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3-D Interactions of Synthetic Jets and Cross-Flows - CFD ONKAR SAHNI, SCOREC, RPI, MICHAEL AMITAY, KENNETH JANSEN, MANE, RPI
— The interaction of synthetic jets with a cross-flow was studied numerically at low Reynolds numbers and low angles of attack by using parallel adaptive flow simulations. These investigations were performed in close co-ordination with the experimental studies to precisely match the physical dimensions and parameters. The focus of the work was to explore the details of the flow structures in the vicinity of the synthetic jets. Both instantaneous and phase-averaged flow fields were collected to understand the interactions. It was found that an array of counter-rotating vortical structures formed by the synthetic jets interacts with the cross flow and develops three-dimensionalities as they advect downstream. The effect of the momentum coefficient (or blowing ratio) on the 3-D interaction was also explored. In the case of low momentum coefficient coherent vortical structures were found to be dominant whereas at high momentum coefficient coherent vortical structures breakdown forming random ones. The agreement between the CFD predictions and the experimental measurements were found to be very good.

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