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Flow Structures and Interactions of a Fail-Safe Actuator WASIF KHAN, YOSEPH ELIMELECH, MICHAEL AMITAY, Rensselaer Polytechnic Institute — Vortex generators are passive devices that are commonly used in many aerodynamic applications. In their basic concept, they enhance mixing, reduce or mitigate flow separation; however, they cause drag penalties at off design conditions. Micro vanes implement the same basic idea of vortex generators but their physical dimensions are much smaller. To achieve the same effect on the baseline flow field, micro vanes are combined with an active flow control device, so their net effect is comparable to that of vortex generators when the active device is energized. As a result of their small size, micro vanes have significantly less drag penalty at off design conditions. This concept of "dual-action" is the reason why such actuation is commonly called hybrid or fail-safe actuation. The present study explores experimentally the flow interaction of a synthetic-jet with a micro vane in a zero pressure gradient flow over a flat plate. Using the stereo particle image velocimetry technique a parametric study was conducted, where the effects of the micro vane shape, height and its angle with respect to the flow were examined, at several blowing ratios and synthetic-jet configurations.

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