P59 Differential Characteristics of the Gas Flow in the Vicinity of a Shock Wave

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Abstract:

Steady shock waves are formed in the flow field in case a stationary supersonic gas flow flows around solid obstacles with complex geometry. The problem of the local flow description in the vicinity of the shock wave includes calculation of the gas flow parameters downstream it and the space derivatives of these parameters. The gas basic flow unevennesses (BFU) were introduced. The gasdynamic parameters derivatives are expressed through them. For the special cases of gas flows such sets of BFU were proposed independently in (Mölder, 1979) and (Uskov, 1983). In the former paper flows with a constant rest enthalpy were considered, in the latter paper thermodynamically perfect gas flows were studied. In the present study four BFU are introduced: the flow nonisobaric factor along the flow line, the streamline curvature, the flow vorticity factor and the flow non-isoenthalpy factor. The BFU are calculated for a thermodynamically imperfect gas with an arbitrary rest enthalpy. In the special cases, the solution coincides with the results of Mölder (1979) and Uskov (1983). The dependences of the BFU downstream the shock on the upstream flow non-isoenthalpy factor is established. Comparison of the results in various thermodynamic models of a gas state is fulfilled. Distribution of the gasdynamic parameters downstream the shock is described by their isolines.

References:

Uskov V. N. (1983) Interference of steady gasdynamic discontinuities. Col. articles: Supersonic gas jets. Novosibirsk, Nauka. P. 22--46. [In Russian]

Mölder S. 1979 Flow behind curved shock waves. University of Toronto Institute for Aerospace Studies (UTIAS) Report No. 217. September.

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