SIMULATION OF FLOW IN A HIGH-SPEED COMBUSTOR IN TWO- AND THREE-DIMENSIONAL FORMULATION

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Abstract: Presented are the results of on-going numerical investigation of a model combustor with supersonic flow at the entrance. The study is performed in the framework of the project of the TsAGI-RAS Computer Modeling Center with participation of experts from N. N. Semenov Institute of Chemical Physics of the Russian Academy of Sciences (ICP RAS), Institute for Computer Aided Design of the Russian Academy of Sciences (ICAD RAS), and N. E. Zhukovsky Central Aerohydrodynamic Institute (TsAGI). The results of two- and three-dimensional calculations using TsAGI numerical technology are compared with the results of three-dimensional calculations on the basis of RAS numerical technology and with experimental data obtained in TsAGI. Both regimes without combustion and regimes with combustion of hydrocarbon fuel are considered. Three-dimensional effects, which change essentially the pressure distribution along the duct walls even in the regime without combustion, are pointed out. Three-dimensional effects in flow with combustion are described. Assumptions are made about possible reasons of discrepancy between experiment and calculations with combustion.

Keywords: high-speed combustor; hydrocarbon fuel; two- and three-dimensional calculations; experimental validation

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