

Separated-flow control by DBD plasma actuator around airfoils at Reynolds number 63,000

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Large-eddy simulations of the separated flow over NACA0015, NACA0012 and NACA0006 airfoil, which are controlled by a DBD plasma actuator, are conducted. Reynolds number based on a chord length is $Re_c=63,000$. For each airfoil, position and operation conditions of DBD plasma actuator, such as the burst frequency(F^+), the degree of induced flow and burst ratio of actuation, are varied as simulation parameters. It is clarified that the effective position of actuator is near separation point to suppress the separation for almost cases. The most effective burst frequency of burst wave is clarified to be different because of the influence of separation region and adverse pressure around airfoils. For NACA0015 with AoA=12 deg. cases, $F^+ \approx 5$ is most effective frequency, which is related to instability of separation shear layer. The effects of control by DBD plasma actuator can be categorized by aerodynamics performance and flow field trend.

Keywords: Flow control, DBD plasma actuator, Airfoil, Separation flow