SPACE PROPULSION SYMPOSIUM (C4)
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SYSTEM OF FUNCTIONAL DIAGNOSTICS OF LPRE

Abstract

The system of functional diagnostics of LPRE for evaluation of correctness of its operation, as well as identification of pre-emergency states of engine by determining the time of occurrence and localization of engine fault at stand fire tests, developed in NPO Energomash, is presented. Main structural components of this system: 1) mathematical model of stationary working processes of a particular engine; 2) the telemetry of slow changing processes (pressures, flowrates and temperatures of propellant components, frequencies of rotation of shafts of turbopump units, positions of drives of operational modes control); 3) algorithms for generating of diagnostic signs and decision-making. Resolution of system of functional diagnostics is determined by the accuracy of measurement of parameters and their sensitivity to a change of the characteristics of the major units. There are three types of diagnostic characteristics: 1) mismatches of measured and calculated on the model a values of parameters of working processes; 2) changes of pressure and power characteristics of pumps and turbines, hydraulic characteristics of lines, thermal state of hot gas lines and cooling ducts; 3) mismatches of functional links arising out of failure. System of functional diagnostics is a complex of computer programs which operate in automatic and semi-automatic modes, and can be used in real-time. The work is illustrated by examples of diagnosing of specific LPRE fault during stand fire tests.