Experimental and theoretical characterization of the safety management system performance in a liquid rocket engine based on electromagnetic properties of combustion products

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The paper presents the emergency protection system of a liquid rocket engine and its structural scheme, which is based on measuring the amplitude of the magnetic field being much faster (0.01 s) than the traditional means (0.04…0.05 s). The authors modeled a system «Combustion chamber», which is a primary measuring transducer of the high-intensity magnetic field produced by the combustion products of hydrocarbon fuels. A time lag (performance) was estimated which occurred after a sudden change of both the pressure in the combustion chamber and the diameter of the nozzle throat. The parametric analysis shows that the combustion chamber volume of the diagnosed engine as well as the design features and the parameters of a transmitter oscillator circuit influence greatly the final performance of the system. Temporal characteristics of the transition process can determine the electrical characteristics as a source of information about the functionality of the liquid rocket engines.

Keywords: *magnetic field, emergency protection system.*

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