

Swirl Screens - Arbitrary Distortion Generating Gauzes

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Swirl screens can be used to simulate distorted turbomachinery inlet conditions on ground tests. Real distortions can be caused by upstream components or transient flight conditions, and they can be recreated in a single component that provides both flow turning and a stagnation pressure profile at the entrance to a wind tunnel or rotating rig. In this paper advances in the technology are presented that allow screens with a hexagonal topology to be used in circular section experiments.

Improvements are presented in three sections. First, how to construct screens with a hexagonal topology and the coordinate transformations required to match arbitrary flow conditions. Second, how bespoke geometries can be created to tackle different applications such as those shown in Fig. 1. Annular screens for low hub-tip ratio applications, variable casing geometry for those with very deep endwall boundary layers, and those with very high inlet Mach numbers into the experiments. Finally, the process of machining the swirl screens from solid using a five-axis mill and a parametric approach to toolpath routing is described and demonstrated.

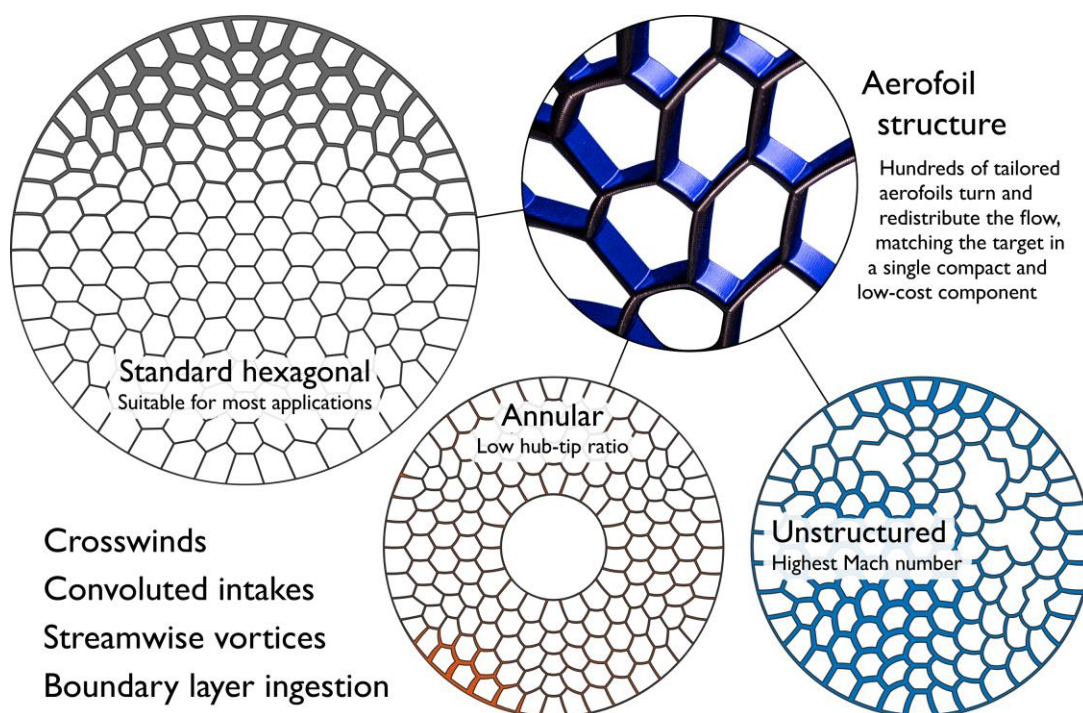


Figure 1 - an example of different swirl screens that could be used to generate a range of different types of inlet distortions to turbomachinery experiments