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Characterizing cylinder and hydrofoil wake dynamics MORTEN KJELDSEN, Norwegian University of Science and Technology (NTNU), BJARTE G. SEIM, NTNU, ROGER E.A. ARNDT, University of Minnesota — A number of high speed PIV measurements of wakes trailing a NACA 0015, c=0.081m, and a cylinder D= 0.0127m, in the speed range 2 through 9 m/s have been made in the high speed water tunnel at SAFL- UMN. The cylinder vortex shedding follows closely St=0.2, while that off the hydrofoil is more irregular. Although the hydrofoil shows a more irregular nature a measure for both shedding frequencies and vortex strength of is of great interest also for drag analysis. The direct approach mapping individual structures, e.g. vorticity based analysis, can be obscured by the quality of the measurements made, hence other methods to reveal frequency and strength are in demand. A study were the mapping of time variation of the main flow direction impulse flux integrated over the wake at, minimum two, downstream positions has been made. A cross-correlation analysis of the impulse flux can reveal structure transport speeds, the frequency spectrum will reflect the shedding frequency, while the temporal variation represents the strength. For the hydrofoil it's shown that a significant cross- correlation is present. In terms of spectra even the more structured shedding from cylinders are hard to capture, and finally the vortex strength found using the cited algorithm seems somewhat unreliable. A thorough comparison between the suggested measure and traditional measures is given.

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