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Turbulence Model Evaluation on a High Pressure Turbine Stage 1 Vane MICHAL OSUSKY, SARA ROSTAMI, GE Global Research, AAMIR SHABBIR, GE Aviation — The accuracy of turbulence modeling depends heavily on the choice of turbulence model. Many turbulence models are only valid for a narrow range of flow regimes, and can produce numerically converged, but physically inaccurate results when applied outside the scope of their intended use. Additionally, the underlying modeling assumptions, such as the linear Boussinesq approximation, impacts the evolution of turbulence in the flow field. As part of the current work, we will study the impact of using various commonly used RANS turbulence models, such as k-omega, BSL, and SST, with and without transition modeling, on the flow field of realistic engine geometries. Additionally, advanced, non-linear turbulence models, such as the Explicit Algebraic Reynolds Stress Model (EARSM), will also be studied for their potential benefits in capturing additional physics in the simulation. Preliminary results show that the EARSM model has a significant impact on the location on laminar to turbulent transition, versus the SST model. All computational results will be compared against detailed experimental data.

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