Update: Deceleration pulse corridor for AECD testing

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31 March–02 April 2015
Simplifying the proposed corridor

- At the 7th AECS meeting TRL presented a proposed deceleration corridor based on full-width impact tests (AECS-07-05, Page 14)
- Following feedback from the experts the shape of the proposed corridor was simplified:
  - Four points deleted (B, C, H and I)
  - All other points identical: Same peak deceleration levels and duration

AECS 7 proposal:  

![AECS 7 proposal graph]

AECS 8 proposal (simplified):

![AECS 8 proposal graph]

- Simplified corridor enables easier replication of pulse with existing test sleds
Proposed Deceleration Corridor (simplified)

100\(g\), 22 ms
\(\Delta v = 154\) km/h

85\(g\), 4 ms
\(\Delta v = 60\) km/h

60 ms
Proposed Deceleration Corridor (simplified)

Proposed Deceleration Corridor

Based on 56 km/h, rigid barrier, full-width impact tests, safety factor 1.3, simplified shape

<table>
<thead>
<tr>
<th>Point</th>
<th>Time (ms)</th>
<th>Deceleration (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>B</td>
<td>34</td>
<td>85</td>
</tr>
<tr>
<td>C</td>
<td>38</td>
<td>85</td>
</tr>
<tr>
<td>D</td>
<td>46</td>
<td>0</td>
</tr>
<tr>
<td>E</td>
<td>0</td>
<td>21</td>
</tr>
<tr>
<td>F</td>
<td>25</td>
<td>100</td>
</tr>
<tr>
<td>G</td>
<td>47</td>
<td>100</td>
</tr>
<tr>
<td>H</td>
<td>60</td>
<td>0</td>
</tr>
</tbody>
</table>
Sled testing of telematics units: Setup

- TRL performed sled testing using the simplified pulse corridor
- Sled specification: Deceleration sled; 230 kJ maximum energy; 12 bungees; 1.8 metres free run
- Vehicle telematics units (containing GSM and GNSS modules, SIM card holders, internal batteries, capacitors, etc.) were used as a substitute AECD units
- 4 test runs with 12 samples (4 different unit designs, 3 samples of each)

TRL thank Stadium United Wireless for providing test samples and support for this programme.
Sled testing of telematics units: Results

- Proposed deceleration levels were achieved easily
- Peak decelerations were between 98 g and 104 g

Example trace of TRL test G225I11:

\[ \Delta v: 99.0 \text{ km/h} \]
\[ \text{Peak deceleration: 99.8 g} \]

- The units were inspected post-test both, visually (for bent, displaced or lifted-off components) and electronically (current consumption, GPS/GSM functionality)
- All 12 samples of telematics units passed the inspections, i.e. remained operable after being subjected to the proposed deceleration pulse.
Conclusions

- The proposed maximum deceleration of circa 100 $g$ was achieved without issues on an existing standard deceleration sled.
- The proposed pulse corridor was wide enough to achieve a valid deceleration pulse with limited effort for pulse-tuning.
- The test setup used allowed the number of sled tests required to be minimised: Three orientations of each system were tested simultaneously.
- All 12 samples of telematics units tested proved able to withstand the test deceleration pulses of circa 100 $g$.

This shows that the proposed deceleration corridor can be replicated easily and AECD control units should be able to withstand it.
Thank you

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