U.S. Human Factors
Non-Use Position Study

Head Restraint Informal Working Group GTR Meeting
Cologne, Germany
January 23-26, 2006

Draft
Objective

- Examine response to visible and physical cues that a head restraint is in a non-use position

- **Torso Angle Change**
  - Determine the minimum torso angle change of the J826 manikin that would give an occupant a physical cue that the head restraint is not in position.

- **Label**
  - Assess label effectiveness to indicate to the occupant that the head restraint should be raised.
Vehicle Approach

- **Vehicle Seat**: 2005 Chrysler Town and Country minivan – Stow n’ Go rear seat

- **Testing**
  - **Nominal Torso Angle Change**
    - 5 degree - OEM position
    - 10 degree – modified head restraint
    - 15 degree – modified head restraint

- **Label**
  - Modified 2005 Volvo SC90 label from rear center head restraint
Human Approach

- Testing was conducted in a static setting, but using a ruse that led participants to believe that they would be driving a vehicle as part of the test.

- Participants were asked to sit in the subject seat and fasten the seatbelt in preparation for watching a brief instructional video and then being driven to another location.
Data Collection

- **Data collected included:**
  - Participant’s response to the stowed head restraint
    - i.e. whether or not the person adjusted the head restraint
  - Participant standing height,
  - Sitting shoulder height,
    - measured inside and outside of the vehicle
  - and Questionnaire responses.
Torso Angle Method
Test Preparation

- Measurements were taken using an J826 manikin to determine the backset distances needed to obtain 10 and 15-degree changes in torso angle.
- Head restraint posts were modified to create the desired change in torso angle.
- Height of the fully raised head restraints were approximately 760 mm
# Head Restraint Measurement Values

<table>
<thead>
<tr>
<th>Condition</th>
<th>Torso Angle (deg)</th>
<th>Measured Torso Angle Change (between OE head restraint up, in deg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OE head restraint up</td>
<td>25.5</td>
<td>N/A</td>
</tr>
<tr>
<td>OE head restraint stowed (5 degree torso angle change)</td>
<td>19.1</td>
<td>6.4</td>
</tr>
<tr>
<td>10 degree torso angle change (stowed)</td>
<td>14.2</td>
<td>11.3</td>
</tr>
<tr>
<td>15 degree torso angle change (stowed)</td>
<td>9.1</td>
<td>16.4</td>
</tr>
</tbody>
</table>
Head Restraint Modification
Side View

5°

10°

15°
Head Restraint Modification
Top View

5°  10°  15°
Head Restraint Modifications
Side View – Stowed and Deployed

5 degrees  10 degrees  15 degrees
Head Restraint Modifications
Side View – Stowed and Deployed with Occupant

5 degrees
10 degrees
15 degrees
Label Condition Design
Test Preparation

- Warning label was developed based on a Volvo label
- Modifications were made to improve the clarity of the symbol
  - Changing the “x” to a “no” (circle with diagonal slash) symbol
  - Rotating the image of the person to show him bending forward due to the stowed head restraint, and
  - Adding an arrow to indicate that the head restraint as pictured on the right side of the image had been raised to a proper position.
- For testing, this label was paired with the 5-degree torso angle condition.
Modified label was printed to be similar in size to the OEM Volvo label
Distribution of Participant Heights by Testing Condition

- 1524 – 1574.8
- 1574.9 – 1625.6
- 1625.7 – 1676.4
- 1676.5 – 1727.2
- 1727.3 – 1778
- 1778.1 – 1828.8
- 1828.9 – 1879.6

Number of Participants

Height Range (mm)
### Number of Participants Who Adjusted the Head Restraint by Condition

<table>
<thead>
<tr>
<th>Condition</th>
<th>Number of Participants Who Adjusted</th>
<th>Number of Participants (n)</th>
<th>Percent Who Adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 degree torso angle change (Chrysler OEM)</td>
<td>3</td>
<td>20</td>
<td>15%</td>
</tr>
<tr>
<td>10 degree torso angle change</td>
<td>19</td>
<td>24</td>
<td>79%</td>
</tr>
<tr>
<td>15 degree torso angle change</td>
<td>4</td>
<td>4</td>
<td>100%</td>
</tr>
<tr>
<td>Label</td>
<td>0</td>
<td>20</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>26</strong></td>
<td><strong>68</strong></td>
<td><strong>38%</strong></td>
</tr>
</tbody>
</table>

*In addition to the head restraint adjustments shown in the table, there were 3 participants who adjusted the seat back angle in this study. All 3 were in the 5 degree or label conditions. One of those three (in the 5 degree condition) also adjusted the head restraint. (Bullet revised - 2/2/05)*
Label Content Comprehension

- No participants who received the label condition treatment adjusted the head restraint.

- Questionnaire responses
  - 33 of 68 (49%) correctly interpreted the label
  - 16 of 68 (24%) thought the label informed the occupant that the head restraint was adjustable
    - They read it as being informative rather than instructive
  - 19 of 68 (26%) stated they did not understand the label
Conclusions

- A 5 degree torso angle change is unlikely to cause an occupant to adjust the head restraint from the non-use position.
- A 10 degree torso angle change was successful in causing a majority of occupants to adjust the head restraint.