



REPORT NUMBER: TWG-MGA-2011-010

**SIDE AIRBAG OUT-OF-POSITION INJURY
TECHNICAL WORKING GROUP**

**NISSAN MOTOR COMPANY, LTD.
2011 INFINITI M37X
NHTSA NUMBER: MB5205TWG2**

TEST DATE: MAY 12, 2011

FINAL REPORT DATE: SEPTEMBER 16, 2011

FINAL REPORT

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Date: 9/16/2011

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Secretary: Donna Janovicz

FINAL REPORT ACCEPTANCE BY:

Date: _____

The results presented in this report relate only to the specified test items.

TABLE OF CONTENTS

<u>Section</u>		<u>Page No.</u>
1	Purpose and Summary of Test	1
2	Occupant and Vehicle Information / Data Sheets	3
 <u>Data Sheet No.</u>		
1	Test Summary	3
2	Test Vehicle Information	4
3	Dummy Positioning in Vehicle	5
4	Dummy Injury Criteria Values	6
 <u>Section</u>		
3	Photographs	8
4	Dummy Response Data Traces	20

SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

The purpose of this test was to obtain data in a static out-of-position side air bag deployment. These data constitute part of the general consumer information collected by Alpha Technology Associate, Inc.

SUMMARY

The effects of a torso airbag deployment in a 2011 Infiniti M37X with an out-of-position Hybrid III 3-Year-Old child dummy were evaluated. The seat airbag was fired remotely. The test was performed by MGA Research Corporation on May 12, 2011. Pre and post test photographs of the vehicle and dummy can be found in Appendix A.

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 Hybrid III 3-Year-Old child dummy (Serial Number 082) was placed in the right front passenger seat lying on the seat per Section 3.3.3.3 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
- Upper Spine Acceleration
- Mid Spine Acceleration
- Lower Spine Acceleration
- Upper Sternum Acceleration
- Lower Sternum Acceleration
- Lower Rib @ Spine Acceleration

The 27 channels of data were recorded on an on-board data acquisition system. Appendix B contains the dummy data traces.

The Hybrid III 3-Year-Old child dummy's visible contact points were as follows:

- Torso/Pelvis airbag to left side of head

The Hybrid III 3-Year-Old child dummy was placed in the right front passenger seat lying on its back with its arms at its sides so that its rearmost arm contacts the seatback. While bending the dummy at the waist, the dummy was slid outboard until the CG of the head was aligned with the vertical centerline of the airbag module and the head touching the armrest. A wedge-shaped foam block was used to support the dummy's back so that the head remained in a neutral position and does not exert a significant downward force on the armrest. The dummy's arm closest to the front edge of the seat was adjusted so that it was parallel to the torso and was rested on the foam block with the fingertips just touching the seat cushion. The rearmost upper arm was adjusted to an orientation 45 degrees to the upper arm.

The dummy's skullcap seam was taped with 4mm electrical tape to prevent the airbag from getting caught in the seam. The dummy's headskin was cleaned with alcohol and dusted with baby powder to achieve acceptable frictional characteristics.

This orientation complies with Section 3.3.3.3 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	3.3.3.3*	Lying child dummy
Torso Airbag	Seat Mounted	Side Airbag
ATD Type/Serial No.	Hybrid III 3 Year Old / 082	Child Dummy

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

Number of Data Channels	27
Number of Airbag Channels	2
Number of High-Speed Video	3

Visible Dummy Contact Points	
Head Contact	Torso/Pelvis bag to left side of 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 August 13, 2010.

TEST VEHICLE INFORMATION

Manufacturer	Infiniti
Model	M37
Body Style	Sedan
NHTSA No.	MB5205TWG2
VIN	JN1BY1AR4BM371469
Color	Platinum Graphite
Delivery Date	7/19/2010
Odometer Reading (mile)	71
Dealer	Field Infiniti
Transmission	Automatic
Final Drive	AWD
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

Driver 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	No
All Wheel Drive	Yes
Power Seats	Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Nissan Motor Company, Ltd.
Date of Manufacture	03/10

GVWR (kg)	2330
GAWR Front (kg)	1172
GAWR Rear (kg)	1191

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench		
Number of Occupants	2	3		5
Capacity Wt. (VCW) (kg)				390
Cargo Wt. (RCLW) (kg)				50

DATA SHEET NO. 3
DUMMY POSITIONING IN VEHICLE

Measurement		Value
Seat Position		Rearmost
Seat Height Position		Lowest
Placed in Position No. 2		---
Seat Back Angle (at headrest post)	SA (°)	1.8
Top of Curtain Airbag Module to Head/Neck Junction	AN (mm)	594
Top of Seat Airbag Module to Head/Neck Junction	AN (mm)	171
Head CG to Door Panel/Window	HD (mm)	112
Head to Seat Back Centerline	HSC (mm)	260
Chest to Dash	CD (mm)	628
Chest to Seatback	CS (mm)	176
Right Arm to Seat Back Centerline	RACL (mm)	N/A
Left Arm to Seat Back Centerline	LACL (mm)	N/A
Right Arm to Door Panel	RA (mm)	N/A
Left Arm to B-Post	LA (mm)	N/A
Knee to Knee	KK (mm)	68
Toe to Toe	TT (mm)	21
Right Knee to Seat Cushion Centerline	KSCR (mm)	218
Left Knee to Seat Cushion Centerline	KSCL (mm)	207
Right Toe to Seat Cushion Centerline	TSCR (mm)	493
Left Toe to Seat Cushion Centerline	TSCL (mm)	455
Nose to Dash	ND (mm)	615
Nose to Seatback	NS (mm)	233
Top of Head to Headliner	HH (mm)	484

DATA SHEET NO. 4
DUMMY INJURY CRITERIA VALUES

NHTSA No. MB5205TWG2

DESCRIPTION	UNIT	MAXIMUM VALUE			
		Position No. 2			
		MAXIMUM	TIME (ms)	MINIMUM	TIME (ms)
Head X	g	21.9	7.1	-33.4	6.1
Head Y	g	71.5	6.0	-3.2	36.4
Head Z	g	18.1	5.8	-8.0	8.8
Head Resultant	g	79.1	6.0		
Upper Neck Fx	N	290.1	13.2	-24.4	5.6
Upper Neck Fy	N	340.1	7.0	-275.4	15.3
Upper Neck Fz	N	285.2	9.8	-545.3	6.7
Upper Neck F Resultant	N	554.7	6.8		
Upper Neck Mx	Nm	15.9	13.7	-8.6	31.0
Upper Neck My	Nm	11.2	12.7	-6.5	39.2
Upper Neck Mz	Nm	9.2	21.1	-0.7	93.3
Upper Neck M Resultant	Nm	20.2	13.9		
Lower Neck Fx	N	226.4	13.7	-18.3	7.3
Lower Neck Fy	N	151.5	5.8	-344.5	14.5
Lower Neck Fz	N	377.0	9.5	-272.2	6.9
Lower Neck F Resultant	N	469.5	9.9		
Lower Neck Mx	Nm	6.5	5.8	-28.2	24.4
Lower Neck My	Nm	0.2	134.4	-13.9	14.7
Lower Neck Mz	Nm	10.7	16.4	-0.3	87.5
Lower Neck M Resultant	Nm	30.0	24.4		
Upper Spine X	G	21.1	7.3	-3.8	46.2
Upper Spine Y	G	19.3	6.7	-5.4	9.6
Upper Spine Z	G	8.2	11.4	-4.7	9.2
Upper Spine Resultant	G	25.3	7.0		
Mid Spine X	G	13.8	7.5	-1.8	45.5
Mid Spine Y	G	20.6	6.9	-2.0	55.5
Mid Spine Z	G	11.9	11.3	-1.8	52.8
Mid Spine Resultant	G	25.4	7.0		
Lower Spine X	G	14.6	10.1	-1.6	26.6
Lower Spine Y	G	8.5	7.5	-2.4	56.0
Lower Spine Z	G	8.7	11.4	-3.4	18.0
Lower Spine Resultant	G	16.8	7.6		
Upper Sternum X	G	33.2	8.5	-14.8	19.2
Lower Sternum X	G	18.4	9.2	-30.6	8.6
Lower Rib @ Spine X	G	14.1	7.9	-6.7	6.9

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

NHTSA No. MB5205TWG2

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	48.6	5.3	19.9	48.6	5.3	19.9

Position 2 Neck Injury Summary (3-Year-Old – Out-Of-Position)

	Nij	Time (msec)	Z Force (N) (CFC 600)	X Force (N) (CFC 600)	Y Moment (N-m) (CFC 600)
Ntf	0.28	9.8	279.32	255.65	9.87
Nte	0.24	38.3	11.19	8.67	-6.44
Ncf	0.29	6.9	-458.65	140.47	4.73
Nce	0.23	50.2	-20.54	19.01	-5.93
Peak Tension (CFC1000)		285.2 N	Peak Compression (CFC 1000)		-545.3 N

Critical Values

Nij Intercepts				Peak Limits	
Tension (CVt)	2120 N	Extension (mCVe)	27 N-m	Tension	1130 N
Compression (CVc)	2120 N	Flexion (mCVf)	68 N-m	Compression	1380 N

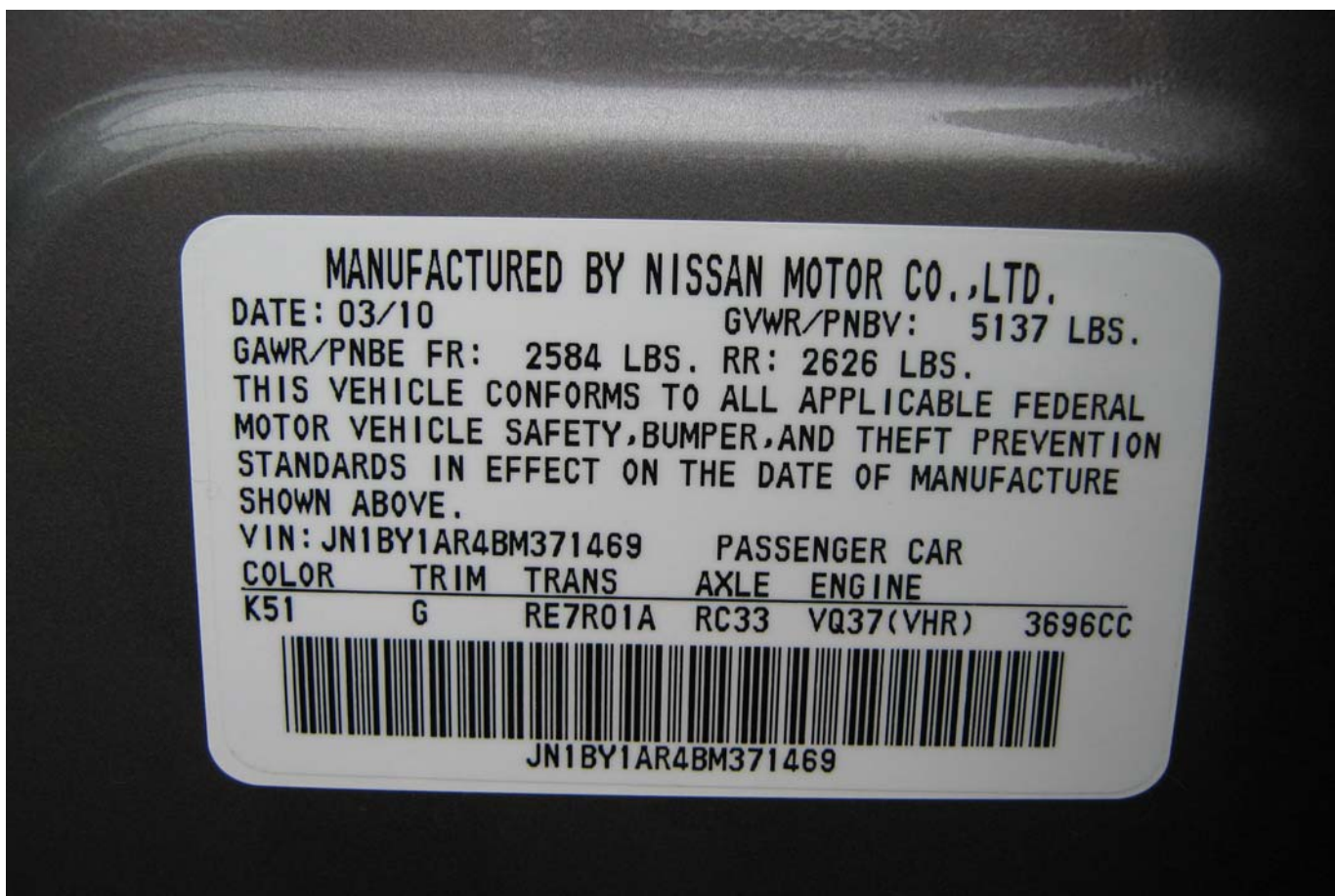
APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

	<u>Page No.</u>
Photo No. 1. Right ¾ Front View of Vehicle, As Received	9
Photo No. 2. Vehicle Certification Placard	9
Photo No. 3. Pre-Test Vehicle Left Side View	10
Photo No. 4. Post-Test Vehicle Left Side View	10
Photo No. 5. Pre-Test 3-Year-Old Child Dummy Left Side View	11
Photo No. 6. Post-Test 3-Year-Old Child Dummy Left Side View	11
Photo No. 7. Pre-Test 3-Year-Old Child Dummy Left Side Closeup View	12
Photo No. 8. Post-Test 3-Year-Old Child Dummy Left Side Closeup View	12
Photo No. 9. Pre-Test 3-Year-Old Child Dummy Left ¾ Front View	13
Photo No. 10. Post-Test 3-Year-Old Child Dummy Left ¾ Front View	13
Photo No. 11. Pre-Test 3-Year-Old Child Dummy Left ¾ Front Closeup View	14
Photo No. 12. Post-Test 3-Year-Old Child Dummy Left ¾ Front Closeup View	14
Photo No. 13. Pre-Test 3-Year-Old Child Dummy Front View	15
Photo No. 14. Post-Test 3-Year-Old Child Dummy Front View	15
Photo No. 15. Pre-Test 3-Year-Old Child Dummy Front Closeup View	16
Photo No. 16. Post-Test 3-Year-Old Child Dummy Front Closeup View	16
Photo No. 17. Pre-Test 3-Year-Old Child Dummy Right ¾ Front View	17
Photo No. 18. Post-Test 3-Year-Old Child Dummy Right ¾ Front View	17
Photo No. 19. Pre-Test 3-Year-Old Child Dummy Right Side View	18
Photo No. 20. Post-Test 3-Year-Old Child Dummy Right Side View	18
Photo No. 21. Pre-Test 3-Year-Old Child Dummy Right ¾ Rear View	19
Photo No. 22. Post-Test Curtain and Torso Airbag Left Side View	19
Photo No. 23. Post-Test Curtain and Torso Airbag Left ¾ Front View	20
Photo No. 24. Post-Test Curtain and Torso Airbag Front View	20



Right ¾ Front View of Vehicle, As Received



Vehicle Certification Placard



Pre-Test Vehicle Left Side View



Post-Test Vehicle Left Side View



Pre-Test 3-Year-Old Child Dummy Left Side View



Post-Test 3-Year-Old Child Dummy Left Side View



Pre-Test 3-Year-Old Child Dummy Left Side Closeup View



Post-Test 3-Year-Old Child Dummy Left Side Closeup View



Pre-Test 3-Year-Old Child Dummy Left 3/4 Front View



Post-Test 3-Year-Old Child Dummy Left 3/4 Front View



Pre-Test 3-Year-Old Child Dummy Left $\frac{3}{4}$ Front Closeup View



Post-Test 3-Year-Old Child Dummy Left $\frac{3}{4}$ Front Closeup View



Pre-Test 3-Year-Old Child Dummy Front View



Post-Test 3-Year-Old Child Dummy Front View



Pre-Test 3-Year-Old Child Dummy Front Closeup View



Post-Test 3-Year-Old Child Dummy Front Closeup View



Pre-Test 3-Year-Old Child Dummy Right ¾ Front View



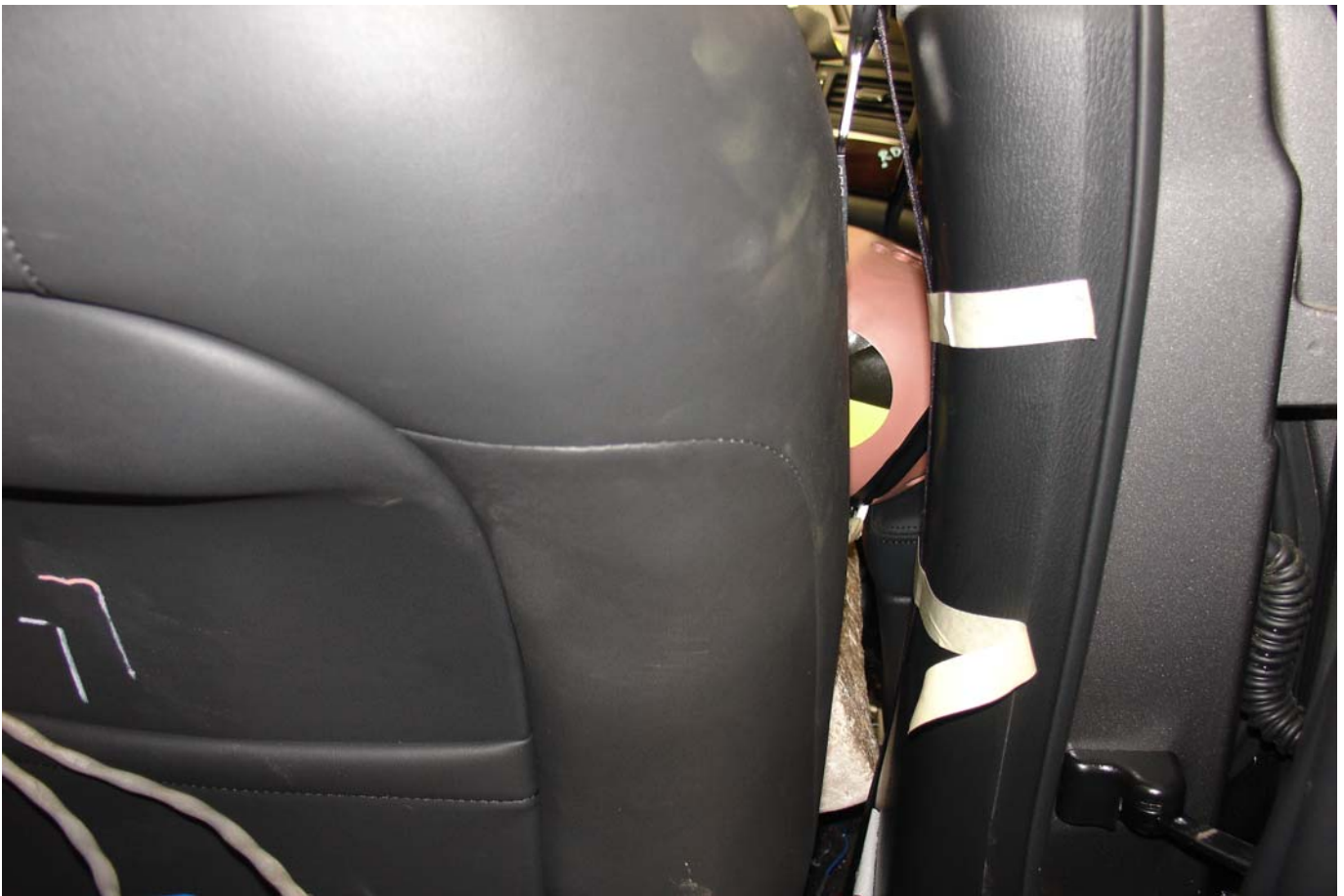
Post-Test 3-Year-Old Child Dummy Right ¾ Front View



Pre-Test 3-Year-Old Child Dummy Right Side View



Post-Test 3-Year-Old Child Dummy Right Side View



Pre-Test 3-Year-Old Child Dummy Right $\frac{3}{4}$ Rear View



Post-Test Curtain and Torso Airbag Left Side View



Post-Test Curtain and Torso Airbag Left 3/4 Front View



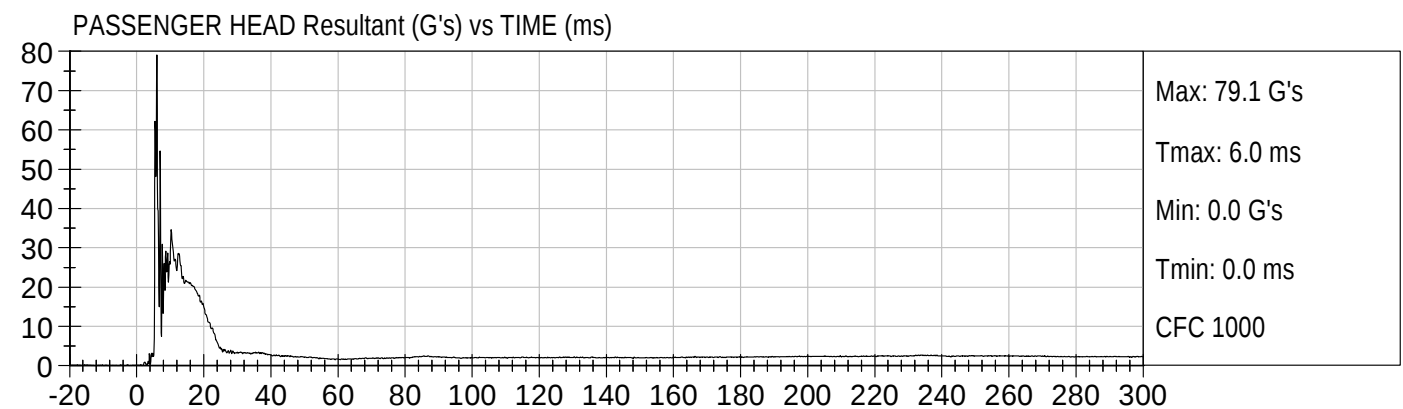
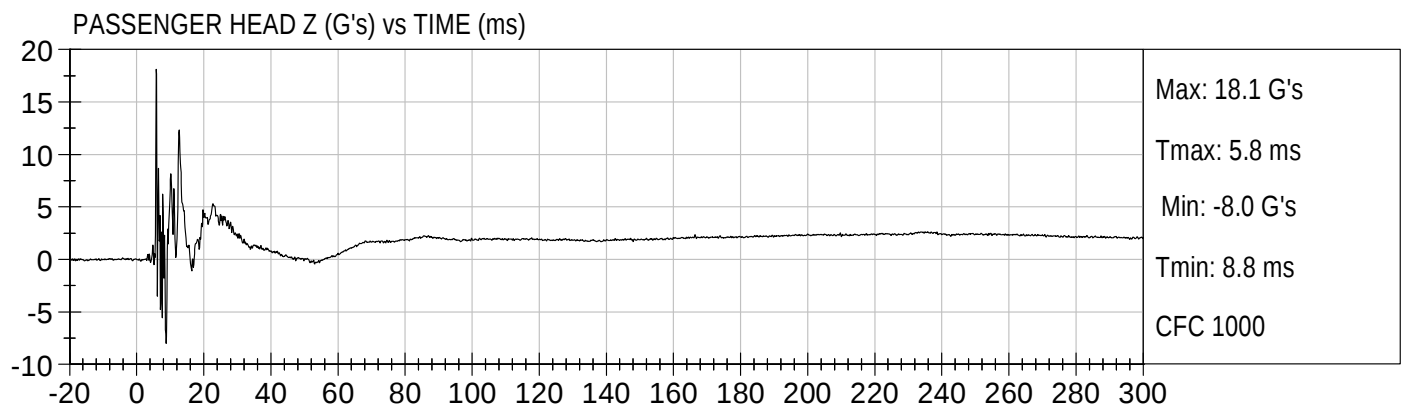
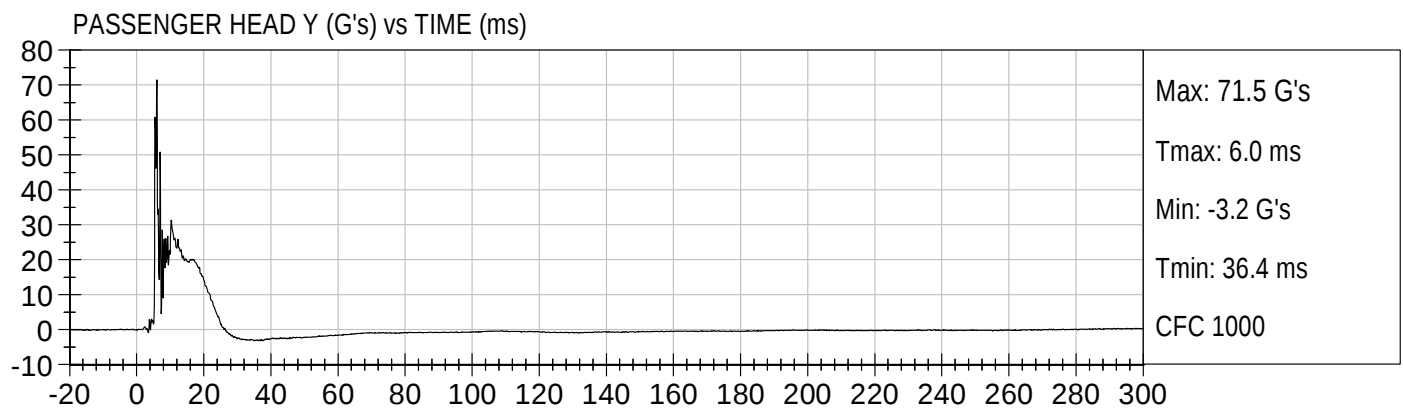
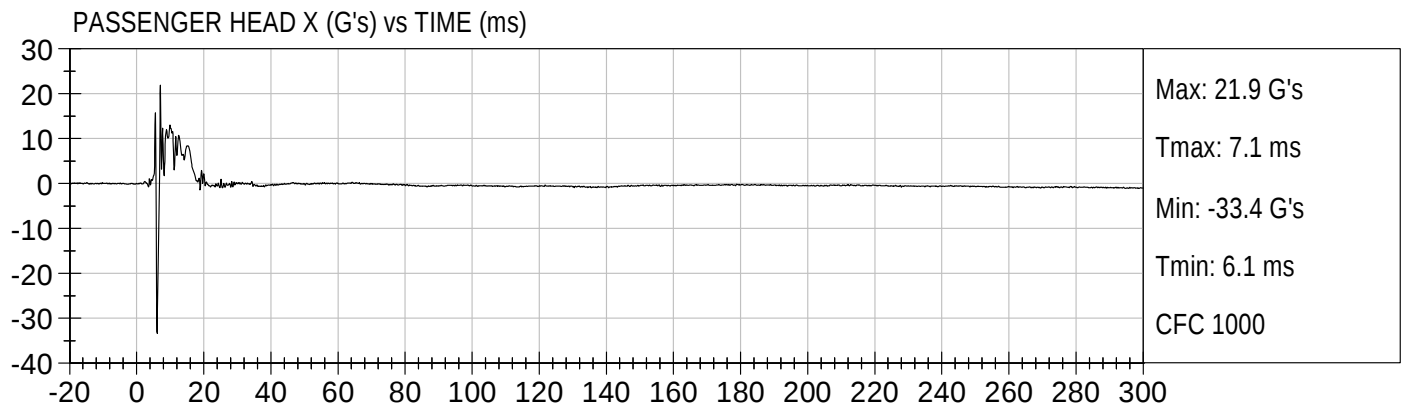
Post-Test Curtain and Torso Airbag Front View

APPENDIX B
DUMMY RESPONSE DATA TRACES

TABLE OF DATA PLOTS

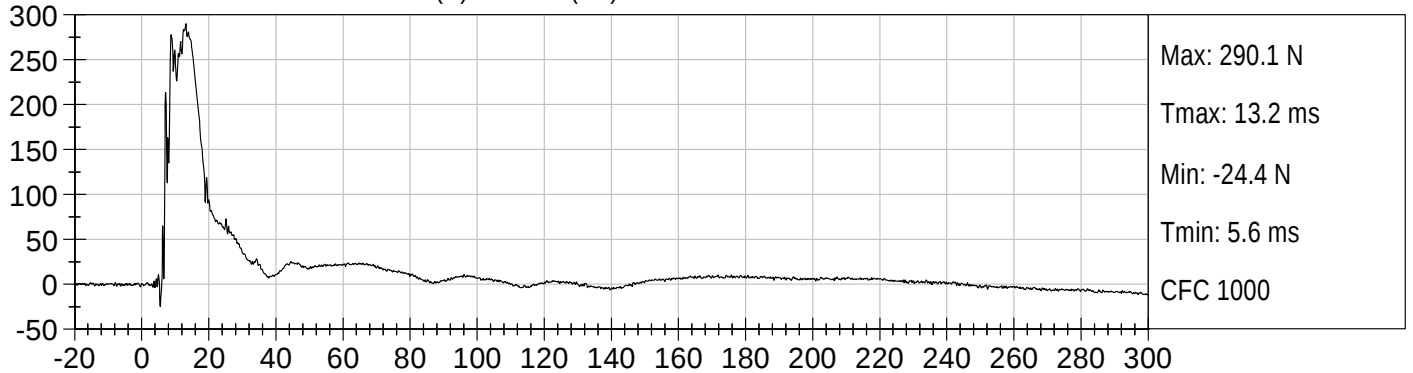
		<u>Page No.</u>
Figure No. 1.	Passenger Head X Acceleration vs. Time	23
Figure No. 2.	Passenger Head Y Acceleration vs. Time	23
Figure No. 3.	Passenger Head Z Acceleration vs. Time	23
Figure No. 4.	Passenger Head Resultant Acceleration vs. Time	23
Figure No. 5.	Passenger Upper Neck X Force vs. Time	24
Figure No. 6.	Passenger Upper Neck Y Force vs. Time	24
Figure No. 7.	Passenger Upper Neck Z Force vs. Time	24
Figure No. 8.	Passenger Upper Neck Resultant Force vs. Time	24
Figure No. 9.	Passenger Upper Neck X Moment vs. Time	25
Figure No. 10.	Passenger Upper Neck Y Moment vs. Time	25
Figure No. 11.	Passenger Upper Neck Z Moment vs. Time	25
Figure No. 12.	Passenger Upper Neck Resultant Moment vs. Time	25
Figure No. 13.	Passenger Lower Neck X Force vs. Time	26
Figure No. 14.	Passenger Lower Neck Y Force vs. Time	26
Figure No. 15.	Passenger Lower Neck Z Force vs. Time	26
Figure No. 16.	Passenger Lower Neck Resultant Force vs. Time	26
Figure No. 17.	Passenger Lower Neck X Moment vs. Time	27
Figure No. 18.	Passenger Lower Neck Y Moment vs. Time	27
Figure No. 19.	Passenger Lower Neck Z Moment vs. Time	27
Figure No. 20.	Passenger Lower Neck Resultant Moment vs. Time	27
Figure No. 21.	Passenger Upper Spine X Acceleration vs. Time	28
Figure No. 22.	Passenger Upper Spine Y Acceleration vs. Time	28
Figure No. 23.	Passenger Upper Spine Z Acceleration vs. Time	28
Figure No. 24.	Passenger Upper Spine Resultant Acceleration vs. Time	28

		<u>Page No.</u>
Figure No. 25.	Passenger Mid Spine X Acceleration vs. Time	29
Figure No. 26.	Passenger Mid Spine Y Acceleration vs. Time	29
Figure No. 27.	Passenger Mid Spine Z Acceleration vs. Time	29
Figure No. 28.	Passenger Mid Spine Resultant Acceleration vs. Time	29
Figure No. 29.	Passenger Lower Spine X Acceleration vs. Time	30
Figure No. 30.	Passenger Lower Spine Y Acceleration vs. Time	30
Figure No. 31.	Passenger Lower Spine Z Acceleration vs. Time	30
Figure No. 32.	Passenger Lower Spine Resultant Acceleration vs. Time	30
Figure No. 33.	Passenger Upper Sternum X Acceleration vs. Time	31
Figure No. 34.	Passenger Lower Sternum X Acceleration vs. Time	31
Figure No. 35.	Passenger Lower Rib @ Spine X Acceleration vs. Time	31
Figure No. 36.	Passenger Seat Airbag – Fire Voltage vs. Time	32
Figure No. 37.	Passenger Seat Airbag – Fire Current vs. Time	32

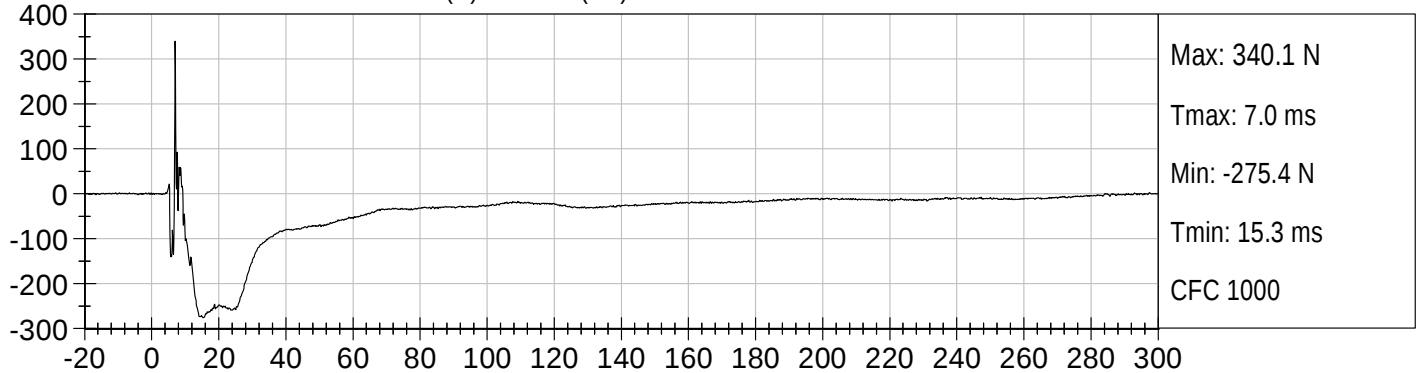




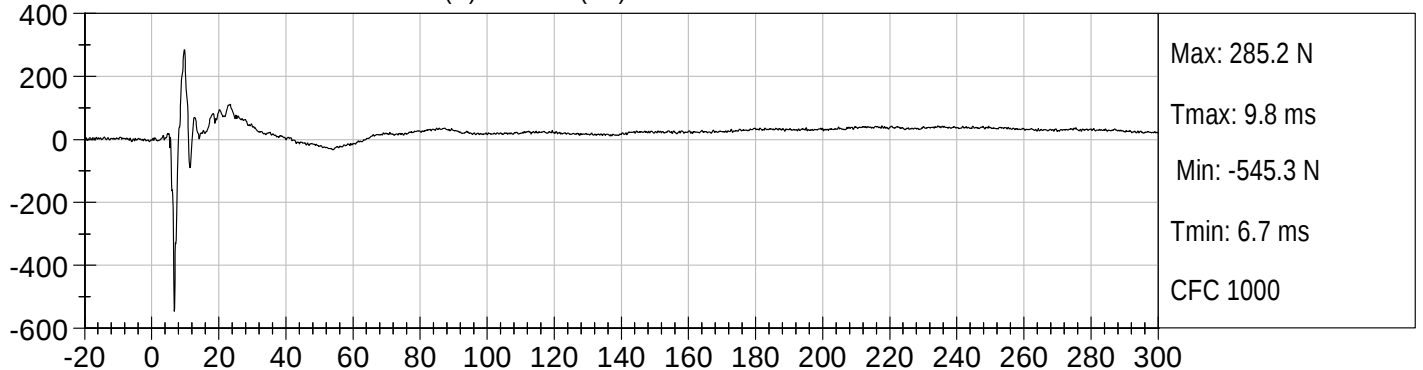
PASSENGER UPPER NECK FX (N) vs TIME (ms)



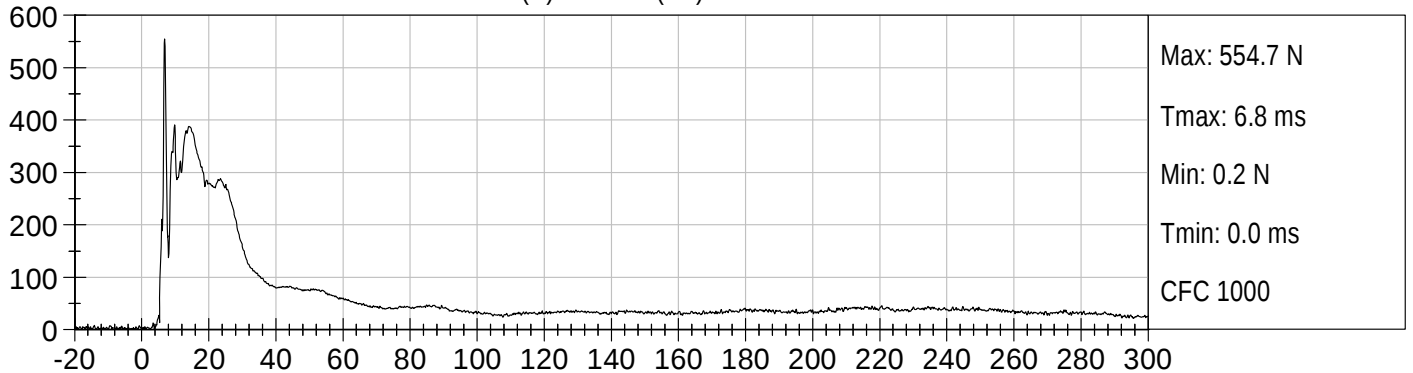
PASSENGER UPPER NECK FY (N) vs TIME (ms)

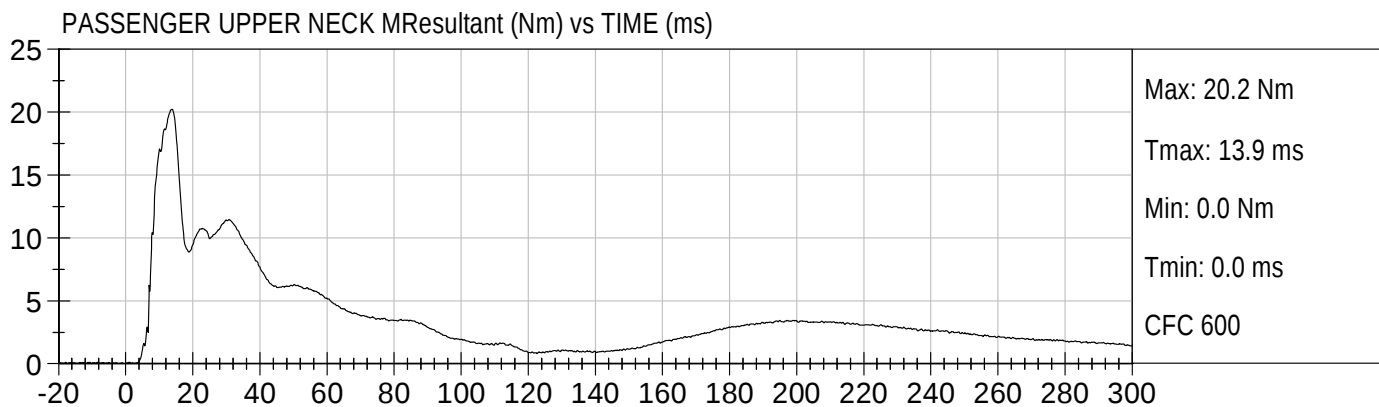
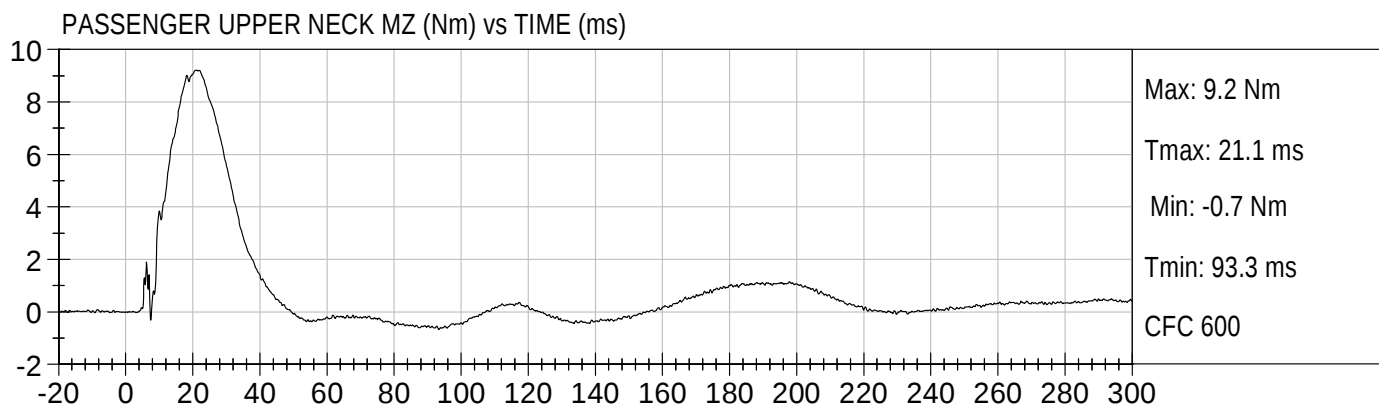
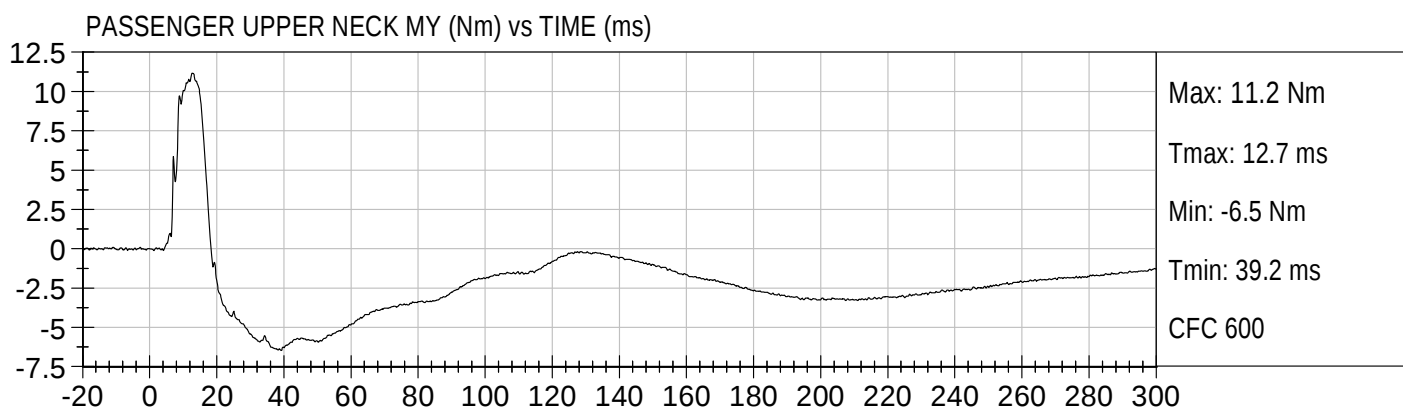
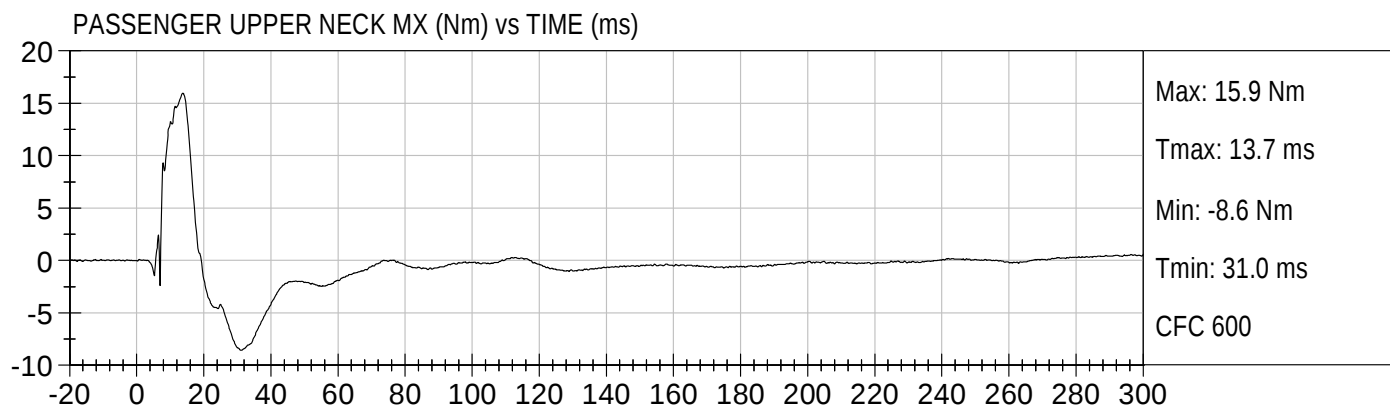


PASSENGER UPPER NECK FZ (N) vs TIME (ms)



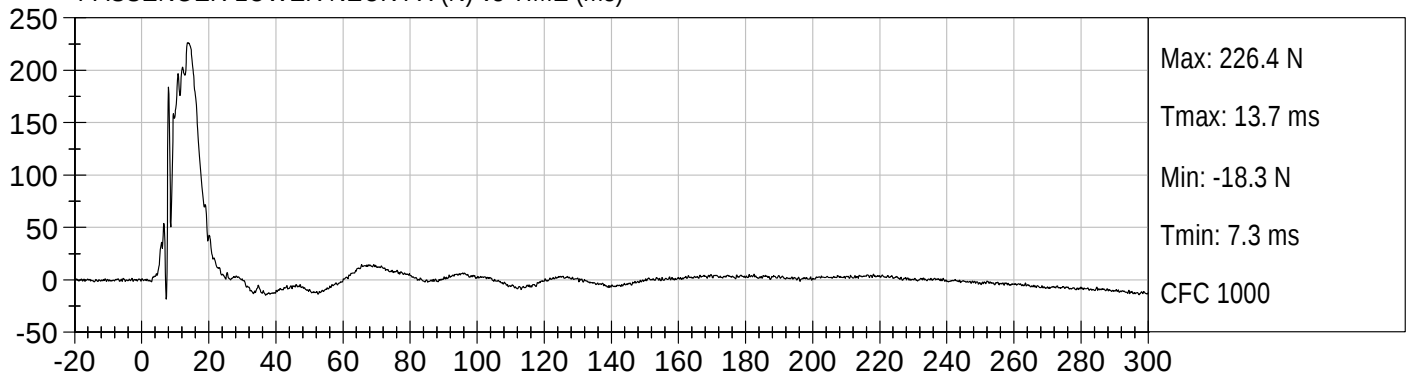
PASSENGER UPPER NECK FResultant (N) vs TIME (ms)



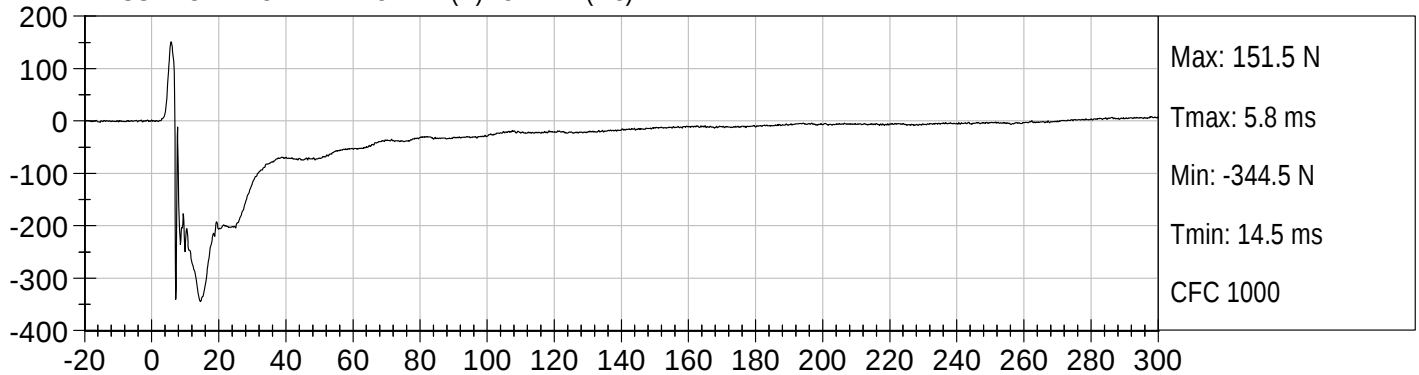




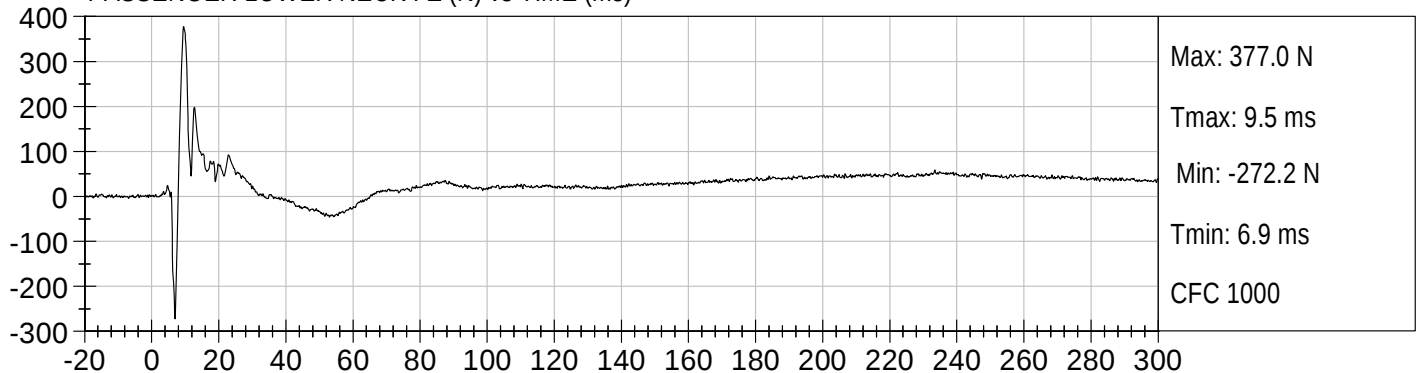
PASSENGER LOWER NECK FX (N) vs TIME (ms)



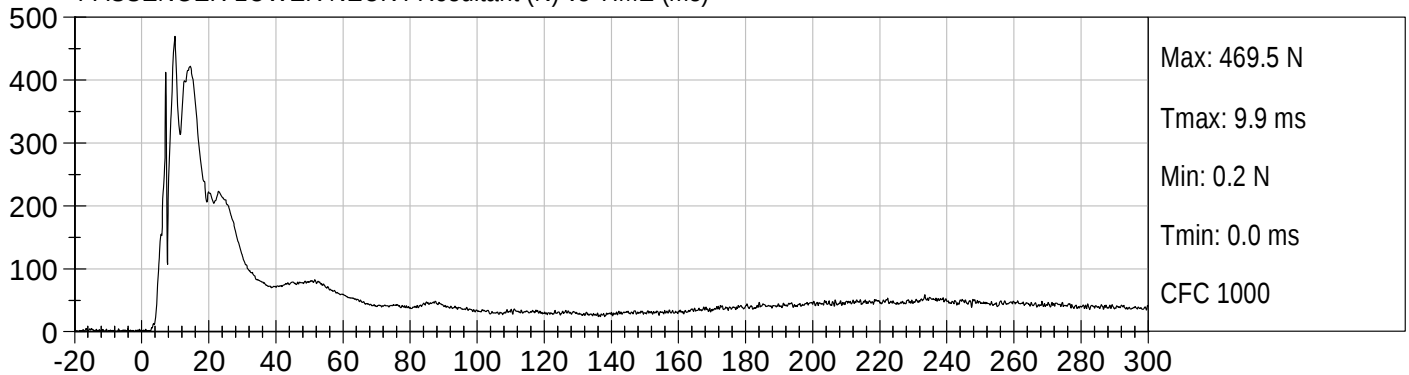
PASSENGER LOWER NECK FY (N) vs TIME (ms)



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

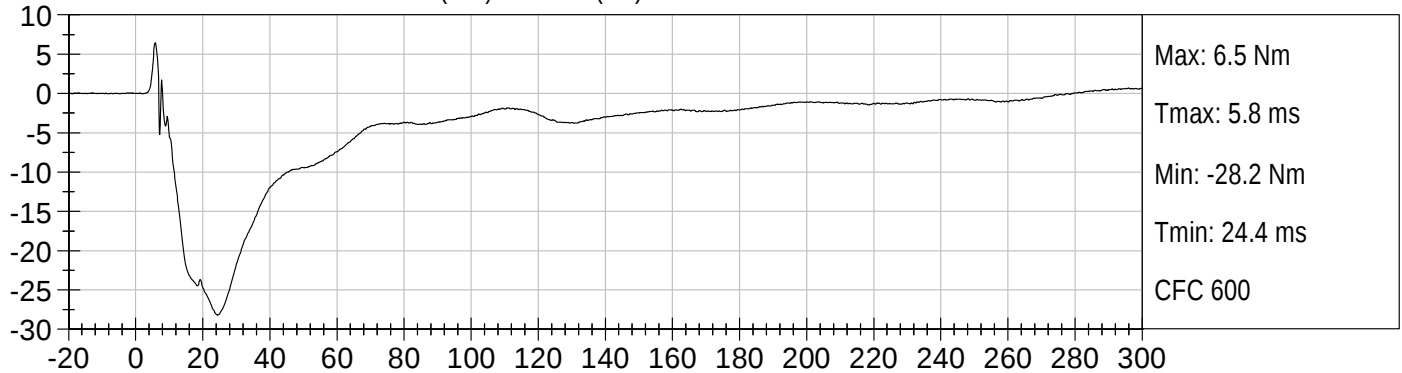


PASSENGER LOWER NECK FResultant (N) vs TIME (ms)

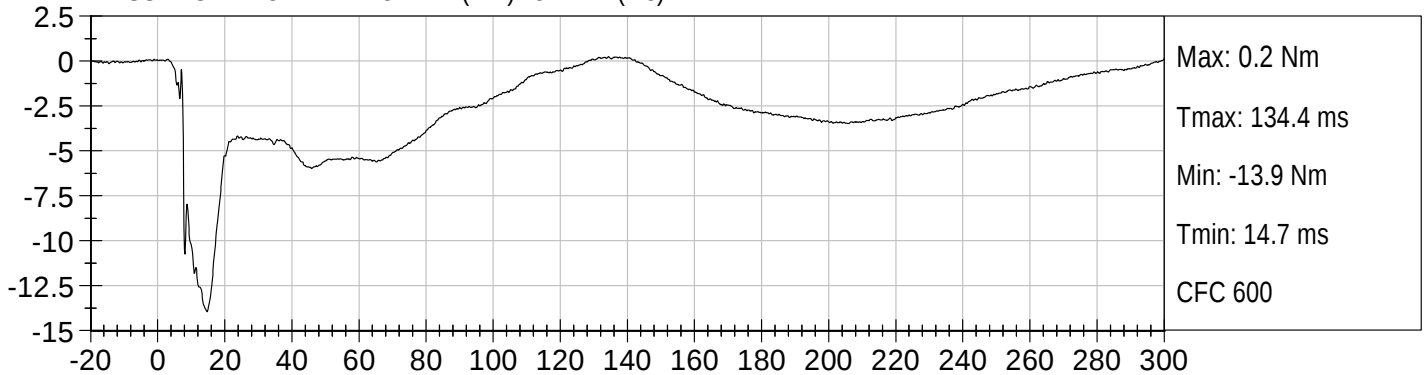




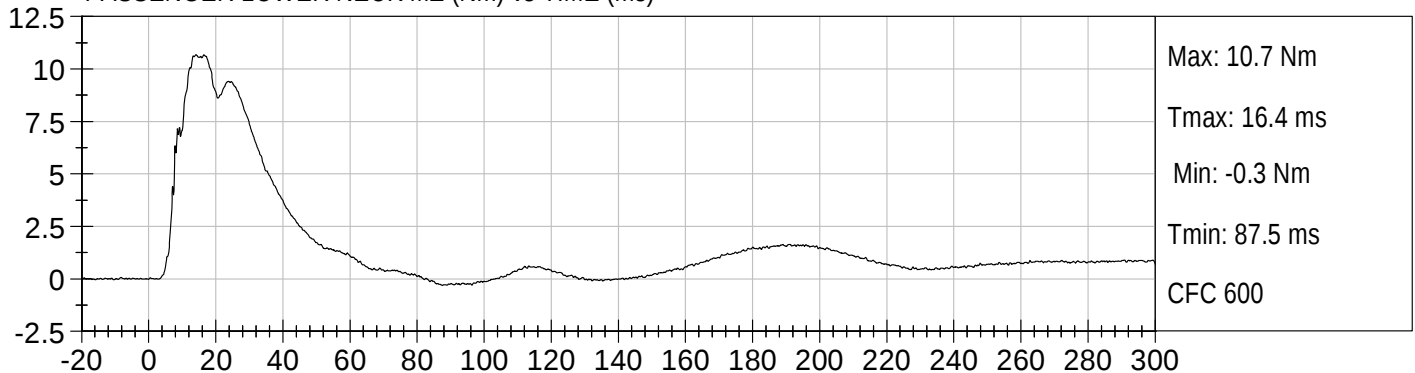
PASSENGER LOWER NECK MX (Nm) vs TIME (ms)



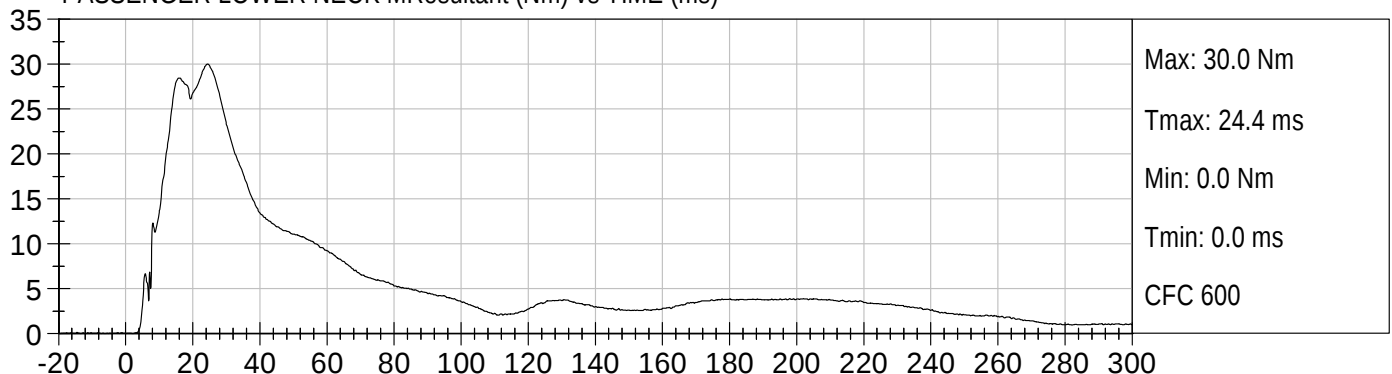
PASSENGER LOWER NECK MY (Nm) vs TIME (ms)



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

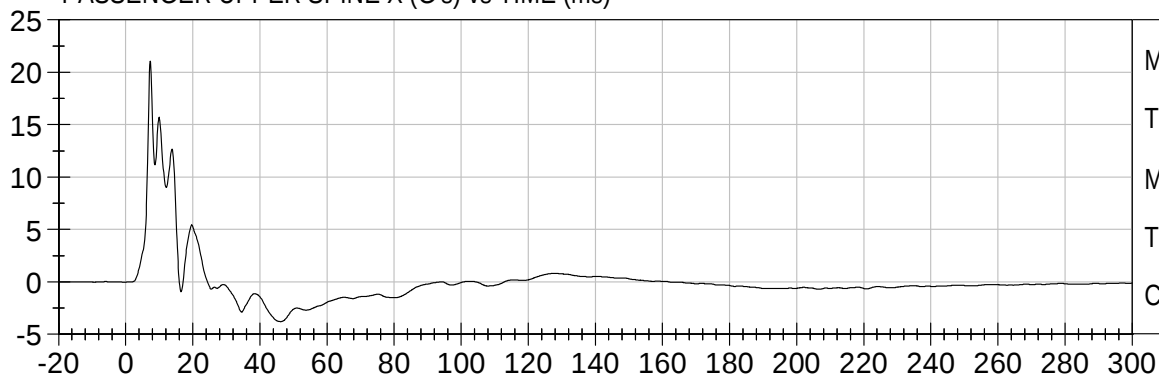


PASSENGER LOWER NECK MResultant (Nm) vs TIME (ms)





PASSENGER UPPER SPINE X (G's) vs TIME (ms)



Max: 21.1 G's

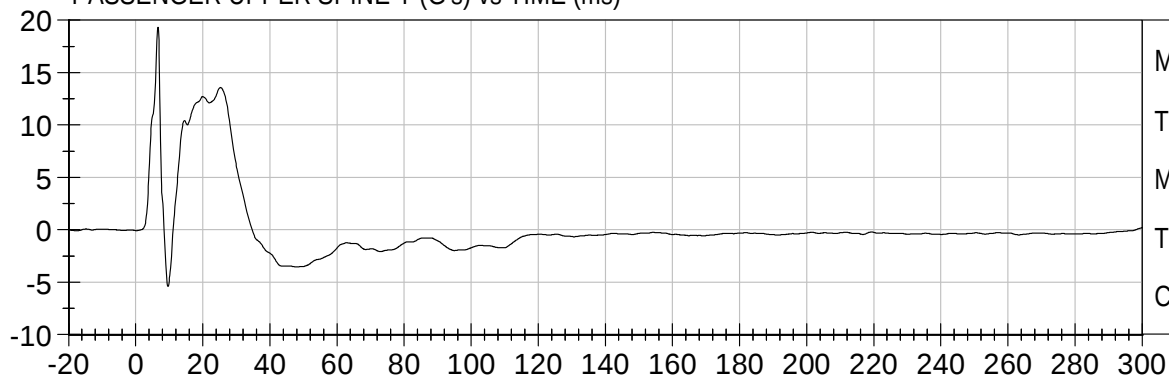
Tmax: 7.3 ms

Min: -3.8 G's

Tmin: 46.2 ms

CFC 180

PASSENGER UPPER SPINE Y (G's) vs TIME (ms)



Max: 19.3 G's

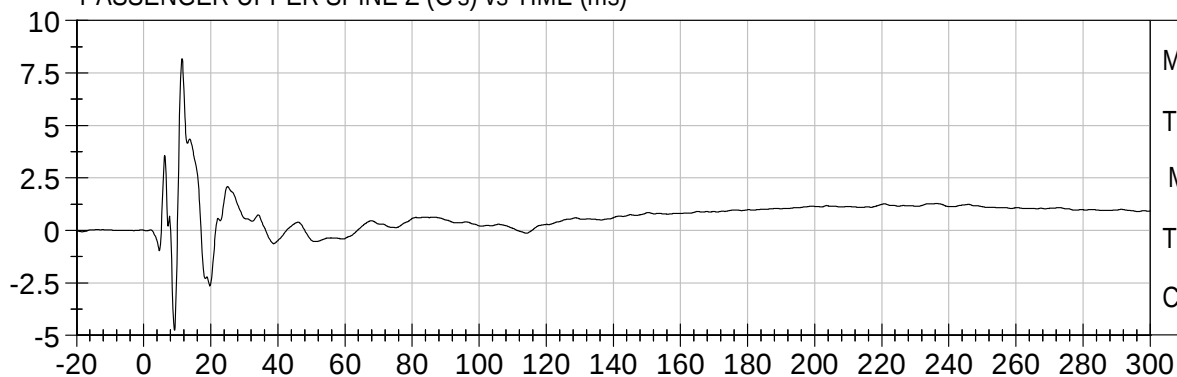
Tmax: 6.7 ms

Min: -5.4 G's

Tmin: 9.6 ms

CFC 180

PASSENGER UPPER SPINE Z (G's) vs TIME (ms)



Max: 8.2 G's

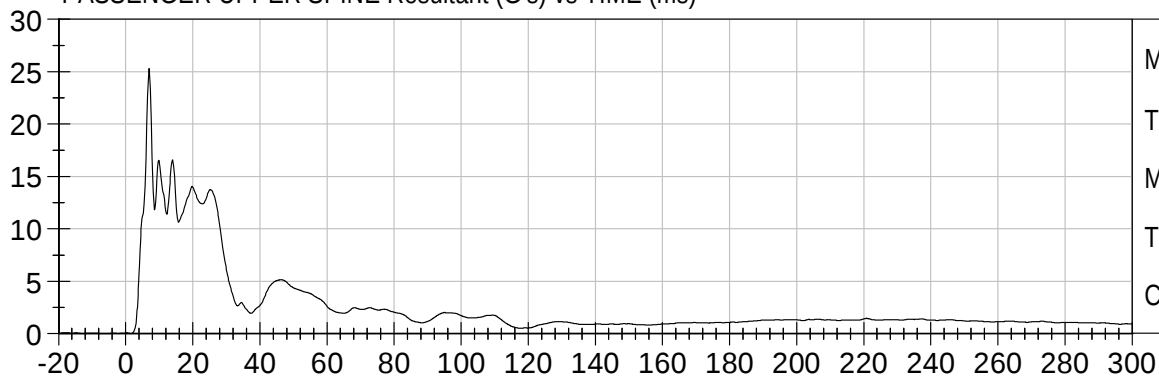
Tmax: 11.4 ms

Min: -4.7 G's

Tmin: 9.2 ms

CFC 180

PASSENGER UPPER SPINE Resultant (G's) vs TIME (ms)



Max: 25.3 G's

Tmax: 7.0 ms

Min: 0.0 G's

Tmin: 1.5 ms

CFC 180

