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Numerical Investigation of the Aerodynamic Performance of Rigid Wing Sails with Eppler 61 airfoils.

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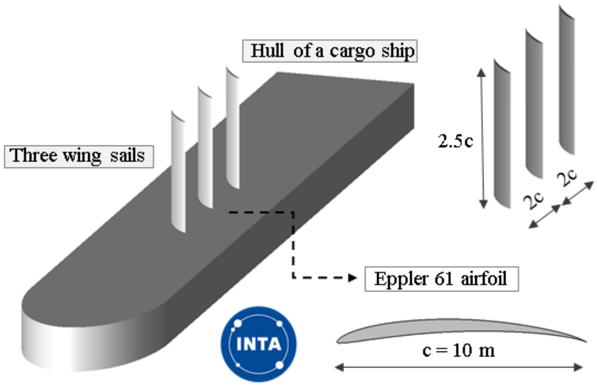
ABSTRACT

This work explores the aerodynamic performance of rigid wing sails to ship propulsion and as means of achieving emissions reductions. The analysis focuses on external loads acting on the wing sails, the propulsive performance, the flow field and the flow separation behind each wing sail. Specifically, it presents a numerical analysis based on the Unsteady Reynolds-Averaged Navier Stoke equations to evaluate the performance of three identical rigid wing sails designed with Eppler 61 airfoils. Each wing sail presents a chord length of 10 meters and a height of 2.5 chords, ensuring an optimal aspect ratio for aerodynamic efficiency. To mitigate potential flow separation effects caused by the wake of preceding sails, the distance between adjacent sails is set to 2 chords. By varying the angle of the wing sails, this study aims to identify configurations that maximize propulsive efficiency while minimizing drag and other undesirable effects. This approach ensures a robust understanding of how the rigid wing sails interact with the complex flow environment on a moving cargo ship.



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