REPORT NUMBER: NCAPCHILD-MGA-2005-007

NEW CAR ASSESSMENT PROGRAM
FRONTAL BARRIER IMPACT TEST

Evenflo Titan 5
Graco Turbo Booster

NHTSA NUMBER: D50310

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

Test Date: December 8, 2004

Report Date: January 19, 2005

FINAL REPORT

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

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

Prepared by: Shefalika Naik Date: 1/19/05
Shefalika Naik, Project Engineer

Reviewed by: David Winkelbauer Date: 1/19/05
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

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7. Author(s) Shefalika Naik, Project Engineer		*8. Performing Organization Report No.* NCAPCHILD-MGA-2005-007
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
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15. Supplementary Notes

16. Abstract

The subjects CRS Evenflo Titan 5 and Graco Turbo Booster 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 December 8, 2004, in conjunction with frontal NCAP.

Measurement Description	Units	Pos. 3 ATD	Pos. 4 ATD
Head Injury Criteria (HIC36)	N/A	796	1570
Head Injury Criteria (HIC15)	N/A	502	1132
Max. Thorax Accel. (3msec Clip)	G's	60	54

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Form DOT F1700.7 (8-72)

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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 56.3 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 42) and left rear (Position 4) child dummy (S/N 144) were calibrated previous to this test. Child dummy certification information is found in Appendix C.

The right rear child dummy's HIC36 was 795.8; maximum chest deceleration over 3 msec was 59.6 g's. The left rear child dummy's HIC36 was 1570.0. The maximum chest deceleration over 3 msec was 54.1 g's. Positions 3 and 4 were forward facing. Position 3 used the vehicle LATCH and top tether for attachments. Position 4 (booster seat) used vehicle seat belts.

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 6 Year Old / 144
Number of Data Channels	16	18
Restraint System	Evenflo Titan 5 (Forward Facing)	Graco Turbo Booster (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)	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 144
Head Contact	CRS Seat back	CRS Seat back, vehicle seat belt
Upper Torso Contact	None	None
Lower Torso Contact	None	None
Left Foot Contact	Passenger Seat Back	Back of Drivers seat
Right Foot Contact	Passenger Seat Back	Back of Drivers seat

SECTION 2… (continued)

DATA SHEET NO. 2
CRS PARAMETER DATA

Child Restraint System (Position 3)	Evenflo Titan 5
Child Restraint System (Position 4)	Graco Turbo Booster
NHTSA No.	D50310

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1938.2
Weight of 2 P572E ATDs	kg	156.0
Rated Cargo/Luggage Weight (RCLW)	kg	45.4
Calculated Vehicle Target Weight (TVTW)	kg	2139.6

TEST VEHICLE WEIGHTS

	Units	As Tested (ATW) (Axle)		
		Front	Rear	Total
Left	kg	593.8	490.8	
Right	kg	575.6	474.5	
Ratio	%	54.8	45.2	
Totals	kg	1169.4	965.3	2134.7

As tested weight of vehicle includes two 50th percentile ATDs, one 3 year old with CRS, one 6 year old with CRS, cargo, equipment and instrumentation.

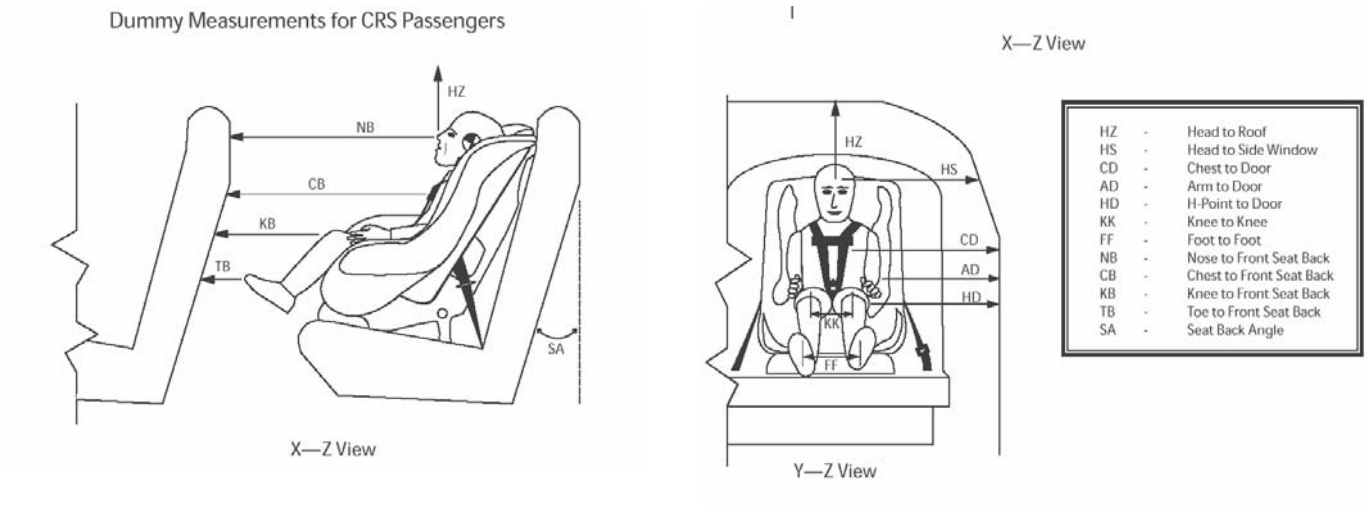
CHEST CLIP DISPLACEMENT

	Units	Left	Right
Right Child Dummy	mm	67	71
Left Child Dummy	mm		

SECTION 2… (continued)

DATA SHEET NO. 3
CHILD DUMMY POSITIONING IN VEHICLE

Child Restraint System (Position 3)	Evenflo Titan 5 (Forward Facing)
NHTSA No.	D50310



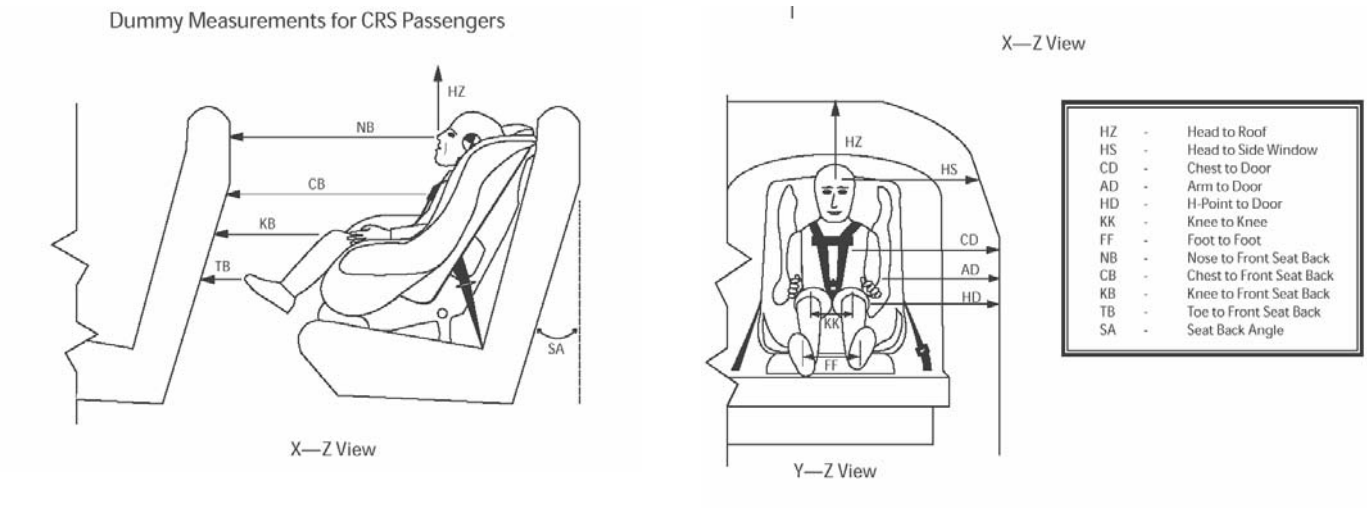
Measurement	Pre-Test (mm)	Post-Test (mm)
	P3 CRS (42)	P3 CRS (42)
SA (deg)	18.1	18.0
HS	447	461
CD	426	426
AD	306	299
HD	362	365
HZ	394	390
NB	691	760
CB	676	744
KK	151	155
FF	111	155
KB - LEFT	422	491
KB – RIGHT	440	551
TB - LEFT	153	391
TB - RIGHT	162	260

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)	Graco Turbo Booster (Forward Facing)
NHTSA No.	D50310



Measurement	Pre-Test (mm)	Post-Test (mm)
	P4 CRS (144)	P4 CRS (144)
SA (deg)	14.7	18.0
HS	458	629
CD	441	485
AD	291	210
HD	345	330
HZ	365	437
NB	630	582
CB	613	625
KK	146	182
FF	132	0
KB - LEFT	404	455
KB – RIGHT	414	467
TB - LEFT	169	221
TB - RIGHT	171	202

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

DATA SHEET NO. 4
CHILD DUMMY INJURY CRITERIA VALUES

Child Restraint System (Position 3)	Evenflo Titan 5
Child Restraint System (Position 4)	Graco Turbo Booster
NHTSA No.	D50310

HEAD PEAK ACCELERATIONS

Location	Axis	Units	Position 3				Position 4			
			Max	Time	Min	Time	Max	Time	Min	Time
Head CG	X	G's	51.7	195	-37.4	116	16.5	252	-72.1	114
Head CG	Y	G's	5.5	129	-17.7	116	4.9	237	-16.1	114
Head CG	Z	G's	65.0	94	-20.9	63	105.4	82	-7.0	57
Resultant	N/A	G's	67.2	88			108.2	82		

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	58	263	-708	123	69	223	-725	71
Neck Force	Y	N	89	91	-34	195	25	193	-367	94
Neck Force	Z	N	2241	93	-607	64	3460	82	-656	114
Resultant	N/A	N	2294	92			3524	82		
Neck Moment	X	N•m	5.3	102	-7.5	127	8.1	93	-20.4	101
Neck Moment	Y	N•m	1.9	264	-16.3	68	15.2	125	-51.6	69
Neck Moment	Z	N•m	1.8	177	-2.3	124	11.4	105	-9.7	283
Resultant	N/A	N•m	16.3	68			51.8	69		

CHEST PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	Position 3				Position 4			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	G's	8.4	192	-49.4	92	7.0	196	-52.5	63
Chest CG	Y	G's	7.6	88	-2.5	218	14.0	90	-8.6	168
Chest CG	Z	G's	28.3	96	-54.4	67	20.7	58	-32.3	86
Resultant	N/A	G's	61.9	67			55.3	62		

CHEST PEAK DISPLACEMENTS

Location	Axis	Units	Position 3				Position 4			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest	X	mm			-15.7	124			-31.5	91

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

Child Restraint System (Position 3)	Evenflo Titan 5
Child Restraint System (Position 4)	Graco Turbo Booster
NHTSA No.	D50310

TETHER FORCE

Location	Axis	Units	Position 3				Position 4			
			Max	Time	Min	Time	Max	Time	Min	Time
Right Tether Force	N/A	N	800	97						

PELVIC PEAK ACCELERATIONS

Location	Axis	Units	Position 3				Position 4			
			Max	Time	Min	Time	Max	Time	Min	Time
Pelvis	X	G's	8.5	249	-60.8	72	10.0	187	-51.6	56
Pelvis	Y	G's	9.2	64	-9.3	60	14.3	95	-8.1	129
Pelvis	Z	G's	15.7	202	-67.5	60	17.6	89	-34.4	59
Resultant	N/A	G's	82.6	60			61.6	58		

FEMUR FORCES

Location	Axis	Units	Position 3				Position 4			
			Max	Time	Min	Time	Max	Time	Min	Time
Left Femur	N/A	N					1219	61	-155	179
Right Femur	N/A	N					1208	62	-238	164

BELT FORCES

Location	Axis	Units	Position 3				Position 4			
			Max	Time	Min	Time	Max	Time	Min	Time
Shoulder Belt	N/A	N					5717	86		
Lap Belt	N/A	N					3486	75		

SECTION 2… (continued)

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

Child Restraint System (Position 3)	Evenflo Titan 5
Child Restraint System (Position 4)	Graco Turbo Booster
NHTSA No.	D50310

HEAD INJURY CRITERIA (HIC36)

Location	HIC	T^1 (msec)	T^2 (msec)	Average Acceleration (G's)
Position 3 - Right	795.8	74.5	107.7	56.5
Position 4 – Left	1570.0	67.7	98.1	76.8

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	501.5	80.9	95.9	64.5
Position 4 – Left	1131.5	76.4	91.4	89.3

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	59.6	65.0	68.0
Position 4 – Left	54.1	60.5	63.5

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

DATA SHEET NO. 5
CRS PERFORMANCE DATA

Child Restraint System (Position 3)	Evenflo Titan 5
Child Restraint System (Position 4)	Graco Turbo Booster
NHTSA No.	D50310

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	

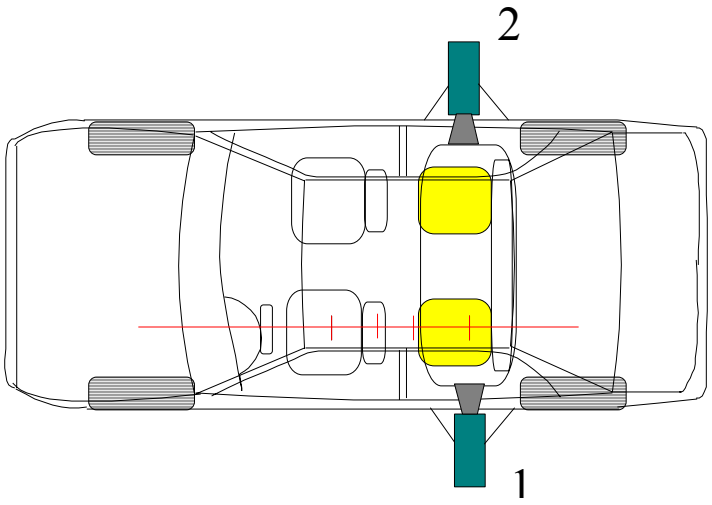
POSITION 4 CRS POST-TEST INSPECTION

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 Titan 5
Child Restraint System (Position 4)	Graco Turbo Booster
NHTSA No.	D50310



No.	Camera View	Location (mm) *			Angle (deg)	Lens (mm)	Speed (fps)
		X	Y	Z			
1	Left Side CRS Lateral View					10	**
2	Right Side CRS Lateral View					13	**

*COORDINATES:

+X = rearward of barrier

+Y = right of monorail centerline

+Z = above ground level

** Camera did not run.

APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

Close-up View of Position 3 CRS Label

Pre-Test Front View of Position 3 CRS

Post-Test Front View of Position 3 CRS

Pre-Test Rear View of Position 3 CRS

Post-Test Rear View of Position 3 CRS

Pre-Test Left Side View of Position 3 CRS

Post-Test Left Side View of Position 3 CRS

Pre-Test Right Side View of Position 3 CRS

Post-Test Right Side View of Position 3 CRS

Close-up View of Position 4 CRS Label

Pre-Test Front View of Position 4 CRS

Post-Test Front View of Position 4 CRS

Pre-Test Rear View of Position 4 CRS

Post-Test Rear View of Position 4 CRS

Pre-Test Left Side View of Position 4 CRS

Post-Test Left Side View of Position 4 CRS

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

Pre-Test Position 4 Left Side View

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

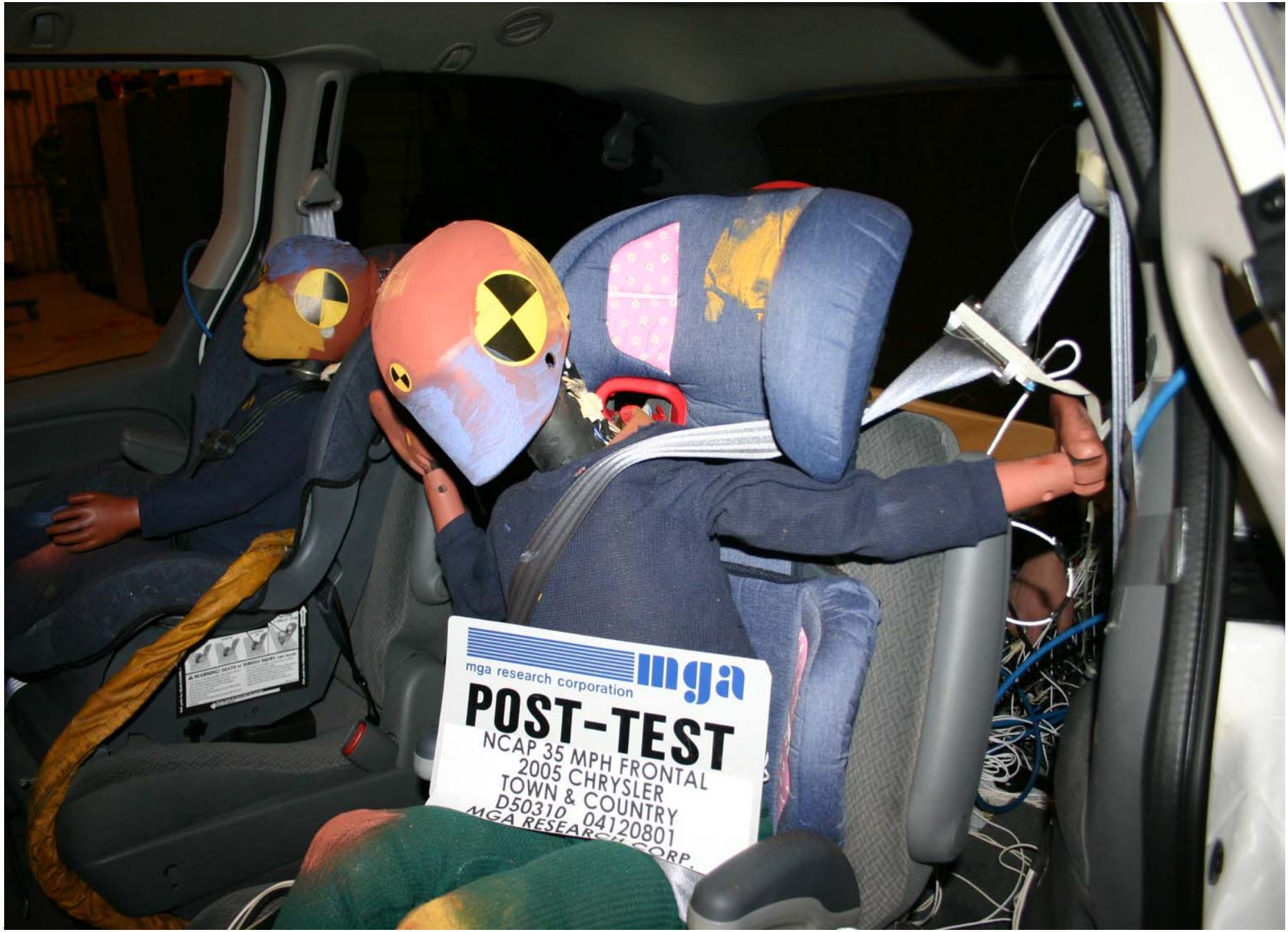
Post-Test Position 3 Front ¾ View

Post-Test Position 4 Front ¾ View

Post-Test Position 3 Foot Contact

Post-Test Position 4 Foot Contact

Post-Test Position 3 Head Contact



Post-Test Position 4 Head Contact

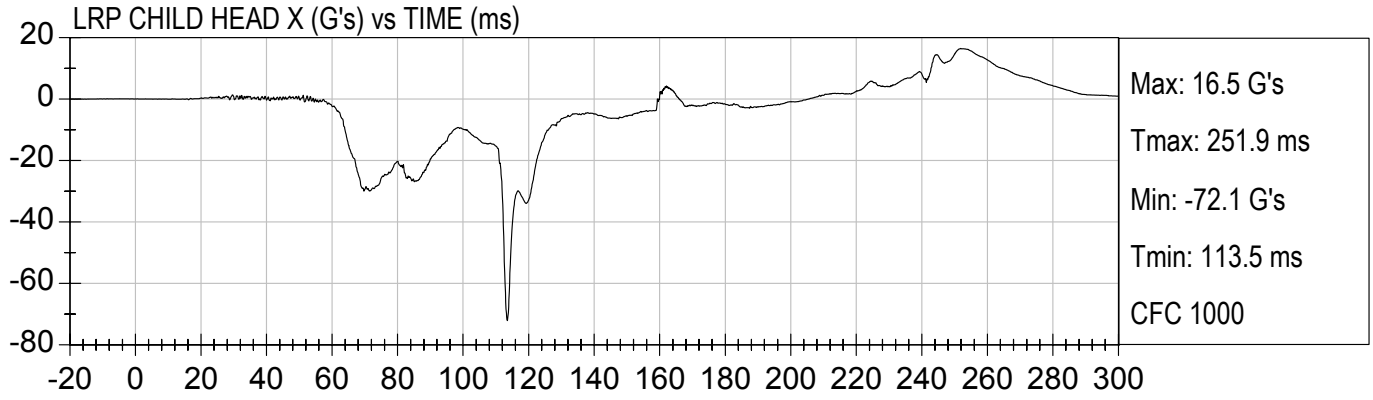
APPENDIX B

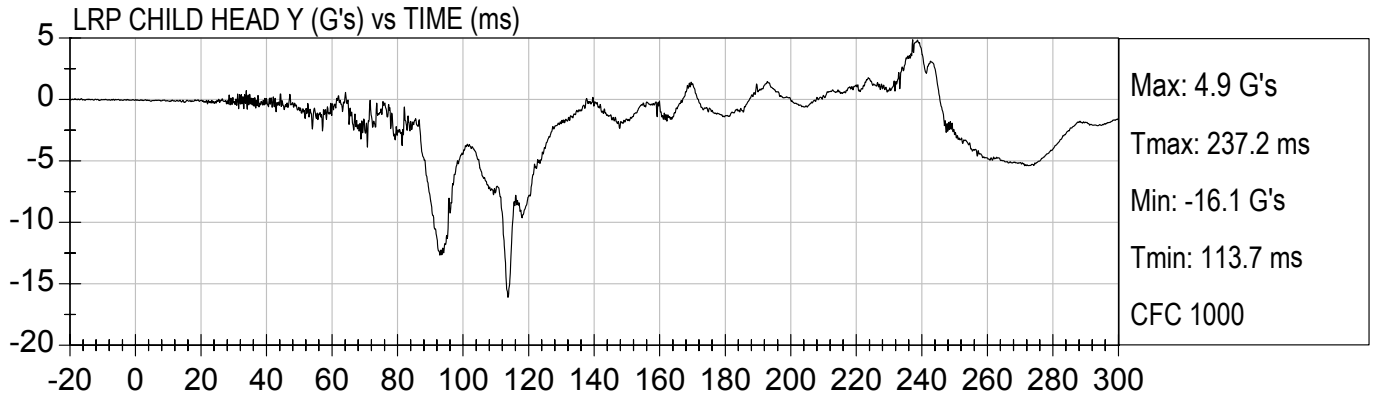
CHILD DUMMY RESPONSE DATA TRACES

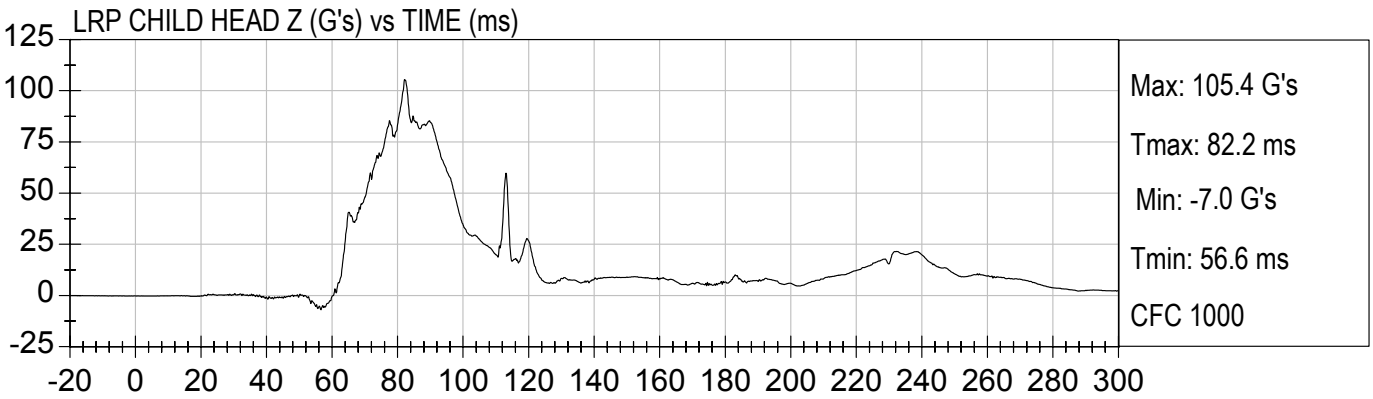
TABLE OF DATA PLOTS

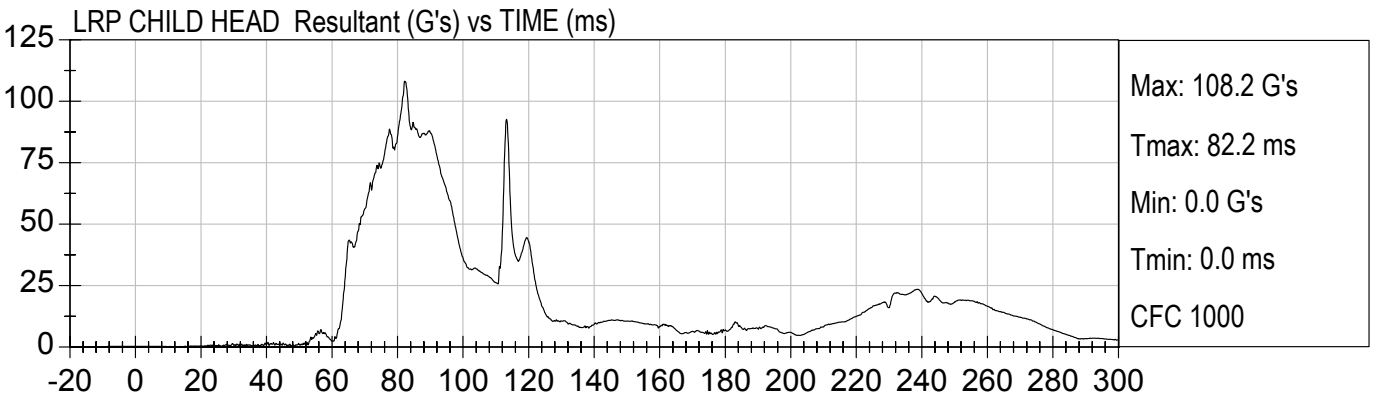
NCAP 35MPH FRONTAL IMPACT
2005 CHRYSLER TOWN AND COUNTRY (D50310)

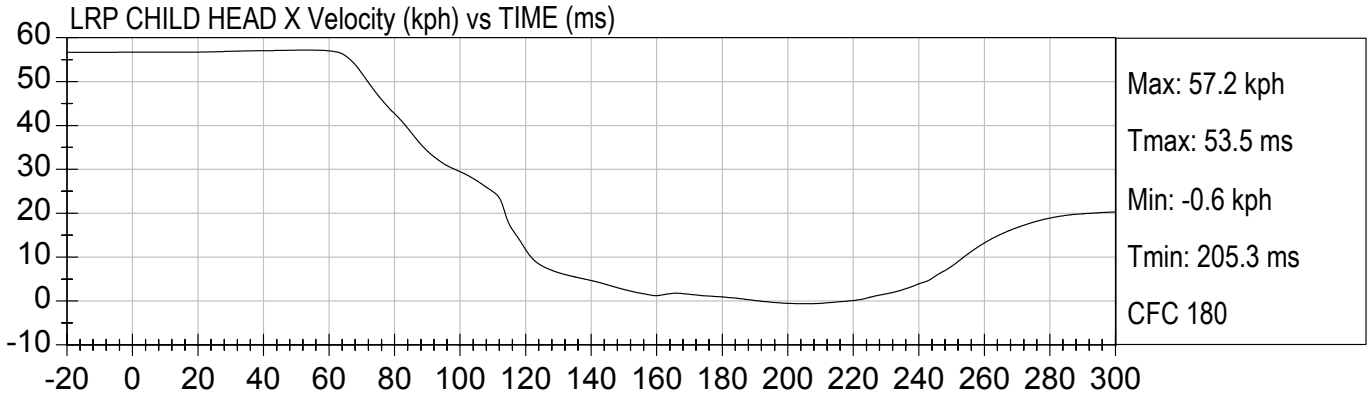
Test Date: 12/08/04
Speed: 35.2 mph (56.6 km/h)

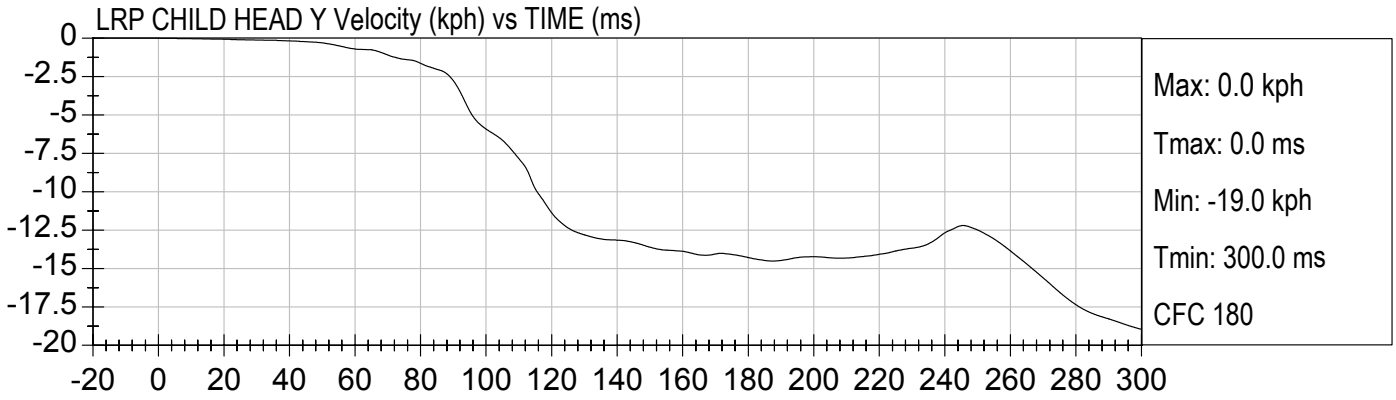


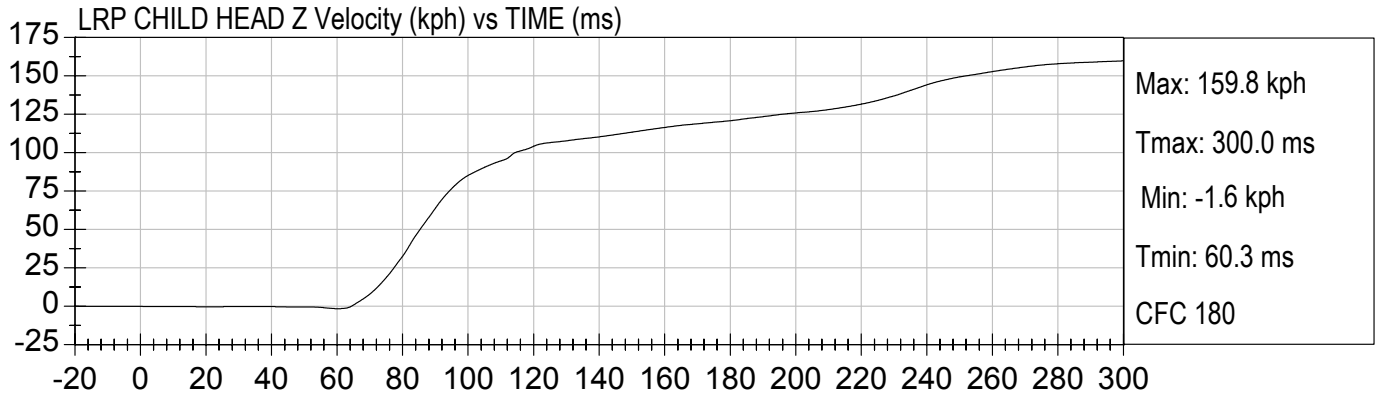






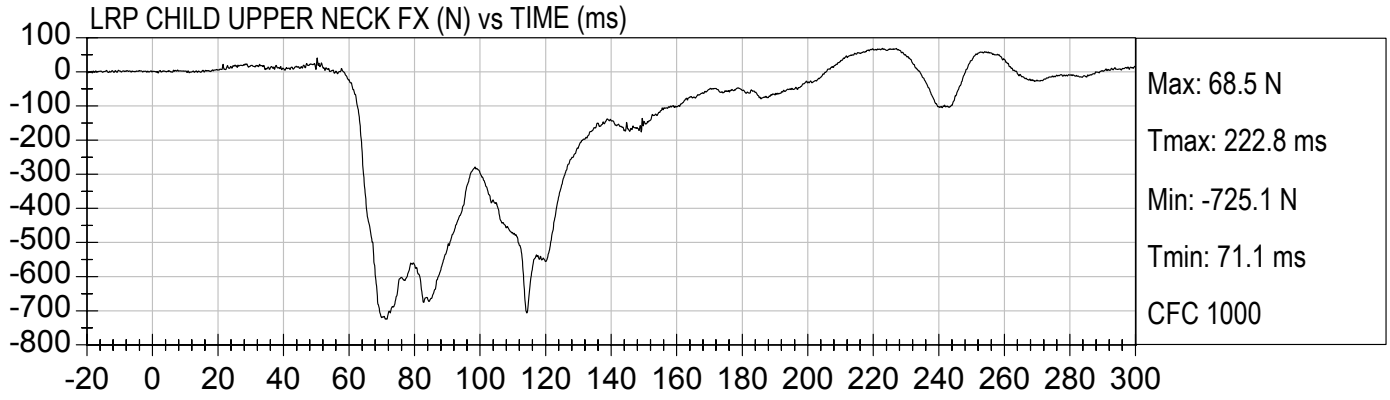

LRP CHILD HEAD X Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 57.2 kph
Tmax: 53.5 ms
Min: -0.6 kph
Tmin: 205.3 ms
CFC 180

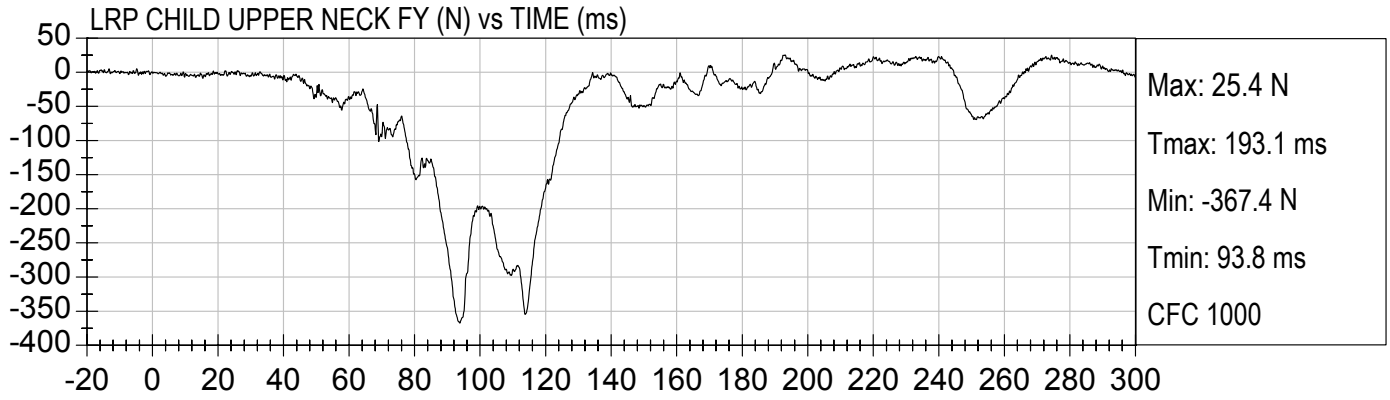

LRP CHILD HEAD Y Velocity (kph) vs TIME (ms)
0
-2.5
-5
-7.5
-10
-12.5
-15
-17.5
-20
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 0.0 kph
Tmax: 0.0 ms
Min: -19.0 kph
Tmin: 300.0 ms
CFC 180

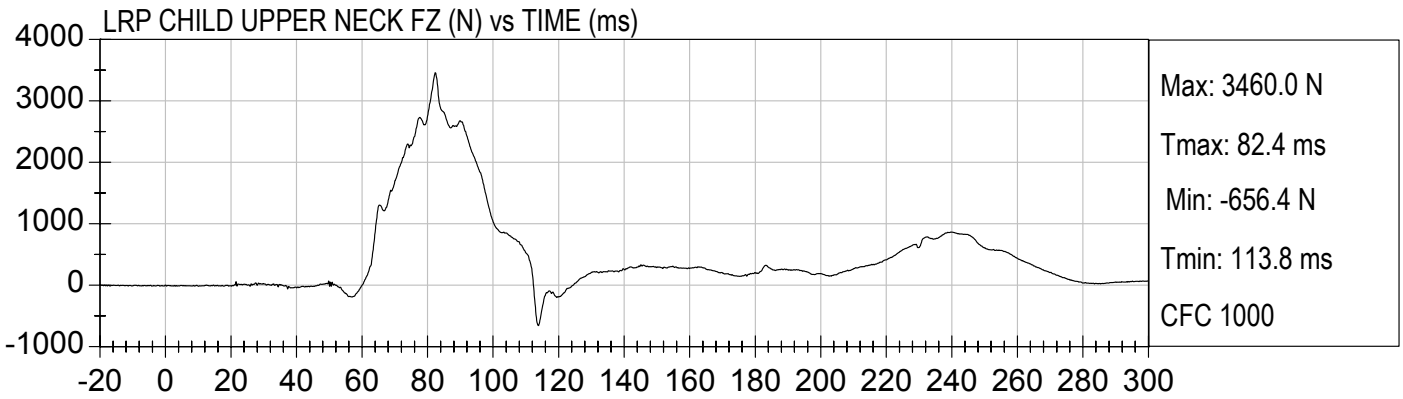

LRP CHILD HEAD Z Velocity (kph) vs TIME (ms)
175
150
125
100
75
50
25
0
-25
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 159.8 kph
Tmax: 300.0 ms
Min: -1.6 kph
Tmin: 60.3 ms
CFC 180

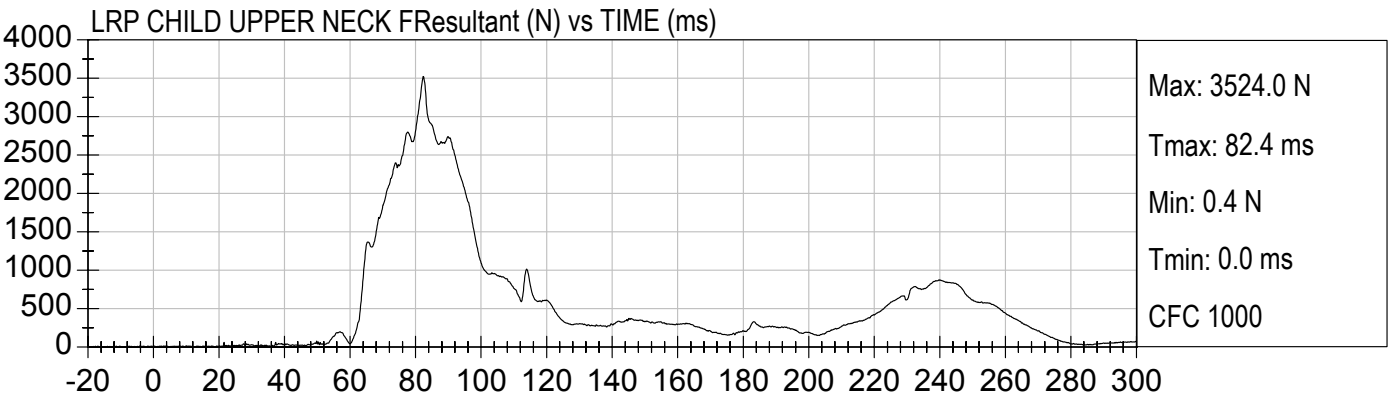
NCAP 35MPH FRONTAL IMPACT
2005 CHRYSLER TOWN AND COUNTRY (D50310)

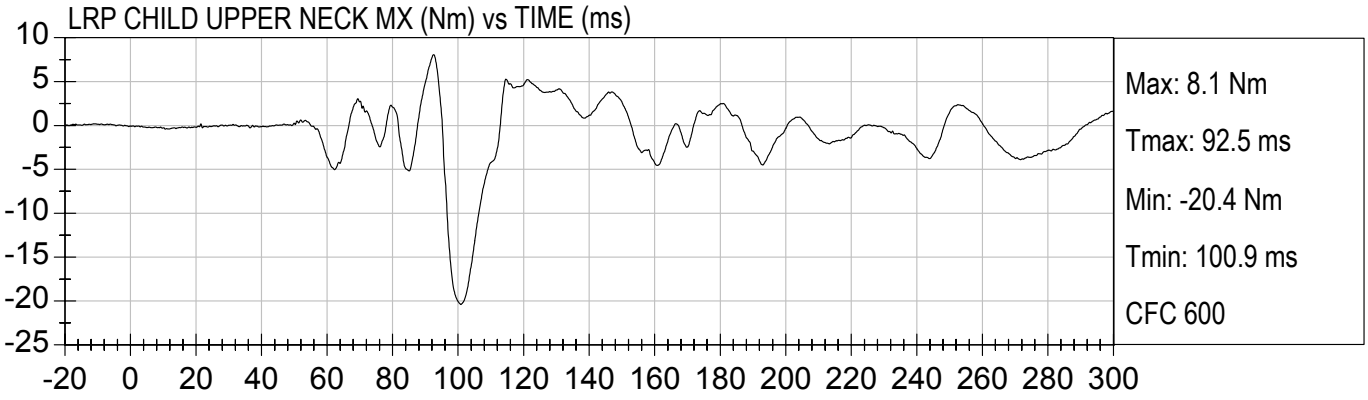
Test Date: 12/08/04
Speed: 35.2 mph (56.6 km/h)

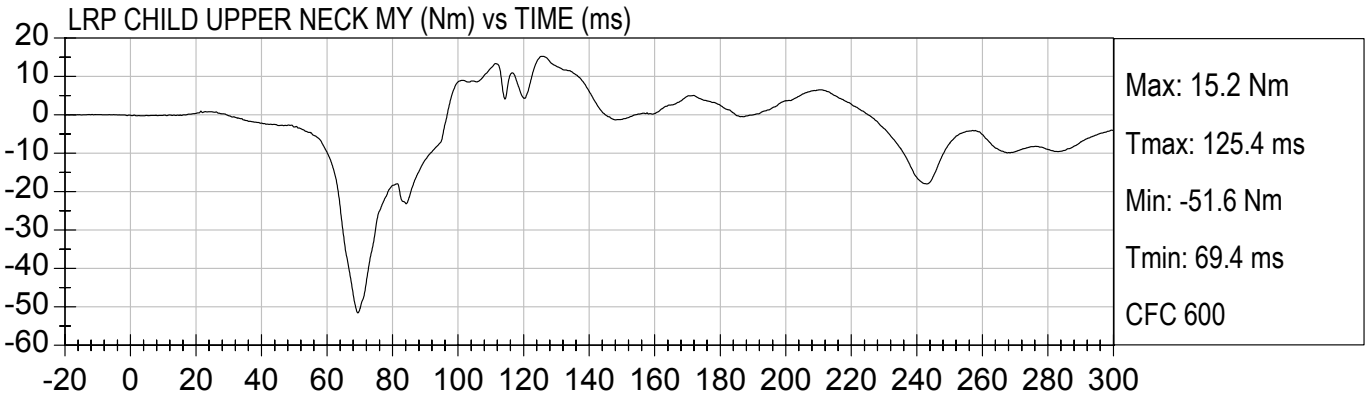


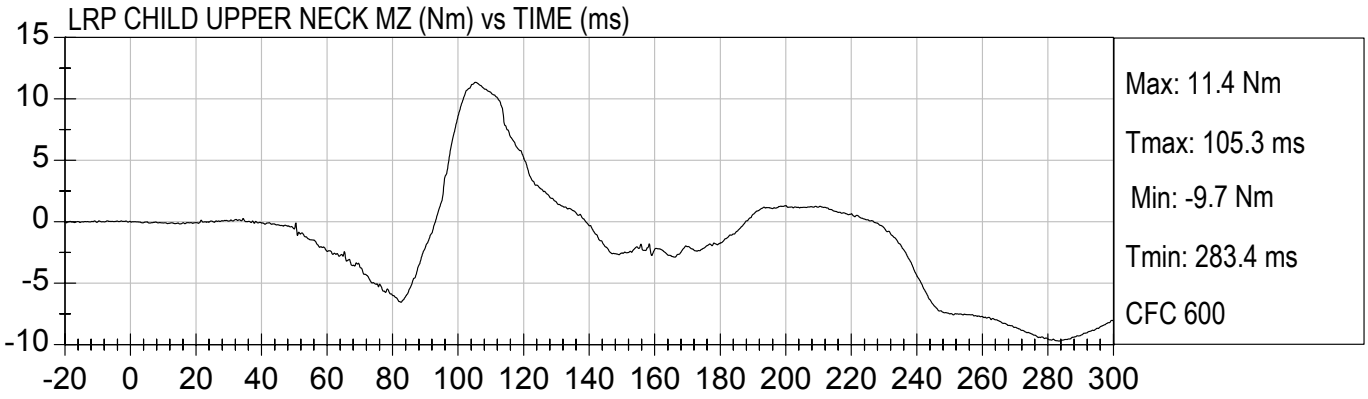


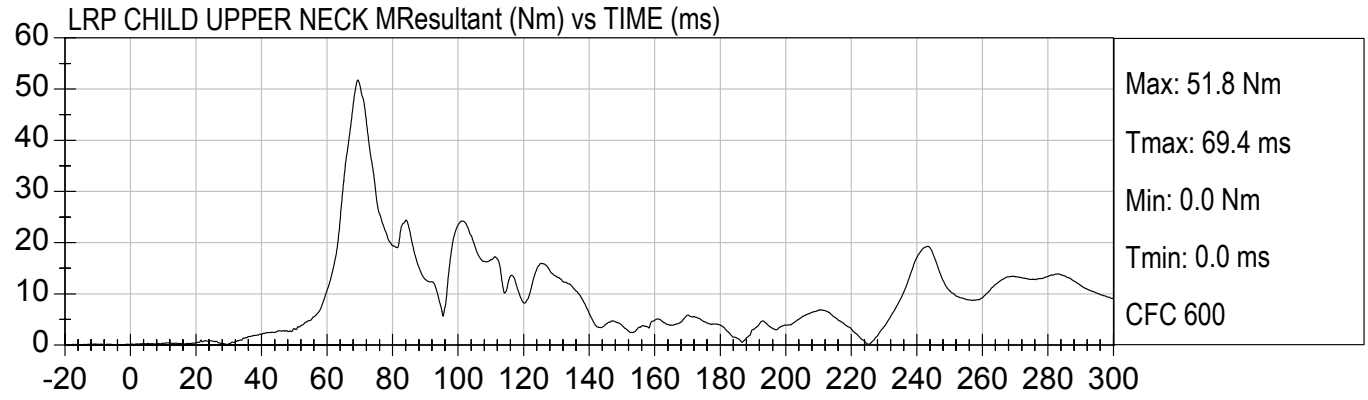





LRP CHILD UPPER NECK MX (Nm) vs TIME (ms)
10
5
0
-5
-10
-15
-20
-25
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 8.1 Nm
Tmax: 92.5 ms
Min: -20.4 Nm
Tmin: 100.9 ms
CFC 600

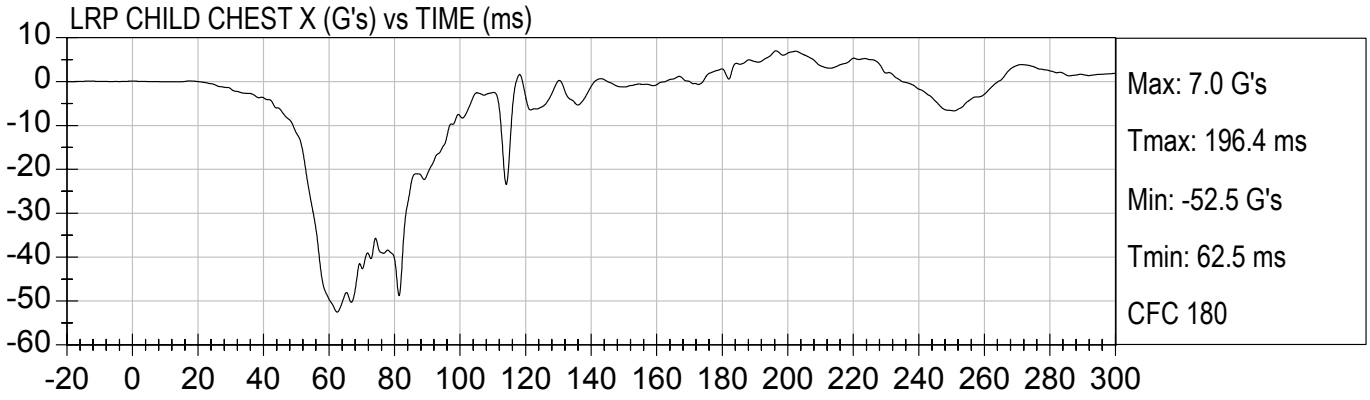

LRP CHILD UPPER NECK MY (Nm) vs TIME (ms)
20
10
0
-10
-20
-30
-40
-50
-60
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 15.2 Nm
Tmax: 125.4 ms
Min: -51.6 Nm
Tmin: 69.4 ms
CFC 600

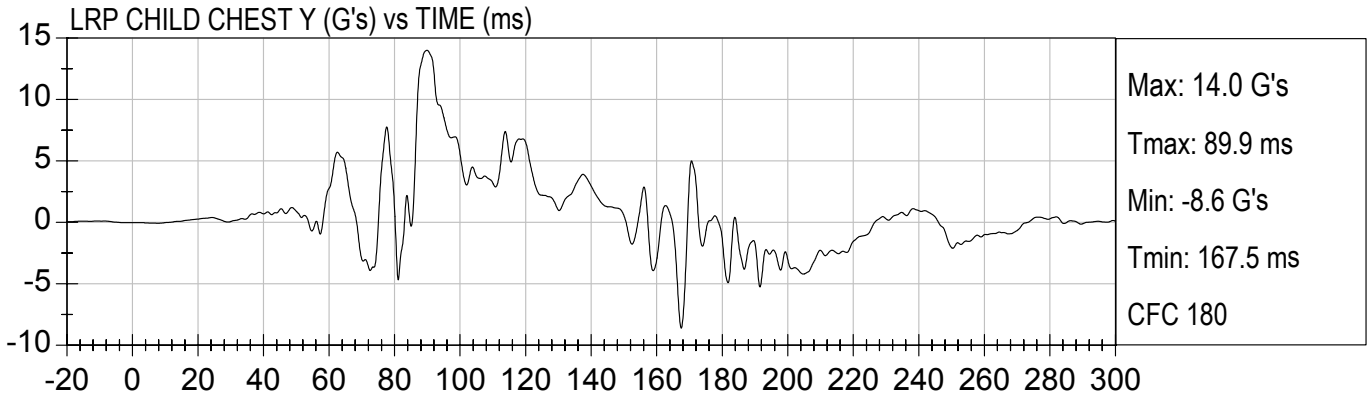

LRP CHILD UPPER NECK MZ (Nm) vs TIME (ms)
15
10
5
0
-5
-10
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 11.4 Nm
Tmax: 105.3 ms
Min: -9.7 Nm
Tmin: 283.4 ms
CFC 600

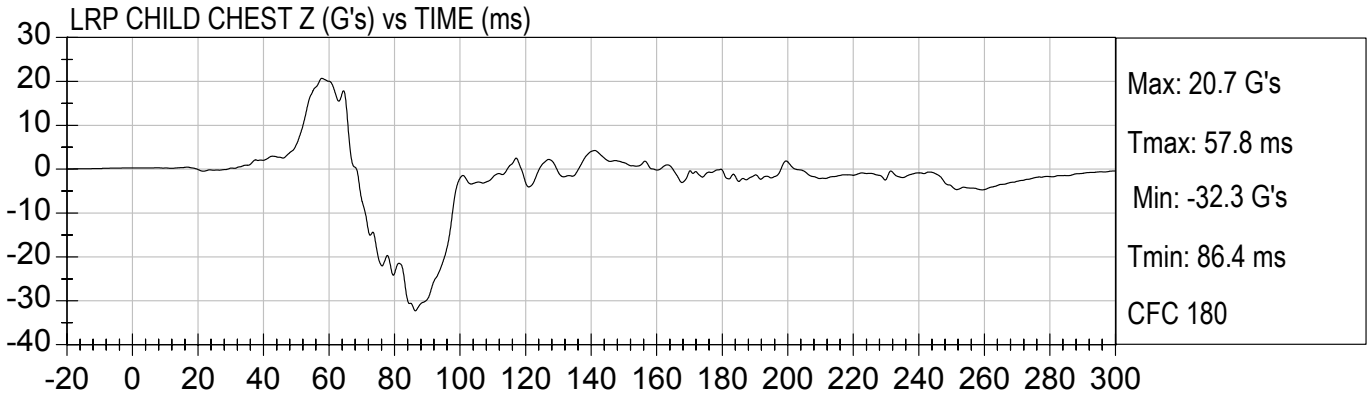

LRP CHILD UPPER NECK MResultant (Nm) vs TIME (ms)
60
50
40
30
20
10
0
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 51.8 Nm
Tmax: 69.4 ms
Min: 0.0 Nm
Tmin: 0.0 ms
CFC 600

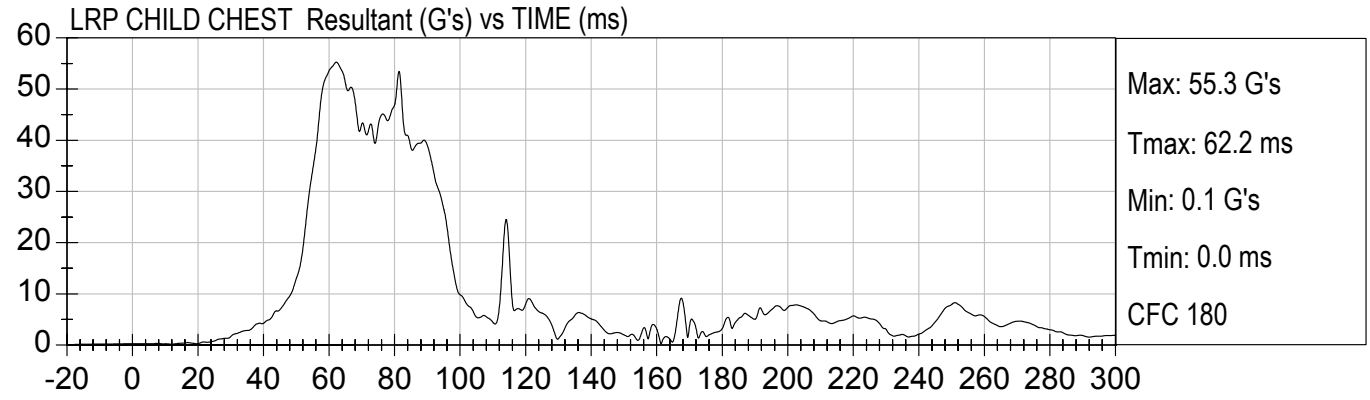
NCAP 35MPH FRONTAL IMPACT
2005 CHRYSLER TOWN AND COUNTRY (D50310)

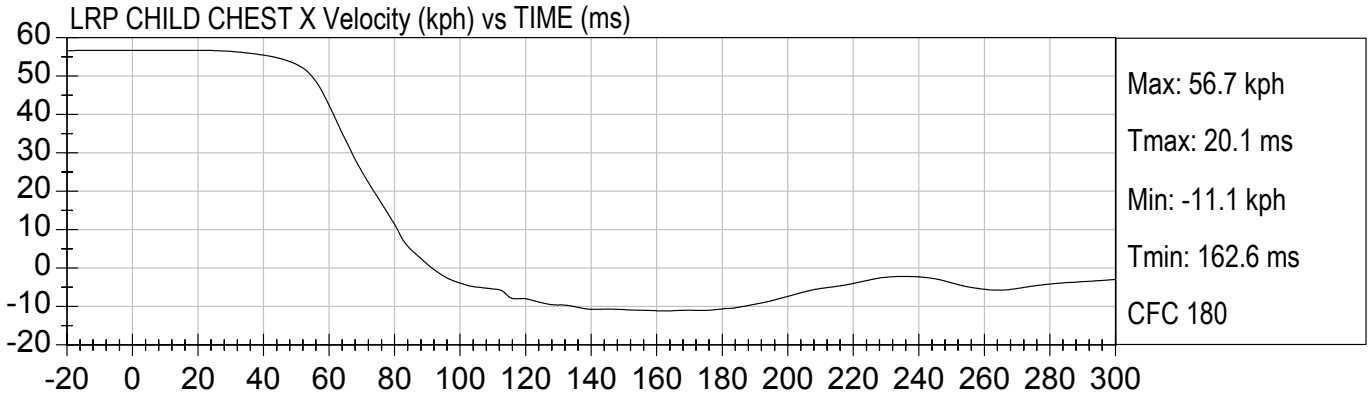
Test Date: 12/08/04
Speed: 35.2 mph (56.6 km/h)

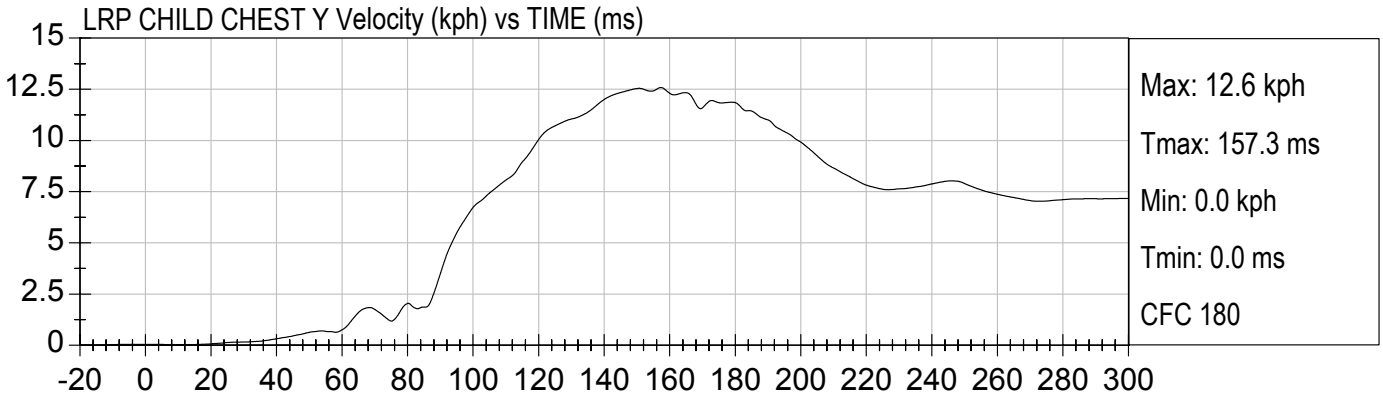


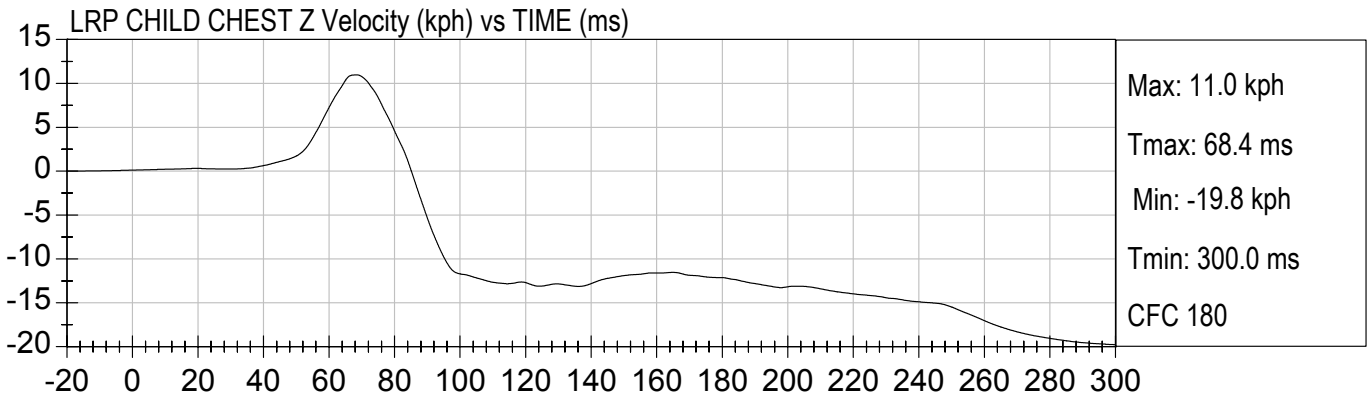


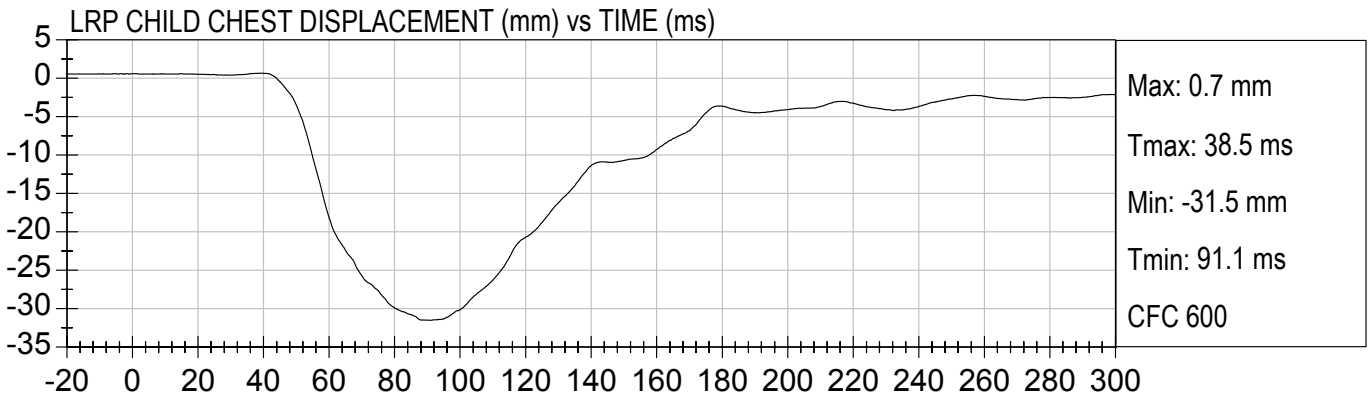





LRP CHILD CHEST X Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 56.7 kph
Tmax: 20.1 ms
Min: -11.1 kph
Tmin: 162.6 ms
CFC 180

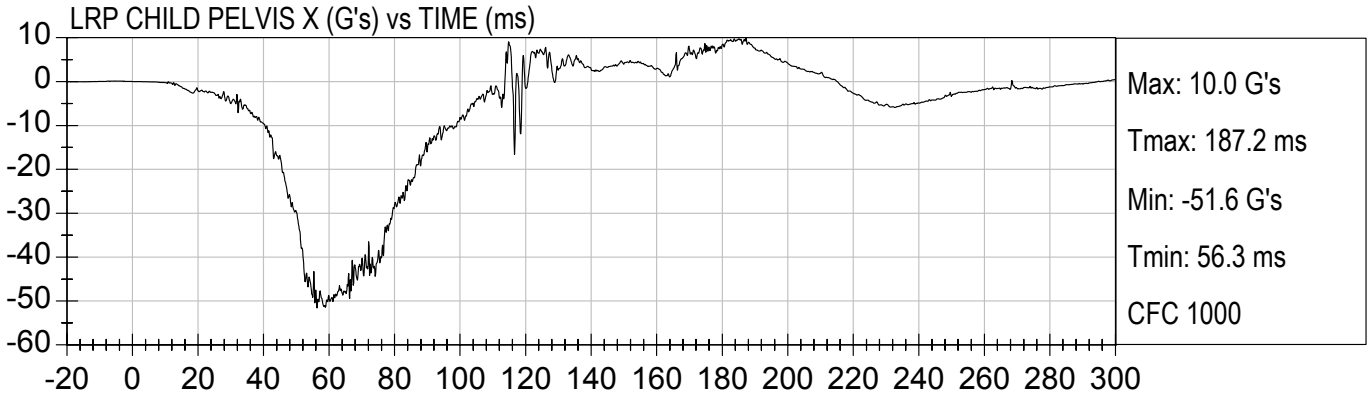

LRP CHILD CHEST Y Velocity (kph) vs TIME (ms)
15
12.5
10
7.5
5
2.5
0
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 12.6 kph
Tmax: 157.3 ms
Min: 0.0 kph
Tmin: 0.0 ms
CFC 180

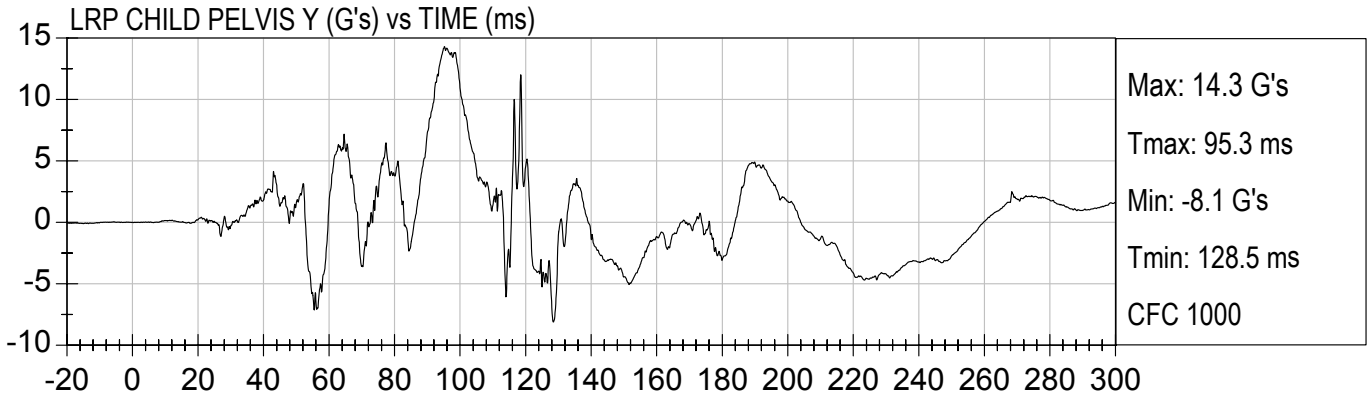

LRP CHILD CHEST Z Velocity (kph) vs TIME (ms)
15
10
5
0
-5
-10
-15
-20
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 11.0 kph
Tmax: 68.4 ms
Min: -19.8 kph
Tmin: 300.0 ms
CFC 180

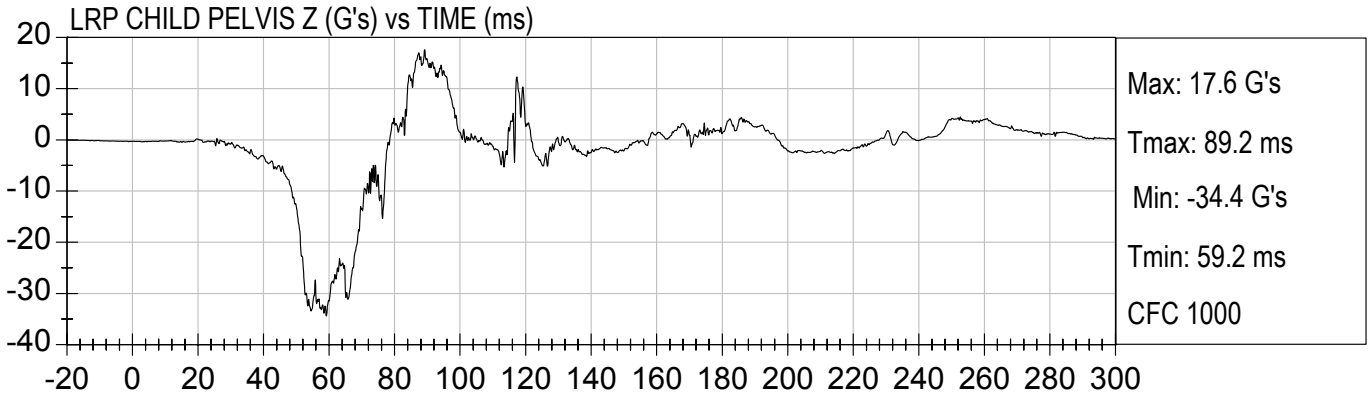

LRP CHILD CHEST DISPLACEMENT (mm) vs TIME (ms)
5
0
-5
-10
-15
-20
-25
-30
-35
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 0.7 mm
Tmax: 38.5 ms
Min: -31.5 mm
Tmin: 91.1 ms
CFC 600

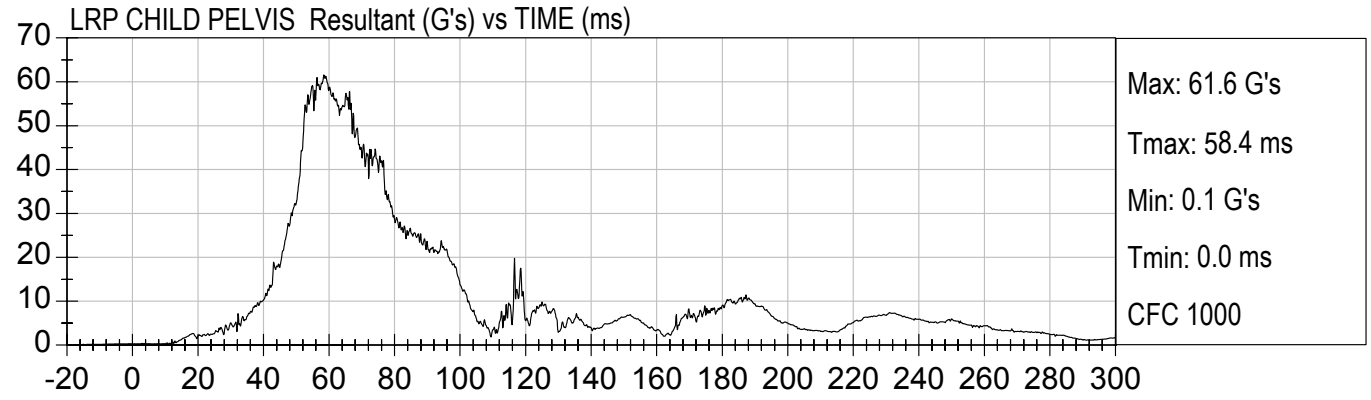
NCAP 35MPH FRONTAL IMPACT
2005 CHRYSLER TOWN AND COUNTRY (D50310)

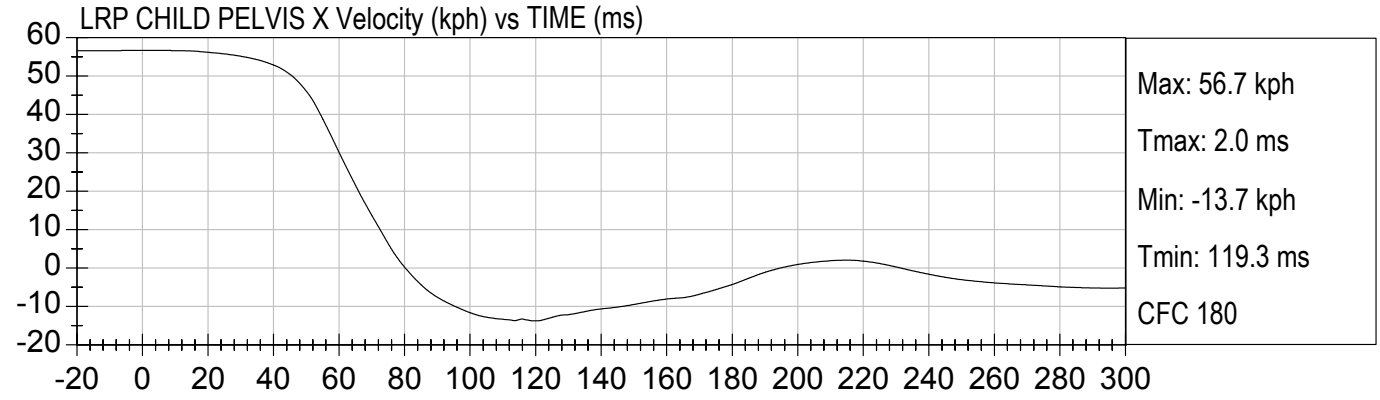
Test Date: 12/08/04
Speed: 35.2 mph (56.6 km/h)

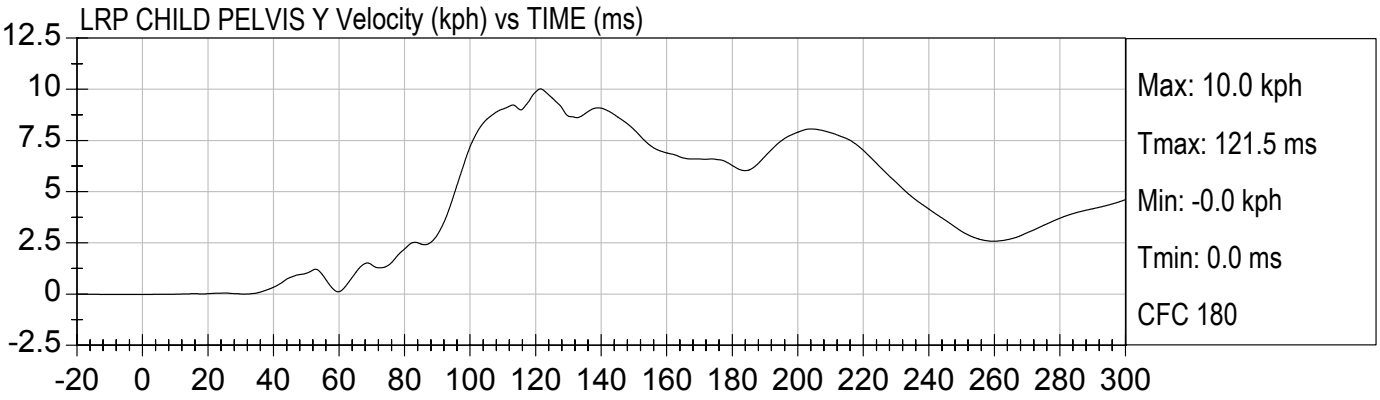


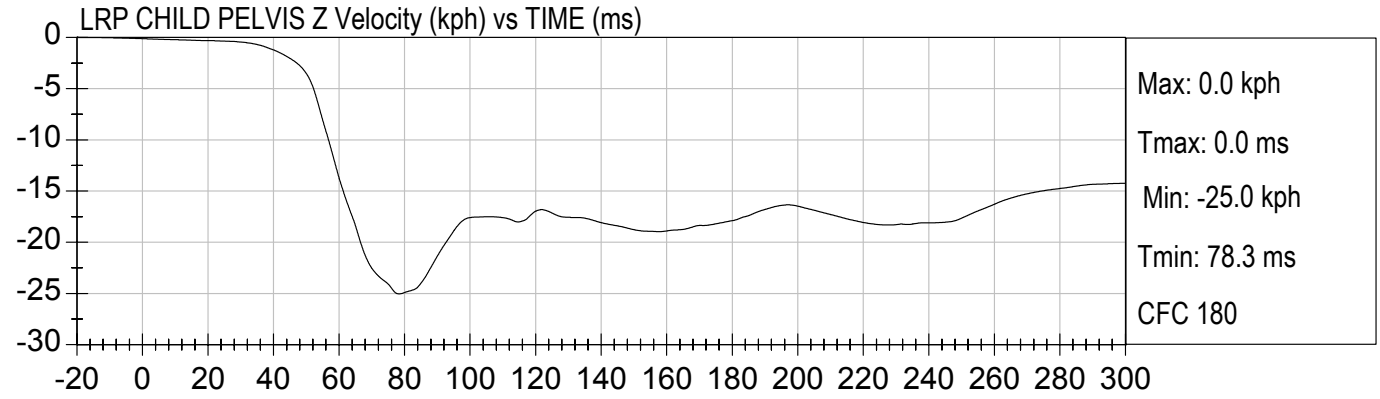






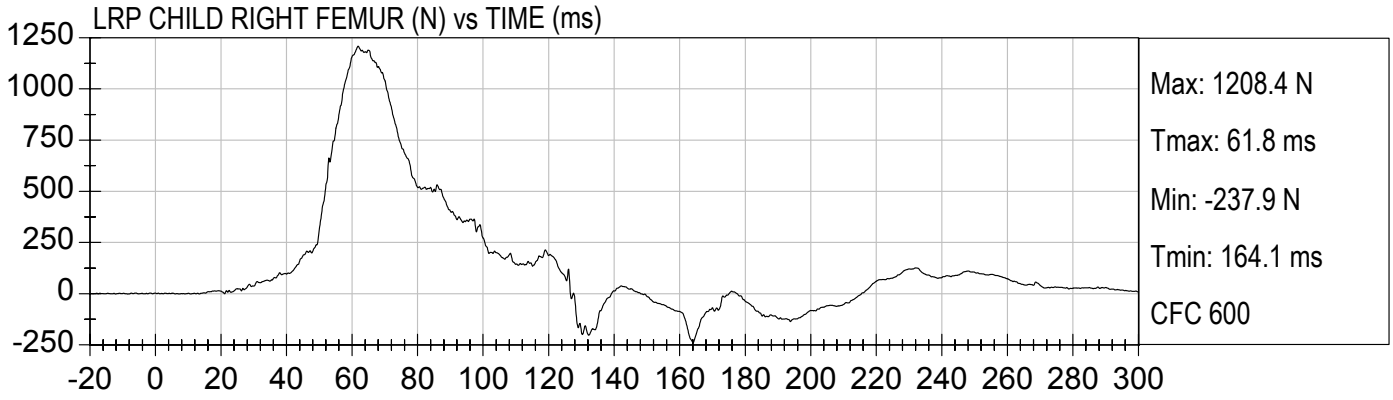

LRP CHILD PELVIS X Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 56.7 kph
Tmax: 2.0 ms
Min: -13.7 kph
Tmin: 119.3 ms
CFC 180

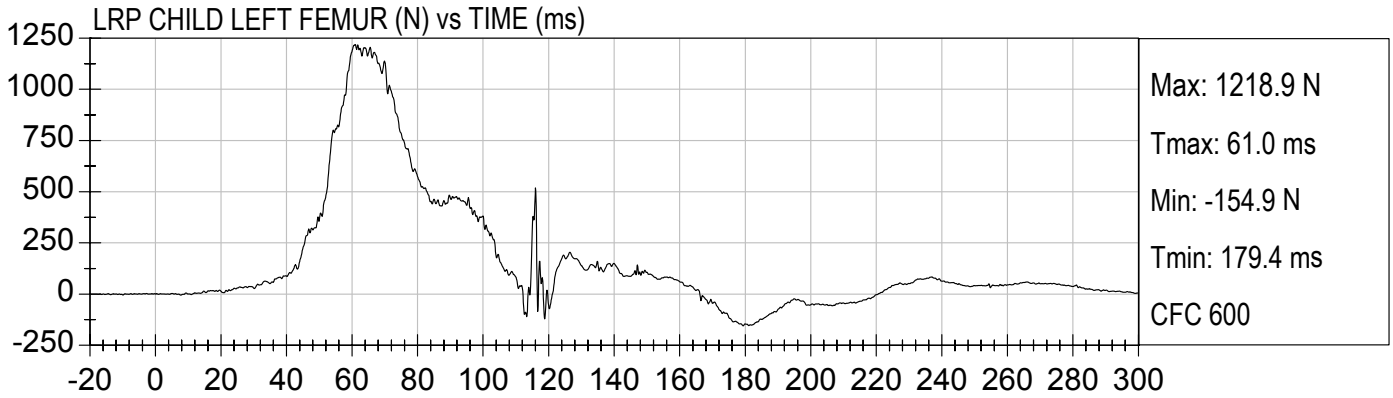

LRP CHILD PELVIS Y Velocity (kph) vs TIME (ms)
12.5
10
7.5
5
2.5
0
-2.5
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 10.0 kph
Tmax: 121.5 ms
Min: -0.0 kph
Tmin: 0.0 ms
CFC 180

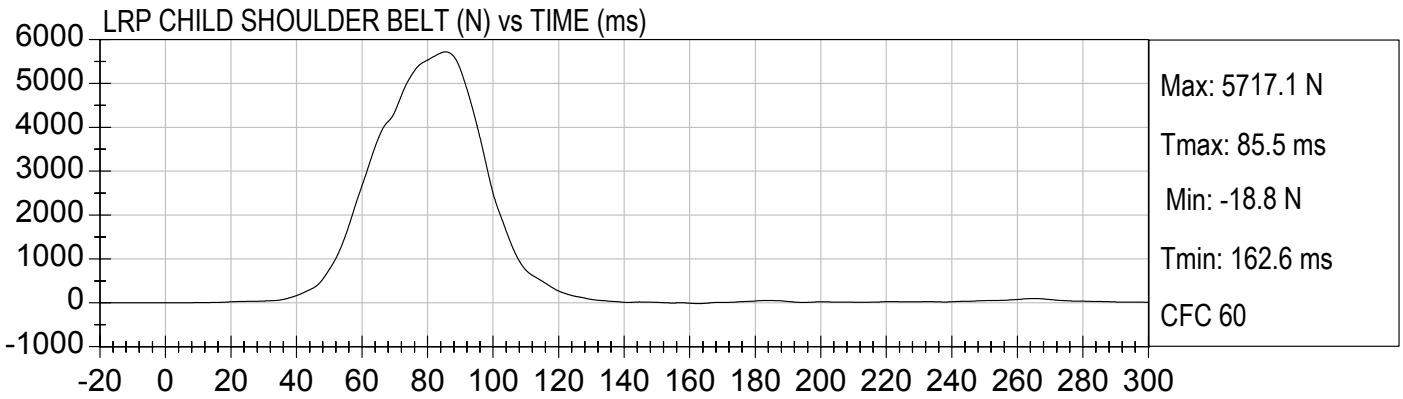

LRP CHILD PELVIS Z Velocity (kph) vs TIME (ms)
0
-5
-10
-15
-20
-25
-30
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 0.0 kph
Tmax: 0.0 ms
Min: -25.0 kph
Tmin: 78.3 ms
CFC 180

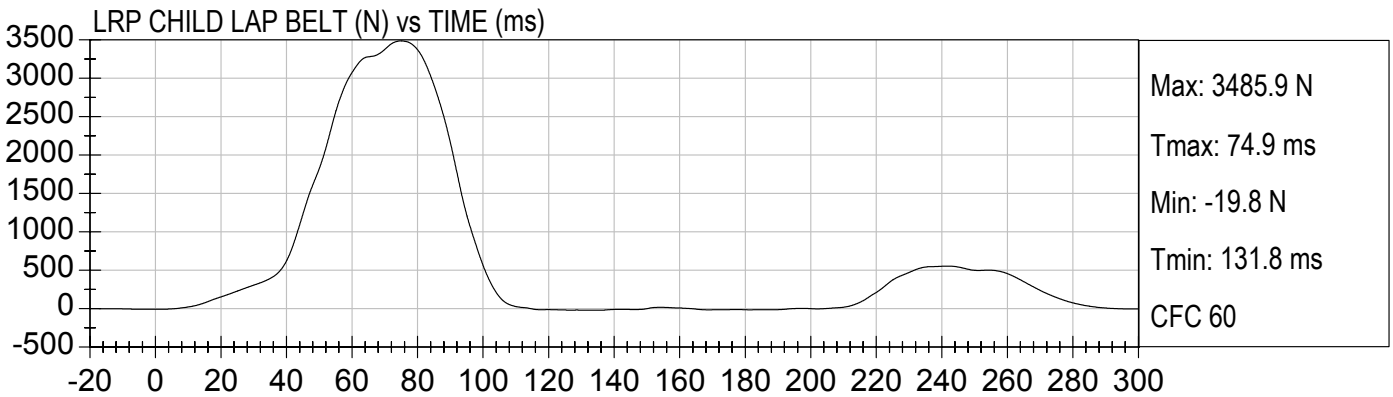
NCAP 35MPH FRONTAL IMPACT
2005 CHRYSLER TOWN AND COUNTRY (D50310)

Test Date: 12/08/04
Speed: 35.2 mph (56.6 km/h)



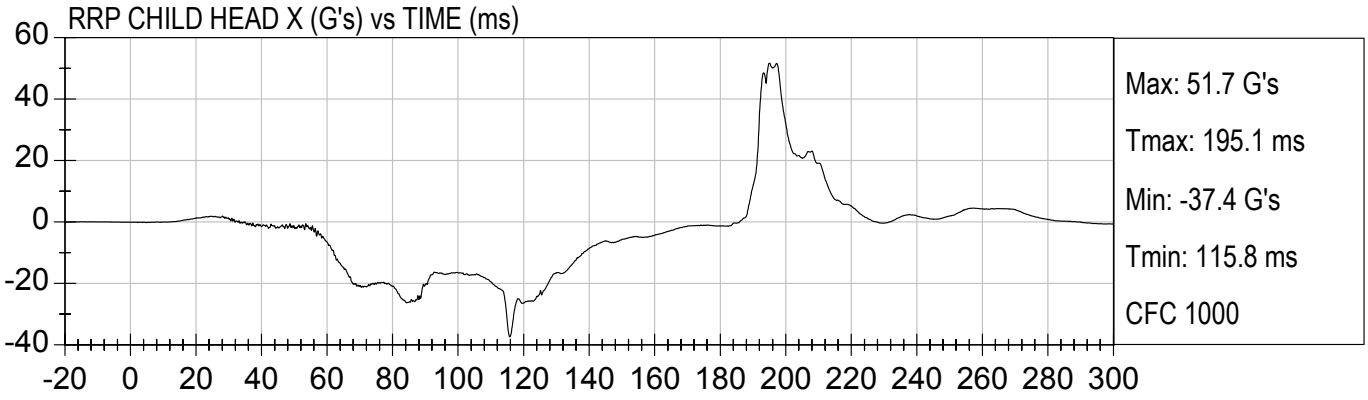


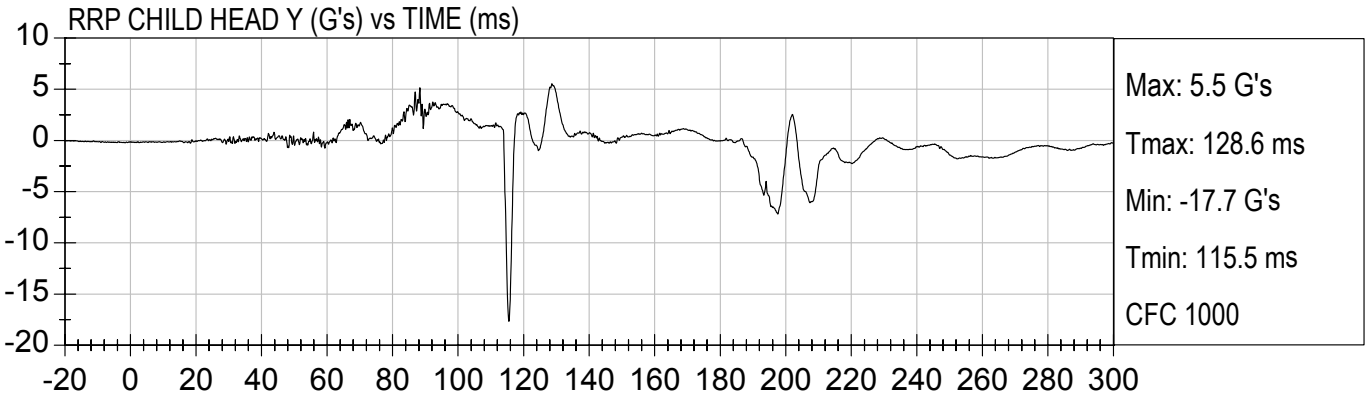


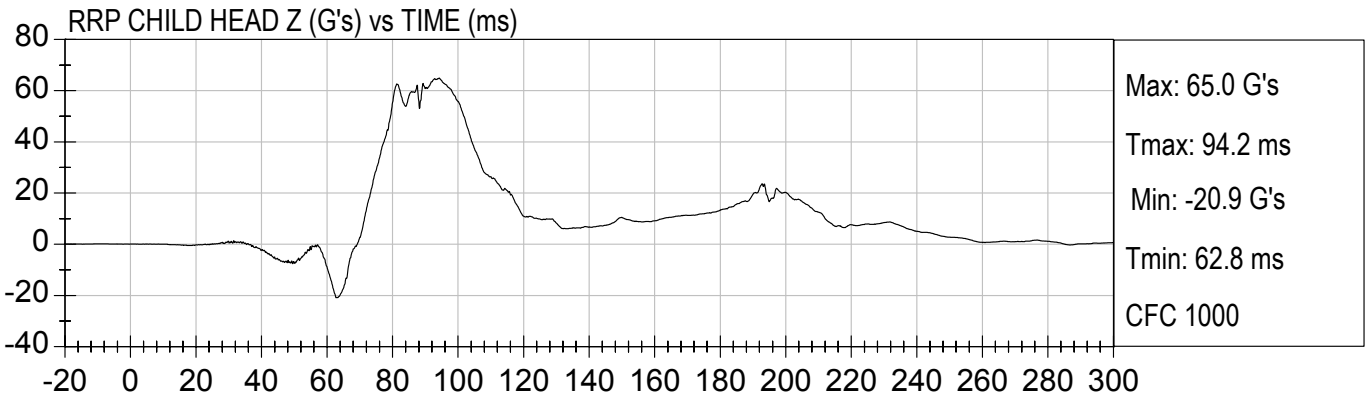


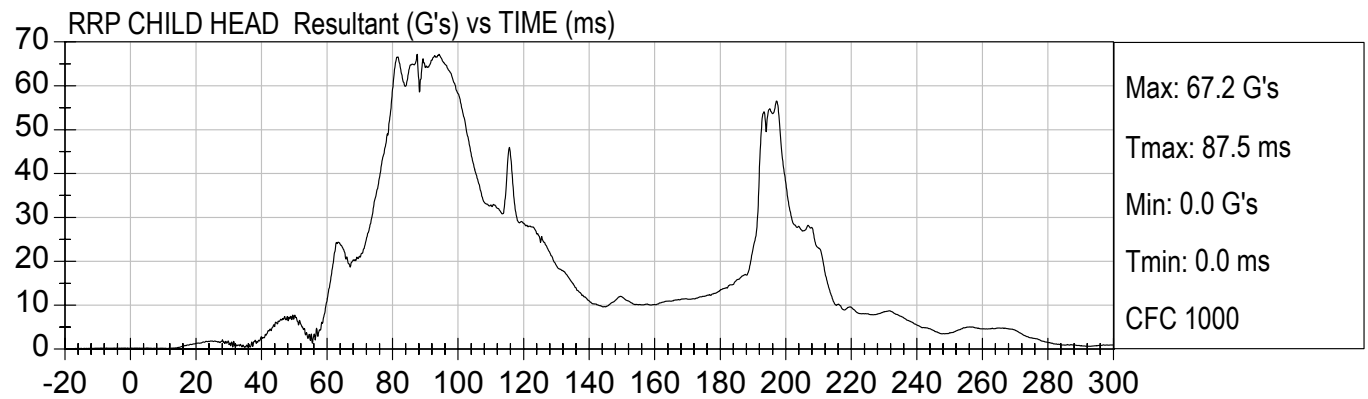
NCAP 35MPH FRONTAL IMPACT
2005 CHRYSLER TOWN AND COUNTRY (D50310)

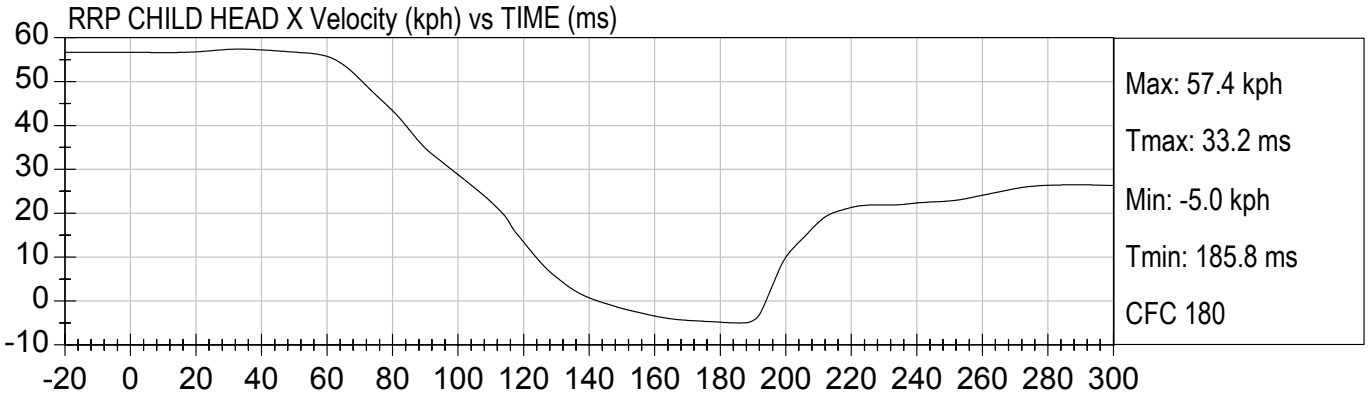
Test Date: 12/08/04
Speed: 35.2 mph (56.6 km/h)

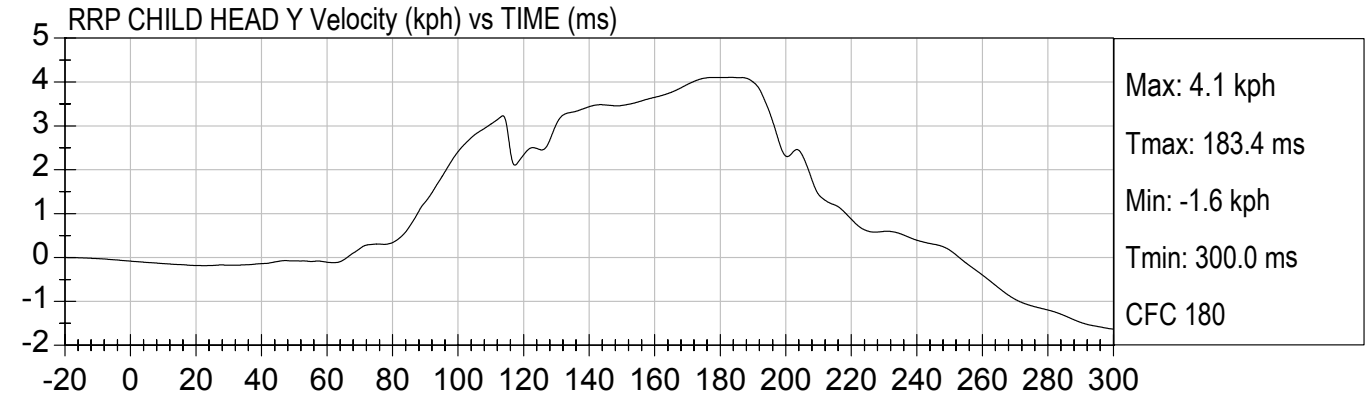


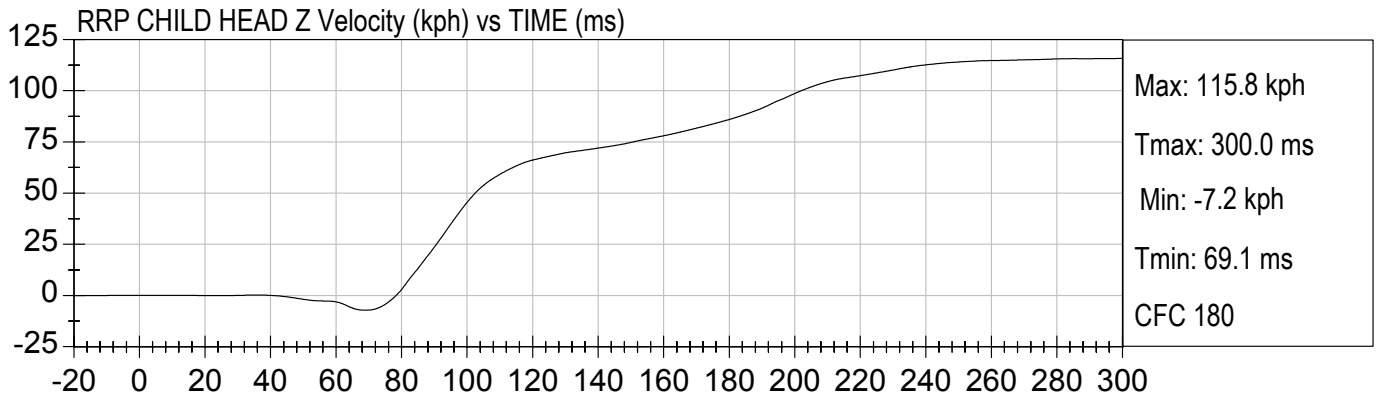






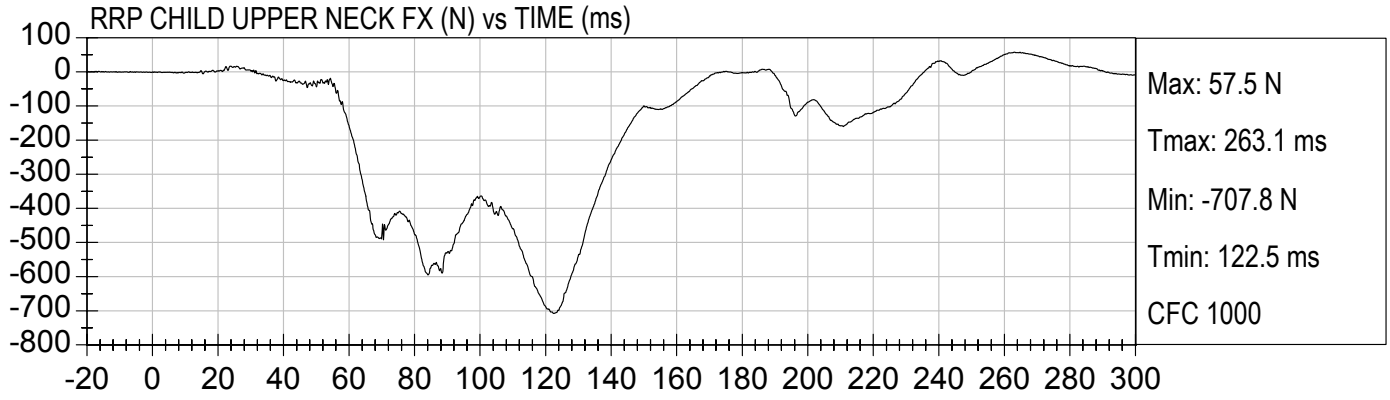

RRP CHILD HEAD X Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 57.4 kph
Tmax: 33.2 ms
Min: -5.0 kph
Tmin: 185.8 ms
CFC 180

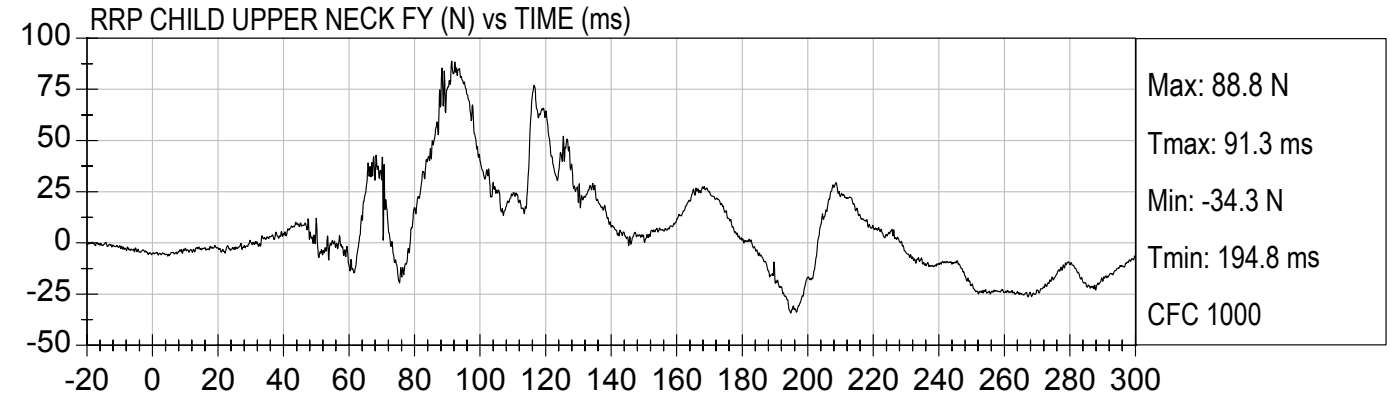

RRP CHILD HEAD Y Velocity (kph) vs TIME (ms)
5
4
3
2
1
0
-1
-2
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 4.1 kph
Tmax: 183.4 ms
Min: -1.6 kph
Tmin: 300.0 ms
CFC 180

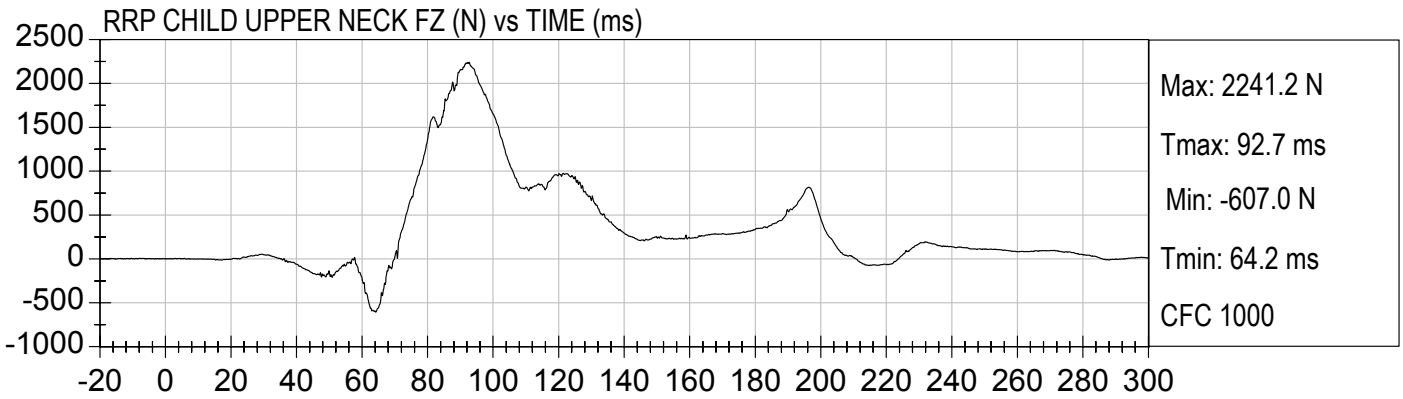

RRP CHILD HEAD Z Velocity (kph) vs TIME (ms)
125
100
75
50
25
0
-25
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 115.8 kph
Tmax: 300.0 ms
Min: -7.2 kph
Tmin: 69.1 ms
CFC 180

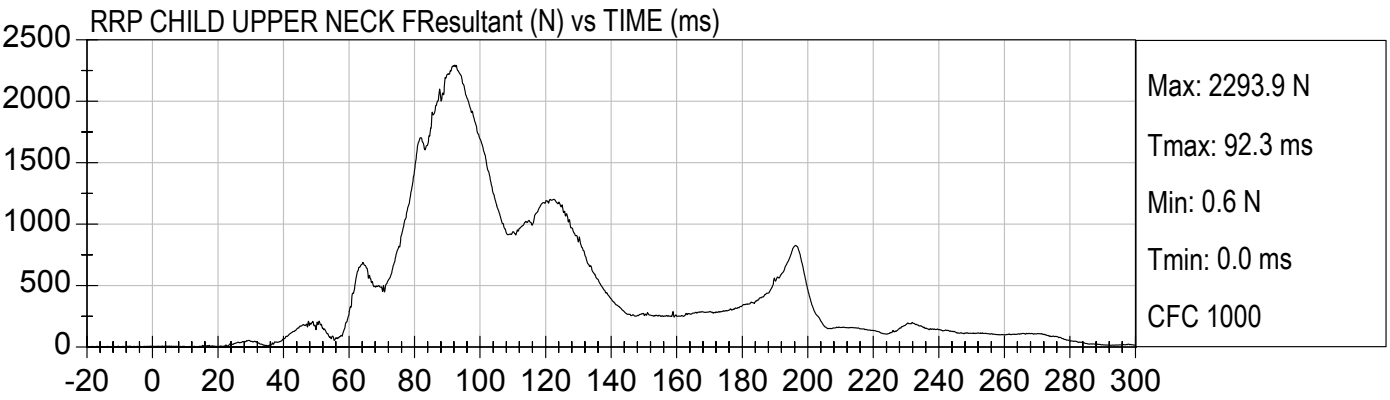
NCAP 35MPH FRONTAL IMPACT
2005 CHRYSLER TOWN AND COUNTRY (D50310)

Test Date: 12/08/04
Speed: 35.2 mph (56.6 km/h)

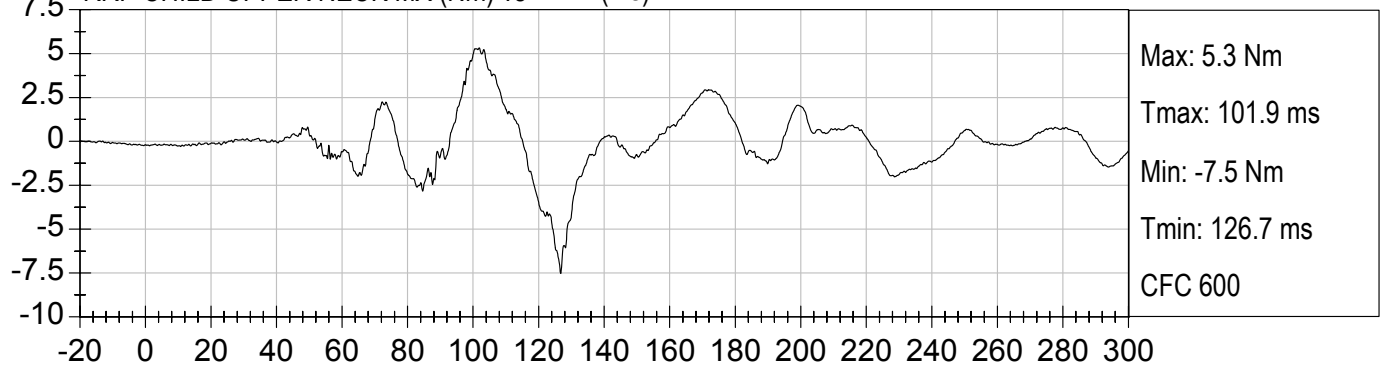




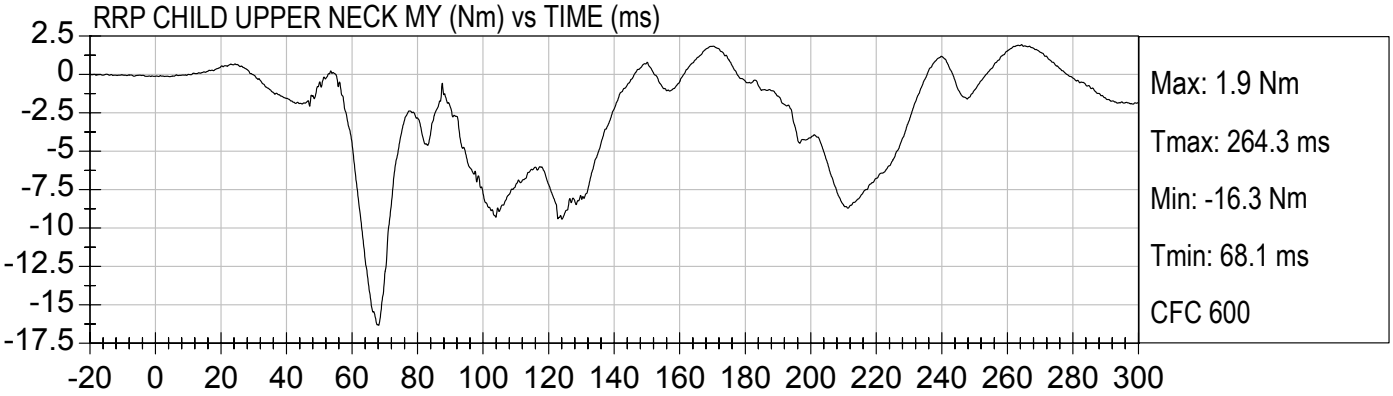




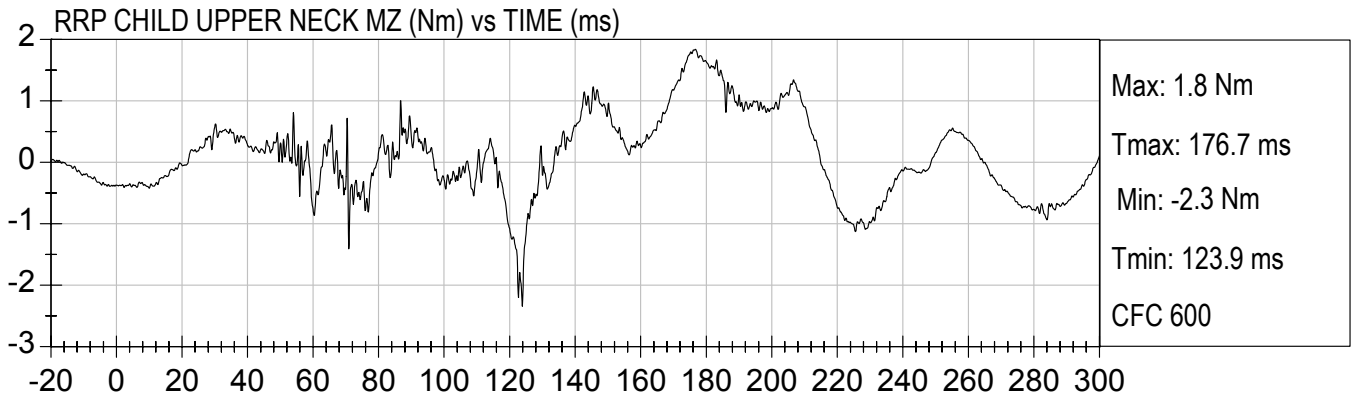
RRP CHILD UPPER NECK MX (Nm) vs TIME (ms)



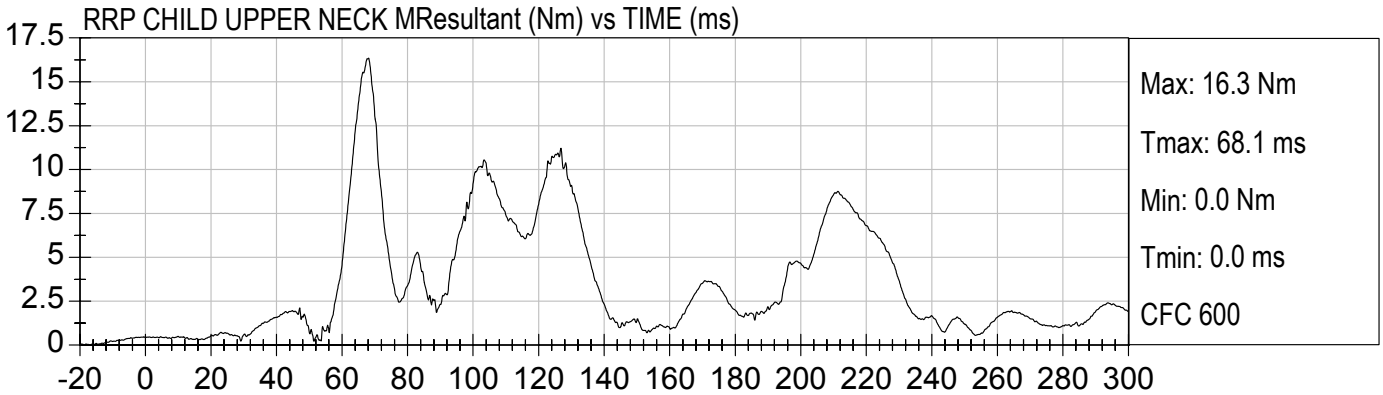
RRP CHILD UPPER NECK MY (Nm) vs TIME (ms)

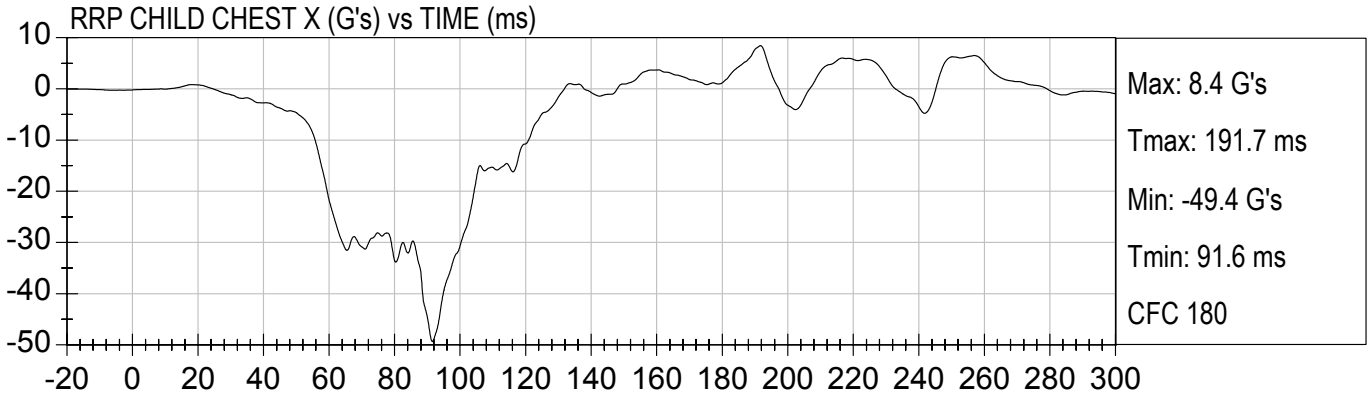


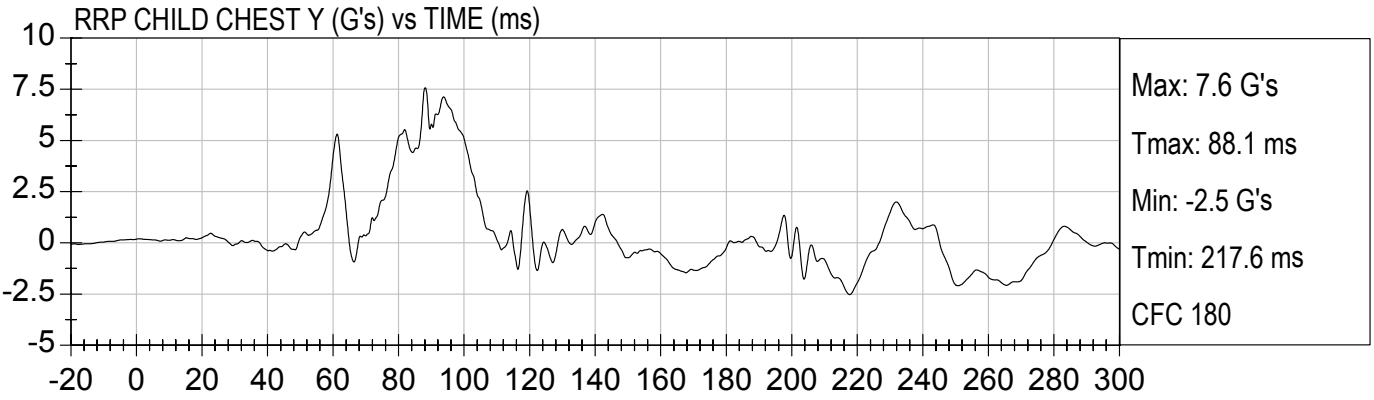
RRP CHILD UPPER NECK MZ (Nm) vs TIME (ms)

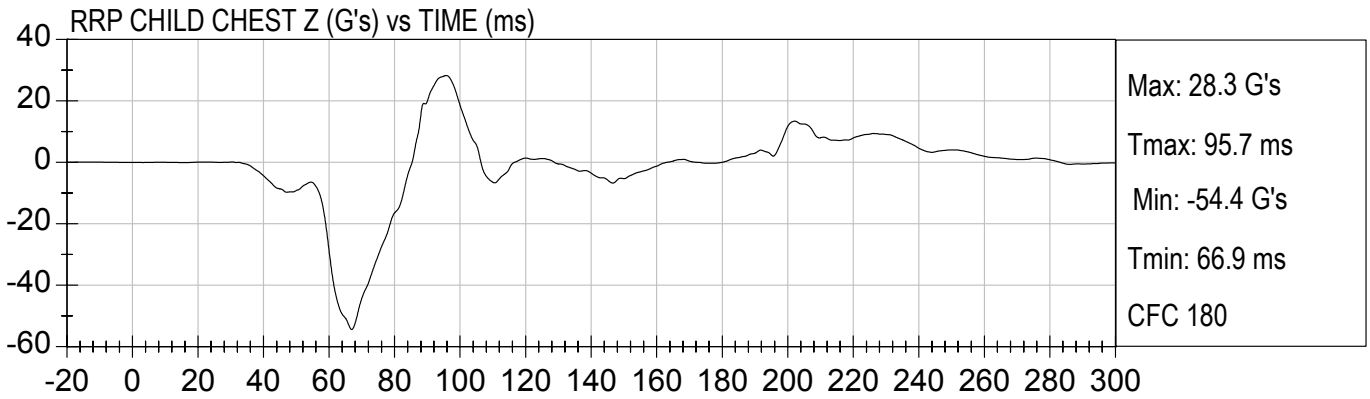


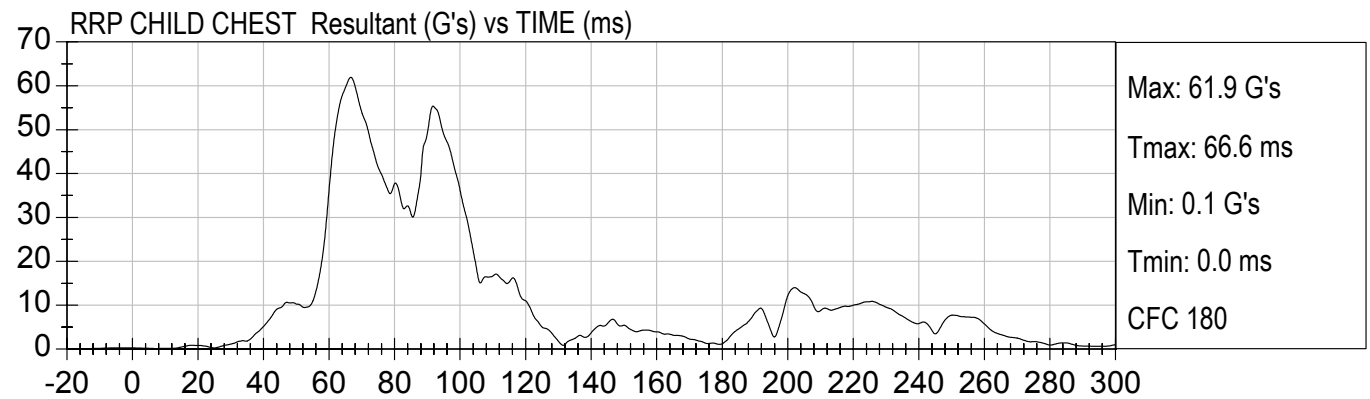
RRP CHILD UPPER NECK MResultant (Nm) vs TIME (ms)




RRP CHILD CHEST X (G's) vs TIME (ms)
10
0
-10
-20
-30
-40
-50
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 8.4 G's
Tmax: 191.7 ms
Min: -49.4 G's
Tmin: 91.6 ms
CFC 180

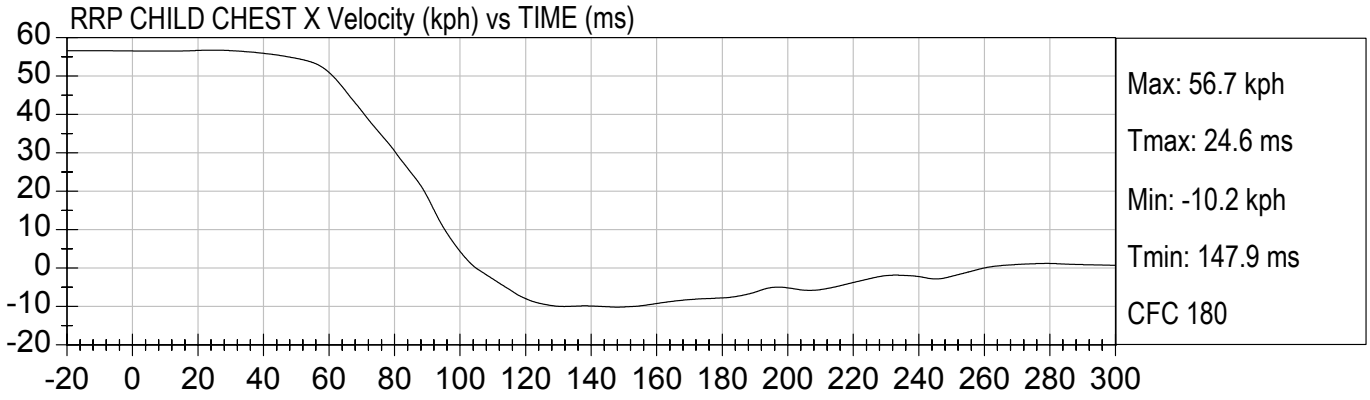

RRP CHILD CHEST Y (G's) vs TIME (ms)
10
7.5
5
2.5
0
-2.5
-5
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 7.6 G's
Tmax: 88.1 ms
Min: -2.5 G's
Tmin: 217.6 ms
CFC 180

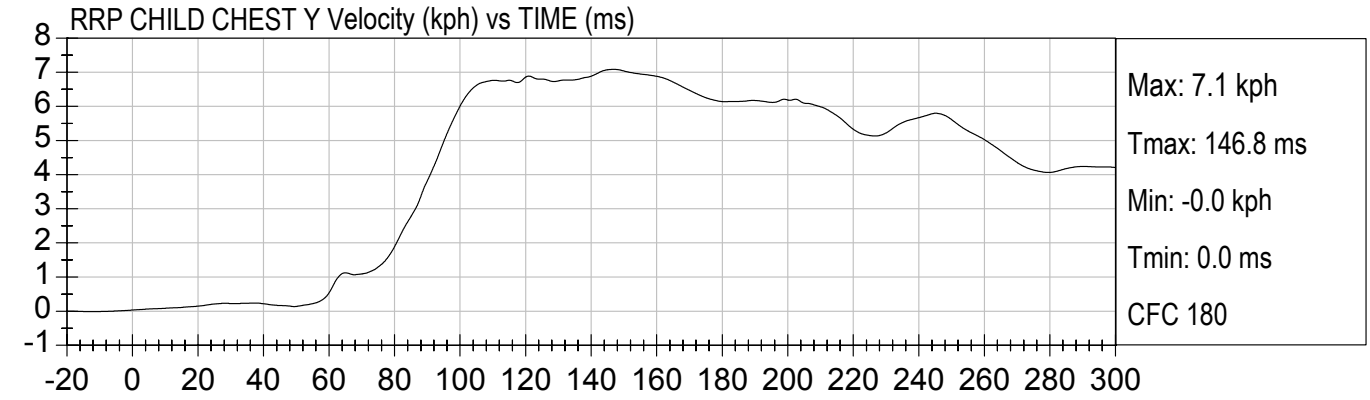

RRP CHILD CHEST Z (G's) vs TIME (ms)
40
20
0
-20
-40
-60
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 28.3 G's
Tmax: 95.7 ms
Min: -54.4 G's
Tmin: 66.9 ms
CFC 180

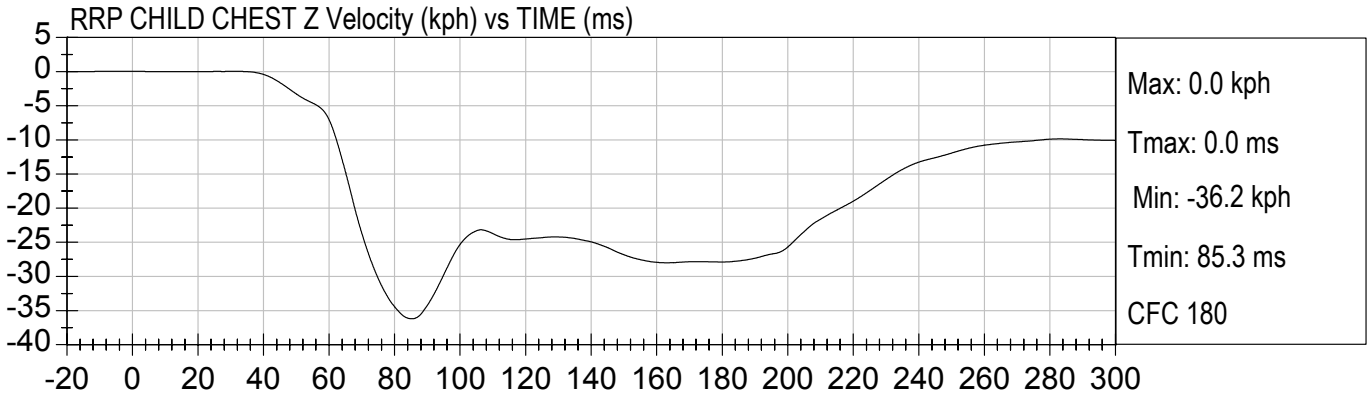

RRP CHILD CHEST Resultant (G's) vs TIME (ms)
70
60
50
40
30
20
10
0
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 61.9 G's
Tmax: 66.6 ms
Min: 0.1 G's
Tmin: 0.0 ms
CFC 180

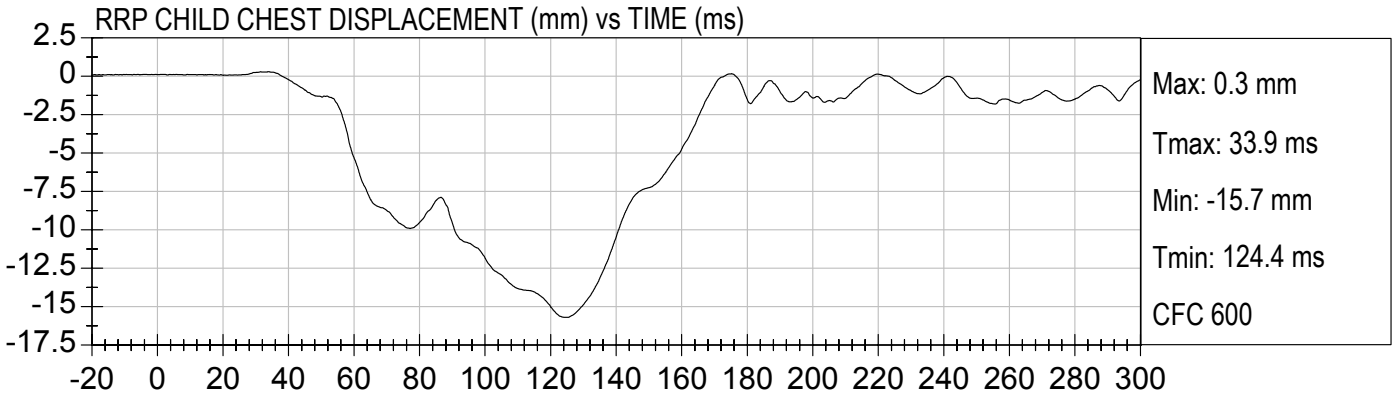
NCAP 35MPH FRONTAL IMPACT
2005 CHRYSLER TOWN AND COUNTRY (D50310)

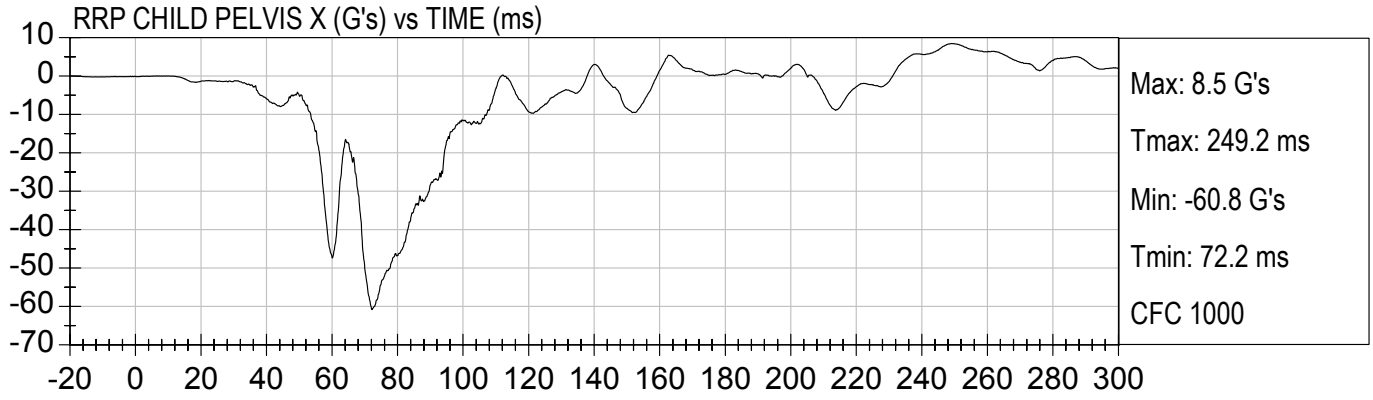
Test Date: 12/08/04
Speed: 35.2 mph (56.6 km/h)

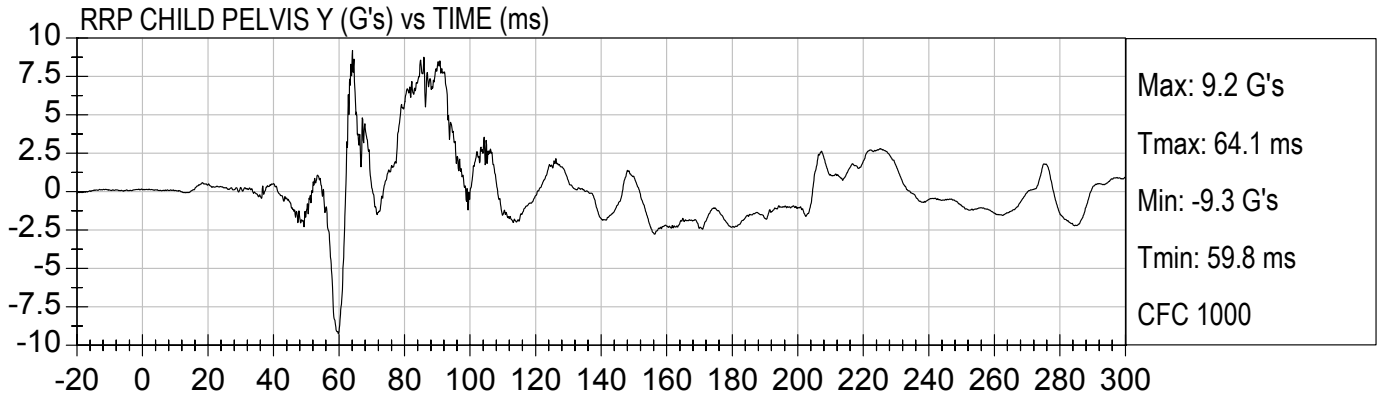


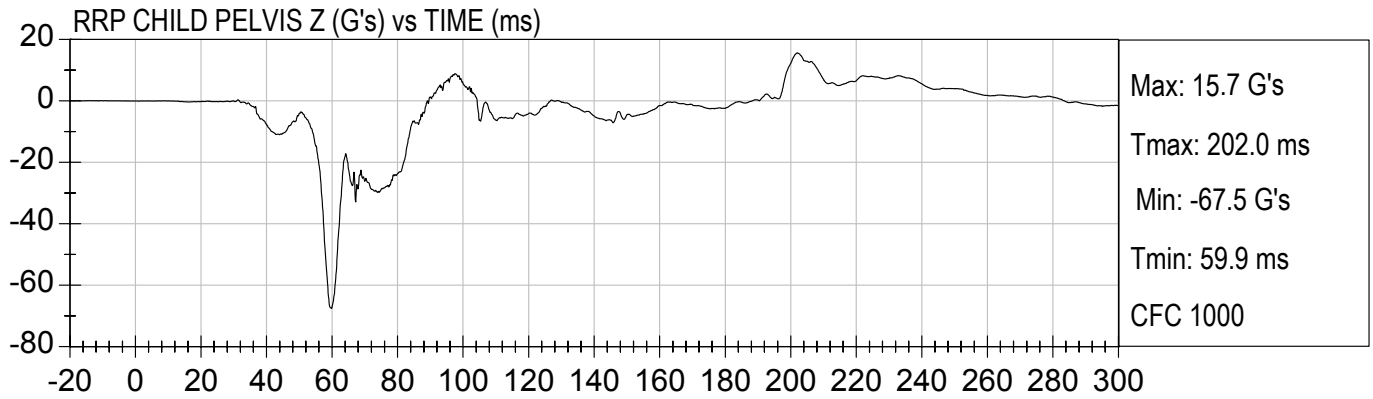


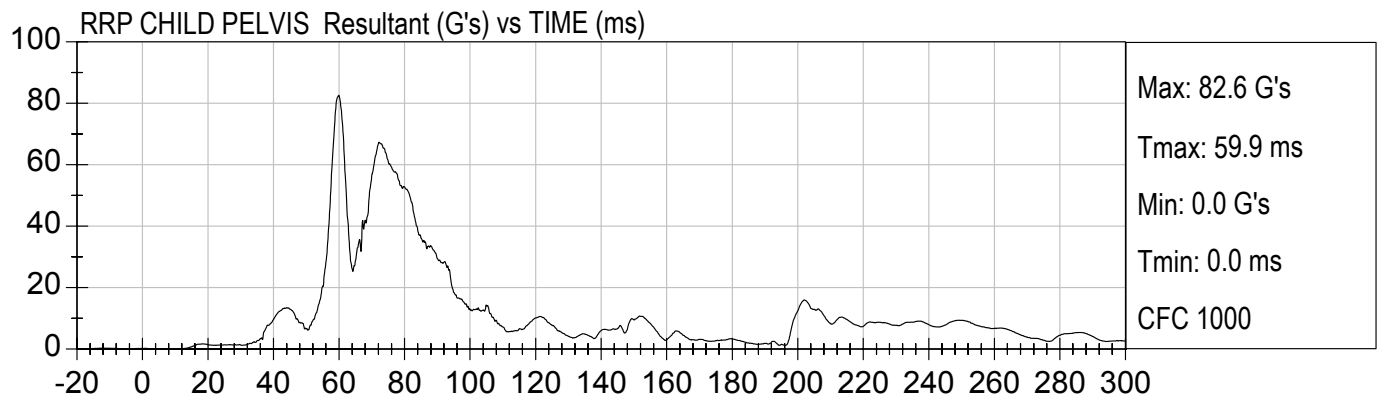


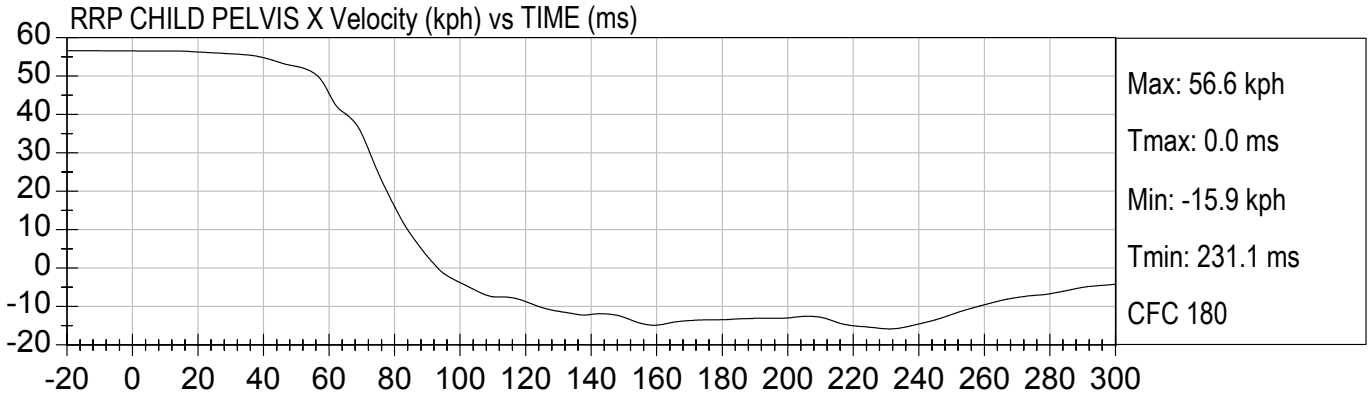


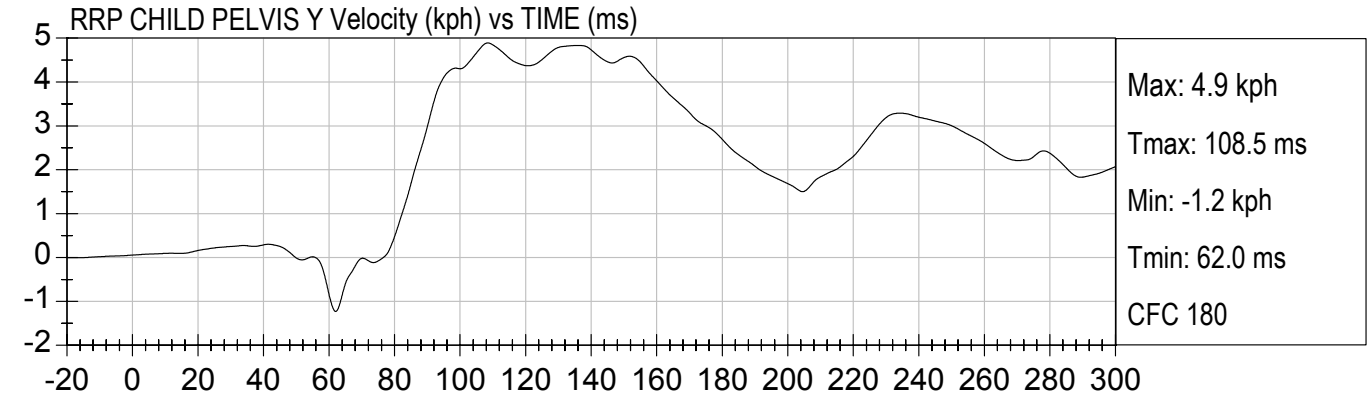

RRP CHILD PELVIS X (G's) vs TIME (ms)
10
0
-10
-20
-30
-40
-50
-60
-70
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 8.5 G's
Tmax: 249.2 ms
Min: -60.8 G's
Tmin: 72.2 ms
CFC 1000

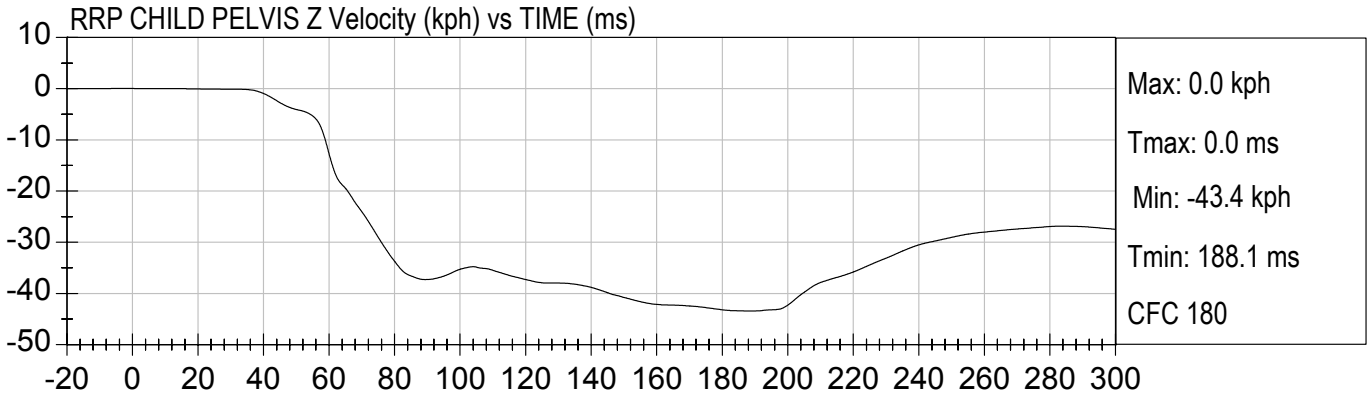

RRP CHILD PELVIS Y (G's) vs TIME (ms)
10
7.5
5
2.5
0
-2.5
-5
-7.5
-10
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 9.2 G's
Tmax: 64.1 ms
Min: -9.3 G's
Tmin: 59.8 ms
CFC 1000

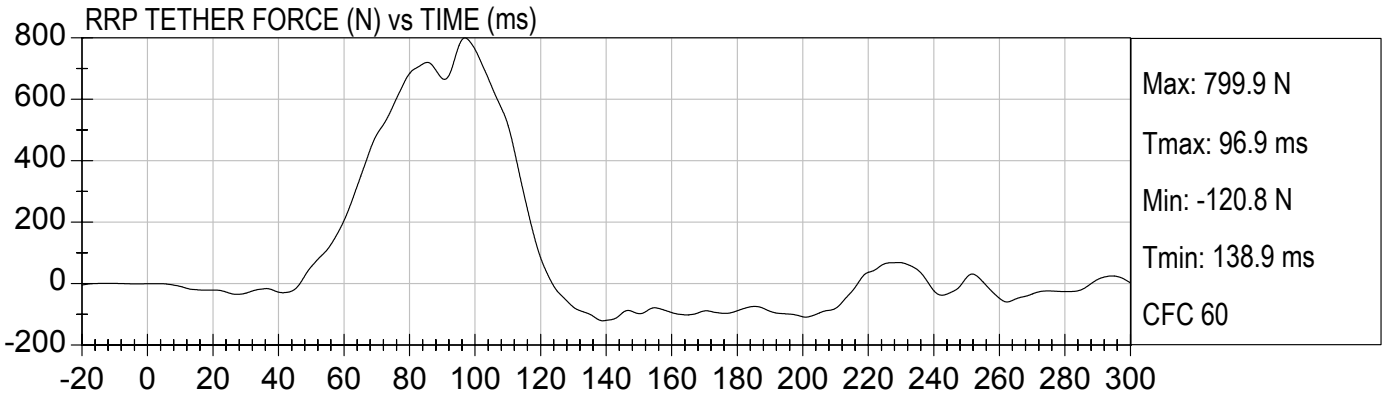

RRP CHILD PELVIS Z (G's) vs TIME (ms)
20
0
-20
-40
-60
-80
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 15.7 G's
Tmax: 202.0 ms
Min: -67.5 G's
Tmin: 59.9 ms
CFC 1000

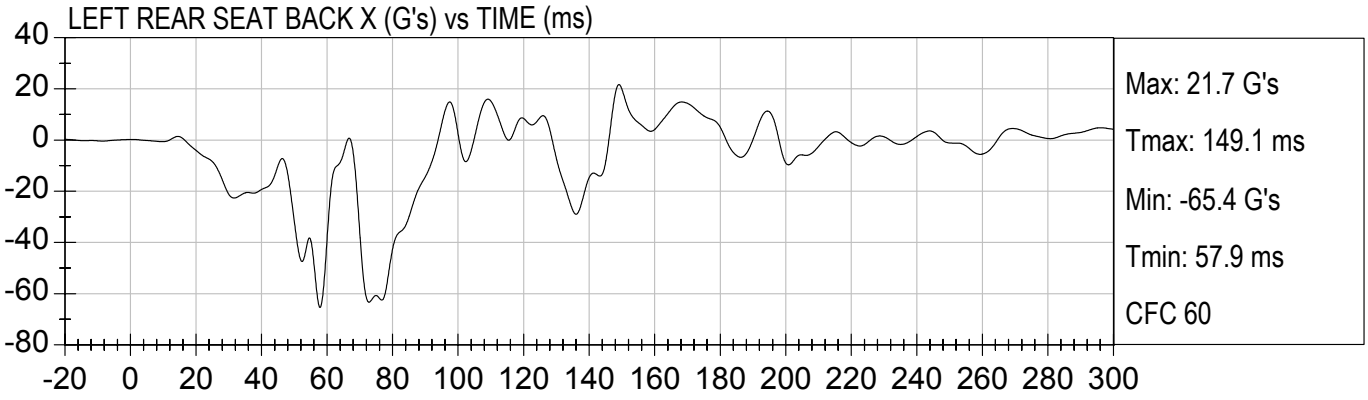

RRP CHILD PELVIS Resultant (G's) vs TIME (ms)
100
80
60
40
20
0
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 82.6 G's
Tmax: 59.9 ms
Min: 0.0 G's
Tmin: 0.0 ms
CFC 1000

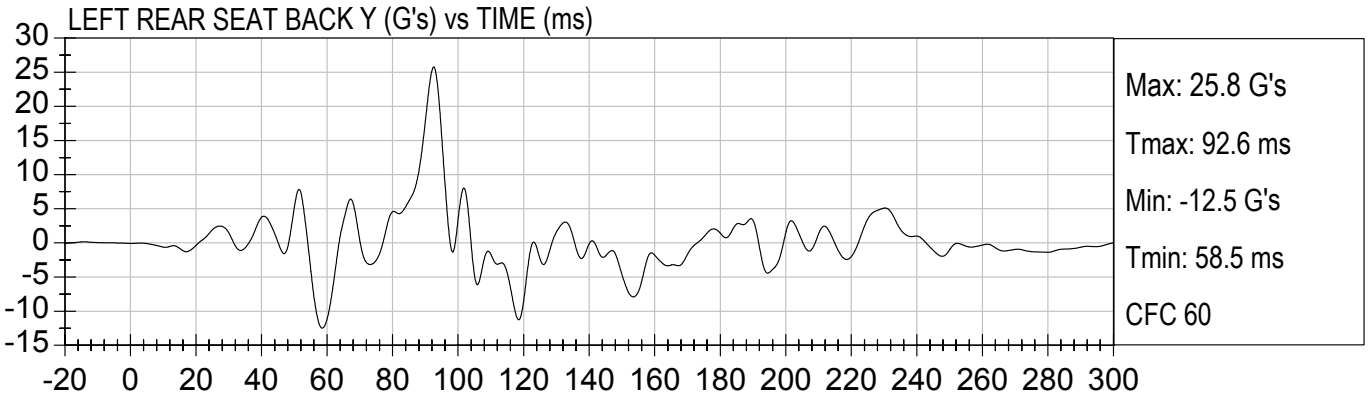

RRP CHILD PELVIS X Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 56.6 kph
Tmax: 0.0 ms
Min: -15.9 kph
Tmin: 231.1 ms
CFC 180

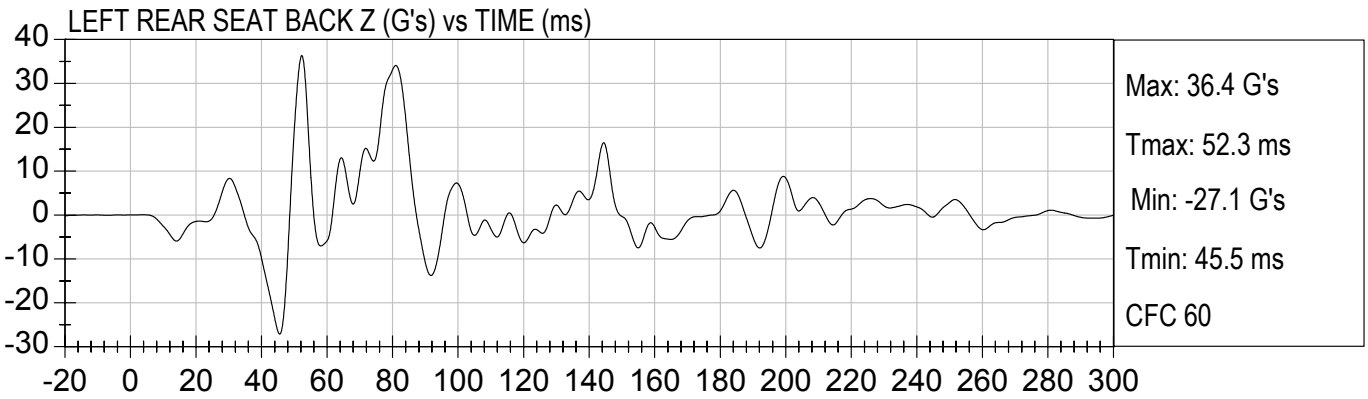

RRP CHILD PELVIS Y Velocity (kph) vs TIME (ms)
5
4
3
2
1
0
-1
-2
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 4.9 kph
Tmax: 108.5 ms
Min: -1.2 kph
Tmin: 62.0 ms
CFC 180

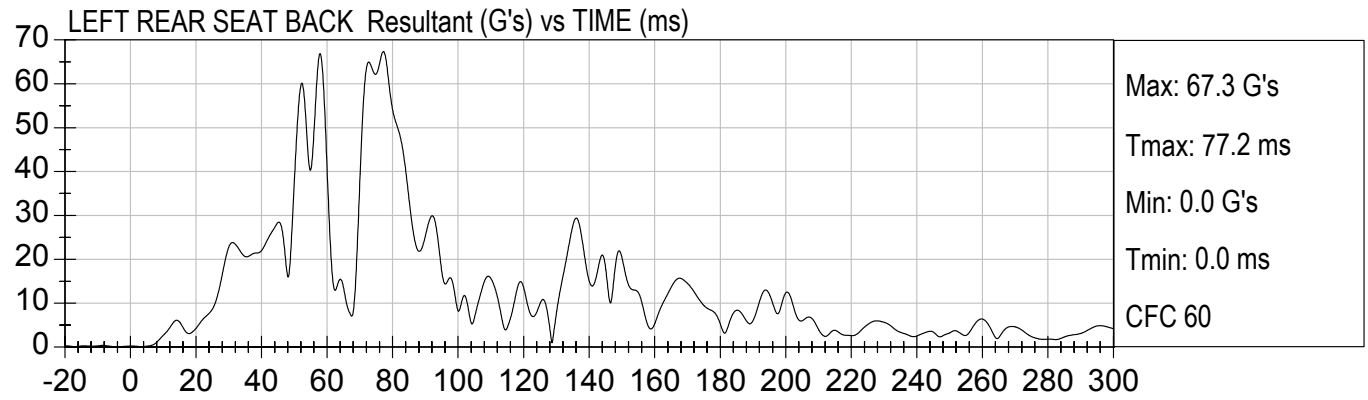

RRP CHILD PELVIS Z Velocity (kph) vs TIME (ms)
10
0
-10
-20
-30
-40
-50
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 0.0 kph
Tmax: 0.0 ms
Min: -43.4 kph
Tmin: 188.1 ms
CFC 180

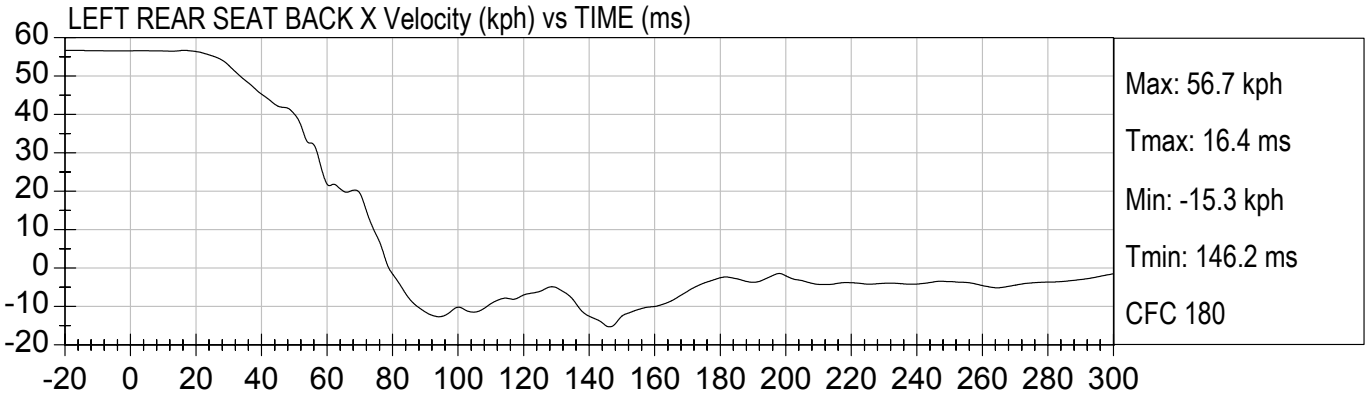

RRP TETHER FORCE (N) vs TIME (ms)
800
600
400
200
0
-200
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 799.9 N
Tmax: 96.9 ms
Min: -120.8 N
Tmin: 138.9 ms
CFC 60

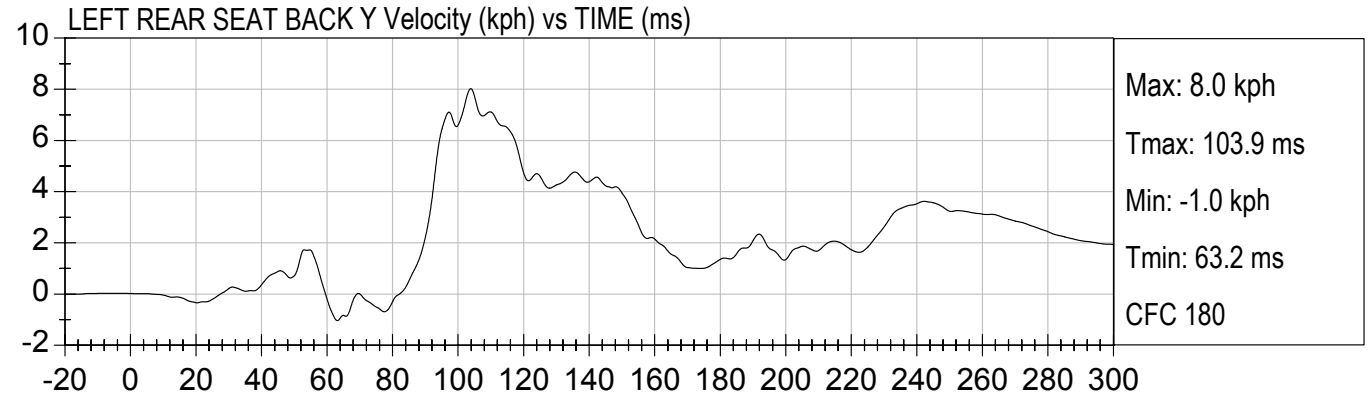

LEFT REAR SEAT BACK X (G's) vs TIME (ms)
Max: 21.7 G's
Tmax: 149.1 ms
Min: -65.4 G's
Tmin: 57.9 ms
CFC 60

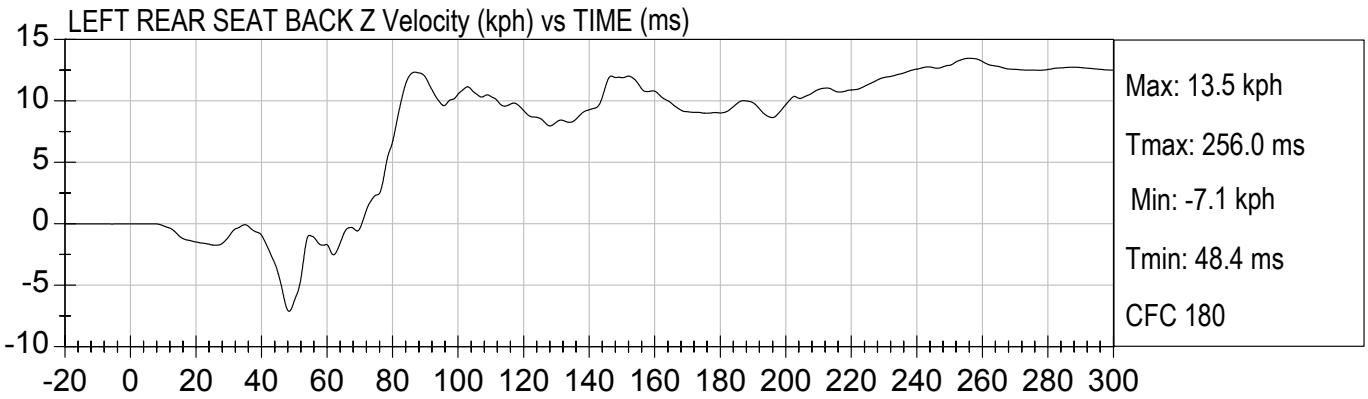

LEFT REAR SEAT BACK Y (G's) vs TIME (ms)
Max: 25.8 G's
Tmax: 92.6 ms
Min: -12.5 G's
Tmin: 58.5 ms
CFC 60

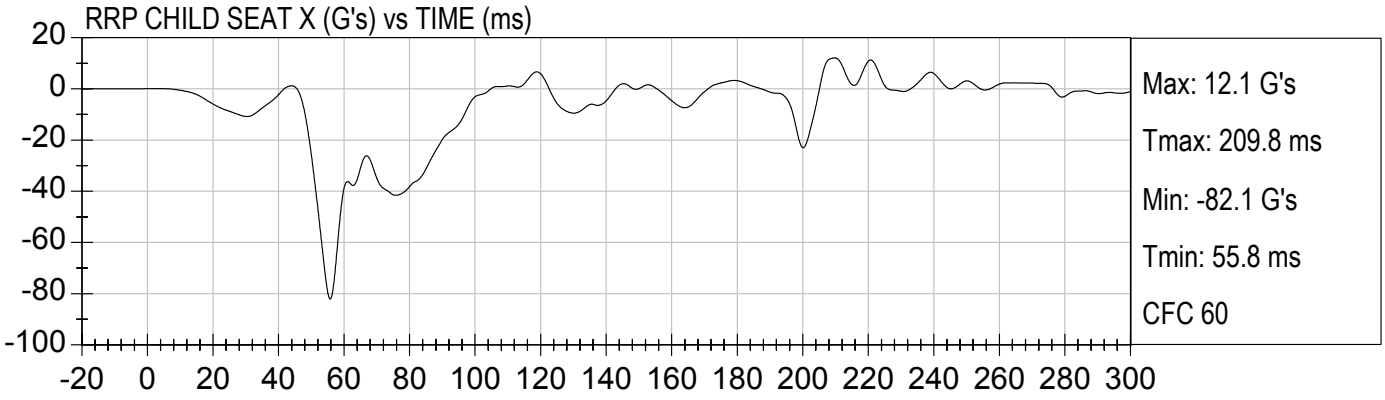

LEFT REAR SEAT BACK Z (G's) vs TIME (ms)
Max: 36.4 G's
Tmax: 52.3 ms
Min: -27.1 G's
Tmin: 45.5 ms
CFC 60

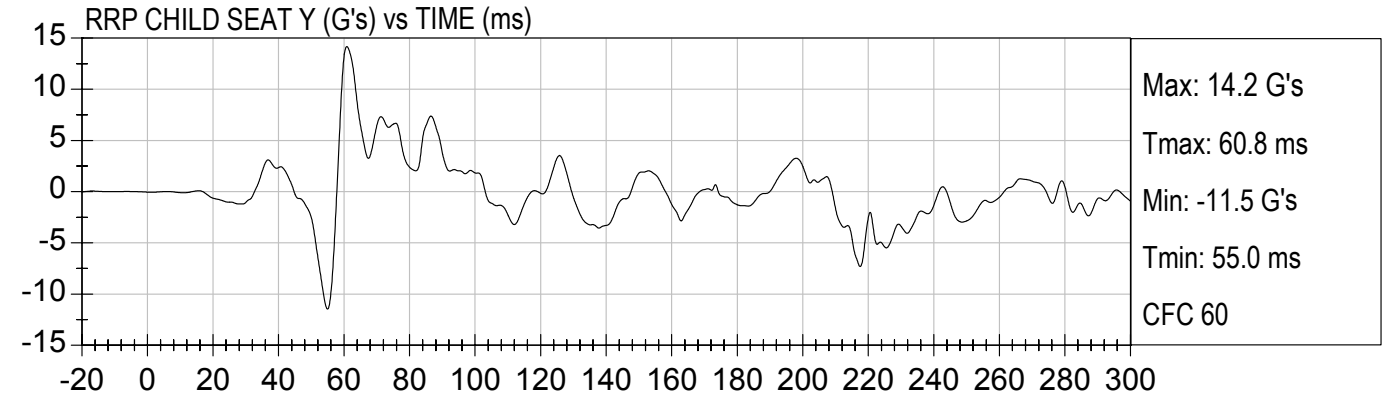

LEFT REAR SEAT BACK Resultant (G's) vs TIME (ms)
Max: 67.3 G's
Tmax: 77.2 ms
Min: 0.0 G's
Tmin: 0.0 ms
CFC 60

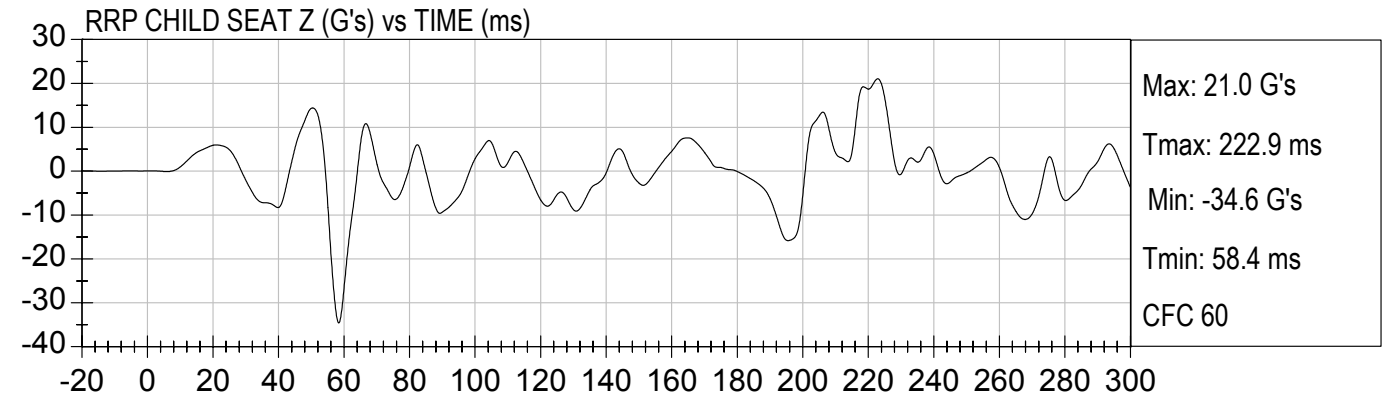

LEFT REAR SEAT BACK X Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 56.7 kph
Tmax: 16.4 ms
Min: -15.3 kph
Tmin: 146.2 ms
CFC 180

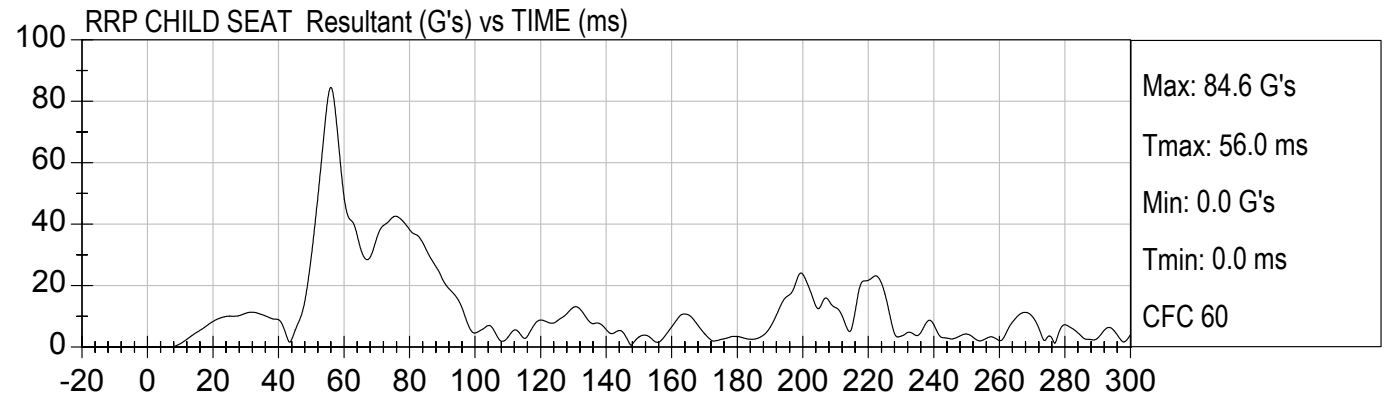

LEFT REAR SEAT BACK Y Velocity (kph) vs TIME (ms)
10
8
6
4
2
0
-2
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 8.0 kph
Tmax: 103.9 ms
Min: -1.0 kph
Tmin: 63.2 ms
CFC 180

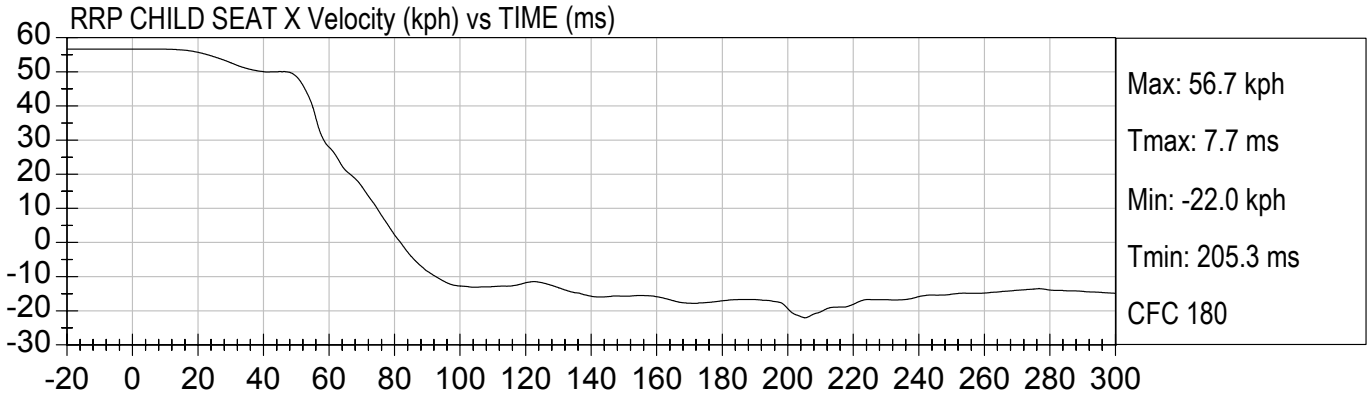

LEFT REAR SEAT BACK Z Velocity (kph) vs TIME (ms)
15
10
5
0
-5
-10
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 13.5 kph
Tmax: 256.0 ms
Min: -7.1 kph
Tmin: 48.4 ms
CFC 180

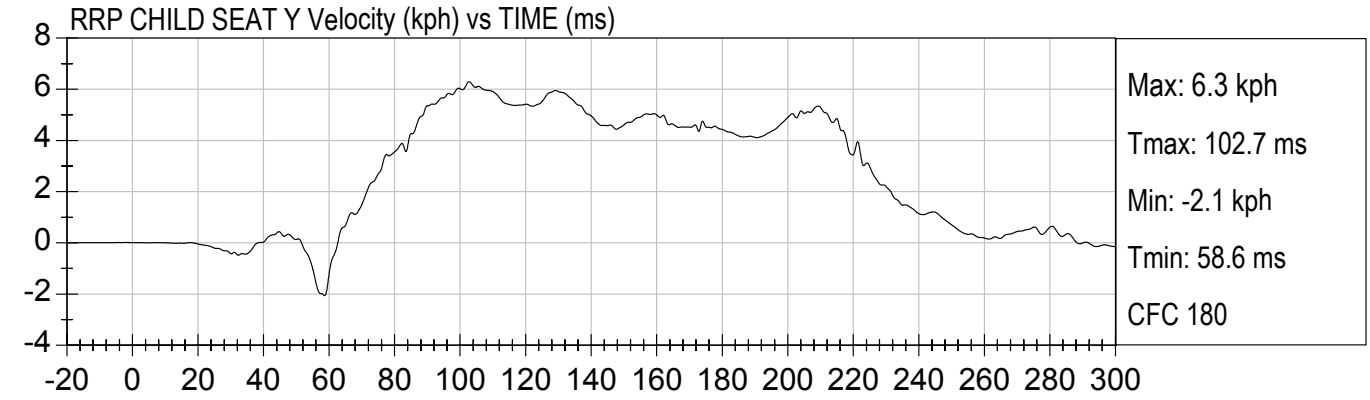

RRP CHILD SEAT X (G's) vs TIME (ms)
20
0
-20
-40
-60
-80
-100
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 12.1 G's
Tmax: 209.8 ms
Min: -82.1 G's
Tmin: 55.8 ms
CFC 60

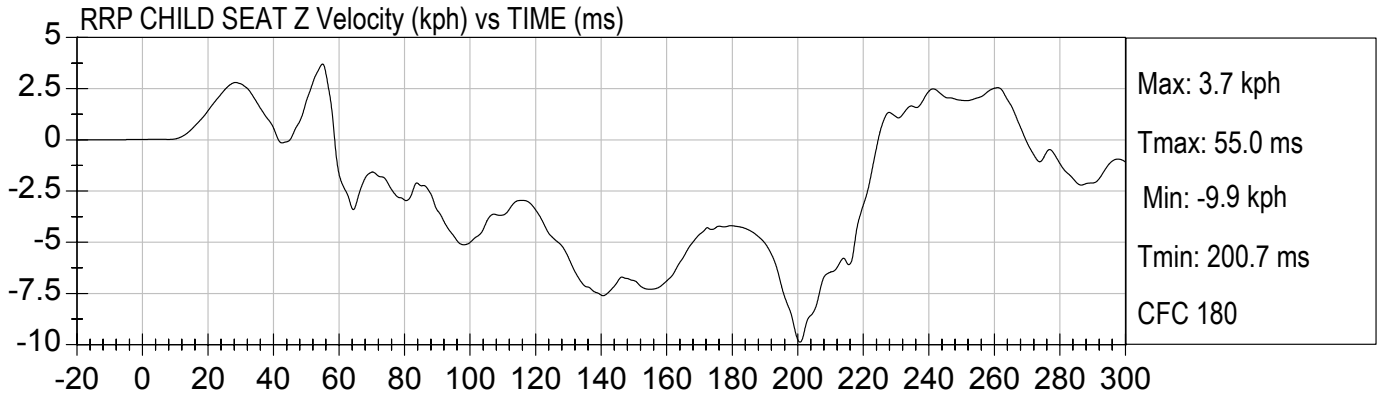

RRP CHILD SEAT Y (G's) vs TIME (ms)
15
10
5
0
-5
-10
-15
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 14.2 G's
Tmax: 60.8 ms
Min: -11.5 G's
Tmin: 55.0 ms
CFC 60

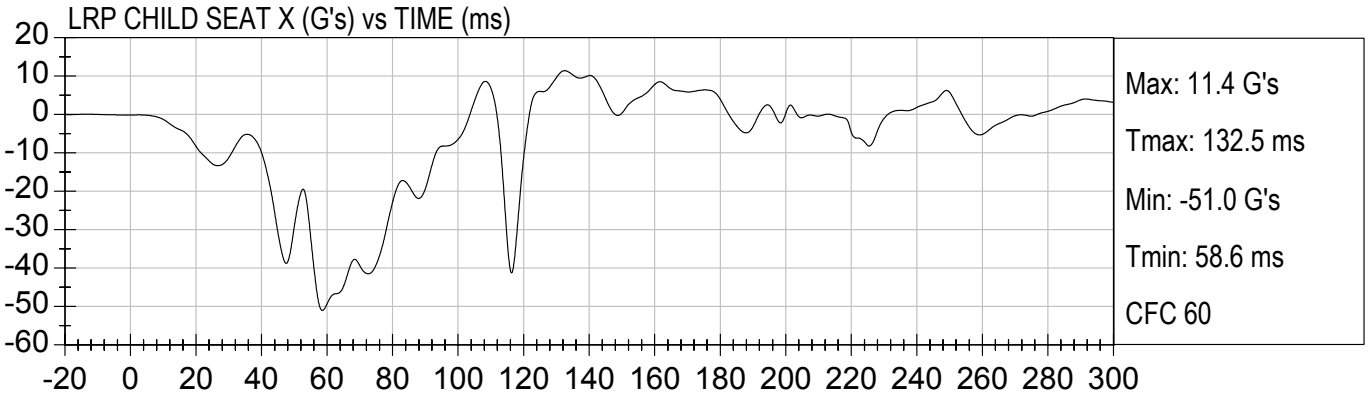

RRP CHILD SEAT Z (G's) vs TIME (ms)
30
20
10
0
-10
-20
-30
-40
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 21.0 G's
Tmax: 222.9 ms
Min: -34.6 G's
Tmin: 58.4 ms
CFC 60

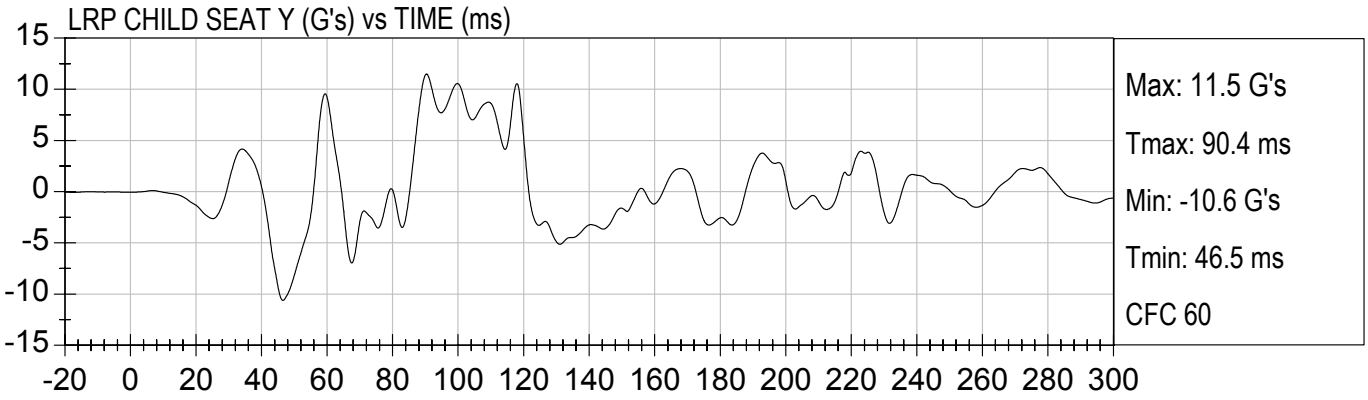

RRP CHILD SEAT Resultant (G's) vs TIME (ms)
100
80
60
40
20
0
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 84.6 G's
Tmax: 56.0 ms
Min: 0.0 G's
Tmin: 0.0 ms
CFC 60

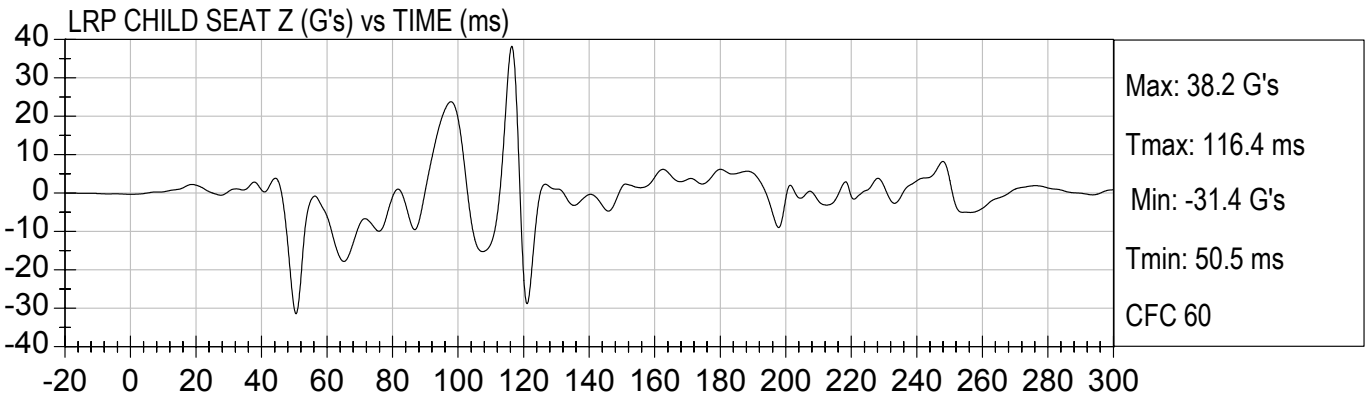

RRP CHILD SEAT X Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20
-30
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 56.7 kph
Tmax: 7.7 ms
Min: -22.0 kph
Tmin: 205.3 ms
CFC 180

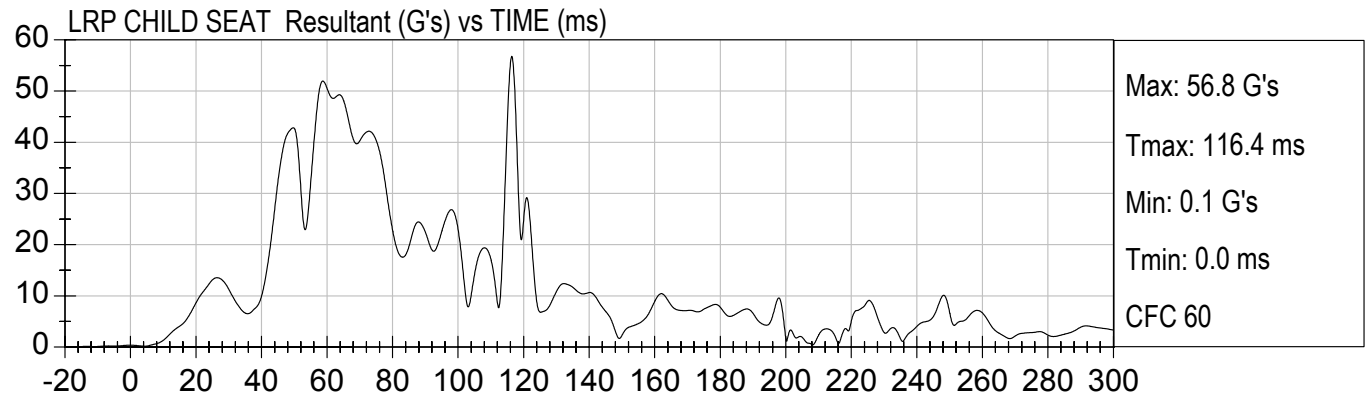

RRP CHILD SEAT Y Velocity (kph) vs TIME (ms)
8
6
4
2
0
-2
-4
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 6.3 kph
Tmax: 102.7 ms
Min: -2.1 kph
Tmin: 58.6 ms
CFC 180

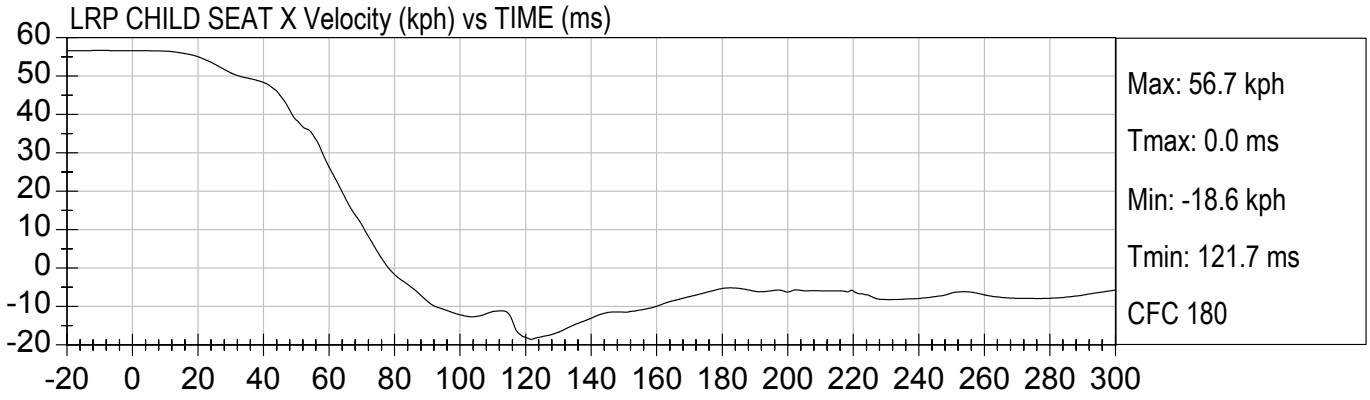

RRP CHILD SEAT Z Velocity (kph) vs TIME (ms)
5
2.5
0
-2.5
-5
-7.5
-10
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 3.7 kph
Tmax: 55.0 ms
Min: -9.9 kph
Tmin: 200.7 ms
CFC 180

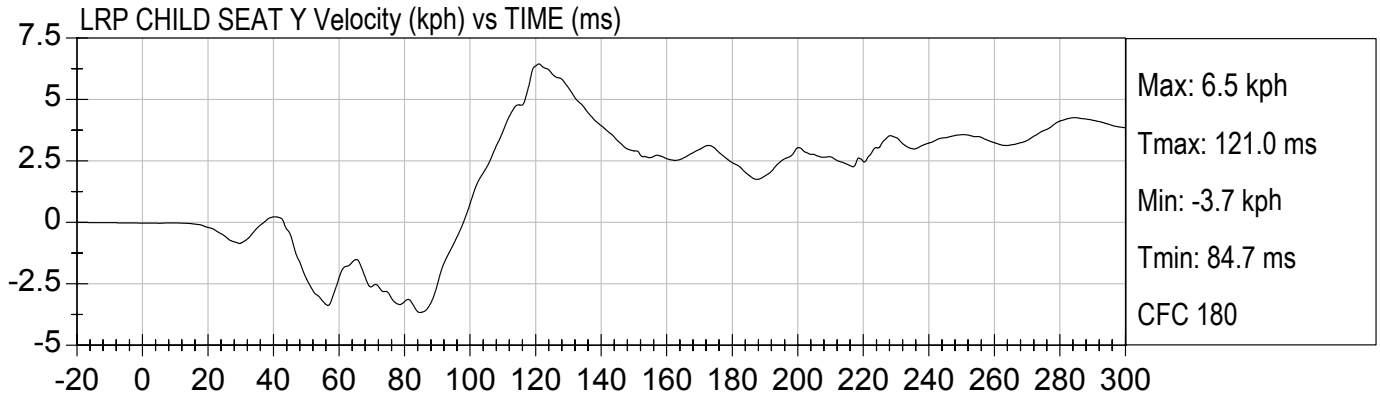

LRP CHILD SEAT X (G's) vs TIME (ms)
Max: 11.4 G's
Tmax: 132.5 ms
Min: -51.0 G's
Tmin: 58.6 ms
CFC 60

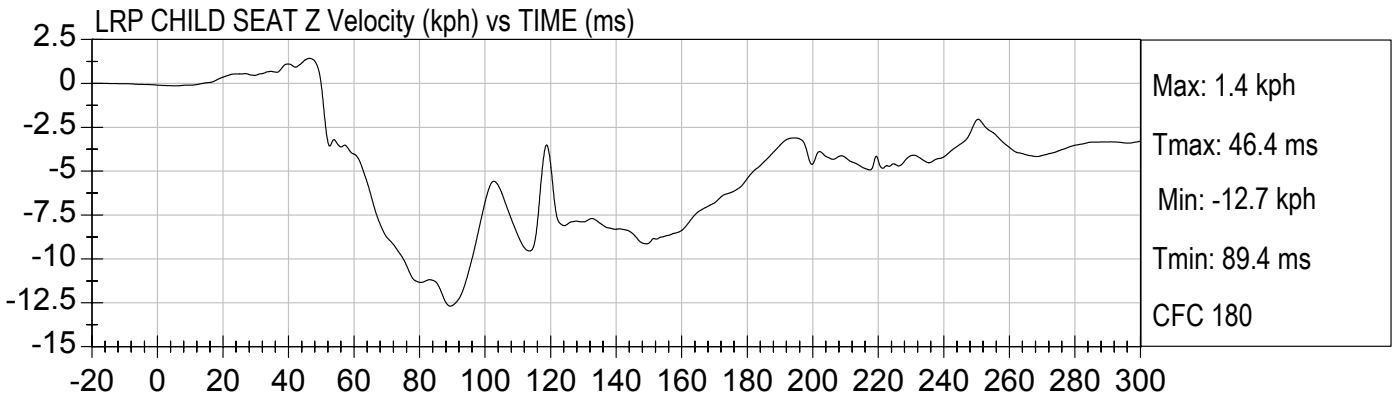

LRP CHILD SEAT Y (G's) vs TIME (ms)
Max: 11.5 G's
Tmax: 90.4 ms
Min: -10.6 G's
Tmin: 46.5 ms
CFC 60


LRP CHILD SEAT Z (G's) vs TIME (ms)
Max: 38.2 G's
Tmax: 116.4 ms
Min: -31.4 G's
Tmin: 50.5 ms
CFC 60


LRP CHILD SEAT Resultant (G's) vs TIME (ms)
Max: 56.8 G's
Tmax: 116.4 ms
Min: 0.1 G's
Tmin: 0.0 ms
CFC 60


LRP CHILD SEAT X Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 56.7 kph
Tmax: 0.0 ms
Min: -18.6 kph
Tmin: 121.7 ms
CFC 180


LRP CHILD SEAT Y Velocity (kph) vs TIME (ms)
7.5
5
2.5
0
-2.5
-5
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 6.5 kph
Tmax: 121.0 ms
Min: -3.7 kph
Tmin: 84.7 ms
CFC 180


LRP CHILD SEAT Z Velocity (kph) vs TIME (ms)
2.5
0
-2.5
-5
-7.5
-10
-12.5
-15
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 1.4 kph
Tmax: 46.4 ms
Min: -12.7 kph
Tmin: 89.4 ms
CFC 180

APPENDIX C

CHILD DUMMY CALIBRATION INFORMATION

Transportation Research Center Inc.

ATD Calibration Report

for

VRTC

HIII 6 Year Old Serial No. 144 Calibration No. 05

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

Transportation Research Center Inc.
572N HIII 6 Year Old Dummy
External Dimensions
Serial No. 144 Calibration No. 05

Test Parameter	Dimension	Specification	Results	Pass
Total Sitting Height	A	622.3 - 647.7 mm	643 mm	Yes
Shoulder Pivot Height	B	348.0 - 363.2 mm	358 mm	Yes
Hip Pivot Height	C	63.5 - 73.7 mm	73 mm	Yes
Hip Pivot from Backline	D	88.9 - 99.1 mm	98 mm	Yes
Shoulder Pivot from Backline	E	53.3 - 63.5 mm	57 mm	Yes
Thigh Clearance	F	88.9 - 104.1 mm	95 mm	Yes
Back of Elbow to Wrist Pivot	G	182.9 - 198.1 mm	189 mm	Yes
Head Back to Backline	H	17.8 - 22.8 mm	22 mm	Yes
Shoulder to Elbow Length	I	215.9 - 231.1 mm	225 mm	Yes
Elbow Rest Height	J	157.4 - 177.8 mm	172 mm	Yes
Buttock to Knee Length	K	370.8 - 391.2 mm	375 mm	Yes
Popliteal Height	L	269.2 - 289.6 mm	276 mm	Yes
Knee to Floor Height	M	307.4 - 322.6 mm	313 mm	Yes
Buttock Popliteal Height	N	320.0 - 340.4 mm	332 mm	Yes
Chest Depth without Jacket	O	129.6 - 144.8 mm	138 mm	Yes
Foot Length	P	170.2 - 184.6 mm	175 mm	Yes
Buttock to Knee Pivot Length	R	342.9 - 363.2 mm	354 mm	Yes
Head Breadth	S	137.1 - 147.3 mm	139 mm	Yes
Head Depth	T	167.6 - 177.8 mm	170 mm	Yes
Hip Breadth	U	208.3 - 223.5 mm	215 mm	Yes
Shoulder Breadth	V	259.1 - 274.3 mm	270 mm	Yes
Foot Breadth	W	62.3 - 77.5 mm	66 mm	Yes
Head Circumference	X	510.5 - 530.9 mm	519 mm	Yes
Chest Circumference with Jacket	Y	596.9 - 622.3 mm	613 mm	Yes
Waist Circumference	Z	558.8 - 584.2 mm	571 mm	Yes
Reference Location for Chest Circumference	AA	325.1 - 335.3 mm	330 mm	Yes
Reference Location for Waist Circumference	BB	153.7 - 163.9 mm	158 mm	Yes

Technician

Approved

Transportation Research Center Inc.

572N Head Drop Test

HIII 6 Year Old Serial No. 144 Calibration No. 05 - 3

Test Date 07/23/2004

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	21.9 °C	Yes
Relative Humidity	10 - 70 %	51 %	Yes
Peak Resultant Acceleration	245 - 300 g	299.8 g	Yes
Peak Lateral Acceleration	15 g Max	4.9 g	Yes
Is Acceleration Curve Unimodal?	Yes	Yes	Yes

Test meets specifications.

Comments:

Technician

Approved

07.23.2004 16:03:07 614

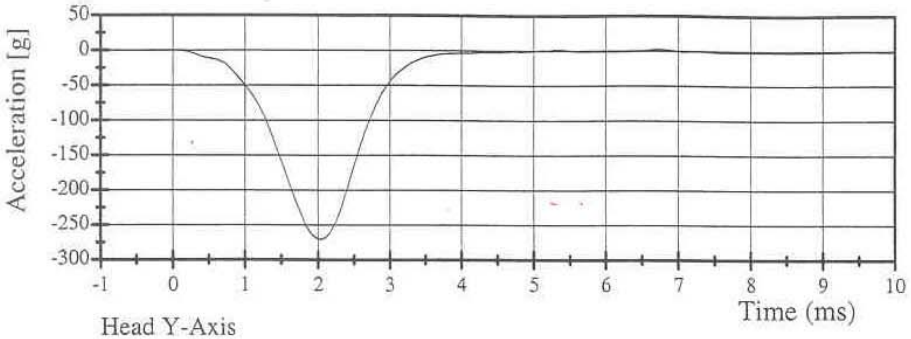
Transportation Research Center Inc.

572N Head Drop Test

HIII 6 Year Old Serial No. 144 Calibration No. 05 - 3

Test Date 07/23/2004

Head X-Axis

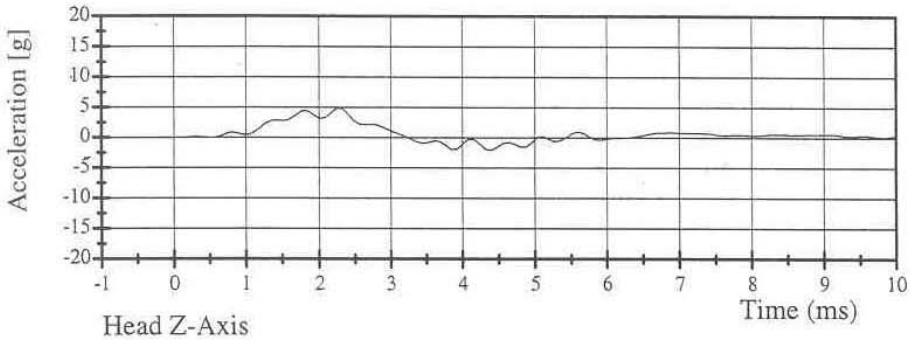


Filter Class: 1000

Max: 2.8 g at 6.7 ms

Min: -270.8 g at 2.0 ms

Head Y-Axis

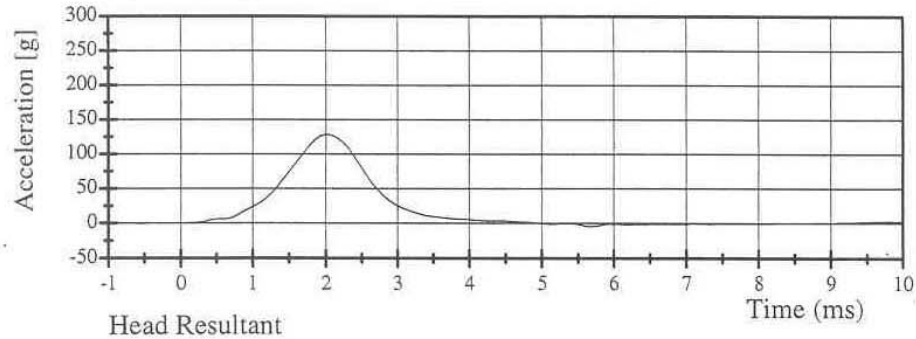


Filter Class: 1000

Max: 4.9 g at 2.3 ms

Min: -2.1 g at 4.4 ms

Head Z-Axis

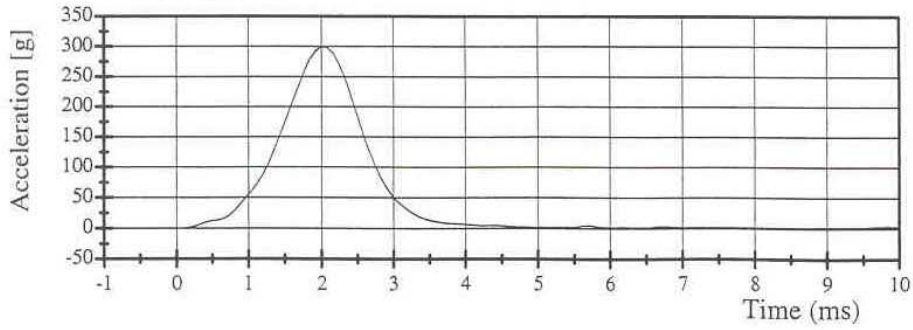


Filter Class: 1000

Max: 128.6 g at 2.0 ms

Min: -4.7 g at 5.7 ms

Head Resultant



Filter Class: 1000

Max: 299.8 g at 2.0 ms

Min: 0.0 g at 0.9 ms

07.23.2004 16:03:09 614

Transportation Research Center Inc.

572N Neck Flexion Test - 6 Channel Transducer

HIII 6 Year Old Serial No. 144 Calibration No. 05 - 3

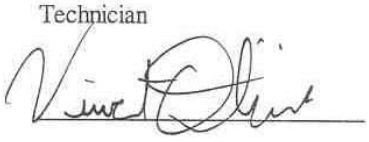
Test Date 07/26/2004

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.9 °C	Yes
Relative Humidity	10 - 70 %	58 %	Yes
Impact Velocity	4.83 - 5.07 m/s	5.04 m/s	Yes
Integrated Pendulum Velocity			
10 ms	1.20 - 1.60 m/s	1.56 m/s	Yes
20 ms	2.40 - 3.40 m/s	3.00 m/s	Yes
30 ms	3.80 - 5.00 m/s	4.35 m/s	Yes
Peak D Plane Rotation	74 - 92 °	75.9 °	Yes
Peak Moment About Occipital Condyles (During time interval rotation is within specified corridors)	27.0 - 33.0 N·m	30.69 N·m	Yes
Positive Moment Decay Time To 5 N·m	103 - 123 ms	111.36 ms	Yes

Test meets specifications.

Comments:

Technician



Approved

07.26.2004 12:55:37 713

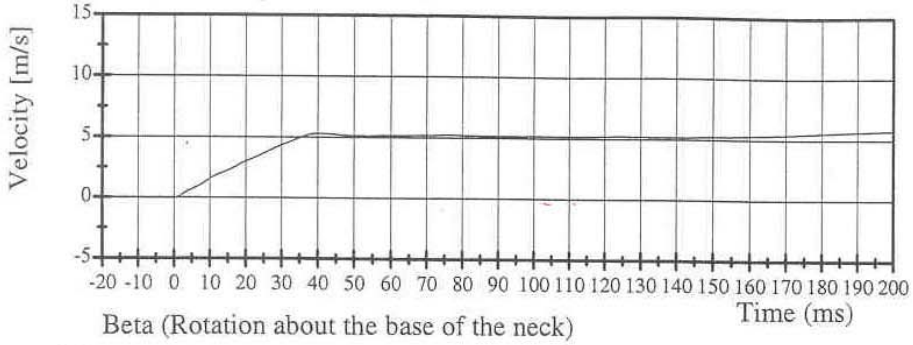
Transportation Research Center Inc.

572N Neck Flexion Test

HIII 6 Year Old Serial No. 144 Calibration No. 05 - 3

Test Date 07/26/2004

Integrated Pendulum Velocity

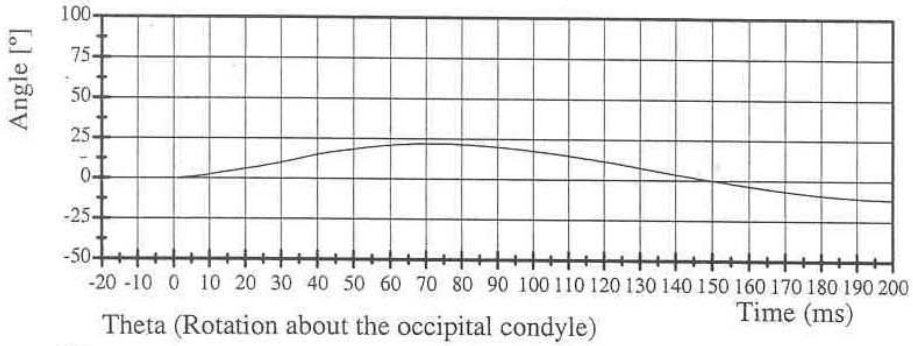


Filter Class: 180

Max: 6.3 m/s at 282.9 ms

Min: -0.0 m/s at -0.1 ms

Beta (Rotation about the base of the neck)

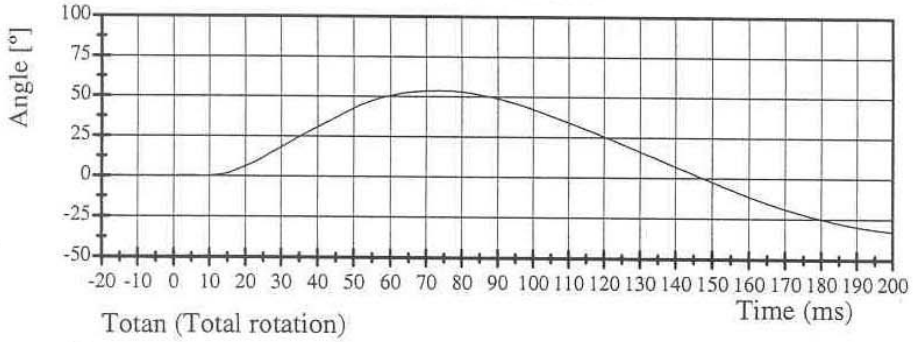


Filter Class: 60

Max: 22.1 ° at 71.1 ms

Min: -12.2 ° at 210.6 ms

Theta (Rotation about the occipital condyle)

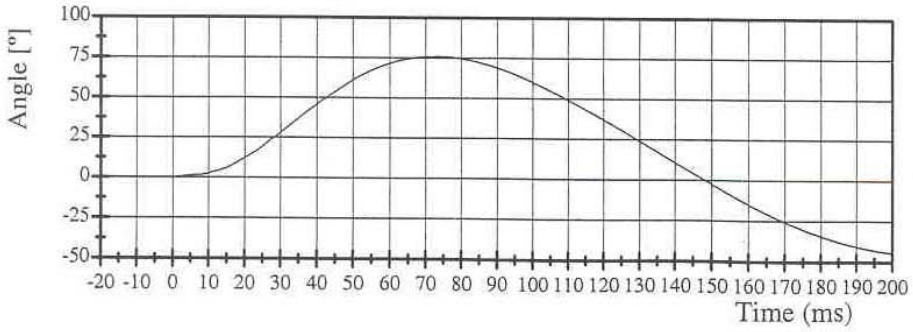


Filter Class: 60

Max: 53.8 ° at 73.7 ms

Min: -33.9 ° at 213.2 ms

Totan (Total rotation)



Filter Class: 60

Max: 75.9 ° at 73.4 ms

Min: -46.0 ° at 212.6 ms

07.26.2004 12:55:38 713

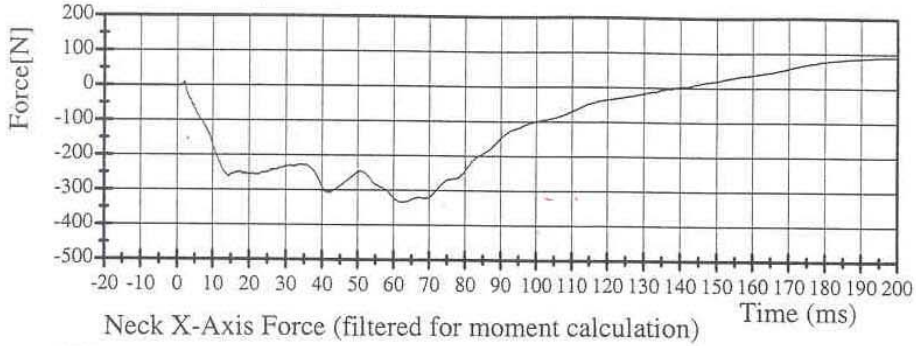
Transportation Research Center Inc.

572N Neck Flexion Test

HIII 6 Year Old Serial No. 144 Calibration No. 05 - 3

Test Date 07/26/2004

Neck X-Axis Force

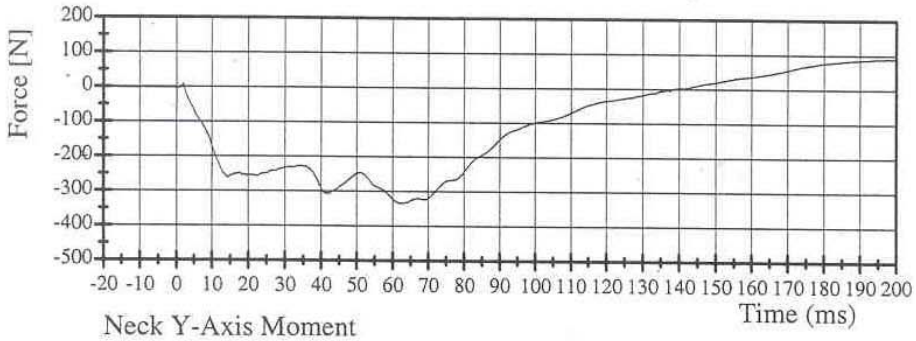


Filter Class: 1000

Max: 91.2 N at 197.5 ms

Min: -334.4 N at 61.8 ms

Neck X-Axis Force (filtered for moment calculation)

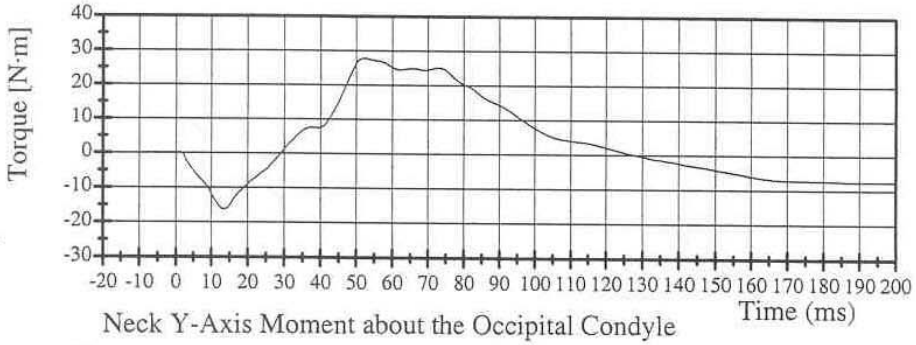


Filter Class: 600

Max: 90.7 N at 199.1 ms

Min: -334.2 N at 62.5 ms

Neck Y-Axis Moment

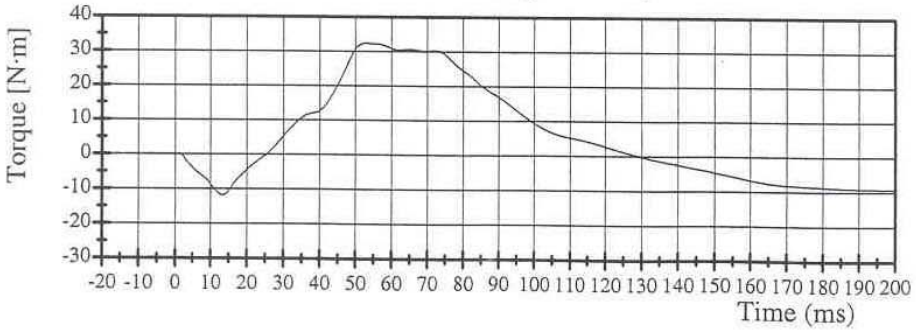


Filter Class: 600

Max: 27.8 N·m at 52.3 ms

Min: -16.2 N·m at 13.8 ms

Neck Y-Axis Moment about the Occipital Condyle



Filter Class: 600

Max: 32.4 N·m at 53.3 ms

Min: -11.7 N·m at 13.3 ms

07.26.2004 12:55:39 713

Transportation Research Center Inc.

572N Neck Extension Test - 6 Channel Transducer

HIII 6 Year Old Serial No. 144 Calibration No. 05 - 5

Test Date 07/26/2004

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	22.0 °C	Yes
Relative Humidity	10 - 70 %	57 %	Yes
Impact Velocity	4.18 - 4.42 m/s	4.41 m/s	Yes
Integrated Pendulum Velocity			
10 ms	1.00 - 1.40 m/s	1.26 m/s	Yes
20 ms	2.20 - 3.00 m/s	2.36 m/s	Yes
30 ms	3.20 - 4.20 m/s	3.48 m/s	Yes
Peak D Plane Rotation	85 - 103 °	90.0 °	Yes
Peak Moment About Occipital Condyles (During time interval rotation is within specified corridors)	-24.0 - (-19.0) N·m	-22.81 N·m	Yes
Negative Moment Decay Time To -5 N·m	123 - 147 ms	134.16 ms	Yes

Test meets specifications.

Comments:

Technician

Approved

07.26.2004 16:15:00 829

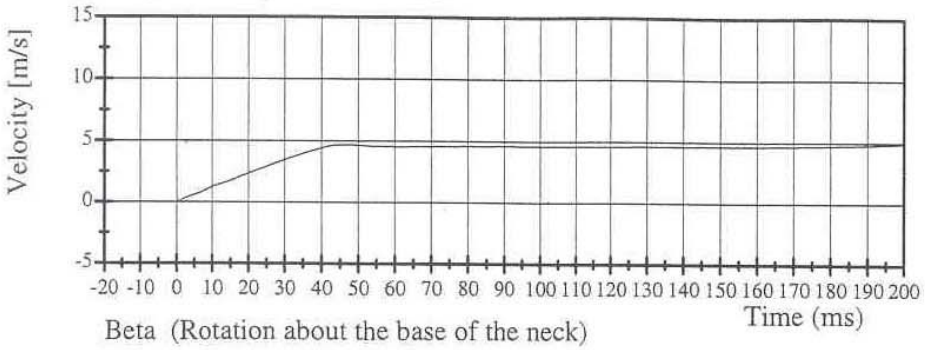
Transportation Research Center Inc.

572N Neck Extension Test

HIII 6 Year Old Serial No. 144 Calibration No. 05 - 5

Test Date 07/26/2004

Integrated Pendulum Velocity

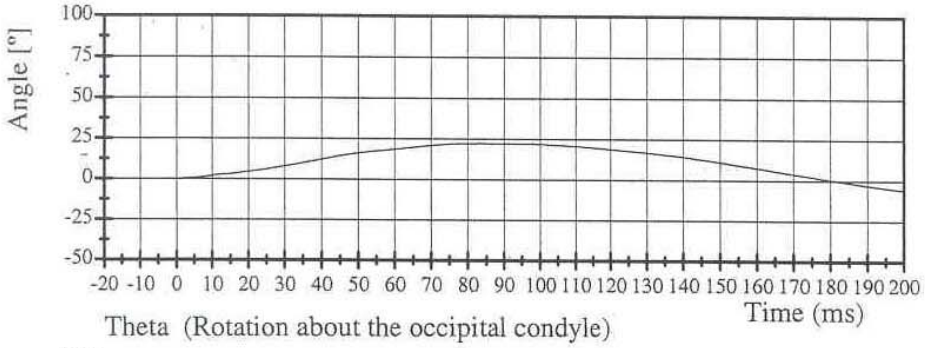


Filter Class: 180

Max: 5.8 m/s at 933.7 ms

Min: -0.0 m/s at -38.7 ms

Beta (Rotation about the base of the neck)

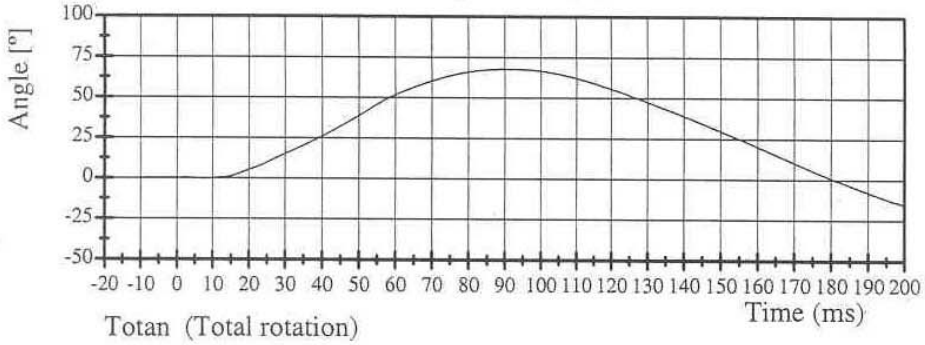


Filter Class: 60

Max: 22.3 ° at 83.7 ms

Min: -10.3 ° at 232.8 ms

Theta (Rotation about the occipital condyle)

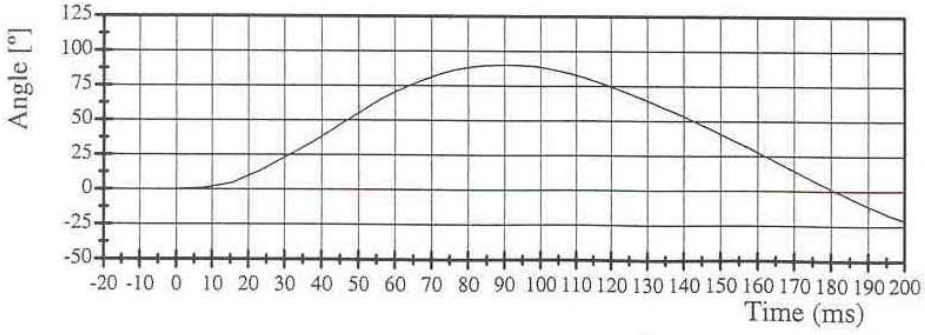


Filter Class: 60

Max: 67.7 ° at 91.1 ms

Min: -25.6 ° at 233.5 ms

Totan (Total rotation)



Filter Class: 60

Max: 90.0 ° at 90.5 ms

Min: -35.9 ° at 233.4 ms

07.26.2004 16:15:01 829

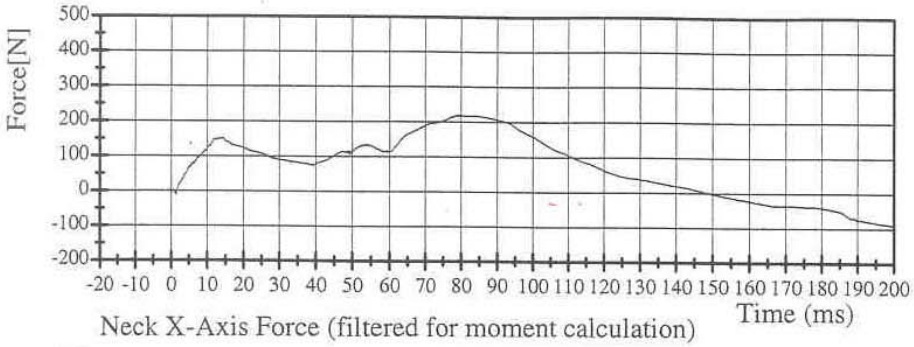
Transportation Research Center Inc.

572N Neck Extension Test

HIII 6 Year Old Serial No. 144 Calibration No. 05 - 5

Test Date 07/26/2004

Neck X-Axis Force

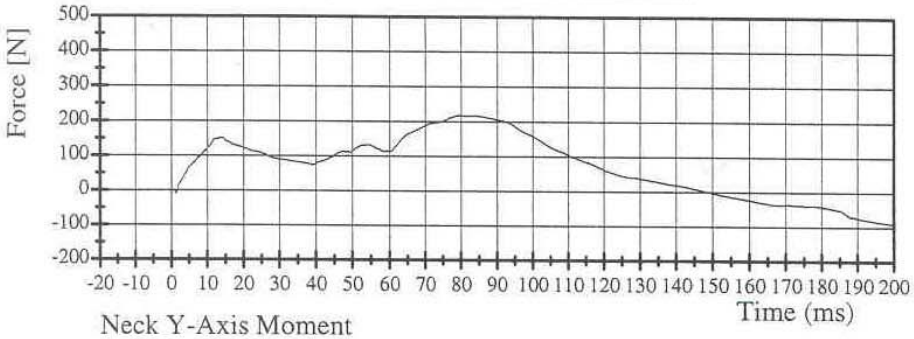


Filter Class: 1000

Max: 219.2 N at 79.5 ms

Min: -112.8 N at 221.4 ms

Neck X-Axis Force (filtered for moment calculation)

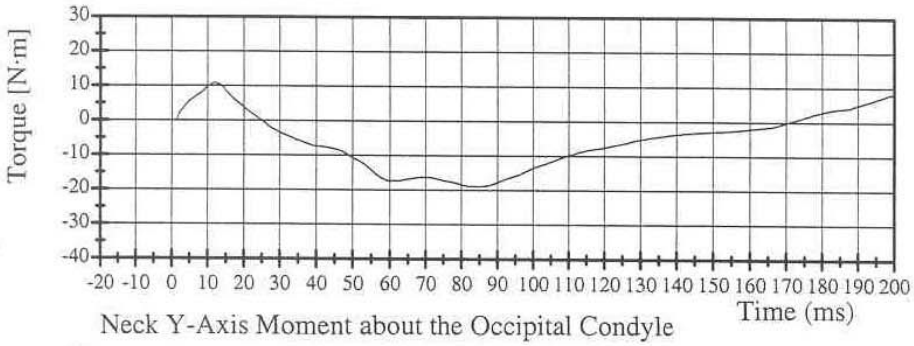


Filter Class: 600

Max: 218.6 N at 79.5 ms

Min: -112.3 N at 221.4 ms

Neck Y-Axis Moment

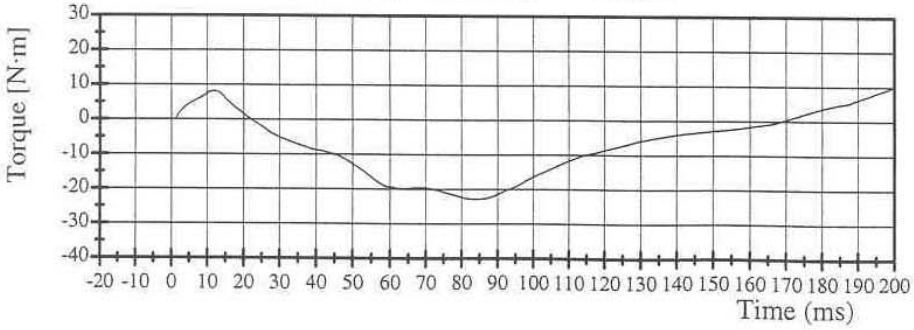


Filter Class: 600

Max: 11.3 N·m at 225.0 ms

Min: -18.9 N·m at 83.9 ms

Neck Y-Axis Moment about the Occipital Condyle



Filter Class: 600

Max: 13.2 N·m at 222.5 ms

Min: -22.8 N·m at 83.9 ms

07.26.2004 16:15:02 829

Transportation Research Center Inc.

572N Thorax Test

HIII 6 Year Old Serial No. 144 Calibration No. 05 - 2

Test Date 07/29/2004

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	52 %	Yes
Pendulum Velocity	6.59 - 6.83 m/s	6.61 m/s	Yes
Maximum Chest Deflection	-46.0 - (-38.0) mm	-46.0 mm	Yes
Peak Impact Probe Force Within Compression Corridor	1150 - 1380 N	1212 N	Yes
Internal Hysteresis	65 - 85 %	73 %	Yes
Maximum Force Between 12.5 mm & 38 mm Of Deflection	<= 1500	1222	Yes

Test meets specifications.

Comments:

Technician

Approved

07.29.2004 07:28:15 958

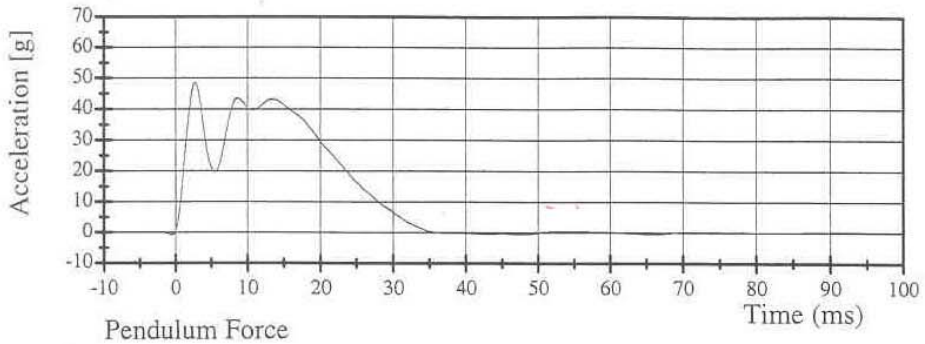
Transportation Research Center Inc.

572N Thorax Test

HIII 6 Year Old Serial No. 144 Calibration No. 05 - 2

Test Date 07/29/2004

Pendulum Deceleration

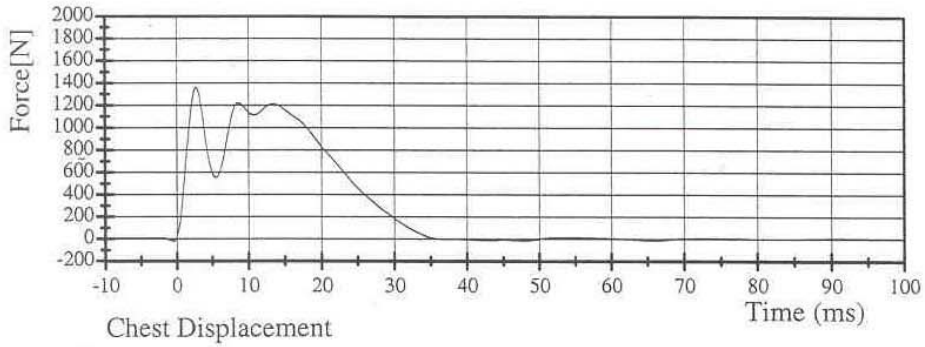


Filter Class: 180

Max: 48.6 g at 2.7 ms

Min: -0.7 g at -0.6 ms

Pendulum Force

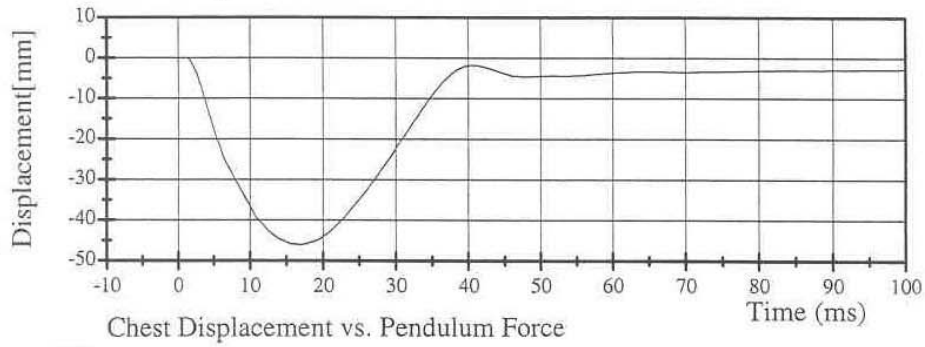


Filter Class: 180

Max: 1363.5 N at 2.7 ms

Min: -19.9 N at -0.6 ms

Chest Displacement

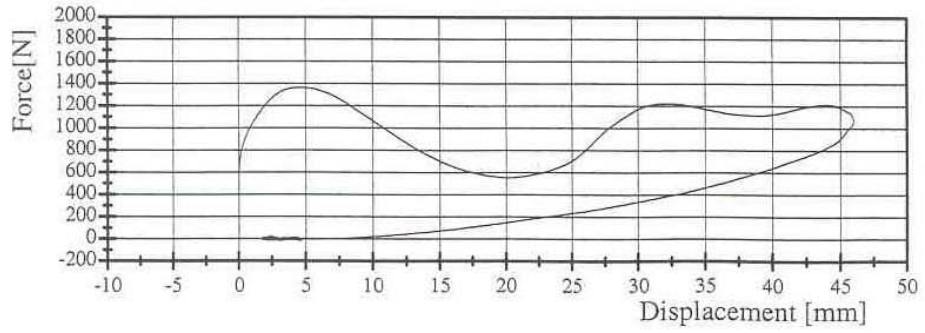


Filter Class: 600

Max: 0.0 mm at -48.2 ms

Min: -46.0 mm at 17.0 ms

Chest Displacement vs. Pendulum Force



07.29.2004 07:28:16 958

TRANSPORTATION RESEARCH CENTER INC.

TORSO FLEXION TEST

HYBRID III SIX-YEAR-OLD

CAL DATE: 29-Jul-04

TRC, INC. TEST NO: 144C05TF2 572 N SN144 TORSO FLEX CAL 05

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	20.6 – 22.2 DEG. C	21.3 DEG. C
RELATIVE HUMIDITY	10 – 70 %	49 %
INITIAL ANGLE OF UNSUPPORRTED DUMMY	<= 22 DEG. REFERENCED TO VERTICAL	21.1 DEG.
MAXIMUM FORCE AT 45 DEG. DURING 10 SECOND PERIOD	147 – 200 N	160.9 N
RETURN ANGLE		24.6 DEG.
DIFFERENCE BETWEEN RETURN ANGLE & INTIAL ANGLE	+/- 8 DEG. OF INTIAL ANGLE	3.5 DEG.
RATE	0.5° - 1.5°/sec	1.03 °/sec

TEST MEETS SPECIFICATIONS

TECHNICIAN

Transportation Research Center Inc.

572N Left Knee Test

HIII 6 Year Old Serial No. 144 Calibration No. 05 - 1

Test Date 07/23/2004

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	21.9 °C	Yes
Relative Humidity	10 - 70 %	49 %	Yes
Pendulum Velocity	2.07 - 2.13 m/s	2.10 m/s	Yes
Maximum Pendulum Force	2000 - 3000 N	2444 N	Yes

Test meets specifications.

Comments:

Technician

Approved

07.23.2004 15:10:43 1688

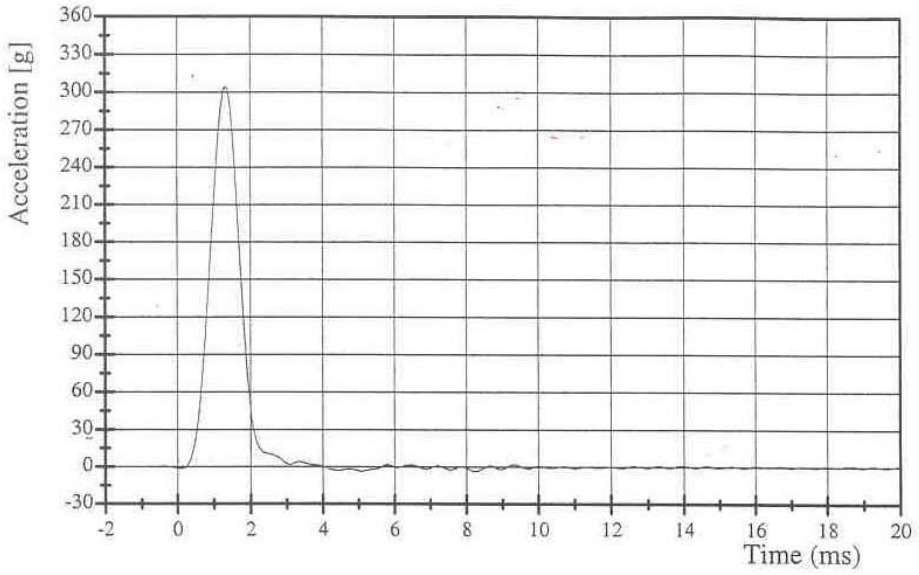
Transportation Research Center Inc.

572N Left Knee Test

HIII 6 Year Old Serial No. 144 Calibration No. 05 - 1

Test Date 07/23/2004

Pendulum Deceleration

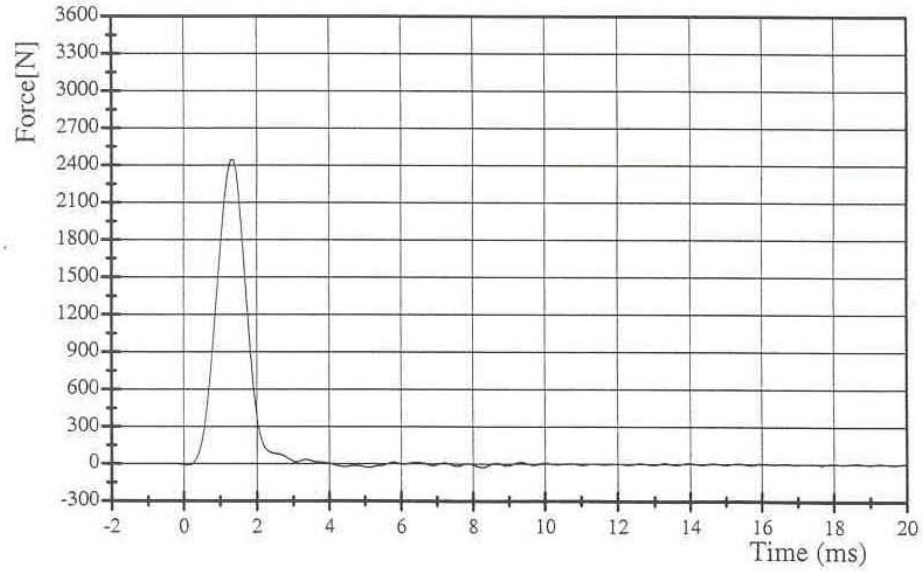


Filter Class: 600

Max: 303.9 g at 1.4 ms

Min: -3.7 g at 8.2 ms

Pendulum Force



Filter Class: 600

Max: 2444.2 N at 1.4 ms

Min: -30.0 N at 8.2 ms

07.23.2004 15:10:44 1688

Transportation Research Center Inc.

572N Right Knee Test

HIII 6 Year Old Serial No. 144 Calibration No. 05 - 1

Test Date 07/23/2004

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	21.8 °C	Yes
Relative Humidity	10 - 70 %	49 %	Yes
Pendulum Velocity	2.07 - 2.13 m/s	2.11 m/s	Yes
Maximum Pendulum Force	2000 - 3000 N	2293 N	Yes

Test meets specifications.

Comments:

Technician

Approved

07.23.2004 14:58:07 1683

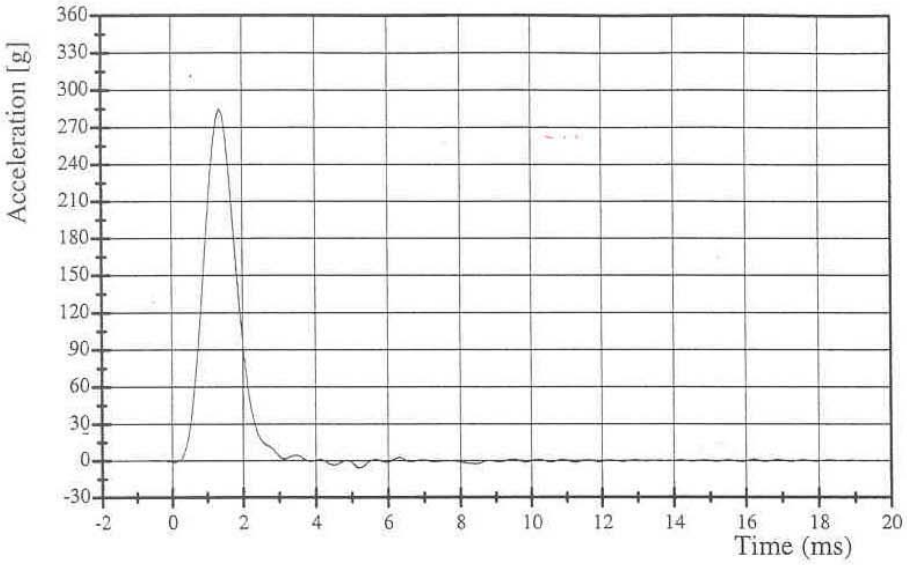
Transportation Research Center Inc.

572N Right Knee Test

HIII 6 Year Old Serial No. 144 Calibration No. 05 - 1

Test Date 07/23/2004

Pendulum Deceleration

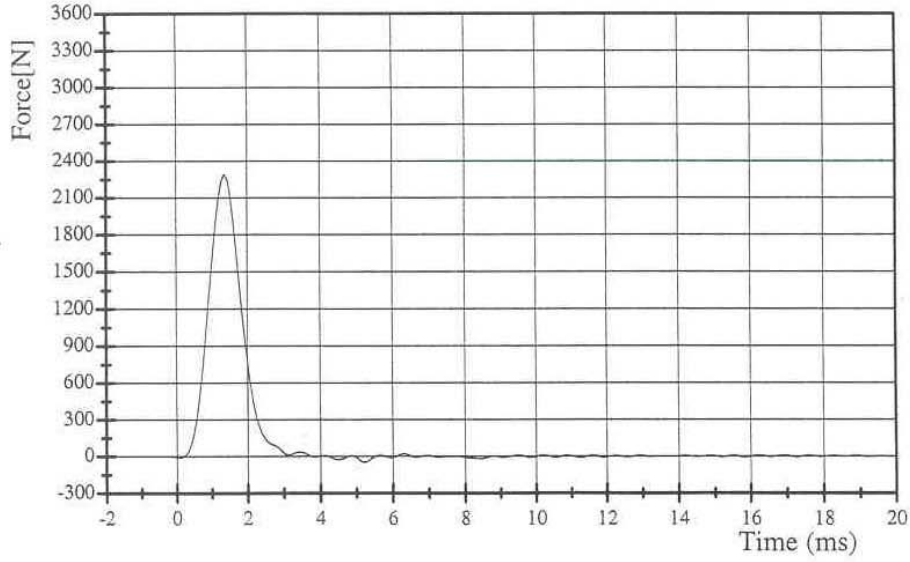


Filter Class: 600

Max: 285.2 g at 1.4 ms

Min: -6.0 g at 5.2 ms

Pendulum Force



Filter Class: 600

Max: 2293.4 N at 1.4 ms

Min: -48.0 N at 5.2 ms

07.23.2004 14:58:08 1683

Hybrid III Calibration Data Sheet

3 Year Old

Head Drop Calibration

ATD Serial No: 042 **Test I.D:** D041811

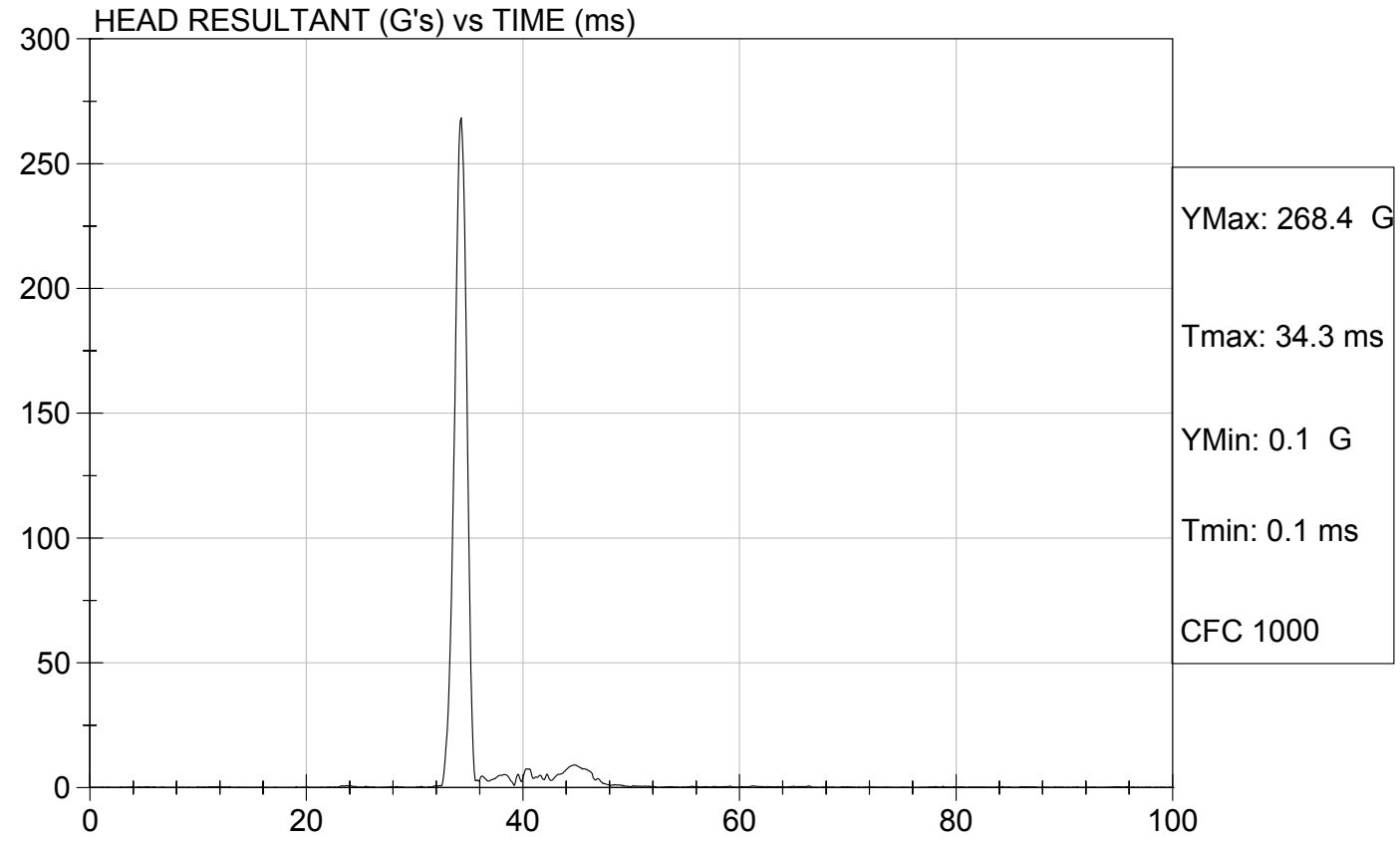
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Peak Resultant Acceleration	G's	250.0 to 280.0	268.4	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-11.5	Pass
Is Acceleration Unimodal?	Yes/No	< 10% Peak	Yes	Pass
		Overall Test Results		Pass

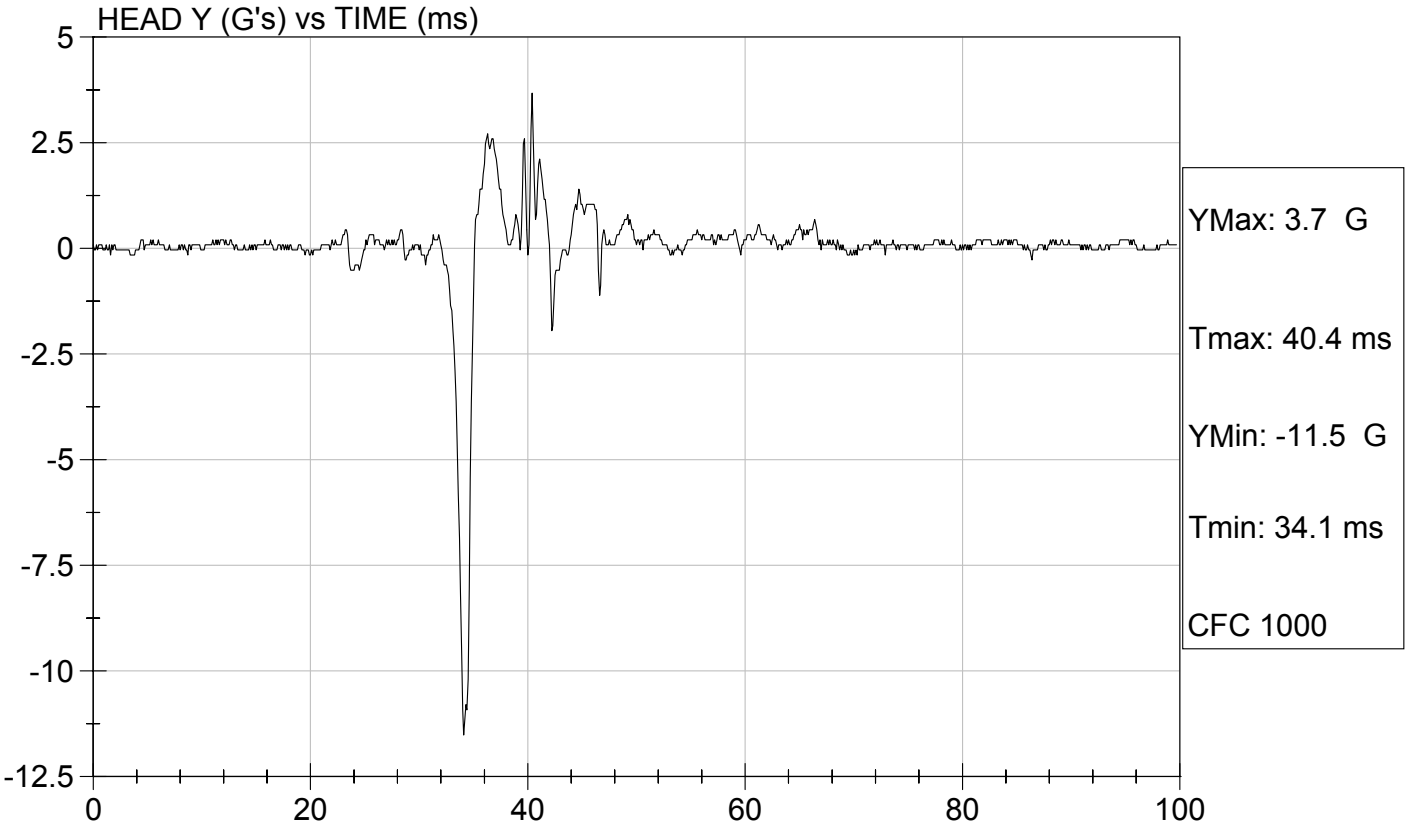
Jessica Hall
Laboratory Technician

08/06/2004
Test Date

David Winkelbauer
Approved By

	Test Description: Head Drop	Test Date: 08/06/2004
	Component: D041811	Speed: 0 ft/s, 0.00 m/s





Hybrid III Calibration Data Sheet

3 Year Old

Neck Flexion Test

ATD Serial No: 042 **Test I.D:** D041812

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity		%	10 to 70	46	Pass
Pendulum Speed		m/s	5.4 to 5.6	5.5	Pass
Pendulum Deceleration	10 msec	m/s	2.0 - 2.7	2.3	Pass
	15 msec	m/s	3.0 - 4.0	3.3	Pass
	20 msec	m/s	4.0 - 5.1	4.5	Pass
D Plane Rotation		deg	70 - 82	81	Pass
Peak Moment within Deflection Corridor		Nm	42.0 - 53.0	43.8	Pass
Positive Moment - Time Curve Decay to 10 Nm		msec	60.0 - 80.0	71.5	Pass
			Overall Test Results		Pass

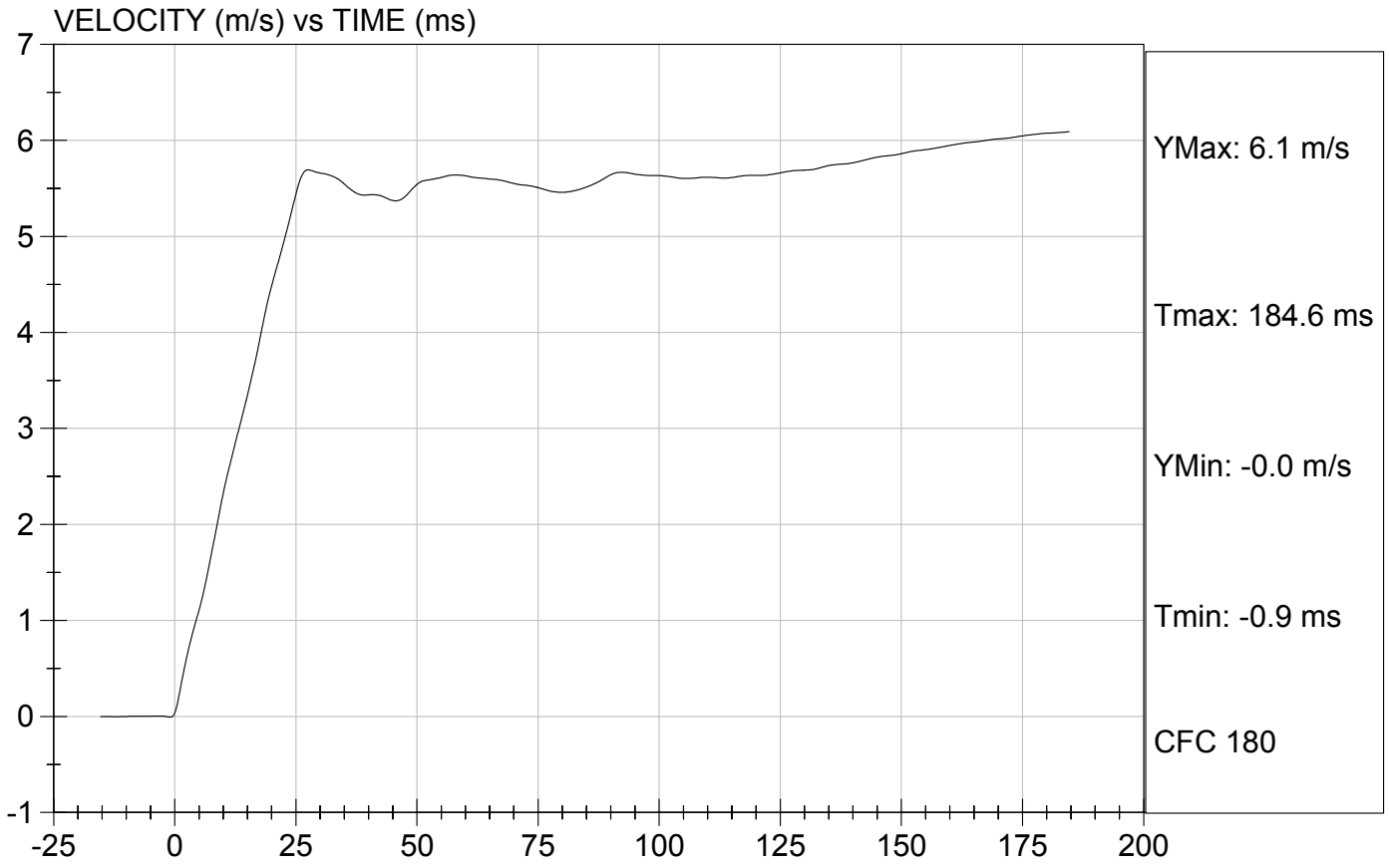
Jessica Hall
Laboratory Technician

08/06/2004
Test Date

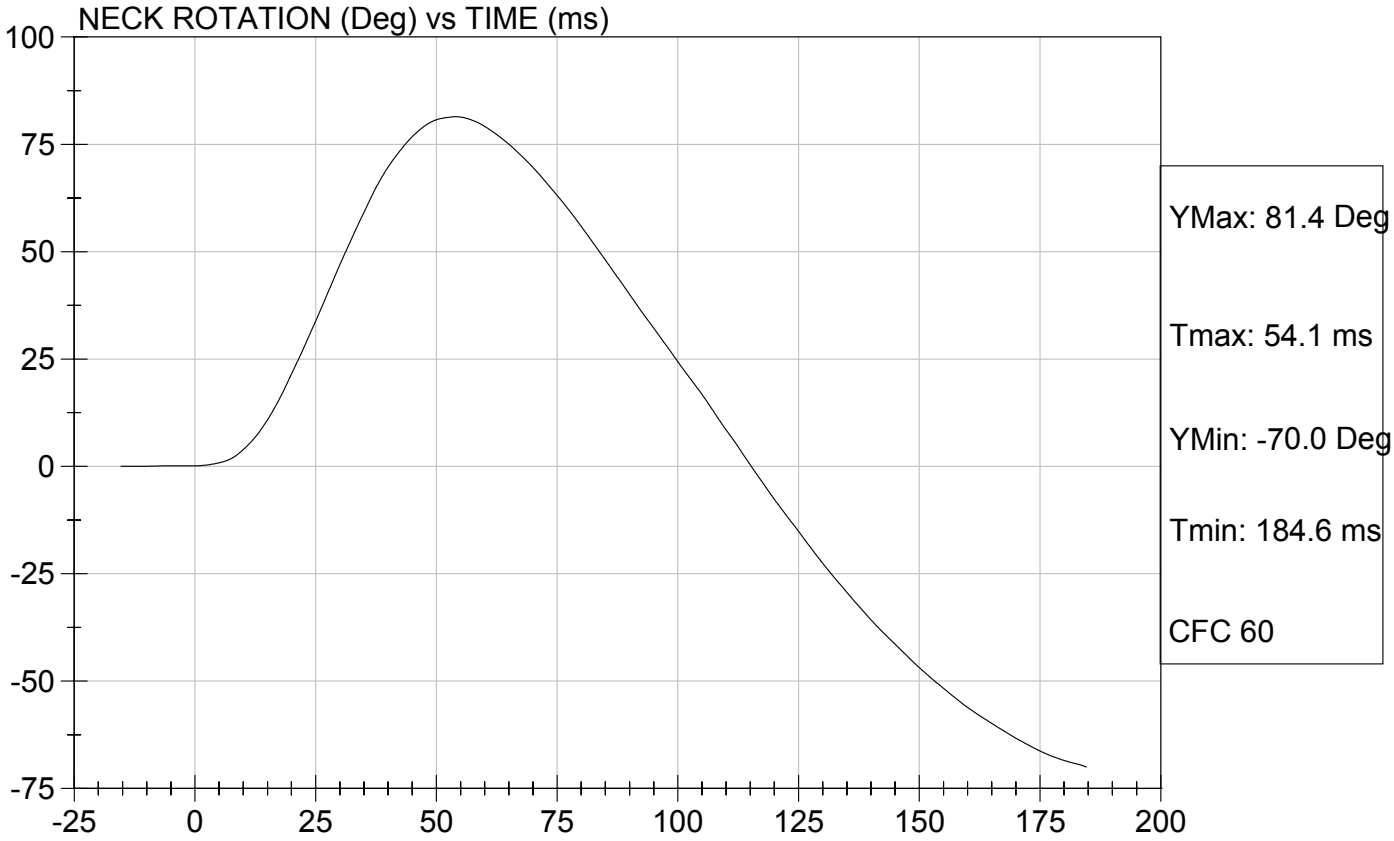
David Winkelbauer
Approved By

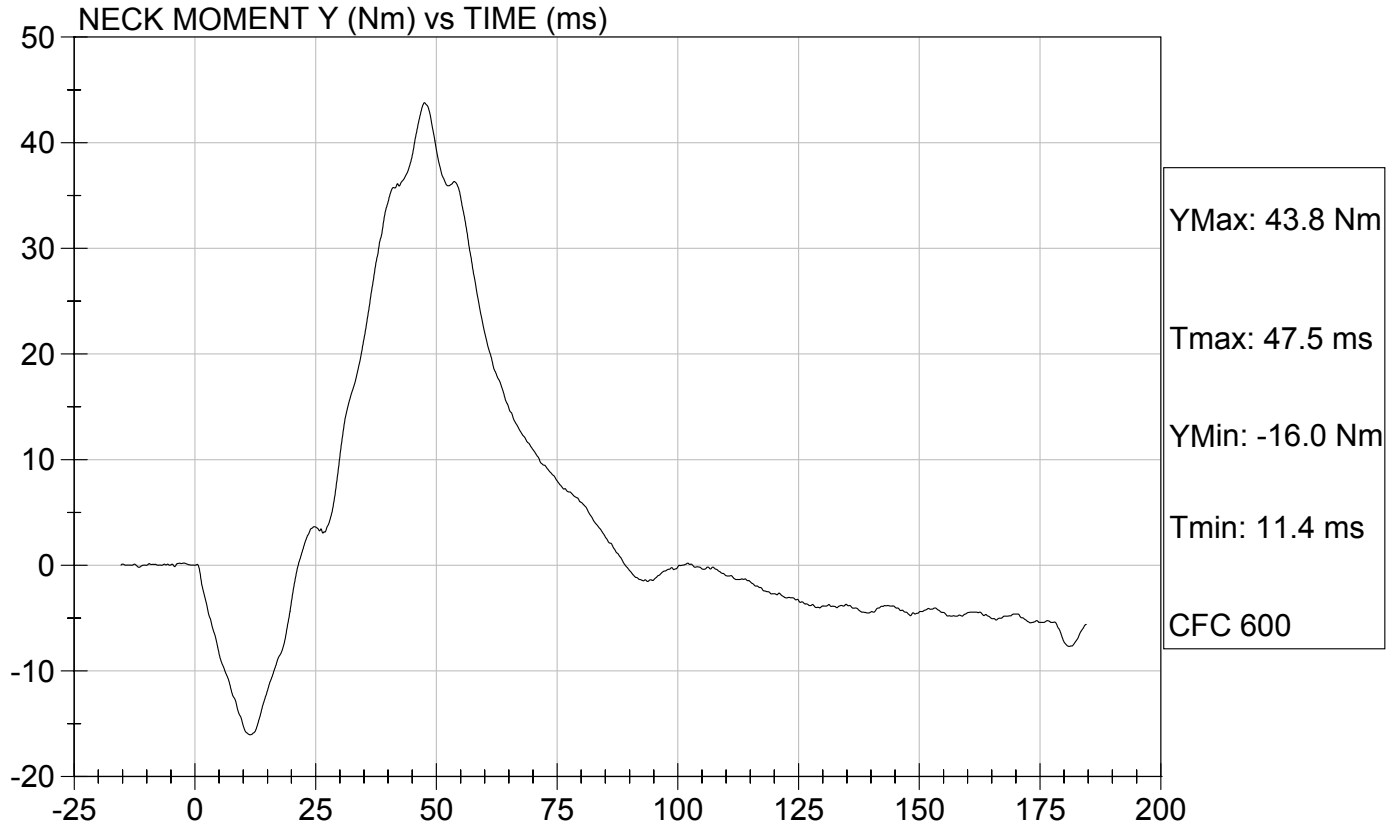
Test Description: Neck Flexion | Test Date: 08/06/2004

Component: D041812 | Speed: 17.98 ft/sec, 5.48 m/sec



	Test Description: Neck Flexion	Test Date: 08/06/2004
	Component: D041812	Speed: 17.98 ft/s, 5.48 m/s





Hybrid III Calibration Data Sheet

3 Year Old

Neck Extension Test

ATD Serial No: 042 **Test I.D:** D041813

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity		%	10 to 70	44	Pass
Pendulum Speed		m/s	3.55 to 3.75	3.75	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	2.9	Pass
D Plane Rotation		deg	83 - 93	85	Pass
Peak Moment within Deflection Corridor		Nm	-53.3 - -43.7	-45.9	Pass
Negative Moment - Time Curve Decay to -10 Nm		msec	60.0 - 80.0	69.1	Pass
			Overall Test Results		Pass

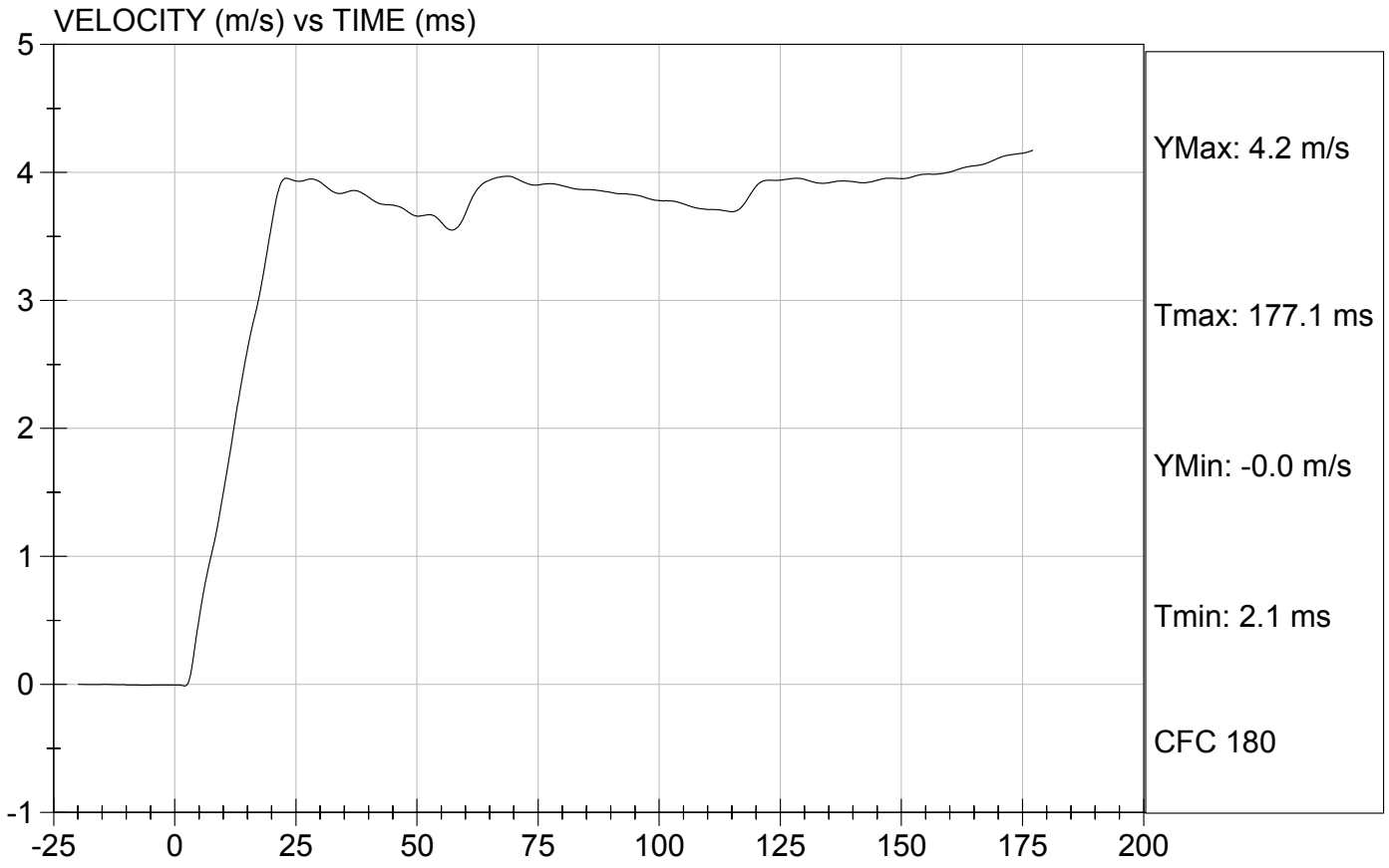
Jessica Hall
Laboratory Technician

08/06/2004
Test Date

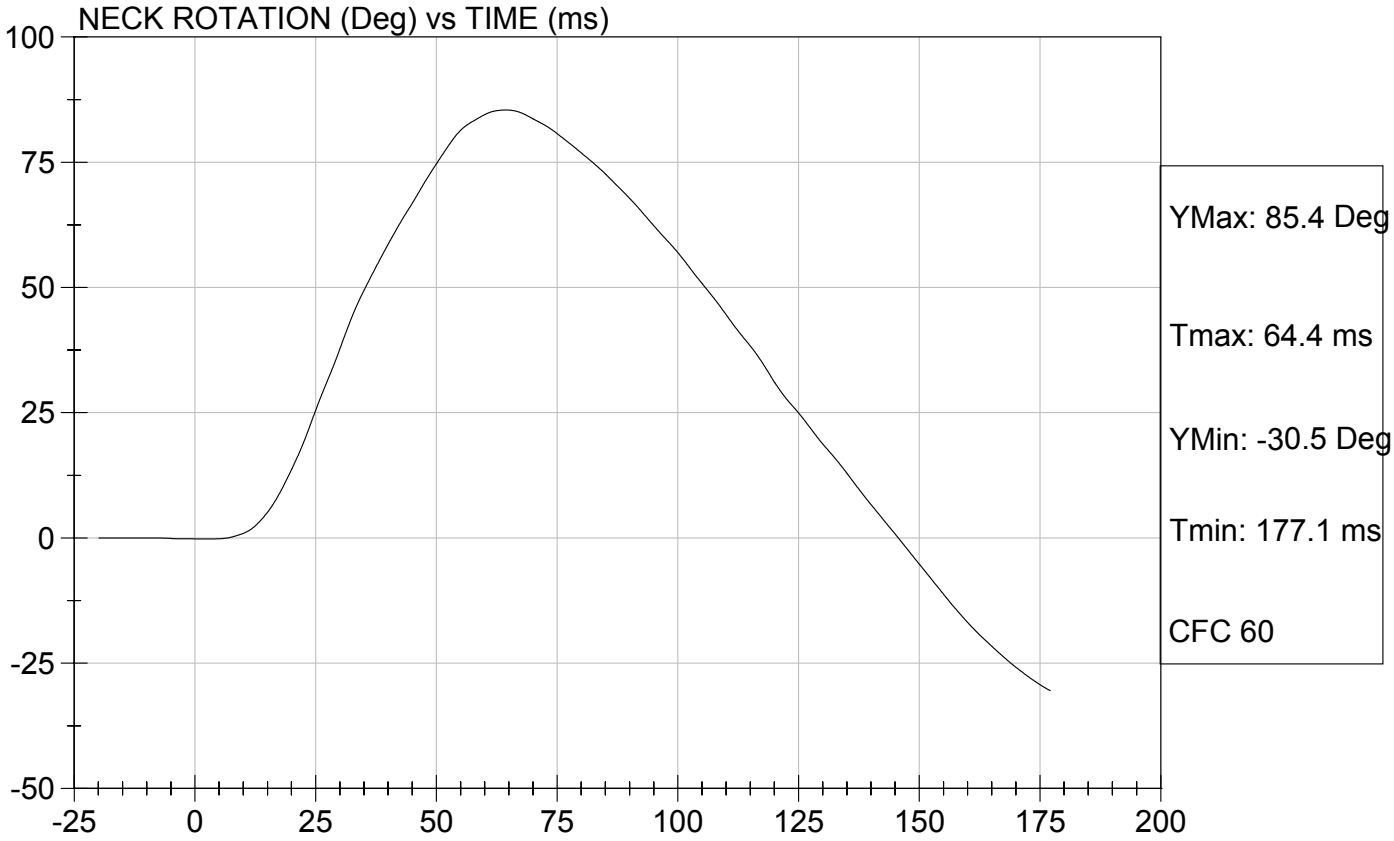
David Winkelbauer
Approved By

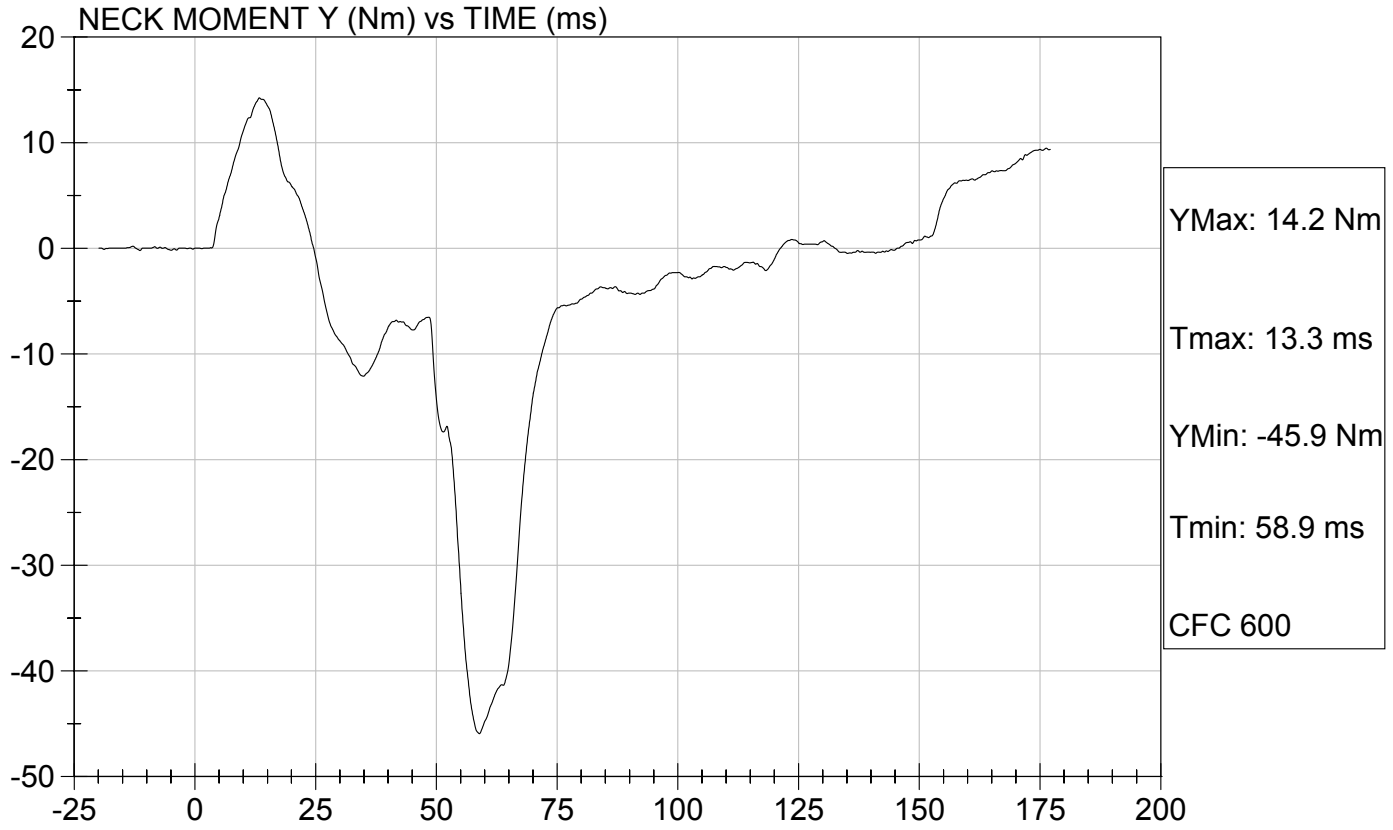
Test Description: Neck Extension Test Date: 08/06/2004

Component: D041813 Speed: 12.29 ft/sec, 3.75 m/sec



	Test Description: Neck Extension	Test Date: 08/06/2004
	Component: D041813	Speed: 12.29 ft/s, 3.75 m/s





Hybrid III Calibration Data Sheet

3 Year Old

Thorax Impact Test

ATD Serial No: 042 **Test I.D:** D041814

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Probe Velocity	m/s	5.9 to 6.1	5.9	Pass
Peak Deflection	mm	32 - 38	37	Pass
Peak Force w/in Deflection Corridor	kN	0.68 - 0.81	0.74	Pass
Internal Hysteresis	%	65 to 85	69	Pass
Max Force 12.5 mm - 32 mm Deflection	kN	Max 0.86	0.48	Pass
		Overall Test Results		Pass

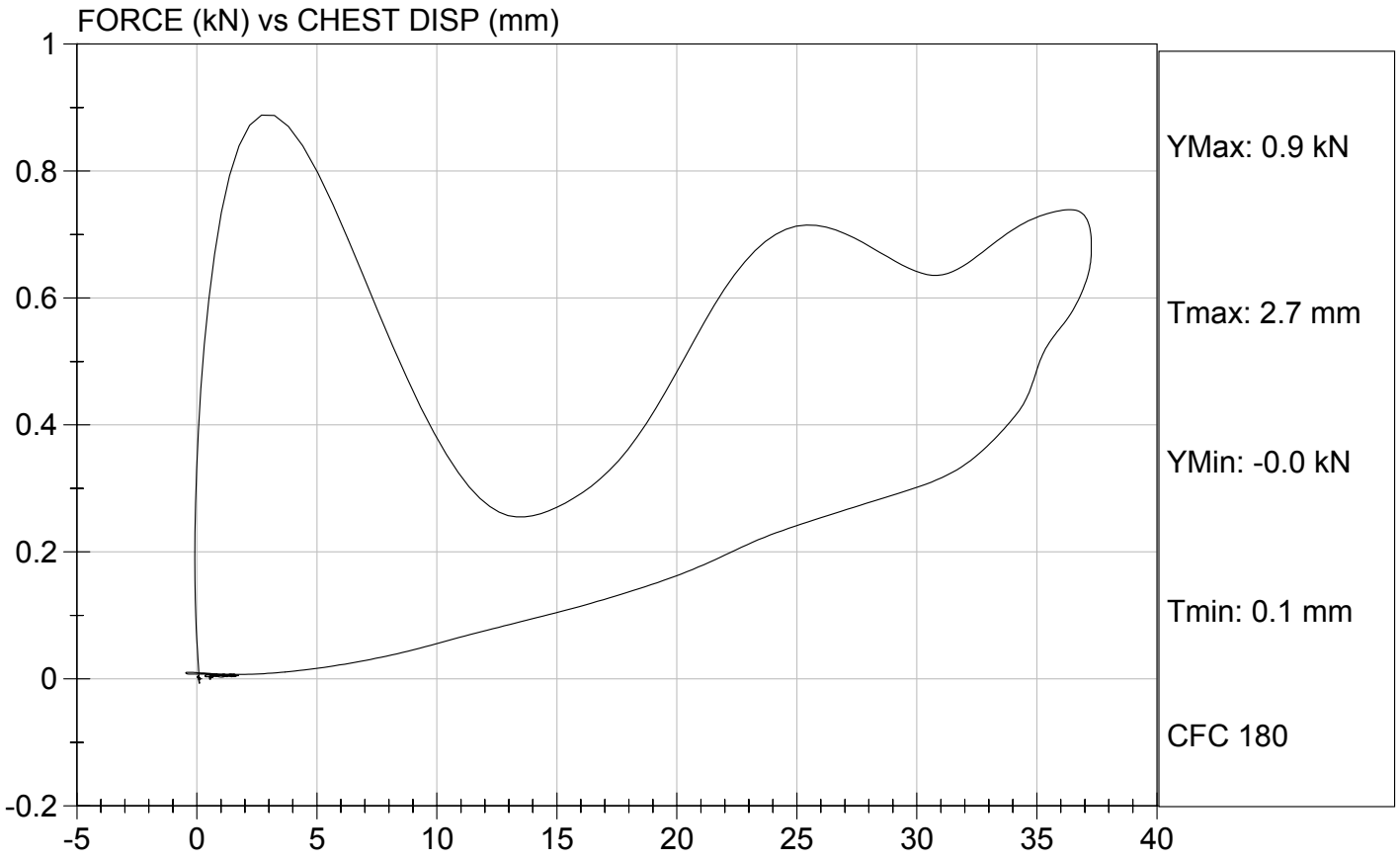
Jessica Hall
Laboratory Technician

08/06/2004
Test Date

David Winkelbauer
Approved By

Test Description: Thorax Impact Test Date: 08/06/2004

Component: D041814 Speed: 19.42 ft/sec, 5.92 m/sec



Hybrid III Calibration Data Sheet

3 Year Old

Torso Lumbar Flexion

ATD Serial No: 042 **Test I.D:** D041817

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	42	Pass
Force At 45 deg.	N	130 - 180	172	Pass
Initial Angle	deg	0 - 15	4	Pass
Return Angle	deg	0 - 10	4	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

08/06/2004
Test Date

David Winkelbauer
Approved By

APPENDIX D

TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

INSTRUMENTS FOR LRP CHILD DUMMY S/N: 144

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X	AH0B0	Endevco	7/23/04
Head Y	ALE80	Endevco	7/23/04
Head Z	AP1H2	Endevco	7/23/04
Upper Neck Load Cell	1626	FTSS	7/20/04
Chest X	P22695	Endevco	11/12/04
Chest Y	L20-B14	Entran	11/12/04
Chest Z	AJ621	Endevco	11/12/04
Chest Deflection Gauge	144	Servo	8/09/04
Pelvis X	J13653	Endevco	9/15/04
Pelvis Y	J13649	Endevco	9/15/04
Pelvis Z	J13713	Endevco	9/15/04
Shoulder Belt	199	Denton	12/07/04
Lap Belt	198	Denton	12/07/04
Right Femur	126	Denton	7/21/04
Left Femur	125	Denton	7/21/04

INSTRUMENTS FOR RRP CHILD DUMMY S/N: 042

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X	B05-J12	Entran	9/15/04
Head Y	B05-J19	Entran	9/15/04
Head Z	A27-Z11	Entran	9/15/04
Upper Neck Load Cell	208	FTSS	5/13/04
Chest X	A27-Z23	Entran	9/15/04
Chest Y	A27-Z24	Entran	9/15/04
Chest Z	A27-Z13	Entran	9/15/04
Chest Deflection Gauge	042	Servo	8/06/04
Pelvis X	A27-Z19	Entran	9/15/04
Pelvis Y	A27-Z07	Entran	9/15/04
Pelvis Z	A27-Z16	Entran	9/15/04
RRP Tether Force	172	FTSS	8/18/04

INSTRUMENTS FOR VEHICLE AND CHILD SEAT

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Left Rear Seat Back X	K18-J06	Entran	12/02/04
Left Rear Seat Back Y	C12-M13	Entran	12/02/04
Left Rear Seat Back Z	K18-J03	Entran	12/02/04
LRP Child Seat X	L17-D29	Entran	12/02/04
LRP Child Seat Y	K18-D17	Entran	12/02/04
LRP Child Seat Z	K18-D25	Entran	12/02/04
RRP Child Seat X	L17-D26	Entran	12/02/04
RRP Child Seat Y	L17-D02	Entran	12/02/04
RRP Child Seat Z	K11-Z14	Entran	12/02/04