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The Hydrodynamic Analysis of Fluid Flow over a Hydrofoil beneath a Free Surface in Subcritical Froude Number. ZEDA YIN, Graduate student at Marshall University, MEHDI ESMAEILPOUR, Assistant Professor at Marshall University — In this work, a numerical simulation of two-dimensional unsteady incompressible viscous ?ow generated by a shallowly submerged hydrofoil under the free surface is presented. The computation is based on finite volume discretization incorporated with the interface capturing volume of fluid method to solve the fluid equation in the motion. The SST k-ω turbulence model is used to capture the turbulent flow for the wave around the hydrofoil. Submerged depths and different angles of attack will be two main variables in this numerical simulation. A comparison of the present numerical results with previous experimental and numerical results will be presented to show how accurate to use turbulence model to simulate the result. A comprehensive simulation of quantities like wave pro?le and forces is performed for angle of attack (AoA) ranging from -15 to 15, and h/c from 0.2 to 0.9 resulting in low Froude numbers ranging from 0.1 to 0.9. The results provide an understanding on the complex flow interactions between the free surface and the hydrofoil of varying AoA and submerged depths.

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