

## **Proposal for amendments to ECE/TRANS/WP.29/2021/82**

This document was produced by the Working Party on Automated/Autonomous and Connected Vehicles (GRVA) at its tenth session, in conformity with the decision noted in ECE/TRANS/WP.29/GRVA/9, para. 83. It is based on informal document GRVA-10-38, as amended in session.

### **Proposal**

*ECE/TRANS/WP.29/2021/82*, replace to read:

*"Insert a new paragraph 2.3.4.5. to read:*

"2.3.4.5. *"Risk Mitigation Function (RMF)"* means an emergency function which can, in the event the driver becomes unresponsive, automatically activate the vehicle steering system for a limited duration to steer the vehicle with the purpose of bringing the vehicle to a safe stop within a target stop area."

*Paragraph 2.4.16., amend to read:*

"2.4.16. A *"Lane Change Procedure"* starts when the direction indicator lamps are activated and ends when the direction indicator lamps are deactivated. It comprises the following operations:

- (a) Activation of the direction indicator lamps;
- (b) Lateral movement of the vehicle towards the lane boundary;
- (c) Lane Change Manoeuvre;
- (d) Resumption of the lane keeping function;
- (e) Deactivation of direction indicator lamps."

*Insert a new paragraph 2.4.19., to read:*

"2.4.19. *"Target stop area"* means a potential stopping area (e.g. emergency lane, hard shoulder, beside the road, slowest lane of traffic, own lane of travel)."

*Insert a new paragraph 2.4.20, to read:*

"2.4.20. *"Beside the road"* means the area of road surface beyond the boundaries of the carriageway which is not a hard shoulder or refuge area."

*Insert a new paragraph 5.1.6.3. (and subparagraphs), to read:*

"5.1.6.3. Vehicles equipped with an RMF shall fulfil the following requirements.

An RMF system shall be subject to the requirements of Annex 6.

5.1.6.3.1. Any RMF shall start an intervention only:

- (a) If the driver is either directly (e.g. through a driver monitoring system) or indirectly (e.g. prolonged failed response to a warning, failure to control the vehicle) assessed to be unresponsive; or
- (b) If it is manually activated.

If the system provides a means for manual activation, this means shall be protected against unintentional operation and accessible to the driver and to passengers adjacent to the driver.

- 5.1.6.3.2. Unless a request for action (e.g. hands-on warning) was already given or the system was manually activated, there shall be an optical and additionally an acoustic and/or haptic (e.g. brake jerks) warning signal before every RMF intervention in order to stimulate the driver to take back control.
- This warning phase shall start at least 5 seconds before the RMF starts an intervention, unless vehicle control by the system is required sooner to prevent the vehicle from crossing the lane markings or to keep an appropriate distance to other vehicles.
- Every RMF intervention shall be indicated to the driver by an optical and additionally an acoustic and/or haptic (e.g. brake jerks) warning signal for as long as the intervention exists.
- These warning signals shall be distinct and of a great urgency.
- 5.1.6.3.3. An RMF intervention shall not unreasonably deactivate or suppress the functionality of activated assistance systems (e.g. AEBS).
- 5.1.6.3.4. The signal to activate the hazard warning lights shall be generated with the start of the intervention.
- 5.1.6.3.5. It shall be possible to override the RMF intervention of the function at any time by a distinct action of the driver.
- The RMF shall implement strategies to provide protection against unintentional override by inputs to the driving controls (e.g. by requiring a significant change in a single input to the accelerator or brake pedal or multiple inputs to override the RMF).
- These strategies shall be demonstrated to the Technical Service at the time of type approval.
- 5.1.6.3.6. During the RMF intervention the vehicle shall slow down with a deceleration demand not greater than  $4\text{m/s}^2$ , unless required by the surrounding traffic (e.g. a decelerating lead vehicle).
- Higher deceleration demand values are also permissible for very short durations, e.g. as haptic warning to stimulate the driver to take back control.
- 5.1.6.3.7. Once the RMF has brought the vehicle to a safe stop in the target stop area, the vehicle shall not move away without manual input.
- 5.1.6.3.8. If the RMF system detects any failures preventing it from performing an intervention, this shall be signalled to the driver.
- 5.1.6.3.9. Additional provisions for systems with the purpose of bringing the vehicle to a safe stop outside its own lane of travel.
- 5.1.6.3.9.1. The RMF shall only be permitted to change lanes, if the vehicle is equipped with detection capabilities to the front, side and rear.
- 5.1.6.3.9.2. Lane change procedures shall only be performed in an uncritical way as described in paragraphs 5.1.6.3.9.7. and 5.1.6.3.9.8. In case the target stop area cannot be reached in an uncritical way the RMF shall aim to keep the vehicle within its current lane of travel while the vehicle is stopping.
- 5.1.6.3.9.3. Before initiating a lane change procedure, RMF shall, if deemed appropriate, reduce the vehicle speed to minimize the risk related to that lane change (e.g. by adapting the speed of the vehicle to that of other vehicles in the target lane).

A lane change procedure shall not start within the first 5s following the start of the RMF intervention.

- 5.1.6.3.9.4. During the intervention the system may perform a single or multiple lane change(s) across regular lanes of traffic and/or to the hard shoulder. Lane changes shall be made only if under the traffic situation these lane changes can be considered to minimize the risk to safety of the vehicle occupants and other road users.
- 5.1.6.3.9.5. A lane change during the intervention shall only be performed if the system has sufficient information about its surrounding to the front, side and rear (as defined in paragraph 5.1.6.9.17.) in order to assess the criticality of that lane change.
- 5.1.6.3.9.6. A lane change during the intervention shall not be performed towards a lane intended for traffic moving in the opposite direction.
- 5.1.6.3.9.7. The intervention shall not cause a collision with another vehicle or road user in the predicted path of the vehicle during a lane change.
- 5.1.6.3.9.8. A lane change procedure shall be predictable and manageable for other road users.
- 5.1.6.3.9.8.1. During the lane change manoeuvre, the RMF shall aim to avoid a lateral acceleration of more than  $1 \text{ m/s}^2$  in addition to the lateral acceleration generated by the lane curvature.
- 5.1.6.3.9.8.2. A lane change manoeuvre shall only be started if a vehicle in the target lane is not forced to unmanageably decelerate due to the lane change of the vehicle.
- 5.1.6.3.9.8.2.1. During the lane change manoeuvre, RMF shall aim to avoid inducing a longitudinal deceleration of more than  $3.7 \text{ m/s}^2$  for a vehicle approaching from the rear.
- 5.1.6.3.9.8.2.2. A lane change manoeuvre shall only be started if there is sufficient space to a vehicle following behind or approaching from the rear in the adjacent lane.
- 5.1.6.3.9.8.2.3. In case the RMF decelerates the vehicle during a lane change procedure, this deceleration shall be factored in when assessing the distance to a vehicle approaching from the rear, and the deceleration shall be manageable for the vehicle approaching from the rear.
- 5.1.6.3.9.8.2.4. Where there is not sufficient headway time for the vehicle behind at the end of the lane change procedure, the RMF shall not increase the rate of deceleration for a certain period of time after the completion of the lane change procedure except for the purpose of avoiding or mitigating the risk of an imminent collision.
- 5.1.6.3.9.8.2.5. How the provisions of paragraph 5.1.6.3.9.8.2. and its subparagraphs are implemented in the system design shall be demonstrated to the Technical Service during type approval.
- 5.1.6.3.9.9. The lane change manoeuvre shall aim to be one continuous movement.
- 5.1.6.3.9.10. A lane change during the intervention shall be completed without undue delay.
- 5.1.6.3.9.11. A lane change manoeuvre shall only be started if the manoeuvre is anticipated to be completed before the vehicle comes to a standstill (i.e. in order to avoid coming to standstill while in the middle of two regular lanes due to stopped traffic ahead).

- 5.1.6.3.9.12 Additional provisions for system behaviour for the vehicle's final lane change during a lane change manoeuvre that is bringing the vehicle to a safe stop beside the road.
- 5.1.6.3.9.12.1. All provisions of paragraph 5.1.6.3.9. shall be applied except 5.1.6.3.9.11., 5.1.6.3.9.13., 5.1.6.3.9.14. and 5.1.6.3.9.16.
- 5.1.6.3.9.12.2. The vehicle may come to a standstill on the lane mark beside the road.
- 5.1.6.3.9.12.3. In addition to the provisions of paragraph 5.1.6.3.9.7., an acoustic warning may be given as warning to other road users unless traffic rules in the country prohibits using an acoustic warning.
- 5.1.6.3.9.12.4. When bringing the vehicle to a stop beside the road the vehicle speed shall not exceed 10 km/h.
- 5.1.6.3.9.13. A lane change manoeuvre during an intervention shall be indicated in advance to other road users by activating the appropriate direction indicator lamps instead of the hazard warning lights.
- 5.1.6.3.9.14. Once the lane change manoeuvre is completed the direction indicator lamps shall be deactivated in a timely manner, and the hazard warning lights shall become active again.
- 5.1.6.3.9.15. (Reserved).
- 5.1.6.3.9.16. Notwithstanding paragraph 5.1.6.3.9.14. when several consecutive lane changes are performed as part of the RMF intervention, the direction indicator may remain active throughout these lane changes while the lateral behaviour shall ensure that each lane change manoeuvre can be perceived as an individual manoeuvre by following traffic.
- 5.1.6.3.9.17. If the vehicle is equipped with the capability to perform lane changes during the RMF intervention, the manufacturer shall declare the detection ranges to the front, side and rear. The declared ranges shall be sufficient to assess that a change into a lane immediately to the left or to the right of the vehicle does not cause a critical situation with another vehicle or road user during a lane change.
- The Technical Service shall assess the correspondence of declared detection ranges and lane change strategy and shall verify that the vehicle's sensing system detects vehicles during the relevant test in Annex 8. These ranges shall be equal or greater than the declared ranges.
- 5.1.6.3.10. The system shall implement strategies to draw external attention to the emergency situation (e.g. triggering an emergency call, activating the horn, keeping the hazard warning lights active), when the driver remains unresponsive once RMF has brought the vehicle to standstill.
- 5.1.6.3.11. Special provisions for M<sub>2</sub>/M<sub>3</sub> vehicles
- 5.1.6.3.11.1. In case the system provides a means for manual activation by a passenger, the RMF system shall provide an indication to this passenger upon activation of the RMF. This indication shall continue until the RMF intervention starts or the activation is overridden by the driver. The driver shall be enabled to override the request from the passenger in order to suppress the RMF intervention.
- 5.1.6.3.11.2. An RMF fitted to a vehicle of Class I, II or A as defined in the Consolidated Resolution on the Construction of Vehicles (R.E.3) shall provide an acoustic and optical indication to the passengers before the intervention would start.

5.1.6.3.12 System information data

The following data shall be provided, together with the documentation package required in Annex 6 of this Regulation, to the Technical Service at the time of type approval:

- (a) Information on how the system confirms that the driver is unresponsive;
- (b) Information on whether the system is capable of performing lane changes and what is considered a target stop area by the system
- (c) Description of the means to detect the driving environment;
- (d) Information/specification on which road types (e.g. motorway, country roads, urban areas, etc.) the system is designed to intervene and how this is ensured;
- (e) Means to override the function and how the system provides protection against unintentional override;
- (f) Description of the driver warning and information concept, including warning before and during an RMF intervention
- (g) In case of lane change capability
  - i. a detailed description of the design provisions implemented to ensure safety of the manoeuvre
  - ii. the means by which the vehicle detects others road users, obstacles and the target stop area
  - iii. Description of how the system selects an appropriate target stop area and a description of the safety criteria on which this selection is based
- (h) Information/specification of the maximum speed the system operates with regards to different traffic environments (highway, urban, etc.) as well as information/specification on how the speed is reduced (e.g. adapted to surrounding traffic; no harsh braking endangering other road users) in order to come to a safe stop."

*Paragraph 12.3. (and subparagraphs), amend to read:*

- "12.3. Transitional Provisions applicable to the 04 series of amendments:
- 12.3.1. As from the official date of entry into force of the 04 series of amendments, no Contracting Party applying this Regulation shall refuse to grant or refuse to accept UN type approvals under this Regulation as amended by the 04 series of amendments.
  - 12.3.2. As from 1 September 2023, Contracting Parties applying this Regulation shall not be obliged to accept UN type approvals to the preceding series of amendments, first issued after 1 September 2023.
  - 12.3.3. Until 1 September 2025, Contracting Parties applying this Regulation shall continue to accept UN type approvals to the preceding series of amendments to this Regulation, first issued before 1 September 2023.
  - 12.3.4. As from 1 September 2025, Contracting Parties applying this Regulation shall not be obliged to accept type approvals issued to the preceding series of amendments to this Regulation.

- 12.3.5. Notwithstanding paragraph 12.3.2. and 12.3.4., Contracting Parties applying this Regulation shall continue to accept UN type approvals issued according to a preceding series of amendments to this Regulation, for vehicles which are not affected by the provisions of paragraph 5.1.6.3.9. introduced with the 04 series of amendments."

*Paragraphs 12.3 and 12.3.1. (former), re-number as paragraphs 12.4. and 12.4.1., to read:*

- 12.4. General transitional provisions
- 12.4.1. Contracting Parties applying this Regulation shall not refuse to grant UN Type approvals according to any preceding series of amendments to this regulation or extensions thereof.

*Annex 8, insert a new paragraph 3.6, to read:*

“3.6 Tests for RMF

The vehicle shall be driven with an activated RMF on a road with all relevant lane markings in a good visible shape.

The test conditions and the vehicle speeds shall be within the operating range of the system as declared by the manufacturer.

Specific details of the mandatory tests described below shall be discussed and agreed between the vehicle manufacturer and the Technical Service to adapt the required testing to the declared use case(s) for which the RMF is designed to operate.

In addition, the manufacturer shall demonstrate to the satisfaction of the Technical Service that the requirements defined in paragraph 5.1.6.3. are fulfilled in the whole operating range of the RMF (specified by the vehicle manufacturer in the system information data). This may be achieved on the basis of appropriate documentation appended to the test report.

- 3.6.1. Tests for an RMF, with the purpose of bringing the vehicle to a safe stop inside its own lane of travel:

The vehicle shall be driven in a way that an intervention is initiated.

The test requirements are fulfilled if:

- (a) The ongoing intervention is indicated to the driver by an optical warning signal and additionally an acoustic and/or haptic warning signal as defined in paragraph 5.1.6.3.2.
- (b) The signal to activate the hazard warning lights is generated with the start of the intervention.
- (c) The deceleration demand does not exceed  $4\text{m/s}^2$  as described in paragraph 5.1.6.3.6.
- (d) Once RMF has brought the vehicle to a safe stop, the vehicle does not move away without manual input.

- 3.6.2. Tests for an RMF, with the purpose of bringing the vehicle to a safe stop outside its own lane of travel:

- 3.6.2.1. Scenario A:

A Lane Change Manoeuvre is possible according to the provisions of paragraph 5.1.6.3.9.8.2.

The vehicle shall be driven in a way that an RMF intervention is initiated while a target stop area outside the current lane of travel is available. In case there is another vehicle in the target lane this shall be positioned in a way not preventing a lane change of the RMF vehicle to the target lane.

The test requirements are fulfilled if:

- (a) The ongoing intervention is indicated to the driver by at least an optical and acoustic and/or haptic warning signal as defined in paragraph 5.1.6.3.2.
- (b) The signal to activate the hazard warning lights is generated with the start of the intervention.
- (c) The lane change manoeuvre is indicated in advance to other road users.
- (d) The RMF vehicle changes the lane(s) following the provisions of paragraph 5.1.6.3.9.8. and its subparagraphs.

3.6.2.2. Scenario B:

A Lane Change Manoeuvre is not possible according to the provisions of paragraph 5.1.6.3.9.8.2.

The vehicle shall be driven in a way that an RMF intervention is initiated while a target stop area outside the current lane of travel is available. At the start of the RMF intervention there shall be another vehicle in the target lane positioned in a way preventing a lane change manoeuvre of the RMF vehicle to the target lane.

The test requirements are fulfilled if:

- (a) The ongoing intervention is indicated to the driver by at least an optical and acoustic and/or haptic warning signal as defined in paragraph 5.1.6.3.2.
- (b) The signal to activate the hazard warning lights is generated with the start of the intervention.
- (c) The lane change manoeuvre is indicated in advance to other road users.
- (d) The RMF vehicle does not start a lane change manoeuvre as long as the vehicle in the target lane is still positioned in a way preventing a lane change manoeuvre.”

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