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**Other Business**

**Submitted by the IGEAD Chair**

This informal paper summarizes the discussions held on the topic of driver education within IGEAD and serves as a basis for further discussion.

### *Introduction*

'Driver education and self-awareness' have previously been identified as possible topics for further work for IGEAD. Questions such as 'How is self-awareness to be improved by training/education for drivers, and changes to the driving test?' and 'What might be the equivalent principles for consumer education by vehicle manufacturers on how their vehicle should be used?' were posed. This also relates to Human Machine Interaction (HMI), another possible topic identified for further work for IGEAD, e.g. how the interaction between vehicle and driver can be used to educate and inform drivers on the available systems on board of the vehicle.<sup>1</sup>

This informal paper summarizes the discussions held on the topic of driver education within IGEAD, and serves as a basis for further discussion. Please note that this informal paper does not present the formal position of the submitter, nor any of the other IGEAD members.

The discussions focused on non-professional drivers and ADS. Though ADAS came up during the discussion as well, it lies outside the scope and tasking of IGEAD. Nevertheless, similar principles can potentially be applicable to both ADAS and ADS, especially considering the combination of several ADAS. Principles and recommendations for ADAS and driver education can therefore serve as a basis for further discussion on ADS and driver education. However, it should additionally be noted that ADAS and ADS can be based on differing approaches regarding user expectation, user behavior, system strategies, hardware and algorithms.

### *Knowledge update – Current state of driver education*

One of the presentations focused on the hierarchical levels of driver behavior and the inclusion of ADS. This perspective has been used in Sweden and Europe since many years. One of the starting principles is that a competent driver is not only skilled, but also sensible and wise. Amongst others, this means that the driver knows how to control the vehicle, knows and understands the traffic rules, is aware of risks and reflects on the consequences of her behavior.

One of the challenges that comes with driver education is that it teaches the driver what to do and how to perform certain tasks. Additionally, the driving test focusses on what a learner driver can do, not what she will do in the future. Additionally, improved skills generally come with increased experience. In other words, driving education is only one way to educate drivers, and hence other methods of informing and/or training drivers should be taken into consideration.

The driver's risk is managed in a so-called 'system approach', including education, enforcement and engineering. Education for example focuses to increase the will, rather than the skill. Enforcement helps to correct and enhance the will to show correct behavior. Engineering also plays a role, e.g. through safe cars, safe road environment, safer infrastructure and trip planning.

Understanding the driver's needs can help to adapt measures as closely as possible to a group and their driving situations, in addition to communication campaigns and driver education. The hierarchical approach is helpful in this perspective, to better grasp the driver's needs and motivations. Additionally, it is important to understand that attitudes about safety are formed at an early age, long before legal driving, and therefore it can be helpful to also target young adolescents.

What does this mean for including ADAS and ADS in vehicles? In the end, ADAS and ADS should be used safely in all traffic situations, and drivers should be able to value its limitations and know how to act accordingly. Additionally, this should become a routine. All in all, we can make use of the pillars and principles that driver education is based on nowadays and adapt these to fit innovations such as ADAS and ADS.

Another presentation focused on principles and guidelines for ADAS and driver education, some of which can be relevant and applicable to ADS and driver education as well. These principles mainly focus on the driver's knowledge of the systems available in the car, the way these systems operate, and how to properly maintain these systems. For example:

- The driver knows what the systems are for, how they function and makes optimal use of the ADAS.
- A driver knows that:

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<sup>1</sup> ECE-TRANS-WP.1-2021-Informal-No.9e

- ADAS names may differ between vehicles (types and brand);
- ADAS sometimes have the same functionality, but the version or method of operation can differ;
- Road, weather and traffic conditions can affect the effectiveness of ADAS.
- A driver knows what a system can do and that the ADAS has limits to what it can do.
- A driver deliberately allows herself to be informed or supported by the ADAS (except emergency systems).
- A driver refrains from negative behavioral adjustments. For example, a shorter following distance because in emergency situations the car will brake anyway.
- Before starting a journey, the driver checks which ADAS are present on the vehicle and how they work. This is especially important for systems that directly influence driving behavior.
- A driver checks whether the sensors and cameras are sufficiently clean before a ride and remains alert to the optimal functioning of the ADAS. The driver acts appropriately in the event of deviations.
- A driver operates the settings of ADAS in a way that contributes to driving behavior in accordance with the driving procedure.
- When an ADAS is switched on, a driver assumes a position in which she can easily take over the driving task from the system and constantly monitor the traffic situation. The driver therefore does not allow herself to be distracted from her driving task and responsibility.
- The driver responds to the information/warnings in accordance with the driving procedure.

#### *Further discussion*

During discussions, several issues came up that require further elaboration. First and foremost, there are many different factors and use cases to take into consideration, that come with certain considerations. Amongst others, the driver of the vehicle can fulfil her role in different ways, e.g. as owner, user or renter, either as a professional or a non-professional driver. Additionally, there is a difference between learner drivers and information to the public who already hold a driver license. In addition, there are several ADAS and ADS's to take into account, that may show a difference in performance and intended use per OEM. The multiplication of ADAS and ADS in a vehicle, as well as dual-mode vehicles, imply potential additional risks. That is, new features and the combination of features may require a different skill set. In other words, different factors and use cases ask for different considerations. External factors can impact the functioning of ADAS and ADS as well as the driver's, such as (extreme) weather. It is helpful to make these distinctions, or to specify to what use case or needs specific recommendations apply to. Standardization can aid in promoting and ensuring safe use of ADAS and ADS.

Currently, there seem to be few education programs focusing on ADAS and especially ADS available, if any. Keeping other contracting parties and relevant institutions up to date on the progress and availability of ADAS and ADS education programs can be helpful.

Another topic that was raised relates to responsibility and how responsibilities should best be distributed. For example, is the driver regarded responsible for knowing the features of the vehicle she drives? Is the OEM responsible for making sure vehicle use is clear and promotes safety? After all, ODD's may vary, leading to a different risk set and considerations per ODD.

One of the difficulties currently faced is the fact that ADAS is widely available, while ADS is not, and use of ADAS is extensive, though the use of ADS is minimal. Hence, it is rather difficult to assess what drivers need to know and how to educate them on the safe use of ADAS and ADS. Therefore, it can be helpful to take into account the issue of driver education from the early stages. Cooperation with other related fora such as WP.29 can be relevant in this regard.

#### *How to move forward*

This informal paper has provided a summary of the discussions within IGEAD on the topic of driver education in relation to ADAS and ADS. Hopefully this overview helps to start the discussion in WP.1. Whether it is desirable to work toward a formal statement about ADAS and/or ADS, amend existing conventions, or include principles in a new convention, is up for discussion. Contracting parties are encouraged to share their knowledge, experience and best practices on the topic of driver education and ADAS and ADS.