Towards biomimetic air retaining ship hull surfaces – AIRCOAT and its experimental and computational validation methods

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ABSTRACT

Air lubrication has a high potential to reduce skin friction of ship hulls. **Active** air lubrication system are already available on the market and initial results could show significant long-term energy savings of 4 % [1]. The EU project AIRCOAT (Air Induced friction Reducing ship Coating) aims to develop a **passive** air lubrication technology inspired by *Salvinia molesta*, a floating water fern that forms a permanent air layer when submerged in water [2]. AIRCOAT will technologically implement this natural phenomenon to produce a biomimetic hull surface with a high potential to significantly reduce the frictional resistance of ships.

The air retaining surfaces based on the Salvinia effect rely on a complex **micro- and nanostructured** surface with hydrophobic and hydrophilic characteristics [3]. Transferring such characteristics onto sea going ships (e.g. container ships) – which are the largest maritime **macrostructures** – and demonstrating its effectivity within a three-year project is an ambitious task that involves a well-defined validation method. The AIRCOAT project does this by means of combining experimental and numerical methods to upscale results from laboratory prototypes to application of full-scale solutions in operational environments.

Small- and large- scale laboratory experiments will investigate the air retaining and friction reducing capabilities of the surface. Visualisation techniques will be used to determine the phenomena occurring at the ship-air-water interface. In parallel a set of numerical studies at different levels (small, large and full scale) will be carried out to estimate the drag reduction for a sea going ship virtually coated with AIRCOAT.

This contribution will introduce into the AIRCOAT project, elaborate on biomimetic air-retaining surfaces and outline the validation concept developed to quantify potential friction reduction.

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