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Production of Unsteady Flows Through the Use of an Active Grid ABDULLAH AZZAM, PHILIPPE LAVOIE, University of Toronto — In many applications, aerodynamic bodies are exposed to complex flows that are non-uniform in both space and time (due for instance to mean shear, wind gust, and/or turbulence). This can lead to significant changes in performance and detrimental unsteady loads. This study investigates the possibility of using an active grid to produce a wide range of flow conditions with varied levels of turbulence intensities, mean flow unsteadiness and non-uniformity by changing the excitation parameters of the grid. Hot-wire and static pressure measurements were taken both upstream and downstream of the grid for a number of excitation protocols and parameters. The grid is shown to produce low frequency (0.25 10 Hz) unsteadiness in the mean flow effectively with high and low levels of free stream turbulence. The highest amplitudes of the unsteady flow are achieved at low frequency, while the minimum amplitude that can be achieved asymptotes to a constant value as the frequency is increased. Furthermore, a mean shear in the flow can be superimposed in addition to the unsteadiness. These results demonstrate that the active grid can be used successfully to produce a range of unsteady flows with complex features from a single apparatus.

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