An Innovative Wind Propulsion System for Naval Ships

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Abstract

The Magnus effect was successfully employed by Flettner in his ship operating with two large propelling cylinders. The spinning cylinders produced propulsive force from the wind on seas which is clean and free source of energy. The rise of fossil fuel costs and extinction of fossil fuel resources have caused a renew interest in Flettner type propulsion. This is becoming a hot topic in naval engineering. Many other applications of producing high lift values from spinning symmetrical cylinders have failed due to rapid increase of frictional torques and also high values of drag force. In this paper, the new application of aerofoil Magnus, wind driven propulsion system is introduced which can be effectively used for any size ships. To show validity of the concept, the NACA0020 aerofoil section with circulating skin is computationally investigated at air speed of 4 m/s correspond to the Reynolds number of 8.2×10^4. The viscous fluid flow solutions were obtained at variety of treadmill speed of the aerofoil skin and different incident angles. The results confirm that high lift to drag ratios may be obtained using treadmill motion.

Keywords: Magnus effect, Propulsion, Treadmill motion, NACA0020 aerofoil, CFD