Summary
Vehicle damage forecasting is a well-known topic in mechanical engineering. One of the basic problems in this topic is the insufficient number of experimental objects that can be the basis of the reliability analysis.

In the automotive area, this problem results from the limited size of the fleets of vehicles under analysis. The CEPIK 2.0 system has recently been introduced in Poland, which collects data about vehicles, as well as about defects detected during periodic car tests at control stations. In total, approximately 40,000,000 of these tests are carried out annually in the country. The use of the CEPIK 2.0 system to forecast damage may significantly increase the level of road safety related to the poor technical condition of vehicles in the country.

In this dissertation, a database of standard registered vehicle faults was prepared. A complementary set of numerical tools was also prepared, including: data filtering programs, programs for operational reliability analysis of the tested sample of vehicles, as well as a methodology for optimizing vehicle reliability parameters. The calculations were carried out in the MS Excel environment.

Age and road mileage of vehicles until the failure (damage) were selected as measures of reliability. The statistical distributions of the moments of failure of the tested vehicles were determined. The experimental data was approximated by a reliability model based on the Weibull distribution. The following were determined: the normalized failure probability density function, the reliability function and the risk function. The degree of fit of the Weibull distribution was assessed using the coefficient of determination R^2. Then, the work presents an example of the use of the proprietary reliability model for a comparative analysis of the influence of the vehicle origin on the probability of its damage.

The purpose of these calculations was to present the possibility of using the CEPIK 2.0 database in the practical prediction of reliability threats. A method for verifying the vehicle reliability model was also developed. For this purpose, information from the prepared database was divided into two groups: basic (covering 30% of data) and verification (covering 70% of data). Then, the verification group was described with a reliability model and the model parameters were optimized. In the summary, the compliance of the models describing the basic group and the verification group was compared. This compliance was assessed using a statistical test.

The most important effects of the doctoral dissertation are:
- development of a database of periodic technical inspections at vehicle inspection stations on the country scale,
- development of a vehicle reliability model according to the Weibull distribution based on a database of periodic technical tests,
- development of a method of forecasting faults in vehicles based on the results of standard technical tests, assuming the proprietary model of reliability.