NUMERICAL AND EXPERIMENTAL INVESTIGATION OF THE LIFT FORCE CREATED BY AN ARTIFICIAL GAS CAVITY UNDER THE BOTTOM OF THE BOAT

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Abstract: A mathematical model of the flow around a towed ship model with a gas cavity under the bottom is developed. The model is based on nonstationary three-dimensional equations of flow of a single-velocity two-phase continuous medium, which is a mechanical mixture of two phases (liquid and gas) with an explicit tracking of the phase interface. The model was tested on the experimental data on (*i*) purging the model gas cavity (without vessel contours) with air in still water, and (*ii*) the hydrodynamic drag of the towed model of the boat with the gas cavity in the moving water. Comparison of the results of numerical calculations with experimental data and observations showed their good qualitative and quantitative agreement on the dynamics of filling the cavity with a gas bubble, the achieved level of the lift, the frequency spectrum of the oscillation of the lifting force, and also, the hydrodynamic drag of the towed model of a boat with a gas cavity for different velocities of the approaching water flow.

Keywords: vessel with gas cavity; mathematical model; hydrodynamic drag; propulsive force; lifting force

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