

# COMPUTER MODEL OF THE ARCHERY ARROW INTERNAL BALLISTICS

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The aim of the research was to summarize a mathematical model of bow and arrow interaction in the vertical plane and to develop an appropriated computer model of the archery arrow internal ballistics. A bow was modeled as a non-deformed riser and hinged to it two non-deformed limbs with Archimedean springs. An arrow was modeled as a rod hinged to the string in a nock point. A mathematical model of bow and arrow interaction was created using Lagrange method as a system of ten differential equations and initial conditions. Correspondent Cauchy problem was solved using Runge-Kutta method and NDSolve programs from Mathematica package. The initial conditions were determined as solution of a static problem based on the bow model in a drawn situation. Correspondent system of non-linear algebraic equations were solved using Newton method with FindRoot program. The model shown its possibility to study main kinematic and kinetic parameters of bow and arrow interaction in the vertical plane. Results of modeling was presented in graphs.

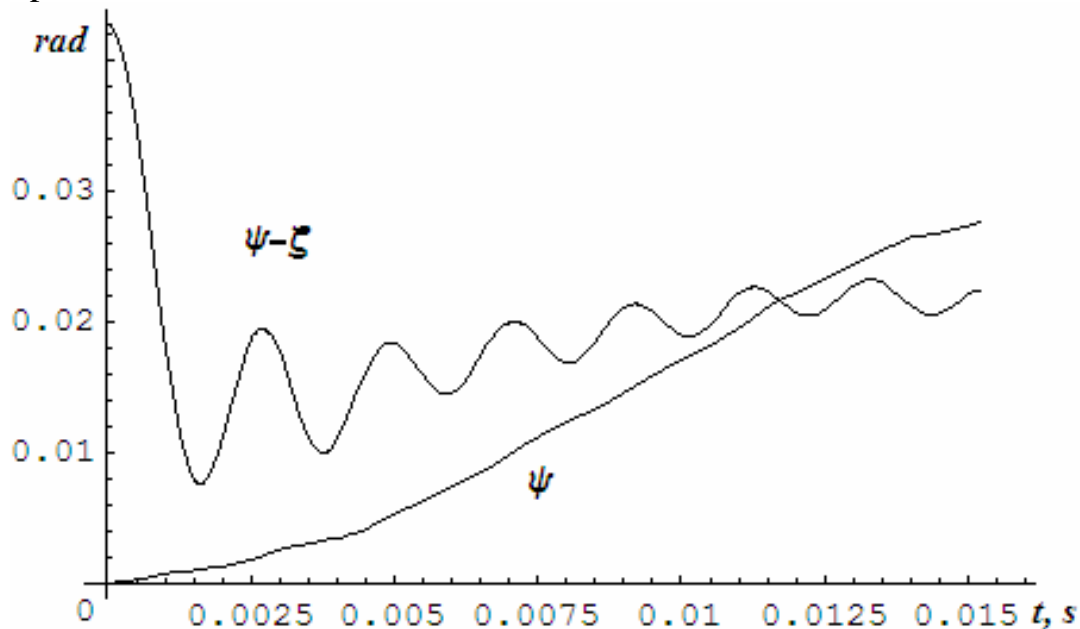


Figure. Kinematic parameters of the archery arrow internal ballistics: an attitude angle ( $\psi$ ) and an angle of attack ( $\psi - \zeta$ ) of the arrow.

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