



**REPORT NUMBER: TWG-MGA-2011-009**

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

**HONDA MFG. OF INDIANA, LLC  
2011 HONDA CIVIC  
NHTSA NUMBER: MB5311TWG2**

**TEST DATE: MAY 12, 2011**

**FINAL REPORT DATE: SEPTEMBER 16, 2011**

**FINAL REPORT**

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Date: \_\_\_\_\_

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

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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 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 Honda Civic 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 3.3.3.4 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 top 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. The dummy was slid outboard until the CG of the head was aligned with the vertical centerline of the airbag module. The door/side trim did not interfere with the placement of the dummy's head. No foam blocks were placed under the dummy's legs.

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 3.3.3.4 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                | 3.3.3.4*                    | 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 top 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 November 10, 2010.

**TEST VEHICLE INFORMATION**

|                                                         |                   |
|---------------------------------------------------------|-------------------|
| Manufacturer                                            | Honda             |
| Model                                                   | Civic             |
| Body Style                                              | Sedan             |
| NHTSA No.                                               | MB5311TWG2        |
| VIN                                                     | 19XFA1F35BE006434 |
| Color                                                   | Atomic Blue Metal |
| Delivery Date                                           | 10/19/2010        |
| Odometer Reading (mile)                                 | 28                |
| Dealer                                                  | Rosen Honda       |
| Transmission                                            | Automatic         |
| Final Drive                                             | Front             |
| Number of Cylinders                                     | 4                 |
| Engine Displacement (L)                                 | 1.8               |
| Engine Placement                                        | Lateral           |
| Automatic Door Lock (ADL)                               | No                |
| Owners Manual Details<br>Instructions on Disabling ADLs | N/A               |
| 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                    | No  |
| Power Seats                        | No  |

**DATA FROM CERTIFICATION LABEL**

|                     |                            |
|---------------------|----------------------------|
| Manufactured By     | Honda Mfg. of Indiana, LLC |
| Date of Manufacture | 09/10                      |

|                 |      |
|-----------------|------|
| GVWR (kg)       | 1665 |
| GAWR Front (kg) | 880  |
| GAWR Rear (kg)  | 785  |

| Measured Parameter      | Front  | Rear  | Third | Total |
|-------------------------|--------|-------|-------|-------|
| Type of Seats           | Bucket | Bench |       |       |
| Number of Occupants     | 2      | 3     |       | 5     |
| Capacity Wt. (VCW) (kg) |        |       |       | 385   |
| Cargo Wt. (RCLW) (kg)   |        |       |       | 45    |

**DATA SHEET NO. 3**  
**DUMMY POSITIONING IN VEHICLE**

| Measurement                                        |           | Value          |
|----------------------------------------------------|-----------|----------------|
| Seat Position                                      |           | Rearmost       |
| Seat Height Position                               |           | Non-Adjustable |
| Placed in Position No. 2                           |           | ---            |
| Seat Back Angle (at headrest post)                 | SA (°)    | 13.4           |
| Top of Curtain Airbag Module to Head/Neck Junction | AN (mm)   | 725            |
| Top of Seat Airbag Module to Head/Neck Junction    | AN (mm)   | 329            |
| Head CG to Door Panel/Window                       | HD (mm)   | 74             |
| Head to Seat Back Centerline                       | HSC (mm)  | 216            |
| Chest to Dash                                      | CD (mm)   | 596            |
| Chest to Seatback                                  | CS (mm)   | 180            |
| 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)   | 87             |
| Toe to Toe                                         | TT (mm)   | 75             |
| Right Knee to Seat Cushion Centerline              | KSCR (mm) | 347            |
| Left Knee to Seat Cushion Centerline               | KSCL (mm) | 355            |
| Right Toe to Seat Cushion Centerline               | TSCR (mm) | 610            |
| Left Toe to Seat Cushion Centerline                | TSCL (mm) | 579            |
| Nose to Dash                                       | ND (mm)   | 605            |
| Nose to Seatback                                   | NS (mm)   | 191            |
| Top of Head to Headliner                           | HH (mm)   | 632            |

**DATA SHEET NO. 4**  
**DUMMY INJURY CRITERIA VALUES**

**NHTSA No. MB5311TWG2**

| DESCRIPTION            | UNIT | MAXIMUM VALUE  |           |         |           |
|------------------------|------|----------------|-----------|---------|-----------|
|                        |      | Position No. 2 |           |         |           |
|                        |      | MAXIMUM        | TIME (ms) | MINIMUM | TIME (ms) |
| Head X                 | g    | 18.5           | 7.9       | -24.1   | 6.9       |
| Head Y                 | g    | 60.0           | 5.8       | -6.1    | 15.4      |
| Head Z                 | g    | 38.9           | 6.8       | -15.0   | 6.1       |
| Head Resultant         | g    | 73.7           | 5.8       |         |           |
| Upper Neck Fx          | N    | 56.0           | 5.8       | -108.6  | 7.6       |
| Upper Neck Fy          | N    | 15.9           | 76.8      | -131.2  | 6.7       |
| Upper Neck Fz          | N    | 25.4           | 244.0     | -762.8  | 7.8       |
| Upper Neck F Resultant | N    | 767.6          | 7.8       |         |           |
| Upper Neck Mx          | Nm   | 2.4            | 32.4      | -8.9    | 11.4      |
| Upper Neck My          | Nm   | 6.2            | 16.0      | -2.2    | 6.9       |
| Upper Neck Mz          | Nm   | 0.9            | 7.1       | -2.7    | 33.6      |
| Upper Neck M Resultant | Nm   | 10.2           | 11.5      |         |           |
| Lower Neck Fx          | N    | 73.0           | 13.4      | -18.9   | 7.7       |
| Lower Neck Fy          | N    | 16.9           | 10.5      | -81.0   | 17.7      |
| Lower Neck Fz          | N    | 16.8           | 233.3     | -690.7  | 7.6       |
| Lower Neck F Resultant | N    | 691.7          | 7.6       |         |           |
| Lower Neck Mx          | Nm   | 2.1            | 29.4      | -12.5   | 14.8      |
| Lower Neck My          | Nm   | 5.2            | 22.4      | -2.2    | 95.2      |
| Lower Neck Mz          | Nm   | 0.9            | 175.7     | -2.5    | 40.8      |
| Lower Neck M Resultant | Nm   | 12.6           | 14.8      |         |           |
| Upper Spine X          | G    | 3.2            | 22.0      | -6.5    | 10.2      |
| Upper Spine Y          | G    | 3.9            | 7.6       | -2.2    | 32.7      |
| Upper Spine Z          | G    | 12.0           | 7.5       | -2.8    | 30.9      |
| Upper Spine Resultant  | G    | 12.7           | 7.5       |         |           |
| Mid Spine X            | G    | 2.8            | 30.5      | -5.4    | 7.4       |
| Mid Spine Y            | G    | 2.3            | 17.5      | -1.7    | 38.9      |
| Mid Spine Z            | G    | 10.4           | 7.5       | -1.7    | 31.6      |
| Mid Spine Resultant    | G    | 11.9           | 7.5       |         |           |
| Lower Spine X          | G    | 1.9            | 31.5      | -2.5    | 17.4      |
| Lower Spine Y          | G    | 3.6            | 19.5      | -1.7    | 40.1      |
| Lower Spine Z          | G    | 10.6           | 7.5       | -2.3    | 31.4      |
| Lower Spine Resultant  | G    | 10.9           | 7.5       |         |           |
| Upper Sternum X        | G    | 5.8            | 33.5      | -10.6   | 8.5       |
| Lower Sternum X        | G    | 7.3            | 7.9       | -15.4   | 10.4      |
| Lower Rib @ Spine X    | G    | 2.7            | 30.9      | -8.1    | 7.8       |

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

**NHTSA No. MB5311TWG2**

| ATD position         | HEAD INJURY CRITERIA (HIC) |                          |                          |       |                          |                          |
|----------------------|----------------------------|--------------------------|--------------------------|-------|--------------------------|--------------------------|
|                      | HIC15                      |                          |                          | HIC36 |                          |                          |
|                      | HIC                        | T <sup>1</sup><br>(msec) | T <sup>2</sup><br>(msec) | HIC   | T <sup>1</sup><br>(msec) | T <sup>2</sup><br>(msec) |
| No. 2<br>Right Front | 12.5                       | 5.5                      | 9.6                      | 12.5  | 5.5                      | 9.6                      |

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

|                                   | Nij           | Time (msec) | Z Force (N)<br>(CFC 600)               | X Force (N)<br>(CFC 600) | Y Moment (N-m)<br>(CFC 600) |
|-----------------------------------|---------------|-------------|----------------------------------------|--------------------------|-----------------------------|
| Ntf                               | 0.06          | 40.3        | 1.51                                   | 7.48                     | 4.34                        |
| Nte                               | 0.00          | -6.9        | 5.31                                   | 0.21                     | -0.05                       |
| Ncf                               | 0.31          | 12.9        | -476.15                                | 33.56                    | 5.52                        |
| Nce                               | 0.43          | 7.6         | -755.49                                | -72.97                   | -1.90                       |
| <b>Peak Tension<br/>(CFC1000)</b> | <b>25.4 N</b> |             | <b>Peak Compression<br/>(CFC 1000)</b> |                          | <b>-762.8 N</b>             |

**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 |

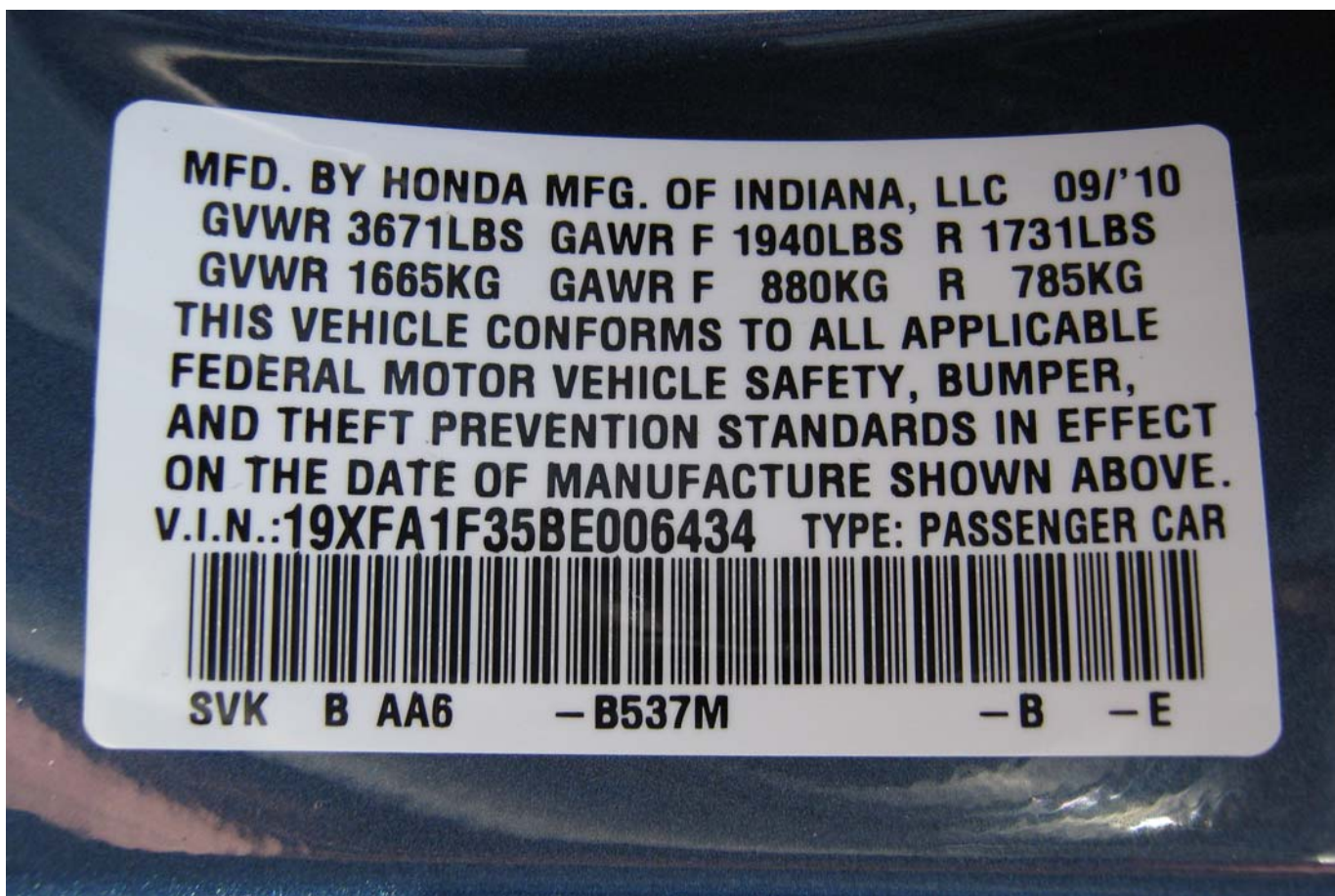
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Right ¾ Front View of Vehicle, As Received



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



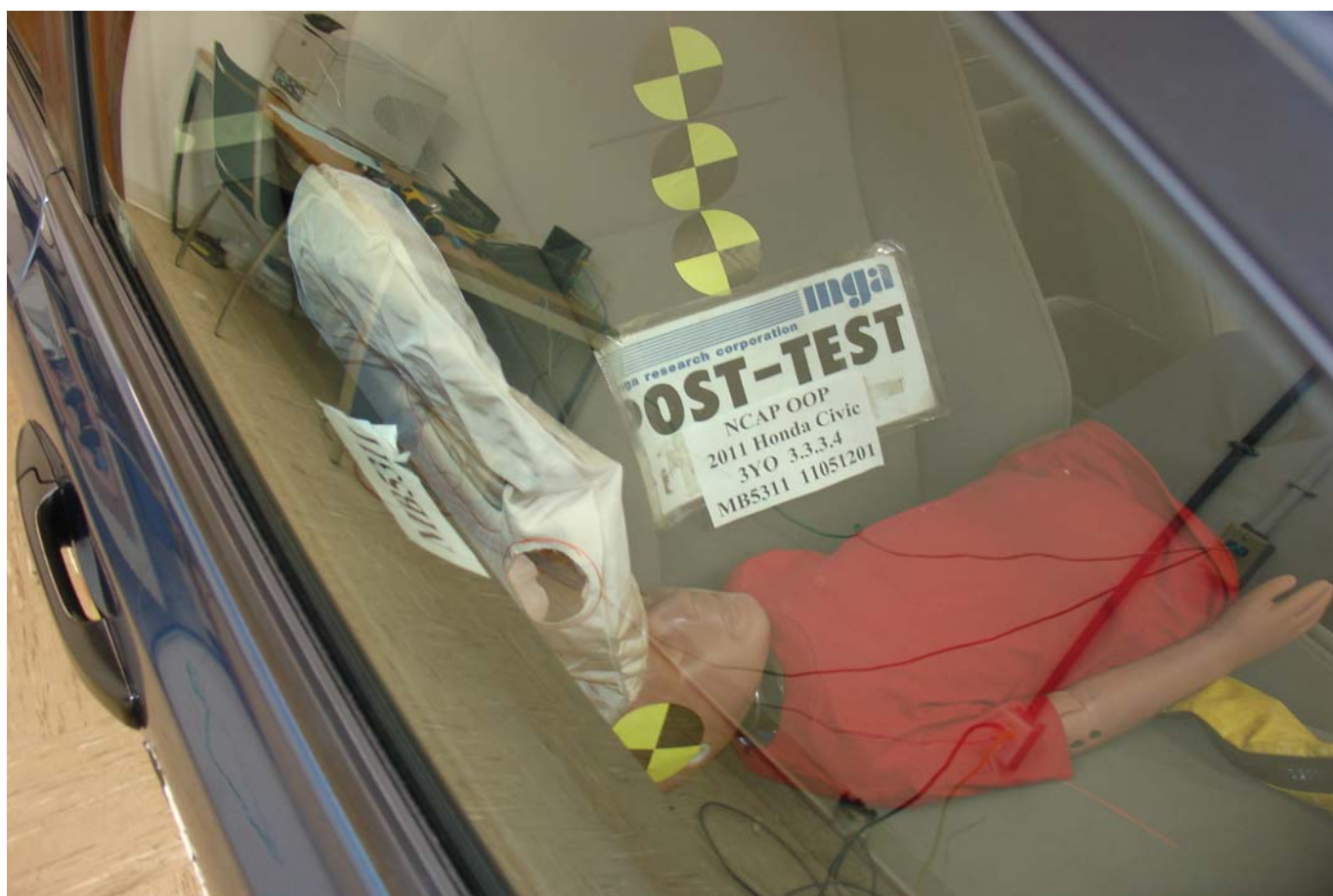
Pre-Test 3-Year-Old Child Dummy Front Closeup View



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



Post-Test Curtain and Torso Airbag Left Side View



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



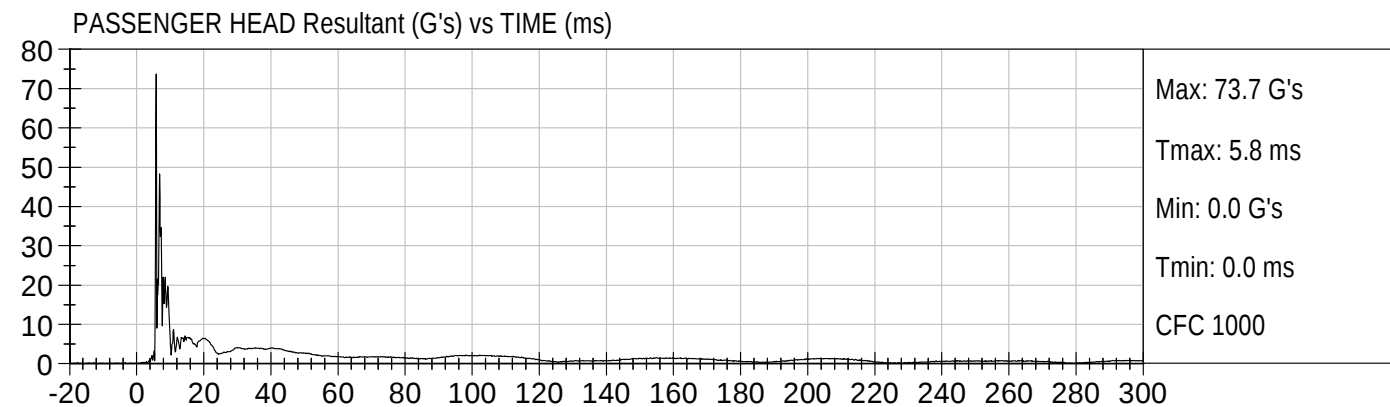
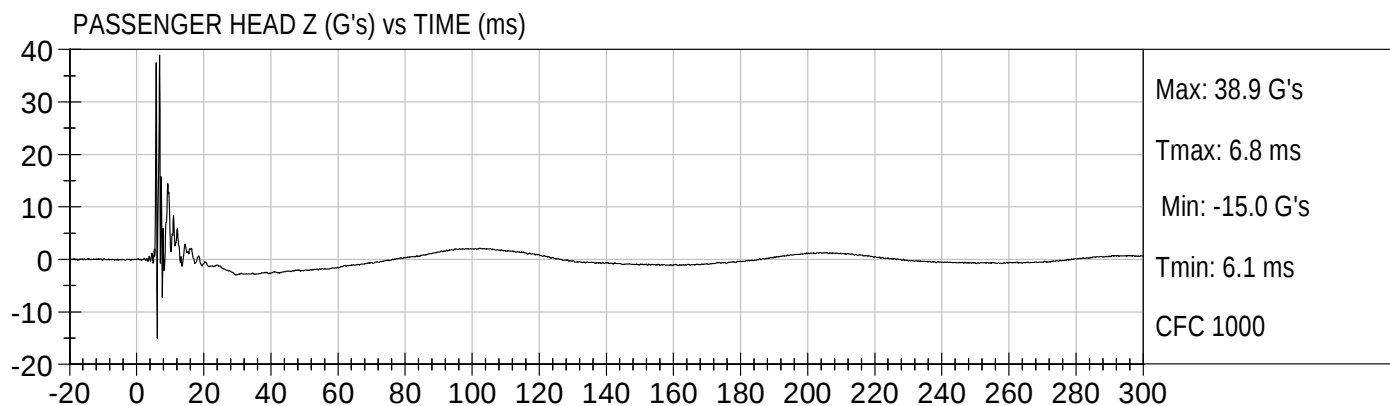
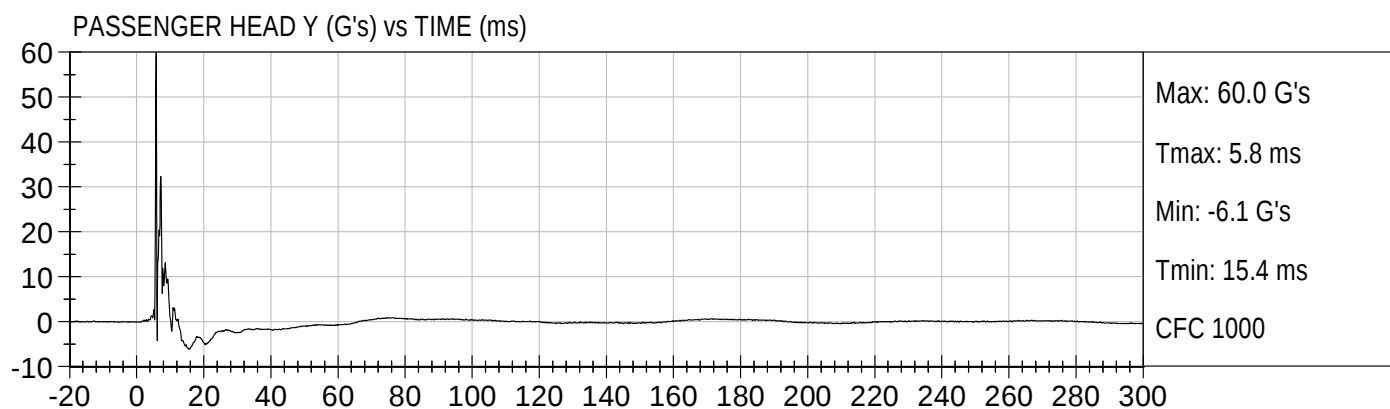
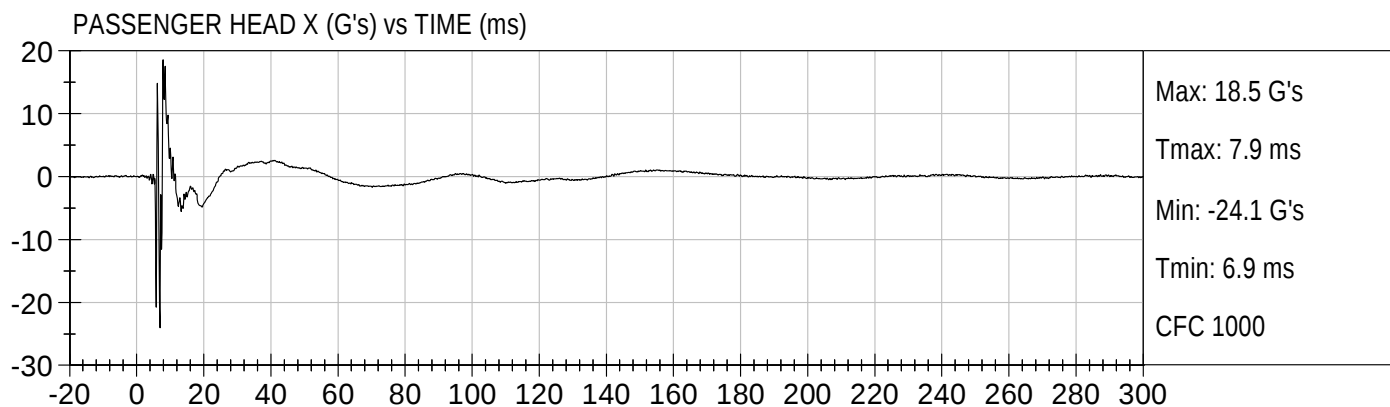
Post-Test Curtain and Torso Airbag Front View

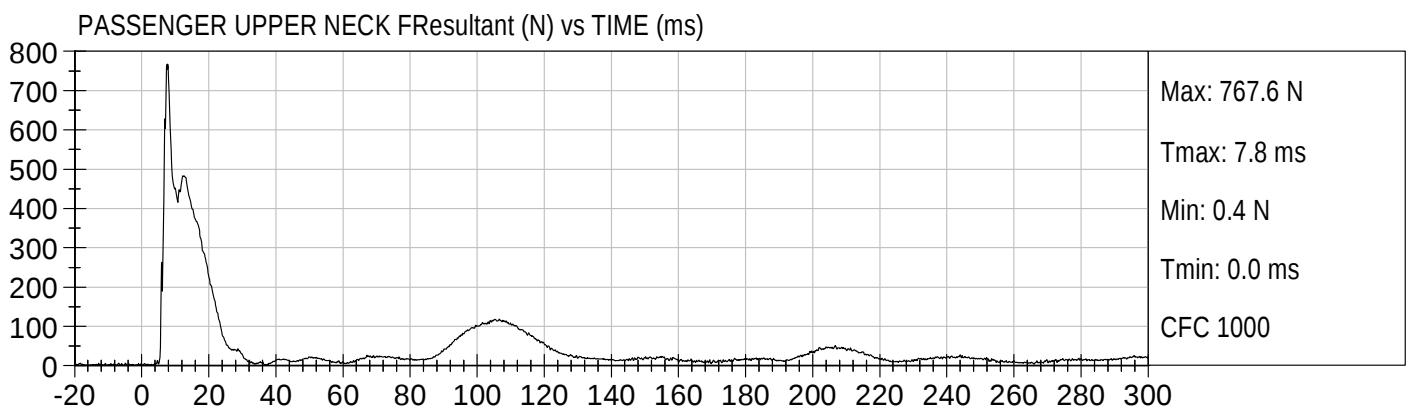
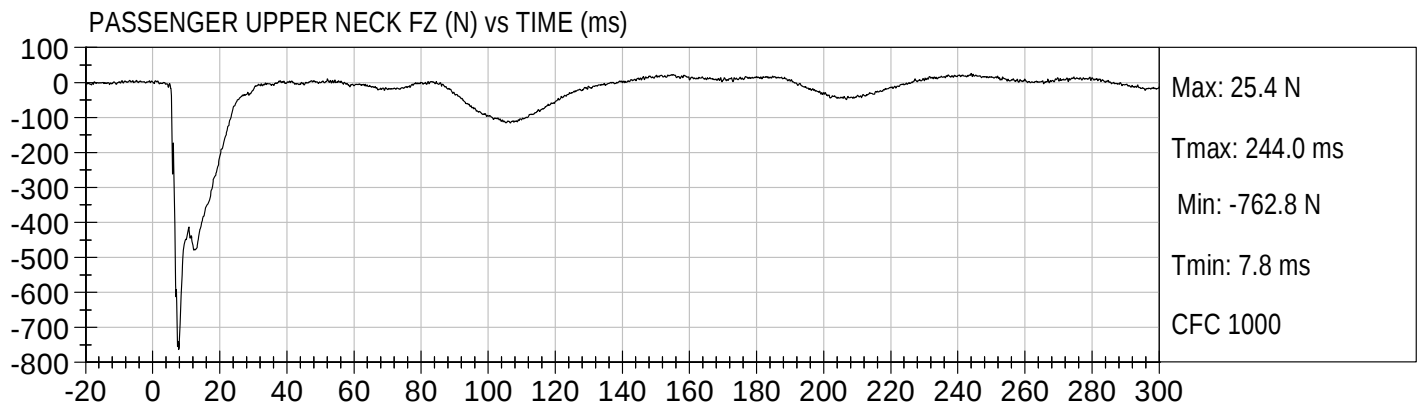
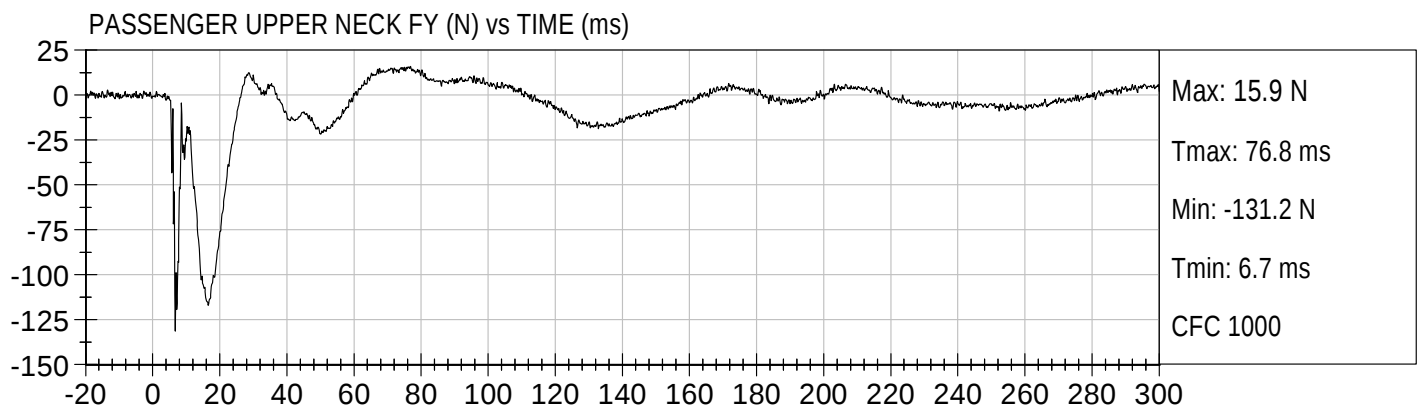
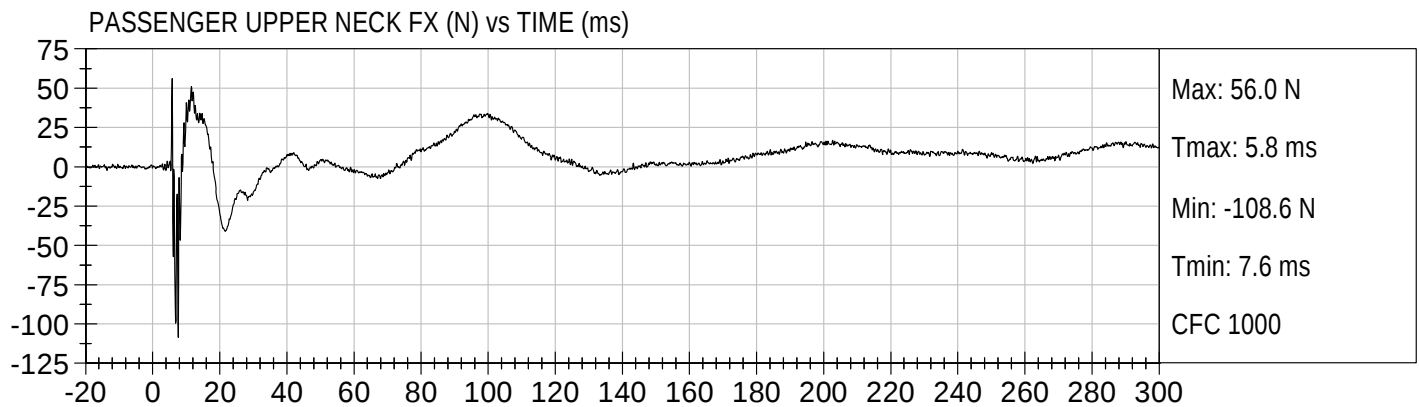
**APPENDIX B**  
**DUMMY RESPONSE DATA TRACES**

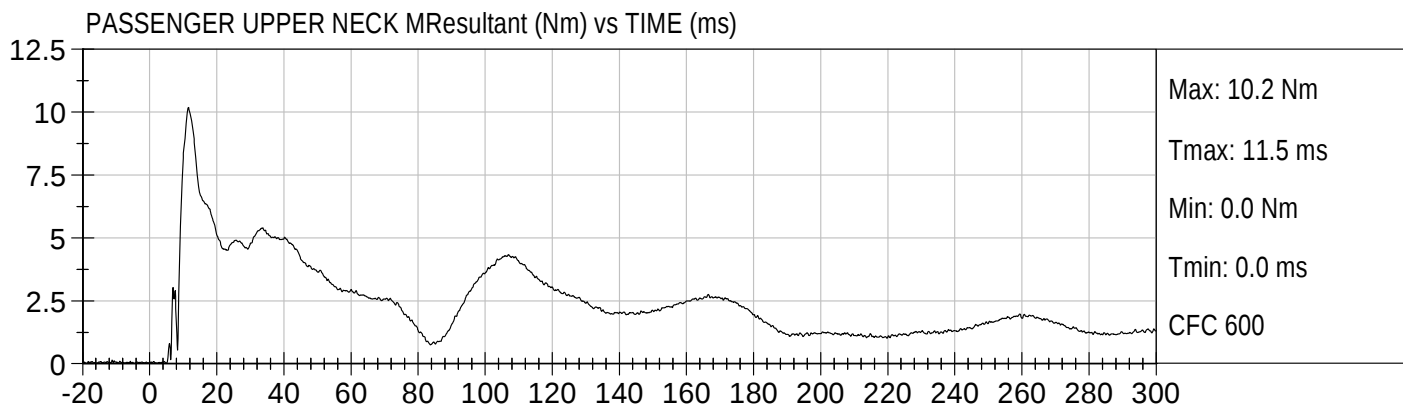
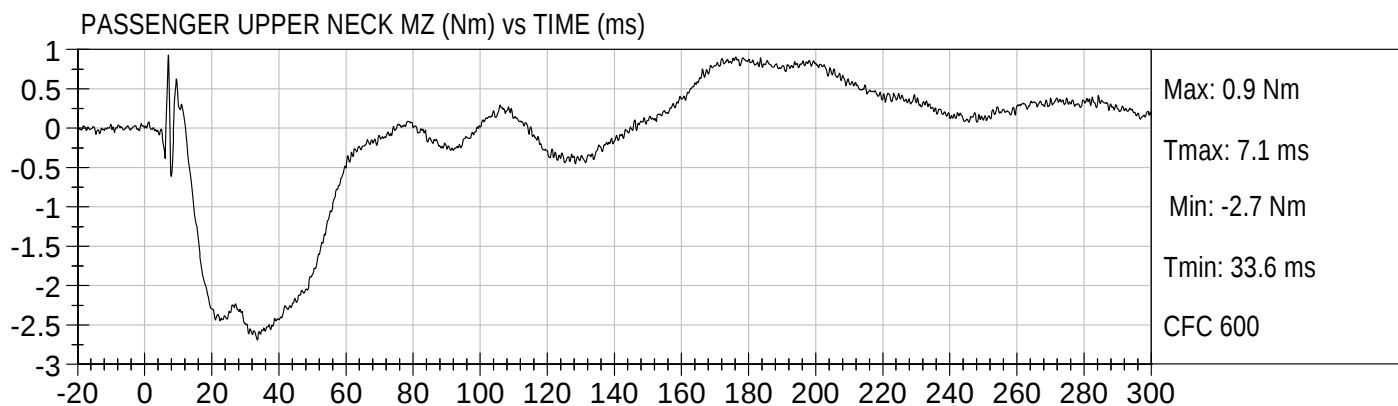
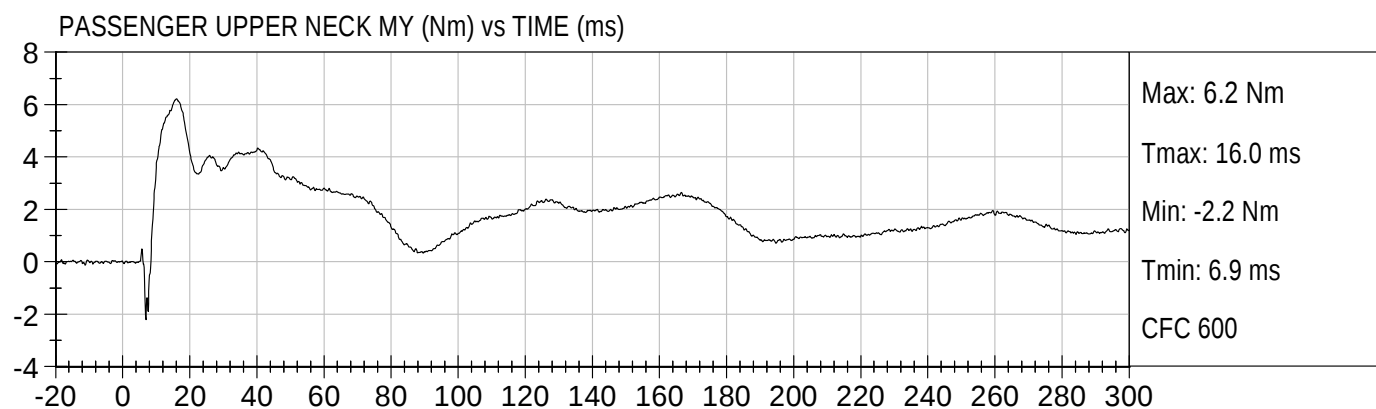
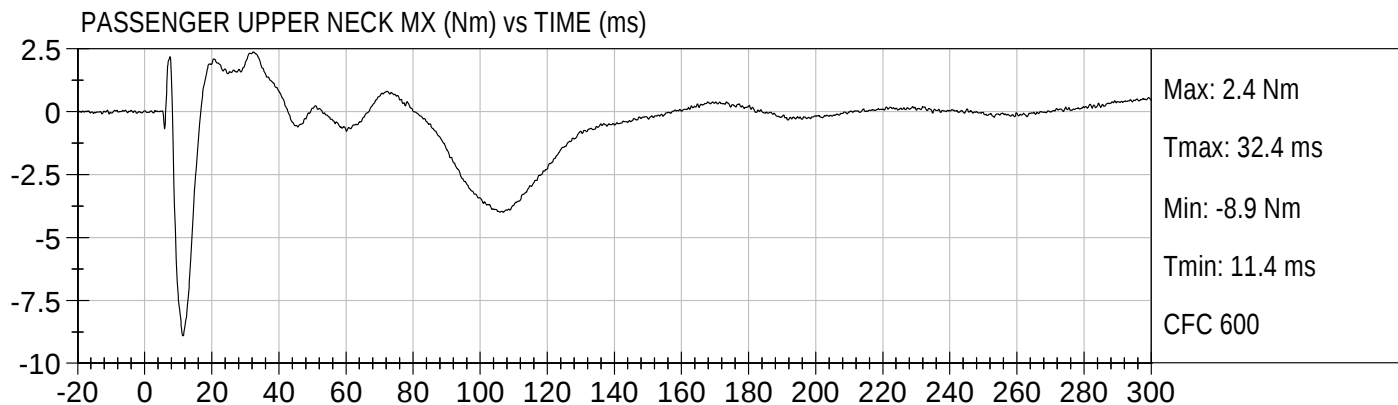
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| Figure No. 37. | Passenger Seat Airbag – Fire Current vs. Time         | 32              |

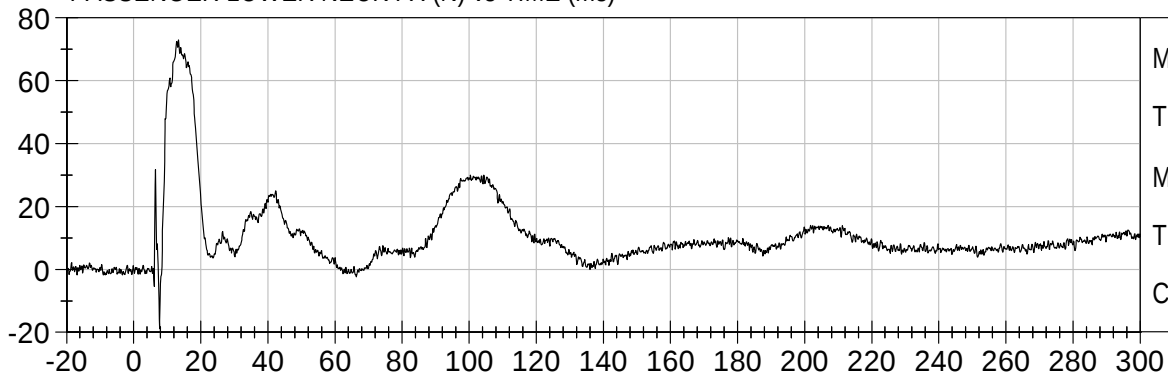






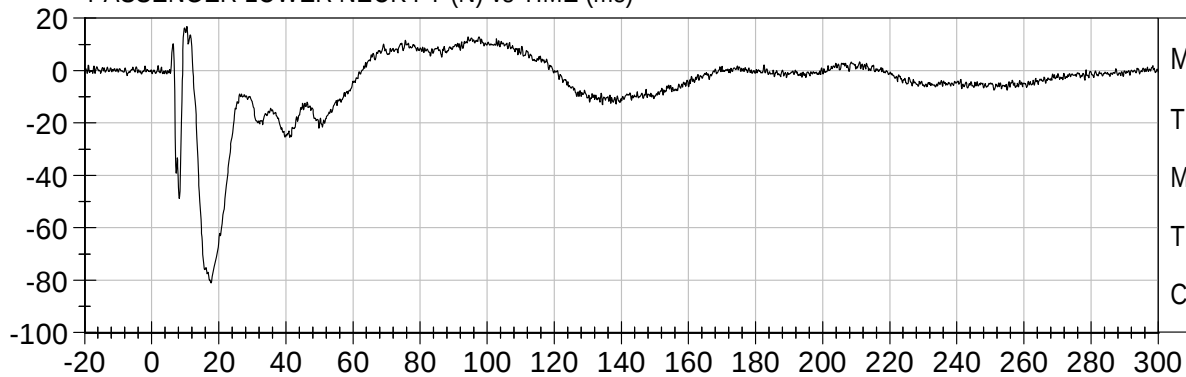


PASSENGER LOWER NECK FX (N) vs TIME (ms)



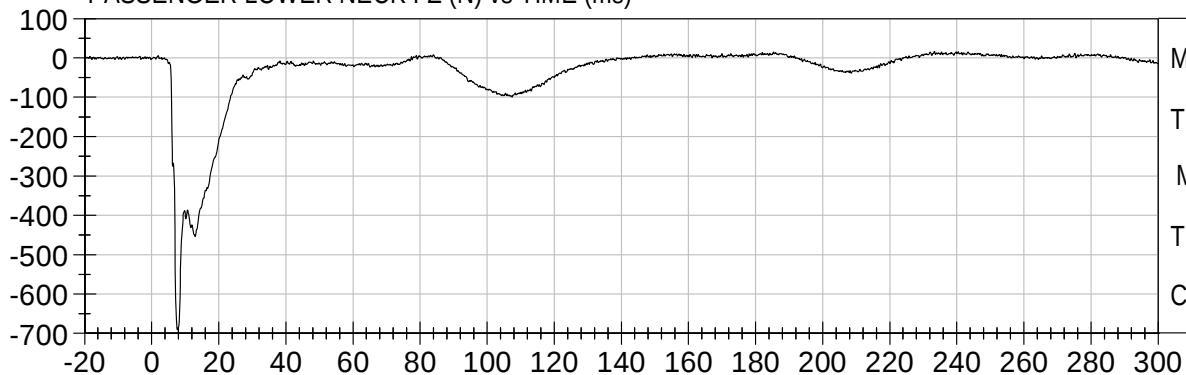
Max: 73.0 N  
Tmax: 13.4 ms  
Min: -18.9 N  
Tmin: 7.7 ms  
CFC 1000

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



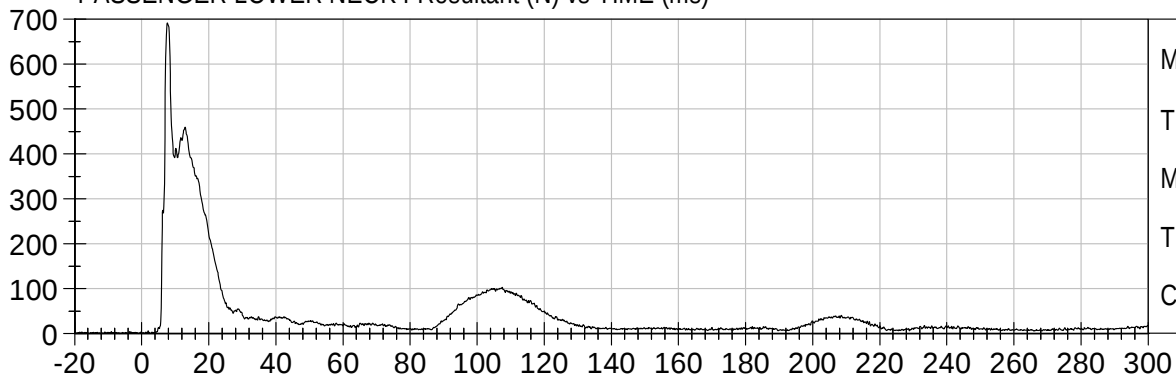
Max: 16.9 N  
Tmax: 10.5 ms  
Min: -81.0 N  
Tmin: 17.7 ms  
CFC 1000

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

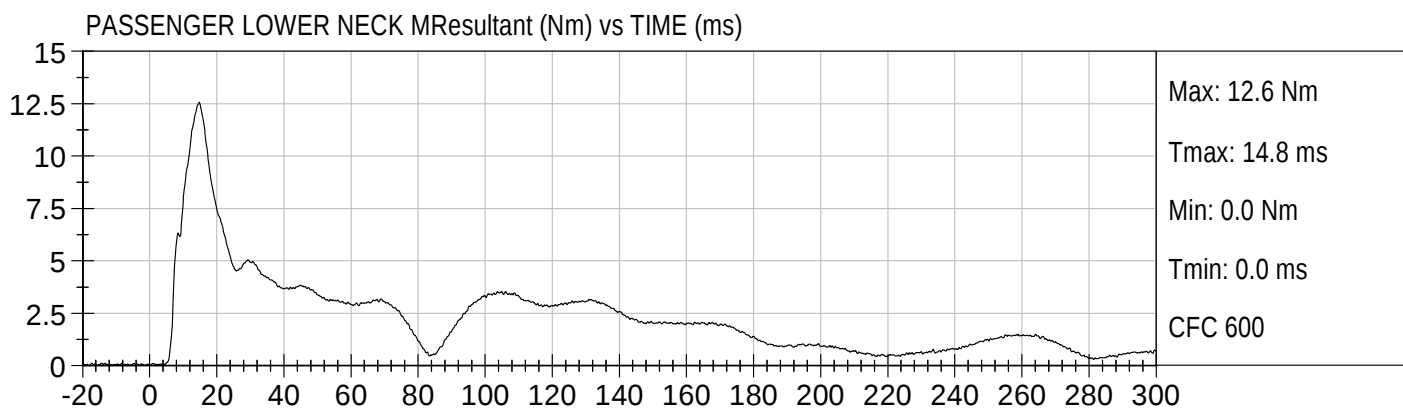
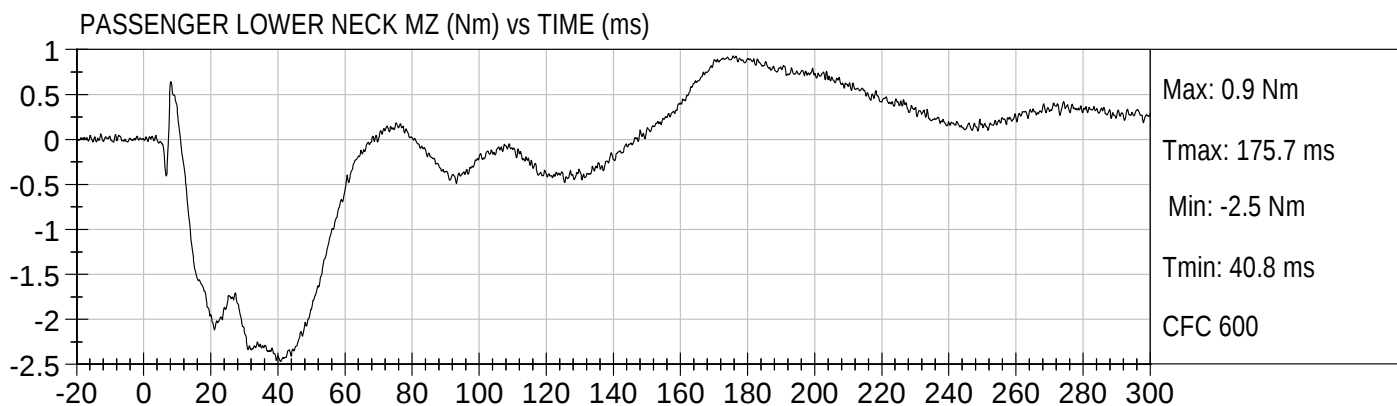
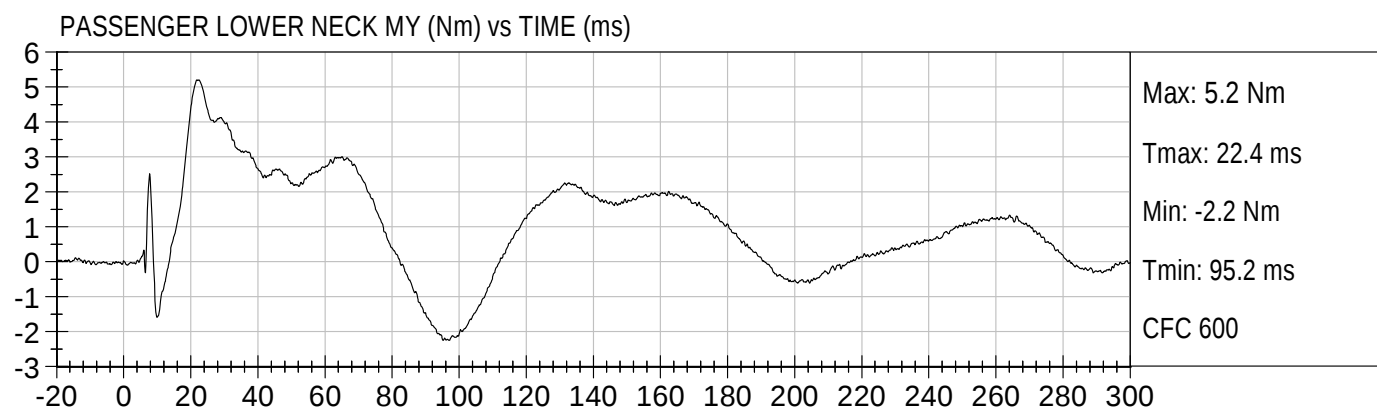
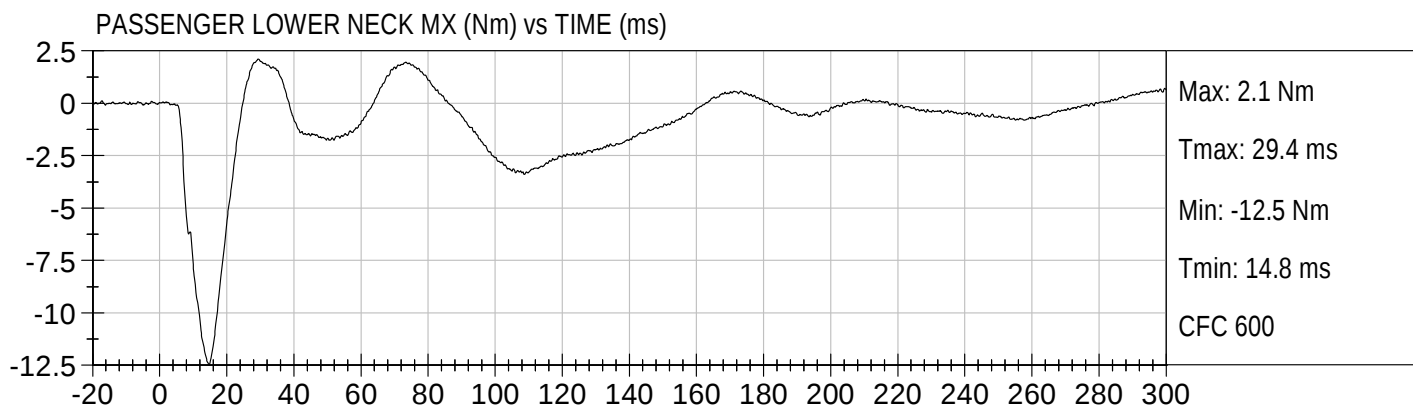


Max: 16.8 N  
Tmax: 233.3 ms  
Min: -690.7 N  
Tmin: 7.6 ms  
CFC 1000

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

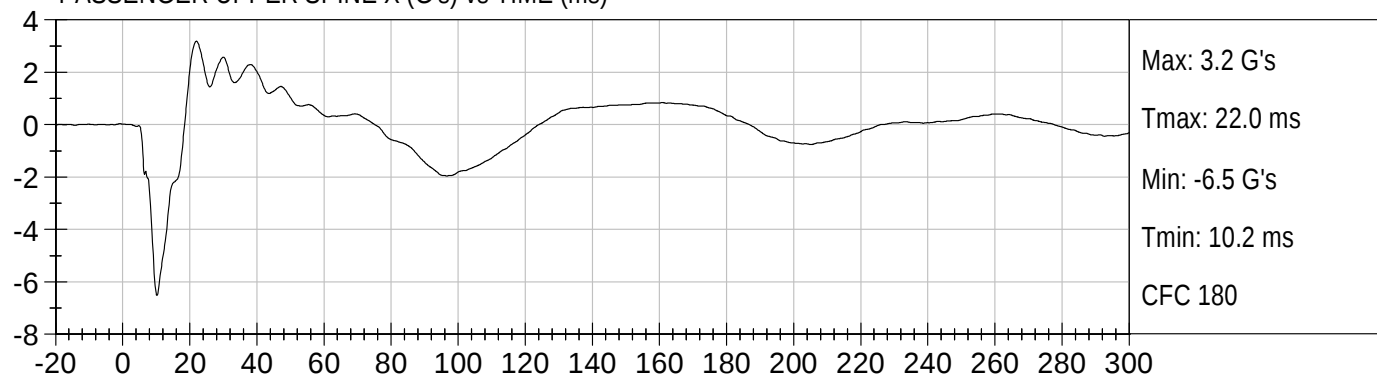


Max: 691.7 N  
Tmax: 7.6 ms  
Min: 0.1 N  
Tmin: 0.4 ms  
CFC 1000

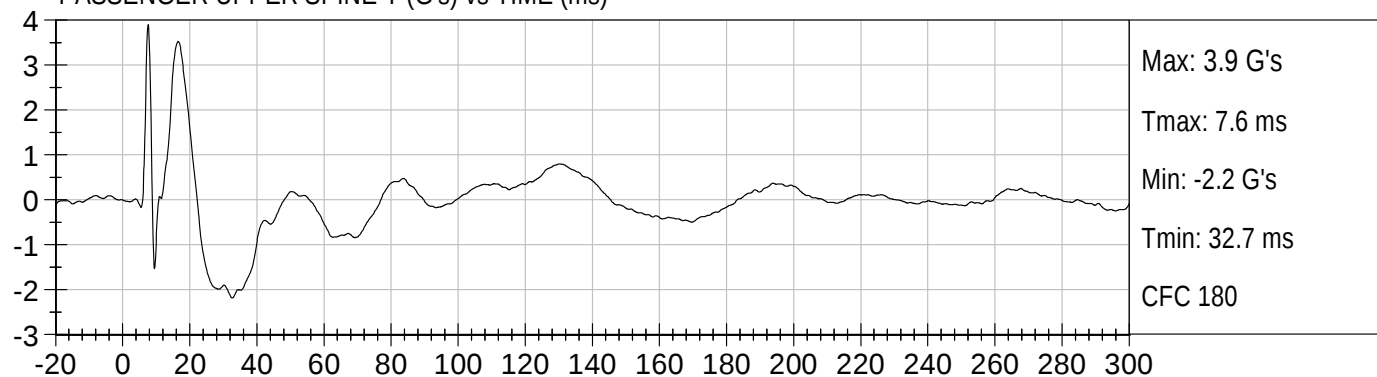




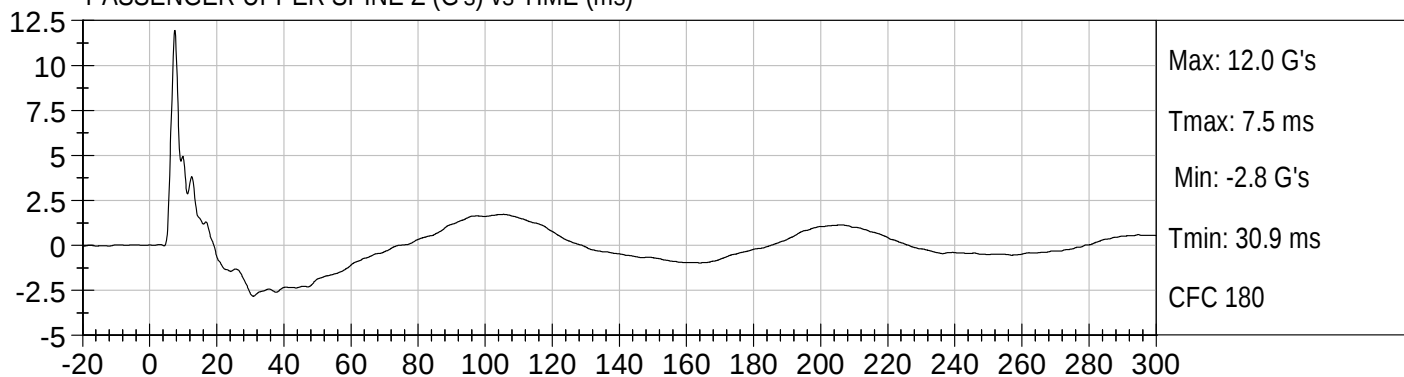
PASSENGER UPPER SPINE X (G's) vs TIME (ms)



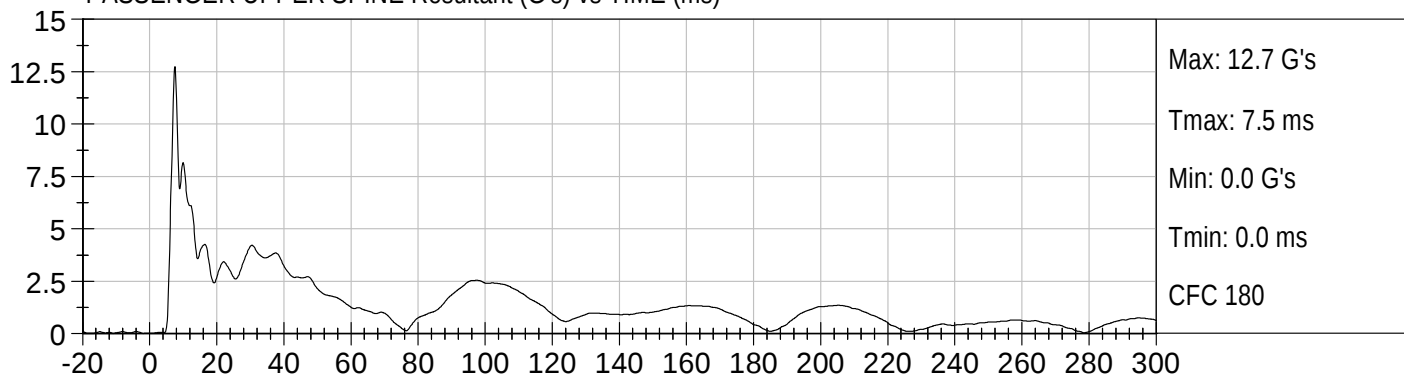
PASSENGER UPPER SPINE Y (G's) vs TIME (ms)



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

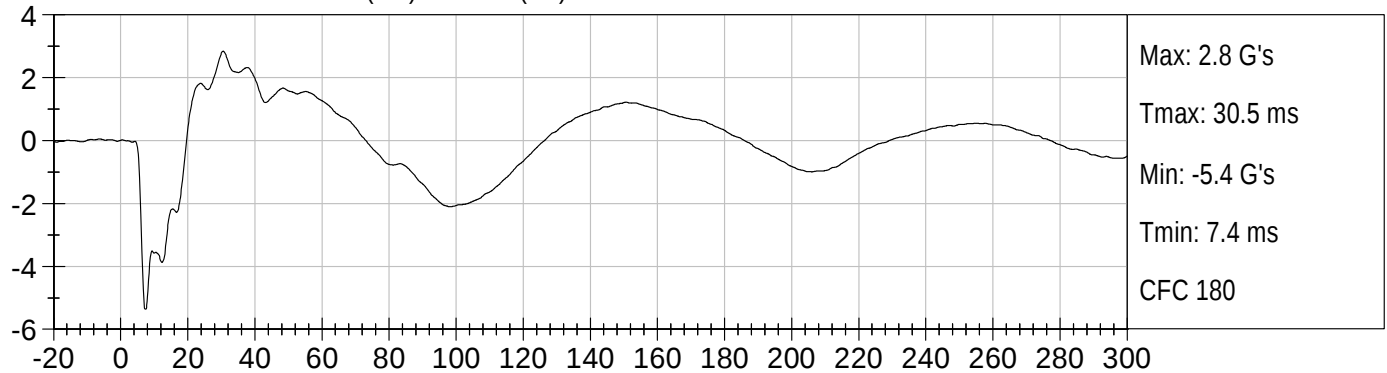


PASSENGER UPPER SPINE Resultant (G's) vs TIME (ms)

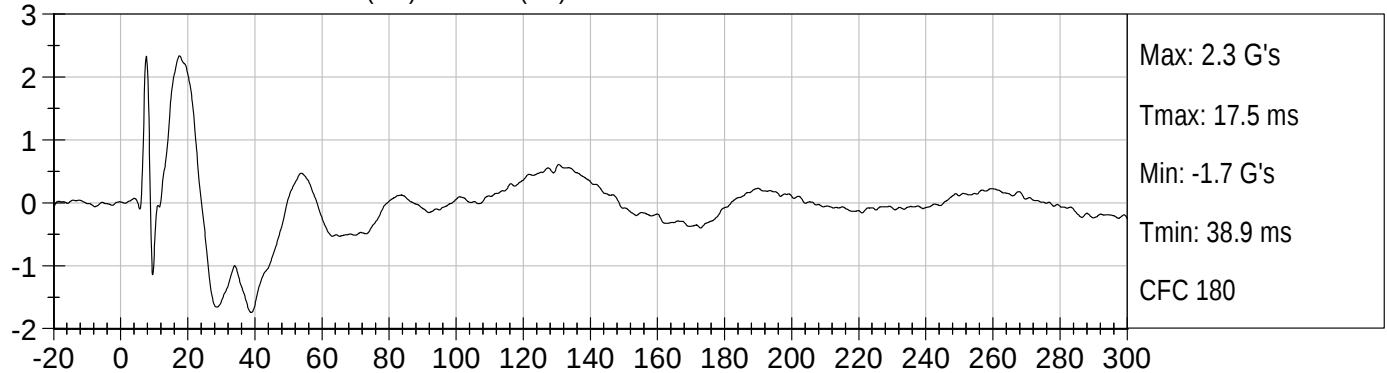




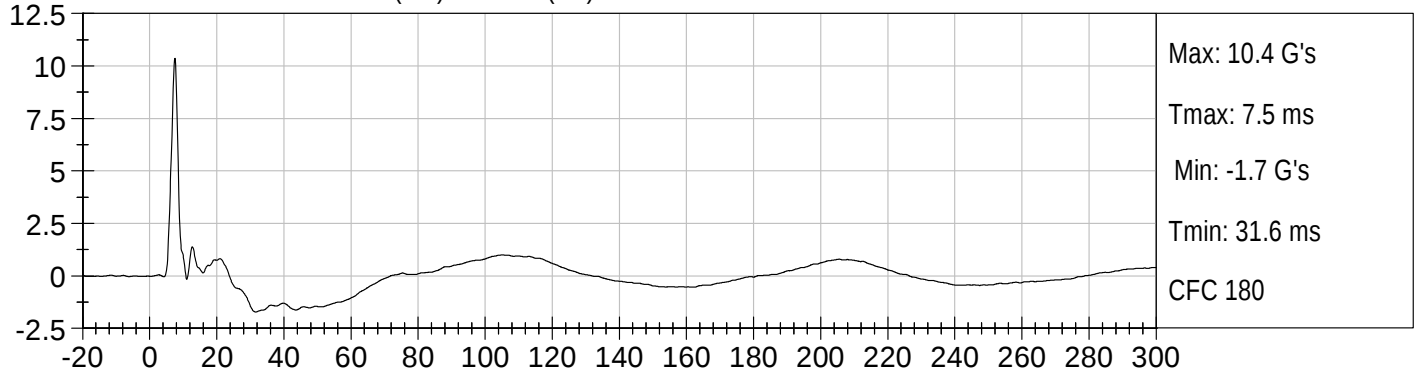
PASSENGER MID SPINE X (G's) vs TIME (ms)



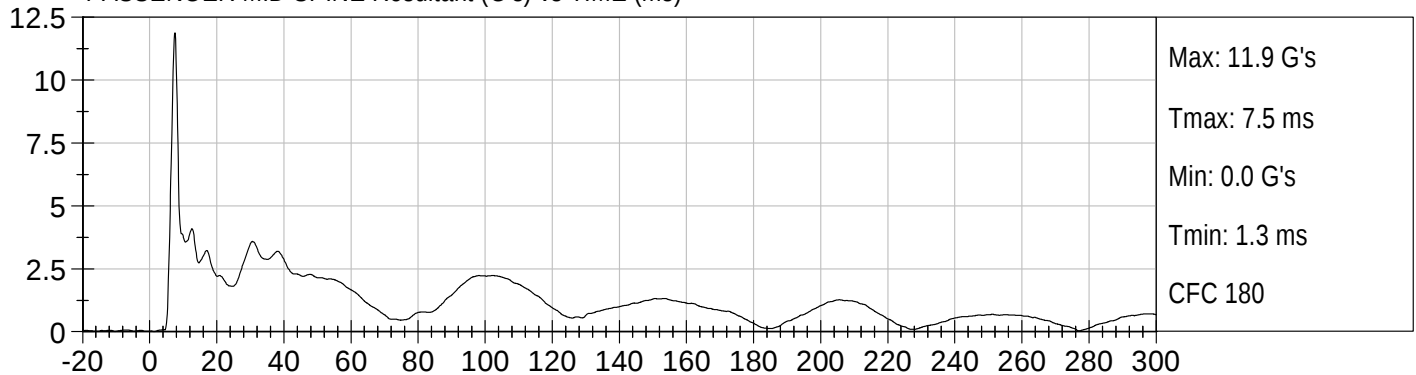
PASSENGER MID SPINE Y (G's) vs TIME (ms)



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

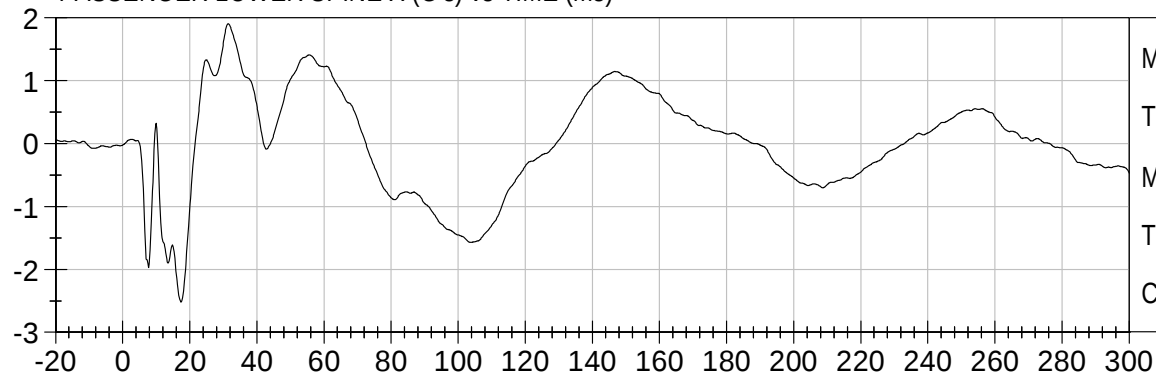


PASSENGER MID SPINE Resultant (G's) vs TIME (ms)



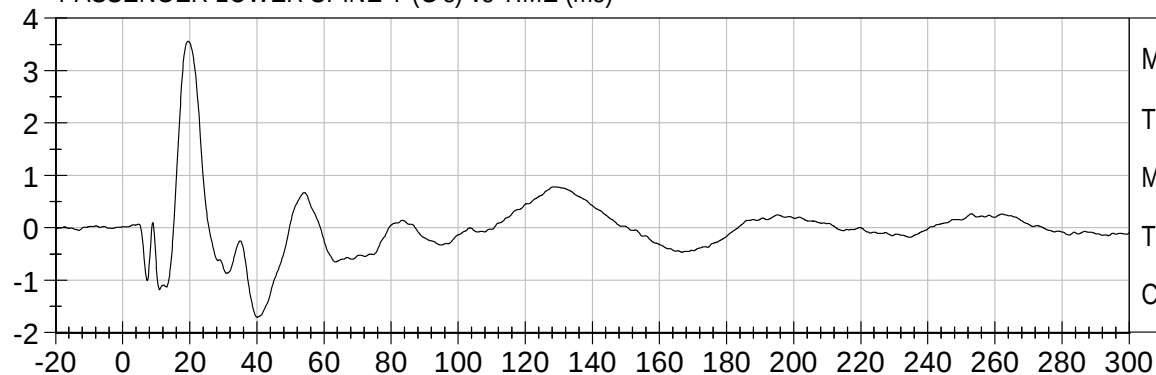


PASSENGER LOWER SPINE X (G's) vs TIME (ms)



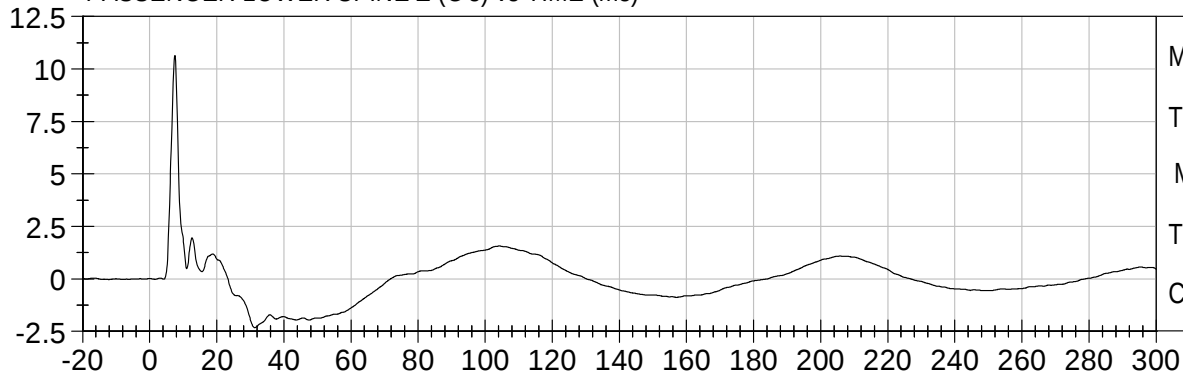
Max: 1.9 G's  
Tmax: 31.5 ms  
Min: -2.5 G's  
Tmin: 17.4 ms  
CFC 180

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



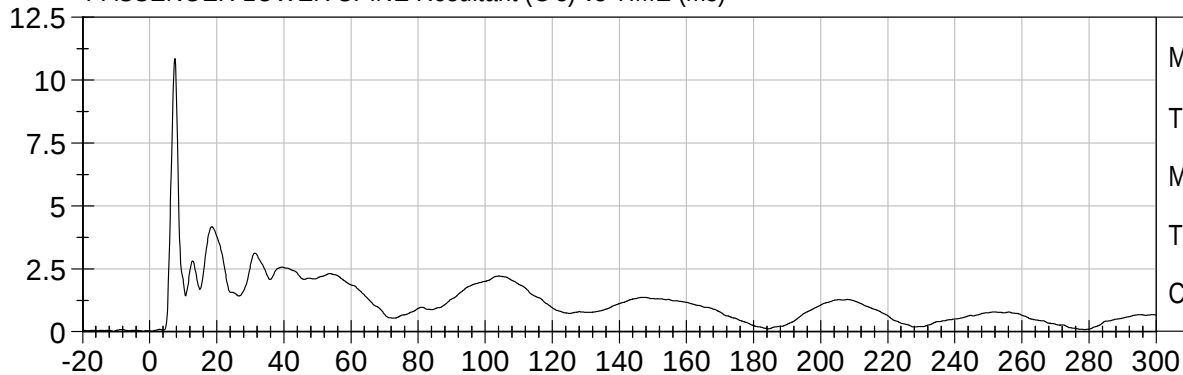
Max: 3.6 G's  
Tmax: 19.5 ms  
Min: -1.7 G's  
Tmin: 40.1 ms  
CFC 180

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



Max: 10.6 G's  
Tmax: 7.5 ms  
Min: -2.3 G's  
Tmin: 31.4 ms  
CFC 180

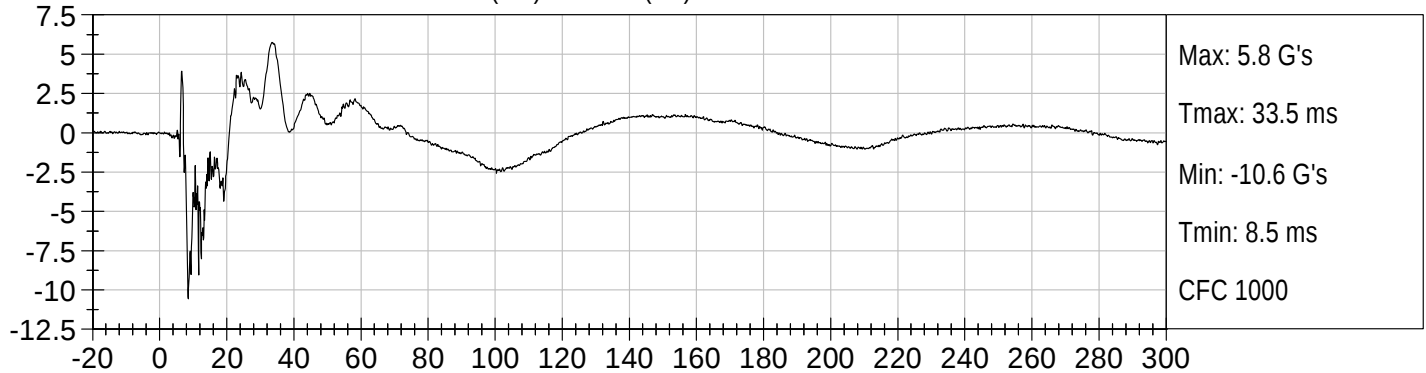
PASSENGER LOWER SPINE Resultant (G's) vs TIME (ms)



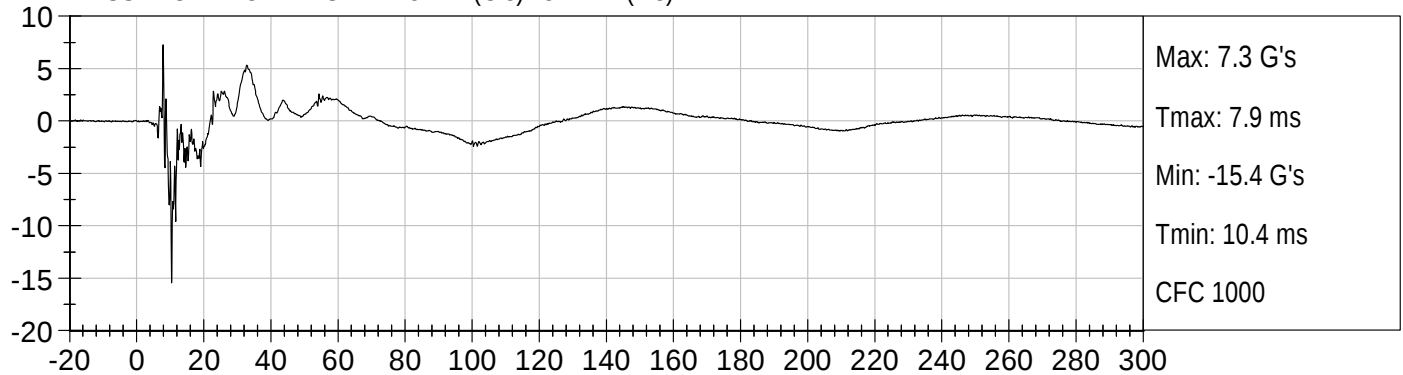
Max: 10.9 G's  
Tmax: 7.5 ms  
Min: 0.0 G's  
Tmin: 0.0 ms  
CFC 180



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



PASSENGER LOWER STERNUM X (G's) vs TIME (ms)



PASSENGER LOWER RIB @ SPINE X (G's) vs TIME (ms)

