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合成射流方向布局对S形进气道分离控制的效应

Effect of slot orientation on synthetic jet-based separation control in a serpentine inlet

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中文摘要:

对合成射流控制一种S形进气道边界层分离进行了数值研究.选用狭缝出口的合成射流,详细讨论了展向和流向两种布局对控制效应的影响.结果显示:流向布局相对展向布局具有抗逆压梯度强、穿透深、控制效果持久等特点,在射流动量系数为 1.62×10^{-3} ,特征频率等于1的工况下,其分离区长度缩减了38.39%.流向布局对S形进气道性能的提升也更显著,出口压力系数比无控制时提高158.91%,总压恢复系数提高0.71%,总压畸变指数降低56.75%.

英文摘要:

A numerical study was conducted to investigate synthetic jet-based boundary layer separation control in a serpentine inlet. Rectangular slots were chosen in this study, spanwise and streamwise orientations of these slots were discussed in detail. The results illustrate streamwise oriented synthetic jet has a higher resistance to the adverse pressure gradient. It penetrates deeper and exhibits stronger persistence than spanwise case as well. When jet momentum coefficient is equal to 1.62×10^{-3} , and the characteristic frequency is 1, separation length is reduced by 38.39% relative to uncontrolled flow field. The performance of serpentine inlet using streamwise oriented synthetic jet are also superior to spanwise case. Outlet pressure coefficient is increased by 158.91%; total pressure recovery coefficient is increased by 0.71%, and total pressure distortion coefficient is reduced by 56.75%.

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