Legal regulation in the field of automated automobile transport and road tests of autonomous vehicles

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Abstract. Increase in demand for transportation services, on the one hand, stimulates development of the road network and construction of new objects of the transport infrastructure providing necessary transport system capacity, on the other hand, it stimulates development of new technologies allowing increase of human mobility, comfort and safety of vehicle driving. In these conditions, a great significance is acquired by development of intelligent transport systems (hereinafter referred to as the ITS) representing, on the one hand, means of connection, control and management built in the vehicles and objects of transport infrastructure, and on the other hand, means of control and fast decision-making based on the information received in real-time mode and available to transport operators and transport service users. ITS development has resulted in emergence of autonomous (driverless) vehicles. Considering the issues that the transport complex faces, it seems that driverless vehicles will be able to provide substantial help in solving them, for example by eliminating the human factor from transportation process. Creation of driverless vehicles is impossible without development of a unified approach to forming a legal and technical framework for their practical implementation. The abovementioned framework may be divided on a provisional basis into regulatory technical and legal ones. In the process of creating driverless vehicles, development testing on public roads is of great importance. Such tests cannot be replaced by research at closed proving grounds where it is impossible to recreate the whole range of rapidly changing driving conditions of the actual use. The existing legal framework in the Russian Federation and in a number of foreign countries allows testing highly automated and fully automated vehicles on public roads.

1. Introduction
Increase in demand for transportation services, on the one hand, stimulates development of the road network and construction of new objects of the transport infrastructure providing necessary transport system capacity, on the other hand, it stimulates development of new technologies allowing increase of human mobility, comfort and safety of vehicle driving. In these conditions, a great significance is acquired by development of intelligent transport systems (hereinafter referred to as the ITS).

At the same time, the development of ITS has led to the emergence of autonomous (unmanned) vehicles. Considering the tasks set for the transport complex, especially in the field of road safety and the environment, it seems that unmanned vehicles will be able to provide significant assistance in solving them, for example, eliminating the human factor from the transportation process.

2. Normative legal regulation in the field of automated automobile transport
When creating unmanned vehicles in world practice, much attention is paid to the development of a unified approach to the formation of a regulatory legal and technical base for their practical implementation. At the same time, the indicated base can be conditionally divided into regulatory technical and regulatory legal.
The normative technical base establishes technical requirements for vehicles and the rules for their operation, elements of road infrastructure, centers for transport planning and control, as well as for the procedure for transferring data or exchanging data between them.

The regulatory framework governs the rules in the field of road safety, insurance, rules in the field of passenger and cargo transportation and applies to transport entities, officials and personnel associated with the movement of vehicles and maintenance of road infrastructure.

To ensure the safety of the movement of automated cars, it is necessary to solve a large list of regulatory issues and, first of all, to regulate the rules of the Vienna Convention on Road Traffic of 1968 (hereinafter referred to as the Vienna Convention), which require constant driver control of the car, and the rules governing the automatic movement of vehicles funds.

Currently, the World Forum for Harmonization of Vehicle Regulations (hereinafter - the WP.29 Working Party) and the Global Road Safety Forum (hereinafter - the WP.1 Working Party) of the UNECE Inland Transport Committee, to which the Russian Federation is a contracting party, active work is underway to harmonize the requirements for automation systems for driving a car, taking into account the Vienna Convention.

Thus, in 2014, the WP.1 working group approved amendments to Articles 8 and 39 of the Vienna Convention, which entered into force on March 23, 2016. The amendments assume that any vehicle system that affects the way of driving is recognized as complying with the provisions Vienna Convention, if it meets one of two requirements [4]:

1) the system is included in the list of equipment that is allowed to be installed on vehicles and that meets the relevant technical requirements (UN rules annexed to the 1958 Geneva Agreement “Agreement concerning the adoption of uniform technical prescriptions for wheeled vehicles, equipment and parts which can be fitted and/or be used on wheeled vehicles and the conditions for reciprocal recognition of approvals granted on the basis of these prescriptions” [5] and the UN Global Technical Regulations, developed as part of the “Agreement concerning the establishing of global technical regulations for wheeled vehicles, equipment and parts which can be fitted and/or be used on wheeled vehicles” [6]);

2) the driver can at any time disable (deactivate) the above system and / or put the vehicle in manual control mode. For this, a person should always be inside the vehicle and should be ready to take control.

Thus, these changes provide the ability to move along the roads of highly automated and even fully automated vehicles.

At the same time, there are more than 50 provisions in the text of the Convention that directly or indirectly establish the responsibilities of the driver, including those requiring a subjective assessment of the road situation, and for which no specific features of application have been established taking into account the use of automated driving systems. In this regard, the presence of the driver in a highly automated and fully automated vehicle remains mandatory.

In contrast to the process of creating conventional cars, when creating unmanned vehicles it is of great importance to conduct development tests on public roads. Such tests cannot replace studies at closed test sites, on which it is impossible to recreate the whole gamut of rapidly changing conditions, the movement of real operating conditions, although in many countries special test sites are being created for testing unmanned vehicles (figure 1).
As a rule, existing legislation does not allow the use of unmanned vehicles for traffic on roads, but in some countries it is allowed to test them. In particular, with a number of restrictions it is allowed to test autonomous vehicles on public roads in Europe (Germany, Denmark, Spain, Poland, Finland, France), Australia, China, Singapore and the USA.

In September 2018, a special working group on automated / autonomous and connected vehicles (hereinafter - GRVA) was created within the framework of the WP.29 working group to develop internationally agreed resolutions and guidelines governing the functions of automatic driving. Within the framework of GRVA, four expert groups have been formed in the following areas [9]:

- functional requirements for automated vehicles;
- test driving ability of automated vehicles;
- cybersecurity and software updates;
- data storage systems for automatic driving and event data loggers.

The World Forum for Harmonization of Vehicle Regulations at its 178th session adopted the revised Framework for Automated / Autonomous Vehicles ECE / TRANS / WP.29 / 2019/34 / Rev.1. The main purpose of the document is to identify key safety and security principles for automatic / autonomous vehicles of level 3 and above. This document identifies work priorities for WP.29 and indicates the outcomes and timelines for their achievement.

General principles that will serve as the basis for the further development of unmanned vehicles include, but are not limited to, issues of cybersecurity, safety of the driver and other road users, a fail-
safe response (detection of system failures) and the possibility of automatically involving the driver in the driving task [7].

It should be noted that the European Commission has developed a strategy for Connected and Automated Driving (hereinafter - CAD) regarding connected and automated driving, and has also created a special working group that prepared preliminary recommendations on legislative changes in the field of autonomous vehicles. At the same time, the working group concluded that [10]:

- EU directives on liability for defective products (85/374/EEC) and on motor insurance (2005/14/EC) are sufficient for future automated systems;
- there is no need to agree on test requirements (the Vienna and Geneva Conventions are enough to test autonomous vehicles while the driver/operator is in the car);
- it is necessary to clarify the responsibility associated with the storage of CAD data and create a mechanism for regulating access to this data;
- The 2010 Intelligent Transport Systems Directive (2010/40/EU) can be used as the basis for adopting an agreed set of rules at EU level to create a single market for autonomous vehicles.

One of the leading countries in the promotion of unmanned vehicles is the United States. On September 7, 2017, a law was passed in the United States Self Drive Act, which allowed the testing of unmanned vehicles on public roads [8]. If earlier the authorities of individual states had to independently determine and regulate the rules of law relating to unmanned driving, now all acts are subject to uniform standards. At the same time, the manufacturer of an unmanned vehicle must prove the safety of the structure and immediately inform the National Highway Traffic Safety Administration about road incidents that have occurred with their car.

An unmanned vehicle approved for trial operation must meet a number of requirements:

- the autopilot system must be reliably protected from hacker attacks and theft of personal data of passengers;
- supervisory authorities should have full access to information on vehicle parameters, its movement, participation in road accidents;
- unmanned vehicles must safely respond to obstacles, road crashes, software failures.
- autonomous vehicles should switch to manual control without problems, be able to interact with pedestrians.

Several states have adopted separate laws governing the testing and movement of unmanned transport systems. As of 2018, 33 states have introduced autonomous vehicle legislation. Twenty-one states have enacted legislation on autonomous vehicles, and governors in nine states have issued administrative decrees for autonomous vehicles (figure 3 [8]).

![Figure 3. Blue indicates the enacted state legislation, green indicates administrative decrees.](chart.png)
March 29, 2018 the Government of the Russian Federation approved an action plan (“roadmap”) to improve legislation and remove administrative barriers in order to ensure the implementation of the National Technology Initiative in the “Autonet” area.

The revised plan (as amended on May 13, 2019) includes 86 items. This plan is aimed at ensuring the priority positions of Russian companies in emerging global markets, including the development and promotion of products and services in the field of multimodal logistics, including the creation and development of telematics service platforms, interaction platforms for sharing and other platform solutions in the field of connected cars. According to plan should be developed [1]:

- the concept of safe interaction of autonomous vehicles with other road users;
- proposals for the normative consolidation of the features of the organization of the movement of autonomous vehicles in urban conditions, outside the city and on highways;
- proposals for the responsibility of developers, owners and operators of autonomous vehicles;
- proposals for accounting for the use of autonomous and automatic driving systems in the development of programs for the integrated development of transport infrastructure and integrated traffic management schemes;
- proposals on the procedure for allowing autonomous vehicles to be used on public roads;
- training requirements for operators of autonomous vehicles.

To create the possibility of testing autonomous vehicles on public roads, the Government of the Russian Federation issued a resolution dated November 26, 2018 No. 1415 "On the experiment on the operation of highly automated vehicles on highways." In accordance with the said decree, from December 1, 2018 to March 1, 2022, manufacturers of autonomous vehicles can test their cars on public roads in the territories of Moscow and the Republic of Tatarstan [2]. The car is allowed on the road, provided that the driver is the operator, who is ready to intervene in the control process at any time if necessary, and the car must be insured during the trial operation in the amount of 10 million rubles.

![Figure 4. Yandex equips serial Prius with its own unmanned modules [13].](image)

In May 2019, State Duma introduced a draft federal law “On the pilot operation of innovative vehicles and amending certain legislative acts of the Russian Federation” (hereinafter - the bill) to the State Duma of the Russian Federation. The bill is aimed at removing legislative barriers and creating favorable legal conditions for the pilot operation of highly automated (innovative) vehicles and involves the introduction of the following changes [3]:

- definition of concepts necessary for regulating the trial operation of innovative vehicles;
- establishing the special legal status of innovative vehicles;
- introduction into the legislation of the Russian Federation the possibility of organizing and conducting pilot operation of innovative vehicles on public roads;
- vesting the Government of the Russian Federation with a number of powers in the field of pilot operation of innovative vehicles;
• regulation of the procedure for issuing permits for the pilot operation of innovative vehicles on public roads.

After the entry into force of the relevant Federal Law, the Government of the Russian Federation will have to determine the federal executive body vested with the authority to develop state policy and legal regulation in the field of innovative transport and control functions in this area, as well as establish the procedure for the pilot operation of innovative vehicles on public roads and the procedure for issuing the appropriate special permission, requirements for the minimum insurance amount, within which the insurer undertakes to indemnify for damage caused by the operation of innovative vehicles.

The amendments proposed in the bill will increase the degree of investment activity of testing innovative technologies of transport and create conditions for the development of the innovative vehicle market segment.

3. Findings
When creating unmanned vehicles, lapping tests on public roads are of great importance. Such tests cannot replace studies at closed test sites, on which it is impossible to recreate the whole gamut of rapidly changing conditions, the movement of real operating conditions.

The existing regulatory framework in the Russian Federation and a number of foreign countries allows testing of highly automated and fully automated vehicles on public roads.

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