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HUMAN FACTOR IN THE "DRIVER-CAR-ROAD-ENVIRONMENT" SAFETY SYSTEM

Summary. *This article considers emergence of a concept of "human factor" and its influence on the complex "Driver – Car – Road – Environment" (DCRE) system. Specific features of the human role in the transport safety system and in the complete complex DCRE system were analyzed. The author substantiated the necessity to consider human factor when reviewing safety of the DCRE system.*

Key words: *automobile transport, safety, DCRE system, human factor.*

Research materials. Safety of automobile transport in the transport process is one of the main road safety tasks in Ukraine, the achievement of which will allow reaching international safety standard. However, the high level of road accidents in Ukraine introduces the problem of automobile transport safety and identification of causes of accidents in a range of national issues of great social and economic importance. Analysis of road accidents indicates critical road traffic situation, identified by different condition of transport vehicles driven by professionals and amateur drivers with different levels of experience and responsibility for their actions, with various spectra of psychophysiological state and state of health; all these factors make the so-called "human factor".

It is known that the safety of automobile transport in the transport process is determined by reliability of the DCRE system in general and reliability of each of its components. Failure of at least one element of this system may lead to an accident. Over time, this led to formation of a concept of "human-machine" system, which includes an operator (human) and a machine, with the help of which the work is performed [7]. The driver, who performs some actions while driving, introduces some uncertainty in the driving system through the so-called "human factor" [4, 6]. The more complex is the task he shall complete, the greater is the uncertainty of the driven object.

In general, operation of the DCRE system is influenced by many factors that are in intricate relations, and a driver sometimes is not able to consider all the factors when choosing among several driving solutions. A driver, a car driven by him, a road on which this vehicle is moving and a vehicle environment comprise a complex system of dynamically related links, united with a common purpose and an information exchange network. Realization of capabilities, weak and strong points provides a driver with an option of selecting of such an operation mode, in which he will have time to process the entire volume of incoming information, to make the right decision based on this information and to implement it timely.

It is proven that in a complex DCRE system a driver is an operator [3, 7]. From the analysis of works of researchers in the field of psychophysiological characteristics of activity of the operator, it is possible to conclude that a driver is a part of the DCRE system, the functions of which are making decisions based on processing of received information and implementation of control actions [1, 5, 9]. It shall be noted that the DCRE system is not a random collection of elements, but a set of functionally related elements. In other case, we are not talking about the system, but about the set of elements from which the system shall be assembled.

According to scientists [3] who investigated methods of improving the system of drivers training, working processes performed by drivers when driving a vehicle are typical for activities of any operator of any complex system. These are the operations connected with reception and processing of information, changing the parameters of the controlled object and control of performed actions. Each of functionally related elements performs either receiving, processing or transmission of information – that is, every element is involved in the process of information transformation. The important point is that any system is designed to perform one or another production process. Thus, the "system" definition can be formulated as "a set of functionally related elements that perform transformations and execute the technological process according to the set goal" [6, 7].

It is well known that if the execution of certain functions is conferred on a human, such system is called a "human-machine" system [7]. It shall be noted here that modern systems can be divided into two classes: technological and organizational ones. In the first class systems, a person who manages the manufacturing units and processes with the help of technical means is the operator. In the process of activity modeling, the operating driver cannot be equated to any of complex technical units. His work is not a completely designed system element. Most of his professional characteristics are formed not in the design process, but in the process of his life and work [9].

The above may be applied to the complex DCRE system. A driver acts as a system controller, which performs functions of reception and processing of outgoing information in conditions of continuous emergence of obstacles, generates control signal and effects the car control using operating elements. Functions associated with the sensory activity of a driver cannot be fully formalized yet. Now there is a gap between approaches to the description of psychological characteristics of the human and functioning of a machine due to specificity of research methods in psychology and technology. Creation of a human-machine system requires a unified approach to this system as a whole and a common language to describe it.

It shall be noted that abroad great importance is given to studies of human-machine DCRE system [11]. The researches, where for optimization of car design parameters the estimates in the form of amount of consumption of physiological energy by a driver while driving are used, are of special interest. The energy consumed by a driver for making decisions may be determined by the ratio of correction of driver's actions and incoming information [5].

As different systems, operation of which is mainly determined by human activities, become the objects of technical construction and design more often, the interest to these problems has increased significantly. A systematic approach for design of the "human-machine" system, as well as for development of effective strategies for study of current problems, is used more often now. The specificity of systematic approach is determined by the fact that it focuses the study of the "human-machine" system on disclosure of integrity of the object and the mechanisms supporting it, identification of different types of relations in a complex object and bringing them together into a single theoretical picture [2, 6].

In connection with the study and design of the "human-machine" system as a functional unity, a relatively new concept of a "human factor" was created [10, 12]. A human factor can be described as a system of psychological, socio-psychological, physiological features and abilities, which are manifested during interaction between people and which have significant impact on efficiency of social labor. First of all, we are talking about human abilities, motives of its behavior, interests and creative abilities, performance, intellect and emotions, will and temperament, self-awareness, formation of social attitudes and value systems, etc. It is a complex of features of a human and its social environment, in the human activities are implemented.

The term "human factors" itself, which was stated as a result of translation and reduction of an expression "human factors engineering", is widely spread mainly in the USA, where it refers to a knowledge area and a new profession, which in Europe and on other continents is defined with a term "ergonomics" for the purpose of definition of a special knowledge area and a sphere of professional activity [2, 10, 12]. Human factors and ergonomics as areas of scientific research and development had some differences at the early stages of their development, despite of the fact that they represented the same direction of scientific and practical activity. However, the differences between them were becoming more leveled over time, and this direction was enriched due to convergence of researches and development of human factors in engineering and ergonomics [8, 11].

Conclusions. During research done on human and its labor activity in a DCRE complex system it was found that combination of operational abilities of a human and speed capabilities of a machine significantly improve control efficiency. Despite joint execution of control functions by a human and a machine, each of the two components of the "human-machine" system complies only with its own peculiar principles, and the effectiveness of the system as a whole is determined by the way the features specific for a human and a machine were identified and considered, including limitations and capabilities.

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