

**REPORT NUMBER: SINCAP-MGA-2013-049**

**NEW CAR ASSESSMENT PROGRAM (NCAP)  
Moving Deformable Barrier Side Impact Test**

**FORD MOTOR COMPANY  
2013 Ford C-MAX Energi SEL 5-Dr Hatchback  
NHTSA No.: MD0210**

**MGA RESEARCH CORPORATION  
5000 Warren Road  
Burlington, WI 53105**



**Test Date: February 21, 2013**

**Final Report Date: March 19, 2013**

**FINAL REPORT**

**U.S. DEPARTMENT OF TRANSPORTATION  
National Highway Traffic Safety Administration  
Office of Crashworthiness Standards  
Mail Code: NVS-111  
1200 New Jersey Ave, SE  
Room W43-410  
Washington, DC 20590**

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Prepared by:   
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Approved by:   
Ben Fischer, Project Engineer

Approval Date: March 19, 2013

FINAL REPORT ACCEPTANCE BY OCWS:

\_\_\_\_\_  
Division Chief, New Car Assessment Program  
NHTSA, Office of Crashworthiness Standards

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

\_\_\_\_\_  
COTR, New Car Assessment Program  
NHTSA, Office of Crashworthiness Standards

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

### Technical Report Documentation Page

| 1. Report No.<br>SINCAP-MGA-2013-049                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 2. Government Accession No.                         | 3. Recipient's Catalog No.                                                                                                                                                                                                                                                                                             |           |                     |  |  |  |                         |       |           |        |                                           |     |      |     |                               |    |    |    |                       |   |      |     |                       |   |      |      |                         |  |  |  |                         |       |           |        |                                           |     |      |     |                                    |    |    |    |                                                            |   |      |      |                                 |    |     |    |                                |    |     |      |
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| 4. Title and Subtitle<br>Final Report of New Car Assessment Program<br>Side Impact MDB Testing of a 2013 Ford C-MAX Energi SEL<br>5-Dr Hatchback; NHTSA No.: MD0210                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                     | 5. Report Date<br>March 19, 2013                                                                                                                                                                                                                                                                                       |           |                     |  |  |  |                         |       |           |        |                                           |     |      |     |                               |    |    |    |                       |   |      |     |                       |   |      |      |                         |  |  |  |                         |       |           |        |                                           |     |      |     |                                    |    |    |    |                                                            |   |      |      |                                 |    |     |    |                                |    |     |      |
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| 7. Author(s)<br>Donna Janovicz, Project Manager<br>Ben Fischer, Project Engineer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                     | 8. Performing Organization Report No.<br>SINCAP-MGA-2013-049                                                                                                                                                                                                                                                           |           |                     |  |  |  |                         |       |           |        |                                           |     |      |     |                               |    |    |    |                       |   |      |     |                       |   |      |      |                         |  |  |  |                         |       |           |        |                                           |     |      |     |                                    |    |    |    |                                                            |   |      |      |                                 |    |     |    |                                |    |     |      |
| 9. Performing Organization Name and Address<br>MGA Research Corporation<br>5000 Warren Road<br>Burlington, WI 53105                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                     | 10. Work Unit No.                                                                                                                                                                                                                                                                                                      |           |                     |  |  |  |                         |       |           |        |                                           |     |      |     |                               |    |    |    |                       |   |      |     |                       |   |      |      |                         |  |  |  |                         |       |           |        |                                           |     |      |     |                                    |    |    |    |                                                            |   |      |      |                                 |    |     |    |                                |    |     |      |
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| 12. Sponsoring Agency Name and Address<br>U.S. Department of Transportation<br>National Highway Traffic Safety Administration<br>Office of Crashworthiness Standards (NVS-111)<br>1200 New Jersey Ave, SE, Room W43-410<br>Washington, D.C. 20590                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                     | 13. Type of Report and Period Covered:<br>Final Test Report<br>February 21, 2013 to March 19, 2013                                                                                                                                                                                                                     |           |                     |  |  |  |                         |       |           |        |                                           |     |      |     |                               |    |    |    |                       |   |      |     |                       |   |      |      |                         |  |  |  |                         |       |           |        |                                           |     |      |     |                                    |    |    |    |                                                            |   |      |      |                                 |    |     |    |                                |    |     |      |
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| 15. Supplementary Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                     |                                                                                                                                                                                                                                                                                                                        |           |                     |  |  |  |                         |       |           |        |                                           |     |      |     |                               |    |    |    |                       |   |      |     |                       |   |      |      |                         |  |  |  |                         |       |           |        |                                           |     |      |     |                                    |    |    |    |                                                            |   |      |      |                                 |    |     |    |                                |    |     |      |
| 16. Abstract<br>A 55/28 km/h 90° Moving Deformable Barrier NCAP Side Impact Test was conducted on the subject 2013 Ford C-MAX Energi SEL 5-Dr Hatchback in accordance with the specifications of the Office of Crashworthiness Standards NCAP Side Laboratory Test Procedure for the generation of consumer information on vehicle side crash protection. The test was conducted at MGA Research Corporation, in Burlington, Wisconsin, on February 21, 2013.<br><br>The impact velocity of the Moving Deformable Barrier (MDB) was 62.2 km/h, and the ambient temperature at the struck (driver's) side of the target vehicle at the time of impact was 21.6° C. The target vehicle post-test maximum crush was 184 mm at level 3. The test vehicle's performance was as follows: <div style="margin-top: 10px;"> <table border="1" style="margin: 10px auto; border-collapse: collapse; text-align: center;"> <thead> <tr> <th colspan="4">Driver ATD (ES-2re)</th> </tr> <tr> <th>Measurement Description</th> <th>Units</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC<sub>36</sub>)</td> <td>N/A</td> <td>1000</td> <td>100</td> </tr> <tr> <td>Maximum Thorax Rib Deflection</td> <td>mm</td> <td>44</td> <td>31</td> </tr> <tr> <td>Total Abdominal Force</td> <td>N</td> <td>2500</td> <td>962</td> </tr> <tr> <td>Pubic Symphysis Force</td> <td>N</td> <td>6000</td> <td>1336</td> </tr> </tbody> </table> <br/> <table border="1" style="margin: 10px auto; border-collapse: collapse; text-align: center;"> <thead> <tr> <th colspan="4">Passenger ATD (SID-IIs)</th> </tr> <tr> <th>Measurement Description</th> <th>Units</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC<sub>36</sub>)</td> <td>N/A</td> <td>1000</td> <td>170</td> </tr> <tr> <td>Resultant Lower Spine Acceleration</td> <td>Gs</td> <td>82</td> <td>56</td> </tr> <tr> <td>Total Pelvic Force<br/>(sum of acetabular and iliac forces)</td> <td>N</td> <td>5525</td> <td>3326</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td>mm</td> <td>38*</td> <td>26</td> </tr> <tr> <td>Maximum Abdomen Rib Deflection</td> <td>mm</td> <td>45*</td> <td>17**</td> </tr> </tbody> </table> </div> |                                                     |                                                                                                                                                                                                                                                                                                                        |           | Driver ATD (ES-2re) |  |  |  | Measurement Description | Units | Threshold | Result | Head Injury Criteria (HIC <sub>36</sub> ) | N/A | 1000 | 100 | Maximum Thorax Rib Deflection | mm | 44 | 31 | Total Abdominal Force | N | 2500 | 962 | Pubic Symphysis Force | N | 6000 | 1336 | Passenger ATD (SID-IIs) |  |  |  | Measurement Description | Units | Threshold | Result | Head Injury Criteria (HIC <sub>36</sub> ) | N/A | 1000 | 170 | Resultant Lower Spine Acceleration | Gs | 82 | 56 | Total Pelvic Force<br>(sum of acetabular and iliac forces) | N | 5525 | 3326 | Maximum Thoracic Rib Deflection | mm | 38* | 26 | Maximum Abdomen Rib Deflection | mm | 45* | 17** |
| Driver ATD (ES-2re)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                     |                                                                                                                                                                                                                                                                                                                        |           |                     |  |  |  |                         |       |           |        |                                           |     |      |     |                               |    |    |    |                       |   |      |     |                       |   |      |      |                         |  |  |  |                         |       |           |        |                                           |     |      |     |                                    |    |    |    |                                                            |   |      |      |                                 |    |     |    |                                |    |     |      |
| Measurement Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Units                                               | Threshold                                                                                                                                                                                                                                                                                                              | Result    |                     |  |  |  |                         |       |           |        |                                           |     |      |     |                               |    |    |    |                       |   |      |     |                       |   |      |      |                         |  |  |  |                         |       |           |        |                                           |     |      |     |                                    |    |    |    |                                                            |   |      |      |                                 |    |     |    |                                |    |     |      |
| Head Injury Criteria (HIC <sub>36</sub> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | N/A                                                 | 1000                                                                                                                                                                                                                                                                                                                   | 100       |                     |  |  |  |                         |       |           |        |                                           |     |      |     |                               |    |    |    |                       |   |      |     |                       |   |      |      |                         |  |  |  |                         |       |           |        |                                           |     |      |     |                                    |    |    |    |                                                            |   |      |      |                                 |    |     |    |                                |    |     |      |
| Maximum Thorax Rib Deflection                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | mm                                                  | 44                                                                                                                                                                                                                                                                                                                     | 31        |                     |  |  |  |                         |       |           |        |                                           |     |      |     |                               |    |    |    |                       |   |      |     |                       |   |      |      |                         |  |  |  |                         |       |           |        |                                           |     |      |     |                                    |    |    |    |                                                            |   |      |      |                                 |    |     |    |                                |    |     |      |
| Total Abdominal Force                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | N                                                   | 2500                                                                                                                                                                                                                                                                                                                   | 962       |                     |  |  |  |                         |       |           |        |                                           |     |      |     |                               |    |    |    |                       |   |      |     |                       |   |      |      |                         |  |  |  |                         |       |           |        |                                           |     |      |     |                                    |    |    |    |                                                            |   |      |      |                                 |    |     |    |                                |    |     |      |
| Pubic Symphysis Force                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | N                                                   | 6000                                                                                                                                                                                                                                                                                                                   | 1336      |                     |  |  |  |                         |       |           |        |                                           |     |      |     |                               |    |    |    |                       |   |      |     |                       |   |      |      |                         |  |  |  |                         |       |           |        |                                           |     |      |     |                                    |    |    |    |                                                            |   |      |      |                                 |    |     |    |                                |    |     |      |
| Passenger ATD (SID-IIs)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                     |                                                                                                                                                                                                                                                                                                                        |           |                     |  |  |  |                         |       |           |        |                                           |     |      |     |                               |    |    |    |                       |   |      |     |                       |   |      |      |                         |  |  |  |                         |       |           |        |                                           |     |      |     |                                    |    |    |    |                                                            |   |      |      |                                 |    |     |    |                                |    |     |      |
| Measurement Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Units                                               | Threshold                                                                                                                                                                                                                                                                                                              | Result    |                     |  |  |  |                         |       |           |        |                                           |     |      |     |                               |    |    |    |                       |   |      |     |                       |   |      |      |                         |  |  |  |                         |       |           |        |                                           |     |      |     |                                    |    |    |    |                                                            |   |      |      |                                 |    |     |    |                                |    |     |      |
| Head Injury Criteria (HIC <sub>36</sub> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | N/A                                                 | 1000                                                                                                                                                                                                                                                                                                                   | 170       |                     |  |  |  |                         |       |           |        |                                           |     |      |     |                               |    |    |    |                       |   |      |     |                       |   |      |      |                         |  |  |  |                         |       |           |        |                                           |     |      |     |                                    |    |    |    |                                                            |   |      |      |                                 |    |     |    |                                |    |     |      |
| Resultant Lower Spine Acceleration                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Gs                                                  | 82                                                                                                                                                                                                                                                                                                                     | 56        |                     |  |  |  |                         |       |           |        |                                           |     |      |     |                               |    |    |    |                       |   |      |     |                       |   |      |      |                         |  |  |  |                         |       |           |        |                                           |     |      |     |                                    |    |    |    |                                                            |   |      |      |                                 |    |     |    |                                |    |     |      |
| Total Pelvic Force<br>(sum of acetabular and iliac forces)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | N                                                   | 5525                                                                                                                                                                                                                                                                                                                   | 3326      |                     |  |  |  |                         |       |           |        |                                           |     |      |     |                               |    |    |    |                       |   |      |     |                       |   |      |      |                         |  |  |  |                         |       |           |        |                                           |     |      |     |                                    |    |    |    |                                                            |   |      |      |                                 |    |     |    |                                |    |     |      |
| Maximum Thoracic Rib Deflection                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | mm                                                  | 38*                                                                                                                                                                                                                                                                                                                    | 26        |                     |  |  |  |                         |       |           |        |                                           |     |      |     |                               |    |    |    |                       |   |      |     |                       |   |      |      |                         |  |  |  |                         |       |           |        |                                           |     |      |     |                                    |    |    |    |                                                            |   |      |      |                                 |    |     |    |                                |    |     |      |
| Maximum Abdomen Rib Deflection                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | mm                                                  | 45*                                                                                                                                                                                                                                                                                                                    | 17**      |                     |  |  |  |                         |       |           |        |                                           |     |      |     |                               |    |    |    |                       |   |      |     |                       |   |      |      |                         |  |  |  |                         |       |           |        |                                           |     |      |     |                                    |    |    |    |                                                            |   |      |      |                                 |    |     |    |                                |    |     |      |
| <p style="text-align: center;">*Proposed IARV      **Passenger Upper Abdominal Rib DY is questionable</p> <p>The two doors on the struck side of the vehicle did not separate from the body at the hinges. The latch became disengaged from the striker on the left rear door. The opposite doors did not open during the side impact event.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                     |                                                                                                                                                                                                                                                                                                                        |           |                     |  |  |  |                         |       |           |        |                                           |     |      |     |                               |    |    |    |                       |   |      |     |                       |   |      |      |                         |  |  |  |                         |       |           |        |                                           |     |      |     |                                    |    |    |    |                                                            |   |      |      |                                 |    |     |    |                                |    |     |      |
| 17. Key Words<br>New Car Assessment Program (NCAP)<br>Side Impact<br>MDB<br>ES-2re<br>SID-IIs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                     | 18. Distribution Statement<br>Copies of this report are available from:<br>National Highway Traffic Safety Administration<br>Technical Information Services Division, NPO-411<br>1200 New Jersey Ave, SE<br>Washington, DC 20590<br>e-mail: <a href="mailto:tis@nhtsa.dot.gov">tis@nhtsa.dot.gov</a> FAX: 202-493-2833 |           |                     |  |  |  |                         |       |           |        |                                           |     |      |     |                               |    |    |    |                       |   |      |     |                       |   |      |      |                         |  |  |  |                         |       |           |        |                                           |     |      |     |                                    |    |    |    |                                                            |   |      |      |                                 |    |     |    |                                |    |     |      |
| 19. Security Classification of Report<br>Unclassified                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 20. Security Classification of Page<br>Unclassified | 21. No. of Pages<br><br>224                                                                                                                                                                                                                                                                                            | 22. Price |                     |  |  |  |                         |       |           |        |                                           |     |      |     |                               |    |    |    |                       |   |      |     |                       |   |      |      |                         |  |  |  |                         |       |           |        |                                           |     |      |     |                                    |    |    |    |                                                            |   |      |      |                                 |    |     |    |                                |    |     |      |

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| D                         | Test Equipment and Instrumentation Calibration Data             | D                   |

## **SECTION 1**

### **TEST PURPOSE AND PROCEDURE**

This moving deformable barrier side impact test is part of the MY 2013 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. DTNH22-09-D-00124. The purpose of this test is to generate comparative side impact performance in a 2013 Ford C-MAX Energi SEL 5-Dr Hatchback. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Side NCAP Laboratory Test Procedure dated September 2012.

## SECTION 2 SUMMARY OF TEST RESULTS

A 2013 Ford C-MAX Energi SEL 5-Dr Hatchback was impacted on the left (driver's) side by a Moving Deformable Barrier (MDB) which was moving forward in a 27° crabbed position to the tow road guidance system at a velocity of 62.2 km/h. The target vehicle was stationary and was positioned at an angle of 63° to the line of forward motion. The side impact test was conducted by MGA Research Corporation in Burlington, Wisconsin, on February 21, 2013. Pretest and post test photographs of the test vehicle, the MDB, and the dummies (ES-2re and SID-IIs) are included in this report.

Dummies were placed in the driver and left rear designated seating positions according to instructions specified in the OCWS NCAP Side Laboratory Test Procedure dated September 2012. The side impact event was documented by eleven (11) cameras. Camera locations are included in this report.

The dummies were instrumented in the following manner:

### DRIVER ATD (ES-2re)

Primary and Redundant Head CG Triaxial Accelerometers

Head 9-Axis Accelerometers

Chest Upper Rib, Middle Rib, and Lower Rib Y-Axis Displacement Potentiometers

Abdomen Forward, Middle, and Rear Y-Axis Load Cells

Lower Spine (T12) Triaxial Accelerometers

Pubic Symphysis Y-Axis Load Cell

### PASSENGER ATD (SID-IIs)

Primary and Redundant Head CG Triaxial Accelerometers

Head 9-Axis Accelerometers

Chest Upper Rib, Middle Rib, and Lower Rib Y-Axis Displacement Potentiometers

Abdomen Upper Rib and Lower Rib Y-Axis Displacement Potentiometers

Lower Spine (T12) Triaxial Accelerometers

Acetabulum and Iliac Wing Y-Axis Load Cells

Appendix B contains the dummy response data. Dummy configuration and performance verification data can be found in Appendix C of this report. Appendix D contains the test equipment and instrumentation calibration data.

Dummy Injury readings were recorded as follows:

### DUMMY INJURY VALUES

| Driver ATD (ES-2re)                       |       |           |        |
|-------------------------------------------|-------|-----------|--------|
| Measurement Description                   | Units | Threshold | Result |
| Head Injury Criteria (HIC <sub>36</sub> ) | N/A   | 1000      | 100    |
| Maximum Thorax Rib Deflection             | mm    | 44        | 31     |
| Total Abdominal Force                     | N     | 2500      | 962    |
| Pubic Symphysis Force                     | N     | 6000      | 1336   |

| Passenger ATD (SID-IIs)                   |       |           |        |
|-------------------------------------------|-------|-----------|--------|
| Measurement Description                   | Units | Threshold | Result |
| Head Injury Criteria (HIC <sub>36</sub> ) | N/A   | 1000      | 170    |
| Resultant Lower Spine Acceleration        | Gs    | 82        | 56     |
| Total Pelvic Force                        | N     | 5525      | 3326   |
| Maximum Thoracic Rib Deflection           | mm    | 38*       | 26     |
| Maximum Abdomen Rib Deflection            | mm    | 45*       | 17**   |

\*Proposed IARV

\*\*Passenger Upper Abdominal Rib DY is questionable

Supplemental restraint information is given below:

#### **SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION**

| Restraint Type                   | Struck Side Driver |          | Struck Side Rear Passenger |          |
|----------------------------------|--------------------|----------|----------------------------|----------|
|                                  | Mounted            | Deployed | Mounted                    | Deployed |
| Frontal Airbag                   | Yes                | No       |                            |          |
| Knee Airbag                      | Yes                | No       |                            |          |
| Side Curtain Airbag              | Yes                | Yes      | Yes                        | Yes      |
| Side Torso/Abdomen/Pelvis Airbag | Yes                | Yes      | No                         |          |
| Seat Belt Pretensioner           | Yes                | Yes      | No                         |          |
| Seat Belt Load Limiter           | Yes                | Yes      | No                         |          |
| Other                            |                    |          |                            |          |

The test data can be found on the NHTSA website at [www.nhtsa.dot.gov](http://www.nhtsa.dot.gov)

#### **GENERAL COMMENTS**

There was no valid data collected for:

Left Lower B-Post Y after 4ms

MDB Rear X after 61ms

MDB Rear Y after 61ms

Passenger Upper Abdominal Rib DY is questionable

The left rear door latch became disengaged from the striker.  
See photos on pages A-55 and A-56.

MGA does not endorse or certify products. The manufacturer's name appears solely for identification purposes.

**SECTION 3**  
**OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS**

**DATA SHEET NO. 1**  
**GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2013 Ford C-MAX Energi SEL 5-Dr Hatchback  
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MD0210  
 Test Date: 2/21/2013

**TEST VEHICLE INFORMATION AND OPTIONS**

|                          |                       |                                   |     |
|--------------------------|-----------------------|-----------------------------------|-----|
| NHTSA No.                | MD0210                | Traction Control System (TCS)     | Yes |
| Model Year               | 2013                  | Auto-Leveling System              | No  |
| Make                     | Ford                  | Automatic Door Locks (ADL)        | Yes |
| Model                    | C-MAX Energi          | Power Window Auto-Reverse         | Yes |
| Body Style               | 5-Dr Hatchback        | Other Optional Feature            | N/A |
| VIN                      | 1FADP5CU1DL520579     | Driver Front Airbag               | Yes |
| Body Color               | Ingot Silver Metallic | Driver Curtain Airbag             | Yes |
| Odometer Reading (km/mi) | 13 / 8                | Driver Head/Torso Airbag          | No  |
| Engine Displacement (L)  | 2.0                   | Driver Torso Airbag               | No  |
| Type/No. Cylinders       | 4                     | Driver Torso/Pelvis Airbag        | Yes |
| Engine Placement         | Lateral               | Driver Pelvis Airbag              | No  |
| Transmission Type        | Automatic             | Driver Knee Airbag                | Yes |
| Transmission Speeds      | CVT                   | Rear Pass. Curtain Airbag         | Yes |
| Overdrive                | NA                    | Rear Pass. Head/Torso Airbag      | No  |
| Final Drive              | Front                 | Rear Pass. Torso Airbag           | No  |
| Roof Rack                | No                    | Rear Pass. Torso/Pelvis Airbag    | No  |
| Sunroof/T-Top            | No                    | Rear Pass. Pelvis Airbag          | No  |
| Running Boards           | No                    | Driver Seat Belt Pretensioner     | Yes |
| Tilt Steering Wheel      | Yes                   | Rear Pass. Seat Belt Pretensioner | No  |
| Power Seats              | Yes – Driver Only     | Driver Load Limiter               | Yes |
| Anti-Lock Brakes (ABS)   | Yes                   | Rear Pass. Load Limiter           | No  |
|                          |                       | Other Safety Restraint            | N/A |

|                                                                           |     |
|---------------------------------------------------------------------------|-----|
| Does owner's manual provide instruction to turn off automatic door locks? | Yes |
|---------------------------------------------------------------------------|-----|

**DATA FROM CERTIFICATION LABEL**

|                     |                    |                 |      |
|---------------------|--------------------|-----------------|------|
| Manufactured By     | Ford Motor Company | GVWR (kg)       | 2250 |
| Date of Manufacture | 01/13              | GAWR Front (kg) | 1119 |
| Vehicle Type        | Passenger Car      | GAWR Rear (kg)  | 1131 |

**VEHICLE SEATING AND WEIGHT CAPACITY DATA**

| Measured Parameter                    | Front | Rear | Third | Total |       |
|---------------------------------------|-------|------|-------|-------|-------|
| Designated Seating Capacity (DSC)     | 2     | 3    |       | 5     | (A)   |
| Capacity Weight (VCW) (kg)            |       |      |       | 374   | (B)   |
| DSC x 68.04 kg                        |       |      |       | 340   | (A-B) |
| Rated Cargo and Luggage Weight (RCLW) |       |      |       | 34    |       |

**VEHICLE SEAT TYPE**

| Seating Location   | Type of Seat Pan |       |             |           | Type of Seat Back |            |       |
|--------------------|------------------|-------|-------------|-----------|-------------------|------------|-------|
|                    | Bucket           | Bench | Split Bench | Contoured | Fixed             | Adjustable |       |
|                    |                  |       |             |           |                   | Manual     | Power |
| Front Seat         | X                |       |             |           |                   |            | X     |
| Rear or Second Row |                  |       | X           |           |                   | w/lever    |       |
| Third Row Seat     |                  |       |             |           |                   |            |       |

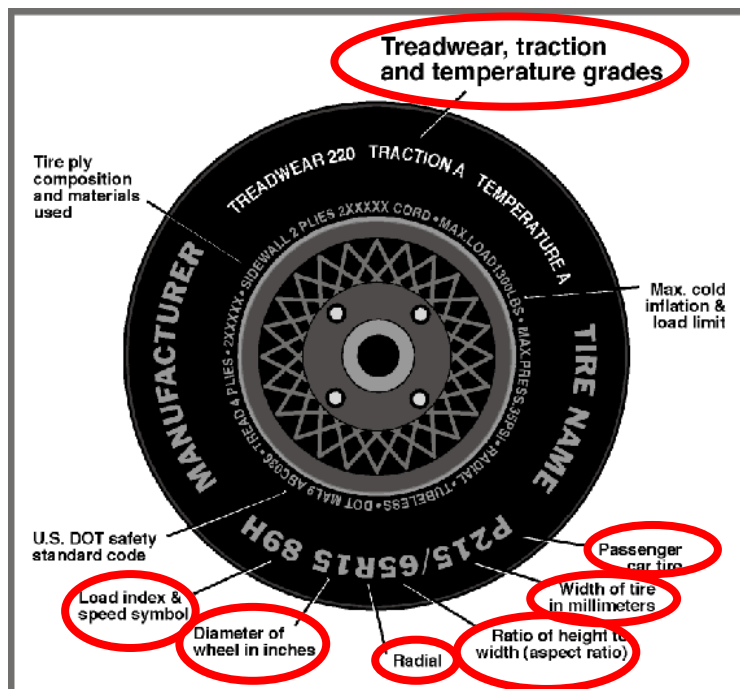
## DATA SHEET NO. 1 (CONTINUED)

### GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2013 Ford C-MAX Energi SEL 5-Dr Hatchback  
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MD0210  
 Test Date: 2/21/2013

### VEHICLE TIRE INFORMATION



| Measured Parameter       | Front                             | Rear                              |
|--------------------------|-----------------------------------|-----------------------------------|
| Max. Tire Pressure (kPa) | 350                               | 350                               |
| Cold Pressure (kPa)      | 260                               | 260                               |
| Recommended Tire Size    | P225/50R17                        | P225/50R17                        |
| Tire Size on Vehicle     | P225/50R17                        | P225/50R17                        |
| Tire Manufacturer        | Michelin                          | Michelin                          |
| Tire Model               | Energy Saver A/S                  | Energy Saver A/S                  |
| Treadwear                | 480                               | 480                               |
| Traction                 | A                                 | A                                 |
| Temperature Grade        | A                                 | A                                 |
| Tire Plies Sidewall      | 1 polyester                       | 1 polyester                       |
| Tire Plies Body          | 1 polyester, 1 polyamide, 2 steel | 1 polyester, 1 polyamide, 2 steel |
| Load Index/Speed Symbol  | 93V                               | 93V                               |
| Tire Material            | Rubber                            | Rubber                            |
| DOT Safety Code Left     | B90A 00NX 4612                    | B90A 00NX 4612                    |
| DOT Safety Code Right    | B90A 00NX 4612                    | B90A 00NX 4612                    |

**DATA SHEET NO. 1 (CONTINUED)**  
**GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2013 Ford C-MAX Energi SEL 5-Dr Hatchback  
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MD0210  
 Test Date: 2/21/2013

**TEST PRESSURES**

|                | Units | LF  | RF  | LR  | RR  |
|----------------|-------|-----|-----|-----|-----|
| As Delivered   | kpa   | 260 | 260 | 260 | 260 |
| Tire Placard   | kpa   | 260 | 260 | 260 | 260 |
| Owner's Manual | kpa   |     |     |     |     |
| As Tested      | kpa   | 260 | 260 | 260 | 260 |

**MDB TIRE SPECIFICATIONS**

|           | Requirement | Units | LF         | RF         | LR         | RR         |
|-----------|-------------|-------|------------|------------|------------|------------|
| Tire Size | P205/75R15  | N/A   | P205/75R15 | P205/75R15 | P205/75R15 | P205/75R15 |
| Tire      | 200 ± 21    | kPa   | 200        | 200        | 200        | 200        |

**TEST VEHICLE AXLE WEIGHTS**

|        | Units | As Delivered (UVW) |       |        | As Tested (ATW) |       |        | Fully Loaded |       |        |
|--------|-------|--------------------|-------|--------|-----------------|-------|--------|--------------|-------|--------|
|        |       | Front              | Rear  | Total  | Front           | Rear  | Total  | Front        | Rear  | Total  |
| Left   | kg    | 495.3              | 402.8 |        | 538.0           | 465.4 |        | 541.2        | 474.0 |        |
| Right  | kg    | 475.0              | 396.4 |        | 485.3           | 437.3 |        | 477.6        | 440.0 |        |
| Ratio  | %     | 54.8               | 45.2  |        | 53.1            | 46.9  |        | 52.7         | 47.3  |        |
| Totals | kg    | 970.3              | 799.2 | 1769.5 | 1023.3          | 902.7 | 1926.0 | 1018.8       | 914.0 | 1932.8 |

**TARGET TEST WEIGHT CALCULATION**

| Measured Parameter                       | Units | Value  |         |
|------------------------------------------|-------|--------|---------|
| Total Delivered Weight (UVW)             | kg    | 1769.5 | (A)     |
| Sum of Actual Weight of 2 P572 ATDs Used | kg    | 129.3  | (B)     |
| Rated Cargo/Luggage Weight (RCLW)        | kg    | 34     | (C)     |
| Calculated Vehicle Target Weight (TVTW)  | kg    | 1932.8 | (A+B+C) |

Does the measured As Tested Vehicle Weight lie within the required weight range (i.e. Calculated Test Vehicle Target Weight – 4.5 kg to 9 kg)? **YES**

**TEST VEHICLE ATTITUDES AND CG**

|                                                                | Units | Fully Loaded | As Tested | Meets Requirement*** |
|----------------------------------------------------------------|-------|--------------|-----------|----------------------|
| Left Front                                                     | mm    | 671          | 668       | Yes                  |
| Right Front                                                    | mm    | 677          | 672       | Yes                  |
| Right Rear                                                     | mm    | 688          | 683       | Yes                  |
| Left Rear                                                      | mm    | 673          | 682       | Yes                  |
| Vehicle CG (Aft of Front Axle)                                 | mm    | 1252         | 1241      |                      |
| Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline) | mm    | 39           | 32        |                      |

\*\*\* The "As Tested" vehicle attitude measurements must be equal to or within ± 10 mm of the "Fully Loaded" vehicle attitude measurements at each wheel well.

**DATA SHEET NO. 1 (CONTINUED)**  
**GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2013 Ford C-MAX Energi SEL 5-Dr Hatchback

NHTSA No. MD0210

Test Program: NCAP Side MDB Impact Test

Test Date: 2/21/2013

**WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW**

| Component Description                                                                                                                                                | Weight (kg) |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| Weight of Ballast, if any                                                                                                                                            | 0.0         |
| Vehicle charging cable, right c-pillar vent, rear headrests, right side mirror, cargo cover/carpet/net/divider, right taillight, jack & tool kit, underbody plastic. | 19.1        |

**DATA SHEET NO. 2**  
**SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEM DATA**

Test Vehicle: 2013 Ford C-MAX Energi SEL 5-Dr Hatchback  
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MD0210  
 Test Date: 2/21/2013

**SEAT POSITIONING**

The driver's seat, front center seat (if applicable), and right front passenger's seat should be set to the mid-track, lowest, mid-angle position. The struck-side rear passenger's seat, rear center seat, and non-struck side rear passenger's seats should be set to the rear-most, lowest, mid-angle position.

**SCRL ANGLE RANGE**

| Seat                      | SCRL (°) |       |       |
|---------------------------|----------|-------|-------|
|                           | Max      | Min   | Mid   |
| Driver Seat               | 19.1     | 8.1   | 13.6  |
| Front Passenger Seat      | Fixed    | Fixed | Fixed |
| Front Center Seat         |          |       |       |
| Struck Side Rear Seat     | Fixed    | Fixed | Fixed |
| Non-Struck Side Rear Seat | Fixed    | Fixed | Fixed |
| Rear Center Seat          | Fixed    | Fixed | Fixed |

**SEAT HEIGHT AND ANGLE**

| Seat                         | As Tested<br>SCRL Angle<br>(Mid) (°) | As Tested<br>SCR Height<br>(mm) | SCR Height<br>Position | SCR Height (mm) |                  |                  |
|------------------------------|--------------------------------------|---------------------------------|------------------------|-----------------|------------------|------------------|
|                              |                                      |                                 |                        | Rear-<br>most   | Mid-<br>Fore/Aft | Forward-<br>Most |
| Driver Seat                  | 13.6                                 | 0                               | Max                    | 54              | 54               | 54               |
|                              | 13.6                                 | 0                               | Mid                    | 27              | 27               | 27               |
|                              | 13.6                                 | 0                               | Min                    | 0               | 0                | 0                |
| Front Passenger Seat         | Fixed                                | Fixed                           | Max                    | Fixed           | Fixed            | Fixed            |
|                              | Fixed                                | Fixed                           | Mid                    | Fixed           | Fixed            | Fixed            |
|                              | Fixed                                | Fixed                           | Min                    | Fixed           | Fixed            | Fixed            |
| Front Center Seat            |                                      |                                 | Max                    |                 |                  |                  |
|                              |                                      |                                 | Mid                    |                 |                  |                  |
|                              |                                      |                                 | Min                    |                 |                  |                  |
| Struck Side Rear Seat        | Fixed                                | Fixed                           | Max                    | Fixed           | Fixed            | Fixed            |
|                              | Fixed                                | Fixed                           | Mid                    | Fixed           | Fixed            | Fixed            |
|                              | Fixed                                | Fixed                           | Min                    | Fixed           | Fixed            | Fixed            |
| Non-Struck Side<br>Rear Seat | Fixed                                | Fixed                           | Max                    | Fixed           | Fixed            | Fixed            |
|                              | Fixed                                | Fixed                           | Mid                    | Fixed           | Fixed            | Fixed            |
|                              | Fixed                                | Fixed                           | Min                    | Fixed           | Fixed            | Fixed            |
| Rear Center Seat             | Fixed                                | Fixed                           | Max                    | Fixed           | Fixed            | Fixed            |
|                              | Fixed                                | Fixed                           | Mid                    | Fixed           | Fixed            | Fixed            |
|                              | Fixed                                | Fixed                           | Min                    | Fixed           | Fixed            | Fixed            |

**DATA SHEET NO. 2 (CONTINUED)**  
**SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEM DATA**

Test Vehicle: 2013 Ford C-MAX Energi SEL 5-Dr Hatchback  
 Test Program: NCAP Side MDB Impact Test

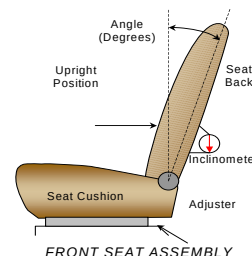
NHTSA No. MD0210  
 Test Date: 2/21/2013

**SEAT FORE/AFT POSITIONS**

| Seat                  | Total Fore/Aft Travel |                           | Test Position from Forward-most Position |                                         |
|-----------------------|-----------------------|---------------------------|------------------------------------------|-----------------------------------------|
|                       | mm                    | Detents                   | mm                                       | Detent                                  |
| Driver Seat           | 254                   |                           | 127                                      |                                         |
| Front Passenger Seat  | 270                   | 39 (1 <sup>st</sup> as 1) | 139                                      | 20 <sup>th</sup> (1 <sup>st</sup> as 0) |
| Front Center Seat     |                       |                           |                                          |                                         |
| Struck Side Rear Seat | Fixed                 | Fixed                     | Fixed                                    | Fixed                                   |
| Non-Struck Side       | Fixed                 | Fixed                     | Fixed                                    | Fixed                                   |
| Rear Center Seat      | Fixed                 | Fixed                     | Fixed                                    | Fixed                                   |

**SEAT BACK ANGLE ADJUSTMENT**

The driver's seat back is positioned to the manufacturer's designated design angle. The front passenger's seat back is positioned in a similar manner as the driver's seat back. The struck side rear seat back is fixed. The rear center and non-struck side rear outboard seat backs are also fixed.



| Seat                       | Total Seat Back Angle Range |         | Test Position from Vertical |                                         |
|----------------------------|-----------------------------|---------|-----------------------------|-----------------------------------------|
|                            | Degrees                     | Detents | Degrees                     | Detent                                  |
| Driver Seat w/Seated Dummy | 57.2                        |         | 4.2                         |                                         |
| Front Passenger Seat       | 50.3                        |         | 4.5                         | 10 <sup>th</sup> (1 <sup>st</sup> as 0) |
| Front Center Seat          |                             |         |                             |                                         |
| Struck Side Rear Seat      | Fixed                       | Fixed   | 9.5*                        | Fixed                                   |
| Non-Struck Side Rear Seat  | Fixed                       | Fixed   | 9.5*                        | Fixed                                   |
| Rear Center Seat           | Fixed                       | Fixed   | 9.5*                        | Fixed                                   |

\*Seat back was fixed, angle measured on headrest post.

## DATA SHEET NO. 2 (CONTINUED)

### SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEM DATA

Test Vehicle: 2013 Ford C-MAX Energi SEL 5-Dr Hatchback NHTSA No. MD0210  
 Test Program: NCAP Side MDB Impact Test Test Date: 2/21/2013

#### SEAT BELT ANCHORAGE ADJUSTMENT

Seat belt anchorages are adjusted in accordance with the information provided by the manufacturer on Form No. 1.

|             | Total # of Positions             | Placed in Position # |
|-------------|----------------------------------|----------------------|
| Driver Seat | 4 detents (1 <sup>st</sup> as 1) | 0 (uppermost as 0)   |
| Rear Seat   | Fixed                            | Not Applicable       |

#### HEAD RESTRAINT ADJUSTMENT

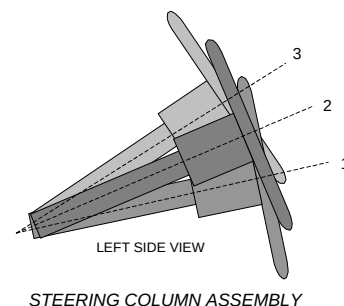
The driver's head restraint is adjusted to the highest and most full forward in-use position. The struck-side rear passenger's head restraint is adjusted to the lowest and most full forward in-use position.

|             | Total # of Positions | Placed in Position # |
|-------------|----------------------|----------------------|
| Driver Seat | 3                    | Highest/Full Forward |
| Rear Seat   | Fixed                | Not Applicable       |

#### STEERING COLUMN ADJUSTMENT

Steering wheel and column adjustments are made so that the steering wheel Ogeometric locus is described when it moves through its full range of motion.

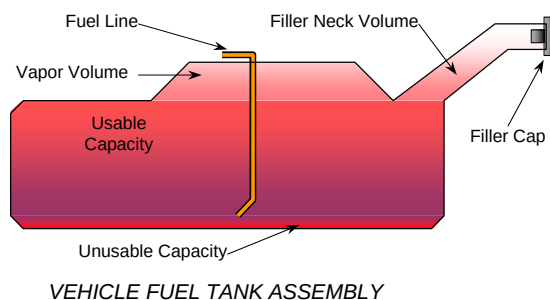
|                                   | Degrees | Fore/Aft Position (mm) |
|-----------------------------------|---------|------------------------|
| Lowermost, Position 1             | 66.5    | 214                    |
| Geometric Center, Position 2      | 63.5    | 189                    |
| Uppermost, Position 3             | 60.5    | 164                    |
| Telescoping Steering Wheel Travel |         | 50                     |
| Test Position                     | 63.5    | 189                    |



#### FUEL PUMP

Describe the fuel pump type, details about how it operates and the location of the fuel filler pipe.

The vehicle is equipped with an electric fuel pump. The electric fuel pump operates for a prescribed amount of time to pressurize the fuel system following the actuation of the ignition. If no attempt has been made to start the engine within 450ms following ignition operation, the fuel pump will shut off. The fuel pump operates continuously while the engine is running. If the engine stalls, the fuel pump is deactivated. Also, fuel pump shut-off is provided, which is designed to stop the fuel flow to the engine if the vehicle sustains an impact above a certain magnitude. The fuel pipe is on the right side.



**DATA SHEET NO. 2 (CONTINUED)**  
**SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEM DATA**

Test Vehicle: 2013 Ford C-MAX Energi SEL 5-Dr Hatchback      NHTSA No. MD0210  
 Test Program: NCAP Side MDB Impact Test      Test Date: 2/21/2013

**FUEL TANK CAPACITY DATA**

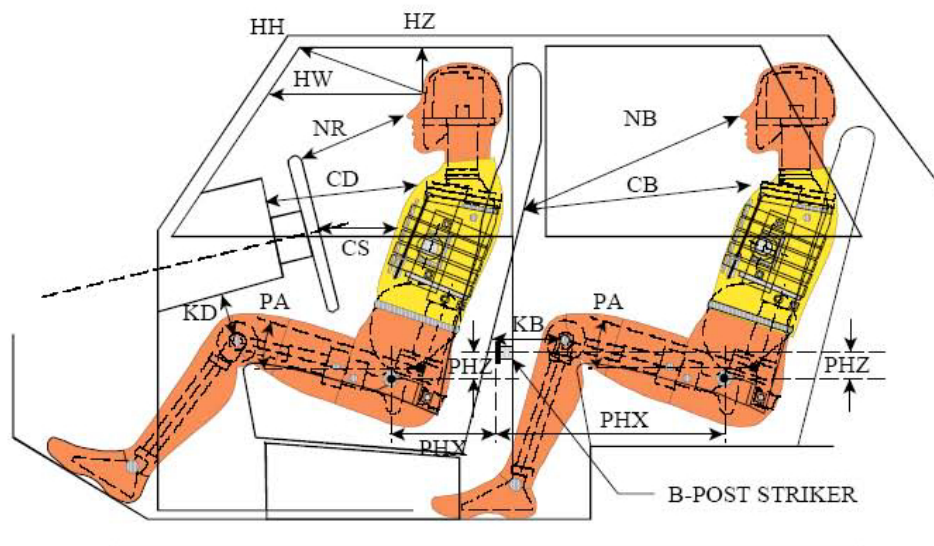
|                                                                 | Liters |
|-----------------------------------------------------------------|--------|
| Usable Capacity of "Standard" Tank (see Form No. 1)             | 51.1   |
| Usable Capacity of "Optional" Tank (see Form No. 1)             | 53.0   |
| Usable Capacity of Standard Tank as Specified in Owner's Manual | 51.1   |
| Usable Capacity of Optional Tank as Specified in Owner's Manual | 53.0   |
| 93% of Usable Capacity                                          | 49.3   |
| Actual Amount of Solvent Used                                   | 49.3   |
| 1/3 of Usable Capacity                                          | 17.7   |

Is the actual amount of solvent used in the test equal to 93%  $\pm$  1%  
 of the Usable Capacity stated in Form No. 1? **YES**

### DATA SHEET NO. 3 DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2013 Ford C-MAX Energi SEL 5-Dr Hatchback  
Test Program: NCAP Side MDB Impact Test

NHTSA No. MD0210  
Test Date: 2/21/2013



**LEFT SIDE VIEW**

NOTE: 2-DOOR VEHICLE SHOWN.  
REAR DUMMY PHX & PHZ  
MEASUREMENTS FOR A 4-DOOR  
VEHICLE WOULD USE THE C-POST  
STRIKER AS A REFERENCE POINT

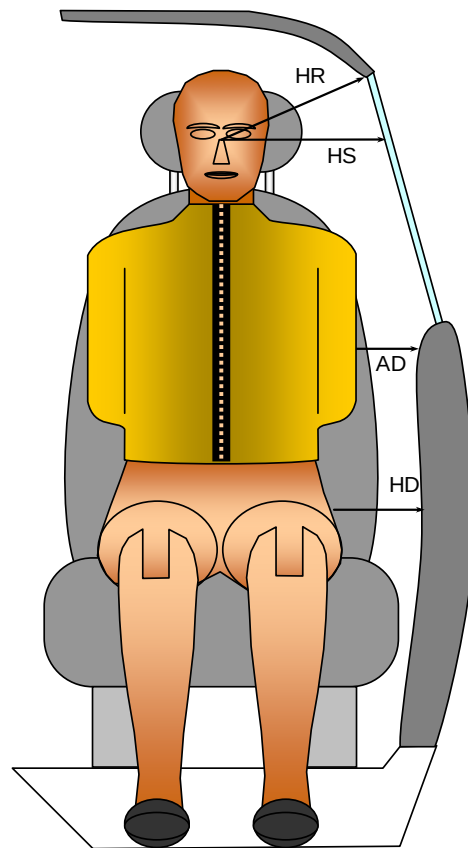
#### DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

| Driver Code | Pass. Code | Measurement Description       | Driver S/N 032 |          | Passenger S/N 306 |          |
|-------------|------------|-------------------------------|----------------|----------|-------------------|----------|
|             |            |                               | Length (mm)    | Angle(°) | Length (mm)       | Angle(°) |
| HH          |            | Head to Header                | 397            | 18.0     |                   |          |
| HW          |            | Head to Windshield            | 788            |          |                   |          |
| HZ          | HZ         | Head to Roof Liner            | 229            |          | 292               |          |
| NR          | NB         | Nose to Rim/Seat Back         | 501            | 14.6     | 530               | 18.7     |
| CD          | CB         | Chest to Dashboard/Seat Back  | 599            | 1.5      | 517               | 5.2      |
| CS          |            | Chest to Steering Wheel       | 412            | 5.4      |                   |          |
| KDL         | KBL        | Left Knee to Dash/Seat Back   | 165            | 38.9     | 255               | 8.6      |
| KDR         | KBR        | Right Knee to Dash/Seat Back  | 178            | 30.7     | 250               | 7.3      |
| PAX         | PAX        | Pelvic Tilt Angle X           |                | 25.2     |                   | 22.2     |
|             | PAY        | Pelvic Tilt Angle Y           |                | -1.0     |                   | 0.0      |
| PHX         | PHX        | Hip Point to Striker (X-Axis) | 173            |          | 223               |          |
| PHZ         | PHZ        | Hip Point to Striker (Z-Axis) | 82             |          | 168               |          |

**DATA SHEET NO. 4**  
**DUMMY LATERAL CLEARANCE DIMENSIONS**

Test Vehicle: 2013 Ford C-MAX Energi SEL 5-Dr Hatchback  
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MD0210  
 Test Date: 2/21/2013



*FRONT VIEW OF DUMMY*

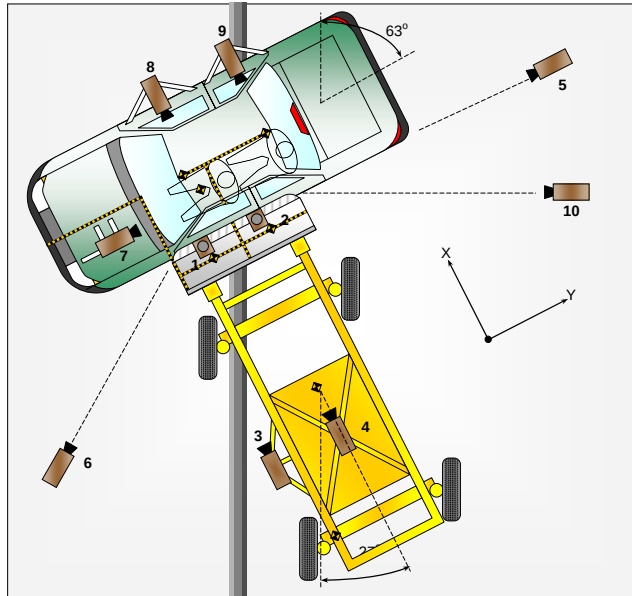
**DUMMY LATERAL CLEARANCE DIMENSION INFORMATION**

| Code | Measurement Description | Units | Driver S/N 032 | Passenger S/N 306 |
|------|-------------------------|-------|----------------|-------------------|
| HR   | Head to Side Header     | mm    | 235            | 253               |
| HS   | Head to Side Window     | mm    | 351            | 349               |
| AD   | Arm to Door             | mm    | 75             | 170               |
| HD   | Hip Point to Door       | mm    | 158            | 157               |

## DATA SHEET NO. 5 CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2013 Ford C-MAX Energi SEL 5-Dr Hatchback  
Test Program: NCAP Side MDB Impact Test

NHTSA No. MD0210  
Test Date: 2/21/2013



### CAMERA LOCATIONS AND DATA

| No. | Camera View             | Coordinates (mm) |       |       | Lens Length (mm) | Operating Frame Rate (fps) |
|-----|-------------------------|------------------|-------|-------|------------------|----------------------------|
|     |                         | X*               | Y*    | Z*    |                  |                            |
| 1   | Overhead Overall        | 180              | 200   | -5080 | 14               | 1000                       |
| 2   | Overhead Close-Up       | 120              | 80    | -5060 | 20               | 1000                       |
| 3   | Left Impact Point (MDB) |                  |       |       | 50               | 1000                       |
| 4   | Side Overall (MDB)      |                  |       |       | 16               | 1000                       |
| 5   | Rear                    | 80               | 4840  | -1120 | 24               | 1000                       |
| 6   | Left Front              | 4140             | -4250 | -1160 | 24               | 1000                       |
| 7   | Driver Front (OB)       |                  |       |       | 16               | 1000                       |
| 8   | Driver Side (OB)        |                  |       |       | 8                | 1000                       |
| 9   | Passenger Side (OB)     |                  |       |       | 8                | 1000                       |
| 10  | Real Time Left Rear     |                  |       |       |                  | 30                         |
| 11  | Real Time Inrun         |                  |       |       |                  | 30                         |

Reference: Impact Point projected to Ground; +X = To Front of MDB, + Y = To Right of MDB, +Z = Down

\* All measurements accurate to  $\pm 6$  mm

Explain why camera(s) did not operate as intended: None

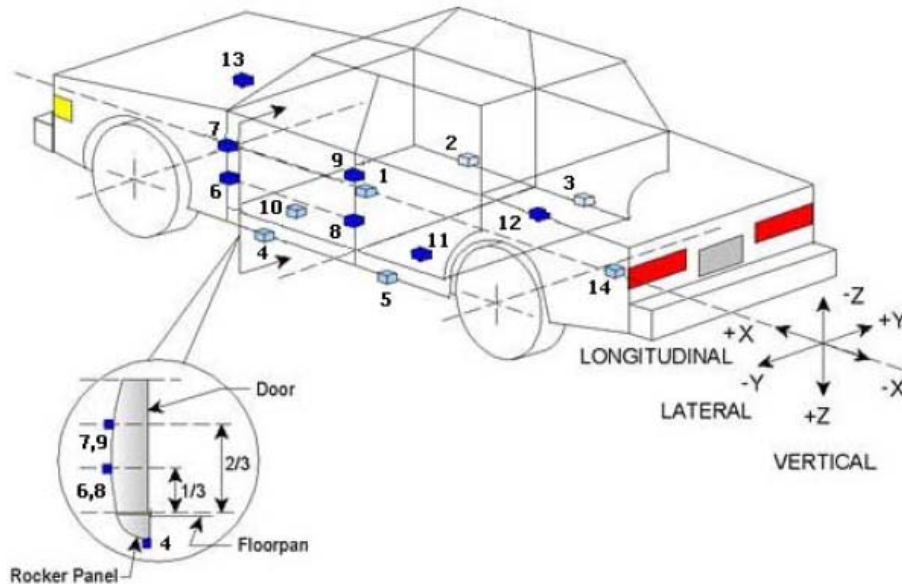
### INSTRUMENTATION

|                                  |    |
|----------------------------------|----|
| Driver Dummy Channels            | 22 |
| Passenger Dummy Channels         | 22 |
| Vehicle Structure Accelerometers | 23 |
| MDB Accelerometers               | 5  |
| MDB Contacts                     | 2  |
| Total                            | 74 |

# **DATA SHEET NO. 6** **TEST VEHICLE ACCELEROMETER LOCATIONS**

Test Vehicle: 2013 Ford C-MAX Energi SEL 5-Dr Hatchback  
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MD0210  
 Test Date: 2/21/2013



## **TEST VEHICLE ACCELEROMETER LOCATIONS**

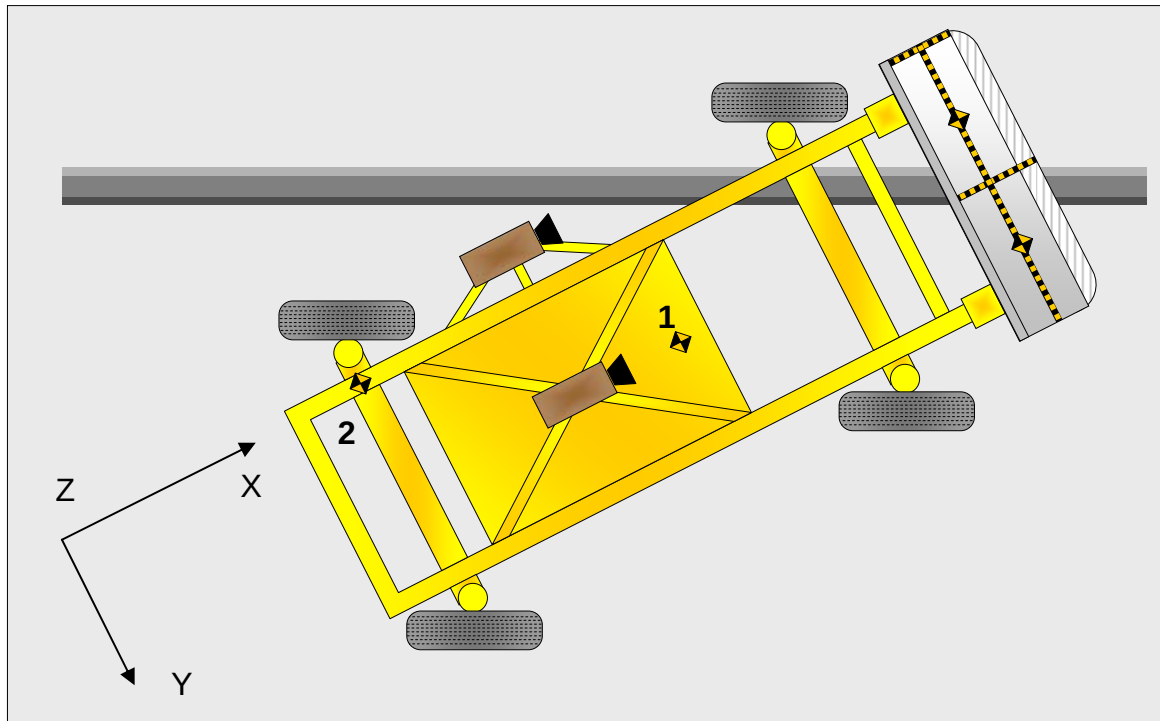
| Accelerometer Location |                           |                  |      |      |
|------------------------|---------------------------|------------------|------|------|
| No.                    | ID                        | Coordinates (mm) |      |      |
|                        |                           | X                | Y    | Z    |
| 1                      | Vehicle CG                | 2139             | 156  | -172 |
| 2                      | Right Sill at Front Seat  | 2280             | 688  | -184 |
| 3                      | Right Sill at Rear Seat   | 1543             | 688  | -193 |
| 4                      | Left Sill at Front Door   | 2502             | -676 | -185 |
| 5                      | Left Sill at Rear Door    | 1448             | -676 | -191 |
| 6                      | Left Lower A-Post         | 2998             | -803 | -535 |
| 7                      | Left Middle A-Post        | 3005             | -813 | -685 |
| 8                      | Left Lower B-Post         | 1916             | -712 | -541 |
| 9                      | Left Middle B-Post        | 1910             | -708 | -772 |
| 10                     | Front Seat Track          | 2164             | -427 | -330 |
| 11                     | Rear Seat Structure       | 1679             | -326 | -401 |
| 12                     | Rt. Rear Occ. Compartment | 1714             | 314  | -215 |
| 13                     | Engine Block              | 3913             | 0    | -751 |
| 14                     | Rear Above Axle           | 862              | 0    | -840 |

Reference: X – Rear Surface of Vehicle (+ forward)  
 Y - Vehicle Centerline (+ to right)  
 Z - Ground Plane (+ down)

**DATA SHEET NO. 7**  
**MDB ACCELEROMETER LOCATIONS**

Test Vehicle: 2013 Ford C-MAX Energi SEL 5-Dr Hatchback  
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MD0210  
 Test Date: 2/21/2013



**MDB ACCELEROMETER LOCATIONS**

| Loc. No. | Accelerometer Location | Measurements (mm) |      |      |
|----------|------------------------|-------------------|------|------|
|          |                        | X                 | Y    | Z    |
| 1        | MDB CG                 | -1675             | 0    | -310 |
| 2        | MDB Rear               | -3140             | -635 | -610 |

Reference: X - MDB Face (+ forward)  
 Y - MDB Centerline (+ to right)  
 Z - Ground Plane (+ down)

**DATA SHEET NO. 8**  
**POST-TEST OBSERVATIONS**

Test Vehicle: 2013 Ford C-MAX Energi SEL 5-Dr Hatchback  
Test Program: NCAP Side MDB Impact Test

NHTSA No. MD0210  
Test Date: 2/21/2013

**TEST DUMMY INFORMATION AND CONTACT POINTS**

| Description       | Front Seat Dummy (ES-2re) | Rear Seat Dummy (SID-IIs)       |
|-------------------|---------------------------|---------------------------------|
| Face              | Curtain Airbag            | Curtain Airbag                  |
| Top of Head       | Curtain Airbag            | Curtain Airbag                  |
| Left Side of Head | Curtain Airbag            | Curtain Airbag                  |
| Back of Head      | Curtain Airbag, Headrest  | Curtain Airbag, Center Seatback |
| Left Shoulder     | Door Panel                | Door Panel                      |
| Upper Torso       | Seatback                  | None                            |
| Lower Torso       | Seatback                  | Door Panel                      |
| Left Hip          | Seatpan                   | Door Panel                      |
| Left Knee         | Door Panel                | Door Panel                      |

**POST-TEST DOOR PERFORMANCE**

| Description                                                        | Struck Side |      | Non-Struck Side |      | Rear Hatch/<br>Other Door |
|--------------------------------------------------------------------|-------------|------|-----------------|------|---------------------------|
|                                                                    | Front       | Rear | Front           | Rear |                           |
| Remained Closed and Operational                                    | No          | No   | Yes             | Yes  | Yes                       |
| Total Separation from Vehicle at Hinges or Latches                 | No          | No   | No              | No   | No                        |
| Latch or Hinge Systems Pulled Out of Their Anchorages              | No          | No   | No              | No   | No                        |
| Disengaged from Latched Position                                   | No          | Yes  | No              | No   | No                        |
| Latch Separated from Striker                                       | No          | No   | No              | No   | No                        |
| Jammed Shut                                                        | Yes         | Yes  | No              | No   | No                        |
| If Door Opened at Striker, Record Width of Opening at Striker (mm) | N/A         | 0 mm | N/A             | N/A  | N/A                       |

**POST-TEST SEAT PERFORMANCE**

| Description                              | Struck Side |      | Non-Struck Side |      |
|------------------------------------------|-------------|------|-----------------|------|
|                                          | Front       | Rear | Front           | Rear |
| Seat Movement Along Seat Track           | No          | No   | No              | No   |
| Seat Disengagement from Floor Pan        | No          | No   | No              | No   |
| Seat Back Movement from Initial Position | No          | No   | No              | No   |
| Seat Back Collapse                       | No          | No   | No              | No   |

**POST-TEST STRUCTURAL OBSERVATIONS**

| Critical Areas of Performance | Observations and Conclusions |
|-------------------------------|------------------------------|
| Pillar Performance            | No Separation                |
| Sill Separation               | None                         |
| Windshield Damage             | None                         |
| Side Window Damage            | None                         |
| Other Notable Effects         | None                         |

**DATA SHEET NO. 8 (CONTINUED)**  
**POST-TEST OBSERVATIONS**

Test Vehicle: 2013 Ford C-MAX Energi SEL 5-Dr Hatchback  
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MD0210  
 Test Date: 2/21/2013

**SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION**

| Restraint Type                   | Struck Side Driver |          | Struck Side Rear Passenger |          |
|----------------------------------|--------------------|----------|----------------------------|----------|
|                                  | Mounted            | Deployed | Mounted                    | Deployed |
| Frontal Airbag                   | Yes                | No       |                            |          |
| Knee Airbag                      | Yes                | No       |                            |          |
| Side Curtain Airbag              | Yes                | Yes      | Yes                        | Yes      |
| Side Torso/Abdomen/Pelvis Airbag | Yes                | Yes      | No                         |          |
| Seat Belt Pretensioner           | Yes                | Yes      | No                         |          |
| Seat Belt Load Limiter           | Yes                | Yes      | No                         |          |
| Other                            |                    |          |                            |          |

**IMPACT POINT LOCATION DATA**

| Measured Parameter                                                            | Units | Tolerance                       | Value |
|-------------------------------------------------------------------------------|-------|---------------------------------|-------|
| Vehicle Wheel Base                                                            | mm    |                                 | 2648  |
| Vertical Impact Reference Line (Aft of Front Axle)<br>(Intended Impact Point) | mm    |                                 | 384   |
| Actual Impact Point (Aft of Front Axle)                                       | mm    |                                 | 378   |
| Horizontal Offset (+forward / -rearward)                                      | mm    | +/- 50 of intended impact point | +6    |
| Vertical Offset (+down / -up)                                                 | mm    | +/- 20 of intended impact point | 0     |

**DATA SHEET NO. 9**  
**MDB SUMMARY OF RESULTS**

Test Vehicle: 2013 Ford C-MAX Energi SEL 5-Dr Hatchback  
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MD0210  
 Test Date: 2/21/2013

**MDB SPECIFICATIONS**

| Measurement Description                 | Length (mm) |
|-----------------------------------------|-------------|
| Serial Number                           | 214.02      |
| Overall Width of Framework Carriage     | 1251        |
| Overall Length Including Honeycomb Face | 4115        |
| Wheelbase of Framework Carriage         | 2595        |
| CG Location aft of Front Axle           | 1134        |

**MDB WEIGHTS**

|        | Units | Front Axle | Rear Axle | Total  |
|--------|-------|------------|-----------|--------|
| Left   | kg    | 390.0      | 300.1     |        |
| Right  | kg    | 376.8      | 294.7     |        |
| Ratio  | %     | 56.3       | 43.7      |        |
| Totals | kg    | 766.8      | 594.8     | 1361.6 |

**SPEED AND ANGLE AT IMPACT DATA**

| Measured Parameter                              | Units   | Requirement  | Value |
|-------------------------------------------------|---------|--------------|-------|
| Trap No. 1 Velocity (Primary)                   | km/h    | 61.1 to 62.7 | 62.2  |
| Trap No. 2 Velocity (Redundant)                 | km/h    | 61.1 to 62.7 | 62.2  |
| MDB CL to Target Vehicle CL                     | degrees | 88.5 to 91.5 | 89.5  |
| MDB Forward Line of Motion to Target Vehicle CL | degrees | 62.5 to 63.5 | 63.0  |
| MDB Crabbed Angle to MDB Forward Line of Motion | degrees | 26 to 28     | 27.0  |

**MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE**

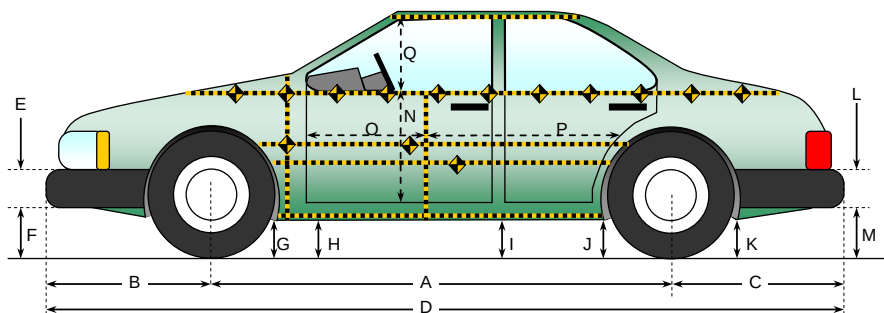
| Vertical Location |                  |        | From Centerline |           | Maximum Crush |
|-------------------|------------------|--------|-----------------|-----------|---------------|
| Row               | Description      | Height | Distance        | Direction |               |
| A                 | Center of Bumper | 432    | 800             | Left      | 202           |
| B                 | Top of Bumper    | 533    | 800             | Left      | 172           |
| C                 | Mid-Level        | 686    | 800             | Left      | 165           |
| D                 | Top of Stack     | 813    | 800             | Left      | 179           |

**DATA SHEET NO. 10**  
**TEST VEHICLE PROFILE MEASUREMENTS**

Test Vehicle: 2013 Ford C-MAX Energi SEL 5-Dr Hatchback  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.  
 Test Date:

MD0210  
2/21/2013



All measurements in (mm) with tolerance of  $\pm 3$  mm

**LEFT SIDE VIEW**

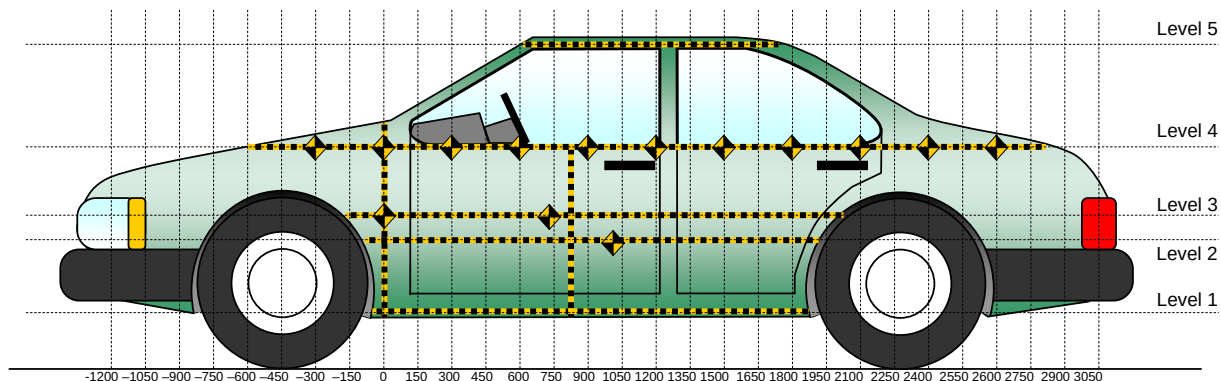
**VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION**

| Code | Measurement Description                | Pre-Test | Post-Test | Difference |
|------|----------------------------------------|----------|-----------|------------|
| A    | Wheelbase                              | 2648     | 2632      | 16         |
| B    | Front Axle to FSOV                     | 900      | 900       | 0          |
| C    | Rear Axle to RSOV                      | 862      | 862       | 0          |
| D    | Total Length at Centerline             | 4410     | 4394      | 16         |
| E    | Front Bumper Thickness                 | 115      | 115       | 0          |
| F    | Front Bumper Bottom to Ground          | 222      | 218       | 4          |
| G    | Sill Height at Front Wheel Well        | 158      | 168       | -10        |
| H    | Sill Height at Front Door Leading Edge | 162      | 176       | -14        |
| I    | Sill Height at B Pillar                | 170      | 169       | 1          |
| J1   | Sill Height at Rear Wheel Well         | 175      | 180       | -5         |
| J2   | Pinch Weld Height at Rear Wheel Well   | 173      | 173       | 0          |
| K    | Sill Height Aft of Rear Wheel Well     | 464      | 461       | 3          |
| L    | Rear Bumper Thickness                  | 117      | 117       | 0          |
| M    | Rear Bumper Bottom to Ground           | 400      | 395       | 5          |
| N    | Sill Height to Window Bottom Sill      | 799      | 718       | 81         |
| O    | Front Door Leading Edge to Impact CL   | 755      | 754       | 1          |
| P    | Rear Door Trailing Edge to Impact CL   | 1230     | 1228      | 2          |
| Q    | Front Window Opening                   | 481      | 553       | -72        |
| R    | Right Side Length                      | 3184     | 3183      | 1          |
| S    | Left Side Length                       | 3184     | 3162      | 22         |
| T    | Vehicle Width at B Post                | 1772     | 1679      | 93         |

# **DATA SHEET NO. 11** **TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS**

Test Vehicle: 2013 Ford C-MAX Energi SEL 5-Dr Hatchback  
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MD0210  
 Test Date: 2/21/2013



All Measurements Shown in mm

**LEFT SIDE VIEW**

## **MAXIMUM EXTERIOR CRUSH MEASUREMENTS**

| Level | Measurement Description | Height Above Ground (mm) | Maximum Exterior Static Crush | Distance from Impact |
|-------|-------------------------|--------------------------|-------------------------------|----------------------|
| 1     | Sill Top                | 215                      | 33                            | 1050                 |
| 2     | Occupant Hip Point      | 623                      | 176                           | 1650                 |
| 3     | Mid Door                | 650                      | 184                           | 1650                 |
| 4     | Window Sill             | 933                      | 100                           | 1800                 |
| 5     | Window Top              | 1535                     | 20                            | 1350                 |

Note: The measurements are taken along the vertical impact reference line.  
 Vehicle measurements forward of the vertical impact reference line are negative.

**DATA SHEET NO. 11 (CONTINUED)**  
**TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS**

Test Vehicle: 2013 Ford C-MAX Energi SEL 5-Dr Hatchback  
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MD0210  
 Test Date: 2/21/2013

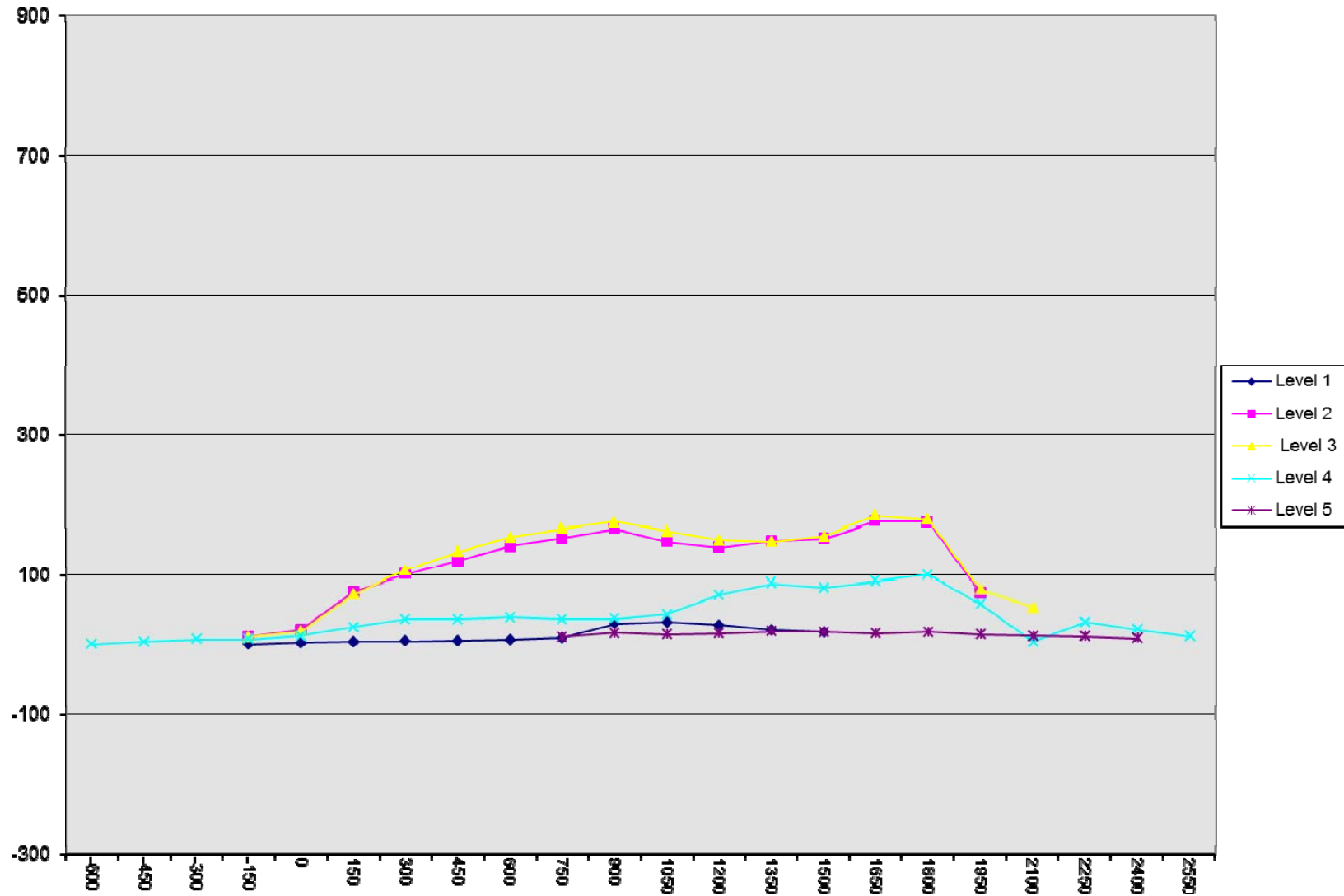
|      | Pre-Test |     |     |     |     | Post-Test |     |     |     |     | Difference |     |     |     |    |
|------|----------|-----|-----|-----|-----|-----------|-----|-----|-----|-----|------------|-----|-----|-----|----|
|      | 1        | 2   | 3   | 4   | 5   | 1         | 2   | 3   | 4   | 5   | 1          | 2   | 3   | 4   | 5  |
| -600 |          |     |     | 329 |     |           |     |     | 331 |     |            |     |     | 2   |    |
| -450 |          |     |     | 304 |     |           |     |     | 309 |     |            |     |     | 5   |    |
| -300 |          |     |     | 283 |     |           |     |     | 292 |     |            |     |     | 9   |    |
| -150 | 250      | 194 | 193 | 269 |     | 252       | 206 | 205 | 278 |     | 2          | 12  | 12  | 9   |    |
| 0    | 250      | 201 | 203 | 259 |     | 254       | 223 | 223 | 273 |     | 4          | 22  | 20  | 14  |    |
| 150  | 251      | 209 | 209 | 252 |     | 256       | 285 | 282 | 278 |     | 5          | 76  | 73  | 26  |    |
| 300  | 252      | 208 | 208 | 244 |     | 258       | 309 | 315 | 281 |     | 6          | 101 | 107 | 37  |    |
| 450  | 253      | 208 | 207 | 237 |     | 260       | 329 | 341 | 274 |     | 7          | 121 | 134 | 37  |    |
| 600  | 255      | 208 | 207 | 230 |     | 263       | 350 | 361 | 270 |     | 8          | 142 | 154 | 40  |    |
| 750  | 255      | 208 | 207 | 226 | 474 | 266       | 361 | 373 | 263 | 486 | 11         | 153 | 166 | 37  | 12 |
| 900  | 260      | 210 | 209 | 222 | 454 | 291       | 376 | 384 | 260 | 472 | 31         | 166 | 175 | 38  | 18 |
| 1050 | 263      | 211 | 210 | 219 | 448 | 296       | 359 | 373 | 263 | 464 | 33         | 148 | 163 | 44  | 16 |
| 1200 | 266      | 213 | 212 | 217 | 448 | 295       | 353 | 362 | 289 | 465 | 29         | 140 | 150 | 72  | 17 |
| 1350 | 268      | 215 | 214 | 216 | 449 | 290       | 364 | 362 | 304 | 469 | 22         | 149 | 148 | 88  | 20 |
| 1500 | 266      | 217 | 216 | 216 | 453 | 285       | 369 | 372 | 298 | 472 | 19         | 152 | 156 | 82  | 19 |
| 1650 |          | 220 | 219 | 221 | 459 |           | 396 | 403 | 312 | 476 |            | 176 | 184 | 91  | 17 |
| 1800 |          | 222 | 221 | 227 | 464 |           | 397 | 400 | 327 | 483 |            | 175 | 179 | 100 | 19 |
| 1950 |          | 211 | 211 | 234 | 473 |           | 286 | 291 | 293 | 489 |            | 75  | 80  | 59  | 16 |
| 2100 |          |     | 204 | 237 | 484 |           |     | 258 | 242 | 498 |            |     | 54  | 5   | 14 |
| 2250 |          |     |     | 245 | 495 |           |     |     | 278 | 508 |            |     |     | 33  | 13 |
| 2400 |          |     |     | 254 | 511 |           |     |     | 277 | 521 |            |     |     | 23  | 10 |
| 2550 |          |     |     | 267 |     |           |     |     | 280 |     |            |     |     | 13  |    |

NOTE: Pre-test measurements are taken when the vehicle is in the "As Tested" weight condition. Vehicle measurements forward of the vertical impact reference line are negative. The crush profile grid is established prior to the test based on an estimated impact point.

**DATA SHEET NO. 11 (CONTINUED)**  
**TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS**

Test Vehicle: 2013 Ford C-MAX Energi SEL 5-Dr Hatchback  
Test Program: NCAP Side MDB Impact Test

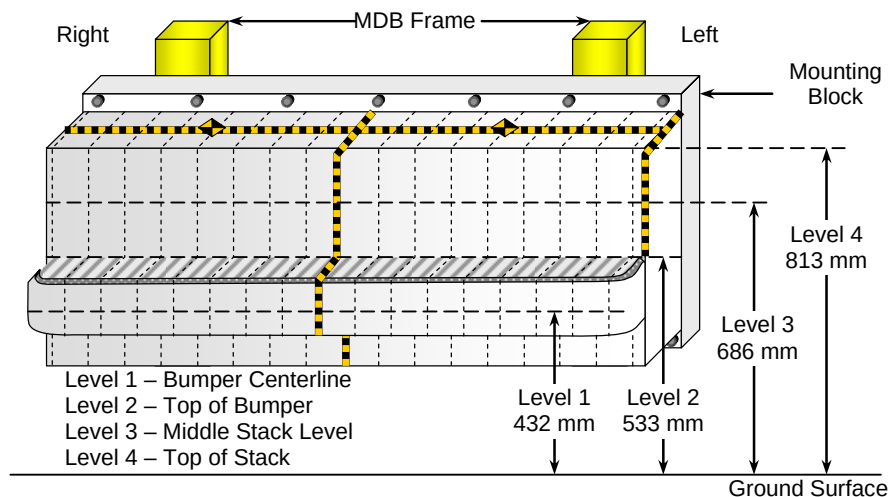
NHTSA No. MD0210  
Test Date: 2/21/2013



**DATA SHEET NO. 12**  
**MDB EXTERIOR STATIC CRUSH MEASUREMENTS**

Test Vehicle: 2013 Ford C-MAX Energi SEL 5-Dr Hatchback  
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MD0210  
 Test Date: 2/21/2013



**FRONT VIEW**

**DEFORMABLE BARRIER STATIC CRUSH**

| Stack Level | Distance Right of Center (mm) |     |     |     |     |     |     |     | C <sub>L</sub> | Distance Left of Center (mm) |     |     |     |     |     |     |     |
|-------------|-------------------------------|-----|-----|-----|-----|-----|-----|-----|----------------|------------------------------|-----|-----|-----|-----|-----|-----|-----|
|             | 800                           | 700 | 600 | 500 | 400 | 300 | 200 | 100 |                | 100                          | 200 | 300 | 400 | 500 | 600 | 700 | 800 |
| 4           | 83                            | 60  | 47  | 47  | 60  | 82  | 110 | 94  | 79             | 77                           | 86  | 93  | 97  | 112 | 124 | 137 | 179 |
| 3           | 67                            | 56  | 58  | 76  | 82  | 85  | 91  | 101 | 80             | 64                           | 58  | 63  | 72  | 85  | 103 | 129 | 165 |
| 2           | 155                           | 146 | 145 | 135 | 117 | 112 | 107 | 115 | 122            | 132                          | 138 | 145 | 148 | 150 | 153 | 164 | 172 |
| 1           | 189                           | 183 | 173 | 171 | 174 | 171 | 172 | 172 | 170            | 172                          | 172 | 174 | 173 | 176 | 181 | 194 | 202 |

**DATA SHEET NO. 13**  
**FMVSS NO. 301 STATIC ROLLOVER RESULTS**

Test Vehicle: 2013 Ford C-MAX Energi SEL 5-Dr Hatchback  
 Test Program: NCAP Side MDB Impact Test

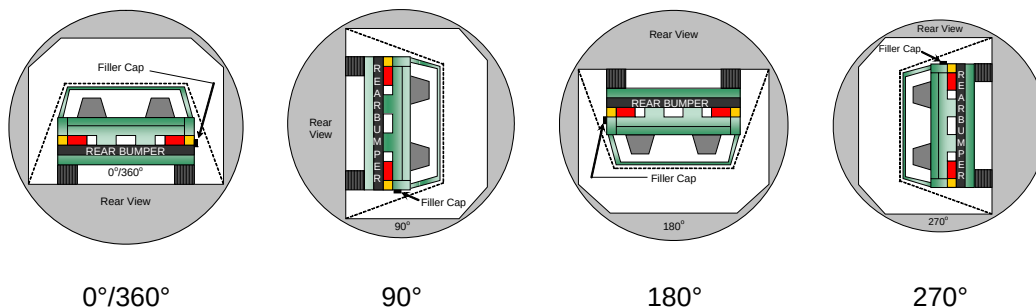
NHTSA No. MD0210  
 Test Date: 2/21/2013

Test Time: 11:30 am

Temperature: 21.6° C

- A. From impact until vehicle motion ceases: 0 oz.  
 (Maximum Allowable = 1 ounce)  
 B. For the 5 minute period after motion ceases: None  
 (Maximum allowable = 5 ounces)  
 C. For the following 25 minutes: None  
 (Maximum allowable = 1 oz./minute)  
 D. Spillage Details: None

**FMVSS 301 STATIC ROLLOVER DATA**



**ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS**

| Test Phase   | Rotation Time | Hold Time | Total Time |
|--------------|---------------|-----------|------------|
| 0° to 90°    | 107           | 300       | 407        |
| 90° to 180°  | 110           | 300       | 410        |
| 180° to 270° | 110           | 300       | 410        |
| 270° to 360° | 113           | 300       | 413        |

**FMVSS 301 ROLLOVER SPILLAGE TABLE (units in ounces)**

| Test Phase   | First 5 Minutes | Sixth Minute | Seventh Minute | Eight Minute |
|--------------|-----------------|--------------|----------------|--------------|
| 0° to 90°    | 0               | 0            | 0              | 0            |
| 90° to 180°  | 0               | 0            | 0              | 0            |
| 180° to 270° | 0               | 0            | 0              | 0            |
| 270° to 360° | 0               | 0            | 0              | 0            |

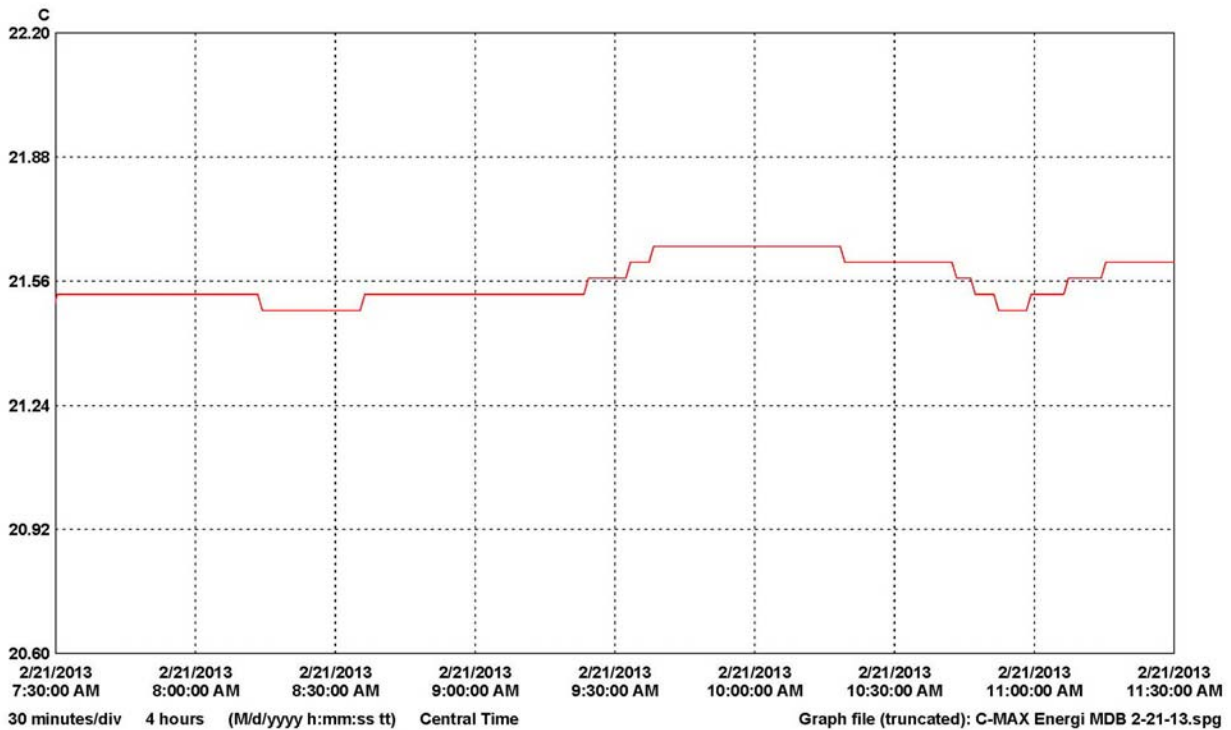
**ROLLOVER SOLVENT SPILLAGE LOCATION TABLE**

| Test Phase   | Spillage Location |
|--------------|-------------------|
| 0° to 90°    |                   |
| 90° to 180°  |                   |
| 180° to 270° |                   |
| 270° to 360° |                   |

**DATA SHEET NO. 14**  
**DUMMY/VEHICLE TEMPERATURE STABILIZATION DATA**

Test Vehicle: 2013 Ford C-MAX Energi SEL 5-Dr Hatchback  
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MD0210  
 Test Date: 2/21/2013



| LN | Serial # | Description | CH | Value | Maximum | Average | Minimum | Units | CH description | Logger file        |
|----|----------|-------------|----|-------|---------|---------|---------|-------|----------------|--------------------|
| 1  | 10102056 | Crash       | 1  |       | 21.65   | 21.56   | 21.48   | C     | Temperature    | 10102056_Crash.spl |

**APPENDIX A**  
**PHOTOGRAPHS**

## TABLE OF PHOTOGRAPHS

|               |                                                                         | <u>Page No.</u> |
|---------------|-------------------------------------------------------------------------|-----------------|
| Photo No. 1.  | As Delivered Right Front Three-Quarter View of Test Vehicle             | A-1             |
| Photo No. 2.  | As Delivered Left Rear Three-Quarter View of Test Vehicle               | A-1             |
| Photo No. 3.  | Pre-Test Frontal View of Test Vehicle                                   | A-2             |
| Photo No. 4.  | Post-Test Frontal View of Test Vehicle                                  | A-2             |
| Photo No. 5.  | Pre-Test Left Front Three-Quarter View of Test Vehicle                  | A-3             |
| Photo No. 6.  | Post-Test Left Front Three-Quarter View of Test Vehicle                 | A-3             |
| Photo No. 7.  | Pre-Test Left Side View of Test Vehicle                                 | A-4             |
| Photo No. 8.  | Post-Test Left Side View of Test Vehicle                                | A-4             |
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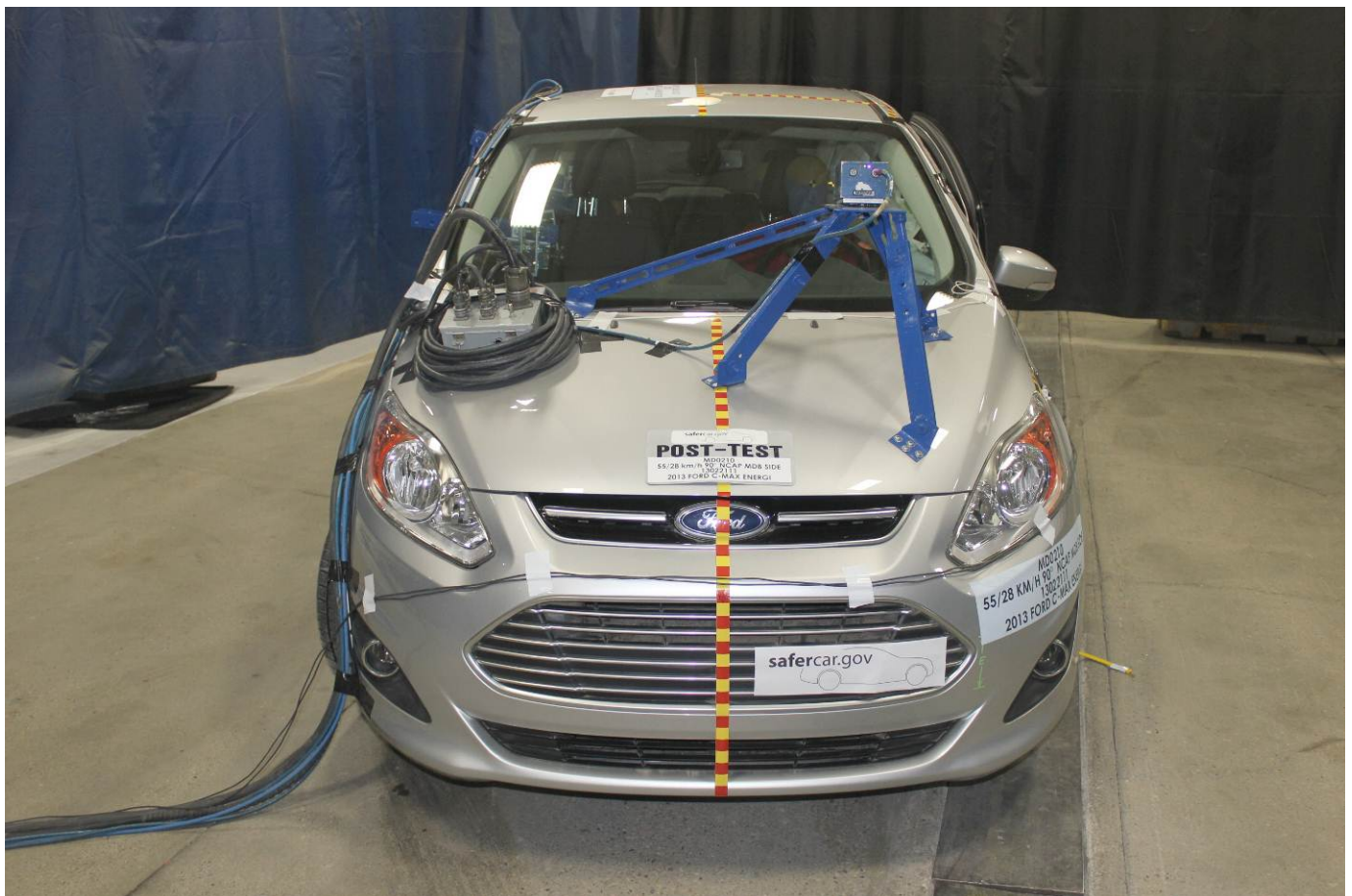
As Delivered Right Front Three-Quarter View of Test Vehicle



As Delivered Left Rear Three-Quarter View of Test Vehicle



Pre-Test Frontal View of Test Vehicle



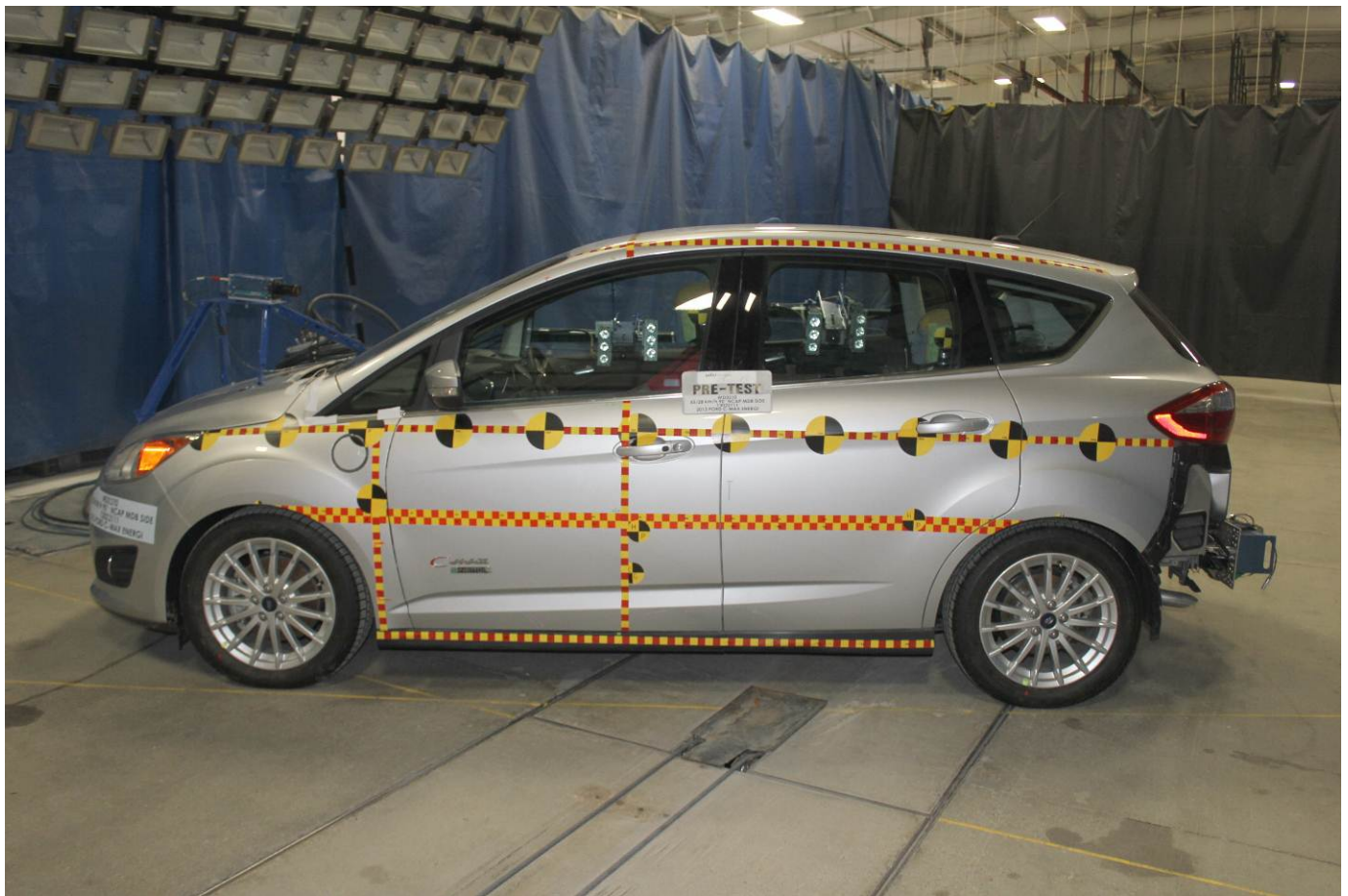
Post-Test Frontal View of Test Vehicle



Pre-Test Left Front Three-Quarter View of Test Vehicle



Post-Test Left Front Three-Quarter View of Test Vehicle



Pre-Test Left Side View of Test Vehicle



Post-Test Left Side View of Test Vehicle



Pre-Test Left Three-Quarter Rear View of Test Vehicle



Post-Test Left Three-Quarter Rear View of Test Vehicle



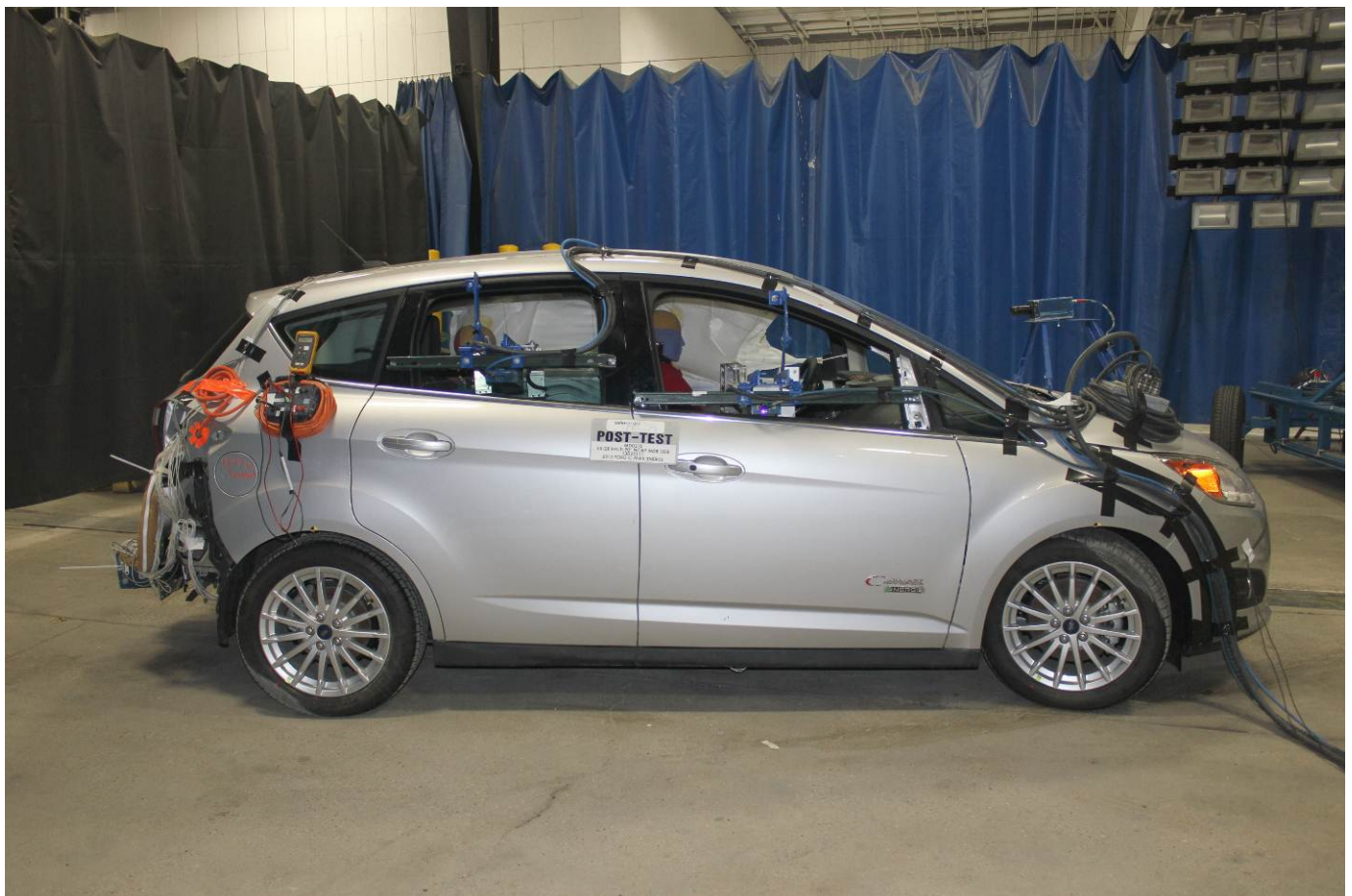
Pre-Test Rear View of Test Vehicle



Post-Test Rear View of Test Vehicle



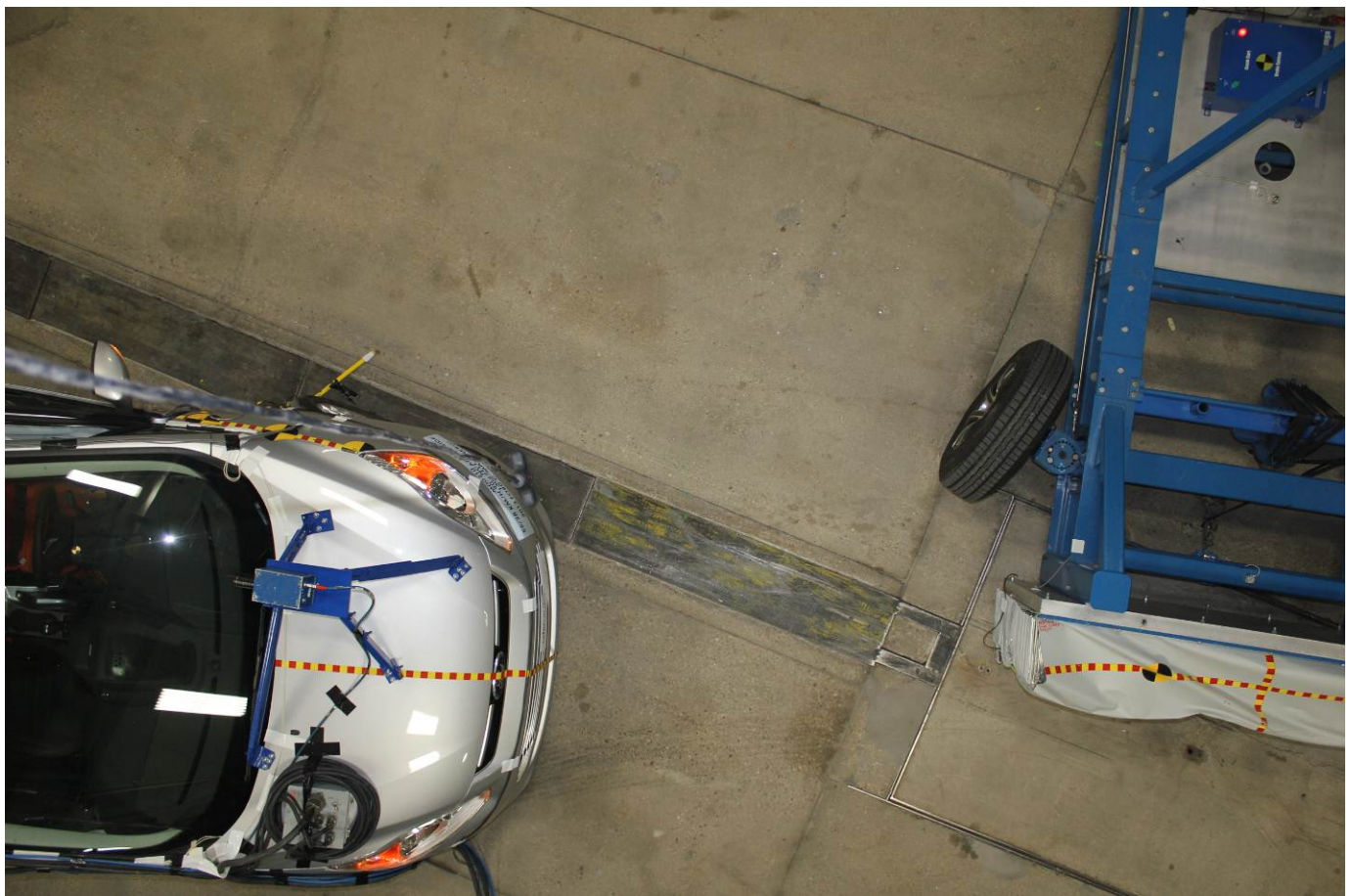
Pre-Test Right Side View of Test Vehicle



Post-Test Right Side View of Test Vehicle



Pre-Test Overhead View of Test Area



Post-Test Overhead View of Test Area



Post-Test Overhead View of Test Area



Pre-Test Left Side View of MDB Positioned Against Side of Test Vehicle



Pre-Test Right Side View of MDB Positioned Against Side of Test Vehicle



Pre-Test Close-Up View of Impact Point Target



Post-Test Close-Up View of Impact Point Target



Pre-Test Left Front Door Latch Close-Up



Post-Test Left Front Door Latch Close-Up



Pre-Test Left Rear Door Latch Close-Up



Post-Test Left Rear Door Latch Close-Up



Pre-Test Front Close-Up View of Driver Dummy



Post-Test Front Close-Up View of Driver Dummy



Pre-Test Left Side View of Driver Dummy Showing Belt and Chalking



Pre-Test Left Side View of Driver Dummy Shoulder and Door Top View



Post-Test Left Side View of Driver Dummy Shoulder and Door Top View



Pre-Test Frontal View of Driver Seat Back Prior to Dummy Positioning



Pre-Test Frontal View of Driver Seat Back Prior to Dummy Positioning



Pre-Test Frontal View of Driver Dummy Head and Shoulders in Relation to Head Restraint



Pre-Test Frontal View of Driver Seat Pan Prior to Dummy Positioning



Pre-Test Overhead View of Driver Dummy Thighs on Seat Pan



Pre-Test Placement of Driver Dummy's Feet



Pre-Test View of Belt Anchorage for Driver Dummy



Pre-Test Left Side View of Steering Wheel

PHOTOGRAPH NOT AVAILABLE

Pre-Test View of Disengaged Parking Brake



Pre-Test View of Parking Brake



Pre-Test Close-Up Left Side View of Driver Seat Track



Pre-Test Close-Up Left Side View of Driver Seat Back



Pre-Test Close-Up View of Driver Seat Back or Head Restraint



Pre-Test Driver Dummy and Door Clearance View



Post-Test Driver Dummy and Door Clearance View



Pre-Test Right Side View of Driver Dummy and Front Seat of Occupant Compartment



Post-Test Right Side View of Driver Dummy and Front Seat of Occupant Compartment



Pre-Test Driver Inner Door Panel View



Post-Test Driver Inner Door Panel View



Post-Test Driver Dummy Close-up Head Contact with Vehicle Interior View



Post-Test Driver Dummy Close-up Head Contact with Side Airbag View



Post-Test Driver Dummy Close-up Torso Contact with Vehicle Interior View



Post-Test Driver Dummy Close-up Torso Contact with Side Airbag View



Post-Test Driver Dummy Close-up Pelvis Contact with Vehicle Interior View

**PHOTOGRAPH NOT APPLICABLE**

Post-Test Driver Dummy Close-up Pelvis Contact with Side Airbag View



Post-Test Driver Dummy Close-up Knee Contact View



Pre-Test Left Side View of Rear Passenger Dummy Showing Belt and Chalking



Pre-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View



Post-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View



Pre-Test Frontal View of Rear Passenger Seat Back Prior to Dummy Positioning



Pre-Test Frontal View of Rear Passenger Seat Back Prior to Dummy Positioning



Pre-Test Frontal View of Rear Passenger Dummy Head and Shoulders in Relation to Head Restraint



Pre-Test Overhead View of Rear Passenger Seat Pan Prior to Dummy Positioning



Pre-Test Overhead View of Rear Passenger Dummy Thighs on Seat Pan



Pre-Test View of Rear Passenger Dummy's Neck Showing Position of Adjustable Neck Bracket



Pre-Test View of Rear Passenger Dummy's Head Showing Dummy's Head is Level



Pre-Test Placement of Rear Passenger Dummy's Feet



Pre-Test View of Belt Anchorage for Rear Passenger Dummy



Pre-Test Close-Up Left Side View of Rear Passenger Seat Track



Pre-Test Close-Up Left Side View of Rear Passenger Seat Back



Pre-Test Close-up View of Rear Passenger Seat Back or Head Restraint



Pre-Test Rear Passenger Dummy and Door Clearance View



Post-Test Rear Passenger Dummy and Door Clearance View



Pre-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment



Post-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment



Pre-Test Rear Passenger Inner Door Panel View



Post-Test Rear Passenger Inner Door Panel View



Post-Test Rear Passenger Dummy Close-up Head Contact with Vehicle Interior View



Post-Test Rear Passenger Dummy Close-up Head Contact with Side Airbag View



Post-Test Rear Passenger Dummy Close-up Torso Contact with Vehicle Interior View

**PHOTOGRAPH NOT APPLICABLE**

Post-Test Rear Passenger Dummy Close-up Torso Contact with Side Airbag View



Post-Test Rear Passenger Dummy Close-up Pelvis Contact with Vehicle Interior View

**PHOTOGRAPH NOT APPLICABLE**

Post-Test Rear Passenger Dummy Close-up Pelvis Contact with Side Airbag View



Post-Test Rear Passenger Dummy Close-up Knee Contact View



Pre-Test View of Fuel Filler Cap or Fuel Filler Neck



Post-Test View of Fuel Filler Cap or Fuel Filler Neck



Pre-Test Front View of MDB Impactor Face



Post-Test Front View of MDB Impactor Face



Pre-Test Top View of MDB Impactor Face



Post-Test Top View of MDB Impactor Face



Pre-Test Left Side View of MDB Impactor Face



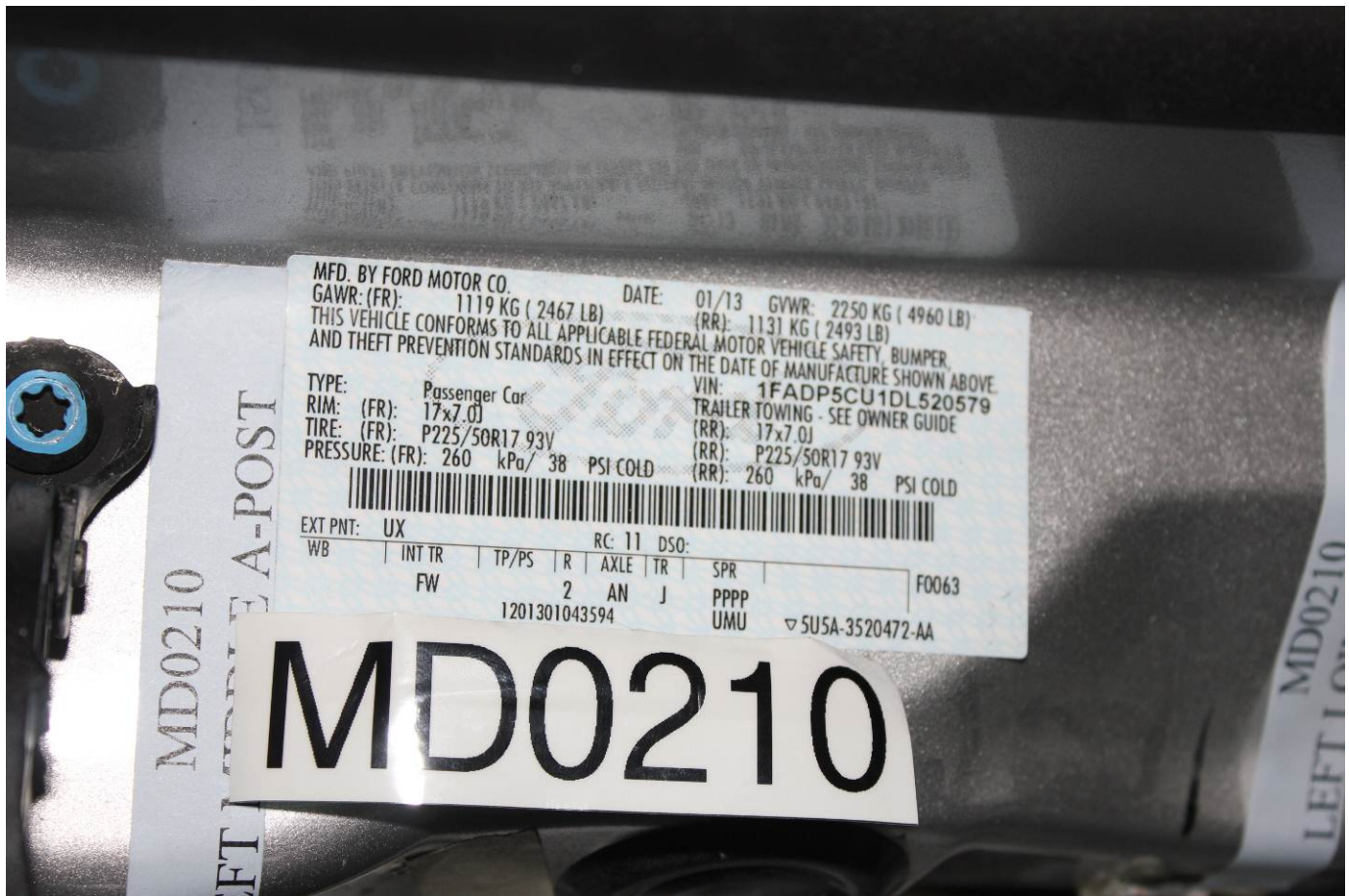
Post-Test Left Side View of MDB Impactor Face



Pre-Test Right Side View of MDB Impactor Face



Post-Test Right Side View of MDB Impactor Face



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Pre-Test Ballast View



Post-Test Primary and Redundant Speed Trap Read-Out



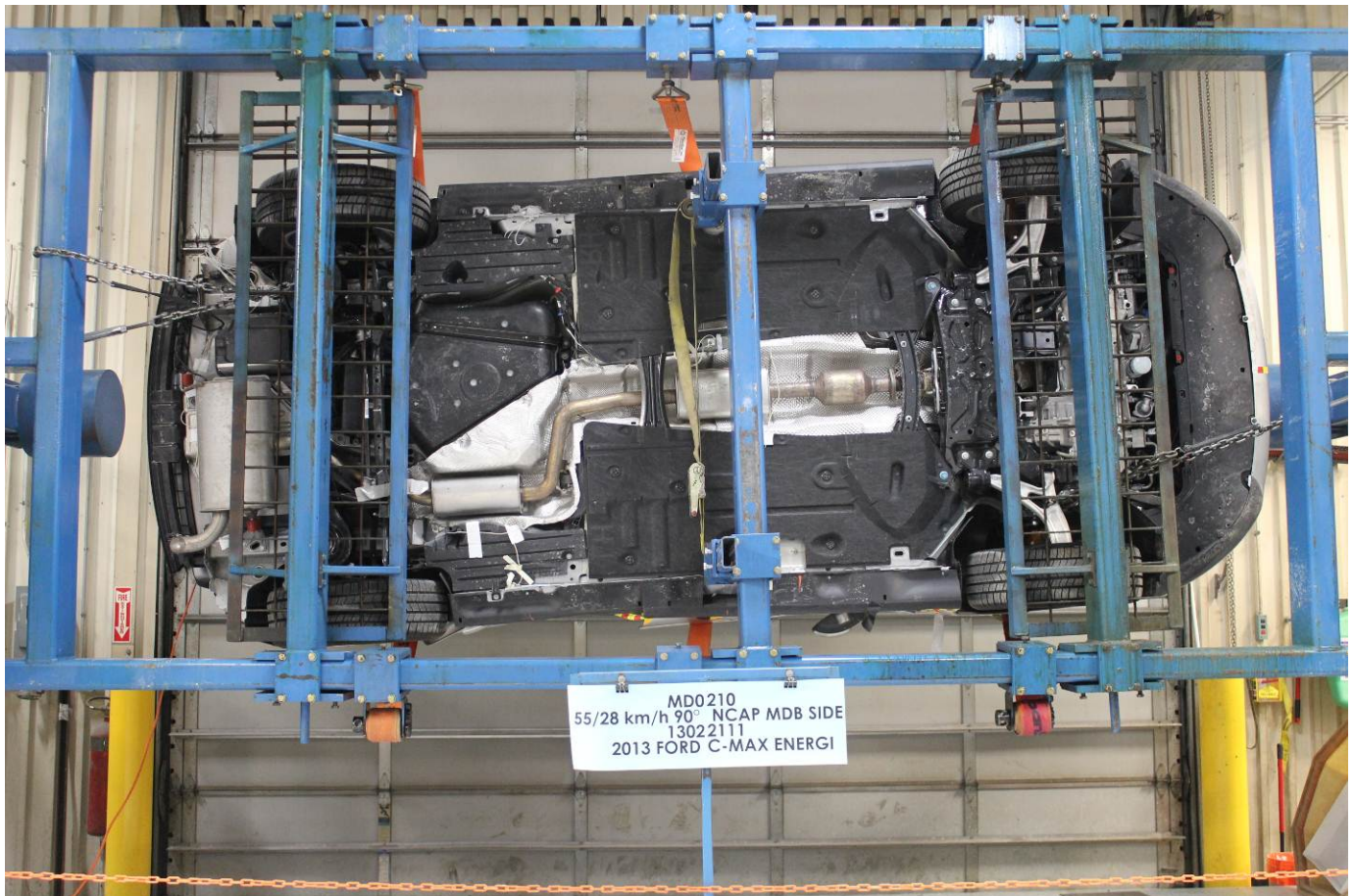
FMVSS No. 301 Static Rollover 0 Degrees



FMVSS No. 301 Static Rollover 90 Degrees



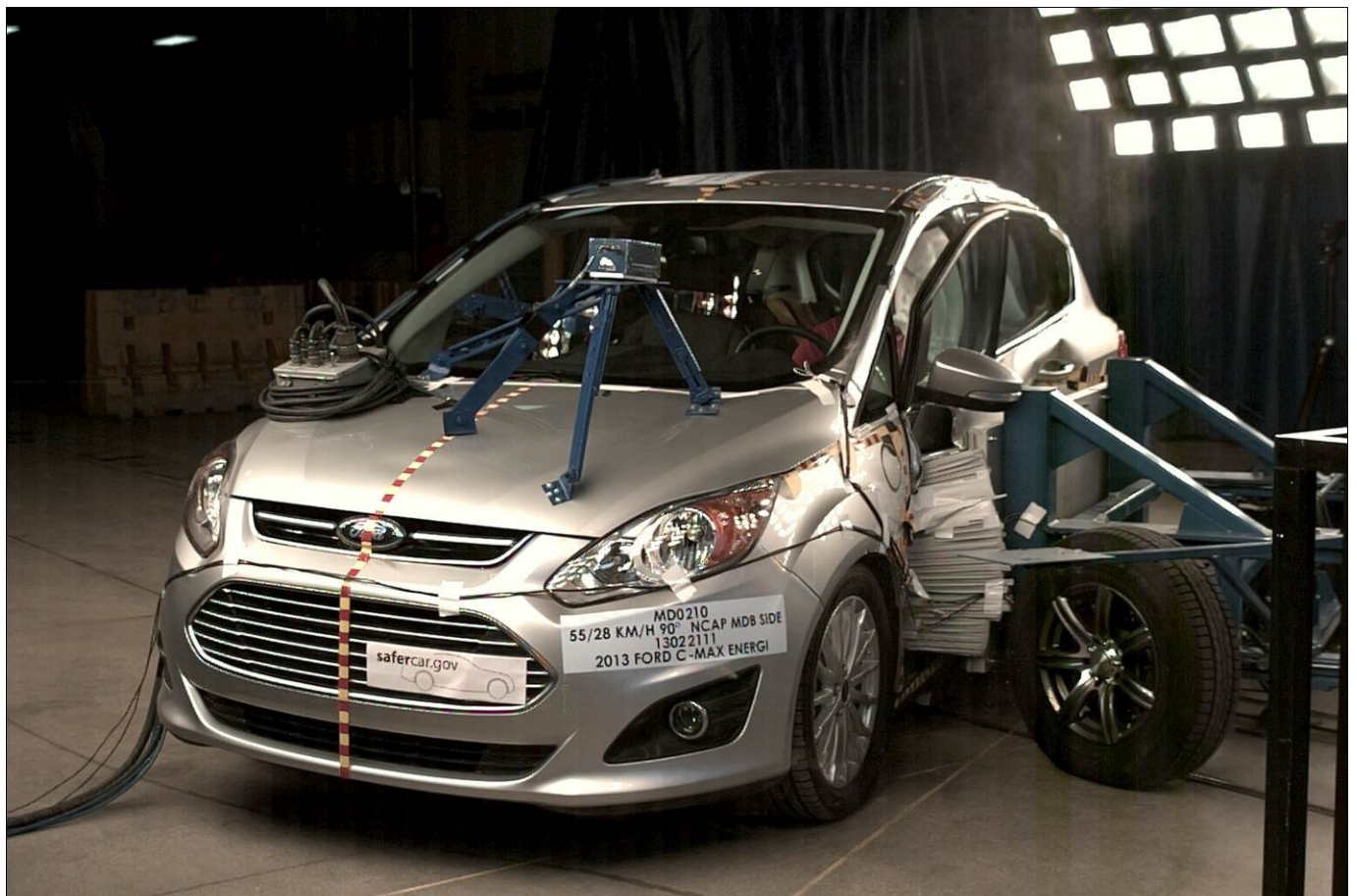
FMVSS No. 301 Static Rollover 180 Degrees



FMVSS No. 301 Static Rollover 270 Degrees



FMVSS No. 301 Static Rollover 360 Degrees



Impact Event



**C-MAX ENERGY**

2013 5-DR ENERGY SEL  
5-PASSENGER  
2.0L ATK IVCY ENGINE  
CVT TRANSMISSION

EXTERIOR  
INGOT SILVER METALLIC  
INTERIOR  
CHARCOAL BLACK LEATHER SEAT

**DL 520579**

**EPA Fuel Economy and Environment**

**Fuel Economy** Midsize cars range from 13 to 100 MPG. The best vehicle rates 112 MPG.

**Electricity + Gasoline** Charge Time 2.5 hours (240V)  
**100** MPGe  
combined city/highway

**Gasoline Only**  
**43** MPG  
combined city/highway

**You save \$6,850**  
in fuel costs  
over 5 years  
compared to the  
average new vehicle.

**Annual fuel cost \$950**

**Fuel Economy & Greenhouse Gas Rating** (tailpipe only) Smog Rating (tailpipe only)

1 10 10 1 10 Best Best

This vehicle emits 110 grams CO<sub>2</sub> per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel & electricity also create emissions; learn more at [fuelconomy.gov](http://fuelconomy.gov)

**Actual results will vary for many reasons, including driving conditions and how you diversify maintain your vehicle. The average new vehicle gets 23 MPG and costs \$11,600 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$3.55 per gallon and \$0.12 per kWh for this is a dual fueled automobile. MPG is miles per gallon (city/combined). Vehicle emissions are a significant cause of climate change and smog.**

**WARRANTY**  
• EXTENDED HYBRID WARRANTY

**STANDARD EQUIPMENT INCLUDED AT NO EXTRA CHARGE**

**EXTERIOR**  
• 17" MACHINED ALUMINUM WHEELS  
• BLIND SPOT MIRRORS  
• FOG LAMPS  
• MIRRORS-MAN FOLD DUAL PWR HEATED WITH APPROACH LAMP

**INTERIOR**  
• SMART GAUGE WITH ECO GUIDE  
• 5-PASS SEATING  
• 2ND ROW 60/40 FOLD FLAT  
• AMBIENT LIGHTING  
• DUAL-ZONE ELECTRONIC AUTO CLIMATE CONTROL  
• IN-FLOOR STORAGE - REAR  
• LEATHER TRIM HEATED 10-WAY POWER DRIVER SEAT  
• LEATHER WRAPPED SHIFT KNOB  
• LEATHER WRAPPED STR WHEEL  
• REAR A/C DUCTS

**FUNCTIONAL**  
• ELECTRONIC PWR ASST STEER  
• FRONT WHEEL DRIVE  
• HOMELINK  
• INTELLIGENT ACCESS W/PUSH BUTTON START  
• LITHIUM ION BATTERY  
• MYKEY  
• REGENERATIVE BRAKING SYS  
• REMOTE KEYLESS ENTRY  
• SPEED CONTROL  
• SYNC W/ MYFORD TOUCH  
• 110V OUTLET

**SAFETY/SECURITY**  
• ADVANCETRAC WITH RSC  
• AIRBAG - DRIVER KNEE  
• AIRBAGS - FRONT AND SIDE  
• 1ST AND 2ND ROW CURTAIN AIRBAGS  
• BRAKES - ABS/ESP/RSC  
• PERIMETER ALARM  
• REVERSE SENSING SYSTEM  
• SECURITY ANTI-THEFT ENGINE IMMOBILIZER  
• SOS POST CRASH ALERT SYS  
• TIRE PRESSURE MONITOR SYS  
• TURN SIGNAL MIRRORS

**INCLUDED ON THIS VEHICLE (MSRP)**

**EQUIPMENT GROUP 300A**

**OPTIONAL EQUIPMENT**

|                               |           |
|-------------------------------|-----------|
| INTER PROTECTION PKG*DLR-INST | 170.00    |
| FRONT LICENSE PLATE BRACKET   | NO CHARGE |
| 50 STATE EMISSIONS            | NO CHARGE |
| CHARGE CORD BAG *DLR-INSTL    | 59.00     |

**PRICE INFORMATION (MSRP)**

BASE PRICE \$32,950.00

TOTAL OPTIONS 229.00

TOTAL VEHICLE & OPTIONS 33,179.00

DESTINATION & DELIVERY 795.00

**TOTAL MSRP \$33,974.00**

SOLD TO  
Watertown Ford, Inc.  
625 Pleasant Street  
Watertown MA 02472

SHIP TO (IF OTHER THAN SOLD TO)

11D 027

RAMP ONE  
**RA04**

RAMP TWO

DEALER NO.  
11D 027

FINAL ASSEMBLY PLANT  
MICHIGAN

METHOD OF TRANS.  
RAIL

ITEM #  
11-1684 O/T 2

CM181 N RA 2X 325 000311 12 18 12

**GOVERNMENT 5-STAR SAFETY RATINGS**

**Overall Vehicle Score To Be Rated**

Based on the combined ratings of frontal, side and rollover. Should ONLY be compared to other vehicles of similar size and weight.

|               |                      |             |
|---------------|----------------------|-------------|
| Frontal Crash | Driver Passenger     | To Be Rated |
| Side Crash    | Front seat Rear seat | To Be Rated |
| Rollover      |                      | To Be Rated |

Star ratings range from 1 to 5 stars (\*\*\*\*\*), with 5 being the highest. Source: National Highway Traffic Safety Administration (NHTSA). [www.safercar.gov](http://www.safercar.gov) or 1-888-327-4236

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Standard messaging & data plan rates may apply.

## Monroney Label

154

Seats

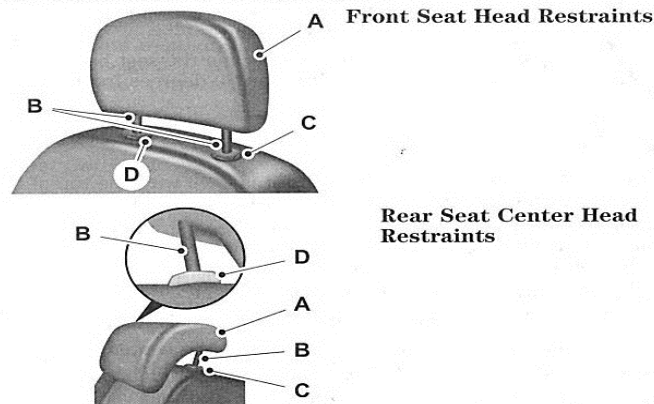
### HEAD RESTRAINTS

**WARNING:** To minimize the risk of neck injury in the event of a crash, the driver and passenger occupants should not sit in or operate the vehicle, until the head restraint is placed in its proper position. The driver should never adjust the head restraint while the vehicle is in motion.

**WARNING:** The adjustable head restraint is a safety device. Whenever possible, it should be installed and properly adjusted when the seat is occupied.

**WARNING:** Install the head restraint properly to minimize the risk of neck injury in the event of a crash.

**Note:** Adjust the seat back to an upright driving position before adjusting any head restraint. Adjust the head restraint so that the top of it is level with the top of your head and as far forward as possible, remaining comfortable. For occupants of extremely tall stature, adjust the head restraint to its highest position.



Head Restraint Use and Adjustment Information from Vehicle Owner's Manual

The head restraints consist of:

- A. An energy absorbing head restraint
- B. Two steel stems
- C. Guide sleeve adjust and release button
- D. Guide sleeve unlock and remove button

#### Adjusting the Head Restraint

Raise: Pull up the head restraint.

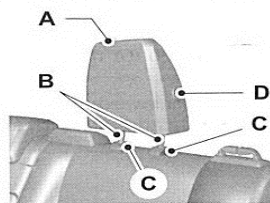
Lower:

1. Press and hold button C.
2. Push the head restraint down.

Remove:

1. Pull up the head restraint until it reaches the highest adjustment position.
2. Press and hold buttons C and D.
3. Pull the head restraint up.

Install: Align the steel stems into the guide sleeves and push the head restraint down until it locks.



**Rear Seat Outboard Head Restraints**

The head restraints consist of:

- A. An energy absorbing head restraint
- B. Two steel stems
- C. Guide sleeve unlock and remove button
- D. Fold button

## Head Restraint Use and Adjustment Information from Vehicle Owner's Manual

Remove:

1. Press and hold buttons C.
2. Pull the head restraint up.

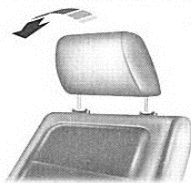
Install: Align the steel stems into the guide sleeves and push the head restraint down until it locks.

Fold:

1. Press and hold button D.
2. Pull it back up to reset.

#### Tilting Head Restraints (If Equipped)

The front head restraints may have a tilting feature for extra comfort. To tilt the head restraint, do the following:



1. Adjust the seat back to an upright driving or riding position.
2. Tilt the head restraint forward by gently pulling the top of the head restraint.

Once it is in its forward-most position, tilt it forward once more to release it to the upright position.

**Note:** Do not attempt to force the head restraint backward after it is tilted. Instead, continue tilting it forward until the head restraint releases to the upright position.

## Head Restraint Use and Adjustment Information from Vehicle Owner's Manual



Post-Test Left Rear Door Disengaged



Post-Test Left Rear Door Disengaged



Post-Test Left Rear Door Disengaged

## **APPENDIX B**

### **DUMMY RESPONSE DATA PLOTS**

**TABLE OF DATA PLOTS**  
**Driver Dummy Instrumentation Plots**

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The following additional data for this test can be obtained from the Research and Development section of the NHTSA website. The website can be found at [www.NHTSA.dot.gov](http://www.NHTSA.dot.gov)

**Additional Driver & Passenger Dummy Instrumentation Data**

Driver Head CG Redundant Acceleration (X) vs. Time

Driver Head CG Redundant Acceleration (Y) vs. Time

Driver Head CG Redundant Acceleration (Z) vs. Time

Driver 9 Axis Head X Arm Y

Driver 9 Axis Head X Arm Z

Driver 9 Axis Head Y Arm X

Driver 9 Axis Head Y Arm Z

Driver 9 Axis Head Z Arm X

Driver 9 Axis Head Z Arm Y

Driver Lower Spine T12 Acceleration (X)

Driver Lower Spine T12 Acceleration (Y)

Driver Lower Spine T12 Acceleration (Z)

Passenger Head CG Redundant Acceleration (X) vs. Time

Passenger Head CG Redundant Acceleration (Y) vs. Time

Passenger Head CG Redundant Acceleration (Z) vs. Time

Passenger 9 Axis Head X Arm Y

Passenger 9 Axis Head X Arm Z

Passenger 9 Axis Head Y Arm X

Passenger 9 Axis Head Y Arm Z

Passenger 9 Axis Head Z Arm X

Passenger 9 Axis Head Z Arm Y

Passenger Middle Thorax Rib Deflection (Y)

Passenger Lower Thorax Rib Deflection (Y)

Passenger Upper Abdomen Rib Deflection (Y)

Passenger Lower Abdomen Rib Deflection (Y)

### **Vehicle Instrumentation Data**

Vehicle Center of Gravity Acceleration (X)  
Vehicle Center of Gravity Acceleration (Y)  
Vehicle Center of Gravity Acceleration (Z)  
Right Side Sill at Front Seat Acceleration (X)  
Right Side Sill at Front Seat Acceleration (Y)  
Right Side Sill at Front Seat Acceleration (Z)  
Right Side Sill at Rear Seat Acceleration (X)  
Right Side Sill at Rear Seat Acceleration (Y)  
Right Side Sill at Rear Seat Acceleration (Z)  
Left Side Sill at Front Seat Acceleration (Y)  
Left Side Sill at Rear Seat Acceleration (Y)  
Lower A-Post Acceleration (Y)  
Middle A-Post Acceleration (Y)  
Lower B-Post Acceleration (Y)  
Middle B-Post Acceleration (Y)  
Front Seat Track Acceleration (Y)  
Rear Seat Track Acceleration (Y)  
Right Rear Occupant Compartment Acceleration (Y)  
Engine Block (X)  
Engine Block (Y)  
Rear Floorpan Above Axle Acceleration (X)  
Rear Floorpan Above Axle Acceleration (Y)  
Rear Floorpan Above Axle Acceleration (Z)

### **MDB Instrumentation Data**

MDB Center of Gravity Acceleration (X)

MDB Center of Gravity Acceleration (Y)

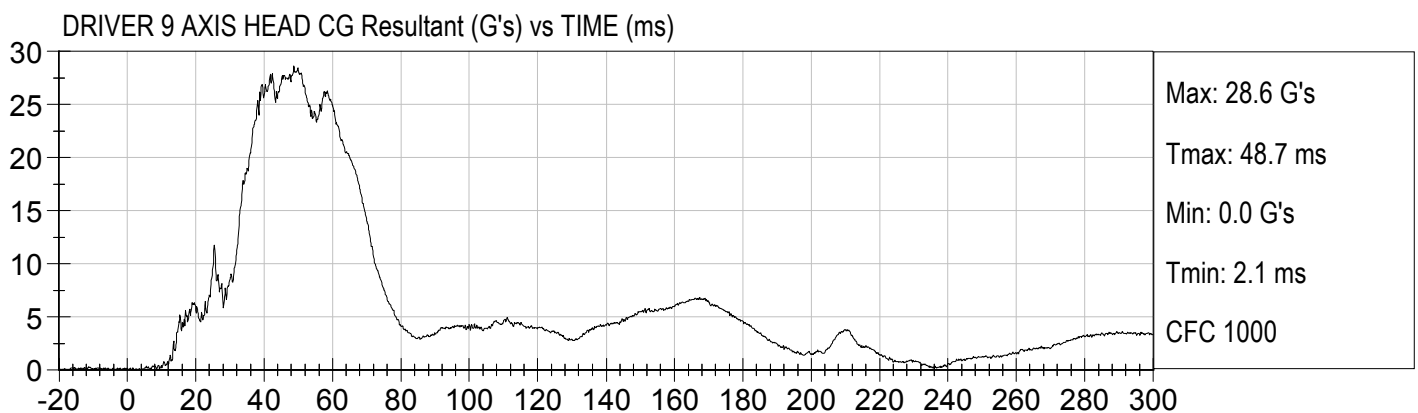
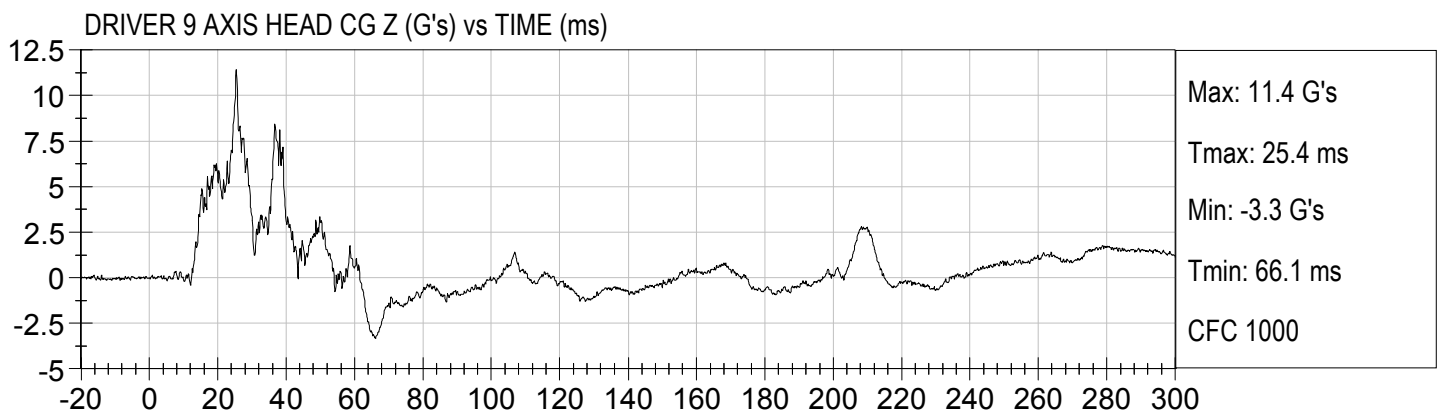
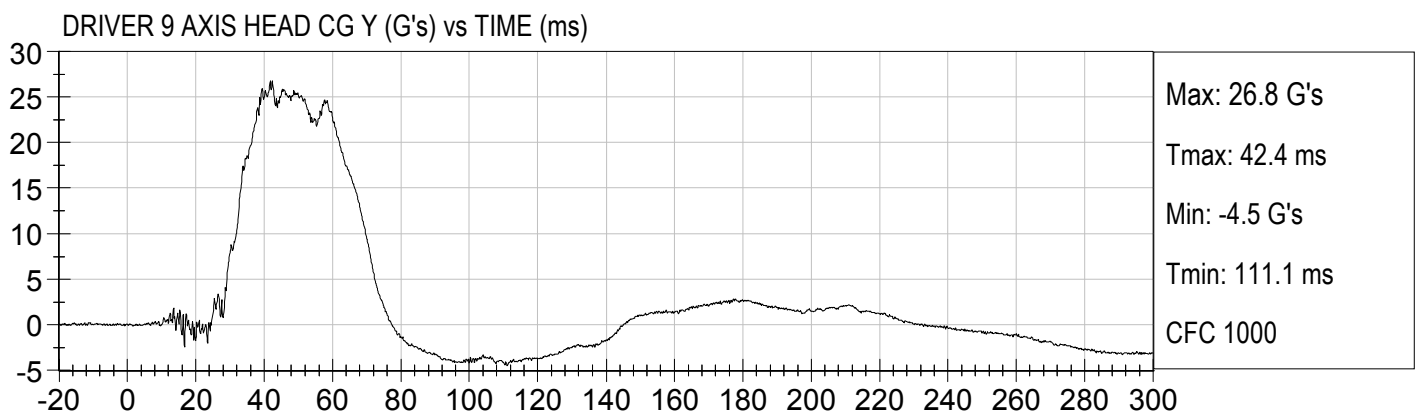
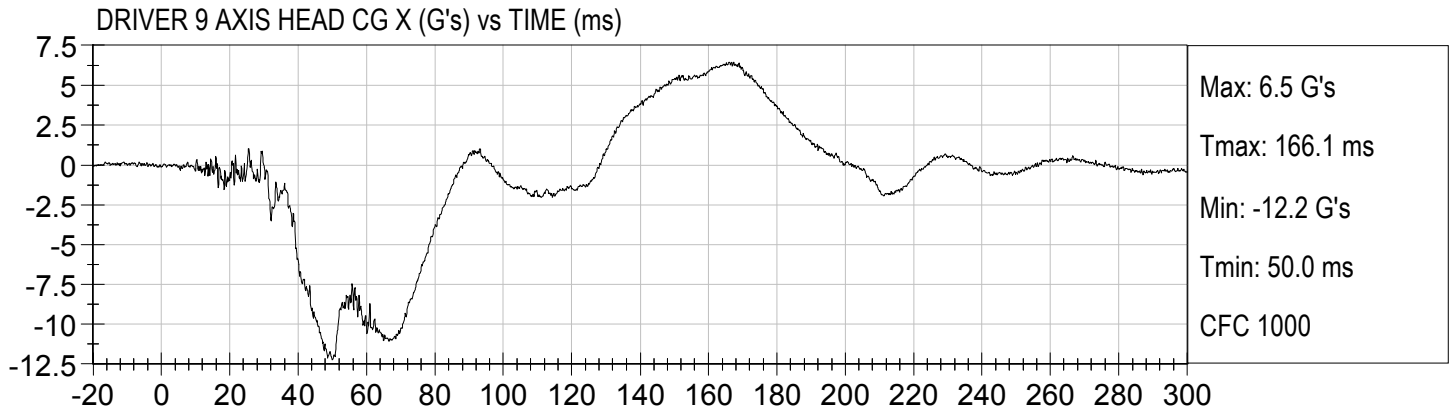
MDB Center of Gravity Acceleration (Z)

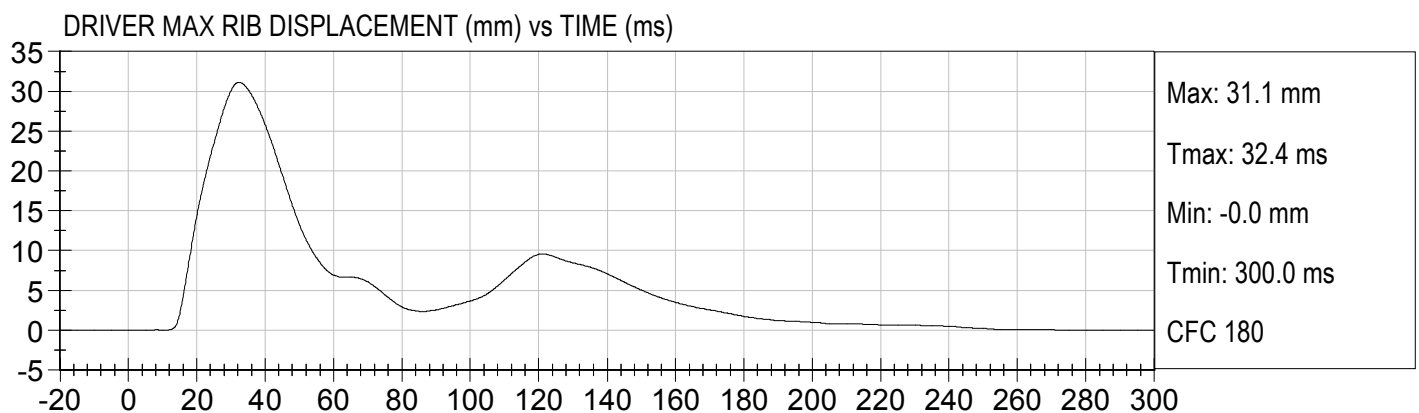
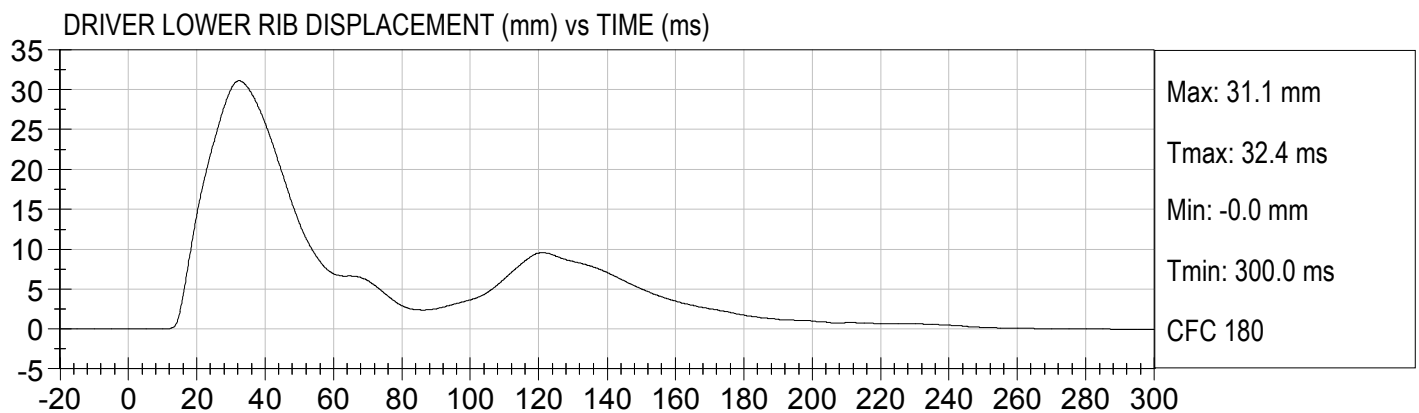
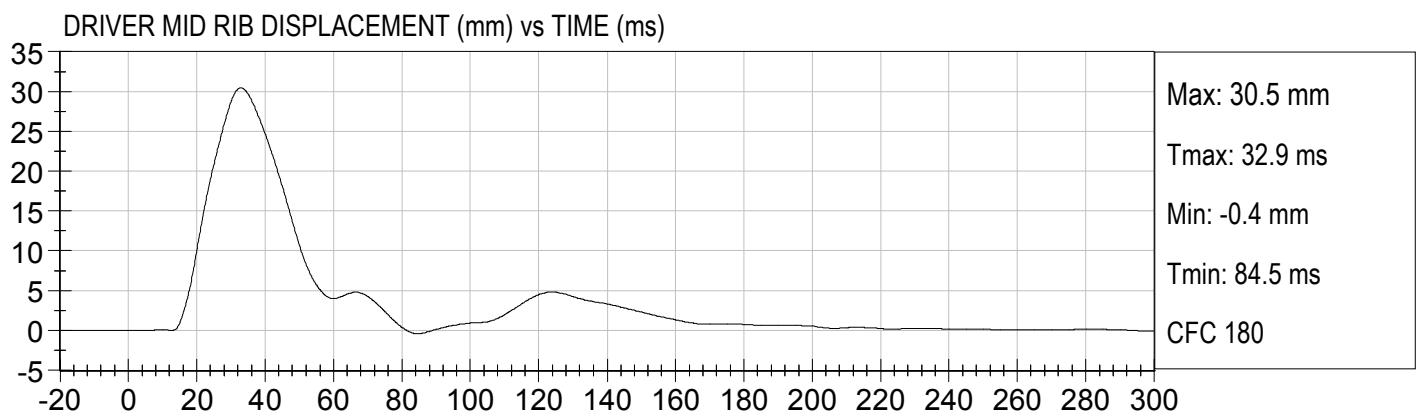
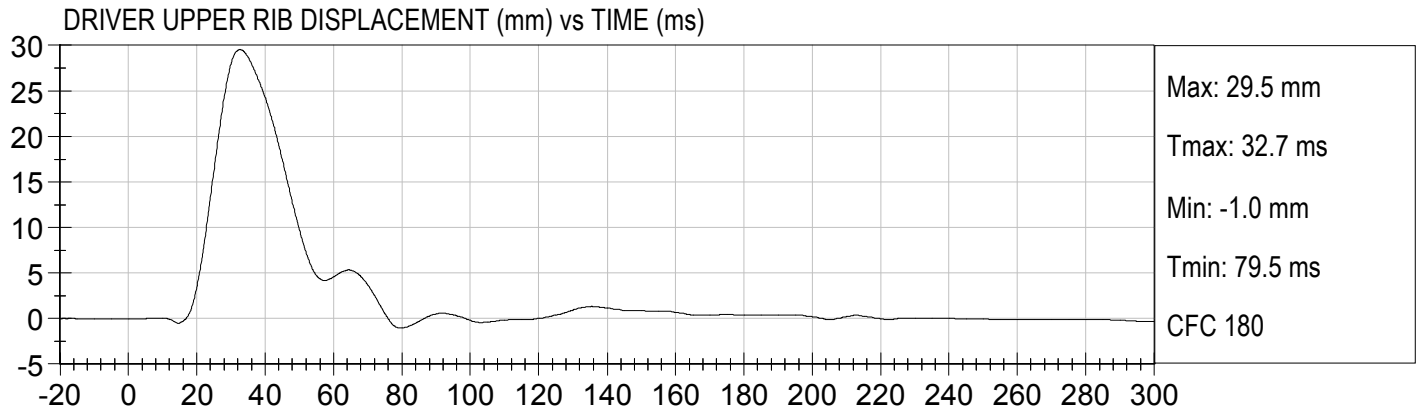
MDB Rear Acceleration (X)

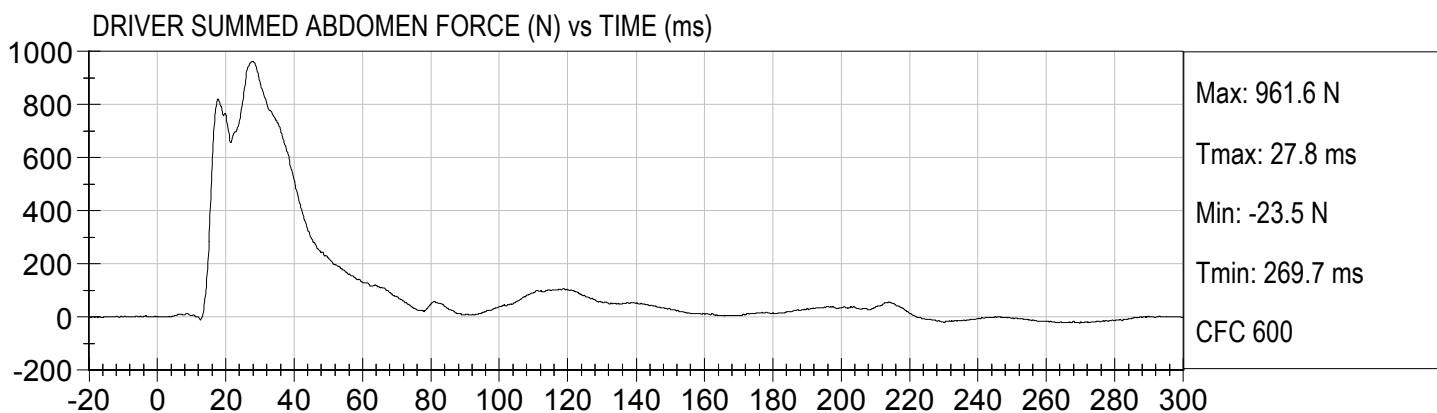
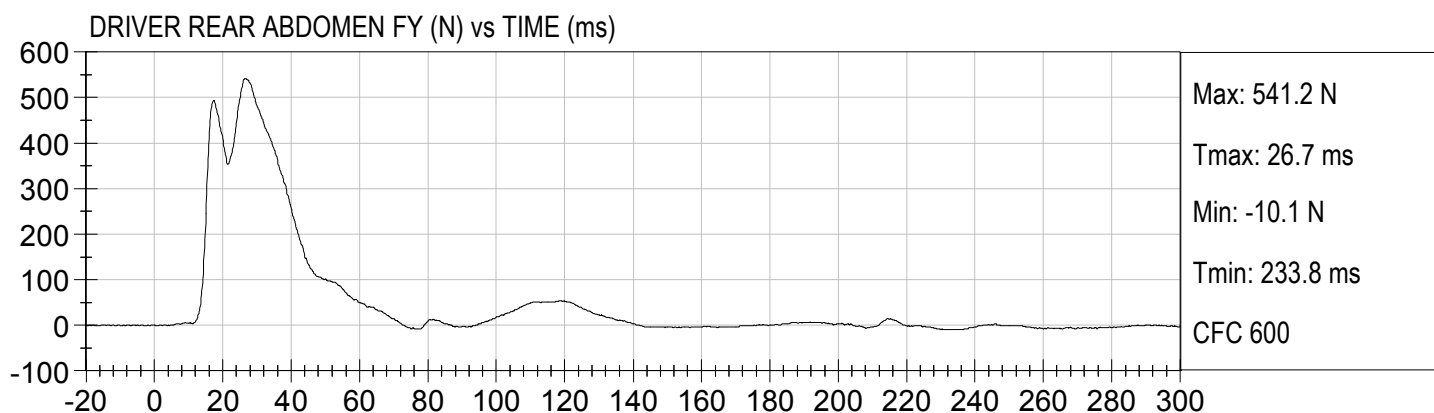
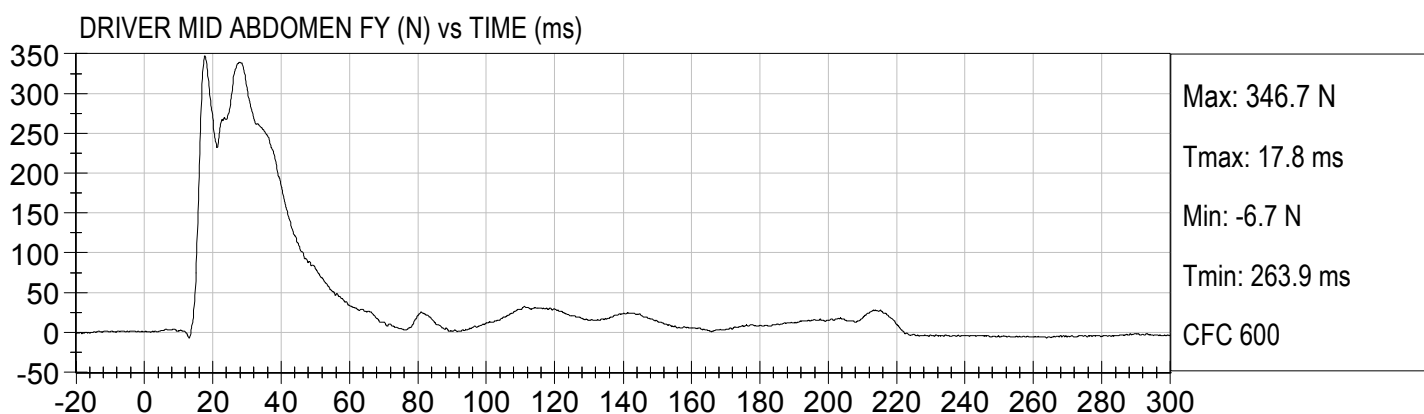
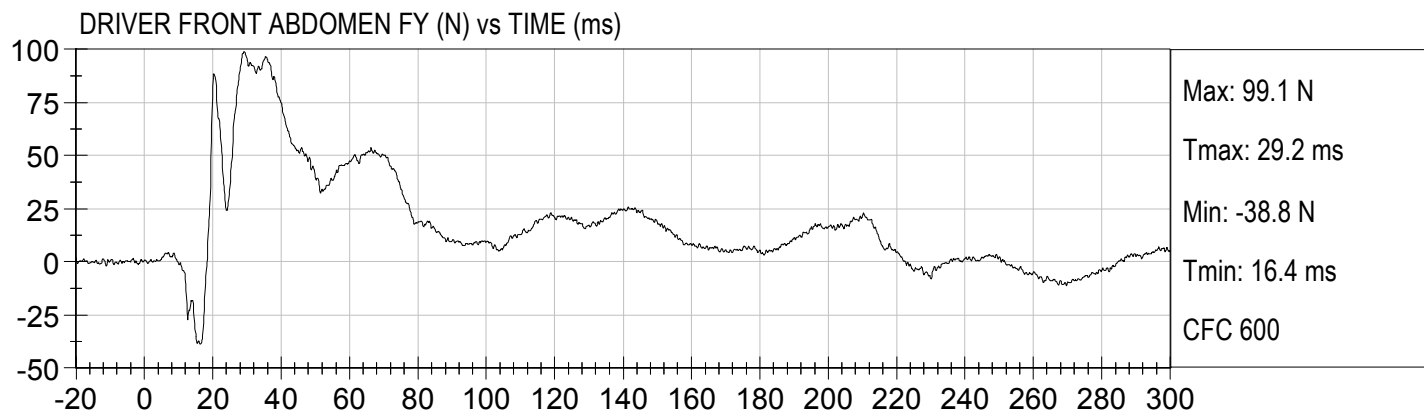
MDB Rear Acceleration (Y)

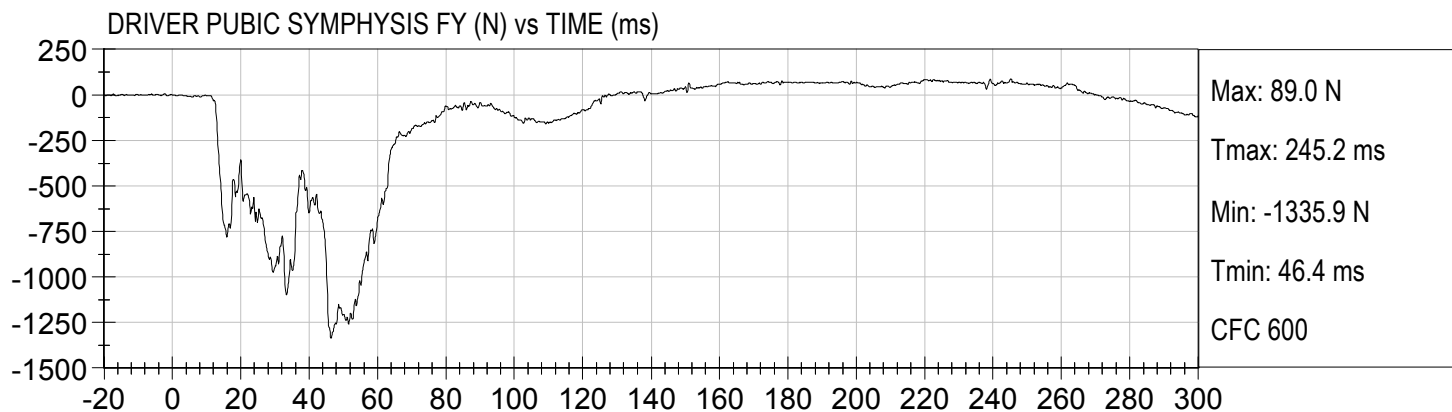
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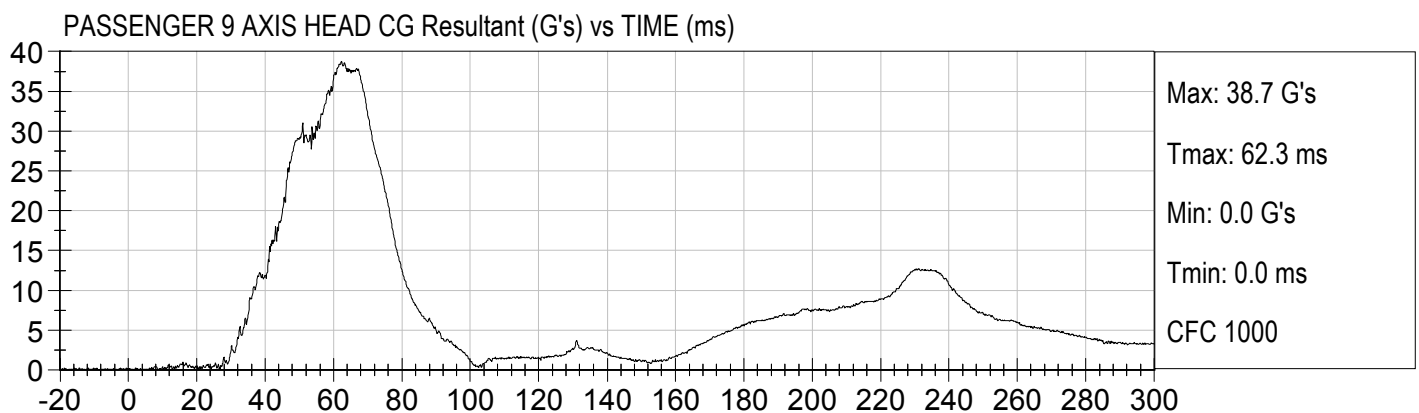
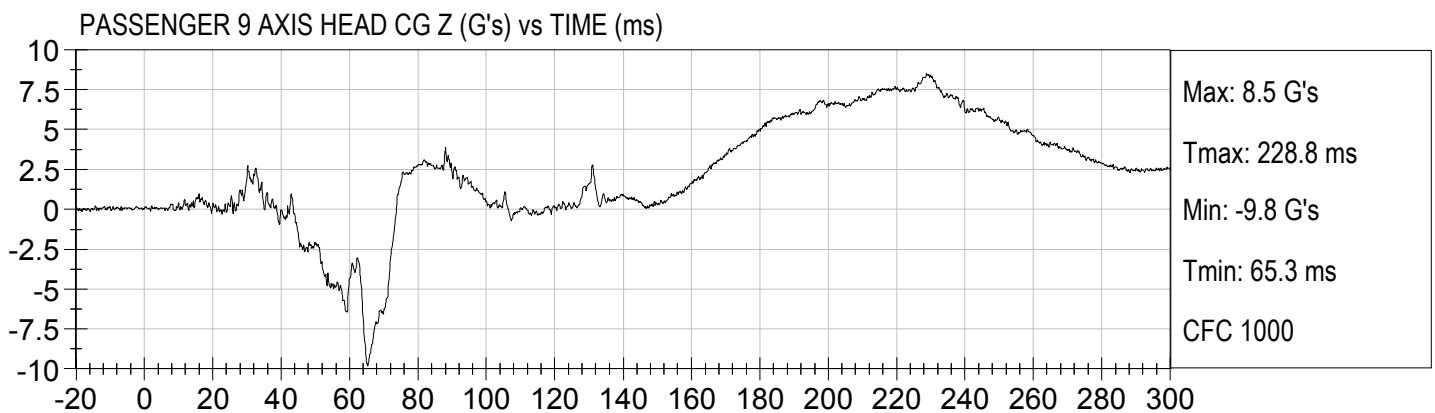
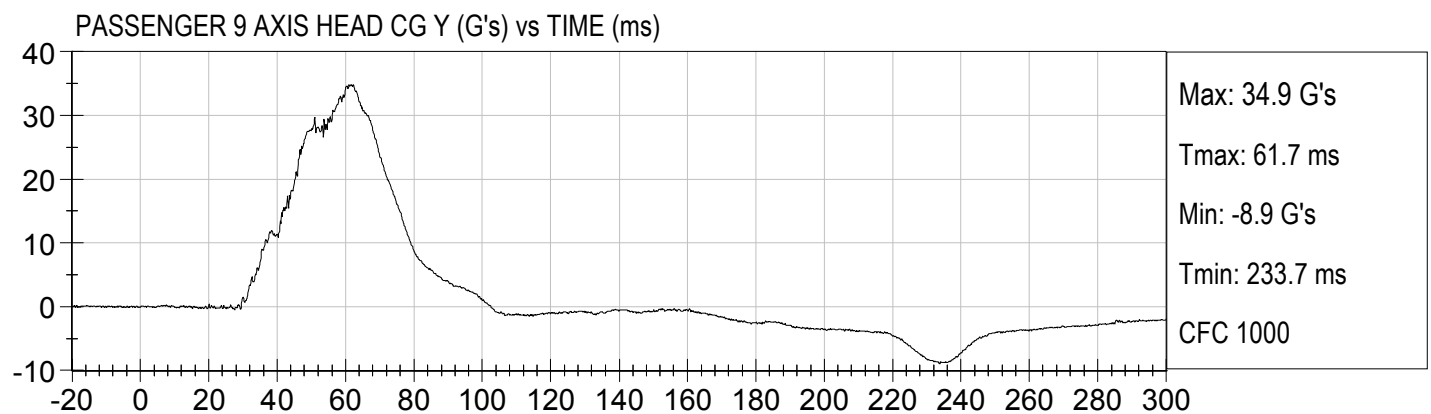
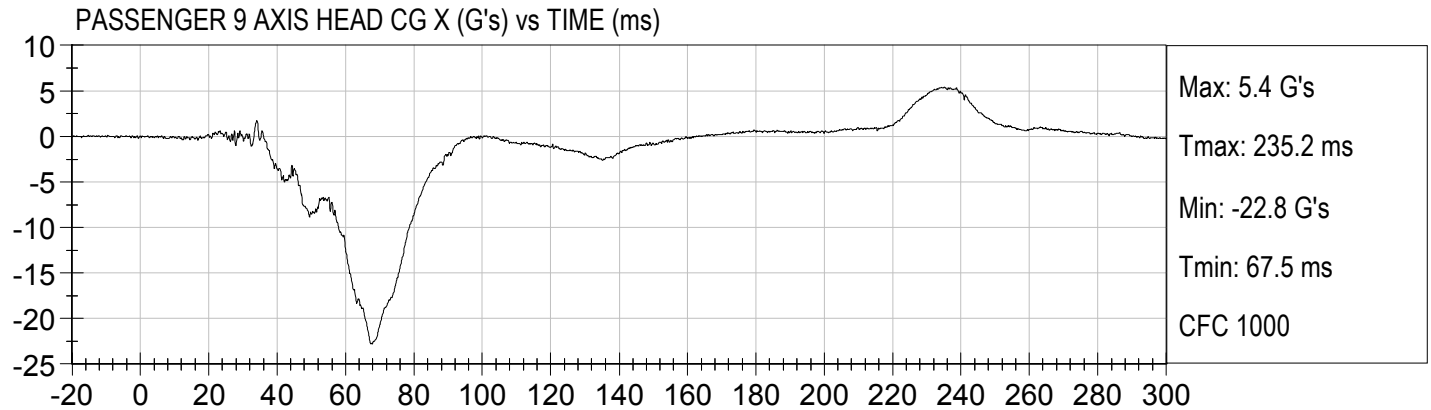
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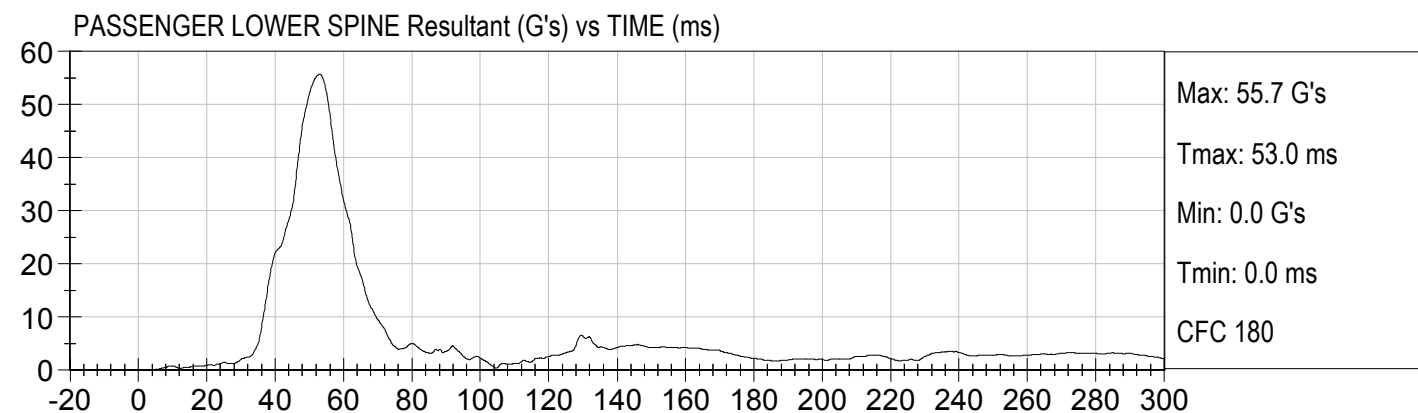
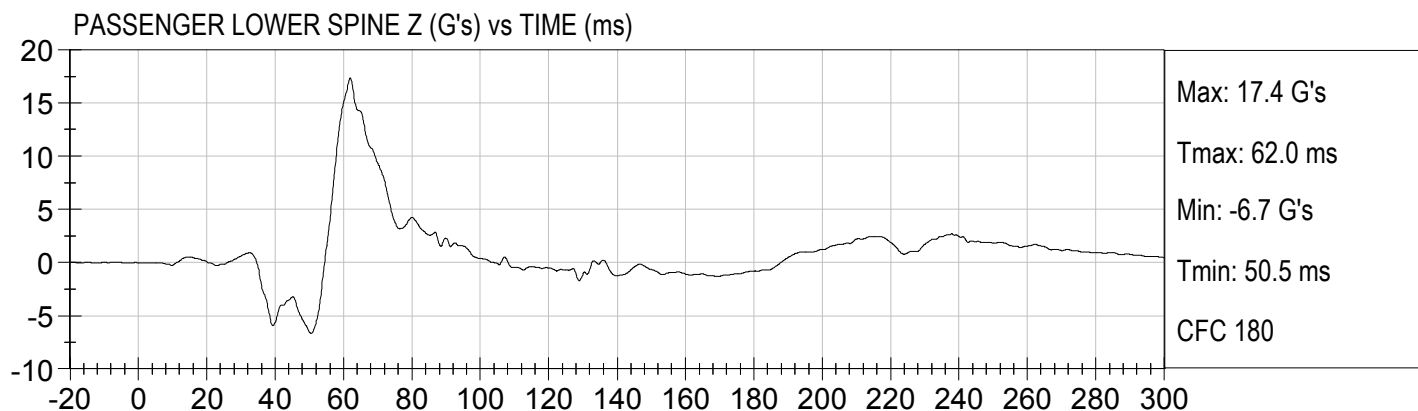
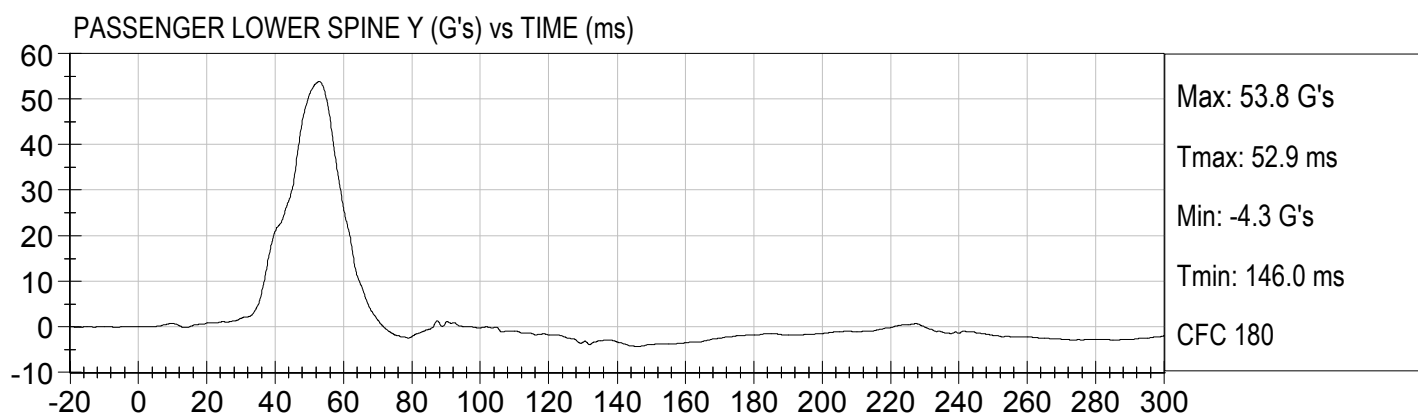
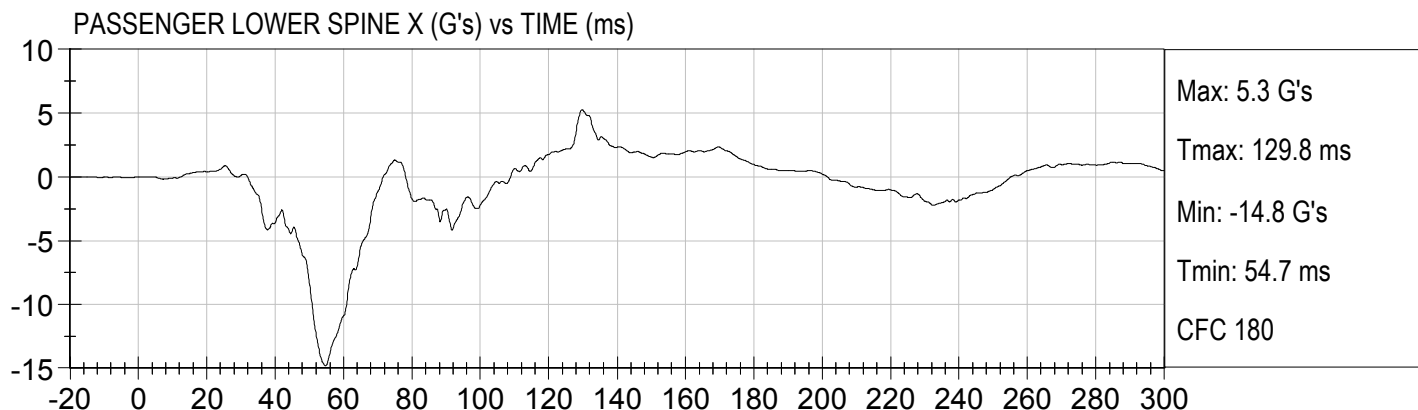


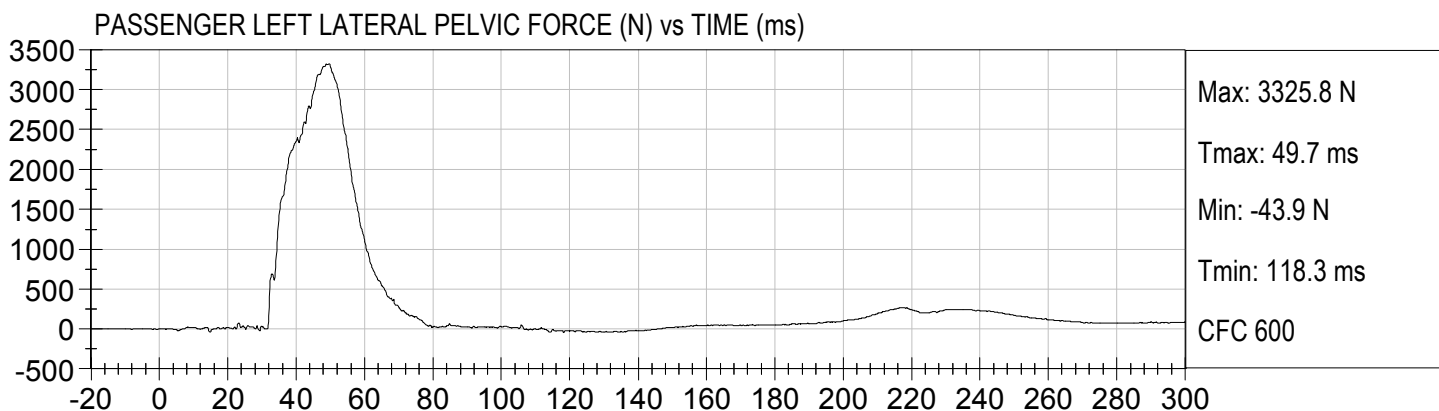
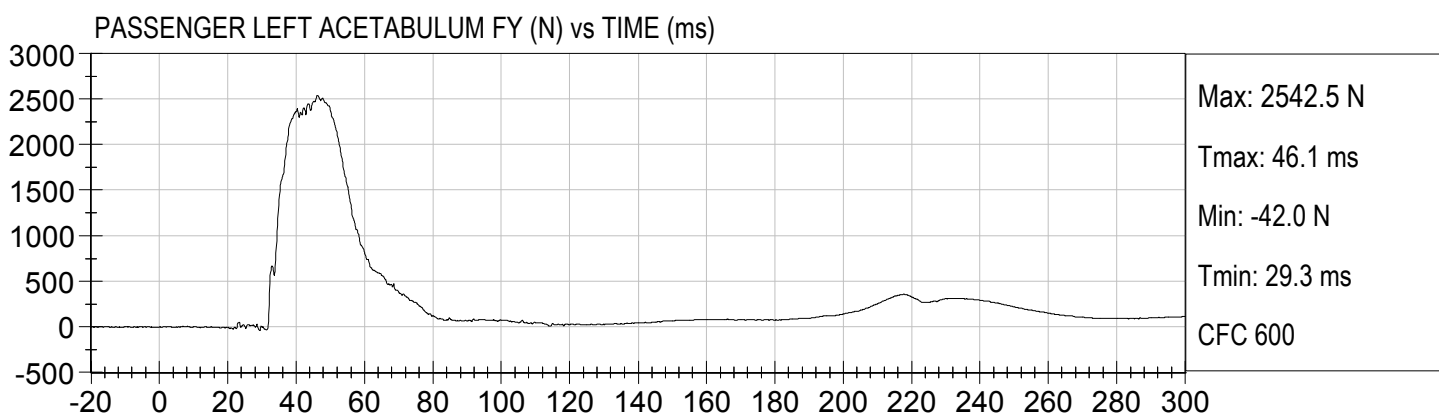
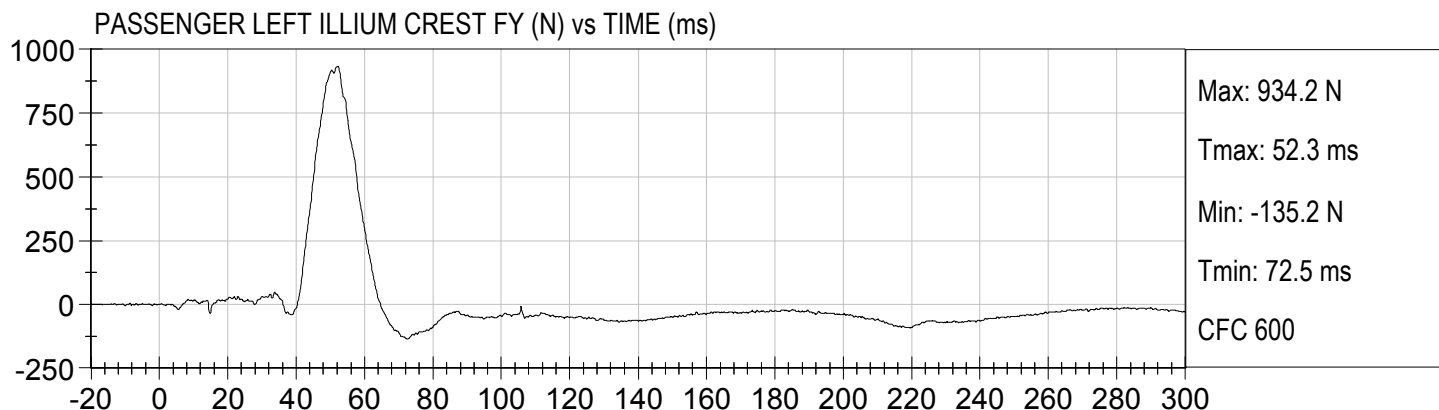












## **APPENDIX C**

### **DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA**

**ES-2re External Measurements**  
**SN: 032**

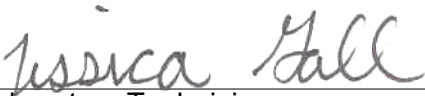
| <b>No.</b> | <b>Name</b>                                    | <b>Spec. (mm)</b> | <b>Result</b> | <b>Pass/Fail</b> |
|------------|------------------------------------------------|-------------------|---------------|------------------|
| <b>1</b>   | Sitting Height                                 | 900 - 918         | 915           | Pass             |
| <b>2</b>   | Seat to Shoulder Joint                         | 558 - 572         | 568           | Pass             |
| <b>3</b>   | Seat to Lower Face of Thoracic Spine Box       | 346 - 356         | 355           | Pass             |
| <b>4</b>   | Seat to Hip Joint (center of bolt)             | 97 - 103          | 98            | Pass             |
| <b>5</b>   | Sole to Seat, Sitting                          | 333 - 451         | 440           | Pass             |
| <b>6</b>   | Head Width                                     | 152 - 158         | 157           | Pass             |
| <b>7</b>   | Shoulder/Arm Width                             | 461 - 479         | 464           | Pass             |
| <b>8</b>   | Thorax Width                                   | 322 - 332         | 323           | Pass             |
| <b>9</b>   | Abdomen Width                                  | 273 - 287         | 281           | Pass             |
| <b>10</b>  | Pelvis Lap Width                               | 359 - 373         | 370           | Pass             |
| <b>11</b>  | Head Depth                                     | 196 - 206         | 203           | Pass             |
| <b>12</b>  | Thorax Depth                                   | 262 - 272         | 264           | Pass             |
| <b>13</b>  | Abdomen Depth                                  | 194 - 204         | 196           | Pass             |
| <b>14</b>  | Pelvis Depth                                   | 235 - 245         | 236           | Pass             |
| <b>15</b>  | Back of Buttocks to Hip Joint (center of bolt) | 150 - 160         | 151           | Pass             |
| <b>16</b>  | Back of Buttocks to Front Knee                 | 597 - 615         | 607           | Pass             |

**MGA RESEARCH CORPORATION**  
**HEAD DROP TEST**  
**ES-2re DUMMY**

**ATD Serial No:** 032

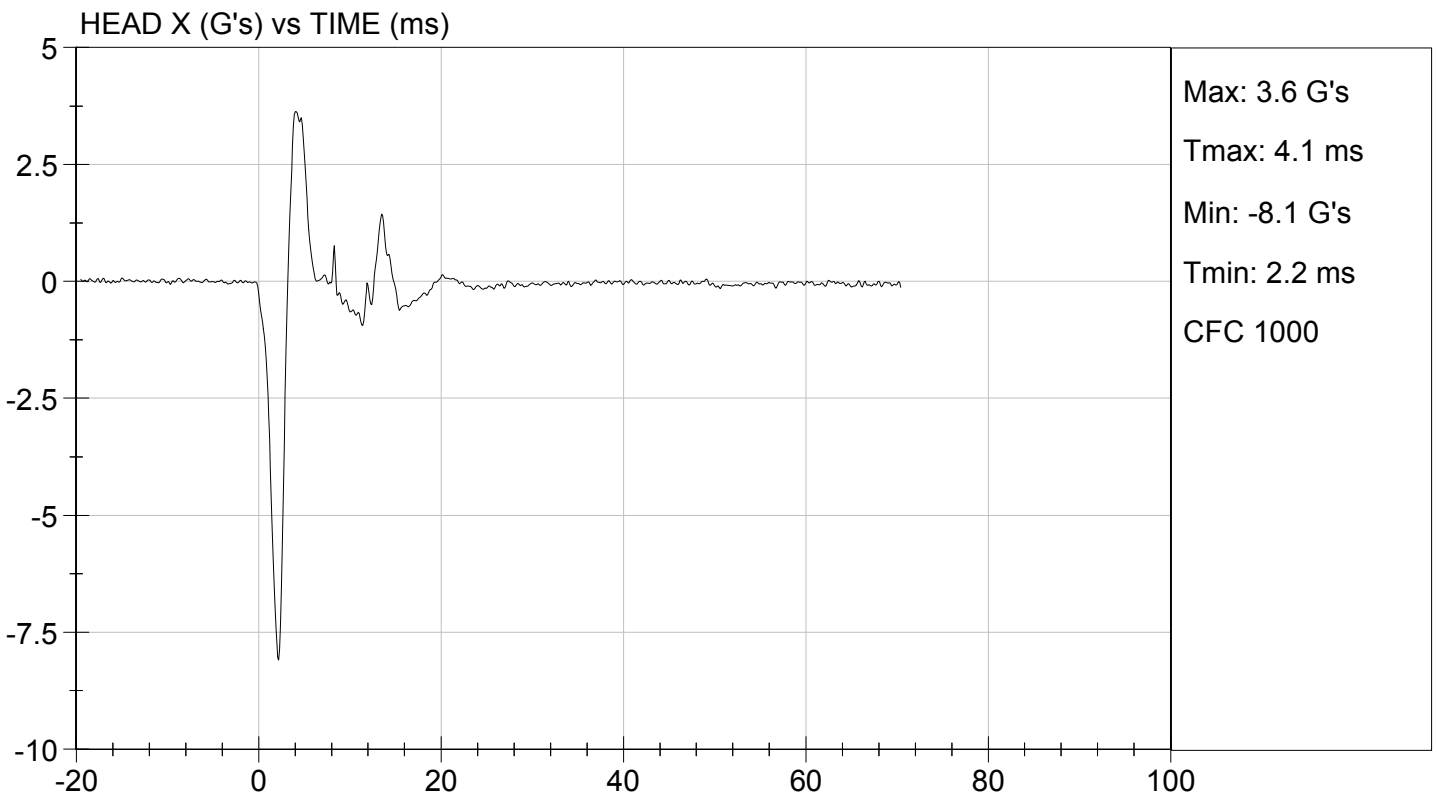
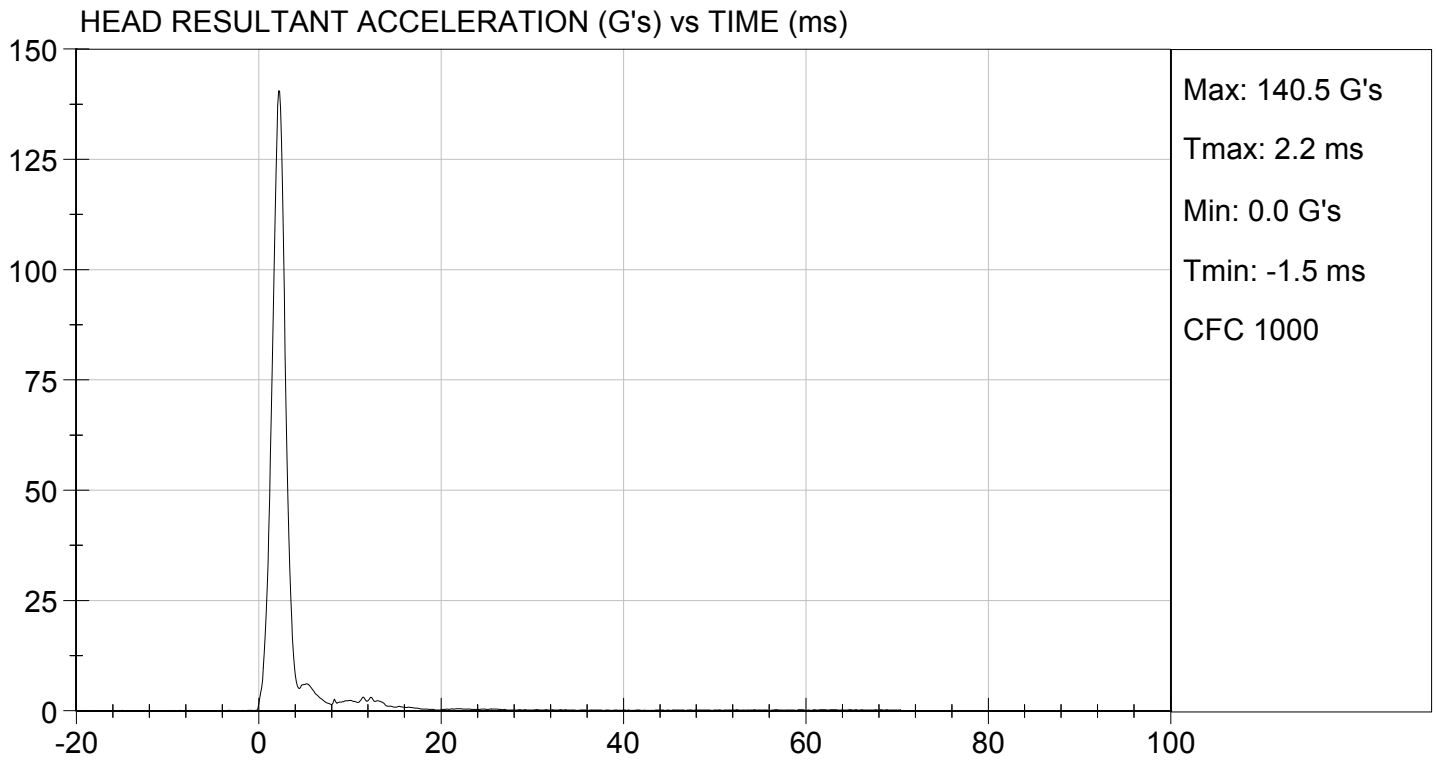
**Test ID:** D13061

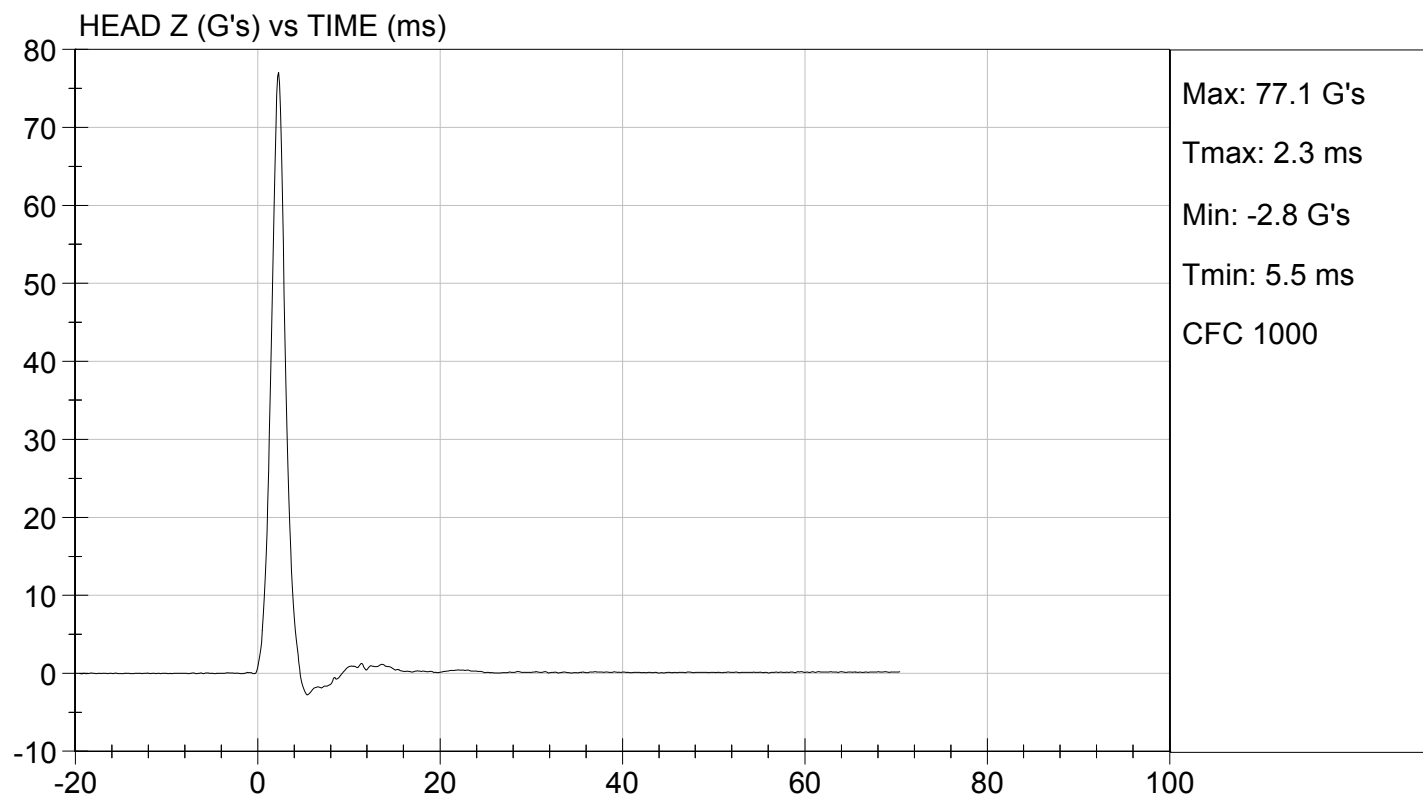
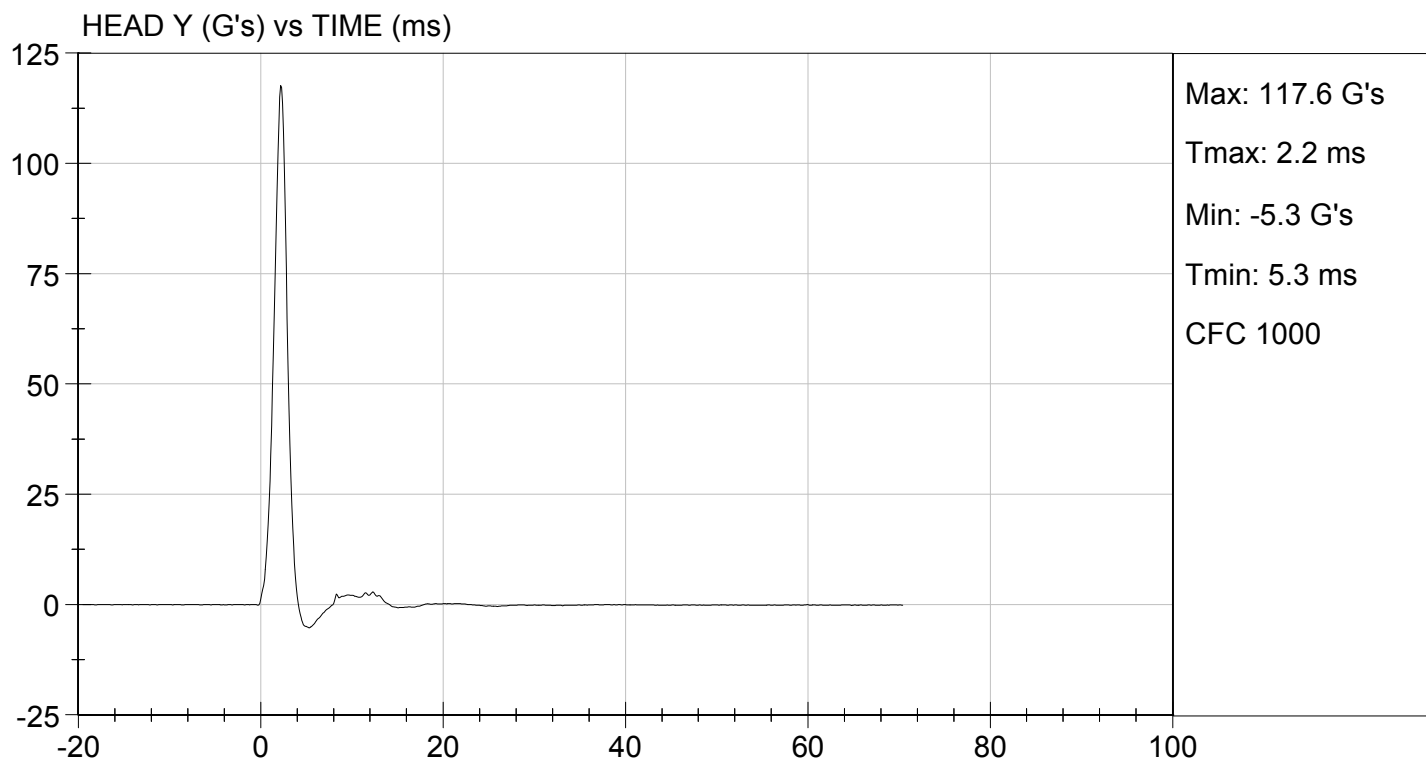
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|--------------------------------|-------|--------------------|--------|-----------|
| Laboratory Temperature         | deg C | 18.9 to 25.6       | 21.0   | Pass      |
| Laboratory Relative Humidity   | %     | 10 to 70           | 24     | Pass      |
| Peak Resultant Acceleration    | G's   | 125 to 155         | 141    | Pass      |
| Peak Longitudinal Acceleration | G's   | <= +/- 15.0        | -8.1   | Pass      |
| Unimodal                       | N/A   | Yes                | Yes    | Pass      |
| Oscillations                   | N/A   | within 15% of peak | Yes    | Pass      |
| Overall Test Results           |       |                    |        | Pass      |

  
Laboratory Technician

01/10/2013  
Test Date

  
Approved By



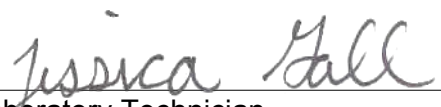


**MGA RESEARCH CORPORATION**  
**NECK PENDULUM TEST**  
**ES-2re DUMMY**

**ATD Serial No:** 032

**Test I.D:** D13062

| Tested Parameter                     |       | Units | Specification   | Result | Pass/Fail |
|--------------------------------------|-------|-------|-----------------|--------|-----------|
| Laboratory Temperature               |       | deg C | 20.6 to 22.2    | 21.0   | Pass      |
| Laboratory Relative Humidity         |       | %     | 10 to 70        | 25     | Pass      |
| Pendulum Speed                       |       | m/s   | 3.30 to 3.50    | 3.46   | Pass      |
| Pendulum Velocity                    | 1 ms  | m/s   | -0.05 to 0.00   | -0.03  | Pass      |
|                                      | 3 ms  | m/s   | -0.25 to -0.375 | -0.33  | Pass      |
|                                      | 14 ms | m/s   | -3.20 to -3.70  | -3.28  | Pass      |
|                                      | 17 ms | m/s   | >= -3.70        | -3.27  | Pass      |
| Maximum Flexion Angle                |       | deg   | 49.0 to 59.0    | 51.8   | Pass      |
| Time of Maximum Flexion Angle        |       | ms    | 54.0 to 66.0    | 62.9   | Pass      |
| Head Rotation Decay Time to 0 Degree |       | ms    | 53.0 to 88.0    | 56.5   | Pass      |
| Overall Results                      |       |       |                 |        | Pass      |

  
 Laboratory Technician

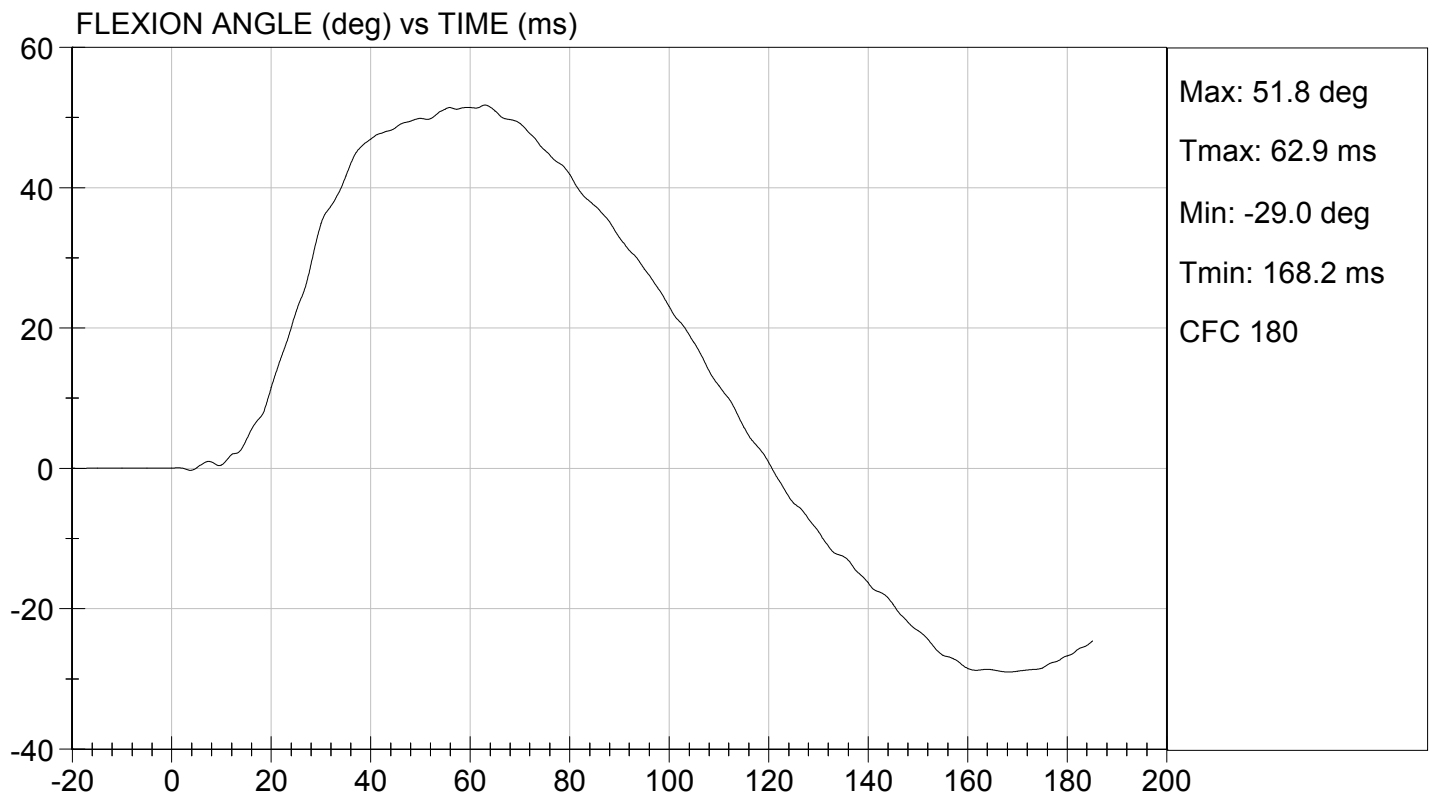
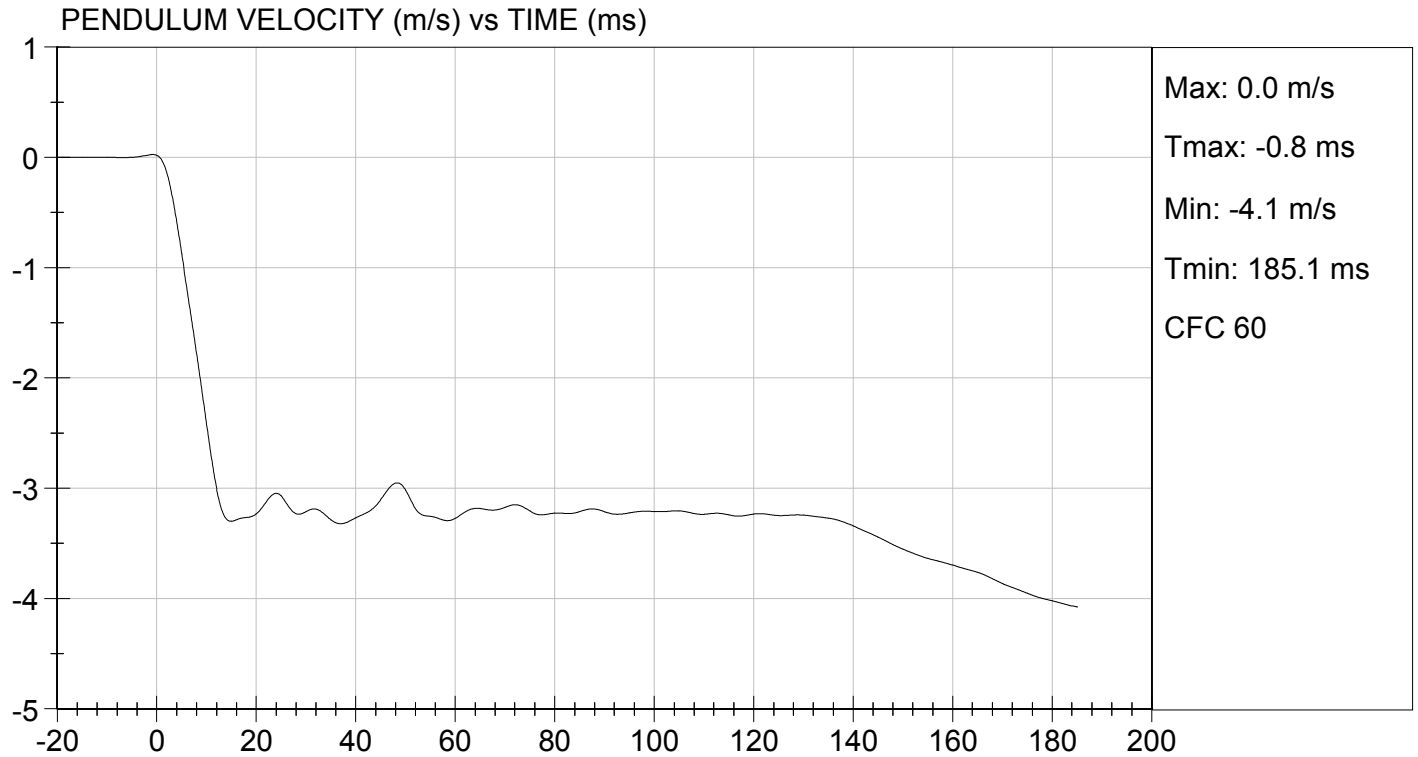
  
 Approved By

01/10/2013  
 Test Date



TEST DESC: NECK BENDING  
VELOCITY: 11.34 ft/s, 3.46 m/s

TEST DATE: 01/10/2013  
TEST #: D13062

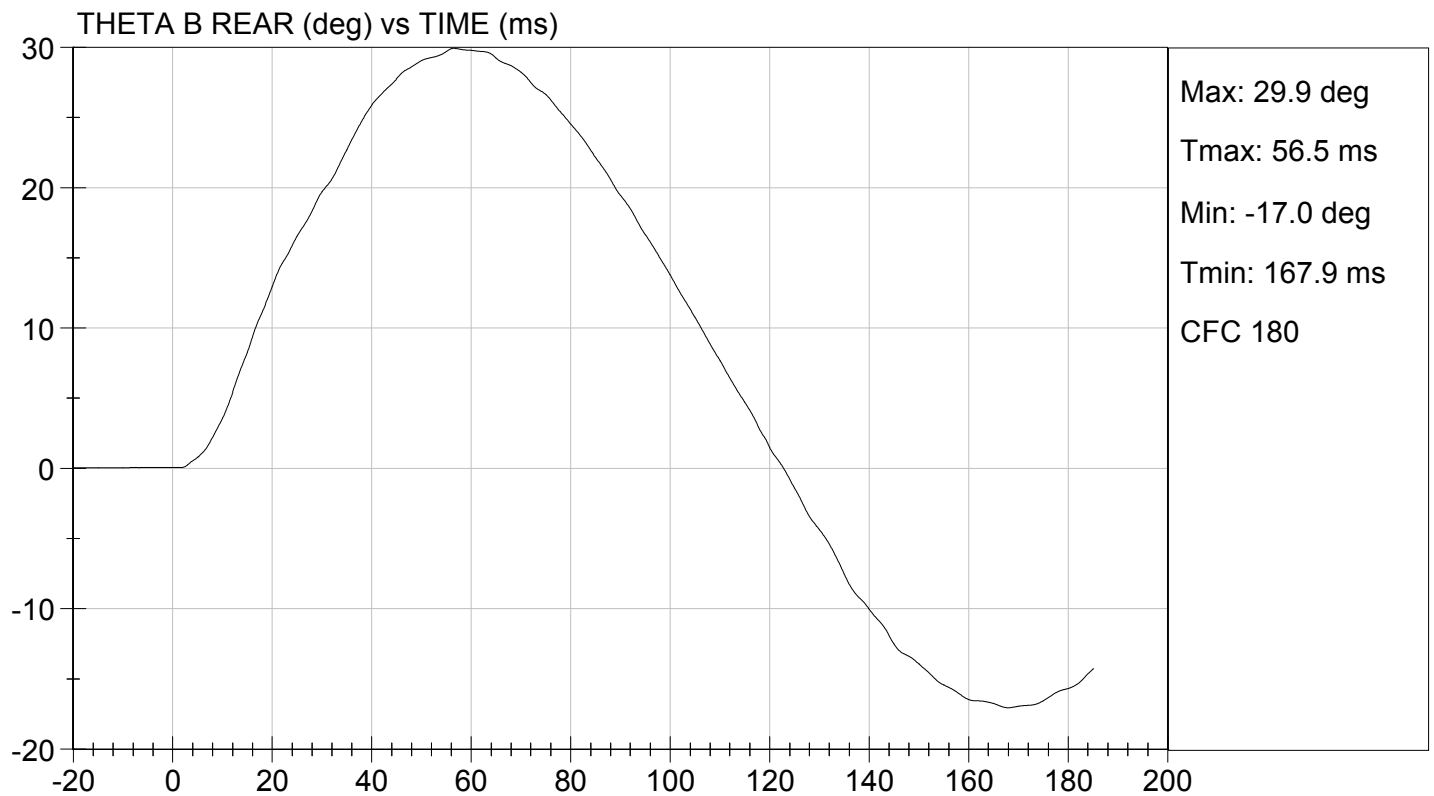
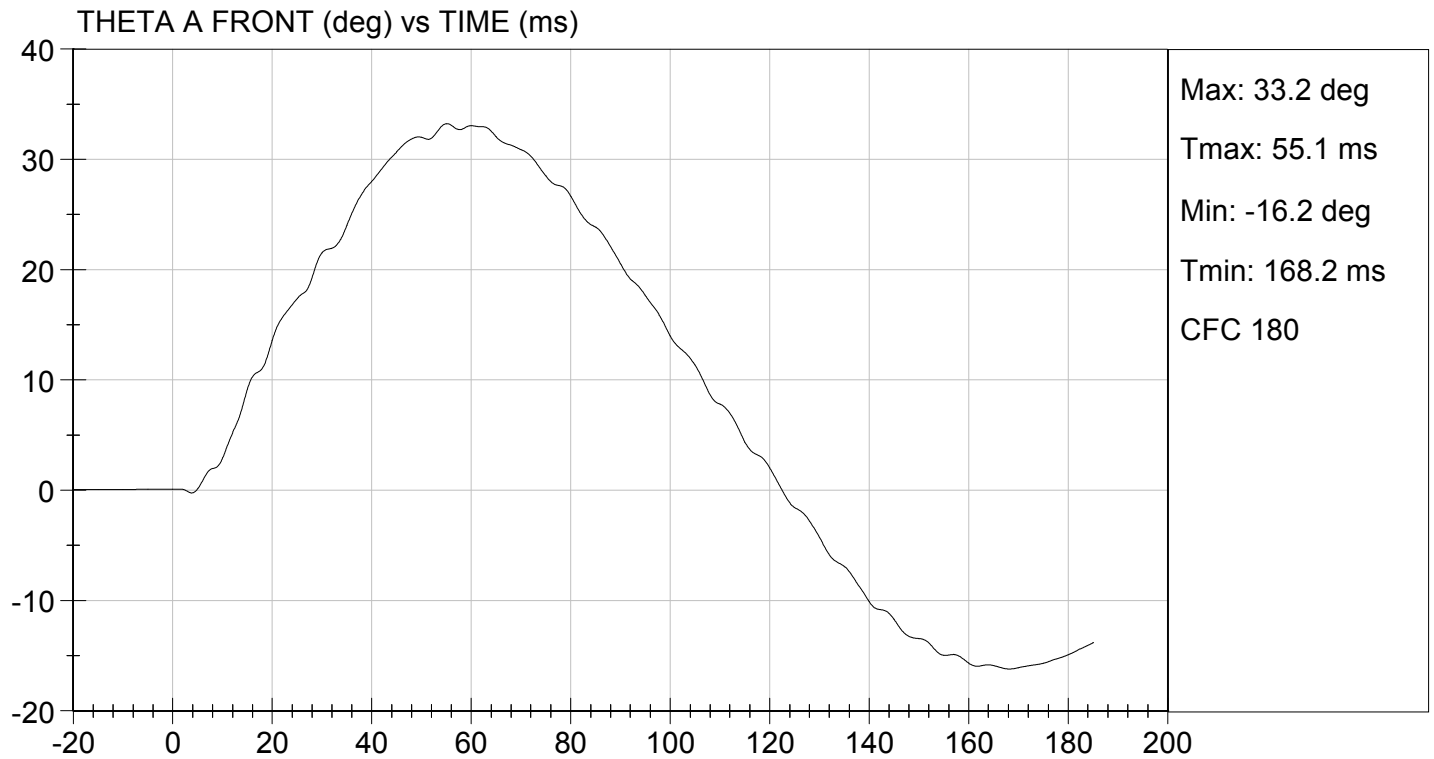




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VELOCITY: 11.34 ft/s, 3.46 m/s

TEST DATE: 01/10/2013

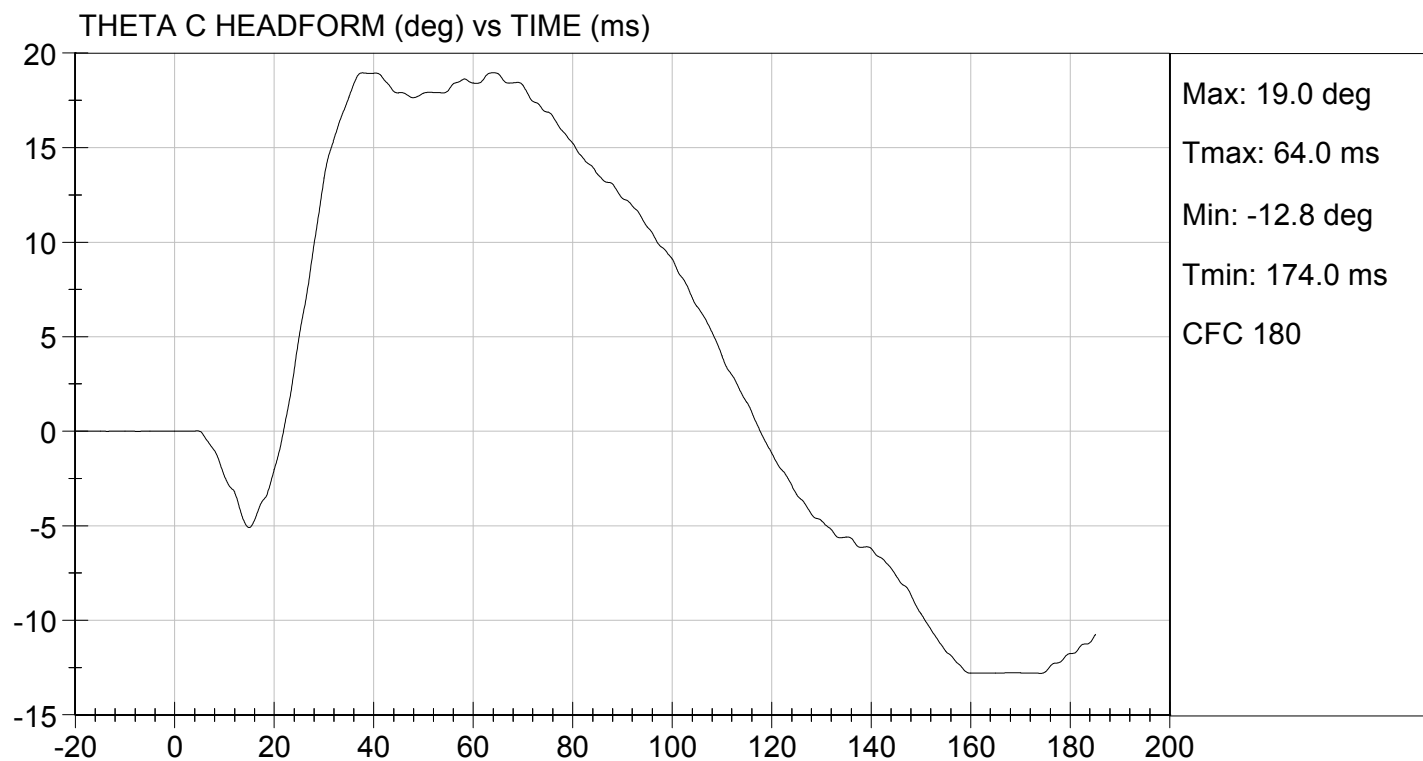
TEST #: D13062





TEST DESC: NECK BENDING  
VELOCITY: 11.34 ft/s, 3.46 m/s

TEST DATE: 01/10/2013  
TEST #: D13062



**MGA RESEARCH CORPORATION**

**SHOULDER IMPACT TEST**

**ES-2re DUMMY**

**ATD Serial No:** 032

**Test I.D:** D13063

| Tested Parameter             | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature       | deg C | 20.6 to 22.2  | 20.7   | Pass      |
| Laboratory Relative Humidity | %     | 10 to 70      | 33     | Pass      |
| Pendulum Speed               | m/s   | 4.20 to 4.40  | 4.3    | Pass      |
| Peak Impactor Acceleration   | G's   | 7.5 to 10.5   | 9.7    | Pass      |
| Overall Test Results         |       |               |        | Pass      |

  
Laboratory Technician

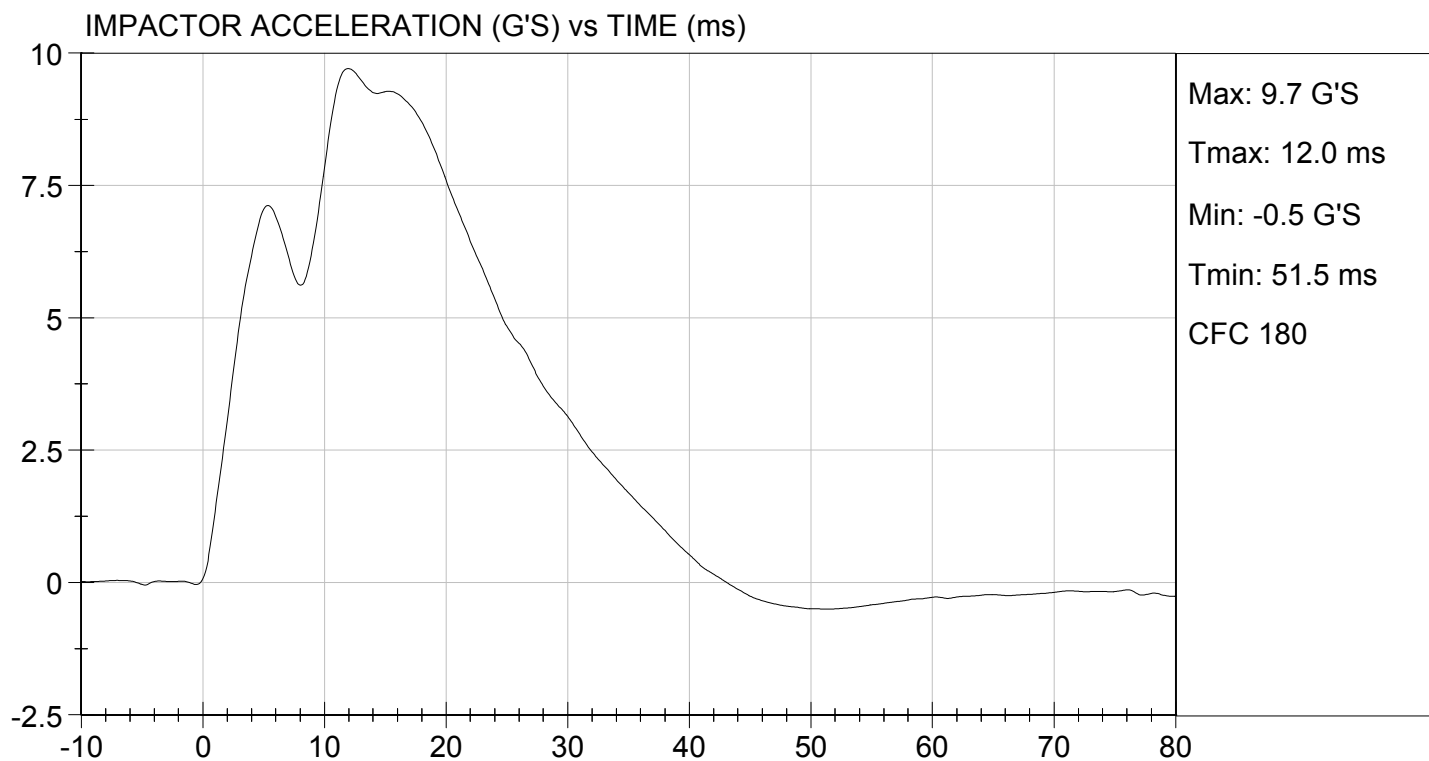
01/11/2013  
Test Date

  
Approved By



TEST DESC: SHOULDER IMPACT  
VELOCITY: 14.12 ft/s, 4.3 m/s

TEST DATE: 01/11/2013  
TEST #: D13063



**MGA RESEARCH CORPORATION**

**UPPER RIB TEST**

**ES-2re DUMMY**

**ATD Serial No:** 032

**Test I.D:** D13064

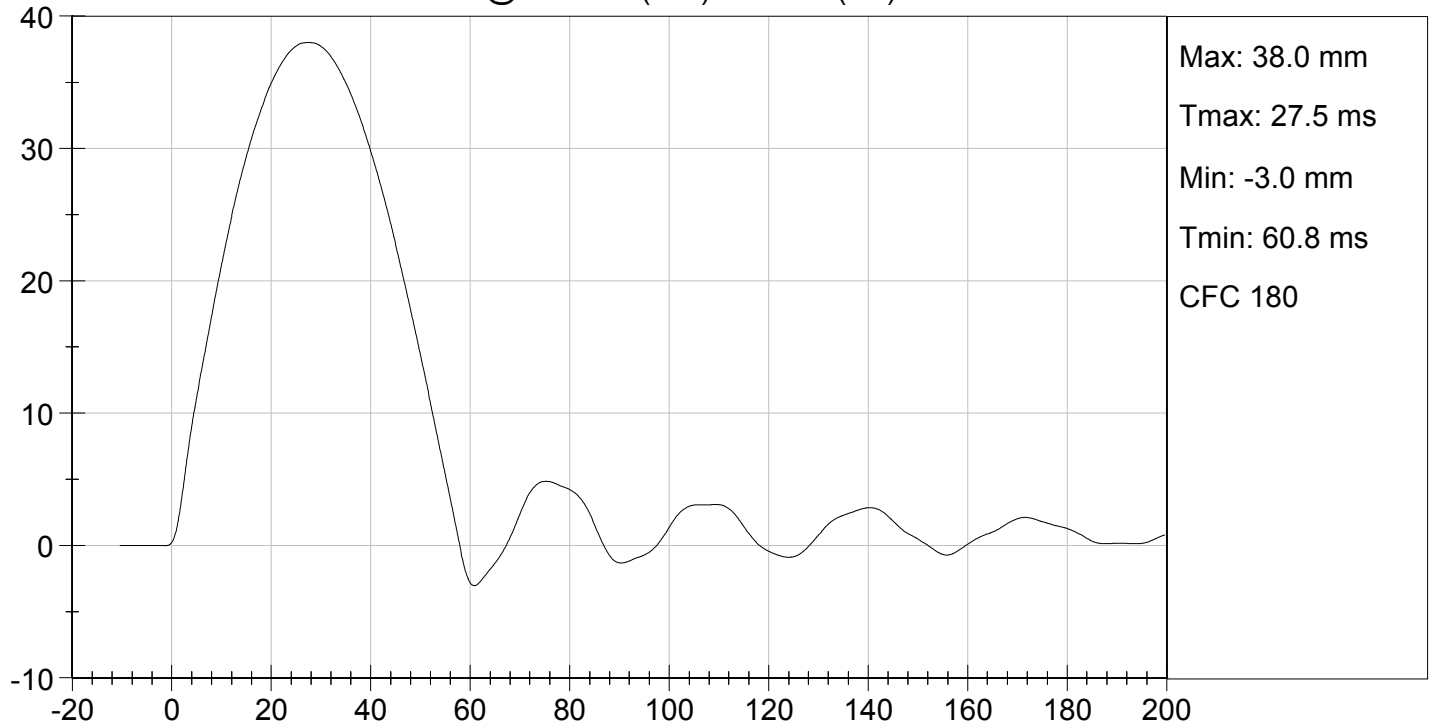
| Tested Parameter             | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature       | deg C | 20.6 to 22.2  | 21.0   | Pass      |
| Laboratory Relative Humidity | %     | 10 to 70      | 24     | Pass      |
| Displacement at 459 mm       | mm    | 36.0 to 40.0  | 38.0   | Pass      |
| Displacement at 815 mm       | mm    | 46.0 to 51.0  | 48.6   | Pass      |
| Overall Test Results         |       |               |        | Pass      |

  
Laboratory Technician

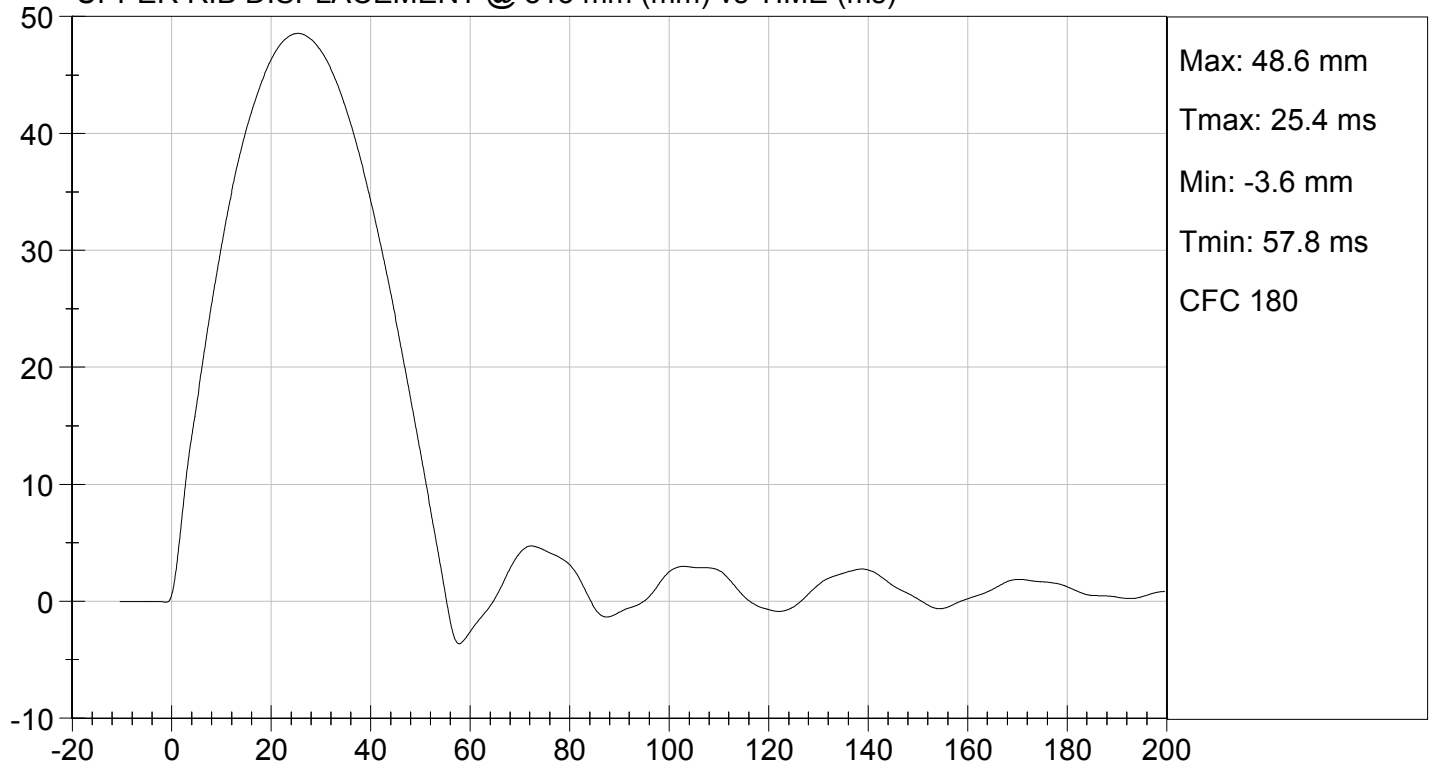
01/10/2013  
Test Date

  
Approved By

UPPER RIB DISPLACEMENT @ 459 mm (mm) vs TIME (ms)



UPPER RIB DISPLACEMENT @ 815 mm (mm) vs TIME (ms)



**MGA RESEARCH CORPORATION**

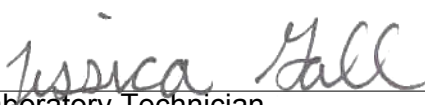
**MID RIB TEST**

**ES-2re DUMMY**

**ATD Serial No:** 032

**Test I.D:** D13065

| Tested Parameter             | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature       | deg C | 20.6 to 22.2  | 21.0   | Pass      |
| Laboratory Relative Humidity | %     | 10 to 70      | 24     | Pass      |
| Displacement at 459 mm       | mm    | 36.0 to 40.0  | 37.7   | Pass      |
| Displacement at 815 mm       | mm    | 46.0 to 51.0  | 47.8   | Pass      |
| Overall Test Results         |       |               |        | Pass      |

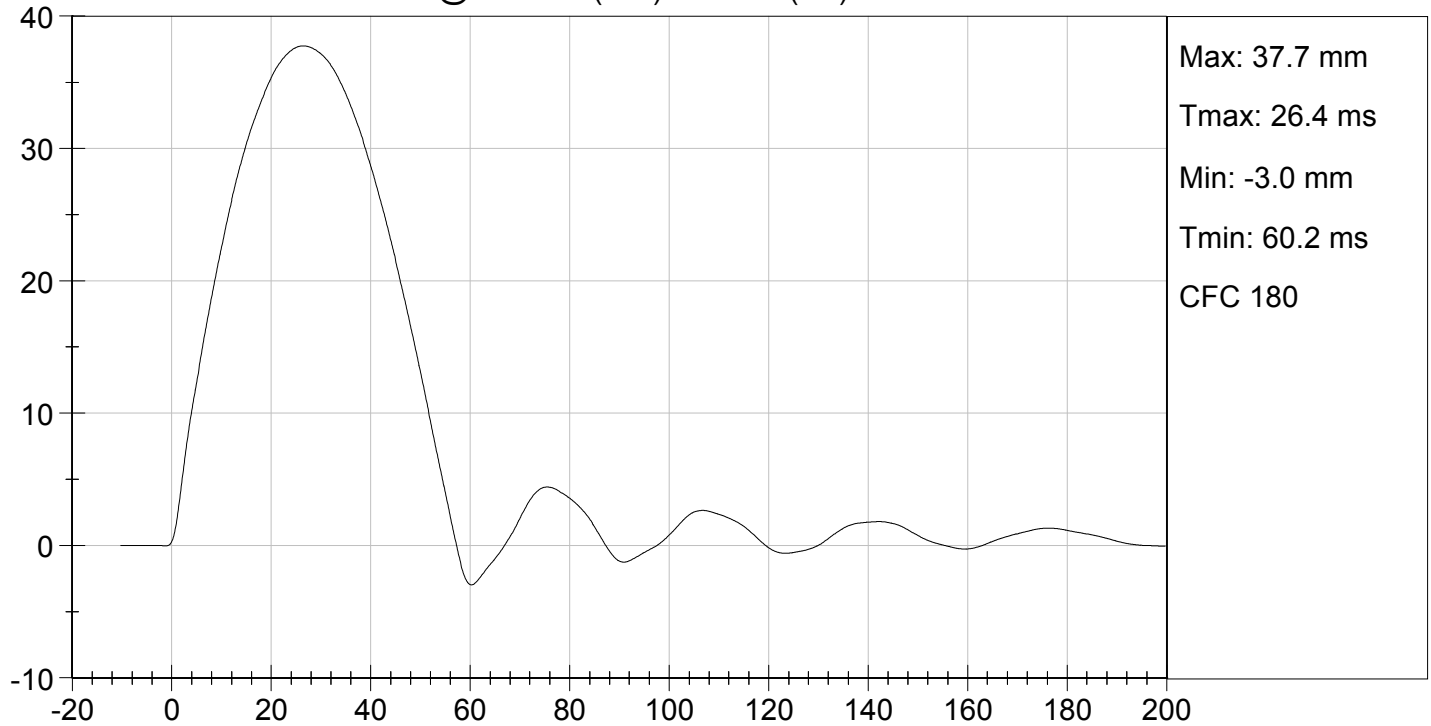
  
Laboratory Technician

01/10/2013  
Test Date

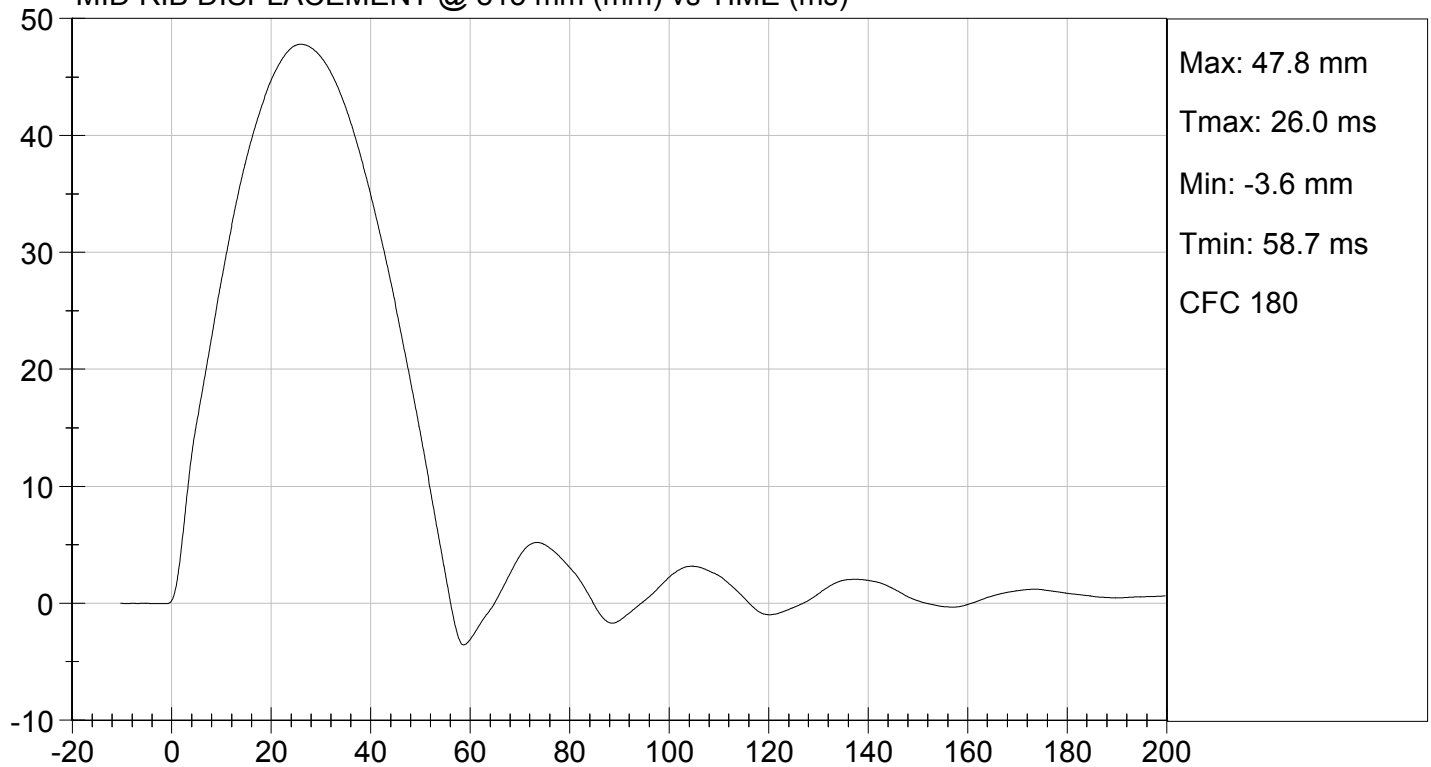
  
Approved By



MID RIB DISPLACEMENT @ 459 mm (mm) vs TIME (ms)



MID RIB DISPLACEMENT @ 815 mm (mm) vs TIME (ms)



**MGA RESEARCH CORPORATION**

**LOWER RIB TEST**

**ES-2re DUMMY**

**ATD Serial No:** 032

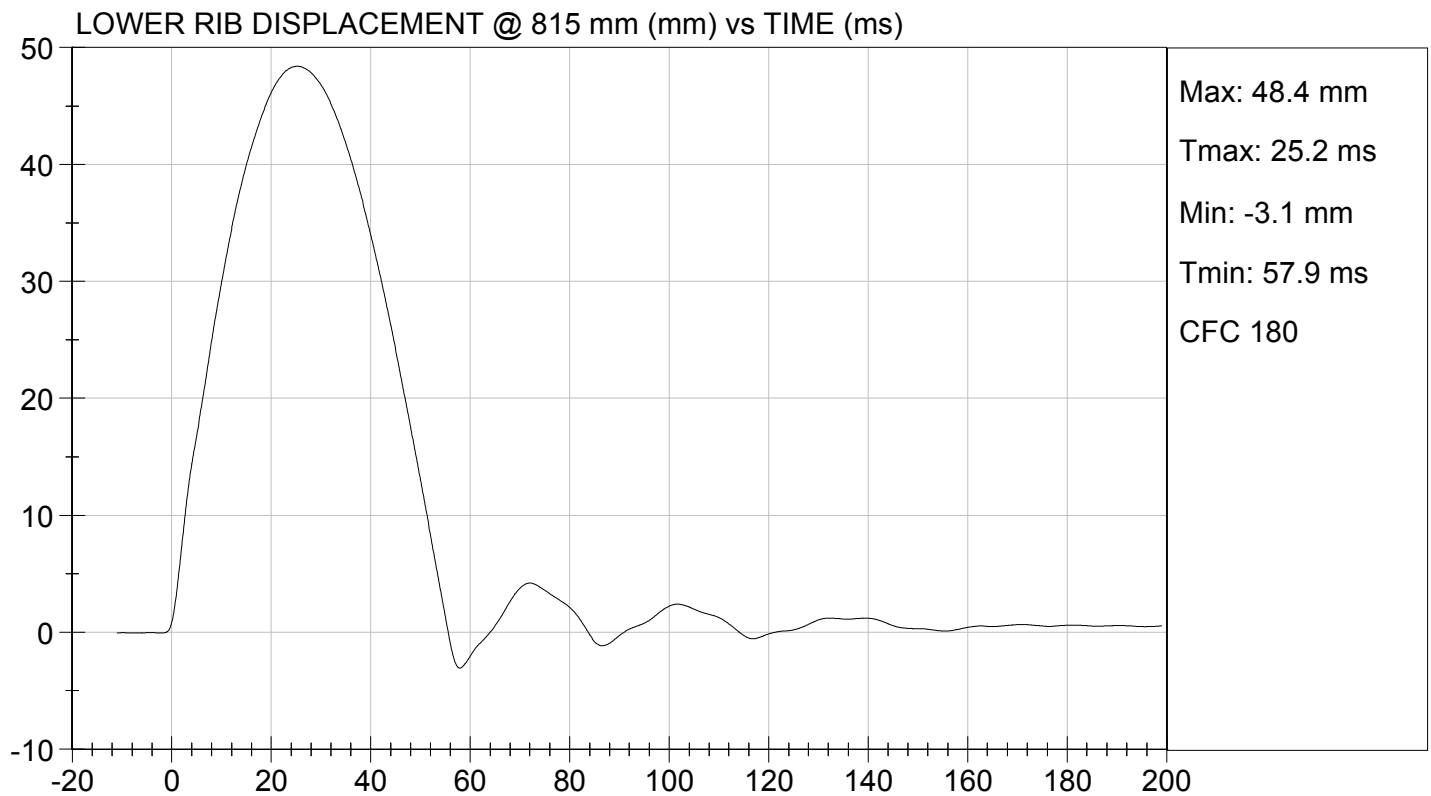
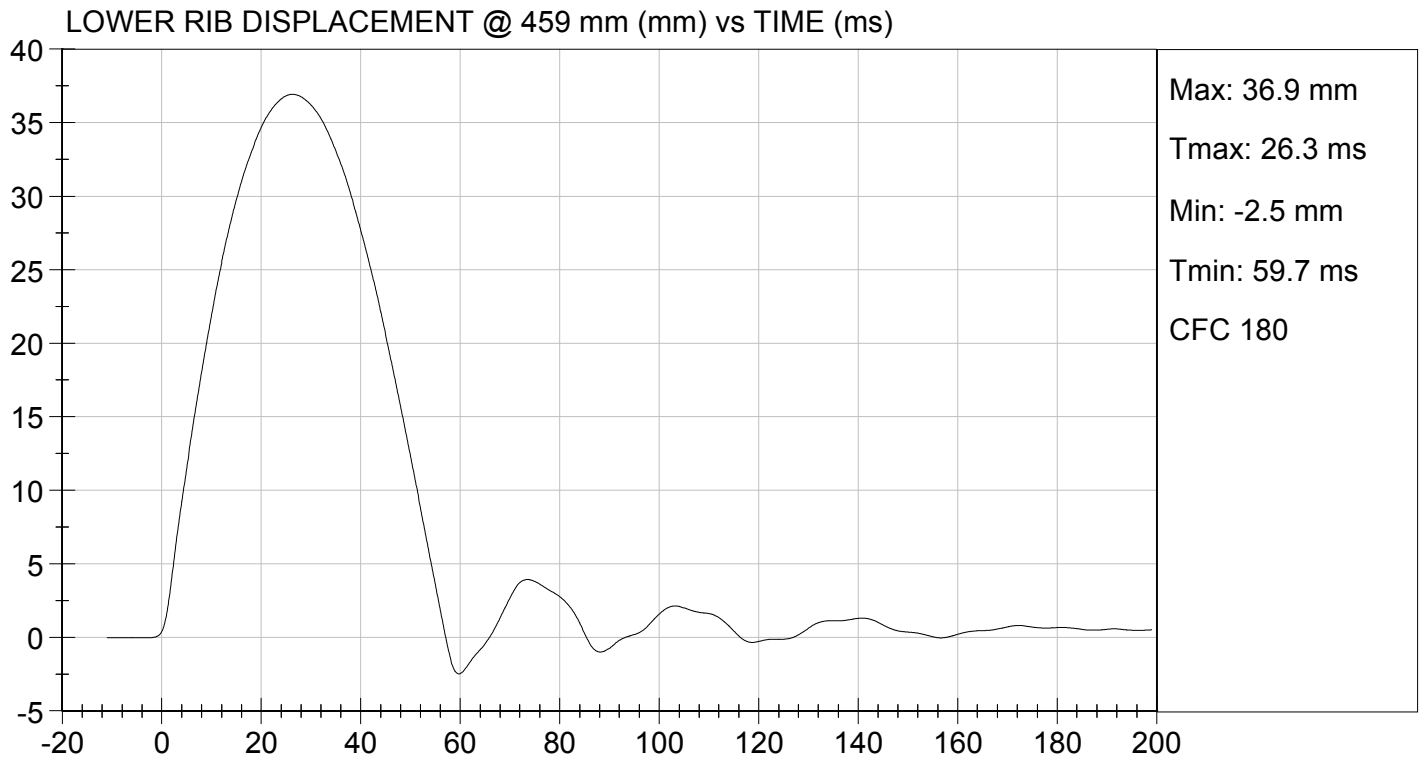
**Test I.D:** D13066

| Tested Parameter             | Units | Specification | Result               | Pass/Fail |
|------------------------------|-------|---------------|----------------------|-----------|
| Laboratory Temperature       | deg C | 20.6 to 22.2  | 21.0                 | Pass      |
| Laboratory Relative Humidity | %     | 10 to 70      | 24                   | Pass      |
| Displacement at 459 mm       | mm    | 36.0 to 40.0  | 36.9                 | Pass      |
| Displacement at 815 mm       | mm    | 46.0 to 51.0  | 48.4                 | Pass      |
|                              |       |               | Overall Test Results | Pass      |

  
Laboratory Technician

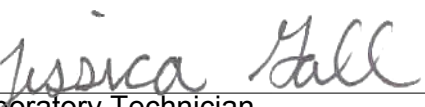
01/10/2013  
Test Date

  
Approved By



**MGA RESEARCH CORPORATION****THORAX IMPACT TEST****ES-2re DUMMY****ATD Serial No:** 032**Test I.D:** D13060

| Tested Parameter                    | Units | Specification | Result | Pass/Fail |
|-------------------------------------|-------|---------------|--------|-----------|
| Temperature                         | deg C | 20.6 to 22.2  | 20.7   | Pass      |
| Humidity                            | %     | 10 to 70      | 33     | Pass      |
| Probe Speed                         | m/s   | 5.40 to 5.60  | 5.58   | Pass      |
| Maximum Impactor Force (after 6 ms) | N     | 5100 to 6200  | 5405   | Pass      |
| Upper Rib Displacement              | mm    | 34.0 to 41.0  | 36.1   | Pass      |
| Middle Rib Displacement             | mm    | 37.0 to 45.0  | 39.2   | Pass      |
| Lower Rib Displacement              | mm    | 37.0 to 44.0  | 38.4   | Pass      |
| Overall Test Results                |       |               |        | Pass      |

  
Laboratory Technician

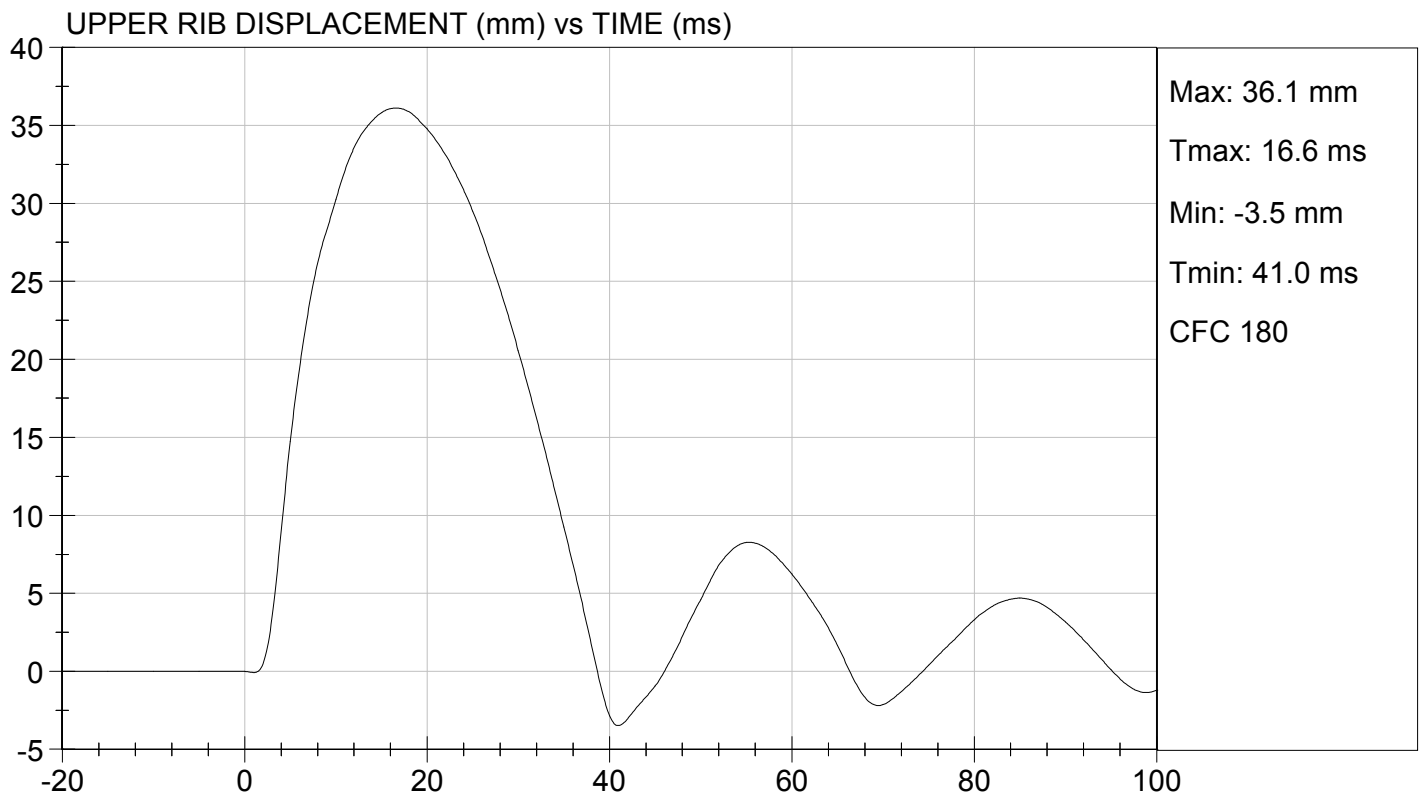
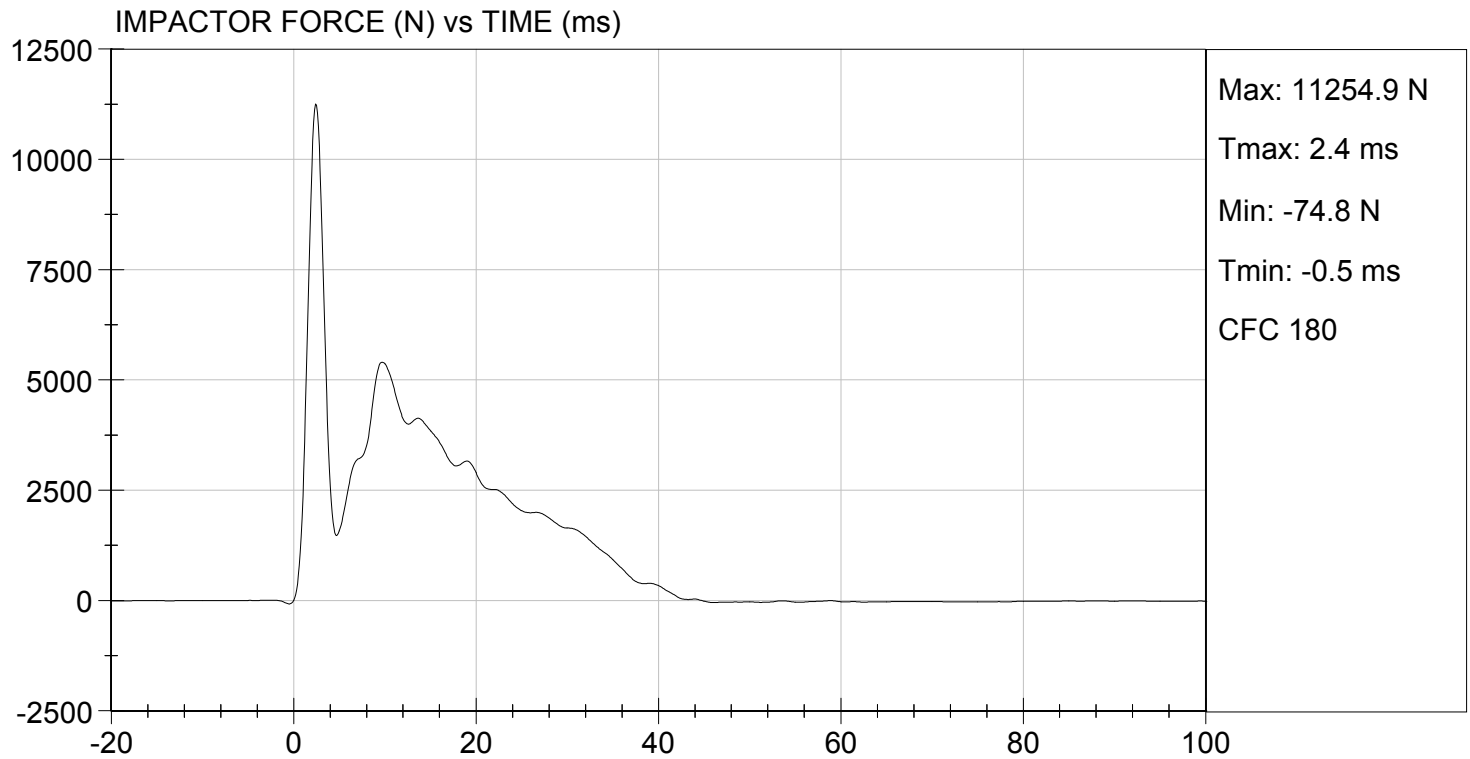
01/11/2013  
Test Date

  
Approved By



TEST DESC: THORAX IMPACT  
VELOCITY: 18.31 ft/s, 5.58 m/s

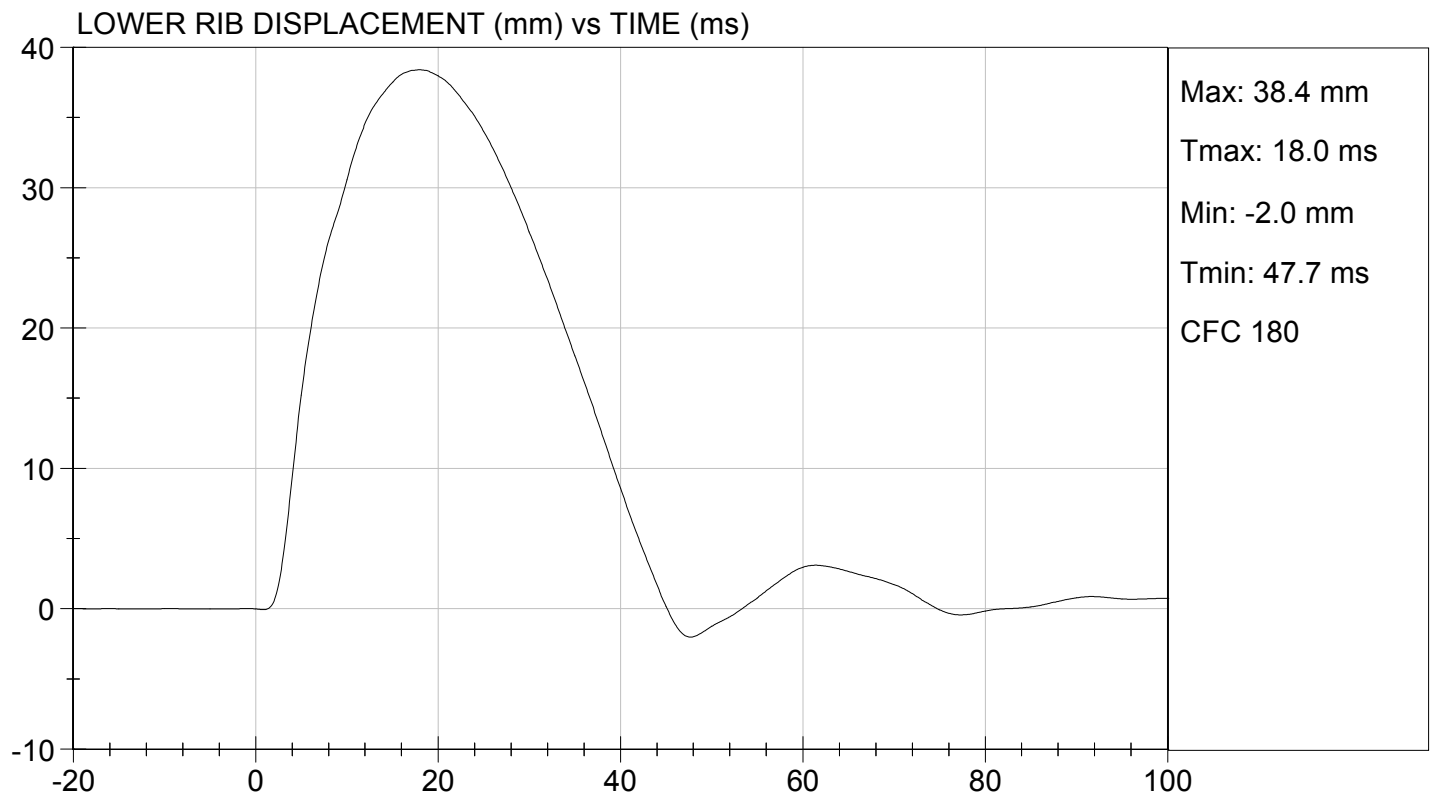
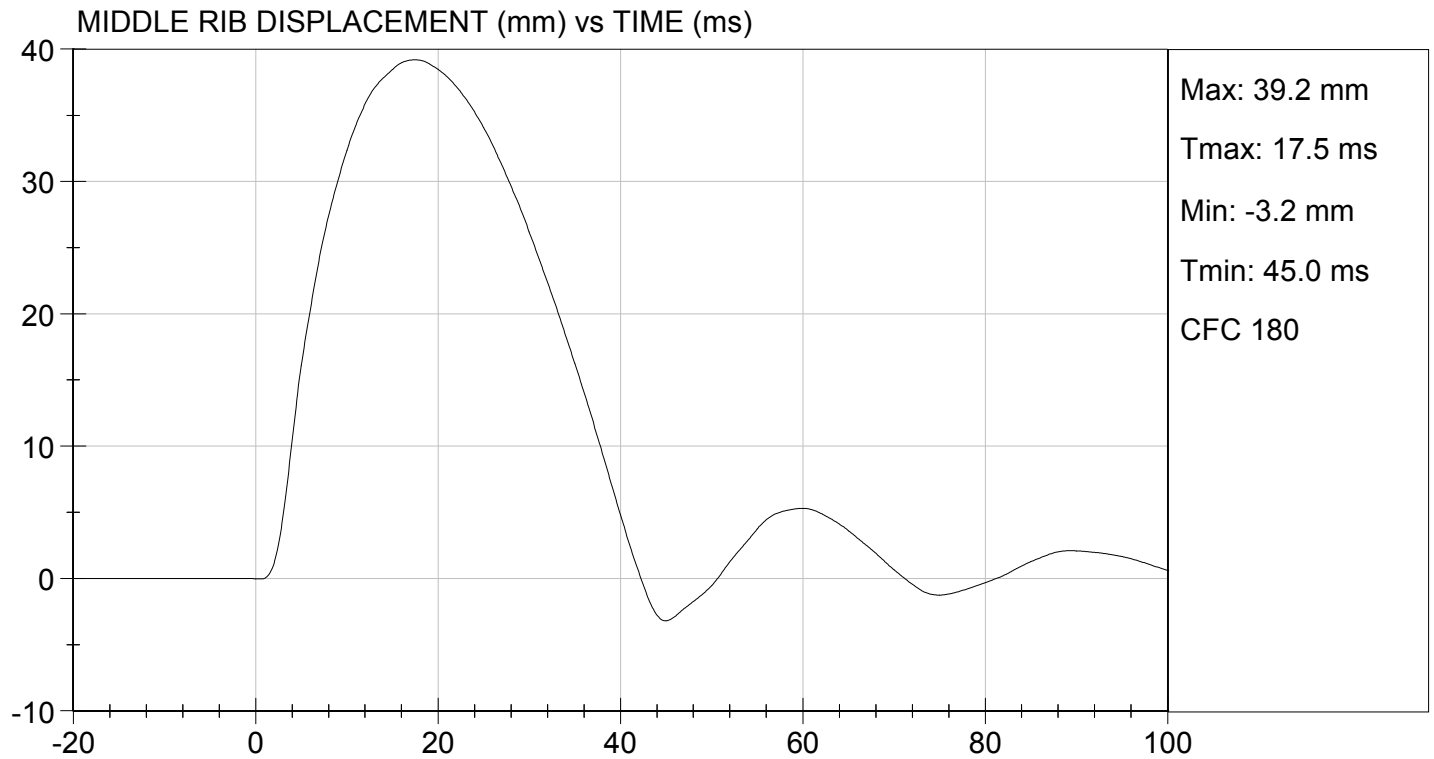
TEST DATE: 01/11/2013  
TEST #: D13060





TEST DESC: THORAX IMPACT  
VELOCITY: 18.31 ft/s, 5.58 m/s

TEST DATE: 01/11/2013  
TEST #: D13060



**MGA RESEARCH CORPORATION**

**ABDOMEN TEST**

**ES-2re DUMMY**

**ATD Serial No:** 032

**Test I.D:** D13067

| Tested Parameter               | Units | Specification | Result | Pass/Fail |
|--------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature         | deg C | 20.6 to 22.2  | 20.7   | Pass      |
| Laboratory Relative Humidity   | %     | 10 to 70      | 33     | Pass      |
| Probe Speed                    | m/s   | 3.90 to 4.10  | 4.10   | Pass      |
| Maximum Impactor Force         | N     | 4000 to 4800  | 4328   | Pass      |
| Time of Maximum Impactor Force | ms    | 10.6 to 13.0  | 10.7   | Pass      |
| Maximum Total Abdomen Force    | N     | 2200 to 2700  | 2468   | Pass      |
| Time of Maximum Abdomen Force  | ms    | 10.0 to 12.3  | 10.4   | Pass      |
| Overall Test Results           |       |               |        | Pass      |

  
Laboratory Technician

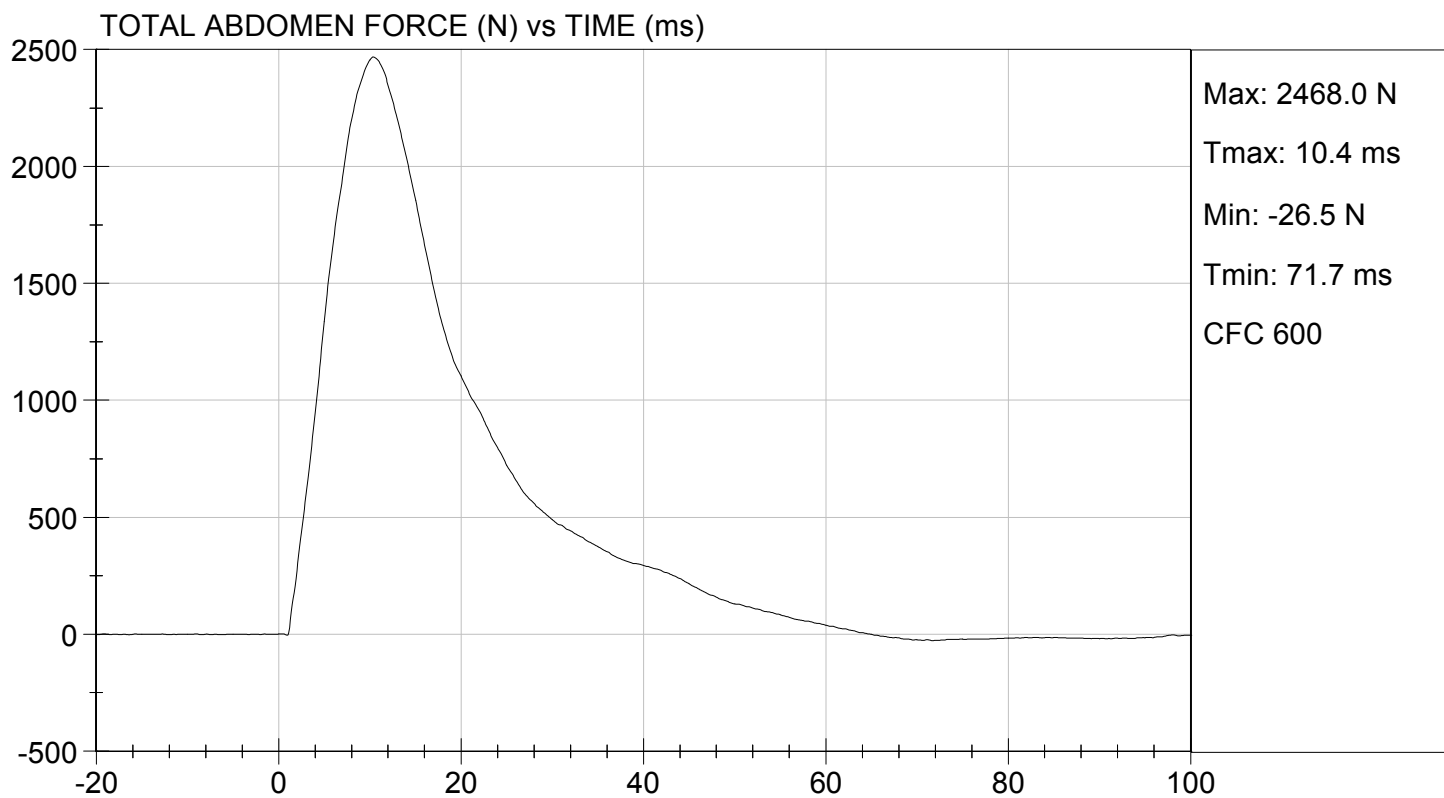
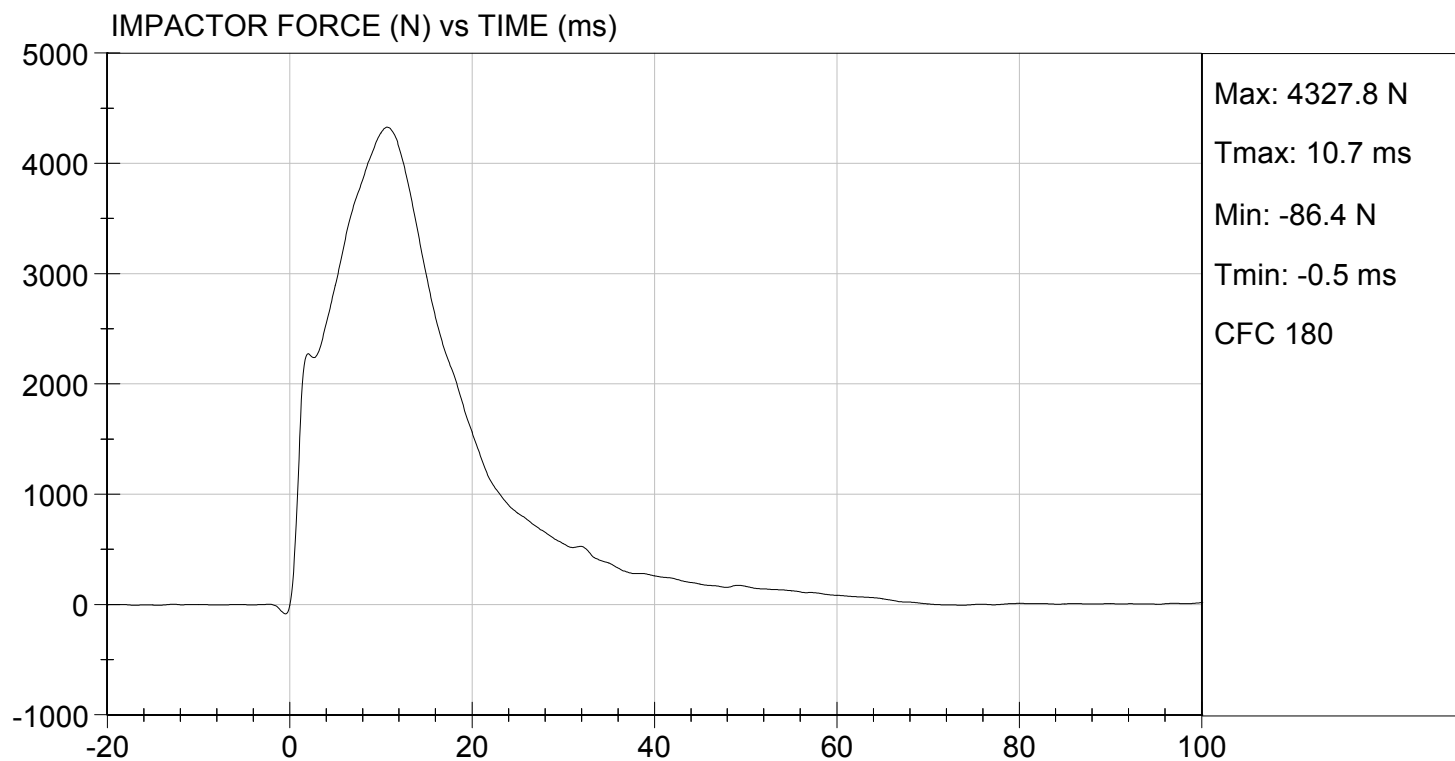
01/11/2013  
Test Date

  
Approved By



TEST DESC: ABDOMEN IMPACT  
VELOCITY: 13.44 ft/s, 4.10 m/s

TEST DATE: 01/11/2013  
TEST #: D13067

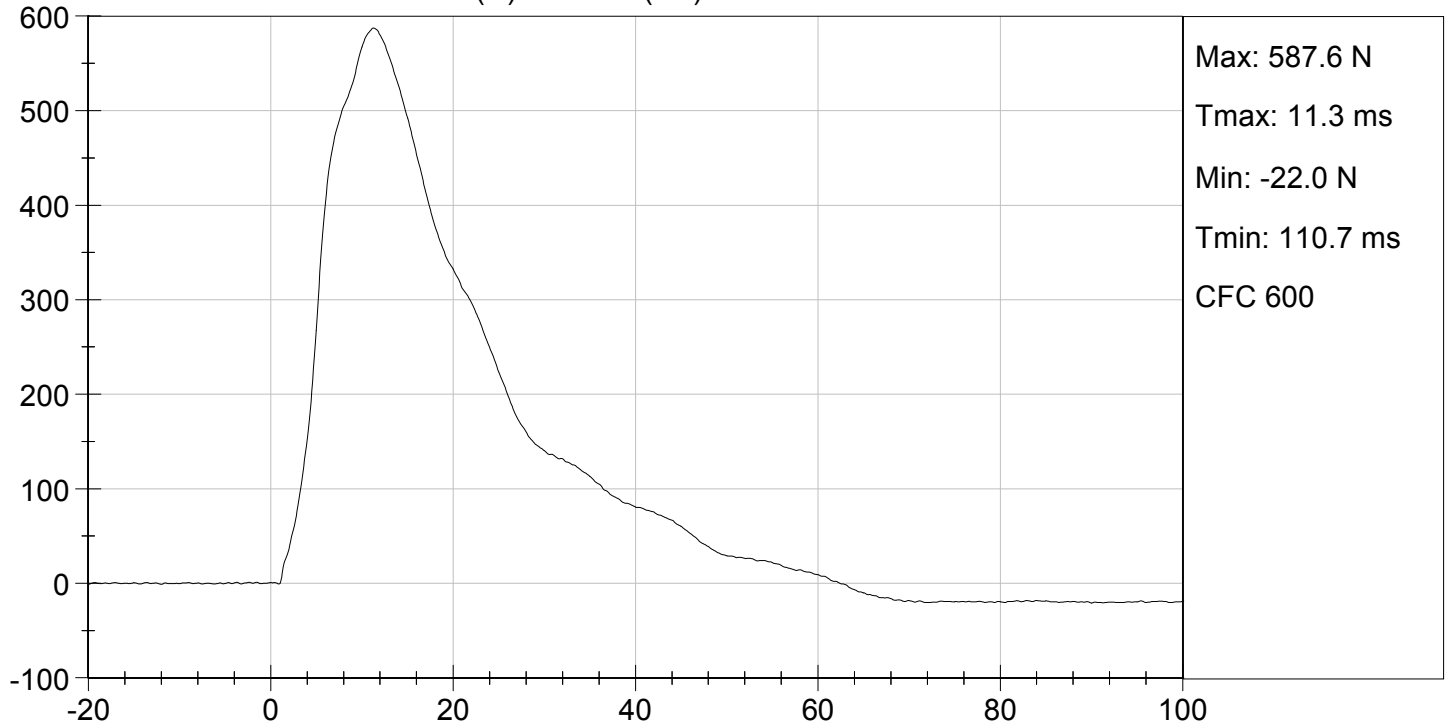




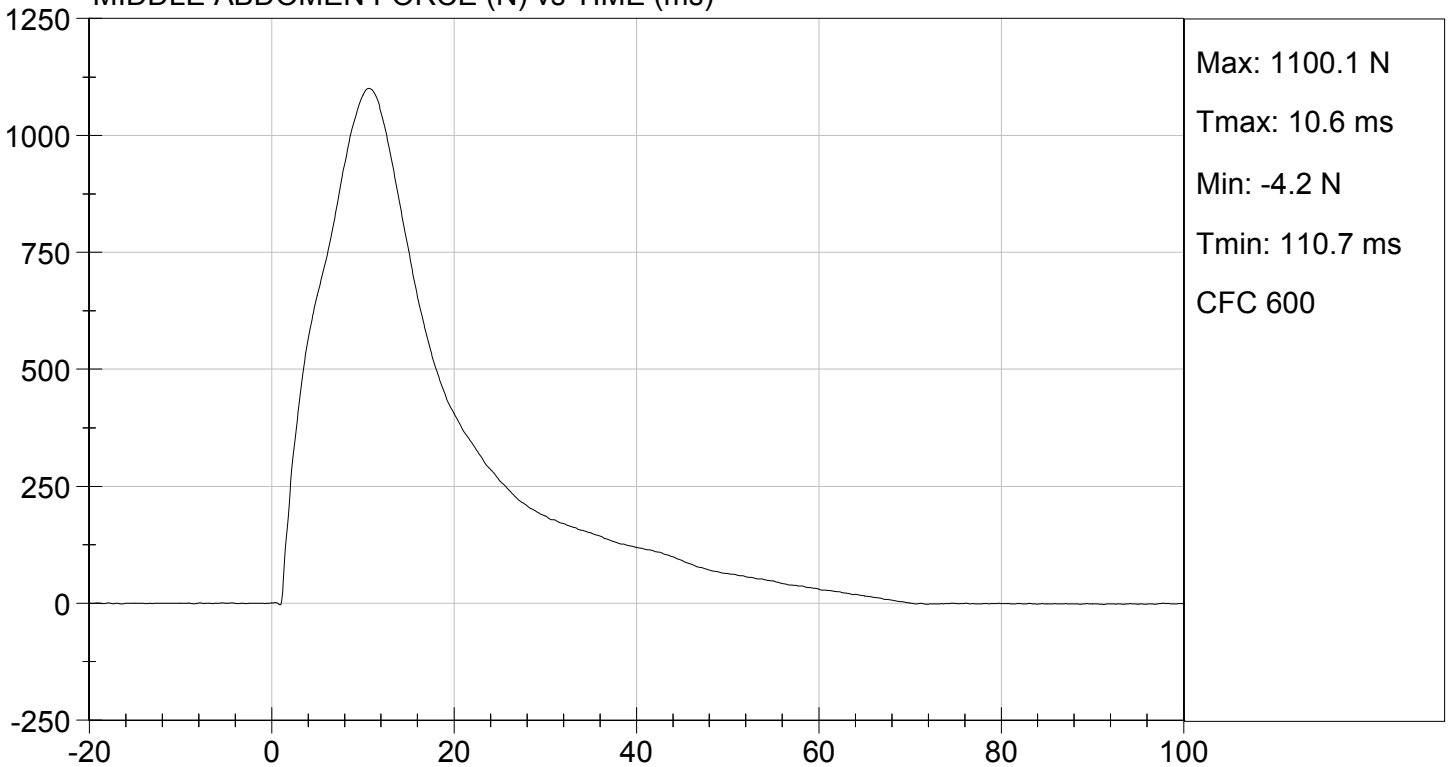
TEST DESC: ABDOMEN IMPACT  
VELOCITY: 13.44 ft/s, 4.10 m/s

TEST DATE: 01/11/2013  
TEST #: D13067

FRONT ABDOMEN FORCE (N) vs TIME (ms)



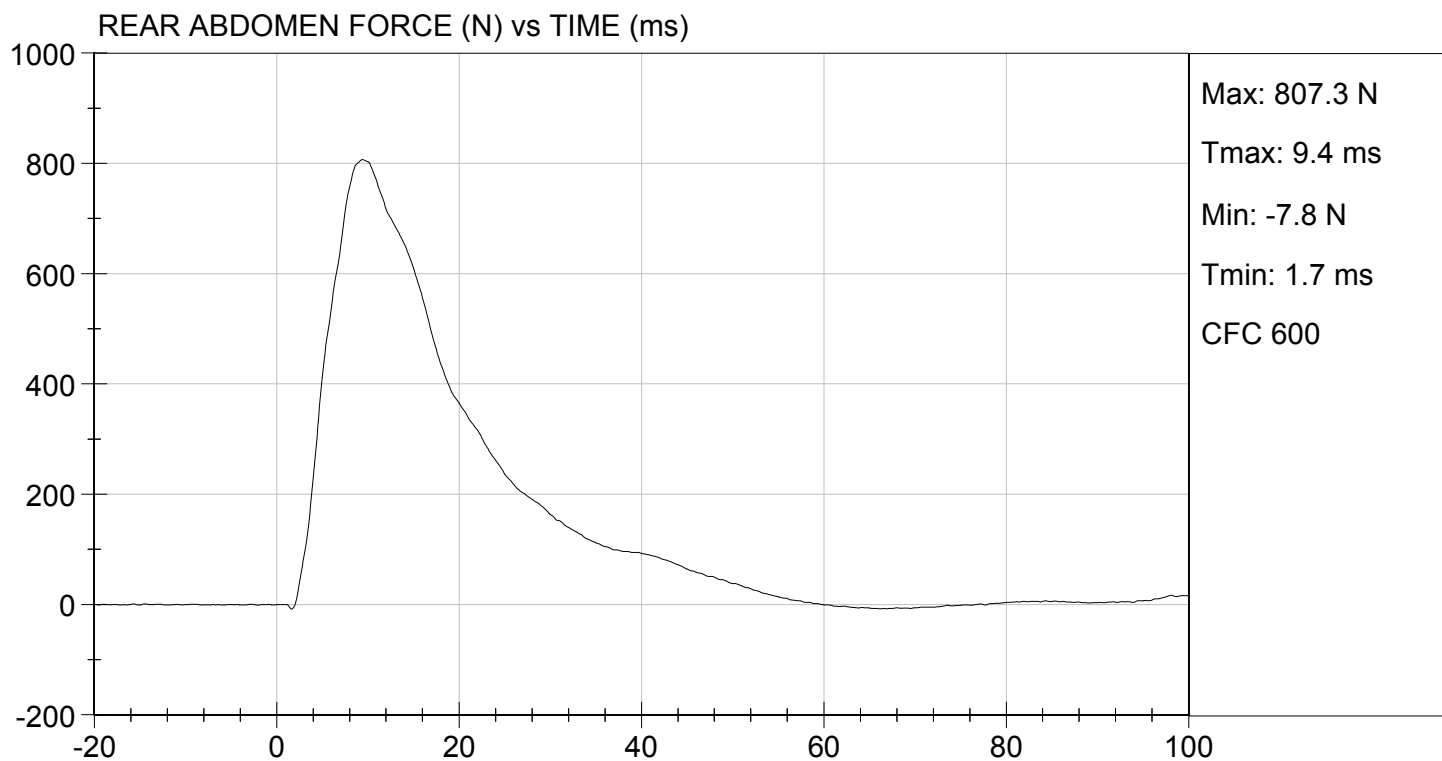
MIDDLE ABDOMEN FORCE (N) vs TIME (ms)





TEST DESC: ABDOMEN IMPACT  
VELOCITY: 13.44 ft/s, 4.10 m/s

TEST DATE: 01/11/2013  
TEST #: D13067



**MGA RESEARCH CORPORATION**  
**LUMBAR SPINE TEST**  
**ES-2re DUMMY**

**ATD Serial No:** 032

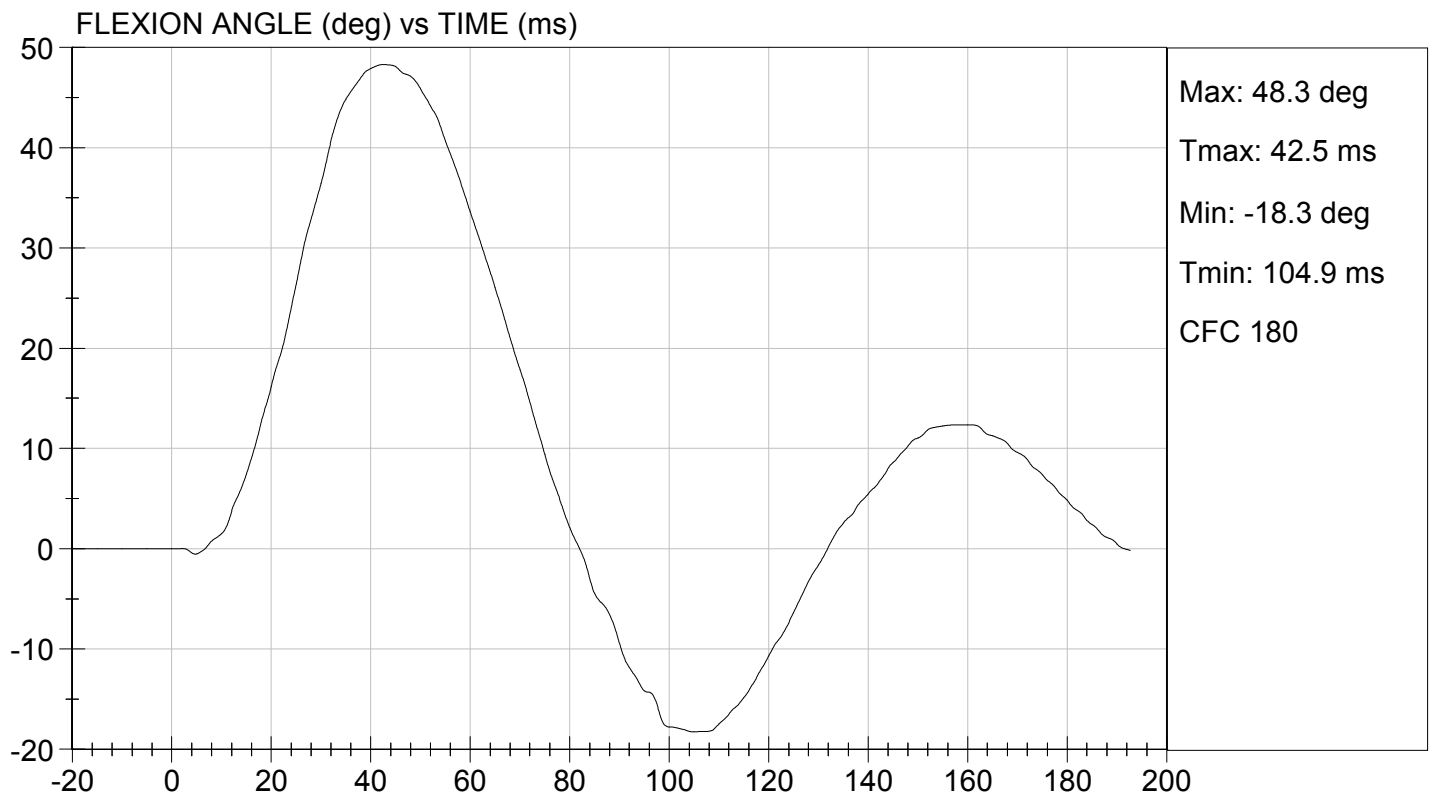
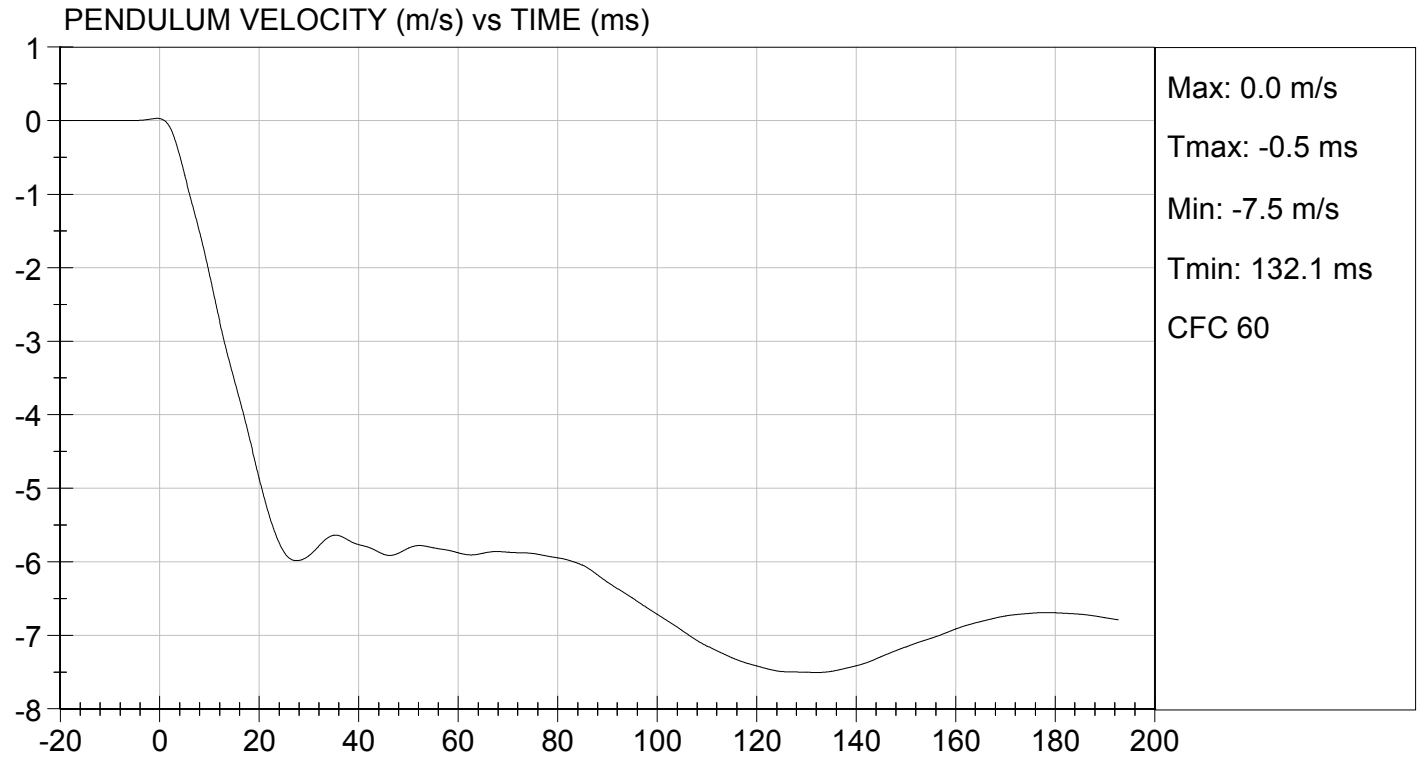
**Test I.D:** D13068

| Tested Parameter                            |        | Units | Specification   | Result | Pass/Fail |
|---------------------------------------------|--------|-------|-----------------|--------|-----------|
| Laboratory Temperature                      |        | deg C | 20.6 to 22.2    | 21.0   | Pass      |
| Laboratory Relative Humidity                |        | %     | 10 to 70        | 47     | Pass      |
| Pendulum Speed                              |        | m/s   | 5.95 to 6.15    | 6.13   | Pass      |
| Pendulum Velocity                           | 1 ms   | m/s   | -0.05 to 0.00   | -0.00  | Pass      |
|                                             | 3.7 ms | m/s   | -0.425 to -0.24 | -0.407 | Pass      |
|                                             | 27 ms  | m/s   | -6.50 to -5.80  | -5.98  | Pass      |
|                                             | 30 ms  | m/s   | >= -6.50        | -5.91  | Pass      |
| Maximum Flexion Angle                       |        | deg   | 45.0 to 55.0    | 48.3   | Pass      |
| Time of Maximum Flexion Angle               |        | ms    | 39.0 to 53.0    | 42.5   | Pass      |
| Headform Rotation Decay to Initial Position |        | ms    | 37 to 57        | 45     | Pass      |
| Overall Results                             |        |       |                 |        | Pass      |

  
 Laboratory Technician

01/10/2013  
 Test Date

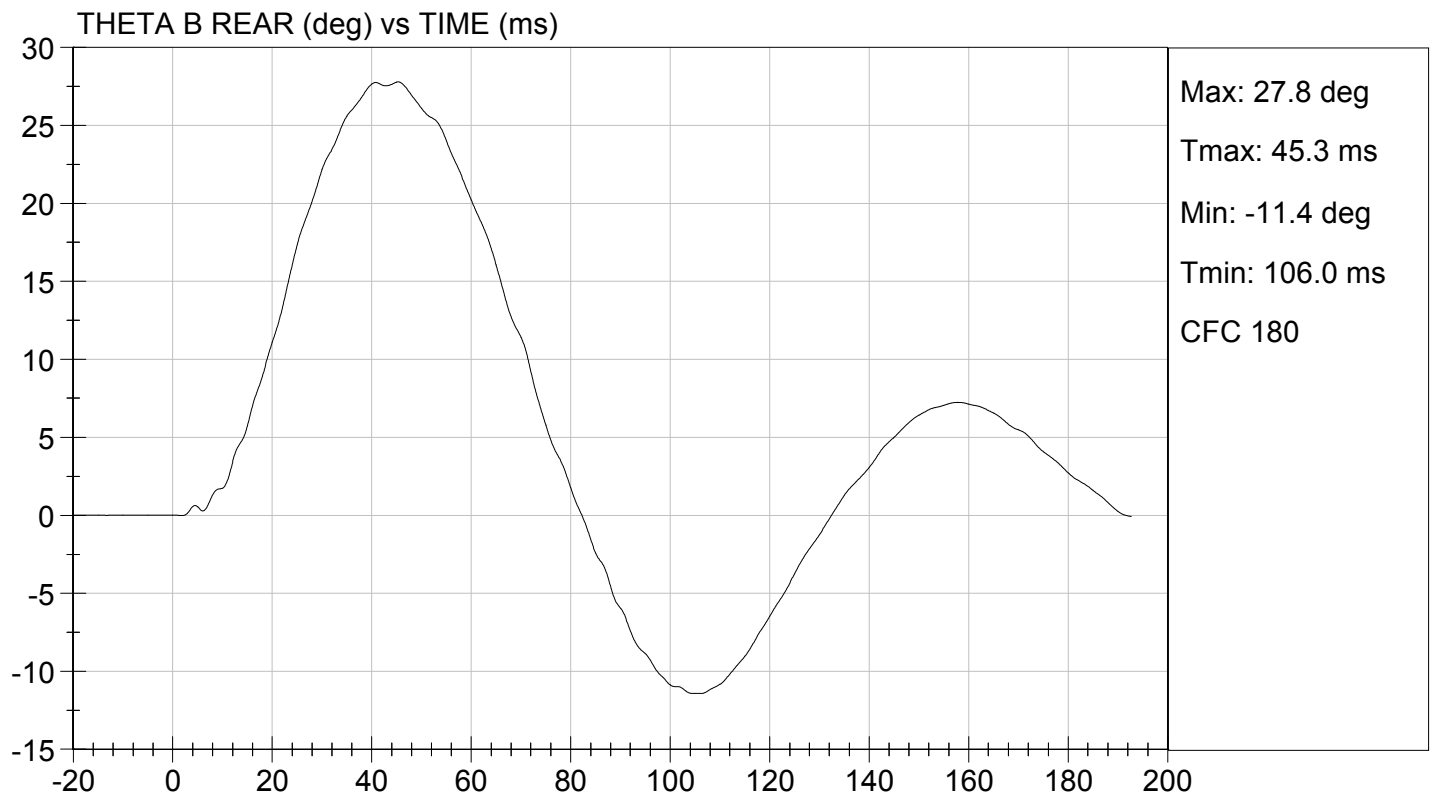
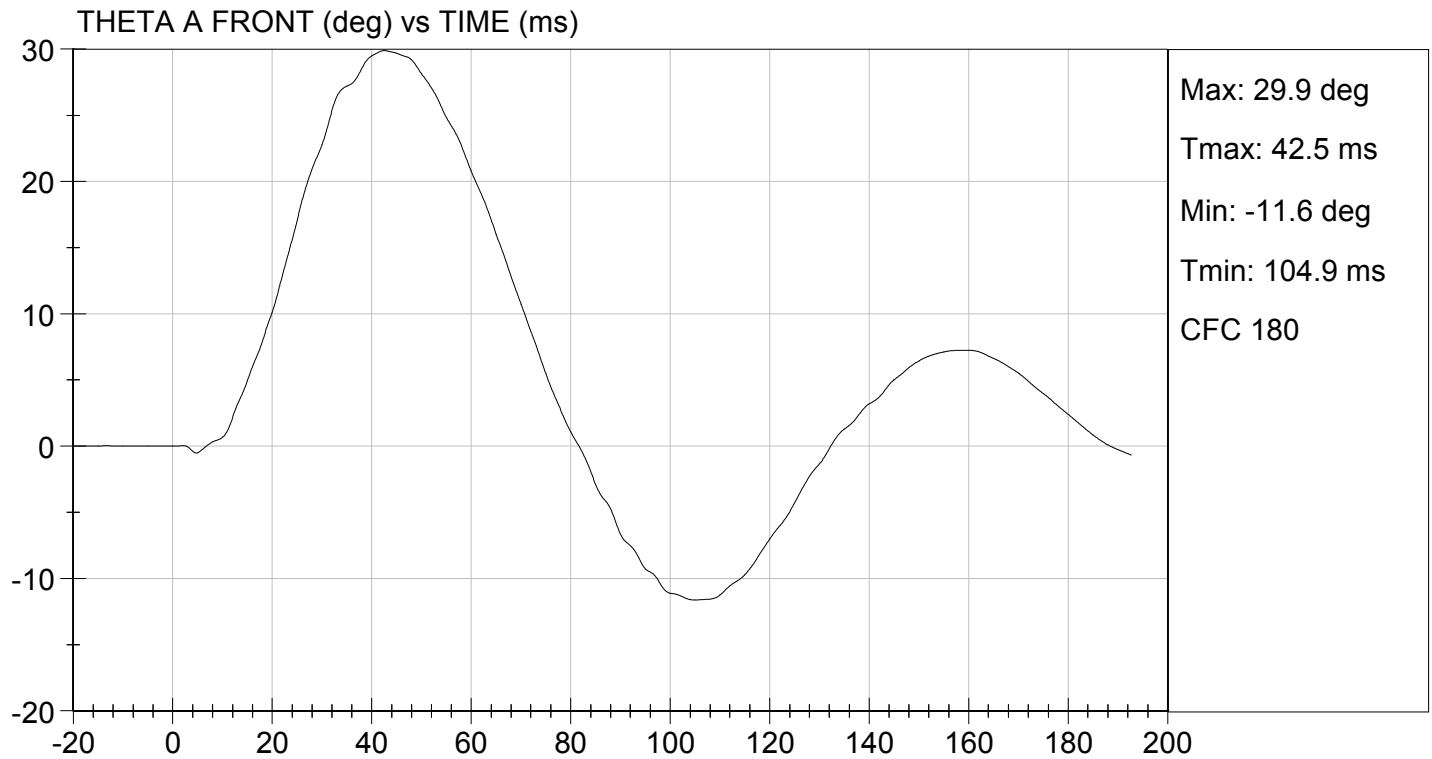
  
 Approved By





TEST DESC: LUMBAR BENDING  
VELOCITY: 20.10 ft/s, 6.13 m/s

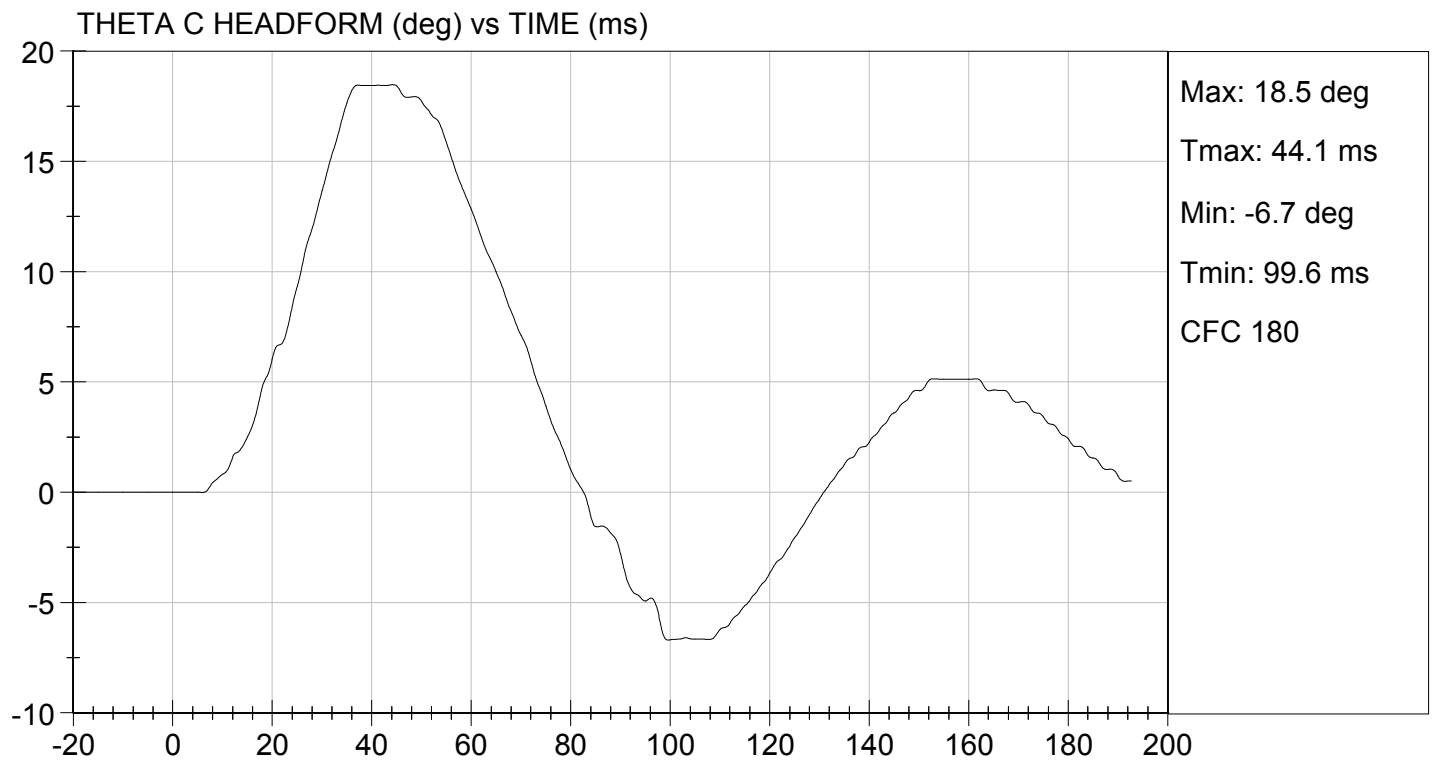
TEST DATE: 01/10/2013  
TEST #: D13068





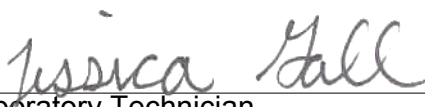
TEST DESC: LUMBAR BENDING  
VELOCITY: 20.10 ft/s, 6.13 m/s

TEST DATE: 01/10/2013  
TEST #: D13068



**MGA RESEARCH CORPORATION****PELVIS TEST  
ES-2re DUMMY****ATD Serial No:** 032**Test I.D:** D13069

| Tested Parameter               | Units | Specification | Result | Pass/Fail |
|--------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature         | deg C | 20.6 to 22.2  | 20.7   | Pass      |
| Laboratory Relative Humidity   | %     | 10 to 70      | 33     | Pass      |
| Probe Speed                    | m/s   | 4.20 to 4.40  | 4.34   | Pass      |
| Maximum Impactor Force         | N     | 4700 to 5400  | 4759   | Pass      |
| Time of Maximum Impactor Force | ms    | 11.8 to 16.1  | 13.1   | Pass      |
| Maximum Pubic Force            | N     | 1230 to 1590  | 1310   | Pass      |
| Time of Maximum Pubic Force    | ms    | 12.2 to 17.0  | 13.9   | Pass      |
| Overall Test Results           |       |               |        | Pass      |

  
Laboratory Technician

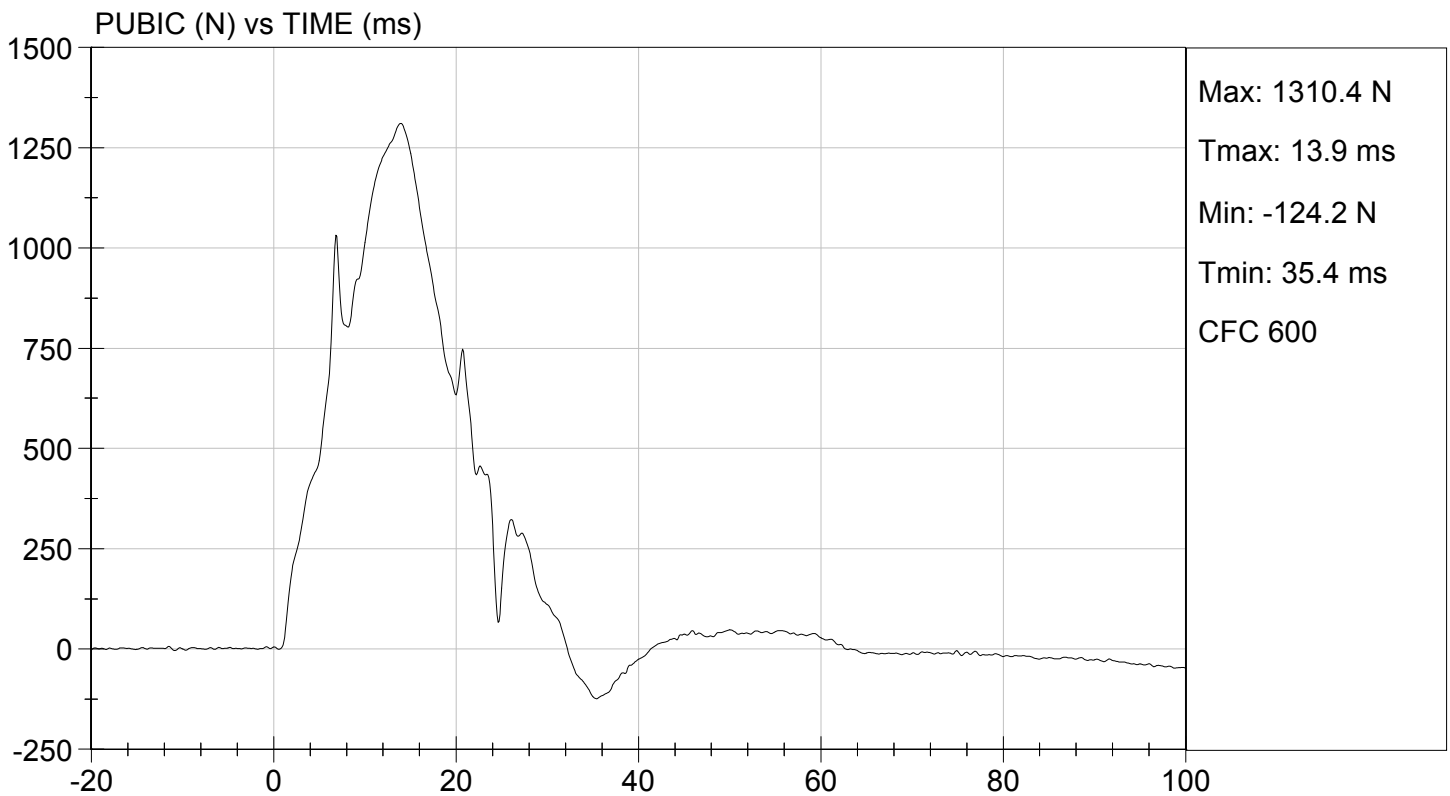
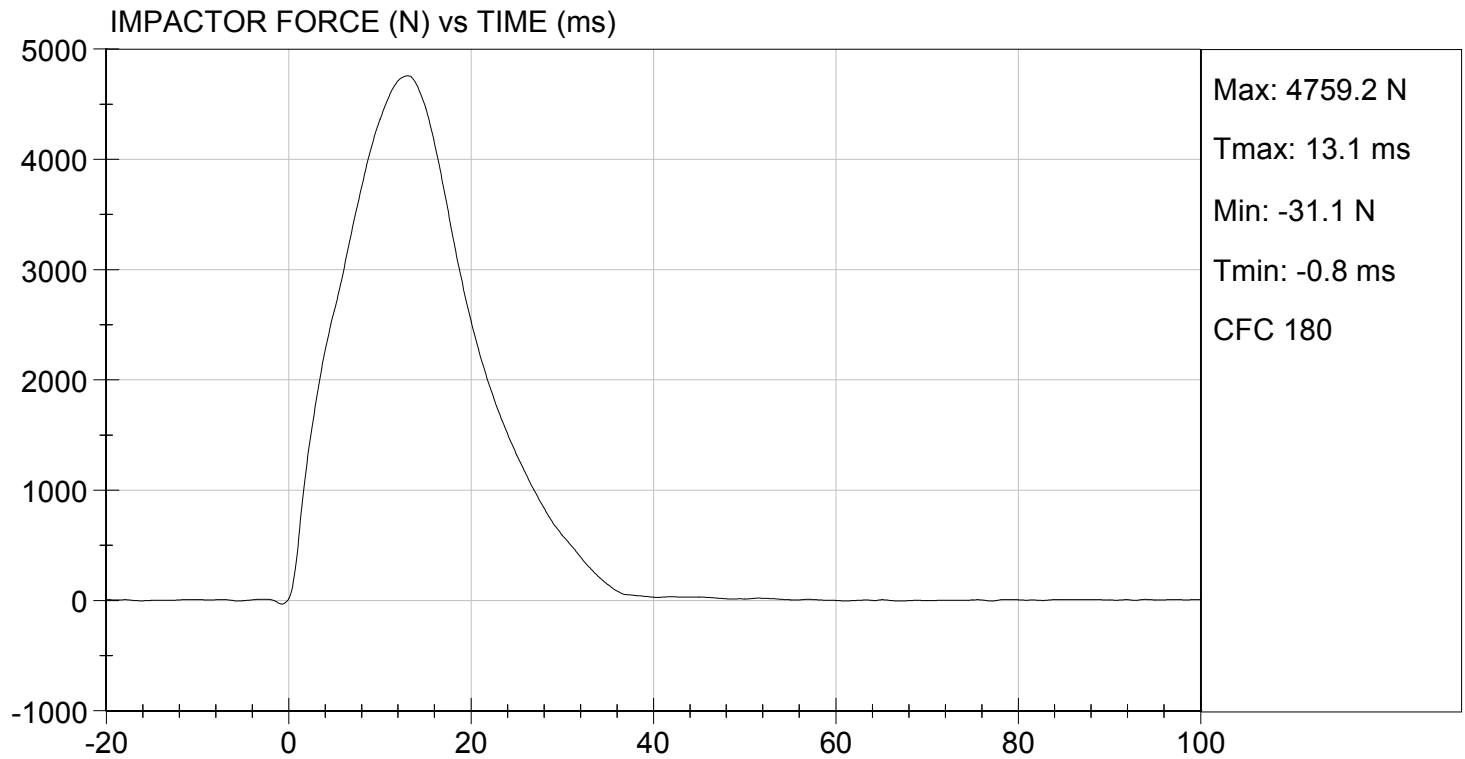
01/11/2013  
Test Date

  
Approved By



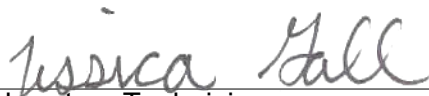
TEST DESC: PELVIS IMPACT  
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 01/11/2013  
TEST #: D13069



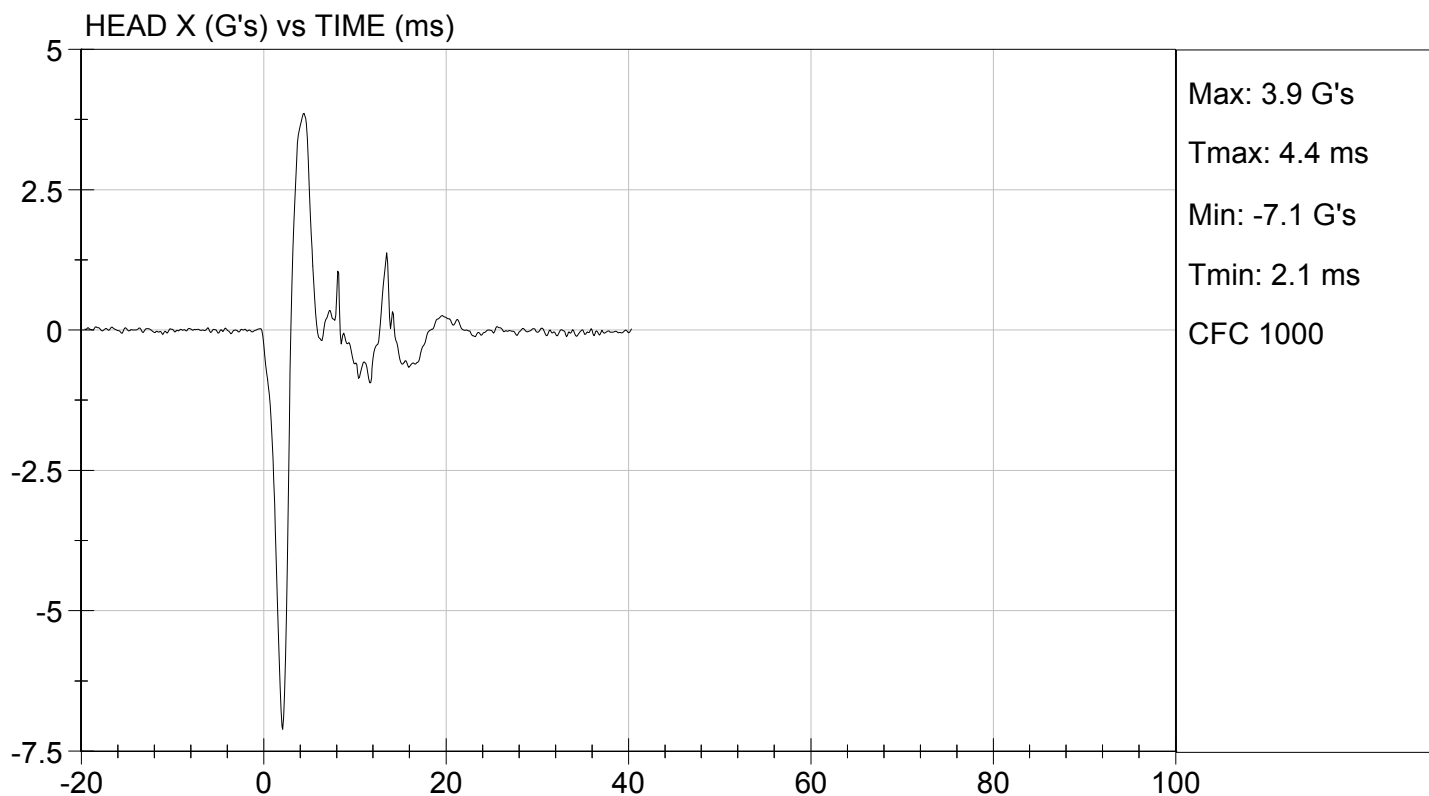
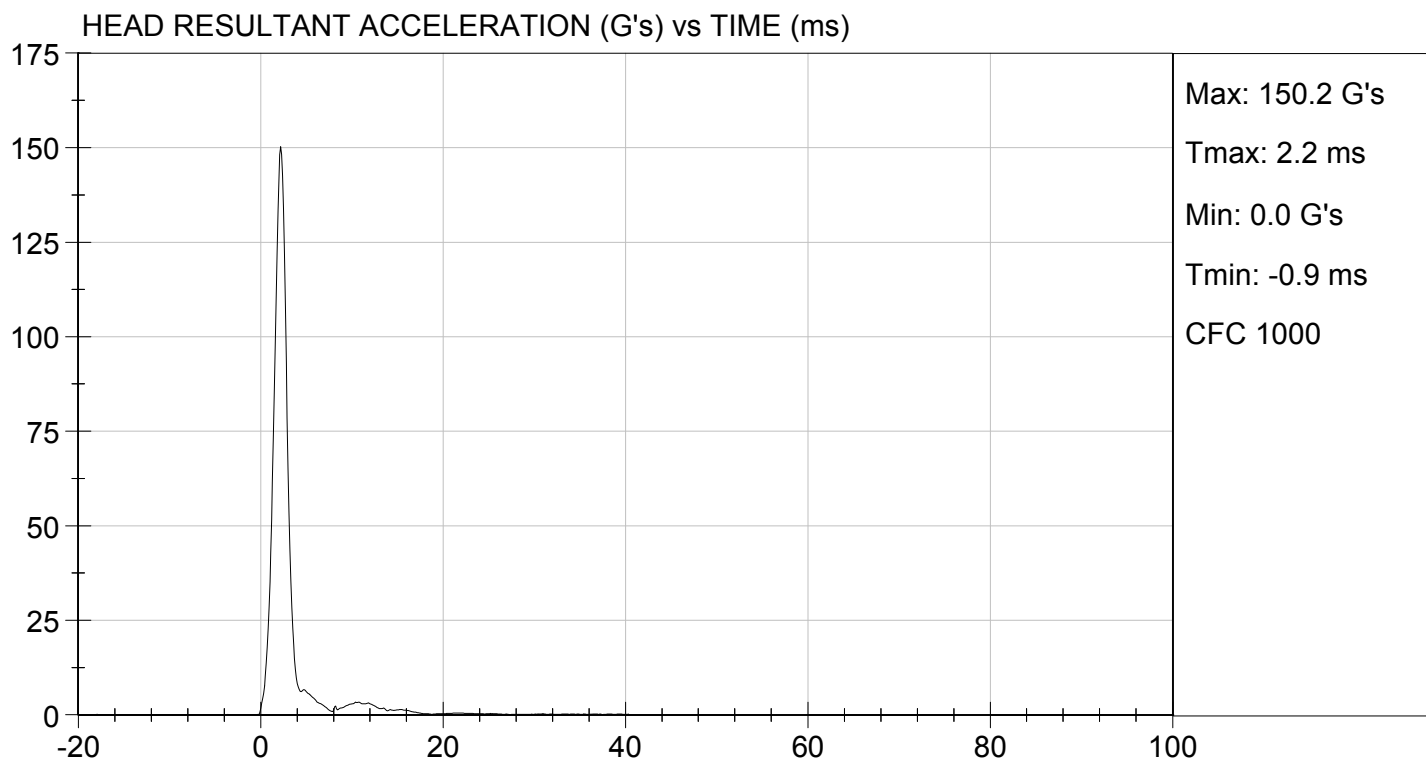
**MGA RESEARCH CORPORATION****HEAD DROP TEST****ES-2re DUMMY**ATD Serial No: 032Test ID: D13491

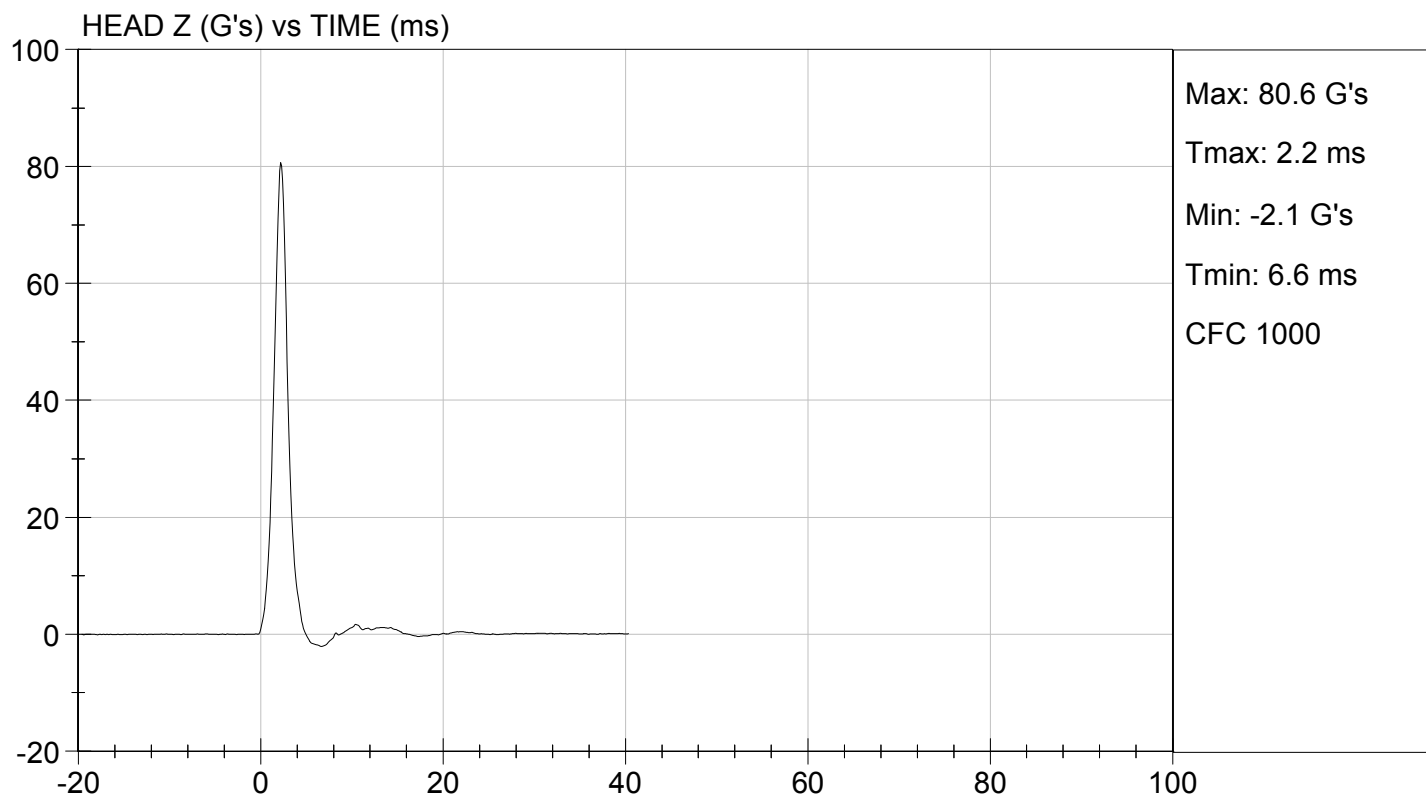
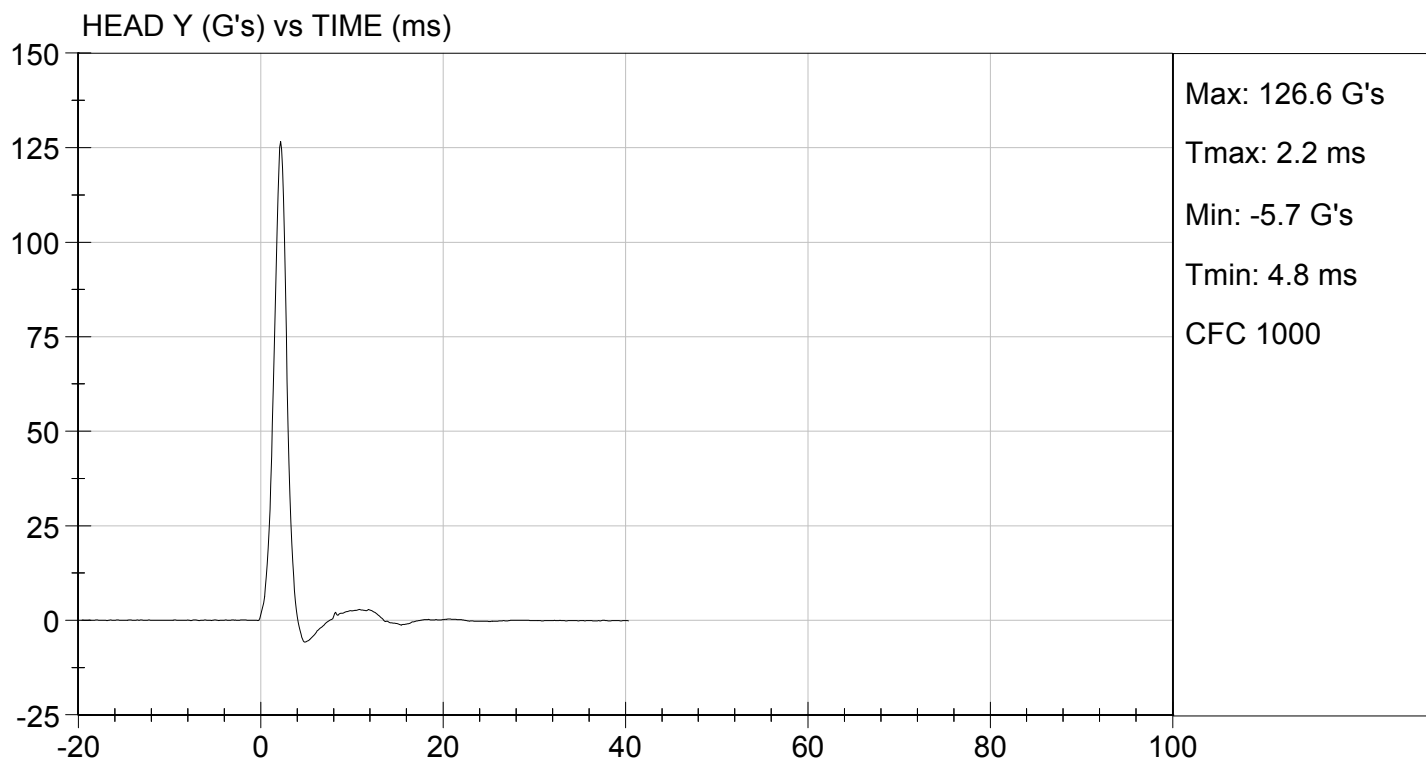
| Tested Parameter               | Units | Specification      | Result | Pass/Fail |
|--------------------------------|-------|--------------------|--------|-----------|
| Laboratory Temperature         | deg C | 18.9 to 25.6       | 20.6   | Pass      |
| Laboratory Relative Humidity   | %     | 10 to 70           | 20     | Pass      |
| Peak Resultant Acceleration    | G's   | 125 to 155         | 150    | Pass      |
| Peak Longitudinal Acceleration | G's   | <= +/- 15.0        | -7.1   | Pass      |
| Unimodal                       | N/A   | Yes                | Yes    | Pass      |
| Oscillations                   | N/A   | within 15% of peak | Yes    | Pass      |
| Overall Test Results           |       |                    |        | Pass      |

  
Laboratory Technician

02/21/2013  
Test Date

  
Approved By





**MGA RESEARCH CORPORATION**  
**NECK PENDULUM TEST**  
**ES-2re DUMMY**

**ATD Serial No:** 032

**Test I.D:** D13492

| Tested Parameter                     |       | Units | Specification   | Result | Pass/Fail |
|--------------------------------------|-------|-------|-----------------|--------|-----------|
| Laboratory Temperature               |       | deg C | 20.6 to 22.2    | 20.6   | Pass      |
| Laboratory Relative Humidity         |       | %     | 10 to 70        | 19     | Pass      |
| Pendulum Speed                       |       | m/s   | 3.30 to 3.50    | 3.39   | Pass      |
| Pendulum Velocity                    | 1 ms  | m/s   | -0.05 to 0.00   | -0.03  | Pass      |
|                                      | 3 ms  | m/s   | -0.25 to -0.375 | -0.33  | Pass      |
|                                      | 14 ms | m/s   | -3.20 to -3.70  | -3.24  | Pass      |
|                                      | 17 ms | m/s   | >= -3.70        | -3.28  | Pass      |
| Maximum Flexion Angle                |       | deg   | 49.0 to 59.0    | 51.5   | Pass      |
| Time of Maximum Flexion Angle        |       | ms    | 54.0 to 66.0    | 60.7   | Pass      |
| Head Rotation Decay Time to 0 Degree |       | ms    | 53.0 to 88.0    | 58.8   | Pass      |
| Overall Results                      |       |       |                 |        | Pass      |

  
 Laboratory Technician

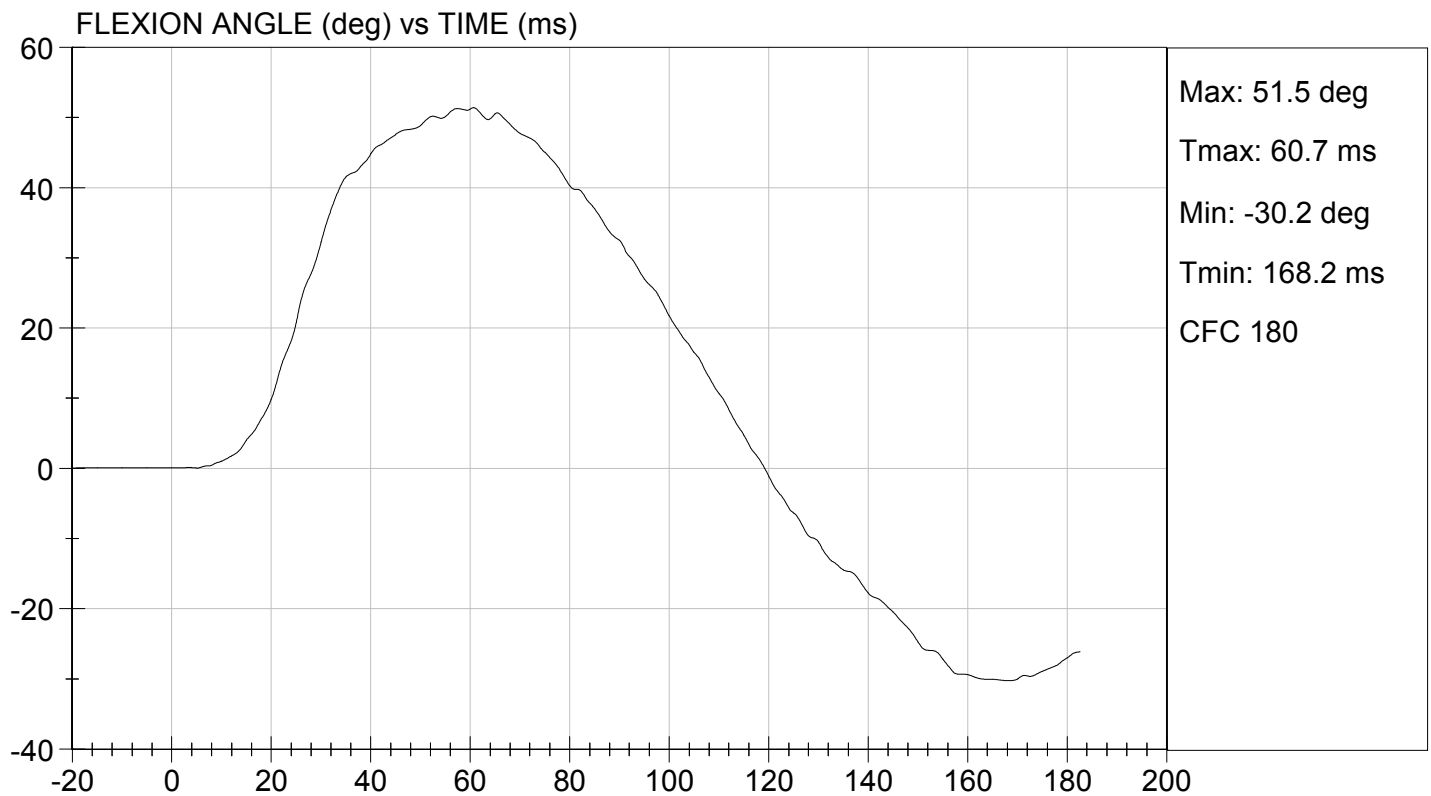
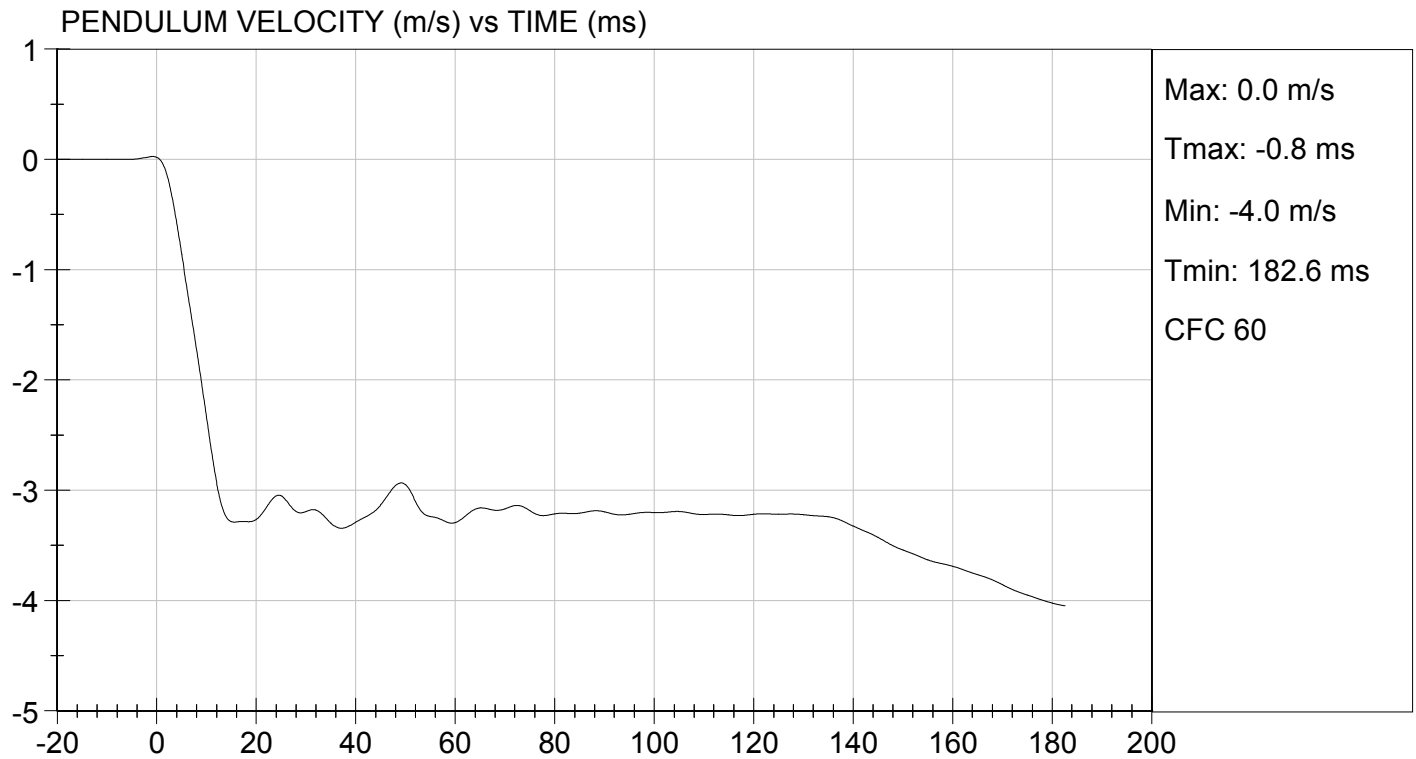
02/21/2013  
 Test Date

  
 Approved By



TEST DESC: NECK BENDING  
VELOCITY: 11.11 ft/s, 3.39 m/s

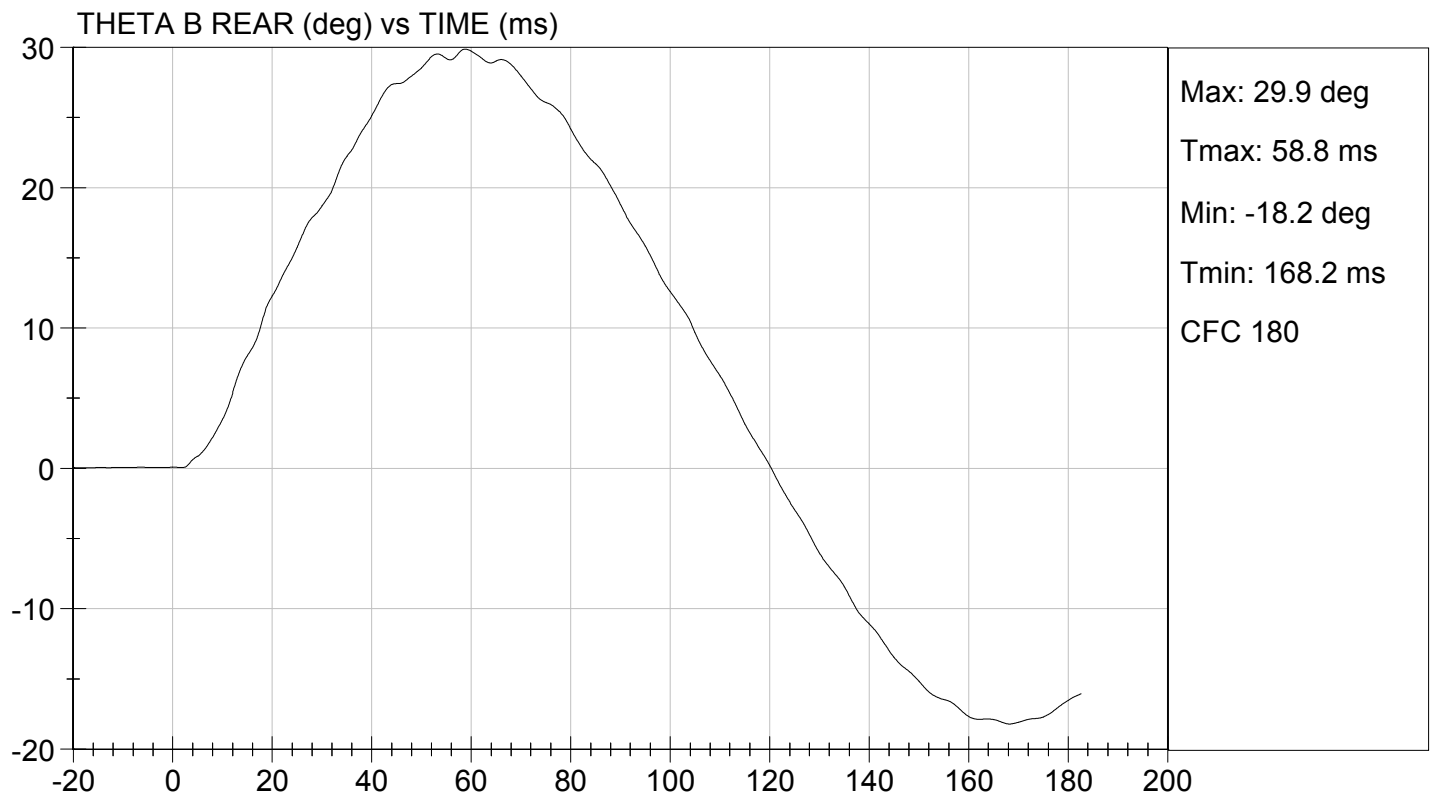
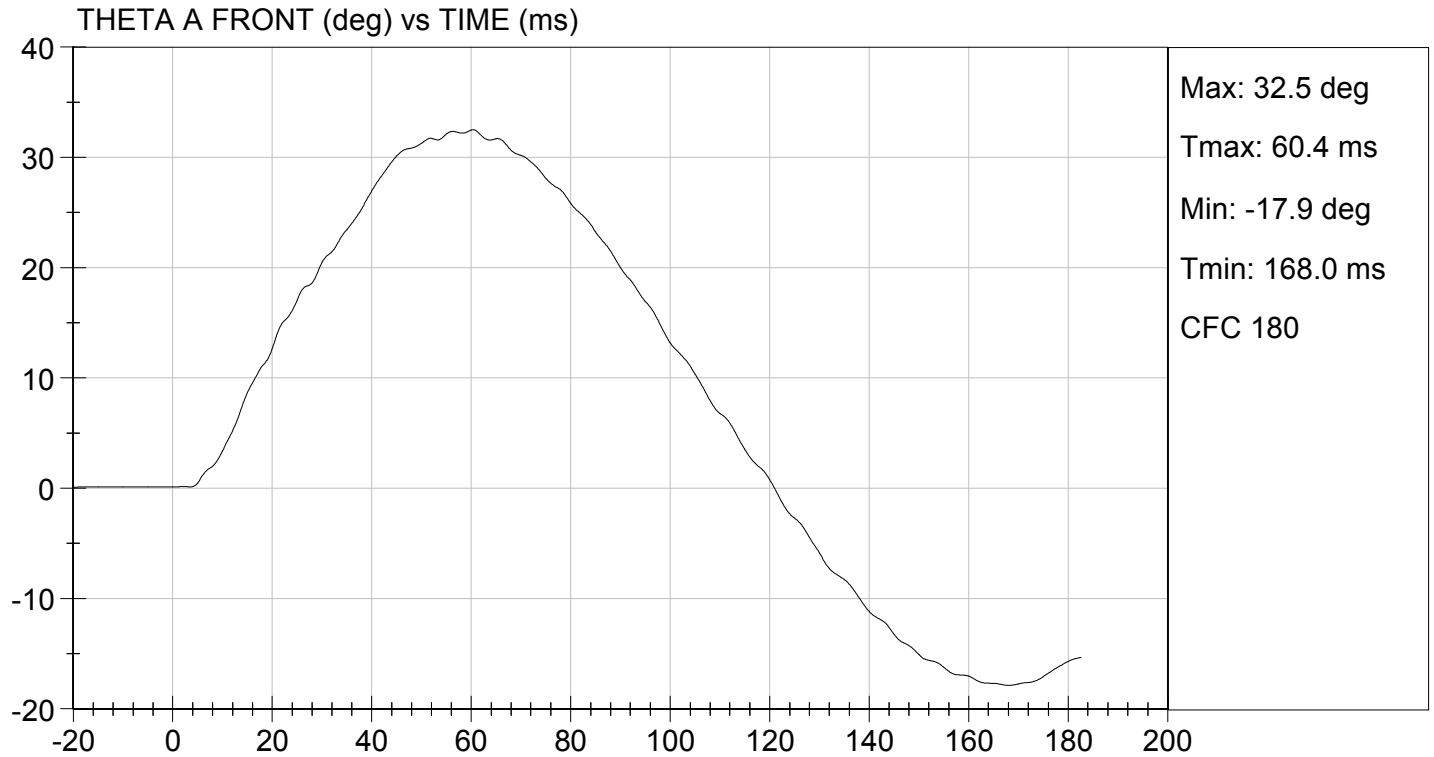
TEST DATE: 02/21/2013  
TEST #: D13492





TEST DESC: NECK BENDING  
VELOCITY: 11.11 ft/s, 3.39 m/s

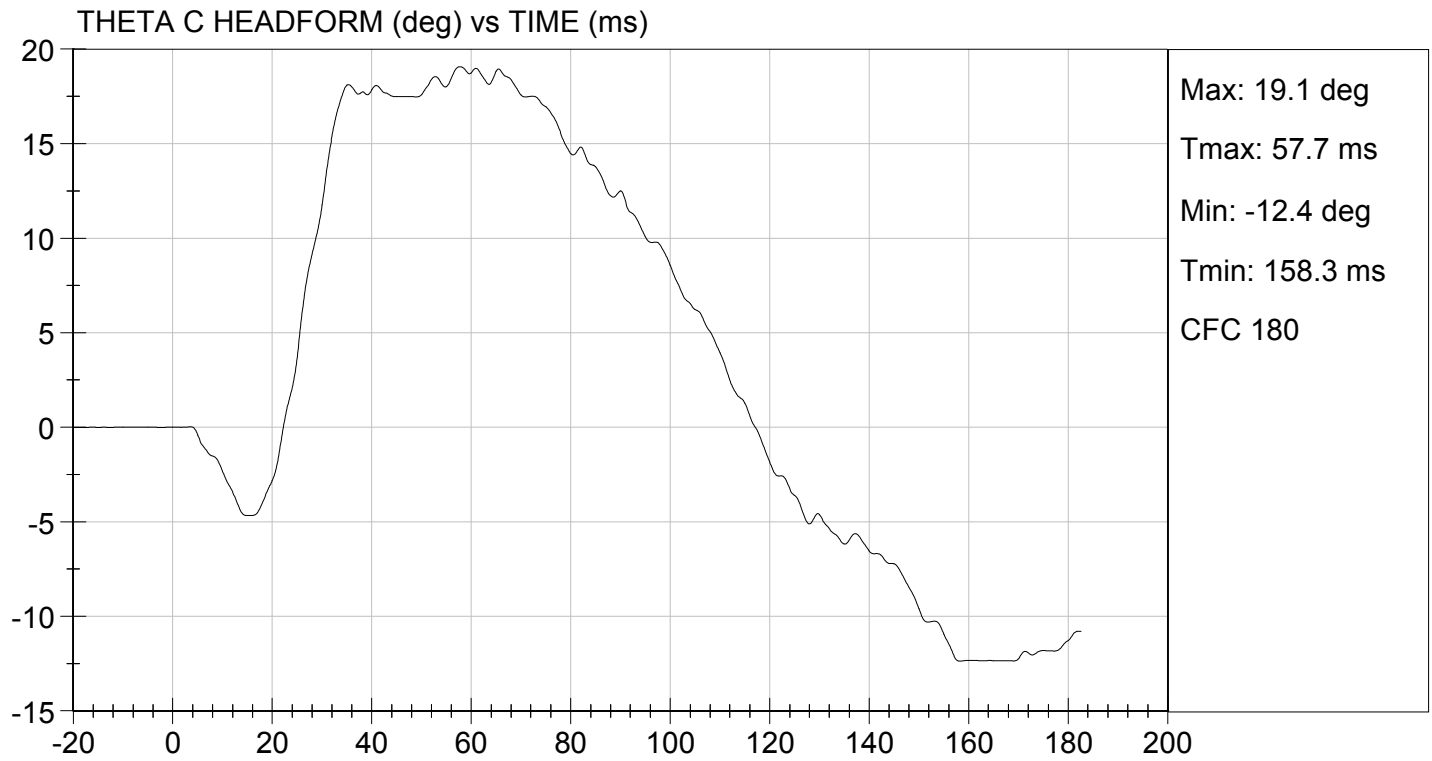
TEST DATE: 02/21/2013  
TEST #: D13492





TEST DESC: NECK BENDING  
VELOCITY: 11.11 ft/s, 3.39 m/s

TEST DATE: 02/21/2013  
TEST #: D13492



**MGA RESEARCH CORPORATION**  
**SHOULDER IMPACT TEST**  
**ES-2re DUMMY**

**ATD Serial No:** 032

**Test I.D:** D13493

| Tested Parameter             | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature       | deg C | 20.6 to 22.2  | 21.1   | Pass      |
| Laboratory Relative Humidity | %     | 10 to 70      | 22     | Pass      |
| Pendulum Speed               | m/s   | 4.20 to 4.40  | 4.34   | Pass      |
| Peak Impactor Acceleration   | G's   | 7.5 to 10.5   | 9.0    | Pass      |
| Overall Test Results         |       |               |        | Pass      |

  
Laboratory Technician

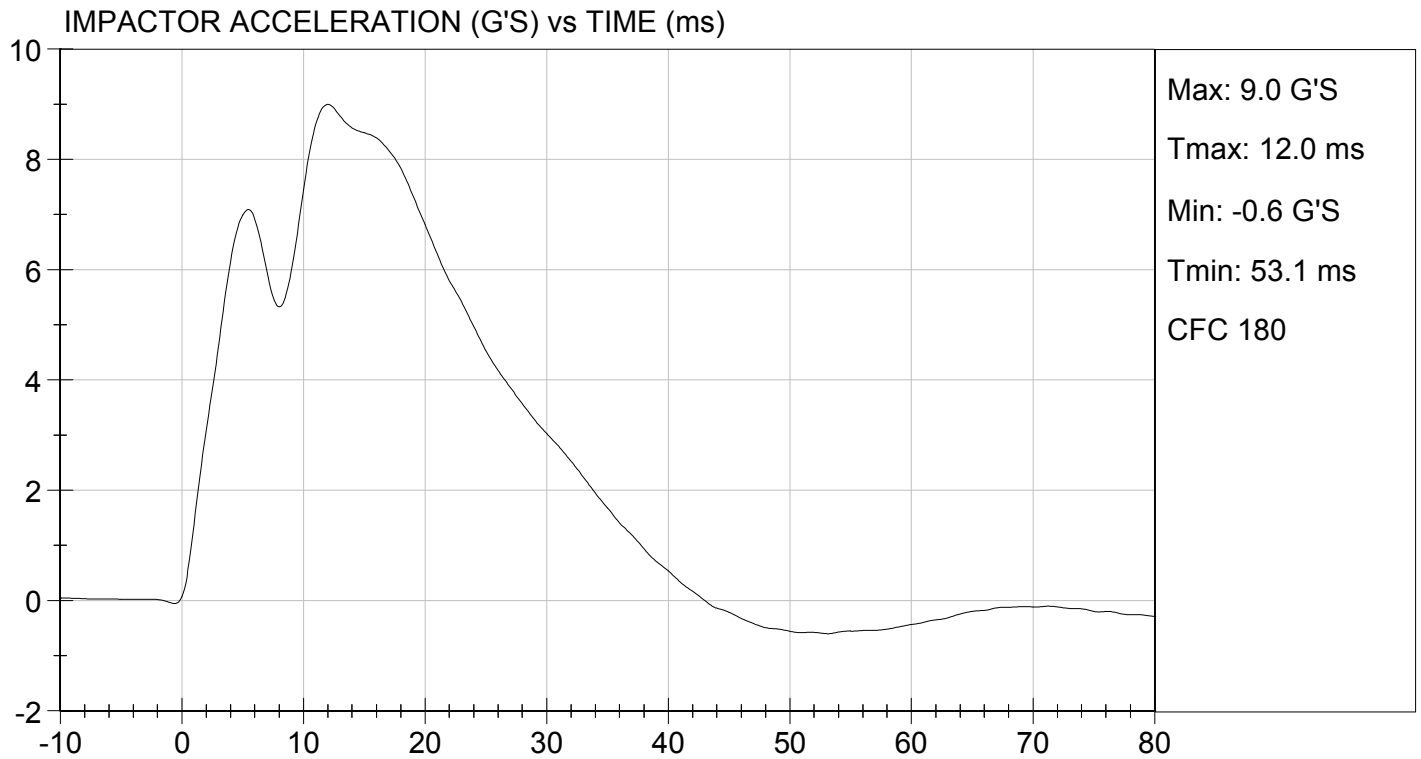
02/22/2013  
Test Date

  
Approved By



TEST DESC: SHOULDER IMPACT  
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 02/22/2013  
TEST #: D13493



**MGA RESEARCH CORPORATION**

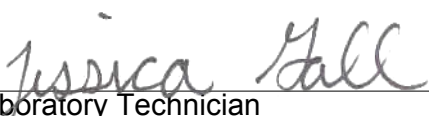
**UPPER RIB TEST**

**ES-2re DUMMY**

**ATD Serial No:** 032

**Test I.D:** D13494

| Tested Parameter             | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature       | deg C | 20.6 to 22.2  | 20.6   | Pass      |
| Laboratory Relative Humidity | %     | 10 to 70      | 20     | Pass      |
| Displacement at 459 mm       | mm    | 36.0 to 40.0  | 38.3   | Pass      |
| Displacement at 815 mm       | mm    | 46.0 to 51.0  | 48.4   | Pass      |
| Overall Test Results         |       |               |        | Pass      |

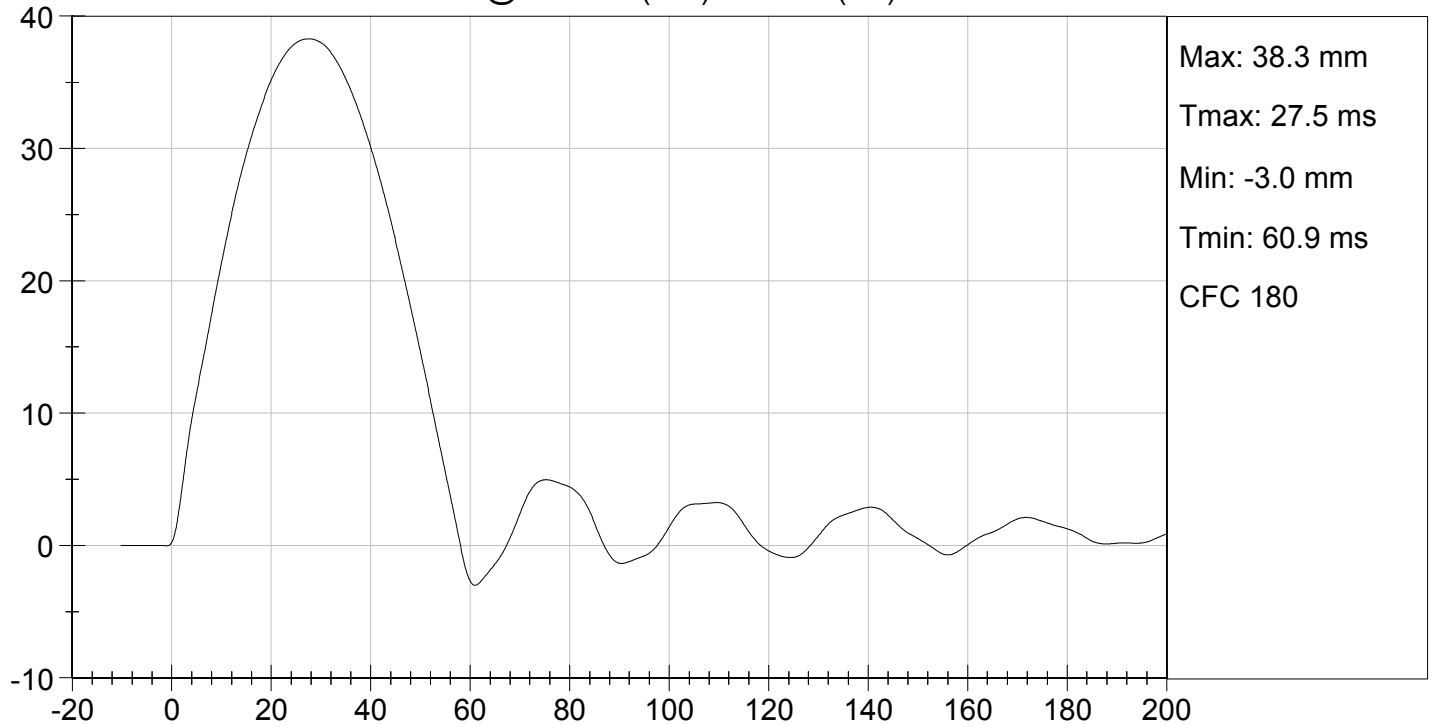
  
Laboratory Technician

02/21/2013  
Test Date

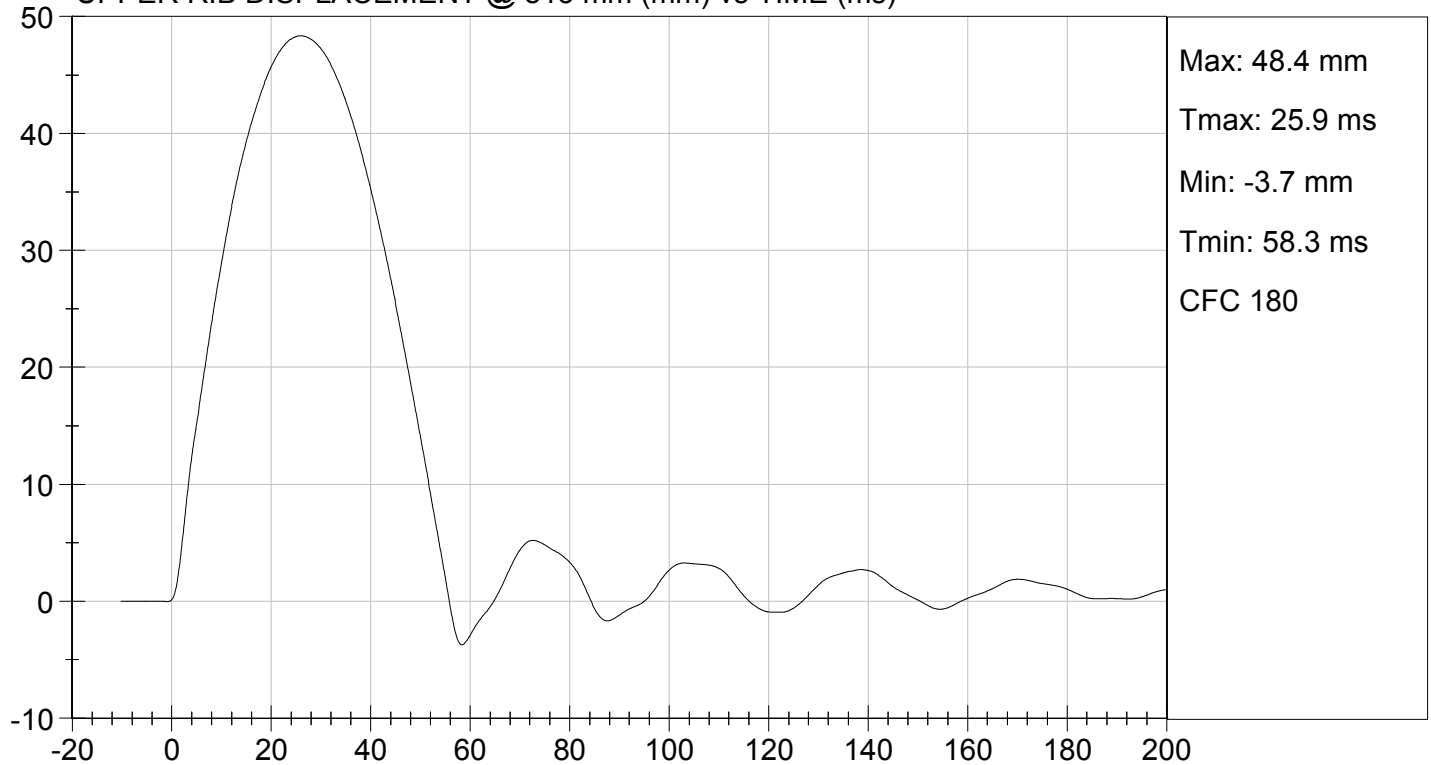
  
Approved By



UPPER RIB DISPLACEMENT @ 459 mm (mm) vs TIME (ms)



UPPER RIB DISPLACEMENT @ 815 mm (mm) vs TIME (ms)



**MGA RESEARCH CORPORATION**

**MID RIB TEST**

**ES-2re DUMMY**

**ATD Serial No:** 032

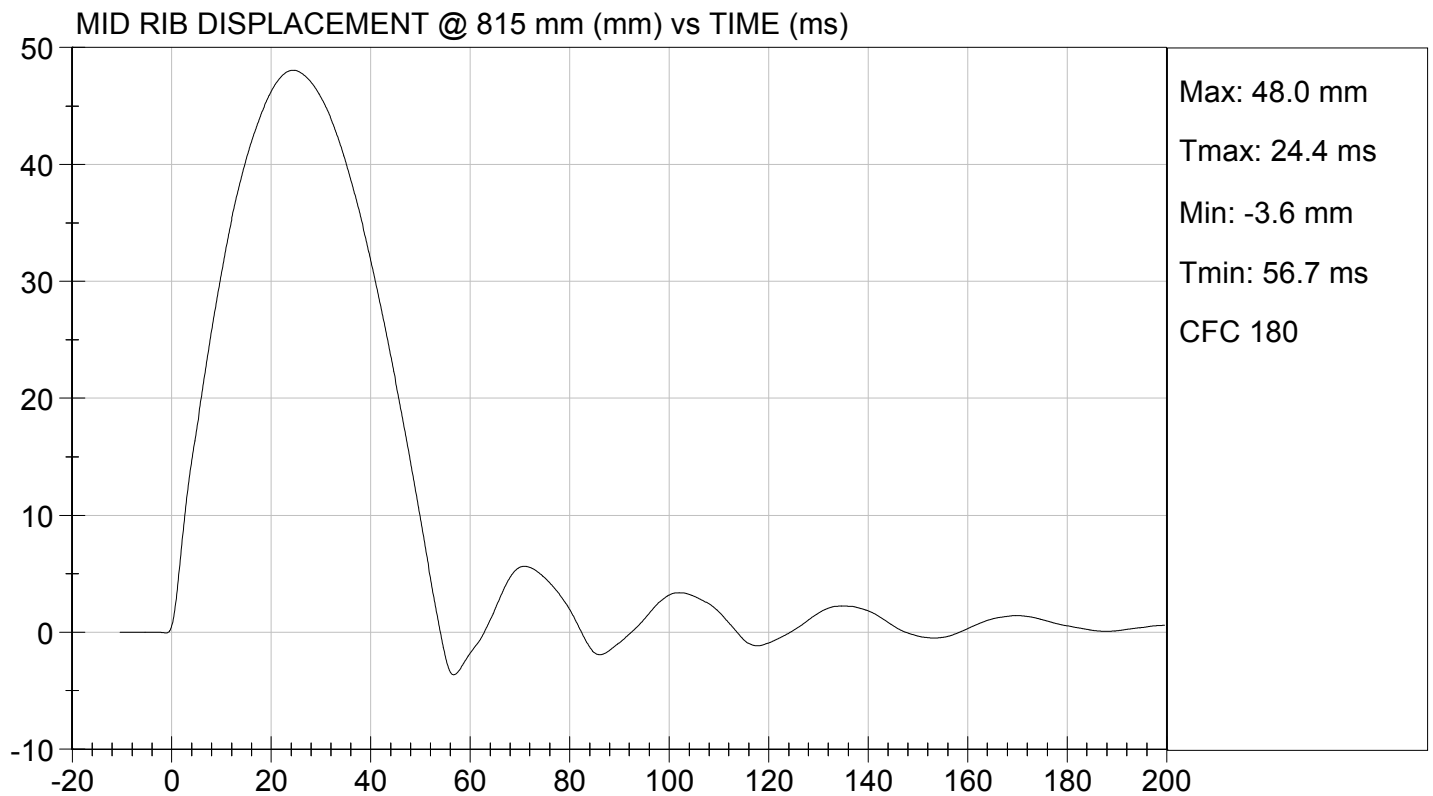
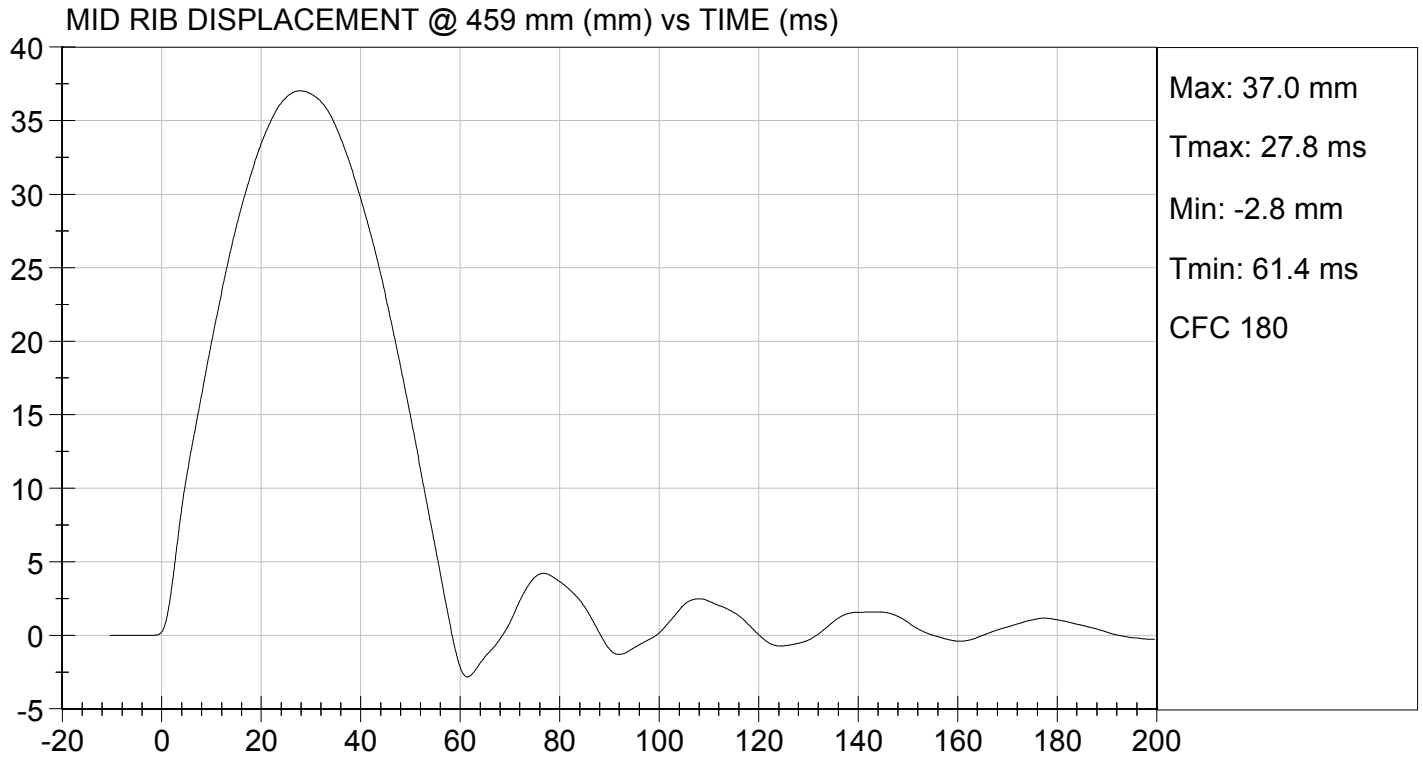
**Test I.D:** D13495

| Tested Parameter             | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature       | deg C | 20.6 to 22.2  | 20.6   | Pass      |
| Laboratory Relative Humidity | %     | 10 to 70      | 20     | Pass      |
| Displacement at 459 mm       | mm    | 36.0 to 40.0  | 37.0   | Pass      |
| Displacement at 815 mm       | mm    | 46.0 to 51.0  | 48.1   | Pass      |
| Overall Test Results         |       |               |        | Pass      |

  
Laboratory Technician

02/21/2013  
Test Date

  
Approved By



**MGA RESEARCH CORPORATION**

**LOWER RIB TEST**

**ES-2re DUMMY**

**ATD Serial No:** 032

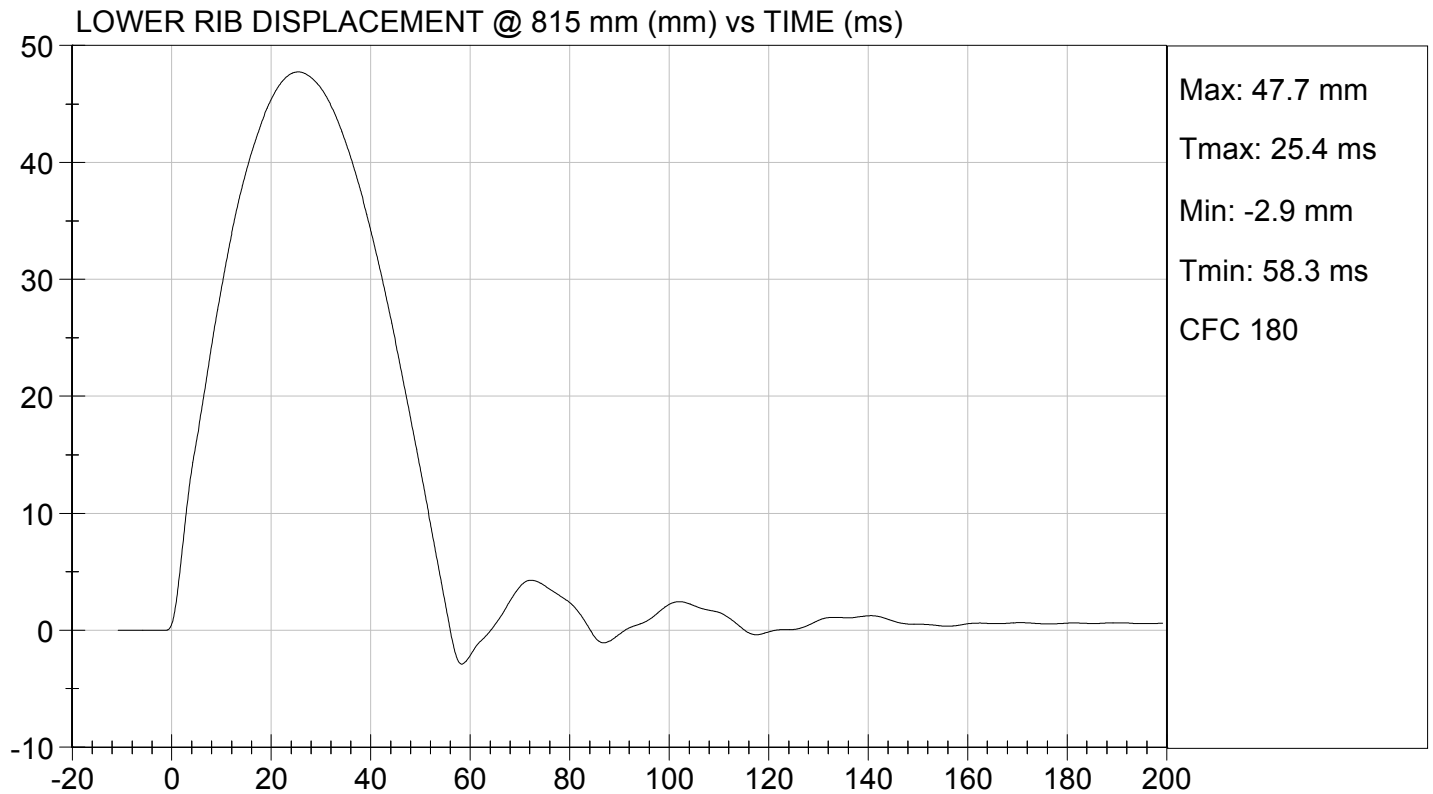
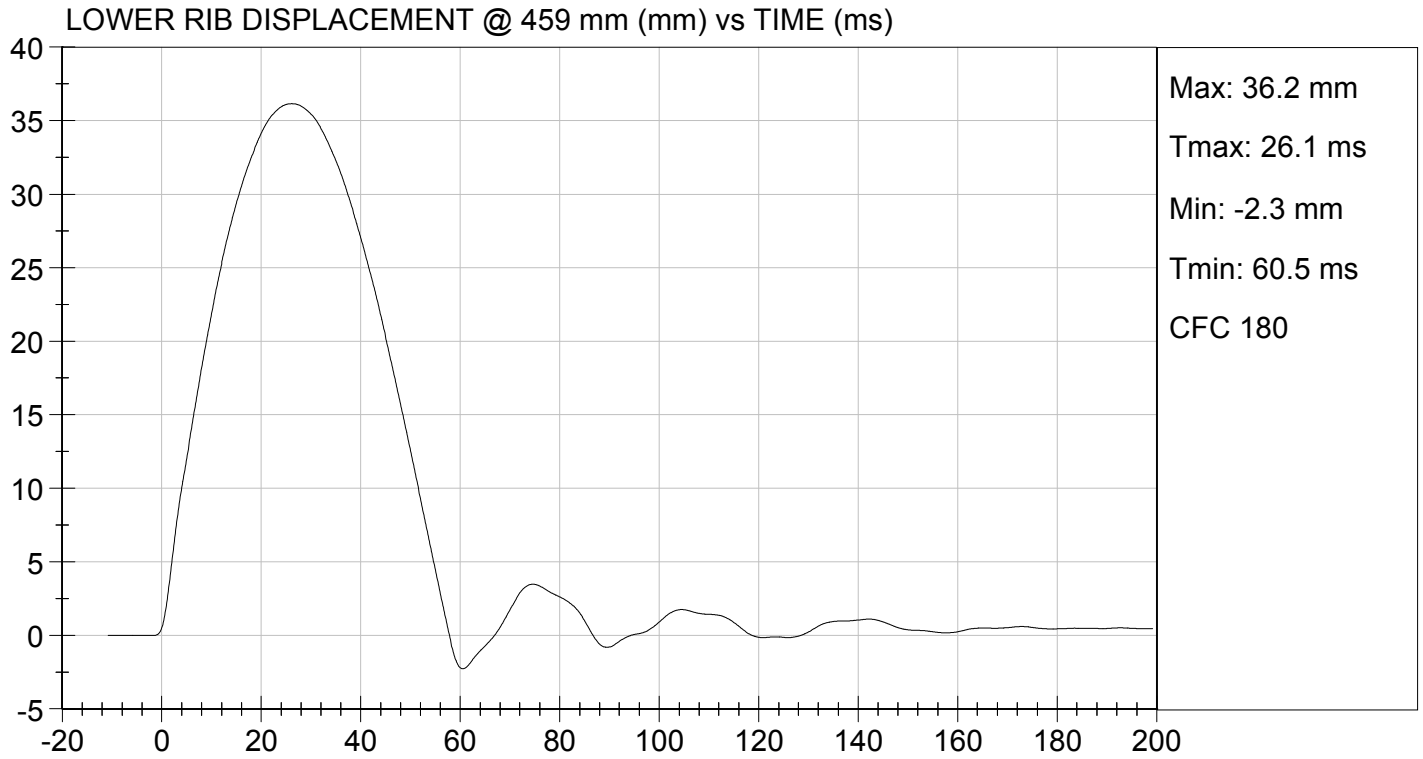
**Test I.D:** D13496

| Tested Parameter             | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature       | deg C | 20.6 to 22.2  | 20.6   | Pass      |
| Laboratory Relative Humidity | %     | 10 to 70      | 20     | Pass      |
| Displacement at 459 mm       | mm    | 36.0 to 40.0  | 36.2   | Pass      |
| Displacement at 815 mm       | mm    | 46.0 to 51.0  | 47.7   | Pass      |
| Overall Test Results         |       |               |        | Pass      |

  
Laboratory Technician

02/21/2013  
Test Date

  
Approved By



**MGA RESEARCH CORPORATION****THORAX IMPACT TEST****ES-2re DUMMY****ATD Serial No:** 032**Test I.D:** D13490

| Tested Parameter                    | Units | Specification | Result | Pass/Fail |
|-------------------------------------|-------|---------------|--------|-----------|
| Temperature                         | deg C | 20.6 to 22.2  | 21.1   | Pass      |
| Humidity                            | %     | 10 to 70      | 22     | Pass      |
| Probe Speed                         | m/s   | 5.40 to 5.60  | 5.58   | Pass      |
| Maximum Impactor Force (after 6 ms) | N     | 5100 to 6200  | 5353   | Pass      |
| Upper Rib Displacement              | mm    | 34.0 to 41.0  | 36.4   | Pass      |
| Middle Rib Displacement             | mm    | 37.0 to 45.0  | 39.5   | Pass      |
| Lower Rib Displacement              | mm    | 37.0 to 44.0  | 38.3   | Pass      |
| Overall Test Results                |       |               |        | Pass      |

  
Laboratory Technician

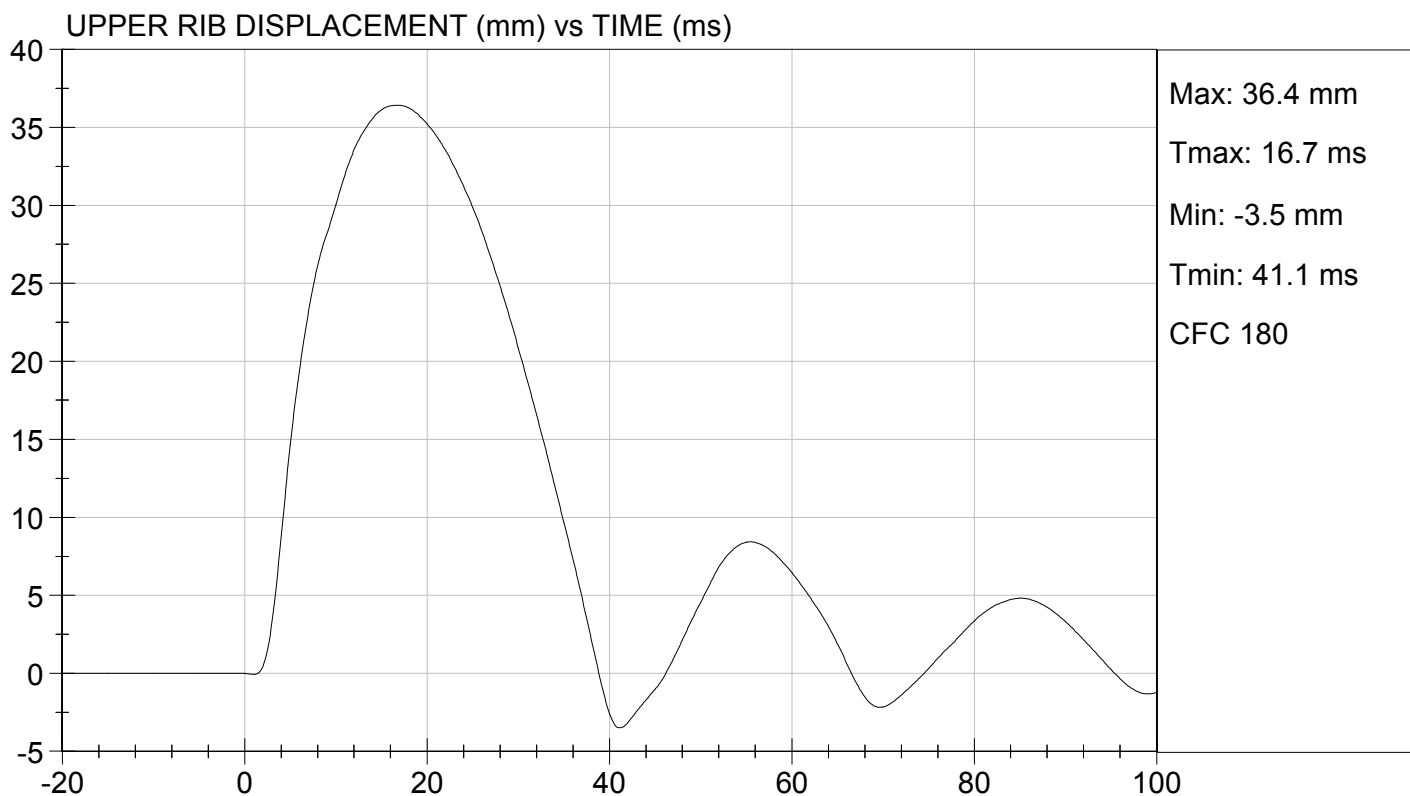
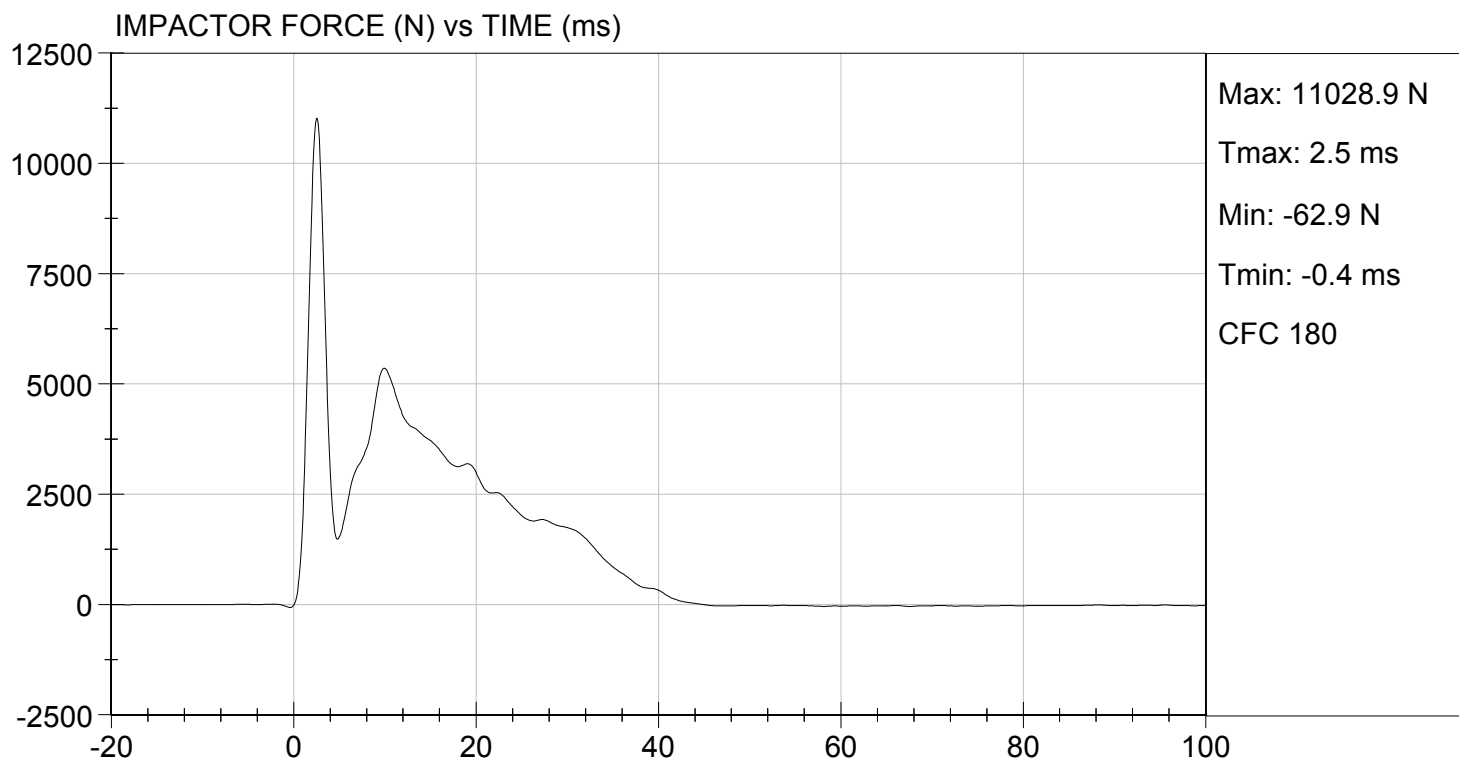
02/22/2013  
Test Date

  
Approved By



TEST DESC: THORAX IMPACT  
VELOCITY: 18.31 ft/s, 5.58 m/s

TEST DATE: 02/22/2013  
TEST #: D13490

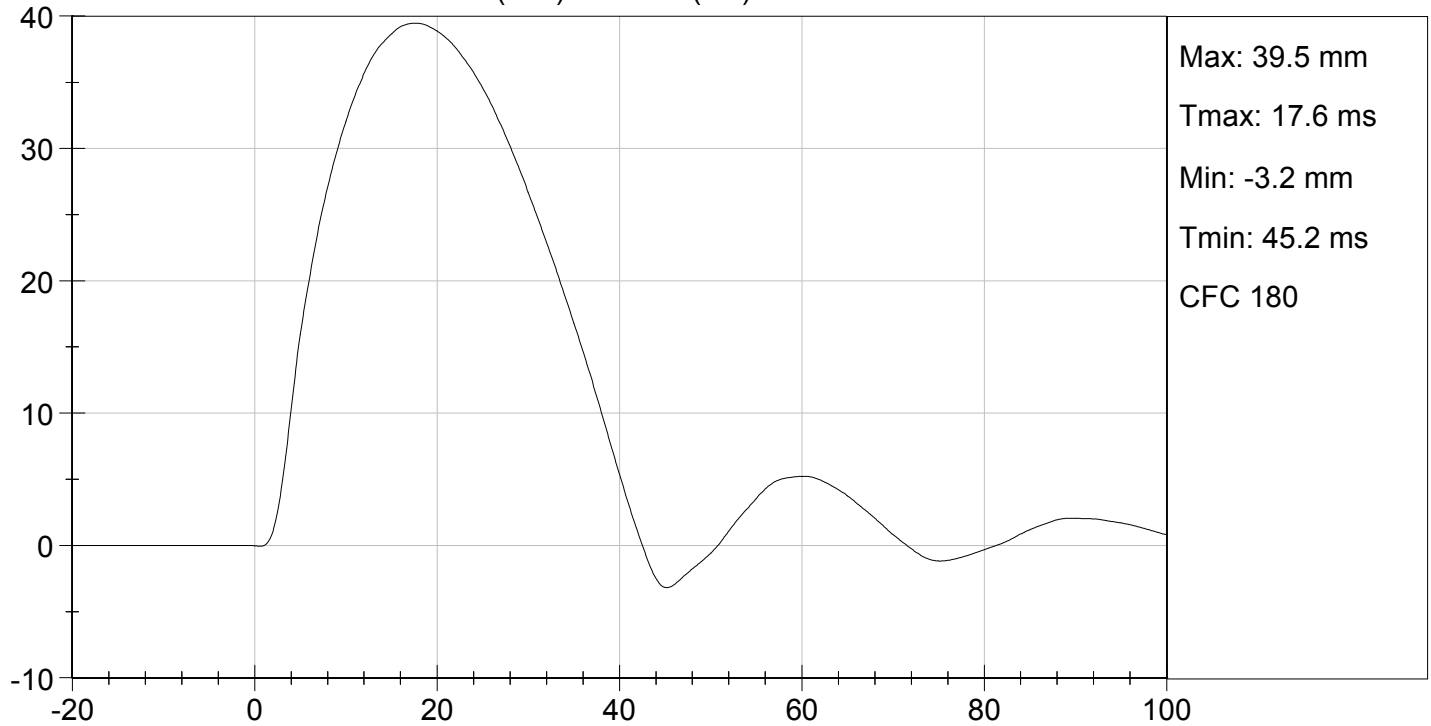




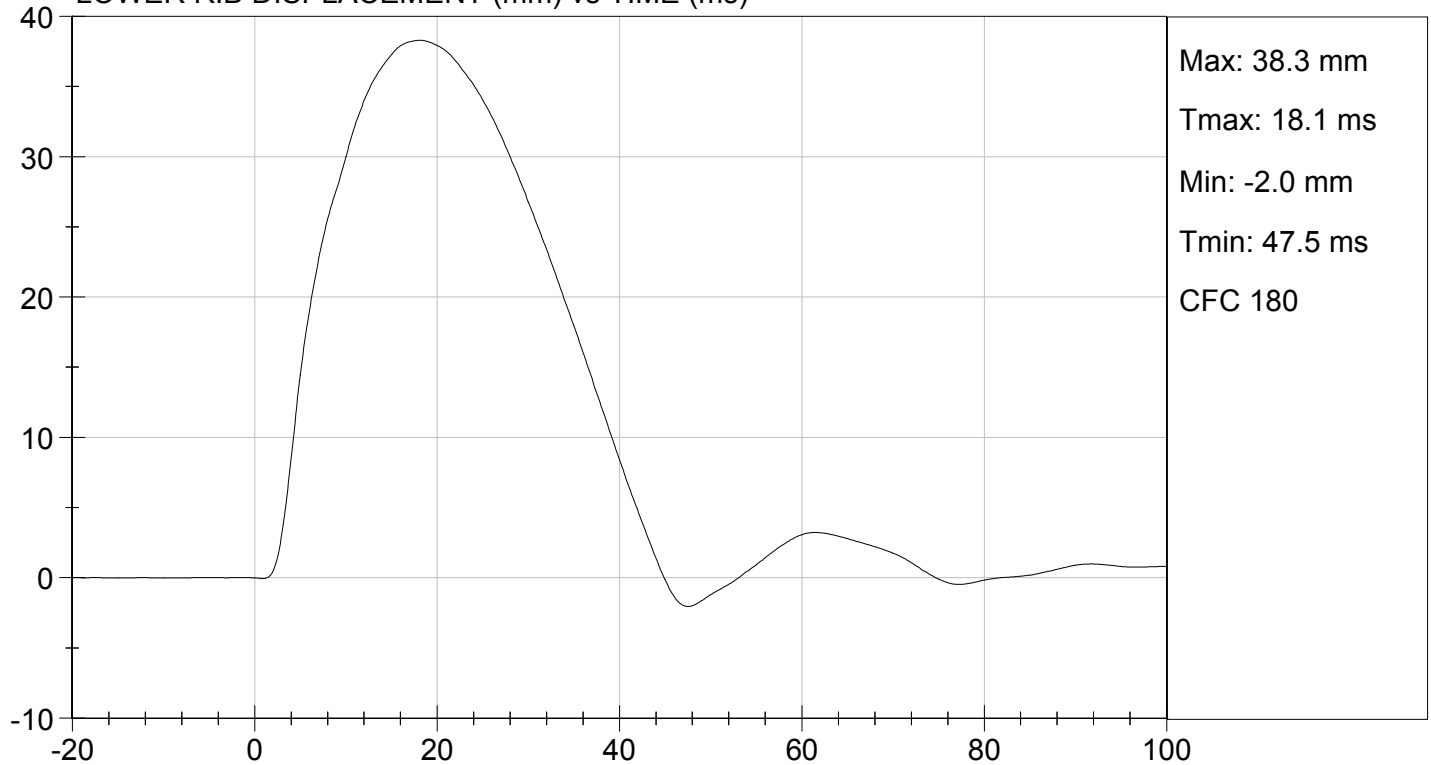
TEST DESC: THORAX IMPACT  
VELOCITY: 18.31 ft/s, 5.58 m/s

TEST DATE: 02/22/2013  
TEST #: D13490

MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)

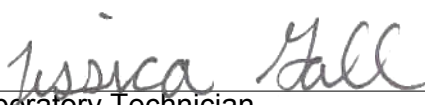


LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



**MGA RESEARCH CORPORATION****ABDOMEN TEST****ES-2re DUMMY****ATD Serial No:** 032**Test I.D:** D13497

| Tested Parameter               | Units | Specification | Result | Pass/Fail |
|--------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature         | deg C | 20.6 to 22.2  | 21.1   | Pass      |
| Laboratory Relative Humidity   | %     | 10 to 70      | 22     | Pass      |
| Probe Speed                    | m/s   | 3.90 to 4.10  | 4.06   | Pass      |
| Maximum Impactor Force         | N     | 4000 to 4800  | 4332   | Pass      |
| Time of Maximum Impactor Force | ms    | 10.6 to 13.0  | 10.8   | Pass      |
| Maximum Total Abdomen Force    | N     | 2200 to 2700  | 2443   | Pass      |
| Time of Maximum Abdomen Force  | ms    | 10.0 to 12.3  | 10.8   | Pass      |
| Overall Test Results           |       |               |        | Pass      |

  
Laboratory Technician

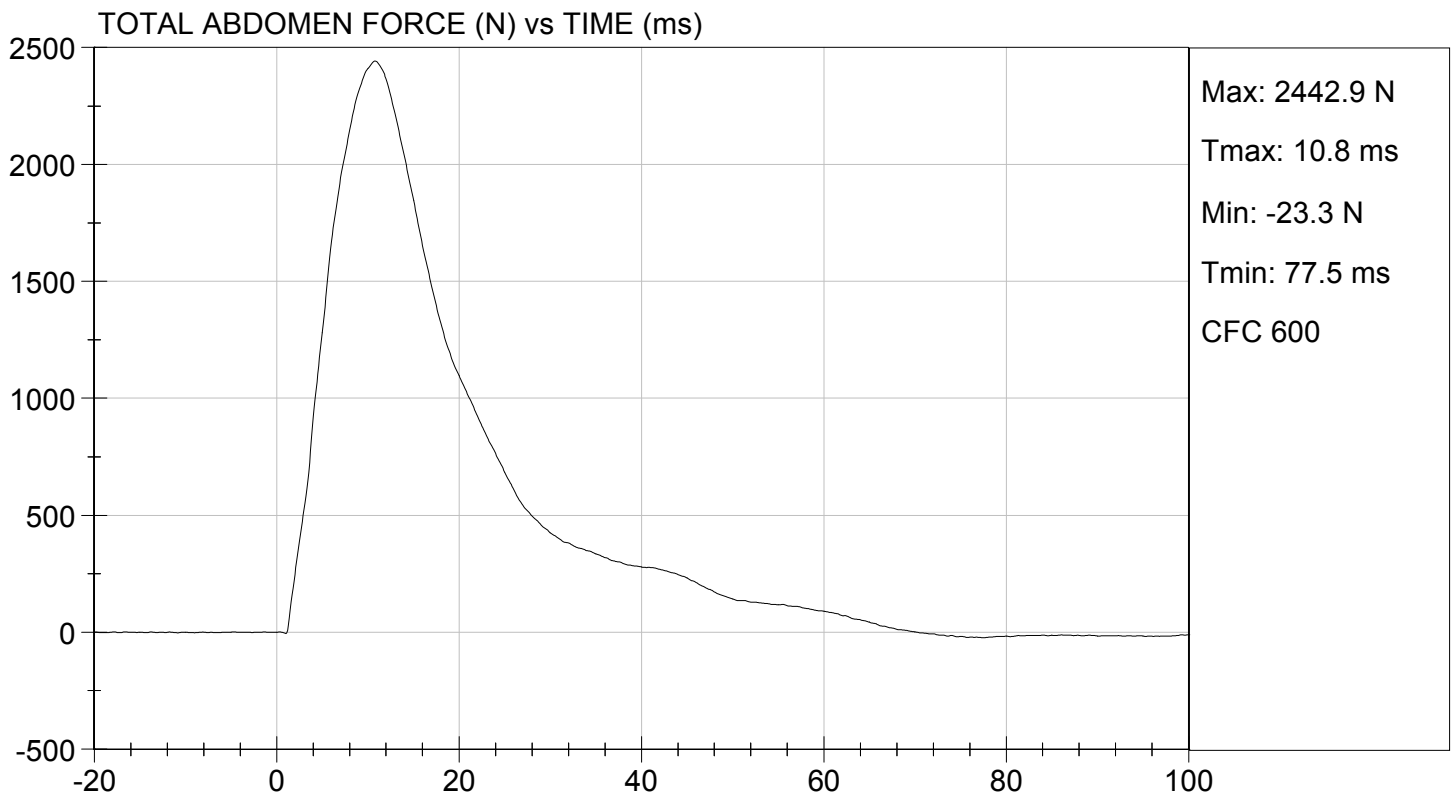
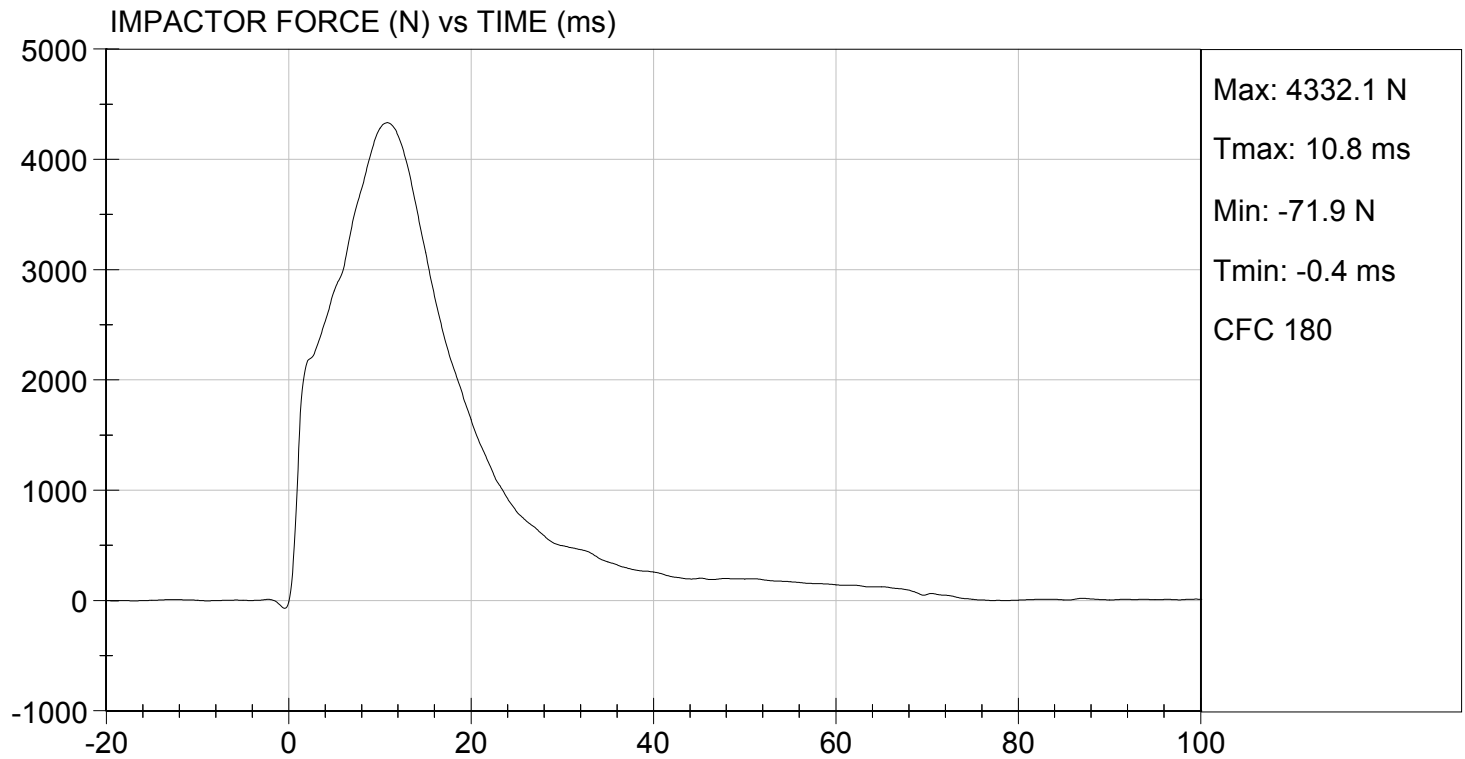
02/22/2013  
Test Date

  
Approved By



TEST DESC: ABDOMEN IMPACT  
VELOCITY: 13.33 ft/s, 4.06 m/s

TEST DATE: 02/22/2013  
TEST #: D13497

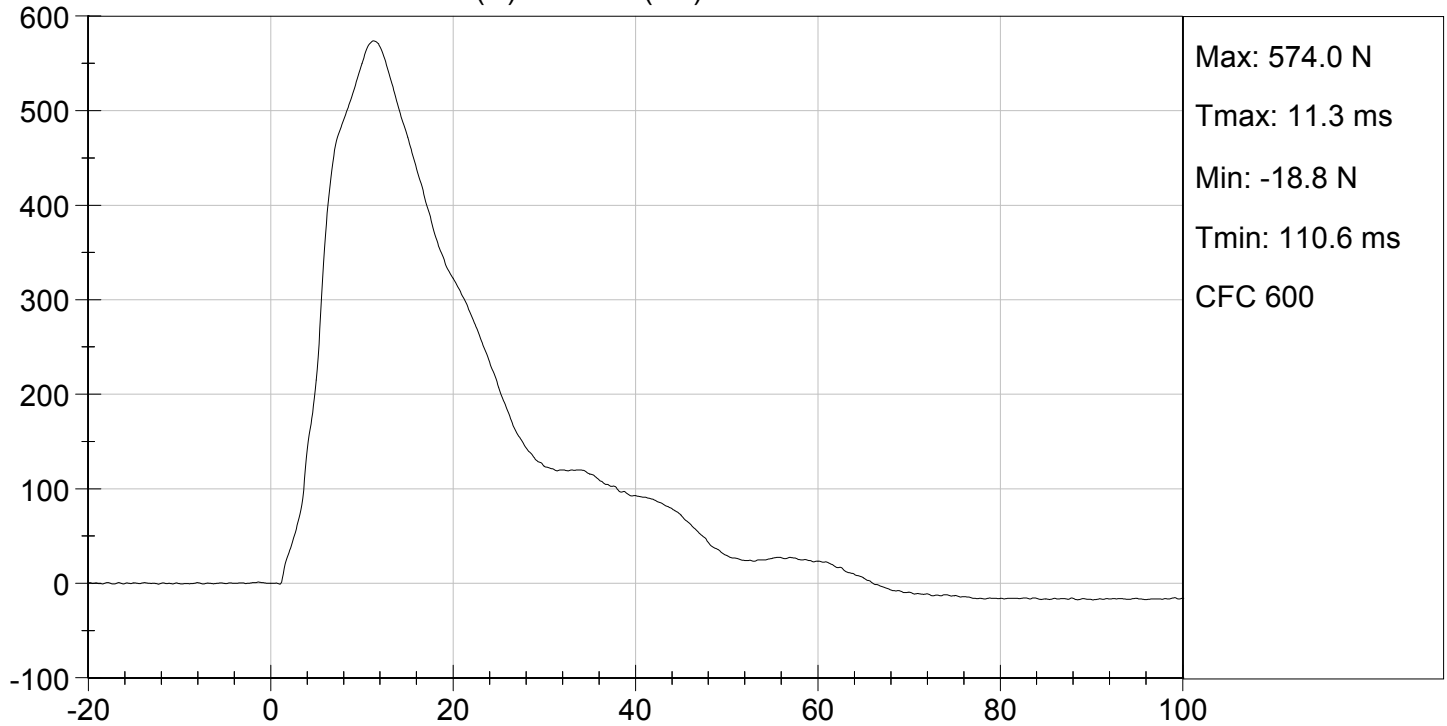




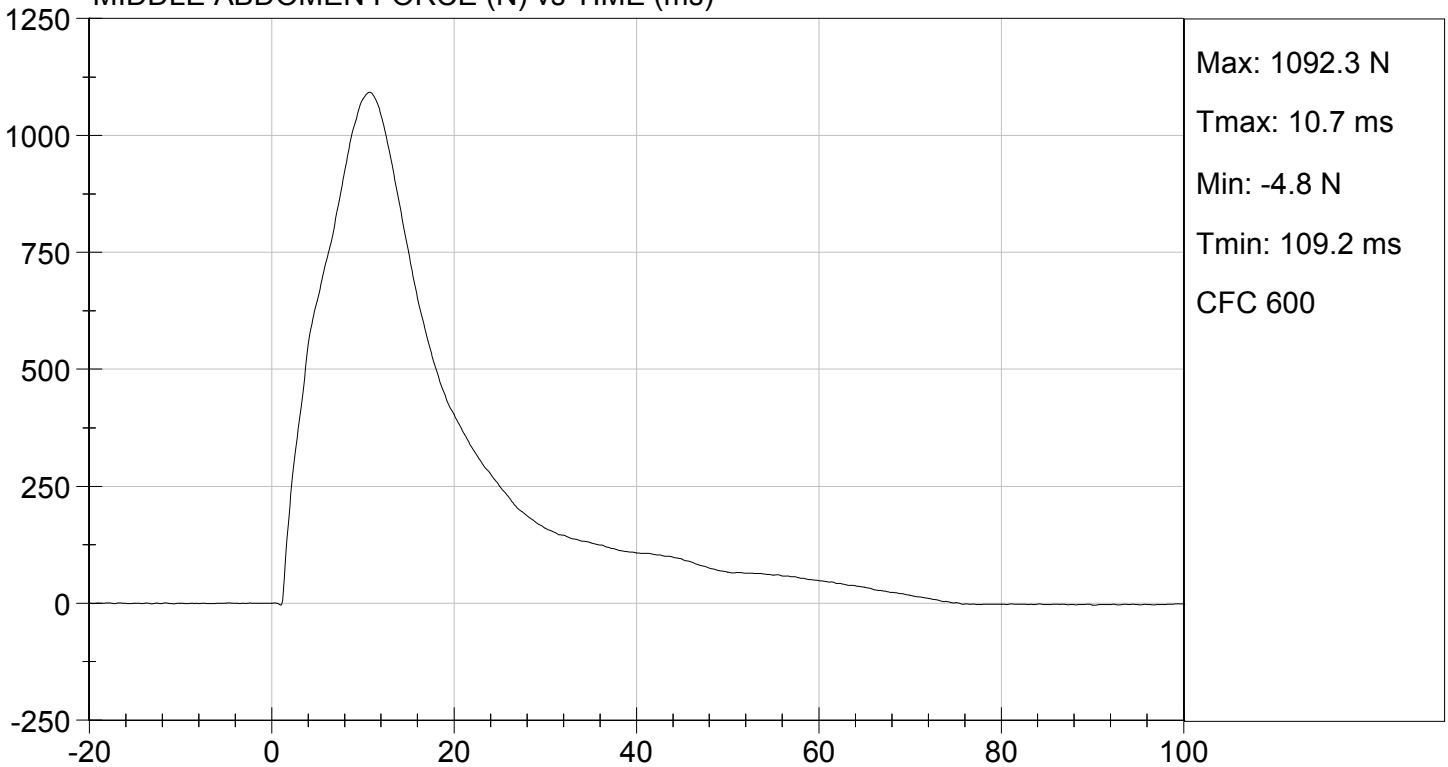
TEST DESC: ABDOMEN IMPACT  
VELOCITY: 13.33 ft/s, 4.06 m/s

TEST DATE: 02/22/2013  
TEST #: D13497

FRONT ABDOMEN FORCE (N) vs TIME (ms)



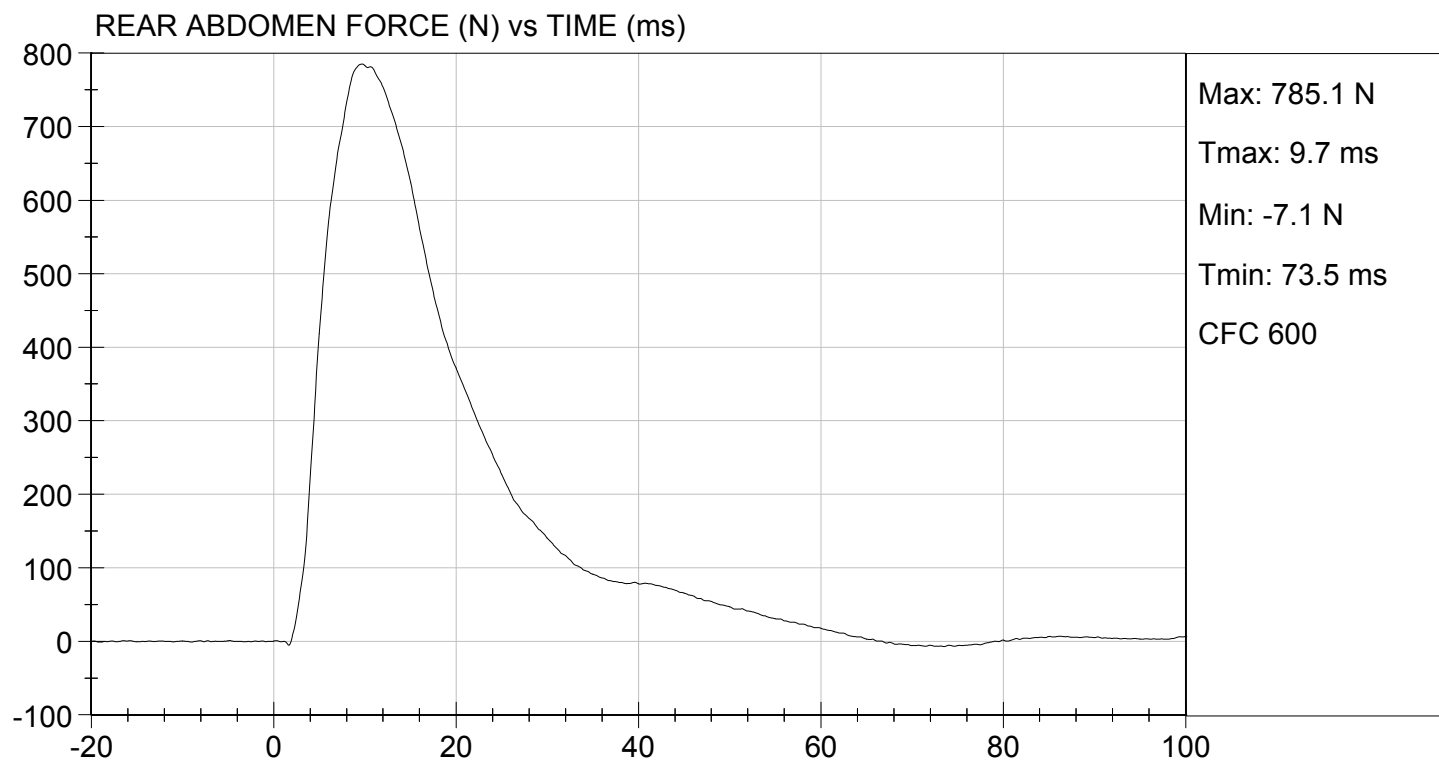
MIDDLE ABDOMEN FORCE (N) vs TIME (ms)





TEST DESC: ABDOMEN IMPACT  
VELOCITY: 13.33 ft/s, 4.06 m/s

TEST DATE: 02/22/2013  
TEST #: D13497

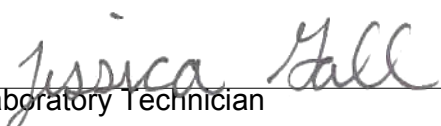


**MGA RESEARCH CORPORATION**  
**LUMBAR SPINE TEST**  
**ES-2re DUMMY**

**ATD Serial No:** 032

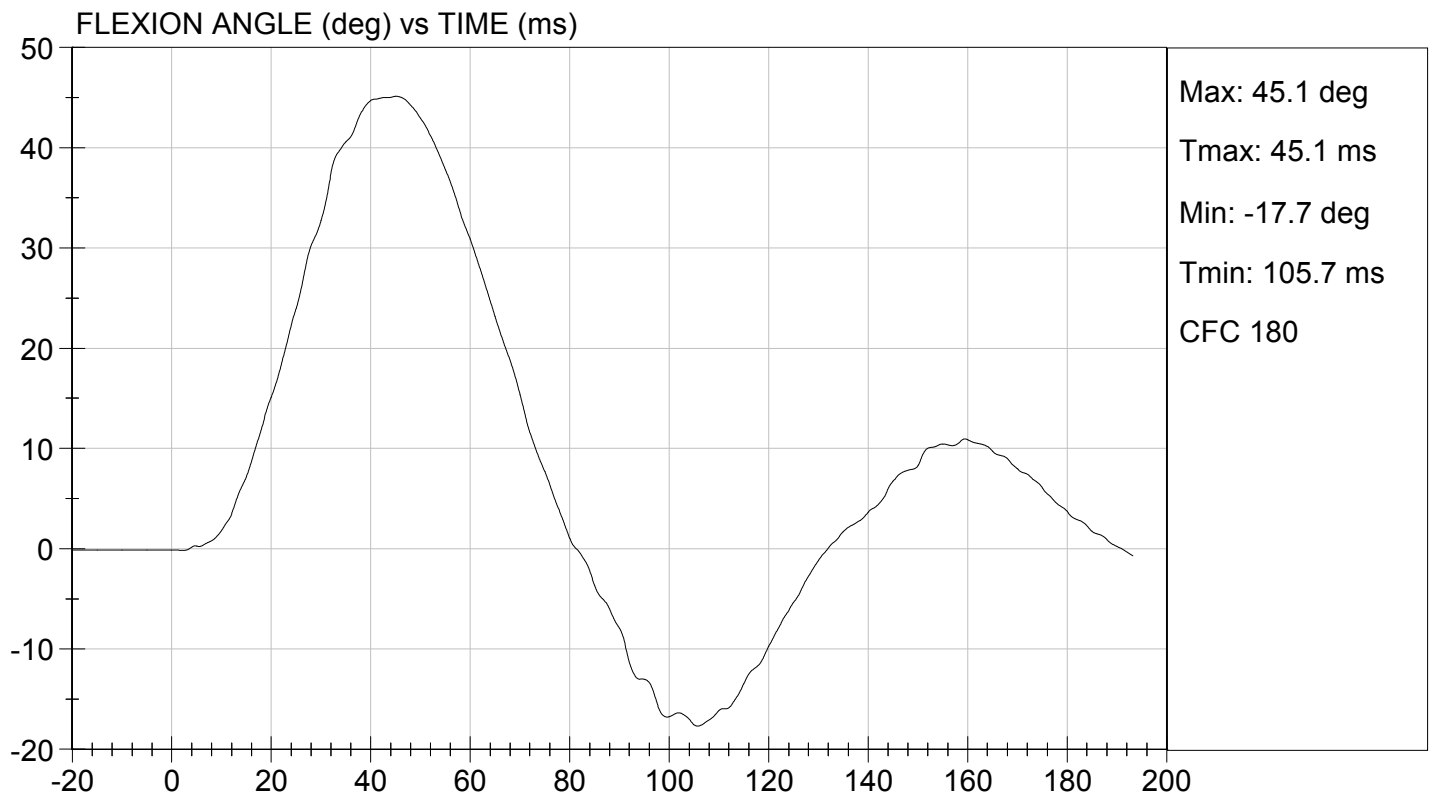
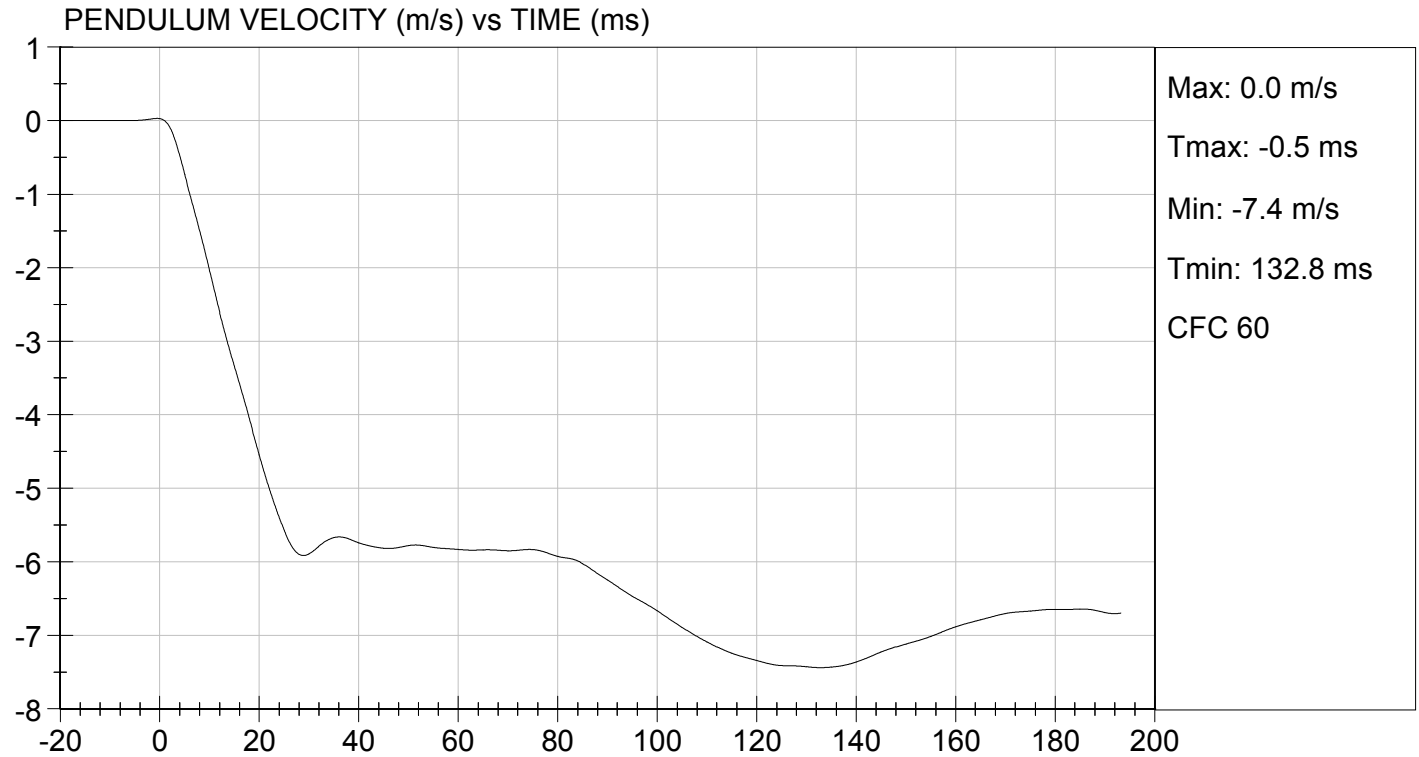
**Test I.D:** D13498

| Tested Parameter                            |        | Units | Specification   | Result | Pass/Fail |
|---------------------------------------------|--------|-------|-----------------|--------|-----------|
| Laboratory Temperature                      |        | deg C | 20.6 to 22.2    | 20.6   | Pass      |
| Laboratory Relative Humidity                |        | %     | 10 to 70        | 19     | Pass      |
| Pendulum Speed                              |        | m/s   | 5.95 to 6.15    | 6.05   | Pass      |
| Pendulum Velocity                           | 1 ms   | m/s   | -0.05 to 0.00   | -0.00  | Pass      |
|                                             | 3.7 ms | m/s   | -0.425 to -0.24 | -0.406 | Pass      |
|                                             | 27 ms  | m/s   | -6.50 to -5.80  | -5.83  | Pass      |
|                                             | 30 ms  | m/s   | >= -6.50        | -5.89  | Pass      |
| Maximum Flexion Angle                       |        | deg   | 45.0 to 55.0    | 45.1   | Pass      |
| Time of Maximum Flexion Angle               |        | ms    | 39.0 to 53.0    | 45.1   | Pass      |
| Headform Rotation Decay to Initial Position |        | ms    | 37 to 57        | 46     | Pass      |
| Overall Results                             |        |       |                 |        | Pass      |

  
 Laboratory Technician

02/21/2013  
 Test Date

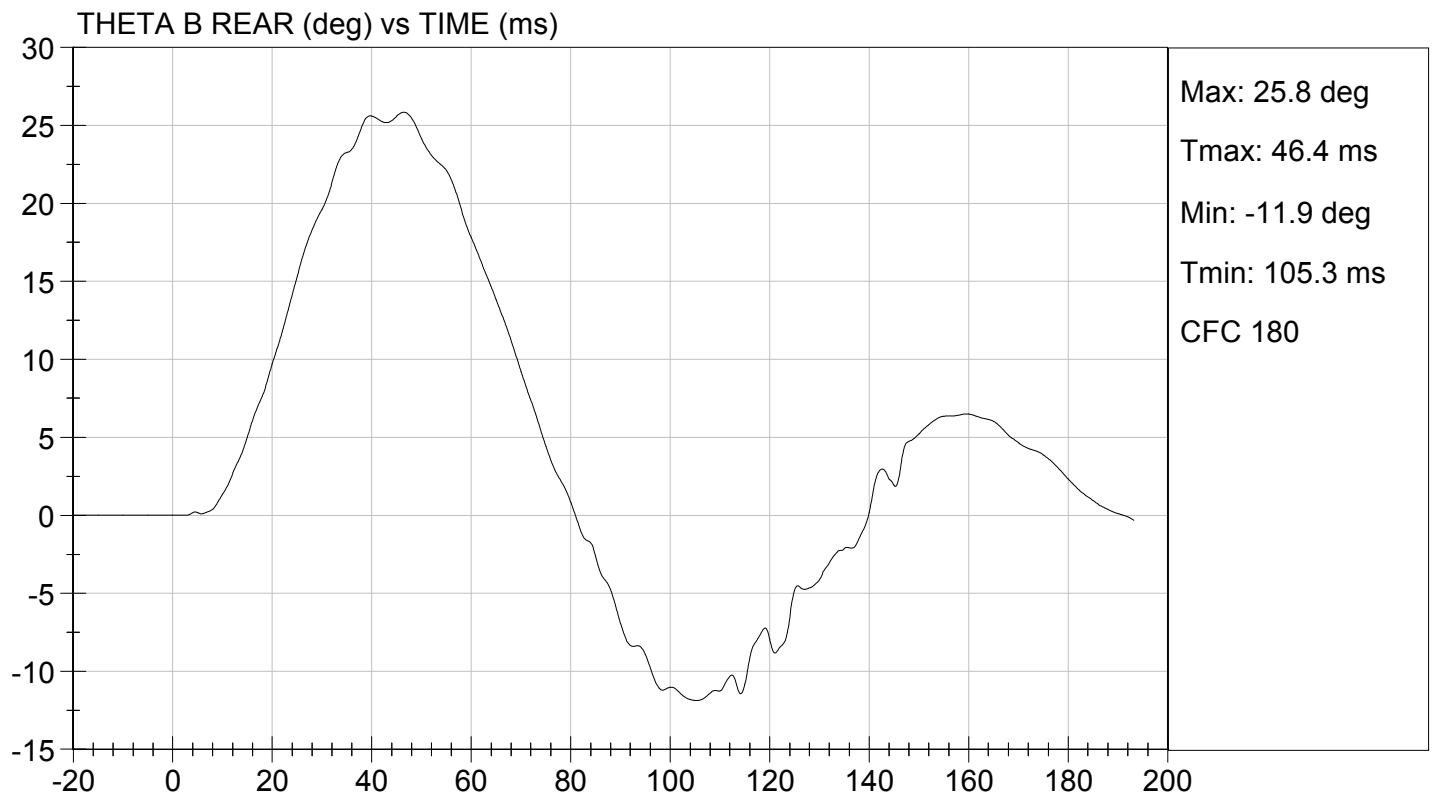
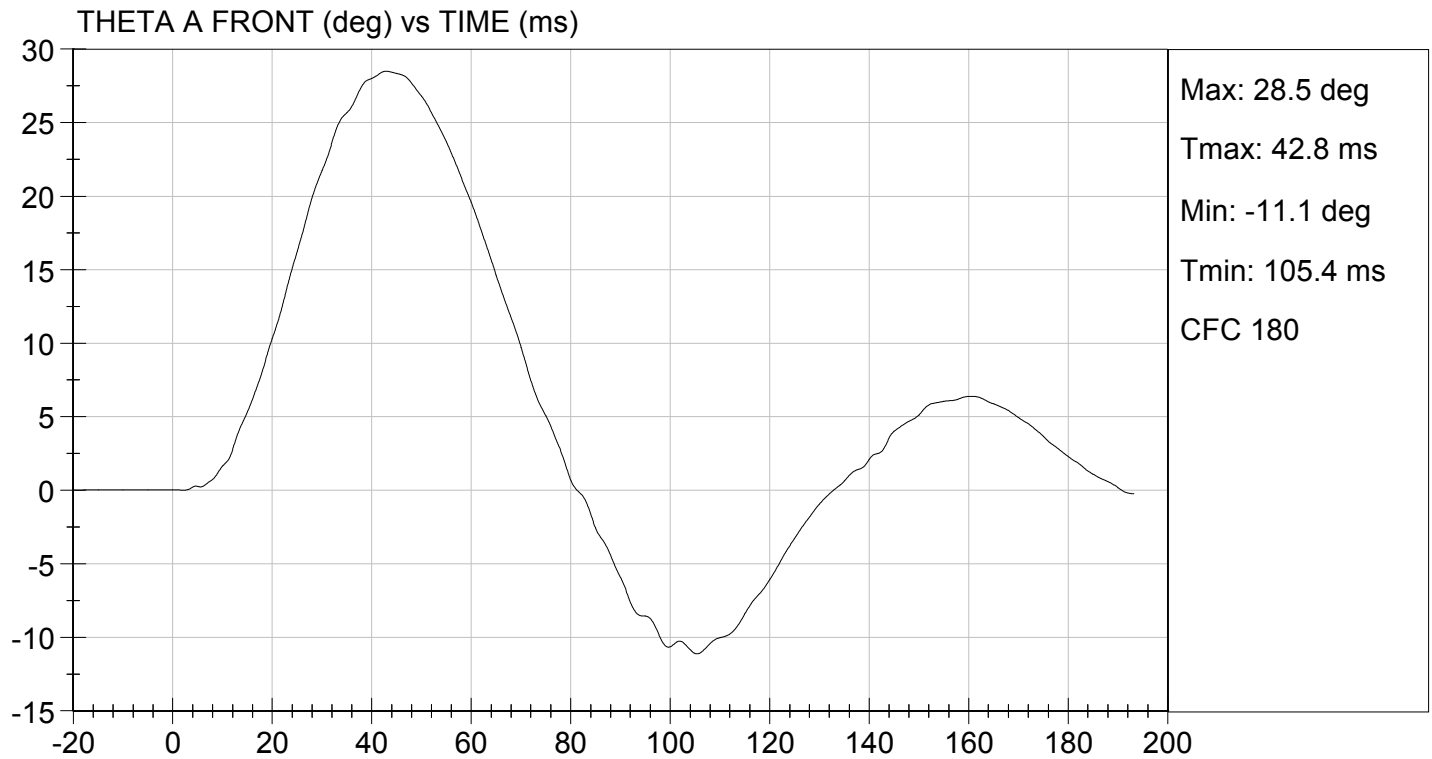
  
 Approved By





TEST DESC: LUMBAR BENDING  
VELOCITY: 19.84 ft/s, 6.05 m/s

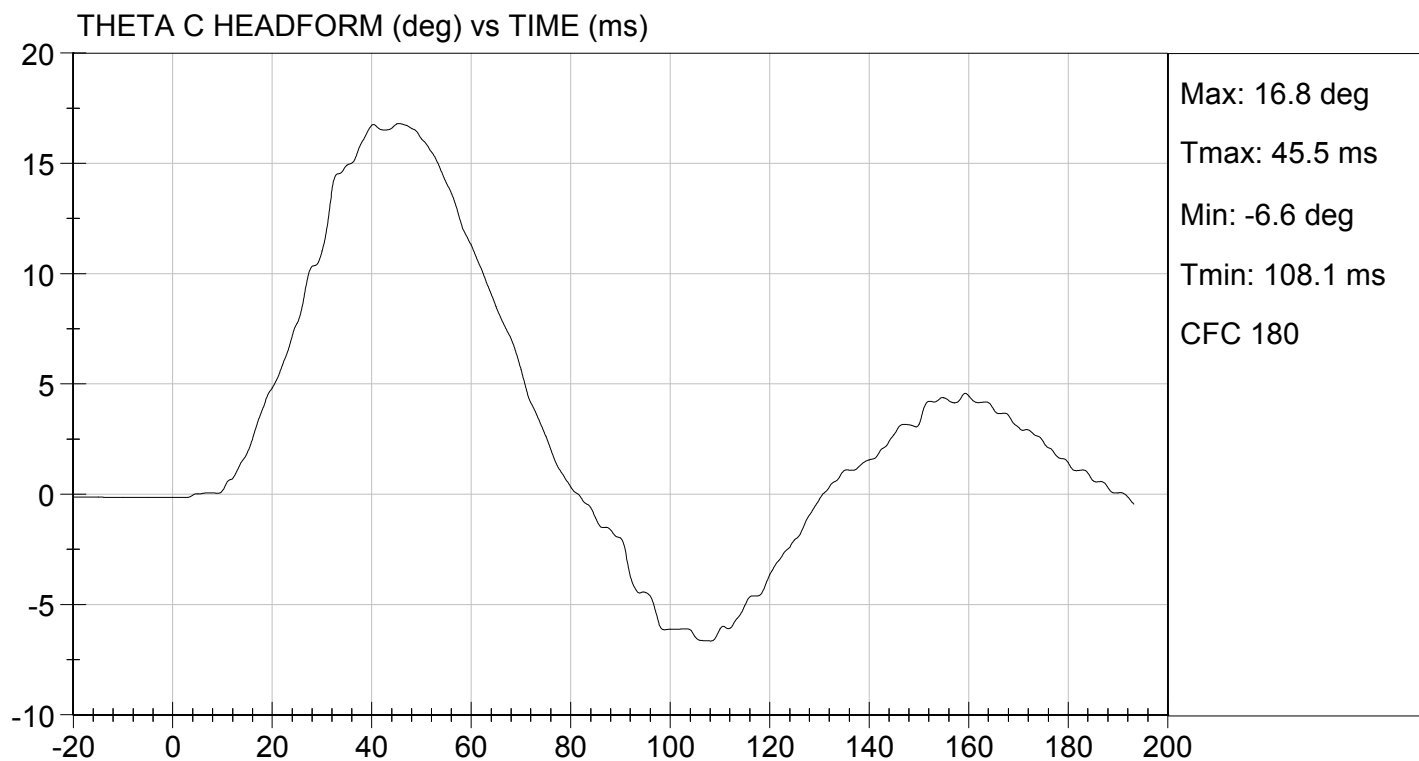
TEST DATE: 02/21/2013  
TEST #: D13498





TEST DESC: LUMBAR BENDING  
VELOCITY: 19.84 ft/s, 6.05 m/s

TEST DATE: 02/21/2013  
TEST #: D13498



**MGA RESEARCH CORPORATION**

**PELVIS TEST  
ES-2re DUMMY**

**ATD Serial No:** 032

**Test I.D:** D13499

| Tested Parameter               | Units | Specification | Result | Pass/Fail |
|--------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature         | deg C | 20.6 to 22.2  | 21.1   | Pass      |
| Laboratory Relative Humidity   | %     | 10 to 70      | 22     | Pass      |
| Probe Speed                    | m/s   | 4.20 to 4.40  | 4.34   | Pass      |
| Maximum Impactor Force         | N     | 4700 to 5400  | 4767   | Pass      |
| Time of Maximum Impactor Force | ms    | 11.8 to 16.1  | 13.0   | Pass      |
| Maximum Pubic Force            | N     | 1230 to 1590  | 1261   | Pass      |
| Time of Maximum Pubic Force    | ms    | 12.2 to 17.0  | 13.8   | Pass      |
| Overall Test Results           |       |               |        | Pass      |

  
Laboratory Technician

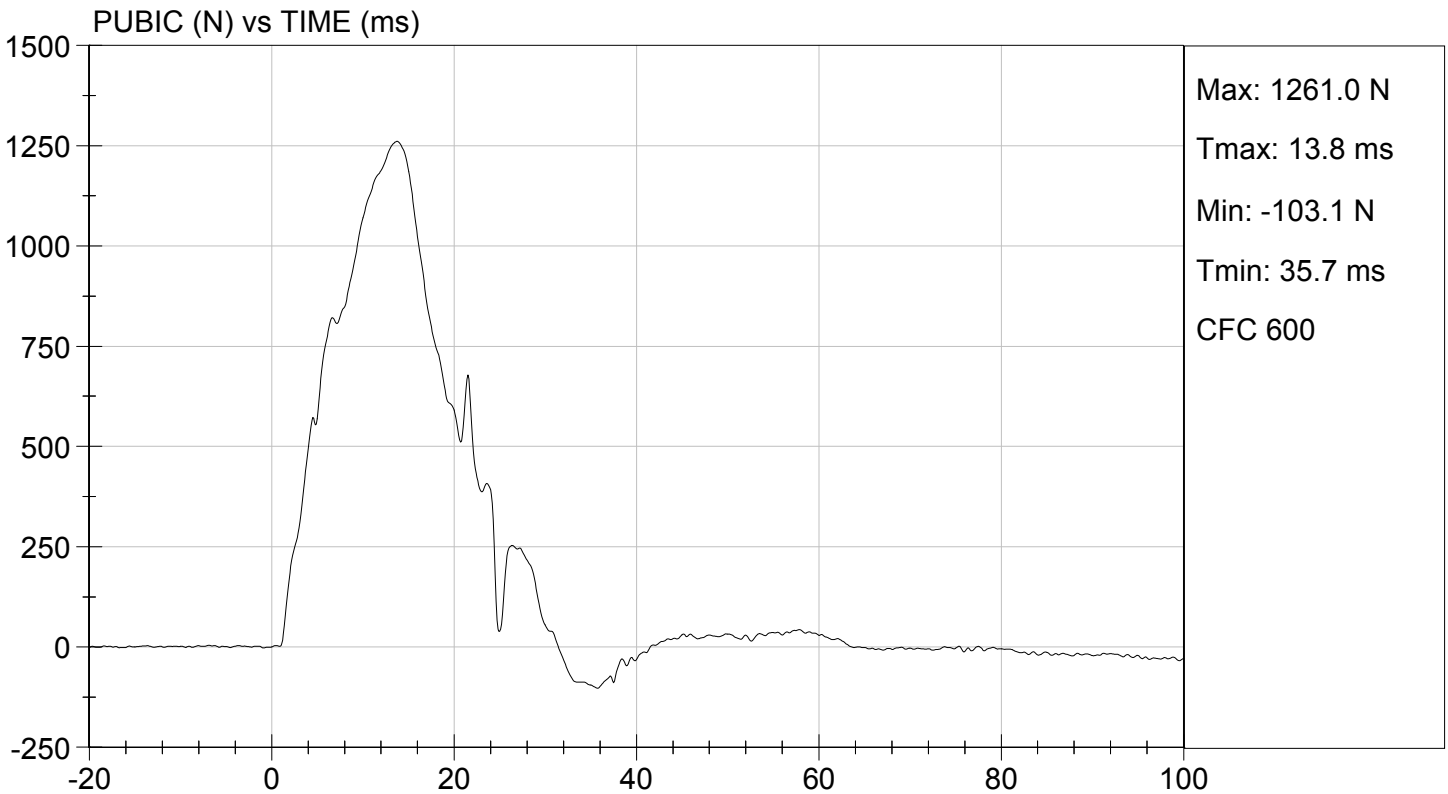
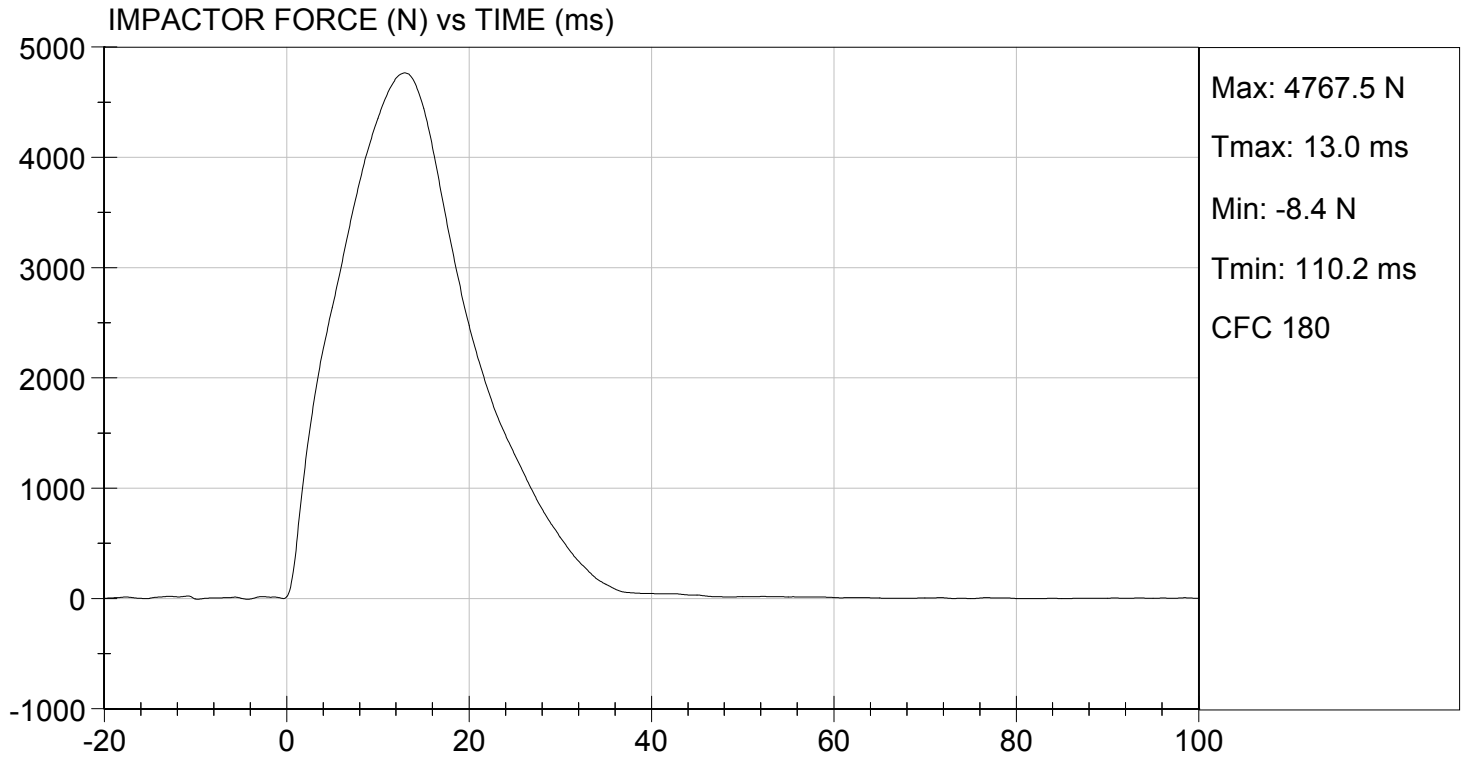
02/22/2013  
Test Date

  
Approved By



TEST DESC: PELVIS IMPACT  
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 02/22/2013  
TEST #: D13499



**SID-IIsD External Measurements**  
**SN: 306**

| <b>No.</b> | <b>Name</b>                   | <b>Spec. (mm)</b> | <b>Result</b> | <b>Pass/Fail</b> |
|------------|-------------------------------|-------------------|---------------|------------------|
| <b>A</b>   | Sitting Height                | 772 - 788         | 785           | Pass             |
| <b>B</b>   | Shoulder Pivot Height         | 437 - 453         | 449           | Pass             |
| <b>C</b>   | H-point Height                | 79 - 89           | 86            | Pass             |
| <b>D</b>   | H-point from Seatback         | 141 - 151         | 147           | Pass             |
| <b>E</b>   | Shoulder Pivot from Backline  | 97 - 107          | 99            | Pass             |
| <b>F</b>   | Thigh Clearance               | 119 -135          | 120           | Pass             |
| <b>G</b>   | Head Breadth                  | 140 - 148         | 141           | Pass             |
| <b>H</b>   | Head Back from Backline       | 40 - 46           | 45            | Pass             |
| <b>I</b>   | Head Depth                    | 178 - 188         | 182           | Pass             |
| <b>J</b>   | Head Circumference            | 541 - 551         | 550           | Pass             |
| <b>K</b>   | Buttock to Knee Length        | 514 - 540         | 538           | Pass             |
| <b>L</b>   | Popliteal Height              | 343 - 369         | 349           | Pass             |
| <b>M</b>   | Knee Pivot to Floor Height    | 392 - 409         | 394           | Pass             |
| <b>N</b>   | Buttock Popliteal Length      | 416 - 442         | 435           | Pass             |
| <b>O</b>   | Chest Depth w/o Jacket        | 195 - 211         | 198           | Pass             |
| <b>P</b>   | Foot Length                   | 216 - 232         | 222           | Pass             |
| <b>Q</b>   | Hip Breadth (w/ pelvic plugs) | 313 - 323         | 317           | Pass             |
| <b>R</b>   | Arm Length                    | 249 - 259         | 250           | Pass             |
| <b>S</b>   | Knee Joint to Seatback        | 477 - 493         | 483           | Pass             |
| <b>V</b>   | Shoulder Width                | 341 - 357         | 351           | Pass             |
| <b>W</b>   | Foot Width                    | 78 - 94           | 82            | Pass             |
| <b>Y</b>   | Chest Circumference w/ jacket | 851 - 881         | 863           | Pass             |
| <b>Z</b>   | Waist Circumference           | 761 - 791         | 782           | Pass             |

**MGA RESEARCH CORPORATION**  
**HEAD DROP TEST**  
**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 306

**Test ID:** D13051

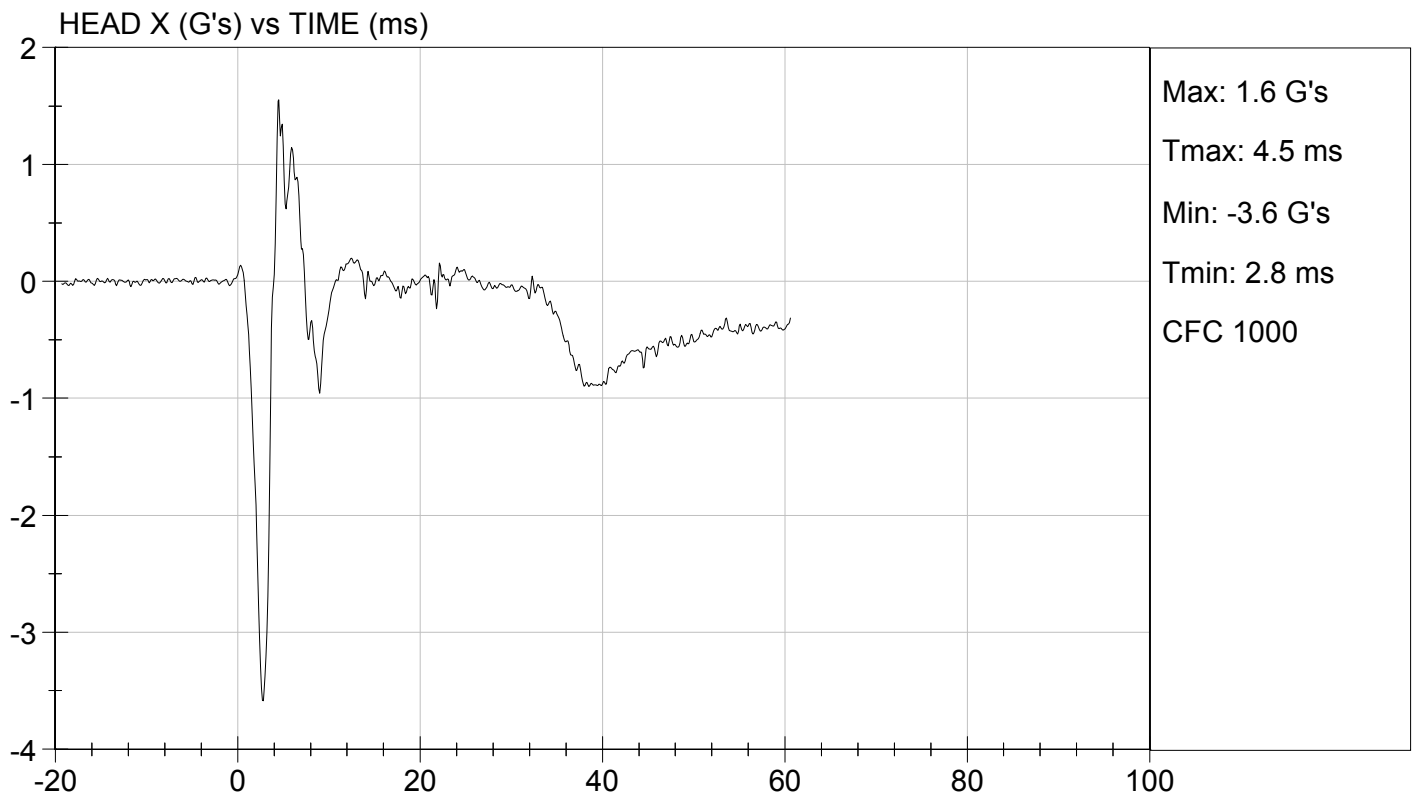
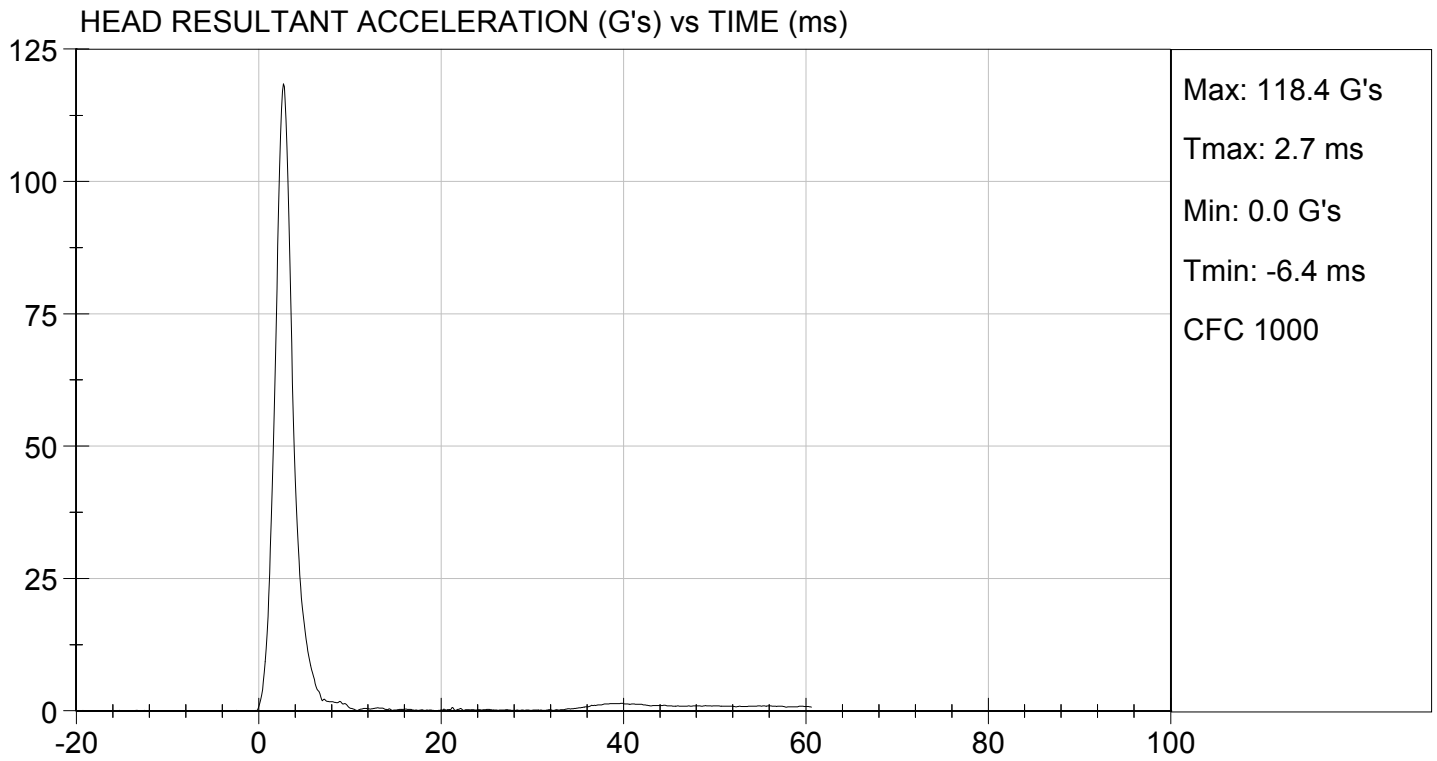
| Tested Parameter               | Units | Specification | Result               | Pass/Fail |
|--------------------------------|-------|---------------|----------------------|-----------|
| Laboratory Temperature         | deg C | 20.6 to 22.2  | 21.0                 | Pass      |
| Laboratory Relative Humidity   | %     | 10 to 70      | 24                   | Pass      |
| Peak Resultant Acceleration    | G's   | 115 to 137    | 118                  | Pass      |
| Peak Longitudinal Acceleration | G's   | +/- 15        | -3.6                 | Pass      |
| Unimodal                       | N/A   | Yes           | Yes                  | Pass      |
| Oscillations                   | N/A   | <15%          | Yes                  | Pass      |
|                                |       |               | Overall Test Results | Pass      |

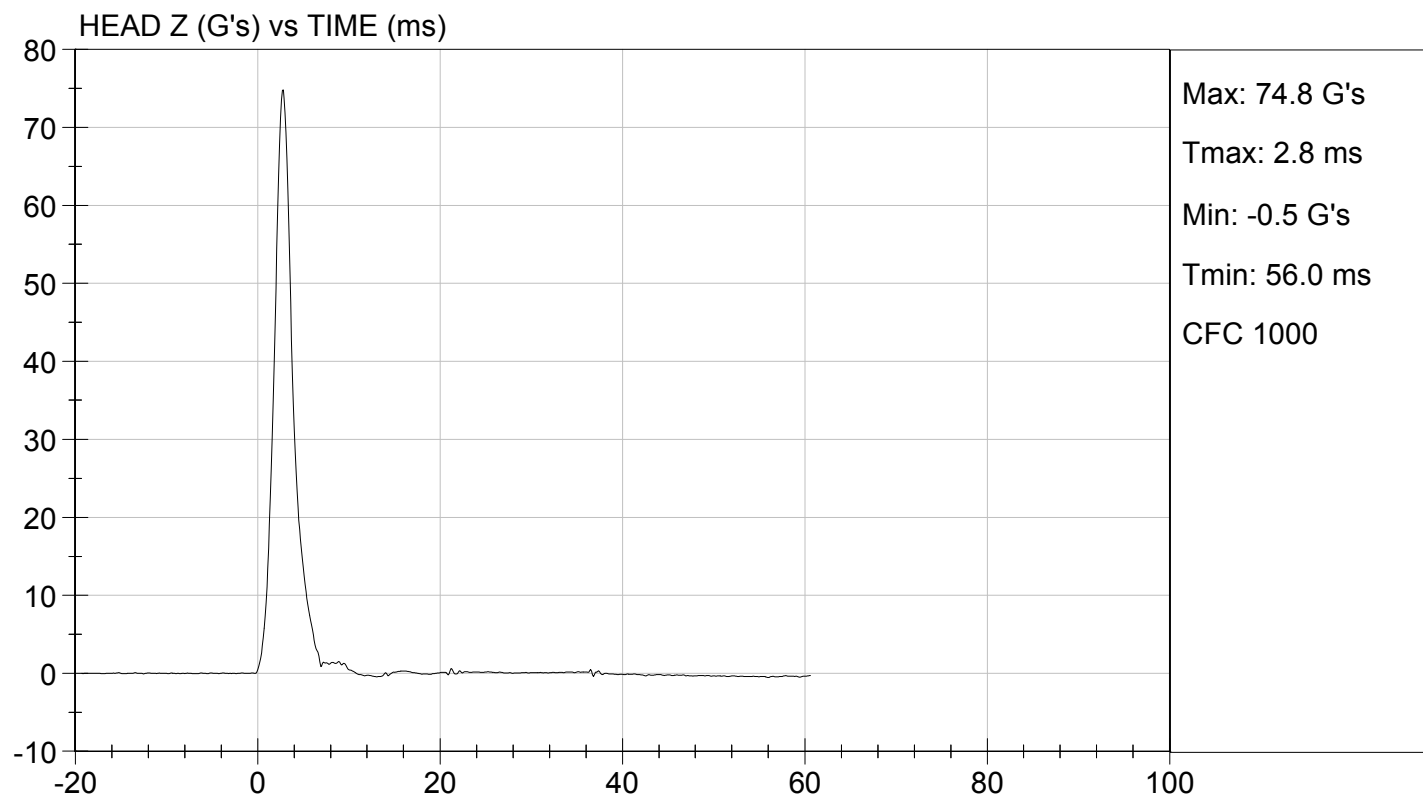
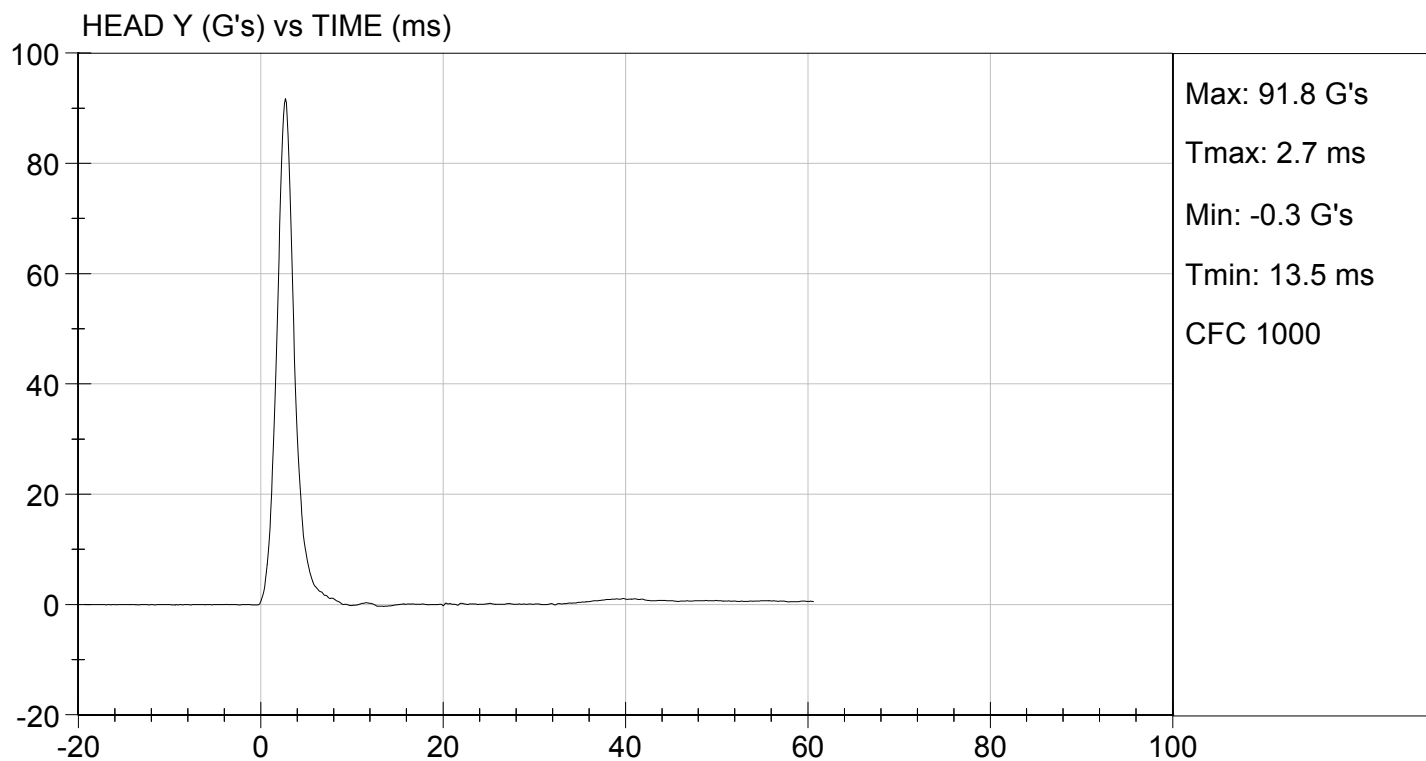
  
Laboratory Technician

01/10/2013

Test Date

  
Approved By





**MGA RESEARCH CORPORATION**  
**LATERAL NECK PENDULUM TEST**  
**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 306

**Test I.D:** D13052

| Tested Parameter                 |           | Units | Specification | Result | Pass/Fail |
|----------------------------------|-----------|-------|---------------|--------|-----------|
| Temperature                      |           | deg C | 20.6 to 22.2  | 20.9   | Pass      |
| Humidity                         |           | %     | 10 to 70      | 25     | Pass      |
| Impact Velocity                  |           | m/s   | 5.51 to 5.63  | 5.52   | Pass      |
| Pendulum Velocity                | 10 ms     | m/s   | 2.20 to 2.80  | 2.57   | Pass      |
|                                  | 15 ms     | m/s   | 3.30 to 4.10  | 3.67   | Pass      |
|                                  | 20 ms     | m/s   | 4.40 to 5.40  | 4.84   | Pass      |
|                                  | 25 ms     | m/s   | 5.40 to 6.10  | 5.42   | Pass      |
|                                  | 25-100 ms | m/s   | 5.50 to 6.20  | 5.55   | Pass      |
| Maximum D-Plane Rotation         |           | deg   | 71 to 81      | 73     | Pass      |
| Time of Maximum D-Plane Rotation |           | ms    | 50 to 70      | 62     | Pass      |
| Maximum Occipital Condyle Moment |           | Nm    | -44 to -36    | -39    | Pass      |
| Time of Moment Decay to 0 Nm     |           | ms    | 102 to 126    | 116    | Pass      |
| Overall Test Results             |           |       |               |        | Pass      |

Jessica Gall  
Laboratory Technician

01/10/2013

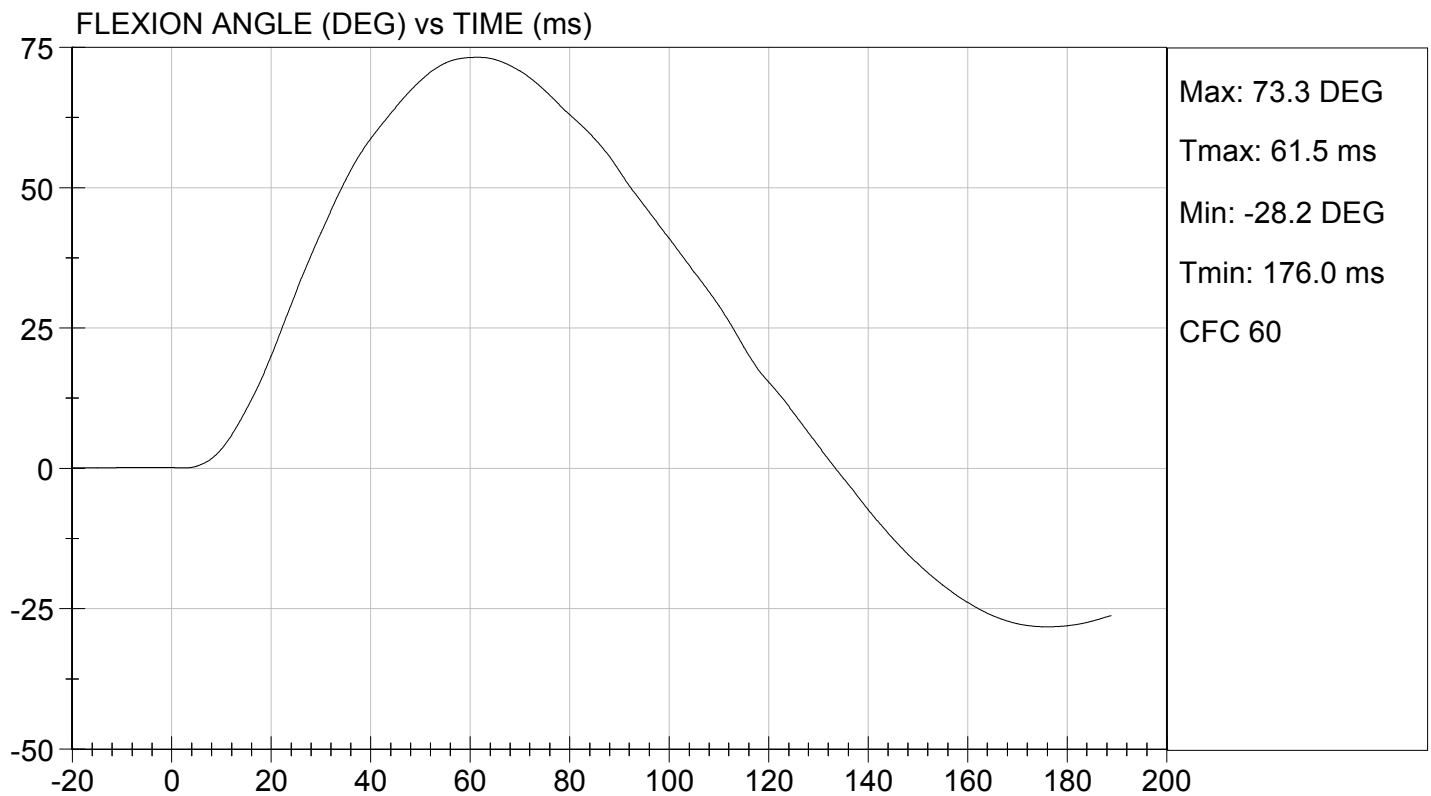
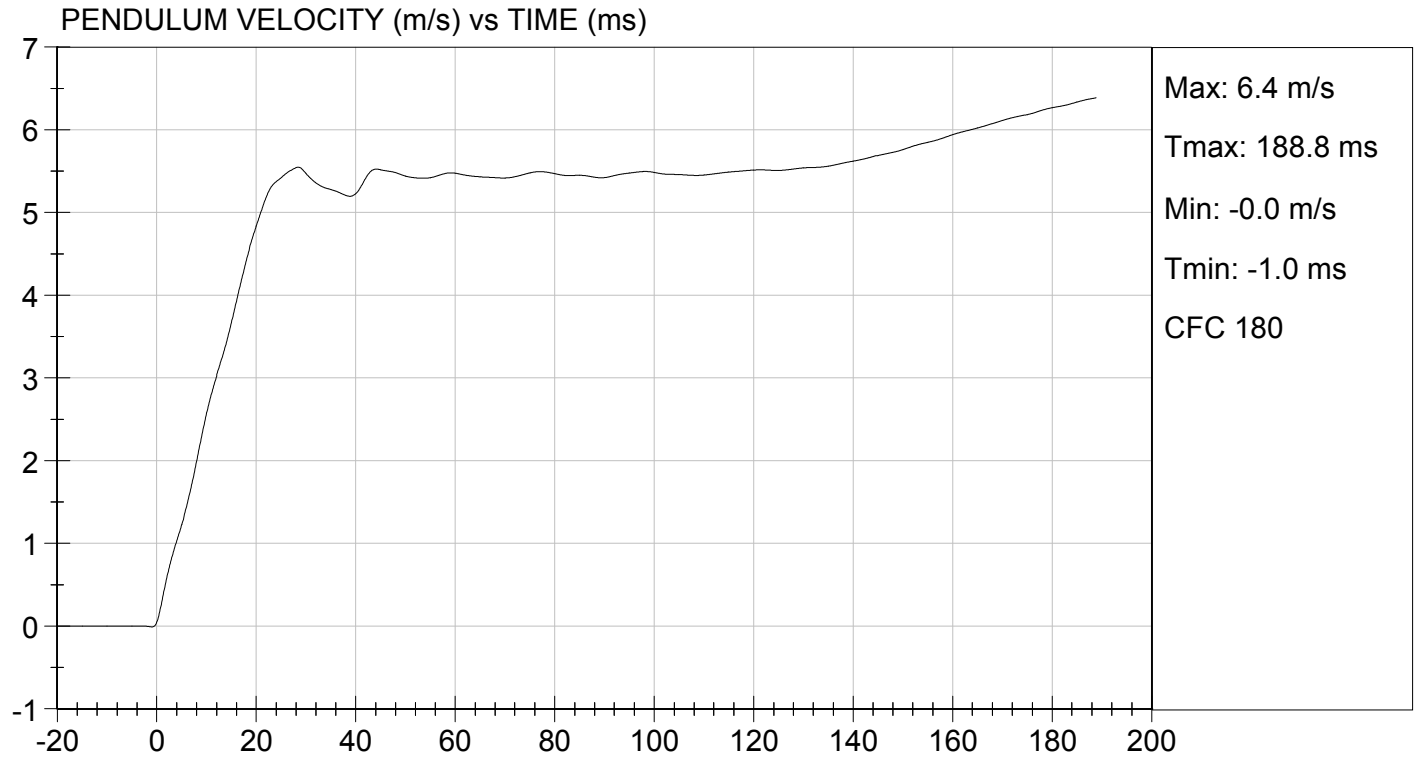
Test Date

David Winkelbauer  
Approved By



TEST DESC: NECK BENDING  
VELOCITY: 18.12 ft/s, 5.52 m/s

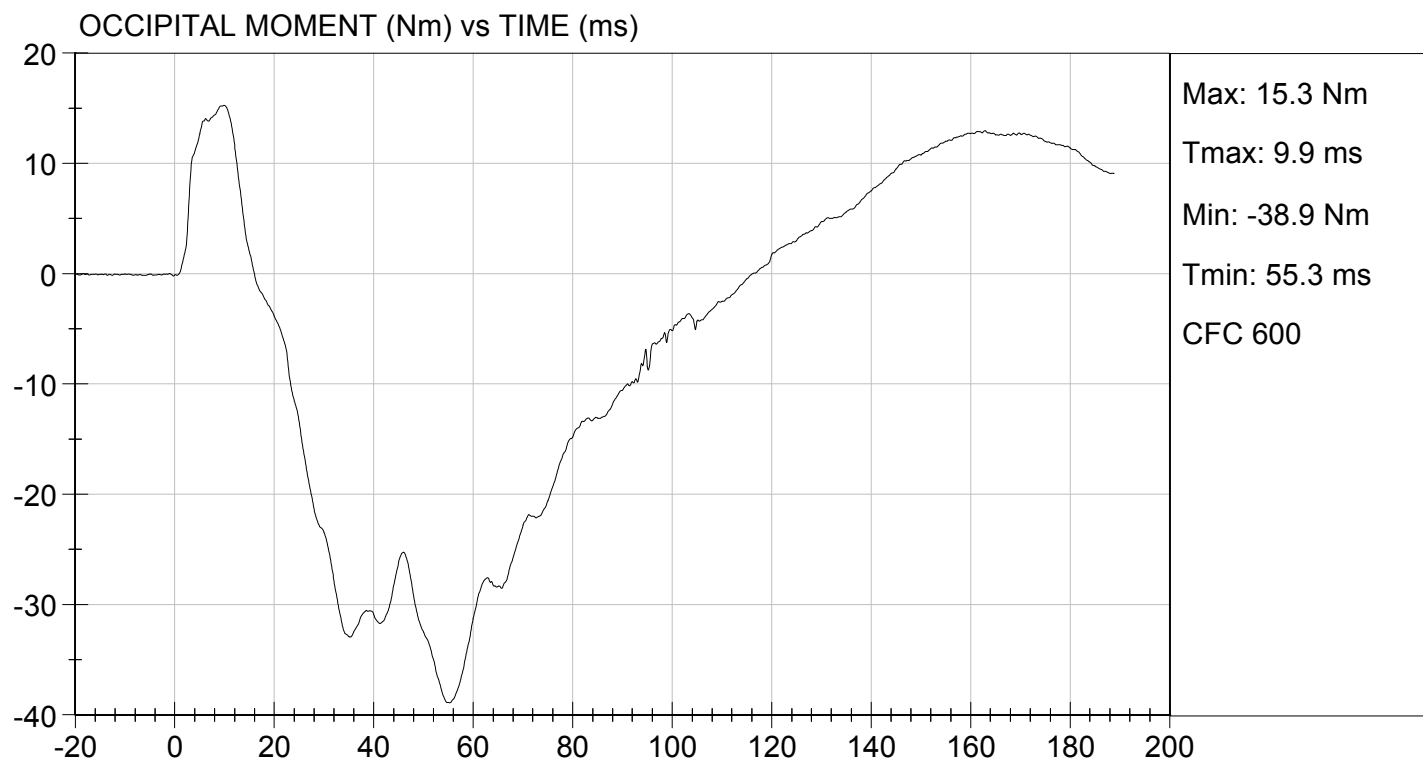
TEST DATE: 01/10/2013  
TEST #: D13052





TEST DESC: NECK BENDING  
VELOCITY: 18.12 ft/s, 5.52 m/s

TEST DATE: 01/10/2013  
TEST #: D13052

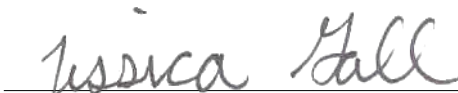


**MGA RESEARCH CORPORATION**  
**SHOULDER IMPACT TEST**  
**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 306

**Test ID:** D13053

| Tested Parameter                | Units | Specification | Result | Pass/Fail |
|---------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature          | deg C | 20.6 to 22.2  | 20.8   | Pass      |
| Laboratory Relative Humidity    | %     | 10 to 70      | 24     | Pass      |
| Impact Velocity                 | m/s   | 4.20 to 4.40  | 4.38   | Pass      |
| Maximum Probe Acceleration      | G's   | 13 to 18      | 15     | Pass      |
| Shoulder Displacement           | mm    | 28 to 37      | 29     | Pass      |
| Upper Spine (T1) Y Acceleration | G's   | 17 to 22      | 19     | Pass      |
| Overall Test Results            |       |               | Pass   |           |

  
Laboratory Technician

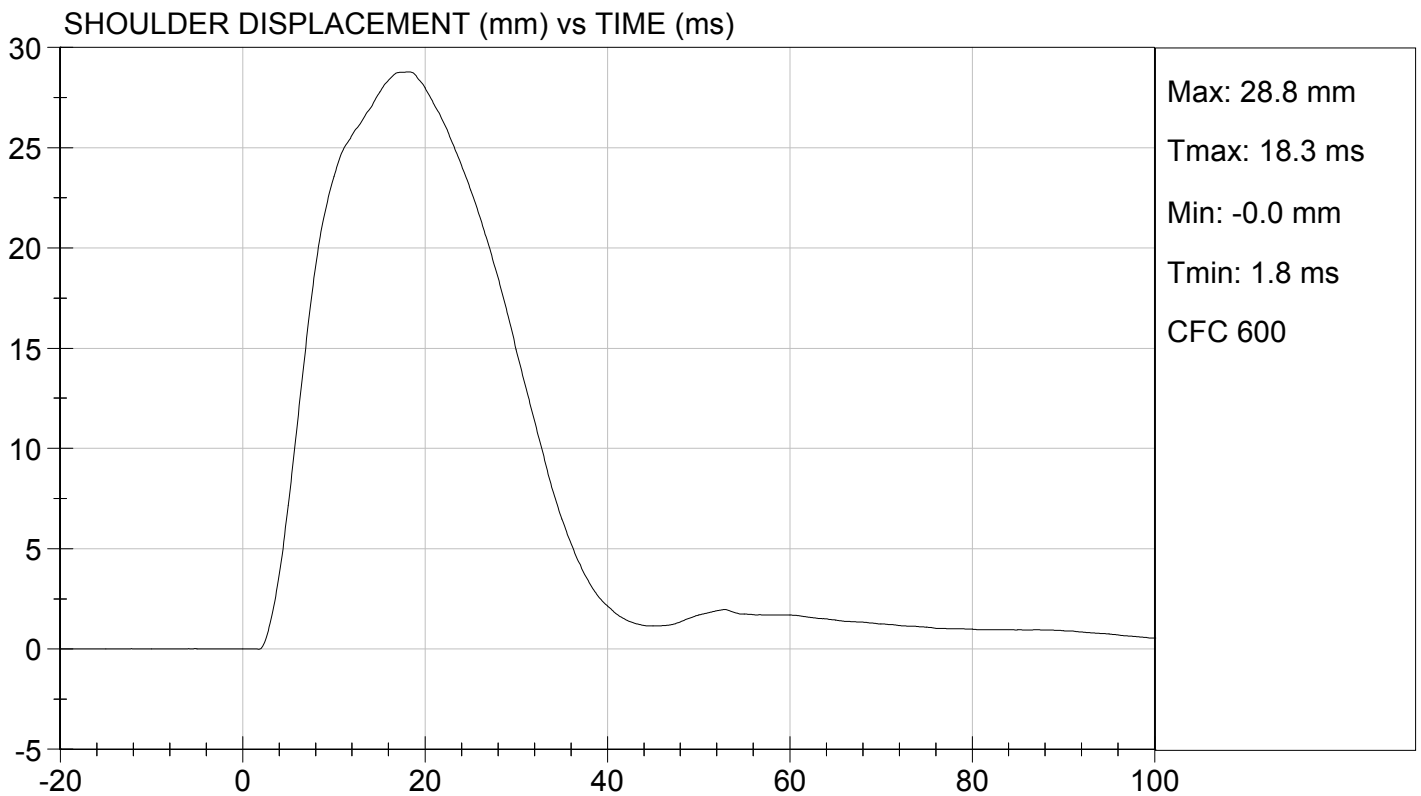
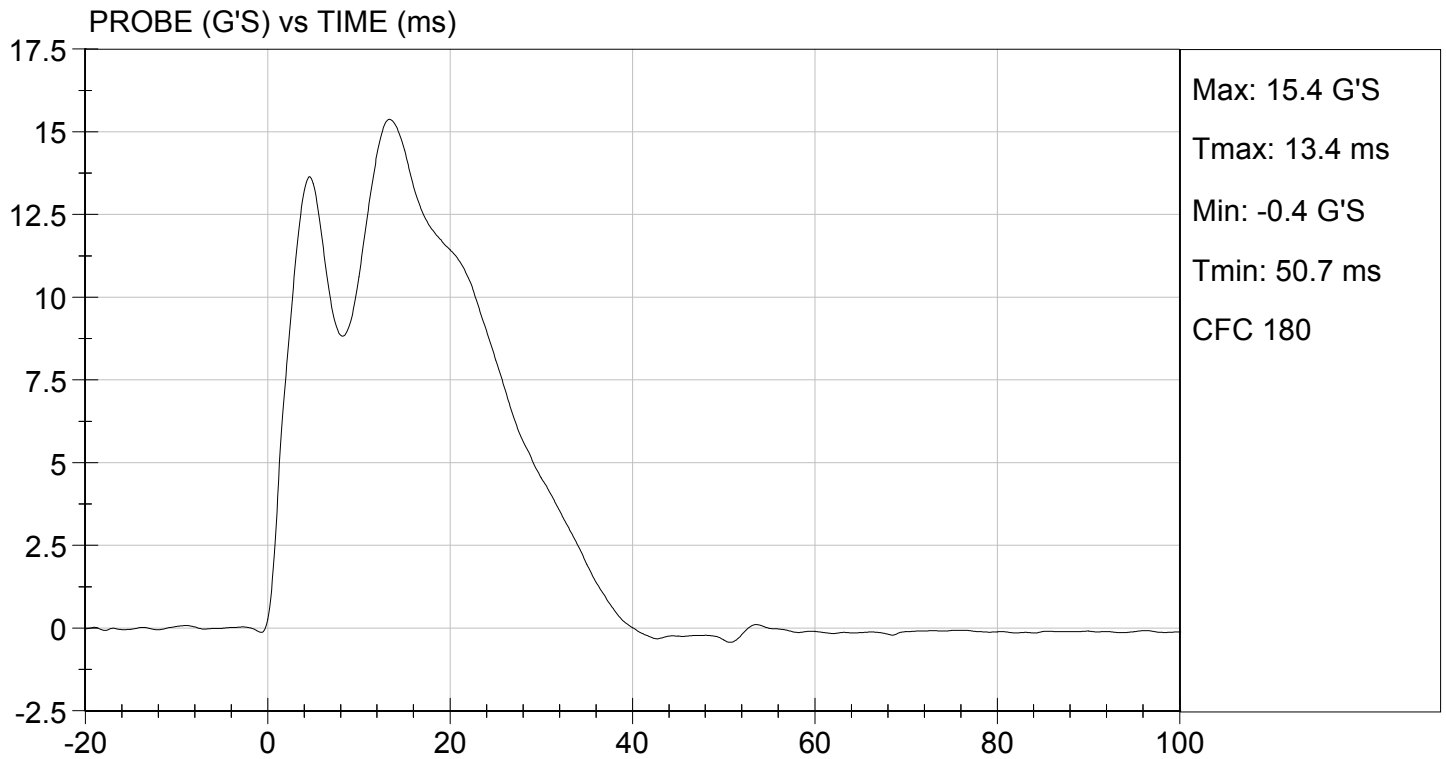
01/10/2013  
Test Date

  
Approved By



TEST DESC: SHOULDER IMPACT  
VELOCITY: 14.37 ft/s, 4.38 m/s

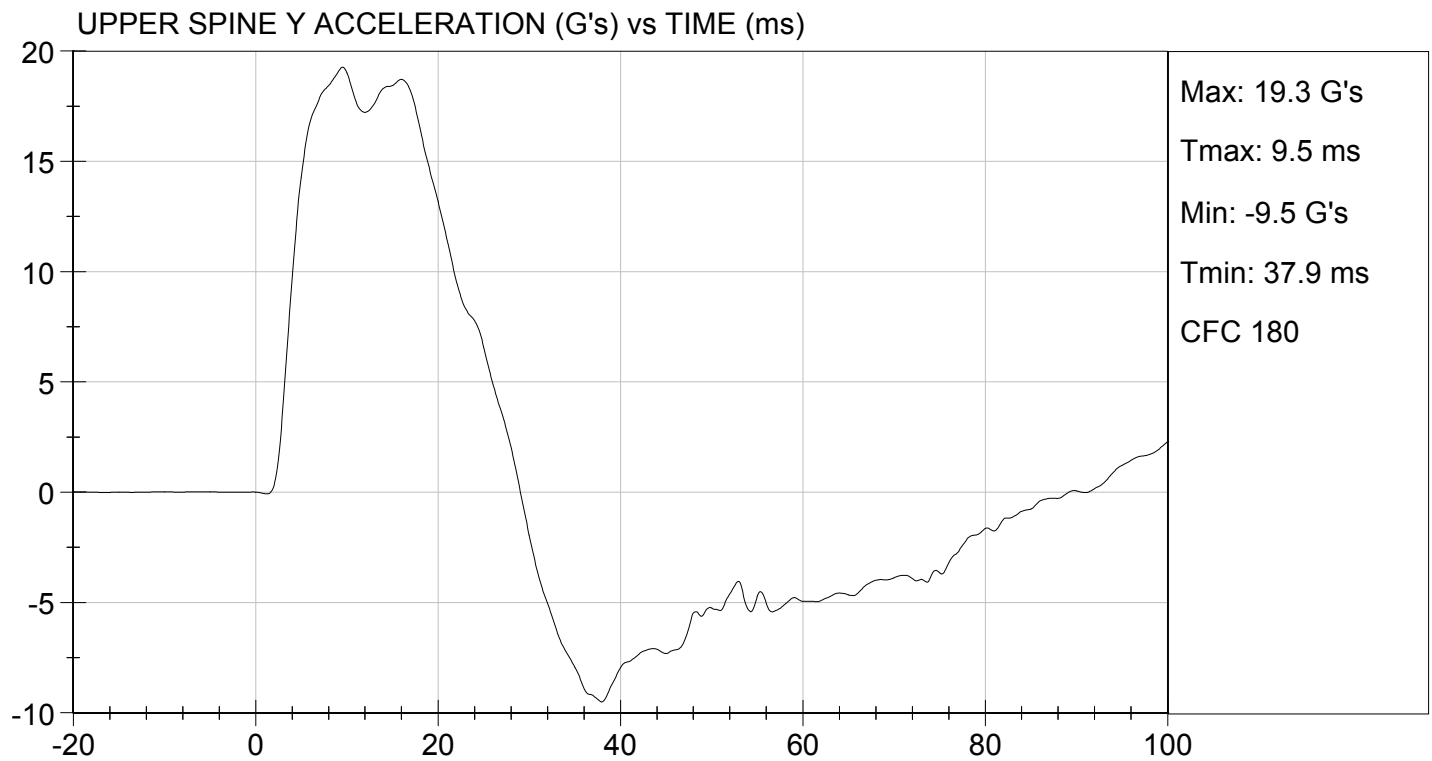
TEST DATE: 01/10/2013  
TEST #: D13053





TEST DESC: SHOULDER IMPACT  
VELOCITY: 14.37 ft/s, 4.38 m/s

TEST DATE: 01/10/2013  
TEST #: D13053

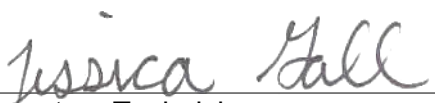


**MGA RESEARCH CORPORATION**  
**THORAX (WITH ARM) IMPACT TEST**  
**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 306

**Test I.D:** D13054

| Tested Parameter                 | Units | Specification | Result | Pass/Fail |
|----------------------------------|-------|---------------|--------|-----------|
| Temperature                      | deg C | 20.6 to 22.2  | 20.8   | Pass      |
| Humidity                         | %     | 10 to 70      | 24     | Pass      |
| Impact Velocity                  | m/s   | 6.60 to 6.80  | 6.77   | Pass      |
| Maximum Probe Acceleration       | G's   | 30 to 36      | 33     | Pass      |
| Shoulder Displacement            | mm    | 31 to 40      | 31     | Pass      |
| Upper Rib Displacement           | mm    | 25 to 32      | 26     | Pass      |
| Middle Rib Displacement          | mm    | 30 to 36      | 31     | Pass      |
| Lower Rib Displacement           | mm    | 32 to 38      | 34     | Pass      |
| Upper Spine (T1) Y Acceleration  | G's   | 34 to 43      | 38     | Pass      |
| Lower Spine (T12) Y Acceleration | G's   | 29 to 37      | 31     | Pass      |
| Overall Test Results             |       |               |        | Pass      |

  
Laboratory Technician

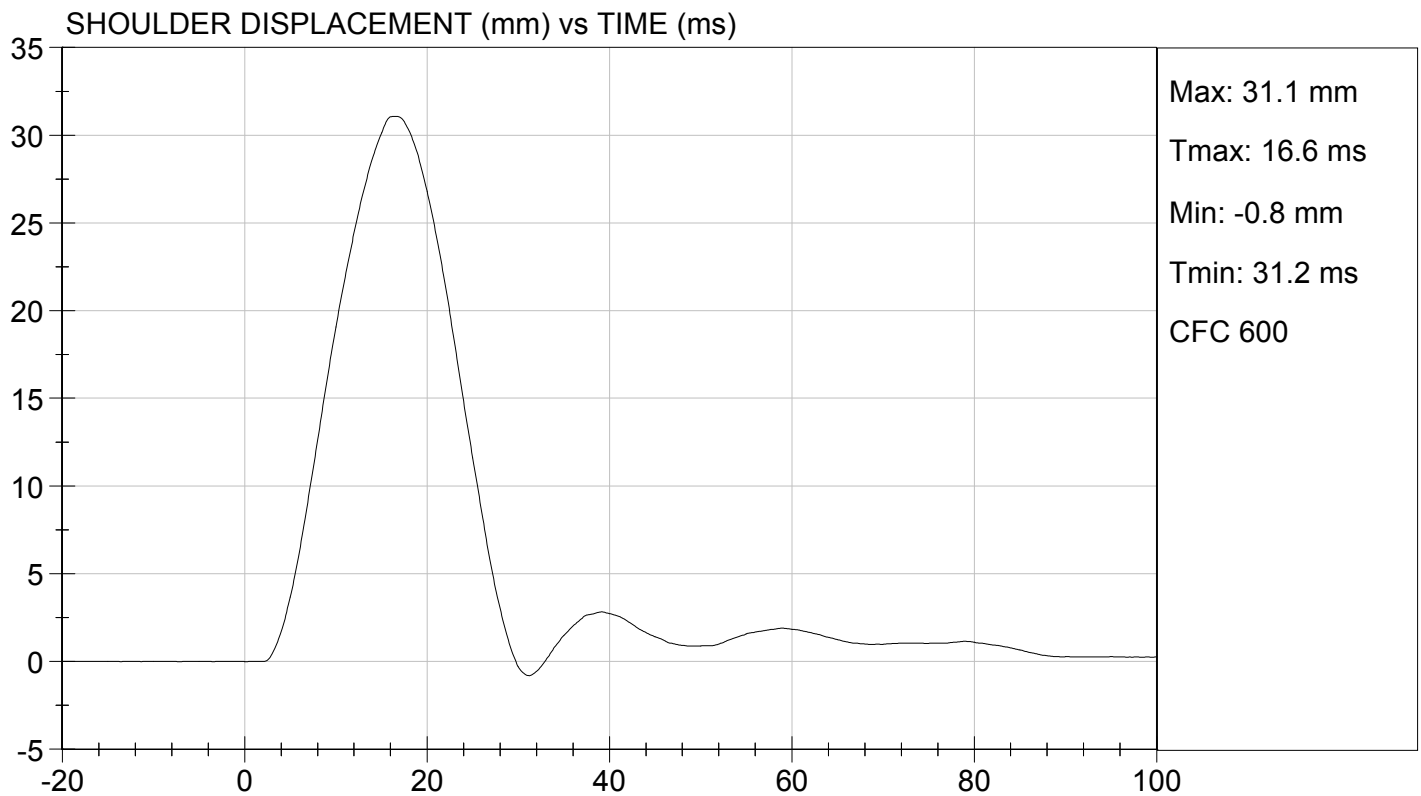
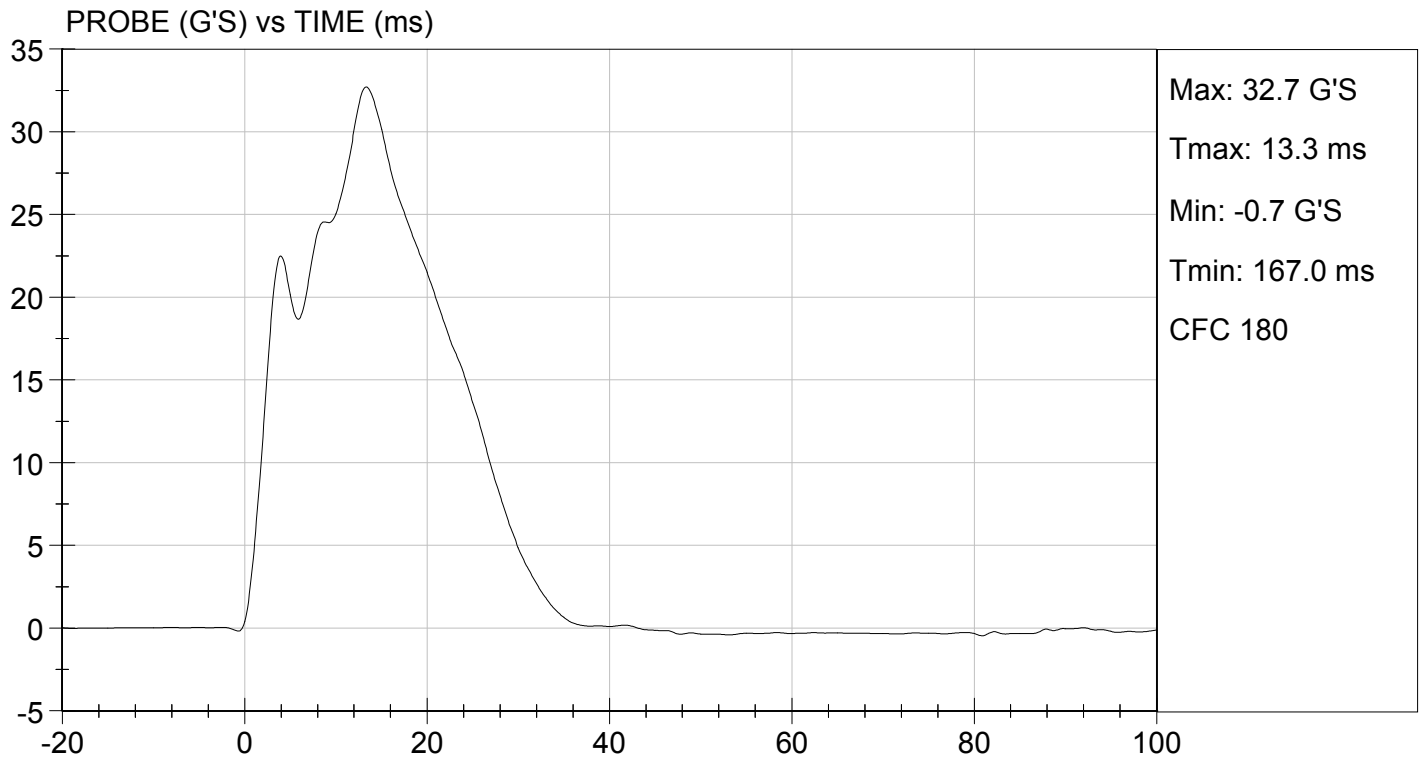
01/10/2013  
Test Date

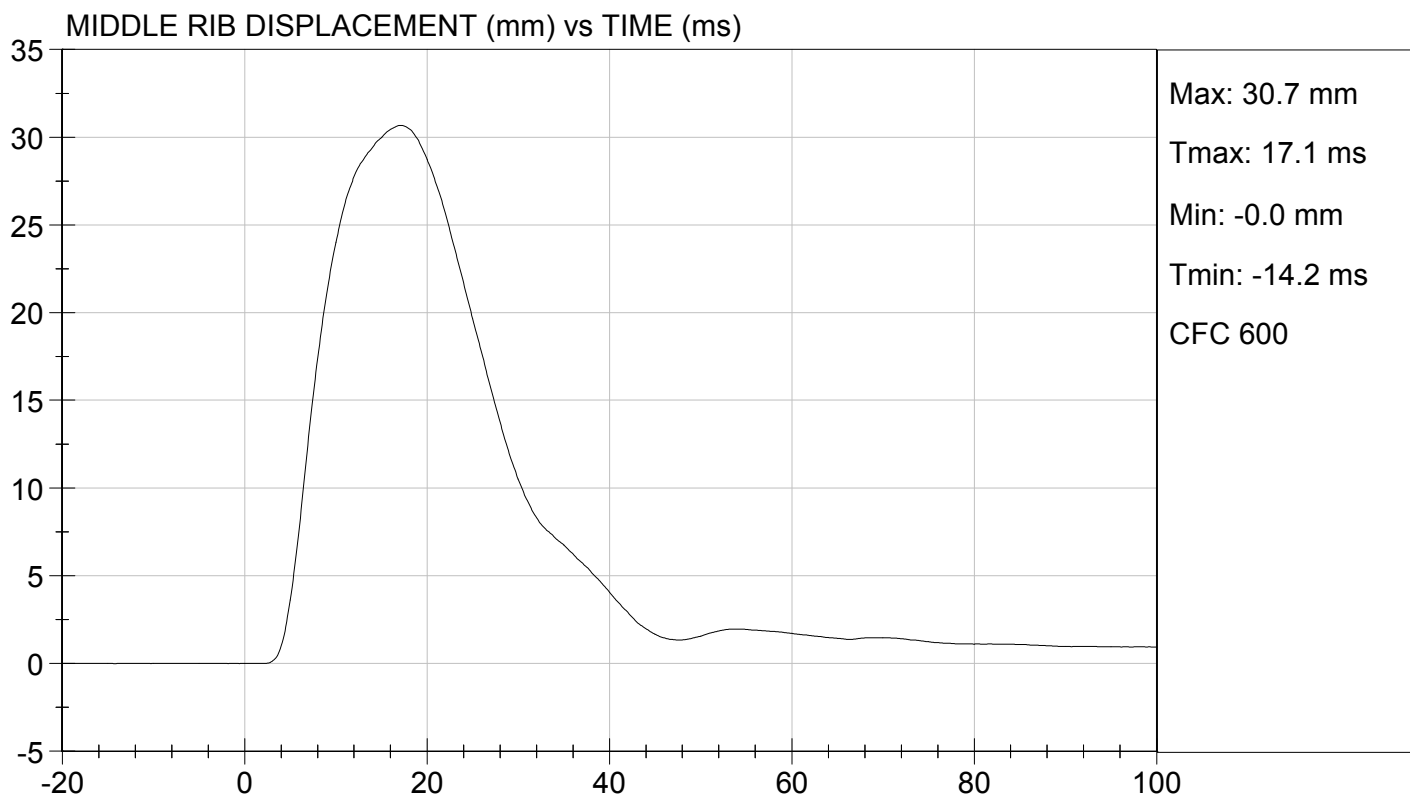
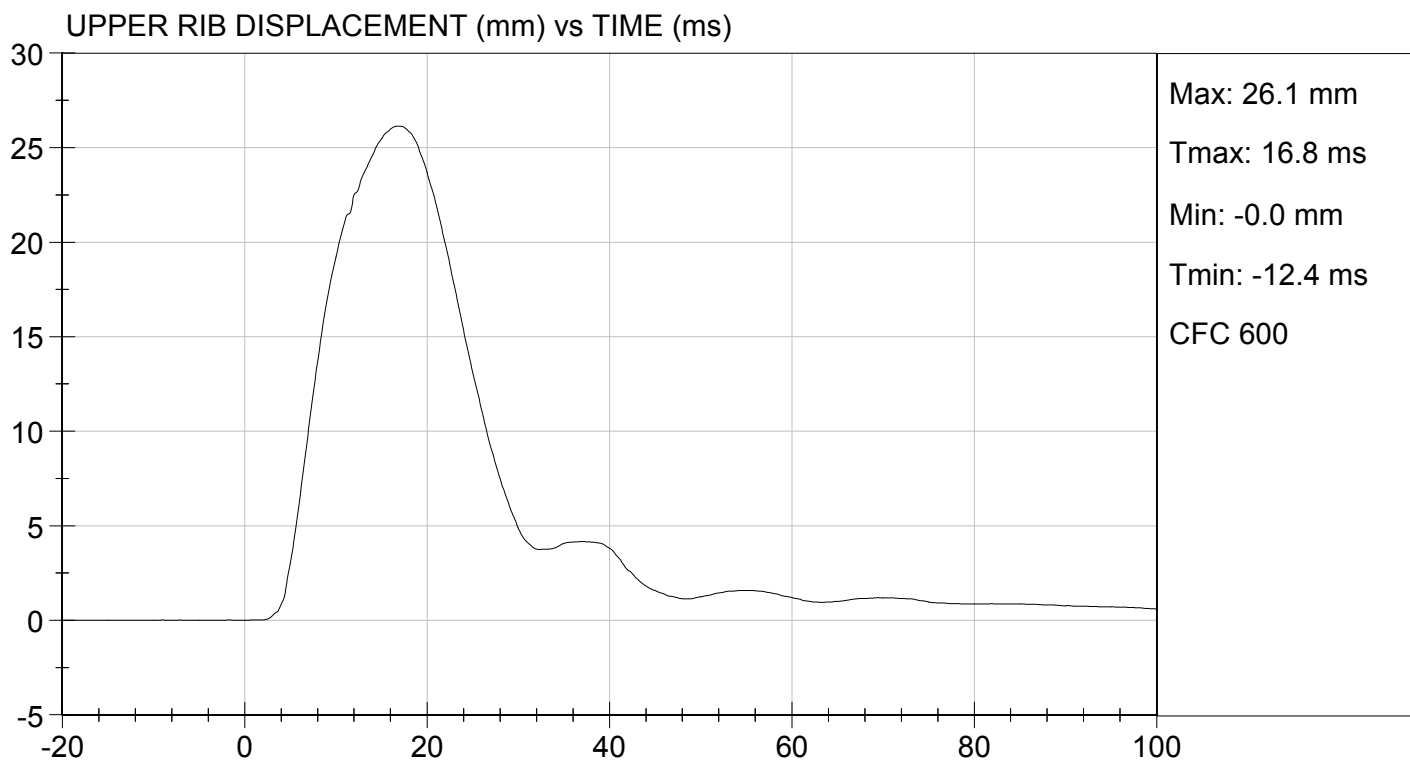
  
Approved By



TEST DESC: THORAX IMPACT WITH ARM  
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 01/10/2013  
TEST #: D13054



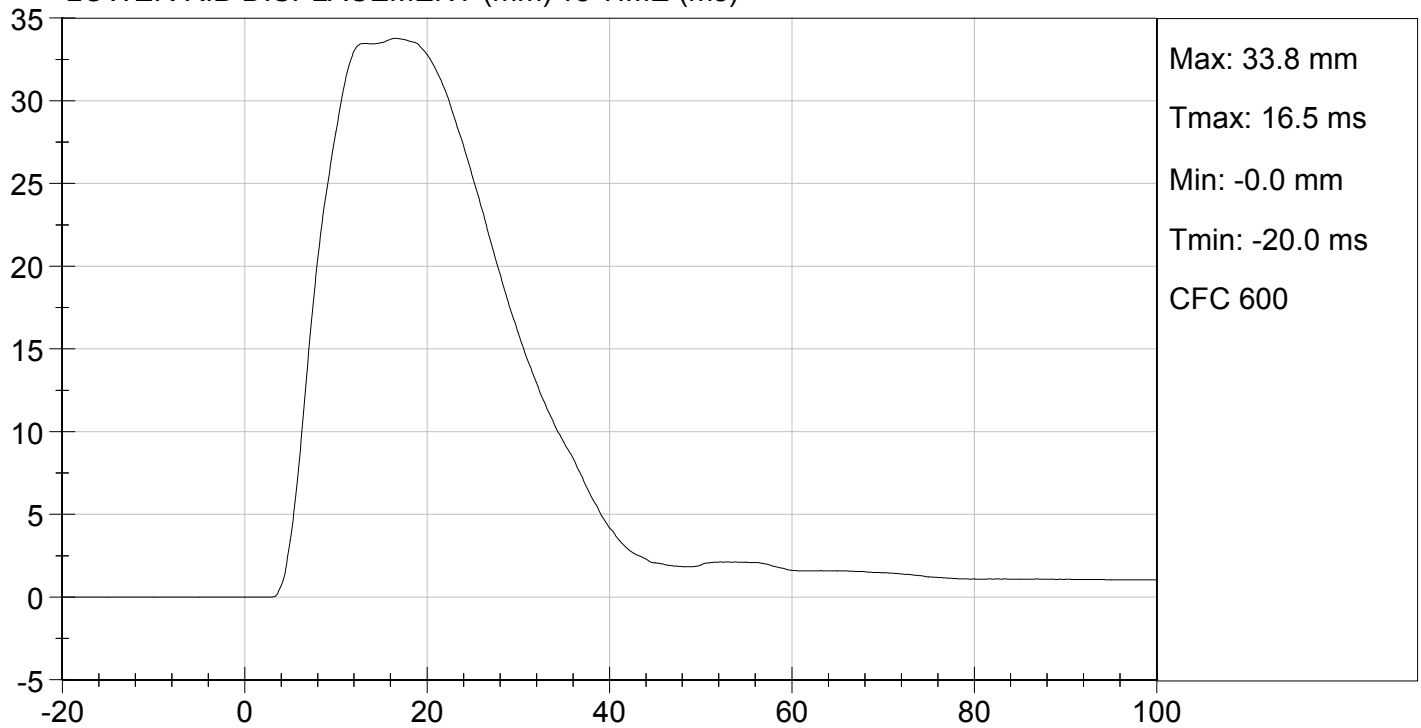




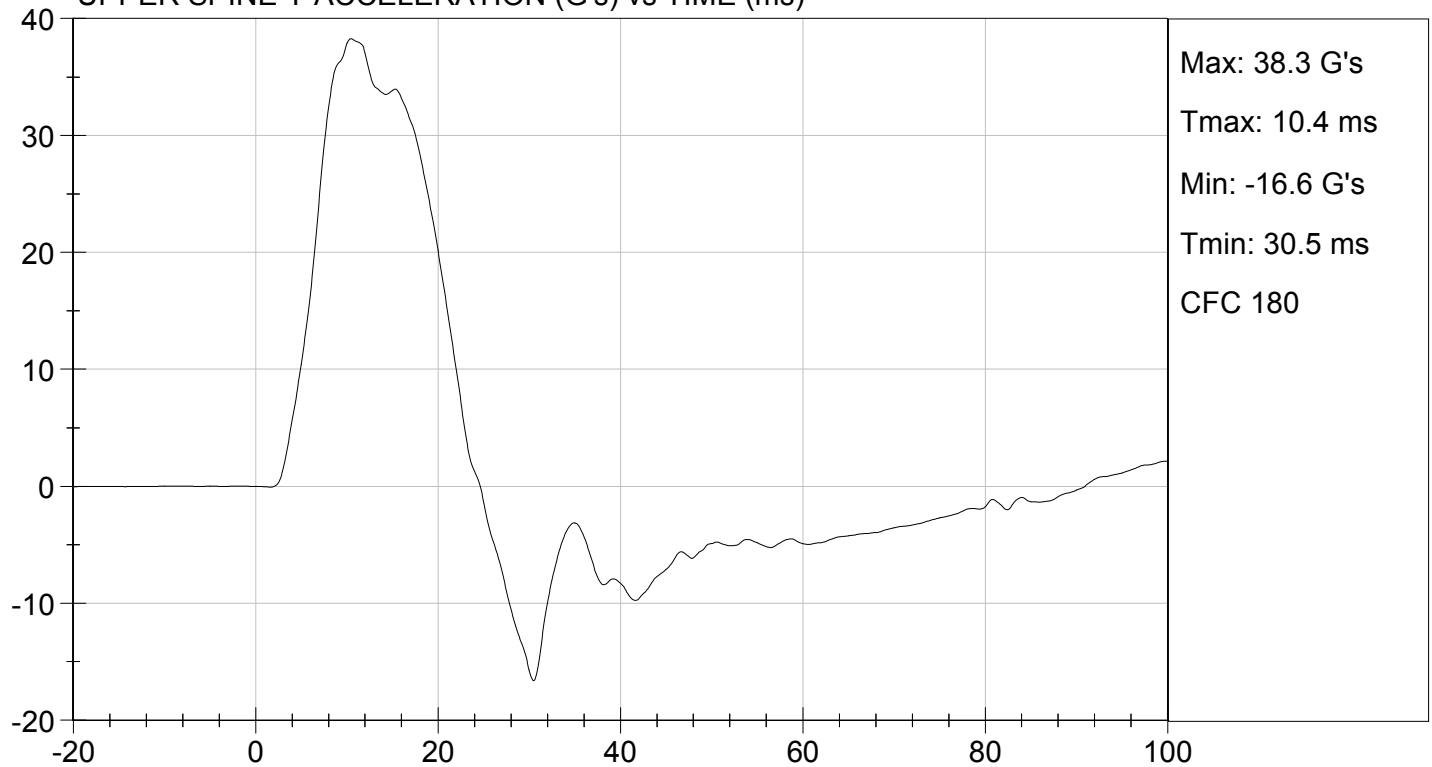
TEST DESC: THORAX IMPACT WITH ARM  
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 01/10/2013  
TEST #: D13054

LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



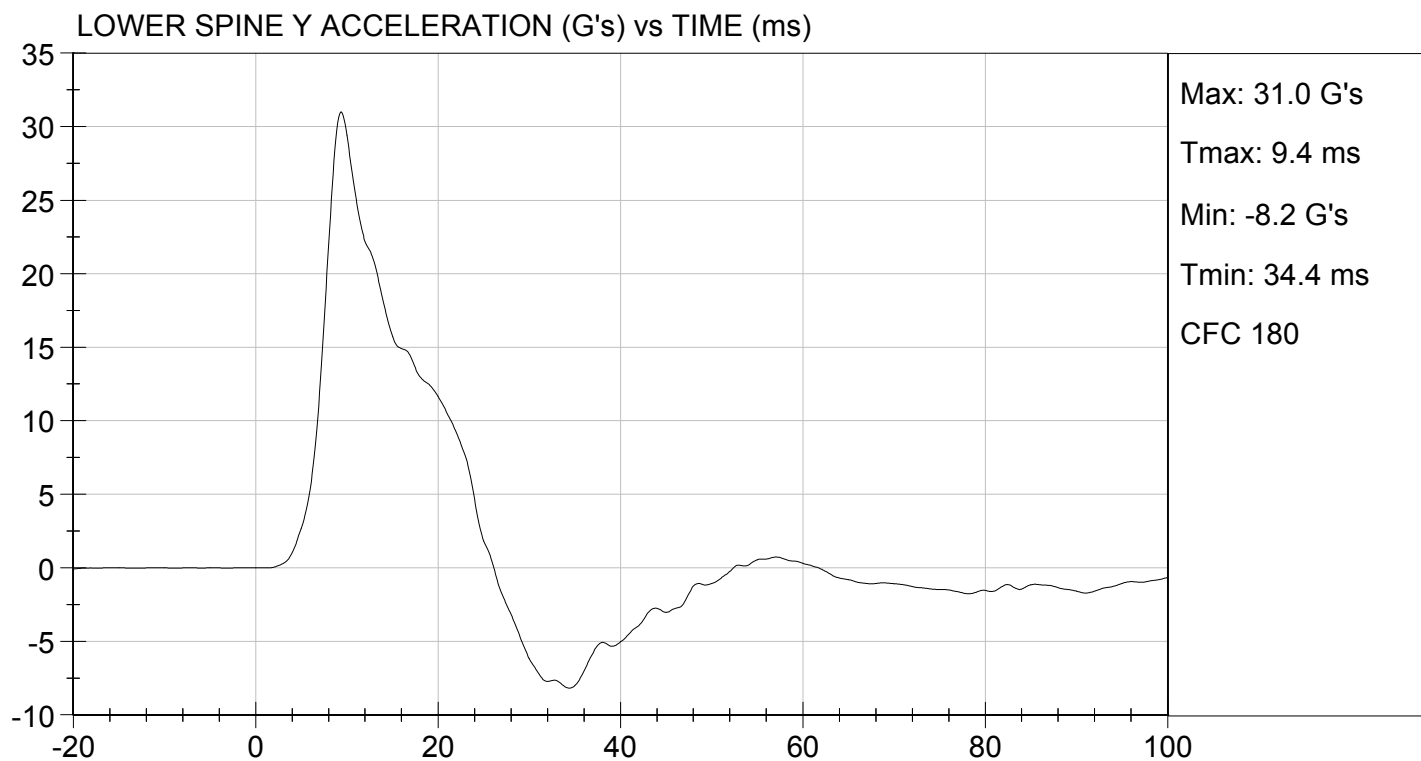
UPPER SPINE Y ACCELERATION (G's) vs TIME (ms)





TEST DESC: THORAX IMPACT WITH ARM  
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 01/10/2013  
TEST #: D13054

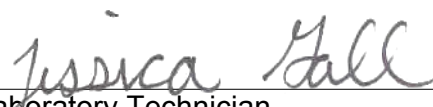


**MGA RESEARCH CORPORATION**  
**THORAX (WITHOUT ARM) IMPACT TEST**  
**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 306

**Test I.D:** D13055

| Tested Parameter                 | Units | Specification | Result | Pass/Fail |
|----------------------------------|-------|---------------|--------|-----------|
| Temperature                      | deg C | 20.6 to 22.2  | 20.8   | Pass      |
| Humidity                         | %     | 10 to 70      | 24     | Pass      |
| Impact Velocity                  | m/s   | 4.20 to 4.40  | 4.34   | Pass      |
| Maximum Probe Acceleration       | G's   | 14 to 18      | 15     | Pass      |
| Upper Rib Displacement           | mm    | 32 to 40      | 38     | Pass      |
| Middle Rib Displacement          | mm    | 39 to 45      | 41     | Pass      |
| Lower Rib Displacement           | mm    | 35 to 43      | 38     | Pass      |
| Upper Spine (T1) Y Acceleration  | G's   | 13 to 17      | 16     | Pass      |
| Lower Spine (T12) Y Acceleration | G's   | 7 to 11       | 8      | Pass      |
| Overall Test Results             |       |               |        | Pass      |

  
 Laboratory Technician

01/10/2013

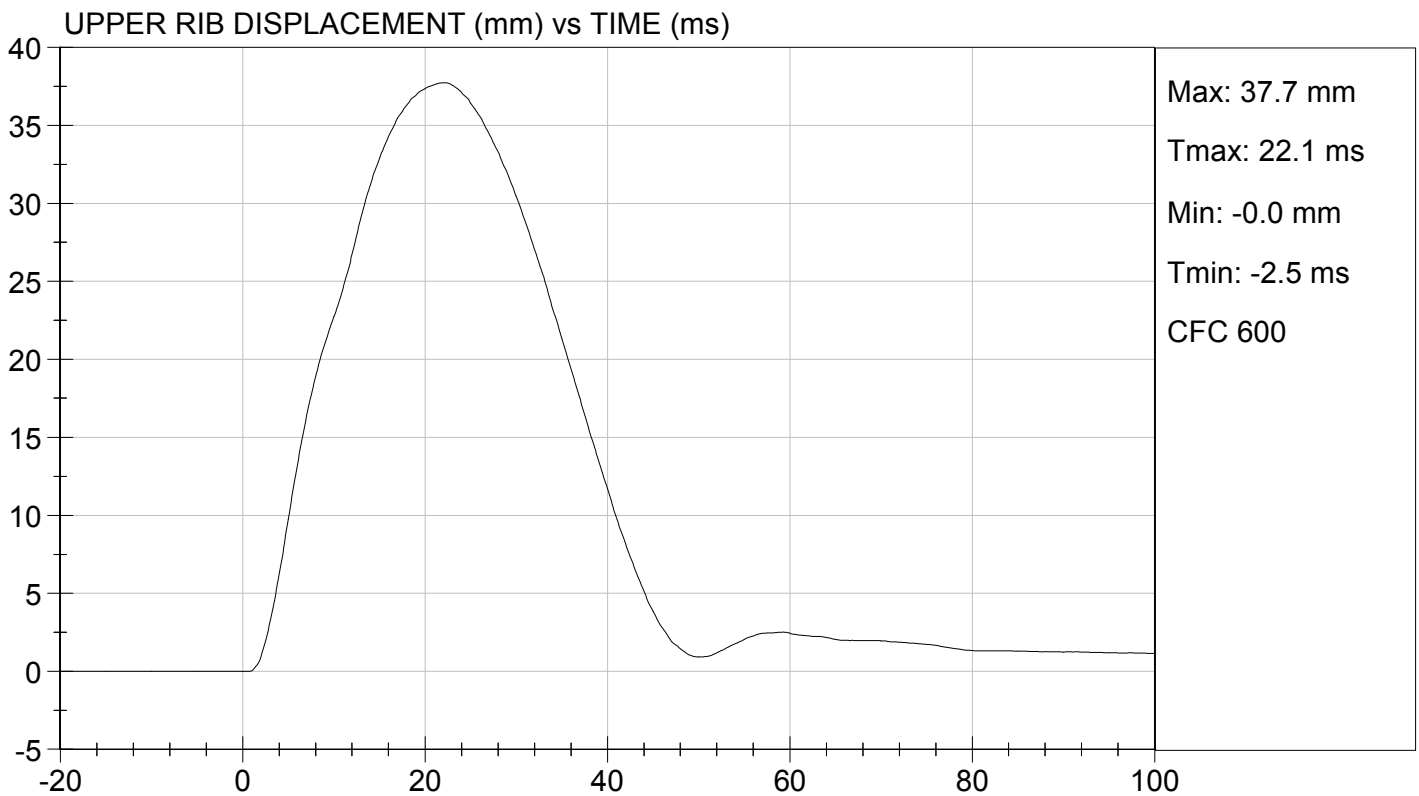
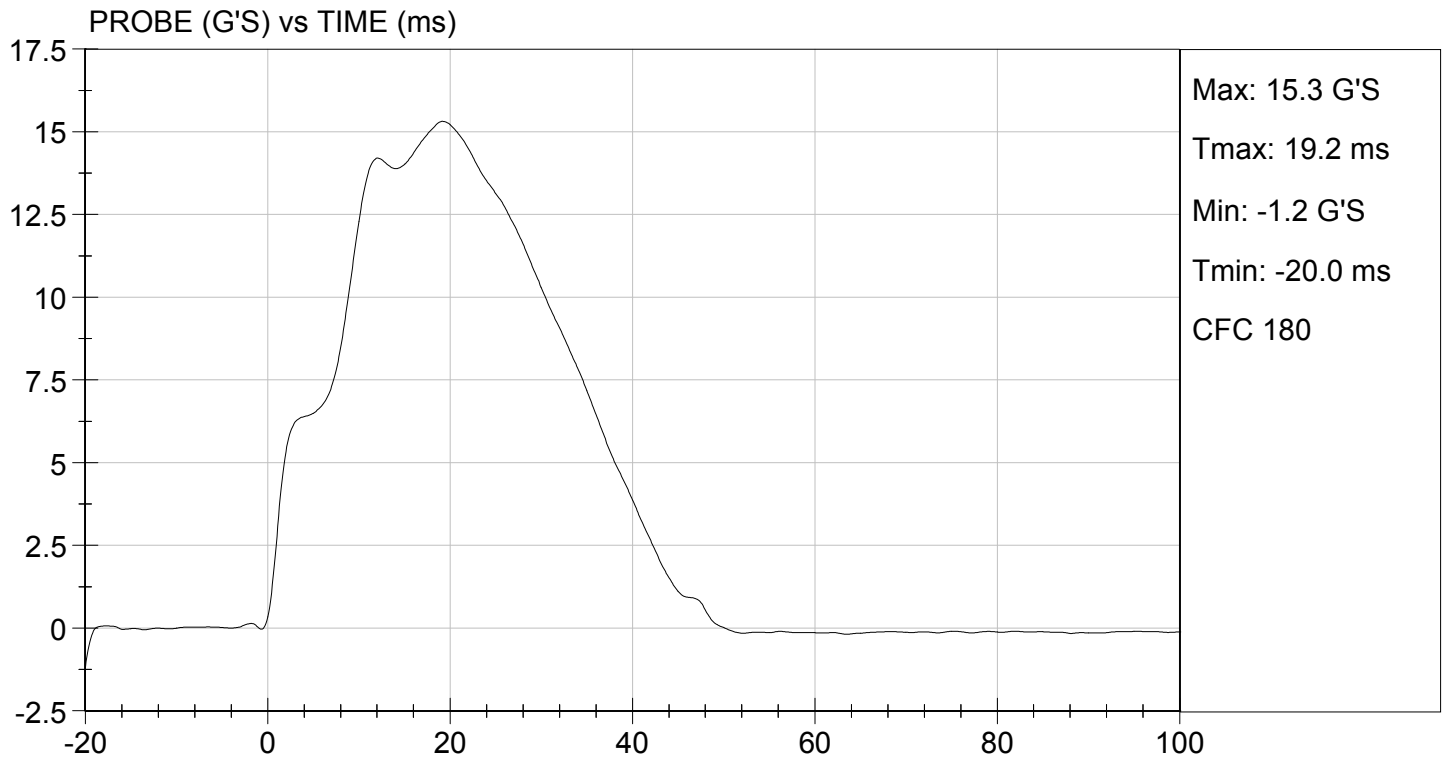
Test Date

  
 Approved By



TEST DESC: THORAX IMPACT WITHOUT ARM  
VELOCITY: 14.25 ft/s, 4.34 m/s

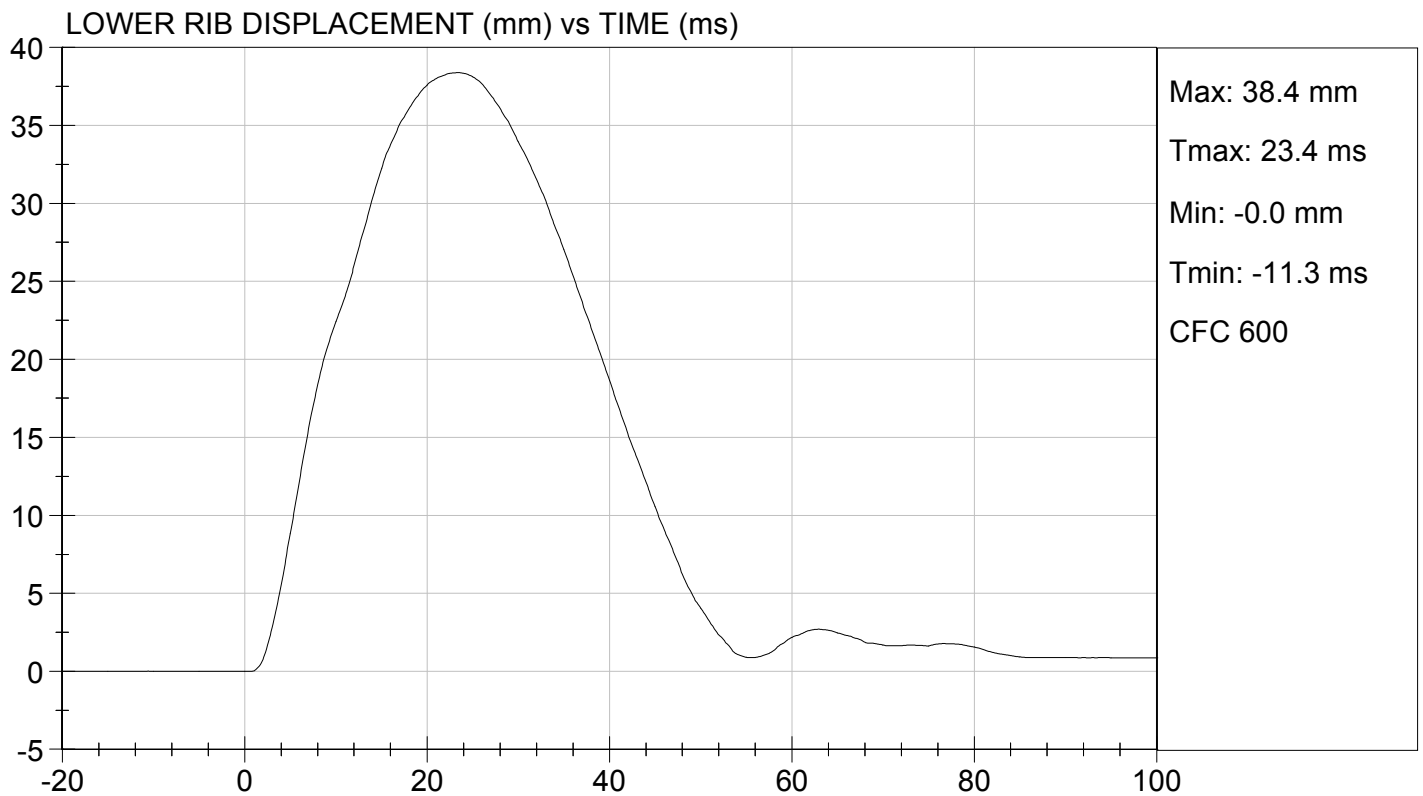
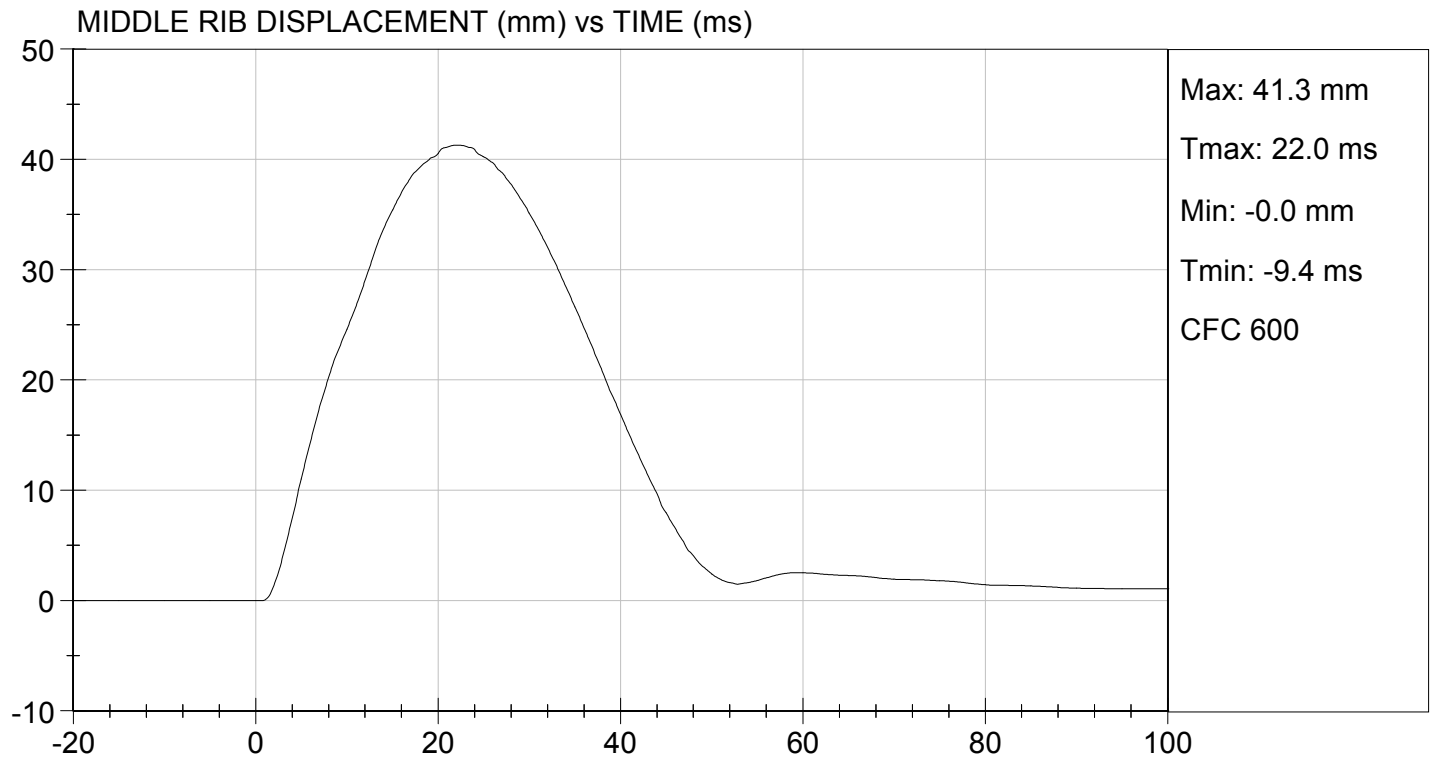
TEST DATE: 01/10/2013  
TEST #: D13055





TEST DESC: THORAX IMPACT WITHOUT ARM  
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 01/10/2013  
TEST #: D13055

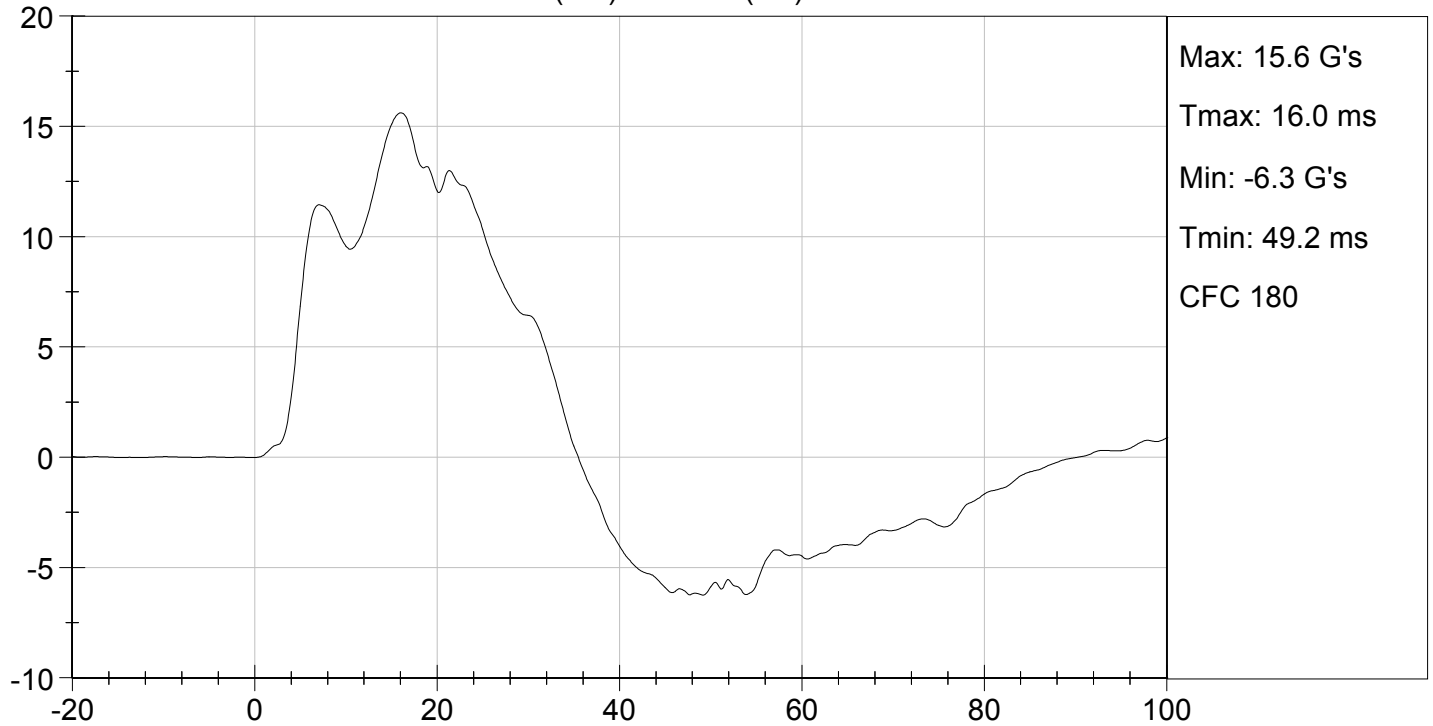




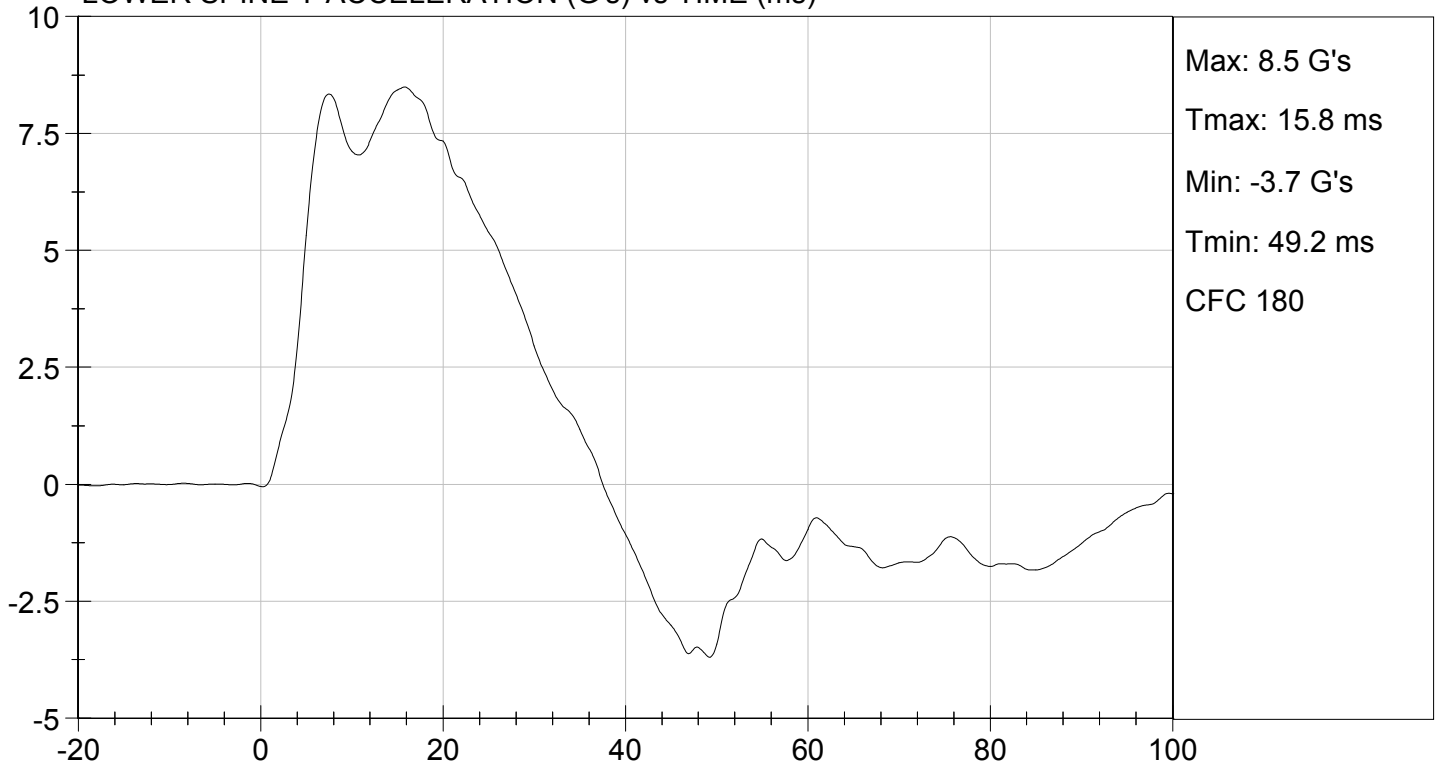
TEST DESC: THORAX IMPACT WITHOUT ARM  
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 01/10/2013  
TEST #: D13055

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



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



**MGA RESEARCH CORPORATION**

**ABDOMINAL IMPACT TEST**

**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 306

**Test I.D:** D13056

| Tested Parameter                 | Units | Specification | Result | Pass/Fail |
|----------------------------------|-------|---------------|--------|-----------|
| Temperature                      | deg C | 20.6 to 22.2  | 20.8   | Pass      |
| Humidity                         | %     | 10 to 70      | 24     | Pass      |
| Impact Velocity                  | m/s   | 4.20 to 4.40  | 4.38   | Pass      |
| Maximum Probe Acceleration       | G's   | 12 to 16      | 13     | Pass      |
| Upper Abdomen Rib Displacement   | mm    | 36 to 47      | 42     | Pass      |
| Lower Abdomen Rib Displacement   | mm    | 33 to 44      | 33     | Pass      |
| Lower Spine (T12) Y Acceleration | G's   | 9 to 14       | 11     | Pass      |
| Overall Test Results             |       |               |        | Pass      |

Jessica Hall  
Laboratory Technician

01/10/2013

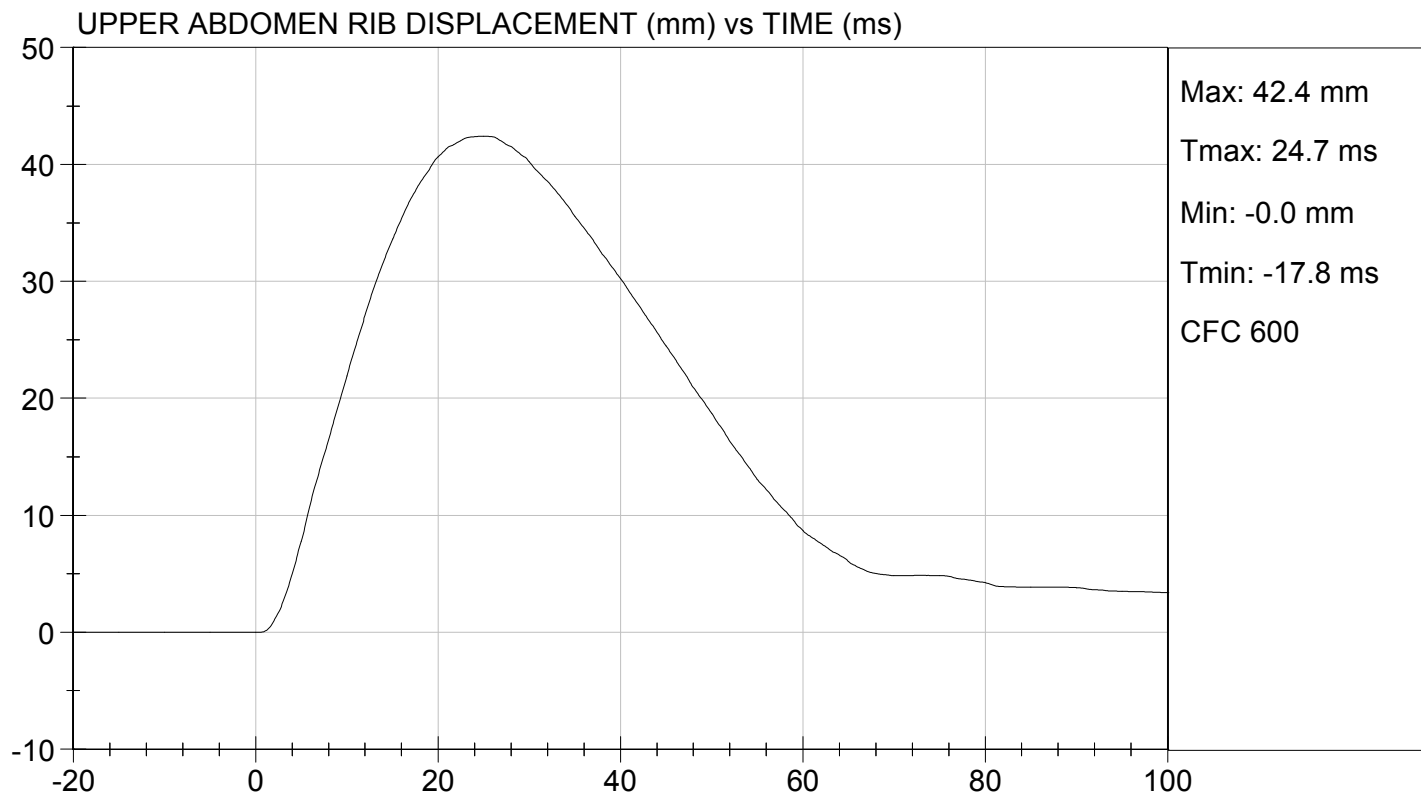
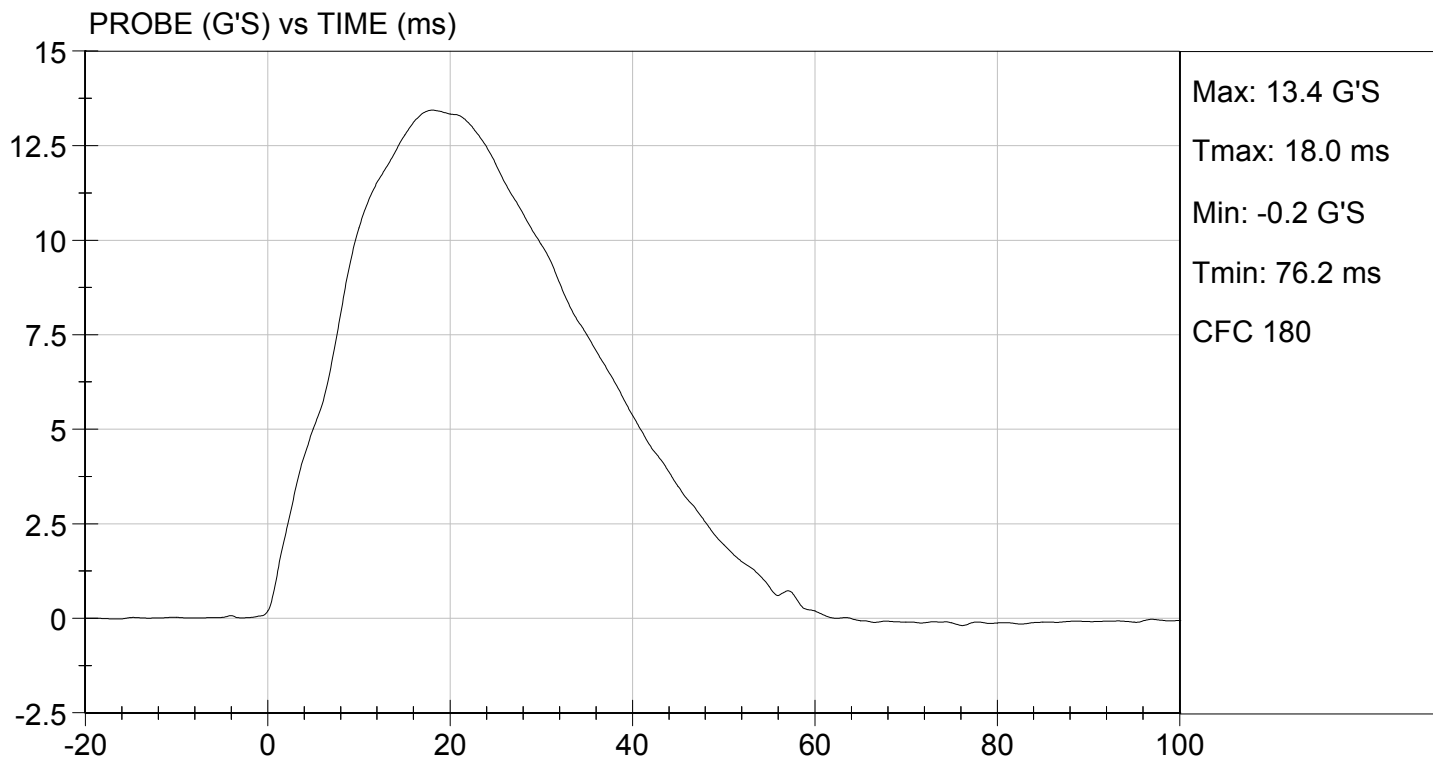
Test Date

David Winkelbauer  
Approved By



TEST DESC: ABDOMEN IMPACT  
VELOCITY: 14.37 ft/s, 4.38 m/s

TEST DATE: 01/10/2013  
TEST #: D13056

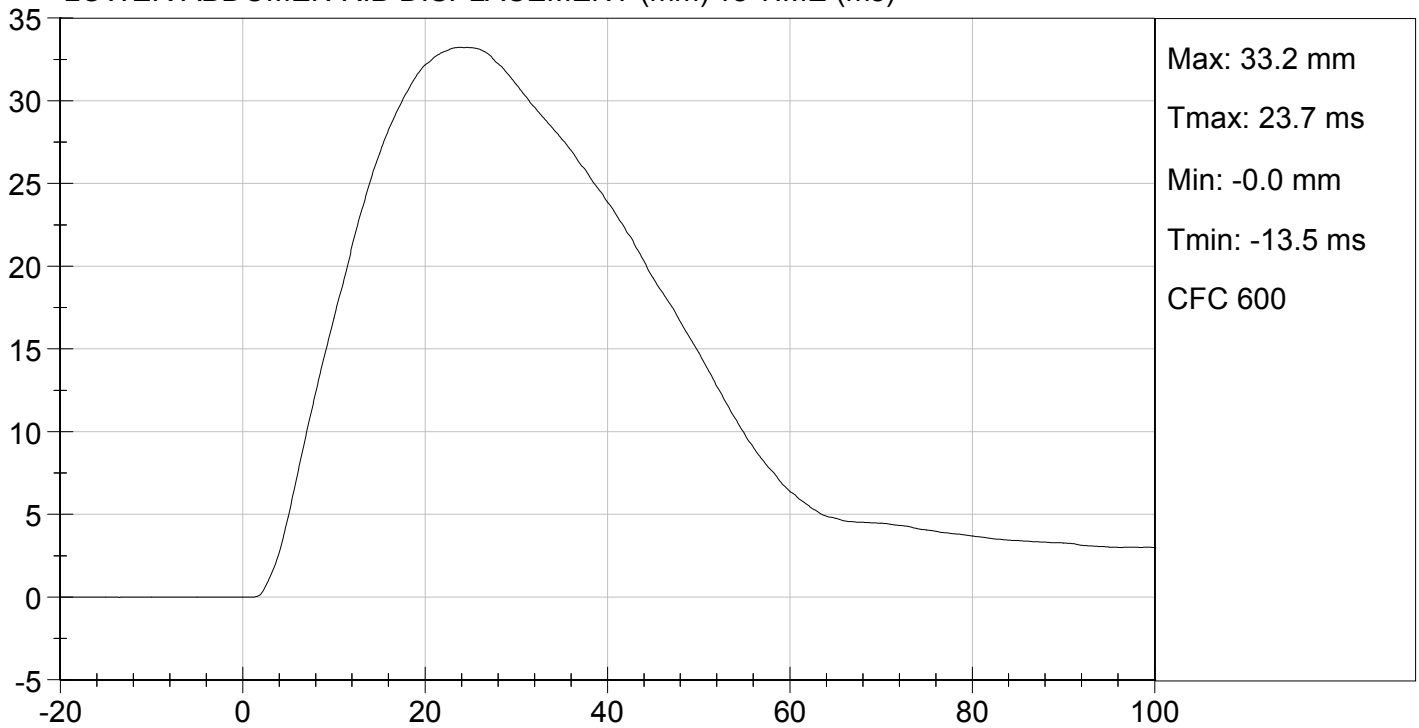




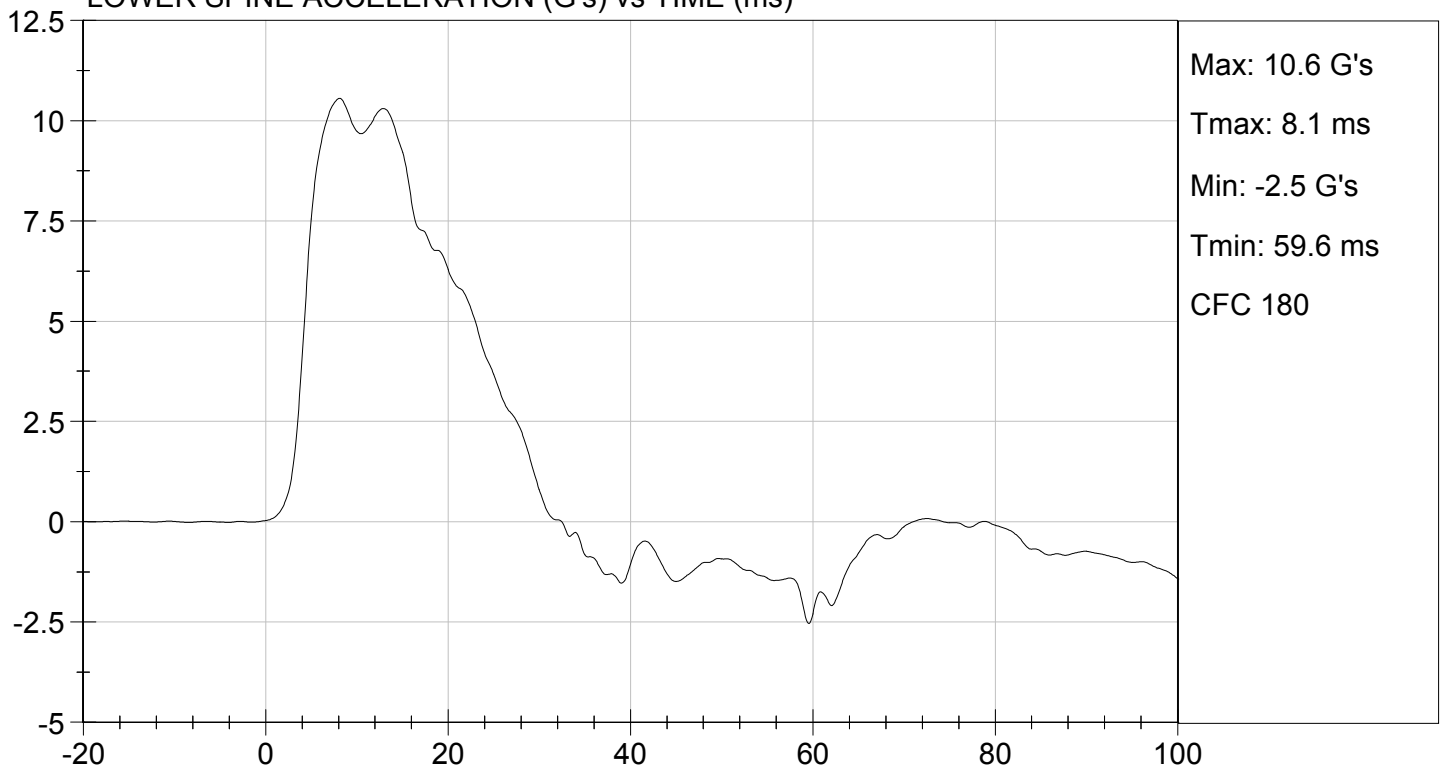
TEST DESC: ABDOMEN IMPACT  
VELOCITY: 14.37 ft/s, 4.38 m/s

TEST DATE: 01/10/2013  
TEST #: D13056

LOWER ABDOMEN RIB DISPLACEMENT (mm) vs TIME (ms)



LOWER SPINE ACCELERATION (G's) vs TIME (ms)



**MGA RESEARCH CORPORATION**

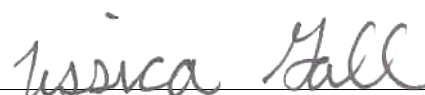
**PELVIS IMPACT TEST**

**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 306

**Test I.D:** D13057

| Tested Parameter                 | Units | Specification | Result | Pass/Fail |
|----------------------------------|-------|---------------|--------|-----------|
| Temperature                      | deg C | 20.6 to 22.2  | 20.8   | Pass      |
| Humidity                         | %     | 10 to 70      | 24     | Pass      |
| Impact Velocity                  | m/s   | 6.60 to 6.80  | 6.68   | Pass      |
| Maximum Probe Acceleration       | G's   | 38 to 47      | 44     | Pass      |
| Pelvis Y Acceleration After 6 ms | G's   | 34 to 42      | 37     | Pass      |
| Peak Acetabulum Force            | N     | 3600 to 4300  | 3,829  | Pass      |
| Overall Test Results             |       |               |        | Pass      |

  
Laboratory Technician

01/10/2013

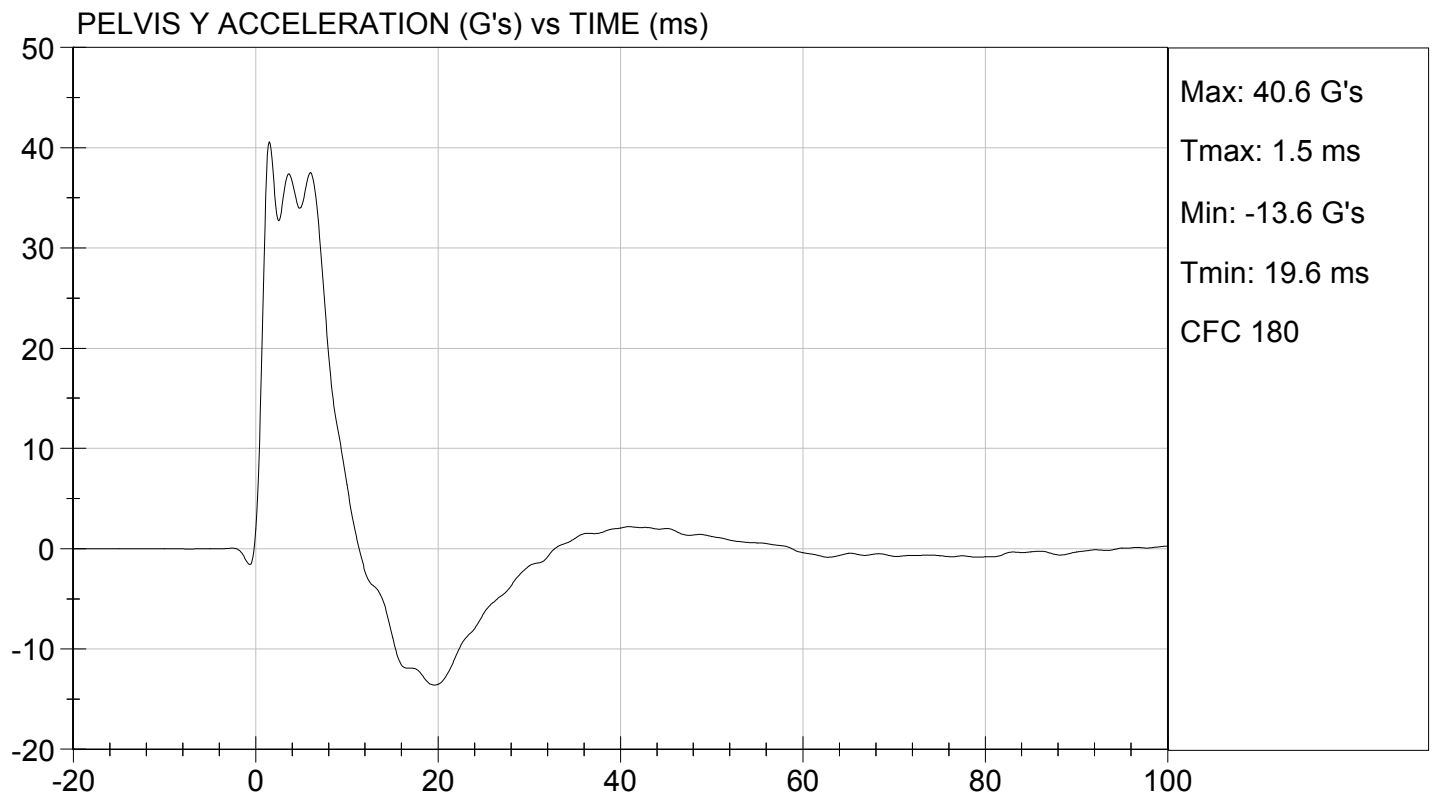
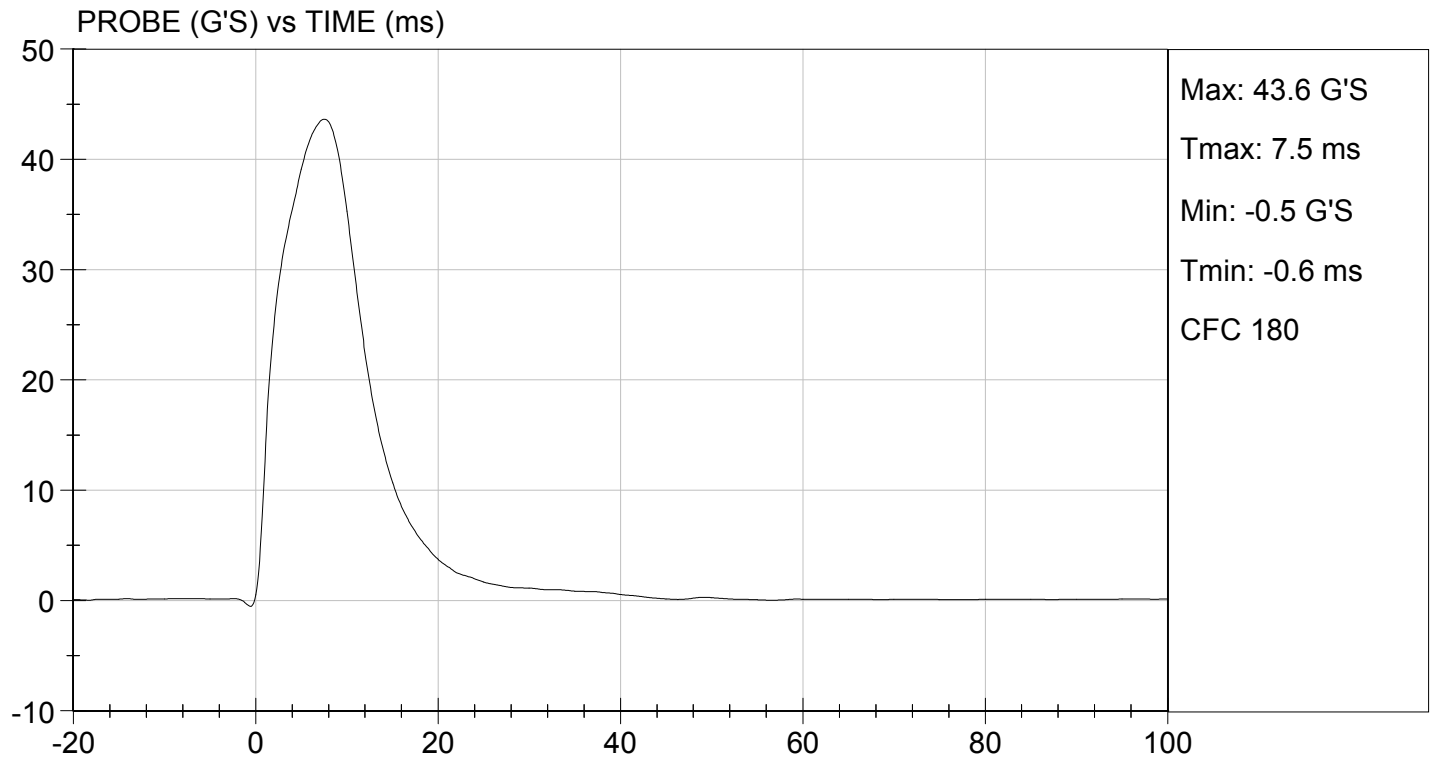
Test Date

  
Approved By



TEST DESC: PELVIS IMPACT  
VELOCITY: 21.93 ft/s, 6.68 m/s

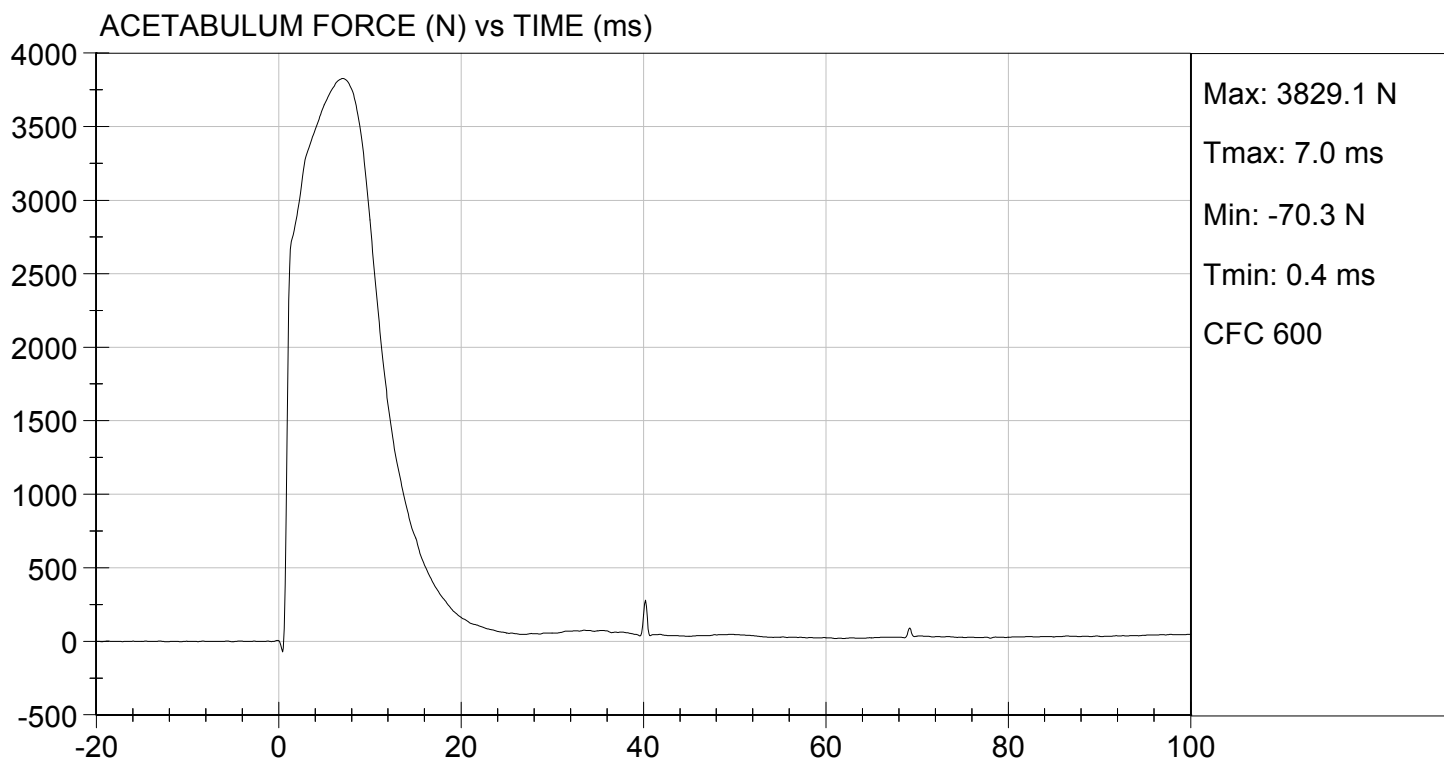
TEST DATE: 01/10/2013  
TEST #: D13057





TEST DESC: PELVIS IMPACT  
VELOCITY: 21.93 ft/s, 6.68 m/s

TEST DATE: 01/10/2013  
TEST #: D13057



**MGA RESEARCH CORPORATION**

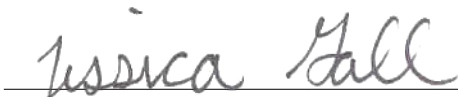
**ILIAC IMPACT TEST**

**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 306

**Test I.D:** D13058

| Tested Parameter           | Units | Specification | Result | Pass/Fail |
|----------------------------|-------|---------------|--------|-----------|
| Temperature                | deg C | 20.6 to 22.2  | 20.8   | Pass      |
| Humidity                   | %     | 10 to 70      | 24     | Pass      |
| Impact Velocity            | m/s   | 4.20 to 4.40  | 4.34   | Pass      |
| Maximum Probe Acceleration | G's   | 36 to 45      | 38     | Pass      |
| Pelvis Y Acceleration      | G's   | 28 to 39      | 31     | Pass      |
| Peak Pelvis Iliac Force    | N     | 4100 to 5100  | 4,568  | Pass      |
| Overall Test Results       |       |               |        | Pass      |

  
Laboratory Technician

01/10/2013

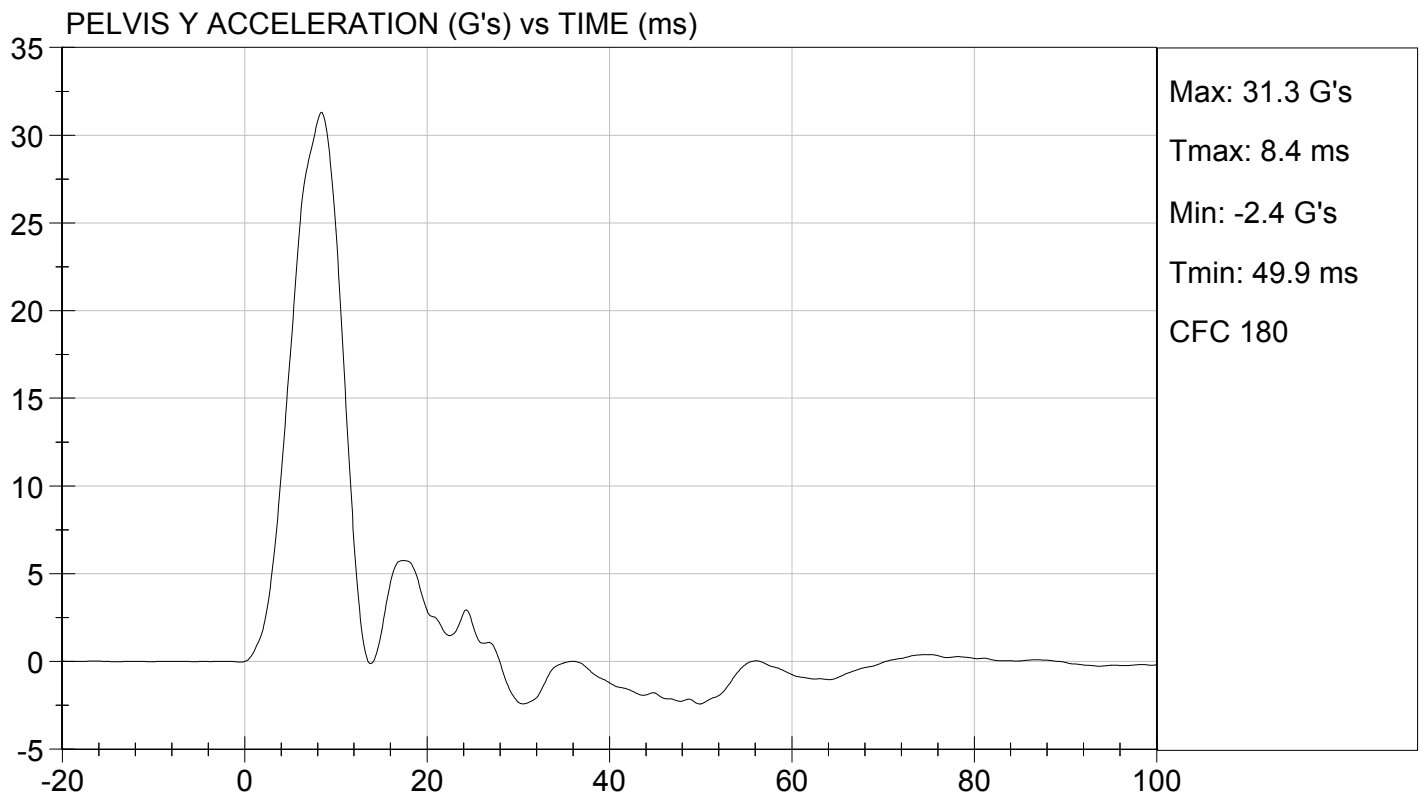
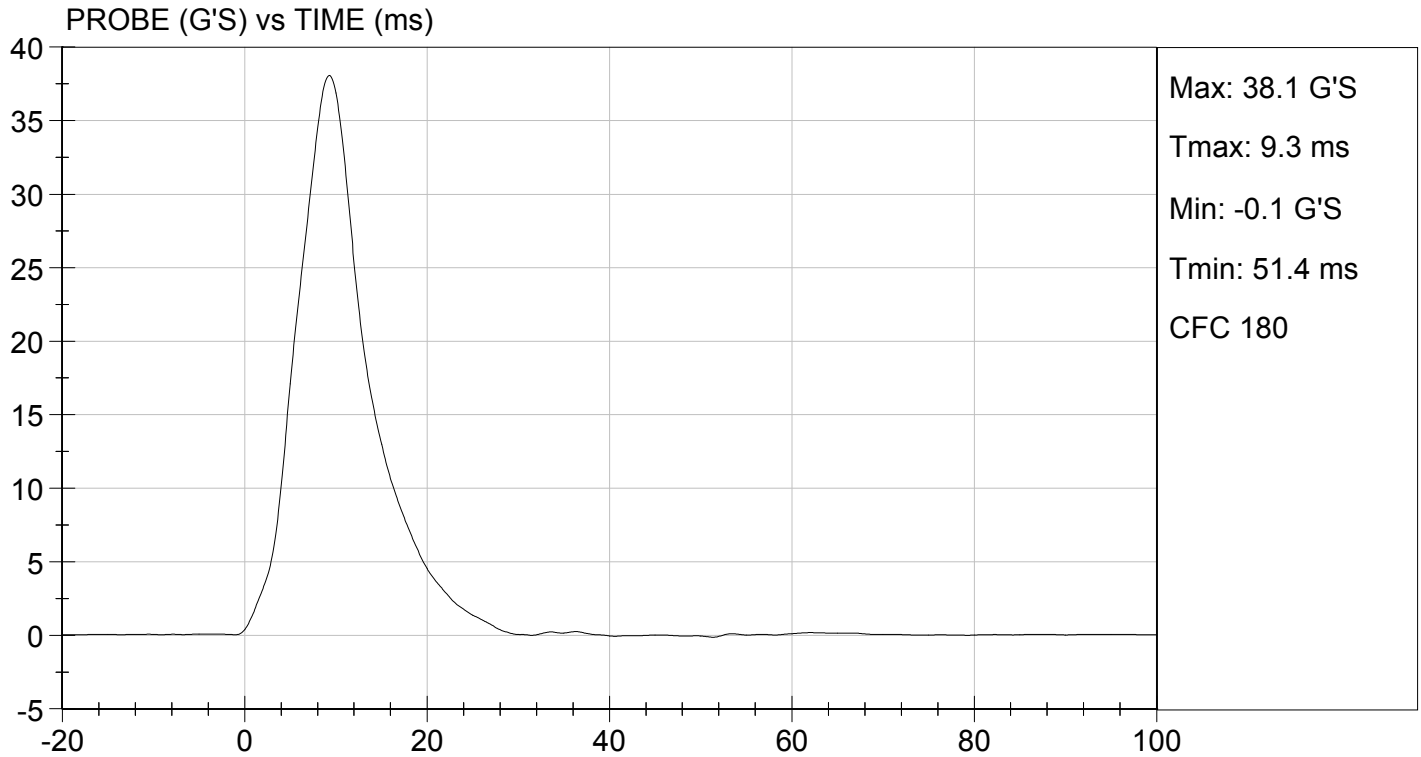
Test Date

  
Approved By



TEST DESC: ILLIAC  
VELOCITY: 14.25 ft/s, 4.34 m/s

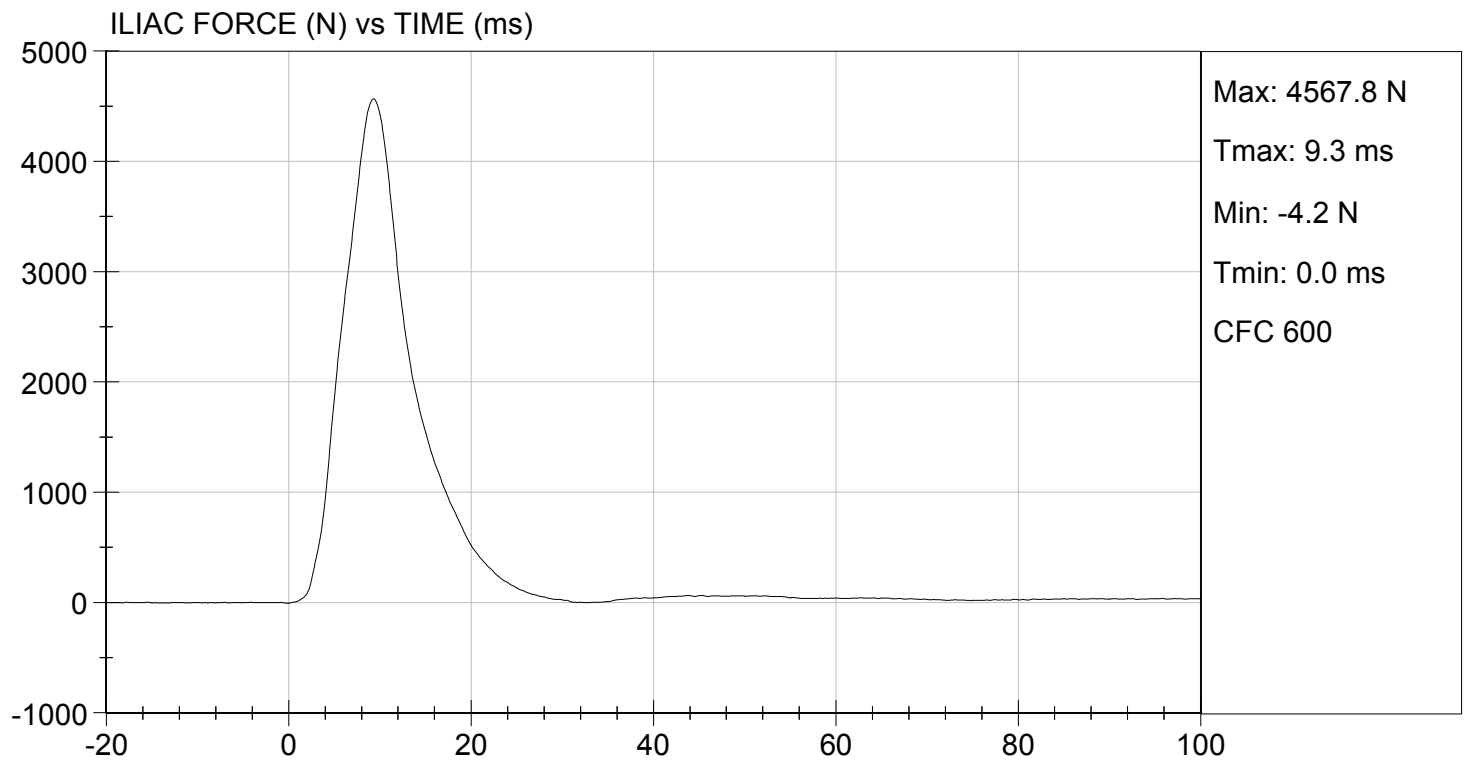
TEST DATE: 01/10/2013  
TEST #: D13058





TEST DESC: ILLIAC  
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 01/10/2013  
TEST #: D13058

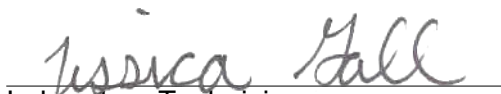


**MGA RESEARCH CORPORATION**  
**HEAD DROP TEST**  
**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 306

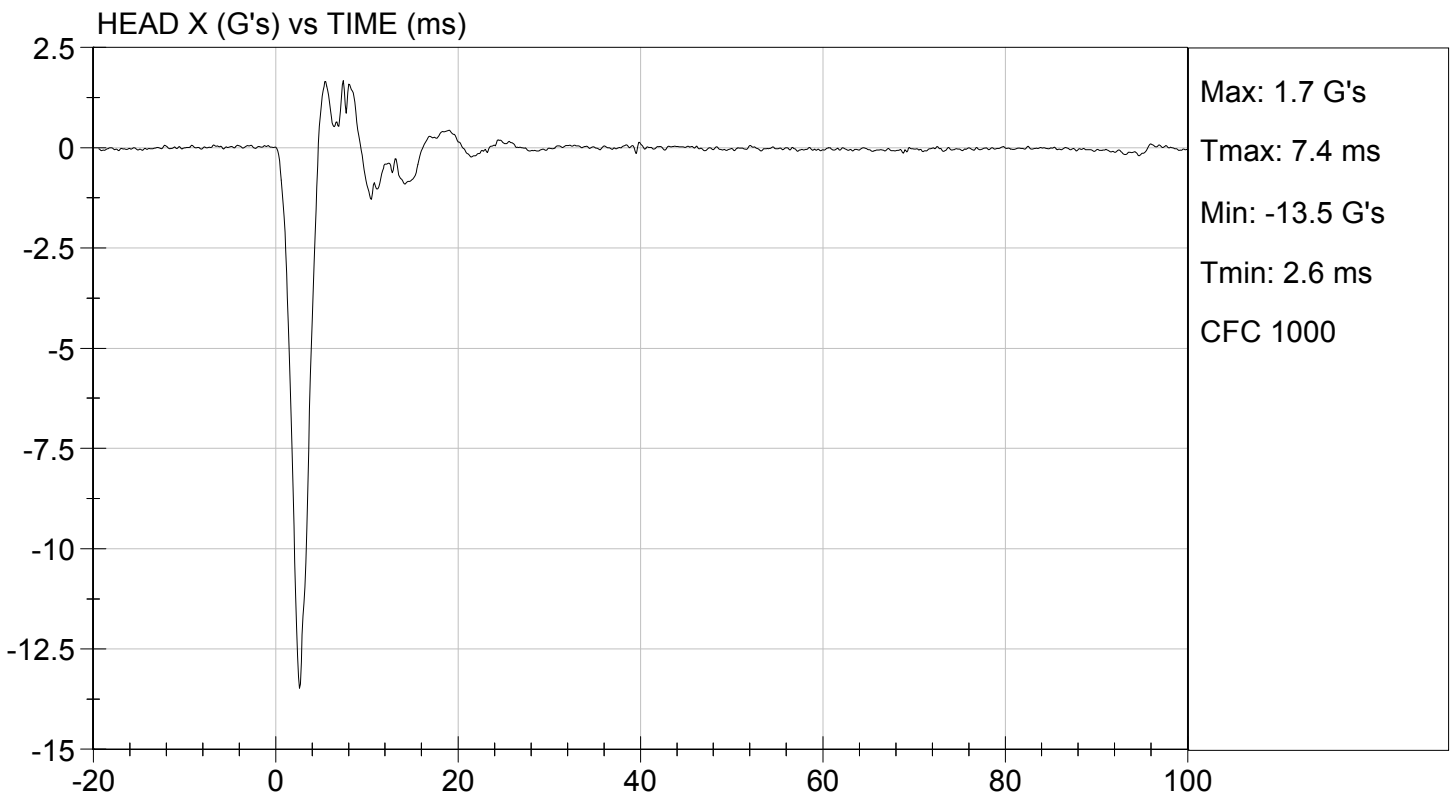
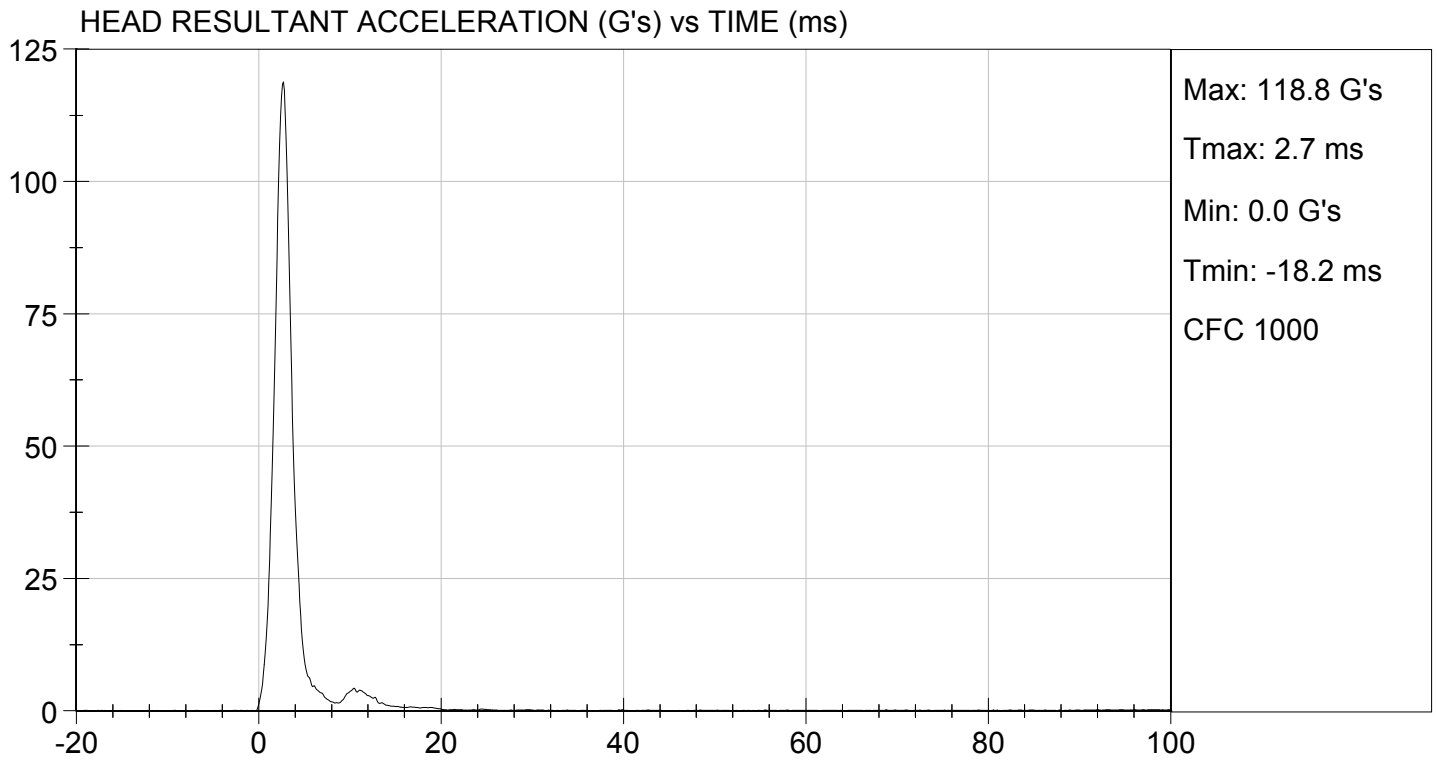
**Test ID:** D13501

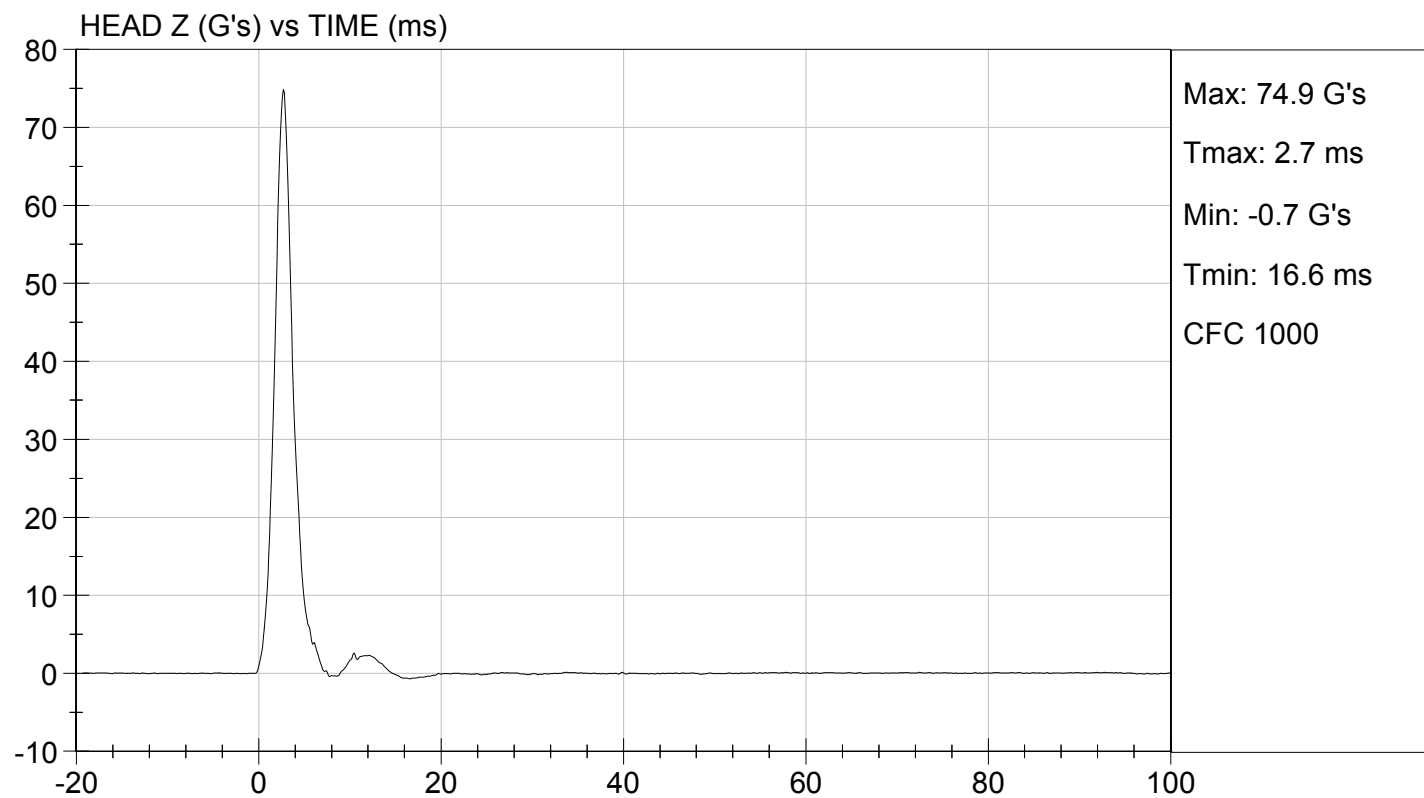
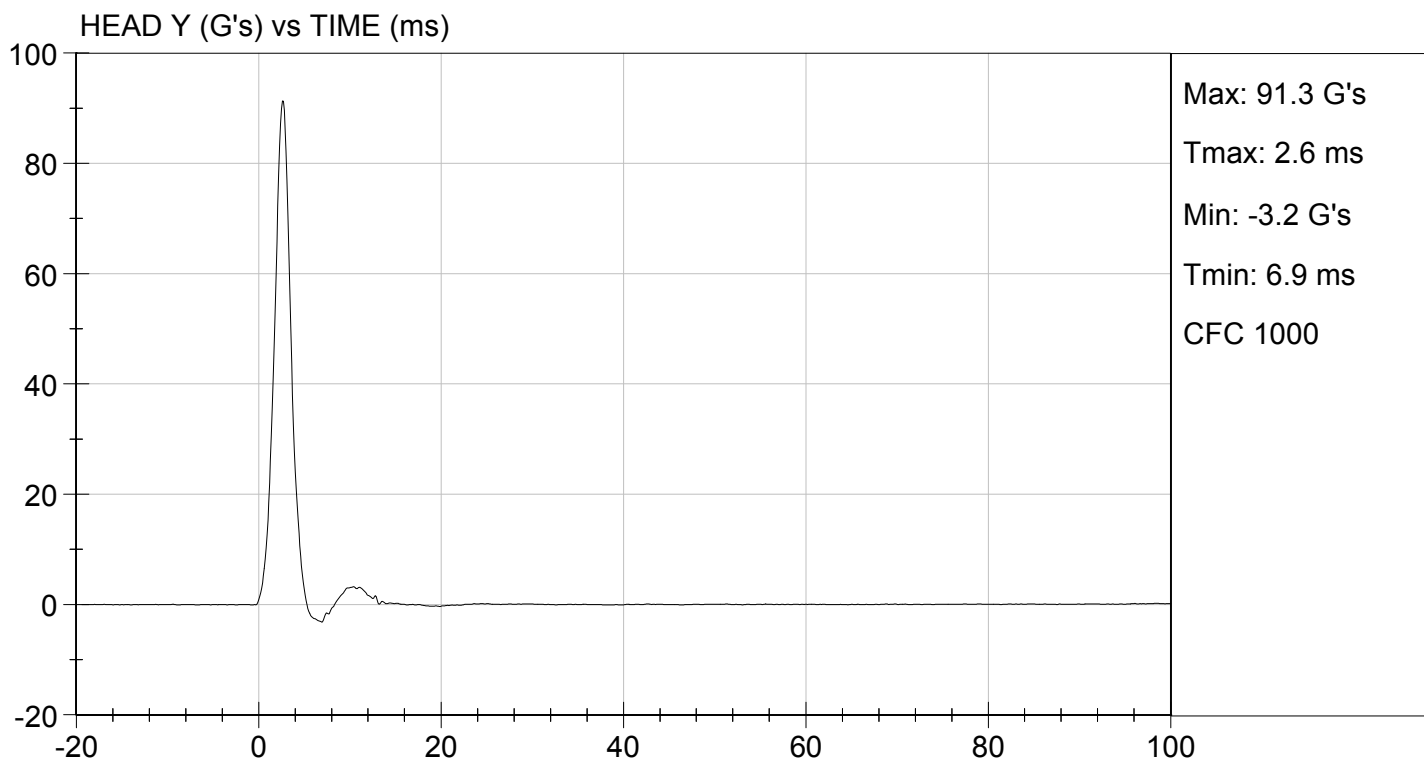
| Tested Parameter               | Units | Specification | Result               | Pass/Fail |
|--------------------------------|-------|---------------|----------------------|-----------|
| Laboratory Temperature         | deg C | 20.6 to 22.2  | 20.9                 | Pass      |
| Laboratory Relative Humidity   | %     | 10 to 70      | 19.6                 | Pass      |
| Peak Resultant Acceleration    | G's   | 115 to 137    | 119                  | Pass      |
| Peak Longitudinal Acceleration | G's   | +/- 15        | -13.5                | Pass      |
| Unimodal                       | N/A   | Yes           | Yes                  | Pass      |
| Oscillations                   | N/A   | <15%          | Yes                  | Pass      |
|                                |       |               | Overall Test Results | Pass      |

  
Laboratory Technician

02/21/2013  
Test Date

  
Approved By



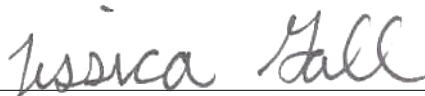


**MGA RESEARCH CORPORATION**  
**LATERAL NECK PENDULUM TEST**  
**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 306

**Test I.D:** D13502

| Tested Parameter                 |           | Units | Specification | Result | Pass/Fail |
|----------------------------------|-----------|-------|---------------|--------|-----------|
| Temperature                      |           | deg C | 20.6 to 22.2  | 21.4   | Pass      |
| Humidity                         |           | %     | 10 to 70      | 24     | Pass      |
| Impact Velocity                  |           | m/s   | 5.51 to 5.63  | 5.52   | Pass      |
| Pendulum Velocity                | 10 ms     | m/s   | 2.20 to 2.80  | 2.63   | Pass      |
|                                  | 15 ms     | m/s   | 3.30 to 4.10  | 3.79   | Pass      |
|                                  | 20 ms     | m/s   | 4.40 to 5.40  | 5.06   | Pass      |
|                                  | 25 ms     | m/s   | 5.40 to 6.10  | 5.51   | Pass      |
|                                  | 25-100 ms | m/s   | 5.50 to 6.20  | 5.52   | Pass      |
| Maximum D-Plane Rotation         |           | deg   | 71 to 81      | 75     | Pass      |
| Time of Maximum D-Plane Rotation |           | ms    | 50 to 70      | 60     | Pass      |
| Maximum Occipital Condyle Moment |           | Nm    | -44 to -36    | -43    | Pass      |
| Time of Moment Decay to 0 Nm     |           | ms    | 102 to 126    | 113    | Pass      |
| Overall Test Results             |           |       |               | Pass   |           |

  
 Laboratory Technician

02/22/2013

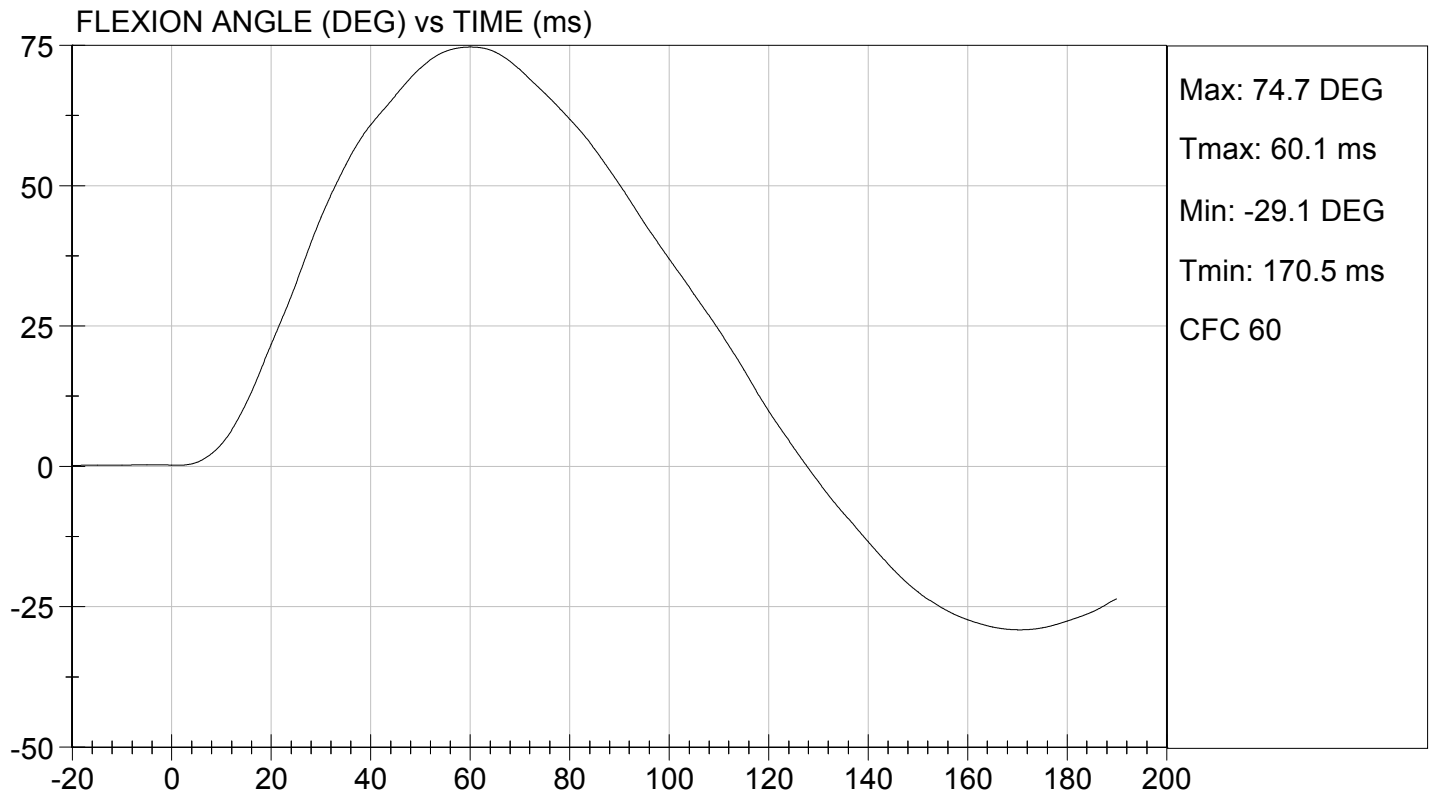
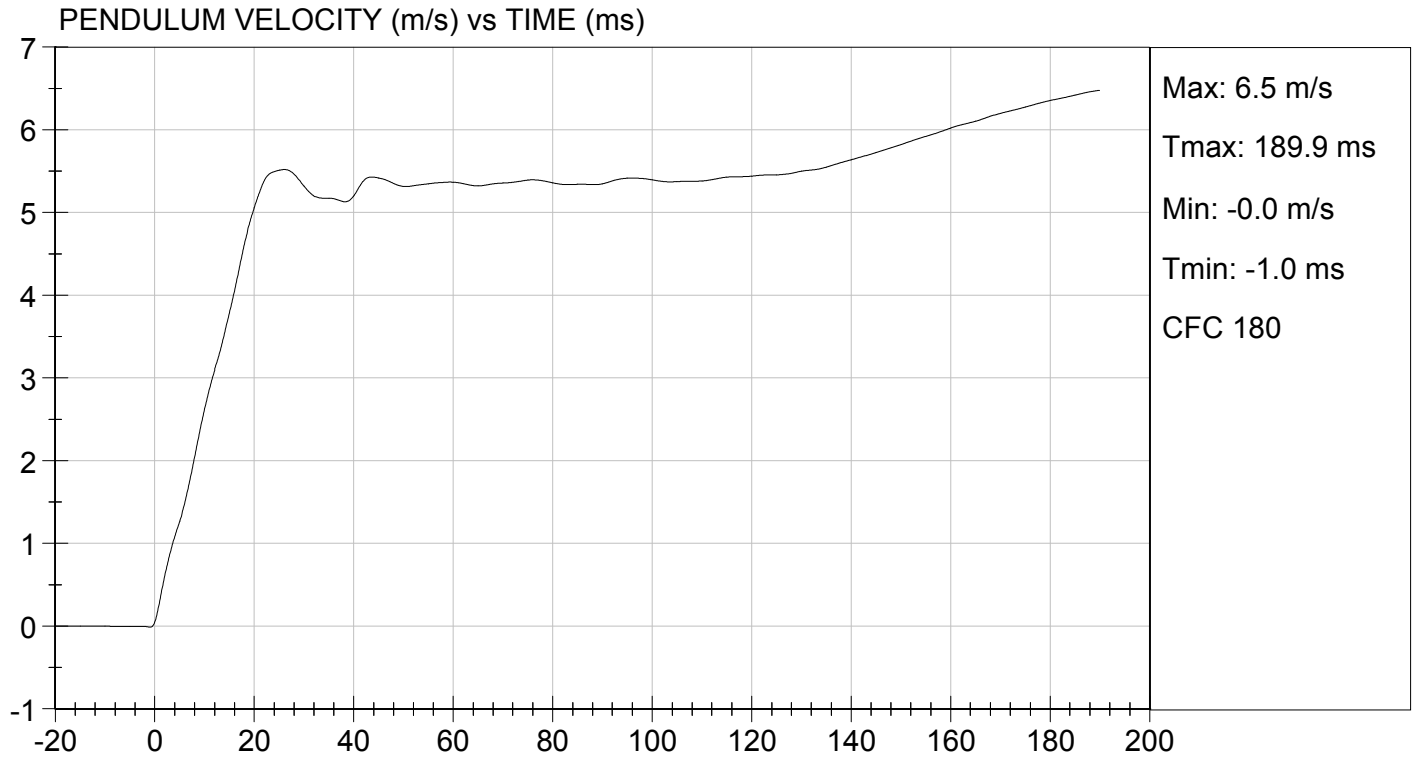
Test Date

  
 Approved By



TEST DESC: NECK BENDING  
VELOCITY: 18.12 ft/s, 5.52 m/s

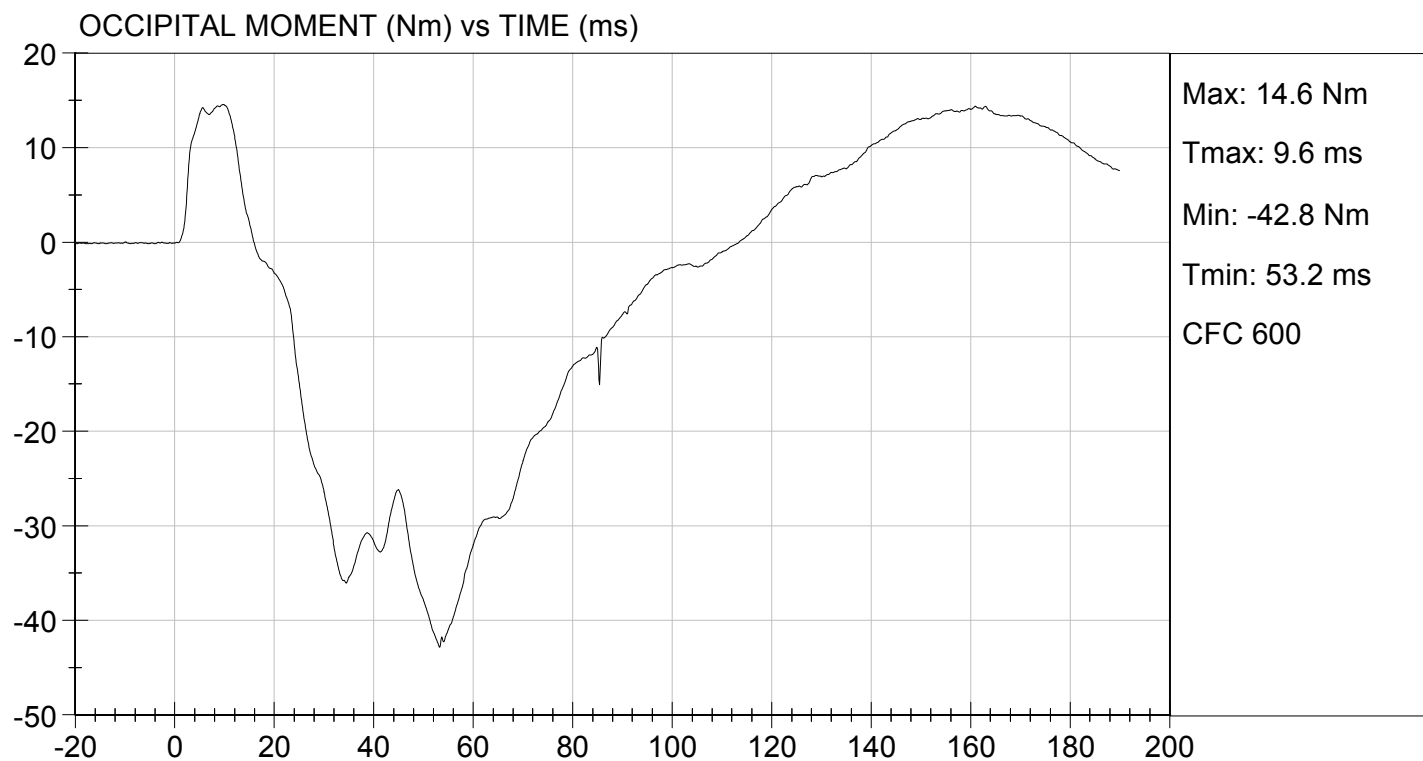
TEST DATE: 02/22/2013  
TEST #: D13502





TEST DESC: NECK BENDING  
VELOCITY: 18.12 ft/s, 5.52 m/s

TEST DATE: 02/22/2013  
TEST #: D13502

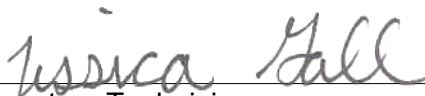


**MGA RESEARCH CORPORATION**  
**SHOULDER IMPACT TEST**  
**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 306

**Test ID:** D13503

| Tested Parameter                | Units | Specification | Result | Pass/Fail |
|---------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature          | deg C | 20.6 to 22.2  | 22.1   | Pass      |
| Laboratory Relative Humidity    | %     | 10 to 70      | 21     | Pass      |
| Impact Velocity                 | m/s   | 4.20 to 4.40  | 4.34   | Pass      |
| Maximum Probe Acceleration      | G's   | 13 to 18      | 15     | Pass      |
| Shoulder Displacement           | mm    | 28 to 37      | 29     | Pass      |
| Upper Spine (T1) Y Acceleration | G's   | 17 to 22      | 20     | Pass      |
| Overall Test Results            |       |               |        | Pass      |

  
Laboratory Technician

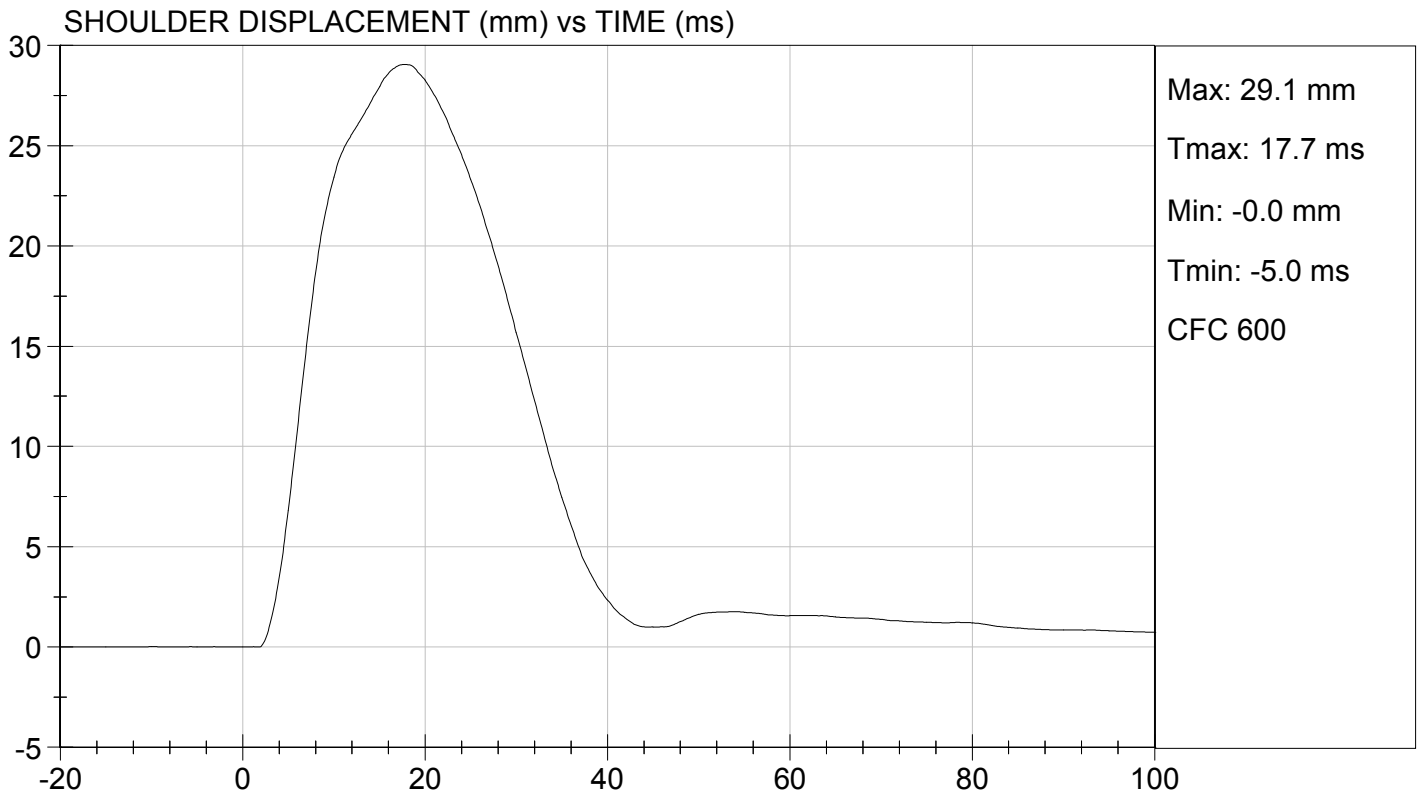
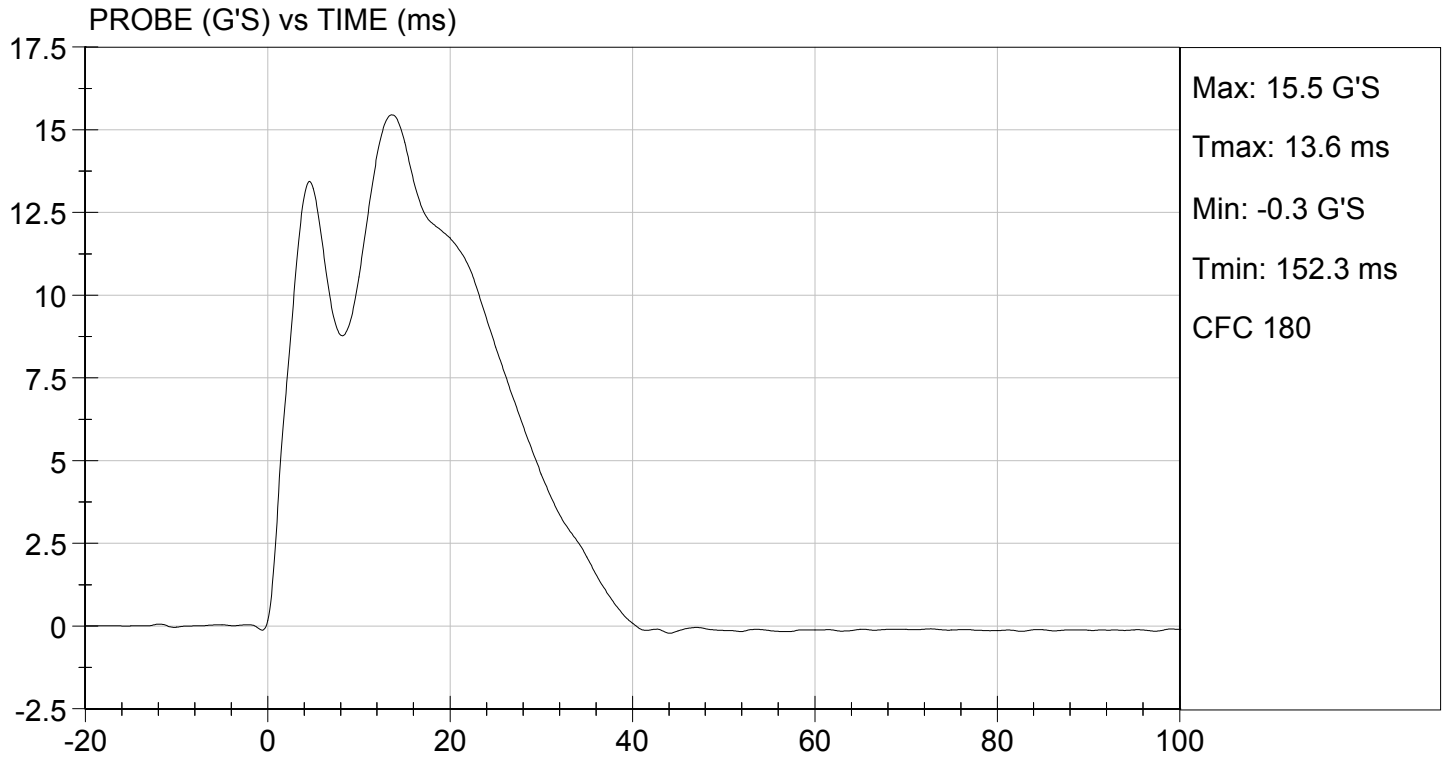
02/21/2013  
Test Date

  
Approved By



TEST DESC: SHOULDER IMPACT  
VELOCITY: 14.25 ft/s, 4.34 m/s

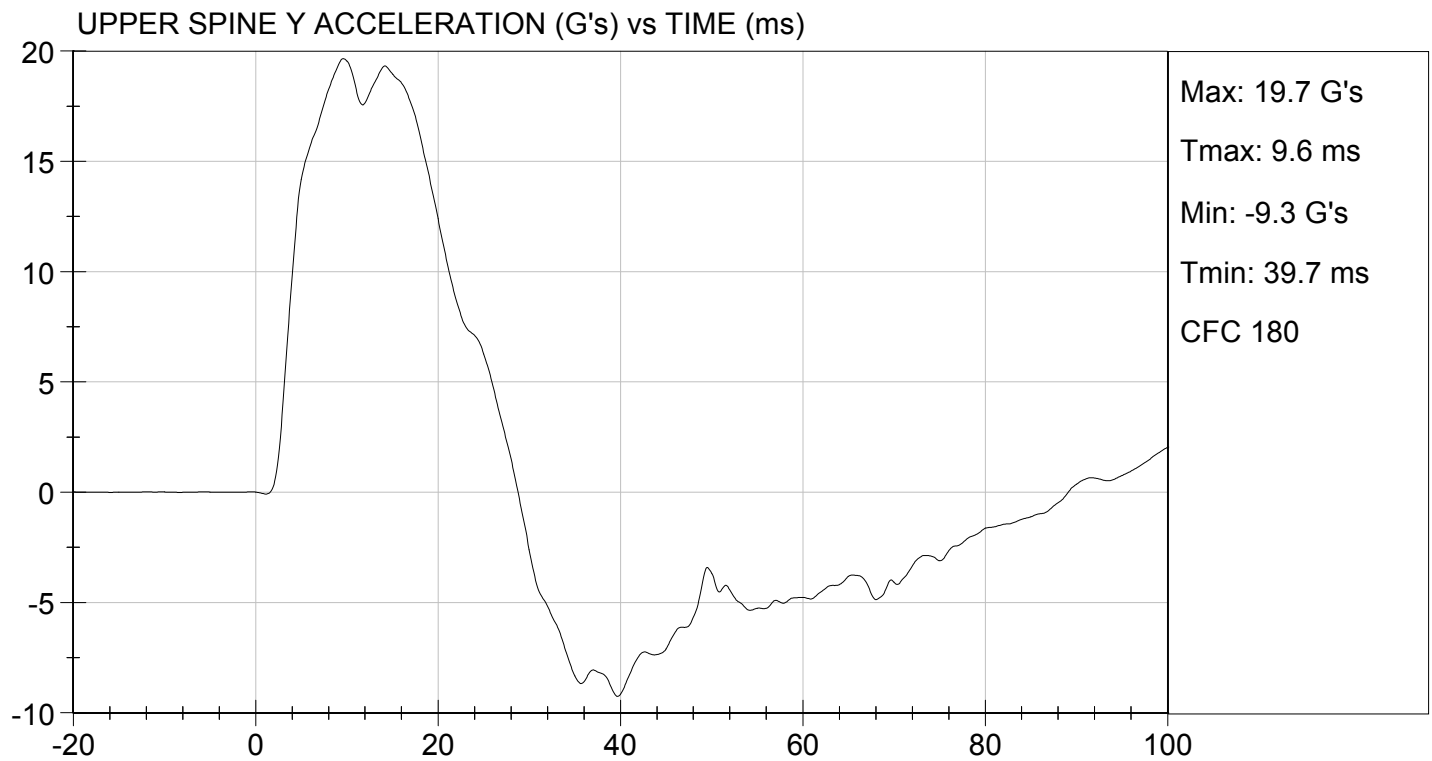
TEST DATE: 02/21/2013  
TEST #: D13503





TEST DESC: SHOULDER IMPACT  
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 02/21/2013  
TEST #: D13503

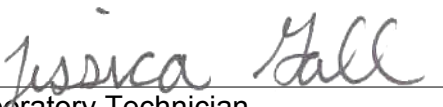


**MGA RESEARCH CORPORATION**  
**THORAX (WITH ARM) IMPACT TEST**  
**SID-IIs BUILD LEVEL D DUMMY**

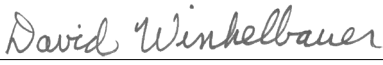
**ATD Serial No:** 306

**Test I.D:** D13504

| Tested Parameter                 | Units | Specification | Result | Pass/Fail |
|----------------------------------|-------|---------------|--------|-----------|
| Temperature                      | deg C | 20.6 to 22.2  | 21.1   | Pass      |
| Humidity                         | %     | 10 to 70      | 32     | Pass      |
| Impact Velocity                  | m/s   | 6.60 to 6.80  | 6.77   | Pass      |
| Maximum Probe Acceleration       | G's   | 30 to 36      | 32     | Pass      |
| Shoulder Displacement            | mm    | 31 to 40      | 31     | Pass      |
| Upper Rib Displacement           | mm    | 25 to 32      | 26     | Pass      |
| Middle Rib Displacement          | mm    | 30 to 36      | 31     | Pass      |
| Lower Rib Displacement           | mm    | 32 to 38      | 34     | Pass      |
| Upper Spine (T1) Y Acceleration  | G's   | 34 to 43      | 40     | Pass      |
| Lower Spine (T12) Y Acceleration | G's   | 29 to 37      | 31     | Pass      |
| Overall Test Results             |       |               |        | Pass      |

  
 Laboratory Technician

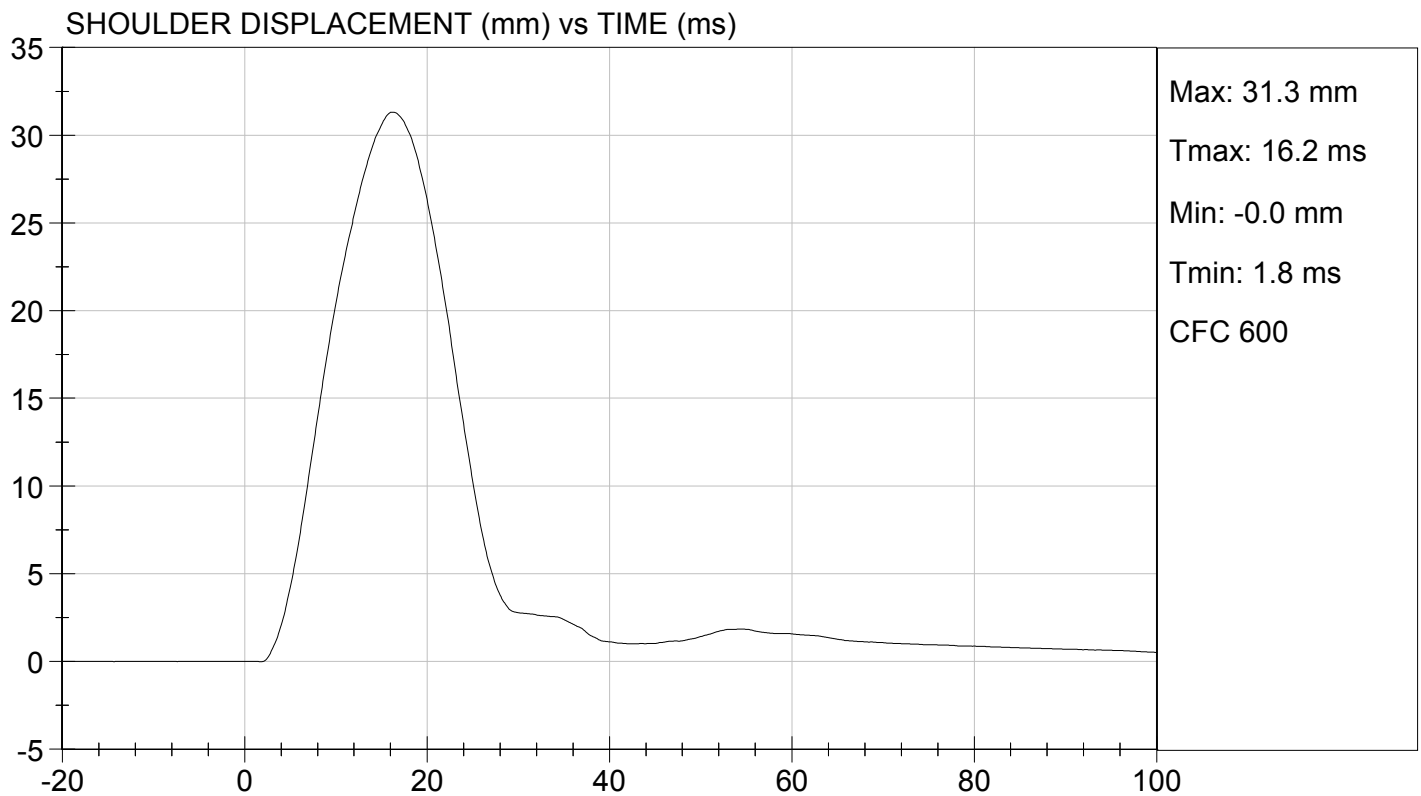
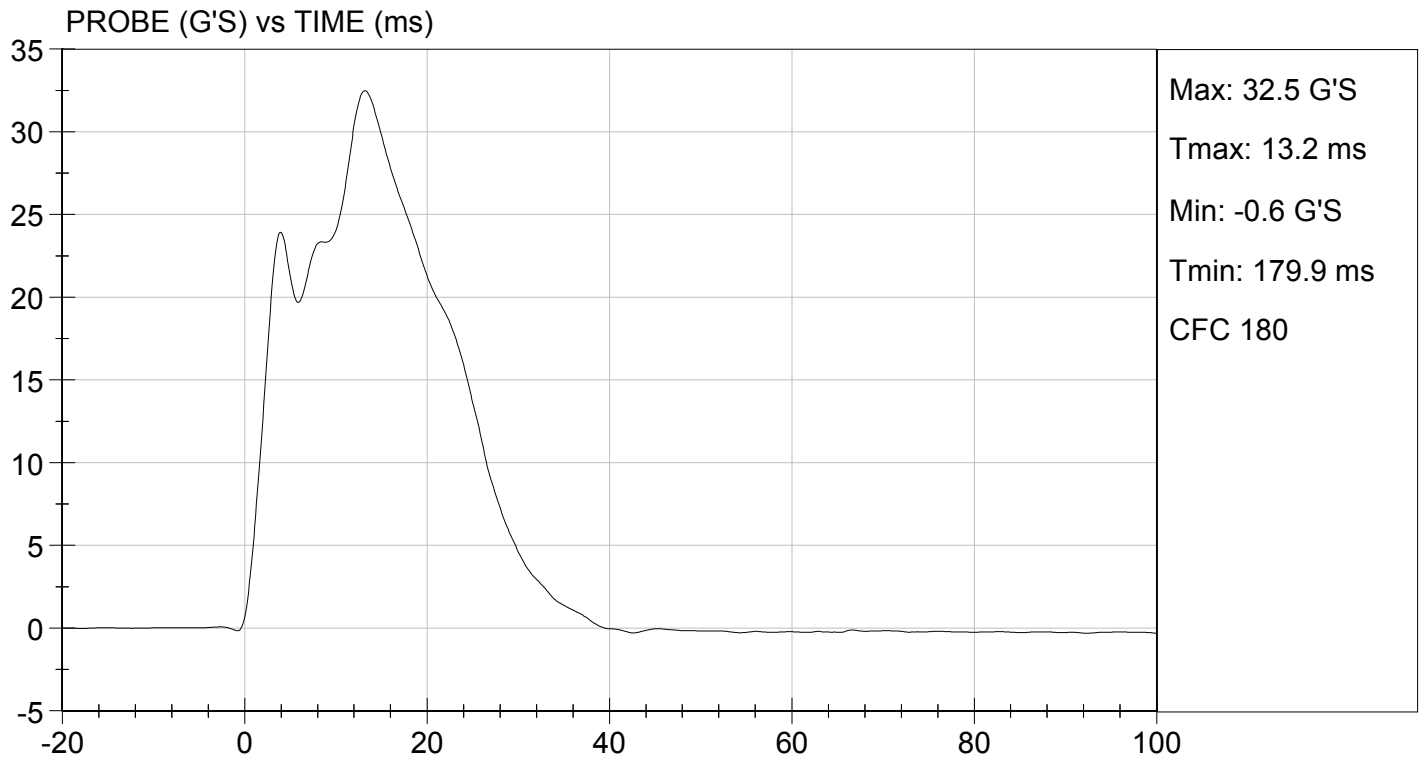
02/21/2013  
 Test Date

  
 Approved By



TEST DESC: THORAX IMPACT WITH ARM  
VELOCITY: 22.22 ft/s, 6.77 m/s

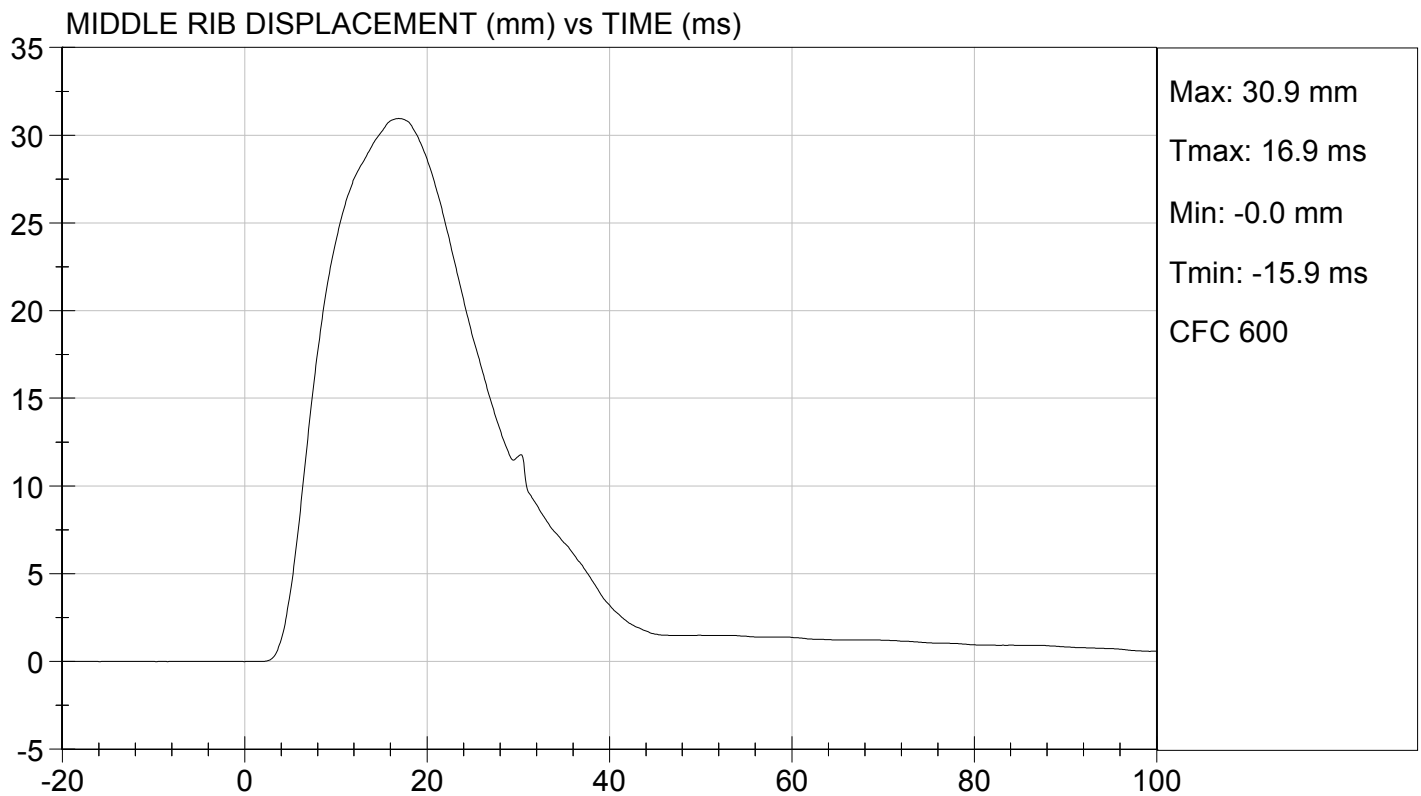
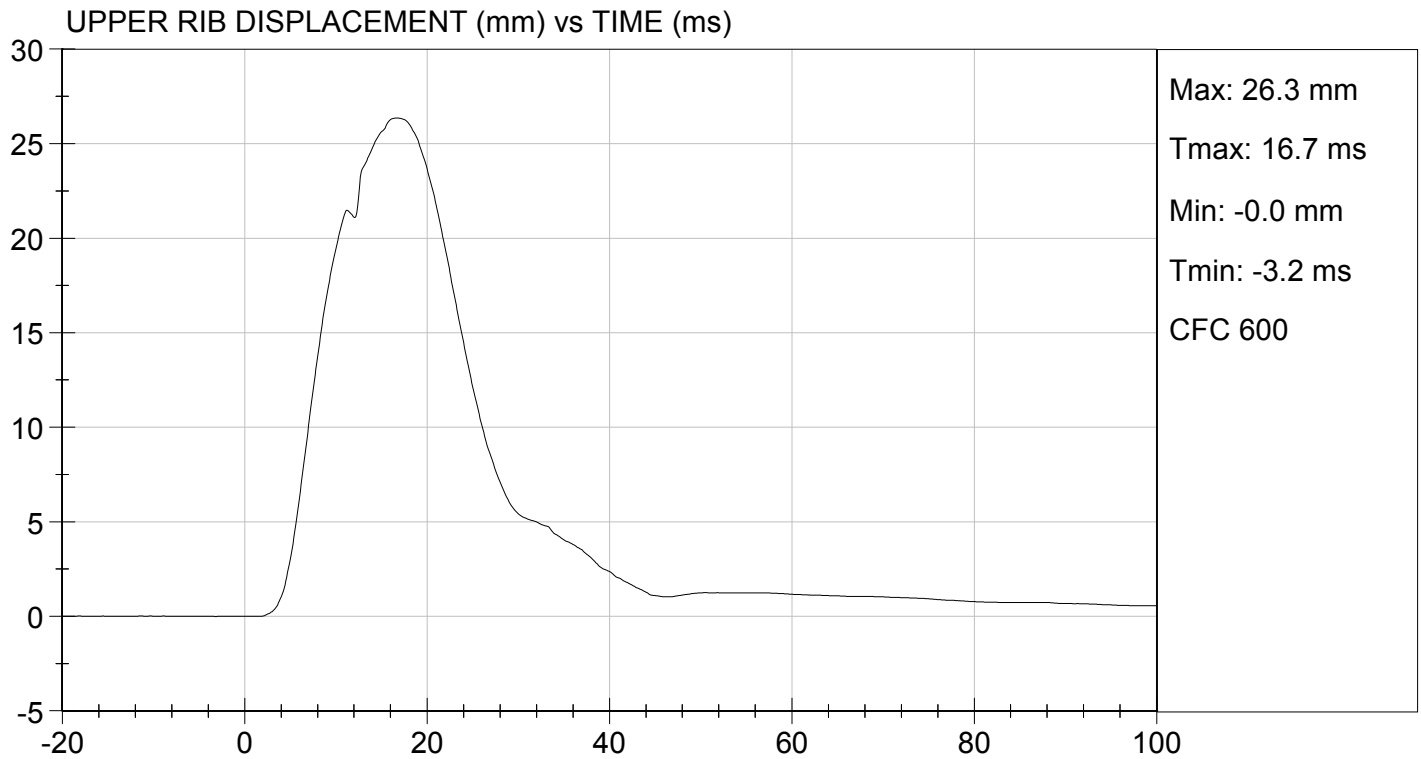
TEST DATE: 02/21/2013  
TEST #: D13504





TEST DESC: THORAX IMPACT WITH ARM  
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 02/21/2013  
TEST #: D13504

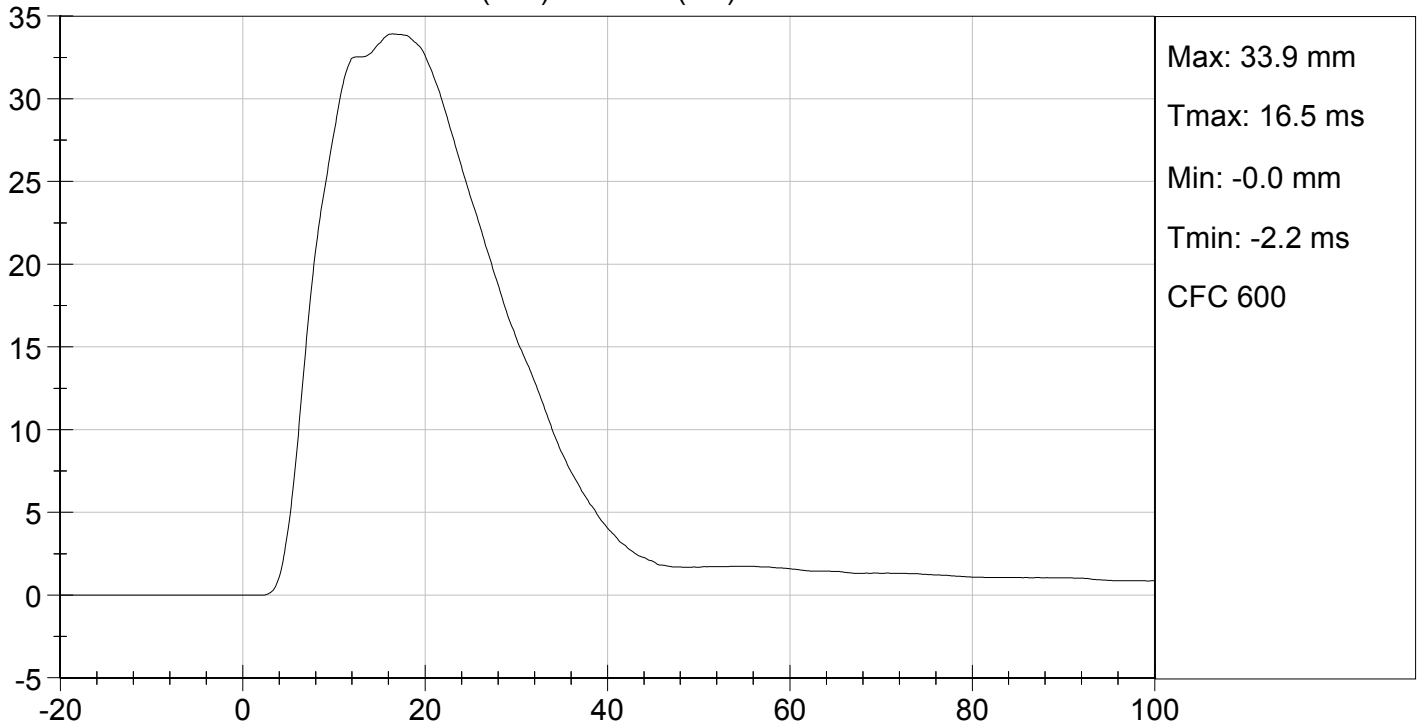




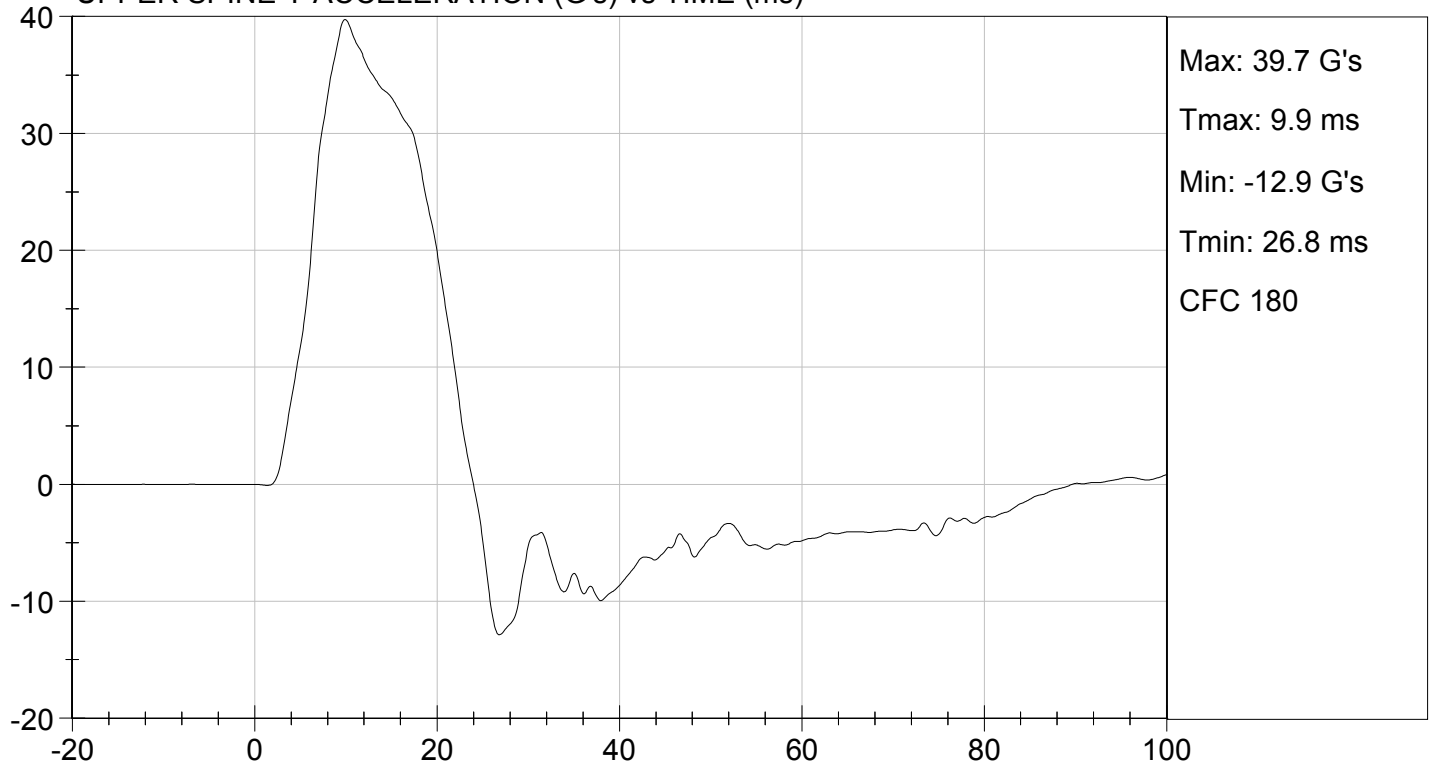
TEST DESC: THORAX IMPACT WITH ARM  
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 02/21/2013  
TEST #: D13504

LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



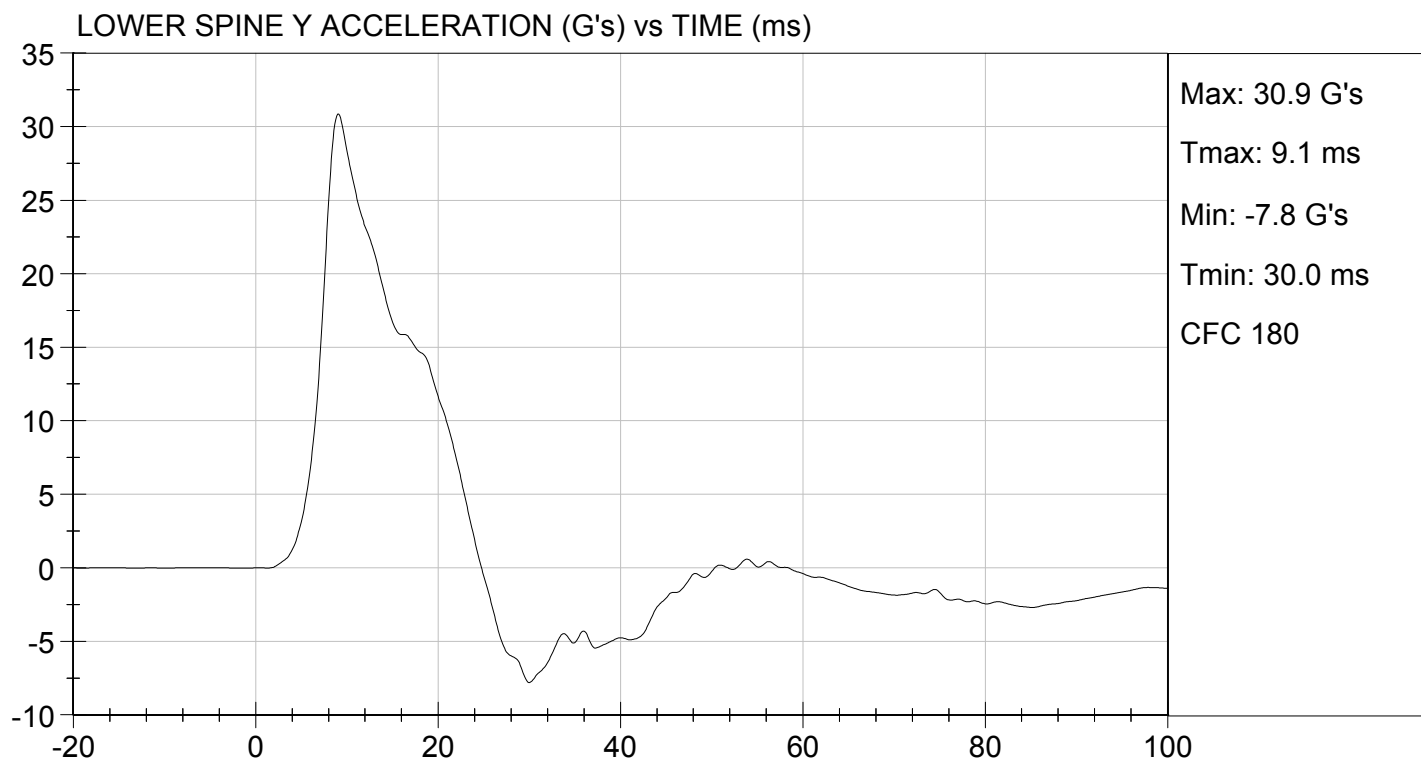
UPPER SPINE Y ACCELERATION (G's) vs TIME (ms)





TEST DESC: THORAX IMPACT WITH ARM  
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 02/21/2013  
TEST #: D13504

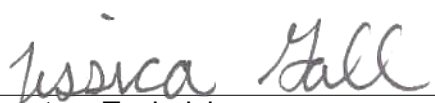


**MGA RESEARCH CORPORATION**  
**THORAX (WITHOUT ARM) IMPACT TEST**  
**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 306

**Test I.D:** D13505

| Tested Parameter                 | Units | Specification | Result | Pass/Fail |
|----------------------------------|-------|---------------|--------|-----------|
| Temperature                      | deg C | 20.6 to 22.2  | 20.7   | Pass      |
| Humidity                         | %     | 10 to 70      | 19.6   | Pass      |
| Impact Velocity                  | m/s   | 4.20 to 4.40  | 4.34   | Pass      |
| Maximum Probe Acceleration       | G's   | 14 to 18      | 15     | Pass      |
| Upper Rib Displacement           | mm    | 32 to 40      | 38     | Pass      |
| Middle Rib Displacement          | mm    | 39 to 45      | 41     | Pass      |
| Lower Rib Displacement           | mm    | 35 to 43      | 38     | Pass      |
| Upper Spine (T1) Y Acceleration  | G's   | 13 to 17      | 15     | Pass      |
| Lower Spine (T12) Y Acceleration | G's   | 7 to 11       | 9      | Pass      |
| Overall Test Results             |       |               |        | Pass      |

  
 Laboratory Technician

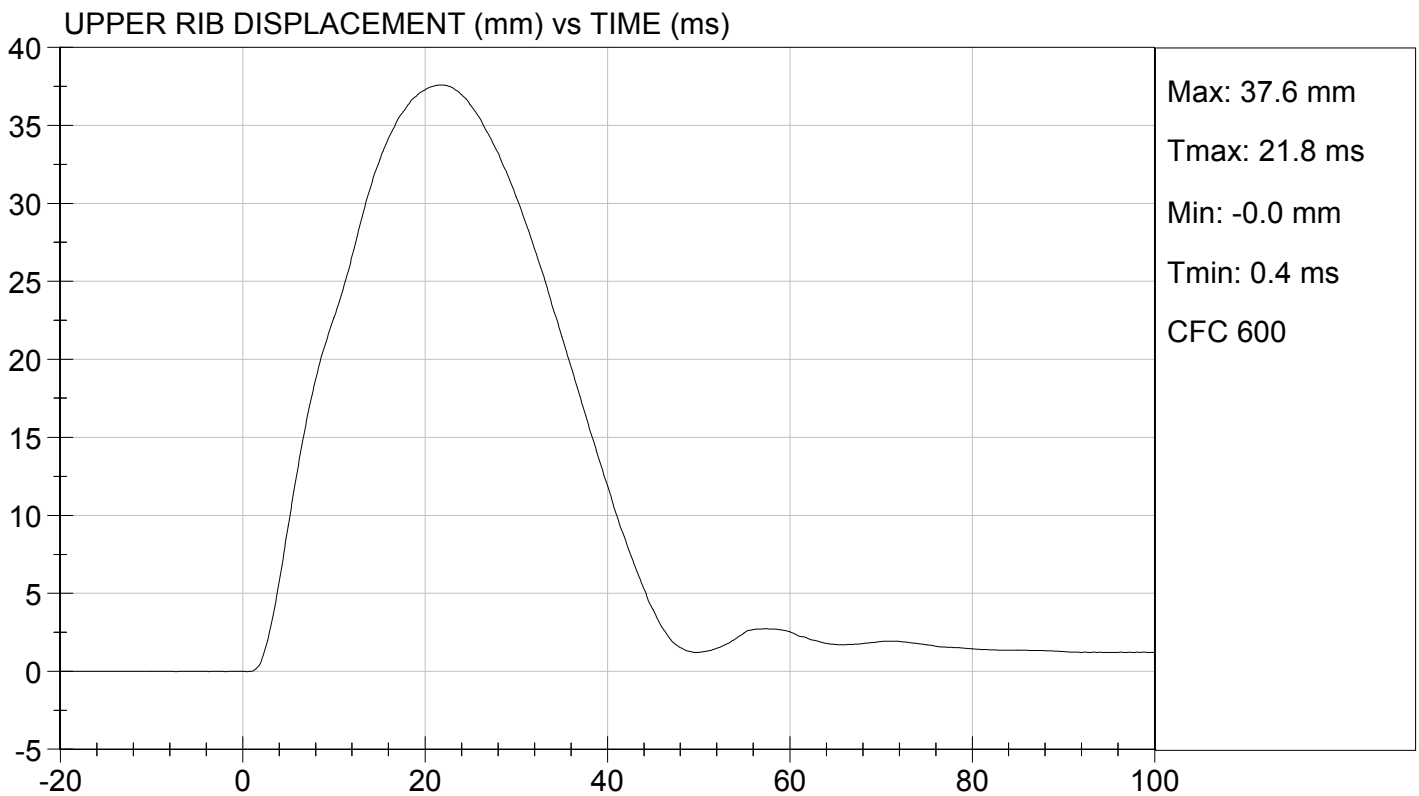
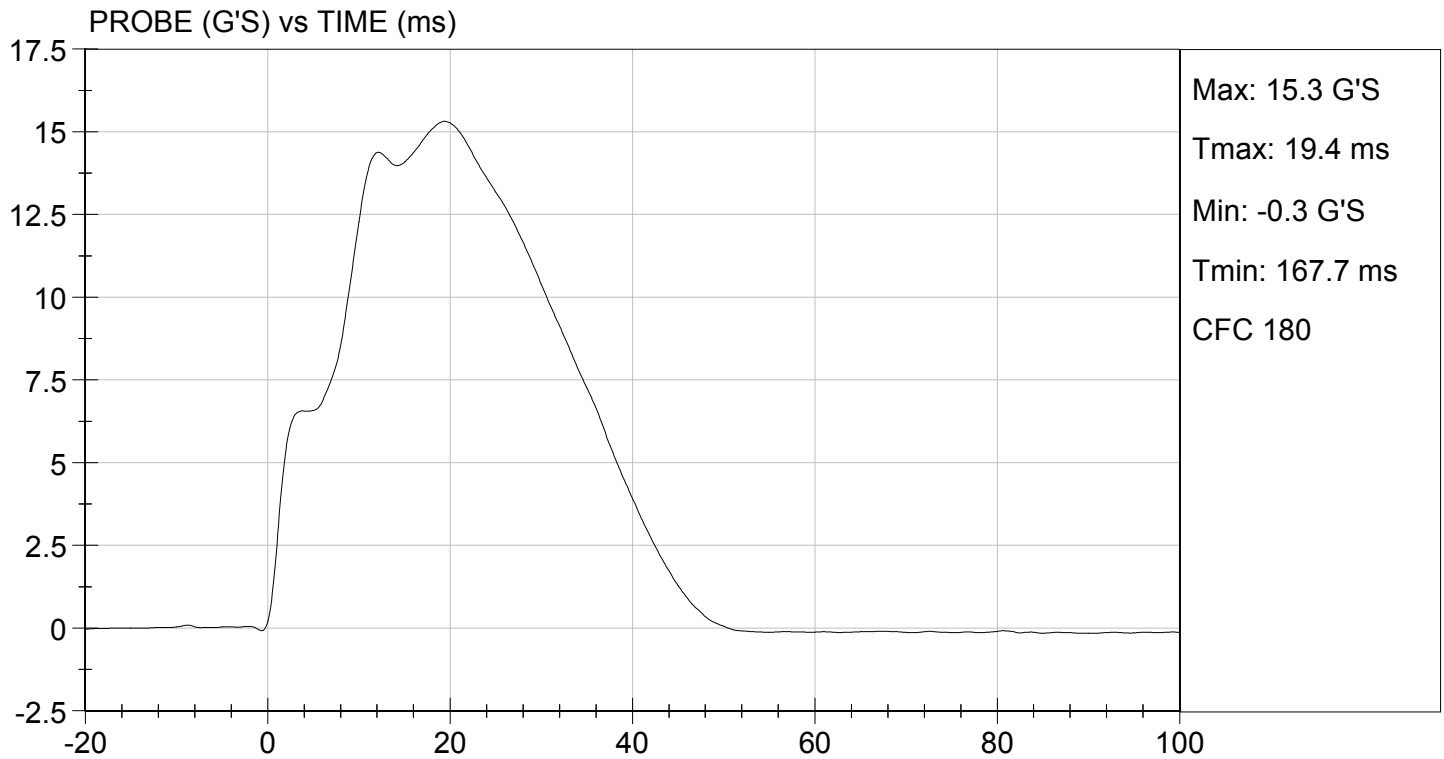
02/21/2013  
 Test Date

  
 Approved By



TEST DESC: THORAX IMPACT WITHOUT ARM  
VELOCITY: 14.25 ft/s, 4.34 m/s

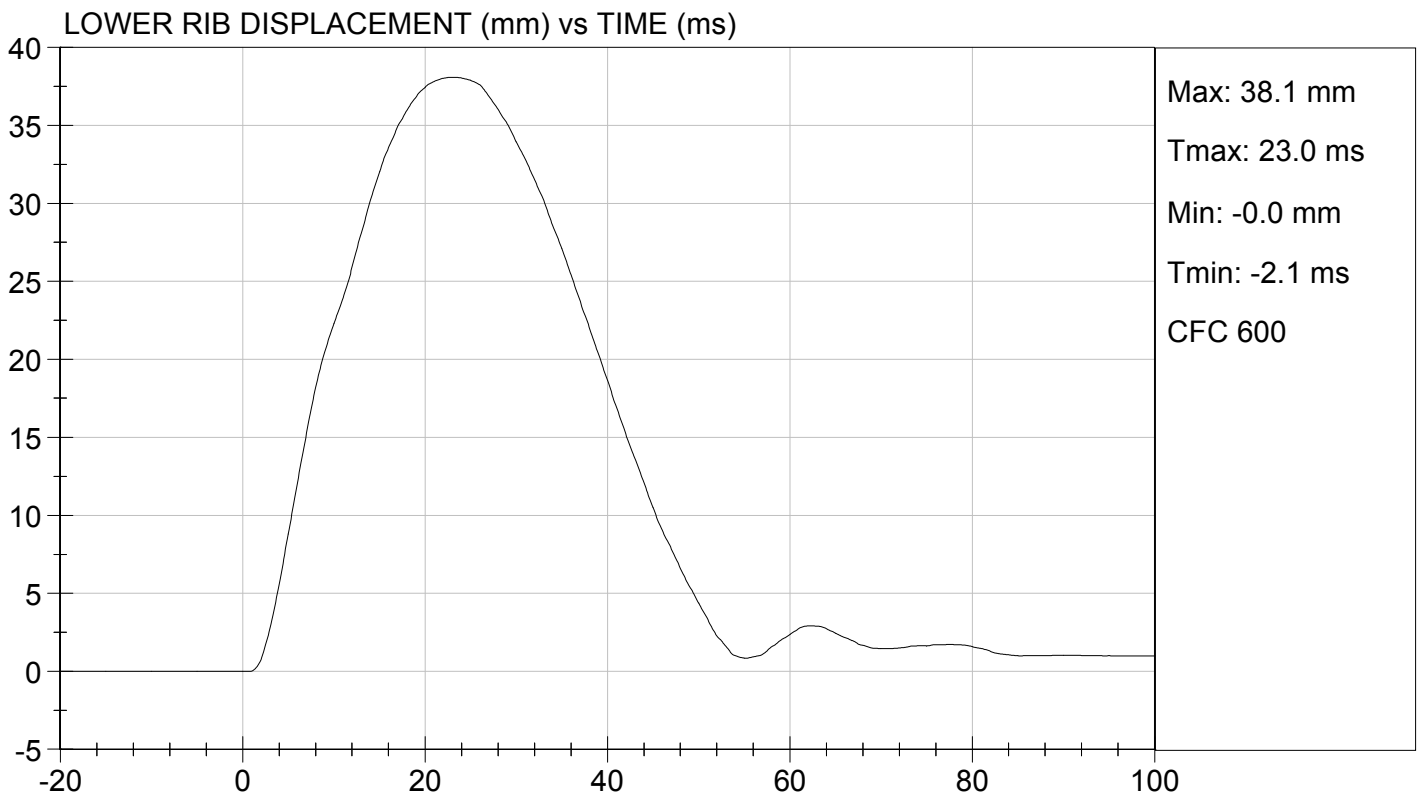
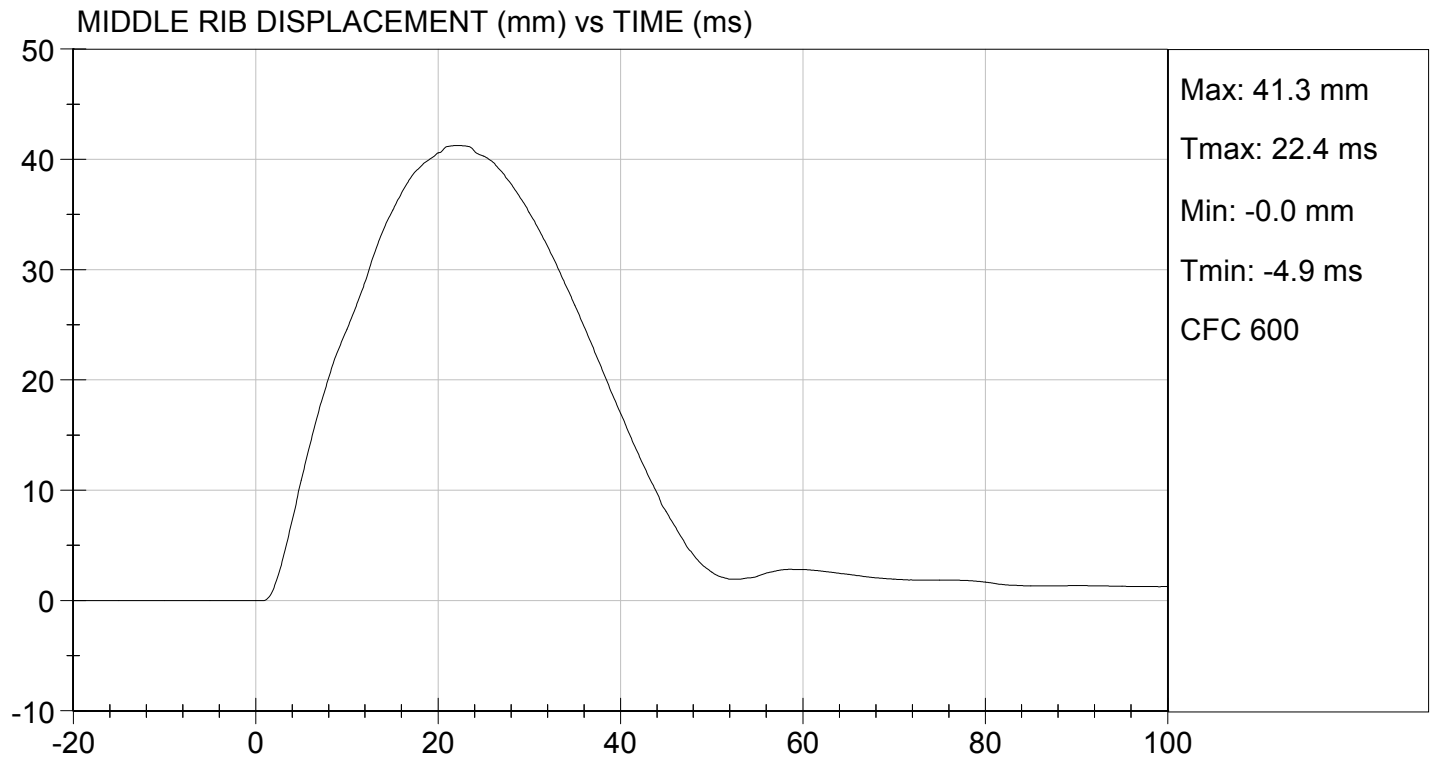
TEST DATE: 02/21/2013  
TEST #: D13505





TEST DESC: THORAX IMPACT WITHOUT ARM  
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 02/21/2013  
TEST #: D13505

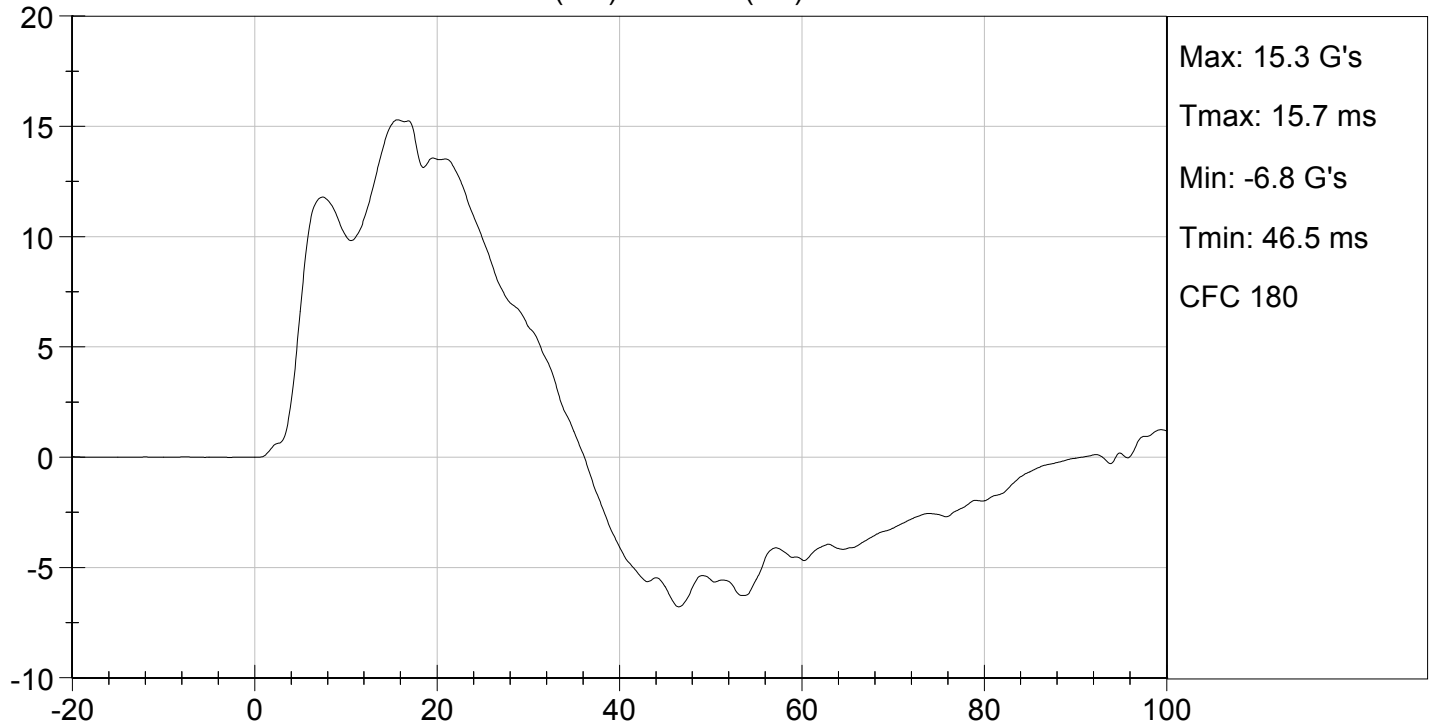




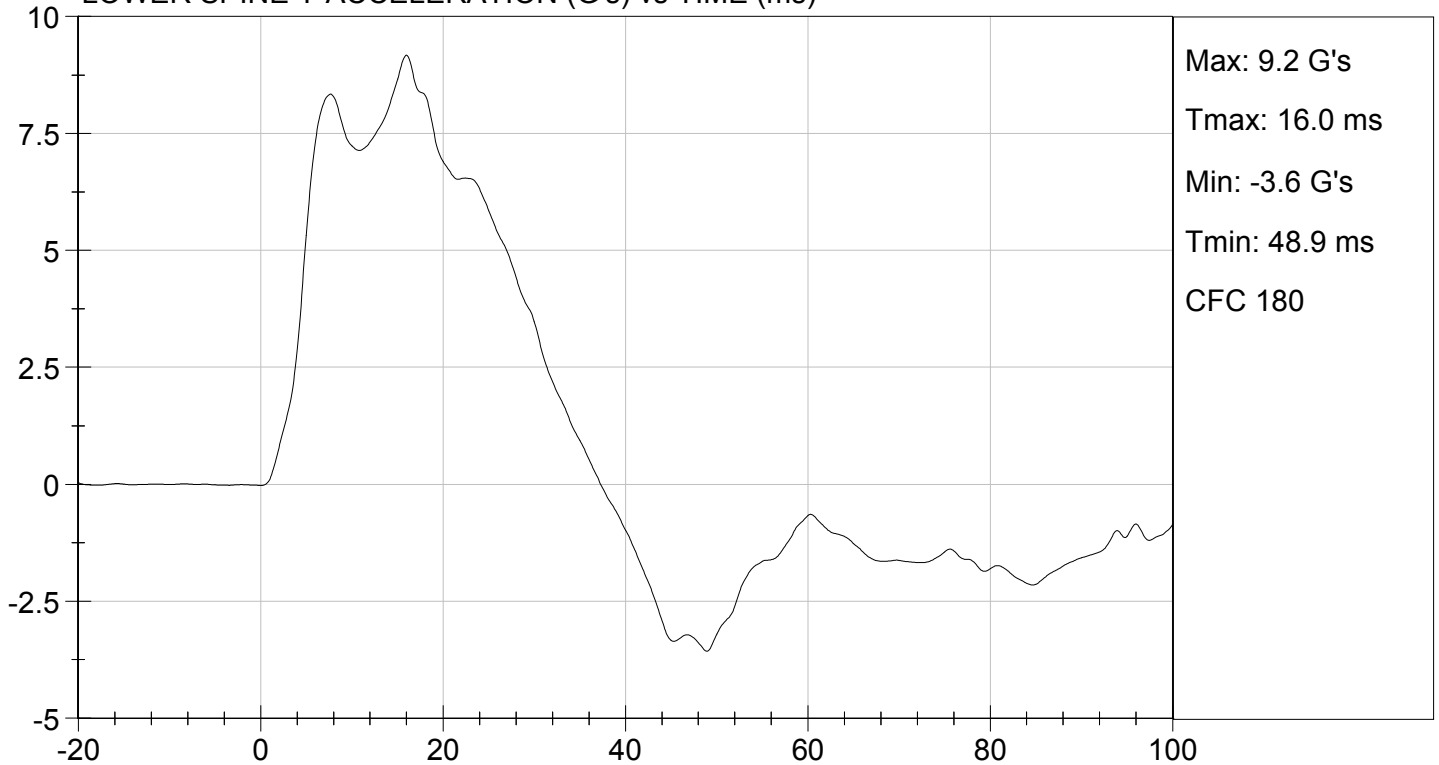
TEST DESC: THORAX IMPACT WITHOUT ARM  
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 02/21/2013  
TEST #: D13505

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



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



**MGA RESEARCH CORPORATION**

**ABDOMINAL IMPACT TEST**

**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 306

**Test I.D:** D13506

| Tested Parameter                 | Units | Specification | Result | Pass/Fail |
|----------------------------------|-------|---------------|--------|-----------|
| Temperature                      | deg C | 20.6 to 22.2  | 20.7   | Pass      |
| Humidity                         | %     | 10 to 70      | 19.6   | Pass      |
| Impact Velocity                  | m/s   | 4.20 to 4.40  | 4.34   | Pass      |
| Maximum Probe Acceleration       | G's   | 12 to 16      | 13     | Pass      |
| Upper Abdomen Rib Displacement   | mm    | 36 to 47      | 40     | Pass      |
| Lower Abdomen Rib Displacement   | mm    | 33 to 44      | 39     | Pass      |
| Lower Spine (T12) Y Acceleration | G's   | 9 to 14       | 10     | Pass      |
| Overall Test Results             |       |               |        | Pass      |

Jessica Hall  
Laboratory Technician

02/21/2013

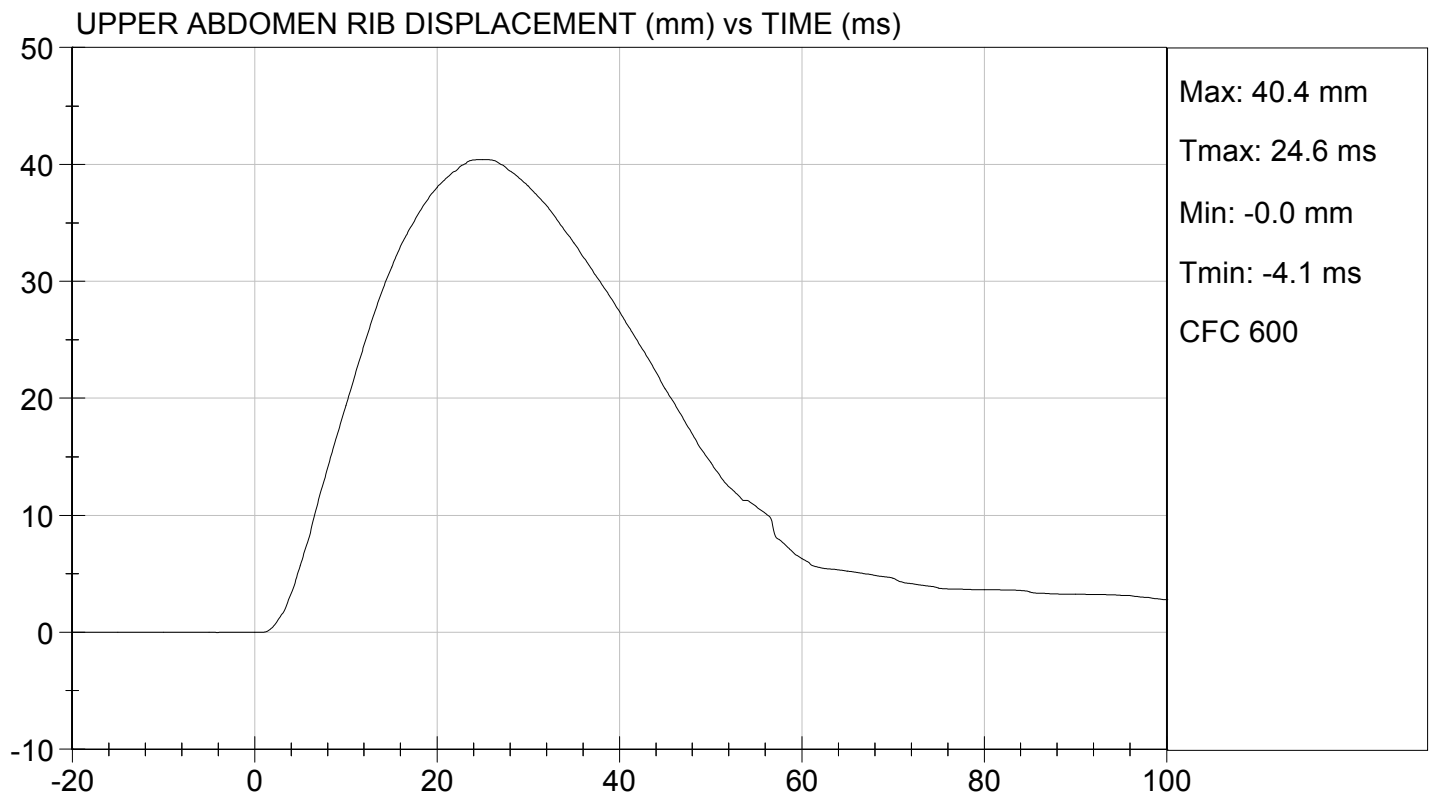
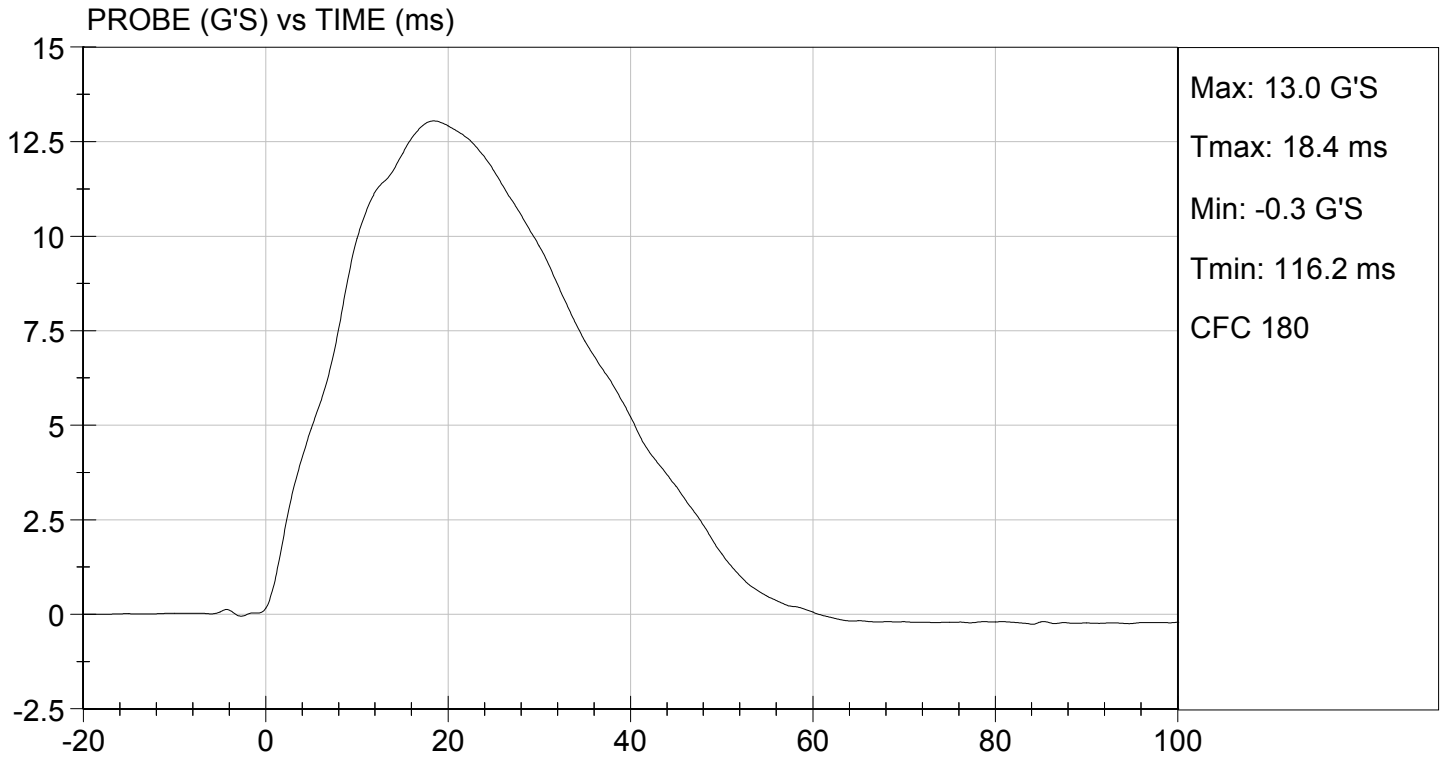
Test Date

David Winkelbauer  
Approved By



TEST DESC: ABDOMEN IMPACT  
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 02/21/2013  
TEST #: D13506

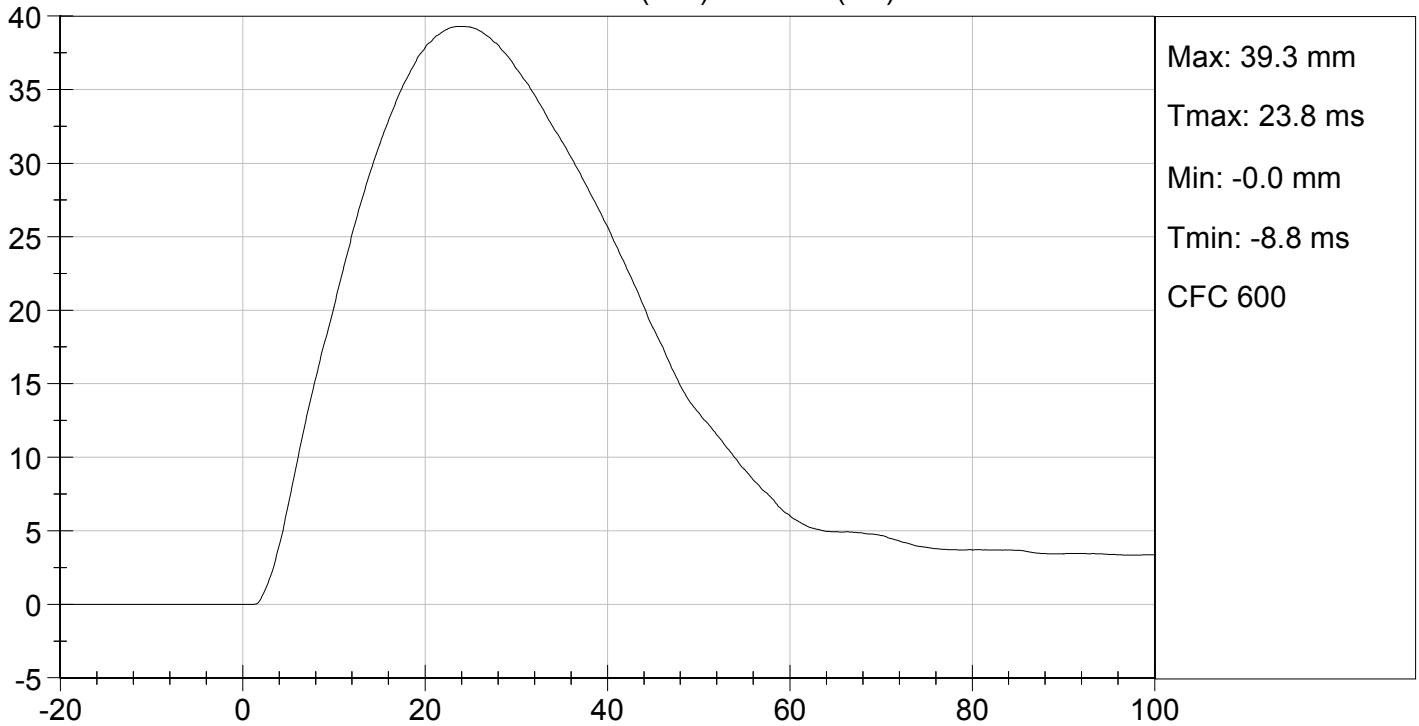




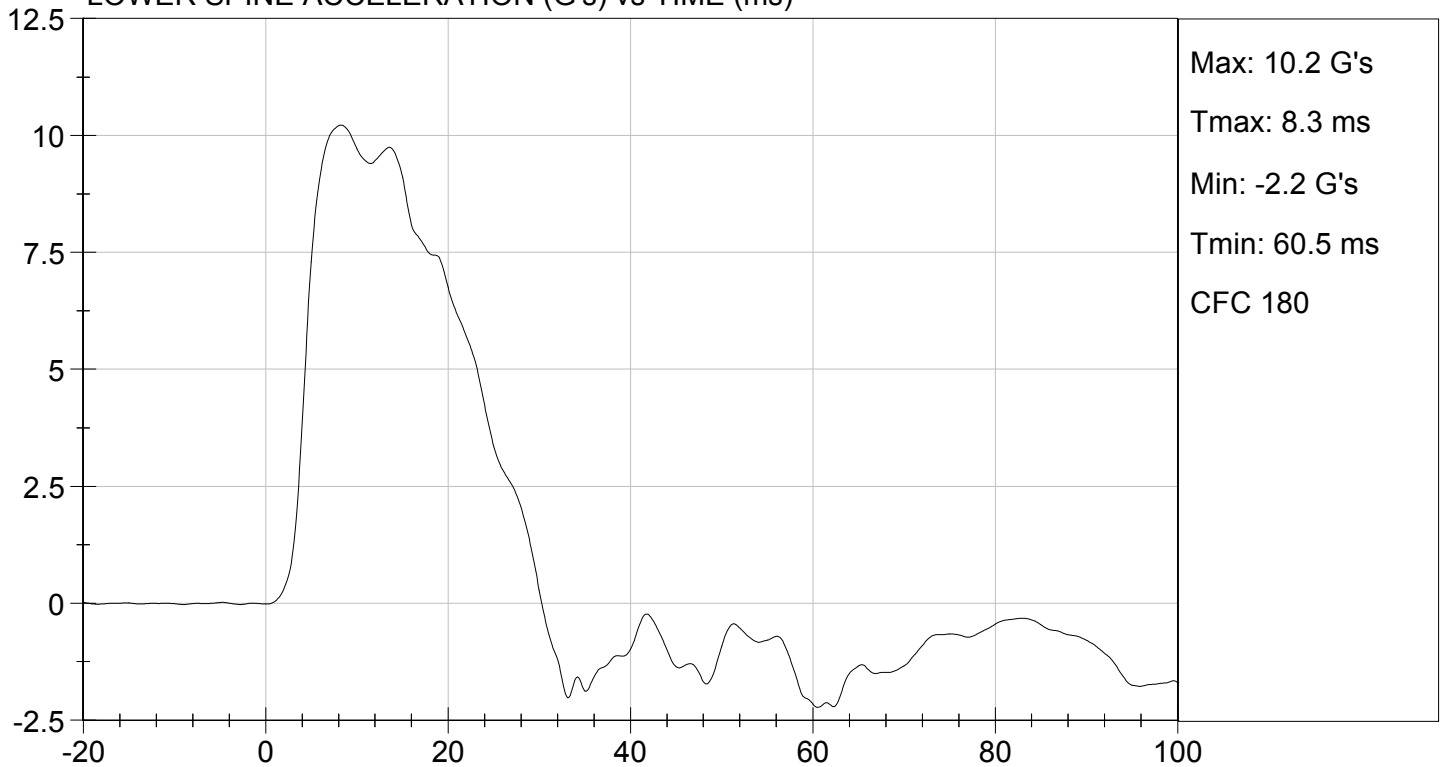
TEST DESC: ABDOMEN IMPACT  
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 02/21/2013  
TEST #: D13506

LOWER ABDOMEN RIB DISPLACEMENT (mm) vs TIME (ms)



LOWER SPINE ACCELERATION (G's) vs TIME (ms)



**MGA RESEARCH CORPORATION**

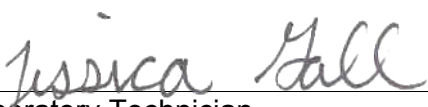
**PELVIS IMPACT TEST**

**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 306

**Test I.D:** D13507

| Tested Parameter                 | Units | Specification | Result | Pass/Fail |
|----------------------------------|-------|---------------|--------|-----------|
| Temperature                      | deg C | 20.6 to 22.2  | 20.8   | Pass      |
| Humidity                         | %     | 10 to 70      | 19.6   | Pass      |
| Impact Velocity                  | m/s   | 6.60 to 6.80  | 6.68   | Pass      |
| Maximum Probe Acceleration       | G's   | 38 to 47      | 38     | Pass      |
| Pelvis Y Acceleration After 6 ms | G's   | 34 to 42      | 41     | Pass      |
| Peak Acetabulum Force            | N     | 3600 to 4300  | 3,861  | Pass      |
| Overall Test Results             |       |               |        | Pass      |

  
Laboratory Technician

02/22/2013

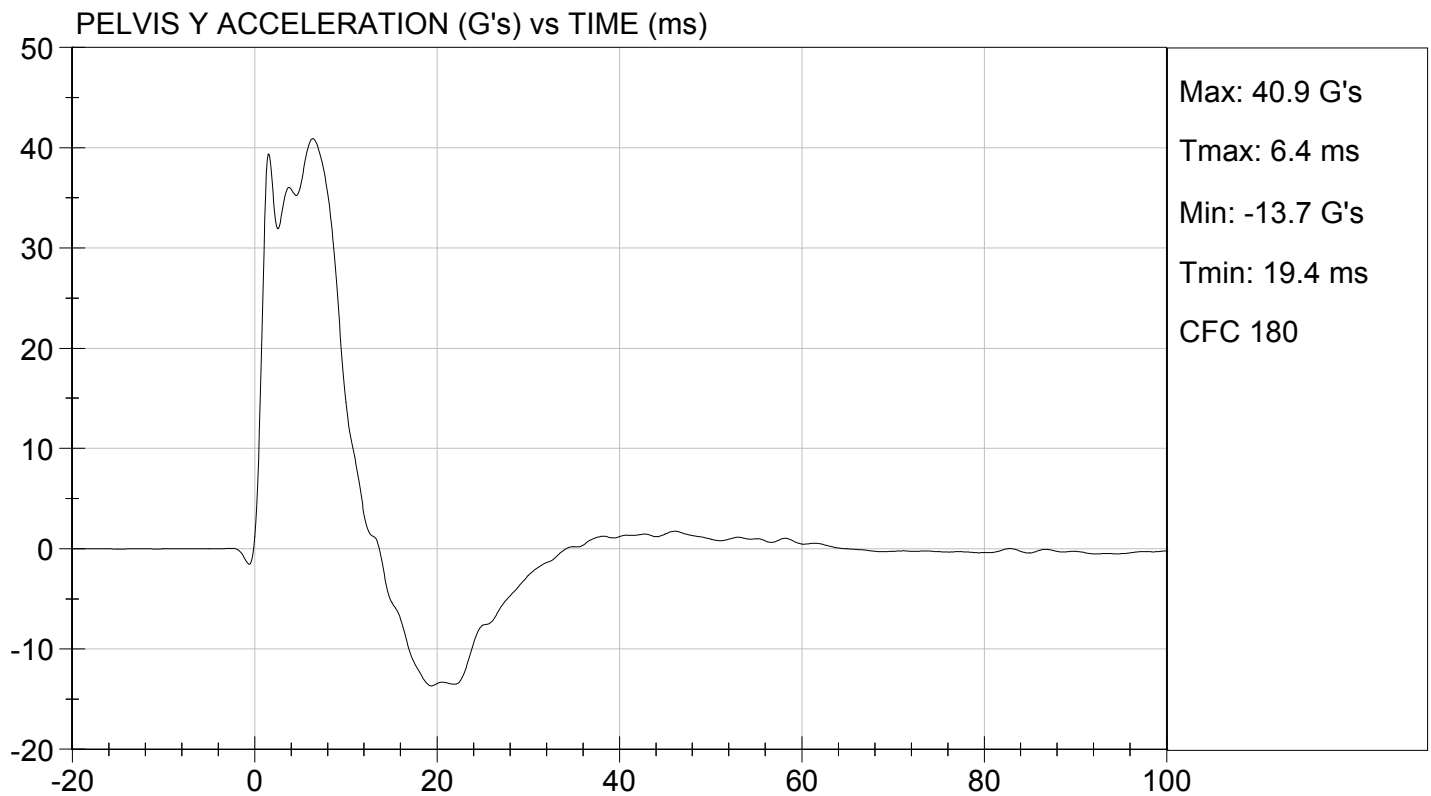
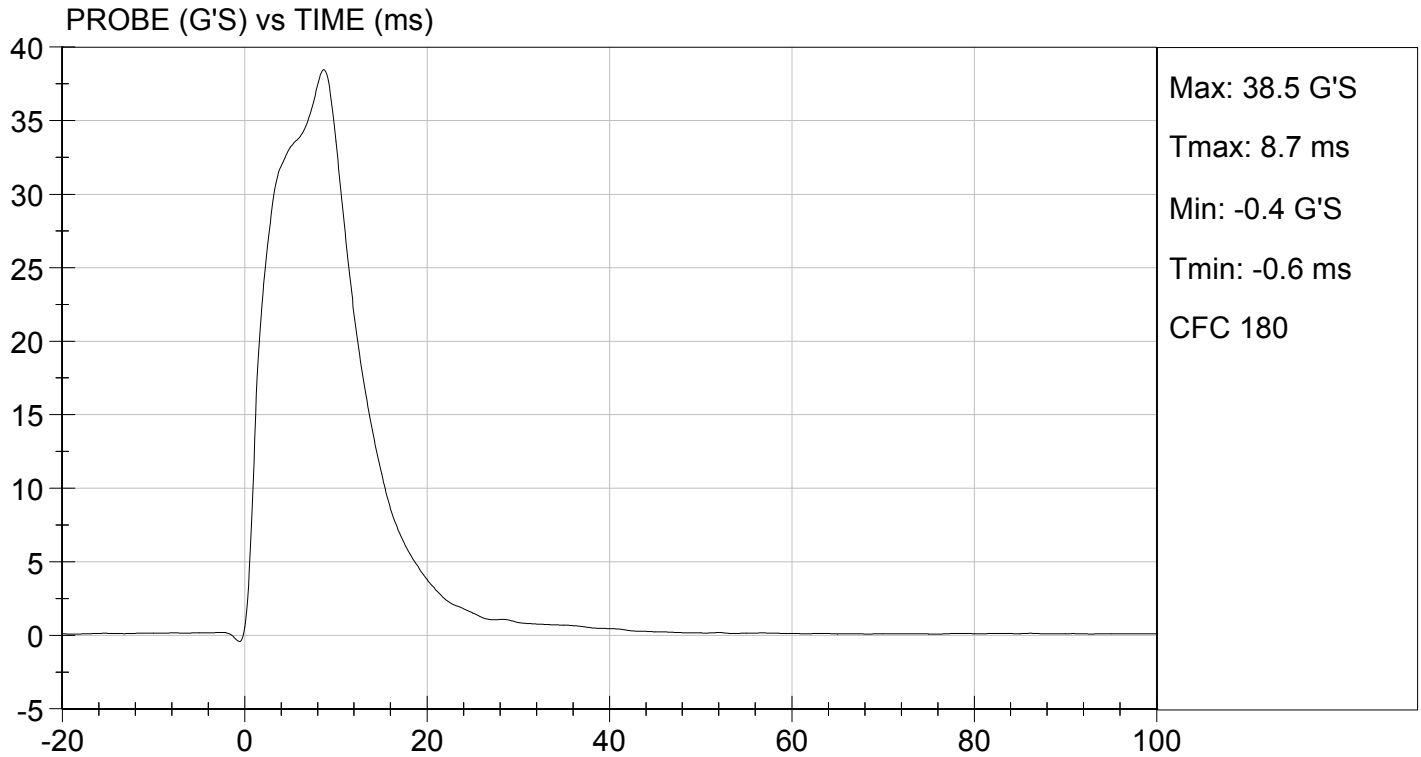
Test Date

  
Approved By



TEST DESC: PELVIS IMPACT  
VELOCITY: 21.90 ft/s, 6.68 m/s

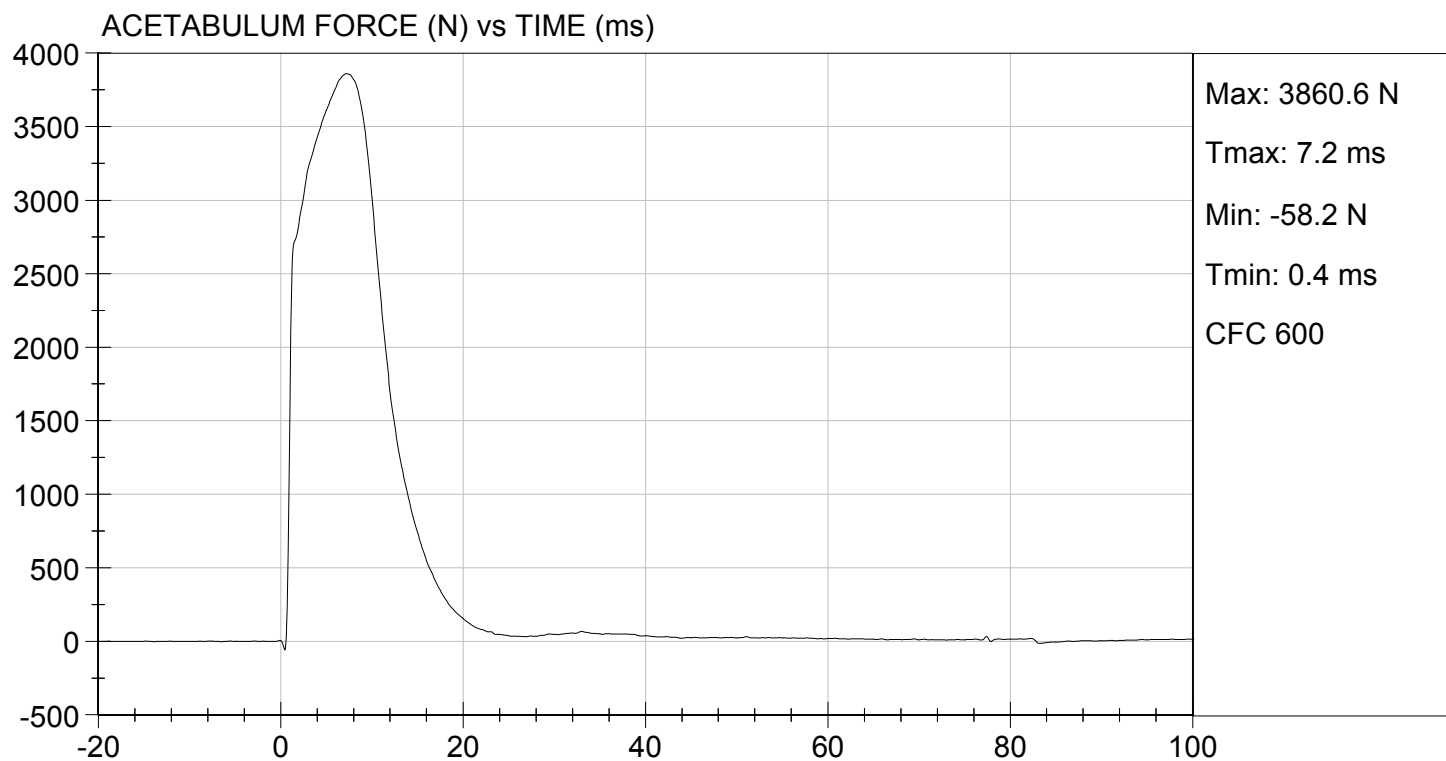
TEST DATE: 02/22/2013  
TEST #: D13507





TEST DESC: PELVIS IMPACT  
VELOCITY: 21.90 ft/s, 6.68 m/s

TEST DATE: 02/22/2013  
TEST #: D13507



**MGA RESEARCH CORPORATION**

**ILIAC IMPACT TEST**

**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 306

**Test I.D:** D13508

| Tested Parameter           | Units | Specification | Result | Pass/Fail |
|----------------------------|-------|---------------|--------|-----------|
| Temperature                | deg C | 20.6 to 22.2  | 20.7   | Pass      |
| Humidity                   | %     | 10 to 70      | 19.6   | Pass      |
| Impact Velocity            | m/s   | 4.20 to 4.40  | 4.34   | Pass      |
| Maximum Probe Acceleration | G's   | 36 to 45      | 38     | Pass      |
| Pelvis Y Acceleration      | G's   | 28 to 39      | 30     | Pass      |
| Peak Pelvis Iliac Force    | N     | 4100 to 5100  | 4,541  | Pass      |
| Overall Test Results       |       |               |        | Pass      |

Jessica Hall  
Laboratory Technician

02/21/2013

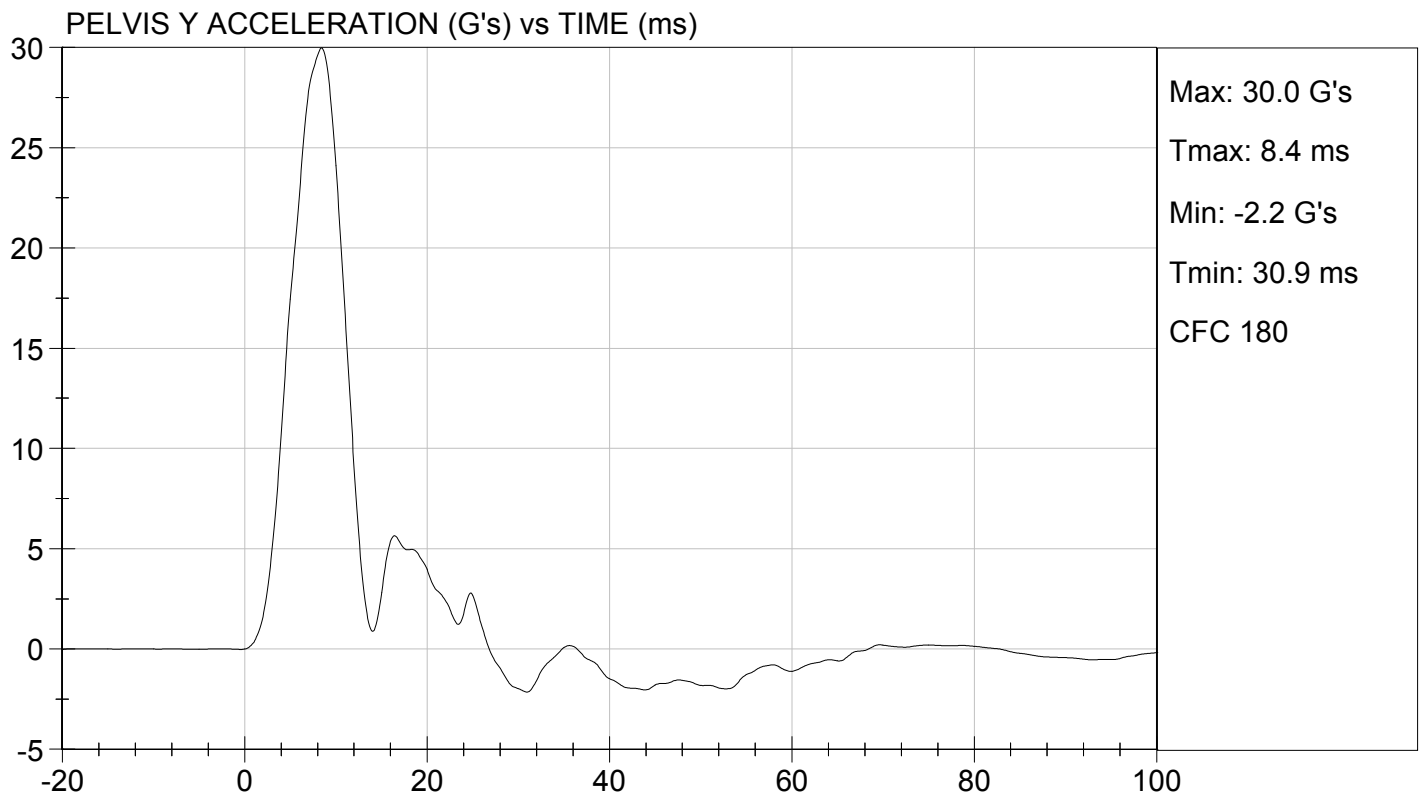
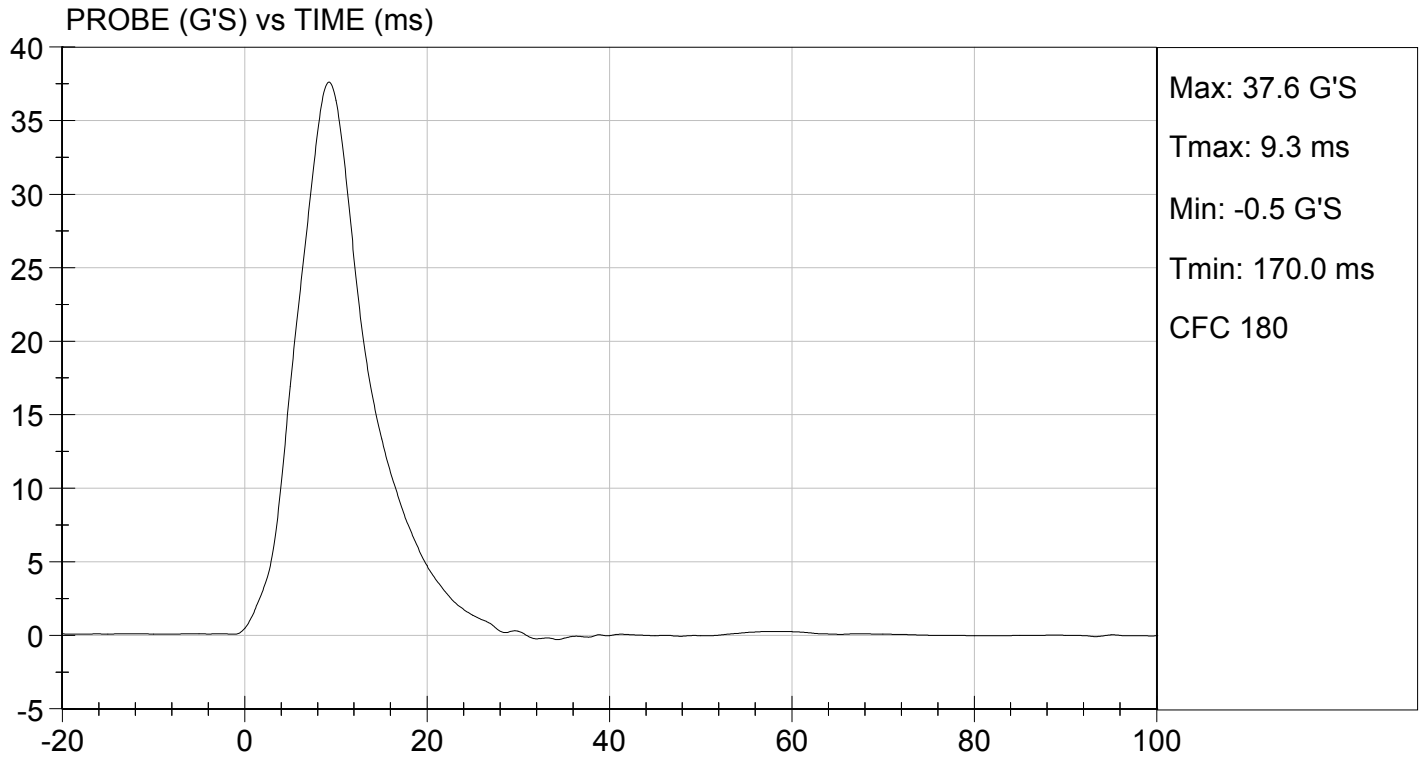
Test Date

David Winkelbauer  
Approved By



TEST DESC: ILLIAC  
VELOCITY: 14.25 ft/s, 4.34 m/s

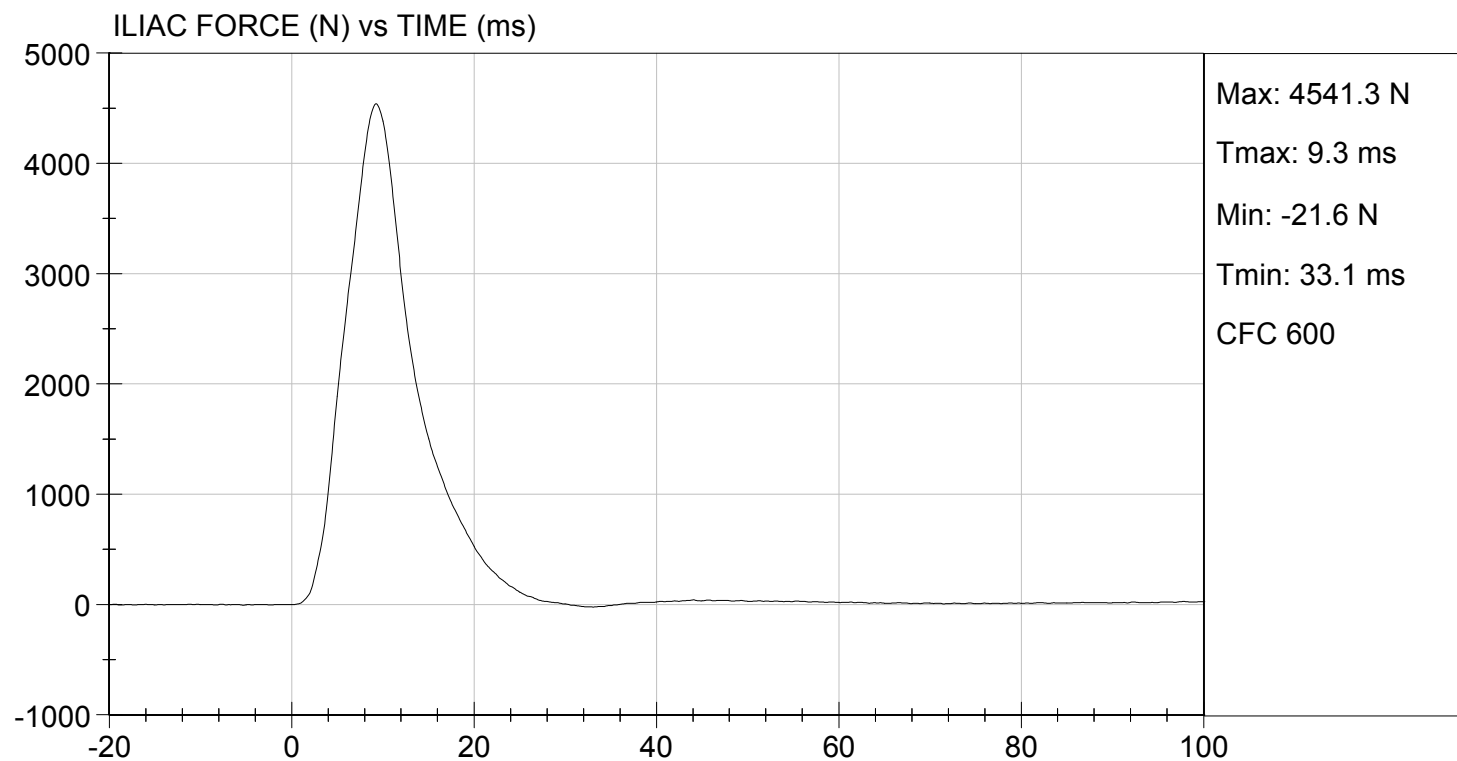
TEST DATE: 02/21/2013  
TEST #: D13508



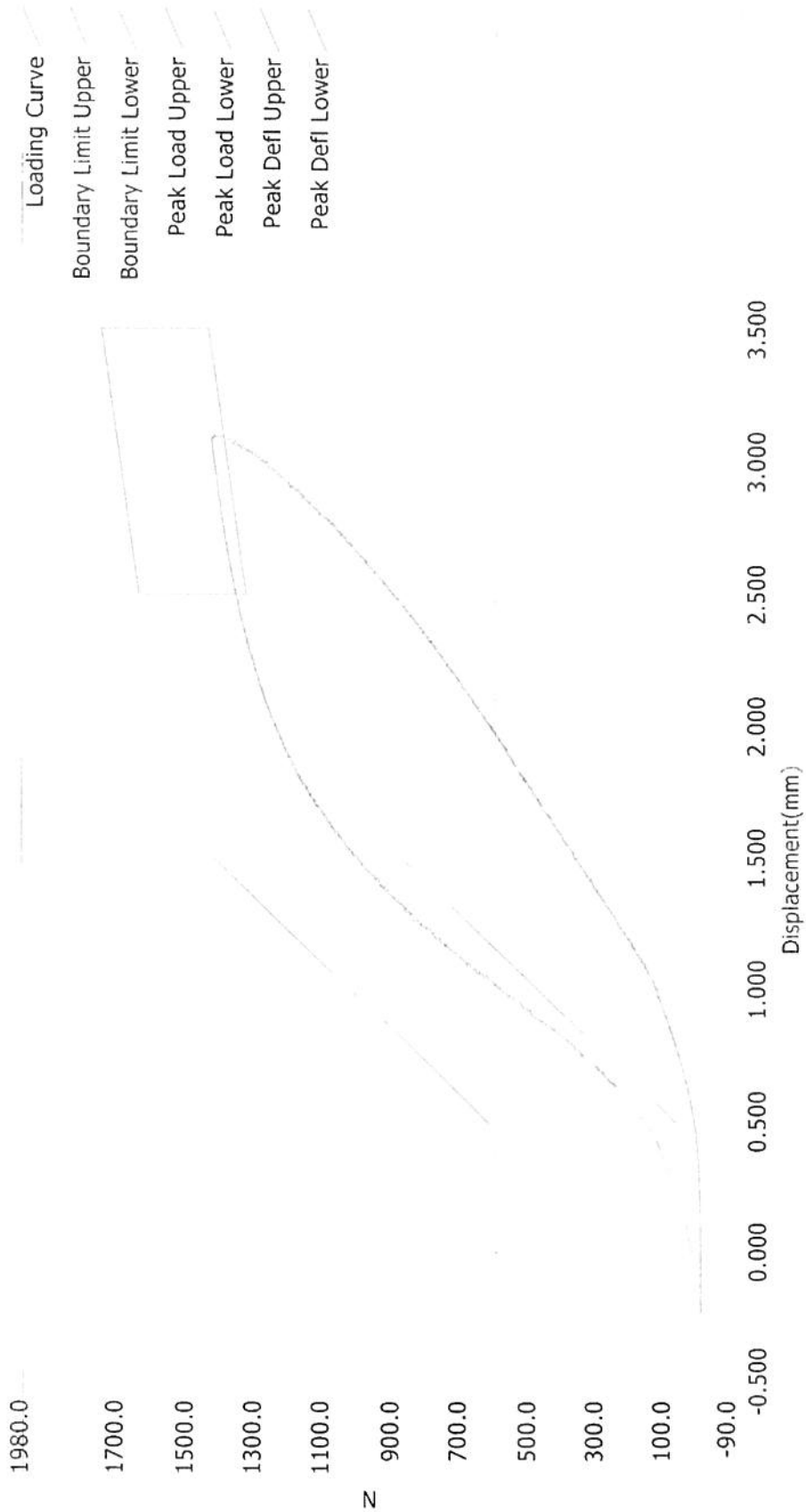


TEST DESC: ILLIAC  
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 02/21/2013  
TEST #: D13508



# Resultant Data - SIDIIs Plug Compression



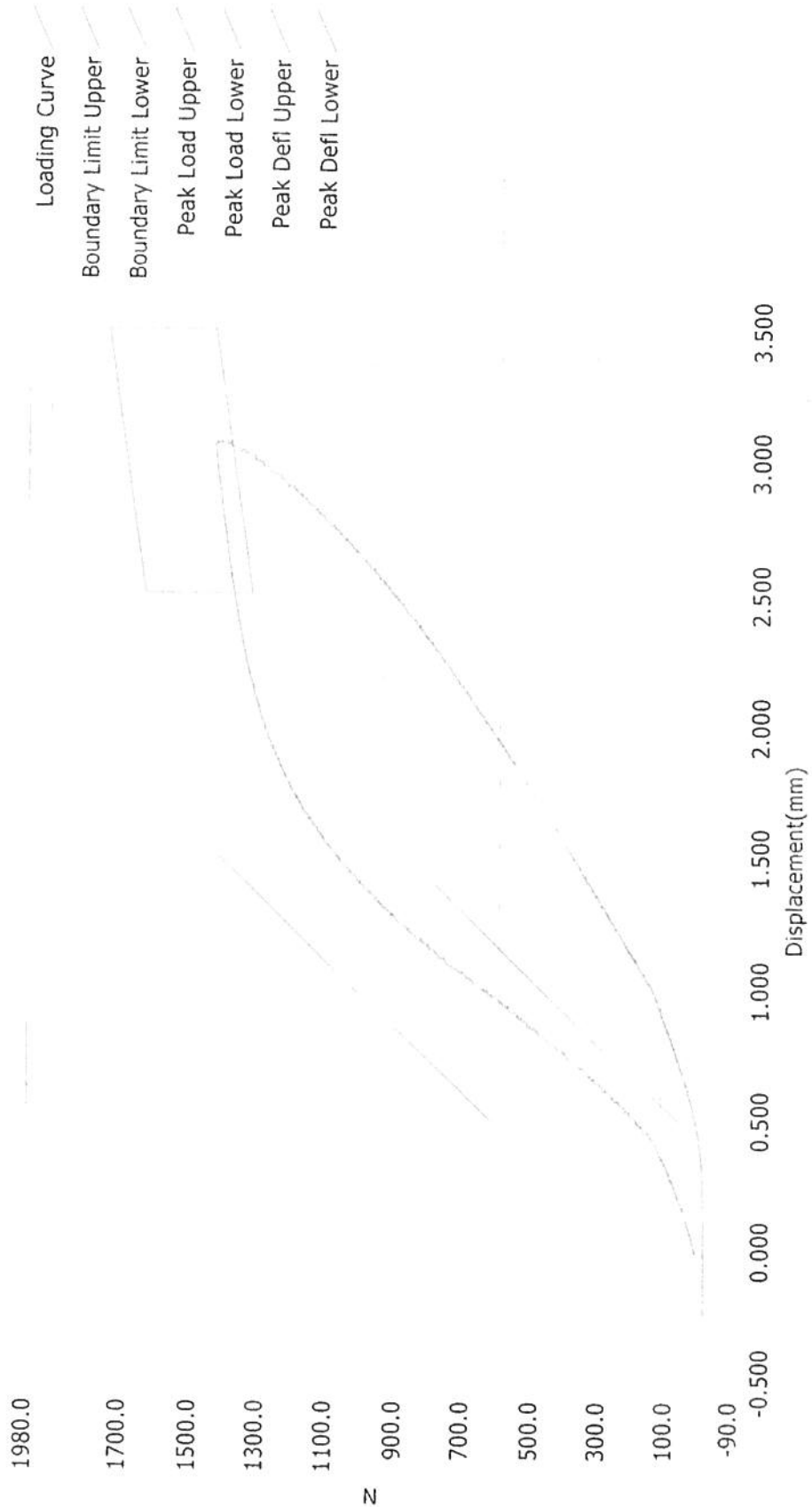
## ATD Calibration Lab

| Test ID | Part Serial Number | Test Date  | Test Time |
|---------|--------------------|------------|-----------|
|         | 47545              | 10/27/2011 | 7:15 PM   |
| Cert ID | ATD Serial Number  | ATD Type   |           |
|         | N/A                | SIDIIs     |           |

Current Date : 10/27/2011

Current Time : 19:41:08

Resultant Data - SIDIIs Plug Compression



ATD Calibration Lab

|                |                           |                  |                  |
|----------------|---------------------------|------------------|------------------|
| <u>Test ID</u> | <u>Part Serial Number</u> | <u>Test Date</u> | <u>Test Time</u> |
|                | 48236                     | 11/8/2011        | 2:04 AM          |
| <u>Cert ID</u> | <u>ATD Serial Number</u>  | <u>ATD Type</u>  |                  |
|                | N/A                       | SIDIIs           |                  |

Current Date : 11/8/2011

Current Time : 02:05:08

## **APPENDIX D**

### **TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA**

**Table 1 – Dummy Instrumentation (ES-2re)**

|                                        |         |    | ES-2re S/N 032 |              |                  |
|----------------------------------------|---------|----|----------------|--------------|------------------|
|                                        |         |    | Serial Number  | Manufacturer | Calibration Date |
| Head CG Accelerometers                 |         | X  | P72799         | Endevco      | 09/28/12         |
|                                        |         | Y  | P72800         | Endevco      | 09/28/12         |
|                                        |         | Z  | P72801         | Endevco      | 09/28/12         |
|                                        |         | Xr | P72802         | Endevco      | 09/28/12         |
|                                        |         | Yr | P72803         | Endevco      | 09/28/12         |
|                                        |         | Zr | P72804         | Endevco      | 09/28/12         |
| 9 Axis Head X                          |         | Y  | P75553         | Endevco      | 01/29/13         |
|                                        |         | Z  | P77579         | Endevco      | 01/29/13         |
| 9 Axis Head Y                          |         | X  | P77581         | Endevco      | 01/29/13         |
|                                        |         | Z  | P77610         | Endevco      | 01/24/13         |
| 9 Axis Head Z                          |         | X  | P77615         | Endevco      | 01/24/13         |
|                                        |         | Y  | P77616         | Endevco      | 01/24/13         |
| Thorax Rib Displacement Potentiometers | Upper   | Y  | G176           | Honeywell    | 10/19/12         |
|                                        | Middle  | Y  | G169           | Honeywell    | 10/19/12         |
|                                        | Lower   | Y  | G164           | Honeywell    | 10/19/12         |
| Abdomen Load Cells                     | Forward | Y  | ABG1513        | Denton       | 04/12/12         |
|                                        | Middle  | Y  | ABG1531        | Denton       | 04/12/12         |
|                                        | Rear    | Y  | ABG1536        | Denton       | 04/12/12         |
| Lower Spine Accelerometers (T12)       |         | X  | P77693         | Endevco      | 10/12/12         |
|                                        |         | Y  | P77714         | Endevco      | 10/12/12         |
|                                        |         | Z  | P77736         | Endevco      | 10/12/12         |
| Public Symphysis Load Cell             |         | Y  | PG462          | Denton       | 04/12/12         |

**Table 2 – Dummy Instrumentation (SID-IIs)**

|                                  |               |        | SID-IIs S/N 306 |              |                  |          |
|----------------------------------|---------------|--------|-----------------|--------------|------------------|----------|
|                                  |               |        | Serial Number   | Manufacturer | Calibration Date |          |
| Head CG Accelerometers           |               |        | X               | P78770       | Endevco          | 11/12/12 |
|                                  |               |        | Y               | P67771       | Endevco          | 11/12/12 |
|                                  |               |        | Z               | P78772       | Endevco          | 11/12/12 |
|                                  |               |        | Xr              | P78787       | Endevco          | 11/12/12 |
|                                  |               |        | Yr              | P78794       | Endevco          | 11/12/12 |
|                                  |               |        | Zr              | P78797       | Endevco          | 11/12/12 |
| 9 Axis Head X                    |               |        | Y               | P77644       | Endevco          | 01/29/13 |
|                                  |               |        | Z               | P77645       | Endevco          | 01/29/13 |
| 9 Axis Head Y                    |               |        | X               | P77646       | Endevco          | 01/29/13 |
|                                  |               |        | Z               | P77647       | Endevco          | 01/29/13 |
| 9 Axis Head Z                    |               |        | X               | P77648       | Endevco          | 01/29/13 |
|                                  |               |        | Y               | P77649       | Endevco          | 01/29/13 |
| Displacement Potentiometers      | Thoracic Rib  | Upper  | Y               | G1187        | FTSS             | 11/19/12 |
|                                  |               | Middle | Y               | G1261        | FTSS             | 11/19/12 |
|                                  |               | Lower  | Y               | G1270        | FTSS             | 11/19/12 |
|                                  | Abdominal Rib | Upper  | Y               | G1287        | FTSS             | 11/19/12 |
|                                  |               | Lower  | Y               | G1304        | FTSS             | 11/19/12 |
| Lower Spine Accelerometers (T12) |               |        | X               | P78801       | Endevco          | 11/12/12 |
|                                  |               |        | Y               | P78802       | Endevco          | 11/12/12 |
|                                  |               |        | Z               | P78803       | Endevco          | 11/12/12 |
| Acetabulum Load Cell             |               |        | Y               | ACG111       | FTSS             | 05/09/12 |
| Iliac Wing Load Cell             |               |        | Y               | IWG226       | FTSS             | 05/14/12 |
| Pelvis Plug (struck side)        |               |        |                 | 47545        | FTSS             | 10/27/11 |
| Pelvis Plug (non-struck side)    |               |        |                 | 48236        | FTSS             | 11/08/11 |

**Table 3 – Vehicle Instrumentation**

|    |                              |   | Serial Number | Manufacturer | Calibration Date |
|----|------------------------------|---|---------------|--------------|------------------|
| 1  | Vehicle Center of Gravity    | X | P66679        | Endevco      | 12/27/12         |
|    | Vehicle Center of Gravity    | Y | P66678        | Endevco      | 12/27/12         |
|    | Vehicle Center of Gravity    | Z | P66680        | Endevco      | 12/27/12         |
| 2  | Right Sill at Front Seat     | X | P77767        | Endevco      | 01/17/13         |
|    | Right Sill at Front Seat     | Y | P77768        | Endevco      | 01/17/13         |
|    | Right Sill at Front Seat     | Z | P77769        | Endevco      | 01/17/13         |
| 3  | Right Sill at Rear Seat      | X | P78922        | Endevco      | 11/02/12         |
|    | Right Sill at Rear Seat      | Y | P78923        | Endevco      | 11/02/12         |
|    | Right Sill at Rear Seat      | Z | P78924        | Endevco      | 11/02/12         |
| 4  | Left Sill at Front Door      | Y | P59273        | Endevco      | 10/08/12         |
| 5  | Left Sill at Rear Door       | Y | P67447        | Endevco      | 10/30/12         |
| 6  | Left A-Post Lower            | Y | P68860        | Endevco      | 01/04/13         |
| 7  | Left A-Post Middle           | Y | P68855        | Endevco      | 01/04/13         |
| 8  | Left B-Post Lower            | Y | P66803        | Endevco      | 01/04/13         |
| 9  | Left B-Post Middle           | Y | P63503        | Endevco      | 11/02/12         |
| 10 | Front Seat Track             | Y | P59405        | Endevco      | 01/04/13         |
| 11 | Rear Seat Track or Structure | Y | P63351        | Endevco      | 11/01/12         |
| 12 | Right Rear Occ. Compartment  | Y | P78881        | Endevco      | 11/03/12         |
| 13 | Engine Block                 | X | P59299        | Endevco      | 12/26/12         |
|    | Engine Block                 | Y | P59298        | Endevco      | 12/26/12         |
| 14 | Rear Floorpan Above Axle     | X | P59347        | Endevco      | 11/01/12         |
|    | Rear Floorpan Above Axle     | Y | P59345        | Endevco      | 11/01/12         |
|    | Rear Floorpan Above Axle     | Z | P59346        | Endevco      | 11/01/12         |

**Table 4 – MDB Instrumentation**

|                       |   | Serial Number | Manufacturer | Calibration Date |
|-----------------------|---|---------------|--------------|------------------|
| MDB Center of Gravity | X | P59379        | Endevco      | 12/26/12         |
| MDB Center of Gravity | Y | P59380        | Endevco      | 12/26/12         |
| MDB Center of Gravity | Z | P59381        | Endevco      | 12/26/12         |
| MDB Rear              | X | P66839        | Endevco      | 12/03/12         |
| MDB Rear              | Y | P66838        | Endevco      | 12/03/12         |