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Numerical Modelling of a Planing Craft With a V-Shaped Spray Interceptor Arrangement in Calm Water

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V-shaped spray interceptors, also referred to as spray deflectors, are a novel concept of spray deflection on planing craft. Conventional spray rails are positioned longitudinally on the bottom of the hull and detach the spray from hull deflecting it towards the sides or slightly down and aftward. The V-shaped spray interceptors, on the other hand, are located in the spray area forward of the stagnation line such that those would deflect the oncoming spray down and aftward, thereby producing a reaction force that reduces the total resistance.
Experimental investigations have shown that compared to the bare hull, a V-shape spray interceptor arrangement reduces the total resistance by up to 25% while conventional spray rail setup only reduced it by up to 18%. The V-shaped spray interceptors have been the subject of a recent numerical investigation, that re-ported a total resistance reduction of 32% (compared to the bare hull), of which 28% was due to reduction of wetted surface and the related viscous drag while remaining 4% was due to aftward deflection of the spray. However, the test vessel was simulated at a fixed running position i.e. the influence of the spray deflectors on the craft's heave and pitch motions was neglected.
This paper features a numerical comparison of two planing craft, one equipped with a V-shaped spray interceptor arrangement and the other with a conventional setup of longitudinal spray rails. Both configurations are simulated in calm water conditions and are free to pitch and heave in a speed range of ($Fr\nabla$ = 1.8 to 4.6). The numerical model is analysed for grid sensitivity and validated against experimental results. The two concepts are compared in terms of total resistance, running position, wetted surface area and hydrodynamic forces acting on the hull.

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