

**Draft report of the 8th Session
GRSG informal group on
awareness of Vulnerable Road Users proximity
in low speed manoeuvres (VRU-Proxi)**

Dates: 5-7 February 2019
Venue: Nissan Global Headquarters
1-1-1 Takashima
Nishi-ku, Yokohama-City, Kanagawa 220-8686
Japan

Contact (host): Mr. Hirao, Ph. D., CPE (NISSAN MOTOR Co., Ltd.)

Chairs: Mr. Matsui (Japan) and Mr. Broertjes (EC)
Secretary: Mr. Broeders (OICA)

The meeting was started with a nice welcome and introduction by Mr. Matsui (Chair) from Japan, Mr. Broertjes (Co-chair) from the European Commission and Mr. Morimoto from Japan (MLIT).

1. Adoption of the agenda

Document: VRU-Proxi-08-01 (Chair)

The chair proposed to change the order of the agenda subjects with agreement of the group.

2. Adoption of the report of the 7th session (Bergisch Gladbach, Germany)

Document: VRU-Proxi-07-07 (Chair)

There were no comments from the group since the publication of the draft notes, the Chair thanked the Secretary and stated that the report of 7th VRU-Proxi session can be adopted.

3. Accidentology

Document: VRU-Proxi-08-02 Rev1 (TRL)

EC has commissioned TRL for accident analysis, TRL presented the status of this collision landscape analysis for the GSR Phase 2:

- Focus of this presentation was VRU awareness for the driver by means of direct vision or detection at front, side (VIS) and rear (REV) as these are especially of interest for the VRU-Proxi working group.
- Objective was to investigate the EU collision landscape, the cost-effectiveness indicators and effect of sets of safety measures as proposed by the European

Commission in GSR phase 2. Double counting the benefits of measures with the same effect and benefits of both proposed and already mandatory safety measures in the market were taken into account.

- This analysis is based on STATS19 (database of reported injury collisions on public roads in Great Britain) with data recorded at four levels:
 - Collision details
 - Vehicle details
 - Casualty details
 - Contributory factors
- TRL approach:
 - Define total population
 - Define target population on top level and detailed level
 - Split by vehicle category
 - Determine societal costs of VRU casualties per vehicle category
- TRL preliminary conclusions based on STATS19 data only are noted below.

1. BSIS:

- a. VRU collisions relevant to BSIS are dominated by collisions with M1 vehicles.
- b. Subjects for debate:
 - i. Should M1/N1 vehicles and $N2 \leq 7.5t$ be considered in scope? OICA: accident statistics are presented before and showed different results.
 - ii. Besides cyclists also pedestrians to be considered?
- c. NL pleased with presentation as M1 and N1 have high number of casualties especially for the injured persons in NL.
- d. No distinction made yet between frontal and side collisions. TRL will update the results when this info is available.

2. Reversing Motion:

- a. VRU collisions relevant to REV dominated by M1/N1 vehicles
- b. This includes VRU crossing at the rear (not considered in current regulation proposal)
- c. Scope of Reversing Motion is in line with scope of GSR Phase 2

3. Moving-Off Information System (MOIS)

- a. Subjects for debate:
 - i. Should M1/N1 vehicle be considered in scope?
 - ii. If N2/N3 are considered in scope, should M1, N1 and M3 be considered in scope as well?
- b. CLEPA: what are typically root causes for M1 as pedestrians are clearly visible? TRL: VRU typically crossing the lane in front of vehicle.
- c. CLEPA: for which situations will AEB systems help? The Chair stated that the speed range between 0 and AEBS activation speed should be covered with MOIS. Minimum speed in current draft UN regulation AEBS M1 is 20 km/h (recently adopted). Furthermore the Chair explained that VRU-Proxi regulation will feed into GSR phase 2. On EU level AEBS is mandated by GSR phase 1 but on UN level not all CPs has mandated AEBS.

4. Direct Vision:

- a. VRU collisions relevant to DIR dominated by collisions with M1 vehicles
 - b. Subjects for debate:
 - i. Should M1/N1 vehicles be considered in scope?
 - ii. If N2/N3 in scope, should M3 also be considered in scope?
 - iii. Contributory factors may play an important role in better defining Direct Vision target population. TRL shall investigate.
- UK: we basically don't know yet how effective the systems will be. What are the causation factors and are these really covered by the measures that are considered? TRL will investigate in the next stage.

Conclusion & next actions:

- TRL to split analysis out to detailed manoeuvres and causation analysis and scale to EU28 level based on ACEA agreed GSR2 approach. Plan is to have this complete before the VRU-Proxi March session.
- IWG to discuss subjects for debate as proposed by TRL in next VRU-Proxi session.

4. Forward motion Vehicle turning - Blind Spot Information System

Documents: GRSG-115-10-Rev.1
[ECE/TRANSP/WP.29/2019/XX]

The Chair explained that the BSIS regulation was adopted by the 115th GRSG and is submitted as a new draft UN Regulation to WP.29 March 2019 session.

OICA announced to think about submitting two proposals for amendments to the BSIS regulation:

1. Refinement of the definition of overall vehicle width and external projections (justification: to be more in line with R46 and Masses and Dimensions regulation EU 1230/2012);
2. Suspending the information signal at the outer lateral range behind the vehicle at the choice of the manufacturer (justification: to avoid self-detection of trailer, false detections and annoyance of the driver). It was noticed that the requirements for the warning signal will not be affected.

OICA stated that these proposals were discussed with BAST (Patrick Seiniger) and first feedback was that there is willingness to accept if convincing evidence (based on data) can be provided.

The Chair asked if the first amendment would be in line with R46 for external projections for mirror and CMS devices. This was confirmed by OICA. Furthermore the Chair wondered whether the systems could be able to anticipate by itself on the typical false detections (e.g. detection of the trailer). OICA was asked to provide justifications.

UK questioned whether the WP.29 approval of BSIS planned in the next March session needs to be postponed. After discussion IWG decided to not shift WP.29 approval.

Conclusion:

If OICA proposes amendments to BSIS regulation then evidence based justifications are needed which may be discussed in the next VRU-Proxi meeting in Brussels.

5. Reversing motion

Documents: VRU-Proxi-08-03 (Japan)
VRU-Proxi-08-04 (Loughborough University)
VRU-Proxi-08-06 (France)
VRU-Proxi-08-08 (OICA)
VRU-Proxi-08-09 (UK)
VRU-Proxi-08-10 (IWG)
VRU-Proxi-08-11 (Japan)
VRU-Proxi-08-14 (TRL)

JP has submitted a working document (VRU-Proxi-08-03) for the 116th GRSG as new series of amendments to ECE R46 (as discussed in 7th VRU-Proxi).

Regulation articulation:

Current R46 consists of 2 parts: Part I contains the device approval and Part II contains the installation approval. FR presented a proposal for regulation articulation concerning reversing motion, consisting of two adaptations:

1. Update R46 Part I with addition of a Class VIII device (mirror and CMS) approval, R46 Part II will remain unchanged.
2. Define new regulation with Part I for component approval for detection devices and Part II installation in vehicle based on already approved devices (in R46 Part I) and detection devices.

The following remarks / issues were raised by the group:

- Due to the new regulation with this approach the transitional provisions would be avoided.
- Amendments to new regulation after adoption may also affect R46, this requires alignment of amendments (more complex situation).
- For Class VIII device approval in Part I of R46 it is not required to cover the whole field of vision of VIII because of multi-modal approach with other devices.
- Because of combined regulations and in case of future amendments, 2 approvals might be required.
- Class VIII marking when field of view is covered by other classes is not possible, but marking may not be necessary for installation.

Position from JP is to only amend R46 or to consider new regulation as stand-alone. FR could accept this proposal from JP. After further discussion JP and FR agreed on the following compromise proposal:

- No amendments to R46 and define a new regulation consisting of two parts:
 - Part I: approval for Class VIII devices (detection system, mirrors and CMS).
 - Part II: approval for vehicle installation of Class VIII devices.

Conclusions:

- The compromise proposal from JP and FR was accepted by the group.
- As this compromise proposal means more than only editorial changes, the chair stated that the changes are too extensive to amend a formal working document for GRSG (as originally planned). Furthermore UK expressed that it is not feasible to submit a formal working document just before GRSG also due to the reference to an ISO regulation (access issues for CPs and delegates). Also VRU-Proxi needs to review the ISO first.

HMI-related issues:

- UK expressed that attention is needed for non-professional drivers as the regulation can be met with a complex solution that might not be intuitive for drivers when they are changing between vehicles. NL supported this concern and claimed that it is also impossible for Periodical Technical Inspection (PTI) and Police to check the functionality of a complex system. Issue was understood but the Chair indicated to have sympathy for the multi-modal approach taking into account a certain level of complexity.
- NL questioned if Class VIII mirrors are really wanted? JP confirmed the need for Class VIII mirrors and argued this has to be included in the proposal.
- CLEPA stated to not supporting differentiation between VRU's and objects as CLEPA believes that distinguishing between objects by using different acoustical flavors would not be useful.
- UK raised concerns for disabled drivers and drivers with reduced hearing capabilities and questioned if additional information to the beep would be required for these drivers. OICA supports a visual signal in addition to the audible warning (as defined in the regulation for the Safety Belt Reminder).

Presentations from Japan:

Japan explained working document that was submitted to GRSG 116 as amendment to R46.

Japan presented a study about Audible Warning system effects for VRU safety (VRU-Proxi-08-11) as addition to VRU-Proxi-05-03.

- Effect of audible warning investigated at a parking lot with mixed group of 24 drivers.
- Warning activation at 1m before the object would avoid 87% of the accidents, 100% reduction if warning was given at 1,5 m before the object would be hit.
- To be noticed that in case of a rear-end overhang the risk for actually overrunning the object is lower.

The Chair noticed that latency shall be taken into account and asked CLEPA to investigate the feasible latency (not start-up time), assumed this can be shared and is not conflicting with IP. This information is required to increase the required distance as shown in the last slide of Japan's presentation. CLEPA responded that detection latency depends on many things like the kind of object (reflection), etc..

The Chair questioned if detection is too difficult now, maybe to add it later? Start with back-up camera's which seems to be "low hanging fruit" and amend it later with detection. TRL referred to a study from VRU-Proxi-03 Keall et al. 2017) which performed an effectiveness analysis of CMS only, detection systems only and CMS and detection systems in combination. Summary of results, baselined to no system installed, as follows:

- CMS only: 41% (95% CI: 12% to 61%)
- Detection system only: 31% (95% CI: -3% to 53%)
- Both CMS and detection system: 30% (95% CI: -1% to 51%)

Presentation from OICA (VRU-Proxi-08-08)

OICA presented their view on the proposal from Japan as submitted to GRSG:

- Regulation proposal allows multiple possible designs but some of them seem not to be realistic.
- OICA proposes a gap between vehicle rear-end and first row of poles of e.g. 0.15m. Based on current proposed regulation by Japan this is in line with JNCAP requirements (same detection angle needed from center of vehicle). JNCAP requires visibility of a 20 cm part out of the full pole width of 30 cm.
- OICA highlighted the 3 intentions of the regulation:
 1. No Class VIII field device must be installed if Class VIII field of view is covered by an existing device.
 2. Class VIII field can be combined from existing devices, new devices and direct view (multi-modal).
 3. No Class VIII field device is required if an Obstacle Detection System is installed that meets the requirements of Annex 13.
- Chair asked CPs to what extent the following solutions are acceptable within the multi-modal approach:
 - Direct view (looking back ocular points, population of drivers, blocked view by contaminated window, interior things people on back seat)
 - Indirect view by Class I mirror to Class VIII mirror (periscope)
- UK asked whether it make sense that if an object is detected the monitor view is changed to wide-angle (as some existing systems currently do). According the chair this option could be considered and incorporated, to be discussed in the drafting group.
- OICA raised concern about the large number of tests that are required by section 5.2 (minimum detection rate). Technical Services are asked to give feedback on this.
- OICA proposed to have a debate on the scope for Reversing Motion (exclude N2, N3, M2, M3). IWG took note and understood the issues, no clear solution yet. Subject for later discussion. The Chair stated that exemptions shall be regulated later on CP level. Not clear for UK how CP can make exemptions, for EU shall be formulated in a framework regulation.

Performance requirements:

The position of the poles and the required visibility of the poles has been discussed thoroughly, following issues were raised:

- The Chair raised the concern that the outer poles can probably also be seen by the side mirrors. This is not preferred although at this moment it is not clear how to solve this issue.
- JNCAP requires 20 cm from 30 cm to be visible. FR proposes to require that each line of poles must be seen by 1 device. Might be a solution, 30 cm free space behind vehicle might be allowed in case of this requirement.
- Is “seeing a slightly part of pole visible” a sufficient requirement? FMVSS: most rear poles a slight of the top of full width should be visible, other poles a certain width (15cm) with striping (black-white marking) is needed to be visible, this can be

at every height and no requirement for the incremental height of this part. Page 60 van FMVSS 111. Discussion NL: concern how to judge just 1 cm on a monitor that is hardly visible. The IWG agreed on the proposal of 15x15cm to be visible on any height or the top of the poles.

- UK raised the question whether fallen people shall also be detected as these are lower than the 1m height of the poles. CLEPA noticed that lowering the detection requirements to 20-30 cm would increase the risk of false detections (for curb stones and other uncritical small material). Statistic data is lacking on these kind of accident details. CPs were asked to provide additional data (if available).
- How shall Technical Services test the multi-modal systems? The chair asked Technical Services to think about textual proposals for testing (although this is basically not at the discretion of Technical Services). NL not in favor of multiple devices, if GRSG decide to accept multimodal then test procedure shall be described.

As a result of the debate IWG formulated a concept for discussion regarding the performance requirements for vision based and non-vision based (detection) systems (slide 3 of VRU-Proxi-08-10).

TRL showed VRU-Proxi-08-14 as prepared during the discussion including worst case scenarios and proposed pragmatic solutions for lower blind spot for vision-based systems in the absence of accidentology data available in the level of detail required. The human data is not yet containing child information, TRL will update the table with additional details for children.

Conclusions:

- As proposed starting point 15 x 15 cm square part shall be visible on the top side or at the side on any random height of the poles (choice of manufacturer)
- Poles might be turned towards the camera if this is needed to improve the view
- This requirement is in line with FMVSS111 and in 4th VRU-Proxi meeting in Tokyo a 15 x 15 cm area was indicated to be enough for identifying a VRU.
- Consequence will be the need of a gap (e.g. 30 cm) between vehicle rear-end and the first row of poles. This is accepted by the IWG.
- Finally the following main questions were listed to be followed-up:

Nr	Main questions	What / who?
1	Fallen person to be taken into account?	Accidentology (ask CP's for in-depth data)
2	Shall detection system give an audible and/or optical warning?	
3	Do we allow direct vision (turning head)?	
4	Do we allow a combination of devices with different type of HMI?	
5	Shall each row of poles (perpendicular to the longitudinal direction of the vehicle) be seen/detected by one (single) device?	CP's to answer
6	Do we allow mirror-to-mirror solution (periscope)?	
7	How to test, static or random position of poles?	
8	Shall exemptions be implemented in the UN Regulation or not?	CP's to answer

Action plan as proposed by the Chair:

- As more reflection is needed for the open discussion points and the compromise proposal to set up an isolated regulation VRU-Proxi has to withdraw the current working document for 116th GRSG from Japan;
- A taskforce must be set up to discuss and define the (new) technical details and the draft regulation
- Taskforce to be chaired by Mr. Hirao, members can be CPs, UTAC, OICA, CLEPA and other parties that are interested are also welcome (TRL, etc.);
- Japan to start already on the draft regulation, new draft regulation shall be presented in the 9th VRU-Proxi meeting at the end of March 2019 in Brussels;
- In the 9th VRU-Proxi meeting the objective is to define an informal document with status of the regulation for the 116th GRSG.

6. Forward motion Vehicle driving straight or taking off from standstill

Document: VRU-Proxi-08-05 (Japan)
VRU-Proxi-08-11 (Japan)
VRU-Proxi-08-13 (Japan)

Japan showed a proposal for a Class IX mirror but this has not been discussed in detail. It was agreed that the relevant documents will be posted on IWG website and that the discussion will take place in the 9th VRU-Proxi session.

7. Status and developments of detection and vision technologies

Document: VRU-Proxi-08-07 (CLEPA)

CLEPA to presented an update of sensor capabilities in relation to detection around vehicle and in particular in distinguishing between humans and non-humans.

Conclusions:

- Radar can detect moving arms and legs by using micro-doppler technology, however static persons are difficult to distinguish from other static objects based on reflection rates only.
- Lidar scanning with beams in all directions possible
- The chair asked if relative costs can be indicated. CLEPA not able to answer this as it depends on many factors. CLEPA will not say anything on costs and stated that regulation shall be technology neutral. IWG decided to not include costs as input variable.
- The updated overview was appreciated and the chair asked if this table can be kept up-to-date, CLEPA confirmed to add actual details if new information will be available.

8. Direct Vision

This subject has not been discussed. The status, progress and details will be continued in the 9th VRU-Proxi meeting in Brussels.

9. Evaluation of Pedestrian and Cyclist Warning Systems for Trucks

No update on this subject. To be followed-up in the 9th VRU-Proxi meeting.

10. State of play of close-proximity vision and detection rulemaking in the contracting parties

European Commission (EC) explained the current situation of GSR Phase 2:

- Members of European Parliament (MEP) are reviewing the GSR proposal from EC.
- First feedback from MEPs contains AEBS-VRU for heavy vehicles. EC has argued that there is no justification for these measures. Also there is an overlap with VRU-detection front.
- Further no fundamental changes or additions to be expected.
- EP-Council-EC trilogue meetings to be scheduled, probably first results available at 9th VRU-Proxi meeting in Brussels.
- OICA: what will be definition of VRU as MEPs are asking for wheel chairs, animals, etc.. European Commission: should be defined as a standardized target with input from the Industry. CLEPA: currently only ISO definition for pedestrian, ISO definition for cyclist will probably be available by the end of 2019.

11. Next meeting

9th meeting: 26-28 March 2019 in Brussels, Belgium, European Commission (Breydel building, Avenue d'Auderghem 45, meeting room 12/A 'M. Ayrat')

Proposal for next meetings:

10th meeting: [TBD, probably end of May / beginning of June. Date will be selected later.
Location: Europe (Stuttgart area?)]

11th meeting: [TBD, could be Russia, Moscow?]

12. Any Other Item