UDC 629.7: 621.642: 532.529

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METHODIC APPROACH TO FORMATION OF ACTIVE CONTROL OF HYDRODYNAMIC CONDITIONS IN FUEL TANKS OF CARRIER ROCKET BASED ON STATUS MONITIRING

A methodical approach to formation of an active control of hydrodynamic conditions (HDC) in fuel tanks (FT) of a carrier rocket (CR) during the flight is developed using the parameter of the free gas inclusion (FGI) in the entrance of the jet engine fuel lines, based on information about the CR status.

Because of inadequacy of the existent methods and tools for measuring the FGI concentration and parameters of their motion in FT, models of the basic processes influencing the FGI formation and motion in the fuel components (FC) spouts exposed to the flight loadings are proposed for the current estimations of these parameters. These models are simple but substantial as regards the control problem.

The HDC model as a control object is formed to forecast the possibility of emerging the critical situations with the FGI concentration in the entrance of the fuel lines, measuring parameters of the CF real pressure field.

A rational control strategy assuming the use of the pressure in the FT free gas volume as a control action providing the necessary controllability and the technique of its change by controlling the gas flow for the FT supercharge are proposed.

The chosen strategy predetermines the possibility of forming the HDC active control system on the basis of a simple control algorithm with the full dimensional feed-back and existing facilities and resources of a carrier rocket for a wider range of the CR trouble-free operation in comparison with passive facilities of the HDC control.

Keywords: carrier rocket, feed system, fuel tank, active control, model, hydrodynamic conditions, free gas inclusions, pressure field, rectified gas diffusion.

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