Submitted by the experts of OICA

Informal Document: ACSF-07-19

7th ACSF meeting

London, June 28-30, 2016

Boundaries CSF – ACSF

New definition and requirements

Version 4.0

Examples of CSF

- CSF influencing vehicle dynamic behaviour
  - to improve vehicle handling performance: adaptive 4-wheel steering system according to speed, lateral acceleration and steering control angle
  - to improve efficiency of e.g. ABS, ESC or traction control.
    - Steering interventions to help ABS during emergency braking, e.g. in u-split condition
    - Steering interventions to help traction control e.g. in slippery uphill's, to prevent unstable drive axle lateral drift on e.g. tractor-semi-trailer combinations
    - Steering interventions to help ESC
    - Driver steering recommendation
  - Side wind / road camber compensation:
    - to reduce driver's effort in the steering wheel to fight against side wind (e.g. for HCVs with large lateral surface)
    - Improve transition from high to low / low to high side wind, e.g. when overtaking a truck

- CSF safety functions preventing potential collisions
  - Evasive steering manoeuvre
  - Run-off road system: intervening when it is detected that the vehicle is about to leave the road or hit a road safety barrier
  - During a manual lane change, system avoiding collision with vehicle in the adjacent lane (e.g. hidden in a blind spot), by "steering back"

- Lane departure avoidance system / LKAS
  - Lane departure protection or haptic warning for LDWS
  - Systems intervening before or after crossing the lane marking

Example 1
Steering to help ABS/ESC

CSF → CSF

SSP Steering Stability Program

- SSP increases active safety by coupling the ESP and power steering.
- This Corrective steering function improves vehicle stability and reduce stopping distances in heterogeneous condition of grip.
- For example, a vehicle is performing an emergency stop on ice. With SSP, ESP no longer limit braking on the left wheels and will help the driver apply a steering angle to correct the trajectory.
- In any case, the driver remains in control of the vehicle.
- The SSP lets the driver choose whether to follow the instructions. If the driver decides not to apply the steering wheel angle recommended by the SSP, the system reverts to conventional braking mode optimizes stability and with a standard ESP.

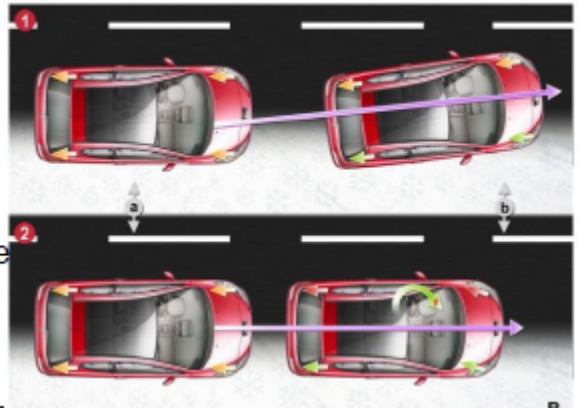


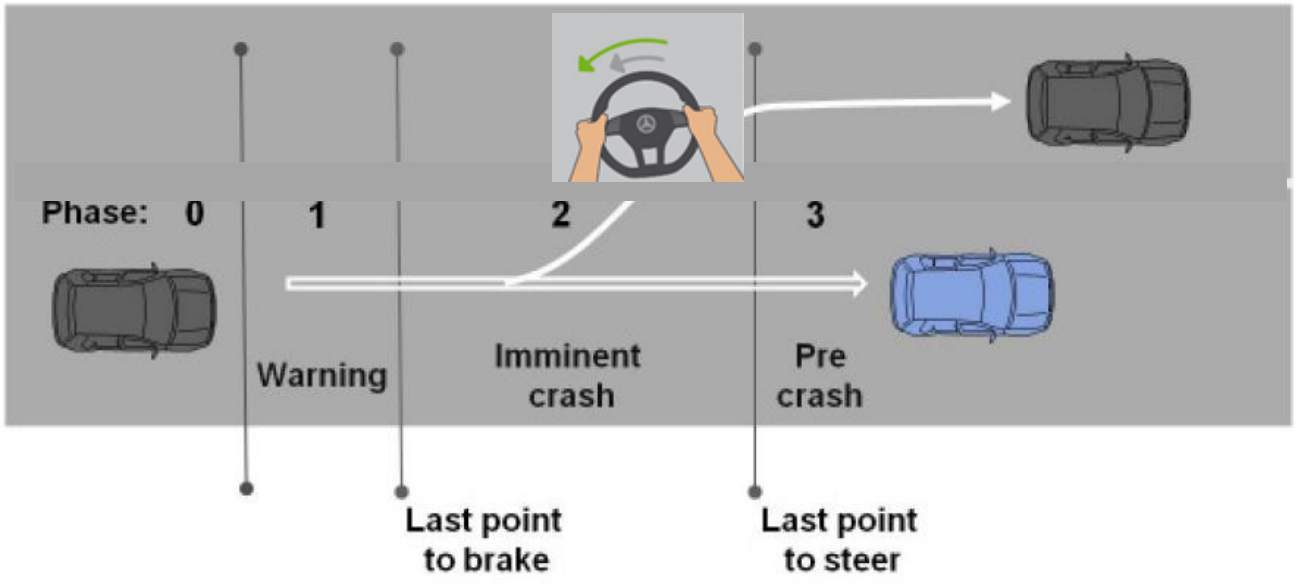
Photo 1 : vehicle without SSP : The stopping distance is not maximal because ABS is limiting the braking in the high grip area to keep the stability of the vehicle

Photo 2: Vehicle with SSP: The system helps the driver to turn the wheel in the opposite side to stabilize the vehicle, the braking on the high grip area can be maximal and the stopping distance is reduced.

CSF ➡ CSF

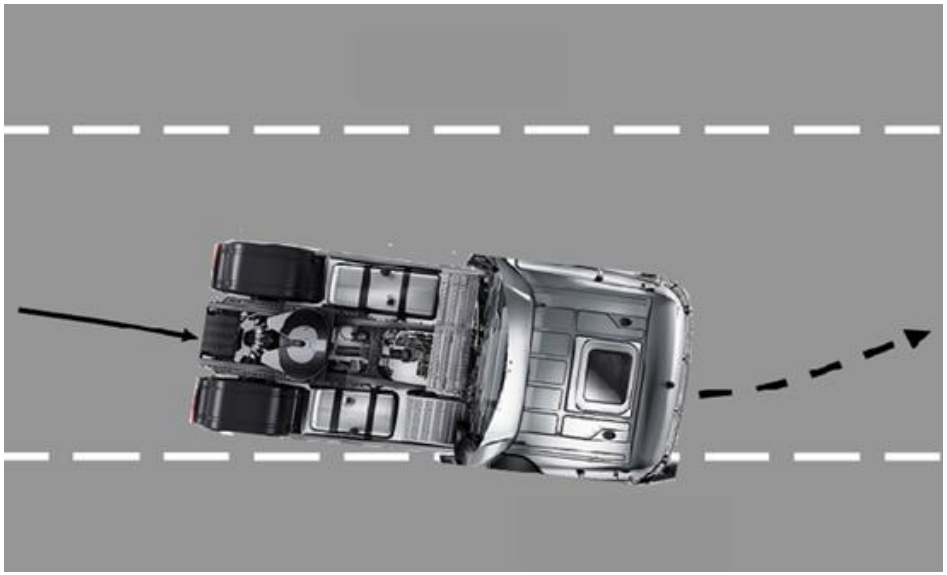
Example 2
Evasive Emergency Steering Assist

- Evasive Emergency Steering Assist can help the driver to avoid a possible accident.
- If the driver initiates an evasive maneuver by turning the steering wheel, the system provides assistance by adding precisely calculated steering torque to support the movement of the steering wheel.



Example 3a

CSF → CSF

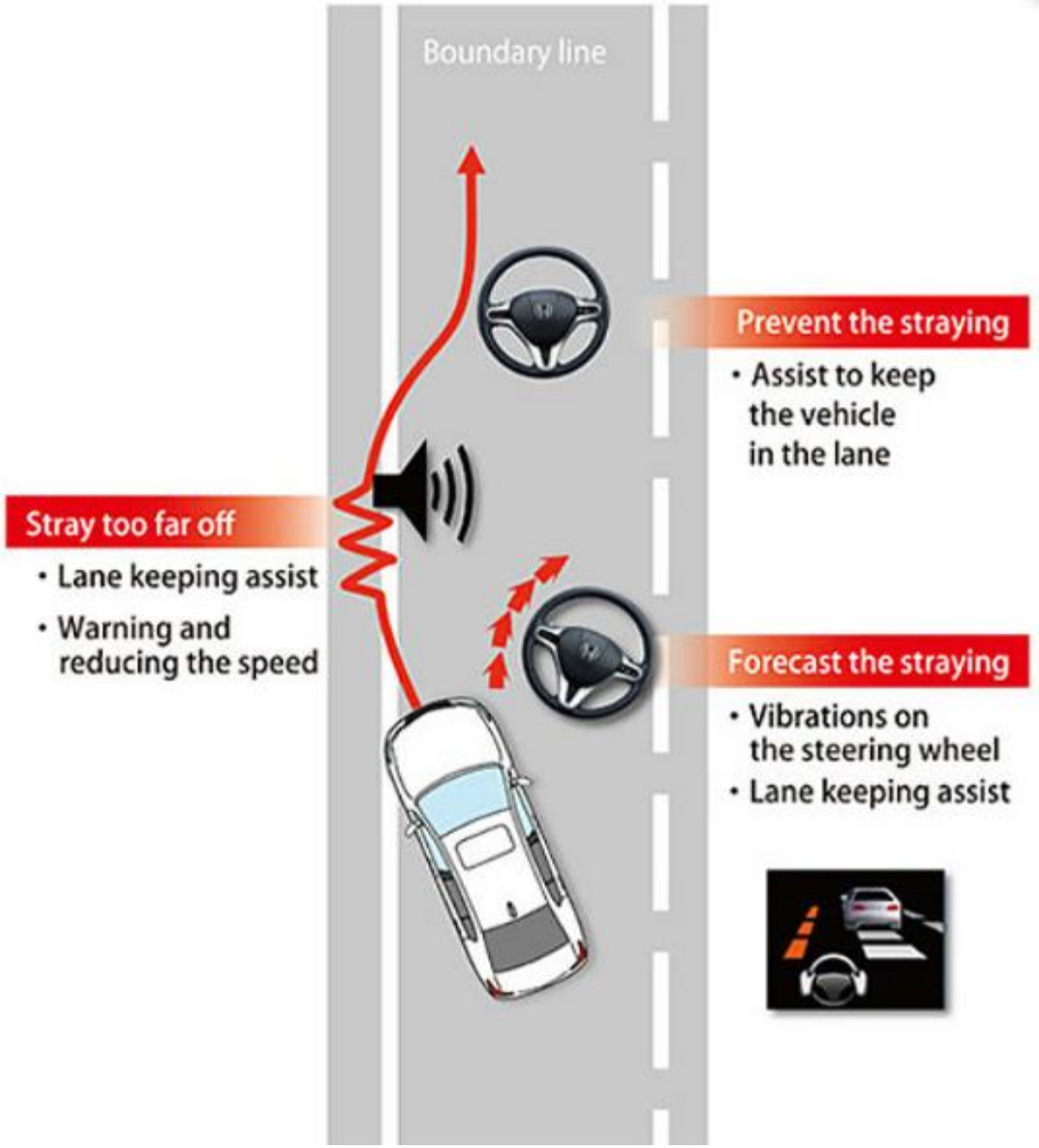


Lane departure protection or Haptic warning for LDWS

- Reaction **after crossing** the lane marking
- Only **single** maneouvre bringing the vehicle back in the lane in a parallel direction to the lane
- The steering correction is (part of) the LDWS haptic warning

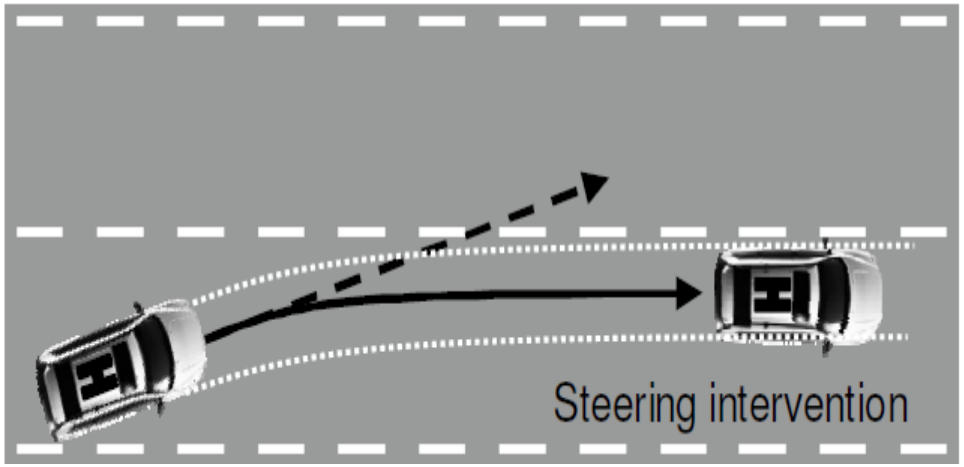
Example 3b

CSF ➡ CSF

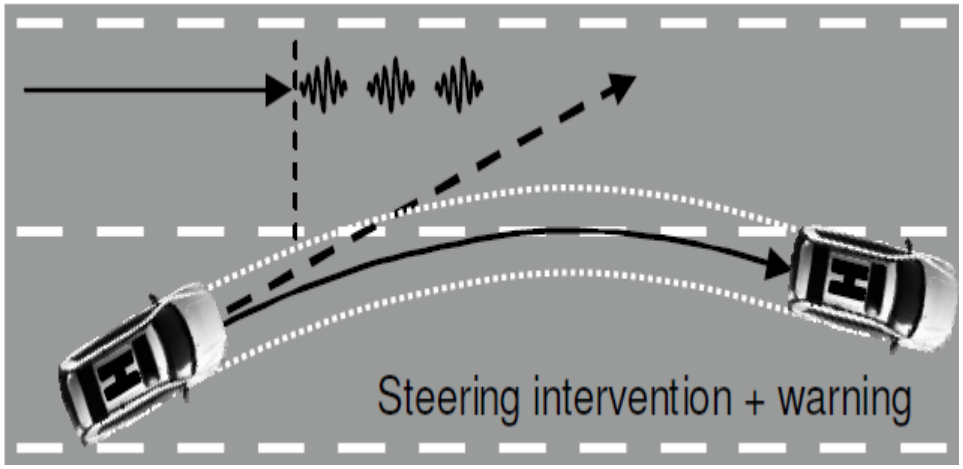


Example 4
Safety Lane Keeping Aid

CSF → **B1**



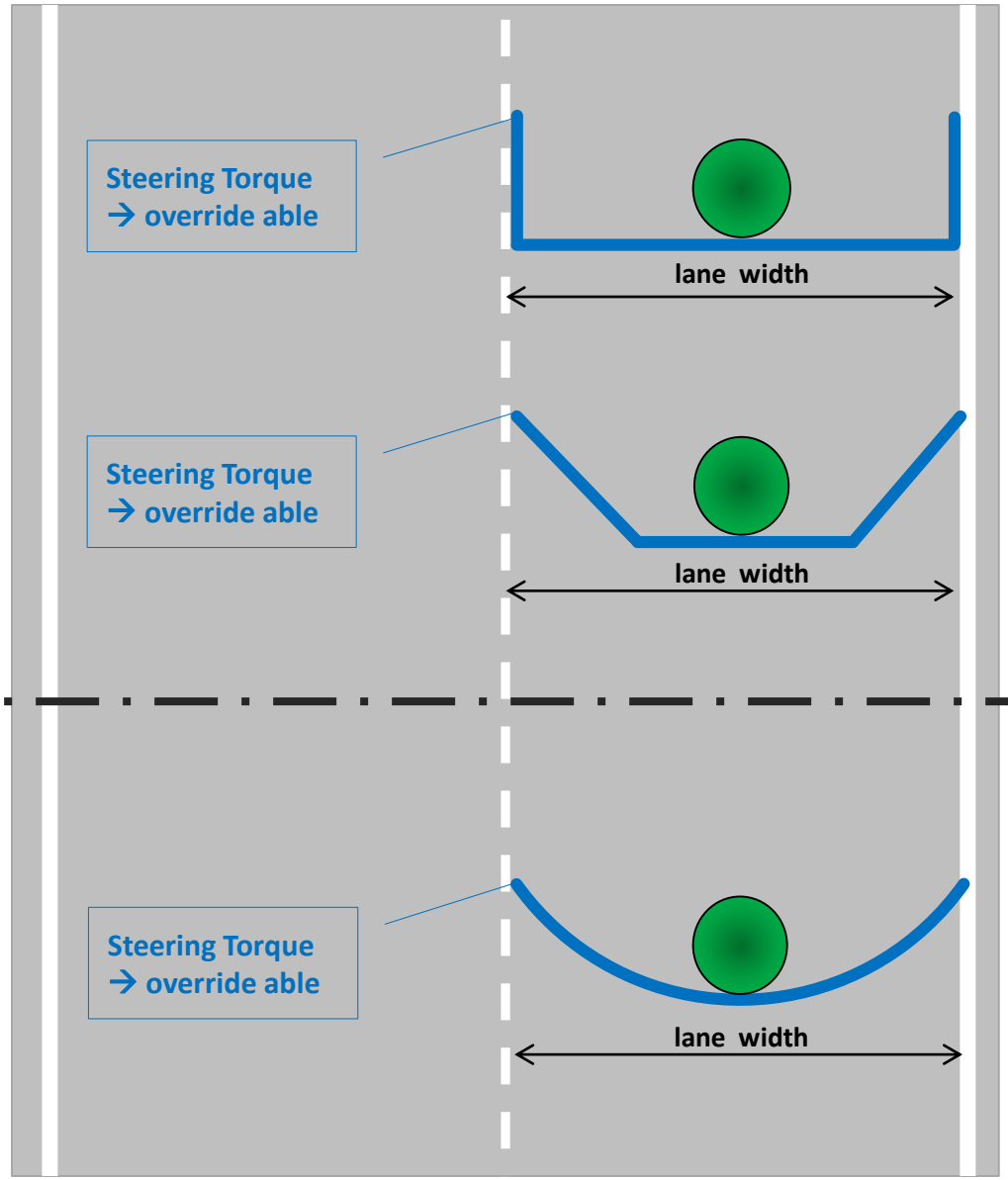
Within system boundaries, vehicle remain between markings



Beyond system boundaries, vehicle crosses markings

Proposed Principles by industry in Tokyo

Boundaries CSF / ACSF



Lane Keeping Assist System (LKAS)

Discontinuous control

CSF

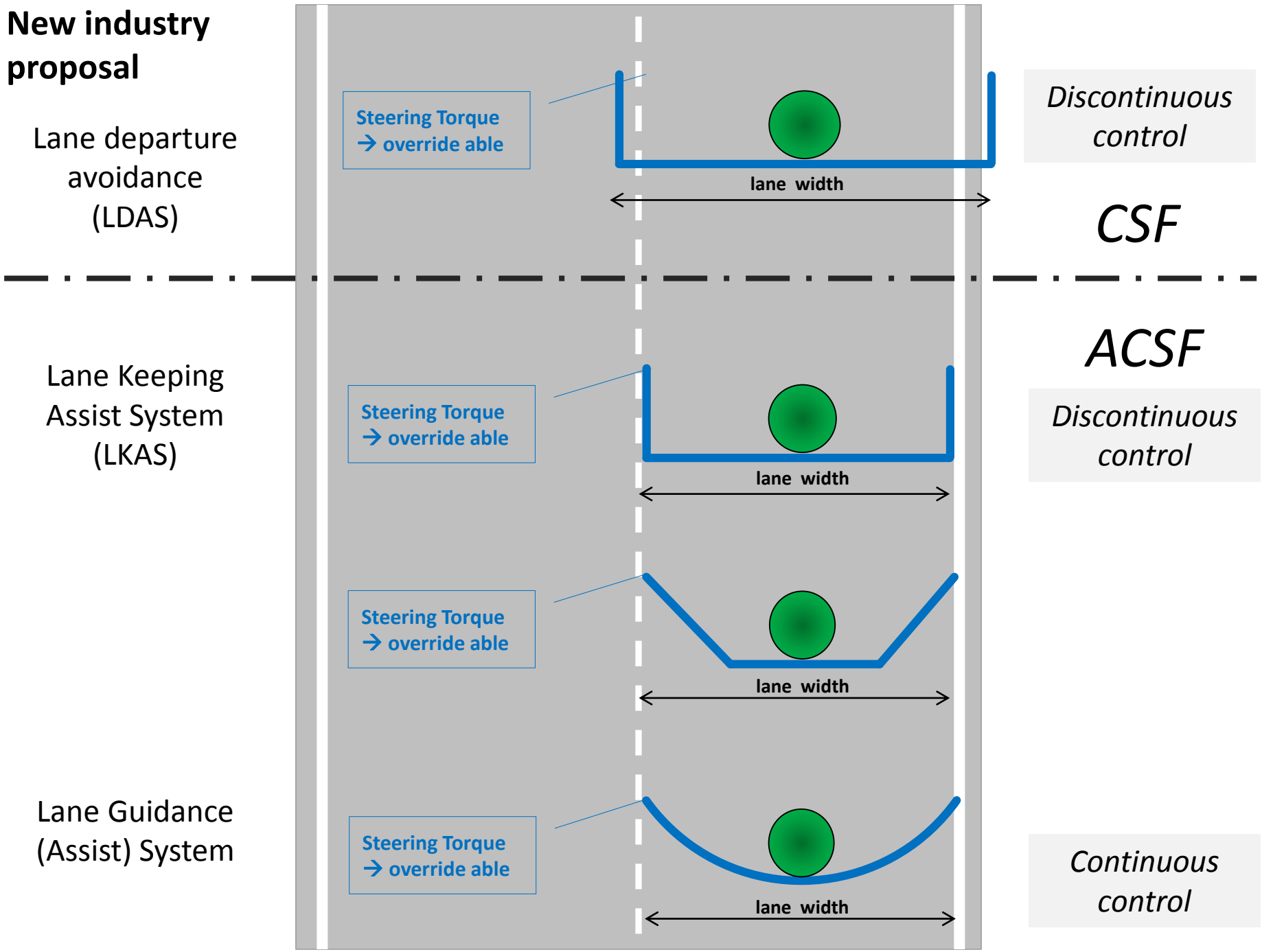
ACSF

Lane Guidance (Assist) System

Continuous control

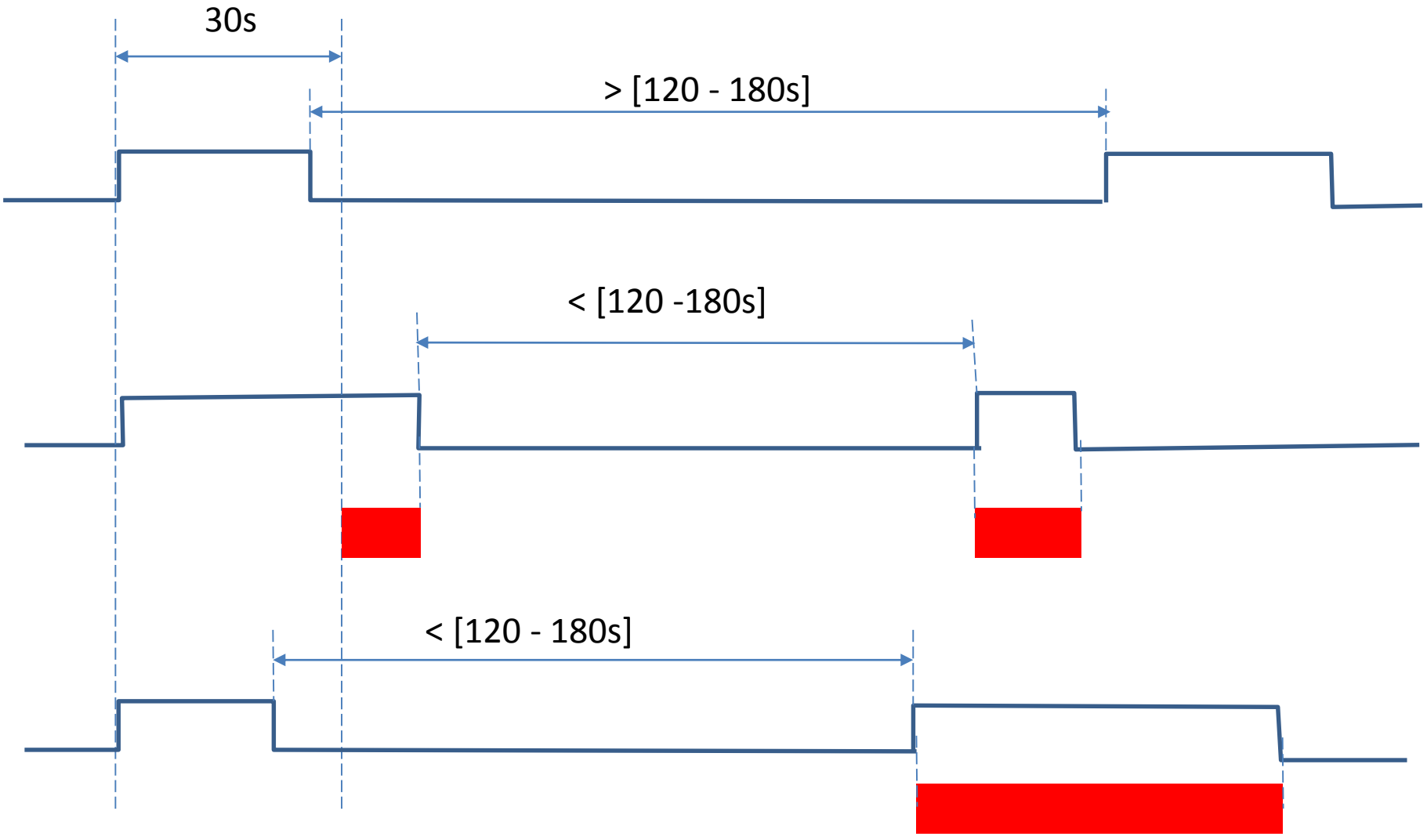
V3.2

New industry proposal



New industry proposal

CSF – acoustic warning for LDAS



- **CSF influencing vehicle dynamics → no acoustic warning**
- **No limit of duration of intervention, may be as long as necessary**

New industry proposal

CSF definition

2.3.4.2. "Corrective steering function (CSF)" means a ~~discontinuous~~ control function within a complex electronic control system whereby, for a limited duration, changes to the steering angle of one or more wheels may result from the automatic evaluation of signals initiated on-board the vehicle, in order ~~to compensate a sudden, unexpected change in the sideforce~~ to improve the vehicle stability (e.g. sidewind, µ-split), to assist driver to prevent potential collisions or to avoid lane departure by interventions beyond the lane markings. ~~Every compensation shall immediately be indicated to the driver by a constant acoustical signal which sounds for at least 1s or as long as the compensation exists, whichever is longer~~. This function shall not be used for lane keeping purposes.

2.xxxx Crossing a lane marking means the outside of the tyre of the vehicle's front wheel closest to the lane markings crosses the inner edge of the visible lane marking.

2.3.4.2.1 Lane Departure Avoidance System (LDAS) means a function which assists the driver to avoid lane departure, by influencing the lateral movement of the vehicle after crossing the lane marking.

New industry proposal

CSF requirements for LDAS

5.xxxx In the case of a LDAS intervention longer than 30s, an acoustic warning shall be provided until the end of the intervention.

In the case of 2 consecutive LDAS interventions within a rolling interval of [120s / 180s], an acoustic warning shall be provided by the system during the second intervention.

Backup slides

ADASS

CSF definition

See previous slide

= discontinuous control with no time limit + hands-on

Lane departure avoidance

Requirements:
- Acoustic warning

CSF that "influences the vehicle dynamic behaviour":
- side wind or road camber compensation
- steering to help ESC, ABS, TC
- etc.

Safety systems e.g. avoiding collision with vehicles in adjacent lanes, run-off road systems etc

No specific requirement added

ACSF definition

"Automatically commanded steering function" (ACSF) means the function within a complex electronic control system where actuation of the steering system can result from automatic evaluation of signals initiated on-board the vehicle, possibly in conjunction with passive infrastructure features, to generate ~~continuous~~ control action in order to assist the driver ~~in following a particular path, in low speed manoeuvring or parking operations"~~

= continuous or discontinuous control

B1 = Hands-on - All roads
- Discontinuous or continuous LKAS

Requirements:
- Warning (optical + haptic/acoustic after 30s hands-off, until driver resumes control
- Disconnect system after 30s of warning

B2 = Hands-off - Motorway only

(May also work hands-on)
- Lane guidance, TJA…

Requirements:
- If no driver activity detected for more than [180s], a distinctive warning shall be sent. Driver activity may be detected by e.g. head and/or eye movement and/or input to any control element of the vehicle.
- If seat belt is unfastened, a distinctive warning shall be sent after [15s / immediately]
- If driver not present in the seat, a distinctive warning shall be sent after [15s / imm.]

industry: Not for B1

- PTI (electronic interface, SW check)

Transition provisions needed