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Drag reduction of three-dimensional riblets on a flat plate turbulent boundary layer[1] GIOACCHINO CAFIERO, GAETANO IUSO, Politecnico di Torino — We performed an experimental investigation of the turbulent flow on a flat plate presenting micro roughness. In addition to the typical longitudinal micro-grooves, commonly referred to as riblets, we also investigate the performance of three-dimensional riblets, i.e. presenting a sinusoidal pattern. Further to the typical cross-section parameters that characterize longitudinal riblets, namely depth (h) and spacing (s) of the micro grooves, the sinusoidal riblets add two more parameters: the wavelength (λ) and the amplitude (A). In our study, we consider a parabolic profile (s/h=0.7) for the cross-section of the micro-grooves and we study two different sinusoidal riblets varying the amplitude (A=0.6mm and A=0.15mm), for a fixed value of the wavelength λ/s=64mm. Our load cell measurements show a consistent effect of the amplitude of the sinusoidal riblets on the friction drag reduction. In particular, while the longitudinal riblets feature drag reductions of the order of 7.7% at s^+=13 (in good agreement with Bechert et al. 1997), the sinusoidal riblets can achieve values as large as 10% for similar values of s^+. Stereoscopic-PIV measurements show the different near wall structure of the flow, when the three-dimensional riblets are employed.

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Gioacchino Cafiero
Politecnico di Torino

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