Submitted by the experts from OICA and CLEPA

Informal document **GRVA-09-43**
9th GRVA, 1-5 February 2021,
Agenda item 6(a)

Proposal for amendments to ECE/TRANS/WP.29/GRVA/2021/13

(Proposal for a Supplement to the 03 series of amendments to UN Regulation No. 79 (Steering equipment)).

This document reflects the outcomes of the discussions held on 28 January 2021 during the workshop organized by Industry on Assistant systems (UN R79). The changes proposed to document GRVA/2021/13 are indicated in blue.

GREEN: Proposal by JAPAN: Japanese proposal is still tentative one. Taking into account OICA's feedback and other CPs opinion, Japan would like to continue to consider this proposal.

I. Proposal

Insert a new Paragraph 2.3.4.4. to read:

"2.3.4.4. "*Risk Mitigation Function* (RMF)" means a function which can in case of confirmed driver unavailability 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: (**Remark**: needed for Option 2 only, see below)~~

~~2.4.16. A "*Lane Change Procedure*" in the case of ACSF of Category C starts when the direction indicator lamps are activated by a deliberate action of the driver and ends when the direction indicator lamps are deactivated. It comprises the following operations:~~

~~(a) Activation of the direction indicator lamps by a deliberate action of the driver;~~

~~(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 2.4.18.*, to read:~~

"2.4.18. "*Target stop area*" means an area (e.g. emergency lane, hard shoulder, beside the road, slowest lane of traffic, own lane of travel) where an RMF aims to stop the vehicle.

Insert a new paragraph 5.1.6.3., 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 only start an intervention in case the driver is confirmed to be unavailable to control the vehicle e.g. through driver monitoring, failed response to a request for action or warning or if it is manually activated by the driver or by the passenger in case of M2 and M3 vehicles.

In case the system provides a means for manual activation, this means shall be protected against unintentional operation.

In case the system provides a means for manual activation by the passenger with M2 and M3 vehicles, a means for manual deactivation (e.g. deactivation switch) shall be provided for the driver.

5.1.6.3.2. Unless a request for action was already given or the system was manually activated, there shall be an optical and acoustical or haptic (ex. braking jerk in short period) warning signal ~~up front~~ before every RMF intervention in order to stimulate the driver to take back control.

Every RMF intervention shall ~~[immediately]~~ be indicated to the driver at least by a clearly visible optical and an acoustic or haptic (ex. braking jerk in short period) 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. The RMF shall aim to bring the vehicle to a safe stop within the target stop area.

5.1.6.3.3.1. RMF shall aim to avoid collisions or mitigate them at the least.

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 function at any time by a distinct action of the driver.

Unintentional input on the acceleration control [and/or braking control] [e.g. not to accept the single full input but to accept the double input, not to accept the braking control by the driver unless the deceleration is equal or greater than the deceleration generated by the system] shall not be accepted as override.

Xxx1 During the RMF intervention the vehicle shall be slowed down with a deceleration demand not greater than 4m/s², 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.

Appropriate deceleration level shall be considered in case of M2 and M3 vehicles with standing passengers.

Xxx3 After the RMF bring the vehicle to a safe stop, it shall keep the vehicle stop unless it would be cancelled [at least during the service brake would be available].

Xxx4. The RMF system shall indicate its operation to other road users by acoustic (ex. Horn) and optical (ex. Hazard warning lights, display) means. The indication continues until the vehicle stops or until the RMF intervention would be cancelled or overridden by the driver according to 5.1.6.3.5.

Xxx5. If the RMF system detects any failures, it shall be informed to the driver. It shall be designed so that there is no influence on basic function of the vehicle even if a failure happens in the RMF system.

yyy. Additional provisions for M2/M3

yyy.1. In case the system provides a means for manual activation by passenger, the RMF system may provide an indication which notice its operation to the passenger who operates the means.

The indication shall start when the passenger operates the means, and continues until the RMF operation would be cancelled or overridden by the driver according to 5.1.6.3.5. or the indication of the next phase indication would start.

yyy.2. **The RMF system equipped to the vehicle with standing passenger shall provide an acoustic indication which notice the RMF intervention to the passengers before the intervention would start. An optical indication is optional.**

The indication shall start before the intervention would start, and continues until the RMF operation would be cancelled or overridden by the driver according to 5.1.6.3.5. or the indication of the next phase indication would start.

Regarding the vehicle without standing passenger, this indication is optional.

yyy.3. **The RMF system shall provide an acoustic indication which notice the RMF intervention to the passengers.**

The indication shall start when the intervention starts, and continues until the RMF operation would be cancelled or overridden by the driver according to 5.1.6.3.5. An optical indication is optional.

Insert a new paragraph 5.1.6.3.6 as follows

5.1.6.3.6. **Additional provisions for systems with the purpose of bringing the vehicle to a safe stop outside its own lane of travel.**

~~**Until uniform provisions and test procedures have been agreed, the manufacturer shall provide the Technical Service as part of the assessment according to Annex 6 appropriate documentation and supporting evidence to demonstrate a safe behavior of the function when bringing the vehicle to a stop outside its own lane of travel. This shall be subject to discussion and agreement between the Technical Service and the vehicle manufacturer.**~~

Leaving the original lane of travel shall only be possible 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.

Until uniform provisions and test procedures have been agreed, the manufacturer shall provide to the satisfaction of the Technical Service as part of the assessment according to Annex 6 appropriate documentation and supporting evidence including physical tests to demonstrate a safe behaviour of the function when bringing the vehicle to a stop outside its lane of travel

Comment to lane change function: Japan recognizes that OICA's proposal is based on ACSF category C requirements. Japan basically understands this idea. However, there are some differences in some parameters between the requirements of ACSF cat. C and OICA proposal. Japan would like to know the reasons why such differences are necessary and evidences of such differences. We would like to consider lane change function taking into account OICA's feedback.

~~*Insert new paragraphs 5.1.6.3.6. to 5.1.6.3.6.13 and 3.6 in Annex 8 as follows*~~

~~**5.1.6.3.6.** **Additional provisions for systems with the purpose of bringing the vehicle to a safe stop outside its own lane of travel.**~~

~~5.1.6.3.6.1. Lane change manoeuvres shall only be performed in an uncritical way as described in paragraph 5.1.6.3.6.6. towards the closest appropriate target stop area. 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.~~

~~5.1.6.3.6.2. During the intervention the system shall perform a single or multiple lane change(s) across regular lanes of traffic as well as to the hard shoulder only, if under the current traffic situation these lane changes can be considered to minimize the risk to safety of the vehicle occupants and other road user.~~

~~5.1.6.3.6.3. 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 5.1.6.3.6.13.) in order to assess the criticality of that lane change.~~

~~5.1.6.3.6.4. A lane change during the intervention shall not be performed towards a lane with traffic in opposite direction.~~

~~5.1.6.3.6.5. The intervention shall not cause a collision with another vehicle or road user in the predicted path of the vehicle during a lane change.~~

~~5.1.6.3.6.6. 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.~~

~~5.1.6.3.6.6.1. When there is an approaching vehicle~~

~~An approaching vehicle in the target lane shall not have to decelerate at a higher level than A m/s², B 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 C seconds.~~

~~With A equal to 3.7 m/s²~~

~~With B equal to:~~

~~(a) 0.0 s, if the lateral movement of the vehicle continued for at least 1 s while the vehicle had not yet crossed the lane marking and the direction indicator had been active for at least 3 s prior to crossing of the lane markings while a vehicle approaching from the rear was detected by the sensing system~~

~~(b) 0.4 s, if the lateral movement of the vehicle continued for less than 1 s or the direction indicator had been active less than 3 s or a vehicle approaching from the rear was not detected by the sensing system for at least 3s prior to the start of the lane change manoeuvre~~

~~With C equal to~~

~~(a) 0.5 s, if the lane change is performed towards a lane intended for slower traffic or towards the hard shoulder~~

~~(b) 1.0 s if performed towards a lane intended for faster traffic.~~

~~5.1.6.3.6.6.2. When there is no vehicle detected~~

~~If no vehicle is detected, the minimal gap to the rear shall be calculated under the assumptions that:~~

~~(a) An approaching vehicle on a regular lane intended for faster traffic is travelling with the allowed or the advised maximum speed whichever is lower.~~

~~(b) An approaching vehicle on a lane intended for slower traffic (including enter-, and exit lanes and shoulders temporarily opened for regular traffic) is travelling with a maximum speed difference of 20 km/h at the start of the lane change manoeuvre while not exceeding the allowed or advised maximum speed~~

~~(c) An approaching vehicle on a hard shoulder is travelling at a maximum speed of 80 km/h and a maximum speed difference to the RMF vehicle at the start of the lane change manoeuvre of 40 km/h.~~

~~5.1.6.3.6.6.3. When there is an equally fast or slower moving vehicle~~

~~A lane change manoeuvre shall only be started if the distance to a vehicle following behind in the target lane at equal or lower speed is greater than that which the following vehicle travels in 0.7 s.~~

~~5.1.6.3.6.7. The changing of a lane shall be aimed to be one continuous movement.~~

~~5.1.6.3.6.8. A lane change during the intervention shall be completed without undue delay.~~

~~5.1.6.3.6.9. 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).~~

~~5.1.6.3.6.10. 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, optionally both may flash alternately.~~

~~5.1.6.3.6.11. 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.~~

~~5.1.6.3.6.12. Notwithstanding paragraph 5.1.6.3.6.12. when several consecutive lane changes are performed as part of the risk mitigation function, 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.~~

Xxx2 **The lateral acceleration induced by the system during the lane change manoeuver shall not exceed 1 m/s2 in addition to the lateral acceleration generated by the lane curvature.**

~~5.1.6.3.6.13. 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 a vehicle driving beside or approaching from the rear or a vehicle or road user ahead in the target lane.~~

~~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.~~

5.1.6.3.7. 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 no longer available;

(b) Description of the means to detect the driving environment (including other road users and obstacles and the target stop area);

(c) 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;

(d) Means to override the function by a distinct action.

(e) Description of the driver warning and information concept

(f) In case of lane changing capability, a detailed description of the design provisions implemented to ensure safety of the manoeuvre and the means by which the vehicle detects it is in a permitted driving environment.

(g) **Information/specification of the maximum speed the system operates (e.g. also in dependence of the traffic environment (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.**

Insert a new paragraph 12.3., 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 5.1.6.3.6. introduced with the 04 series of amendments.

Paragraphs 12.3 and 12.3.1., re-number as 1**2**.4. and 1**2**.4.1.

Insert a new paragraph 3.6. in Annex 8, 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 range of the RMF operation (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 at least an optical signal.~~
~~(b) The signal to activate the hazard warning lights is generated with the start of the intervention.~~

~~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 5.1.6.3.6.~~

~~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 signal.~~
~~(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 changed the lane(s) following the provision of paragraph 5.1.6.3.6.~~

~~3.6.2.2. Scenario B:~~

~~A Lane Change Manoeuvre is not possible according to the provisions of paragraph 5.1.6.3.6.~~

~~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 signal.~~

~~**(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.~~

II. Justification

1. ECE/TRANS/WP.29/GRVA/2020/16 suggested the introduction of RMF as an additional subcategory of an Emergency Steering Function. As advised by GRVA in its fourth session, this proposal introduces the provisions for a potential lane change during the intervention as a separate new function and are aligned on those proposed for an ALKS in a parallel document.

2. Functions with lane change, to cope with temporary driver inability, to control the vehicle (e.g. caused by a health problem) are currently not considered in UN Regulation No. 79. The proposed RMF would warn and possibly call back the driver while automatically performing emergency lane change(s), with the aim to bring the vehicle, if possible (depending on traffic, etc.), to a standstill in an area with a low risk of collision (called "target stop area" in the proposal, e.g. hard shoulder), because it is the safest area to stop (access of emergency vehicles, low collision risk at the emergency lane). The function may be activated manually or automatically.

3. The amendment seeks to permit such a function, aimed at reducing risks in traffic, which could so far not be type-approved.

4. Uncontrolled vehicle movement could be avoided or mitigated by an RMF.

5. Other traffic participants are made aware of the criticality of the situation through the hazard warning lights and/or the appropriate direction indicator. Since it is a last resort function and the result of another car in the same situation not equipped with an RMF would be worse. ~~, shorter gaps and harsher braking of approaching vehicles are justifiable.~~

~~6. Other traffic participants are made aware of the criticality of the situation through the hazard warning lights and/or the appropriate direction indicator. Since it is a last resort function and the result of another car in the same situation not equipped with an RMF would be worse, shorter gaps and harsher braking of approaching vehicles are justifiable.~~

~~7. This is reflected in the parameters for B and C. If the emergency situation as well as the intention to change lanes has been communicated to a vehicle in the adjacent lane for a sufficiently long period of time, the other vehicle can be expected to react more quickly (B=0s, meaning as soon as the vehicle crosses the lane marking).~~

~~8. Additionally, when the lane change is performed to a lane with slower traffic, distances are usually smaller when travelling slower and additionally there are traffic rules prohibiting an "undercut"[1] situation, which is why a smaller remaining distance between the two vehicles (C=0.5s) should be permitted.~~

~~9. The distance between the two vehicles can be reduced, especially when there is a slower moving vehicle in the adjacent lane, because there is no critical situation resulting from the lane change *per se*. Even if a deceleration becomes necessary, the slower moving vehicle in the adjacent lane will have sufficient capabilities to adapt its speed accordingly due to the speed difference.~~

~~10. The speed of a vehicle on a slower lane is assumed to be at max. 20km/h faster than that of the RMF vehicle, as it is prohibited by various traffic rules to undercut on a slower~~

[1] Note by the secretariat: "undercut" is understood as overtaking the vehicle located on the other - faster – lane.

~~lane. Where undercuting is permitted, the jurisdiction indicates that this requires careful behaviour with a max. speed difference of 20km/h.~~

~~11. The speed of an approaching vehicle on a hard shoulder is assumed to be 80km/h at maximum, but not exceeding the speed of the RMF vehicle by more than 40km/h, because most hard shoulders are not to be used for regular traffic, unless explicitly opened for it. If vehicles pass on the hard shoulder (e.g. before an exit) they have to demonstrate very careful behaviour. The proposed 40km/h speed difference already takes into account an additional 20km/h more than what is rules suitable when passing a slower moving vehicle in an undercut situation.~~