

## **EARPA Position Paper**

### **EARPA Highlights on Cooperative, Connected and Automated Mobility**

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#### **About EARPA**

Founded in 2002, EARPA is the association of automotive R&D organisations. It brings together the most prominent independent R&D providers in the automotive sector throughout Europe. Its membership counts at present 48 members ranging from large and small commercial organisations to national institutes and universities.

#### **Introduction**

The objective of this document is to *highlight a selection of research and innovation priorities identified by EARPA experts in the context of cooperative, connected and automated mobility (CCAM)*. The document complements the EARPA position papers "Saving Thousands of Lives on European Roads" and "The Role of Electronics and Communication Systems in European Road Transport and ICT", both published in 2018. It is to emphasize particular aspects of these papers as well as from roadmaps released by entities such as ERTRAC in that domain and it shall steer specific research items that may currently be underrepresented in European road transport research.

In addition, EARPA wishes to emphasize the need of supporting basic research (Technology Readiness Level - TRL - especially in the range of 2 to 5) that is a prerequisite before developing and implementing CCAM products or services in road transport applications.

#### **Highlights**

##### **1. Tools and methods for (self-)assessment of the security of connected objects in the road transport industry**

- *Challenge:* Security of hardware and cybersecurity in general are key elements for ensuring the trust of citizens and businesses in the deployment of new products and services related to mobility as well as consolidating the leadership of European industry in the automotive sector including the aftersales market.
- *Scope:* To ensure the companies' adoption of good practices and techniques and considering the entry into force of the cybersecurity act, new tools and methods should be designed to manage the digital (hardware and software) security of products and services. Transport and mobility market organisation including with the citizen as final user (e.g. careful consideration of GDPR in that framework) offers a complexity that requires a tailored approach.
- *Expected impact:* Tools that are user friendly and easily integrated in existing tool chains for security level assessment for increased interoperability and data exchange among the stakeholders of the value chain for road transport.

##### **2. Reliability and safety of Artificial Intelligence modules in product development**

- *Challenge:* Artificial Intelligence (AI) has become an important corner stone in the development of Automated Driving (AD). In order to comply with safe driving patterns and,

in that sense, standards for functional safety, reliable methods of verifying the outcome of such AI modules must be developed and validated.

- **Scope:** AD vehicles need to interact with their environment that includes vehicles driven by manually, other AD vehicles and vulnerable road users. To be able to draw conclusions from a complex environment, AI modules are trained on designated data sets. Coverage rates of the data sets and verification of the output from the AI module, to comply with safe behaviour, becomes crucial. These verifications should be conducted through various means, including real testbeds especially during last development stages.
- **Expected impact:** Development of referential verification methods for using AI modules as input to decision-making functionality of the AD vehicle will serve as an enabler for CCAM and emphasize safety aspects throughout design processes. The verification methods should integrate real testbeds for proving and checking the compliance of developed AI for AD vehicles during last development stages.

### **3. Developing ethical Artificial Intelligence for CCAM**

- *Challenge:* AI has become a key technology for CCAM but narrow unsupervised optimisation may be incorporating discrimination, unconscious bias and making societally unacceptable choices. The challenge is to make desired ethical behaviour explicit and to examine actual outcomes and applicability in different contexts (countries, urban/rural etc.).
- *Scope:* Development of ethical principles for CCAM both at a system level (including accessibility and social issues) and at a driving behaviour level (choice of behaviour when collisions are inevitable and injury or loss of life may occur). Exploration of specific use-cases and development of a framework for verification of ethical behaviour of CCAM.
- *Expected impact:* Development of ethical AI has implications for architectures, design tools and vehicle verification procedures. It will promote desirability, acceptability and safety of CCAM.

### **4. Methods and tools for Europe-wide accident analysis of different levels of automated driving**

- *Challenge:* Current accident analysis is one of the sources used for the definition of test scenarios. However, in the case of automated driving even in mixed traffic, the distribution of accidents is expected to be different from the distribution known from conventional vehicles. Accident data should be collected already from the beginning of their deployment, even though statistical significance cannot be reached during the first years.
- *Scope:* Relevant stakeholders, such as the companies dealing with the development of vehicles and the organisations focused on accident reconstruction, testing and approval as well as governmental bodies, should join forces to define a Europe-wide accident database of vehicles with different levels of automation. To that purpose, wider usage and reliance on already existing testbeds and deployed smart-areas may be an ideal solution.
- *Expected impact:* The database of accidents will improve the analysis of weak points of automated vehicles in the future and will serve for the testing and approval processes, complementing data on critical scenarios derived from other sources. It will allow strengthening collaboration between organizations in Europe providing test facilities (testbeds, smart-areas) and other stakeholders.

### **5. Closing the gap of data and connectivity as an enabler of safe, automated mobility**

- *Challenge:* Connectivity and data have the potential to augment current vehicle safety features due to their capacity to include all kinds of road users and their potential to extend current electronic horizon standards. Furthermore, the safety of cooperative, connected and automated vehicles can move from a reactive to a proactive approach as vehicles may share



their intentions. Guaranteed availability, interoperability and trustworthiness of data is key for massive adoption.

- *Scope:* Development of advanced connectivity enabled functions together with tools and methodologies for their (safe) design and thorough verification and validation including all CCAM stakeholders (road users, road managers, service/data providers, etc...). Evolution and demonstration of current and future functions and access technologies taking into account the (safe) interaction between the different involved actors.
- *Expected impact:* Improvement of safety and traffic flow by using road automation due to enabling complex interactions between all mobility stakeholders. It will also support and accelerate other initiatives dealing with CCAM due to its interactive nature.

## Conclusion

Cooperative, connected and automated mobility enabled by digitalisation offers opportunities for Europe to work together and ensure the quick and efficient adoption of new transport modes, increase transport safety and maintain the competitiveness of European industry by providing the relevant tools to its value chain. EARPA members contribute to transferring this knowledge and expertise to stakeholders to take advantage of those opportunities for the benefit of society.

These EARPA highlights align with the European Union priorities, and their integration in the Horizon Europe programme would be highly appreciated. To this end, EARPA members are happy to interact with other stakeholders to develop these topics further.

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*For further information, please contact our contact persons of the Foresight Group  
"Connectivity Automation Safety"*

## Contact

### **FG CAS Speaker**

Peter Urban

E: peter.urban@ika.rwth-aachen.de

T: +49 241 80 27015

### **FG CAS Secretary**

Bastiaan Krosse

E: bastiaan.krosse@tno.nl

T: +31 88 866 5396

### **Editor of this paper**

Bernard Stree

E: bernard.stree@cea.fr

T: +33 4 38 78 09 35

More information at our website: [www.earpa.eu](http://www.earpa.eu)