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Patterned Surface Roughness for Passive Transition Delay[1]
ROBERT DOWNS, JENS H.M. FRANSSON, Linné FLOW Centre, KTH Mechanics — Surface roughness is demonstrably detrimental to boundary-layer stability in many scenarios; it is now known that sensibly chosen roughness can also delay the onset of transition, resulting in a drag reduction. The latest part of an ongoing research effort[2] exploring the use of streamwise streaks to attenuate growth of forced disturbances, the present experiments employ a spatially periodic surface pattern to modify the flow in a flat plate boundary layer. With respect to conventional cylindrical surface roughness, the critical roughness-height-based Reynolds number of the surface pattern is improved. Tollmien–Schlichting waves are excited via suction and blowing at the wall, to form a well-controlled disturbance. A parametric study reveals that patterned roughness inhibits the growth of these T–S waves and increases the transition Reynolds number by 70% compared with the smooth plate reference case. Systematic changes to the pattern spacing demonstrate that the roughness can also accelerate the onset of transition.

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[2]Shahinfar et al. *Phys. Rev. Lett.* 109, 074501 (2012).

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