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# PARAMETRIC DETERMINATION OF HYDRODYNAMIC PROCESSES IN FEED SYSTEM OF SPACE STAGE IN STOPPING AND STARTING THE CRUISE ENGINE

A methodic approach to a parametric determination of hydrodynamic processes in the feed system of the launch vehicle space stage in starting and stopping the cruise engine for a complex mission is developed.

The approach takes into account special features of the stage feed system operation and its design, including the power dissipation in a liquid, acoustic phenomena in manifolds, wall compliance of manifolds and gas inclusions in a liquid, the configuration of the supply line, time dependencies of the valve overlapping area in engine stopping and the time changes in the cruise inlet pressure and flow rate in starting.

The approach is based on mathematical simulation of supply lines as distributed parameter systems, approximation of their frequency characteristics by hydrodynamic finite elements and building a mathematical model of a nonlinear dynamics of the engine feed system. The results of a numerical simulation of hydraulic shock in the bench feed system, which is structurally close to the standard feed system, demonstrated a satisfactory agreement between the calculated and experimental parameters of hydrodynamic processes.

The methodic approach proposed allows the determination of the hydraulic shock parameters and the resulting effects in different members of the space stage feed system in starting and stopping its cruise engine in the flight, the reduction of the scope and costs of the experimental development work, in particular, when changes in the feed system are applied to the stage design.

***Keywords:*** *liquid launch vehicle, space stage, starting and stopping cruise engine, parameters of hydraulic impact for feed system, mathematical simulation, model testing.*

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