REPORT NUMBER: TWG-MGA-2007-010

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

DAIMLERCHRYSLER CORPORATION
2007 DODGE NITRO SLT 4X4
NHTSA NUMBER: M70305TWG2

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

Test Date: May 4, 2007

Final Report Date: May 30, 2007

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.

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Jessica Gall, Project Engineer

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Technical Report Documentation Page

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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 MGA Research Corporation in Burlington, Wisconsin, on May 4, 2007.			

HIC 15	HIC 36	NIJ NTF	NIJ NTE	NIJ NCF	NIJ NCE
1.6	1.8	0.00	0.00	0.13	0.10

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SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

The purpose of this test was to obtain data in a static out-of-position side airbag deployment. 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 a curtain airbag deployment in a 2007 Dodge Nitro with an out-of-position SID-IIs Build Level D were evaluated. The test was performed by MGA Research Corporation on May 4, 2007. 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 Removed Driver Door
- Front Through Windshield
- Left Side ¾ View Through Windshield

One SID-IIs Build Level D dummy (Serial Number 032) was placed in the right front passenger seat situated in the forward-facing position per Section 3.3.5.2 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 dummy was instrumented with the following instrumentation:

- Head Accelerations
- Upper Neck Load Cell
- Lower Neck Load Cell

The 18 channels of data were recorded on an on-board data acquisition system. Appendix B contains the dummy data traces. Appendix C contains the instrumentation calibration data.

The SID-IIs dummy's visible contact points were as follows: The curtain airbag to the top and left side of the head.

The SID-IIs dummy was placed in the center of the right front passenger seat facing forward. The dummy's outboard arm was rotated horizontal in the forward direction with respect to the dummy to clear the armrest. The dummy was positioned outboard until it contacted the door trim panel. The dummy may have been leaned outboard to ensure that the deployment trajectory of the airbag intersected with the centerline of the top of the head. Masking tape was wrapped around the dummy's neck bracket to hold the dummy in place, if necessary.

This orientation complies with Section 3.3.5.2 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	3.3.5.2*	Forward-facing SID-IIs dummy
Curtain Airbag	Roof-Rail Mounted	Side airbag
Torso Airbag		
ATD Type/Serial No.	SID-IIs Build Level D / 032	5th Percentile Adult Female

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

Number of Data Channels	18
Number of Real-Time Video	1
Number of High-Speed Video	3

Visible Dummy Contact Points	
Head Contact	Curtain airbag to top and left side of the head
Left Shoulder Contact	None
Left Torso Contact	None
Left Pelvis Contact	None

DATA SHEET NO. 2

TEST VEHICLE INFORMATION

Please note that this vehicle had previously been tested in an NCAP Frontal Impact on October 20, 2006.

TEST VEHICLE INFORMATION

Manufacturer	Dodge
Model	Nitro
Body Style	SUV
NHTSA No.	M70305TWG2
VIN	1D8GU58K57W547196
Color	Light Khaki Met
Delivery Date	10/5/06
Odometer Reading (mile)	92
Dealer	Frank Boucher
Transmission	Automatic
Final Drive	4 Wheel
Number of Cylinders	6
Engine Displacement (L)	3.7
Engine Placement	Longitudinal
Automatic Door Lock (ADL)	Yes
Owners Manual Details Instructions on Disabling ADLs	Yes
Bucket Seats	Yes

TEST VEHICLE OPTIONS

Front Airbag	Yes
Driver Side Curtain Airbag	Yes
Driver Side Torso Airbag	No
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 (driver only)	Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	DaimlerChrysler Corporation
Date of Manufacture	9/06

GVWR (kg)	2541
GAWR Front (kg)	1248
GAWR Rear (kg)	1429

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench		
Number of Occupants	2	3		5
Capacity Wt. (VCW) (kg)				521
Cargo Wt. (RCLW) (kg)				181

DATA SHEET NO. 3

DUMMY POSITIONING IN VEHICLE

Measurement		Value
Seat Position		5 notches back from front position
Seat Height Position		Non-adjustable
Placed in Position No. 2		---
Seat Back Angle	SA (°)	25
Top of Airbag Module to Head/Neck Junction	AN (mm)	262
Head CG to Door Panel/Window	HD (mm)	206
Head to Seat Back Centerline	HSC (mm)	129
Chest to Dash	CD (mm)	434
Chest to Seatback	CS (mm)	---
Right Arm to Seat Back Centerline	RACL (mm)	273
Left Arm to Seat Back Centerline	LACL (mm)	67
Right Arm to Door Panel	RA (mm)	---
Left Arm to Door Panel	LA (mm)	---
Knee to Knee	KK (mm)	143
Toe to Toe	TT (mm)	---
Right Knee to Seat Cushion Centerline	KSCR (mm)	---
Left Knee to Seat Cushion Centerline	KSCL (mm)	0
Right Toe to Seat Cushion Centerline	TSCR (mm)	---
Left Toe to Seat Cushion Centerline	TSCL (mm)	---
Nose to Dash	ND (mm)	652
Nose to Seatback	NS (mm)	---
Top of Head to Headliner	HH (mm)	100

DATA SHEET NO. 4

DUMMY INJURY CRITERIA VALUES

NHTSA No. M70305TWG2

		MAXIMUM VALUE			
		Position No. 2			
DESCRIPTION	UNIT	MAXIMUM	TIME (ms)	MINIMUM	TIME (ms)
Head X	g	2.5	15.4	-5.0	19.7
Head Y	g	10.3	30.0	-2.5	113.8
Head Z	g	6.2	18.4	-4.1	20.6
Head Resultant	g	10.5	30.0		
Head X Redundant	g	2.6	15.4	-5.0	19.7
Head Y Redundant	g	10.2	29.9	-2.9	109.5
Head Z Redundant	g	6.1	18.3	-3.8	20.5
Head Resultant Redundant	g	10.4	29.9		
Upper Neck Fx	N	79.8	55.7	-30.3	25.8
Upper Neck Fy	N	4.6	0.0	-160.5	54.8
Upper Neck Fz	N	10.1	0.6	-447.4	14.4
Upper Neck F Resultant	N	452.0	14.3		
Upper Neck Mx	N-m	4.7	22.1	-8.2	32.5
Upper Neck My	N-m	4.6	19.0	-2.6	67.2
Upper Neck Mz	N-m	1.0	185.0	-1.4	36.0
Upper Neck M Resultant	N-m	8.2	32.5		
Lower Neck Fx	N	51.0	17.6	-54.6	46.8
Lower Neck Fy	N	37.0	32.9	-130.3	45.2
Lower Neck Fz	N	12.9	8.6	-398.3	14.5
Lower Neck F Resultant	N	398.8	14.5		
Lower Neck Mx	N-m	0.4	13.0	-23.1	45.5
Lower Neck My	N-m	20.1	14.6	-1.7	232.7
Lower Neck Mz	N-m	1.7	32.9	-5.2	45.3
Lower Neck M Resultant	N-m	26.6	47.1		

DATA SHEET NO. 4 (continued)

DUMMY INJURY CRITERIA VALUES

NHTSA No. M70305TWG2

	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	1.6	20.8	35.0	1.8	10.9	35.9

Position 2 Neck Injury Summary (SID-IIs Build Level D – Out-Of-Position)

	Nij	Time (msec)	Z Force (N) (CFC 600)	X Force (N) (CFC 600)	Y Moment (N-m) (CFC 600)
Ntf	0.00	0.40	7.69	-1.29	0.02
Nte	0.00	8.70	2.23	-2.56	-0.19
Ncf	0.13	14.60	-444.88	56.42	1.61
Nce	0.10	65.40	-194.97	39.54	-3.24
Peak Tension (CFC1000)		**10.1 N**	**Peak Compression (CFC 1000)**		**-447.4 N**

Critical Values

Nij Intercepts				Peak Limits	
Tension (CVt)	3880 N	Extension (mCVe)	61 N-m	Tension	2070 N
Compression (CVc)	3880 N	Flexion (mCVf)	155 N-m	Compression	2520 N
Condyle Offset	**0.01778 m**				

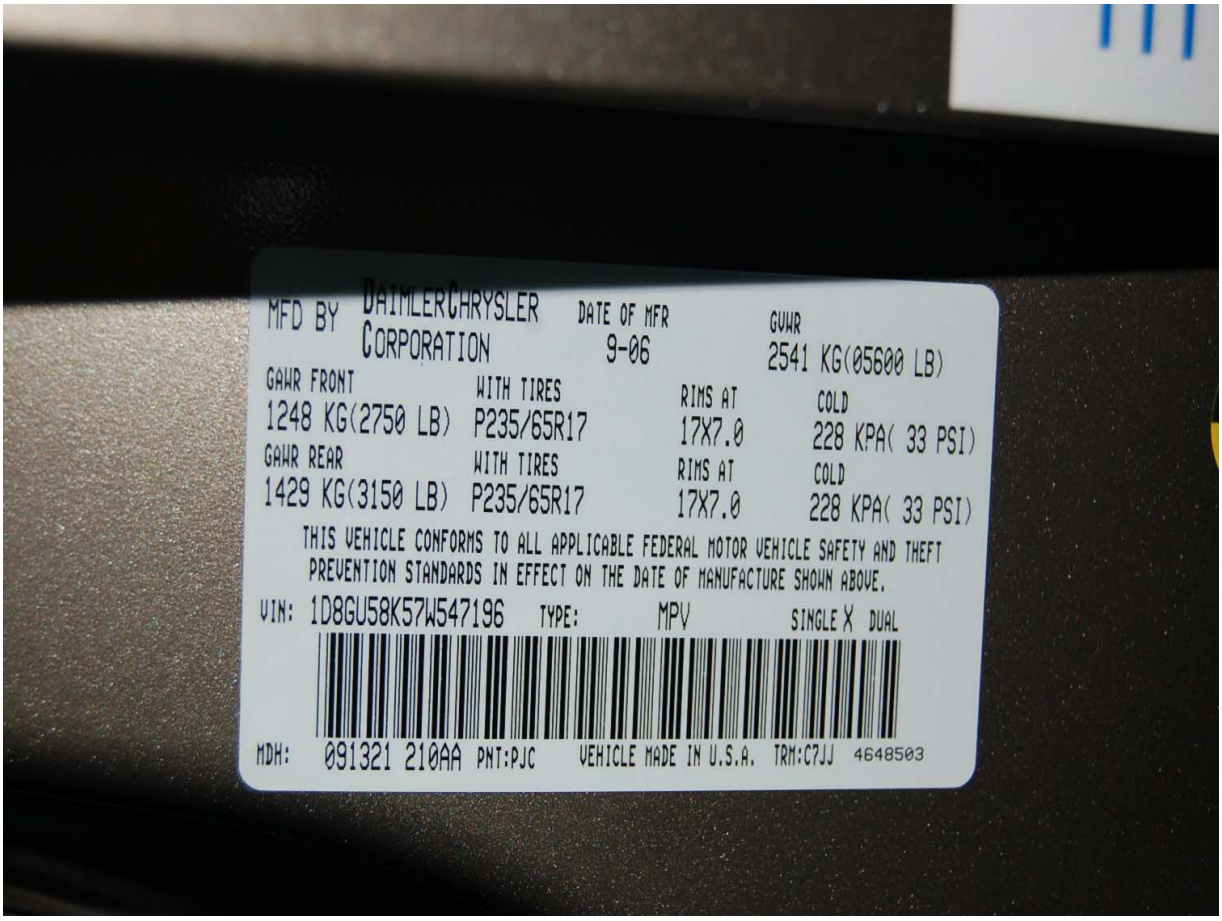
APPENDIX A

PHOTOGRAPHS

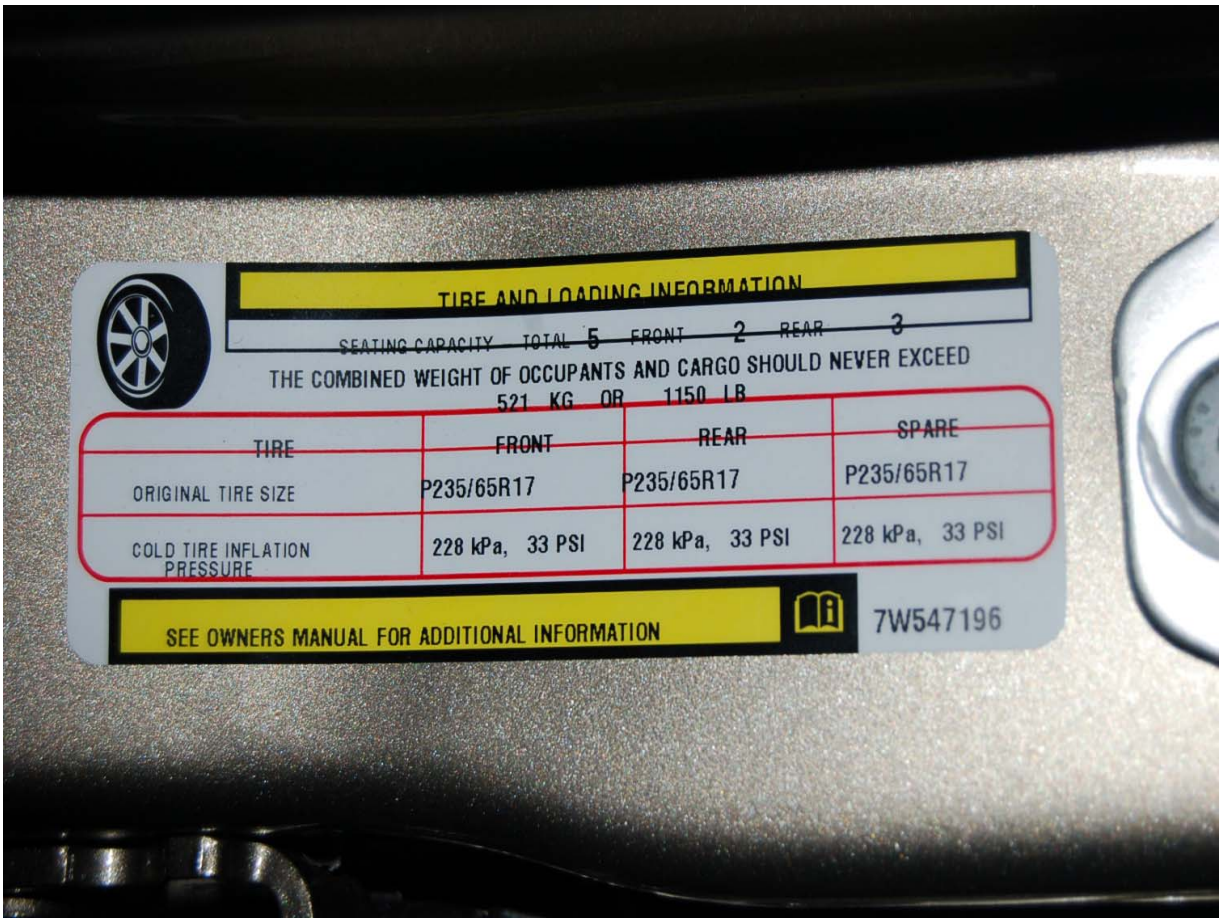
TABLE OF PHOTOGRAPHS

Pre-Test Vehicle Left Side View

Post-Test Vehicle Left Side View



Vehicle Certification Placard



Vehicle Tire Placard

Pre-Test SID-IIs Dummy Left Side View

Post-Test SID-IIs Dummy Left Side View

Pre-Test SID-IIs Dummy Left Side¾View

Post-Test SID-IIs Dummy Left Side¾View

Pre-Test SID-IIs Dummy Left Side¾Closeup View

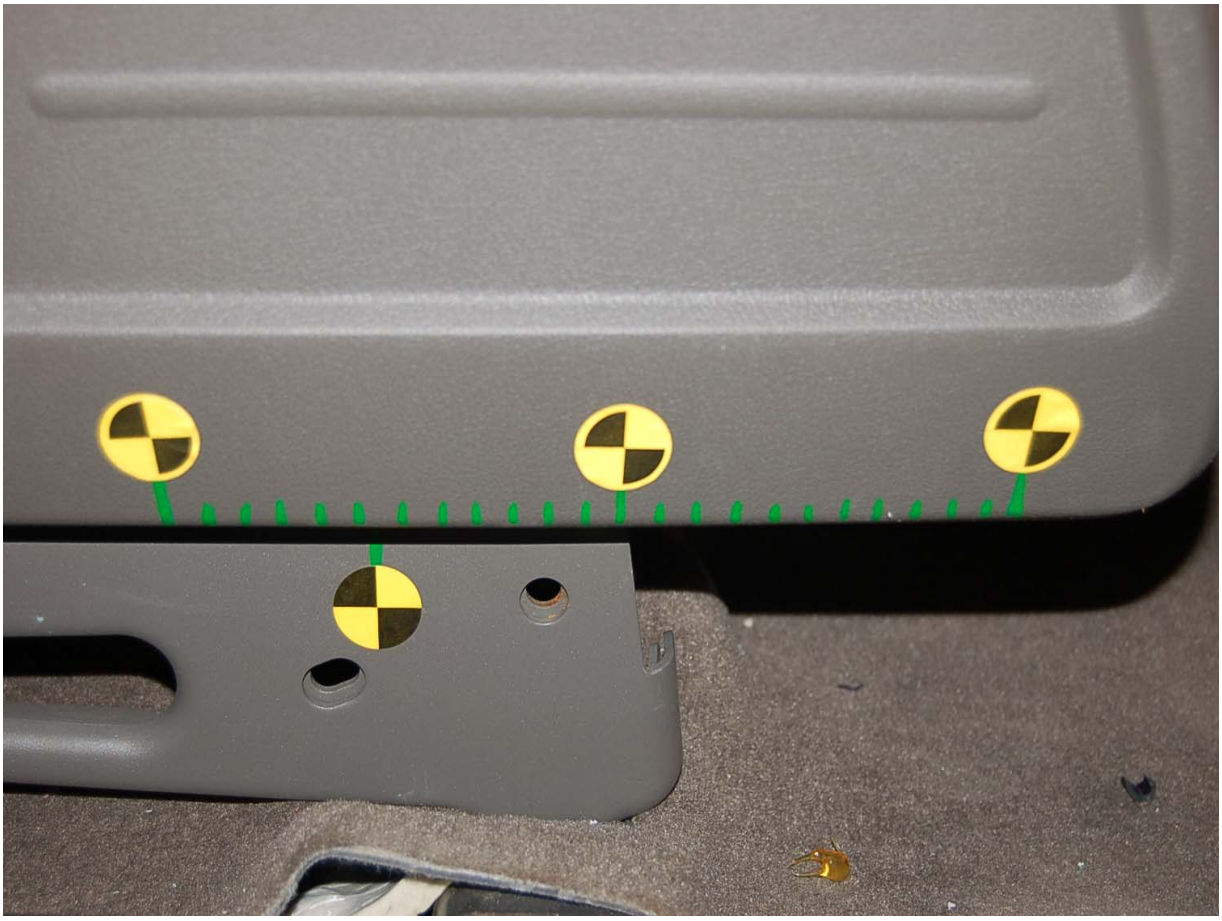
Post-Test SID-IIs Dummy Left Side¾Closeup View

Pre-Test SID-IIs Dummy Front Head View

Post-Test SID-IIs Dummy Front Head View

Post-Test SID-IIs Dummy View Through RF Window

Post-Test Right Side Passenger Compartment View



Seat Position View

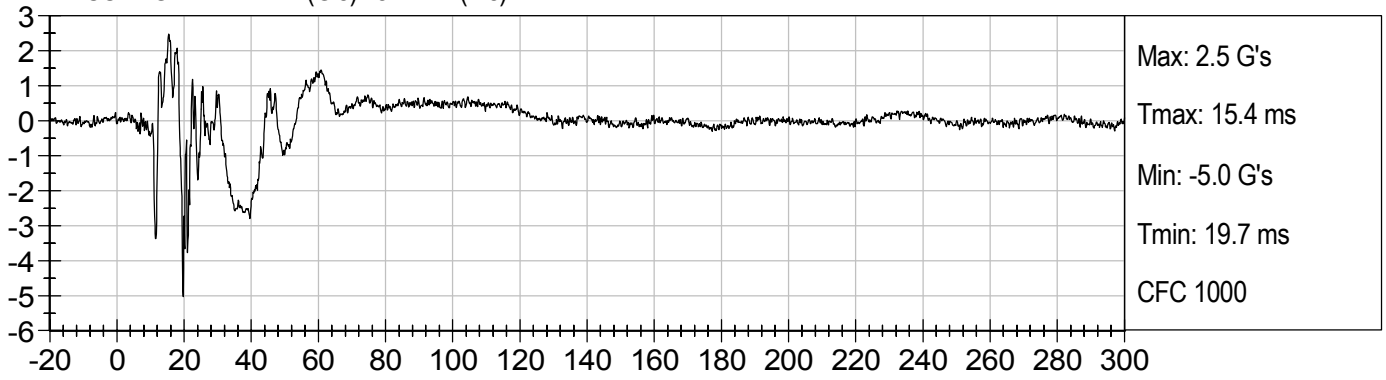
APPENDIX B

DUMMY RESPONSE DATA TRACES

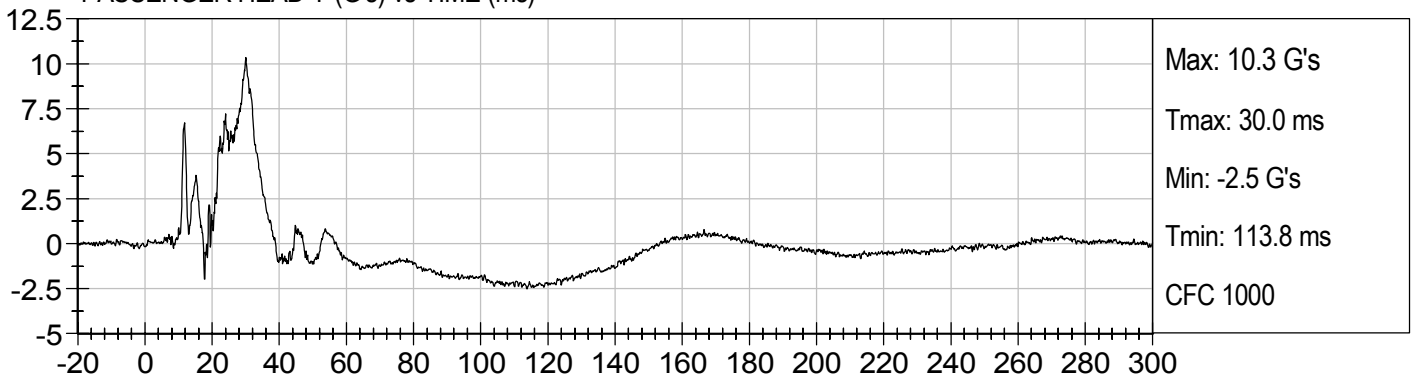
TABLE OF DATA PLOTS

NCAP SIDE OOP SID-IIsD POSITION 3.3.5.2 Test Date: 05/04/2007
2007 DODGE NITRO M70305 Speed: 0.0 mph (0.0 km/h)

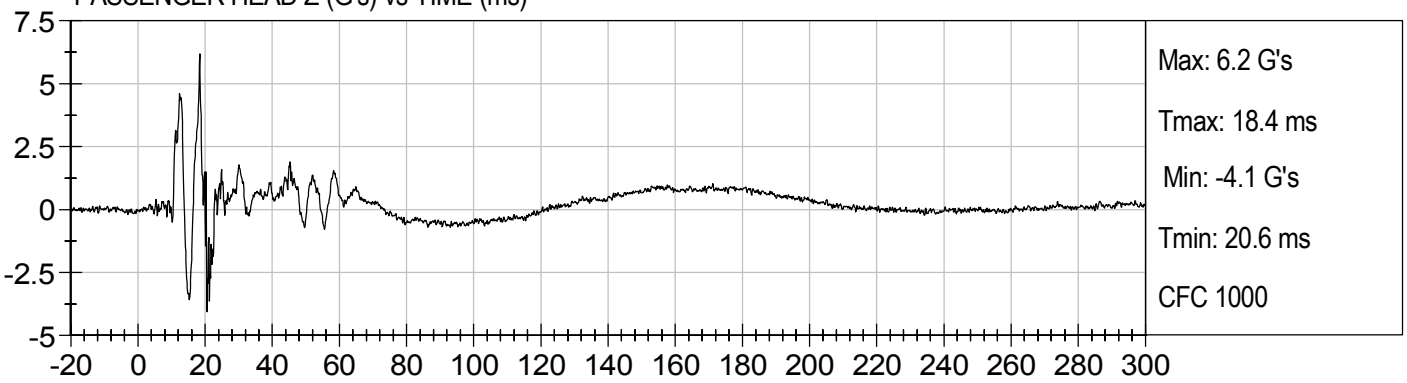
PASSENGER HEAD X (G's) vs TIME (ms)



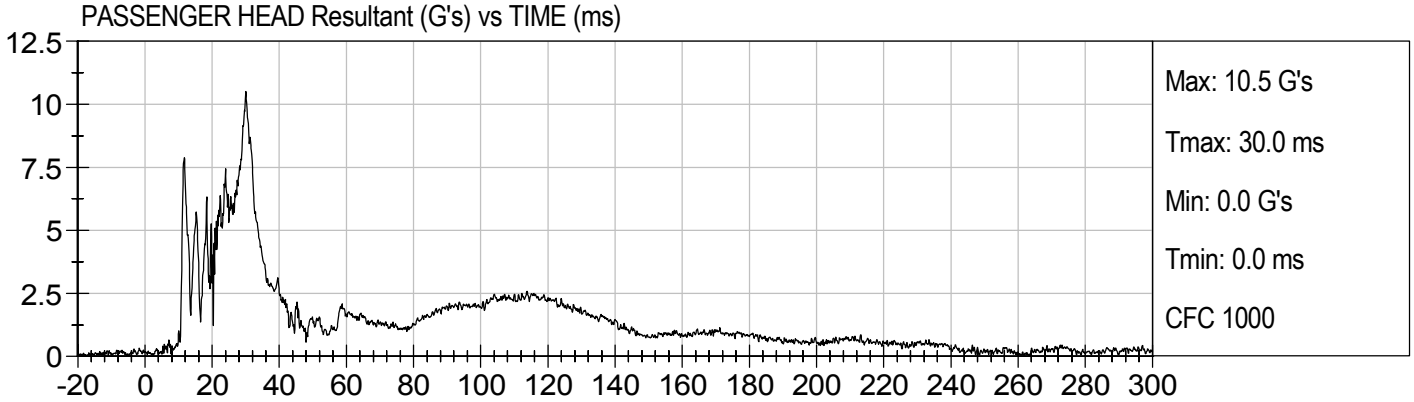
PASSENGER HEAD Y (G's) vs TIME (ms)



PASSENGER HEAD Z (G's) vs TIME (ms)

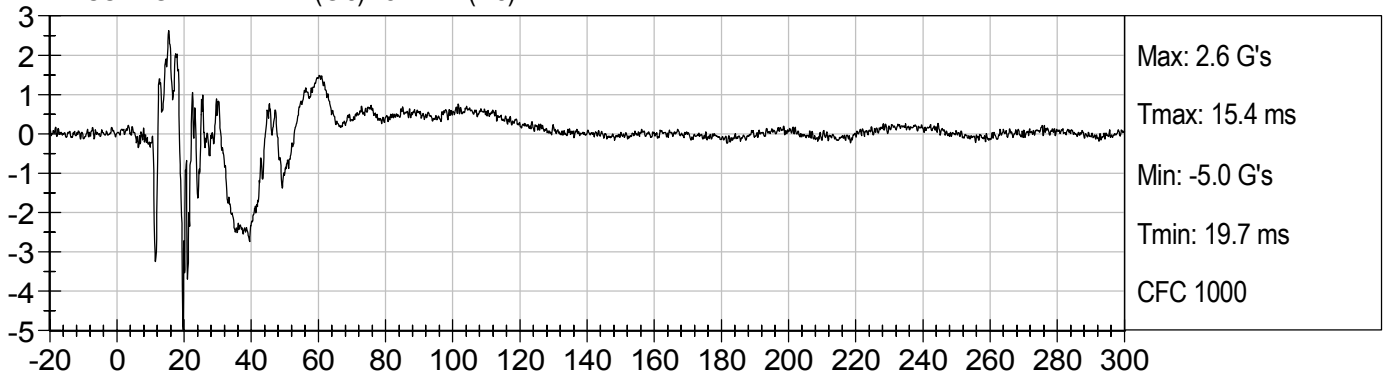


PASSENGER HEAD Resultant (G's) vs TIME (ms)

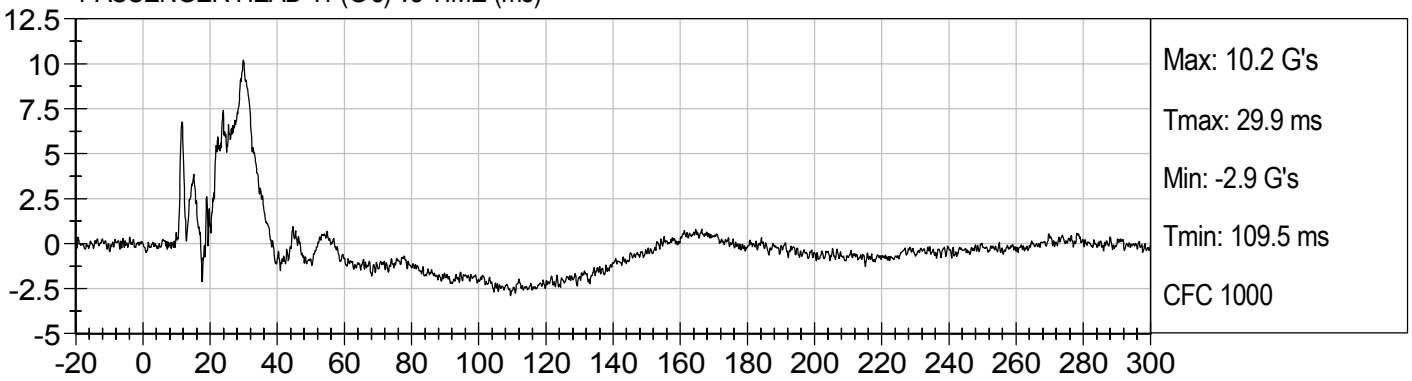


NCAP SIDE OOP SID-IIsD POSITION 3.3.5.2 Test Date: 05/04/2007
2007 DODGE NITRO M70305 Speed: 0.0 mph (0.0 km/h)

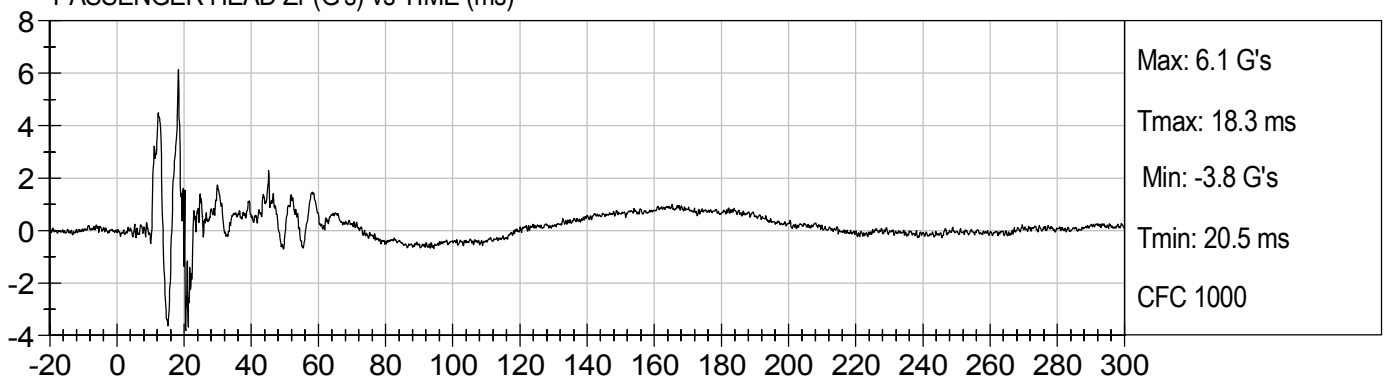
PASSENGER HEAD Xr (G's) vs TIME (ms)



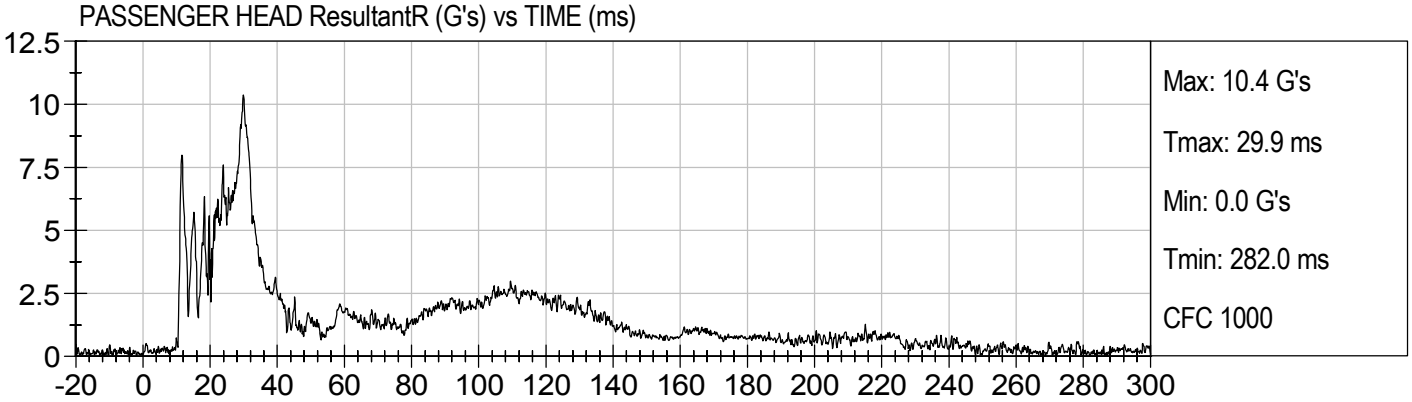
PASSENGER HEAD Yr (G's) vs TIME (ms)



PASSENGER HEAD Zr (G's) vs TIME (ms)

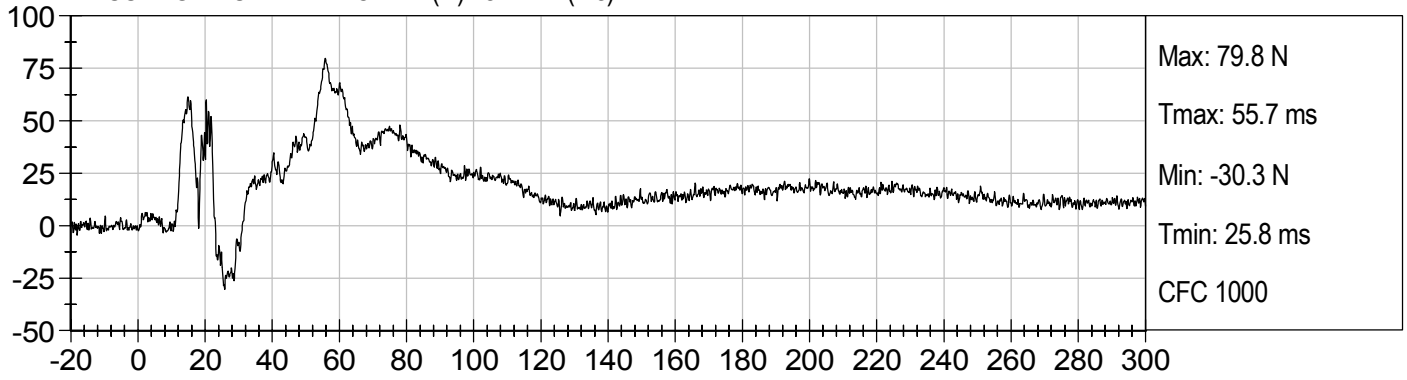


PASSENGER HEAD ResultantR (G's) vs TIME (ms)

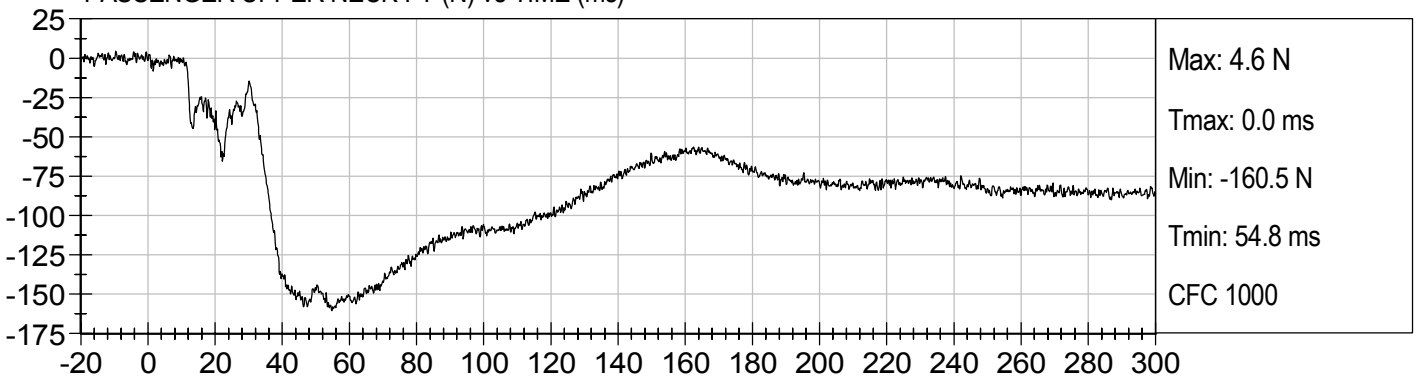


NCAP SIDE OOP SID-IIsD POSITION 3.3.5.2 Test Date: 05/04/2007
2007 DODGE NITRO M70305 Speed: 0.0 mph (0.0 km/h)

PASSENGER UPPER NECK FX (N) vs TIME (ms)



PASSENGER UPPER NECK FY (N) vs TIME (ms)



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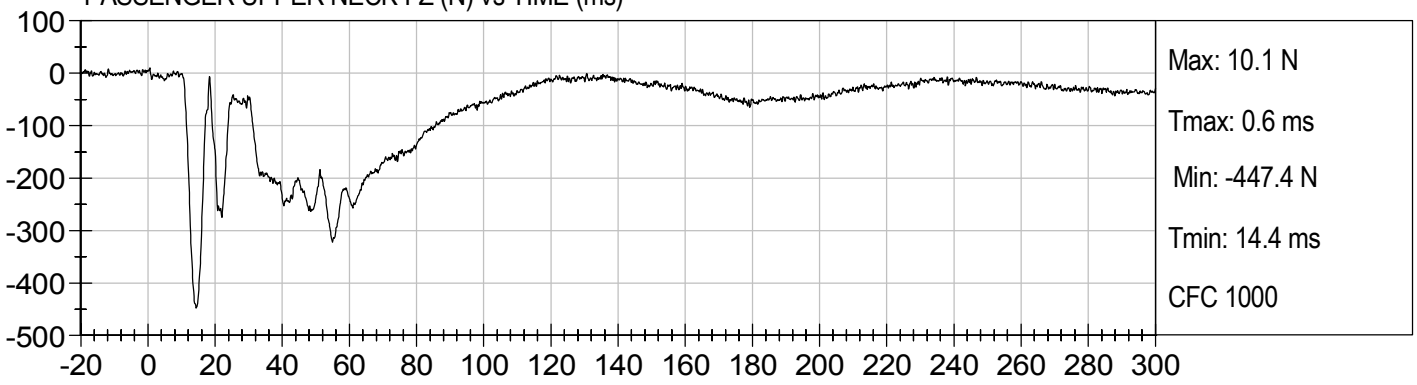
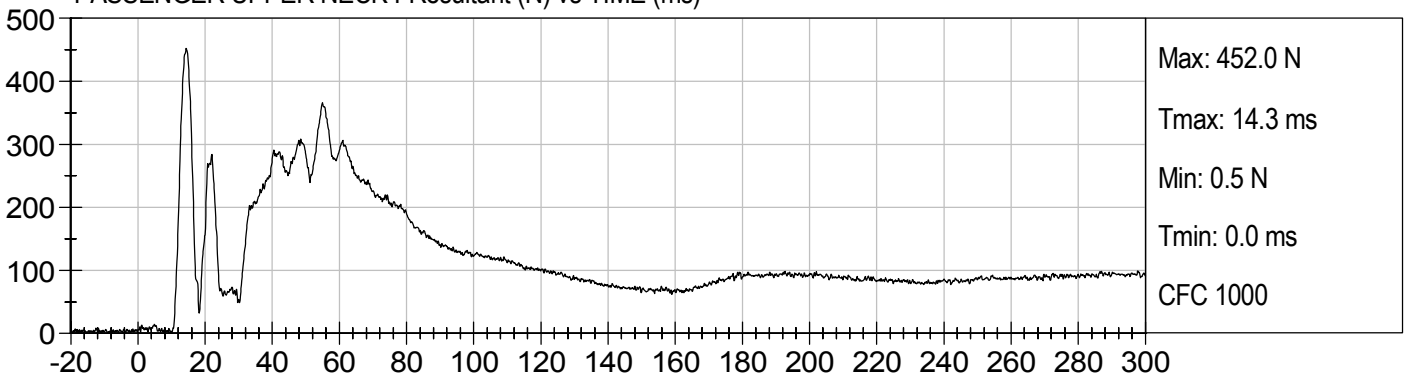
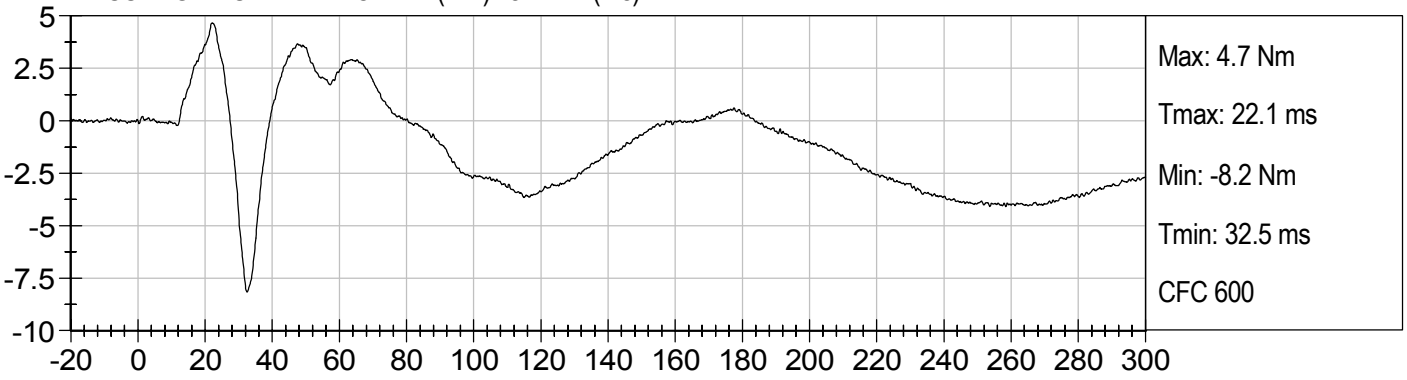


PASSENGER UPPER NECK FResultant (N) vs TIME (ms)

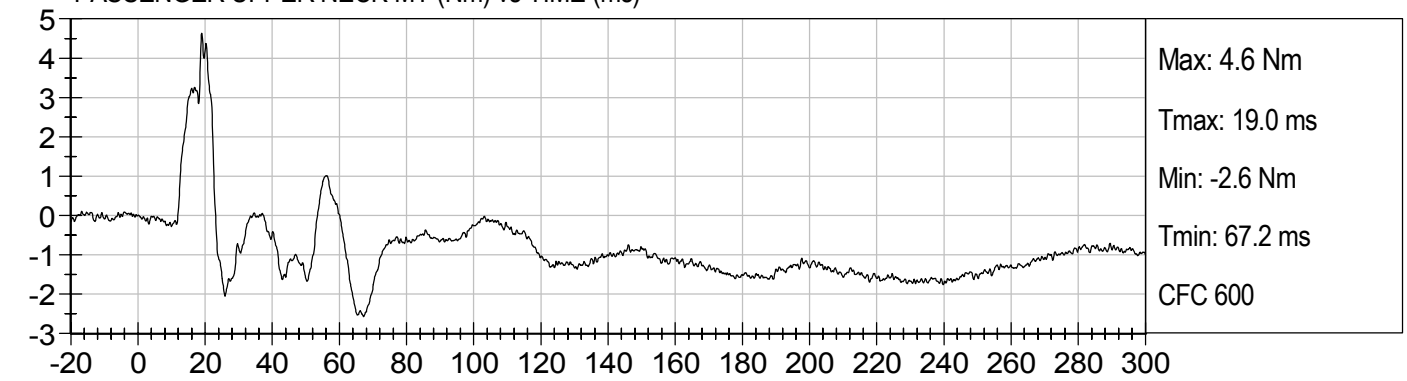


NCAP SIDE OOP SID-IIsD POSITION 3.3.5.2 Test Date: 05/04/2007
2007 DODGE NITRO M70305 Speed: 0.0 mph (0.0 km/h)

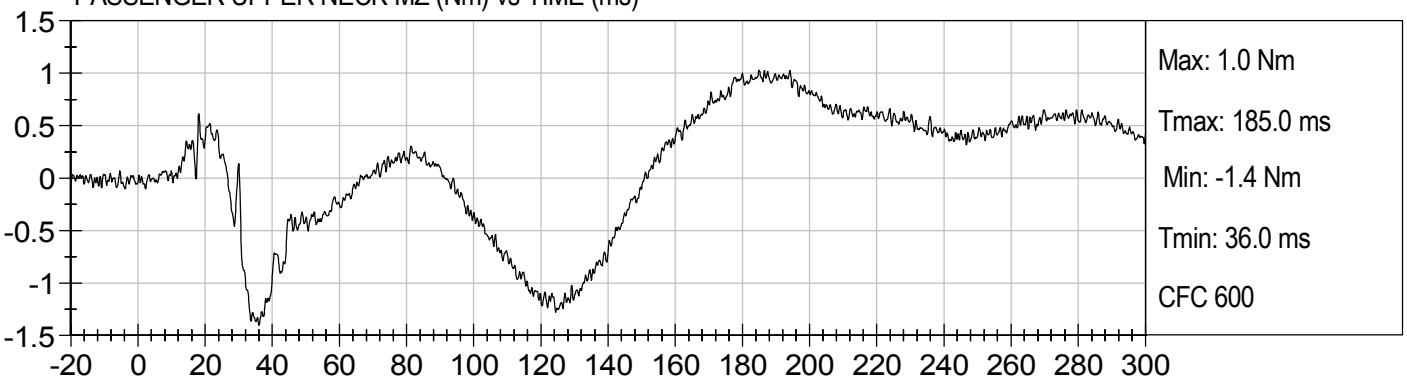
PASSENGER UPPER NECK MX (Nm) vs TIME (ms)



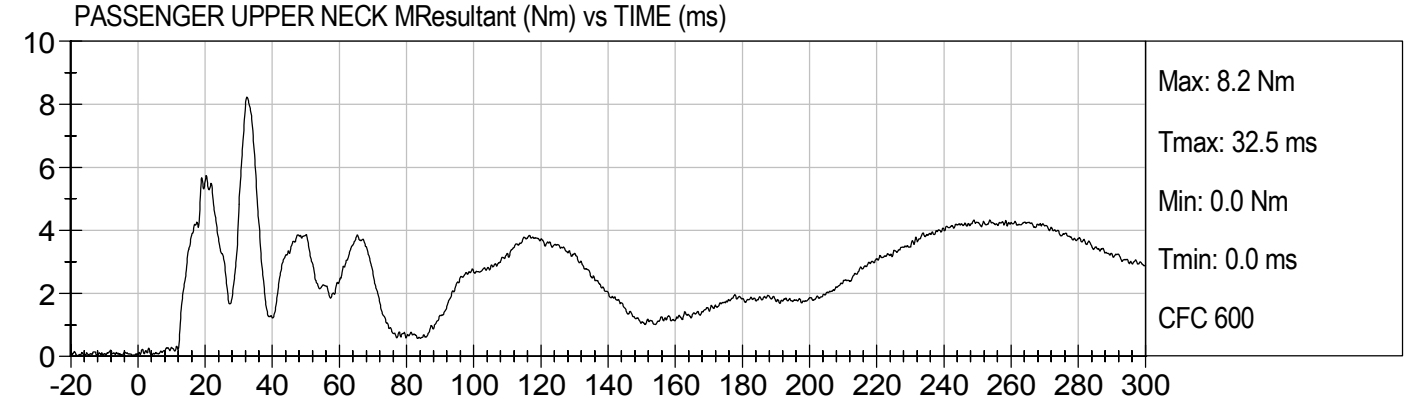
PASSENGER UPPER NECK MY (Nm) vs TIME (ms)



PASSENGER UPPER NECK MZ (Nm) vs TIME (ms)

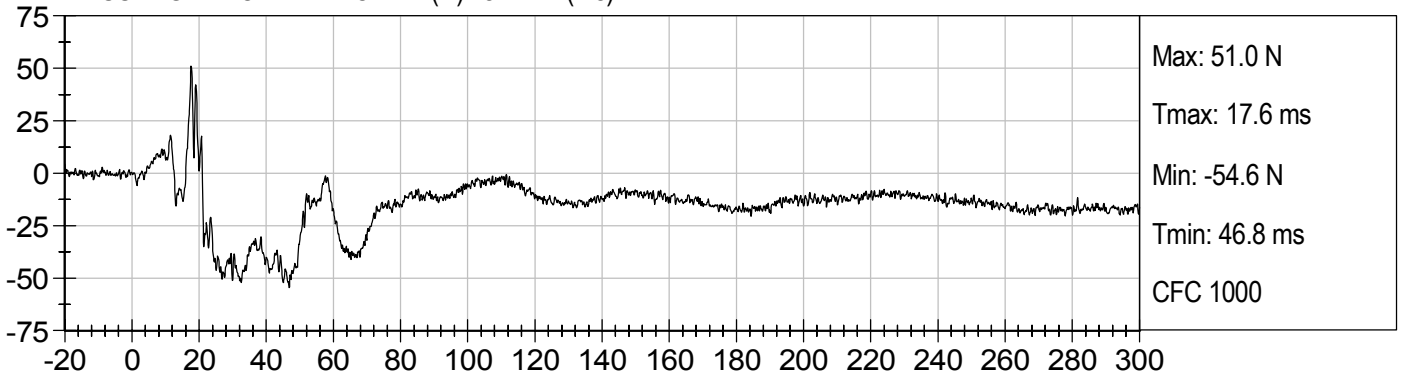


PASSENGER UPPER NECK MResultant (Nm) vs TIME (ms)

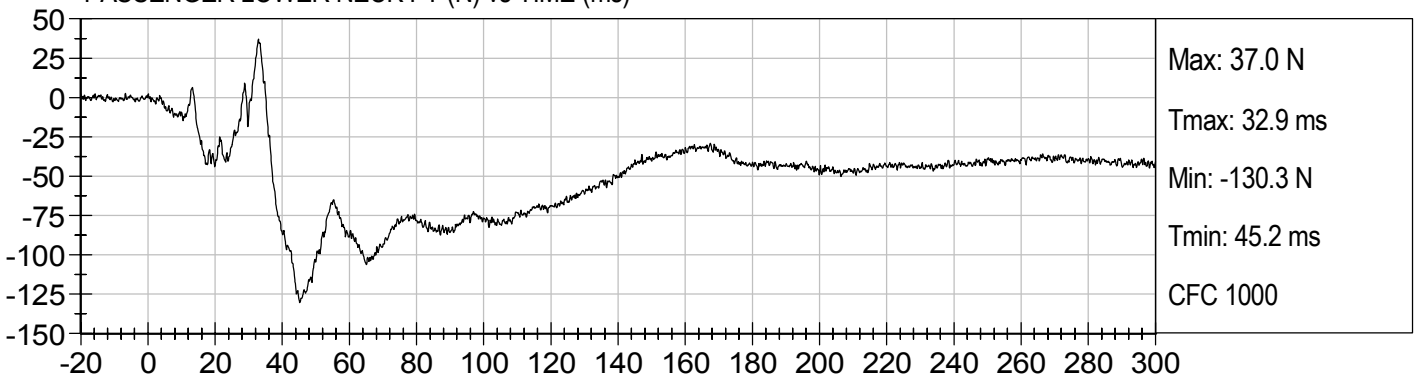


NCAP SIDE OOP SID-IIsD POSITION 3.3.5.2 Test Date: 05/04/2007
2007 DODGE NITRO M70305 Speed: 0.0 mph (0.0 km/h)

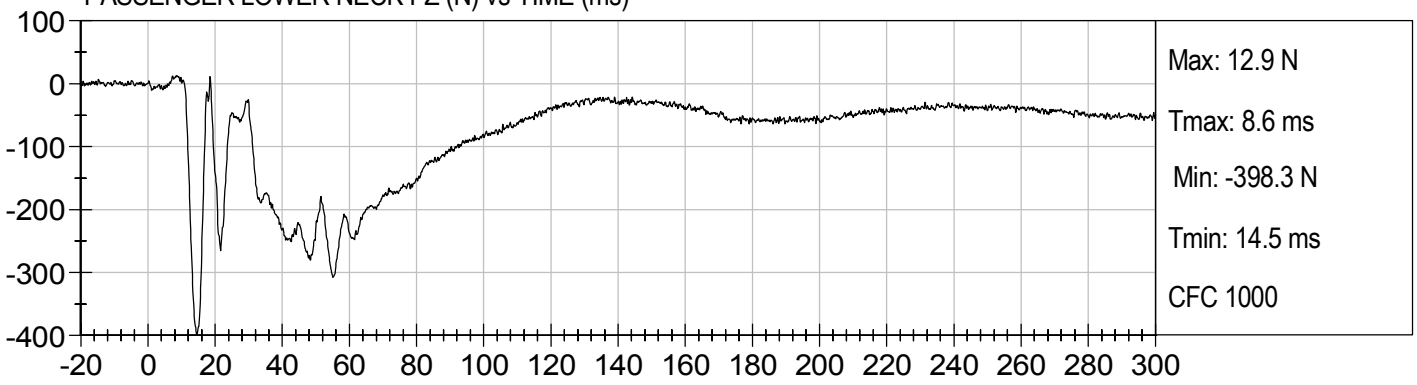
PASSENGER LOWER NECK FX (N) vs TIME (ms)



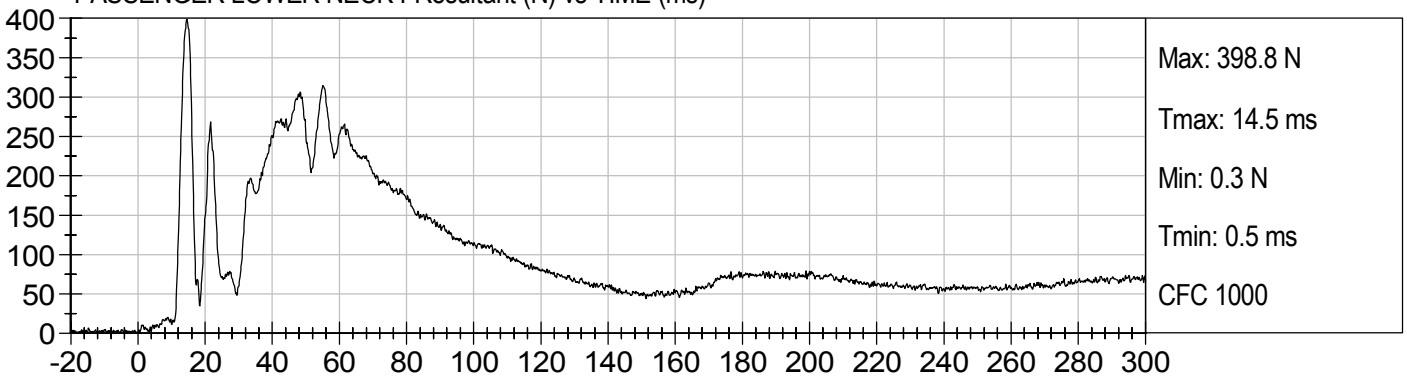
PASSENGER LOWER NECK FY (N) vs TIME (ms)



PASSENGER LOWER NECK FZ (N) vs TIME (ms)

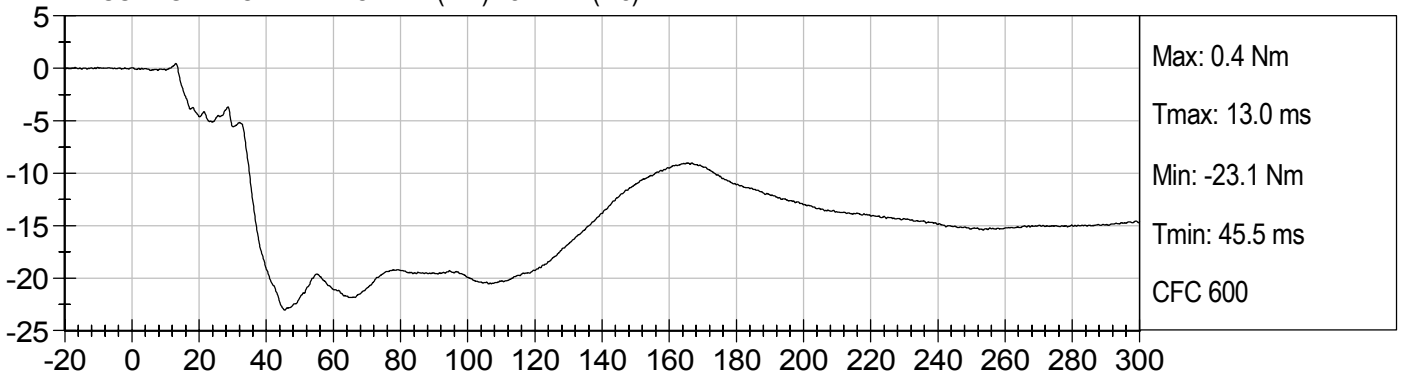


PASSENGER LOWER NECK FResultant (N) vs TIME (ms)

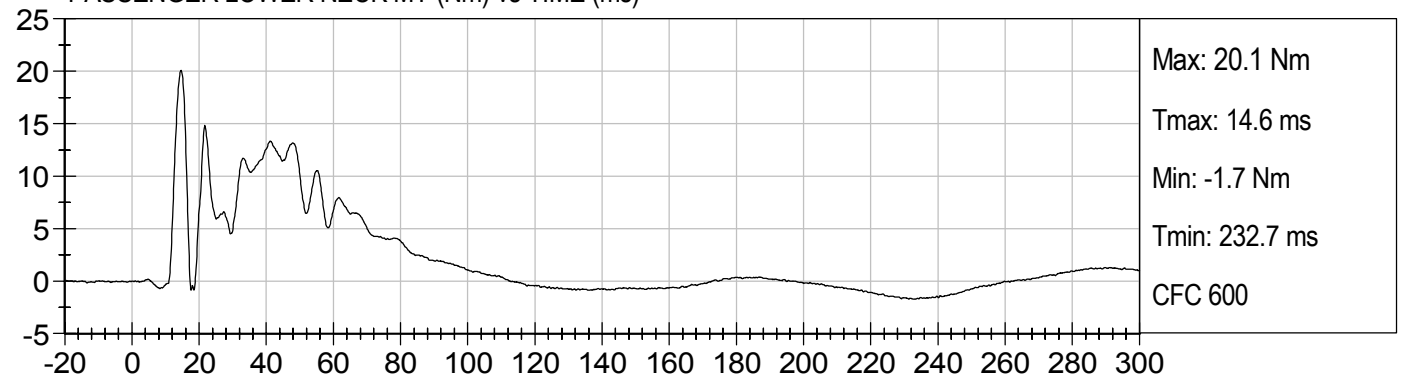


NCAP SIDE OOP SID-IIsD POSITION 3.3.5.2 Test Date: 05/04/2007
2007 DODGE NITRO M70305 Speed: 0.0 mph (0.0 km/h)

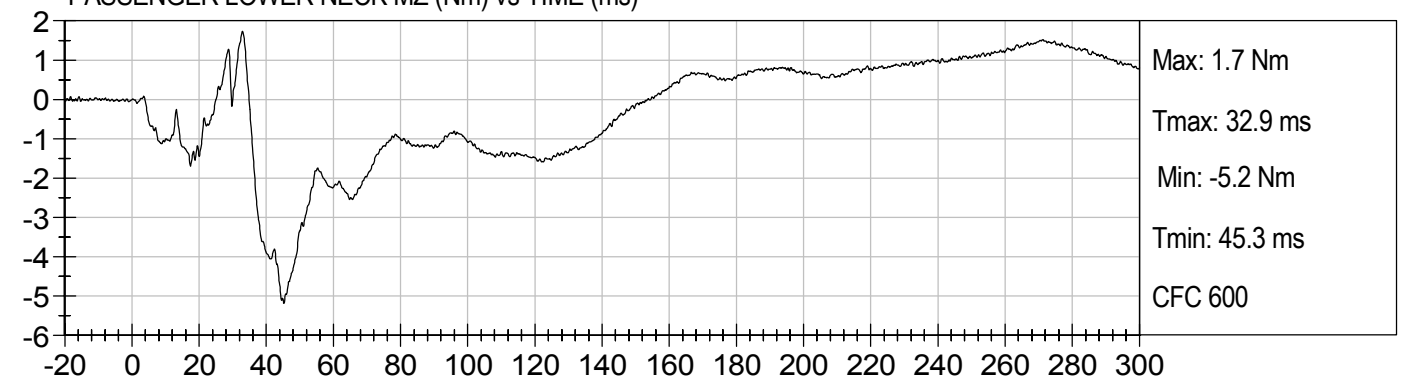
PASSENGER LOWER NECK MX (Nm) vs TIME (ms)



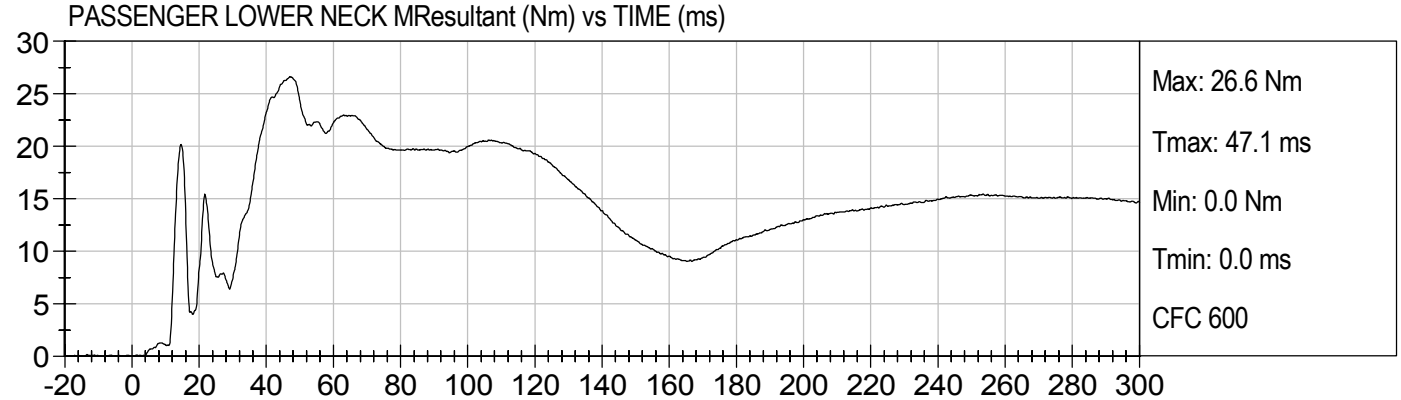
PASSENGER LOWER NECK MY (Nm) vs TIME (ms)



PASSENGER LOWER NECK MZ (Nm) vs TIME (ms)



PASSENGER LOWER NECK MResultant (Nm) vs TIME (ms)



APPENDIX C

INSTRUMENTATION CALIBRATION DATA

SID-IIs Build Level D – Serial Number 032

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X	P47837	Endevco	4/19/2007
Head Y	P47845	Endevco	4/19/2007
Head Z	P47835	Endevco	4/19/2007
Head X Redundant	P47846	Endevco	4/19/2007
Head Y Redundant	P47844	Endevco	4/19/2007
Head Z Redundant	P47838	Endevco	4/19/2007
Upper Neck Load Cell	NG180	FTSS	3/13/2007
Lower Neck Load Cell	LNG101	FTSS	3/19/2007