The experience of testing and applying functional simulators-based technology for designing systems and integral units of rocket and space equipment

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Until recently at the stage of designing rocket and space equipment the projected operating parameters of complex engineering systems were defined according to own calculations, in particular by writing own program codes, according to the experimental method and / or 3D-simulation in computational software packages. In recent times there have appeared new engineering analysis tools, e.g. Siemens LMS Imagine. LabAMESim, that allow developing multidisciplinary 1D-models of engineering systems, simulating complex operation of technical systems and modeling their ongoing physical processes.The technology for designing the functional simulators as applied to the systems and integral units of the designed items of equipment was tested in S.P. Korolev Rocket and Space Corporation Energia in order to define its applicability and potential for designing the items of rocket and space equipment. The article presents the results of modeling the complex inflight functioning of the upper stage propulsive effector fragment and the separating process of the projected item component parts. We also introduce the simulation results for the thermocontrol systems hydraulic circuits, electromechanical drives, air-over hydraulics aggregates, charge-driven piston mechanism, relay-controlled device and electrical circuitry. The simulation results were compared and coincided very well with the test data and / or calculation data. We recommend applying the functional simulation technology as an additional tool when designing the systems and items of rocket and space equipment.

Keywords: *simulation modeling, computer-generated simulation, functional simulator, AMESim, air-over hydraulics, separating, push-rod, thermocontrol system, hydraulic circuit, valve, electromechanical drive, charge-driven piston mechanism, relay-controlled device, electrical circuitry*

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