Contribution ID: **93** Type: **Paper**

Drag based Shape Optimization of Submarines and AUVs Using CFD Analysis

Thursday, 16 June 2022 11:10 (20 minutes)

Nowadays, underwater hulls have a wide range of applications both in the military and in scientific, commercial and security fields. Next to Submarines, Autonomous Underwater Vehicles (AUVs) are increasingly spreading thanks to their capabilities to carry out a significant variety of missions, including interacting with underwater infrastructures, coastal and underwater inspections, intelligence gathering, environmental and fish monitoring and, of course, research and fight against underwater threats.
One of the main performance characteristics of an underwater vehicle is its resistance curve. The estimation of this curve is a crucial factor in preliminary design phases in order to correctly choose and dimension the right propulsion plant and propeller and, in general, to reach operational requirements.
In the last decade, with the advent of higher computing power and robust algorithms, the application of Computational Fluid Dynamics (CFD) analysis is rapidly emerging as a fast, reliable and cost-effective tool in the assessment of the hydrodynamic performances.
The first part of the paper discusses the implementation of a simulation environment, a “virtual towing tank”, suitable for a generic underwater vehicle using a CFD software. A simulation is conducted and the numerical results are validated by comparing them with the available experimental data obtained from the literature.
In the second part of the paper, several modern technologies related to the underwater sector are analysed to identify their influence on the shape during the design phase of an underwater vehicle. Particular considerations are dedicated to the different positions and profiles of the sail allowed by the integration of the optronic periscopes. Further considerations are made on the shape of the bow necessary for the integration of sonars of different types and sizes. In conclusion, various tests are carried out in the virtual towing tank in order to detect the trend-line of optimisation for each case studies.

Primary authors: BONO, Gianpaolo (Italian Navy General Staff - 5th Department Submarines); BUTTARO, Gianni (Italian Navy General Staff - 5th Department Submarines)

Presenter: BUTTARO, Gianni (Italian Navy General Staff - 5th Department Submarines)

Session Classification: 4B

Track Classification: Underwater technology and marine robotics