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Coordination of work on automation between working parties (GRs)
Fitness of UN GTRs and UN Regulations for ADS

Proposal for amendments to UN Regulation No. 13 (Heavy Vehicle Braking)

Submitted by the task force on regulatory fitness for Automated Driving Systems*

The text reproduced below was prepared by the experts from the Task Force (TF) on regulatory Fitness for ADS (FADS) to introduce amendments to enable the application of UN Regulation No. 13 to automated vehicles, including those without manual controls. The modifications to the current text of the Regulation are marked in bold or strikethrough characters. Items for which TF on FADS requires further discussion to reach consensus are in square brackets.

* In accordance with the programme of work of the Inland Transport Committee for 2025 as outlined in proposed programme budget for 2025 (A/79/6 (Sect. 20), table 20.6), 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.

I. Proposal

Paragraph 1.2.5., shall be delete:

"1.2. This Regulation does not apply to:

…

~~1.2.5. Vehicles of Categories M2, M3 and N, which are not equipped with manual braking controls intended for use during normal operation.~~"

Paragraph 2.3., amend to read:

"2.3. "*Braking system*" means the combination of parts whose function is progressively to reduce the speed of a moving vehicle or bring it to a halt, or to keep it stationary if it is already halted; these functions are specified in paragraph 5.1.2. The system consists of the control **(if any)**, the transmission, and the brake proper; "

Paragraph 2.5., amend to read:

"2.5. "Transmission" means the combination of components comprised between the control **and/or ADS (as applicable),** and the brake and linking them functionally. The transmission may be mechanical, hydraulic, pneumatic, electric or mixed. Where the braking power is derived from or assisted by a source of energy independent of the driver, the reserve of energy in the system is likewise part of the transmission.

The transmission is divided into two independent functions: the control transmission and the energy transmission. Whenever the term "transmission" is used alone in this Regulation, it means both the "control transmission" and the "energy transmission". The control and supply lines between towing vehicles and trailers shall not be considered as parts of the transmission.

Paragraph 2.34.2.1., amend to read:

"2.34.2.1. "*Directional control*" means a function within a vehicle stability function that assists the driver **or the ADS**, in the event of under steer and over steer conditions, within the physical limits of the vehicle in maintaining the direction intended by the driver **or the ADS** in the case of a power-driven vehicle and assists in maintaining the direction of the trailer with that of the towing vehicle in the case of a trailer."

Paragraph 5.1.2.1., amend to read:

"5.1.2.1. Service braking system

The service braking system shall make it possible to control the movement of the vehicle and to halt it safely, speedily and effectively, whatever its speed and load, on any up or down gradient. It shall be possible to graduate this braking action. ~~The~~ **A** driver**, if any,** shall be able to achieve this braking action from his driving seat without removing his hands from the steering control."

Paragraph 5.1.2.2., amend to read:

"5.1.2.2. Secondary braking system

The secondary braking system shall make it possible to halt the vehicle within a reasonable distance in the event of failure of the service braking system. It shall be possible to graduate this braking action. ~~The~~ **A** driver**, if any,** shall be able to obtain this braking action from his driving seat while keeping at least one hand on the steering control. For the purposes of these provisions, it is assumed that not more than one failure of the service braking system can occur at one time."

Paragraph 5.1.2.3., amend to read:

"5.1.2.3. Parking braking system

The parking braking system shall make it possible to hold the vehicle stationary on an up or down gradient even in the absence of the driver, the working parts being then held in the locked position by a purely mechanical device. ~~The~~ **A driver, if any,** shall be able to achieve this braking action from his driving seat, subject, in the case of a trailer, to the provisions of paragraph 5.2.2.10. of this Regulation. The trailer air brake and the parking braking system of the towing vehicle may be operated simultaneously provided that the driver **or the ADS (as appropriate)** is able to check, at any time, that the parking brake performance of the vehicle combination, obtained by the purely mechanical action of the parking braking system, is sufficient."

Paragraph 5.1.4.7., amend to read:

"5.1.4.7. It shall be possible to verify, in a frequent and simple way, the correct operational status of those [~~complex~~] electronic systems which have control over braking. If special information is needed, this shall be made freely available."

Paragraph 5.2.1.2.1., amend to read:

"5.2.1.2.1. **Except for vehicles of categories X and Y,** there shall be at least two controls, independent of each other and readily accessible to the driver from his normal driving position.

For all categories of vehicles, except M_2 ~~and~~**,** M_3**, X and Y[1],** every brake control (excluding an endurance braking system control) shall be designed such that it returns to the fully off position when released. This requirement shall not apply to a parking brake control (or that part of a combined control) when it is mechanically locked in an applied position;"

Paragraph 5.2.1.2.7.2., amend to read:

"5.2.1.2.7.2. If the service braking force and transmission depend exclusively on the use, controlled by the driver **or the ADS**, of an energy reserve, there shall be at least two completely independent energy reserves, each provided with its own transmission likewise independent; each of them may act on the brakes of only two or more wheels so selected as to be capable of ensuring by themselves the prescribed degree of secondary braking without endangering the stability of the vehicle during braking; in addition, each of the aforesaid energy reserves shall be equipped with a warning device as defined in paragraph 5.2.1.13. below. In case of compressed-air braking systems, in each service braking circuit in at least one of the air reservoirs a device for draining and exhausting is required in an adequate and easily accessible position;"

Paragraph 5.2.1.26.4., amend to read:

"5.2.1.26.4. After **[the powertrain has been deactivated]** ~~the ignition/start switch which controls the electrical energy for the braking equipment has been switched off~~ and/or the key removed, it shall remain possible to apply the parking braking system, whereas releasing by using the parking brake control shall be prevented.

However, the parking braking system may also be released when this action is part of an operation of a remote-control system fulfilling the technical requirements of an ACSF of Category A as specified in the 02 series of amendments to UN Regulation No. 79 or later series of amendments.

Furthermore, the parking brake shall be automatically applied, at least when the vehicle is detected to be stationary and additionally any of the following conditions is fulfilled:

[1] As defined in the Consolidated Resolution on the Construction of Vehicles (R.E.3.), document ECE/TRANS/WP.29/78/Rev.8, para.2 https://unece.org/transport/standards/transport/vehicleregulations-wp29/resolutions

(a) The ignition/start switch which controls the electrical energy for the braking equipment has been switched off and/or the key removed;

(b) The driver is deemed to leave the driving seat (e.g. via a detection of door opening, unfastening of seat belt). Alternatively, for vehicles of category M, the parking brake shall be automatically applied if no input **by the ADS, nor** any control by the driver nor any brakes application are detected for a time greater than 30 seconds.

However, the automatic application of the parking braking system may be suppressed by the driver (e.g. during maintenance operation, manoeuvring situations, to avoid park brake freezing in winter conditions) with a dedicated action (e.g. by pedal actuation, a switch)."

Paragraph 5.2.1.26.5., amend to read:

"5.2.1.26.5. If the parking braking system detects a request (generated automatically or by the driver **or the ADS**):

(a) To fully apply the parking brake (i.e. to reach the mechanically locked position of the parking brake), or

(b) To gradually control the parking brake action,

The actuation of the warning as required in paragraph 2.6. of Annex 8 may be delayed until the parking brake system has detected the correct clamping of the parking brake. The yellow warning signal specified in paragraph 5.2.1.29.1.2. shall be displayed at the latest 10s rafter the request for a full parking brake application, in the case the stable state is not reached."

Paragraph 5.2.2.24.6.3., amend to read:

"5.2.2.24.6.3. A towing trailer may only be operated in conjunction with a power-driven vehicle which is equipped with at least a pneumatic and an electric control line, as per 5.1.3.1.2. In the event of such a trailer being connected to a power-driven vehicle equipped with only an electric control line according to paragraph 5.1.3.1.3. it is considered that this combination is not compatible. In this case the towing trailer, when electrically connected to the power-driven vehicle, shall automatically apply the brakes of the trailer or remain braked. The driver shall be warned by the separate yellow warning signal **specified** in paragraph 5.2.1.29.2."

Paragraph 5.3.3., amend to read:

"5.3.3. Whilst ~~the~~ **an** ADS **feature** is active, ~~detected faults~~ **warnings (e.g. defect warning signals, signals from a warning device, failure status) and other information intended for the driver** as specified in this UN Regulation **(including those received from a trailer)** shall be transmitted to the ADS. ~~Warning signals related to faults detected while the ADS is not active shall either be transmitted to the ADS or shall be stored and transmitted to the ADS the next time it is activated, as appropriate.~~

The means by which it is ensured that existing detected faults are transmitted to the ADS before an ADS feature becomes active (e.g. previously detected faults which remain present) shall be documented by the manufacturer and demonstrated in accordance with Annex 18."

Insert new paragraph 5.3.4. to read:

"5.3.4. Without prejudice to the requirements of other applicable regulations, the braking control(s) and transmission links between the braking control(s) and brake(s) may be disabled or disconnected whilst an ADS feature is active."

Annex 4, insert new paragraphs 1.1.3. and 1.1.4. to read:

"**1.1.3. For vehicles of categories X and Y, all tests in this annex shall be conducted, and all respective requirements shall be fulfilled. In the**

absence of manual driving controls, braking tests shall be conducted using dedicated activation methods, which may include:

(a) A test mode allowing to manually control or trigger the braking functions, or;

(b) Any other method subject to agreement between the vehicle manufacturer and the technical service, ensuring that the evaluation accurately reflects real-world ADS braking performance.

Wherever this annex details a control being actuated or a force being applied, that shall be understood as a braking demand being made through the selected activation method above. The manufacturer shall demonstrate that the test activation method accurately replicates ADS braking performance, and a detailed description of the method used shall be included in the test report. The braking demand made shall be recorded in the test report alongside the results of each test.

1.1.4. For vehicles equipped with an ADS, other than those of categories X and Y, the tests in this annex shall be performed at least in the manual driving mode. Tests do not have to be performed in ADS mode providing the manufacturer can demonstrate to the technical service that the same braking performance can be achieved when braking demands are made by the ADS. However, testing to verify this shall be performed at the request of the technical service."

Annex 19 – Part 2, paragraph 1.1.4.1.4., amend to read:

"1.1.4.1.4. Engine management:

Control of the engine, or any other source(s) of motive power, to be shown to be independent from **control** demand **by the driver or the ADS (as applicable)**."

Annex 19 – Part 2, paragraph 1.1.4.1.6., amend to read:

"1.1.4.1.6. Differential type/differential lock(s):

Effect of self-locking or driver/**ADS** selected locking **(as applicable)** to be shown, e.g. function maintained, reduced or switched-off."

Annex 21, paragraph 2.1.1., amend to read:

"2.1.1. Where a vehicle is equipped with a vehicle stability function as defined in paragraph ~~2.4.~~ **2.34.** of this Regulation, the following shall apply:

In the case of directional control the function shall have the ability to automatically control individually the speed of the left and right wheels on each axle or an axle of each axle group by selective braking based on the evaluation of actual vehicle behaviour in comparison with a determination of vehicle behaviour demanded by the driver **or the ADS (as applicable)**.

In the case of roll-over control the function shall have the ability to automatically control the wheel speeds on at least two wheels of each axle or axle group by selective braking or automatically commanded braking based on the evaluation of actual vehicle behaviour that may lead to vehicle roll-over.[1]

In both cases, the function is not required:

(a) When the vehicle speed is below 20 km/h;

(b) Until the initial start-up self-test and plausibility checks have been completed;

(c) When the vehicle is being driven in reverse;

(d) When it has been automatically or manually disabled**, or disabled by an ADS**. In this case, the following conditions shall apply as appropriate:

(i) When a vehicle is equipped with a means to automatically disable the vehicle stability function to provide increased traction by modifying the functionality of the drive train, the disablement and its re-instatement shall be automatically linked to the operation which changes the functionality of the drive train;

(ii) When a vehicle is equipped with a means to manually disable the vehicle stability function, the vehicle stability function shall be automatically reinstated at the initiation of each new ignition cycle;

(iii) A constant optical warning signal shall inform the driver that the vehicle stability function has been disabled. The yellow warning signal specified in paragraph 2.1.5. below may be used for this purpose. The warning signals specified in paragraph 5.2.1.29. of this Regulation shall not be used.

While an ADS feature is active, the signal shall be transmitted to the ADS."

Annex 21, paragraph 2.1.2., amend to read:

"2.1.2. To realise the functionality defined above a vehicle stability function shall include, in addition to selective braking and/or automatically commanded braking, at least the following:

(a) The ability to control engine power output;

(b) In the case of directional control: The determination of actual vehicle behaviour from values of yaw rate, lateral acceleration, wheel speeds, and from the ~~driver's~~ control **demand by the driver or the ADS (as applicable)** to the braking and steering systems and to the engine. Only on-board generated information shall be used. If these values are not directly measured, the evidence of the appropriate correlation with directly measured values under all driving conditions (e.g. including driving in a tunnel) shall be shown to the Technical Service at the time of type approval;

(c) In the case of roll-over control: The determination of actual vehicle behaviour from values of the vertical force on the tyre(s) (or at least lateral acceleration and wheel speeds) and from the ~~driver's~~ control **demand by the driver or the ADS (as applicable)** to the braking system and to the engine. Only on-board generated information shall be used. If these values are not directly measured, the evidence of the appropriate correlation with directly measured values under all driving conditions (e.g. including driving in a tunnel) shall be shown to the Technical Service at the time of type approval;

(d) In the case of a towing vehicle equipped according to paragraph 5.1.3.1. of this Regulation: The ability to apply the service brakes of the trailer via the respective control line(s) independently of the driver **or the ADS**."

Annex 21, paragraph 2.1.4., amend to read:

"2.1.4. Interventions of the vehicle stability function shall be indicated to the driver by a flashing optical warning signal fulfilling the relevant technical requirements of Regulation No. 121 **or, whilst an ADS feature is active, transmitted to the ADS as defined in paragraph 5.3.3**. The indication shall be present as long as the vehicle stability function is in an intervention mode. The warning signal specified in paragraph 5.2.1.29.1.2. of this Regulation shall not be used for this purpose.

Additionally, interventions by systems related to the vehicle stability function (including traction control, trailer stability assist, corner brake control, other similar functions that use throttle individual torque control to operate and share common components with vehicle stability function, and ESC or VSF intervention on the steering angle of one or more wheels for the purpose of vehicle stability) may also be indicated to the driver by this flashing optical warning signal **or, if an ADS feature is active, transmitted to the ADS in accordance with paragraph 5.3.3**."

Annex 21, paragraph 2.1.5., amend to read:

"2.1.5. A vehicle stability function failure or defect shall be detected and indicated to the driver by an optical warning signal fulfilling the relevant technical requirements of Regulation No. 121**, or transmitted to the ADS (as applicable)**.

The warning signal specified in paragraph 5.2.1.29.1.2. of this Regulation shall not be used for this purpose.

The warning signal shall be constant and remain displayed as long as the failure or defect persists and the ignition (start) switch is in the "on" (run) position."

Annex 21, paragraph 2.1.6., amend to read:

"2.1.6. In the case of a power-driven vehicle equipped with an electric control line and electrically connected to a trailer with an electric control line the driver shall be warned by a specific optical warning signal fulfilling the relevant technical requirements of Regulation No. 121 whenever the trailer provides the information "VDC Active" via the data communications part of the electric control line. The optical signal defined in paragraph 2.1.4. above may be used for this purpose.

While an ADS feature is active, the optical warning to the driver is not required. The warning signal shall be transmitted to the ADS in accordance with paragraph 5.3.3."

Annex 21 – Appendix 2, paragraph 2.1., amend to read:

"2.1. The validity of the applied modelling and simulation tool shall be verified by means of comparisons with a practical vehicle test(s). The test(s) utilised for the validation shall be those which, without control action, would result in loss of directional control (under-steer and over-steer) and/or roll-over control as appropriate to the functionality of the stability control function installed on a vehicle.

During the test(s) the following motion variables, as appropriate, shall be recorded or calculated in accordance with ISO 15037 Part 1:2006 or Part 2:2002 as relevant:

(a) Yaw velocity;

(b) Lateral acceleration;

(c) Wheel load or wheel lift;

(d) Forward velocity;

(e) ~~Driver input~~ **Control demand by the driver or the ADS (as applicable)**."

Annex 22, paragraph 3.6., amend to read:

"3.6. The vehicle user's handbook provided by the manufacturer shall ~~warn the driver~~ **include a warning about** the consequences of not checking the compatibility of the automated connector between the towing vehicle and the trailer. Information about mixed mode operation shall also be provided if applicable.

To enable the driver to check the compatibility, vehicles fitted with an automated connector shall have a marking specifying the category according to paragraph 2. of this annex. For categories B and D also the type of the installed automated connector shall be shown. This marking shall be indelible and visible to ~~the driver~~ **a user** when standing on the ground beside the vehicle."

II. Justification

1. At its 190th session in June 2023, WP.29 endorsed the report (ECE/TRANS/WP.29/2023/86) transmitted by the expert groups on regulatory fitness for automated vehicles and invited the GRs to start the work on amending the regulations identified by the expert groups in the report.

2. At its seventeenth session in September 2023, the Working Party on Automated/Autonomous and Connected Vehicles (GRVA) agreed that the TF on FADS, which was tasked by GRVA to amend the UN Regulations and Global Technical Regulations under its purview to accommodate automated vehicles, should first submit amendments for automated vehicles, which are also equipped with controls for manual driving. This significantly reduces the number of changes needed regarding testing provisions, which can be carried out under manual driving, as well as those regarding definitions and requirements directly or indirectly related to the presence of a driver.

3. A detailed informal document, explaining the changes and gathering questions and answers regarding this proposal, has been transmitted to GRVA by the TF on FADS as informal document GRVA-18-33.

4. Where in the current vehicles categories, a driver-oriented warning strategy is essential, in a vehicle of Categories X or Y, it might not be the case anymore. FADS has therefore tried to determine what should be the strategy to be expected from an ADS where no human driver is available to observe and respond to optical or acoustic signals. It is to be expected from an ADS to autonomously monitor, interpret, and address braking performance indicators thus ensuring that the system can promptly detect and respond to potential issues without relying on human intervention. As of the twenty second GRVA session, this topic was still open (see informal document WP29-194-16, horizontal topic Nos. 2 and 3)

5. To ensure safety and uniformity in approval processes for all types of passenger cars, including ADS equipped vehicles, it is proposed to include vehicles, which are not equipped with manual braking controls intended for use during normal operation.

6. By transmitting all fault and warning signals to the ADS, the system can log, monitor, and use these inputs to interpret the same information that a human driver would receive, ensuring consistency in reactions, such as triggering emergency procedures or adaptive braking responses when faults are detected. As of the 22nd session of GRVA, this topic is still open (see informal document WP29-194-16, horizontal topic Nos. 2 and 3)

7. The proposed amendment to the existing paragraph 5.3.3. aim to ensure that the ADS, when active, can appropriately receive and process critical vehicle information, specifically warnings and fault signals that would otherwise be directed to the human driver. As of the twenty-second GRVA session, this topic was still open (see informal document WP29-194-16, horizontal topic Nos. 2 and 3)

8. Where the trailer is requested to the transmit an information to the towing vehicle it should be understood that the information shall be transmitted and therefore routed by the ADS.

9. It has been deemed necessary to provide clear guidance on testing requirements for ADS equipped vehicles, including those without manual controls (Category X or Y) and those equipped with ADS but still having manual driving modes (other than Category X or Y). This aims to ensure that all types of vehicles covered by this regulation can be fairly assessed and type-approved under the same regulatory framework.

10. Regarding the testing of Vehicle Stability Functions, as a next step, the TF on FADS has agreed to consider the concept of demonstrating the requirements of Annex 21 *via* the safety demonstration of the ADS. The TF on FADS will further study whether and how such a demonstration could be allowed and may propose to enable it with a future revision to the proposed amendments.