

ON THE CHOICE OF PROGRAMS TO CONTROL ROCKET MOTION ALONG A BALLISTIC TRAJECTORY

*Institute of Technical Mechanics
of the National Academy of Sciences of Ukraine and the State Space Agency of Ukraine
15 Leshko-Popel St., Dnipro 49005, Ukraine; e-mail: office.itm@nas.gov.ua*

This paper formulates the complex problem of co-optimization of the design parameters, trajectory parameters, and control programs of a single-stage rocket with a solid-propellant sustainer engine at the initial design stage. The problem is formulated as an optimal control problem with constraints in the form of equalities and differential constraints. The parameters to be optimized are the basic design parameters of the rocket and the trajectory parameters that determine rocket motion control programs. In the proposed approach, the control programs (time variation of the pitch) in different portions of the trajectory are formed as polynomials, which reduces the optimal control problem considered to a nonlinear programming problem with constraints in the form of equalities and differential constraints. The solution of the complex problem formulated in this paper allows one to determine motion control programs optimal in a given class of functions and advisable values of the rocket design parameters at the initial design stage.

Keywords: *controlled rocket, mathematical model, design parameters, trajectory parameters, control program, initial design stage, solid-propellant rocket engine.*

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