

Distr.: General
26 April 2018

Original: English only

Economic Commission for Europe

Inland Transport Committee

Global Forum for Road Traffic Safety

Special session

Geneva, 3-4 May 2018

Agenda item 2 (i) of the provisional agenda

Convention on Road Traffic (1968):

**Automated vehicles - Vehicles with automated driving systems:
the concept of other activities than driving**

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

**Submitted by the experts from France, Spain, Finland, Japan, the
United States of America and the Netherlands**

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

I. Background

(a) The report of the 75th 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”, and the comparative requirement in Article 10 of the 1949 Convention “The driver ... shall drive in a reasonable and prudent manner”. Specifically these principles state:

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.”

(b) In its 75th session, WP.1 confirmed that the two principles will be applied by the contracting parties to the Vienna Convention as well as considered/followed by those applying the Geneva Convention. WP.1 also agreed that no amendment to either Convention was necessary at this time. It was further 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 document, in doing so, the IGEAD has focused on so-called ‘level 3’ or conditionally automated¹ and ‘level 4’ or highly automated vehicle² systems as these are systems that will or may issue a takeover demand. And the IGEAD has noted the ongoing work in WP.29 and its subgroups to create clear technical standards for automated vehicle technologies.

(c) In preparing this document, the IGEAD assumes that it is possible to develop a safe conditionally automated (equivalent to SAE Level 3) or highly automated (equivalent to SAE Level 4) system, and that clear technical standards are available to verify the safety of the system. It is also worth noting that a safe ‘level 3’ system will need to manage the driver’s attention so that they are alert enough to resume control of the vehicle in response to a takeover demand from the vehicle.

(d) This assumption facilitates this discussion paper, which explores basic principles on the kinds of drivers’ adaptive behaviour which the Conventions do not prevent. This paper should not be understood as stating that such other activities are safe. Therefore, countries may wish to impose domestic regulation as they see fit to promote the deployment of new technology and support the advancement of road safety.

(e) 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.

(f) The record of the 76th WP.1 session (March 2018) states that “WP.1 discussed that more evidence was needed in the context of other activities and road safety and that the precautionary principle may be advisable”. This paper continues to explore this.

¹ Conditionally automated vehicle systems will exercise dynamic control of the vehicle for sustained periods, but rely on the driver to resume dynamic control of the vehicle – i.e. act as a fallback – in situations where the system is unable to cope.

² Highly automated vehicle systems will exercise dynamic control of the vehicle for sustained periods, and do not rely on the driver to resume dynamic control when the system is unable to cope – i.e. the vehicles system is its own fall back.

II. Explanatory definitions

(a) “Other activities in the context of automated driving (Level 3-5)”: means activities other than driving (cfr to Vienna Convention, Article 8, paragraph 6) that go beyond manually exercising dynamic control of the vehicle and activities like e.g. setting radio/navigation/Air Conditioning/Heating systems that are available for manual driven vehicles.

(b) “Operational Design Domain (ODD)” refers to the environmental, geographic, time-of-day, traffic, infrastructure, and other conditions under which an automated driving system is specifically designed to function.

III. Frame for the “other activities”

It may be helpful to consider a ‘frame’ for “other activities”, based on the assumption that it is possible to develop a safe level 3 system, and that clear technical standards are available to verify the safety of the system. The four elements of the frame are:

1. Principle 1: “these activities do not prevent the driver from responding to demands from the vehicle systems for taking over the driving task”
2. Principle 2: “these activities are consistent with the prescribed use of the vehicle systems and their defined functions”
3. Traffic laws applicable in the country
4. Driver’s capabilities

A. Principle 1: “these activities do not prevent the driver from responding to demands from the vehicle systems for taking over the driving task”

(i) Each time the automated system issues a take-over request the driver is expected to take over the driving task, and hence they must be able, ready and willing to do so. Should they not meet one or more of these three ‘conditions’ there is a potential that they would compromise road safety or traffic flow. For example, when the driver does not follow system’s take-over requests, the system should take steps in such to support continued road safety.

(ii) Therefore, the ‘other activity’ should not compromise the ability, readiness, or willingness of the driver. It is not yet known which ‘other activities’ are suitable; therefore, should the driver perform activities preventing them from responding to the demands from the systems for taking over the driving task, then the system should take steps in such a way as to support continued road safety.

(ii) In the case of highly automated driving, the driver must be able to resume dynamic control of the vehicle at the end of the ODD. Therefore, the driver would need to further adapt (e.g. reduce) their other activities to safely continue the rest of their journey.

B. Principle 2: “these activities are consistent with the prescribed use of the vehicle systems and their defined functions”

(i) This principle highlights the consistency between those “other activities” and “the prescribed use of the vehicle systems and their defined functions”, i.e. the driver have discretion only within the technically prescribed functionality of the system.

(ii) There is a balance between the vehicle’s offer to perform dynamic control for the driver (i.e. conditional or highly automated driving) – this is the 1st term, and the driver’s own skills and capability to resume dynamic control in response to a takeover demand – this is the second term. The principle 2 focuses on 1st term.

(iii) From the point of view of the driver, they must remain sufficiently alert to e.g. take over from the system when requested to do so. The subjective assessment of each individual is mostly decisive here since each person can and wants to carry out other activities to a different degree. The drivers must decide themselves if and how much certain other activities impair or hinder their awareness.

(iv) From the point of view of the vehicle manufacturers, they can guarantee the requested level of safety only in the case the “other activities” are performed through the integrated communication displays (so called “infotainment systems”) because these are developed under full control of the vehicle manufacturer and can be controlled by the automation system: in case of a take-over request, other activities are automatically terminated by the system (i.e. the projection on the screen instantly vanishes and the takeover request is instead displayed). The “handheld” nomadic devices are considered part of the integrated communication displays when paired to the vehicle system.

(v) However, the manufacturer cannot guarantee this level of safety should the driver decide to perform their “other activities” aside of the integrated communication displays since the system would have no influence on these activities. This is a situation similar to that of the current conventional vehicles with no automation, and the same rules should apply in this case.

(vi) The design of the vehicle integrated communication displays should be based on sound evidence³ that, when used properly according to the manufacturer’s recommendation (“...consistent with the prescribed use of the vehicle systems...”), they will improve road safety (or, at the very least, not make it worse).

(vii) The systems that support drivers of Level 3 and 4 vehicles to safely undertake other activities may monitor driver availability and traffic situation, and be tied in to the automation system in a way that makes (Level 3) or encourages (Level 4) a driver to resume control, and ensures a sufficient lead time for a safe takeover, and thus support road safety outcomes. Any such systems would need to be verified as being compliant with recognized technical standards.

C. Applicable traffic laws

(i) As it is currently the case in conventional vehicles (i.e. with a low level of assistance), the driver is supposed to know and follow the traffic laws applicable in the territory where they drive. Therefore, if a specific “other activity” is prohibited in that territory, the driver should not undertake it. This applies even if the vehicle is designed in such a way as to allow them to undertake that “other activity”.

³ Such sound evidence is currently being constructed by the engaged stakeholders (universities, research laboratories, vehicle manufacturers, etc.).

- (ii) drivers might have responsibility for responding to not only takeover demand but also obvious emergency situations.
- (iii) Should the driver choose to perform other activities that are prohibited, they would do so under their own responsibility, and obviously would face the possibility of being penalised, if the performing that other activity contravened domestic laws.
- (iv) Drivers using vehicles with conditionally automation activated should be aware of risks of being distracted and its impact on road safety.
- (v) Drivers using vehicles with high automation activated will be considered passengers while the ADS is engaged
 - After the ADS has detected and communicated to the driver that it is capable of controlling the vehicle;
 - After the driver has confirmed ADS to be engaged;
 - Until the transition demand is emitted by the system; and
 - [provided that the system is the fall-back ready-user capable of performing a minimum risk and safe manoeuvre should the driver not respond to the transition demand.]
- (vi) Drivers using vehicles with high automation⁴ activated will be allowed to perform any other activities than driving in consistency with national traffic law,
 - Until the transition demand is emitted by the system; and
 - provided that the system is the fall-back capable of performing a minimum risk and safe manoeuvre should the driver not respond to the transition demand.

D. Driver's capabilities

- (i) As it is currently the case in conventional vehicles (i.e. ones that offer driver assistance systems or no assistance), the driver must have the physical and mental capabilities to drive the vehicle. This is currently guaranteed by the driving licence.
- (ii) This will still be the case in conditionally automated vehicles, as the driver must be ready, willing and able (i.e. have the capability to) resume dynamic control in response to the system take over demand.
- (iii) Even if the vehicle allows the driver to undertake "other activities" the driver must make a decision, based on their assessment of their capabilities and their understanding of the law. Should they not have the capability, then they should not undertake this other activity.

E. Conclusions about the frame for the "other activities"

- (i) As long as the boundaries of the frame are respected, a driver may – in theory – undertake "other activities". Should they go beyond the frame, then the driver should stop that "other activity". However, there may be trade-offs to be considered between the various elements of the frame.

⁴ vehicles with high automation, are those equipped with systems that will bring the vehicle to a safe place at the end of the ODD when the driver does not respond to a takeover request (Belgium)

(ii) Going beyond the boundaries of the frame is likely to happen when a conditionally automated vehicle issues a transition demand. For addressing this case, the means that support drivers of conditionally and highly automated vehicles to safely undertake other activities may:

- monitor driver's availability;
- be tied in to the automation system in a way that makes (conditionally automated) or encourages (highly automated) a driver to resume control, and
- ensure a sufficient lead time for a safe takeover,

such to support road safety outcomes.

(iii) As from the time the driver crosses the limits defining the safe "other activities" described above, i.e.

- performs activities preventing them from responding to the demands from the systems (Principle 1),
- performs their "other activities" aside of the integrated communication display (Principle 2),
- does not follow the traffic laws applicable in the territory where he drives (applicable traffic laws), or
- performs activities beyond their physical or mental capabilities,

then they would do so under their own responsibility.

IV. Special case of the transition demand

(a) Drivers using vehicles with conditionally or high automation activated remain in the frame defining the acceptable other activities described above until the take-over process is finalized i.e. until the driver performs the driving task and the automation system is deactivated.

(b) As from the time the system issues a take-over request with sufficient lead time, the driver who is expected to react without undue delay and to performs the driving task, is out of the frame of the "other activities" described above, the principles 1 & 2 do not apply anymore, and the situation becomes similar to that of the conventional vehicles:

- (i) the driver is supposed to know and follow the traffic laws applicable in the territory where he drives, and
- (ii) the driver is supposed to have the physical and mental capabilities for driving the vehicle.

(c) Should the driver fail to take over dynamic control of the vehicle, the system initiates the transition to the minimal risk condition (e.g. automatically start to slow down the vehicle immediately and therefore minimize danger to vehicle occupants and other road users).

V. Potential examples of other activities for automated driving:

(a) Use of the vehicle infotainment system, located perceptually upright to the driver, for other 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.)

- (b) 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
- (c) For high levels of automation, use of hand-held consumer electronic devices (smartphone + tablet) that are not linked to the car infotainment system and reading (books + newspaper),.
- (d) Research demonstrates the necessity of managing a driver's attention, so that they are alert enough and have sufficient situational awareness to resume control from the automation system. However, it is not clear what specific 'other activities' deliver this condition and thus meet the road safety outcomes sought by the principles above. Therefore, studies, researches, and experiments are needed to identify what activities can be done safely. Should WP29 develop safety standards that facilitate drivers to safely undertake specific 'other activities' in line with principles above, then WP1 can consider if such activities are permissible.

VI. Conclusions

- (a) Assuming that sound evidence and clear technical standards are available, the driver may undertake "other activities" than driving. The "other activity" must be within the 'frame' and driver must respect the boundaries of the frame
 - (b) Furthermore, decisions on whether or not integrated information systems are a mechanism by which a driver can safely perform "other activities" should only be taken following acceptance of sound evidence that these systems at least do not worsen road safety, and the development of clear technical standards.
 - (c) Transition demands in conditionally automated (equivalent to SAE Level 3) or highly automated (equivalent to SAE Level 4) system systems should include all safe guarding principles to support the driver in safe transition to manual/assisted driving, though this would be for WP. 29 to deliver.
-