
Fundamental relationship as the basis of ISS integrated propulsion system mathematical model

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The integrated propulsion system (IPS) of the International Space Station (ISS) as a pneumohydraulic system is the facility containing a large number of elements. Malfunction in the IPS operation may be critical for the ISS functioning. So, solving the modeling task and investigating the phenomenon of fluid and gas distribution between the capacities during the IPS operation is the essential task. To solve this problem, we developed a mathematical model of the system. According to the proposed relationships, we carried out numerical calculations for the model system containing three tanks. The initial boost gas pressure and liquid volumes in all tanks were given. As a model fluid we selected water, as a model gas we selected molecular nitrogen. The purpose of the calculation was testing the model relationships. The findings of the research show the adequacy and consistency of the model. The process directions are in accordance with the conceptions about the state change patterns in the described system. The relationships could be used in developing an IPS pneumohydraulic mathematical model, which makes it possible to assess and analyze the system processes while operating the IPS.

Keywords: *integrated propulsion system, pneumohydraulic system, modeling of fluid redistribution, mathematical model, analysis of system operation.*

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