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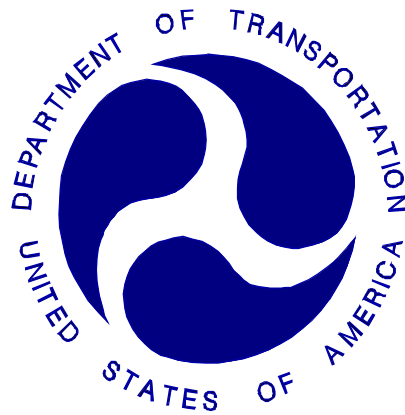
NEW CAR ASSESSMENT PROGRAM (NCAP)
SIDE AIRBAG OUT-OF-POSITION INJURY TESTING

2005 BUICK RENDEZVOUS
MULTIPURPOSE VEHICLE

NHTSA NUMBER: M50104TWG2

CALSPAN CORPORATION TEST NUMBER: 8642-TWG-10

CALSPAN CORPORATION
TRANSPORTATION SCIENCES CENTER
P.O. BOX 400
BUFFALO, NEW YORK 14225



May 10, 2005

FINAL REPORT

U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Rulemaking
Office of Crashworthiness Standards
Mail Code: NVS-111
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Washington, DC 20590

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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 the Calspan Corporation Crash Test Facility in Buffalo, New York, on May 10, 2005.							
Injury Summary							
HIC15	HIC36	Clip (g's)	Chest Displacement (mm)	NIJ NTF	NIJ NTE	NIJ NCF	NIJ NCE
17.0	18.4	37.9	-3.2	0.40	0.40	0.46	0.00
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 Administration Technical Reference Division Room 5111 (NAD-52) 400 Seventh St., S.W. Washington, D.C. 20590 Telephone No. (202) 366-4946 ATTN: Robert Hornicle			
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SECTION 1

PURPOSE AND SUMMARY OF TEST M50104TWG2

1.1 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 No. DTNH22-01-D-32005.

1.2 SUMMARY

The effects of a seat mounted side airbag deployment in a 2005 Buick Rendezvous with an out-of-position three-year-old child were evaluated. The test was performed by Calspan Corporation on May 10, 2005. Pre-and post-test photographs of the vehicle and dummy can be found in Appendix A.

One high-speed digital camera was used to document the side airbag deployment event. The camera was placed in perpendicular the right-front seat centerline as to capture the deployment event. The recorded image rate is 1000 frames per second.

One part 572, Hybrid III three-year-old child anthropomorphic test device (ATD), was placed in the right front seat situated in the forward facing position 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, chest, and pelvic triaxial accelerometers. In addition upper six axial neck force and moment load cell sensors were utilized.

Seventeen channels of data were recorded using an on-board data acquisition system. Appendix A contains photographs. Appendix B contains dummy response data traces. Appendix C contains the Instrumentation Data Channel assignments.

The Hybrid III three-year-old child dummy's visible contact points were as follows: The airbag to the back of the head and the thoracic spine, right scapula, lumbar spine and right ilium of the ATD.

The three-year-old child dummy was seated on the outboard edge of foam block, aligning the upper spine with the deployment trajectory of the airbag. To maintain the level of the airbag module top height and the dummy head neck junction, two foam blocks were stacked. The dummy's head was placed in between the seat bolster side trim to minimize the fore-aft clearance between the neck and the seatback. The head was allowed to remain in its neutral orientation. The heels were placed at heel placement. The dummy was placed so that the pelvis and upper torso contacted the door trim panel with the door closed while maintaining the neck/torso junction to the airbag module intersection height. The outboard arm was then placed on the armrest. The inboard arm was placed such that the upper arm contacted the seatback and the fingertips contacted the booster. This orientation complies with section 3.3.3.1 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

DATA SHEET NO. 1

TEST SUMMARY

TEST CONFIGURATION INFORMATION:

	TEST DATA	DESCRIPTION
Seating Position:	P2	Right Front Seating Position
Test:	3.3.3.1*	Forward facing Hybrid-III three-year-old child dummy on booster block
Airbag:	Seat	Bolster mounted thorax side airbag
Booster Block	300mm x 450 mm x 75 mm	Block consisted of HD36 foam with a density of 44.8 g/L
ATD Type/Serial No.:	P572P/040	Hybrid III three-year-old child dummy

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

<u>Number of Data Channels</u>	17	
<u>Number of Cameras:</u>	0	<u>Real Time</u>
	1	<u>High Speed Digital</u>
	0	<u>High Speed Film</u>

VISIBLE DUMMY CONTACT POINTS

Head Contact:	The back of the head (occipital bone) was struck by the airbag during deployment
Upper Torso Contact:	Airbag to the thoracic spine and right scapula
Lower Torso Contact:	Airbag to the lumbar spine and right ilium.
Left Knee Contact:	None
Right Knee Contact:	None

DATA SHEET 2

VEHICLE PARAMETER DATA

Year/Make/Model/Body Style: 2005 Buick Rendezvous MPV

NHTSA No. : M50104 ; VIN: 3G5DB03E65S538583‡ ; Color: Red

Engine Data: 6 Cylinders; - CID; 3.4 Liters; - cc

Placement: - Longitudinal or In-Line; X Transverse or Lateral

Transmission Data: 4 Speeds; - Manual; X Automatic; X Overdrive

Final Drive: - Rear Wheel Drive; - Front Wheel Drive; X Four Wheel Drive

Safety Belt Features – Driver X Pretensioner (Shoulder); X Load Limiter; X Adj. Anchorage

Safety Belt Features - Passenger X Pretensioner (Shoulder); X Load Limiter; X Adj. Anchorage

Major Options: X ADLs; X A/C; X Pwr.Strg.; X Pwr. Brakes

X Pwr. Windows; X Pwr. Door Locks; X Tilt Wheel

Date Received: 1/13/2005 ; Odometer Reading 60 km

Selling Dealer: East Aurora Buick Pontiac GMC Cadillac

& Address: 535 Main St, East Aurora, NY 14052-1703

DATA FROM TIRE VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured by: General Motors De Mexico

Date of Manufacture 11/04

GVWR: 2470 kg; GAWR: 1260 kg FRONT; 1230 kg REAR

DATA FROM TIRE PLACARD:

Recommended Tire Size: P255/60R17 S

* Recommended Cold Tire Pressure: 240 kPa FRONT; 240 kPa REAR

DATA FROM TIRE SIDEWALL:

Size of Tires on Test Vehicle: P255/60R17 98S ; Manufacturer: Goodyear Integrity

Tire Pressure with Maximum Capacity Vehicle Load: Front: 240 kPa; Rear: 240 kPa

Treadwear: 460 ; Traction: A ; Temperature: B

VEHICLE CAPACITY DATA:

Type of Front Seats: - Bench; X Bucket; - Split Bench

Number of Occupants: 2 Front; 3 Rear; 5 Total

Vehicle Capacity Weight (VCW) = 523 kg

No. of Occupants x 68.04 kg = 340.2 kg

Rated Cargo/Luggage Weight (RCLW) = 182.8 kg **

*Tire pressure used for test

** Maximum RCLW of 136.1 kg was used for the target weight calculation.

‡ This vehicle had previously been tested in an NCAP frontal impact on February 10, 2005.

DATA SHEET NO. 3

CHILD DUMMY POSITIONING IN VEHICLE

NHTSA No. M50104TWG2

Measurement		Value
Total Fore/Aft Travel (mm)		190
Test Distance Rearward of Full-Forward (mm)		95
Total Fore/Aft Travel (Detents)		17 (0-16)
Placed in Position #		8
Seat Back Angle	SA (°)	20.3
Airbag Module Width	AMW (mm)	120
Airbag Width	ABW (mm)	300
Airbag Module Length	AML (mm)	250
Airbag Length	ABL (mm)	280
Top of Airbag Module to Head/Neck Junction	AN (mm)	0
Head CG to Door Panel/Window	HD (mm)	170
Head to Seat Back Centerline	HSC (mm)	195
Head to B-Pillar (side of the head)	HB (mm)	208
Head to Roof, Z (top of the head)	HZ (mm)	220 (top of head)
Head to Header	HHH (mm)	516
Chest to Dash	CD (mm)	485
Chest to Seatback	CS (mm)	-
Right Arm to Seat Back Centerline	RACL (mm)	-
Right Arm to Seat Back Centerline	RACL (°)	-
Left Arm to Seat Back Centerline	LACL (mm)	60
Left Arm to Seat Back Centerline	LACL (°)	-
Right Arm to Door Panel	RA (mm)	5
Left Arm to Door Panel	LA (mm)	-
Knee to Knee	KK (mm)	123
Toe to Toe	TT (mm)	180
Right Knee to Seat Cushion Centerline	KSCR (mm)	-115
Left Knee to Seat Cushion Centerline	KSCL (mm)	0
Right Toe to Seat Cushion Centerline	TSCR (mm)	-75
Left Toe to Seat Cushion Centerline	TSCL (mm)	75
Nose to Dash	ND (mm)	524
Nose to Seatback	NS (mm)	-
Nose to Header	NR (mm)	497
Foam Block Depth	(mm)	300
Foam Block Width	(mm)	450
Foam Block Thickness	(mm)	75
HD36 foam density	(g/L)	44.8

DATA SHEET 4

CHILD DUMMY INJURY CRITERIA VALUES

NHTSA No. M50104TWG2

		MAXIMUM VALUE			
		Position #2			
DESCRIPTION	Unit	Maximum	Time (ms)	Minimum	Time (ms)
Head X	g	15.1	16.1	-2.2	33.0
Head Y	g	2.7	58.8	-16.1	13.8
Head Z	g	10.6	15.4	-22.5	11.1
Head Resultant	g	27.2	13.0	0.0	-4.5
Upper Neck Fx	N	347.4	16.1	-49.4	160.1
Upper Neck Fy	N	156.5	58.2	-379.8	15.4
Upper Neck Fz	N	246.2	23.3	-513.8	10.9
Upper Neck F Resultant	N	594.5	13.3	0.0	-10.7
Upper Neck Mx	N-m	11.0	11.7	-22.0	21.7
Upper Neck My	N-m	22.5	16.1	-8.9	37.7
Upper Neck Mz	N-m	5.6	59.6	-8.7	26.8
Upper Neck M Resultant	N-m	25.2	20.4	0.0	-16.6
Chest X	g	45.7	7.5	-7.4	18.8
Chest Y	g	3.8	29.5	-34.0	10.7
Chest Z	g	6.5	19.6	-7.0	12.2
Chest Resultant	g	51.8	7.5	0.0	-35.1
Chest Displacement	mm	32.4	10.6	-3.2	9.1
Pelvic X	g	9.3	13.4	-2.1	9.4
Pelvic Y	g	4.0	11.1	-9.5	21.9
Pelvic Z	g	5.2	8.0	-23.1	10.6
Pelvic Resultant	g	23.1	10.6	0.0	-20.1

DATA SHEET 4

CHILD DUMMY INJURY CRITERIA VALUES (CONTINUED)

NHTSA No. M50104TWG2

	HEAD INJURY CRITERIA (HIC)							
	HIC15				HIC36			
		t ₁	t ₂	Average		t ₁	t ₂	Average
	HIC	(msec)	(msec)	Acceleration t ₁ to t ₂	HIC	(msec)	(msec)	Acceleration t ₁ to t ₂
Position #2 – Right Front	17.0	9.0	23.8	16.8 g	18.2	9.0	24.4	14.1 g

	CLIP SUMMARY*			
	CLIP (g's)	t ₁ (msec)	t ₂ (msec)	CSI
Position #2 – Right Front	37.9	9.9	13.0	80.3

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

Position 2 Neck Injury Summary (HIII 3 year old – Out of Position)

Nij V10	Nij	Time (ms)	Z Force (N)	X Force (N)	Y Moment (N-m)
Ntf	0.40	16.1	149.9	344.9	22.5
Nte	0.40	33.0	228.8	-29.6	-7.8
Ncf	0.46	13.3	-426.4	231.2	17.9
Nce	0.00	44.4	-0.1	-0.1	0.0

Peak Tension (CFC1000) 246.2 N

Peak Compression (CFC1000) -513.8 N

Critical Values

Nij Intercepts			Peak Limits	
Tension (CVt)	2120 N	Extension (mCVe)	27 N-m	Tension 1430 N
Compression (CVc)	2120 N	Flexion (mCVf)	68 N-m	Compression -1380 N

Condyle Offset 0.0

APPENDIX A

PHOTOGRAPHS

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Figure A-1: Pre-Test Vehicle Left Side View



Figure A-2: Post-Test Vehicle Left Side View

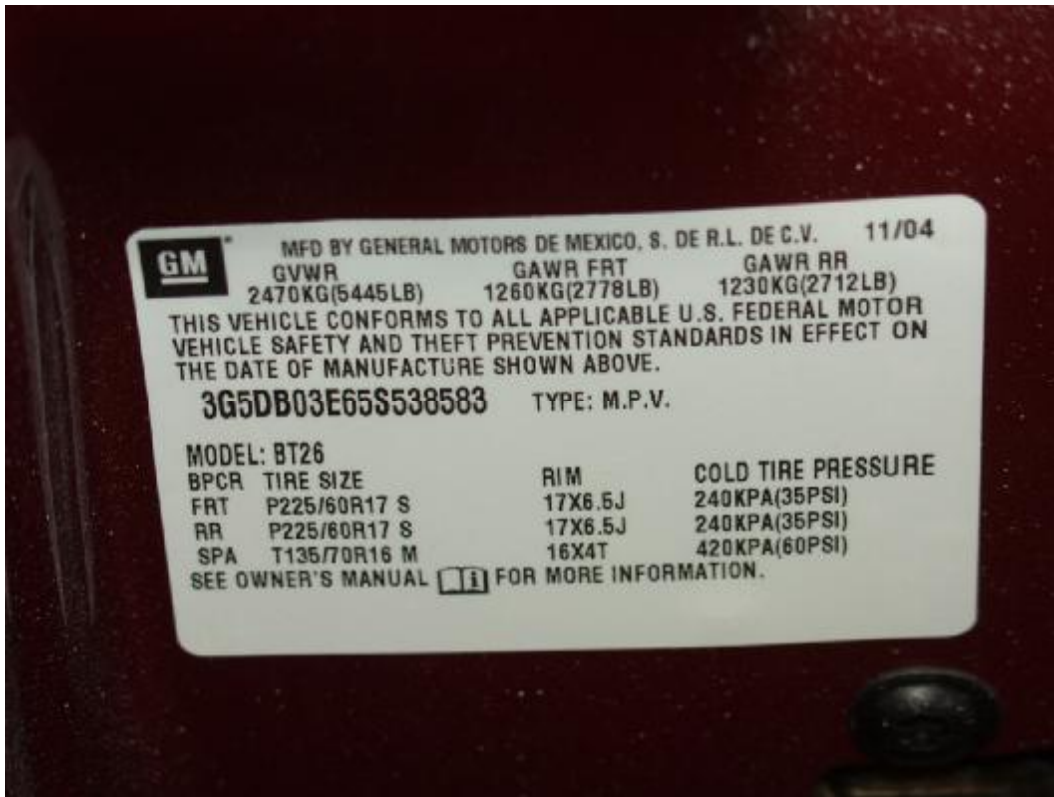


Figure A-3: Vehicle Certification Placard



Figure A-4: Vehicle Tire Placard



Figure A-5: Pre-Test Dummy Frontal View



Figure A-6: Post-Test Dummy Frontal View



Figure A-7: Pre-Test Left Side of Dummy View



Figure A-8: Post-Test Left Side of Dummy View



Figure A-9: Pre-Test Right Side of Dummy View

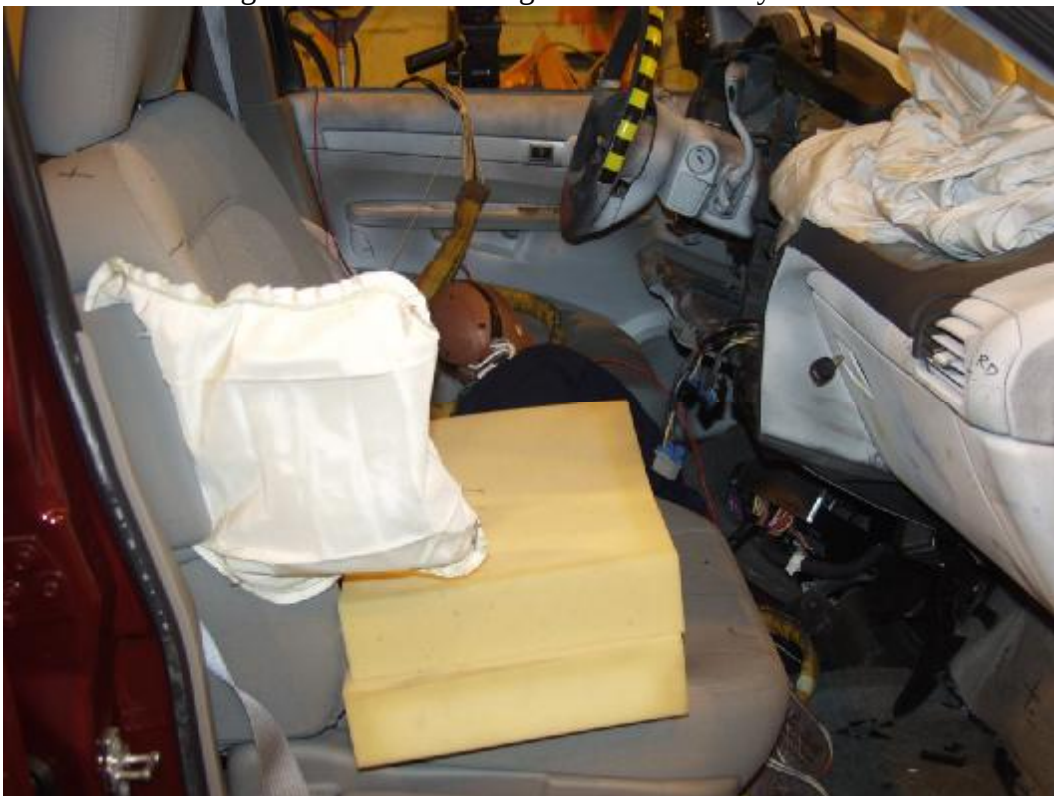


Figure A-9: Post-Test Right Side of Dummy View

APPENDIX B

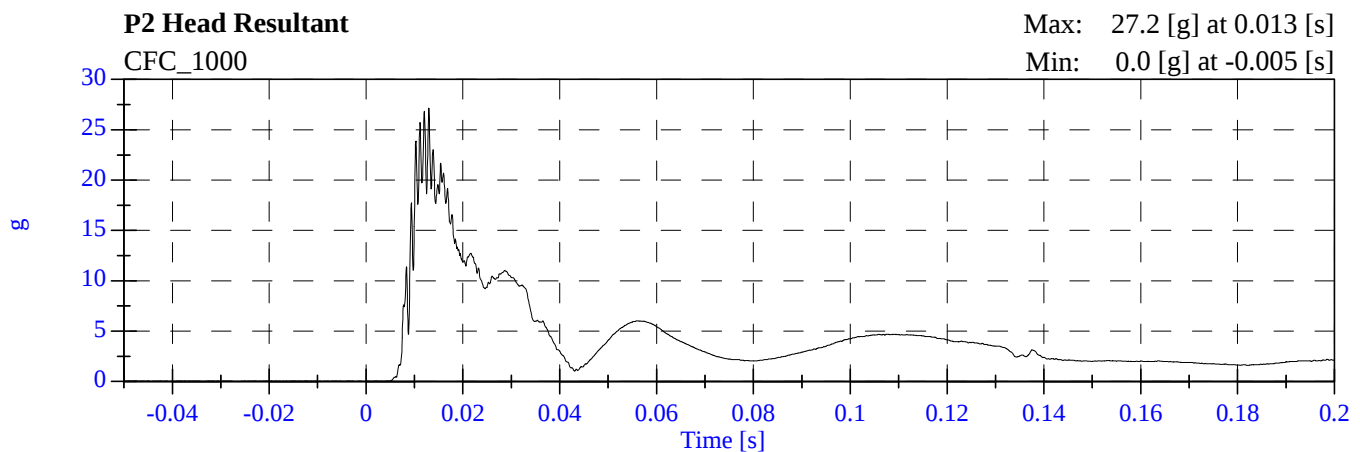
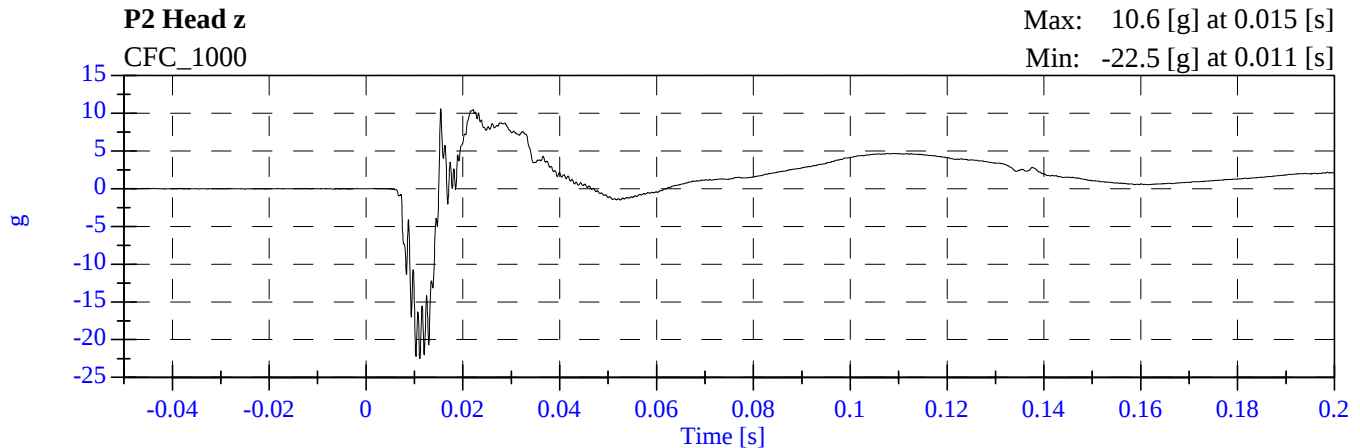
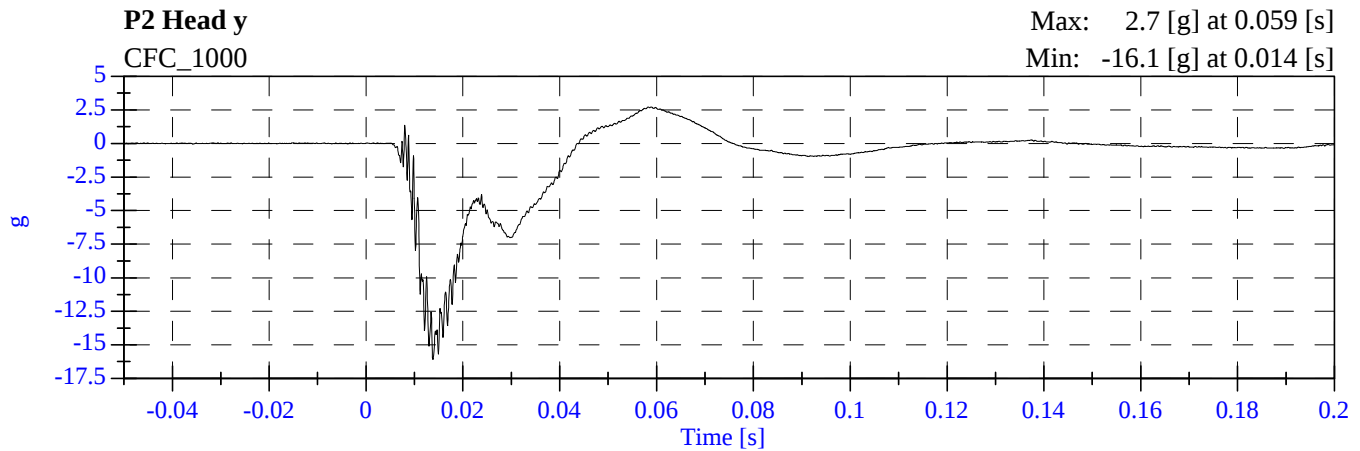
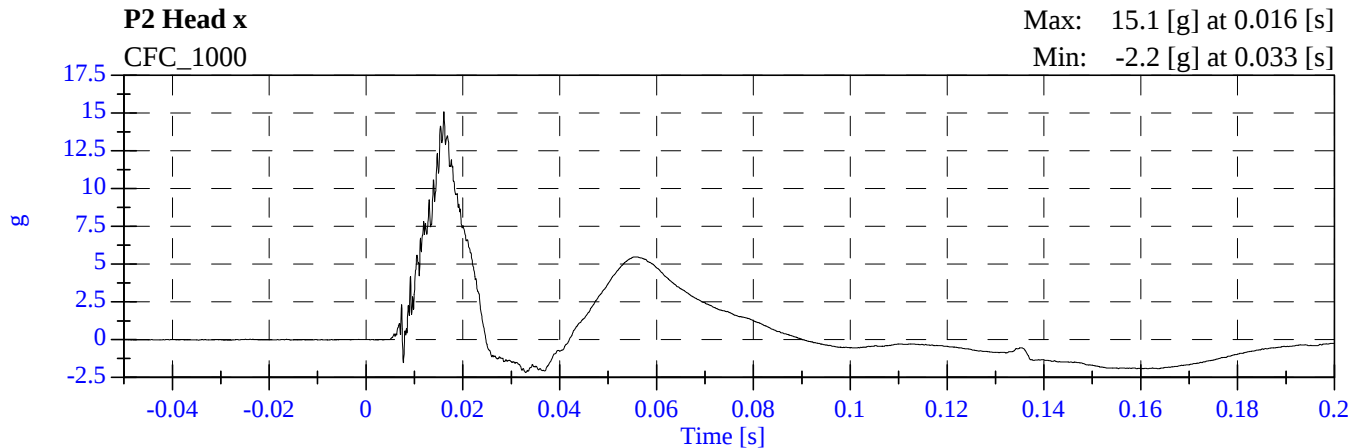
CHILD DUMMY RESPONSE DATA TRACES

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6	P2 Upper Neck Fy [N, CFC_1000]	B-4
7	P2 Upper Neck Fz [N, CFC_1000]	B-4
8	P2 Upper Neck F Resultant [N, CFC_1000]	B-4
9	P2 Upper Neck Mx [N-m, CFC_600]	B-5
10	P2 Upper Neck My [N-m, CFC_600]	B-5
11	P2 Upper Neck Mz [N-m, CFC_600]	B-5
12	P2 Upper Neck M Resultant [N-m, CFC_600]	B-5
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21	P2 Pelvic Resultant [g, CFC_1000]	B-8

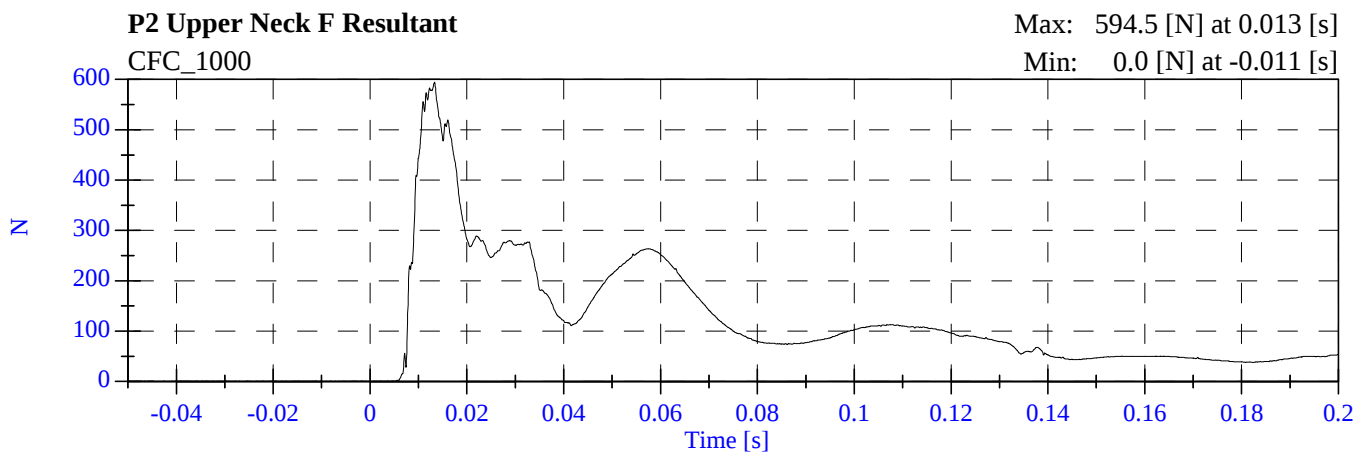
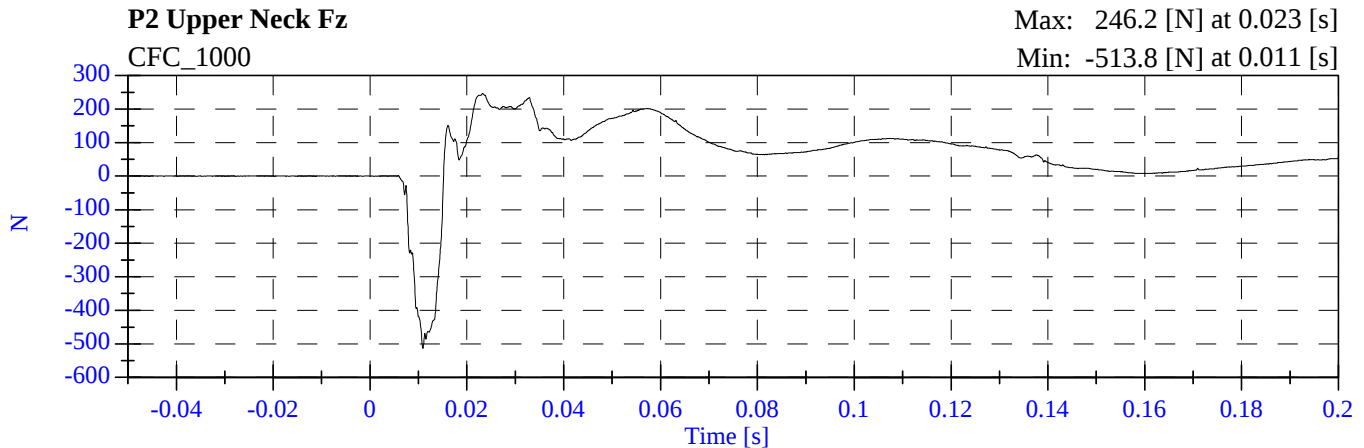
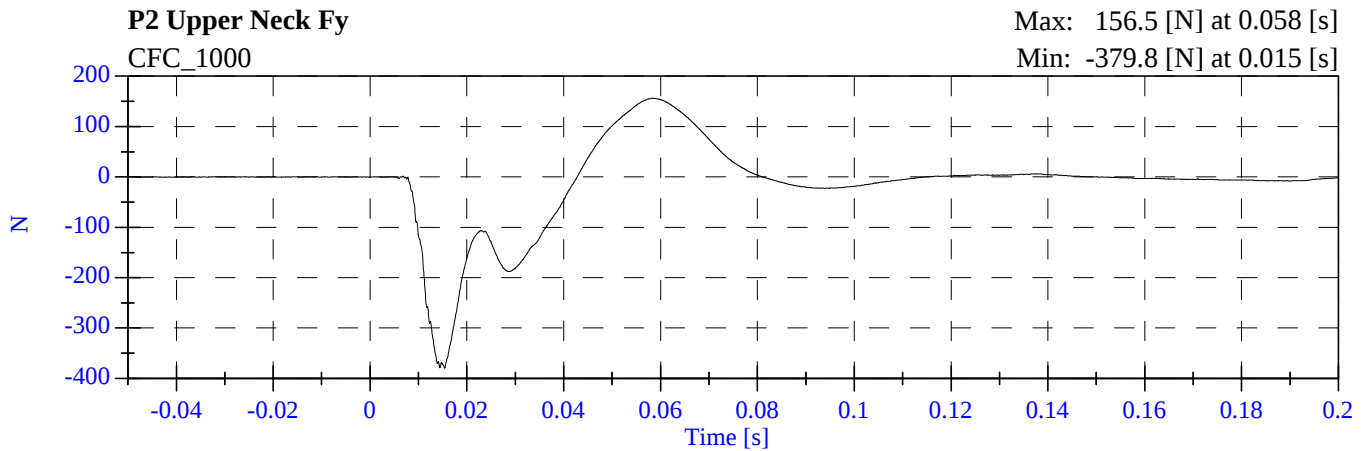
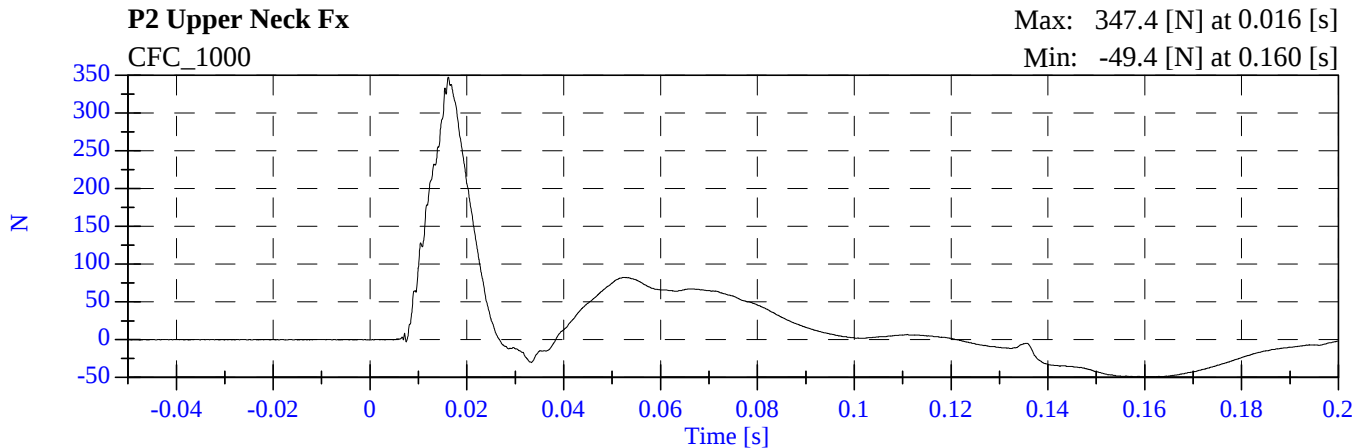
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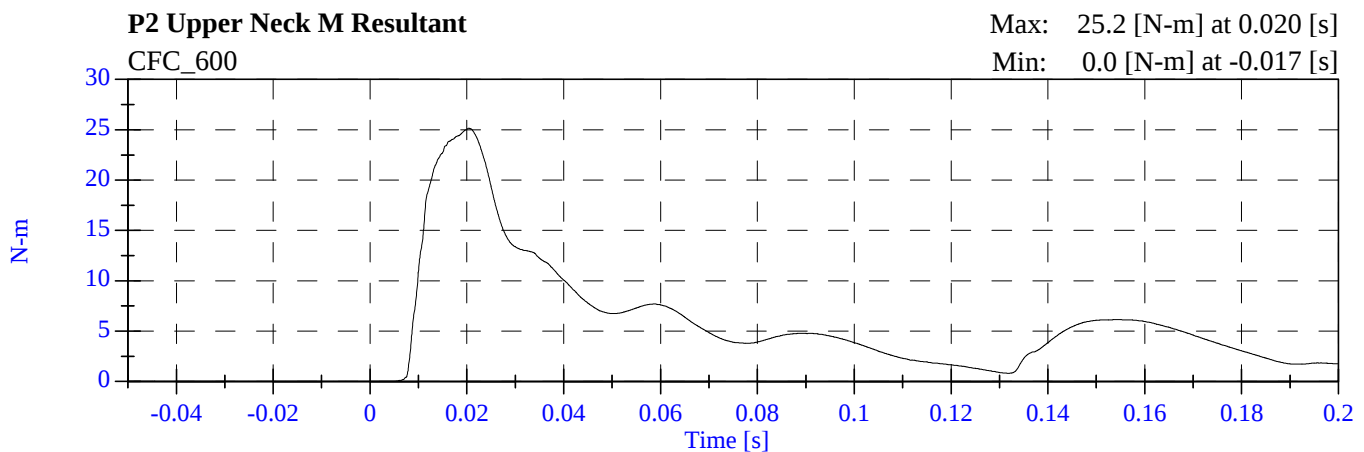
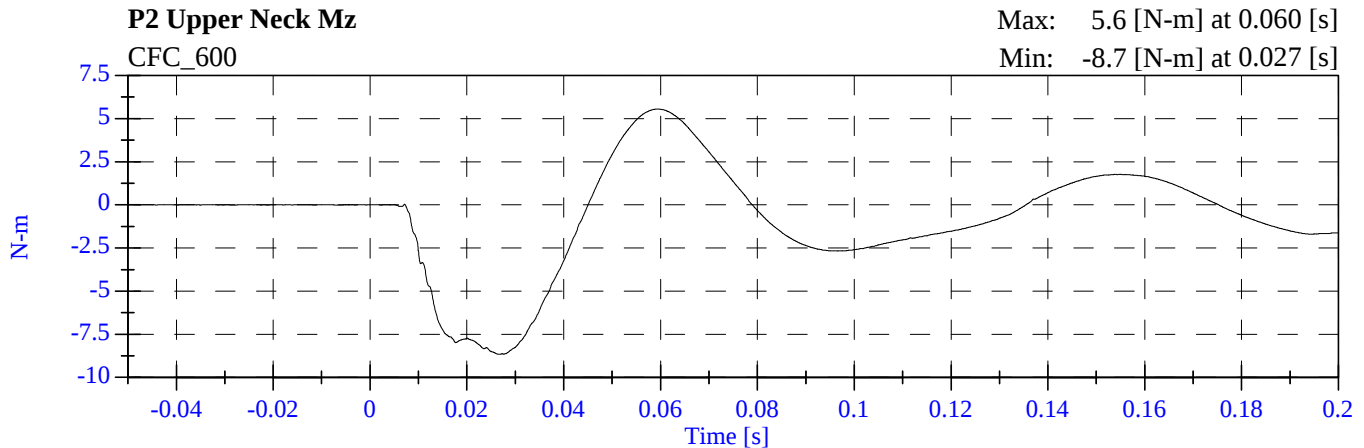
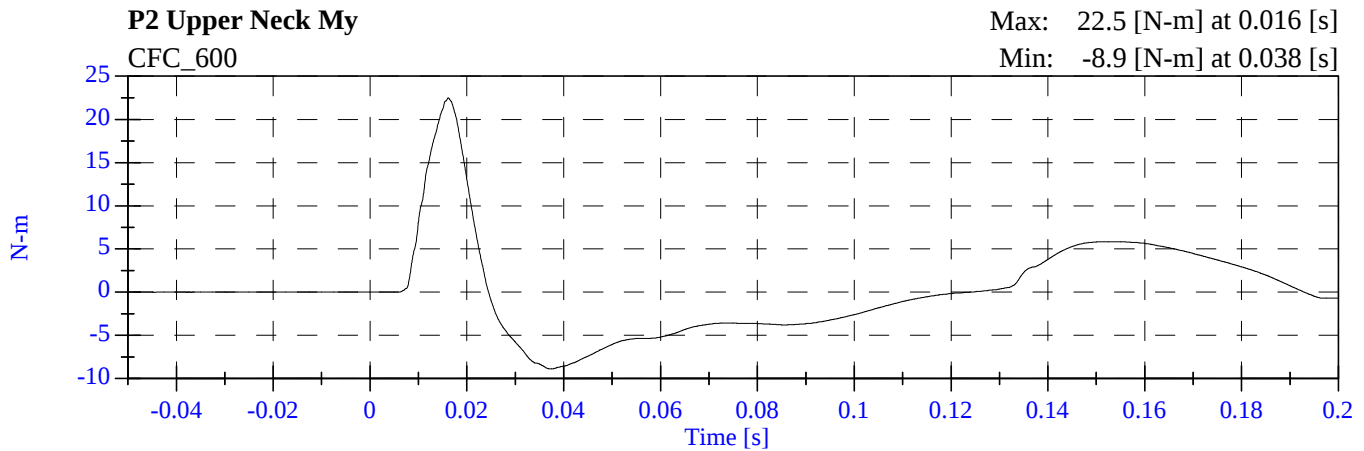
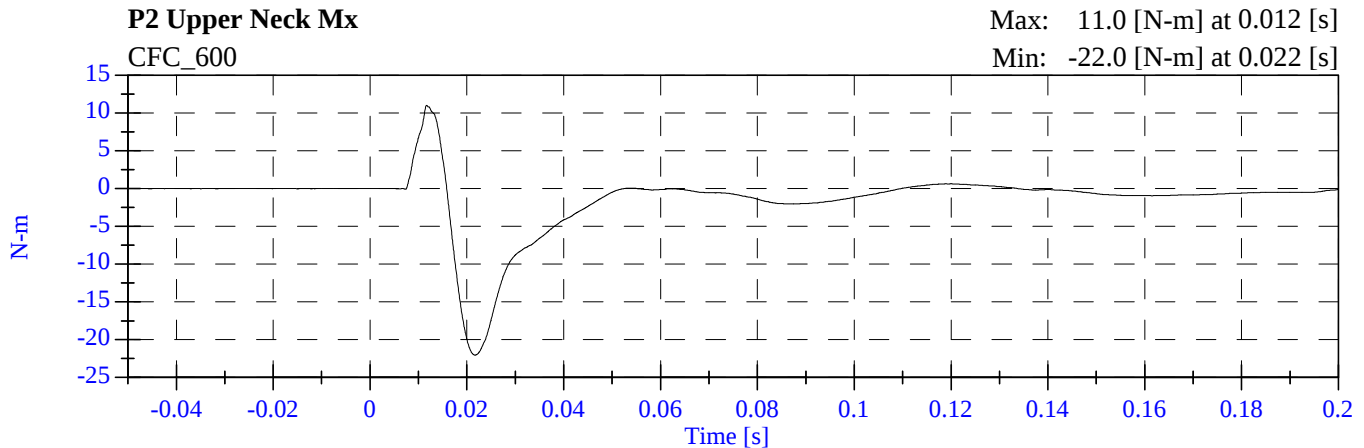
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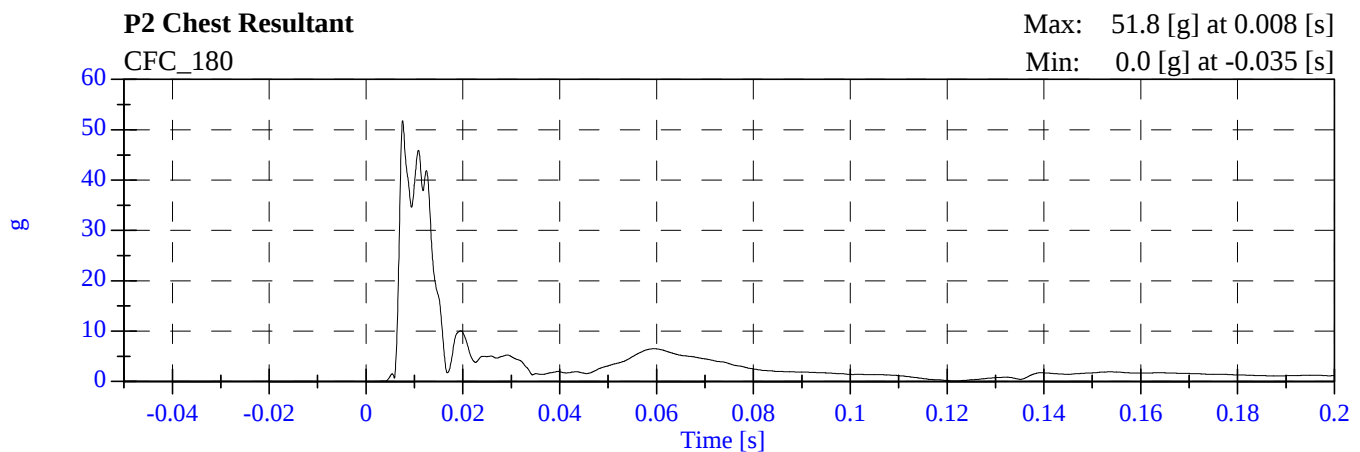
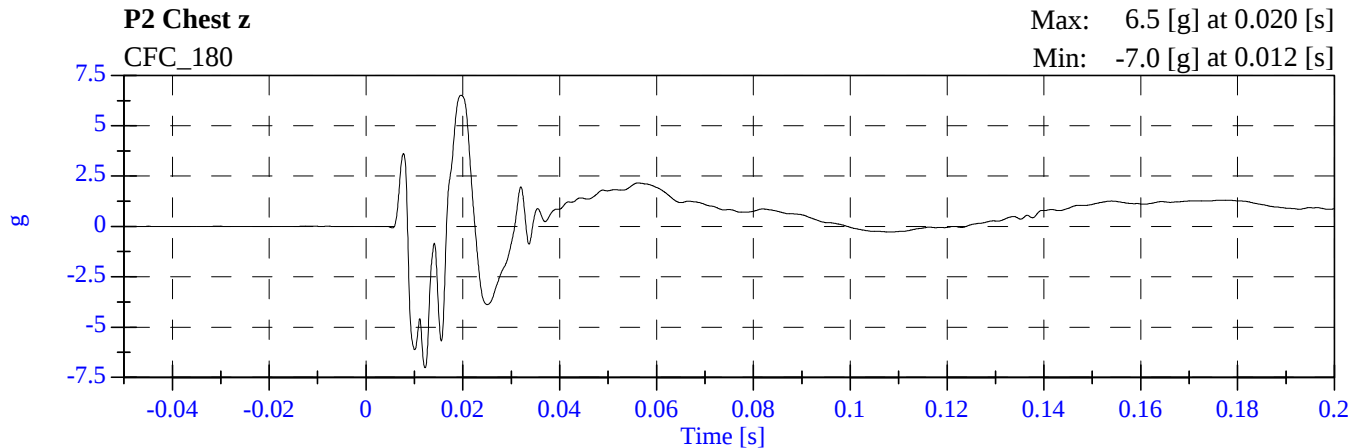
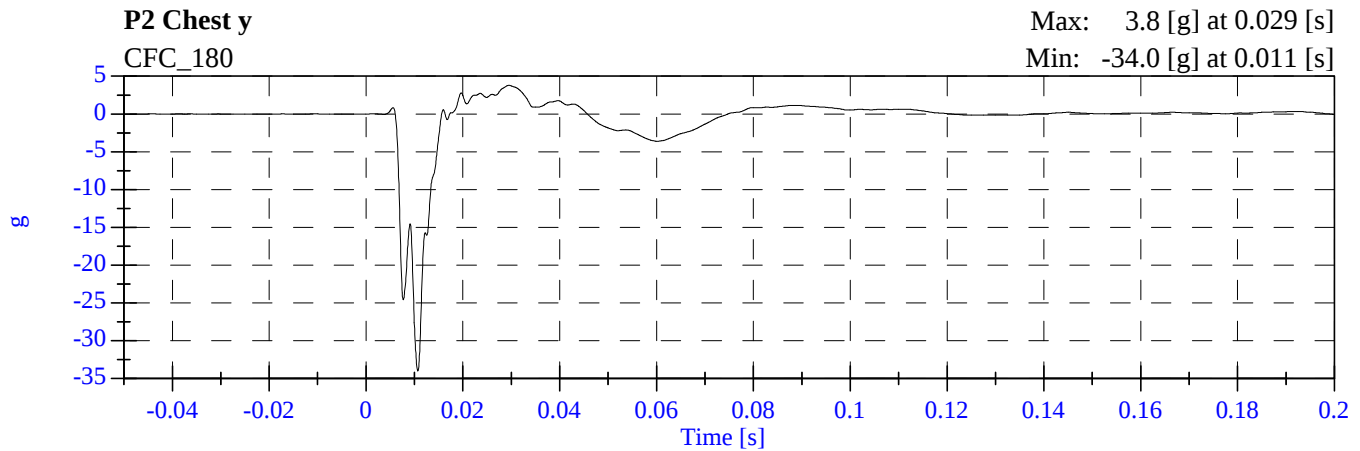
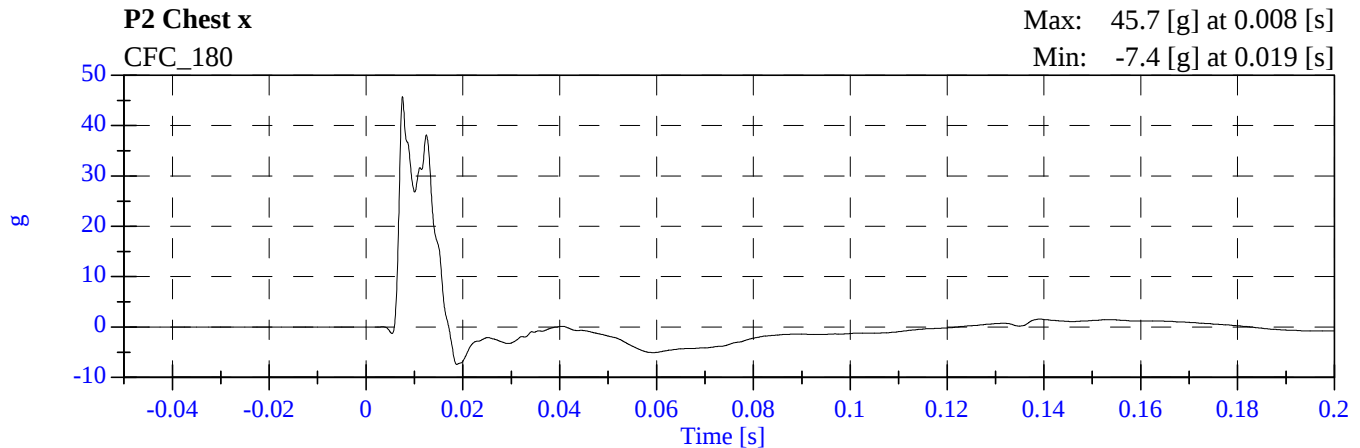
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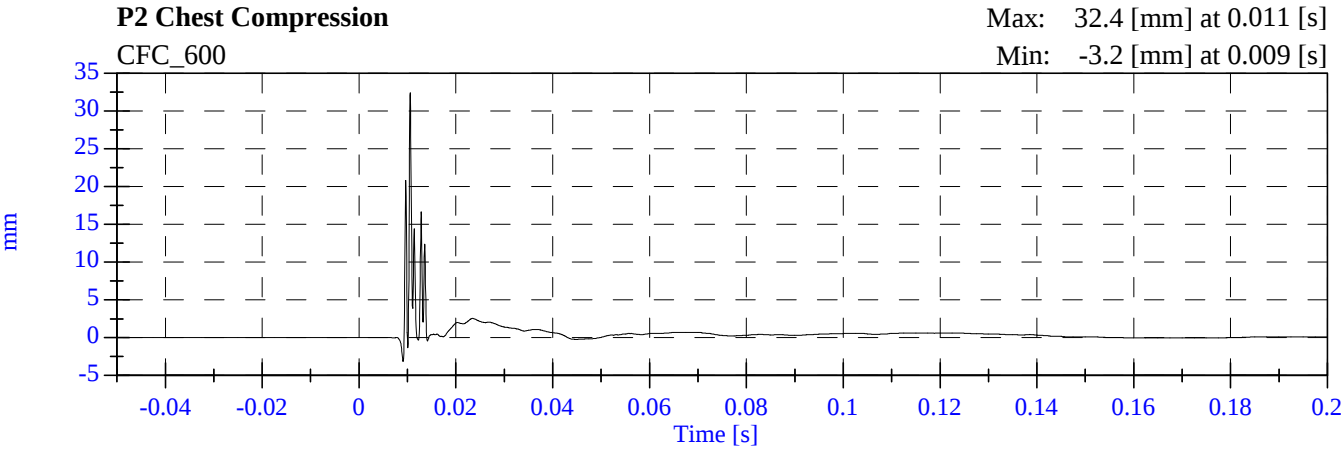


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M50104TWG2 - May 10, 2005

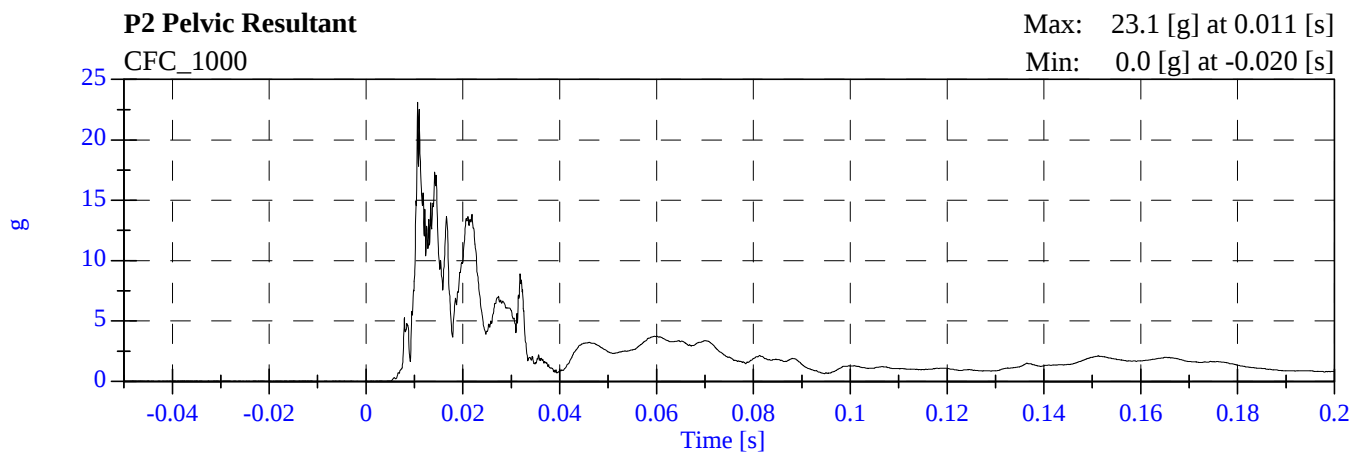
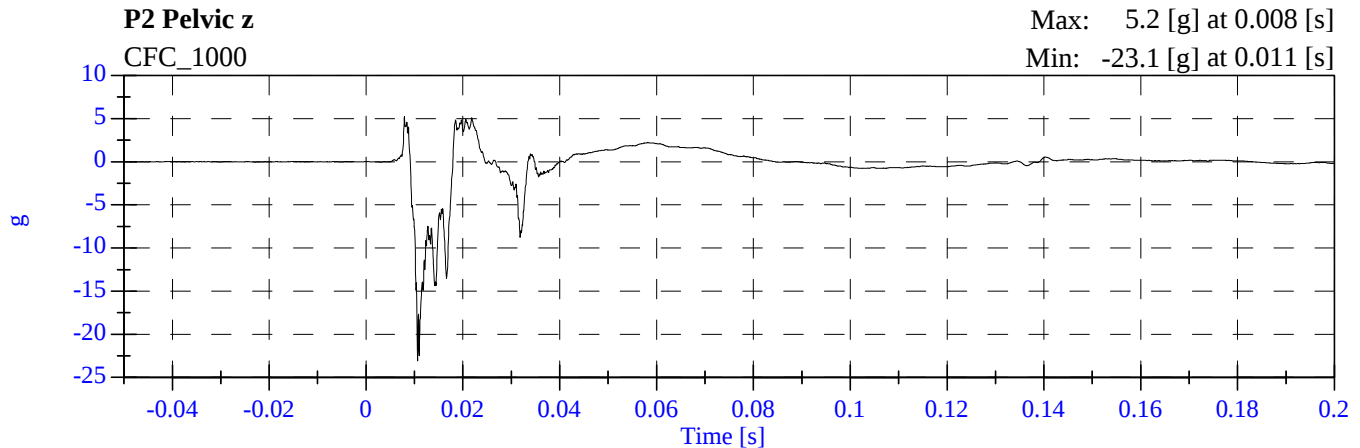
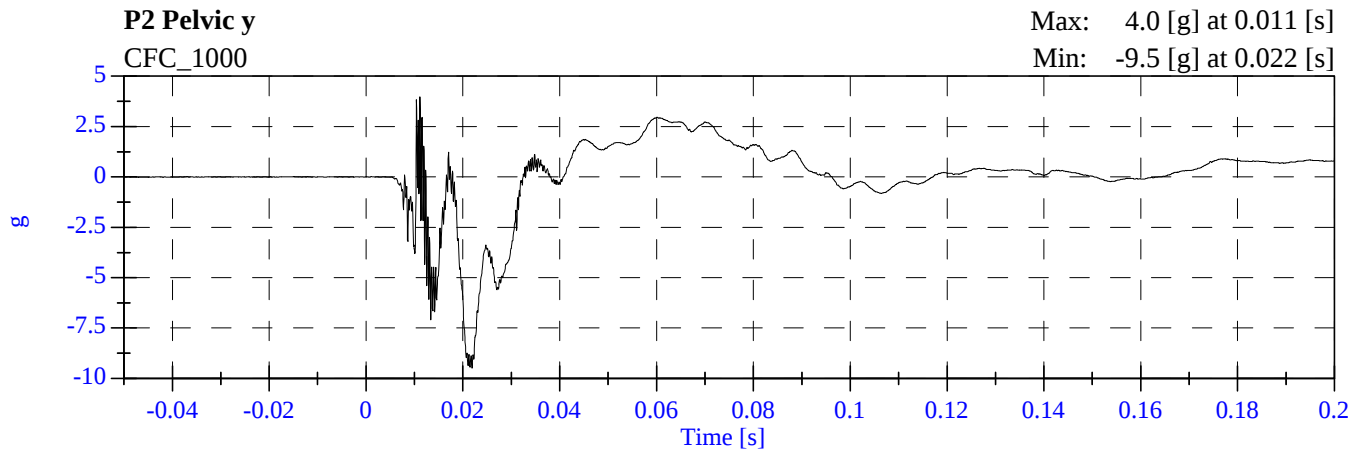
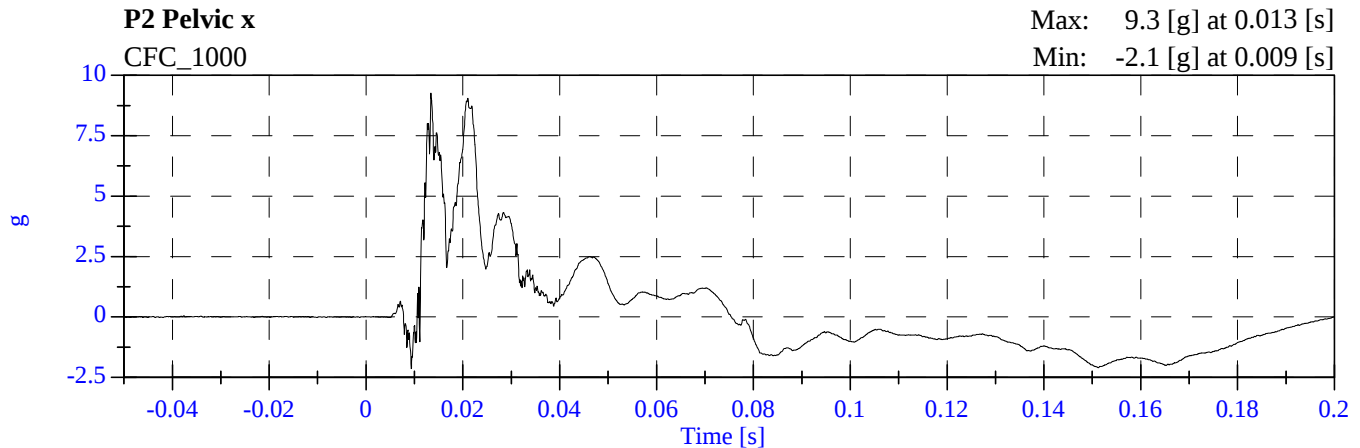


M50104TWG2 - 2005 Buick Rendezvous
M50104TWG2 - May 10, 2005



M50104TWG2 - 2005 Buick Rendezvous

M50104TWG2 - May 10, 2005



APPENDIX C

TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

P572P INSTRUMENTATION

	POSITION #2 (RIGHT FRONT) SERIAL NO.: 040		
	SERIAL NUMBER	MANUFACTURER	CALIBRATION DATE
HEAD AX	AC-J36611	ENDEVCO	25-Jan-05
HEAD AY	AC-P35789	ENDEVCO	04-Jan-05
HEAD AZ	AC-J27466	ENDEVCO	25-Jan-05
UPPER NECK FX	LC-210Fx	Denton	02-Aug-04
UPPER NECK FY	LC-210Fy	Denton	02-Aug-04
UPPER NECK FZ	LC-210Fz	Denton	02-Aug-04
UPPER NECK MX	LC-210Mx	Denton	02-Aug-04
UPPER NECK MY	LC-210My	Denton	02-Aug-04
UPPER NECK MZ	LC-210Mz	Denton	02-Aug-04
CHEST AX	AC-P21399	ENDEVCO	02-Dec-04
CHEST AY	AC-CC92H	ENDEVCO	25-Jan-05
CHEST AZ	AC-J29006	ENDEVCO	25-Jan-05
CHEST DISPLACEMENT X	DS-040	SERVO	02-Aug-04
PELVIS AX	AC-01G18-F09	ENTRAN	25-Jan-05
PELVIS AY	AC-J27525	ENDEVCO	25-Jan-05
PELVIS AZ	AC-J17988	ENDEVCO	25-Jan-05