

Title:

Aerodynamic Analysis of the Flow past Airfoils with Passive Vortex Generators

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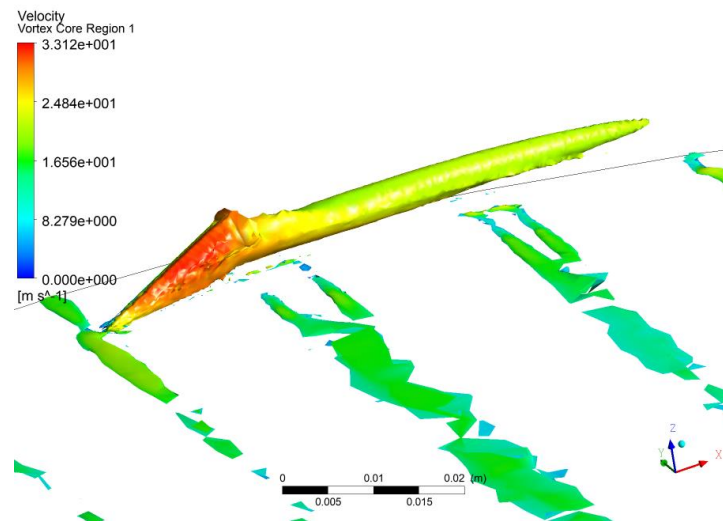
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Grant:

None

Short Description:

Passive vortex generators are widely used for heat and mass transfer enhancement in static mixers and heat exchangers. Trapezoidal vortex generators are used in the high efficiency vortex static mixer (HEV) because they generate a complex flow structure enhancing the transport phenomena. Moreover, vortex generators are used also on airfoils and cars to delay or suppress flow separation. Mainly the flow past triangular and rectangular winglets was studied in the open literature showing good performance in enhancing the lift and drag coefficients. In this project, non-conventional vortex generators are being investigated. They consist of an inclined trapezoidal tab similar to that used in the HEV static mixer. Inline array of several vortex generators are fixed on an airfoil and the drag and lift coefficients are analyzed for different geometries using computational fluid dynamics. Different cases are analyzed where the inclination angles and the size of the vortex generator are investigated and assessed. Moreover, the effect of adding a hole in the VG is also investigated. The results are then compared to conventional vortex generators, mainly triangular and rectangular winglets. The present results are validated against experimental and numerical data from the literature as well as results obtained at NDU's lab.



Vortex core generated using Ansys Fluent CFD solver colored by the velocity magnitude