Biomechanical Responses of HY-III and BioRID II
Presented by Japan

Part 1

Informal GTR Meeting
at NHTSA (Washington DC, USA)
Part 1
Different Biomechanical Responses of HY-III and BioRID II
Objective

To verify different biomechanical responses of HY-III and BioRID II
Test Methods

- Simulated rear-end impact tests using Mini-sled
- Impact velocity: 8 km/h
- High speed camera: motion of dummies

Test Set-up

- Rigid seat
- Use of back pressure distribution sensor in order to measure interaction pressure between the back and the seatback
Test Results

**Human Volunteer**

**HY-III**

**BioRID II**
<table>
<thead>
<tr>
<th>Time (ms)</th>
<th>HY-III</th>
<th>BioRID II</th>
<th>Human Volunteer</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (ms)</td>
<td><img src="HY-III_0ms.png" alt="Image" /></td>
<td><img src="BioRID_II_0ms.png" alt="Image" /></td>
<td>![Image](Human Volunteer_0ms.png)</td>
</tr>
<tr>
<td>50 (ms)</td>
<td><img src="HY-III_50ms.png" alt="Image" /></td>
<td><img src="BioRID_II_50ms.png" alt="Image" /></td>
<td>![Image](Human Volunteer_50ms.png)</td>
</tr>
<tr>
<td>70 (ms)</td>
<td><img src="HY-III_70ms.png" alt="Image" /></td>
<td><img src="BioRID_II_70ms.png" alt="Image" /></td>
<td>![Image](Human Volunteer_70ms.png)</td>
</tr>
<tr>
<td>90 (ms)</td>
<td><img src="HY-III_90ms.png" alt="Image" /></td>
<td><img src="BioRID_II_90ms.png" alt="Image" /></td>
<td>![Image](Human Volunteer_90ms.png)</td>
</tr>
<tr>
<td>150 (ms)</td>
<td><img src="HY-III_150ms.png" alt="Image" /></td>
<td><img src="BioRID_II_150ms.png" alt="Image" /></td>
<td>![Image](Human Volunteer_150ms.png)</td>
</tr>
</tbody>
</table>
Kinematics

HA: Head Angle
NA: Neck Angle
TA: Torso Angle

T1-HP: Length change between T1 and Hip point

[Graphs showing kinematic data for HA-NA, NA-TA, HA-TA, and T1-HP with markers for average ±1 standard deviation (S.D.), BioRID-II, and Hybrid-III.]
Conclusion

• The pattern of the interaction pressure distribution between the seatback and the back of torso on the HY-III and BioRID II is different.

• In the case of HY-III, the localized back pressure is observed both at the top of the torso and at the lower lumber.

• The pattern of back pressure distribution of BioRID II is observed to be similar with that of human volunteer with transferred upward movement that is from the lower lumber to the top of the torso.

• The S-shape deformation of the neck which is proper causation of the whiplash associated disorder is characterized by the interaction pattern between the seatback and the back of the torso.

• BioRID II is closer in terms of S-shape deformation pattern of the neck and the head/neck angle relative to T1 of human volunteer than HY-III.

• It is pointed out that the head angle relative to the torso of BioRID II is better than that of HY-III as the evaluation index.
Seatback pressure

Upper

Lower

0ms  30ms  50ms  100ms  150ms  200ms

Visual motion and Spine shapes (red line)