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Convention on Road Traffic (1968):

Automated driving

Discussion paper on possible driver's "other activities" while an automated driving system is engaged

Submitted by France, Japan, Netherlands, Spain, and United Kingdom of Great Britain and Northern Ireland

This document aims at contributing to an annotated outline of a guidance document on driver activities (i.e. "activities other than driving") in a highly automated vehicle.

I. Background

1. The report of the seventy-fifth WP.1 session recalls that at its previous session WP.1 agreed on principles in the context of paragraph 6 of Article 8 of the 1968 Convention, namely its first sentence: “A driver of a vehicle shall at all times minimize **any activity other than driving**”. In addition, it is worth noting the comparative requirement in Article 10 of the 1949 Convention “The driver ... shall drive in a reasonable and prudent manner”.
2. In its seventy-fifth session, WP.1 agreed that no amendment to either Convention was necessary at this time. It was also agreed that the “other activities” noted in the principles should be better elaborated, in particular with reference to the activities which could compromise road safety or endanger road users. WP.1 agreed to begin work on the elaboration of a set of recommendations on the topic. The IGEAD was requested to prepare a proposal.
3. It is indeed the purpose of the current draft document/discussion paper, i.e. to provide some recommendations on the more detailed interpretation of the Conventions’ requirement that the driver shall minimise activities other than driving, as part of efforts to prevent dangers to road safety. However, this is a discussion paper to explore basic principles on the kinds of drivers’ adaptive behaviour which the Conventions do not prevent, and should not be understood as stating that such activities are safe. Therefore, countries may wish to impose other domestic regulation as they see fit.

II. Principles and approaches

4. As stated in the seventy-fifth WP.1 session report the two principles are as written below:

“When the vehicle is driven by vehicle systems that do not require the driver to perform the driving task, the driver can engage in activities other than driving as long as:

 - 1: *these activities do not prevent the driver from responding to demands from the vehicle systems for taking over the driving task, and*
 - 2: *these activities are consistent with the prescribed use of the vehicle systems and their defined functions.”*
5. It is rather easy to understand the scope of the first principle: each time the automated system asks the driver to take over the driving task, they must be able to do so. This means that the “other activities” meet here their first barrier.
6. To better understand, and to ease the discussion at the December WP.1 special session, hereunder the term “level of automation”, with reference to their SAE definitions, will be used.
7. The understanding of the first principle is quite obvious when speaking about level 3 automation (conditional automated driving) of automation because there may be several take over demands from the system during a journey within the operational design domain. But this first principle can also apply to those systems of level 4 (highly automated driving) of automation where driver’s intervention may be expected to resume dynamic control of the vehicle at the end of the operational design domain: The driver would, in line with their ongoing duty to minimise activities other than driving, need to further adapt (e.g. reduce) their secondary activities to safely continue the rest of their journey.
8. Should the driver not take over dynamic control of the vehicle following a system request, the vehicle should perform a minimum risk manoeuvre which would minimise

danger to the vehicle's occupants and other road users. Road safety is thus not endangered, which is the most important consequence.

9. Regarding both levels/situations, one can immediately understand that more "other activities" could be envisaged as being possible in the second situation (Level 4) than in the first one (Level 3), always bearing in mind that the main criterion guiding the driver's decision making on adapting their behaviour to the level of automation and efficacy of safety systems is road safety).

10. With respect to the second principle, which highlights the consistency between those "other activities" and "the prescribed use of the vehicle systems and their defined functions": where are the limits beyond which road safety could be compromised road safety or road users could be endangered?

III. What kind of other activities?

11. Irrespective of the level of automation it is unfortunate that the manufacturers' marketing communication frequently stresses the possibility of undertaking other activities when the vehicle is equipped with automated driving systems (ADSs). In addition, drivers usually perform many other activities while driving non-automated vehicles and expect to do more when in an automated vehicle. The target of the current discussion paper is to pave the way toward full automation by elaborating a common understanding on this item. WP.1 at its seventy-fifth session confirmed that the two principles will be applied by the State party to the Vienna Convention as well as considered/followed by those applying the Geneva Convention.

12. Even if Article 8 (§ 6) of the Vienna Convention is applied by all its Contracting Parties, nowadays the legal situation with regard to other activities is not yet fully harmonized among them. For instance, most contracting parties forbid the use of a hand-held mobile device while some do not (though they may have other rules that act as an effective prohibition). A similar situation applies to Geneva contracting parties, where many forbid drivers from holding mobile devices while driving, even though this is not required by that convention.

13. The target of this discussion paper is certainly not an attempt to harmonise those different situations, but rather to find a common envelope of those "other activities" depending on the level of automation. While technologies are likely to be developed to meet a global market, it may be appropriate for some differences in how those technologies are used to exist at national level to reflect national context.

IV. What are the views of the vehicle manufacturers on "other activities"?

14. (a) This subject is a very important issue for the vehicle manufacturers. In their opinion, "Automated Driving" and their underlying technology have great potential to improve road safety while providing new opportunities for mobility.

(b) By relieving the driver from the need to be able to exercise dynamic (i.e. operational and tactical) control while the ADS is engaged, the driver could potentially to safely engage in other activities safely during this time without compromising their ability to resume manual control whenever the system requires transitions from automated to manual mode. Indeed, non-driving-related activities can also prevent driver states that impair driving performance, by avoiding negative effects of underload and low driver activity levels (c.f. Neubauer et al. 2012; Young & Stanton 2002).

(c) The automotive industry proposes a definition of “other activities”, as “secondary activities: other activities in the context of automated/autonomous driving (Level 3 -5) mean activities that go beyond the use of e.g. radio/navigation/Air Conditioning/Heating systems etc. that are accepted today for manual/assisted driving”.

(d) Manufacturer’s general approach for secondary activities in the context of ADSs (i.e. Level 3 and those level 4 systems where the action of the driver is expected at the end of the use case):

(i) The manufacturers have defined a general approach as follows:

- The Manufacturers focus on vehicle integrated communication displays for the use of secondary activities (so called “infotainment systems”) that are operated from the driver’s seat;
- On-board integrated solutions for secondary activities are developed under full control of the vehicle manufacturer;
- On-board integrated infotainment can be controlled by the automation system: in case of a take-over request, secondary activities are automatically terminated by the system (i.e. the projection on the screen instantly vanishes and the takeover request is instead displayed);
- Automation system ensures sufficient lead time for a safe take-over.

(ii) Examples of secondary activities for automated driving: secondary activities that do not prevent the driver from take-over demands are thus imaginable as being ‘allowed’. For conditionally automated vehicles, complex secondary activities, those which require a high level of physical and/or cognitive engagement and thus have a significant impact on the driver’s capability to take-over the operation of the vehicle would not be allowed. On the contrary, simple secondary activities, or those which do not require a high level of physical or cognitive engagement should be allowed while the ADS is engaged. These could from today’s perspective include:

- Use of the vehicle infotainment system, located perceptually upright to the driver, for secondary activities which are not related to the driving task (e.g. video streaming, e-mailing, use of the internet, video-chats, Skype meetings with shared desktop, etc.).
- Use of hand-held consumer electronic devices (smartphone + tablet) that are physically or electronically linked to the vehicle infotainment system (e.g. via an app or other measures) and therefore can be commanded by the vehicle’s HMI.
- We could potentially foresee the use of hand-held consumer electronic devices (smartphone + tablet) that are not linked to the car infotainment system and reading (books + newspaper), if studies show it is safe.

(iii) It would be advisable to conduct additional studies to identify which secondary activities do not negatively influence the driver’s capability to resume the dynamic control of the vehicle.

(e) Manufacturer’s general approach for secondary activities in the context of autonomous driving systems (i.e. some level 4 and level 5 systems):

- Preliminary explanation: Level 4 (highly automation) systems in this context must be understood as those whereby conventional driver intervention in the dynamic aspects of driving is no longer needed with the automated driving system engaged within the operational design domain (distraction is not a safety issue anymore).

(f) Such systems can inform the driver with a sufficiently long lead time when it approaches the limits of its operational design domain. Therefore, a limitation of secondary activities may not be appropriate for these level 4 systems. That would basically mean that the driver may be as well sleeping (maybe in combination with an alarm several minutes before the limits of the operational design domain are reached) for these systems.

(g) Alcohol consumption is a more difficult subject; in theory, a driver of a highly automated vehicle could consume alcohol. However, if the driver wishes to resume control (potentially at the end of an operational design domain) their blood alcohol limit would need to be below national limits to (legally) resume control of the vehicle. Issues such as the amount of alcohol consumed, and the length of the journey in automated mode would come into play.

(h) However, these systems are currently not encompassed by the technical approval regulations within WP.29. These concepts may nevertheless be discussed within WP.1 when higher level functionalities in vehicles are discussed.

(i) It is important to stress that manufacturers developed in depth thoughts around this very paramount issue of highly and fully automated vehicles. It is possible/probable that manufacturers will seek to protect their reputation by designing infotainment systems such that they can safely integrate most “other activities” and these will immediately terminate in case of a takeover demand by the automated driving system. It will be important that the efficacy of such systems is clearly demonstrated and independently verified.

(j) However, public authorities may remain responsible of the way the principles will apply irrespective of the means the manufacturers will offer to help in this matter. Moreover, there are some activities that will have to be considered: when the automated driving system is engaged (e.g. on a motorway), is it possible to safely eat a sandwich, drink a coffee or smoke a cigarette or still more, do several of those things at the same time? Whatever help the manufacturers are ready to provide to the public authorities regarding “other activities”, final decisions will remain in the hands of the latter.

(k) Experience in practice of these automated systems and e.g. the interface between driver and vehicle is needed. There should be a clearly defined HMI interface that delivers safety critical/related HMI to the driver. A harmonised approach to safety critical HMI may well be helpful to avoid driver confusion. It may seem reasonable to ‘allow’ the use of an infotainment system as the preferred medium from an HMI perspective, subject to the HMI taking priority. But this will have to be determined in the future. For the moment, this approach seems to be reasonable. Future research on operational performance of different HMI principles is needed and might further improve road safety.

V. What are the views of the contracting parties on “other activities” and the way to go forward?

15. The views expressed by the representatives of contracting parties during the last IGEAD meeting of mid-November (8th meeting, held in Paris) were in general in favour of a common approach of the topic, avoiding too detailed guidelines/measures. Moreover, some contracting parties are already quite advanced in the process of implementation of such guidelines. **The best means to remain faithful to those views is to provide the information collected at the “tour de table” organized at the occasion of the 8th meeting of the IGEAD, based on the review of the document IGEAD-08-03:**

(a) Spain: Supports that we should keep in an overall development on the principle. If too detailed, it is not good for addressing the currently non-existing

technology. WP.1 should remain at broad level. We should highlight what we believe the most important, e.g. recommend WP.29 to elaborate on driver monitoring. Spain will allow mobile device as from level 3 to promote automated fleets.

(b) United Kingdom: The “prescribed” functionalities that enable drivers to safely undertake other activities should not be exclusively OEM provided, third parties should be able to provide retrofit systems to ensure competition. There are no plans to lift the ban on hand-held devices at this stage, because of the potential for negative behaviour impacts on drivers of conventional vehicles (such devices could be plugged in to on-board systems but not held (or manipulated)). This may change when car park penetration makes this possible (i.e. most vehicles are highly or fully automated). The same applies to sleeping due to journey distances in UK to avoid negative impacts on traffic flow. The UK also mentioned the work of the MIT AHEAD project, which highlights the need to manage driver attention, to get the “sweet spot” where a driver is alert enough to resume control, but not so engaged that they cannot respond to the system demands.

(c) Japan: supports the principles, elaborated in an acceptable wording. They are good for future discussions. However, they should not be too much detail described, as should anticipate the technologies that will come in the market, should allow development of the technologies. Also, should take into account the situation at domestic level. Japan may have different rules with regard to “other activities”. For some guidelines, monitoring the driver, recognition of the mode from the exterior (enforcement by police forces) as well as how to keep record to trace whether the driver activated the automated mode might be the aspects to be discussed.

(d) Finland: mentioned that on the OICA document, the only comment would be on the reliance on OEM systems to control driver distraction, for the same reasons UK mentioned. Finland mentioned that while there was now a new idea in the OICA document on allowing also devices connected to the vehicle systems via an app, they would be cautious with this approach as well. In general, Finland suggests being careful when defining the responsibilities of the driver, to make sure the vehicle does not then rely on the driver to actually perform exactly as the rules say. We should be sure the vehicle is tolerant to human error, in that if the driver does something wrong, the vehicle should be able to compensate. The aim here should be to maximise road safety and fully use the potential of the new technologies.

(e) Sweden: regarded the OICA document as a good starting point for further discussions; relating to the document, Sweden is of the opinion that the principles in the current document are just related to level 3, not to level 4. In addition, there should be a clear difference between the activities permitted according to the levels. Level 3 should be a shared responsibility between the vehicle and the driver. We cannot only put the “responsibility” on the driver. As regulators, we cannot tell in detail what is permitted and what is not (sweet spot). For that reason, we must put more responsibility on the manufactures to prove what is safe in relation to their systems. For level 4, no matter of scenario or ODD, it should be possible for a wide variety of secondary activities. Need to have evidence that it is safe to use the level 3 in some conditions (high speed).

(f) Belgium: Supports Finland and Sweden. Belgium found that the differences between level 3 and level 4 are not sufficiently clear.

(g) Switzerland: Supported the previous contracting parties. The Swiss representative said that it should be clarified whether the driver must respond quickly or not. The amount of time to respond to a take-over demand and resume control such as the risks when not responding (what is the minimal risk manoeuvre and what are the possible consequences?) are essential for the decision what activities should be allowed or not. So there could be more things allowed for specific systems. For example, with a traffic jam

pilot in level 3, that is designed to work at low speed on interstate, more activities could be allowed. In level 4 almost all should be allowed.

(h) Germany: the document IGEAD-08-03 (OICA) is a good basis for discussion. The approach taken to differentiate between automated and autonomous is correct. Nevertheless, there are some questions. “Reading books” is quite a difficult item, even more difficult is “sleeping”, and Germany would hesitate naming these activities in the final guidelines. Regarding the principles on secondary tasks, we should focus on general items. Furthermore, Germany recommends communicating to the WP.29 colleagues on the issues that need to be reviewed.

(i) Netherlands: Supports Germany and also considers that the current document is a good start for discussion. Taking decisions in this area is very urgent since the first cars of level 3 are popping up. If no answer fast, then it will lead to binary decisions at national levels. Maybe we should state where the driver is responsible. What should the responsibility of the driver be in certain automated driving conditions? According to the answer, the driver may or may not be permitted to perform secondary activities. The intensity of distraction is important and we must use the scientific knowledge in this area. For example, in a city, the awareness of the driver should be higher than on motorway. Hence let's go to the general principles: sweet spot between the extreme situations; would discriminate between the situations where the driver must be the back-up, and those where the vehicle is the back-up. Definition of driver's levels of responsibility (DLRs) under the driver point of view, mirroring the SAE levels. License plate for automation recognition and new (blue?) lights when automation is active will help selling the automation.

(j) France: Sure, that we will have to evolve on this issue quickly. With certain systems, some secondary activities will probably be possible. It would be stupid to forbid activities while we know that some drivers will take some liberties. France will most probably implement something via regulation, not only guidelines. France do not have definitive positions for the time being since treated at high political level. France stressed also the need to detect from the outside that the car is in an automated mode, namely in order to allow police forces to differentiate between car drivers allowed to do some “other activities” from those who are not because in a manual mode.

(k) CLEPA: Supports the approach of this document as basis. General principles are preferred rather to create a comprehensive list of those “other activities”. Perhaps some broad categories of “other activities” could be described to cope with the considerations mentioned during the meeting. The Original equipment manufacturer (OEM) could then refer to such broad categories which is in line with the view of the manufacturer described in Section 4 of this document

VI. First conclusions

16. (a) Preliminary outcomes of the consultations within the IGEAD highlight that depending on the level of automation some “other activities” could be allowed, others not. It depends on what the level of automation expects the driver to do. The type of activities should not be described in detail, the possible impact of the secondary activity on a takeover demand is the critical issue.

(b) For some contracting parties, secondary activities could even go until the allowance of sleeping at high levels of automation. But we have also to bear in mind that some drivers will use those vehicles alternatively in a fully automated mode (to rest or to relax) and in a manual mode (for the pleasure of driving). In the latter case of course, nothing more than what exists in our current domestic legislations should be allowed.

(c) Finally, it has to be pointed out that in case the automated mode (high or full automation) is engaged, performing “other activities” is never an obligation; for the near future, one can also state that the general basic principle remains “to minimize other activities”, but that nevertheless some activities might be allowed depending on the level of automation.

(d) Of course, everything in discussion document is open for discussion and for any constructive new proposals and/or wording, to help develop guidance in due course.
