

REPORT NUMBER: TWG-MGA-2007-011

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

**DAIMLERCHRYSLER CORPORATION
2006 JEEP GRAND CHEROKEE LAREDO
NHTSA NUMBER: M60303TWG2**

**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**

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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 MGA Research Corporation in Burlington, Wisconsin, on May 4, 2007. <table style="margin-left: auto; margin-right: auto; border: none;"> <tr> <td style="text-align: center;">HIC 15</td> <td style="text-align: center;">HIC 36</td> <td style="text-align: center;">NIJ NTF</td> <td style="text-align: center;">NIJ NTE</td> <td style="text-align: center;">NIJ NCF</td> <td style="text-align: center;">NIJ NCE</td> </tr> <tr> <td style="text-align: center;">0.7</td> <td style="text-align: center;">0.9</td> <td style="text-align: center;">0.01</td> <td style="text-align: center;">0.00</td> <td style="text-align: center;">0.08</td> <td style="text-align: center;">0.13</td> </tr> </table>				HIC 15	HIC 36	NIJ NTF	NIJ NTE	NIJ NCF	NIJ NCE	0.7	0.9	0.01	0.00	0.08	0.13
HIC 15	HIC 36	NIJ NTF	NIJ NTE	NIJ NCF	NIJ NCE										
0.7	0.9	0.01	0.00	0.08	0.13										
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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 2006 Jeep Grand Cherokee 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 $\frac{3}{4}$ 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 right 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	5 th 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 of right 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 Side Impact on August 28, 2006.

TEST VEHICLE INFORMATION

Manufacturer	Jeep
Model	Grand Cherokee Laredo
Body Style	MPV
NHTSA No.	M60303TWG2
VIN	1J8GR48K26C130511
Color	Bright Silver Met
Delivery Date	8/16/06
Odometer Reading (mile)	215
Dealer	Walton on Dempster
Transmission	Automatic
Final Drive	4 Wheel
Number of Cylinders	6
Engine Displacement (L)	3.7
Engine Placement	Longitudinal
Automatic Door Lock (ADL)	No
Owners Manual Details Instructions on Disabling ADLs	N/A
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	Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	DaimlerChrysler Corporation
Date of Manufacture	08/05

GVWR (kg)	2677
GAWR Front (kg)	1339
GAWR Rear (kg)	1452

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench		
Number of Occupants	2	3		5
Capacity Wt. (VCW) (kg)				498
Cargo Wt. (RCLW) (kg)				158

DATA SHEET NO. 3
DUMMY POSITIONING IN VEHICLE

Measurement		Value
Seat Position		Full Forward
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)	242
Head CG to Door Panel/Window	HD (mm)	174
Head to Seat Back Centerline	HSC (mm)	128
Chest to Dash	CD (mm)	443
Chest to Seatback	CS (mm)	---
Right Arm to Seat Back Centerline	RACL (mm)	283
Left Arm to Seat Back Centerline	LACL (mm)	78
Right Arm to Door Panel	RA (mm)	---
Left Arm to Door Panel	LA (mm)	---
Knee to Knee	KK (mm)	129
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)	575
Nose to Seatback	NS (mm)	---
Top of Head to Headliner	HH (mm)	72

DATA SHEET NO. 4
DUMMY INJURY CRITERIA VALUES

NHTSA No. M60303TWG2

		MAXIMUM VALUE			
		Position No. 2			
DESCRIPTION	UNIT	MAXIMUM	TIME (ms)	MINIMUM	TIME (ms)
Head X	g	2.4	29.8	-4.6	20.1
Head Y	g	1.9	48.8	-6.0	17.0
Head Z	g	3.7	20.7	-2.4	22.1
Head Resultant	g	6.6	16.2		
Head X Redundant	g	2.5	29.7	-4.5	20.0
Head Y Redundant	g	2.0	48.3	-5.6	16.9
Head Z Redundant	g	4.0	20.6	-2.3	22.0
Head Resultant Redundant	g	6.8	16.1		
Upper Neck Fx	N	61.8	34.9	-23.3	117.3
Upper Neck Fy	N	107.5	43.4	-43.7	1.6
Upper Neck Fz	N	9.0	0.0	-438.2	23.0
Upper Neck F Resultant	N	447.8	23.0		
Upper Neck Mx	N-m	2.3	244.7	-6.0	27.1
Upper Neck My	N-m	5.4	77.2	-1.5	236.1
Upper Neck Mz	N-m	4.7	131.4	-1.1	221.7
Upper Neck M Resultant	N-m	6.2	27.1		
Lower Neck Fx	N	48.1	55.4	-39.0	124.4
Lower Neck Fy	N	117.1	68.7	-26.4	18.4
Lower Neck Fz	N	15.0	0.6	-381.3	22.8
Lower Neck F Resultant	N	383.5	22.8		
Lower Neck Mx	N-m	16.0	46.2	-4.3	115.7
Lower Neck My	N-m	17.9	22.7	-1.4	30.2
Lower Neck Mz	N-m	7.7	68.7	-1.7	16.2
Lower Neck M Resultant	N-m	19.1	22.9		

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

NHTSA No. M60303TWG2

ATD position	HEAD INJURY CRITERIA (HIC)					
	HIC15			HIC36		
	HIC	T ¹ (msec)	T ² (msec)	HIC	T ¹ (msec)	T ² (msec)
No. 2 Right Front	0.7	15.0	30.0	0.9	13.8	35.5

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	0.01	130.90	0.23	-16.82	0.78
Nte	0.00	154.10	1.74	-6.34	-0.20
Ncf	0.08	53.40	-232.39	42.71	3.02
Nce	0.13	22.90	-435.05	53.33	-1.05
Peak Tension (CFC1000)	9.0 N		Peak Compression (CFC 1000)		-438.2 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

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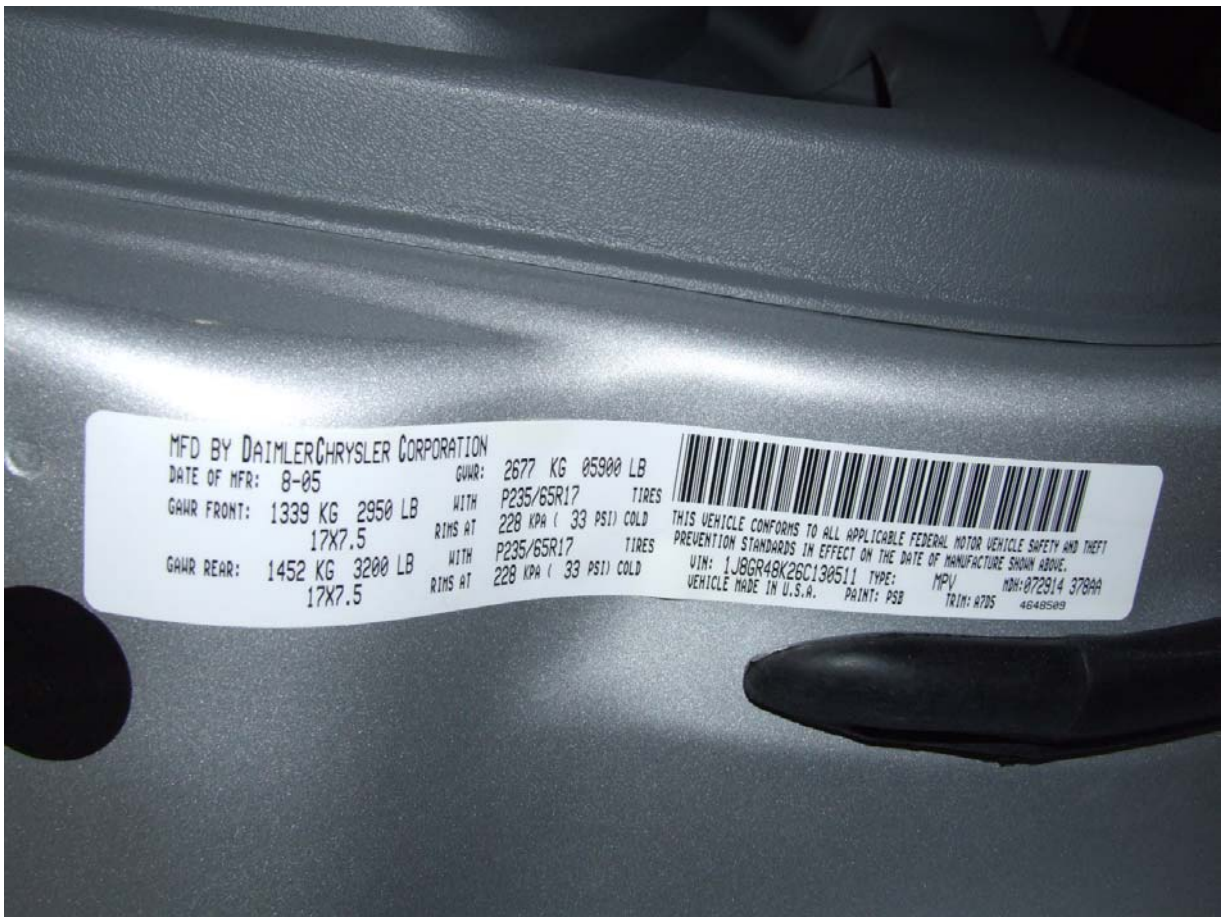
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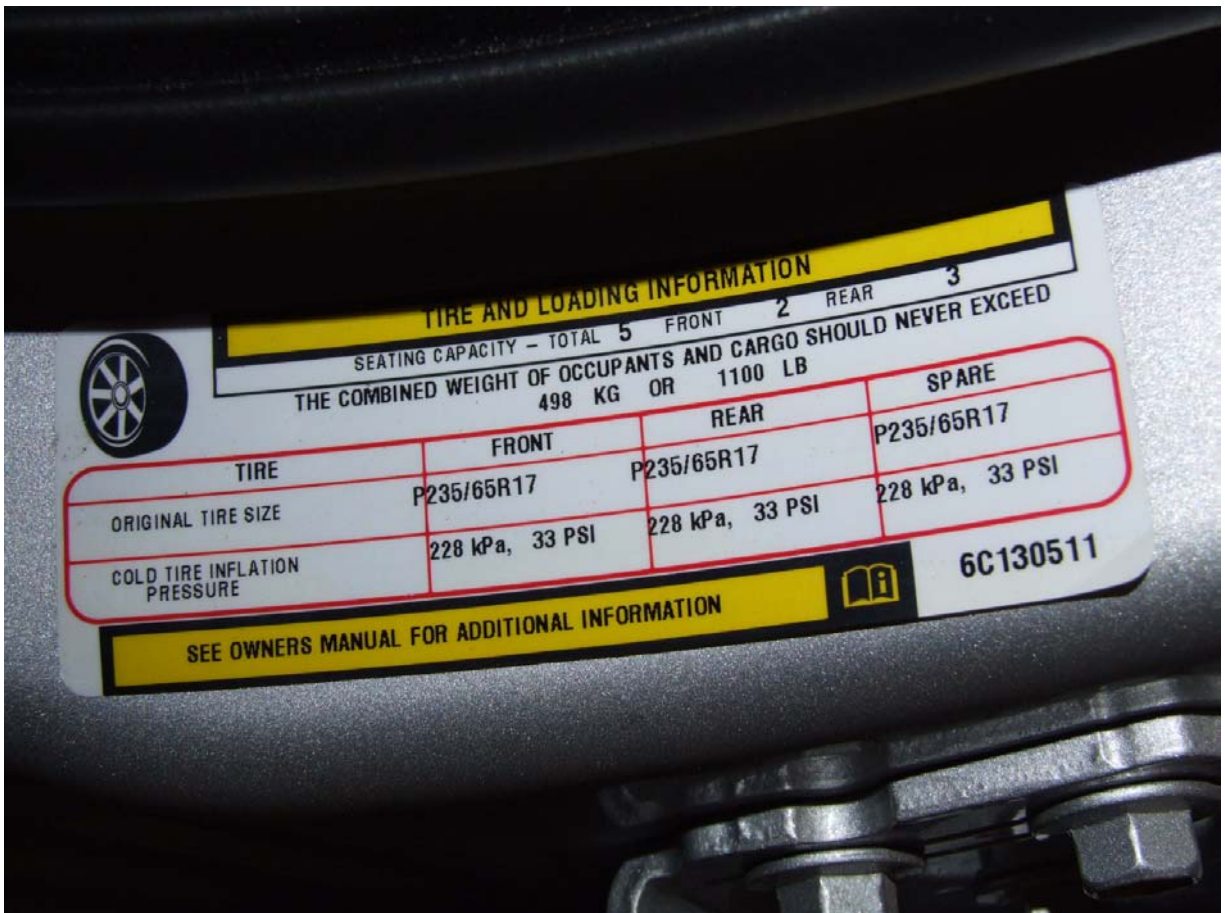
Pre-Test Vehicle Left Front $\frac{3}{4}$ View



Post-Test Vehicle Left Front $\frac{3}{4}$ 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 Side Closeup View



Post-Test SID-IIs Dummy Left Side Closeup View



Pre-Test SID-IIs Dummy Left Side $\frac{3}{4}$ View



Post-Test SID-IIs Dummy Left Side $\frac{3}{4}$ View



Pre-Test SID-IIs Dummy Front Head View



Post-Test SID-IIs Dummy Front Head View



Pre-Test SID-II's Dummy Left Side $\frac{3}{4}$ Closeup View



Post-Test SID-II's Dummy Left Side $\frac{3}{4}$ Closeup View



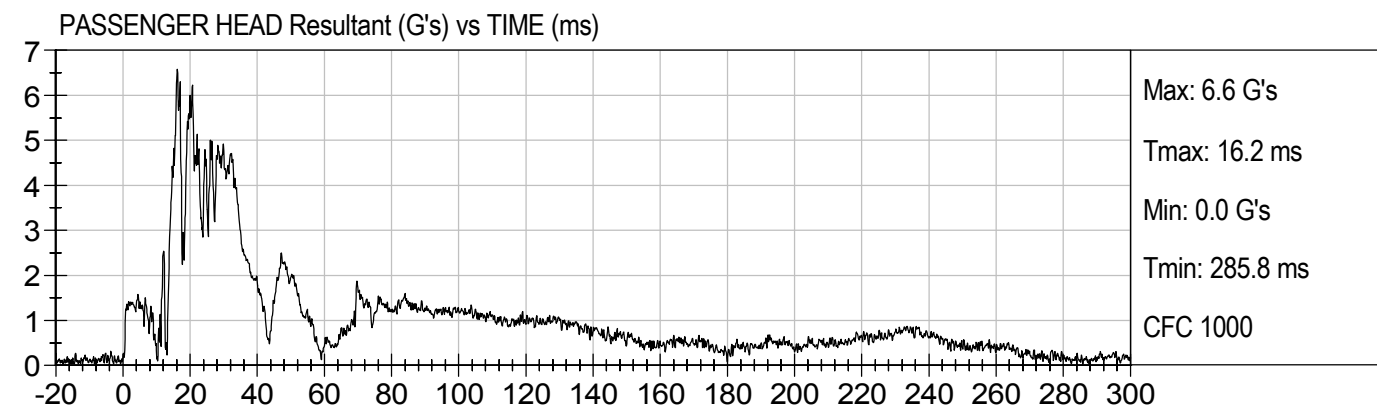
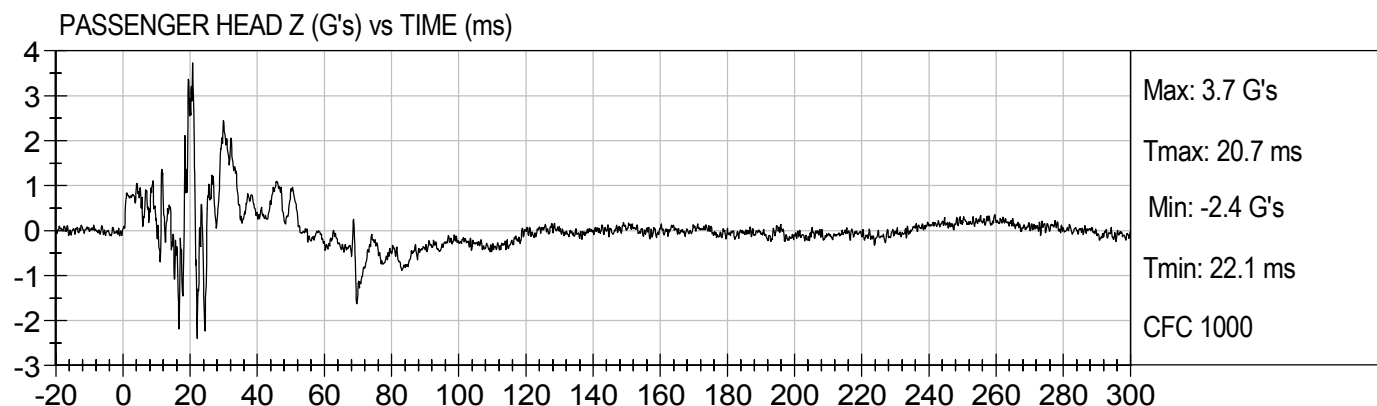
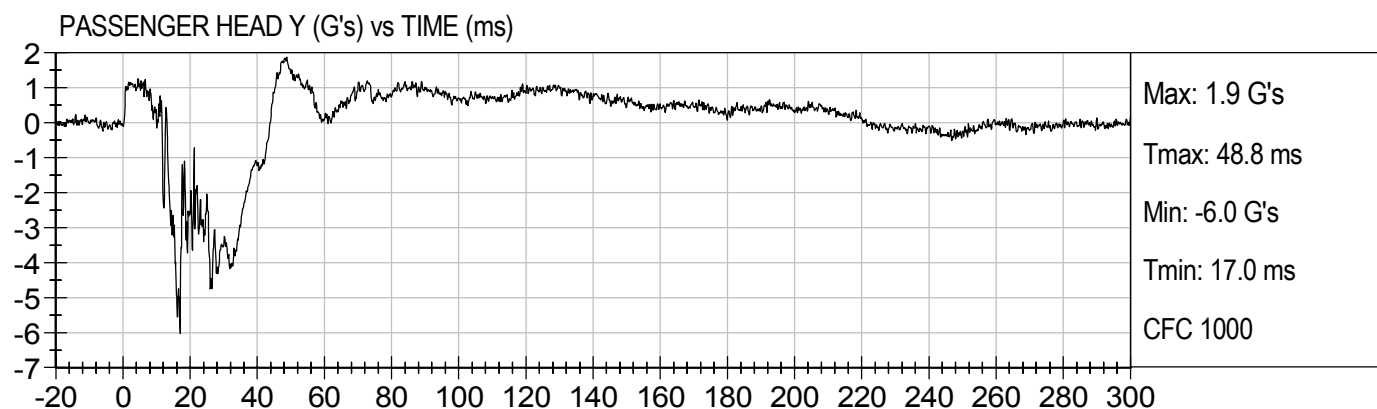
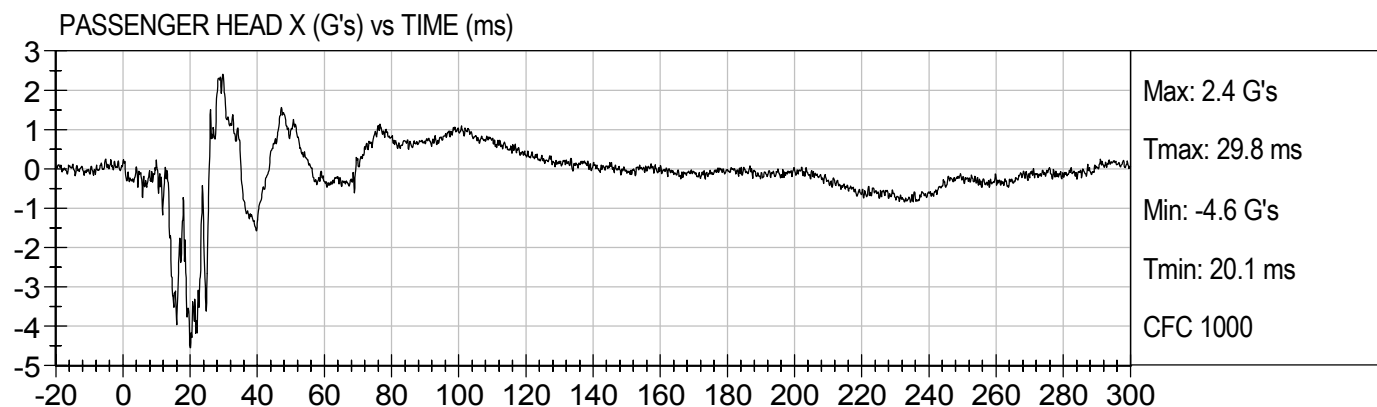
Seat Position View

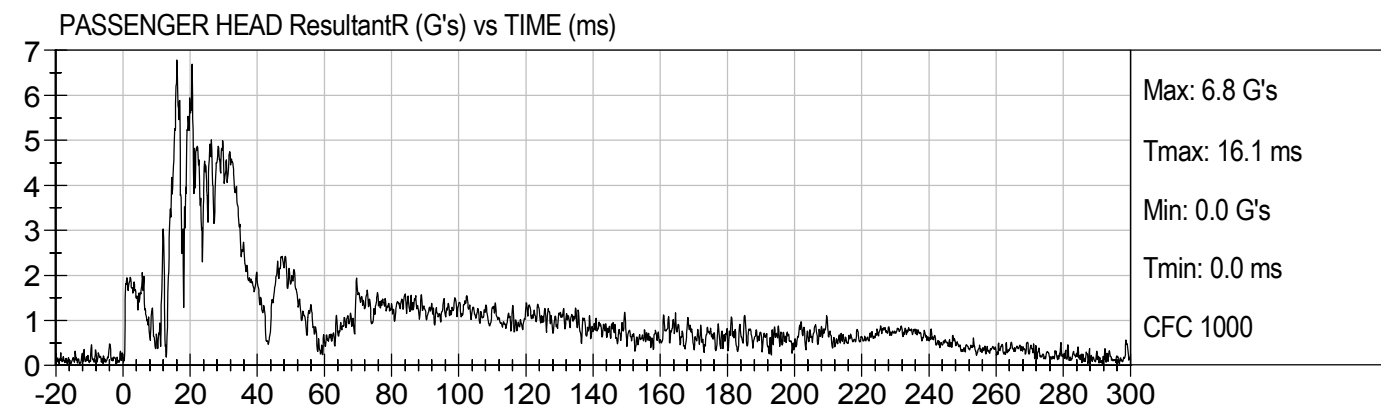
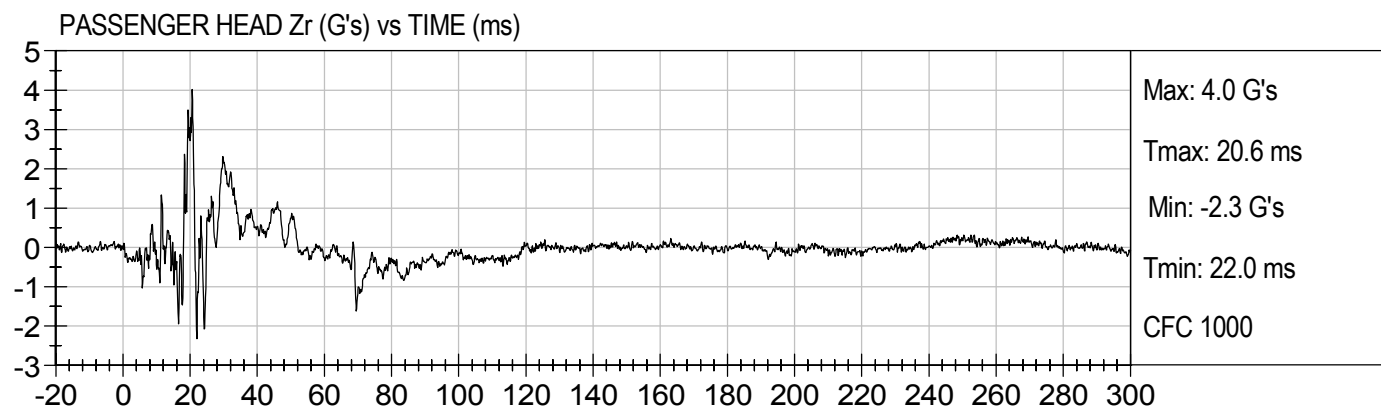
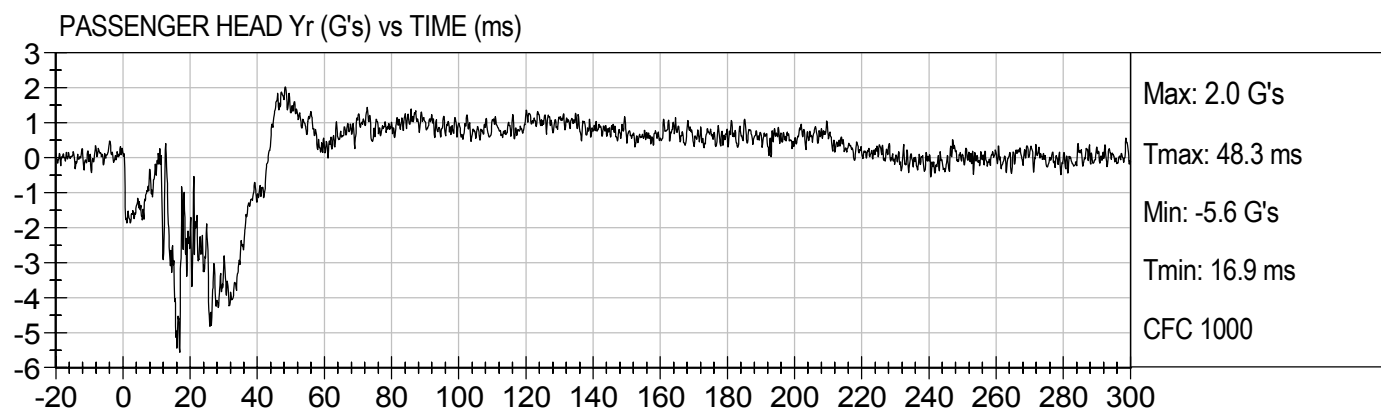
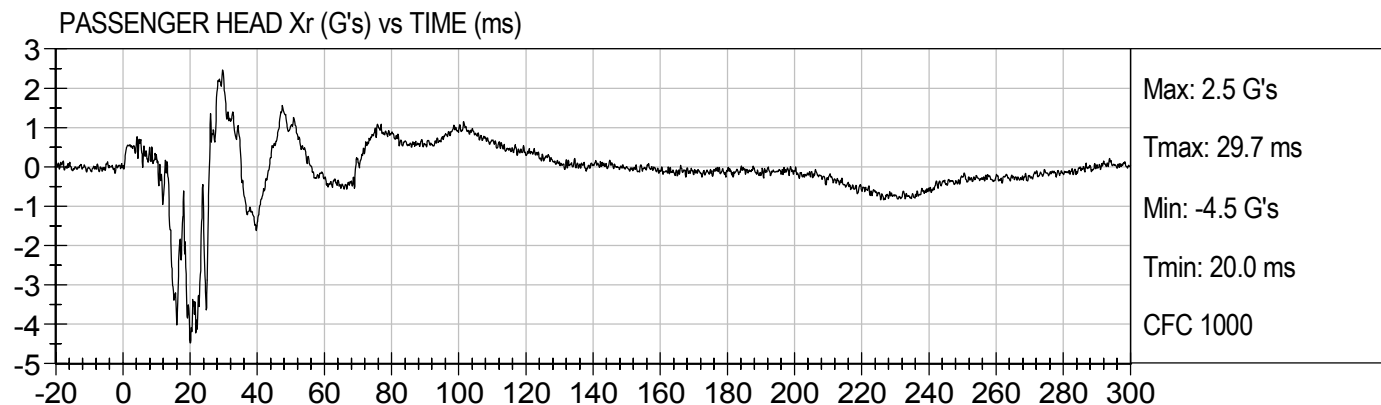
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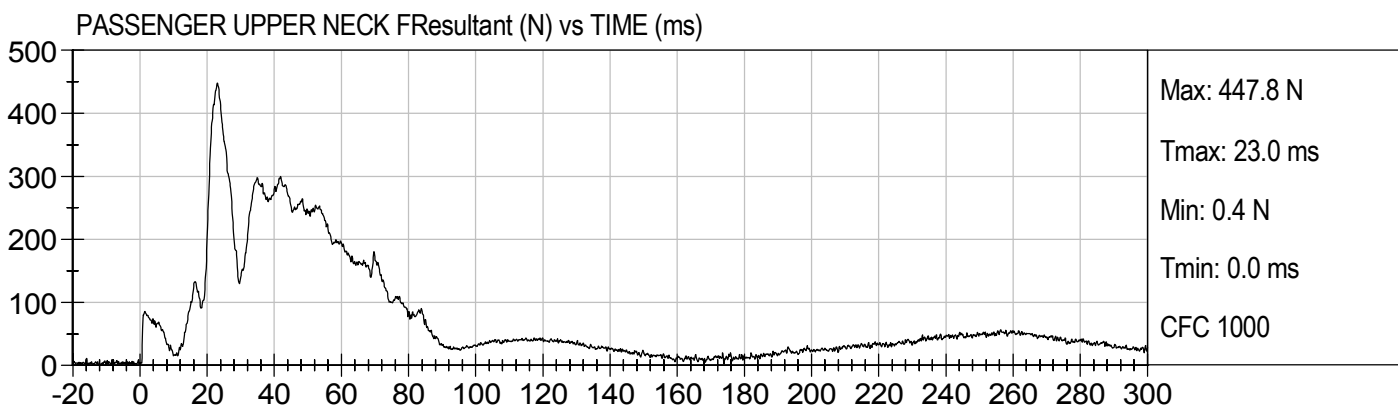
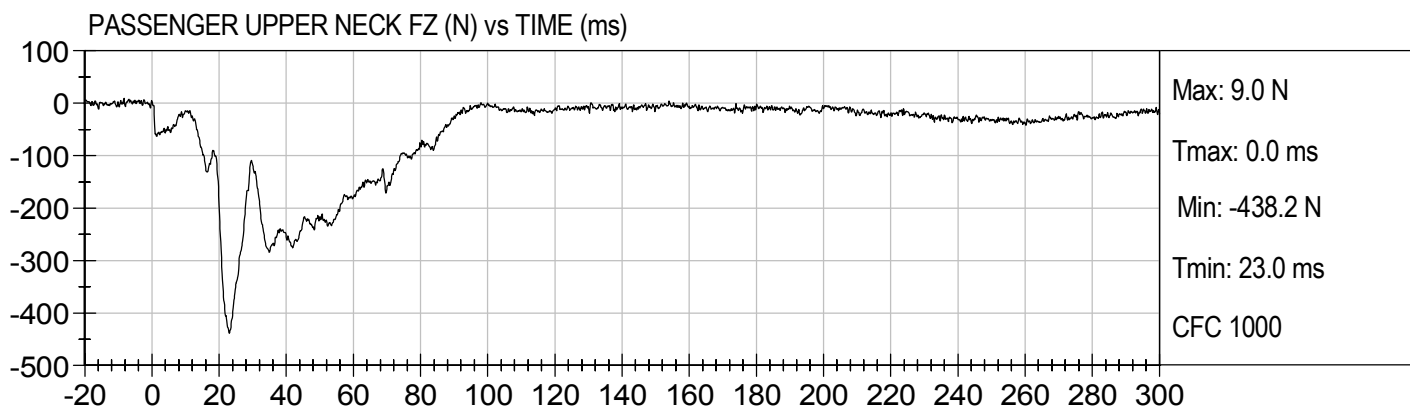
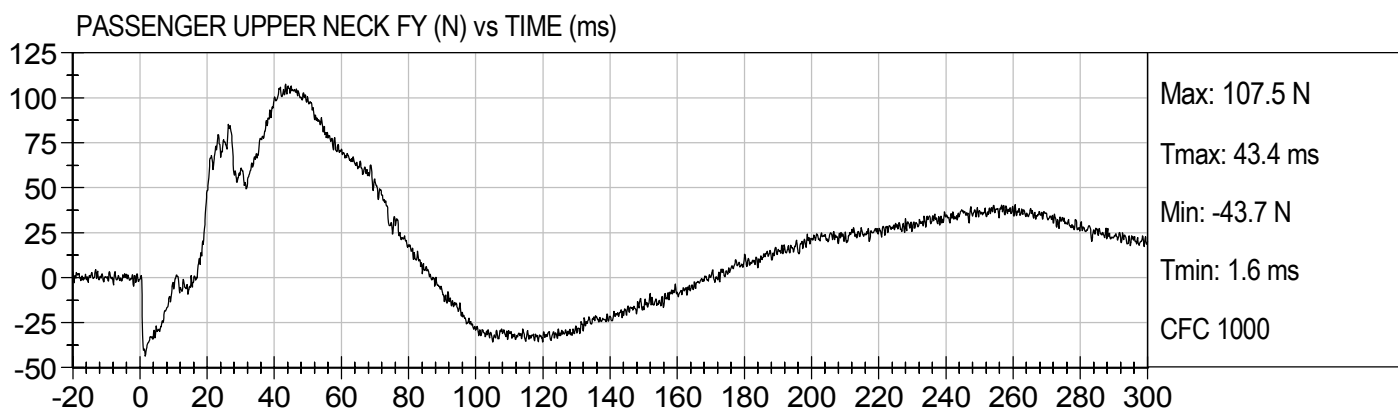
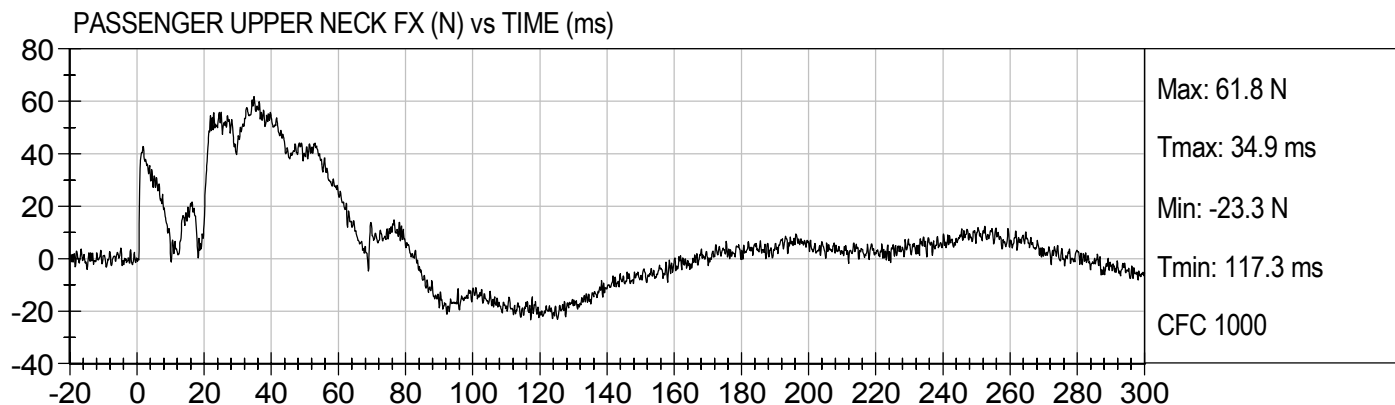
DUMMY RESPONSE DATA TRACES

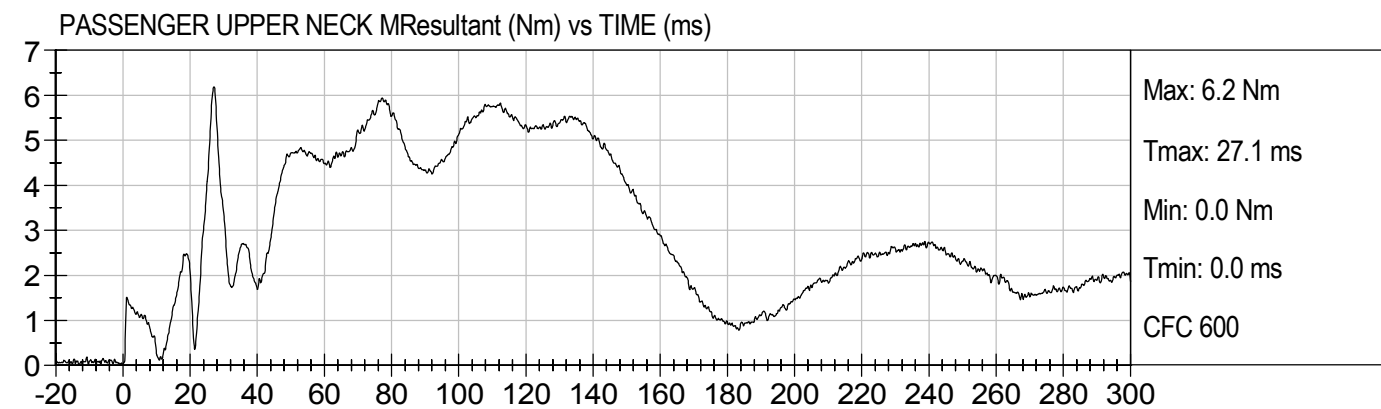
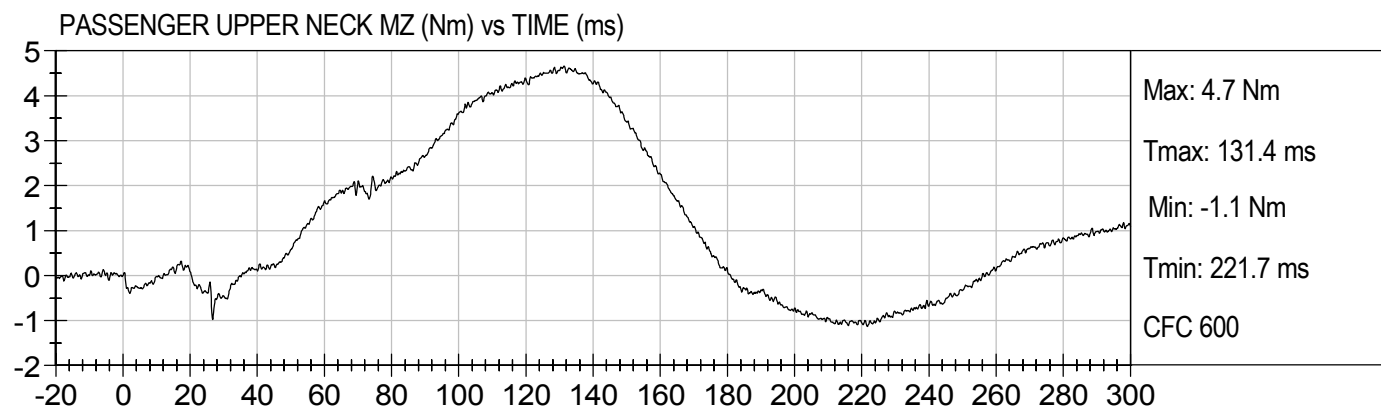
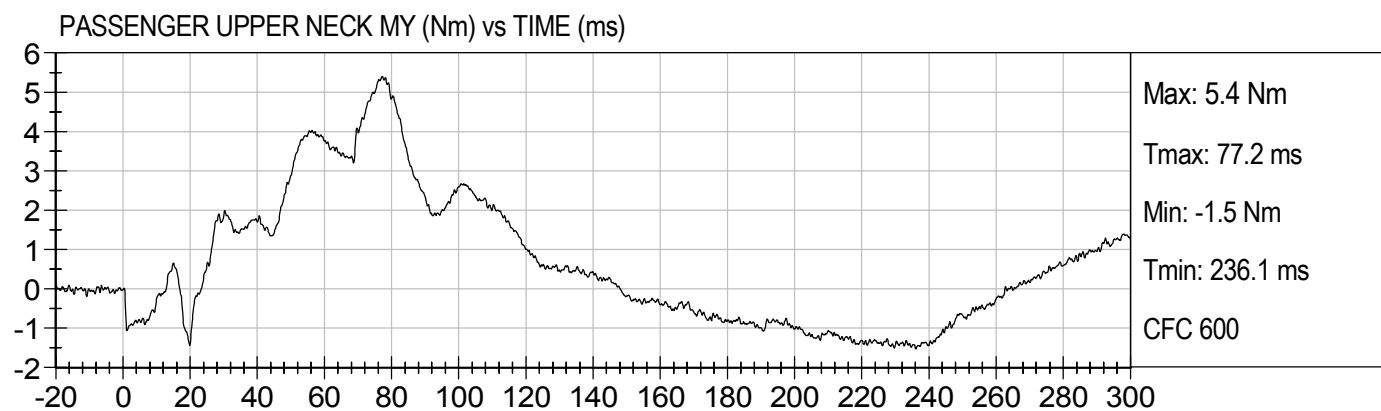
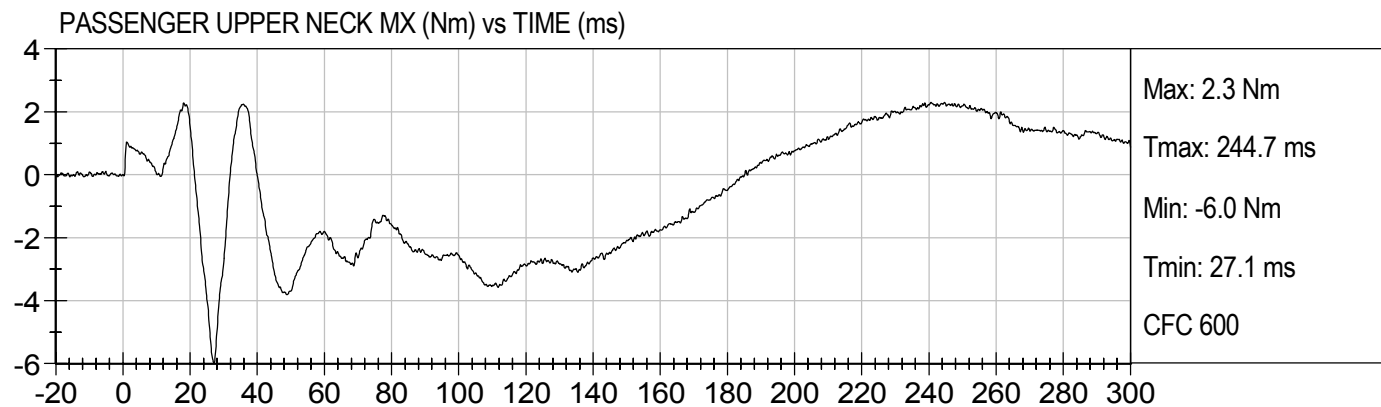
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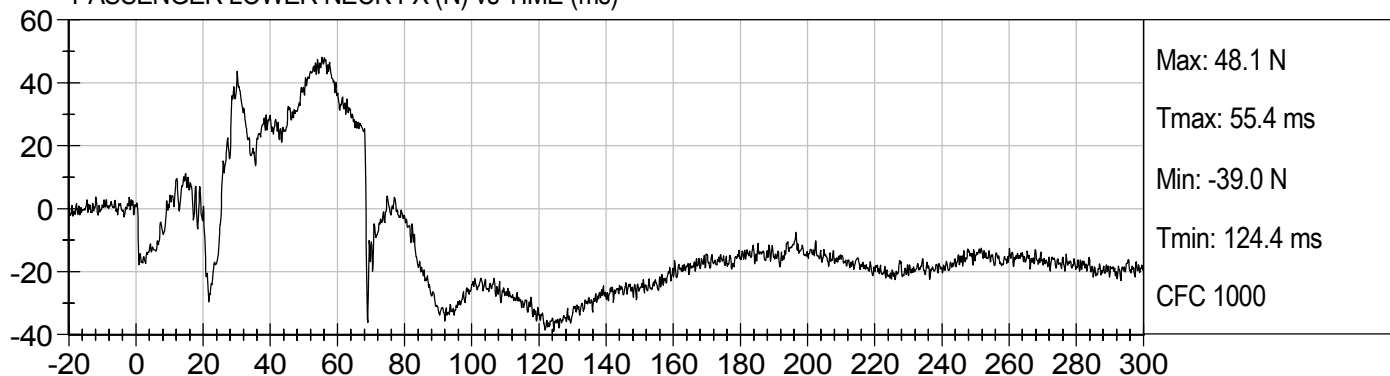




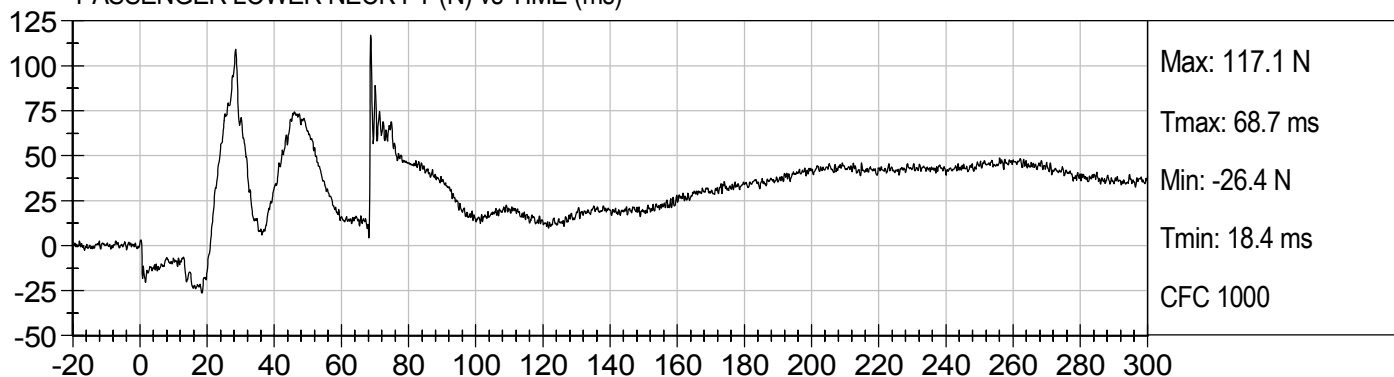




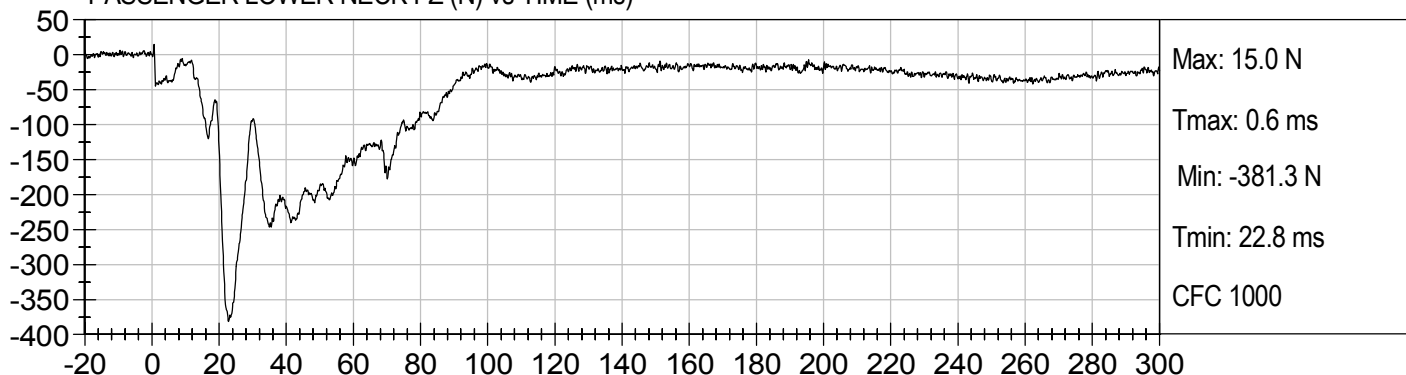
PASSENGER LOWER NECK FX (N) vs TIME (ms)



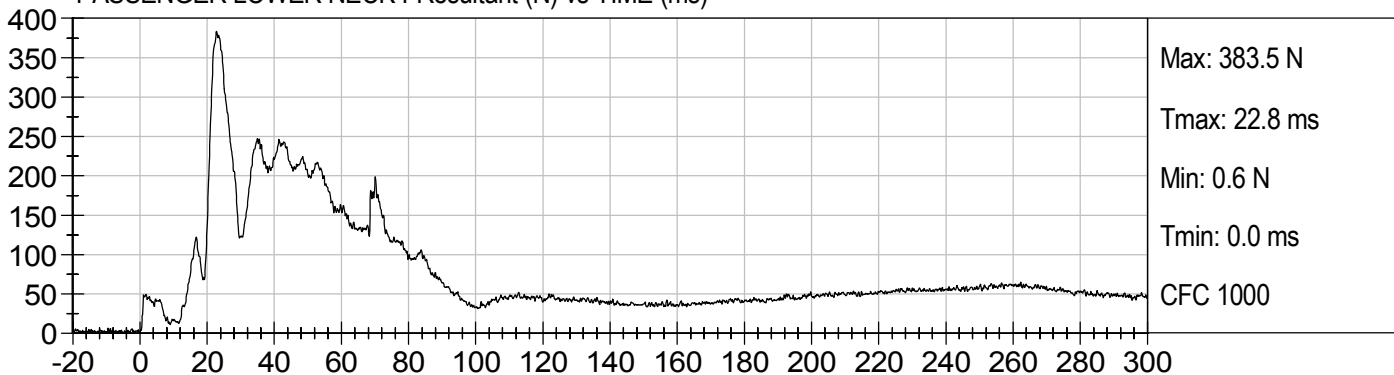
PASSENGER LOWER NECK FY (N) vs TIME (ms)



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

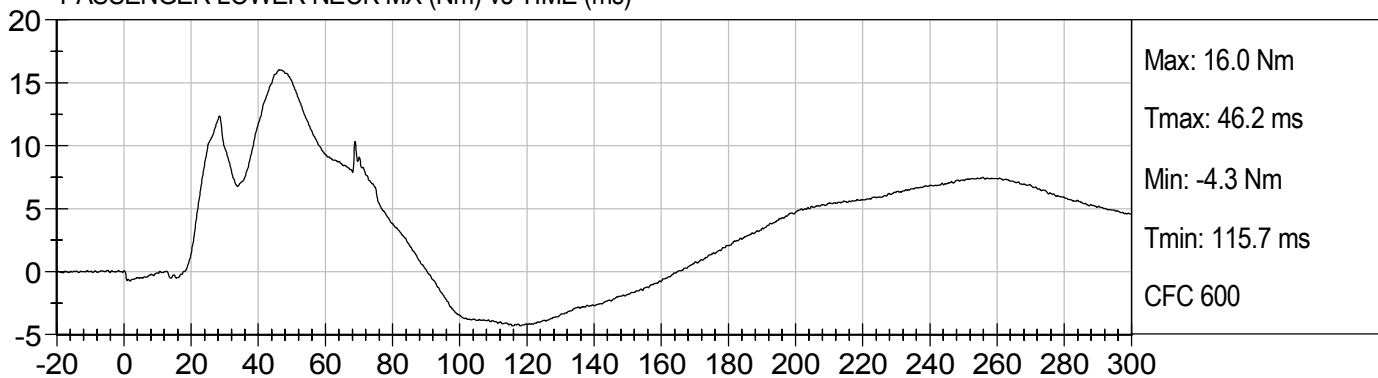


PASSENGER LOWER NECK FResultant (N) vs TIME (ms)

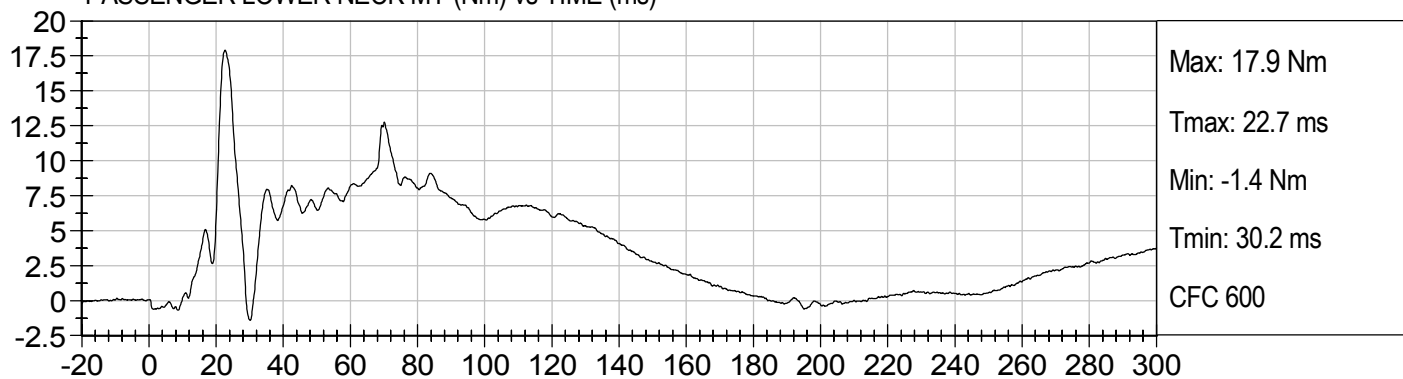




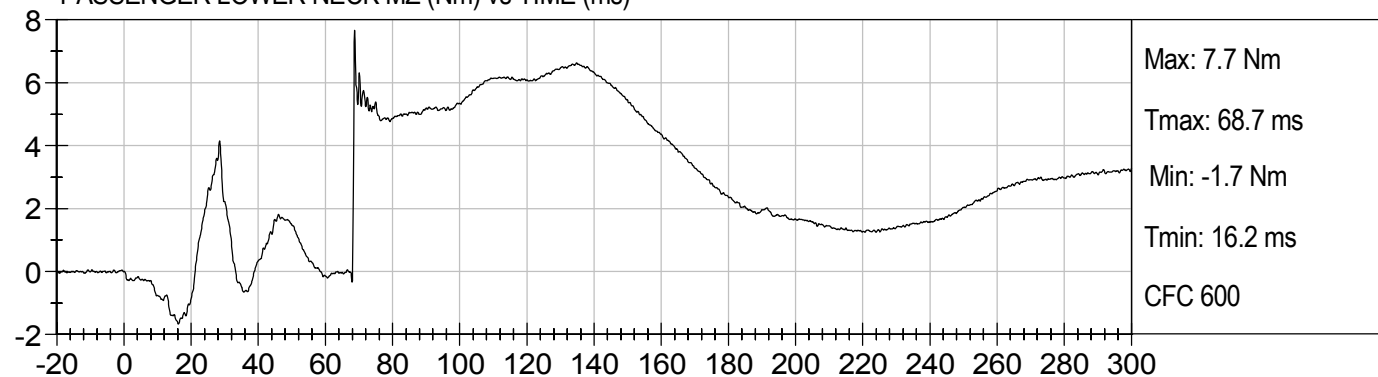
PASSENGER LOWER NECK MX (Nm) vs TIME (ms)



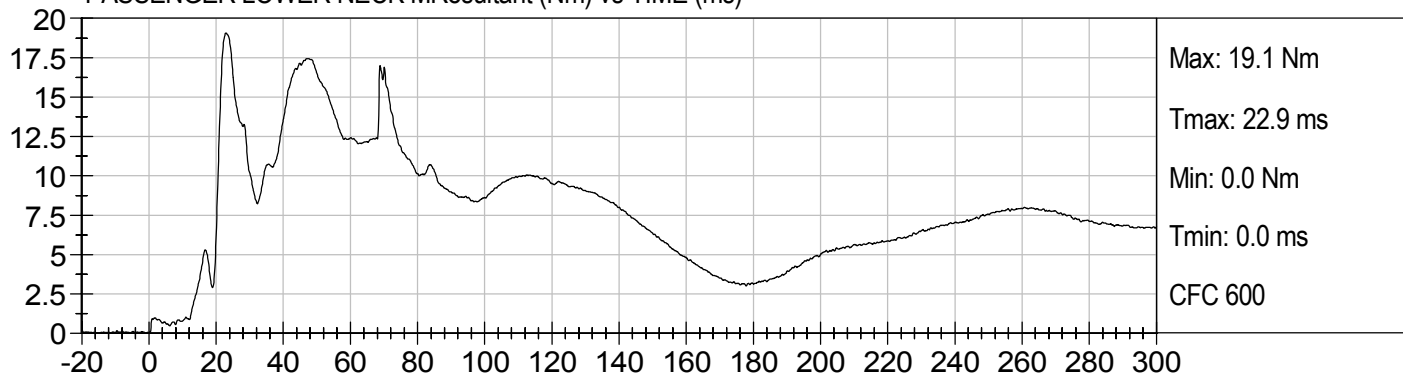
PASSENGER LOWER NECK MY (Nm) vs TIME (ms)



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