

Abstract Submitted
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On Using Shaped Honeycombs for Experimental Generation of Arbitrary Velocity Profiles in Test Facilities¹ ALIREZA SAFARIPOUR, DAVID OLSON, AHMED NAGUIB, MANOOOCHEHR KOOCHESFAHANI, Michigan State University — It is common to use a uniform approach flow in the study of most problems in aerodynamics. Motivated by situations where the approach flow is not uniform, the focus of the current work is on the experimental generation of arbitrary velocity profiles in a flow facility (water tunnel) using the shaped honeycomb technique originally proposed by Kotansky (1966). Employing further refinement of this approach, multiple honeycomb devices are designed and fabricated to produce prescribed velocity profiles. The performance of these devices is assessed in terms of their agreement with the desired velocity profiles and the level of turbulence they produce. Single-component molecular tagging velocimetry (1c-MTV) is used to characterize the resulting mean and fluctuating streamwise velocity profiles and their streamwise development. The shaped honeycomb technique is shown to be effective in producing the desired velocity profiles with high fidelity while maintaining velocity fluctuations level at or below that of the freestream prior to installation of the devices.

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