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Group of Experts on drafting a new legal instrument on the use of automated vehicles in traffic

Fourth session

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Item 2 of the provisional agenda

Substantive activities

Activities of other Working Parties and relevant Groups of the United Nations related to Automated Vehicles

Note by the secretariat

This document provides information on the activities of the Working Party on Automated/Autonomous and Connected vehicles (GRVA), subsidiary to the World Forum for Harmonization of Vehicle Regulations (WP.29), on activities of interest for the Group of Experts (GoE) on drafting a new legal instrument on the use of automated vehicles in traffic (LIAV).

Summary

This document provides the Group of Experts with an overview of activities performed by GRVA on:

- (a) The safety of automated driving systems;
- (b) The cyber security of automated driving systems.

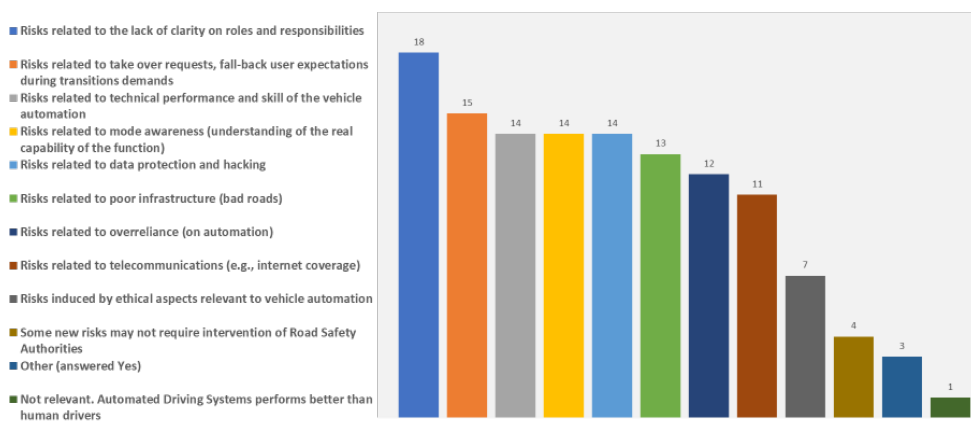
It is intended to identify existing activities addressing the risks mentioned by experts of the Group concerning safety challenges mentioned during the third session while reviewing the outcome of the survey “Safe Deployment of Automated Vehicles in International Traffic”.

I. Introduction

1. The GoE on LIAV was informed, at its May 2022 session, of the outcome of the survey titled “Safe Deployment of Automated Vehicles in International Traffic” (GE.3-03-01), circulated by the secretariat in January 2022. Following discussion on the answers provided to question 3, the Group of Experts requested the secretariat to provide information on activities of other working parties dealing with automated vehicles.

2. The answers to question 3, reading “What are the additional road safety risks posed by automated vehicles in comparison to traditional ones that you believe require intervention by road safety authorities”, were summarized in the presentation prepared by the experts from Canada and Sweden (GE.3-03-01), see slide below¹:

What are the additional road safety risks posed by automated vehicles in comparison to traditional ones that you believe require intervention by road safety authorities?



3. The following chapters are providing information on ongoing activities related to the responses provided to question 3. Each of them includes a section “point of interest”, linking these findings to existing activities within UNECE.

II. Safety Recommendations/Requirements for and Assessment of Automated Driving Systems

4. At its February 2018 session, the Inland Transport Committee (ITC) acknowledged the importance of WP.29’s activities related to automated, autonomous and connected vehicles and requested WP.29 to consider establishing a dedicated subsidiary Working Party (In French: Groupe de Rapporteurs - GR).

5. WP.29 implemented this request at its June 2018 session. WP.29 worked also on the development of the Framework on Automated/Autonomous and Connected Vehicles (FADAV), aimed at guiding the work of GRVA on Automated Driving Systems (ADS).

6. GRVA currently focuses on safety provisions related to the dynamics of vehicles (braking, steering), Advanced Driver Assistance Systems (ADAS), ADS as well as Cyber Security provisions. The group supervises around eight informal work groups (IWGs) and tasks forces.

Note: WP.29 administers three multilateral Agreements, two of them dealing with technical vehicle regulations. The 1958 Agreement is the basis for the adoption of UN Regulations and contains provisions concerning the mutual recognition (amongst the 54 contracting parties) of type approvals issued in conformity with the provisions of the UN Regulations. The 1998

¹ Summary report of the GoE on LIAV informal meetings hosted by Canada and Sweden in January and March 2022, <https://unece.org/transport/documents/2022/05/informal-documents/canada-sweden-summary-report-goe-liav-informal>

Agreement (Global Agreement) forms the basis for the establishment of Global Technical Regulations (UN GTRs) suitable for Contracting Parties using a self-certification or a type approval regime. 38 Parties are contracting parties to this Agreement.

A. Framework on Automated/Autonomous and Connected Vehicles

7. The FDAV, developed at the intergovernmental level, provides guidance to WP.29 subsidiary Working Parties, mainly GRVA, related to their activities on the safety of automated vehicles.

8. The document defines key principles for the safety and security of automated/autonomous vehicles of Levels 3 and higher² as well as a programme of activities (ECE/TRANS/WP.29/2019/34/Rev.2 as amended by ECE/TRANS/WP.29/2021/151).³

9. This Framework was originally drafted by several Member States (China, the European Union, Japan, and the United States of America). It was adopted by WP.29 at its 178th session in June 2019 (ECE/TRANS/WP.29/2019/34) and then by ITC. The annex of the document, containing a table with a list of activities, deliverables and corresponding envisaged timelines, was amended in November 2021.

10. The FDAV serves as a basis and structure for the global ADS activities, which are coordinated by GRVA.

B. Guidelines and Recommendations concerning Safety Requirements for Automated Driving Systems

11. The FDAV includes the activity to develop “Functional Requirements for automated/autonomous vehicles” as one of WP.29’s work priorities and mandated it to the IWG on Functional Requirements for Automated Vehicles (FRAV) (ECE/TRANS/WP.29/2019/34/Rev.2 as amended by ECE/TRANS/WP.29/2021/151).

12. The IWG on FRAV produced draft guidelines and recommendations concerning Safety Requirements for ADS (WP.29-187-10), tabled for endorsement at the 187th session of WP.29 in June 2022. This document is aimed to facilitate and record its work in progress and isn’t the final version.

13. The IWG on FRAV is preparing a set of functional requirements for system safety, failsafe response, Human Machine Interface (HMI) / operator information, object and event detection and response (Functional Requirements) and the Operational Design Domain (ODD).

C. New Assessment/Test Method for Automated Driving

14. The FDAV also includes the development of a “New Assessment/Test Method for automated driving” (NATM) as one of WP.29 work priorities and mandated the IWG on Validation Methods for Automated Driving (VMAD) for this item (ECE/TRANS/WP.29/2019/34/Rev.2 as amended by ECE/TRANS/WP.29/2021/151).

15. Since then, the IWG on VMAD is working on this mandate and develops assessment methods, including scenarios, to validate the safety of automated systems based on a multi-pillar approach including audit, simulation/virtual testing, test track, and real-world testing.

16. The first iteration of the NATM was adopted as a reference document for the validation of ADS during the 183rd session of WP.29 in March 2021 (ECE/TRANS/WP.29/2021/61). Recently, the IWG on VMAD produced a second version

² See Automated Driving definitions referenced in WP.29 ECE/TRANS/WP.29/1140, adopted in March 2018

³ <https://unece.org/transport/publications/framework-document-automatedautonomous-vehicles-updated>; https://unece.org/sites/default/files/2022-02/FDAV_Brochure%20-%20Update%20Clean%20Version.pdf

of the NATM – Master Document (ECE/TRANS/WP.29/2022/57), which was endorsed by GRVA in January 2022 and by WP.29 at its 187th session in June 2022.

17. Building on this work, the IWG on VMAD also developed NATM guidelines that could provide direction to developers and Contracting Parties of the 1958 and the 1998 UN vehicle regulations agreements on recommended procedures for validating the safety of ADS. This document (ECE/TRANS/WP.29/2022/58 as amended by WP.29-187-08) was endorsed by GRVA in May 2022 and by WP.29 in June 2022.

D. Event Data Recorder / Data Storage System for Automated Driving

18. Other items in the FDAV include the development of provisions related to Event Data Recorder (EDR) as well as to Data Storage System for Automated Driving (DSSAD), which were mandated to the corresponding IWG on EDR/DSSAD (ECE/TRANS/WP.29/2019/34/Rev.2 as amended by ECE/TRANS/WP.29/2021/151).

19. The IWG on EDR/DSSAD has elaborated Guidance on Event Data Recorder Performance Elements appropriate for adoption in the 1958 and 1998 Agreement Resolutions or Regulations (ECE/TRANS/WP.29/2020/100/Rev.1). They also elaborated UN Regulation No. 160, uniform provisions concerning the approval of motor vehicles with regard to EDR (ECE/TRANS/WP.29/2020/123/Rev.1), which was adopted by WP.29 on its 183rd session in March 2021.

E. Activities initiated before the adoption of the FDAV

20. The work on UN Regulation No. 157 on Automated Lane Keeping System (ALKS) was initiated prior to the adoption of the FDAV within GRVA, and its predecessor group the Working Party on Brakes and Running Gear (GRRF). This workstream aimed at developing requirements for the approval (in the framework of the 1958 Agreement) of lane keeping technology in the context of conditional automation. (This anteriority explains why ALKS was also included in the mandate of the IWG on EDR/DSSAD in the FDAV (ECE/TRANS/WP.29/2019/34/Rev.2).

21. This UN Regulation currently covers automated systems with a limited operational design domain (motorway) and a limited use case (congestion and traffic speeds below 60 km/h).

22. The first draft was finalized by GRVA in March 2020. It was the first regulatory step for an ADS. It includes general requirements regarding system safety and the failsafe response, handling of transition demands and HMI, to prevent misunderstanding or misuse by the driver. It was adopted by WP.29 and the Administrative Committee for the 1958 Agreement (AC.1) at their June 2020 sessions.

23. The original version of UN Regulation No. 157 (ECE/TRANS/WP.29/2020/81) entered into force on 22 January 2021.

24. A supplement to the original version (ECE/TRANS/WP.29/2021/17) was adopted by WP.29 in March 2021 to introduce clarifications.

25. A second supplement (ECE/TRANS/WP.29/2021/74), adopted in November 2021, included clarifications and an extension of the scope of the regulation to include trucks and buses/coaches.

26. In May 2022, GRVA completed drafting activities concerning a new series of amendments to the Regulation to cover higher design speeds (up to 130 km/h) and automatic lane changes (see ECE/TRANS/WP.29/2022/59/Rev.1), tabled for adoption by WP.29 in June 2022. If adopted, this amendment would be expected to enter into force in January 2023.

27. List of Countries applying the Regulation:

<i>Participant</i>	<i>Application of Regulation No. 157</i>
Albania	22 Jan 2021
Armenia	22 Jan 2021
Australia	22 January 2021
Austria	22 January 2021
Azerbaijan	22 January 2021
Belarus	22 January 2021
Belgium	22 January 2021
Bosnia and Herzegovina	22 January 2021
Bulgaria	22 January 2021
Croatia	22 January 2021
Czech Republic	22 January 2021
Denmark	22 January 2021
Egypt	22 January 2021
Estonia	22 January 2021
European Union	22 January 2021
Finland	22 January 2021
France	22 January 2021
Georgia	22 January 2021
Germany	22 January 2021
Greece	22 January 2021
Hungary	22 January 2021
Italy	22 January 2021
Japan	22 January 2021
Kazakhstan	22 January 2021
Latvia	22 January 2021
Lithuania	22 January 2021
Luxembourg	22 January 2021
Malaysia	22 January 2021
Montenegro	22 January 2021
Netherlands	22 January 2021
New Zealand	22 January 2021
Nigeria	22 January 2021
North Macedonia	22 January 2021
Norway	22 January 2021
Pakistan	22 January 2021
Poland	22 January 2021
Portugal	22 January 2021
Republic of Korea	22 January 2021
Republic of Moldova	22 January 2021
Romania	22 January 2021
Russian Federation	22 January 2021
San Marino	22 January 2021
Serbia	22 January 2021
Slovakia	22 January 2021
Slovenia	22 January 2021
South Africa	22 January 2021

<i>Participant</i>	<i>Application of Regulation No. 157</i>
Spain	22 January 2021
Sweden	22 January 2021
Switzerland	22 January 2021
Thailand	22 January 2021
Tunisia	22 January 2021
Turkey	22 January 2021
Ukraine	22 January 2021
United Kingdom of Great Britain and Northern Ireland	22 January 2021

F. Points of Interest

28. This section provides information on ongoing activities (FRAV/VMAD) on ADS, mandated by the FDAV, with two channels, one under the 1958 Agreement, limited to one ADS (UN Regulation No. 157) and a second parallel channel aiming at covering all types of ADS and thus providing a global coordination on that matter. It should be noted that the activities under the two channels are not producing identical wording and concepts, given the different purposes and timelines. In fact, GRVA's parent body, WP.29, agreed that [...] GRVA could continue to work on UN Regulation No. 157, to address the scope extension to heavy vehicles, increased speeds and automated lane changes. WP.29 also agreed that this work should not diverge from the outcome of the activities at the IWGs on FRAV and VMAD, and that if these two groups needed more time [...], then the outcome of these two IWGs would amend UN Regulation No. 157, as needed. It shall also be noted that the FRAV activities are "work in progress" at the time when this document is drafted.

1. Risks related to the lack of clarity on roles and responsibilities

(a) *FDAV*

29. The current draft guidelines concerning safety requirements for ADS elaborated by FRAV (WP.29-187-10) includes, e.g. in chapter 3, recommendations on information which the manufacturer should provide to the user, e.g. on the roles and responsibilities, on transfer of control procedures as well as for the correct understanding of the intended uses and limitations of the ADS feature(s).

(b) *UN Regulation No. 157*

30. UN Regulation No. 157 (ECE/TRANS/WP.29/2022/59/Rev.1), e.g. chapter 6, provides requirements for HMI, including for the kind of information that should be indicated to the user, like the system status and its intentions, among others.

2. Risks related to take over requests, fall-back user expectations during transition demands

(a) *FDAV*

31. The current draft guidelines concerning safety requirements for ADS developed by FRAV (WP.29-187-10) provides, e.g. in chapter 4, recommendations related to the *transition of control* and to *fallback* responses. They are aiming, among others, at enabling a safe *transition of control*, without endangering the safety of the vehicle occupants or other road users, as well as at enabling a clear communication of information to the user.

(b) *UN Regulation No. 157*

32. UN Regulation No. 157, e.g. in chapters 3 and 5, provides requirements for the *transition demand*, for situations in which a transition demand shall be issued, for the operation of the system during the transition phase and also for the procedure, in case of no

response to the transition demand is given by the driver (what leads to initiating a Minimum Risk Manoeuvre).

3. Risks related to technical performance and skill of the vehicle automation

(a) *FDAV*

33. The IWG on FRAV provides recommendations, e.g. in chapter 4 of WP.29-187-10, for the ADS performance of the dynamic driving task and its management of safety-critical situations and system failures.

34. The NATM guidelines (ECE/TRANS/WP.29/2022/58 as amended by WP.29-187-08), developed by the IWG on VMAD, e.g. as described in chapter IV, are aiming at ensuring and validating the safe performance of ADS by applying a multi-pillar testing approach.

(b) *UN Regulation No. 157*

35. UN Regulation No. 157 provides requirements for the technical performance of the ALKS system, e.g. in chapter 5. It lays down provisions for performing the dynamic driving task, transition demands as well as Emergency Manoeuvre and Minimum Risk Manoeuvre, among others. The Regulation also includes tests to ensure these skills and requests verification by Technical Services.

4. Risks related to mode awareness

(a) *FDAV*

36. The current draft guidelines concerning safety requirements for ADS developed by FRAV (WP.29-187-10) include, e.g. in chapter 4, provisions for HMI and require clear and unambiguous information to the user as well as clear indication about the intentions, e.g. to put the vehicle in a Minimum Risk Condition.

(b) *UN Regulation No. 157*

37. UN Regulation No. 157 provides, for instance in chapter 6, requirements for HMI in order to ensure a clear communication about the status of the system to the driver.

(c) *Others*

38. GRVA introduces in UN Regulation No. 79 (steering equipment) provisions for the type approval of ADAS, for systems of Levels 1 and 2². GRVA received feedback from the automotive industry on possible improvements to this Regulation. GRVA established a Task Force on ADAS to further discuss amendments to UN Regulation No. 79 and to develop a new regulation on a subset of ADAS that the group calls Driver Control Assistance Systems (DCAS). GRVA invited the task force to discuss the risk related to mode awareness and to clarify the boundaries between ADAS and ADS. The task force delivered a presentation on their initial deliberations on this matter (see GRVA-12-17: <https://unece.org/sites/default/files/2022-01/GRVA-12-17e.pdf>). (See also para. 41 below.)

5. Risks related to data protection and hacking

39. Risks related to data protection and hacking are addressed in chapter III of this document.

6. Risks related to poor infrastructure (bad roads)

40. Risks related to poor infrastructure are indirectly addressed by the ODD, which needs to be declared by the manufacturer and defines the specific operating conditions of the ADS (e.g. environmental, geographic, time-of-day, traffic, infrastructure, speed range, weather and other conditions) under which the ADS is designed to operate without any intervention by the driver (see UN Regulation No. 157, e.g. chapter 2 and also WP.29-187-10, e.g. chapter 2 and 3).

7. Risks related to overreliance (on automation)

41. The risk of overreliance is mostly relevant for Level 2 (ADAS) systems as the driver must stay in the loop during the driving task. This is not the case for Level 3 systems and above (see details on GRVA activities related to this in para. 38 above).

8. Risks related to telecommunication (e.g. internet coverage)

42. ADS consists of onboard hardware, software, and sensors that together perform the dynamic driving task. On the contrary, remote driving (also known as teleoperation) and vehicle-to-vehicle communications rely on off-board information, but neither of those technologies constitute automated driving, nor are under mass production. Before telecommunications can safely perform a driving task, technical challenges related to network coverage, latency and interference will need to be addressed.

(<https://unece.org/sites/default/files/2022-01/Brochure%20Automated%20Vehicles.pdf>).

9. Risks induced by ethical aspects relevant to vehicle automation

43. Given the current technological state of the art, it is expected that ADS will have to comply with the same rules as conventional vehicles driven by drivers. This matter would actually belong to the potential matters for discussion by the GoE on LIAV. For the time being, existing traffic rules stipulate that the driver shall at all times have its speed under control [...], and slowdown or stop whenever circumstances so require [...] (Geneva Convention on Road Traffic 1949, Article 10). It is also noted that complex situations don't provide much time for computation. From the safety point of view, it is argued that this time should be used for optimizing trajectories, decelerations, and interactions with road users to avoid or, at least, mitigate a crash in cases when avoidance is impossible, instead of computing highly complex and subjective parameters related to potential victims (<https://unece.org/sites/default/files/2022-01/Brochure%20Automated%20Vehicles.pdf>).

III. Cyber Security and software updates

A. UN Regulation Nos. 155 and 156

44. WP.29 adopted UN Regulation No. 155 (ECE/TRANS/WP.29/2020/79, as amended by ECE/TRANS/WP.29/2020/94 and ECE/TRANS/WP.29/2020/97) and UN Regulation No. 156 (ECE/TRANS/WP.29/2020/80) at its 181st session in June 2020, which provides provisions for cyber security aspects for the Contracting Parties of the 1958 Agreement.

1. UN Regulation No. 155 - Cyber security and cyber security management system

45. To address the increasing risks related to cyber-attacks, data protection and hacking, WP.29 and AC.1 adopted UN Regulation No. 155. It provides a framework for approval of the vehicle manufacturers Cyber Security Management System (CSMS), defines requirements for corresponding processes and contained provisions on the evidence manufacturers must provide to obtain approval of a vehicle type. The Regulation entered into force on 21 January 2021.

2. UN Regulation No. 156 - Software update and software update management system

46. WP.29 adopted UN Regulation No. 156, which provides a framework for approval of the vehicle manufacturer's Software Update Management System (SUMS). It requires vehicle manufacturers to establish specific processes and to provide certain evidence. It also addresses over-the-air-updates (OTA) and provides requirements for vehicle types. The Regulation entered into force on 21 January 2021.

47. List of Countries applying the Regulations Nos. 155 and 156: same as for UN Regulation No. 157, see above.

B. Proposal for Recommendations on uniform provisions concerning cyber security and software updates

48. GRVA adopted a proposal for recommendations on uniform provisions concerning cyber security and software updates (ECE/TRANS/WP.29/2022/60), as guidance for Contracting Parties of the 1998 Agreement, at its twelfth session in January 2022 and submitted it to the 187th session of WP.29 in June 2022 for endorsement.

49. The document provides guidance when formulating regulation or legislation on cyber security for automotive vehicles and/or regulation or legislation on software updates and the processes for updating a vehicle's software. It includes technical requirements for the vehicle and for the management system.

C. Points of Interest

1. Risks related to "data protection and hacking"

Note: Following a proposal from a contracting party to address the data security of intelligent and connected vehicles (GRVA-13-32), GRVA requested, at its May 2022 session, the IWG on Cyber Security and OTA issues to organize a meeting to discuss possibilities of working on data security and data protection, as well as to define concrete actions that the group could envisage, if applicable.

(a) FDAV

50. The recommendations on uniform provisions concerning cyber security and software updates (ECE/TRANS/WP.29/2022/60) provide guidance for Contracting Parties to the 1998 Agreement when formulating regulation or legislation on cyber security for automotive vehicles and/or regulation or legislation on software updates and the processes for updating a vehicle's software. As such, the technical requirements herein are aligned to the furthest extent possible with the requirements from UN Regulations Nos. 155 and 156 that pertain to the 1958 Agreement's Contracting Parties regarding cyber security and software updates, respectively. Parenthetical references have been added pointing to corresponding section(s) in the corresponding regulation

(b) UN Regulations Nos. 155 and 156

51. UN Regulations Nos. 155 and 156, e.g. in chapter 7, require manufacturers to implement measures, including provisions for the establishment of CSMS and SUMS, to mitigate the risks related to data protection and hacking.
