Ford Round Robin:

1. Test Set-up and Plan
2. Test Results
3. Impactor Issues
4. Summary
Ford - Test Set-up and Plan:

Vehicle Information:
- Mid-size truck/utility vehicle
- Bumper Lower Reference Line (BLRL) 350–485mm
- Bumper / fascia design similarly to sedan approach

Test Locations:
- Near middle (2A)
- Aligned with headlamps (3B)

Testing Objectives:
- Evaluation of repeatability and reproducibility to further understand the potential feasibility issues associated with mid-size truck/utility vehicles
  - Due to part availability and limited test time the objectives were adjusted to assess the influence of ride height
## Ford - Test Results (Center Location):

<table>
<thead>
<tr>
<th>Test Number</th>
<th>Location</th>
<th>Tibia 1 Nm</th>
<th>Tibia 2 Nm</th>
<th>Tibia 3 Nm</th>
<th>Tibia 4 Nm</th>
<th>ACL mm</th>
<th>MCL mm</th>
<th>PCL mm</th>
<th>Ride Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>GTR Proposed Criteria</td>
<td></td>
<td>340</td>
<td>340</td>
<td>340</td>
<td>340</td>
<td>13</td>
<td>22</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Test 1 (SN01)</td>
<td>2A</td>
<td>216</td>
<td>357</td>
<td>293</td>
<td>144</td>
<td>2.5</td>
<td>1.8</td>
<td>2.6</td>
<td>Low – 50 mm</td>
</tr>
<tr>
<td>Test 3 (SN01)</td>
<td>2B</td>
<td>325</td>
<td>370</td>
<td>272</td>
<td>100</td>
<td>5.9</td>
<td>7.1</td>
<td>2.4</td>
<td>Mid</td>
</tr>
<tr>
<td>Test 5 (SN01)</td>
<td>2B</td>
<td>339</td>
<td>297</td>
<td>187</td>
<td>72</td>
<td>10.5</td>
<td>19.7</td>
<td>6.1</td>
<td>High - 50 mm</td>
</tr>
<tr>
<td>Test 6 (E-leg)</td>
<td>2A</td>
<td>Data did not record</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Observations:**
- MCL, PCL and ACL tend to increase with increasing ride height
- Tibia numbers did not show a trend
**Ford - Test Results (Outside Location):**

<table>
<thead>
<tr>
<th>Test Number</th>
<th>Location</th>
<th>Tibia 1 Nm</th>
<th>Tibia 2 Nm</th>
<th>Tibia 3 Nm</th>
<th>Tibia 4 Nm</th>
<th>ACL mm</th>
<th>MCL mm</th>
<th>PCL mm</th>
<th>Ride Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>GTR Proposed Criteria</td>
<td></td>
<td>340</td>
<td>340</td>
<td>340</td>
<td>340</td>
<td>13</td>
<td>22</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Test 2 (SN01)</td>
<td>3B</td>
<td>153</td>
<td>138</td>
<td>112</td>
<td>63</td>
<td>4.4</td>
<td>7.8</td>
<td>2</td>
<td>Mid</td>
</tr>
<tr>
<td>Test 7 (E-leg)</td>
<td>3B</td>
<td>148</td>
<td>136</td>
<td>106</td>
<td>52</td>
<td>6.4</td>
<td>9.9</td>
<td>3</td>
<td>Mid</td>
</tr>
<tr>
<td>Test 4 (SN01)</td>
<td>1A</td>
<td>340</td>
<td>320</td>
<td>233</td>
<td>106</td>
<td>9.4</td>
<td>16.3</td>
<td>7.2</td>
<td>High - 50 mm</td>
</tr>
</tbody>
</table>

**Observations:**
- Similar to the center location, the measurements increased with increasing ride height.
- Comparable results between SN01 (test 2) and E-Leg (test 5).
Ford - Flex Pli Impactor Issues:

SN01:
• Capacitor Issues: impactor was only recording approximately 500ms of data compared to the typically 2s.
  o DTS was called in to troubleshoot the leg and discovered that the capacitor failed. DTS replaced the capacitor.

E-Leg:
• Connection problems: the “Slice bus up to PC” connector disconnected from the circuit board inside the base slice.
  o The base slice was an older version. Inside the unit the wire was not strain relieved due to space. The wire tension caused the connector to separate. DTS was able to repair the base slice.
  o Connection issues continued, the capacitor was disconnected between runs in order for the software to recognize the leg
• The flesh cover zipper was broken and outer flesh cover was worn and had holes.
• The impactor was missing the quick release cable, cable housing and hanging bracket
Ford Testing - Summary

• Mid-size trucks and sport utility vehicles designed with off-road characteristics (larger approach angles and running clearances) will have increased challenges in meeting the proposed Flex-Pli criteria as compared to sedans.
  o Initial testing suggests sensitivity to ride height variations. This will increase the engineering complexity to use one design to account for the large range of ride height ranges.

• Full size trucks tend to have even larger bumper lower reference line ranges typically spanning 370 – 540mm. This large ride height range and other larger truck attributes, such as those list below, are not compatible with the GTR lower leg requirements regardless of impactor.
  o Overall vehicle length, maneuverability, garageability, rise to curb and ground clearance
  o Heavy duty bumper systems that support harsh worksite environments
  o Provisions for mounting snow plows and winches
Thank You!