

## COMMENTS ON THE TESTING PROCEDURES

The aim is to take into account:

- The feasibility of the future mandatory tests by the major part of the technical services according to their own facilities or their projected investments.
- The possible risks encountered during the tests.
- The exclusion for performing the tests on open roads.
- The possibility to demonstrate the compliance through the documentation provided by the manufacturer.
- The protocols and equipment already used in other regulations and/or other assessments (e.g. Euro NCAP).

Remarks:

- 1- When the length of track has been estimated, we took for acceleration of the vehicle ( $2,28 \text{ m/s}^2$ ) and for braking ( $-6,43 \text{ m/s}^2$ ).
- 2- Some comments join those from BAST (e.g. availability of the tracks)

-Draft report: ACSF 04-19

<b>CAT E system</b>								
FU1	FU2	EM1A	[EM1B]	EM2	TR1	TR2	TR3	TR4
curved track	straight track	straight track	straight track	straight track	curved track	curved track	straight track	curved track
Lane keeping	Lane change	braking target	slow moving target	stationary target	lateral acceleration exceeded	missing lane marking	two objects on different lanes	failure in a curve
<u>Tests necessary:</u>								
D								
J								
SE								
NL								
EC								
ROK								
OICA								
CLEPA								

tbc. Next meeting

tbd next meeting

tbd next meeting

### FU1: Functionality Test 1 (FU1): ACSF 04-20

Drive the vehicle with activated ACSF at least 5 min on a track with various curvatures with road markings at each side of the lane at various speeds up to  $v_{smax}$  and down to  $v_{smin}$ . The usage of a lead vehicle is optional. If a lead vehicle is used and the time gap is not selected by the system, the vehicle shall drive between [2 s] and [3 s] behind the lead vehicle. The lead vehicle shall drive within the lane markings. The speed of the lead vehicle shall be selected such that the lateral acceleration is not more than  $1 \text{ m/s}^2$ .

The requirements of the test are fulfilled if the vehicle does not cross any lane marking.

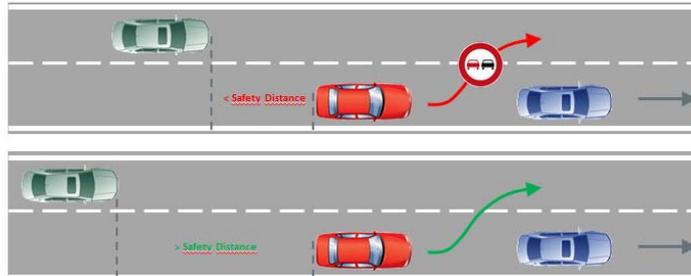
**Comments:** Needs to have about a 5 km section of highway with curves traveled continuously at various speeds between  $v_{smin}$  and  $v_{smax}$ . (Which Technical Service has this facility?).

**Proposal:** To have as alternative the possibility to perform the test:

- either on a road circuit with the possibility to travel some parts (curves) at a speed  $< v_{smin}$  (if too high)
- or on a total cumulative distance of road tracks (e.g. same loop traveled at different speeds).

**Additional comment:** Is the lead vehicle can be used to prevent from seeing the markings?

## FU2: Functionality Test 2 (FU2): ACSF 03-14



Drive the red vehicle with activated ACSF at least 1 min on a track with road markings at each side of the lane where ACSF can be activated with a speed of [30 km/h] below  $v_{smax}$  or at  $v_{smin}$ , whatever is higher. In front of the red vehicle drives the blue vehicle with the same speed. To the same time the green vehicle is driving with the same speed as the other vehicles on the adjacent lane. The time gap between the “green” vehicle and the red vehicle should be 1s.

The driver in the red vehicle shall increase the set speed for the ACSF-system by [20 km/h]. Nevertheless the red vehicle should not perform the lane change manoeuvre, because of the short safety distance to the green vehicle. After at least 1 min of driving, the green vehicle shall reduce the speed by [5 km/h]. In consequence the distance to the red vehicle will increase. The distance/time gap between the green and the red vehicle shall be recorded at that time, when the red vehicle starts the lane change manoeuvre. (Alternatively, the distance between green and red car could be increased stepwise, until the red car is able to start the lane change manoeuvre).

### Comments:

- Require to have more than 1,5 km of a straight highway track (when traveled 1' at 100 km/h if  $V_{smax} = 130\text{km/h}$ ).
- Risk of collision against the blue car.
- Difficulty to stabilize speeds and safe distances for 3 vehicles together. No tolerance on the time gap between the green and red vehicles.

Proposal: Have the possibility to replace the real blue car by a platform for “target car”. Test should be performed at 70 km/h (current limitation of platforms) (\*). Time gap of 1 s should be replaced by  $1 \pm 0,1$  s. The both scenario would be separated. A precise distance should be defined between the blue car and the red car (e.g. 44m corresponding to a Time To Collision equals at 8s) once the red car reached 90 km/h. The time 1' should be replaced by 4 s corresponding to the stabilization of all parameters. Have the possibility to abort the willingness to overtake (as proposed by BAST).

For information, the total distance to perform the test is upper to 500m (acceleration equals  $1,5 \text{ m/s}^2$  when increasing the speed from 70 to 90 km/h)

(\*): Compliance with other speeds above 70km/h could be demonstrated through the use of documentation provided by the manufacturer (\*). This kind of figure already exists for instance in R130 (LDWS).

## EM1A: Emergency Test 1 A (EM1A): ACSF 04-20

Drive the vehicle with activated ACSF at least 1 min behind a lead vehicle. If the time gap is not selected by the system, the vehicle shall drive at a gap of 3 s behind the lead vehicle. The lead vehicle shall drive within the lane markings on a track with road markings at each side of the lane at a speed 10 km/h below  $v_{smax}$ . Then the lead vehicle decelerates with  $6 \text{ m/s}^2$  and with a mean brake jerk of  $6 \text{ m/s}^3$  in the first second of braking.

The requirements of the test are fulfilled if the vehicle does not collide with the lead vehicle.

### Comments:

- Require to have a 2 km highway track (when traveled 1' at 120 km/h if  $V_{smax} = 130\text{km/h}$ ).
- Require to have a 500 m straight highway lane for the test
- Potential collision at high speed.

- Current platforms for "target-car" used as lead vehicle are limited at 70 km/h.

**Proposal:** Use the existing and very similar test Euro NCAP 2014 interurban C2C collision avoidance, 50 km/h, 2 scenarios at 2 & 6 m/s<sup>2</sup> decelerations, 2 scenarios at 12 & 40 m inter-distance (\*).

**NB:** Between 130 and 160 meters of straight highway lane are required with a 70km/h target or with Euro NCAP scenario conditions.

(\* ) or another value defined by the inter-distance regulation of the vehicle under test.

## EM2 : Emergency Test 2 (EM2): ACSF 04-20

Drive the vehicle with activated ACSF at least 1 min on a track with road markings at each side of the lane at a speed 10 km/h below V<sub>smax</sub>. The vehicle shall approach a stationary motorcycle Target (L3) target being placed in the center of the lane.

The requirements of the test are fulfilled if the vehicle does not collide with the motorcycle Target (L3) target.

The Test is not applicable for systems which are not able to follow the lane without a lead vehicle.

### Comments:

- Require to have a 2 km highway track (when traveled 1' at 120 km/h if V<sub>smax</sub> =130km/h)

- Potential collision at 120 km/h.

- Motorcycle target doesn't exist today.

### Proposal:

Take the protocol Euro NCAP corresponding to the collision on a stationary target (80 km/h, stabilized speed 4 s before collision)

**NB:** About 380 meters of straight highway lane are required.

## TR1: Transition Test 1 (TR1): ACSF 04-20

Drive the vehicle with activated ACSF at least 1 min on a track with road markings at each side of the lane at a speed of 10 km/h below v<sub>smax</sub>. The usage of a lead vehicle is optional. If a lead vehicle is used and the time gap is not selected by the system, the vehicle shall drive between [2 s] and [3 s] behind the lead vehicle. The lead vehicle shall drive within the lane markings. After a straight section of at least 200 m the vehicle shall enter a curve of more than 90° that demands a lateral vehicle acceleration of more than 3 m/s<sup>2</sup>. The test driver of the vehicle shall not take over manual steering control again until the minimum risk maneuver is finished.

The requirements of the test are fulfilled if the transition demand was given at least when the lateral acceleration exceeds [3] m/s<sup>2</sup> and the minimum risk manoeuvre as specified by the manufacturer was initiated. The vehicle shall not cross any lane marking before the minimum risk manoeuvre was initiated.

### Comments:

- Require a section with a long curve having a very high radius (370 m) to respect the value of 3 m/s<sup>2</sup> for lateral acceleration coupled with a previous too long straight section of highway track.

- Require to have a 2 km highway track (when traveled 1' at 120 km/h if V<sub>smax</sub> =130km/h) before the scenario

- Need to clarify the hypothesis for the minimum risk manoeuvre (intervene 0, 4, 5 or 10 seconds after?)

- Need to build different curves versus the V<sub>smax</sub>

### Proposal:

- Choose the test speed between 70 and 100 km/h (\*) versus the radius available in the test center.

- Reduce the distance of the straight section before entering in the curve (e.g. Corresponding to 2s)

- Initiate quickly the MRM (4s) for reducing the length of the curve.

(\*): Compliance with other conditions could be demonstrated through the use of documentation provided by the manufacturer (\*).

## TR2: Transition Test 2 (TR2): ACSF 04-20

Drive the vehicle with activated ACSF at least 1 min on a track with road markings at each side of the lane at a speed of 10 km/h below  $v_{smax}$ . The usage of a lead vehicle is optional. If a lead vehicle is used and if the time gap is not selected by the system, the vehicle shall drive between [2 s] and [3 s] behind the lead vehicle. The lead vehicle shall drive within the lane markings. After a straight section of at least 200 m the vehicle shall approach a section with a length of 200 m with only one lane marking at the driver's side. The test driver of the vehicle shall not take over manual steering control again.

The requirements of the test are fulfilled if:

- the vehicle is following the initial path for the complete section with missing lane marking without crossing the lane marking, or
- the transition demand is given before the vehicle is entering the section with missing lane markings and the vehicle shall follow the initial path without crossing the lane marking for at least [5] seconds after the transition demand. If the driver does not take over the driving task, a minimum risk manoeuvre as specified by the manufacturer is initiated.

Comments:

- The description of the method is not in coherence with the scheme (Straight section versus circle section).
- Require to have a 2 km highway track (when traveled 1' at 120 km/h if  $V_{smax}=130\text{km/h}$ ) before the scenario
- For information the test need a minimum of 540 meters of straight lane.

Proposal: Make the test at 80 km/h (\*)

(\*): Compliance with other speeds could be demonstrated through the use of documentation provided by the manufacturer (\*).

## TR4: Transition Test 4 (TR4): ACSF 04-07

### Check failure warning, transition demand and minimum risk manoeuvre

- drive on a circle track (radius such that the lateral acceleration is between 0,5 and 3  $\text{m/s}^2$  for the given test speed) with road markings of good visibility (acc. ECE-R 130, Annex 3) at each side of the lane at a speed of 10 km/h below  $v_{smax}$
- Induce a failure of the ACSF (A: steering failure, B: protective braking failure)
- test driver shall not take over manual steering control again

Test is passed:

- A: the failure warning is given and the transition demand is given latest 1s after the failure was induced and the minimum risk manoeuvre was finished: hazard lights are activated and vehicle follows the initial path curvature and the vehicle comes to standstill within 90°

B: the failure warning is given and the transition demand is given latest 1s after the failure was induced and the minimum risk manoeuvre was finished: hazard lights

Comments:

- Require a complete circle with a minimum radius more than 370 m ( if  $V_{smax}=130\text{km/h}$ )
- Need to clarify the hypothesis for the minimum risk manoeuvre (intervene 0, 4, 5 or 10 seconds after?)

Proposal : Make the test on a 90° to 120 quarter circle track, at a chosen test speed between 70 and 100 km/h (\*)

(\*): completed with OEM declaration that 120 km/h speeds is validated.

## EXAMPLES OF TARGETS

### EURO NCAP Moving/braking official target (>2014)

Maximum **relative** Impact speed = 50kph

Maximum speed = 60kph



### EURO NCAP Stationnary official target (>2014)

Maximum **relative** Impact speed = 50kph



### 3D Balloon (future 2018 Euro NCAP protocols)

Maximum **relative** Impact speed = 120kph

### 2D Platform (future 2018 Euro NCAP protocols)

Maximum speed = 70kph

