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Receptivity and Transient Growth of Disturbances Generated by Random Distributed Roughness[1] ROBERT DOWNS III, EDWARD WHITE, NICHOLAS DENISSEN, Case Western Reserve University — Recent experiments on the receptivity of transient disturbances to 3D roughness have utilized spanwise-periodic arrays of cylindrical roughness elements. To connect these experiments with more realistic situations, quasi-random rough surfaces are generated numerically and manufactured using rapid-prototyping technology. Measurements of the resulting disturbances are obtained in a Blasius boundary layer using hotwire anemometry for freestream velocities of 7.5, 9.3 and 11.3 m/s; these values correspond to roughness-based Reynolds numbers of $Re_k = 164$, 227 and 301. The $Re_k = 301$ case is observed to be supercritical with transition occurring approximately 180 mm downstream of the roughness elements. Measurements over the roughness surface are made for the $Re_k = 227$ case in order to study the distributed receptivity effect of the roughness elements. Evidence of transient growth is apparent in the behavior of the disturbance energy and comparisons are made between spanwise power spectra computed from the disturbance profiles and the roughness elements.

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Robert Downs III
Case Western Reserve University

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