

Abstract Submitted
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Preventing boundary layer separation by non-uniform suction control¹ JAMES RAMSAY, MATHIEU SELLIER, University of Canterbury, WEI HUA HO, University of South Africa — Suction of the boundary layer has been studied as a method of flow control for over a hundred years. However, its use has failed to migrate to mainstream engineering applications. There are two main reasons for this: one, the relative complexity and broad parameter space for the control makes it difficult and costly to design; two, the energy required to generate the suction can often outweigh the savings from reduced drag or improved performance. To address these issues, an investigation of suction control on laminar flow around the circular cylinder and within an axisymmetric diverging pipe has been performed. Numerical simulations were performed with optimisation to determine the most effective and efficient applications of suction to achieve a variety of objectives. The models without suction were validated against experimental data from the literature. With the aim of making the design of suction control more accessible in real applications, the focus of the results was on the relationships between the uncontrolled flow and the optimised control parameters. Particular attention was paid to the objective of controlling the separation of the boundary layer and its potential use as an objective, or as an important feature, in determining the best control.

¹NZ Royal Aeronautical Society, Canterbury Branch

James Ramsay
University of Canterbury

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