REPORT NUMBER: TWG-CAL-04-01

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

2003 NISSAN MURANO

NHTSA NUMBER: C35200TWG3

GENERAL DYNAMICS TEST NUMBER: 8642-TWG-01

GENERAL DYNAMICS
ADVANCED INFORMATION ENGINEERING SERVICES
TRANSPORTATION SCIENCES CENTER
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November 3, 2003

FINAL REPORT

U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Rulemaking
Office of Crashworthiness Standards
Mail Code: NVS-111
400 Seventh Street, SW, Room No. 5313
Washington, DC 20590

This Final Test Report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, under Contract No. DTNH22-01-D-32005. This document is disseminated under the sponsorship of the U.S. Department of Transportation in the interest of information exchange. The United States Government assumes no liability for its contents or use thereof.

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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 the General Dynamics Advanced Information Engineering Services Crash Test Facility in Buffalo, New York, on November 3, 2003.

Injury Summary

HIC15	HIC36	Clip (g's)	Chest Displacement (mm)	NIJ NTF	NIJ NTE	NIJ NCF	NIJ NCE
0.0	0.0	0.2	0.0	0.00	0.02	0.01	0.01

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 C35200TWG3

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 roof-rail-mounted side airbag deployment in a 2003 Nissan Murano with an out-of-position six-year-old child were evaluated. The test was performed by General Dynamics Advanced Information Engineering Services on November 3, 2003. 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. Camera locations and other pertinent camera information can be found in this report.

One part 572, Hybrid III six–year-old child anthropomorphic test device (ATD), was placed in the right rear seat situated in the side 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, chest displacement and upper six axial neck force and moment load cell sensors were utilized.

Sixteen 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 IIII six-year-old child dummy's visible contact points were as follows: The top of the dummy's head was contacted the airbag.

The six-year-old child dummy was placed in the right rear occupant position on a foam booster block with its arms hanging at its sides and its legs oriented inboard. The dummy's back was placed in contact with the door trim panel armrest with its head in a neutral position and not in contact with the vehicle B-or C-pillars but within the trajectory of the deploying airbag. This orientation complies with section 3.3.4.1 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 dated August 8, 2000.

SECTION 2

DATA SHEET NO. 1

TEST SUMMARY

TEST CONFIGURATION INFORMATION:

	TEST DATA	DESCRIPTION
Seating Position:	P3	Right Rear Seating Position
Test:	3.3.4.1*	Inboard facing Hybrid-III 6-year-old child dummy on booster block
Airbag:	Side Curtain	Head Side Curtain Bag
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.:	P572N/182	Hybrid III six year old child dummy

*- Procedure as defined by Lund, et al and the Technical Working Group dated August 8, 2000

Number of Data Channels	16	
Number of Cameras:	0	Real Time
	1**	High Speed Digital
	0	High Speed Film

** Camera trigger malfunctioned during the event, coverage is not available.

VISIBLE DUMMY CONTACT POINTS

Head Contact:	The top of the head was struck by the side curtain.
Upper Torso Contact:	None
Lower Torso Contact:	None
Left Knee Contact:	None
Right Knee Contact:	None

DATA SHEET NO. 2

VEHICLE PARAMETER DATA

Year/Make/Model/Body Style: 2003 Nissan Murano MPV

Vehicle Body Color: Gold VIN: JN8AZ08T43W101802[1]

Vehicle NHTSA No.: C35200 Month & Year of Manufacture: 11/02

Engine Data: 6 Cylinders; - CID; 3.5 Liters; - cc

Engine Placement: - Longitudinal; or X Lateral

Transmission: 4 Speed; - Manual; X Automatic; X Overdrive

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

Odometer Reading 84 km

Supplemental Airbag Restraints:

Front Occupant: X Frontal; - Knee; X Side; X Curtain

Rear Occupant: X Frontal; - Knee; - Side; X Curtain

Options: X A/C; X Power Steering; X Power Brakes; X Power Windows

DATA FROM TIRE PLACARD

Recommended Tire Size: P235/65R18

*Recommended Cold Tire Pressure: 230 kpa FRONT; 230 kpa REAR

DATA FROM TIRE SIDEWALL:

Size of Tires on Test Vehicle: P235/65R18 104T; Manufacturer: Goodyear

Tire Pressure with Maximum Capacity Vehicle Load: Front: 300 kPa; Rear: 300 kPa

Treadwear: 360; Traction: A; Temperature: A

VEHICLE CAPACITY DATA:

Number of Occupants: 2 Front; 3 Rear; 0 3rd Seat; 5 Total

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

Type of Rear Seats: - Bucket; - Bench; X Split Bench; X Contoured

Type of Front Seat Back: - Fixed; X Adjustable with X Lever or - Knob

Type of Rear Seat Back: - Fixed; X Adjustable with X Lever or - Knob

Vehicle Max Capacity Loading = 390 kg (A)

No. of Occupants x 68.04 kg. = 340.2 kg (B)

Vehicle Cargo Capacity = 49.8 kg (A-B)

TEST VEHICLE DELIVERED WEIGHT WITH MAXIMUM FLUIDS:

Left Front =	520.5 kg	Left Rear =	361.0 kg
Right Front =	529.5 kg	Right Rear =	343.5 kg
TOTAL FRONT =	1050.0 kg	TOTAL REAR =	704.5 kg
% of Total Weight =	59.8 %	% of Total Weight =	40.2 %

TOTAL WEIGHT = 1754.5 kg

* Tire pressure used in test.

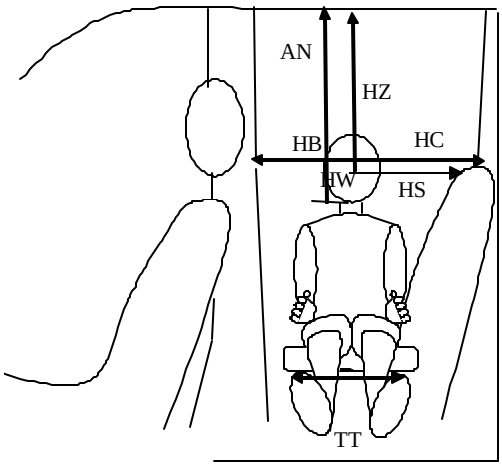
[1] This vehicle had previously been tested in an Indicant FMVSS 214 side impact on April 15, 2003.

DATA SHEET NO. 3

CHILD DUMMY POSITIONING IN VEHICLE

NHTSA No. C35200TWG3

Measurements for Roof-Rail Mounted Airbags



X-Z View

HZ = Head CG to Roof
HC = Head CG to C-Pillar
HB = Head CG to B-Pillar
HS = Head CG to Seat
HW = Head CG to Window
TT = Toe to Toe
AN = Top of the Airbag Module to the Head/Neck Junction

Measurements for Position #3 (Right Rear)	
	Dimension (mm)
HZ	254
HW	145
HC	180
HB	453
HS	276
TT	78
AN	400
Airbag Module Length	1520
Airbag Module Width	400
Foam Block Depth[1]	300
Foam Block Width[1]	450
Foam Block Thickness[1]	75

[1] Foam block consisted of HD36 foam material with a density of 44.8 g/L

DATA SHEET 4

CHILD DUMMY INJURY CRITERIA VALUES

NHTSA No. C35200TWG3

		MAXIMUM VALUE			
		Position #3			
DESCRIPTION	**Unit**	**Maximum**	**Time (ms)**	**Minimum**	**Time (ms)**
Head X	**g**	1.9	21.8	-2.1	21.5
Head Y	**g**	1.7	25.3	-2.1	20.7
Head Z	**g**	1.4	18.9	-1.3	19.5
Head Resultant	**g**	2.6	19.8	0.0	-43.1
Upper Neck Fx	**N**	9.0	19.8	-7.2	32.6
Upper Neck Fy	**N**	6.2	33.0	-3.5	20.8
Upper Neck Fz	**N**	11.5	36.4	-35.0	20.6
Upper Neck F Resultant	**N**	35.9	20.6	0.0	-12.3
Upper Neck Mx	**N-m**	0.6	41.3	-0.2	50.2
Upper Neck My	**N-m**	0.4	26.9	-0.8	34.2
Upper Neck Mz	**N-m**	0.3	42.3	-0.2	68.3
Upper Neck M Resultant	**N-m**	0.8	35.3	0.0	-14.5
Chest X	**g**	0.2	33.4	-0.2	20.4
Chest Y	**g**	0.2	22.8	-0.2	38.0
Chest Z	**g**	0.2	19.7	-0.2	23.5
Chest Resultant	**g**	0.3	19.9	0.0	4.7
Chest Displacement	**mm**	0.1	28.1	0.0	126.0
Pelvic X	**g**	0.6	10.7	-0.8	11.2
Pelvic Y	**g**	§	§	§	§
Pelvic Z	**g**	0.5	9.9	-0.5	27.3
Pelvic Resultant	**g**	§	§	§	§

§ - Data is Questionable

DATA SHEET 4

CHILD DUMMY INJURY CRITERIA VALUES (CONTINUED)

NHTSA No. C35200TWG3

	HEAD INJURY CRITERIA (HIC)							
	HIC15				HIC36			
	HIC	t_1 (msec)	t_2 (msec)	Average Acceleration t_1 to t_2	HIC	t_1 (msec)	t_2 (msec)	Average Acceleration t_1 to t_2
Position #3 - Right	0.0	18.7	33.7	1.0	0.0	8.1	36.8	0.9

	CLIP SUMMARY*			
	CLIP (g's)	t_1 (msec)	t_2 (msec)	CSI
Position #3 - Right	0.2	30.9	34.2	0.0

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

Position 3 Neck Injury Summary (HIII 6 year old – Out of Position)

Nij V10	Nij	Time (ms)	Z Force (N)	X Force (N)	Y Moment (N-m)
Ntf	0.00	28.3	0.6	2.1	0.3
Nte	0.02	35.9	7.2	-3.4	-0.6
Ncf	0.01	20.2	-29.1	4.8	0.2
Nce	0.001	70.3	-2.2	3.4	-0.3

Peak Tension (CFC1000) 11.5 N **Peak Compression (CFC1000) -35.0 N**

Critical Values

Nij Intercepts				Peak Limits	
Tension (CVt)	2880 N	Extension (mCVe)	37 N-m	Tension	1890 N
Compression (CVc)	2880 N	Flexion (mCVf)	93 N-m	Compression	-1820 N

Condyle Offset -0.01778

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

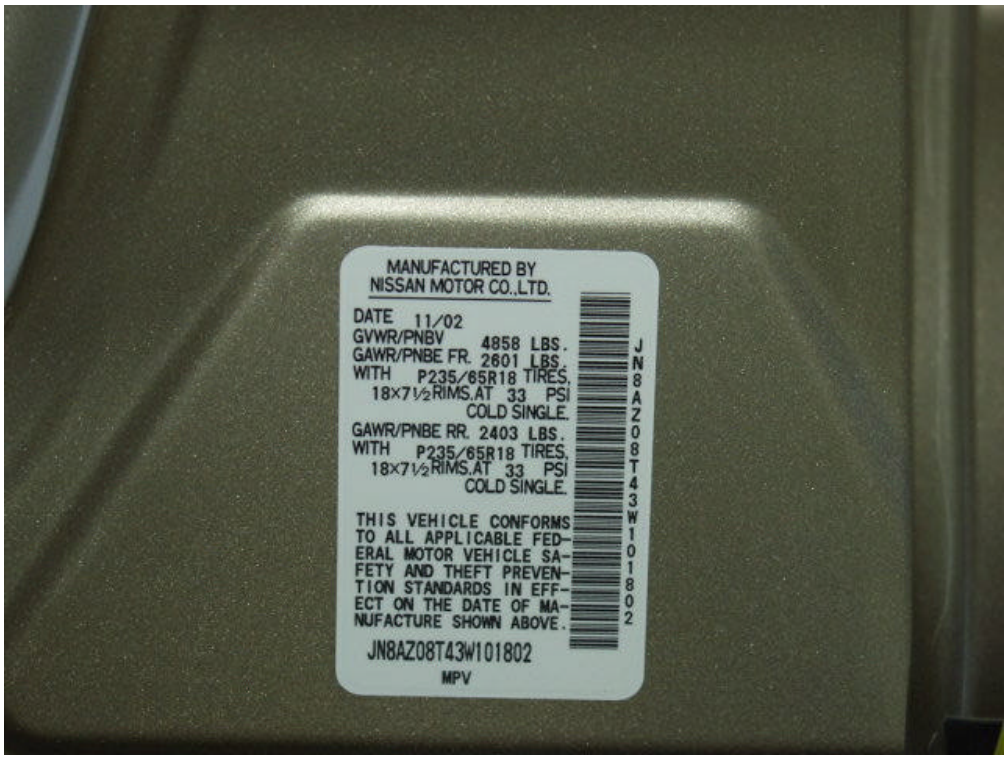


Figure A-3: Vehicle Certification Placard

Figure A-4: Vehicle Tire Placard

Figure A-5: Pre-Test Frontal View of Dummy

Figure A-6: Post-Test Frontal View of Dummy

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

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

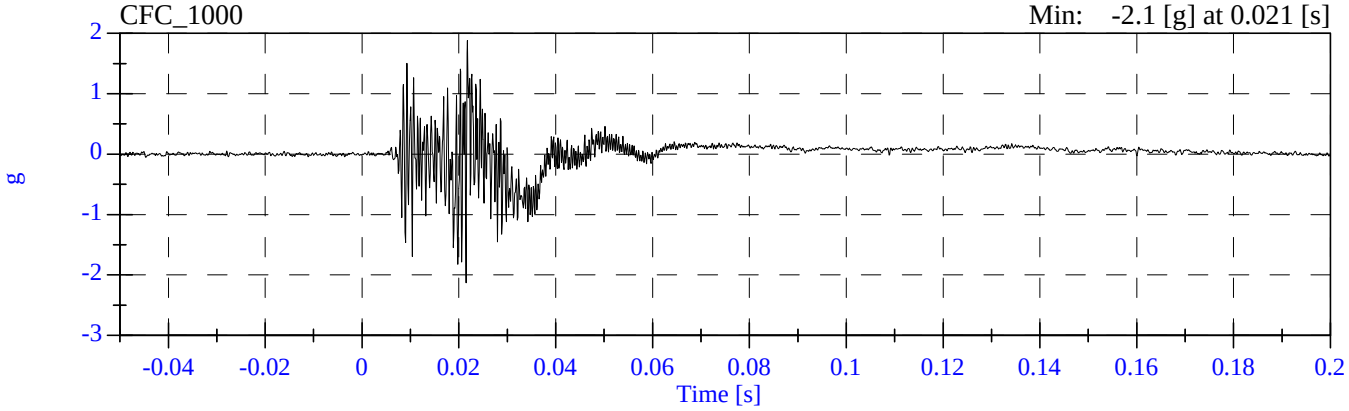
APPENDIX B

CHILD DUMMY RESPONSE DATA TRACES

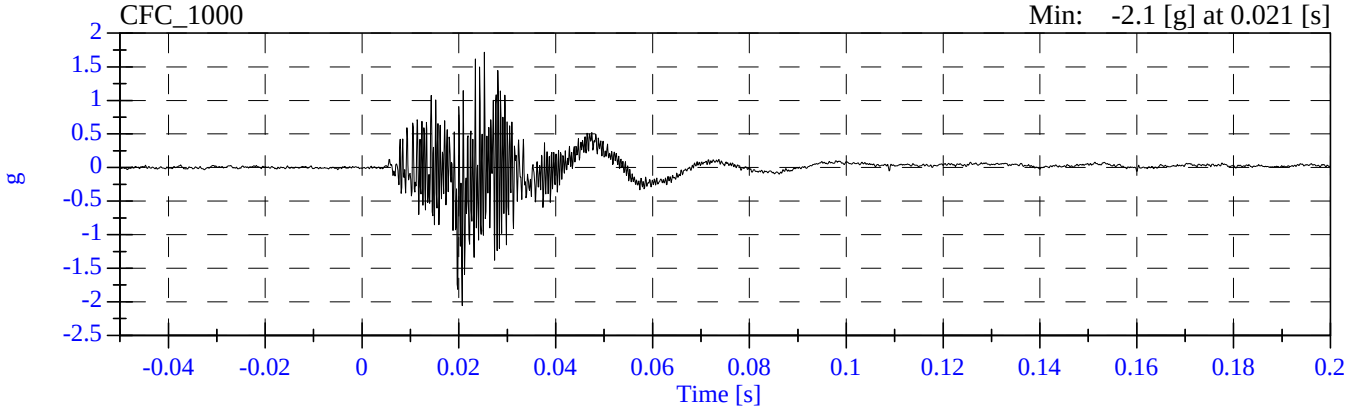
TABLE OF DATA PLOTS

TWG Test - Nissan Murano
C35200TWG3 - November 03, 2003

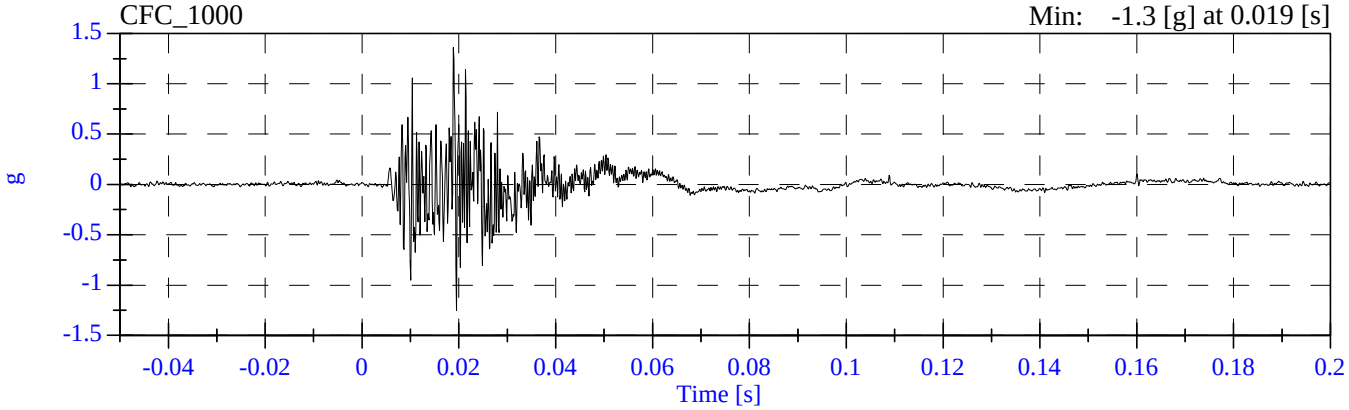
P3 Head x
CFC_1000
Max: 1.9 [g] at 0.022 [s]
Min: -2.1 [g] at 0.021 [s]



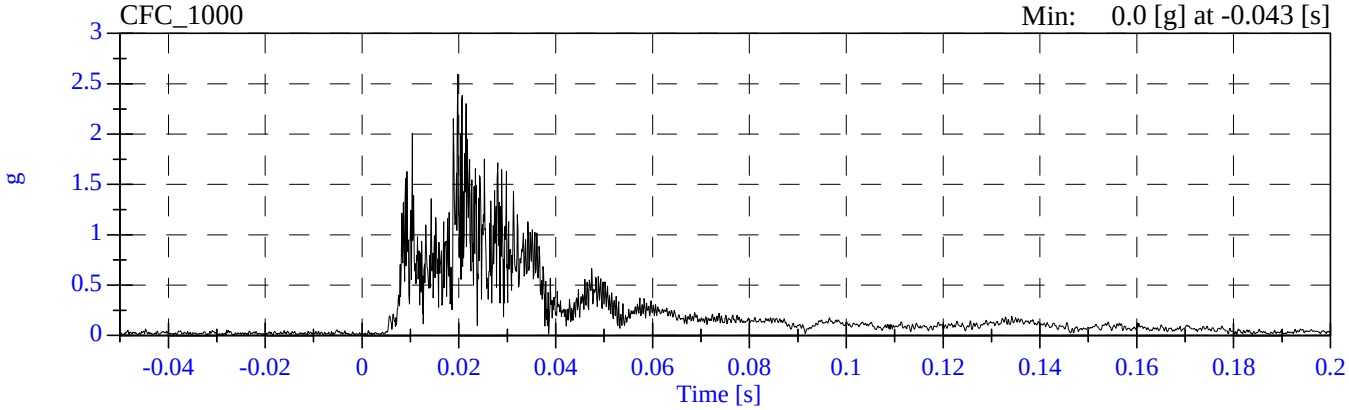
P3 Head y
CFC_1000
Max: 1.7 [g] at 0.025 [s]
Min: -2.1 [g] at 0.021 [s]



P3 Head z
CFC_1000
Max: 1.4 [g] at 0.019 [s]
Min: -1.3 [g] at 0.019 [s]

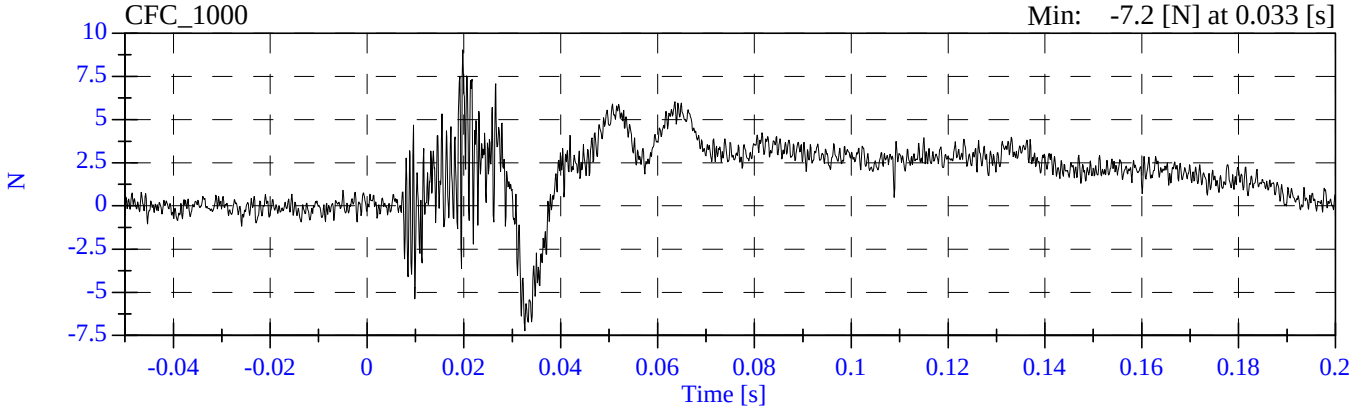


P3 Head Resultant
CFC_1000
Max: 2.6 [g] at 0.020 [s]
Min: 0.0 [g] at -0.043 [s]

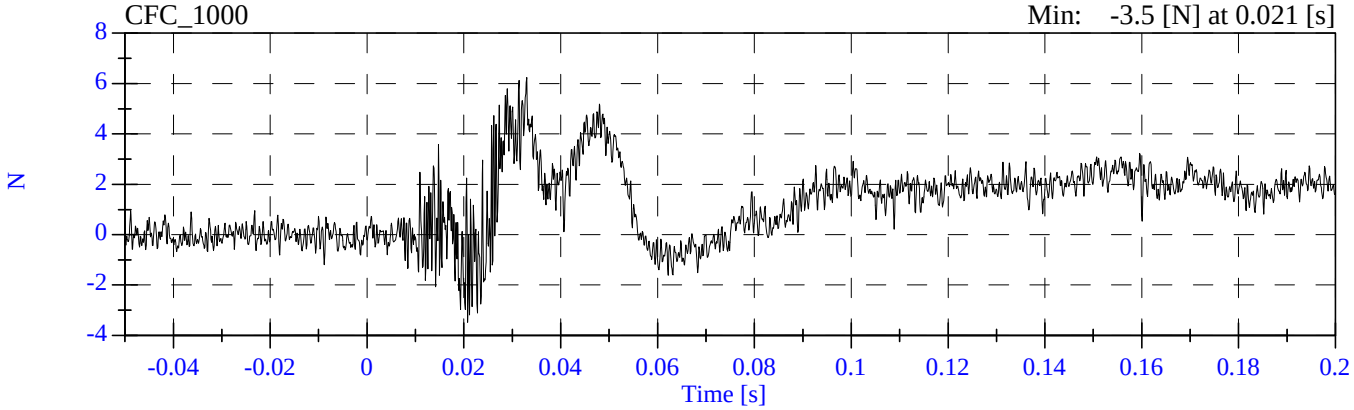


TWG Test - Nissan Murano
C35200TWG3 - November 03, 2003

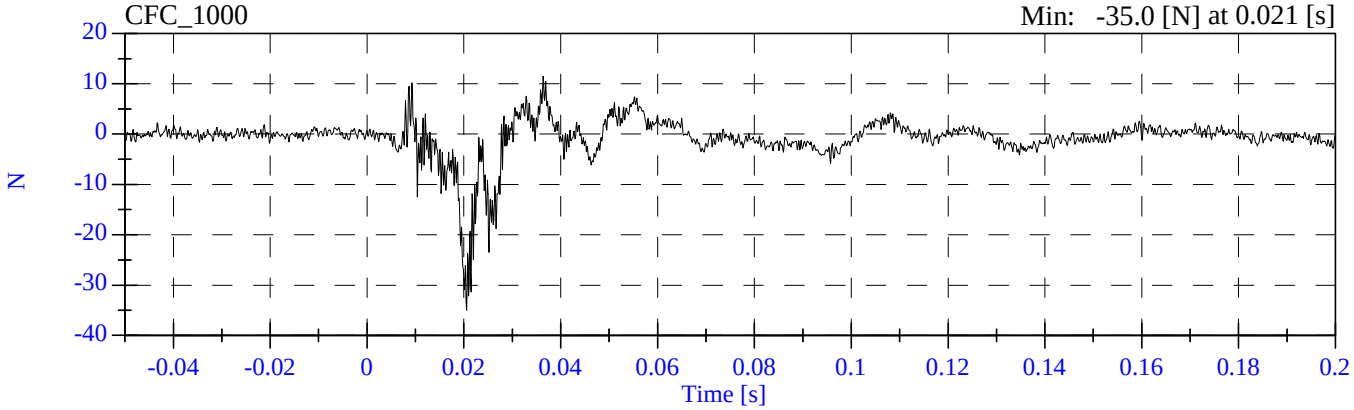
P3 Upper Neck Fx
CFC_1000
Max: 9.0 [N] at 0.020 [s]
Min: -7.2 [N] at 0.033 [s]



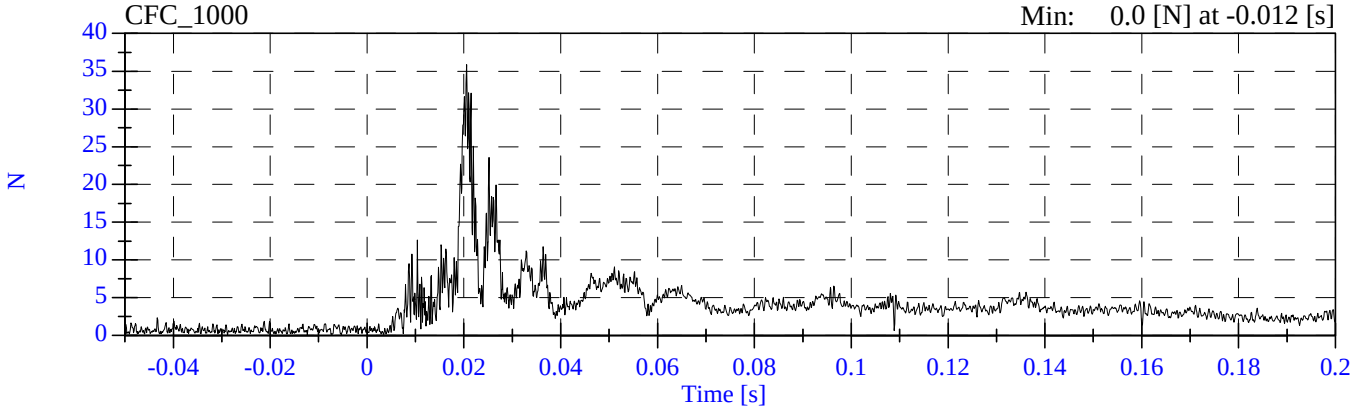
P3 Upper Neck Fy
CFC_1000
Max: 6.2 [N] at 0.033 [s]
Min: -3.5 [N] at 0.021 [s]



P3 Upper Neck Fz
CFC_1000
Max: 11.5 [N] at 0.036 [s]
Min: -35.0 [N] at 0.021 [s]

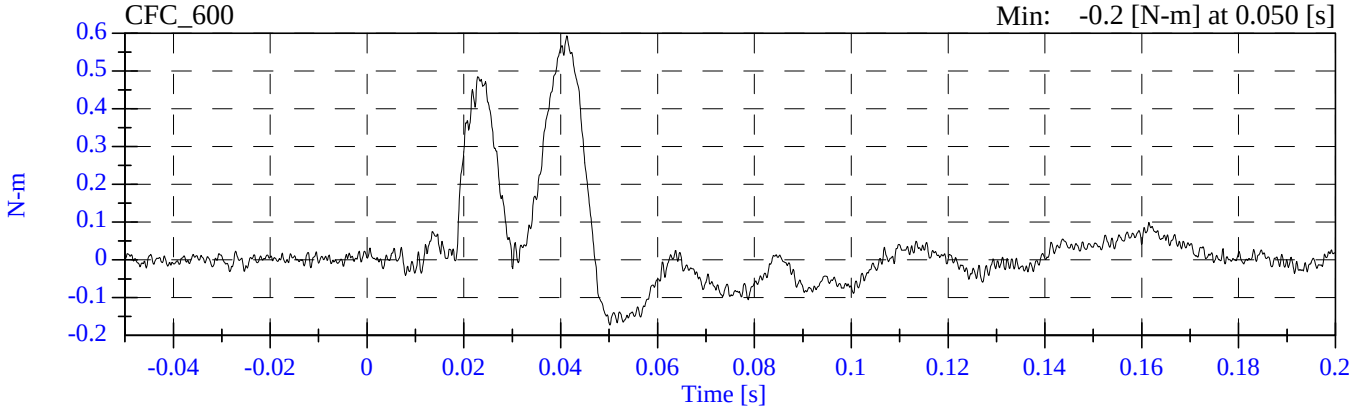


P3 Upper Neck F Resultant
CFC_1000
Max: 35.9 [N] at 0.021 [s]
Min: 0.0 [N] at -0.012 [s]

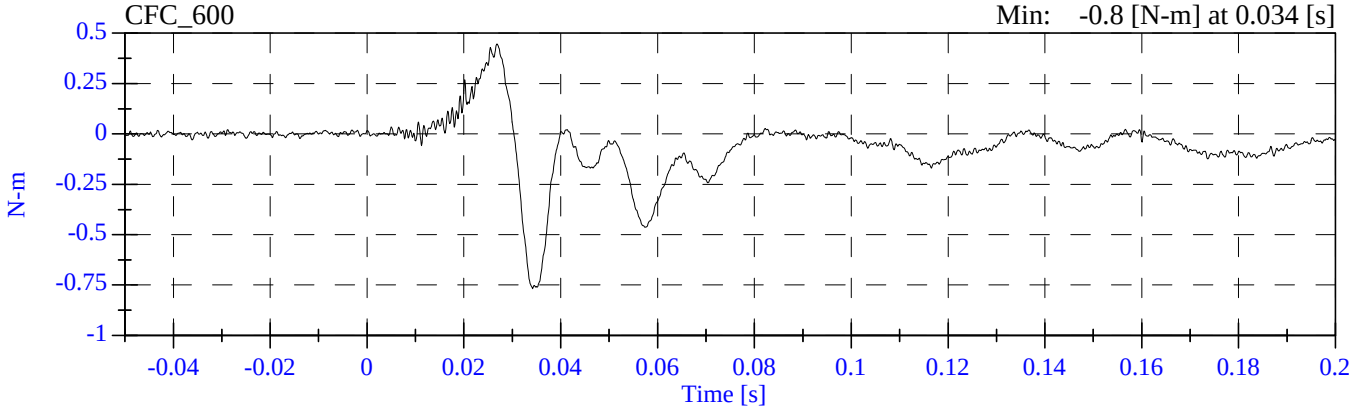


TWG Test - Nissan Murano
C35200TWG3 - November 03, 2003

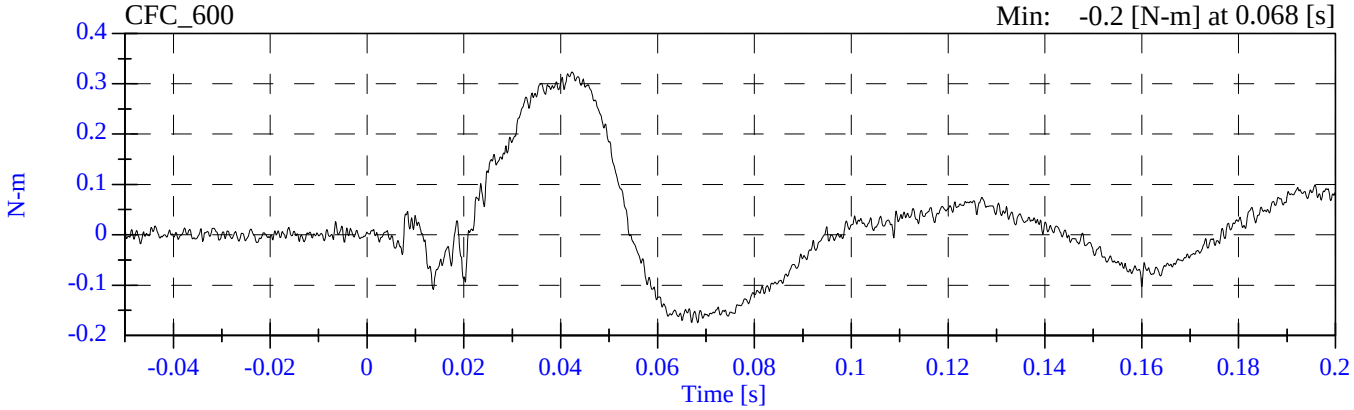
P3 Upper Neck Mx
CFC_600
Max: 0.6 [N-m] at 0.041 [s]
Min: -0.2 [N-m] at 0.050 [s]



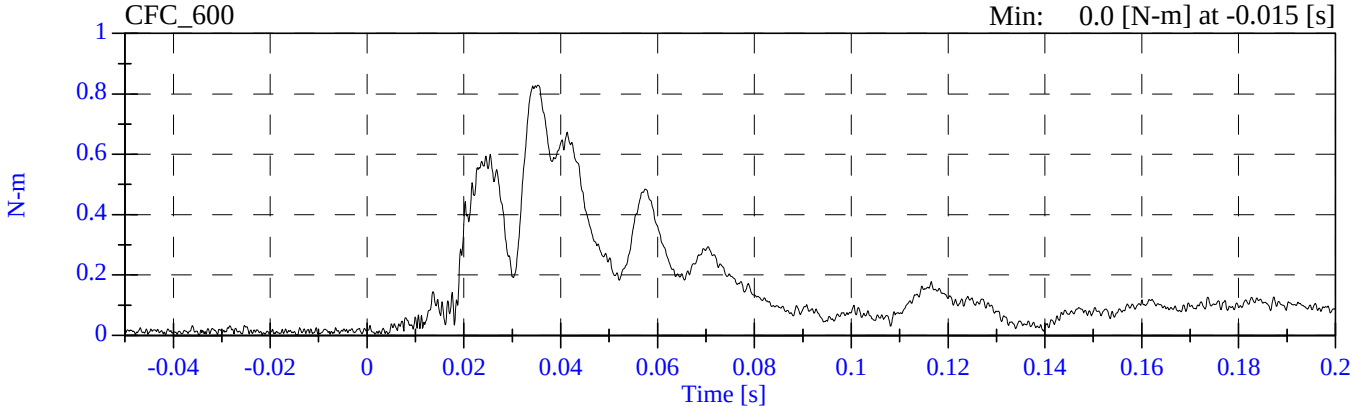
P3 Upper Neck My
CFC_600
Max: 0.4 [N-m] at 0.027 [s]
Min: -0.8 [N-m] at 0.034 [s]



P3 Upper Neck Mz
CFC_600
Max: 0.3 [N-m] at 0.042 [s]
Min: -0.2 [N-m] at 0.068 [s]

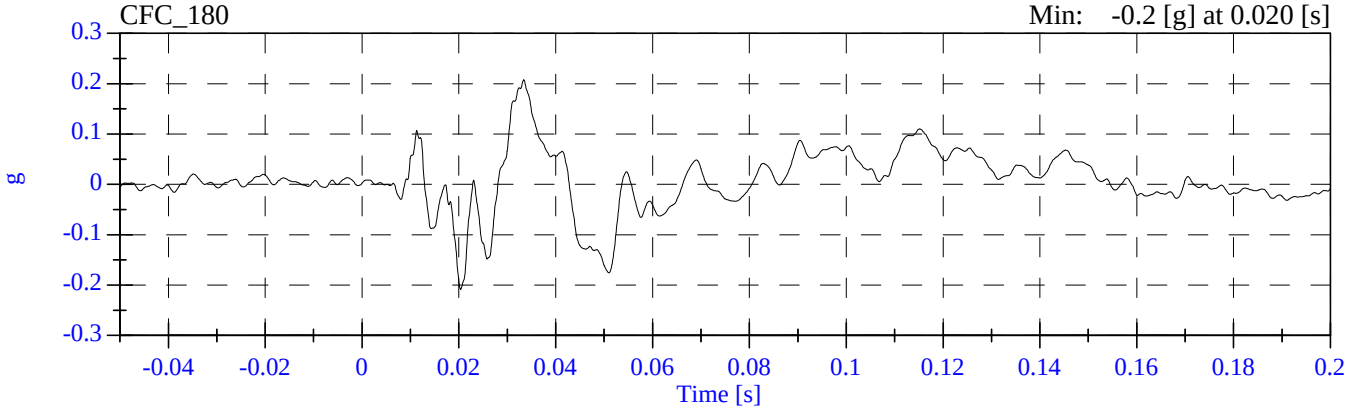


P3 Upper Neck M Resultant
CFC_600
Max: 0.8 [N-m] at 0.035 [s]
Min: 0.0 [N-m] at -0.015 [s]

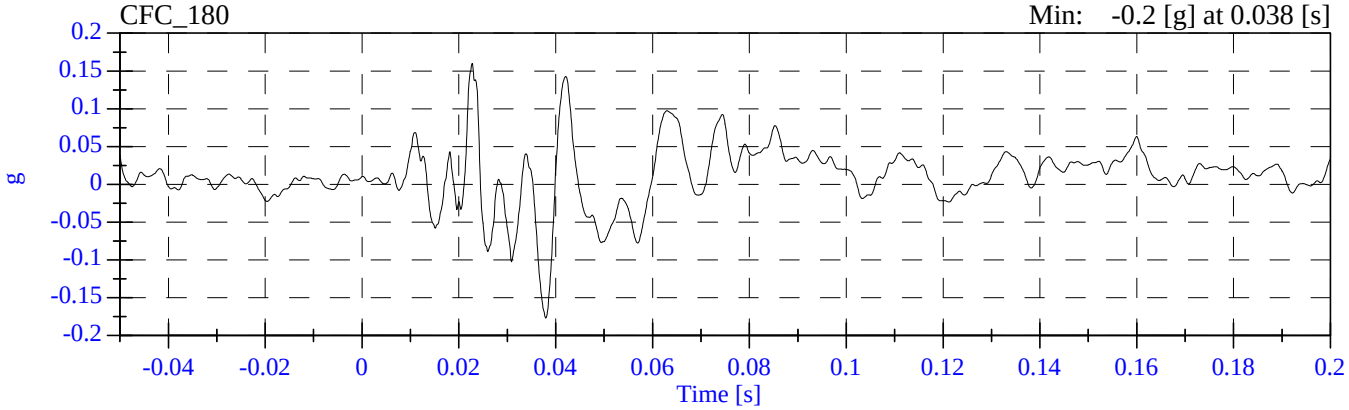


TWG Test - Nissan Murano
C35200TWG3 - November 03, 2003

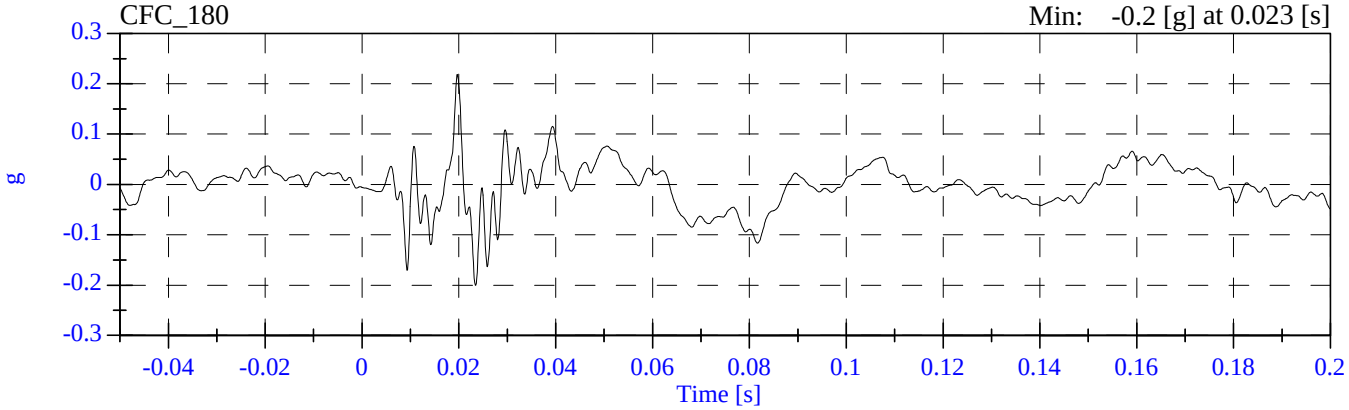
P3 Chest x
CFC_180
Max: 0.2 [g] at 0.033 [s]
Min: -0.2 [g] at 0.020 [s]



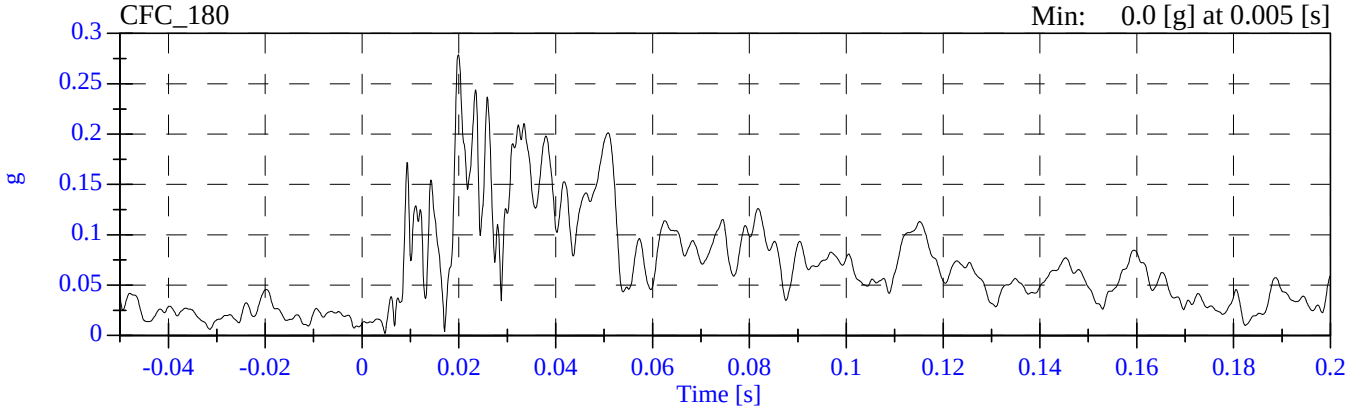
P3 Chest y
CFC_180
Max: 0.2 [g] at 0.023 [s]
Min: -0.2 [g] at 0.038 [s]



P3 Chest z
CFC_180
Max: 0.2 [g] at 0.020 [s]
Min: -0.2 [g] at 0.023 [s]



P3 Chest Resultant
CFC_180
Max: 0.3 [g] at 0.020 [s]
Min: 0.0 [g] at 0.005 [s]



TWG Test - Nissan Murano
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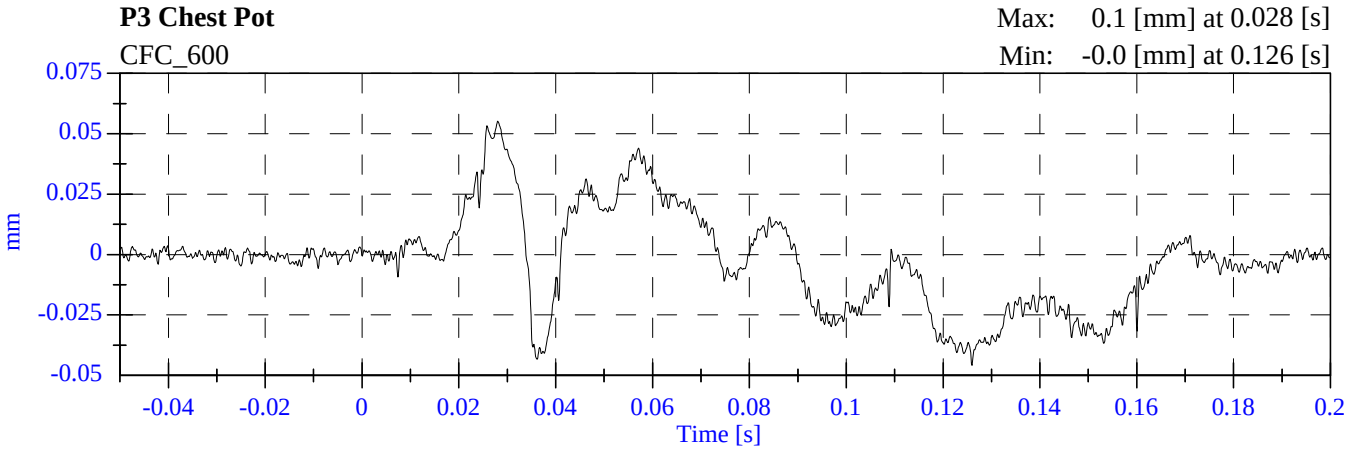

TWG Test - Nissan Murano
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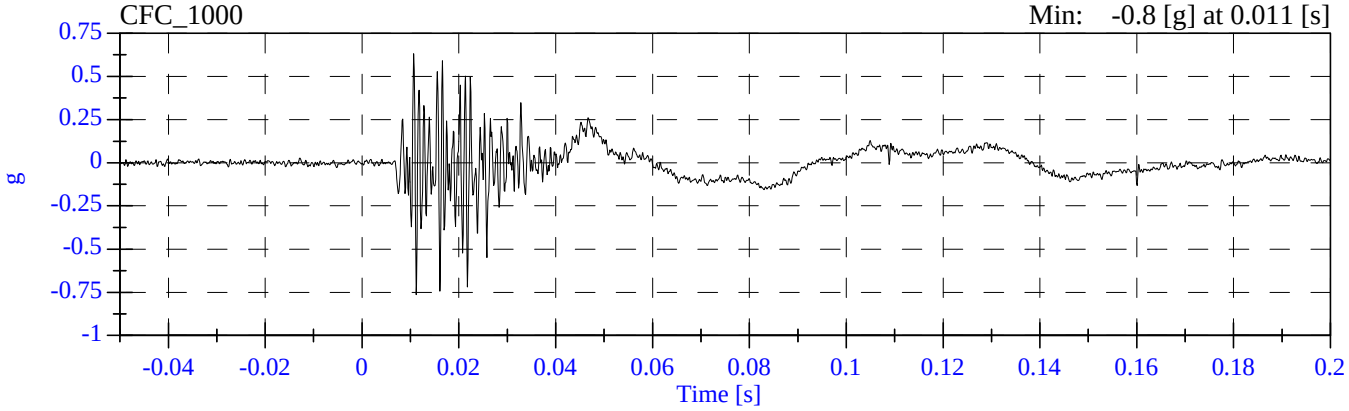
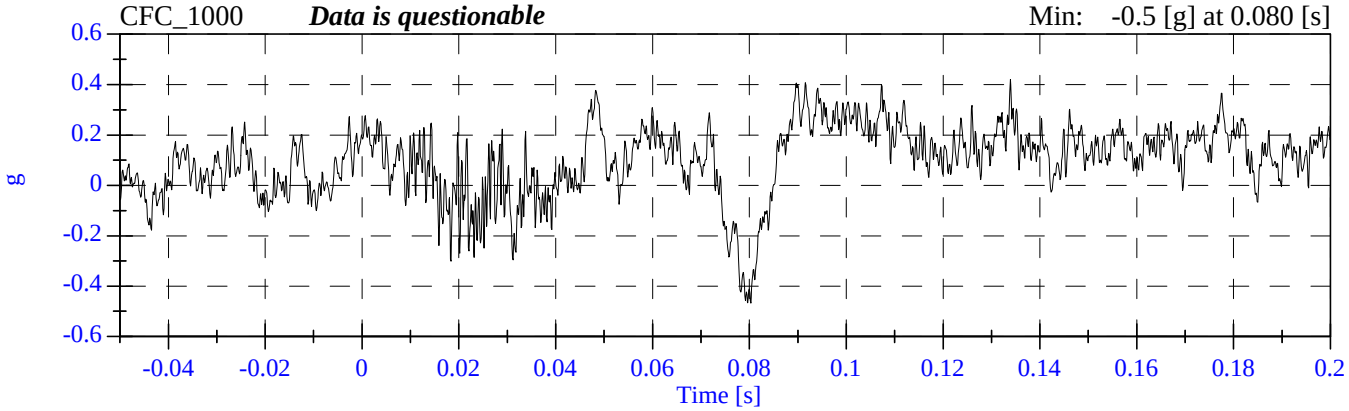
P3 Pelvic x
CFC_1000
Max: 0.6 [g] at 0.011 [s]
Min: -0.8 [g] at 0.011 [s]



P3 Pelvic y
CFC_1000 ***Data is questionable***
Max: 0.4 [g] at 0.134 [s]
Min: -0.5 [g] at 0.080 [s]



P3 Pelvic z
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Max: 0.5 [g] at 0.010 [s]
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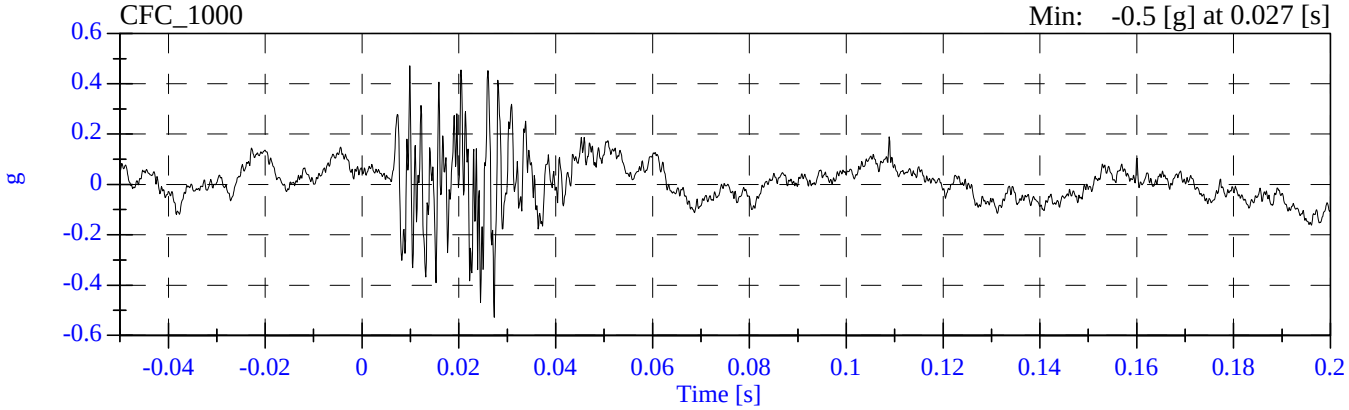
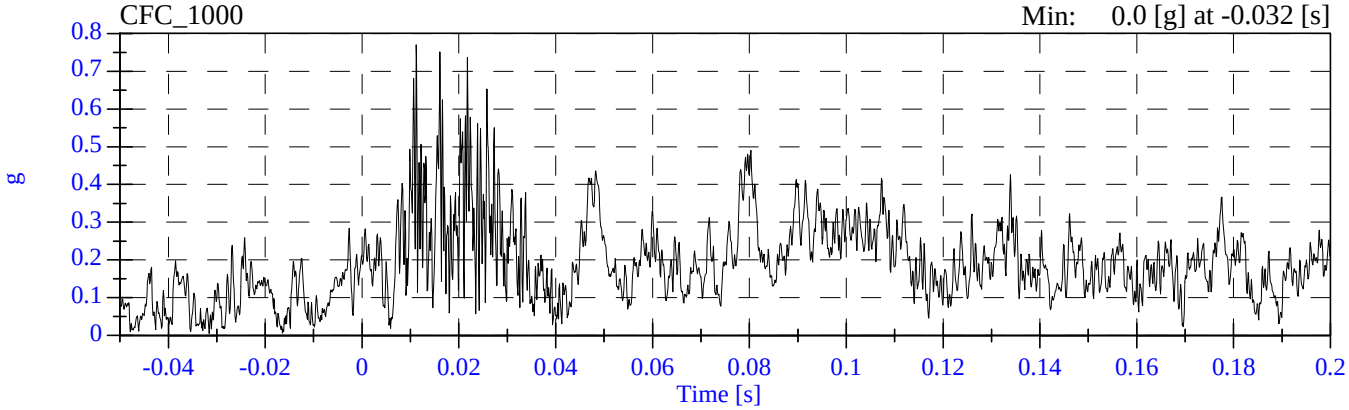


P3 Pelvic Resultant
CFC_1000
Max: 0.8 [g] at 0.011 [s]
Min: 0.0 [g] at -0.032 [s]



APPENDIX C

TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

P572N INSTRUMENTATION

	POSITION #3 (RIGHT) SERIAL NO.: 182		
	SERIAL NUMBER	MANUFACTURER	CALIBRATION DATE
HEAD AX	AC-P23884	ENDEVCO	18-Sep-03
HEAD AY	AC-ACC63	ENDEVCO	19-Sep-03
HEAD AZ	AC-AJ4G1	ENDEVCO	19-Sep-03
UPPER NECK FX	LC-1563Fx	DENTON	29-Sep-03
UPPER NECK FY	LC-1563Fy	DENTON	29-Sep-03
UPPER NECK FZ	LC-1563Fz	DENTON	29-Sep-03
UPPER NECK MX	LC-1563Mx	DENTON	29-Sep-03
UPPER NECK MY	LC-1563My	DENTON	29-Sep-03
UPPER NECK MZ	LC-1563Mz	DENTON	29-Sep-03
CHEST AX	AC-ACC02	ENDEVCO	19-Sep-03
CHEST AY	AC-AKAA4	ENDEVCO	19-Sep-03
CHEST AZ	AC-AJ4R6	ENDEVCO	19-Sep-03
CHEST DISPLACEMENT X	DS-182	SERVO	3-Oct-03
PELVIS AX	AC-P10095	ENDEVCO	13-Feb-03
PELVIS AY	AC-AJ7H0	ENDEVCO	19-Sep-03
PELVIS AZ	AC-J20047	ENDEVCO	27-May-03