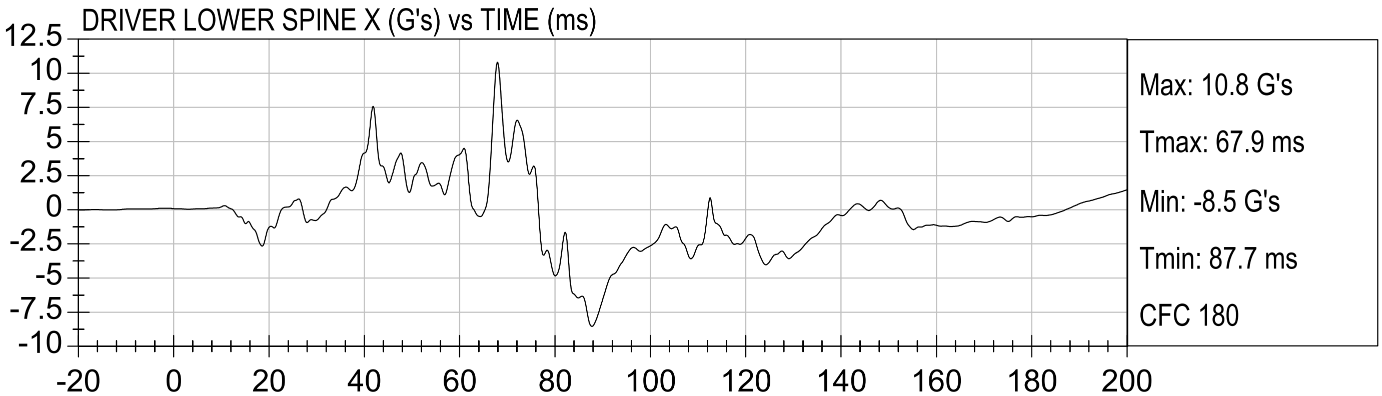

DRIVER UPPER SPINE X Velocity (kph) vs TIME (ms)
1
0
-1
-2
-3
-4
-5
-6
-7
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 0.8 kph
Tmax: 31.6 ms
Min: -6.2 kph
Tmin: 80.9 ms
CFC 180

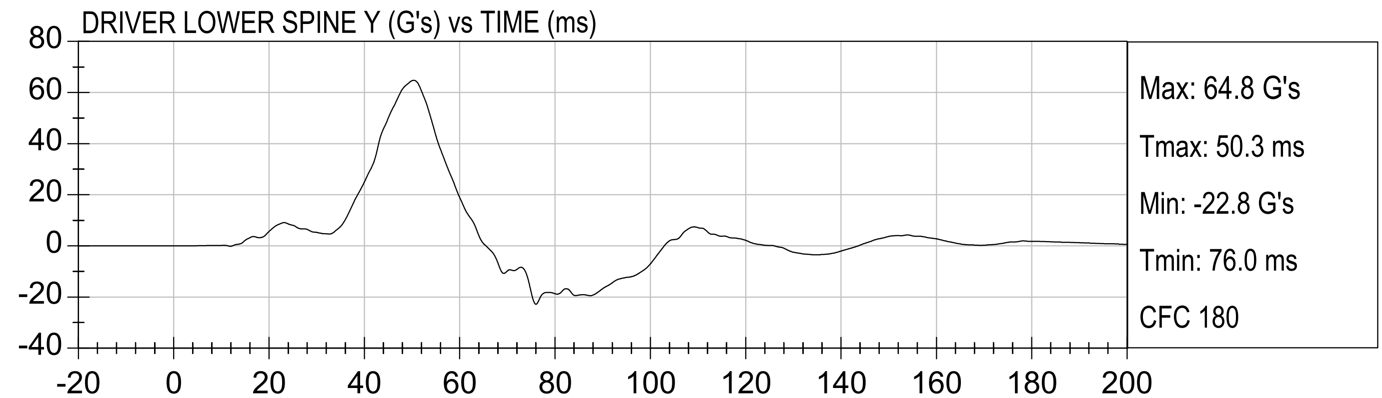

DRIVER UPPER SPINE Y Velocity (kph) vs TIME (ms)
40
30
20
10
0
-10
-20
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 32.2 kph
Tmax: 1.0 ms
Min: -11.6 kph
Tmin: 78.6 ms
CFC 180

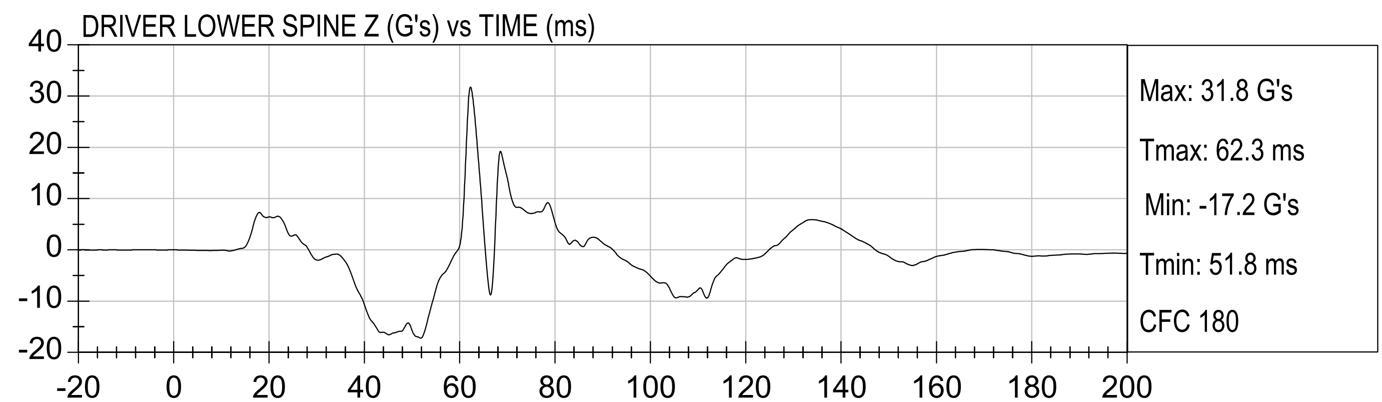

DRIVER UPPER SPINE Z Velocity (kph) vs TIME (ms)
4
3
2
1
0
-1
-2
-3
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 3.0 kph
Tmax: 147.9 ms
Min: -2.3 kph
Tmin: 76.3 ms
CFC 180

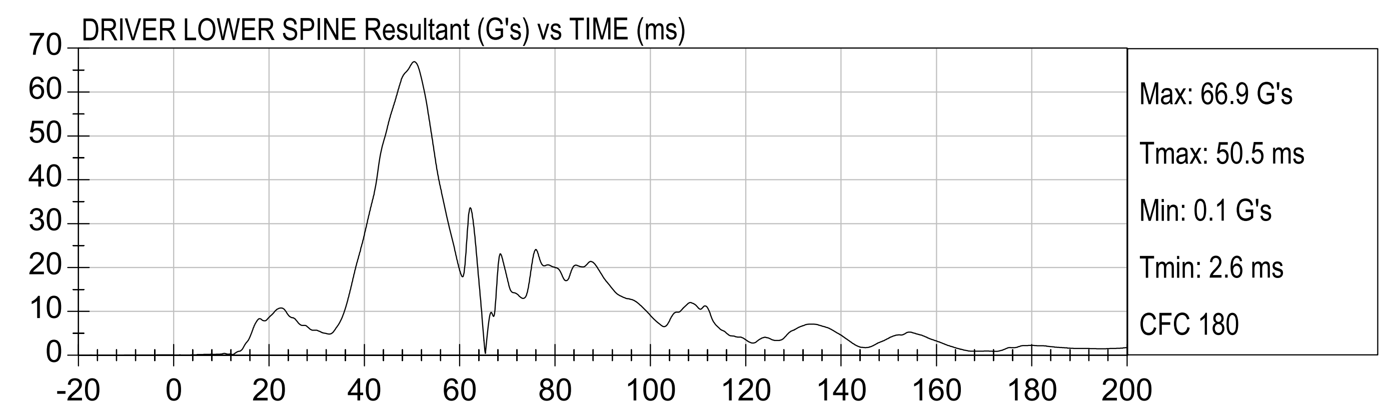
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)



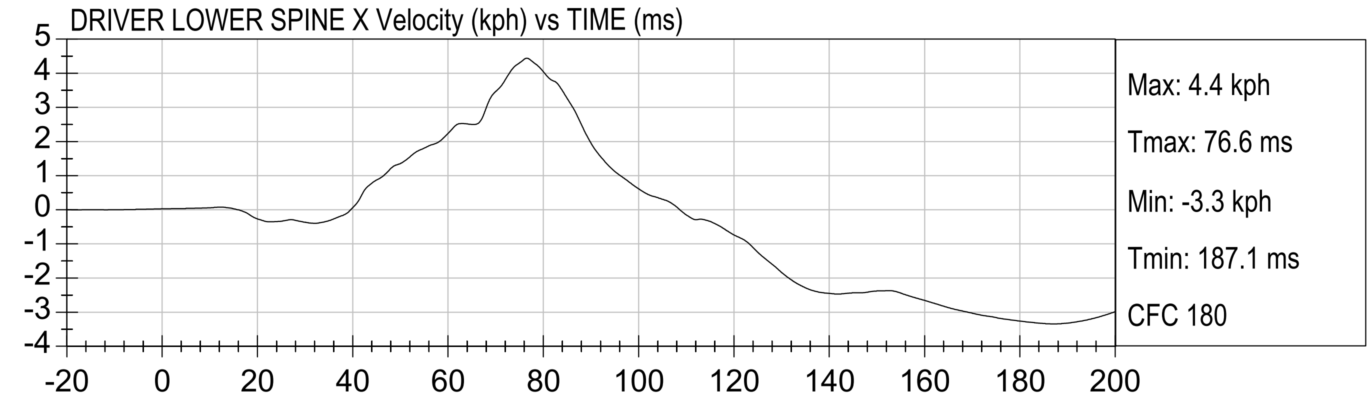


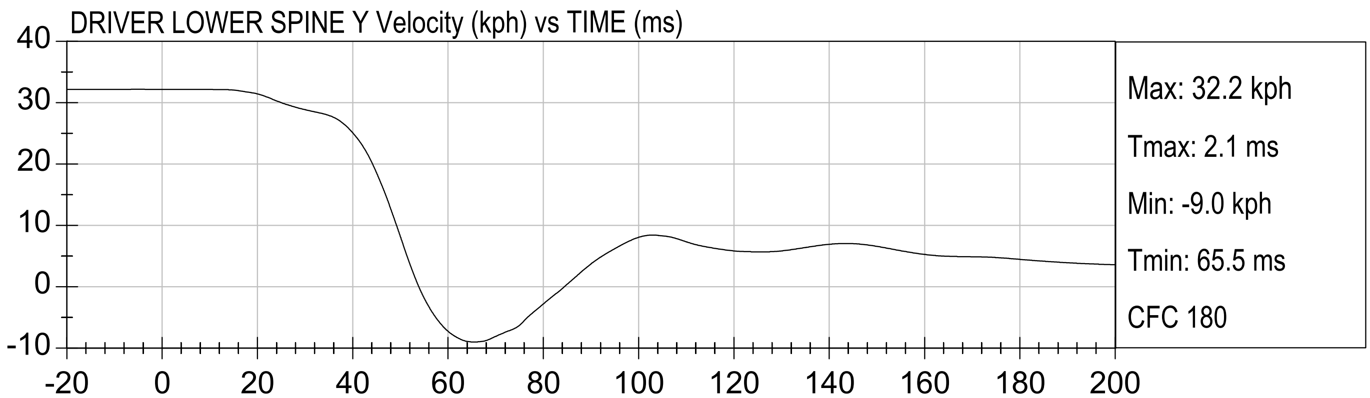


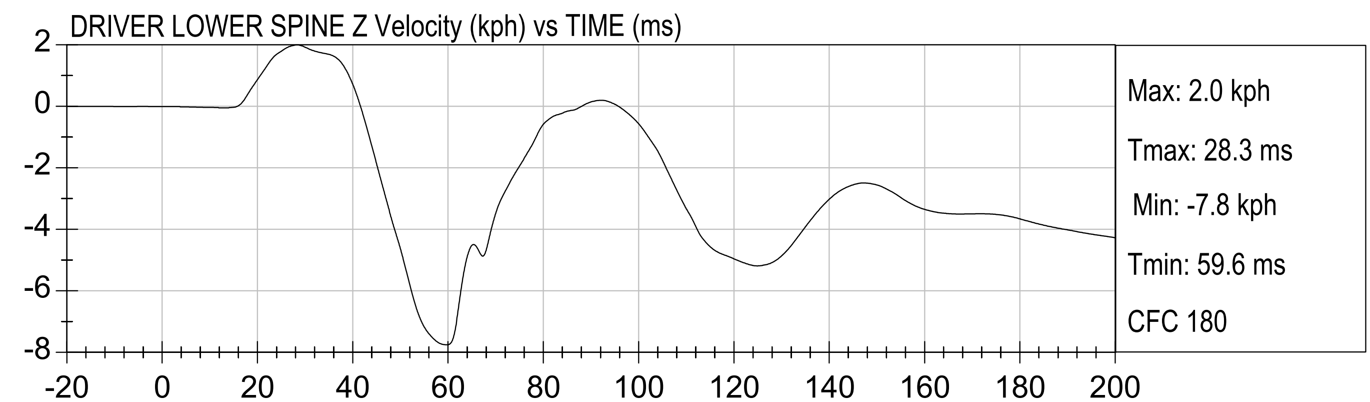


OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

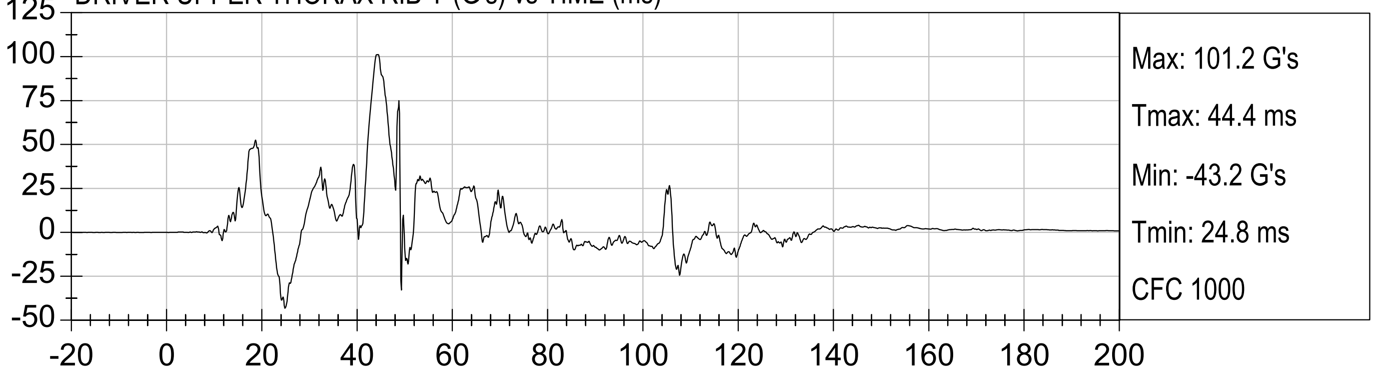
Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)



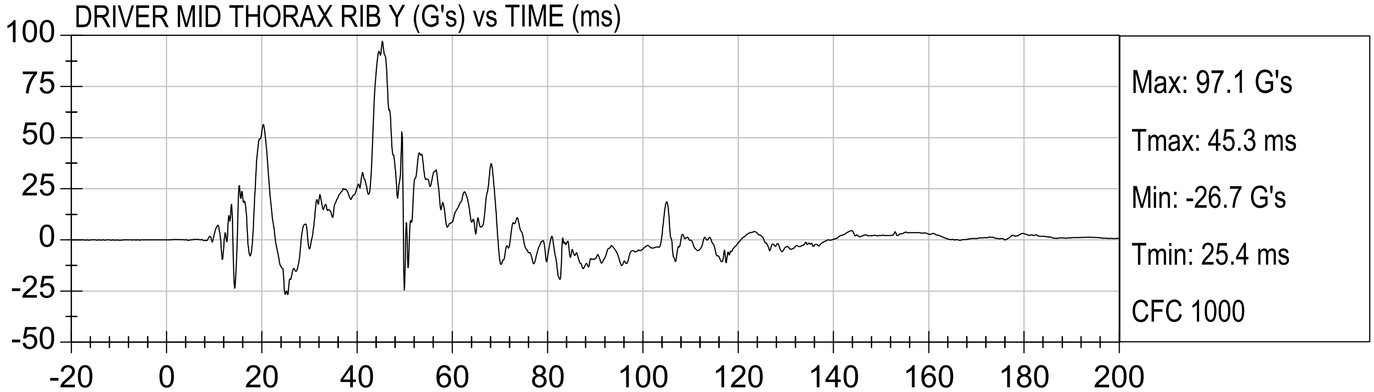




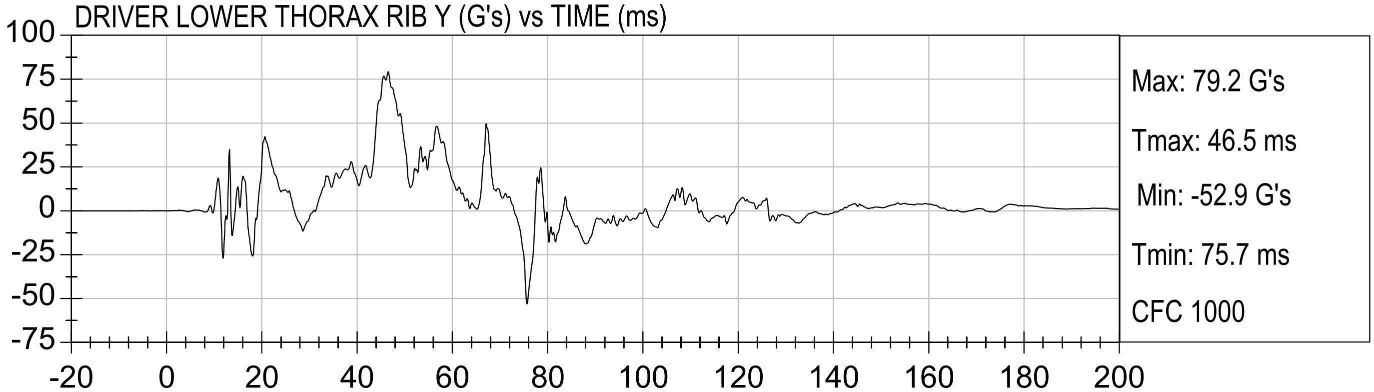
DRIVER UPPER THORAX RIB Y (G's) vs TIME (ms)

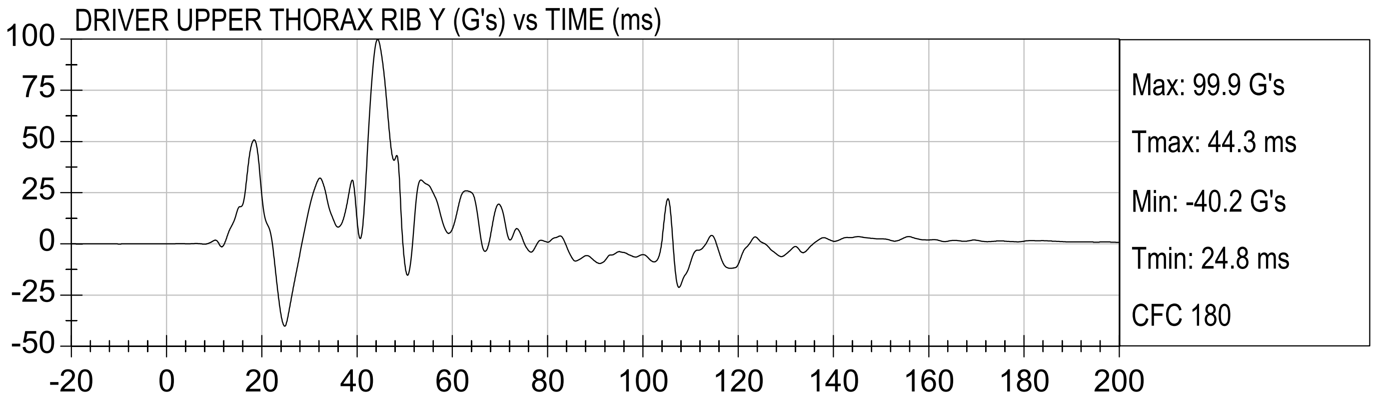


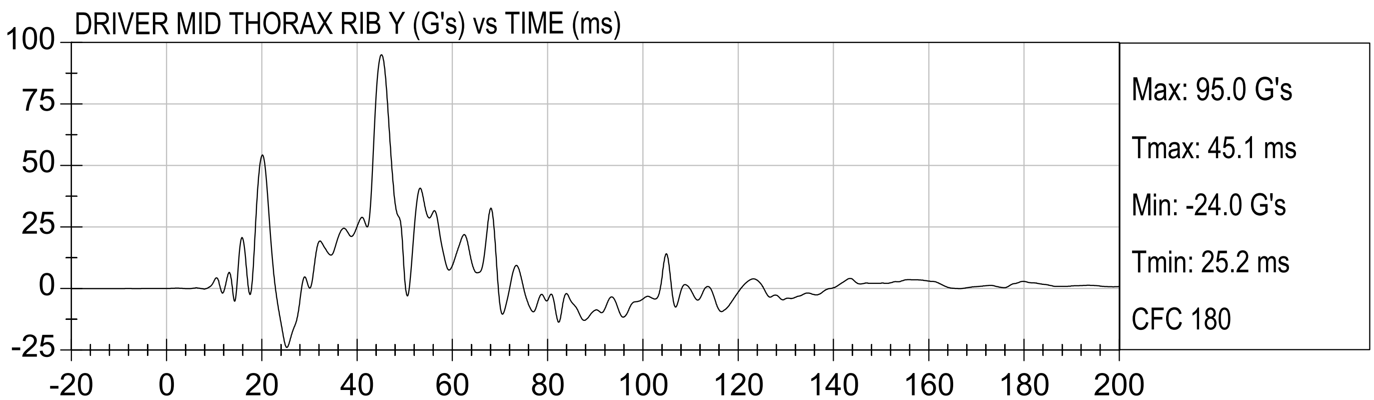
DRIVER MID THORAX RIB Y (G's) vs TIME (ms)

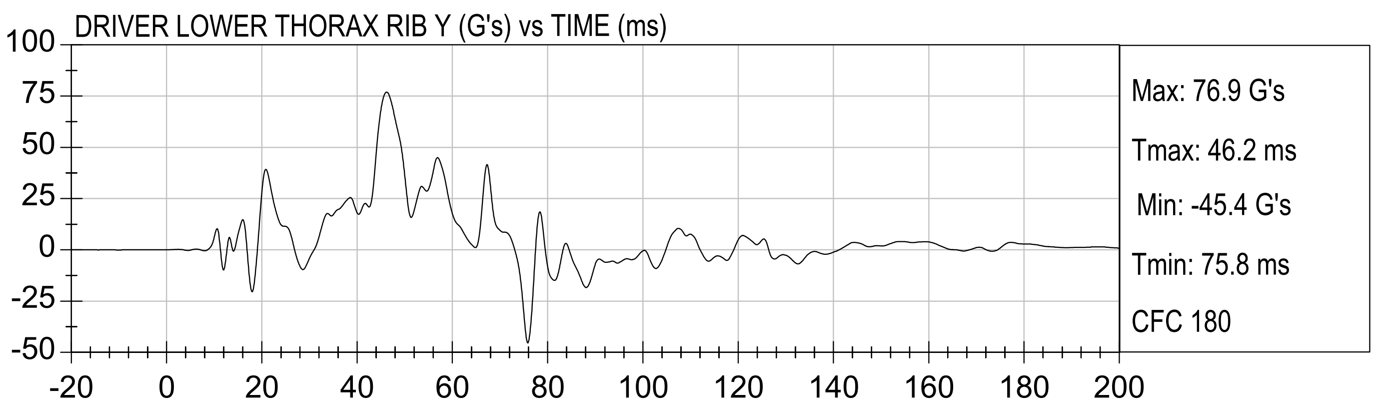


DRIVER LOWER THORAX RIB Y (G's) vs TIME (ms)

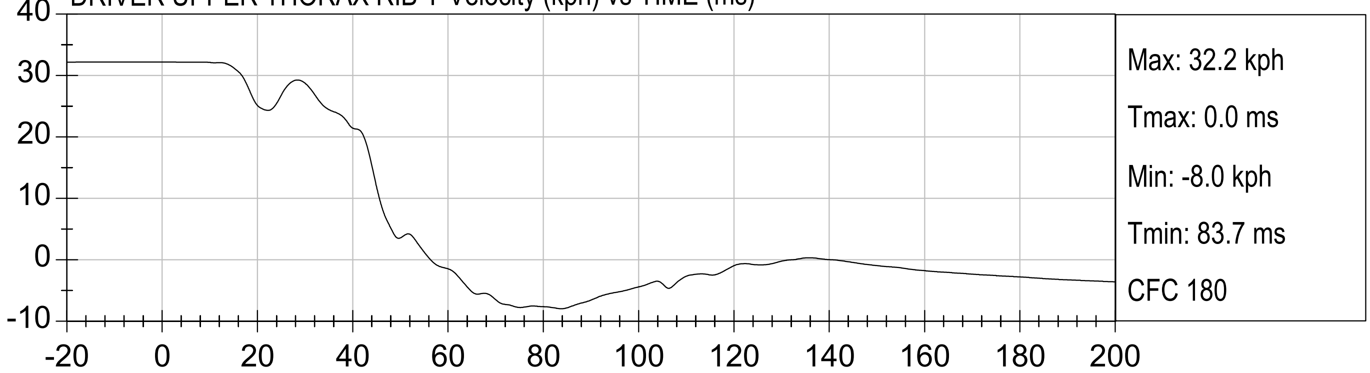



DRIVER UPPER THORAX RIB Y (G's) vs TIME (ms)
Max: 99.9 G's
Tmax: 44.3 ms
Min: -40.2 G's
Tmin: 24.8 ms
CFC 180

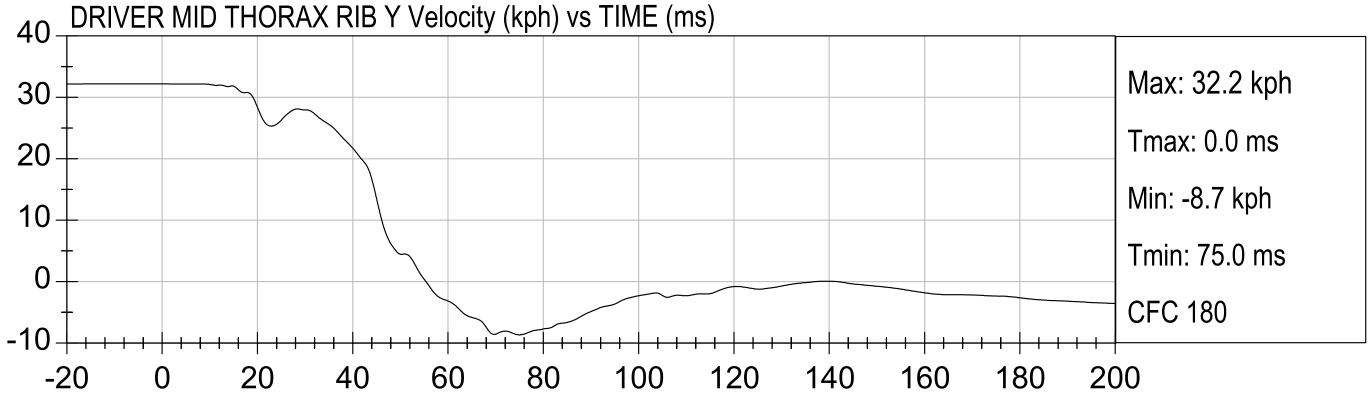

DRIVER MID THORAX RIB Y (G's) vs TIME (ms)
Max: 95.0 G's
Tmax: 45.1 ms
Min: -24.0 G's
Tmin: 25.2 ms
CFC 180


DRIVER LOWER THORAX RIB Y (G's) vs TIME (ms)
Max: 76.9 G's
Tmax: 46.2 ms
Min: -45.4 G's
Tmin: 75.8 ms
CFC 180

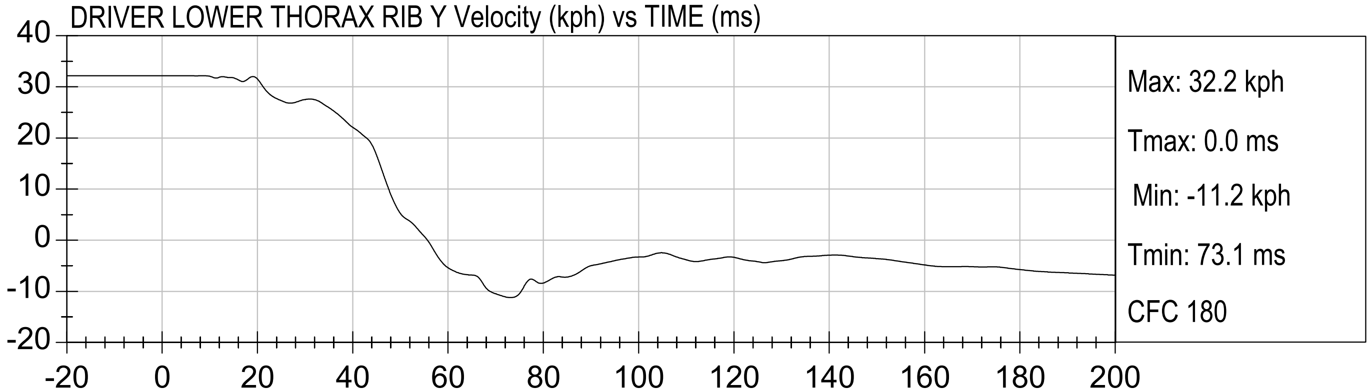
DRIVER UPPER THORAX RIB Y Velocity (kph) vs TIME (ms)



DRIVER MID THORAX RIB Y Velocity (kph) vs TIME (ms)



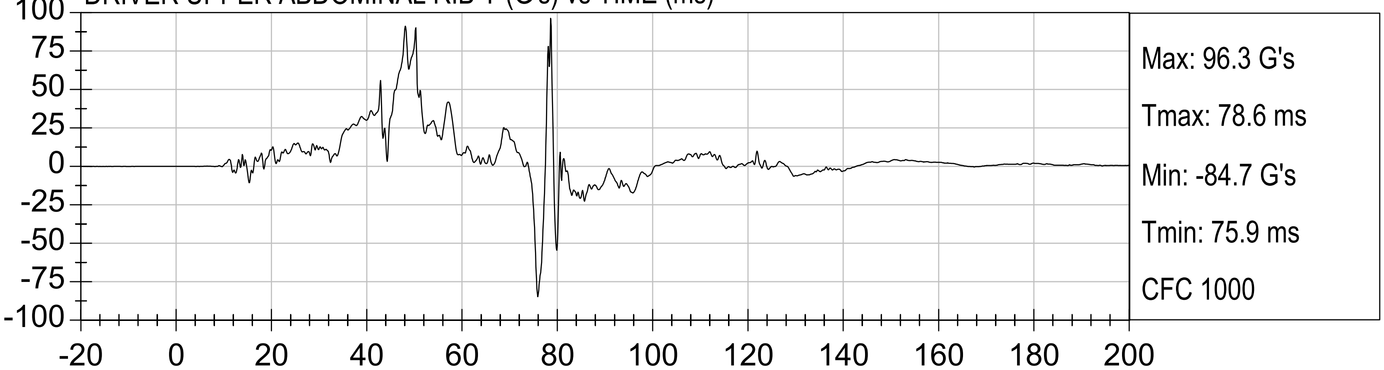
DRIVER LOWER THORAX RIB Y Velocity (kph) vs TIME (ms)



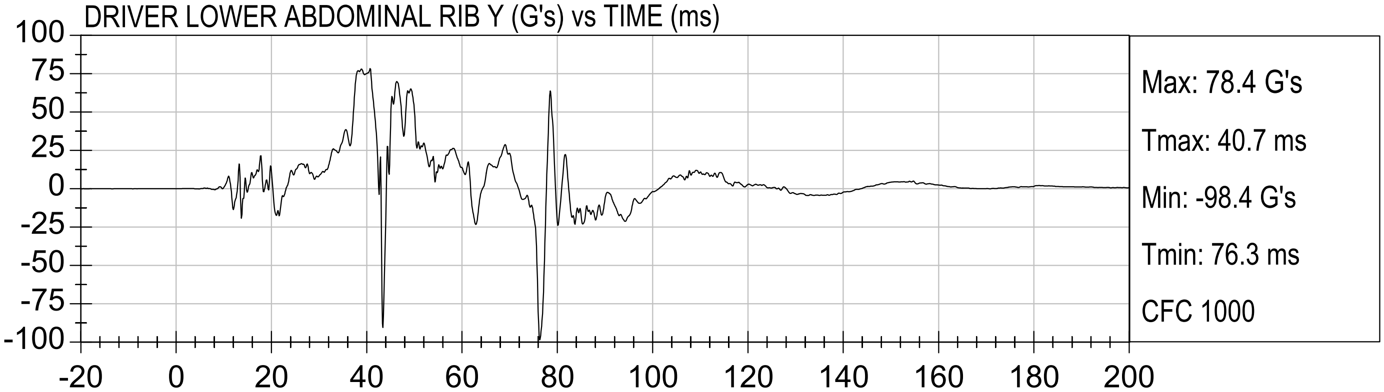
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)

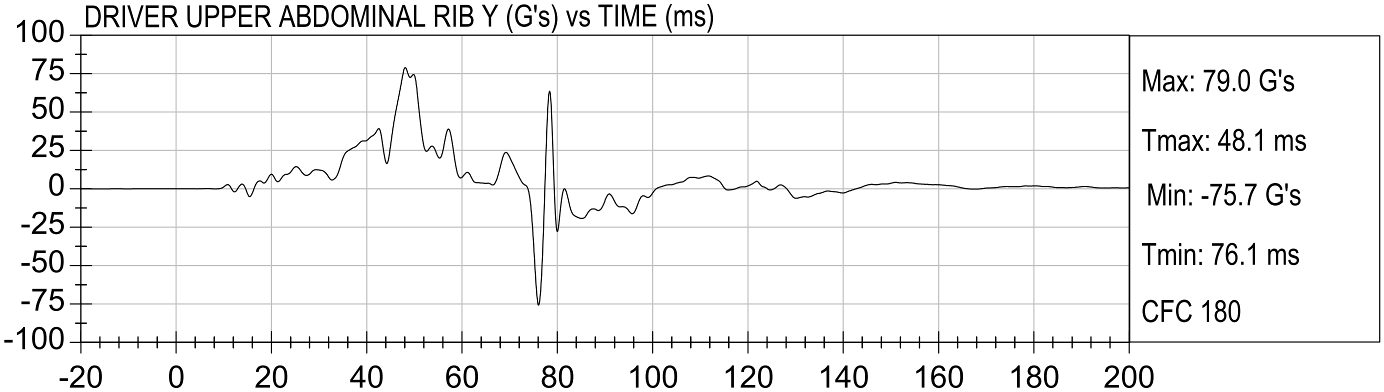
DRIVER UPPER ABDOMINAL RIB Y (G's) vs TIME (ms)



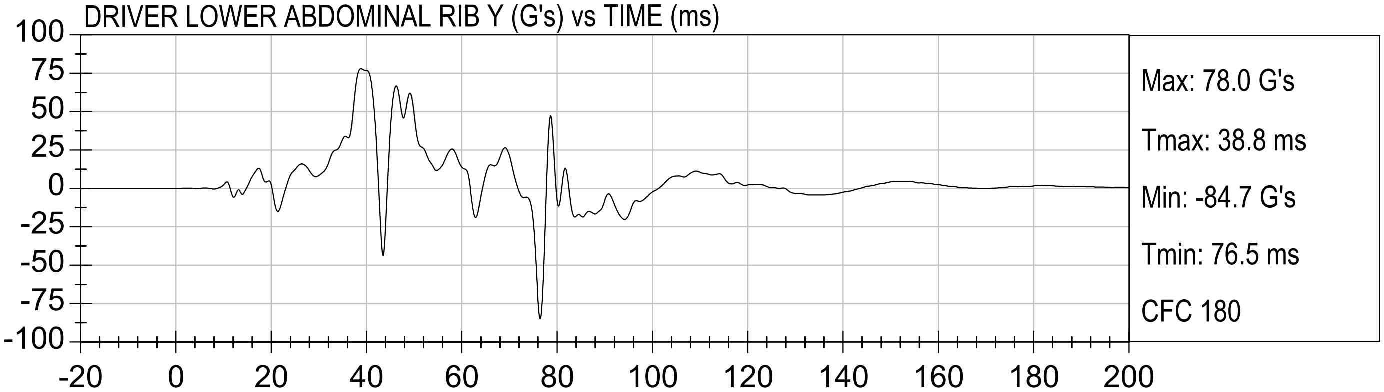
DRIVER LOWER ABDOMINAL RIB Y (G's) vs TIME (ms)

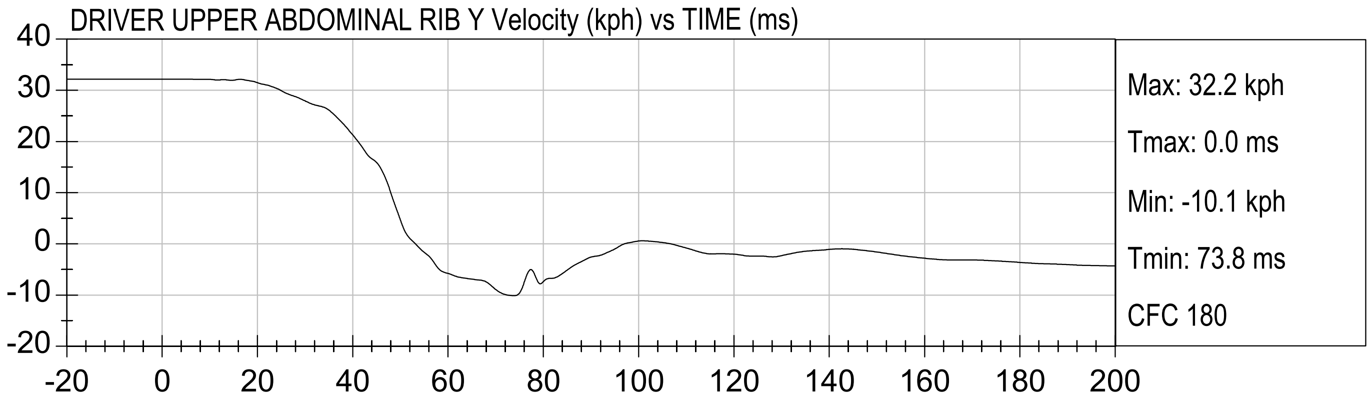


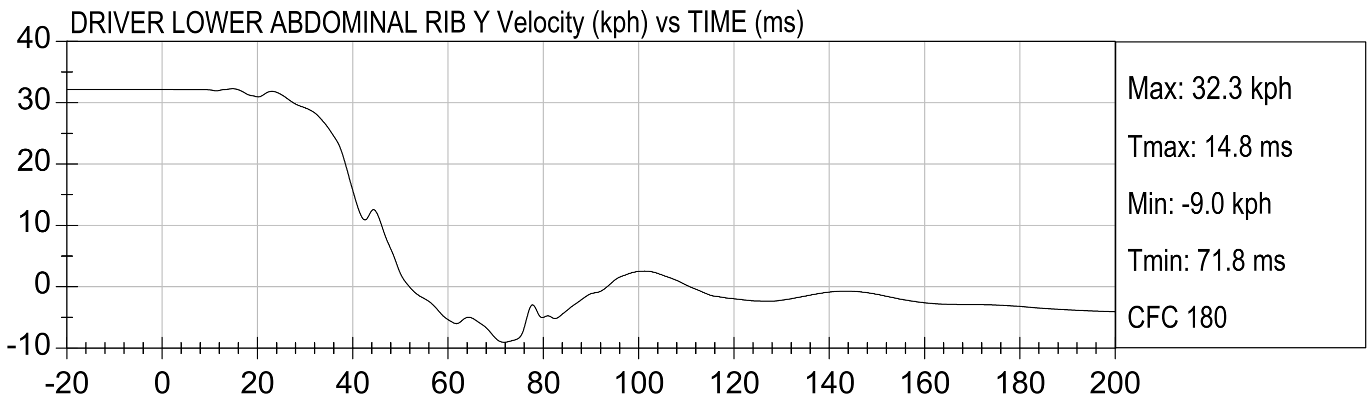
DRIVER UPPER ABDOMINAL RIB Y (G's) vs TIME (ms)

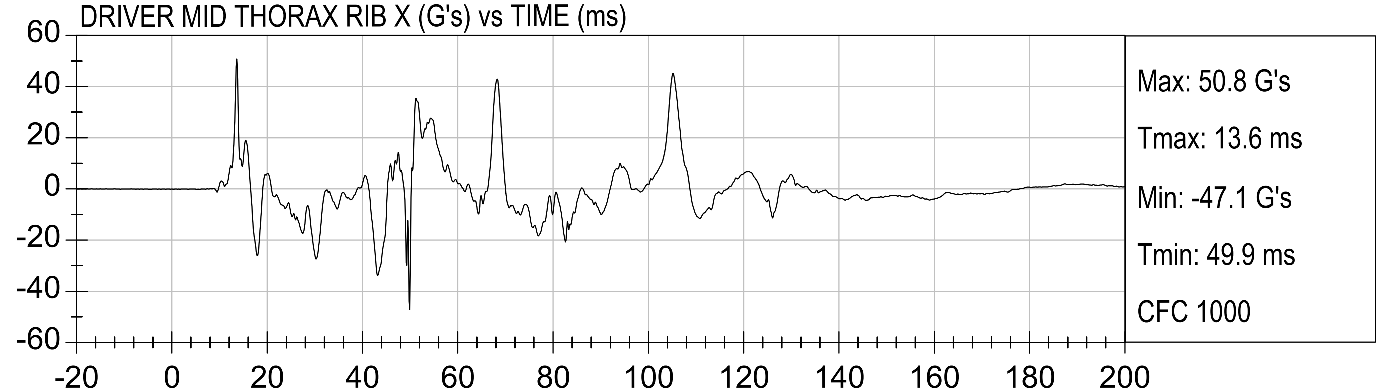


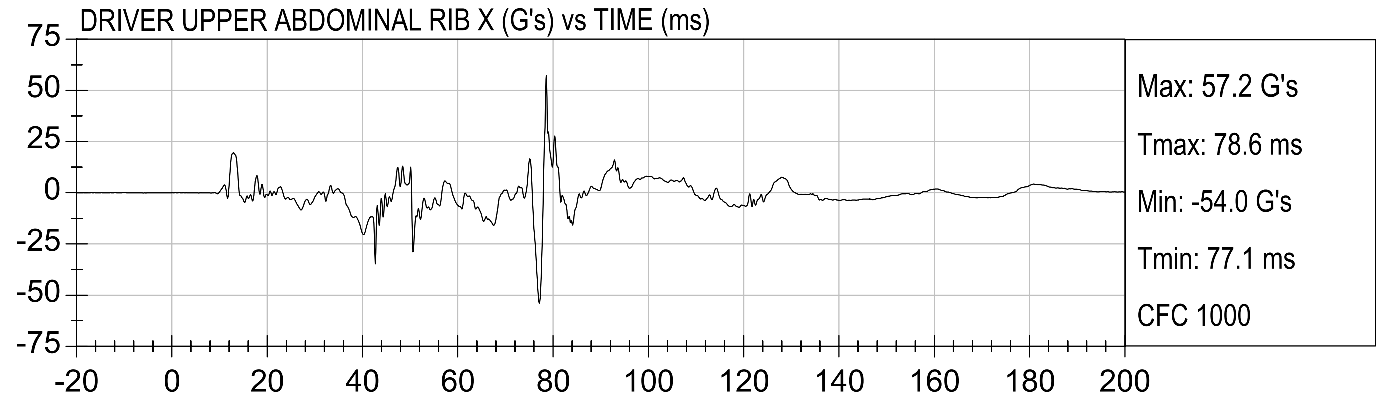
DRIVER LOWER ABDOMINAL RIB Y (G's) vs TIME (ms)

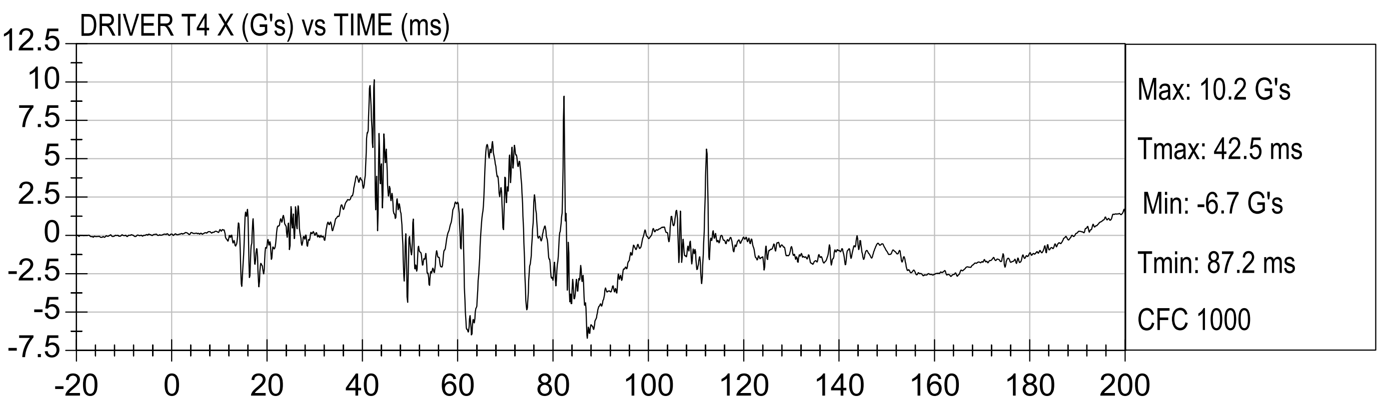



DRIVER UPPER ABDOMINAL RIB Y Velocity (kph) vs TIME (ms)
40
30
20
10
0
-10
-20
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 32.2 kph
Tmax: 0.0 ms
Min: -10.1 kph
Tmin: 73.8 ms
CFC 180


DRIVER LOWER ABDOMINAL RIB Y Velocity (kph) vs TIME (ms)
40
30
20
10
0
-10
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 32.3 kph
Tmax: 14.8 ms
Min: -9.0 kph
Tmin: 71.8 ms
CFC 180

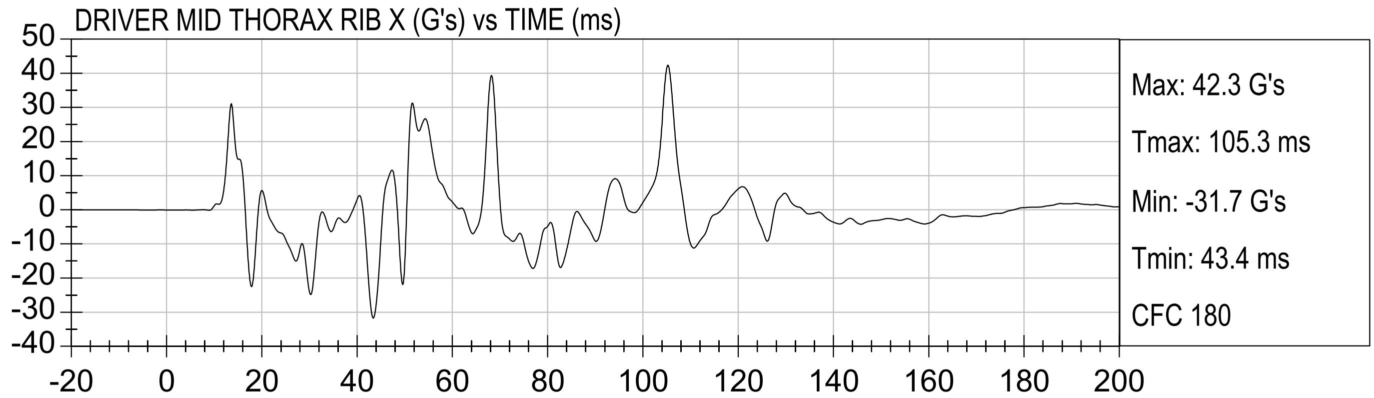

DRIVER MID THORAX RIB X (G's) vs TIME (ms)
Max: 50.8 G's
Tmax: 13.6 ms
Min: -47.1 G's
Tmin: 49.9 ms
CFC 1000

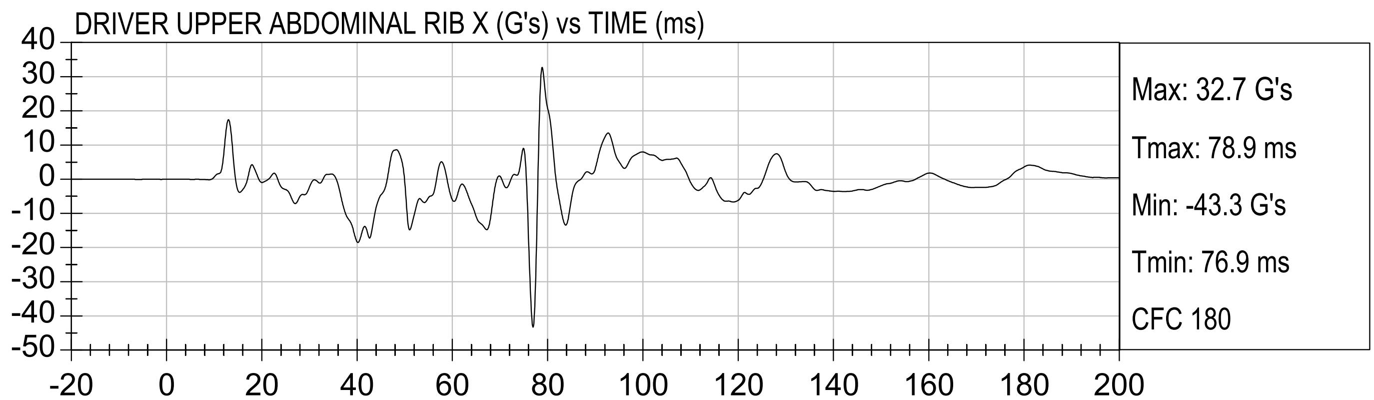

DRIVER UPPER ABDOMINAL RIB X (G's) vs TIME (ms)
Max: 57.2 G's
Tmax: 78.6 ms
Min: -54.0 G's
Tmin: 77.1 ms
CFC 1000

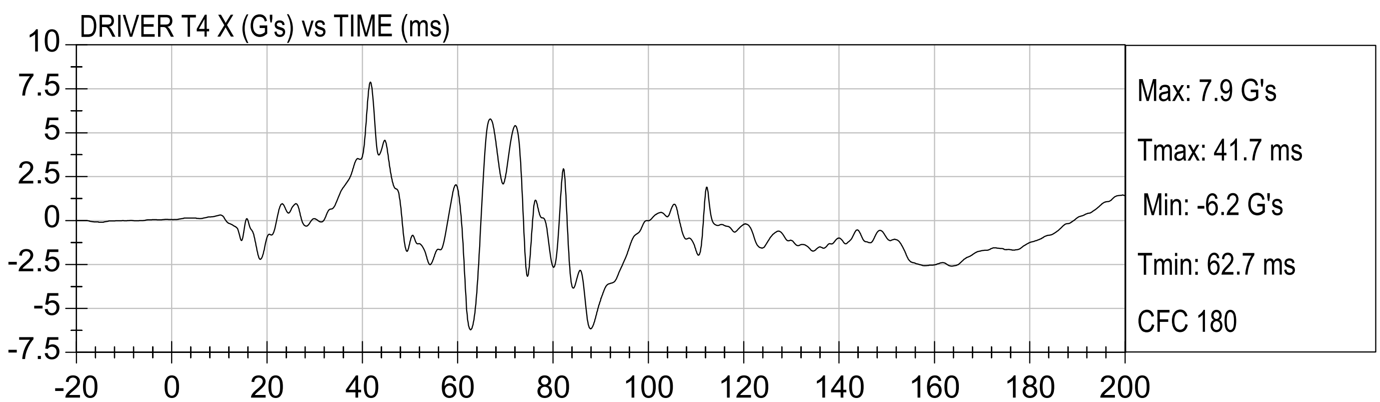

DRIVER T4 X (G's) vs TIME (ms)
Max: 10.2 G's
Tmax: 42.5 ms
Min: -6.7 G's
Tmin: 87.2 ms
CFC 1000

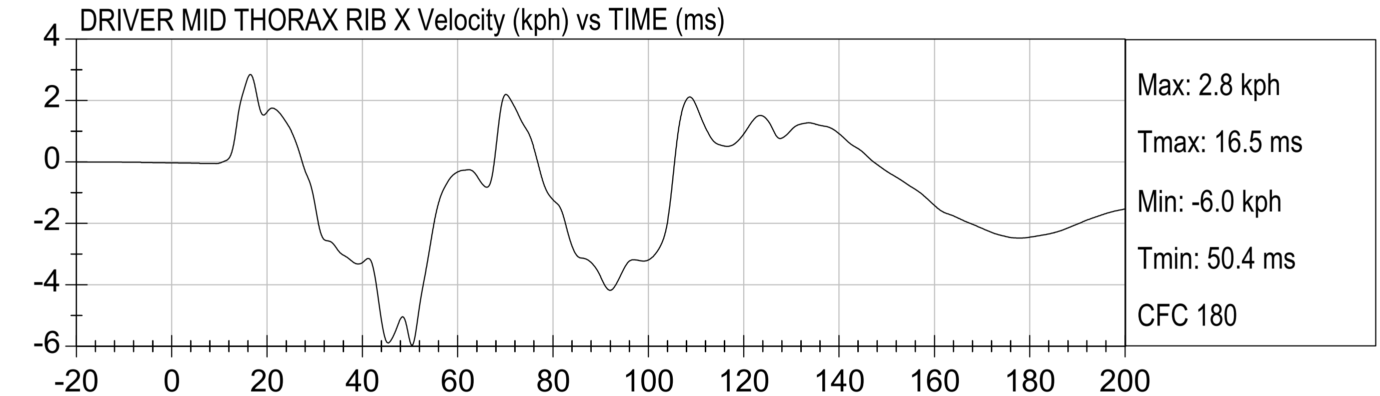
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

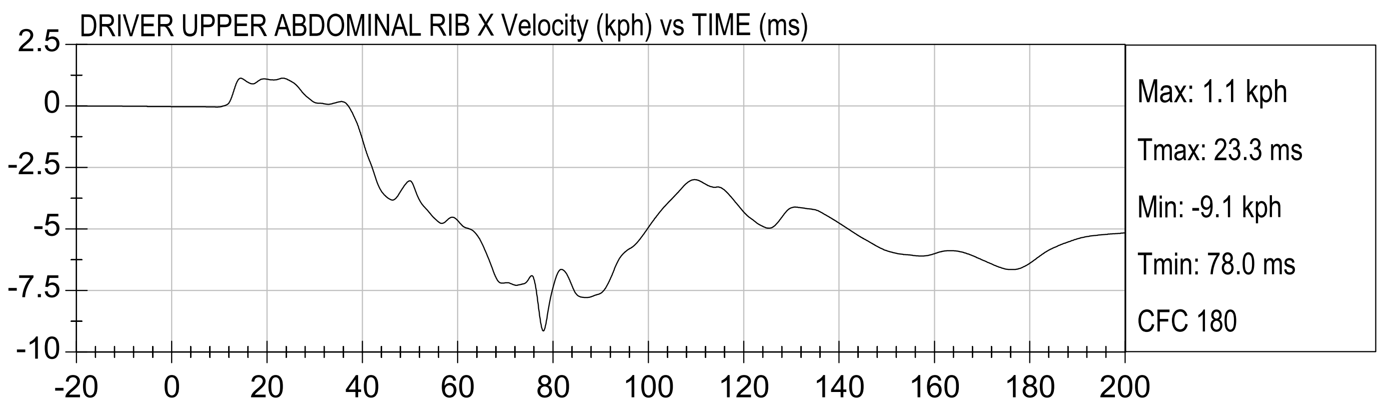
Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)

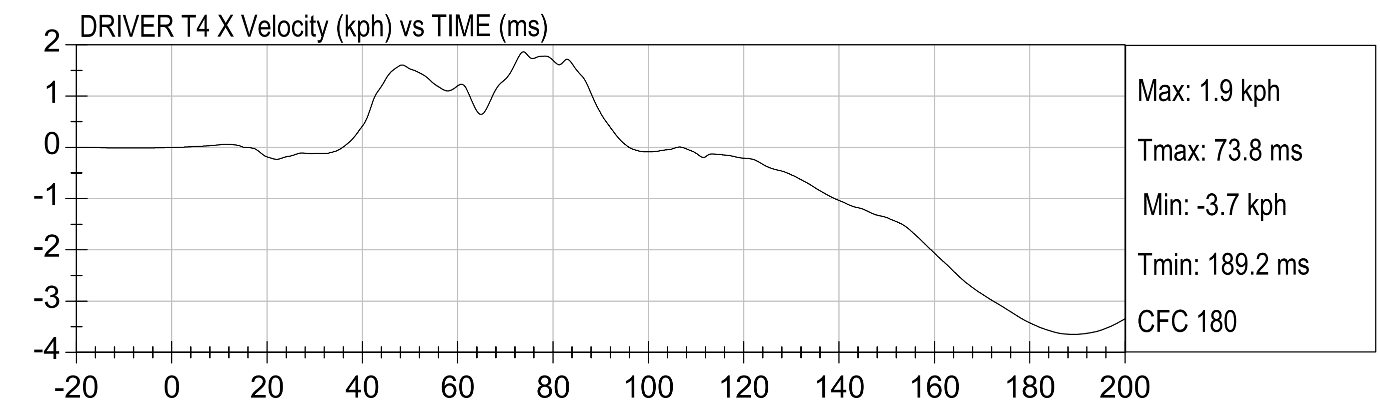







DRIVER MID THORAX RIB X Velocity (kph) vs TIME (ms)
4
2
0
-2
-4
-6
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 2.8 kph
Tmax: 16.5 ms
Min: -6.0 kph
Tmin: 50.4 ms
CFC 180

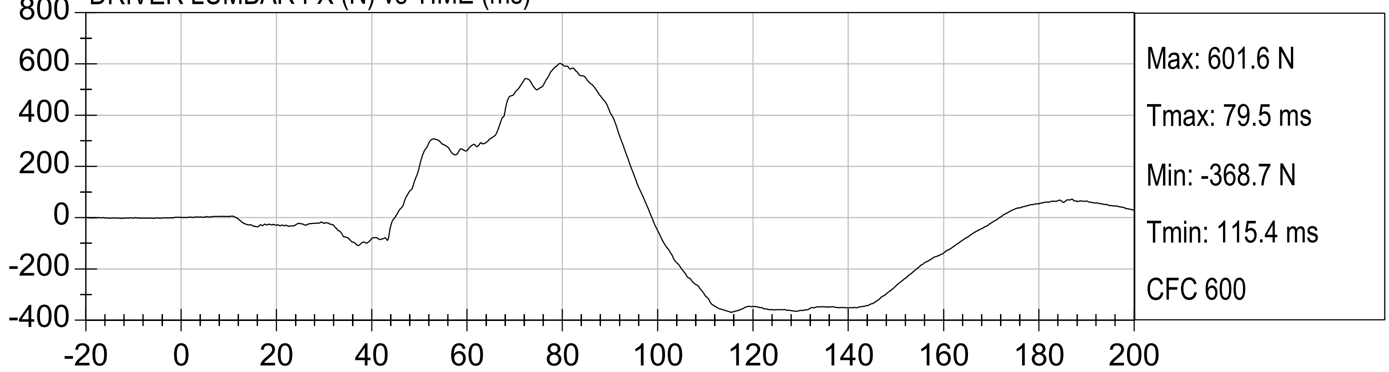

DRIVER UPPER ABDOMINAL RIB X Velocity (kph) vs TIME (ms)
2.5
0
-2.5
-5
-7.5
-10
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 1.1 kph
Tmax: 23.3 ms
Min: -9.1 kph
Tmin: 78.0 ms
CFC 180


DRIVER T4 X Velocity (kph) vs TIME (ms)
2
1
0
-1
-2
-3
-4
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 1.9 kph
Tmax: 73.8 ms
Min: -3.7 kph
Tmin: 189.2 ms
CFC 180

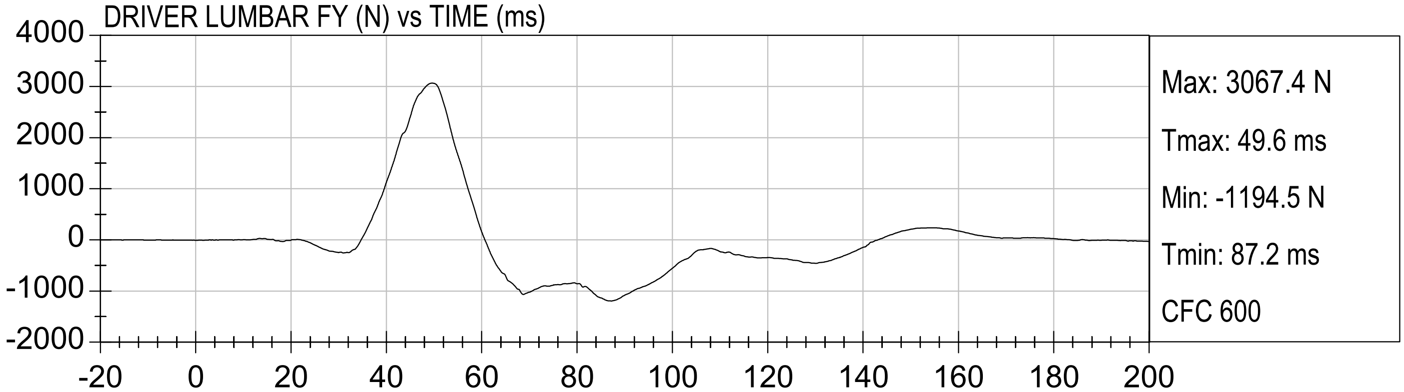
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)

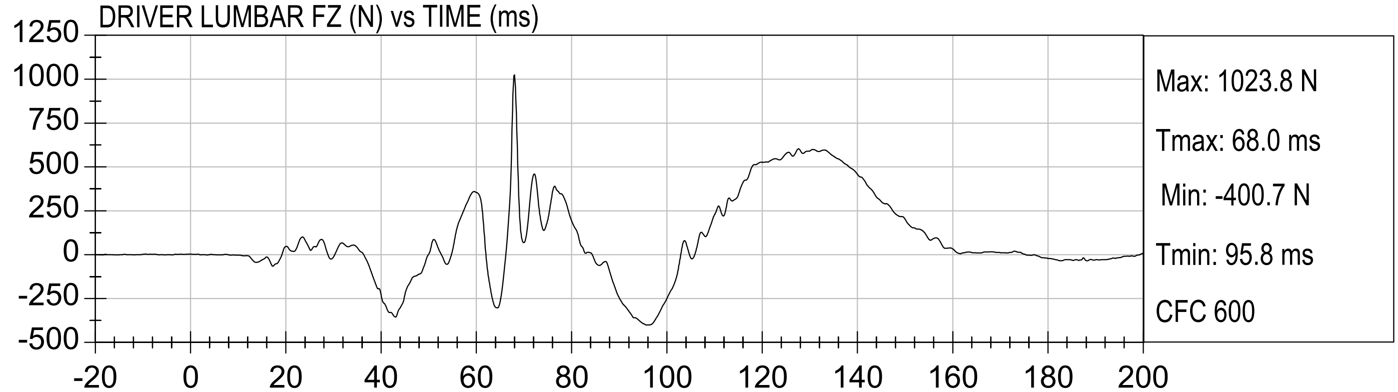
DRIVER LUMBAR FX (N) vs TIME (ms)



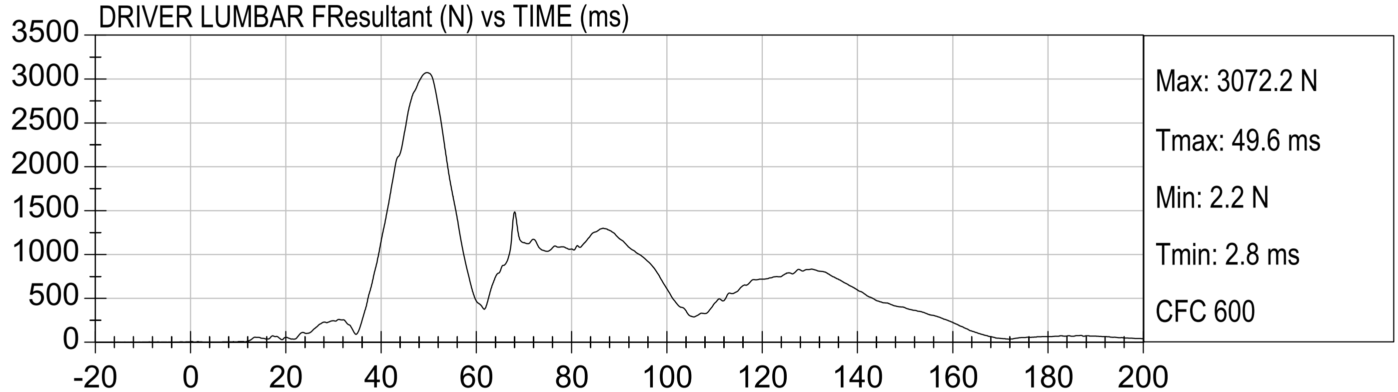
DRIVER LUMBAR FY (N) vs TIME (ms)



DRIVER LUMBAR FZ (N) vs TIME (ms)



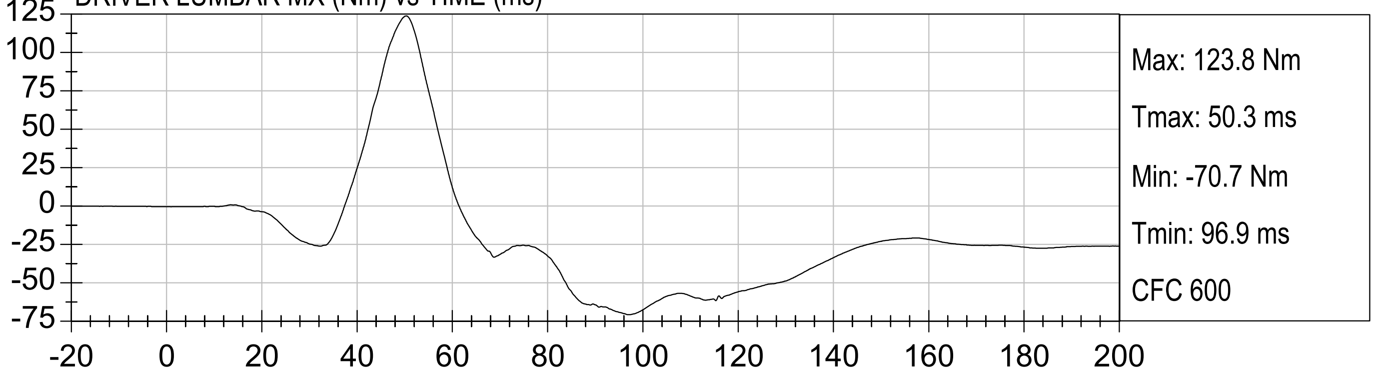
DRIVER LUMBAR FResultant (N) vs TIME (ms)



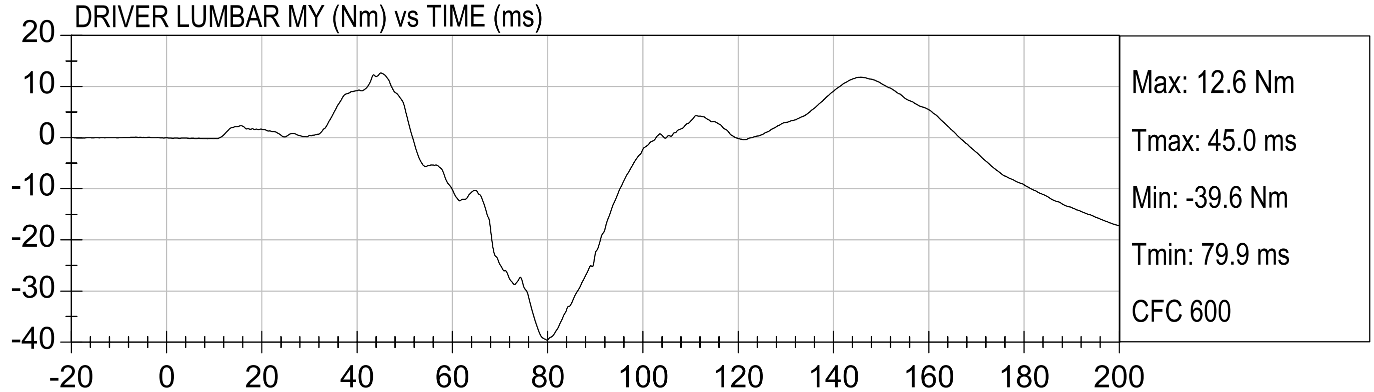
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)

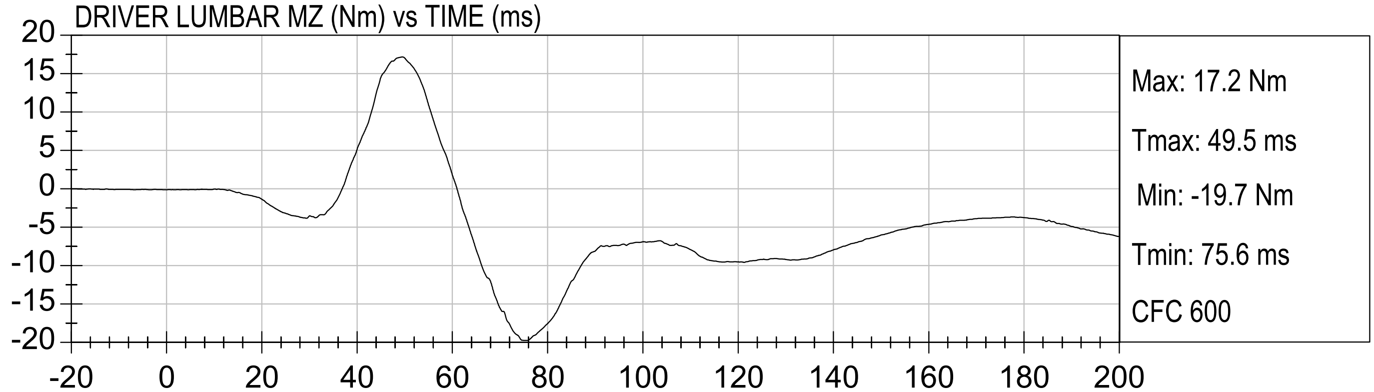
DRIVER LUMBAR MX (Nm) vs TIME (ms)



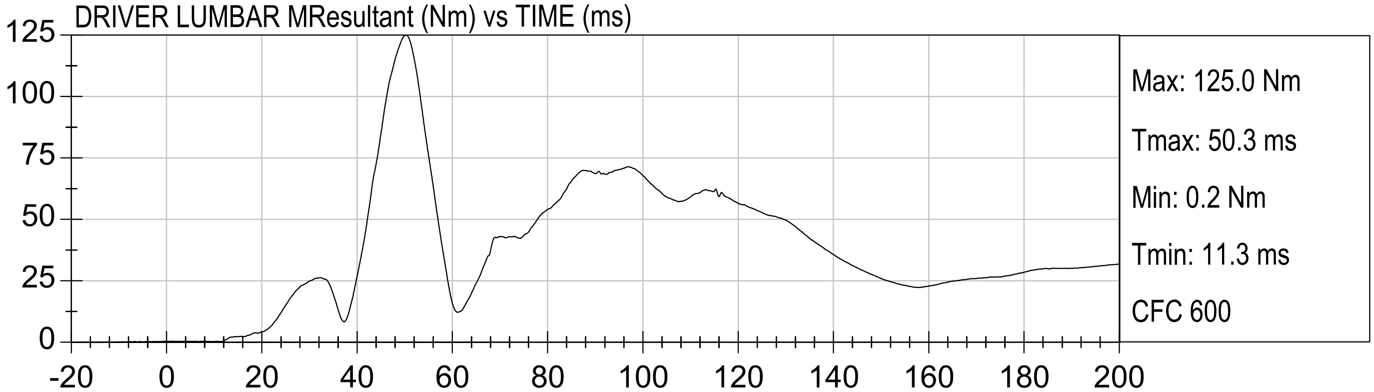
DRIVER LUMBAR MY (Nm) vs TIME (ms)



DRIVER LUMBAR MZ (Nm) vs TIME (ms)

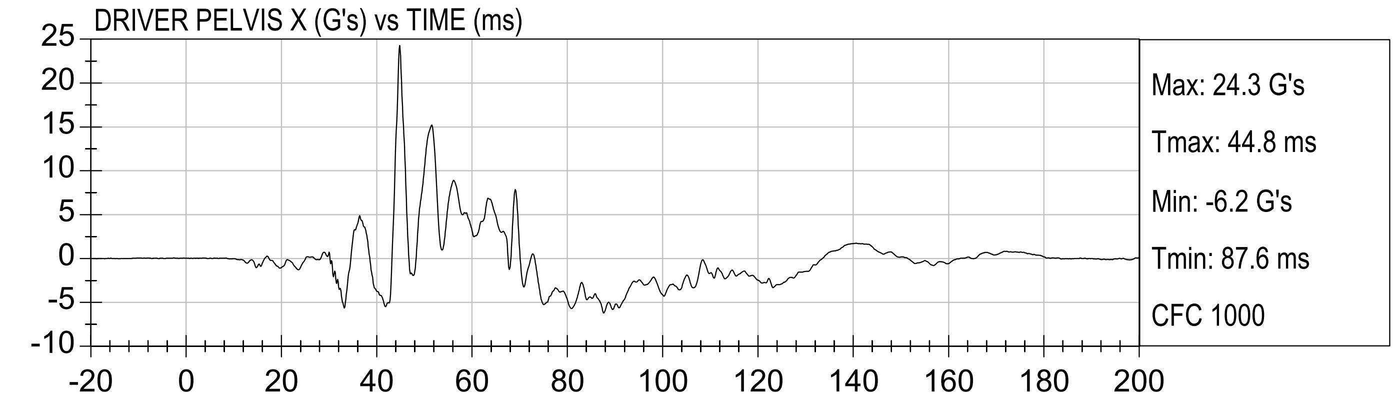


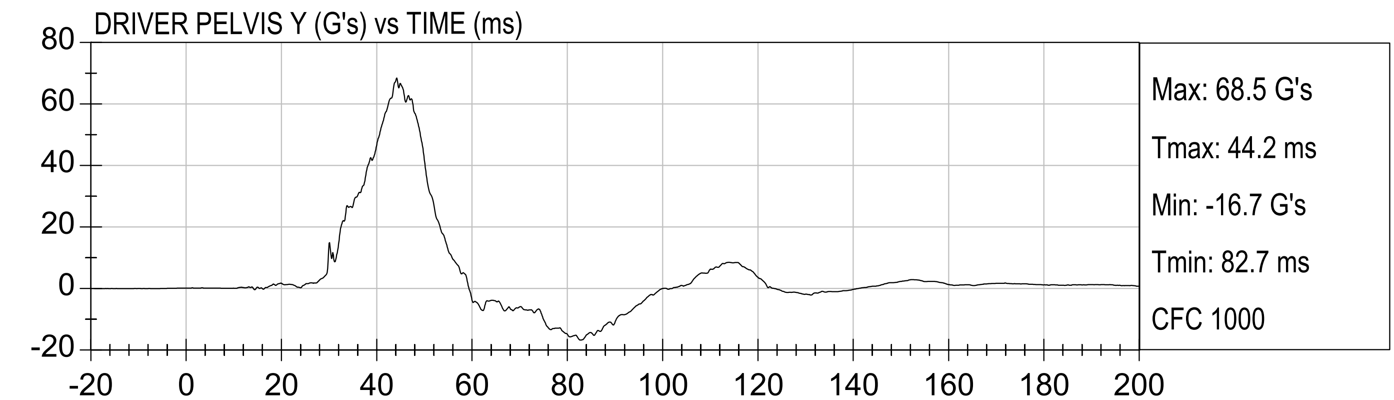
DRIVER LUMBAR MResultant (Nm) vs TIME (ms)

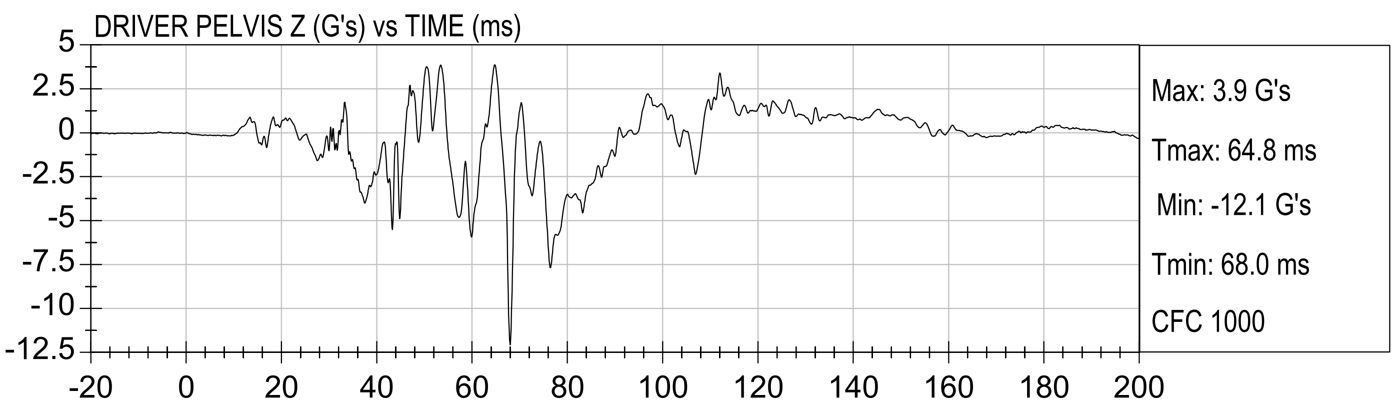


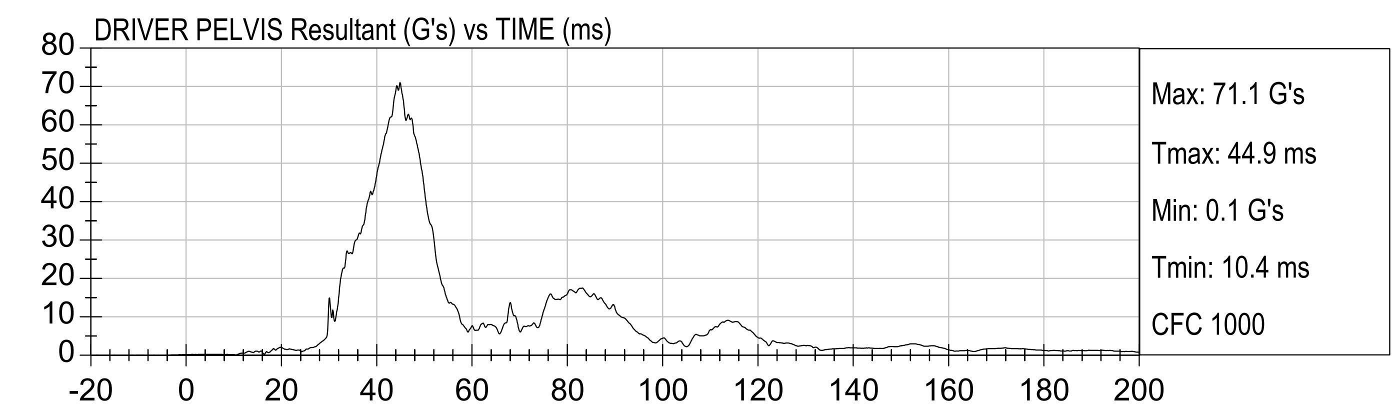
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

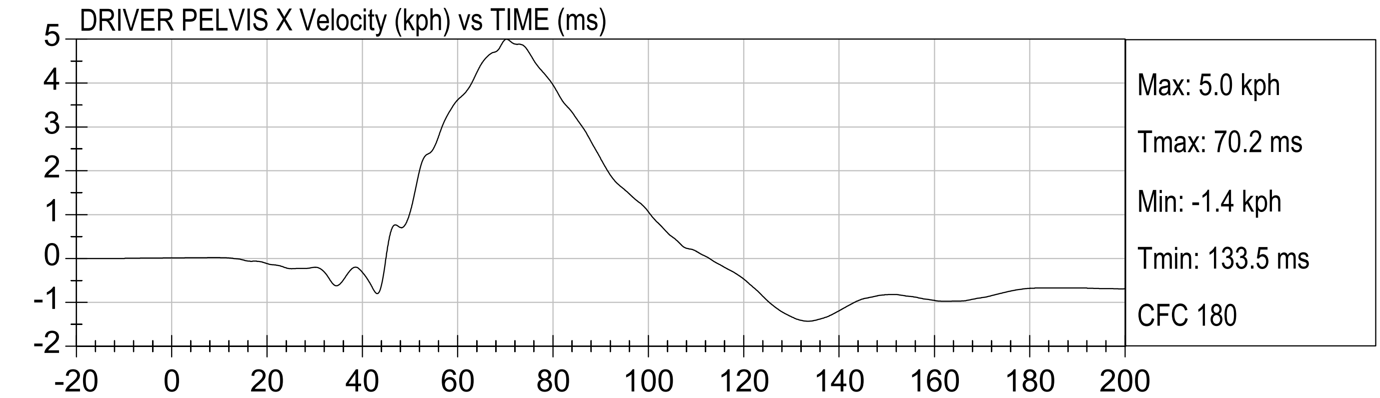
Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)

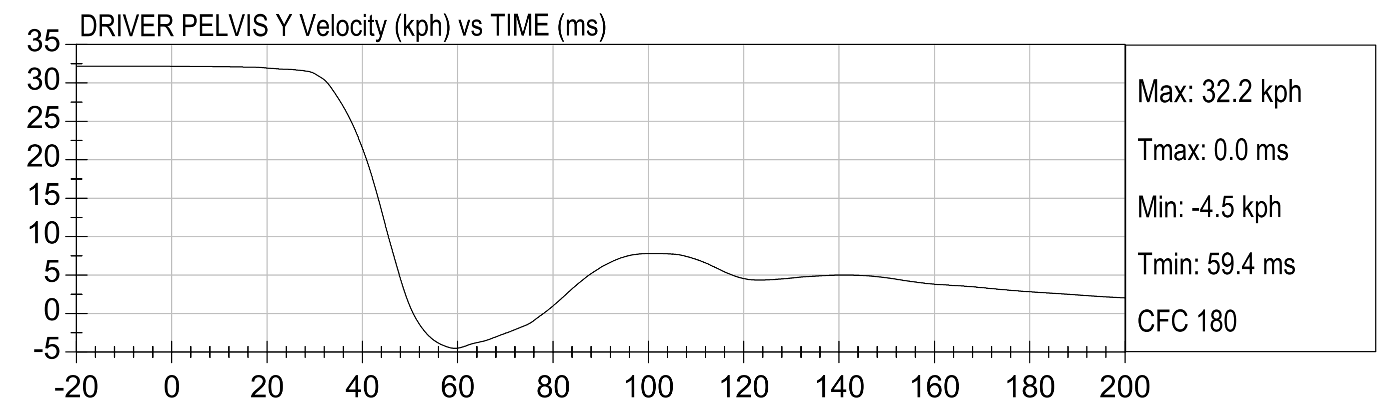


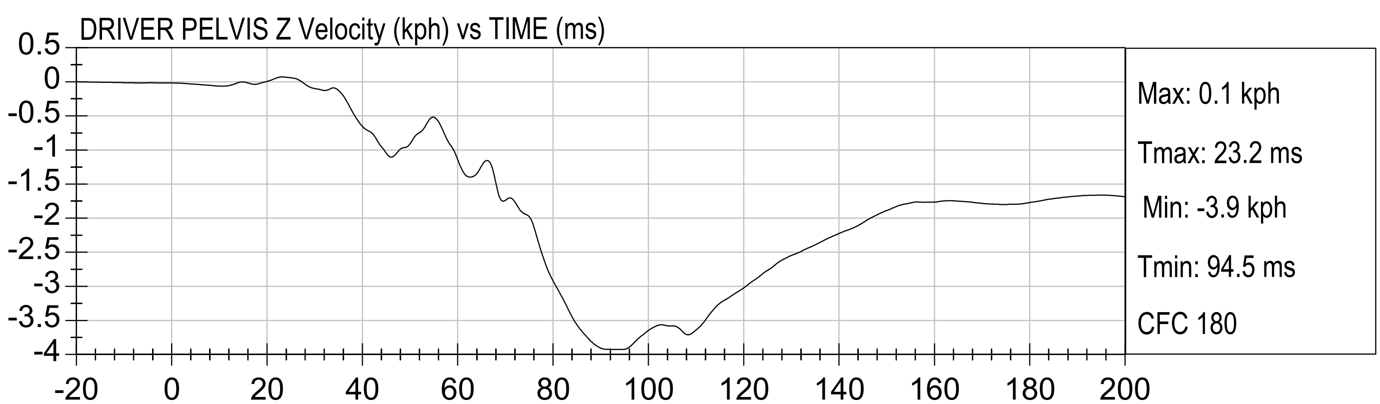







DRIVER PELVIS X Velocity (kph) vs TIME (ms)
Max: 5.0 kph
Tmax: 70.2 ms
Min: -1.4 kph
Tmin: 133.5 ms
CFC 180

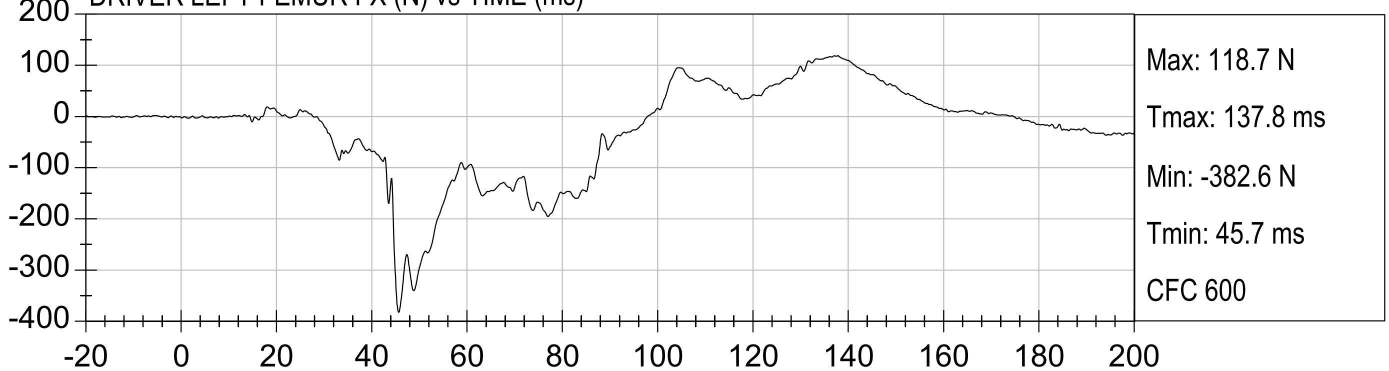

DRIVER PELVIS Y Velocity (kph) vs TIME (ms)
Max: 32.2 kph
Tmax: 0.0 ms
Min: -4.5 kph
Tmin: 59.4 ms
CFC 180


DRIVER PELVIS Z Velocity (kph) vs TIME (ms)
Max: 0.1 kph
Tmax: 23.2 ms
Min: -3.9 kph
Tmin: 94.5 ms
CFC 180

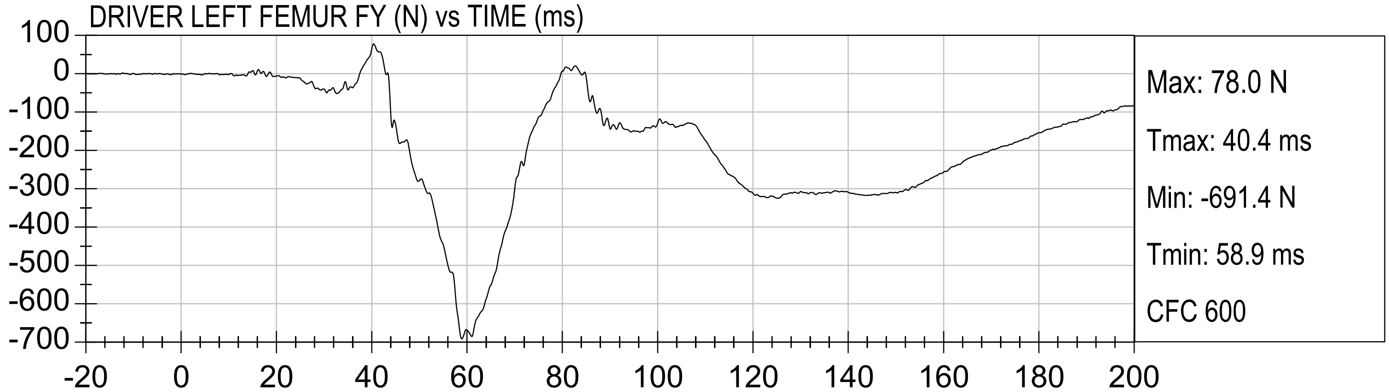
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)

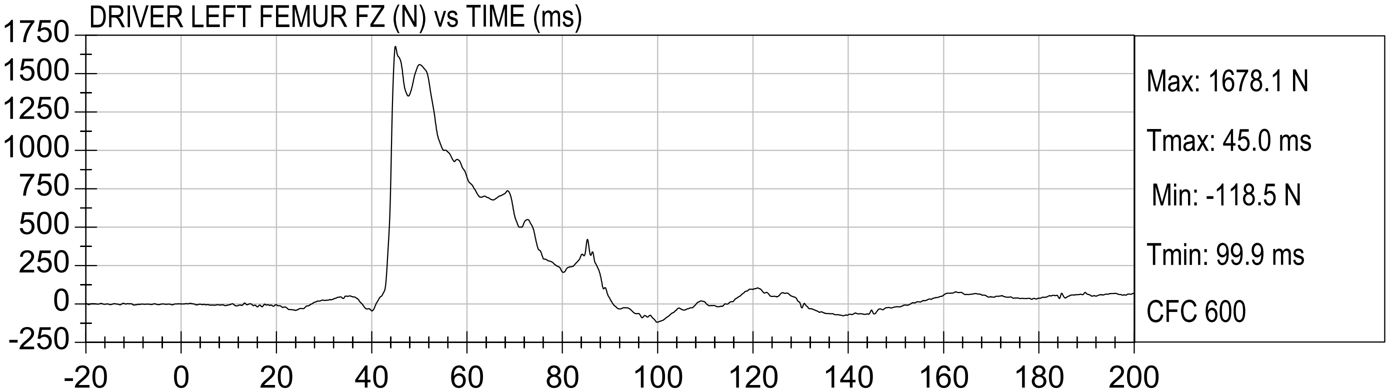
DRIVER LEFT FEMUR FX (N) vs TIME (ms)



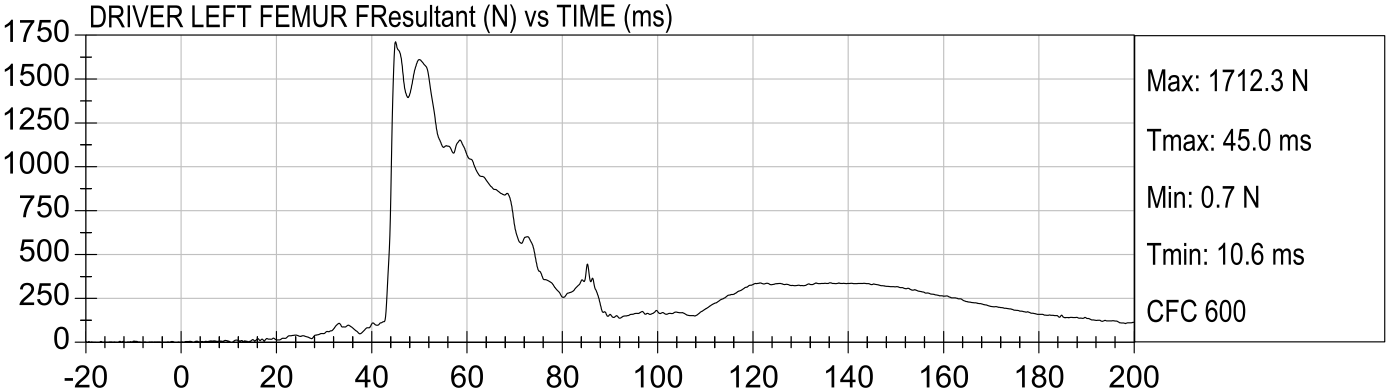
DRIVER LEFT FEMUR FY (N) vs TIME (ms)

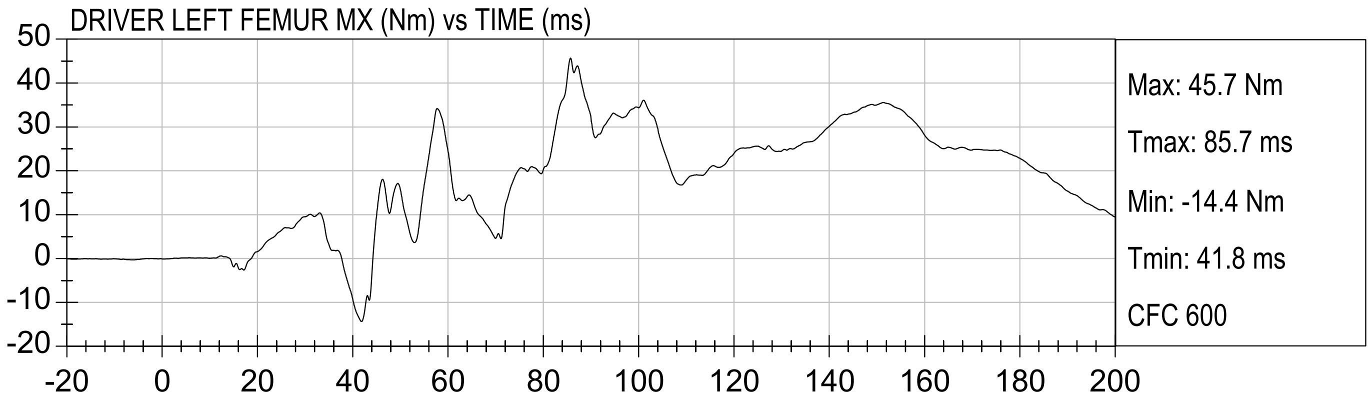


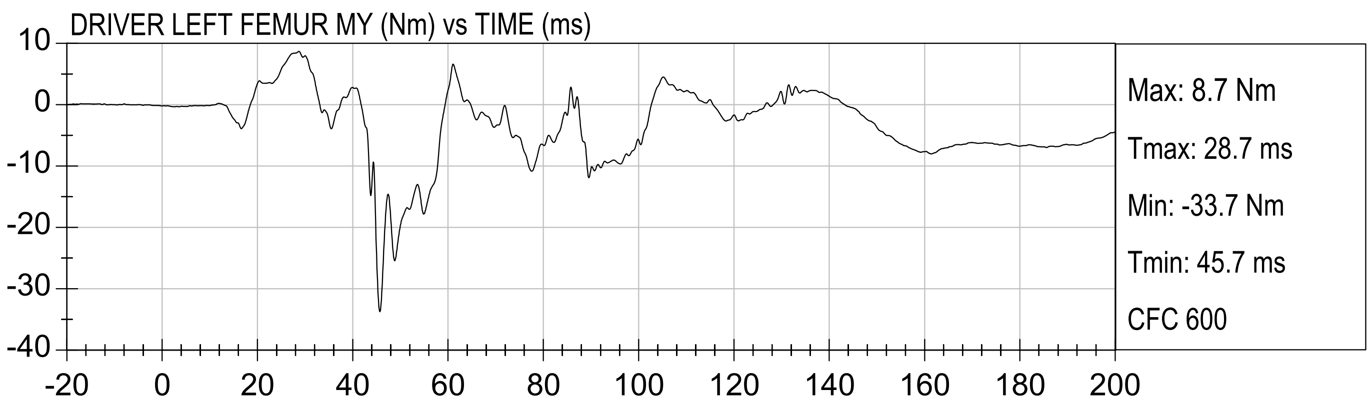
DRIVER LEFT FEMUR FZ (N) vs TIME (ms)

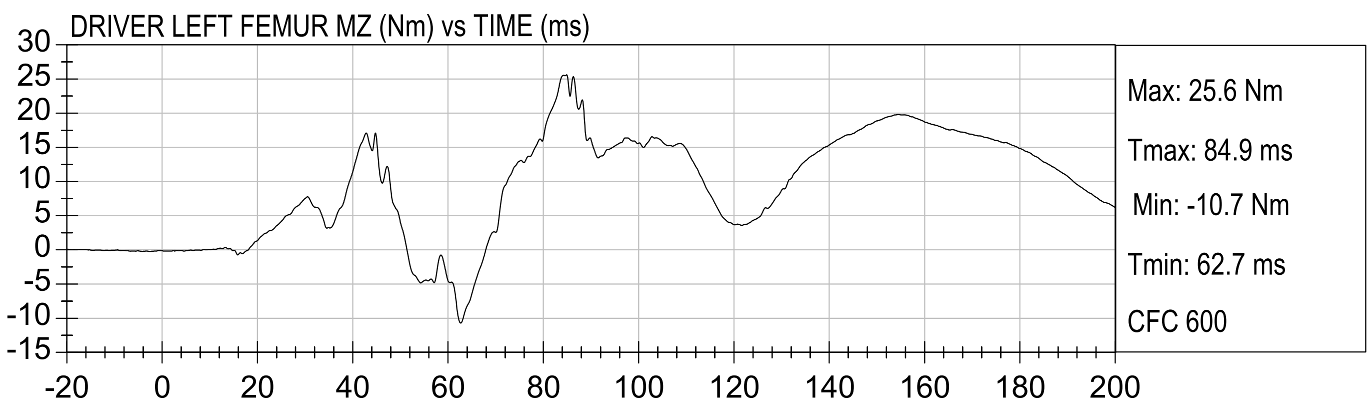


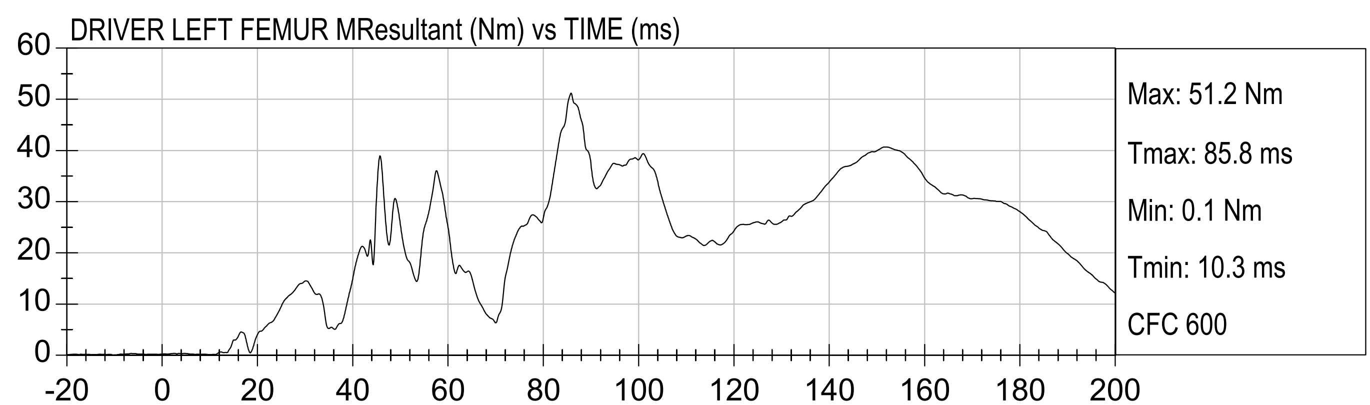
DRIVER LEFT FEMUR FResultant (N) vs TIME (ms)




DRIVER LEFT FEMUR MX (Nm) vs TIME (ms)
Max: 45.7 Nm
Tmax: 85.7 ms
Min: -14.4 Nm
Tmin: 41.8 ms
CFC 600
50
40
30
20
10
0
-10
-20
-20
0
20
40
60
80
100
120
140
160
180
200

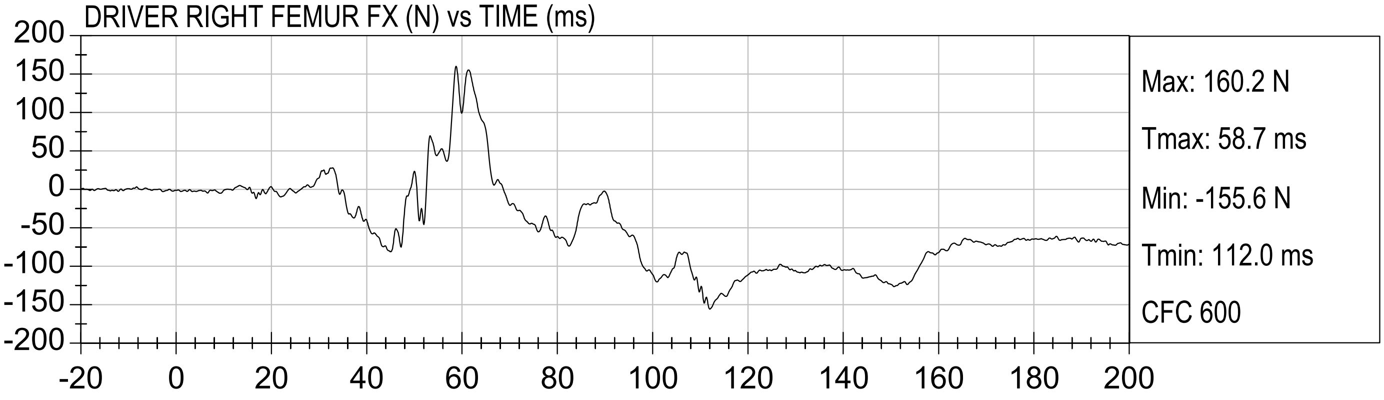

DRIVER LEFT FEMUR MY (Nm) vs TIME (ms)
Max: 8.7 Nm
Tmax: 28.7 ms
Min: -33.7 Nm
Tmin: 45.7 ms
CFC 600
10
0
-10
-20
-30
-40
-20
0
20
40
60
80
100
120
140
160
180
200

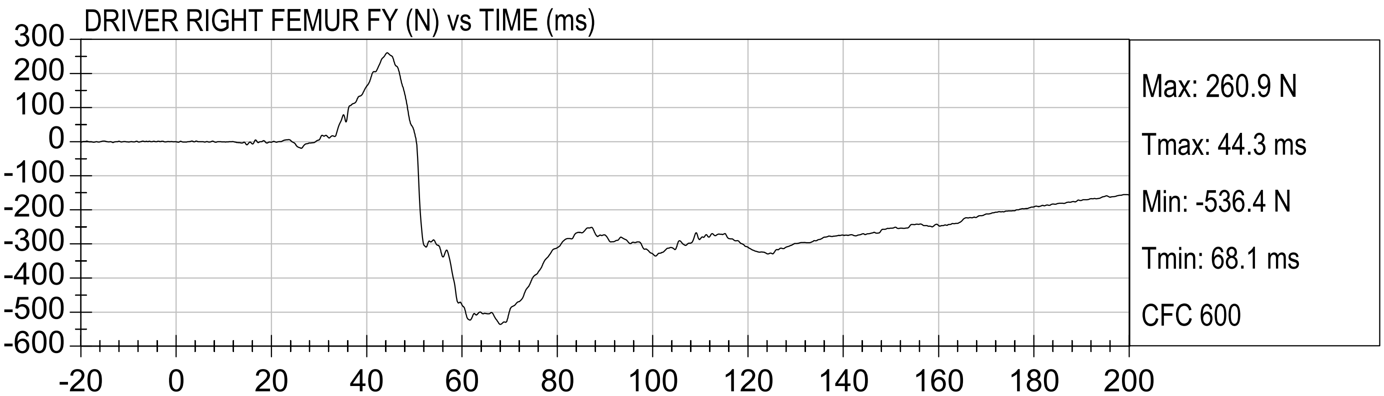

DRIVER LEFT FEMUR MZ (Nm) vs TIME (ms)
Max: 25.6 Nm
Tmax: 84.9 ms
Min: -10.7 Nm
Tmin: 62.7 ms
CFC 600
30
25
20
15
10
5
0
-5
-10
-15
-20
0
20
40
60
80
100
120
140
160
180
200

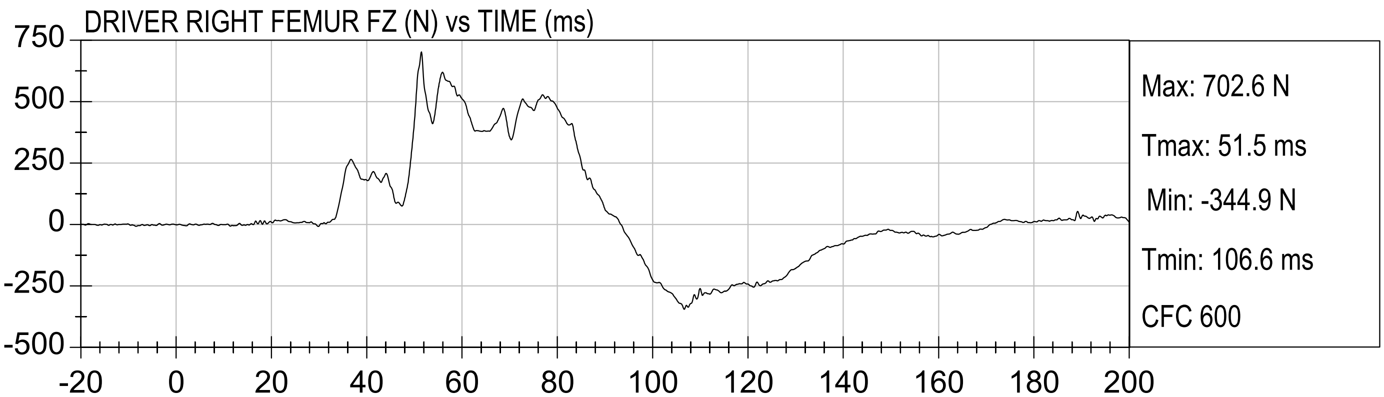

DRIVER LEFT FEMUR MResultant (Nm) vs TIME (ms)
Max: 51.2 Nm
Tmax: 85.8 ms
Min: 0.1 Nm
Tmin: 10.3 ms
CFC 600
60
50
40
30
20
10
0
-20
0
20
40
60
80
100
120
140
160
180
200

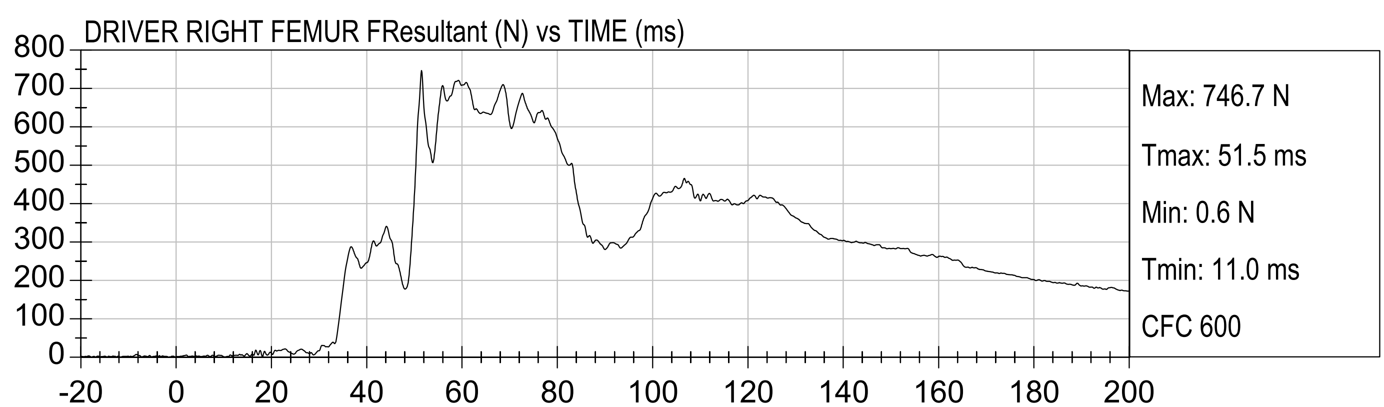
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)





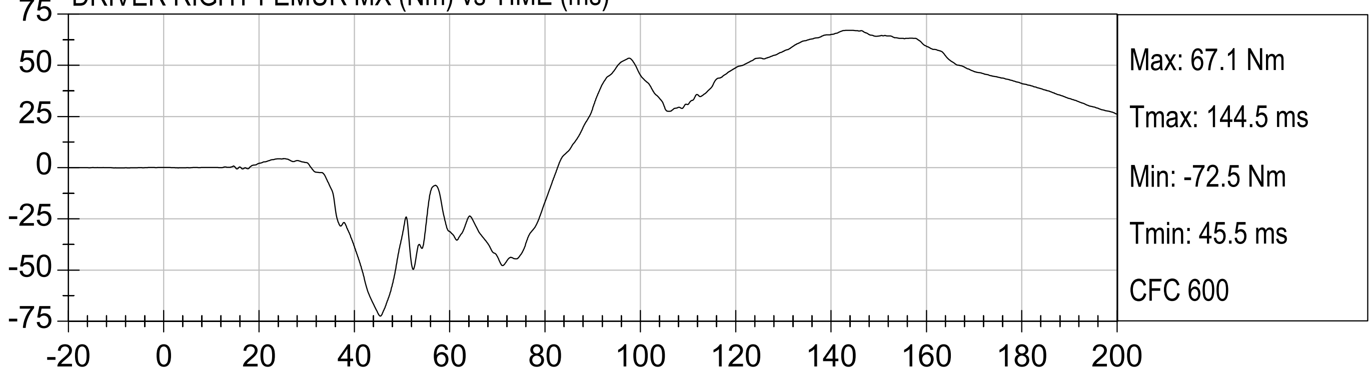




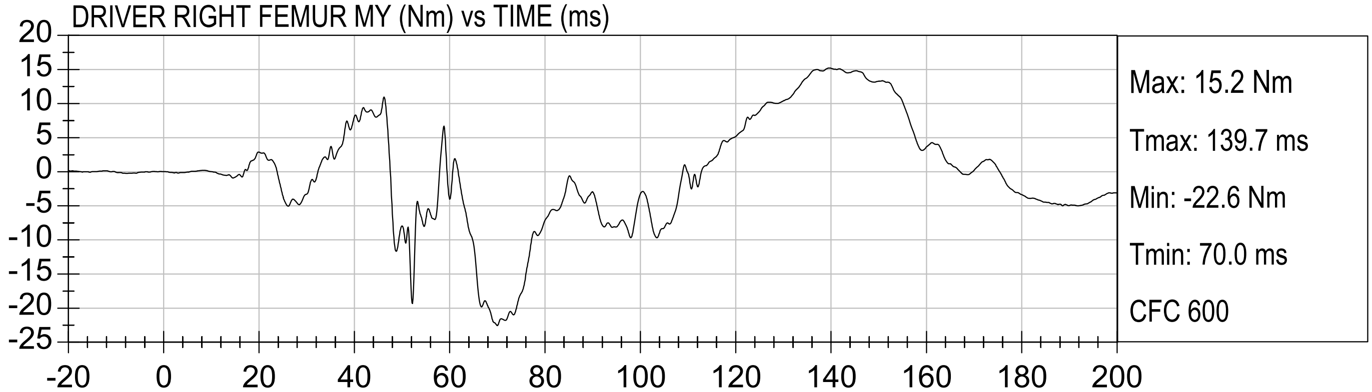
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)

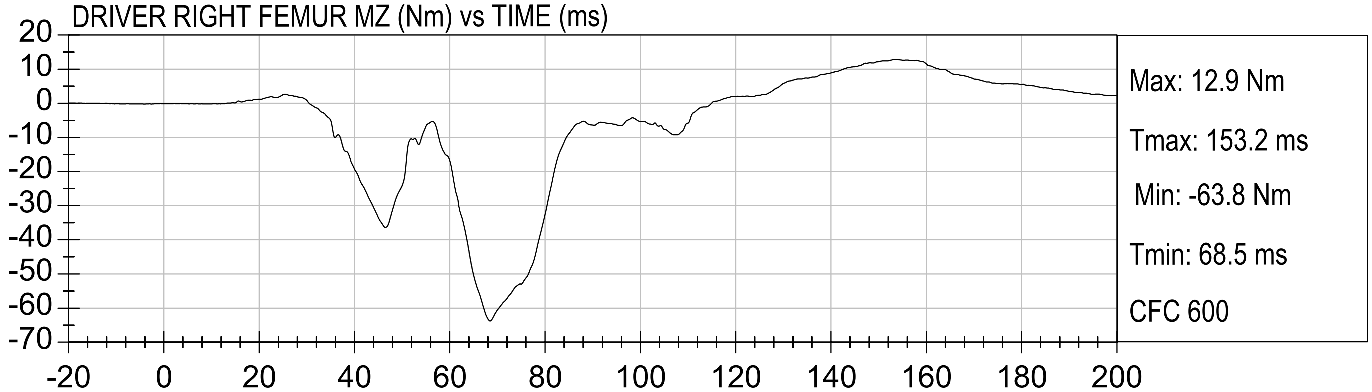
DRIVER RIGHT FEMUR MX (Nm) vs TIME (ms)



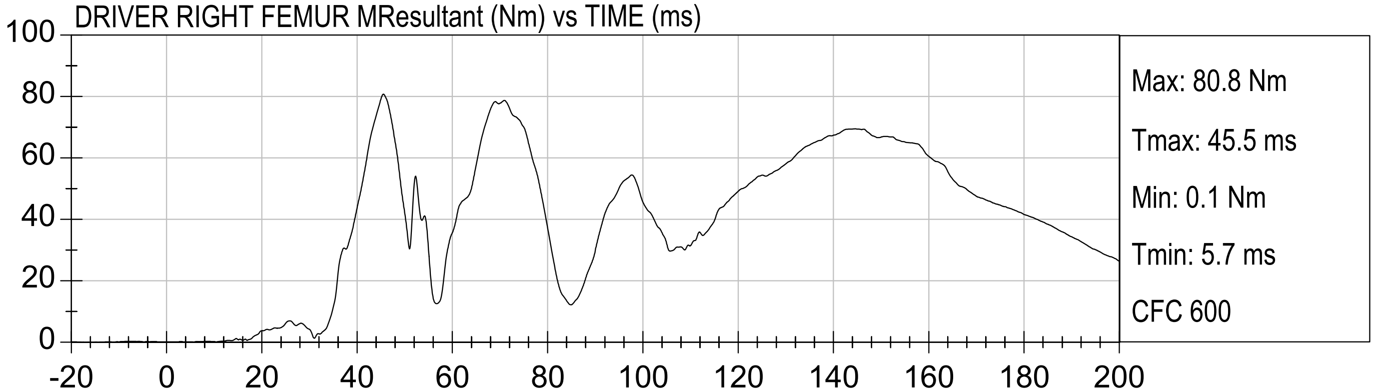
DRIVER RIGHT FEMUR MY (Nm) vs TIME (ms)

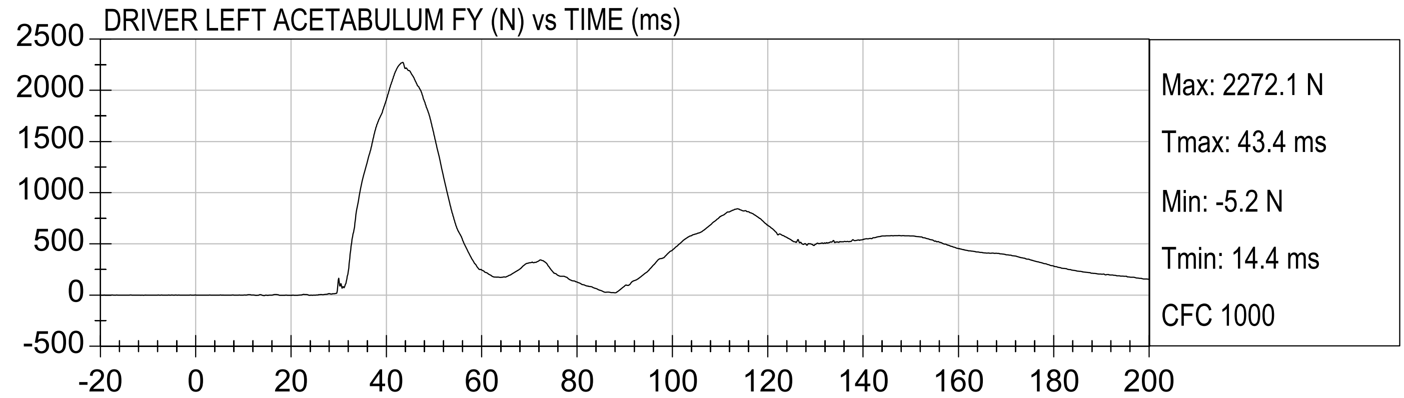


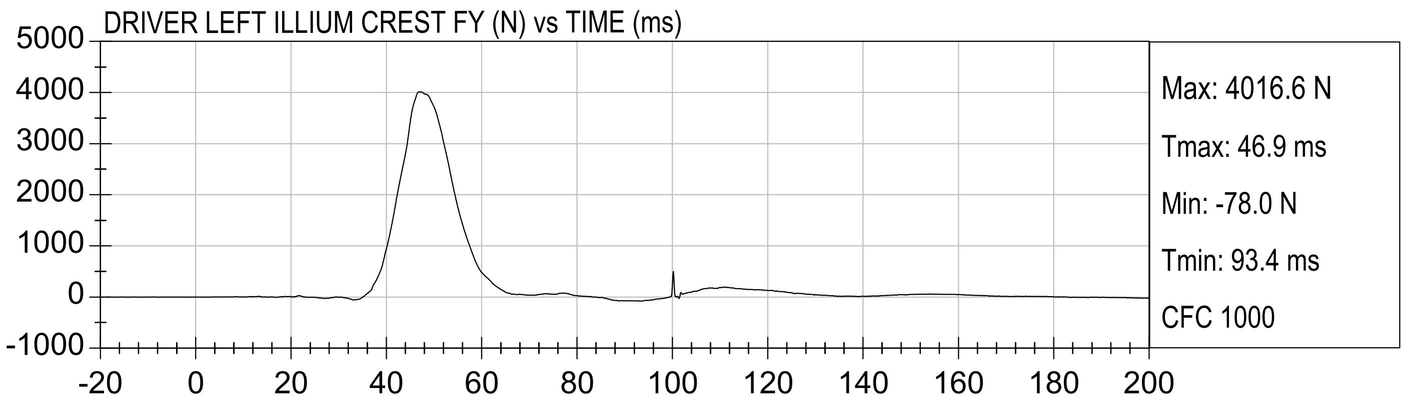
DRIVER RIGHT FEMUR MZ (Nm) vs TIME (ms)

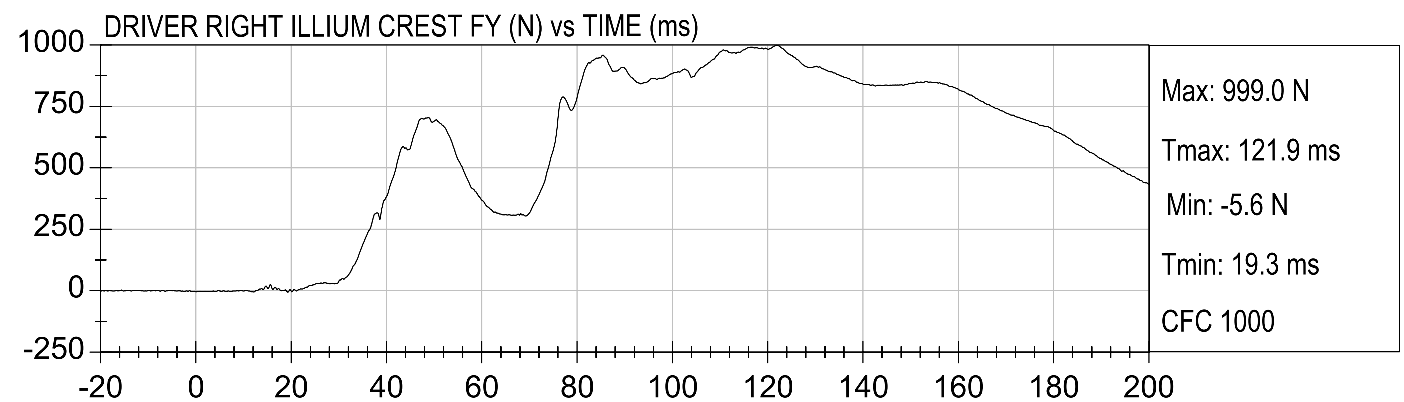


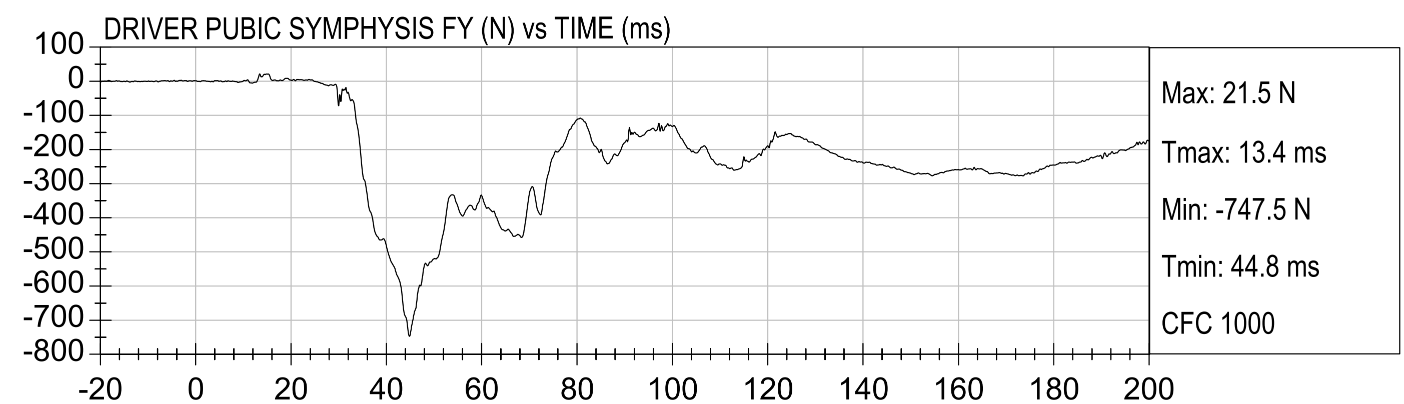
DRIVER RIGHT FEMUR MResultant (Nm) vs TIME (ms)




DRIVER LEFT ACETABULUM FY (N) vs TIME (ms)
2500
2000
1500
1000
500
0
-500
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 2272.1 N
Tmax: 43.4 ms
Min: -5.2 N
Tmin: 14.4 ms
CFC 1000


DRIVER LEFT ILLIUM CREST FY (N) vs TIME (ms)
5000
4000
3000
2000
1000
0
-1000
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 4016.6 N
Tmax: 46.9 ms
Min: -78.0 N
Tmin: 93.4 ms
CFC 1000

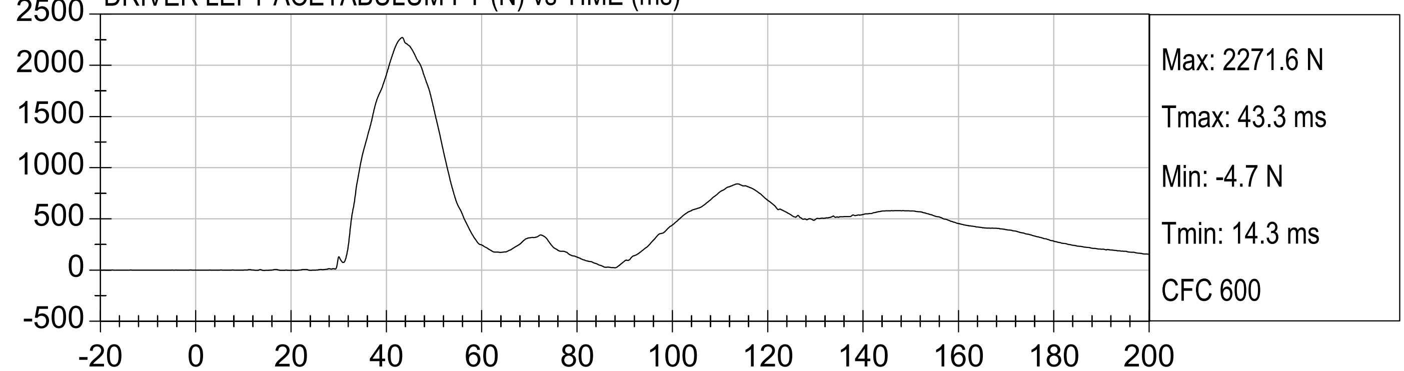

DRIVER RIGHT ILLIUM CREST FY (N) vs TIME (ms)
1000
750
500
250
0
-250
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 999.0 N
Tmax: 121.9 ms
Min: -5.6 N
Tmin: 19.3 ms
CFC 1000


DRIVER PUBIC SYMPHYSIS FY (N) vs TIME (ms)
100
0
-100
-200
-300
-400
-500
-600
-700
-800
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 21.5 N
Tmax: 13.4 ms
Min: -747.5 N
Tmin: 44.8 ms
CFC 1000

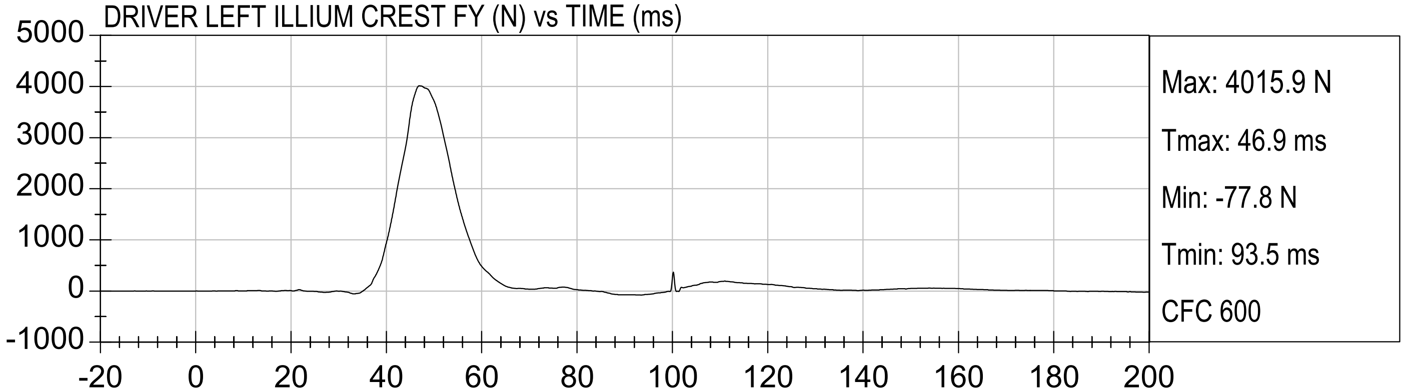
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)

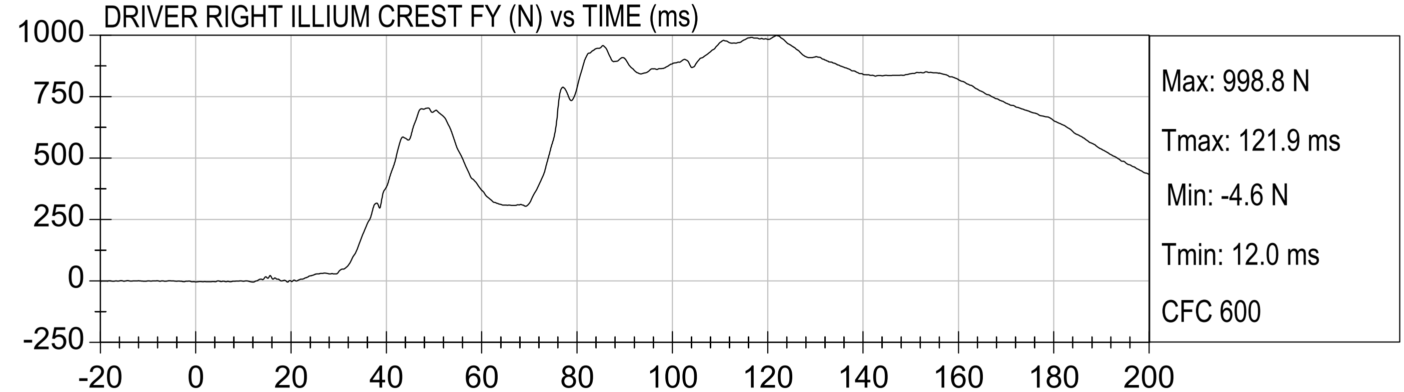
DRIVER LEFT ACETABULUM FY (N) vs TIME (ms)



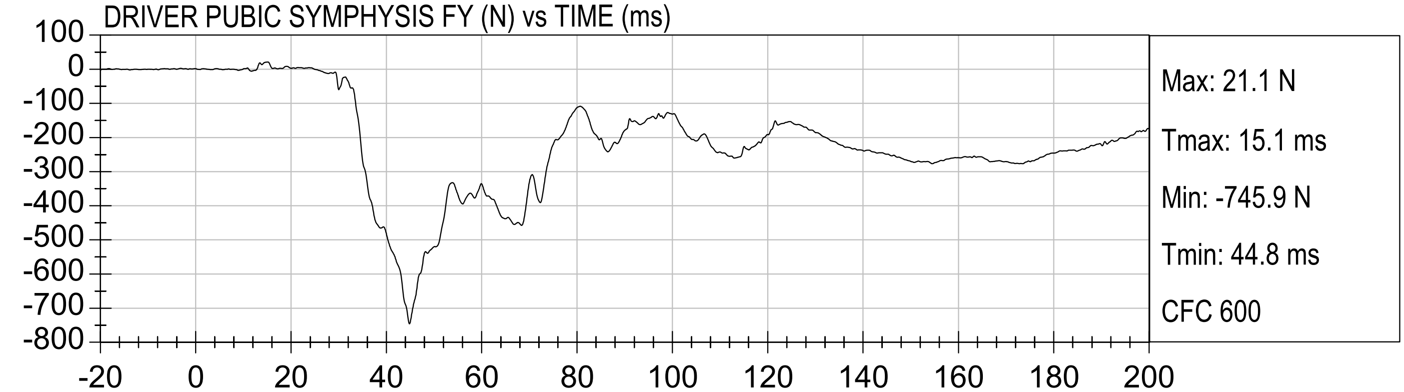
DRIVER LEFT ILLIUM CREST FY (N) vs TIME (ms)



DRIVER RIGHT ILLIUM CREST FY (N) vs TIME (ms)



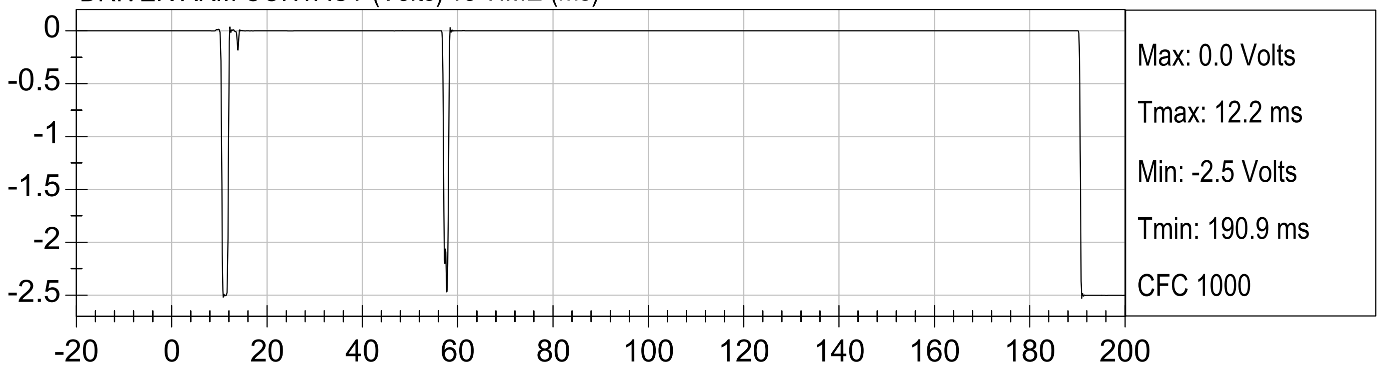
DRIVER PUBIC SYMPHYSIS FY (N) vs TIME (ms)



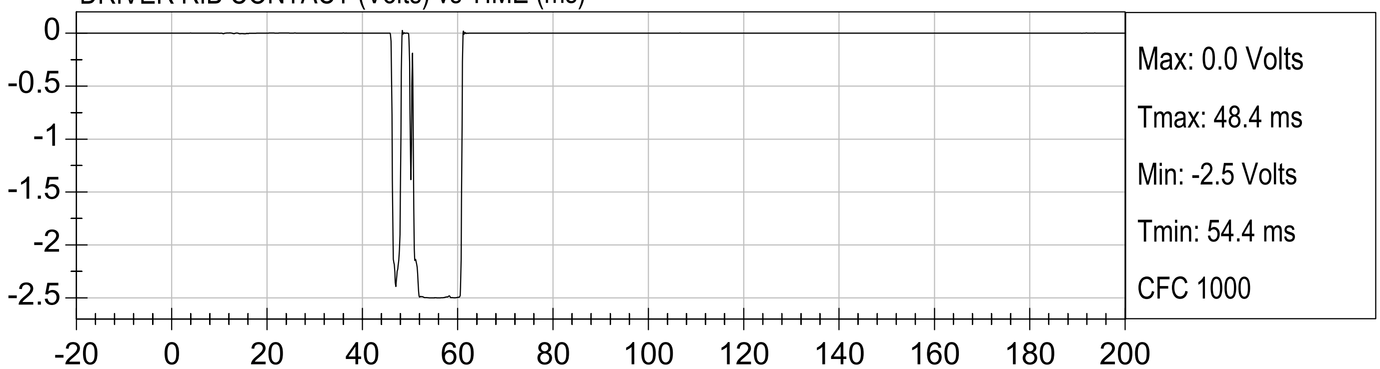
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)

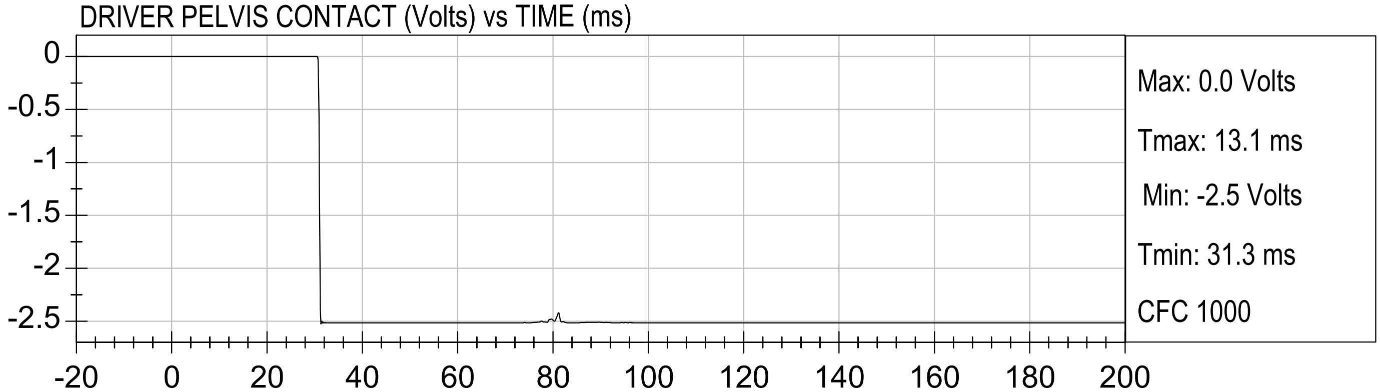
DRIVER ARM CONTACT (Volts) vs TIME (ms)



DRIVER RIB CONTACT (Volts) vs TIME (ms)



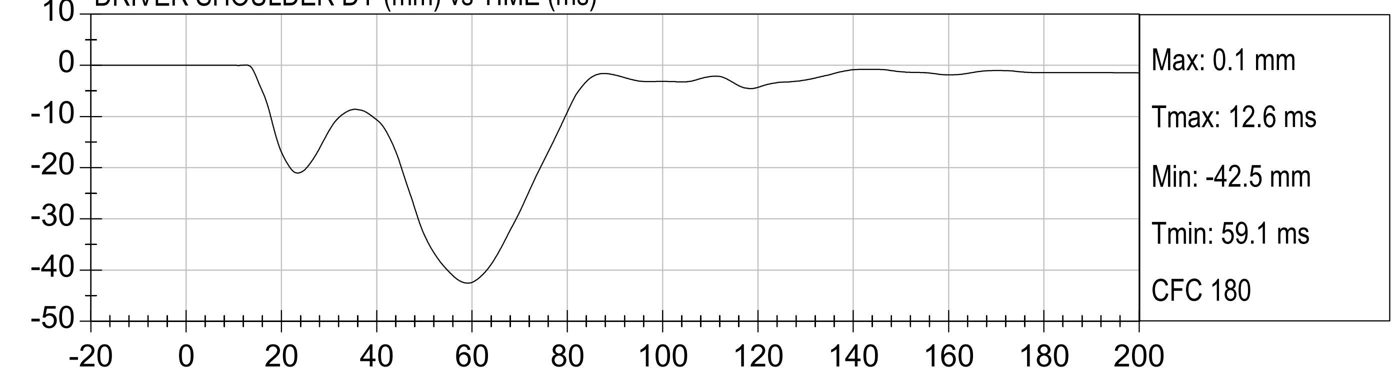
DRIVER PELVIS CONTACT (Volts) vs TIME (ms)



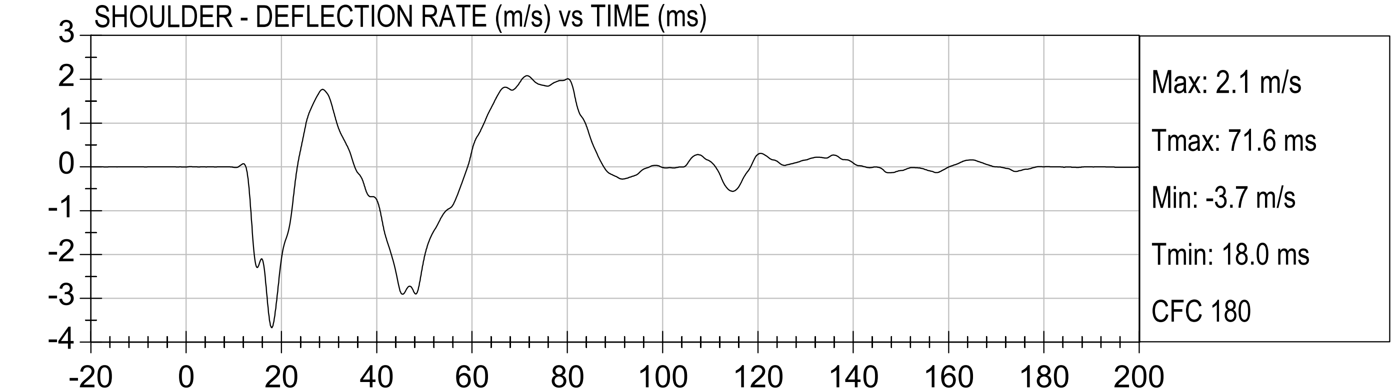
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)

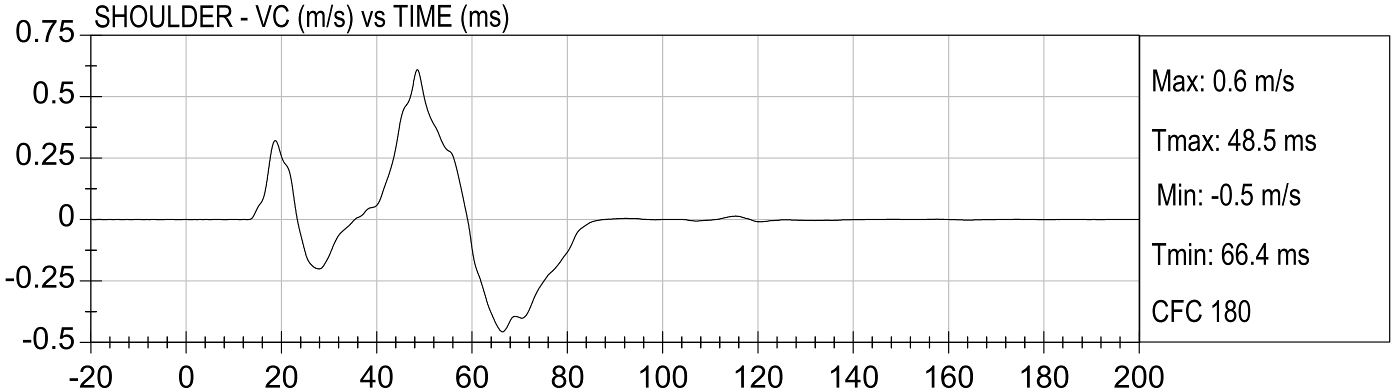
DRIVER SHOULDER DY (mm) vs TIME (ms)

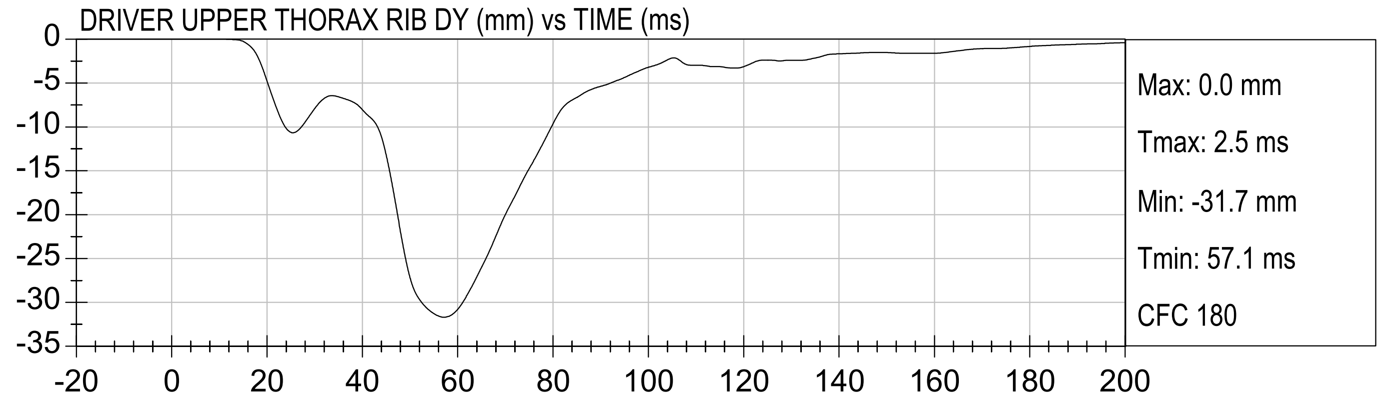


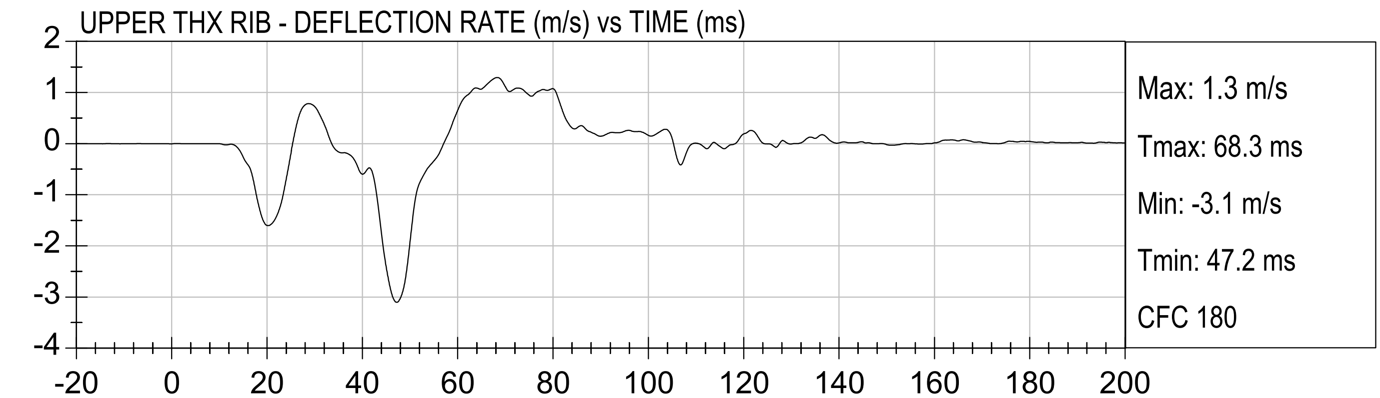
SHOULDER - DEFLECTION RATE (m/s) vs TIME (ms)

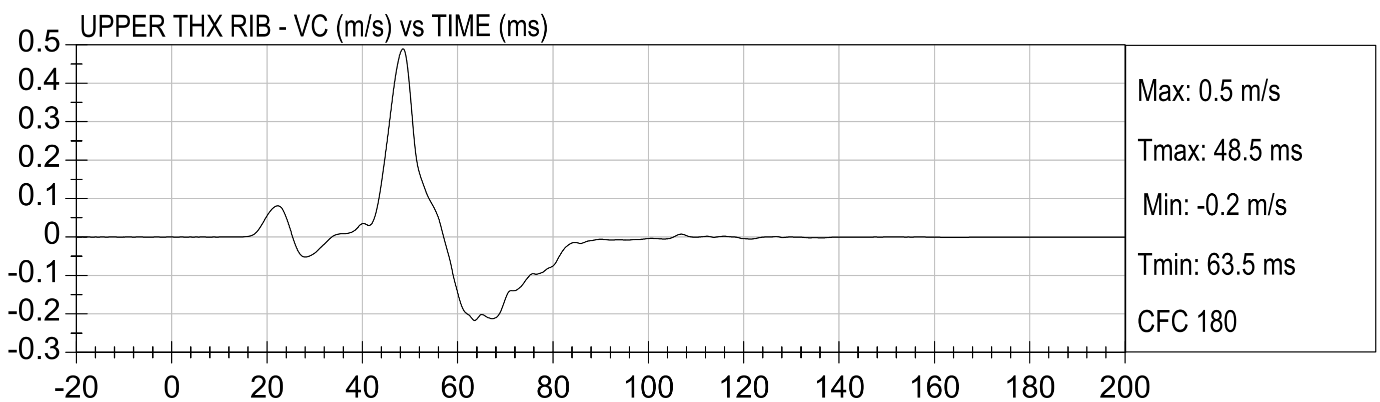


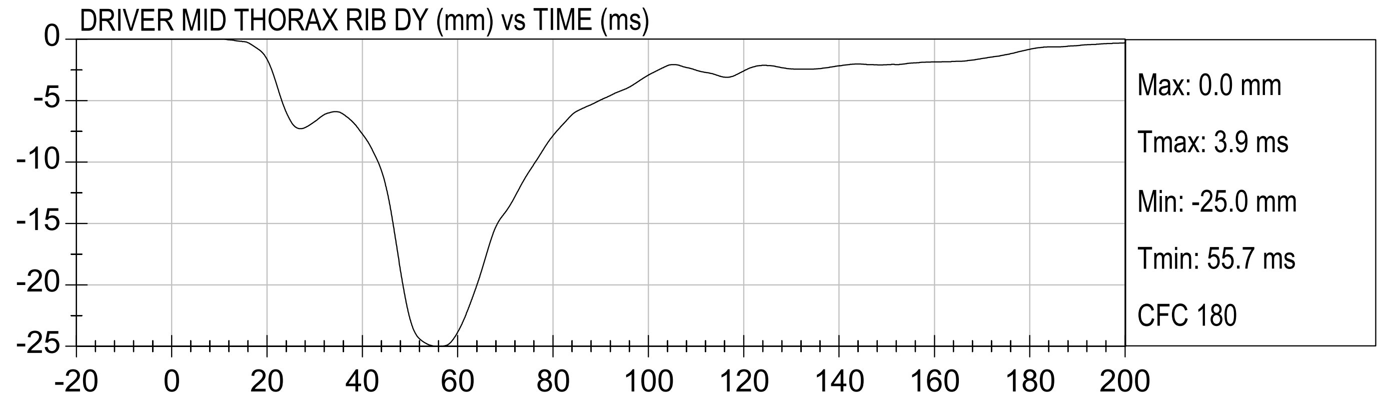
SHOULDER - VC (m/s) vs TIME (ms)

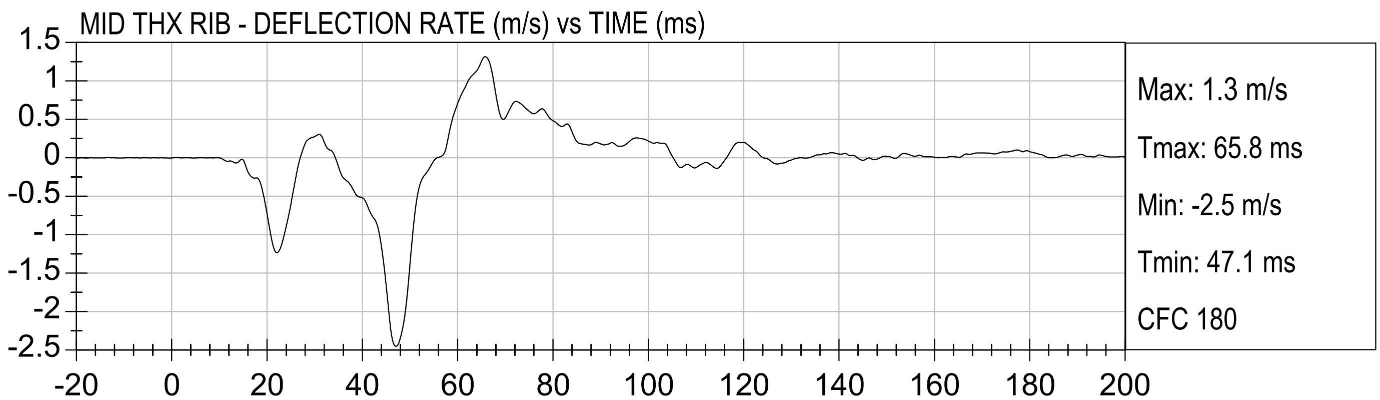


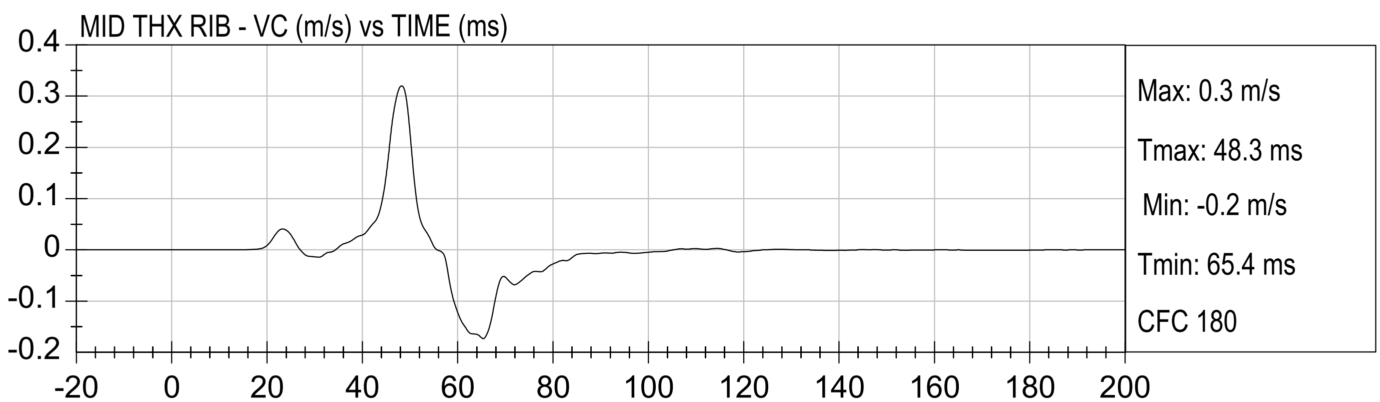

DRIVER UPPER THORAX RIB DY (mm) vs TIME (ms)
0
-5
-10
-15
-20
-25
-30
-35
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 0.0 mm
Tmax: 2.5 ms
Min: -31.7 mm
Tmin: 57.1 ms
CFC 180


UPPER THX RIB - DEFLECTION RATE (m/s) vs TIME (ms)
2
1
0
-1
-2
-3
-4
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 1.3 m/s
Tmax: 68.3 ms
Min: -3.1 m/s
Tmin: 47.2 ms
CFC 180


UPPER THX RIB - VC (m/s) vs TIME (ms)
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 0.5 m/s
Tmax: 48.5 ms
Min: -0.2 m/s
Tmin: 63.5 ms
CFC 180


DRIVER MID THORAX RIB DY (mm) vs TIME (ms)
0
-5
-10
-15
-20
-25
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 0.0 mm
Tmax: 3.9 ms
Min: -25.0 mm
Tmin: 55.7 ms
CFC 180

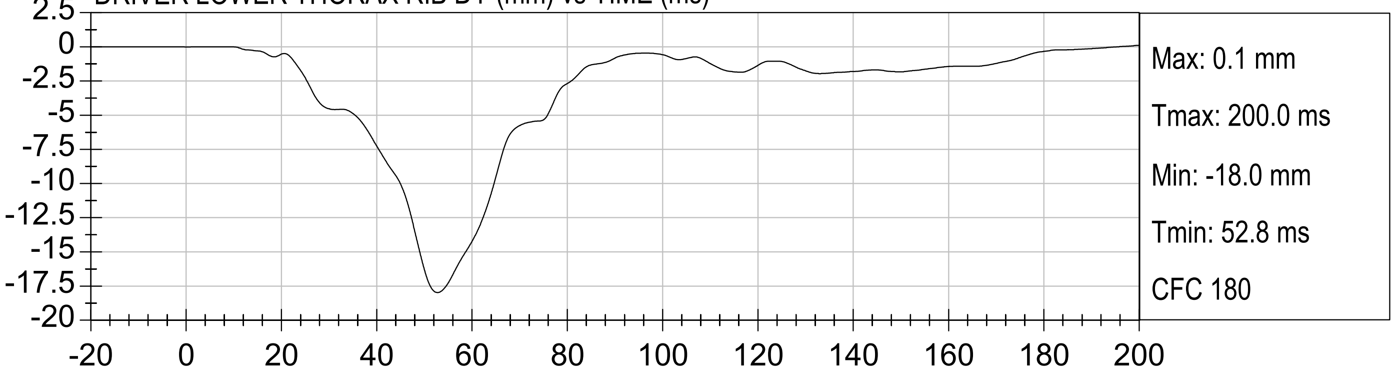

MID THX RIB - DEFLECTION RATE (m/s) vs TIME (ms)
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 1.3 m/s
Tmax: 65.8 ms
Min: -2.5 m/s
Tmin: 47.1 ms
CFC 180


MID THX RIB - VC (m/s) vs TIME (ms)
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 0.3 m/s
Tmax: 48.3 ms
Min: -0.2 m/s
Tmin: 65.4 ms
CFC 180

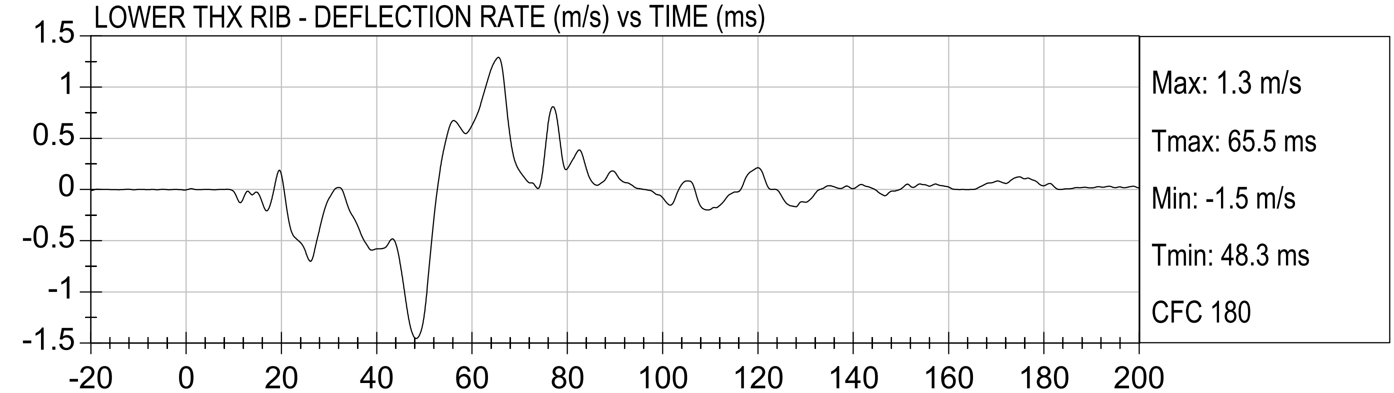
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)

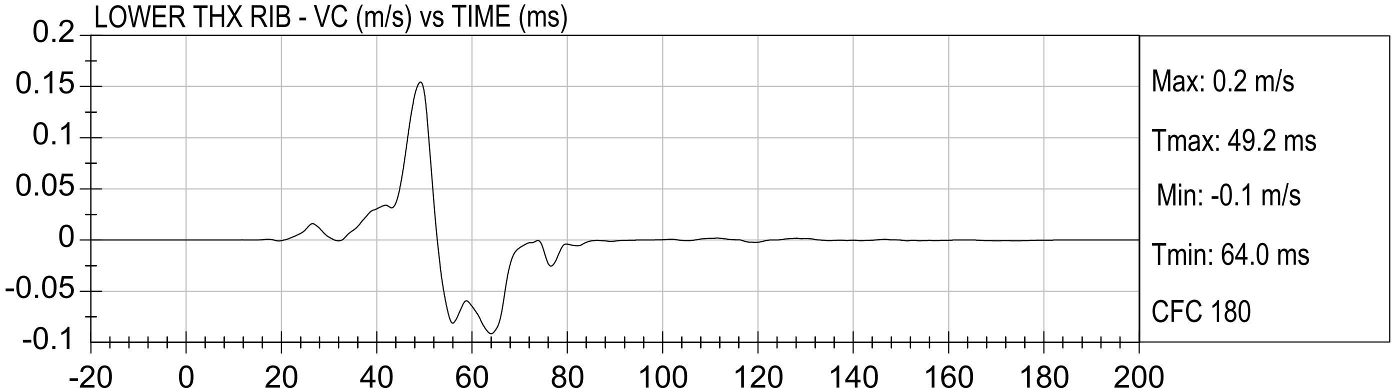
DRIVER LOWER THORAX RIB DY (mm) vs TIME (ms)

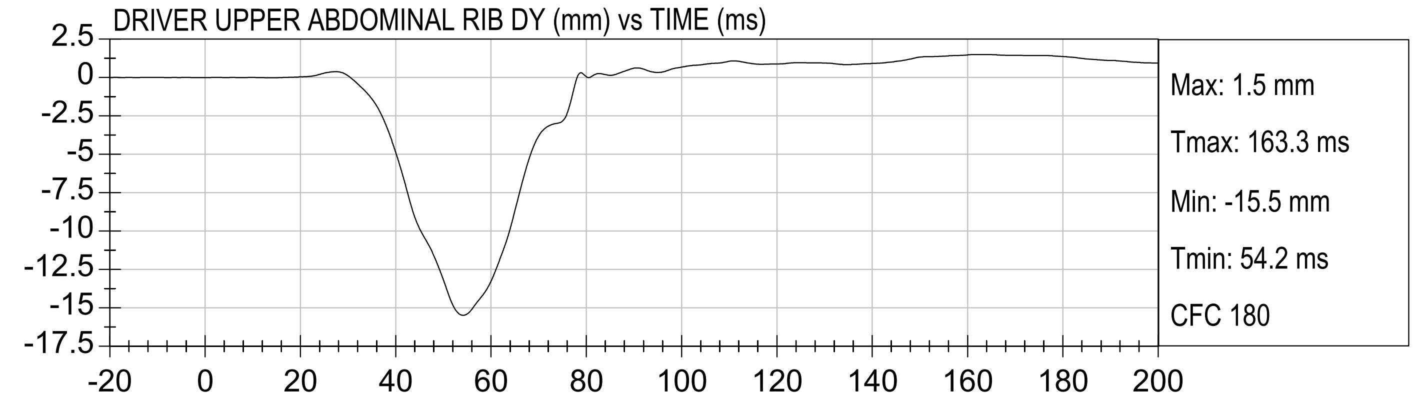


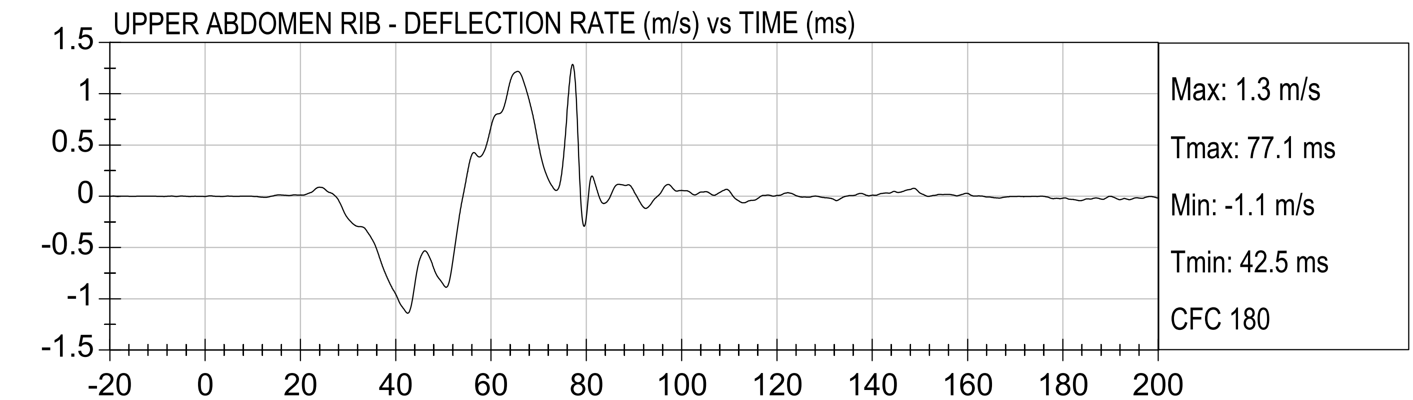
LOWER THX RIB - DEFLECTION RATE (m/s) vs TIME (ms)

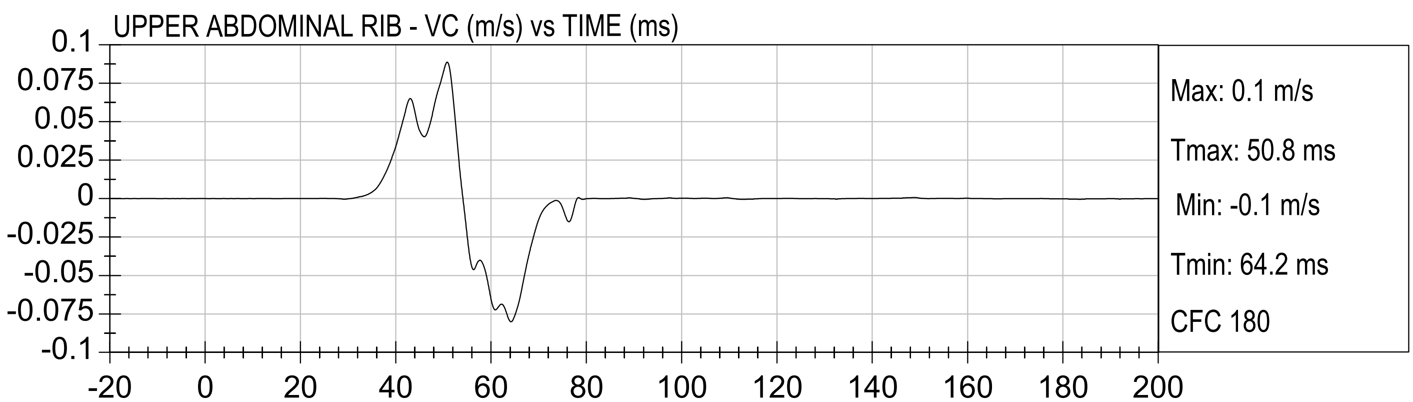


LOWER THX RIB - VC (m/s) vs TIME (ms)



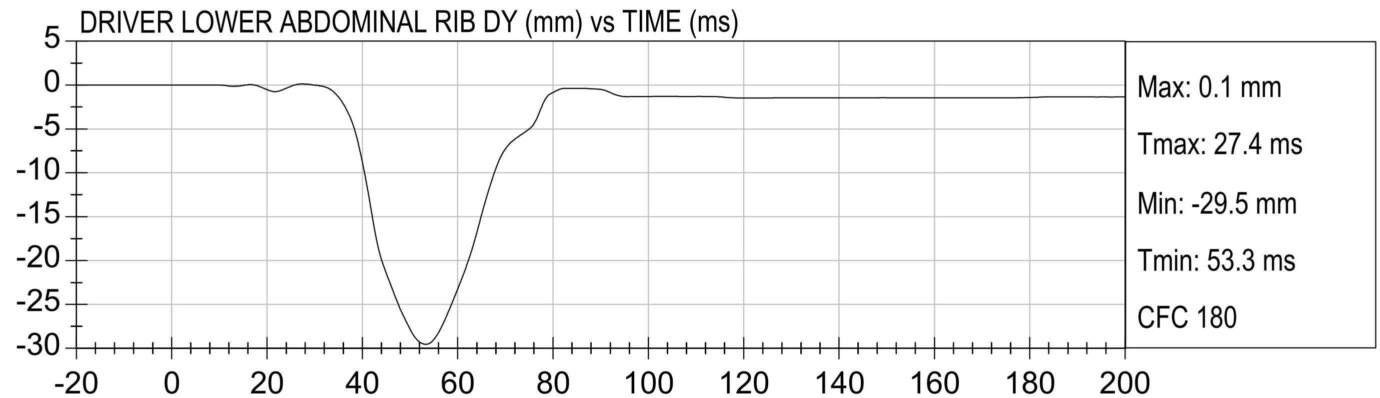

DRIVER UPPER ABDOMINAL RIB DY (mm) vs TIME (ms)
2.5
0
-2.5
-5
-7.5
-10
-12.5
-15
-17.5
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 1.5 mm
Tmax: 163.3 ms
Min: -15.5 mm
Tmin: 54.2 ms
CFC 180

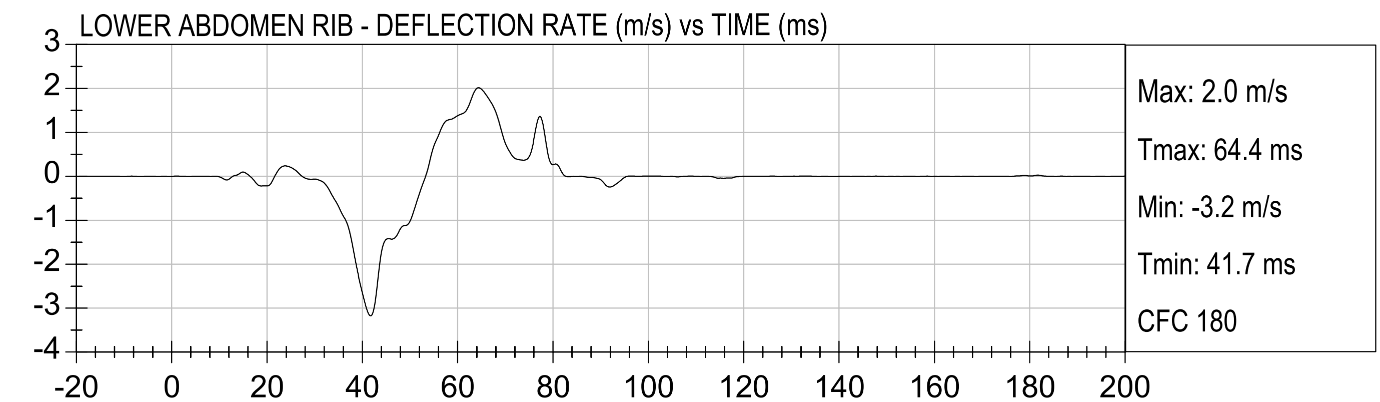

UPPER ABDOMEN RIB - DEFLECTION RATE (m/s) vs TIME (ms)
1.5
1
0.5
0
-0.5
-1
-1.5
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 1.3 m/s
Tmax: 77.1 ms
Min: -1.1 m/s
Tmin: 42.5 ms
CFC 180

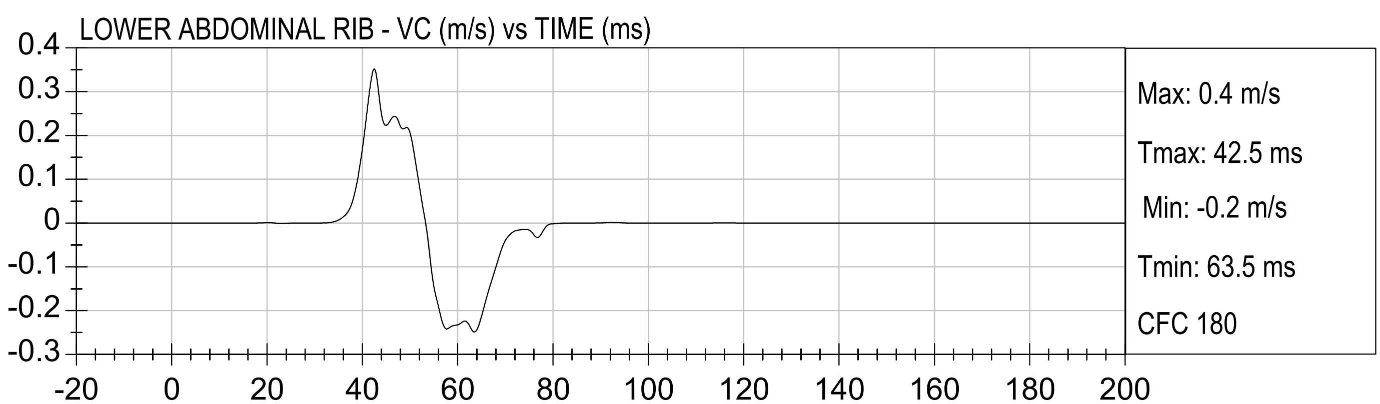

UPPER ABDOMINAL RIB - VC (m/s) vs TIME (ms)
0.1
0.075
0.05
0.025
0
-0.025
-0.05
-0.075
-0.1
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 0.1 m/s
Tmax: 50.8 ms
Min: -0.1 m/s
Tmin: 64.2 ms
CFC 180

OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)



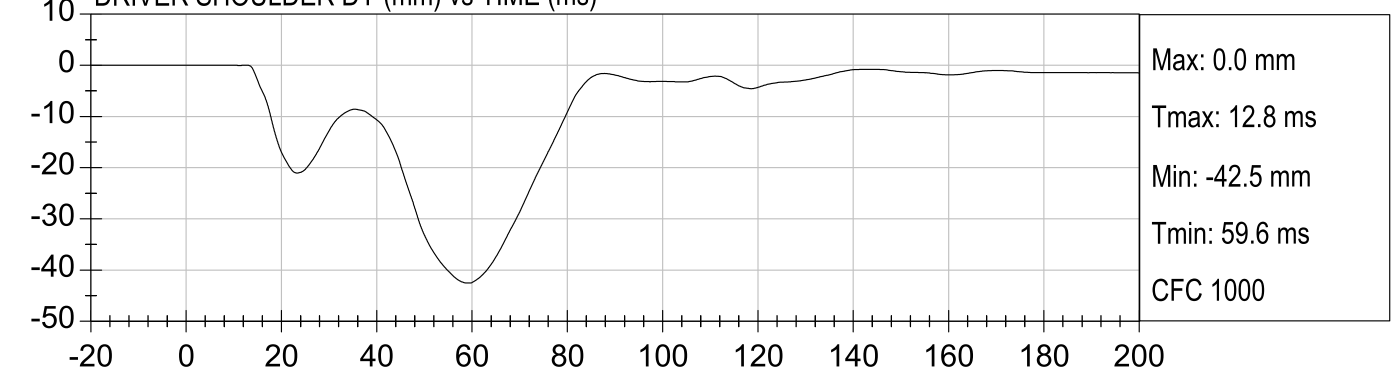




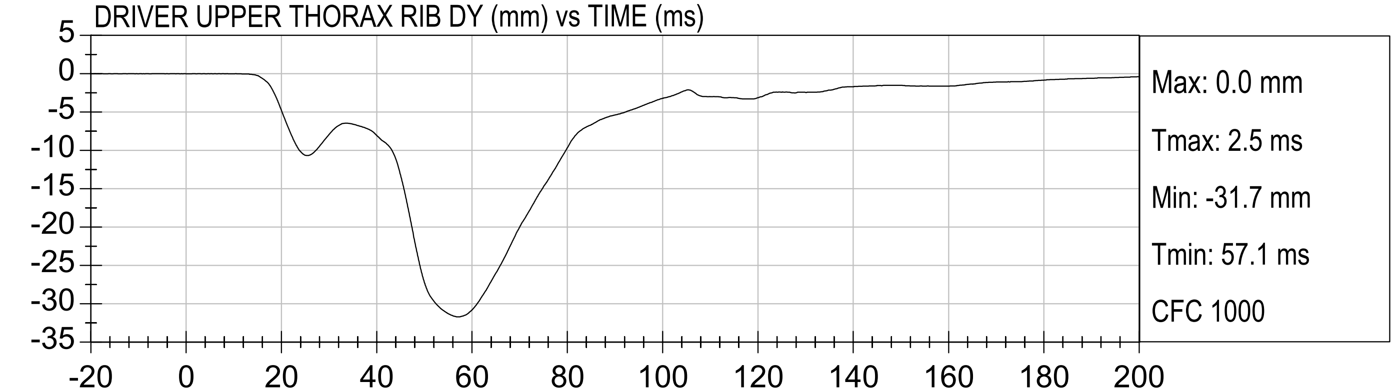
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)

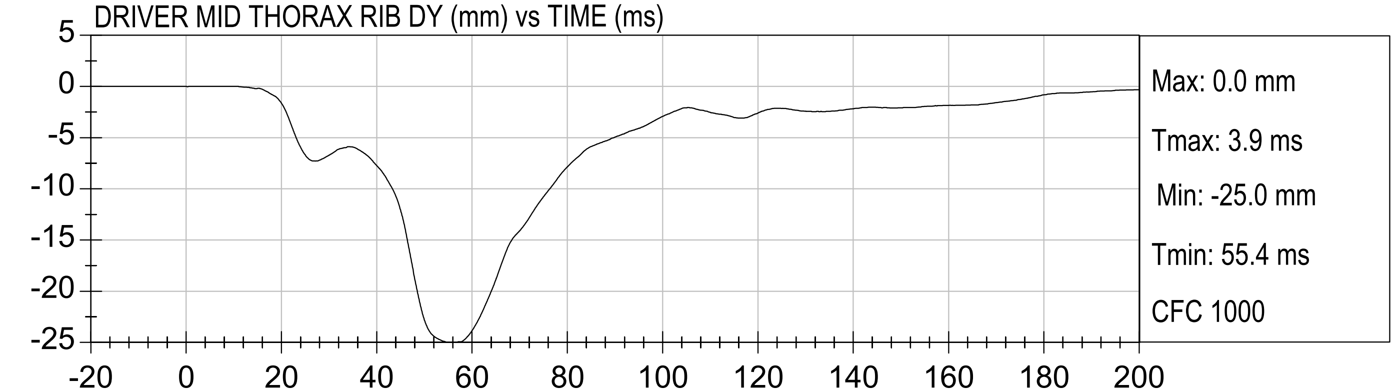
DRIVER SHOULDER DY (mm) vs TIME (ms)



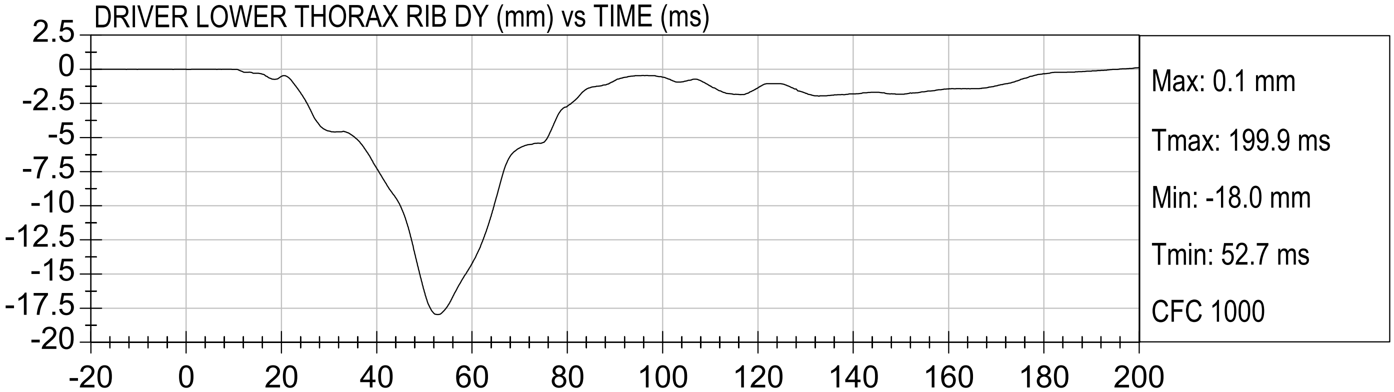
DRIVER UPPER THORAX RIB DY (mm) vs TIME (ms)



DRIVER MID THORAX RIB DY (mm) vs TIME (ms)

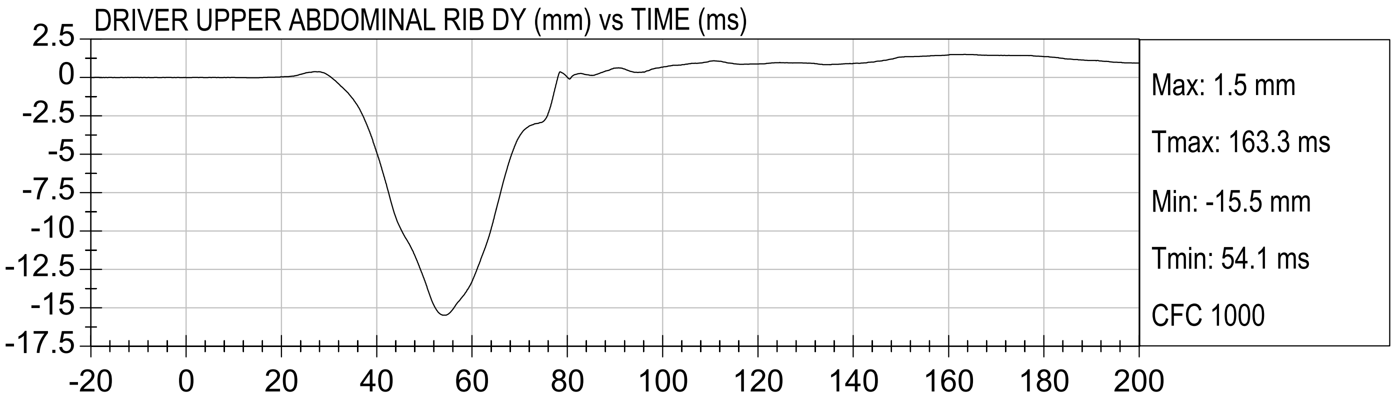


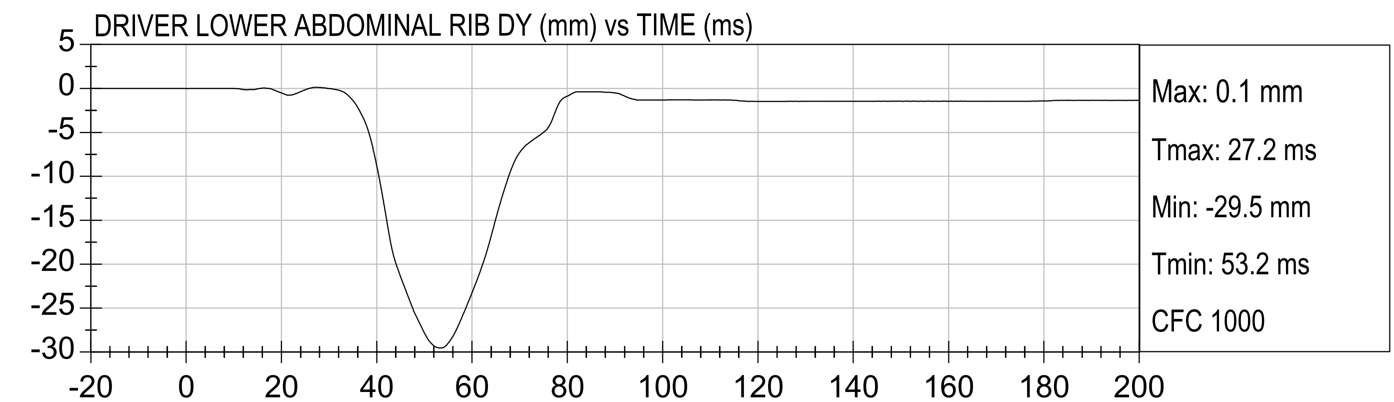
DRIVER LOWER THORAX RIB DY (mm) vs TIME (ms)



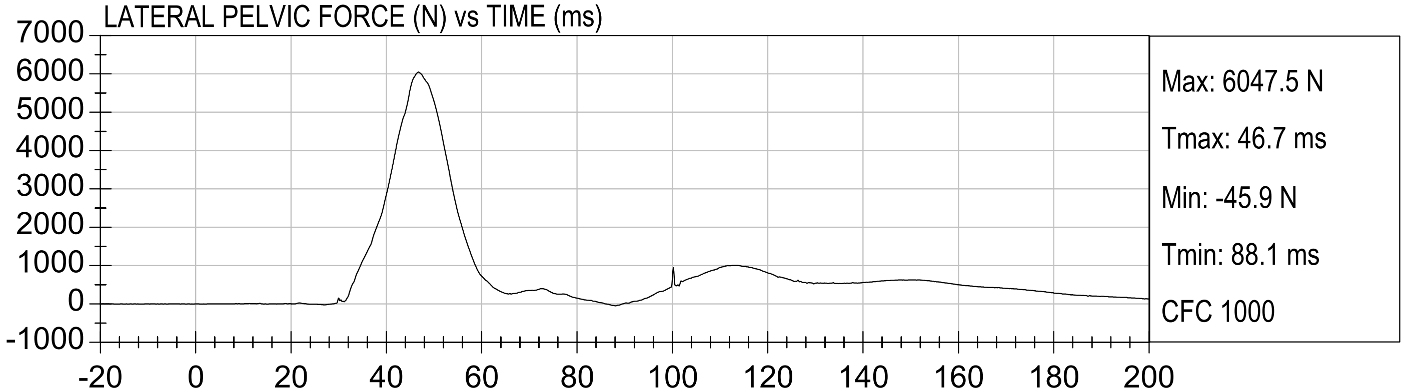
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)

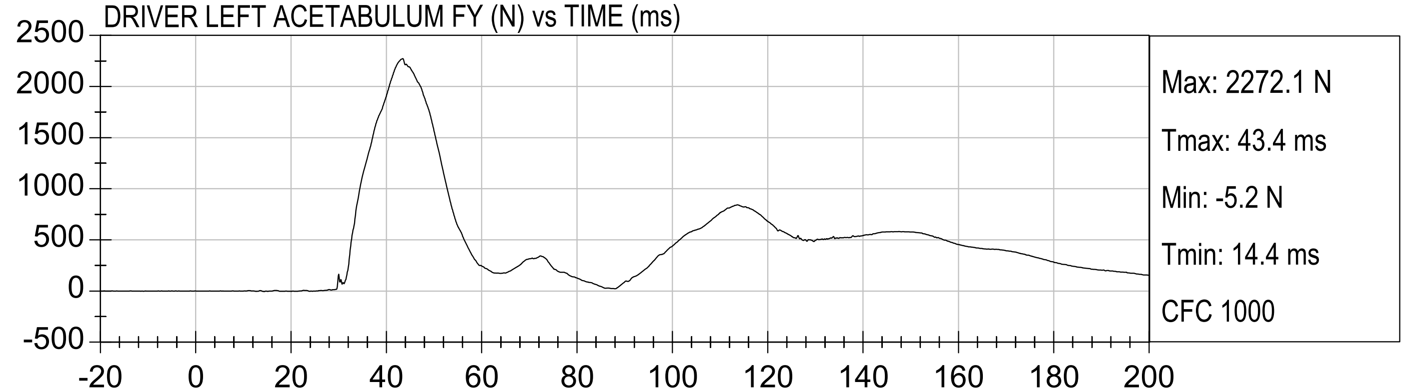




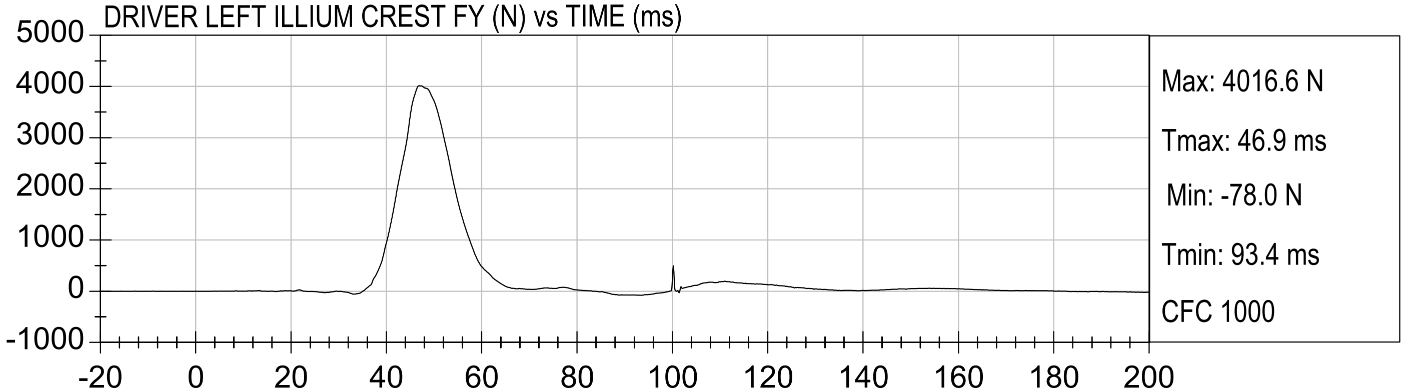
LATERAL PELVIC FORCE (N) vs TIME (ms)



DRIVER LEFT ACETABULUM FY (N) vs TIME (ms)

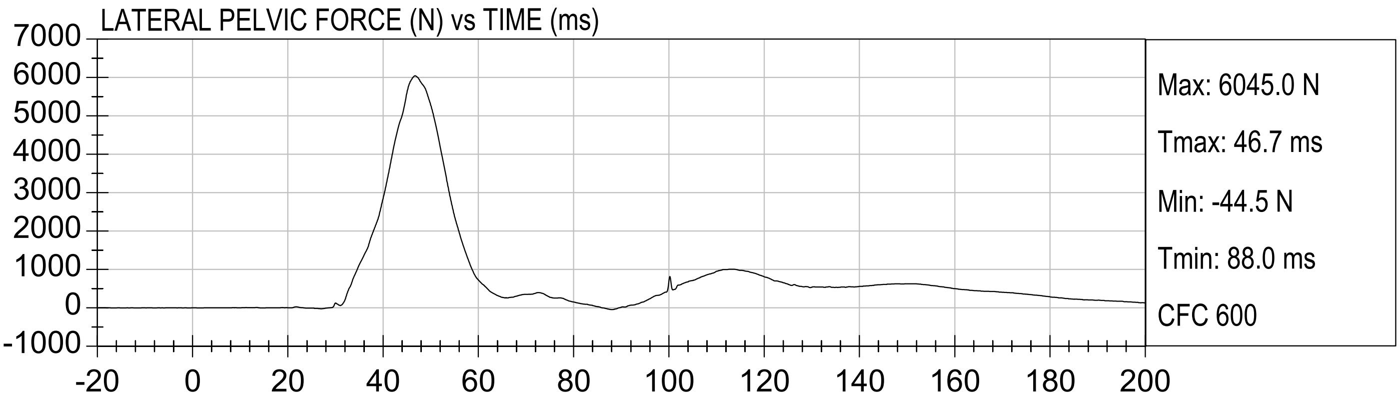


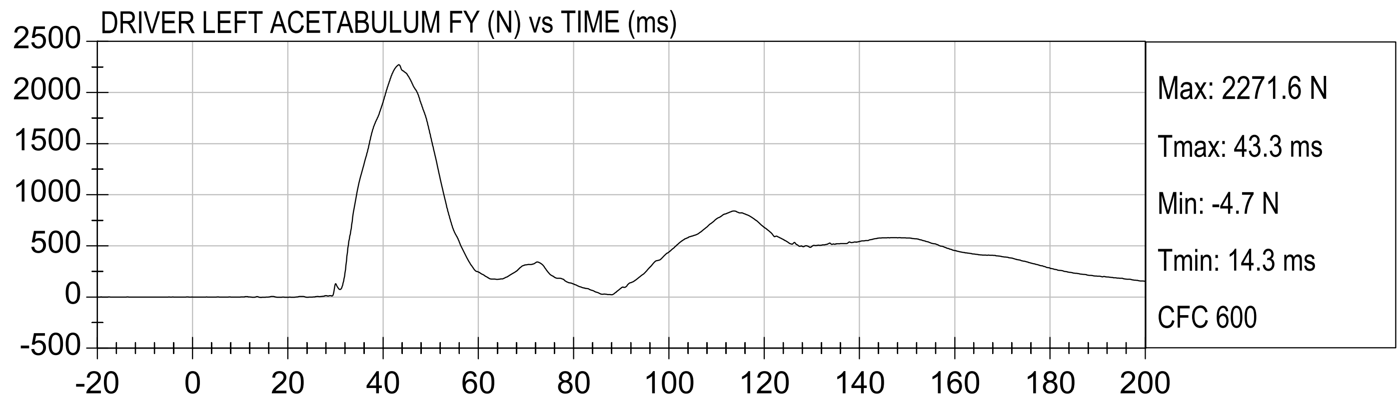
DRIVER LEFT ILLIUM CREST FY (N) vs TIME (ms)

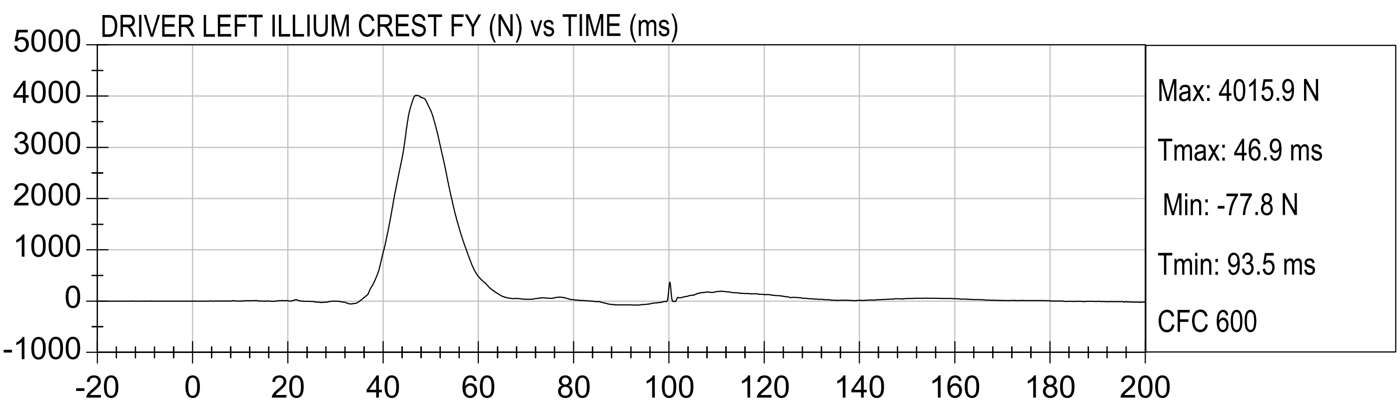


OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)

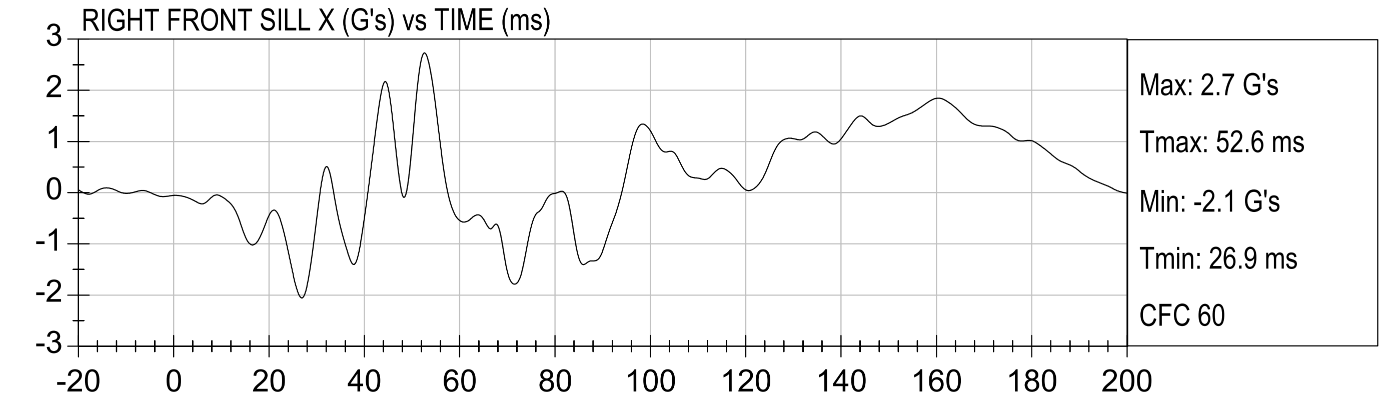


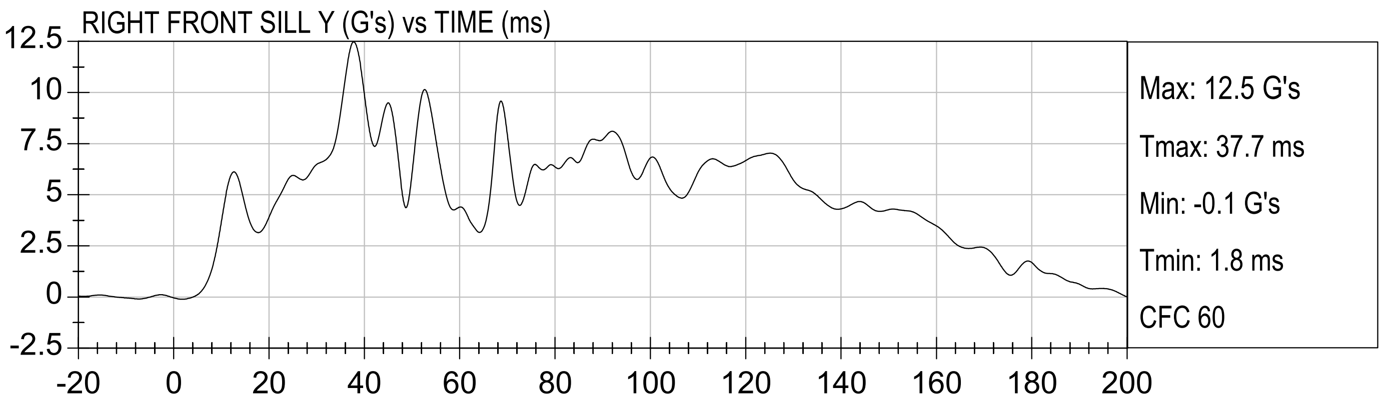


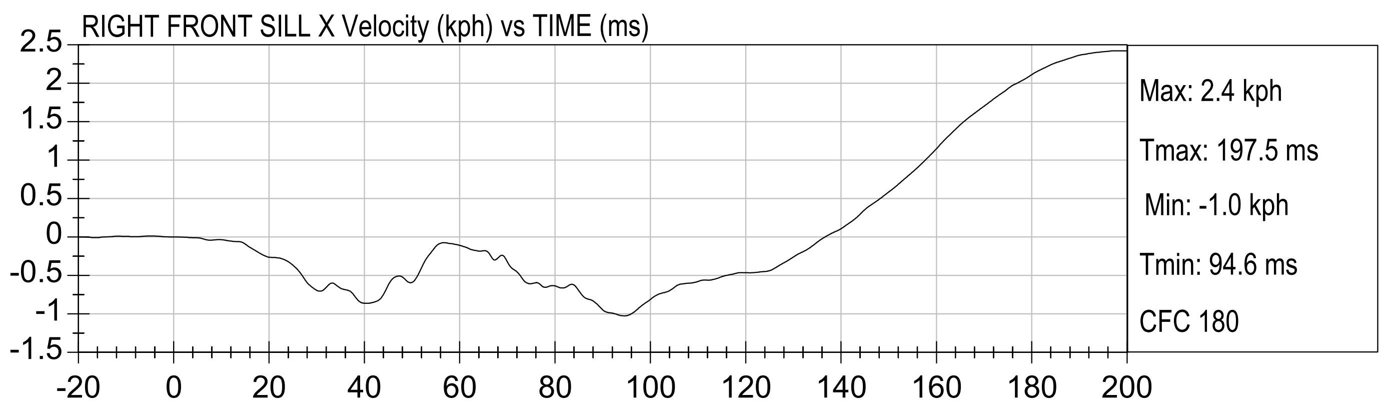


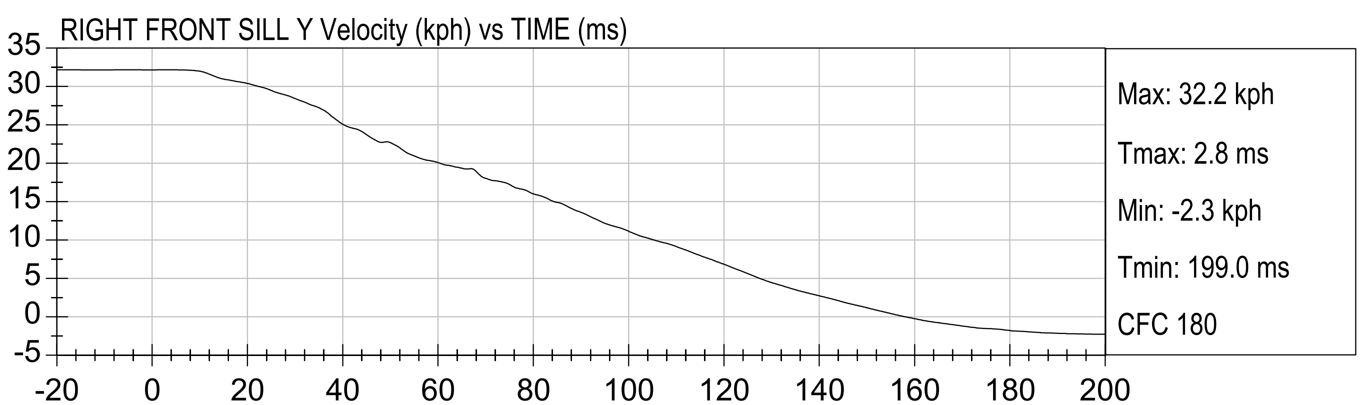
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)





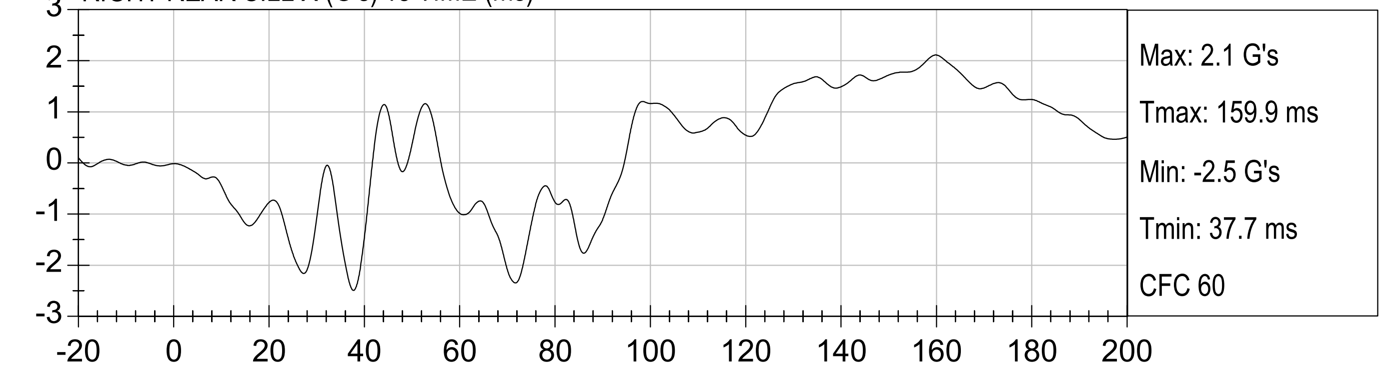




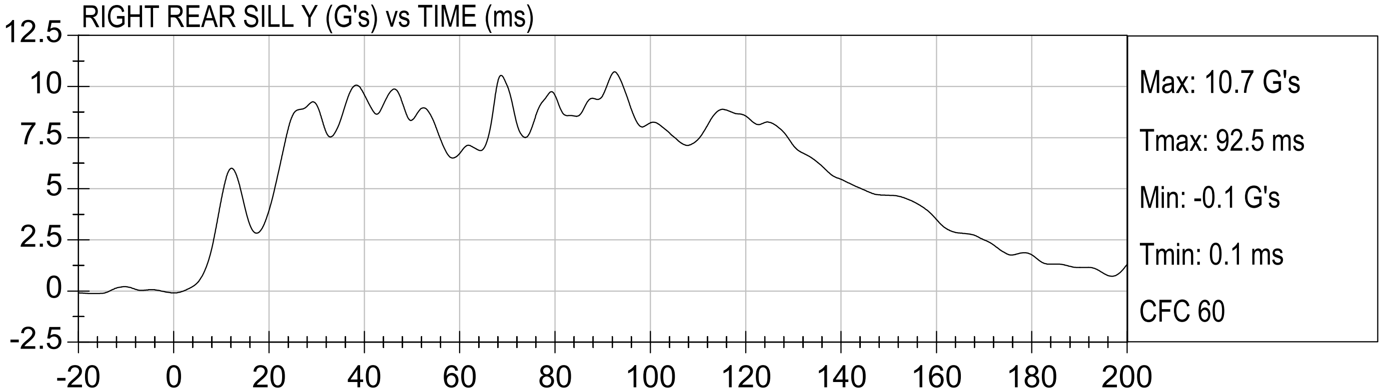
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)

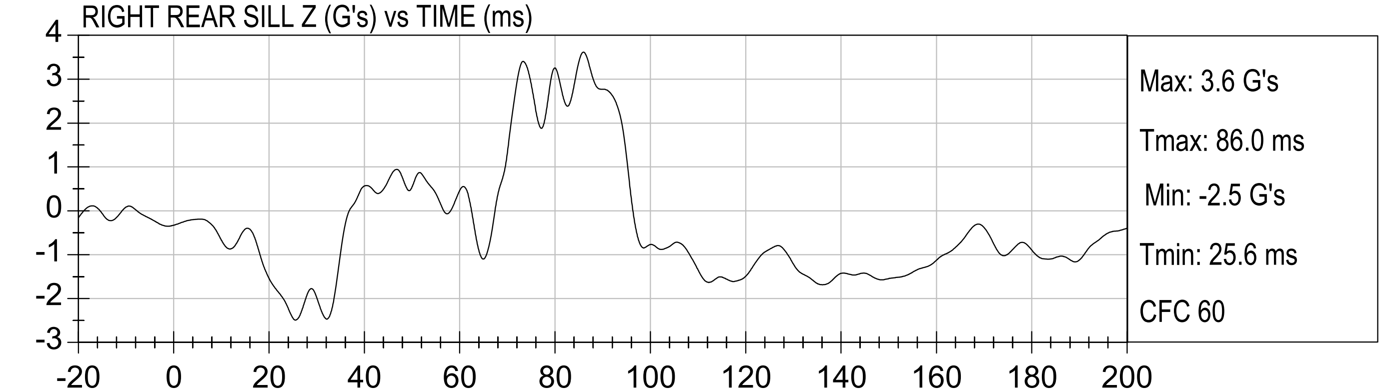
RIGHT REAR SILL X (G's) vs TIME (ms)



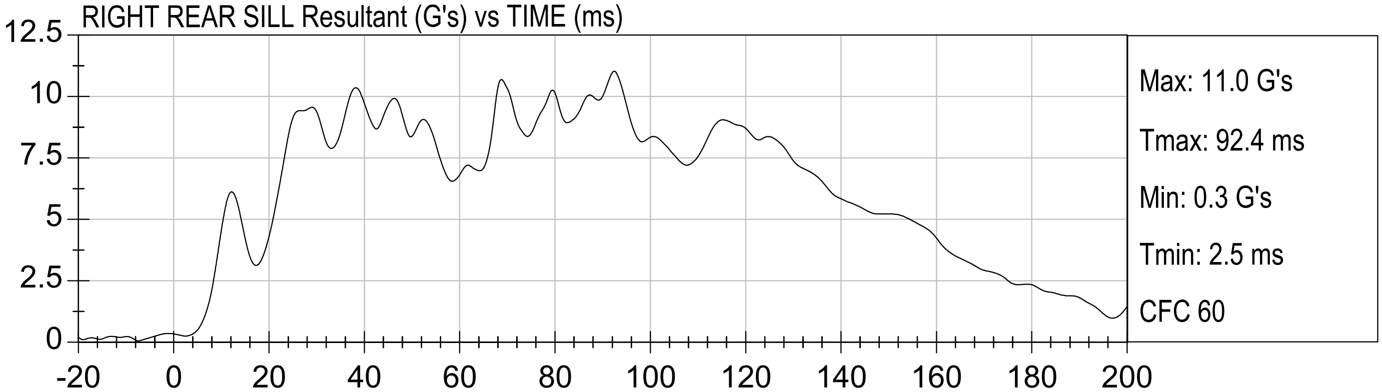
RIGHT REAR SILL Y (G's) vs TIME (ms)

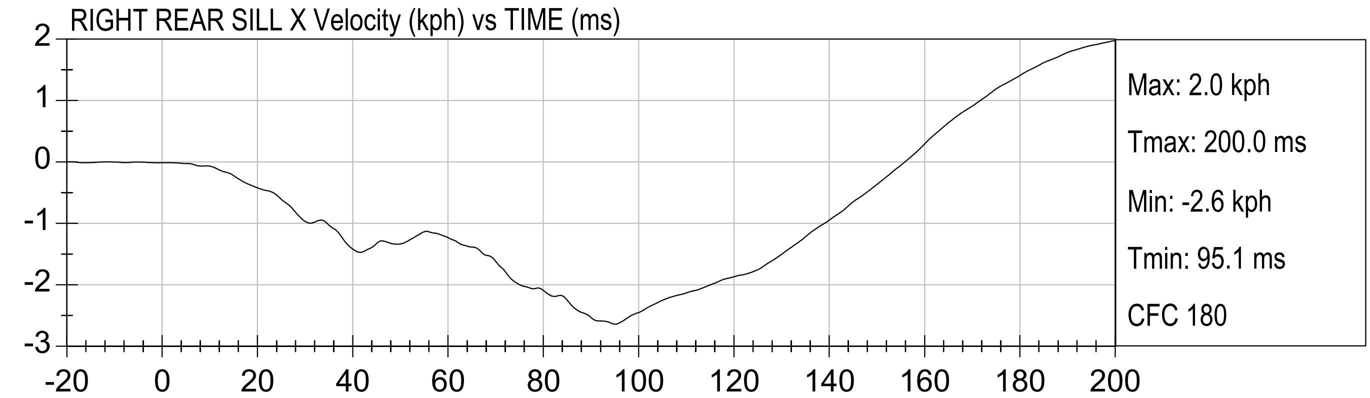


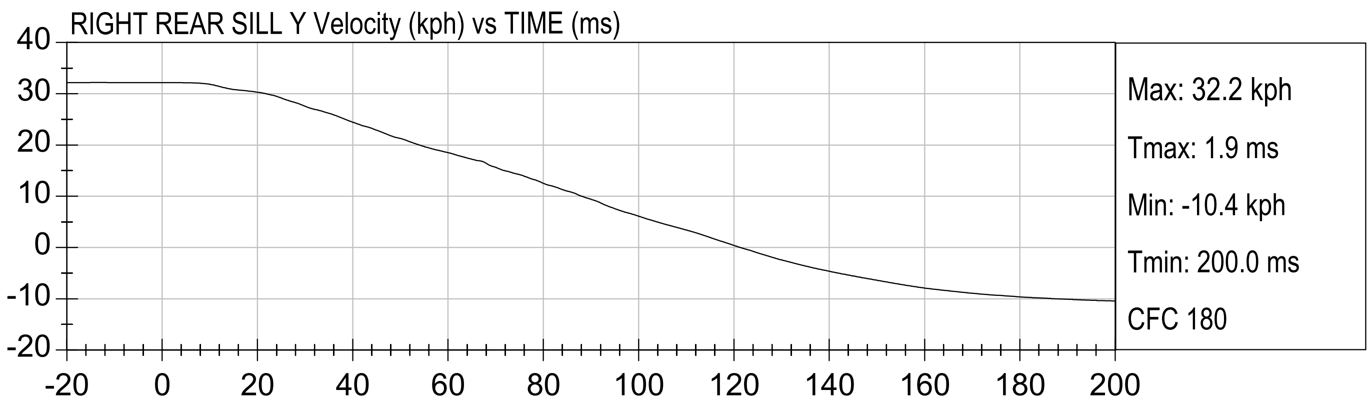
RIGHT REAR SILL Z (G's) vs TIME (ms)

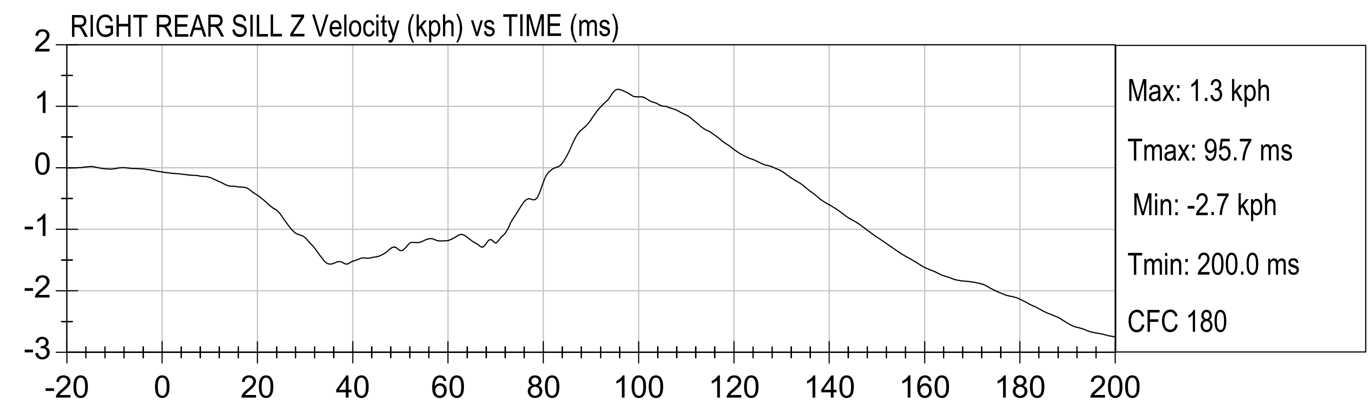


RIGHT REAR SILL Resultant (G's) vs TIME (ms)




RIGHT REAR SILL X Velocity (kph) vs TIME (ms)
Max: 2.0 kph
Tmax: 200.0 ms
Min: -2.6 kph
Tmin: 95.1 ms
CFC 180

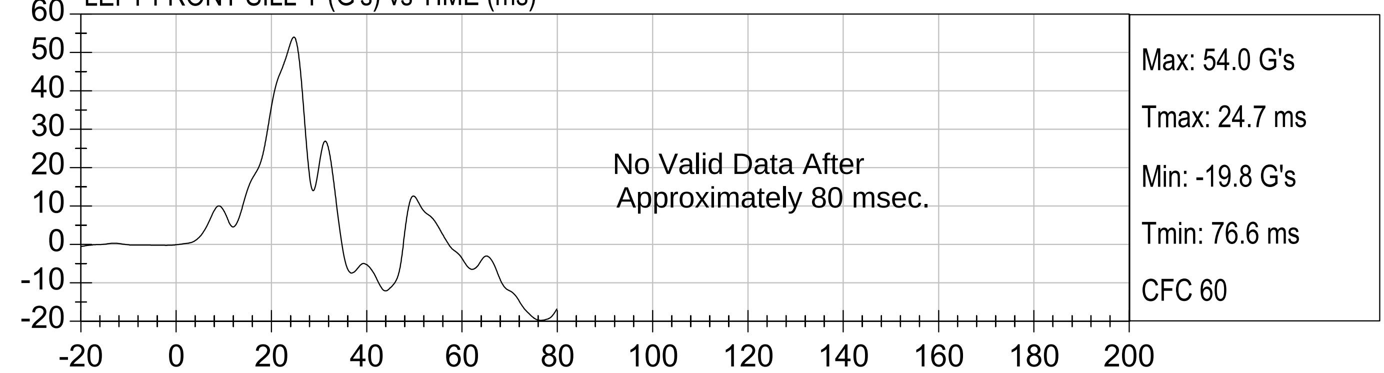

RIGHT REAR SILL Y Velocity (kph) vs TIME (ms)
Max: 32.2 kph
Tmax: 1.9 ms
Min: -10.4 kph
Tmin: 200.0 ms
CFC 180


RIGHT REAR SILL Z Velocity (kph) vs TIME (ms)
Max: 1.3 kph
Tmax: 95.7 ms
Min: -2.7 kph
Tmin: 200.0 ms
CFC 180

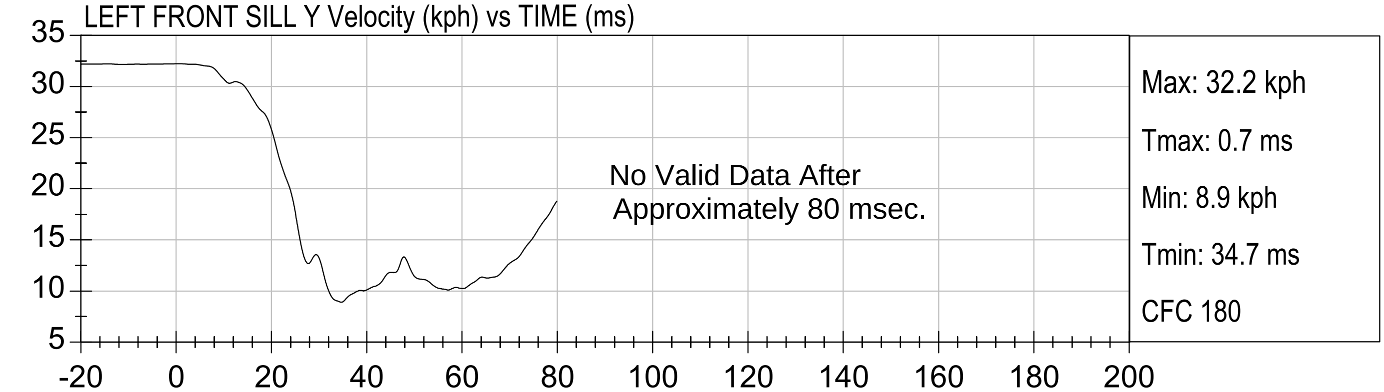
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)

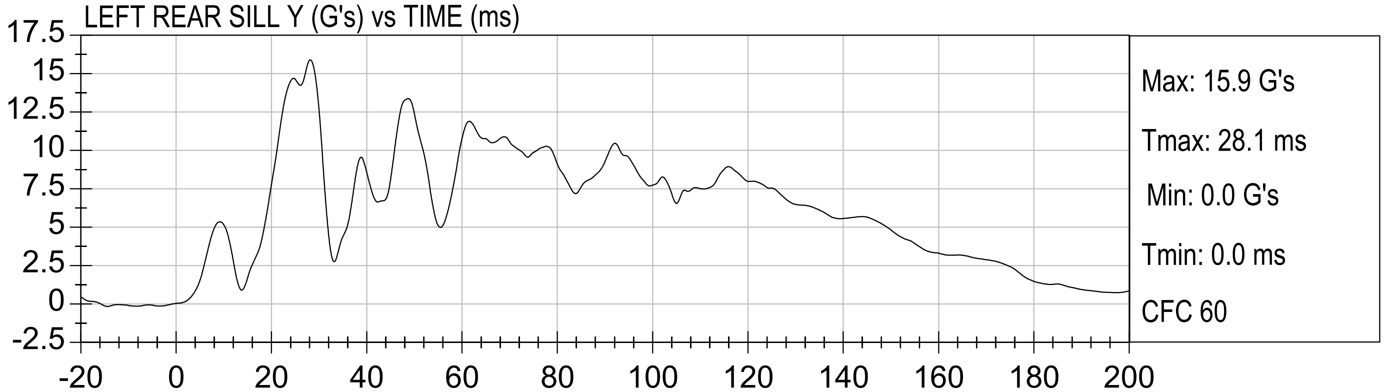
LEFT FRONT SILL Y (G's) vs TIME (ms)



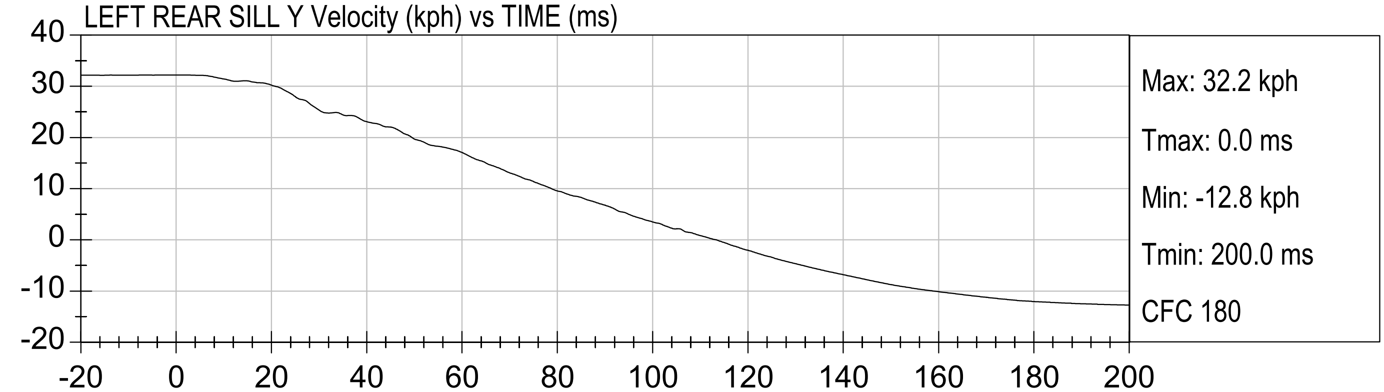
LEFT FRONT SILL Y Velocity (kph) vs TIME (ms)



LEFT REAR SILL Y (G's) vs TIME (ms)



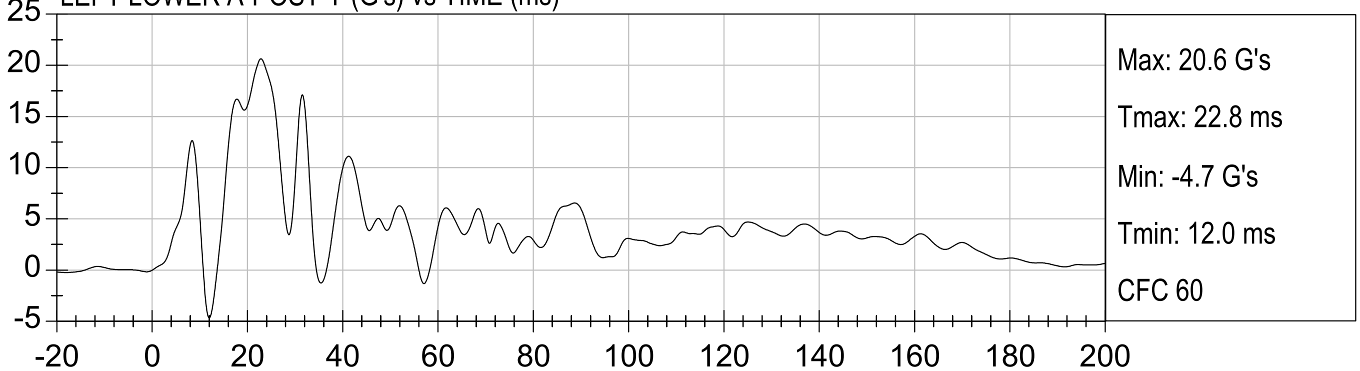
LEFT REAR SILL Y Velocity (kph) vs TIME (ms)



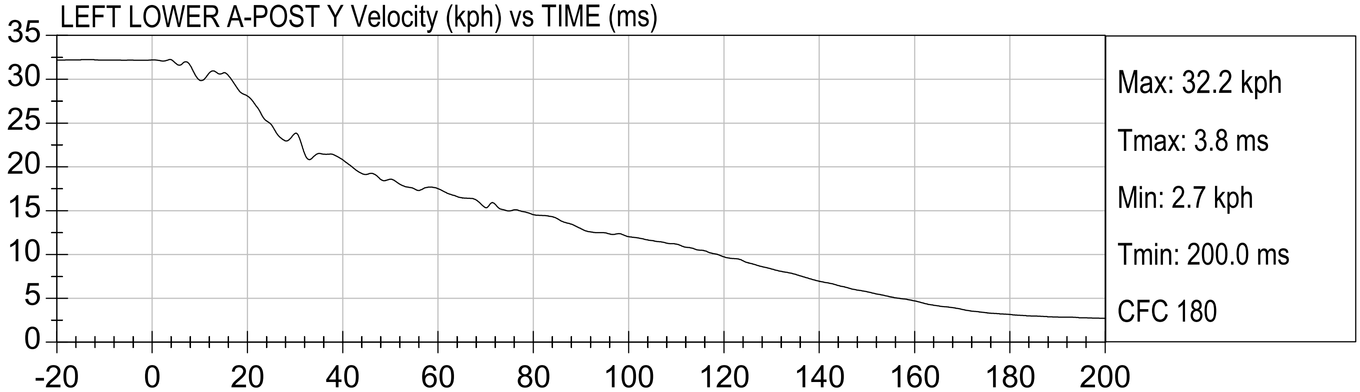
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)

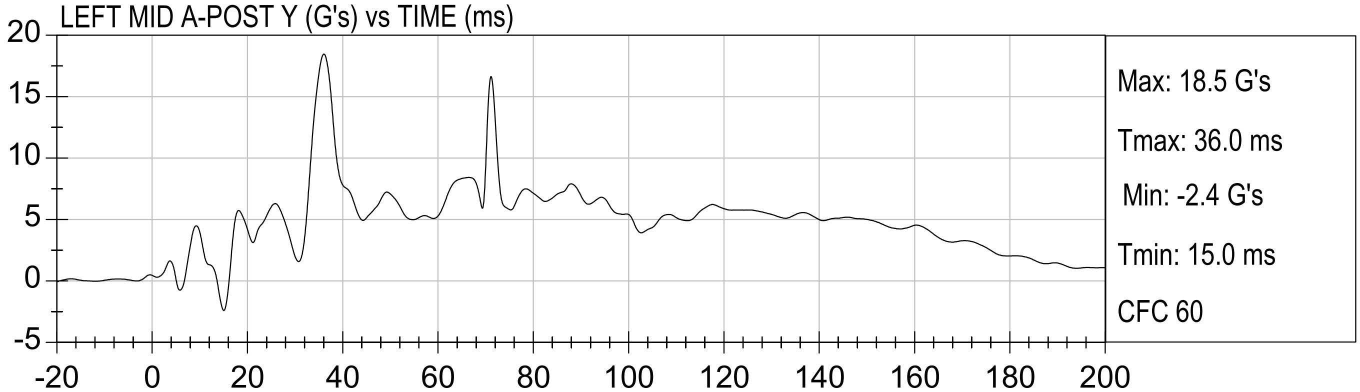
LEFT LOWER A-POST Y (G's) vs TIME (ms)



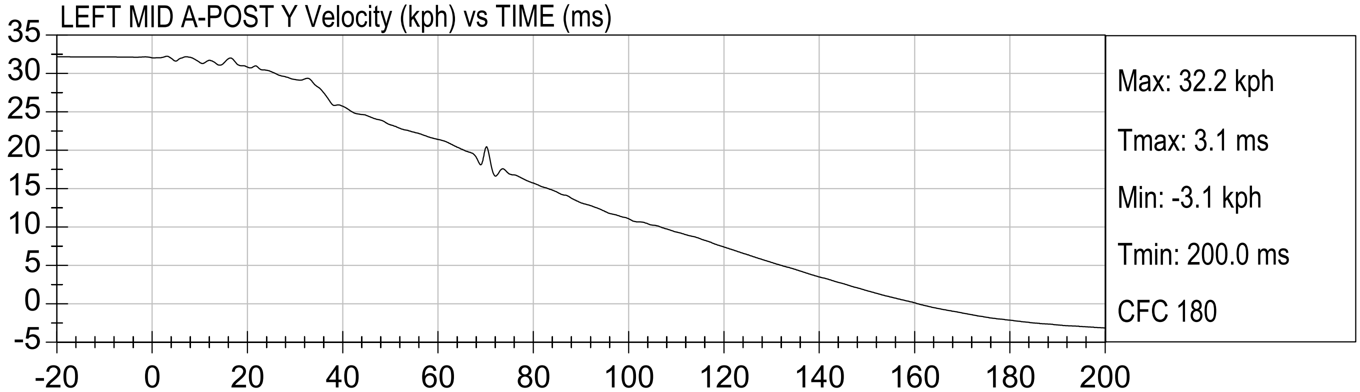
LEFT LOWER A-POST Y Velocity (kph) vs TIME (ms)



LEFT MID A-POST Y (G's) vs TIME (ms)

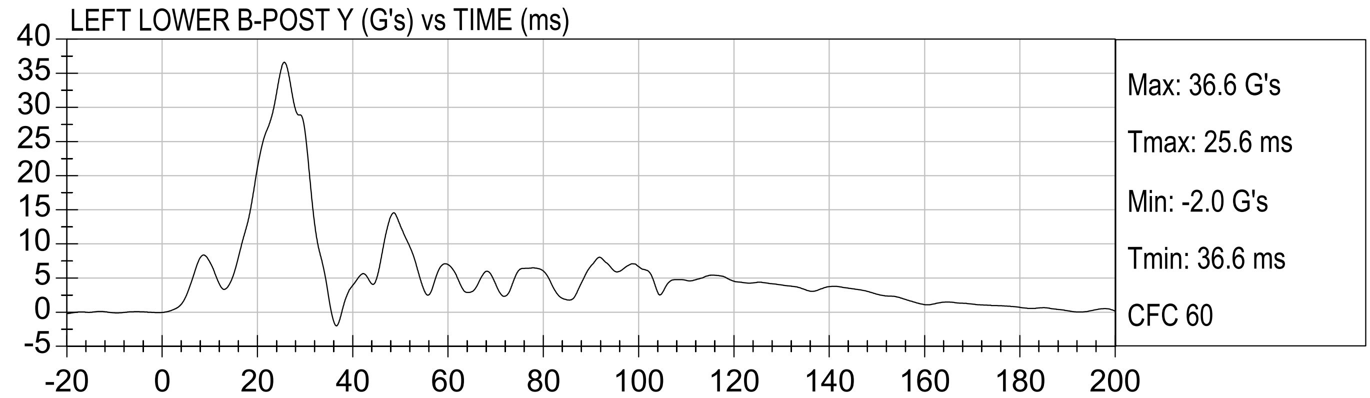


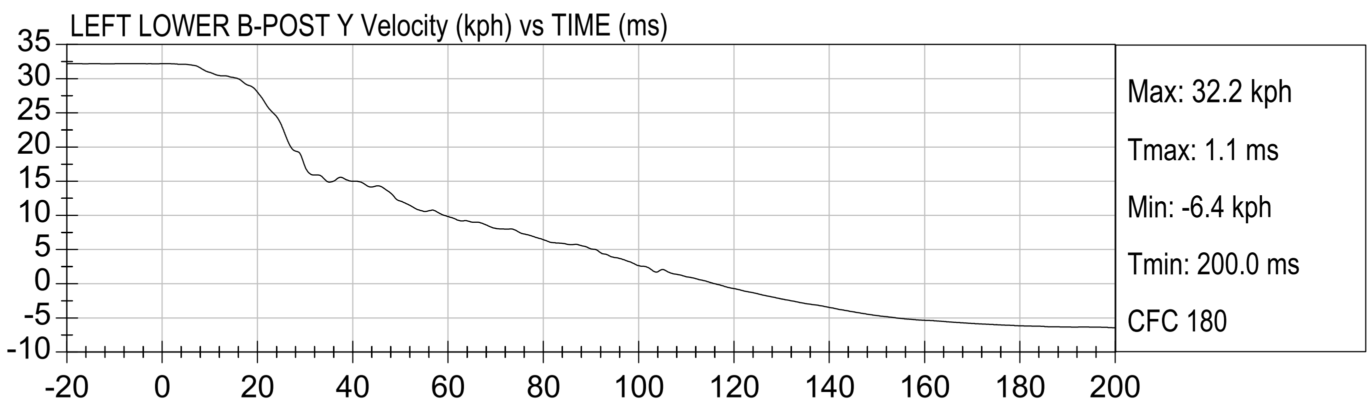
LEFT MID A-POST Y Velocity (kph) vs TIME (ms)

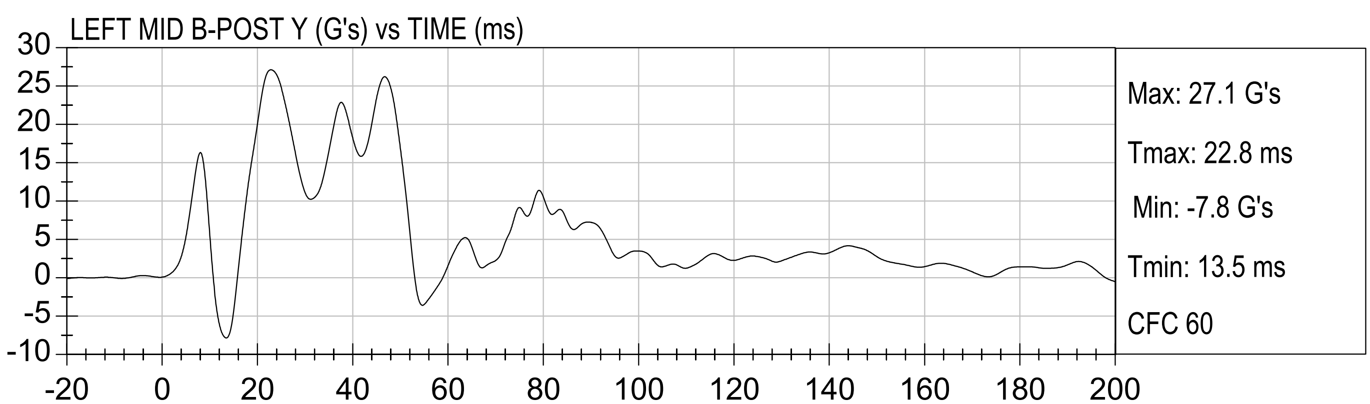


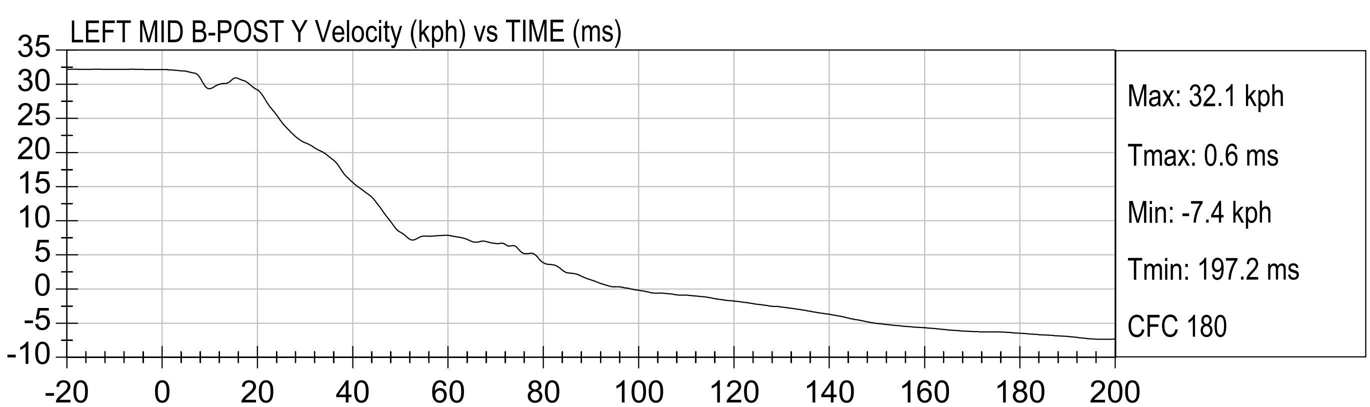
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

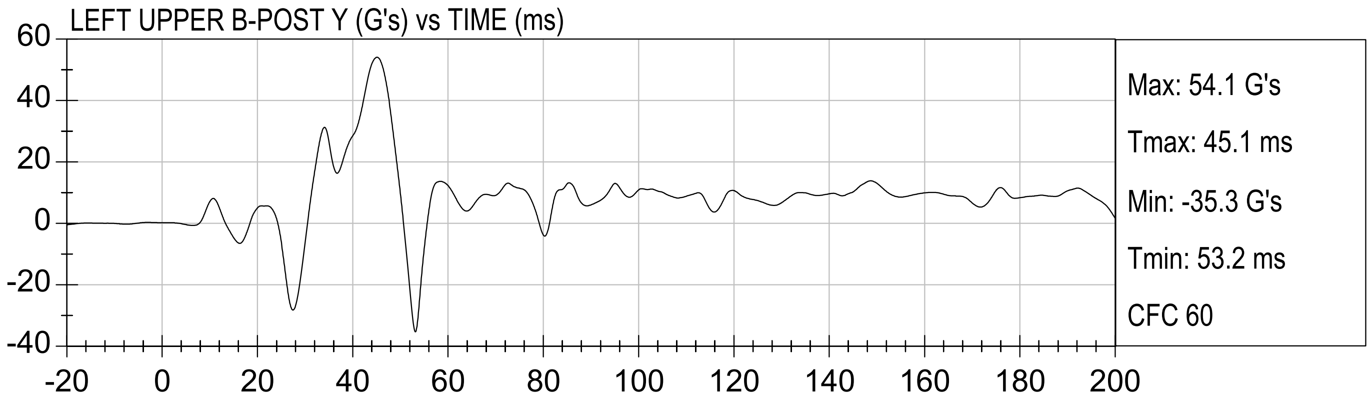
Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)

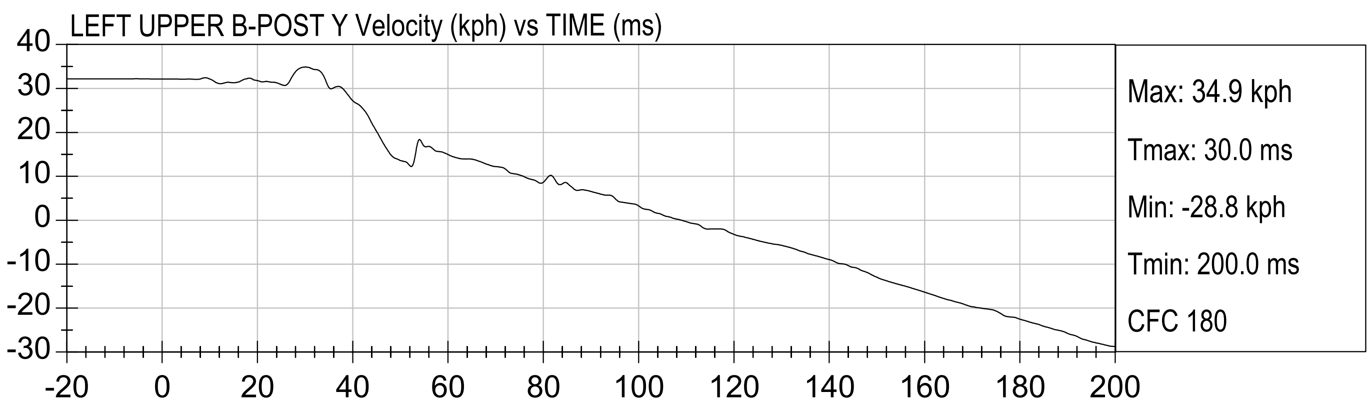


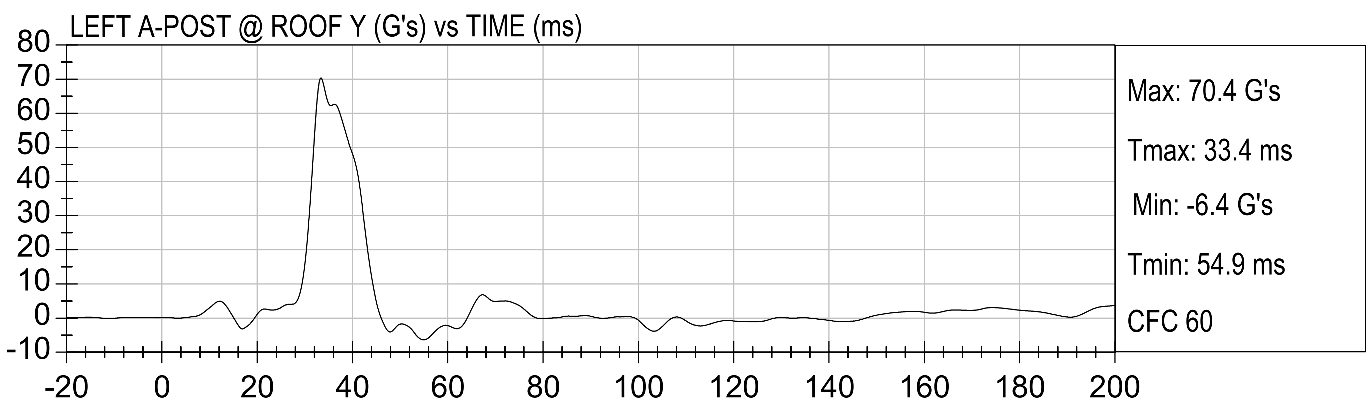


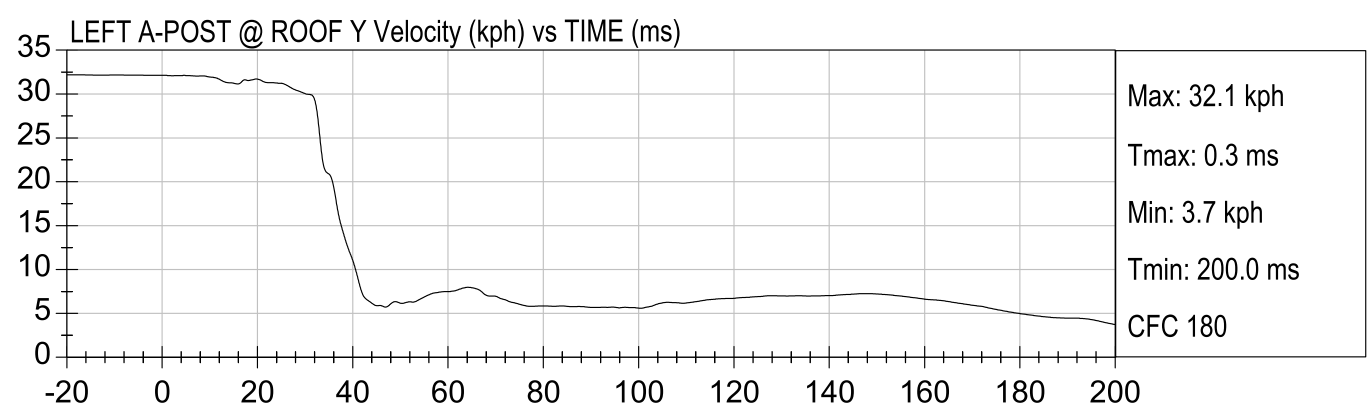


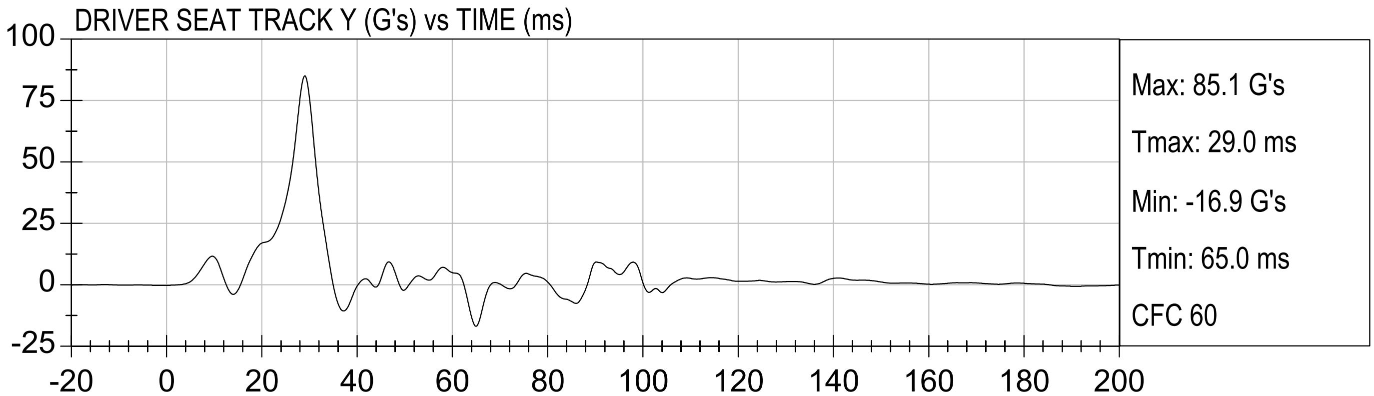


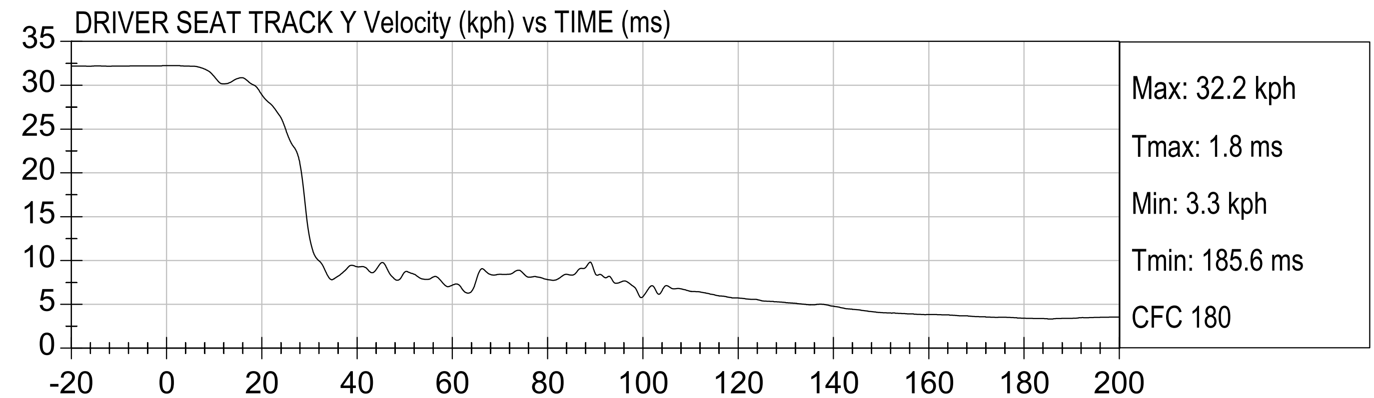

LEFT UPPER B-POST Y (G's) vs TIME (ms)
Max: 54.1 G's
Tmax: 45.1 ms
Min: -35.3 G's
Tmin: 53.2 ms
CFC 60


LEFT UPPER B-POST Y Velocity (kph) vs TIME (ms)
Max: 34.9 kph
Tmax: 30.0 ms
Min: -28.8 kph
Tmin: 200.0 ms
CFC 180


LEFT A-POST @ ROOF Y (G's) vs TIME (ms)
Max: 70.4 G's
Tmax: 33.4 ms
Min: -6.4 G's
Tmin: 54.9 ms
CFC 60


LEFT A-POST @ ROOF Y Velocity (kph) vs TIME (ms)
Max: 32.1 kph
Tmax: 0.3 ms
Min: 3.7 kph
Tmin: 200.0 ms
CFC 180

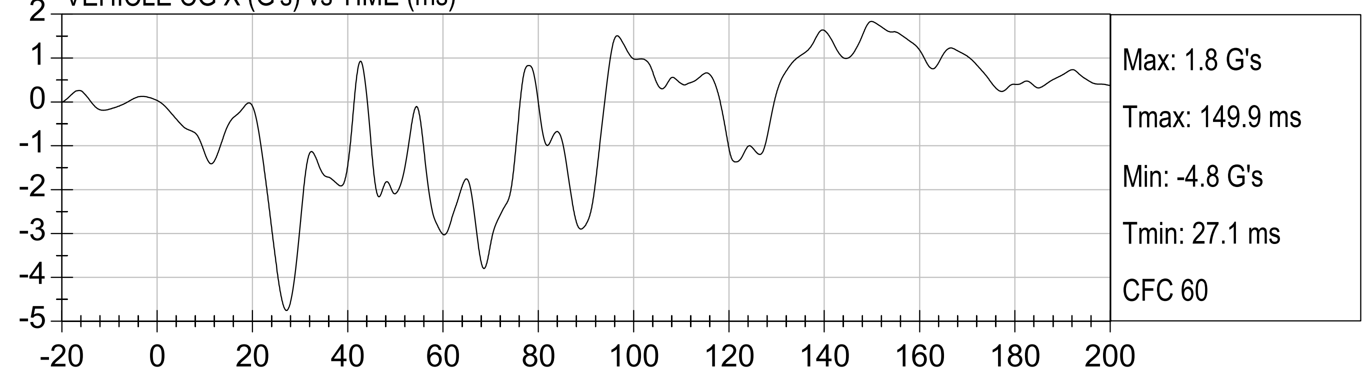

DRIVER SEAT TRACK Y (G's) vs TIME (ms)
100
75
50
25
0
-25
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 85.1 G's
Tmax: 29.0 ms
Min: -16.9 G's
Tmin: 65.0 ms
CFC 60


DRIVER SEAT TRACK Y Velocity (kph) vs TIME (ms)
35
30
25
20
15
10
5
0
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 32.2 kph
Tmax: 1.8 ms
Min: 3.3 kph
Tmin: 185.6 ms
CFC 180

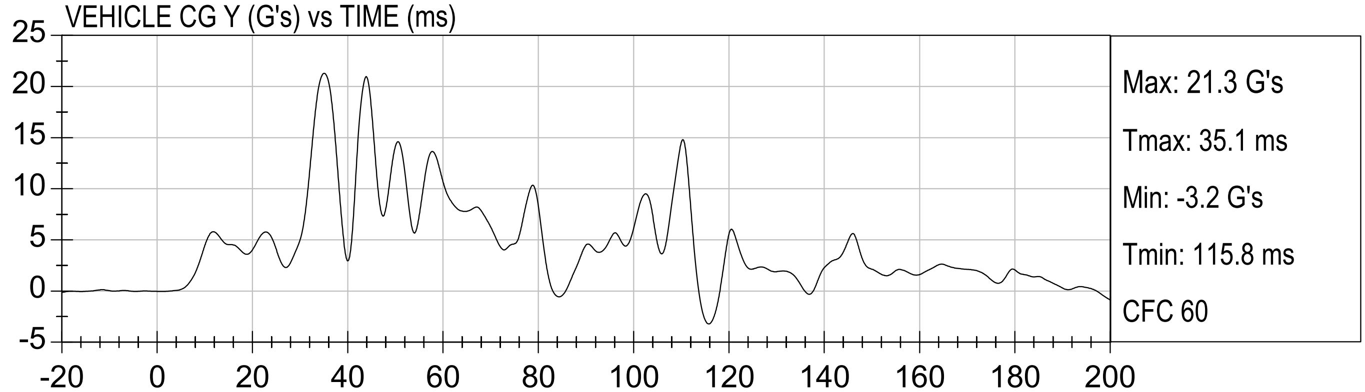
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)

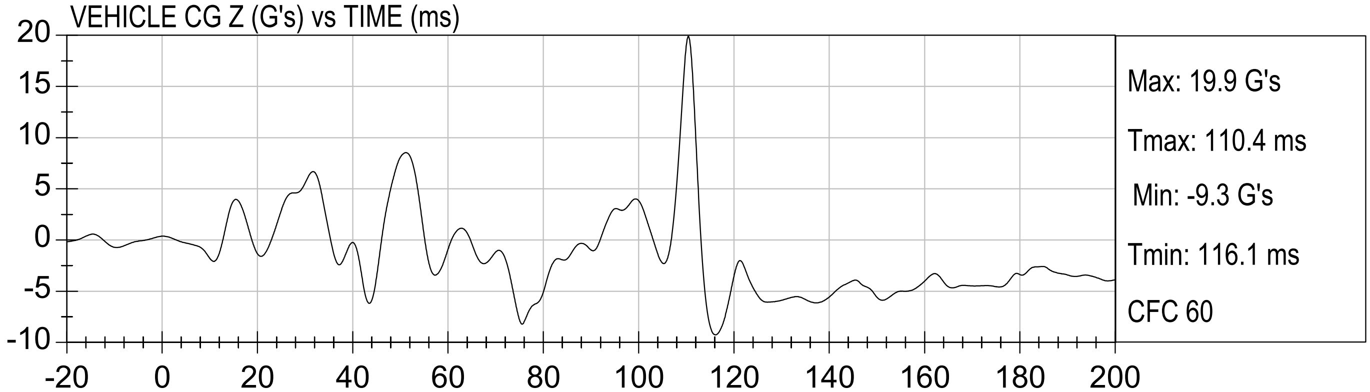
VEHICLE CG X (G's) vs TIME (ms)



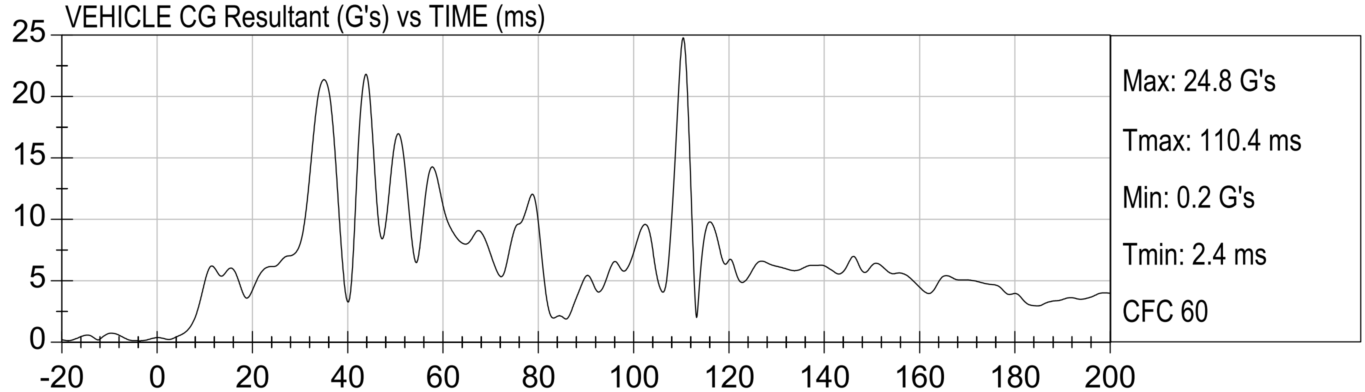
VEHICLE CG Y (G's) vs TIME (ms)

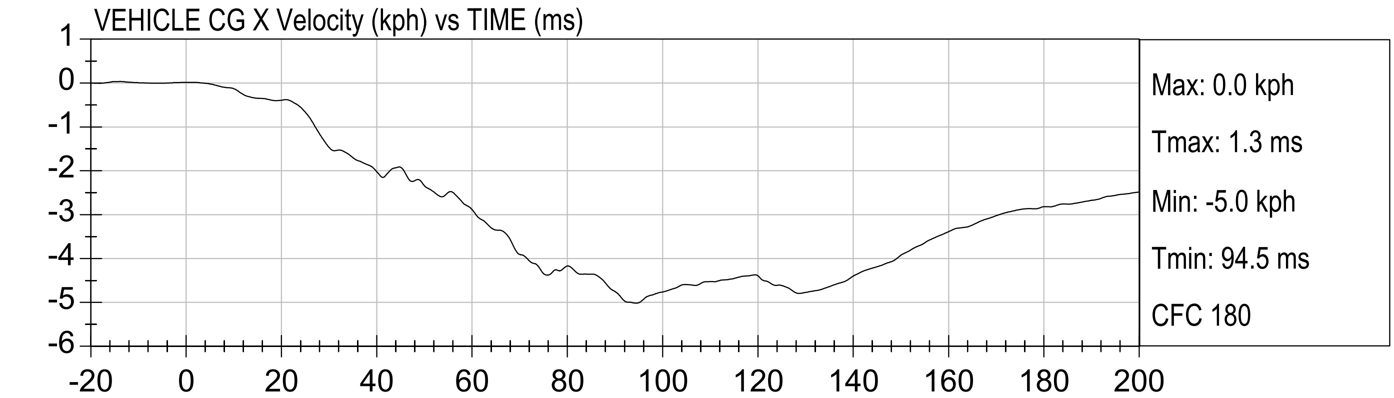


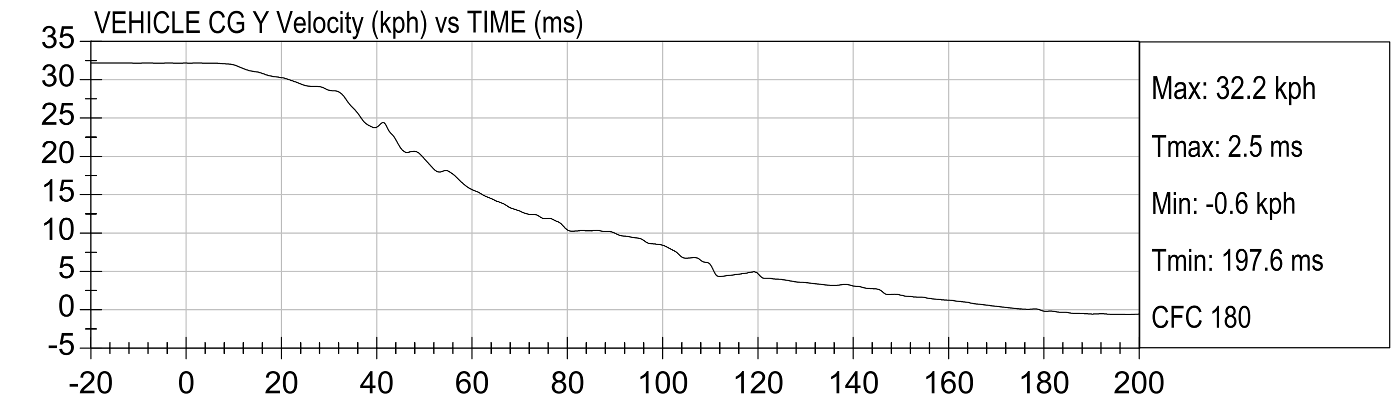
VEHICLE CG Z (G's) vs TIME (ms)

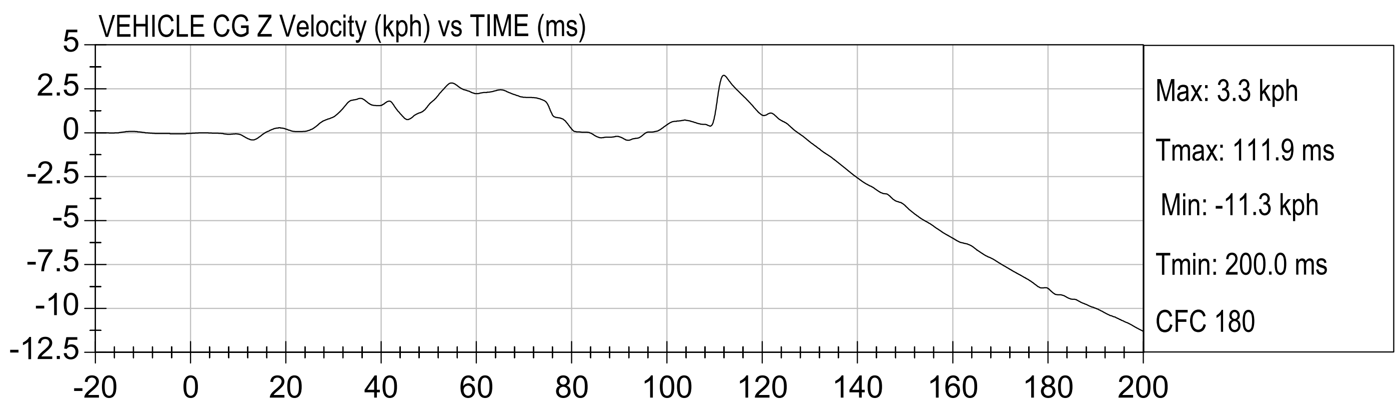


VEHICLE CG Resultant (G's) vs TIME (ms)




VEHICLE CG X Velocity (kph) vs TIME (ms)
Max: 0.0 kph
Tmax: 1.3 ms
Min: -5.0 kph
Tmin: 94.5 ms
CFC 180
1
0
-1
-2
-3
-4
-5
-6
-20
0
20
40
60
80
100
120
140
160
180
200

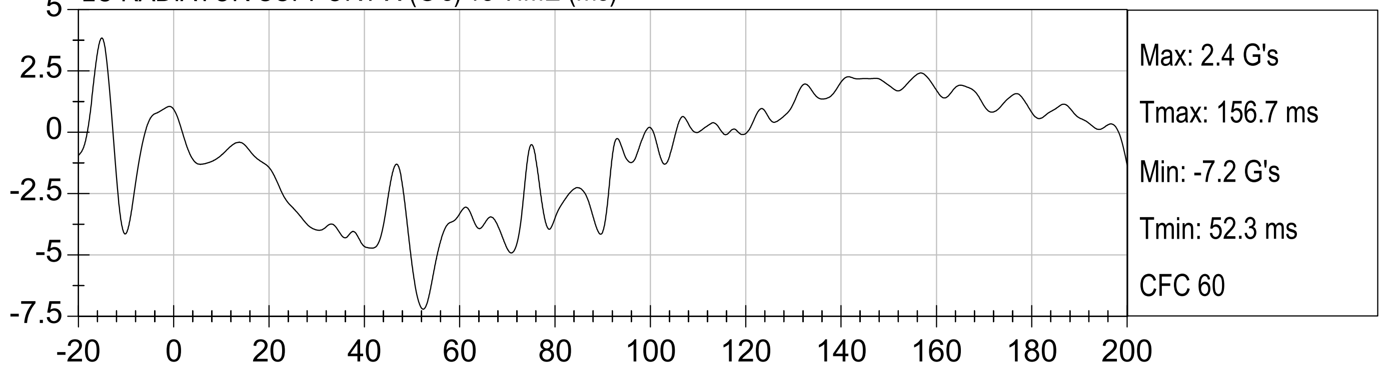

VEHICLE CG Y Velocity (kph) vs TIME (ms)
Max: 32.2 kph
Tmax: 2.5 ms
Min: -0.6 kph
Tmin: 197.6 ms
CFC 180
35
30
25
20
15
10
5
0
-5
-20
0
20
40
60
80
100
120
140
160
180
200


VEHICLE CG Z Velocity (kph) vs TIME (ms)
Max: 3.3 kph
Tmax: 111.9 ms
Min: -11.3 kph
Tmin: 200.0 ms
CFC 180
5
2.5
0
-2.5
-5
-7.5
-10
-12.5
-20
0
20
40
60
80
100
120
140
160
180
200

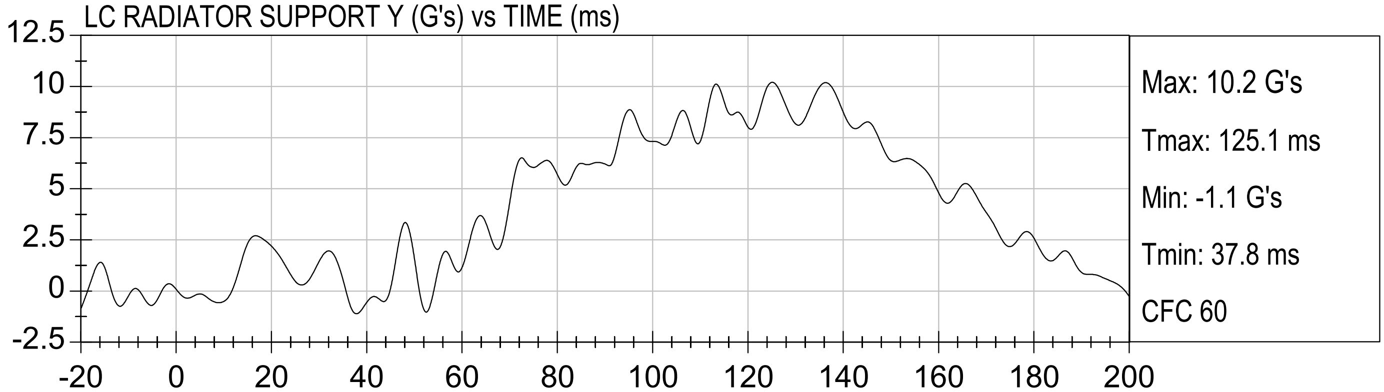
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)

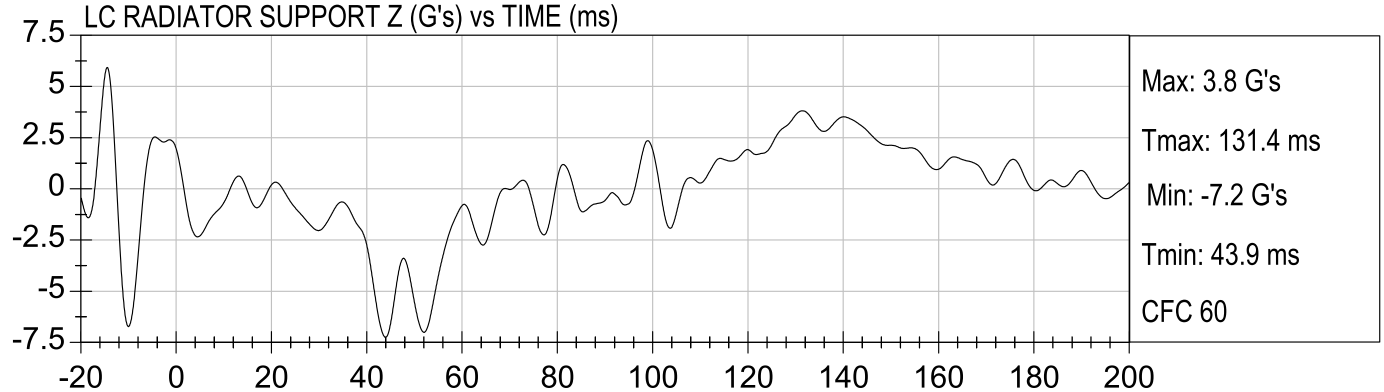
LC RADIATOR SUPPORT X (G's) vs TIME (ms)



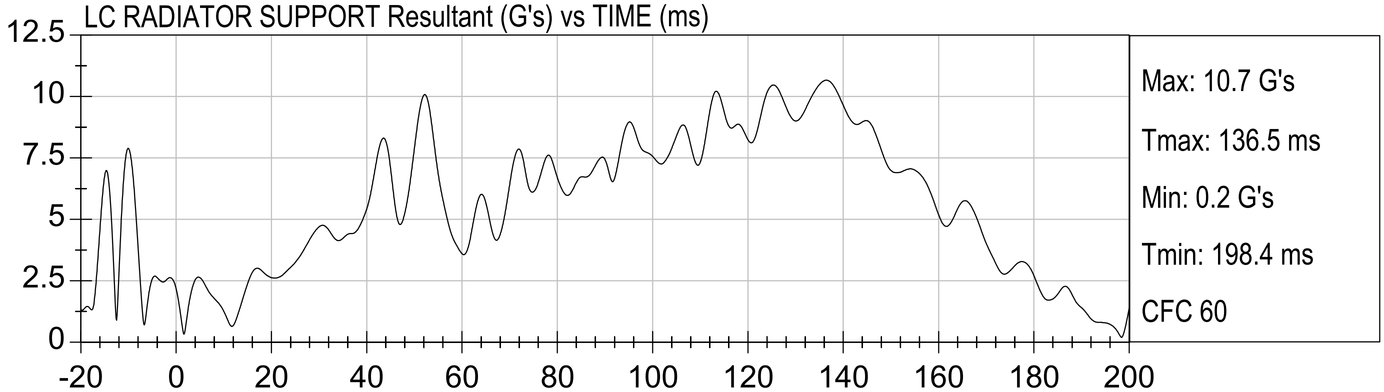
LC RADIATOR SUPPORT Y (G's) vs TIME (ms)



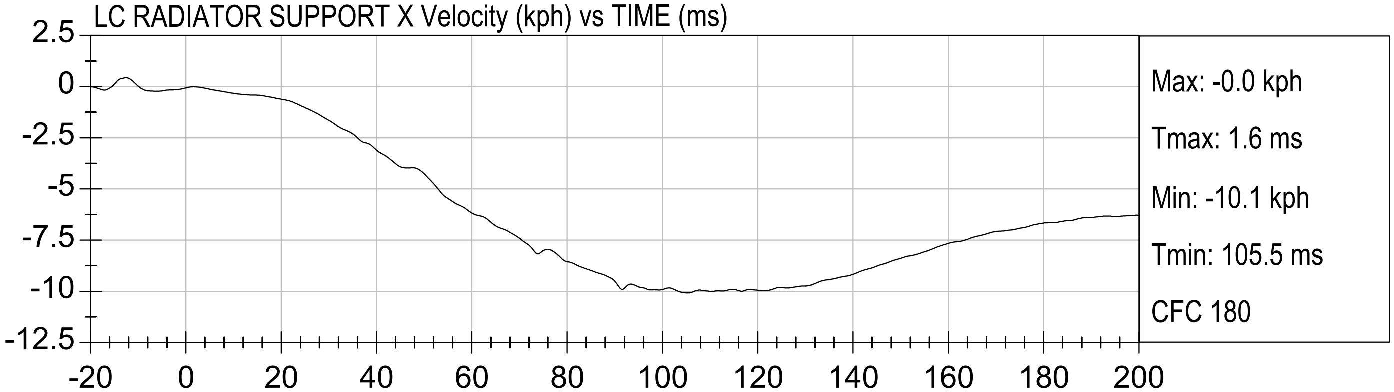
LC RADIATOR SUPPORT Z (G's) vs TIME (ms)



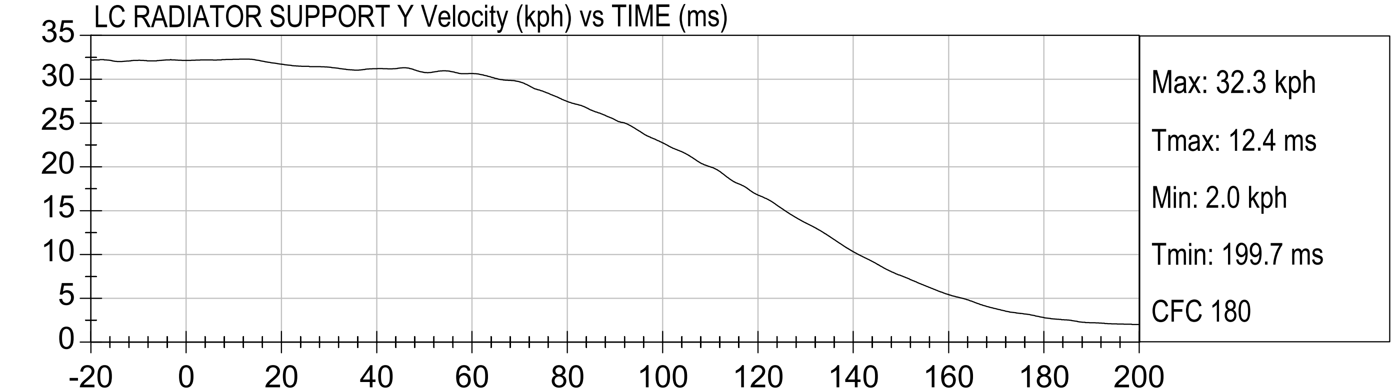
LC RADIATOR SUPPORT Resultant (G's) vs TIME (ms)



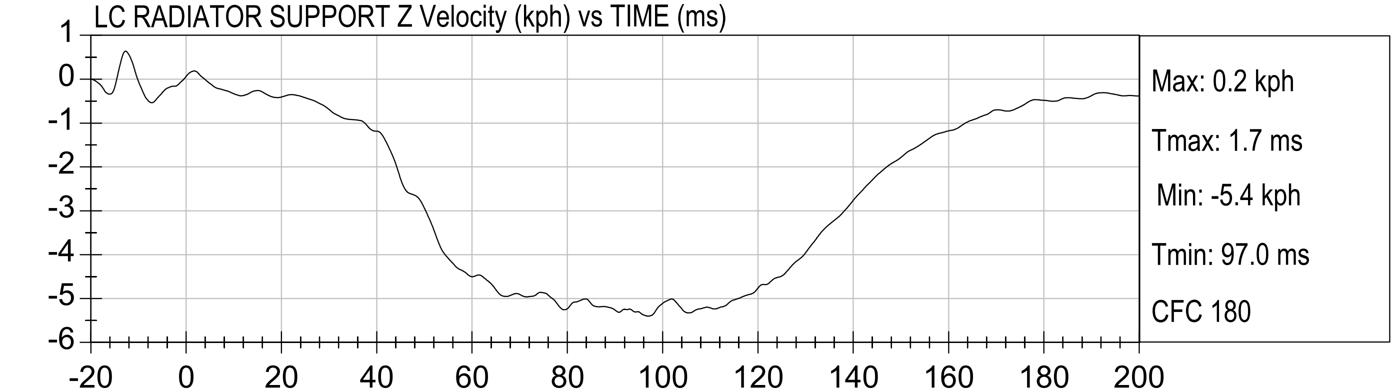
LC RADIATOR SUPPORT X Velocity (kph) vs TIME (ms)



LC RADIATOR SUPPORT Y Velocity (kph) vs TIME (ms)



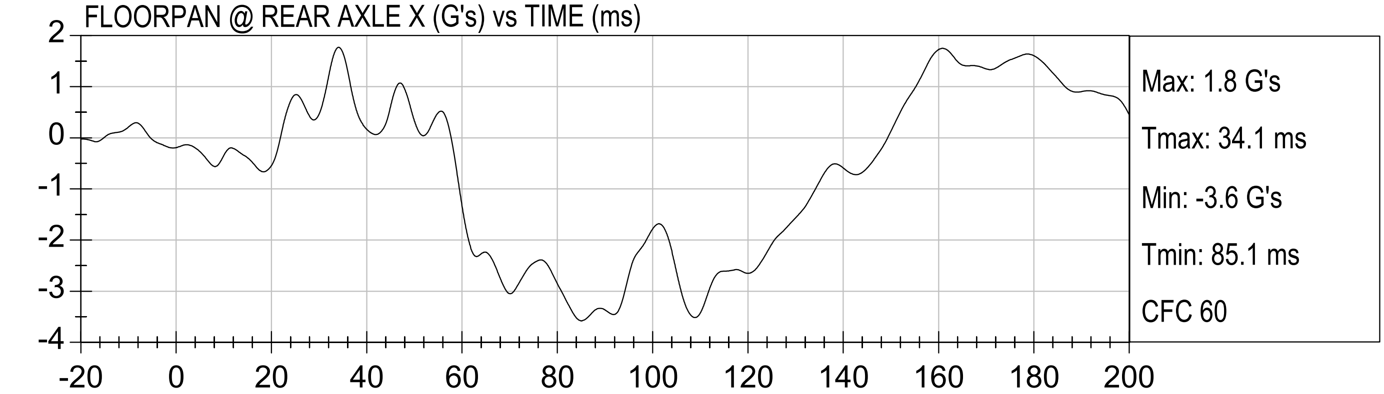
LC RADIATOR SUPPORT Z Velocity (kph) vs TIME (ms)



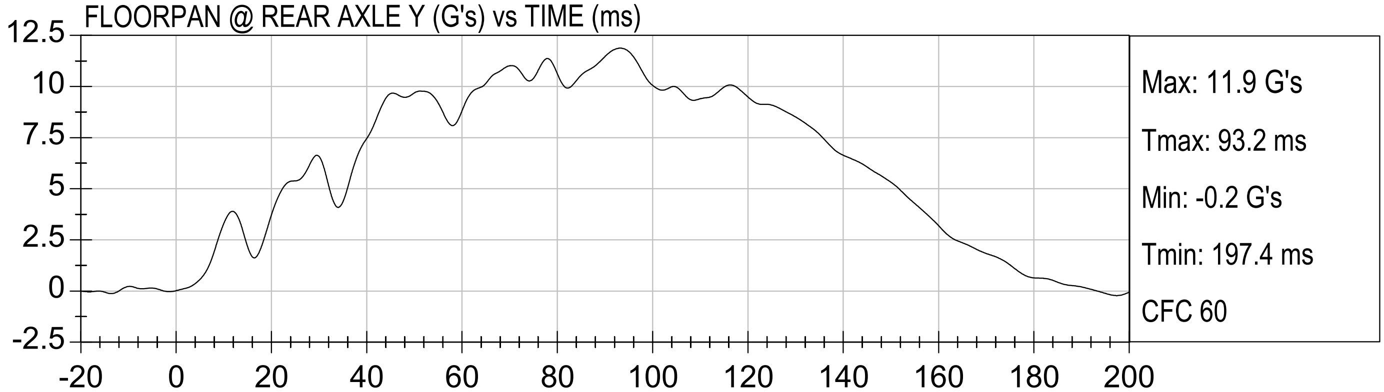
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)

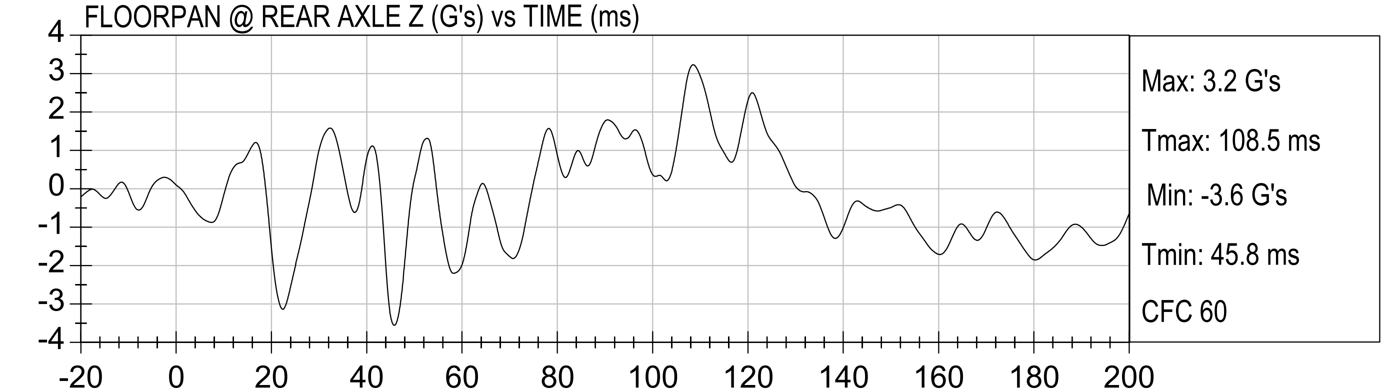
FLOORPAN @ REAR AXLE X (G's) vs TIME (ms)



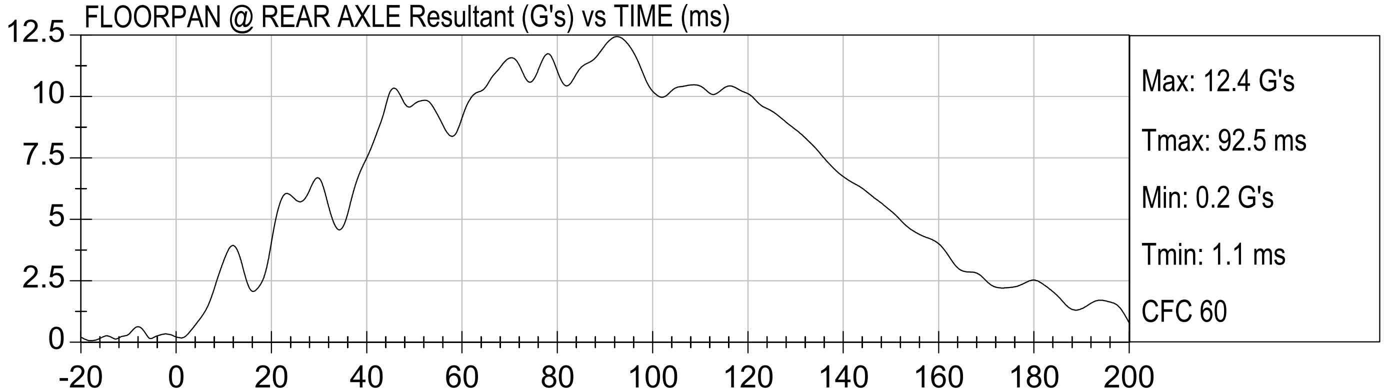
FLOORPAN @ REAR AXLE Y (G's) vs TIME (ms)

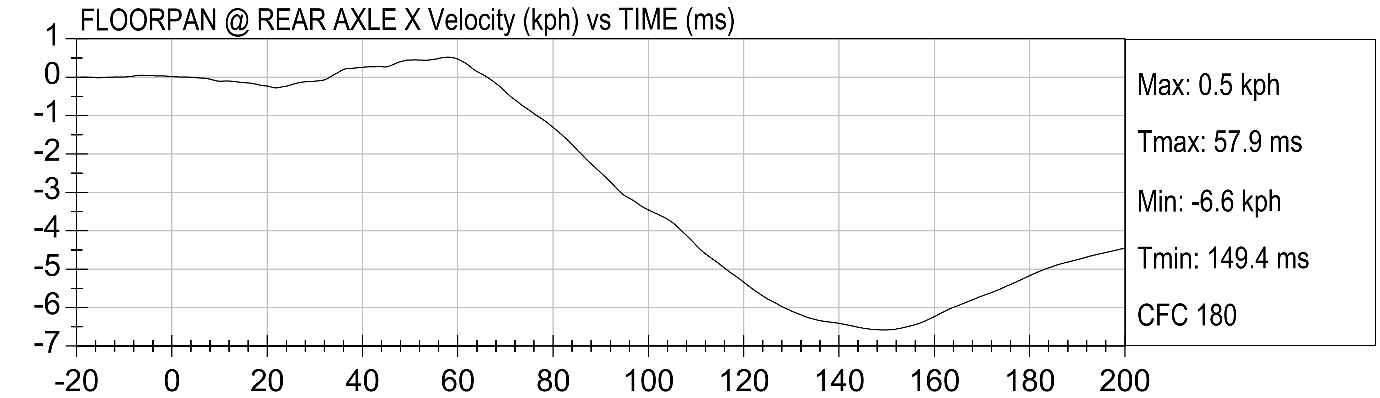


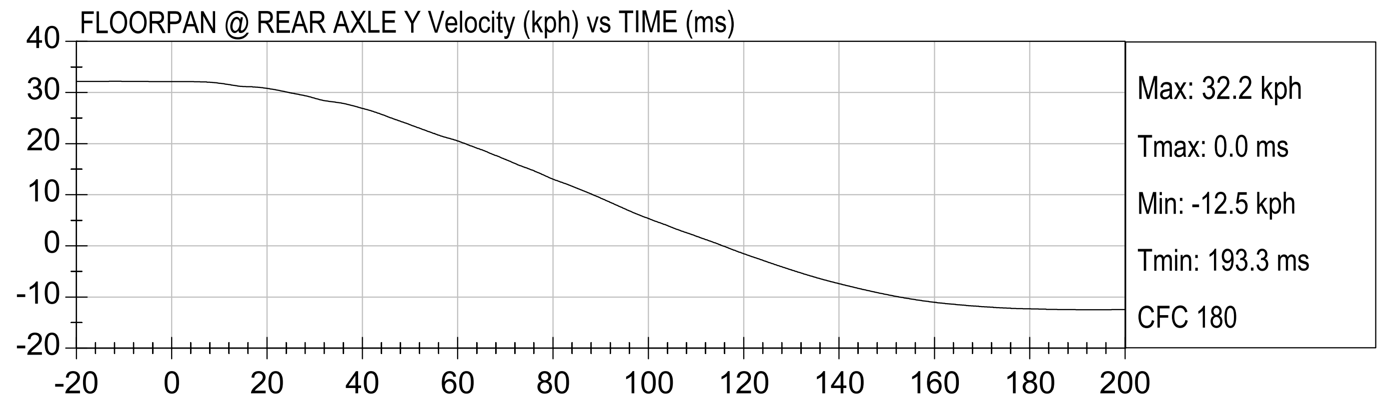
FLOORPAN @ REAR AXLE Z (G's) vs TIME (ms)

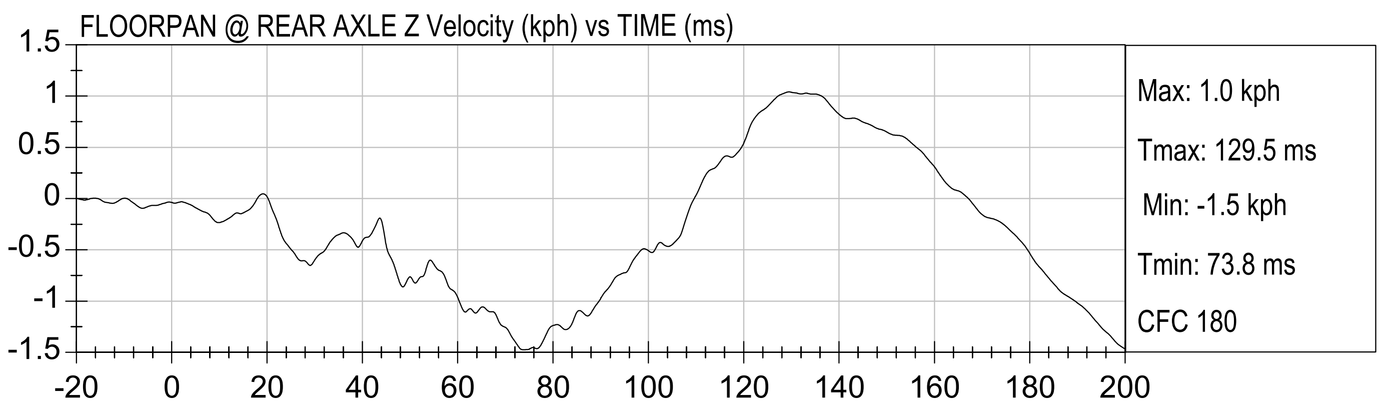


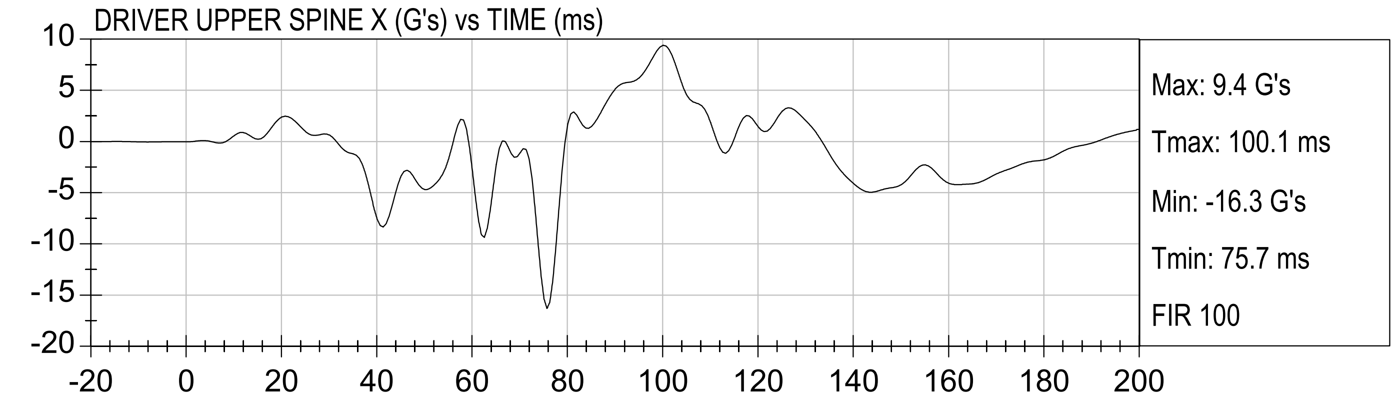
FLOORPAN @ REAR AXLE Resultant (G's) vs TIME (ms)

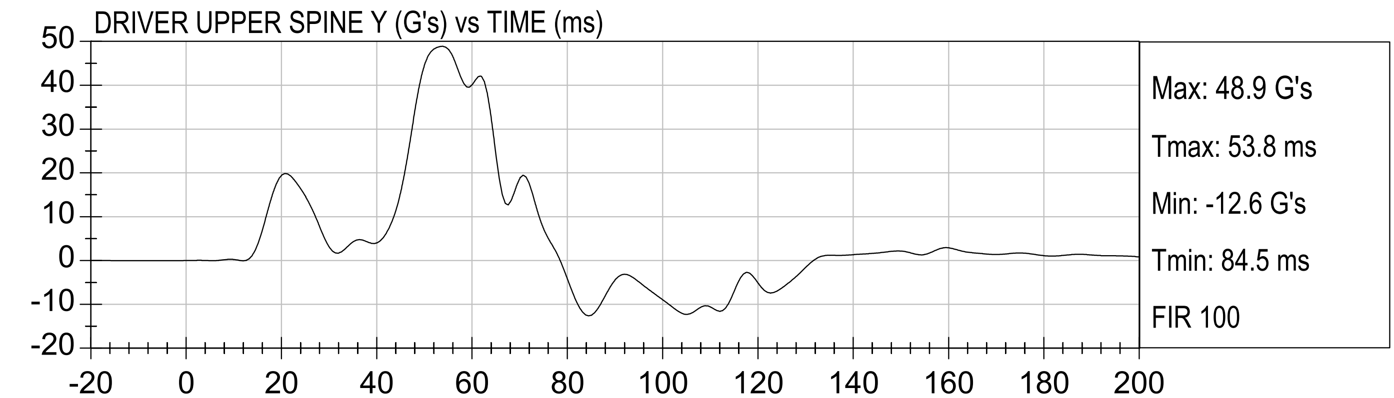


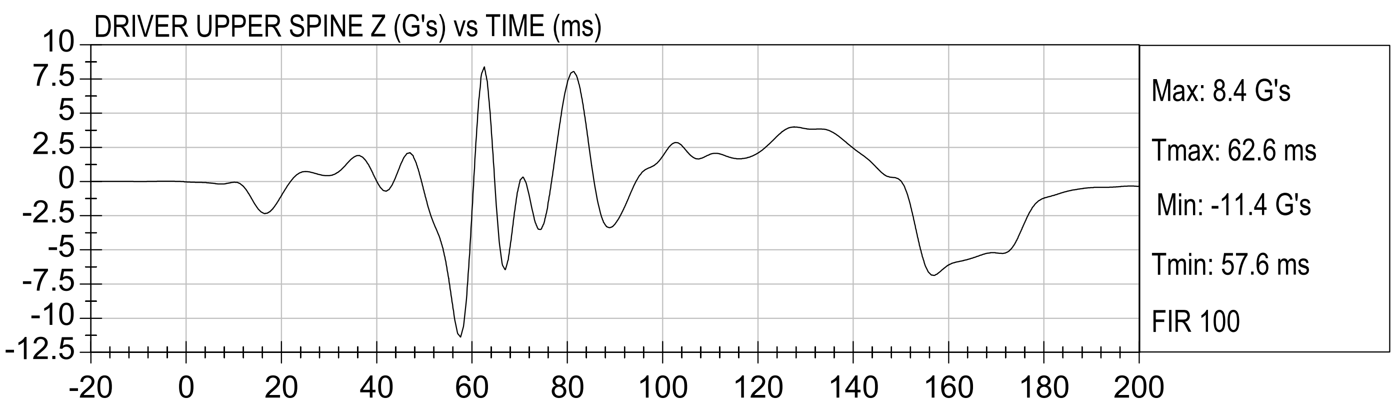

FLOORPAN @ REAR AXLE X Velocity (kph) vs TIME (ms)
Max: 0.5 kph
Tmax: 57.9 ms
Min: -6.6 kph
Tmin: 149.4 ms
CFC 180


FLOORPAN @ REAR AXLE Y Velocity (kph) vs TIME (ms)
Max: 32.2 kph
Tmax: 0.0 ms
Min: -12.5 kph
Tmin: 193.3 ms
CFC 180


FLOORPAN @ REAR AXLE Z Velocity (kph) vs TIME (ms)
Max: 1.0 kph
Tmax: 129.5 ms
Min: -1.5 kph
Tmin: 73.8 ms
CFC 180

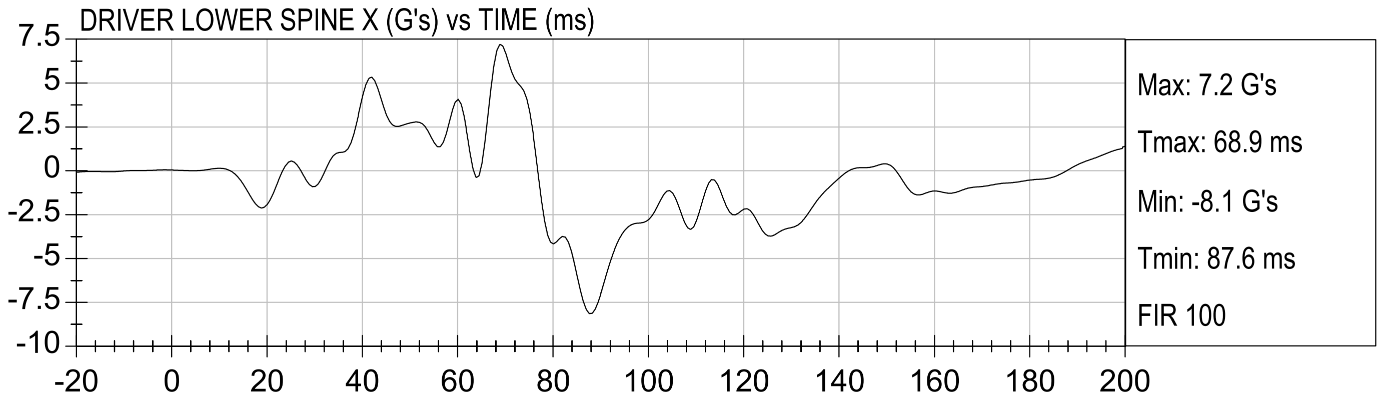

DRIVER UPPER SPINE X (G's) vs TIME (ms)
Max: 9.4 G's
Tmax: 100.1 ms
Min: -16.3 G's
Tmin: 75.7 ms
FIR 100

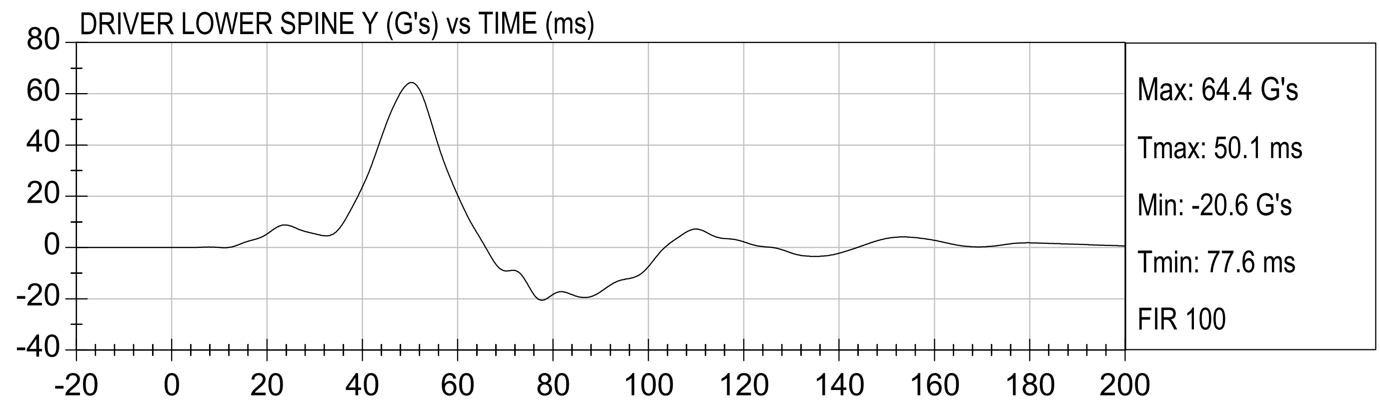

DRIVER UPPER SPINE Y (G's) vs TIME (ms)
Max: 48.9 G's
Tmax: 53.8 ms
Min: -12.6 G's
Tmin: 84.5 ms
FIR 100

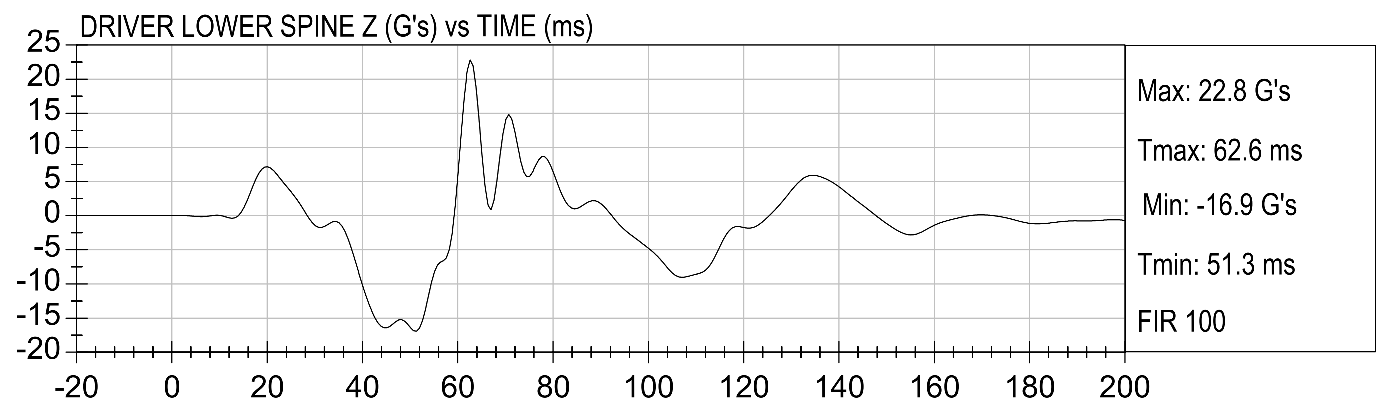

DRIVER UPPER SPINE Z (G's) vs TIME (ms)
Max: 8.4 G's
Tmax: 62.6 ms
Min: -11.4 G's
Tmin: 57.6 ms
FIR 100

OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)

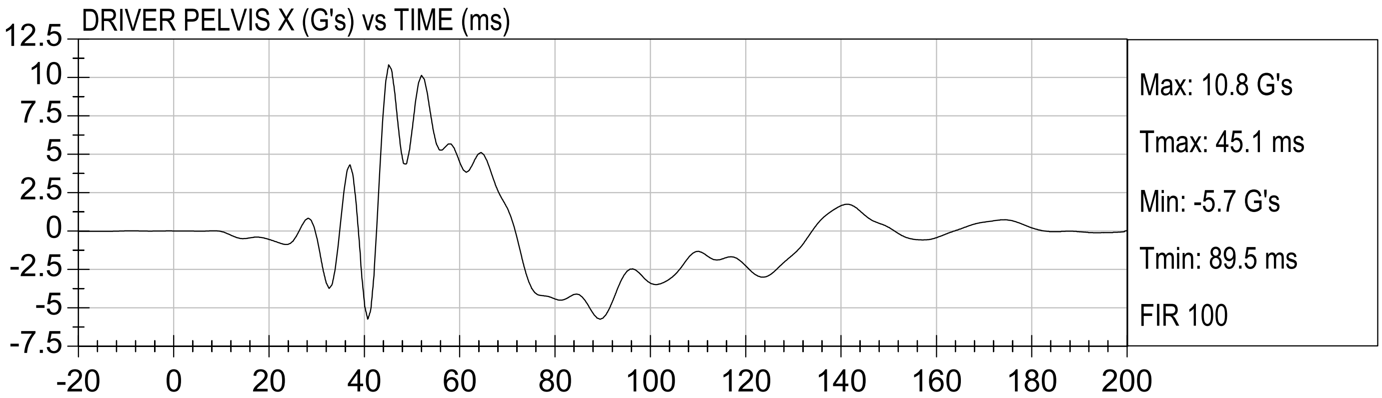


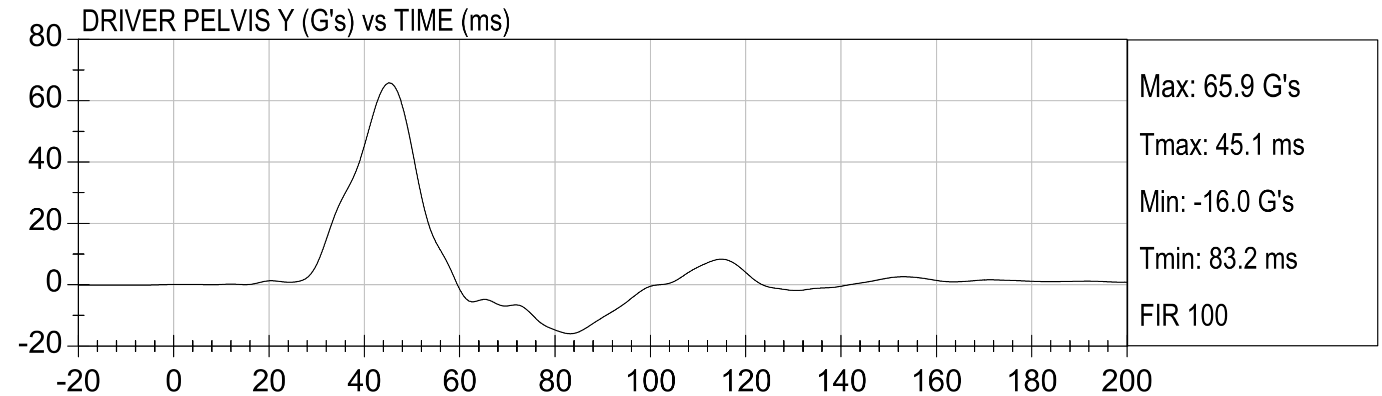


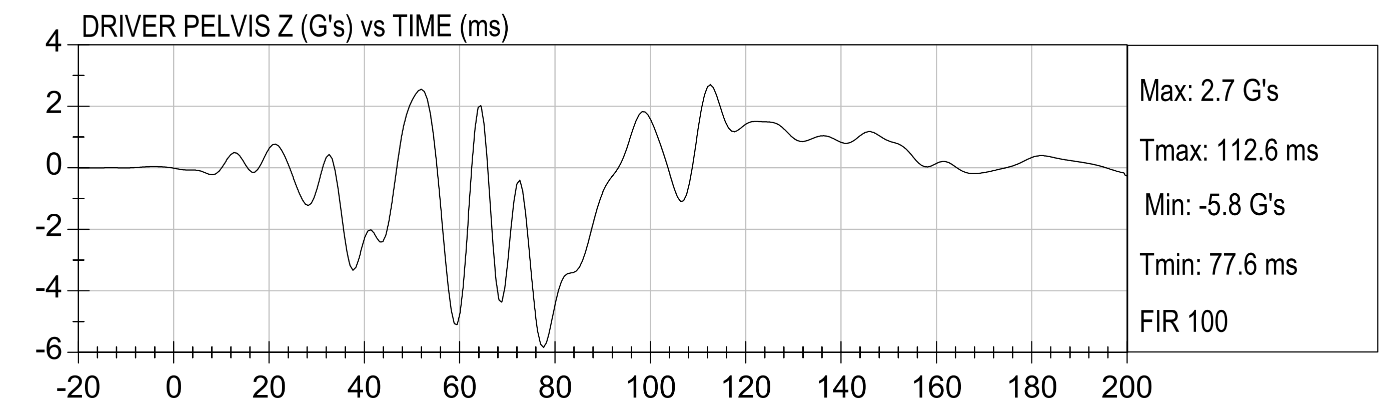


OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)

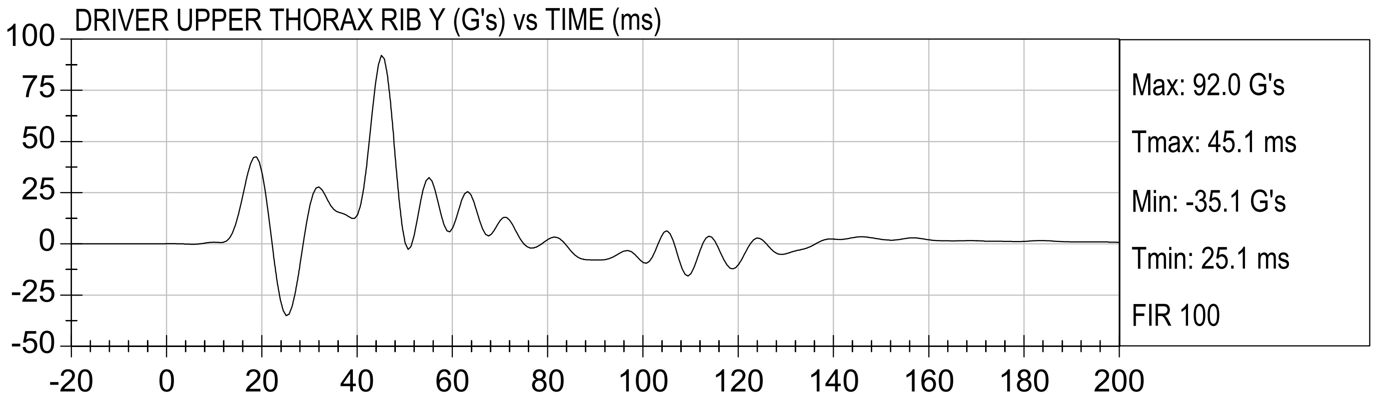


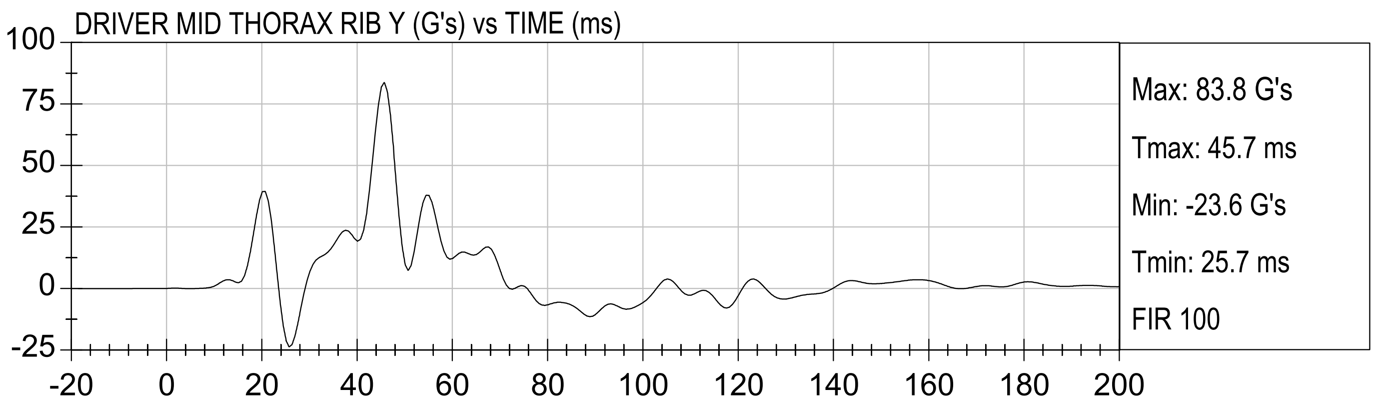


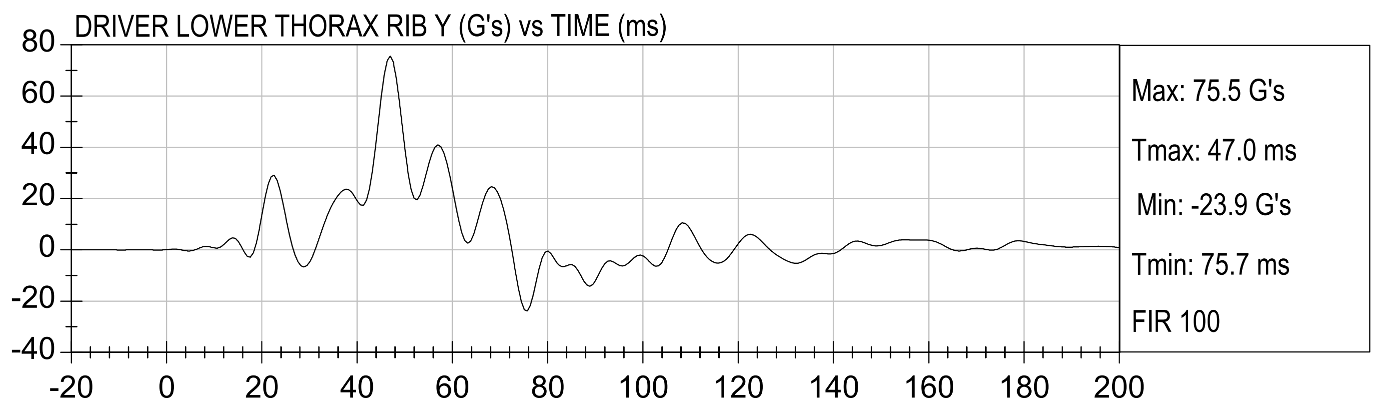


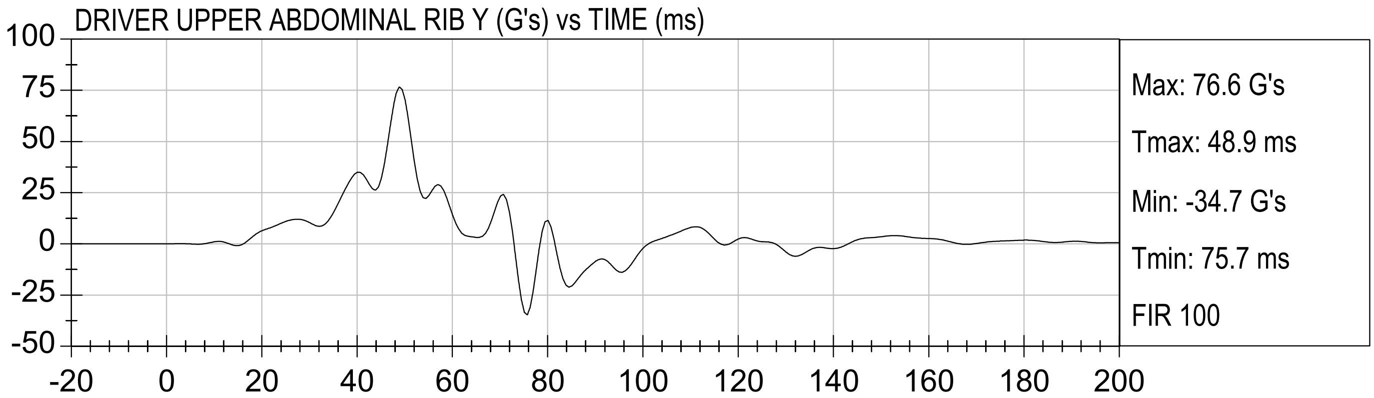
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

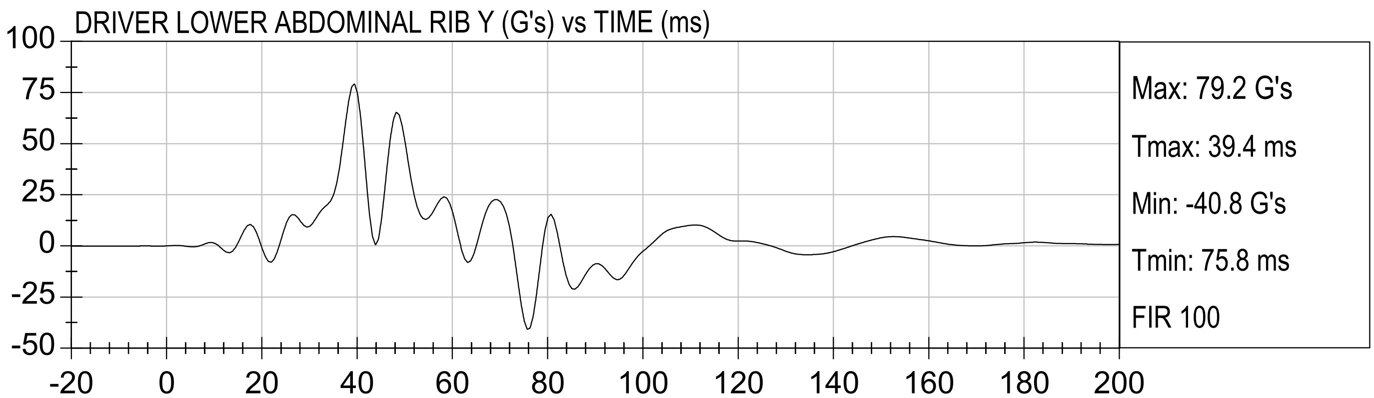
Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)



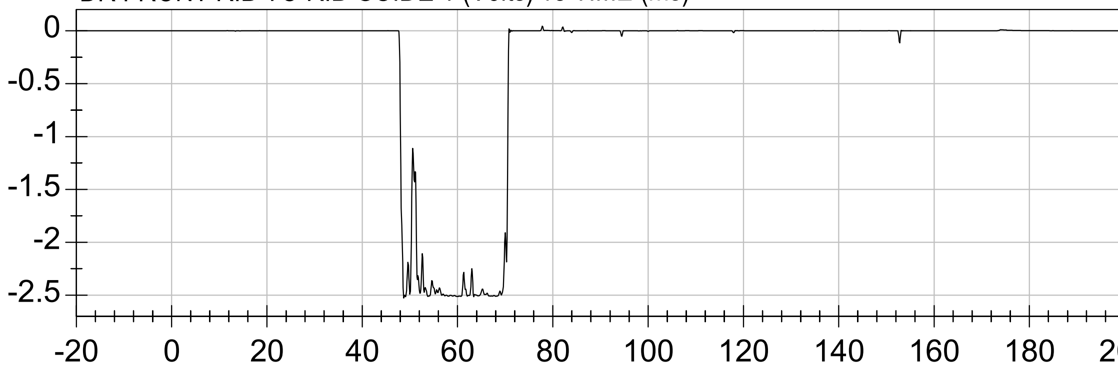





DRIVER UPPER ABDOMINAL RIB Y (G's) vs TIME (ms)
100
75
50
25
0
-25
-50
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 76.6 G's
Tmax: 48.9 ms
Min: -34.7 G's
Tmin: 75.7 ms
FIR 100

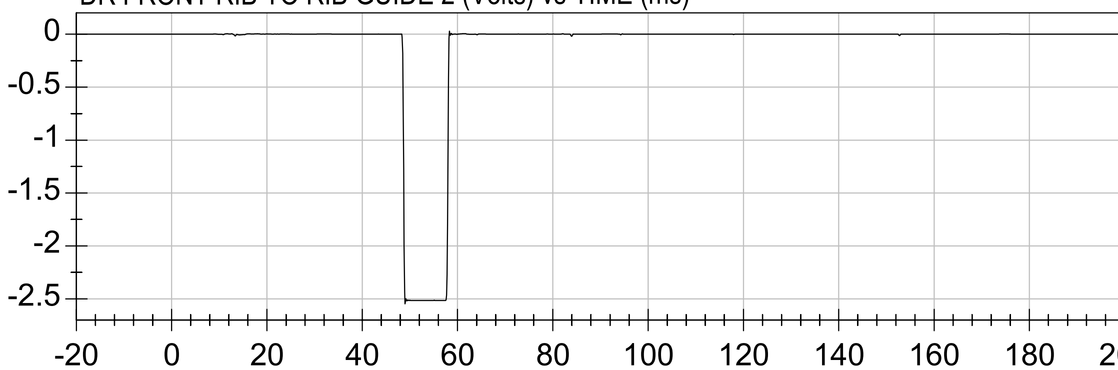

DRIVER LOWER ABDOMINAL RIB Y (G's) vs TIME (ms)
100
75
50
25
0
-25
-50
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 79.2 G's
Tmax: 39.4 ms
Min: -40.8 G's
Tmin: 75.8 ms
FIR 100

DR FRONT RIB TO RIB GUIDE 1 (Volts) vs TIME (ms)



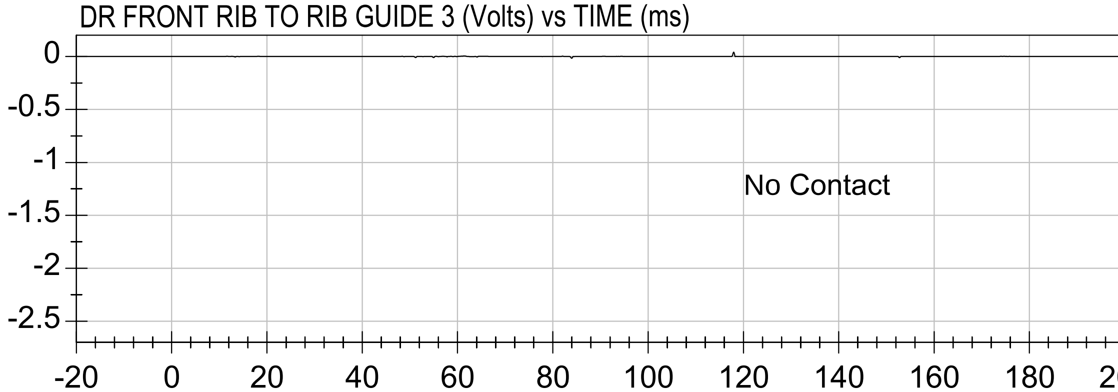
Max: 0.0 Volts
Tmax: 77.8 ms
Min: -2.5 Volts
Tmin: 48.7 ms
CFC 1000

DR FRONT RIB TO RIB GUIDE 2 (Volts) vs TIME (ms)



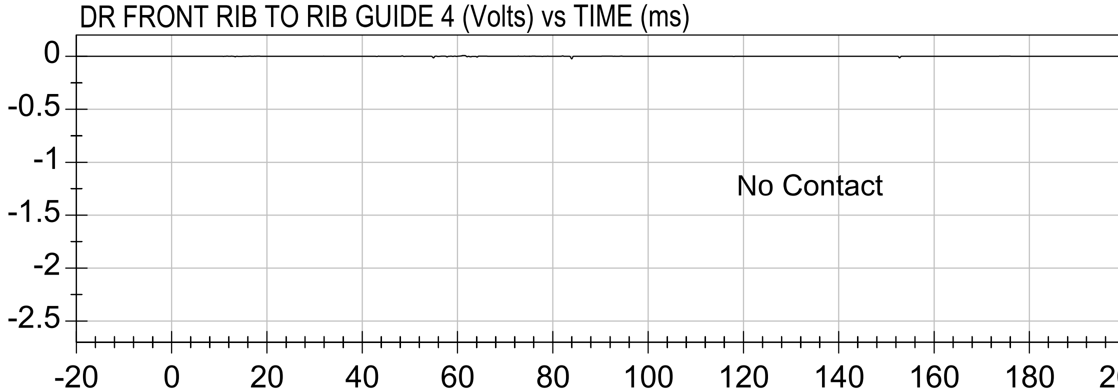
Max: 0.0 Volts
Tmax: 58.3 ms
Min: -2.5 Volts
Tmin: 49.0 ms
CFC 1000

DR FRONT RIB TO RIB GUIDE 3 (Volts) vs TIME (ms)



Max: 0.0 Volts
Tmax: 117.9 ms
Min: -0.0 Volts
Tmin: 84.0 ms
CFC 1000

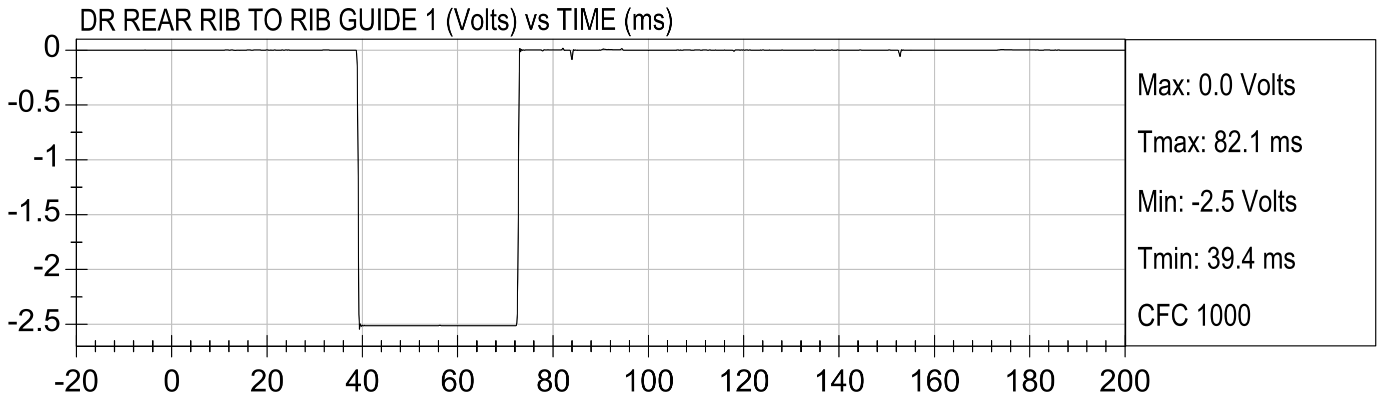
DR FRONT RIB TO RIB GUIDE 4 (Volts) vs TIME (ms)

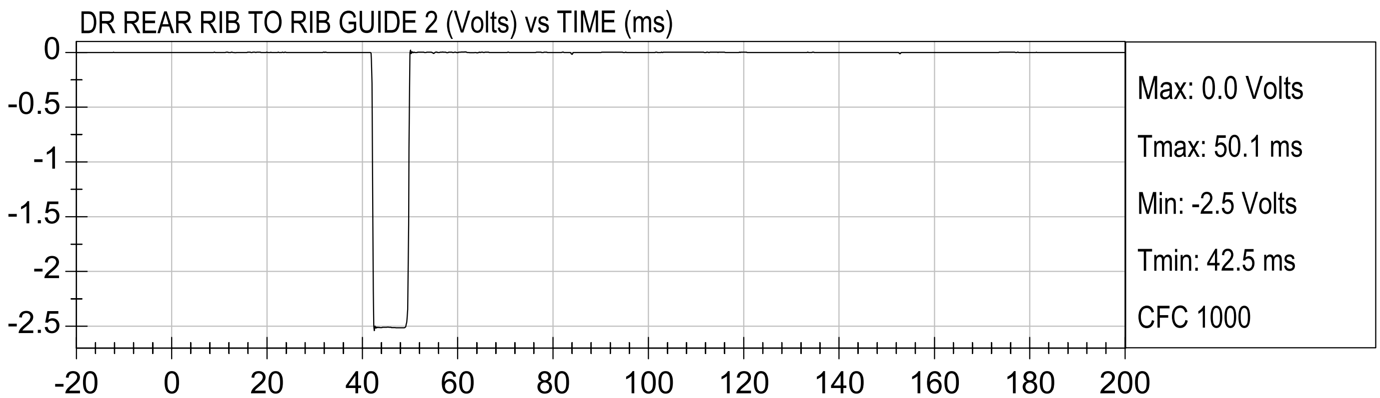


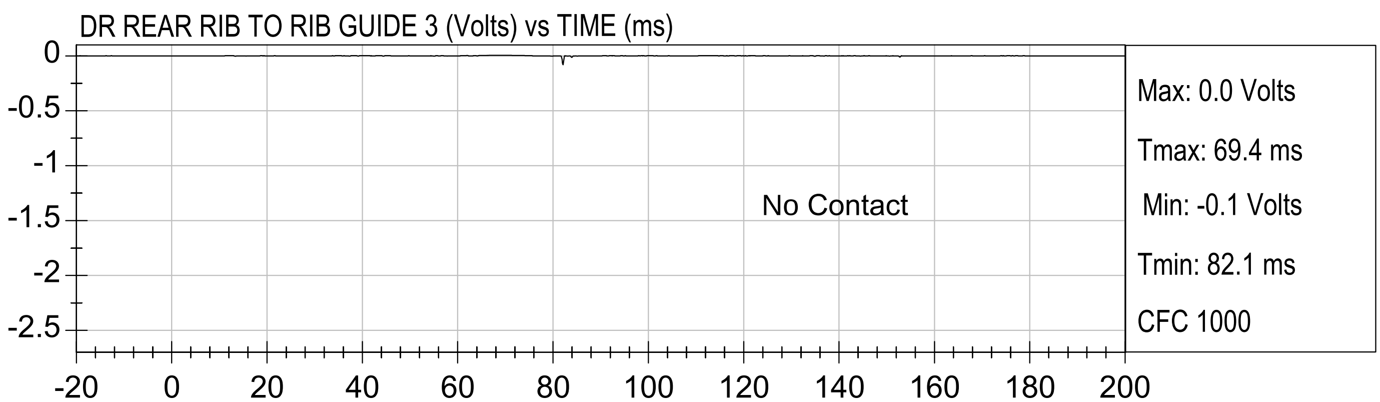
Max: 0.0 Volts
Tmax: 61.4 ms
Min: -0.0 Volts
Tmin: 84.0 ms
CFC 1000

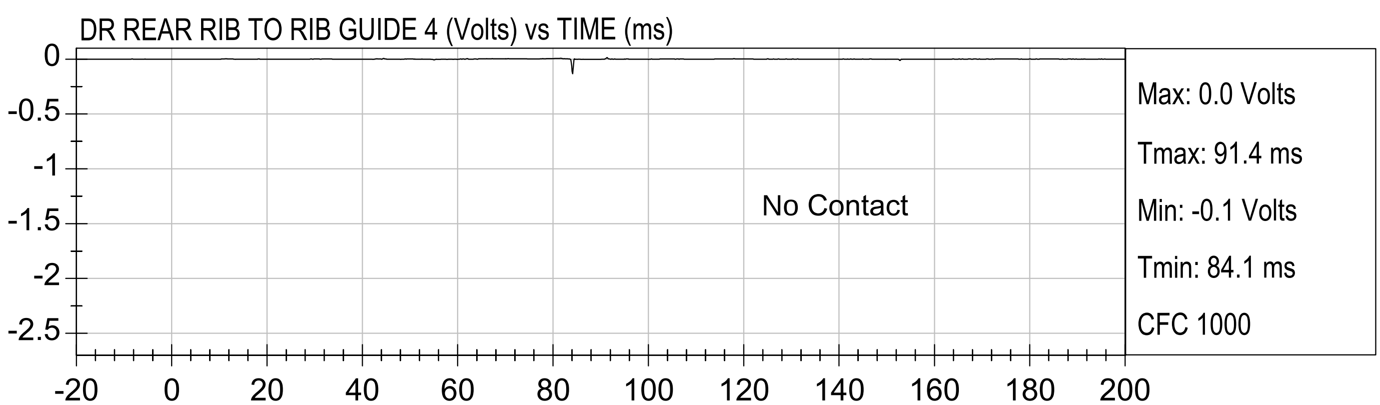
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)

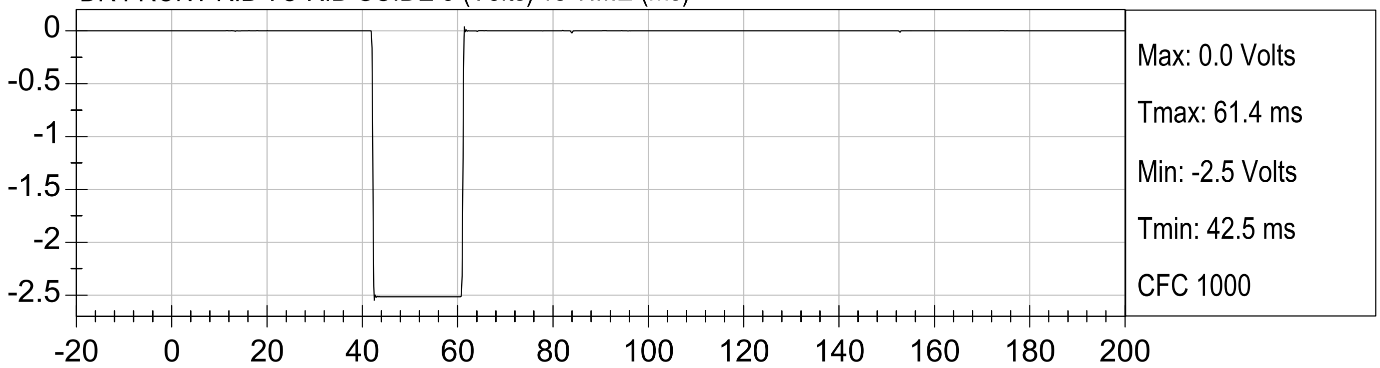




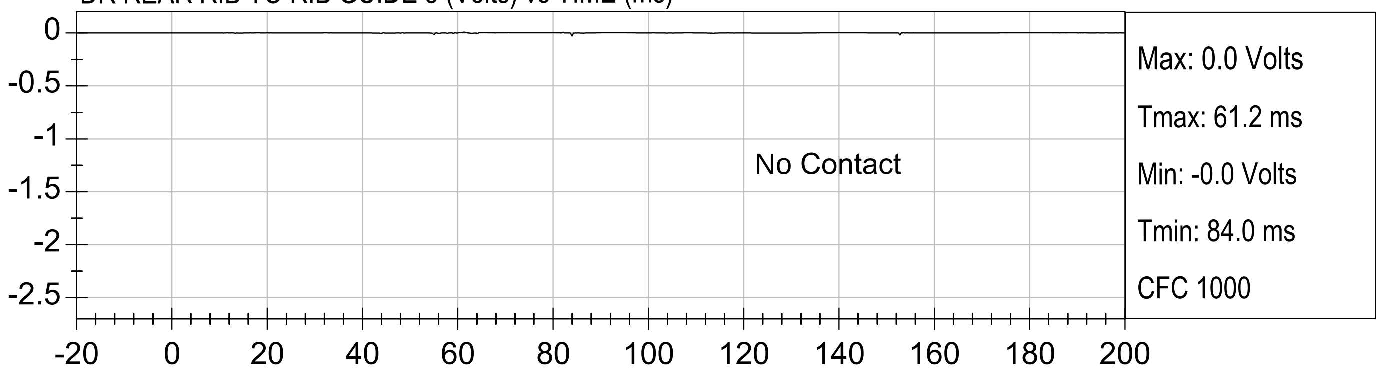




DR FRONT RIB TO RIB GUIDE 5 (Volts) vs TIME (ms)

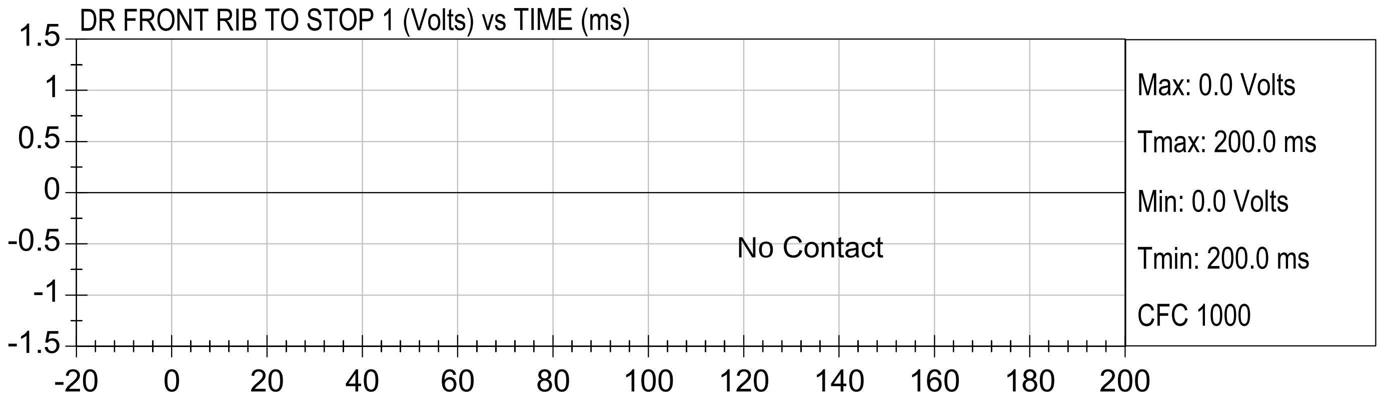


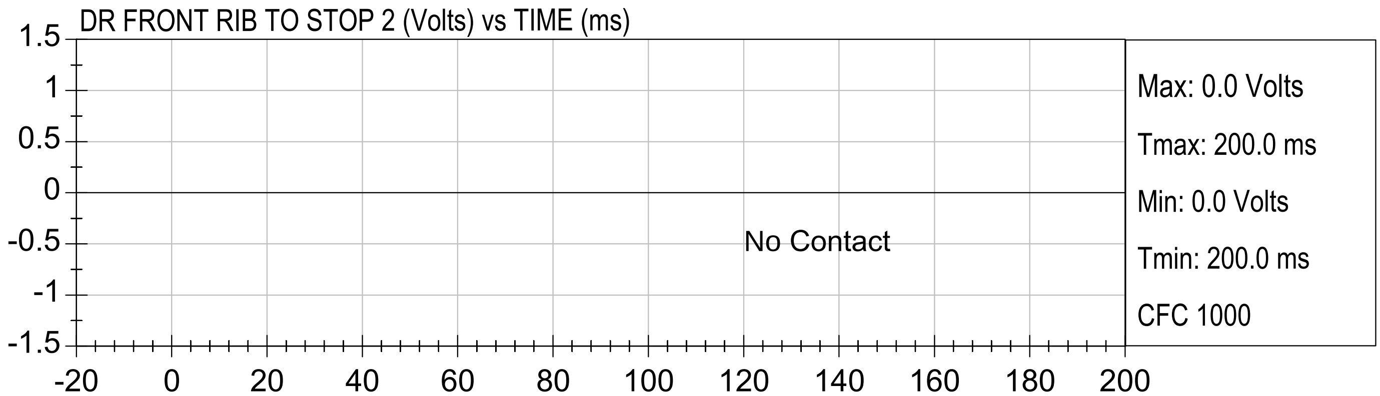
DR REAR RIB TO RIB GUIDE 5 (Volts) vs TIME (ms)

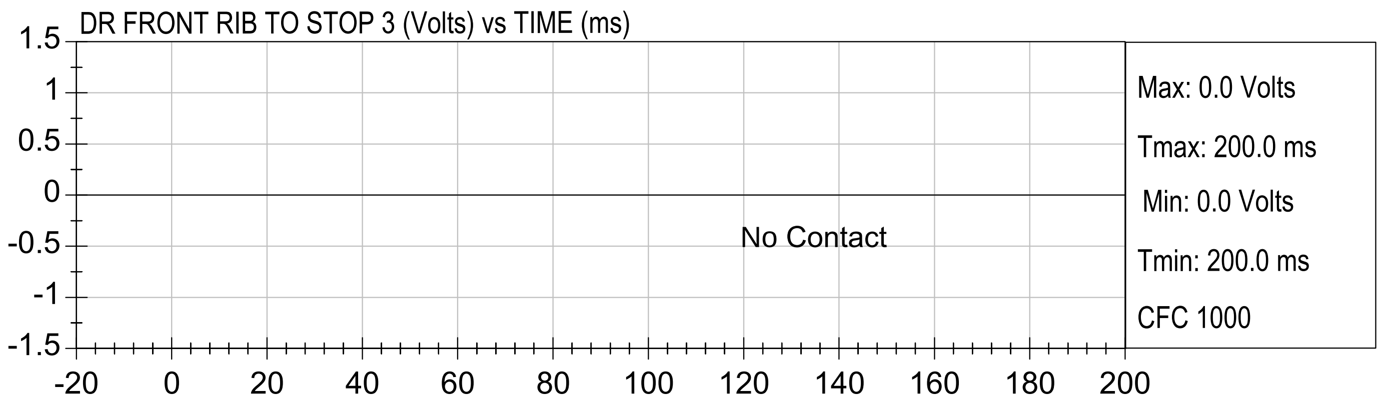


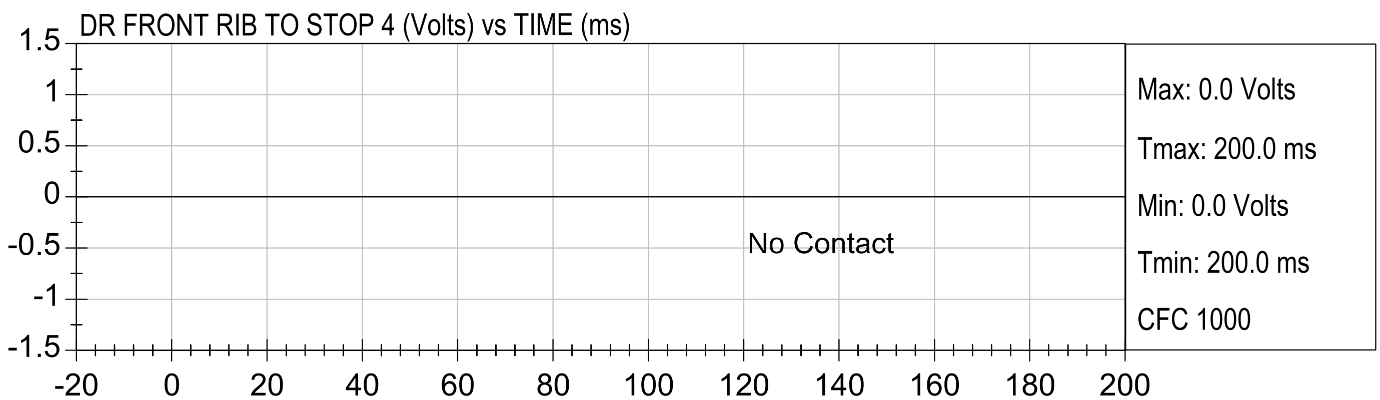
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)



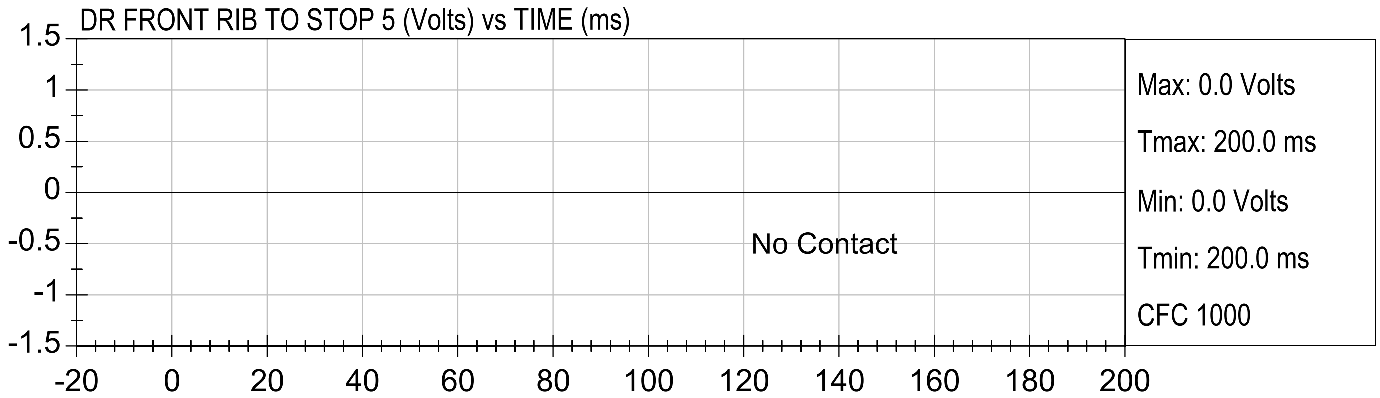


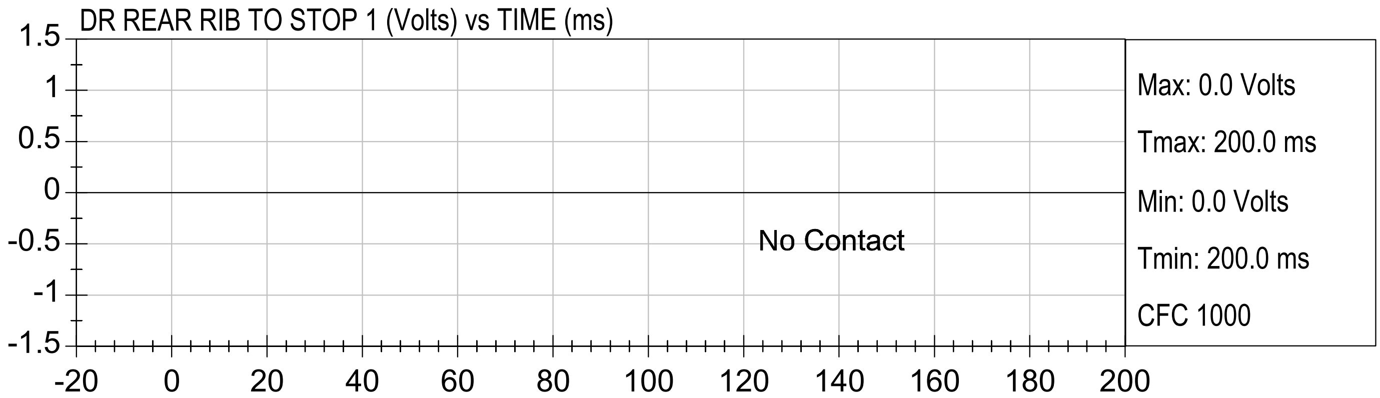


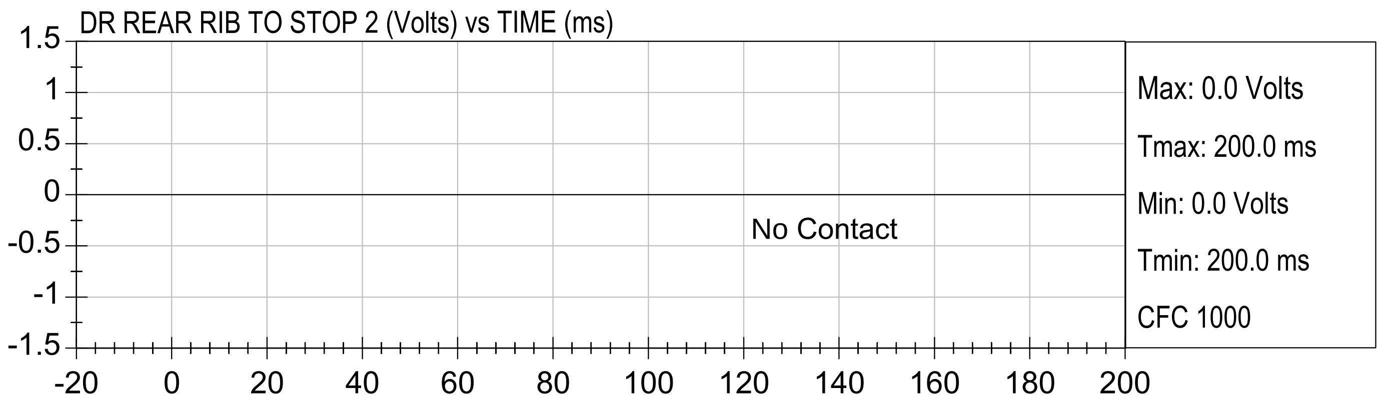


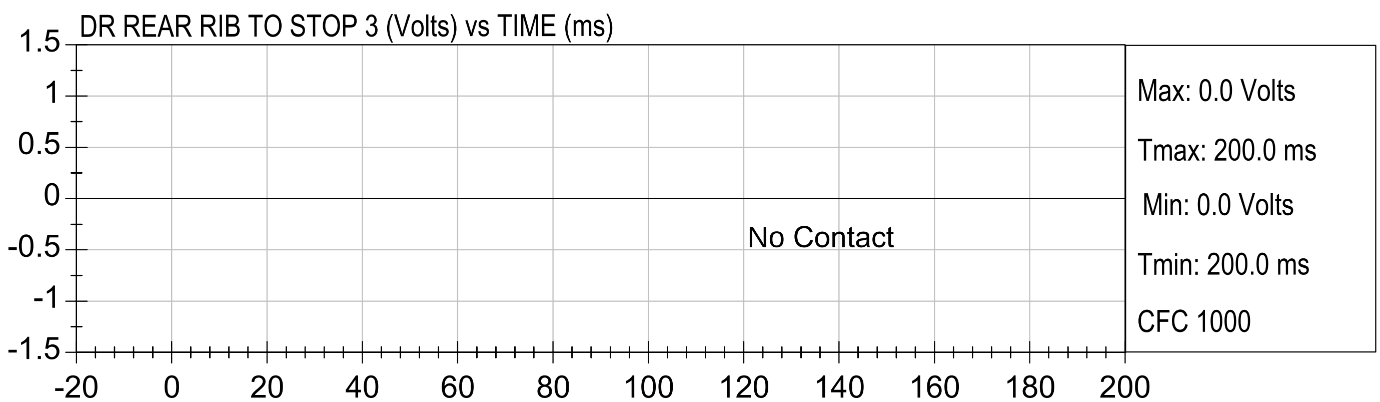
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0519

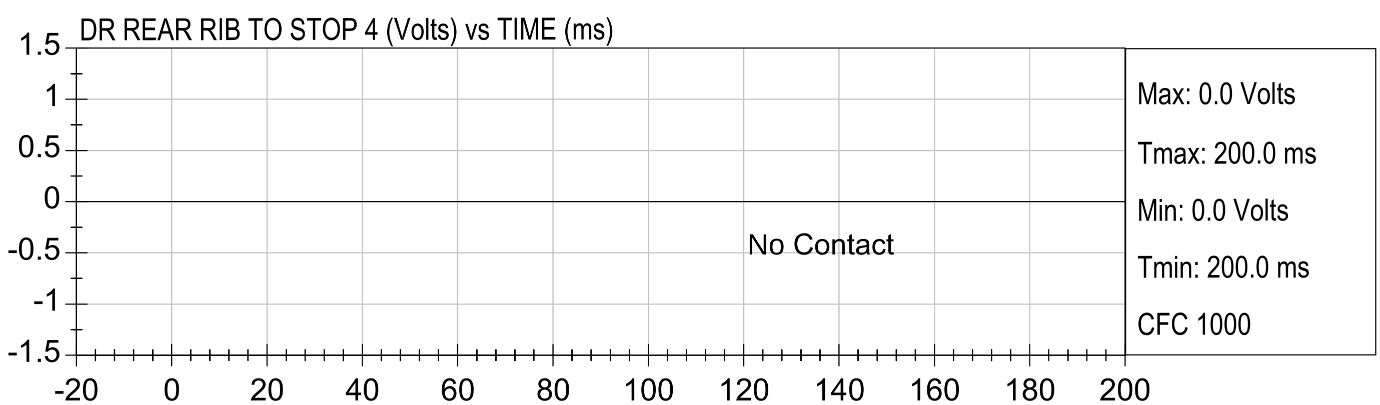
Test Date: 3/20/2003
Speed: 20.0 mph (32.2 km/h)

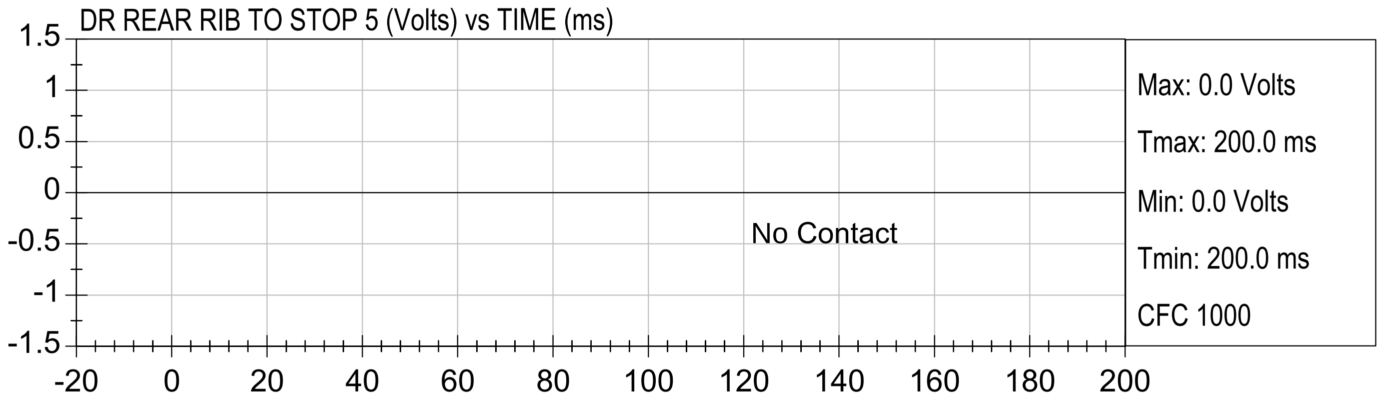



DR REAR RIB TO STOP 1 (Volts) vs TIME (ms)
No Contact
Max: 0.0 Volts
Tmax: 200.0 ms
Min: 0.0 Volts
Tmin: 200.0 ms
CFC 1000


DR REAR RIB TO STOP 2 (Volts) vs TIME (ms)
No Contact
Max: 0.0 Volts
Tmax: 200.0 ms
Min: 0.0 Volts
Tmin: 200.0 ms
CFC 1000


DR REAR RIB TO STOP 3 (Volts) vs TIME (ms)
No Contact
Max: 0.0 Volts
Tmax: 200.0 ms
Min: 0.0 Volts
Tmin: 200.0 ms
CFC 1000


DR REAR RIB TO STOP 4 (Volts) vs TIME (ms)
No Contact
Max: 0.0 Volts
Tmax: 200.0 ms
Min: 0.0 Volts
Tmin: 200.0 ms
CFC 1000


DR REAR RIB TO STOP 5 (Volts) vs TIME (ms)
1.5
1
0.5
0
-0.5
-1
-1.5
-20
0
20
40
60
80
100
120
140
160
180
200
No Contact
Max: 0.0 Volts
Tmax: 200.0 ms
Min: 0.0 Volts
Tmin: 200.0 ms
CFC 1000

APPENDIX C

SID IIs CONFIGURATION AND PERFORMANCE VERIFICATION DATA

<u>CERTIFICATION DATA</u>

Dummy Serial Number: 033

Calibration Test Results Summary

Dummy Serial Number: 033

Pre-Test Calibration

Head Drop Test:	The head passed all drop test requirements.
Neck Pendulum Test:	The neck passed all impact test requirements.
Shoulder Impact Test:	The shoulder passed all impact test requirements.
Thorax (with arm) Test:	The thorax did not pass all impact test requirements.
Thorax (without arm) Test:	The thorax did not pass all impact test requirements.
Abdomen Impact Test:	The abdomen did not pass all impact test requirements.
Pelvis Test:	The pelvis passed all impact test requirements.

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HEAD DROP TEST

SID IIs DUMMY

Date: 3/19/03

Dummy Serial Number: 033

Test Number: D03381/D03391

TEST PARAMETER	SPECIFICATION	TEST RESULTS	
		D03381	D03391
Temperature (ºC)	18.9° – 25.6°	20.7	21.3
Humidity	10% - 70%	26	28
Resultant Accel	115 - 145 g's	118	118
Peak Longitudinal Accel	(-15) – (+ 15) g's	7	10

TEST MEETS SPECIFICATIONS

Technician: ____________________________________

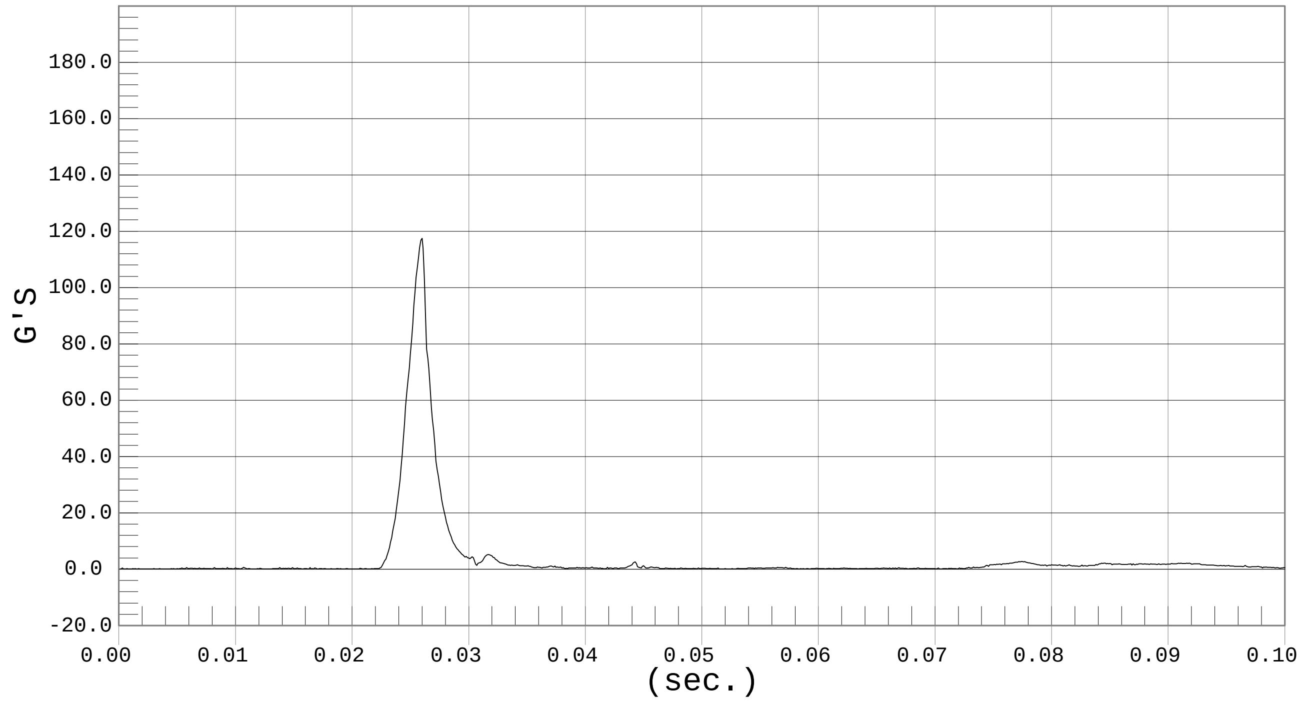
Approved By: ____________________________________

PEAK RESULTANT ACCELERATION

Test Desc.: Head Drop
Component: Dummy #033

Test Date: 03-19-03
Speed: 0.0 fps, 0.00 M/s

Ymin = .07 G'S @ 0.0005 sec., Ymax = 117.54 G'S @ 0.0259 sec.

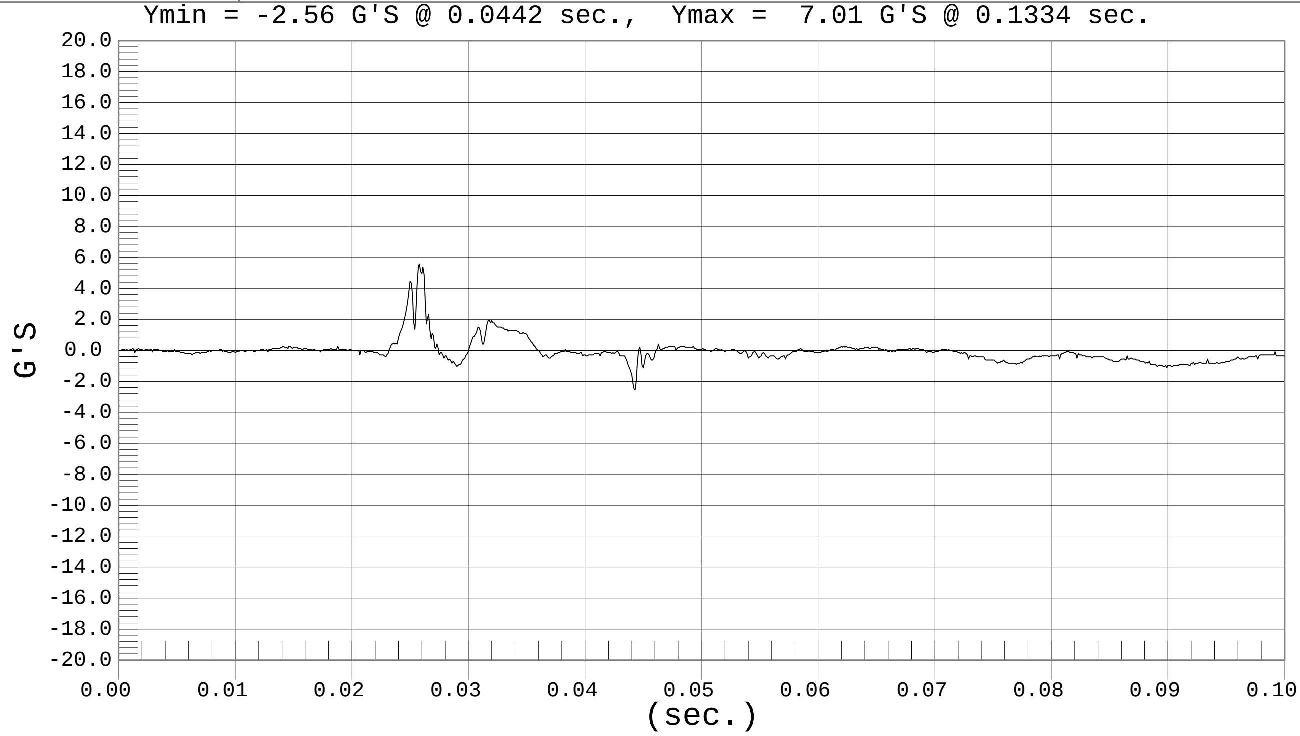


PEAK LONGITUDINAL ACCELRATION

Test Desc.: Head Drop
Component: Dummy #033

Test Date: 03-19-03
Speed: 0.0 fps, 0.00 M/s

Ymin = -2.56 G'S @ 0.0442 sec., Ymax = 7.01 G'S @ 0.1334 sec.

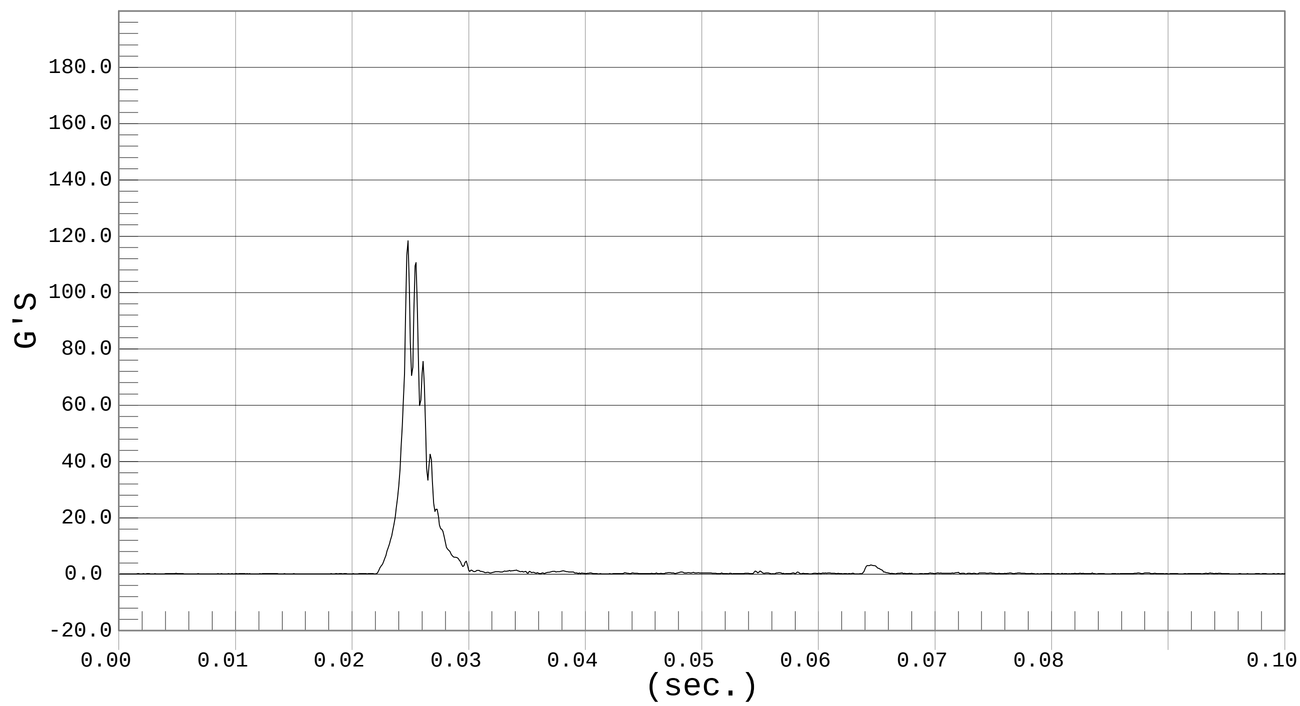


PEAK RESULTANT ACCELERATION

Test Desc.: Head Drop
Component: Dummy #033

Test Date: 03-19-03
Speed: 0.0 fps, 0.00 M/s

Ymin = .07 G'S @ 0.0002 sec., Ymax = 118.34 G'S @ 0.0247 sec.

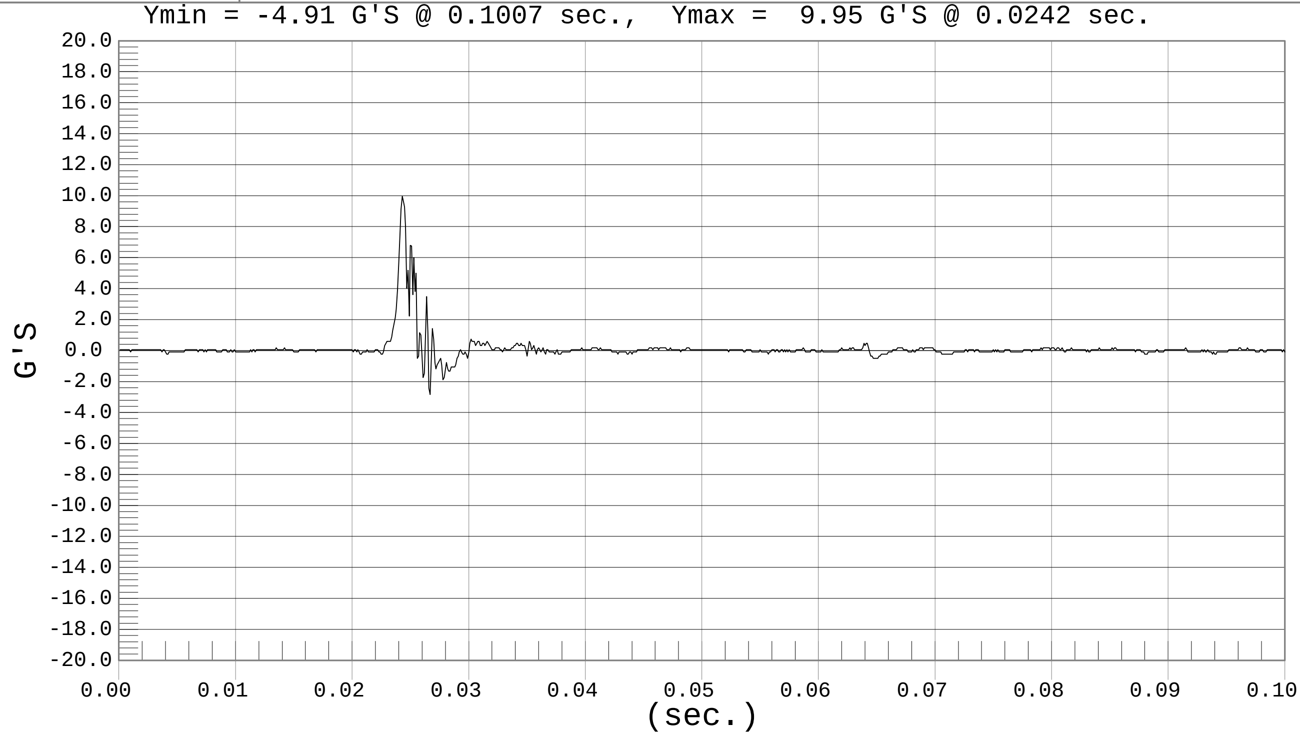


PEAK LONGITUDINAL ACCELRATION

Test Desc.: Head Drop
Component: Dummy #033

Test Date: 03-19-03
Speed: 0.0 fps, 0.00 M/s

Ymin = -4.91 G'S @ 0.1007 sec., Ymax = 9.95 G'S @ 0.0242 sec.



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LATERAL NECK PENDULUM TEST

SID IIs DUMMY

Date: 3/19/03

Dummy Serial Number: 033

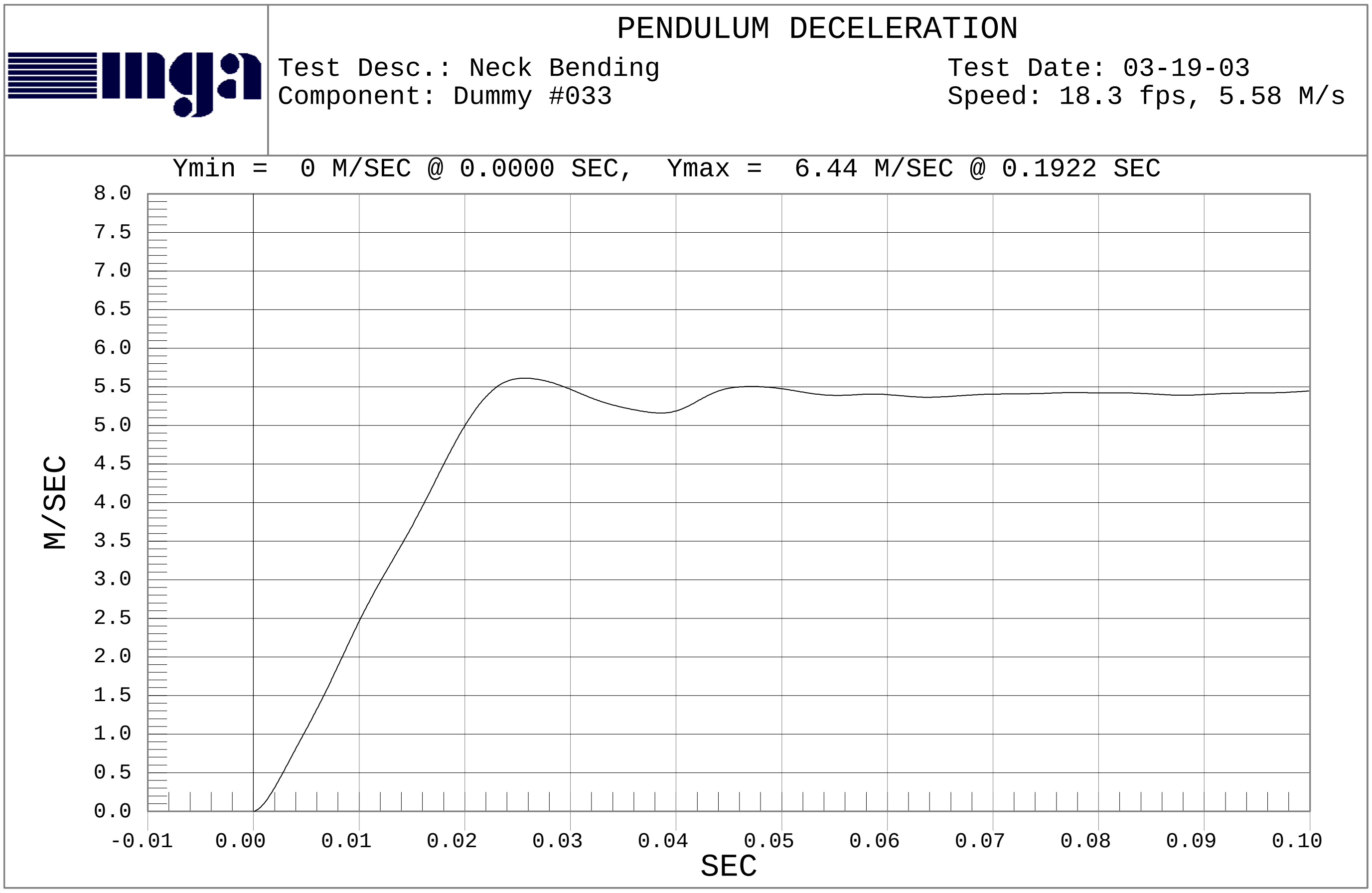
Test Number: D03382/D03392

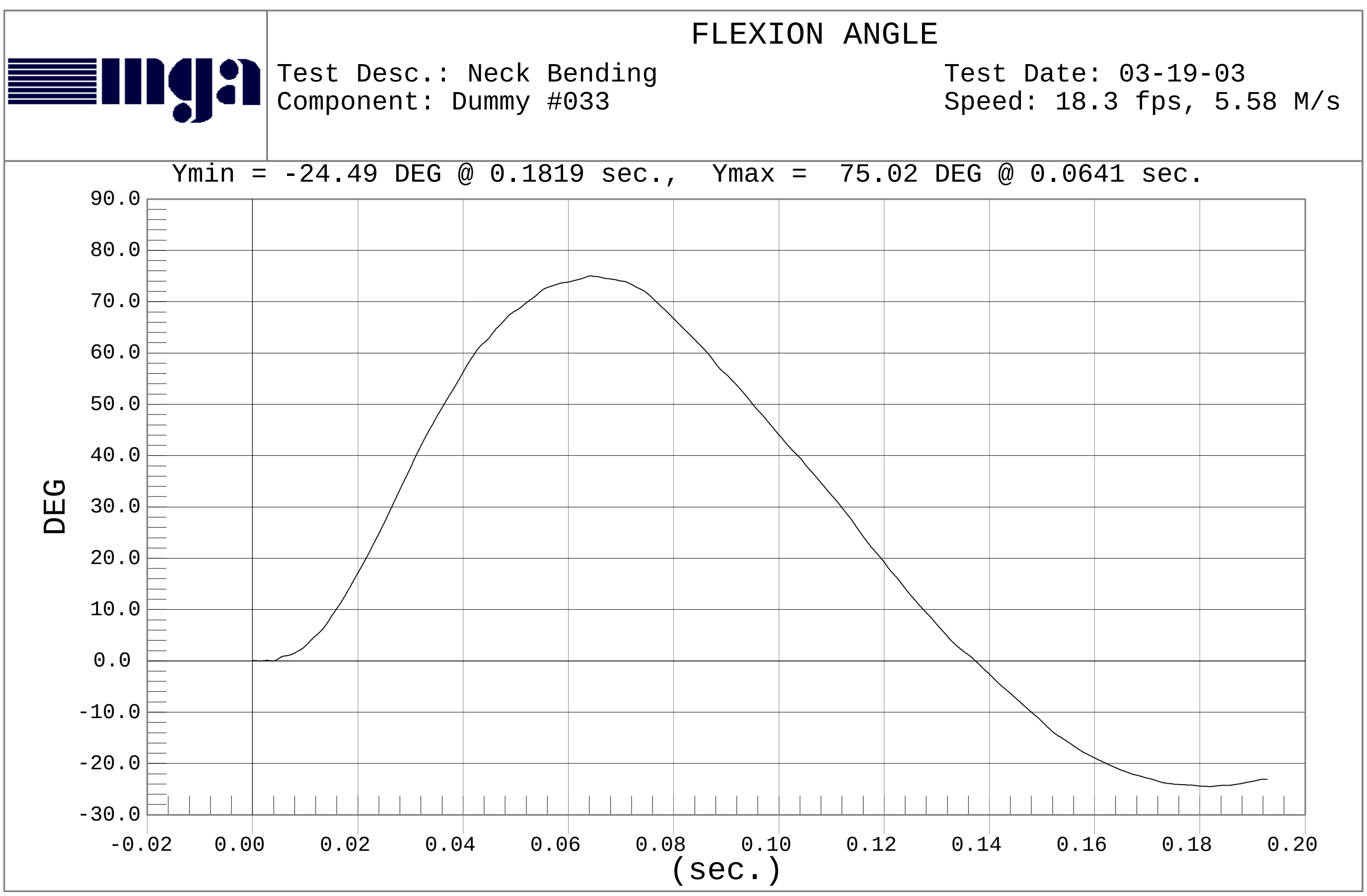
TEST PARAMETER		SPECIFICATION	TEST RESULTS	
			D03382	D03392
Temperature (ºC)		20.8° – 22.2°	20.9	21.1
Humidity		10% - 70%	25	24
Impact Velocity (m/s)		5.51-5.63	5.58	5.57
Delta Velocity (m/s)	10 ms	2.10-2.70	2.48	2.33
	15 ms	3.00-3.80	3.72	3.51
	20 ms	4.20-5.20	5.02	4.76
	25-60 ms	5.00-6.40	5.61	5.49
Peak D-Plane Rotation (deg)		72-82	75	79
Decay Time of D-Plane Rotation Peak to Zero Degree (ms)		60-83	73	72
Peak Occipital Condyle Moment (Nm)		(-43) – (-36)	-42	-42
Time at 10 or -10 Nm after Peak Moment (ms)		90 – 98	91	92
Time of last Moment Peak to Max Rotation (ms)		<14	7	12
Front Pot Peak Rotation (deg)		59 – 72	66	66
Time of Front Pot Peak Rotation (ms)		61 – 73	65	64
Rear Pot Peak Rotation (deg)		47 – 56	52	53
Time of Rear Pot Peak Rotation (ms)		62 – 73	68	65

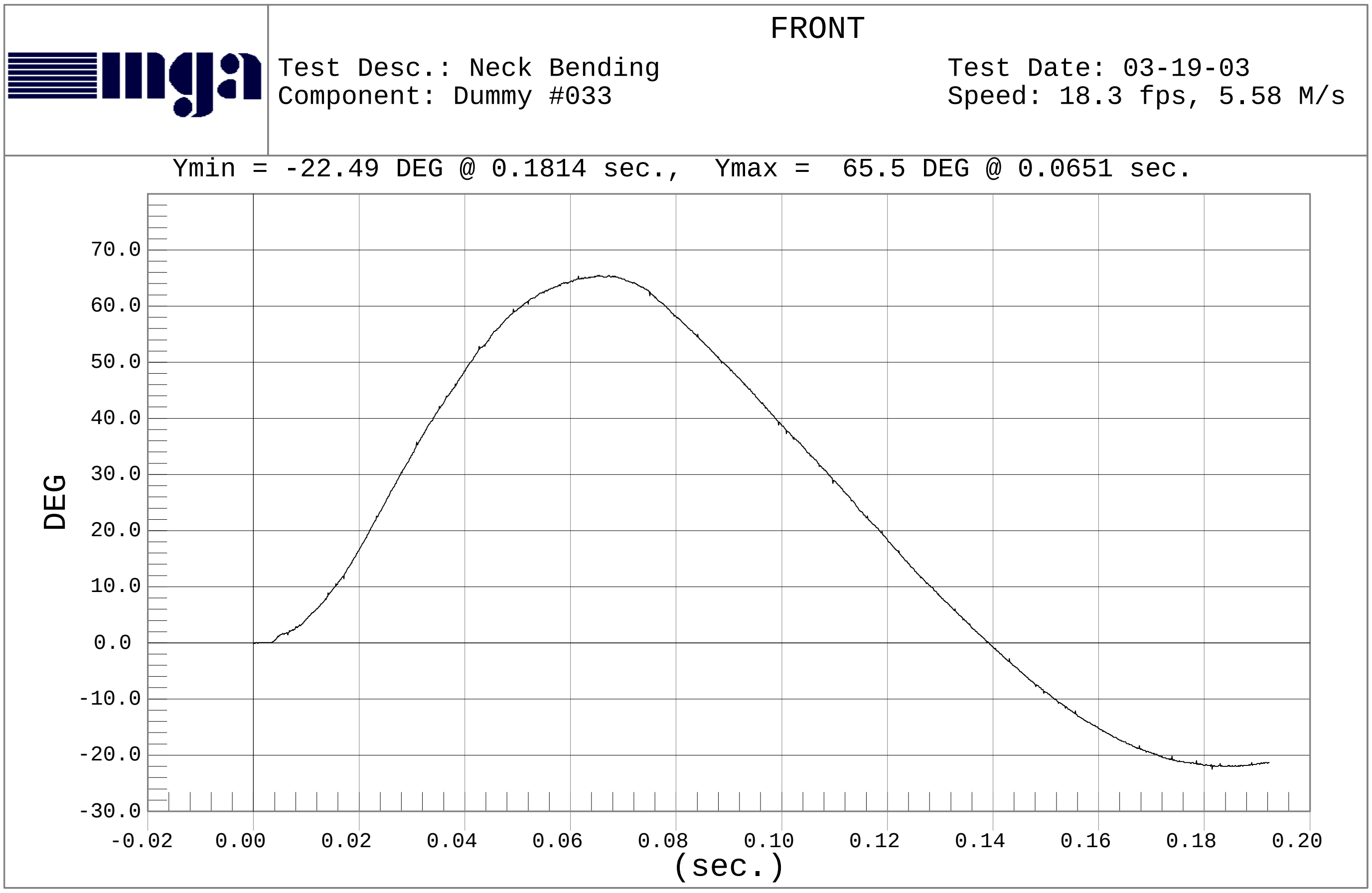
TEST MEETS SPECIFICATIONS

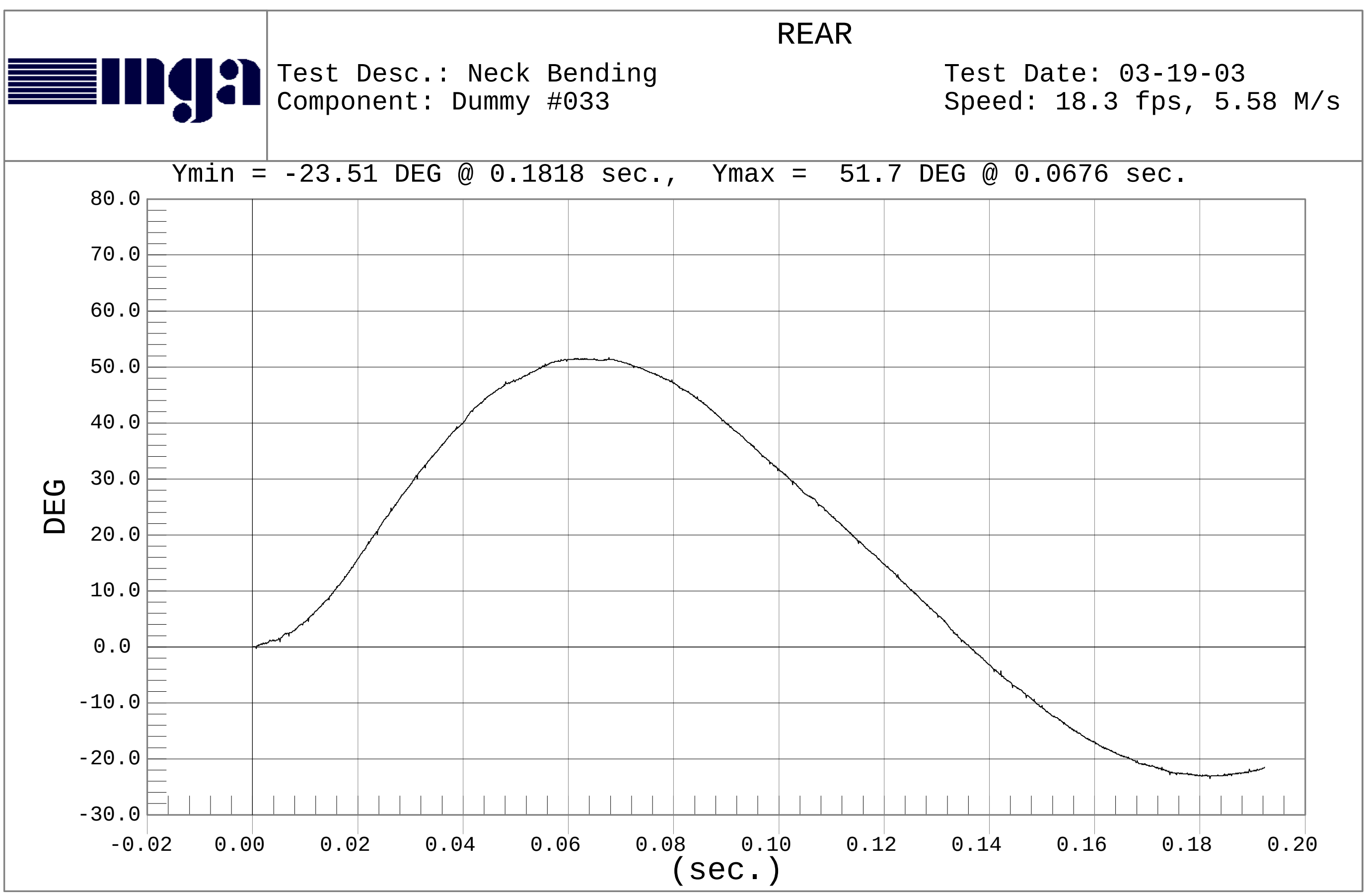
Technician: ___________________________________

Approved By:___________________________________


PENDULUM DECELERATION
Test Desc.: Neck Bending
Component: Dummy #033
Test Date: 03-19-03
Speed: 18.3 fps, 5.58 M/s
Ymin = 0 M/SEC @ 0.0000 SEC, Ymax = 6.44 M/SEC @ 0.1922 SEC
M/SEC
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.01
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.10
SEC


FLEXION ANGLE
Test Desc.: Neck Bending
Component: Dummy #033
Test Date: 03-19-03
Speed: 18.3 fps, 5.58 M/s
Ymin = -24.49 DEG @ 0.1819 sec., Ymax = 75.02 DEG @ 0.0641 sec.
DEG
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-0.02
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
0.18
0.20
(sec.)


FRONT
Test Desc.: Neck Bending
Component: Dummy #033
Test Date: 03-19-03
Speed: 18.3 fps, 5.58 M/s
Ymin = -22.49 DEG @ 0.1814 sec., Ymax = 65.5 DEG @ 0.0651 sec.
DEG
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-0.02
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
0.18
0.20
(sec.)

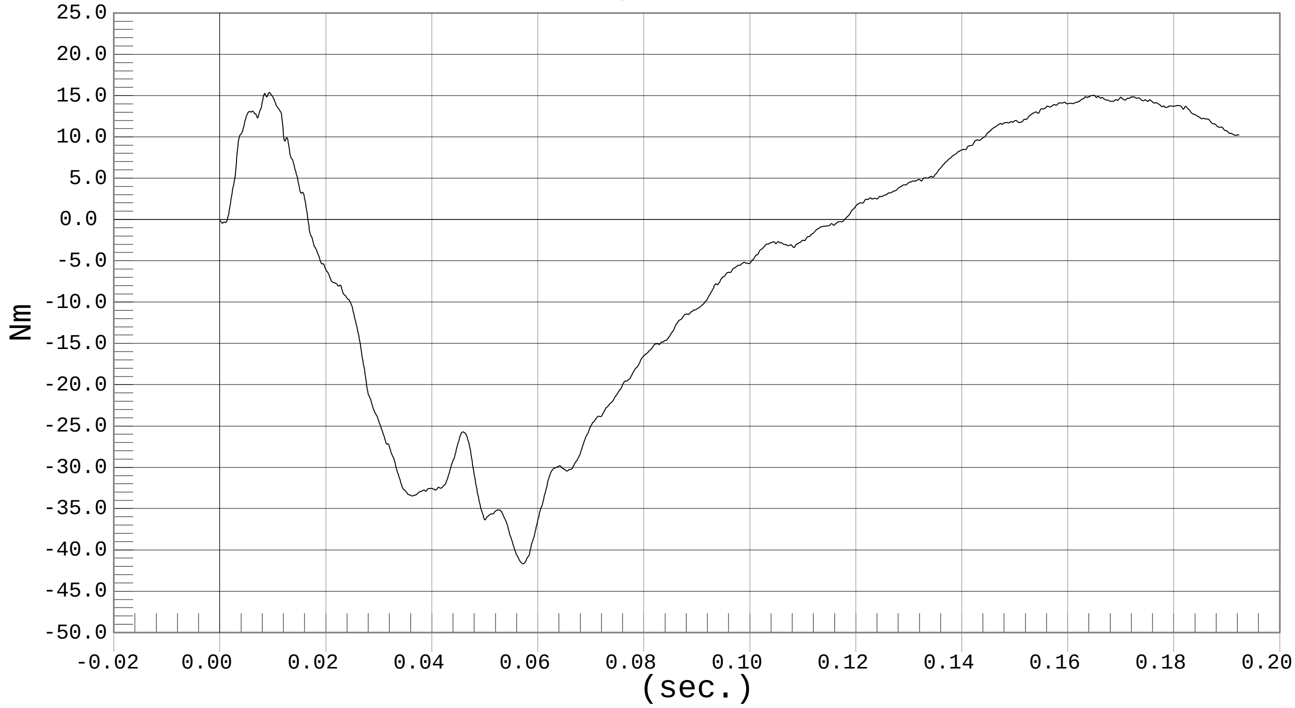

REAR
Test Desc.: Neck Bending
Component: Dummy #033
Test Date: 03-19-03
Speed: 18.3 fps, 5.58 M/s
Ymin = -23.51 DEG @ 0.1818 sec., Ymax = 51.7 DEG @ 0.0676 sec.
DEG
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-0.02
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
0.18
0.20
(sec.)

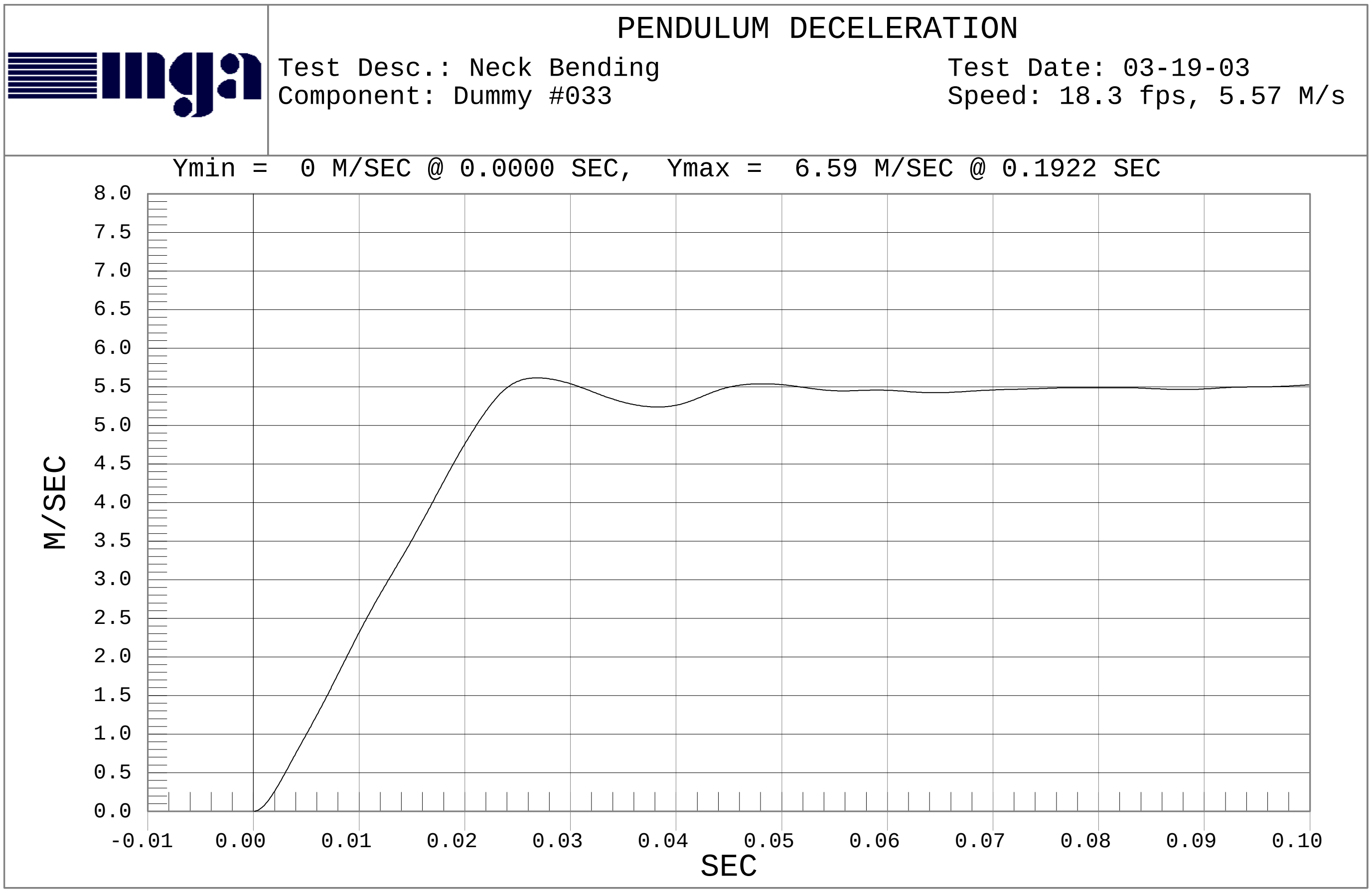
OCCIPITAL MOMENT

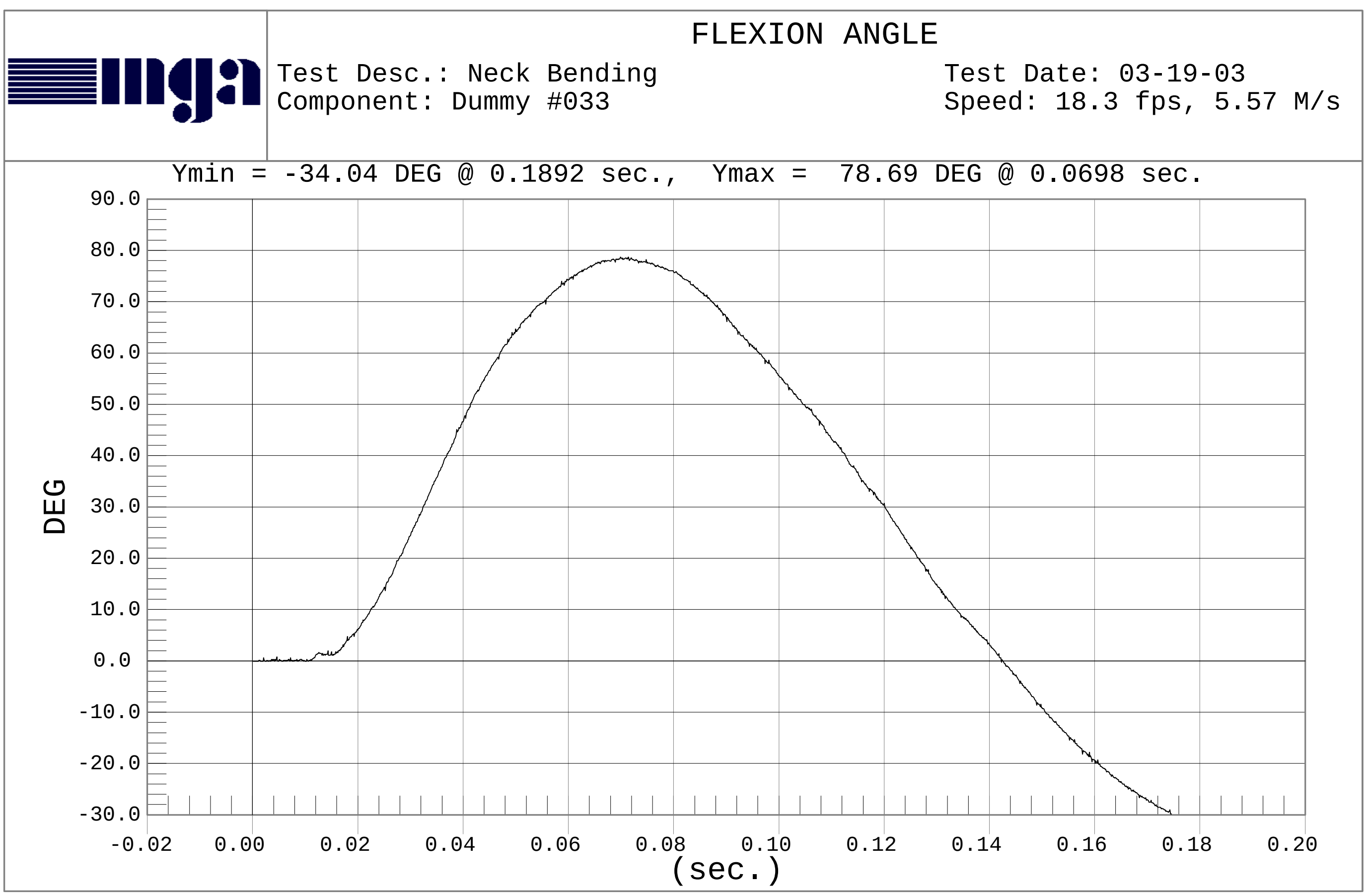
Test Desc.: Neck Bending
Component: Dummy #033

Test Date: 03-19-03
Speed: 18.3 fps, 5.58 M/s

Ymin = -41.69 Nm @ 0.0571 sec., Ymax = 15.37 Nm @ 0.0092 sec.




PENDULUM DECELERATION
Test Desc.: Neck Bending
Component: Dummy #033
Test Date: 03-19-03
Speed: 18.3 fps, 5.57 M/s
Ymin = 0 M/SEC @ 0.0000 SEC, Ymax = 6.59 M/SEC @ 0.1922 SEC
M/SEC
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.01
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.10
SEC

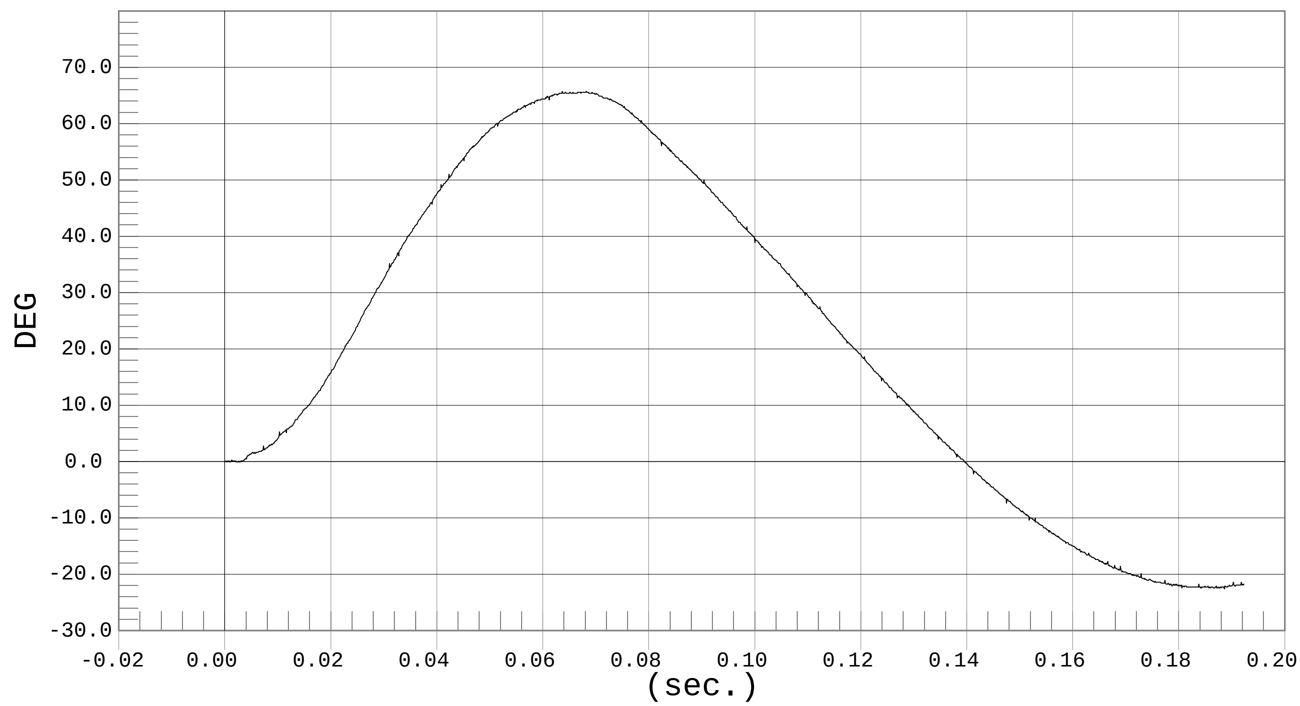

FLEXION ANGLE
Test Desc.: Neck Bending
Component: Dummy #033
Test Date: 03-19-03
Speed: 18.3 fps, 5.57 M/s
Ymin = -34.04 DEG @ 0.1892 sec., Ymax = 78.69 DEG @ 0.0698 sec.
DEG
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-0.02
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
0.18
0.20
(sec.)

FRONT

Test Desc.: Neck Bending
Component: Dummy #033

Test Date: 03-19-03
Speed: 18.3 fps, 5.57 M/s

Ymin = -22.59 DEG @ 0.1885 sec., Ymax = 65.72 DEG @ 0.0636 sec.

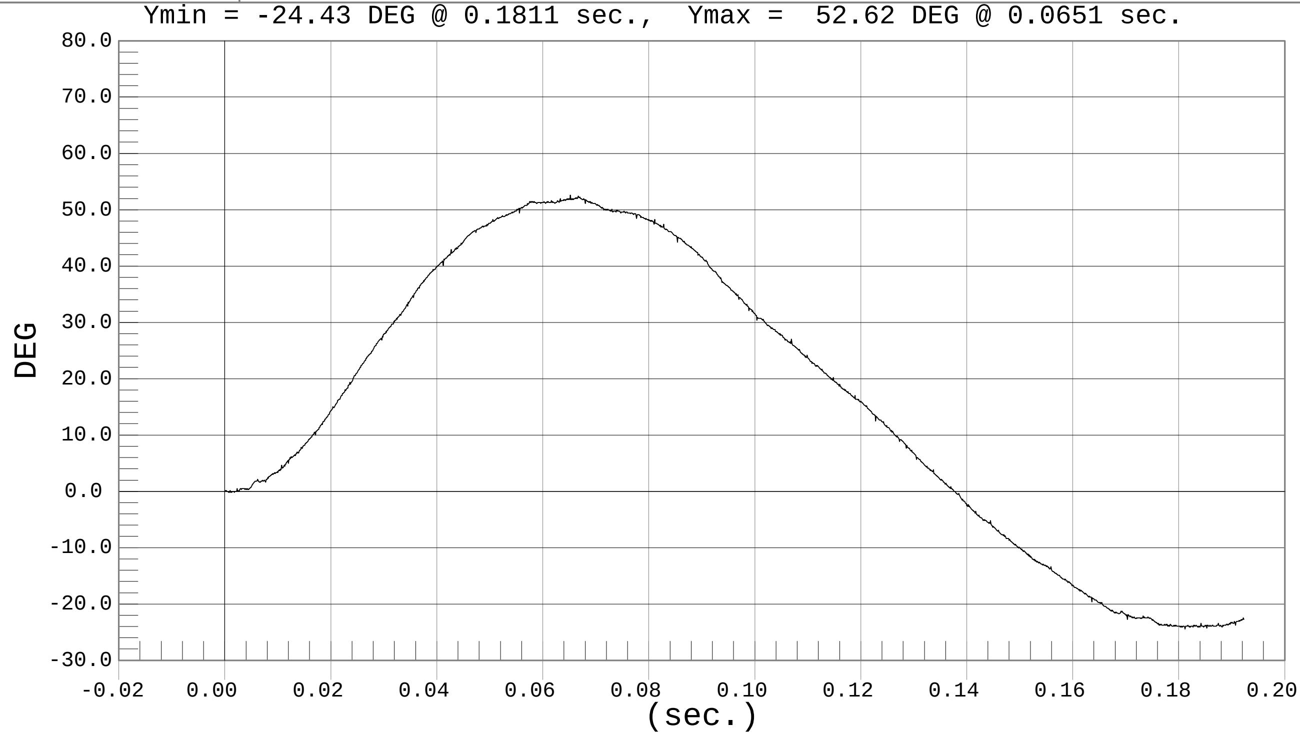


REAR

Test Desc.: Neck Bending
Component: Dummy #033

Test Date: 03-19-03
Speed: 18.3 fps, 5.57 M/s

Ymin = -24.43 DEG @ 0.1811 sec., Ymax = 52.62 DEG @ 0.0651 sec.

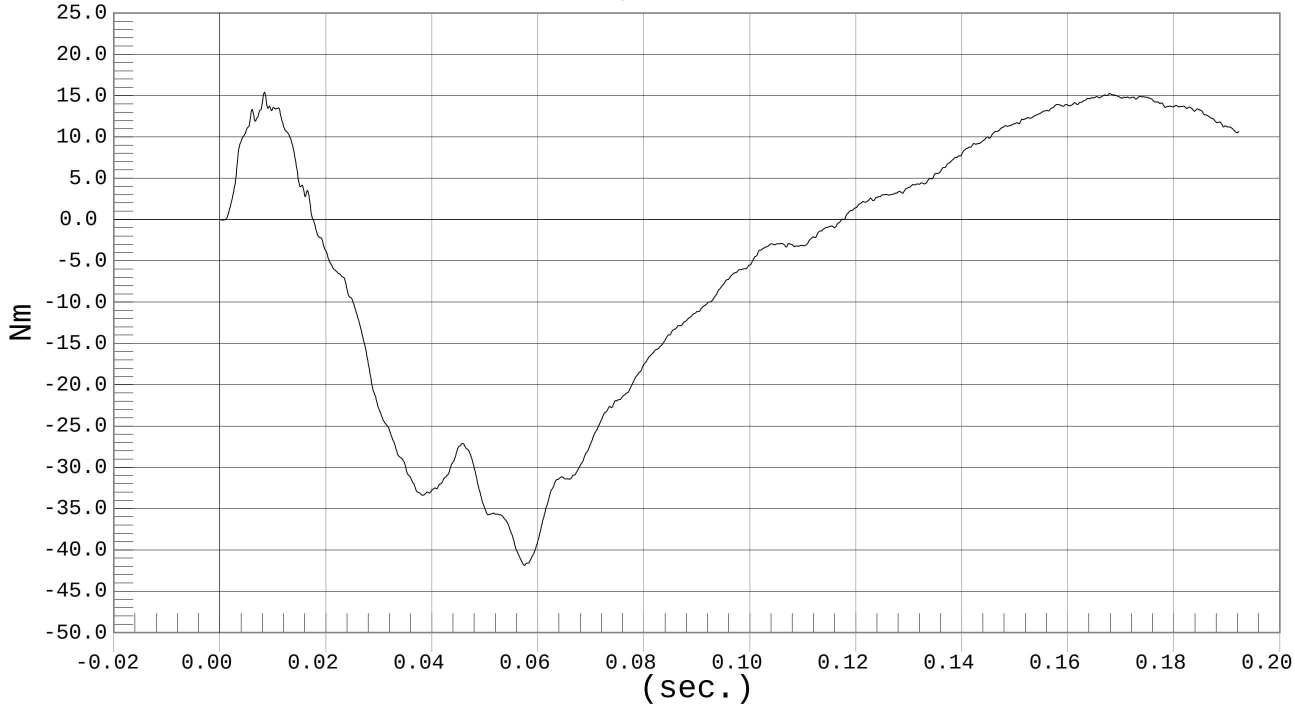


OCCIPITAL MOMENT

Test Desc.: Neck Bending
Component: Dummy #033

Test Date: 03-19-03
Speed: 18.3 fps, 5.57 M/s

Ymin = -41.86 Nm @ 0.0574 sec., Ymax = 15.43 Nm @ 0.0083 sec.



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

SID IIs DUMMY

Date: 3/19/03

Dummy Serial Number: 033

Test Number: D03383/D03393

TEST PARAMETER	SPECIFICATION	TEST RESULTS	
		D03383	D03393
Temperature (ºC)	20.8° – 22.2°	21.0	21.3
Humidity	10% - 70%	26	25
Impact Velocity	4.41 - 4.59 m/s	4.52	4.52
Probe Force	1.6 - 2.4 kN	2.3	2.3
Shoulder Displacement	27-39 mm	32	32

TEST MEETS SPECIFICATIONS

Technician: ______________________________

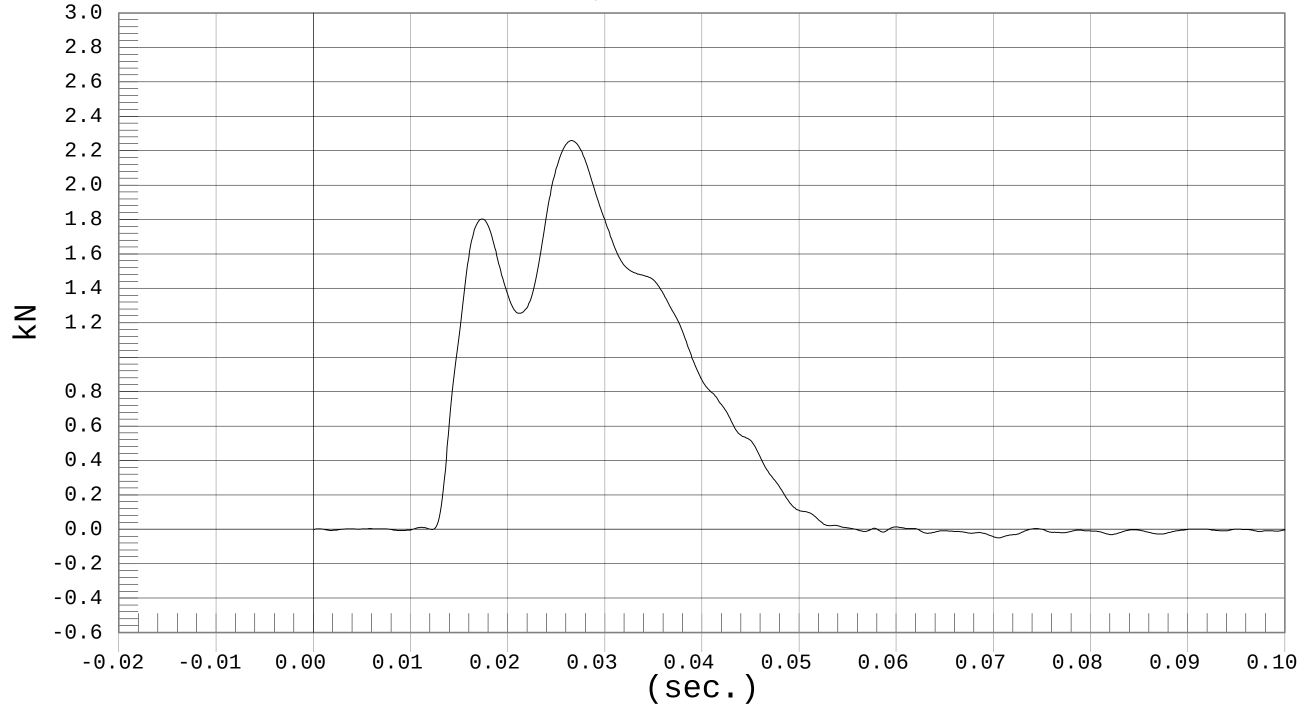
Approved By:______________________________

PROBE FORCE

Test Desc.: Shoulder Impact
Component: Dummy #033

Test Date: 03-19-03
Speed: 14.8 fps, 4.52 M/s

Ymin = -.05 kN @ 0.0704 sec., Ymax = 2.26 kN @ 0.0265 sec.

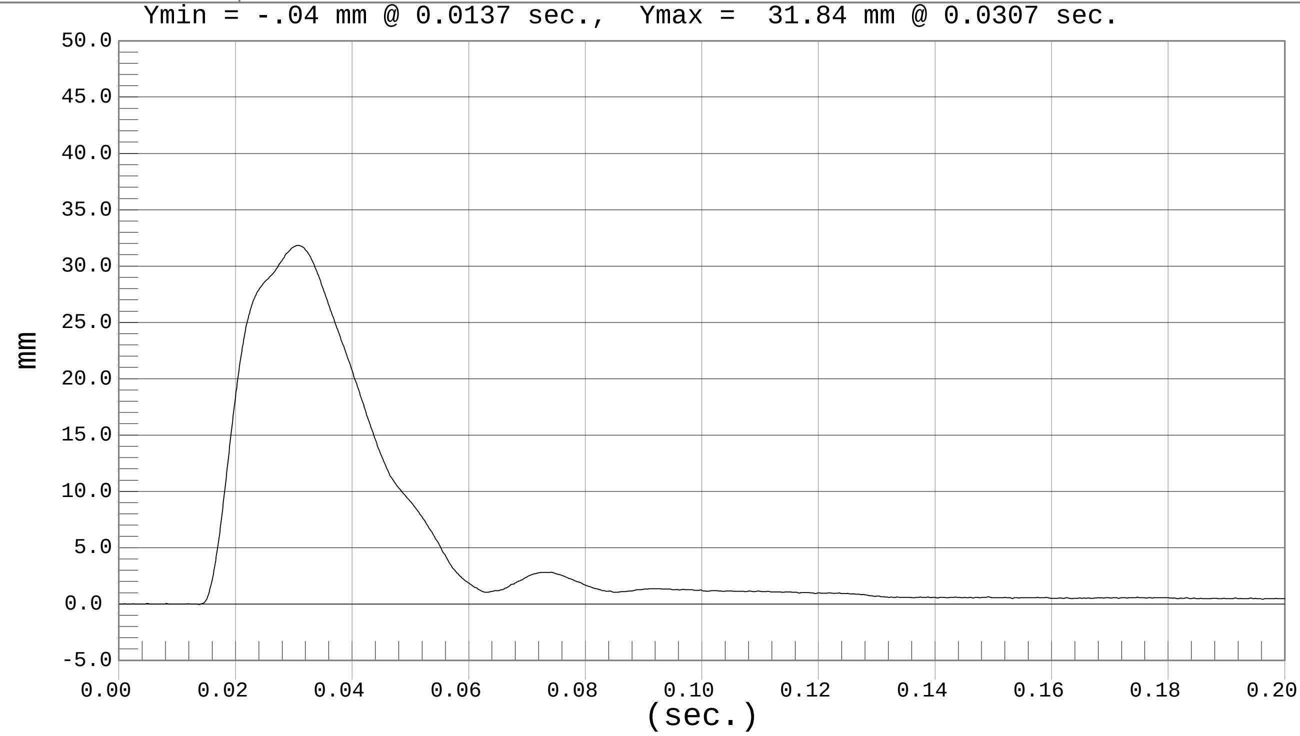


SHOULDER DISPLACEMENT

Test Desc.: Shoulder Impact
Component: Dummy #033

Test Date: 03-19-03
Speed: 14.8 fps, 4.52 M/s

Ymin = -.04 mm @ 0.0137 sec., Ymax = 31.84 mm @ 0.0307 sec.

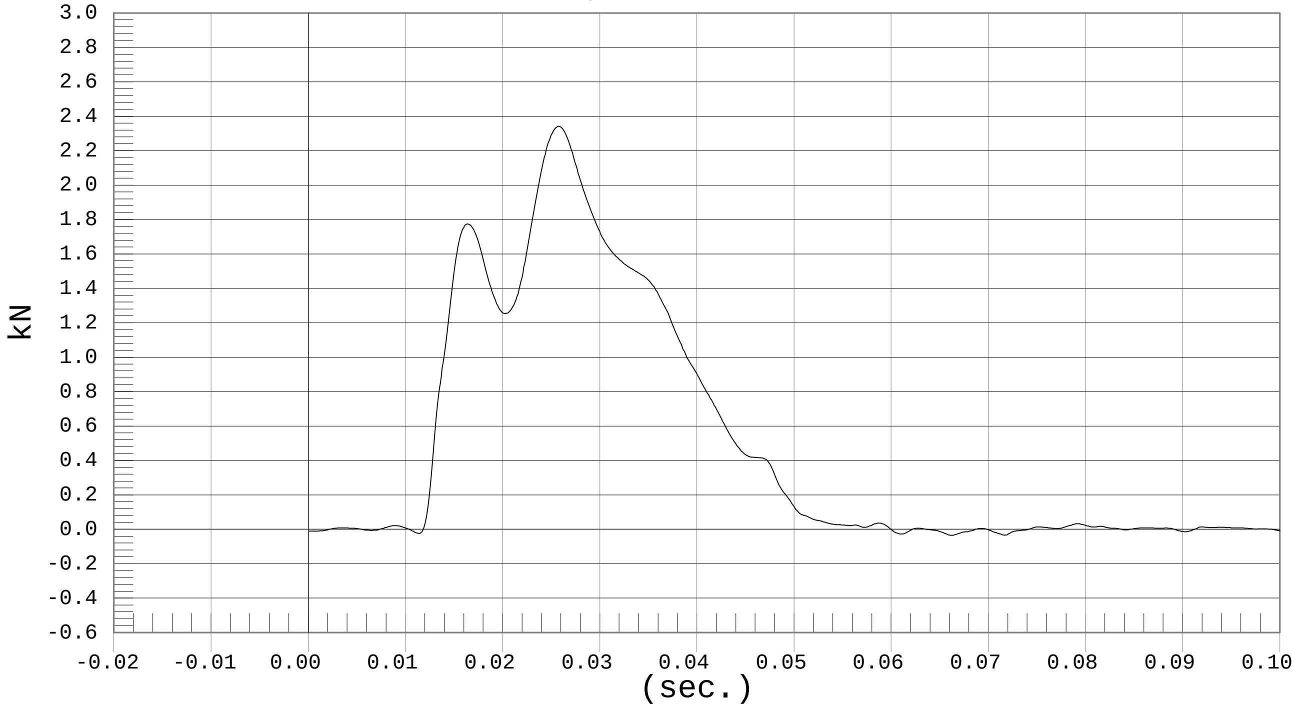


PROBE FORCE

Test Desc.: Shoulder Impact
Component: Dummy #033

Test Date: 03-19-03
Speed: 14.8 fps, 4.52 M/s

Ymin = -.04 kN @ 0.0661 sec., Ymax = 2.34 kN @ 0.0257 sec.

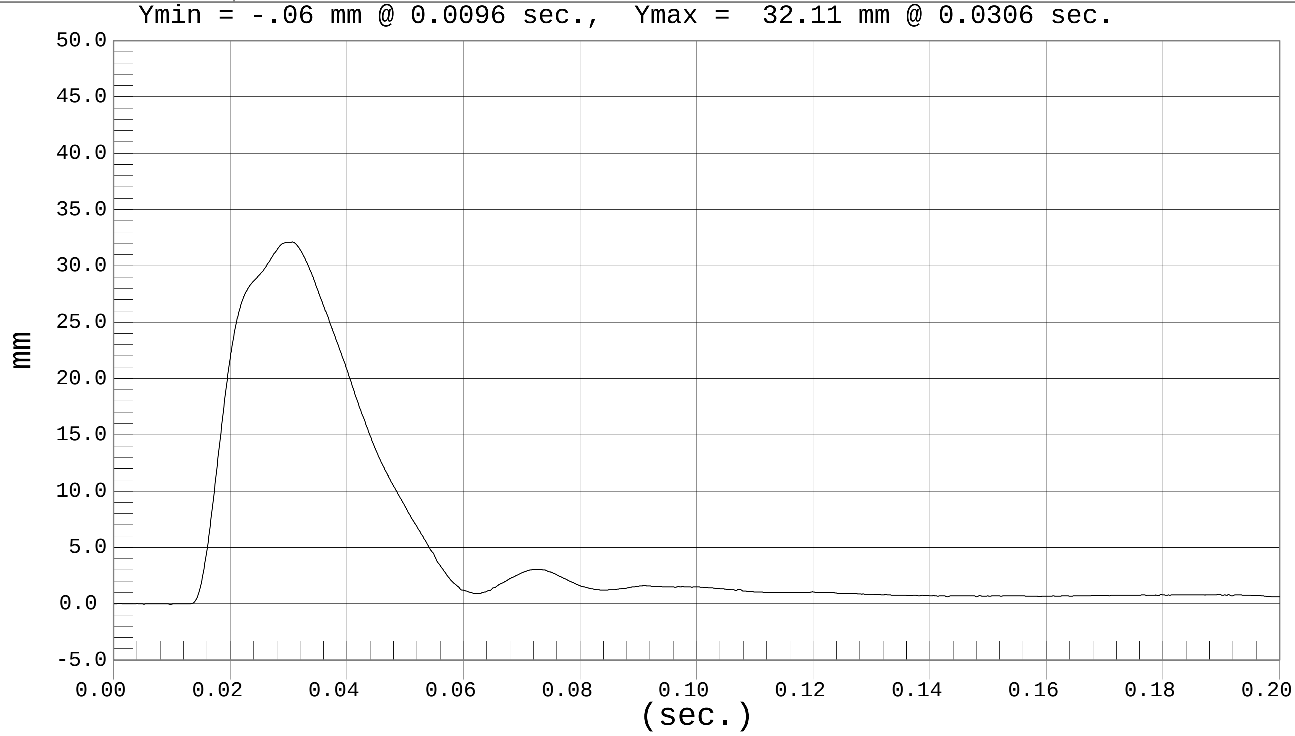


SHOULDER DISPLACEMENT

Test Desc.: Shoulder Impact
Component: Dummy #033

Test Date: 03-19-03
Speed: 14.8 fps, 4.52 M/s

Ymin = -.06 mm @ 0.0096 sec., Ymax = 32.11 mm @ 0.0306 sec.



MGA RESEARCH CORPORATION

THORAX (WITH ARM) IMPACT TESTS

SID IIs DUMMY

Date: 3/19/03

Dummy Serial Number: 033

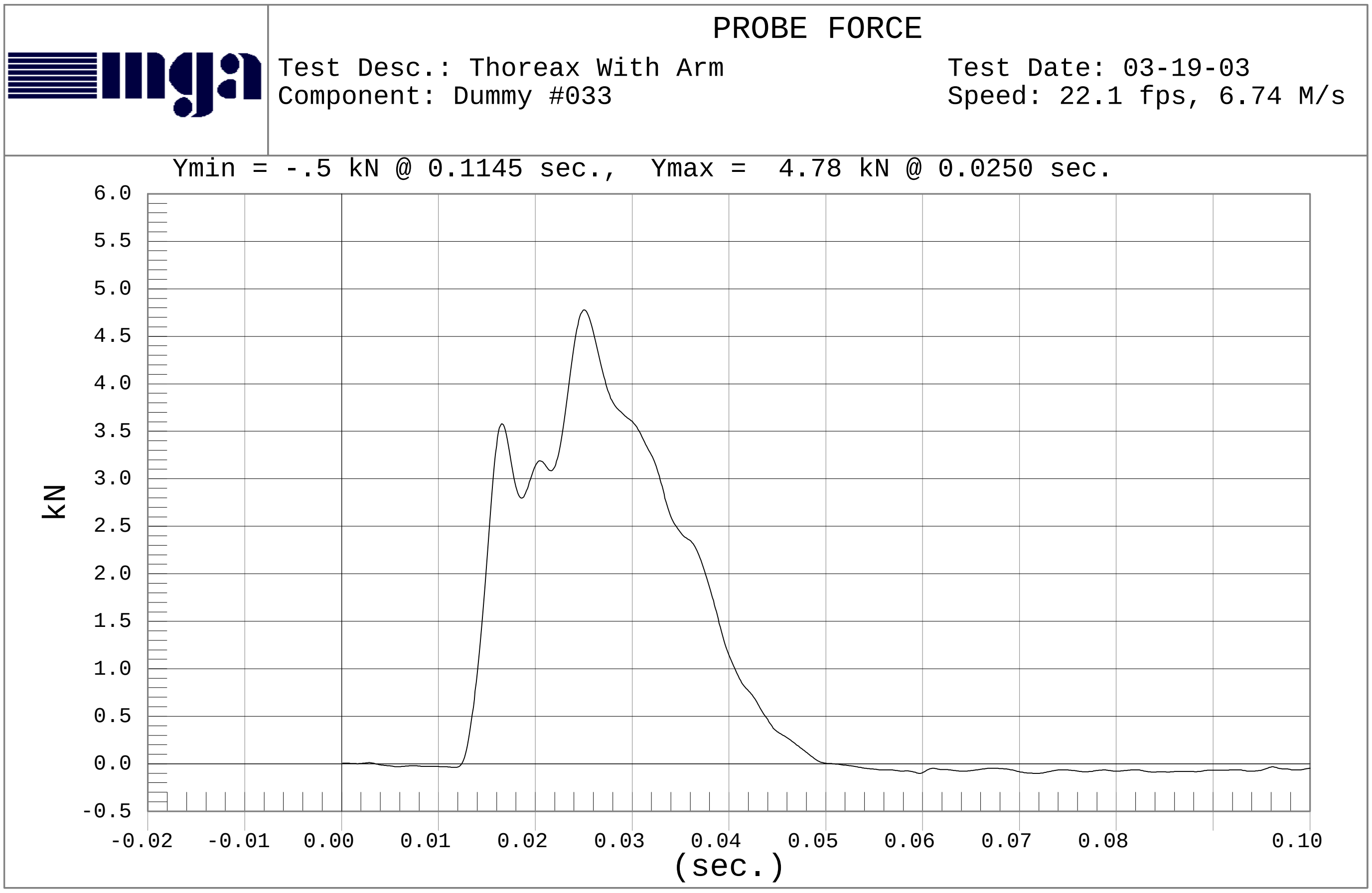
Test Number: D03384/D03394

TEST PARAMETER	SPECIFICATION	TEST RESULTS	
		D03384	D03394
Temperature (ºC)	20.8° – 22.2°	21.1	21.2
Humidity	10% - 70%	26	25
Impact Velocity	6.57 - 6.84 m/s	6.74	6.75
Probe Force	4.1 – 4.7 kN	*4.78	*4.78
Upper Spine Acceleration	34 – 48 g's	42	42
Lower Spine Acceleration	31 - 36 g's	36	35
Upper Rib Displacement	23 - 35 mm	28	29
Middle Rib Displacement	29 - 44 mm	33	33
Lower Rib Displacement	33 - 40 mm	36	37
Shoulder Displacement	30 - 42 mm	33	35

*TEST DOES NOT MEET SPECIFICATIONS

Technician: ____________________________________

Approved By:____________________________________



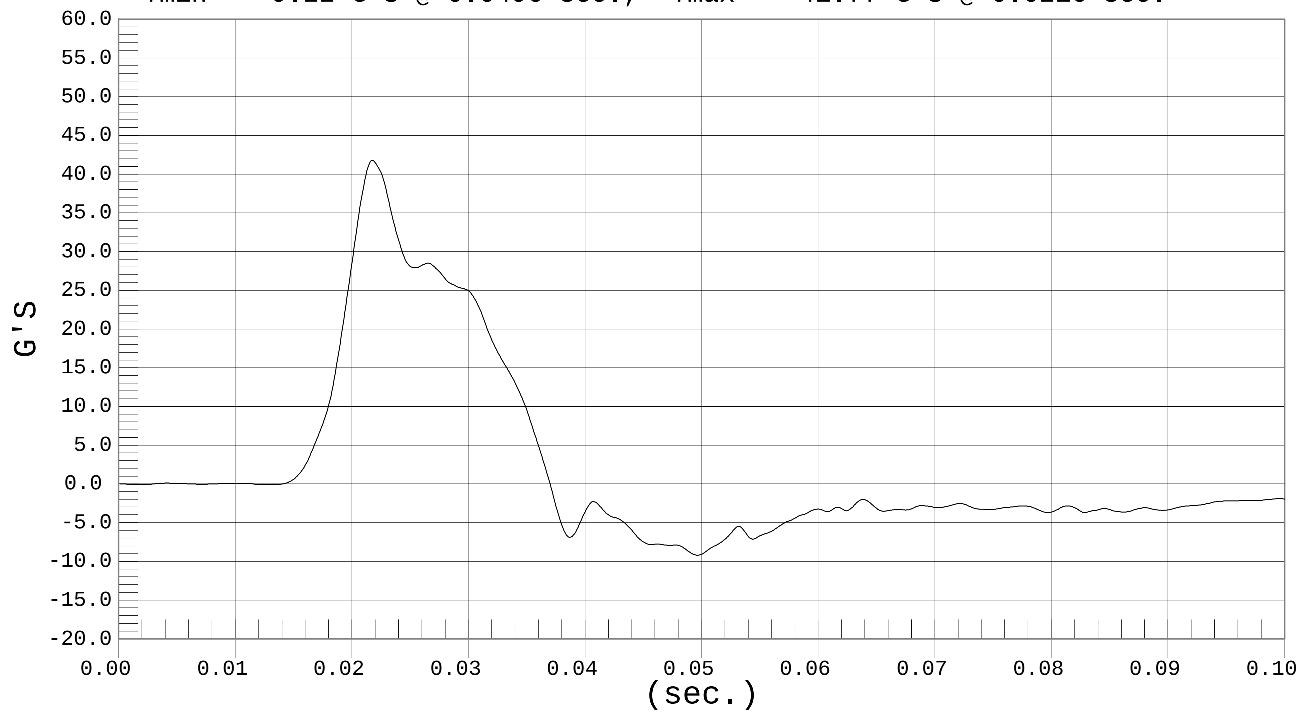
PROBE FORCE
Test Desc.: Thoreax With Arm
Component: Dummy #033
Test Date: 03-19-03
Speed: 22.1 fps, 6.74 M/s
Ymin = -.5 kN @ 0.1145 sec., Ymax = 4.78 kN @ 0.0250 sec.
kN
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-0.02
-0.01
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.10
(sec.)

UPPER SPINE ACCELERATION

Test Desc.: Thoreax With Arm
Component: Dummy #033

Test Date: 03-19-03
Speed: 22.1 fps, 6.74 M/s

Ymin = -9.22 G'S @ 0.0496 sec., Ymax = 41.77 G'S @ 0.0216 sec.

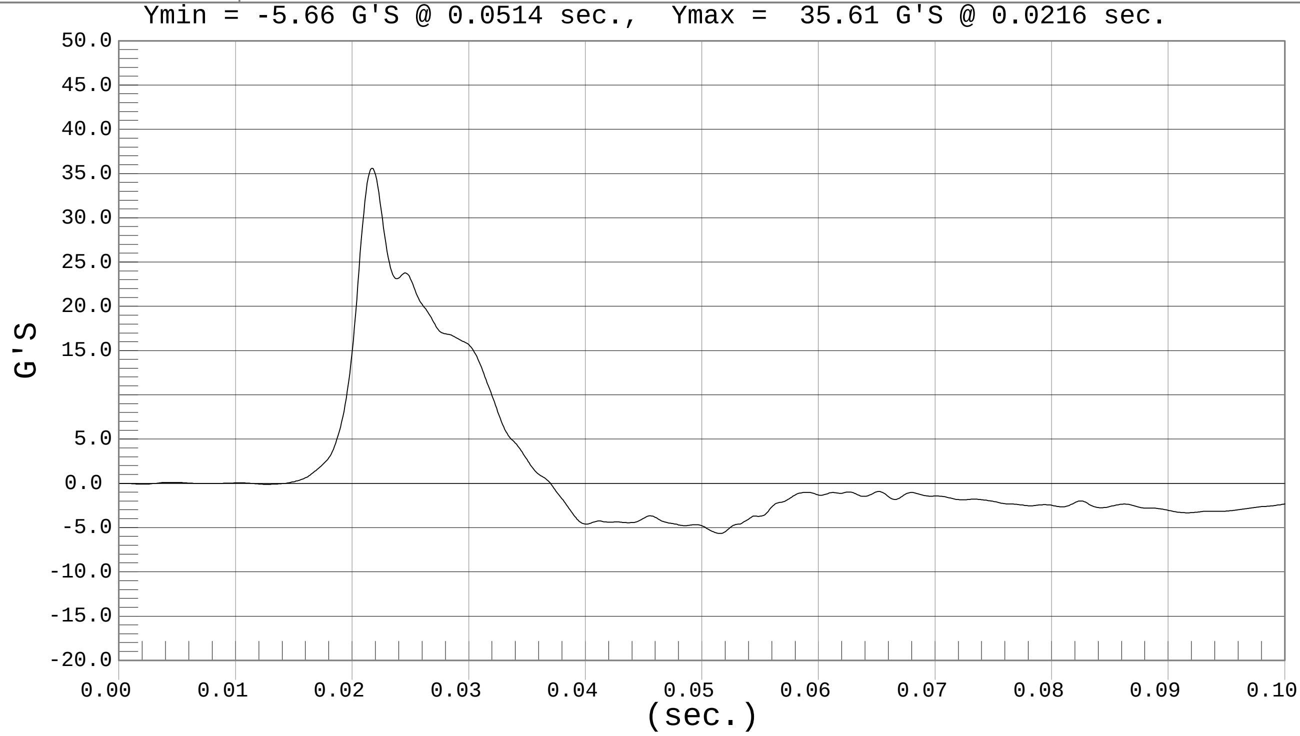


LOWER SPINE ACCELERATION

Test Desc.: Thoreax With Arm
Component: Dummy #033

Test Date: 03-19-03
Speed: 22.1 fps, 6.74 M/s

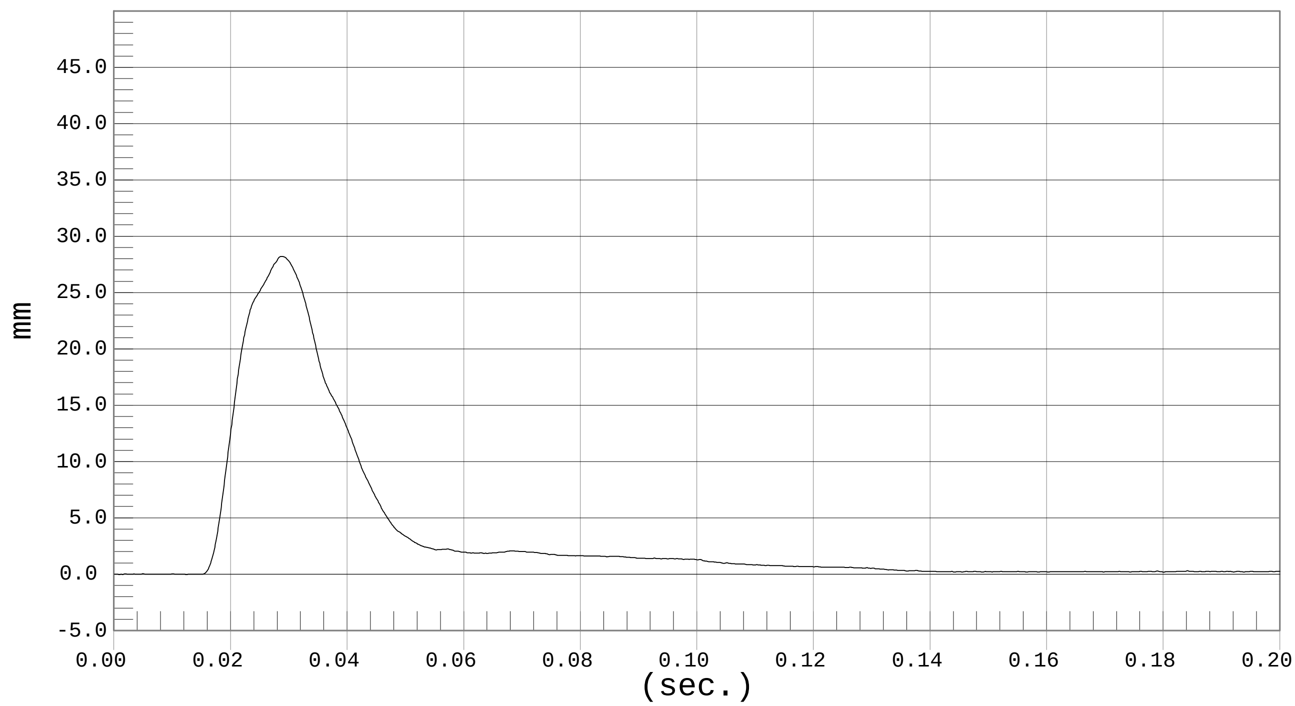
Ymin = -5.66 G'S @ 0.0514 sec., Ymax = 35.61 G'S @ 0.0216 sec.



UPPER RIB DISPLACEMENT

Test Desc.: Thoreax With Arm
Component: Dummy #033
Test Date: 03-19-03
Speed: 22.1 fps, 6.74 M/s

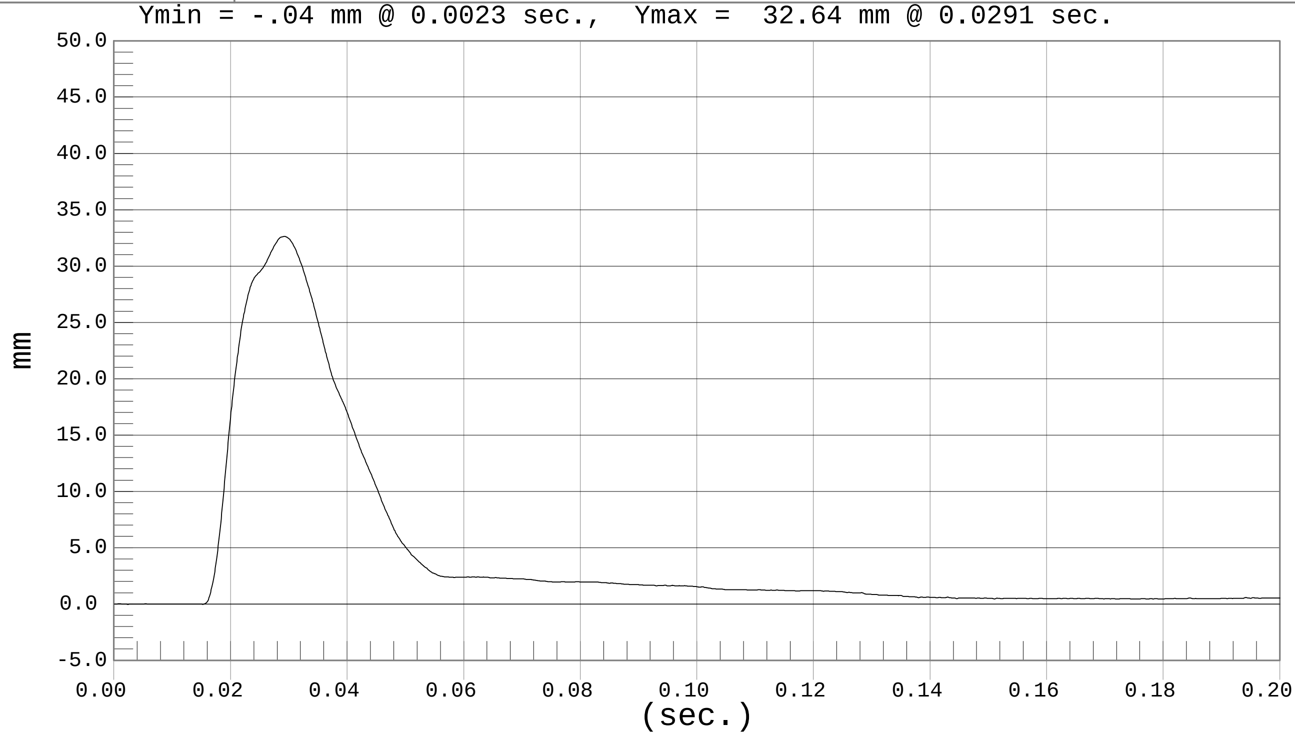
Ymin = -.02 mm @ 0.0014 sec., Ymax = 28.21 mm @ 0.0287 sec.



MIDDLE RIB DISPLACEMENT

Test Desc.: Thoreax With Arm
Component: Dummy #033
Test Date: 03-19-03
Speed: 22.1 fps, 6.74 M/s

Ymin = -.04 mm @ 0.0023 sec., Ymax = 32.64 mm @ 0.0291 sec.

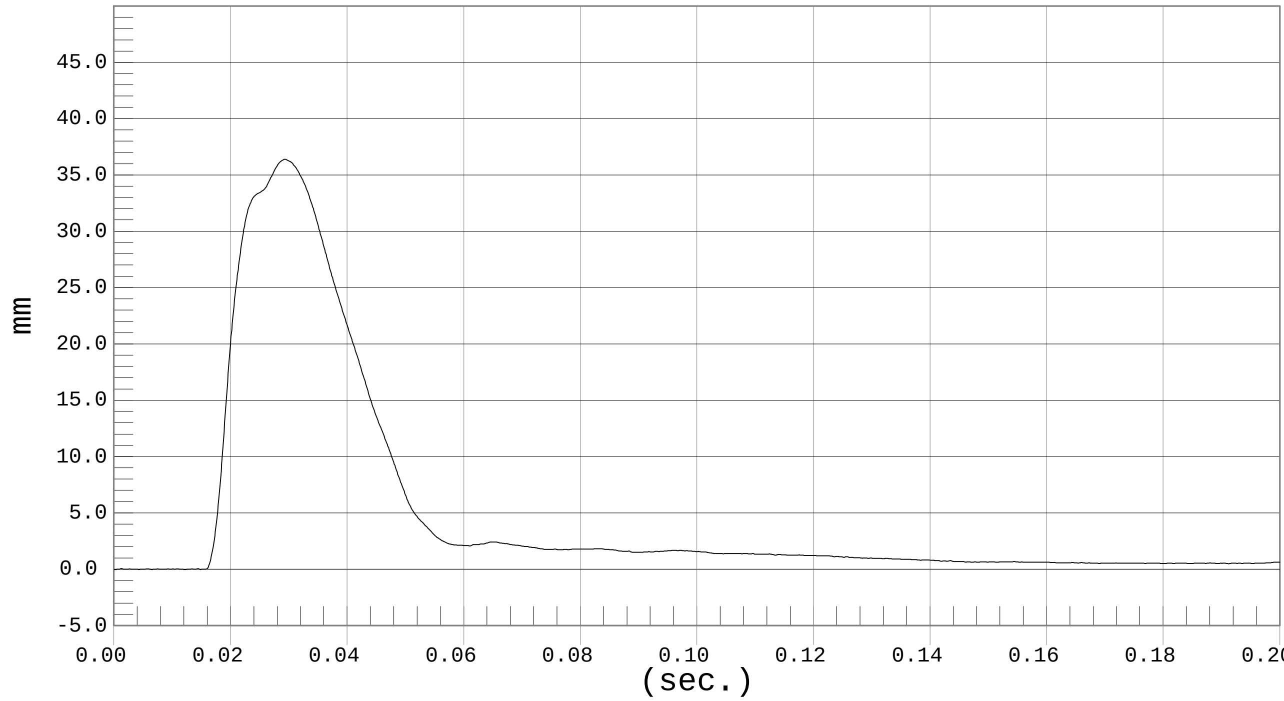


LOWER RIB DISPLACEMENT

Test Desc.: Thoreax With Arm
Component: Dummy #033

Test Date: 03-19-03
Speed: 22.1 fps, 6.74 M/s

Ymin = -.03 mm @ 0.0121 sec., Ymax = 36.39 mm @ 0.0293 sec.

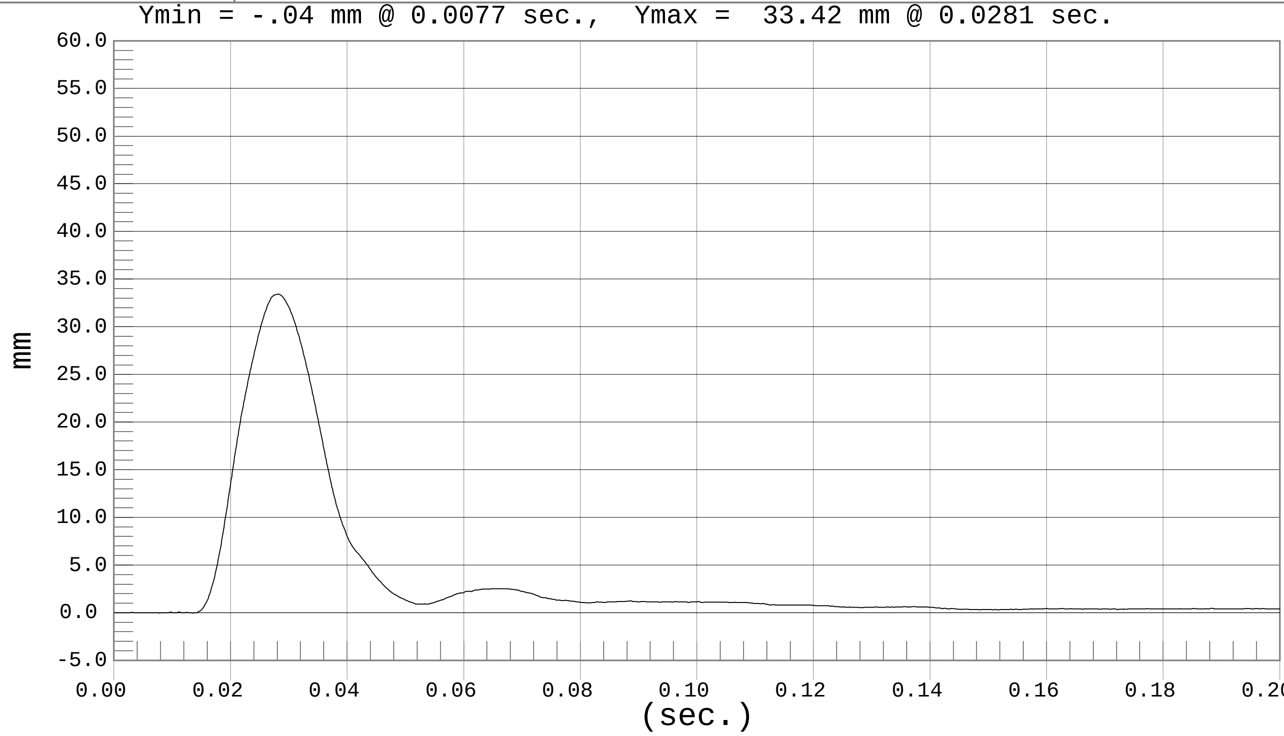


SHOULDER DISPLACEMENT

Test Desc.: Thoreax With Arm
Component: Dummy #033

Test Date: 03-19-03
Speed: 22.1 fps, 6.74 M/s

Ymin = -.04 mm @ 0.0077 sec., Ymax = 33.42 mm @ 0.0281 sec.

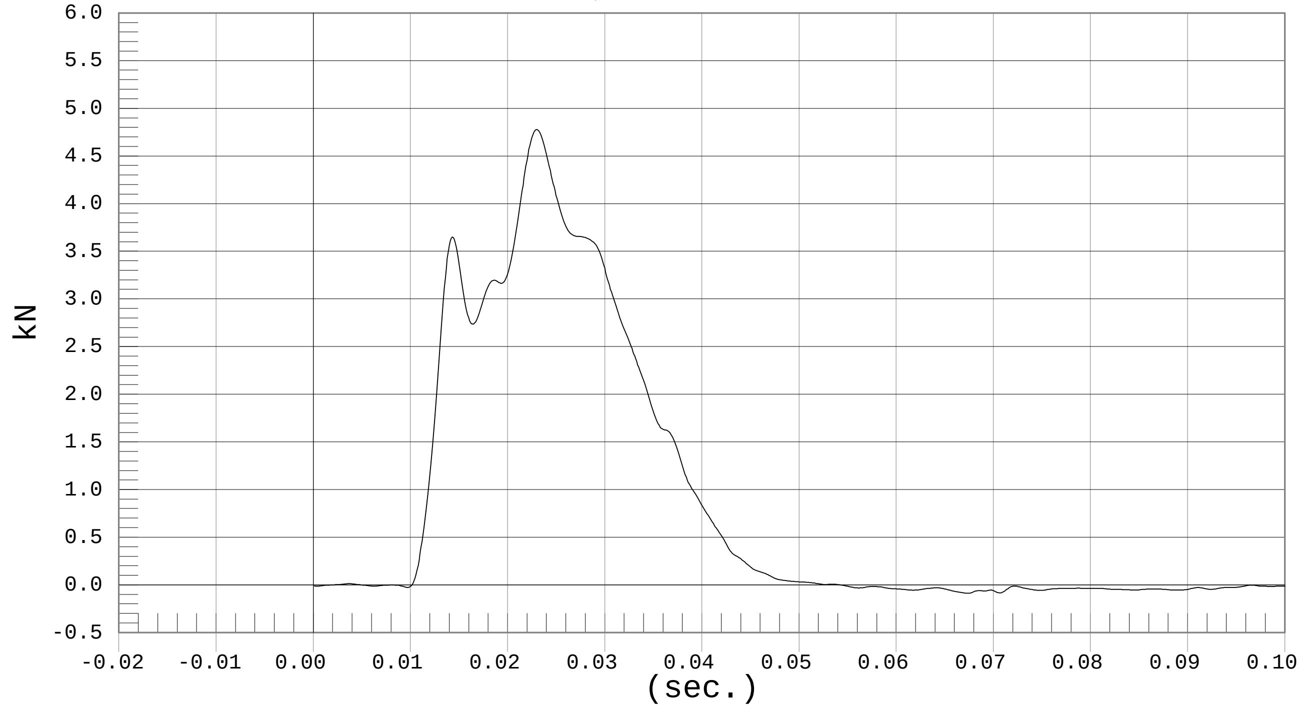


PROBE FORCE

Test Desc.: Thorax With Arm
Component: Dummy #033

Test Date: 03-19-03
Speed: 22.1 fps, 6.75 M/s

Ymin = -.11 kN @ 0.1217 sec., Ymax = 4.78 kN @ 0.0229 sec.

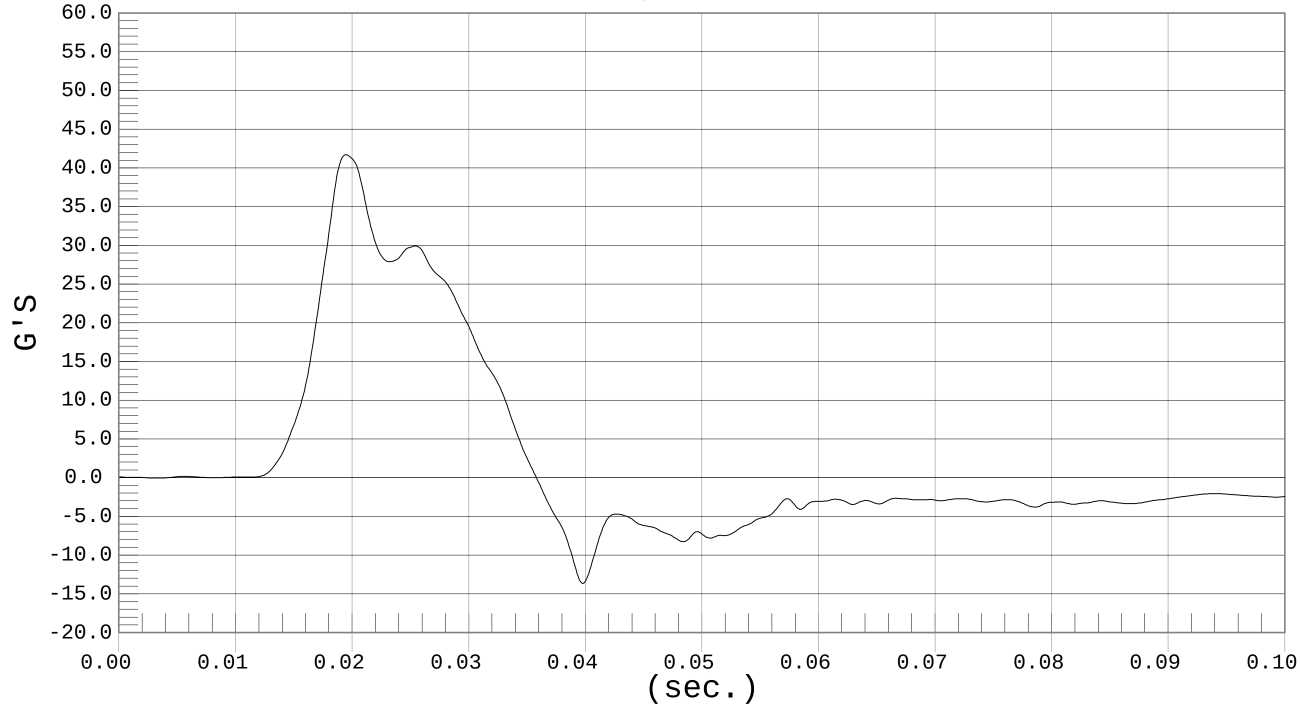


UPPER SPINE ACCELERATION

Test Desc.: Thorax With Arm
Component: Dummy #033

Test Date: 03-19-03
Speed: 22.1 fps, 6.75 M/s

Ymin = -13.66 G'S @ 0.0397 sec., Ymax = 41.71 G'S @ 0.0194 sec.

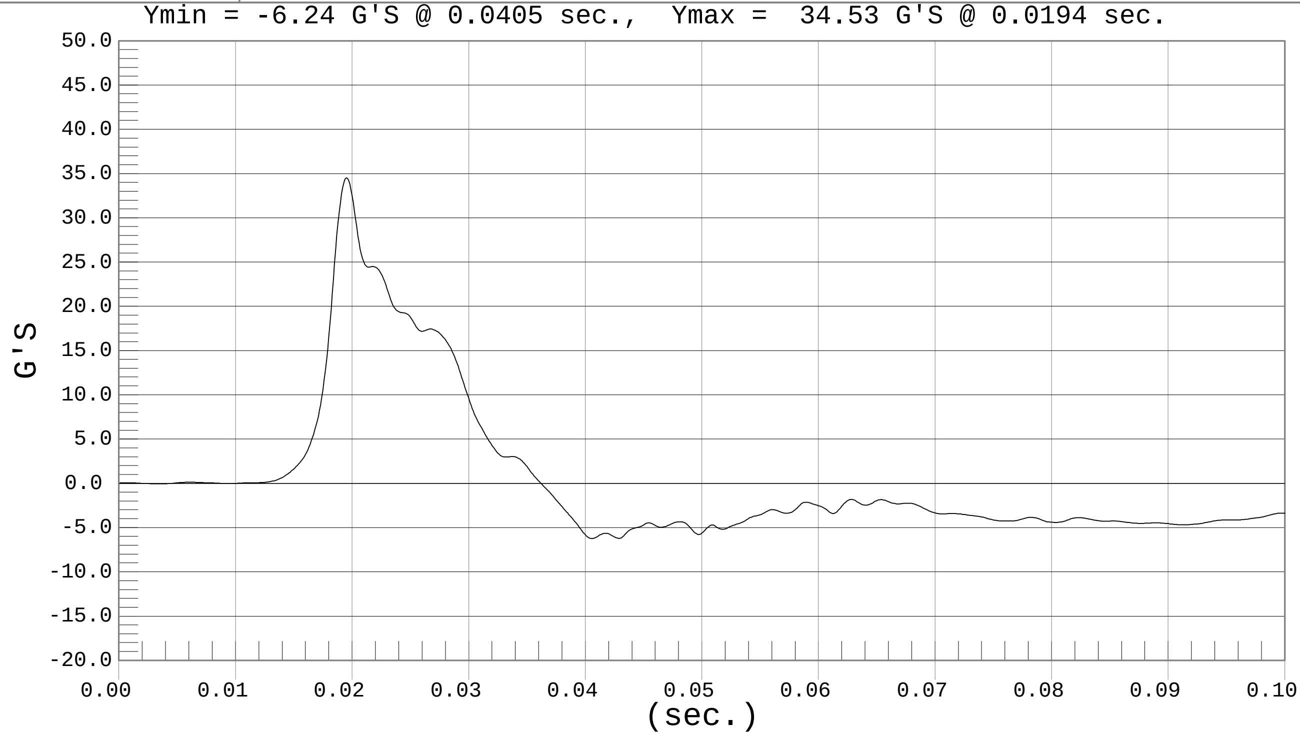


LOWER SPINE ACCELERATION

Test Desc.: Thorax With Arm
Component: Dummy #033

Test Date: 03-19-03
Speed: 22.1 fps, 6.75 M/s

Ymin = -6.24 G'S @ 0.0405 sec., Ymax = 34.53 G'S @ 0.0194 sec.

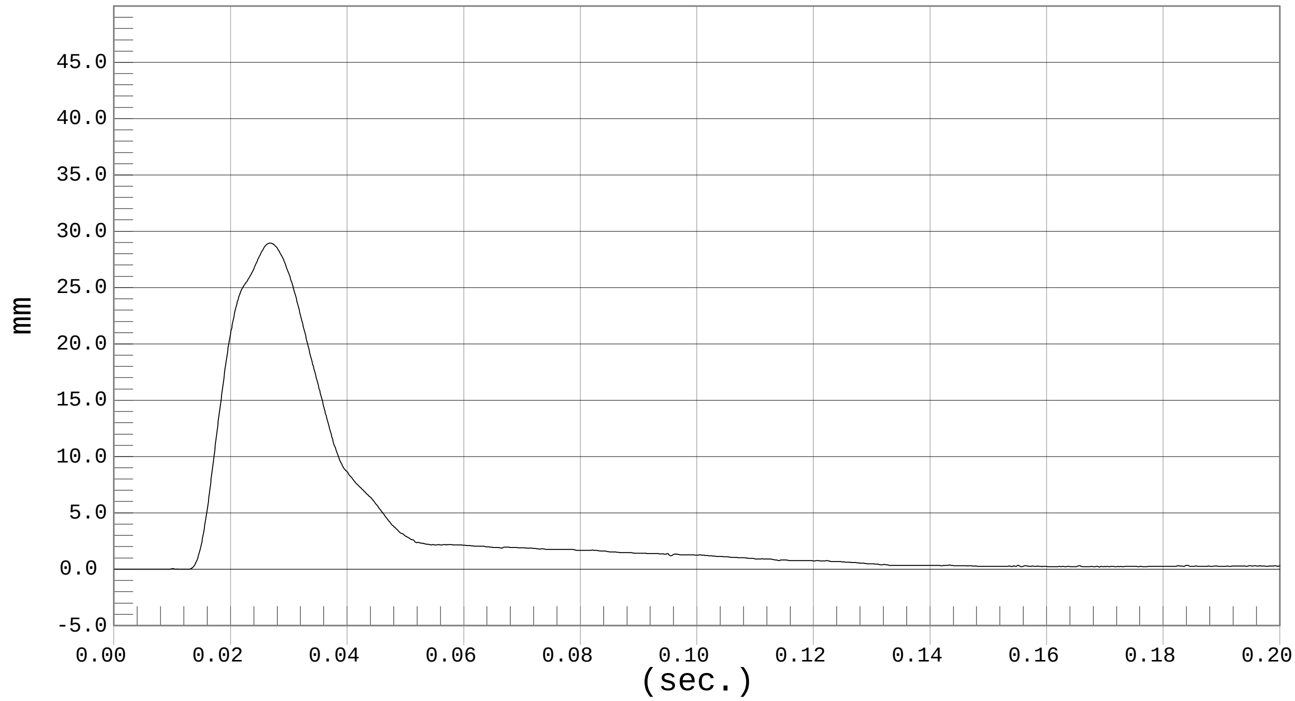


UPPER RIB DISPLACEMENT

Test Desc.: Thorax With Arm
Component: Dummy #033

Test Date: 03-19-03
Speed: 22.1 fps, 6.75 M/s

Ymin = -.01 mm @ 0.0094 sec., Ymax = 28.95 mm @ 0.0267 sec.

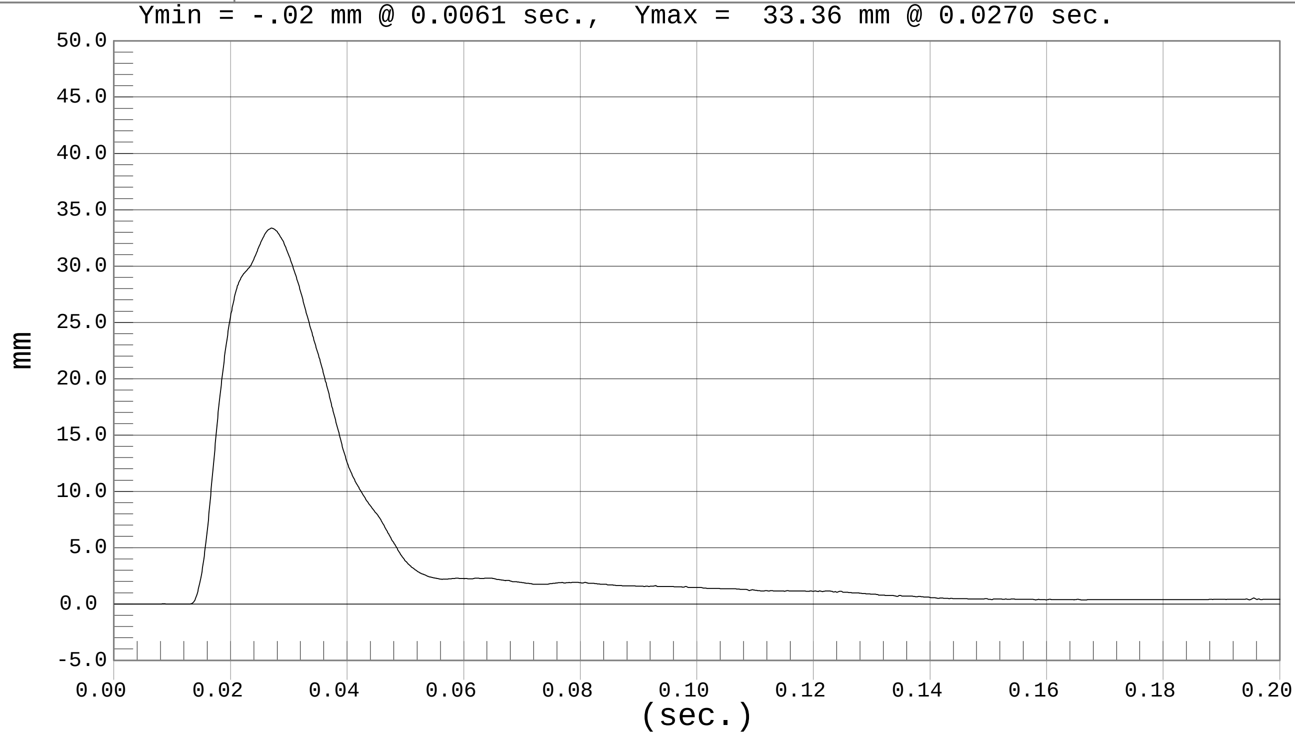


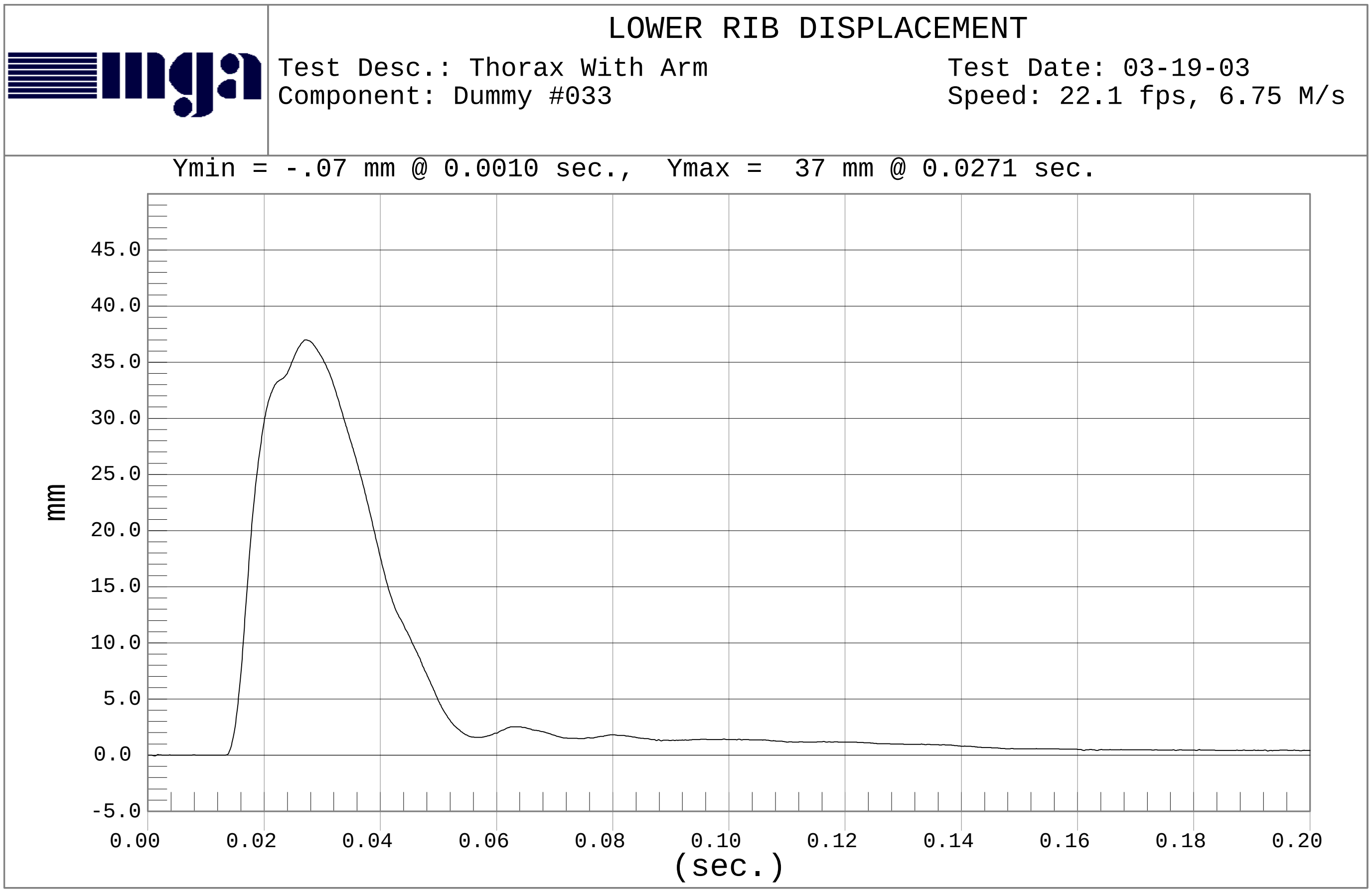
MIDDLE RIB DISPLACEMENT

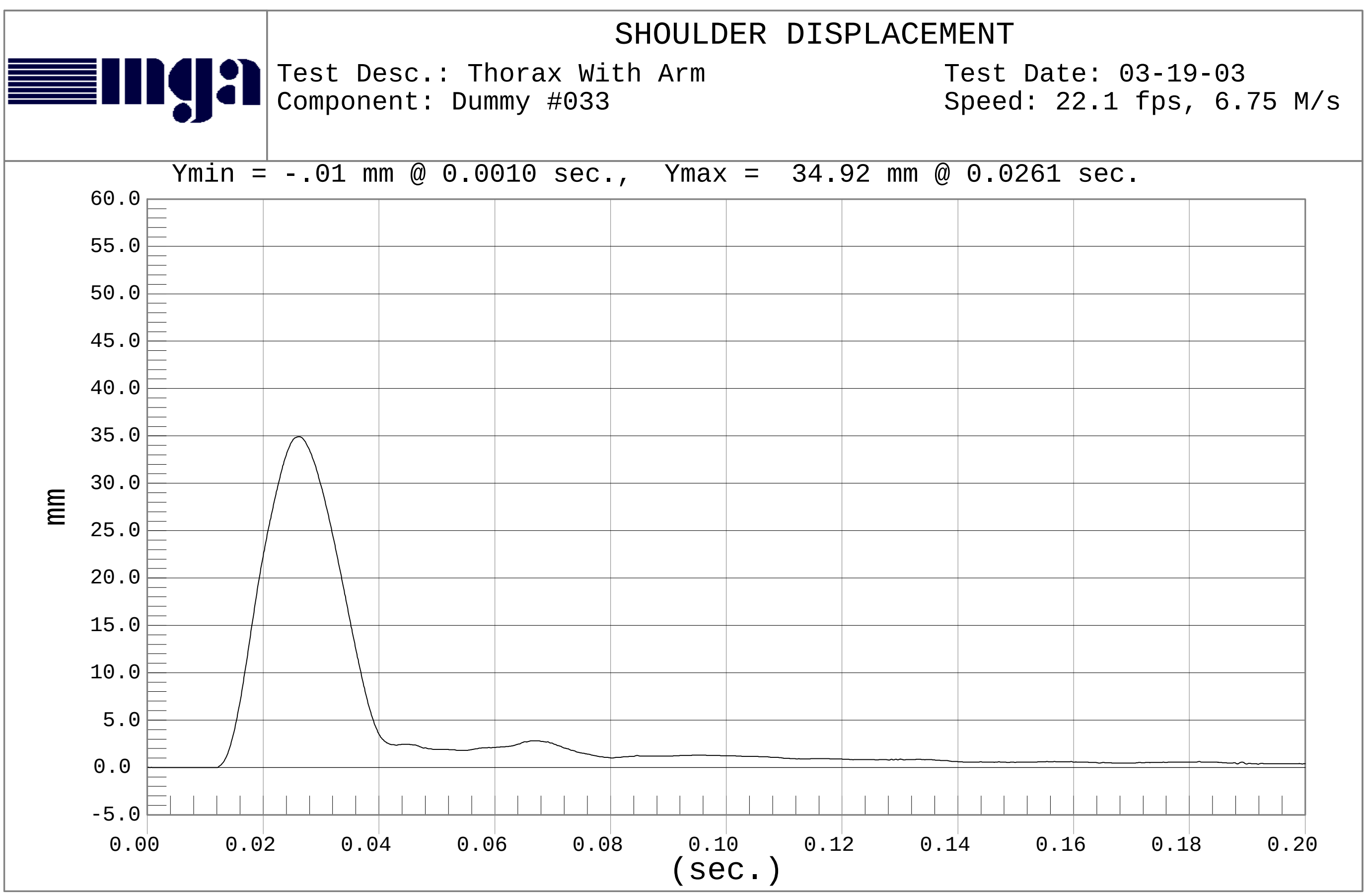
Test Desc.: Thorax With Arm
Component: Dummy #033

Test Date: 03-19-03
Speed: 22.1 fps, 6.75 M/s

Ymin = -.02 mm @ 0.0061 sec., Ymax = 33.36 mm @ 0.0270 sec.




LOWER RIB DISPLACEMENT
Test Desc.: Thorax With Arm
Component: Dummy #033
Test Date: 03-19-03
Speed: 22.1 fps, 6.75 M/s
Ymin = -.07 mm @ 0.0010 sec., Ymax = 37 mm @ 0.0271 sec.
mm
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
-5.0
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
0.18
0.20
(sec.)


SHOULDER DISPLACEMENT
Test Desc.: Thorax With Arm
Component: Dummy #033
Test Date: 03-19-03
Speed: 22.1 fps, 6.75 M/s
Ymin = -.01 mm @ 0.0010 sec., Ymax = 34.92 mm @ 0.0261 sec.
mm
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
-5.0
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
0.18
0.20
(sec.)

MGA RESEARCH CORPORATION

THORAX (WITHOUT ARM) IMPACT TESTS

SID IIs DUMMY

Date: 3/19/03

Dummy Serial Number: 033

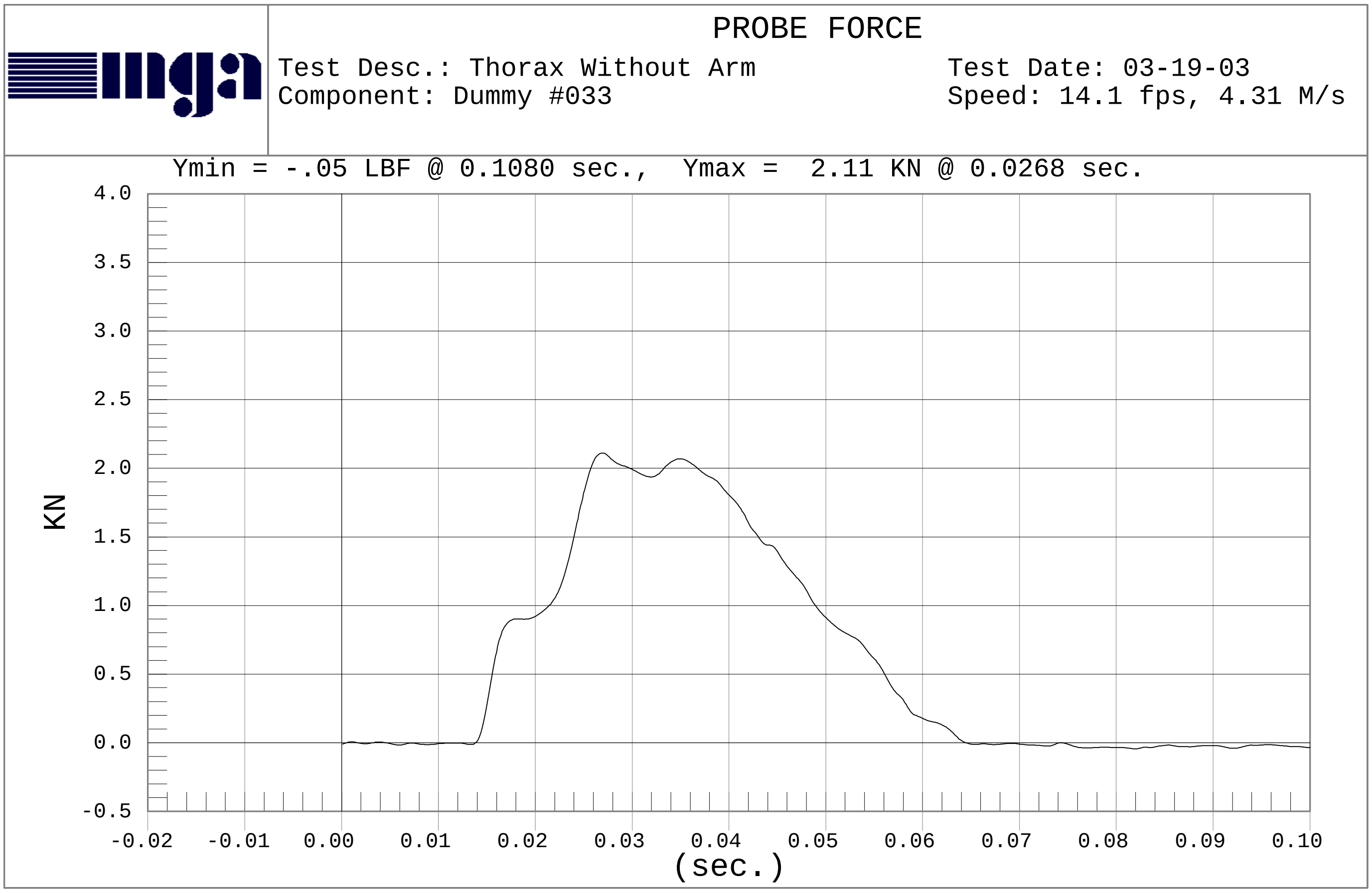
Test Number: D03385/D03395

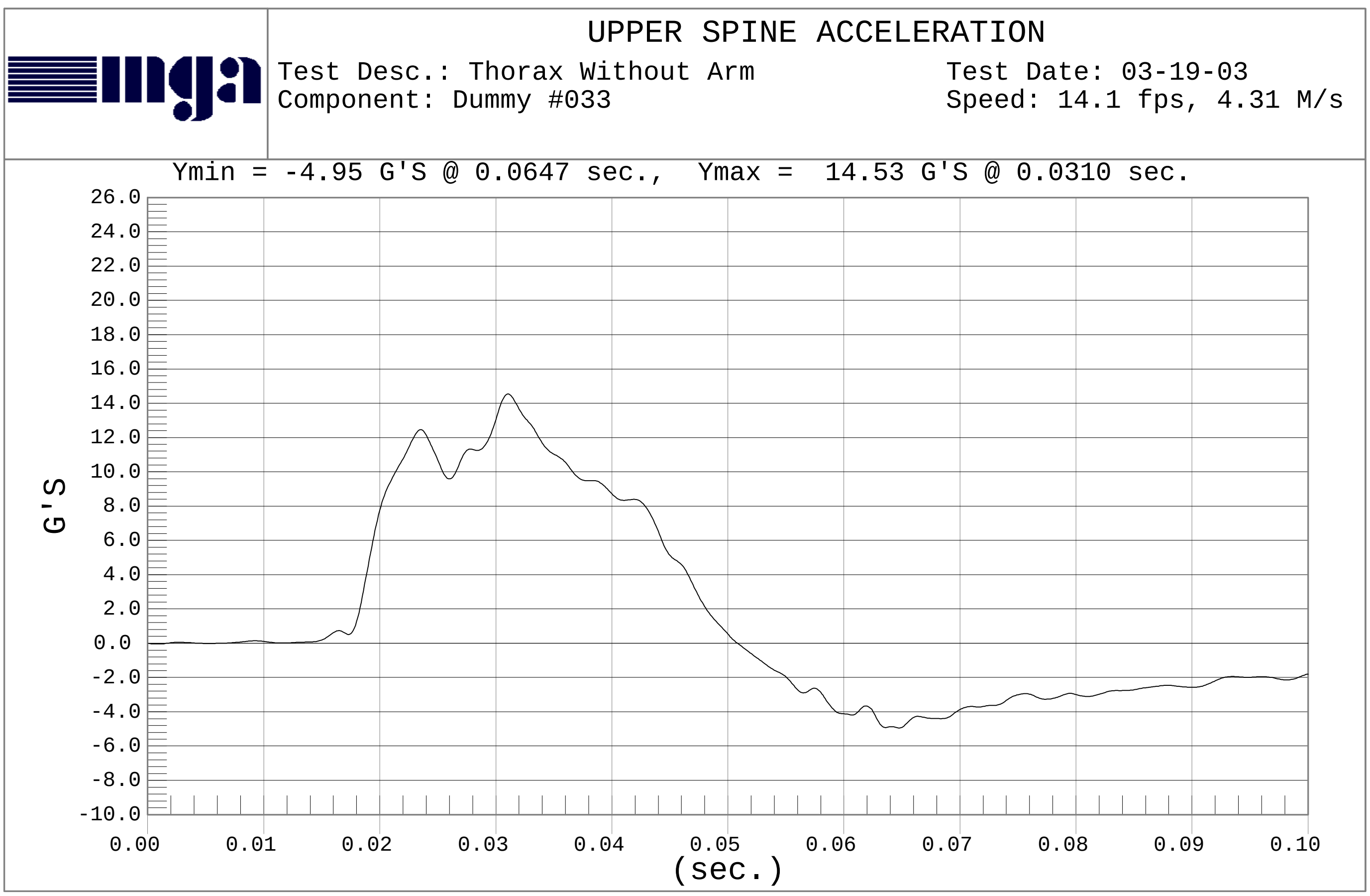
TEST PARAMETER	SPECIFICATION	TEST RESULTS	
		D03385	D03395
Temperature (ºC)	20.8° – 22.2°	21.1	21.2
Humidity	10% - 70%	26	25
Impact Velocity	4.2 - 4.4m/s	4.3	4.3
Probe Force	1.8 - 2.3 kN	2.1	2.2
Upper Spine Acceleration	13 - 18 g's	15	15
Lower Spine Acceleration	8 - 13 g's	10	11
Upper Rib Displacement	32 - 41 mm	37	*31
Middle Rib Displacement	40 - 51 mm	43	*39.8
Lower Rib Displacement	34 - 47 mm	42	42

*TEST DOES NOT MEET SPECIFICATIONS

Technician: ________________________________

Approved By:________________________________


PROBE FORCE
Test Desc.: Thorax Without Arm
Component: Dummy #033
Test Date: 03-19-03
Speed: 14.1 fps, 4.31 M/s
Ymin = -.05 LBF @ 0.1080 sec., Ymax = 2.11 KN @ 0.0268 sec.
KN
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-0.02
-0.01
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.10
(sec.)

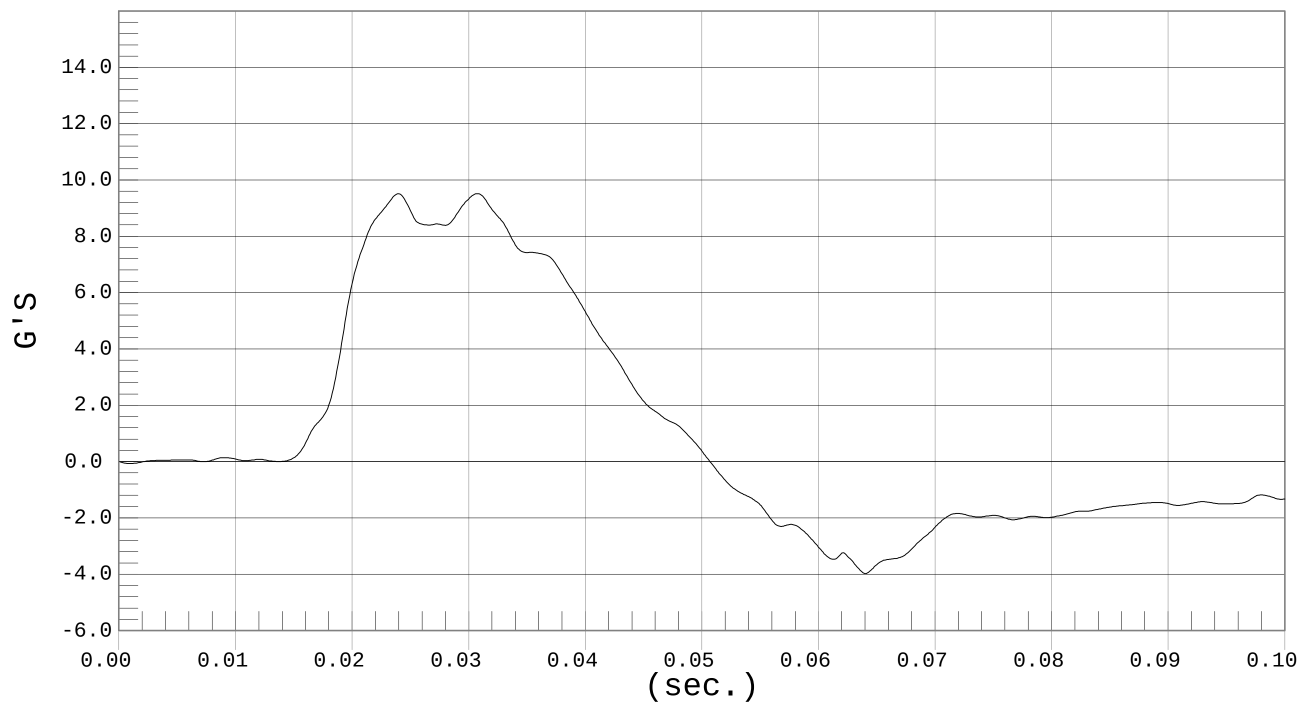

UPPER SPINE ACCELERATION
Test Desc.: Thorax Without Arm
Component: Dummy #033
Test Date: 03-19-03
Speed: 14.1 fps, 4.31 M/s
Ymin = -4.95 G'S @ 0.0647 sec., Ymax = 14.53 G'S @ 0.0310 sec.
G'S
26.0
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.10
(sec.)

LOWER SPINE ACCELERATION

Test Desc.: Thorax Without Arm
Component: Dummy #033

Test Date: 03-19-03
Speed: 14.1 fps, 4.31 M/s

Ymin = -3.98 G'S @ 0.0639 sec., Ymax = 9.52 G'S @ 0.0307 sec.

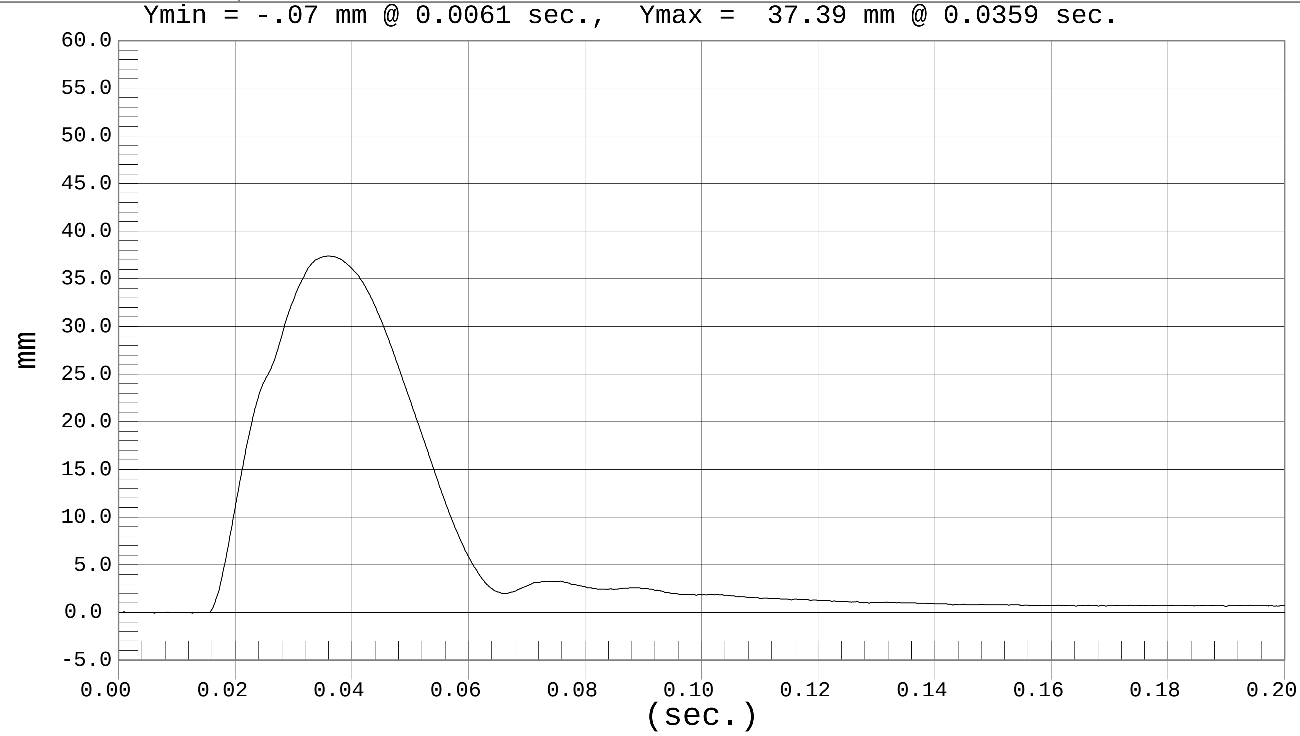


UPPER RIB DISPLACEMENT

Test Desc.: Thorax Without Arm
Component: Dummy #033

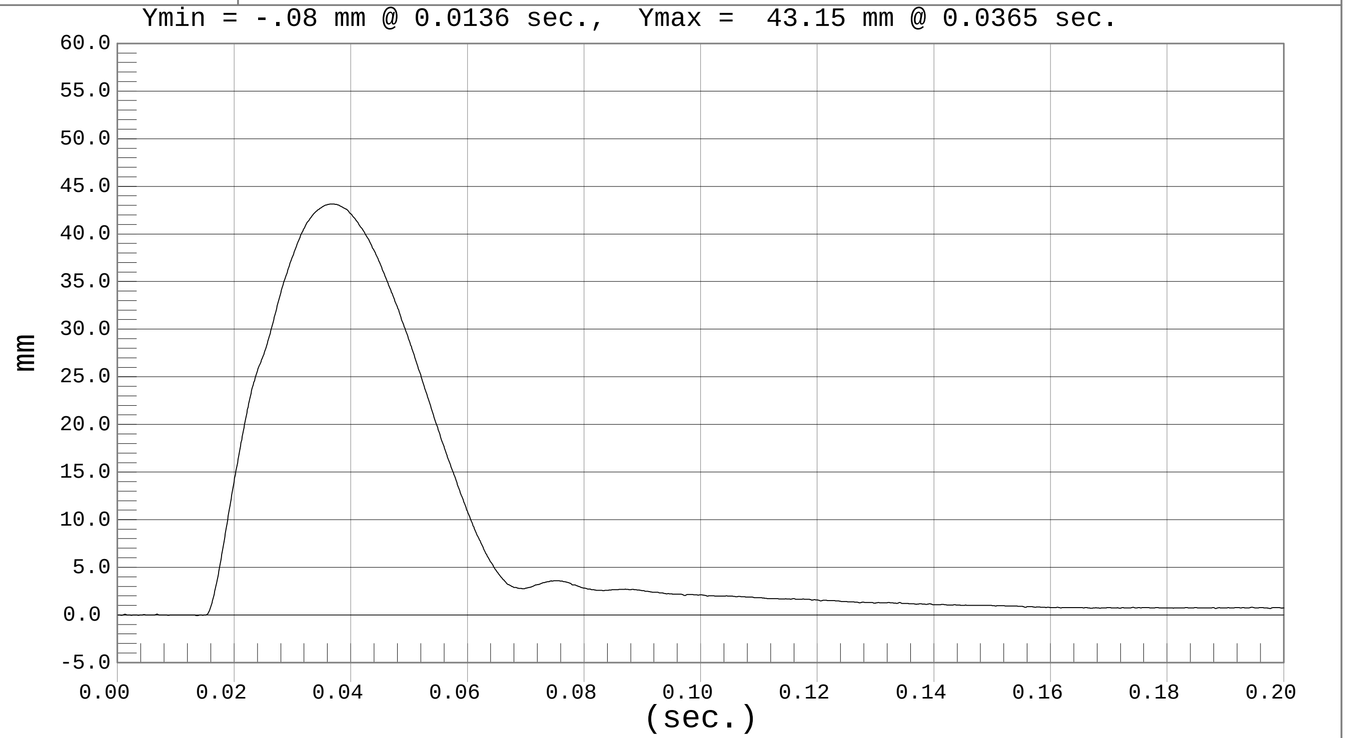
Test Date: 03-19-03
Speed: 14.1 fps, 4.31 M/s

Ymin = -.07 mm @ 0.0061 sec., Ymax = 37.39 mm @ 0.0359 sec.



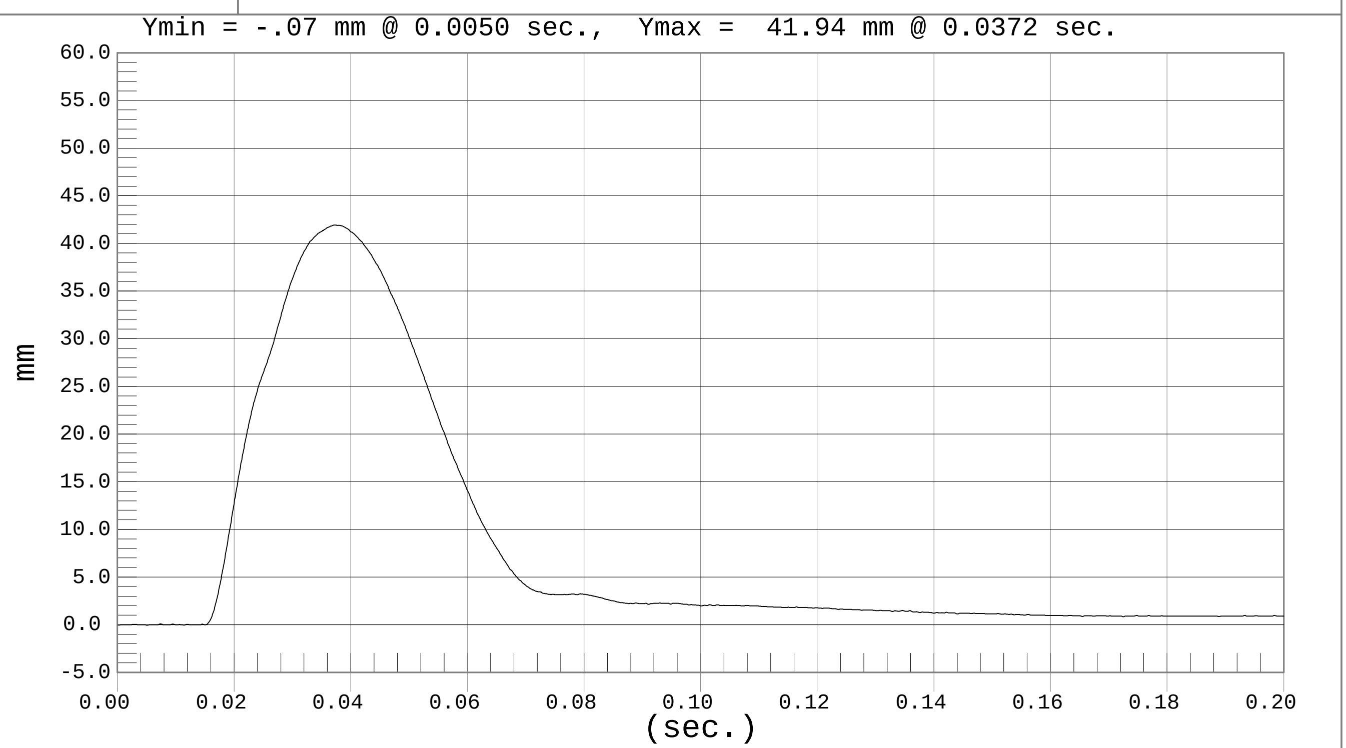
MIDDLE RIB DISPLACEMENT

Test Desc.: Thorax Without Arm   Test Date: 03-19-03
Component: Dummy #033   Speed: 14.1 fps, 4.31 M/s



LOWER RIB DISPLACEMENT

Test Desc.: Thorax Without Arm   Test Date: 03-19-03
Component: Dummy #033   Speed: 14.1 fps, 4.31 M/s

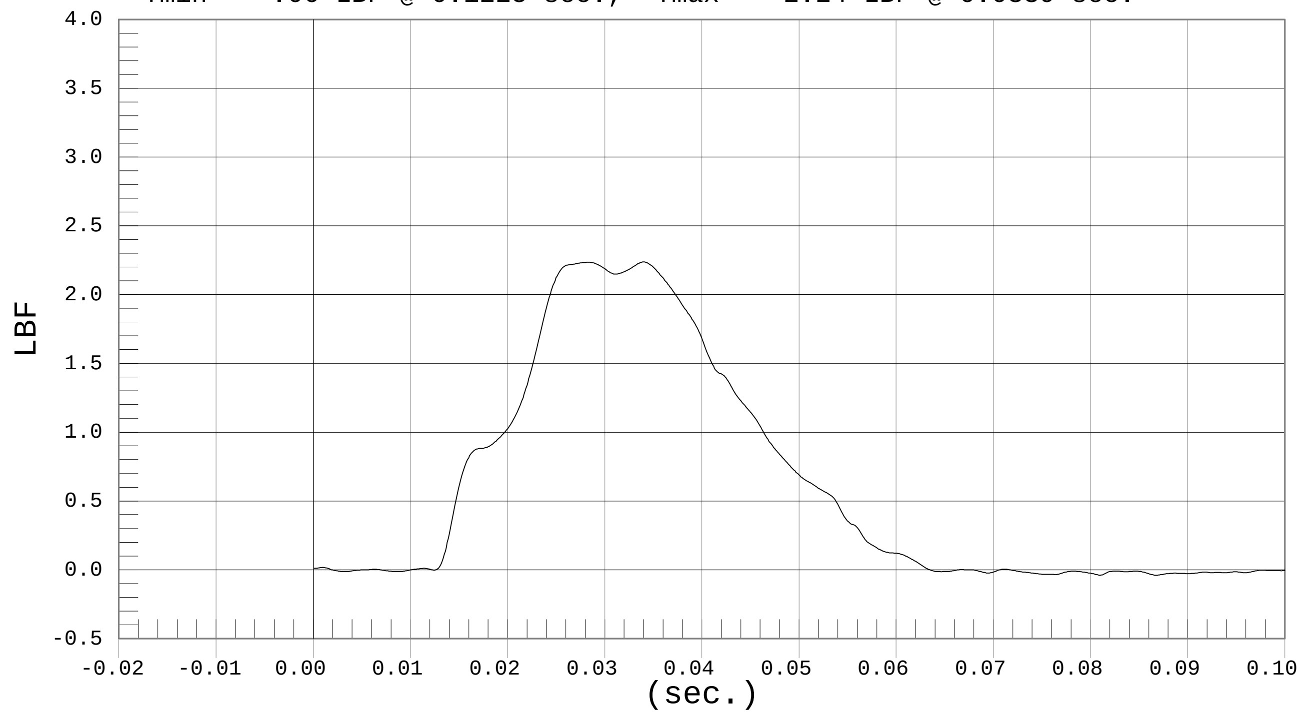


PROBE FORCE

Test Desc.: Thorax Without Arm
Component: Dummy #033

Test Date: 03-19-03
Speed: 14.2 fps, 4.33 M/s

Ymin = -.06 LBF @ 0.1225 sec.,   Ymax = 2.24 LBF @ 0.0339 sec.

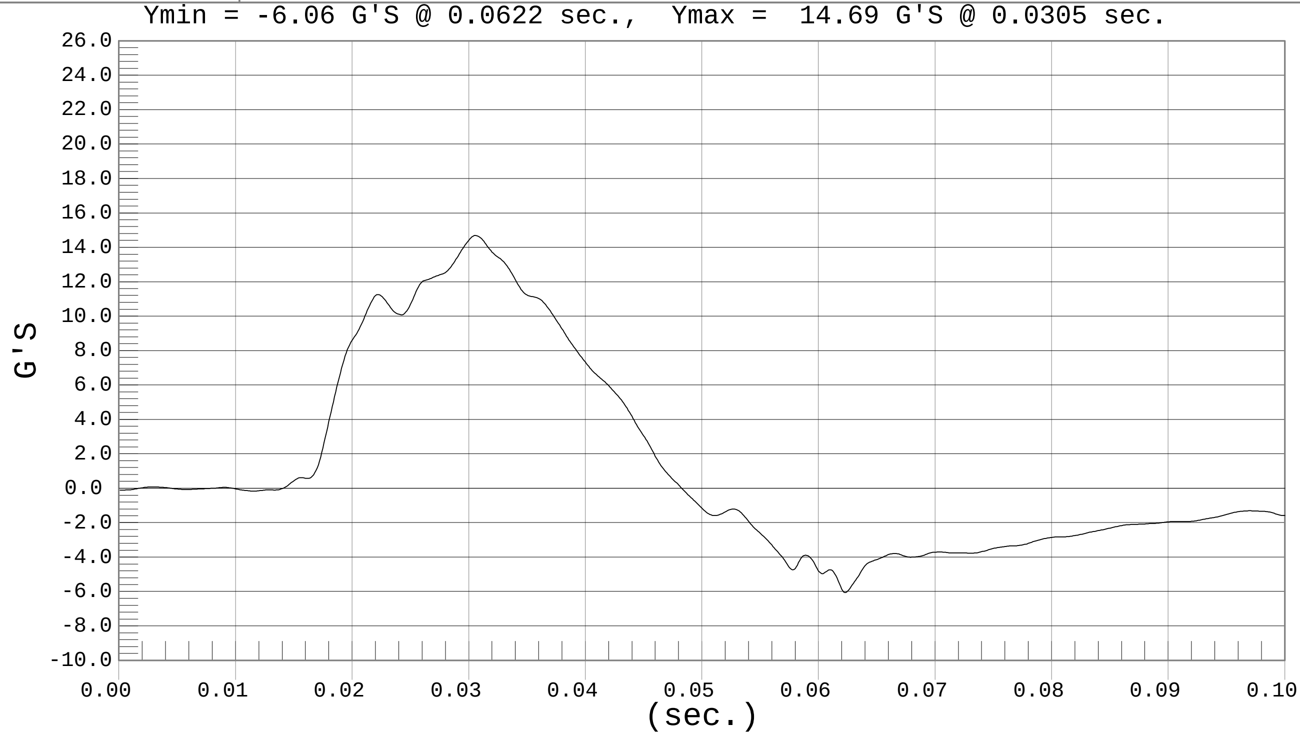


UPPER SPINE ACCELERATION

Test Desc.: Thorax Without Arm
Component: Dummy #033

Test Date: 03-19-03
Speed: 14.2 fps, 4.33 M/s

Ymin = -6.06 G'S @ 0.0622 sec.,   Ymax = 14.69 G'S @ 0.0305 sec.

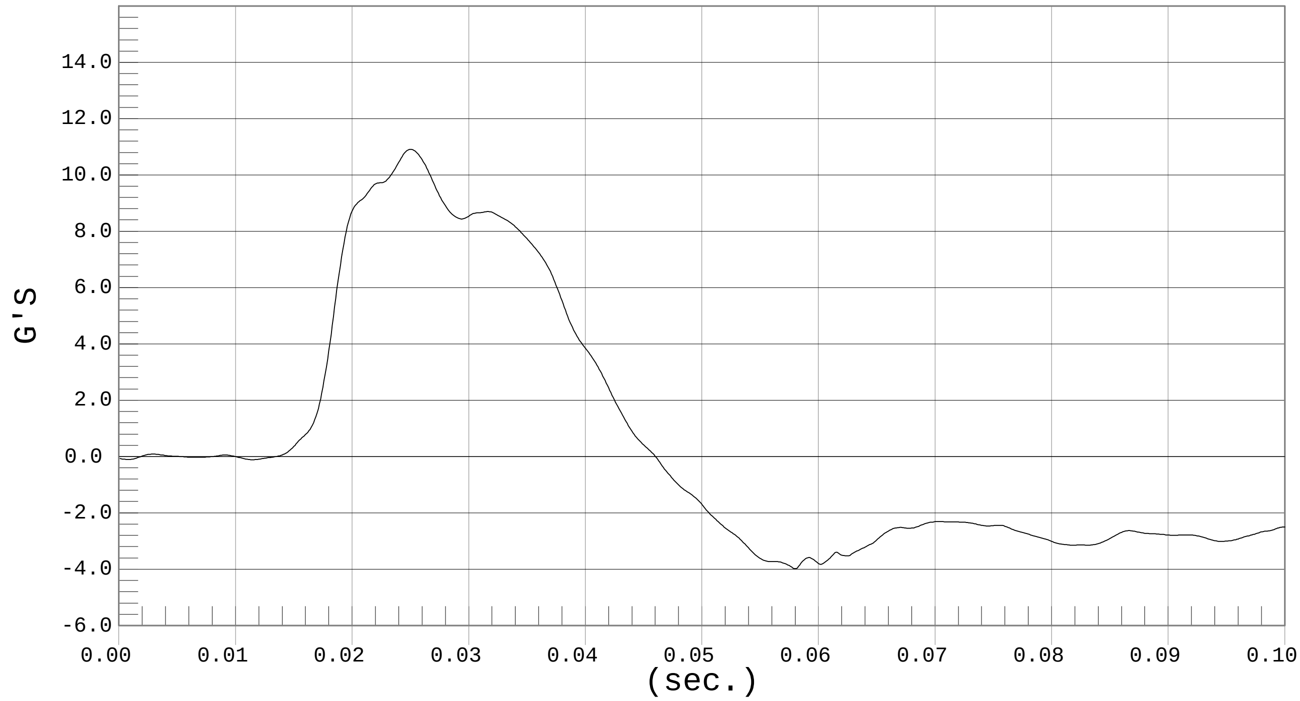


LOWER SPINE ACCELERATION

Test Desc.: Thorax Without Arm
Component: Dummy #033

Test Date: 03-19-03
Speed: 14.2 fps, 4.33 M/s

Ymin = -3.98 G'S @ 0.0579 sec., Ymax = 10.91 G'S @ 0.0249 sec.

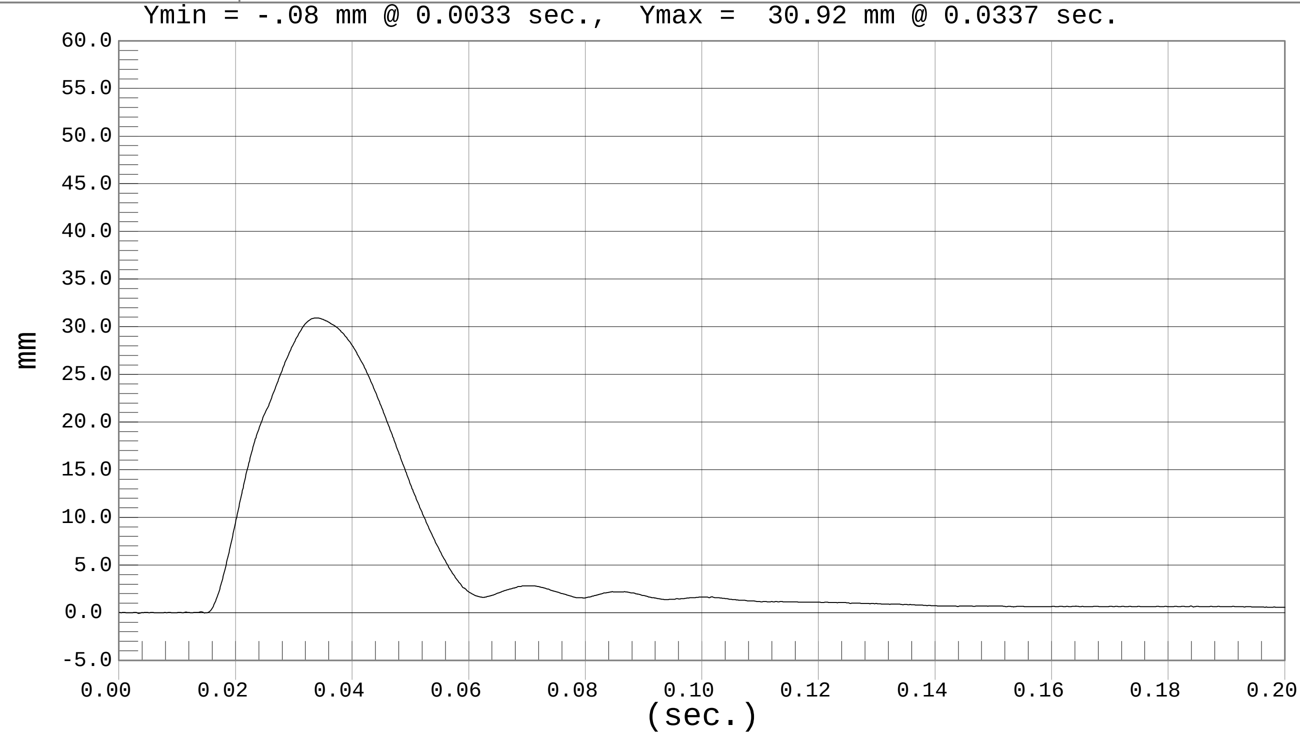


UPPER RIB DISPLACEMENT

Test Desc.: Thorax Without Arm
Component: Dummy #033

Test Date: 03-19-03
Speed: 14.2 fps, 4.33 M/s

Ymin = -.08 mm @ 0.0033 sec., Ymax = 30.92 mm @ 0.0337 sec.

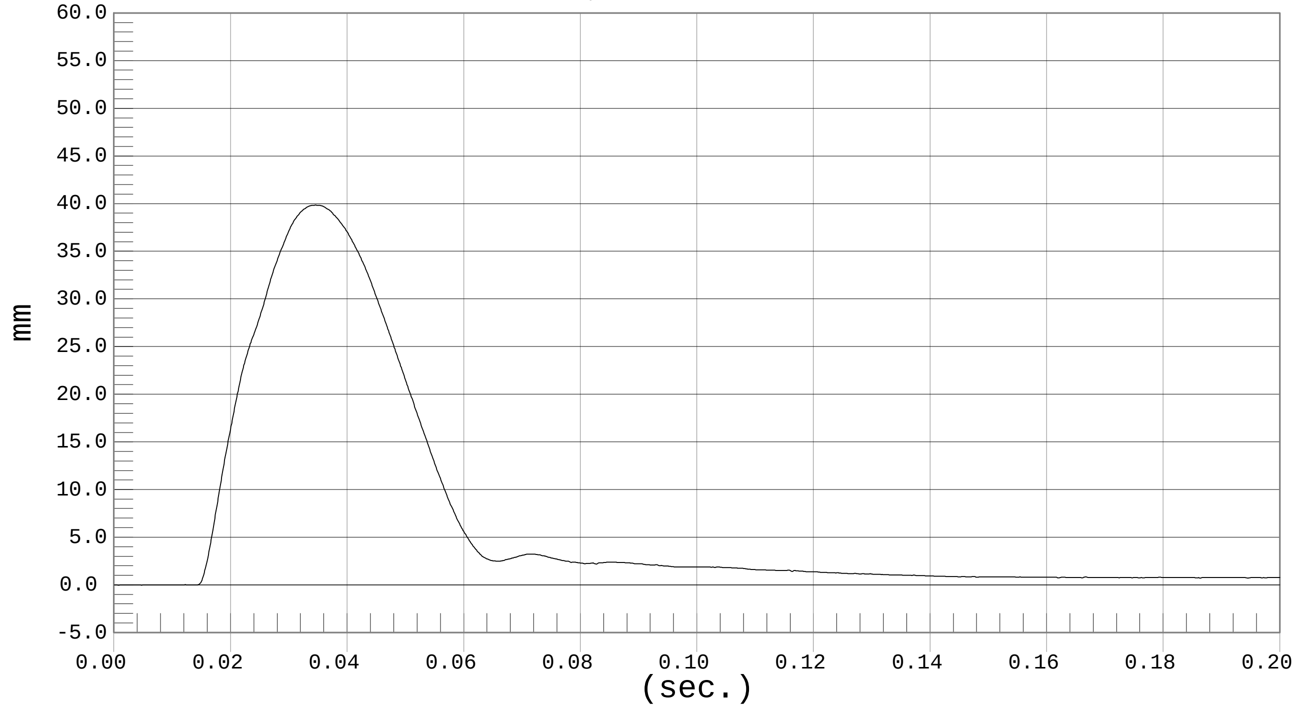


MIDDLE RIB DISPLACEMENT

Test Desc.: Thorax Without Arm
Component: Dummy #033

Test Date: 03-19-03
Speed: 14.2 fps, 4.33 M/s

Ymin = -.02 mm @ 0.0006 sec., Ymax = 39.84 mm @ 0.0345 sec.

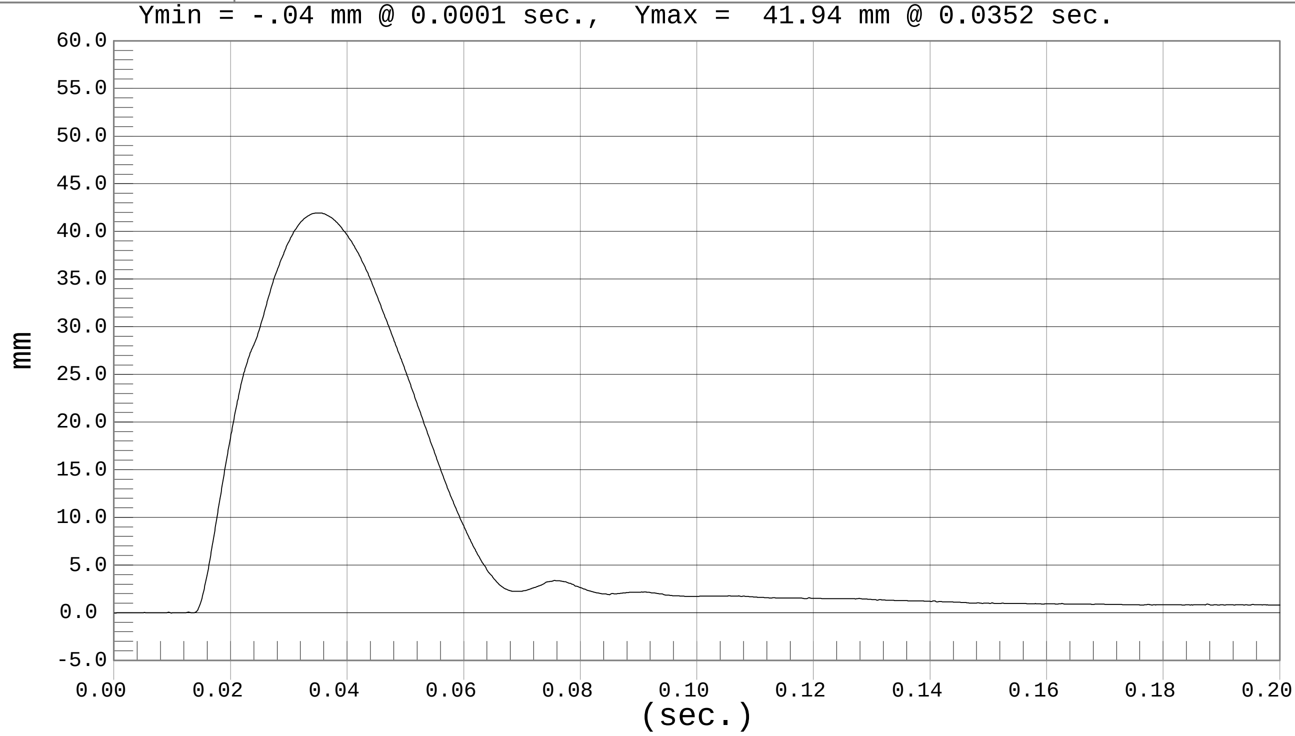


LOWER RIB DISPLACEMENT

Test Desc.: Thorax Without Arm
Component: Dummy #033

Test Date: 03-19-03
Speed: 14.2 fps, 4.33 M/s

Ymin = -.04 mm @ 0.0001 sec., Ymax = 41.94 mm @ 0.0352 sec.



MGA RESEARCH CORPORATION

ABDOMINAL IMPACT TEST

SID IIs DUMMY

Date: 3/19/03

Dummy Serial Number: 033

Test Number: D03386/D03396

TEST PARAMETER	SPECIFICATION	TEST RESULTS	
		D03386	D03396
Temperature (ºC)	20.8° – 22.2°	21.2	21.3
Humidity	10% - 70%	26	25
Impact Velocity	4.41 - 4.59 m/s	4.52	4.50
Probe Force	1.3 - 1.9 kN	1.6	1.7
Upper Spine Acceleration	5 - 9 g's	7	6
Lower Spine Acceleration	10 - 12 g's	*15	*15
Upper Rib Displacement	44 - 55 mm	47	48
Middle Rib Displacement	44 - 56 mm	*42	46

TEST MEETS SPECIFICATIONS

Technician: ______________________________

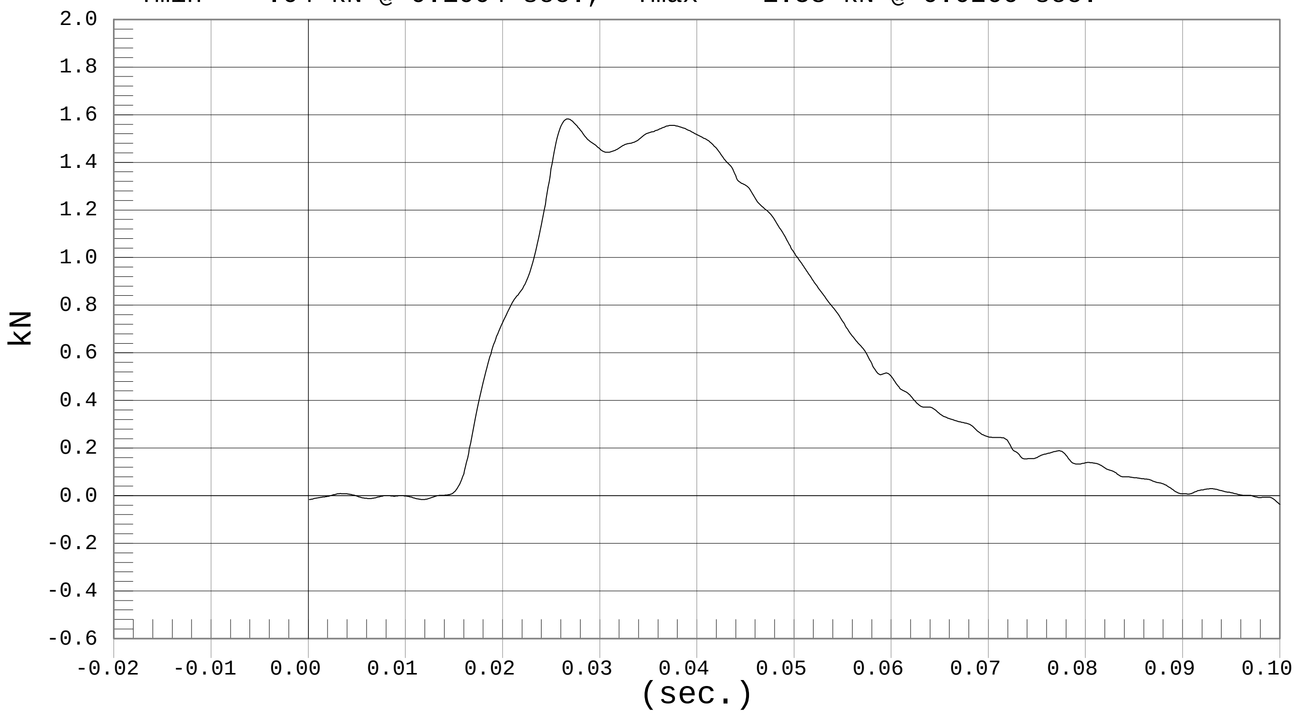
Approved By:______________________________

PROBE FORCE

Test Desc.: Abdomen Impact
Component: Dummy #033

Test Date: 03-19-03
Speed: 14.8 fps, 4.52 M/s

Ymin = -.04 kN @ 0.1004 sec., Ymax = 1.58 kN @ 0.0266 sec.

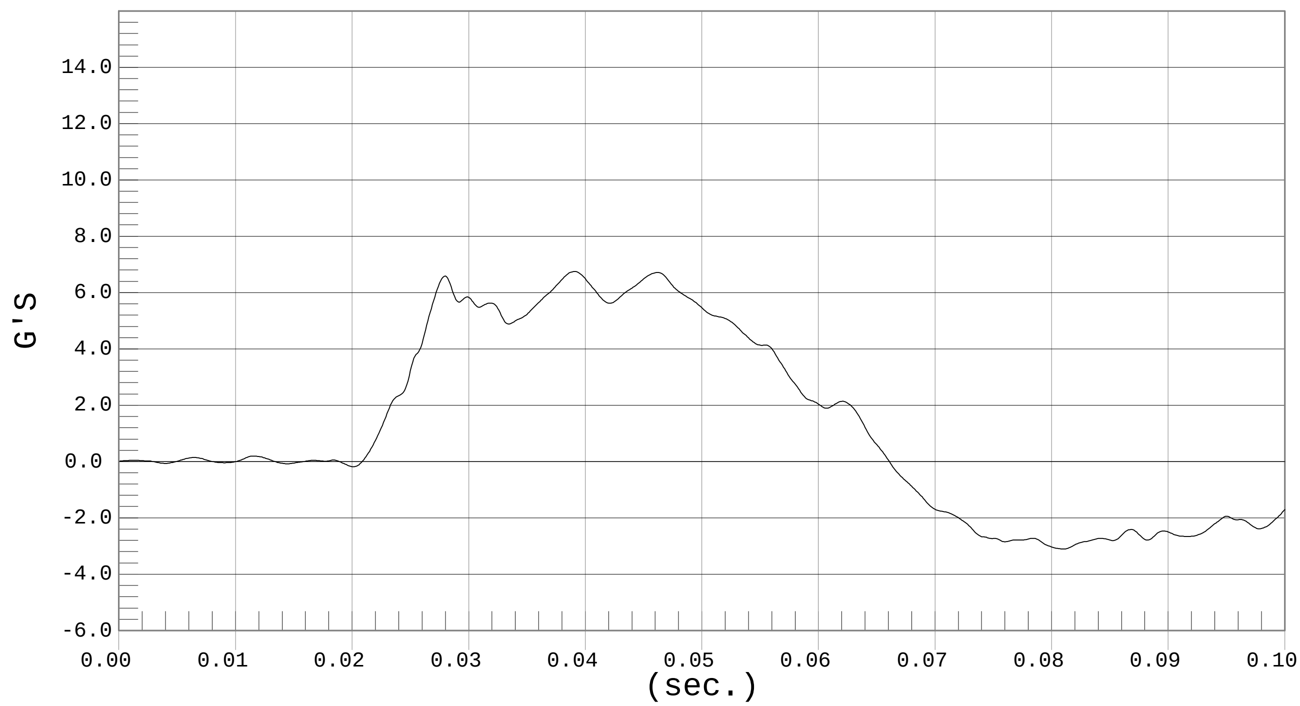


UPPER SPINE ACCELERATION

Test Desc.: Abdomen Impact
Component: Dummy #033

Test Date: 03-19-03
Speed: 14.8 fps, 4.52 M/s

Ymin = -3.1 G'S @ 0.0809 sec., Ymax = 6.75 G'S @ 0.0390 sec.

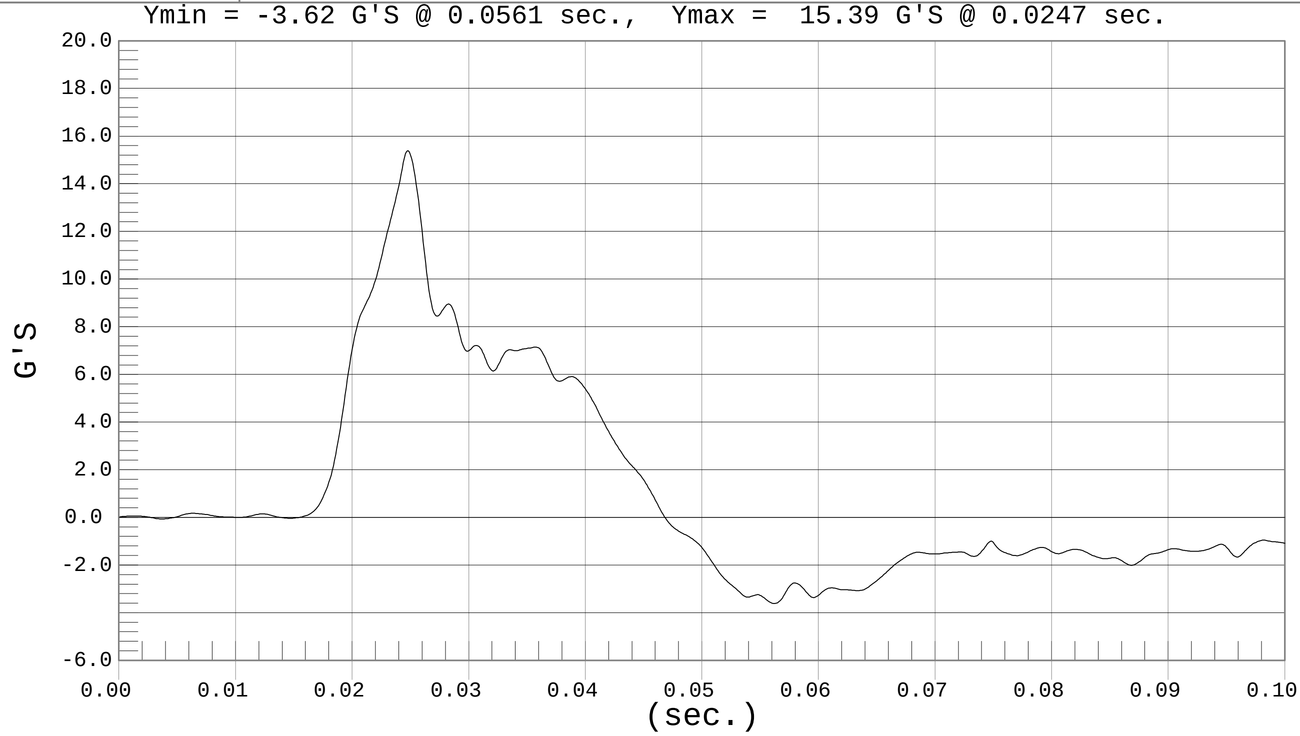


LOWER SPINE ACCELERATION

Test Desc.: Abdomen Impact
Component: Dummy #033

Test Date: 03-19-03
Speed: 14.8 fps, 4.52 M/s

Ymin = -3.62 G'S @ 0.0561 sec., Ymax = 15.39 G'S @ 0.0247 sec.

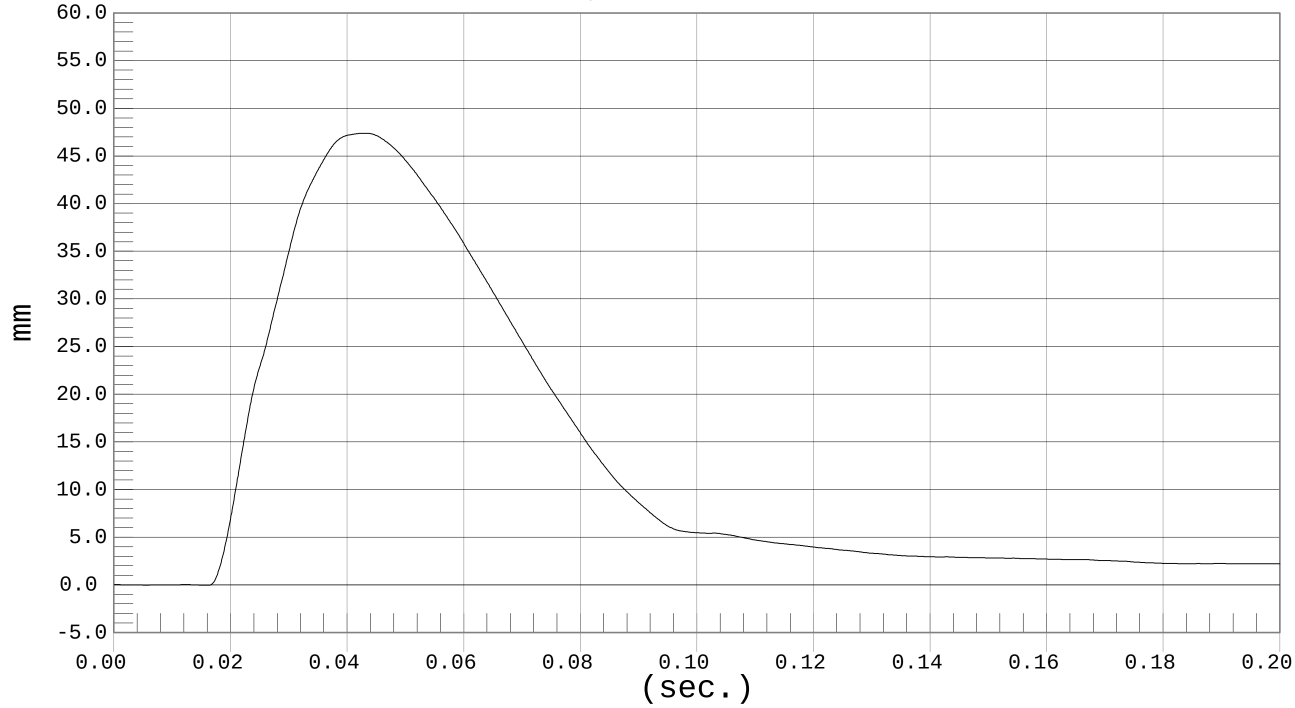


UPPER RIB DISPLACEMENT

Test Desc.: Abdomen Impact
Component: Dummy #033

Test Date: 03-19-03
Speed: 14.8 fps, 4.52 M/s

Ymin = -.05 mm @ 0.0160 sec., Ymax = 47.38 mm @ 0.0430 sec.

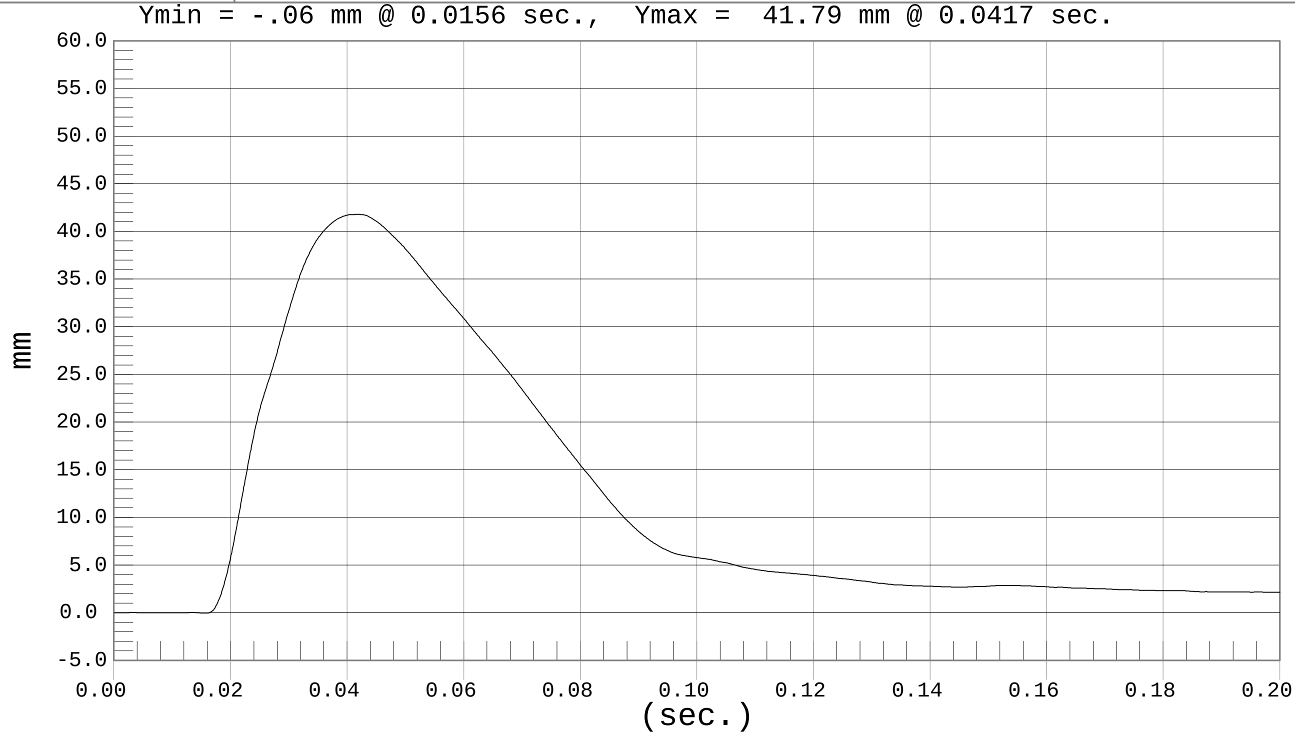


LOWER RIB DISPLACEMENT

Test Desc.: Abdomen Impact
Component: Dummy #033

Test Date: 03-19-03
Speed: 14.8 fps, 4.52 M/s

Ymin = -.06 mm @ 0.0156 sec., Ymax = 41.79 mm @ 0.0417 sec.

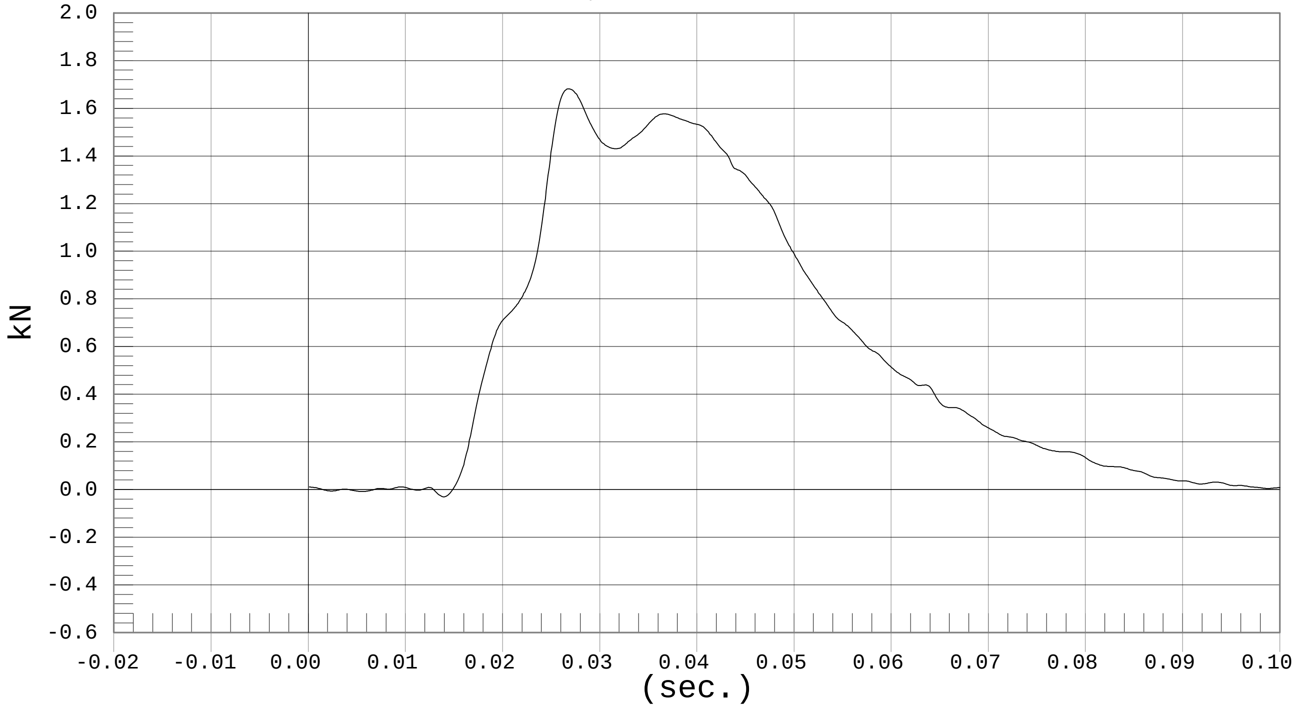


PROBE FORCE

Test Desc.: Abdomen Impact
Component: Dummy #033

Test Date: 03-19-03
Speed: 14.8 fps, 4.50 M/s

Ymin = -.03 kN @ 0.0139 sec., Ymax = 1.68 kN @ 0.0267 sec.

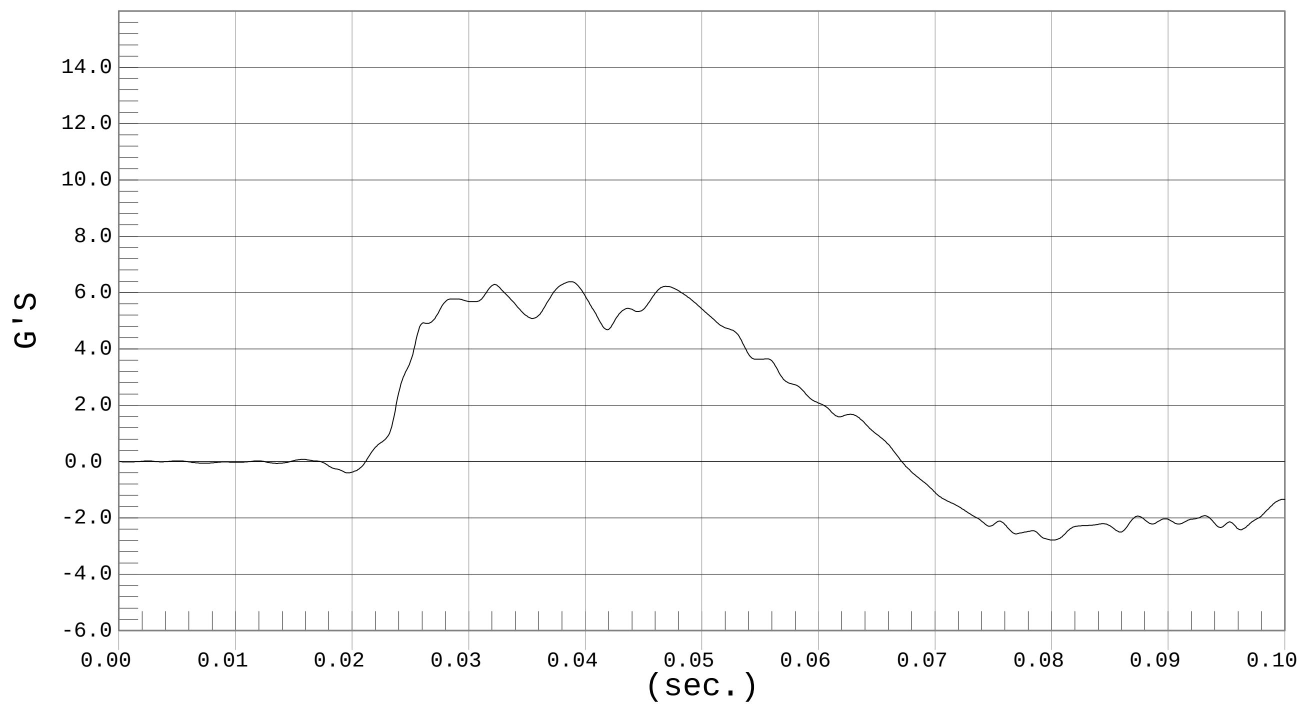


UPPER SPINE ACCELERATION

Test Desc.: Abdomen Impact
Component: Dummy #033

Test Date: 03-19-03
Speed: 14.8 fps, 4.50 M/s

Ymin = -2.79 G'S @ 0.0800 sec., Ymax = 6.39 G'S @ 0.0387 sec.

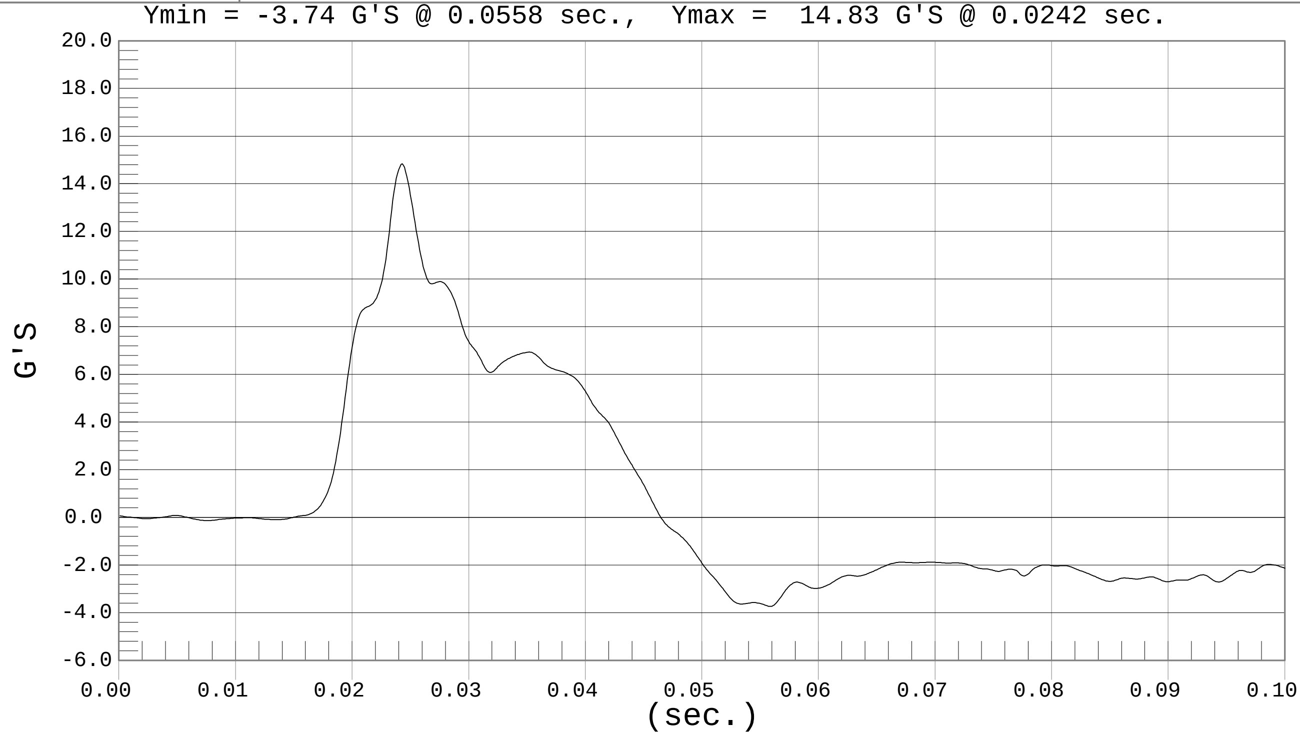


LOWER SPINE ACCELERATION

Test Desc.: Abdomen Impact
Component: Dummy #033

Test Date: 03-19-03
Speed: 14.8 fps, 4.50 M/s

Ymin = -3.74 G'S @ 0.0558 sec., Ymax = 14.83 G'S @ 0.0242 sec.

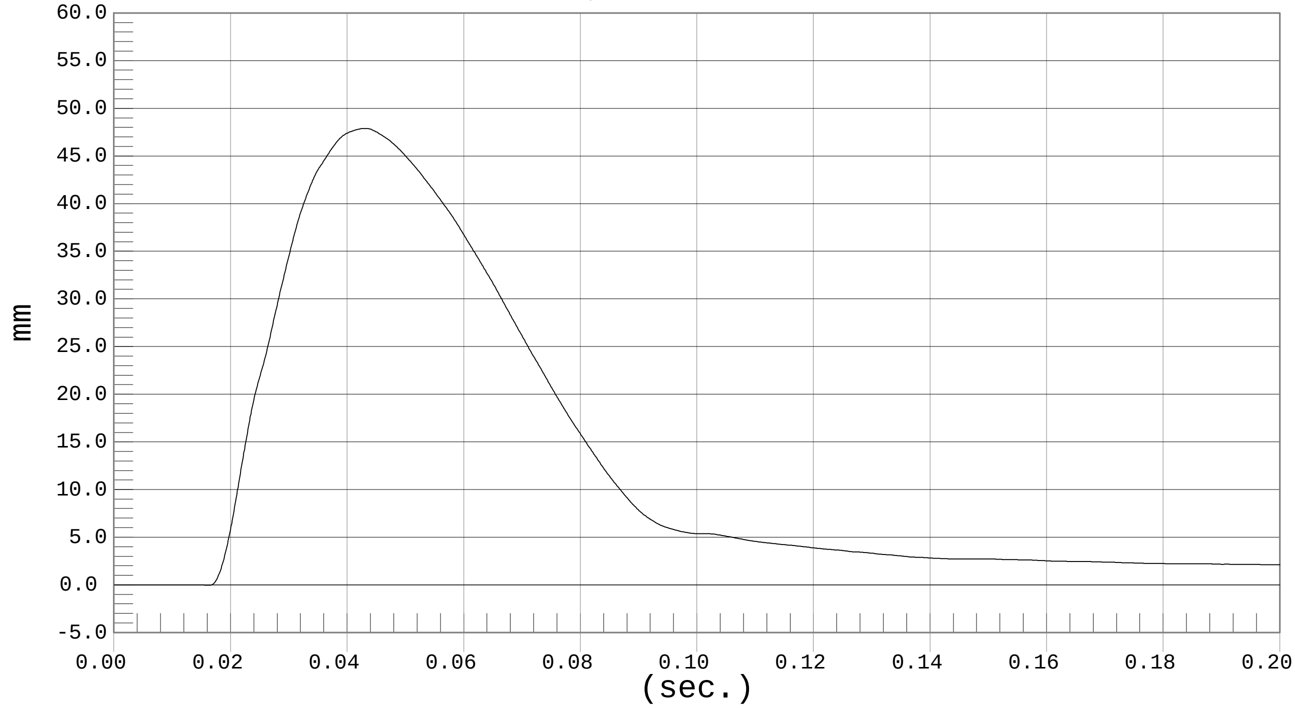


UPPER RIB DISPLACEMENT

Test Desc.: Abdomen Impact
Component: Dummy #033

Test Date: 03-19-03
Speed: 14.8 fps, 4.50 M/s

Ymin = -.04 mm @ 0.0162 sec., Ymax = 47.89 mm @ 0.0430 sec.

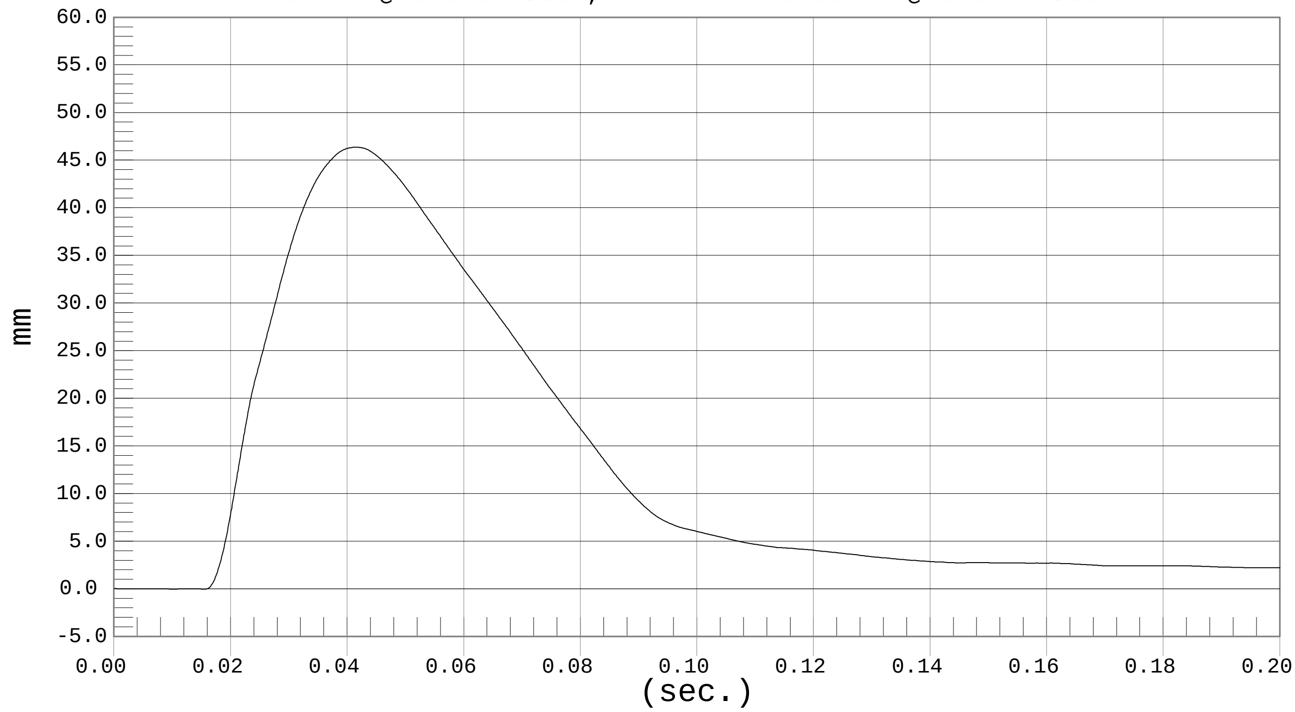


LOWER RIB DISPLACEMENT

Test Desc.: Abdomen Impact
Component: Dummy #033

Test Date: 03-19-03
Speed: 14.8 fps, 4.50 M/s

Ymin = -.04 mm @ 0.0101 sec., Ymax = 46.36 mm @ 0.0414 sec.



MGA RESEARCH CORPORATION

PELVIS IMPACT TEST

SID IIs DUMMY

Date: 3/19/03

Dummy Serial Number: 033

Test Number: D03389/D03399

TEST PARAMETER	SPECIFICATION	TEST RESULTS	
		D03389	D03399
Temperature (ºC)	20.8° – 22.2°	21.7	21.4
Humidity	10% - 70%	25	24
Impact Velocity	6.57 - 6.84 m/s	6.75	6.75
Probe Force	5.0 - 7.2 kN	5.8	6.5
Pelvis G's	46 - 60 g's	48	48

TEST MEETS SPECIFICATIONS

Technician: ______________________________

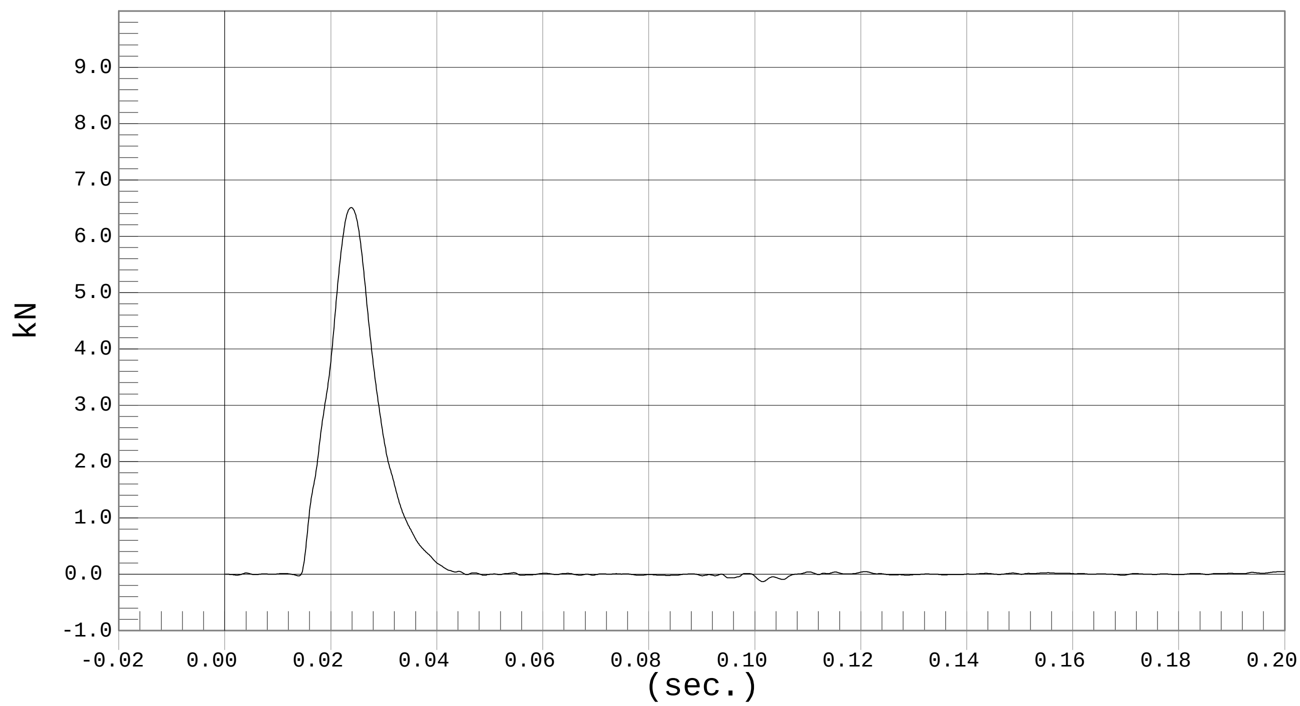
Approved By: ______________________________

IMPACTOR FORCE

Test Desc.: Pelvis Impact
Component: Dummy #033

Test Date: 03-19-03
Speed: 22.1 fps, 6.75 M/s

Ymin = -.13 kN @ 0.1014 sec., Ymax = 6.51 kN @ 0.0237 sec.

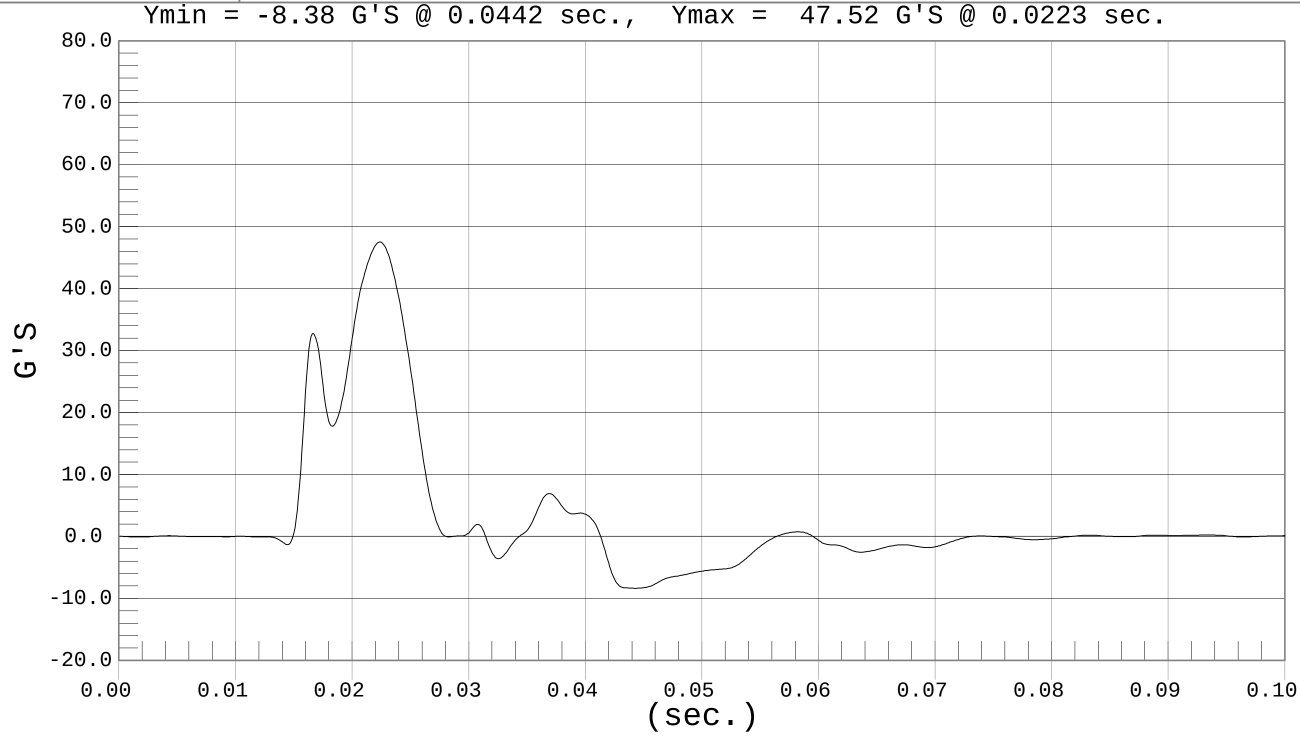


PELVIS ACCELERATION

Test Desc.: Pelvis Impact
Component: Dummy #033

Test Date: 03-19-03
Speed: 22.1 fps, 6.75 M/s

Ymin = -8.38 G'S @ 0.0442 sec., Ymax = 47.52 G'S @ 0.0223 sec.

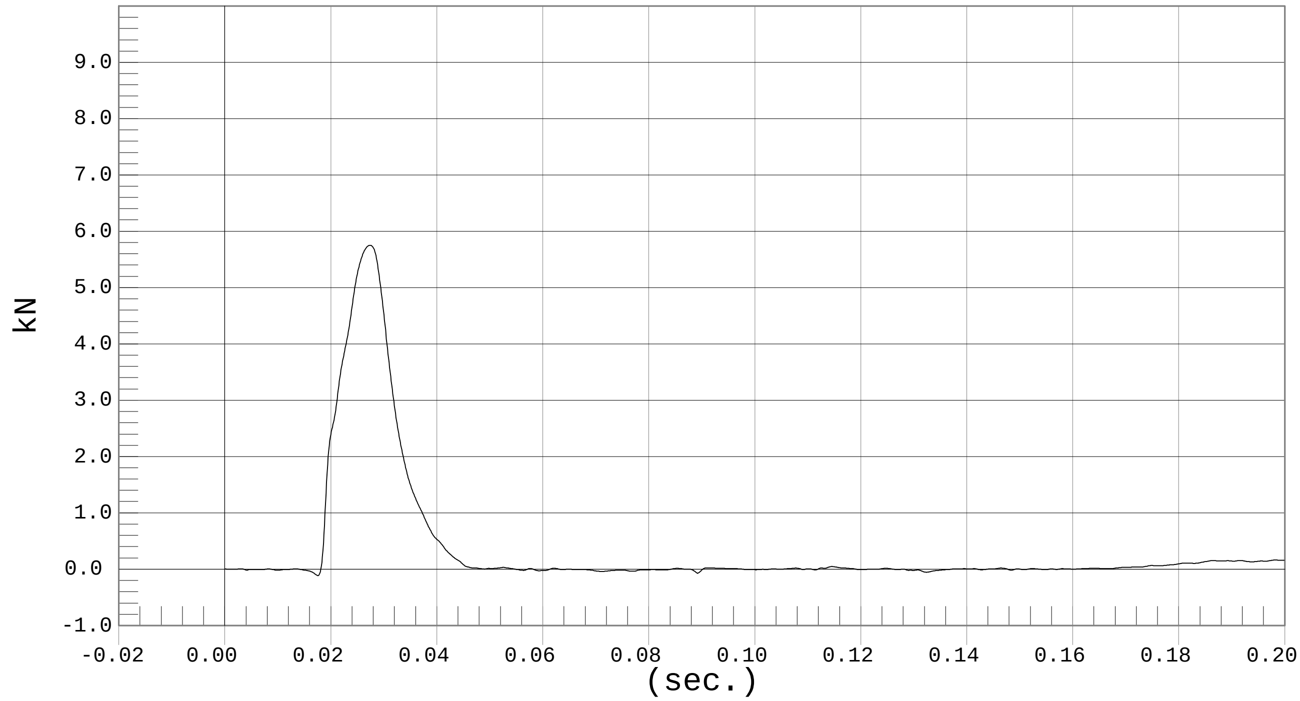


IMPACTOR FORCE

Test Desc.: Pelvis Impact
Component: Dummy #033

Test Date: 03-18-03
Speed: 22.2 fps, 6.75 M/s

Ymin = -.11 kN @ 0.0174 sec., Ymax = 5.75 kN @ 0.0273 sec.

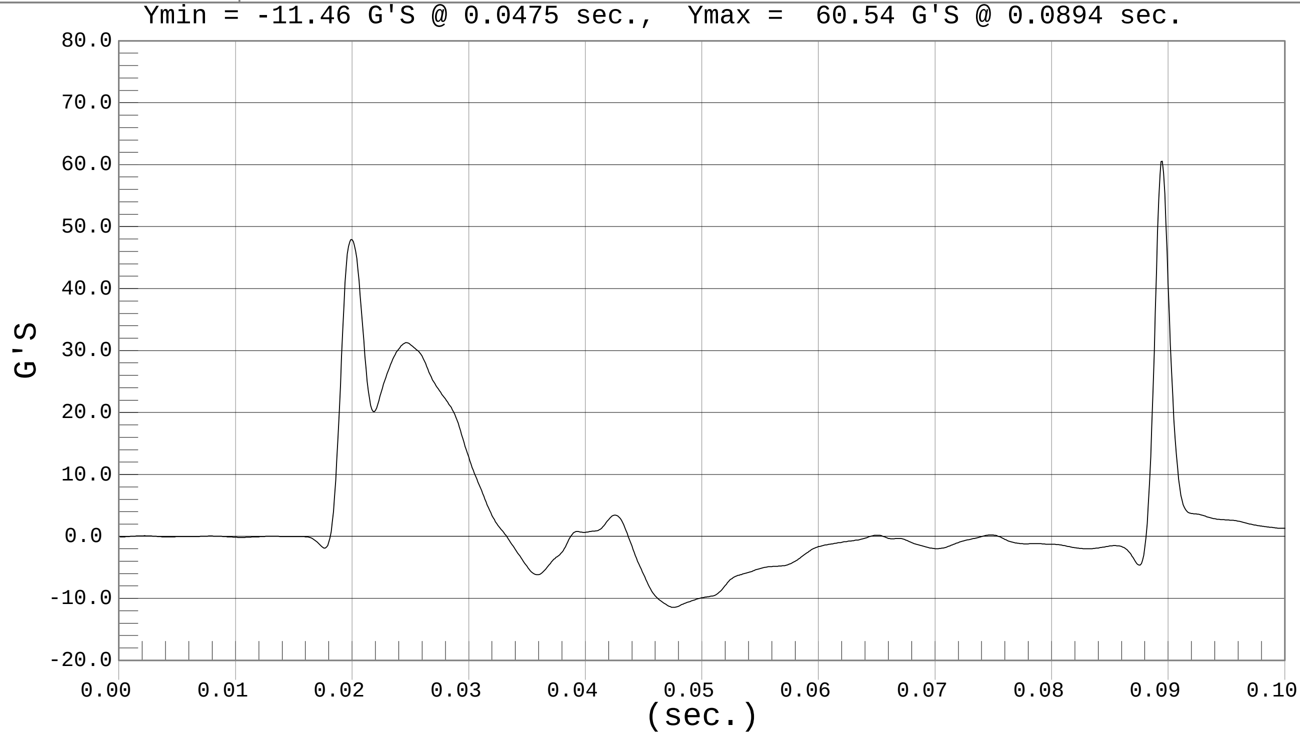


PELVIS ACCELERATION

Test Desc.: Pelvis Impact
Component: Dummy #033

Test Date: 03-18-03
Speed: 22.2 fps, 6.75 M/s

Ymin = -11.46 G'S @ 0.0475 sec., Ymax = 60.54 G'S @ 0.0894 sec.



CERTIFICATION DATA

Dummy Serial Number: 033

Calibration Test Results Summary

Dummy Serial Number: 033

Post-Test Calibration

Head Drop Test:	The head passed all drop test requirements.
Neck Pendulum Test:	The neck did not pass all impact test requirements.
Shoulder Impact Test:	The shoulder passed all impact test requirements.
Thorax (with arm) Test:	The thorax passed all impact test requirements.
Thorax (without arm) Test:	The thorax passed all impact test requirements.
Abdomen Impact Test:	The abdomen did not pass all impact test requirements.
Pelvis Test:	The pelvis passed all impact test requirements.

MGA RESEARCH CORPORATION

HEAD DROP TEST

SID IIs DUMMY

Date: 3/27/03

Dummy Serial Number: 033

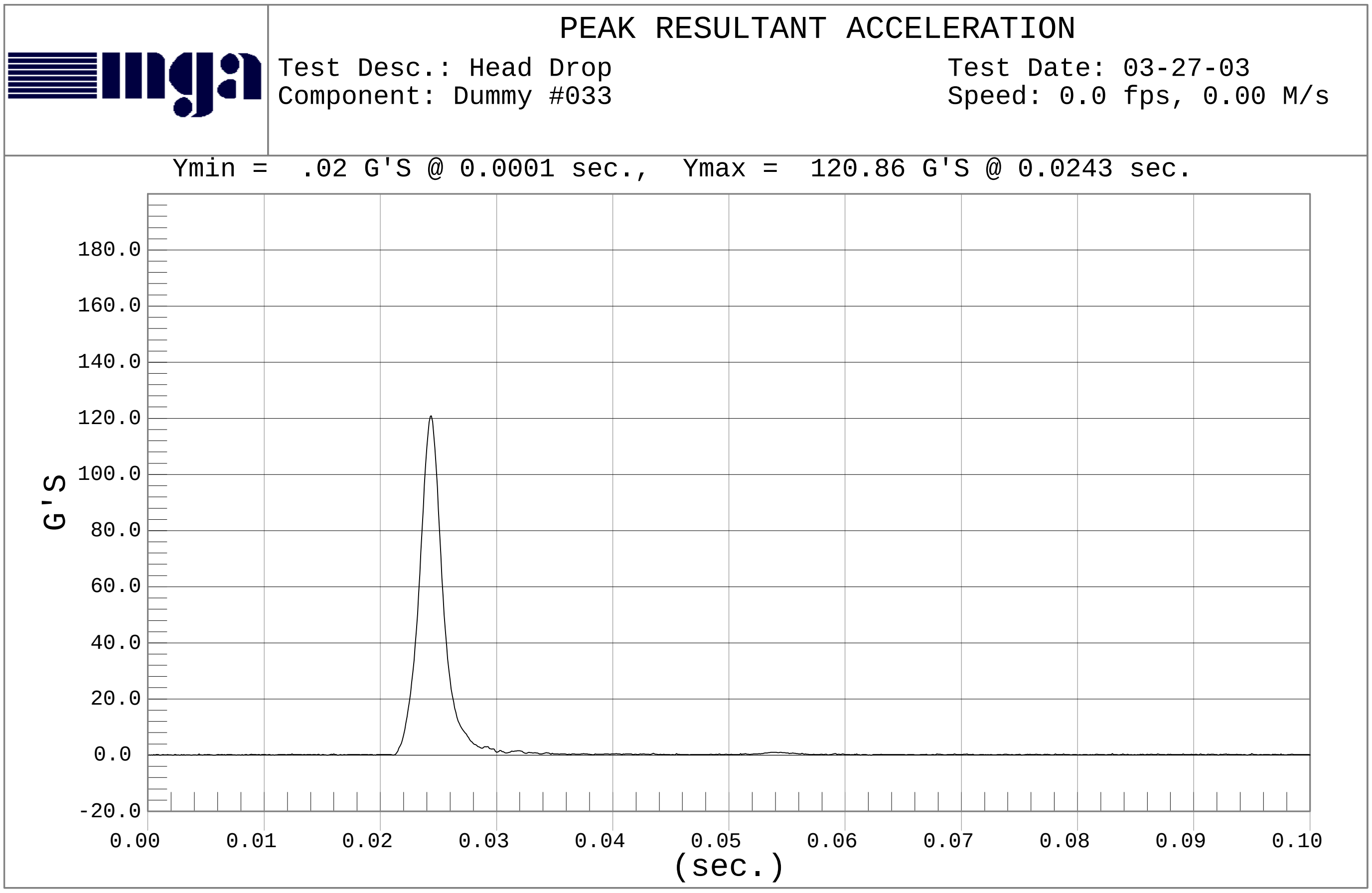
Test Number: D03521/D03531

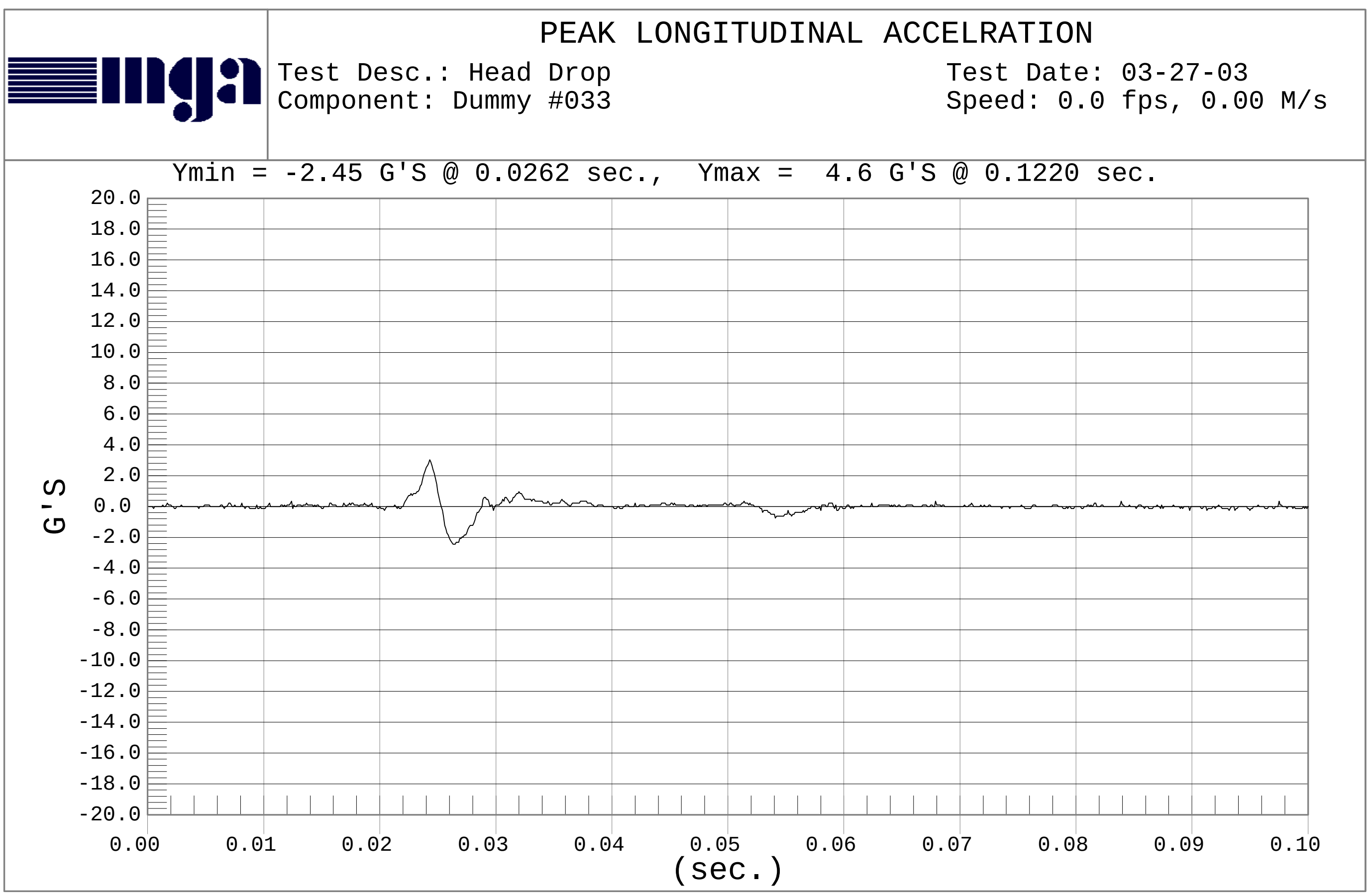
TEST PARAMETER	SPECIFICATION	TEST RESULTS	
		D03521	D03531
Temperature (ºC)	18.9° – 25.6°	21.4	21.6
Humidity	10% - 70%	27	25
Resultant Accel	115 - 145 g's	121	116
Peak Longitudinal Accel	(-15) – (+ 15) g's	5	4

TEST MEETS SPECIFICATIONS

Technician: ______________________________

Approved By:______________________________


PEAK RESULTANT ACCELERATION
Test Desc.: Head Drop
Component: Dummy #033
Test Date: 03-27-03
Speed: 0.0 fps, 0.00 M/s
Ymin = .02 G'S @ 0.0001 sec., Ymax = 120.86 G'S @ 0.0243 sec.
G'S
(sec.)

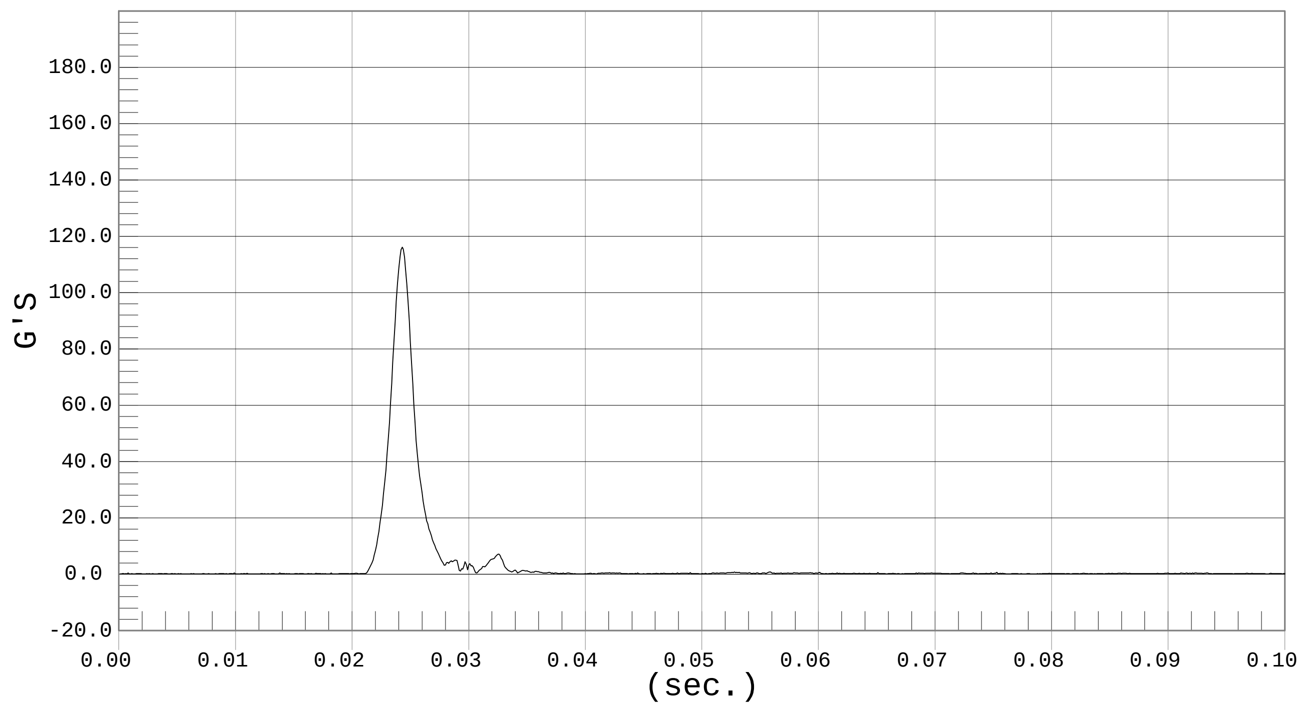

PEAK LONGITUDINAL ACCELRATION
Test Desc.: Head Drop
Component: Dummy #033
Test Date: 03-27-03
Speed: 0.0 fps, 0.00 M/s
Ymin = -2.45 G'S @ 0.0262 sec., Ymax = 4.6 G'S @ 0.1220 sec.
G'S
(sec.)

PEAK RESULTANT ACCELERATION

Test Desc.: Head Drop
Component: Dummy #033

Test Date: 03-27-03
Speed: 0.0 fps, 0.00 M/s

Ymin = .06 G'S @ 0.0019 sec., Ymax = 116.08 G'S @ 0.0242 sec.

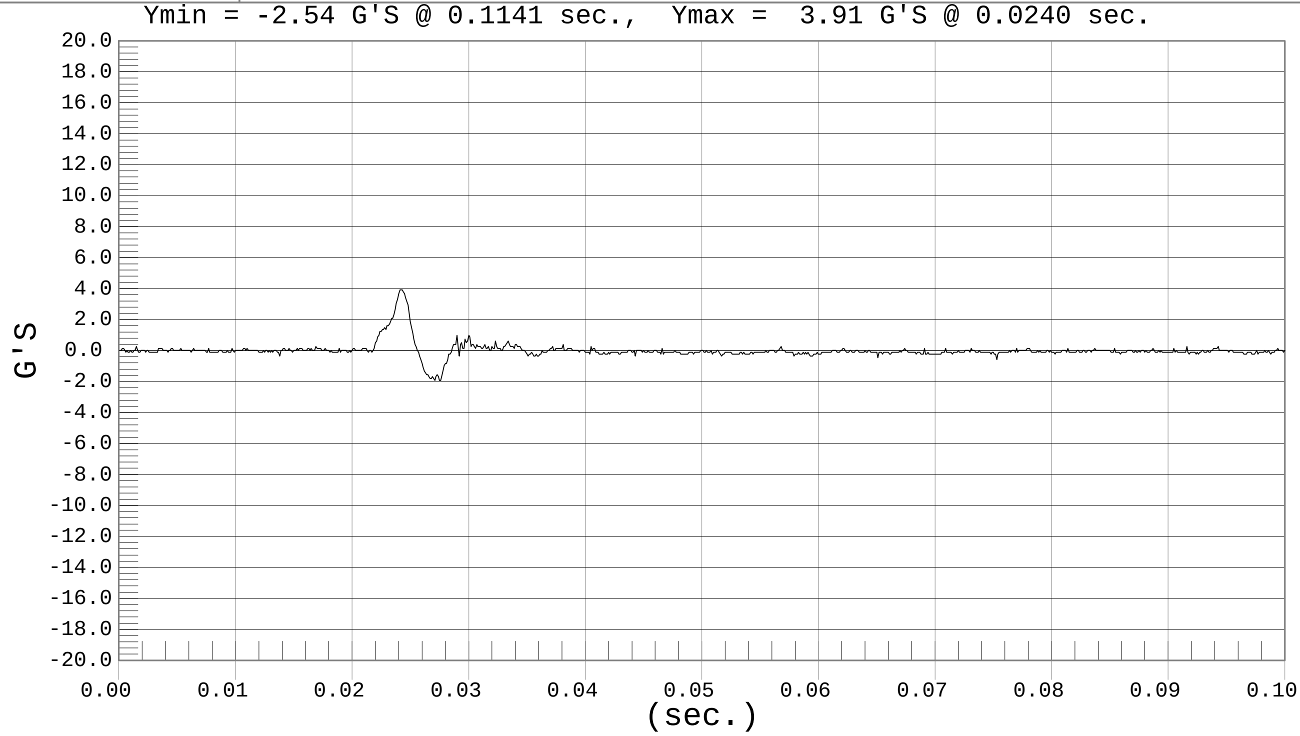


PEAK LONGITUDINAL ACCELRATION

Test Desc.: Head Drop
Component: Dummy #033

Test Date: 03-27-03
Speed: 0.0 fps, 0.00 M/s

Ymin = -2.54 G'S @ 0.1141 sec., Ymax = 3.91 G'S @ 0.0240 sec.



MGA RESEARCH CORPORATION

LATERAL NECK PENDULUM TEST

SID IIs DUMMY

Date: 3/27/03

Dummy Serial Number: 033

Test Number: D03522/D03532

TEST PARAMETER		SPECIFICATION	TEST RESULTS	
			D03522	D03532
Temperature (ºC)		20.8° – 22.2°	21.4	21.5
Humidity		10% - 70%	27	26
Impact Velocity (m/s)		5.51-5.63	5.57	5.55
Delta Velocity (m/s)	10 ms	2.10-2.70	2.21	2.45
	15 ms	3.00-3.80	3.34	3.59
	20 ms	4.20-5.20	4.51	4.73
	25-60 ms	5.00-6.40	5.65	5.72
Peak D-Plane Rotation (deg)		72-82	74	76
Decay Time of D-Plane Rotation Peak to Zero Degree (ms)		60-83	66	69
Peak Occipital Condyle Moment (Nm)		(-43) – (-36)	-43	*-43.3
Time at 10 or -10 Nm after Peak Moment (ms)		90 – 98	90	90
Time of last Moment Peak to Max Rotation (ms)		<14	6	10
Front Pot Peak Rotation (deg)		59 – 72	58*	60
Time of Front Pot Peak Rotation (ms)		61 – 73	64	64
Rear Pot Peak Rotation (deg)		47 – 56	*46.64	49
Time of Rear Pot Peak Rotation (ms)		62 – 73	61*	*61

*TEST DOES NOT MEET SPECIFICATIONS

Technician: ___________________________________

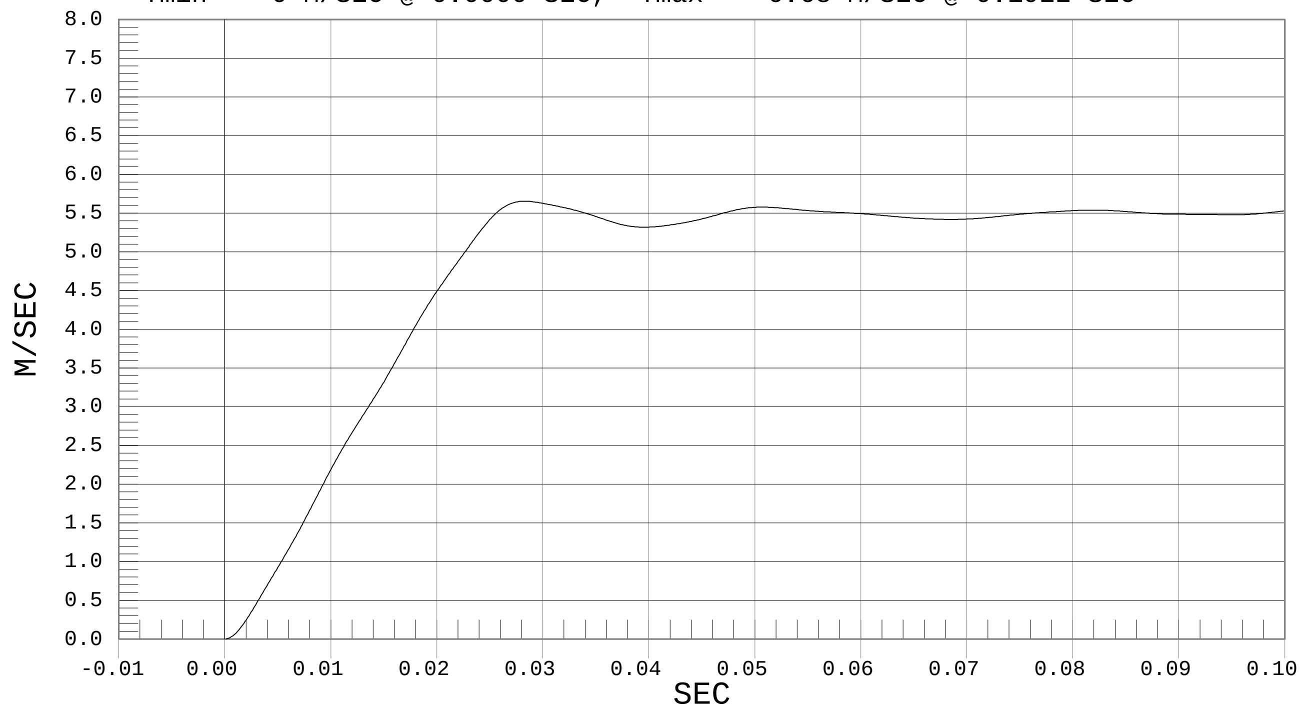
Approved By:___________________________________

PENDULUM DECELERATION

Test Desc.: Neck Bending
Component: Dummy #033

Test Date: 03-27-03
Speed: 18.3 fps, 5.57 M/s

Ymin = 0 M/SEC @ 0.0000 SEC, Ymax = 6.68 M/SEC @ 0.1922 SEC

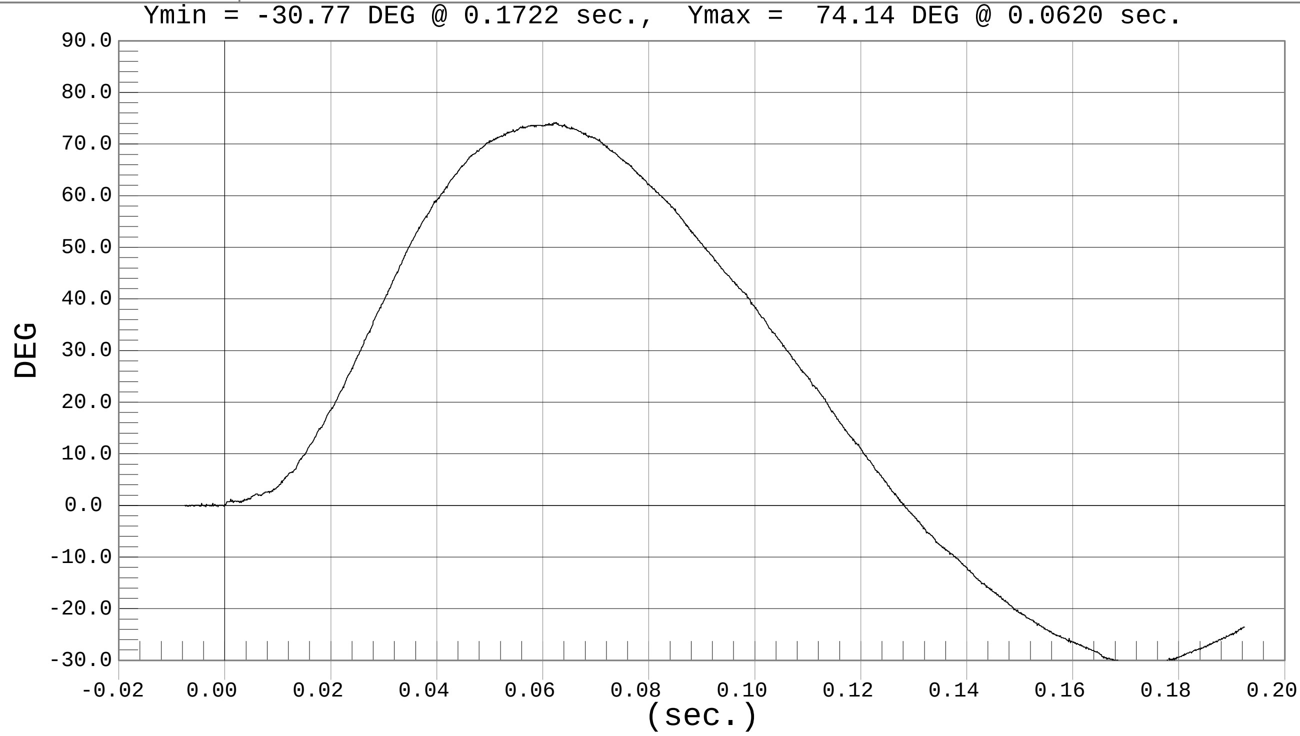


FLEXION ANGLE

Test Desc.: Neck Bending
Component: Dummy #033

Test Date: 03-27-03
Speed: 18.3 fps, 5.57 M/s

Ymin = -30.77 DEG @ 0.1722 sec., Ymax = 74.14 DEG @ 0.0620 sec.

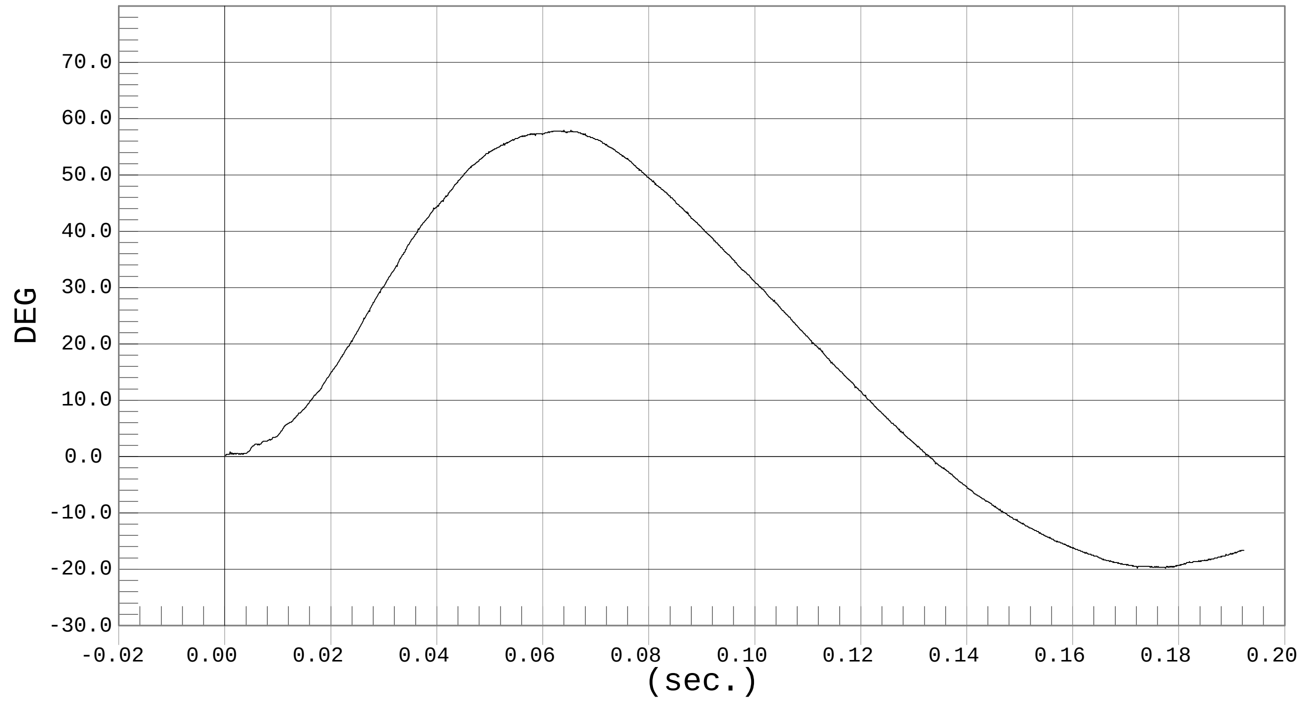


FRONT

Test Desc.: Neck Bending
Component: Dummy #033

Test Date: 03-27-03
Speed: 18.3 fps, 5.57 M/s

Ymin = -19.83 DEG @ 0.1721 sec., Ymax = 57.97 DEG @ 0.0639 sec.

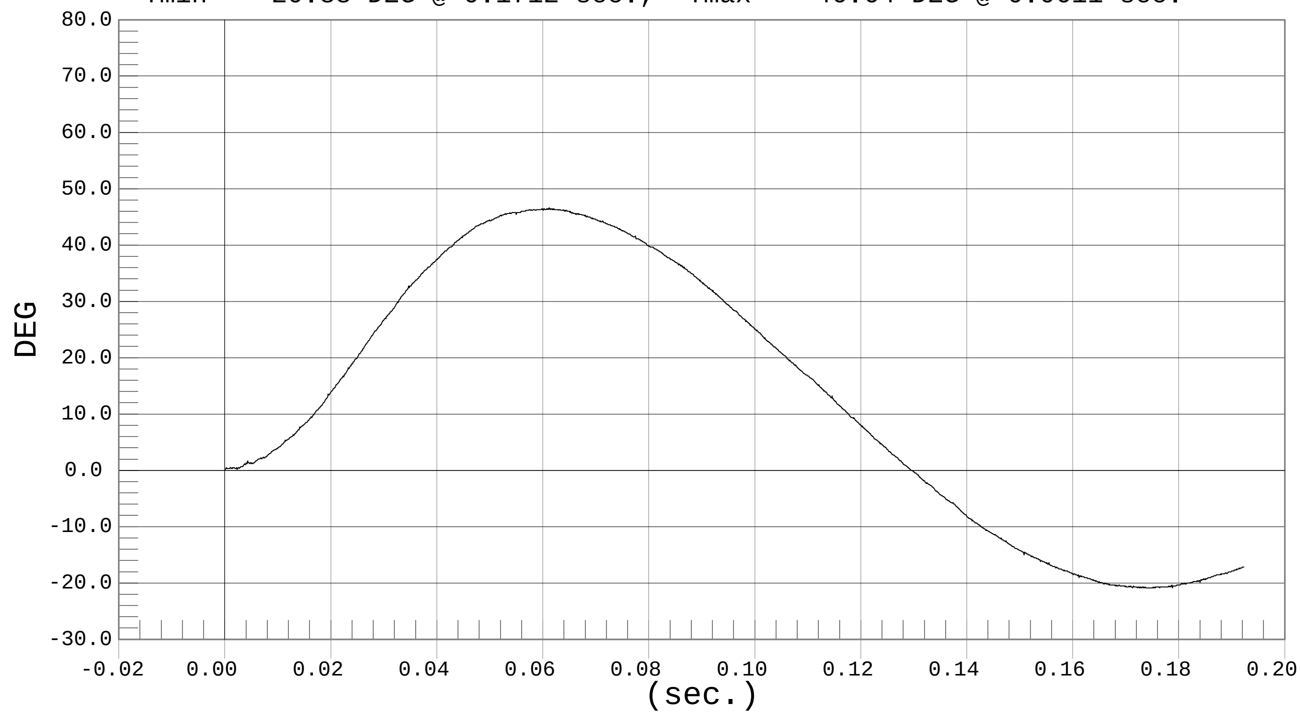


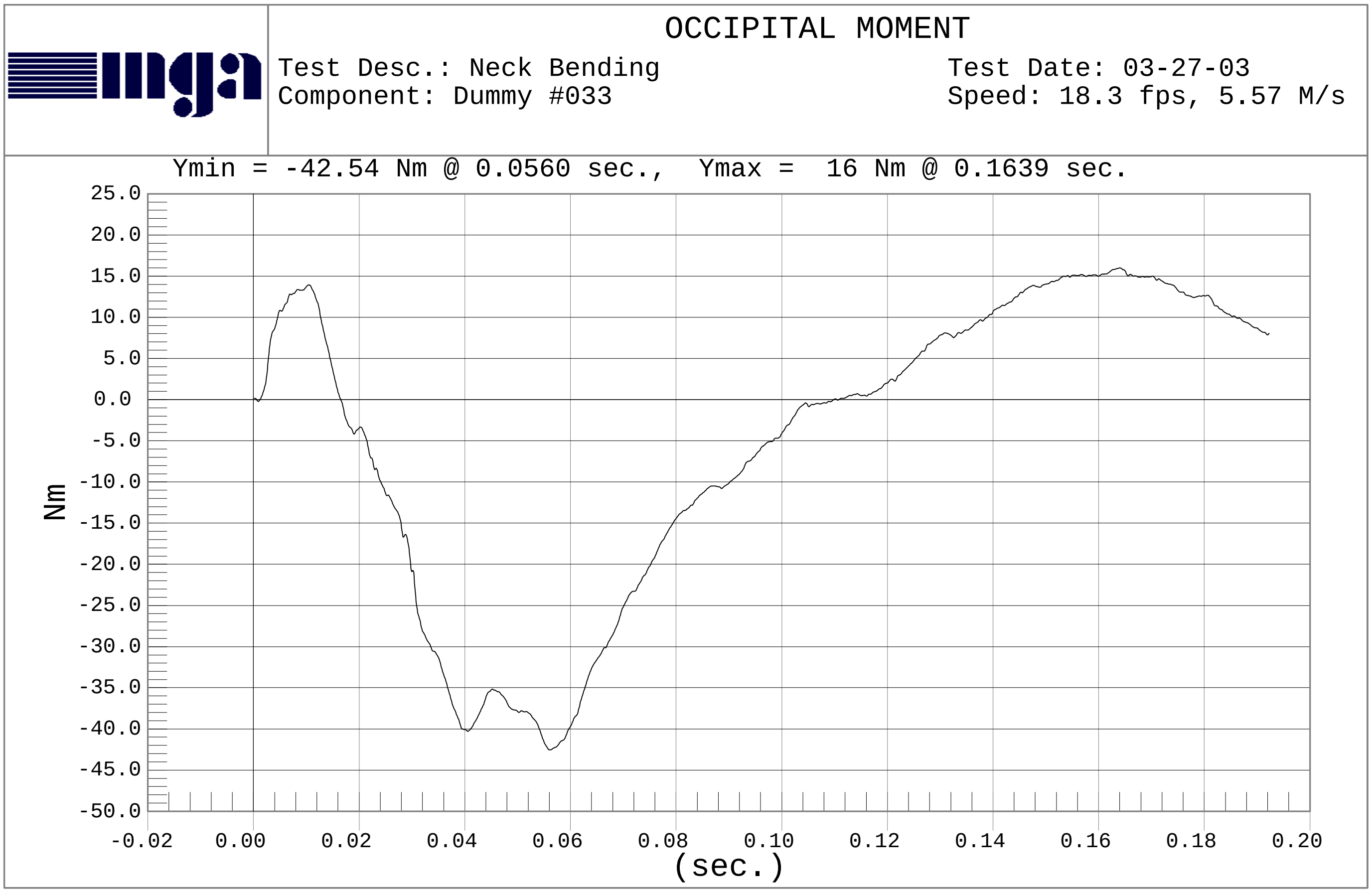
REAR

Test Desc.: Neck Bending
Component: Dummy #033

Test Date: 03-27-03
Speed: 18.3 fps, 5.57 M/s

Ymin = -20.88 DEG @ 0.1712 sec., Ymax = 46.64 DEG @ 0.0611 sec.



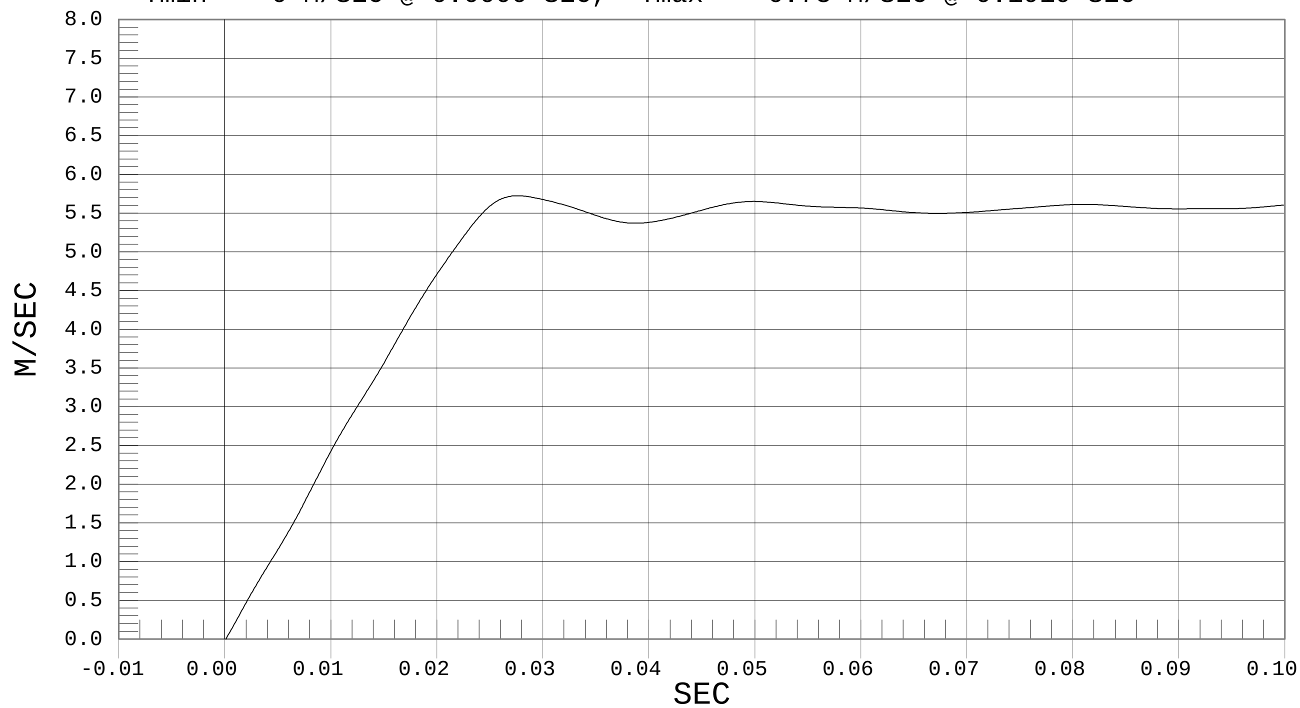

OCCIPITAL MOMENT
Test Desc.: Neck Bending
Component: Dummy #033
Test Date: 03-27-03
Speed: 18.3 fps, 5.57 M/s
Ymin = -42.54 Nm @ 0.0560 sec., Ymax = 16 Nm @ 0.1639 sec.
Nm
(sec.)
25.0
20.0
15.0
10.0
5.0
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
-40.0
-45.0
-50.0
-0.02
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
0.18
0.20

PENDULUM DECELERATION

Test Desc.: Neck Bending
Component: Dummy #033

Test Date: 03-27-03
Speed: 18.2 fps, 5.55 M/s

Ymin = 0 M/SEC @ 0.0000 SEC, Ymax = 6.73 M/SEC @ 0.1919 SEC

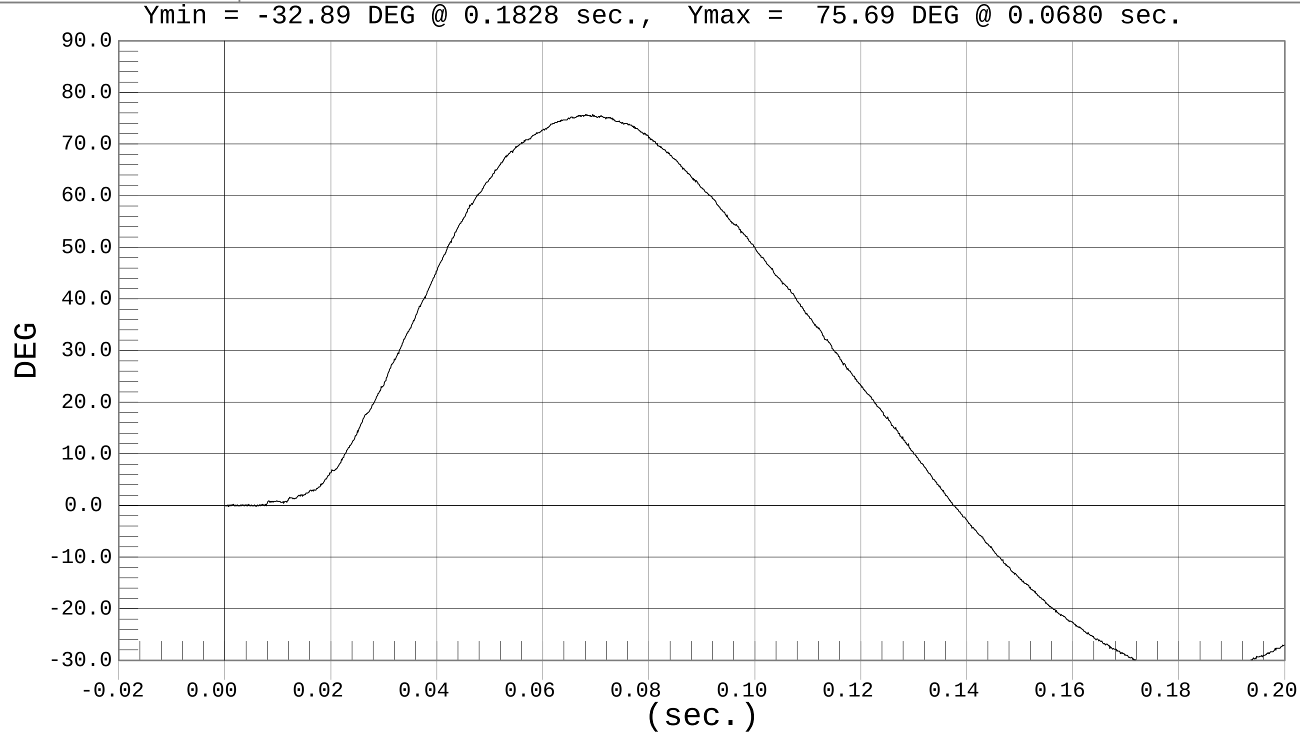


FLEXION ANGLE

Test Desc.: Neck Bending
Component: Dummy #033

Test Date: 03-27-03
Speed: 18.2 fps, 5.55 M/s

Ymin = -32.89 DEG @ 0.1828 sec., Ymax = 75.69 DEG @ 0.0680 sec.

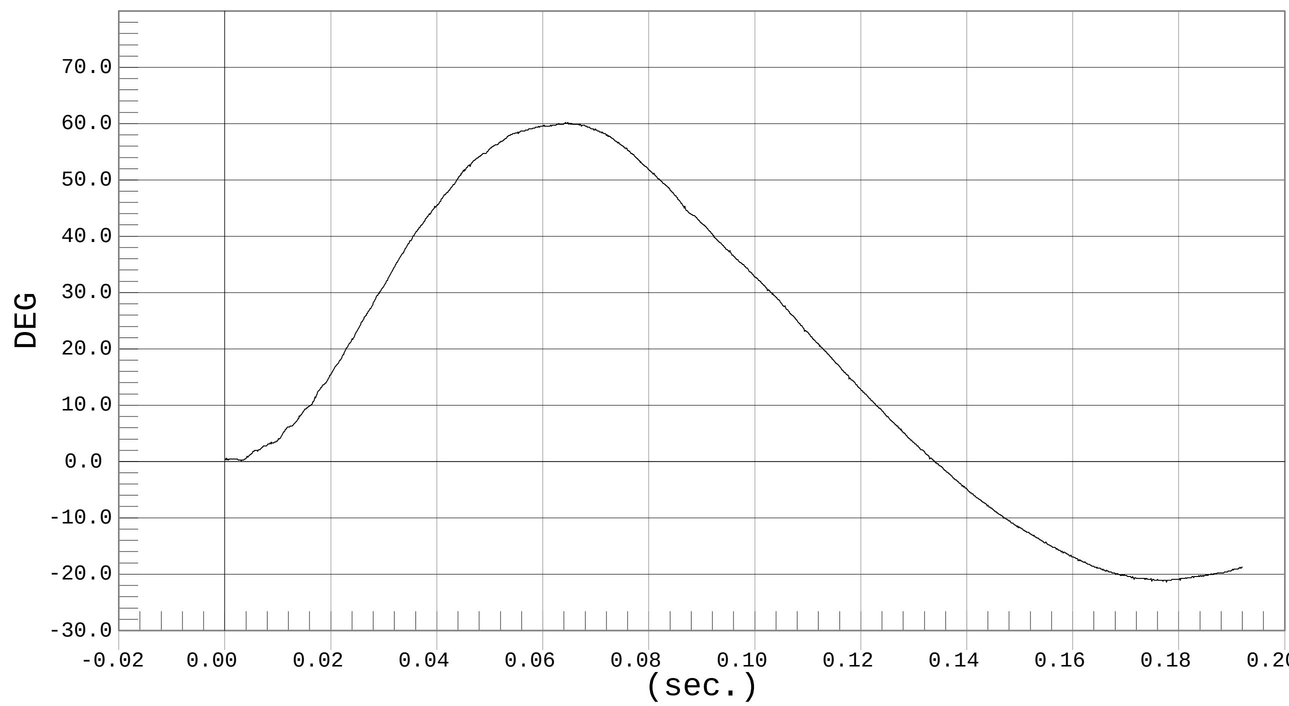


FRONT

Test Desc.: Neck Bending
Component: Dummy #033

Test Date: 03-27-03
Speed: 18.2 fps, 5.55 M/s

Ymin = -21.43 DEG @ 0.1776 sec., Ymax = 60.21 DEG @ 0.0642 sec.

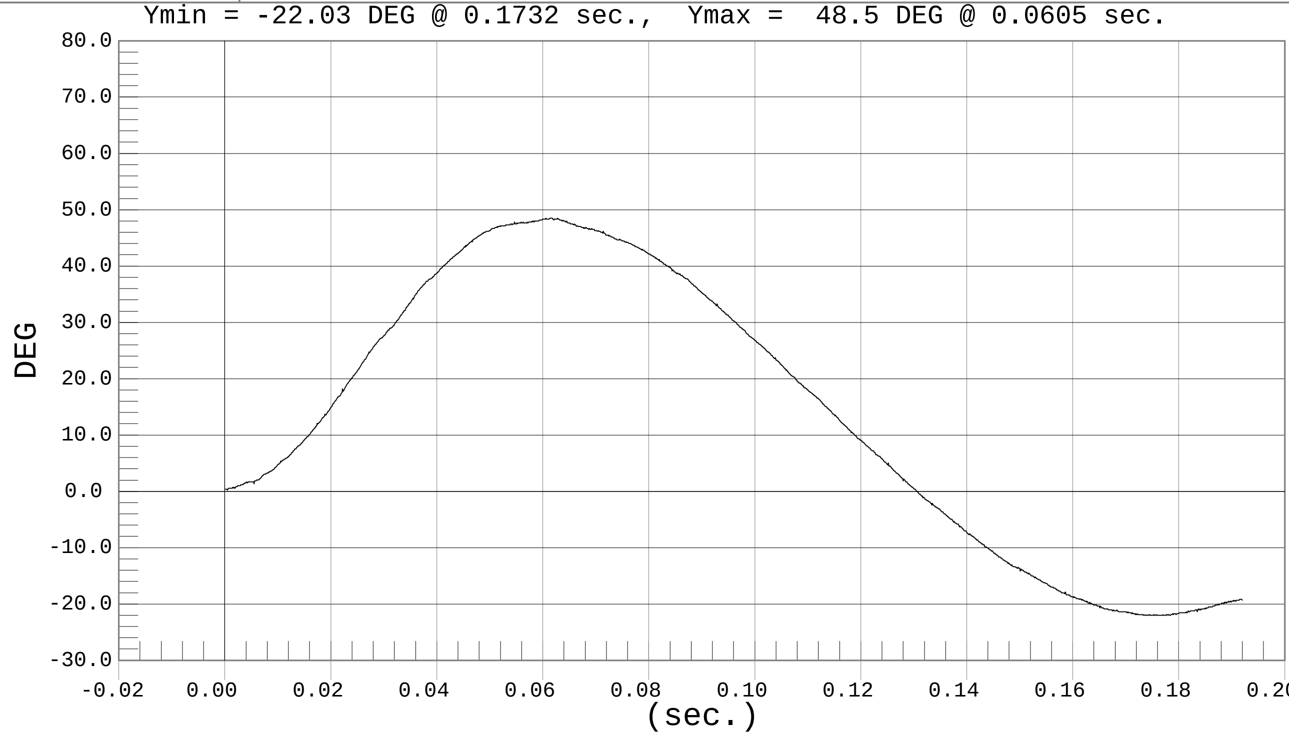


REAR

Test Desc.: Neck Bending
Component: Dummy #033

Test Date: 03-27-03
Speed: 18.2 fps, 5.55 M/s

Ymin = -22.03 DEG @ 0.1732 sec., Ymax = 48.5 DEG @ 0.0605 sec.

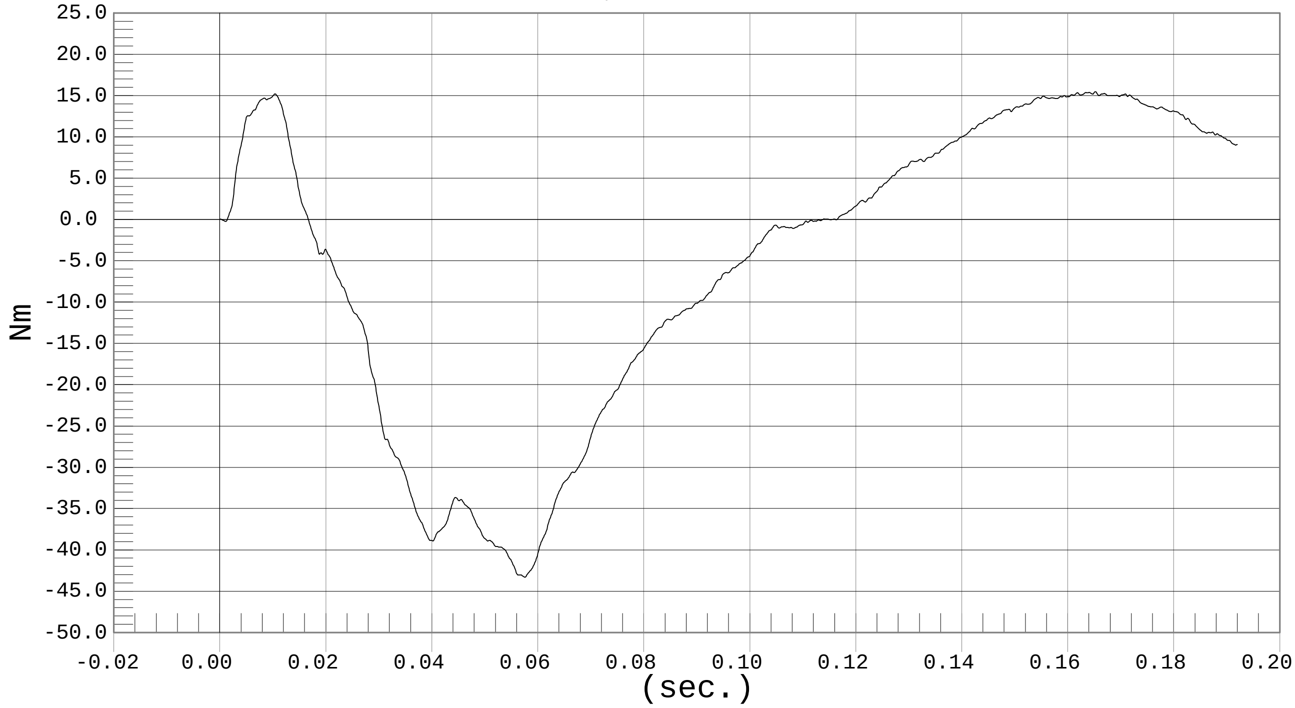


OCCIPITAL MOMENT

Test Desc.: Neck Bending
Component: Dummy #033

Test Date: 03-27-03
Speed: 18.2 fps, 5.55 M/s

Ymin = -43.3 Nm @ 0.0575 sec., Ymax = 15.48 Nm @ 0.1651 sec.



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

SID IIs DUMMY

Date: 3/26/03

Dummy Serial Number: 033

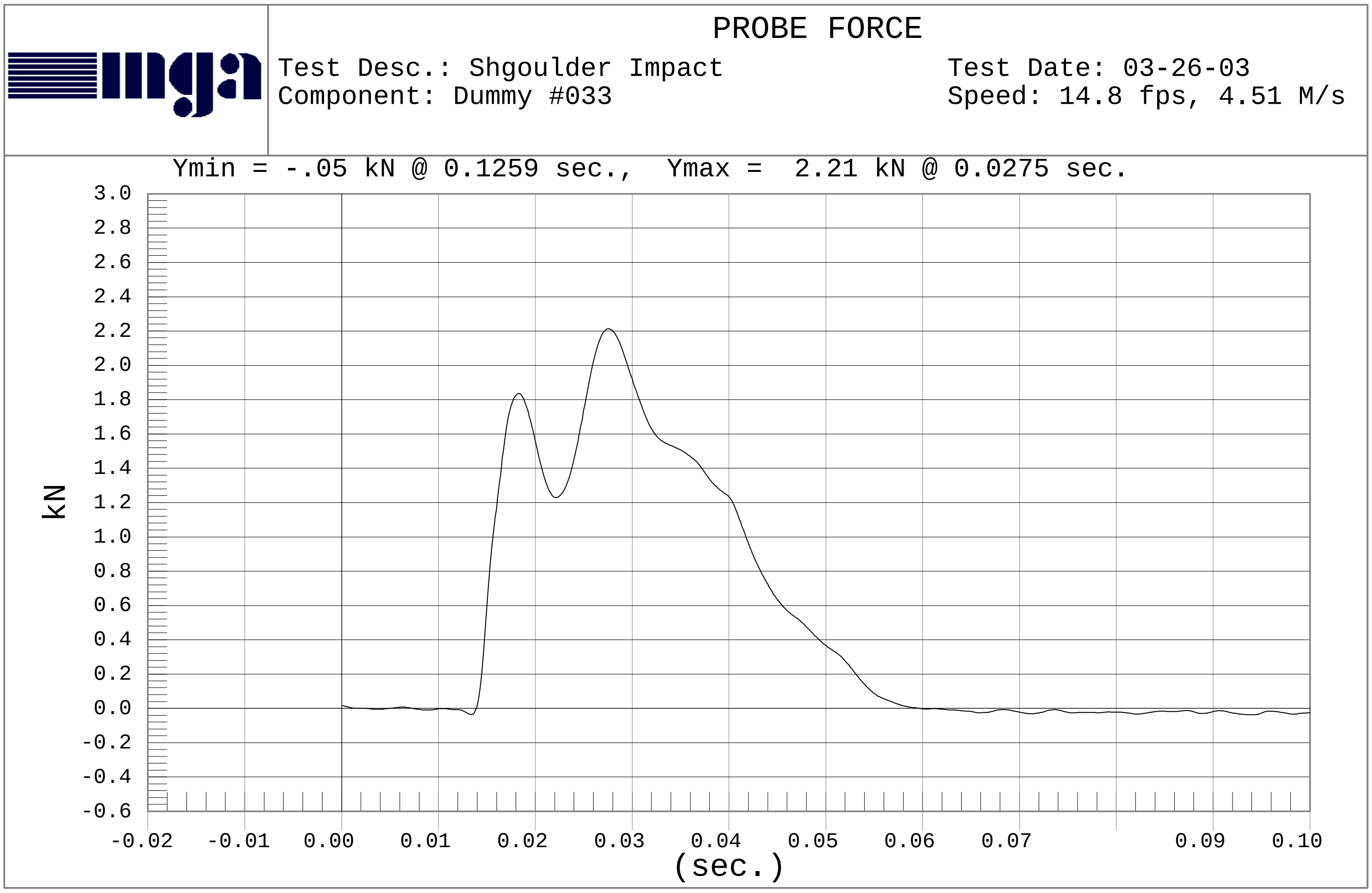
Test Number: D03523/D03533

TEST PARAMETER	SPECIFICATION	TEST RESULTS	
		D03523	D03533
Temperature (ºC)	20.8° – 22.2°	22.1	21.4
Humidity	10% - 70%	26	25
Impact Velocity	4.41 - 4.59 m/s	4.51	4.48
Probe Force	1.6 - 2.4 kN	2.2	2.3
Shoulder Displacement	27-39 mm	33	33

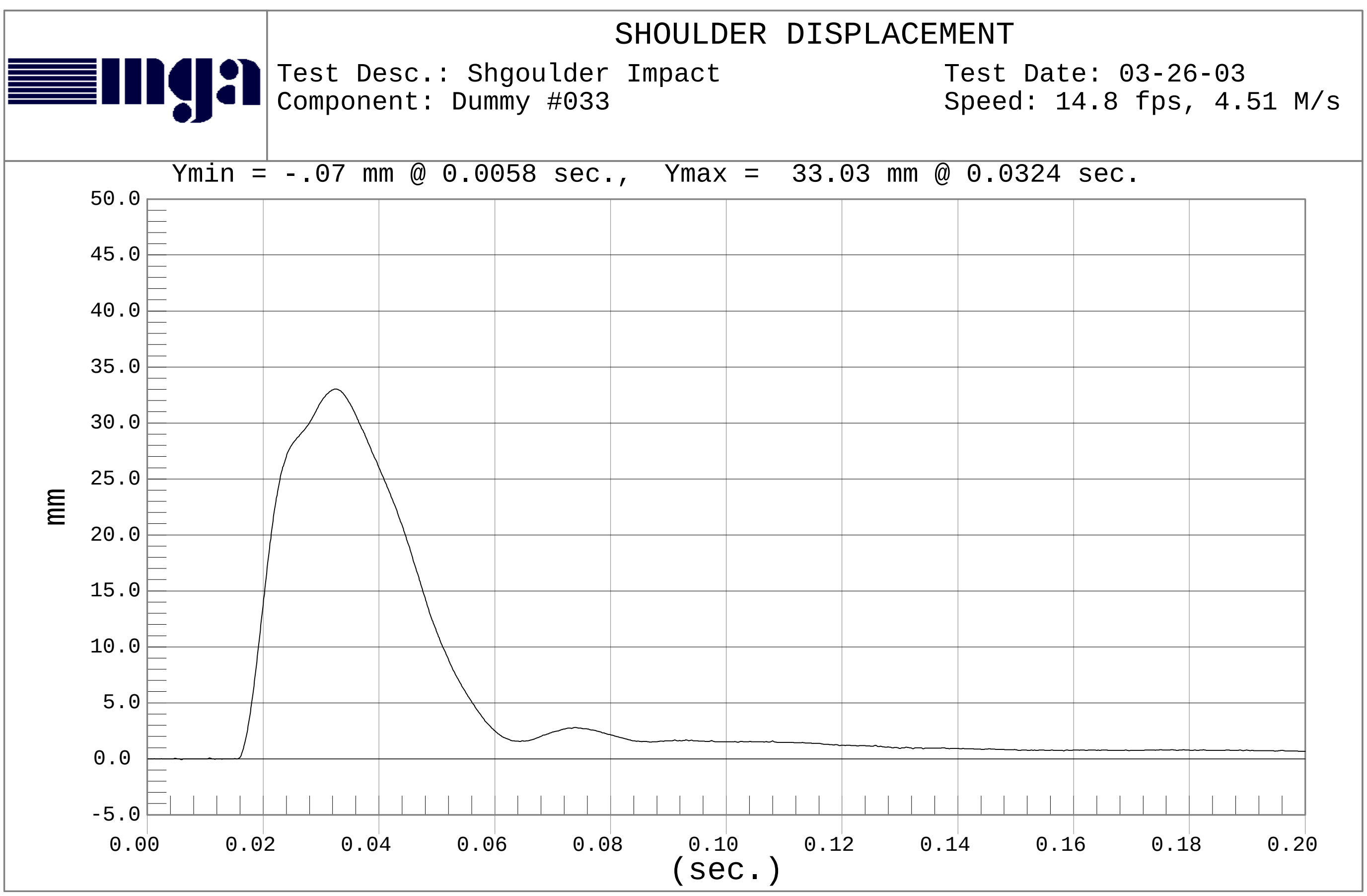
TEST MEETS SPECIFICATIONS

Technician: ______________________________

Approved By:______________________________



PROBE FORCE
Test Desc.: Shgoulder Impact
Component: Dummy #033
Test Date: 03-26-03
Speed: 14.8 fps, 4.51 M/s
Ymin = -.05 kN @ 0.1259 sec., Ymax = 2.21 kN @ 0.0275 sec.
kN
(sec.)



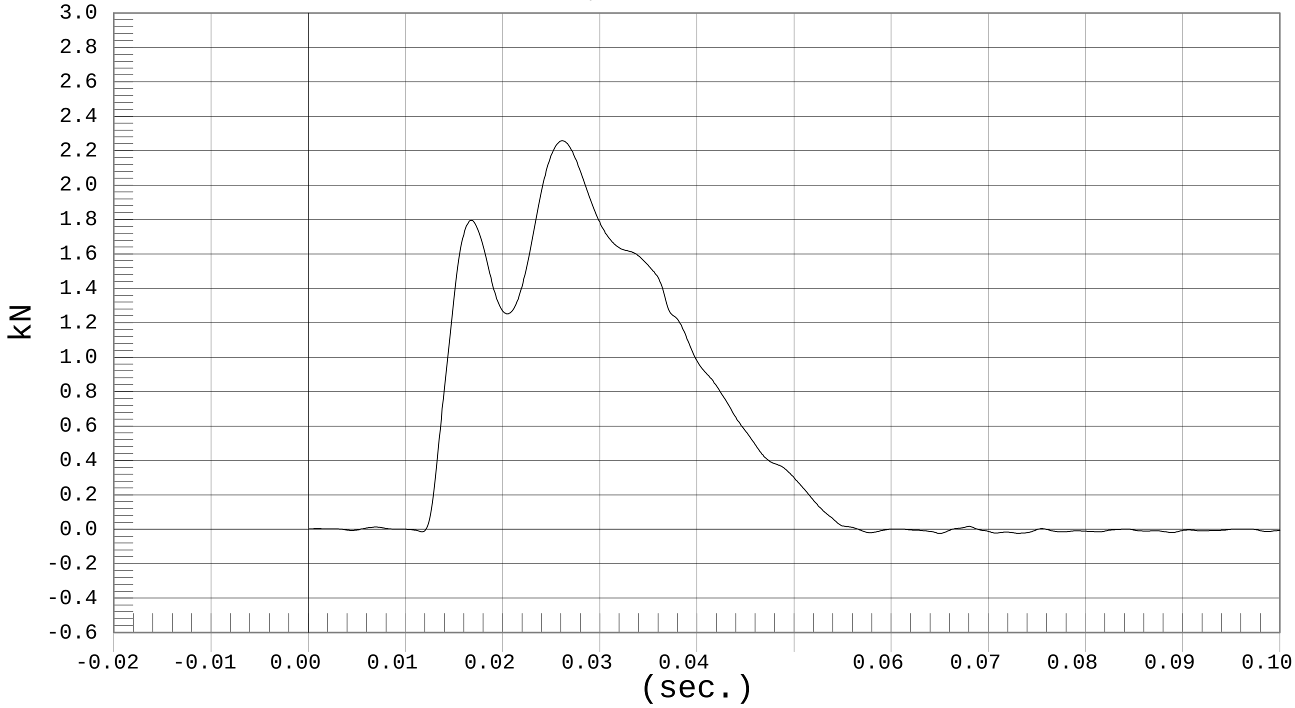
SHOULDER DISPLACEMENT
Test Desc.: Shgoulder Impact
Component: Dummy #033
Test Date: 03-26-03
Speed: 14.8 fps, 4.51 M/s
Ymin = -.07 mm @ 0.0058 sec., Ymax = 33.03 mm @ 0.0324 sec.
mm
(sec.)

PROBE FORCE

Test Desc.: Shoulder Impact
Component: Dummy #033

Test Date: 03-26-03
Speed: 14.7 fps, 4.48 M/s

Ymin = -.05 kN @ 0.1587 sec., Ymax = 2.26 kN @ 0.0261 sec.

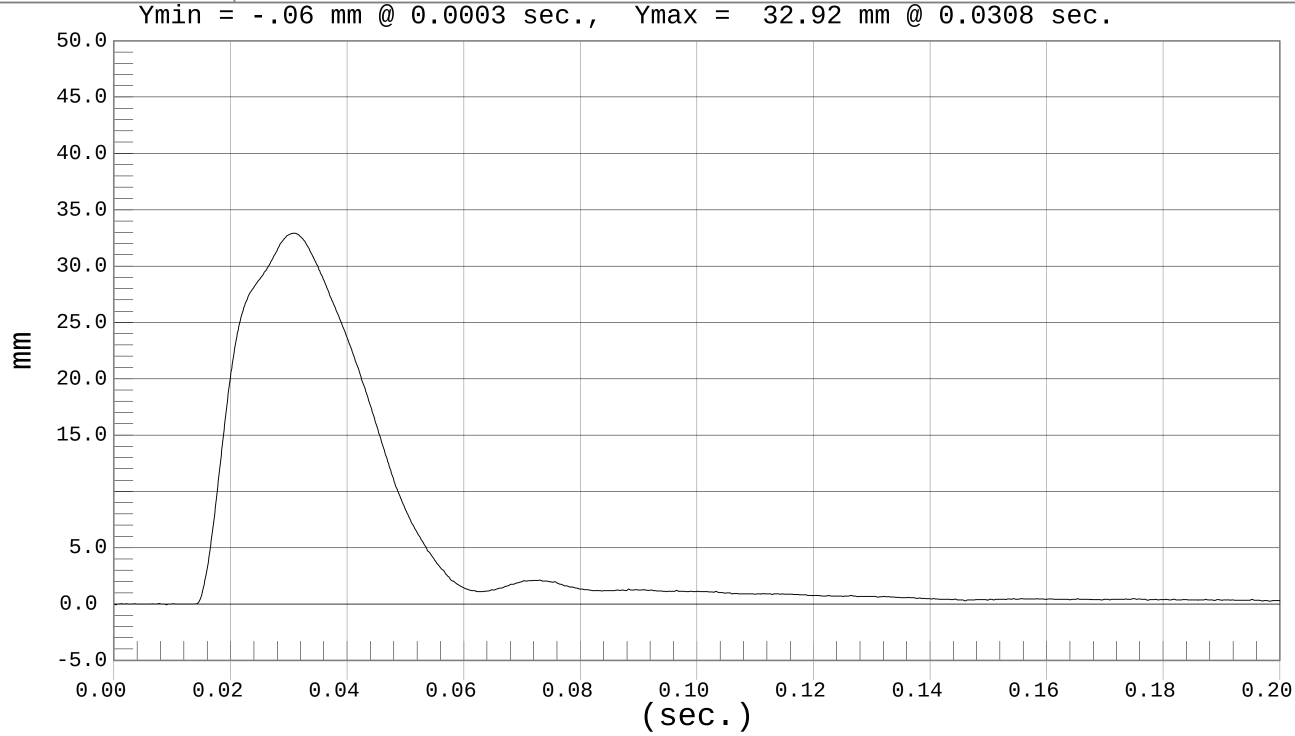


SHOULDER DISPLACEMENT

Test Desc.: Shoulder Impact
Component: Dummy #033

Test Date: 03-26-03
Speed: 14.7 fps, 4.48 M/s

Ymin = -.06 mm @ 0.0003 sec., Ymax = 32.92 mm @ 0.0308 sec.



MGA RESEARCH CORPORATION

THORAX (WITH ARM) IMPACT TESTS

SID IIs DUMMY

Date: 3/26/03

Dummy Serial Number: 033

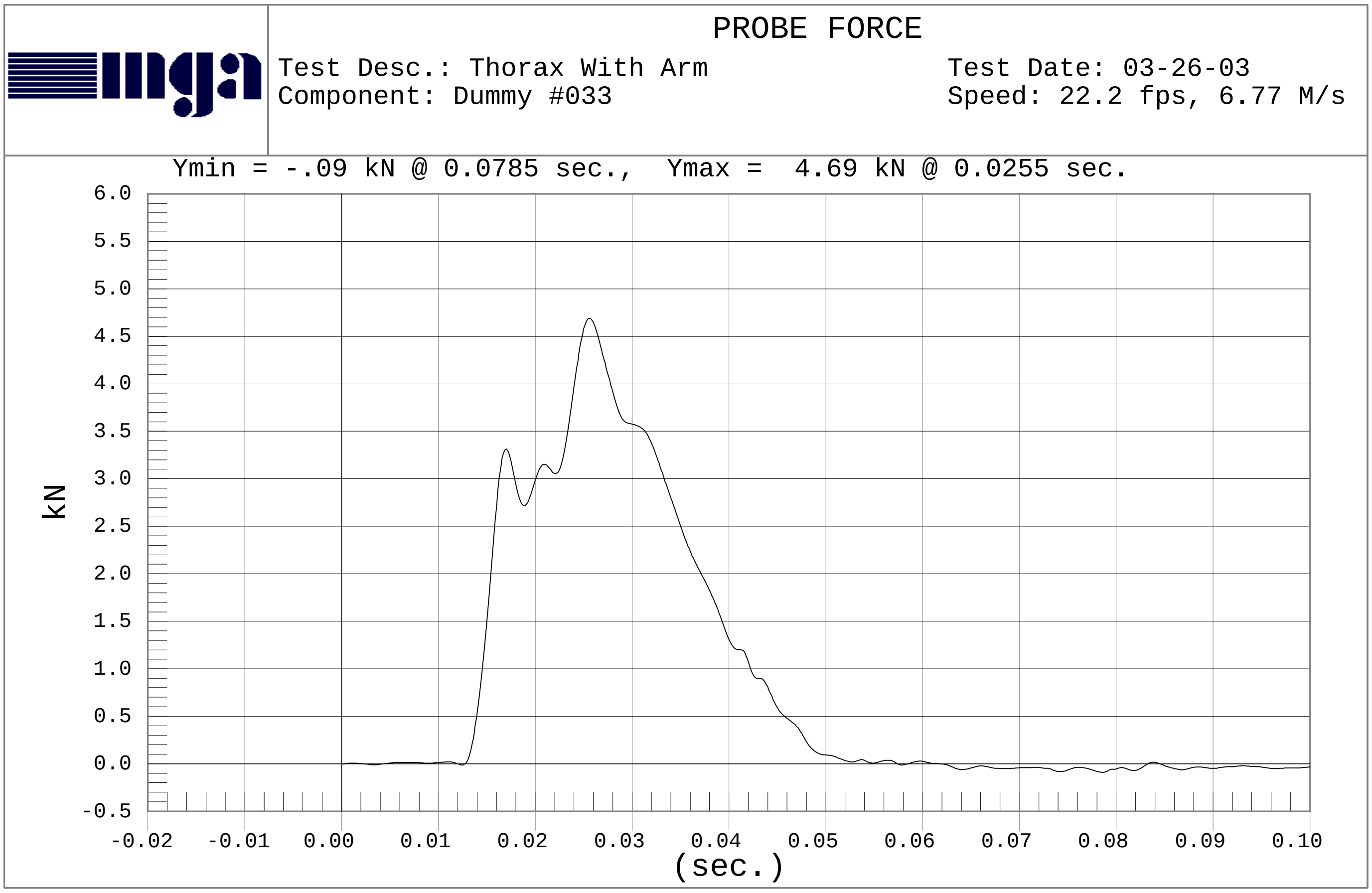
Test Number: D03524/D03534

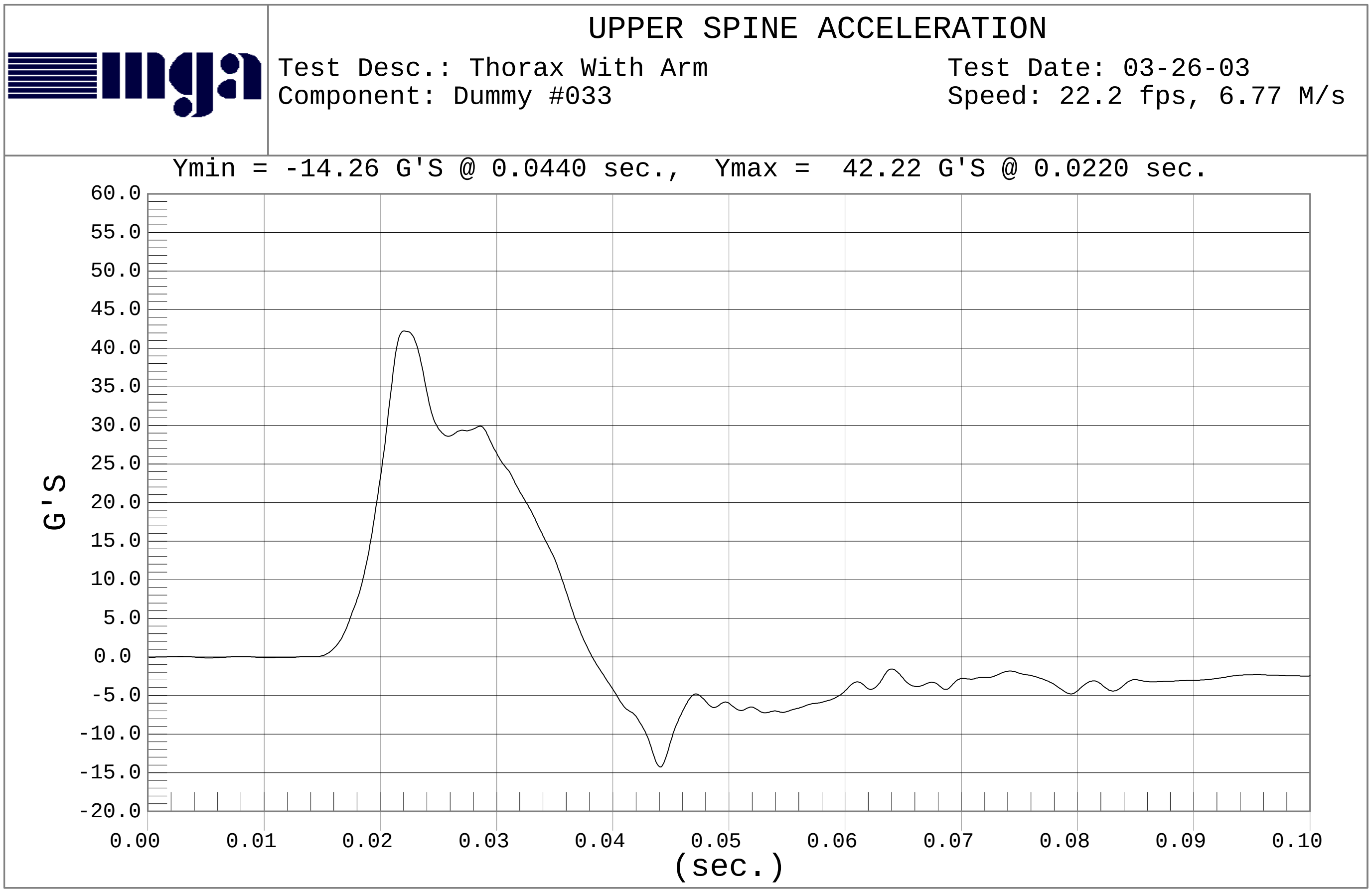
TEST PARAMETER	SPECIFICATION	TEST RESULTS	
		D03524	D03534
Temperature (ºC)	20.8° – 22.2°	22.0	21.3
Humidity	10% - 70%	26	26
Impact Velocity	6.57 - 6.84 m/s	6.77	6.75
Probe Force	4.1 – 4.7 kN	4.7	4.7
Upper Spine Acceleration	34 – 48 g's	42	42
Lower Spine Acceleration	31 - 36 g's	34	35
Upper Rib Displacement	23 - 35 mm	29	30
Middle Rib Displacement	29 - 44 mm	33	32
Lower Rib Displacement	33 - 40 mm	37	33
Shoulder Displacement	30 - 42 mm	34	39

TEST MEETS SPECIFICATIONS

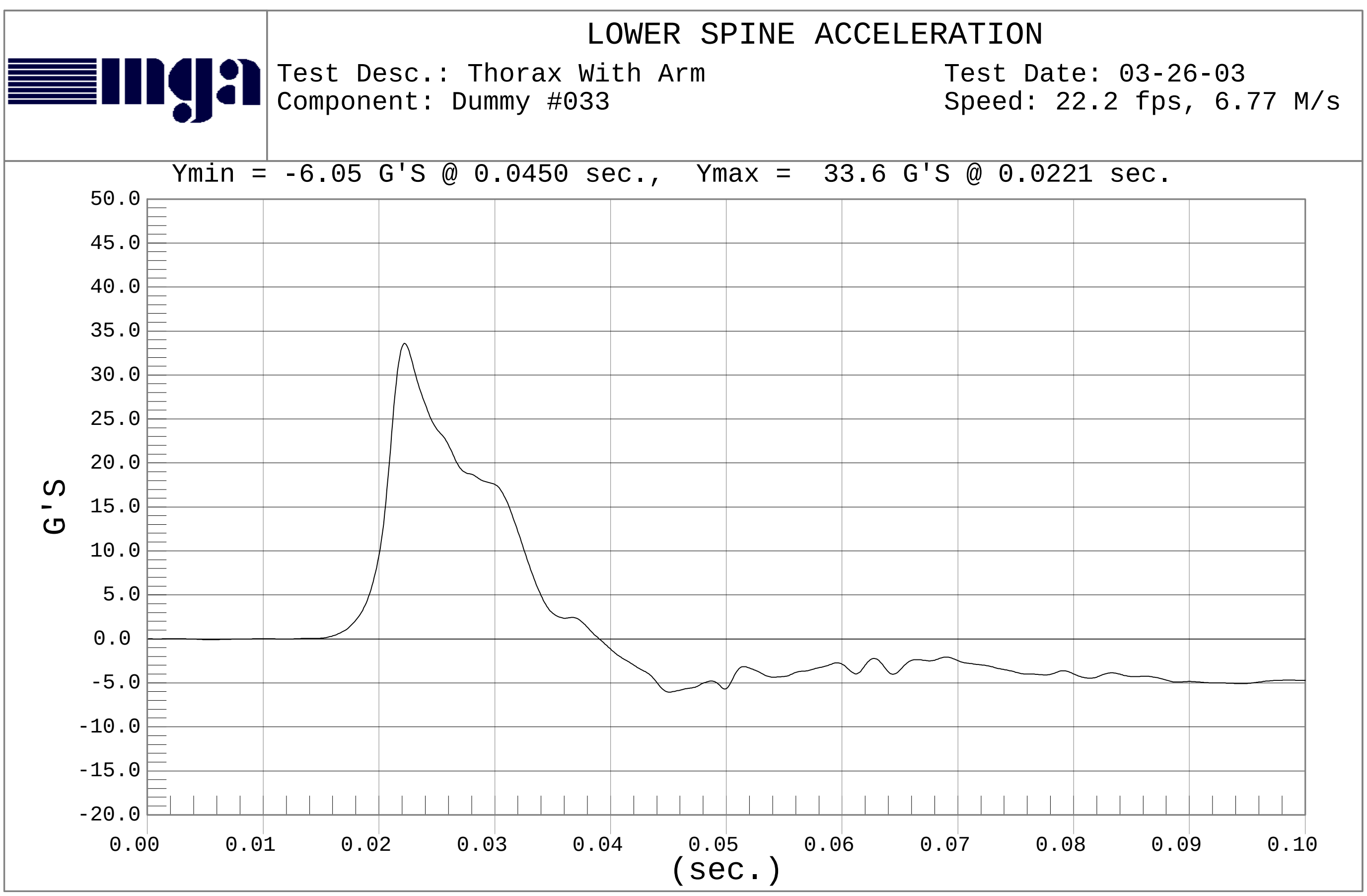
Technician: ____________________

Approved By: ____________________


PROBE FORCE
Test Desc.: Thorax With Arm
Component: Dummy #033
Test Date: 03-26-03
Speed: 22.2 fps, 6.77 M/s
Ymin = -.09 kN @ 0.0785 sec., Ymax = 4.69 kN @ 0.0255 sec.
kN
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-0.02
-0.01
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.10
(sec.)



UPPER SPINE ACCELERATION
Test Desc.: Thorax With Arm
Component: Dummy #033
Test Date: 03-26-03
Speed: 22.2 fps, 6.77 M/s
Ymin = -14.26 G'S @ 0.0440 sec., Ymax = 42.22 G'S @ 0.0220 sec.
G'S
(sec.)



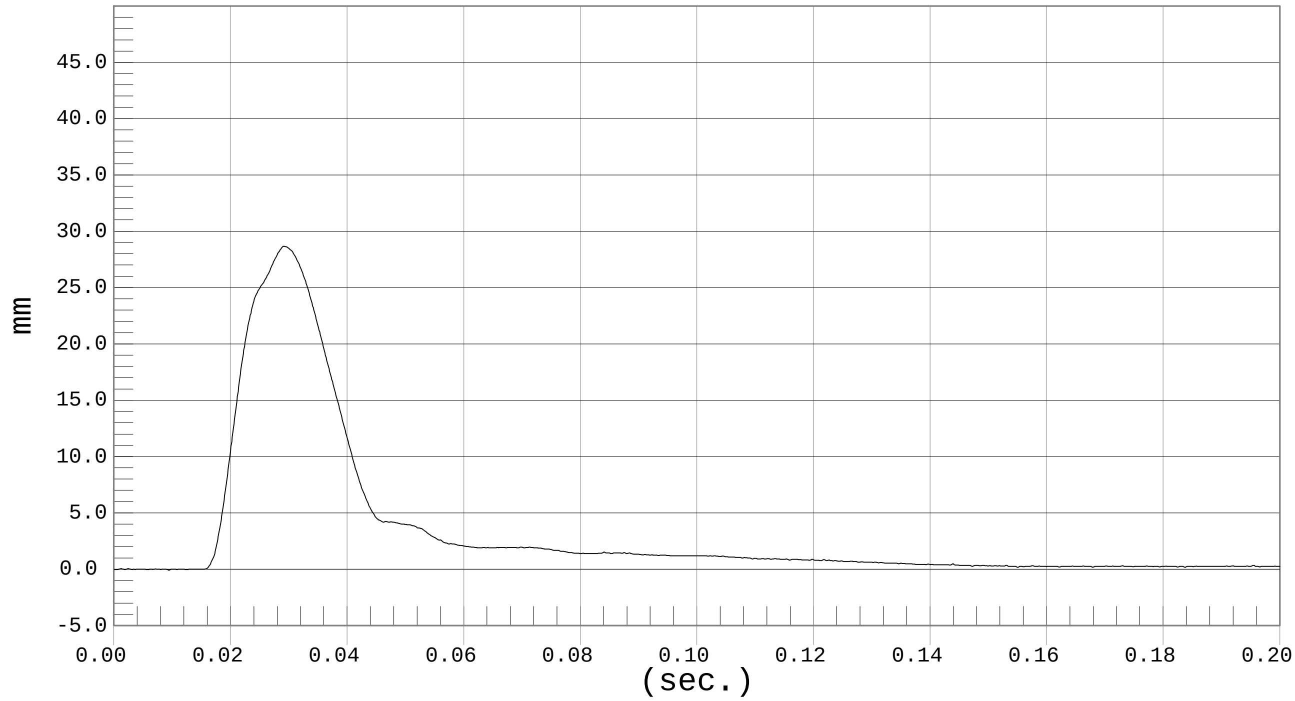
LOWER SPINE ACCELERATION
Test Desc.: Thorax With Arm
Component: Dummy #033
Test Date: 03-26-03
Speed: 22.2 fps, 6.77 M/s
Ymin = -6.05 G'S @ 0.0450 sec., Ymax = 33.6 G'S @ 0.0221 sec.
G'S
(sec.)

UPPER RIB DISPLACEMENT

Test Desc.: Thorax With Arm
Component: Dummy #033

Test Date: 03-26-03
Speed: 22.2 fps, 6.77 M/s

Ymin = -.09 mm @ 0.0093 sec., Ymax = 28.67 mm @ 0.0290 sec.

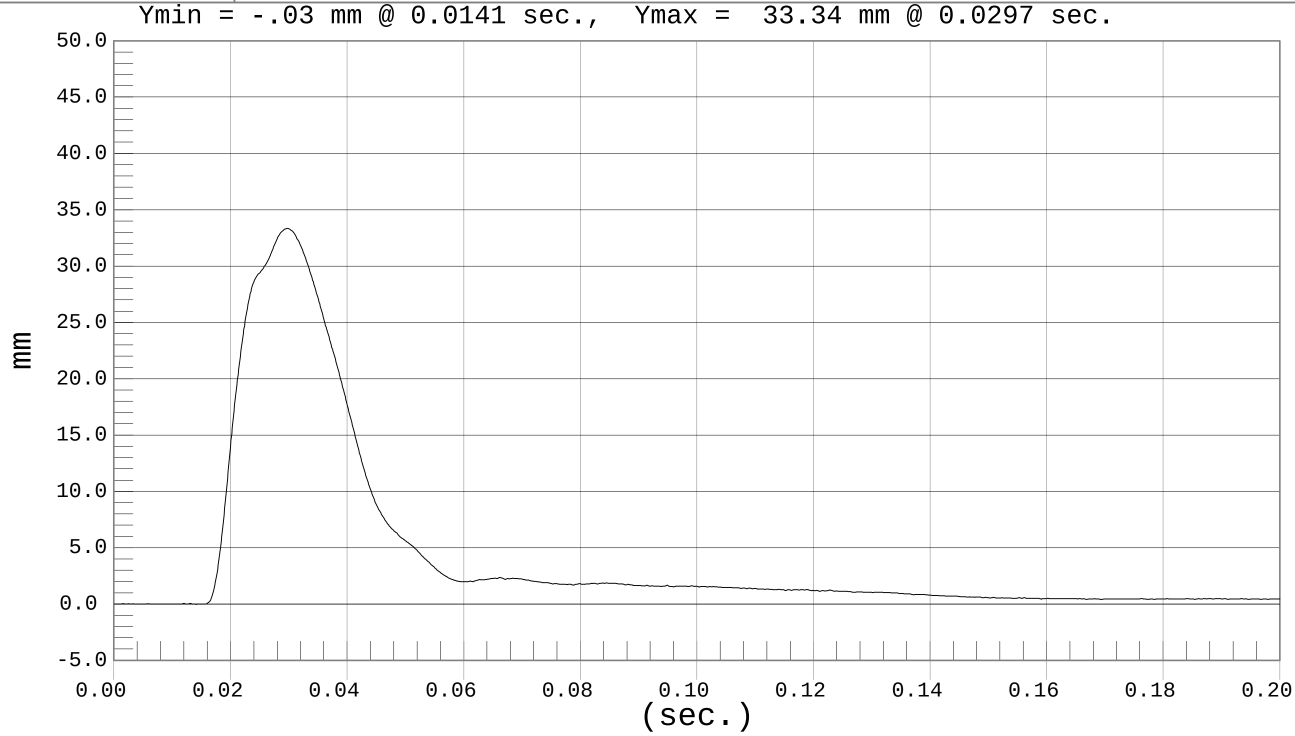


MIDDLE RIB DISPLACEMENT

Test Desc.: Thorax With Arm
Component: Dummy #033

Test Date: 03-26-03
Speed: 22.2 fps, 6.77 M/s

Ymin = -.03 mm @ 0.0141 sec., Ymax = 33.34 mm @ 0.0297 sec.

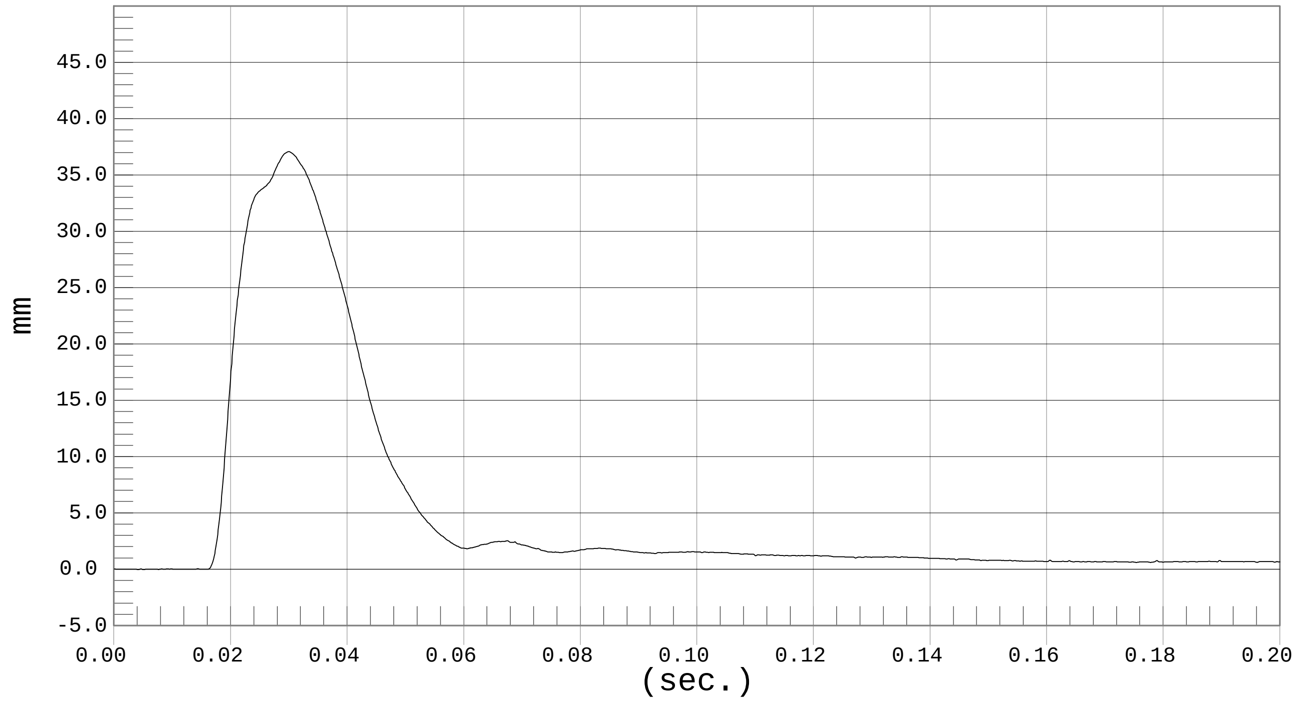


LOWER RIB DISPLACEMENT

Test Desc.: Thorax With Arm
Component: Dummy #033

Test Date: 03-26-03
Speed: 22.2 fps, 6.77 M/s

Ymin = -.05 mm @ 0.0041 sec., Ymax = 37.08 mm @ 0.0299 sec.

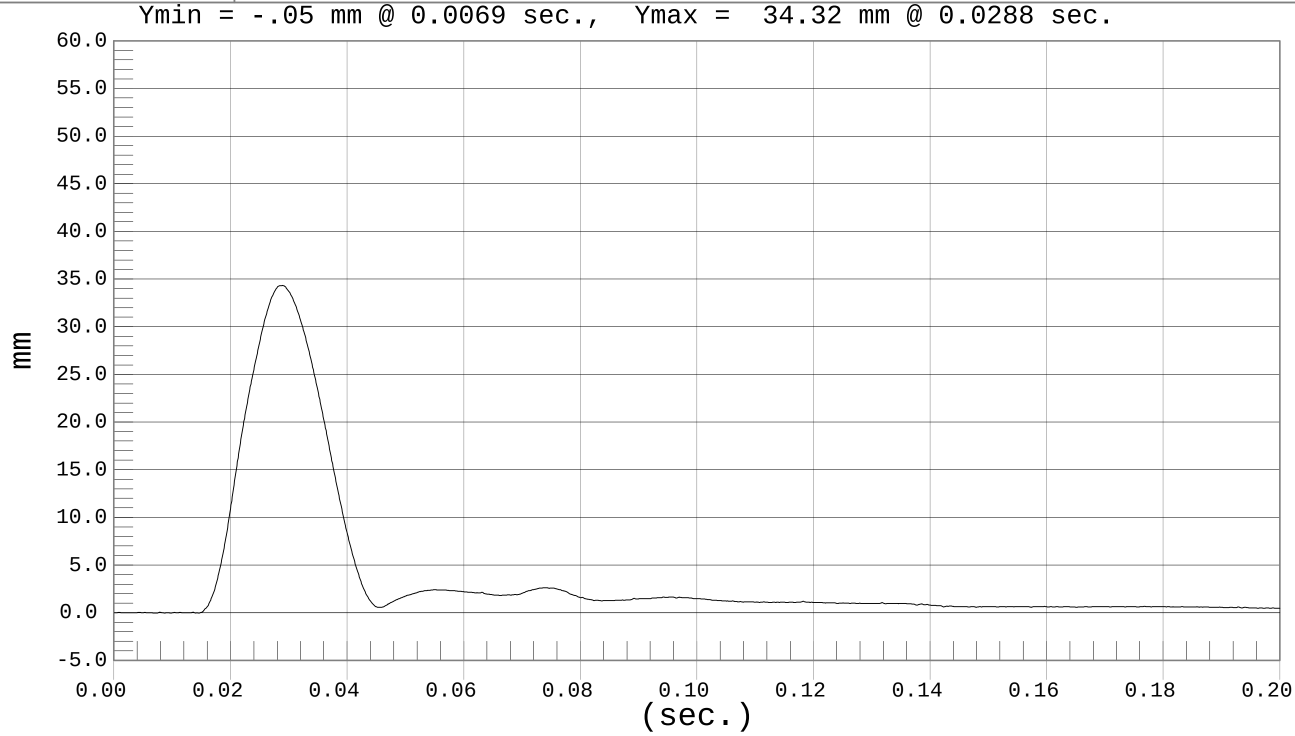


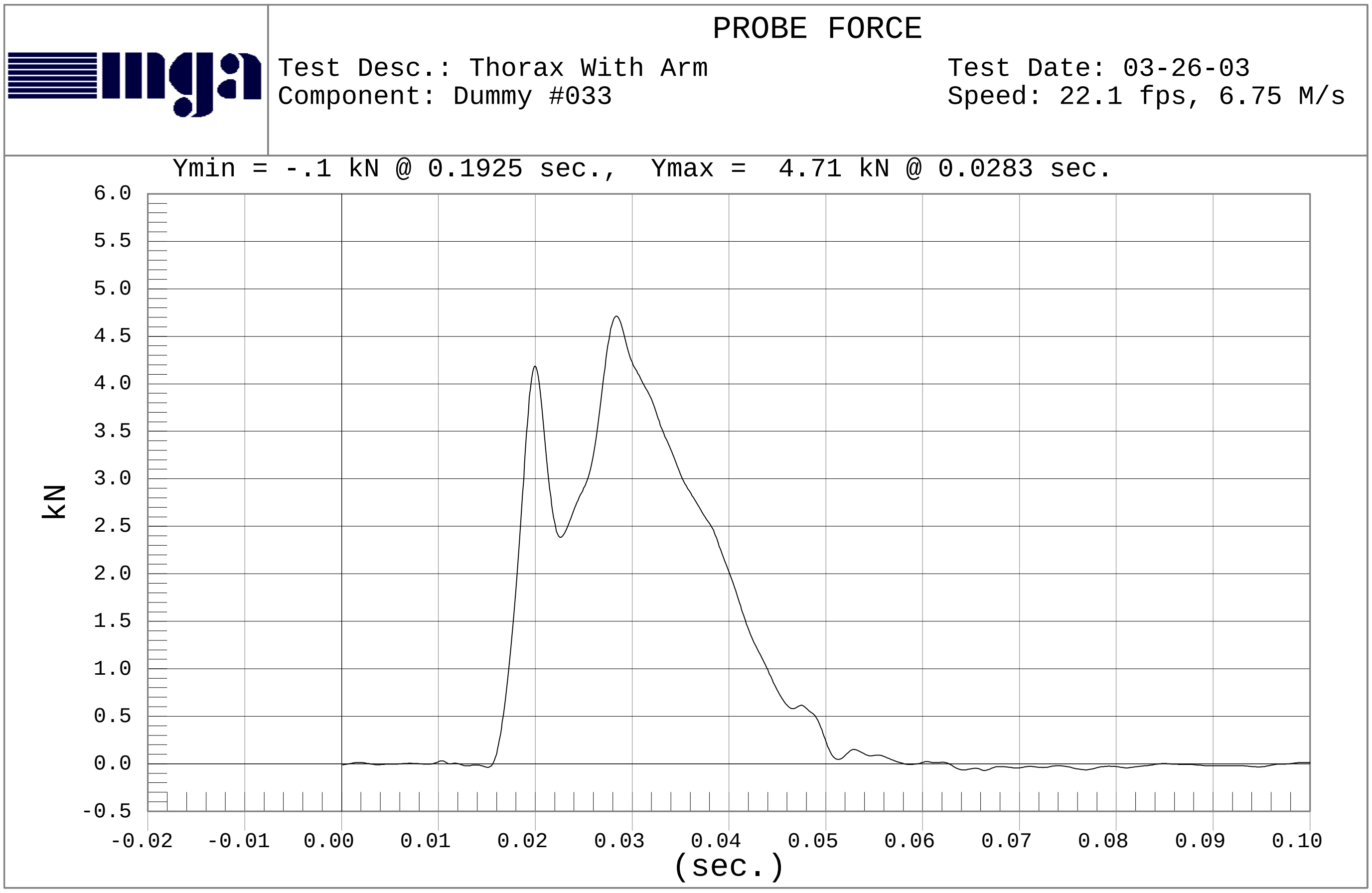
SHOULDER DISPLACEMENT

Test Desc.: Thorax With Arm
Component: Dummy #033

Test Date: 03-26-03
Speed: 22.2 fps, 6.77 M/s

Ymin = -.05 mm @ 0.0069 sec., Ymax = 34.32 mm @ 0.0288 sec.





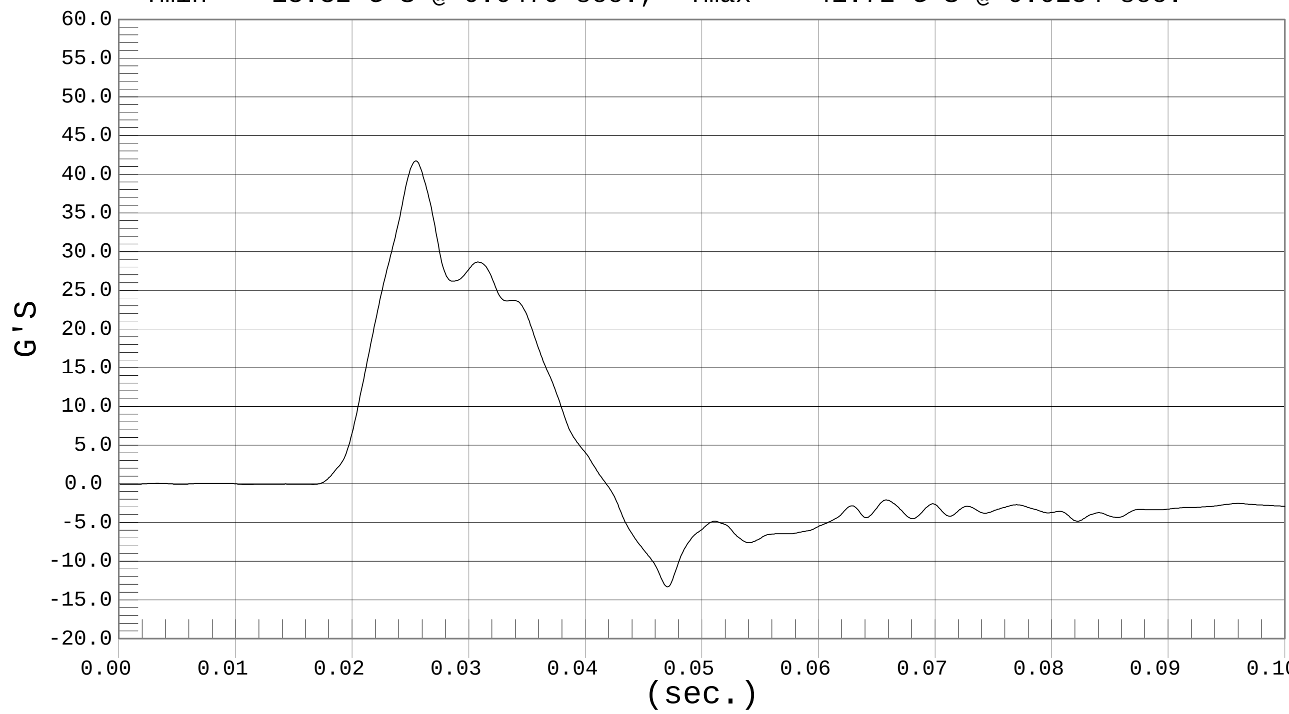
PROBE FORCE
Test Desc.: Thorax With Arm
Component: Dummy #033
Test Date: 03-26-03
Speed: 22.1 fps, 6.75 M/s
Ymin = -.1 kN @ 0.1925 sec., Ymax = 4.71 kN @ 0.0283 sec.
kN
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-0.02
-0.01
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.10
(sec.)

UPPER SPINE ACCELERATION

Test Desc.: Thorax With Arm
Component: Dummy #033

Test Date: 03-26-03
Speed: 22.1 fps, 6.75 M/s

Ymin = -13.32 G'S @ 0.0470 sec., Ymax = 41.72 G'S @ 0.0254 sec.

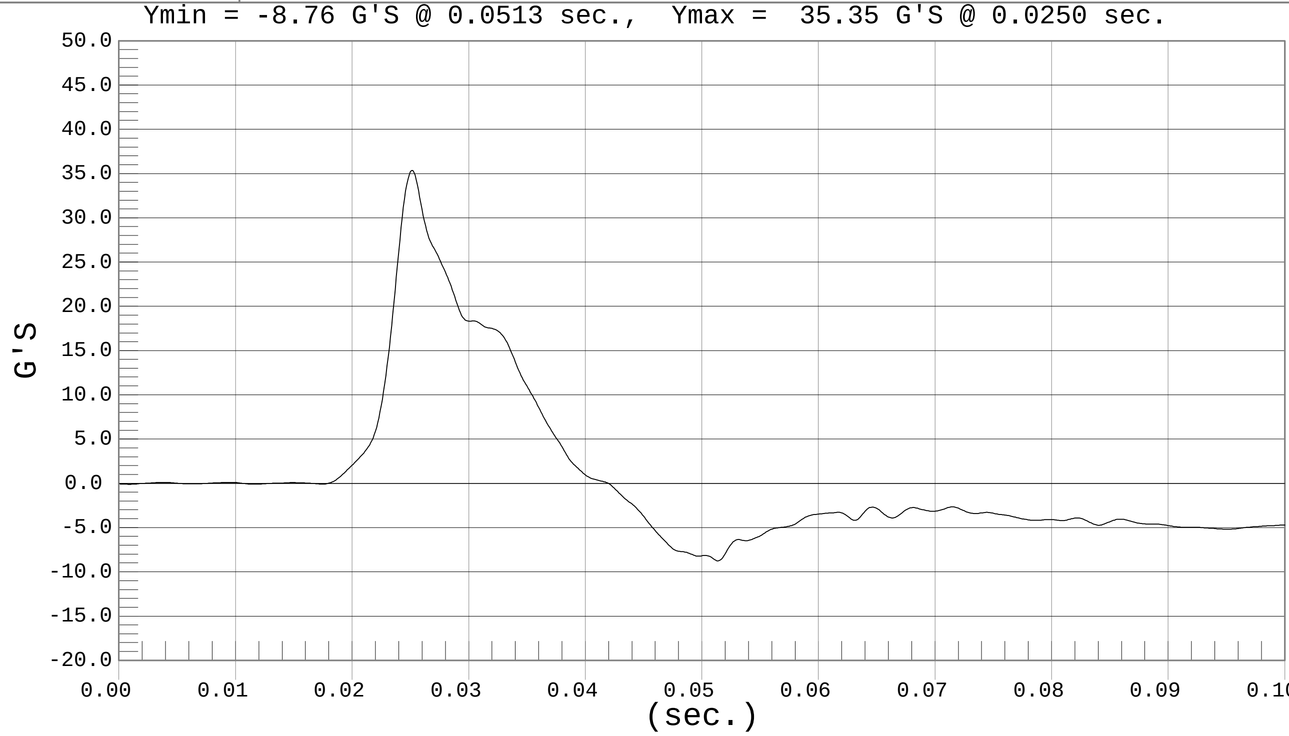


LOWER SPINE ACCELERATION

Test Desc.: Thorax With Arm
Component: Dummy #033

Test Date: 03-26-03
Speed: 22.1 fps, 6.75 M/s

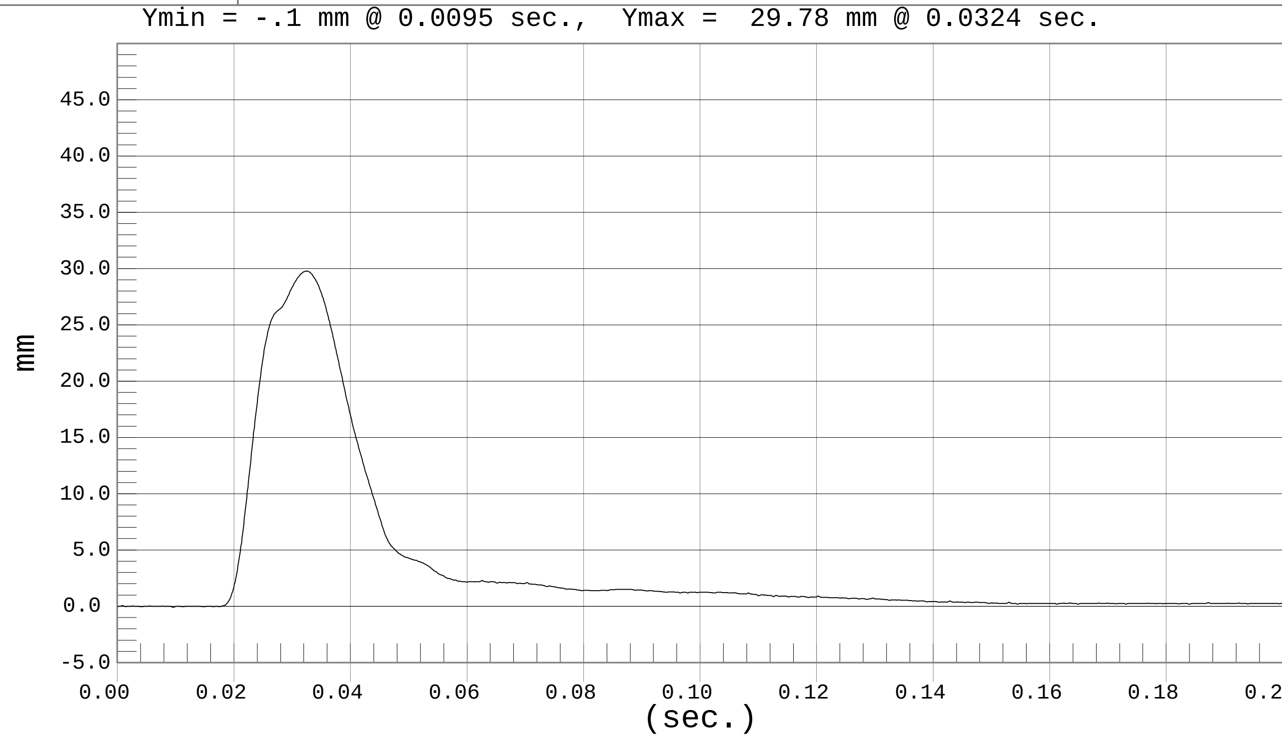
Ymin = -8.76 G'S @ 0.0513 sec., Ymax = 35.35 G'S @ 0.0250 sec.



UPPER RIB DISPLACEMENT

Test Desc.: Thorax With Arm
Component: Dummy #033

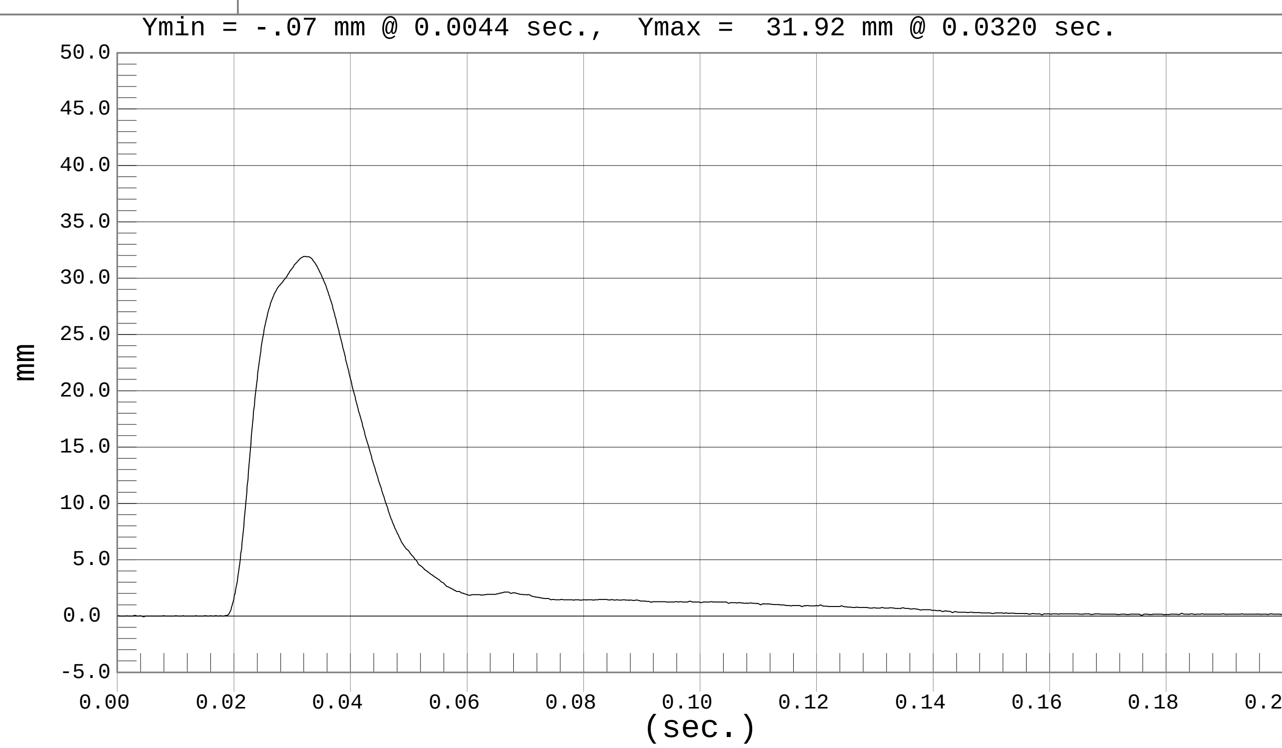
Test Date: 03-26-03
Speed: 22.1 fps, 6.75 M/s



MIDDLE RIB DISPLACEMENT

Test Desc.: Thorax With Arm
Component: Dummy #033

Test Date: 03-26-03
Speed: 22.1 fps, 6.75 M/s

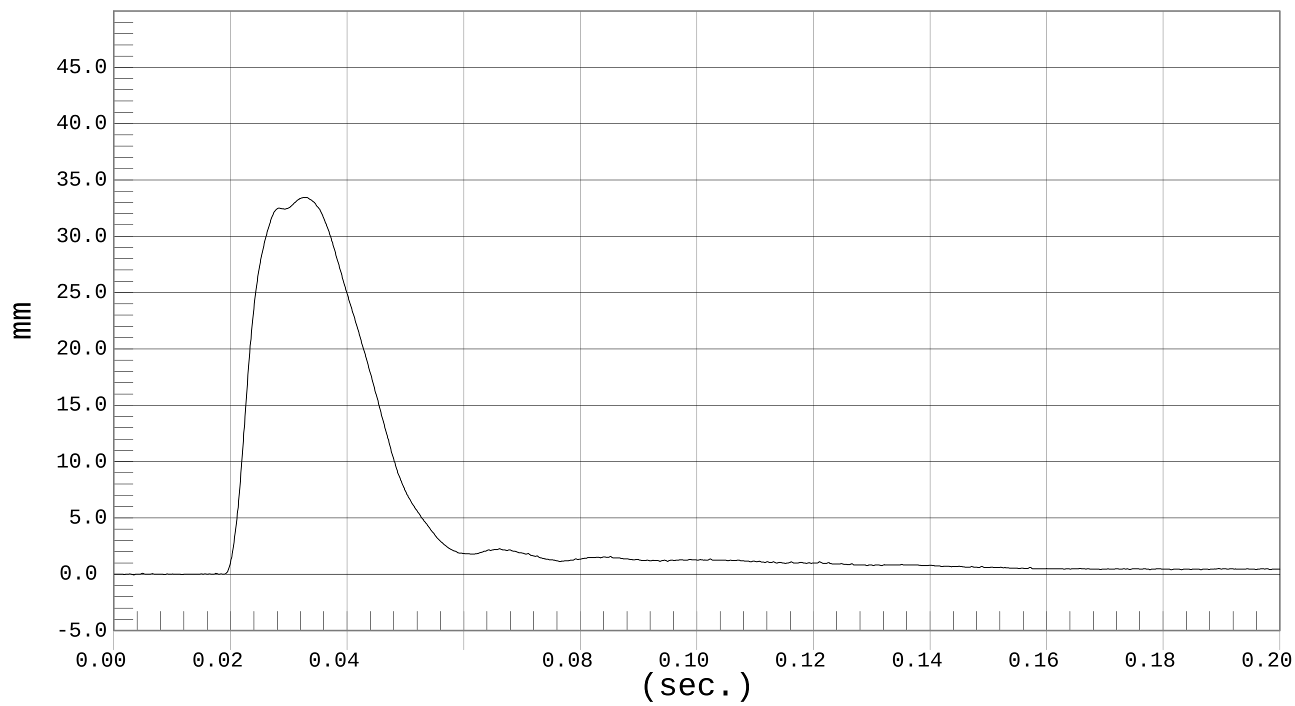


LOWER RIB DISPLACEMENT

Test Desc.: Thorax With Arm
Component: Dummy #033

Test Date: 03-26-03
Speed: 22.1 fps, 6.75 M/s

Ymin = -.07 mm @ 0.0033 sec., Ymax = 33.44 mm @ 0.0329 sec.

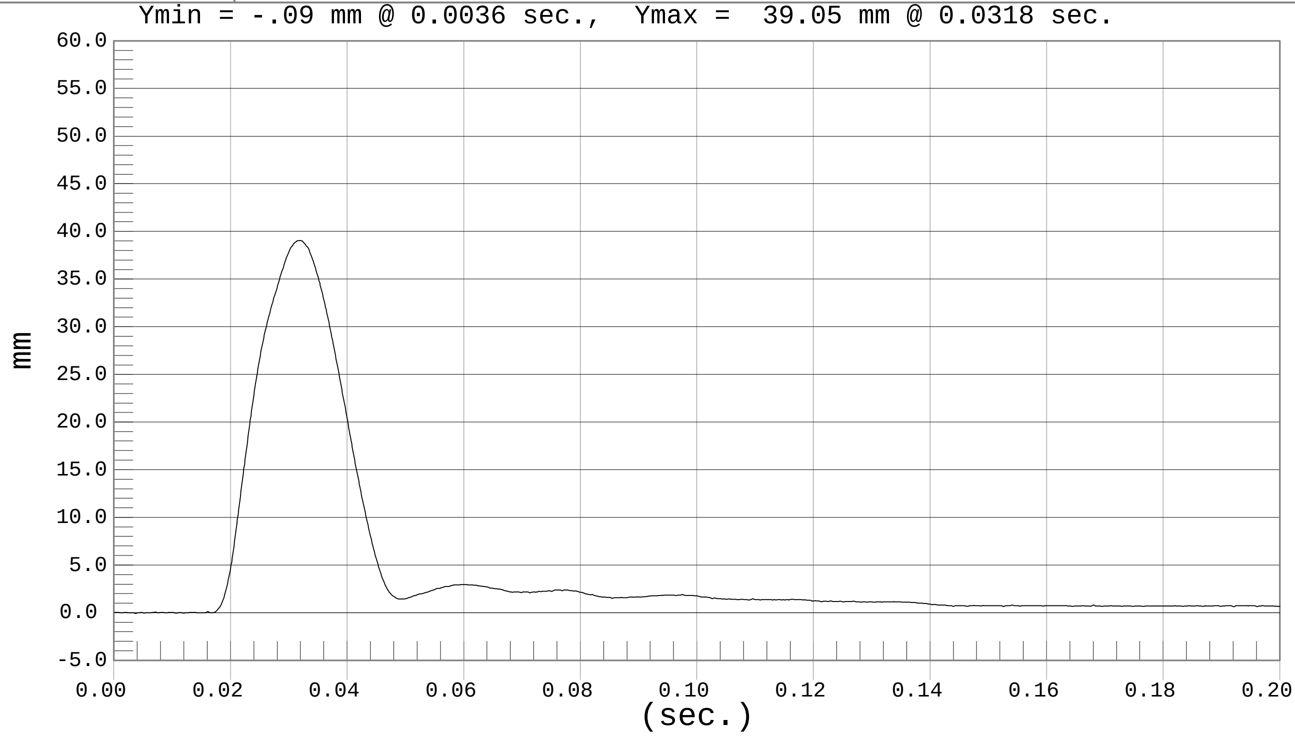


SHOULDER DISPLACEMENT

Test Desc.: Thorax With Arm
Component: Dummy #033

Test Date: 03-26-03
Speed: 22.1 fps, 6.75 M/s

Ymin = -.09 mm @ 0.0036 sec., Ymax = 39.05 mm @ 0.0318 sec.



MGA RESEARCH CORPORATION

THORAX (WITHOUT ARM) IMPACT TESTS

SID IIs DUMMY

Date: 3/26/03

Dummy Serial Number: 033

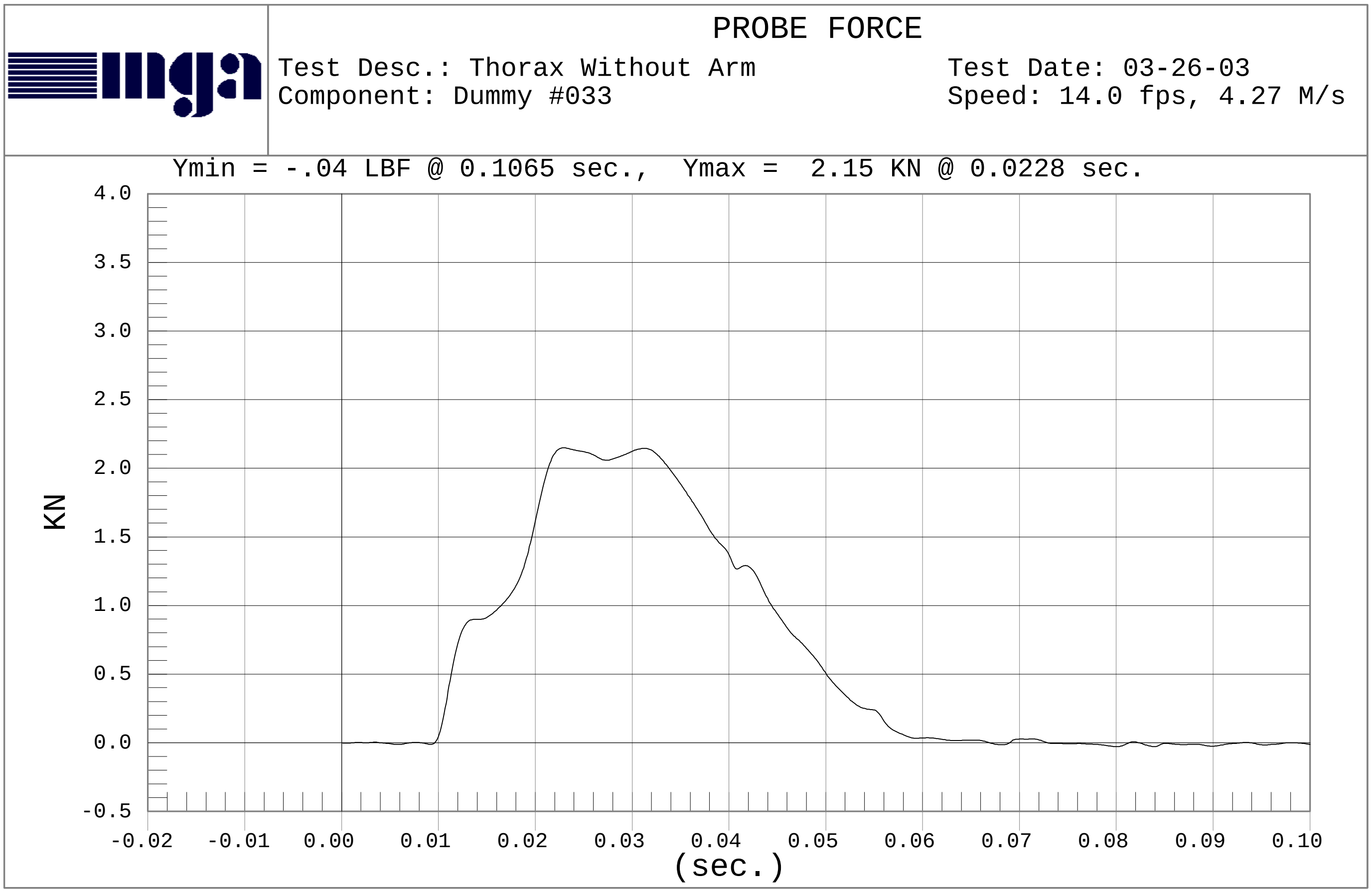
Test Number: D03525/D03535

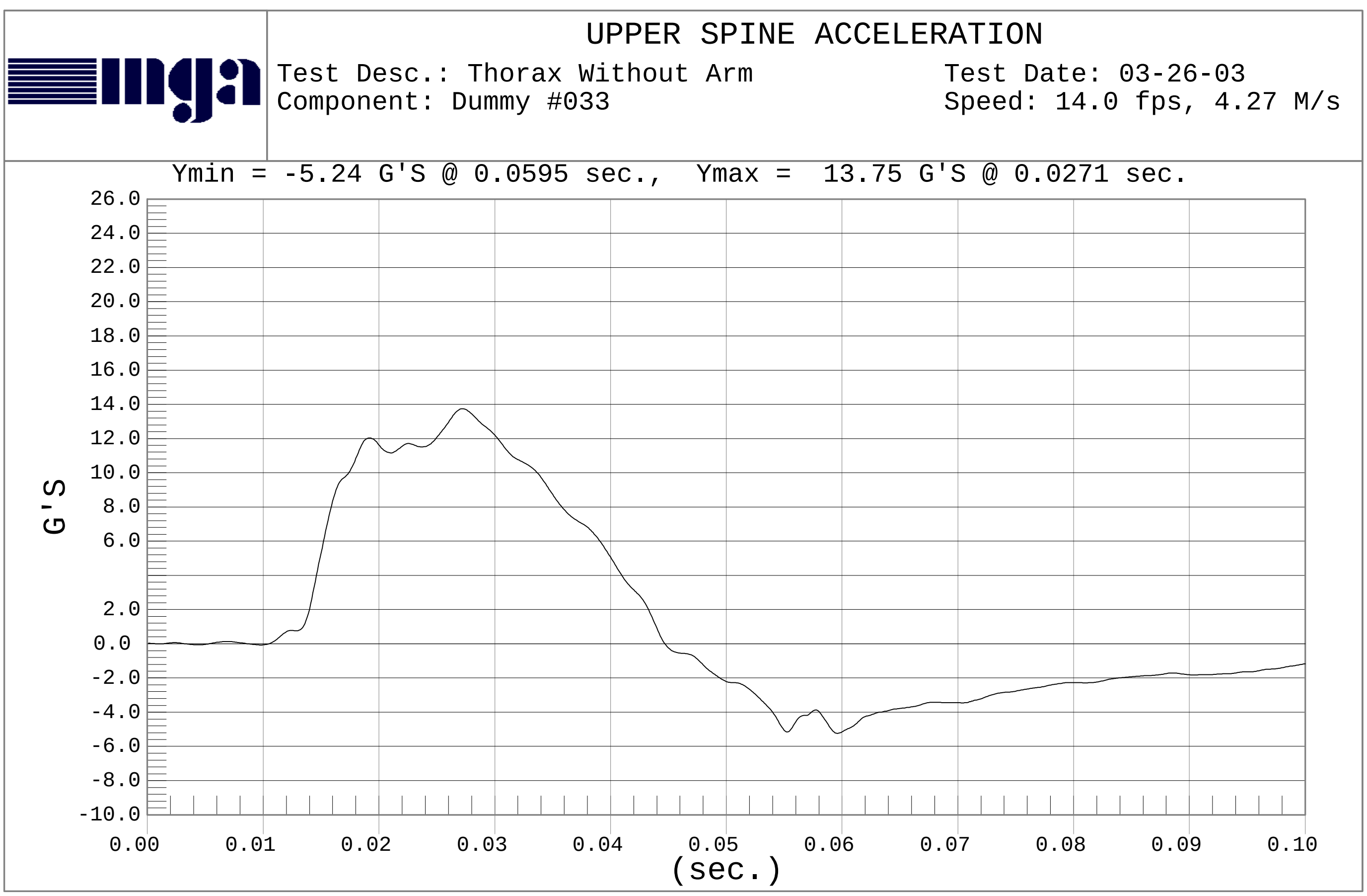
TEST PARAMETER	SPECIFICATION	TEST RESULTS	
		D03525	D03535
Temperature (ºC)	20.8° – 22.2°	21.8	21.3
Humidity	10% - 70%	25	26
Impact Velocity	4.2 - 4.4m/s	4.3	4.3
Probe Force	1.8 - 2.3 kN	2.2	2.1
Upper Spine Acceleration	13 - 18 g's	14	14
Lower Spine Acceleration	8 - 13 g's	10	10
Upper Rib Displacement	32 - 41 mm	33	38
Middle Rib Displacement	40 - 51 mm	41	41
Lower Rib Displacement	34 - 47 mm	43	37

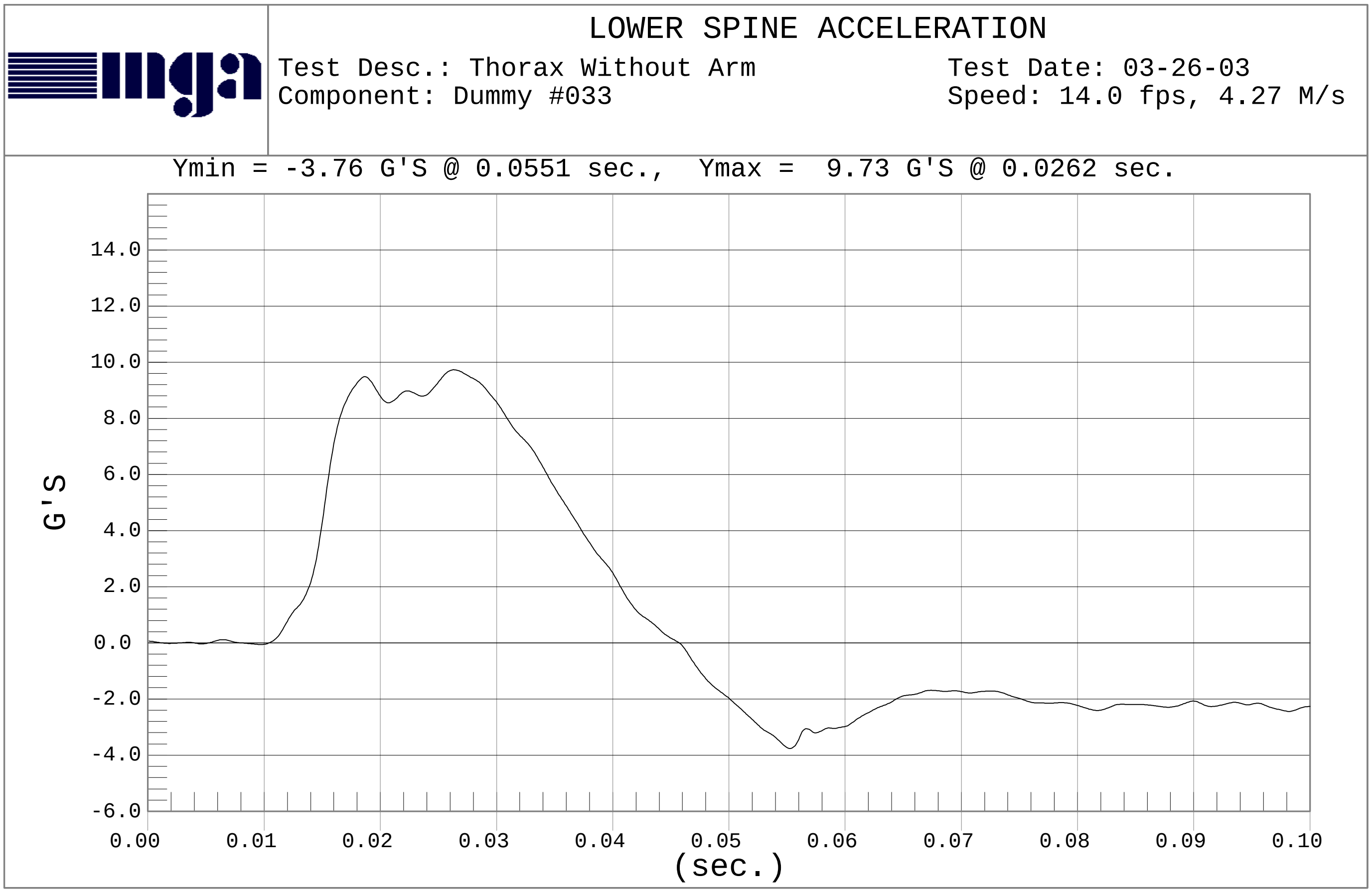
TEST MEETS SPECIFICATIONS

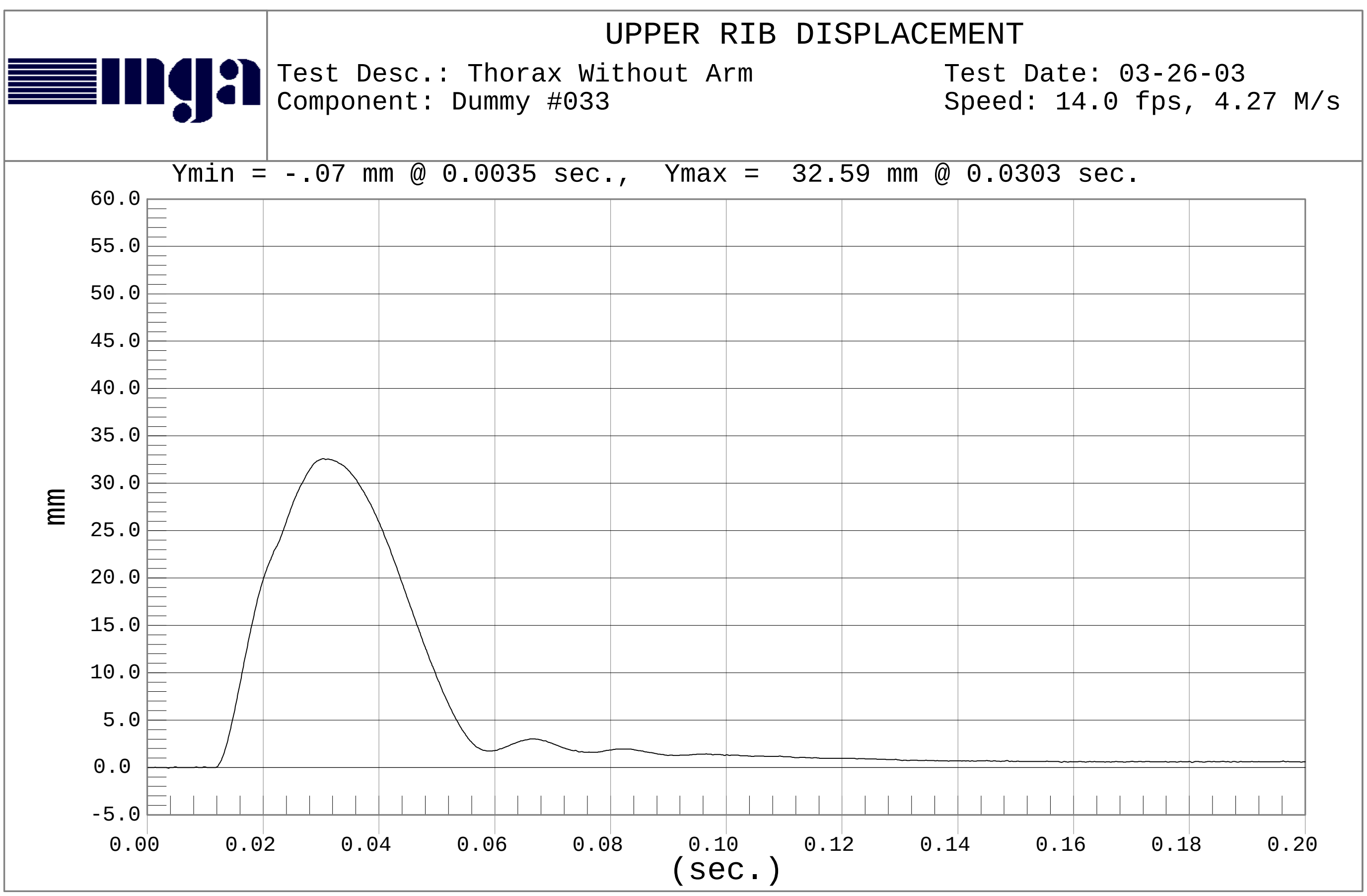
Technician: ________________________________

Approved By:________________________________


PROBE FORCE
Test Desc.: Thorax Without Arm
Component: Dummy #033
Test Date: 03-26-03
Speed: 14.0 fps, 4.27 M/s
Ymin = -.04 LBF @ 0.1065 sec., Ymax = 2.15 KN @ 0.0228 sec.
KN
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-0.02
-0.01
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.10
(sec.)


UPPER SPINE ACCELERATION
Test Desc.: Thorax Without Arm
Component: Dummy #033
Test Date: 03-26-03
Speed: 14.0 fps, 4.27 M/s
Ymin = -5.24 G'S @ 0.0595 sec., Ymax = 13.75 G'S @ 0.0271 sec.
G'S
26.0
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
2.0
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.10
(sec.)


LOWER SPINE ACCELERATION
Test Desc.: Thorax Without Arm
Component: Dummy #033
Test Date: 03-26-03
Speed: 14.0 fps, 4.27 M/s
Ymin = -3.76 G'S @ 0.0551 sec., Ymax = 9.73 G'S @ 0.0262 sec.
G'S
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
-2.0
-4.0
-6.0
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.10
(sec.)

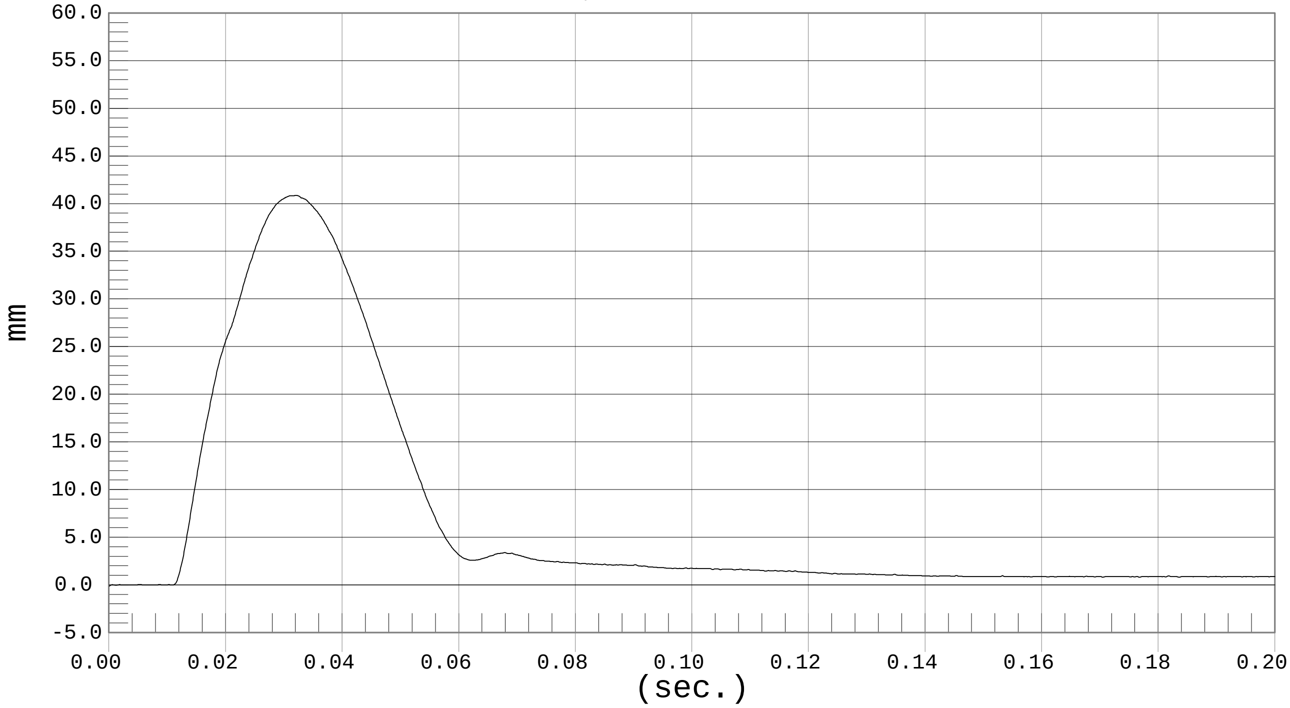

UPPER RIB DISPLACEMENT
Test Desc.: Thorax Without Arm
Component: Dummy #033
Test Date: 03-26-03
Speed: 14.0 fps, 4.27 M/s
Ymin = -.07 mm @ 0.0035 sec., Ymax = 32.59 mm @ 0.0303 sec.
mm
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
-5.0
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
0.18
0.20
(sec.)

MIDDLE RIB DISPLACEMENT

Test Desc.: Thorax Without Arm
Component: Dummy #033

Test Date: 03-26-03
Speed: 14.0 fps, 4.27 M/s

Ymin = -.12 mm @ 0.0000 sec., Ymax = 40.87 mm @ 0.0320 sec.

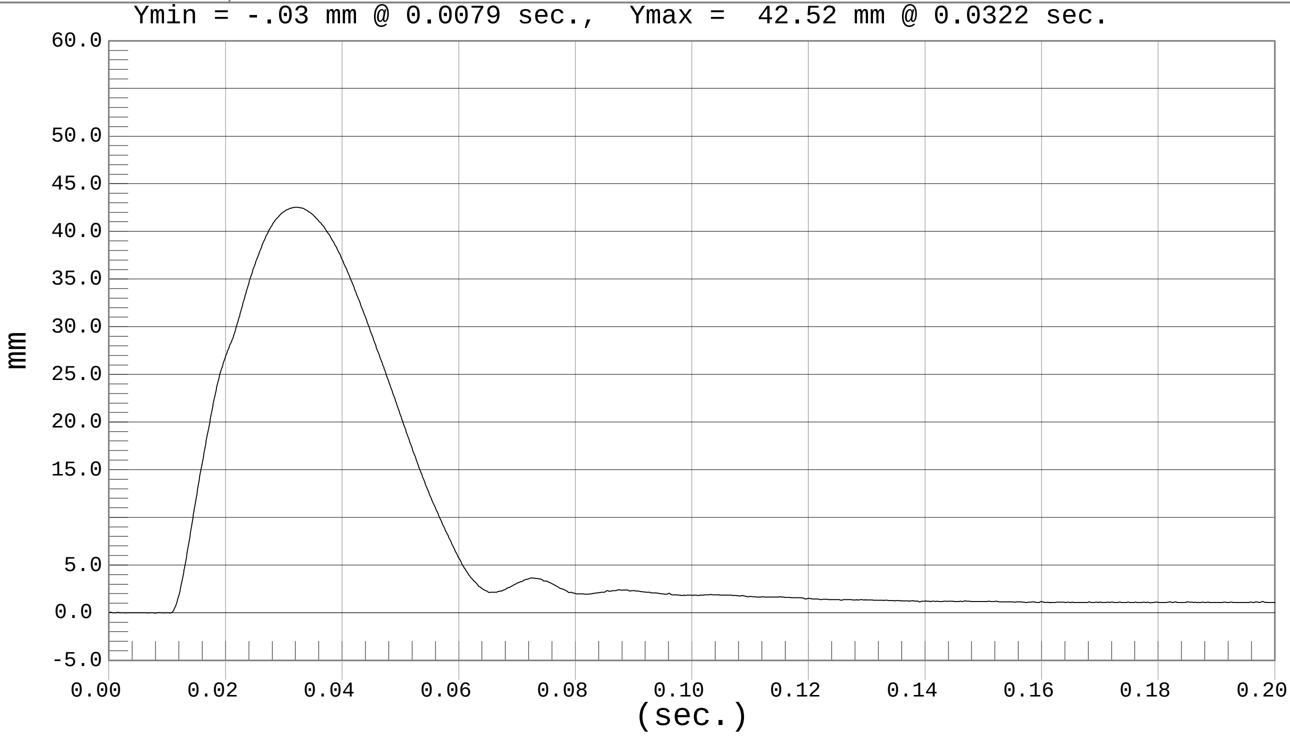


LOWER RIB DISPLACEMENT

Test Desc.: Thorax Without Arm
Component: Dummy #033

Test Date: 03-26-03
Speed: 14.0 fps, 4.27 M/s

Ymin = -.03 mm @ 0.0079 sec., Ymax = 42.52 mm @ 0.0322 sec.

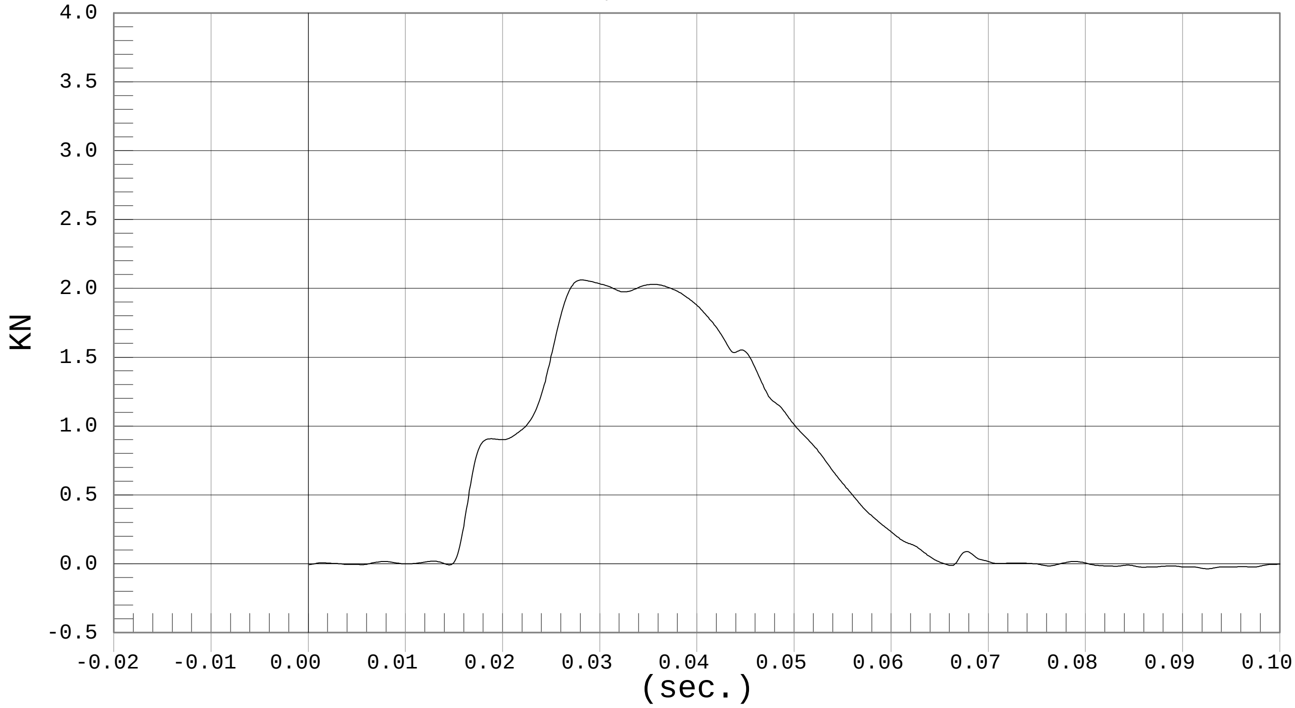


PROBE FORCE

Test Desc.: Thorax Without Arm
Component: Dummy #033

Test Date: 03-26-03
Speed: 14.1 fps, 4.29 M/s

Ymin = -.04 LBF @ 0.1930 sec., Ymax = 2.06 KN @ 0.0280 sec.

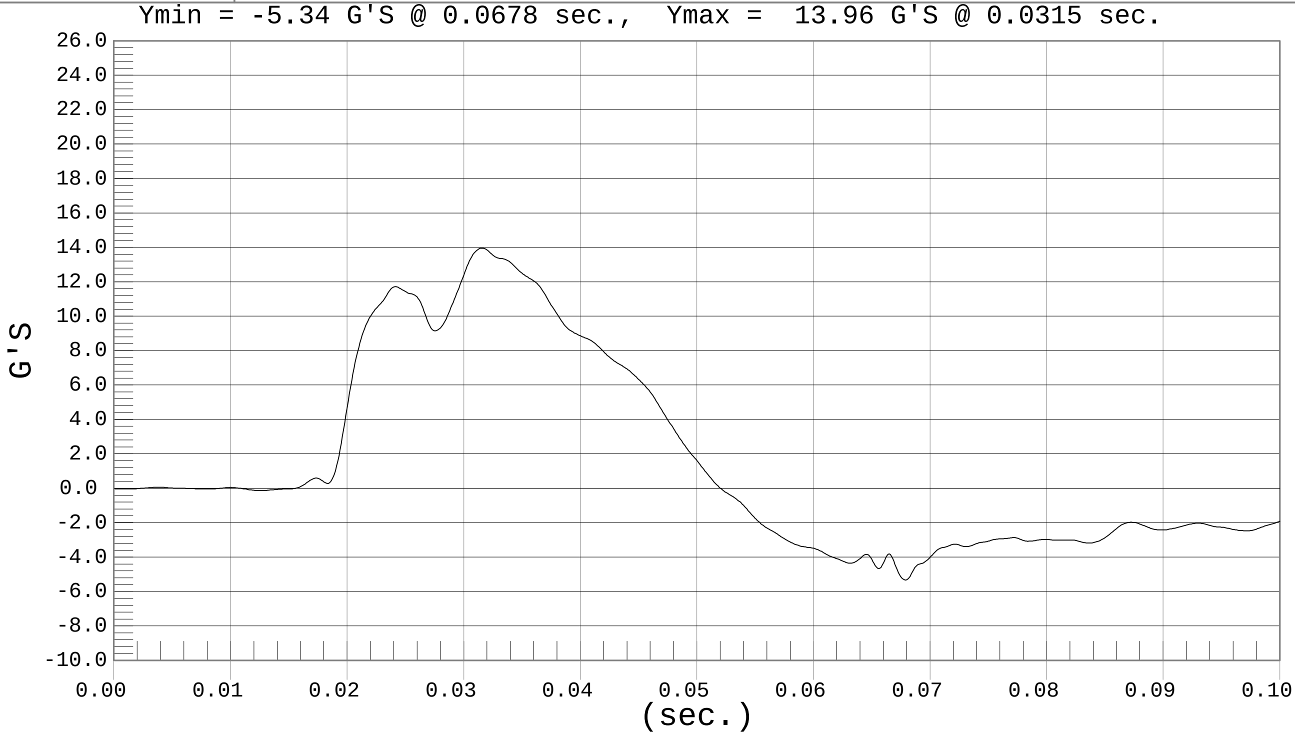


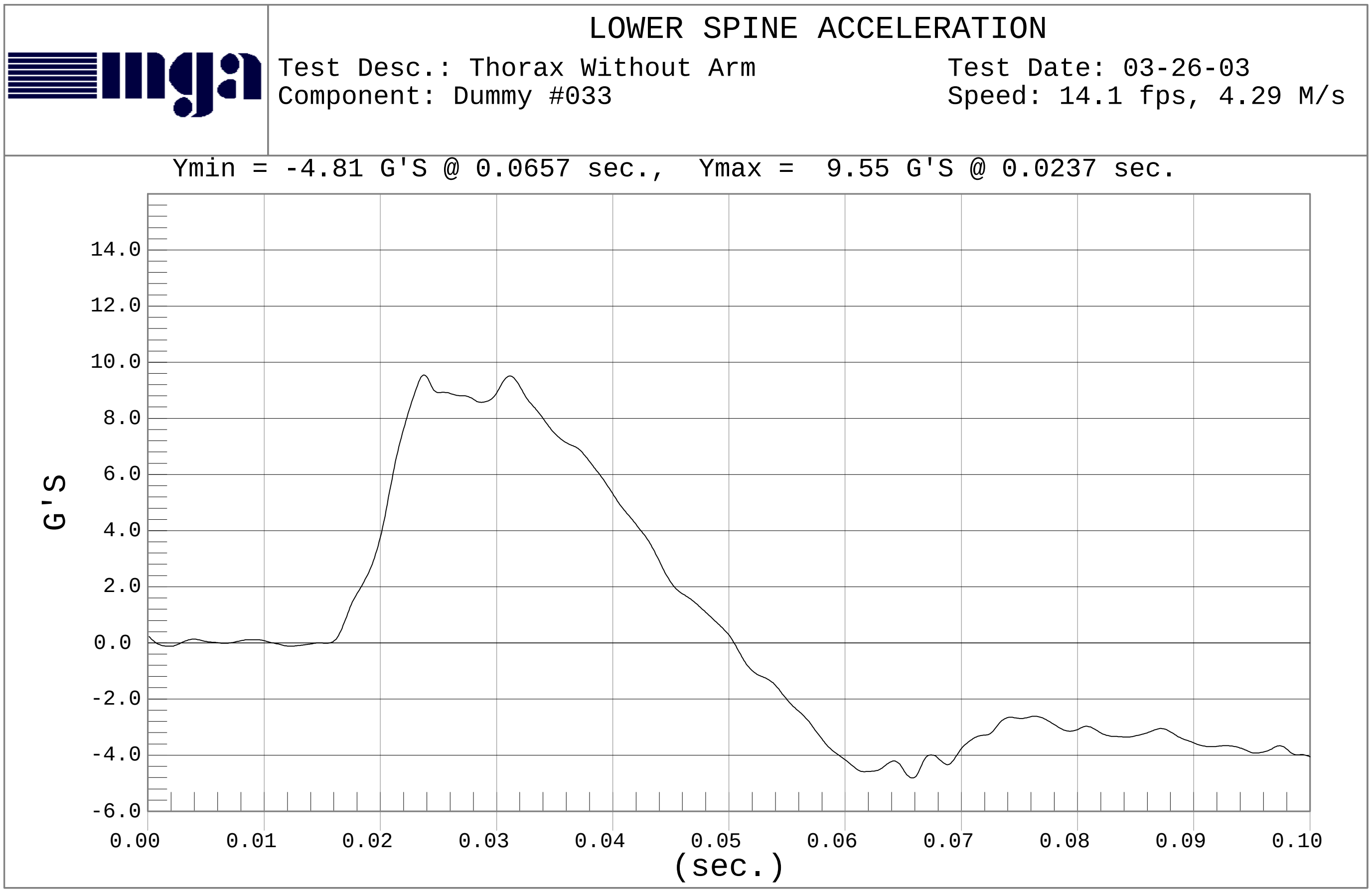
UPPER SPINE ACCELERATION

Test Desc.: Thorax Without Arm
Component: Dummy #033

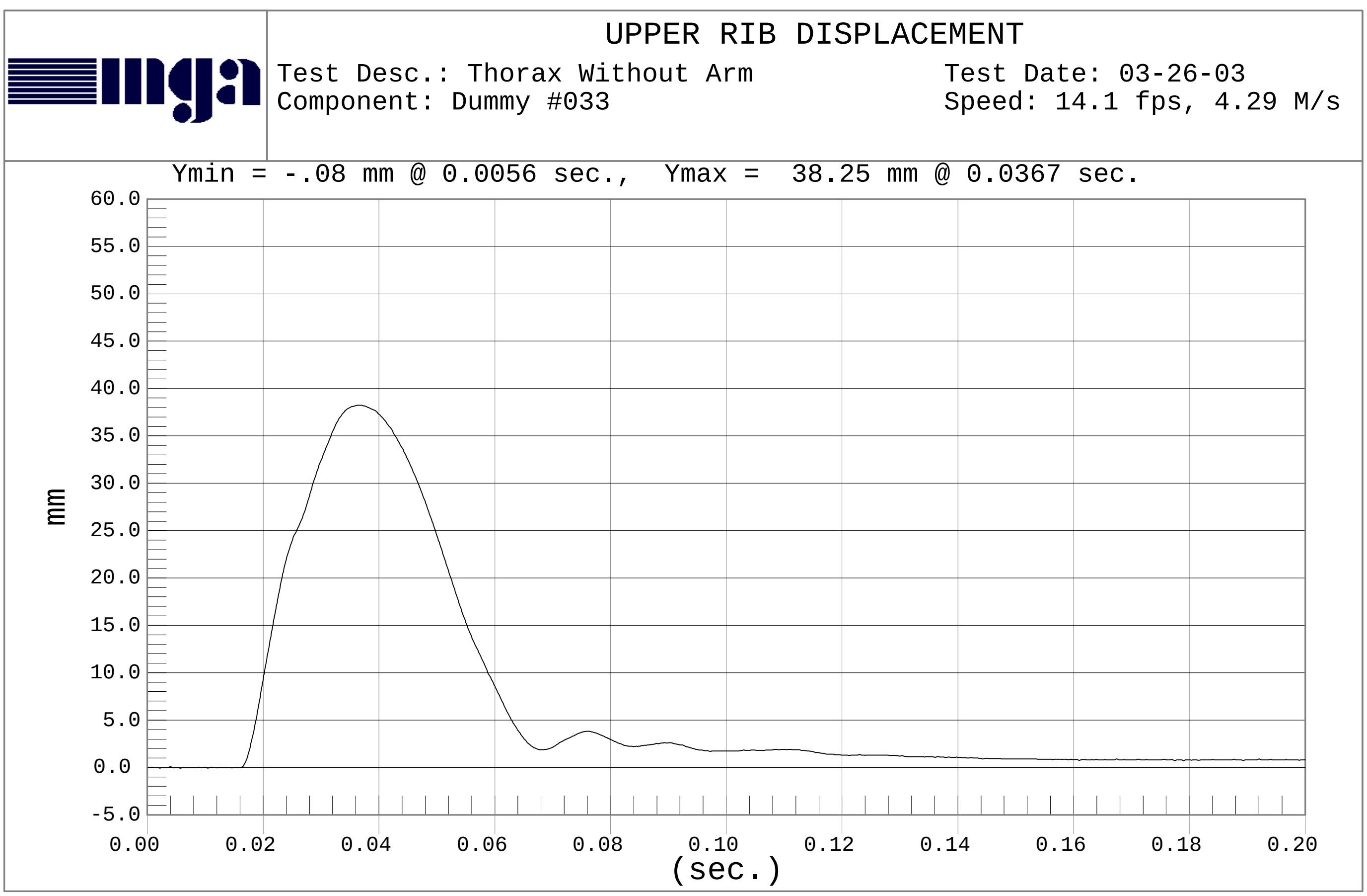
Test Date: 03-26-03
Speed: 14.1 fps, 4.29 M/s

Ymin = -5.34 G'S @ 0.0678 sec., Ymax = 13.96 G'S @ 0.0315 sec.

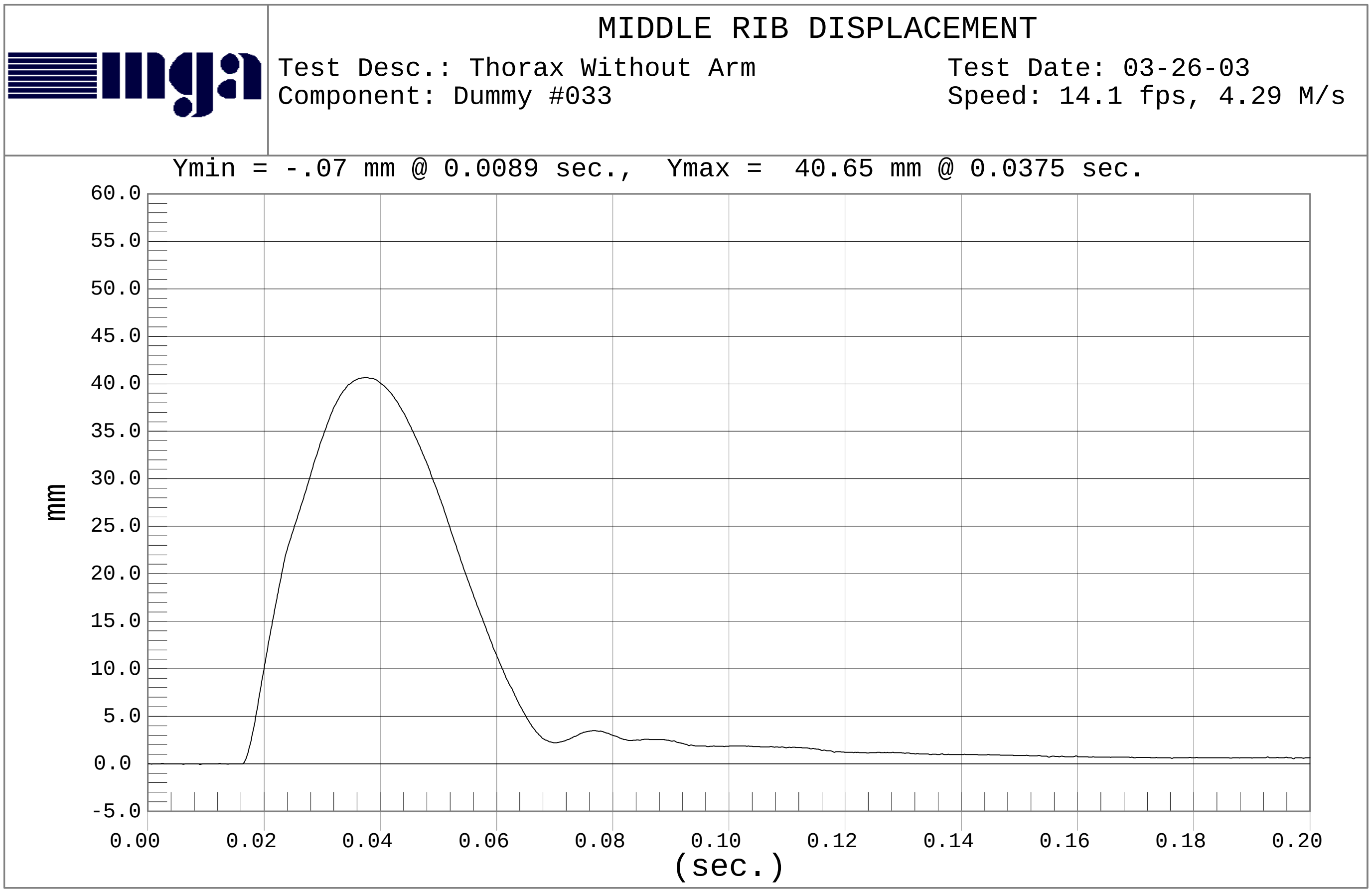


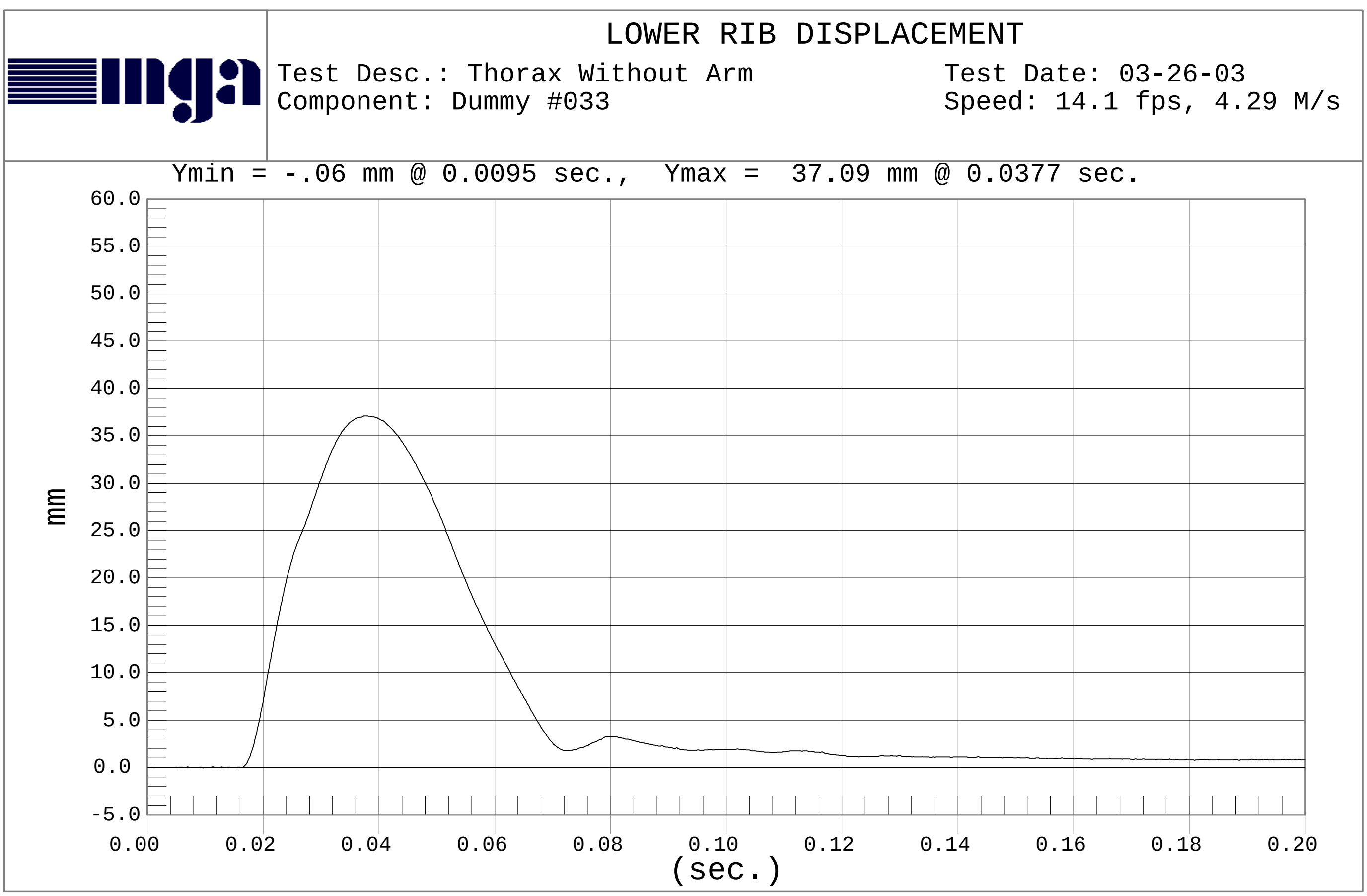


LOWER SPINE ACCELERATION
Test Desc.: Thorax Without Arm
Component: Dummy #033
Test Date: 03-26-03
Speed: 14.1 fps, 4.29 M/s
Ymin = -4.81 G'S @ 0.0657 sec., Ymax = 9.55 G'S @ 0.0237 sec.
G'S
(sec.)



UPPER RIB DISPLACEMENT
Test Desc.: Thorax Without Arm
Component: Dummy #033
Test Date: 03-26-03
Speed: 14.1 fps, 4.29 M/s
Ymin = -.08 mm @ 0.0056 sec., Ymax = 38.25 mm @ 0.0367 sec.
mm
(sec.)


MIDDLE RIB DISPLACEMENT
Test Desc.: Thorax Without Arm
Component: Dummy #033
Test Date: 03-26-03
Speed: 14.1 fps, 4.29 M/s
Ymin = -.07 mm @ 0.0089 sec., Ymax = 40.65 mm @ 0.0375 sec.
mm
(sec.)


LOWER RIB DISPLACEMENT
Test Desc.: Thorax Without Arm
Component: Dummy #033
Test Date: 03-26-03
Speed: 14.1 fps, 4.29 M/s
Ymin = -.06 mm @ 0.0095 sec., Ymax = 37.09 mm @ 0.0377 sec.
mm
(sec.)

MGA RESEARCH CORPORATION

ABDOMINAL IMPACT TEST

SID IIs DUMMY

Date: 3/26/03

Dummy Serial Number: 033

Test Number: D03526/D03536

TEST PARAMETER	SPECIFICATION	TEST RESULTS	
		D03526	D03536
Temperature (ºC)	20.8° – 22.2°	21.8	21.3
Humidity	10% - 70%	25	25
Impact Velocity	4.41 - 4.59 m/s	4.50	4.51
Probe Force	1.3 - 1.9 kN	1.7	1.7
Upper Spine Acceleration	5 - 9 g's	7	7
Lower Spine Acceleration	10 - 12 g's	*14	*14
Upper Rib Displacement	44 - 55 mm	47	47
Middle Rib Displacement	44 - 56 mm	43	45

*TEST DID NOT MEET SPECIFICATIONS

Technician: ___________________________________

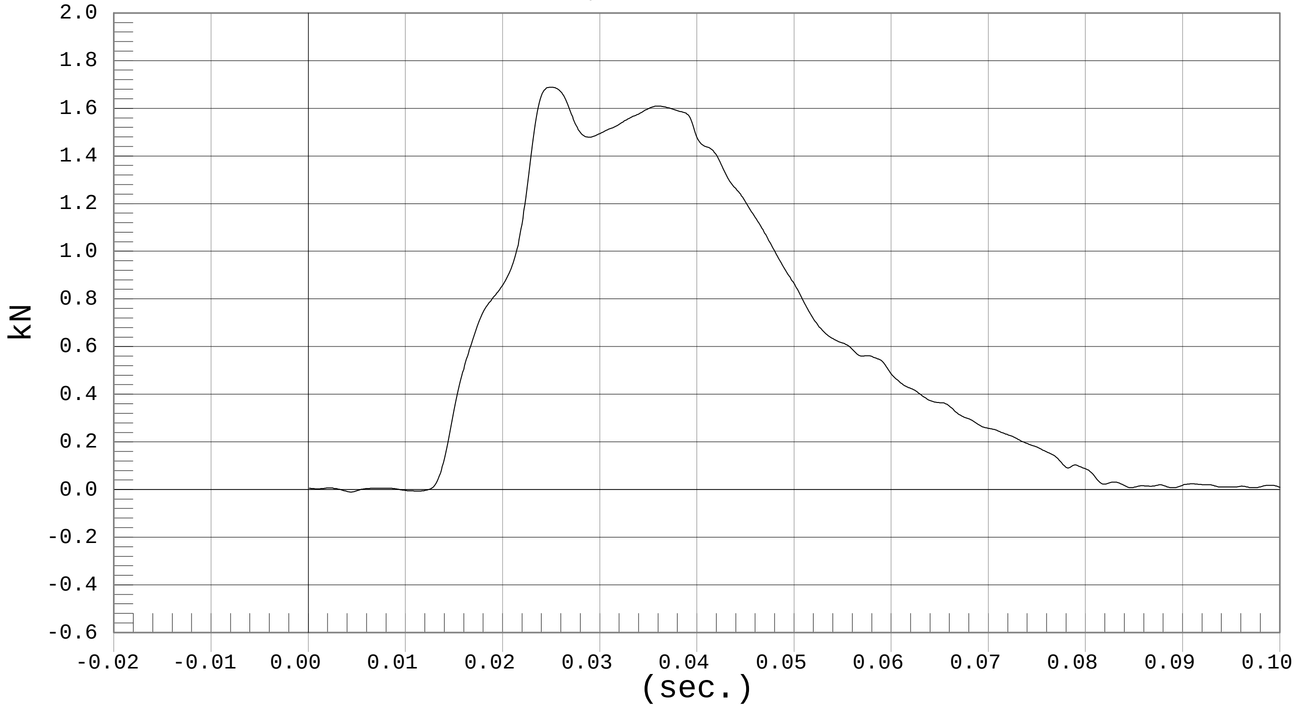
Approved By:___________________________________

PROBE FORCE

Test Desc.: Abdomen Impact
Component: Dummy #033

Test Date: 03-26-03
Speed: 14.8 fps, 4.50 M/s

Ymin = -.02 kN @ 0.1247 sec., Ymax = 1.69 kN @ 0.0248 sec.

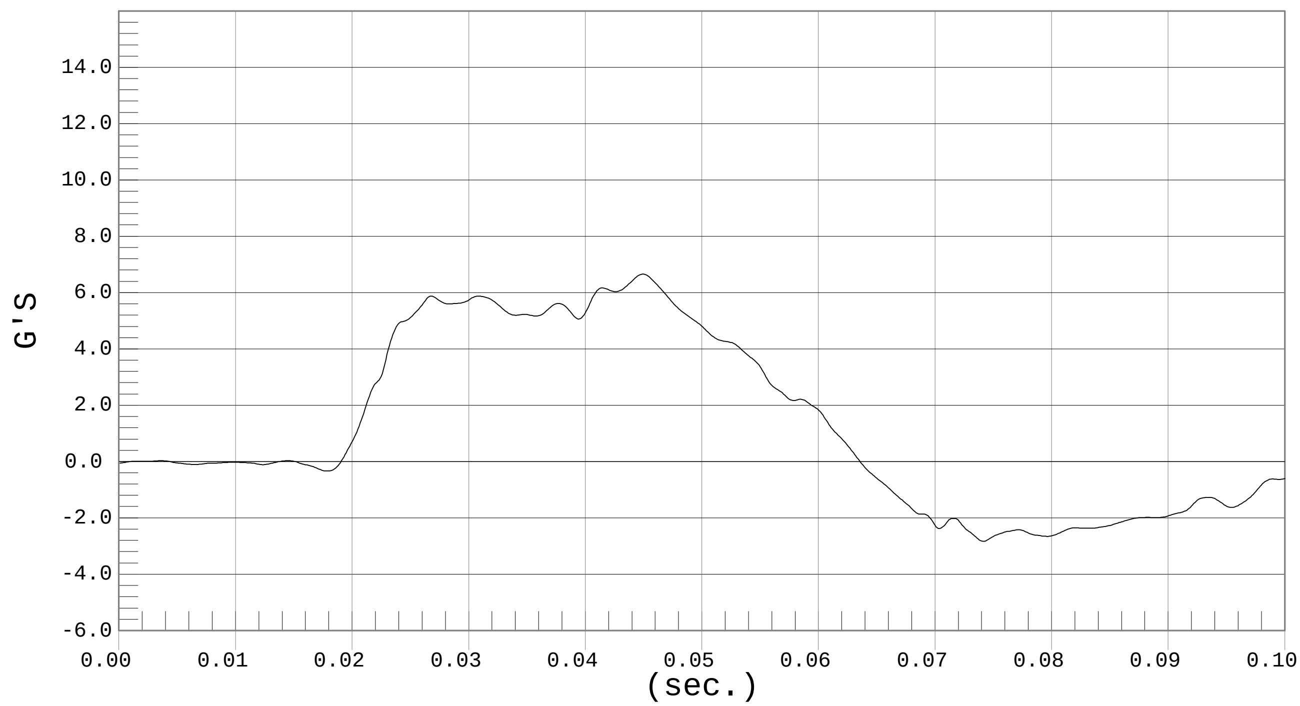


UPPER SPINE ACCELERATION

Test Desc.: Abdomen Impact
Component: Dummy #033

Test Date: 03-26-03
Speed: 14.8 fps, 4.50 M/s

Ymin = -2.83 G'S @ 0.0741 sec., Ymax = 6.65 G'S @ 0.0449 sec.

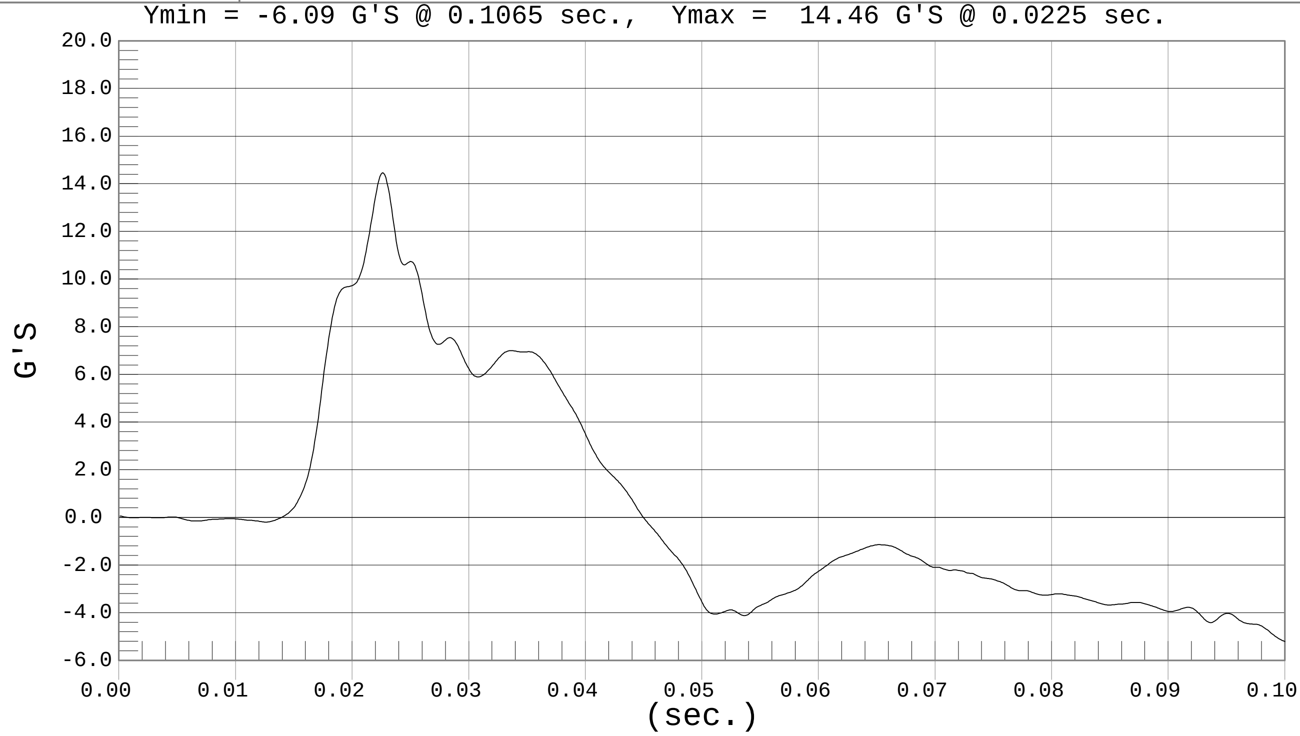


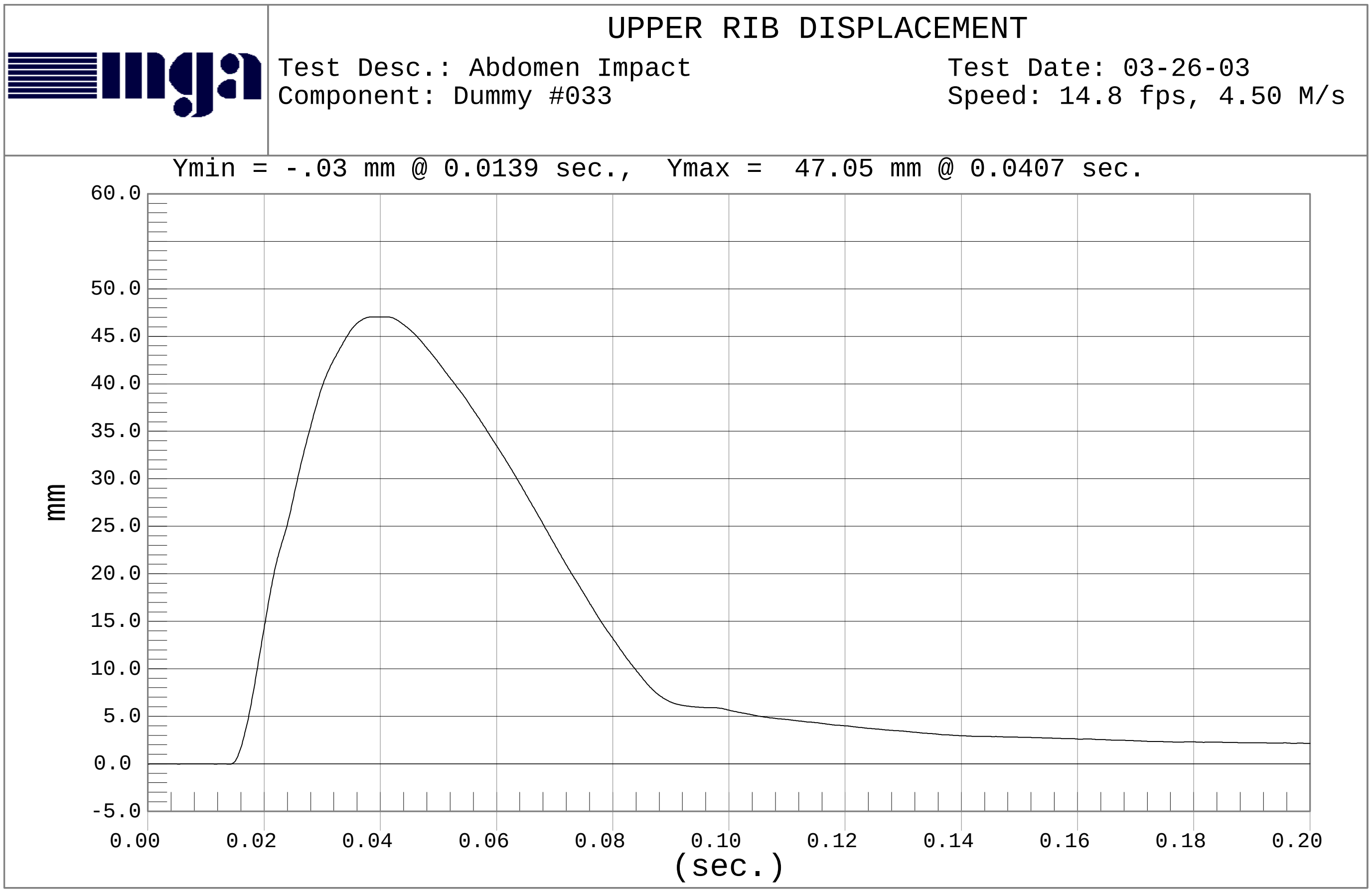
LOWER SPINE ACCELERATION

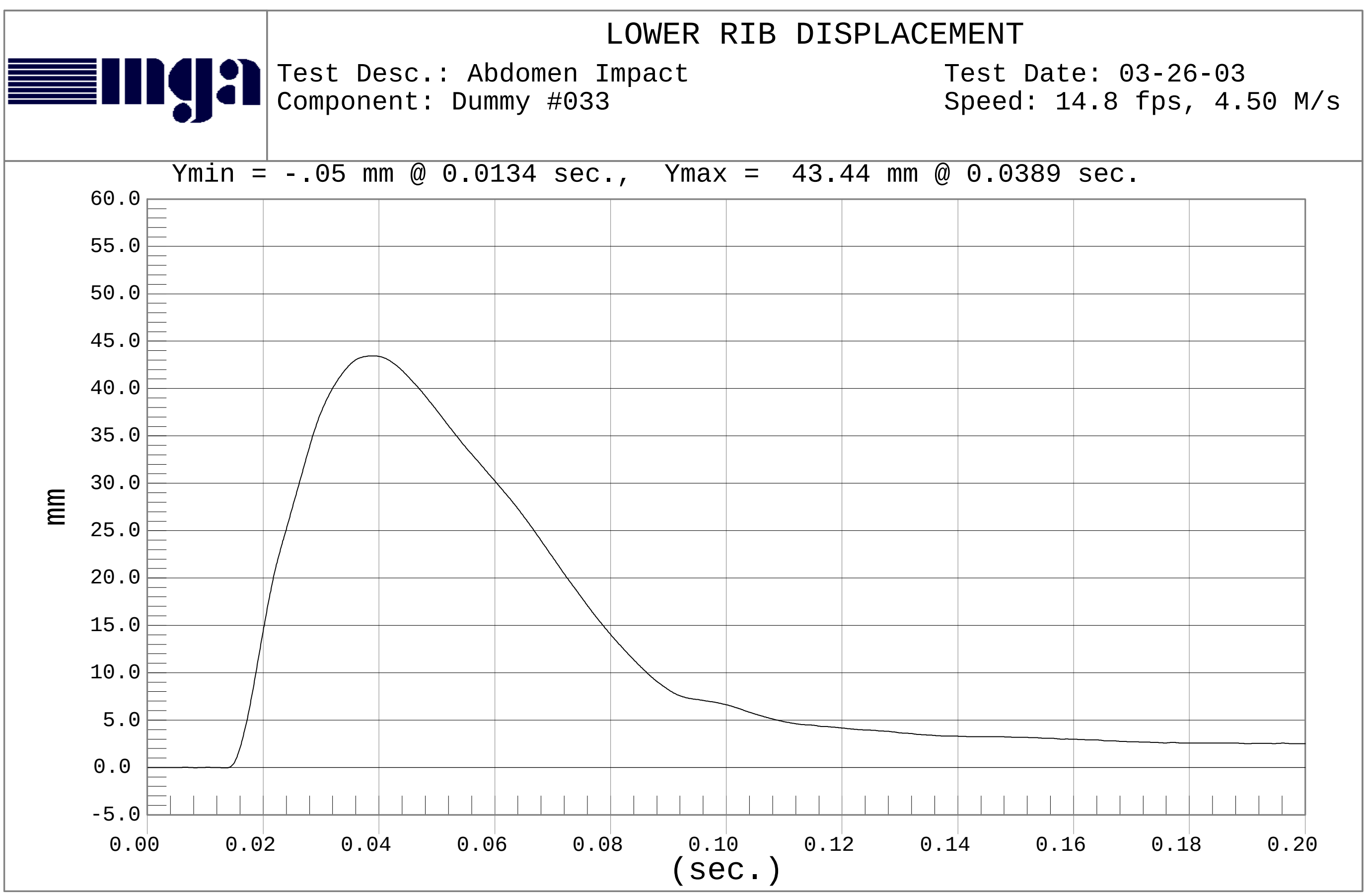
Test Desc.: Abdomen Impact
Component: Dummy #033

Test Date: 03-26-03
Speed: 14.8 fps, 4.50 M/s

Ymin = -6.09 G'S @ 0.1065 sec., Ymax = 14.46 G'S @ 0.0225 sec.




UPPER RIB DISPLACEMENT
Test Desc.: Abdomen Impact
Component: Dummy #033
Test Date: 03-26-03
Speed: 14.8 fps, 4.50 M/s
Ymin = -.03 mm @ 0.0139 sec., Ymax = 47.05 mm @ 0.0407 sec.
mm
60.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
-5.0
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
0.18
0.20
(sec.)

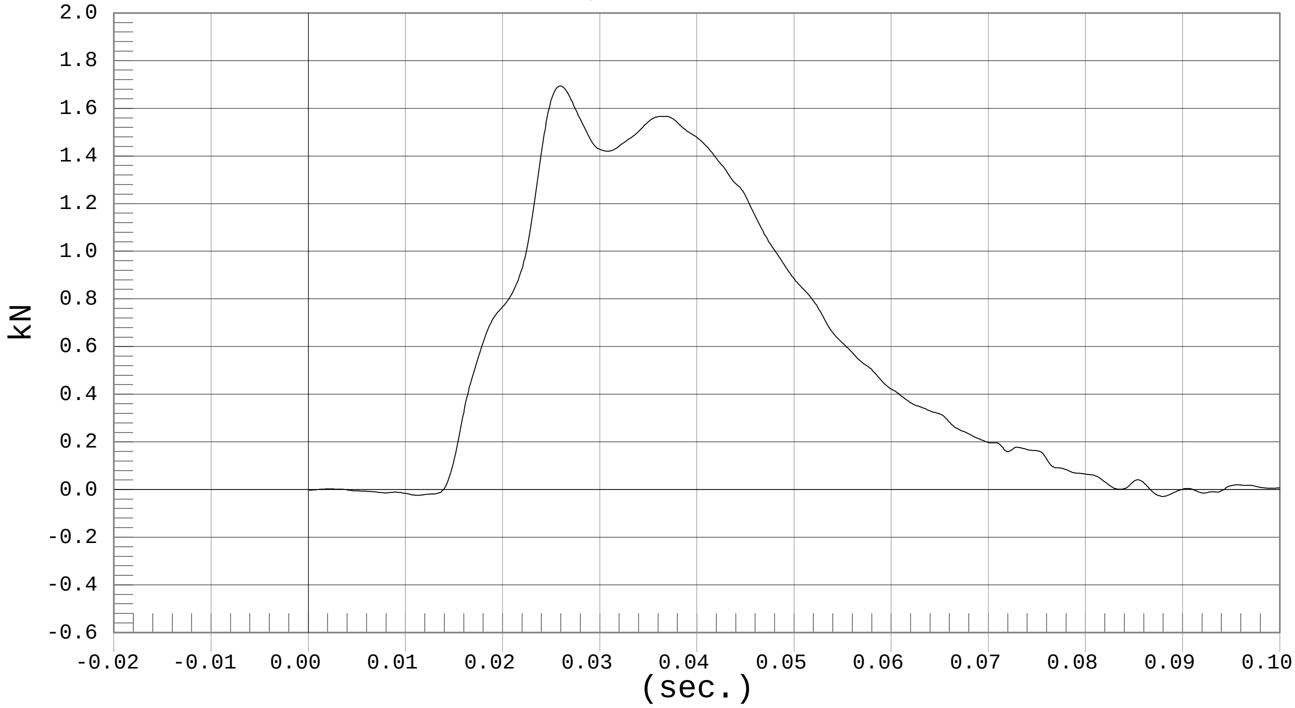

LOWER RIB DISPLACEMENT
Test Desc.: Abdomen Impact
Component: Dummy #033
Test Date: 03-26-03
Speed: 14.8 fps, 4.50 M/s
Ymin = -.05 mm @ 0.0134 sec., Ymax = 43.44 mm @ 0.0389 sec.
mm
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
-5.0
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
0.18
0.20
(sec.)

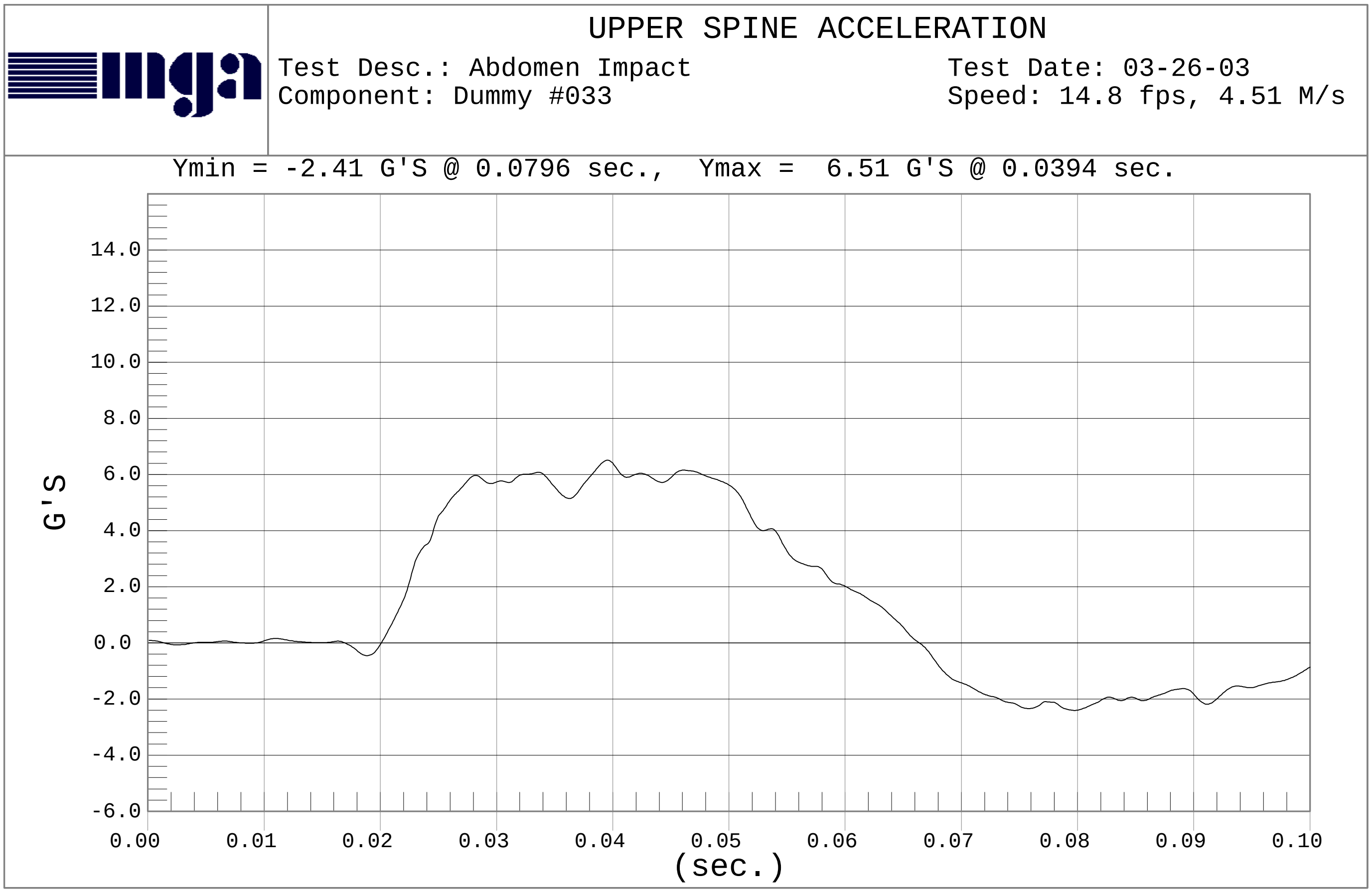
PROBE FORCE

Test Desc.: Abdomen Impact
Component: Dummy #033

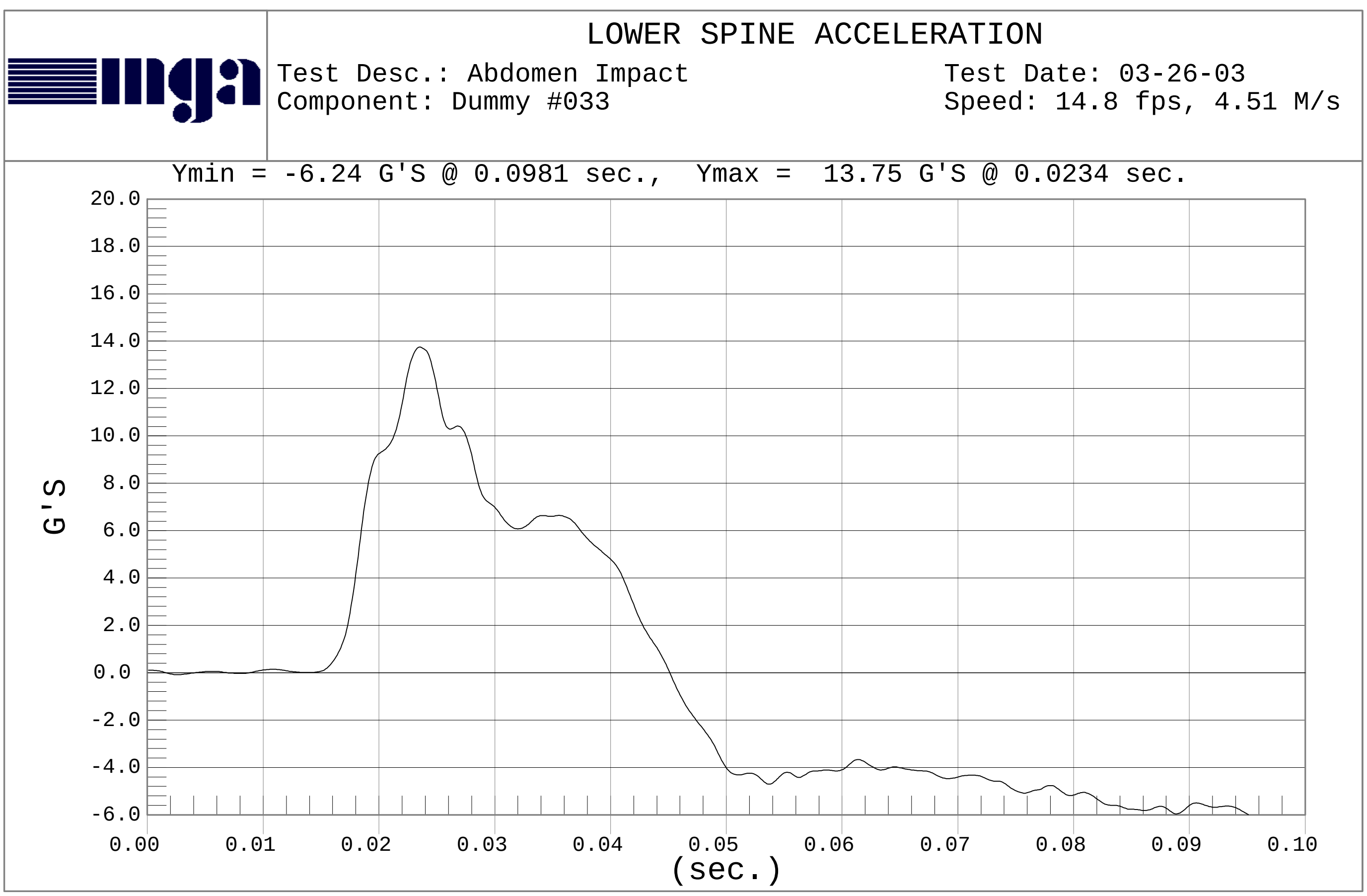
Test Date: 03-26-03
Speed: 14.8 fps, 4.51 M/s

Ymin = -.05 kN @ 0.1159 sec., Ymax = 1.69 kN @ 0.0258 sec.

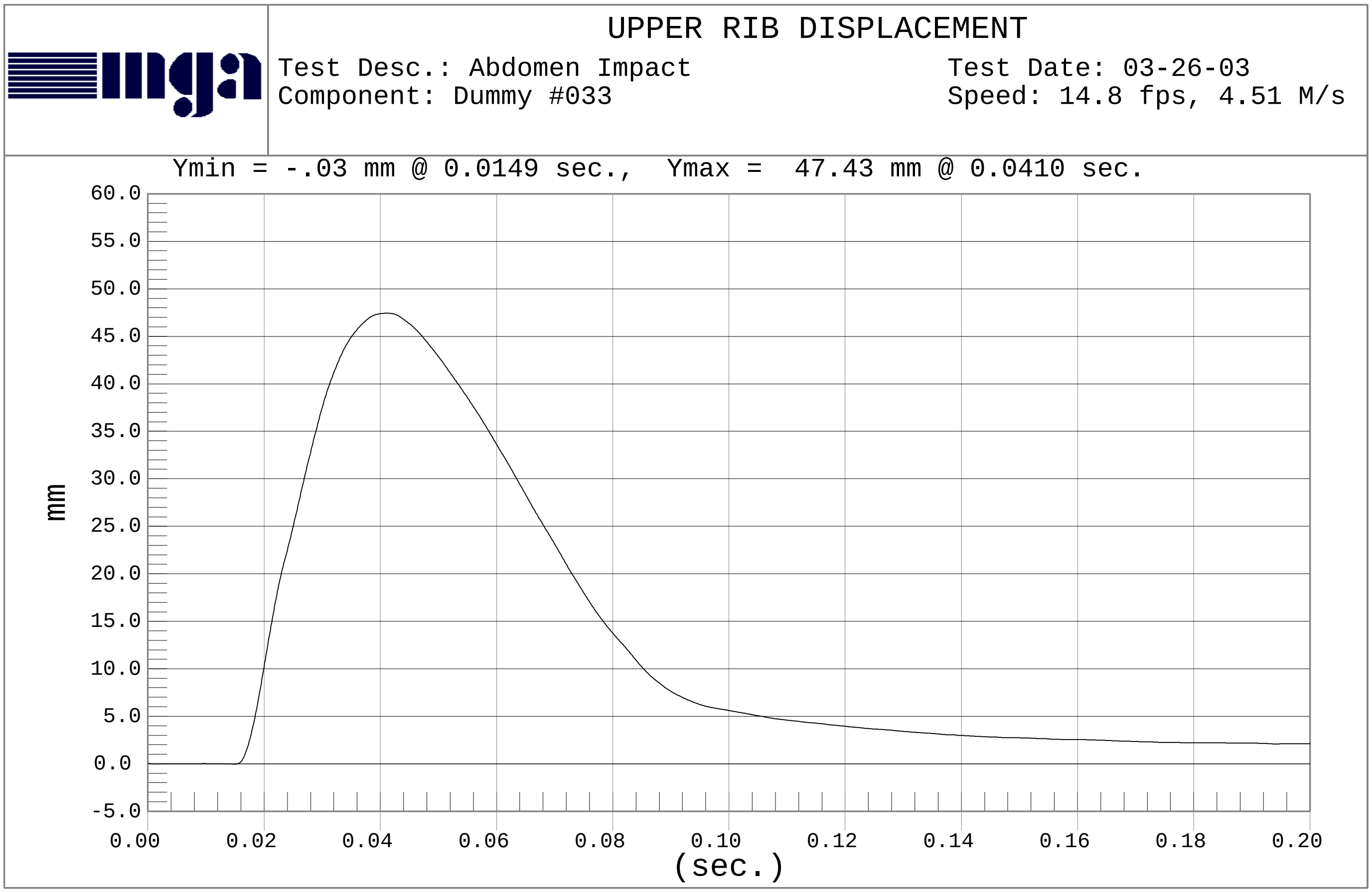


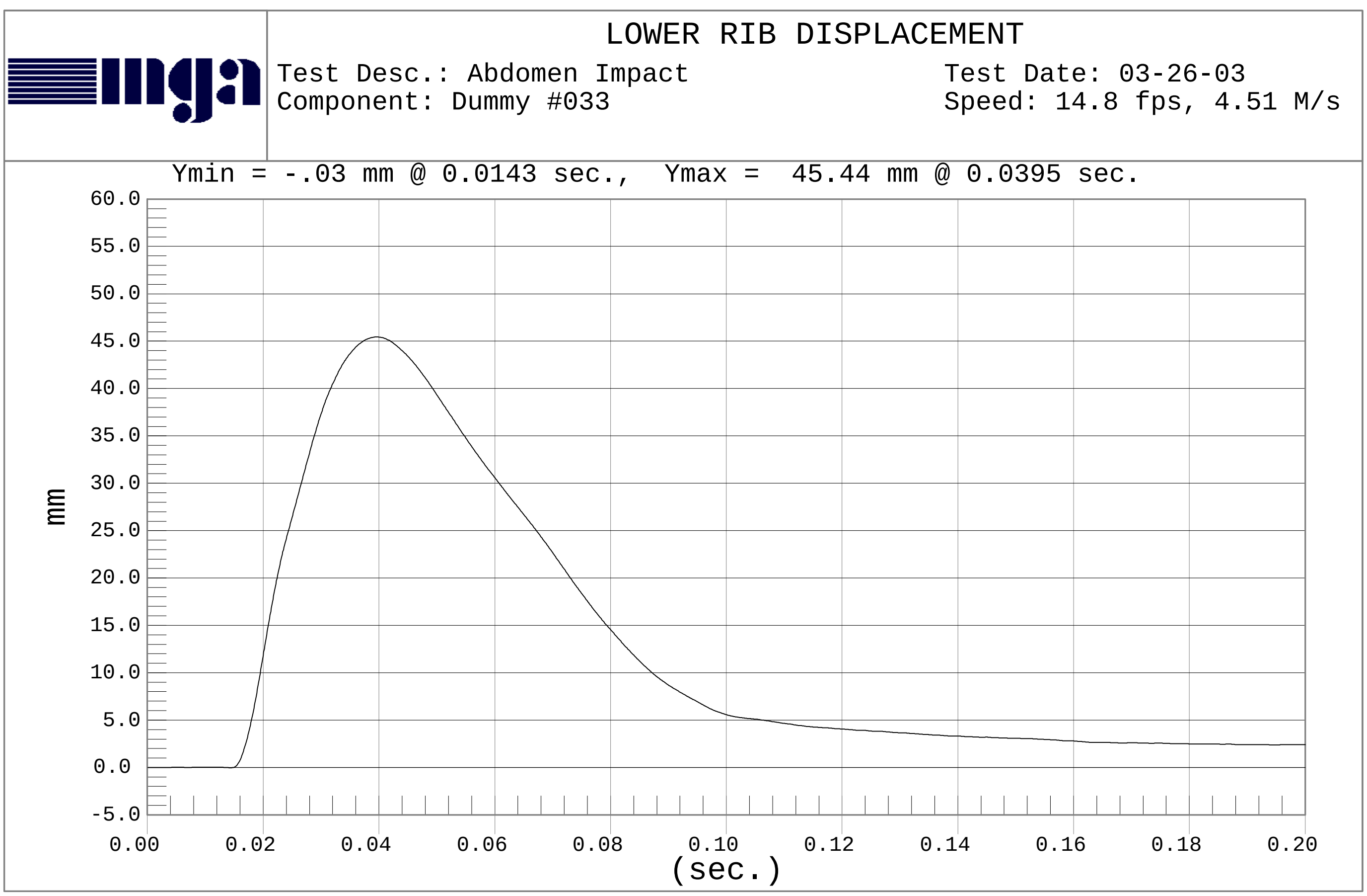


UPPER SPINE ACCELERATION
Test Desc.: Abdomen Impact
Component: Dummy #033
Test Date: 03-26-03
Speed: 14.8 fps, 4.51 M/s
Ymin = -2.41 G'S @ 0.0796 sec., Ymax = 6.51 G'S @ 0.0394 sec.
G'S
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
-2.0
-4.0
-6.0
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.10
(sec.)



LOWER SPINE ACCELERATION
Test Desc.: Abdomen Impact
Component: Dummy #033
Test Date: 03-26-03
Speed: 14.8 fps, 4.51 M/s
Ymin = -6.24 G'S @ 0.0981 sec., Ymax = 13.75 G'S @ 0.0234 sec.
G'S
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
-2.0
-4.0
-6.0
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.10
(sec.)


UPPER RIB DISPLACEMENT
Test Desc.: Abdomen Impact
Component: Dummy #033
Test Date: 03-26-03
Speed: 14.8 fps, 4.51 M/s
Ymin = -.03 mm @ 0.0149 sec., Ymax = 47.43 mm @ 0.0410 sec.
mm
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
-5.0
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
0.18
0.20
(sec.)


LOWER RIB DISPLACEMENT
Test Desc.: Abdomen Impact
Component: Dummy #033
Test Date: 03-26-03
Speed: 14.8 fps, 4.51 M/s
Ymin = -.03 mm @ 0.0143 sec., Ymax = 45.44 mm @ 0.0395 sec.
mm
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
-5.0
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
0.18
0.20
(sec.)

MGA RESEARCH CORPORATION

PELVIS IMPACT TEST

SID IIs DUMMY

Date: 3/26/03

Dummy Serial Number: 033

Test Number: D03529/D03539

TEST PARAMETER	SPECIFICATION	TEST RESULTS	
		D03529	D03539
Temperature (ºC)	20.8° – 22.2°	21.6	21.4
Humidity	10% - 70%	25	25
Impact Velocity	6.57 - 6.84 m/s	6.71	6.75
Probe Force	5.0 - 7.2 kN	5.6	6.0
Pelvis G's	46 - 60 g's	49	48

TEST MEETS SPECIFICATIONS

Technician: ____________________

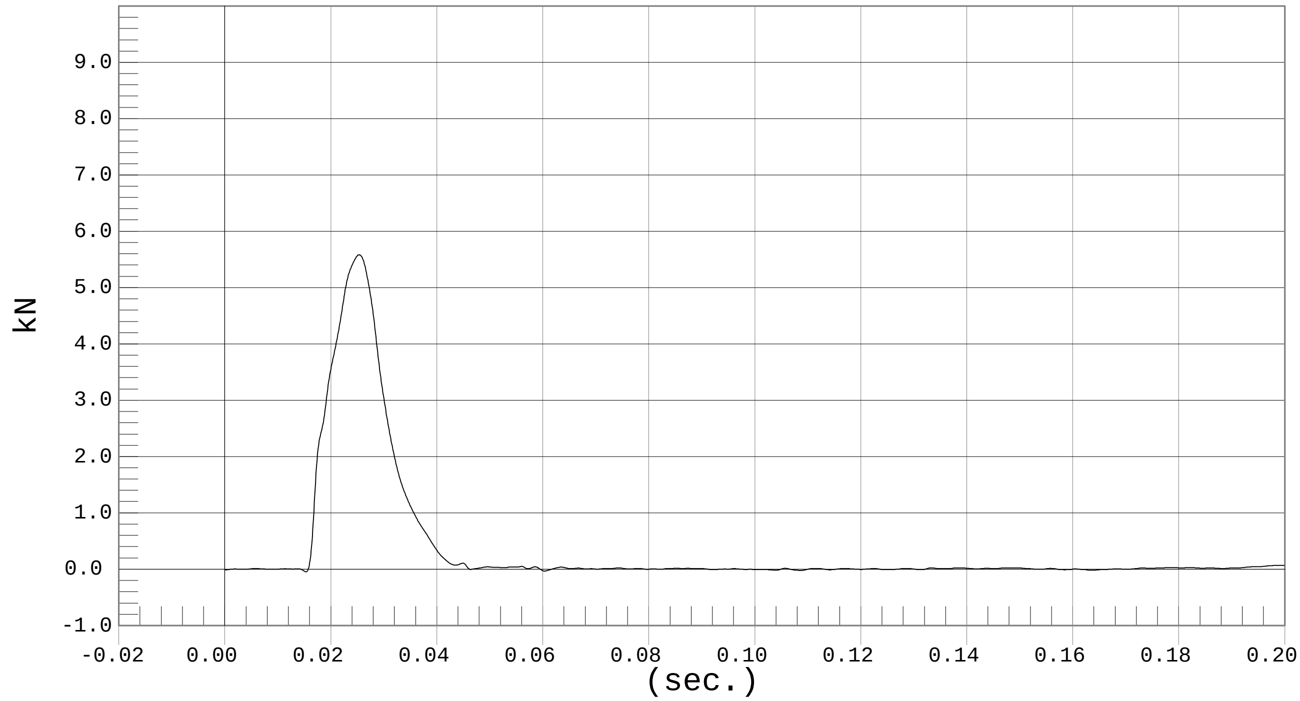
Approved By: ____________________

IMPACTOR FORCE

Test Desc.: Pelvis Impact
Component: Dummy #033

Test Date: 03-26-03
Speed: 22.0 fps, 6.71 M/s

Ymin = -.05 kN @ 0.0152 sec., Ymax = 5.58 kN @ 0.0252 sec.

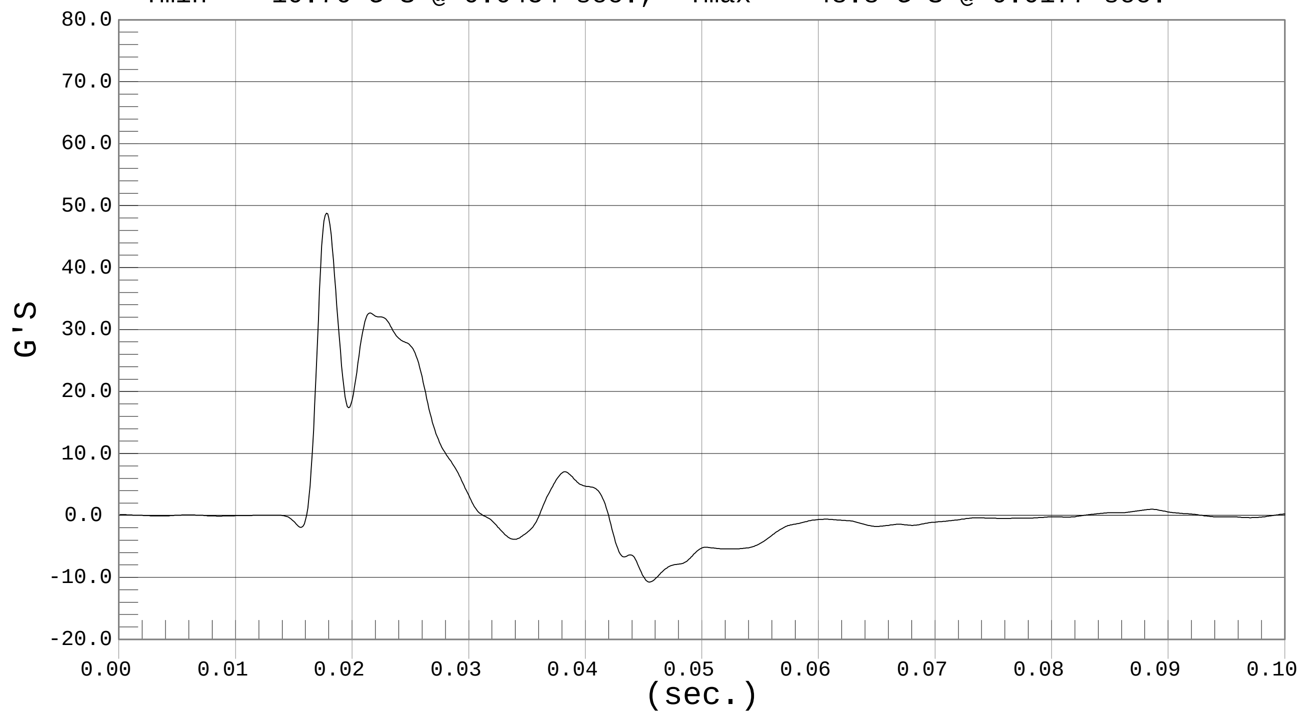


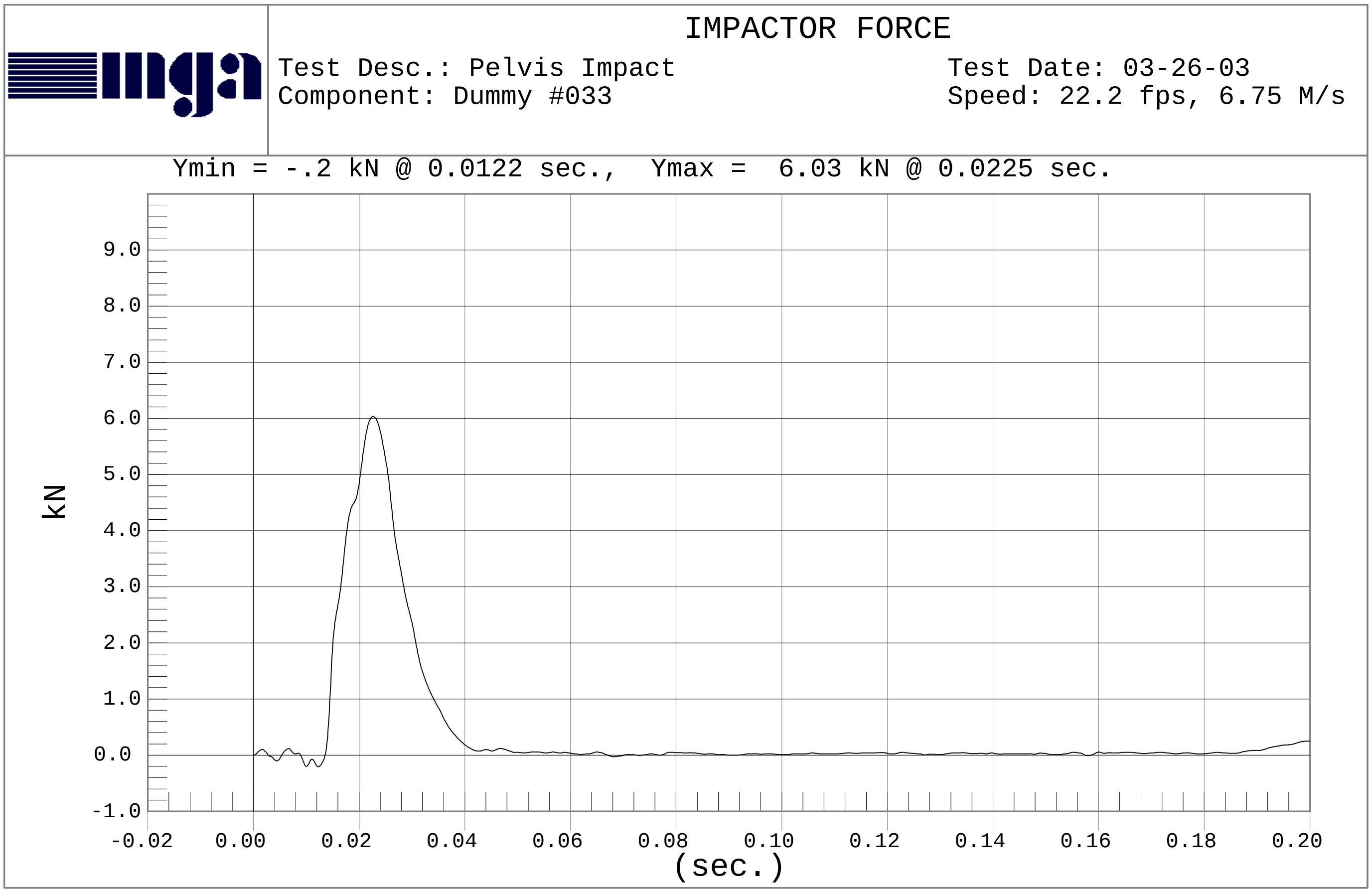
PELVIS ACCELERATION

Test Desc.: Pelvis Impact
Component: Dummy #033

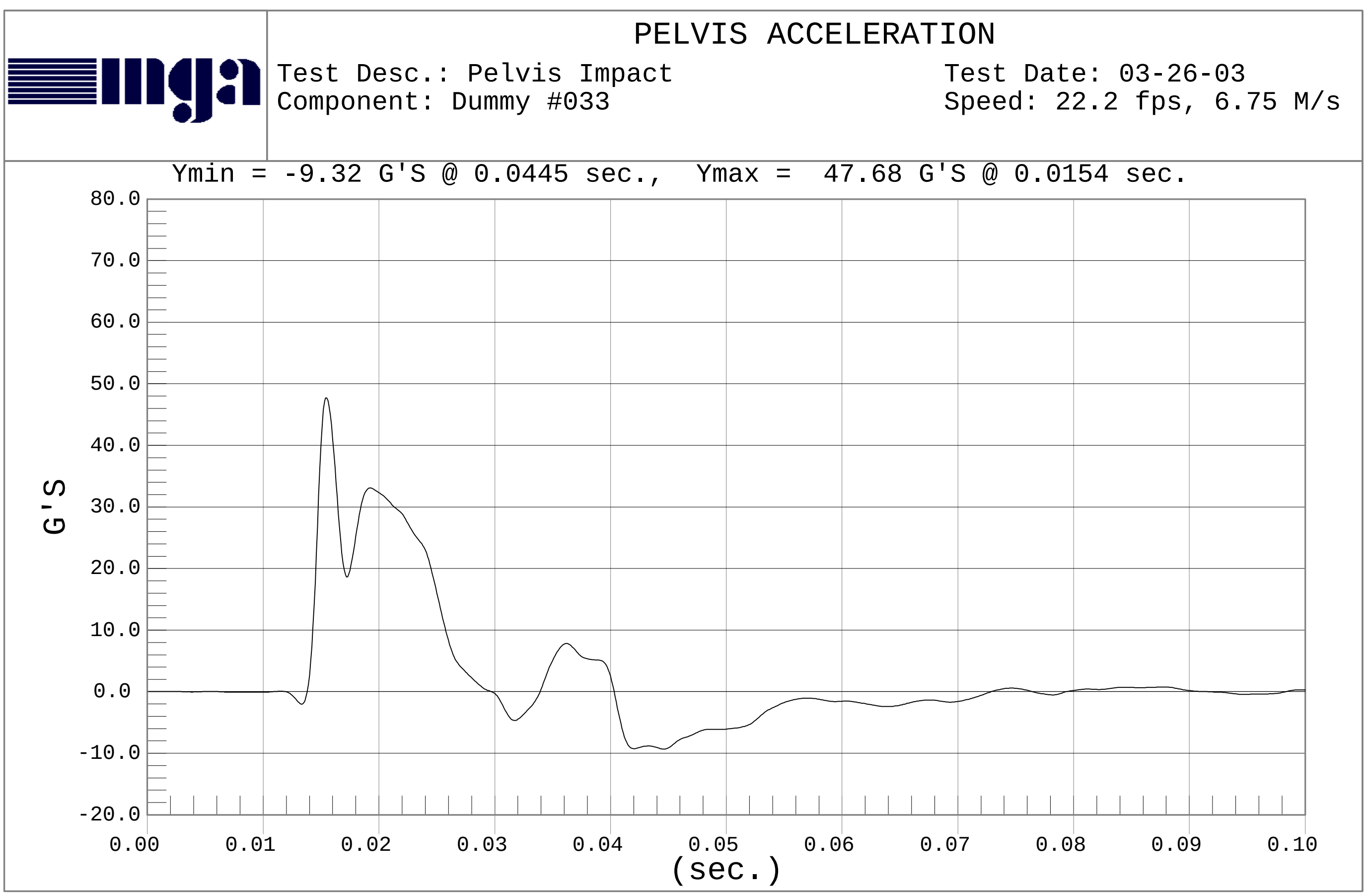
Test Date: 03-26-03
Speed: 22.0 fps, 6.71 M/s

Ymin = -10.76 G'S @ 0.0454 sec., Ymax = 48.8 G'S @ 0.0177 sec.





IMPACTOR FORCE
Test Desc.: Pelvis Impact
Component: Dummy #033
Test Date: 03-26-03
Speed: 22.2 fps, 6.75 M/s
Ymin = -.2 kN @ 0.0122 sec., Ymax = 6.03 kN @ 0.0225 sec.
kN
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
-1.0
-0.02
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
0.18
0.20
(sec.)



PELVIS ACCELERATION
Test Desc.: Pelvis Impact
Component: Dummy #033
Test Date: 03-26-03
Speed: 22.2 fps, 6.75 M/s
Ymin = -9.32 G'S @ 0.0445 sec., Ymax = 47.68 G'S @ 0.0154 sec.
G'S
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
-10.0
-20.0
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.10
(sec.)

APPENDIX D
TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

DUMMY CALIBRATION DATA

	INSTRUMENTS FOR LEFT FRONT DUMMY SID IIS: 033		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X Accelerometer	P17858	Endevco	1/10/03
Head Y Accelerometer	P12566	Endevco	1/10/03
Head Z Accelerometer	P15638	Endevco	1/10/03
Driver Upper Neck Load Cell	N304FX	FTSS	6/14/02
Driver Upper Arm X	B02A25-N01	Entran	1/9/03
Driver Upper Arm Y	02A16-A13	Entran	1/9/03
Driver Upper Arm Z	B02A25-N04	Entran	1/9/03
Driver Shoulder X	P17848	Endevco	1/10/03
Driver Shoulder Y	P16336	Endevco	1/10/03
Driver Shoulder Z	P16225	Endevco	1/10/03
Driver Shoulder Load Cell	S101FX	FTSS	6/25/02
Driver Upper Thorax Rib Y	01J02-F07	Entran	1/8/03
Driver Mid Thorax Rib Y	B02A18-N03	Entran	1/8/03
Driver Mid Thorax Rib X	AHT13	Endevro	1/24/03
Driver Lower Thorax Rib Y	P15951	Endevco	1/10/03
Driver Upper Abdominal Rib Y	99H30-Z07	Entran	1/9/03
Driver Upper Abdominal Rib X	APY16	Endevco	1/30/03
Driver Lower Abdominal Rib Y	01J02-F12	Entran	1/9/03
Driver T4 X	AGTY1	Endevco	1/8/03
Driver Shoulder DY	020SHD	Honeywell	1/13/03
Driver Upper Thorax Rib DY	020RB1	Honeywell	1/13/03
Driver Mid Thorax Rib DY	020RB2	Honeywell	1/13/03
Driver Lower Thorax Rib DY	020RB3	Honeywell	1/13/03
Driver Upper Abdominal Rib DY	020RB4	Honeywell	1/13/03
Driver Lower Abdominal Rib DY	020RB5	Honeywell	1/13/03
Driver Upper Spine X	B02A09-F04	Entran	1/9/03
Driver Upper Spine Y	01G25-N18	Entran	1/9/03
Driver Upper Spine Z	02A16-A12	Entran	1/9/03
Driver Lower Spine X	02A16-A03	Entran	1/9/03
Driver Lower Spine Y	B02A18-N14	Entran	1/9/03
Driver Lower Spine Z	02A04-A24	Entran	1/9/03
Driver Lumbar Load Cell	L104FX	FTSS	5/10/02
Driver Lumbar MX	L104MX	FTSS	8/15/02
Driver Lumbar MY	L104MY	FTSS	6/24/02
Driver Lumbar MZ	L104MZ	FTSS	6/24/02
Driver Left Acetabulum FY	AC111FY	FTSS	6/25/02
Driver Left Illium Crest FY	IW113FY	FTSS	6/25/02
Driver Right Illium Crest FY	IW115FY	FTSS	6/25/02
Pubic Symphysis FY	P106FY	FTSS	6/24/02
Driver Right Femur Load Cell	F109FX	FTSS	1/20/03
Driver Left Femur Load Cell	F107FX	FTSS	1/20/03
Pelvis X Accelerometer	B02A25-N05	Entran	1/9/03
Pelvis Y Accelerometer	B02A18-N13	Entran	1/9/03
Pelvis Z Accelerometer	02A18-N03	Entran	1/9/03

VEHICLE INSTRUMENT CALIBRATION

	VEHICLE ACCELEROMETERS		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Left Mid A-Post Y	D11-F16	ENTRAN	1/30/03
Left Lower A-Post Y	H01-N13	ENTRAN	10/30/02
Left A-Post @ Roof	H07-F07	ENTRAN	1/16/03
Left Mid B-Post Y	H01-N14	ENTRAN	10/31/02
Left Upper B-Post Y	H14-N08	ENTRAN	10/7/02
Left Lower B-Post Y	H01-N31	ENTRAN	11/19/02
Floorpan @ Rear Axle X	H01-N26	ENTRAN	11/19/02
Floorpan @ Rear Axle Y	99F216	ENTRAN	10/31/02
Floorpan @ Rear Axle Z	E03-H06	ENTRAN	11/19/02
Driver Seat Track Y	E03-H14	ENTRAN	10/8/02
Right Front Sill X	A08-A11	ENTRAN	10/7/02
Right Front Sill Y	F04-N08	ENTRAN	10/18/02
Right Front Sill Z	L23-A05	ENTRAN	11/19/02
Right Rear Sill X	A08-M01	ENTRAN	2/24/03
Right Rear Sill Y	A08-M08	ENTRAN	2/24/03
Right Rear Sill Z	E10-F20	ENTRAN	1/30/03
Left Rear Sill Y	I25-F15	ENTRAN	1/16/03
Left Front Sill Y	G01-N14	ENTRAN	7/24/02
Vehicle CG X	A08-M03	ENTRAN	2/24/03
Vehicle CG Y	A08-M11	ENTRAN	2/24/03
Vehicle CG Z	A09-N37	ENTRAN	2/24/03
Lower Center Radiator Support X	I25-J09	ENTRAN	10/7/02
Lower Center Radiator Support Y	99F251	ENTRAN	1/15/03
Lower Center Radiator Support Z	D11-F14	ENTRAN	11/19/02

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

APPENDIX E
DUMMY PEAK RESPONSES

DRIVER PEAK RESPONSE TABLE

Location				Peak Response	
				2000 Saab 9-5 3/20/03	
	Class	Axis	Units	Peak	Time
Head	1000	X	G	-84.0	61.2
	1000	Y	G	369.0	61.3
	1000	Z	G	124.1	61.1
	1000	RES	G	393.5	61.3
Head Injury Criteria (HIC15)				2233	
t1				60.6	
t2				61.9	
Head Injury Criteria (HIC36)				2233	
t1				60.6	
t2				61.9	
Upper Neck Force	1000	X	N	-495	66.5
	1000	Y	N	386	63.8
	1000	Z	N	-2180	61.6
	1000	RES	N	2187	61.6
Upper Neck Moment	600	X	Nm	-57.6	62.7
	600	Y	Nm	45.4	92.8
	600	Z	Nm	14.2	77.9
	600	RES	Nm	58.4	62.7

DRIVER PEAK RESPONSE TABLE (CONTINUED)

Location	Peak Response				
				2000 Saab 9-5 3/20/03	
	Class	Axis	Units	Peak	Time
Shoulder G's	180	X	G	-39.8	14.9
	180	Y	G	108.9	13.7
	180	Z	G	-48.1	16.9
	180	RES	G	115.8	17.0
Shoulder Force	180	X	N	277	54.6
	600	Y	N	2294	54.1
	600	Z	N	207	45.5
Upper Arm	180	X	G	66.2	14.0
	180	Y	G	116.4	13.7
	180	Z	G	62.4	13.8
	180	RES	G	145.4	13.8
Upper Spine	180	X	G	-24.3	75.1
	180	Y	G	49.8	54.5
	180	Z	G	14.6	62.3
	180	RES	G	50.3	54.6
Upper Thorax Rib	180	Y	G	99.9	44.3
Mid Thorax Rib	180	Y	G	95.0	45.1
Lower Thorax Rib	180	Y	G	76.9	46.2
Upper Abdominal Rib	180	Y	G	79.0	48.1
Lower Abdominal Rib	180	Y	G	-84.7	38.8

DRIVER PEAK RESPONSE TABLE (CONTINUED)

Location	Peak Response				
				2000 Saab 9-5 3/20/03	
	Class	Axis	Units	Peak	Time
Shoulder Deflection	180	Y	mm	-42.5	59.1
Upper Thorax Deflection	180	Y	mm	-31.7	57.1
Middle Thorax Deflection	180	Y	mm	-25.0	55.7
Lower Thorax Deflection	180	Y	mm	-18.0	52.8
Upper Abdominal Rib Deflection	180	Y	mm	-15.5	54.2
Lower Abdominal Rib Deflection	180	Y	mm	-29.5	53.3
Shoulder Deflection Rate	180		m/s	-3.7	18.0
Upper Thorax Deflection Rate	180		m/s	-3.1	47.2
Middle Thorax Deflection Rate	180		m/s	-2.5	47.1
Lower Thorax Deflection Rate	180		m/s	-1.5	48.3
Upper Abdominal Rib Deflection Rate	180		m/s	1.3	77.1
Lower Abdominal Rib Deflection Rate	180	Y	m/s	-3.2	41.7
Shoulder VC	180	Y	m/s	0.6	48.5
Upper Thorax Rib VC	180	Y	m/s	0.5	48.5
Mid Thorax Rib VC	180	Y	m/s	0.3	48.3
Lower Thorax Rib VC	180	Y	m/s	0.2	49.2
Upper Abdominal Rib VC	180	Y	m/s	0.1	50.8
Lower Abdominal Rib VC	180	Y	m/s	0.4	42.5

DRIVER PEAK RESPONSE TABLE (CONTINUED)

Location	Peak Response				
				2000 Saab 9-5 3/20/03	
	Class	Axis	Units	Peak	Time
Lower Spine	180	X	G	10.8	67.9
	180	Y	G	64.8	50.3
	180	Z	G	31.8	62.3
	180	RES	G	66.9	50.5
Lumbar Force	600	X	N	602	79.5
	600	Y	N	3067	49.6
	600	Z	N	1024	68.0
Lumbar Moment	600	X	Nm	123.8	50.3
	600	Y	Nm	-39.6	79.9
	600	Z	Nm	-19.7	75.6
Left Acetabulum Force	600	Y	N	2272	43.3
Left Illium Crest Force	600	Y	N	4016	46.9
Sum of Left Acetabulum & Left Illium Crest	600	Y	N	6045	46.7
Right Illium Crest	600	Y	N	999	121.9
Pubic Symphysis Force	600	Y	N	-746	44.8
Right Femur Force	600	X	N	160	58.7
	600	Y	N	-536	68.1
	600	Z	N	703	51.5
	600	RES	N	747	51.5

DRIVER PEAK RESPONSE TABLE (CONTINUED)

Location	Peak Response				
				2000 Saab 9-5 3/20/03	
	Class	Axis	Units	Peak	Time
Right Femur Moment	600	X	Nm	-72.5	45.5
	600	Y	Nm	-22.6	70.0
	600	Z	Nm	-63.8	68.5
	600	RES	Nm	80.8	45.5
Left Femur Force	600	X	N	-383	45.7
	600	Y	N	-691	58.9
	600	Z	N	1678	54.0
	600	RES	N	1712	45.0
Left Femur Moment	600	X	Nm	45.7	85.7
	600	Y	Nm	-33.7	45.7
	600	Z	Nm	25.6	84.9
	600	RES	Nm	51.2	85.8
Pelvis	1000	X	G	24.3	44.8
	1000	Y	G	68.5	44.2
	1000	Z	G	-12.1	68.0