Note by the secretariat   Informal document **WP.29-177-19**
                                           177th WP.29, 12-15 March 2019
                                           Agenda items 2.3 and 17

Framework document on automated/autonomous vehicles

1. Purpose

This Framework document's primary purpose is to provide a guidance for WP.29 and its subsidiary Working Parties by identifying the principles to facilitate and guide discussions and activities on automated/autonomous vehicle performance. The framework defines the work priorities for WP.29 and indicates the deliverables, timelines and working arrangements for those activities.

2. Working Principles

1. The harmonization of technical provisions and/or guidance and resolutions for automated/ autonomous vehicle shall be conducted within the contexts of both the 1958 Agreement and 1998 Agreement.

2. The technical provisions [and guidance resolutions] for automated vehicle will be performance based and technology neutral, based on the current state-of-the-art while avoiding restricting future innovation.

3. They shall take into account existing standards/guidelines of the contracting parties and in standardization bodies as well as previous work and reference documents agreed in UNECE.

4. Implementation of technical provisions through the identified work priorities at the level of GRVA (or other GRs) will aim at developing detailed technical requirements which may take the form of regulatory or non-regulatory instruments (e.g. guidelines, recommendations, UN regulations, GTRs) as agreed and accepted by the contracting parties.

5. This document shall be approved and managed by WP.29 as specific work items are expected to be prepared in multiple GRs with extensive cross-coordination between them.

3. AV Principles

The following list of topics are intended to guide discussions and activities on automated/autonomous vehicles within WP.29 and each of its relevant subsidiary Working Parties. The aim is to capture the shared interests and concerns of regulatory authorities, provide the general parameters for our work, and to assist with common definitions and guidance within WP.29 and for interested stakeholders.

It is recognised that for automated vehicles to fulfill their potential to improve road transport, then they must be placed on the market in a way that reassures road users of their safety. If automated vehicles confuse users, disrupt road traffic, or otherwise perform poorly then they will fail. This document seeks to avoid this outcome by creating the framework to helping to deliver safe and secure road vehicles, and to promote collaboration and communication amongst those involved in their development and oversight.

4. Safety Vision

The level of safety to be ensured by automated vehicles is defined as "an automated vehicles shall not cause any non-tolerable risk", meaning that automated vehicle systems, under their operational domain (OD), shall not cause any traffic accidents resulting in injury or death that are reasonably foreseeable and preventable. Based on this principle, this framework sets out a series of vehicle safety topics to be taken into account to ensure their safety.

5. Key safety aspects to be considered by WP29 bodies

This section is based on discussions and activities on automated/autonomous vehicles in the respective legislative systems of Contracting Parties and using this to guide WP.29 and each of its relevant subsidiary Working Parties on AV related safety aspects. The guidance will be revised and updated by the relevant GRs (see Annex) taking into account technological and industrial developments.

The following is a list of common principles with brief descriptions and explanation. It is expected these would form the basis for further development within the GRs.

a. **System Safety:** When in the automated mode (OD), the automated vehicle should be free of unreasonable safety risks to the driver and other road users and ensure compliance with road traffic regulations.

b. **Failsafe Response:** The automated vehicles should be able to detect when a problem is encountered or when the conditions for the OD are not met anymore. In such a case the vehicle should be able to transition automatically (minimum risk manoeuvre) to a minimal risk condition with or without take over request.

c. **Human Machine Interface (HMI) /Operator information:** Automated vehicle should include driver engagement monitoring in cases where drivers could be involved (e.g. take over requests) in the driving task to assess driver awareness and readiness to perform the full driving task. In addition, automated vehicle should allow interaction with other road users (e.g. by means of external HMI on operational status of the vehicle, etc.)

d. **Object Event Detection and Response (OEDR):** The automated vehicles shall be able to detect and respond to object/events that may be reasonably expected in the OD.

e. **Operational Domain (OD) (automated mode):** For the assessment of the vehicle safety, the vehicle manufacturers should document the OD available on their vehicles and the functionality of the vehicle within the prescribed OD. The OD should describe the specific conditions under which the automated vehicle is intended to drive in the automated mode. The OD should include the following information at a minimum: roadway types; geographic area; speed range; environmental conditions (weather as well as day/night time); and other domain constraints.

f. **Validation for System Safety (reshown):** Vehicle manufacturers should demonstrate a robust design and validation process based on a systems-engineering approach with the goal of designing automated driving systems free of unreasonable safety risks and ensuring compliance with road traffic regulations and the principles listed in this document. Design and validation methods should include a hazard analysis and safety risk assessment for ADS, for the overall vehicle design into which it is being integrated and when applicable, for the broader transportation ecosystem. Design and validation methods should demonstrate the behavioural competencies an Automated Driving System would be expected to perform during a normal operation, the performance during crash avoidance situations and the performances during a crash. Test approaches may include a combination of simulation, test track and on road testing.

g. **Cybersecurity:** The automated vehicle should be protected against cyber-attacks in accordance with established best practices for cyber vehicle physical systems.

h. Software **Updates**: Vehicle manufacturers should ensure system updates occur as needed in a safe way and provide for after-market repairs and modifications as needed.

i. **Event Data Recorder:** [Description: TBD]

j. **Data Storage System for Automated Driving vehicles (DSSAD):** The automated vehicles should have the function that collects and records the necessary data related to the system status, occurrence of malfunctions, degradations or failures in a way that can be used to establish the cause of any crash.

Additional *issues not listed in the currently agreed WP29 priorities*

k. *Remote operation (e.g., unmanned urban transport pods)*

l. *Safety of In-Use Vehicles:* Vehicle manufacturers should ensure safety of in-use vehicles, measures related to maintenance and the inspection of automated vehicles etc.

m. *Consumer Education and Training:* Vehicle manufacturers should develop, document and maintain employee, dealer, distributor, and consumer education and training programs to address the anticipated differences in the use and operation of automated vehicles from those of conventional vehicles.

4. Table 1 - Detailed WP.29 work priorities related to automated/ autonomous vehicles.

Title	Allocation to	Main targets	Comments	Deliverable/ Deadline
Functional Requirements for automated / autonomous vehicles	GRVA	Automated / Autonomous vehicles	This work item should cover the functional requirements for the combination of the different functions for driving: longitudinal control (acceleration, braking and road speed), lateral control (lane discipline), environment monitoring (headway, side, rear), minimum risk manoeuvre, transition demand, HMI (internal and external) and driver monitoring. This work item should also cover the requirements for Functional Safety.	[March 2020: Common principles based on existing national/regional guidelines and other relevant reference documents[[March 2020: Functional requirements Lane Keeping systems of SAE levels 3/4 (New UN Regulation for contracting parties to the 1958 Agreement)
New assessment / Test method	GRVA	Automated / Autonomous vehicles	Multi-pillar concept: Audit, simulation, electronic system compliance, digital identity, test track, real world driving evaluation. This work item should also cover the assessment of Functional Safety.	[March 2020:review of the existing and upcoming methods and a proposed way forward for the assessment of AD] [March 2020: The test and assessment method for Lane Keeping systems of SAE levels 3/4 as New UN Regulation for contracting parties to the 1958 Agreement]
Cyber security and (Over-the-Air) Software updates	GRVA	Conventional and Automated / Autonomous vehicles	Work of Task Force on Cyber Security and (OTA) software updates (TF CS/OTA) ongoing. Draft recommendations on the approach (based on draft technical requirements).	[March 2020: Review of the test phase on the draft requirements]
Data Storage System for Automated Driving vehicles (DSSAD)	First: GRVA Later: GRSG (in coordination with GRVA)	Automated / Autonomous vehicles	DSSAD are for autonomous vehicles (e.g. accident recoding). This work item should take into consideration of the discussion at GRVA and its Informal Working Group on Automatically Commended Steering Function (IWG on ACSF). Clear objectives, deadline and the identification of differences with EDR to be determined first before discussion on detailed data information.	[March 2020: DSSAD requirements for Lane Keeping systems of SAE levels 3/4 as New UN Regulation for contracting parties to the 1958 Agreement]
Event Data Recorder (EDR)	GRSG	Conventional and Automated / Autonomous vehicles	Existing systems - as road safety measure (e.g. accident recoding).	[November 2020: agreed technical requirements.]