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Conceptual Approach to Improving Road Safety by Improving Reliability of Equipment

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Abstract

The article deals with the problems of road safety, transport logistics, maintenance of motor vehicles.

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1. Introduction

The aim of the study is to validate the concepts of the development of the traffic safety system, the definition of strategies to reduce the accident rate in road transport under modern conditions.

Today, this issue is particularly tough and important. This is due to the increase in traffic flow, backlog in infrastructure development, increasing public demand for safe, high-tech and modern transport. The aggravation of the problem has been obvious since the early 2000s, when the accident rates started to grow significantly. The risk zone growth was 10% of the total volume of the vehicles. It is estimated that road accidents and incidents today damage the Russian economy at the rate of 2.2-2.5% of gross domestic product.

According to the statistics of road accidents, 80% of them occur due to violations of road safety requirements, about 20% occur due to technical failures and malfunctions.

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General taxonomy and methodical approach to solving the traffic safety problems must be underpinned by a whole set of institutional arrangements, both at the level of federal projects and target programs, and at the level of local governments. Another important factor is the prevention and promotion activities aimed at reducing the number of traffic accidents of all severities.

Special attention should be paid to the technical validity, serviceability and compliance with procedural regulations of the vehicles' condition. This is especially true when their work is connected with the carriage and service of passengers, transport of dangerous goods.

This is also an urgent matter in the system of aircraft maintenance and surface coverings in Russian airports. The aviation enterprises have certain rules of being in a controlled area, as well as traffic rules at the airport. There are cases when there is a traffic accident involving specialized equipment. This can lead to flight delays, downtime performance and significant financial losses. Therefore, all air transport companies try to maintain a high degree of reliability of equipment in service and avoid cases when due to the failure of individual units or elements dangerous incident or a traffic accident can occur [Lukyanov (2000)].

2. Main part

Reliability is understood as the "property of an object to keep, in time within the established values, the parameters characterizing the ability to perform the required functions in the set modes and conditions of use, maintenance, repair, storage and transportation" [State Committee for Standards (1983)].

Reliability is usually characterized by a combination of properties such as dependability, durability, maintainability and storability.

If dependability, defined as "property of an object to continuously maintain usable state for a certain time or a certain operating time," reflects the considered property of an object in the given conditions, durability, maintainability and storability are connected both with the object properties, and the characteristics of the operation system, that is, system of maintenance and repairs, method for providing spare parts, storage and transportation conditions, etc.

Of course, these properties depend on the application of equipment, the actions of individual economic factors and the extent of human influence on the whole system. Therefore, reliability can mean dependability of an object in conditions set by the normative and technical documentation, except as expressly provided.

Events that entail a malfunction of a system or mechanism are called failures. Consequently, reliability, being one of the properties that characterize the quality of the object is directly related to all other properties that act as the object parameters in determining the reliability of an object. In turn, all the most advanced technical features including accuracy, speed, efficiency, safety, etc. can be implemented only in case of high reliability. Frequent downtimes of an object, caused by failures, reduce its performance, efficiency, safety, and often cast doubt on the feasibility of using such an object [Glossary of terms and definitions (1999)].

As a result, during a failure an emergency situation may appear, the development of which is fraught with both obviously known and unpredictable consequences, including material, economic, environmental, social and other types of damage.

The issue of the safety concept baseline originates from the failure and critical situations analysis system, on which the overall risk model is based, and the system is called an "acceptable risk model." The reasons for this transformation lay in the transition from sustainable development and regulated activities in the development of the state to the social and political instability of society, growth of economic problems, limiting wear of fixed assets, increase in the frequency and the number of emergency situations, etc. An objective concept of automobile safety must have a balance between the optimal level of expenses for maintenance of vehicles, lack of downtime, outages and the acceptable level of risk for a given situation. This can be intuitively seen in the graph shown in Figure 1.