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Numerical Study for Separation Control Mechanism of Impulse Actuation[1] SOLKEUN JEE, NASA Ames, OMAR LOPEZ MEJIA, Universidad de los Andes, Colombia, ROBERT MOSER, University of Texas at Austin — A flow control mechanism by which impulse actuation delays flow separation is investigated numerically. The actuation produces a short-duration high-velocity jet, which exploits the sensitivity of separated flow to momentary actuation. Previous experimental and numerical studies have shown that this actuation disrupt the separated region on a stalled airfoil, reattaching the boundary layer. This actuation, which is spatially as well as temporally localized, globally alters the baseline flow over long time (100 times the actuation time). The computations reported here provide detailed flow structure associated with the actuation and the separated flow. The flow modification includes four major stages following an impulse actuation: disruption of the separated region, vorticity extraction from the boundary layer, the reattachment and return to stall. It was hypothesized that the disruption of the separating layer is resulted from interactions with the vortices produced by the actuation. This was tested by artificially introducing similar vortices up- and downstream of the nominal separation. Results are consistent with the hypothesis and show that a complete disruption of the separated shear layer is required for the desired flow modifications.

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