Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

DNS and LES of Transitional Flow around The T106C Turbine blade Using the High-Order FR/CPR Method[1] MOHAMMAD ALHAWWARY[2], Z. J. WANG[3], University of Kansas — A high-order Navier-Stokes solver based on the flux reconstruction (FR) or the correction procedure via reconstruction (CPR) formulation is employed to perform direct numerical simulations (DNS) and large eddy simulations (LES) of a well-known benchmark problem – transitional flow over the low-pressure turbine T106C cascade. Using both h- and p-refinements to achieve a DNS resolution we were able to establish a "converged" solution, including the mean pressure and skin-friction distribution, and the wake loss. The identified DNS levels were achieved using a 4th order solution on a coarse mesh and a 3rd order one on a medium mesh, both agreed very well. Then LES on the coarse mesh with 3rd order schemes and varying the (X+,Y+,Z+) resolutions was conducted to assess the mesh dependence of the solution. In particular, we study the error in the transition location and the mean skin-friction due to the different coarse (X+,Y+,Z+) resolutions of these LES results. These h and p-refinement (coarse and medium meshes, at 2nd, 3rd and 4th order accuracy) as well as coarse (X+,Y+,Z+) studies will provide much needed guideline in mesh resolution to achieve a certain level of accuracy for flow parameters of interest to designers.

[1]We would like to acknowledge the support from the AFOSR under grant FA9550-16-1-0128, and US Army Research Office under grant W911NF-15-1-0505
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Date submitted: 31 Jul 2019 Electronic form version 1.4