ABSTRACT

The wake transition of the flow around two circular cylinders placed in staggered arrangements with fixed streamwise separation of $5D$ and cross-stream separation varying from 0 to $3D$ has been studied. The wake transition is compared to that of a single isolated cylinder. Linear stability analysis utilizing Floquet theory and direct numerical simulations using a spectral/hp element spatial discretization were carried out. The unstable modes that first appear in the wake transition of the flow around a single cylinder, which are the long-spanwise-wavelength mode A and the short-spanwise-wavelength mode B, are also found in the flow around the staggered arrangements. However, a third mode, referred to as mode C, is also present in the wake transition of the flow around staggered arrangements, depending on the relative positioning of the cylinders. This mode has an intermediate spanwise wavelength and period-doubling character. The structure and onset characteristics of mode C are analysed and the nonlinear character of the bifurcation for this mode is investigated.

REFERENCES

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