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Mathematical Modeling of Turbulent Supersonic Flows in Inlets with Rotating Cowl

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Methods of physical experiment and mathematical modeling have been used to study the properties of flows in adjusted inlets designed to operate in a wide range of Mach number. The variation of inlet geometry was performed by cowl rotation. The experimental investigations have been carried out in the blow-down wind tunnel at Mach numbers from 2 to 6 and in the hot-shot wind tunnel at Mach numbers from 5 to 8. The computations were performed on the basis of the full Navier–Stokes equations and the two-equation turbulence model by Wilcox. The experimental pressure distributions along the inlet walls were used for the verification of simulation results. Comparison have shown a good agreement. Computations within the wide range of flow and geometric parameters help to carry out the experiments and provide a basis for the choice of optimum configurations and explanation of flow features.

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