Issues to be resolved in evaluation of Regulation R94 amendments

1. **Is an accident analysis needed to update information on changing vehicle fleet?**

   Background: R94 is based on a reference crash of 50 km/h car-car crash 50% overlap. Does this reference need to be updated to reflect other frontal crash conditions? For example, how relevant are crashes between passenger cars and heavy goods vehicles, roadside obstacles etc.
   Action: *National/European analysis of accident distributions and collision speeds. Sources. PENDANT, CCIS, RISER, GIDAS, etc.*

2. **Assess potential for harmonisation for frontal impact procedures**.
   Background: The USA and Japan both require a full frontal impact test procedure and Japan also requires an offset test procedure (R94). Changes to R94 that can be incorporated into a global frontal impact standard would be beneficial for European industry and would allow for better frontal impact protection.
   Action: The introduction of a full frontal impact test in Europe could allow better harmonisation with the US and Japan. A combined offset and full frontal test procedure should be analyzed for suitable test speeds.

3. **Validate that the PDB test guarantees a minimum EES test severity for all vehicles.**
   *Background: The test severity defined under **Point 4** must be ensured to be enforced with the PDB. Sufficient test and simulation data does not exist to confirm the PDB can achieve this. The PDB energy absorbing capacity will allow a completely rigid vehicle (a steel block) to have acceptable test results for occupant protection. Although these vehicles are unlikely to be designed, there is the theoretical potential for an acceptable test result with an unacceptable vehicle.*
   Actions: Investigate potential to misuse PDB. Investigate application of Full Width Barrier test.

4. **Finalise the test severity for regulation test – determine acceptable minimum values for vehicles.**
   Background: The reference car-car test in R94 assumes a collision partner identical to the test vehicle. Compatibility research shows that the energy absorption demands for small cars and large cars are different in a fixed barrier test procedure. A test severity metric (such as Equivalent Energy Speed – EES) should be determined for the test vehicle based on the vehicles mass. One example is to use a reference collision partner of a set mass so that small cars have higher EES speeds than heavy vehicles. Accident analysis and collision probability models could define a minimum required EES for all vehicles in the test category. As example, a median vehicle mass for the European fleet (approx 1500 kg) could be used.
   Action: Collision speed and vehicle mass distribution scenarios evaluating the collision violence for different vehicle categories and the risk of collisions. Sources: EU Project Improver, GIDAS, CCIS.

5. **Validate the PDB EES calculation method**
   *Background: PDB test results to date are reported with the EES experienced by the test vehicle. The data is based on a calculation of the energy absorbed by the PDB. This calculation cannot be directly verified. Thus the EES value determined in **Point 3** cannot be positively confirmed for the PDB.*

6. **Validate that PDB provides the required test requirements for interior restraints**
   *Background: In connection to **Point 2** and **Point 4** the PDB may produce a test that does not sufficiently test the restraint system to address certain injuries.*
   Action: Investigate need to complement the PDB with a Full Width Barrier test.

7. **Identify critical injury mechanisms (in particular relevance of thorax injuries in high deceleration pulse type accidents)**
   Background: Information presented was presented from the UK to EEVC WG15 in 2006. The information showed an increase in chest injuries for newer vehicle models. Does this information suggest specific restraint system tests are necessary (for example a high pulse test)?
   Action: Collection of national and European injury statistics, preferably grouped with collision severity. Sources: CCIS, GIDAS, Pendant, STRADA, etc