REPORT NUMBER: TWG-MGA-2006-003

NEW CAR ASSESSMENT PROGRAM
SIDE AIRBAG OUT-OF-POSITION INJURY TESTING

NISSAN MOTOR CO., LTD
2006 INFINITI FX35 CROSSOVER
NHTSA NUMBER: M65205TWG2

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

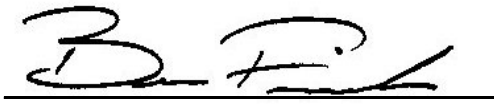
Test Date: June 8, 2006

Final Report Date: August 16, 2006

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 DTNH22-03-D-12005.

Prepared by:  Date: 8/16/06

Ben Fischer, Project Engineer

Reviewed by:  Date: 8/16/06

David Winkelbauer, Facility Director

Technical Report Documentation Page

1. Report No. TWG-MGA-2006-003	*2. Government Accession No.*	*3. Recipient's Catalog No.*	
4. Title and Subtitle Final Report 2006 Infinti FX35 Crossover NHTSA No.: M65205TWG2		*5. Report Date* August 16, 2006 *6. Performing Organization Code* MGA	
7. Author(s) Ben Fischer, Project Engineer		*8. Performing Organization Report No.* TWG-MGA-2006-003	
9. Performing Organization Name and Address MGA Research Corporation 5000 Warren Road Burlington, WI 53105		*10. Work Unit No.* *11. Contract or Grant No.* DTNH22-03-D-12005	
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Rulemaking, Office of Crashworthiness Standards 400 Seventh Street, SW, Room 5311 Washington, D.C. 20590		*13. Type of Report and Period Covered* 6/08/06 – 8/16/06 *14. Sponsoring Agency Code* NVS-111	
15. Supplementary Notes			
16. Abstract This side impact out-of-position test was performed in conjunction with a New Car Assessment Program (NCAP). This test was conducted at MGA Research Corporation in Burlington, Wisconsin, on June 8, 2006.			

HIC 15	HIC 36	NIJ NTF	NIJ NTE	NIJ NCF	NIJ NCE
12.1	14.8	0.18	0.84	0.50	0.71

17. Key Words New Car Assessment Program (NCAP) Side Airbag Out-of-Position		*18. Distribution Statement* Copies of this report are available from: National Highway Traffic Safety Admin., Technical Ref. Division, Room 5108 (NPO-230) 400 Seventh Street, S.W. Washington, D.C. 20590	
19. Security Classif. (of this report) Unclassified	*20. Security Classif. (of this page)* Unclassified	*21. No. of Pages* 26	22. Price

Form DOT F1700.7 (8-72)

TABLE OF CONTENTS

SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

The purpose of this test was to obtain data in a static out-of-position side impact. These data constitute part of the general consumer information collected by the New Car Assessment Program (NCAP) sponsored by the National Highway Traffic Safety Administration (NHTSA) under contract number DTNH22-03-D-12005.

SUMMARY

The effects of both a seat-mounted side airbag and a curtain airbag deployment in a 2006 Infiniti FX35 Crossover with an out-of-position six-year-old child were evaluated. The test was performed by MGA Research Corporation on June 8, 2006. Pre and post test photographs of the vehicle and dummy can be found in Appendix A.

One real-time camera (24 fps) and three high-speed cameras (1000 fps) were used to document the side airbag deployment event. The following camera locations were used:

- Left Side Through Driver Window
- Front Through Windshield
- Left Side ¾ View Through Windshield

One Part 572N, 6-year-old child dummy (Serial Number 144) was placed in the right front passenger seat situated in the forward-facing position per Section 3.3.3.5 according to dummy placement instructions specified in the Recommended Procedures for Evaluating Occupant Injury Risk from Deploying Side Airbags as prepared by the Side Airbag Out-of-Position Injury Technical Working Group (TWG).

The child dummy was instrumented with head tri-axial accelerometers. In addition, upper and lower neck force and moment load cell sensors were utilized.

The 15 channels of data were recorded on an on-board data acquisition system. Appendix B contains the dummy head and neck response data traces. Appendix C contains the instrumentation calibration data.

The HIII 6-year-old child dummy's visible contact points were as follows: The seat airbag to the right scapula and right side of the posterior thorax and pelvis and the curtain airbag to the top of the head.

The HIII 6-year-old child dummy was placed on the outboard edge of the foam block, aligning the upper spine with the deployment trajectory of the airbag. The dummy's head was placed in between the seat bolster and pillar trim to minimize the fore-aft clearance between the neck and the seatback. The head remained in its neutral orientation. The legs were aligned such that they crossed the heel placement points. The dummy was then positioned so the dummy's neck/torso junction was aligned vertically with the top edge of the airbag module. While maintaining the neck/torso top of the airbag module alignment, the vehicle door was closed and the pelvis was moved outboard until it made contact with the door trim/armrest. The outboard forearm was placed on the armrest. The inboard arm was positioned such that the upper arm

contacted the seat back and the fingertips contacted the booster seat. This orientation complies with Section 3.3.3.5 of the TWG Recommended Procedures for Evaluating Occupant Injury Risk from Deploying Side Airbags as defined by Lund, et al and the Technical Working Group First Revision dated July, 2003.

SECTION 2

OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1

TEST SUMMARY

	Test Data	Description
Seating Position	P2	Right Front Seating Position
Test	3.3.3.5*	Forward-facing HIII 6-year-old child dummy on booster block leaning against door trim panel
Airbag	Seat-Mounted Roof-Rail Mounted	Torso airbag Side curtain airbag
Booster Block	300 m x 455 mm x 75 mm	Block consisted of HD36 foam with a density of 44.8 g/L
ATD Type/Serial No.	P572N / 144	HIII 6-year-old child dummy

* Procedure as defined by Lund, et al and the Technical Working Group dated July, 2003

Number of Data Channels	15
Number of Real-Time Video	1
Number of High-Speed Video	3

Visible Dummy Contact Points	
Head Contact	Curtain airbag to top of head
Upper Torso Contact	Side airbag to the right side of torso
Lower Torso Contact	Side airbag to the right side of pelvis (ilium)
Left Knee Contact	None
Right Knee Contact	None

DATA SHEET NO. 2

TEST VEHICLE INFORMATION

Please note that this vehicle had previously been tested in an
NCAP Frontal Impact on May 8, 2006

TEST VEHICLE INFORMATION

Manufacturer	Infiniti
Model	FX35 Crossover
Body Style	4-Door MPV
NHTSA No.	M65205TWG2
VIN	JNRAS08W46X205232
Color	Black Obsidian
Delivery Date	4/26/06
Odometer Reading (mile)	127
Dealer	Fields Infiniti
Transmission	Automatic
Final Drive	4WD
Number of Cylinders	6
Engine Displacement (L)	3.5
Engine Placement	Longitudinal
Automatic Door Lock (ADL)	No
Owners Manual Details Instructions on Disabling ADLs	No
Bucket Seats	Yes

TEST VEHICLE OPTIONS

Front Airbag	Yes
Driver Side Curtain Airbag	Yes
Driver Side Torso Airbag	Yes
Rear Passenger Side Curtain Airbag	Yes
Rear Passenger Side Torso Airbag	No
Force Limiter	Yes
Pretensioner	Yes
Power Steering	Yes
Power Door Locks	Yes
Tilt Wheel	Yes
Air Conditioning	Yes
Anti-lock Brakes	Yes
Traction Control	Yes
All Wheel Drive	Yes
Power Seats	Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Nissan Motor Co., Ltd.
Date of Manufacture	2/06

GVWR (kg)	2486
GAWR Front (kg)	1187
GAWR Rear (kg)	1311

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench		
Number of Occupants	2	3		5
Capacity Wt. (VCW) (kg)				431
Cargo Wt. (RCLW) (kg)				90.8

DATA SHEET NO. 3

DUMMY POSITIONING IN VEHICLE

Measurement		Value
Total Fore/Aft Travel (mm)		260
Test Distance Rearward of Full-Forward (mm)		260
Total Fore/Aft Travel (detents)		---
Placed in Position No. 2		---
Seat Back Angle	SA (°)	25
Airbag Module Width (curtain)	AMW (mm)	37
Airbag Width (curtain)	ABW (mm)	501
Airbag Module Length (curtain)	AML (mm)	305
Airbag Length (curtain)	ABL (mm)	1393
Top of Airbag Module to Head/Neck Junction	AN (mm)	---
Head CG to Door Panel/Window	HD (mm)	97
Head to Seat Back Centerline	HSC (mm)	124
Head to B-Pillar (cg)	HB (mm)	228
Head to Roof, Z (top of the head)	HZ (mm)	123
Head to Header	HHD (mm)	107
Chest to Dash	CD (mm)	659
Chest to Seatback	CS (mm)	257
Right Arm to Seat Back Centerline	RACL (mm)	---
Right Arm to Seat Back Centerline	RACL (°)	---
Left Arm to Seat Back Centerline	LACL (mm)	---
Left Arm to Seat Back Centerline	LACL (°)	---
Right Arm to Door Panel	RA (mm)	17
Left Arm to Door Panel	LA (mm)	282
Knee to Knee	KK (mm)	131
Toe to Toe	TT (mm)	152
Right Knee to Seat Cushion Centerline	KSCR (mm)	172
Left Knee to Seat Cushion Centerline	KSCL (mm)	18
Right Toe to Seat Cushion Centerline	TSCR (mm)	12
Left Toe to Seat Cushion Centerline	TSCL (mm)	139
Nose to Dash	ND (mm)	698
Nose to Seatback	NS (mm)	346
Nose to Header	HR (mm)	216
Foam Block Depth	(mm)	300
Foam Block Width	(mm)	455
Foam Block Thickness	(mm)	75

DATA SHEET NO. 4

DUMMY INJURY CRITERIA VALUES

NHTSA No. M65205TWG2

		MAXIMUM VALUE			
		Position No. 2			
DESCRIPTION	UNIT	MAXIMUM	TIME (MS)	MINIMUM	TIME (MS)
Head X	g	17.4	8.5	-8.2	25.6
Head Y	g	2.8	4.4	-7.1	12.0
Head Z	g	11.8	25.3	-14.5	7.6
Head Resultant	g	22.5	7.5	0.0	0.0
Upper Neck Fx	N	407.5	9.0	-80.3	25.3
Upper Neck Fy	N	108.8	0.5	-165.0	13.4
Upper Neck Fz	N	267.1	16.7	-488.9	7.3
Upper Neck F Resultant	N	632.3	7.3	0.5	0.0
Upper Neck Mx	N-m	10.0	10.7	-11.1	22.0
Upper Neck My	N-m	38.5	7.8	-30.0	25.9
Upper Neck Mz	N-m	1.8	0.4	-6.3	15.8
Upper Neck M Resultant	N-m	39.1	7.9	0.0	0.0
Lower Neck Fx	N	554.0	9.9	-435.6	4.6
Lower Neck Fy	N	152.3	3.5	-271.2	9.8
Lower Neck Fz	N	294.9	3.4	-400.9	7.0
Lower Neck F Resultant	N	685.9	9.8	0.5	0.0
Lower Neck Mx	N-m	3.4	4.8	-26.1	13.5
Lower Neck My	N-m	11.6	157.0	-48.9	15.0
Lower Neck Mz	N-m	3.6	3.1	-19.5	9.8
Lower Neck M Resultant	N-m	56.8	14.9	0.0	0.0

DATA SHEET NO. 4 (continued)

DUMMY INJURY CRITERIA VALUES

	HEAD INJURY CRITERIA (HIC)					
	HIC15			HIC36		
ATD position	HIC	T^1 (msec)	T^2 (msec)	HIC	T^1 (msec)	T^2 (msec)
No. 2 Right Front	12.1	4.2	17.8	14.8	3.6	28.6

Position 2 Neck Injury Summary (HIII 6-year-old – Out-of-Position)

Nij V10	Nij	Time (msec)	Z Force (N) (CFC 600)	X Force (N) (CFC 600)	Y Moment (N-m) (CFC 600)
Ntf	0.18	12.20	3.78	352.13	16.87
Nte	0.84	25.60	179.01	-75.82	-28.63
Ncf	0.50	7.40	-465.61	401.36	30.98
Nce	0.71	28.30	-4.18	14.07	-26.24
Peak Tension (CFC1000)		**267.1 N**	**Peak Compression (CFC 1000)**		**-488.9 N**

Critical Values

Nij Intercepts				Peak Limits	
Tension (CVt)	2800 N	Extension (mCVe)	37 N-m	Tension	1490 N
Compression (CVc)	2800 N	Flexion (mCVf)	93 N-m	Compression	1820 N
Condyle Offset	**0.01778 m**				

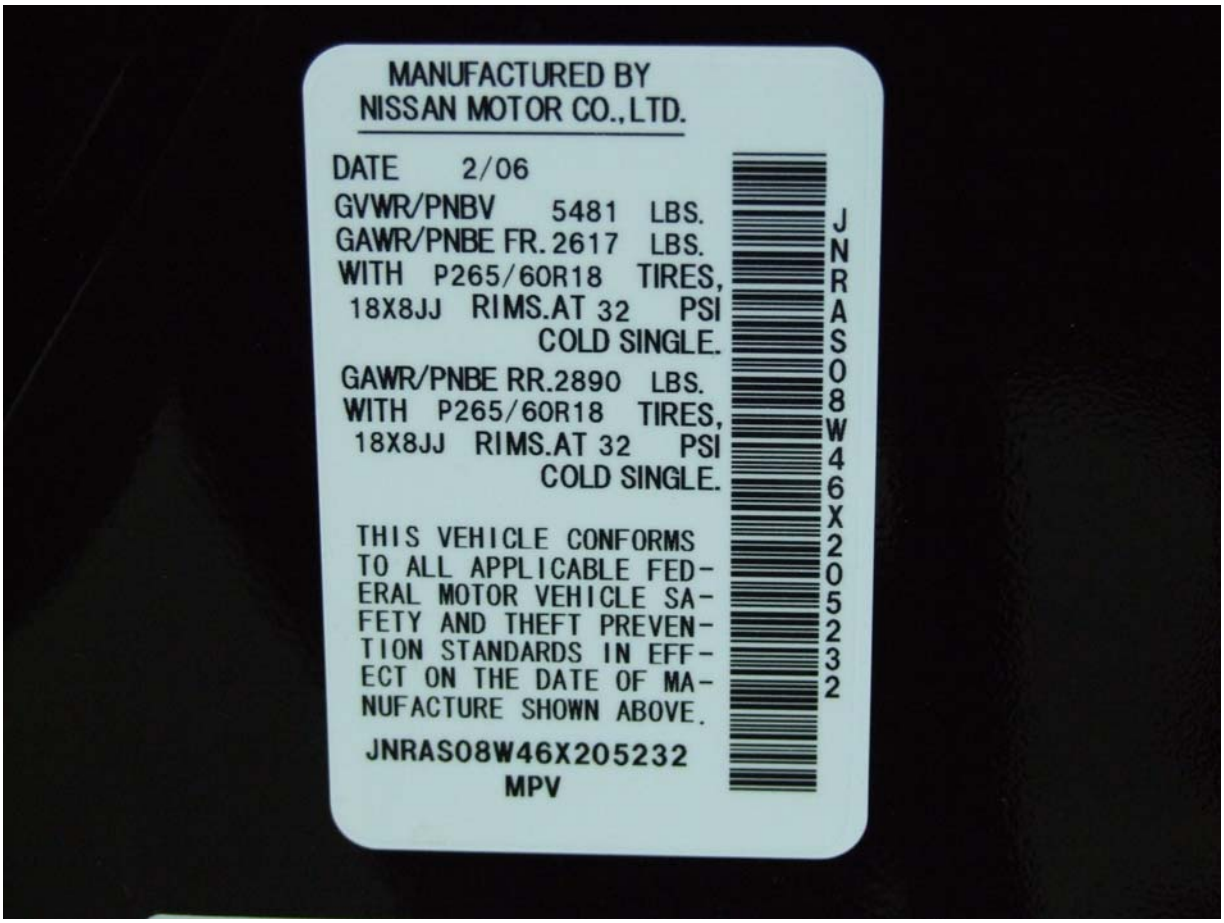
APPENDIX A

PHOTOGRAPHS

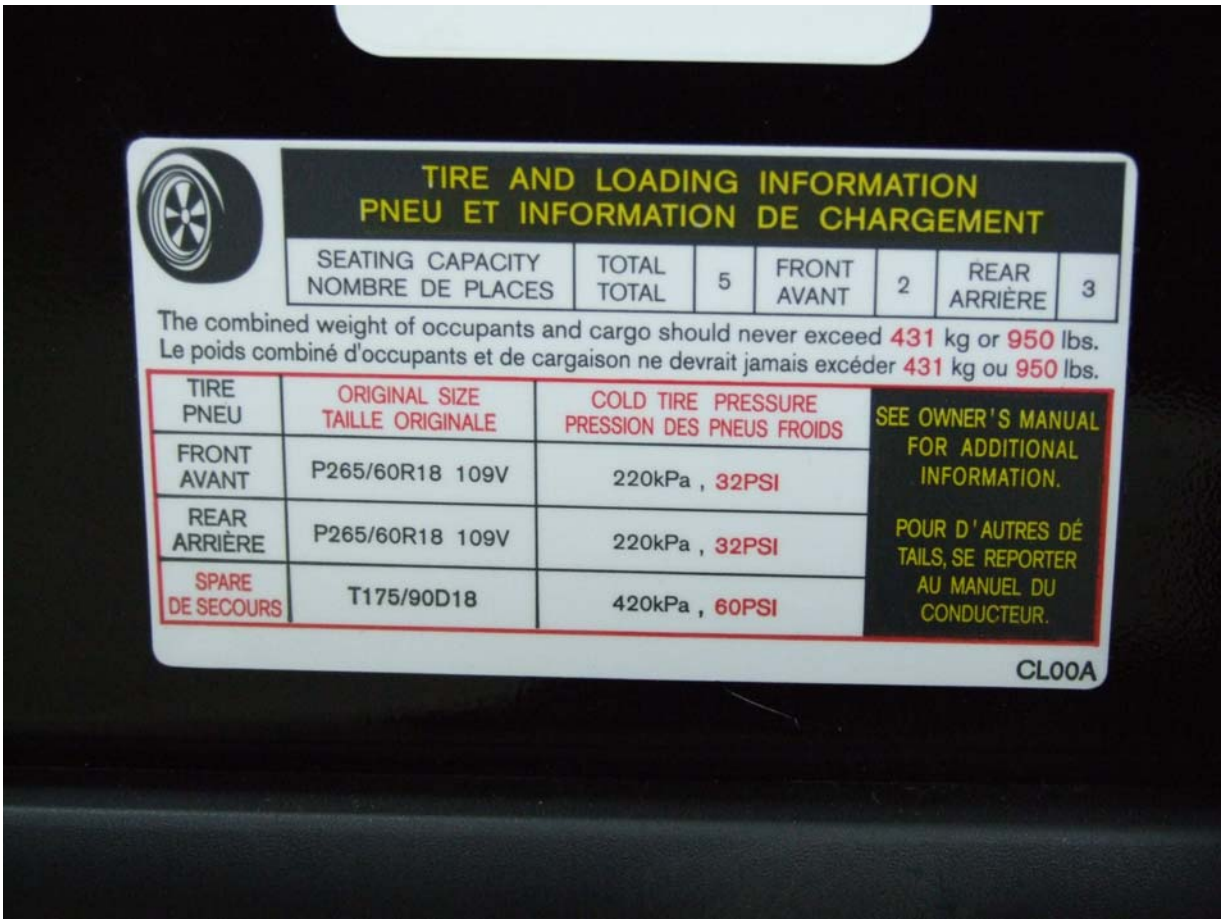
TABLE OF PHOTOGRAPHS

Pre-Test Vehicle Left Side View

Post-Test Vehicle Left Side View



Vehicle Certification Placard



Vehicle Tire Placard

Pre-Test Child Dummy Left Side View

Post-Test Child Dummy Left Side View

Pre-Test Child Dummy Frontal View

Post-Test Child Dummy Frontal View

Pre-Test Child Dummy Head View

Post-Test Child Dummy Head View

Pre-Test Child Dummy Head View (Through Window)

Post-Test Child Dummy Head View (Through Window)

APPENDIX B

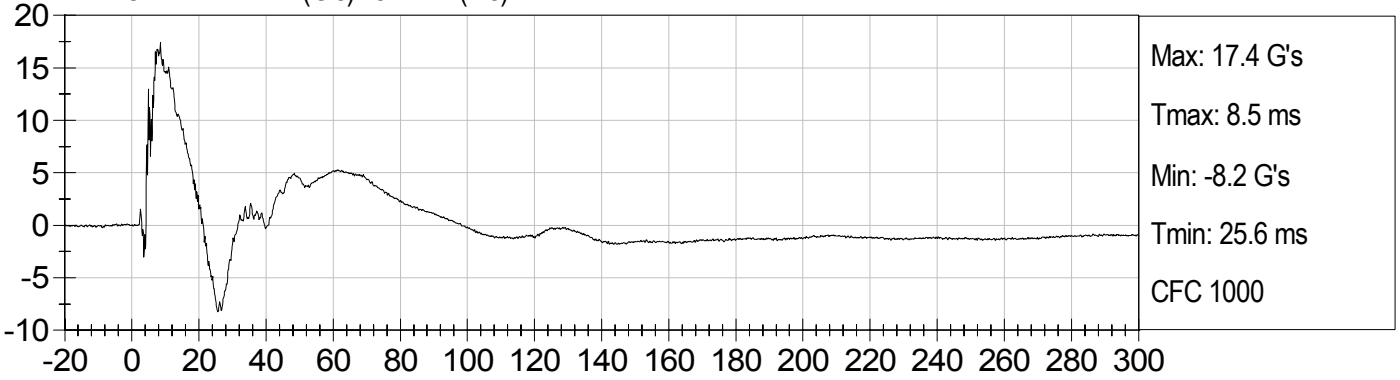
DUMMY RESPONSE DATA TRACES

TABLE OF DATA PLOTS

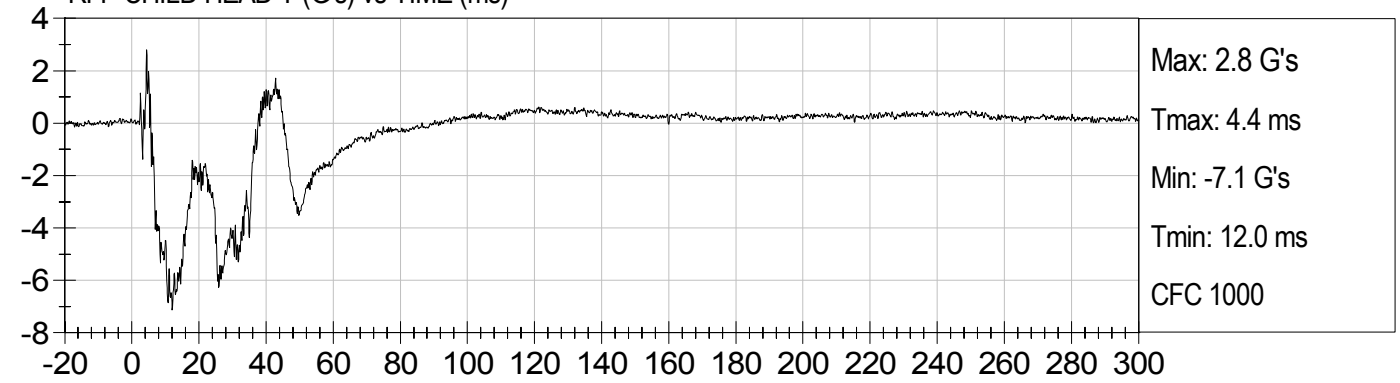
NCAP OOP - 6YO FORWARD FACING
2006 INFINITI X35

Test Date: 06/08/2006
Speed: 0.0 mph (0.0 km/h)

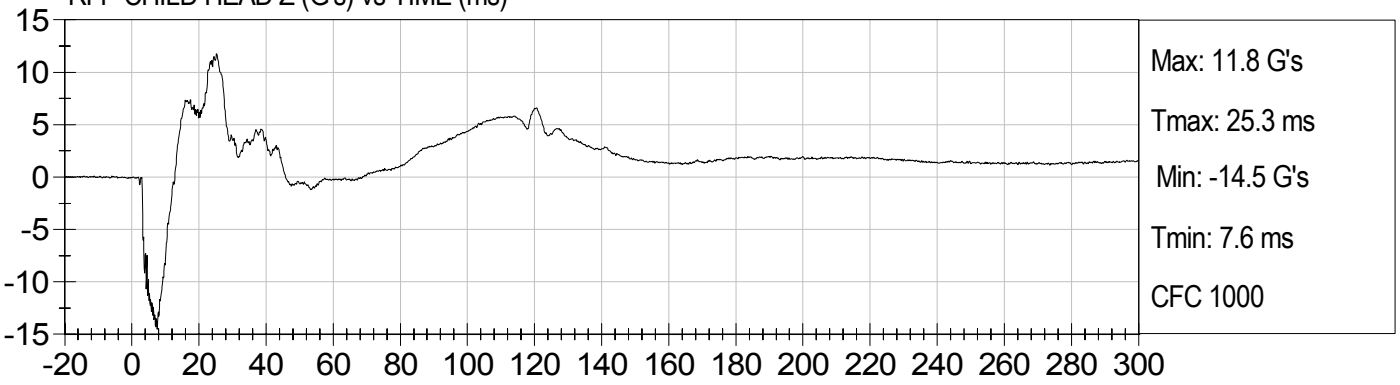
RFP CHILD HEAD X (G's) vs TIME (ms)



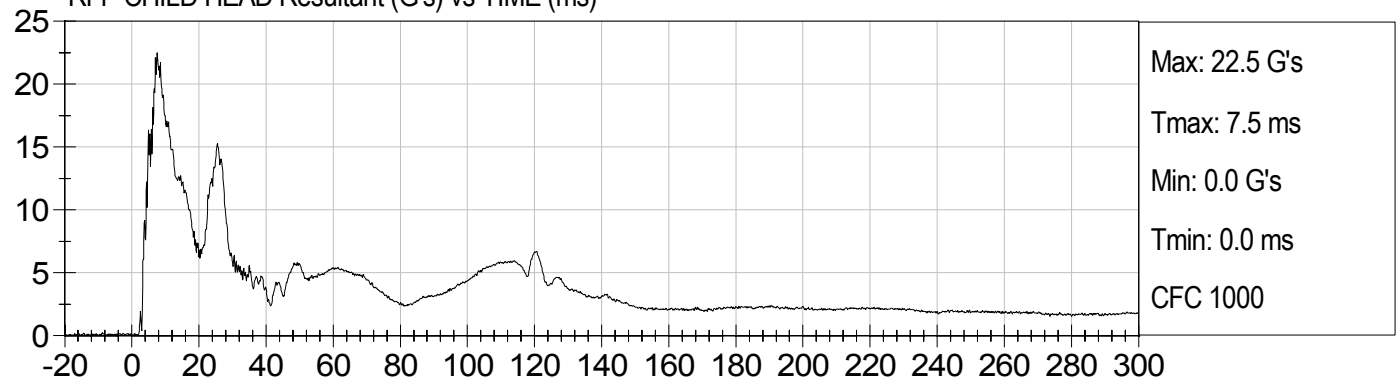
RFP CHILD HEAD Y (G's) vs TIME (ms)

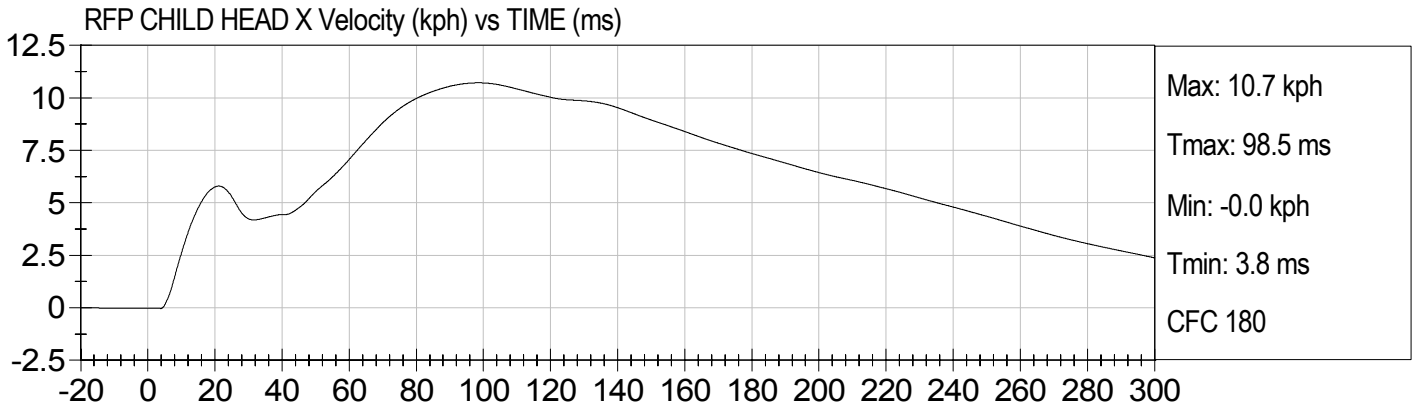


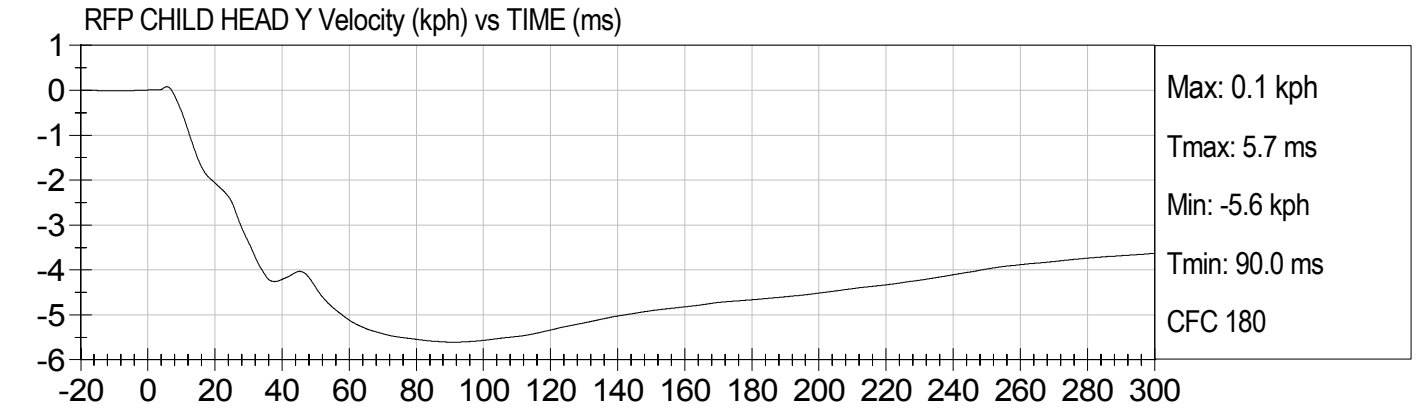
RFP CHILD HEAD Z (G's) vs TIME (ms)

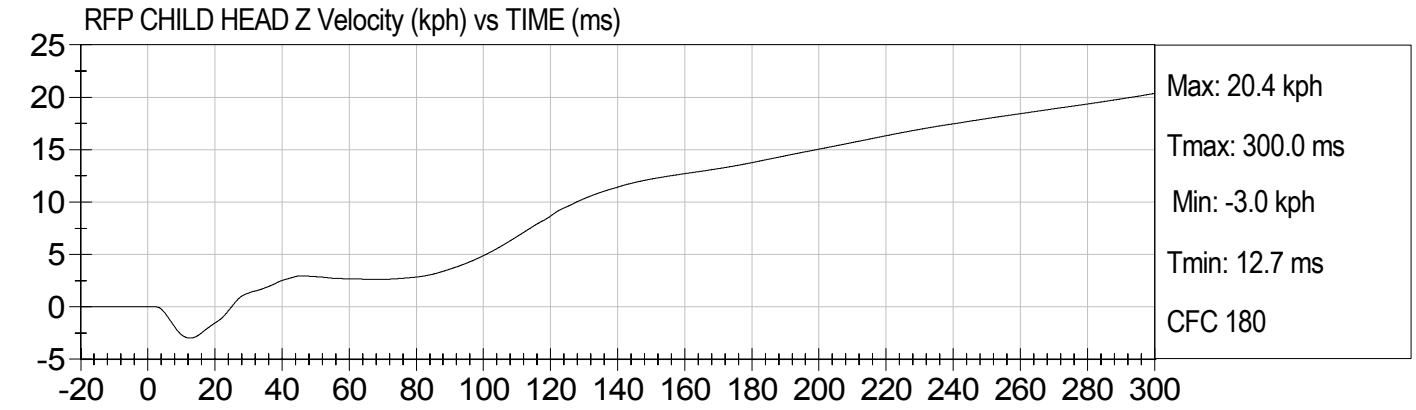


RFP CHILD HEAD Resultant (G's) vs TIME (ms)




RFP CHILD HEAD X 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: 10.7 kph
Tmax: 98.5 ms
Min: -0.0 kph
Tmin: 3.8 ms
CFC 180

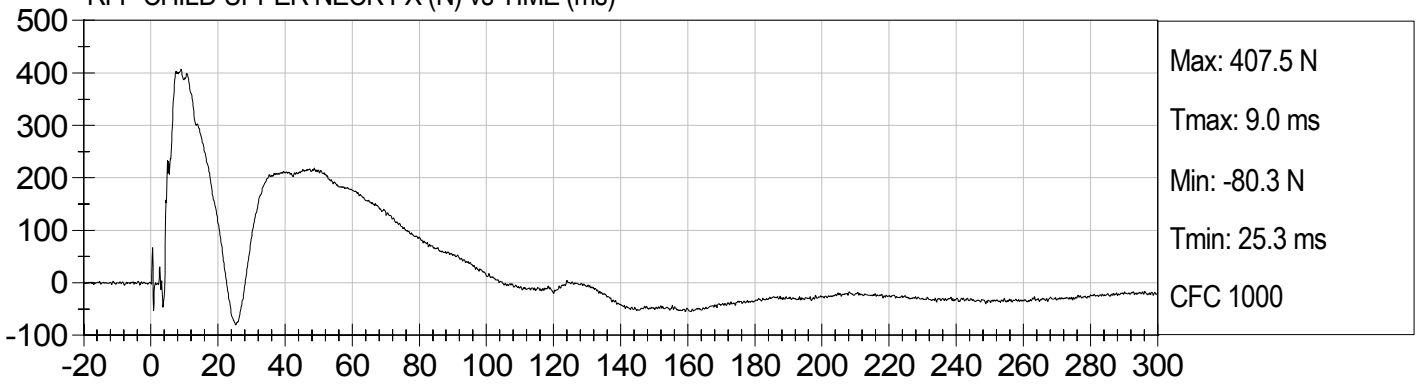

RFP CHILD HEAD Y Velocity (kph) vs TIME (ms)
1
0
-1
-2
-3
-4
-5
-6
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 0.1 kph
Tmax: 5.7 ms
Min: -5.6 kph
Tmin: 90.0 ms
CFC 180


RFP CHILD HEAD Z Velocity (kph) vs TIME (ms)
25
20
15
10
5
0
-5
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 20.4 kph
Tmax: 300.0 ms
Min: -3.0 kph
Tmin: 12.7 ms
CFC 180

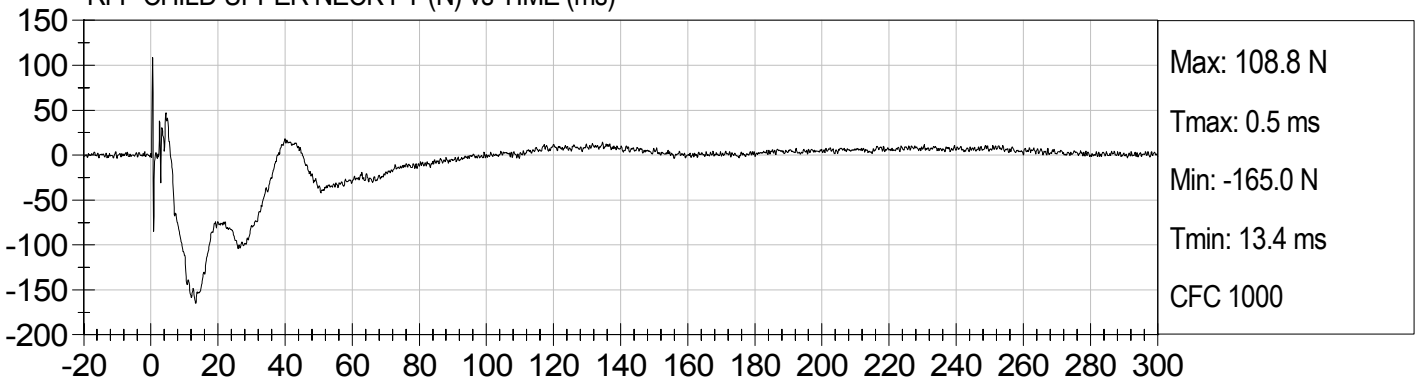
NCAP OOP - 6YO FORWARD FACING
2006 INFINITI X35

Test Date: 06/08/2006
Speed: 0.0 mph (0.0 km/h)

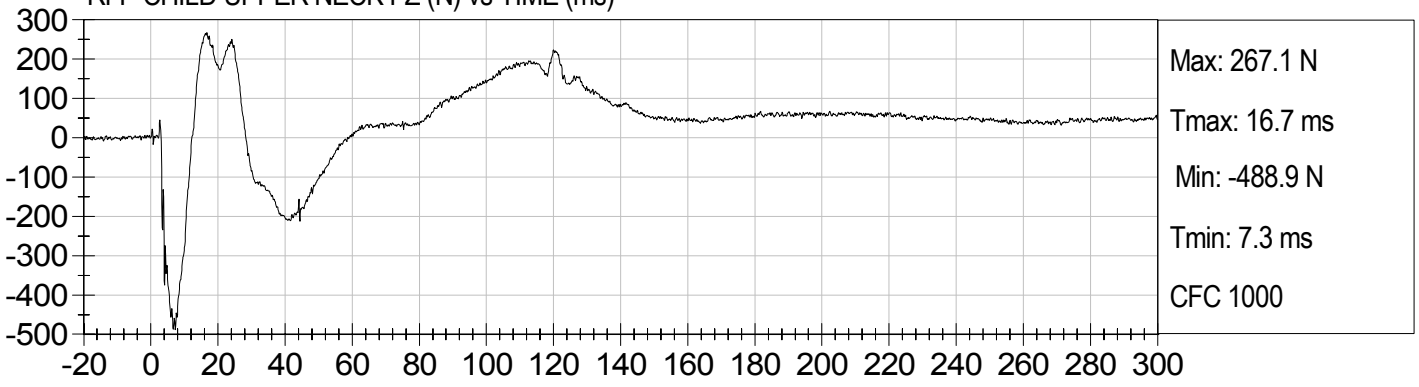
RFP CHILD UPPER NECK FX (N) vs TIME (ms)



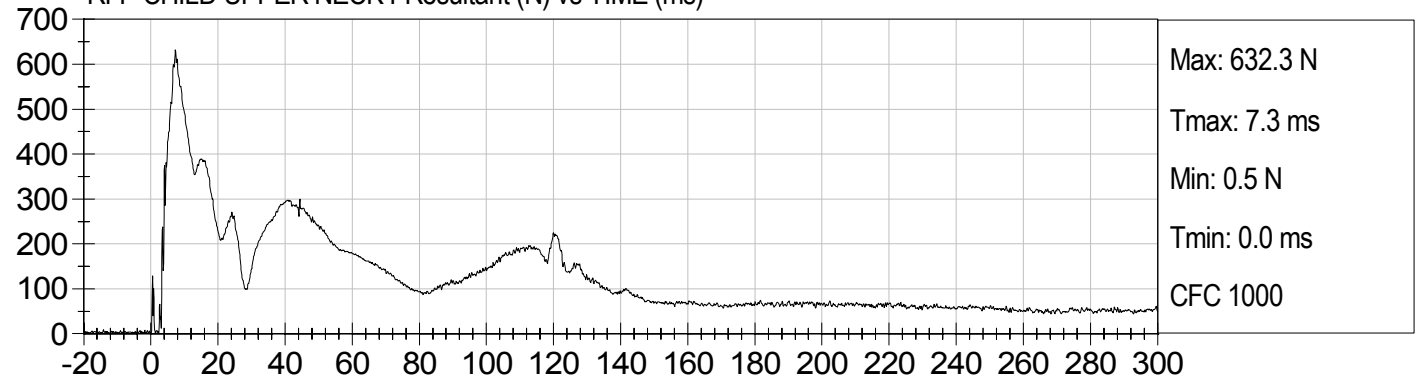
RFP CHILD UPPER NECK FY (N) vs TIME (ms)



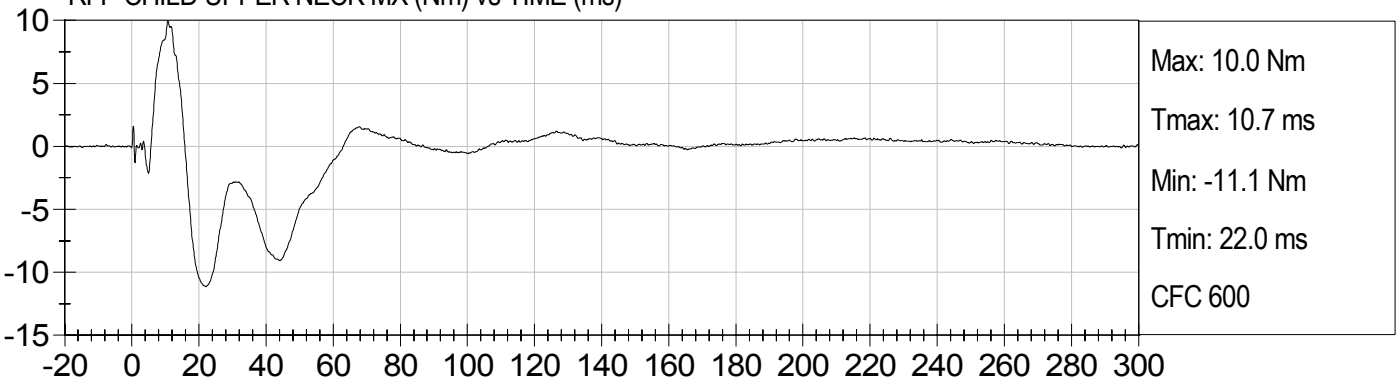
RFP CHILD UPPER NECK FZ (N) vs TIME (ms)



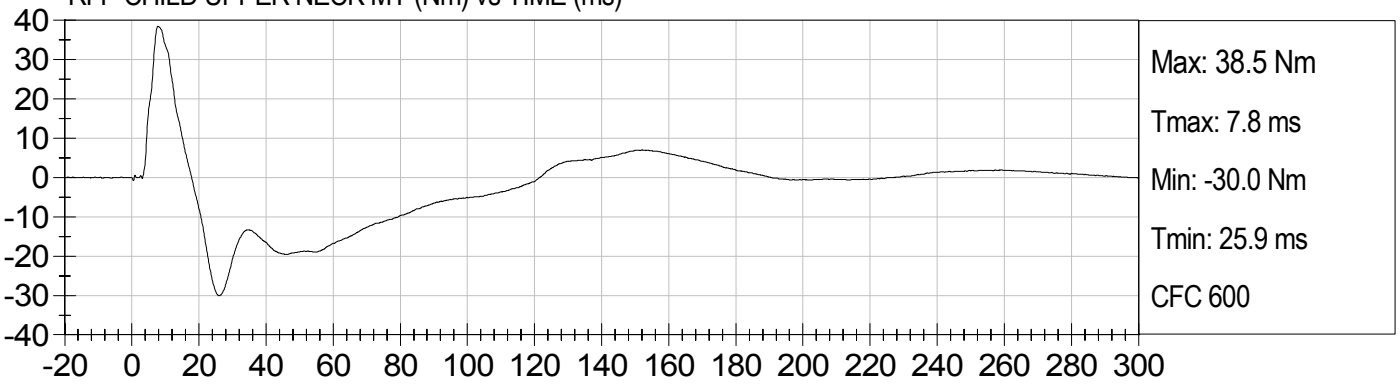
RFP CHILD UPPER NECK FResultant (N) vs TIME (ms)



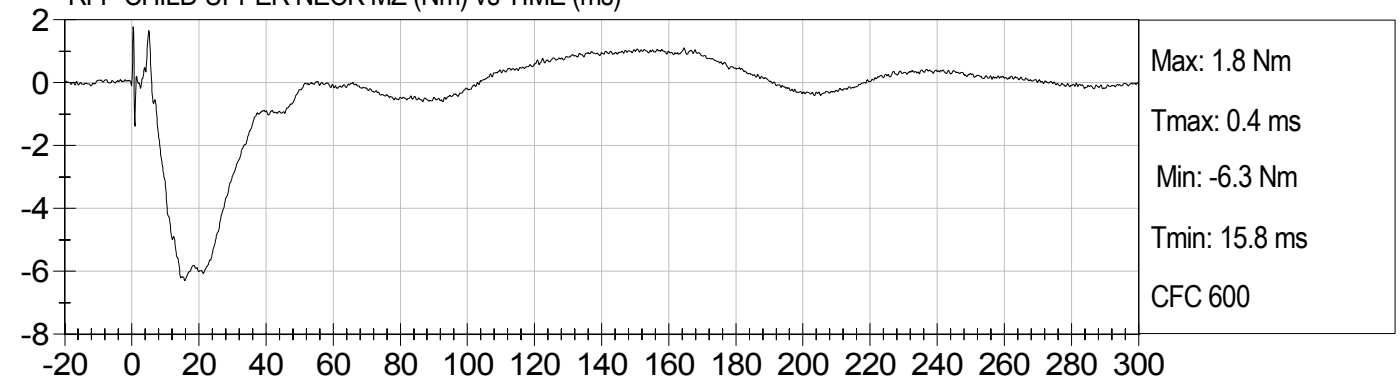
RFP CHILD UPPER NECK MX (Nm) vs TIME (ms)



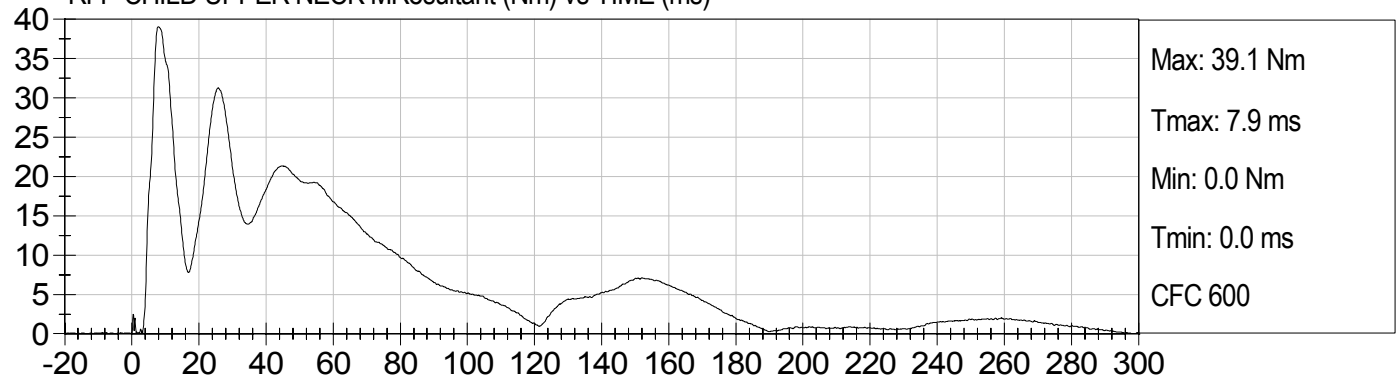
RFP CHILD UPPER NECK MY (Nm) vs TIME (ms)



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



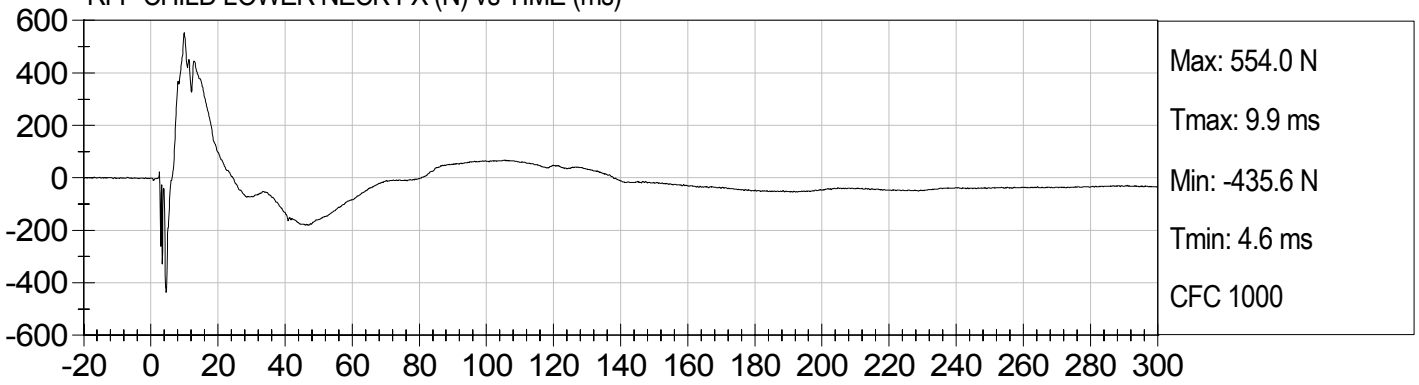
RFP CHILD UPPER NECK MResultant (Nm) vs TIME (ms)



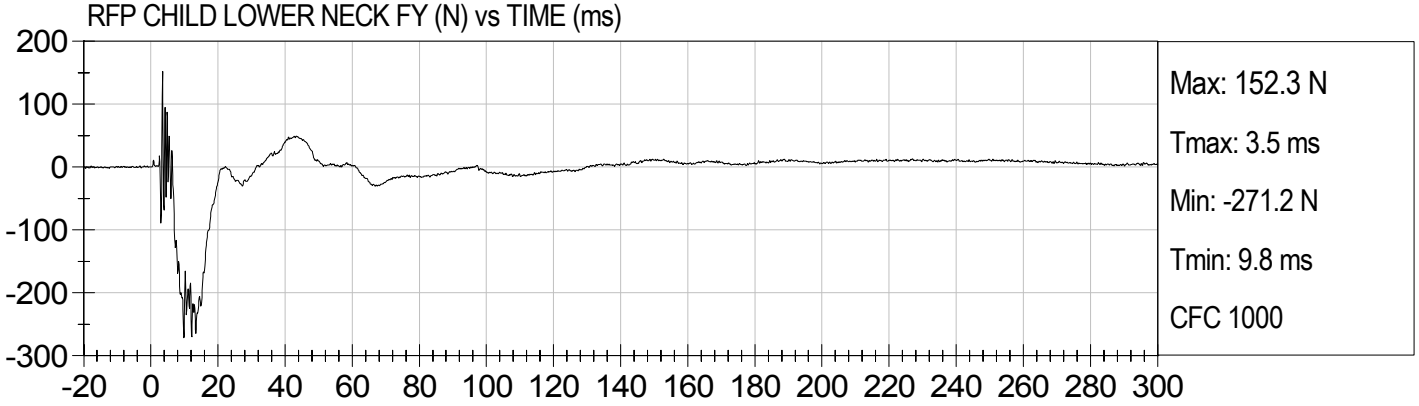
NCAP OOP - 6YO FORWARD FACING
2006 INFINITI X35

Test Date: 06/08/2006
Speed: 0.0 mph (0.0 km/h)

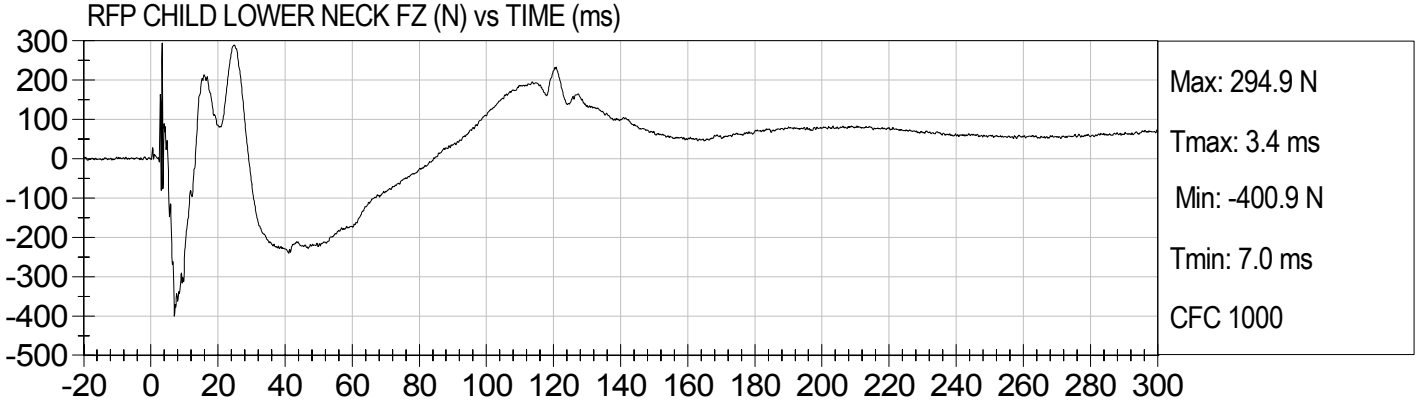
RFP CHILD LOWER NECK FX (N) vs TIME (ms)



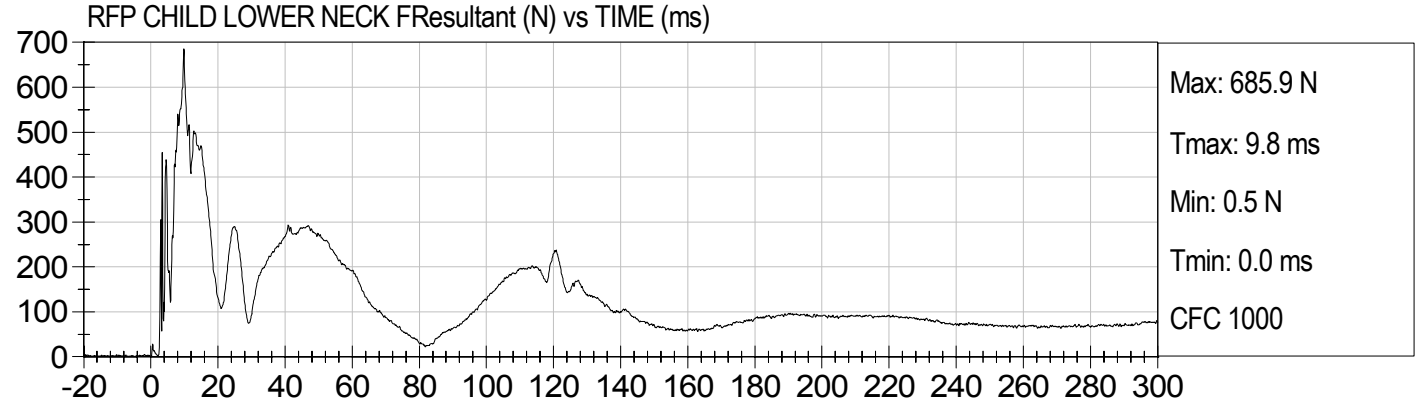
RFP CHILD LOWER NECK FY (N) vs TIME (ms)



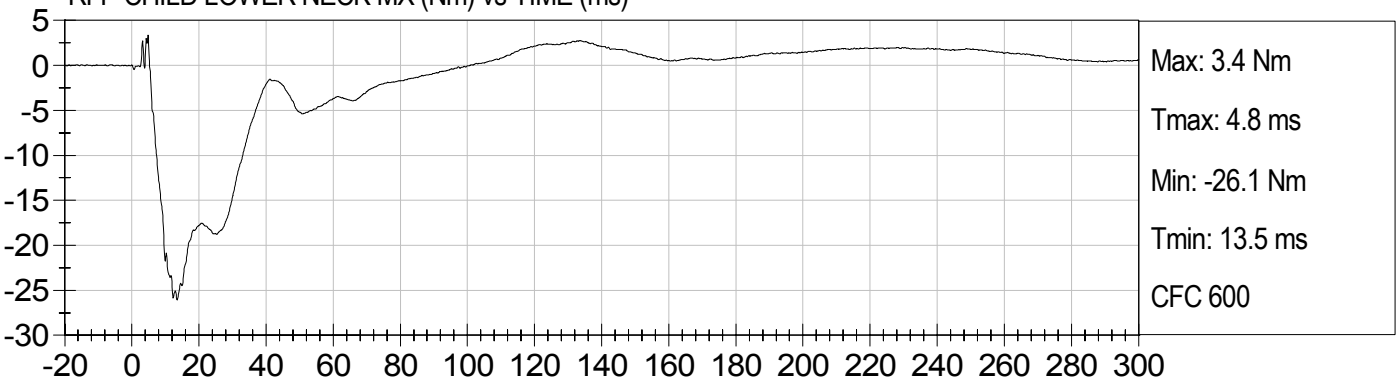
RFP CHILD LOWER NECK FZ (N) vs TIME (ms)



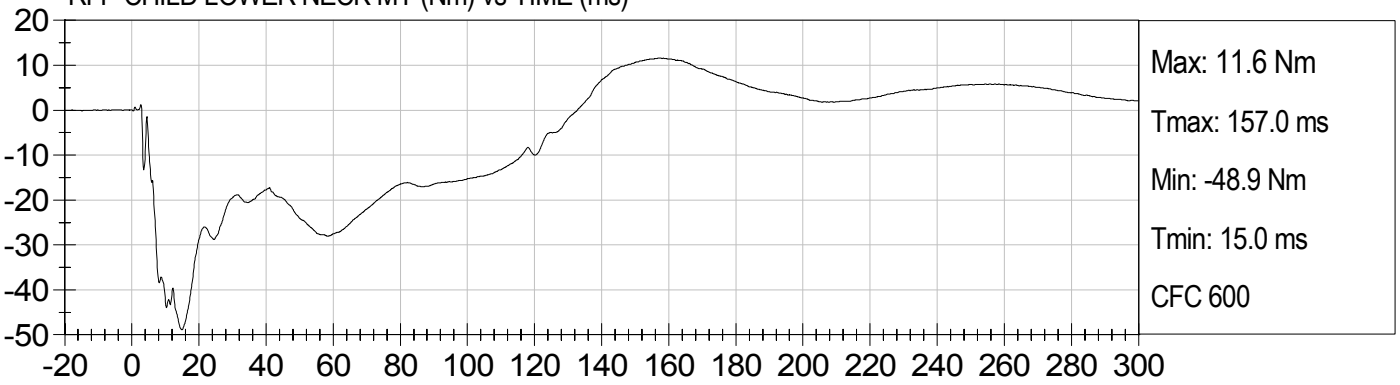
RFP CHILD LOWER NECK FResultant (N) vs TIME (ms)



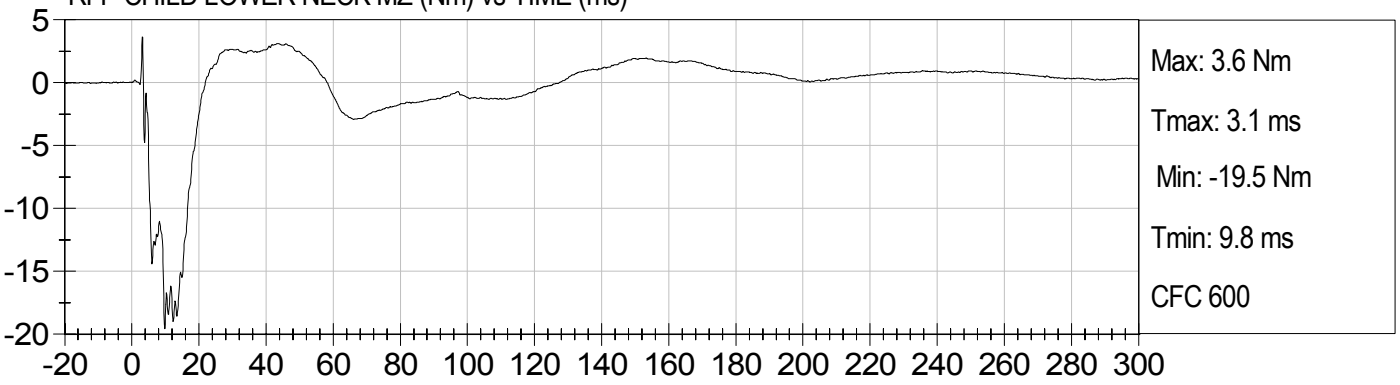
RFP CHILD LOWER NECK MX (Nm) vs TIME (ms)



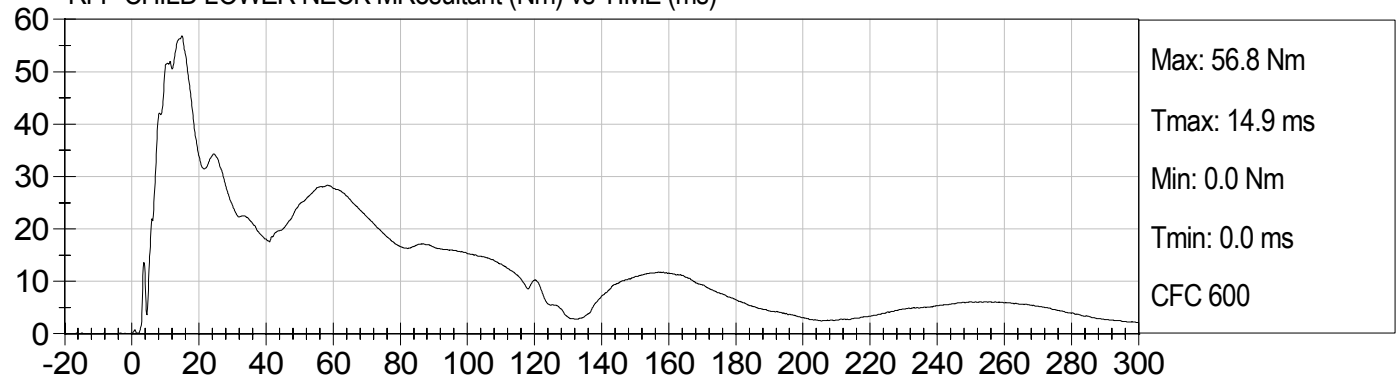
RFP CHILD LOWER NECK MY (Nm) vs TIME (ms)



RFP CHILD LOWER NECK MZ (Nm) vs TIME (ms)



RFP CHILD LOWER NECK MResultant (Nm) vs TIME (ms)



APPENDIX C

INSTRUMENTATION CALIBRATION DATA

SIX YEAR OLD – SERIAL NUMBER 144

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X	G29-X17	Entran	5/24/06
Head Y	G29-X47	Entran	5/24/06
Head Z	G29-X06	Entran	5/24/06
Upper Neck Load Cell	N197	FTSS	5/03/06
Lower Neck Load Cell	LNG147	Denton	5/18/06