



Federal Ministry
of Transport and
Digital Infrastructure

Informal Document **ACSF-03-09**

Presentation for Document ACSF-03-03_rev1

Oliver Kloeckner

2.-3. September 2015
3rd meeting of the IG ASCF
Munich, Airport



Federal Ministry
of Transport and
Digital Infrastructure

Requirements for ACSF



Structure of the ASCF requirements





Content :

- **Category 1 ACSF**: a function that operates at a speed no greater than 10 km/h to assist the driver, on demand, in low speed manoeuvring or parking operations.
- **Category 2 ACSF**, t.b.d. by OICA
- **Category 3 ACSF**, a function that operates at a speed no greater than [130 km/h] and which can perform a single manoeuvre (e.g. lane change) when commanded by the driver.
- **Category 4 ACSF**, a function that operates at a speed no greater than [130 km/h] and which can indicate the possibility of a single manoeuvre (e.g. lane change) but performs that function only following a command confirmation by the driver.
- **Category 5 ACSF**, a function that operates at a speed no greater than [130 km/h], which is initiated by the driver and which can continuously determine the possibility of a manoeuvre (e.g. lane change) and complete these manoeuvres for extended periods without further driver command/confirmation.



(Main) Content :

- **“Motorway”** means, a road section, dedicated exclusively to motor vehicles, having [*a speed limit of more than 100 km/h and*] at least two traffic lanes for each direction of travel and having a physical separation of traffic moving in opposite directions
- **“Transition demand ”** means an instruction from the ACSF to the driver that they have to take over manual control of the steering task again
- **“Minimum risk manoeuvre”** means a procedure to reach a status with as little risk as possible in the given traffic situation, when the driver fails to respond to the takeover request
- **“Emergency Manoeuvre”** is a manoeuvre performed by the system in case of a sudden unexpected event in which the vehicle is in imminent danger to collide with another object, in order to avoid or mitigate a collision



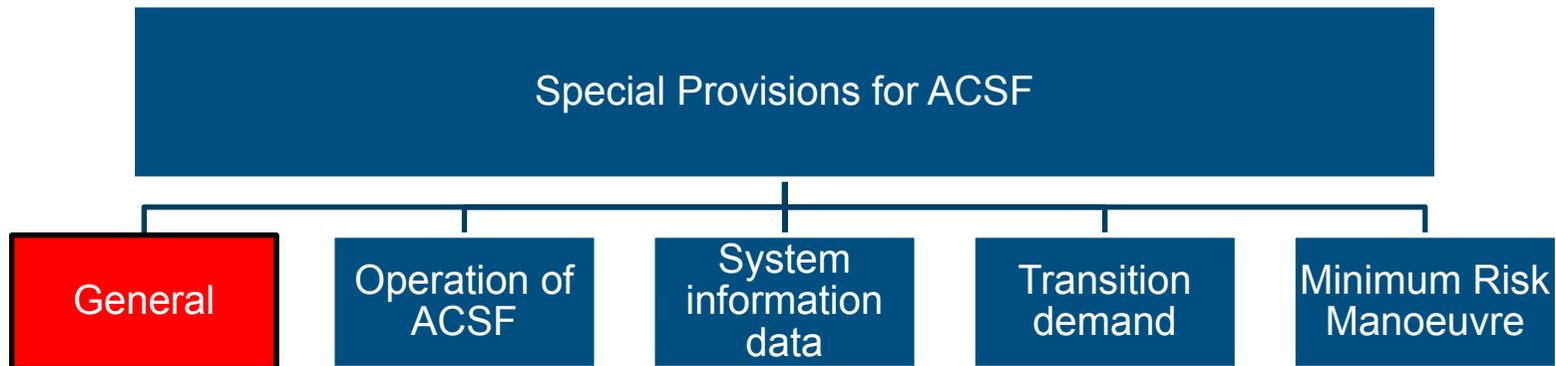
Content :

- **Any termination of control or a transition demand shall produce a distinctive driver warning by a [yellow or red] visual signal and either an acoustic signal or by imposing a haptic warning signal.**
- **This warning shall be provided before the system (function) becomes in-operational, if the termination is not intended by the driver.**
- **If the driver does not take over manual control, the warning shall be escalating with time in terms of enlarging the intensity of the warning and/or in terms of adding and/or changing the warning means**



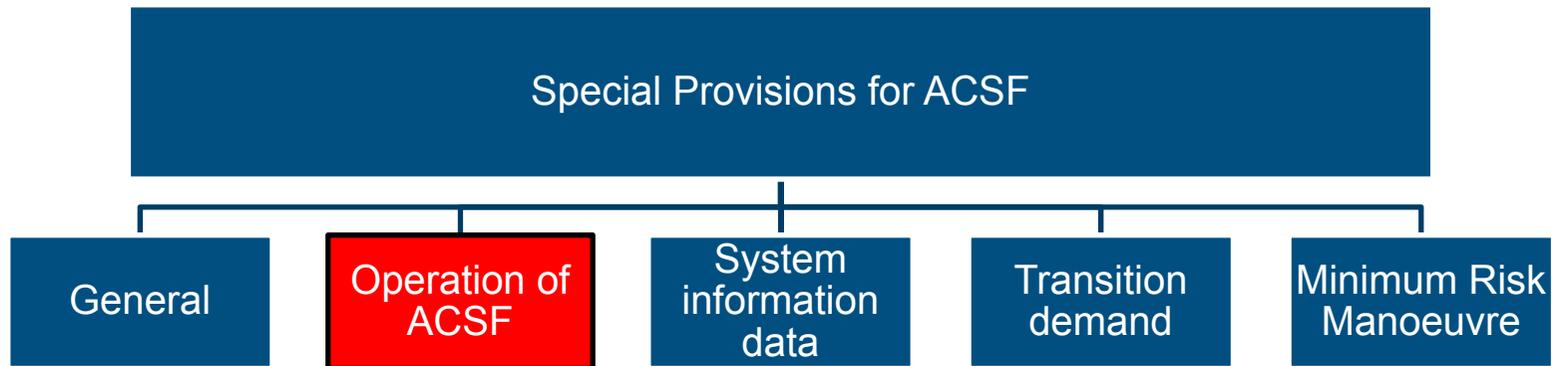
Content :

- **Any sudden termination of control caused by a failure of the system physical or functional failure shall produce immediately a distinctive driver warning by a [red] visual signal and either an acoustic signal that shall remain operational until the driver has resumed control.**



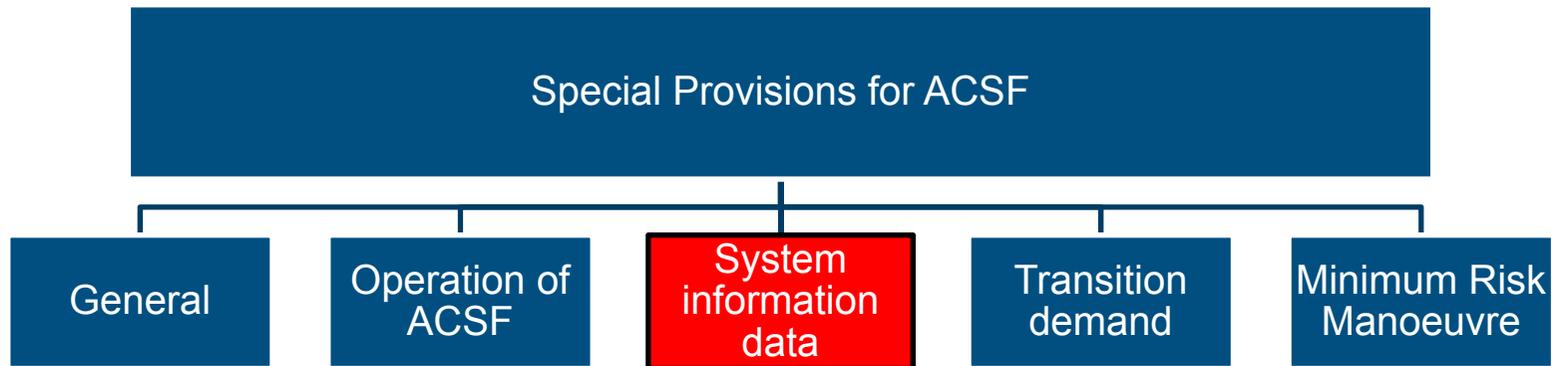
Content :

- **Vehicle shall have a means to activate or deactivate the system**
- **System can only be activated, if conditions for safe operation are fulfilled**
- **System shall be able to detect, if the driver is steering manually**
- **system shall not induce a lateral acceleration of more than [3] m/s**
- **system shall comprise an attention recognition system**
- **Vehicle shall not induce any safety critical situations and the movements of the vehicle shall be clear to other road users**
- **System shall at any time give a noticeable and distinctive signalization to the driver about the system status**



Content :

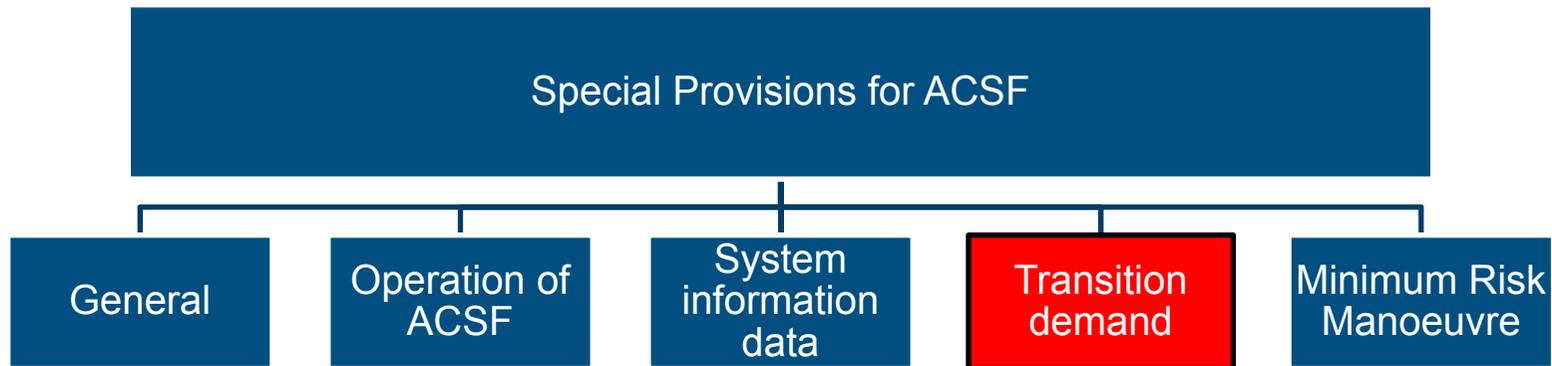
- **Requirements for a lane change manoeuvre**
- **Activation of direction indicator**
- **Lane change manoeuvre shall be completed, except the system detects an imminent critical situation or the system is overridden by the driver**
- **System shall ensure a safe lateral distance to other road users**
- **If the system detects an unexpected imminent danger (e.g. impending collision), an emergency manoeuvre shall be carried out**
- **Attention recognition system, warning if driver is inattentive**



Content :

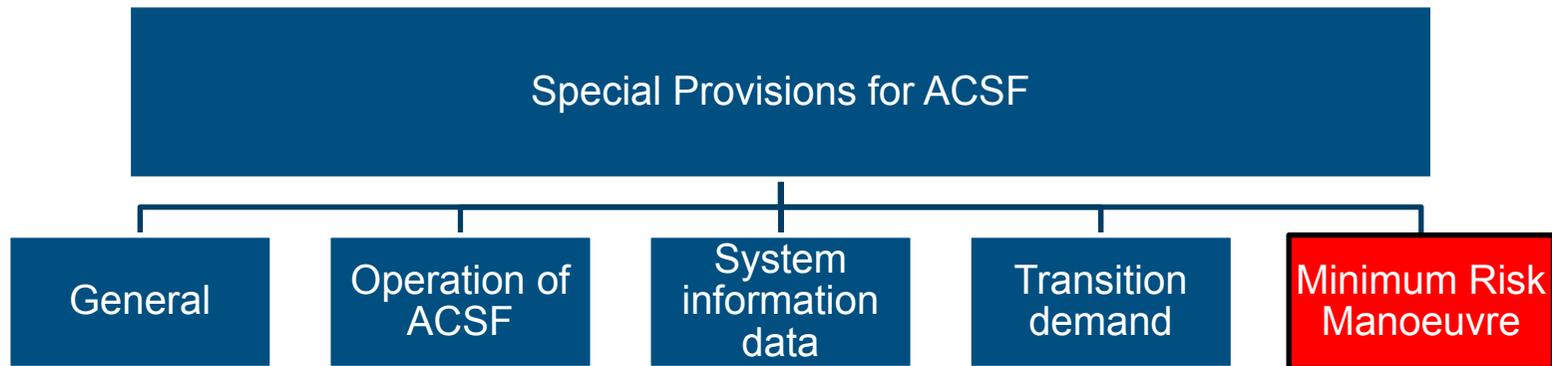
Data to be provided to the Techn. Service (together w. the documentation pack.)

- **Values for V_{smax} and V_{smin}**
- **Conditions under which the system can be activated**
- **Information about system boundaries at which the activated system shall issue a transition demand**
- **Specific values for time intervals which are foreseen for safe transition to manual steering under different circumstances**
- **Documentation about the chosen strategies regarding the minimum risk manoeuvre which is foreseen depending on the given traffic situation**
- **Documentation about the chosen strategies regarding the emergency manoeuvre**



Content :

- The timing of the transition demand shall be such that sufficient time is provided for a safe transition to manual steering
- Transition demand shall be provided by a [yellow] visual signal and either an acoustic signal or by imposing a haptic warning signal
- Transition demand shall be provided, if
 - system detects that its boundaries are reached or will be reached shortly or in case of a system failure
 - the speed of the vehicle with activated ACSF exceeds v_{smax}
 - the vehicle reaches a lateral acceleration of more than [3] m/s²
 - the attention recognition system detects the driver to be inattentive although a warning to restore attentiveness was provided
 - driver's seatbelt is unfastened and/or if driver's seat is left by the driver



Content :

- **If the system detects that after a transition demand the driver does not take over manual control of the steering again the vehicle shall carry out a minimum risk manoeuvre**



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Tests for ACSF



What is covered by the current tests of Annex 7 ?

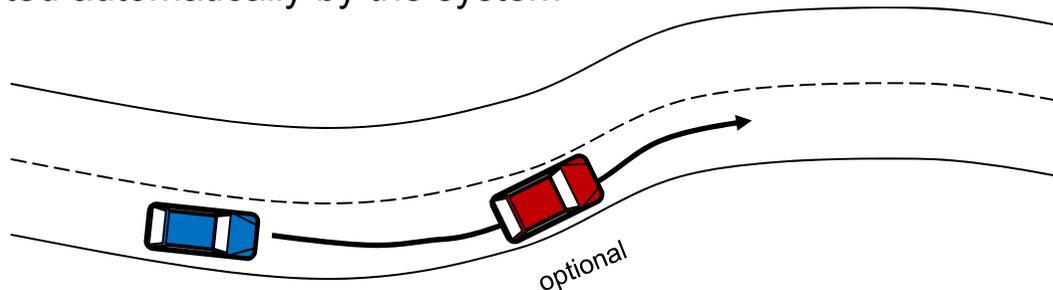
	Description	What is tested
FU 1	Lane keeping test	Functionality of Lane keeping
FU 2 [new]	Lane change test proposed by OICA	Functionality of Lane Change Manoeuvre
TR 1	Tight curve ($a_y < 3 \text{ m/s}^2$)	Transition demand
		Minimum risk manoeuvre
		System boundary $a_y > [3] \text{ m/s}^2$
TR 2 [new]	Missing lane marking	Transition demand
		Minimum risk manoeuvre
		Check if lane keeping can be continued with only one lane marking
EM 1	Braking behind lead vehicle	Emergency braking behind a car
EM 2	Braking behind motorcycle	Emergency braking behind a small static obstacle (motorcycle)



FU1 (lane keeping test)

Check if vehicle stays on path under normal operating conditions
(lead vehicle is optional)

- at least 5 min driving on a track with various curvatures with road markings of good visibility at each side of the lane at various speeds up to v_{smax} and down to v_{smin}
- drive within the lane markings with $a_y \leq 1 \text{ m/s}^2$
- The usage of a lead vehicle is optional
- If test is performed with a lead vehicle, the time gap shall be 2 s to 3 s or could be adjusted automatically by the system



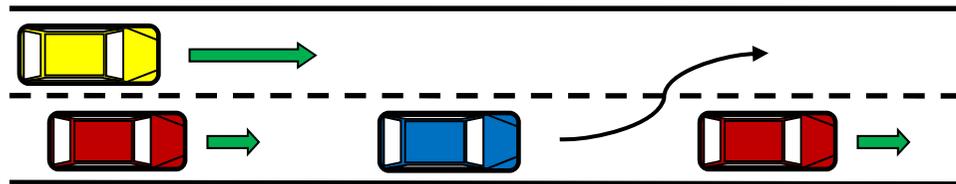
Test is passed: Vehicle does not cross any lane marking



FU 2 [new] (Lane change test)

⇒ A new test will be proposed by OICA

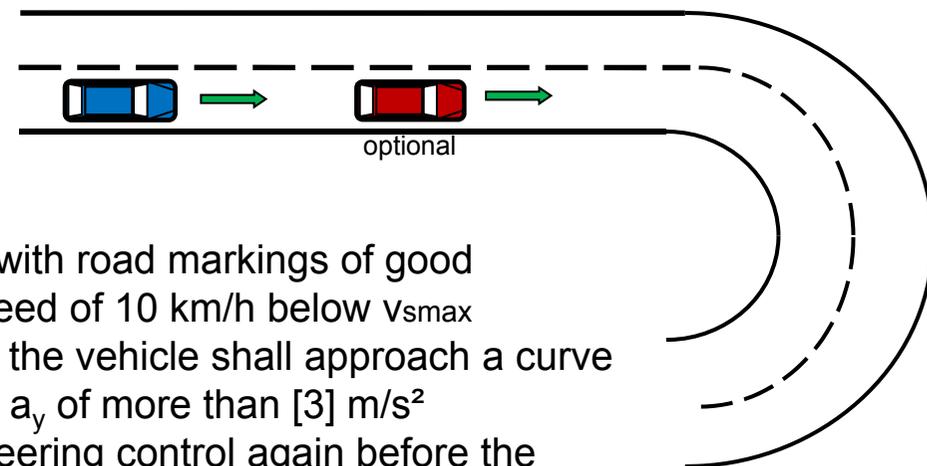
This test shall replace the former test EM 3 (abortion of a lane change), as the discussion showed, that EM 3 seems to be very complex and difficult to realise.





TR 1 (tight curve: a_y beyond system boundaries)

Check transition demand and
minimum risk manoeuvre
(lead vehicle is optional)



- driving at least 1 min behind on a track with road markings of good visibility at each side of the lane at a speed of 10 km/h below v_{smax}
- after a straight section of at least 200 m the vehicle shall approach a curve of more than 90° that would demand an a_y of more than [3] m/s²
- test driver shall not take over manual steering control again before the minimum risk manoeuvre is finished
- The usage of a lead vehicle is optional

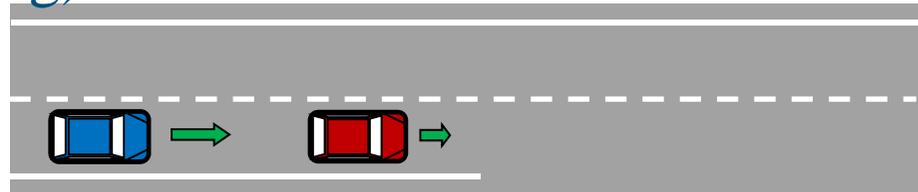
Test is passed:

- transition demand was given at least when the lateral acceleration exceeds [3] m/s²
- the minimum risk manoeuvre as specified by the manufacturer was initiated
- vehicle does not cross any lane marking before the minimum risk manoeuvre was initiated.



TR 2 new (missing lane marking)

Check transition demand and
minimum risk manoeuvre
(lead vehicle is optional)



- driving at least 1 min on a track with road markings of good visibility at each side of the lane at a speed of 10 km/h below v_{max}
- 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
- test driver shall not take over manual steering control again
- The usage of a lead vehicle is optional

Test is passed:

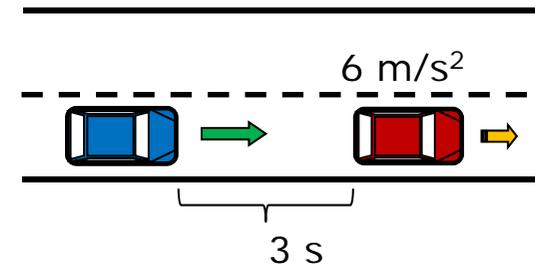
- the transition demand is given before the vehicle is entering the section with missing lane markings and the vehicle shall follow the initial path for at least [5] seconds after the transition demand and the minimum risk maneuver as specified by the manufacturer was initiated, or
- the vehicle follows the initial path for the complete section with only one lane marking without crossing any lane marking.



EM 1 (Braking behind lead vehicle)

Basic automatic emergency braking capability if lead vehicle suddenly decelerates sharply

- Test speed of both vehicles 10 km/h below v_{smax}
- Initial time gap 3 s
- Lead vehicle deceleration 6 m/s^2 , mean jerk 6 m/s^3



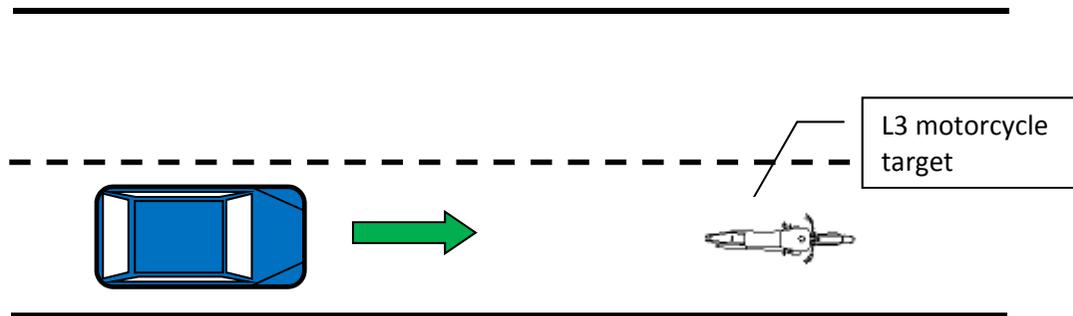
Test is passed: No collision



EM 2 (Braking behind motorcycle)

Basic emergency braking capability
(motorcycle stands statically in the lane)

- Test speed 10 km/h below v_{smax}
- L3 motorcycle stands centered in the lane
- Test is not feasible for ACSF systems, which are only working with lead vehicle



Test is passed: No collision

Thank you for your attention!

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Robert-Schuman-Platz 1
D-53175 Bonn

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