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Prepared by: Eric Peschman, Project Engineer
Date: November 7, 2011

Reviewed by: Michael Janovicz, Program Manager
Date: November 7, 2011

FINAL REPORT ACCEPTED BY:

Edward E. Chan

Date of Acceptance
Compliance tests were conducted on the subject 2011 Starcraft Quest School Bus, NHTSA No.: CB0902, in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-222-04 for the determination of FMVSS 222 compliance.

Test Failures: See Section 2, Test Data Summary. See Section 9, Laboratory Notice of Test Failure.
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<td>9 Laboratory Notice of Test Failure</td>
<td>137</td>
</tr>
</tbody>
</table>
SECTION 1
PURPOSE OF COMPLIANCE TEST

All tests were conducted on a 2011 Starcraft Quest School Bus, NHTSA No.: CB0902, in
accordance with the specifications of the Office of Vehicle Safety Compliance (OVSC) Test
Procedures TP-222-04 to determine compliance to the requirements of Federal Motor Vehicle

This program is sponsored by the National Highway Traffic Safety Administration (NHTSA),
under Contract No.: DTNH22-08-D-00075.
The passenger seating and crash protection tests were conducted from March 17, 2011 through August 30, 2011. All tests were conducted by MGA Research Corporation at the Wisconsin Operations. The test vehicle, a 2011 Starcraft Quest School Bus NHTSA No.: CB0902, does not appear to meet all the requirements of FMVSS 222. The test failures are listed below.

**FAILURE**

During the rearward seat back force deflection test for Seat No. S7, the seat reached the maximum allowable deflection of 254 mm before it absorbed 948 joules (316W joules) of energy. The total energy absorbed was 776 Joules. Another rearward seat back force deflection test was run on Seat No. S4 to confirm the results of S7 with similar results. The total energy absorbed by S4 was 820 Joules out of a required 948 Joules.
SECTION 2 (CONTINUED)
TEST DATA SUMMARY

LINEAR AND AREA MEASUREMENTS
Seat to seat/barrier spacing was checked on all seats and found to be 520 mm or less as shown on Data Sheet No. 1.

The seat back height and front surface area of Seat Nos. S1, S5, S6, and S10 were measured in accordance with Section 12.1 of OVSC TP-222-04. As shown in Data Sheet No. 2 for S1, S5, S6, and S10, the seat back area is greater than ninety percent of the seat bench width multiplied by 610.

The restraining barrier position and projected rear surface area of Barrier Nos. B1 and B10 were measured in accordance with OVSC TP-222-04. As shown in Data Sheet No. 3 for B1 and B10, the projected perimeters of the seats S1 and S10 fall completely within the perimeters of the restraining barriers B1 and B10.

SEAT CUSHION RETENTION
Seat No. S2 was tested in accordance with Section 12.3 of OVSC TP-222-04. Seat cushion weight was 24.9 N for S2. The target force for S2 was 124.5 N. For S2, the lower time limit boundary (t1) was approximately 5 seconds with approximate load duration of 11 seconds. As shown in Data Sheet No. 4, the seat cushion tested met all requirements.

SEAT BACK FORCE/DEFLECTION TEST - FORWARD
Seat No. S10 was tested in accordance with Section 12.4 of OVSC TP-222-04. Seat bench width was determined to be 1,000 mm for S10. “W” was calculated to be 3 for S10. The seating reference point (SRP) was 473 mm above the bus floor. The deflection of the seat back at conclusion of lower loading bar loading at 1,557W N load was 72 mm for S10. The allowable maximum deflection without moving the seat back to within 102 mm of another seat or restraining barrier was 356 mm. The seat back movement rate determined by the test engineer was 12.3 mm/sec. The test was stopped when the maximum 356 mm deflection was reached (actual deflection was 358 mm). The minimum required area under the force versus deflection curve of the upper loading bar was 452 W or 1,356 joules for S10. S10 only achieved 1,318 joules. As shown on Data Sheet No. 4, S10 does not meet the force deflection forward requirements.
SECTION 2 (CONTINUED)
TEST DATA SUMMARY

RESTRAINING BARRIER FORCE/DEFLECTION TEST
Barrier No. B1 was tested in accordance with Section 12.4 of OVSC TP-222-04. Seat bench width of the aft seat was determined to be 1,000 mm. “W” was calculated to be 3 for B1. The deflection of the restraining barrier at the conclusion of the lower loading bar loading at 1,557W was 85 mm. The maximum allowed deflection without moving the restraining barrier to within interference of door operation was 356 mm. The barrier movement rate determined by the test engineer was 12.4 mm/sec. The tests were stopped when the maximum deflection of 356 mm was reached for B1. The area under the force versus deflection curve of the upper loading bar was 1,442 joules. The minimum required area under the force versus deflection curve of the upper loading bar was 452 W or 1,356 joules. As shown on Data Sheet No. 6, B1 has met the force deflection requirements.

SEAT BACK FORCE/DEFLECTION TEST - REARWARD
Seat Nos. S7 and S4 were tested in accordance with Section 12.4 of OVSC TP-222-04. Seat bench width was determined to be 1,000 mm and “W” was calculated to be 3 for both seats. The allowable maximum deflection without moving the seat back to within 102 mm of another seat was 254 mm. The seat back movement rate determined by the test engineer was 8.7 mm/sec for S7 and S4. The location of the loading bar was 343 mm above the SRP. The test was stopped when the maximum deflection of the seat back of 254 mm was achieved for S7. The area under the force versus deflection curve of the loading bar was 776 joules for S7, and 820 joules for S7. The minimum required area under the force versus deflection curve of the loading bar was 316 W or 948 joules. As shown in Data Sheet No. 7, S7 and S4 did not meet the force deflection rearward requirements.

HEAD FORM IMPACT ZONE TESTS
Seat Nos. S3 and S8 were tested in accordance with Section 12.6 of OVSC TP-222-04. The mass of the head form was 5.21 kg. All head form contact area, impact energy, and head injury criteria were met for both S3 and S8. Data from these tests are presented in Data Sheet No. 8 and Data Sheet No.9.

KNEE FORM IMPACT ZONE TESTS
Seat Nos. S3 and S8 were tested in accordance with Section 12.7 of OVSC TP-222-04. The mass of the knee form was 4.53 kg. All knee form contact area criteria and impact energy criteria were met for both S3 and S8. Data from these tests are presented on Data Sheet No. 10.
### INCOMPLETE VEHICLE (IF APPLICABLE)

| Manufacturer: | Chevrolet |
| Make/Model:   | School Bus |
| VIN:          | 1GB3G3BG2B1112157 |
| Build Date:   | 11/10 |
| Certification Date: | 11/10 |

### COMPLETED VEHICLE (SCHOOL BUS)

| Manufacturer: | Forest River, Inc. |
| Year/Make/Model: | 2011 / Starcraft School Bus / Quest |
| VIN: | 1GB3G3BG2B1112157 |
| NHTSA No.: | CB0902 |
| Color: | Yellow |
| GVWR: | 5,579 kg / 12,300 lb |
| Build Date: | 10/10 |
| Certification Date: | 11/10 |

### DATES

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<th>Date:</th>
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<tr>
<td>Start of Compliance Test:</td>
<td>03/17/11</td>
</tr>
<tr>
<td>Completion of Compliance Test:</td>
<td>08/30/11</td>
</tr>
</tbody>
</table>

### TEST VEHICLE DISPOSITION


Compliance Test: All tests were performed in accordance with the references outlined in TP-222-04.

Recorded By: [Signature]

Approved By: [Signature] Date: 08/30/11
**GENERAL TEST DATA SHEET**

**Test Vehicle:** 2011 Starcraft Quest School Bus  
**NHTSA No.:** CB0902  
**Test Lab:** MGA Research Corporation  
**Test Dates:** 03/17/11 – 08/30/11

### SCHOOL BUS IDENTIFICATION

<table>
<thead>
<tr>
<th>Model Year/Mfr./Make/Model:</th>
<th>2011 / Starcraft Bus / Quest</th>
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</thead>
<tbody>
<tr>
<td>Passenger Capacity:</td>
<td>(1 Driver, 29 Passengers)</td>
</tr>
<tr>
<td>NHTSA No.:</td>
<td>CB0902</td>
</tr>
<tr>
<td>VIN:</td>
<td>1GB3G3BG2B1112157</td>
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<tr>
<td>Conventional or Forward Control:</td>
<td>Conventional</td>
</tr>
<tr>
<td>Wheel Base:</td>
<td>4026</td>
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<tr>
<td>GAWR (Certification Label) FRONT:</td>
<td>1,950 kg / 4,300 lb</td>
</tr>
<tr>
<td>GAWR (Certification Label) REAR:</td>
<td>3,901 kg / 8,600 lb</td>
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<tr>
<td>GVWR (Certification Label) TOTAL:</td>
<td>5,579 kg / 12,300 lb</td>
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</tbody>
</table>

### TEST CONDITIONS

<table>
<thead>
<tr>
<th>Date(s) of Test:</th>
<th>03/17/11 – 08/30/11</th>
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</thead>
<tbody>
<tr>
<td>Ambient Temperature (°C):</td>
<td>21°C</td>
</tr>
<tr>
<td>Required Temperature Range (°C):</td>
<td>0°C to 32°C</td>
</tr>
</tbody>
</table>

### SEAT IDENTIFICATION

<table>
<thead>
<tr>
<th>Seat Manufacturer:</th>
<th>The C.E. White Co.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model Name &amp; Number:</td>
<td></td>
</tr>
</tbody>
</table>

**Description of Seats:**  
Seat frames are constructed of 25.4 mm square and round welded steel tubing. The seat back is a steel pan welded to the tubing. The front of the seat is covered with 60 mm of soft foam. The rear of the seat back is covered with 25 mm Styrofoam and 25 mm of thick soft foam. The seat back vertical frame members are covered in 50 mm Styrofoam. The seat cushion is constructed of 8 mm plywood; which is 100 mm tapering to 75 mm seat foam. The seats are covered in 0.6 mm of vinyl.
SECTION 3
COMPLIANCE TEST DATA

The following data sheets document the results of testing on the 2011 Starcraft Quest School Bus, NHTSA No.: CB0902.
### DATA SHEET 1
#### SEAT TO SEAT/BARRIER SPACING

**Test Vehicle:** 2011 Starcraft Quest School Bus  
**NHTSA No.:** CB0902  
**Test Lab:** MGA Research Corporation  
**Test Dates:** 03/17/11 – 08/30/11

<table>
<thead>
<tr>
<th>Seat Number</th>
<th>Measurement of Spacing From SRP Forward to Seat/Barrier (mm)</th>
<th>Requirement ≤ 610 mm (≤ 24&quot;) Class 1 Buses Only</th>
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</thead>
<tbody>
<tr>
<td>S1</td>
<td>490</td>
<td>PASS</td>
</tr>
<tr>
<td>S2</td>
<td>500</td>
<td>PASS</td>
</tr>
<tr>
<td>S3</td>
<td>495</td>
<td>PASS</td>
</tr>
<tr>
<td>S4</td>
<td>475</td>
<td>PASS</td>
</tr>
<tr>
<td>S5</td>
<td>465</td>
<td>PASS</td>
</tr>
<tr>
<td>S6</td>
<td>520</td>
<td>PASS</td>
</tr>
<tr>
<td>S7</td>
<td>510</td>
<td>PASS</td>
</tr>
<tr>
<td>S8</td>
<td>510</td>
<td>PASS</td>
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<tr>
<td>S9</td>
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<td>PASS</td>
</tr>
<tr>
<td>S10</td>
<td>515</td>
<td>PASS</td>
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</tbody>
</table>

**Comments:** None

**Recorded By:** 

**Approved By:** Michael January  
**Date:** 03/17/11
DATA SHEET 2
SEAT BACK HEIGHT AND FRONT SURFACE AREA TEST

Test Vehicle: 2011 Starcraft Quest School Bus
NHTSA No.: CB0902
Test Lab: MGA Research Corporation
Test Dates: 03/17/11 – 08/30/11

SEAT NUMBER: S1

1. Maximum vertical height of the seat back above the SRP = 611 mm

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>Is item 1 &gt; 610 mm? (S5.1.2) Yes – Pass; No – Fail</td>
<td>PASS</td>
</tr>
</tbody>
</table>

3. Maximum transverse width of the seat cushion (W1) = 1,000 mm
4. Calculate the following: \(0.75 \times W1 = 750\) mm
5. Calculate the following: \(0.9 \times W1 \times 610 \text{ mm} = 549,000 \text{ mm}^2\)
6. Project the front surface of the seat back onto a vertical transverse plane. Measure the projected surface area that falls between:
   - A horizontal plane that passes through the SRP and a horizontal plane 610 mm above the SRP; and
   - A vertical longitudinal plane that passes through the inboard-most point of the seat cushion and a vertical longitudinal plane that passes through the outboard-most point of the seat cushion.

Use the following for a typical trapezoidal shape:

6.1 Seat back width at 610 mm above the SRP height (A) = 895 mm
6.2 Seat back width at the SRP height (B) = 960 mm
6.3 Area = \(\frac{1}{2} (A+B) \times 610 \text{ mm} = 565,775 \text{ mm}^2\)

<table>
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<th></th>
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<tr>
<td>7.</td>
<td>Is item 6.1 &gt; item 4? (S5.1.2) Yes – Pass; No – Fail</td>
<td>PASS</td>
</tr>
<tr>
<td>8.</td>
<td>Is item 6.3 &gt; item 5? (S5.1.2) Yes – Pass; No – Fail</td>
<td>PASS</td>
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</tbody>
</table>

Comments: None

Recorded By: 
Approved By: Michael Janczy Date: 03/18/11
DATA SHEET 2
SEAT BACK HEIGHT AND FRONT SURFACE AREA TEST

Test Vehicle: 2011 Starcraft Quest School Bus  
NHTSA No.: CB0902  
Test Lab: MGA Research Corporation  
Test Dates: 03/17/11 – 08/30/11

SEAT NUMBER: S5

1. Maximum vertical height of the seat back above the SRP = 612 mm

<table>
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<tbody>
<tr>
<td>2. Is item 1 &gt; 610 mm? (S5.1.2) Yes – Pass; No – Fail</td>
<td>PASS</td>
</tr>
</tbody>
</table>

3. Maximum transverse width of the seat cushion (W1) = 760 mm
4. Calculate the following: 0.75 x W1 = 570 mm
5. Calculate the following: 0.9 x W1 x 610 mm = 417,240 mm²
6. Project the front surface of the seat back onto a vertical transverse plane. Measure the projected surface area that falls between:
   - A horizontal plane that passes through the SRP and a horizontal plane 610 mm above the SRP; and
   - A vertical longitudinal plane that passes through the inboard-most point of the seat cushion and a vertical longitudinal plane that passes through the outboard-most point of the seat cushion.

   Use the following for a typical trapezoidal shape:

6.1 Seat back width at 610 mm above the SRP height (A) = 670 mm
6.2 Seat back width at the SRP height (B) = 750 mm
6.3 Area = \( \frac{1}{2} (A+B) \times 610 \text{ mm} = 433,100 \text{ mm}^2 \)

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<td>PASS</td>
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<tr>
<td>8. Is item 6.3 &gt; item 5? (S5.1.2) Yes – Pass; No – Fail</td>
<td>PASS</td>
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</tbody>
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Comments: None

Recorded By:  
Approved By: Michael 
Date: 03/18/11
DATA SHEET 2
SEAT BACK HEIGHT AND FRONT SURFACE AREA TEST

Test Vehicle: 2011 Starcraft Quest School Bus
NHTSA No.: CB0902
Test Lab: MGA Research Corporation
Test Dates: 03/17/11 – 08/30/11

SEAT NUMBER: S6

1. Maximum vertical height of the seat back above the SRP = 612 mm

<table>
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<th>PASS/FAIL</th>
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</thead>
<tbody>
<tr>
<td>2. Is item 1 &gt; 610 mm? (S5.1.2) Yes – Pass; No – Fail</td>
<td>PASS</td>
</tr>
</tbody>
</table>

2. Maximum transverse width of the seat cushion (W1) = 770 mm
4. Calculate the following: 0.75 x W1 = 578 mm
5. Calculate the following: 0.9 x W1 x 610 mm = 422,730 mm²
6. Project the front surface of the seat back onto a vertical transverse plane. Measure the projected surface area that falls between:
   - A horizontal plane that passes through the SRP and a horizontal plane 610 mm above the SRP; and
   - A vertical longitudinal plane that passes through the inboard-most point of the seat cushion and a vertical longitudinal plane that passes through the outboard-most point of the seat cushion.

Use the following for a typical trapezoidal shape:
6.1 Seat back width at 610 mm above the SRP height (A) = 690 mm
6.2 Seat back width at the SRP height (B) = 750 mm
6.3 Area = ½ (A+B) x 610 mm = 439,200 mm²

<table>
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<td>7. Is item 6.1 &gt; item 4? (S5.1.2) Yes – Pass; No – Fail</td>
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<td>8. Is item 6.3 &gt; item 5? (S5.1.2) Yes – Pass; No – Fail</td>
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</table>

Comments: None

Recorded By: [Signature]
Approved By: [Signature]  Date: 03/18/11
DATA SHEET 2
SEAT BACK HEIGHT AND FRONT SURFACE AREA TEST

Test Vehicle: 2011 Starcraft Quest School Bus  NHTSA No.: CB0902
Test Lab: MGA Research Corporation  Test Dates: 03/17/11 – 08/30/11

SEAT NUMBER: S10

1. Maximum vertical height of the seat back above the SRP = 611 mm

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<tr>
<td>2.</td>
<td>Is item 1 &gt; 610 mm? (S5.1.2) Yes – Pass; No – Fail</td>
<td>PASS</td>
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</tbody>
</table>

3. Maximum transverse width of the seat cushion (W1) = 1,000 mm
4. Calculate the following: 0.75 x W1 = 750 mm
5. Calculate the following: 0.9 x W1 x 610 mm = 549,000 mm²
6. Project the front surface of the seat back onto a vertical transverse plane. Measure the projected surface area that falls between:
   • A horizontal plane that passes through the SRP and a horizontal plane 610 mm above the SRP; and
   • A vertical longitudinal plane that passes through the inboard-most point of the seat cushion and a vertical longitudinal plane that passes through the outboard-most point of the seat cushion.
   Use the following for a typical trapezoidal shape:
   6.1 Seat back width at 610 mm above the SRP height (A) = 905 mm
   6.2 Seat back width at the SRP height (B) = 970 mm
   6.3 Area = ½ (A+B) x 610 mm = 571,875 mm²

<table>
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<td>PASS</td>
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Comments: None

Recorded By: [Signature]

Approved By: [Signature]  Date: 03/18/11
DATA SHEET 3
RESTRAINING BARRIER POSITION AND PROJECTED REAR SURFACE AREA

Test Vehicle: 2011 Starcraft Quest School Bus  
NHTSA No.: CB0902
Test Lab: MGA Research Corporation  
Test Dates: 03/17/11 – 08/30/11

BARRIER NUMBER: B1

1. Measure the distance (X) from SRP of seat immediately aft of barrier in a horizontal longitudinal line forward to barrier. X = 515 mm.

2. Is distance X ≤ 610 mm? (S5.2) Yes – Pass; No – Fail  
   PASS

3. Measure distance U at inboard (i) and outboard (o) side of barrier.  
   U_i = 360 mm  
   U_o = 360 mm

4. Measure distance V at inboard (i) and outboard (o) sides of seat.  
   V_i = 473 mm  
   V_o = 473 mm

5. Is U_i ≤ V_i? Yes – Pass; No – Fail  
   PASS

6. Is U_o ≤ V_o? Yes – Pass; No – Fail  
   PASS

7. Maximum vertical height of the barrier above the SRP of the seat located immediately rearward of the barrier (S) = 661 mm

8. Is item 7 > 610 mm? (S5.2 & S5.1.2) Yes – Pass; No – Fail  
   PASS

9. Maximum transverse width of the seat cushion of the seat immediately rearward of the barrier (W1) = 1,000 mm

10. Calculate the following: Calculate the following: 0.75 x W1 = 750 mm

11. Calculate the following: 0.9 x W1 x 610 mm = 549,000 mm²
12. Project the front surface of the barrier onto a vertical transverse plane. Measure the projected surface area (± 2%) that falls between the following planes, which are determined relative to the seat located immediately rearward of the barrier:

- A horizontal plane that passes through the SRP and a horizontal plane 610 mm above the SRP; and
- A vertical longitudinal plane that passes through the inboard-most point of the seat cushion and a vertical longitudinal plane that passes through the outboard-most point of the seat cushion.

Use the following for a typical trapezoidal shape:

12.1 Seat back width at 610 mm above the SRP height (A) = 890 mm
12.2 Seat back width at the SRP height (B) = 970 mm
12.3 Area = ½ (A+B) x 610 mm = 567,300 mm²

<table>
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Comments: None

Recorded By: 

Approved By: Michael Janisz

Date: 03/18/11
DATA SHEET 3
RESTRAINING BARRIER POSITION AND PROJECTED REAR SURFACE AREA

Test Vehicle: 2011 Starcraft Quest School Bus
NHTSA No.: CB0902
Test Lab: MGA Research Corporation
Test Dates: 03/17/11 – 08/30/11

BARRIER NUMBER: B10

1. Measure the distance (X) from SRP of seat immediately aft of barrier in a horizontal longitudinal line forward to barrier. X = 523 mm.

2. Is distance X ≤ 610 mm? (S5.2) Yes – Pass; No – Fail

3. Measure distance U at inboard (i) and outboard (o) side of barrier.
   U_i = 360 mm   U_o = 360 mm

4. Measure distance V at inboard (i) and outboard (o) sides of seat.
   V_i = 473 mm   V_o = 473 mm

5. Is U_i < V_i? Yes – Pass; No – Fail

6. Is U_o < V_o? Yes – Pass; No – Fail

7. Maximum vertical height of the barrier above the SRP of the seat located immediately rearward of the barrier (S) = 665 mm

8. Is item 7 > 610 mm? (S5.2 & S5.1.2) Yes – Pass; No – Fail

9. Maximum transverse width of the seat cushion of the seat immediately rearward of the barrier (W1) = 1,000 mm

10. Calculate the following: Calculate the following: 0.75 x W1 = 750 mm

11. Calculate the following: 0.9 x W1 x 610 mm = 549,000 mm^2
12. Project the front surface of the barrier onto a vertical transverse plane. Measure the projected surface area (± 2%) that falls between the following planes, which are determined relative to the seat located immediately rearward of the barrier:

- A horizontal plane that passes through the SRP and a horizontal plane 610 mm above the SRP; and
- A vertical longitudinal plane that passes through the inboard-most point of the seat cushion and a vertical longitudinal plane that passes through the outboard-most point of the seat cushion.

Use the following for a typical trapezoidal shape:

12.1 Seat back width at 610 mm above the SRP height (A) = 896 mm
12.2 Seat back width at the SRP height (B) = 980 mm
12.3 Area = \( \frac{1}{2} \times (A+B) \times 610 \text{ mm} = 572,180 \text{ mm}^2 \)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>13. Is item 12.1 &gt; item 10? (S5.1.2) Yes – Pass; No – Fail</td>
<td></td>
<td>PASS</td>
</tr>
<tr>
<td>14. Is item 12.3 &gt; item 11? (S5.1.2) Yes – Pass; No – Fail</td>
<td></td>
<td>PASS</td>
</tr>
</tbody>
</table>

Comments: None

Recorded By: [Signature]

Approved By: [Signature] Date: 03/18/11
DATA SHEET 4
SEAT CUSHION LATCHING AND RETENTION TEST

Test Vehicle: 2011 Starcraft Quest School Bus  NHTSA No.: CB0902
Test Lab: MGA Research Corporation  Test Dates: 03/17/11 – 08/30/11

SEAT NUMBER: S2

1. Is the passenger seat cushion designed to be removable without tools or to flip up?
   Yes

   1.1. Is the seat equipped with a self-latching mechanism?
   (S5.1.5 (a)) Yes – Pass; No – Fail
   PASS

2. Cushion Weight = 24.9 N
3. Cushion Weight x 5 = F = 124.5 N (S5.1.5 (b))
4. Complete the following force/time graph:

<table>
<thead>
<tr>
<th>TIME, SECONDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>t1 = 5 sec.</td>
</tr>
<tr>
<td>t2 = 11 sec.</td>
</tr>
</tbody>
</table>

   F must be 5 x Cushion Weight; t1 and t2 must be according to the following expressions:
   1 sec. < t1 < 5 sec. (+1.0 sec. and -0.0 sec.)
   t2 = t1 + 5sec. (+1.0 sec. and -0.0 sec.)

5. Did seat cushion separate from the seat structure at any attachment point? (S5.1.5 (b)) Yes – Fail; No – Pass
   PASS

Describe Seat Cushion Attachments: Two fixed clips at leading edge and two rotating clips at rear edge.

Comments: None

Recorded By: [Signature]

Approved By: [Signature]  Date: 07/13/11
DATA SHEET 5
SEAT BACK FORCE DEFLECTION TEST - FORWARD

Test Vehicle: 2011 Starcraft Quest School Bus
Test Lab: MGA Research Corporation
NHTSA No.: CB0902
Test Dates: 03/17/11 – 08/30/11

SEAT NUMBER: S10

1. Seat Bench Width = 1,000 mm
   \[ W = \frac{\text{Seat Bench Width}}{381} \text{ mm (round to nearest whole number)} = (3) \]

2. Seat Reference Point (SRP) location is: (Description of location as supplied by the COTR): 473 mm Above Floor, 0 mm from center

3. Location of lower loading bar is 0 mm above the SRP.
   (Requirement: Between 102 mm above and 102 mm below the SRP) (S5.1.3.1)
   Length of lower loading bar = 876 mm
   Seat Back width at SRP = 970 mm
   (Loading Bar Length = Seat Back Width – 102 mm, +13, -6.3)

4. Include x-y plot of Force vs. Time for the lower loading bar.

5. Deflection of the seat back at conclusion of lower bar loading (1,557W position) = 72 mm.

6. Maximum deflection allowed without moving the seat back to within 102 mm of another seat or restraining barrier = 356 mm (must be 356 mm of less) (S5.1.3)

7. Seat back movement rate selected by the test engineer = 12.3 mm/sec

8. Location of upper loading bar is in a horizontal plane 406 mm above the SRP.
   (Requirement: 406 mm) (S5.1.3.3).
   Upper Loading Bar Length = 839 mm
   Seat back width at 406 mm above the SRP height = 940 mm
   (Loading Bar Length = Seat Back Width – 102 mm, +13, -6.3)

9. Reason for stopping seat back deflection:
   ___ Reached deflection determined in Item 5 above (if less than 356 mm)
   \textbf{X} Reached 356 mm maximum allowed deflection (Actual deflection was 358 mm)
   ___ Force exceeded 10,676 N
   ___ Separation was about to occur

10. Include the x-y plot of force vs. deflection for the upper loading bar with boundaries of Figure 14 (OVSC TP-222) superimposed.

11. Is the seat in its final deflected position within 102 mm of the next seat or barrier? Yes – Fail; No – Pass

<table>
<thead>
<tr>
<th></th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.</td>
<td>PASS</td>
</tr>
</tbody>
</table>
### DATA SHEET 5 (CONTINUED)
### SEAT BACK FORCE DEFLECTION TEST – FORWARD

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.</td>
<td>Does the forward force vs. deflection trace of the seat back lie within the unshaded area? (S5.1.3) Yes – Pass; No – Fail</td>
<td>PASS</td>
</tr>
<tr>
<td>13.</td>
<td>Include a deflection vs. time plot for the upper loading bar.</td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>The area within the force vs. deflection curve = 1,318 joules N-m</td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>452(\cdot)W = 1,356 joules N-m (S5.1.3.4)</td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>Is item 14 &gt; item 15? (S5.1.3.4) Yes – Pass; No – Fail</td>
<td>FAIL</td>
</tr>
</tbody>
</table>

**Comments:** Data indicates possible non-compliance. At the direction of the COTR, no formal Laboratory Notice of Test Failure will be issued.

Recorded By: [Signature]

Approved By: [Signature] Date: 05/24/11
DATA SHEET 6
RESTRAINING BARRIER FORCE/DEFLECTION TEST

Test Vehicle: 2011 Starcraft Quest School Bus
NHTSA No.: CB0902
Test Lab: MGA Research Corporation
Test Dates: 03/17/11 – 08/30/11

BARRIER NUMBER: B1

1. Seat cushion width of seat immediately rearward of restraining barrier = 1,000 mm
   \[ W = \text{(Seat Cushion Width)}/381 \text{ mm (round to nearest whole number)} = (3) \]

2. Location of SRP of seat rearward of restraining barrier is: (Description of location as supplied by the manufacturer): 473 mm Above Floor.

3. Location of lower loading bar is 0 mm above/below the SRP.
   (Requirement: between 102 mm above and 102 mm below the SRP) (S5.1.3.1)
   Length of loading bar = 876 mm
   Width of barrier at SRP = 973 mm
   (Loading Bar Length = Seat Back Width – 102 mm, +13, -6.3)

4. Include the x-y plot of force vs. time for the lower loading bar.

5. Deflection of the barrier at the conclusion of lower bar loading (1,557W position) = 85 mm.

6. Maximum deflection allowed without moving the restraining barrier to within interference of door operation = 356 mm (must be 356 mm or less).

7. Barrier movement rate selected by the test engineer = 12.4 mm/sec

8. Location of upper loading bar is in a horizontal plane 406 mm above the SRP.
   (Requirement: 406 mm) (S5.1.3.3)
   Upper loading bar length = 839 mm
   Barrier width at 406 mm above the SRP height = 940 mm
   (Loading Bar Length = Seat Back Width – 102 mm, +13, -6.3)

9. Reason for stopping restraining barrier deflection:
   
   – Reached 356 mm maximum
   – Force exceeded 10,676 N
   – Separation was about to occur
   – Interference with door operation

10. Maximum deflection of barrier 356 mm.
   (Requirement: maximum allowed is 356 mm) (S5.2.3 (b))

| 11. | Does the restraining barrier interfere with the normal operation of the door? (S5.2.3 (c)) Yes – Fail; No – Pass | PASS |

PASS/FAIL
RESTRAINING BARRIER FORCE/DEFLECTION TEST

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>12.</strong></td>
<td>Did any separation of barrier component or the separation of the barrier from the vehicle occur? (S5.1.3 (d) &amp; (e)) Yes – Fail; No – Pass</td>
<td><strong>PASS</strong></td>
</tr>
</tbody>
</table>

13. Include the x-y plot of force vs. deflection for the upper loading bar with boundaries of Figure 14 (OVSC TP-222) superimposed.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>14.</strong></td>
<td>Does the forward force vs. deflection trace of the barrier back lie within the unshaded area? (S5.2.3(a)) Yes – Pass; No – Fail</td>
<td><strong>PASS</strong></td>
</tr>
</tbody>
</table>

15. Include a deflection vs. time plot for the upper loading bar.

16. The area within the force vs. deflection curve = 1,442 joules N-m

17. 452W = 1,356 joules N-m (S5.2.3) (S5.1.3.4)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>18.</strong></td>
<td>Is item 16 &gt; item 17? Yes – Pass; No – Fail</td>
<td><strong>PASS</strong></td>
</tr>
</tbody>
</table>

Comments: None

Recorded By: [Signature]

Approved By: [Signature] Date: 05/26/11
SEAT NUMBER: S7

1. Seat bench width = 1,000 mm
   
   \[ W = \frac{\text{Seat Cushion Width}}{381} \text{ mm (round to nearest whole number)} = (3) \]

2. Location of the loading bar is in a horizontal plane 343 mm above the SRP of the test seat. (Requirement: 343 mm above SRP) (S5.1.4.1)
   
   Loading bar length = 825 mm
   
   Seat back width at 343 mm above the SRP height = 927 mm
   
   \[ \text{(Loading Bar Length} = \text{Seat Back Width} - 102 \text{ mm, } +13, -6.3) \]

3. Deflection of the seat back at 222 N preload = 21.7 mm

4. Maximum deflection allowed without moving the seat back to within 102 mm of another seat = 254 mm (maximum allowed + 254 mm) (S5.1.4)

5. Seat back movement rate selected by the test engineer = 8.7 mm/sec

6. Reason for stopping deflection:
   
   - Reached deflection determined in item 4 above
   - Reached 254 mm maximum allowed deflection
   - Force exceeded 9,786 N
   - Separation was about to occur

7. Include the x-y plot of force vs. deflection for the loading bar with the boundaries of Figure 18 (OVSC TP-222) superimposed.

   **PASS**

8. Does the force vs. deflection plot lie within the boundaries of Figure 18 (OVSC TP-222)? Yes – Pass; No – Fail
   
   **PASS**

9. Include a deflection vs. time plot for the loading bar.

10. \[ 316W = 948 \text{ joules N-m} \]

11. The area within the force vs. deflection curve = 776 joules N-m

   **FAIL**

12. Is item 11 > item 10? (S5.1.4.2) Yes – Pass; No – Fail

   **FAIL**

Comments: None

Recorded By: [Signature]

Approved By: [Signature] Date: 07/08/11
Test Vehicle: 2011 Starcraft Quest School Bus
Test Lab: MGA Research Corporation
NHTSA No.: CB0902
Test Dates: 03/17/11 – 08/30/11

SEAT NUMBER: S4

1. Seat bench width = 1,000 mm
   \[ W = \frac{\text{Seat Cushion Width}}{381} \text{ mm} \text{ (round to nearest whole number)} = (3) \]

2. Location of the loading bar is in a horizontal plane 343 mm above the SRP of the test seat. (Requirement: 343 mm above SRP) (S5.1.4.1)
   Loading bar length = 851 mm
   Seat back width at 343 mm above the SRP height = 928 mm
   (Loading Bar Length = Seat Back Width – 102 mm, +13, -6.3)

3. Deflection of the seat back at 222 N preload = 22.2 mm

4. Maximum deflection allowed without moving the seat back to within 102 mm of another seat = 254 mm (maximum allowed + 254 mm) (S5.1.4)

5. Seat back movement rate selected by the test engineer = 8.7 mm/sec

6. Reason for stopping deflection:
   ___ Reached deflection determined in item 4 above
   ___ Reached 254 mm maximum allowed deflection
   ___ Force exceeded 9,786 N
   ___ Separation was about to occur

7. Include the x-y plot of force vs. deflection for the loading bar with the boundaries of Figure 18 (OVSC TP-222) superimposed.

<table>
<thead>
<tr>
<th>Does the force vs. deflection plot lie within the boundaries of Figure 18 (OVSC TP-222) Yes – Pass; No – Fail</th>
<th>PASS</th>
</tr>
</thead>
</table>

8. Include a deflection vs. time plot for the loading bar.

9. 316W = 948 joules N-m

10. 316W = 948 joules N-m

11. The area within the force vs. deflection curve = 820 joules N-m

<table>
<thead>
<tr>
<th>Is item 11 &gt; item 10? (S5.1.4.2) Yes – Pass; No – Fail</th>
<th>FAIL</th>
</tr>
</thead>
</table>

Comments: This test was performed to confirm the failure of Seat S7.
1. Locate x-y reference point on sketch above for head form impact locations. (Label the positive and negative directions, if applicable)
2. Identify head form impact location on sketch by placing H1, H2, H3, H4, H5, H6, and H7 in the appropriate location.
3. Define the plane of reference for head form impact angle:
   0° = Parallel with Floor, (+) is Up, (-) is Down
   X = From Inboard Edge of Seat
   Y = Measured Vertically from the SRP
DATA SHEET 8 (CONTINUED)
HEAD FORM IMPACT CONTACT AREA REQUIREMENT

4. Complete the following table:

<table>
<thead>
<tr>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)*</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head Impact &amp; Test #</td>
<td>Location</td>
<td>Speed Trap Impact Velocity** mps</td>
<td>Derived Velocity mps</td>
<td>Contact Area (CA) mm²</td>
<td>CA ≥ 1935 mm²</td>
<td>Yes-</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>Y</td>
<td>Angle</td>
<td></td>
<td></td>
<td>PASS</td>
</tr>
<tr>
<td>H1</td>
<td>-747</td>
<td>486</td>
<td>0°</td>
<td>1.58</td>
<td>1.87</td>
<td>4,130</td>
</tr>
<tr>
<td>H2</td>
<td>-640</td>
<td>486</td>
<td>0°</td>
<td>1.59</td>
<td>1.49</td>
<td>3,870</td>
</tr>
<tr>
<td>H3</td>
<td>-532</td>
<td>487</td>
<td>0°</td>
<td>1.60</td>
<td>1.98</td>
<td>3,640</td>
</tr>
<tr>
<td>H4</td>
<td>-424</td>
<td>487</td>
<td>0°</td>
<td>1.60</td>
<td>1.25</td>
<td>3,830</td>
</tr>
<tr>
<td>H5</td>
<td>-770</td>
<td>357</td>
<td>0°</td>
<td>1.59</td>
<td>1.47</td>
<td>4,400</td>
</tr>
<tr>
<td>H6</td>
<td>-664</td>
<td>357</td>
<td>0°</td>
<td>1.59</td>
<td>1.21</td>
<td>2,640</td>
</tr>
<tr>
<td>H7</td>
<td>-557</td>
<td>357</td>
<td>0°</td>
<td>1.60</td>
<td>2.04</td>
<td>2,680</td>
</tr>
</tbody>
</table>

* Contact Velocity from Item 7 below
** Velocity Range = 1.52 mps, +0.08, -0 mps

5. Attach Contact Area Prints.
6. Attach acceleration versus time plots for each impact.
7. Integrate the acceleration versus time plots and attach plots of the results that show velocity versus time.

Comments: All measurements are referenced to the point where the horizontal plane through the SRP intersects the vertical line tangent to the inboard edge at the seat. In the case of Seat No. S3, the inboard edge of the seat is on the right hand side of the seat as viewed from the rear.

Recorded By: [Signature]

Approved By: [Signature] Date: 04/20/11
DATA SHEET 8
HEAD FORM IMPACT CONTACT AREA REQUIREMENT

Test Vehicle: 2011 Starcraft Quest School Bus  NHTSA No.: CB0902
Test Lab: MGA Research Corporation  Test Dates: 03/17/11 – 08/30/11

SEAT NUMBER: S8

REAR SURFACE

1. Locate x-y reference point on sketch above for head form impact locations. (Label the positive and negative directions, if applicable)
2. Identify head form impact location on sketch by placing H1, H2, H3, H4, H5, and H6 in the appropriate location.
3. Define the plane of reference for head form impact angle:
   $0^\circ = \text{Parallel with Floor, (+) is Up, (-) is Down}$
   $X = \text{From Inboard Edge of Seat}$
   $Y = \text{Measured Vertically from the SRP}$
4. Complete the following table:

<table>
<thead>
<tr>
<th>Head Impact &amp; Test #</th>
<th>Location</th>
<th>Speed Trap Impact Velocity** mps</th>
<th>Derived Velocity mps</th>
<th>Contact Area (CA) mm^2</th>
<th>CA ≥ 1935 mm^2</th>
<th>Yes-PASS</th>
<th>No-FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>X=459</td>
<td>Y=482</td>
<td>0º</td>
<td>1.60</td>
<td>1.59</td>
<td>3,940</td>
<td>PASS</td>
</tr>
<tr>
<td>H2</td>
<td>X=575</td>
<td>Y=485</td>
<td>0º</td>
<td>1.58</td>
<td>1.41</td>
<td>3,950</td>
<td>PASS</td>
</tr>
<tr>
<td>H3</td>
<td>X=685</td>
<td>Y=485</td>
<td>0º</td>
<td>1.58</td>
<td>1.74</td>
<td>3,980</td>
<td>PASS</td>
</tr>
<tr>
<td>H4</td>
<td>X=453</td>
<td>Y=335</td>
<td>0º</td>
<td>1.58</td>
<td>1.69</td>
<td>2,530</td>
<td>PASS</td>
</tr>
<tr>
<td>H5</td>
<td>X=551</td>
<td>Y=335</td>
<td>0º</td>
<td>1.59</td>
<td>1.66</td>
<td>2,480</td>
<td>PASS</td>
</tr>
<tr>
<td>H6</td>
<td>X=665</td>
<td>Y=336</td>
<td>0º</td>
<td>1.59</td>
<td>1.50</td>
<td>2,660</td>
<td>PASS</td>
</tr>
</tbody>
</table>

* Contact Velocity from Item 7 below
** Velocity Range = 1.52 mps, +0.08, -0 mps

5. Attach Contact Area Prints.
6. Attach acceleration versus time plots for each impact.
7. Integrate the acceleration versus time plots and attach plots of the results that show velocity versus time.

Comments: All measurements are referenced to the point where the horizontal plane through the SRP intersects the vertical line tangent to the inboard edge at the seat. In the case of Seat No. S8, the inboard edge of the seat is on the right hand side of the seat as viewed from the rear.

Recorded By: [Signature]

Approved By: [Signature] Date: 04/25/11
TEST VEHICLE: 2011 Starcraft Quest School Bus
NHTSA No.: CB0902
TEST LAB: MGA Research Corporation
TEST DATES: 03/17/11 – 08/30/11

SEAT NUMBER: S3

REAR SURFACE

1. Locate x-y reference point on sketch above for head form impact locations. (Label the positive and negative directions, if applicable)
2. Identify head form impact location on sketch by placing H8, H9, H10, H11, H12, H13 and H14 in the appropriate location.
3. Define the plane of reference for head form impact angle:
   0° = Parallel with Floor, (+) is Up, (-) is Down
   X = From Inboard Edge of Seat
   Y = Measured Vertically from the SRP
4. Complete the following table:

<table>
<thead>
<tr>
<th>Head impact &amp; Test #</th>
<th>Location</th>
<th>Speed Trap Impact Velocity ** mps</th>
<th>Derived Velocity ** mps</th>
<th>Max HIC</th>
<th>Energy Req’d joules</th>
<th>Column 5 &lt; 1000</th>
<th>Column 6 &gt; 4.5 joules</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>Y</td>
<td>Angle</td>
<td></td>
<td></td>
<td>Yes-PASS</td>
<td>No-FAIL</td>
</tr>
<tr>
<td>H8</td>
<td>-450</td>
<td>357</td>
<td>0º</td>
<td>6.66</td>
<td>6.75</td>
<td>114</td>
<td>11.83</td>
</tr>
<tr>
<td>H9</td>
<td>-341</td>
<td>357</td>
<td>0º</td>
<td>6.63</td>
<td>6.76</td>
<td>102</td>
<td>12.23</td>
</tr>
<tr>
<td>H10</td>
<td>-235</td>
<td>357</td>
<td>0º</td>
<td>6.65</td>
<td>6.81</td>
<td>84</td>
<td>14.02</td>
</tr>
<tr>
<td>H11</td>
<td>-127</td>
<td>356</td>
<td>0º</td>
<td>6.66</td>
<td>6.76</td>
<td>152</td>
<td>10.85</td>
</tr>
<tr>
<td>H12</td>
<td>-113</td>
<td>484</td>
<td>0º</td>
<td>6.66</td>
<td>6.77</td>
<td>117</td>
<td>8.29</td>
</tr>
<tr>
<td>H13</td>
<td>-208</td>
<td>485</td>
<td>0º</td>
<td>6.63</td>
<td>6.79</td>
<td>101</td>
<td>9.32</td>
</tr>
<tr>
<td>H14</td>
<td>-315</td>
<td>488</td>
<td>0º</td>
<td>6.65</td>
<td>6.80</td>
<td>104</td>
<td>9.02</td>
</tr>
</tbody>
</table>

* Impact velocity from item No. 6 below  
** Impact velocity range = 6.69 mps, +0, -0.08 mps

5. Attach acceleration versus time plots for each impact.  
6. Integrate the acceleration versus time plots and attach plots of the results that show velocity versus time.

Comments: All measurements are referenced to the point where the horizontal plane through the SRP intersects the vertical line tangent to the inboard edge at the seat. In the case of Seat No. S3, the inboard edge of the seat is on the right hand side of the seat as viewed from the rear.

Recorded By:  

Approved By:  

Date: 04/21/11
REAR SURFACE

1. Locate x-y reference point on sketch above for head form impact locations. (Label the positive and negative directions, if applicable)
2. Identify head form impact location on sketch by placing H8, H9, H10, H11, H12, and H13 in the appropriate location.
3. Define the plane of reference for head form impact angle:
   0° = Parallel with Floor, (+) is Up, (-) is Down
   X = From Inboard Edge of Seat
   Y = Measured Vertically from the SRP
4. Complete the following table:

<table>
<thead>
<tr>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)*</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head impact &amp; Test #</td>
<td>Location</td>
<td>Speed Trap Impact Velocity ** mps</td>
<td>Derived Velocity ** mps</td>
<td>Max HIC</td>
<td>Energy Req’d joules</td>
<td>Column 5 &lt; 1000</td>
<td>Column 6 &gt; 4.5 joules</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>Y</td>
<td>Angle</td>
<td></td>
<td></td>
<td>Yes-</td>
<td>No-</td>
</tr>
<tr>
<td>----------------</td>
<td>-----</td>
<td>-----</td>
<td>-------</td>
<td>------</td>
<td>-----</td>
<td>------</td>
<td>-----</td>
</tr>
<tr>
<td>H8</td>
<td>112</td>
<td>480</td>
<td>0°</td>
<td>6.68</td>
<td>6.84</td>
<td>117</td>
<td>7.98</td>
</tr>
<tr>
<td>H9</td>
<td>229</td>
<td>480</td>
<td>0°</td>
<td>6.67</td>
<td>6.79</td>
<td>98</td>
<td>9.87</td>
</tr>
<tr>
<td>H10</td>
<td>343</td>
<td>480</td>
<td>0°</td>
<td>6.69</td>
<td>6.79</td>
<td>101</td>
<td>9.50</td>
</tr>
<tr>
<td>H11</td>
<td>105</td>
<td>335</td>
<td>0°</td>
<td>6.68</td>
<td>7.01</td>
<td>170</td>
<td>9.35</td>
</tr>
<tr>
<td>H12</td>
<td>221</td>
<td>335</td>
<td>0°</td>
<td>6.67</td>
<td>6.88</td>
<td>89</td>
<td>14.82</td>
</tr>
<tr>
<td>H13</td>
<td>335</td>
<td>335</td>
<td>0°</td>
<td>6.64</td>
<td>6.77</td>
<td>101</td>
<td>15.50</td>
</tr>
</tbody>
</table>

* Impact velocity from item No. 6 below
** Impact velocity range = 6.69 mps, +0, -0.08 mps

5. Attach acceleration versus time plots for each impact.
6. Integrate the acceleration versus time plots and attach plots of the results that show velocity versus time.

Comments: All measurements are referenced to the point where the horizontal plane through the SRP intersects the vertical line tangent to the inboard edge at the seat. In the case of Seat No. S8, the inboard edge of the seat is on the right hand side of the seat as viewed from the rear.

Recorded By: [Signature]

Approved By: [Signature] Date: 04/25/11
DATA SHEET 10
KNEE FORM IMPACT TEST

Test Vehicle: 2011 Starcraft Quest School Bus  NHTSA No.: CB0902
Test Lab: MGA Research Corporation  Test Dates: 03/17/11 – 08/30/11

SEAT NUMBER: S3

REAR SURFACE

1. Locate x-y reference point on sketch above for knee form impact locations. (Label the positive and negative directions, if applicable)
2. Identify knee form impact location on sketch by placing K1, K2, K3, K4, K5, K6, K7, and K8 in the appropriate location.
3. Define the plane of reference for knee form impact angle:
   0° = Parallel with Floor, (+) is Up, (-) is Down
   X = From Inboard Edge of the Seat
   Y = Measured Vertically from the SRP
DATA SHEET 10 (CONTINUED)
KNEE FORM IMPACT TEST

4. Complete the following table:

<table>
<thead>
<tr>
<th>Knee impact &amp; Test #</th>
<th>Location</th>
<th>Speed Trap Impact Velocity ** mps</th>
<th>Derived Velocity ** mps</th>
<th>Cont. Area mm²</th>
<th>Resist Force (N)</th>
<th>Column 5 &gt; 1935 mm²</th>
<th>Column 6 &lt; 2669N</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>Y</td>
<td>Angle</td>
<td></td>
<td></td>
<td></td>
<td>Yes-PASS</td>
<td>No-FAIL</td>
</tr>
<tr>
<td>K1</td>
<td>-722</td>
<td>257</td>
<td>0º</td>
<td>4.86</td>
<td>5.02</td>
<td>2,710</td>
<td>1,408</td>
</tr>
<tr>
<td>K2</td>
<td>-520</td>
<td>257</td>
<td>0º</td>
<td>4.90</td>
<td>5.01</td>
<td>2,430</td>
<td>1,169</td>
</tr>
<tr>
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<td>-315</td>
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<td>0º</td>
<td>4.87</td>
<td>5.04</td>
<td>2,430</td>
<td>1,359</td>
</tr>
<tr>
<td>K4</td>
<td>-111</td>
<td>256</td>
<td>0º</td>
<td>4.86</td>
<td>5.04</td>
<td>3,070</td>
<td>1,655</td>
</tr>
<tr>
<td>K5</td>
<td>-389</td>
<td>156</td>
<td>0º</td>
<td>4.83</td>
<td>4.63</td>
<td></td>
<td>1,442</td>
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<tr>
<td>K6</td>
<td>-84</td>
<td>155</td>
<td>0º</td>
<td>4.81</td>
<td>4.91</td>
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<td>2,053</td>
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<tr>
<td>K7</td>
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<td>0º</td>
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<td>4.80</td>
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<td>1,428</td>
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</tbody>
</table>

* Impact velocity from item No. 7 below

** Impact velocity range = 4.86 mps, +0.076, -0 mps for contact area (K1 through K4)

** Impact velocity range = 4.86 mps, +0, -0.076 mps for contact area (K5 through K8)

5. Attach Contact Area Prints for K1, K2, K3 and K4.

6. Attach acceleration versus time plots for each impact.

7. Integrate the acceleration versus time plots and attach plots of the results that show velocity versus time for each plot K1 through K8.

8. Attach force vs. time plots for K5, K6, K7 and K8.

Comments: All measurements are referenced to the point where the horizontal plane through the SRP intersects the vertical line tangent to the inboard edge at the seat. In the case of Seat No. S3, the inboard edge of the seat is on the right hand side of the seat as viewed from the rear.

Recorded By: [Signature]

Approved By: [Signature] Date: 04/19/11
SEAT NUMBER: S8

REAR SURFACE

1. Locate x-y reference point on sketch above for knee form impact locations. (Label the positive and negative directions, if applicable)
2. Identify knee form impact location on sketch by placing K1, K2, K3, K4, K5, K6, K7, and K8 in the appropriate location.
3. Define the plane of reference for knee form impact angle:
   0° = Parallel with Floor, (+) is Up, (-) is Down
   X = From Inboard Edge of the Seat
   Y = Measured Vertically from the SRP
4. Complete the following table:

<table>
<thead>
<tr>
<th>Knee impact &amp; Test #</th>
<th>Location</th>
<th>Speed Trap Impact Velocity ** mps</th>
<th>Derived Velocity ** mps</th>
<th>Cont. Area mm²</th>
<th>Resist Force (N)</th>
<th>Column 5 &gt; 1935 mm²</th>
<th>Column 6 &lt; 2669N</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>Y</td>
<td>Angle</td>
<td></td>
<td></td>
<td>Yes-PASS</td>
<td>No-FAIL</td>
</tr>
<tr>
<td>K1</td>
<td>386</td>
<td>207</td>
<td>0º</td>
<td>4.89</td>
<td>5.00</td>
<td>2,470</td>
<td>1,463</td>
</tr>
<tr>
<td>K2</td>
<td>489</td>
<td>207</td>
<td>0º</td>
<td>4.89</td>
<td>4.99</td>
<td>2,310</td>
<td>1,390</td>
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<tr>
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<td>591</td>
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<td>0º</td>
<td>4.89</td>
<td>4.98</td>
<td>2,560</td>
<td>1,376</td>
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<tr>
<td>K4</td>
<td>694</td>
<td>207</td>
<td>0º</td>
<td>4.89</td>
<td>4.86</td>
<td>2,460</td>
<td>1,435</td>
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<tr>
<td>K5</td>
<td>81</td>
<td>205</td>
<td>0º</td>
<td>4.82</td>
<td>5.14</td>
<td>2,527</td>
<td></td>
</tr>
<tr>
<td>K6</td>
<td>182</td>
<td>206</td>
<td>0º</td>
<td>4.85</td>
<td>5.02</td>
<td>1,201</td>
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<tr>
<td>K7</td>
<td>51</td>
<td>61</td>
<td>0º</td>
<td>4.86</td>
<td>4.99</td>
<td>2,332</td>
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<tr>
<td>K8</td>
<td>152</td>
<td>61</td>
<td>0º</td>
<td>4.84</td>
<td>4.87</td>
<td>1,245</td>
<td></td>
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</table>

* Impact velocity from item No. 7 below

** Impact velocity range = 4.86 mps, +0.076, -0 mps for contact area (K1 through K4)

** Impact velocity range = 4.86 mps, +0, -0.076 mps for contact area (K5 through K8)

5. Attach Contact Area Prints for K1, K2, K3 and K4.
6. Attach acceleration versus time plots for each impact.
7. Integrate the acceleration versus time plots and attach plots of the results that show velocity versus time for each plot K1 through K8.
8. Attach force vs. time plots for K5, K6, K7 and K8.

Comments: All measurements are referenced to the point where the horizontal plane through the SRP intersects the vertical line tangent to the inboard edge at the seat. In the case of Seat No. S8, the inboard edge of the seat is on the right hand side of the seat as viewed from the rear.

Recorded By: [Signature]
Approved By: [Signature] Date: 04/26/11
## SECTION 4
INSTRUMENTATION AND EQUIPMENT LIST

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<th>Equipment</th>
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<th>Model / Serial No.</th>
<th>Cal. Date</th>
<th>Cal. Due Date</th>
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<td>Interface</td>
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<td>06/14/11</td>
<td>12/14/11</td>
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<tr>
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<td>1315-101-01A / 634-10k</td>
<td>04/07/11</td>
<td>10/07/11</td>
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<td>PCB</td>
<td>1315-101-01A / 671</td>
<td>02/10/11</td>
<td>08/10/11</td>
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<td>Key Transducer</td>
<td>1315-101-01 / 260</td>
<td>02/11/11</td>
<td>08/11/11</td>
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<td>Key Transducer</td>
<td>1315-101-01 / 271</td>
<td>02/11/11</td>
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<td>08/11/11</td>
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<td>Digital Protractor</td>
<td>Pro 360 / 001</td>
<td>Daily</td>
<td>Daily</td>
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<td>Stanley</td>
<td>Powerlock / 173</td>
<td>02/28/11</td>
<td>08/28/11</td>
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<td>Impact Fixture</td>
<td>MGA</td>
<td>IF2003A</td>
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<td>Camera</td>
<td>Sony</td>
<td>DSC-575</td>
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<td>Sokkia Corp.</td>
<td>Planix5 / 007319</td>
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### TABLE OF PHOTOGRAPHS

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<th>No.</th>
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<th>Page No.</th>
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<tbody>
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<td>Left Side View of School Bus</td>
<td>38</td>
</tr>
<tr>
<td>2</td>
<td>Right Side View of School Bus</td>
<td>39</td>
</tr>
<tr>
<td>3</td>
<td>¾ Front View From Left Side of School Bus</td>
<td>40</td>
</tr>
<tr>
<td>4</td>
<td>¾ Front View From Right Side of School Bus</td>
<td>41</td>
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<tr>
<td>5</td>
<td>¾ Rear View From Left Side of School Bus</td>
<td>42</td>
</tr>
<tr>
<td>6</td>
<td>¾ Rear View From Right Side of School Bus</td>
<td>43</td>
</tr>
<tr>
<td>7</td>
<td>Certification Label &amp; Tire Placard</td>
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<td>8</td>
<td>Incomplete Vehicle Label</td>
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<td>9</td>
<td>Vehicle Interior View From Front to Rear</td>
<td>46</td>
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<td>10</td>
<td>Vehicle Interior View From Rear to Front</td>
<td>47</td>
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<tr>
<td>11</td>
<td>Pre-Test of Seat Cushion Retention Set Up on Seat S2</td>
<td>48</td>
</tr>
<tr>
<td>12</td>
<td>Pre-Test of Seat Back S10 Force Deflection Forward Test</td>
<td>49</td>
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<tr>
<td>13</td>
<td>Post-Test of Seat Back S10 Force Deflection Forward Test</td>
<td>50</td>
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<tr>
<td>14</td>
<td>Pre-Test of Barrier B1 Force Deflection Forward Test</td>
<td>51</td>
</tr>
<tr>
<td>15</td>
<td>Post-Test of Barrier B1 Force Deflection Forward Test</td>
<td>52</td>
</tr>
<tr>
<td>16</td>
<td>Pre-Test of Seat Back S7 Force Deflection Rearward Test</td>
<td>53</td>
</tr>
<tr>
<td>17</td>
<td>Post-Test of Seat Back S7 Force Deflection Rearward Test</td>
<td>54</td>
</tr>
<tr>
<td>18</td>
<td>Pre-Test of Seat Back S4 Force Deflection Rearward Test</td>
<td>55</td>
</tr>
<tr>
<td>19</td>
<td>Post-Test of Seat Back S4 Force Deflection Rearward Test</td>
<td>56</td>
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<tr>
<td>20</td>
<td>Post-Test of Head and Knee Impact Locations on Seat S3</td>
<td>57</td>
</tr>
<tr>
<td>21</td>
<td>Post-Test of Head and Knee Impact Locations on Seat S8</td>
<td>58</td>
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</table>
Test Vehicle: 2011 Starcraft Quest School Bus
Test Lab: MGA Research Corporation
NHTSA No.: CB0902
Test Dates: 03/17/11 – 08/30/11

Left Side View of School Bus
Test Vehicle: 2011 Starcraft Quest School Bus
NHTSA No.: CB0902
Test Lab: MGA Research Corporation
Test Dates: 03/17/11 – 08/30/11

Right Side View of School Bus
Test Vehicle: 2011 Starcraft Quest School Bus
Test Lab: MGA Research Corporation
NHTSA No.: CB0902
Test Dates: 03/17/11 – 08/30/11

¾ Front View From Left Side of School Bus
Test Vehicle: 2011 Starcraft Quest School Bus
Test Lab: MGA Research Corporation
NHTSA No.: CB0902
Test Dates: 03/17/11 – 08/30/11

¾ Front View From Right Side of School Bus
Test Vehicle: 2011 Starcraft Quest School Bus
NHTSA No.: CB0902
Test Lab: MGA Research Corporation
Test Dates: 03/17/11 – 08/30/11
Test Vehicle: 2011 Starcraft Quest School Bus

NHTSA No.: CB0902

Test Dates: 03/17/11 – 08/30/11

Test Lab: MGA Research Corporation

¾ Rear View From Right Side of School Bus
Test Vehicle: 2011 Starcraft Quest School Bus
Test Lab: MGA Research Corporation
NHTSA No.: CB0902
Test Dates: 03/17/11 – 08/30/11

<table>
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<th>Front Axle</th>
<th>1950</th>
<th>4300 (lb)</th>
<th>LT225/75R16E</th>
<th>16 X 6.5J</th>
<th>448 SPF</th>
<th>SINGLE DUAL</th>
<th>65 PSI LP</th>
<th>✔</th>
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<tr>
<td>Size/Type</td>
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<td>0 (lb)</td>
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<td>16 X 6.5J</td>
<td>448 SPF</td>
<td>SINGLE DUAL</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Size/Type</td>
<td>Rear Axle</td>
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<td>8600 (lb)</td>
<td>LT225/75R16E</td>
<td>16 X 6.5J</td>
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Test Vehicle:
2011 Starcraft Quest School Bus

NHTSA No.:
CB0902

Test Dates:
03/17/11 – 08/30/11

Test Lab:
MGA Research Corporation

Vehicle Interior View From Front to Rear
Vehicle Interior View From Rear to Front
Test Vehicle: 2011 Starcraft Quest School Bus
Test Lab: MGA Research Corporation
NHTSA No.: CB0902
Test Dates: 03/17/11 – 08/30/11

Pre-Test of Seat Cushion Retention Set Up on Seat S2
Pre-Test of Seat Back S10 Force Deflection Forward Test
Post-Test of Seat Back S10 Force Deflection Forward Test
Pre-Test of Barrier B1 Force Deflection Forward Test
Test Vehicle: 2011 Starcraft Quest School Bus
Test Lab: MGA Research Corporation
NHTSA No.: CB0902
Test Dates: 03/17/11 – 08/30/11

Post-Test of Barrier B1 Force Deflection Forward Test
Test Vehicle:
2011 Starcraft Quest School Bus

NHTSA No.:
CB0902

Test Lab:
MGA Research Corporation

Test Dates:
03/17/11 – 08/30/11

Pre-Test of Seat Back S7 Force Deflection Rearward Test
Test Vehicle: 2011 Starcraft Quest School Bus
NHTSA No.: CB0902
Test Dates: 03/17/11 – 08/30/11

Test Lab: MGA Research Corporation

Post-Test of Seat Back S7 Force Deflection Rearward Test
Pre-Test of Seat Back S4 Force Deflection Rearward Test
<table>
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<tr>
<th>Test Vehicle:</th>
<th>2011 Starcraft Quest School Bus</th>
<th>NHTSA No.:</th>
<th>CB0902</th>
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</thead>
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<tr>
<td>Test Lab:</td>
<td>MGA Research Corporation</td>
<td>Test Dates:</td>
<td>03/17/11 – 08/30/11</td>
</tr>
</tbody>
</table>

Post-Test of Seat Back S4 Force Deflection Rearward Test
Post-Test of Head and Knee Impact Locations on Seat S3
Post-Test of Head and Knee Impact Locations on Seat S8
# TABLE OF TEST PLOTS

<table>
<thead>
<tr>
<th>No.</th>
<th>Test Description</th>
<th>Page No.</th>
</tr>
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<tbody>
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<td>Seat Cushion Retention Seat S2 Force vs. Time</td>
<td>61</td>
</tr>
<tr>
<td>2</td>
<td>Seat Back Forward Deflection Seat S10 (Lower) Force vs. Time</td>
<td>62</td>
</tr>
<tr>
<td>3</td>
<td>Seat Back Forward Deflection Seat S10 (Lower) Displacement vs. Time</td>
<td>62</td>
</tr>
<tr>
<td>4</td>
<td>Seat Back Forward Deflection Seat S10 (Upper) Force vs. Time</td>
<td>63</td>
</tr>
<tr>
<td>5</td>
<td>Seat Back Forward Deflection Seat S10 (Upper) Displacement vs. Time</td>
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<tr>
<td>6</td>
<td>Seat Back Forward Deflection Seat S10 (Upper) Force vs. Displacement</td>
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<tr>
<td>7</td>
<td>Barrier Forward Deflection Barrier B1 (Lower) Force vs. Time</td>
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<td>8</td>
<td>Barrier Forward Deflection Barrier B1 (Lower) Displacement vs. Time</td>
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<td>9</td>
<td>Barrier Forward Deflection Barrier B1 (Upper) Force vs. Time</td>
<td>66</td>
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<tr>
<td>10</td>
<td>Barrier Forward Deflection Barrier B1 (Upper) Displacement vs. Time</td>
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</tr>
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<td>11</td>
<td>Barrier Forward Deflection Barrier B1 (Upper) Force vs. Displacement</td>
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<tr>
<td>12</td>
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FMVSS 222 HEAD FORM IMPACTS (1.5 m/s)  Test Date: 4-19-2011
Component ID: 2011 Starcraft Quest  NHTSA #: CB0902
Location: S3H1  speed trap: 1.582 m/s

Head X Acceleration (G's) VS TIME (S)

Max: 0.54 G's
TMax: 0.13 S
Min: -5.49 G's
TMin: 0.04 S

HIC 36: 1.44  T1: 23.50 S  T2: 59.50 S

VELOCITY X (m/s) VS TIME (S)

Max: 1.88 m/s
TMax: -0.01 S
Min: -0.25 m/s
TMin: 0.09 S
VEL@IMP: 1.873m/s
FMVSS 222 HEAD FORM IMPACTS (1.5 m/s)  
Test Date: 4-20-2011  
Component ID: 2011 Starcraft Quest  
Location: S3H2  
speed trap: 1.594 m/s  
NHTSA #: CB0902

Head X Acceleration (G's) VS TIME (S)  
HIC 36: 1.80  
T1: 23.00 S  
T2: 59.00 S

Max: 0.45 G's  
TMax: 0.15 S  
Min: -6.11 G's  
TMin: 0.03 S

VELOCITY X (m/s) VS TIME (S)

Max: 1.53 m/s  
TMax: -0.01 S  
Min: -0.84 m/s  
TMin: 0.10 S  
VEL@IMP: 1.494m/s
FMVSS 222 HEAD FORM IMPACTS (1.5 m/s)
Test Date: 4-20-2011
Component ID: 2011 Starcraft Quest
Location: S3H3          speed trap: 1.602 m/s
NHTSA #: CB0902

Head X Acceleration (G's) VS TIME (S)

- Max: 2.42 G's
- Tmax: 0.18 S
- Min: -5.94 G's
- Tmin: 0.03 S

VELOCITY X (m/s) VS TIME (S)

- Max: 1.99 m/s
- Tmax: -0.01 S
- Min: -0.16 m/s
- Tmin: 0.10 S
- VEL@IMP: 1.976 m/s
FMVSS 222 HEAD FORM IMPACTS (1.5 m/s)  Test Date: 4-20-2011
Component ID: 2011 Starcraft Quest  NHTSA #: CB0902
Location: S3H4  speed trap: 1.597 m/s

Head X Acceleration ($) VS TIME (S)  HIC 36: 1.90  T1: 21.50 S  T2: 57.50 S
Max: 2.01  Tmax: 0.18 S
Min: -6.43  Tmin: 0.03 S

VELOCITY X (m/s) VS TIME (S)
Max: 1.29 m/s  Tmax: -0.01 S
Min: -1.42 m/s  Tmin: 0.77 S
VEL@IMP: 1.249 m/s
FMVSS 222 HEAD FORM IMPACTS (1.5 m/s)  Test Date: 4-20-2011
Component ID: 2011 Starcraft Quest  NHTSA #: CB0902
Location: S3H5  speed trap: 1.589 m/s

Head X Acceleration (m/s²) VS TIME (S)
Max: 1.28  Tmax: 0.26 S
Min: -4.73  Tmin: 0.06 S
HIC 36: 1.18  T1: 38.30 S  T2: 74.30 S

VELOCITY X (m/s) VS TIME (S)
Max: 1.49 m/s  Tmax: -0.01 S
Min: -0.87 m/s  Tmin: 0.12 S
VEL@IMP: 1.466 m/s
FMVSS 222 HEAD FORM IMPACTS (1.5 m/s)  
Test Date: 4-20-2011  
Component ID: 2011 Starcraft Quest  
Location: S3H6  
speed trap: 1.587 m/s

Component ID: 2011 Starcraft Quest  
NHTSA #: CB0902

Max: 1.51 G's  
TMax: 0.26 S  
Min: -4.86 G's  
TMin: 0.06 S

Max: 1.24 m/s  
TMax: -0.01 S  
Min: -1.27 m/s  
TMin: 0.13 S  
VEL@IMP: 1.209 m/s
FMVSS 222 HEAD FORM IMPACTS (1.5 m/s)

Component ID: 2011 Starcraft Quest
Location: S3H7           speed trap: 1.599 m/s

Test Date: 4-20-2011
NHTSA #: CB0902

Head X Acceleration (G's) VS TIME (S)

Max: 2.71 G's
TMax: 0.24 S
Min: -4.39 G's
TMin: 0.05 S

HIC 36: 0.98    T1: 33.90 S   T2: 69.90 S

VELOCITY X (m/s) VS TIME (S)

Max: 2.04 m/s
TMax: -0.00 S
Min: -0.17 m/s
TMin: 0.11 S
VEL@IMP: 2.037 m/s
FMVSS 222 HEAD FORM IMPACTS (1.5 m/s)  
Component ID: 2011 Starcraft Quest  
Location: S8H2  
speed trap: 1.579 m/s  
Test Date: 4-24-2011  
NHTSA #: CB0902

Head X Acceleration (G's) VS TIME (S)

Max: 1.95 G's  
TMax: 0.20 S  
Min: -5.64 G's  
TMin: 0.04 S  
HIC 36: 1.66  
T1: 22.90 S  
T2: 58.90 S

VELOCITY X (m/s) VS TIME (S)

Max: 1.45 m/s  
TMax: -0.01 S  
Min: -0.92 m/s  
TMin: 0.10 S  
VEL@IMP: 1.411 m/s
FMVSS 222 HEAD FORM IMPACTS (1.5 m/s)
Component ID: 2011 Starcraft Quest
Location: S8H4 speed trap: 1.580 m/s
Test Date: 4-24-2011
NHTSA #: CB0902

Max: 1.18 G's
TMax: 0.26 S
Min: -4.35 G's
TMin: 0.05 S

HIC 36: 0.88
T1: 39.30 S
T2: 75.30 S

Head X Acceleration (G's) VS TIME (S)

Max: 1.72 m/s
TMax: -0.01 S
Min: -0.57 m/s
TMin: 0.12 S
VEL@IMP: 1.694 m/s
FMVSS 222 HEAD FORM IMPACTS (1.5 m/s)
Test Date: 4-24-2011
Component ID: 2011 Starcraft Quest
Location: S8H5 speed trap: 1.587 m/s
NHTSA #: CB0902

Head X Acceleration (G's) VS TIME (S)

Max: 0.87 G's
TMax: 0.26 S
Min: -4.34 G's
TMin: 0.06 S

VELOCITY X (m/s) VS TIME (S)

Max: 1.68 m/s
TMax: -0.01 S
Min: -0.60 m/s
TMin: 0.12 S
VEL@IMP: 1.663m/s
FMVSS 222 HEAD FORM IMPACTS (1.5 m/s)  
Test Date: 4-24-2011  
Vehicle: 2011 Starcraft Quest  
Location: S8H6  
NHTSA #: CB0902  

**Head X Acceleration (G's) VS TIME (S)**  
Max: 0.66 G's  
TMax: 0.26 S  
Min: -4.63 G's  
TMin: 0.06 S  
HIC 36: 1.04  
T1: 40.90 S  
T2: 76.90 S

** VELOCITY X (m/s) VS TIME (S)**  
Max: 1.53 m/s  
TMax: -0.01 S  
Min: -0.83 m/s  
TMin: 0.12 S  
VEL@IMP: 1.502 m/s
HEAD FORM IMPACT (6.69 m/s)  
Component ID: 2011 Starcraft Quest  
Location: S3H8  
speed trap: 6.656 m/s  
NHTSA#: CB0902  
Test Date: 4-20-2011

**HEAD X ACCELERATION (G's) VS TIME (S)**
- Max: 0.48 G's
- Tmax: 0.08 S
- Min: -47.53 G's
- Tmin: 0.02 S

**VELOCITY X (m/s) VS TIME (S)**
- Max: 6.77 m/s
- Tmax: -0.01 S
- Min: -3.48 m/s
- Tmin: 0.07 S

**FORCE X (N) VS TIME (S)**
- Max: 24.32 N
- Tmax: 0.08 S
- Min: -2,429.27 N
- Tmin: 0.02 S

**ENERGY**
- 11.83 J
HEAD FORM IMPACT (6.69 m/s)  Test Date: 4-20-2011
Component ID: 2011 Starcraft Quest
Location: S3H9 speed trap: 6.632 m/s
NHTSA#: CB0902

Max: 0.72 G's
TMax: 0.09 S
Min: -41.46 G's
TMin: 0.02 S

Max: 6.77 m/s
TMax: -0.01 S
Min: -3.42 m/s
TMin: 0.07 S
VEL@IMP: 6.756 m/s

Max: 37.04 N
TMax: 0.09 S
Min: -2,118.97 N
TMin: 0.02 S

Energy: 12.23 J
HEAD FORM IMPACT (6.69 m/s)
Component ID: 2011 Starcraft Quest
Location: S3H10 speed trap: 6.649 m/s
NHTSA#: CB0902
Test Date: 4-21-2011

Max: 1.00 G's
TMax: 0.08 S
Min: -39.23 G's
TMin: 0.02 S

Max: 6.83 m/s
TMax: -0.01 S
Min: -3.18 m/s
TMin: 0.08 S
VEL@IMP: 6.811 m/s

Max: 51.31 N
TMax: 0.08 S
Min: -2,005.27 N
TMin: 0.02 S

Energy: 14.02 J
**HEAD FORM IMPACT (6.69 m/s)**

Component ID: 2011 Starcraft Quest

Location: S3H11  speed trap: 6.657 m/s

NHTSA#: CB0902

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**Max:** 4.87 G's  
**TMax:** 0.09 S  
**Min:** -65.61 G's  
**TMin:** 0.01 S

---

**Max:** 6.77 m/s  
**TMax:** -0.01 S  
**Min:** -2.44 m/s  
**TMin:** 0.07 S  
**VEL@IMP:** 6.755 m/s

---

**Max:** 248.94 N  
**TMax:** 0.09 S  
**Min:** -3353.10 N  
**TMin:** 0.01 S

---

**Energy:** 10.85 J
HEAD FORM IMPACT (6.69 m/s)  
Test Date: 4-21-2011  
Component ID: 2011 Starcraft Quest  
Location: S3H12  speed trap:  6.662 m/s  
NHTSA#: CB0902

**HEAD X ACCELERATION (G's) VS TIME (S)**

- Max: 0.62 G's
- TMax: 0.07 S
- Min: -45.15 G's
- Tmin: 0.01 S

**VELOCITY X (m/s) VS TIME (S)**

- Max: 6.79 m/s
- TMax: -0.01 S
- Min: -3.27 m/s
- Tmin: 0.07 S

**FORCE X (N) VS TIME (S)**

- Max: 31.51 N
- TMax: 0.07 S
- Min: -2,307.79 N
- Tmin: 0.01 S

**ENERGY**

Energy: 8.29 J
HEAD FORM IMPACT (6.69 m/s)  Test Date: 4-21-2011
Component ID: 2011 Starcraft Quest
Location: S3H13  speed trap:  6.633 m/s  NHTSA#: CB0902

**HEAD X ACCELERATION (G's) VS TIME (S)**
- Max: 14.07 G's
- TMax: 0.10 S
- Min: -48.20 G's
- Tmin: 0.01 S
Hic: 100.82  T1:  6.80 ms  T2:  42.00 ms

**VELOCITY X (m/s) VS TIME (S)**
- Max: 6.82 m/s
- Tmax: -0.01 S
- Min: -3.04 m/s
- Tmin: 0.07 S
VEL@IMP: 6.794 m/s

**FORCE X (N) VS TIME (S)**
- Max: 719.03 N
- Tmax: 0.10 S
- Min: -2,463.61 N
- Tmin: 0.01 S

**ENERGY**
- Energy: 9.32 J
HEAD FORM IMPACT (6.69 m/s)  
Test Date: 4-24-2011  
Component ID: 2011 Starcraft Quest  
Location: S8H9  
speed trap: 6.665 m/s  
NHTSA#: CB0902  

**HEAD X ACCELERATION (G's) VS TIME (S)**  
- Max: 0.75 G’s  
- Tmax: 0.08 S  
- Min: -53.12 G’s  
- Tmin: 0.01 S  

**FORCE X (N) VS TIME (S)**  
- Max: 38.14 N  
- Tmax: 0.08 S  
- Min: -2714.74 N  
- Tmin: 0.01 S  

**FORCE (N) VS TIME (SEC)**  
Energy: 9.87 J
HEAD FORM IMPACT (6.69 m/s) Test Date: 4-24-2011
Component ID: 2011 Starcraft Quest
Location: S8H10 speed trap: 6.690 m/s NHTSA#: CB0902

Max: 0.56 G's
TMax: 0.08 S
Min: -66.00 G's
TMin: 0.01 S

Max: 6.82 m/s
TMax: -0.01 S
Min: -2.86 m/s
TMin: 0.07 S
VEL@IMP: 6.792 m/s

Max: 28.42 N
TMax: 0.08 S
Min: -3,373.29 N
TMin: 0.01 S

Energy: 9.50 J
HEAD FORM IMPACT (6.69 m/s)  Test Date: 4-24-2011
Component ID: 2011 Starcraft Quest  Location: S8H11  speed trap: 6.681 m/s
NHTSA#: CB0902

Max: 5.18 G's  TMax: 0.08 S
Min: -70.87 G's  Tmin: 0.01 S

Max: 7.02 m/s  TMax: -0.01 S
Min: -1.97 m/s  TMin: 0.06 S
VEL@IMP: 7.007 m/s

Max: 264.66 N  TMax: 0.08 S
Min: -3,622.26 N  TMin: 0.01 S

Energy: 9.35 J
HEAD FORM IMPACT (6.69 m/s)  Test Date: 4-25-2011
Component ID: 2011 Starcraft Quest  NHTSA#: CB0902
Location: S8H13  speed trap: 6.636 m/s

Max: 0.67 G's  
TMax: 0.09 S
Min: -44.13 G's  
TMin: 0.02 S

Max: 6.79 m/s
TMax: -0.01 S
Min: -3.18 m/s
TMin: 0.07 S
VEL@IMP: 6.774 m/s

Max: 34.18 N
TMax: 0.09 S
Min: -2,255.53 N
TMin: 0.02 S

Energy: 15.50 J
FMVSS 222 KNEE FORM IMPACTS
Component ID: 2011 Starcraft Quest
Location: S3K1          speed trap: 4.863 m/s
Test Date: 4-19-2011
NHTSA #: CB0902

Knee X Acceleration (G's) VS TIME (S)
Max: 21.99 G's
TMax: 0.02 s
Min: -31.68 G's
TMin: 0.17 s

VELOCITY X (m/s) VS TIME (S)
Max: 5.06 m/s
TMax: 0.12 s
Min: -1.80 m/s
TMin: 0.24 s
VEL@IMP: 5.02 m/s

FORCE X (N) VS TIME (S)
Max: 977.35 N
TMax: 0.02 s
Min: -1,407.68 N
TMin: 0.17 s
Knee X Acceleration (G's) VS TIME (S)

Max: 21.66 G's
TMax: 0.02 s
Min: -26.31 G's
TMin: 0.16 s

VELOCITY X (m/s) VS TIME (S)

Max: 5.05 m/s
TMax: 0.12 s
Min: -2.10 m/s
TMin: 0.23 s
VEL@IMP: 5.01 m/s

FORCE X (N) VS TIME (S)

Max: 962.60 N
TMax: 0.02 s
Min: -1,169.41 N
TMin: 0.16 s
FMVSS 222 KNEE FORM IMPACTS
Component ID: 2011 Starcraft Quest
Location: S3K3    speed trap: 4.871 m/s

Test Date: 4-19-2011
NHTSA #: CB0902

Knee X Acceleration (G's) VS TIME (S)
Max: 23.42 G's
TMax: 0.02 s
Min: -30.57 G's
TMin: 0.17 s

VELOCITY X (m/s) VS TIME (S)
Max: 5.08 m/s
TMax: 0.13 s
Min: -1.97 m/s
TMin: 0.23 s
VEL@IMP: 5.04 m/s

FORCE X (N) VS TIME (S)
Max: 1,040.64 N
TMax: 0.02 s
Min: -1,358.66 N
TMin: 0.17 s
FMVSS 222 KNEE FORM IMPACTS
Component ID: 2011 Starcraft Quest
Location: S3K4          speed trap:  4.858 m/s

Test Date: 4-19-2011
NHTSA #: CB0902

Knee X Acceleration (G’s) VS TIME (S)
Max: 21.72 G’s
TMax: 0.02 s
Min: -37.23 G’s
TMin: 0.16 s

VELOCITY X (m/s) VS TIME (S)
Max: 5.08 m/s
TMax: 0.12 s
Min: -1.37 m/s
TMin: 0.20 s
VEL@IMP: 5.04 m/s

FORCE X (N) VS TIME (S)
Max: 965.32 N
TMax: 0.02 s
Min: -1,654.55 N
TMin: 0.16 s
FMVSS 222 KNEE FORM IMPACTS
Component ID: 2011 Starcraft Quest
Location: S3K5     speed trap: 4.828 m/s

Test Date: 4-19-2011
NHTSA #: CB0902

Knee X Acceleration (G's) VS TIME (S)
Max: 21.99 G's
TMax: 0.02 s
Min: -32.46 G's
TMin: 0.18 s

VELOCITY X (m/s) VS TIME (S)
Max: 4.73 m/s
TMax: 0.12 s
Min: -2.15 m/s
TMin: 0.24 s
VEL@IMP: 4.63 m/s

FORCE X (N) VS TIME (S)
Max: 977.18 N
TMax: 0.02 s
Min: -1,442.30 N
TMin: 0.18 s
FMVSS 222 KNEE FORM IMPACTS
Component ID: 2011 Starcraft Quest
Location: S3K6 speed trap: 4.814 m/s

Test Date: 4-19-2011
NHTSA #: CB0902

Knee X Acceleration (G's) VS TIME (S)
Max: 23.21 G's
TMax: 0.02 s
Min: -46.19 G's
TMin: 0.16 s

VELOCITY X (m/s) VS TIME (S)
Max: 4.96 m/s
TMax: 0.12 s
Min: -1.68 m/s
TMin: 0.18 s
VEL@IMP: 4.91 m/s

FORCE X (N) VS TIME (S)
Max: 1,031.49 N
TMax: 0.02 s
Min: -2,052.63 N
TMin: 0.16 s
FMVSS 222 KNEE FORM IMPACTS
Component ID: 2011 Starcraft Quest
Location: S3K7 speed trap: 4.840 m/s
Test Date: 4-19-2011
NHTSA #: CB0902

Knee X Acceleration (G's) VS TIME (S)
Max: 24.26 G's
TMax: 0.02 s
Min: -51.45 G's
TMin: 0.16 s

VELOCITY X (m/s) VS TIME (S)
Max: 4.78 m/s
TMax: 0.12 s
Min: -2.11 m/s
TMin: 0.18 s
VEL@IMP: 4.67 m/s

FORCE X (N) VS TIME (S)
Max: 1,078.14 N
TMax: 0.02 s
Min: -2,286.19 N
TMin: 0.16 s
FMVSS 222 KNEE FORM IMPACTS
Component ID: 2011 Starcraft Quest
Location: S3K8 speed trap: 4.827 m/s

Test Date: 4-19-2011
NHTSA #: CB0902

Knee X Acceleration (G's) VS TIME (S)
Max: 24.15 G's
TMax: 0.02 s
Min: -32.14 G's
TMin: 0.18 s

VELOCITY X (m/s) VS TIME (S)
Max: 4.88 m/s
TMax: 0.12 s
Min: -2.08 m/s
TMin: 0.21 s
VEL@IMP: 4.8 m/s

FORCE X (N) VS TIME (S)
Max: 1,073.36 N
TMax: 0.02 s
Min: -1,428.39 N
TMin: 0.18 s
FMVSS 222 KNEE FORM IMPACTS
Component ID: 2011 Starcraft Quest
Location: S8K1    speed trap: 4.893 m/s
Test Date: 4-24-2011
NHTSA #: CB0902

Knee X Acceleration (G's) VS TIME (S)
Max: 24.05 G's
TMax: 0.02 s
Min: -32.92 G's
TMin: 0.18 s

VELOCITY X (m/s) VS TIME (S)
Max: 5.06 m/s
TMax: 0.12 s
Min: -1.77 m/s
TMin: 0.24 s
VEL@IMP: 5 m/s

FORCE X (N) VS TIME (S)
Max: 1,068.77 N
TMax: 0.02 s
Min: -1,462.74 N
TMin: 0.18 s
FMVSS 222 KNEE FORM IMPACTS
Component ID: 2011 Starcraft Quest
Location: S8K2 speed trap: 4.890 m/s

Test Date: 4-26-2011
NHTSA #: CB0902

**Knee X Acceleration (G's) VS TIME (S)**
- Max: 23.93 G's
- Tmax: 0.02 s
- Min: -31.29 G's
- Tmin: 0.16 s

**VELOCITY X (m/s) VS TIME (S)**
- Max: 5.04 m/s
- Tmax: 0.12 s
- Min: -1.90 m/s
- Tmin: 0.24 s
- Vel@Imp: 4.99 m/s

**FORCE X (N) VS TIME (S)**
- Max: 1,063.28 N
- Tmax: 0.02 s
- Min: -1,390.41 N
- Tmin: 0.16 s
FMVSS 222 KNEE FORM IMPACTS
Component ID: 2011 Starcraft Quest
Location: S8K3 speed trap: 4.890 m/s

Test Date: 4-26-2011
NHTSA #: CB0902

Knee X Acceleration (G's) VS TIME (S)
Max: 23.56 G's
TMax: 0.02 s
Min: -30.96 G's
TMin: 0.18 s

VELOCITY X (m/s) VS TIME (S)
Max: 5.03 m/s
TMax: 0.12 s
Min: -1.86 m/s
TMin: 0.24 s
VEL@IMP: 4.98 m/s

FORCE X (N) VS TIME (S)
Max: 1,046.78 N
TMax: 0.02 s
Min: -1,375.86 N
TMin: 0.18 s
FMVSS 222 KNEE FORM IMPACTS
Component ID: 2011 Starcraft Quest
Location: S8K4 speed trap: 4.892 m/s
Test Date: 4-26-2011
NHTSA #: CB0902

**Knee X Acceleration (G's) VS TIME (S)**
- Max: 23.47 G's
- Tmax: 0.02 s
- Min: -32.29 G's
- Tmin: 0.17 s

**VELOCITY X (m/s) VS TIME (S)**
- Max: 4.93 m/s
- Tmax: 0.12 s
- Min: -1.96 m/s
- Tmin: 0.23 s
- Vel@Imp: 4.86 m/s

**FORCE X (N) VS TIME (S)**
- Max: 1,043.18 N
- Tmax: 0.02 s
- Min: -1,435.14 N
- Tmin: 0.17 s
FMVSS 222 KNEE FORM IMPACTS
Component ID: 2011 Starcraft Quest
Location: S8K5          speed trap:  4.823 m/s
Test Date: 4-26-2011
NHTSA #: CB0902

Knee X Acceleration (G's) VS TIME (S)
Max: 24.12 G's
TMax: 0.02 s
Min: -56.86 G's
TMin: 0.16 s

VELOCITY X (m/s) VS TIME (S)
Max: 5.16 m/s
TMax: 0.12 s
Min: -1.37 m/s
TMin: 0.18 s
VEL@IMP: 5.14 m/s

FORCE X (N) VS TIME (S)
Max: 1,071.95 N
TMax: 0.02 s
Min: -2,526.96 N
TMin: 0.16 s
FMVSS 222 KNEE FORM IMPACTS
Component ID: 2011 Starcraft Quest
Location: S8K6  speed trap: 4.851 m/s
Test Date: 4-26-2011
NHTSA #: CB0902

Knee X Acceleration (G's) VS TIME (S)
Max: 25.04 G's
TMax: 0.02 s
Min: -27.03 G's
TMin: 0.18 s

VELOCITY X (m/s) VS TIME (S)
Max: 5.06 m/s
TMax: 0.12 s
Min: -1.80 m/s
TMin: 0.22 s
VEL@IMP: 5.02 m/s

FORCE X (N) VS TIME (S)
Max: 1,112.87 N
TMax: 0.02 s
Min: -1,201.12 N
TMin: 0.18 s
FMVSS 222 KNEE FORM IMPACTS
Component ID: 2011 Starcraft Quest
Location: S8K7 speed trap: 4.856 m/s
Test Date: 4-26-2011
NHTSA #: CB0902

Knee X Acceleration (G's) VS TIME (S)
Max: 23.32 G's
TMax: 0.02 s
Min: -52.48 G's
TMin: 0.16 s

VELOCITY X (m/s) VS TIME (S)
Max: 5.03 m/s
TMax: 0.12 s
Min: -1.72 m/s
TMin: 0.18 s
VEL@IMP: 4.99 m/s

FORCE X (N) VS TIME (S)
Max: 1,036.49 N
TMax: 0.02 s
Min: -2,332.00 N
TMin: 0.16 s
FMVSS 222 KNEE FORM IMPACTS
Component ID: 2011 Starcraft Quest
Location: S8K8 speed trap: 4.837 m/s
Test Date: 4-26-2011
NHTSA #: CB0902

Knee X Acceleration (G's) VS TIME (S)
Max: 23.36 G's
TMax: 0.02 s
Min: -28.02 G's
TMin: 0.18 s

VELOCITY X (m/s) VS TIME (S)
Max: 4.95 m/s
TMax: 0.12 s
Min: -1.87 m/s
TMin: 0.22 s
VEL@IMP: 4.87 m/s

FORCE X (N) VS TIME (S)
Max: 1,038.28 N
TMax: 0.02 s
Min: -1,245.34 N
TMin: 0.18 s
SECTION 7
WELT CONTACT POINTS
SECTION 8
BUS FLOOR PLAN

Rear Emergency
Exit Door

Front of Bus

Driver

RF Door

S5 S4 S3 S2 S1 B1
S6 S7 S8 S9 S10 B10
LABORATORY NOTICE OF TEST FAILURE TO OVSC

<table>
<thead>
<tr>
<th>Test Procedure:</th>
<th>FMVSS 222</th>
</tr>
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<tbody>
<tr>
<td>Test Vehicle:</td>
<td>2011 Starcraft Quest Bus</td>
</tr>
<tr>
<td>NHTSA No.:</td>
<td>CB0902</td>
</tr>
<tr>
<td>Contract No.:</td>
<td>DTNH22-08-D-00075</td>
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<tr>
<td>Manufacturer.:</td>
<td>Forest River, Inc.</td>
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<tr>
<td>Manufacture Date:</td>
<td>11/10</td>
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<tr>
<td>Test Date:</td>
<td>07/05/11</td>
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<tr>
<td>Test Lab:</td>
<td>MGA Research Corp.</td>
</tr>
<tr>
<td>Project Engineer:</td>
<td>Eric Peschman</td>
</tr>
<tr>
<td>Delivery Order No.:</td>
<td>1</td>
</tr>
<tr>
<td>VIN:</td>
<td>1GB3G3BG2B1112157</td>
</tr>
</tbody>
</table>

TEST FAILURE DESCRIPTION
During the rearward seat back force deflection test for Seat No. S4, the test article failed to absorb 948 joules (316W joules) of energy before it reached the displacement limit of 254 mm. The total energy absorbed was 820 Joules.

FMVSS REQUIREMENTS DESCRIPTION
Paragraph S5.1.4  Seat performance rearward. When a school bus passenger seat that has another seat behind it is subjected to the application of force as specified in S5.1.4.1 and S5.1.4.2:

(b) Seat back deflection shall not exceed 254 mm; (for determination of (a) and (b) the force/deflection curve describes only the force applied through the loading bar, and only the rearward travel of the pivot attachment point of the loading bar, measured from the point at which the initial application of 222 N is attained.

S5.1.4.2 Apply additional force horizontally rearward through the loading bar until 316W joules (J) of energy has been absorbed in deflecting the seat back.

Remarks: No remarks.

Notification to NHTSA (COTR):  Lawrence Valvo

Date: 07/05/11

By: Eric Peschman