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Sensitivity of an Asymmetric 3D Diffuser to Vortex Generator Induced Inlet Condition Perturbations EMILY SAYLES, Stanford University, SVEN GRUNDMANN, Center of Smart Interfaces, CHRISTOPHER ELKINS, JOHN EATON, Stanford University — Experiments were performed to investigate the flow in an asymmetric 3D diffuser that is highly sensitive to inlet condition perturbations. Previous velocity field measurements showed that in its standard configuration this diffuser develops a stable three-dimensional separation bubble. However, weak secondary flows induced by tunable dielectric barrier discharge plasma actuators in the inlet of the diffuser resulted both in dramatic improvements and degradations in the diffuser's performance. Two configurations of vortex generators were selected based on their having analogous effects on the diffuser's pressure recovery. These vortex generators were placed in the inlet of the diffuser and magnetic resonance velocimetry was used to obtain three-dimensional velocity data. The data reveal markedly different separation bubble structures, with the improved pressure recovery corresponding to a reduced reversed flow area. Additionally, the vortex generators which improve the diffuser's performance create a more uniform velocity profile at the end of the expanding section, while the other configuration facilitates the persistence of a high velocity core through the diffuser's outlet.

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