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Effect of truncated cone roughness element density on hydrodynamic drag[1] KRISTOFER WOMACK, Johns Hopkins University, MICHAEL SCHULTZ, United States Naval Academy, CHARLES MENEVEAU, Johns Hopkins University — An experimental study was conducted on rough-wall, turbulent boundary layer flow with roughness elements whose idealized shape model barnacles that cause hydrodynamic drag in many applications. Varying planform densities of truncated cone roughness elements were investigated. Element densities studied ranged from 10% to 79%. Detailed turbulent boundary layer velocity statistics were recorded with a two-component LDV system on a three-axis traverse. Hydrodynamic roughness length (z_0) and skin-friction coefficient (C_f) were determined and compared with the estimates from existing roughness element drag prediction models including Macdonald et al. (1998) and other recent models. The roughness elements used in this work model idealized barnacles, so implications of this data set for ship powering are considered.

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