

REPORT NUMBER: NCAPCHILD-MGA-2004-002

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

**Evenflo Vanguard 5
Britax Roundabout**

NHTSA NUMBER: M40301

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



Test Date: November 4, 2003

Report Date: December 8, 2003

FINAL REPORT

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

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

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

Prepared by: Shefalika Agarwal Date: 12/08/03
Shefalika Agarwal, Project Engineer

Reviewed by: David Winkelbauer Date: 12/08/03
David Winkelbauer, Facility Director

FINAL REPORT ACCEPTED BY:

Manager, New Car Assessment Program

Date of Acceptance

COTR, NCAP Frontal Impact Program

Date of Acceptance

Technical Report Documentation Page

1. Report No. NCAPCHILD-MGA-2004-002		2. Government Accession No.		3. Recipient's Catalog No.																	
4. Title and Subtitle Final Report of New Car Assessment Program Testing of Evenflo Vanguard 5 and Britax Roundabout Child Restraint Systems NHTSA No.: M40301		5. Report Date December 8, 2003		6. Performing Organization Code MGA																	
		7. Author(s) Shefalika Agarwal, Project Engineer		8. Performing Organization Report No. NCAPCHILD-MGA-2004-002																	
9. Performing Organization Name and Address MGA Research Corporation 5000 Warren Road Burlington, WI 53105		10. Work Unit No.		11. Contract or Grant No. DTNH22-01-D-12005																	
		12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Rulemaking, Office of Crashworthiness Standards 400 Seventh Street, SW, Room 5311 Washington, D.C. 20590		13. Type of Report and Period Covered Final Report 11/04/03 to 12/0803																	
				14. Sponsoring Agency Code NVS-111																	
15. Supplementary Notes																					
16. Abstract The subjects CRS Evenflo Vanguard 5 and Britax Roundabout were tested in conjunction with a Frontal NCAP test in support of research 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 November 4, 2003, in conjunction with frontal NCAP.																					
<table border="1"> <thead> <tr> <th>Measurement Description</th> <th>Units</th> <th>Pos. 3 ATD</th> <th>Pos. 4 ATD</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC36)</td> <td>N/A</td> <td>694</td> <td>791</td> </tr> <tr> <td>Head Injury Criteria (HIC15)</td> <td>N/A</td> <td>394</td> <td>556</td> </tr> <tr> <td>Max. Thorax Accel. (3msec Clip)</td> <td>G's</td> <td>40</td> <td>51</td> </tr> </tbody> </table>						Measurement Description	Units	Pos. 3 ATD	Pos. 4 ATD	Head Injury Criteria (HIC36)	N/A	694	791	Head Injury Criteria (HIC15)	N/A	394	556	Max. Thorax Accel. (3msec Clip)	G's	40	51
Measurement Description	Units	Pos. 3 ATD	Pos. 4 ATD																		
Head Injury Criteria (HIC36)	N/A	694	791																		
Head Injury Criteria (HIC15)	N/A	394	556																		
Max. Thorax Accel. (3msec Clip)	G's	40	51																		
17. Key Words 56.3 km/h NCAP Frontal Barrier Impact Test New Car Assessment Program (NCAP) Evenflo Vanguard 5 Britax Roundabout NHTSA No: M40301			18. Distribution Statement Copies of this report are available from: National Highway Traffic Safety Admin., Technical Ref. Division, Room 5108 (NPO-230) 400 Seventh Street, S.W. Washington, D.C. 20590																		
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 106	22. Price																		

TABLE OF CONTENTS

<u>Section</u>		<u>Page No</u>
1	Purpose and Summary of Test	1
2	Data Sheets	2
<u>Data Sheet No.</u>		
1	Crash Test Summary	2
2	CRS Parameter Data	3
3	Child Dummy Positioning in Vehicle	4
4	Child Dummy Injury Criteria Values	6
5	CRS Performance Data	9
6	CRS Camera Data	10
<u>Appendix</u>		
A	Photographs	A
B	Child Dummy Response Data Traces	B
C	Child Dummy Calibration Information	C
D	Test Equipment List and Calibration Information	D

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 56.8 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, both dummies had six upper axial neck force and moment sensors.

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

The right rear child dummy's HIC36 was 693.8; maximum chest deceleration over 3 msec was 40.3 g's. The left rear child dummy's HIC36 was 790.6. The maximum chest deceleration over 3 msec was 51.1 g's. Position 3 and Position 4 were forward facing and used the vehicle LATCH and top tether for attachments.

**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 / 40	HIII 3 Year Old / 42
Number of Data Channels	22	22
Restraint System	Evenflo Vanguard 5 (Forward Facing)	Britax Roundabout (Forward Facing)

CAMERA COVERAGE

High Speed	16
Real Time	1
Total	17

POST TEST DOOR OPENING

Description	Front	Rear
Left Side Doors	Door remained closed and latched; Door opened without tools	Door remained closed and latched; Door opened without tools
Right Side Doors	Door remained closed and latched; Door opened without tools	Door remained closed and latched; Door opened without tools
Hatch/Other Door	None	None

POST TEST SEAT DATA

Location	Seat Movement (mm)	Seat Back Failure
P1 (Left Front)	0	None
P2 (Right Front)	3 forward	None
P3 (Right Rear)	0	None
P4 (Left Rear)	0	None

VISIBLE DUMMY CONTACT POINTS

Description	Position 3 CRS (S/N 40)	Position 4 CRS (S/N 42)
Head Contact	Back of head to CRS	Back of head to CRS
Upper Torso Contact	None	Chin to clip
Lower Torso Contact	None	None
Left Foot Contact	None	None
Right Foot Contact	None	None

SECTION 2... (continued)

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

Child Restraint System (Position 3)	Evenflo Vanguard 5 (Forward Facing)
Child Restraint System (Position 4)	Britax Roundabout (Forward Facing)
NHTSA No.	M40301

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1552.3
Weight of 2 P572E ATDs	kg	156.0
Rated Cargo/Luggage Weight (RCLW)	kg	52.2
Calculated Vehicle Target Weight (TVTW)	kg	1760.5

TEST VEHICLE WEIGHTS

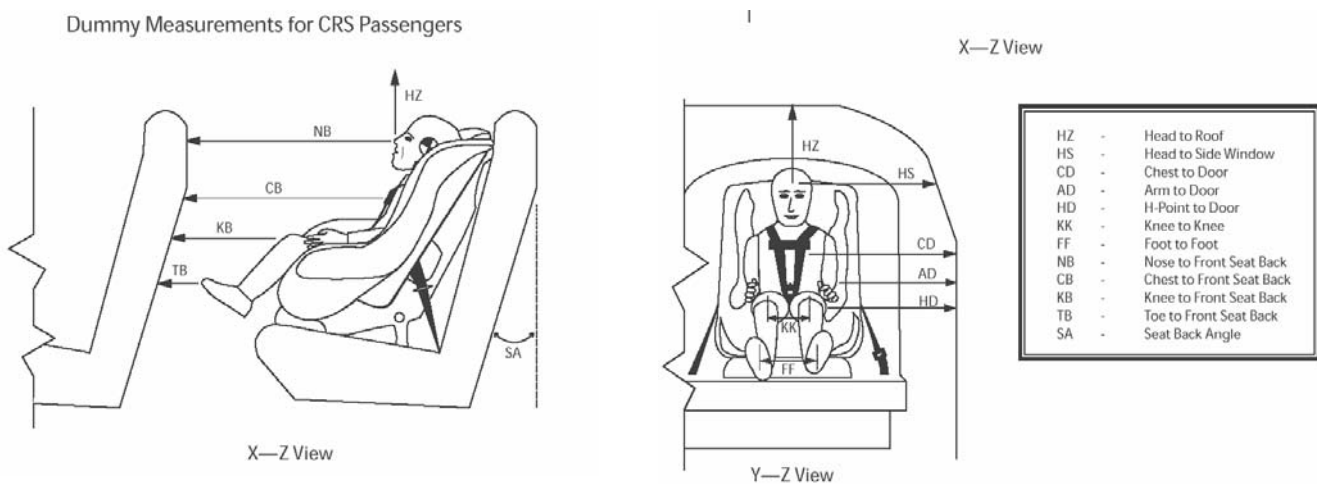
	Units	As Tested (ATW) (Axle)		
		Front	Rear	Total
Left	kg	552.5	339.3	
Right	kg	541.6	322.5	
Ratio	%	62.3	37.7	
Totals	kg	1094.1	661.8	1755.9

As tested weight of vehicle includes two 50th percentile ATDs, two 3 year old with CRS, cargo, equipment and instrumentation.

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

Child Restraint System (Position 3)	Evenflo Vanguard 5 (Forward Facing)
NHTSA No.	M40301

Dummy Measurements for CRS Passengers



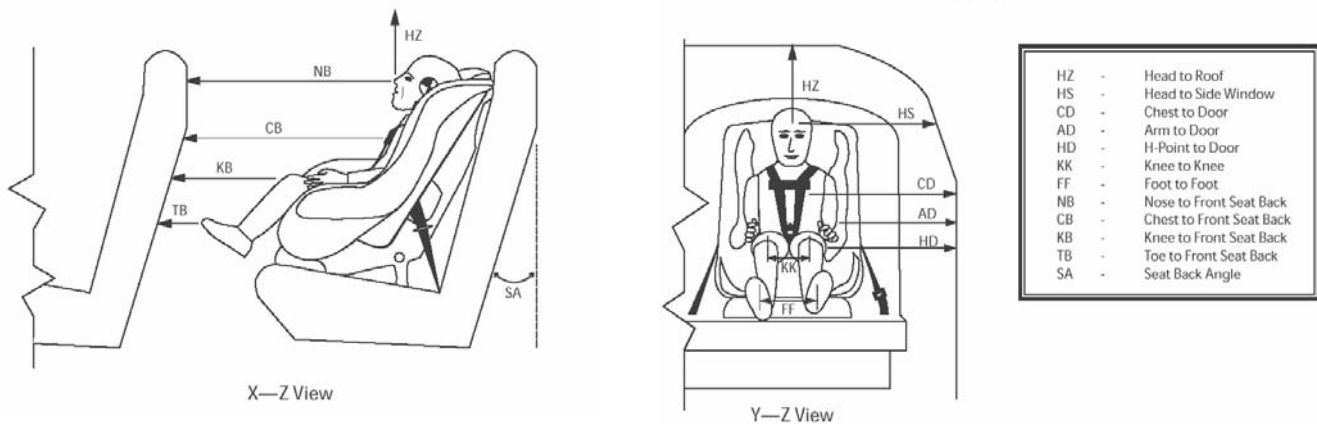
Measurement	Pre-Test (mm)	Post-Test (mm)
	P3 CRS (40)	P3 CRS (40)
SA (deg)	22.6	22.6
HS	439	414
CD	381	363
AD	256	246
HD	307	328
HZ	364	347
NB	682	781
CB	661	757
KK	130	130
FF	124	125
KB - LEFT	428	494
KB - RIGHT	436	514
TB - LEFT	149	149
TB - RIGHT	147	208

All dimensions in mm (unless noted)
P3 – Right Rear Passenger (Forward Facing)

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

Child Restraint System (Position 4)	Britax Roundabout (Forward Facing)
NHTSA No.	M40301

Dummy Measurements for CRS Passengers



Measurement	Pre-Test (mm)	Post-Test (mm)
	P4 CRS (42)	P4 CRS (42)
SA (deg)	22.4	22.4
HS	446	472
CD	382	372
AD	252	248
HD	204	312
HZ	304	293
NB	676	724
CB	632	676
KK	154	200
FF	152	278
KB - LEFT	391	412
KB - RIGHT	381	428
TB - LEFT	184	190
TB - RIGHT	172	148

All dimensions in mm (unless noted)
P4 – Left Rear Passenger (Forward facing)

SECTION 2... (continued)

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

Child Restraint System (Position 3)	Evenflo Vanguard 5 (Forward Facing)
Child Restraint System (Position 4)	Britax Roundabout (Forward Facing)
NHTSA No.	M40301

HEAD PEAK ACCELERATIONS

Location	Axis	Units	Position 3				Position 4			
			Max	Time	Min	Time	Max	Time	Min	Time
Head CG	X	G's	40.7	199	-24.1	80	1.8	34	-28.9	103
Head CG	Y	G's	4.1	122	-2.1	146	7.2	126	-7.6	117
Head CG	Z	G's	59.2	93	-13.4	52	70.0	88	-19.9	49
Resultant	N/A	G's	61.9	93			72.1	88		

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	10	8	-598	116	4	24	-260	103
Neck Force	Y	N	19	129	-38	82	11	118	-43	86
Neck Force	Z	N	1892	92	-330	52	2790	88	774	50
Resultant	N/A	N	1959	92			2792	88		
Neck Moment	X	N•m	1.0	49	-3.2	104	1.6	138	-4.5	98
Neck Moment	Y	N•m	4.8	86	-6.1	63	5.5	87	-5.0	66
Neck Moment	Z	N•m	1.2	149	-0.9	193	2.7	105	-1.1	59
Resultant	N/A	N•m	6.3	105			5.7	87		

CHEST PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	Position 3				Position 4			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	G's	5.4	192	-41.8	86	2.7	170	-35.4	80
Chest CG	Y	G's	1.8	74	-3.9	89	3.0	58	-6.4	81
Chest CG	Z	G's	20.3	100	-31.0	61	22.9	87	-39.8	62
Resultant	N/A	G's	42.2	89			52.7	63		

SECTION 2... (continued)

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

Child Restraint System (Position 3)	Evenflo Vanguard 5 (Forward Facing)
Child Restraint System (Position 4)	Britax Roundabout (Forward Facing)
NHTSA No.	M40301

TETHER FORCE

Location	Axis	Units	Position 3				Position 4			
			Max	Time	Min	Time	Max	Time	Min	Time
Tether Force (Center)	N/A	N	2816	83	-65	144				
Right Tether Force	N/A	N					3644	71	-25	163
Left Tether Force	N/A	N					3525	70	-44	167

PELVIC PEAK ACCELERATIONS

Location	Axis	Units	Position 3				Position 4			
			Max	Time	Min	Time	Max	Time	Min	Time
Pelvis	X	G's	9.5	144	-42.5	68	11.0	125	-38.5	78
Pelvis	Y	G's	5.5	72	-5.4	56	2.4	146	-9.8	77
Pelvis	Z	G's	11.9	102	-33.3	71	8.9	97	-38.0	63
Resultant	N/A	G's	53.2	68			51.4	77		

HEAD PEAK REDUNDANT ACCELERATIONS

Location	Axis	Units	Position 3				Position 4			
			Max	Time	Min	Time	Max	Time	Min	Time
Head CG	X	G's	38.3	199	-26.2	80	0.6	23	-29.1	74
Head CG	Y	G's	3.9	123	-1.6	77	7.2	126	-8.2	116
Head CG	Z	G's	59.3	92	-12.3	50	70.4	88	-20.8	49
Resultant	N/A	G's	62.5	92			73.2	84		
Head Rear	Z	G's								

CHEST PEAK REDUNDANT ACCELERATIONS

Location	Axis	Units	Position 3				Position 4			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	G's	5.4	192	-40.7	88	2.4	170	-36.2	80
Chest CG	Y	G's	1.5	74	-3.6	89	2.2	46	-7.0	82
Chest CG	Z	G's	20.3	100	-31.4	61	23.1	87	-40.4	62
Resultant	N/A	G's	41.1	89			53.3	63		

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

Child Restraint System (Position 3)	Evenflo Vanguard 5 (Forward Facing)
Child Restraint System (Position 4)	Britax Roundabout (Forward Facing)
NHTSA No.	M40301

HEAD INJURY CRITERIA (HIC36)

Location	HIC	T ¹ (msec)	T ² (msec)	Average Acceleration (G's)
Position 3 - Right	693.8	74.1	110.1	51.8
Position 4 – Left	790.6	68.1	103.0	55.2

HIC 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	393.5	82.0	97.0	58.6
Position 4 – Left	555.6	76.7	91.7	67.2

HIC 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	40.3	87.2	90.2
Position 4 – Left	51.1	61.3	64.3

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

SECTION 2... (continued)

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

Child Restraint System (Position 3)	Evenflo Vanguard 5 (Forward Facing)
Child Restraint System (Position 4)	Britax Roundabout (Forward Facing)
NHTSA No.	M40301

POSITION 3 CRS POST-TEST INSPECTION

Location	Damage	Remarks
Upper Tether Strap	None	
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	

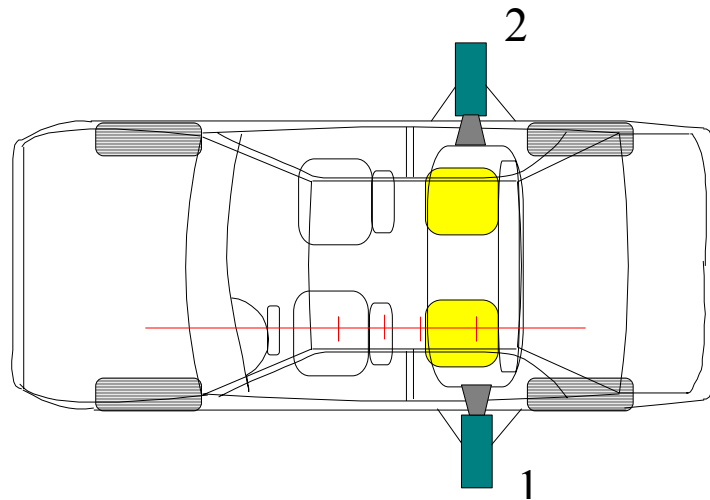
POSITION 4 CRS POST-TEST INSPECTION

Location	Damage	Remarks
Upper Tether Strap	None	
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	

SECTION 2... (continued)

DATA SHEET NO. 6
CRS CAMERA DATA

Child Restraint System (Position 3)	Evenflo Vanguard 5 (Forward Facing)
Child Restraint System (Position 4)	Britax Roundabout (Forward Facing)
NHTSA No.	M40301



No.	Camera View	Location (mm) *			Angle (deg)	Lens (mm)	Speed (fps)
		X	Y	Z			
1	Left Side CRS Lateral View					13	510
2	Right Side CRS Lateral View					13	526

*COORDINATES:

- +X = film plane rearward of barrier
- +Y = film plane to right of monorail centerline
- +Z = film plane above ground level

APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

		<u>Page No.</u>
Photo No. 1.	Close-up View of Position 3 CRS Label	A-1
Photo No. 2.	Pre-Test Frontal View of Position 3 CRS	A-2
Photo No. 3.	Post-Test Front View of Position 3 CRS	A-3
Photo No. 4.	Pre-Test Rear View of Position 3 CRS	A-4
Photo No. 5.	Post-Test Rear View of Position 3 CRS	A-5
Photo No. 6.	Pre-Test Left Side View of Position 3 CRS	A-6
Photo No. 7.	Post-Test Left Side View of Position 3 CRS	A-7
Photo No. 8.	Pre-Test Right Side View of Position 3 CRS	A-8
Photo No. 9.	Post-Test Right Side View of Position 3 CRS	A-9
Photo No. 10.	Close-up View of Position 4 CRS Label	A-10
Photo No. 11.	Pre-Test Frontal View of Position 4 CRS	A-11
Photo No. 12.	Post-Test Front View of Position 4 CRS	A-12
Photo No. 13.	Pre-Test Rear View of Position 4 CRS	A-13
Photo No. 14.	Post-Test Rear View of Position 4 CRS	A-14
Photo No. 15.	Pre-Test Left Side View of Position 4 CRS	A-15
Photo No. 16.	Post-Test Left Side View of Position 4 CRS	A-16
Photo No. 17.	Pre-Test Right Side View of Position 4 CRS	A-17
Photo No. 18.	Post-Test Right Side View of Position 4 CRS	A-18
Photo No. 19.	Pre-Test Position 3 Left Side View	A-19
Photo No. 20.	Post-Test Position 3 Left Side View	A-20
Photo No. 21.	Pre-Test Position 4 Left Side View	A-21
Photo No. 22.	Post-Test Position 4 Left Side View	A-22
Photo No. 23.	Pre-Test Position 3 Right Side View	A-23
Photo No. 24.	Post-Test Position 3 Right Side View	A-24
Photo No. 25.	Pre-Test Position 4 Right Side View	A-25
Photo No. 26.	Post-Test Position 4 Right Side View	A-26
Photo No. 27.	Pre-Test Position 3 Rear View	A-27
Photo No. 28.	Post-Test Position 3 Rear View	A-28
Photo No. 29.	Pre-Test Position 4 Rear View	A-29
Photo No. 30.	Post-Test Position 4 Rear View	A-30

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

FOR YOUR CHILD'S CONTINUED SAFETY

Please take a few moments to promptly fill out and return the attached card.

Although child restraint systems undergo testing and evaluation, it is possible that a child restraint could be recalled.

In case of recall, we can reach you only if we have your name and address, so please send in the card to be on our recall list.

**Please fill this card out and mail it NOW,
while you are thinking about it.**

It's already addressed and we've paid the postage.

Tear off and mail this part.

Consumer: Just fill in your name and address.

Your Name: _____

Your Street Address: _____

City: _____ **State:** _____ **Zip Code:** _____



CHILD RESTRAINT REGISTRATION CARD

RESTRAINT MODEL: E9L0240
SERIAL NUMBER: E9L02401953
MANUFACTURED IN: Sept 19, 2003
BATCH NUMBER: 504459

Check

I have been trained by the store in the installation of this restraint.

#4 04/01

P200700

Close-up View of Position 4 CRS Label

A-11.



Pre-Test Frontal View of Position 4 CRS



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



Post-Test Left Side View of Position 4 CRS

A-17.



Pre-Test Right Side View of Position 4 CRS



Post-Test Right Side View of Position 4 CRS



Pre-Test Position 3 Left Side View



Post-Test Position 3 Left Side View

A-21.



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

A-25.



Pre-Test Position 4 Right Side View

A-26.



Post-Test Position 4 Right Side View



Pre-Test Position 3 Rear View



Post-Test Position 3 Rear View



Pre-Test Position 4 Rear View



Post-Test Position 4 Rear View

APPENDIX B
CHILD DUMMY RESPONSE DATA TRACES

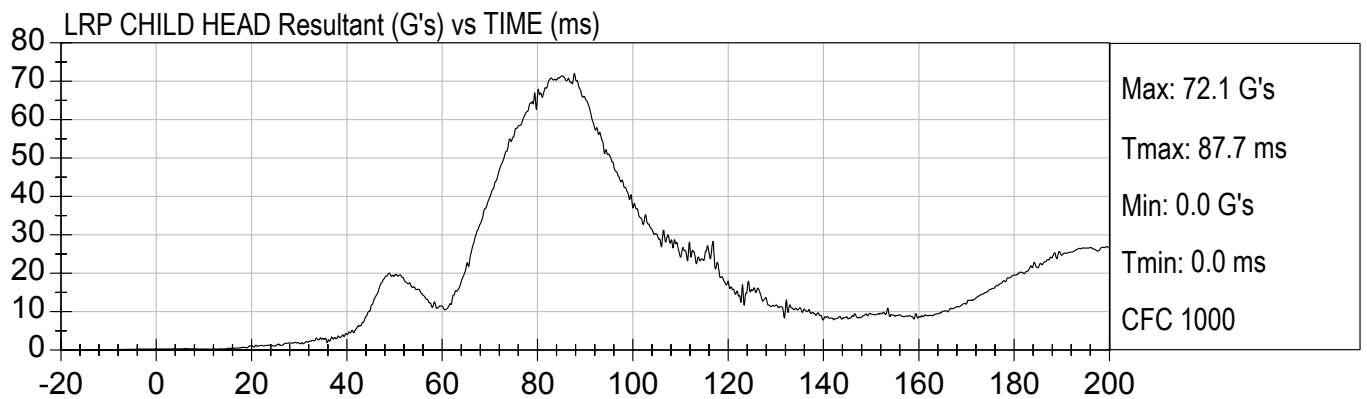
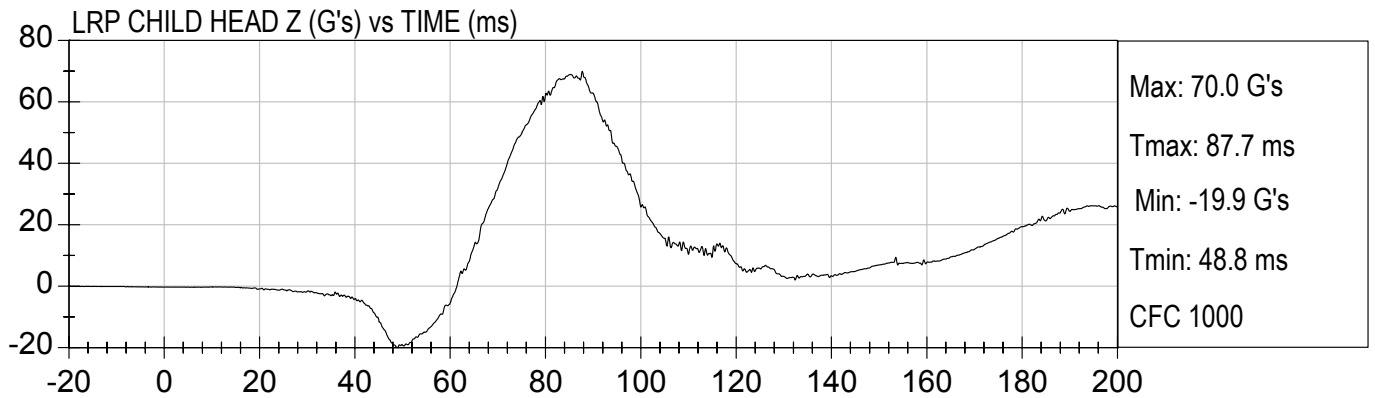
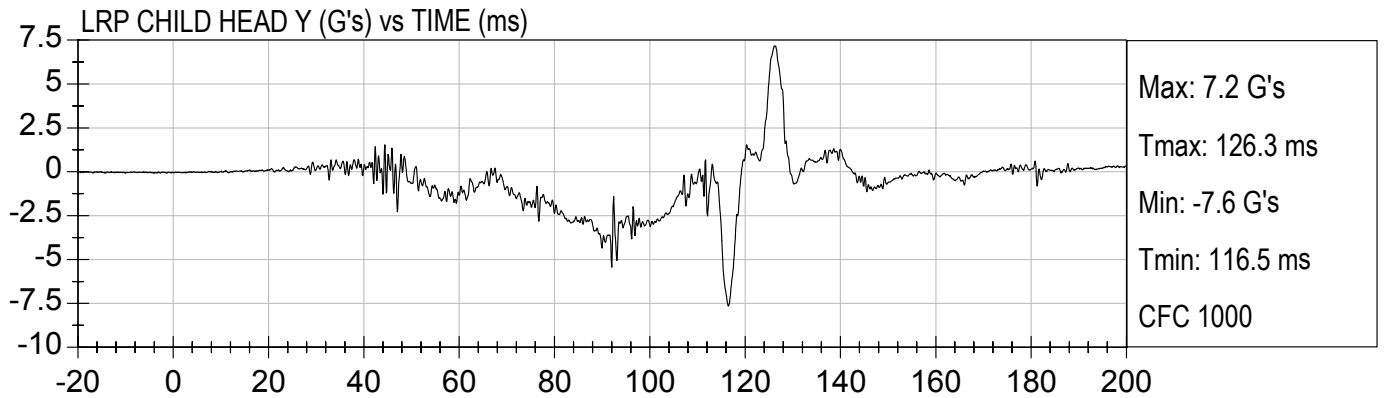
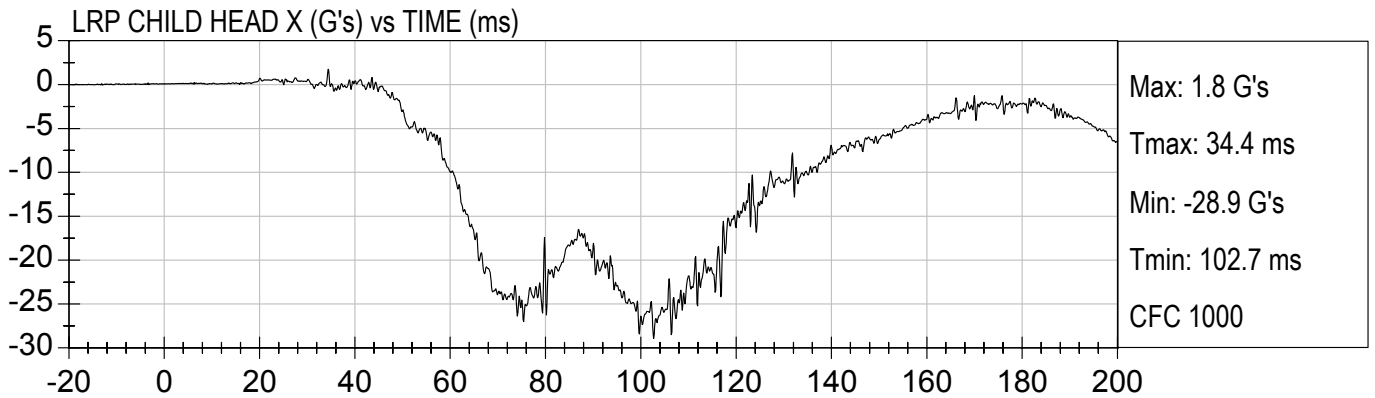
TABLE OF DATA PLOTS

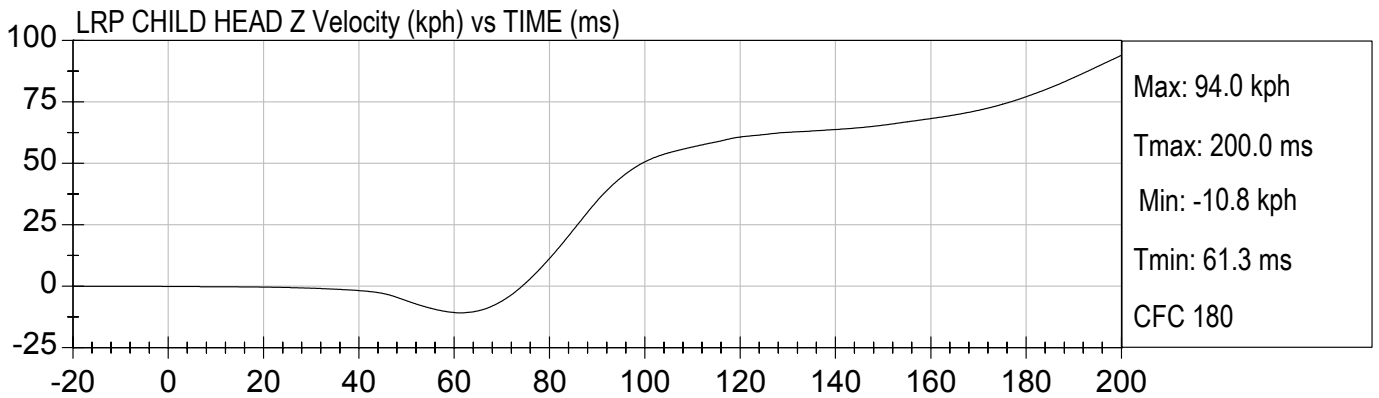
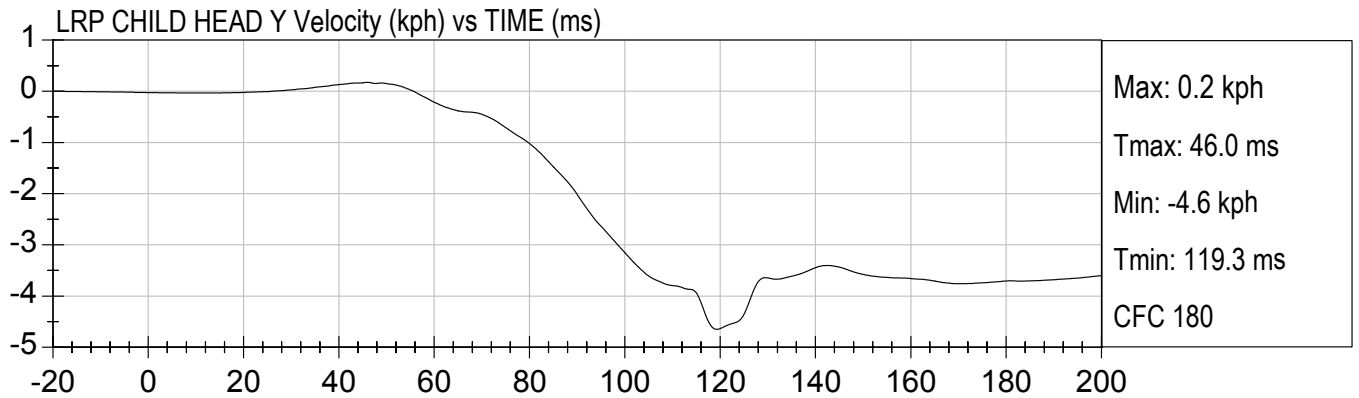
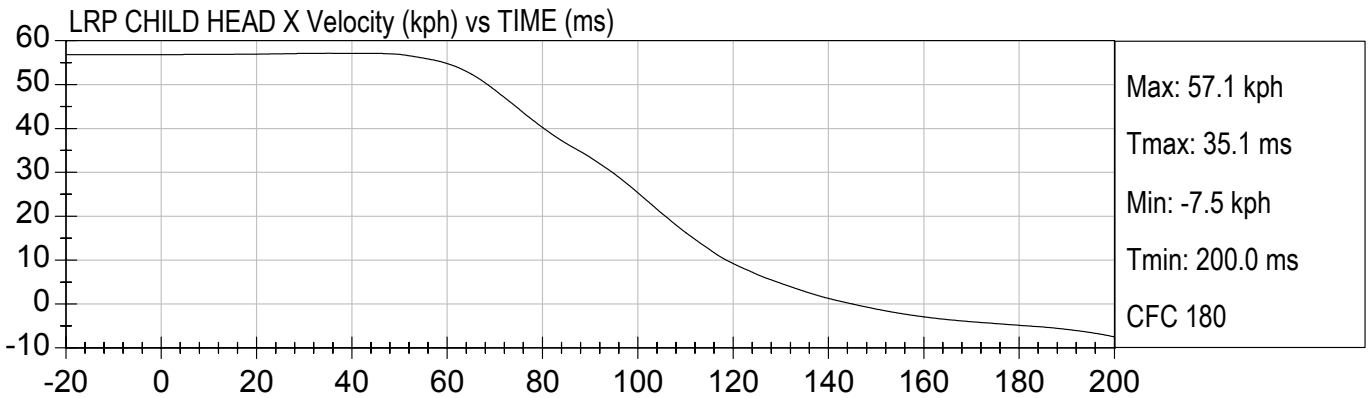
		<u>Page No.</u>
Figure No. 1.	LRP Child Head X Acceleration vs. Time	B-1
Figure No. 2.	LRP Child Head Y Acceleration vs. Time	B-1
Figure No. 3.	LRP Child Head Z Acceleration vs. Time	B-1
Figure No. 4.	LRP Child Head Resultant Acceleration vs. Time	B-1
Figure No. 5.	LRP Child Head X Velocity vs. Time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

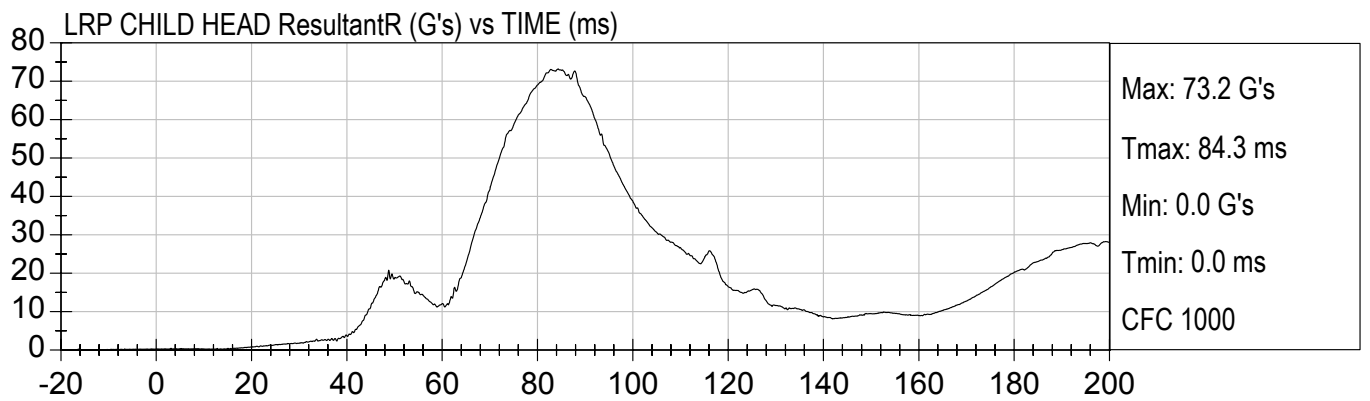
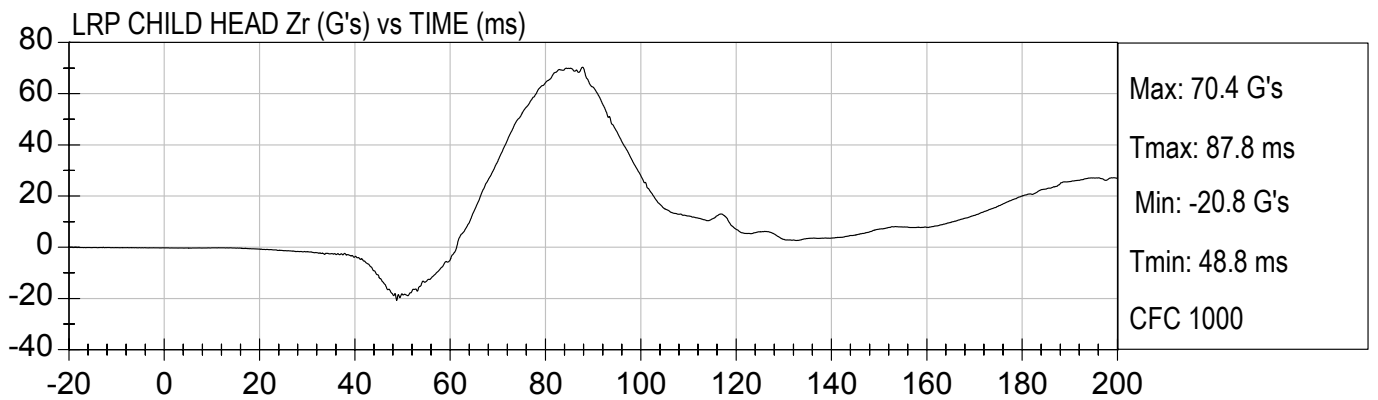
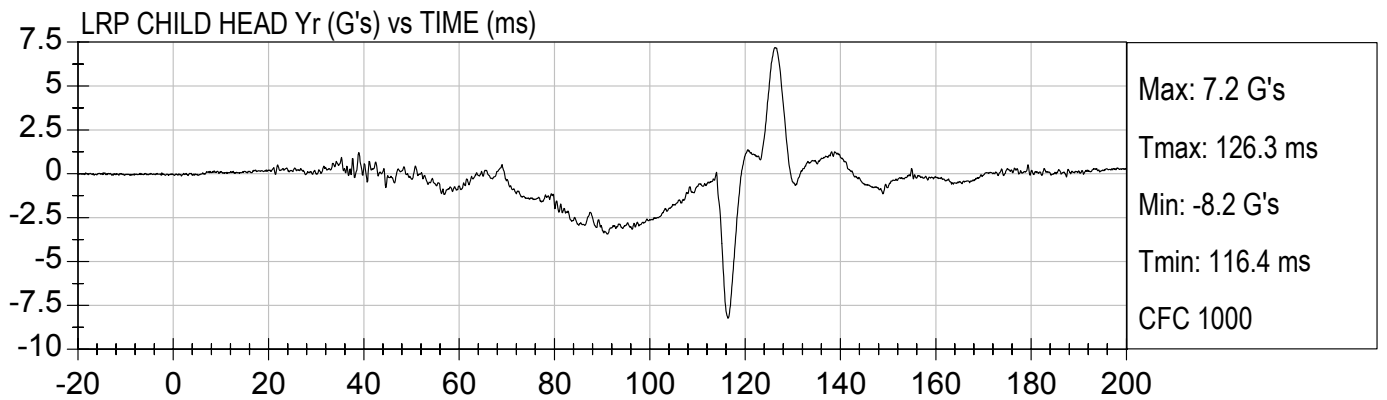
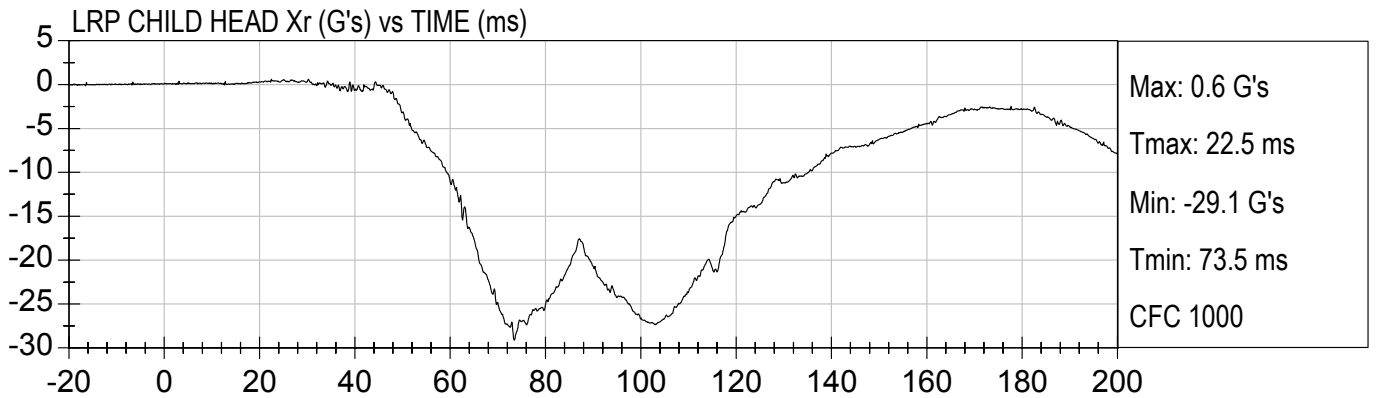
		<u>Page No.</u>
Figure No. 29.	LRP Child Chest Z Velocity vs. Time	B-8
Figure No. 30.	LRP Child Chest Displacement vs. Time	B-8
Figure No. 31.	LRP Child Chest X Redundant Acceleration vs. Time	B-9
Figure No. 32.	LRP Child Chest Y Redundant Acceleration vs. Time	B-9
Figure No. 33.	LRP Child Chest Z Redundant Acceleration vs. Time	B-9
Figure No. 34.	LRP Child Chest Resultant Redundant Acceleration vs. Time	B-9
Figure No. 35.	LRP Child Chest X Redundant Velocity vs. Time	B-10
Figure No. 36.	LRP Child Chest Y Redundant Velocity vs. Time	B-10
Figure No. 37.	LRP Child Chest Z Redundant Velocity vs. Time	B-10
Figure No. 38.	LRP Child Pelvis X Acceleration vs. Time	B-11
Figure No. 39.	LRP Child Pelvis Y Acceleration vs. Time	B-11
Figure No. 40.	LRP Child Pelvis Z Acceleration vs. Time	B-11
Figure No. 41.	LRP Child Pelvis Resultant Acceleration vs. Time	B-11
Figure No. 42.	LRP Child Pelvis X Velocity vs. Time	B-12
Figure No. 43.	LRP Child Pelvis Y Velocity vs. Time	B-12
Figure No. 44.	LRP Child Pelvis Z Velocity vs. Time	B-12
Figure No. 45.	LRP Right Tether Force vs. Time	B-13
Figure No. 46.	LRP Left Tether Force vs. Time	B-13
Figure No. 47.	RRP Child Head X Acceleration vs. Time	B-14
Figure No. 48.	RRP Child Head Y Acceleration vs. Time	B-14
Figure No. 49.	RRP Child Head Z Acceleration vs. Time	B-14
Figure No. 50.	RRP Child Head Resultant Acceleration vs. Time	B-14
Figure No. 51.	RRP Child Head X Velocity vs. Time	B-15
Figure No. 52.	RRP Child Head Y Velocity vs. Time	B-15
Figure No. 53.	RRP Child Head Z Velocity vs. Time	B-15
Figure No. 54.	RRP Child Head X Redundant Acceleration vs. Time	B-16
Figure No. 55.	RRP Child Head Y Redundant Acceleration vs. Time	B-16
Figure No. 56.	RRP Child Head Z Redundant Acceleration vs. Time	B-16
Figure No. 57.	RRP Child Head Resultant Redundant Acceleration vs. Time	B-16

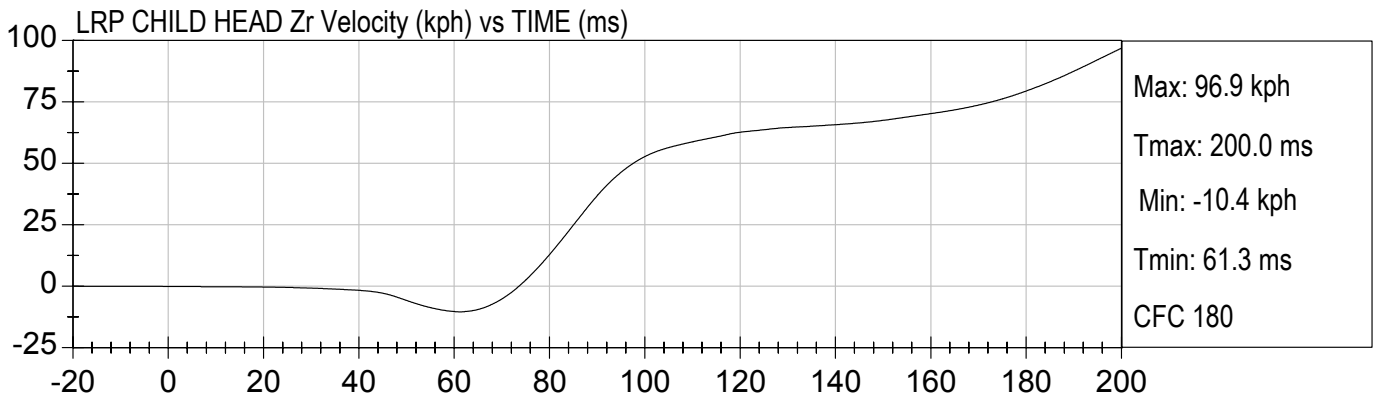
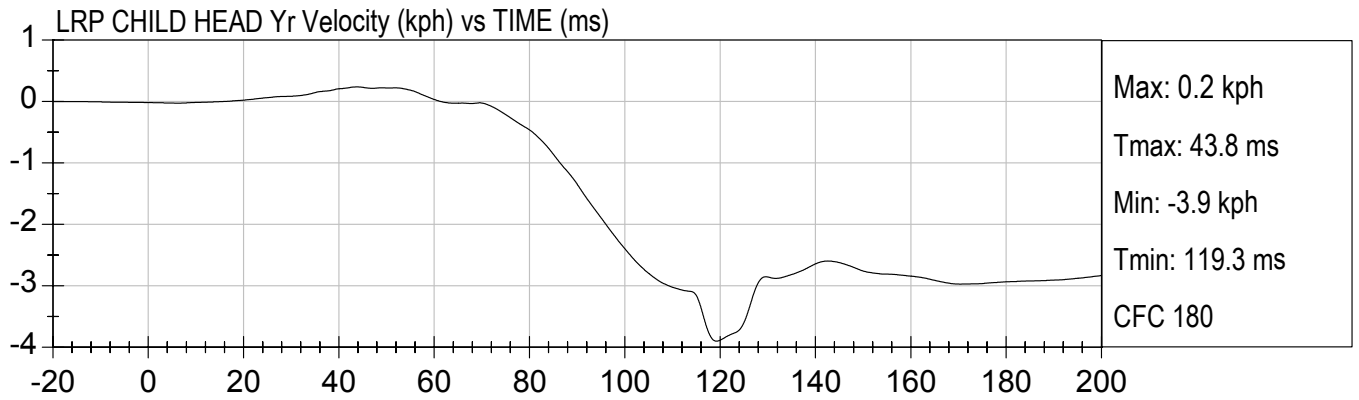
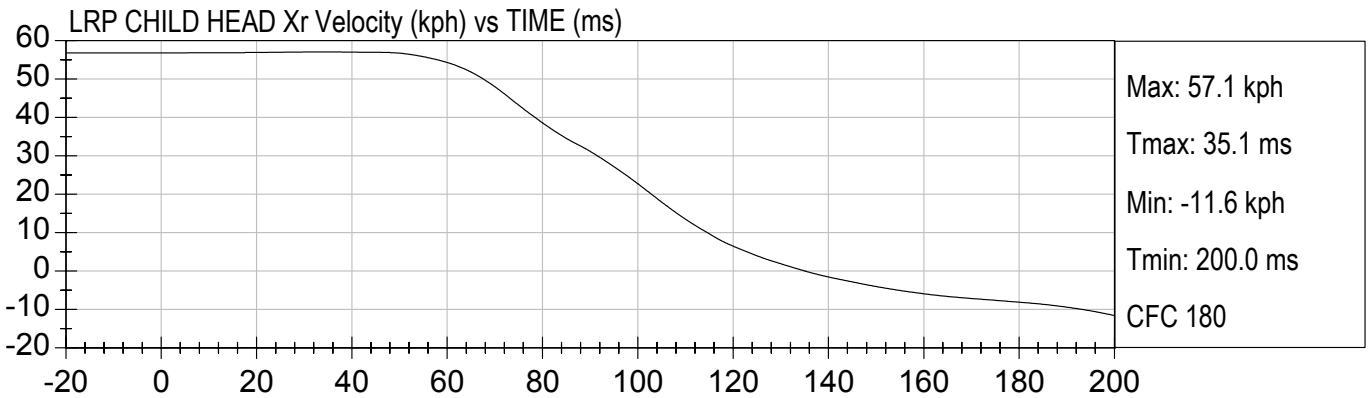
		<u>Page No.</u>
Figure No. 58.	RRP Child Head X Redundant Velocity vs. Time	B-17
Figure No. 59.	RRP Child Head Y Redundant Velocity vs. Time	B-17
Figure No. 60.	RRP Child Head Z Redundant Velocity vs. Time	B-17
Figure No. 61.	RRP Child Upper Neck Force X vs. Time	B-18
Figure No. 62.	RRP Child Upper Neck Force Y vs. Time	B-18
Figure No. 63.	RRP Child Upper Neck Force Z vs. Time	B-18
Figure No. 64.	RRP Child Upper Neck Force Resultant vs. Time	B-18
Figure No. 65.	RRP Child Upper Neck Moment X vs. Time	B-19
Figure No. 66.	RRP Child Upper Neck Moment Y vs. Time	B-19
Figure No. 67.	RRP Child Upper Neck Moment Z vs. Time	B-19
Figure No. 68.	RRP Child Upper Neck Moment Resultant vs. Time	B-19
Figure No. 69.	RRP Child Chest X Acceleration vs. Time	B-20
Figure No. 70.	RRP Child Chest Y Acceleration vs. Time	B-20
Figure No. 71.	RRP Child Chest Z Acceleration vs. Time	B-20
Figure No. 72.	RRP Child Chest Resultant Acceleration vs. Time	B-20
Figure No. 73.	RRP Child Chest X Velocity vs. Time	B-21
Figure No. 74.	RRP Child Chest Y Velocity vs. Time	B-21
Figure No. 75.	RRP Child Chest Z Velocity vs. Time	B-21
Figure No. 76.	RRP Child Chest Displacement vs. Time	B-21
Figure No. 77.	RRP Child Chest X Redundant Acceleration vs. Time	B-22
Figure No. 78.	RRP Child Chest Y Redundant Acceleration vs. Time	B-22
Figure No. 79.	RRP Child Chest Z Redundant Acceleration vs. Time	B-22
Figure No. 80.	RRP Child Chest Resultant Redundant Acceleration vs. Time	B-22
Figure No. 81.	RRP Child Chest X Redundant Velocity vs. Time	B-23
Figure No. 82.	RRP Child Chest Y Redundant Velocity vs. Time	B-23
Figure No. 83.	RRP Child Chest Z Redundant Velocity vs. Time	B-23
Figure No. 84.	RRP Child Pelvis X Acceleration vs. Time	B-24
Figure No. 85.	RRP Child Pelvis Y Acceleration vs. Time	B-24
Figure No. 86.	RRP Child Pelvis Z Acceleration vs. Time	B-24

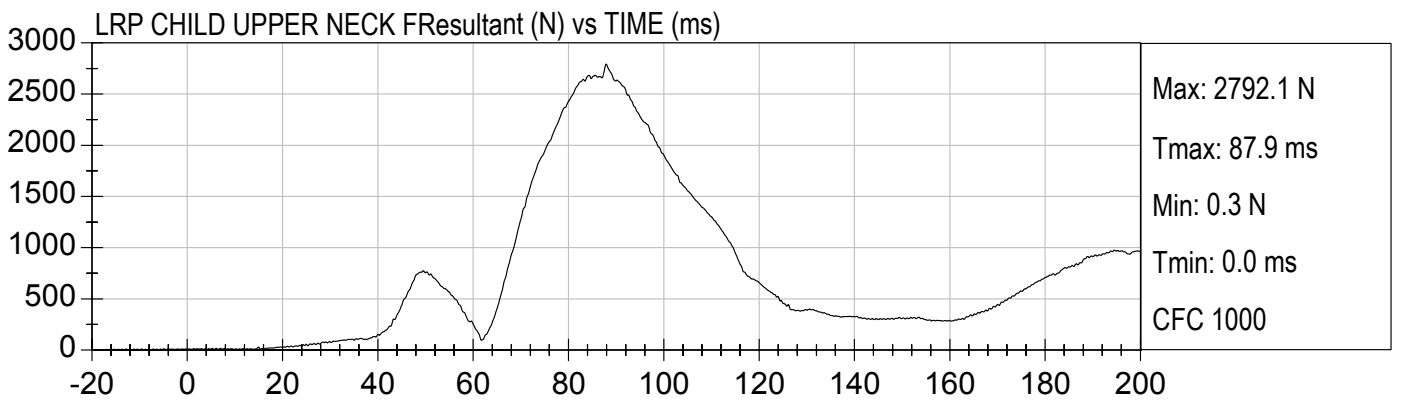
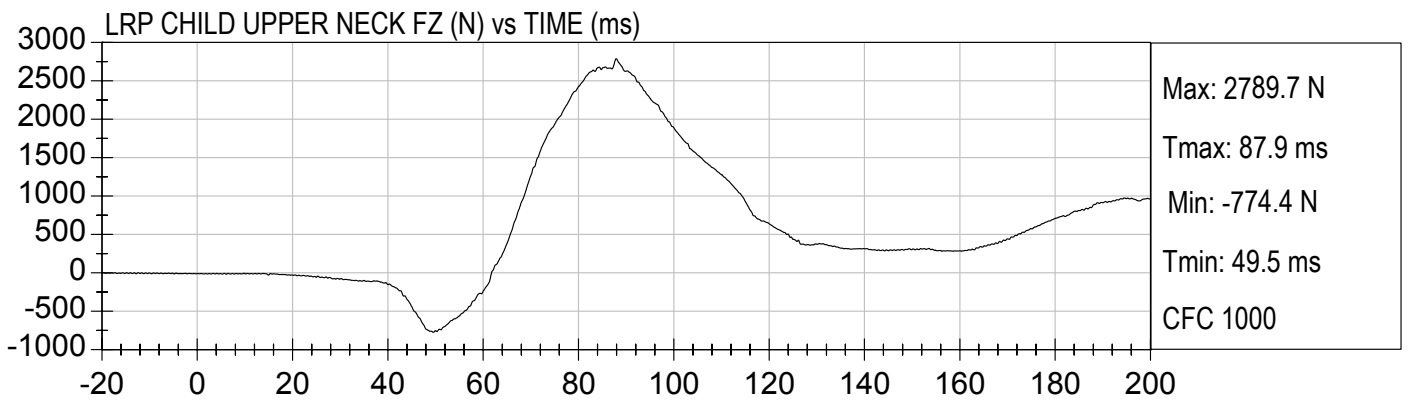
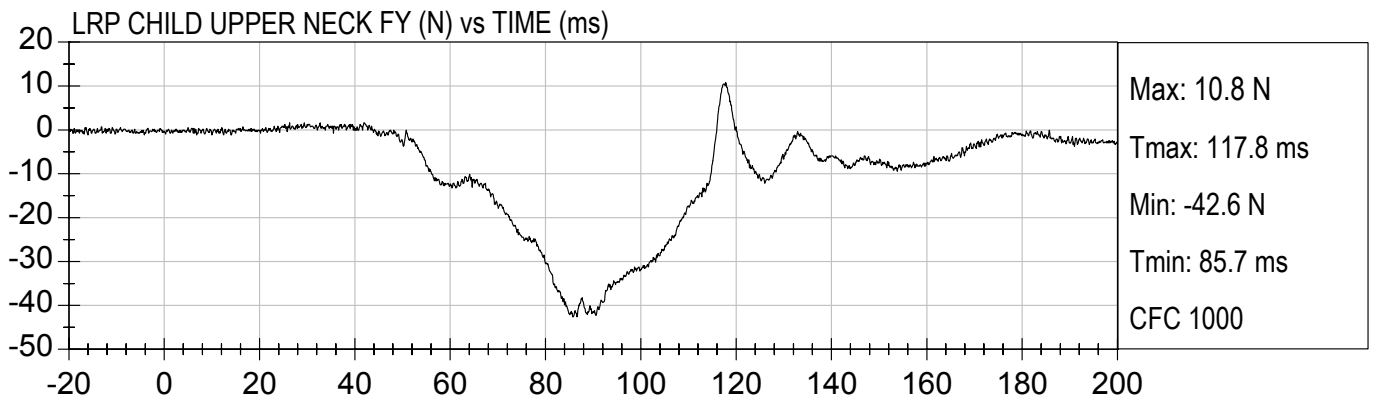
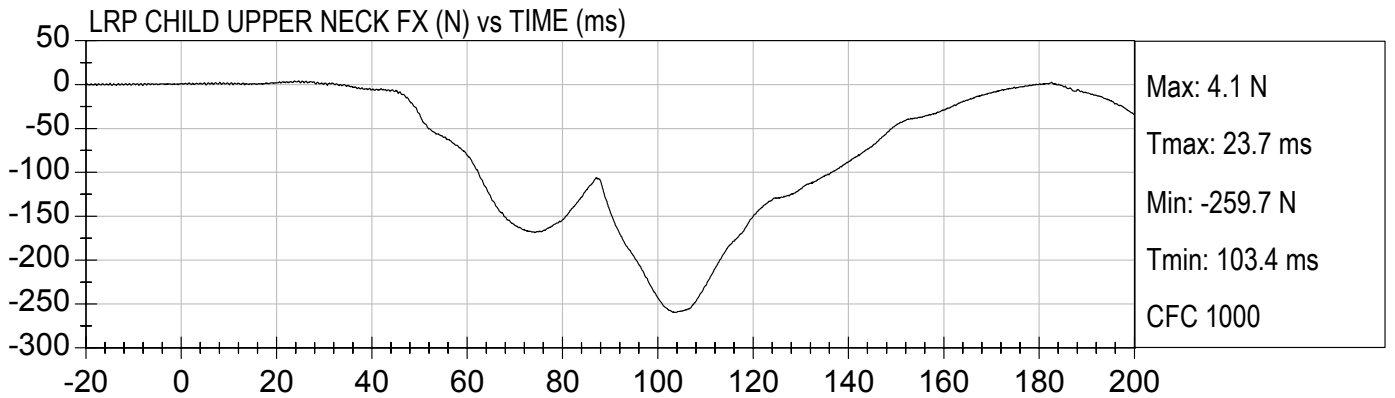
		<u>Page No.</u>
Figure No. 87.	RRP Child Pelvis Resultant Acceleration vs. Time	B-24
Figure No. 88.	RRP Child Pelvis X Velocity vs. Time	B-25
Figure No. 89.	RRP Child Pelvis Y Velocity vs. Time	B-25
Figure No. 90.	RRP Child Pelvis Z Velocity vs. Time	B-25
Figure No. 91.	RRP Tether Force vs. Time	B-25





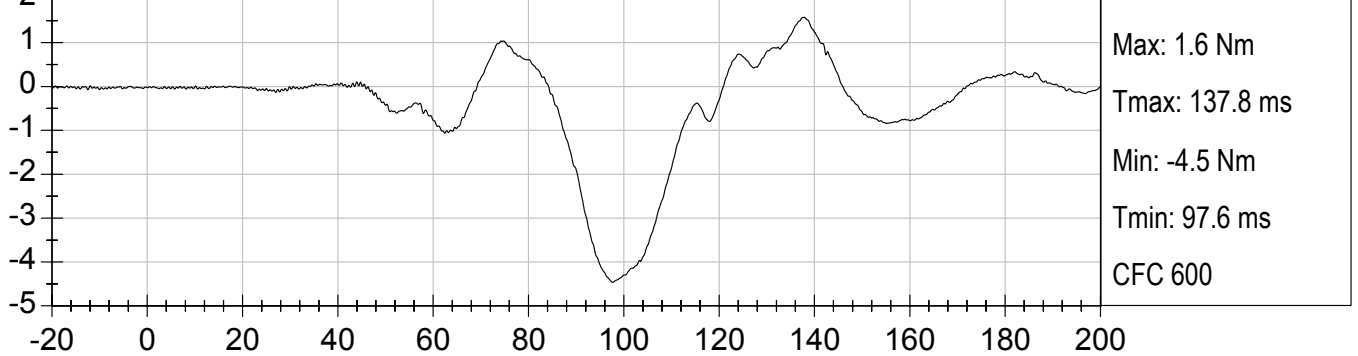




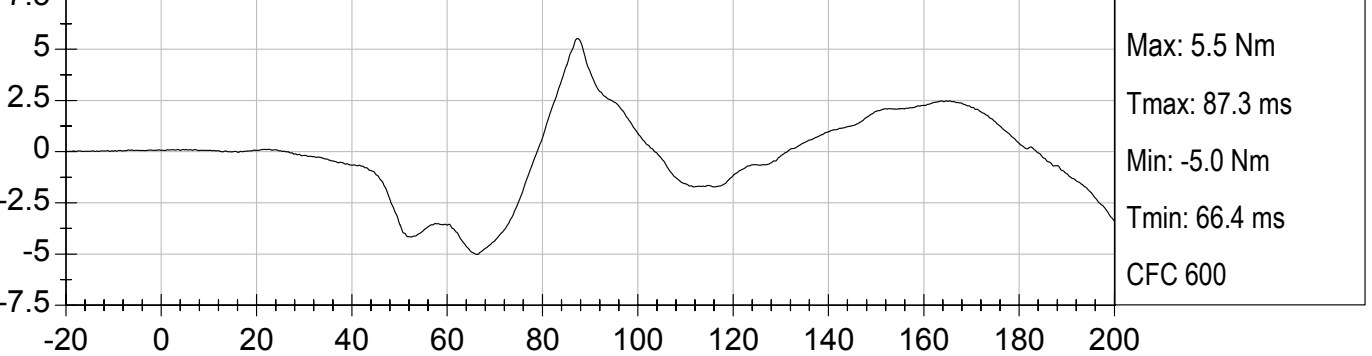




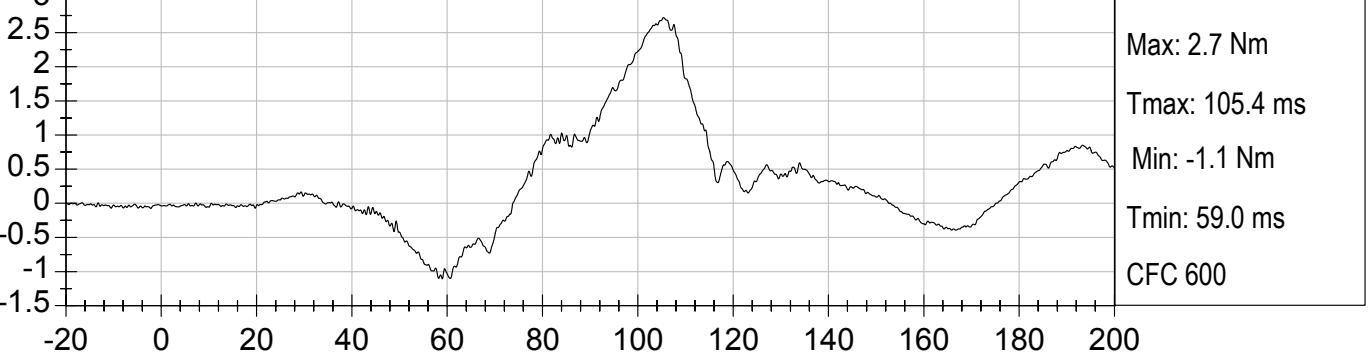
LRP CHILD UPPER NECK MX (Nm) vs TIME (ms)



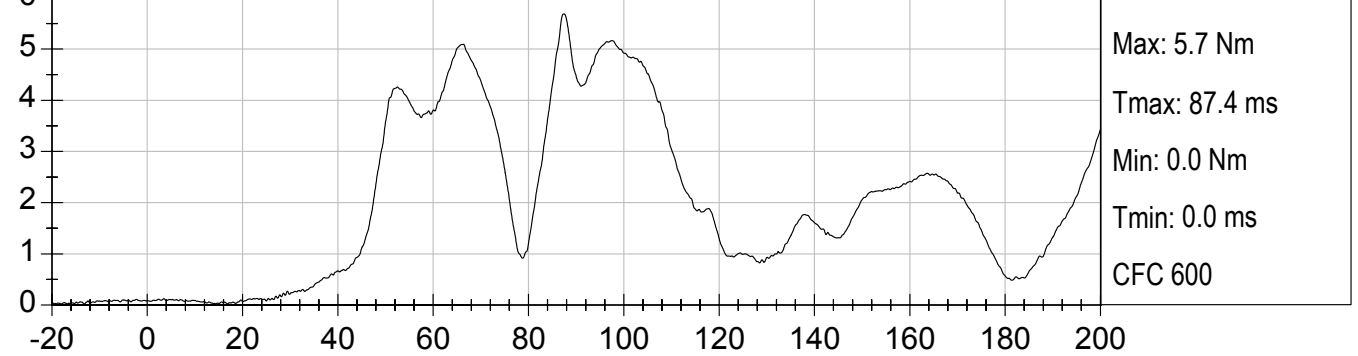
LRP CHILD UPPER NECK MY (Nm) vs TIME (ms)

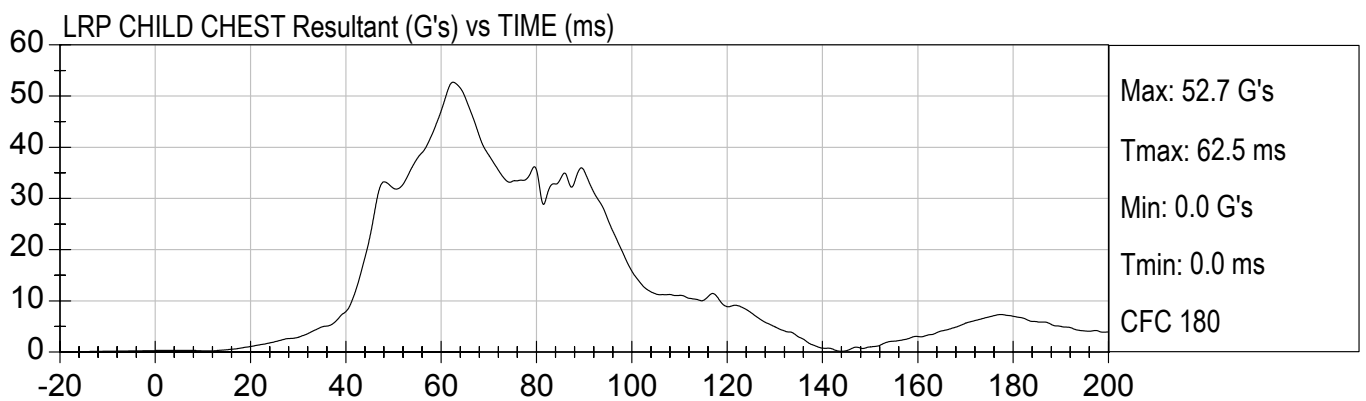
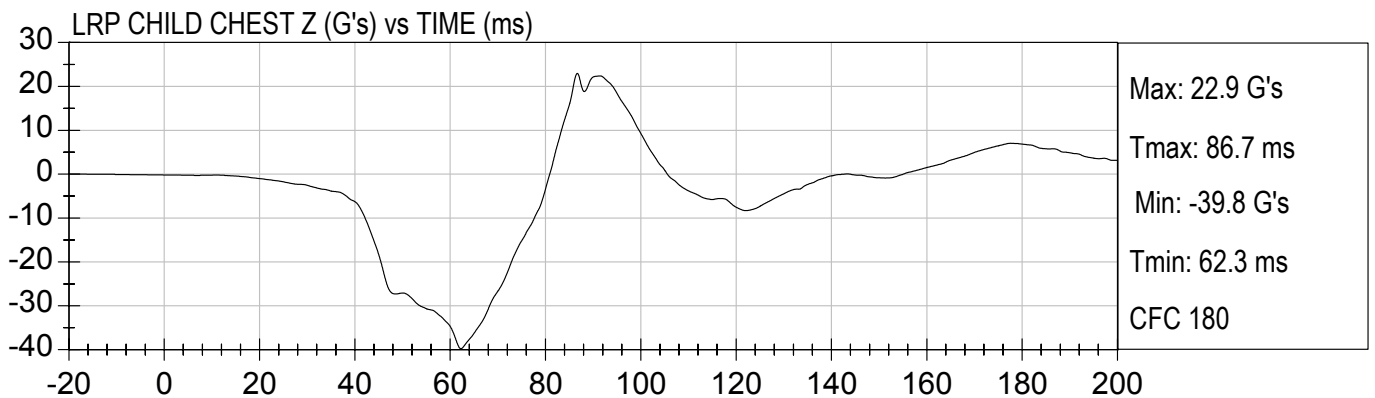
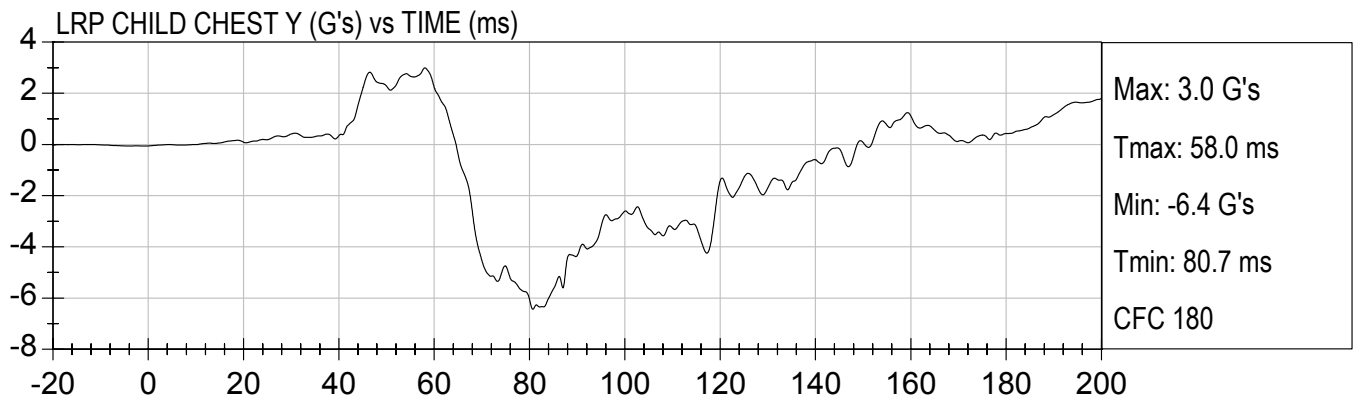
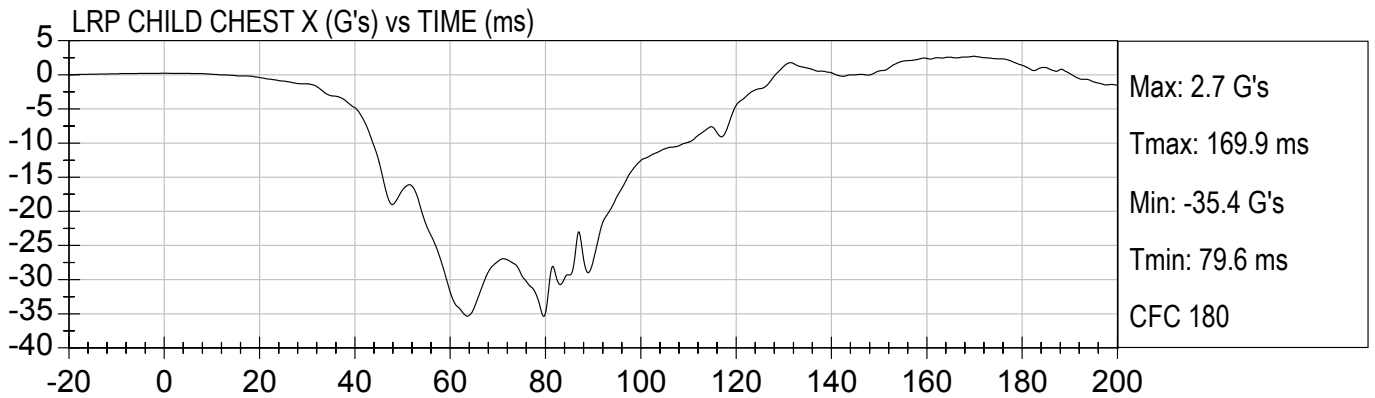


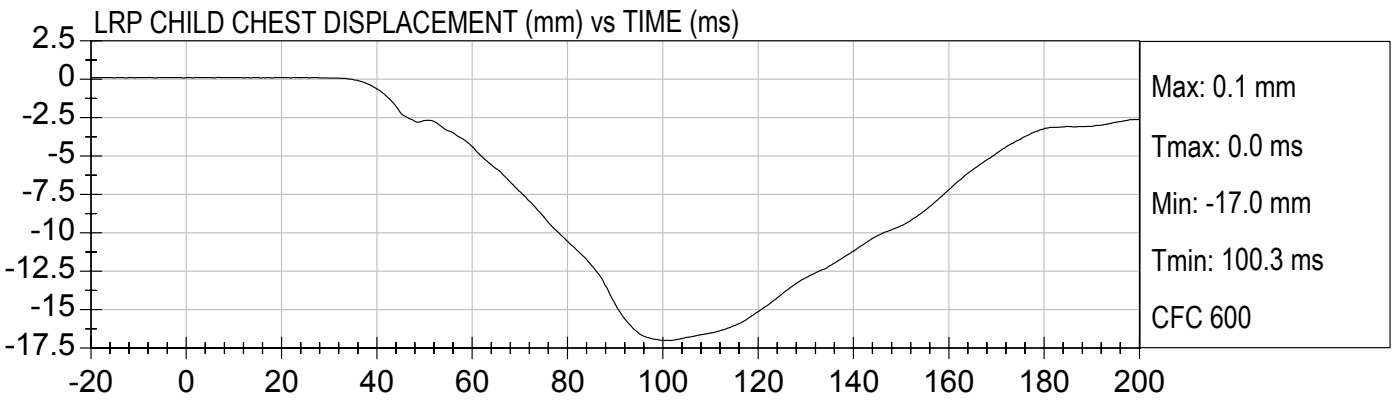
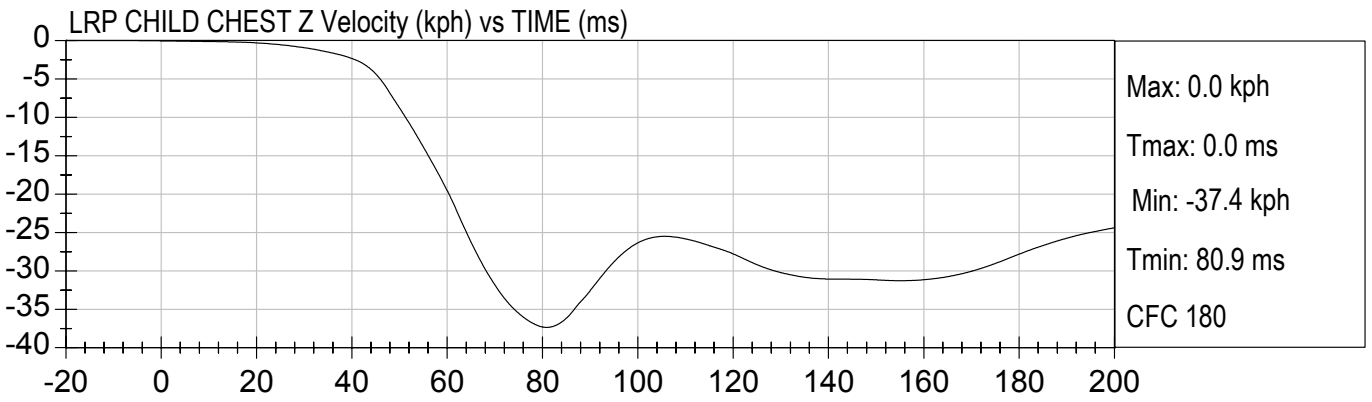
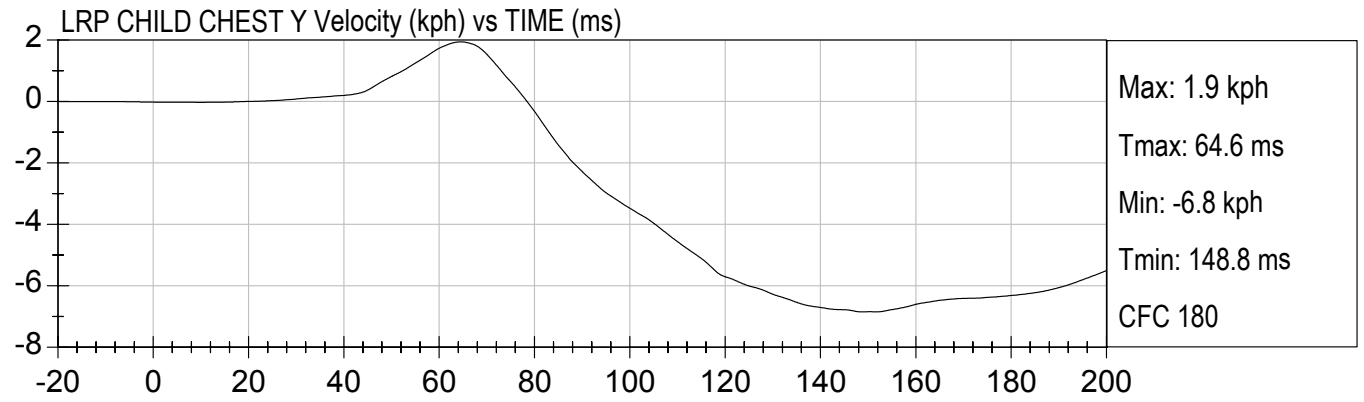
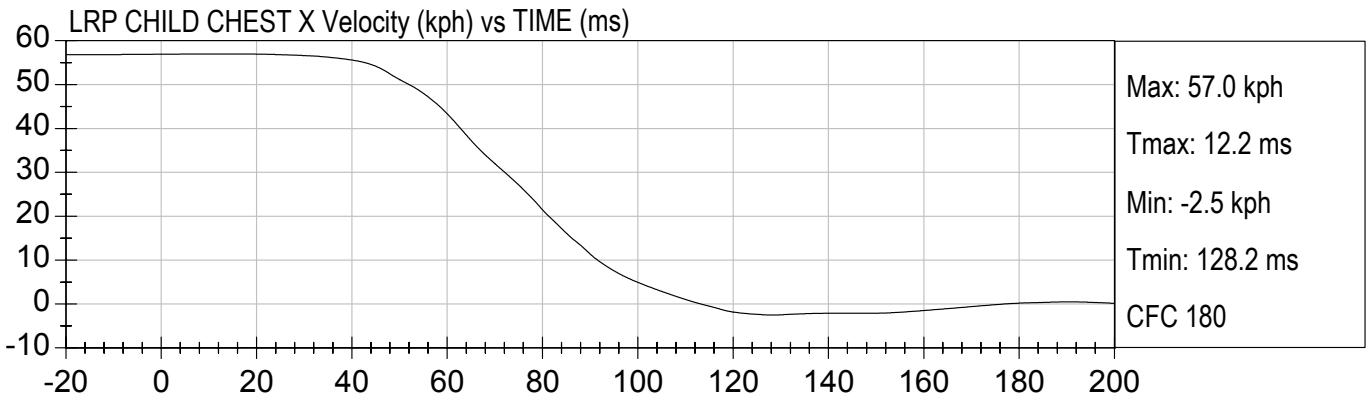
LRP CHILD UPPER NECK MZ (Nm) vs TIME (ms)

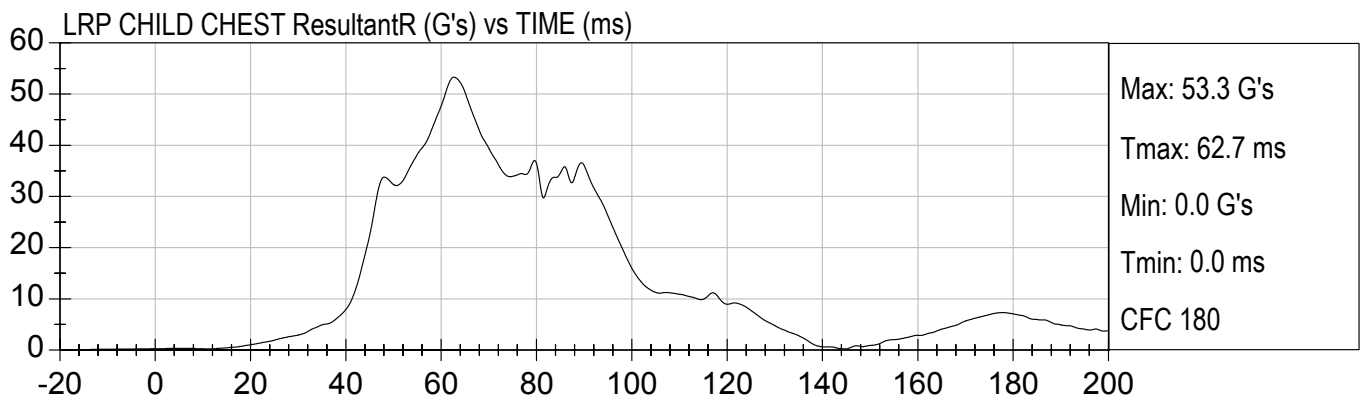
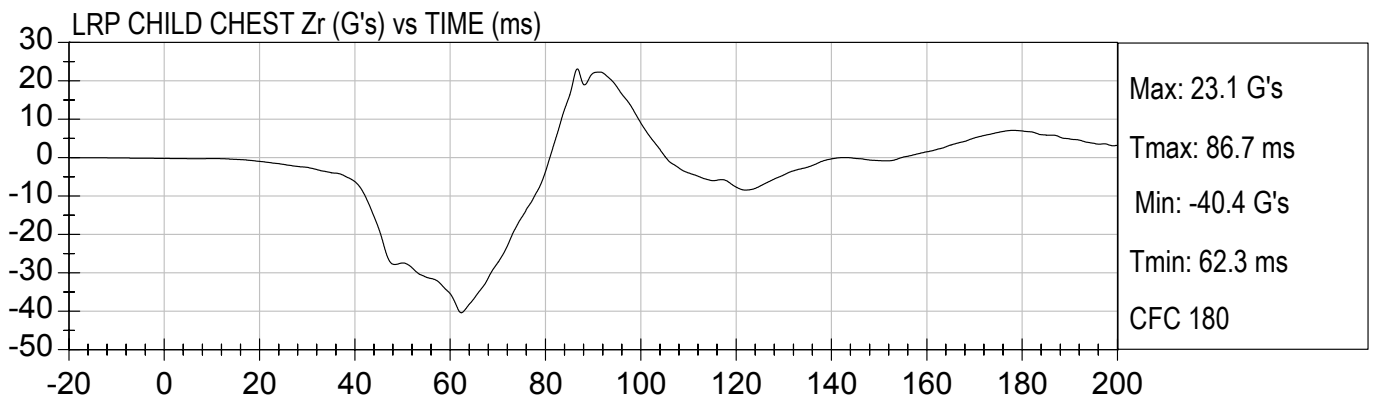
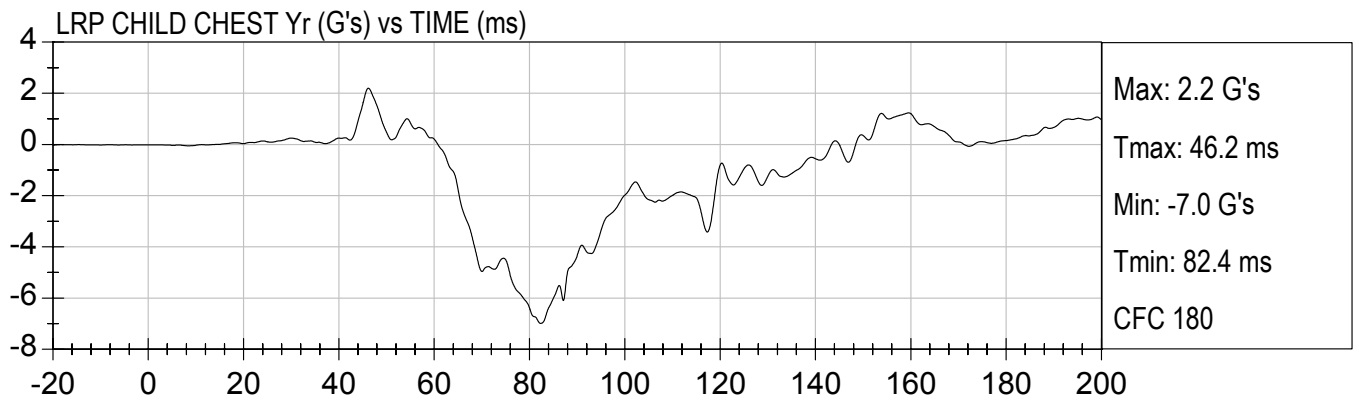
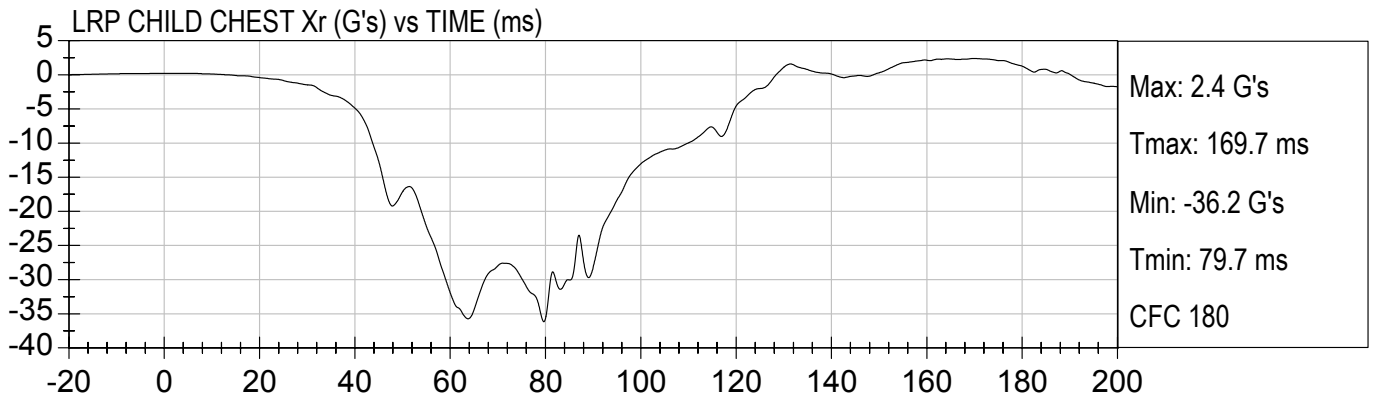


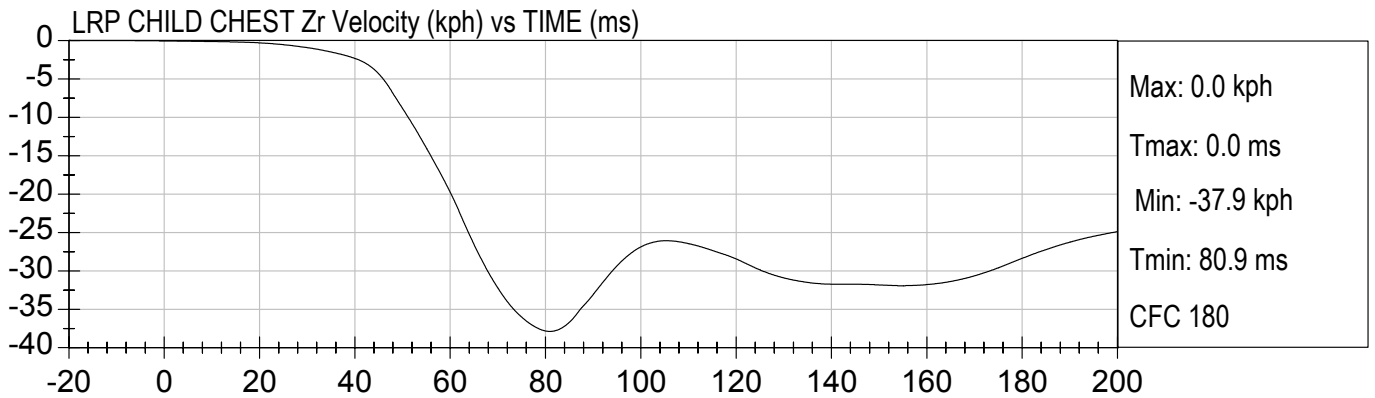
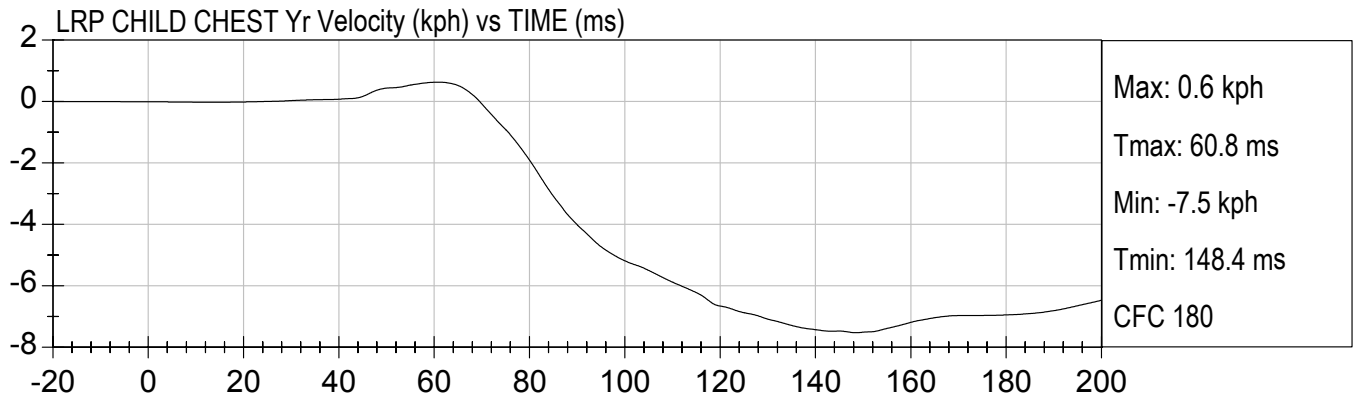
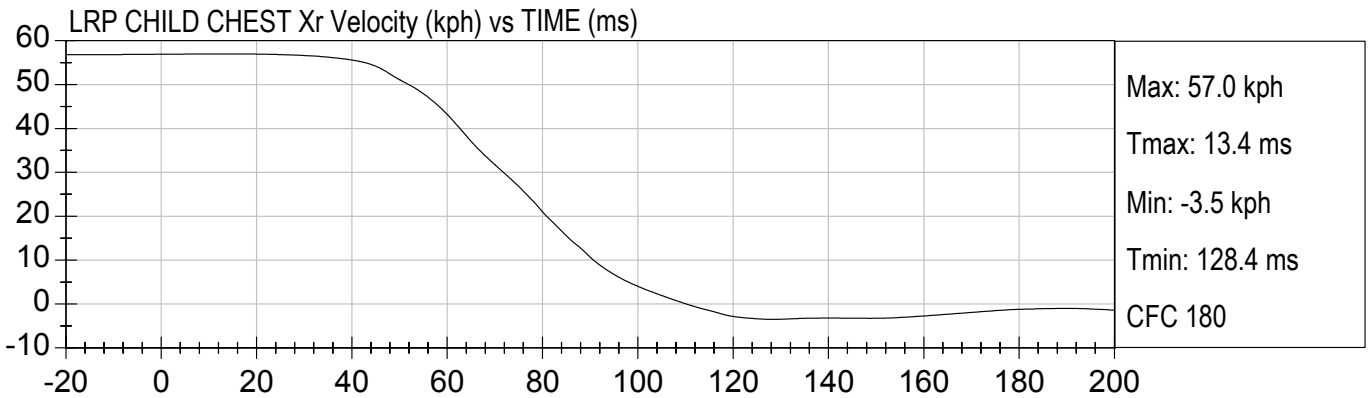
LRP CHILD UPPER NECK MResultant (Nm) vs TIME (ms)

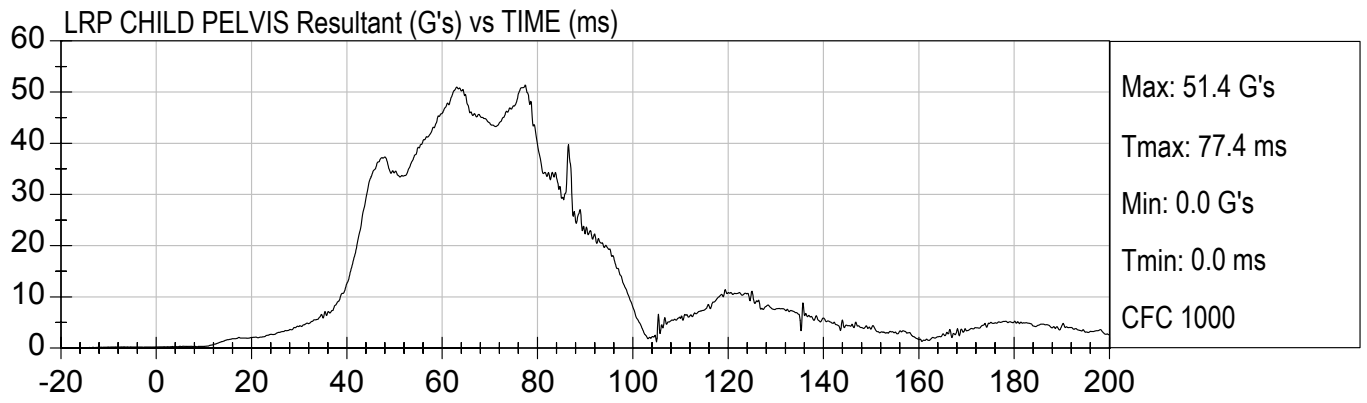
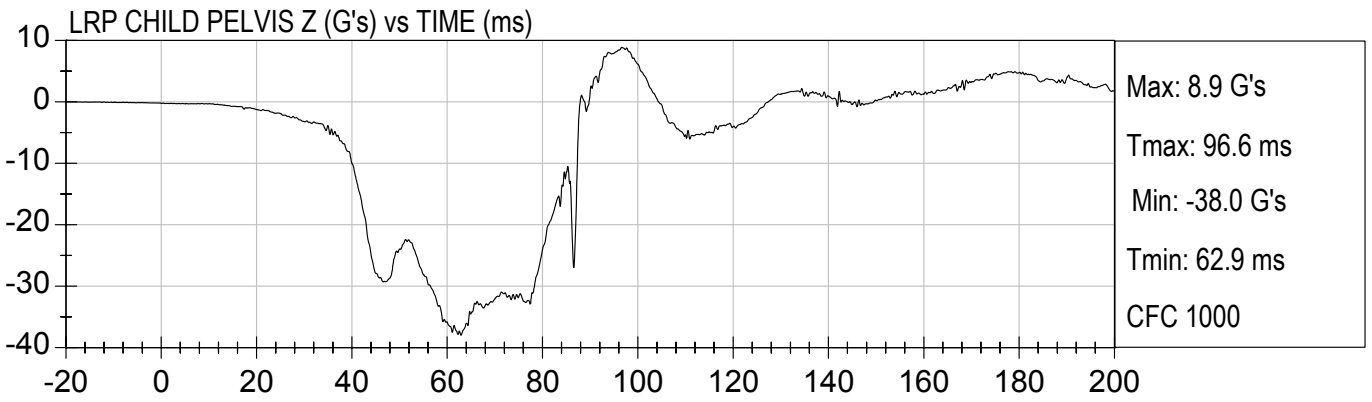
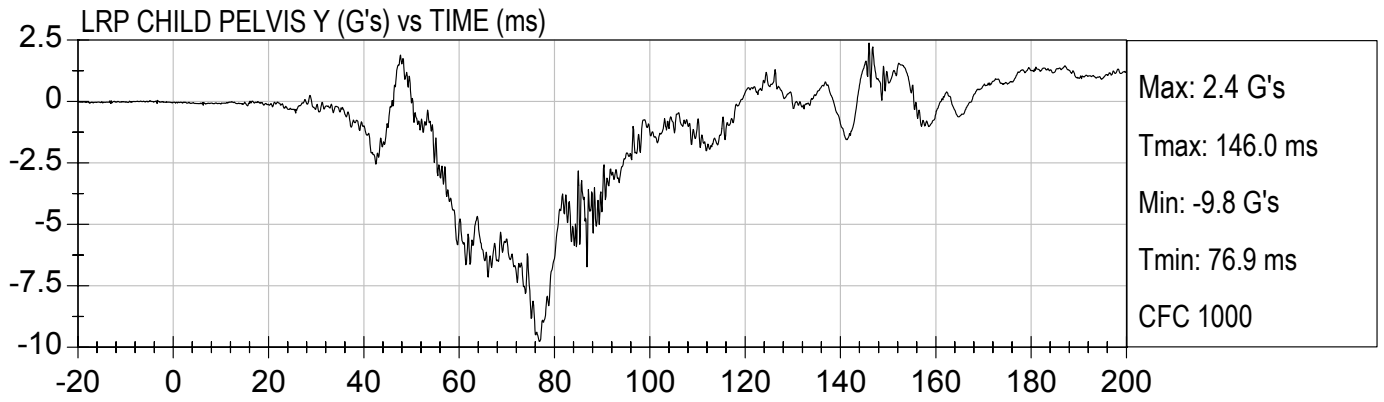
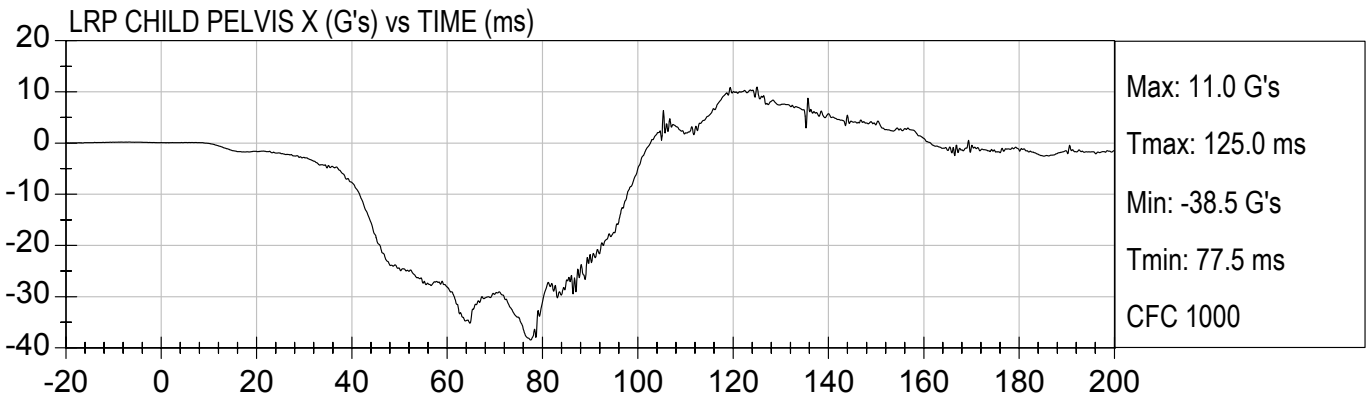






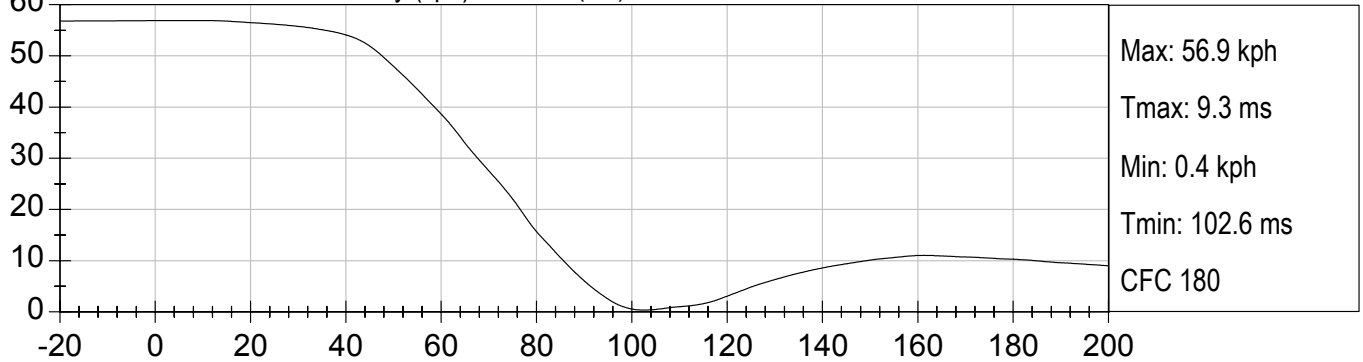




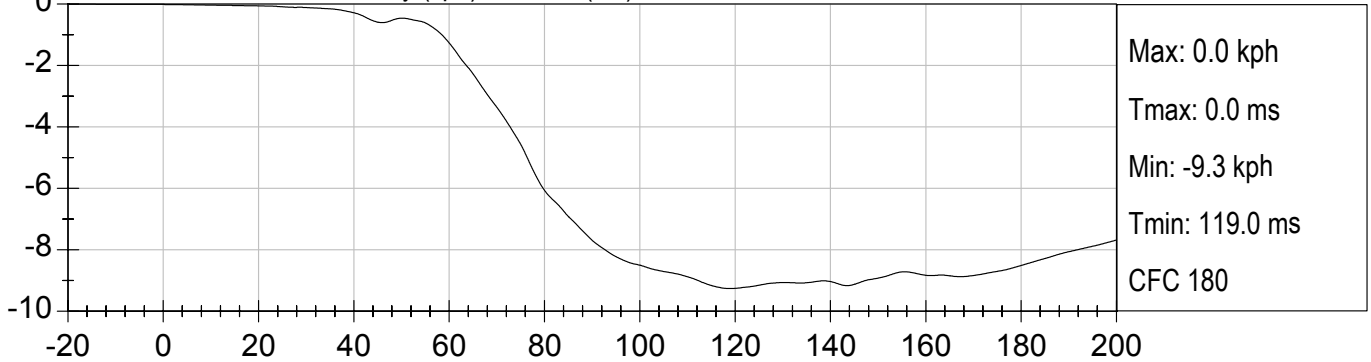




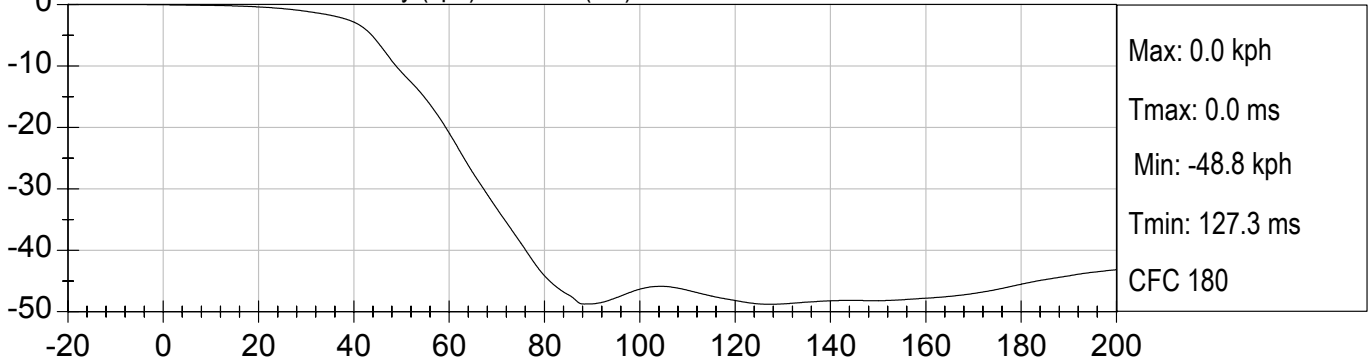
LRP CHILD PELVIS X Velocity (kph) vs TIME (ms)

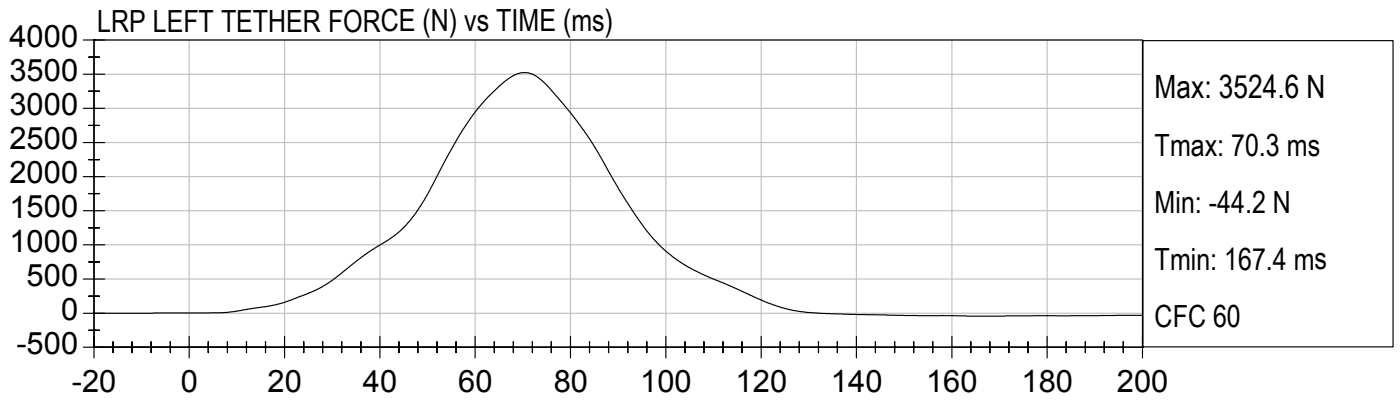
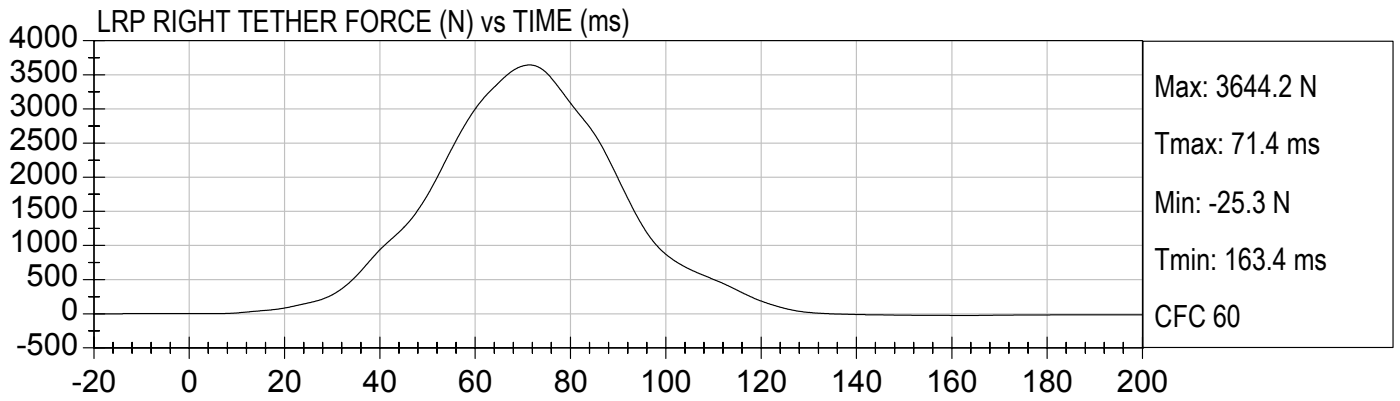


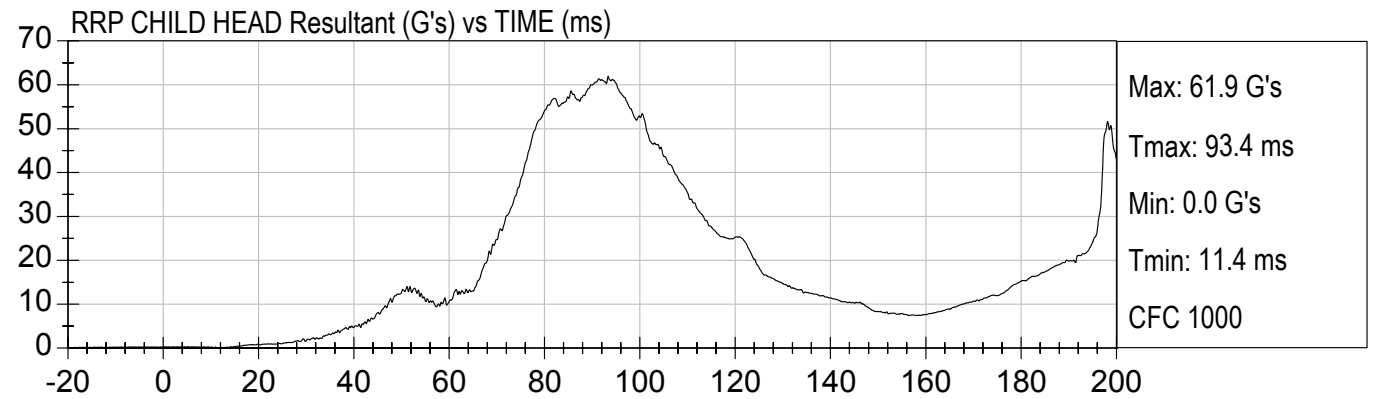
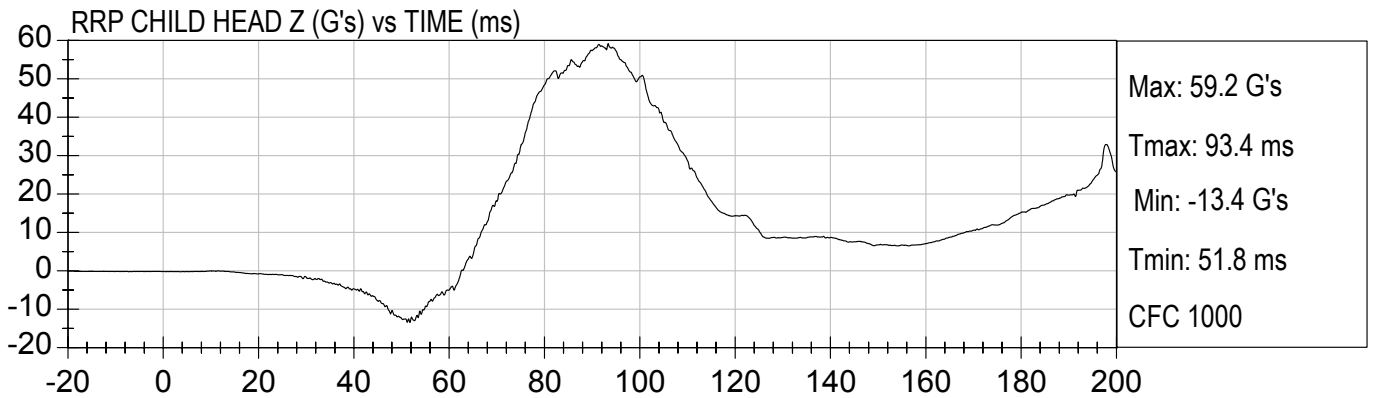
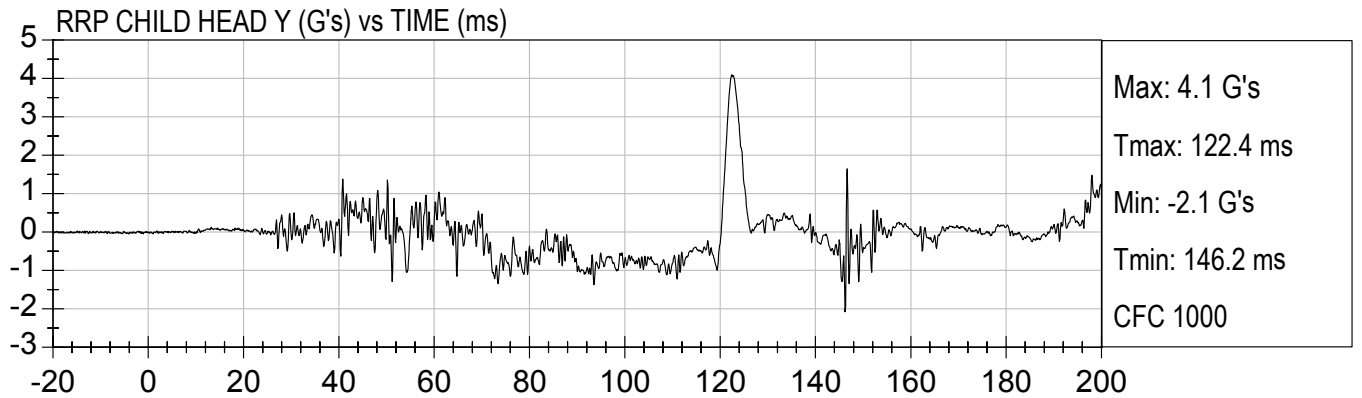
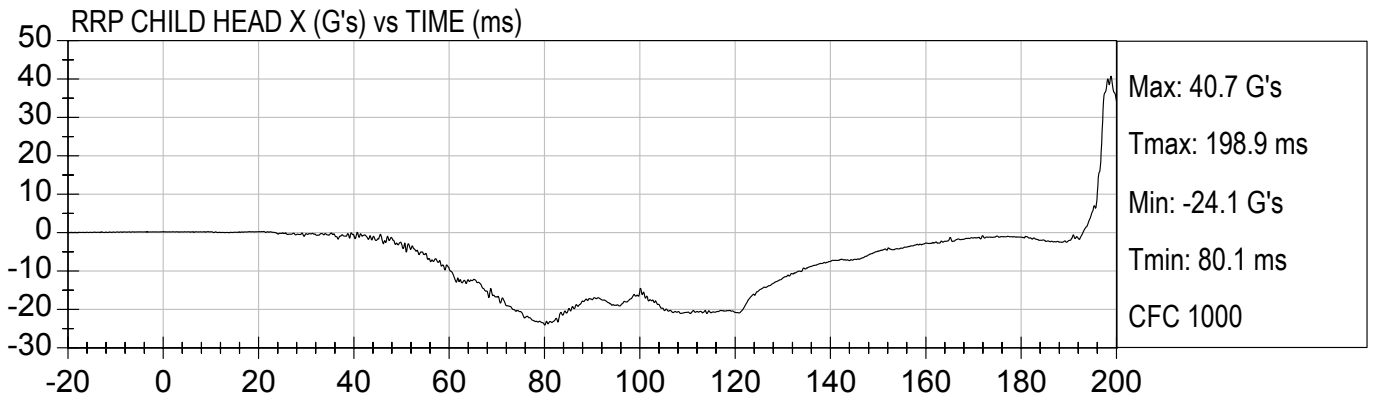
LRP CHILD PELVIS Y Velocity (kph) vs TIME (ms)



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

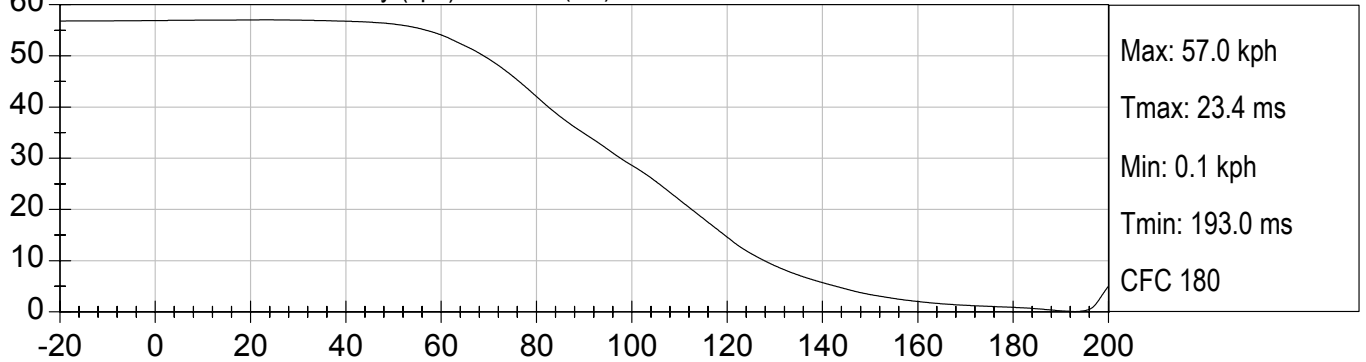




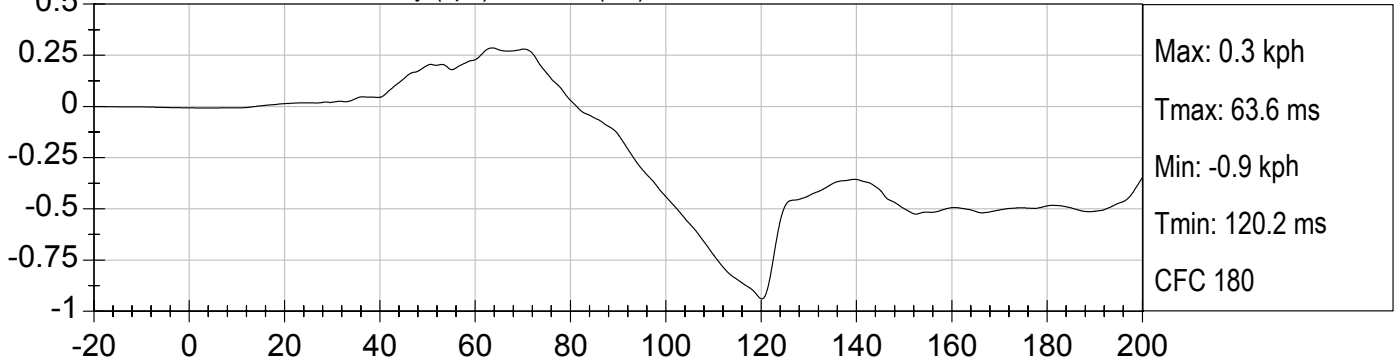




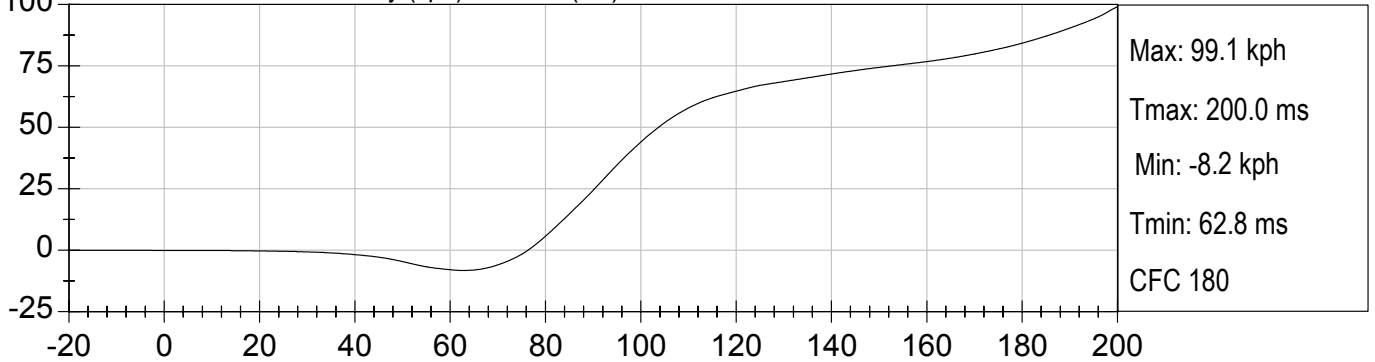
RRP CHILD HEAD X Velocity (kph) vs TIME (ms)

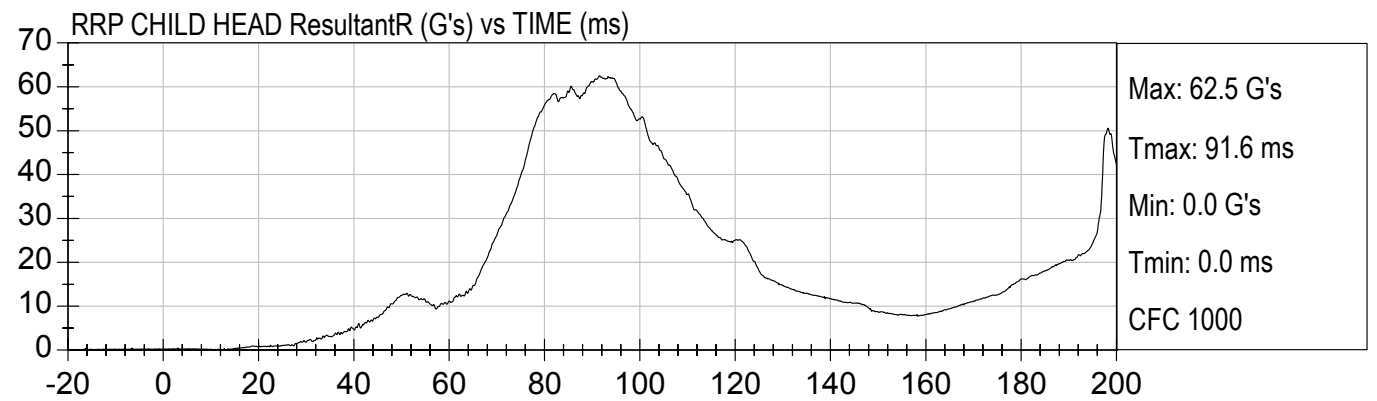
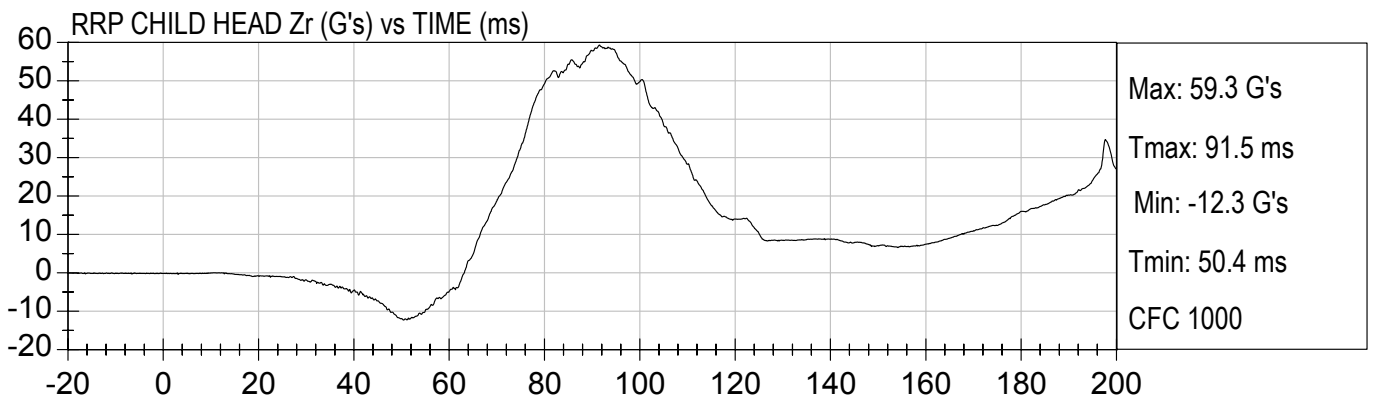
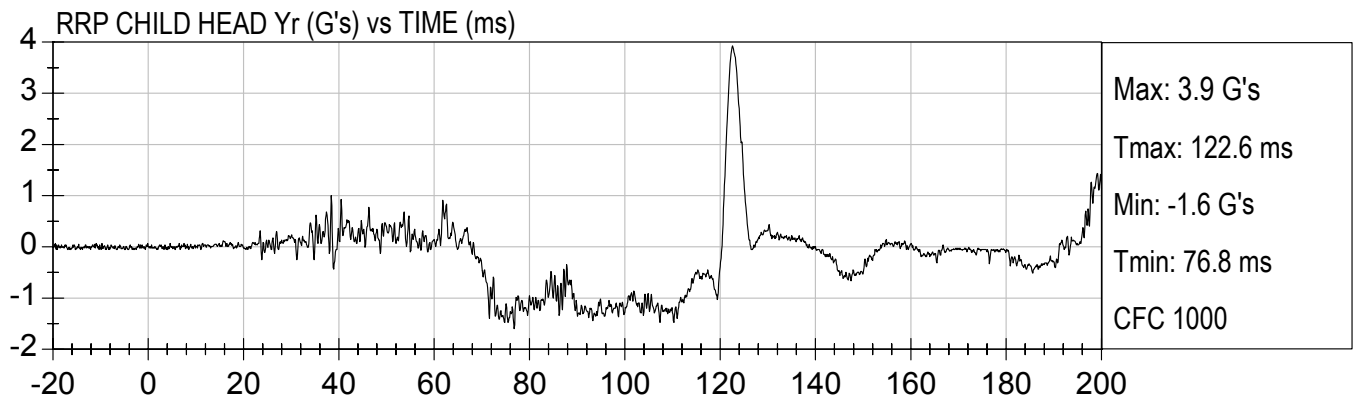
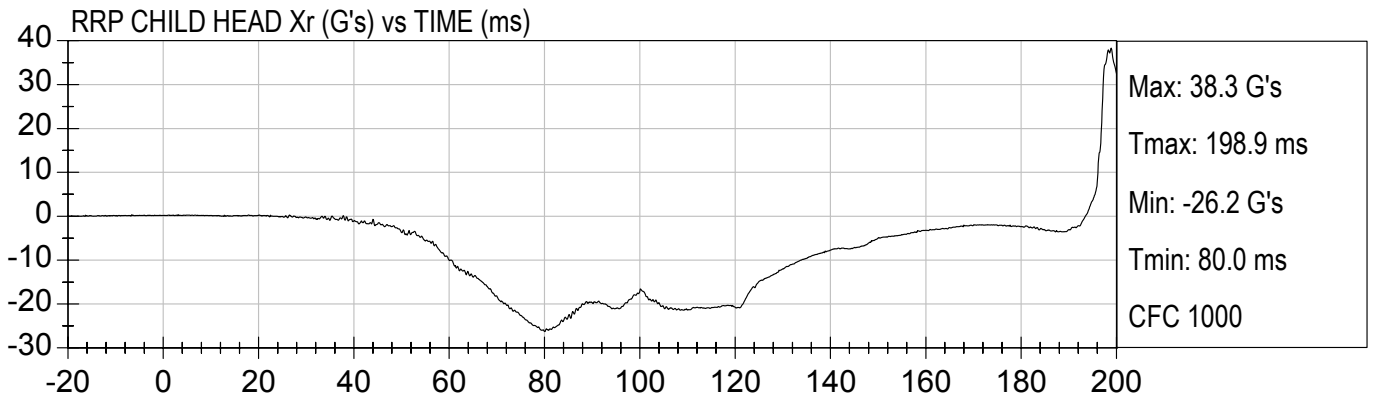


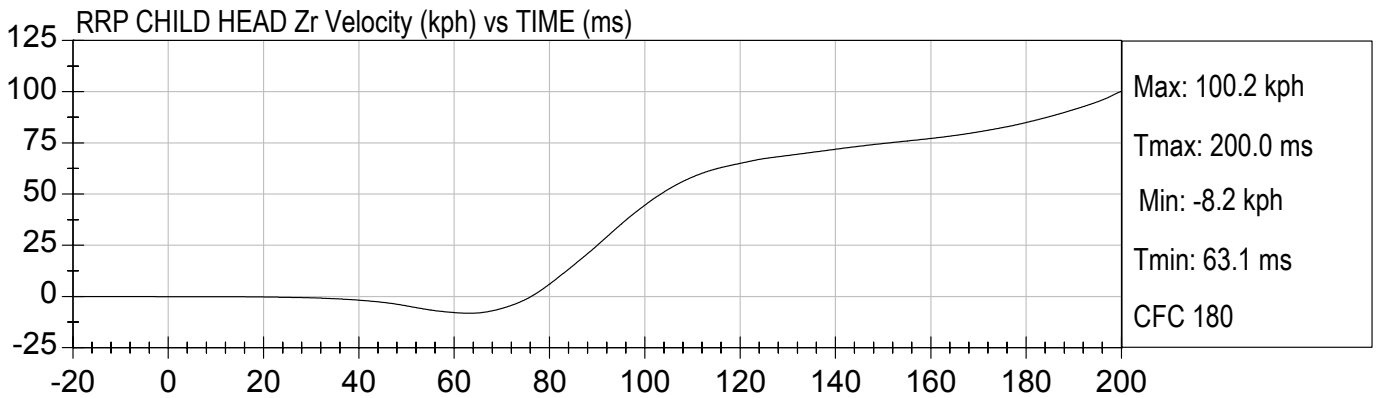
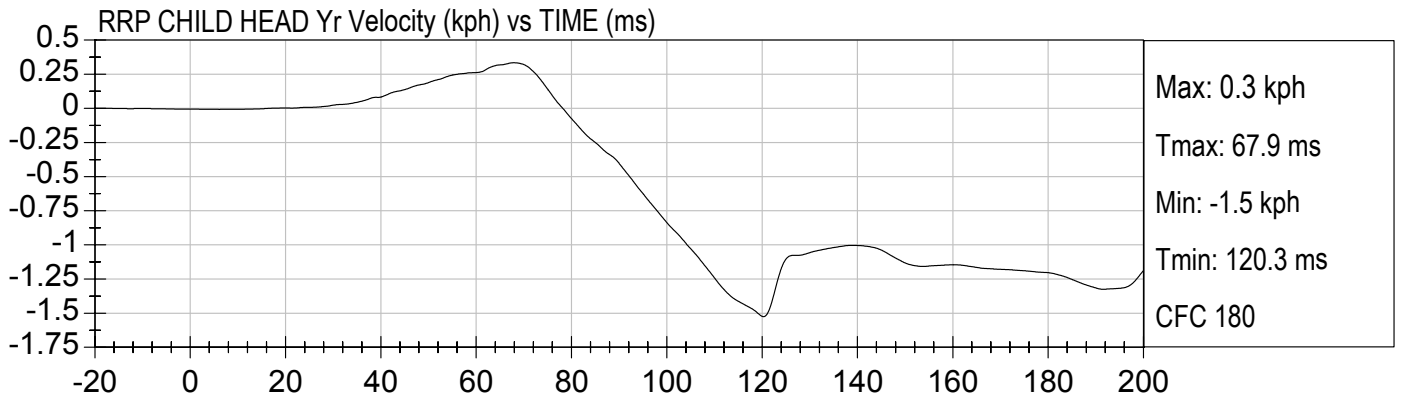
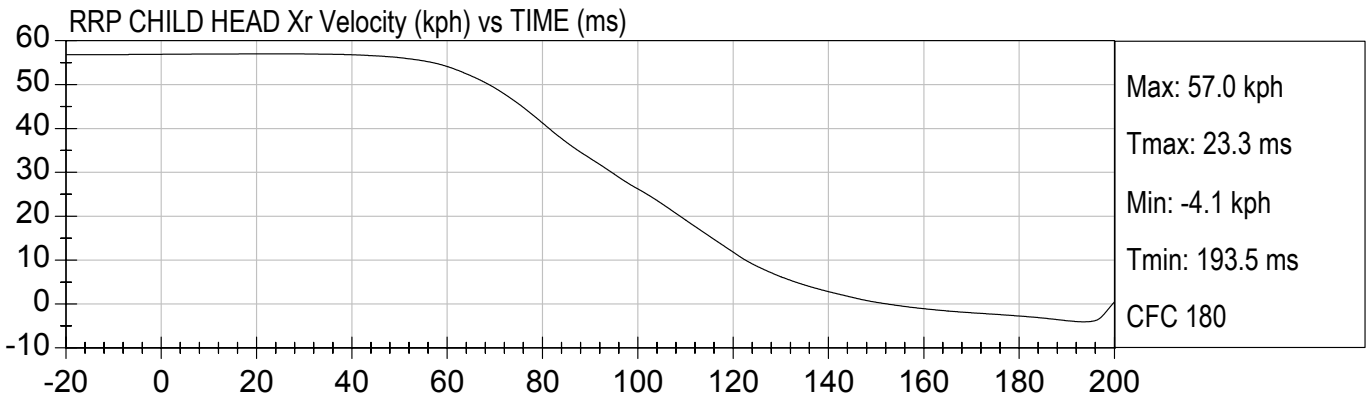
RRP CHILD HEAD Y Velocity (kph) vs TIME (ms)

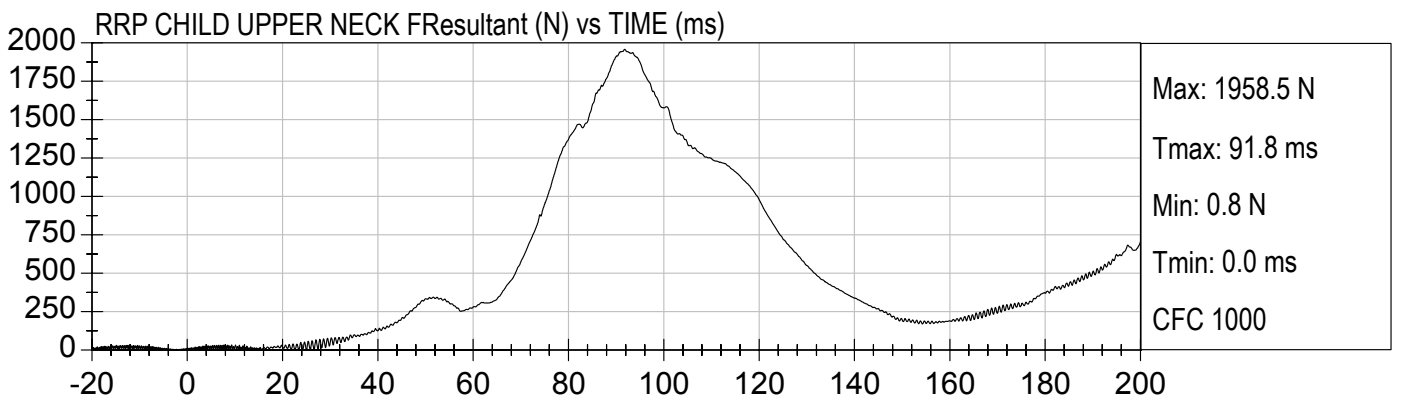
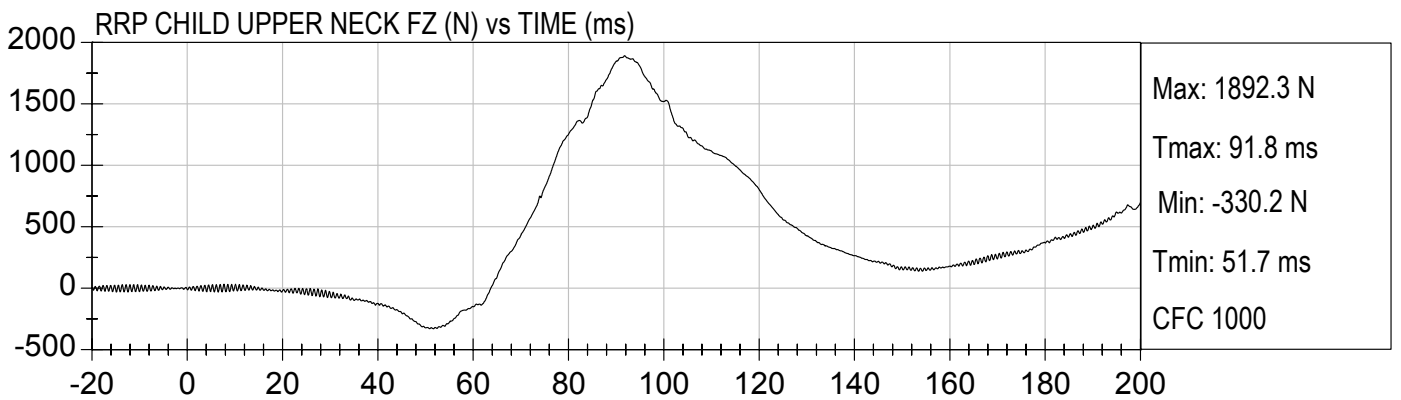
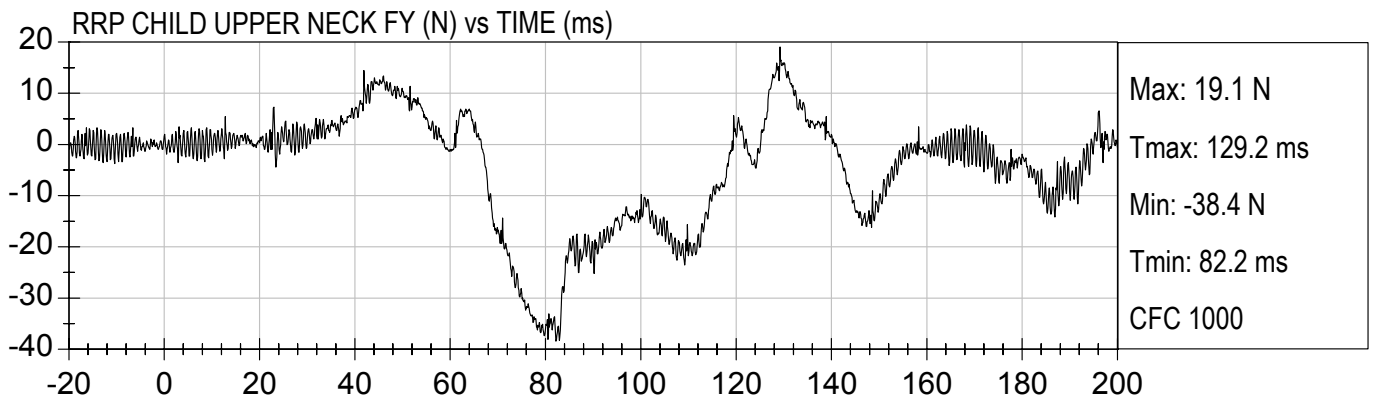
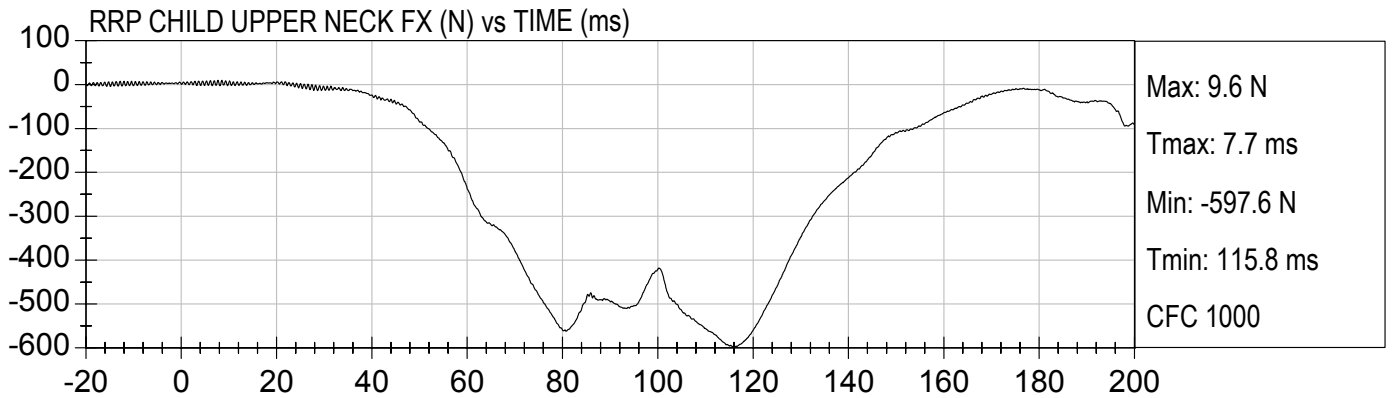


RRP CHILD HEAD Z Velocity (kph) vs TIME (ms)



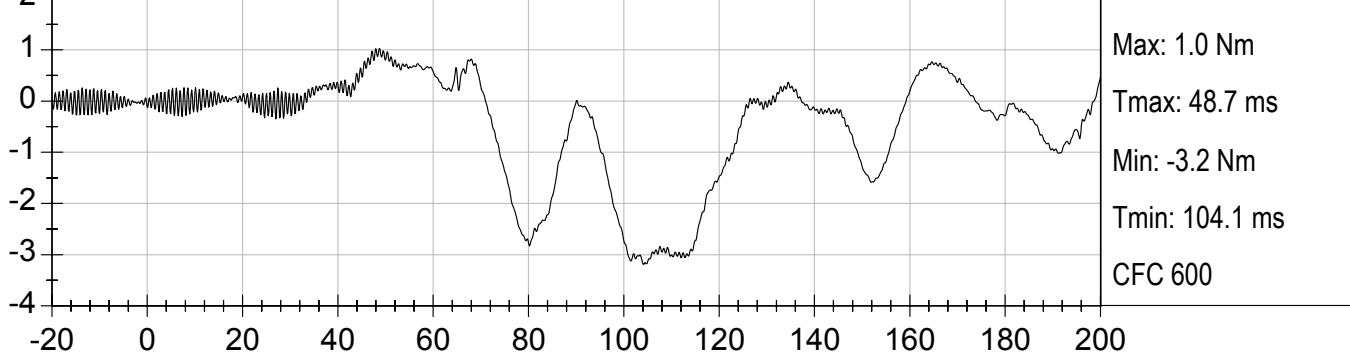




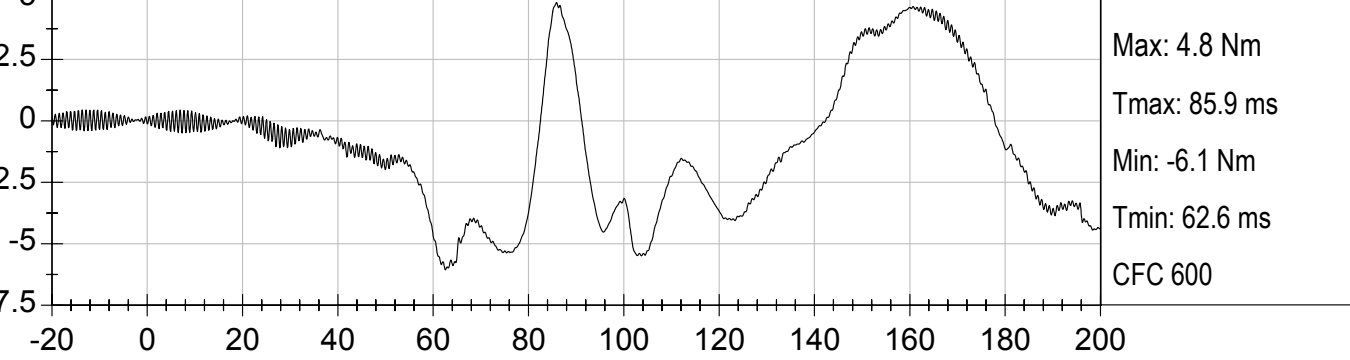




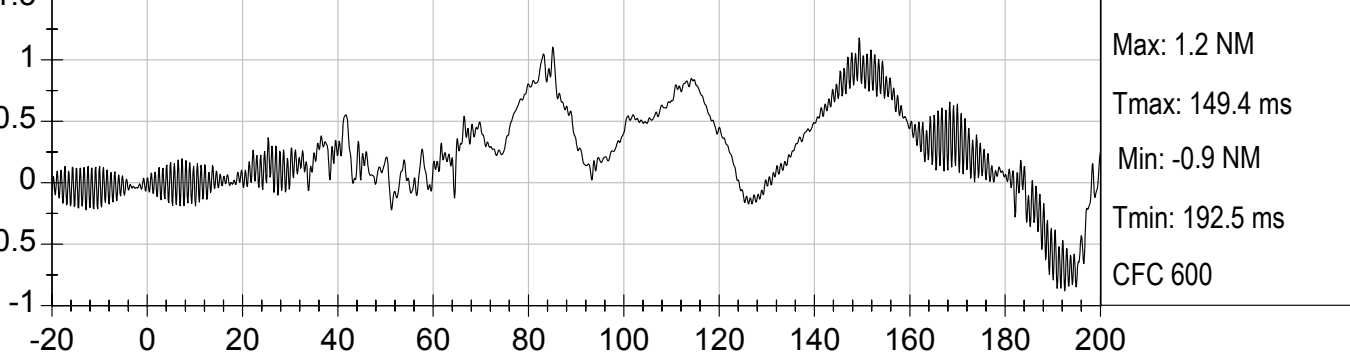
2 RRP CHILD UPPER NECK MX (Nm) vs TIME (ms)



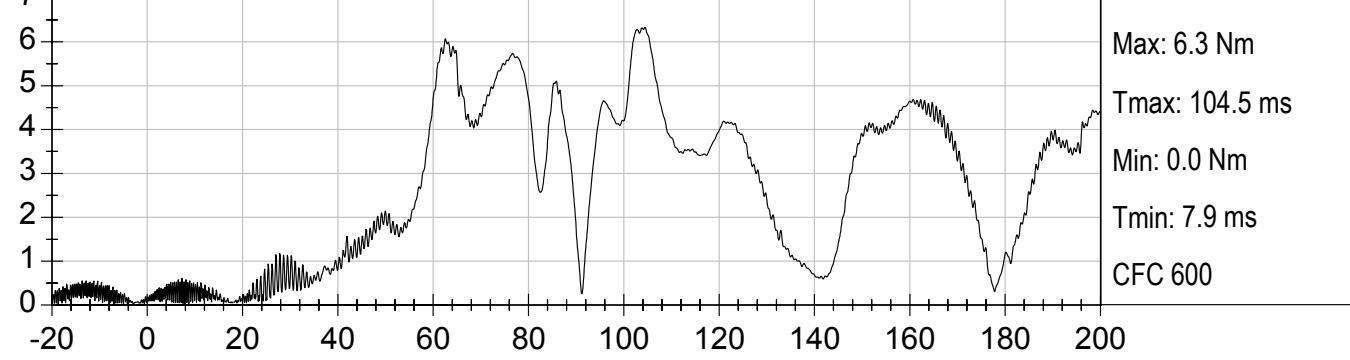
5 RRP CHILD UPPER NECK MY (Nm) vs TIME (ms)

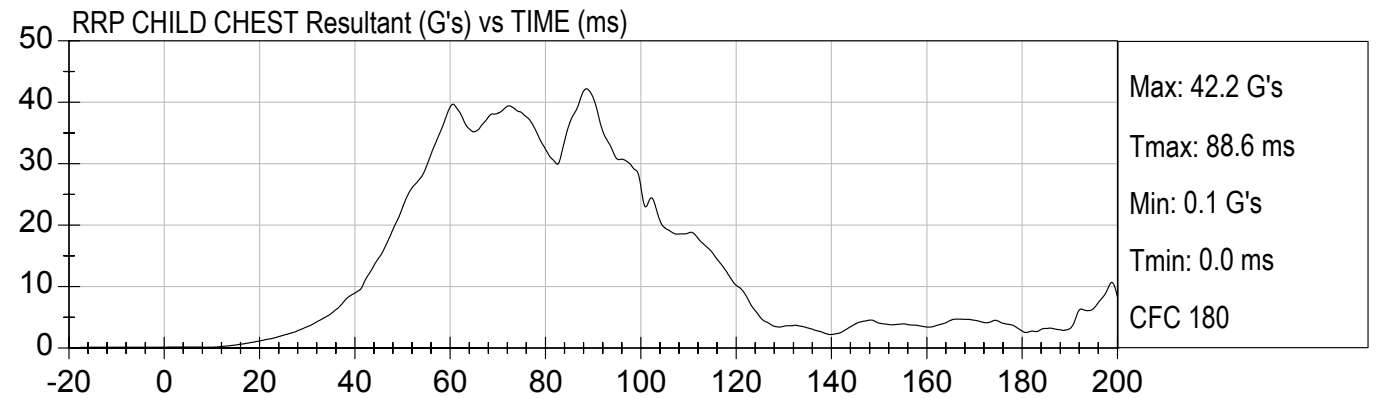
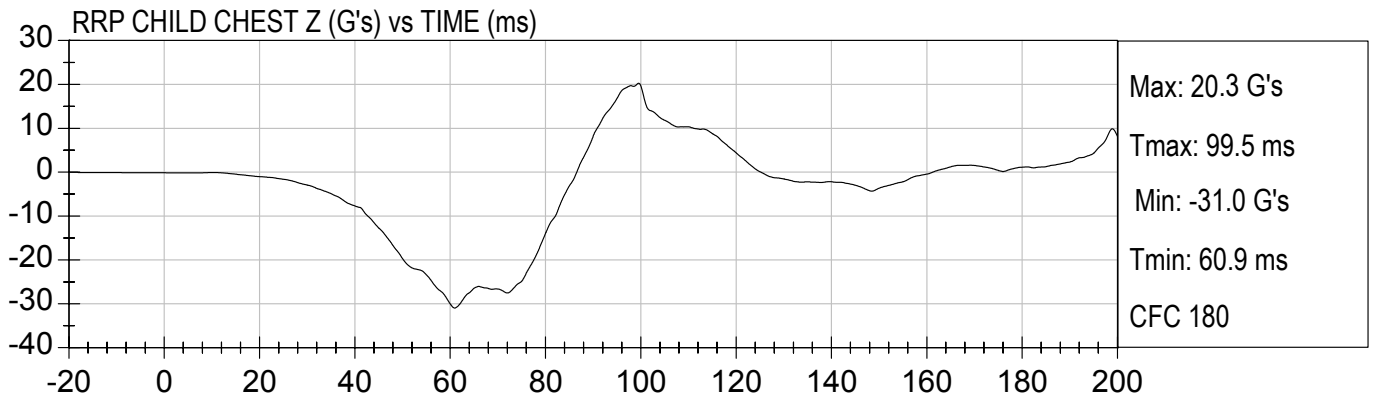
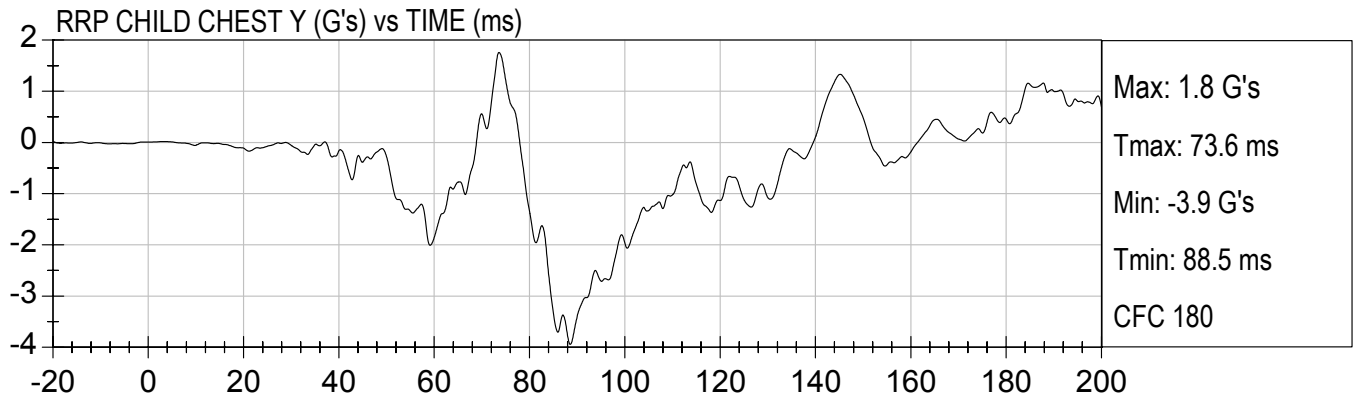
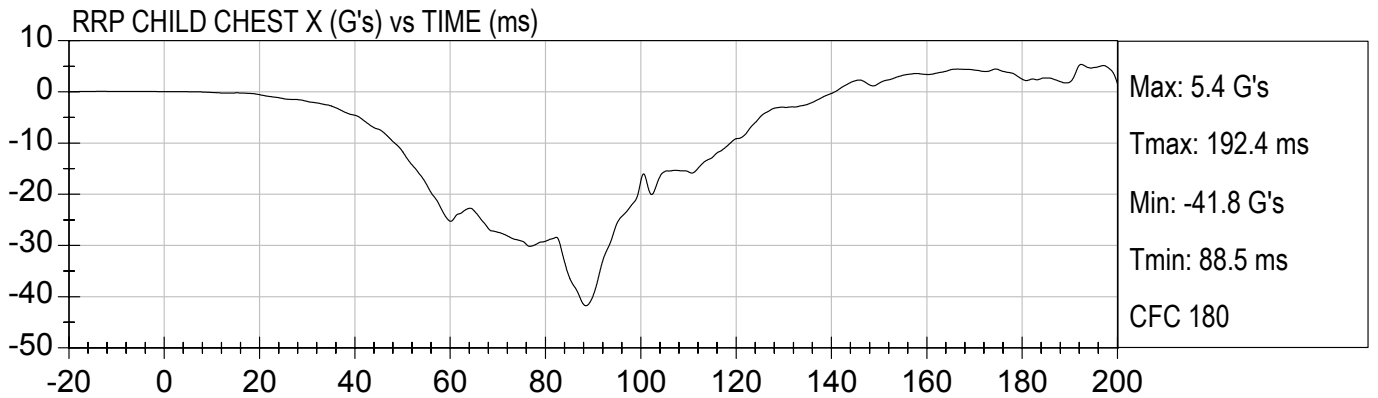


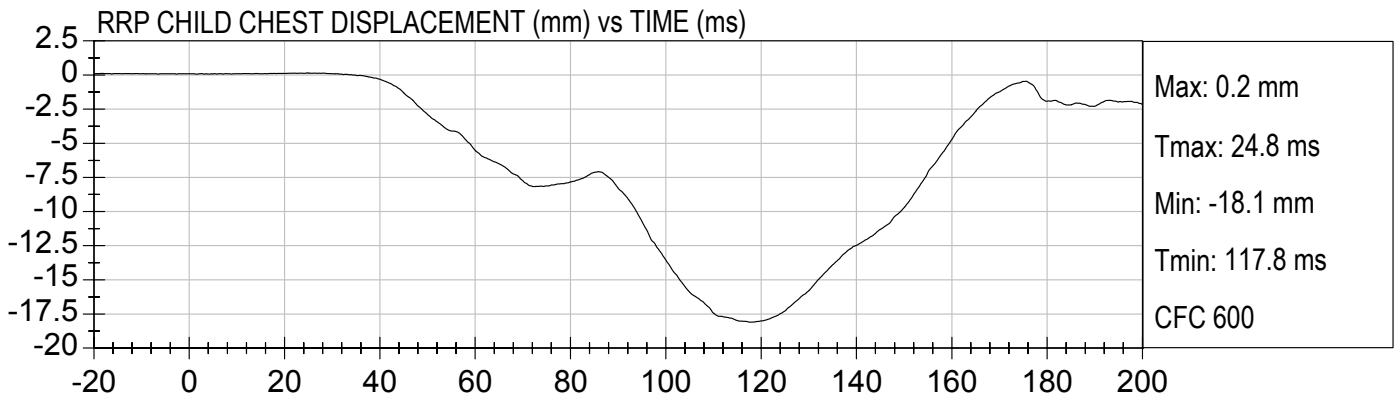
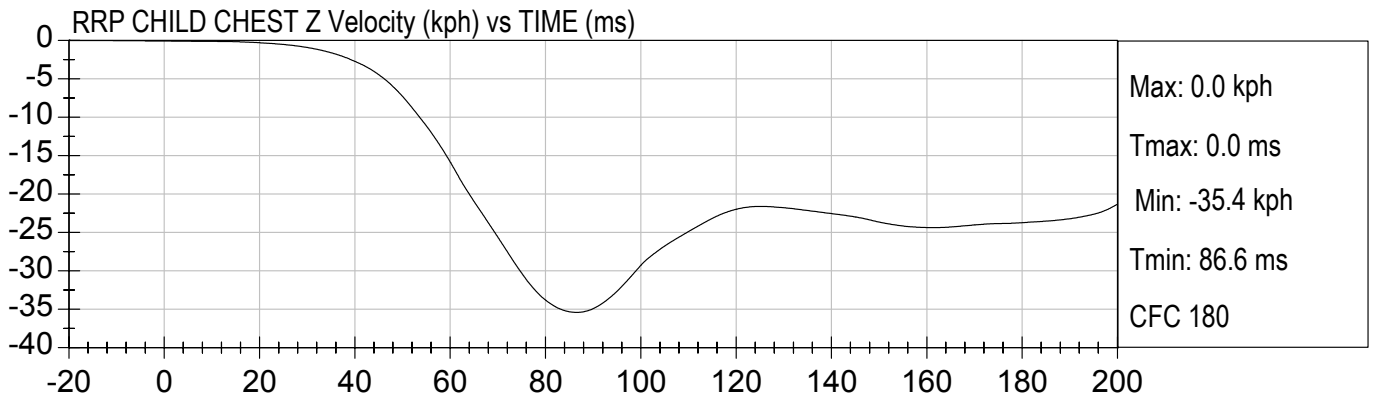
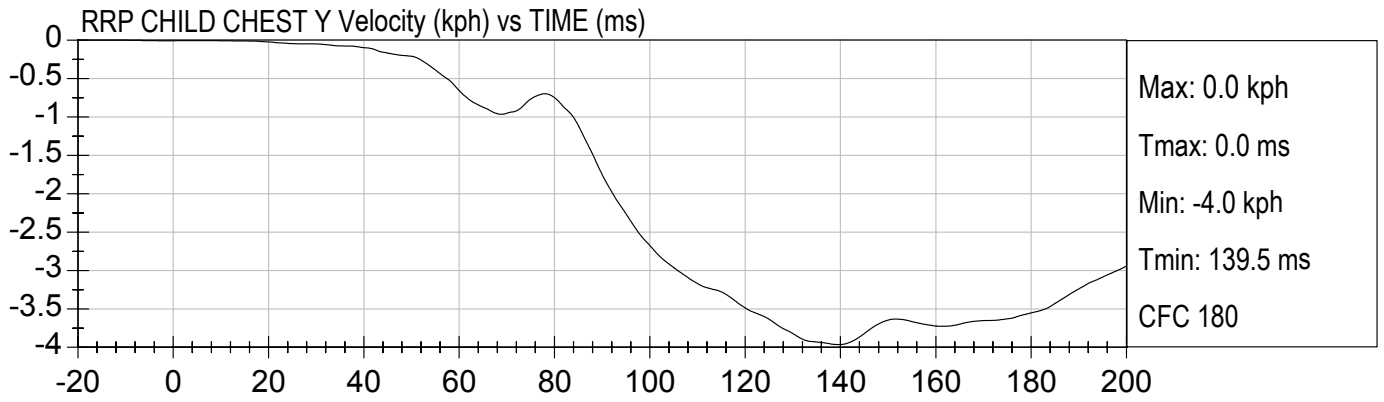
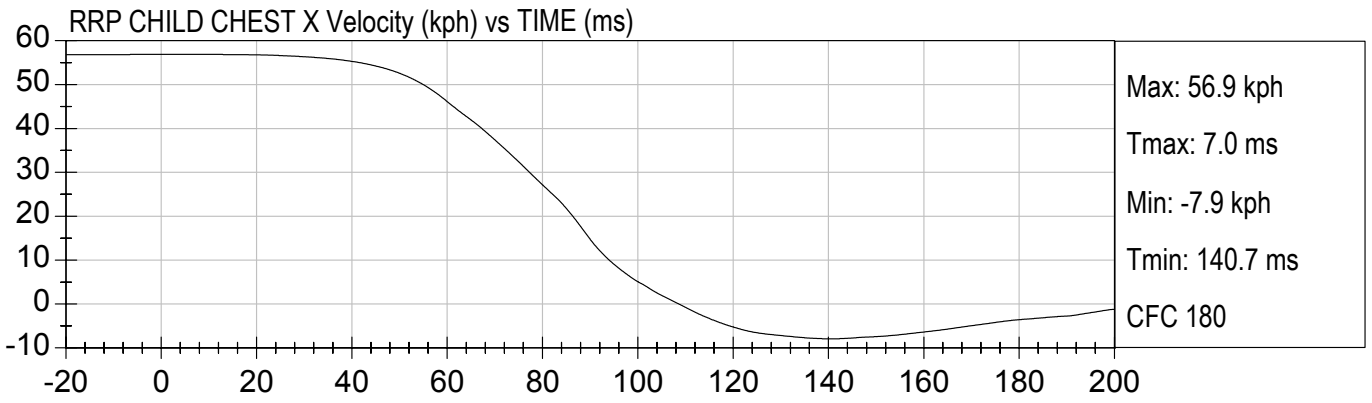
1.5 RRP CHILD UPPER NECK MZ (NM) vs TIME (ms)

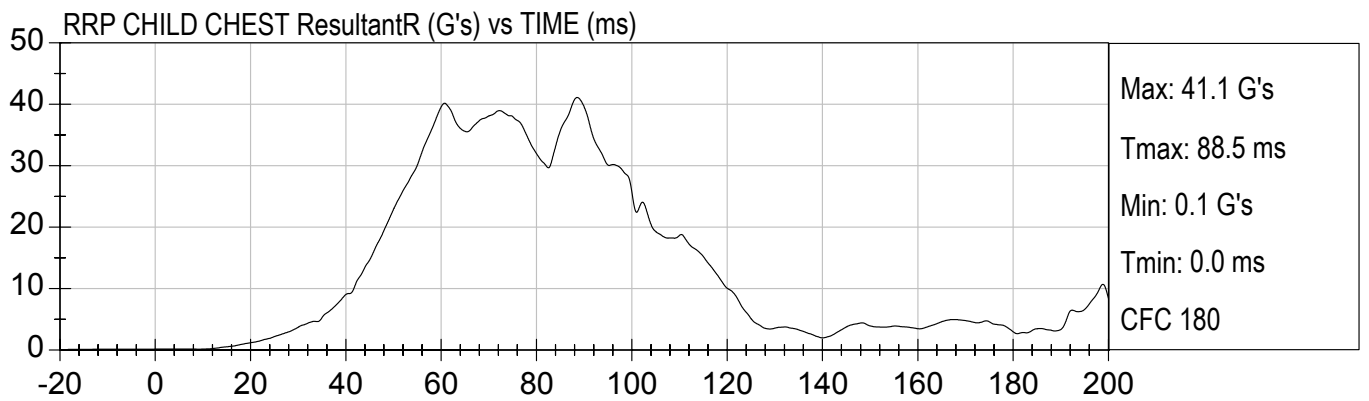
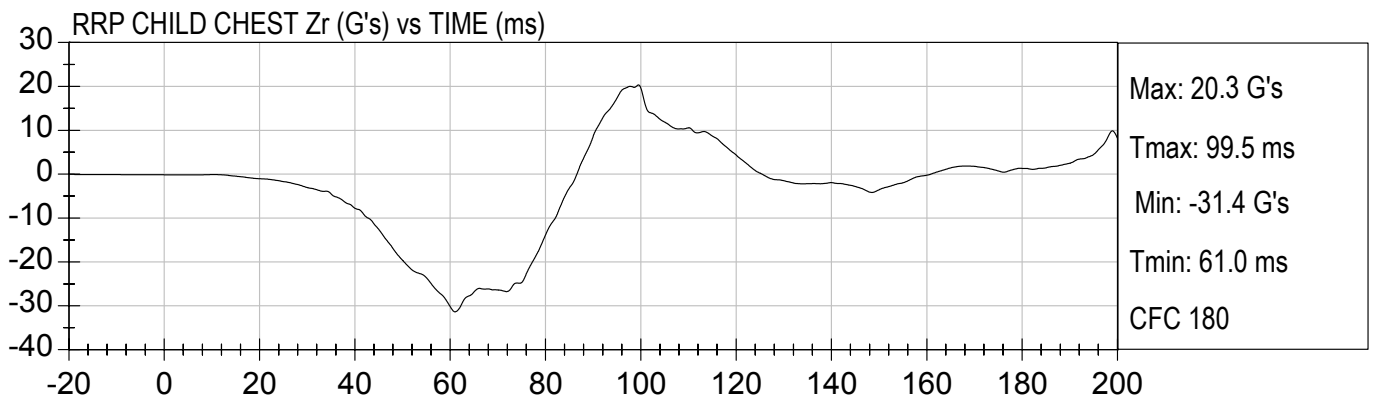
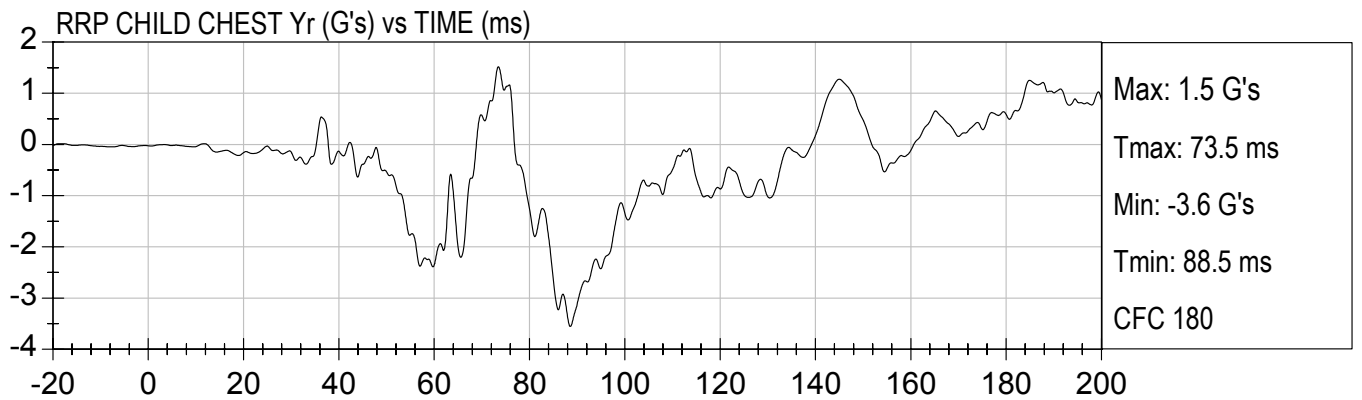
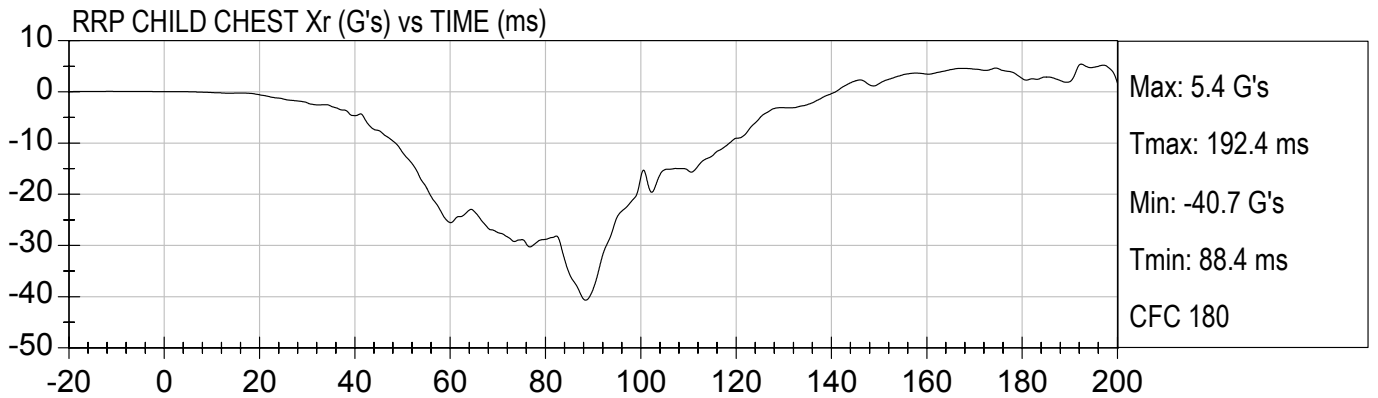


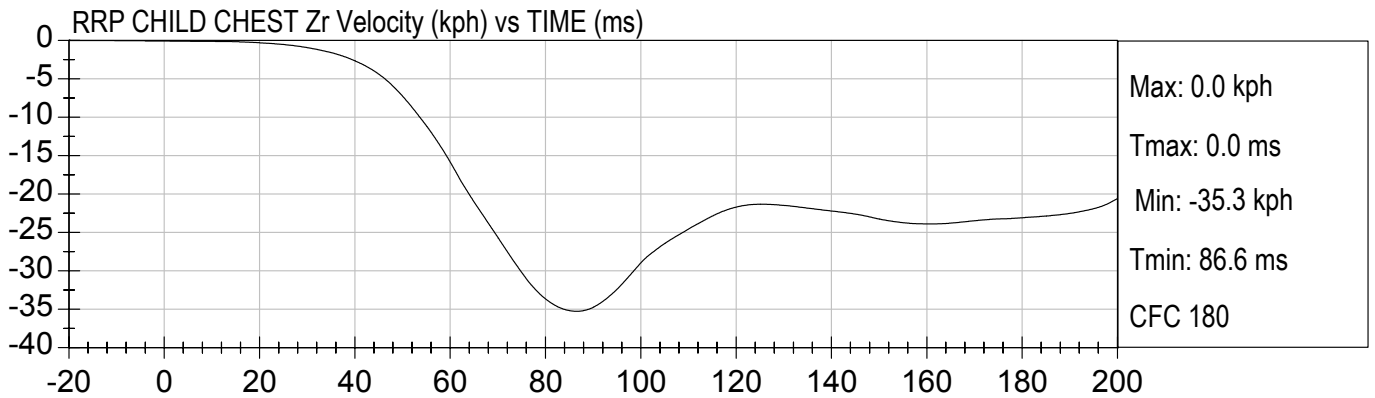
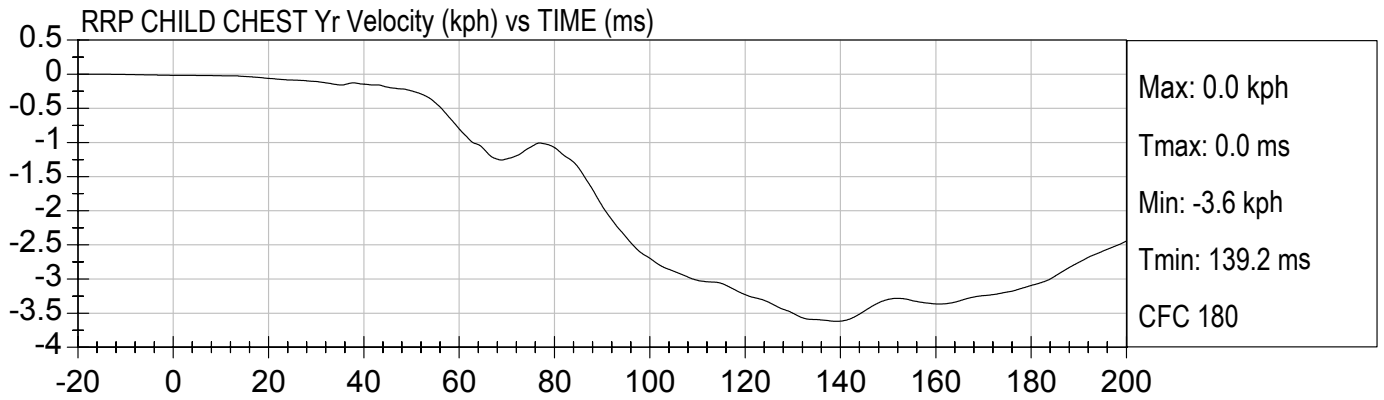
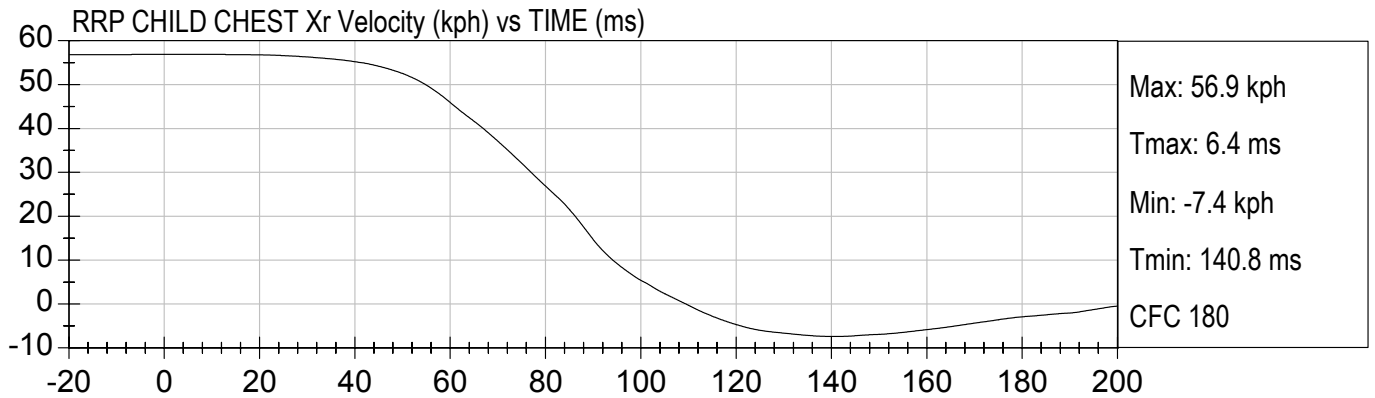
7 RRP CHILD UPPER NECK MResultant (Nm) vs TIME (ms)

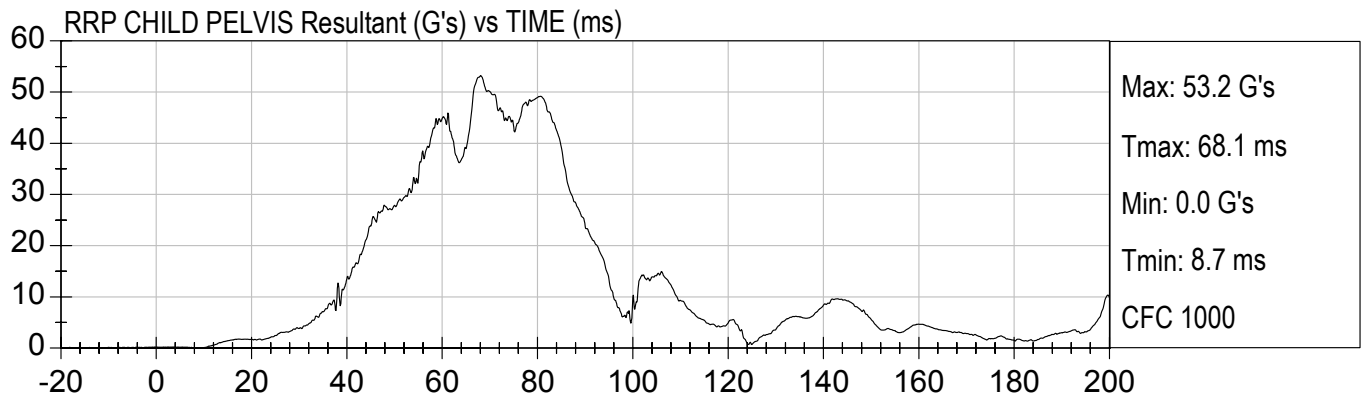
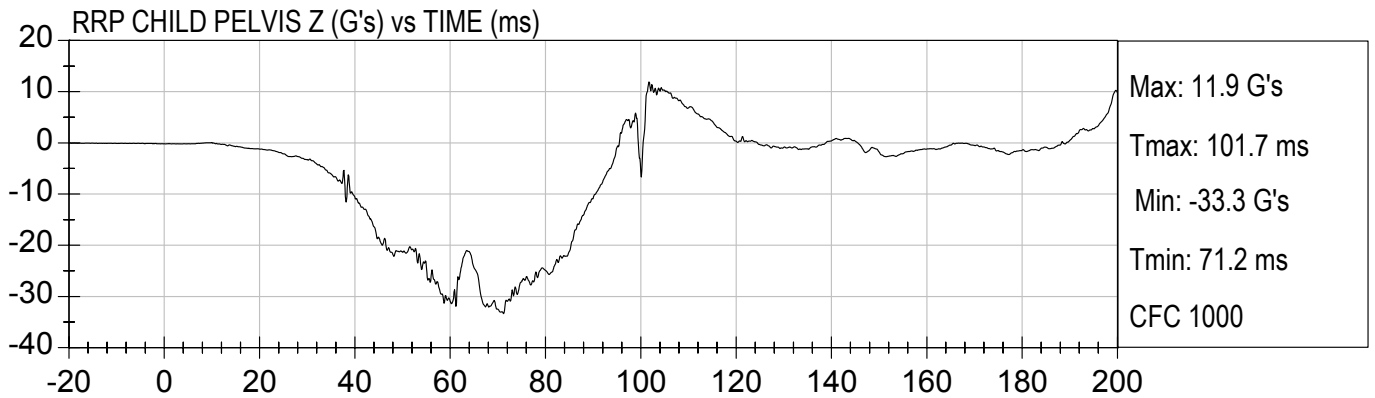
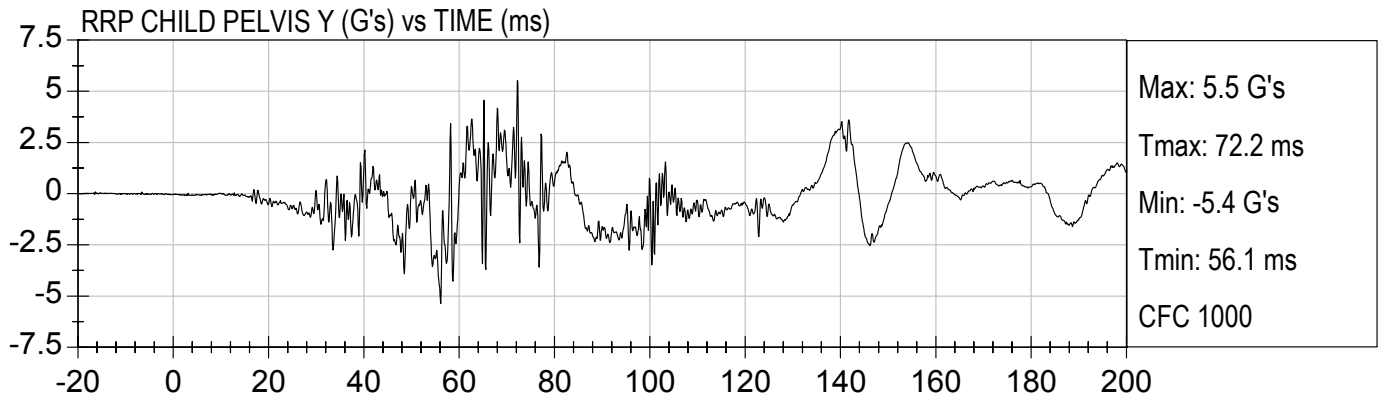
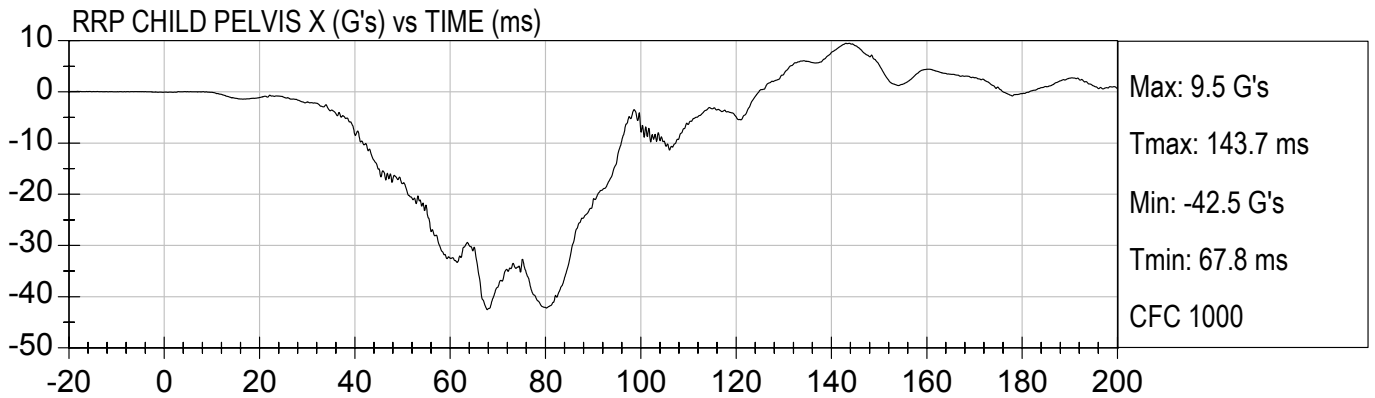


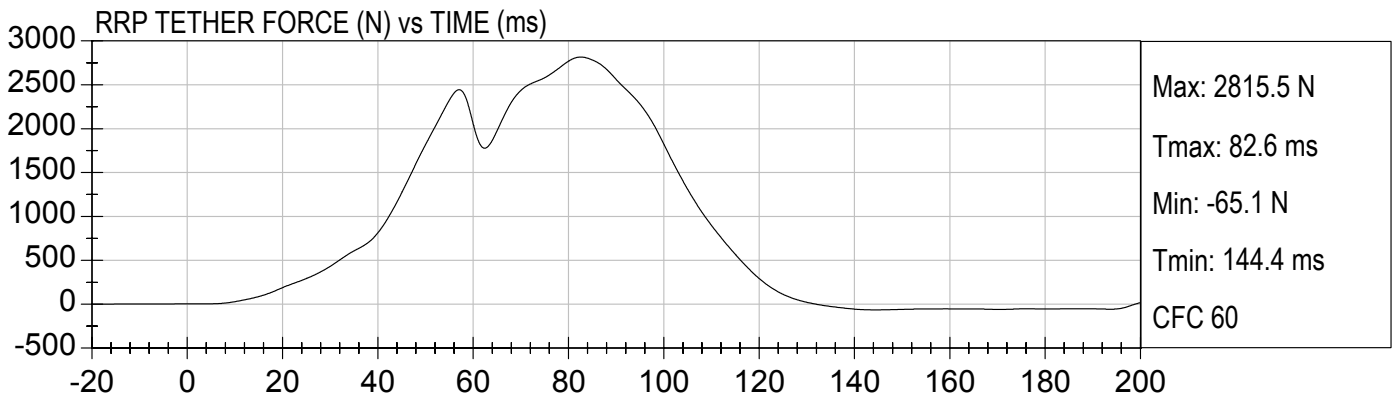
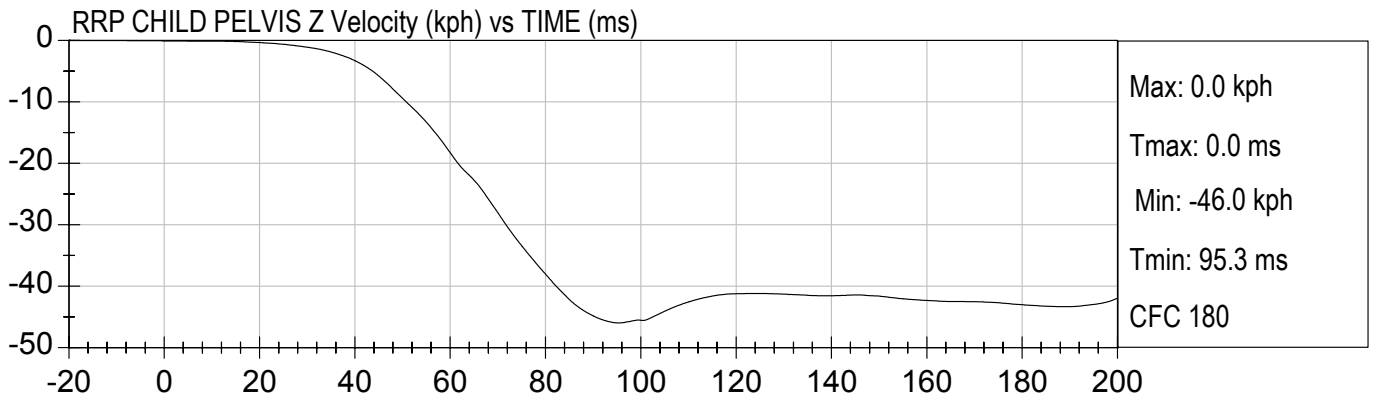
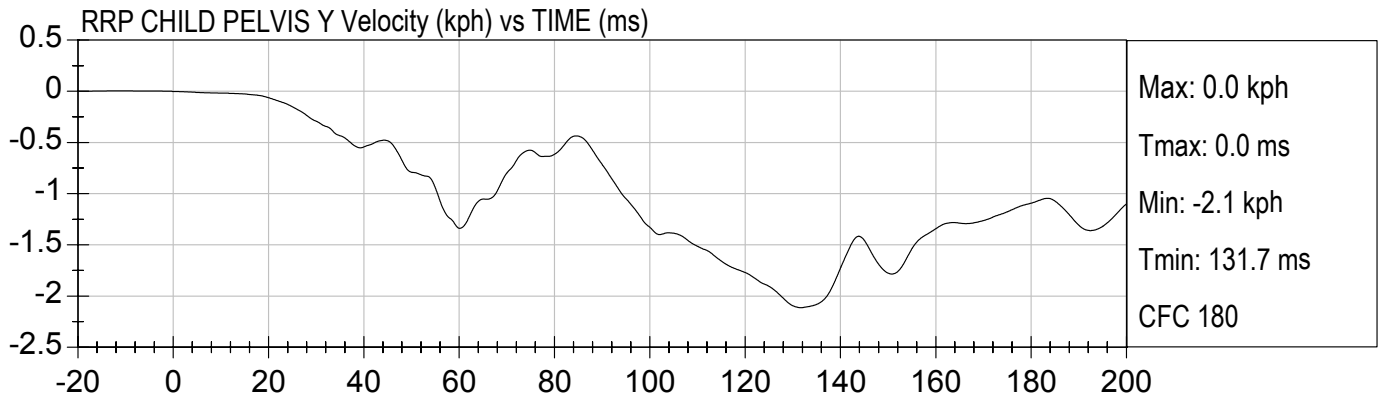
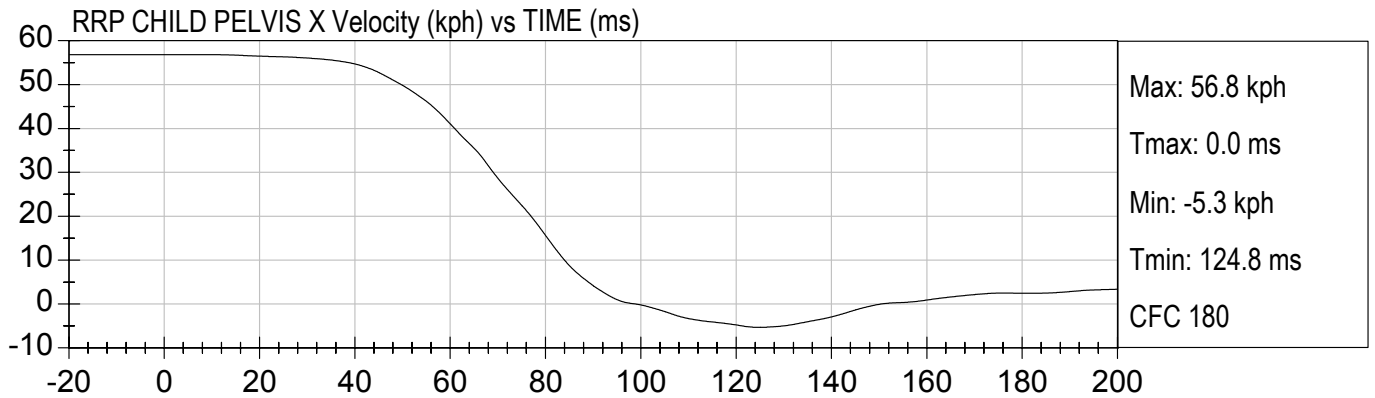












APPENDIX C
CHILD DUMMY CALIBRATION INFORMATION

**Transportation Research Center
Inc.**

ATD Calibration Report

for

VRTC

**HIII 3 Year Old Serial No. 040
Calibration No. 02**



Transportation Research Center Inc.
P.O. Box B-67
10820 St. Rt. 347
East Liberty, OH 43319-0367

Transportation Research Center Inc.
572P HIII 3 Year Old Dummy
External Dimensions
Serial No. 040 Calibration No. 02

Test Parameter	Dimension	Specification	Results	Pass
Total Sitting Height	A	538.5 - 553.7 mm	550 mm	Yes
Shoulder Pivot Height	B	307.3 - 322.6 mm	315 mm	Yes
Hip Pivot Height	C	33.0 - 43.2 mm	40 mm	Yes
Hip Pivot from Backline	D	56.9 - 67.1 mm	60 mm	Yes
Shoulder Pivot from Backline	E	58.4 - 68.6 mm	64 mm	Yes
Thigh Clearance	F	81.0 - 91.2 mm	86 mm	Yes
Back of Elbow to Wrist Pivot	G	247.4 - 262.6 mm	251 mm	Yes
Head Back to Backline	H	48.3 - 58.4 mm	55 mm	Yes
Shoulder to Elbow Length	I	185.0 - 200.7 mm	196 mm	Yes
Elbow Rest Height	J	133.6 - 148.8 mm	139 mm	Yes
Buttock to Knee Length	K	287.3 - 302.5 mm	297 mm	Yes
Popliteal Height	L	221.0 - 236.2 mm	229 mm	Yes
Knee to Floor Height	M	241.6 - 256.8 mm	254 mm	Yes
Buttock Popliteal Height	N	217.9 - 233.2 mm	225 mm	Yes
Chest Depth without Jacket	O	134.6 - 149.9 mm	145 mm	Yes
Foot Length	P	137.7 - 147.8 mm	140 mm	Yes
Stature	Q	932.2 - 957.6 mm	950 mm	Yes
Buttock to Knee Pivot Length	R	251.5 - 261.6 mm	254 mm	Yes
Head Breadth	S	128.3 - 143.5 mm	138 mm	Yes
Head Depth	T	167.4 - 182.6 mm	178 mm	Yes
Hip Breadth	U	200.7 - 215.9 mm	204 mm	Yes
Shoulder Breadth	V	236.5 - 251.7 mm	239 mm	Yes
Foot Breadth	W	53.6 - 63.8 mm	57 mm	Yes
Head Circumference	X	500.4 - 515.6 mm	503 mm	Yes
Chest Circumference with Jacket	Y	527.1 - 552.5 mm	531 mm	Yes
Waist Circumference	Z	527.1 - 552.5 mm	540 mm	Yes
Reference Location for Chest Circumference	AA	248.9 - 259.1 mm	254 mm	Yes
Reference Location for Waist Circumference	BB	160.0 - 170.2 mm	165 mm	Yes

Technician



Approved




Transportation Research Center Inc.

572P Head Drop Test

HIII 3 Year Old Serial No. 040 Calibration No. 02 - 1

Test Date 10/09/2003

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	21.1 °C	Yes
Relative Humidity	10 - 70 %	47 %	Yes
Peak Resultant Acceleration	250 - 280 g	262.1 g	Yes
Peak Lateral Acceleration	15 g Max	-4.5 g	Yes
Is Acceleration Curve Unimodal?	Yes	Yes	Yes

Comments:

Technician



Approved



10.09.2003 09:57:28 607

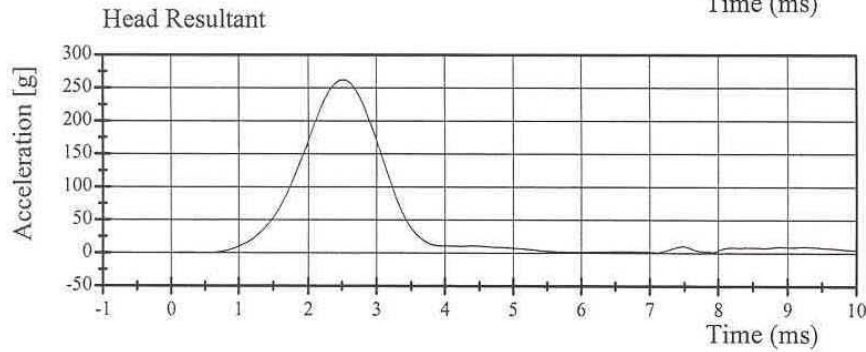
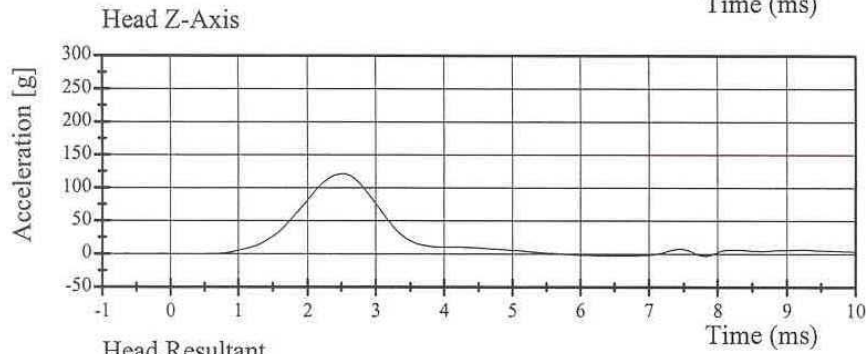
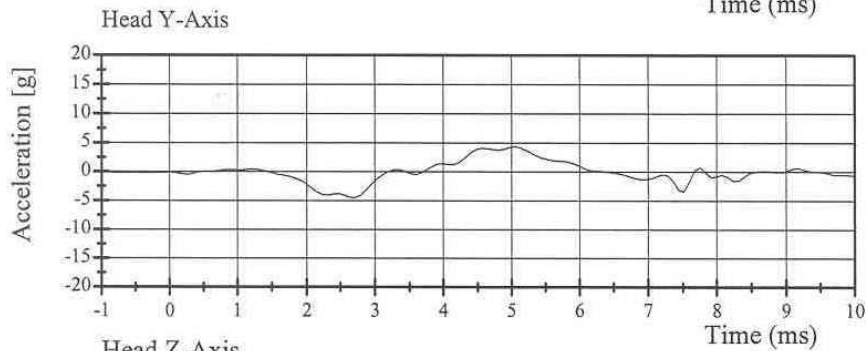
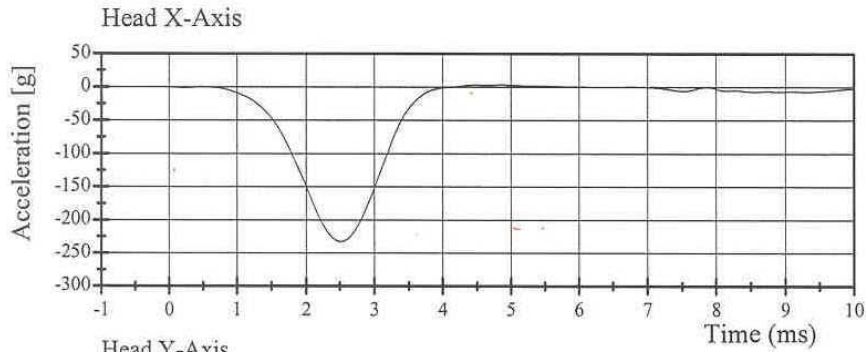


Transportation Research Center Inc.

572P Head Drop Test

HIII 3 Year Old Serial No. 040 Calibration No. 02 - 1

Test Date 10/09/2003



10.09.2003 09:57:30 607



Transportation Research Center Inc.

572P Neck Flexion Test - 6 Channel Transducer

HIII 3 Year Old Serial No. 040 Calibration No. 02 - 3

Test Date 10/09/2003

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.1 °C	Yes
Relative Humidity	10 - 70 %	44 %	Yes
Impact Velocity	5.40 - 5.60 m/s	5.58 m/s	Yes
Integrated Pendulum Velocity			
10 ms	2.00 - 2.70 m/s	2.60 m/s	Yes
15 ms	3.00 - 4.00 m/s	3.71 m/s	Yes
20 ms	4.00 - 5.10 m/s	5.03 m/s	Yes
Peak D Plane Rotation	70 - 82 °	71.8 °	Yes
Peak Moment About Occipital Condyles (During time interval rotation is within specified corridors)	42.0 - 53.0 N·m	46.29 N·m	Yes
Positive Moment Decay Time To 10 N·m	60 - 80 ms	69.12 ms	Yes

Comments:

Technician



Approved



10.09.2003 08:57:58 637



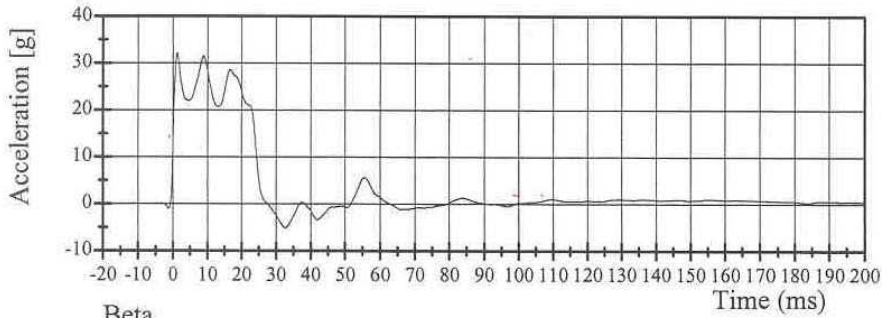
Transportation Research Center Inc.

572P Neck Flexion Test

HIII 3 Year Old Serial No. 040 Calibration No. 02 - 3

Test Date 10/09/2003

Pendulum Deceleration

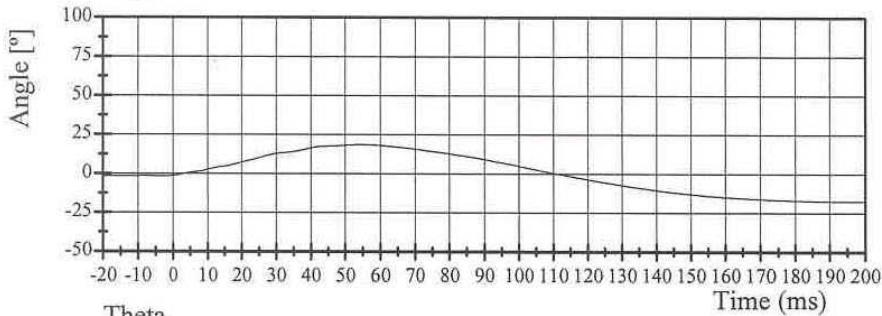


Filter Class: 180

Max: 32.1 g at 1.3 ms

Min: -5.1 g at 32.7 ms

Beta

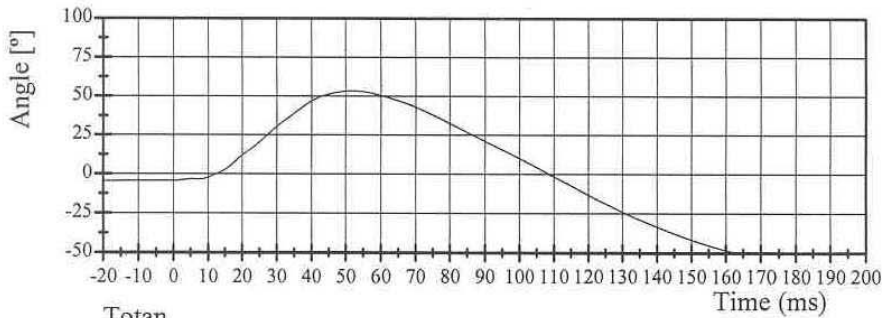


Filter Class: 60

Max: 18.5 ° at 55.1 ms

Min: -17.6 ° at 201.9 ms

Theta

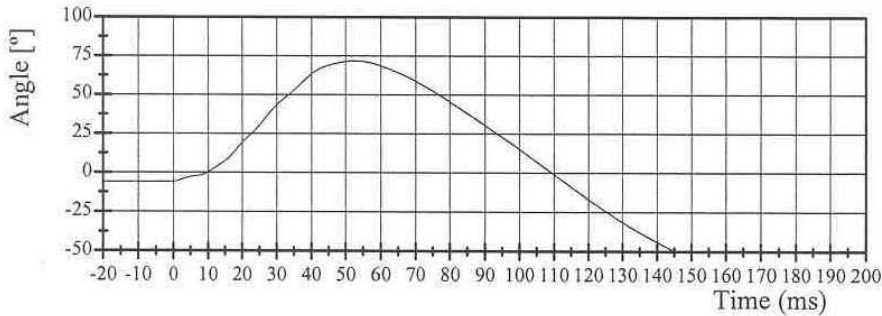


Filter Class: 60

Max: 53.4 ° at 51.7 ms

Min: -57.3 ° at 192.6 ms

Totan



Filter Class: 60

Max: 71.8 ° at 52.6 ms

Min: -74.9 ° at 192.9 ms

10.09.2003 08:57:59 637

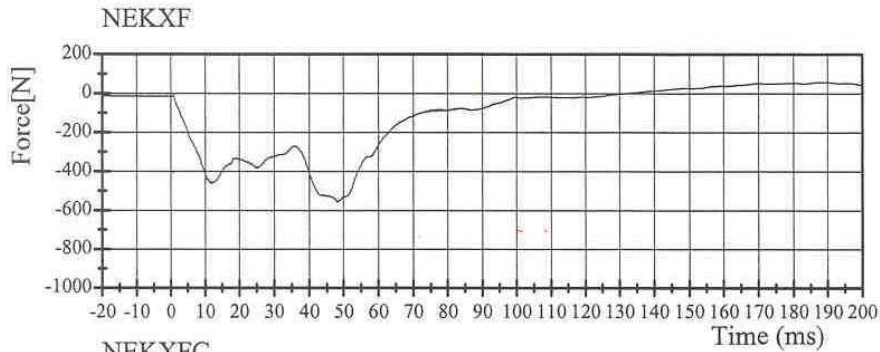


Transportation Research Center Inc.

572P Neck Flexion Test

HIII 3 Year Old Serial No. 040 Calibration No. 02 - 3

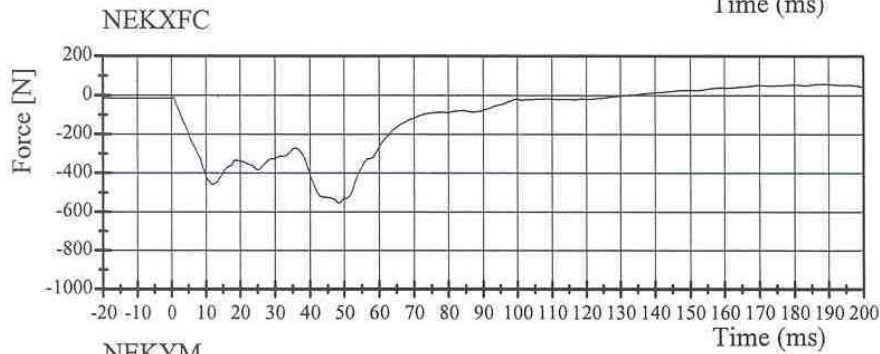
Test Date 10/09/2003



Filter Class: 1000

Max: 58.6 N at 187.5 ms

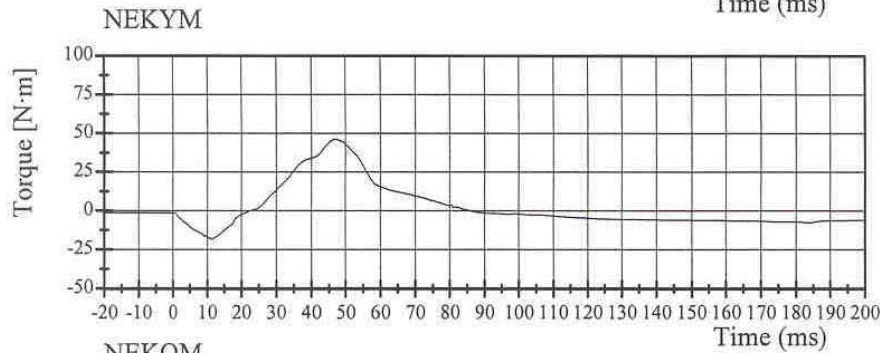
Min: -555.8 N at 48.1 ms



Filter Class: 600

Max: 58.5 N at 187.4 ms

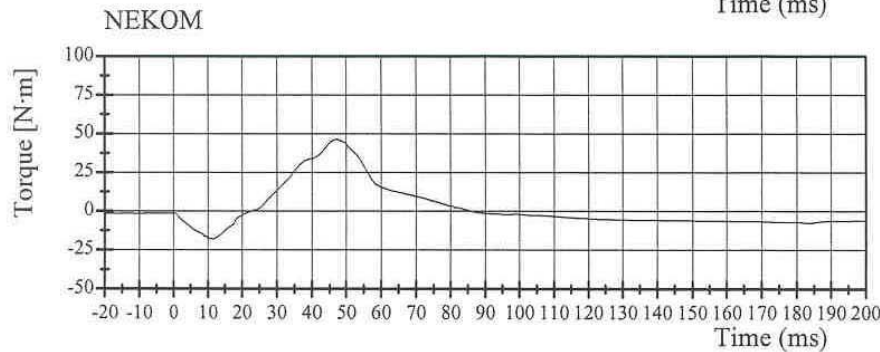
Min: -554.6 N at 48.2 ms



Filter Class: 600

Max: 46.3 N·m at 47.3 ms

Min: -18.0 N·m at 11.4 ms



Filter Class: 600

Max: 46.3 N·m at 47.3 ms

Min: -18.0 N·m at 11.4 ms

10.09.2003 08:58:00 637



Transportation Research Center Inc.

572P Neck Extension Test - 6 Channel Transducer

HIII 3 Year Old Serial No. 040 Calibration No. 02 - 2

Test Date 10/09/2003

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.1 °C	Yes
Relative Humidity	10 - 70 %	47 %	Yes
Impact Velocity	3.55 - 3.75 m/s	3.71 m/s	Yes
Integrated Pendulum Velocity			
10 ms	1.00 - 1.40 m/s	1.38 m/s	Yes
15 ms	1.90 - 2.50 m/s	2.44 m/s	Yes
20 ms	2.80 - 3.50 m/s	3.32 m/s	Yes
Peak D Plane Rotation	83 - 93 °	86.8 °	Yes
Peak Moment About Occipital Condyles (During time interval rotation is within specified corridors)	-53.3 - (-43.7) N·m	-46.33 N·m	Yes
Positive Moment Decay Time To -10 N·m	60 - 80 ms	66.16 ms	Yes

Comments:

Technician



Approved



10.09.2003 09:53:50 953



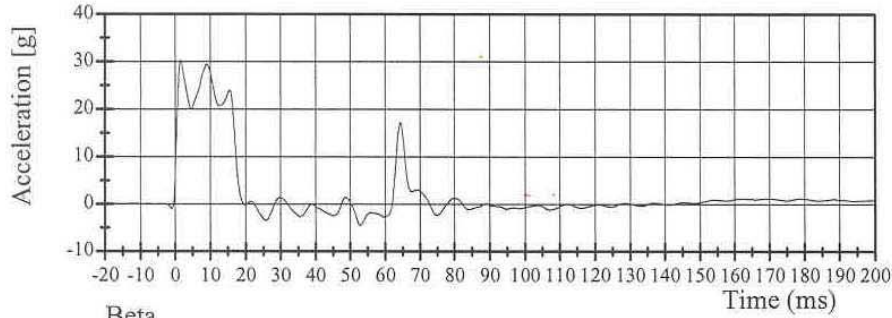
Transportation Research Center Inc.

572P Neck Extension Test

HIII 3 Year Old Serial No. 040 Calibration No. 02 - 2

Test Date 10/09/2003

Pendulum Deceleration

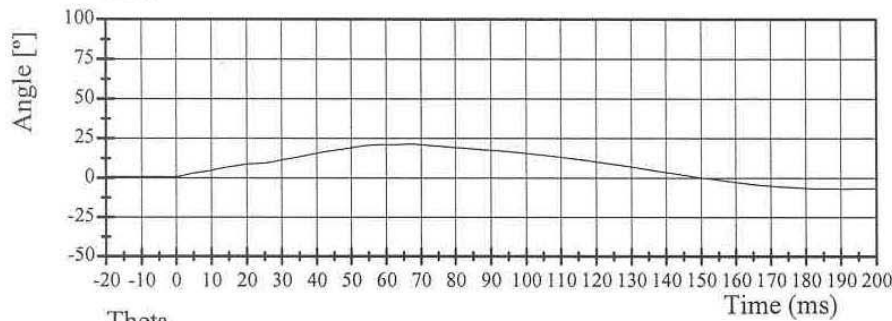


Filter Class: 180

Max: 30.2 g at 1.7 ms

Min: -4.5 g at 52.8 ms

Beta

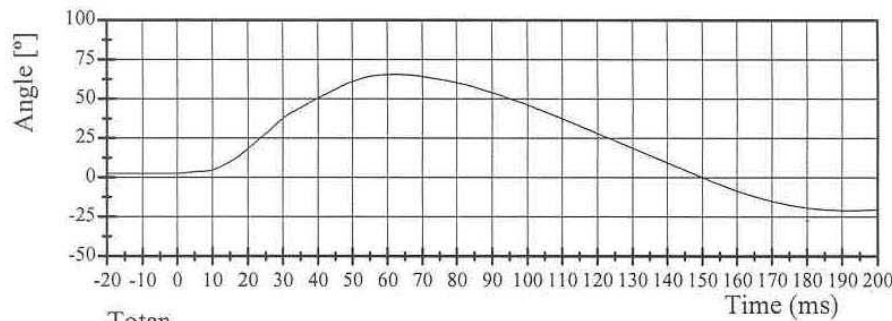


Filter Class: 60

Max: 21.4° at 67.0 ms

Min: -6.8° at 190.8 ms

Theta

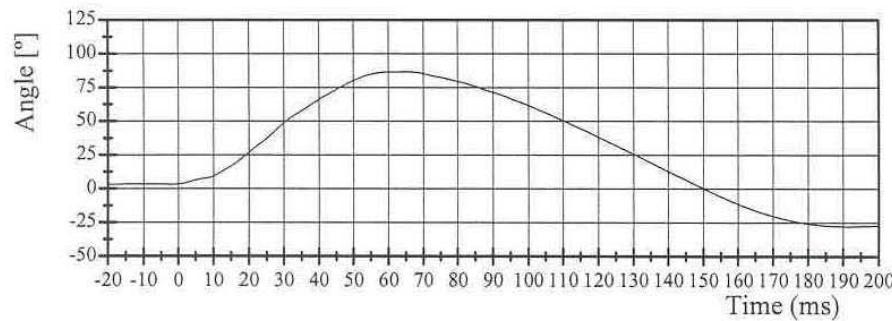


Filter Class: 60

Max: 65.5° at 62.4 ms

Min: -20.9° at 191.8 ms

Totan



Filter Class: 60

Max: 86.8° at 65.4 ms

Min: -27.8° at 191.6 ms

10.09.2003 09:53:51 953

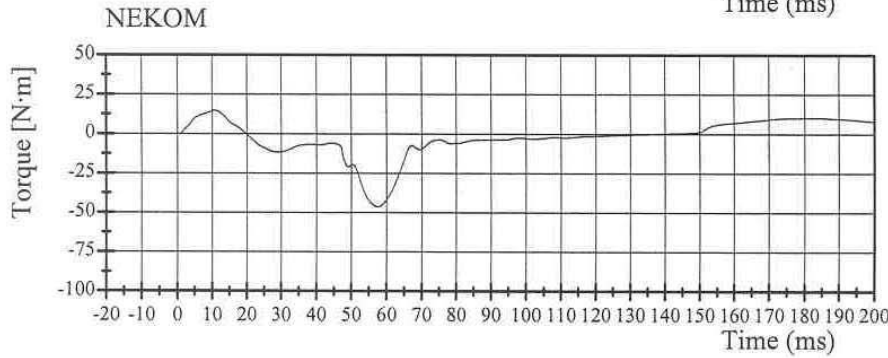
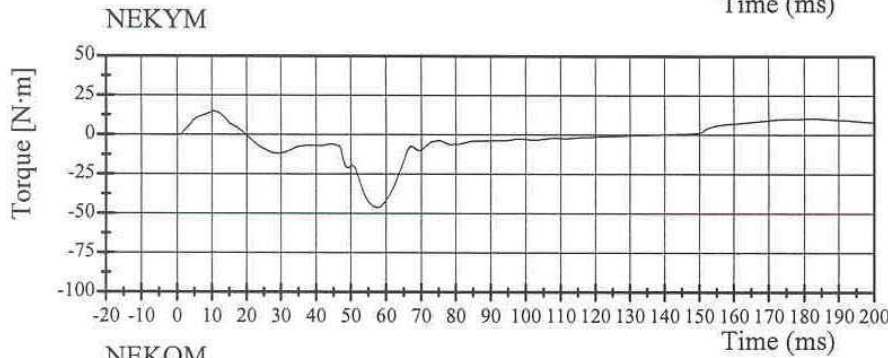
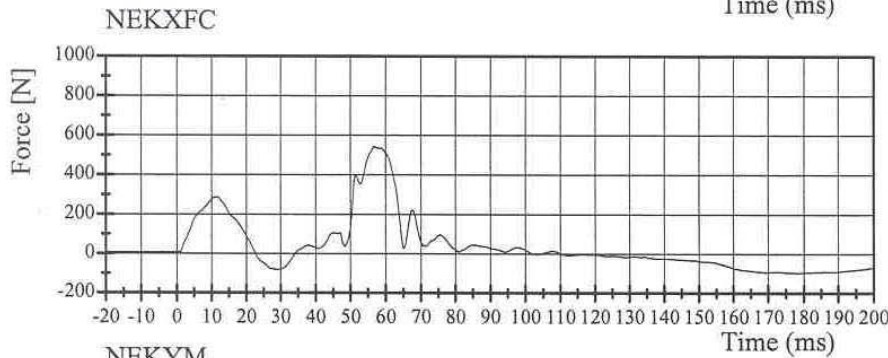
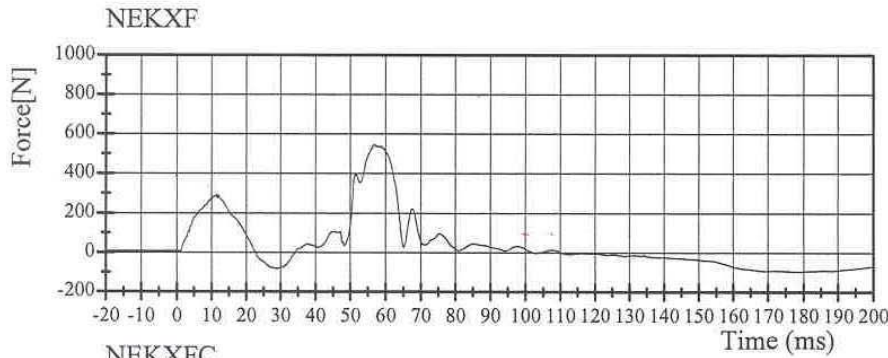


Transportation Research Center Inc.

572P Neck Extension Test

HIII 3 Year Old Serial No. 040 Calibration No. 02 - 2

Test Date 10/09/2003



10.09.2003 09:53:52 953



Transportation Research Center Inc.

572P Thorax Test

HIII 3 Year Old Serial No. 040 Calibration No. 02 - 3

Test Date 10/10/2003

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.1 °C	Yes
Relative Humidity	10 - 70 %	62 %	Yes
Pendulum Velocity	5.90 - 6.10 m/s	6.05 m/s	Yes
Maximum Chest Deflection	-38.0 - (-32.0) mm	-32.5 mm	Yes
Peak Impact Probe Force Within Compression Corridor	680 - 810 N	715 N	Yes
Internal Hysteresis	65 - 85 %	71 %	Yes
Maximum Force Between 12.5 mm & 32 mm Of Deflection	<= 910	778	Yes

Comments:

Technician



Approved



10.10.2003 09:47:24 998

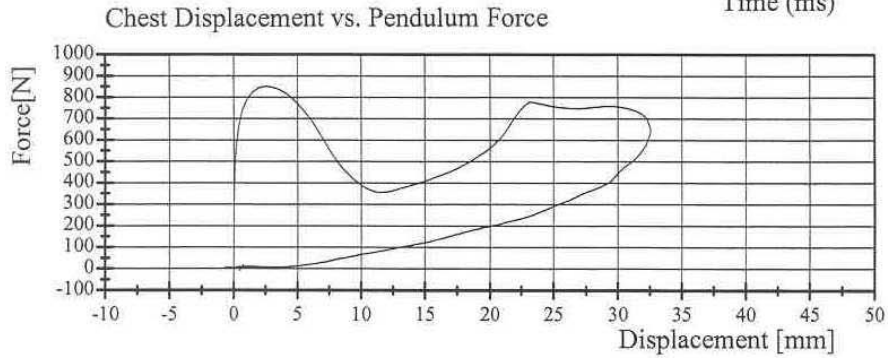
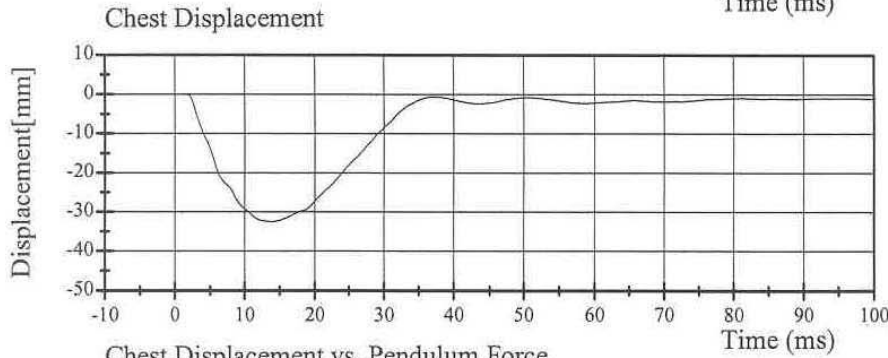
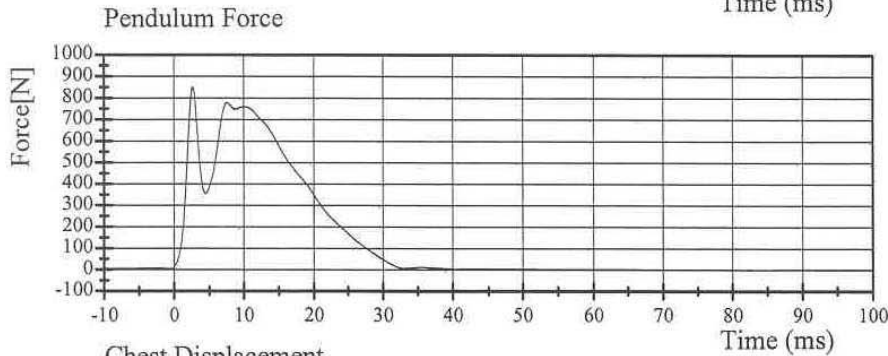
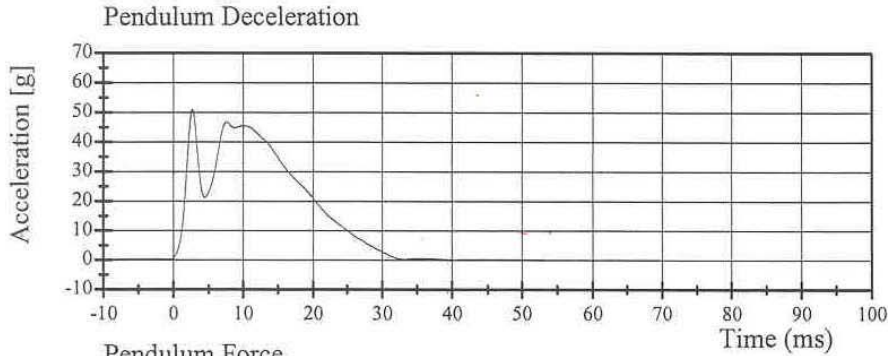


Transportation Research Center Inc.

572P Thorax Test

HIII 3 Year Old Serial No. 040 Calibration No. 02 - 3

Test Date 10/10/2003



10.10.2003 09:47:25 998



TRANSPORTATION RESEARCH CENTER INC.

TORSO FLEXION TEST

HYBRID III THREE-YEAR-OLD

CAL DATE: 09-Oct-03

TRC, INC. TEST NO: 040C02TF1 572 P SN 040 TORSO FLEX CAL 02

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9 – 25.6 DEG. C	21.7 DEG. C
RELATIVE HUMIDITY	10 – 70 %	44 %
INITIAL ANGLE OF UNSUPPORTRED DUMMY	<= 15 DEG. REFERENCED TO VERTICAL	9.2 DEG.
MAXIMUM FORCE AT 45 DEG. DURING 10 SECOND PERIOD	130 – 180 N	152.6 N
RETURN ANGLE		14.8 °
DIFFERENCE BETWEEN RETURN ANGLE & INTIAL ANGLE	+/- 8 ° OF INTIAL ANGLE	5.6 °
RATE	0.5° - 1.5°/sec	1.0 °/sec

TEST MEETS SPECIFICATIONS

TECHNICIAN



**Transportation Research Center
Inc.**

ATD Calibration Report

for

VRTC

**HIII 3 Year Old Serial No. 042
Calibration No. 02**



Transportation Research Center Inc.
P.O. Box B-67
10820 St. Rt. 347
East Liberty, OH 43319-0367

Transportation Research Center Inc.
572P HIII 3 Year Old Dummy
External Dimensions
Serial No. 042 Calibration No. 02

Test Parameter	Dimension	Specification	Results	Pass
Total Sitting Height	A	538.5 - 553.7 mm	546 mm	Yes
Shoulder Pivot Height	B	307.3 - 322.6 mm	313 mm	Yes
Hip Pivot Height	C	33.0 - 43.2 mm	37 mm	Yes
Hip Pivot from Backline	D	56.9 - 67.1 mm	59 mm	Yes
Shoulder Pivot from Backline	E	58.4 - 68.6 mm	63 mm	Yes
Thigh Clearance	F	81.0 - 91.2 mm	87 mm	Yes
Back of Elbow to Wrist Pivot	G	247.4 - 262.6 mm	253 mm	Yes
Head Back to Backline	H	48.3 - 58.4 mm	49 mm	Yes
Shoulder to Elbow Length	I	185.0 - 200.7 mm	193 mm	Yes
Elbow Rest Height	J	133.6 - 148.8 mm	136 mm	Yes
Buttock to Knee Length	K	287.3 - 302.5 mm	293 mm	Yes
Popliteal Height	L	221.0 - 236.2 mm	228 mm	Yes
Knee to Floor Height	M	241.6 - 256.8 mm	249 mm	Yes
Buttock Popliteal Height	N	217.9 - 233.2 mm	229 mm	Yes
Chest Depth without Jacket	O	134.6 - 149.9 mm	137 mm	Yes
Foot Length	P	137.7 - 147.8 mm	141 mm	Yes
Stature	Q	932.2 - 957.6 mm	936 mm	Yes
Buttock to Knee Pivot Length	R	251.5 - 261.6 mm	258 mm	Yes
Head Breadth	S	128.3 - 143.5 mm	136 mm	Yes
Head Depth	T	167.4 - 182.6 mm	176 mm	Yes
Hip Breadth	U	200.7 - 215.9 mm	209 mm	Yes
Shoulder Breadth	V	236.5 - 251.7 mm	243 mm	Yes
Foot Breadth	W	53.6 - 63.8 mm	57 mm	Yes
Head Circumference	X	500.4 - 515.6 mm	510 mm	Yes
Chest Circumference with Jacket	Y	527.1 - 552.5 mm	536 mm	Yes
Waist Circumference	Z	527.1 - 552.5 mm	543 mm	Yes
Reference Location for Chest Circumference	AA	248.9 - 259.1 mm	254 mm	Yes
Reference Location for Waist Circumference	BB	160.0 - 170.2 mm	165 mm	Yes

Technician



Approved




Transportation Research Center Inc.

572P Head Drop Test

HIII 3 Year Old Serial No. 042 Calibration No. 02 - 1

Test Date 10/15/2003

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	21.1 °C	Yes
Relative Humidity	10 - 70 %	32 %	Yes
Peak Resultant Acceleration	250 - 280 g	259.5 g	Yes
Peak Lateral Acceleration	15 g Max	-8.0 g	Yes
Is Acceleration Curve Unimodal?	Yes	Yes	Yes

Comments:

Technician



Approved



10.15.2003 14:25:05 611

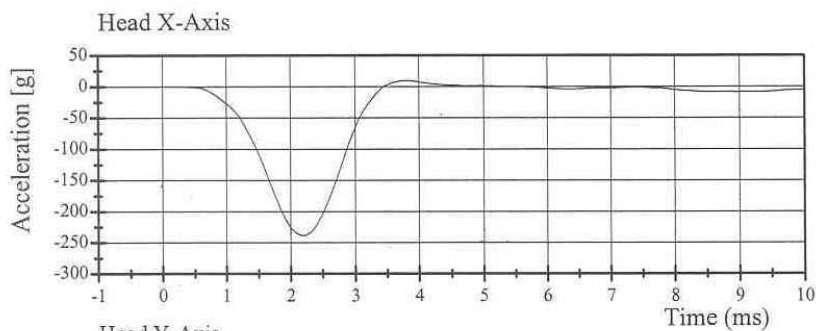


Transportation Research Center Inc.

572P Head Drop Test

HIII 3 Year Old Serial No. 042 Calibration No. 02 - 1

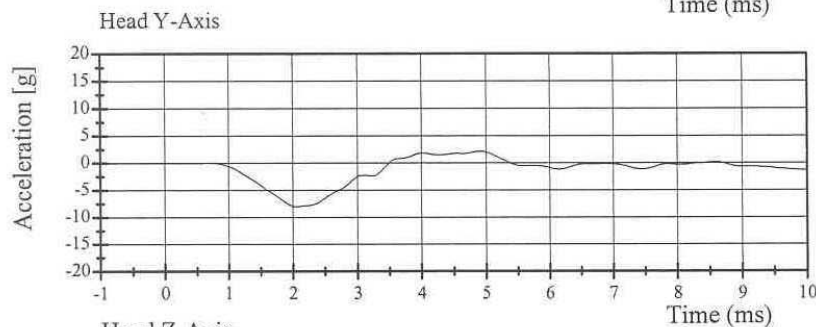
Test Date 10/15/2003



Filter Class: 1000

Max: 9.9 g at 3.8 ms

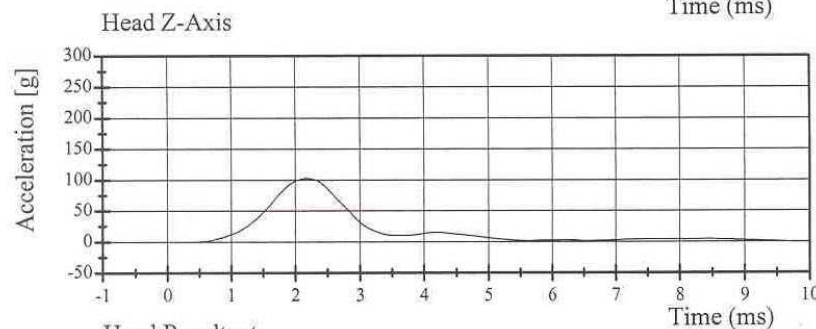
Min: -238.1 g at 2.2 ms



Filter Class: 1000

Max: 2.2 g at 4.9 ms

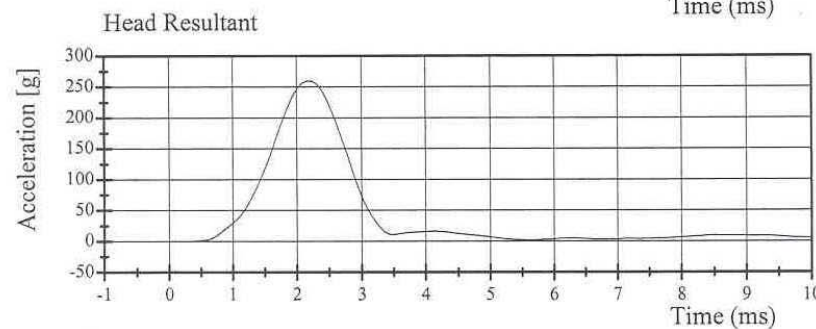
Min: -8.0 g at 2.1 ms



Filter Class: 1000

Max: 103.0 g at 2.2 ms

Min: -0.8 g at 10.0 ms



Filter Class: 1000

Max: 259.5 g at 2.2 ms

Min: 0.0 g at 4.9 ms

10.15.2003 14:25:05 611



Transportation Research Center Inc.

572P Neck Flexion Test - 6 Channel Transducer

HIII 3 Year Old Serial No. 042 Calibration No. 02 - 2

Test Date 10/15/2003

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.1 °C	Yes
Relative Humidity	10 - 70 %	31 %	Yes
Impact Velocity	5.40 - 5.60 m/s	5.47 m/s	Yes
Integrated Pendulum Velocity			
10 ms	2.00 - 2.70 m/s	2.36 m/s	Yes
15 ms	3.00 - 4.00 m/s	3.41 m/s	Yes
20 ms	4.00 - 5.10 m/s	4.62 m/s	Yes
Peak D Plane Rotation	70 - 82 °	73.7 °	Yes
Peak Moment About Occipital Condyles (During time interval rotation is within specified corridors)	42.0 - 53.0 N·m	42.46 N·m	Yes
Positive Moment Decay Time To 10 N·m	60 - 80 ms	71.36 ms	Yes

Comments:

Technician



Approved



10.15.2003 15:21:00 640

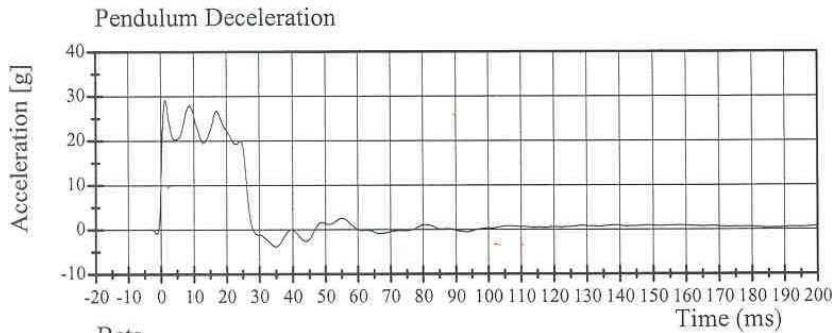


Transportation Research Center Inc.

572P Neck Flexion Test

HIII 3 Year Old Serial No. 042 Calibration No. 02 - 2

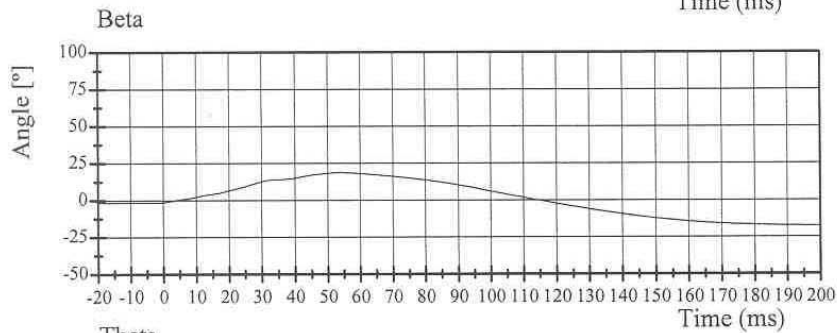
Test Date 10/15/2003



Filter Class: 180

Max: 29.2 g at 1.4 ms

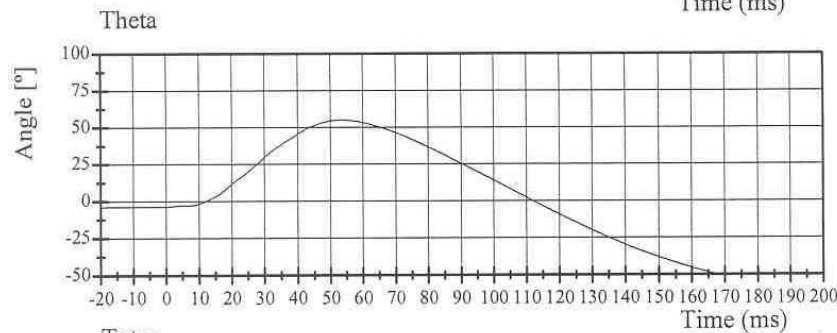
Min: -3.8 g at 35.0 ms



Filter Class: 60

Max: 18.7 ° at 53.9 ms

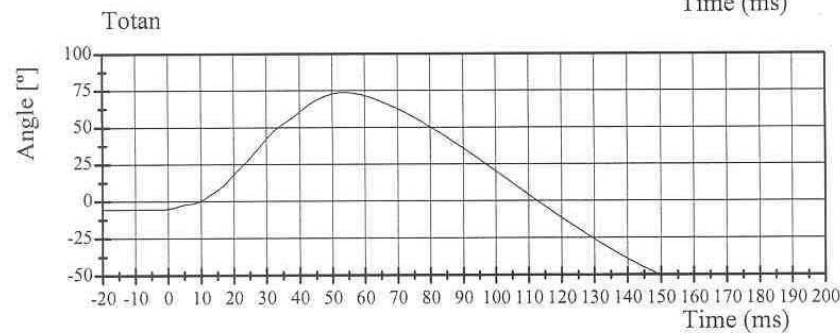
Min: -17.6 ° at 214.3 ms



Filter Class: 60

Max: 55.0 ° at 53.4 ms

Min: -56.8 ° at 200.0 ms



Filter Class: 60

Max: 73.7 ° at 53.6 ms

Min: -74.4 ° at 201.8 ms

10.15.2003 15:21:01 640

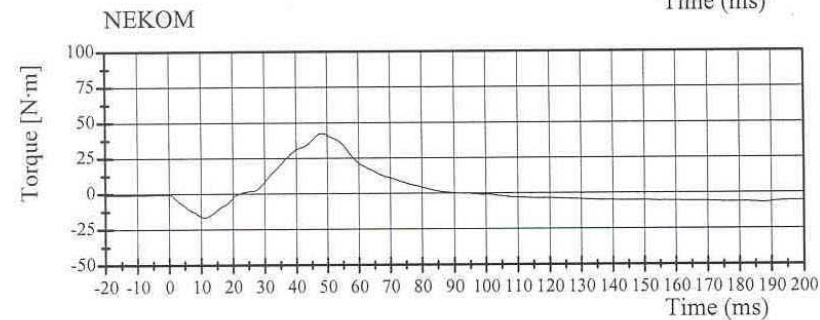
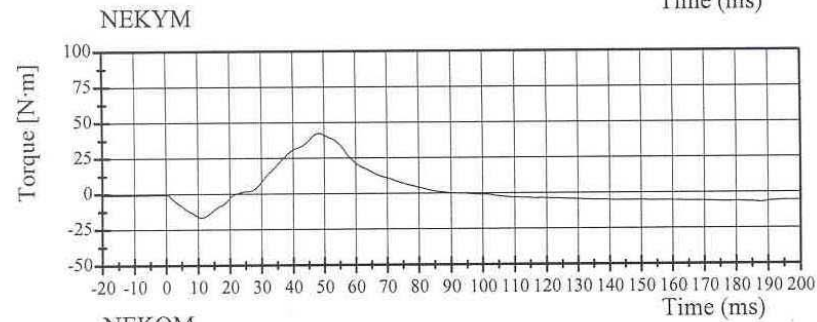
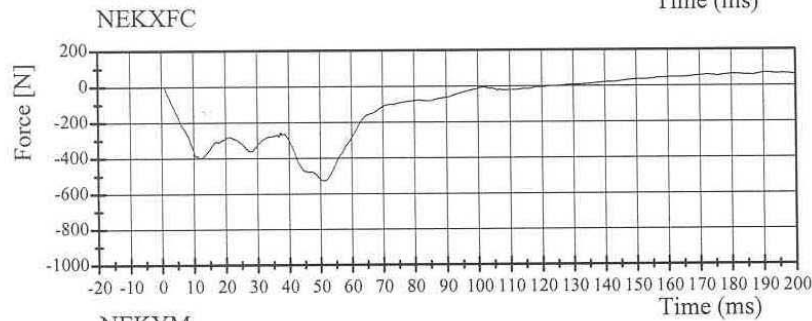
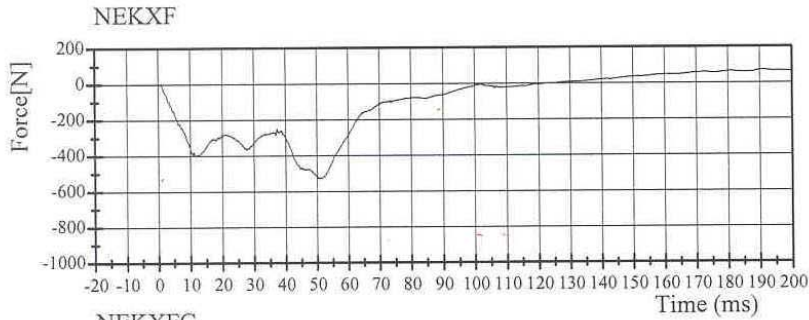


Transportation Research Center Inc.

572P Neck Flexion Test

HIII 3 Year Old Serial No. 042 Calibration No. 02 - 2

Test Date 10/15/2003



10.15.2003 15:21:02 640



Transportation Research Center Inc.

572P Neck Extension Test - 6 Channel Transducer

HIII 3 Year Old Serial No. 042 Calibration No. 02 - 3

Test Date 10/16/2003

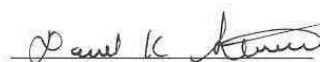
Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.1 °C	Yes
Relative Humidity	10 - 70 %	32 %	Yes
Impact Velocity	3.55 - 3.75 m/s	3.72 m/s	Yes
Integrated Pendulum Velocity			
10 ms	1.00 - 1.40 m/s	1.37 m/s	Yes
15 ms	1.90 - 2.50 m/s	2.44 m/s	Yes
20 ms	2.80 - 3.50 m/s	3.29 m/s	Yes
Peak D Plane Rotation	83 - 93 °	87.0 °	Yes
Peak Moment About Occipital Condyles (During time interval rotation is within specified corridors)	-53.3 - (-43.7) N·m	-47.07 N·m	Yes
Positive Moment Decay Time To -10 N·m	60 - 80 ms	72.08 ms	Yes

Comments:

Technician



Approved



10.16.2003 08:30:06 942



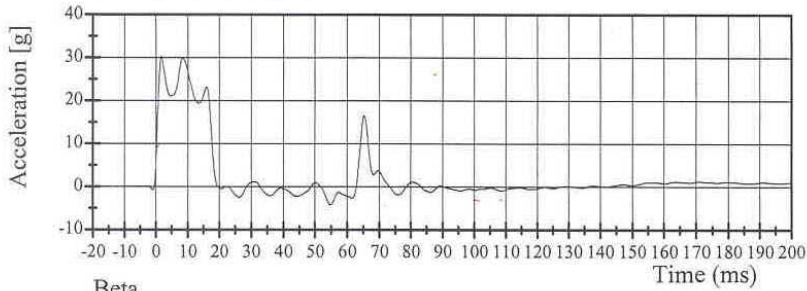
Transportation Research Center Inc.

572P Neck Extension Test

HIII 3 Year Old Serial No. 042 Calibration No. 02 - 3

Test Date 10/16/2003

Pendulum Deceleration

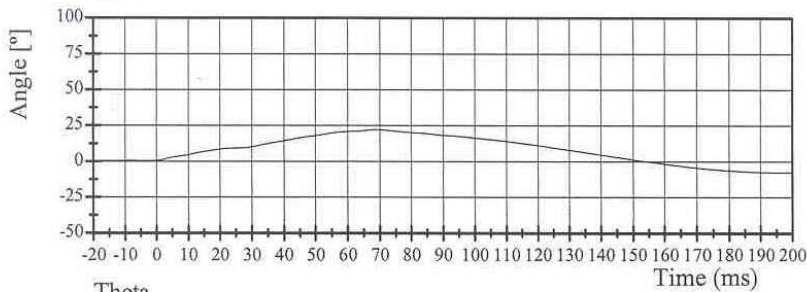


Filter Class: 180

Max: 30.4 g at 1.7 ms

Min: -4.2 g at 54.8 ms

Beta

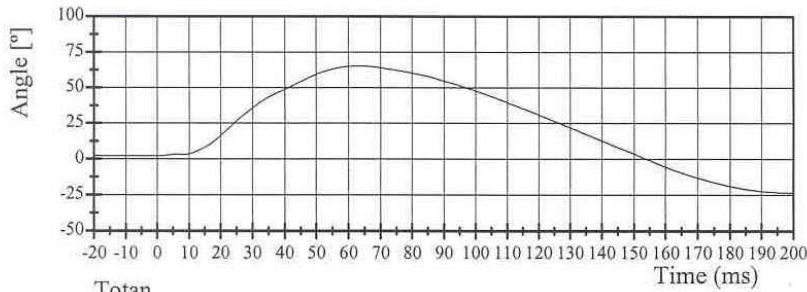


Filter Class: 60

Max: 22.2 ° at 68.8 ms

Min: -7.6 ° at 200.0 ms

Theta

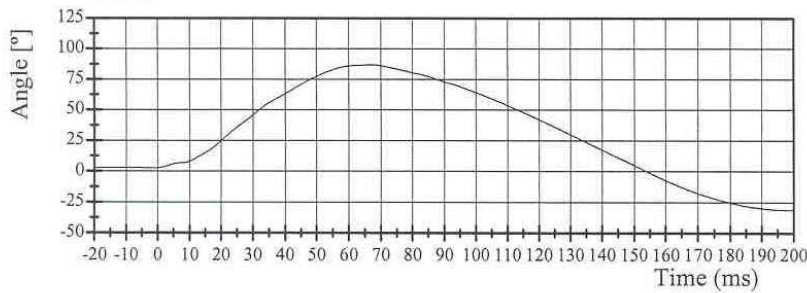


Filter Class: 60

Max: 65.3 ° at 63.4 ms

Min: -23.5 ° at 199.6 ms

Totan



Filter Class: 60

Max: 87.0 ° at 67.0 ms

Min: -31.1 ° at 199.6 ms

10.16.2003 08:30:07 942

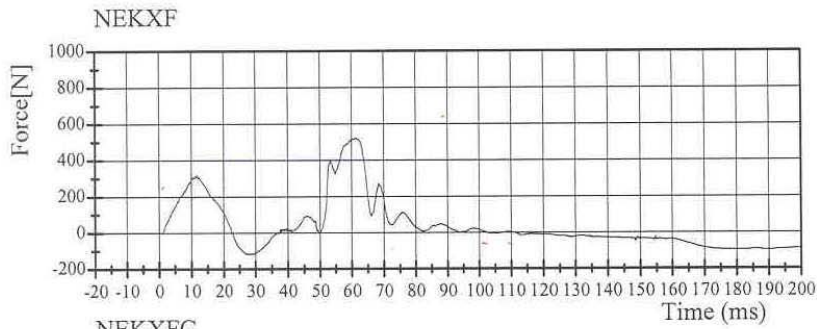


Transportation Research Center Inc.

572P Neck Extension Test

HIII 3 Year Old Serial No. 042 Calibration No. 02 - 3

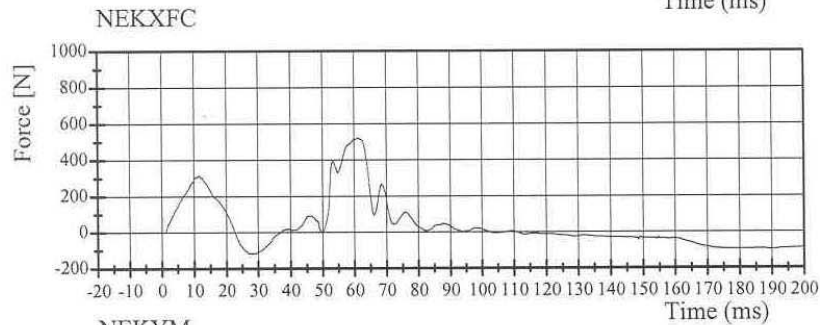
Test Date 10/16/2003



Filter Class: 1000

Max: 521.6 N at 61.4 ms

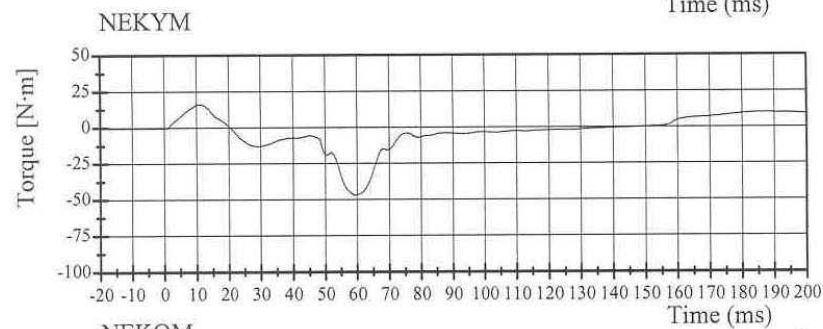
Min: -119.7 N at 28.4 ms



Filter Class: 600

Max: 520.8 N at 61.3 ms

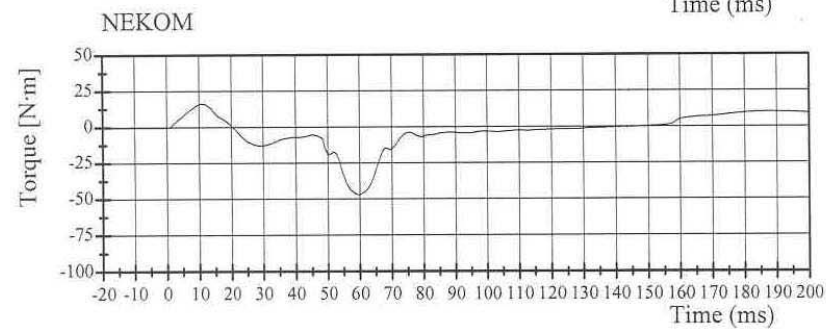
Min: -119.0 N at 28.3 ms



Filter Class: 600

Max: 16.2 N·m at 11.3 ms

Min: -47.1 N·m at 59.7 ms



Filter Class: 600

Max: 16.2 N·m at 11.3 ms

Min: -47.1 N·m at 59.7 ms

10.16.2003 08:30:08 942



Transportation Research Center Inc.

572P Thorax Test

HIII 3 Year Old Serial No. 042 Calibration No. 02 - 1

Test Date 10/17/2003

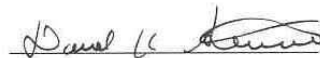
Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.7 °C	Yes
Relative Humidity	10 - 70 %	30 %	Yes
Pendulum Velocity	5.90 - 6.10 m/s	6.05 m/s	Yes
Maximum Chest Deflection	-38.0 - (-32.0) mm	-35.0 mm	Yes
Peak Impact Probe Force Within Compression Corridor	680 - 810 N	746 N	Yes
Internal Hysteresis	65 - 85 %	71 %	Yes
Maximum Force Between 12.5 mm & 32 mm Of Deflection	<= 910	795	Yes

Comments:

Technician



Approved



10.17.2003 13:12:32 991

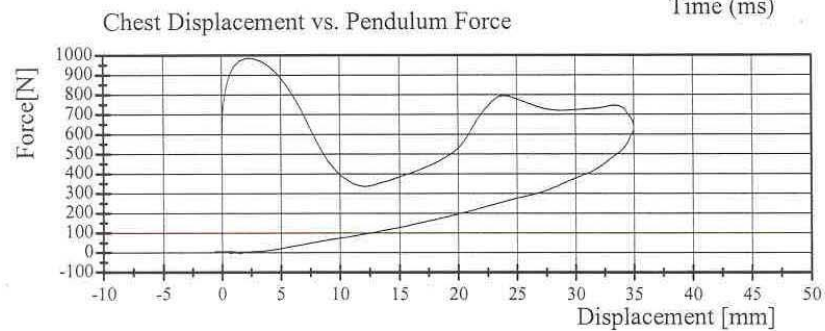
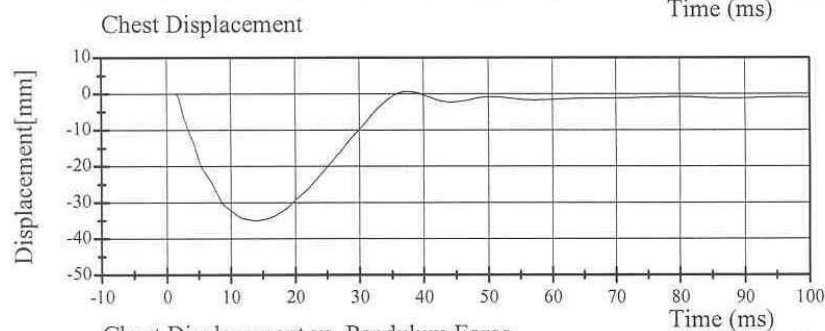
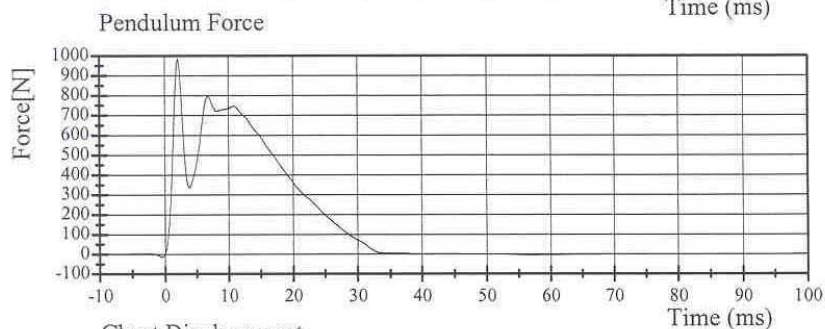
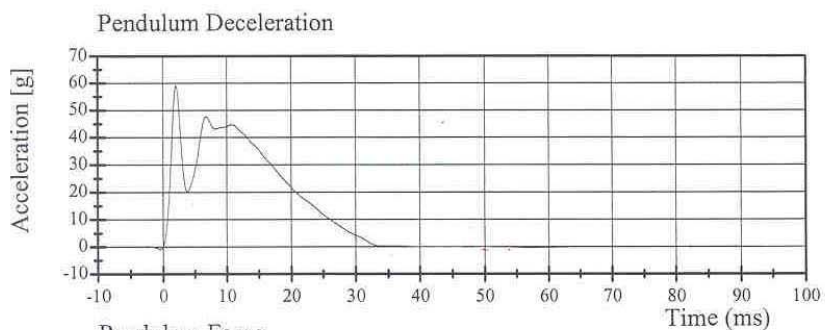


Transportation Research Center Inc.

572P Thorax Test

HIII 3 Year Old Serial No. 042 Calibration No. 02 - 1

Test Date 10/17/2003



10.17.2003 13:12:33 991



TRANSPORTATION RESEARCH CENTER INC.

TORSO FLEXION TEST

HYBRID III THREE-YEAR-OLD

CAL DATE: 16-Oct-03

TRC, INC. TEST NO: 042C02TF1 572 P SN 042 TORSO FLEX CAL 02

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9 – 25.6 DEG. C	21.7 DEG. C
RELATIVE HUMIDITY	10 – 70 %	36 %
INITIAL ANGLE OF UNSUPPORTED DUMMY	≤ 15 DEG. REFERENCED TO VERTICAL	4.9 DEG.
MAXIMUM FORCE AT 45 DEG. DURING 10 SECOND PERIOD	130 – 180 N	179.8 N
RETURN ANGLE		2.5 DEG.
DIFFERENCE BETWEEN RETURN ANGLE & INITIAL ANGLE	$\pm 10^\circ$ OF INITIAL ANGLE	7.4 °
RATE	0.5° - 1.5°/sec	1.0 °/sec

TEST MEETS SPECIFICATIONS

TECHNICIAN 

APPENDIX D

TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

INSTRUMENTS FOR RRP CHILD DUMMY S/N: 040

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X	AP1Y1	Endevco	8/7/03
Head Y	ACC81	Endevco	8/7/03
Head Z	AHY71	Endevco	8/7/03
Head X Redundant	P22190	Endevco	9/4/03
Head Y Redundant	P22180	Endevco	9/4/03
Head Z Redundant	P22805	Endevco	9/4/03
Upper Neck Load Cell	210	Denton	8/25/03
Chest X	J13649	Endevco	10/6/03
Chest Y	ANBP7	Endevco	9/4/03
Chest Z	J13422	Entran	10/6/03
Chest X Redundant	J13653	Endevco	10/6/03
Chest Y Redundant	AP1C6	Endevco	9/4/03
Chest Z Redundant	J13713	Endevco	10/6/03
Chest Deflection Gauge	040	Servo	10/14/03
Pelvis X	AMTG3	Endevco	8/6/03
Pelvis Y	AMTL6	Endevco	8/6/03
Pelvis Z	ALC37	Endevco	8/6/03
Tether Force	159	FTSS	9/18/03

INSTRUMENTS FOR LRP CHILD DUMMY S/N: 042

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X	AKAH1	Entran	8/6/03
Head Y	J17709	Entran	8/6/03
Head Z	AJ412	Endevco	8/6/03
Head X Redundant	J18260	Endevco	8/6/03
Head Y Redundant	J20298	Endevco	8/6/03
Head Z Redundant	J20473	Endevco	8/6/03
Upper Neck Load Cell	94	FTSS	9/2/03
Chest X	J12449	Endevco	8/7/03
Chest Y	J12425	Endevco	8/7/03
Chest Z	J12462	Endevco	8/7/03
Chest X Redundant	P27029	Endevco	5/20/03
Chest Y Redundant	P23012	Endevco	9/4/03
Chest Z Redundant	P10148	Endevco	5/23/03
Chest Deflection Gauge	042	Servo	10/23/03
Pelvis X	AGTT3	Endevco	8/7/03
Pelvis Y	AC913	Endevco	8/7/03
Pelvis Z	J11630	Entran	8/7/03
Right Tether Force	161	Denton	9/18/03
Left Tether Force	162	Denton	9/18/03