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Ventilated supercavitation around a moving body in a still fluid[1]

YEUNWOO CHO, JAEHO CHUNG, Korea Adv Inst of Sci Tech — This experimental study examines ventilated supercavity formation in a free-surface bounded environment where a body is in motion and the fluid is at rest. For a given torpedo-shaped body and water depth (H), depending on the cavitator diameter (d_c) and the submergence depth (h_s), four different cases are investigated according to the blockage ratio ($B=d_c/d_h$, where d_h is the hydraulic diameter) and the dimensionless submergence depth ($h^*=h_s/H$). Cases 1–4 are no cavitator in fully submerged (B=0, h*=0.5), small blockage in fully submerged (B=15%, h*=0.5), small blockage in shallowly submerged (B=1.5%, h*=0.17) and large blockage in fully submerged (B=3%, h*=0.5) cases. In case 1, no supercavitation is observed and only a bubbly flow (B) and a foamy cavity (FC) are observed. In cases 2 and 3, a twin-vortex supercavity (TV), a reentrant-jet supercavity (RJ), a half-supercavity with foamy cavity downstream (HSF), B and FC are observed. In case 4, a half-supercavity with a ring-type vortex shedding downstream (HSV), double-layer supercavities (RJ inside and TV outside (RJTV), TV inside and TV outside (TVTV), RJ inside and RJ outside (RJRJ)), B, FC and TV are observed. The body-frontal-area-based drag coefficient for a moving torpedo-shaped body with a supercavity is measured to be approximately 0.11 while that for a cavitator-free moving body without a supercavity is approximately 0.4.

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