

## Emergency Steering Function (ESF)

### Proposal for draft amendments to UN R79 after 15<sup>th</sup> session of the ACSF informal group

#### Background

This document is based on OICA-CLEPA proposal **GRRF 84-23** which was discussed during the 84<sup>th</sup> meeting of **GRRF**. The content is basically unchanged but reordered / renumbered to make the proposal easier to understand. Changes to the original text are marked in red. The use of square brackets indicates paragraphs which are still under discussion in the informal group.

#### Proposal:

*Insert a new paragraph 2.3.4.3. to read:*

- 2.3.4.3**      **“Emergency Steering Function (ESF)” means a control function which can automatically detect a potential collision and automatically activate the vehicle steering system for a limited duration, to steer the vehicle with the purpose of avoiding or mitigating a collision, with:**
- i.      another vehicle driving/\* in an adjacent lane,**
    - a.      drifting towards the path of the subject vehicle and/or,**
    - b.      into which path the subject vehicle is drifting and/or,**
    - c.      into which lane the driver initiates a lane change manoeuver.**
  - ii.     an obstacle obstructing the path of the subject vehicle or when the obstruction of the subject vehicle’s path is deemed imminent.**

**ESF shall cover one or more use cases from the list above.**

**/\* the vehicle may be driving in the same or the opposite direction as the subject vehicle.**

*Insert a new paragraph 5.1.6.2 and subparagraphs to read:*

**5.1.6.2. Provisions for ESF**

An ESF system shall be subject to the requirements of Annex 6

**5.1.6.2.1. Any ESF shall only start an intervention in case a risk of a collision is detected.**

**5.1.6.2.2 Any vehicle fitted with ESF shall be equipped with means to monitor the driving environment (e.g. lane markings, road edge, other road users) in line with the specified use case. These means shall monitor the driving environment at any time the ESF is active.**

**5.1.6.2.3 An automatic avoidance manoeuvre initiated by an ESF shall not lead the vehicle to leave the road.**

**5.1.6.2.4 In the case of an ESF intervention on a road or a lane delimited with lane markings on one or both side(s), an automatic avoidance manoeuvre initiated by an ESF shall not lead the vehicle to cross a lane marking.** However, if the intervention starts during a lane change manoeuvre performed by the driver or during an unintentional drift into the adjacent lane, the system may steer the vehicle back into its original lane of travel.

**5.1.6.2.5 In the case of an ESF intervention in the absence of a lane marking on one or both side(s) the intervention shall not lead to a lateral offset of more than 0.75 m into the corresponding direction.**

**5.1.6.2.6 The ESF intervention shall not lead the vehicle to collide with another road user.\***

**\* Until uniform test procedures have been agreed, the manufacturer shall provide the Technical Service documentation and supporting evidence to demonstrate compliance with this provision. This information shall be subject to discussion and agreement between the Technical Service and the vehicle manufacturer.**

**5.1.6.2.7 The manufacturer shall demonstrate during type approval, to the satisfaction of the technical service, which means to monitor the driving environment, are fitted to the vehicle to satisfy the provisions in the above subparagraphs of 5.1.6.2.**

**5.1.6.2.8 Any intervention of an ESF shall be indicated to the driver with an optical and with an acoustic or haptic warning signal to be provided at the latest with the start of the ESF intervention.**

**5.1.6.2.9 A system failure shall be indicated to the driver with an optical warning signal. However, when the system is manually deactivated, the indication of failure mode may be suppressed.**

For this purpose appropriate signals used by other warning systems (e.g. blind spot detection, lane departure warning, forward collision warning) are deemed to be sufficient to fulfil the requirements for the respective optical, acoustic or haptic signals above.

**5.1.6.2.10 The steering control effort necessary to override the directional control provided by the system shall not exceed [50 N].**

**5.1.6.2.11 The vehicle shall be tested in accordance with the relevant vehicle tests specified in Annex 8 of this Regulation.**

**5.1.6.2.12 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:

- Use case(s) where ESF is designed to operate (among the use cases i.a, i.b, i.c and ii. specified in the ESF definition 2.3.4.3),
- The conditions under which the system is active, e.g. the vehicle speed range  $V_{\text{max}}$  ,  $V_{\text{min}}$ .
- How ESF detects a risk of a collision.
- **Description of the means to detect the driving environment.**

- **How to deactivate/reactivate the function**

## Tests to be added into Annex 8

### 3.3 Tests for ESF

The vehicle shall be driven with activated ESF on a road with lane markings on each side, positioned within the lane markings.

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

Further details of the 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) the ESF is designed to operate.

In addition, the manufacturer shall demonstrate to the satisfaction of the Technical Service that the requirements defined in paragraph 5.1.6.2.1 to 5.1.6.2.6. are fulfilled in the whole range of the ESF operation range (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.

#### [3.3.1 Test for ESF Type i a/b: (unintentional lateral manoeuvre)

A target vehicle driving in the adjacent lane shall approach the vehicle under test and one of the vehicles shall minimize their lateral distance.

The tests requirements are fulfilled if:

- (a) an ESF intervention is started, and
- (b) the warnings are provided no later than the ESF intervention starts, and
- (c) the ESF intervention does not lead the vehicle to leave its original lane.]

#### [3.3.2 Test for ESF Type i c: (intentional lateral manoeuvre)

The vehicle under test starts a lane change while another vehicle is driving in the adjacent lane such that no intervention of the ESF system would lead to a collision.

The test requirements are fulfilled if:

- (a) an ESF intervention is started, and
- (b) the warnings are provided no later than the ESF intervention starts, and
- (c) the ESF intervention does not lead the vehicle to leave its original lane. ]

#### [3.3.3 Test for ESF Type ii.:

The vehicle under test shall approach an object positioned within its trajectory. The object shall be of such size and positioned in a way that the vehicle can pass the object without crossing the lane markings.

The tests requirements are fulfilled if:

- (a) the ESF intervention avoids or mitigates the collision, and
- (b) the warnings are provided no later than the ESF intervention starts, and
- (b) the ESF intervention does not lead the vehicle to leave its lane.]

**[3.3.4 Tests for systems able to operate in the absence of lane markings**

In case any system works in absence of ~~any~~ lane markings the corresponding ~~above~~ tests from sections 3.3.1 to 3.3.3 need to be repeated on a test track without lane markings.

These test requirements are fulfilled if,

- (a) an ESF intervention is started, and
- (b) the warnings are provided no later than the ESF intervention starts, and
- (c) the lateral offset during the manoeuvre is 0.75 m, as specified in paragraph 5.1.6.2.2., at maximum and
- (d) the vehicle has not left the road due to the ESF intervention.]

**[3.3.5 False reaction test for ESF Type ii**

The vehicle under test shall approach a [coloured] plastic sheet with a thickness less than [3mm], a width of [0.8]m and a length ~~less than~~ of [2m] positioned between the lane markings in the trajectory of the vehicle. The plastic sheet shall be of such size and positioned in a way that the vehicle could pass the sheet without crossing the lane markings

The test requirements are fulfilled, if the ESF does not start any intervention.]