Look, no hands!

How much human input does a car need to drive itself on a motorway at 40 mph? That's the question asked by the UK government in August in its preparations for the introduction of vehicle automation onto UK roads, but there's no simple answer, as **Filip Florek** explains.

Drivers currently are required constantly to maintain awareness of any changes on the road, trying to anticipate what other road users and pedestrians might do next but accidents of course, still happen. There is a tremendous effort across the UK to reduce road fatalities and one way to do this is to introduce technology to vehicles that gives them the potential to increase road safety. An example of such technology is the Automated Lane Keeping System or ALKS.

ALKS, when activated, will keep a vehicle within its lane, controlling its movements for extended periods of time without the driver needing to do anything. The driver would, though, be expected to be ready and able to resume driving control when prompted by the vehicle. And herein lies the problem.

How can the driver maintain full situational awareness at all times, when the idea behind the technology is to allow the driver to do something else with their time, something 'productive'? Such non-driving-related tasks could include reading text messages, browsing the internet or even watching a film. If the vehicle is in complete control of the dynamic driving task, a 'secondary driving task' may effectively become a driver's primary task, both cognitively and physically.

Existing industry standards consider these tasks as a distraction and recommend them being 'locked out' during driving. The proposed introduction of ALKS will have a significant impact on driver distraction standards and acceptance testing in the automotive industry, especially when the permissible use of the infotainment system fails to address the relationship with the existing laws prohibiting the use of electronic devices like laptops, tablets or smartphones while driving. For ALKS to meet safety objectives, legislation will need to confirm that ALKS-equipped vehicles are legal to use by all occupants when ALKS is activated.

Maintaining situational awareness

Maintaining situational awareness when an operator is no longer controlling the equipment has been the focus of research, analysis and recommendations for decades. ALKS should encourage the driver to maintain some degree of situational awareness, together with an understanding of the performance and operational status of ALKS itself. For this, we need to understand how driver behaviour might change due to the presence and use of the new technology and what happens when control of the vehicle needs to shift back to the driver.

A driver would be expected to take over the controls in case of a vehicle systems failure or downgraded performance, for example caused by the weather, and resume previously interrupted manual driving. What does the driver need to know about the vehicle in order for them to spot a fault early, before the operational envelope of ALKS is exceeded and a failure occurs?

The Centre for Connected and Autonomous Vehicles (CCAV) is the UK government's representative in this arena. CCAV defines the driver's residual responsibility to respond to the handover request and calls it the 'transition demand'. Communication of the vehicle's state and its understanding of surroundings is an

The CIEHF's response to CCAV's call for evidence

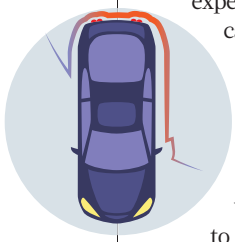
important aspect in developing trust between human driver and the automated vehicle. Existing driver interfaces don't communicate this kind of information effectively however, especially when the transition demand occurs, with the result that the driver may not be able to react in time.

A great deal of attention should be given to specifying guidelines for the driver interface so the design is completely intuitive and communication with the driver can occur rapidly and fluidly at all times, whether or not they are actively monitoring ALKS. Understanding the term 'monitoring' is key to specifying the split of responsibilities between the driver and vehicle. Specifically, ensuring appropriate detection and response to a handover request implies, to a certain degree, 'monitoring'.

Call for evidence

In 2016, CCAV consulted the public on the regulatory requirements of so-called 'motorway pilots', committing to consult further when these systems were ready for commercial deployment. Building on the responses, the new 2020 call for evidence process follows other EU countries in the adaptation of UN Regulation on ALKS for passenger cars. According to the UN Regulation, ALKS is classified as a Society of Automotive Engineers (SAE) Level 3 conditional driving automation system (where no driving automation is at Level 0, and full driving automation is at Level 5). This states that ALKS, once activated, may completely take control of the driving task.

However, the CCAV call for evidence asks whether vehicles using this technology should be legally defined as an automated vehicle in line with the Automated and Electric Vehicles Act 2018 (AEVA) which would mean car makers would be responsible for the safety of the vehicle when the automated system is engaged, rather than the driver.



By adopting non-standardised definition of the automated vehicle, there is a potential for incoherence and ambiguity. In SAE Level 3, the driver remains the 'fallback-ready' user, and so must remain responsive to vehicle requests to perform a driving task. On the other hand, AEVA says the driver is not required to monitor or control the vehicle in specific conditions.

Additionally, there is no specific information on what constitutes controlling and monitoring a vehicle by the driver under vehicle operating modes. In contrast, the term 'automated' is an important aspect of the SAE's definitions and is used precisely to reflect the capabilities of the vehicle, separating capabilities from 'driver assistance' to 'automated', a vitally important aspect, both for governance and usability.

The call for evidence caused much discussion in the CIEHF community, notably about the perception of risk within our society, road safety culture, driver requirements to maintain sufficient situational awareness, and alignment between technology and societal needs. By responding to the call in the way it has through a comprehensive response document and lobbying on these very relevant issues, CIEHF, as a professional body, could influence decisions on the implementation of ALKS affecting all road users in the UK. The CIEHF experts engaged in this response came from relevant transport domains including automotive, aerospace and rail.

ALKS will have a significant impact on driver distraction standards and acceptance testing in the automotive industry

What next?

Technological progress alone will not be enough for ALKS to achieve its potential. The next steps should focus on:

- Initiating dialogue between all key parties: the public, the car makers, the governing bodies, law enforcement and road safety agencies in the UK.
- Informing the public about the potential benefits to them and what they can and cannot do in ALKS-equipped vehicles. Public understanding of the changes in the driver's role in future vehicles is essential.
- Informing the public about in-car occupants monitoring, detailing what data will be collected and why. Integration of ethical principles for data collection and management will be essential to align this emerging technology with the society.
- Future research in collaboration with key parties. Professional organisations like CIEHF should encourage the public to get involved in trials and be part of the innovation process.

CIEHF's response to the government's call for evidence identified and explored several other assertions by CCAV that did not have full consideration of human factors nor sufficient evidence. This included response to handover requests, dual-function allocation to primary driving controls, reliability of the driver monitoring system and conditions where driver inputs may be suppressed by ALKS. Also included were conditions related to driver attentiveness, the environment and infrastructure but without consideration of availability, serviceability and safety.

Vehicle technology roll-out should not be restricted but guided, where regulations ensure safety of all road users but also sustain innovation. This initiative should be considered as a positive step towards technological adaptation and public acceptance of automated vehicle technology and to enable new and emerging technologies.

The full version of CIEHF's response to the CCAV call is available to download at **https://bit.ly/CIEHFALKSResponse**

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