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Aerodynamic Performance of a Pitching Bio-Inspired Corrugated Airfoil

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Abstract : In the present study, the aerodynamic performance of a rigid two-dimensional pitching bio-inspired corrugate airfoil was numerically investigated at Reynolds number of 14000. The Open Field Operations And Manipulations (OpenFOAM) computational fluid dynamic tool is used to solve flow governing equations numerically. The k-ω SST turbulence model with low Reynolds correction (k-ω SST LRC) and the pimpleDyMFOAM solver are utilized to simulate the flow field around pitching bio-airfoil. The lift and drag coefficients of the airfoil are calculated at reduced frequencies k=1.24-4.96 and the angular amplitude of A=5[°]-20[°]. Results show that in a fixed reduced frequency, the absolute value of the sectional lift and drag coefficients increase with increasing pitching amplitude. In a fixed angular amplitude, the absolute value of the lift and drag coefficients increase as the pitching reduced frequency increases.

Keywords : bio-inspired pitching airfoils, OpenFOAM, low Reynolds k-ω SST model, lift and drag coefficients
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