



UNR157-03-07

OICA/CLEPA Input

to the

Special interest group on UN-R 157

In response to

“react to road users/traffic signs as good as a human driver”

“detectable collision” and

FR presentation - vehicle config vs ADS safety

Homework to Industry from SIG ALKS-02:

Review if expected ALKS system capabilities with regard to traffic rules could be described as:

„The ALKS shall be able to react to other road users/traffic signs as good as a human driver.“

Industry review:

„as good as a human driver“ – in contrast to the reference to a human driver in par. 5.2.5. on collision avoidance there is no existing guidance on how capable a human driver is of complying with traffic rules in different scenarios and there is a spectrum of human driver's capabilities. Therefore introducing this reference would not help in defining harmonized type approval requirements.

„to be able to react to something“ – the ALKS doesn't necessarily need to possess the same detection capabilities as a human driver, it needs to be able to cope with a certain situation in a similar manner.

„reasonably foreseeable situations“ – the ALKS should be expected to cope with those situations that are reasonably foreseeable, but not even the most unlikely one

Therefore Industry still believes a clarification as proposed in SIG 157 02-09 with regard to the expected system behavior in interaction with emergency and enforcement vehicles is more suitable.

Considerations from UK implementation of R 157- ALKS

Examples of UK traffic rules

- A driver must comply with the direction of an enforcement officer

(Rule 106, 107 & 108)



Not all enforcement vehicles have sirens and blue flashing lights so will the vehicle respond to them?

- Red X - You must not proceed further in this lane

(Rule 258)



A legal requirements so can they be detected and understood?

- If you are involved in a collision which causes damage or injury to any other person, vehicle, animal or property, you must stop

(Rule 268)



Will this collision be a detectable collision?



Homework to Industry from SIG ALKS-02:

What is considered a „detectable collision“?

Food for thought by

Industry:

Two general principles:

- In general, ALKS is (only) expected to be as good as a human driver. → What a human driver is not capable of, we don't expect the ALKS to be capable of either.
- Through appropriate driver recognition we ensure the driver remains sufficiently vigilant while ALKS is active. → The driver is still receptive to acoustic and haptic signals.

So what real need is there for an ALKS response in case of a collision?

Vehicle configuration will evolve during lifetime

- due to the **use of the vehicle**,
 - Ex: load variation: vehicle unloaded, loaded, overloaded
- because some parts wear out and **their performance changes with wear**,
 - Ex: tyre breaking distance
- because they can be **replaced by parts different from those used to homologate the vehicle**,
 - Ex: retreaded tyres for trucks
- because their repair will induce a **different adjustment** from that carried out in the factory,
 - Ex: cameras, detection sensors,
- because **the traffic rules require it**.
 - Ex: winter tyre fitment.



Example of interference between ADS safety requirements and vehicle configuration: R157 amendment for « highway chauffeur ».

- Braking demand threshold in case of « imminent collision » : 5 m/s^2
- Detection table for speed above 60 km/h

<i>Specified maximum speed / km/h</i>	<i>Minimum forward detection range / m</i>
0...60	46
70	50
80	60
90	75
100	90
110	110
120	130
130	150

$\mu = 0,5$
seems to be the minimum adhesion level required to ensure adequate reaction time even at 130 km/h.

Lower μ levels can be reached in operation depending on the road conditions (dry, wet, snow, ice...), the type of tires fitted on the vehicle, their level of wear...



This observation raises two questions

- How will the system cope with different grip conditions depending on the road and the vehicle's tire fitment during the vehicle's lifetime?
 - What are the consequences for the vehicle user/owner if the solutions are not standard?
- How will the system comply with local traffic rules in winter (mandatory special equipment on specific roads & countries) without recognizing its tires?
 - Who is liable in case of accident? The vehicle manufacturer or the vehicle owner?
- GRVA work should take these questions into considerations when proposing regulatory framework
 - (however GRAV may not be responsible to address these questions)

Influence of vehicle configuration on ALKS

General Industry observations:

- There are responsibilities (e.g. appropriate tyres, snow tyres, proper load, load properly secured) that remain with the driver because the driver will have driven the vehicle manually before ALKS becomes active.
- Beyond that, ALKS needs to implement strategies to cope with reasonably expected changes in vehicle configuration (e.g. different load conditions, different permitted tyres fitted to the vehicle, different tyre age) and external influences (e.g. varying grip conditions of the road)
- These strategies may vary depending on the detection capabilities of the system, e.g. by
 - Making reasonable assumptions (e.g. with regard to feasible deceleration)
 - Limiting the ODD and preventing the ALKS from being active under certain conditions (e.g. not operating below a certain temperature)
 - Adapting the system's control strategies to safely operate even under those conditions (e.g. detection capabilities to detect snow/ice on the road and offering the system accordingly)

and what exactly these strategies are will be demonstrated to the Technical Service during Type Approval.

Handling of vehicle configuration and road conditions for ALKS

Condition	Responsibility of the Driver	Responsibility of the ALKS
Operational safety of vehicle <ul style="list-style-type: none"> e.g. vehicle load limits/overload, load securing, ... 	Ensure the vehicle is in the legally permitted state to drive (permitted load, load secured properly).	Handling of the full range of the legally permitted load conditions.
Vehicle part conditions, because some parts wear out and their performance changes with wear <ul style="list-style-type: none"> e.g. tyre braking distance 	Ensure the vehicle is in the legally permitted state to drive (maintanance).	Handling of full range of the legally permitted conditions for vehicle parts e.g. tyre tread depth (robustness of ALKS)
Usage of un-released vehicle parts, because they can be replaced by parts different from those used to homologate the vehicle, <ul style="list-style-type: none"> e.g. retreaded tyres for trucks 	Ensure appropriate vehicle parts are fitted to the vehicle. Additional responsibility for workshops and technical services.	Handling of the full range of parts, which are released for a vehicle with ALKS (robustness of ALKS)
Different grip conditions of the road due to change of weather conditions	Ensure, that system is only used within specified ODD and deactivate, when recognizing that ODD limits are reached.	The system must be designed to cope with reasonably expected environmental/road conditions (adjustment of ALKS behavior regard to conditions. Active safety systems (ABS, ESC...) are supporting in critical events.
Calibration of vehicle sensors, because their repair will induce a different adjustment from that carried out in the factory, <ul style="list-style-type: none"> e.g. sensors for perception (cameras, ...) 	Ensure, that vehicle will be repaired properly in experienced and educated workshops. Workshop: Follow instructions for replacement.	Implement strategies to ensure safe operation, perform self-checks to confirm proper system performance.
Required vehicles equipment, by the traffic rules. <p>e.g. winter tyre fitment.</p>	Ensure the vehicle is in the legally permitted state to drive.	-