Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Active flow control over a finite wing. Part 2: Numerical investigation ONKAR SAHNI, SCOREC, RPI, MICHAEL AMITAY, MANE, RPI, KENNETH JANSEN, SCOREC, RPI — In complement to the experimental investigations, numerical simulations are performed to study the effects of active flow control via arrays of synthetic jet actuators. The complexity of flow structures due to 3D interactions over varied range of angles of attack, sweep, Reynolds numbers, and arrangements of synthetic jets, create a need for adaptive flow simulations. In this work, solution-based mesh adaptivity is applied in order to effectively capture the flow features and relevant quantities by attaining local mesh resolution that matches the physical length scales of the flow structures in a non-uniform fashion. Furthermore, anisotropy in the flow field is also taken into account by adaptively constructing anisotropic elements, especially layered and graded elements in the boundary layers to resolve near-wall flow structures. Using these techniques the 3D interactions in the flow field are studied and compared with the experimental data to analyze the effectiveness of flow controls on 3D configurations.

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Date submitted: 05 Aug 2008 Electronic form version 1.4