

Hybrid RANS-LES Modelling of Turbomachinery Flows

P. G. Tucker

The hybridization of RANS (Reynolds Averaged Navier-Stokes) and LES (Large Eddy Simulation), in its various forms, for turbomachinery is explored. In a hierarchical fashion both the handling of turbulence and geometry are considered. The latter is necessary to help more economically deal with the increasingly coupled nature of turbomachinery flows. These become more prevalent as manufacturers strive towards meeting ever more stringent challenges with respect to fuel burn and environmental noise. Future challenges, in terms of numerical schemes and models are outlined, along with areas of clear success. Except for the combustor, most zones of the aeroengine are considered. Also, the aeroacoustic and aerodynamic coupling between engines and airframes and their hybrid RANS-LES modeling is shown when using hierarchical geometry. The use of well-resolved LES to understand critical flow physics and refine low order models is outlined.