Abstract Submitted
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Study on three-dimensional separation in diffusers[1] ELBERT JEYAPAUL[2], PAUL DURBIN[3], Iowa State University — A family of three-dimensional diffusers having the same adverse pressure gradient but varying inlet aspect ratios have been studied by detached eddy simulation and Reynolds averaged computation. They provide a geometry for fundamental study of three-dimensional, turbulent separation. The diffuser has a rectangular cross section with two flared walls. RANS computations used the the standard $k-\omega$ and SST turbulence models. Experimental results of Cherry et al provide a reference against which the DES was validated. The SST model has been observed to be overly sensitive to inlet channel aspect ratio. Separation is observed to switch from top to the side wall at higher expansion ratios, while DES predicts separation to stay on the top wall. The recirculating region predicted by the model changes sides even for very small side angles. In a symmetrically–sloped diffuser the model does not predict a symmetric separation at higher side angles. The Reynolds stress models predict symmetric separation, so some of the shortcomings to the SST formulation emerge from the eddy viscosity assumption.

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