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## NORMALIZATION OF ENGINEERING SYSTEM STRENGTH AND RELIABILITY

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This paper briefly overviews the studies conducted in 2014 – 2018 along the following research line of the Institute of Technical Mechanics of the National Academy of Sciences of Ukraine and the State Space Agency of Ukraine approved by the Presidium of the National Academy of Sciences of Ukraine: the strength, reliability and optimization of mechanical systems, launch vehicles, and spacecraft. The paper generalizes investigations into the effect of local loads and contact interactions of structural components which result in stress and strain concentration and plastic deformation zones and increase the risk of failure under local actions. Failure mechanisms, which govern limiting loads and safety factors, are constructed using schemes of a perfectly plastic material. Carrying capacity prediction schemes for thin-walled structures are considered with account for plastic deformations. Projection iterative schemes of the local variation method, which reduce the computation time in comparison with the standard local variation method, are proposed. The paper considers solar concentrator dynamics and strength simulation issues and investigations into the vibration strength, local-loading strength, and thermal strength of solar concentrators and into the effect of residual stresses developed in production processes and electrolyte formulation for those processes. Methods were developed for increasing the longevity of materials by setting up self-organizing processes therein under energy loading with fields of different physical nature. Normative basics were developed for calculating the life of launch vehicle launching facility structures. Quantitative and qualitative requirements for the reliability of an engineering system and components thereof to be met at the design stage were identified. Software reliability models and failure features were analyzed. Basic approaches to software reliability assurance were analyzed, and it was pointed out that they cannot assess software reliability in full measure. Factors that affect the number of software errors and factors that contribute to software reliability improvement were revealed, and ways to improve software reliability were proposed.

**eywords:** *strength, reliability, longevity, engineering systems, residual life, projection iterative methods.*

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