DIRECT VISION
Proposal – Division Urban and Rural N3 Vehicles (Part 1)

VRU-PROXI 14TH SESSION
WebEx meeting

ACEA WORKING GROUP TRUCK SAFETY
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Erik Dahlberg, Director Technical Affairs, Scania

May 27, 2020

VRU-Proxi-14-06
ACEA COMMERCIAL VEHICLE MEMBERS

![Logos of ACEA members]

- DAF
- DAIMLER
- Ford Trucks
- IVECO
- MAN
- Scania
- Volvo Group
Direct Vision

Background
DIRECT VISION - BACKGROUND

• Direct Vision will become a requirement in the EU under the General Safety Regulation, GSR and will apply for
  • new types 2026-01-07
  • all registrations 2029-01-07
• Regulation (EU) 2019/2144, specifies that specificities of different categories of vehicles must be taken into account in the Direct Vision requirement
• The Direct Vision Technical Requirements are now being developed within UN ECE VRU-Proxi
Annex 2.5.8 Safer HGV Front End Design

T&E welcomed the study and the range of studies referenced, including the focus on VRUs in urban areas – specifically on direct vision, it would perhaps make a comparison with active safety measures

The Commission indicated the need to compare active systems and direct vision

Fatality Reductions by Improvements to Direct Vision

Research acknowledges that improved frontal and lateral direct vision is effective in preventing VRU casualties in accident scenarios such as run overs while the HGV is pulling away or turning, or while a VRU is crossing the road in front of the HGV (Summerskill, 2011; Welfers et al., 2011), (Volvo Trucks, 2013). However, no study could be identified that quantified the effectiveness of improved direct vision

• “Direct Vision may not be as effective at preventing accidents compared with alerting systems or well-positioned cameras”
• Initially, there was no scientific study available, that shows the benefit of improved direct vision
TRL analysis show limited benefit of Direct Vision

**ACCIDENT ANALYSES SHOW MINOR BENEFIT OF IMPROVING DIRECT VISION**

### Results from STATS19 (UK) as reduction of total number of fatalities, seriously and slightly injured, all road users

<table>
<thead>
<tr>
<th>VIS Approach</th>
<th>Direct Visibility CAB design</th>
<th>Severities</th>
<th>Fatal</th>
<th>Serious</th>
<th>Slight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Best-in-class cab savings</td>
<td>-0.10%</td>
<td>-0.02%</td>
<td>-0.01%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>High-visibility cab savings</td>
<td>-0.95%</td>
<td>-0.20%</td>
<td>-0.06%</td>
<td></td>
</tr>
<tr>
<td>Driver Support / Active Safety</td>
<td>VRU detection savings</td>
<td>-1.40%</td>
<td>-0.29%</td>
<td>-0.09%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AEB-VRU savings</td>
<td>-1.53%</td>
<td>-0.32%</td>
<td>-0.10%</td>
<td></td>
</tr>
</tbody>
</table>

**THE PROBLEM IS REAL, BUT**

- **Construction traffic** in cities remains high and **increasing bicycle traffic** results in a higher number of accidents.
- Active safety systems have no blind spots and are **always... looking in the right direction...** prepared to take correct action to avoid or mitigate the accident and not dependent on driver actions.
- Active safety benefits will be **available on all types** of trucks and buses.
- **VRU detection mandatory as from 07/2024,** direct vision from 01/2029. An additional benefit of Direct Vision is therefore limited.

With permission of DG GROW, TRL worked on that issue and found a clear priority for VRU detection and VRU intervention. Thus, it was the priority of ACEA to advocate for those assistance systems.
### Active systems introduced before Direct Vision

<table>
<thead>
<tr>
<th>LEGAL REQUIREMENT</th>
<th>CATEGORY</th>
<th>NEW TYPES</th>
<th>ALL TYPES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced driver distraction warning</td>
<td>M, N</td>
<td>2024-07-07</td>
<td>2025-07-07</td>
</tr>
<tr>
<td>Driver drowsiness and attention warning</td>
<td>M, N</td>
<td>2022-07-06</td>
<td>2024-07-07</td>
</tr>
<tr>
<td>Intelligent Speed Assistance</td>
<td>M, N</td>
<td>2022-07-06</td>
<td>2024-07-07</td>
</tr>
<tr>
<td>Safety Belt Reminders</td>
<td>M, N</td>
<td>2022-07-06</td>
<td>2024-07-07</td>
</tr>
<tr>
<td>Emergency Stop Signal</td>
<td>M, N</td>
<td>2022-07-06</td>
<td>2024-07-07</td>
</tr>
<tr>
<td>Alcohol interlock installation facilitation</td>
<td>M, N</td>
<td>2022-07-06</td>
<td>2024-07-07</td>
</tr>
<tr>
<td>Tyre Pressure Monitoring</td>
<td>M, N, 03, 04</td>
<td>2022-07-06</td>
<td>2024-07-07</td>
</tr>
<tr>
<td>Reversing detection</td>
<td>M, N, 03, 04</td>
<td>2022-07-06</td>
<td>2024-07-07</td>
</tr>
<tr>
<td>Blind spot information system</td>
<td>M, M1, M2, M3, N1, N3</td>
<td>2022-07-06</td>
<td>2024-07-07</td>
</tr>
<tr>
<td>Pedestrian and cyclist collision warning</td>
<td>M, M1, N1, N3</td>
<td>2022-07-06</td>
<td>2024-07-07</td>
</tr>
<tr>
<td>Direct Vision Requirements</td>
<td>M, M1, M2, N1, N3</td>
<td>2026-01-07</td>
<td>2029-01-07</td>
</tr>
<tr>
<td>Autonomous vehicles; Driver availability monitoring system</td>
<td>M, M2, M3, N2, N3</td>
<td>2022-07-06</td>
<td>2024-07-07</td>
</tr>
<tr>
<td>Autonomous vehicles; EDR (also non-automated vehicles)</td>
<td>M, M2, M3, N2, N3</td>
<td>2026-01-07</td>
<td>2029-01-07</td>
</tr>
<tr>
<td>Autonomous vehicles; Systems to replace the driver's control of the vehicle</td>
<td>M, M2, M3, N2, N3</td>
<td>2022-07-06</td>
<td>2024-07-07</td>
</tr>
<tr>
<td>Autonomous vehicles; Systems to provide the vehicle with real-time information on the state of the vehicle and the surrounding area</td>
<td>M, M2, M3, N2, N3</td>
<td>2022-07-06</td>
<td>2024-07-07</td>
</tr>
<tr>
<td>Autonomous vehicles; Harmonised format for the exchange of data for instance for multi-brand vehicle platooning</td>
<td>M, M2, M3, N2, N3</td>
<td>2022-07-06</td>
<td>2024-07-07</td>
</tr>
<tr>
<td>Autonomous vehicles; Systems to provide safety information to other road users</td>
<td>M, M2, M3, N2, N3</td>
<td>2022-07-06</td>
<td>2024-07-07</td>
</tr>
<tr>
<td>New item, Hydrogen and Fuel cell vehicles</td>
<td>M, M2, M3, N2, N3</td>
<td>2022-07-06</td>
<td>2024-07-07</td>
</tr>
<tr>
<td>Protection of vehicle against cyber attacks</td>
<td>M, M2, M3, N2, N3</td>
<td>2022-07-06</td>
<td>2024-07-07</td>
</tr>
</tbody>
</table>

Already introduced: Updating lateral side guards (Amendment 01), Fire Safety for buses (Amendment 02), RUP (Amendment 03)

- By July 2024, all new vehicles have to be equipped with blind spot information and moving off information systems
- This means, by 2029 most vehicles in the then existing fleet have a “next to ultimate” VRU accident avoidance performance
Direct Vision
Different needs in different operation
# GSR – DIRECT VISION

London method as drop-off for GSR Direct Vision

<table>
<thead>
<tr>
<th>Pragmatic license to operate in London</th>
<th>Dogmatic GSR Direct vision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct vision <strong>AND/OR</strong> advanced assistance systems</td>
<td>Direct vision <strong>WITHOUT</strong> advanced assistance systems</td>
</tr>
<tr>
<td>Digital volumetric method for direct vision rating of each individual vehicle to get <strong>access to London</strong></td>
<td>Digital volumetric/physical method for direct vision type approval of worst case vehicle of a vehicle family to get <strong>access to the market</strong></td>
</tr>
</tbody>
</table>

**LOCAL requirement 2020 1*/2024 3***:  
- Greater London/UK

**UNECE legislation (2026 NT and 2029 AT):**  
- Europe & 52 countries following UNECE (e.g. Australia, Russia, Japan …)

<table>
<thead>
<tr>
<th>Rating of vehicles</th>
<th>Pass/Fail criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image 1" /></td>
<td><img src="image2.png" alt="Image 2" /></td>
</tr>
<tr>
<td><strong>FULLFIL LONDON REQUIREMENT FOR DIRECT VISION</strong></td>
<td><strong>FULLFIL GSR REQUIREMENT FOR DIRECT VISION</strong></td>
</tr>
<tr>
<td><strong>YES</strong></td>
<td><strong>YES</strong></td>
</tr>
<tr>
<td><strong>ACTIVE SYSTEMS ADDED</strong></td>
<td><strong>NO TYPE APPROVAL</strong></td>
</tr>
<tr>
<td><strong>ACCESS TO LONDON</strong></td>
<td><strong>ACCESS TO MARKET</strong></td>
</tr>
<tr>
<td><strong>NO</strong></td>
<td><strong>NO</strong></td>
</tr>
</tbody>
</table>
Direct visibility through windows is essential and the important base for driver awareness of surrounding traffic. **The need depends on the traffic situation:**

- **Driving at higher speeds on highways and rural roads and:** good overview, long distance forward visibility and a high eye position is beneficial

- **Driving at lower speeds in urban areas:** Close-up visibility forward and at both sides are more important

When insufficient, due to truck design for different context, visibility must be compensated by detection and indirect vision.
 Improvements in Direct Vision help the driver in different traffic situations in different ways

- The need for Direct Vision differs from different type of transports
  - Long range versus short range visibility

- The focus on the use of the vehicles should be taken into account

- To reach the best effect for road safety, Direct Vision need to be complemented with active detection systems

- All aspects in society must be considered when establishing a new requirement to achieve the best total effect on safety for vulnerable road users, safety and comfort for the driver, the environment / fuel consumption / transport efficiency and the logistic chain
Safety benefits of specific trucks for urban traffic

Special segments operating in dense city conditions

Adopted for low average speed, high traffic density, many pick-ups and deliveries over short distances in good road conditions:

- Cab in low position
- Low instep and low floor for multi entry/leave
- Engine in/behind cab
- Low eye position adopted to other road users
- Additional windows to improve close up direct visibility

Less feasible for heavy construction in rough conditions

- Low ground clearance and too small approach angle

Not feasible for long haul

- High driver position with overview visibility needed/preferred on highway
- Soiling, glare and driving comfort
- Living comfort and overnight stay, i.e. space, flat floor and insulation
Safety benefits of high cabs in long haulage

On highways and rural roads at a high driving speed (80 to 90 km/h) a good direct view of the road in front is needed to:

- Drive safely and stop in time in case of
  - Traffic jam,
  - Accidents,
  - Road work
  - Wild animals on the road

- Plan the route
  - A long vehicle combination can not easily change lanes or do other quick manoeuvres
  - Read directional traffic signs

- Stop the truck, stopping distance for a loaded truck approx 95 m

- Only a rested driver is a safe driver
- Drivers have to work and live in the cabin – shortage in the number of drives is a main concern of the transport sector
Redesign is limited due to technical conditions

- Driver eye-point cannot be lowered due to required cooling capacity
- To take a “direct vision city rating” and apply that to long haul vehicles neglects the optimization of those for highway application
A low cab have higher drag \((C\text{dx}A)\) than a high cab, resulting in a penalty of about 2\% in the certified \(\text{CO}_2\) values (VECTO Long-haul cycle, G20N vs S20N).

This will not only influence Energy consumption and \(\text{CO}_2\), but also the operating range of Battery Electric Vehicles (low cab requires an additional 3kWh/100km vs high cab).

Highest cab – highest cooling capacity, best aerodynamic performance

Medium-high cab – medium cooling capacity, medium aerodynamic performance
DIRECT VISION

Two different levels needed

- To be demanded a **Rural** Direct Vision Requirement

- To be demanded an **Urban** Direct Vision Requirement
CONCLUSIONS:

- Heavy vehicle trucks consist of many different application with many different tasks
- The result is different chassis and cab heights due to the different needs
- Improved safety must be considered from urban to highway conditions
- Detection systems are under development and required in GSR with the purpose to protect VRU’s by 2024
- Cab and vehicle design will affect CO₂, already CO₂ approved vehicles may be changed with possible worse CO₂ figures as a result

The Direct Vision regulation must therefore include a certification method with different requirements for different applications and taking active detection systems into account