FEDERATION INTERNATIONALE DE L'AUTOMOBILE
EUROPEAN BUREAU

POLICY POSITION ON AUTONOMOUS DRIVING

Executive Summary

In-vehicle technologies can bring significant safety, efficiency and reliability improvements in the medium-to-long term by assisting drivers in critical situations. Great uncertainties remain as to if, how and when higher levels of automation will be available to regular drivers:

- Who will be the main players and how will they approach increasing full automation?
- Will the new intelligence be embedded mainly in vehicles, in (general or highway) infrastructure, based on highly accurate maps or shared/a combination between these?
- How quickly could the new functionalities be installed and how are they to be paid for?
- How will the issues of mixed vehicle types (automated and non-automated) and mixed road types (motorways, country lanes, private roads) be managed in the long transition phase?

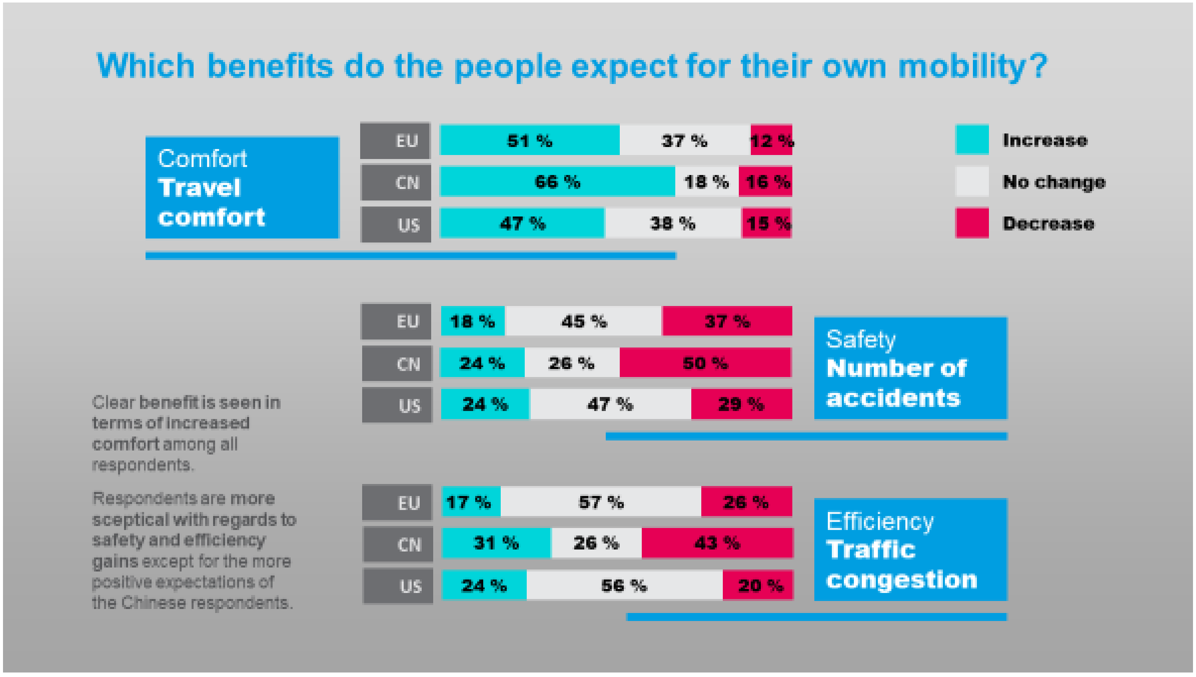
<table>
<tr><th>Assisted driving (SAE 1/2)
The driver alone handles the vehicle, whilst the vehicles systems can intervene to correct specific parameters</th><th>Automated (SAE 3)
The vehicle handles at least two functions (or all) but the driver is always expected to be able to regain control if needed</th><th>Autonomous (SAE 4/5)
The vehicle handles all functions on its own, including putting the vehicle in safe mode if needed.
In Level 5, no driver required</th></tr>
<tr><td colspan="3">• User should always be aware of the level of automation s/he is in
• Intuitive HMI design with clear indications on the systems capability/ what is expected of the driver/ operator</td></tr>
<tr><td colspan="2">• Smart design allowing to warn drivers and/or give them sufficient time to resume driving if needed
• Update of the Driving License Directive required</td><td>Must be able to deal with mixed traffic situations</td></tr>
<tr><td>Driver liable</td><td>Vehicle should store data that helps identify – in the case of an accident – who is liable whilst fully respecting data protection and privacy law
Mixed liability possible</td><td>Operator liable</td></tr>
<tr><td></td><td colspan="2">Need to adapt European and international conventions to account for a new situation, i.e. driverless vehicles</td></tr>
</table>

Industry and policymakers should work together to ensure that opportunities are not overlooked and that potential obstacles are dealt with in a timely fashion. The FIA European Bureau and its member Clubs, acknowledging this trend and representing automobile consumers, encourage policymakers and the industry to:

- Design automated functionalities with the user in mind, with user-friendly Human Machine Interfaces and sufficient lead time for drivers to resume driving if necessary
- Focus efforts on establishing good human machine interaction to prevent a critical decrease of attention and misuse of automated functions
- Encourage data sharing between private and public actors to make up-to-date, standardised digital maps available
- Promote the education, training, and awareness of driving assistance technologies, including the safe use of the systems' functionalities.
- Organise awareness campaigns to accompany the progressive deployment of automation functionalities

Introduction

There are numerous predictions as to when the first fully automated cars will populate Europe's roads, ranging from 2025 to 2030. As imperfect as human drivers may be, we are still a long way from vehicles that can deal with the complexity of the traffic situations, which exist today. Until such time, drivers should be able to benefit from technology support through Advanced Driver Assistance Systems (ADAS). The FIA European Bureau would like to bring the consumer's perspective into the current debate on increased autonomous driving trends. At this stage, user acceptance is still relatively low, as demonstrated by a recent survey carried out in the L3Pilot project[1] (see infographic). Europeans mostly expect greater comfort with automated vehicles (56%) but are rather pessimistic when it comes to improving safety (18%) or efficiency (17%) of road transport.

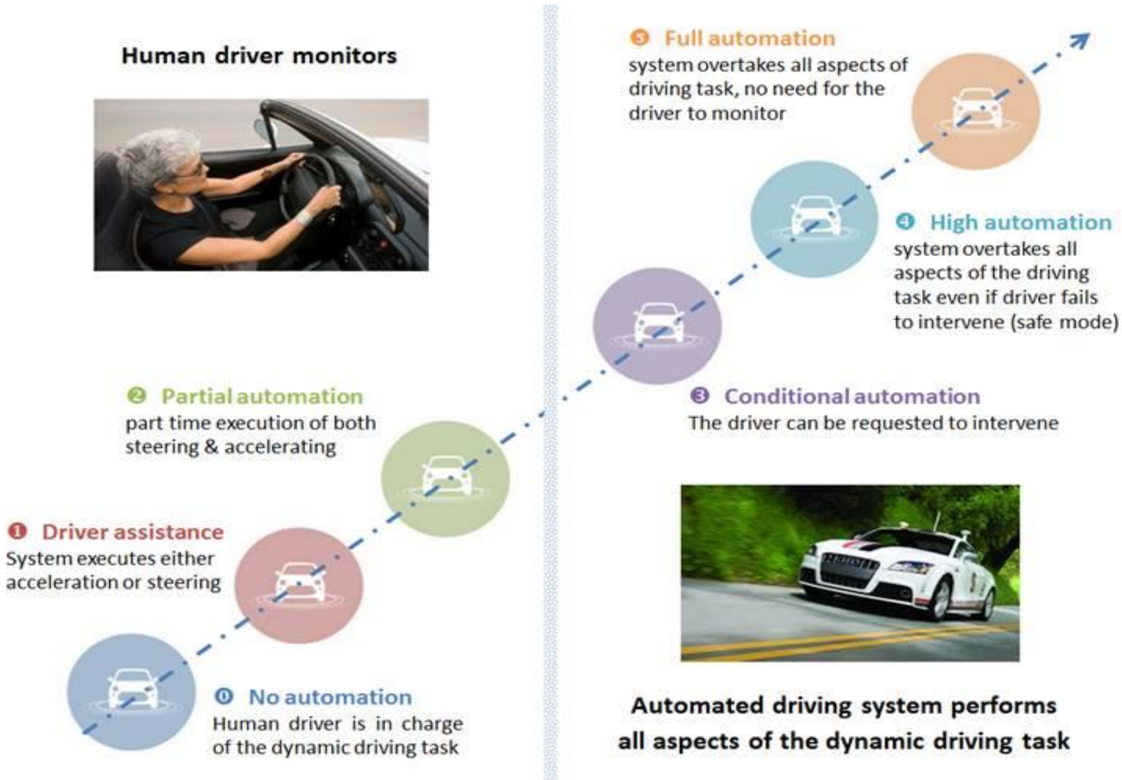


Today's vehicles increasingly support drivers via warning systems, some of which even take over specific driving function for a limited time. The rise in driver assistance, vehicle connectivity and deployment of Cooperative Intelligent Transport Systems (ITS) pave the way for increased vehicle automation.

This Policy Position outlines the challenges linked to the deployment of automated functionalities which are meant to improve the safety, comfort and efficiency of personal mobility. It will highlight the technical prerequisites required to reap these benefits as well as the legislative upgrades needed.

[1] L3Pilot Project survey on user acceptance of autonomous driving, November 2019.

OVERVIEW OF THE VARIOUS LEVELS OF AUTOMATED DRIVING AS DEFINED BY SAE J3016



Existing levels of automated driving according to SAE classification

Full automation is expected to enhance road safety and personal mobility efficiency, improving traffic flow and mainstreaming eco-driving. It should support the optimisation of infrastructure use and increase productivity by allowing drivers to perform other tasks. Most of the expected benefits would only be fully realised once public and private transport are fully autonomous, which is likely to take time. In the meantime, the expected safety gains would directly depend on how well autonomous vehicles behave in mixed traffic situations[2].

The standard[3] developed by the Society of Automotive Engineers (SAE) details five levels of automation for on-road vehicles. In the following sections, "*the dynamic driving task*" is defined as "*all the real-time functions required operating a vehicle in on-road traffic*[4]".

Drivers are in charge of monitoring their driving environment from driver assistance systems (level 1) to partial automation (level 2). Driver assistance systems usually detect undesirable conditions (such as drowsiness) and warn, control and correct drivers' behaviour. Steering and acceleration/deceleration is mostly undertaken by the driver. In partial automation mode, systems can

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[2] Einführung von Automatisierungsfunktionen in der Pkw-Flotte: Auswirkungen auf Bestand und Sicherheit', Prognos AG, August 2018. Study commissioned by ADAC e.V.

[3] https://www.sae.org/standards/content/j3016_201806/

[4] SAE « Taxonomy and definitions for Terms related to On-Road Motor Vehicles Automated Driving Systems », page 6. The dynamic driving task includes, without limitation: object and event detection, recognition, and classification; object and event response; Manoeuvre planning; Steering, turning, lane keeping, and lane changing; acceleration and deceleration, enhancing visibility for other road users (lighting, signalling and gesturing...).

take over both the steering and the acceleration patterns, using information from the driving environment. The driver is still expected to perform all remaining requirements of the dynamic driving task.

Conditional automation describes a phase, where the human driver can trigger an automated driving system that will perform both steering and accelerating/decelerating. The driver is expected to resume the dynamic driving task as soon as the system issues a request to intervene. This is by far the most complex system since it must cater for a safe transition from machine to a human driver in case of emergency.

In both high (level 4) and full (level 5) automation modes, the vehicle can automatically return to a minimal risk stage. Full automation mode can assume all dynamic driving tasks without expecting the driver's intervention under any road and environmental conditions. In full automation mode, a human driver does not need to be in the vehicle.

Regardless of the technical capabilities, the switch to a fully automated vehicle will also be an important cost factor and therefore take time both for private and public transport. Mixed traffic situations will remain a reality for the years to come and ADAS should support the drivers of non-automated vehicles to avoid a worsening of road safety.

Technical prerequisites to reap automation's benefits

Manufacturers should have a duty to ensure the full functionality of a vehicle's automated functionalities, provided that it is properly maintained and inspected. They should bear the liability for any flaws in the system over the lifetime of the vehicle.

European legislation should be upgraded to ensure full access to vehicle data for independent operators, in order to ensure that independents can still maintain and repair vehicles with automated features. Roadworthiness testing should be adapted to assess the operability and safety of automated driving features as soon as vehicles are deployed on the European market, without significantly increasing prices for citizens.

Infrastructure

Today's automated car trials rely on in-vehicle sensing technologies, spatial positioning and digital maps. Vehicle to Infrastructure (V2I) communication is currently not needed for the rolling out of automated vehicles, which will most likely rely on highly accurate and up-to-date infrastructure maps. However, greater consistency should be sought when building or maintaining roads, since it would benefit society at large. Clear, consistent and internationally harmonised road markings should be well maintained to ensure visibility for all drivers.

Maps

As automated vehicles will need to deal with variable signs and conditions, public and private authorities should be required to provide constantly updated digital maps providing a compulsory minimum set of information about the road network. The European ITS Directive should be regularly upgraded to include the requirements needed to support automation.

Drivers & Human Machine Interface

For the foreseeable future, drivers will still be expected to oversee the technology; be capable of resuming control and taking operational decisions. Sufficient time should be given to the human driver to take over.

The role of the driver and the actual driving tasks change according to the level of automation in a vehicle. The user interface must be tailored to the requirements of a specific operation mode. Vehicles that support more than one operation mode should always give enough feedback to the driver to avoid mode confusion.

The Human Machine Interfaces (HMI) should be optimized and enforced through strict regulations and standards. Interfaces should only provide information that the driver is capable of processing. For instance, a revision of the European Statement of Principle on HMI (2008/653/EC) could better define requirements for HMI and follow its implementation with effective enforcement.

Further research should deepen our understanding of vehicle automation implications on driver awareness and define an acceptable driver workload as well as measures to limit system dependency. As safe driving will increasingly depend on the combined performance of the human being and automation, successful designs will need to achieve good integration of the two.

In SAE levels 1 – 2 the driver always remains in control. Vigilance is a central aspect for assisted driving, yet our research shows that driver vigilance decreased after five minutes of hands-off driving and is significantly undermined after 15 minutes[5]. Distraction, already believed to be the root cause of 25 to 55% of all accidents, will be of growing concern in a world of automated driving[6]. Driver assistance systems should support the driver, but never suggest that the driver could solely rely on them. The HMI should require a driver to continuously perform part of the driving task to keep her in the loop.

In SAE level 3 the driver may delegate the driving task to the vehicle for certain periods of time and focus on different activities. Vehicle manufacturers should design systems to prevent a critical decrease in attention by monitoring the driver's responsiveness. In-vehicle features should ensure that the driver stays ready to resume the driving task on request. Technical measures should prevent predictable and dangerous misuse of automated features (e. g. sleepiness, leaving the driver's seat).

[5] "Motivationale und psychophysische Leistungsgrenzen im Rahmen der Überwachung von Kontrollelementen (Vigilanzaufgabe) zur Durchführung einer Teilautomatisierten Fahrausgabe", Gutachten im Auftrag des ADAC e.V, Prof. Dr Mark Vollrath

[6] RAC Foundation (2013), Elizabeth Box & Ivo Wengraf, "Young Driver Safety - Solutions to an age-old problem", p. 35-36.

In SAE level 4, high automation mode can assume all dynamic driving tasks without expecting the driver's intervention under any road and environmental conditions.

SAE level 5 does not require a driver in the vehicle. An operator must monitor the autonomous vehicle. An in-vehicle driver interface is required only when the vehicle is designed to be used in another operating mode. Passengers should have an option to stop the vehicle in an emergency.

European projects such as L3Pilot are critical to improving our understanding of the interactions between human drivers and vehicle systems. Further research should deepen our understanding of vehicle automation implications on driver awareness and define an acceptable driver workload as well as measures to limit system dependency. As safe driving will increasingly depend on the combined performance of the human being and automation, successful designs will need to achieve good integration of the two.

Education and training

Automation development should be based on realistic driver expectations and understanding of the operation of automated features (including system limits and use constraints). In order to facilitate technology deployment, drivers should thoroughly be informed about their vehicles' assistance systems and the related boundaries of such systems (activation, deactivation, failure). Existing systems should be fully reliable by the time they are available to the public and brought closer to citizens via targeted awareness-raising. Drivers should benefit from adapted education and training to acquire a working knowledge of when and how to use automation features and to understand the basics of the technology. New requirements should be introduced in the European Driving Licence Directive to include driver assistance systems and regular refreshers courses should be foreseen for licence holders as the technology develops.

Liability schemes in case of an accident or infringement to the highway code need to be carefully designed for each level of automation and clearly communicated to the users to ensure a smooth transition between full driver liability to full manufacturer and road operator liability.

International legal framework

In 2016, the United Nations Economic Commission for Europe (UNECE) amended the Vienna Convention on Road Traffic of 1968 to regulate the use of ADAS. Although the driverless operation of automated vehicles in traffic is still not allowed, the amendment confirmed the systems are in line with the Vienna Convention if they comply with the relevant type approval regulations or if the driver can override them or switch them off. Besides, the modification to the Convention, did not clarify the issue whether drivers must constantly monitor (control) the automated operation of their vehicles or may turn their attention away from driving and engage in other activities.

A further amendment of the Vienna Convention would be needed to provide the legal certainty to deploy these vehicles throughout Europe. Besides, UNECE Regulation 79 on "Uniform Provisions Concerning the Approval of Vehicles with Regard to Steering Equipment" should also be upgraded since it only allows automated steering up to 10 km/h.

In order to facilitate deployment of driverless vehicles, harmonised type approval requirements would be needed at European and/or international level. A system to store data in accordance to date protection regulation should be foreseen, to clarify liability if needed and continuously improve the systems.

FIA European Bureau encourages authorities to cater for the safe deployment of automation modes. From a legislative perspective, this means making sure that traffic accident victims are quickly compensated regardless of the liable party and that timely legislation allows for technology deployment, once the technology is market-ready and safe.

Source: Volvo

The FIA European Bureau participates in EU-funded projects promoting the deployment of automated driving:

L3Pilot tests the viability of automated driving as a safe and efficient means of transportation on public roads. It will focus on large-scale piloting of SAE Level 3 functions, with additional assessment of some Level 4 functions. The functionality of the systems will be exposed to variable conditions with 1,000 drivers and 100 cars across ten European countries, including cross-border routes. https://www.l3pilot.eu/

Arcade builds consensus across stakeholders from all sectors for a sound and harmonized deployment of Connected, Cooperative and Automated Driving (CAD) in Europe and beyond https://connectedautomateddriving.eu/about/arcade-project/

Fédération Internationale de l'Automobile (FIA) European Bureau

The FIA European Bureau, based in Brussels, is a consumer body comprising 103 Mobility Clubs that represent over 36 million members from across Europe, the Middle East and Africa. The FIA European Bureau represents the interests of our members as motorists, riders, pedestrians and passengers. We work to ensure safe, affordable, clean and efficient mobility for all. Learn more at www.fiaregion1.com