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AISCOS a New Approach to Active Flow Control of Separation. P. REINHARD, B. DEMANETT, J. KIEDAISCH, H. NAGIB, IIT, USA — Most studies of Active Flow Control (AFC) of separated flows have centered upon steady or periodic blowing, and Zero-Mass Flux (ZMF). However, ZMF with superposition of steady suction, or oscillatory suction, has recently demonstrated improved effectiveness in controlling large separated zones. Coupled with demonstrated hysteresis in the reattachment of such zones, we were led to the development of the concept of Adaptive Intermittent Suction Control of Separation (AISCOS). The concept and its effectiveness were demonstrated using a generic separated flow field over a hump model. While we have not tested AISCOS within a feedback arrangement to demonstrate its full potential, parametric testing of variables such as frequency and duty cycle have been carried out. When comparing the improvement as a result of AISCOS to other approaches such as ZMF, and to best potentially available improvement in peak C_p value over the hump for a fully attached flow, we find that nearly double the change in peak C_p could be hypothetically achieved in the case of ZMF. The best steady suction performance resulted in 22% of additional improvement over ZMF, and comparable improvements are achieved with AISCOS using various duty cycles. Most probably, the less than optimum location of the AFC slot on this model limited the potential of the improvement from the application of suction-based methods; the model and its AFC slot were originally designed to work most effectively with ZMF only.

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