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Experimental Measurements of the Turbulent Boundary Layer on a Towed Array Model KIMBERLY CIPOLLA, DAVID HART, WILLIAM KEITH, NAVSEA Newport, DEBORAH FUREY, PAISAN ATSAVAPRANEE, NAVSEA Carderock — Experimental measurements were made of the boundary layer growth and associated mean wall shear stress along varying lengths of a towed array model. Inert towed array modules (approximately 3.68 cm in diameter, and up to 125 m long) were towed in the NSWCCD High Speed Tow Basin at tow speed values of 7.5, 15, 25 and 30 kts. The objective was to provide data on long thin cylinders at zero angle of attack to determine the hydrodynamic loading and axisymmetric turbulent boundary layer development on towed arrays. Three-dimensional velocity field measurements were obtained over the length of the cylinders with a stationary Stereo-PIV system. Simultaneous measurements of total drag were obtained for each cylinder with an underwater load cell rigidly attached to the tow point at the base of the strut and used to compute the tangential drag coefficients. A small field of view (30 cm x 30 cm) was used to obtain sufficient resolution near the wall to estimate the wall shear stress along the length of the array from the SPIV data. These results will be compared with the measured spatially averaged mean wall shear stress and the boundary layer momentum thickness estimations at the downstream end of the arrays determined from a control volume analysis.

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