



ACEA

European
Automobile
Manufacturers
Association

DIRECT VISION

Evaluation Approach

17TH VRU-PROXI

ACEA WORKING GROUP TRUCK SAFETY

10 March, 2021

VRU-Proxi-17-06

DIRECT VISION – EVALUATION APPROACH

Two (*three*) different approaches has been proposed to evaluate the direct vision performance of trucks

- Combined approach, in which the visible volumes in the front, the left-hand and the right-hand views are summed up and evaluated against one limit value
- Separated approach, in which each of the visible volumes are evaluated against separate limit values
- Separated plus combined approach, hybrid of the two above, in which the sum of the visible volumes is evaluated against a limit value, while in addition one or more of the separate volume(s) is/are evaluated against separate limit values(s)

EVALUATION APPROACH – SEPARATED 1

- The separated approach is not technology neutral since it tends to set a design requirement in each evaluated direction and leaves little design freedom
- Separated approach fails to address the concern for sub-optimisation, since such sub-optimisation could theoretically still be done within any of the three views
- The separated approach sets a limit to what can be achieved – trucks with the best front view in its category cannot meet the proposed limit and well-recognised best in class trucks fail in other directions
- The separated approach is to the disadvantage of the integration of Advanced Assistant Systems, particularly to the front volume due to camera and sensor systems positioning

EVALUATION APPROACH – SEPARATED 2

- The separated approach – if too rigid front limit values are applied – hinders target achievement in other legal requirements, e.g. CO₂ emissions, Noise emissions and EU VII emissions
 - An over-sized front elongation along with ground clearance requirements might result in higher aerodynamic drag and therefore higher CO₂ emissions
 - Revision of the Phase 3 Noise limit values (to be applied 2026) may lead to stricter limits that require additional packaging space in the front
 - Euro VII Emission standards may require additional packaging space requirements for heating facilities and filter systems that need to move close to the engine
- The separated approach leads to a disadvantage of narrow cab vehicles for the front volume, although these vehicles have better driver/passenger side volumes
- The separated approach induces design and evaluation uncertainties, most notably regarding position of A-pillars and rear view mirrors in relation to the driver's eye position

EVALUATION APPROACH – SEPARATED 3

- In separated approach, when a limit volume is reached in either direction, no further improvement in that direction will count – a small improvement in one view would therefore be prioritised over large improvements in other views
- Due to moderate correlation between the separated volumes and the average distance to VRUs, the sum of the volumes counts lower than in combined approach
 - Physical testing approach for the front volume shows significant differences to the application of the measurement method (up to 14,8 percent as in revised VRU proxy meeting #15 documents)
- The separated approach would disqualify a huge amount of fit-for-purpose trucks for which it would not be possible to achieve the limits even with all available design improvements
 - In that sense our customers could not continue using the benefits of e.g. the best cabs in long haulage, high capacity transport and timber transport applications

EVALUATION APPROACH – COMBINED

- The combined approach gives a fair challenge for the industry to enhance direct vision and preserves technology neutrality
 - awards best in class direct vision design
 - every direct vision improvement counts
- The combined approach is far simpler in design evaluation and specification predictability
- The combined approach is already established in UK – one evaluation method
- The combined approach perfectly complements the benefits of the fitment with BSIS and MOIS
- Provided that an equal direct vision improvement (in number of affected vehicles) would be achieved with the combined approach, it is preferred over the separated approach in all aspects due to the above arguments
- Combined approach, with current limits proposed by ACEA, would imply an ambitious direct visibility improvement compare to vehicles on the roads today

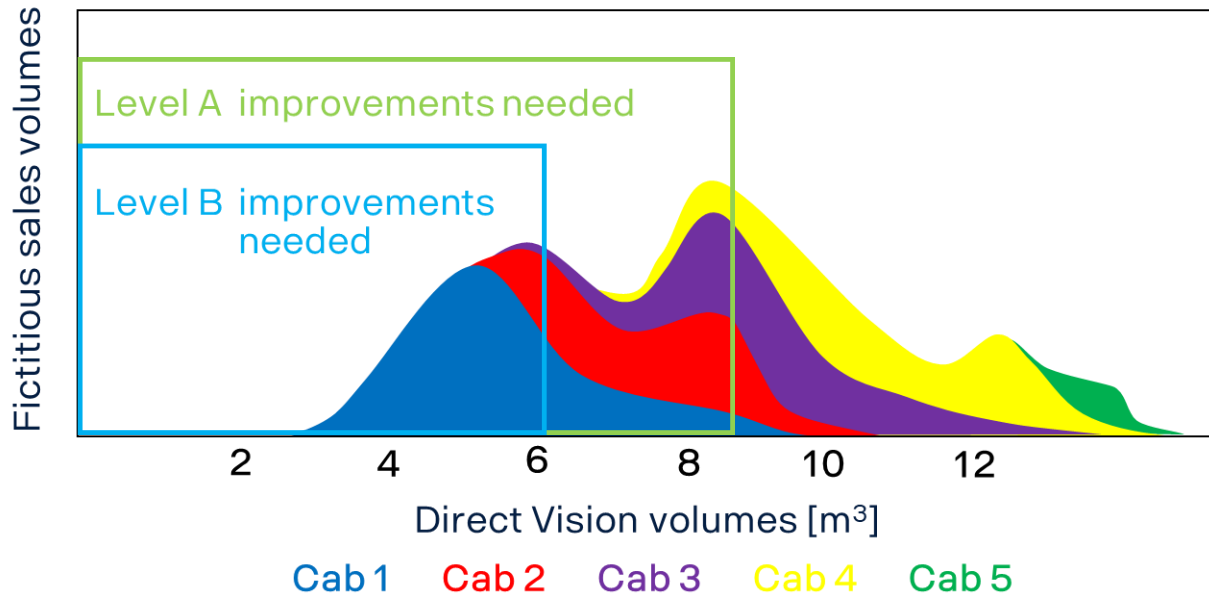
EVALUATION APPROACH – HYBRID

- The separated plus combined approach fails in feasibility for many of the same arguments as of the separated approach
 - Ultimately depending on the choice of limit value for the front view

SEPARATED VS COMBINED APPROACH

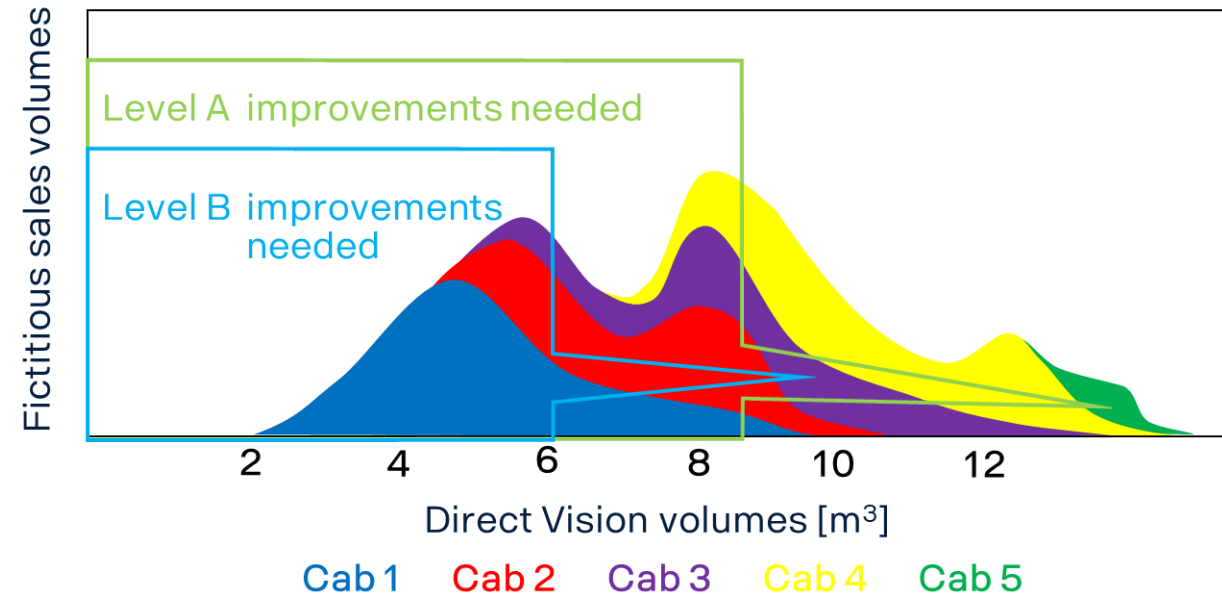
N.B. vehicle volumes and cab examples are fictitious, i.e. do not correspond to any specific OEM

Fictitious sales volumes vs Direct Vision Volume
Combined approach - total



- Fictitious, but realistic distribution of today's heavy trucks estimated using the **combined approach**
- Five cabs, different chassis

Fictitious sales volumes vs Direct Vision Volume
Separated approach - total

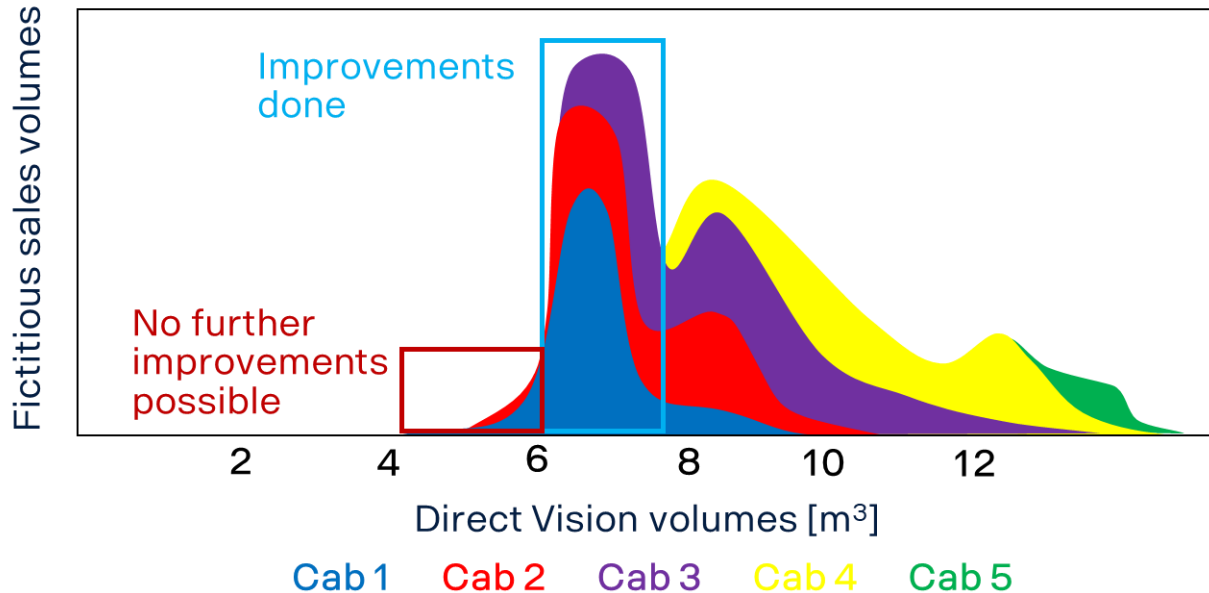


- Corresponding distribution of today's heavy trucks estimated using the **separated approach**
- Five cabs, different chassis
- Complete values differ due to method

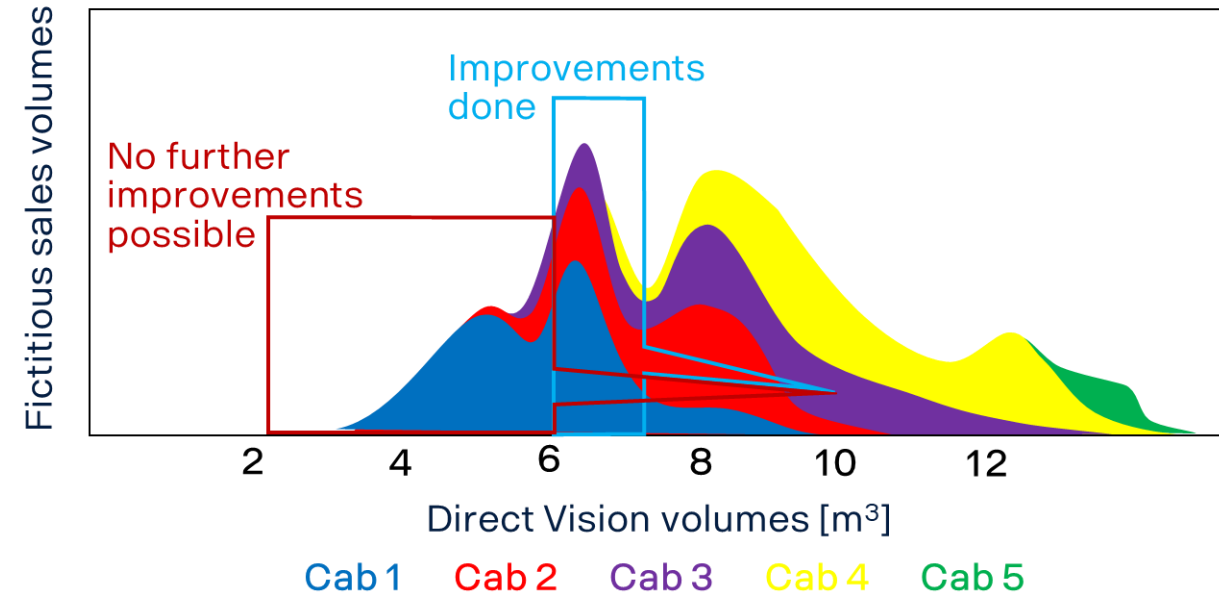
POSSIBLE IMPROVEMENTS – LEVEL B

N.B. vehicle volumes and cab examples are fictitious, i.e. do not correspond to any specific OEM

Fictitious sales volumes vs Direct Vision Volume
Combined approach – Level B - improved



Fictitious sales volumes vs Direct Vision Volume
Separated approach – Level B - improved



- Fictitious, but realistic distribution of improved heavy trucks **combined approach** (level B target)
- Some trucks cannot meet the ACEA Level B limit despite design changes

- Fictitious, but realistic distribution of improved heavy trucks **separated approach** (level B target)
- Huge amount of trucks cannot meet the ACEA Level B limit despite design changes

EVALUATION APPROACH – SUMMARY

- ACEA's position is that the combined approach is the feasible method to evaluate direct vision performance
- Only after establishing the evaluation approach to be used, it is possible to analyse the full effects of different limit values for different vehicles