REPORT NUMBER: NCAPCHILD-MGA-2004-006

NEW CAR ASSESSMENT PROGRAM
FRONTAL BARRIER IMPACT TEST

Evenflo Vanguard 5
Cosco Touriva

NHTSA NUMBER: M45303

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

Test Date: January 13, 2004

Report Date: February 18, 2004

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.

Prepared by: Shefalika Agarwal Date: 2/18/04
Shefalika Agarwal, Project Engineer

Reviewed by: David Winkelbauer Date: 2/18/04
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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15. Supplementary Notes

16. Abstract

The subjects CRS Evenflo Vanguard 5 and Cosco Touriva 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 January 13, 2004, in conjunction with frontal NCAP.

Measurement Description	Units	Pos. 3 ATD	Pos. 4 ATD
Head Injury Criteria (HIC36)	N/A	529	624
Head Injury Criteria (HIC15)	N/A	343	400
Max. Thorax Accel. (3msec Clip)	G's	52	45

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SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

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

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

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 529.0; maximum chest deceleration over 3 msec was 52.2 g's. The left rear child dummy's HIC36 was 623.9. The maximum chest deceleration over 3 msec was 45.1 g's. Position 3 and Position 4 were forward facing and used the vehicle LATCH and top tether for attachments.

Test Notes

There was no valid data collected for:

Left Rear Pelvis Z Acceleration

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)	Cosco Touriva (Forward Facing)

CAMERA COVERAGE

High Speed	16
Real Time	1
Total	17

POST TEST DOOR OPENING

Description	Front	Rear
Locked/Unlocked Doors	Doors were unlocked	Doors were unlocked
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 40)	Position 4 CRS (S/N 42)
Head Contact	Back of head to CRS	Back of head to CRS
Upper Torso Contact	None	None
Lower Torso Contact	None	None
Left Foot Contact	Passenger seat back	Driver seat back
Right Foot Contact	Passenger seat back	Driver seat back

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)	Cosco Touriva (Forward Facing)
NHTSA No.	M45303

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1499.2
Weight of 2 P572E ATDs	kg	156.0
Rated Cargo/Luggage Weight (RCLW)	kg	45.4
Calculated Vehicle Target Weight (TVTW)	kg	1700.6

TEST VEHICLE WEIGHTS

	Units	As Tested (ATW) (Axle)		
		Front	Rear	Total
Left	kg	507.6	342.0	
Right	kg	502.1	341.6	
Ratio	%	59.6	40.4	
Totals	kg	1009.7	683.6	1693.3

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

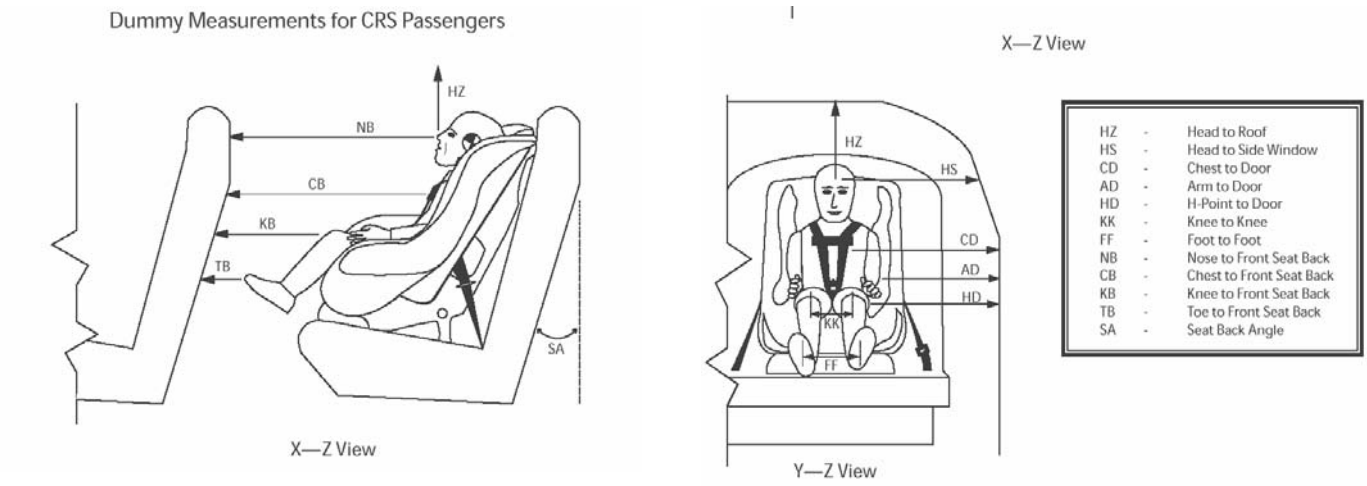
CHEST CLIP DISPLACEMENT

	Units	Left	Right
Right Child Dummy	mm	95	76
Left Child Dummy	mm	98	65

SECTION 2… (continued)

DATA SHEET NO. 3
CHILD DUMMY POSITIONING IN VEHICLE

Child Restraint System (Position 3)	Evenflo Vanguard 5 (Forward Facing)
NHTSA No.	M45303



Measurement	Pre-Test (mm)	Post-Test (mm)
	P3 CRS (40)	P3 CRS (40)
SA (deg)	11.5	11.5
HS	378	353
CD	333	336
AD	221	220
HD	279	232
HZ	316	311
NB	550	561
CB	506	596
KK	146	135
FF	149	138
KB - LEFT	340	392
KB – RIGHT	336	380
TB - LEFT	62	76
TB - RIGHT	66	53

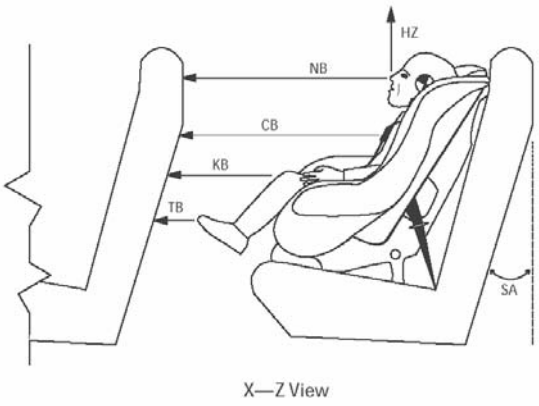
All dimensions in mm (unless noted)
P3 – Right Rear Passenger (Forward Facing)

SECTION 2… (continued)

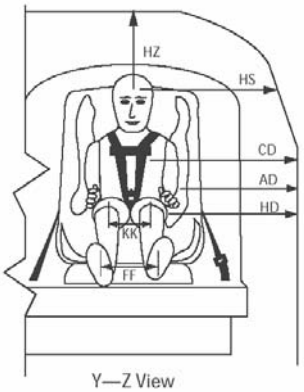
DATA SHEET NO. 3
CHILD DUMMY POSITIONING IN VEHICLE

Child Restraint System (Position 4)	Cosco Touriva (Forward Facing)
NHTSA No.	M45303

Dummy Measurements for CRS Passengers



X—Z View



Y—Z View

X—Z View

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

Measurement	Pre-Test (mm)	Post-Test (mm)
	P4 CRS (42)	P4 CRS (42)
SA (deg)	10.5	10.5
HS	422	416
CD	345	388
AD	246	238
HD	318	297
HZ	333	305
NB	549	568
CB	517	546
KK	146	130
FF	124	141
KB - LEFT	334	385
KB – RIGHT	323	378
TB - LEFT	102	91
TB - RIGHT	99	76

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 Vanguard 5
Child Restraint System (Position 4)	Cosco Touriva
NHTSA No.	M45303

HEAD PEAK ACCELERATIONS

Location	Axis	Units	Position 3				Position 4			
			Max	Time	Min	Time	Max	Time	Min	Time
Head CG	X	G's	45.3	197	-30.2	69	23.5	200	-32.2	78
Head CG	Y	G's	2.9	194	-4.8	65	2.7	110	-7.6	90
Head CG	Z	G's	56.6	82	-4.7	44	59.0	82	-9.5	44
Resultant	N/A	G's	60.7	83			64.6	83		

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	12	189	-833	74	38	193	-222	77
Neck Force	Y	N	33	190	-134	66	15	200	-58	94
Neck Force	Z	N	1824	78	-357	200	2804	83	-351	44
Resultant	N/A	N	1939	78			2810	83		
Neck Moment	X	N•m	2.8	107	-8.2	86	1.9	119	-5.9	93
Neck Moment	Y	N•m	7.0	70	-9.9	50	1.9	71	-4.1	55
Neck Moment	Z	N•m	2.3	88	-1.5	39	5.2	95	-3.4	174
Resultant	N/A	N•m	12.6	84			8.0	93		

CHEST PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	Position 3				Position 4			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	G's	6.2	186	-33.9	77	9.7	190	-34.7	72
Chest CG	Y	G's	2.2	87	-9.1	64	1.9	187	-9.9	81
Chest CG	Z	G's	13.0	200	-42.9	65	11.1	82	-33.7	64
Resultant	N/A	G's	53.8	64			46.5	65		

CHEST PEAK DISPLACEMENTS

Location	Axis	Units	Position 3				Position 4			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	mm			-18.0	98			-16.1	112

SECTION 2… (continued)

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

Child Restraint System (Position 3)	Evenflo Vanguard 5
Child Restraint System (Position 4)	Cosco Touriva
NHTSA No.	M45303

TETHER FORCE

Location	Axis	Units	Position 3				Position 4			
			Max	Time	Min	Time	Max	Time	Min	Time
Tether Force	N/A	N	4012	60	-122	199	4661	68	-15	153

PELVIC PEAK ACCELERATIONS

Location	Axis	Units	Position 3				Position 4			
			Max	Time	Min	Time	Max	Time	Min	Time
Pelvis	X	G's	9.7	125	-61.0	66	15.9	120	-47.8	66
Pelvis	Y	G's	8.7	74	-11.0	61	3.5	130	-15.8	62
Pelvis	Z	G's	13.8	200	-39.4	62.3	**	**	**	**
Resultant	N/A	G's	71.7	65						

** - No Valid Data collected

HEAD PEAK REDUNDANT ACCELERATIONS

Location	Axis	Units	Position 3				Position 4			
			Max	Time	Min	Time	Max	Time	Min	Time
Head CG	X	G's	43.6	197	-33.0	66	23.0	200	-31.1	76
Head CG	Y	G's	2.9	194	-5.4	65	4.8	62	-8.3	90
Head CG	Z	G's	56.4	82	-4.3	43	60.3	83	-8.8	44
Resultant	N/A	G's	61.3	82			65.8	83		

CHEST PEAK REDUNDANT ACCELERATIONS

Location	Axis	Units	Position 3				Position 4			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	G's	6.4	186	-33.0	77	9.9	190	-35.7	72
Chest CG	Y	G's	2.8	85	-9.8	64	1.9	174	-8.9	82
Chest CG	Z	G's	13.2	200	-42.5	65	11.8	82	-33.6	64
Resultant	N/A	G's	54.0	64			47.0	65		

SECTION 2… (continued)

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

Child Restraint System (Position 3)	Evenflo Vanguard 5
Child Restraint System (Position 4)	Cosco Touriva
NHTSA No.	M45303

HEAD INJURY CRITERIA (HIC36)

Location	HIC	T^1 (msec)	T^2 (msec)	Average Acceleration (G's)
Position 3 - Right	529.0	64.3	100.3	46.4
Position 4 – Left	623.9	63.0	99.0	49.6

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	343.9	77.3	92.3	55.5
Position 4 – Left	399.9	73.9	88.9	58.9

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	52.2	61.9	64.9
Position 4 – Left	45.1	63.3	66.3

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 Vanguard 5 (Forward Facing)
Child Restraint System (Position 4)	Cosco Touriva (Forward Facing)
NHTSA No.	M45303

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	Yes	Top tether opening to top tether slot
Fabric Tears on CRS	None	
Vehicle Seat Structure	None	
Vehicle Seat Fabric Tears	None	
Child Dummy	None	

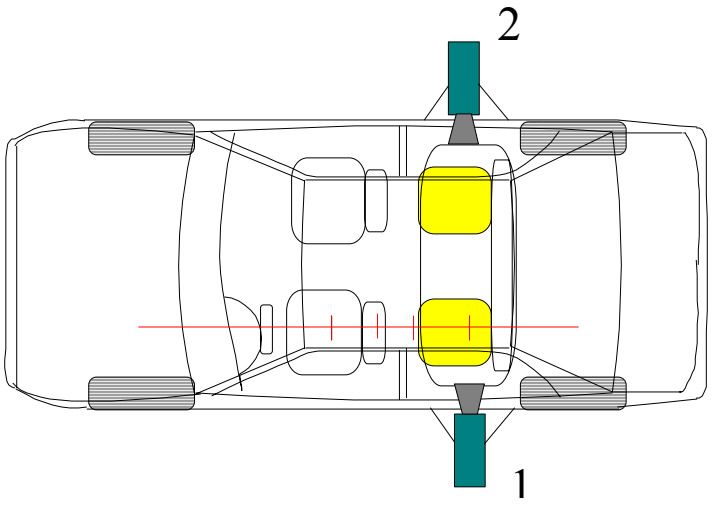
POSITION 4 CRS POST-TEST INSPECTION

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)	Cosco Touriva (Forward Facing)
NHTSA No.	M45303



No.	Camera View	Location (mm) *			Angle (deg)	Lens (mm)	Speed (fps)
		X	Y	Z			
1	Left Side CRS Lateral View					13	524
2	Right Side CRS Lateral View					13	*

*COORDINATES:

+X = film plane rearward of barrier

+Y = film plane to right of monorail centerline

+Z = film plane above ground level

* No timing marks

APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

A-1.

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

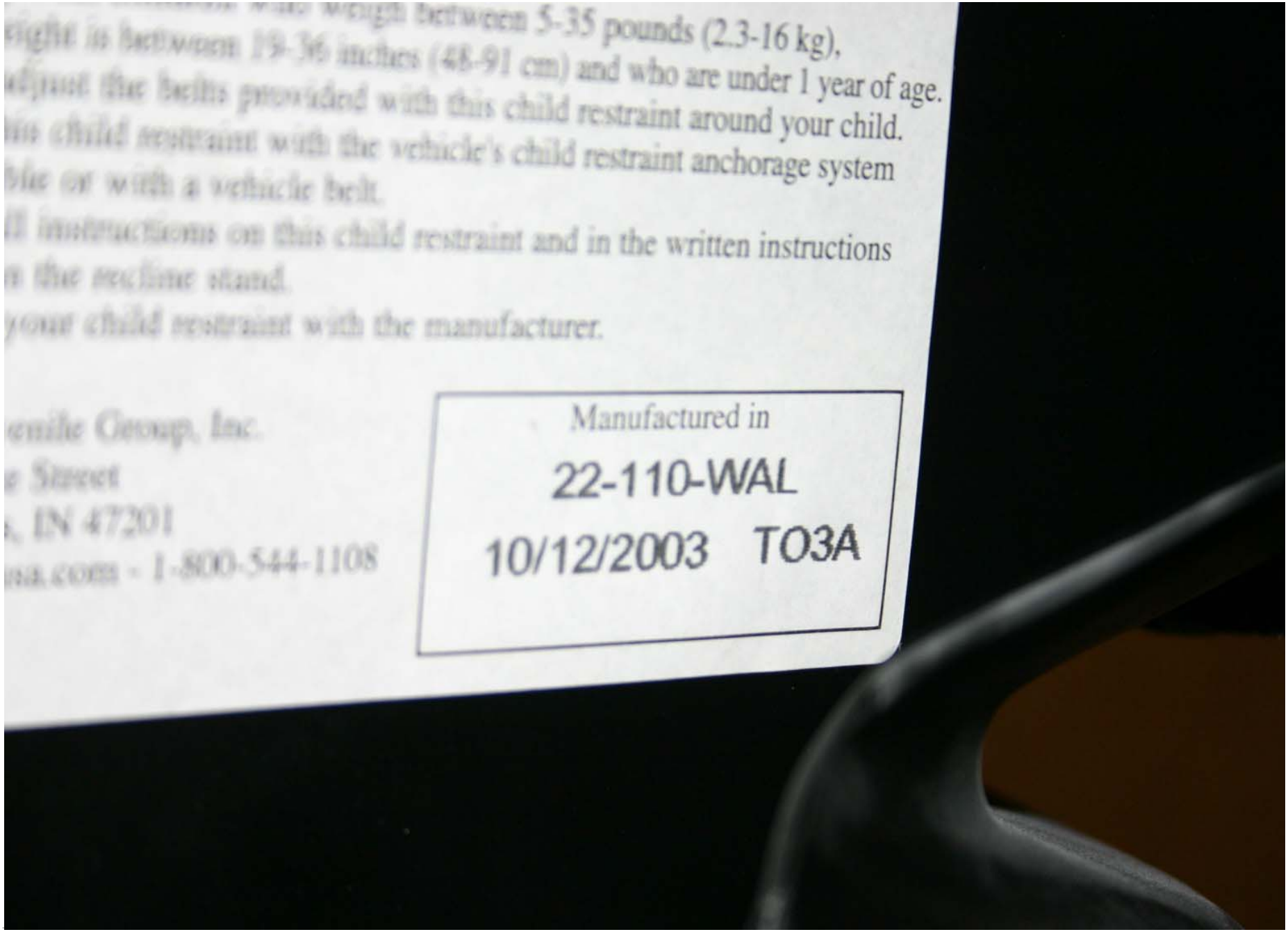
Post-Test Rear View of Position 3 CRS

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



A-10.

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

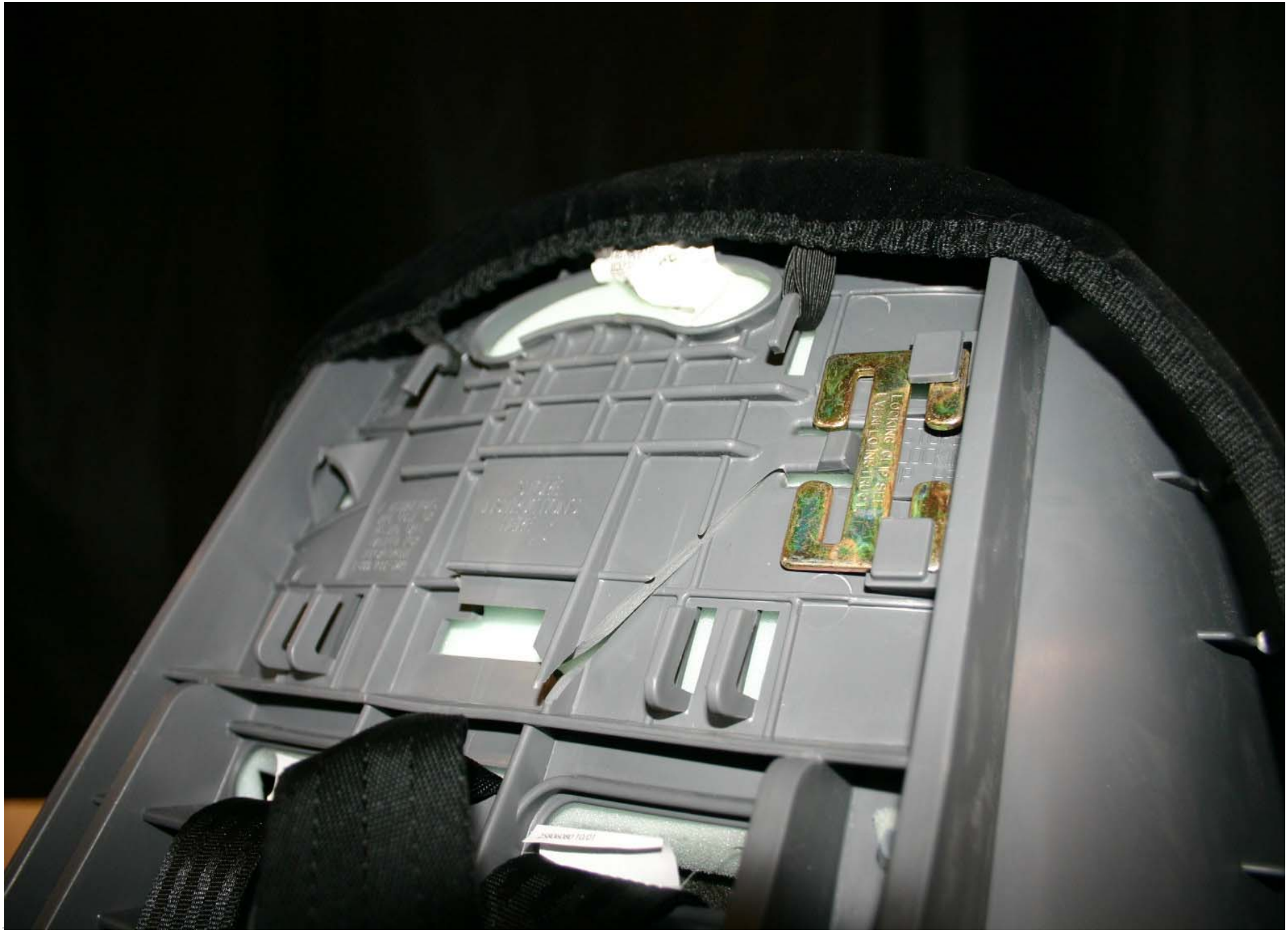
Pre-Test Position 3 Foot Contact View

Pre-Test Position 4 Foot Contact View

Post-Test Position 3 Front ¾ View

Post-Test Position 4 Front ¾ View

Post-Test Position 3 (Evenflo Child Seat) Left View of Cracks



Post-Test Position 3 (Evenflo Child Seat) Right View of Cracks

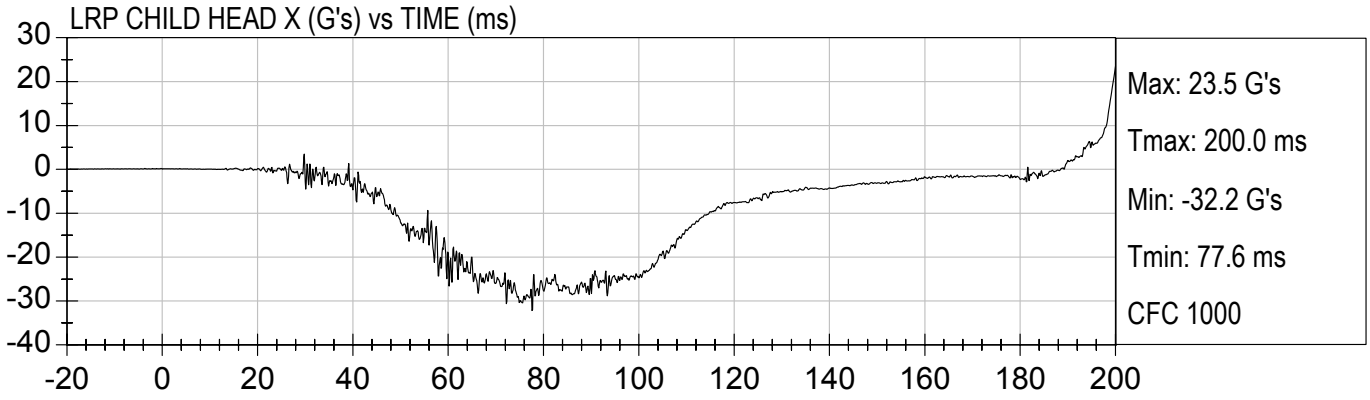
APPENDIX B

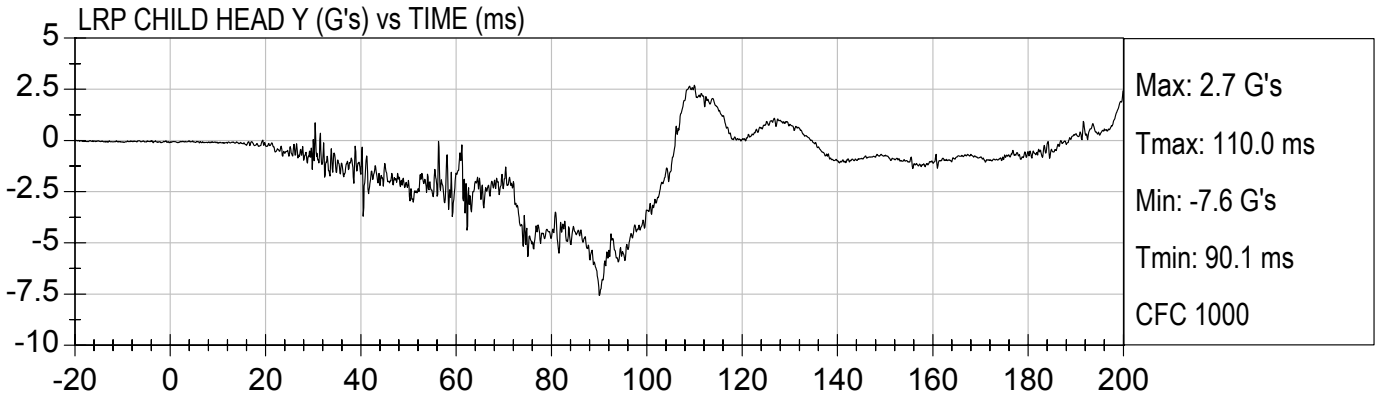
CHILD DUMMY RESPONSE DATA TRACES

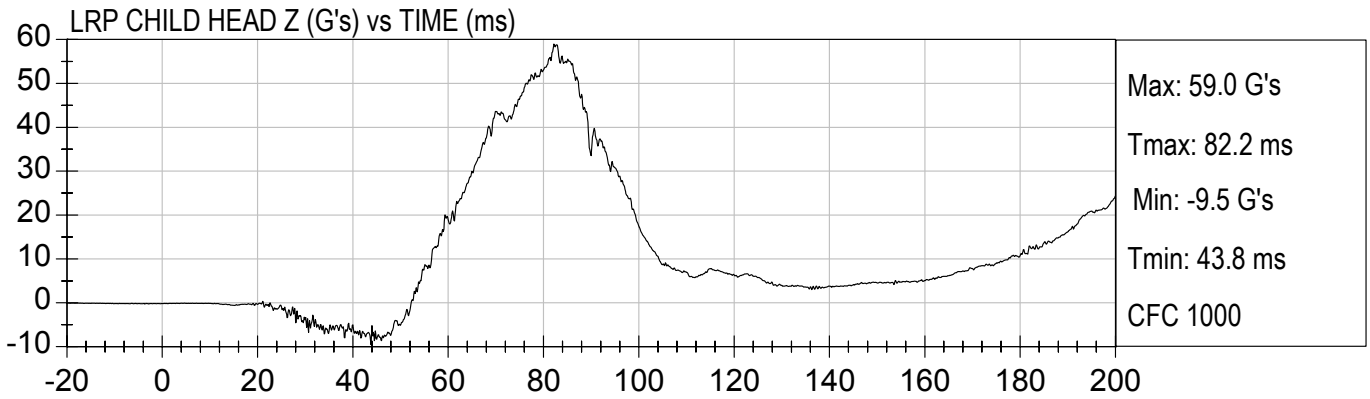
TABLE OF DATA PLOTS

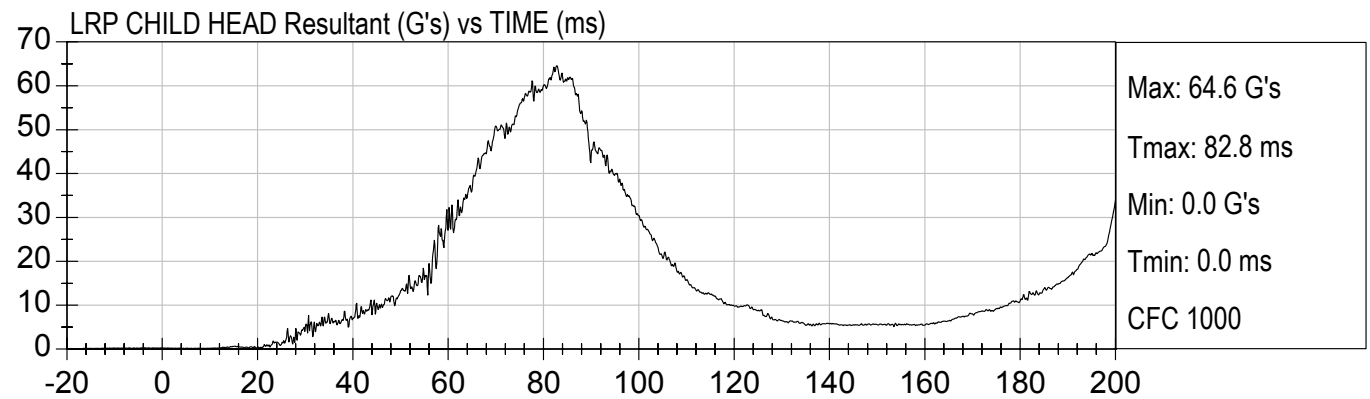
35MPH NCAP FRONTAL
2004 ACURA TSX

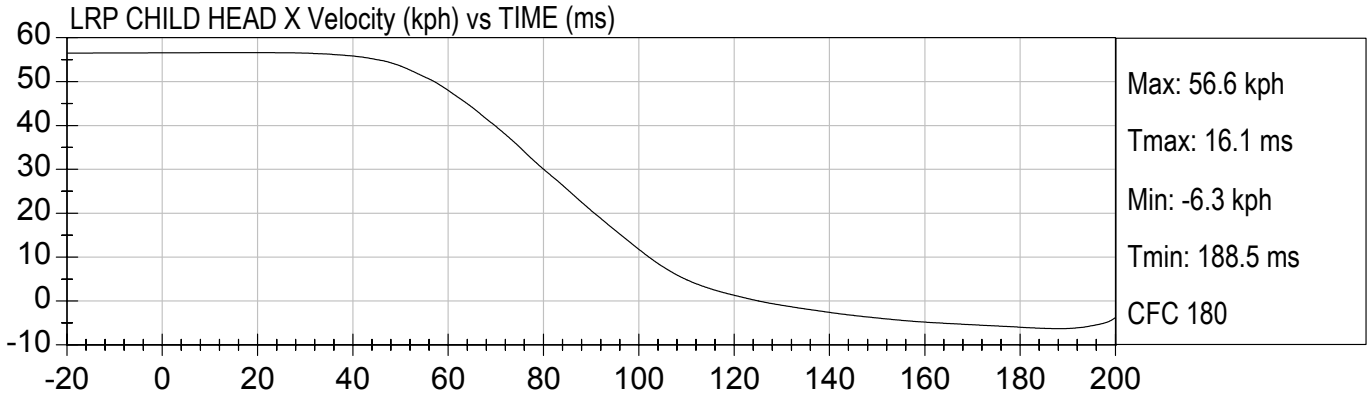
Test Date: 1/13/2004
Speed: 35.1 mph (56.5 km/h)

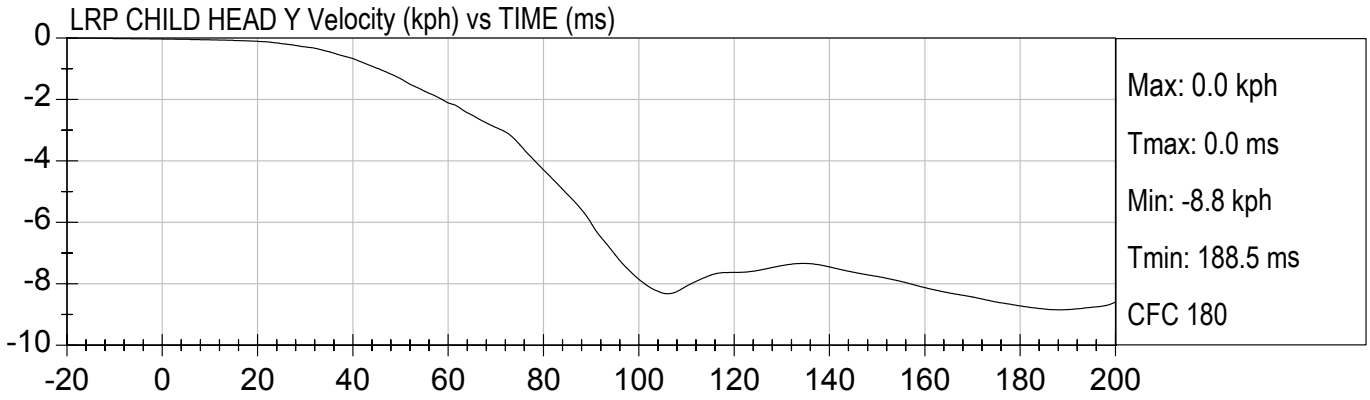


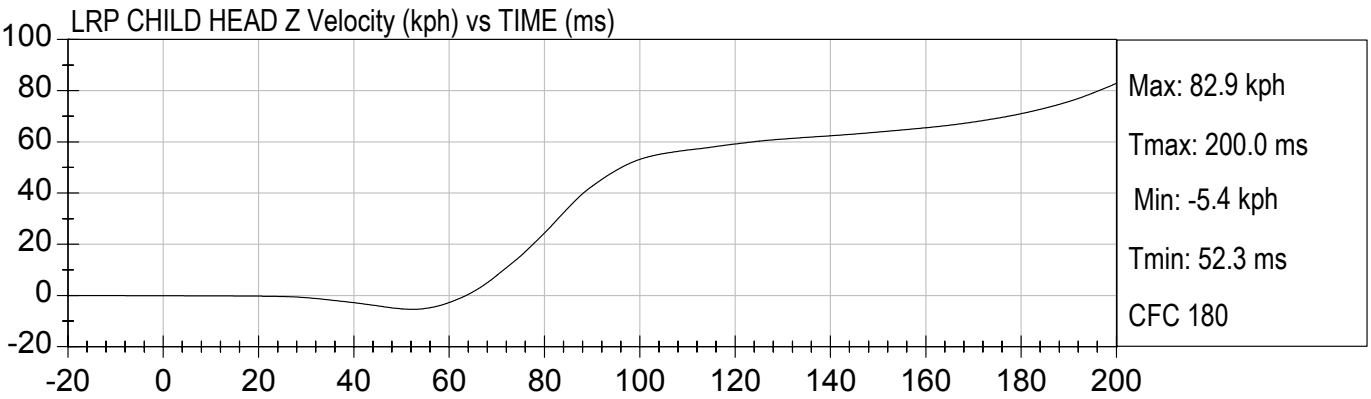






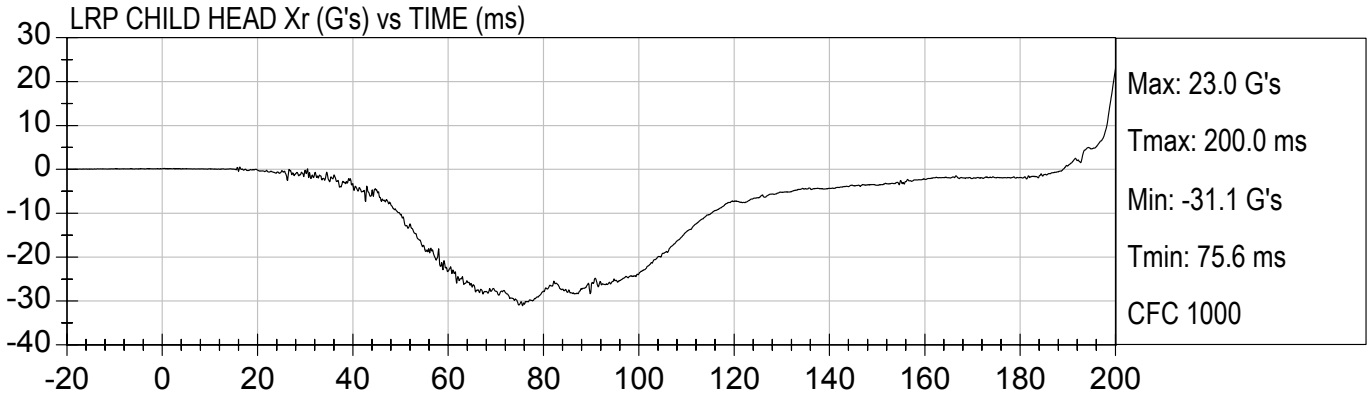

LRP CHILD HEAD X Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20 0 20 40 60 80 100 120 140 160 180 200
Max: 56.6 kph
Tmax: 16.1 ms
Min: -6.3 kph
Tmin: 188.5 ms
CFC 180

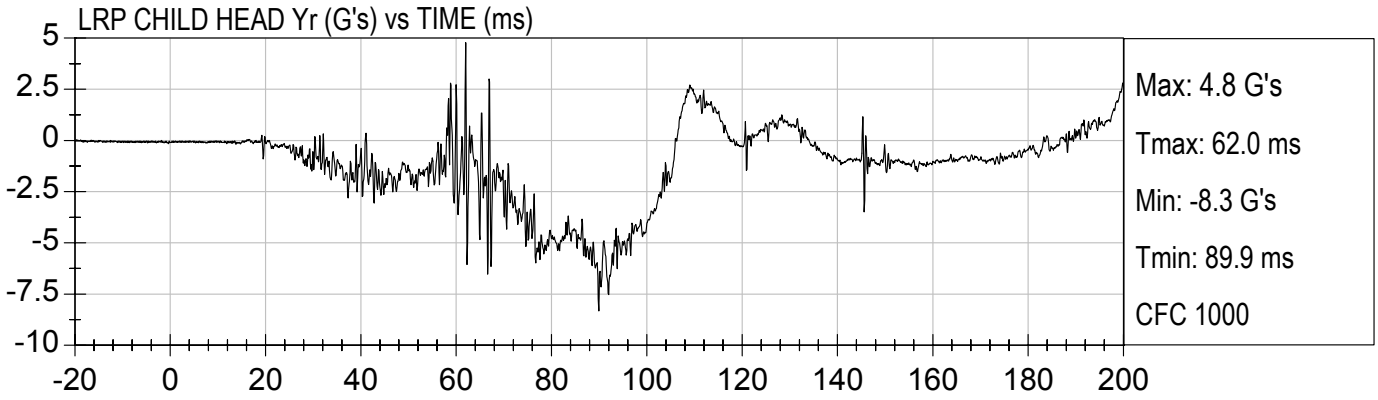

LRP CHILD HEAD Y Velocity (kph) vs TIME (ms)
0
-2
-4
-6
-8
-10
-20 0 20 40 60 80 100 120 140 160 180 200
Max: 0.0 kph
Tmax: 0.0 ms
Min: -8.8 kph
Tmin: 188.5 ms
CFC 180

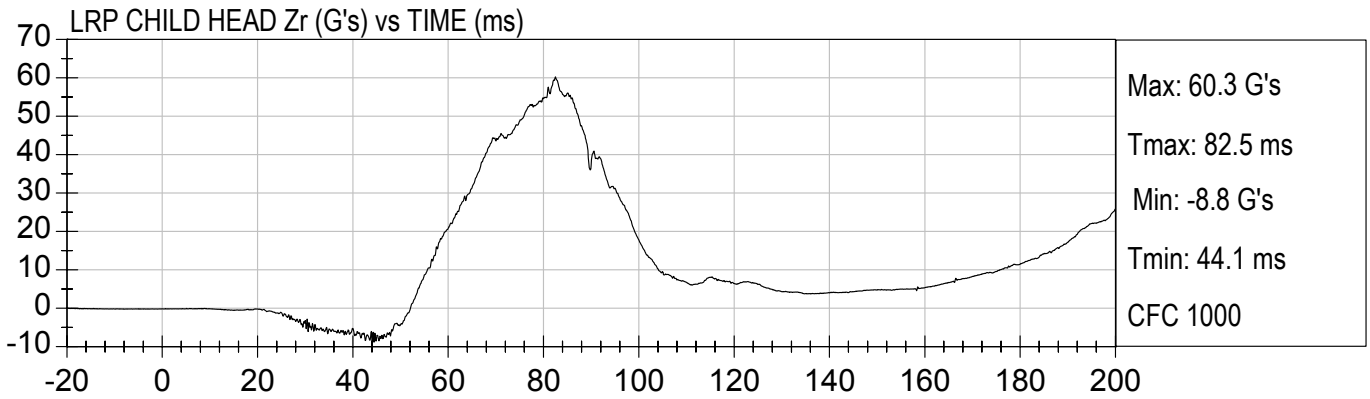

LRP CHILD HEAD Z Velocity (kph) vs TIME (ms)
100
80
60
40
20
0
-20
-20 0 20 40 60 80 100 120 140 160 180 200
Max: 82.9 kph
Tmax: 200.0 ms
Min: -5.4 kph
Tmin: 52.3 ms
CFC 180

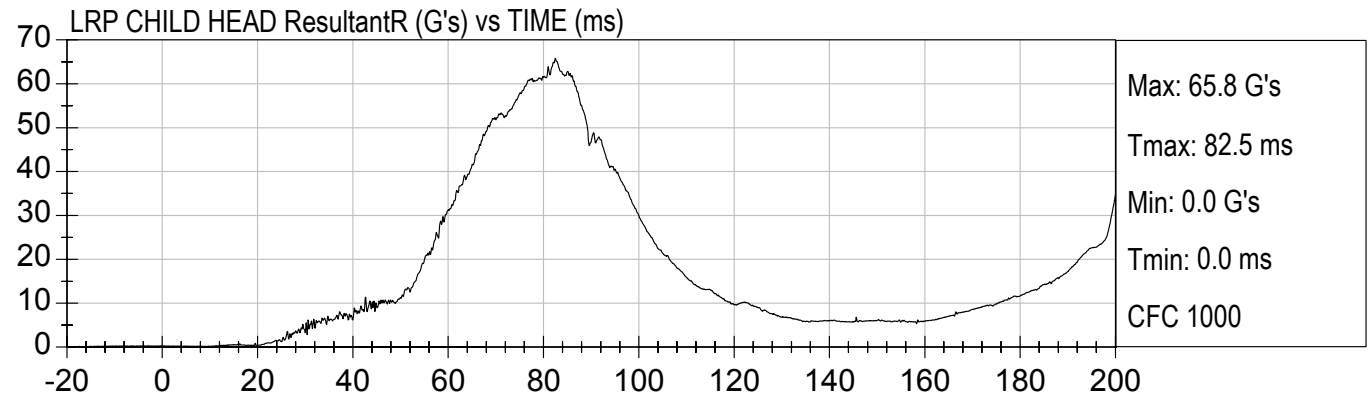
35MPH NCAP FRONTAL
2004 ACURA TSX

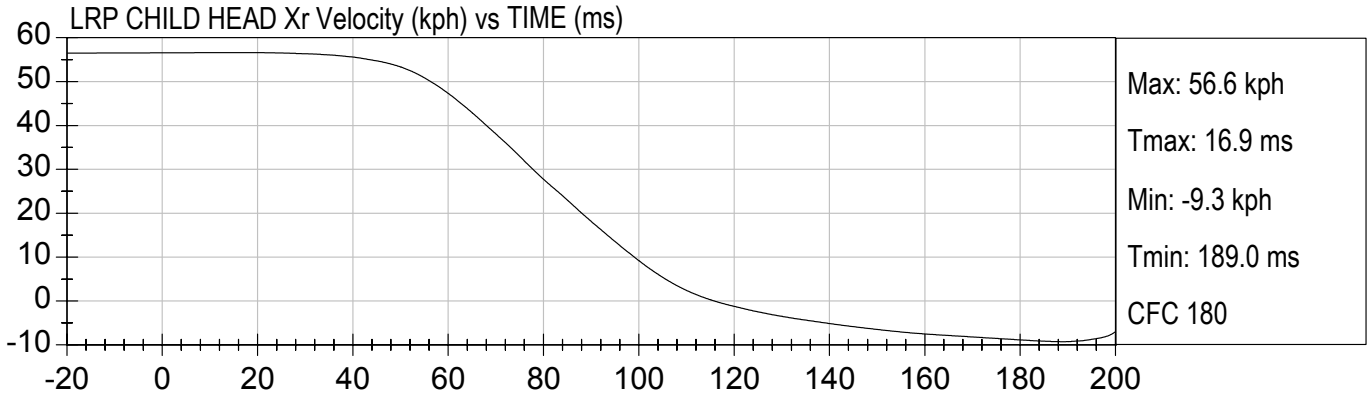
Test Date: 1/13/2004
Speed: 35.1 mph (56.5 km/h)

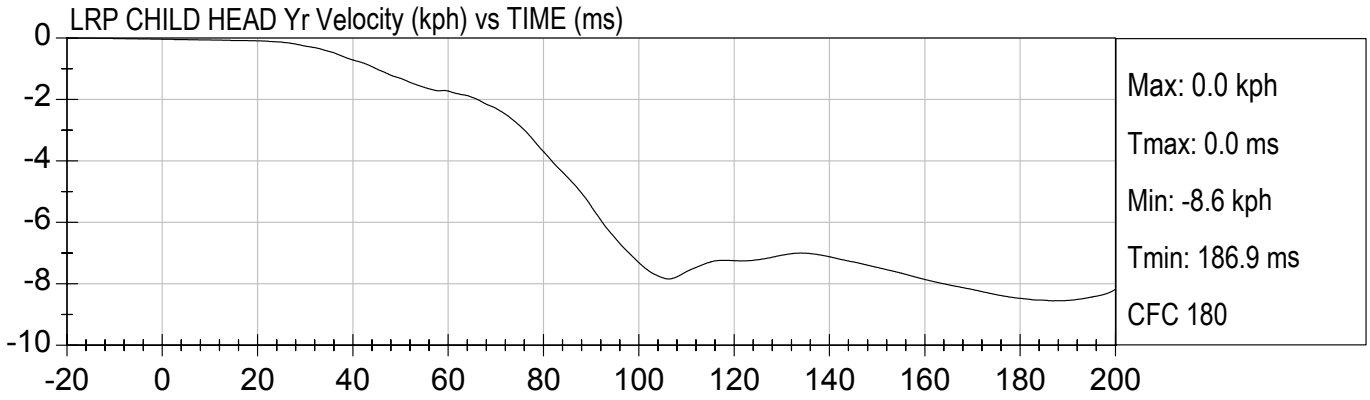


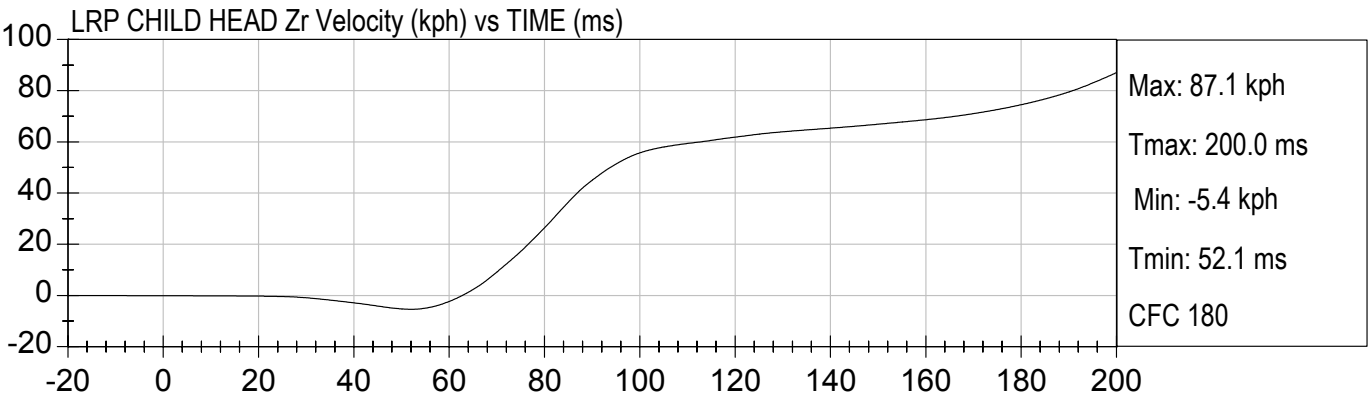






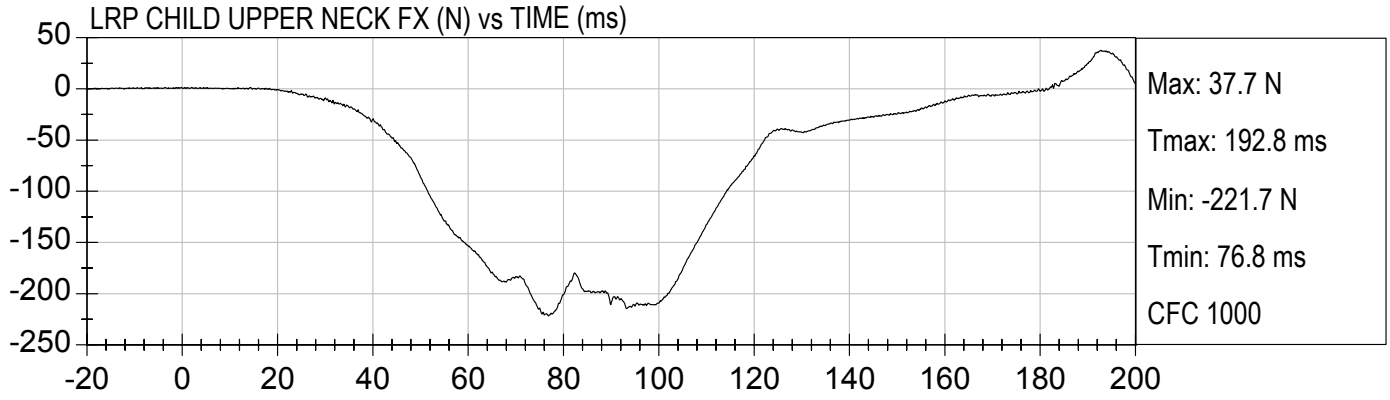

LRP CHILD HEAD Xr Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 56.6 kph
Tmax: 16.9 ms
Min: -9.3 kph
Tmin: 189.0 ms
CFC 180

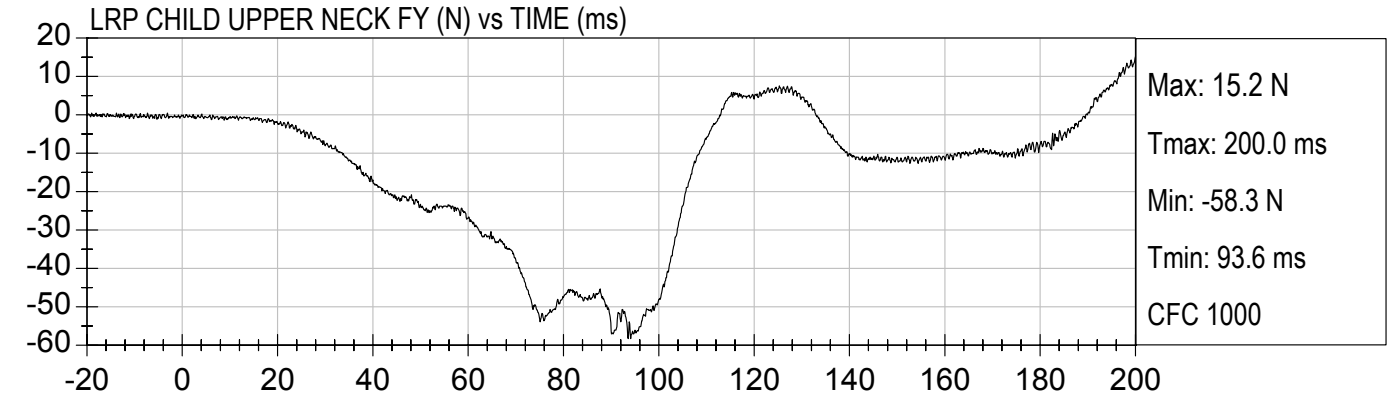

LRP CHILD HEAD Yr Velocity (kph) vs TIME (ms)
0
-2
-4
-6
-8
-10
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 0.0 kph
Tmax: 0.0 ms
Min: -8.6 kph
Tmin: 186.9 ms
CFC 180

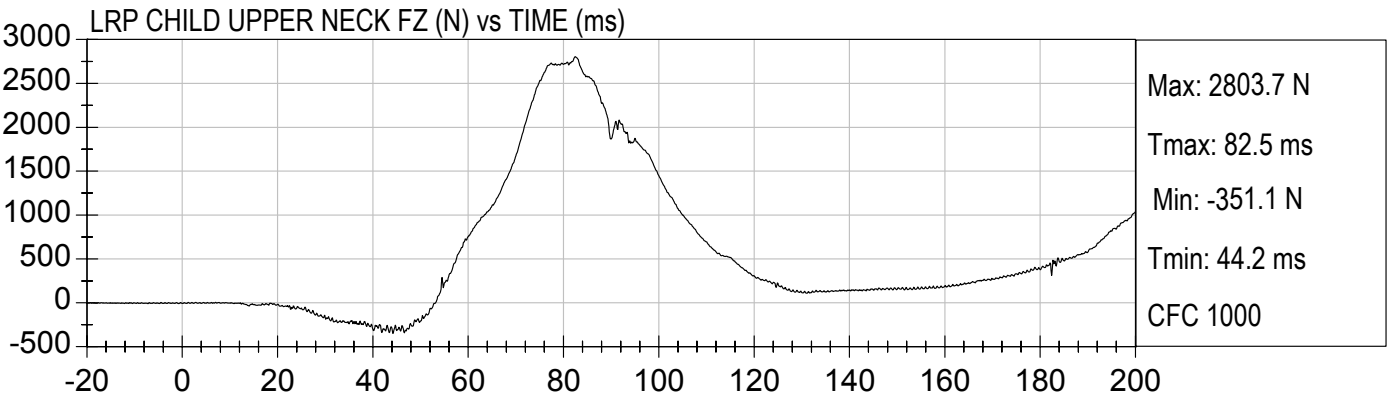

LRP CHILD HEAD Zr Velocity (kph) vs TIME (ms)
100
80
60
40
20
0
-20
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 87.1 kph
Tmax: 200.0 ms
Min: -5.4 kph
Tmin: 52.1 ms
CFC 180

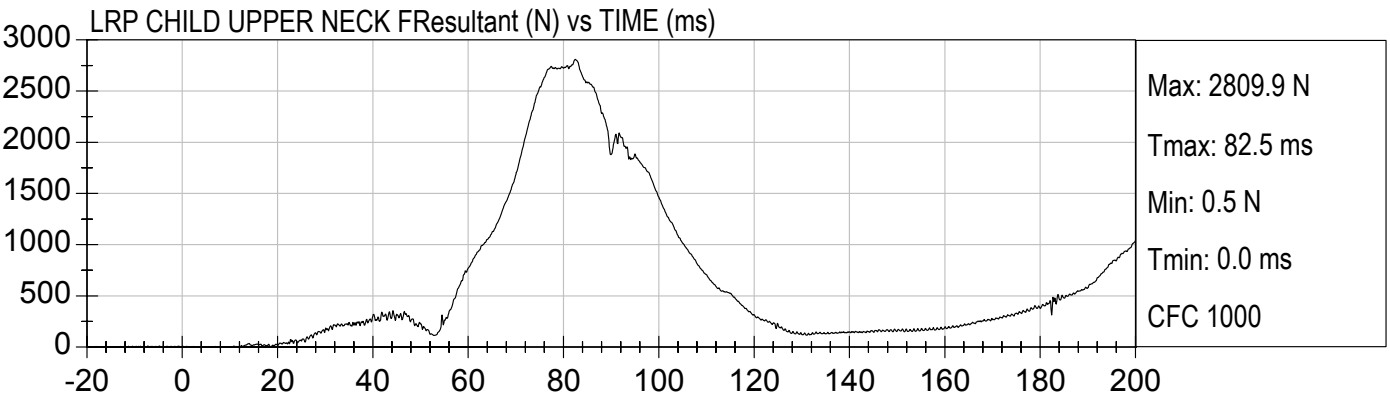
35MPH NCAP FRONTAL
2004 ACURA TSX

Test Date: 1/13/2004
Speed: 35.1 mph (56.5 km/h)



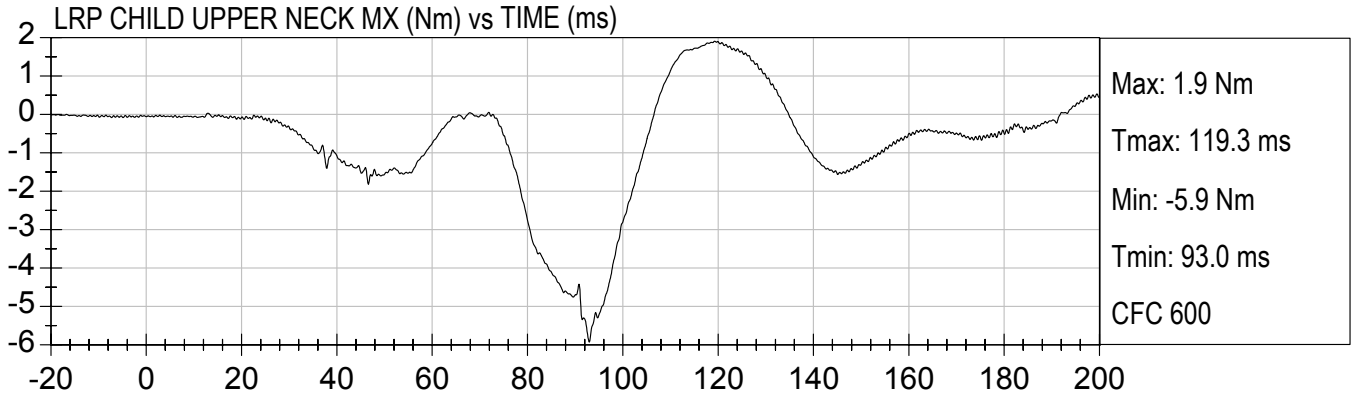


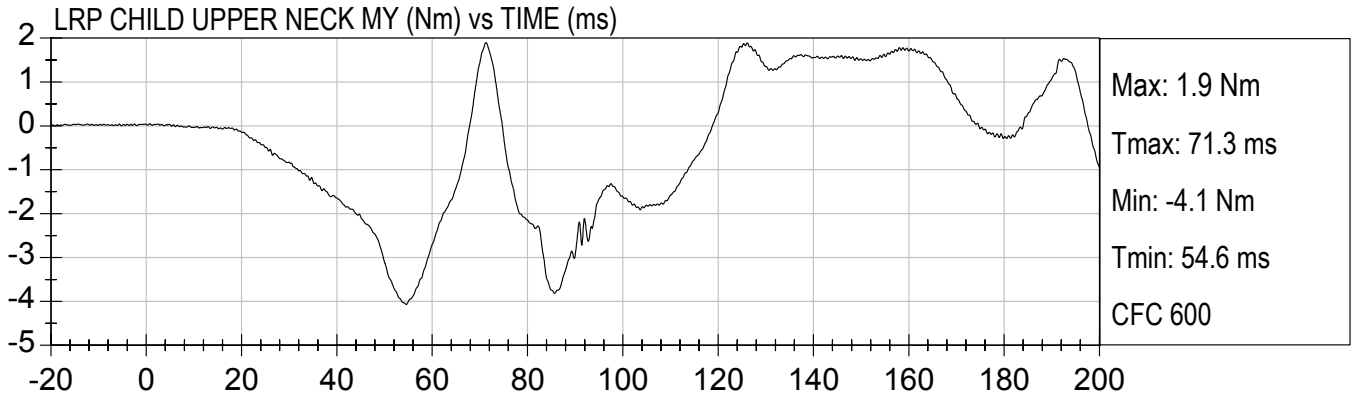


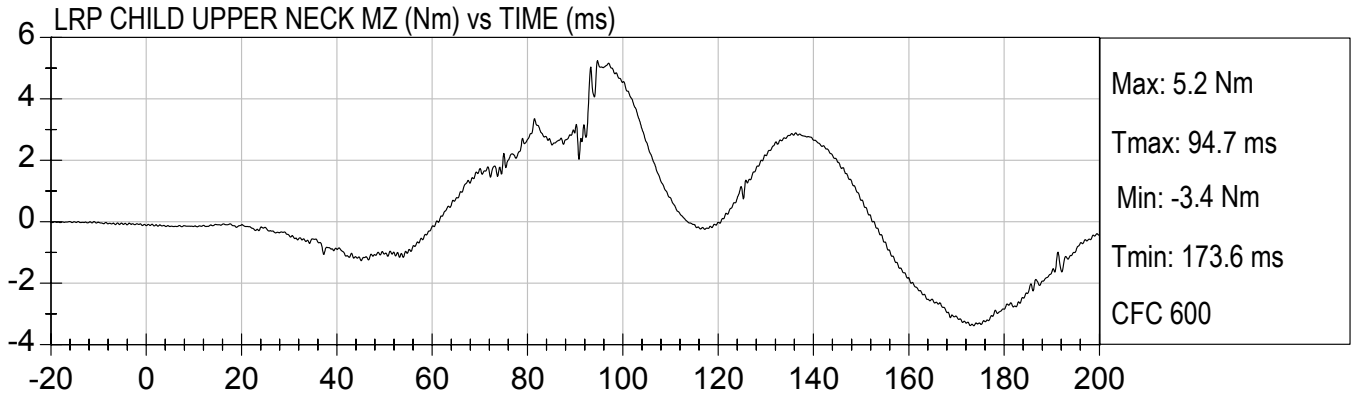


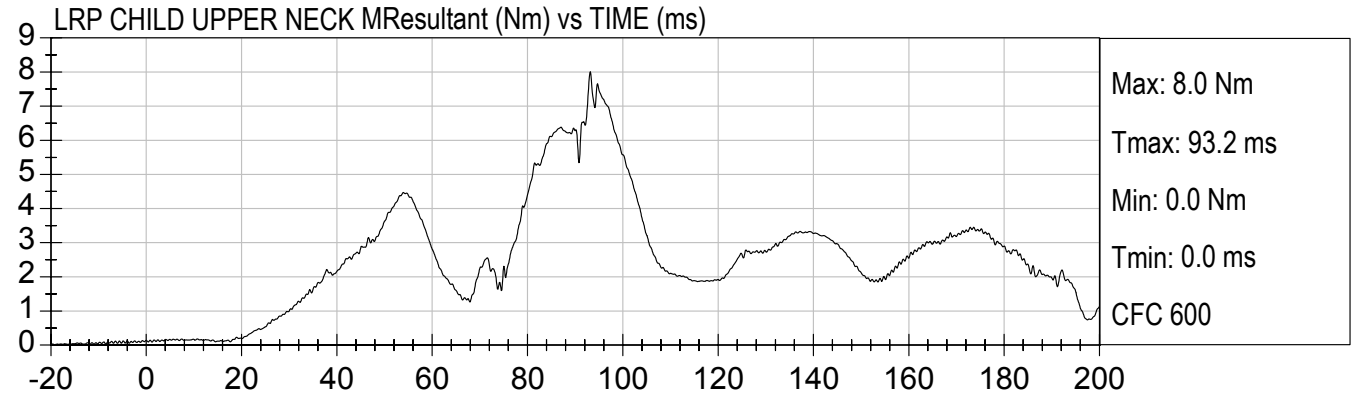
35MPH NCAP FRONTAL
2004 ACURA TSX

Test Date: 1/13/2004
Speed: 35.1 mph (56.5 km/h)



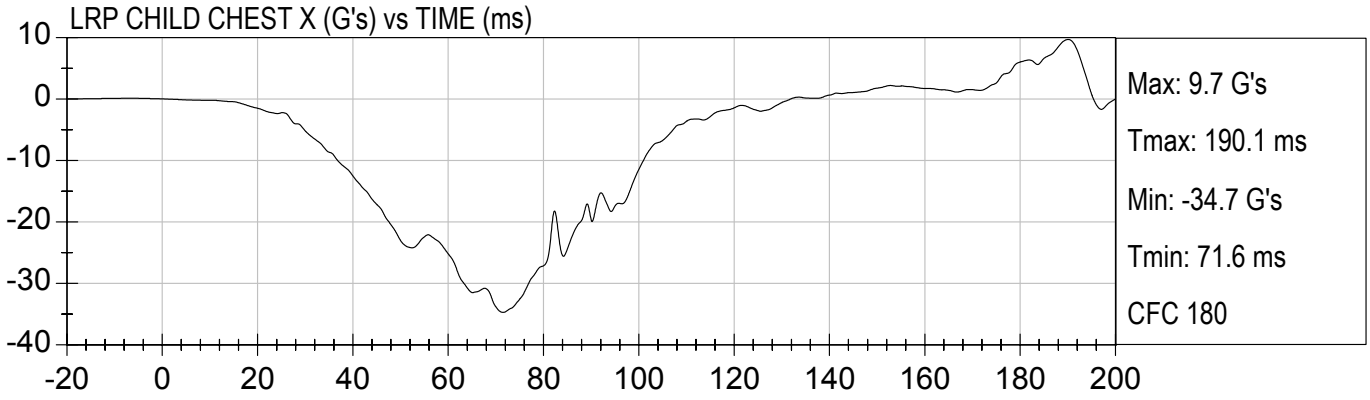


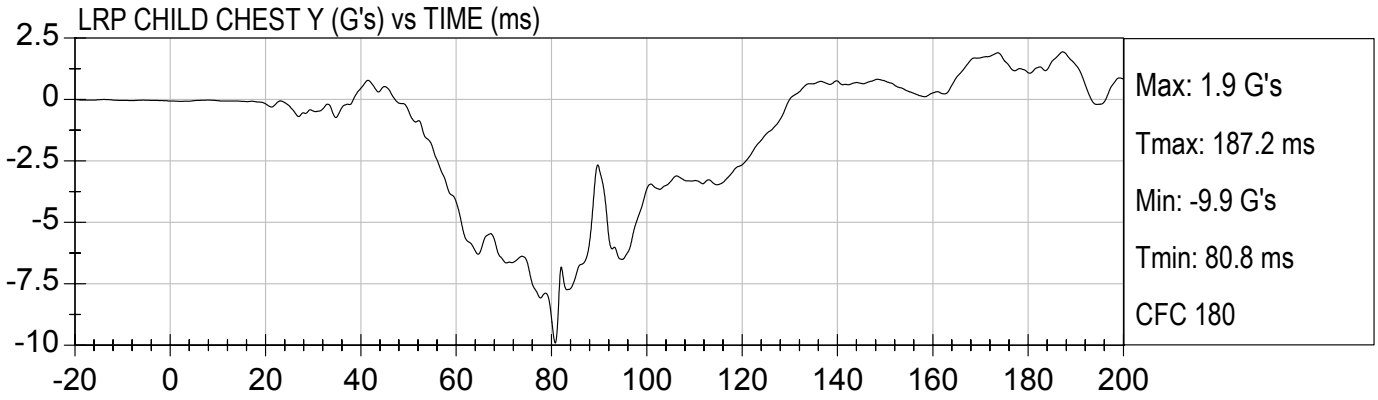


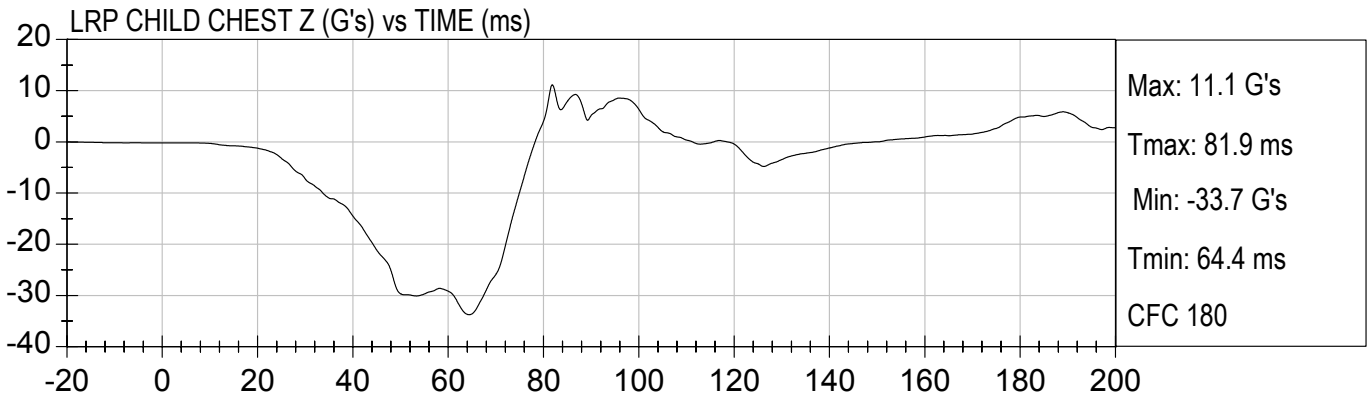


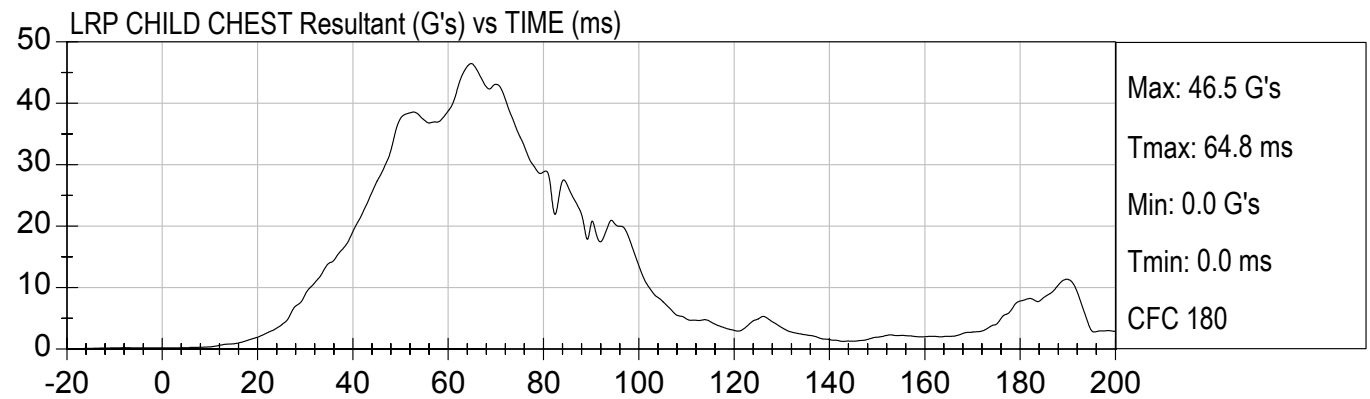
35MPH NCAP FRONTAL
2004 ACURA TSX

Test Date: 1/13/2004
Speed: 35.1 mph (56.5 km/h)



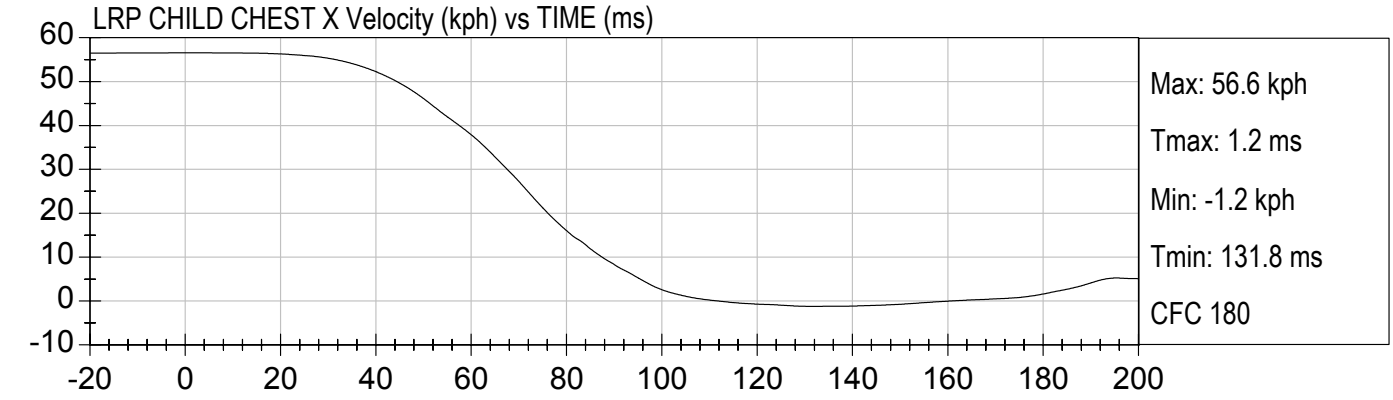


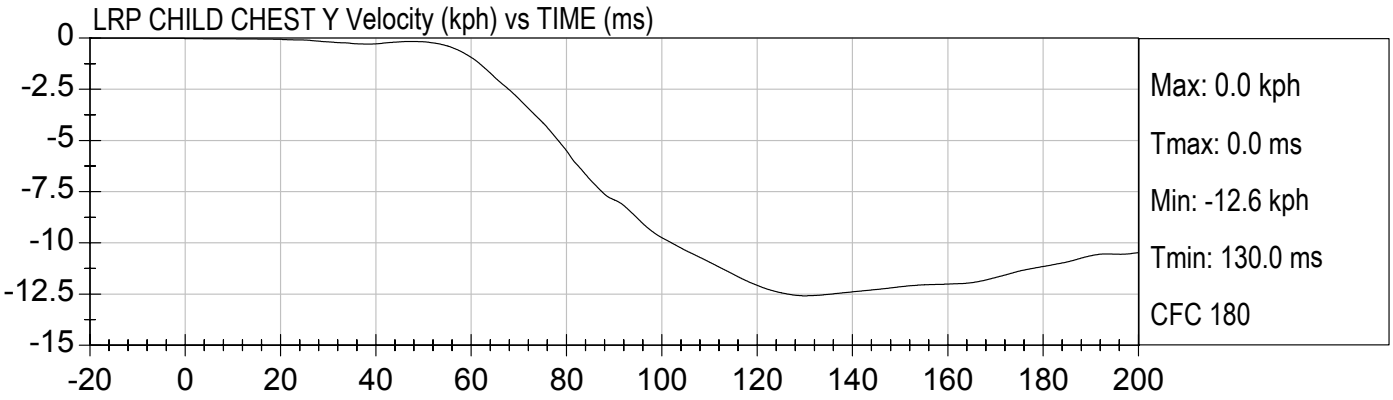


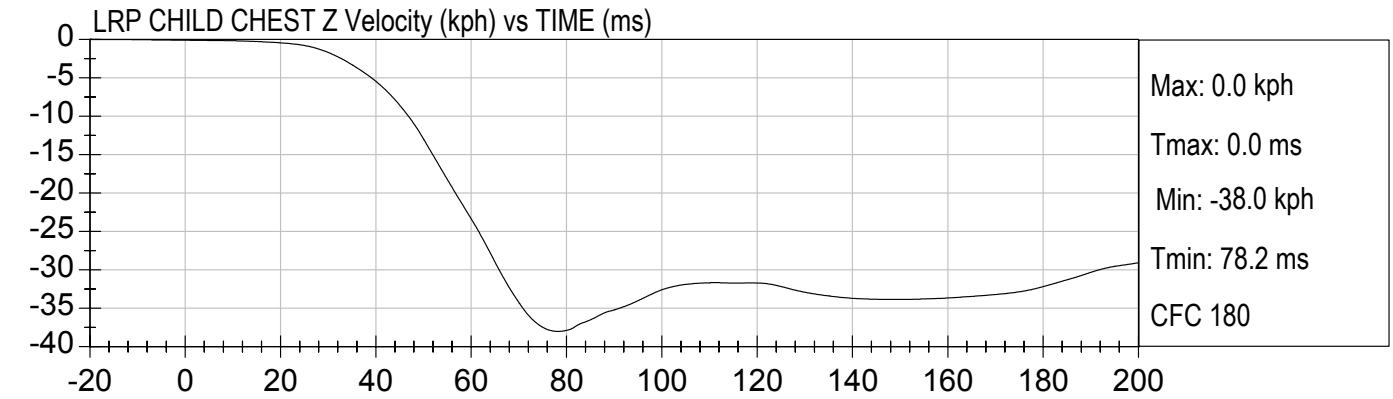


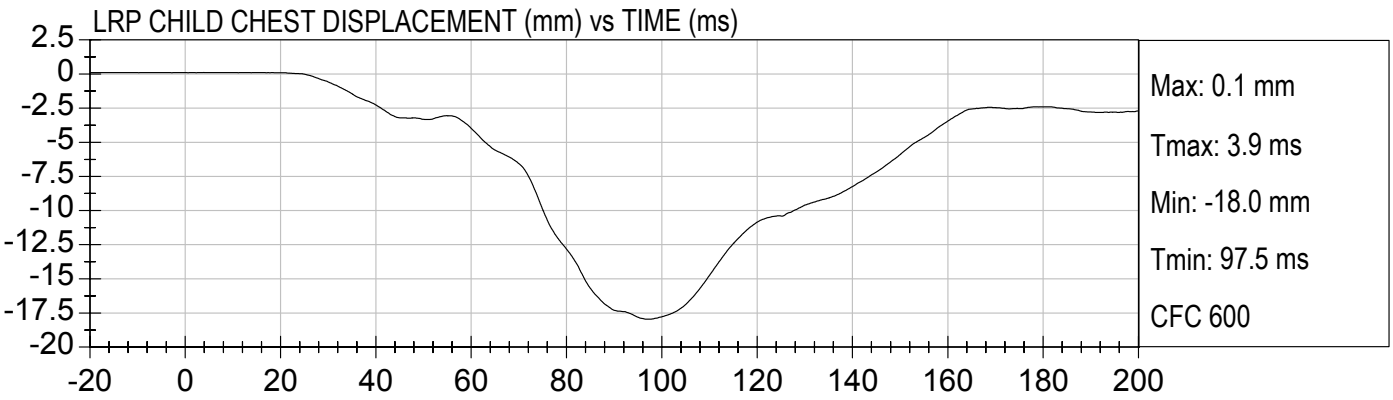
35MPH NCAP FRONTAL
2004 ACURA TSX

Test Date: 1/13/2004
Speed: 35.1 mph (56.5 km/h)



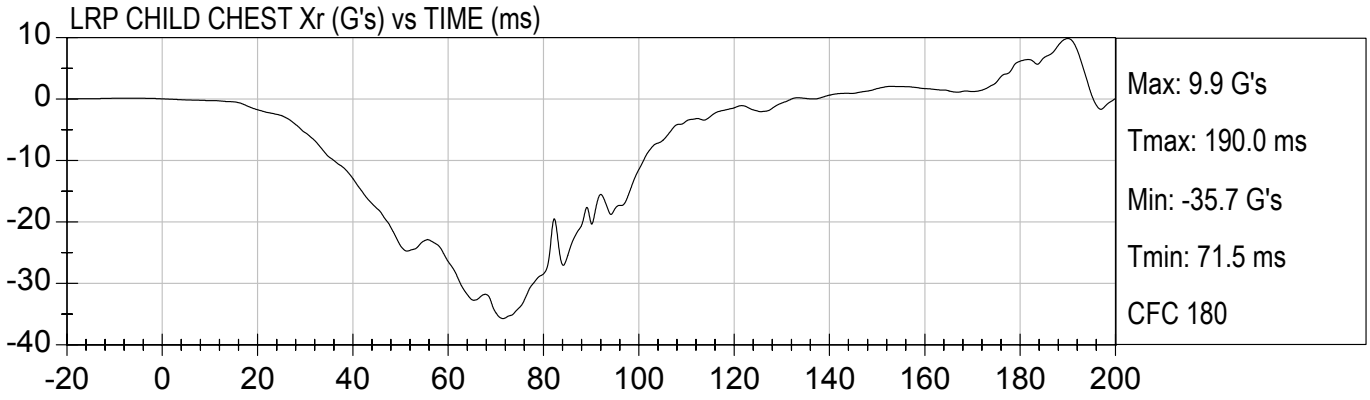


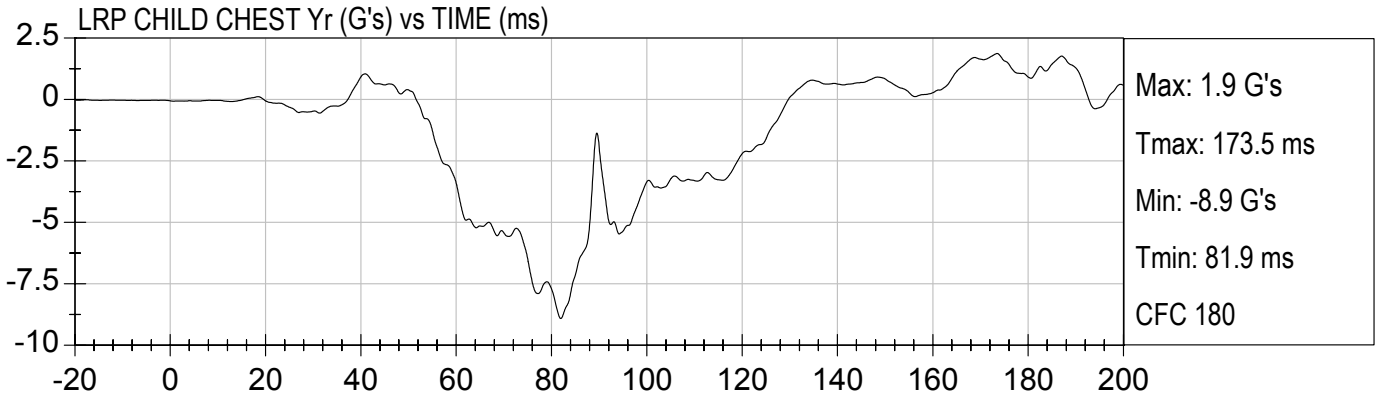


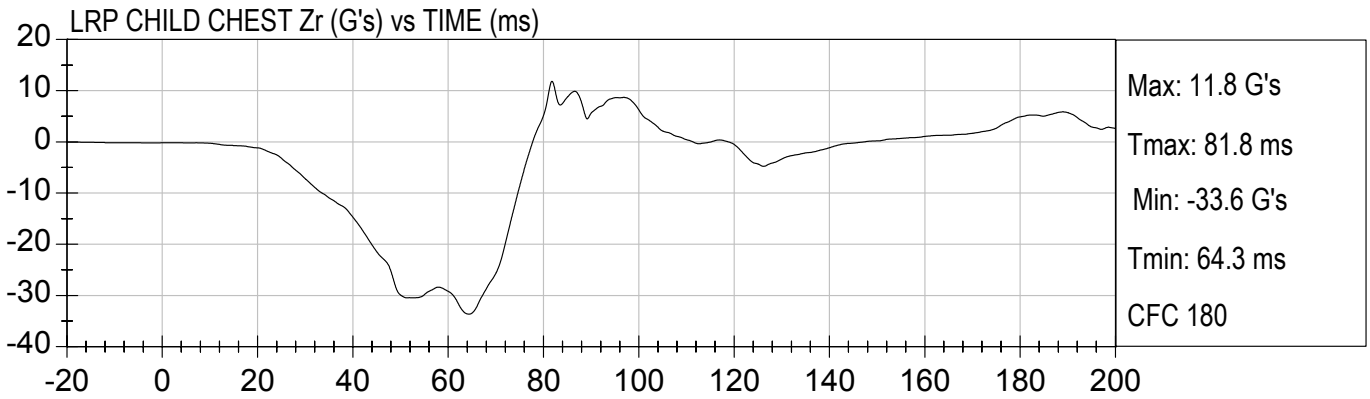


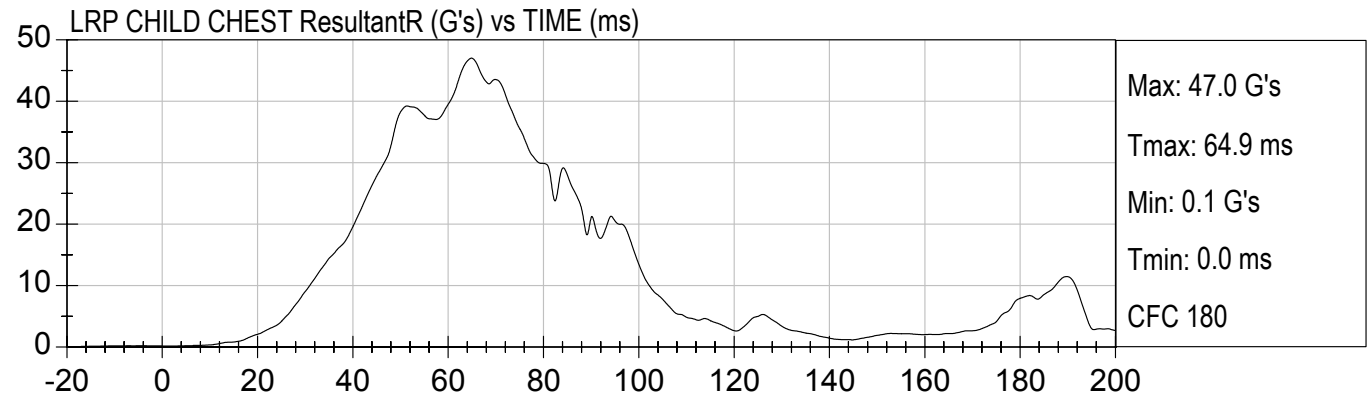
35MPH NCAP FRONTAL
2004 ACURA TSX

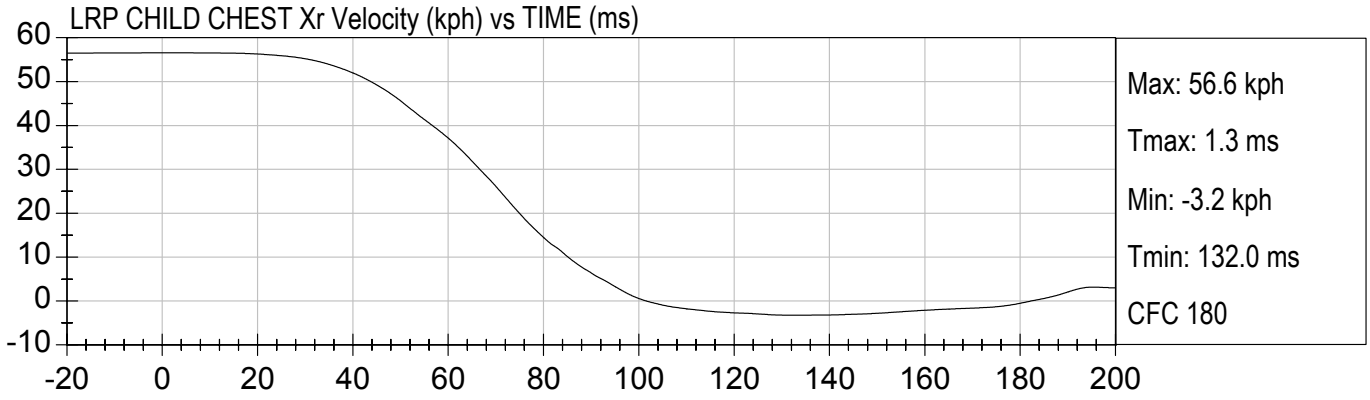
Test Date: 1/13/2004
Speed: 35.1 mph (56.5 km/h)

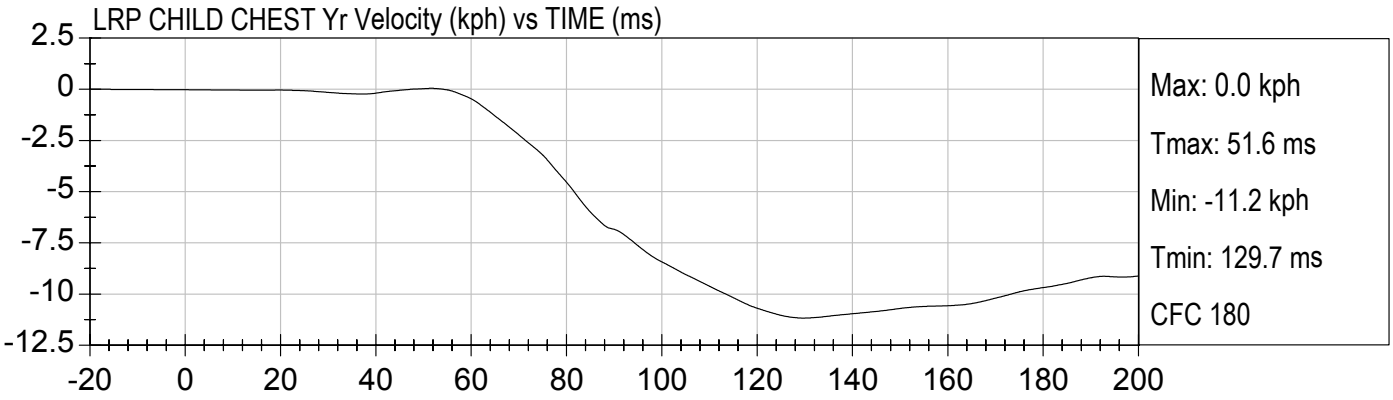


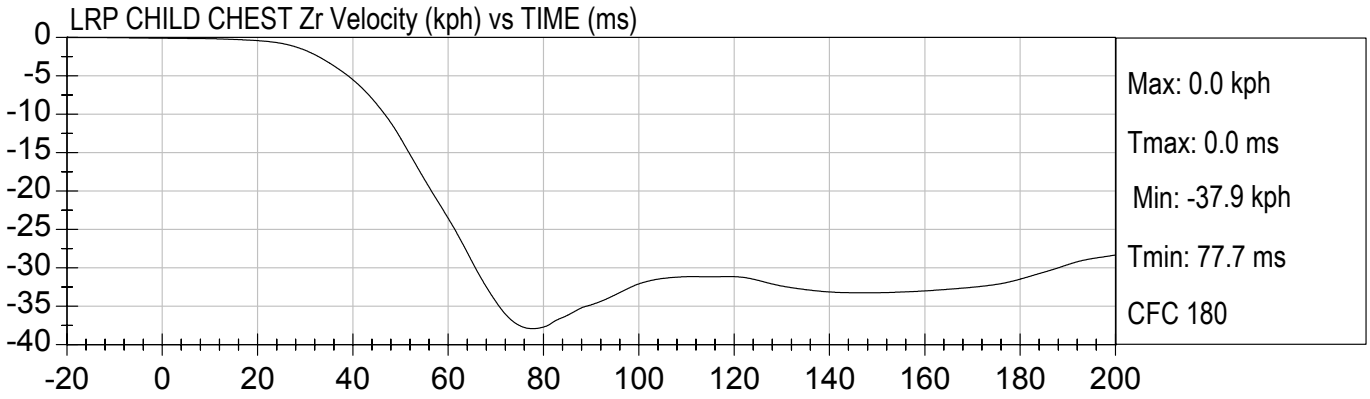






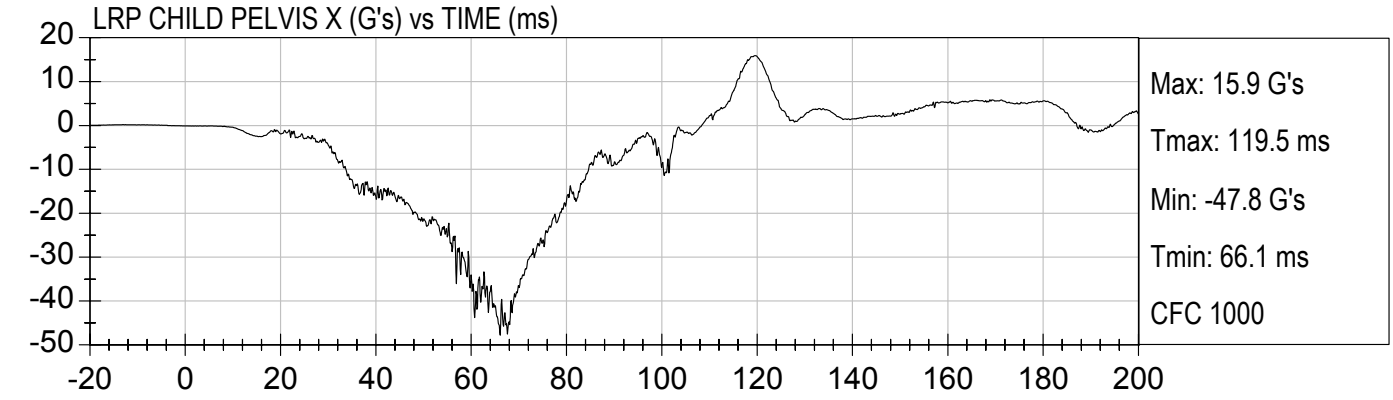

LRP CHILD CHEST Xr Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 56.6 kph
Tmax: 1.3 ms
Min: -3.2 kph
Tmin: 132.0 ms
CFC 180

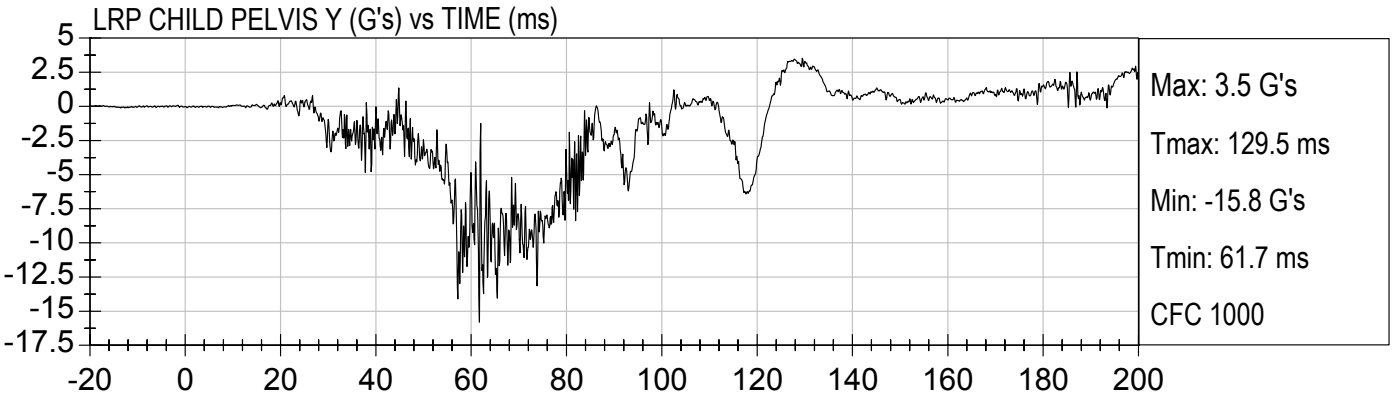

LRP CHILD CHEST Yr Velocity (kph) vs TIME (ms)
2.5
0
-2.5
-5
-7.5
-10
-12.5
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 0.0 kph
Tmax: 51.6 ms
Min: -11.2 kph
Tmin: 129.7 ms
CFC 180

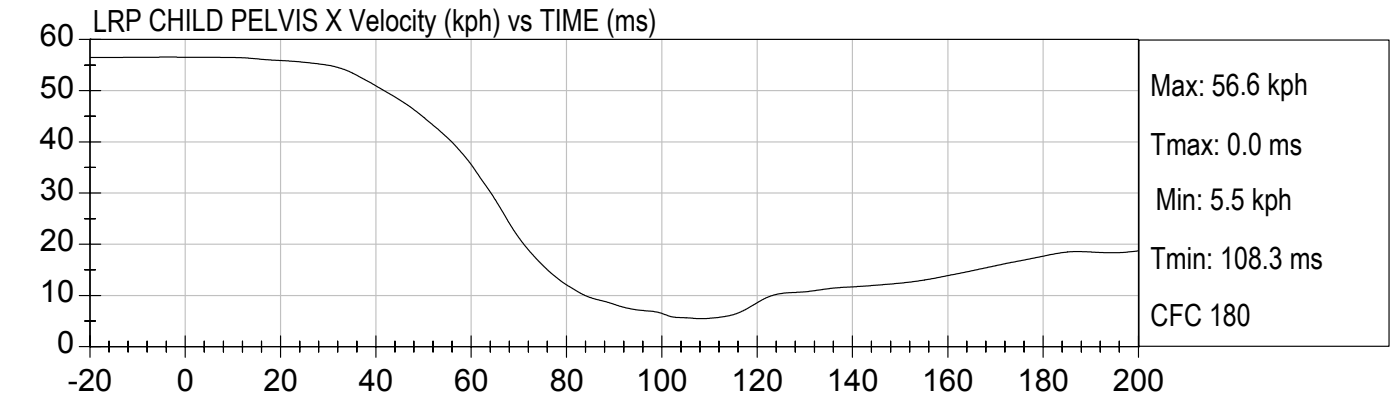

LRP CHILD CHEST Zr Velocity (kph) vs TIME (ms)
0
-5
-10
-15
-20
-25
-30
-35
-40
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 0.0 kph
Tmax: 0.0 ms
Min: -37.9 kph
Tmin: 77.7 ms
CFC 180

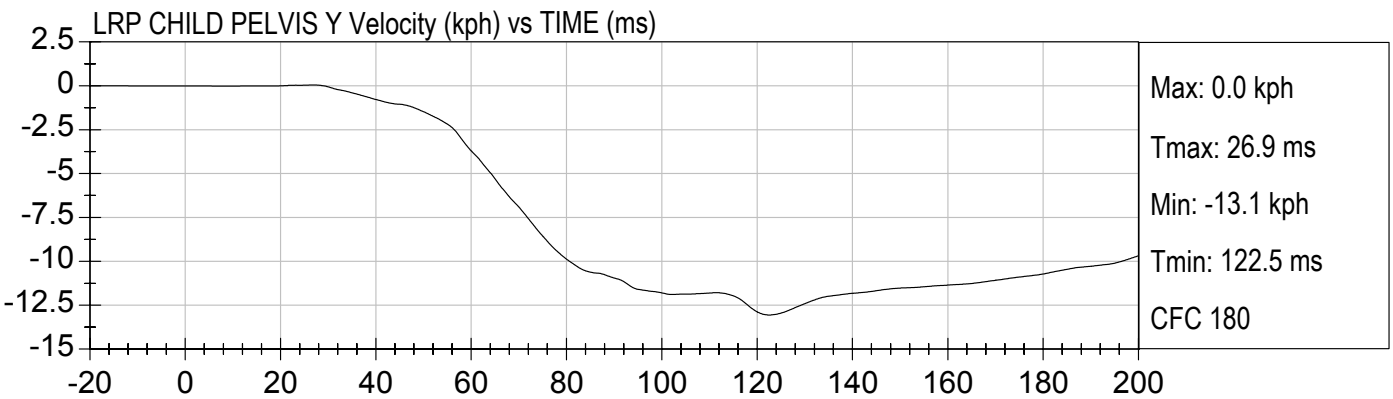
35MPH NCAP FRONTAL
2004 ACURA TSX

Test Date: 1/13/2004
Speed: 35.1 mph (56.5 km/h)



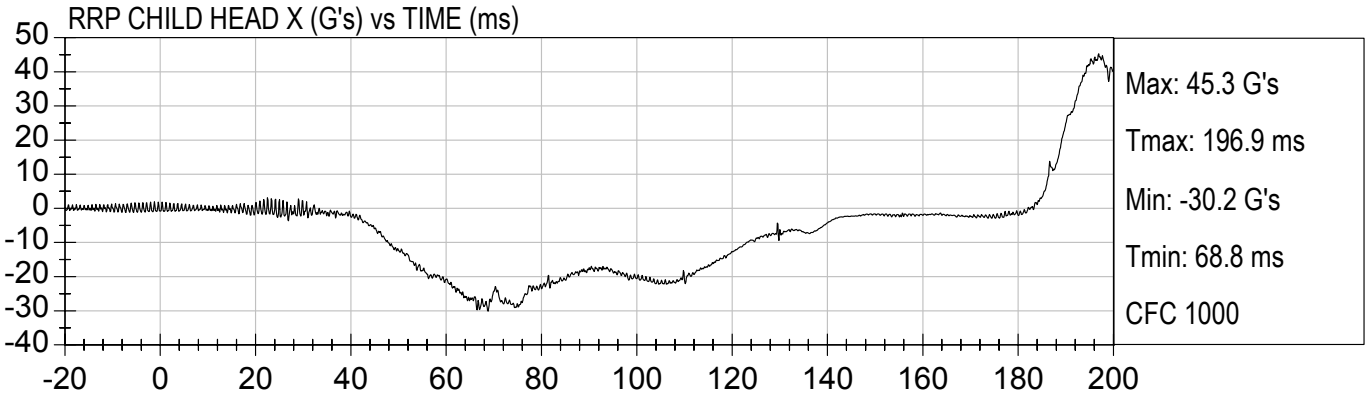


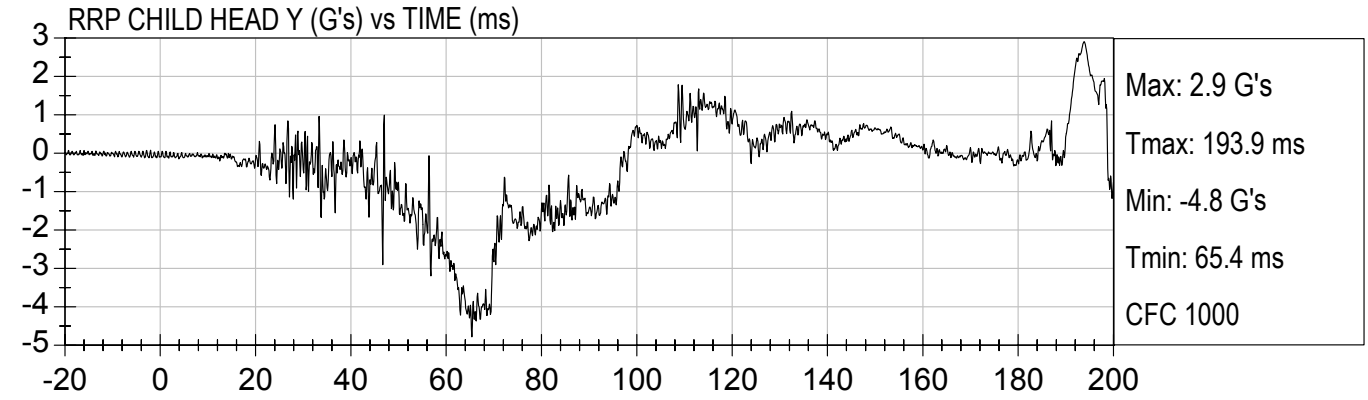


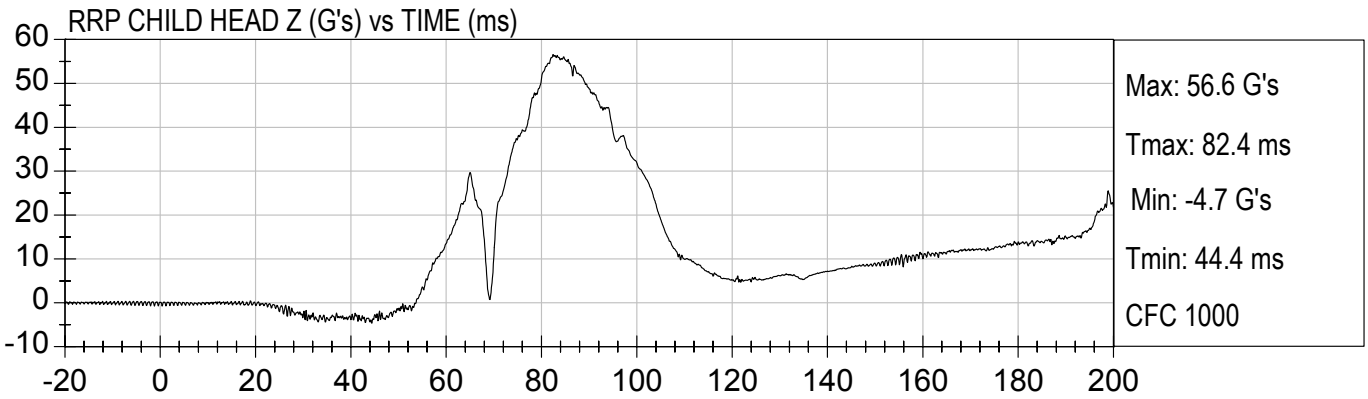


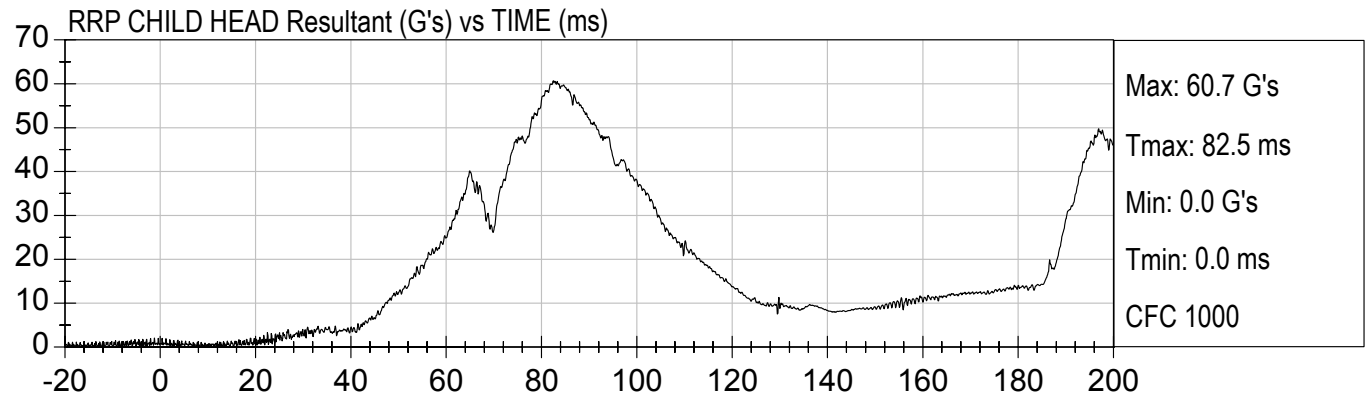
35MPH NCAP FRONTAL
2004 ACURA TSX

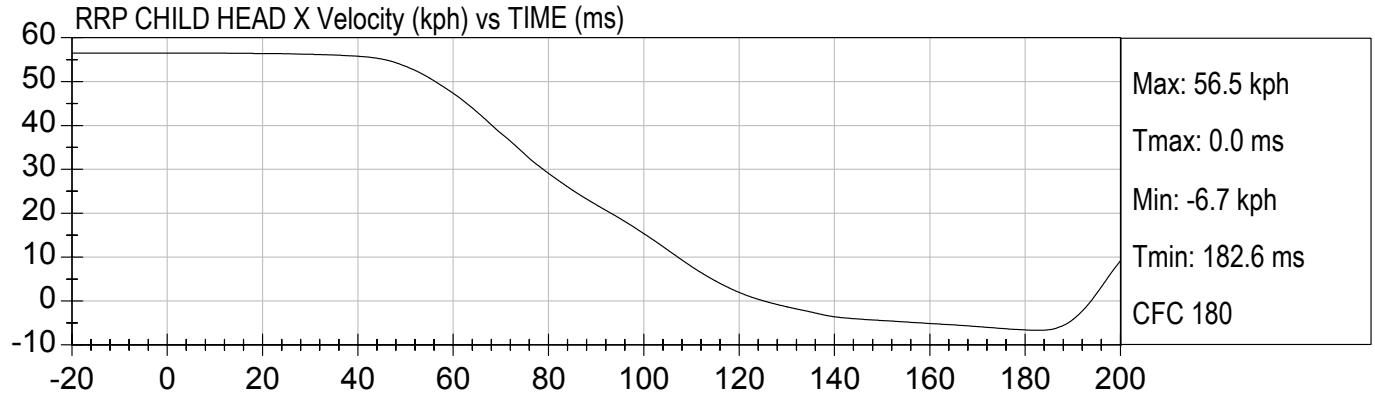
Test Date: 1/13/2004
Speed: 35.1 mph (56.5 km/h)

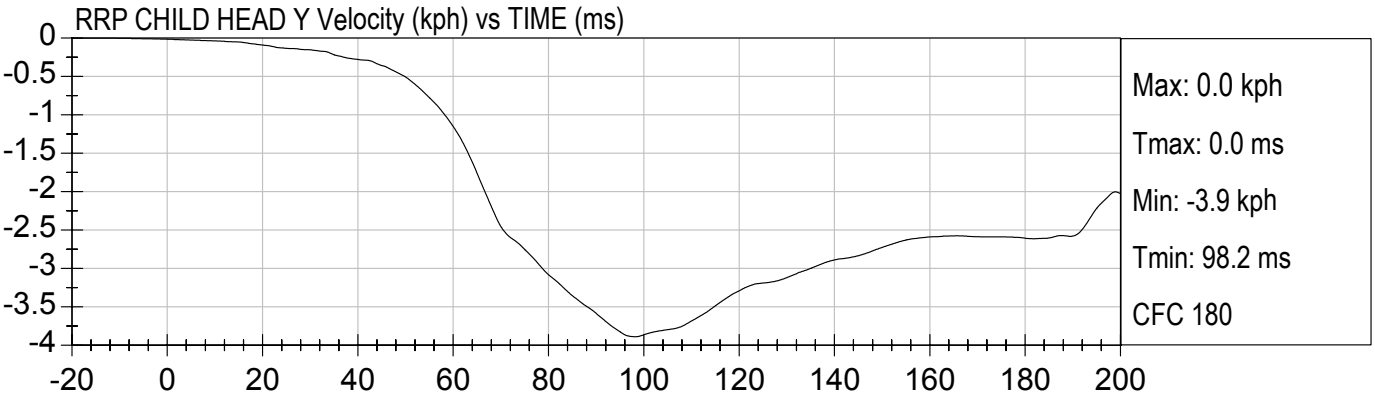


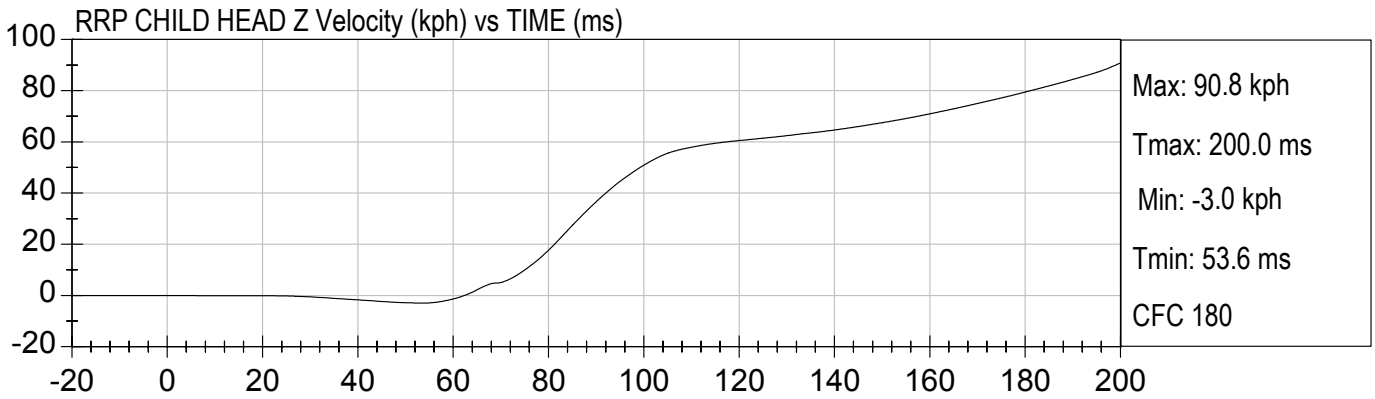






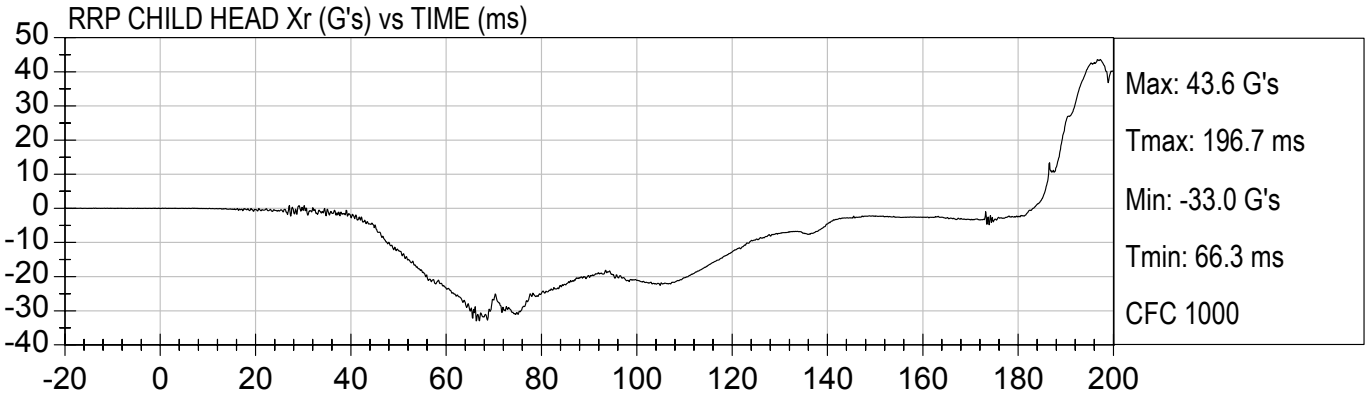

RRP CHILD HEAD X Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20 0 20 40 60 80 100 120 140 160 180 200
Max: 56.5 kph
Tmax: 0.0 ms
Min: -6.7 kph
Tmin: 182.6 ms
CFC 180

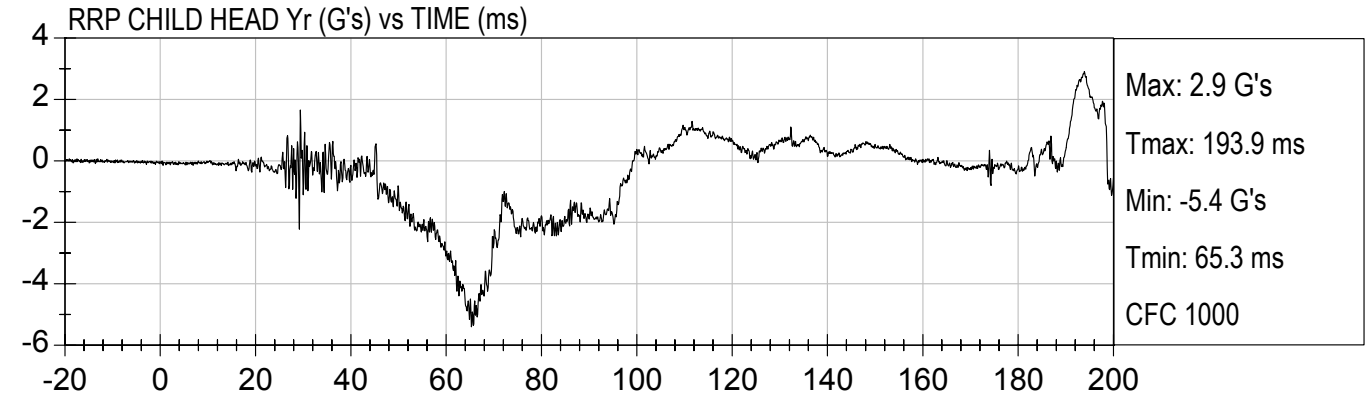

RRP CHILD HEAD Y Velocity (kph) vs TIME (ms)
0
-0.5
-1
-1.5
-2
-2.5
-3
-3.5
-4
-20 0 20 40 60 80 100 120 140 160 180 200
Max: 0.0 kph
Tmax: 0.0 ms
Min: -3.9 kph
Tmin: 98.2 ms
CFC 180

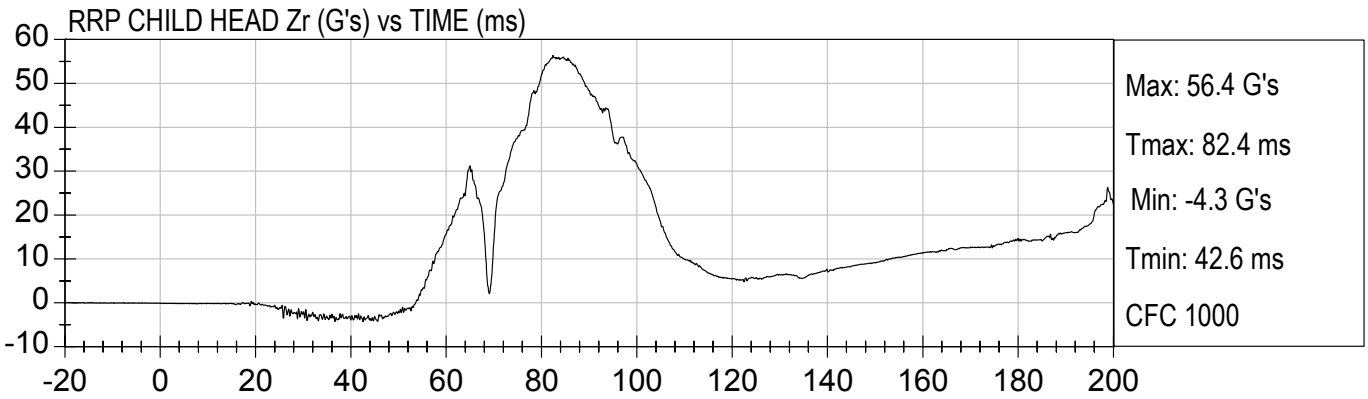

RRP CHILD HEAD Z Velocity (kph) vs TIME (ms)
100
80
60
40
20
0
-20
-20 0 20 40 60 80 100 120 140 160 180 200
Max: 90.8 kph
Tmax: 200.0 ms
Min: -3.0 kph
Tmin: 53.6 ms
CFC 180

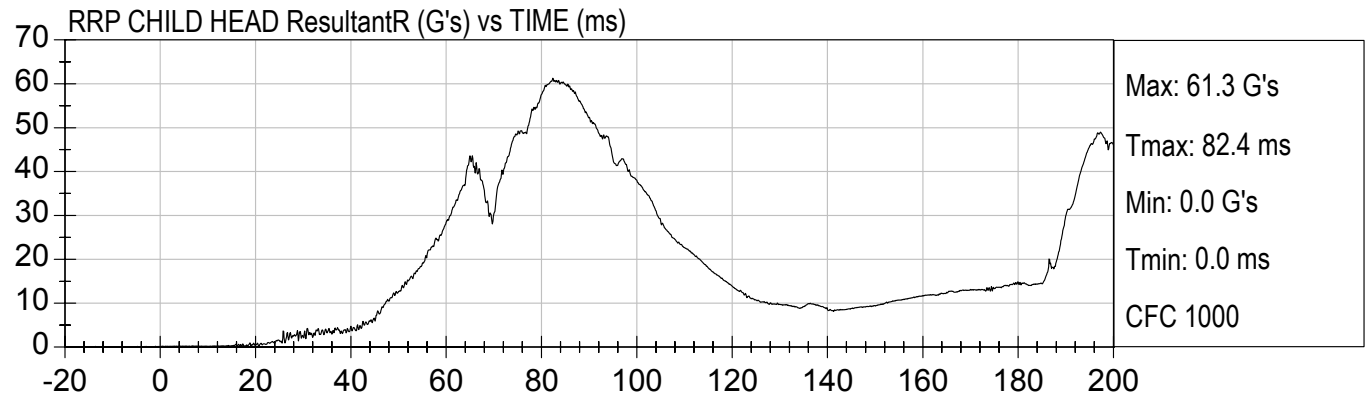
35MPH NCAP FRONTAL
2004 ACURA TSX

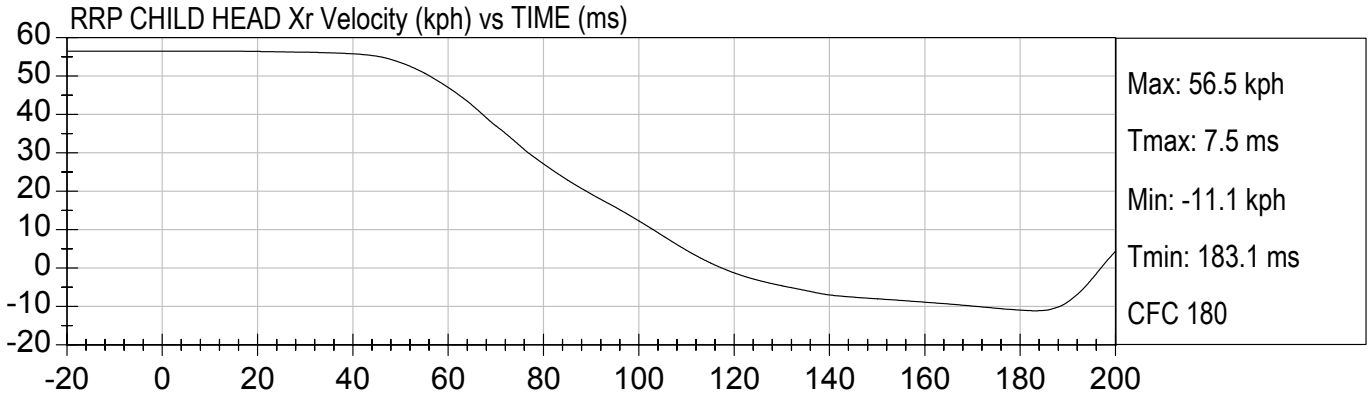
Test Date: 1/13/2004
Speed: 35.1 mph (56.5 km/h)

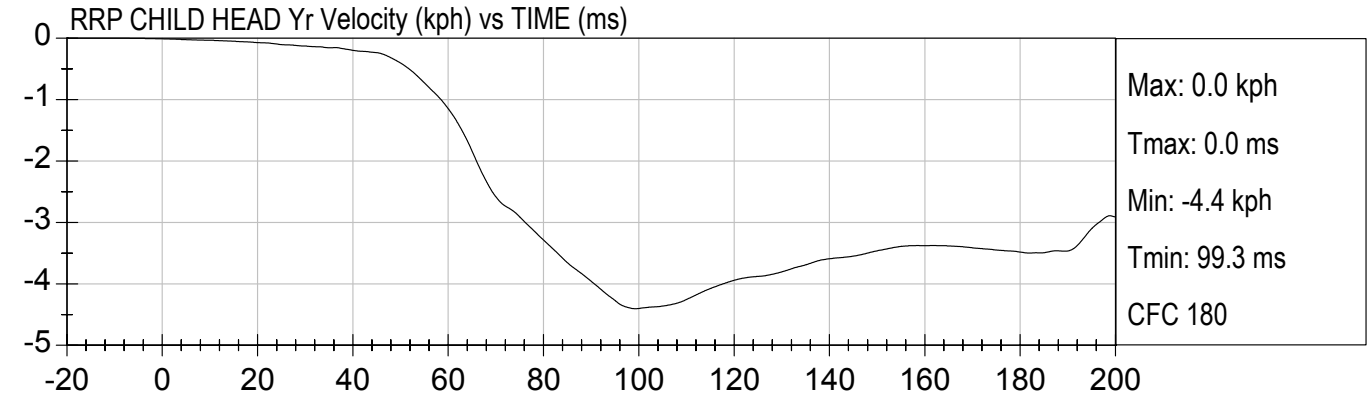


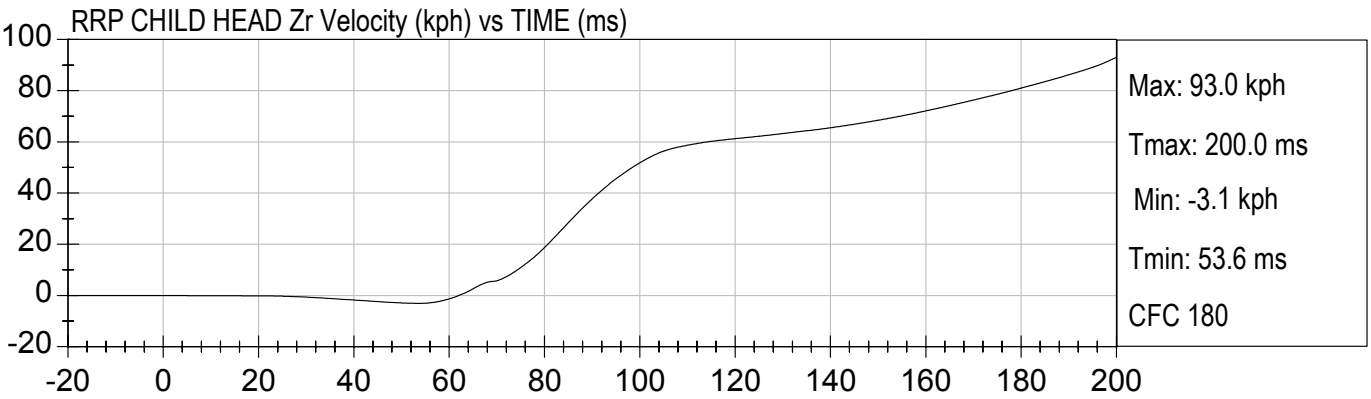






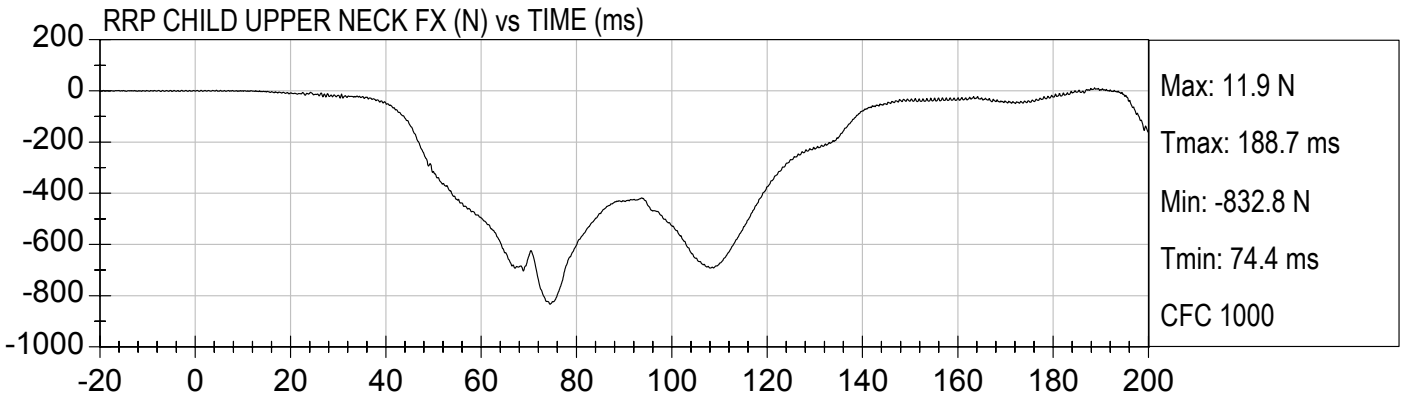

RRP CHILD HEAD Xr Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20
-20 0 20 40 60 80 100 120 140 160 180 200
Max: 56.5 kph
Tmax: 7.5 ms
Min: -11.1 kph
Tmin: 183.1 ms
CFC 180

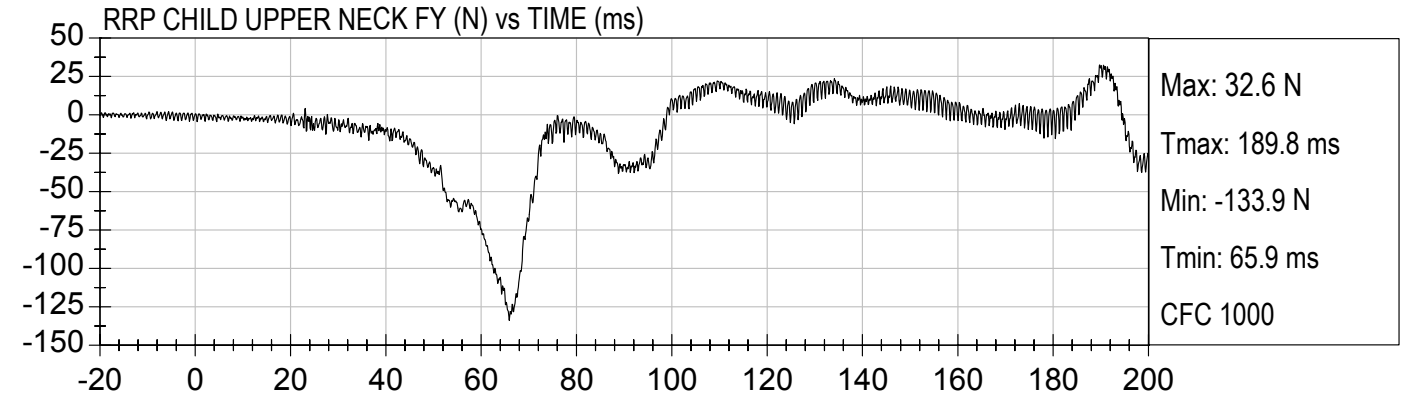

RRP CHILD HEAD Yr Velocity (kph) vs TIME (ms)
0
-1
-2
-3
-4
-5
-20 0 20 40 60 80 100 120 140 160 180 200
Max: 0.0 kph
Tmax: 0.0 ms
Min: -4.4 kph
Tmin: 99.3 ms
CFC 180

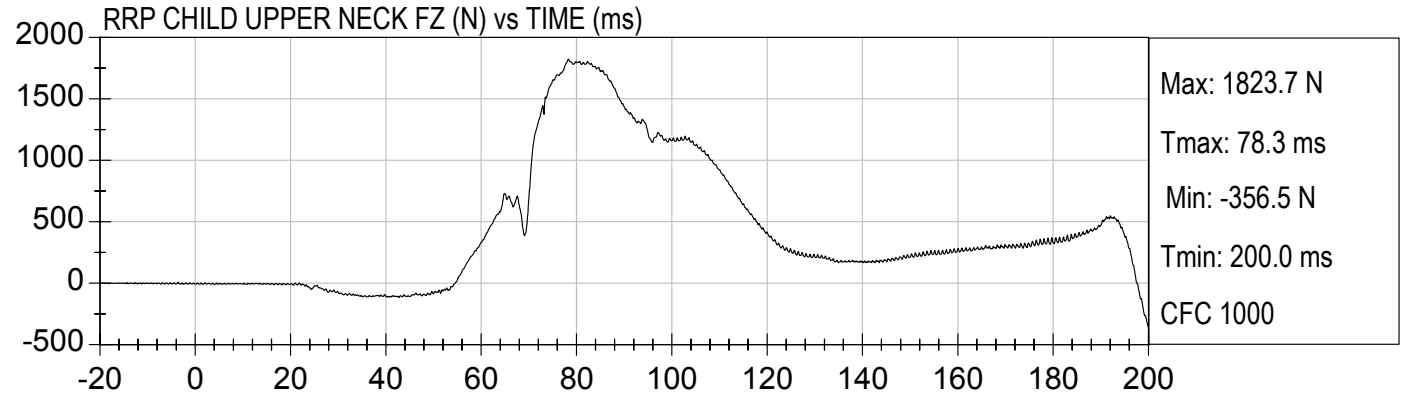

RRP CHILD HEAD Zr Velocity (kph) vs TIME (ms)
100
80
60
40
20
0
-20
-20 0 20 40 60 80 100 120 140 160 180 200
Max: 93.0 kph
Tmax: 200.0 ms
Min: -3.1 kph
Tmin: 53.6 ms
CFC 180

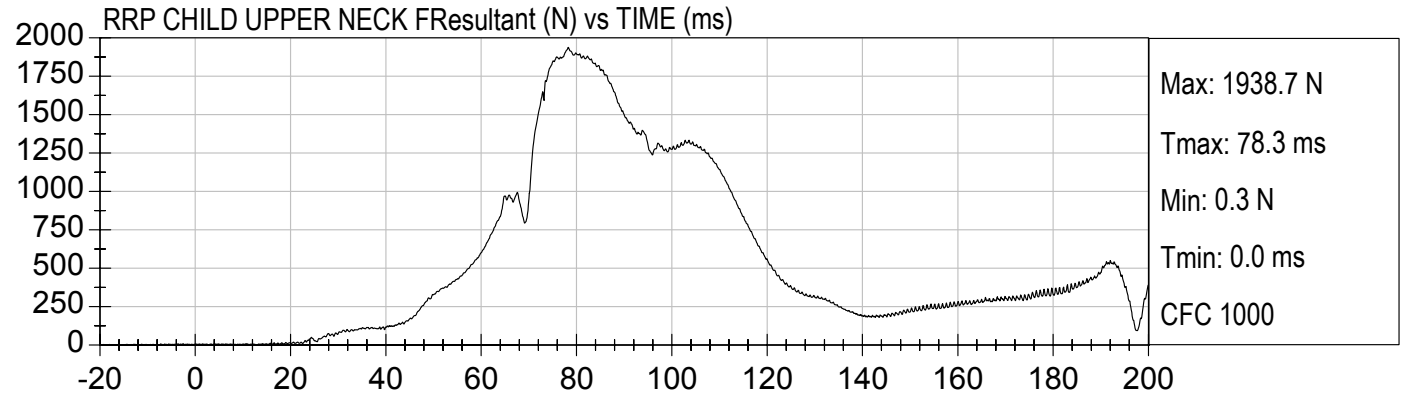
35MPH NCAP FRONTAL
2004 ACURA TSX

Test Date: 1/13/2004
Speed: 35.1 mph (56.5 km/h)



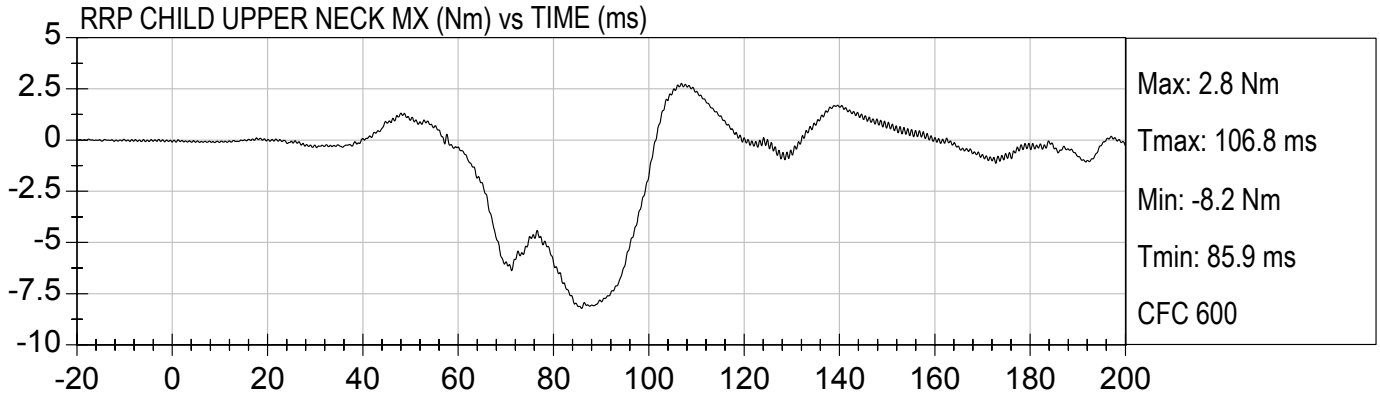


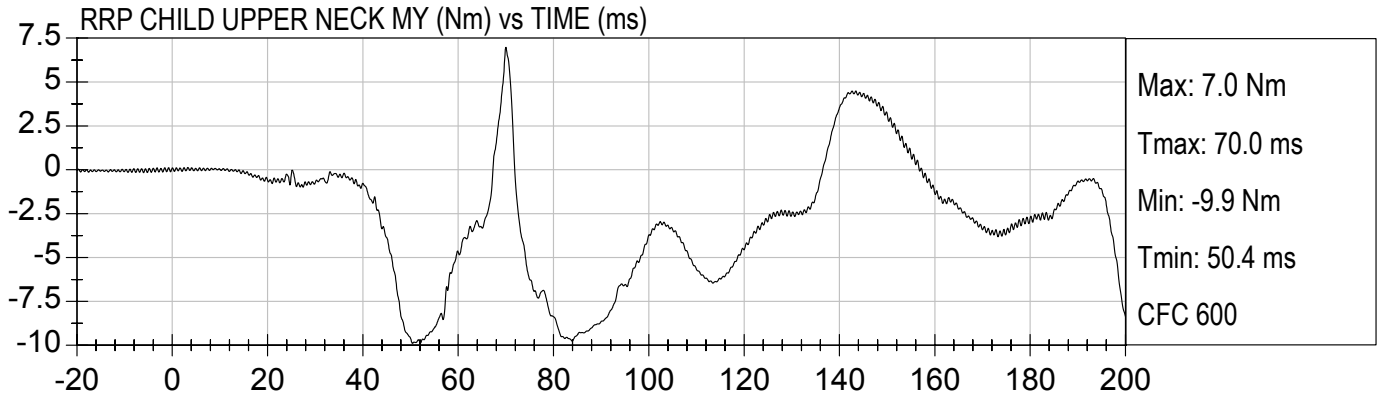


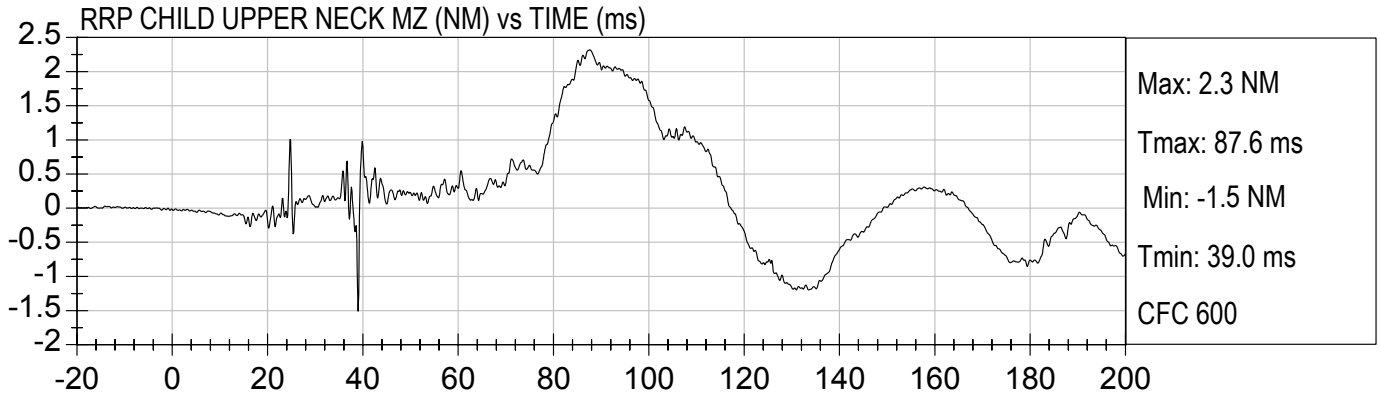


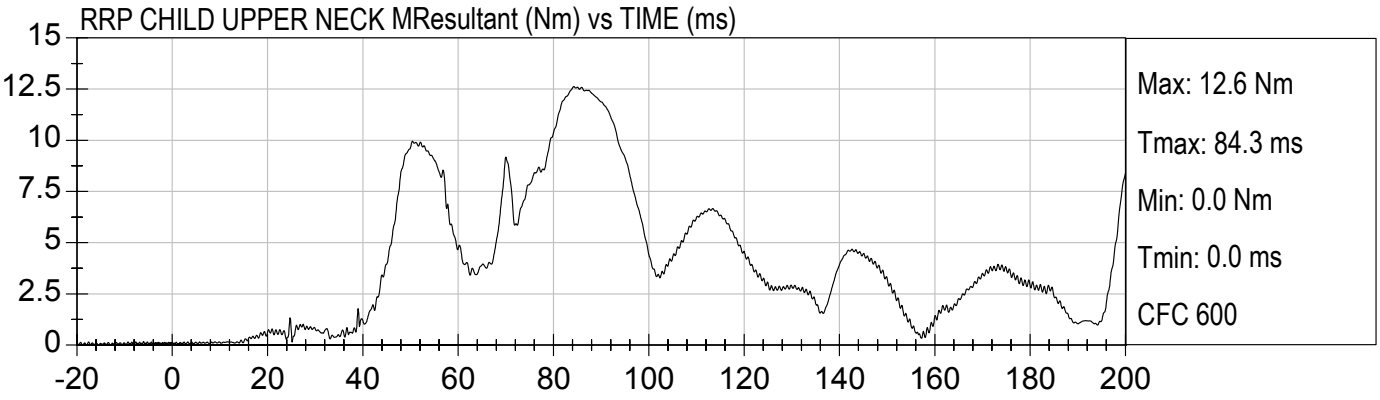
35MPH NCAP FRONTAL
2004 ACURA TSX

Test Date: 1/13/2004
Speed: 35.1 mph (56.5 km/h)



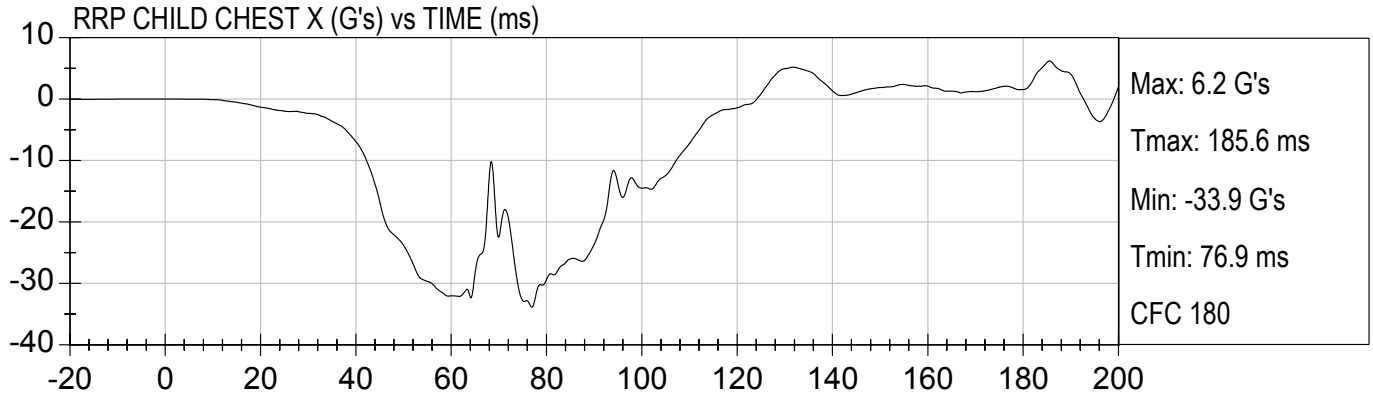


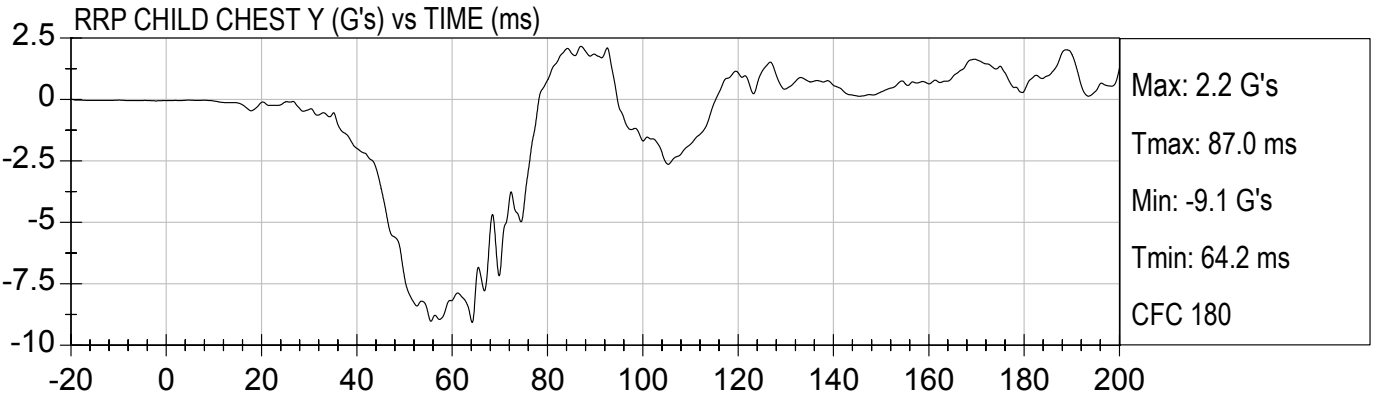


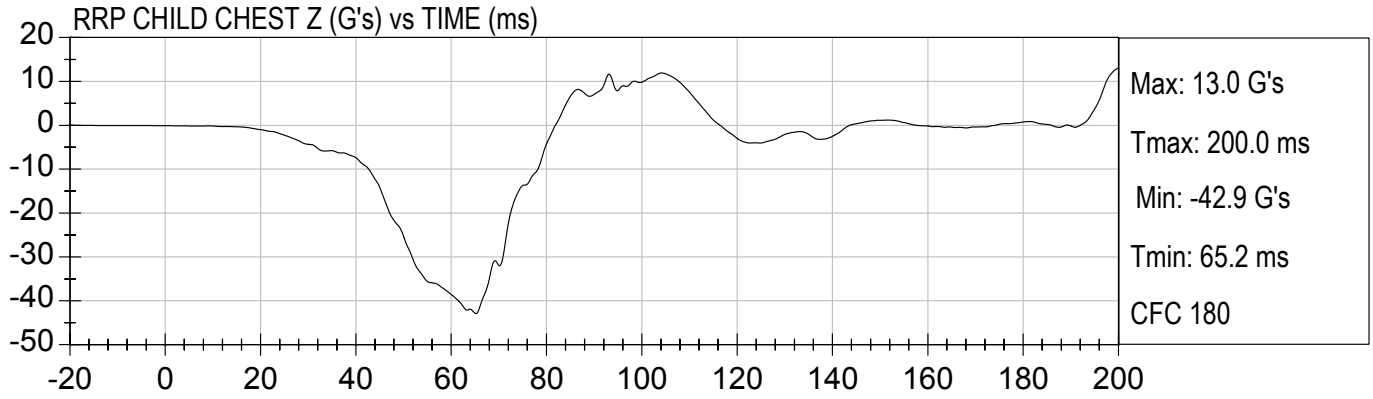


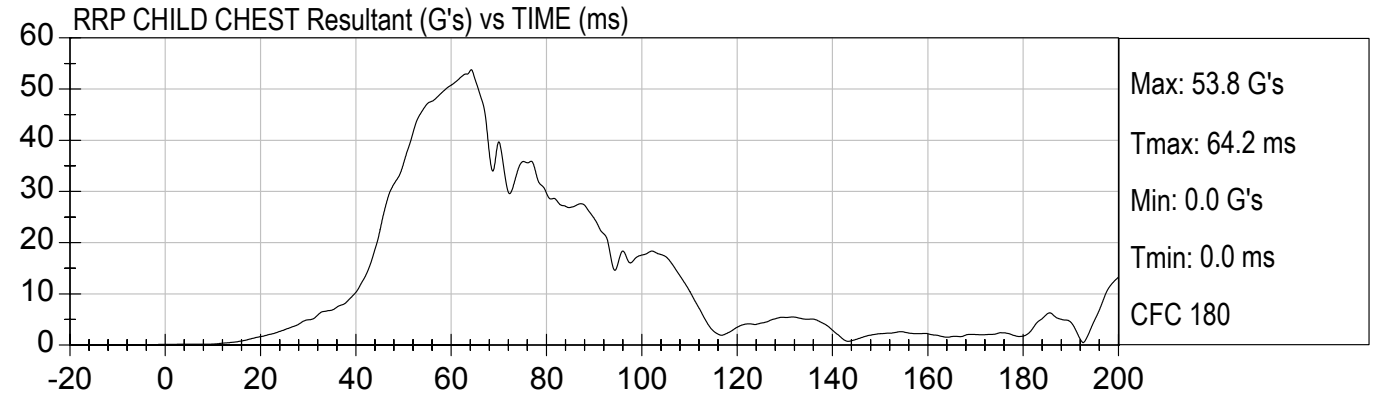
35MPH NCAP FRONTAL
2004 ACURA TSX

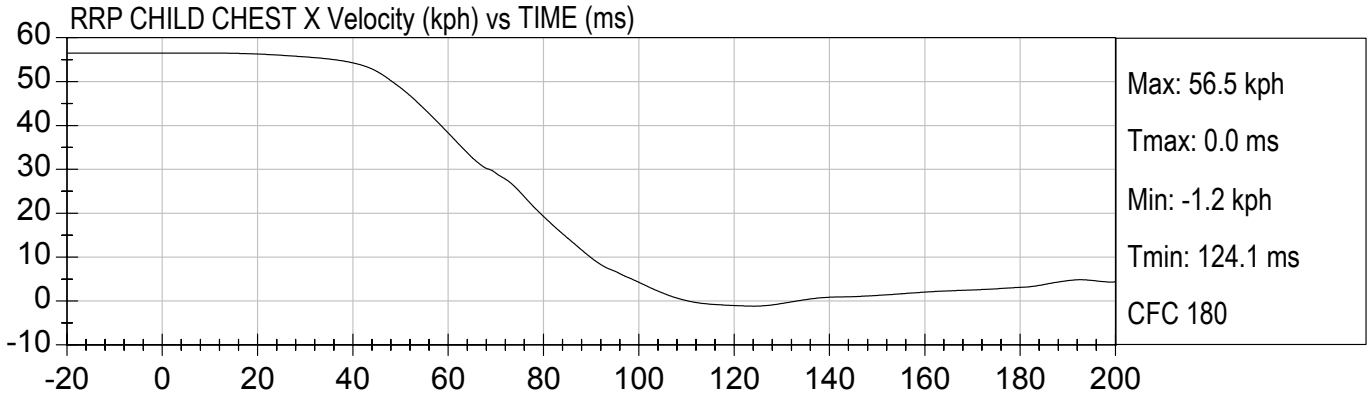
Test Date: 1/13/2004
Speed: 35.1 mph (56.5 km/h)

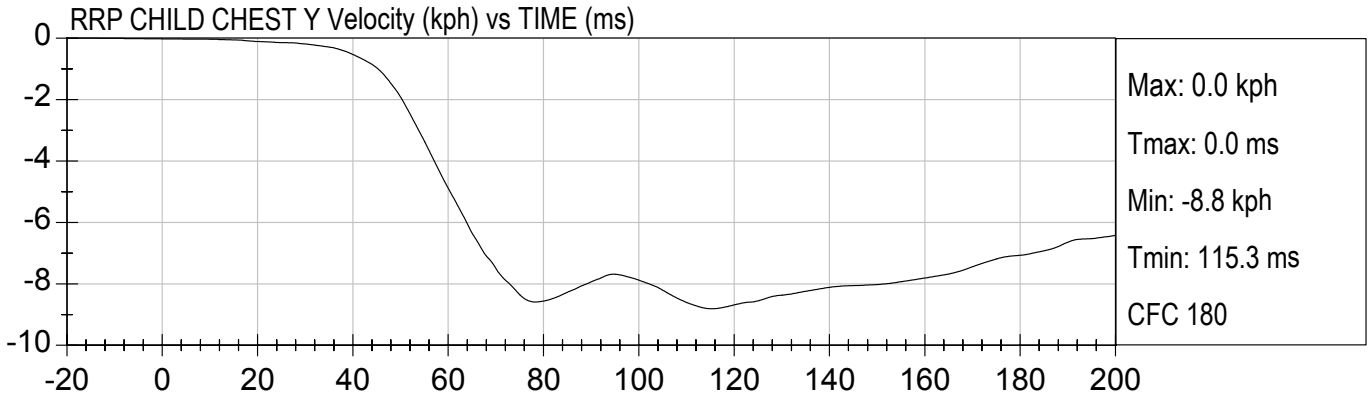


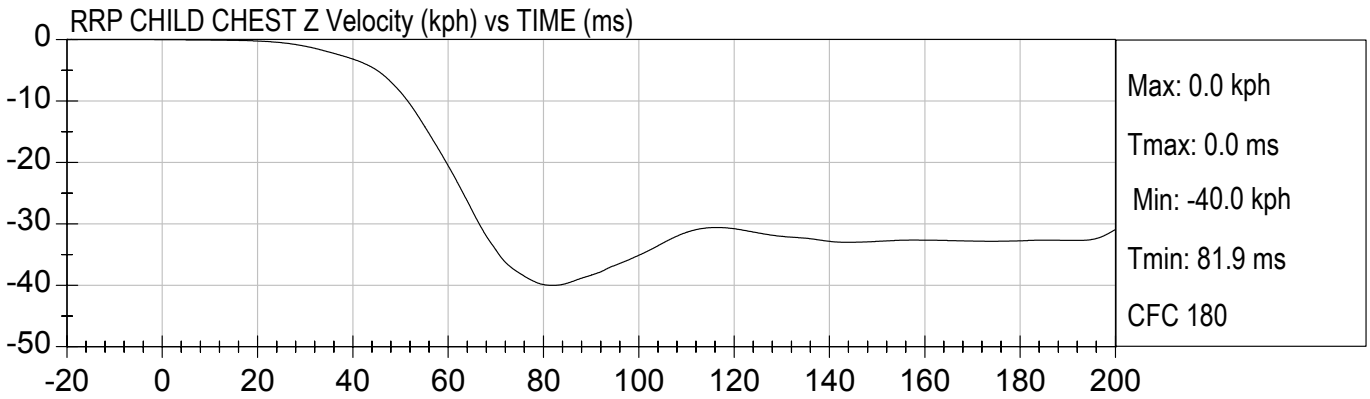


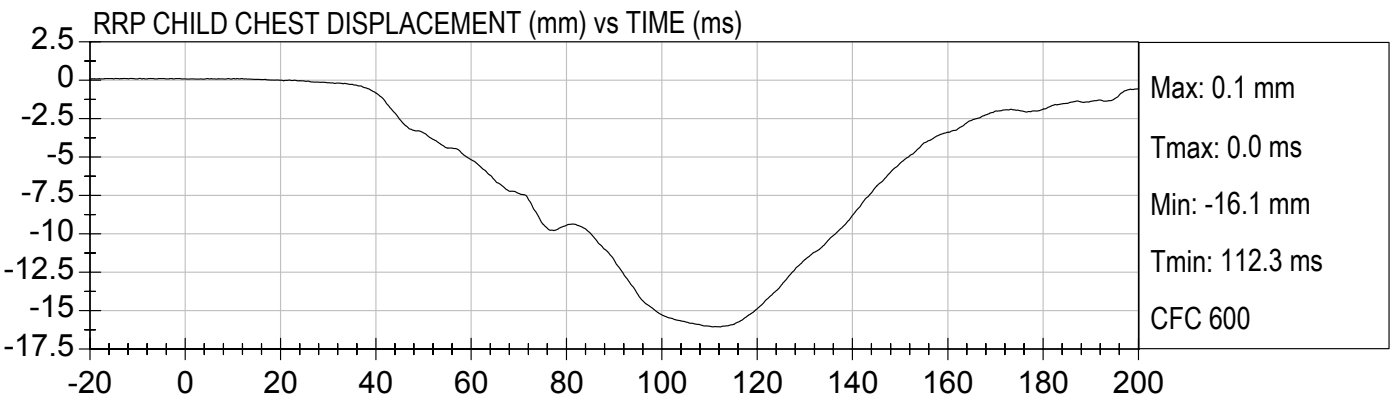





RRP CHILD CHEST X Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20 0 20 40 60 80 100 120 140 160 180 200
Max: 56.5 kph
Tmax: 0.0 ms
Min: -1.2 kph
Tmin: 124.1 ms
CFC 180

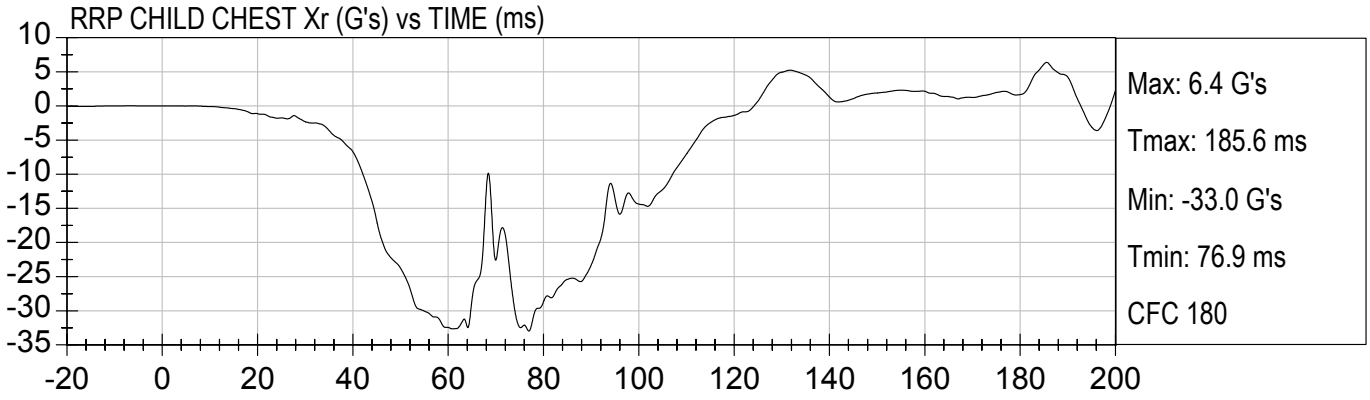

RRP CHILD CHEST Y Velocity (kph) vs TIME (ms)
0
-2
-4
-6
-8
-10
-20 0 20 40 60 80 100 120 140 160 180 200
Max: 0.0 kph
Tmax: 0.0 ms
Min: -8.8 kph
Tmin: 115.3 ms
CFC 180

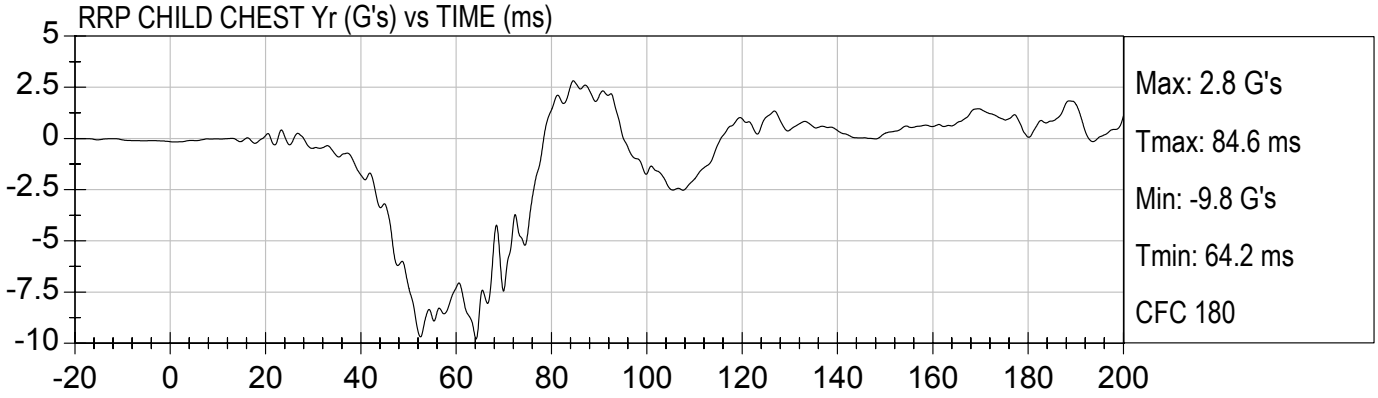

RRP CHILD CHEST Z Velocity (kph) vs TIME (ms)
0
-10
-20
-30
-40
-50
-20 0 20 40 60 80 100 120 140 160 180 200
Max: 0.0 kph
Tmax: 0.0 ms
Min: -40.0 kph
Tmin: 81.9 ms
CFC 180

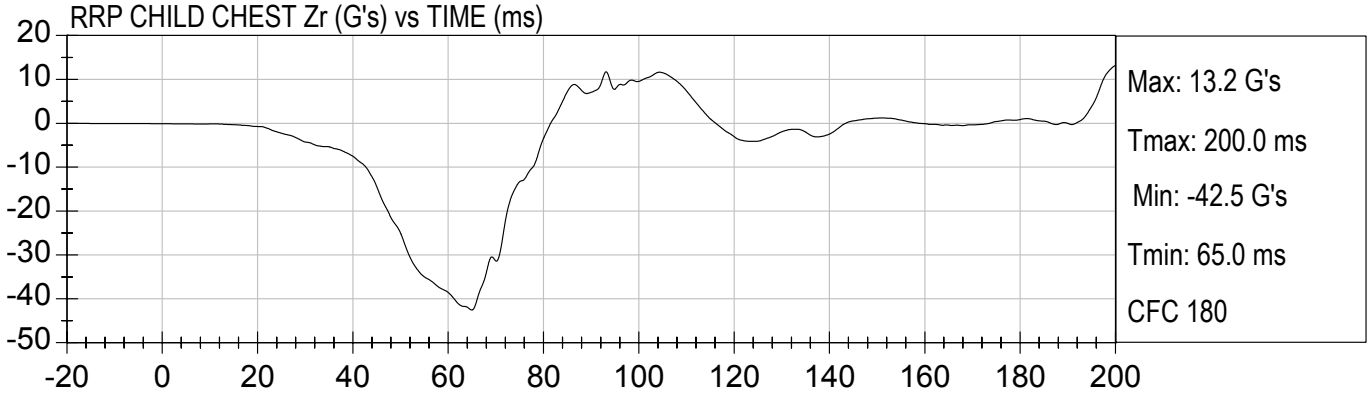

RRP CHILD CHEST DISPLACEMENT (mm) vs TIME (ms)
2.5
0
-2.5
-5
-7.5
-10
-12.5
-15
-17.5
-20 0 20 40 60 80 100 120 140 160 180 200
Max: 0.1 mm
Tmax: 0.0 ms
Min: -16.1 mm
Tmin: 112.3 ms
CFC 600

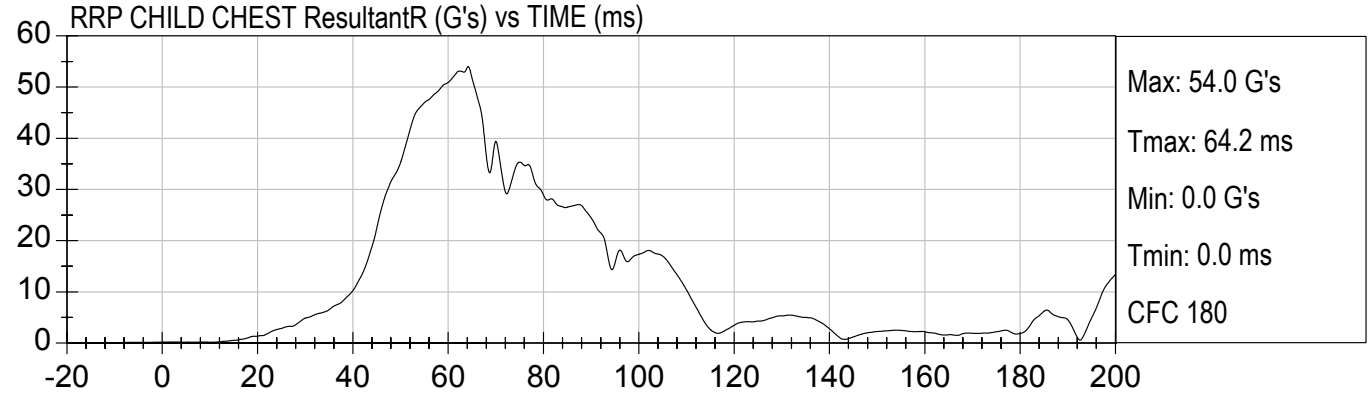
35MPH NCAP FRONTAL
2004 ACURA TSX

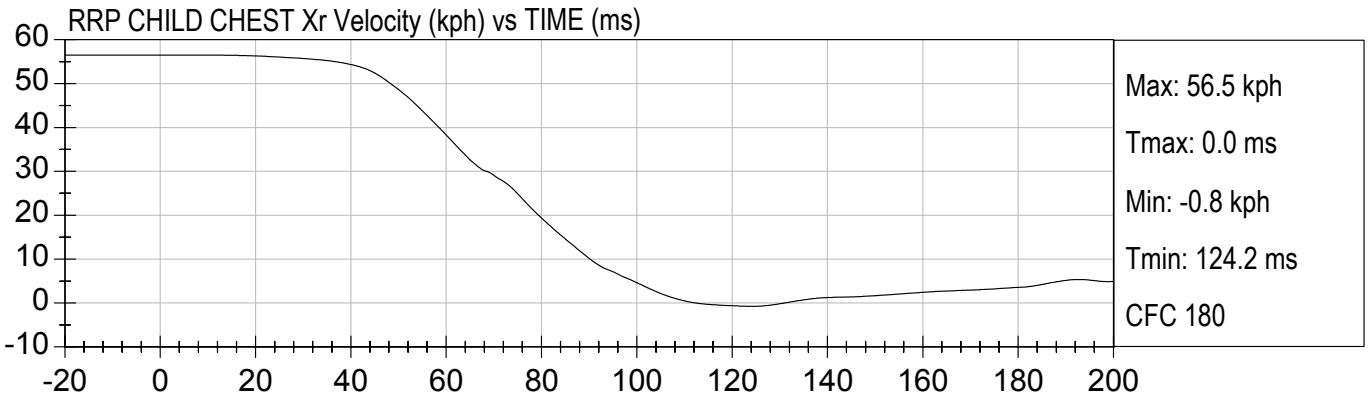
Test Date: 1/13/2004
Speed: 35.1 mph (56.5 km/h)

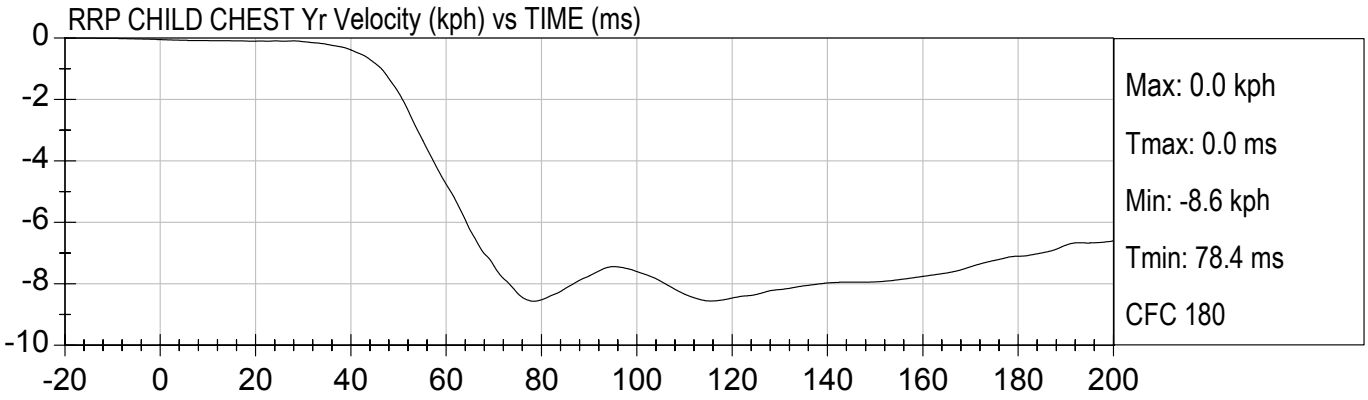


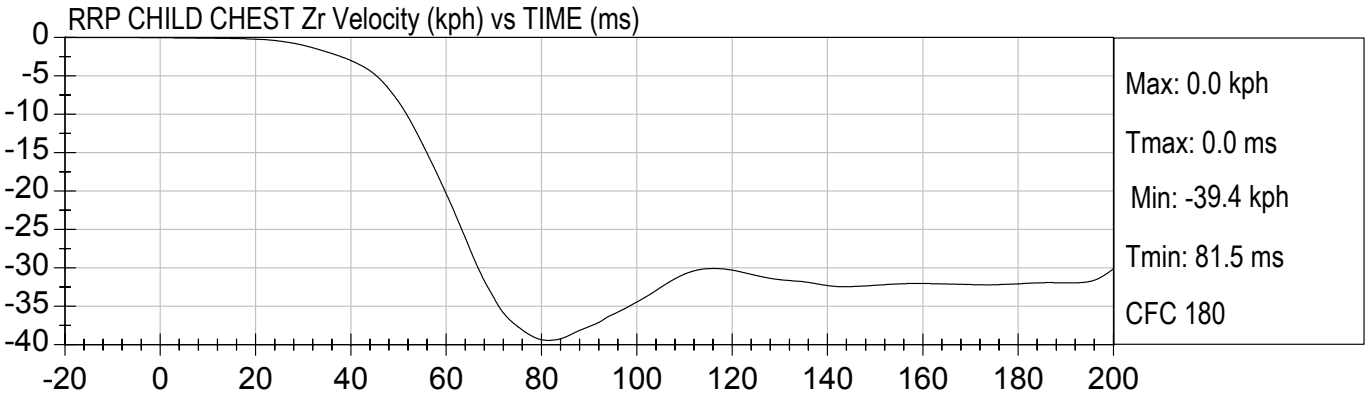






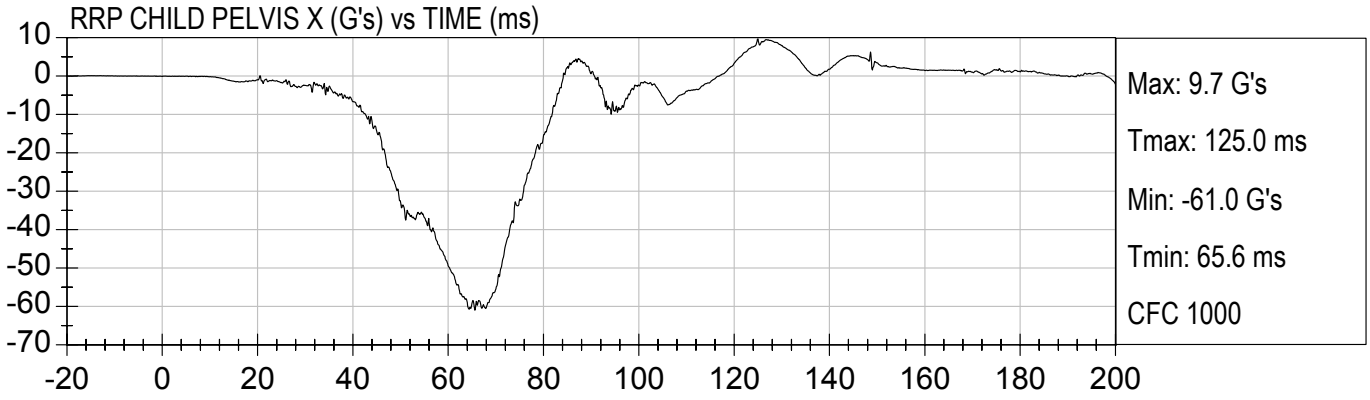

RRP CHILD CHEST Xr Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20 0 20 40 60 80 100 120 140 160 180 200
Max: 56.5 kph
Tmax: 0.0 ms
Min: -0.8 kph
Tmin: 124.2 ms
CFC 180

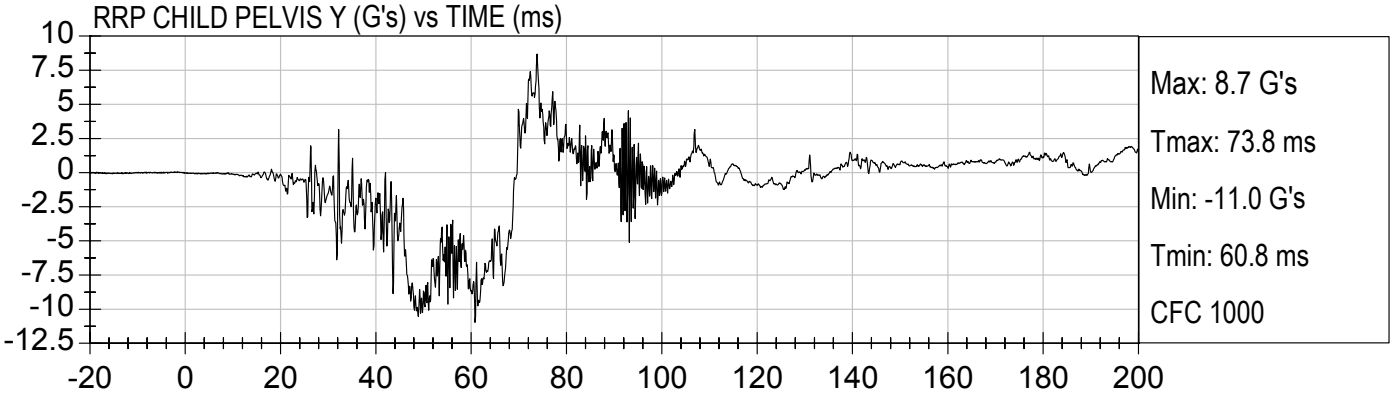

RRP CHILD CHEST Yr Velocity (kph) vs TIME (ms)
0
-2
-4
-6
-8
-10
-20 0 20 40 60 80 100 120 140 160 180 200
Max: 0.0 kph
Tmax: 0.0 ms
Min: -8.6 kph
Tmin: 78.4 ms
CFC 180

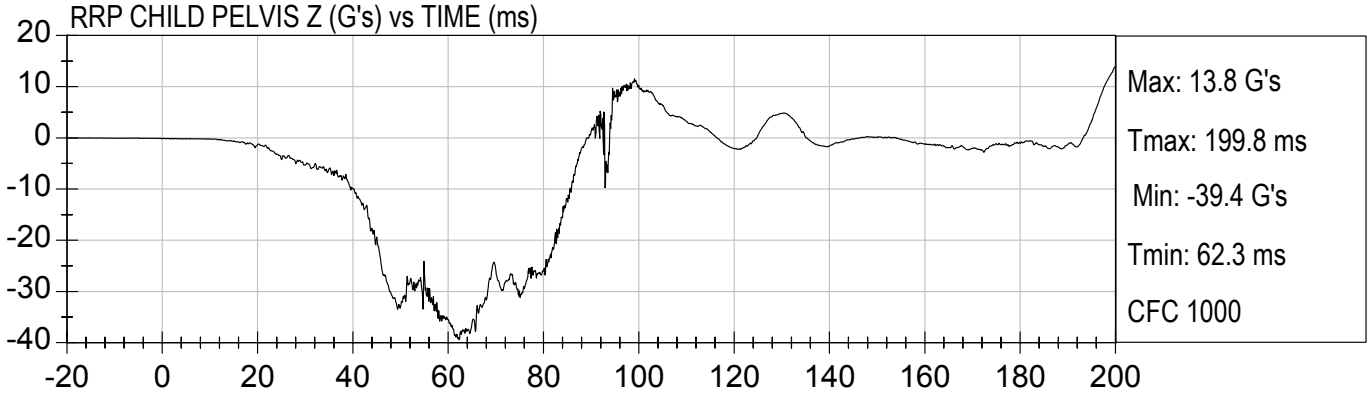

RRP CHILD CHEST Zr Velocity (kph) vs TIME (ms)
0
-5
-10
-15
-20
-25
-30
-35
-40
-20 0 20 40 60 80 100 120 140 160 180 200
Max: 0.0 kph
Tmax: 0.0 ms
Min: -39.4 kph
Tmin: 81.5 ms
CFC 180

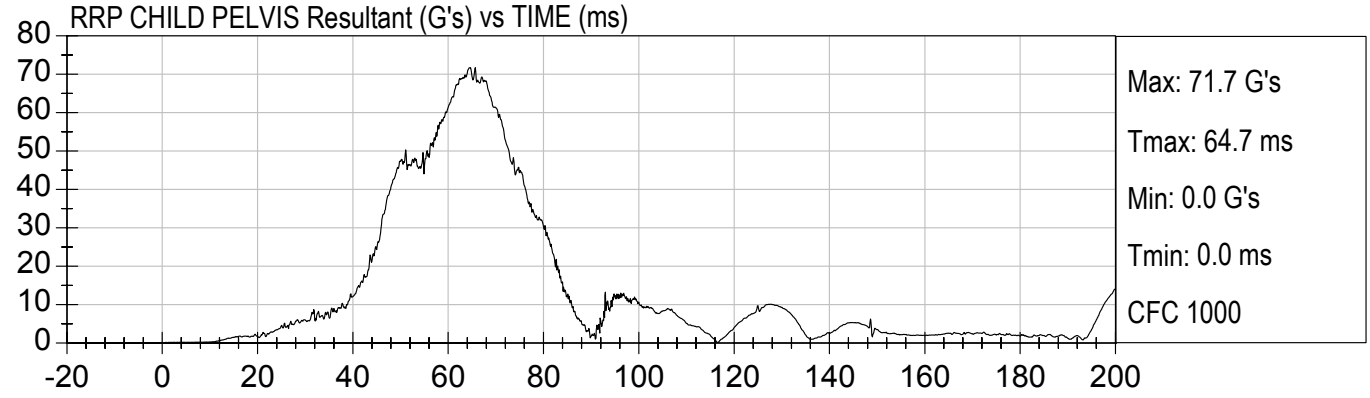
35MPH NCAP FRONTAL
2004 ACURA TSX

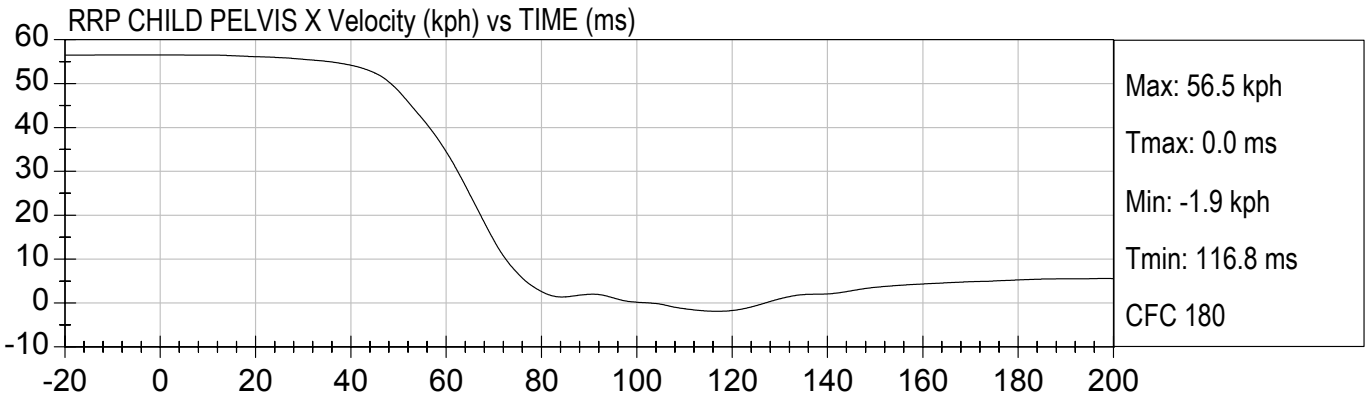
Test Date: 1/13/2004
Speed: 35.1 mph (56.5 km/h)

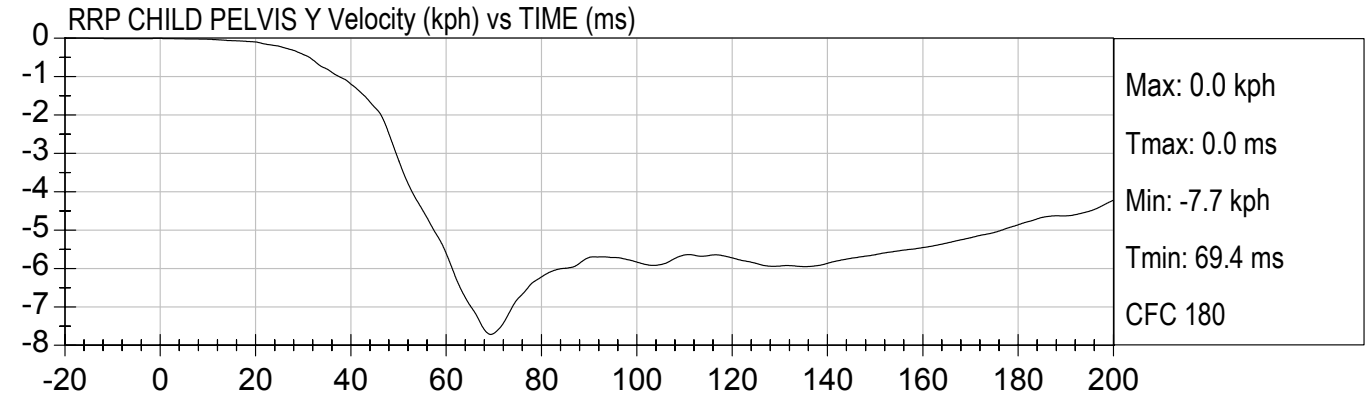


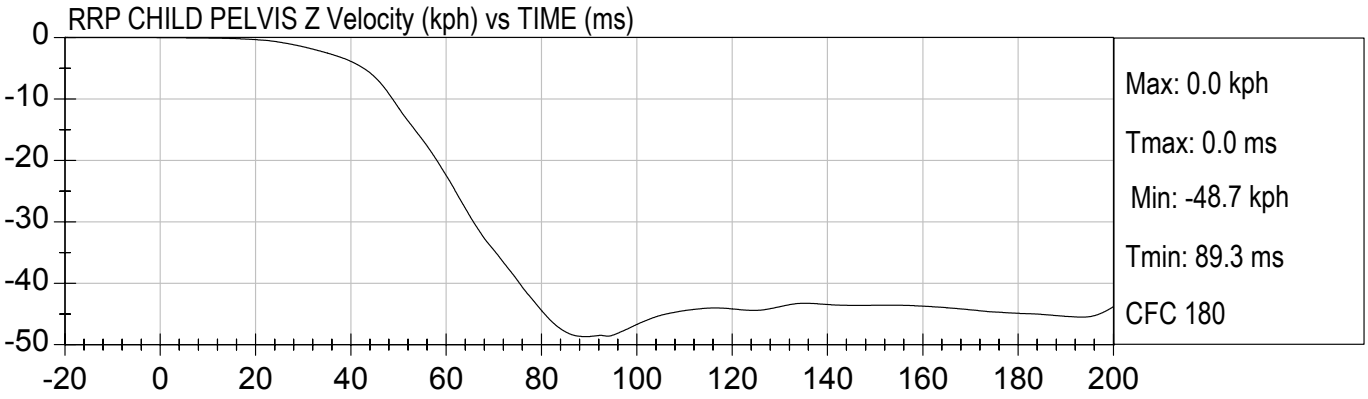


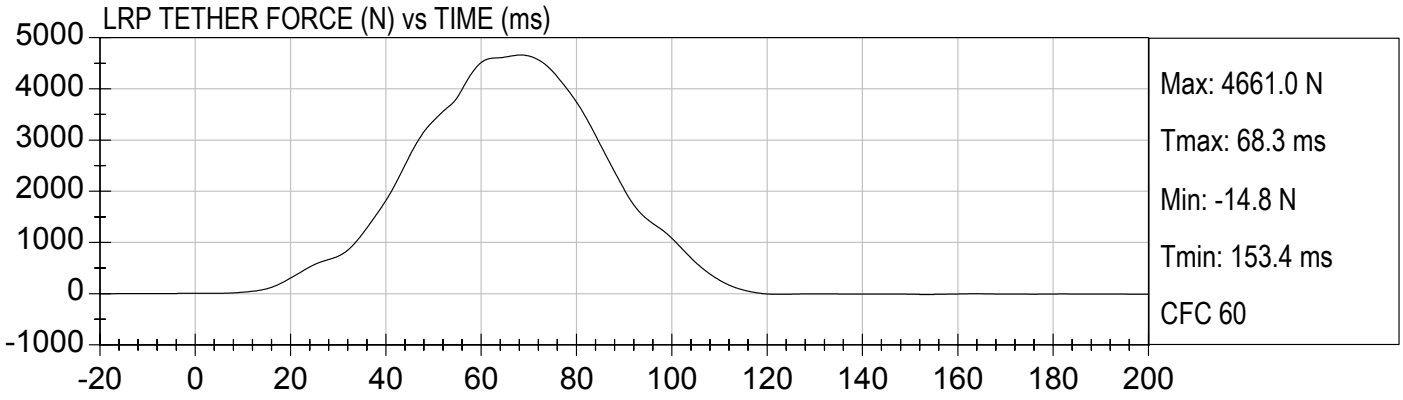


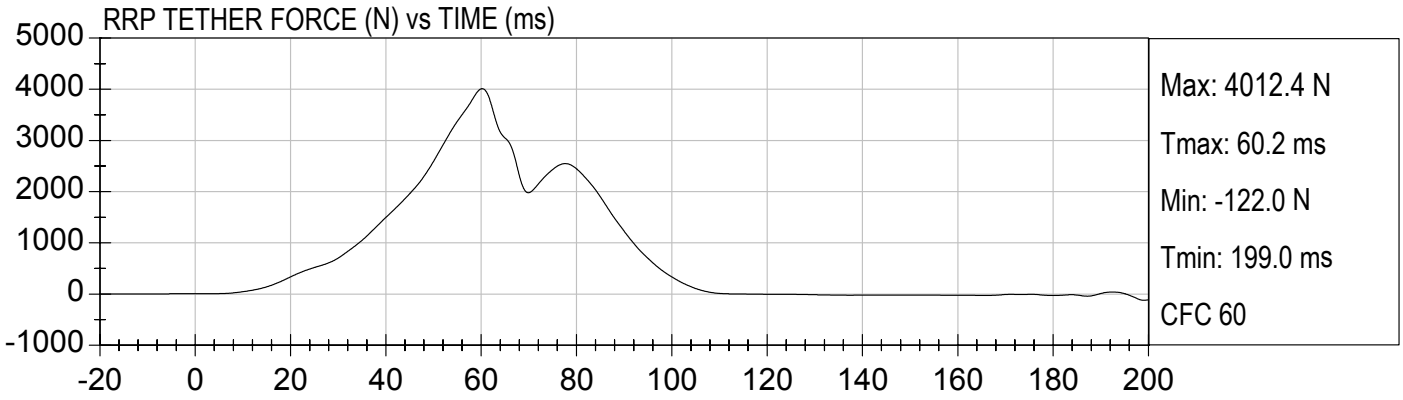



RRP CHILD PELVIS X Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20 0 20 40 60 80 100 120 140 160 180 200
Max: 56.5 kph
Tmax: 0.0 ms
Min: -1.9 kph
Tmin: 116.8 ms
CFC 180


RRP CHILD PELVIS Y Velocity (kph) vs TIME (ms)
0
-1
-2
-3
-4
-5
-6
-7
-8
-20 0 20 40 60 80 100 120 140 160 180 200
Max: 0.0 kph
Tmax: 0.0 ms
Min: -7.7 kph
Tmin: 69.4 ms
CFC 180


RRP CHILD PELVIS Z Velocity (kph) vs TIME (ms)
0
-10
-20
-30
-40
-50
-20 0 20 40 60 80 100 120 140 160 180 200
Max: 0.0 kph
Tmax: 0.0 ms
Min: -48.7 kph
Tmin: 89.3 ms
CFC 180


LRP TETHER FORCE (N) vs TIME (ms)
5000
4000
3000
2000
1000
0
-1000
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 4661.0 N
Tmax: 68.3 ms
Min: -14.8 N
Tmin: 153.4 ms
CFC 60


RRP TETHER FORCE (N) vs TIME (ms)
5000
4000
3000
2000
1000
0
-1000
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 4012.4 N
Tmax: 60.2 ms
Min: -122.0 N
Tmin: 199.0 ms
CFC 60

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

V. V. Walton

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

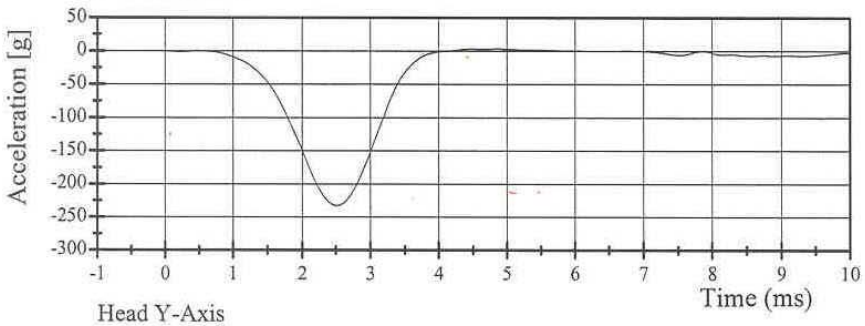
Transportation Research Center Inc.

572P Head Drop Test

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

Test Date 10/09/2003

Head X-Axis

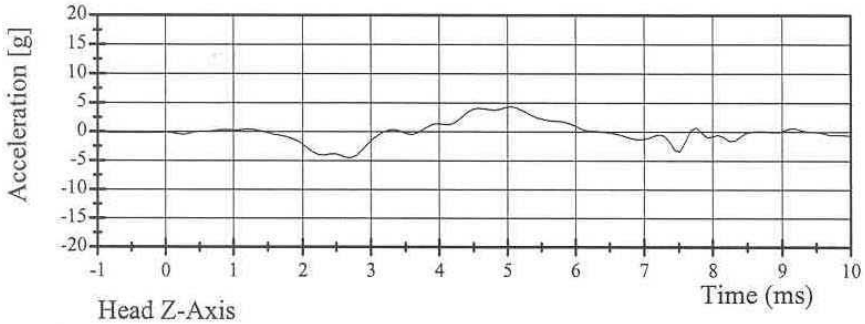


Filter Class: 1000

Max: 3.5 g at 4.9 ms

Min: -232.3 g at 2.5 ms

Head Y-Axis

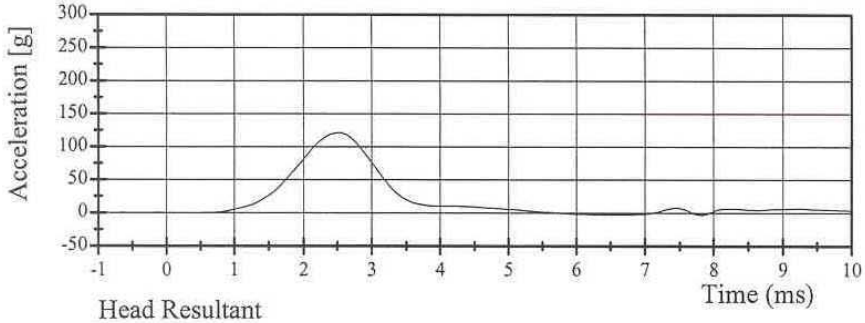


Filter Class: 1000

Max: 4.4 g at 5.0 ms

Min: -4.5 g at 2.7 ms

Head Z-Axis

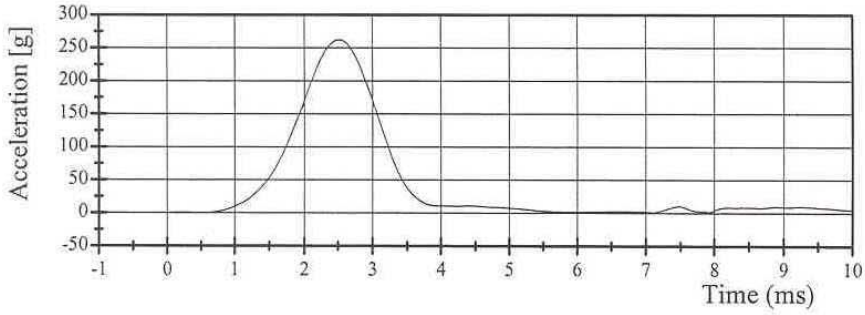


Filter Class: 1000

Max: 121.6 g at 2.6 ms

Min: -3.0 g at 7.8 ms

Head Resultant



Filter Class: 1000

Max: 262.1 g at 2.6 ms

Min: 0.0 g at 2.0 ms

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

V. J. Walton

10.09.2003 08:57:58 637

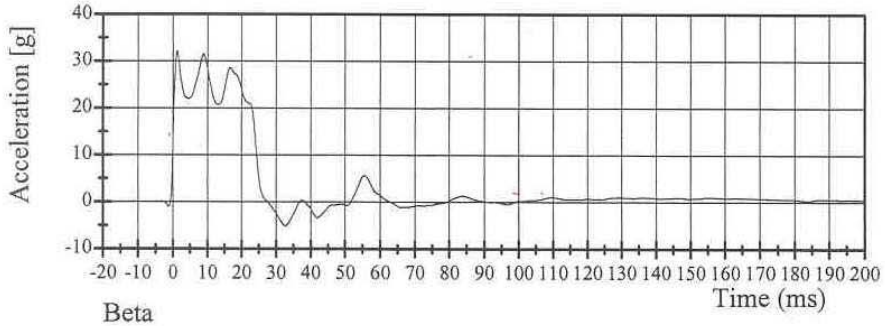
Transportation Research Center Inc.

572P Neck Flexion Test

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

Test Date 10/09/2003

Pendulum Deceleration

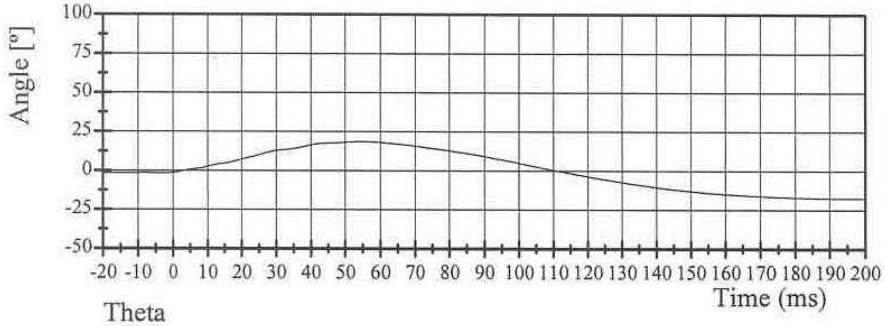


Filter Class: 180

Max: 32.1 g at 1.3 ms

Min: -5.1 g at 32.7 ms

Beta

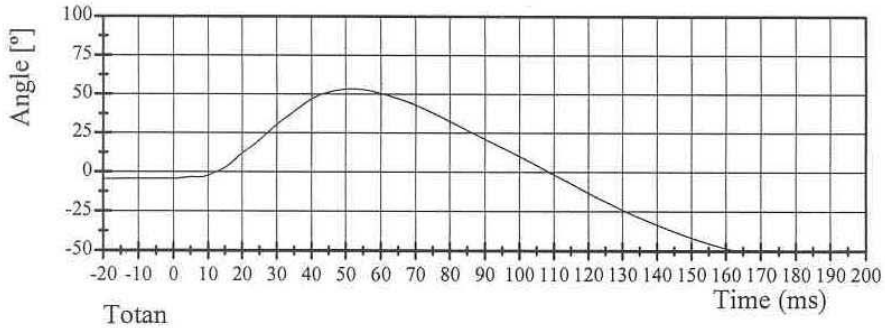


Filter Class: 60

Max: 18.5 ° at 55.1 ms

Min: -17.6 ° at 201.9 ms

Theta

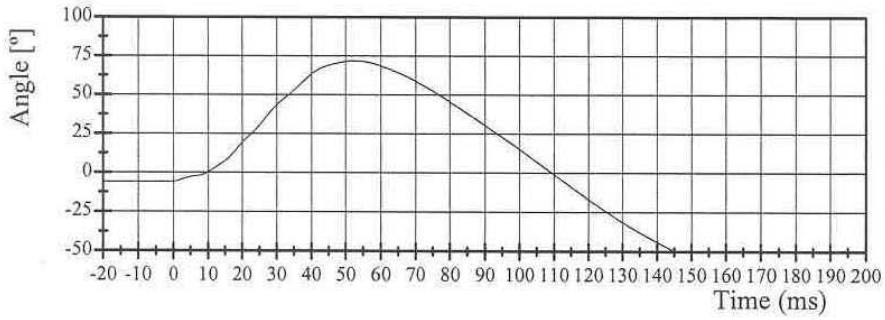


Filter Class: 60

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

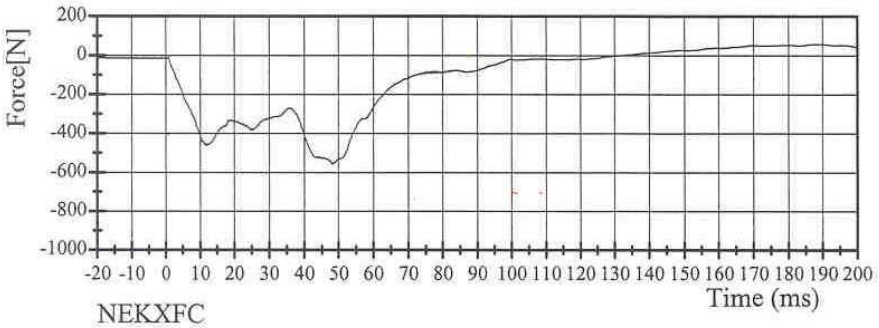
Transportation Research Center Inc.

572P Neck Flexion Test

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

Test Date 10/09/2003

NEKXF

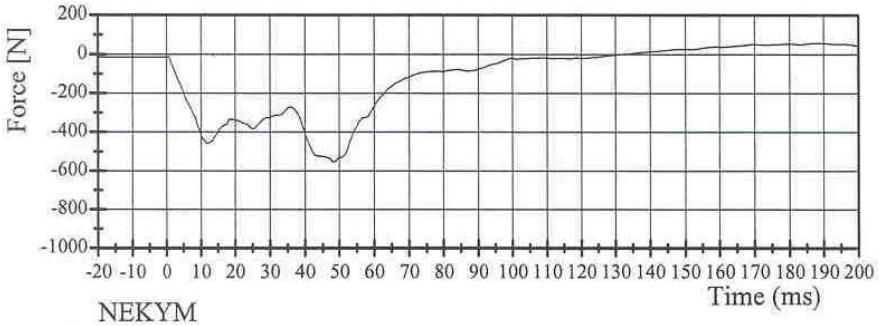


Filter Class: 1000

Max: 58.6 N at 187.5 ms

Min: -555.8 N at 48.1 ms

NEKXFC

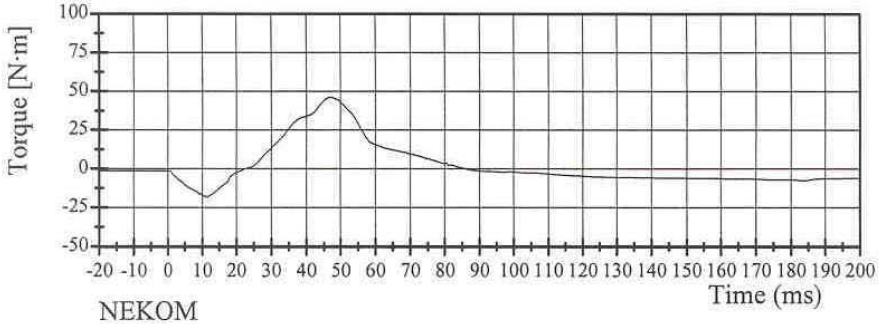


Filter Class: 600

Max: 58.5 N at 187.4 ms

Min: -554.6 N at 48.2 ms

NEKYM

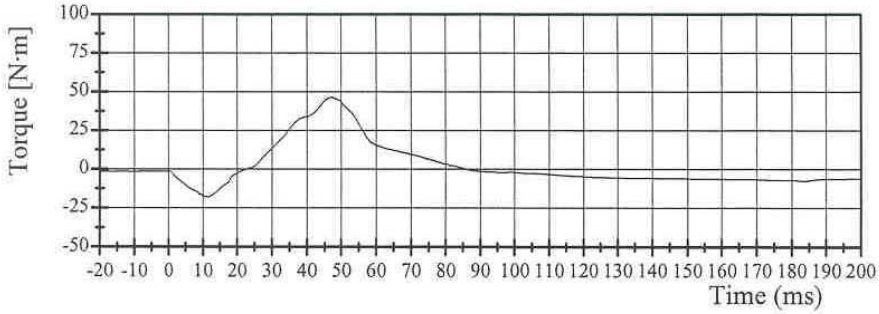


Filter Class: 600

Max: 46.3 N·m at 47.3 ms

Min: -18.0 N·m at 11.4 ms

NEKOM



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

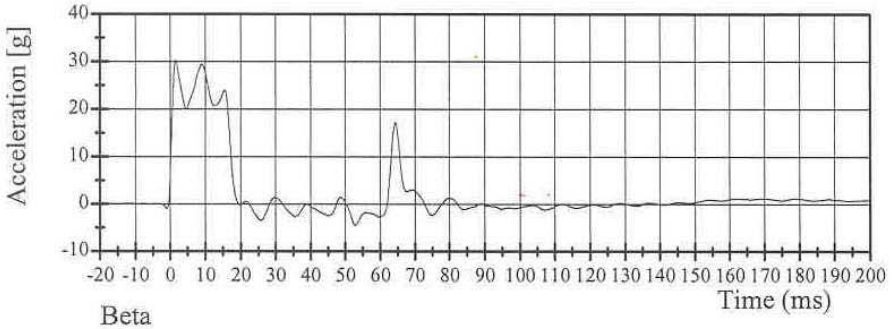
Transportation Research Center Inc.

572P Neck Extension Test

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

Test Date 10/09/2003

Pendulum Deceleration

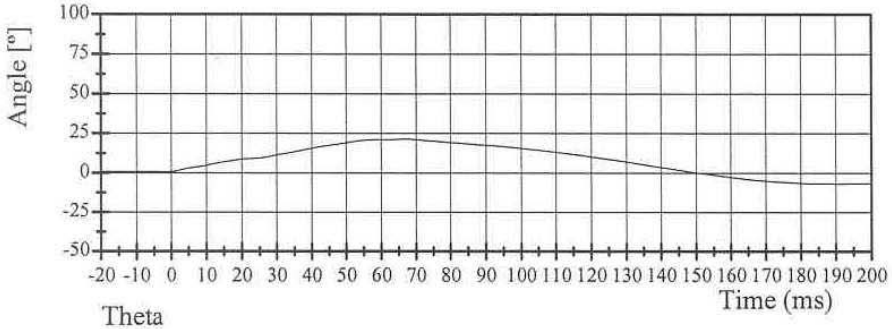


Filter Class: 180

Max: 30.2 g at 1.7 ms

Min: -4.5 g at 52.8 ms

Beta

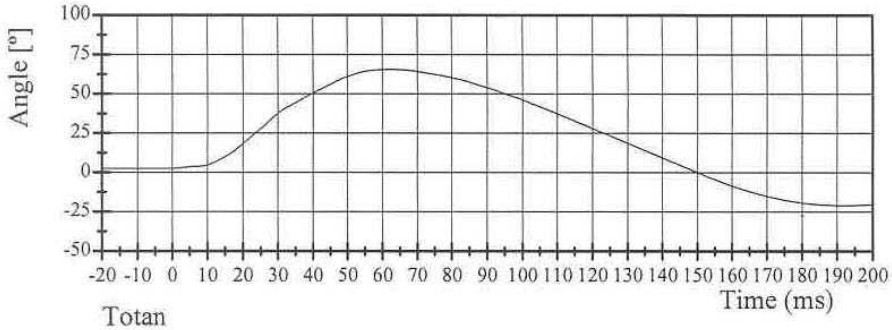


Filter Class: 60

Max: 21.4 ° at 67.0 ms

Min: -6.8 ° at 190.8 ms

Theta

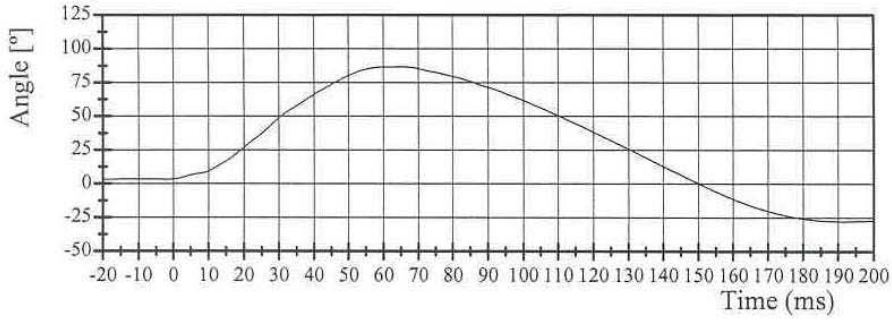


Filter Class: 60

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

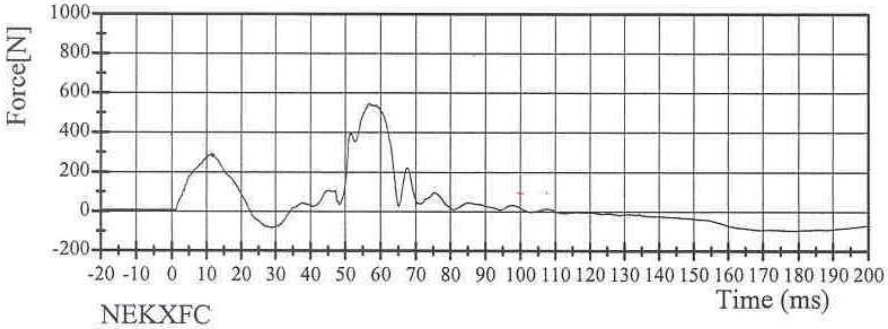
Transportation Research Center Inc.

572P Neck Extension Test

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

Test Date 10/09/2003

NEKXF

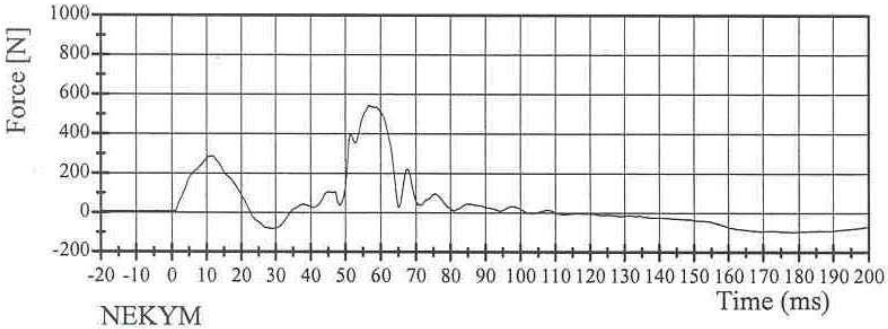


Filter Class: 1000

Max: 543.9 N at 56.9 ms

Min: -97.1 N at 175.3 ms

NEKXFC

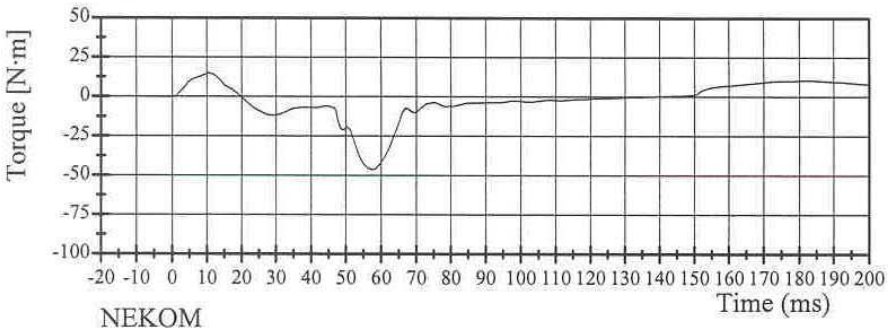


Filter Class: 600

Max: 543.2 N at 56.8 ms

Min: -96.2 N at 178.7 ms

NEKYM

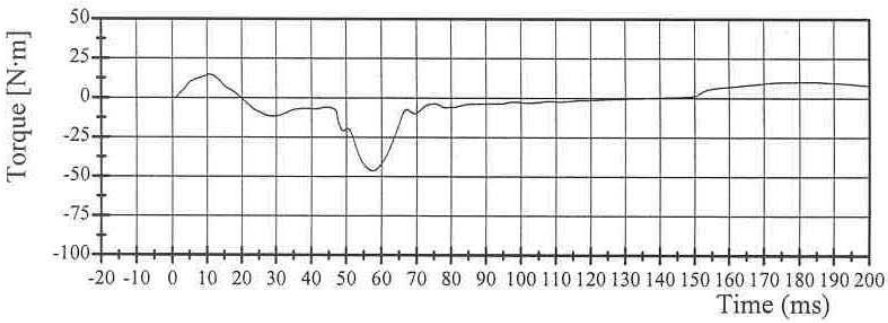


Filter Class: 600

Max: 15.1 N·m at 10.4 ms

Min: -46.3 N·m at 57.6 ms

NEKOM



Filter Class: 600

Max: 15.1 N·m at 10.4 ms

Min: -46.3 N·m at 57.6 ms

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

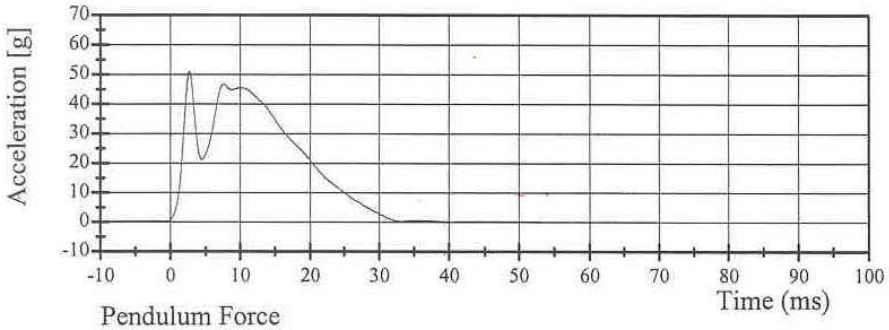
Transportation Research Center Inc.

572P Thorax Test

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

Test Date 10/10/2003

Pendulum Deceleration

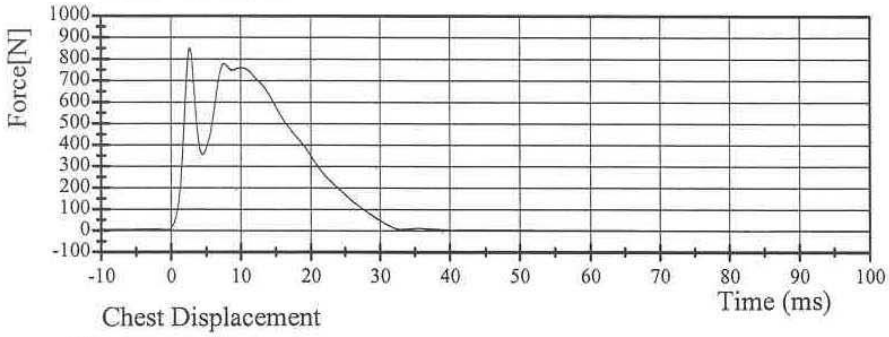


Filter Class: 180

Max: 51.0 g at 2.6 ms

Min: -0.4 g at 433.0 ms

Pendulum Force

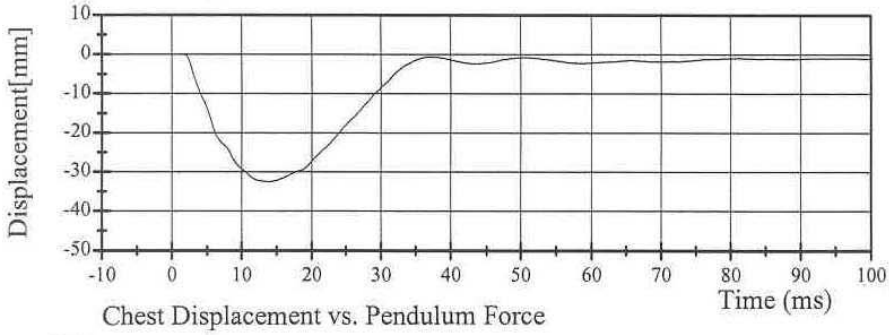


Filter Class: 180

Max: 850.3 N at 2.6 ms

Min: -7.0 N at 433.0 ms

Chest Displacement

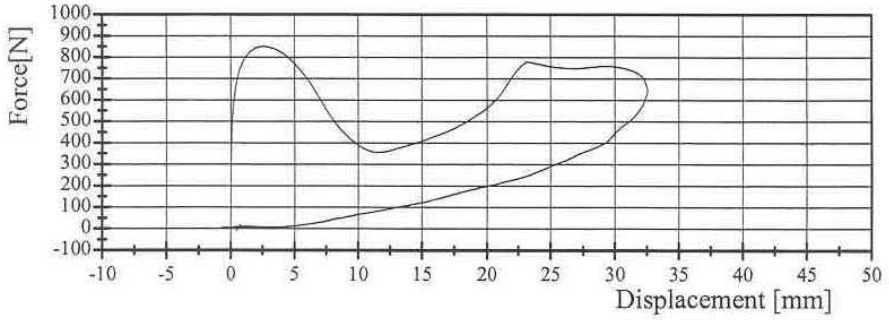


Filter Class: 600

Max: 0.7 mm at 725.3 ms

Min: -32.5 mm at 13.9 ms

Chest Displacement vs. Pendulum Force



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 UNSUPPORRTED 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

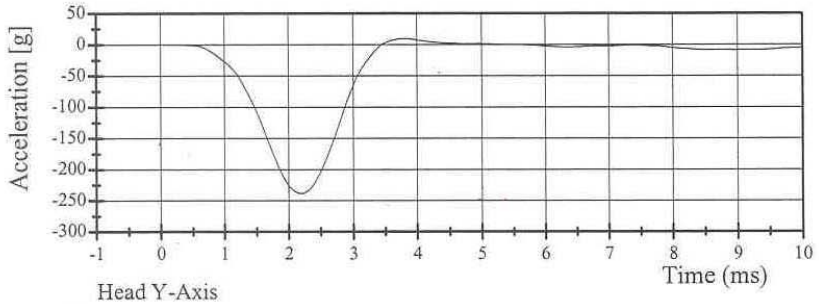
Transportation Research Center Inc.

572P Head Drop Test

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

Test Date 10/15/2003

Head X-Axis

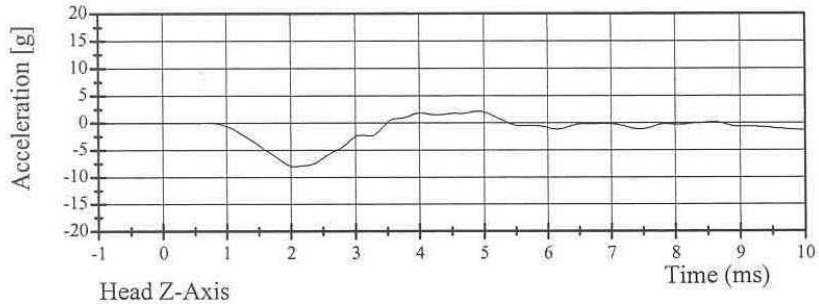


Filter Class: 1000

Max: 9.9 g at 3.8 ms

Min: -238.1 g at 2.2 ms

Head Y-Axis

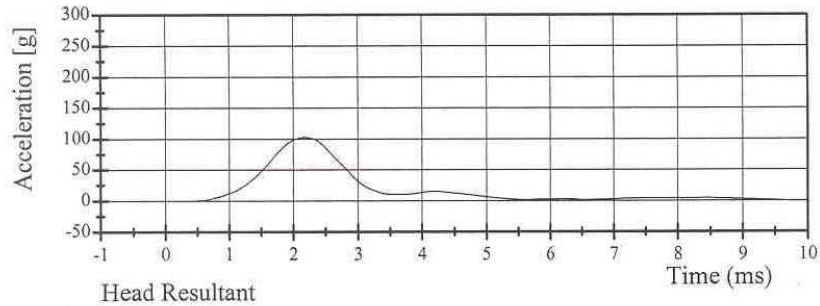


Filter Class: 1000

Max: 2.2 g at 4.9 ms

Min: -8.0 g at 2.1 ms

Head Z-Axis

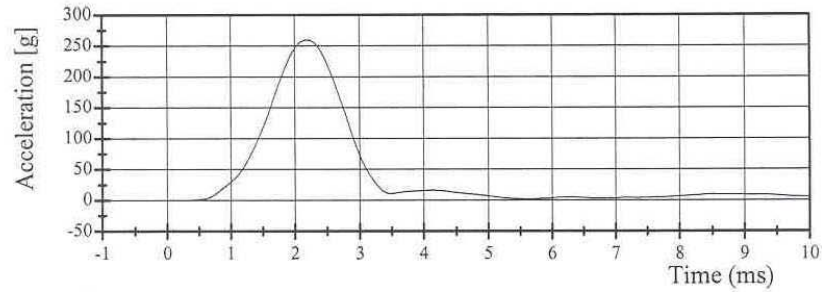


Filter Class: 1000

Max: 103.0 g at 2.2 ms

Min: -0.8 g at 10.0 ms

Head Resultant



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

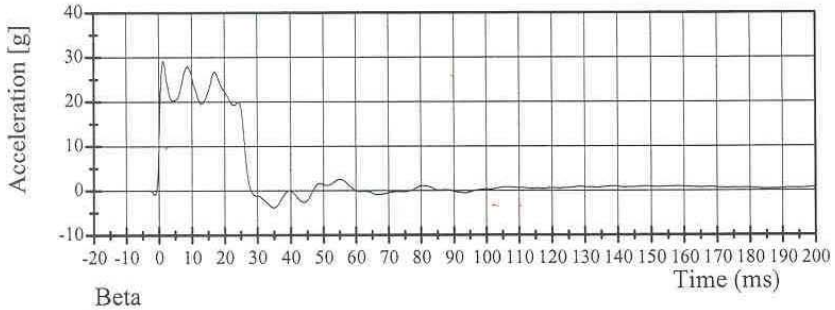
Transportation Research Center Inc.

572P Neck Flexion Test

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

Test Date 10/15/2003

Pendulum Deceleration

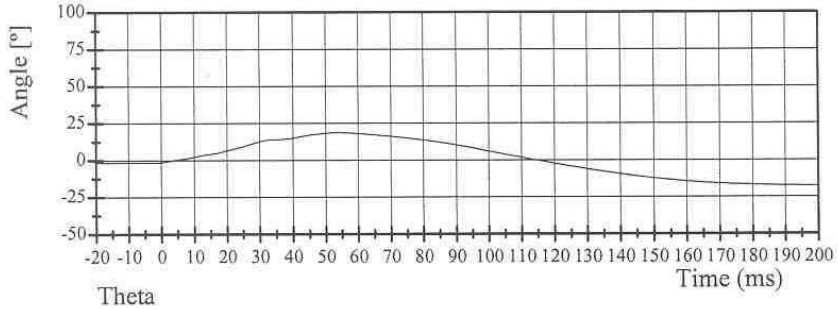


Filter Class: 180

Max: 29.2 g at 1.4 ms

Min: -3.8 g at 35.0 ms

Beta

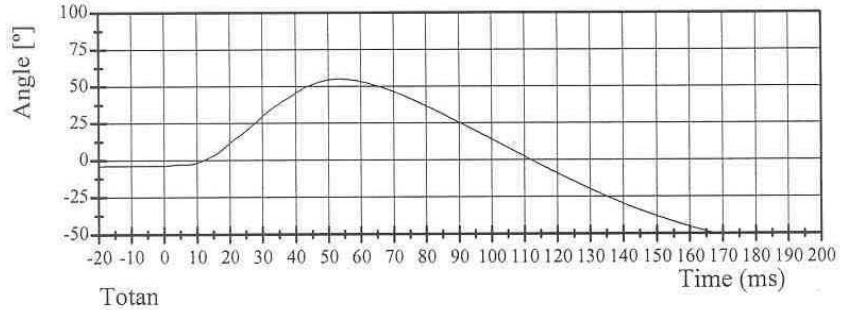


Filter Class: 60

Max: 18.7 ° at 53.9 ms

Min: -17.6 ° at 214.3 ms

Theta

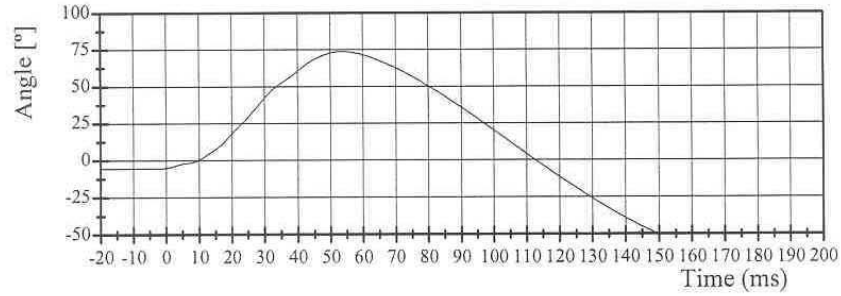


Filter Class: 60

Max: 55.0 ° at 53.4 ms

Min: -56.8 ° at 200.0 ms

Totan



Filter Class: 60

Max: 73.7 ° at 53.6 ms

Min: -74.4 ° at 201.8 ms

10.15.2003 15:21:01 640

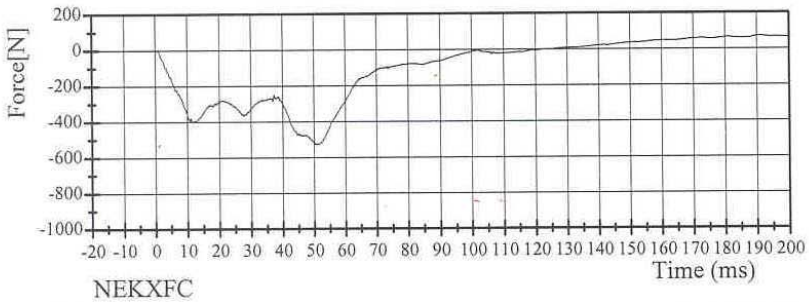
Transportation Research Center Inc.

572P Neck Flexion Test

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

Test Date 10/15/2003

NEKXF

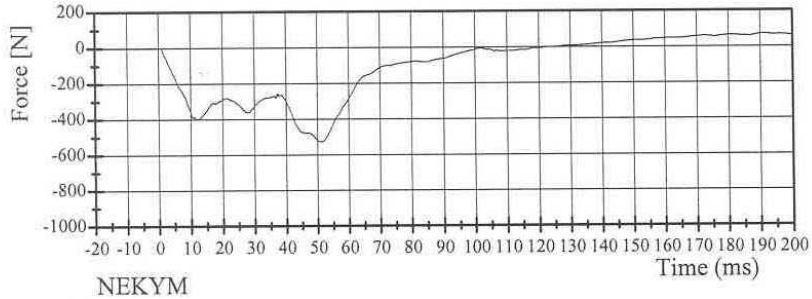


Filter Class: 1000

Max: 70.8 N at 190.9 ms

Min: -528.1 N at 51.2 ms

NEKXFC

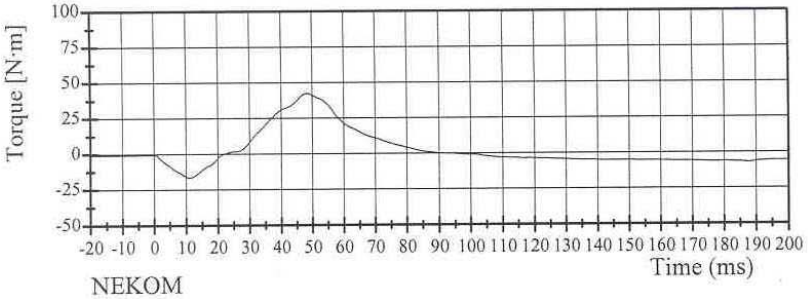


Filter Class: 600

Max: 70.7 N at 191.0 ms

Min: -527.8 N at 51.3 ms

NEKYM

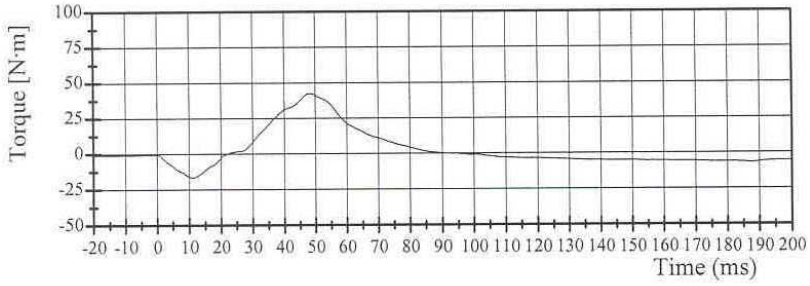


Filter Class: 600

Max: 42.5 N·m at 48.5 ms

Min: -16.8 N·m at 11.3 ms

NEKOM



Filter Class: 600

Max: 42.5 N·m at 48.5 ms

Min: -16.8 N·m at 11.3 ms

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

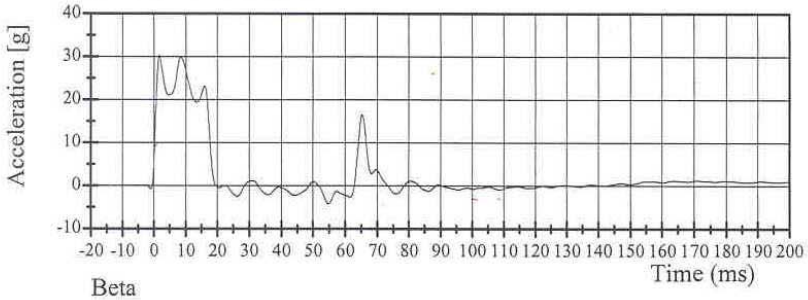
Transportation Research Center Inc.

572P Neck Extension Test

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

Test Date 10/16/2003

Pendulum Deceleration

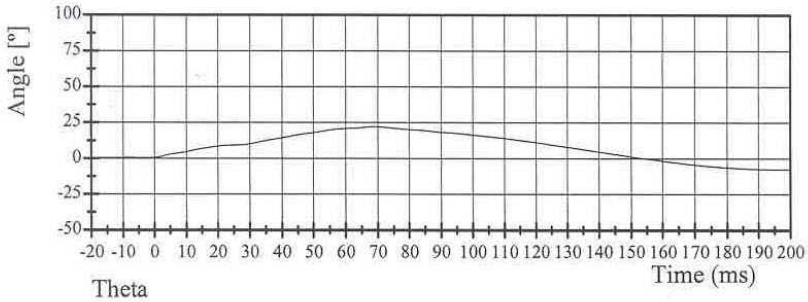


Filter Class: 180

Max: 30.4 g at 1.7 ms

Min: -4.2 g at 54.8 ms

Beta

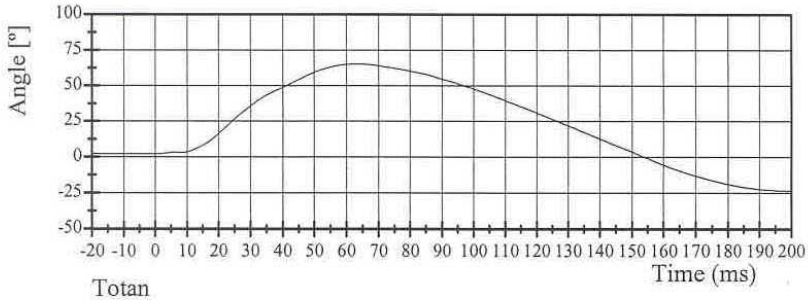


Filter Class: 60

Max: 22.2 ° at 68.8 ms

Min: -7.6 ° at 200.0 ms

Theta

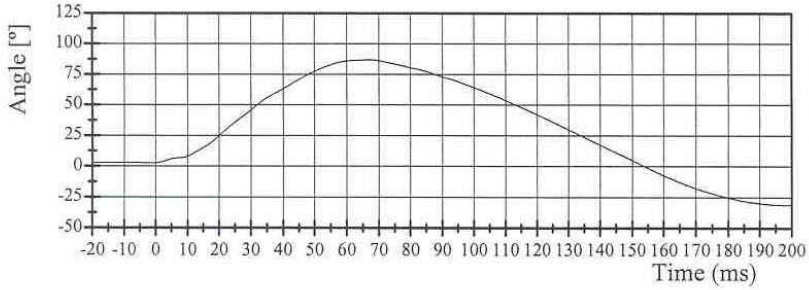


Filter Class: 60

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

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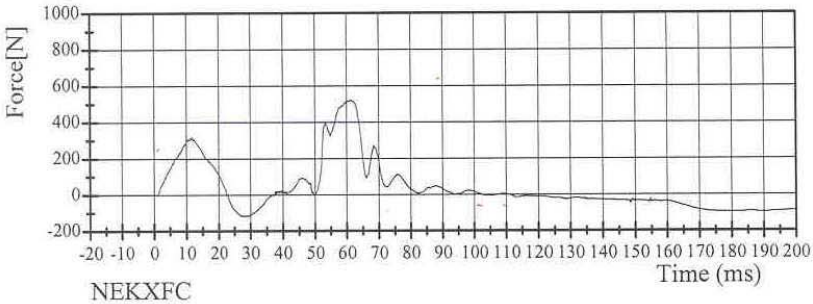
Transportation Research Center Inc.

572P Neck Extension Test

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

Test Date 10/16/2003

NEKXF

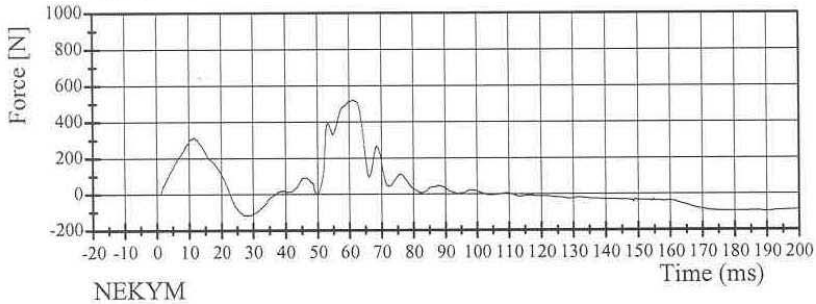


Filter Class: 1000

Max: 521.6 N at 61.4 ms

Min: -119.7 N at 28.4 ms

NEKXFC

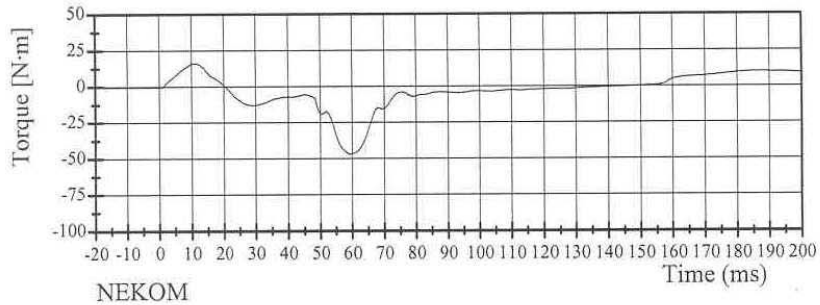


Filter Class: 600

Max: 520.8 N at 61.3 ms

Min: -119.0 N at 28.3 ms

NEKYM

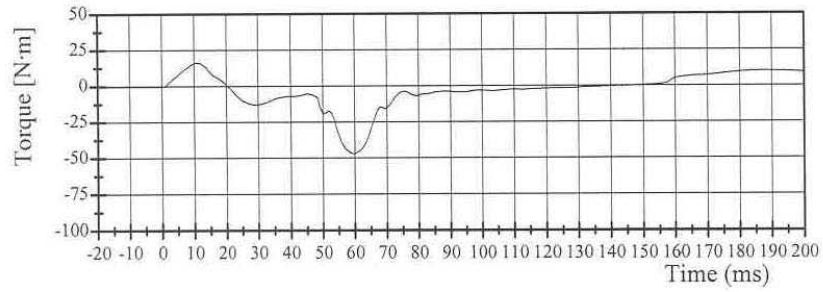


Filter Class: 600

Max: 16.2 N·m at 11.3 ms

Min: -47.1 N·m at 59.7 ms

NEKOM



Filter Class: 600

Max: 16.2 N·m at 11.3 ms

Min: -47.1 N·m at 59.7 ms

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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

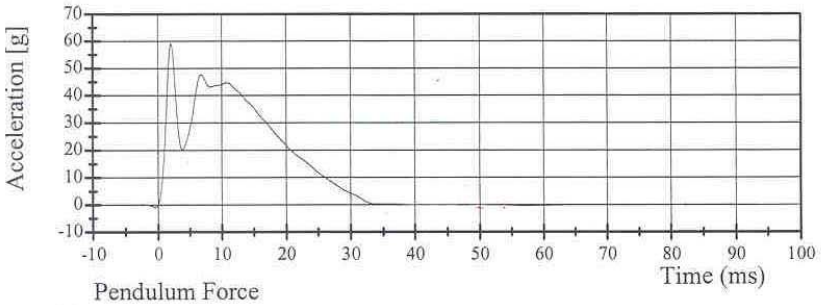
Transportation Research Center Inc.

572P Thorax Test

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

Test Date 10/17/2003

Pendulum Deceleration

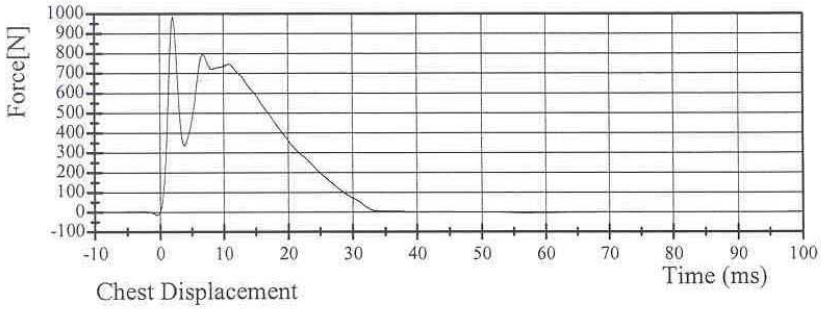


Filter Class: 180

Max: 59.1 g at 2.1 ms

Min: -0.9 g at -0.4 ms

Pendulum Force

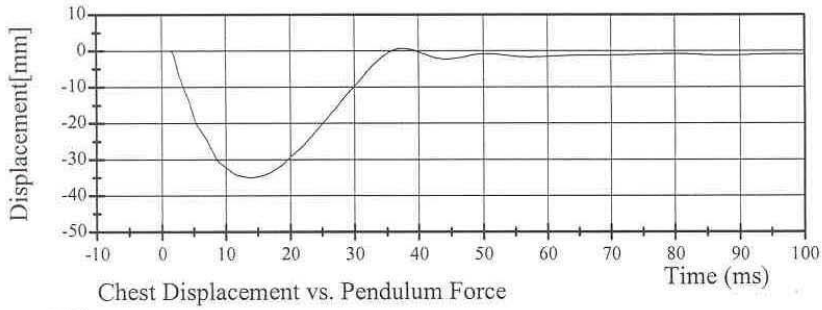


Filter Class: 180

Max: 984.8 N at 2.1 ms

Min: -15.2 N at -0.4 ms

Chest Displacement

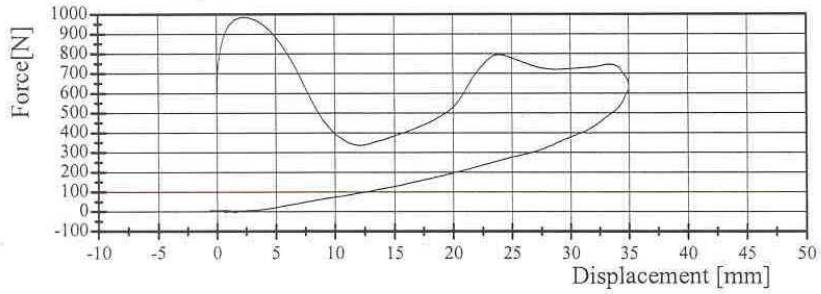


Filter Class: 600

Max: 0.7 mm at 37.3 ms

Min: -35.0 mm at 14.0 ms

Chest Displacement vs. Pendulum Force



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 UNSUPPORRTED 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 & INTIAL ANGLE	+/- 10° OF INTIAL 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	8/07/03
Head Y	ACC81	Endevco	8/07/03
Head Z	AHY71	Endevco	8/07/03
Head X Redundant	P22190	Endevco	9/04/03
Head Y Redundant	P22180	Endevco	9/04/03
Head Z Redundant	P22805	Endevco	9/04/03
Upper Neck Load Cell	210	Denton	8/25/03
Chest X	J13649	Endevco	10/06/03
Chest Y	ANBP7	Endevco	9/04/03
Chest Z	J13422	Entran	10/06/03
Chest X Redundant	J13653	Endevco	10/06/03
Chest Y Redundant	AP1C6	Endevco	9/04/03
Chest Z Redundant	J13713	Endevco	10/06/03
Chest Deflection Gauge	040	Servo	10/14/03
Pelvis X	AMTG3	Endevco	8/06/03
Pelvis Y	AMTL6	Endevco	8/06/03
Pelvis Z	ALC37	Endevco	8/06/03
Tether Force	172	FTSS	10/11/03

INSTRUMENTS FOR LRP CHILD DUMMY S/N: 042

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X	AKAH1	Entran	8/06/03
Head Y	J17709	Entran	8/06/03
Head Z	AJ4J0	Endevco	11/10/03
Head X Redundant	J18260	Endevco	8/06/03
Head Y Redundant	J20298	Endevco	8/06/03
Head Z Redundant	AJ9C2	Endevco	11/10/03
Upper Neck Load Cell	94	FTSS	9/02/03
Chest X	J12449	Endevco	8/07/03
Chest Y	J12425	Endevco	8/07/03
Chest Z	J12462	Endevco	8/07/03
Chest X Redundant	P24154	Endevco	12/05/03
Chest Y Redundant	P23012	Endevco	9/04/03
Chest Z Redundant	P23059	Endevco	12/05/03
Chest Deflection Gauge	042	Servo	10/23/03
Pelvis X	AGTT3	Endevco	8/07/03
Pelvis Y	AHTT2	Endevco	11/10/03
Pelvis Z	J11630	Entran	8/07/03
Tether Force	157	Denton	8/21/03