**Preliminary draft**

Submitted by the expert from Japan

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Agenda item False reaction scenario

# Proposal for amendments to false reaction avoidance of UN Regulation 152

## I. Proposal

*Remove existing scenarios of false reaction avoidance*:

~~1. Vehicle Target~~

~~1.1. Two stationary vehicles. of Category $M_1$ AA saloon shall be positioned:~~

~~(a) So as to face in the same direction of travel as the subject vehicle;~~

~~(b) With a distance of 4.5m (with a tolerance of +0.2/-0.0 m) between them;~~

~~(c) With the rear of each vehicle aligned with the other.~~

~~1.2. The subject vehicle shall travel for a distance of at least 60 m. at a constant speed in the range of speeds listed in the Table of paragraph 5.2.1.4. of this Regulation to pass centrally between the two stationary vehicles.~~

~~During the test there shall be no adjustment of any subject vehicle control other than slight steering adjustments to counteract any drifting.~~

~~1.3. The AEBS shall not provide a collision warning and shall not initiate the emergency braking.~~

~~2. Pedestrian Target~~

~~2.1. A pedestrian target as prescribed in 6.3.2. shall be positioned:~~

~~(a) So as to face in the same direction of travel as the subject vehicle.~~

~~(b) With a distance of 1 m (with a tolerance of +0.2/-0.0 m) from the subject vehicle side closest to the target toward the side in the direction of traffic.~~

~~2.2. The subject vehicle shall travel in a straight line for a distance of at least 60 m. at a constant speed in the range of speeds listed in the Table of paragraph 5.2.2.4. to pass the stationary pedestrian target.~~

~~During the test there shall be no adjustment of any subject vehicle control other than slight steering adjustments to counteract any drifting.~~

~~2.3. The AEBS shall not provide a collision warning and shall not initiate the emergency braking.~~

~~3. Bicycle Target~~

~~3.1. A bicycle target as prescribed in 6.3.3. shall be positioned:~~

~~(a) So as to face in the same direction of travel as the subject vehicle.~~

~~(b) With a distance of 1 m (with a tolerance of +0.2/-0.0 m) from the subject vehicle side closest to the target toward the side in the direction of traffic.~~

~~3.2. The subject vehicle shall travel in a straight line for a distance of at least 60 m. at a constant speed in the range of speeds listed in the Table of paragraph 5.2.3.4. to pass the stationary bicycle target.~~

~~During the test there shall be no adjustment of any subject vehicle control other than slight steering adjustments to counteract any drifting.~~

~~3.3. The AEBS shall not provide a collision warning and shall not initiate the emergency braking.~~

*Insert **new** scenarios of false reaction avoidance, to read:*

***F: The folowing scenarios will be easier to understand with a schematic because without it in mind, it's difficult to have a good point of view. Or with more specifications and details.***

***J: Schematics were shown in the document AEBS-12-10-R1. It will be possible to add the same schematics in also the text.***

**"The following scenarios shall be used as the tool in order to share technical information which clarifies behaviour and the safety concept of the system between the Technical Service and the vehicle manufacturer. In each scenario, the vehicle manufacturer shall demonstrate the Technical Service how the system behaves safely. So, these scenarios don't have specific pass / fail criteria.**

## Scenario 1: Left turn or Right turn at the intersection

***F: This scenario can be related with €NCAP CCFTap with a stationnary oncomming vehicle. Radius of curve and speed in curve are already set.***

***J: We understand that CCFTap is the test for AEBS performance of collision avoidance or mitigation at the intersection. On the other hand, Scenario 1 is the scenario for false reaction of AEBS at the intersection. No collision is expected physically in this scenario, because the subject vehicle passes in front of the stationary oncoming vehicle by a left turn or a right turn.***

**1.1. In this scenario, the subject vehicle passes by a left turn or right turn in front of an oncoming vehicle that is stopped to make a left turn or right turn at an intersection.**

***F: Where is the oncomming vehicle in the crossroad ? Is it straight ?***

***J: In the research, angle of the stationary was 17 degree (please see page 3 of AEBS-12-09). And in this scenario, straight can be allowed.***

**1.2. The subject vehicle drives at a speed of [30] km/h (with a tolerance of +0/-2 km/h) toward the intersection, and decelerates by braking to a speed of not less than [20] km/h at a point where the subject vehicle begins to steer left / right, and the TTC to the oncoming vehicle is not more than [2.3] seconds. When the subject vehicle turns left or right in the intersection, the speed is reduced to not less than [13] km/h, and then drives at a constant speed. The TTC to the oncoming vehicle is**

**not more than [1.4] seconds at when the wrap ratio between the subject vehicle and the oncoming vehicle becomes 0%.**

***F: How long (in meter) or how strong (deceleration in G) does the subject vehicle has to brake ? Is it not better to start the test at 20kph ? What is the purpose of the braking part from 30 to 20 kph ?***

***J: Normal drivers decelerate by braking before a left turn or a right turn at the small intersection. The purpose of the braking part from 30 kph to 20 kph is that AEBS has the possibility of different reactions between the two cases during braking and non-braking. Therefore, it is not necessary to specify braking distance and deceleration G.***

***F: What is the radius of the curve that the subject vehicle has to follow?***

***J: In this scenario, the trajectory of the subject vehicle is managed indirectly by the speed and the TTC to the oncoming stationary vehicle. Therefore, it is not necessary to specify the radius of the curve.***

***F: Is the speed tolerance is the same in staight line than in the curve?***

***J: During a left turn or a right turn, the speed tolerance is different to that of straight line. It is "not less than xx km".***

## Scenario 2: Right turn or Left turn of a forward vehicle

***F: This scenario can be related with €NCAP CCRb (for the following part) and CCFTap, for the curving forward vehicle part.***

***J: Also in this scenario, no collision is expected physically, because the forward vehicle turns right or left at a corner. So, we understand that the purpose of this scenario is different to CCRb and CCFTap.***

**2.1. In this scenario, the subject vehicle follows a forward vehicle. After that, the forward vehicle turns right or left at a corner, and the subject vehicle goes straight.**

**2.2. Both the forward vehicle and the subject vehicle drive at a speed of [40] km/h (with a tolerance of +0/-2 km/h) on the straight road. The forward vehicle decelerates by braking to a speed of [10] km/h (with a tolerance of +0/-2 km/h) in order to turn right or left at the corner, and the subject vehicle also decelerates by braking to keep appropriate distance with the forward vehicle. At when the forward vehicle begins to turn right or left, the speed of the subject vehicle is not less than [30] km/h and the TTC to the frontal vehicle is not more than [3.5] seconds. After that, the subject vehicle decelerates to a speed of not less than [21] km/h, and then drives at a constant speed. The TTC to the forward vehicle is not more than [1.6] seconds at when the wrap ratio between the subject vehicle and the oncoming vehicle becomes 0%.**

***F: What is the inter-distance (in meter) between the two vehicles ?***

***J: The inter-distance (in meter) between the two vehicles is not specified when the two vehicles are running with the constant speed. After when the forward vehicle starts to turn right or left, the distance of the two vehicles is managed indirectly by the speeds of the two vehicles and by the TTC between the two vehicles.***

***F: How long (in meter) or how strong (deceleration in G) does the forward vehicle has to brake ?***

***J: In the research, braking distance of the forward vehicle was about 30m (almost 0.2G). In this scenario, it is not necessary to specify braking distance or deceleration, because the relation between the two vehicles can be managed by TTC.***

***F: What is the radius of the curve that the subject vehicle has to follow?***

*J: In this scenario, the trajectory of the forward vehicle is managed indirectly by the speed and the TTC to the subject vehicle. Therefore, it is not necessary to specify the radius of the curve.*

*F: The appropriate distance for the subject vehicle is calculated by the safety distance (at least 2 second behind the front vehicle) ?*

*How strong is the subject deceleration ?*

*J: In the research, deceleration of the subject vehicle was from 1.3 m/s$^2$ (25%ile) to 2.0 m/s$^2$ (75%ile) just when the forward vehicle started to turn left. In this scenario, it is not necessary to specify the distance or deceleration of the subject vehicle, because they can be managed indirectly by the speed and the TTC.*

*F: Does the subject vehicle has to keep a distance of no more than 3.5s of TTC until the forward vehicle has left its trajectory?*

*J: The subject vehicle has to keep a distance of no more than 3.5s (it was revised to 4.7s in AEBS-13-06) of TTC just when the forward vehicle begins to turn right or left. After that, the subject vehicle has to keep a distance of no more than 1.6s (it was revised to 2.5s in AEBS-13-06) of TTC just when the wrap ratio between the subject vehicle and the forward vehicle becomes 0%.*

## Scenario 3: Passing each other at a curved road

**3.1.** **In this scenario, the subject vehicle and another vehicle pass each other at a small radius curved road.**

**3.2.** **The subject vehicle and another vehicle ([M1] category) approaches a curve from opposite directions of which the radius is not more than [20] m at the centre of the road. Speed of the two vehicles is [20] km/h (with a tolerance of +0/-2 km/h) constant. In the curve, the subject vehicle drives inner lane than the centre of the road, and another vehicle drives outer lane than the centre of the road. The subject vehicle and another vehicle pass each other at approximately [middle] of the curve.**

*F: Does the two vehicle are in their center-lane ?*

*J: Yes. And this scenario has been deleted in the revised proposal AEBS-13-06.*

## Scenario 4: Curved road with guard pipes and a stationary object

*F: This scenario can be related with €NCAP CPTA or CCFtap with a stationnary target.*
*J: In this scenario, the stationary object is positioned just outside of the guard pipes, and no collision is expected physically. Therefore, we consider the purpose of this scenario is different to that of CPTA or CCFtap with a stationary target.*

**4.1.** **In this scenario, the subject vehicle drives a small radius curved road of which the guard pipes are constructed to the outer side, and a stationary vehicle ([M1] category) or a stationary pedestrian target is positioned just outside of the guard pipes and where on the extension of the centre of the lane.**

*F: What is the specification of the guard pipes ? For exemple, Japanese guard pipe and French are different?*

*J: In the research, length of each guard pipe (straight shape) was 2 m, diameter was 48.6 mm, material was steel and color was white (exactly same type of guard pipe as the one which is used in actual road in Japan). In this scenario, it is not necessary to specify the detail specification of the guard pipes, because the purpose of the guard pipes is to recognize that the stationary object* *is positioned outside of its trajectory. Normal drivers do not mind an object which is positioned outside of the guard pipes in their driving.*

4.2. **The subject vehicle drives at a speed of [30] (with a tolerance of +0/-2 km/h) km/h toward the curve of which the radius is not more than [25] m at the outer side of the road, and decelerates by braking to a speed of not less than [24] km/h at a point where the subject vehicle enters the curve. The TTC to the stationary vehicle or a stationary pedestrian target is not more than [1.5] seconds at when the subject vehicle begins to turn in the curve. In the curve, the subject vehicle drives outer lane than the centre of the road. After that, the subject vehicle continue to turn in the curve at a constant speed of not less than [24] km/h. The TTC to the stationary vehicle or a stationary pedestrian target is not more than [1.0] second at when the wrap ratio between the subject vehicle and the stationary vehicle becomes 0%, or at when the offset ratio* between the subject vehicle and the centre of the pedestrian target becomes -100%.**

***offset ratio between the subject vehicle and the stationary object is calculated by the following formula.**

$$R_{offset} = L_{offset} / (0.5 * W_{vehicle}) * 100$$

$R_{offset}$ **: Offset ratio [%]**

$L_{offset}$ **: Amount of offset between the centre of the subject vehicle and the centre of the stationary object, and the direction of offset to the driver's seat side is defined as plus (+) [m]**

$W_{vehicle}$ **: Width of the subject vehicle [m]**

*F: How long is the curve ?*

*J: In the research, the length of the curve (the total length of the guard pipes) was about 24m. In this scenario, it is not necessary to specify the length of the curve, because the purpose of the curve is to recognize that the stationary object is positioned outside of the curve.*

*F: How strong is the deceleration ?*

*J: In the research, the deceleration of normal drivers was below 1.5 m/s$^2$. In this scenario, it is not necessary to specify the deceleration, because it is managed indirectly be the speed and by the TTC to the stationary object.*

## Scenario 5: Straight road on which a pedestrian is walking

*F: This scenario can be related with €NCAP CPLA with an offset of 1m as specified in this scenario.*
*J: This scenario has been deleted in the revised proposal AEBS-13-06.*

5.1. **In this scenario, the subject vehicle drives a straight road on which a pedestrian is walking on the roadside in the same direction to the subject vehicle or walking on the roadside in oncoming direction to the subject vehicle.**

5.2. **The subject vehicle drives a straight road at a speed of [30] km/h (with a tolerance of +0/-2 km/h), and a pedestrian is walking at a speed of about [5] km/h (with a tolerance of ± 0.2 km/h). The directions of a walking pedestrian:**

**(a) Same as the subject vehicle**

**(b) Oncoming to the subject vehicle.**

**The closest distance between outer side of the subject vehicle and the pedestrian is not more than [1] m, and guard pipes:**

**(a) Positioned between the subject vehicle and the pedestrian**

**(b) Not positioned**

***F: What is the distance between guard pipe and the vehicle ? And guard pipe and Pedestrian ?***

***What kind of guard pipe?***

***J: In the research, the distance between the subject vehicle and the pedestrian was about 0.8 m. And the specification of the guard pipes was same as the ones used in Scenario 4.***

## Scenario 6: Lane change due to road construction

***F: This scenario can be related with €NCAP Cut-in scenario in which the subject vehicle change its lane instead of the target. In which S-curve and offset are already defined***
***J: In this scenario, the object is a signboard, and the lane change is carried out by the subject vehicle. Therefore we understand that the purpose of this scenario is different to €NCAP Cut-in scenario***

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**6.1. In this scenario, the subject vehicle changes the lane in front of the signboard which is positioned in the centre of the lane and notifies the driver that the lane is reduced.**

***F: What kind of signboard ? Small / Large ?***

***J: In the research, the width of the signboard was approximately 0.55 m, the height was approximately 1.55 m and the material was steel (painted yellow).***

**6.2. The subject vehicle drives a straight road at a speed of [40] km/h (with a tolerance of +0/-2 km/h), and begins to steer in order to change the lane in front of the signboard which notifies reducing the lane. No other vehicles approach the subject vehicle. The TTC to the signboard is not more than [3.7] seconds at when the subject vehicle begins to steer. During changing the lane, the speed of the subject vehicle is constant, and the TTC to the signboard is not more than [3.0] seconds at when the offset ratio between the subject vehicle and the centre of the signboard becomes -100%.**

***F: How long is the S-curve to change the lane ? What is the offset of the changing lane for the car at the end of the S-curve in order to change the lane ?***

***J: It is not necessary to specify the trajectory of the subject vehicle during the lane change, because it can be managed indirectly by the speed and TTC.***

## Scenario 7: Left turn or Right turn of another vehicle on the opposite lane

***F: This scenario can be related with CCFtap (for the curve part)***
***J: In this scenario, no collision is expected physically, therefore, we understand that the purpose of this scenario is different to CCFTap. And this scenario has been deleted in the revised proposal AEBS-13-06.***

**7.1. In this scenario, on a straight road, another vehicle comes into the lane of oncoming side from left side or right side of the road.**

**7.2. The subject vehicle drives a straight road at a speed of [40] km/h (with a tolerance of +0/-2 km/h). The other vehicle turns right or left from**

**left or right side of the road and comes into the lane of oncoming side at a speed of not more than [3] km/h. During the right turn or left turn of the other vehicle, the outer corner of the vehicle slightly touches the lane marking, but it doesn't cross the lane marking. The TTC to the other vehicle is not more than [1.0] second at when the outer corner of the other vehicle touches the lane marking.**

*F: What is the radius of the other vehicle curve ?*

*J: It is not specified, but almost the smallest radius (fully turned the steering control) of the other vehicle.*

*F: For now, our equipment is not disign to lower its speed accuretly at 3kph, but it is accurate a 10kph. Maybe in the future it will be able to perform a test at this speed*

*J: The reason of 3 km/h (very low speed) is in order to keep duration of proximity between the two vehicles as long as possible. We understand that 10 km/h is possible.*

*F: After the other vehicle slightly touch the lane, does it go back at the center lane or it will remain on the middle lane ? (it's for the specification of the other vehicle curve path)*

*J: It is not necessary to specify the position of the other vehicle after it slightly touch the lane, because the front view of the subject vehicle has already passes the other vehicle.*

## Scenario 8: Lane change on a straight road with guard pipes and a stationary pedestrian target

*F: This scenario can be related with €NCAP Cut-in test in which the subject vehicle is the one which change the line*
*J: This scenario has been deleted in the revised proposal AEBS-13-06.*

**8.1. In this scenario, the subject vehicle changes the lane, and guard pipes are positioned at the road side of the target lane.**

**8.2. The subject vehicle drives a straight road at a speed of [30] km/h (with a tolerance of +0/-2 km/h), and begins to steer in order to change the lane. A stationary pedestrian target is positioned outside of the guard pipes which is positioned at the roadside of the target lane, and the position of a pedestrian target is in front of the centre line of the subject vehicle when the angle between the centre line of the subject vehicle and the lane marking becomes approximately maximum.**"

*F: How long and how short is the changing lane ?*

*J: It is not necessary to specify that, because the trajectory of the subject vehicle during lane change is managed indirectly by the geometry between the subject vehicle and the stationary pedestrian target.*

*F: What are the distance between guard pipe and the road ? Between the pedestrian and the guard pipe ?*

*J: In the research, the guard pipe was positioned just outside the road, and the pedestrian target was positioned just outside the guard pipes.*

*F: How the pedestrian is positionning ? Face to the car ? Walking (in stationnary) in the same way than the car ? opposite direction ?*

*J: In the research, the pedestrian target was positioned in the same way (in stationary) to the road, and opposite direction to the subject vehicle.*

## II. Justification

1. The False Reaction scenarios in Annex 3-Appendix 2 were based on R131 (trucks in highways), and it was not verified sufficiently whether they are appropriate for passenger cars. Therefore, Japan proposes some additional or amendment scenarios in the Appendix.

2. The above scenarios are based on the traffic scenes where it is possible for passenger cars to encounter on public roads.

3. In the above scenarios, the subject vehicle speed and TTC to the related objects are based on the basic research which was carried out by Japan in order to measure data of driving behaviour of normal drivers.

4. The False Reaction scenarios shall be used as the tool in order to share technical information which clarifies behaviour and the safety concept of the system between the Technical Service and the manufacturer. The safety concept to the False Reaction is different in each vehicle manufacturer, therefore, simple and appropriate pass / fail criteria cannot be defined according to new technologies in the future.

***F: So if no criteria is defined, how the technical service will prove the system behaves safely ?***
***Depending of the scenario and the parameters (TTC and so on), a safe system may be the one who brakes.***
***But if it brakes to earlier then it will be considered as not safe ?***
***So is there a TTC criteria from the moment where a braking from the system is considered as safe ?***
***Or should we design the tests in order to have a clear definition of a safe system ?***
***If we define a false reaction test as a test where a safe vehicle do not brake or alert then some scenario or caracteristics have to be modified. (Please see the pages 6 to 10 from the AEBS-11-10 document)***

***J: According to pages 6 to 10 from the AEBS-11-10 document, it seem to intend the test of early intervention of AEBS. On the other hand, each scenario in our proposal doesn't intend to evaluate early intervention of AEBS, because no collision is expected physically in each scenario. If some systems do not alert and do not intervene emergency braking in some scenarios, it will be easier for Technical Services to prove the system behaves safely. On the other hand, in some scenarios, providing an alert or providing slightly braking control in short duration might be effective for normal drivers in order to recognize the traffic situation correctly. Therefore, it is difficult to establish a simple pass / fail criteria. The main purpose of the scenarios is the tool which is used at when the vehicle manufacturer provides the Technical Service the design concept in the critical traffic situations for AEBS. In some cases, when driving behavior of the driver is considered, it is difficult to judge simply whether false reaction or not. Therefore, it is necessary to keep some flexibilities, and Annex 3 is appropriate position for the assessment of false reaction.***

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