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Separation control in a conical diffuser with an annular inlet[1]
KIN PONG LO, CHRISTOPHER ELKINS, JOHN EATON, Stanford University
— Conical diffusers are commonly used in turbomachines to slow down the flow and recover pressure. In typical applications such as the diffuser behind a power turbine, the inlet to the diffuser is an annulus. A large central separation bubble forms if the central hub ends abruptly. A long streamlined tail cone can eliminate the separation, but it is often unfeasible for structural reasons. Experiments were performed to investigate various means to manage both the central separation bubble and any separation on the outer diffuser walls. The Reynolds number is 66000 based on the annulus bulk velocity and hydraulic diameter. Full-field, three-component velocity data were measured using magnetic resonance velocimetry. The central separation bubble behind the hub extends the full length of the diffuser in the absence of any control. A Coanda jet at the end of the hub can strongly reduce or completely eliminate the central separation bubble. However this can cause separation from the conical diffuser walls in some cases. A step in the outer diffuser wall acts to fix the location of separation making it more amenable to control. Several control mechanisms for this outer separation bubble are under investigation.

[1]Siemens Power Generation

Kin Pong Lo
Stanford University

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