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Measurements of wakes originated from 2-bladed and 3-bladed rotors

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Measurements of wakes originated from 2-bladed and 3-bladed rotors were carried out using a hot-wire probe system in an open jet wind tunnel. Hot-wire anemometry was adopted to characterize the spanwise profiles of mean wind speed, turbulence intensity and momentum flux for downwind locations at 0.5, 1, 2, 3, and 4 rotor diameters. The results showed that the 2-bladed rotor spun faster than the 3-bladed one, where the ratio of the two blade angular velocities was 1.065:1 under the same inflow condition with a uniform distribution of 5.4 m/s flow velocity. The turbulence flow statistics of the rotor wakes showed that the wake originated from the 3-bladed rotor has larger velocity deficit, streamwise turbulence intensity, momentum flux magnitude, but smaller spanwise turbulence intensity. The velocity spectrum showed peaks associated with the presence of the blade-induced tip vortices in the near wake region (approximately within 3 rotor diameters).