

## **DRAFT REPORT**

### **GRRF Ad-hoc Meeting**

### **Lane Keeping Assist System**

19-20 November 2013  
OICA offices  
4 rue de Berri  
75008 Paris

#### **0. Election of Chairman and Secretary**

Chair: Mr. Gunneriusson (S)  
Vice Chair: Mr. Hirose (J)  
Secretary: Mr. Fontaine (OICA)

Spain informed having no particular position on this subject for the time being and was present as an observer.

The rep from the Republic of South Korea (ROK) informed being mandated from the Korea Transportation Safety Authority, and therefore being a delegate from the national authorities.

#### **1. Welcome and Introduction – Chairman**

##### **a. Mandate from GRRF**

The Chair recalled that GRRF in its 75<sup>th</sup> session did not agree on the creation of an informal group, therefore there is no official mandate from GRRF with regard to this ad-hoc group for the time being.

##### **b. Terms of reference**

Document: LKAS-01-02 (J)

J presented the document LKAS-01-02 as a proposal from J for an activity plan of the LKAS ad-hoc group.

OICA found premature to discuss another meeting date (ref Table 1 of the document). The expert from OICA explained that there is currently no vision on the future and the strategy of the ad hoc group. He suggested to discuss this item when clarification about the issues and their possible solutions will be available, at the end of the meeting.

Conclusion: item to be rediscuss at the end of the meeting (see item XXX).

At the end of the meeting, the Secretary recalled that GRRF did not provide any mandate to the group, rather suggested Japan to discuss with the interested parties on this issue. Hence a simple report to GRRF would be sufficient. J said that the meeting permitted to make clear what kind of items must be clarified.

## 2. Agreement on meeting objectives

Documents: LKAS-01-03 (J)  
LKAS-01-05 (J)

J explained the J idea of the work per document LKAS-01-03:

- Preventing drivers being confused by poor HMI should the system be not regulated (e.g. confusion on vs. off states of the system)
- Ensuring minimum performance requirements such that the drivers knows what minimum system intervention he may expect.

OICA understood the document as a summary of the objectives for the future rule or guidelines, but was keen 1<sup>st</sup> that all parties have a common understanding of the objectives of the meeting. The delegate suggested to 1<sup>st</sup> define the status of LKAS.

J claimed having already shown justifications for the work, with relevant safety benefits.

D questioned whether systems showing the problems shown in slide 1 of the document 01-03 still exist.

J clarified that the J guidelines prevent these systems from the market.

OICA acknowledged the above, but recalled that J is not signatory to UN R79, while other parts of the world are. He added that the current text of UN R79 could prevent poor systems from the market and that no data today show that LKAS cause any accident.

J informed to sign UN R79 in the near future, hence reviewed its text in depth, and found that the regulation does not well protect from the confusions and issues tabled in document LKAS-01-03. The expert from J stressed that this is why J proposes guidelines.

CLEPA pointed out the CEL annex of UN R79, which provides all the necessary requirements that the safety of the system must fulfil to get an approval.

The group had a debate on the way to proceed, and agreed that some further discussions and clarifications are still needed, such that the group decided to get back to this item later.

J introduced document LKAS-01-05 as a skeleton paper providing the basic requirements and their justifications for a legal document concerning LKAS.

After revision of document LKAS-01-05 by the group, the Chair clarified that his intention was to consider the option of no regulation, and taking account of the LKAS, perhaps per adaptation of UN R79. The Chair stated that the exercise of assessing document LKAS-01-05 with regard to R79 coverage would permit

the group to have a view on whether the discussions should take the direction of guidelines, new regulation, amendments to R79 or other. Should the group decide not to stop discussions, then some further investigation would be needed.

NL found guidelines not appropriate because ISO standards can already be considered as guidelines. The delegate from NL added that guidelines would not bring safety benefits, and UNECE would not be the good platform for this type of document. he said that should Contracting Parties want to mandate a system which brings safety improvement, then a regulation would be the right choice. But as long as LKAS is considered a comfort system, then UN R79 adaptation would solve all the issues.

The European Commission fully supported NL.

ROK also found that UN R79, perhaps adapted with a new annex dedicated to LKAS, could provide an appropriate basis for addressing LKAS, in particular annex 6 which provides a concept wide enough for intergrating the safety aspects of a new technology.

J found that amendments to UN R79 is better than guidelines.

D mostly agreed with NL, a new regulation is not a good solution for the moment. The delegate from D added that D currently does not want to judge about guidelines vs amendment to UN R79 as the right way to proceed and found that further discussions seem to be needed.

S found amendments to UN R79 as the best way forward.

OICA found necessary that some further investigation is conducted on this.

Regarding amending UN R79, it could depend on the added requirements.

OICA committed to review all this at the forthcoming GERF meeting.

CLEPA supported OICA, found this 2 day discussions fruitful, and found the key question as to whether LKAS is a comfort vs safety system. CLEPA committed to review this question internally.

The Chair concluded that it is too early to consider performance limits. With regard to comfort vs safety, the Chair found that LKAS could be regarded as both, depending on the situation.

### **3. Background – Japan**

Document: GRRF-75-33

J tabled document GRRF-75-33. The experts discussed this document as follows:

- The group acknowledged that the document does not contain M1 data
- J was convinced that even with the minimum figure of fatalities (< 0.5% of total fatalities), as J has no intention to mandate LKAS, there will be safety benefits in regulating LKAS with minimum requirements. OICA then questioned whether the existence of LKAS guidelines would increase the number of LKAS on the road.
- OICA stressed that, if the system is not made mandatory, then evidence of the existence of poor systems would justify guidelines/rulemaking. The expert from OICA added that, on the other side, there is no

justifications for making LKAS mandatory. OICA as a consequence was questioning the motivation for regulating LKAS.

- J was indeed convinced that the current LKASs are safe, but but was convinced on the need for introducing minimum requirements because there is a fear that the increase of LKAS introduction may make poor systems appear in the market. OICA questioned whether customers would accept such poor systems, i.e. the market would probably self regulate. OICA pointed ou that, in addition, UN R79 guarantees minimum limits. The expert from OICA said that a balance must be found between the limits of the technology and the limits of what the driver is ready to accept, similar to the discussions for AEBS one year ago.
- J took the example of ESS in R13H, as an if fitted provision and suggested that LKAS could follow the same approach. CLEPA challenged the comparison because LKAS is a CEL system, and informed that, after research, they could not find any road user confusion due to LKAS.
- OICA added that some guidelines on ITS do already exist and provide sufficient safety net forLKAS. OICA was of the opinion that no rulemaking should be started on the assumption that poor systems will be introduced in the market.
- J pointed out having no intention to impose the J guidelines to the ad hoc group. ROK was not convinced about LKAS, but found ASLD a similar case with minimum requirements. The delegate found necessary to improve UN R79 for correctly covering LKAS.

#### **4. Background – Sweden(P)**

Document: AECS-01-XX (S)

S was keen to introduce their vision.

The Chair, as representative of Sweden, introduced AECS-01-XX, made by the S transpport administration. Background: project dated 2002. In 2008, a “vision zero” program was established in S. he clarified that the document provides the vision, but the practical goal is reducing by half, i.e. 210 fatalities, the number of fatalities per year in Sweden. He stressed the following items:

- Page 5: Just after the lauch by s of their program, the EU decided to reduce by half the number of fatalities in 2020 compared to 2010. This made problem to S, with a new goal of 133 fatalities a year. Hence a S working group was established (pages 11 and 13).
- Page 24: the representative of S showed that Industry predicted that 100% of the vehicles would be equipped with LKAS in 2015. It was questioned wether the existing fleet was taken into account. OICA found a conflict with the LDWS EU commitment. The delegate from S clarified that the document was tabled to explain the commitment of S in the ad hoc group. The delegate stress that the authorities usually rely very much on the good functioning of fthe driver assistance systems, which explains the need for a certain level of performance.

The expert from OICA pointed out that passenger cars are not driven by trained professionals, rather by usual customers (e.g. rental cars). The experts were

informed that in addition, S believes the LKAS to be a corner stone toward autonomous driving (in S, by 2016).

OICA stressed that current LKAS are used only above a certain speed, in straight roads, etc. the experts questioned whether S has the objective of making the system work in all conditions. It was stressed by OICA that there are 2 kinds of system currently on the market, comfort systems and safety systems. The expert wondered whether excluding low cost vehicles because the system may be too expensive for them. J was ready to discuss this item, relating to the content of the requirements.

## 5. Views from industry

### a. OICA / CLEPA

Document: LKAS-01-XX (CLEPA/OICA)

OICA presented document LKAS-01-XX. The expert explained that CLEPA/OICA there is currently no sufficient evidence nor urgency on the need to regulate LKAS and recommended that further investigation be conducted for assessing the best way forward.

The European Commission questioned how UN R79 can guarantee that LKAS can be overridden, and how TSs can test that. TRW clarified that the threshold is usually < 3 Nm on the steering wheel.

European Commission suggested that threshold values are not limiting the designers, but that some self declaration is requested such that there is some check of the technology.

The European Commission saw some conflict between the requirement of tendency for self center, and the autonomous steering, where the radius decreases and LKAS follows the lane.

OICA clarified that the manufacturers are sensitive to their liability, and that, should a system work in a curve, then the manufacturer would have to demonstrate the safety of the system in all modes and situation, via the CEL annex.

The Chair questioned the threshold as from which a system should be regulated.

OICA answered that only continuous systems would be in stake, and that autonomous driving is currently of concern from the Contracting Parties rather than the manufacturers, as the technology is not mature for the market.

The Chair question the process of Type Approval if the manufacturer only discusses with the TS. It was clarified that the Technical Services do tell the manufacturer what they have to do, rather than the inverse. NL clarified that the CEL annex usually focuses on failure management rather than respect of the limit values. The CEL annex is more an assessment of the safety philosophy provided by the manufacturer.

A tour de table was organized for getting an overview of the Contracting Parties' opinions about the question of regulating LKAS:

D found it premature to regulate LKAS due to lack of experience. The expert requested more justifications for what makes confusion to the driver e.g. in the existing systems.

NL found it strange to create guidelines on LKAS, because documents LKAS-01-04 and LKAS-01-05 address corrective or automatically commanded steering, and it is too early to regulate autonomous steering. The delegate from NL said that perhaps some additional provisions in UN R79 addressing the maximum time for corrective steering would be of interest. Concerning the guidelines, the expert found this of no interest as the ISO standard will play that role, i.e. new guidelines would be a redundancy with the existing ISO standards. Finally, the expert found added value for safety in a system similar to AEBS, whereby the vehicle would turn around an obstacle. The Chair recalled that LDWS only addresses heavy vehicles.

ROK found that basic features like warning types (acoustic, optical and haptic), threshold for system performances and suppression conditions should be added to UN R79.

The European Commission found these upcoming systems beneficial, and found it a waste to prevent from introduction of the technology, but on the other hand feared the introduction of dangerous systems. The European Commission would oppose minimum performance requirements, but would agree with basic rules (qualitative text). Yet some non negotiable parameters should be defined (e.g. maximum steering wheel torque that needs to be overcome to regain control). The delegate from the European Commission was of the opinion that systems permitting e.g. to read the newspaper while driving should be forbidden (autonomous steering system). He was keen that a text exist for discriminating the autonomous systems from the others.

Spain had no official position.

J recalled their intention: minimum requirements for maintaining safety.

## **6. Discussion about the legal approach**

Documents: LKAS-01-05 (J)  
LKAS-01-05-Rev.1 (Secretary)

J introduced document LKAS-01-05 as a skeleton paper providing the basic requirements and their justifications for a legal document concerning LKAS.

After revision of document LKAS-01-05 by the group, the Chair clarified that his intention was to consider the option of no regulation, and taking account of the LKAS, perhaps per adaptation of UN R79. The Chair stated that the exercise of assessing document LKAS-01-05 with regard to R79 coverage would permit the group to have a view on whether the discussions should take the direction of guidelines, new regulation, amendments to R79 or other. Should the group decide not to stop discussions, then some further investigation would be needed.

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OICA committed to review all this at the forthcoming GEF meeting.

CLEPA supported OICA, found this 2 day discussions fruitful, and found the key question as to whether LKAS is a comfort vs safety system. CLEPA committed to review this question internally.

The Chair concluded that it is too early to consider performance limits. With regard to comfort vs safety, the Chair found that LKAS could be regarded as both, depending on the situation.

## **7. Discussion about existing technical requirements / guidelines for LKAS that should be clarified**

Document: LKAS-01-04 (J)

The Chair questioned how the manufacturers could do today between ITS, LDWS, ISO, Vienna Convention, product liability, UN R79, for approving a vehicle.

J presented the document LKAS-01-04. The expert from J informed the group that this document was an attempt to cover Industry's concerns with regard to LKAS.

OICA found that a column showing the items covered by UN R79 was missing (warning, failure modes, whether in the core of the text or in the CEL annex).

The expert from OICA pointed out that each item was covered in some way or another by UN R79, ISO or the current J guidelines. The delegate was seeking clarification about the "purpose" column in the document LKAS-01-04, e.g. the purpose of provisions for operating speed. J found this similar to the provisions in the introduction of AEBS regulation. J was keen that some fruitful discussions take place on these items.

J presented document LKAS-01-05. The expert from J clarified that in general, the option numbering is from the most severe (1) to the most relax (4).

The Chair found it necessary to study in depth the documents because it shows that, even if the LKAS is covered by different texts, their interpretation is such that the level of performance can differ very much (even be opposite).

J was also keen to discuss the document in depth, then decide the way to proceed.

It was suggested to add a column in document LKAS-01-05 showing how UN R79 addresses each item. Conclusion: the group agreed to add a column, for assessing whether the items are covered by R79. The aim was that, at the end of the exercise, the group should decide the way to proceed, i.e. amending UN R79, elaborate new guidelines, or any other option. The Secretariat then created the document LKAS-01-05-Rev.1

The group was informed of the different systems:

- LKAS assists the driver in keeping the vehicle between the lanes
- LDWS warns after the vehicle has crossed the line.
- Criterion for discriminating corrective from automatically commanded and autonomous is “continuous action”.

OICA clarified that LKAS is not designed for regulating the drivers from misuse, i.e. from reading a newspaper.

J was of the opinion that there is no necessity to discriminate the comfort from the safety LKAS.

### **Definitions**

A debate took place about the definitions in UN R79 with regard to the different systems. Paragraph 2.3.4. specifies that “the driver remains at all times in primary control of the vehicle” i.e. the driver must control the steering control (in the frame of the steering system regulation); the secondary control of the vehicle is provided by systems like LKAS. J found the definitions sufficient as LKAS is clearly a corrective steering system. Yet at the time of autonomous steering system, it may be opportune to improve the definitions of UN R79. The European Commission contested the reading of UN R79, because of the texts of paragraphs 2.3.4.1. and 2.3.4.2., where PAS is part of advanced driver assistance, without the driver having the hands on the steering wheel.

### **Scope**

J was keen not to exclude any category, but proposed to focus on M1 w/o excluding any other category. In addition, the expert from J informed that LKAS currently requires electric steering system.

OICA clarified that heavy vehicles are currently implementing LDWS, and do not have LKAS. Still OICA found LKAS not mature for a rulemaking because on M1 vehicles, different systems are still under development. Yet the concern of a wide scope would be that a Contracting Party mandates LKAS on vehicles fitted with hydraulic steering.

CLEPA was confused that the figures of the J documents justified LKAS on heavy vehicles, while J proposes that the ad-hoc group focuses on LKAS for M1 category.

J clarified that data only exist for heavy vehicles, and they extrapolated them for light vehicles.

### **Operating speed**

J suggested option 2 because the key parameter is to maintain road safety (avoid driver's confusion).

J announced being flexible about minimum performance requirements (e.g. operating speed limit), i.e. would agree deleting.

J justified the 60km/h limit of option 2 per the limit in LDWS regulation, and LKAS is designed for primarily use on highway. OICA found it necessary that flexibility be provided in operating speed limit, because there is no clear limit in state of the art systems. CLEPA challenged the proposed wording (shall) because this may prevent the driver from the control of the vehicle. J conceded that this was subject to the presence of a manual switch. OICA clarified that it is impossible today to determine an operating speed limit and that there is a need for a manual switch because this is no emergency system.

Conclusion: item not covered by UN R79. Group to decide later about possible speed limit

### **Acceleration etc. caused by the operation of the system**

J commented that this item is necessary to avoid driver's confusion, but J was ready to hear the other delegations' opinions.

OICA pointed out that the item raised in document LKAS-01-04 is covered by UN R79, yet the proposal from J per document LKAS-01-05 is not covered the regulation.

NL found that the lateral acceleration is covered by UN R79, but the longitudinal acceleration is covered by UN R13. In addition, a good understanding of the CEL annex would prevent dangerous systems, even while no value is specified.

The group was informed that UN R13H by selective braking permits deceleration up to zero.

CLEPA was of the opinion that the requirement that the driver can always override the system would cover this item because the driver can simply apply the necessary force on the steering wheel.

Conclusion: need for further discussions on this item.

### **Road shape**

OICA found the value of 1000m reasonable.

The Chair pointed out that having a small curve limit would mandate the system to detect lane markings up to this limit. OICA stressed that this was covered by one of the comments raised by OICA at GRRF, that a limit would prevent systems designed for straight road.

CLEPA added that a too low limit would not be convenient to the driver on country roads.

J supported a clear distinction between LDWS and LKAS as LKAS is intrusive. J also supported the 1000m limit.

NL found that for a safety systems, it does not matter whether it is comfortable, because if the driver is not happy, then he can switch off the system.

### **Lane marking**

J clarified their proposal for option 2 because of the need for early detection by LKAS; the expert indicated the need for time and space for initiating control of the steering system. He said that, in addition, state of the art systems are different according to the markets. J agreed that the wording should be improved.

Industry indeed challenged the proposed wording.

ROK informed that the country has blue lane markings.

NL recalled that the UN regulations must cope with mutual recognition and that it would be counterproductive to have provisions limiting this concept.

OICA pointed out the technical challenge behind the discussion D repeated the need not to exclude systems which can function without lane marking. J was of the opinion that such systems would be out of scope. CLEPA pointed out that the absence of markings on certain portions would make the system switch from activation to deactivation repeatedly with inconvenience for the driver. J stressed that the current situation is that a system approved per UN R79, could face approval problems in J.

Conclusion: need for further discussions.

### **LKAS performance requirement**

Should some criteria be adopted, some amendments to UN R79 or other regulation should be initiated.

Conclusion: not covered by UN R79.

### **Functional limitation of the system**

J found this item necessary for avoiding confusion. The group agreed to pay attention to the meaning of “operating”.

CLEPA challenged the reference to “high priority warning” because it is not yet sure whether LKAS discussed in this group addresses safety system or comfort system.

Conclusion: need for further discussions.

### **Requirement for the end of the system operation**

OICA recalled that the CEL annex covers this for avoiding roll-over, etc. “easy and safe handling of the vehicle up to maximum speed”.

The Chair raised the concern of the situation when the system loses the marking within a curve: how does it give back the control to the driver?

CLEPA clarified that the end can be done smoothly in the case the marking cannot be detected anymore. Yet if the system becomes out of order (failure), then the end should occur abruptly.

NL said that a Technical Service should check per CEL annex, assessing what would be the consequences if such event would occur, and added that a Technical Service may request to perform a test. The criterion would be that the vehicle remains stable, yet UN R79 does not contain any test nor value for this. D informed that such systems abruptly releasing the control do exist, yet the forces/moments are so low that they do not make the vehicle unstable.

CLEPA confirmed that the systems currently in the market do not have safety issues thanks to the level of torques.

OICA also recalled that UN R79 is clear that the automatic systems, per Annex CEL, cannot cause any deterioration of the steering system handling.

The group convened that there is no intention to bring suspicion on the Technical Services, and was keen to provide assistance when felt necessary.

### **Holding a steering wheel by the driver**

NL was keen that the system avoids overreliance. The expert favoured option 1 (the operation shall be cancelled when there is no steering operation of the driver for more than 5s) + an optical warning. The expert also questioned the 5 second value.

CLEPA was of the opinion that a sleeping driver cannot remove the hands from the steering wheel.

OICA questioned whether switching off the system when the driver is asleep would always be a good point for safety.

The Chair supported that point of view because the system may give the conditions for sleeping, then switch off the assistance.

J favoured option 3 because the Vienna Convention is clear that the driver should not be asleep. The expert from J informed that J assumes that the driver controls the vehicle even if the hands are not on the steering wheel.

CLEPA suggested that the warning be repeated if there is no reaction from the driver.

OICA pointed out that there must be a balance between the avoiding overreliance and too frequent alarms.

Conclusion: not covered by R79.

NL, supported by the European Commission, found the criterion important because the assistances should not provide the driver too much tools to leave the control to the system.

ROK found this important for safety. The expert favoured haptic or acoustic warning.

D found a warning necessary, with no suggestion

Spain had no opinion.

Conclusion: important item, partially covered by UN R79.

### **Override**

Conclusion: Fully covered by UN R79.

### **Condition of non-operational being allowed**

There was a debate about whether actioning the direction indicator can be considered as "overriding" the system.

Conclusion: Option 3 favoured by the group and paragraph 5.1.6. of UN R79 addresses this.

### **ON/OFF switch**

The group was informed about the discussions currently being held at WP1 that a system not covered by a UN regulation must be overridable or capable of being switched off.

CLEPA would recommend default off, with a mandatory switch that the driver can voluntarily switch on the system.

The European Commission would favour a default on, with a switch such that the driver can switch off the system.

Some CLEPA expert pointed out that LKAS is a system intervening when normally driving, hence would recommend default off.

J justified their position that almost all current LKAS are “last memory” systems and J favoured a default off system.

OICA stressed that the criterion is the acceptability from the driver, a default on system is acceptable if it does not burden a driver. The expert suggested not to be too restrictive today, until the time there are lots of systems in the market. The group was informed that in addition, the “switch” can be a software button in a menu.

NL thought that a comfort system should be default off with a switch.

ROK found that a mandatory system should be default on.

The European Commission did not find important whether it is default on or off, and supported a switch and would favour default on system. D fully supported the European Commission.

Conclusion: need for further discussion

### **Malfunction warning / Status display**

OICA clarified that UN R79 does cover this per the CEL annex.

J clarified that “operating” means passive activation and was keen to distinguish functional from internal failures.

CLEPA did not find beneficial for the driver that the system indicates whether it can detect the lane markings, rather whether it can intervene.

The European Commission found sufficient that the system indicates whether there is a malfunction (electric, sensor, etc). The rest was considered not relevant as mainly for maintenance purpose.

Conclusion: covered by R79, + need for more discussions.

### **Information to be known to users**

J was not keen for such requirement.

OICA pointed out that the document reflects the current situation.

UN R79, paragraph 5.5.2. *It must be possible to verify in a simple way the correct operational status of those Electronic Systems, which have control over steering. If special information is needed, this shall be made freely available.*

This is only for PTI

The Secretariat was of the opinion that the driving license covers this.

Conclusion: no need for requirement.

### **Failsafe**

CLEPA supported that there is a request for redundancy.

### **Conformity with the safety aspects of complex electronic control systems**

J supported the current wording of UN R79

There was no comment from the group.

### **EMC**

Acceptable, no comment.

## 8. Next steps

The Chair raised the question of a further meeting: the objective of the next meeting would be to check the list of items not covered by UN R79, identifying which are of importance to safety and assessing whether amending UN R79 is relevant.

J committed to prepare for a next meeting a recollection of the important items of the document LKAS-01-05, together with the relevant amendments for UN R79.

NL said that GRRF could not do fruitful action with a document available at such a short notice. The expert suggested that no further meeting take place before the next GRRF session, rather a report on the outcomes of this meeting. It was suggested to establish a written report 3 weeks before GRRF session, taking into account the Industry point of view via email exchange during the month of January.

J was ready to wait for the results of the discussions with all ad hoc group members, then make a decision. J clarified that there is no obligation to report back to GRRF, yet J was keen not to delay input to GRRF. However J favoured holding a 2<sup>nd</sup> meeting before the next session of GRRF.

After discussions, J agreed to aim the September GRRF session.

### Conclusion:

- report to be delivered to GRRF by end of January.
- In the meantime, email discussion for having a consolidated report containing the positions of all parties.
- No 2<sup>nd</sup> meeting before February session of GRRF.