

Overview of Coandă jet lift enhancement and two-dimensional computational studies

ABSTRACT

Motivated by attempts to enhance wind-turbine aerodynamic performance and efficiency, Coandă Jet Lift Enhancement for Circulation Control that has drawn great attention from researchers and industries is investigated numerically. Coandă Jet Circulation Control Techniques has a long history of development, although meticulous Modelling and innovations for practical applications for energy conversion (such as for wind-turbine applications), aircraft wing lift enhancement and propulsion (such as for Coandă-MAV) are continually in progress. Along this line, the influence of Coandă effect for lift generation and enhancement is here investigated using two-dimensional CFD simulation. To that end, attention is focussed on Coandă jet configuration located at the trailing edge, to reveal the key elements that could exhibit the desired performance criteria for lift enhancement and drag reduction, or a combination of both. Parametric studies are carried out to obtain some optimum configuration, by varying pertinent airfoil geometrical and Coandă jet parameters. Particular attention is also given to turbulence modelling, by meticulous choice of appropriate turbulent models and scaling, commensurate with the grid generation, CFD code utilized and computational effectiveness. The present two-dimensional Coandă jet studies are carried out with wind turbine and micro-air-vehicle design in view, and discussed in the light of recent results from similar research.

Keyword: CFD; Circulation control; Coandă effect; Lift augmentation; Wind turbine