Proposal for amendments to ECE/TRANS/WP.29/GRVA/2021/3

This document is based on informal GRVA-10-26 prepared by the Special Interest Group on UN Regulation No. 157. It includes the modifications introduced during the tenth session of the Working Party on Automated/Autonomous and Connected Vehicles (GRVA).

Proposal:

Introduction, amend to read:

"**Introduction**

The intention of the Regulation is to establish uniform provisions concerning the approval of vehicles with regard to Automated Lane Keeping Systems (ALKS).

ALKS ...

ALKS can be activated under certain conditions on roads where pedestrians and cyclists are prohibited and which, by design, are equipped with a physical separation that divides the traffic moving in opposite directions and prevent traffic from cutting across the path of the vehicle. In a first step, the original text of this UN Regulation limits the operational speed to 60 km/h maximum ~~and passenger cars (M₁ vehicles)~~**.**

This UN Regulation … (See e.g. Informal Document 4 Revision 1 of the seventy-eight session of WP.1)."

Paragraph 1.1., amend to read:

"1.1.   This Regulation applies to the type approval of vehicles of Categories ~~M₁~~ **M and N**[1] with regards to their Automated Lane Keeping System."

Paragraph 5.2.3.3., amend to read:

"5.2.3.3.   The activated system shall detect the distance to the next vehicle in front as defined in paragraph 7.1.1. and shall adapt the vehicle speed in order to avoid collision.

While the ALKS vehicle is not at standstill, the system shall adapt the speed to adjust the distance to a vehicle in front in the same lane to be equal or greater than the minimum following distance.

In case the minimum time gap cannot be respected temporarily because of other road users (e.g. vehicle is cutting in, decelerating lead vehicle, etc.), the vehicle shall readjust the minimum following distance at the next available opportunity without any harsh braking unless an emergency manoeuvre would become necessary.

The minimum following distance shall be calculated using the formula:

$$d_{min} = v_{ALKS} * t_{front}$$

Where:

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[1]   As defined in the Consolidated Resolution on the Construction of Vehicles (R.E.3.), document ECE/TRANS/WP.29/78/Rev.6, para. 2 - www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29resolutions.html

| | | d_{min} | = | the minimum following distance |

d_{min} = the minimum following distance

v_{ALKS} = the present speed of the ALKS vehicle in m/s

t_{front} = minimum time gap in seconds between the ALKS vehicle and a leading vehicle in front as per the table below:

Present speed of the ALKS vehicle		Minimum time gap M_1/N_1	Minimum following distance M_1/N_1	Minimum time gap $M_2/M_3 // N_2/N_3$	Minimum following distance $M_2/M_3 // N_2/N_3$
(km/h)	(m/s)	(s)	(m)	(s)	(m)
7.2	2.0	1.0	2.0	1.2	2.4
10	2.78	1.1	3.1	1.4	3.9
20	5.56	1.2	6.7	1.6	8.9
30	8.33	1.3	10.8	1.8	15.0
40	11.11	1.4	15.6	2.0	22.2
50	13.89	1.5	20.8	2.2	30.6
60	16.67	1.6	26.7	2.4	40.0

For speed values not mentioned in the table, linear interpolation shall be applied.

Notwithstanding the result of the formula above for present speeds below 2 m/s the minimum following distance shall never be less than 2 m **for M₁, N₁ and 2.4 m for M₂, M₃, N₂, N₃.**

~~When the system is active, the vehicle shall comply with the minimum following distances per the local traffic rules of Contracting Party regions, as declared by the vehicle manufacturer in the Appendix of Annex 1, for vehicles of categories M2, N2, M3, N3.~~"

Paragraph 5.2.5.2., amend to read:

"5.2.5.2.   The activated system shall avoid a collision with a cutting-in vehicle,

(a)   Provided the cutting in vehicle maintains its longitudinal speed which is lower than the longitudinal speed of the ALKS vehicle and

(b)   Provided that the lateral movement of the cutting in vehicle has been visible for a time of at least 0.72 seconds before the reference point for *TTCLaneIntrusion* is reached,

(c)   When the distance between the vehicle's front and the cutting in vehicle's rear corresponds to a TTC calculated by the following equation:

TTCLaneIntrusion > *vrel* / (2· **6 m/s²**) + 0.35 *s*

Where:

~~X   =   6m/s² for M₁, N₁ and 5m/s² for M₂, M₃, N₂, N₃~~

Vrel   =   relative velocity between both vehicles, positive for vehicle being faster than the cutting in vehicle

TTCLaneIntrusion   =   The TTC value**,** when the outside of the tyre of the intruding vehicle's front wheel closest to the lane markings crosses a line 0.3 m beyond the outside edge of the visible lane marking to which the intruding vehicle is being drifted."

Paragraph 5.3.4., amend to read:

"5.3.4.   The vehicle shall implement a logic signal indicating emergency braking as specified in UN Regulation No. 13-H **or 13, as appropriate**."

Paragraph 7.1., amend to read:

7.1.   Sensing requirements

"The fulfilment of the provisions of this paragraph shall be demonstrated by the manufacturer to the technical service during the inspection of the safety approach as part of the assessment to Annex 4 and according to the relevant tests in Annex 5.

The ALKS vehicle shall be equipped with a sensing system such that, it can at least determine the driving environment (e.g. road geometry ahead, lane markings) and the traffic dynamics:

(a)   Across the full width of its own traffic lane, the full width of the traffic lanes immediately to its left and to its right, up to the limit of the forward detection range;

(b)   Along the full length of the vehicle **or combination** and up to the limit of the lateral detection range.

The requirements of this paragraph are without prejudice to other requirements in this Regulation, most notably paragraph 5.1.1. **and 5.1.2."**

Paragraph 7.1.2, amend to read:

"7.1.2.   Lateral detection range

The manufacturer shall declare the lateral detection range. The declared range shall be sufficient to cover the full width of the lane immediately to the left and of the lane immediately to the right of the vehicle **or combination**.

The Technical Service shall verify that the vehicle sensing system detects vehicles during the relevant test in Annex 5. This range shall be equal or greater than the declared range."

Paragraph 7.1.5., amend to read:

"7.1.5.   The fulfilment of the provisions of paragraph 7.1. and its subparagraphs shall be demonstrated to the technical service and tested according to the relevant tests in Annex 5.

Where the ALKS can operate with a vehicle combination, the manufacturer shall demonstrate to the Technical Service at the time of type approval the strategies implemented to ensure that the sensing capability is always sufficient for the length of trailer attached."

Paragraph 8.4.3., delete and replace by new heading with subparagraphs to read:

"8.4.3.   ~~The data shall be retrievable even after an impact of a severity level set by UN Regulations Nos. 94, 95 or 137. If the main on-board vehicle power supply is not available, it shall still be possible to retrieve all data recorded on the DSSAD, as required by national and regional law.~~

Retrievability of data

8.4.3.1.   **For vehicles of Category M_1 and N_1 the data shall be retrievable even after an impact of a severity level set by UN Regulations Nos. 94, 95 or 137 as applicable.**

8.4.3.2.   **For vehicles of Categories M_2, M_3, N_2 and N_3, the following applies.**

Either:

(a)   The data shall be retrievable even after a mechanical shock of a severity level as specified in the component test of Annex 9C of the 03 series of amendment to UN Regulation No. 100, and

(b)   The DSSAD shall be mounted in a position such as to be protected against mechanical damage resulting from a typical vehicle crash (e.g. frontal impact). This shall be demonstrated to the technical service

together with appropriate documentation (e.g. calculations or simulations);

Or, alternatively,

Sufficient crash protection may be demonstrated by the manufacturer by fulfilling the requirements of paragraph 8.4.3.1. (e.g. for M_2 / N_2 vehicles derived from M_1 / N_1).

8.4.3.3. If the main on-board vehicle power supply is not available, it shall still be possible to retrieve all data recorded on the DSSAD, as required by national and regional law."

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