

Abstract Submitted
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Rough-Wall Turbulent Boundary Layers JAMES ALLEN, New Mexico State University, JASON MONTY, HENRY NG, MIN CHONG, University of Melbourne — In his 1962 report on “Turbulent Boundary Layers in Incompressible Flow” (Prog. Aero. Sci., Vol. 2, 1-219), J. C. Rotta identifies six possible turbulent boundary layers reaching precise equilibrium. All but one of these flows requires a roughened wall. At the University of Melbourne, a favourable pressure-gradient wind-tunnel has been carefully modified in an attempt to experimentally validate Rotta’s fifth equilibrium condition. This particular flow requires exponentially increasing freestream velocity (in the streamwise direction) with constant height roughness elements on one wall. Although the difficulty of realising such a facility has been overcome, two inevitable hinderances of rough-wall boundary layer measurements remain: the uncertainty in virtual origin of the turbulent layer and the determination of wall shear stress. Fortunately, equilibrium flows afford an opportunity to indirectly determine wall shear stress through a momentum balance, provided the equilibrium condition of streamwise similarity of the mean velocity is fulfilled. The validity of determining wall shear stress as such has been investigated and compared with other commonly adopted methods.

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