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DEVELOPMENT OF THE ANALYSIS METHODS FOR SOLAR PROBE THERMAL PROTECTION

Abstract

The purpose of this research was to develop computational technique for design of thermal protection of Solar Probe. Methods of thermo-ballistic analysis of space transportation systems for an interorbital flight will be created. It is planned to develop a method for designing the trajectory of a spacecraft using the gravitational maneuver at the Venus. Also, there will be proposed a method of optimization of the trajectory of the transport maneuver under consideration with various optimization criteria (speed, mass criteria). A method of optimal design of thermal protection will be developed with a theoretically predicted effect of a change in thermal state depending on changes in trajectory parameters. It is planned to develop computational algorithms and software in order to solve the problems of refining the integral characteristics of the radiative heat flux and thermal materials under unsteady heating conditions. Computational verification of the developed algorithms with respect to high-temperature thermal protective materials will be performed, including as part of the structural element of thermal protection. Practical use of scientific results is possible in related industries, in solving problems related to the optimal design of thermally loaded structures, with the creation of thermal protection, including on the basis of promising materials with high heat resistance. The development of a methodology for solving thermal design problems will allow optimal design of rocket, aerospace and nuclear engineering designs and can be used in modeling and diagnosing processes in medicine, engine building, power engineering, metallurgy, studying the mechanical, thermal engineering and optical properties of new materials.