

3D Numerical Studies on Jets Acoustic Characteristics of Chevron Nozzles for Aerospace Applications

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Abstract : The present environmental issues have made aircraft jet noise reduction a crucial problem in aero-acoustics research. Acoustic studies reveal that addition of chevrons to the nozzle reduces the sound pressure level reasonably with acceptable reduction in performance. In this paper comprehensive numerical studies on acoustic characteristics of different types of chevron nozzles have been carried out with non-reacting flows for the shape optimization of chevrons in supersonic nozzles for aerospace applications. The numerical studies have been carried out using a validated steady 3D density based, k- ϵ turbulence model. In this paper chevron with sharp edge, flat edge, round edge and U-type edge are selected for the jet acoustic characterization of supersonic nozzles. We observed that compared to the base model a case with round-shaped chevron nozzle could reduce 4.13% acoustic level with 0.6% thrust loss. We concluded that the prudent selection of the chevron shape will enable an appreciable reduction of the aircraft jet noise without compromising its overall performance. It is evident from the present numerical simulations that k- ϵ model can predict reasonably well the acoustic level of chevron supersonic nozzles for its shape optimization.

Keywords : supersonic nozzle, Chevron, acoustic level, shape optimization of Chevron nozzles, jet noise suppression

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