

REPORT NUMBER: NCAPCHILD-MGA-2003-002

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

**Century 1500 STE
Century Accel Overhead**

NHTSA NUMBER: M30206

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



Test Date: December 11, 2002

Report Date: December 20, 2002

FINAL REPORT

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

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Manager, New Car Assessment Program

Date of Acceptance

COTR, NCAP Frontal Impact Program

Date of Acceptance

Technical Report Documentation Page

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16. Abstract A frontal load cell barrier test was conducted on the subject CRS Century 1500 STE and Century Accel Overhead in accordance with the specifications of the Office of Crashworthiness Standards Test Procedure for the determination of CRS crashworthiness. This test was conducted at MGA Research Corporation in Burlington, Wisconsin on December 11, 2002.					
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SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

The purpose of this test was to obtain CRS performance data in a frontal impact NCAP condition.

This 56.5 kph frontal barrier impact test is part of the Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under contract number DTNH22-01-D-12005.

SUMMARY

Both child dummies were instrumented with head, chest, and pelvic triaxial accelerometers. In addition, redundant head z acceleration, and upper and lower six axial neck force and moment sensors were utilized.

The right rear (Position 3) child dummy (S/N 42) and left rear (Position 4) child dummy (S/N 40) were calibrated previous to this test. Child dummy certification information is found in Appendix C.

The right rear child dummy's HIC was 792.4; maximum chest deceleration over 3 msec was 54.4 g's. The left rear child dummy's HIC was not calculated because there was no valid data collected for the head CG Y acceleration. The maximum chest deceleration over 3 msec was 38.5 g's. Positions 3 and 4 used the vehicle LATCH and top tether for attachment.

**SECTION 2
DATA SHEET NO. 1
CRASH TEST SUMMARY**

TEST DUMMY INFORMATION

Description	Position 3 CRS	Position 4 CRS
Dummy Type / Serial No.	HIII 3 Year Old / 42	HIII 3 Year Old / 40
Number of Data Channels	23	23
Restraint System	Century 1500 STE	Century Accel Overhead

CAMERA COVERAGE

High Speed	17
Real Time	1
Total	18

POST TEST DOOR OPENING

Description	Front	Rear
Left Side Doors	Door remained closed and latched; Door opened without tools	Not Applicable
Right Side Doors	Door remained closed and latched; Door opened without tools	Not Applicable
Hatch/Other Door	None	Door remained closed and latched; Door opened without tools

POST TEST SEAT DATA

Location	Seat Movement (mm)	Seat Back Failure
P1 (Left Front)	0	None
P2 (Right Front)	0	None
P3 (Right Rear)	0	None
P4 (Left Rear)	0	None

VISIBLE DUMMY CONTACT POINTS

Description	Position 3 CRS (S/N 42)	Position 4 CRS (S/N 40)
Head Contact	Left Arm	Overhead Shield
Upper Torso Contact	None	None
Lower Torso Contact	None	None
Left Foot Contact	Seat back (2 levels)	Seat back (2 levels)
Right Foot Contact	Seat back (2 levels)	Seat back (2 levels)

SECTION 2... (continued)

**DATA SHEET NO. 2
CRS PARAMETER DATA**

Child Restraint System (Position 3)	Century 1500 STE
Child Restraint System (Position 4)	Century Accel Overhead
NHTSA No.	M30206

TARGET TEST WEIGHT CALCULATION

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

TEST VEHICLE WEIGHTS

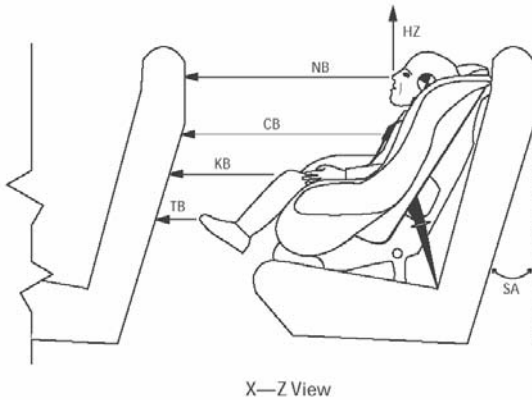
	Units	As Tested (ATW) (Axle)		
		Front	Rear	Total
Left	kg	425.5	250.8	
Right	kg	416.0	247.7	
Ratio	%	62.8	37.2	
Totals	kg	841.5	498.5	1340.0

As tested weight of vehicle includes two ATDs, two 3 year olds with CRS, cargo, equipment and instrumentation.

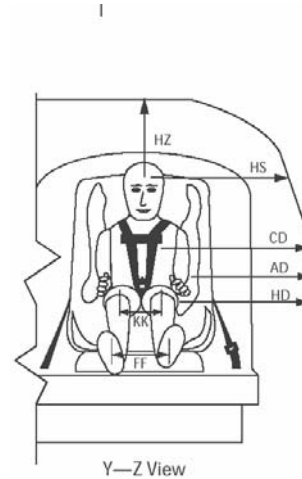
SECTION 2... (continued)
DATA SHEET NO. 3
CHILD DUMMY POSITIONING IN VEHICLE

Child Restraint System (Position 3)	Century 1500 STE
Child Restraint System (Position 4)	Century Accel Overhead
NHTSA No.	M30206

Dummy Measurements for CRS Passengers



X—Z View



Y—Z View

X—Z View

HZ	-	Head to Roof
HS	-	Head to Side Window
CD	-	Chest to Door
AD	-	Arm to Door
HD	-	H-Point to Door
KK	-	Knee to Knee
FF	-	Foot to Foot
NB	-	Nose to Front Seat Back
CB	-	Chest to Front Seat Back
KB	-	Knee to Front Seat Back
TB	-	Toe to Front Seat Back
SA	-	Seat Back Angle

Measurement	Pre-Test (mm)		Post-Test (mm)	
	P3 CRS (42)	P4 CRS (40)	P3 CRS (42)	P4 CRS (40)
SA (deg)	24	27	24	26
HS	335	322	365	401
CD	277	265	304	310
AD	177	140	180	162
HD	226	185	147	212
HZ	305	291	247	241
NB	470	499	508	514
CB	468	500	490	504
KK	127	170	145	148
FF	127	220	146	150
KB - LEFT	250	285	268	307
KB - RIGHT	252	310	260	311
TB - LEFT	22	27	100	65
TB - RIGHT	24	41	108	65

All dimensions in mm (unless noted)
P3 – Right Rear Passenger
P4 – Left Rear Passenger

SECTION 2... (continued)

**DATA SHEET NO. 4
CHILD DUMMY INJURY CRITERIA VALUES**

Child Restraint System (Position 3)	Century 1500 STE
Child Restraint System (Position 4)	Century Accel Overhead
NHTSA No.	M30206

HEAD PEAK ACCELERATIONS

Location	Axis	Units	Position 3				Position 4			
			Max	Time	Min	Time	Max	Time	Min	Time
Head CG	X	G's	26.2	200	-37.8	85	62.2	200	-30.9	99
Head CG	Y	G's	14.3	107	-2.3	131	*	*	*	*
Head CG	Z	G's	59.4	82	-3.6	35	59.0	91	-7.2	33
Resultant	N/A	G's	68.7	82						
Rear	Z	G's	88.1	78	-10.7	57	74.0	84	-14.1	53

* No valid data collected

UPPER NECK PEAK FORCES AND MOMENTS

Location	Axis	Units	Position 3				Position 4			
			Max	Time	Min	Time	Max	Time	Min	Time
Neck Force	X	N	8	188	-876	85	90	190	-671	83
Neck Force	Y	N	109	77	-67	133	76	119	-170	71
Neck Force	Z	N	2339	84	-79	34	2009	85	-232	35
Resultant	N/A	N	2483	84			2110	85		
Neck Moment	X	N•m	4.4	80	-6.1	136	1.7	184	-8.0	84
Neck Moment	Y	N•m	7.9	147	-16.7	86	4.3	134	-5.9	57
Neck Moment	Z	N•m	1.7	127	-1.8	151	1.4	150	-2.5	115
Resultant	N/A	N•m	16.8	86			8.2	84		

LOWER NECK PEAK FORCES AND MOMENTS

Location	Axis	Units	Position 3				Position 4			
			Max	Time	Min	Time	Max	Time	Min	Time
Neck Force	X	N	227	200	-1651	84	316	195	-946	86
Neck Force	Y	N	14	41	-369	81	462	78	-237	94
Neck Force	Z	N	1038	79	-135	49	1277	91	-244	35
Resultant	N/A	N	1956	84			1597	90		
Neck Moment	X	N•m	17.6	79	-10.1	135	3.3	116	-33.8	89
Neck Moment	Y	N•m	139.7	84	-14.5	200	115.9	83	-15.1	192
Neck Moment	Z	N•m	13.3	79	-4.8	137	2.2	142	-15.4	88
Resultant	N/A	N•m	140.8	84			120.6	83		

SECTION 2... (continued)

**DATA SHEET NO. 4... (continued)
CHILD DUMMY INJURY CRITERIA VALUES**

Child Restraint System (Position 3)	Century 1500 STE
Child Restraint System (Position 4)	Century Accel Overhead
NHTSA No.	M30206

CHEST PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	Position 3				Position 4			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	G's	3.4	183	-38.2	69	17.7	186	-37.5	79
Chest CG	Y	G's	5.5	87	-3.4	109	3.1	79	-6.9	98
Chest CG	Z	G's	17.7	83	-40.2	66	21.6	94	-25.8	70
Resultant	N/A	G's	55.1	66			39.5	76		

TETHER FORCE

Location	Axis	Units	Position 3				Position 4			
			Max	Time	Min	Time	Max	Time	Min	Time
Tether Force	N/A	N	**	**	**	**	**	**	**	**

** Not recorded because the load cell would not fit between the tether anchor and the CRS

PELVIC PEAK ACCELERATIONS

Location	Axis	Units	Position 3				Position 4			
			Max	Time	Min	Time	Max	Time	Min	Time
Pelvis	X	G's	10.9	130	-38.5	64	13.4	169	-42.1	77
Pelvis	Y	G's	7.3	70	-7.9	83	8.3	68	-7.6	96
Pelvis	Z	G's	52.0	66.4	-6.1	197	10.4	96	-29.3	66
Resultant	N/A	G's	63.8	66			48.4	73		

SECTION 2... (continued)
DATA SHEET NO. 4... (continued)
CHILD DUMMY INJURY CRITERIA VALUES

Child Restraint System (Position 3)	Century 1500 STE
Child Restraint System (Position 4)	Century Accel Overhead
NHTSA No.	M30206

HEAD INJURY CRITERIA (HIC36)

Location	HIC	T ¹ (msec)	T ² (msec)	Average Acceleration (G's)
Position 3 - Right	792.4	63.4	98.4	55.2
Position 4 - Left				

HIC36 is as defined in FMVSS 208. The maximum time interval from t1 to t2 is 36 milliseconds.

HEAD INJURY CRITERIA (HIC15)

Location	HIC	T ¹ (msec)	T ² (msec)	Average Acceleration (G's)
Position 3 - Right	505.2	72.0	87.0	64.7
Position 4 - Left				

HIC15 is as defined in FMVSS 208. The maximum time interval from t1 to t2 is 15 milliseconds.

CLIP SUMMARY

Location	CLIP	T ¹ (msec)	T ² (msec)
Position 3 - Right	54.4	65.4	68.4
Position 4 - Left	38.5	74.5	77.5

The maximum chest resultant acceleration is defined as the maximum acceleration which exceeds 0.003 seconds in duration.

POSITION 3 NECK INJURY SUMMARIES

Nij V10	Nij
Ntf	0.15
Nte	1.5
Ncf	0.01
Nce	0.16

POSITION 4 NECK INJURY SUMMARIES

Nij V10	Nij
Ntf	0.8
Nte	0.92
Ncf	0.09
Nce	0.18

SECTION 2... (continued)

**DATA SHEET NO. 5
CRS PERFORMANCE DATA**

Child Restraint System (Position 3)	Century 1500 STE
Child Restraint System (Position 4)	Century Accel Overhead
NHTSA No.	M30206

POSITION 3 CRS POST-TEST INSPECTION

Location	Damage	Remarks
Upper Tether Strap	Yes	Upper strap anchor and rod inside the child seat bent.
Upper Tether Buckle	None	
Upper Tether Hook	None	
Vehicle Upper Tether Anchor	None	
Lower Anchor Strap	None	
Lower Anchor Buckle	None	
Lower Anchor Hooks	None	
Vehicle Lower CRS Anchors	None	
Five Point Harness Connections	None	
Cracks on CRS	None	
Fabric Tears on CRS	None	
Vehicle Seat Structure	None	
Vehicle Seat Fabric Tears	None	
Child Dummy	None	

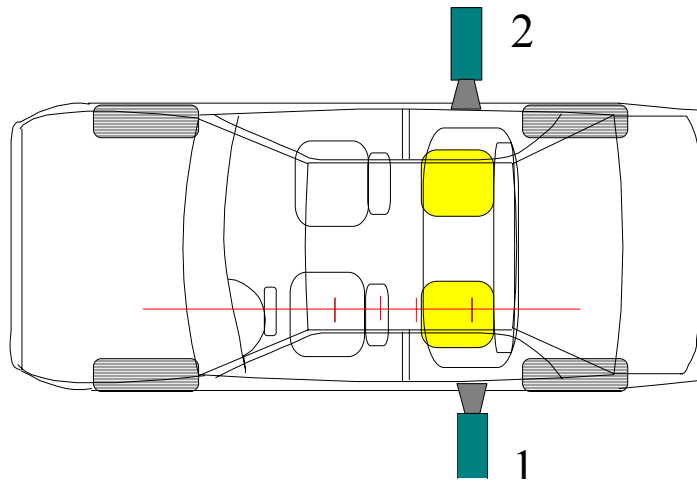
POSITION 4 CRS POST-TEST INSPECTION

Location	Damage	Remarks
Upper Tether Strap	Yes	Small crack in plastic. Plastic turns white showing stress.
Upper Tether Buckle	None	
Upper Tether Hook	None	
Vehicle Upper Tether Anchor	None	
Lower Anchor Strap	Yes	Lower straps cracked plastic and dug into plastic, pinching the strap. Cracks on left and right side 40mm long. Some stress marks where LATCH strap was routed through the CRS.
Lower Anchor Buckle	None	
Lower Anchor Hooks	None	
Vehicle Lower CRS Anchors	None	
Five Point Harness Connections	None	
Cracks on CRS	Yes	
Fabric Tears on CRS	None	
Vehicle Seat Structure	None	
Vehicle Seat Fabric Tears	None	
Child Dummy	None	

SECTION 2... (continued)

DATA SHEET NO. 6
CRS CAMERA DATA

Child Restraint System (Position 3)	Century 1500 STE
Child Restraint System (Position 4)	Century Accel Overhead
NHTSA No.	M30206



No.	Camera View	Location (mm) *			Angle (deg)	Lens (mm)	Speed (fps)
		X	Y	Z			
1	Left Side CRS Lateral View	2520	-7950	1620	90	50	Did not run
2	Right Side CRS Lateral View	2950	7200	1670	90	50	1020

*COORDINATES:

+X = film plane rearward of barrier

+Y = film plane to right of monorail centerline

+Z = film plane above ground level

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- 5. Properly securing the car seat in the vehicle using a seat belt designed to restrain both the car seat and your child or by using LATCH. Many seat belts are NOT safe to use with this car seat, even though they can easily be threaded through or around the car seat.
- 6. Properly securing your child in the car seat.

Manufactured by: Graco Children's Products, Inc.
Macedonia, Ohio USA 44056

Model number

Manufactured in:

44164ELM
1000 STE MG

2002 08 05 IN
YEAR - MONTH - DAY
ANNÉE - MOIS - JOUR

PB-28230-A

A-1.

Close-up View of Position 3 CRS Label

A-2.



Pre-Test Frontal View of Position 3 CRS

A-3.



Post-Test Front View of Position 3 CRS

A-4.



Pre-Test Rear View of Position 3 CRS

A-5.



Post-Test Rear View of Position 3 CRS

A-6.



Pre-Test Left Side View of Position 3 CRS

A-7.



Post-Test Left Side View of Position 3 CRS

A-8.



Pre-Test Right Side View of Position 3 CRS

A-9.



Post-Test Right Side View of Position 3 CRS

1-888-224-6549.

This child restraint system conforms to all applicable Federal Motor Vehicle Safety Standards.
This Restraint is Certified for Use in Motor Vehicles and Aircraft.

Child restraints could be recalled for safety reasons. You must register this restraint to be reached in a recall. Send your name, address and the restraint's model number and manufacturing date to Graco Children's Products Inc., PO Box 100, Elverson, PA 19520-9974 or call 1-888-224-6549. For recall information, call the U.S. Government's Auto Safety Hotline at 1-800-424-9393 (202-366-0123 in DC area).

- Toddlers and 40 lb
40 in. (10 forward f

Model number

Manufactured in:

Manufactured by:
Graco Children's Products, Inc.
Macedonia, Ohio USA 44056

45600LJTI
ACCEL ON SE

2002 07 23 M
 YEAR - MONTH - DAY
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282220

A-10.

Close-up View of Position 4 CRS Label

A-11.



Pre-Test Frontal View of Position 4 CRS

A-12.



Post-Test Front View of Position 4 CRS

A-13.



Pre-Test Rear View of Position 4 CRS

A-14.



Post-Test Rear View of Position 4 CRS

A-15.



Pre-Test Left Side View of Position 4 CRS

A-16.



Post-Test Left Side View of Position 4 CRS

A-17.



Pre-Test Right Side View of Position 4 CRS

A-18.



Post-Test Right Side View of Position 4 CRS



Pre-Test Position 3 Left Side View



Post-Test Position 3 Left Side View



Pre-Test Position 4 Left Side View

A-22.



Post-Test Position 4 Left Side View



Pre-Test Position 3 Right Side View



Post-Test Position 3 Right Side View



Pre-Test Position 4 Right Side View



Post-Test Position 4 Right Side View

A-27.



Pre-Test Position 3 Rear View



Post-Test Position 3 Rear View



Pre-Test Position 4 Rear View



Post-Test Position 4 Rear View

A-31.

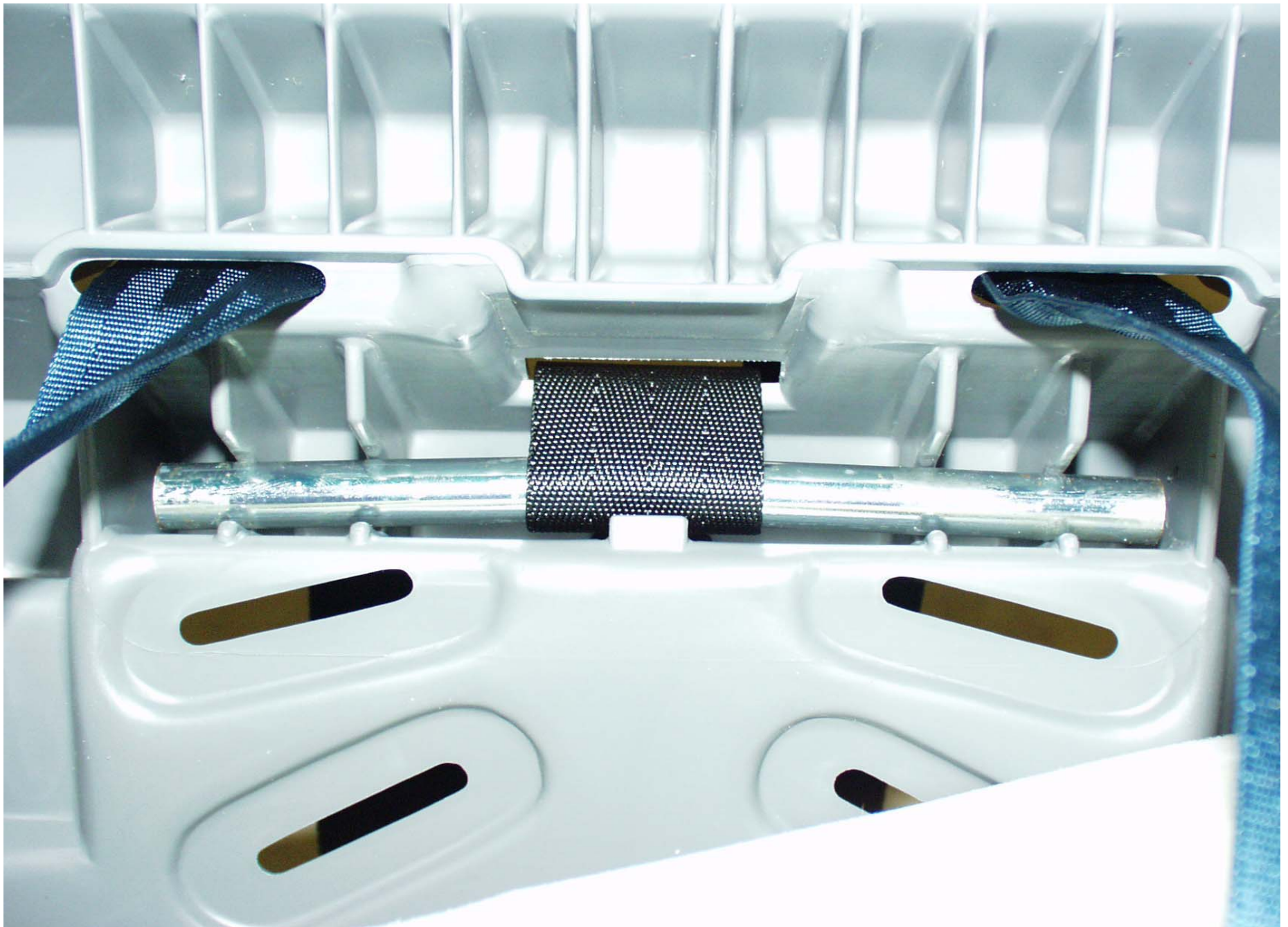


Post-Test Position 3 Feet Contact



Post-Test Position 4 Head and Feet Contact

A-33.



Post-Test Position 3 Tether Strap Bar

A-34.



Post-Test Position 4 Upper Tether Strap Area



Post-Test Position 4 Left Lower Anchor Strap



Post-Test Position 4 Left Lower Anchor Strap



Post-Test Position 4 Right Lower Anchor Strap



Belt here forward facing 20-40 lbs (9-18 kg)
 Se coloca el cinturón aquí para asientos orientados hacia delante para niños que pesan entre 20 y 40 libras (9 y 18 kg)

- lea y entienda las instrucciones del manual de propietario antes de usar este asiento.
- RECUERDE**, la seguridad de su niño depende de:
1. Elegir el modo de uso correcto del asiento de seguridad, según el tamaño de su niño.
 2. Insertar las correas en las ranuras correctas para su niño.
 3. Elegir una ubicación adecuada para el asiento de seguridad en su vehículo.
 4. Colocar el cinturón de seguridad del vehículo de manera correcta o LATCH.
 5. Sujetar el asiento de seguridad diseñado para contener ambos el asiento de seguridad y su niño o usando LATCH. Muchos cinturones de seguridad NO son seguros para su uso con este asiento de seguridad, incluso si se colocan fácilmente a través o alrededor de este asiento de seguridad.
 6. Sujetar a su niño correctamente en el asiento de seguridad.

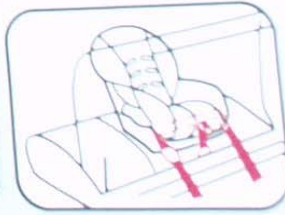
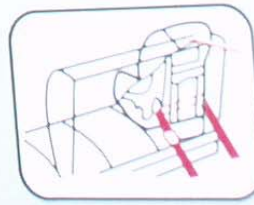
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en el vehículo fabricante lo...
 • Los conectores LATCH cuando se usa el cinturón de seguridad del vehículo para instalar el asiento de seguridad.

Belt here rear-facing up to 30 lbs (13.6 kg)
 Se coloca el cinturón aquí para niños orientados hacia atrás para niños de hasta 30 libras (13.6 kg)

Cinturón de regazo solamente



Este a está d segur conti
 Oriento libras
 • Niñ 20 or

Post-Test Position 4 Right Lower Anchor Strap

APPENDIX B
CHILD DUMMY RESPONSE DATA TRACES

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Figure No. 29.	LRP Child Pelvis X Acceleration vs. Time	B-8
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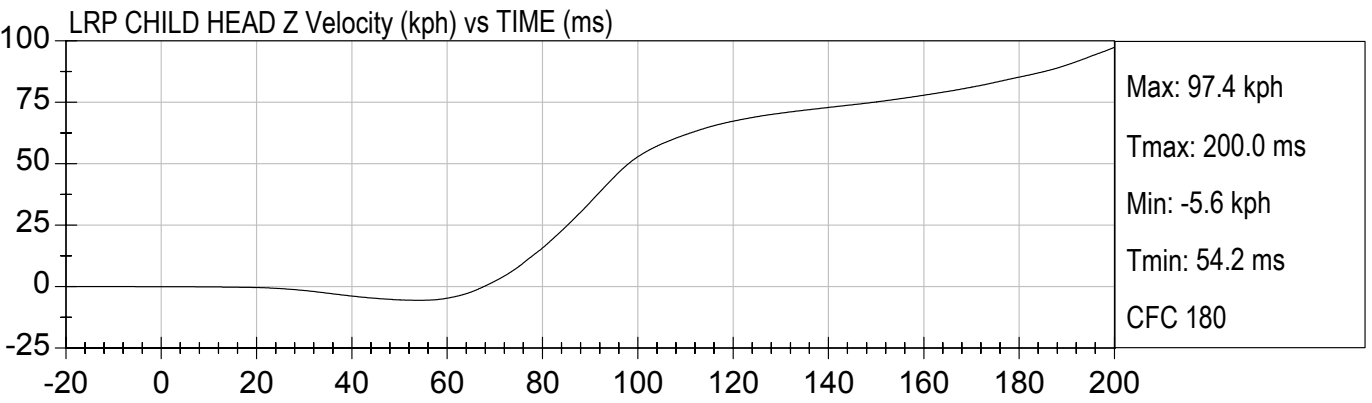
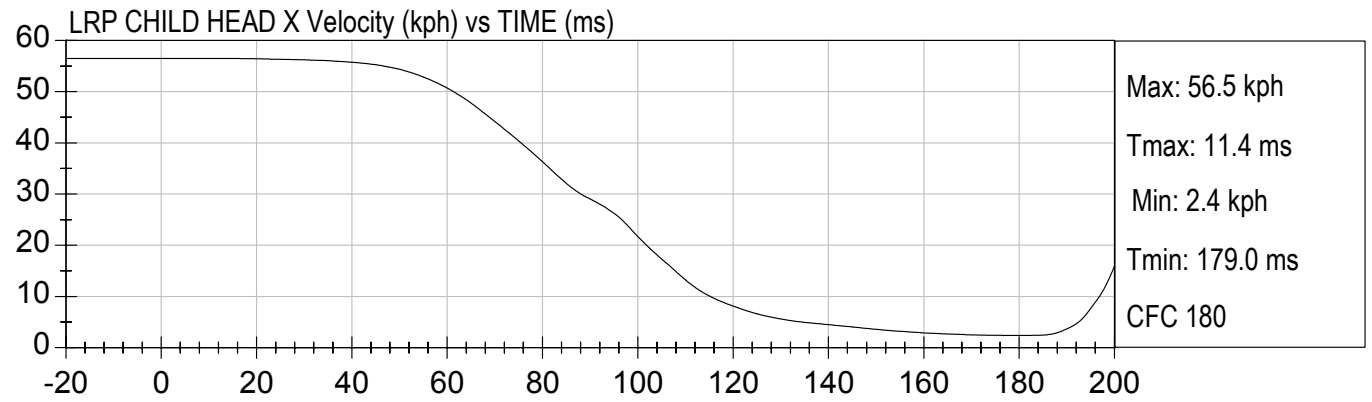
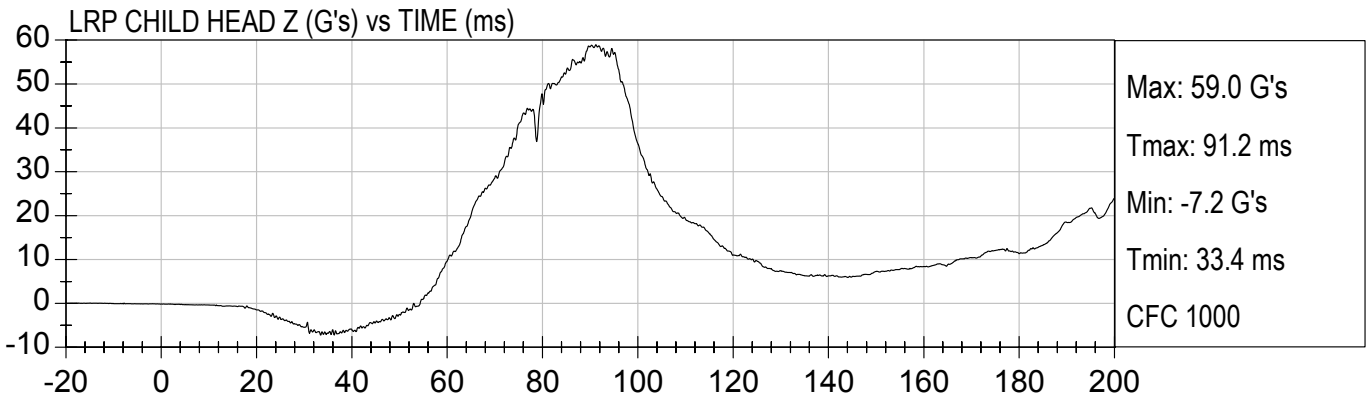
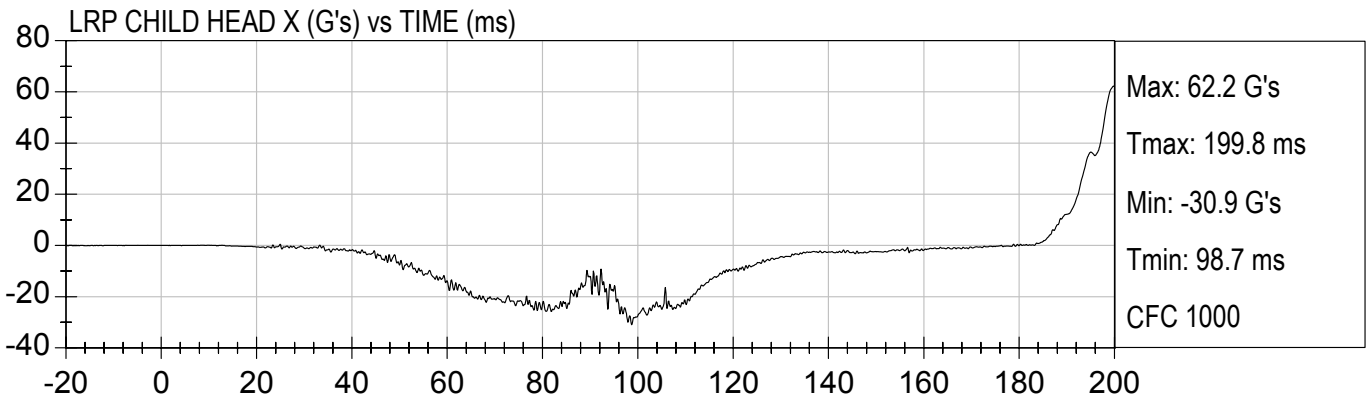
Figure No. 31.	LRP Child Pelvis Z Acceleration vs. Time	B-8
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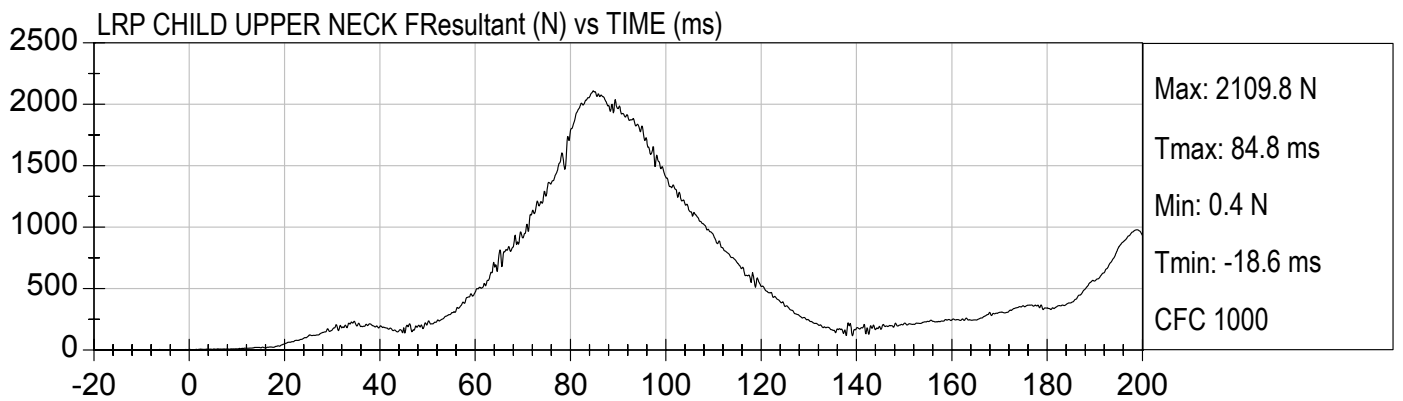
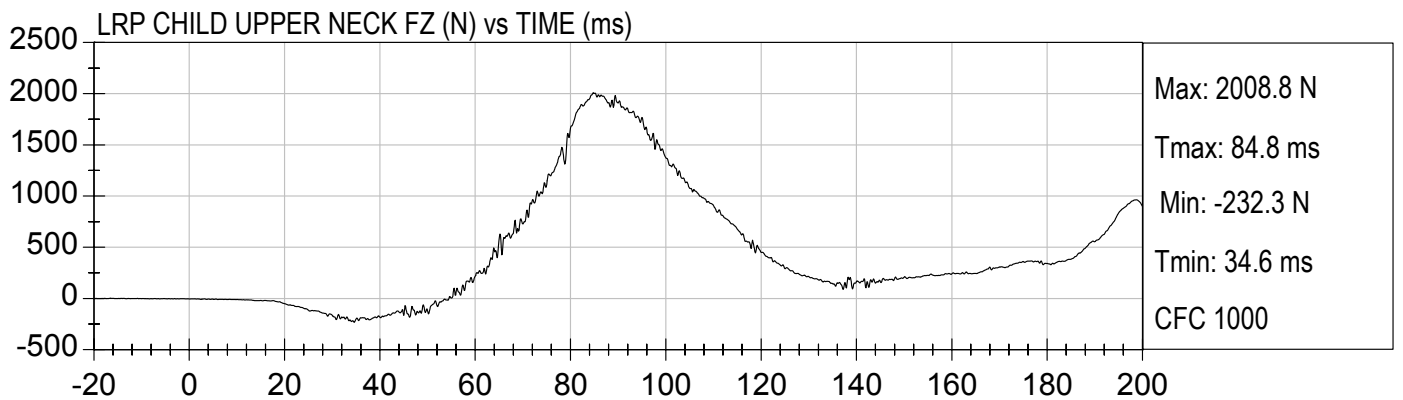
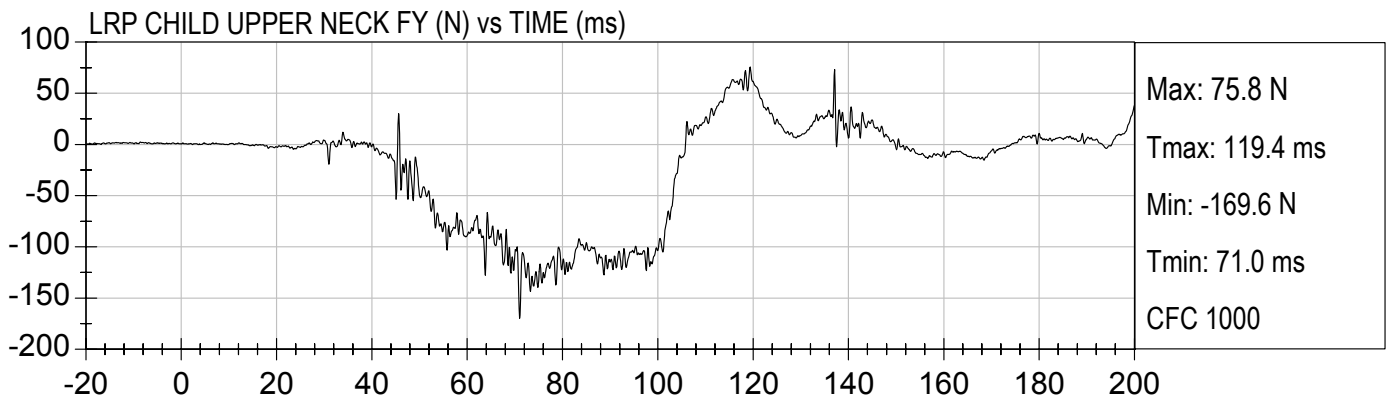
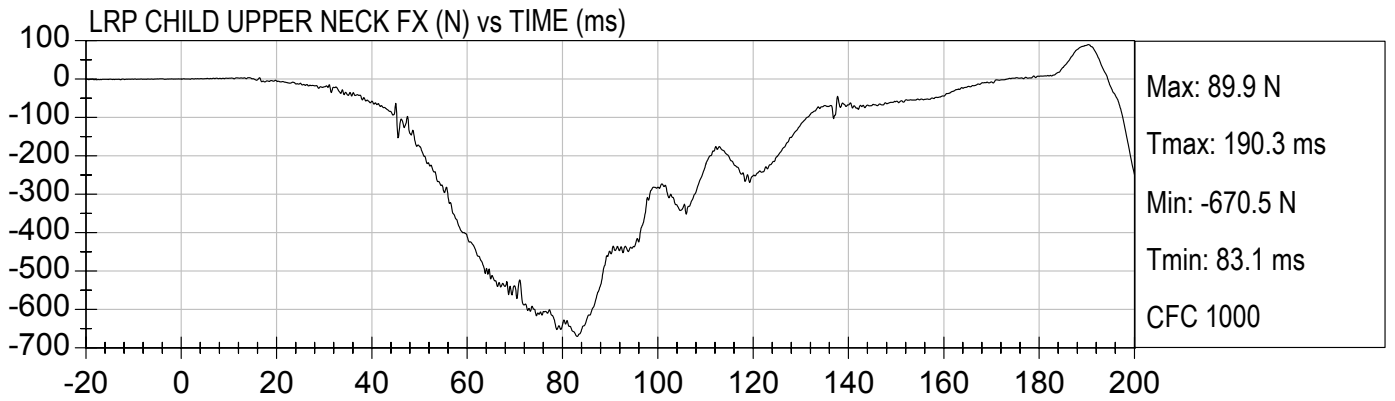
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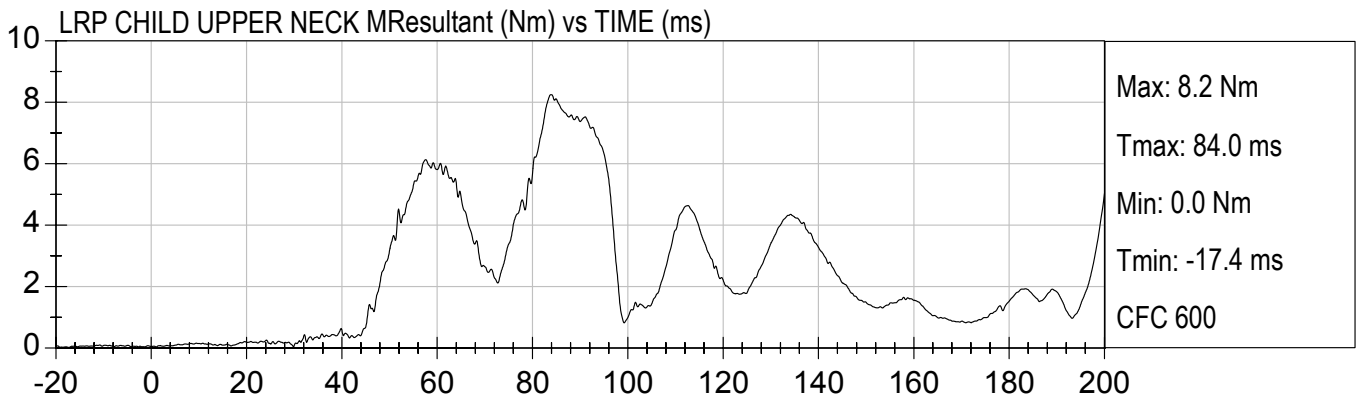
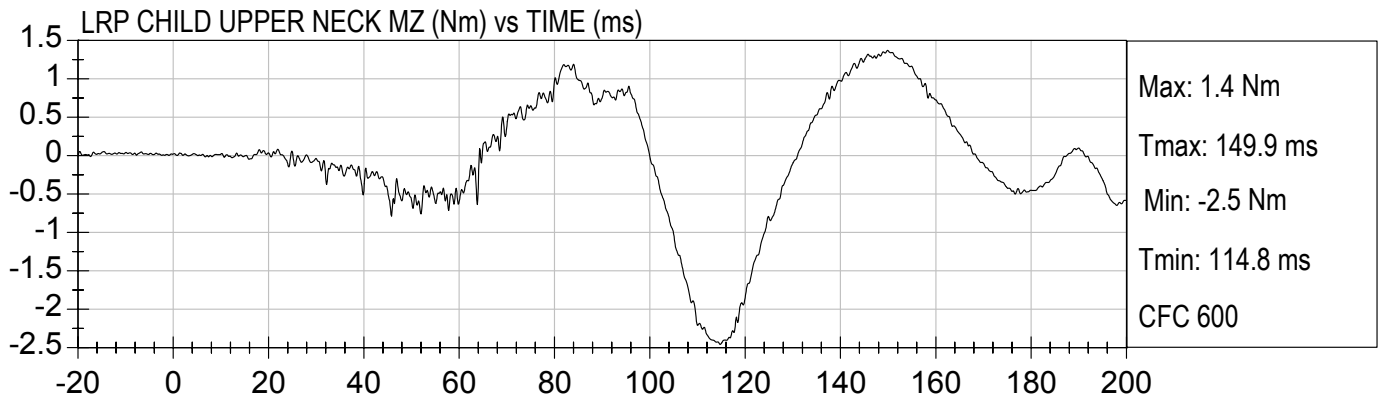
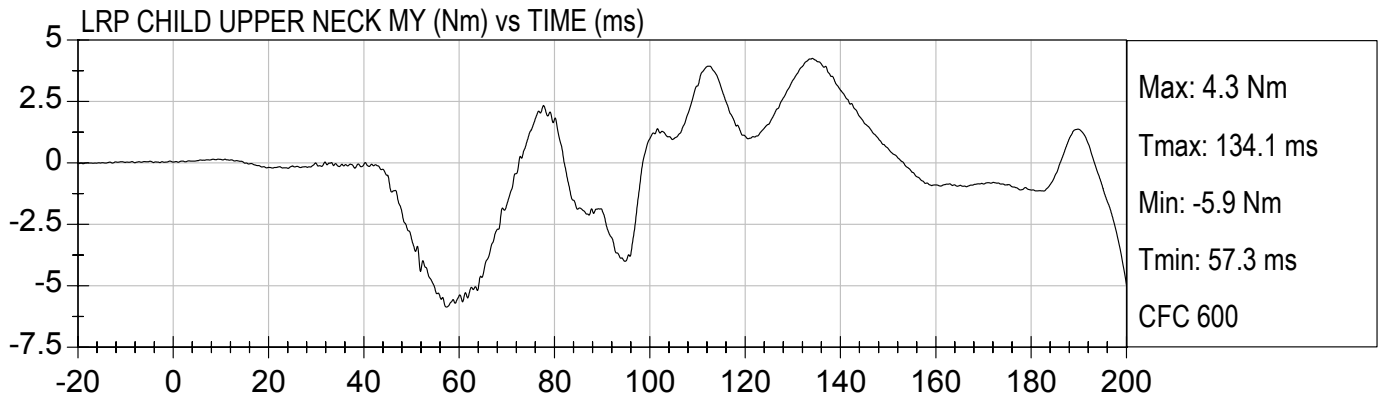
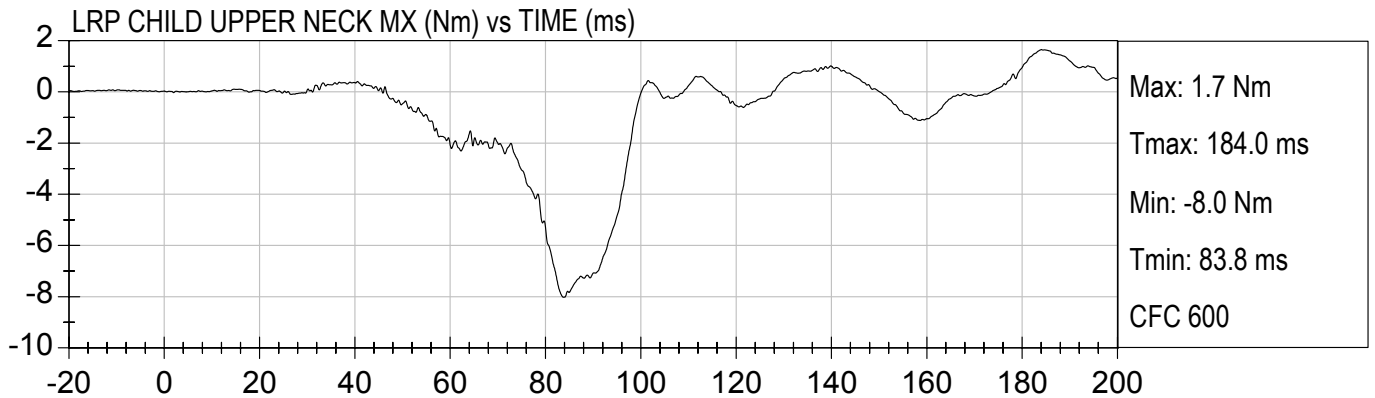




35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

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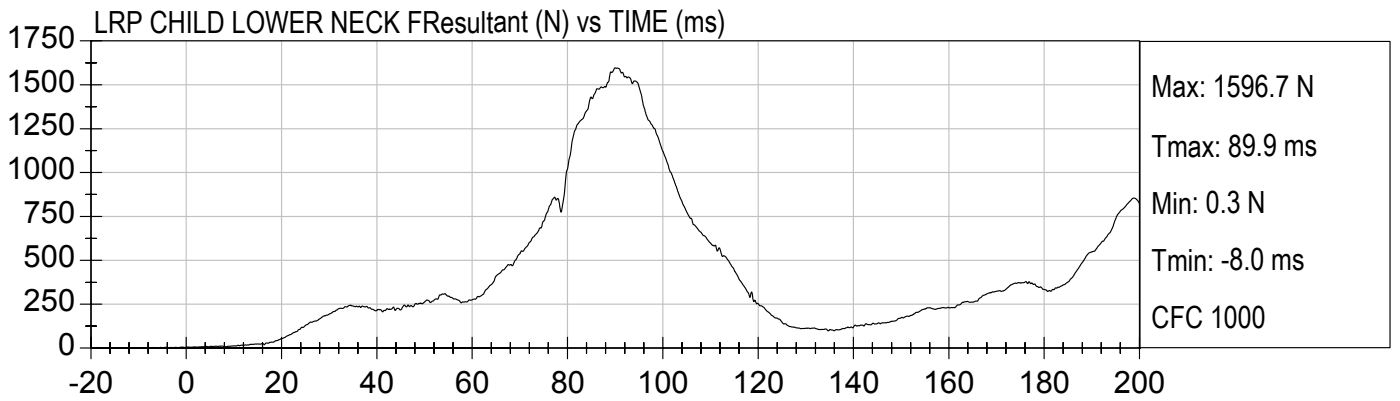
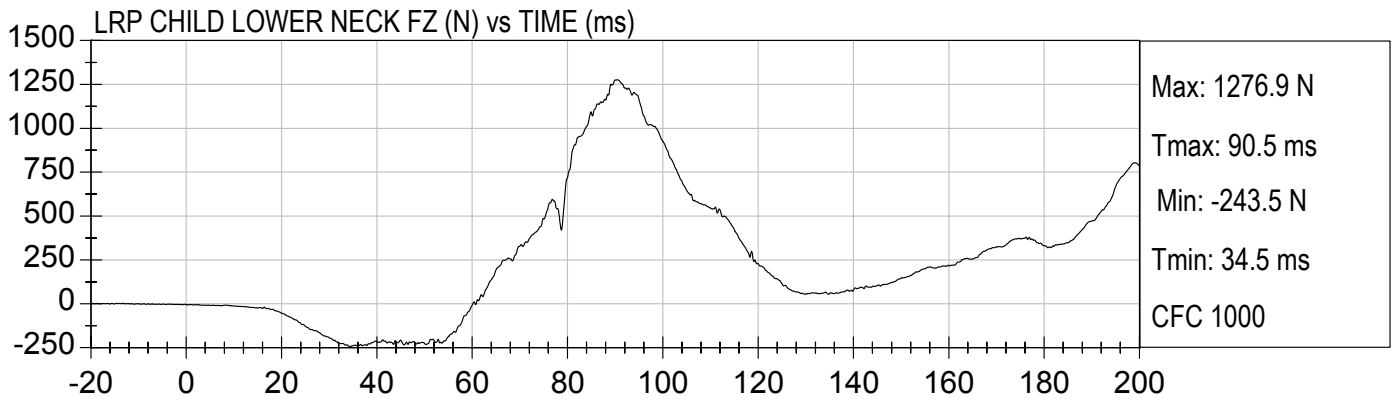
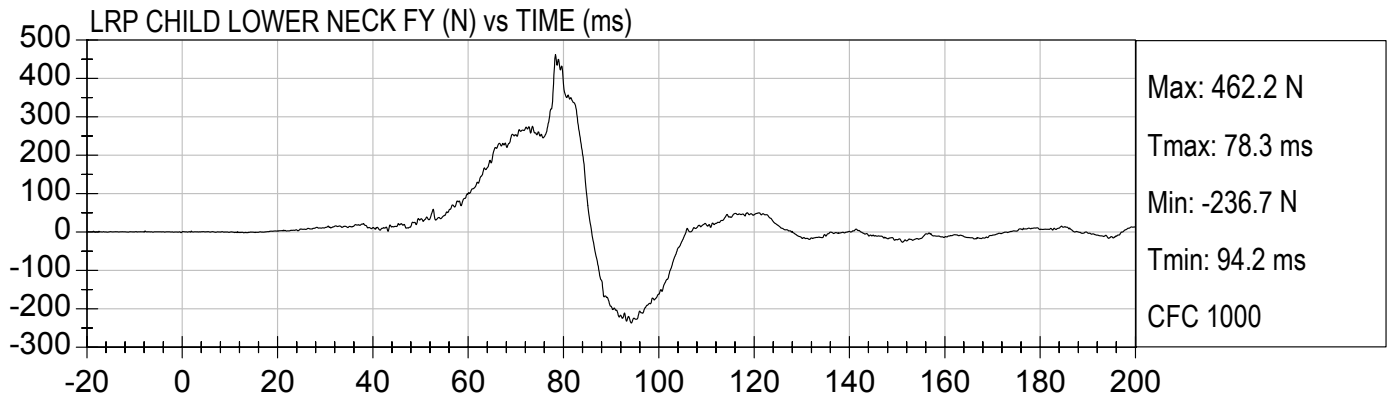
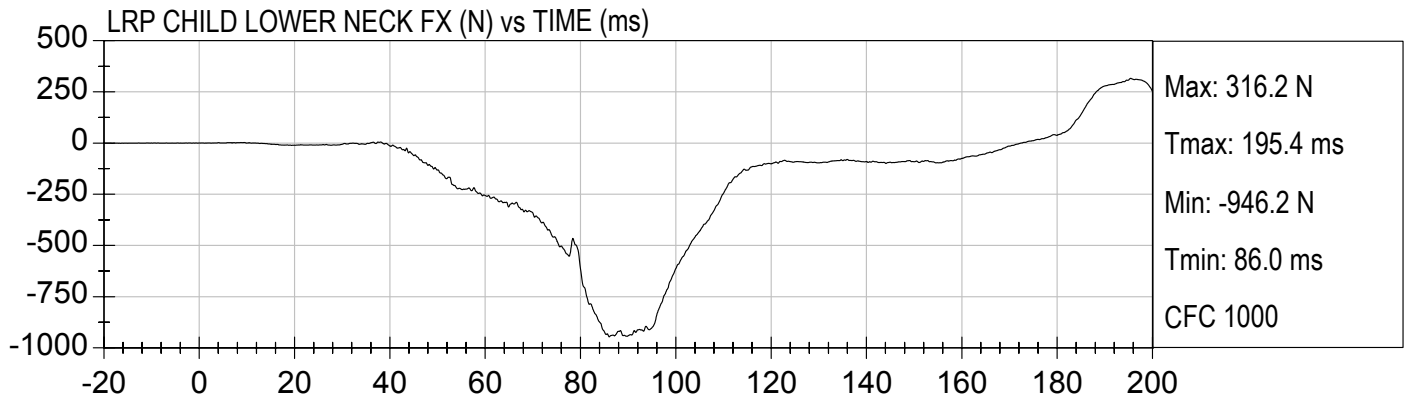






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2003 ZX2 2 DOOR

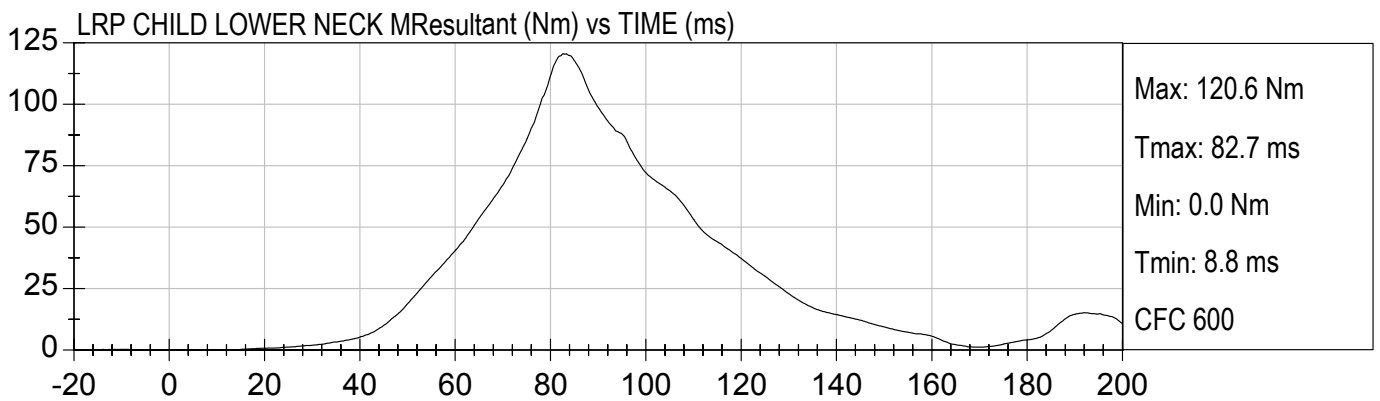
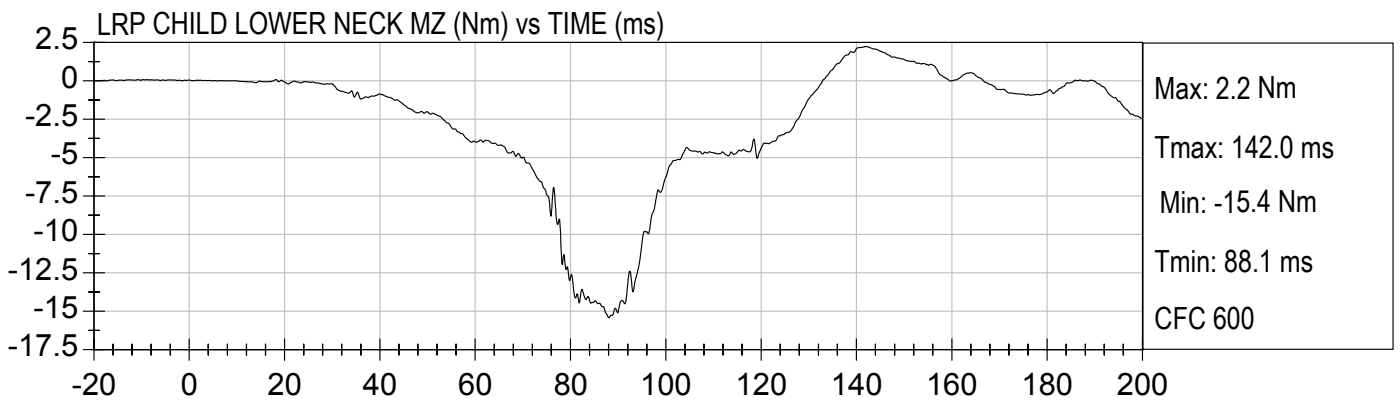
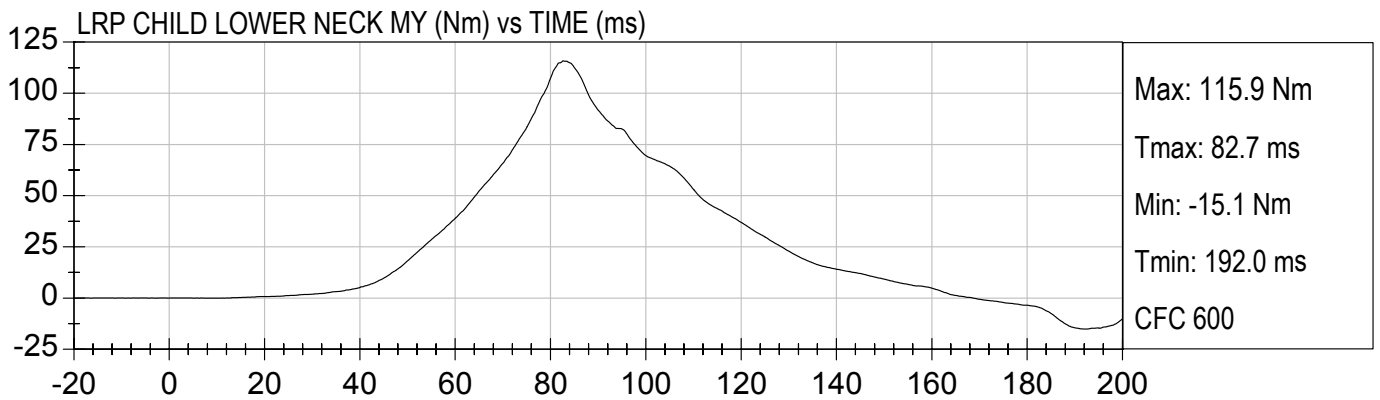
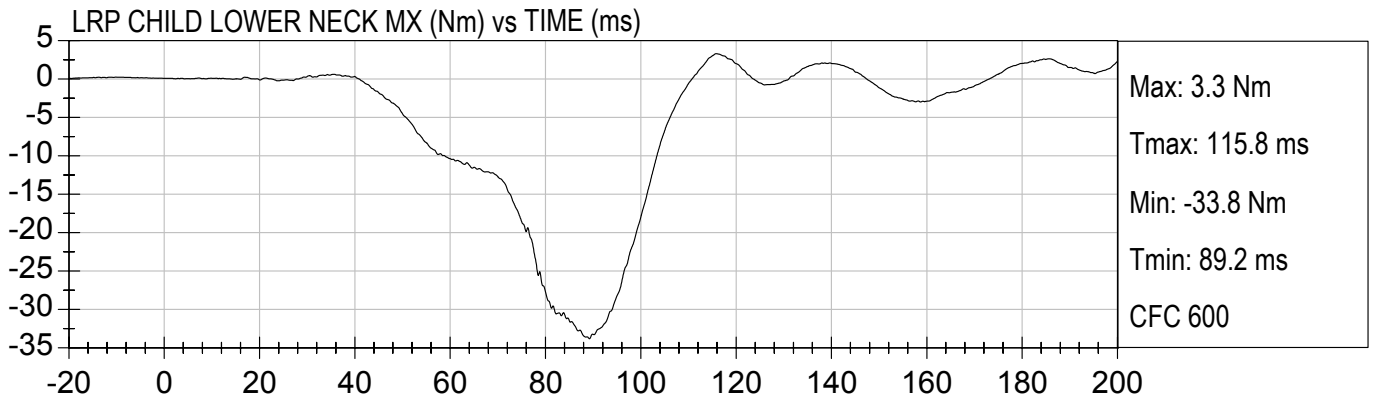
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2003 ZX2 2 DOOR

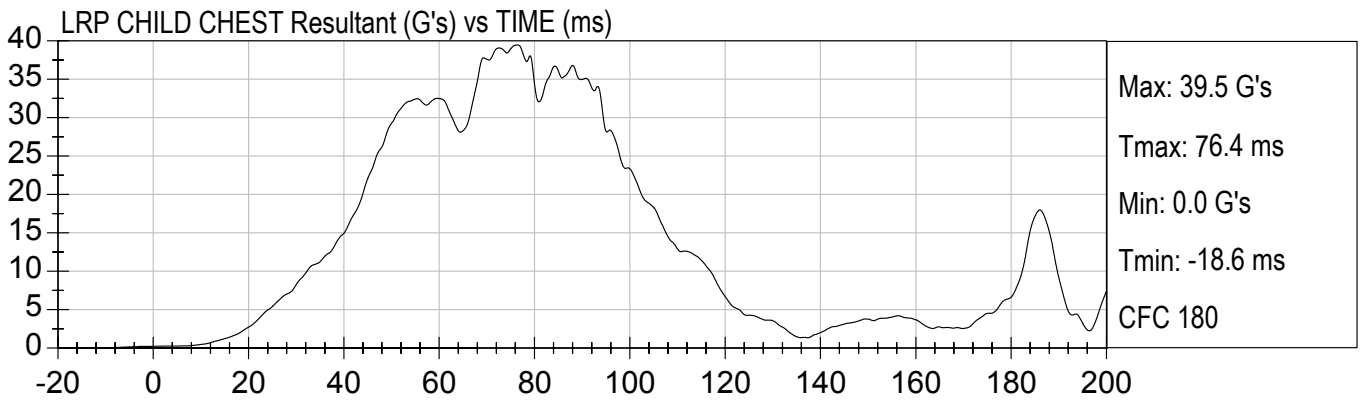
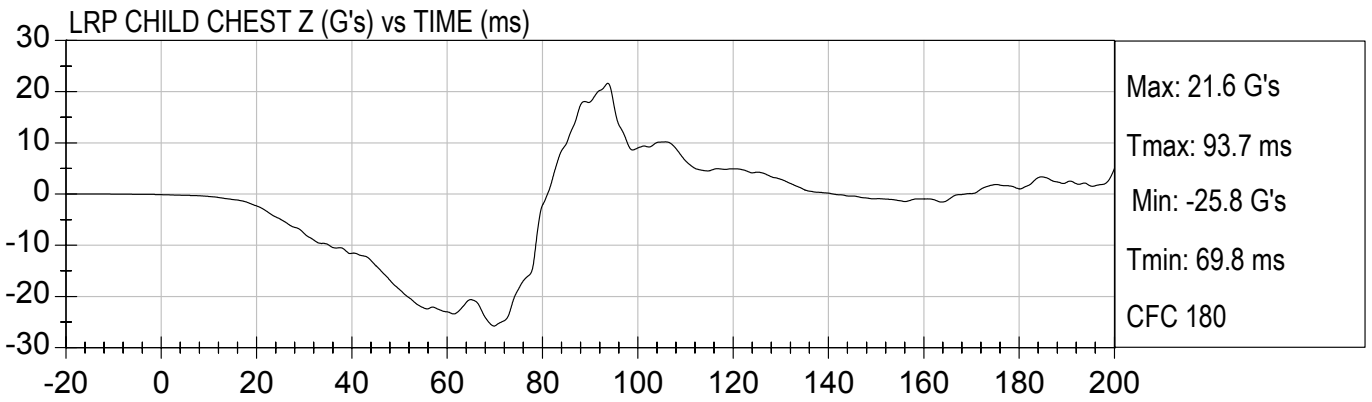
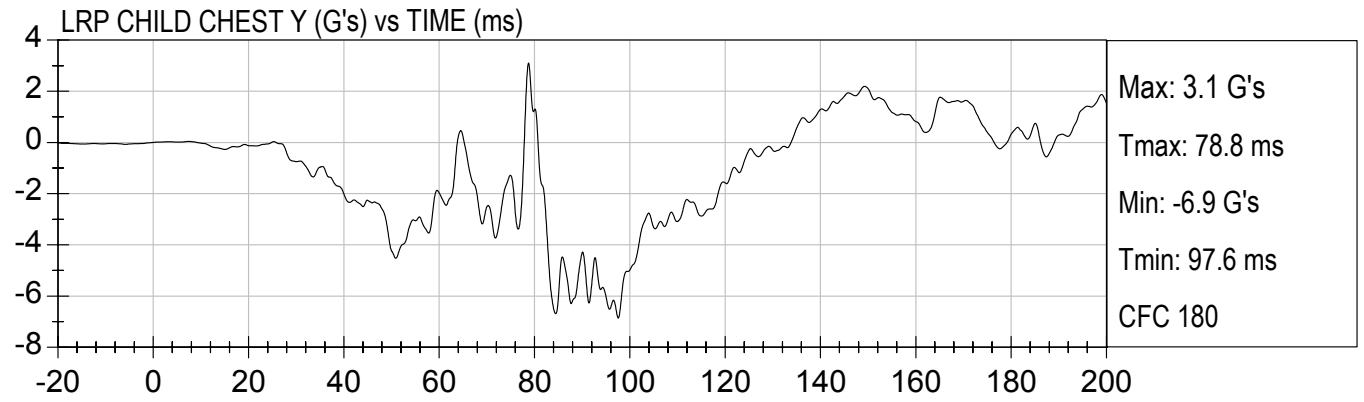
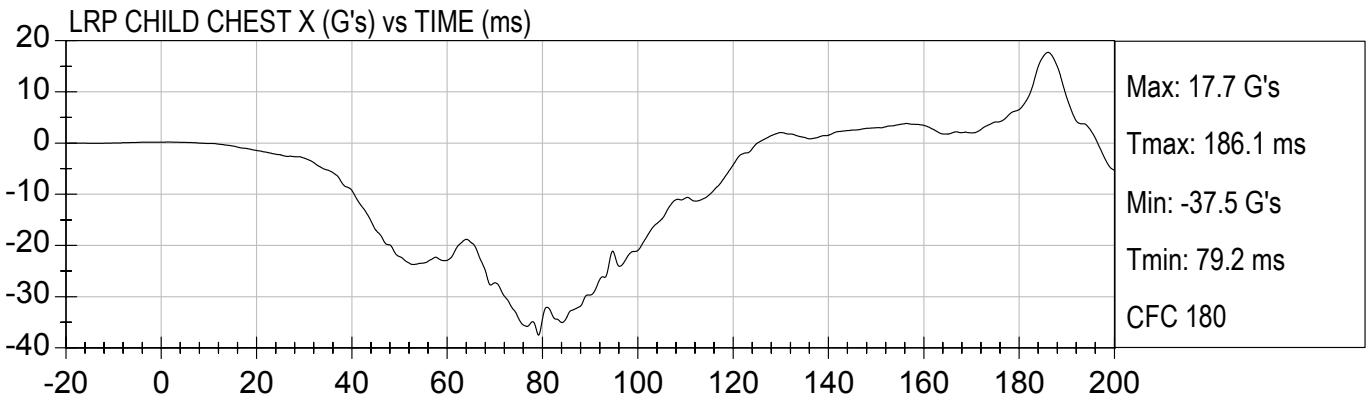
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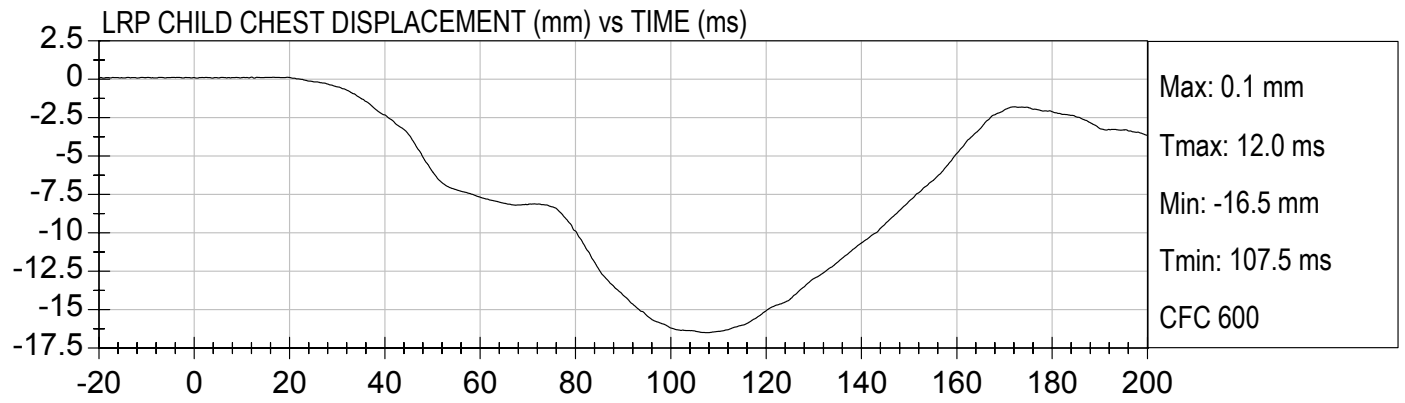
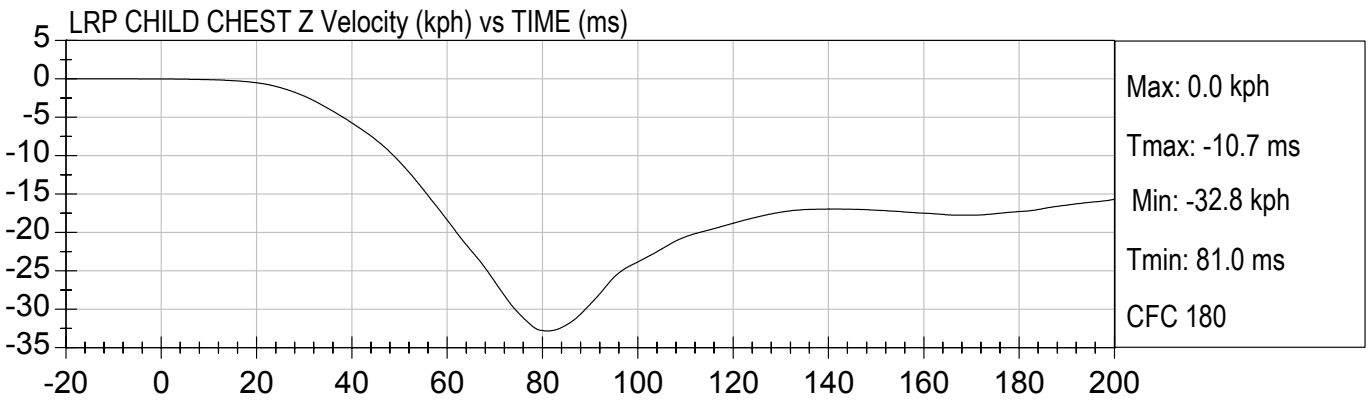
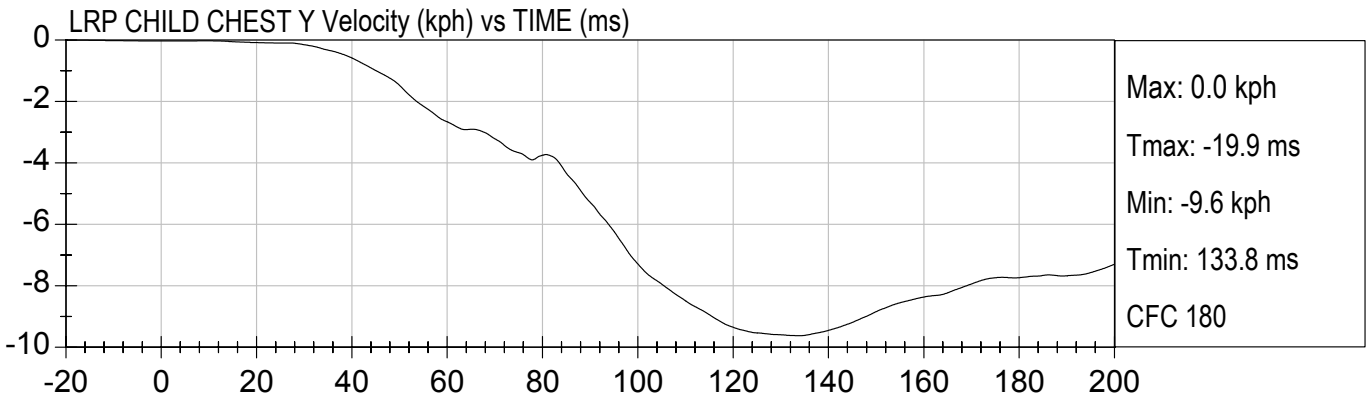
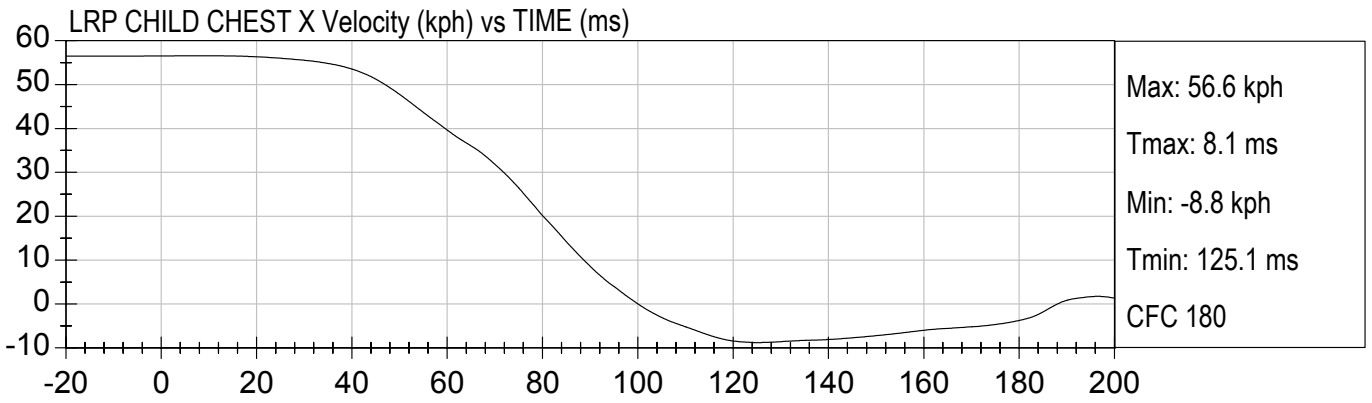


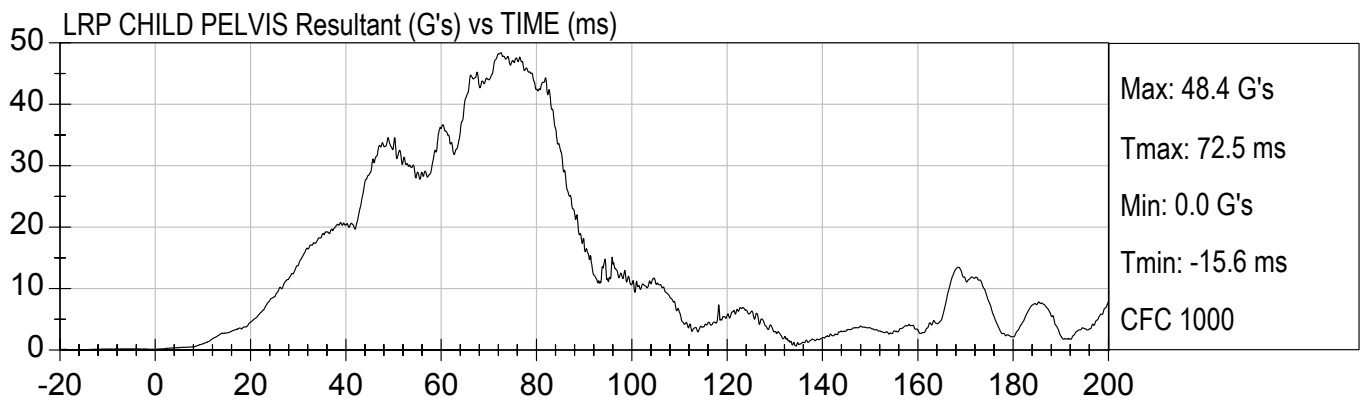
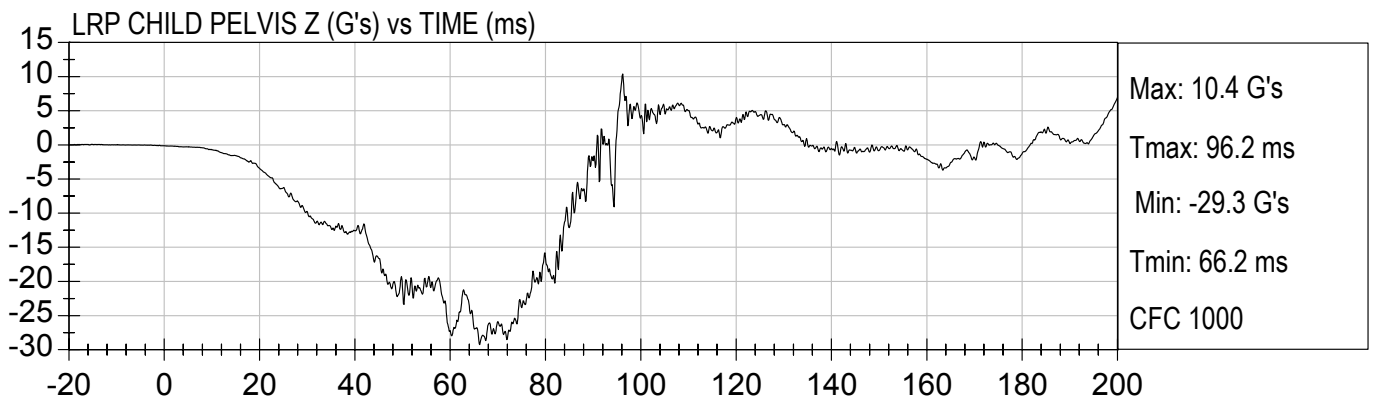
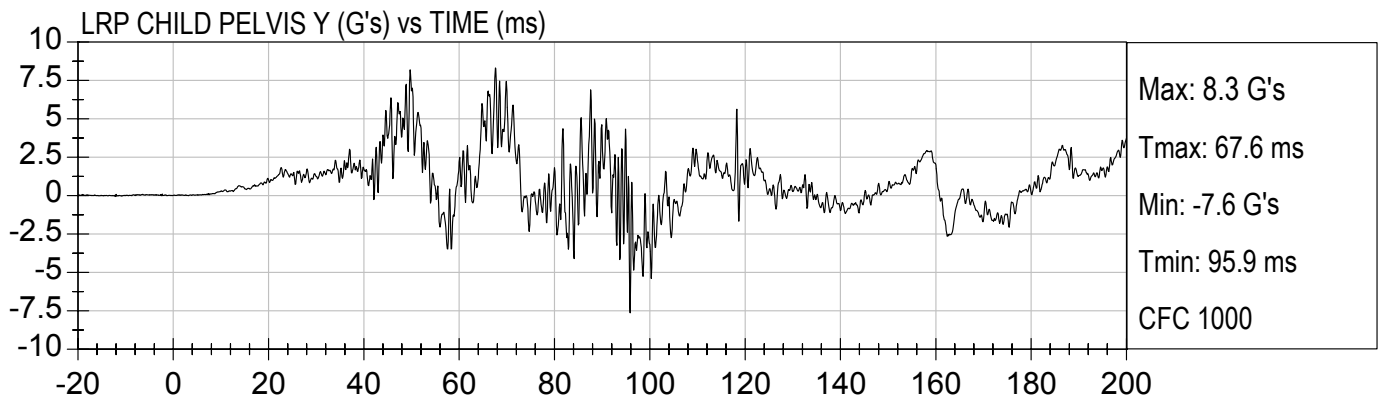
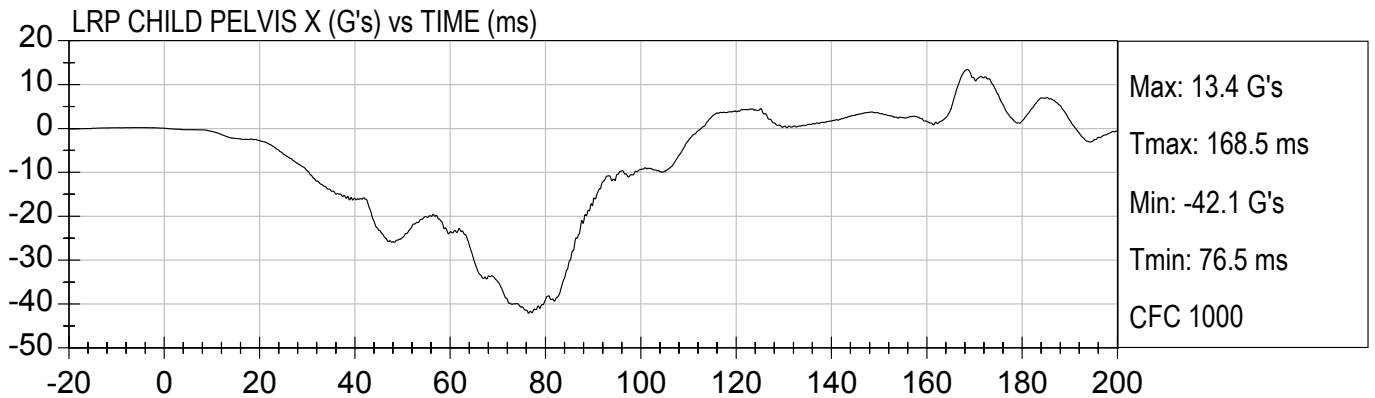


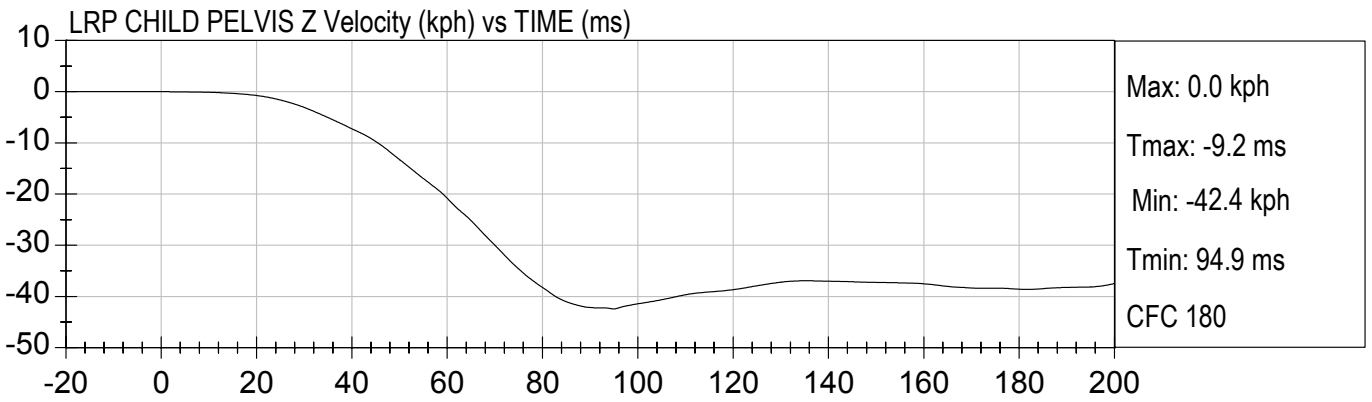
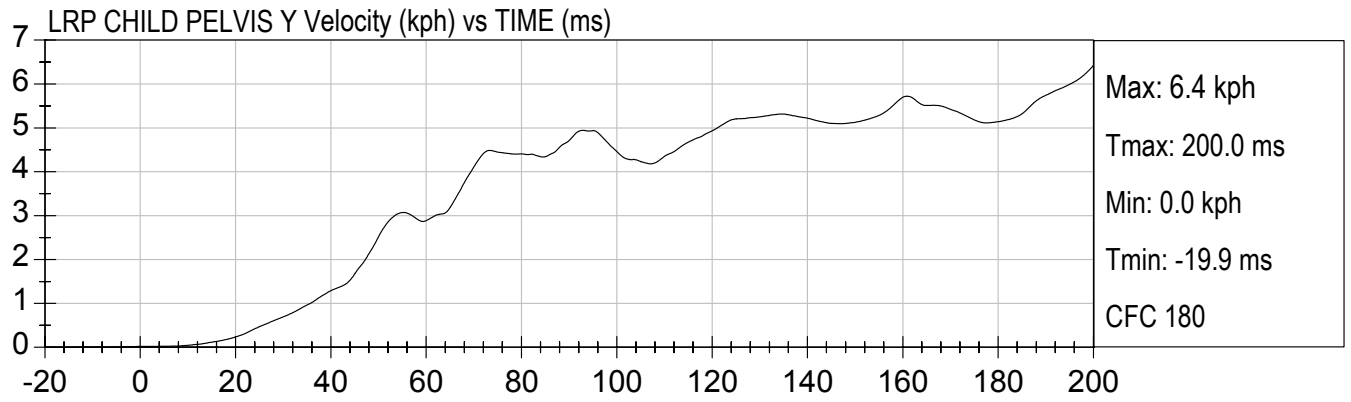
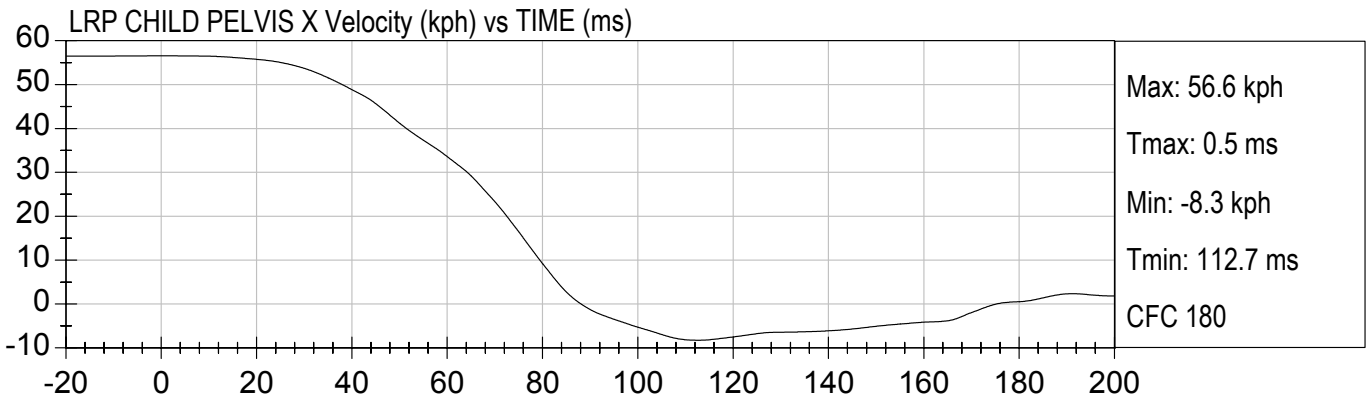
35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

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





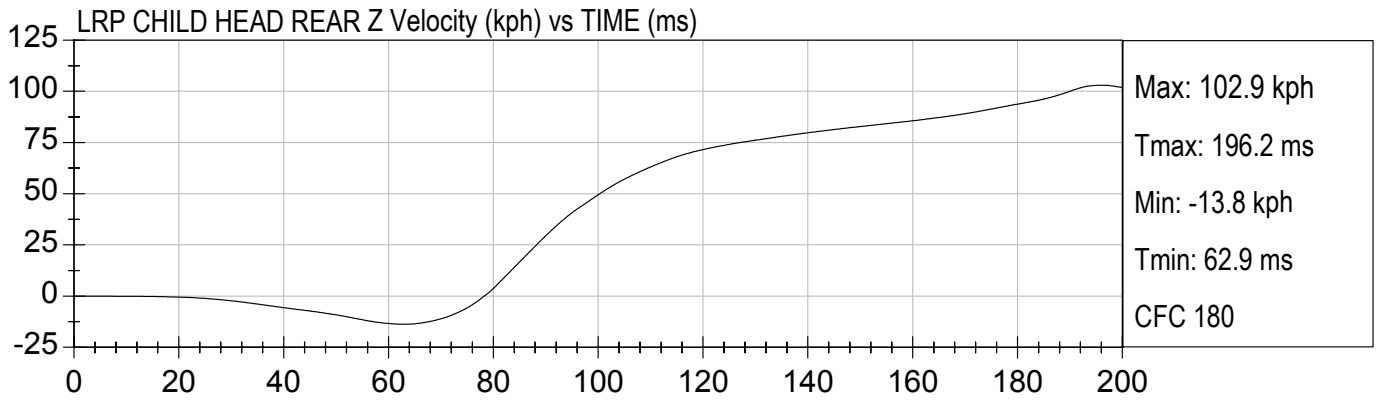
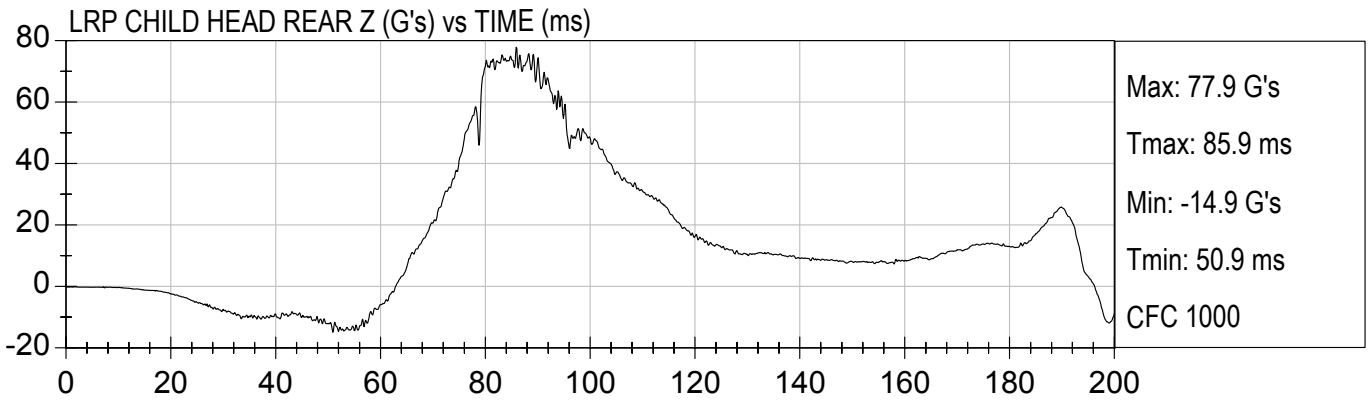






35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

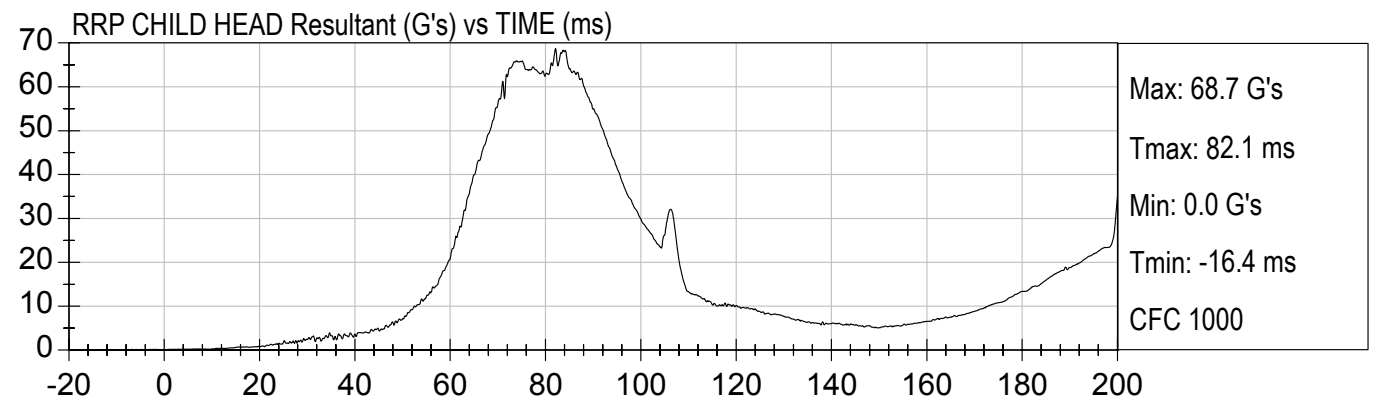
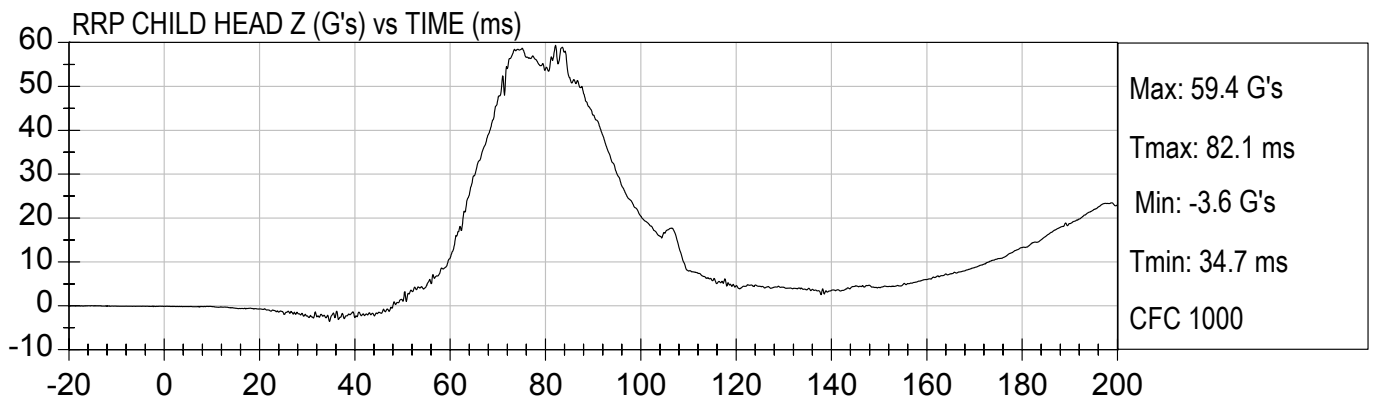
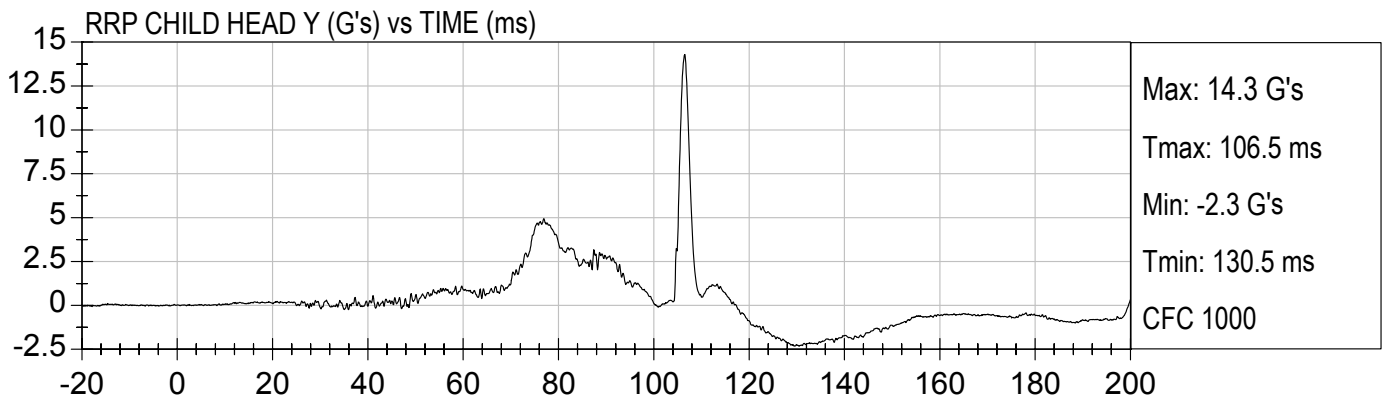
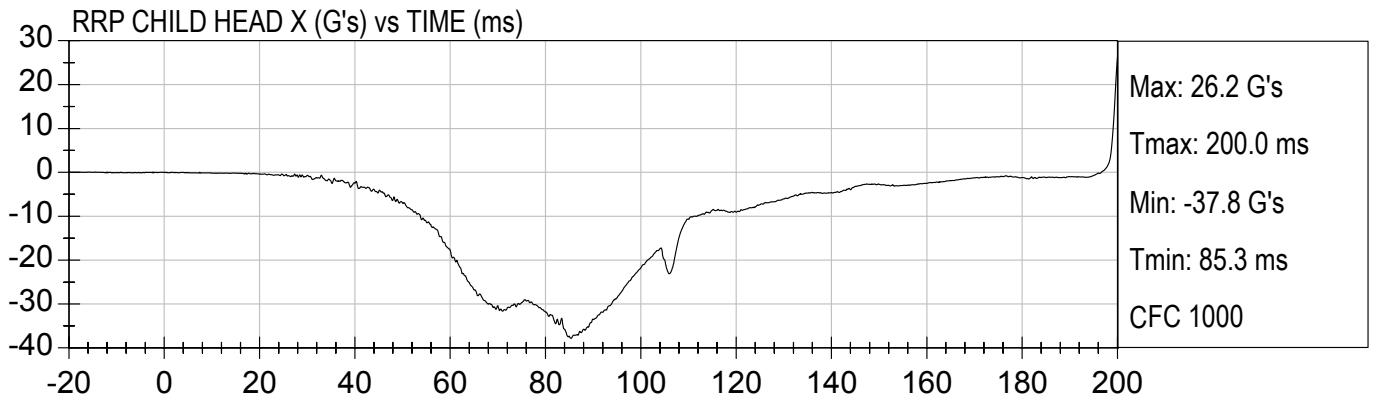
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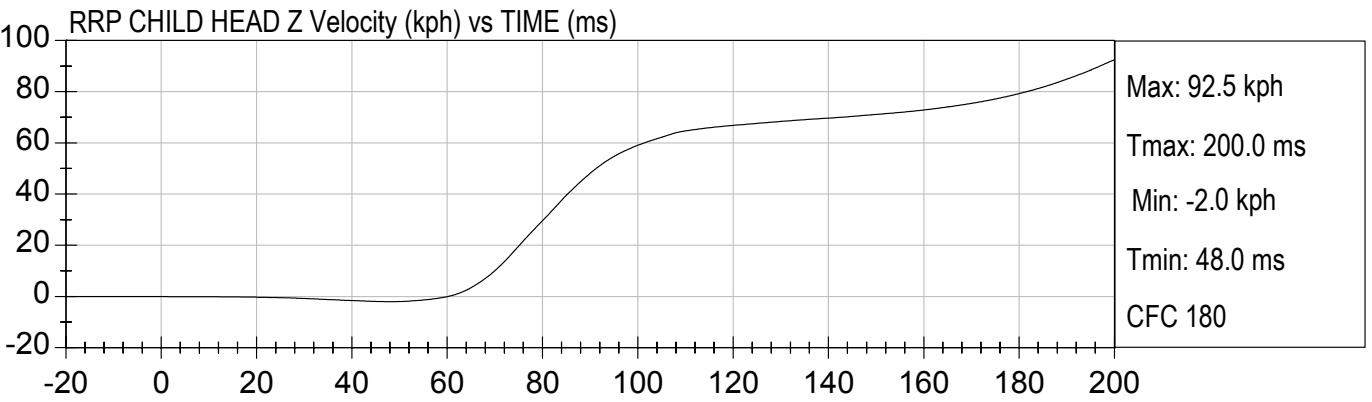
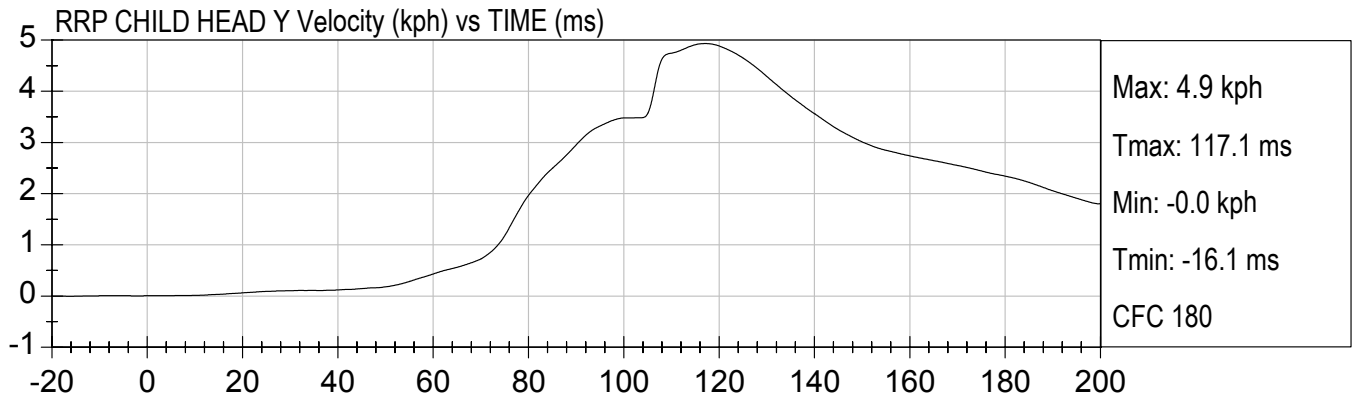
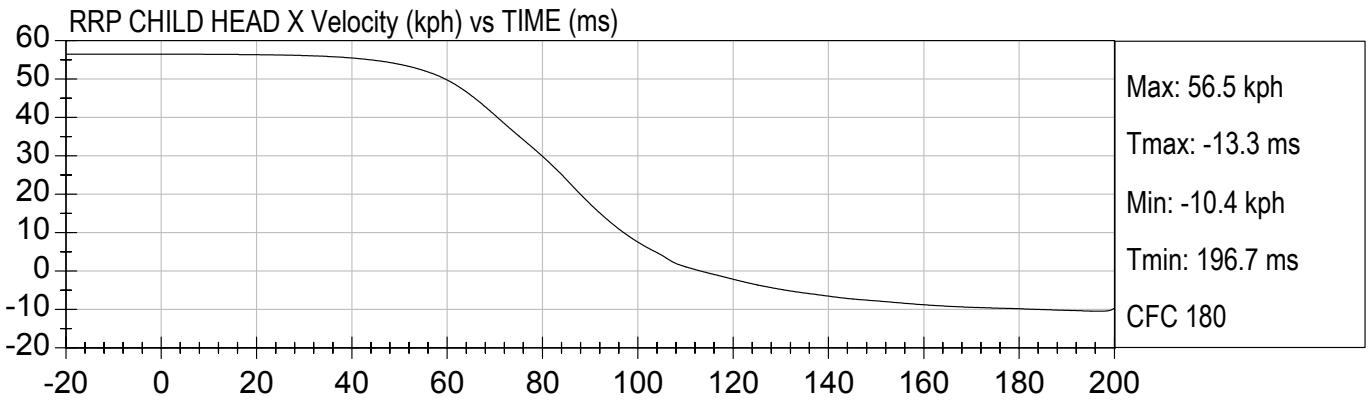




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2003 ZX2 2 DOOR

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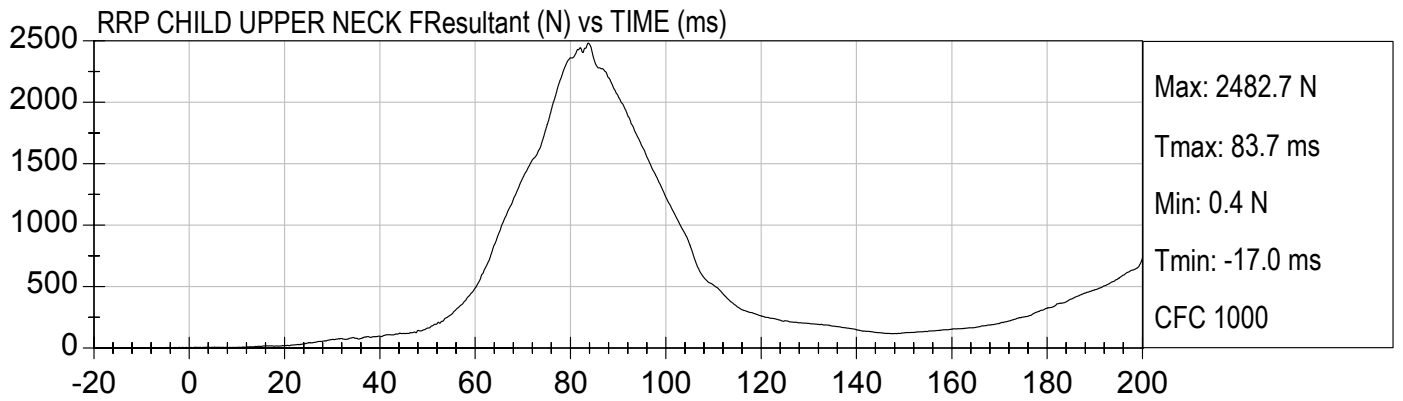
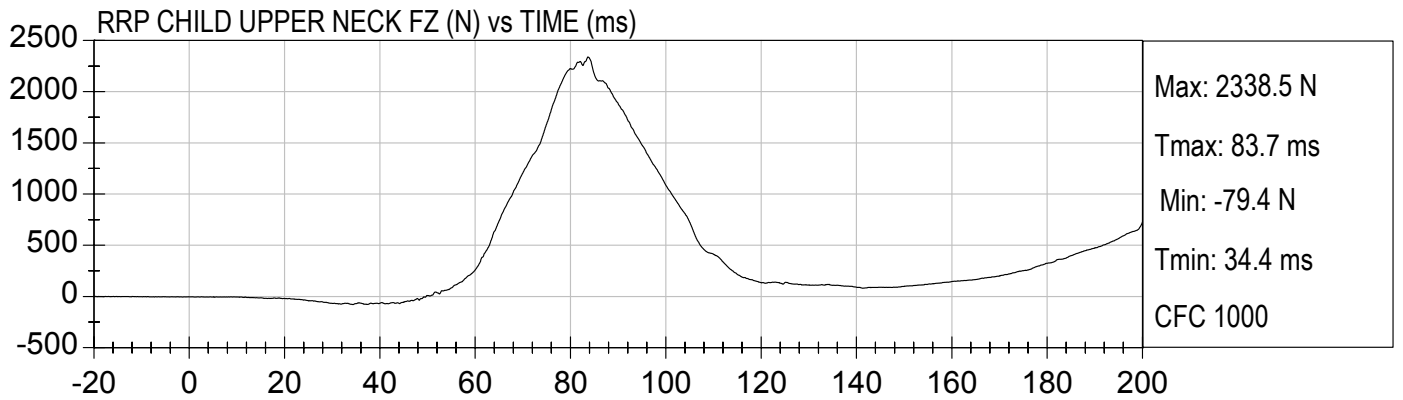
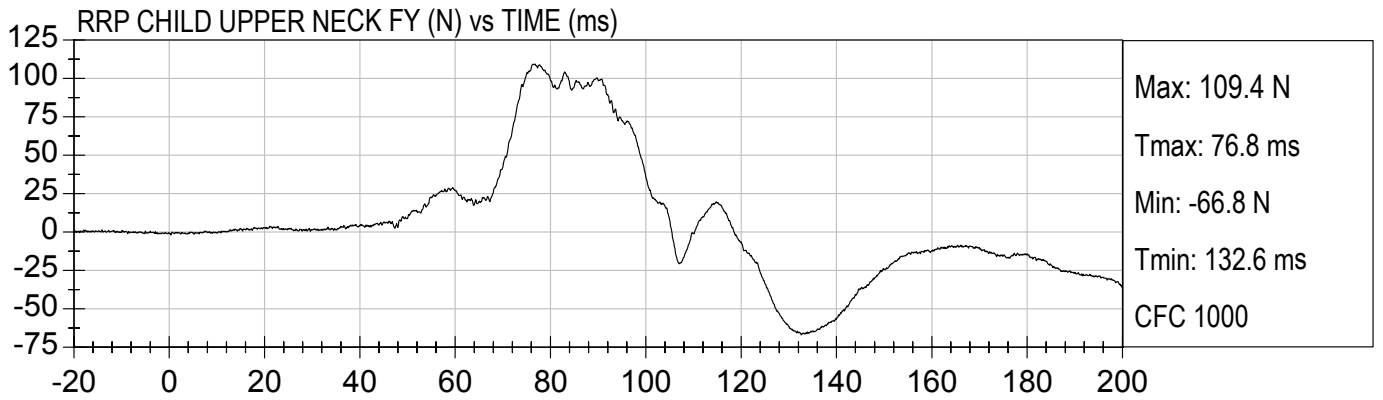
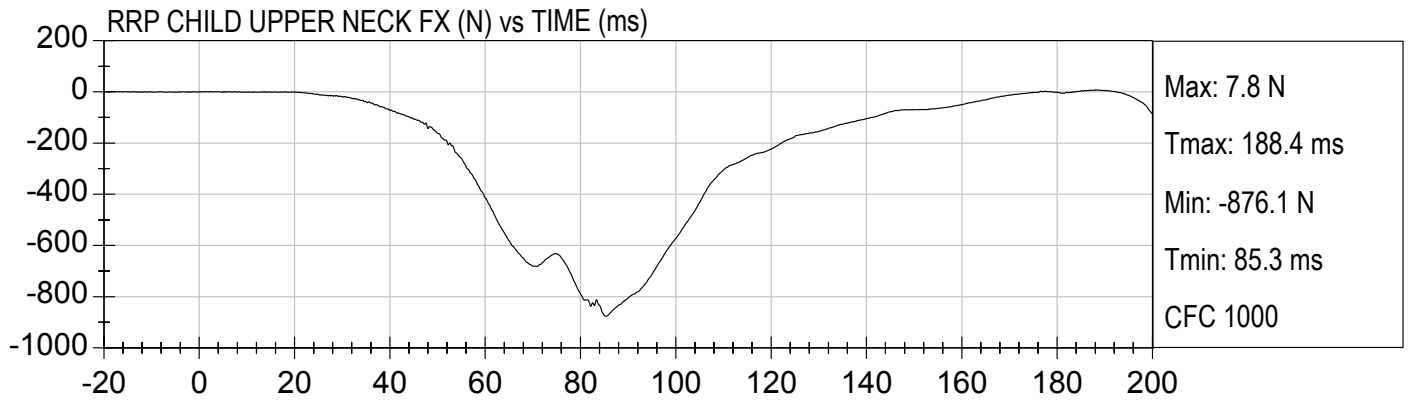






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2003 ZX2 2 DOOR

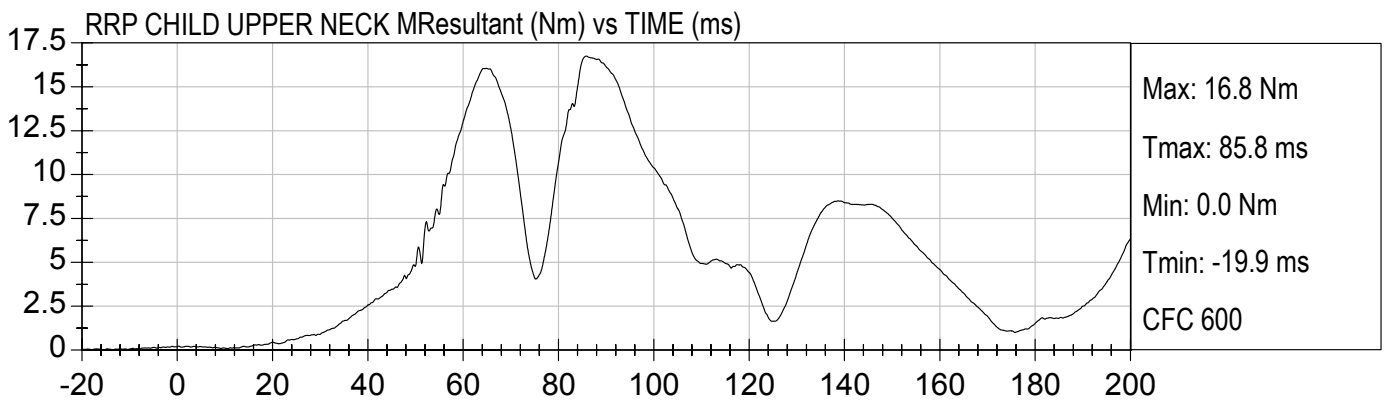
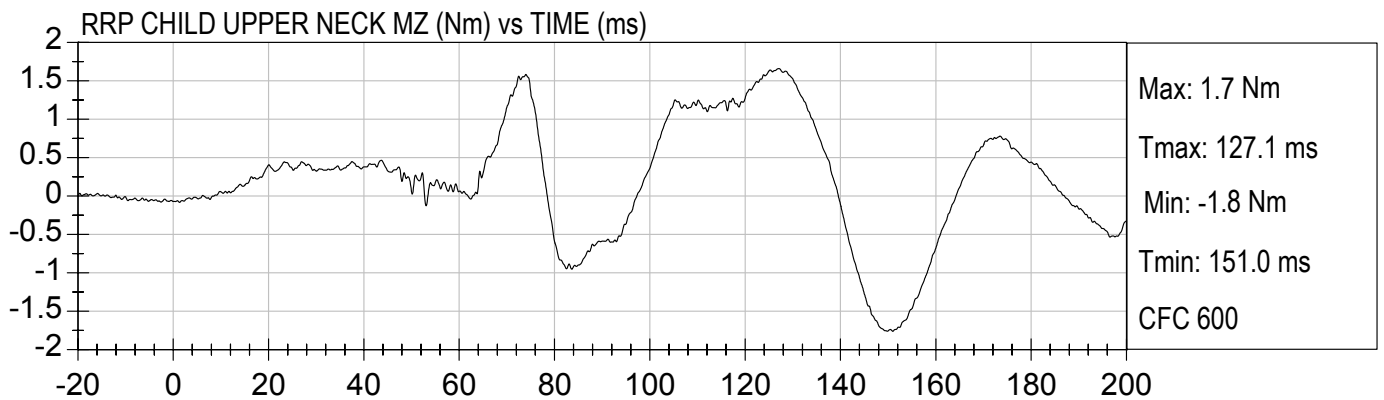
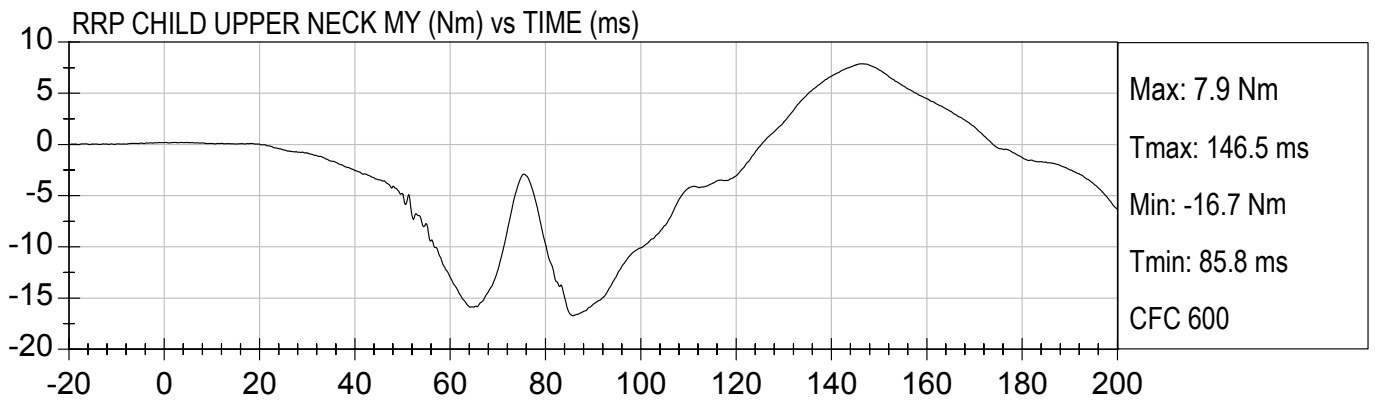
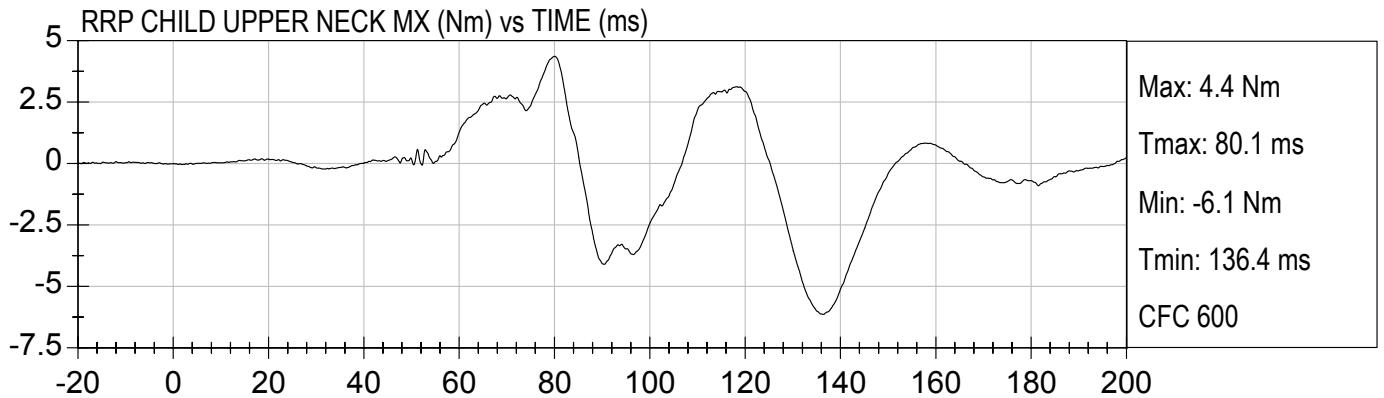
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35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

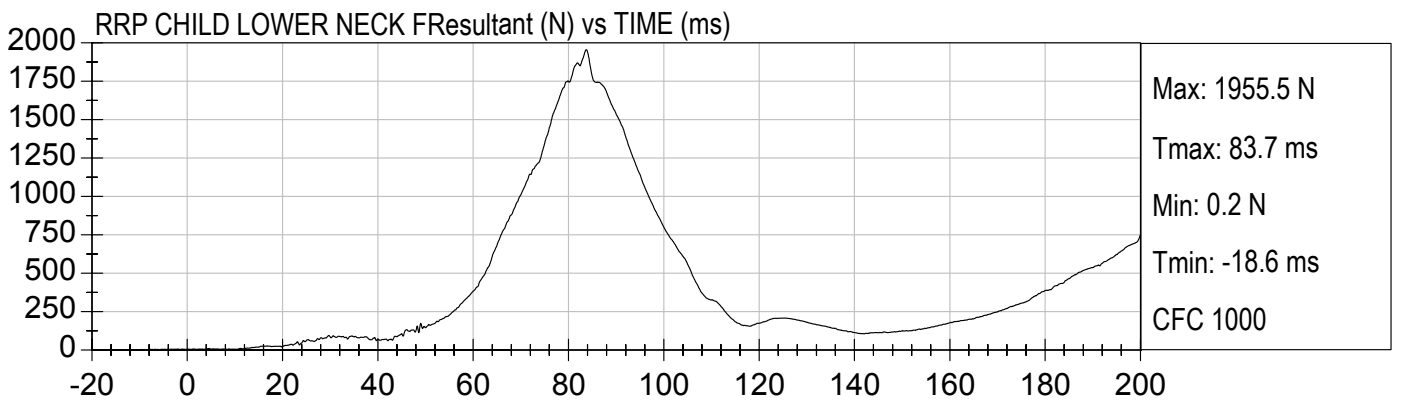
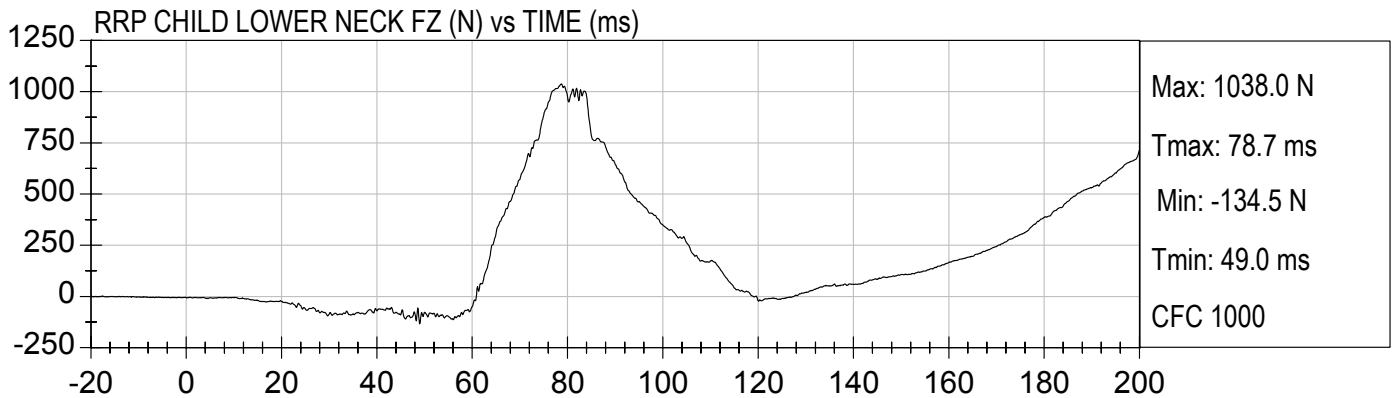
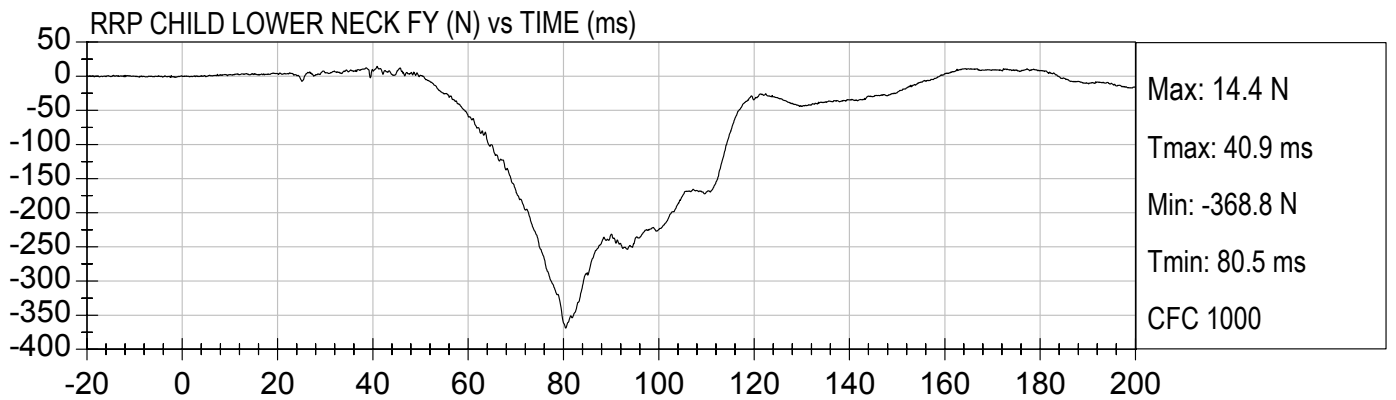
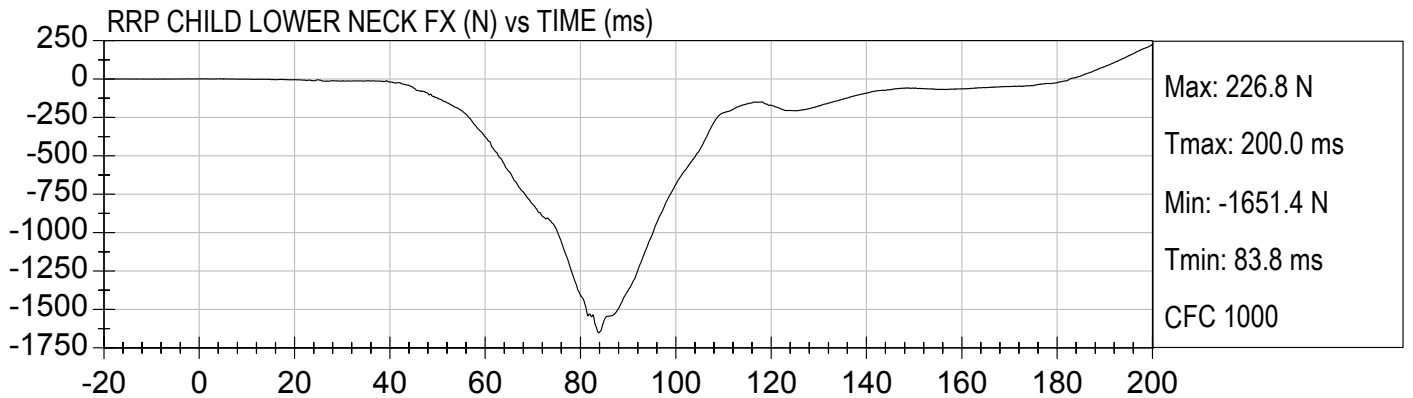
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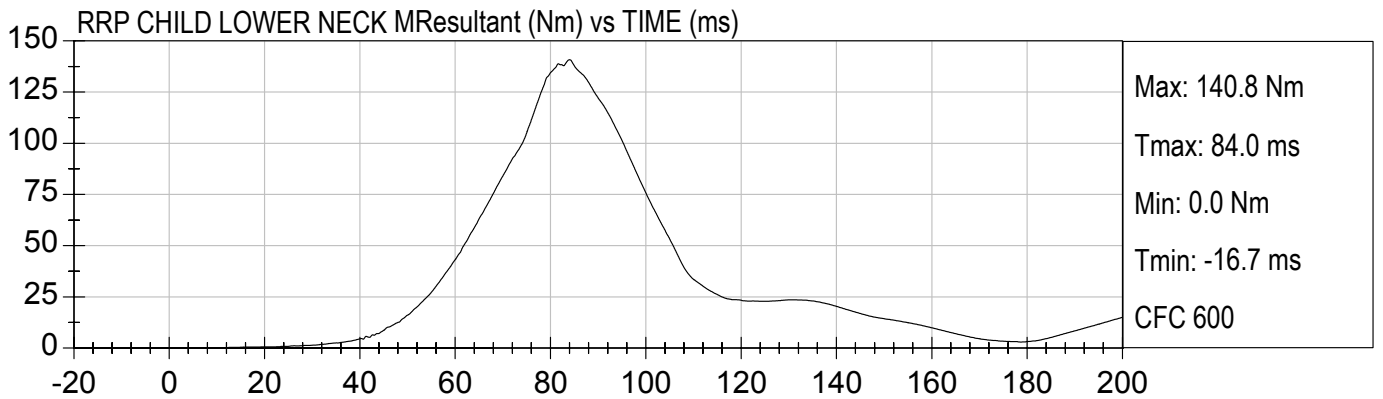
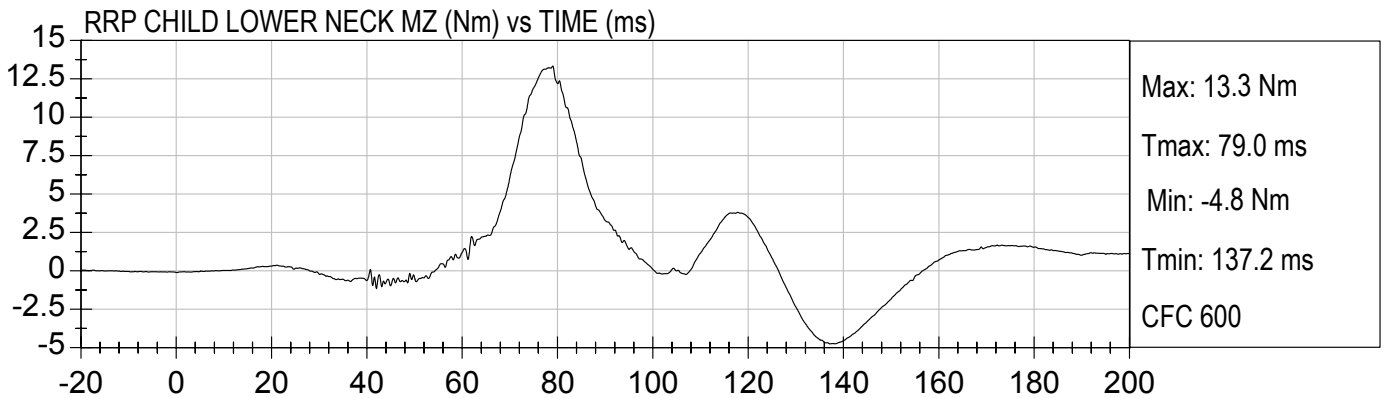
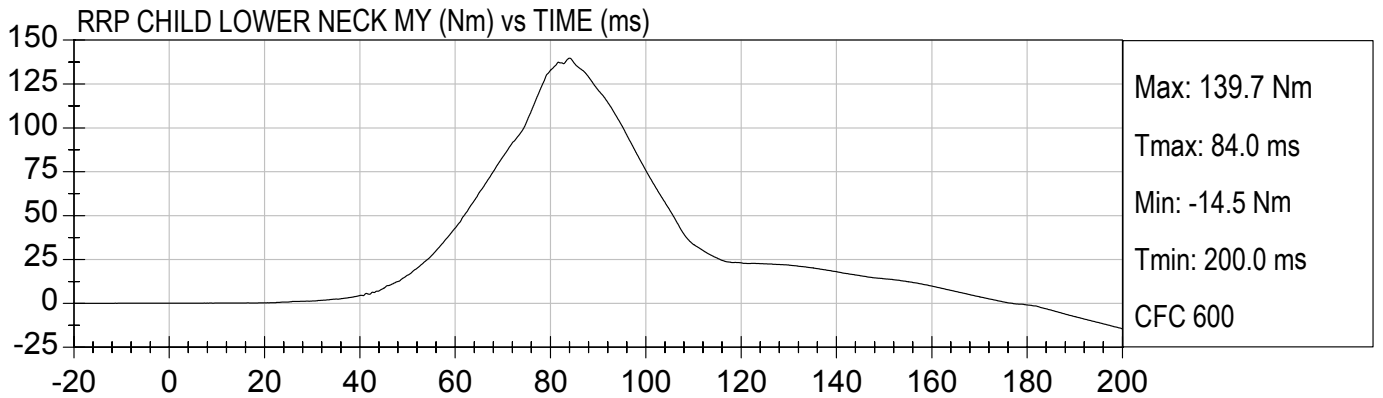
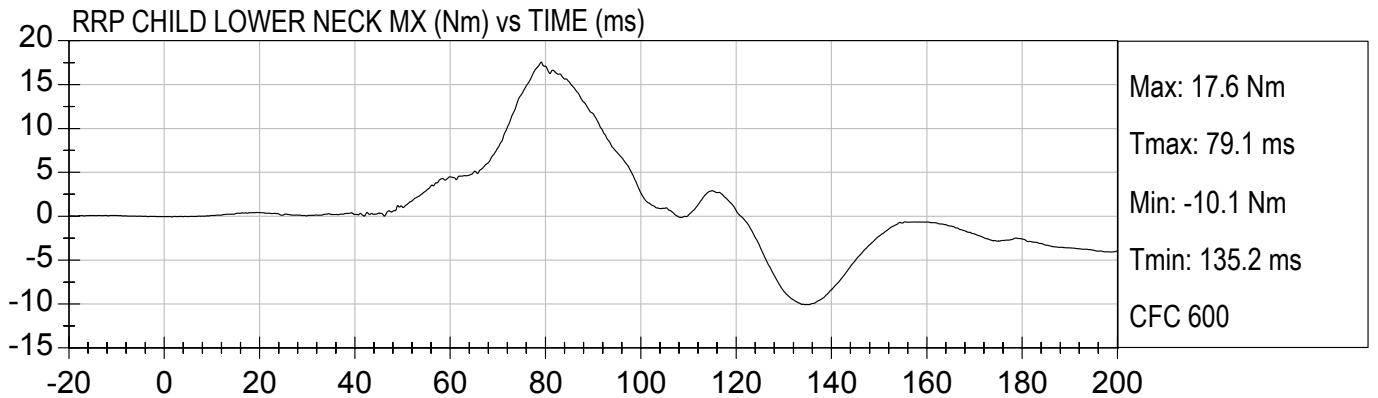
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35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

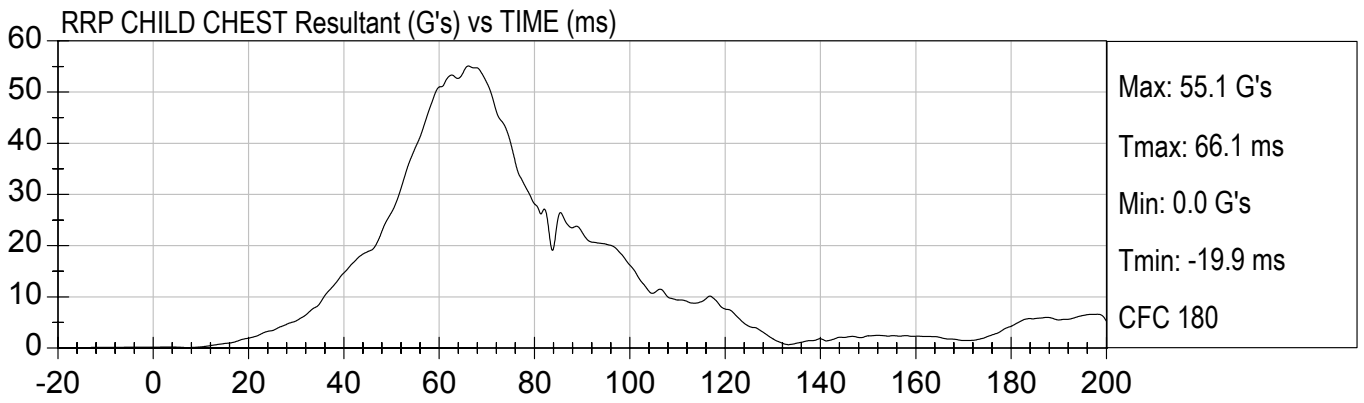
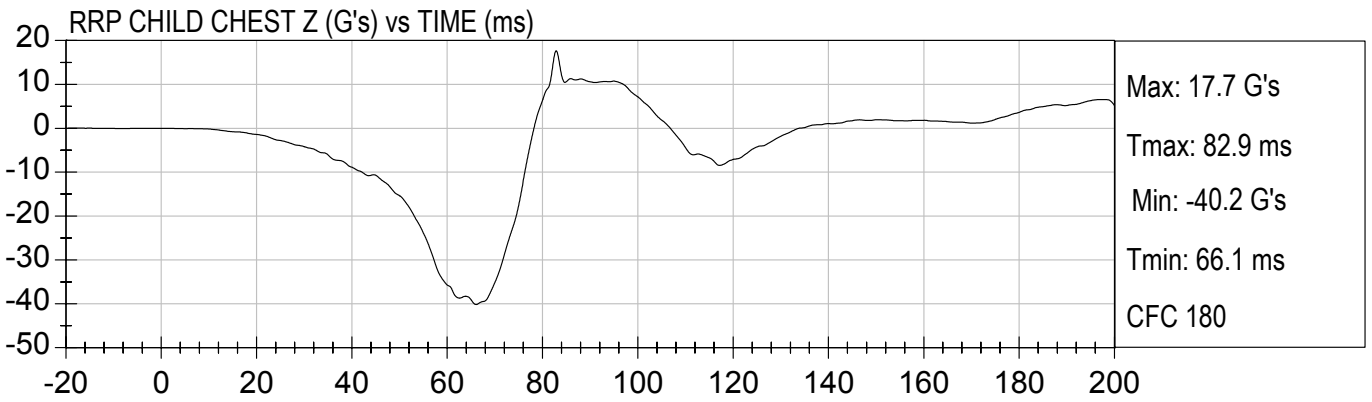
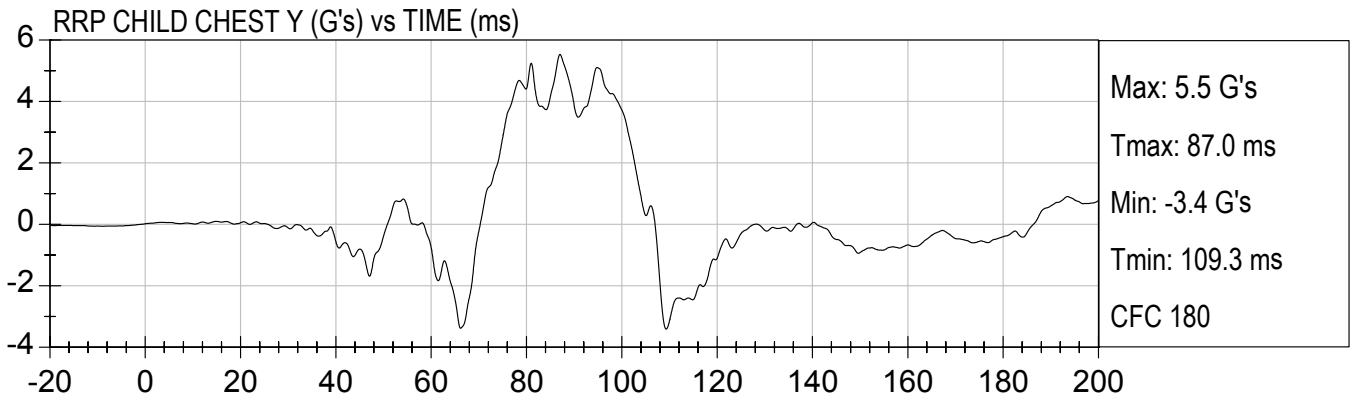
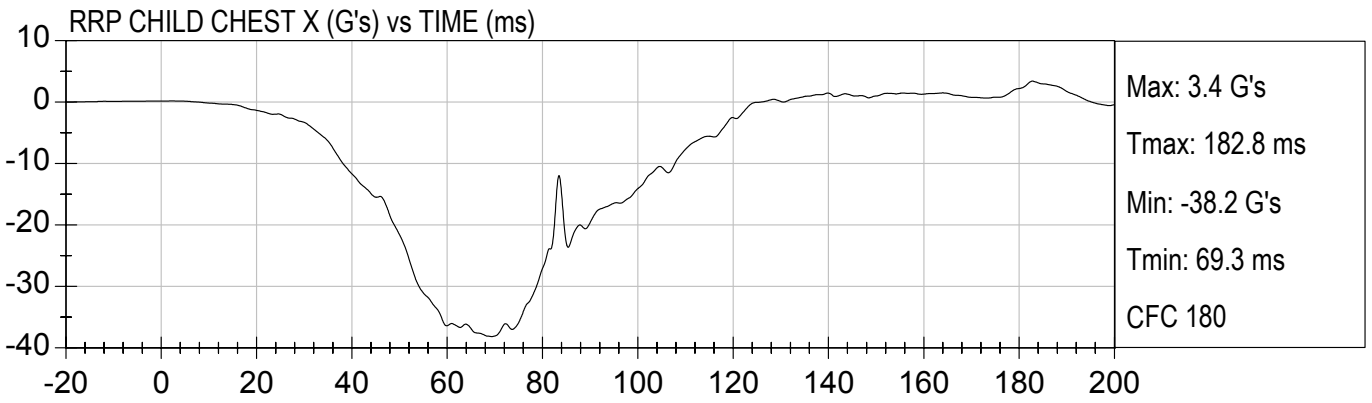
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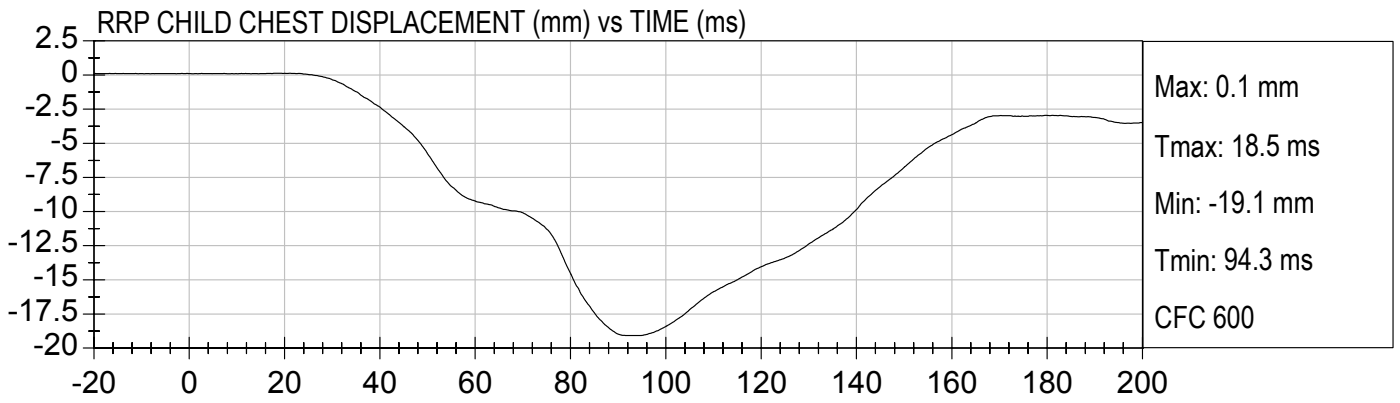
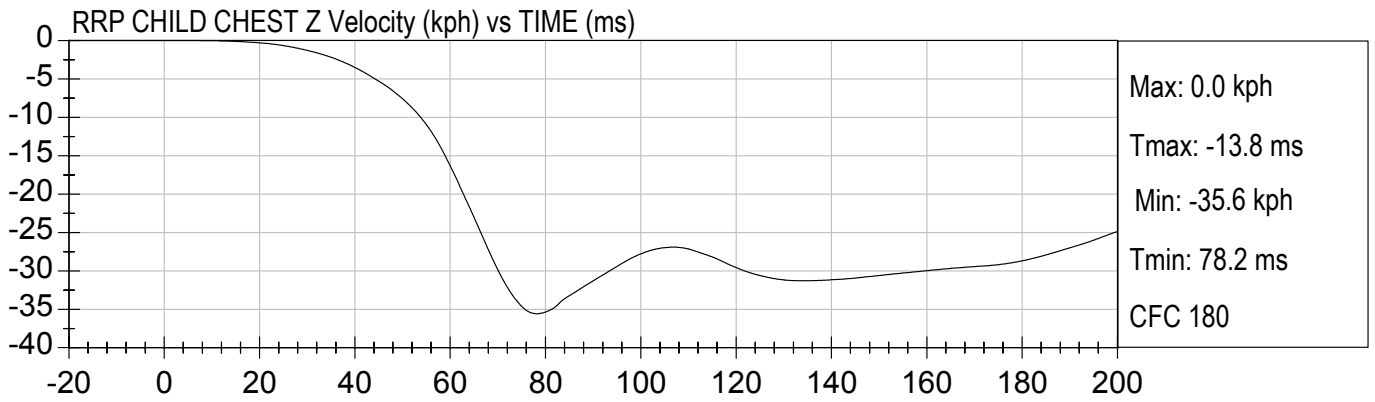
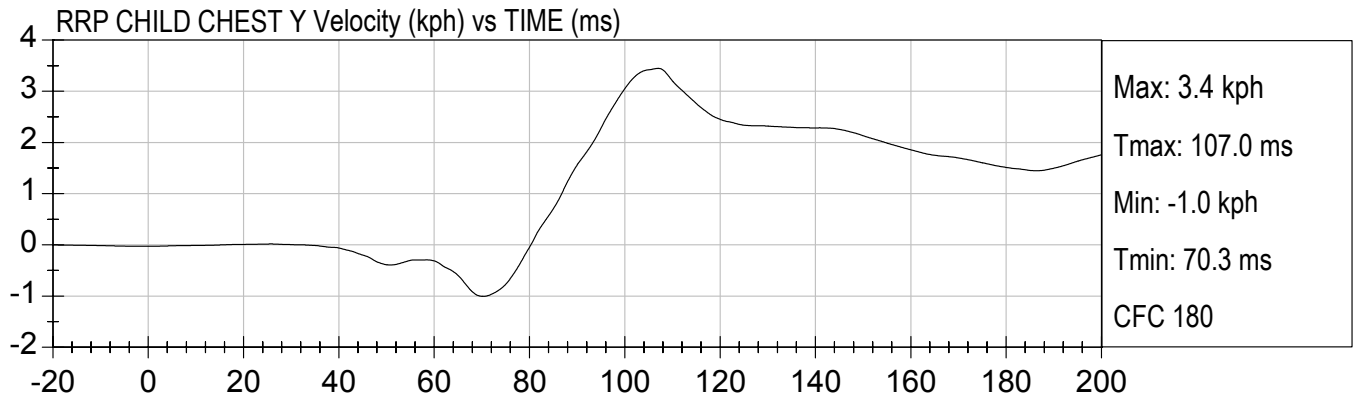
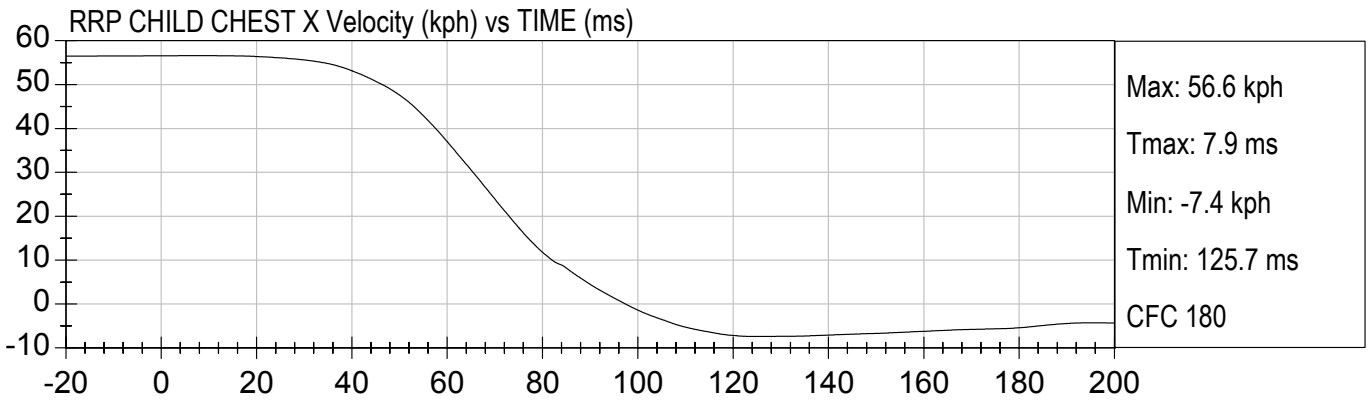




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2003 ZX2 2 DOOR

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Speed: 35.1 mph (56.5 km/h)

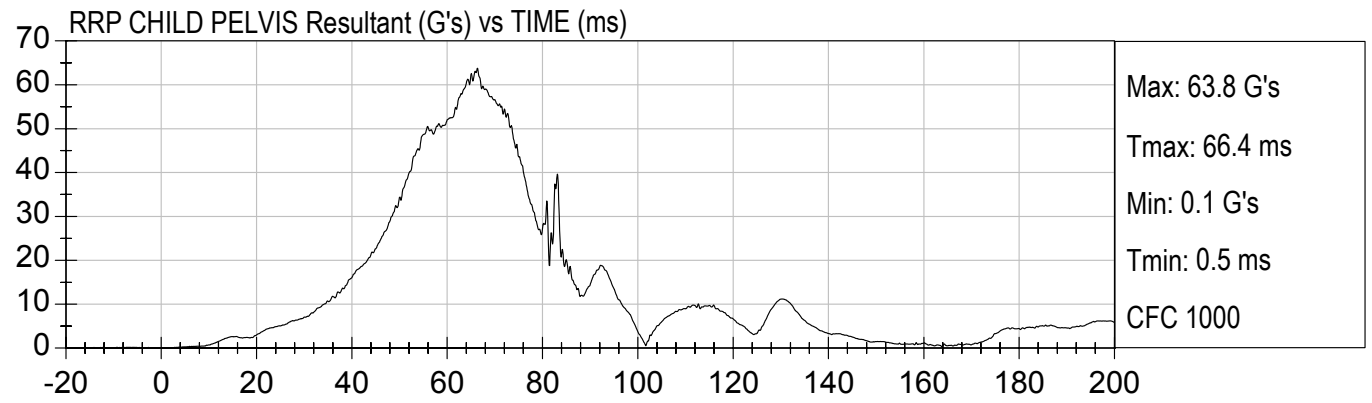
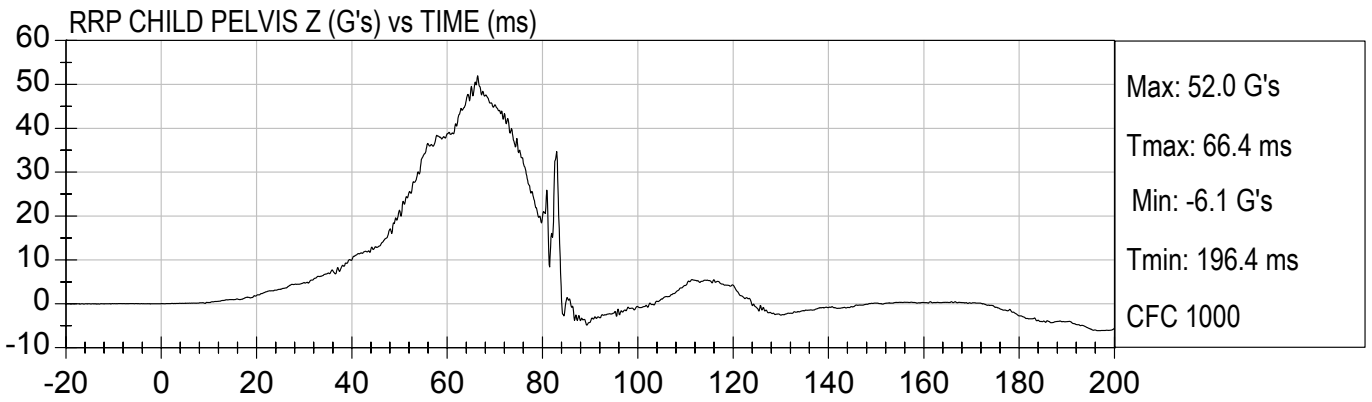
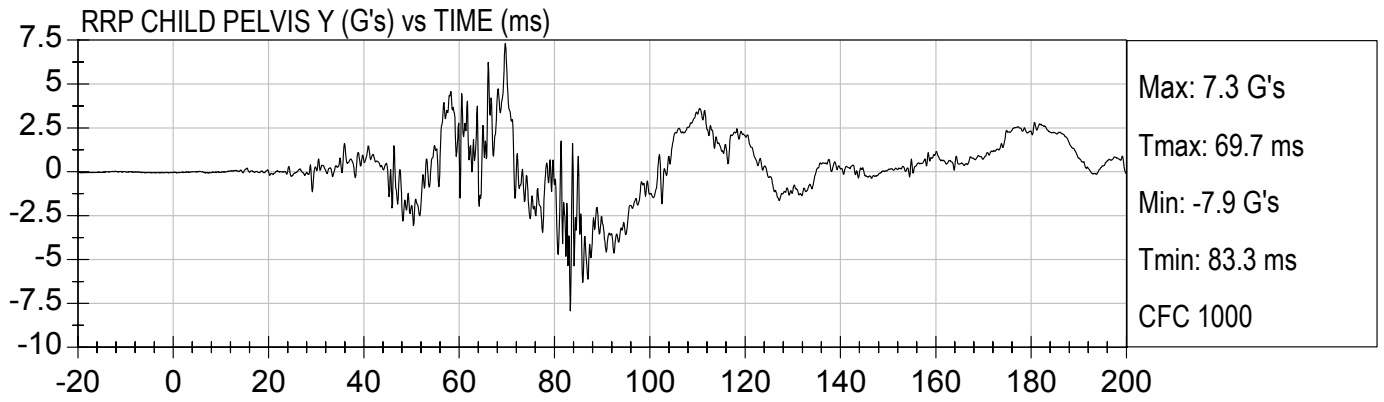
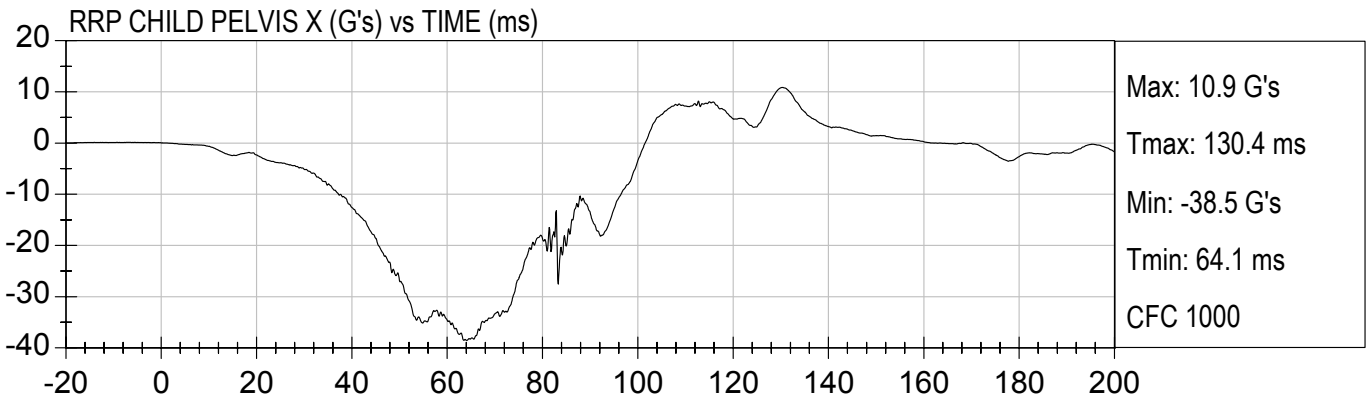






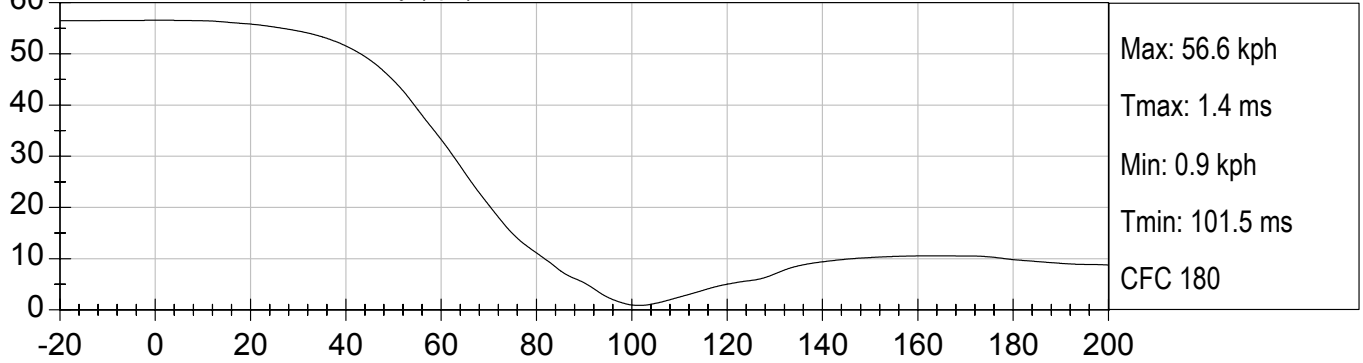
35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

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

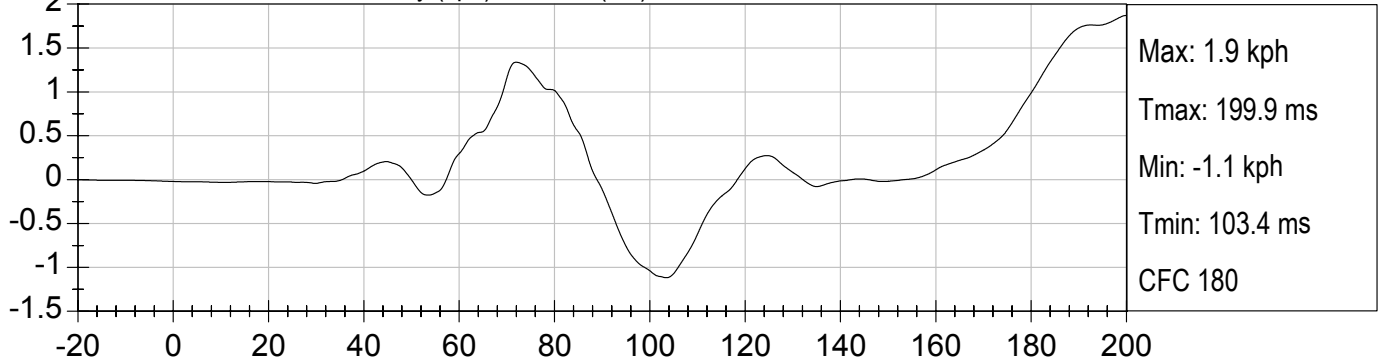




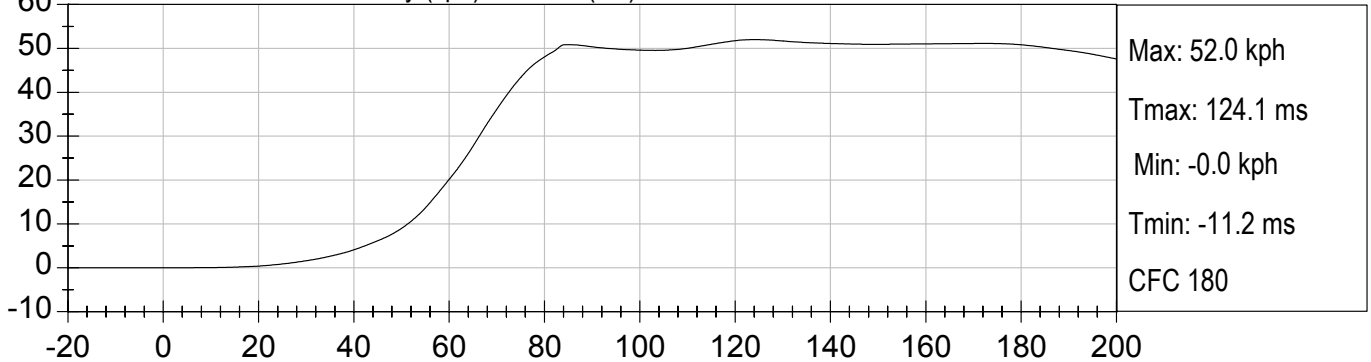
RRP CHILD PELVIS X Velocity (kph) vs TIME (ms)



RRP CHILD PELVIS Y Velocity (kph) vs TIME (ms)



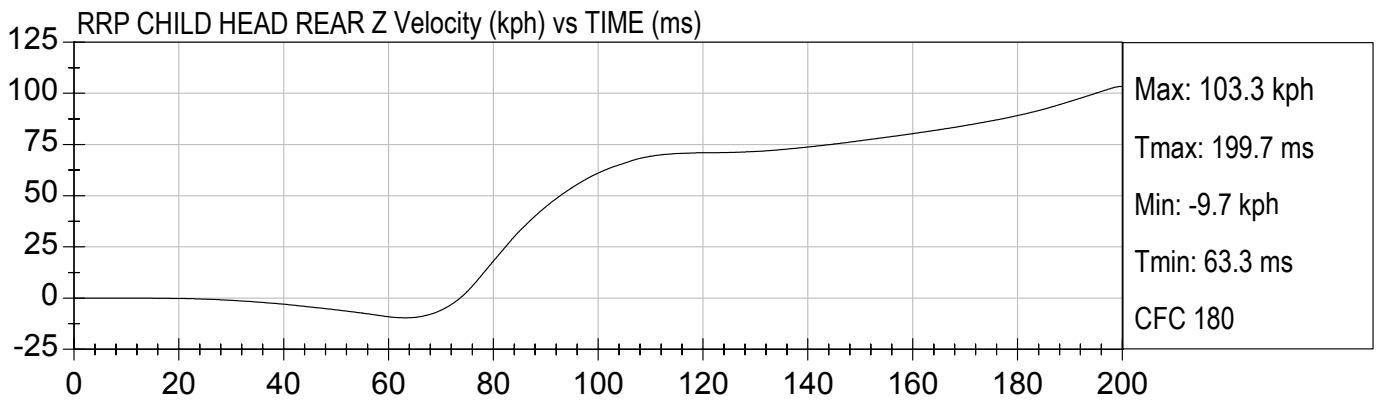
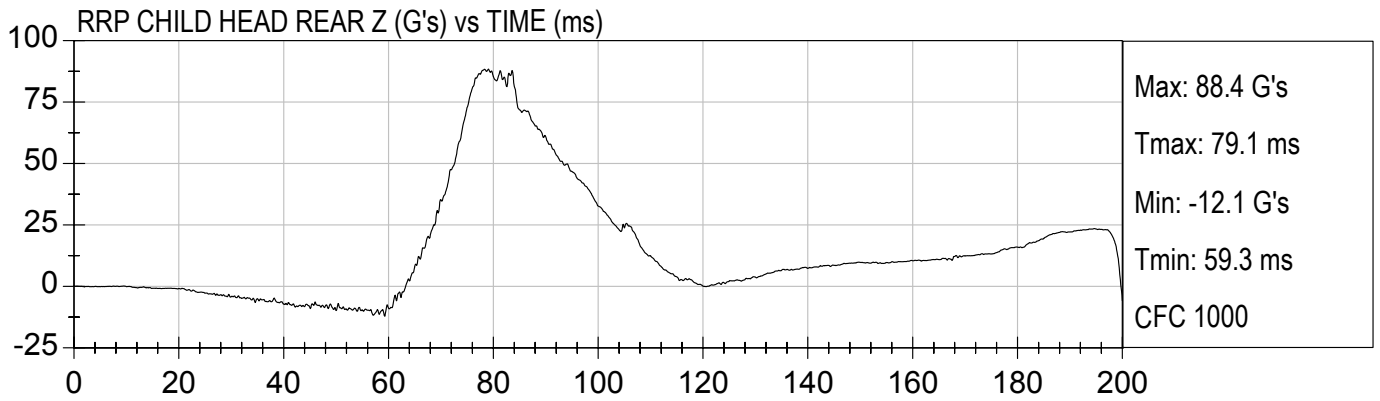
RRP CHILD PELVIS Z Velocity (kph) vs TIME (ms)





35 MPH FRONTAL IMPACT
2003 ZX2 2 DOOR

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



APPENDIX C
CHILD DUMMY CALIBRATION INFORMATION

Hybrid III Calibration Data Sheet
3 Year Old
Head Drop Calibration

ATD Serial No: 040

Test I.D.: D021451

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
Peak Resultant Acceleration	G's	225.0 to 275.0	267.1	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-5.2	Pass
Is Acceleration Unimodal?	Yes/No	< 10% Peak	Yes	Pass
Overall Test Results				Pass

 Laboratory Technician

 11/13/2002
 Test Date

 Approved By



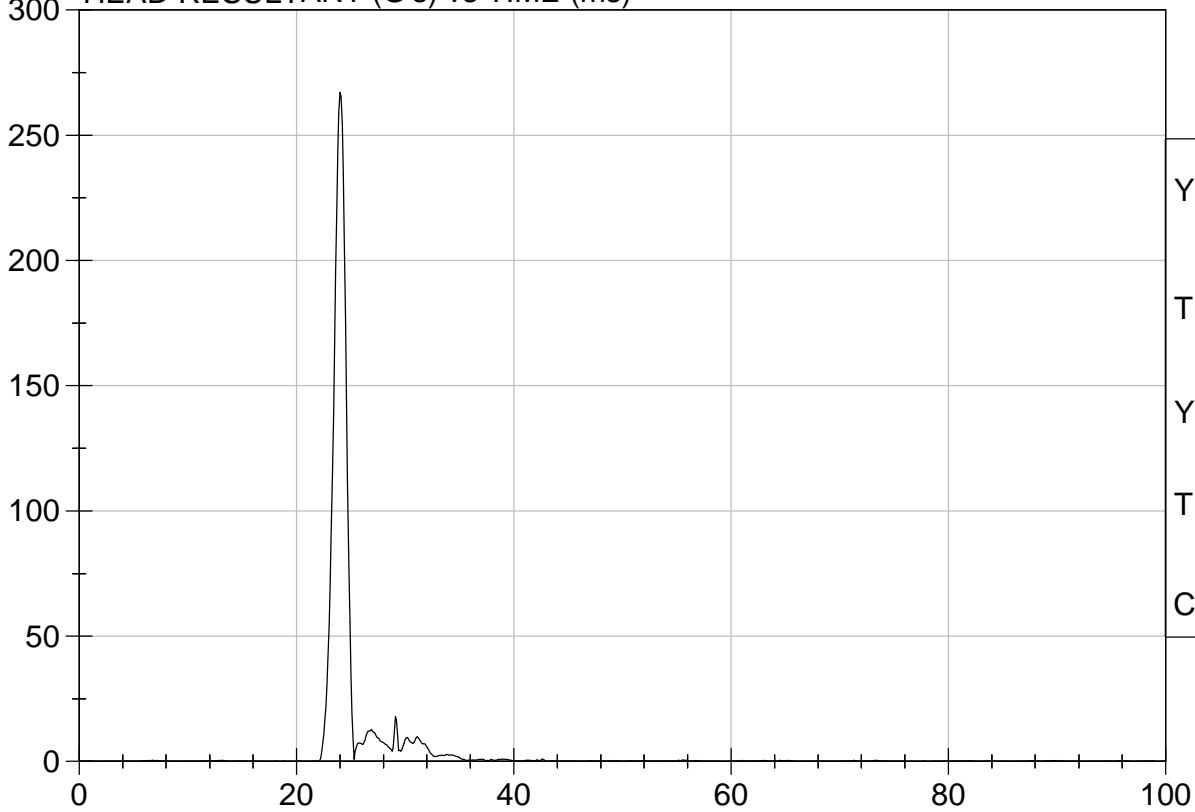
Test Description: Head Drop

Test Date: 11/13/2002

Component: D021451

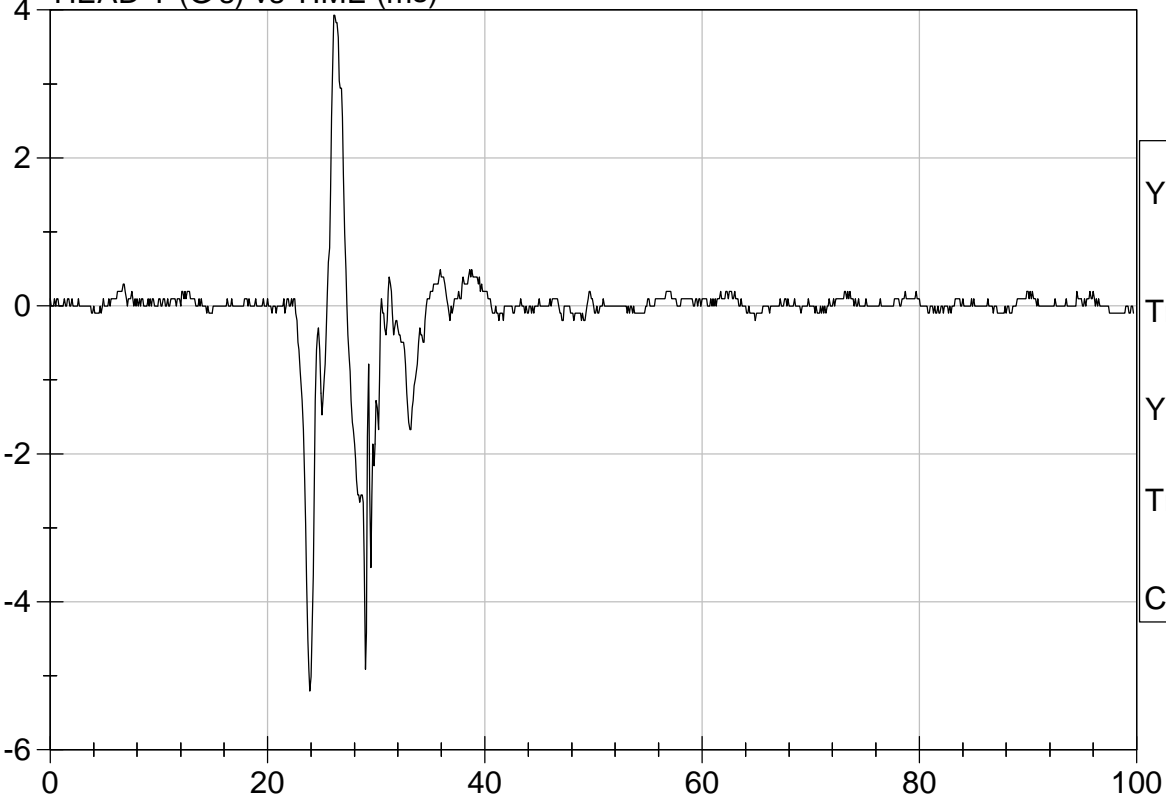
Speed: 0 ft/s, 0.00 m/s

HEAD RESULTANT (G's) vs TIME (ms)



YMax: 267.1 G
Tmax: 24.0 ms
YMin: 0.0 G
Tmin: 0.2 ms
CFC 1000

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



YMax: 3.9 G
Tmax: 26.1 ms
YMin: -5.2 G
Tmin: 23.9 ms
CFC 1000

Hybrid III Calibration Data Sheet
3 Year Old
Neck Flexion Test

ATD Serial No: 040

Test I.D: D021452

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity		%	10 to 70	29	Pass
Pendulum Speed		m/s	5.4 to 5.6	5.49	Pass
Pendulum Deceleration	10 msec	m/s	2.0 - 2.7	2.2	Pass
	15 msec	m/s	3.0 - 4.0	3.2	Pass
	20 msec	m/s	4.0 - 5.1	4.4	Pass
D Plane Rotation		deg	70 - 82	78.0	Pass
Peak Moment within Deflection Corridor		deg	42.0 - 53.0	46.1	Pass
Positive Moment - Time Curve Decay to 10 Nm		msec	60.0 - 80.0	71.9	Pass
Overall Test Results					Pass

 Laboratory Technician

11/13/2002

 Test Date

 Approved By

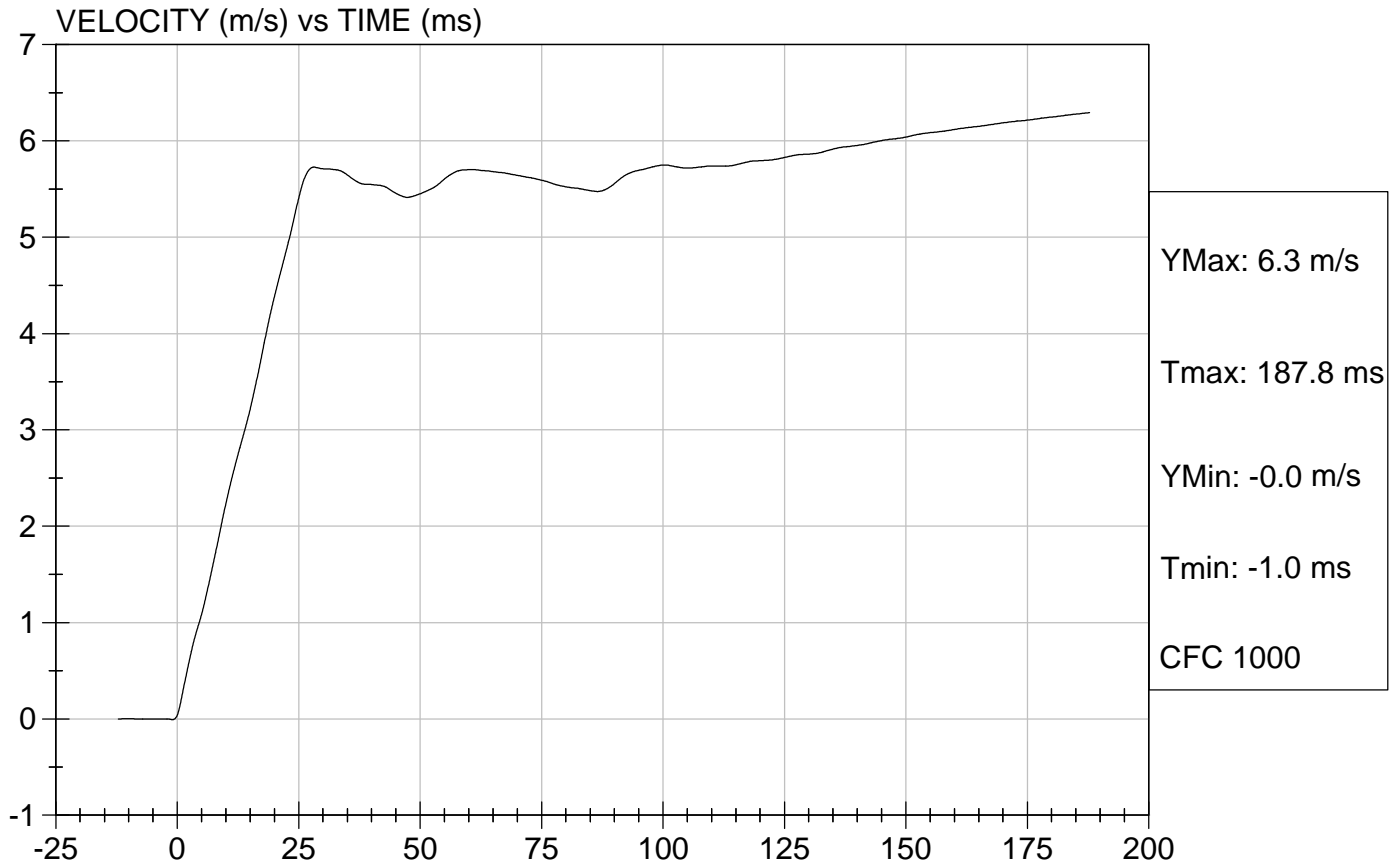


Test Description: Neck Flexion

Test Date: 11/13/2002

Component: D021452

Speed: 18.02 ft/sec, 5.49 m/sec





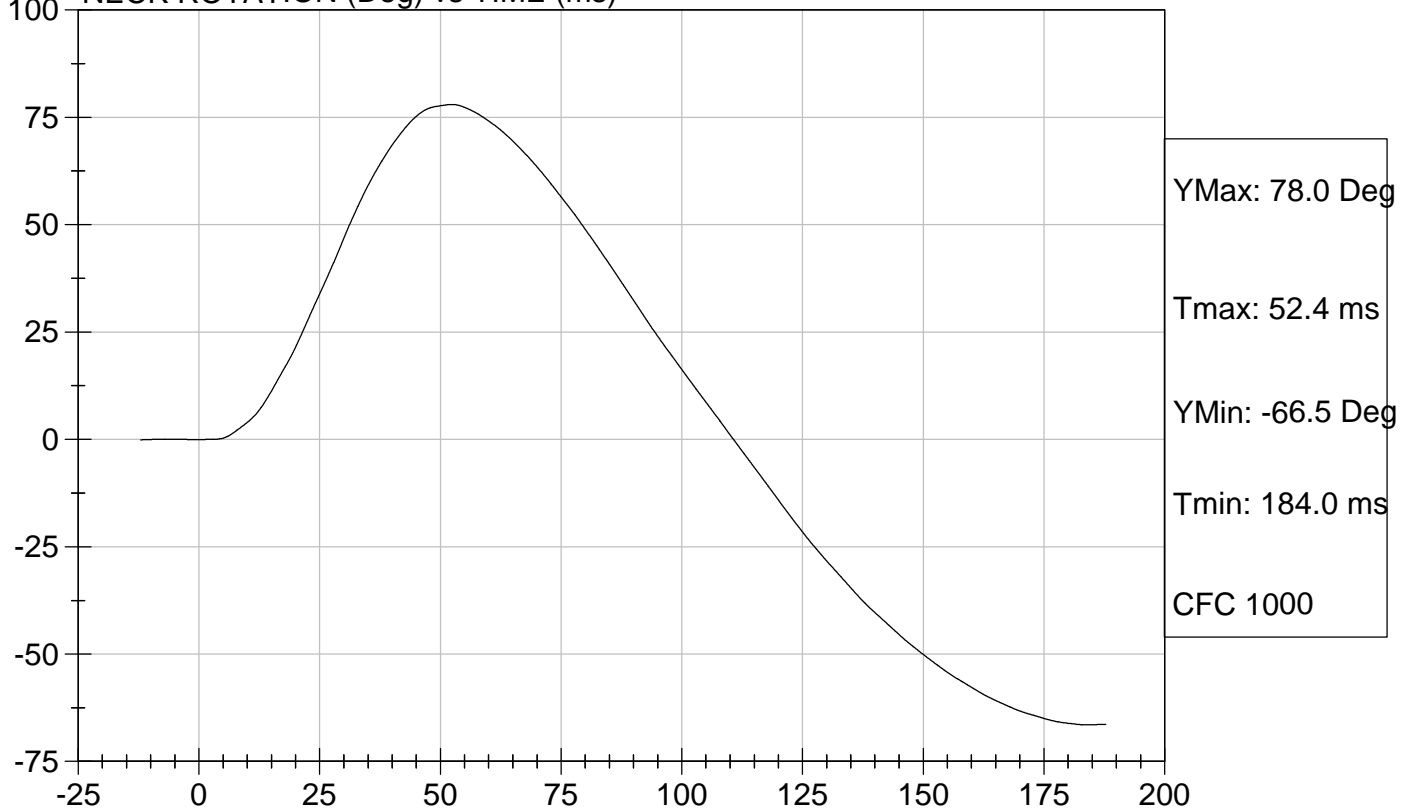
Test Description: Neck Flexion

Test Date: 11/13/2002

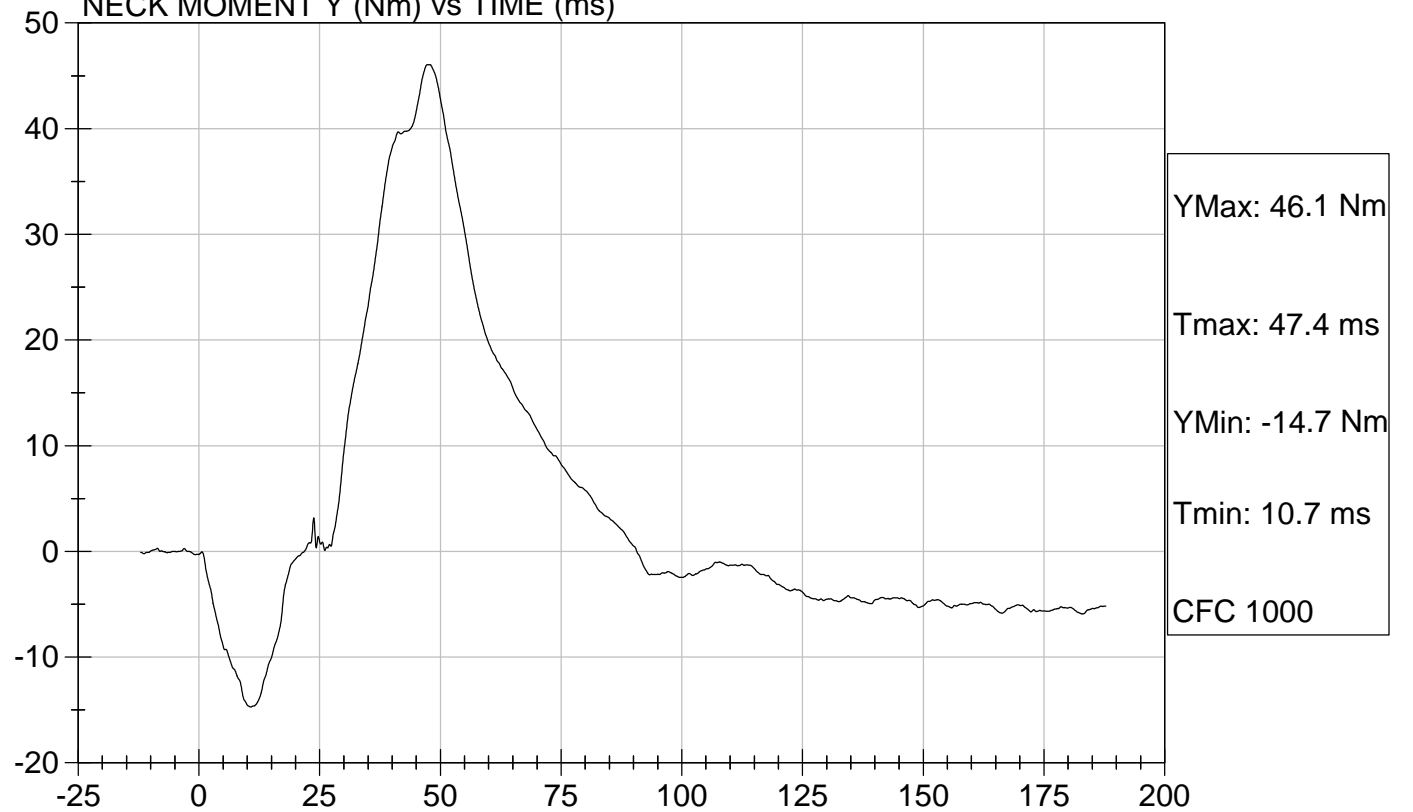
Component: D021452

Speed: 18.02 ft/s, 5.49 m/s

NECK ROTATION (Deg) vs TIME (ms)



NECK MOMENT Y (Nm) vs TIME (ms)



Hybrid III Calibration Data Sheet
3 Year Old
Neck Extension Test

ATD Serial No: 040

Test I.D: D021453

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity		%	10 to 70	31	Pass
Pendulum Speed		m/s	3.55 to 3.75	3.67	Pass
Pendulum Deceleration	6 msec	m/s	1.0 - 1.4	1.3	Pass
	10 msec	m/s	1.9 - 2.5	2.2	Pass
	14 msec	m/s	2.8 - 3.5	3.0	Pass
D Plane Rotation		deg	83 - 93	90.2	Pass
Peak Moment within Deflection Corridor		deg	-53.3 - -43.7	-48.0	Pass
Negative Moment - Time Curve Decay to -10 Nm		msec	60.0 - 80.0	67.1	Pass
Overall Test Results					Pass

 Laboratory Technician

11/14/2002

 Test Date

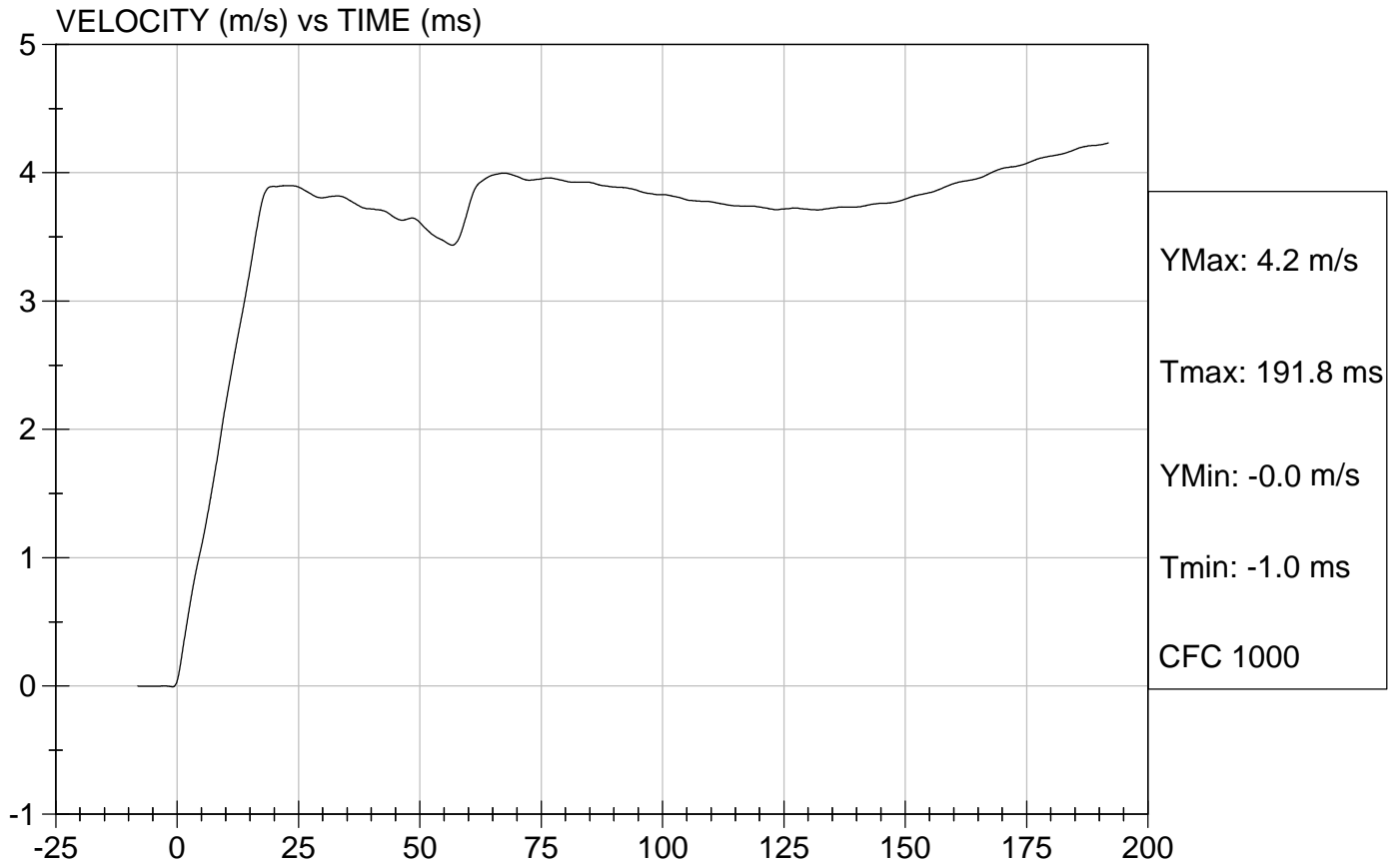
 Approved By



Test Description: Neck Extension Test Date: 11/14/2002

Component: D021453

Speed: 12.03 ft/sec, 3.67 m/sec





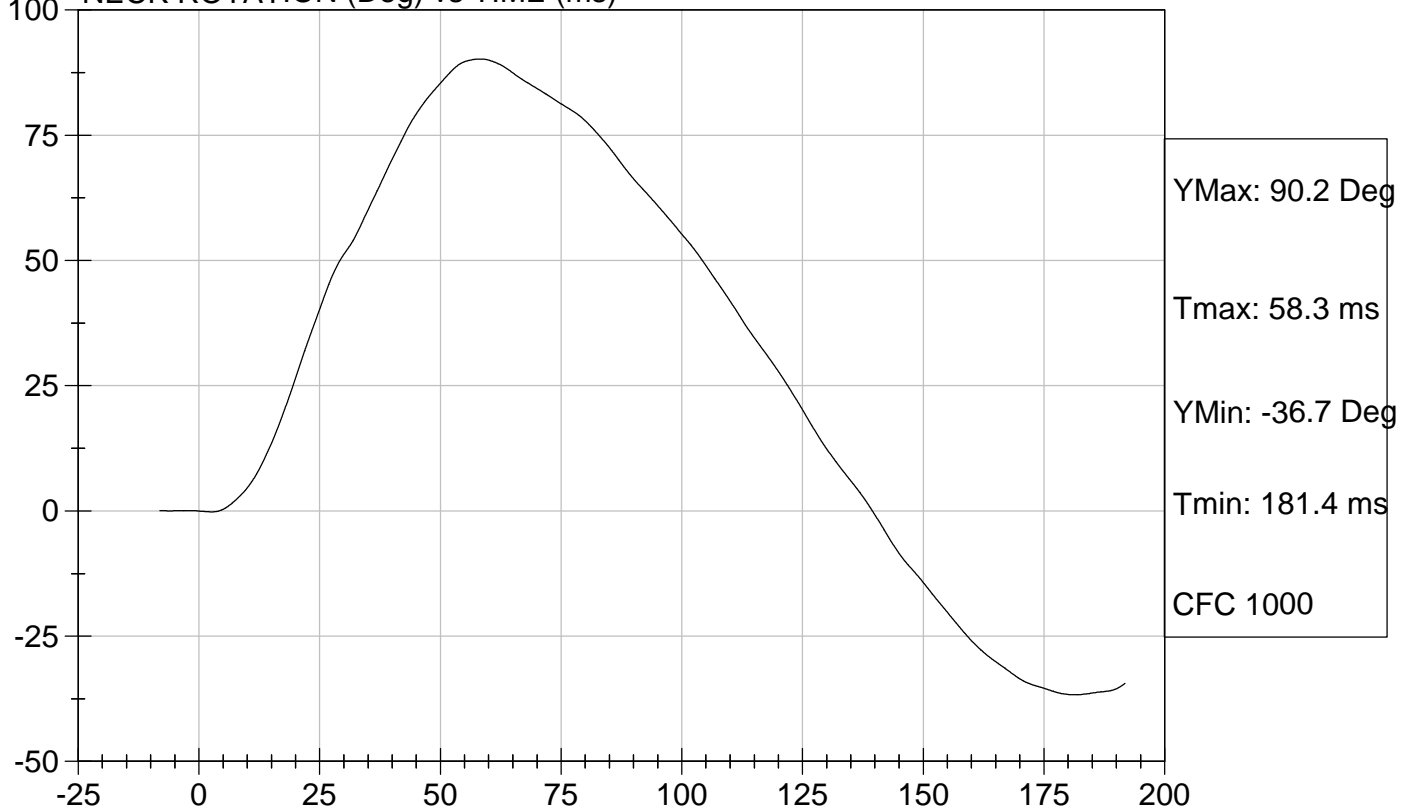
Test Description: Neck Extension

Test Date: 11/14/2002

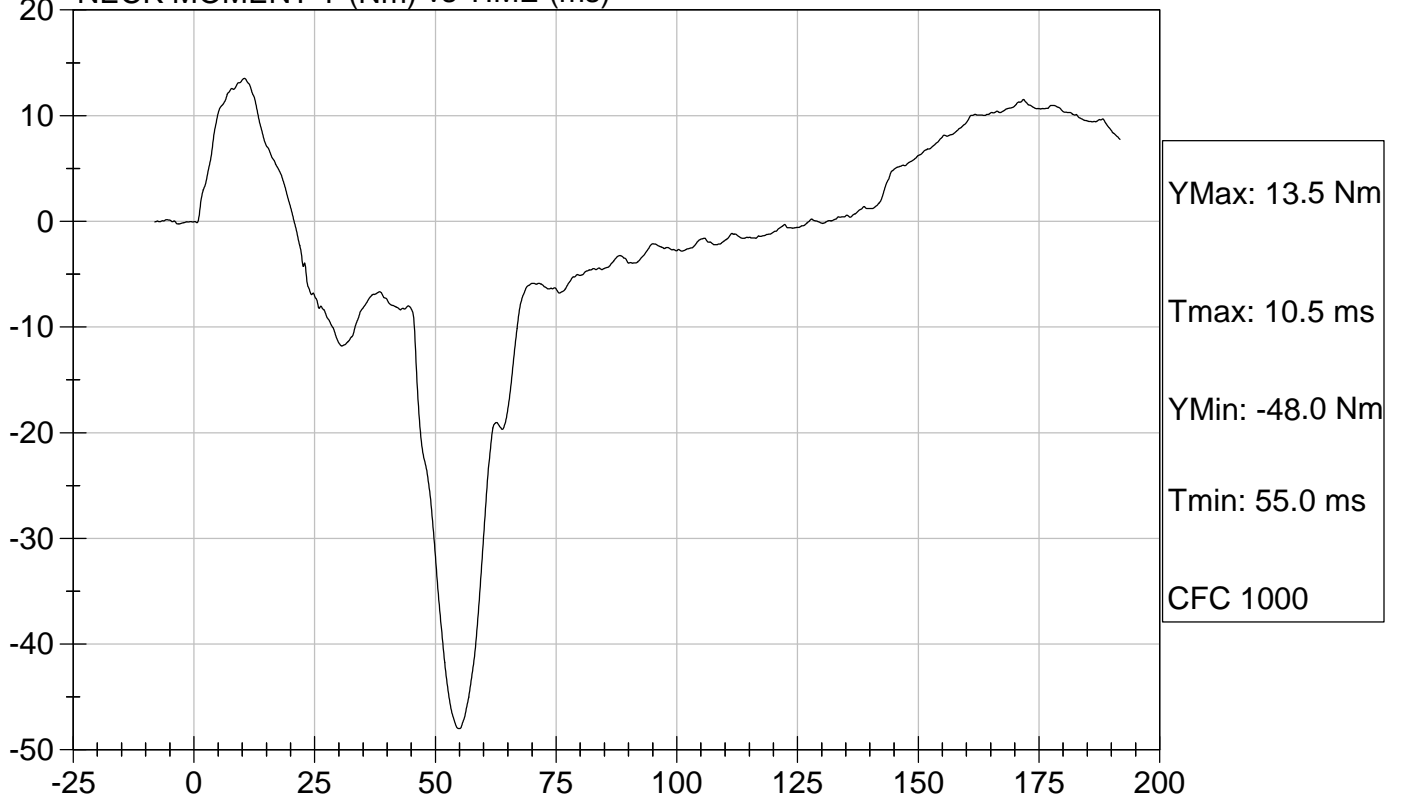
Component: D021453

Speed: 12.03 ft/s, 3.67 m/s

NECK ROTATION (Deg) vs TIME (ms)



NECK MOMENT Y (Nm) vs TIME (ms)



Hybrid III Calibration Data Sheet
3 Year Old
Thorax Impact Test

ATD Serial No: 040

Test I.D.: D021454

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	31	Pass
Probe Velocity	m/s	5.9 to 6.1	5.96	Pass
Peak Deflection	mm	32 - 38	33	Pass
Peak Resistive Force w/in Deflection Corridor	kN	0.68 - 0.81	0.69	Pass
Internal Hysteresis	%	65 to 85	71	Pass
Max Force 12.5 mm - 32 mm Deflection	kN	Max 0.86	0.84	Pass
Overall Test Results				Pass

 Laboratory Technician

 11/19/2002
 Test Date

 Approved By

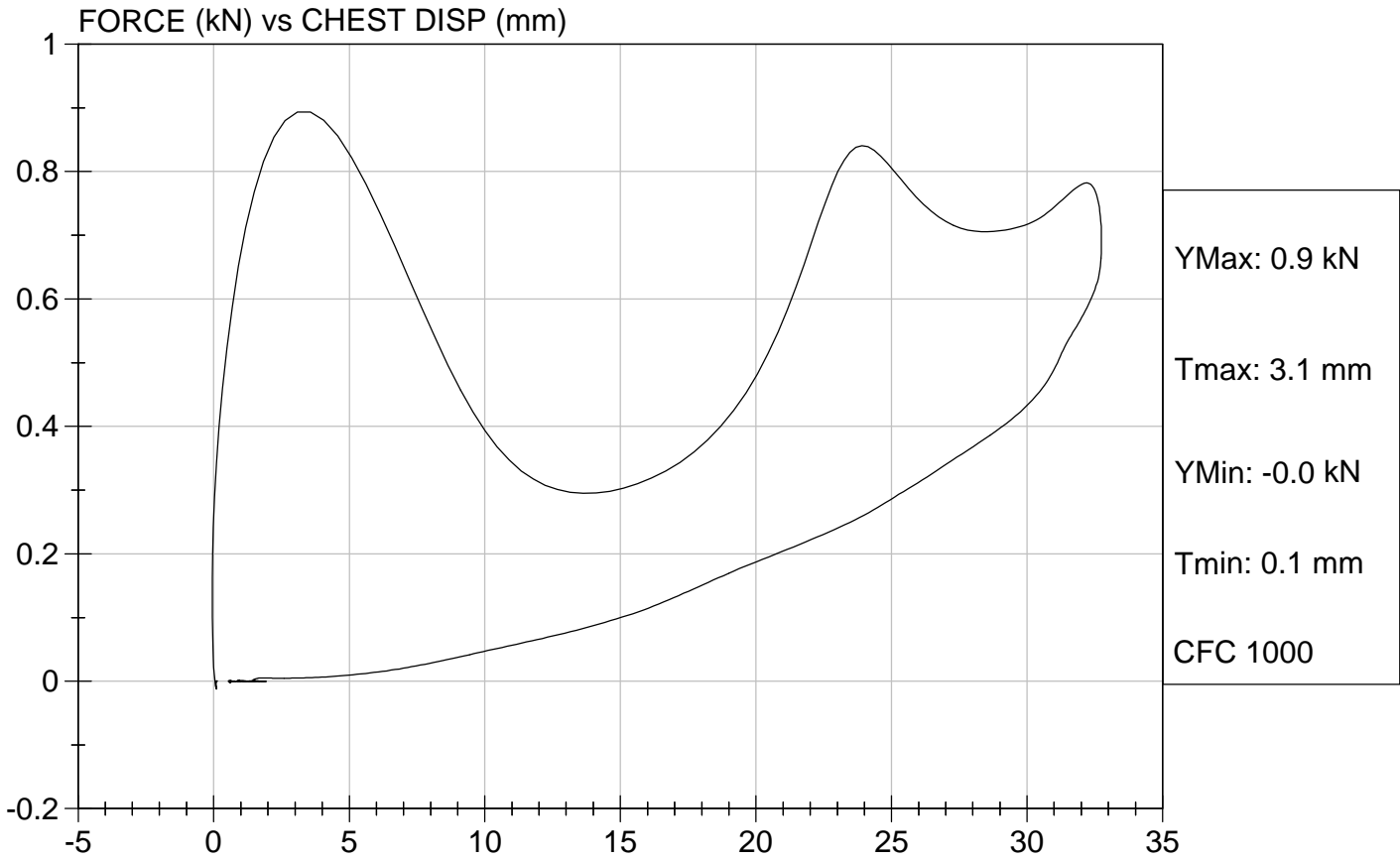


Test Description: Thorax Impact

Test Date: 11/19/2002

Component: D021454

Speed: 19.55 ft/sec, 5.96 m/sec



Hybrid III Calibration Data Sheet
3 Year Old
Torso Lumbar Flexion

ATD Serial No: 040

Test I.D.: D021455

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Force At 45 deg.	N	130 - 180	142	Pass
Initial Angle	deg	0 - 15	7	Pass
Return Angle	deg	0 - 10	5	Pass
Overall Test Results				Pass

 Laboratory Technician

 11/19/02
 Test Date

 Approved By

Hybrid III Calibration Data Sheet
3 Year Old
Head Drop Calibration

ATD Serial No: 042

Test I.D.: D021461

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
Peak Resultant Acceleration	G's	225.0 to 275.0	258.3	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	9.9	Pass
Is Acceleration Unimodal?	Yes/No	< 10% Peak	Yes	Pass
Overall Test Results				Pass

 Laboratory Technician

 11/13/2002
 Test Date

 Approved By



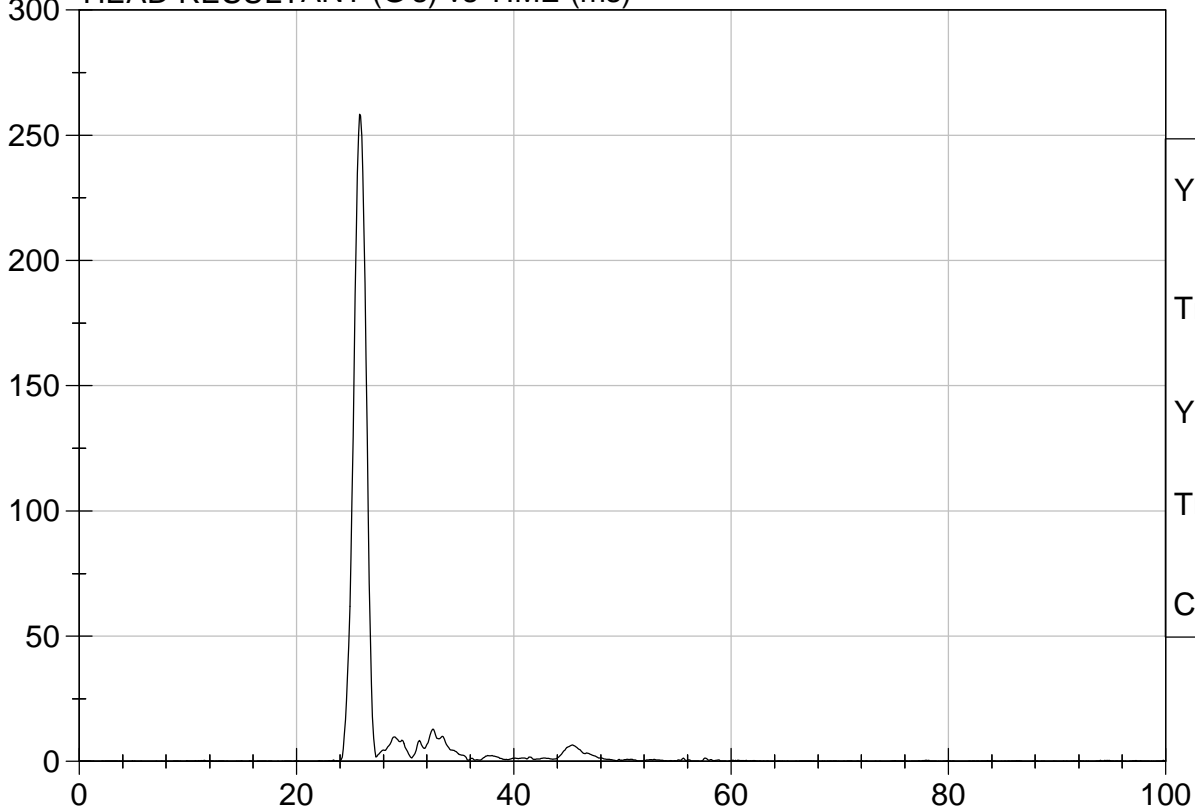
Test Description: Head Drop

Test Date: 11/13/2002

Component: D021461

Speed: 0 ft/s, 0.00 m/s

HEAD RESULTANT (G's) vs TIME (ms)



YMax: 258.3 G

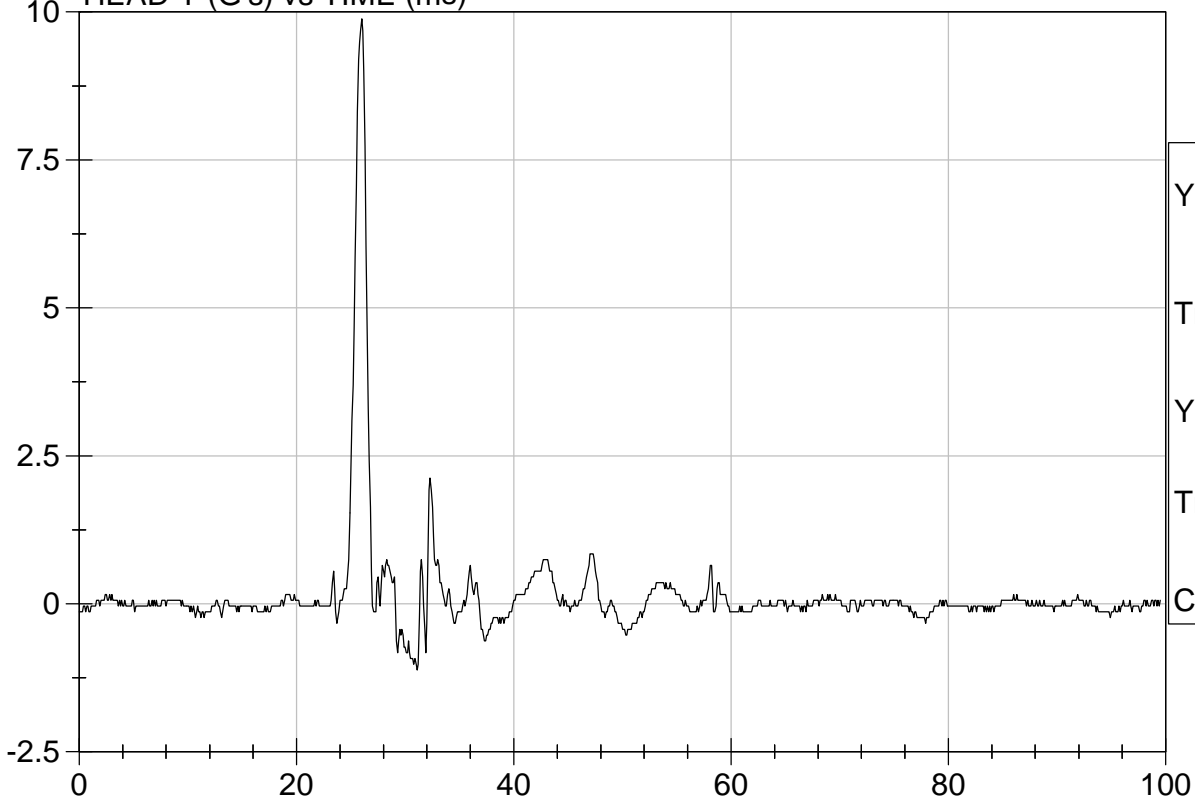
Tmax: 25.8 ms

YMin: 0.1 G

Tmin: 1.1 ms

CFC 1000

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



YMax: 9.9 G

Tmax: 26.0 ms

YMin: -1.1 G

Tmin: 31.1 ms

CFC 1000

Hybrid III Calibration Data Sheet
3 Year Old
Neck Flexion Test

ATD Serial No: 042

Test I.D: D021462

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity		%	10 to 70	31	Pass
Pendulum Speed		m/s	5.4 to 5.6	5.53	Pass
Pendulum Deceleration	10 msec	m/s	2.0 - 2.7	2.3	Pass
	15 msec	m/s	3.0 - 4.0	3.4	Pass
	20 msec	m/s	4.0 - 5.1	4.5	Pass
D Plane Rotation		deg	70 - 82	81.0	Pass
Peak Moment within Deflection Corridor		deg	42.0 - 53.0	45.1	Pass
Positive Moment - Time Curve Decay to 10 Nm		msec	60.0 - 80.0	72.0	Pass
Overall Test Results					Pass

 Laboratory Technician

11/14/2002

 Test Date

 Approved By

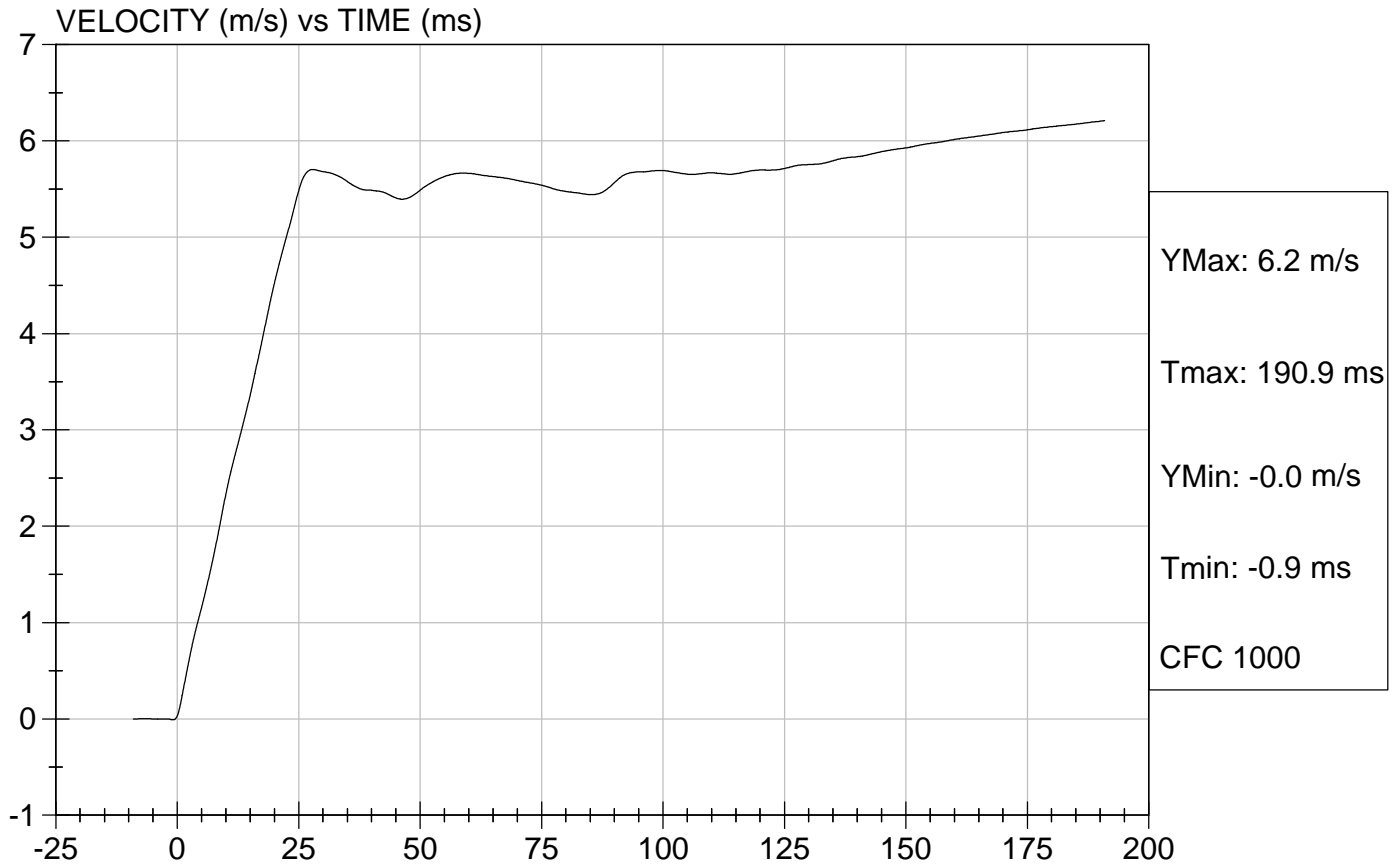


Test Description: Neck Flexion

Test Date: 11/14/2002

Component: D021462

Speed: 18.15 ft/sec, 5.53 m/sec





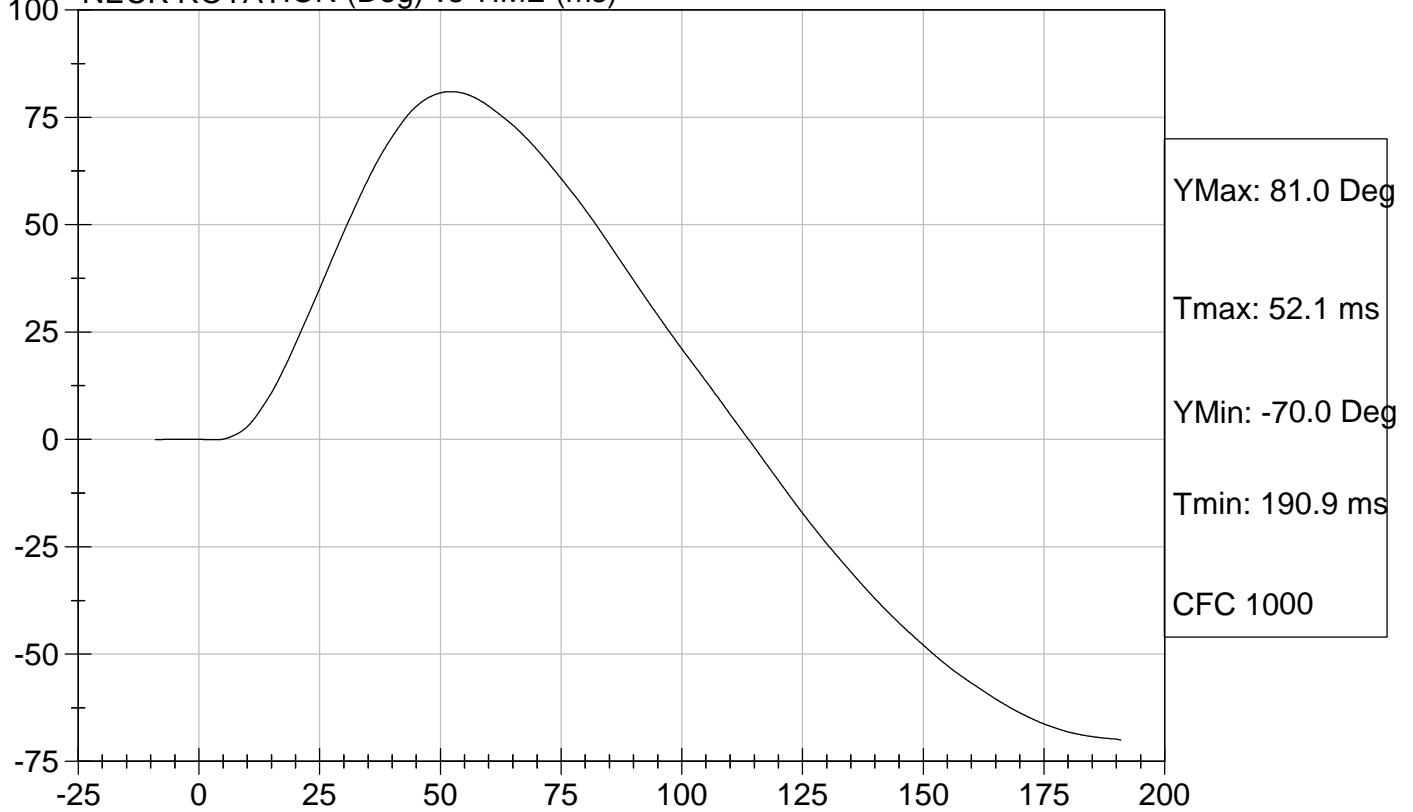
Test Description: Neck Flexion

Test Date: 11/14/2002

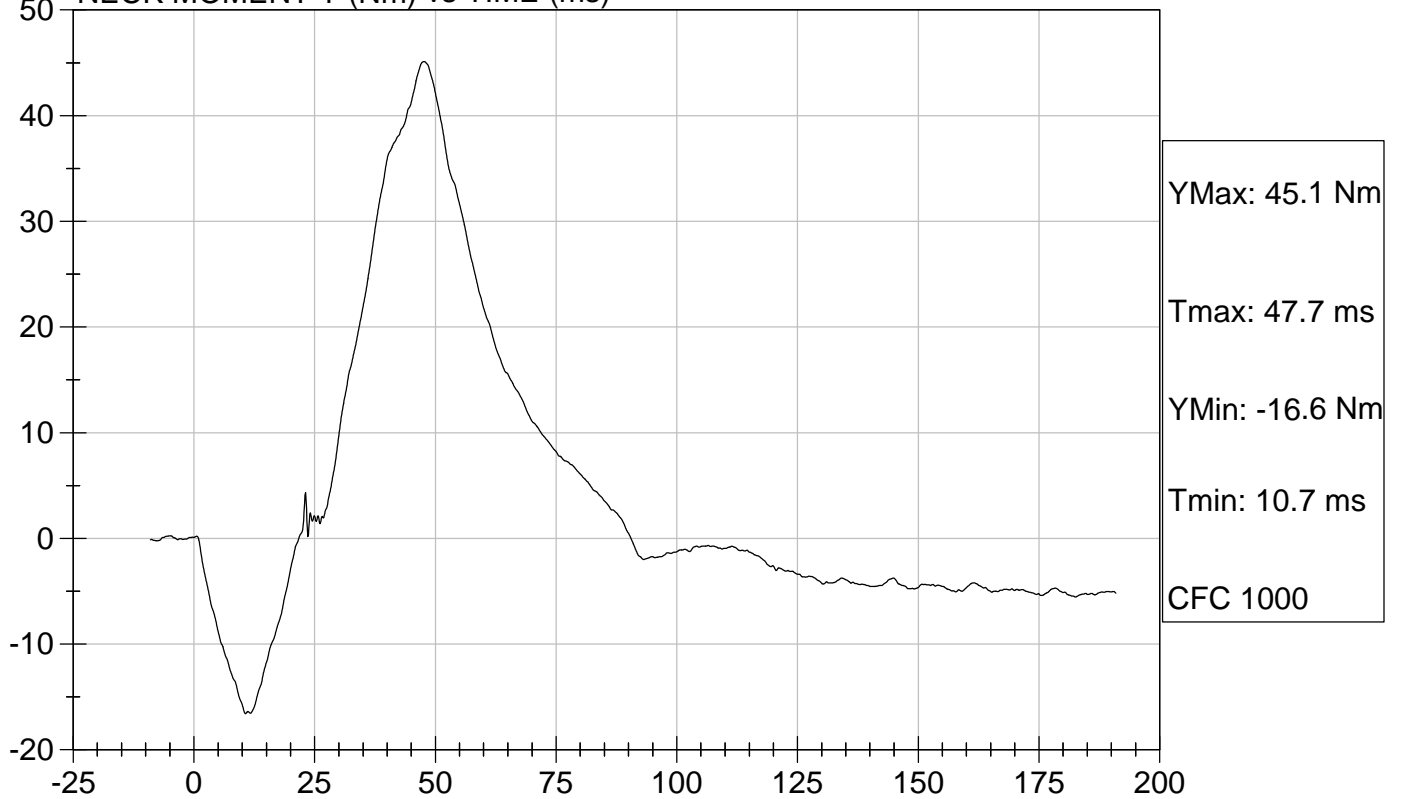
Component: D021462

Speed: 18.15 ft/s, 5.53 m/s

NECK ROTATION (Deg) vs TIME (ms)



NECK MOMENT Y (Nm) vs TIME (ms)



Hybrid III Calibration Data Sheet
3 Year Old
Neck Extension Test

ATD Serial No: 042

Test I.D: D021463

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity		%	10 to 70	31	Pass
Pendulum Speed		m/s	3.55 to 3.75	3.73	Pass
Pendulum Deceleration	6 msec	m/s	1.0 - 1.4	1.3	Pass
	10 msec	m/s	1.9 - 2.5	2.2	Pass
	14 msec	m/s	2.8 - 3.5	3.0	Pass
D Plane Rotation		deg	83 - 93	85.8	Pass
Peak Moment within Deflection Corridor		deg	-53.3 - -43.7	-44.5	Pass
Negative Moment - Time Curve Decay to -10 Nm		msec	60.0 - 80.0	69.9	Pass
Overall Test Results					Pass

 Laboratory Technician

11/14/2002

 Test Date

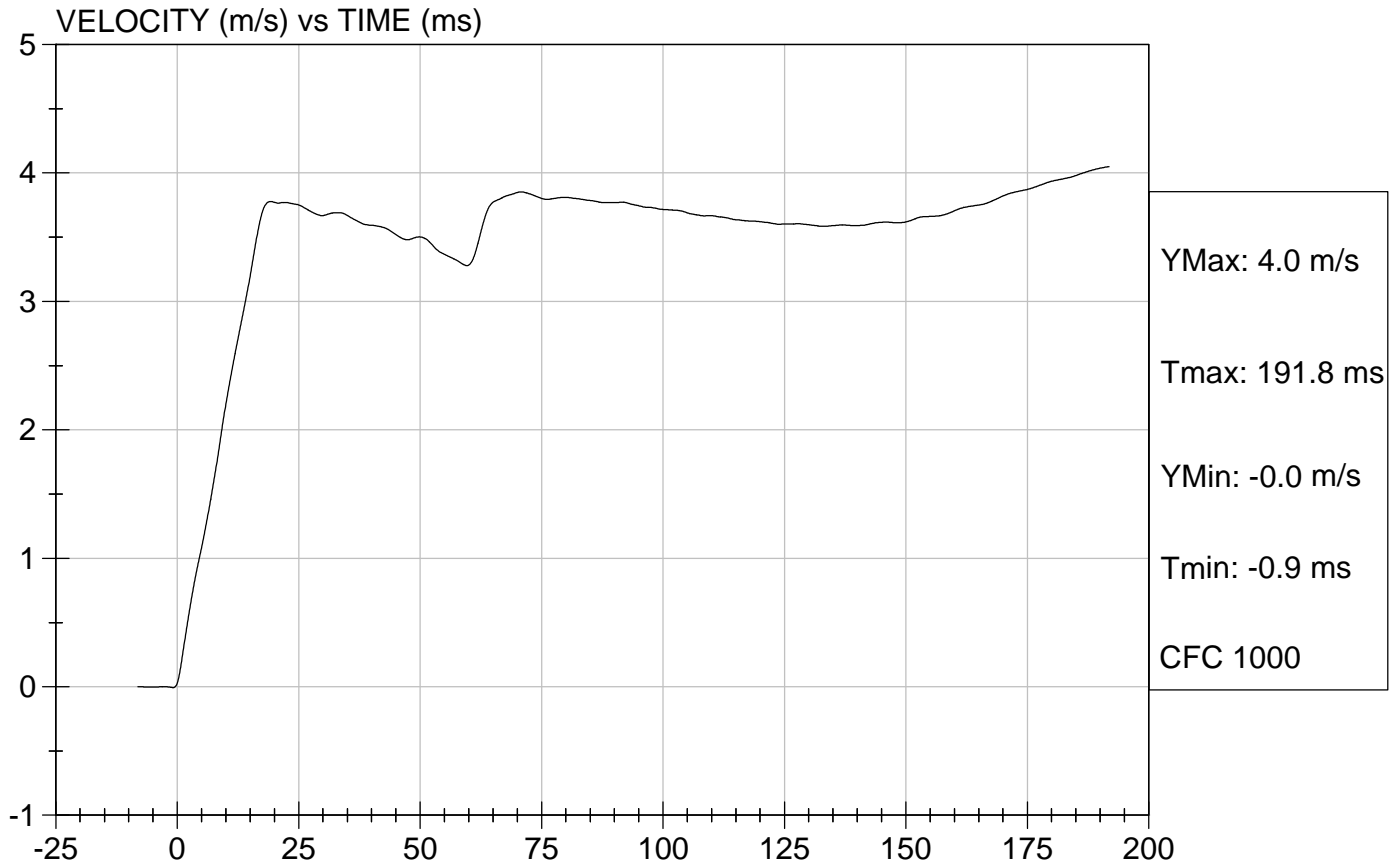
 Approved By



Test Description: Neck Extension Test Date: 11/14/2002

Component: D021463

Speed: 12.23 ft/sec, 3.73 m/sec





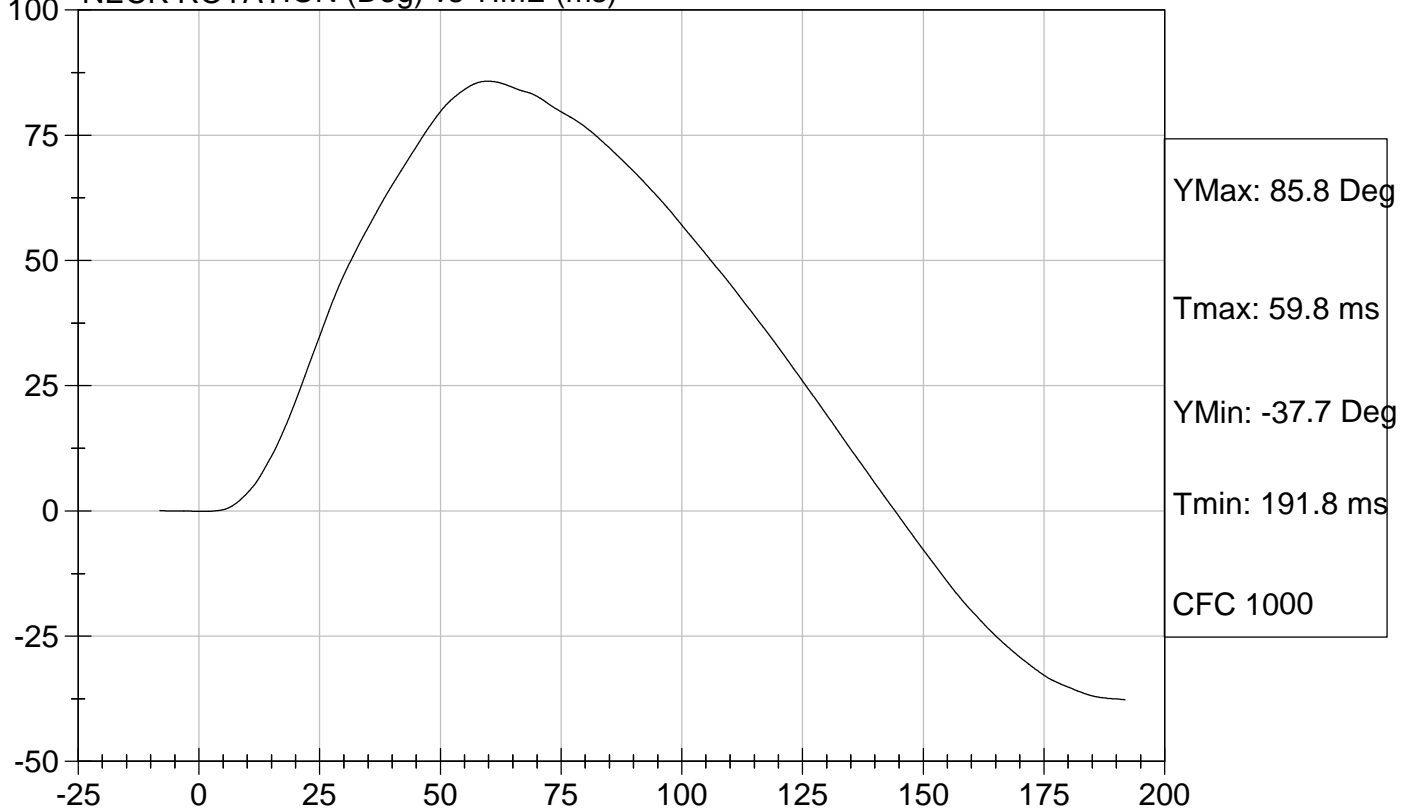
Test Description: Neck Extension

Test Date: 11/14/2002

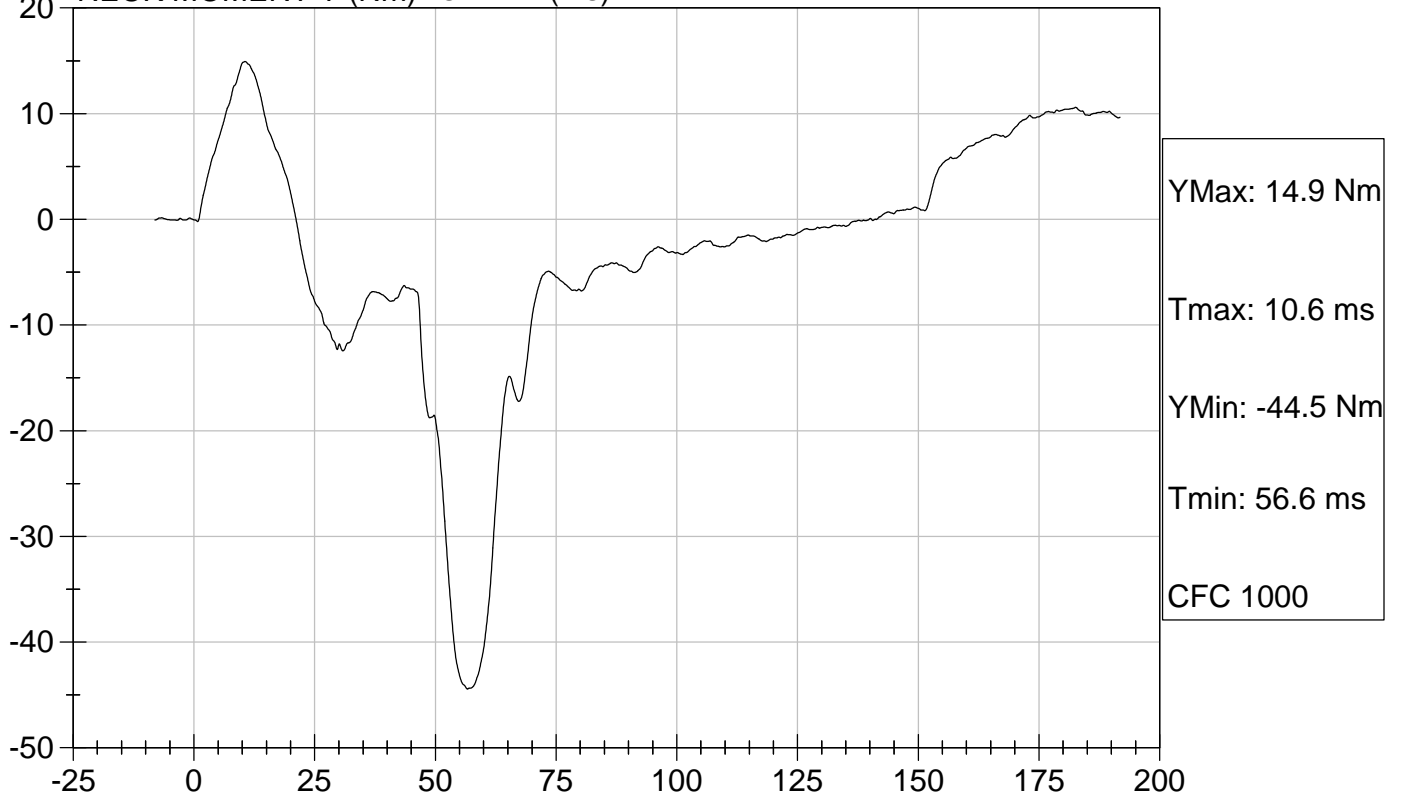
Component: D021463

Speed: 12.23 ft/s, 3.73 m/s

NECK ROTATION (Deg) vs TIME (ms)



NECK MOMENT Y (Nm) vs TIME (ms)



Hybrid III Calibration Data Sheet
3 Year Old
Thorax Impact Test

ATD Serial No: 042

Test I.D.: D021464

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Probe Velocity	m/s	5.9 to 6.1	6.00	Pass
Peak Deflection	mm	32 - 38	33	Pass
Peak Resistive Force w/in Deflection Corridor	kN	0.68 - 0.81	0.72	Pass
Internal Hysteresis	%	65 to 85	72	Pass
Max Force 12.5 mm - 32 mm Deflection	kN	Max 0.86	0.80	Pass
Overall Test Results				Pass

 Laboratory Technician

 11/15/2002
 Test Date

 Approved By

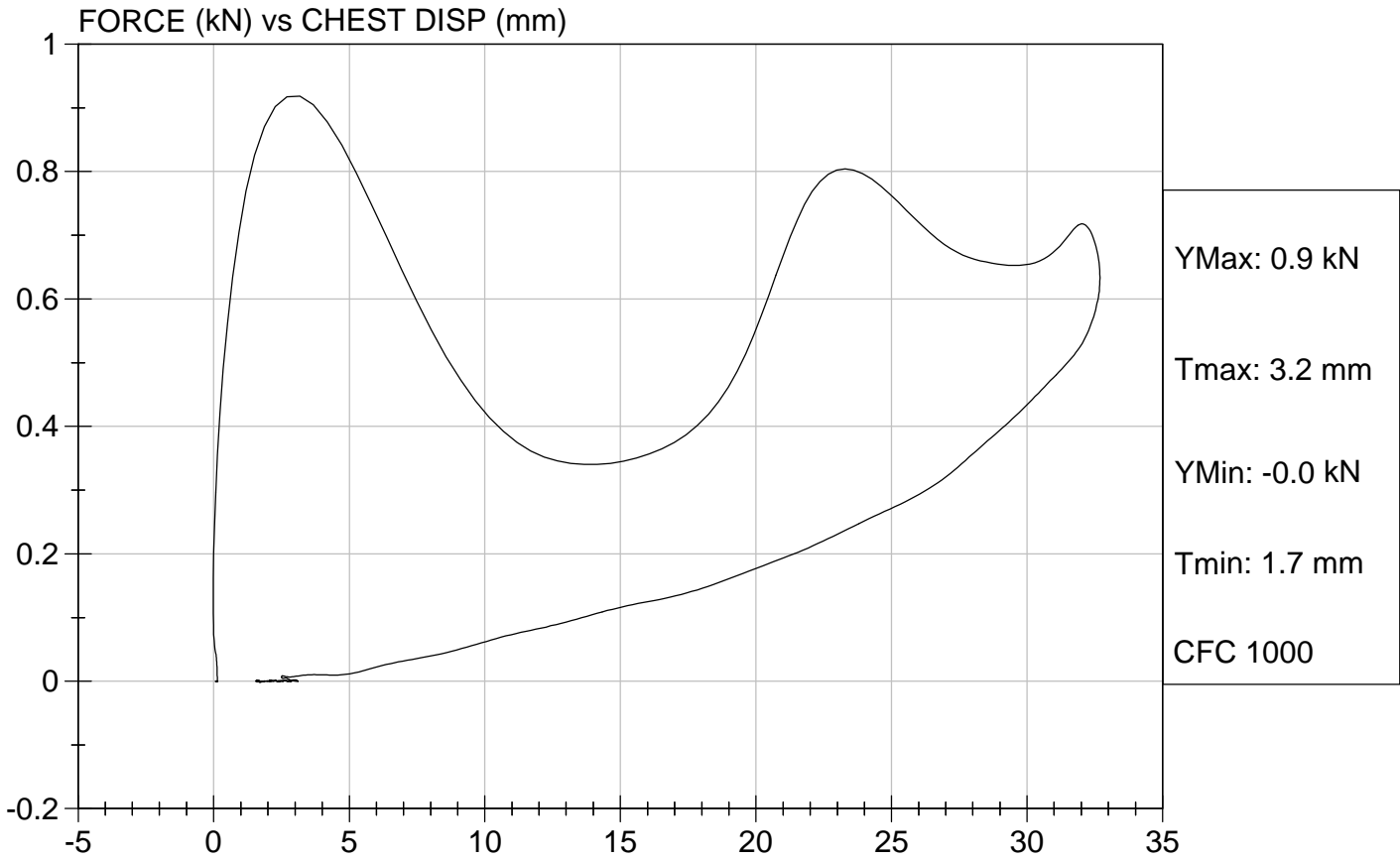


Test Description: Thorax Impact

Test Date: 11/15/2002

Component: D021464

Speed: 19.67 ft/sec, 6.00 m/sec



Hybrid III Calibration Data Sheet
3 Year Old
Torso Lumbar Flexion

ATD Serial No: 042

Test I.D.: D021465

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Force At 45 deg.	N	130 - 180	157	Pass
Initial Angle	deg	0 - 15	8	Pass
Return Angle	deg	0 - 10	6	Pass
Overall Test Results				Pass

 Laboratory Technician

 11/19/02
 Test Date

 Approved By

APPENDIX D

TEST EQUIPMENT LIST AND CALIBRATION INSTRUMENTATION

INSTRUMENTS FOR LRP CHILD DUMMY S/N: 40

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X	AAMD5	Endevco	11/16/02
Head Y	J27509	Endevco	11/13/02
Head Z	J20014	Endevco	11/16/02
Head Z Redundant	AC9F9	Endevco	11/16/02
Upper Neck Load Cell	86	Denton	10/4/02
Lower Neck Load Cell	210	Denton	10/4/02
Chest X	AC9P8	Endevco	11/13/02
Chest Y	J23996	Endevco	11/16/02
Chest Z	H12-F08	Entran	11/16/02
Chest Deflection Gauge	40	Servo	11/15/02
Pelvis X	BG37J	Endevco	11/16/02
Pelvis Y	J35560	Endevco	11/16/02
Pelvis Z	DE15J	Endevco	11/16/02

INSTRUMENTS FOR RRP CHILD DUMMY S/N: 42

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X	H10-F10	Entran	11/13/02
Head Y	H10-F12	Entran	11/13/02
Head Z	AJ4L1	Endevco	11/13/02
Head Z Redundant	ADAT0	Endevco	11/13/02
Upper Neck Load Cell	121	FTSS	10/4/02
Lower Neck Load Cell	120	FTSS	10/4/02
Chest X	J19547	Endevco	11/13/02
Chest Y	CC92H	Endevco	11/13/02
Chest Z	J26976	Endevco	11/13/02
Chest Deflection Gauge	42	Servo	11/15/02
Pelvis X	BE95J	Endevco	11/13/02
Pelvis Y	DE54J	Endevco	11/13/02
Pelvis Z	H12-F30	Entran	11/13/02