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Statistical Features and Levels of Natural Disturbances at Transition in Supersonic Boundary Layer

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The experiments on natural disturbance development in a boundary layer on a flat plate are executed at Mach number $M = 2$. Modified Kovasznay's method is applied for pulsation decomposition in compressible flow. It is shown that, the method is more suitable for measurement by a constant temperature hot-wire anemometer and increases accuracy of estimations. Dimensionless values of mass flow and temperature fluctuations and their relation are obtained depending on a Reynolds number in transition region of the supersonic boundary layer. The study of the statistical characteristics of natural pulsations in supersonic boundary layer is carried out. Linear and nonlinear regime of transition is determined. Statistical diagram of pulsations from laminar to turbulent stage is obtained. Bicoherence data indicates on the quadratic phase coupling of unstable waves. The quadratic interaction is decreased for low frequency waves in the last stage of transition. The activity is executed at support of RFBR, grant 03-01-00164.

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