Additional research of the NL

GRSP Informal Working Group on Frontal Impact

TNO | Knowledge for business

GRSP Informal Working Group on Frontal Impact
Contents

• Frontal crash pulse analysis
  Small Family Car (SFC) crash pulses are compared
  • Car-to-MPDB
  • Car-to-Barrier
  • Car-to-Car

• Test result comparison
  • Euro NCAP
  • Car-to-MPDB
  • Car-to-Car
Frontal crash pulse analysis

• Verify whether the vehicle crash pulse in a MPDB-to-car is representative for an average European car in different car-to-car collisions

• A Small Family Car is an average European car of 1500kg

• Small Family Car-to-MPDB (45/45 km/h) as reference compared to:
  • Small Family Car - to - Supermini (56/56 km/h)

  • Small Family Car - to - Small Family Car (56/56 km/h)

  • Small Family Car - to - Large SUV (56/56 km/h)

  • Small Family Car - to - Barrier (ODB: 56 km/h, PDB: 60 km/h)
Frontal crash pulse analysis
SFC-to-MPDB and SFC-to-Supermini
Frontal crash pulse analysis
SFC-to-MPDB and SFC-to-SFC
Frontal crash pulse analysis
SFC-to-MPDB and SFC-to-SUV
Frontal crash pulse analysis
SFC-to-MPDB, SFC-to-ODB and SFC-to-PDB
Frontal crash pulse analysis

Conclusions

- In the SFC-to-MPDB test, the SFC crash pulse is representative for a collision with an average European (SFC) vehicle

- The SFC-to-MPDB test shows a real car-to-car crash pulse compared to the ODB and PDB pulses
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# Frontal Impact Tests

## Test set-up

<table>
<thead>
<tr>
<th></th>
<th>Euro NCAP</th>
<th>MPDB-to-Car</th>
<th>Car-to-Car</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Velocity</strong></td>
<td>64 km/h</td>
<td>56 km/h</td>
<td>56 km/h</td>
</tr>
<tr>
<td><strong>Overlap</strong></td>
<td>40%</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>1191kg</td>
<td>1225kg</td>
<td>1221kg</td>
</tr>
<tr>
<td><strong>Collision partner</strong></td>
<td>ODB</td>
<td>MPDB</td>
<td>Large SUV</td>
</tr>
<tr>
<td><strong>Velocity</strong></td>
<td>0km/h</td>
<td>56 km/h</td>
<td>56 km/h</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>Inf</td>
<td>1487kg</td>
<td>2551kg</td>
</tr>
</tbody>
</table>
Test Comparison
Post crash deformation

**Euro NCAP**
- Little to no A-Pillar deformation
- Little to no intrusion

**Car-to-MPDB**
- Significant A-Pillar deformation
- Significant intrusion

**Car-to-Car**
- Large A-Pillar deformation due to direct loading
- Large intrusion due to penetration
Test Comparison
Vehicle accelerations

- Barrier tests show higher initial acceleration levels compared to the car-to-car due to different structural interaction.

- Poor structural interaction will affect the energy absorption and the performance of the restraint system.
Test Comparison
Restraint systems

• Due to the low initial acceleration level the restraint system is triggered late, leading to higher dummy loadings

• This issue will not be solved when the PDB test as proposed is adopted

• Additional criteria or tests are required to assess partner protection and avoid misuse of the PDB

<table>
<thead>
<tr>
<th></th>
<th>Airbag firing time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Euro NCAP</td>
<td>Not determined</td>
</tr>
<tr>
<td>MPDB-to-Car</td>
<td>~14ms</td>
</tr>
<tr>
<td>Car-to-Car</td>
<td>~26ms</td>
</tr>
</tbody>
</table>
Test Comparison

Conclusions

• A barrier is a homogeneous collision partner that guarantees good structural interaction

• Good structural interaction is crucial to ensure engagement of the energy absorbing structures and for in-time triggering of the restraint systems

• Additional assessment criteria or tests are required to assess partner protection and to avoid misuse of the PDB

• A car-to-MPDB test shows to be the best method to imitate a car-to-car collision