



The
Federal Government

Report on the Implementation of the Automated and Connected Driving Strategy



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Germany as a pioneer and international catalyst

With the „Strategy for Automated and Connected Driving - Remain a lead provider, become a lead market, introduce regular operations” (ACD Strategy), the Federal Government adopted in September 2015 important guidelines in order to shape the road transport of the future. The systematic implementation of the ACD Strategy enables the Federal Government to tap the potential of the technologies of automated and connected driving (ACD) with the aim of enhancing transport safety and efficiency, of reducing transport emissions and of making Germany a more competitive site for economic activity and a more attractive location for innovative businesses.

Germany has established itself as a pioneer and an international catalyst for ACD. Since 2015, at Germany's initiative, essential priority areas of the cooperation of the G7 Ministers of Transport have been the development and introduction of ACD technologies in combination with intelligent transport systems (ITS).

Germany is actively involved in working groups of the UN Economic Commission for Europe (UNECE) in order to adopt uniform international standards in the technical spheres as well as uniform and basic behavioural rules for ACD.

At EU level, Germany decisively cooperates in the definition of the content of the activities of the European Commission in connection with ACD and, at Member State level, essentially contributes to shaping the high-level dialogue forum (“High-Level Structural Dialogue”) which was set up in 2017. Germany organized the 2nd High-Level Structural Dialogue in Frankfurt in September 2017.

Inter-departmental implementation of the strategy in six fields of action

Basic measures for the introduction of ACD technologies were initiated in the six fields of action, i.e. infrastructure, legislation, innovation, interconnectivity, cyber security, data protection as well as societal dialogue. Apart from the activities already undertaken and launched which are within the responsibility of the government departments involved, working groups (WG) have developed recommendations for action concerning the further implementation of the ACD Strategy in an inter-departmental programme organisation. For this purpose, experts of the Automated Driving Round Table were consulted.

Infrastructure

The technologies for automated and connected driving as well as ITS applications require mobile communications and WiFi infrastructures as well as standardized components for vehicle-to-vehicle and vehicle-to-infrastructure communication. Considering the initial practical deployment scenarios for automated and connected driving functions on federal motorways, it has to be assumed that the data volumes to be expected for security-related applications are low compared with streaming and further entertainment services. Nevertheless, a prioritization of data flows will be necessary in the future. Moreover, a seamless mobile communications coverage along the federal motorways still needs to be ensured. This clearly shows the demand for a higher density of the mobile communications networks along the federal motorways. The currently existing digital fixed network infrastructure is also only insufficiently usable for the applications taken into account so far and must therefore be strengthened within the context of the broadband roll-out. The auctioning of the 700 MHz frequencies (Second Digital Dividend) which took place in mid-2015 will contribute to enhancing network coverage. The use of the frequencies involves a clear coverage obligation to be complied with by the mobile communications companies. This includes, *inter alia*, the obligation to ensure the full coverage with broadband mobile communications services on all major transport arteries (e.g. federal motorways). The further upgrading of the digital network infrastructure will in the future make

a closer coordination between road and network operators necessary. As regards the roadside infrastructure, no further standardizations are required for the initial ACD deployment scenarios on federal motorways. Beyond the horizon of 2020, the specific requirements for the digital network and road infrastructure will have to be assessed for other road categories.

Legislation

Within WP 12 and WP 29 of UNECE, German representatives are actively working on the implementation of the strategy. Within WP 1, the further development of the Vienna Convention to include higher levels of automation is pushed forward. Furthermore, within WP 29, Germany actively contributes to speeding up the international coordination efforts to adapt the technical regulations for type-approval to take account of higher levels of automation up to autonomous driving.

Three legislative proposals have been enacted for the adaptation of the national legal framework:

- Ratifying legislation to transpose the amendment to the Vienna Convention on Road Traffic with a view to automated driving functions entered into force on 13 December 2016.
- In accordance with the amendment of the Vienna Convention, the Eight Act amending the Road Traffic Act entered into force on 21 June 2017 which contains fundamental rules on the interaction of drivers and motor vehicles using conditional and highly automated driving functions.
- In the context of the amendment of the Intelligent Transport Systems Act due to European provisions on EU-wide real-time traffic information services, the Federal Highway Research Institute (BAST) as the “National Body” will review the road, traffic and travel data made available by data providers. The amendment of this act entered into force on 25 July 2017.

As part of driver training and the driving test, the manual operation of the vehicle as well as the use of additional automated driving functions must in the future be taken into consideration. For the type-approval of automated and connected vehicles it is, inter alia, recommended that an overarching

rule is to be elaborated at UNECE level since automated driving functions place specific demands on a great variety of vehicle components which are due to the complex nature of these functions. This rule should also comprise regulations on the standardisation of the man-machine interface. This is to ensure that the request by the driver to assume the driving task is transmitted in an unambiguous and clear manner and independent of the manufacturer.

And it is also necessary to check cyber security and thus the software installed in the vehicles and updates thereof within the framework of type-approval and the periodical technical inspection.

Innovation

Given the rapid pace of technological development and increasingly fierce international competition, it is imperative to strengthen Germany's competitiveness and innovative capacity. To achieve this objective, policymakers must create optimum outline conditions for research and development (R&D) across the whole value chain of automated and connected vehicles and communicate the potential benefit of ACD for society. Moreover, the task of the Federal Government is to set targets for R&D, especially with regard to system safety and to see to the binding adoption of such values by the relevant international institutions.

Already today, the Federal Government is promoting the research and development of ACD solutions by implementing appropriate programmes ranging from fundamental research to application research. In order to maintain and extend the system competences in the field of automated and connected road transport, it is necessary, on the one hand, to ensure a closer co-ordination of research funding for which various government departments are responsible and, on the other, to provide for further investment in R&D supported by a focussed long-term funding. Ever shorter innovation cycles and the growing importance of electronic systems and software in the vehicle, which is equally true for the overall transport system, require new collaborative schemes, also in the R&D sector. It is of particular importance, apart from the research into and the evolution of the relevant key technologies, to obtain and further extend an overall system competence for the automobile of the future. It is necessary to adopt a funding approach covering the development of the components as well as

the research into the interconnection of the vehicles to enable the German research institutions and manufacturers to maintain their leading role in the development of automation functions up to autonomous driving; this funding approach would ensure the evolution of these functions. The investigation of complex system functions for the automated and connected road transport of the future which also includes autonomous driving systems is of great significance. When working on the research fields for the automated and connected road transport of the future which were listed by the WG Innovation, account should therefore also be taken of scenarios for the use of autonomous vehicles in public transport as autonomous public transport shuttle services and of goods transport. In addition, the aim of a long-term R&D approach is to advance the cooperation of universities, research institutions and enterprises (mainly SME).

Germany can offer a wide range of opportunities for the trialling of the ACD systems in real world driving so that it will be possible to validate the currently still open issues arising from research and development work on ACD functions in a practice-oriented approach. Digital test beds on public roads of different categories are an essential basis to shape the road transport of the future. Industry and the research community use these real-life laboratories to trial ACD in real world driving and in driving situations with varying complexity. Efforts have to be made to safeguard and increase the investment in research activities concerning mixed traffic and the impacts of the new technologies as well as in new test beds. The findings obtained from trials on test beds provide decisive bases for transport policy decisions. Therefore, a regular exchange of experience between the test bed operators and users on the setting up and extension as well as the operation and use of test beds has to be established. For this purpose, the Federal Government should provide a central exchange platform for the operators and users of test beds which will also particularly support the interaction of the automotive industry and the information and communications technology sector. As a basis, regular expert meetings with the automotive and the information and communications technology sectors on the use of digital test beds have already been organized which are also attended by representatives from local authorities, regional administrations, associations and institutions of higher education.

At European level, Germany participates in the Round Table of the automotive and telecom industries for ACD (“The Alliance”) which was

initiated by EU Commissioner Oettinger. The first common milestone is to be a cross-border large-scale test as a CEF project. Germany will take part in this project for which the „digital motorway test bed“ will also be used. Within the context of the initiative “GEAR 2030” of DG GROWTH of the European Commission, Germany addresses the challenges facing the European automotive industry in the years to come as regards its competitiveness.

Interconnectivity

An essential foundation for the evolution of ACD is the availability of traffic-relevant mobility data and geodata. Such data are collected by industry and the public sector and are provided in very different ways. Road users also collect data. Intelligent Transport Systems (ITS) can capture, transmit and process traffic-related data and information by using innovative information and communications technologies. Therefore, ITS are of essential importance for enhancing safety, environmental friendliness and efficiency in road transport. Interconnectivity creates additional new potential for traffic control. To exploit this potential it is necessary to increasingly provide the appropriate data in a standardized form and with the relevant availability for their interoperable use. Several activities have already been launched to provide and use traffic-related data and services within the framework of a series of national and international projects. Here, the ITS Directive 2010/40/EU and the Delegated Regulations adopted on its basis are an essential prerequisite. There is, however, a backlog when it comes to the seamless supply of available high-quality traffic information by the infrastructure managers. At European level, a co-ordinated approach is followed for the introduction of cooperative intelligent transport systems. Apart from the High-Level Structural Dialogue forum, Germany actively cooperated in this field in the C-ITS Initiative of DG MOVE.

Satellite navigation is an important cross-cutting technology for ACD. With GALILEO, the European satellite navigation programme, the European Union is developing, with substantial German participation, a technological lighthouse project which, with the launch of the “First Services” at the end of 2016, is for the first time available to a large number of users. The exact position determination of vehicles will also lead to location-based value-added services. The provision of data for the development of value-added services has to be further investigated.

Another component of the exchange of information through interconnection are the vehicle probe data. These data offer great scope for the improvement of transport safety and efficiency and should therefore be made available. In consideration of data protection and vehicle safety, non-discriminatory access to these data is to be granted while at the same time safeguarding the commercial interests of all parties involved. For this reason, the necessary framework rules must be elaborated and agreed upon.

Cyber security and data protection

Guaranteeing cyber security and data protection is an essential basis for the acceptance of automated and connected vehicle systems. It has to be assumed that the overwhelming share of the data collected, processed and transmitted entail a personal reference. Innovations in connection with vehicle and infrastructure development increasingly rely on information and communications technology. Thus they are exposed to possible safety-critical attacks. Against this background, industry and government must urgently take relevant counter-measures.

Policymakers and public authorities must elaborate European and international regulations as a framework for technical standards and norms of industry which, on the one hand, protect the consumer interests and, on the other, make it possible to introduce innovations within the scope of the ACD Strategy. A crucial factor here is the EU General Data Protection Regulation which has entered into force, on the basis of which technical and organizational measures are to be taken already during the drawing-board stage of vehicles which are necessary to comply with data protection requirements (privacy by design). Furthermore, it is planned to establish privacy-friendly factory settings (privacy by default). Technical standards and norms must be enacted for the electronic storage and transmission of personal data. It is essential to ensure the transparency of the data which have been collected, processed and transmitted. From the technical point of view, the necessary arrangements have to be made to comply with data protection law, i.e. the granting and withdrawal of access rights.

A reference architecture model should be the basis for an holistic cyber security concept for automated and connected vehicles, covering the whole life cycle of a vehicle, from the development of a vehicle type up to its taking out of service. A first version of the reference architecture model was

elaborated and agreed on by the Federal Government to be presented as the German position for the international standardization process.

At UNECE level, it is necessary to define mandatory requirements for an holistic cyber security concept for vehicles which have to be complied with for granting type-approval. Within the framework of WP 29, Germany and Japan have already elaborated basic outline requirements concerning data protection and cyber security which were adopted in March 2017 at the plenary session of WP 29 and published as a UNECE document. In the context of the High-Level Structural Dialogue at EU level, a Public Private Data Taskforce was set up which deals with issues relating to mobility data and the possibilities of data sharing associated with ACD. Germany will actively participate in the discussion and elaboration of forward-looking proposals.

Societal dialogue

In order to enable a successful and targeted dialogue of the Federal Government with society on automated and connected driving, a common communications strategy of the federal government departments has to be prepared. Against the background of the challenges to be mastered and the opportunities presented to every individual and to society as a whole, it is necessary to outline realistic expectations that will be realised with a higher number of automated and connected vehicles participating in road traffic in combination with ITS.

Since September 2016, the independent and high-level Ethics Commission on Automated and Connected Driving including representatives from academia, society, the automotive industry and the digital technology sector has been dealing with the provision of ethical insights and the development of guidelines for the deployment of automated driving systems in complex traffic situations. On 20 June 2017, the findings of the Commission were presented to the public and published in a report. This report provides a valuable and well-founded basis for a targeted societal debate. The Federal Government acknowledged the findings of the Ethics Commission and, on 23 August 2017, adopted an action plan for the elaboration of ethical rules for self-driving computers which is to form the basis for the accelerated evolution of the new technologies.

In order to successfully introduce automated and connected vehicles on public roads, it is absolutely necessary having a discussion with society and create acceptance. It is equally important to develop overarching transport strategies which give equal consideration to private motorized transport, freight transport and public transport. Automated and connected vehicle technologies are to be promoted even more in urban and rural environments, to be included in multi-modal transport concepts and to be made perceptible on digital test beds.

Conclusions and prospects

The Federal Government is firmly focussed on the implementation of the objectives of the ACD Strategy. Well-targeted measures have been initiated in the six fields of action which strengthen Germany's position as a global leader as regards the outline conditions for the development, trialling and introduction of ACD technologies.

At national and international level, intensified efforts were made to create the legal framework for ACD, both for users and industry. The amendment of the Road Traffic Act will create legal certainty for the deployment of conditional and highly automated vehicle systems. Research programmes and the trialling on digital and also cross-border test beds support the development and introduction of the technologies.

The momentum of development for ACD is high and is undergoing change away from gradual and evolutionary towards disruptive and revolutionary approaches. Especially with regard to global competition, it is therefore necessary to create outline conditions for the development, trialling and introduction of autonomous vehicle systems.

Against this background, it is urgently required to consistently continue the implementation of the ACD Strategy of the Federal Government also in the new parliamentary term and to widen the focus to encompass higher degrees of automation and complex mobility scenarios. The essential conditions to successfully continue the implementation of the strategy are:

- an even closer cross-departmental coordination of the activities at national, European and international level,
- the continuous back-up funding from the federal budget especially for the support of research and innovation,
- the continuation of the close exchange of views with industry, academia as well as regional and local authorities.

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