

Early Design Prediction of Submersible Maneuvers

Authors : Hernani Brinati, Mardel de Conti, Moyses Szajnbok, Valentina Domiciano

Abstract : This study brings a mathematical model and examples for the numerical prediction of submersible maneuvers in the horizontal and in the vertical planes. The geometry of the submarine is here taken as a body of revolution plus a sail, two horizontal and two vertical rudders. The model includes the representation of the hull resistance and of the propeller thrust and torque, what enables to consider the variation of the longitudinal component of the velocity of the ship when maneuvering. The hydrodynamic forces are represented through power series expansions of the acceleration and velocity components. The hydrodynamic derivatives for the body of revolution are mostly estimated based on fundamental principles applicable to the flow around airplane fuselages in the subsonic regime. The hydrodynamic forces for the sail and rudders are estimated based on a finite aspect ratio wing theory. The objective of this study is to build an expedite model for submarine maneuvers prediction, based on fundamental principles, which may be convenient in the early stages of the ship design. This model is tested against available numerical and experimental data.

Keywords : submarine maneuvers, submarine, maneuvering, dynamics

Conference Title : ICMNE 2015 : International Conference on Marine and Naval Engineering

Conference Location : Zurich, Switzerland

Conference Dates : January 13-14, 2015