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ANALYSIS OF THE EFFECT OF TURBULENT VISCOSITY MODELS ON THE CALCULATION OF ROCKET ENGINE COMBUSTION PRODUCT JET FLOWS

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This paper reports the results of calculations of turbulent gas jet flows with the use of an algebraic turbulence model (Safronov's model) and two one-parameter differential turbulence models (Sekundov's model and the Nut-90 model). The aim of this paper is to choose the model most appropriate for jet engine combustion product flow calculation out of the three above-mentioned models. A turbulent flow in a supersonic jet is calculated by solving the "viscous layer" equations by application of an implicit marching method along the jet axis. The turbulence model is chosen by comparing the calculated data with experimental data reported in the literature. Using this choice criterion, the algebraic turbulence model and the Nut-90 one-parameter differential turbulence model were chosen for the calculation of turbulent jet engine flows. Sekundov's turbulent model overestimates turbulent mixing in comparison with the experimental data; because of this, that model was excluded from the subsequent analysis. Using the two chosen turbulence models, flows in combustion product jets were calculated for two jet engines differing both in the exit nozzle dimensions and in the combustion product composition. From the results of the study of flows in combustion product jets it may be concluded that none of the three turbulence models considered cannot be used as a universal model in the calculation of jet engine combustion product flows. The appropriate turbulence model can only be chosen based on experimental data.

Keywords: *jet, turbulence, experiment, rocket engine, combustion products, numerical calculation, flow parameters.*

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