

Abstract Submitted
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Investigating the effect of hull on marine propeller in crashback using LES AMAN VERMA, HYUNCHUL JANG, KRISHNAN MAHESH, University of Minnesota — Crashback is an off-design condition where the marine vessel moves forward while the propeller is in reverse rotation, resulting in a highly unsteady separated flow. According to experiments, an upstream hull significantly increases the side-forces on a propeller in crashback below an advance ratio of $J = -0.7$. LES is performed for an open propulsor with and without hull at two advance ratios, $J = -1.0$ and $J = -0.5$. The experimentally observed behavior is reproduced using LES. At $J = -1.0$, two noticeable flow features are found with the hull - a recirculation zone located on the hull in the vicinity of the propeller and a vortex ring much closer to the propeller. In contrast, at $J = -0.5$, the recirculation zone is weaker and farther upstream of the propeller. As a result, the hull does not significantly alter the flow in the immediate vicinity of the propeller. For both advance ratios, side forces are mostly generated from the leading edge separation on suction side. However, high levels of side forces are also generated from trailing edge separation on suction side at $J = -1.0$. This work was supported by the United States Office of Naval Research under ONR Grant N00014-08-1-0433.

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