Innovative methodology for calculation and design of liquid-propellant rocket engine combustion chamber

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The methodology for mathematical modeling which makes it possible to perform calculations and design of liquid-propellant rocket engine combustion chambers, minimizing the number of bench tests, has been proposed in this article. Nowadays the numerous fire tests are the basic methods to test the strength of the combustion chambers. By combining a number of software packages (ANSYS, pSeven) the developed methodology enables us not only to perform a checking calculation but to design an optimal structure as well. We describe a step-by-step sequence of actions. Moreover, we give some recommendations for a calculation of a LPRE combustion chamber on several operating modes in terms of low-cycle fatigue. The proposed methodology has been approved while designing the 11D58MF cruise engine.

Keywords: *mathematical modeling, finite-element method, substructure, cyclic symmetry, anisotropy coefficients, optimization, mode of deformation, nozzle, combustion chamber, liquid-propellant rocket engine, cooling channels.*

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