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STRENGTH, RELIABILITY, AND LIFE OF AEROSPACE AND POWER ENGINEERING STRUCTURES

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This paper gives a brief overview of investigations into the strength, reliability, and life of aerospace and power engineering structures conducted along the following reseach line of the Institute of Technical mechanics of the National Academy of Sciences of Ukraine and the State Space Agency of Ukraine: the strength, reliabiliyty, and optimization of mechanical systems, launch vehicle, and spacecraft. The basic literature sources of 1991–2021 are cited. A more detailed consideration is given to the results obtained in 2014–2021 and published (monographs, articles indexed in international citation databases, and international conference papers). They involve the simulation of deformation of inhomogeneous material, in particular concrete, in heat-and-power engineering structures, the life estimation of shell structures of rocket/space hardware in the presence of stress concentrators in the form of openings, inclusions, and cracks, and the development of a methodological basis for the strength, reliability, and life of launch complexes for launch vehicles of different spacecraft classes. The methodological stages of calculation are considered, and high-intensity thermomechanical loads are classified. The life of launch complexes is determined using the notion of low- and high-cycle fatigue. Consideration is given to the development of fast projection-iteration schemes of the finite-element method and the method of local variations, which significantly reduce the computational time and may be used to advantage when a large body of calculations is needed in the design and development of new aerospace hardware and power engineering structures with the use of experiments at the developmental stage. In doing so, the effect of inelastic deformations in the vicinity of cutouts is analyzed. A numerical simulation of the strength and stability of inhomogeneous shell structures with the use of the above-mentioned new computational schemes is considered. Investigations of this type first of all involve inhomogeneous thin-walled shell structures at local loads and the effect of reinforcing inclusions on stress and strain concentration.

Keywords: *strength, reliability, life, power engineering, launch vehicles, launch complexes, inhomogeneous shell structures.*

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