

Calculation of the interaction of a supersonic jet with a flat obstacle inclined off the jet axis

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This paper presents results of a numerical solution of the model problem of the interaction of a plane supersonic jet with a semiinfinite flat plate inclinable off the jet axis. The paper is devoted to the study of the flow parameters in the jet flow field and the pressure distribution over the plate surface as a function of the plate inclination. The aim of the paper is to obtain the flow parameters in the jet flow field and the pressure distribution over the plate surface as a function of the plate inclination angle and front edge position. To obtain numerical results, marching algorithms in the inviscid gas and viscous layer approximation were used. At specified values of the supersonic underexpanded/overexpanded jet parameters, calculations were conducted in the plate inclination angle range of 0 to 20°. The position of the plate front edge was specified by two coordinates: a longitudinal and a transversal one, and in the parametric calculations the transversal coordinate was varied at a fixed longitudinal one. The cross-section at which the nonuniform jet field starts to interact with the plate was determined as a function of both the plate front edge position and the plate inclination. The numerical study showed the following: with increasing plate inclination angle, the oscillation frequencies of the flow parameters in the jet flow field and on the plate surface decrease, while their oscillation amplitudes increase, and the position of the maximum pressure point on the plate surface depends on the initial position of the plate front edge and may not coincide with the cross-section at which the jet-plate interaction starts. The results obtained may be used in qualitative estimation of the effect of different parameters in the jet flow field.

Keywords: *supersonic jet, flat plate, interaction, inviscid gas, viscous layer approximation, marching algorithm, numerical calculations, pressure distributions, flow parameters.*

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