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Economic Commission for Europe**Inland Transport Committee****World Forum for Harmonization of Vehicle Regulations****Working Party on Automated/Autonomous and Connected Vehicles****Seventh session**

Geneva, 21-25 September 2020

Item 6 (a) of the provisional agenda

UN Regulation No. 79 (Steering equipment):**Automatically Commanded Steering Function****Proposal for a supplement to the 03 series of amendments to
UN Regulation No. 79 (Steering equipment)****Submitted by the expert from Germany***

The text reproduced below was prepared by the experts from Germany. It is based on informal document GRVA-05-53, presented during the fifth session of Working Party on Automated/Autonomous and Connected Vehicles (GRVA). The modifications to the existing text of the Regulation are marked in bold for new or strikethrough for deleted characters.

I. Proposal

Paragraph 5.6.4.7., amend to read

5.6.4.7. Critical situation

A situation is deemed to be critical when, at the time a lane change manoeuvre starts, an approaching vehicle in the target lane would have to decelerate at a higher level than 3m/s^2 , 0.4 seconds after the lane change manoeuvre has started, to ensure the distance between the two vehicles is never less than that which the lane change vehicle travels in 1 second.

The resulting critical distance at the start of the lane change manoeuvre shall be calculated using the following formula:

* In accordance with the programme of work of the Inland Transport Committee for 2020 as outlined in proposed programme budget for 2020 (A/74/6 (part V sect. 20) para 20.37), the World Forum will develop, harmonize and update UN Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.



$$S_{critical} = (v_{rear} - v_{ACSF}) * t_B + (v_{rear} - v_{ACSF})^2 / (2 * a) + v_{ACSF} * t_G$$

Where:

v_{rear}	is	The actual speed of the approaching vehicle or 130 km/h whatever value is lower
v_{ACSF}	is	The actual speed of the ACSF vehicle
a	=	3 m/s ² (Deceleration of the approaching vehicle)
t_B	=	0.4 s (Time after the start of the lane change manoeuvre at which the deceleration of the approaching vehicle starts)
t_G	=	1 s (Remaining gap of the vehicles after the deceleration of the approaching vehicle).

If the manufacturer considers additional influencing parameters when identifying the critical situation (e.g. acceleration of the ego-vehicle and/or deceleration of the approaching vehicle), the formula may be modified and the modification shall be declared to and assessed by the Technical Service. It shall remain ensured that an approaching vehicle would not have to decelerate at a higher level than 3m/s², 0.4 seconds after the lane change manoeuvre has started, to ensure the distance between the two vehicles is never less than that which the lane change vehicle travels in 1 second. The modified formula used by the manufacturer to identify the critical situation shall be part of the type approval documentation.”

II. Justification

1. Systems already in use to date were brought to market, based on exemption approvals in the European Union. These systems show a good and safe performance. The systems, if approved according to the provisions in the 03 series of amendments to UN Regulation No. 79, would have to be modified in a way, which would negatively affect the performance of the technology. No safety aspects could be seen to justify such product modification. Therefore, this proposal is made to accommodate the current text of UN Regulation No. 79 and make it fit for actual technology.
2. The current formula for the calculation of $s_{critical}$ does not take the actual dynamic behaviour of the vehicles into account, resulting therefore in required gaps that under some traffic conditions don't usually occur.
3. It should be possible to consider a more dynamic calculation of the critical distance as long as the safety principle to not force an approaching vehicle to more strongly decelerate than 3 m/s² is not violated.
4. Since there are different ways of addressing the dynamic behaviour of the vehicles with regard to the original formula, we propose, provided that the safety principle is maintained, to allow the manufacturer to specify its own formula instead of aiming to define a specific more complex formula in the Regulation.