

Design, Analysis and Optimisation of Novel Morphing Chevron Nozzle in Gas Turbine Engines

Faculty advisor: Prof. Shaker Meguid

This study is motivated by the need to advance the concept of using mixing enhancement devices, such as chevron, to reduce jet noise. In spite of its current use in some engines, the impact of the concept of mixing enhancement to reduce jet noise remains unclear. For example, it is not clear how these devices impact jet noise and aero-performance. Furthermore, what is the effect of the number of chevrons along the jet axis, their length and angle for a given nozzle diameter and flow characteristics, upon vortex strength and ultimately noise reduction. Three aspects of the work are accordingly examined: (i) design and develop novel modular morphing chevrons using SMAs not only to reduce noise but also heat signature, (ii) develop a unified physics-based aero-thermo-acoustic prediction model that takes into account the morphed chevron geometric parameters, flow and thermal characteristics, and far-field noise, and (iii) test and develop functional prototypes capable of demonstrating the proof of concept, its strength, challenges and the associated costs.