

Emergency Steering Function (ESF)

Consolidated document after 13th session (incl. Homework)

(Text (neutral) was agreed by the delegates in the 13th session, text highlighted in yellow, is still tbd.)

(Paragraph 5.1.6.3 was renumbered to 5.1.6.2)

OICA-CLEPA homework in Red This document is based on ACSF-13-17

Draft Proposal:

Paragraph 2.3.4., amend to read:

2.3.4. "Advanced Driver Assistance Steering System" means a system, additional to the main steering system, that provides assistance to the driver in steering the vehicle but in which the driver remains at all times in primary control of the vehicle. It comprises one or ~~both~~ **more** of the following functions:

2.3.4.1. "Automatically commanded steering function (ACSF)" means [...]

2.3.4.2. "Corrective steering function (CSF)" means [...]

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 manoeuvre.
- 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 5.1.6.32. to read:

5.1.6.32. Provisions for ESF

Any ESF shall fulfil the following requirements.

5.1.6.32.1. ESF shall only start an intervention in case a risk of a collision is detected.

5.1.6.32.2. An automatic avoidance manoeuvre initiated by an ESF shall not steer the vehicle out of the lane of travel. 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.

In case of an ESF able to intervene in the absence of lane markings, the ESF intervention on such roads shall not lead to a lateral offset of more than 0.75 m. The vehicle shall not

leave the road due to the ESF intervention. For that purpose, the system shall be able to detect the road edge.

Any vehicle fitted with ESF shall be equipped with means to detect lane markings and to monitor the driving environment (e.g. other road users) in line with the specified use case in the system information data. The system shall monitor the driving environment at any time the ESF is active.

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

The manufacturer shall demonstrate during type approval, to the satisfaction of the technical service, which means to detect lane markings and to monitor the driving environment, are fitted to the vehicle to satisfy these provisions.

[5.1.6. 32.3. 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.

~~For this purpose signals given [at the same time] by other active warning systems (e.g. blind spot detection, forward collision warning) are deemed to be sufficient to fulfil the requirement for the optical and /or acoustical signals above.]~~

~~For this purpose directionally 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.~~

Justification:

Haptic and acoustic warnings are regulated for LDWS / AEBS in Reg 130 + 131. To not confuse the driver with more and more different warnings the respective ones already on at the start of the intervention should be sufficient.

5.1.6. 32.4. 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.

Remark: PTI maybe considered separately

5.1.6. 32.5. The steering control effort necessary to override the directional control provided by the system shall not exceed [30/50 N].

Justification:

Proposal is to keep the 50N. see industry specific document [Bench Study - Overriding Force of 50N.pptx](#)

5.1.6. 32.6 The ESF shall be subject to the requirements of Annex 6.

5.1.6. 32.7 The vehicle shall be tested in accordance with the relevant vehicle tests specified in Annex 8 of this Regulation. [The detailed test procedure shall be discussed and agreed between the vehicle manufacturer and the technical service. The test results shall be appended to the test report.]

Suggestion: Move the yellow sentence to the corresponding section of Annex 8

Remark: To be discussed with an “extended version” of Annex 8 in the next meeting

5.1.6. 32.8. 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_{smax} , V_{smin} .
- How ESF detects a risk of a collision.
- How to deactivate/reactivate the function

Tests to be added into Annex 8

Homework: OICA to propose an extended wording

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 OEM) 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:

- an ESF intervention is started, and
- the warnings are provided no later than the ESF intervention starts, and
- 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:

- an ESF intervention is started, and
- the warnings are provided no later than the ESF intervention starts, and
- 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 in the lane such that the ESF intervention can be performed according to the specification of the manufacturer. The object shall be of such size and positioned in a way that the system can pass the object without crossing the lane marking.

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 (Concept from Document 13-13 from Japan)

The vehicle under test shall approach a colored plastic sheet with a thickness less than [3mm] and a length less than [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:

- (a) The ESF does not start any intervention.

Different colour than the test track surface!!

Justification:

ESF aims at reducing the risk of collisions. Implementations of ESF will vary regarding means of detection, range of detection and speed range. Therefore, it is difficult to define a concise test for each and every implementation. As a baseline, the tests above offer the Technical Service the opportunity to verify the ESF capability by taking into consideration within the specification of the OEM.

A non-destructive test for the overriding force once the ESF maneuver has started seems not feasible, since the driver of the ESF vehicle would have to oversteer in the opposite direction of the intervention leading to the collision itself.