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**TRAFFIC ACCIDENTS: MAIN CAUSES,
ACCIDENTS ANALYSIS, REDUCTION
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This article analyzes traffic accidents in the Rostov region in 2018, their main causes, dependence on time of day, driving experience, age of drivers. Methods for reducing accident rates are proposed. There is a decrease in the number of road accidents compared with 2017 on the example of statistical data provided by the State Road Transport Inspectorate and posted on the Internet. Options for conducting additional internships, contests of knowledge of the road traffic regulations, driving skills competitions, road rally, methods of speed limit remote control, comfortable driving, introduction of driver physical monitoring systems, introduction of vehicle technical condition monitoring systems, fault indication systems are considered. Special attention is given to the use of risk-based approach in road transport enterprises and risk class reduction.

Keywords: traffic accident, accident, accident rate on transport, reduction methods, electronic devices, risk-based approach.

Introduction. Table 1 presents information on accidents on the Rostov region roads in 2017-2018. It includes the total number of cases of road traffic accidents (RTA), cases of injury and death of road users. It provides comparative data (in percentage form) in relation to the last year's period (LYP).

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**ДОРОЖНО-ТРАНСПОРТНЫЕ
ПРОИСШЕСТВИЯ: ОСНОВНЫЕ
ПРИЧИНЫ, АНАЛИЗ АВАРИЙНОСТИ,
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Анализируются дорожно-транспортные происшествия в Ростовской области за 2018 год, их основные причины, зависимость от времени суток, водительского стажа, возраста водителей, предлагаются методы снижения аварийности. Отмечается снижение количества дорожно-транспортных происшествий по сравнению с 2017 годом на примере статистических данных, предоставленных государственной автомобильной инспекцией и размещенных в сети интернет. Рассматриваются варианты проведения дополнительных стажировок, конкурсов знаний «Правил дорожного движения», соревнований по мастерству вождения, по дорожному ралли. Предложены методы дистанционного контроля скоростного режима, комфортного вождения. Рассмотрена целесообразность внедрения систем контроля физического состояния водителя и технического состояния транспортного средства, систем индикации неисправностей. Отдельно рассматриваются применение риск-ориентированного подхода в автотранспортных предприятиях и снижение класса риска.

Ключевые слова: дорожно-транспортное происшествие, ДТП, аварийность на транспорте, методы снижения, электронные устройства, риск-ориентированный подход.

Table 1

Number of accidents on the roads of the Rostov region

Indicator name	RTA	± % LYP	dead	± % LYP	injured	± % LYP
Number of accidents in 2017	4626	-7.1	598	-16.0	5838	-4.4
Number of accidents in 2018	3925	-15.2	554	-7.4	4860	-16.8

Despite the overall dynamics of reducing the number of road traffic accidents in 2018 compared to 2017, their total number remains very impressive. In 2018 in the Rostov region, there were 3925 accidents in which 554 people died and 4860 people were injured. The number of accidents involving children under 16 years - 378, 19 children died and 403 children were injured in these accidents. Every day people die on the Rostov region roads. What are the causes of these accidents? Analyzing the statistics [1], it can be noted that the maximum number of accidents occur both in dinner time and in the evening rush hours, which can be explained by the general fatigue of drivers. Table 2 shows the number of accidents at different times of day.

Table 2

Road traffic accidents by the time of their occurrence

Time of the day interval	00–01	01–02	02–03	03–04	04–05	05–06	06–07	07–08	08–09	09–10	10–11	11–12
Number of accidents	90	74	55	58	52	46	101	173	187	183	169	199

Continuation of table 2

Time of the day interval	12–13	13–14	14–15	15–16	16–17	17–18	18–19	19–20	20–21	21–22	22–23	23–24
Number of accidents	202	194	194	225	212	272	282	249	227	181	168	132

Tables 3-5 provide data on the number of accidents due to traffic violations (traffic rules), depending on the type of vehicle, intoxication, age and drivers' experience.

Table 3

Number of accidents for different types of vehicles and drivers in a state of intoxication

Types of vehicles and drivers in a state of intoxication	Number of accidents
All types of vehicles	3334
Cars	2716
Cars with drivers in the state of intoxication	196
Trucks	266
Trucks with drivers in the state of intoxication	5
Buses	73
Buses with drivers in the state of intoxication	2

Types of vehicles and drivers in a state of intoxication	Number of accidents
Motorcycles	89
Motorcycles with drivers in the state of intoxication	28
Mopeds and equivalent vehicles	55
Trams	1
Trams with drivers in the state of intoxication	0
Trolleybuses	3
Trolleybuses with drivers in the state of intoxication	0
Tractors and other self-propelled machinery	11
Tractors and other self-propelled machinery with drivers in the state of intoxication	1

Table 4

Age of drivers, years	00–10	10–14	14–16	16–18	18–21	21–25	25–30	30–40	40–50	50–60	60–70	More than 70
Number of accidents	0	5	6	16	165	287	464	916	593	399	247	72

Table 5

Driving experience, years	До 2	2–5	5–10	10–15	More than 15
Number of accidents	229	397	655	459	

Summarizing the information presented in tables 2-5, it is worth noting that 3334 accidents occurred because of traffic violations by drivers. Of these, drivers of cars — 2716 accidents, drivers of trucks — 266 accidents and bus drivers — 73 accidents. The number of bus passengers' casualties amounted to 9 people, which is 40 % less than in 2017. Some sources claim that the younger the driver is, the more likely he is to become the culprit of an accident [2]. Statistics say the opposite. The number of accidents with drivers from 18 to 25 years is 452 cases, and at the age of 25 to 30 years — 464 cases, in the age group from 30 to 40 years — 916 cases. With the further increase in the age of drivers, the number of accidents gradually decreases. Therefore, for the age group from 40 to 50 years, the number of accidents is 599, and for the group from 50 to 60 years, this figure is 399. The biggest number of accidents caused by drivers is observed among the drivers with long work experience (over 15 years) — 1427 cases. For drivers with experience less than 2 years, there were only 229 accidents. 244 accidents were drunken-driving accidents; in 80 cases drivers refused to undergo a medical examination.

Table 6 presents statistical data on the most typical emergencies associated with road accidents. It considers 3925 cases. Among them 995 people were injured in accidents, at the place of which there were

violations of the mandatory requirements for the operating condition of automobile roads and railway crossings under the conditions of ensuring road safety (RS).

Table 6

Accident circumstances and the number of the injured

Accident circumstance	Number of the injured
Collision of vehicles	1782
Overturning of vehicles	225
Collision with a standing vehicle	188
Automobile-pedestrian accident	1096
Collision with an obstacle	250
Automobile-bicyclist accident	117
Collision with animal-drawn transport	0
Passenger drop	98
Collision with an animal	3
Other types of circumstances	166

Table 6 shows that the maximum number of the injured (1782) was in car collisions. The second place was automobile-pedestrian accident — 1096 cases. The third most common accident — violation of the operational condition of roads and railway crossings to comply with road safety — 995 cases. Attention is also drawn to the increase in the number of accidents caused by the operation of technically defective vehicles. In 2018, there was an increase of 53.8% compared to the same indicator last year.

Conclusion. Possible ways to reduce the number of accidents:

- assessment of traffic rules knowledge. It may be voluntary, organizing knowledge competitions in road transport companies, as well as arranging competitions for motorists as road rally. Drivers working in road transport enterprises should regularly undergo training on traffic rules knowledge. For unemployed drivers with experience over 15 years and age over 35 years, it is recommended to introduce a mandatory test of traffic rules knowledge, for example, with periodic reissue of the driver's license. The incentive to comply with the traffic rules is also the presence on the vehicles of transport enterprises phones with the person responsible for the observation of traffic rules or the dispatcher, given the fact that any person who recorded the fact of traffic rules violation by the car of the enterprise can call them;
- driving quality improvement. To this extent, it is necessary to include the organization of courses of driving maneuvers training of motorists and employees of enterprises working on certain vehicles, as well as driving competitions for motorists and between motor transport enterprises. In addition, it is possible to carry out such activities as cultural events (family events) for family members of employees of

motor transportation enterprises [3]. An important factor is the installation of critical acceleration sensors on vehicles, which could record motion smoothness of these vehicles. For vehicles, carrying passengers and heavy goods, especially in a liquid state, the installation of such sensors should be mandatory;

- organization of systems that monitor physical well-being of drivers. If a driver violates work-rest schedule, or just suddenly feels bad, but continues to drive a vehicle — it can lead to a tragedy. On trucks weighing more than 3.5 tons, on buses and cars carrying passengers, it is necessary to provide an alcohol-screening device that activates periodically [4]. Information on exceeding the safe threshold values of these parameters should be displayed on the dispatcher control unit of the motor transport enterprise and on the external light indicator installed on the car, as well as on the information board in the cabins of cars carrying passengers;

- installation of systems that control the car speed and its technical condition. The systems should transmit data to motor transport enterprises on the vehicle speed, on its technical serviceability [5]. Information on exceeding the safe threshold values should also be sent to the dispatcher control unit of the motor transport enterprise and the external light indicator on the vehicle, as well as to information boards in the cabins of cars carrying passengers;

- weekly monitoring of roadway and road equipment state for compliance with the requirements for the operational state of roads and railway crossings to comply with road safety.

Achieving all of the above-mentioned things will help to increase the level of safety of road transport enterprises and to reduce the hazard class resulting from the application of the risk-based approach.

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