Numerical and theoretical research of high-temperature supersonic flow interaction with the model of flight vehicle profile

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The article considers the results of numerical and theoretical research of a high-temperature flow with the specified velocity value (M = 4) around the flight vehicle element profile model when total temperature of a free-stream flow is T = 1134 K. The free-stream flow consists of kerosene-air mixture combustion products flowing out from a supersonic nozzle of the liquid rocket engine working to the liquid-gas scheme. This scheme of model tests has advantages due to simplicity of realization, longer operation time in comparison with impulse devices, and also allows to regulate total temperature of the flow. The fields of working medium parameter distribution over the nozzle were obtained by the finite element analysis using general-purpose program system ANSYS 14.5 when a gas generator worked at the optimal distance from the test object and without the latter as well as in the presence of profile support which allowed determining the pressure distribution over the surface of the test object and calculating the final force on the supporting bracket. The minimum value of pressure in the working medium generator chamber ensuring steady flow in the nozzle was also determined.*

Keywords: *profile supersonic flow, liquid rocket engine, numerical modeling, ANSYS.*

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