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**CURRENT PROBLEMS IN THE LOW-FREQUENCY DYNAMICS OF LIQUID-PROPELLANT ROCKET PROPULSION SYSTEMS**

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One of the key problems in liquid-propellant rocket engine (LPRE) design is to provide the stability of LPRE working processes, in particular low-frequency stability. In LPRE experimental tryout, every so often there occur situations where the development of divergent oscillations set up in some of the LPRE loops or units results in contingencies: exceeding the engine ultimate strength, pump stall, chamber ignition, etc. Such contingencies may lead to grave consequences, including engine and bench equipment failure. Because of this, mathematical simulation is one of the main tools that allow one to predict the dynamic performance of an LPRE both in its steady operation and in transients and its startup operation features at the design and tryout stage. This paper overviews and analyzes scientific publications for the past 15 years concerned with the study of the dynamics and low-frequency stability of advanced LPREs and units thereof along different lines. This analysis made it possible to identify problems in low-frequency stability prediction and assurance for liquid-propellant rocket propulsion systems (LPRPSs) under design, to cover new research results (experimental and theoretical) on the origination and development of all-engine low-frequency oscillations and low-frequency oscillations in LPRPS systems and units and to identify new approaches to the mathematical simulation and study of low-frequency processes in LPRPSs and promising lines of investigation. The main lines of the analysis are as follows: the low-frequency dynamics of cavitating inducer-equipped centrifugal pumps and LPRE gas paths, LPRE thrust control problems, the interaction of launch vehicle airframe longitudinal oscillations with low-frequency processes in the sustainer LPRPS, dynamic processes during an LPRE startup/shutdown, and low-frequency in-chamber oscillations.

**Keywords:** *liquid-propellant rocket engine, low-frequency stability, all-engine oscillations, cavitation, inducer-equipped centrifugal pump, feed system, gas generator, combustion chamber.*

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