OICA

„CERTIFICATION OF AUTOMATED VEHICLES"

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SOME BASIC FACTS

➢ **Automated vehicles that can/will also be operated manually (automation switched-off):**
  ▪ **No justification to derogate from currently existing legislation for manual operation**
  ▪ **Automated operation will need to be addressed in addition in order to enable certification**

➢ **Future years: mix of manually operated/automated/fully autonomous (driverless) vehicles/pods**
  ➔ **Fully autonomous vehicles/pods with no possibility of manual operation will still need to meet various pieces of existing legislation (i.e. some crashworthiness requirements, braking performance, …)**
  ➔ **Critical review/adaptation of remaining necessary requirements will be needed in order to adapt, where needed, existing legislation currently applicable to "manual" vehicles**

- **Existing legislation and certification will remain necessary for automated vehicles, when operated manually**
- **Even fully autonomous/driverless vehicles/pods (no manual operation) will for long time need to meet some requirements due to traffic mix ➔ need to evaluate and possibly adapt each regulation**
- **Need to develop additional requirements and certification scheme for automated driving functions (Levels 4 and 5, possibly level 3)**
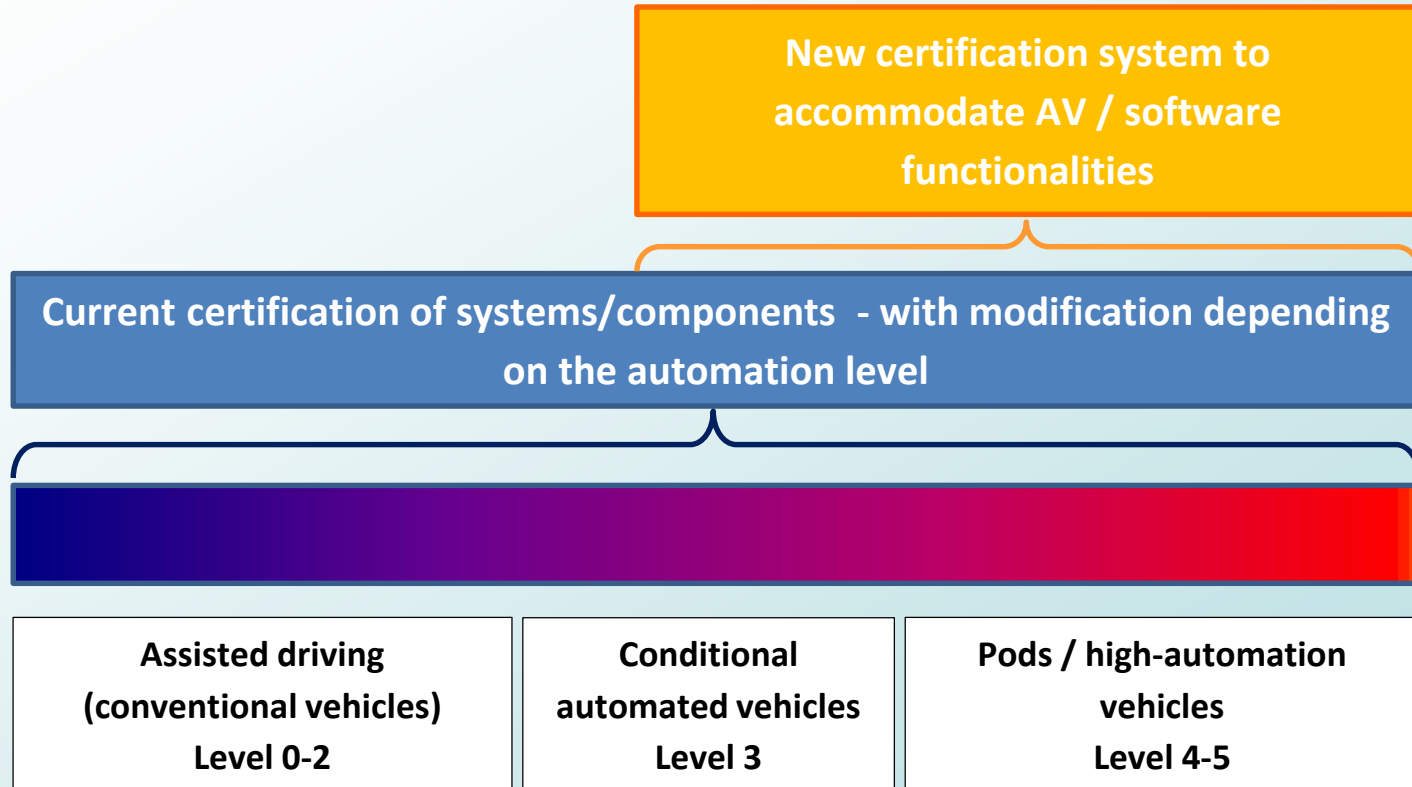
HOW CAN AUTOMATED OPERATION BE REGULATED?

➢ **Current legislation is "vertical", i.e. different vehicle aspects/systems covered by different regulations (front impact, side impact, steering, braking, lighting, …)**

➢ **Automated operation however entails that the vehicle can "replace the driver" and is not a "simple" combination of vertical systems anymore:**

  ➔ **Vehicle must:**
- ✓ **Monitor the driving environment**
- ✓ **Evaluate the situation**
- ✓ **Make decision**
- ✓ **Perform the decision**

  ➔ **Automated functions will entail some "classical" performance requirements to assess the safety of the various components/software/…but this will likely not cover all aspects**

Current regulatory system approach likely not able to cover all aspects of automated driving

INITIAL PROPOSAL

➜ **Focus will be on level [3] / 4 / 5 systems (level 3 is at least partially addressed through UN R79 activities)**

➜ **Focus on the development of a concept to get automated/autonomous vehicles certified**

➜ **Introduction of a „technology umbrella" supported by modules / building blocks, instead of a continuation of an approach for each and every upcoming technology / system**

CONCEPTUAL OUTLINE

New certification system to accommodate AV / software functionalities

Current certification of systems/components - with modification depending on the automation level

Assisted driving (conventional vehicles) Level 0-2	Conditional automated vehicles Level 3	Pods / high-automation vehicles Level 4-5

INITIAL IDEAS FOR "NEW CERTIFICATION SYSTEM TO ACCOMMODATE AV / SOFTWARE FUNCTIONALITIES"

a. **Basic capability of the vehicle based on test cases that represent well the 4 use cases (parking / urban / interurban / highway)**

   - Results of OEM internal real world drives etc.

   ➔ *Desired outcome: Assurance of basic capabilities before further testing*

b. **Assessment of these test cases to be conducted on dedicated test fields (video recording?) or through simulation or other type of demonstration**

   ➔ *Desired outcome: Vehicle is capable of dealing with the typical driving conditions for each use case/domain that a certification is requested for*

c. **Real world test drive (e.g. by a technical service) - Similar to today's random „driving test" lasting 30-60 minutes**

   ➔ *Desired outcome: Targeted at demonstrating how the vehicle generally behaves in traffic and that relevant rules of the road are obeyed*

d. **„Extreme / interesting" traffic situations: via simulation based on industry pooled data sets**

   ➔ *Desired outcome: understanding how the vehicle reacts under extreme conditions (as safe as a human driver)*

ILLUSTRATION OF THE GENERIC CONCEPT FOR „NEW CERTIFICATION SYSTEM TO ACCOMMODATE AV / SOFTWARE FUNCTIONALITIES"

Use case		Parking			Highway			Extra-urban			Urban		
SAE Level		[3]*	4	5	[3]*	4	5	[3]*	4	5	[3]*	4	5
General system requirements	System reliability/functional safety/redundancy (incl. min risk manoeuvre etc)												
	System activation/deactivation												
	HMI												
	Data storage												
	Cybersecurity measures												
	Indication to other users that auto function is "on"												
	Etc.												
Vehicle behavior on the road	(a) Basic capabilities of the vehicle	Review results of OEM test drives; to be based on tbd representative driving conditions											
	(b) Test scenarios for type approval testing	Limited number of specific test cases for each regime to be defined so that technical services can conduct the tests and approve compliance to the test scenario on a test field											
	(c) Real world test drive	Similar to today's random „driving test" lasting 30-60 minutes (could be a module by regions)											
	(d) Repository of test cases for simulation	Extreme / interesting cases based on simulations Can become part of the audit process and manufacturer self-declaration											

[3]* When not covered by ACSF

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SUMMARY

> The proposed process aims at maintaining the existing certification process, including witness testing and shared responsibility

> However, augmenting it with several elements to accommodate AV / software functionalities which

  ✓ Introduce a new concept as multiple systems and technologies have to interact and the focus cannot remain on a single component any more

  ✓ Suggests a modified release and approval system that takes into consideration the multitude of different traffic scenarios that cannot be described/ tested in the traditional way any more

> Suggested test/validation process is expected to be applicable in a type approval as well as in a self certification environment