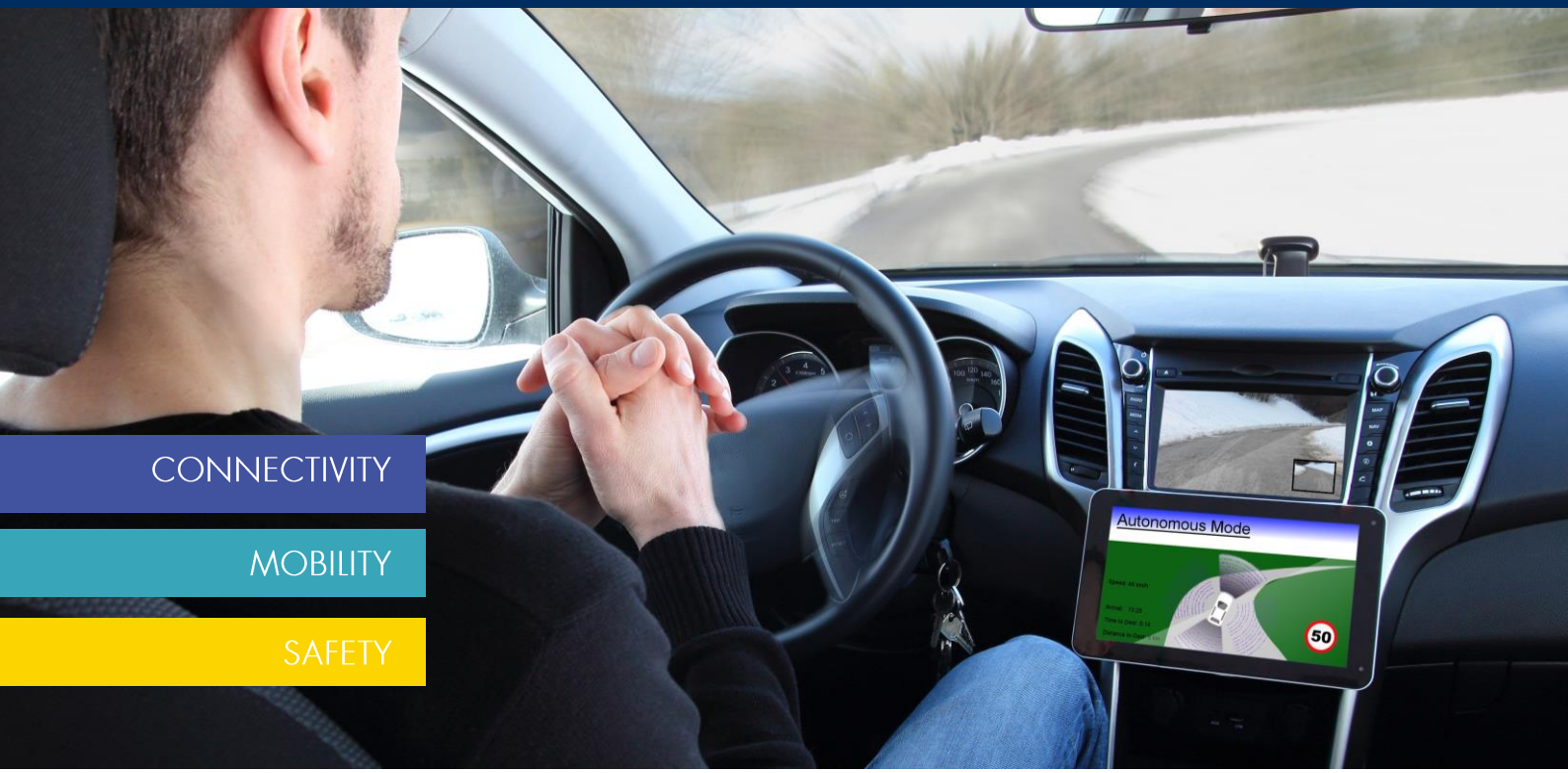
POLICY POSITION ON AUTONOMOUS DRIVING



Executive Summary

The automotive sector is developing technologies to further assist drivers, which could ultimately lead to fully autonomous driving. Automated functionalities can bring significant safety, efficiency and reliability improvements in the medium-to-long term. There are currently great uncertainties 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 automation?
- What will be the sequence of functionalities and will different actors adopt similar innovation paths?
- 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?

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 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
- Make sure that drivers are always fully aware of the vehicle's current level of automation and their level of liability
- Remove accident liability from drivers of conditionally automated cars who show typical and reasonable user behaviour. In conditional automation mode, the vehicle should store data that helps identify – in the case of an accident – who is liable whilst fully respecting data protection and privacy law
- Focus efforts on establishing good human machine interaction to ensure a seamless introduction of automation and prevent a critical decrease of attention and misuse of automated functions
- Adapt national legal frameworks and international conventions to allow for a safe introduction of highly automated features.
- Organise awareness campaigns to accompany the progressive deployment of automation functionalities
- Add new requirements to the European Driving Licence Directive to include automated features and new vehicle functionalities with regular renewal opportunities on offer as technology develops
- Encourage data sharing between private and public actors to make up-to-date, standardised digital maps available

Introduction

There are numerous predictions as to when the first fully automated cars will populate Europe's roads, ranging from 2025 to 2030. The FIA would like to bring the consumer's perspective into the current debate on increased autonomous driving trends. At this stage, user acceptance poses a challenge with over half (56%) of AA UK members indicating that they "*would not trust manufacturers and government assurance that driverless cars were safe*"[1]. Opinions are split as to whether driverless cars would become as safe as human drivers with 38% of respondent agreeing and 37% disagreeing.

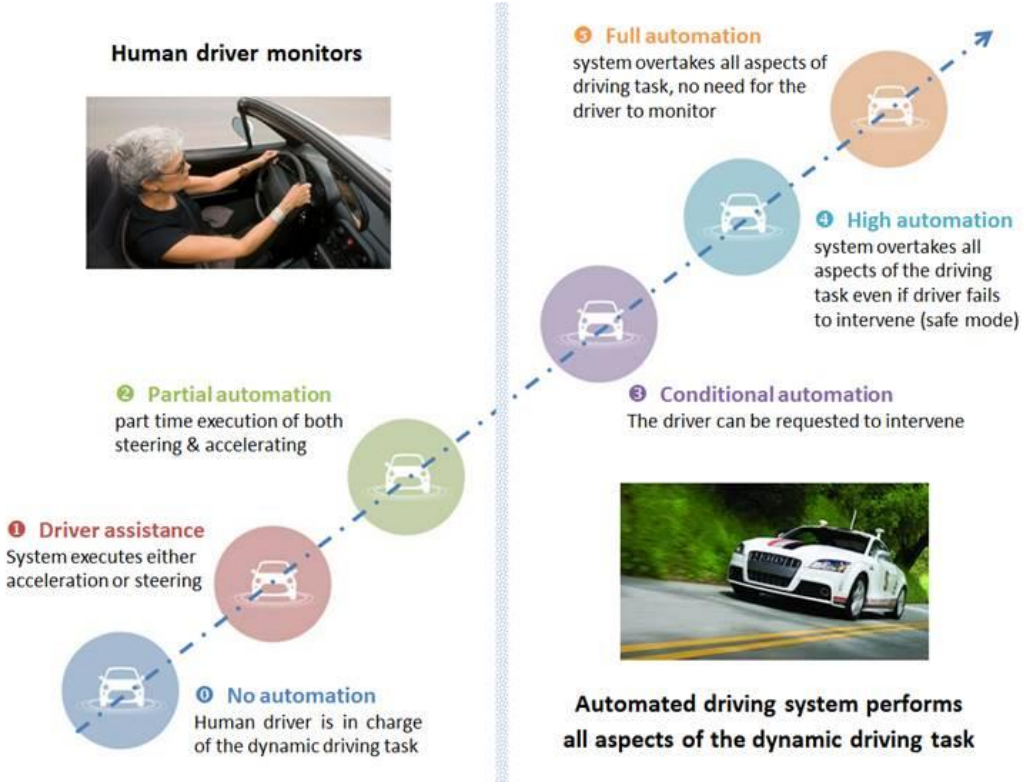
Today's vehicles increasingly support drivers via warning systems, some of which even take over specific driving tasks. The rise in driver assistance, vehicle connectivity and deployment of cooperative

[1] AA Populus poll based on 21,202 members answers (2012).

Intelligent Transport Systems (ITS) paves the way for increased vehicle automation. Partially automated systems are available today, which stirs media interest and public discussions.

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.

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



Existing levels of automated driving according to SAE classification

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.

Potential benefits and challenges are closely linked to the levels of driving automation considered. The standard[2] 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*[3]".

[2] http://standards.sae.org/j3016_201401/ Standard J3016

[3] 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...).

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 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 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 when the driver fails to intervene. High 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.

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.

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.

Source : continental corporation 2013

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. Vigilance is a central aspect for partially automated driving: research shows that driver vigilance decreased after five minutes and is significantly undermined after 15 minutes[4]. Distraction, already believed to be the root cause of 25 to 55% of all accidents, will be a growing concern in a world of automated driving[5].

Vehicle manufacturers should design systems so as to prevent a critical attention decrease by monitoring the driver's responsiveness in automation levels up to 3. In-vehicle features should periodically remind the driver that he is in charge of monitoring the vehicle status. Technical measures should prevent predictable and dangerous misuse of automated features (e.g. sleepiness, leaving the driver's seat). The Human Machine Interfaces (HMI) should be further optimised and enforced through strict regulations and standards such as the European Statement of Principle on HMI. Interfaces should only provide information that the driver is capable of processing, designed according to the principle of keeping the driver-in-the-loop.

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

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

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

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.

Legal framework

The FIA promotes legal certainty:

- Drivers should be aware at all times of the car's level of automation and of their responsibility to take action and monitor the car
- Drivers of partly automated cars are required to permanently monitor the car. They are not allowed to take their eyes off the road for a continued period of time. Partly automated systems should be designed in a way to ensure a driver's sustained attention, e.g. by temporary activation/deactivation
- Drivers are not required to permanently monitor conditional automated cars. Conditional automated driving features should, therefore, comply with verifiable technical minimum requirements. Drivers should be allowed to engage in activities not related to driving as long as they are able to assume the driving task at the vehicle's request within a period of time adequate to the situation. Drivers of conditional automated cars who show typical and reasonable user behaviour should not be held liable
- In conditional and highly automation system operations and driver interventions should be recorded in a way that they can be used as evidence to clarify whether or not a driver of an automated car is liable for an incident. Data protection and data security as well as transparency should be ensured for the user

The United Nations Economic Commission for Europe (UNECE) recently amended the Vienna Convention on Road Traffic of 1968 to regulate the use of driver assistance systems (DAS). According to the amendment, automated driving systems will be 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. The driverless operation of automated vehicles (on public roads) is still not allowed.

However, the amendment does 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. 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.

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.

FIA Region I 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 participates in EU-funded projects promoting intelligent transport systems:

iMobility Support fosters the deployment of intelligent mobility in Europe by organising iMobility Forum activities including stakeholder networking, deployment support, awareness raising and dissemination of results.
www.imobilitysupport.eu

Compass4D demonstrates the benefits of cooperative systems for road users. It aims foremost to increase road safety and energy efficiency, while reducing the level of congestion in cities. **www.compass4d.eu**

Fédération Internationale de l'Automobile (FIA) Region I office

FIA Region I is a consumer body representing 107 Mobility Clubs and their 38 million members from across Europe, the Middle East and Africa. The FIA represents the interests of our members as motorists, riders, pedestrians and passengers. FIA Region I is working to ensure safe, affordable, clean and efficient mobility for all. Learn more at www.fiaregion1.com