Wake structure and thrust generation of a flapping foil in two-dimensional flow - DTU Orbit (21/12/2018)

**Wake structure and thrust generation of a flapping foil in two-dimensional flow**

We present a combined numerical (particle vortex method) and experimental (soap film tunnel) study of a symmetric foil undergoing prescribed oscillations in a two-dimensional free stream. We explore pure pitching and pure heaving, and contrast these two generic types of kinematics. We compare measurements and simulations when the foil is forced with pitching oscillations, and we find a close correspondence between flow visualisations using thickness variations in the soap film and the numerically determined vortex structures. Numerically, we determine wake maps spanned by oscillation frequency and amplitude, and we find qualitatively similar maps for pitching and heaving. We determine the drag–thrust transition for both pitching and heaving numerically, and we discuss it in relation to changes in wake structure. For heaving with low oscillation frequency and high amplitude, we find that the drag–thrust transition occurs in a parameter region with wakes in which two vortex pairs are formed per oscillation period, in contrast to the common transition scenario in regions with inverted von Kármán wakes.

**General information**

State: Published  
Organisations: Department of Physics, Biophysics and Fluids, Department of Mechanical Engineering, Fluid Mechanics, Coastal and Maritime Engineering  
Contributors: Andersen, A. P., Bohr, T., Schnipper, T., Walther, J. H.  
Number of pages: 12  
Publication date: 2017  
Peer-reviewed: Yes

**Publication information**

Journal: Journal of Fluid Mechanics  
Volume: 812  
Article number: R4  
ISSN (Print): 0022-1120  
Ratings:  
BFI (2018): BFI-level 2  
Web of Science (2018): Indexed yes  
BFI (2017): BFI-level 2  
Scopus rating (2017): CiteScore 3.33 SJR 1.591 SNIP 1.702  
Web of Science (2017): Impact factor 2.893  
Web of Science (2017): Indexed yes  
BFI (2016): BFI-level 2  
Scopus rating (2016): CiteScore 2.82 SJR 1.744 SNIP 1.671  
Web of Science (2016): Impact factor 2.821  
Web of Science (2016): Indexed yes  
BFI (2015): BFI-level 2  
Scopus rating (2015): CiteScore 2.57 SJR 1.896 SNIP 1.639  
Web of Science (2015): Impact factor 2.514  
Web of Science (2015): Indexed yes  
BFI (2014): BFI-level 2  
Scopus rating (2014): CiteScore 2.66 SJR 1.864 SNIP 1.805  
Web of Science (2014): Impact factor 2.383  
Web of Science (2014): Indexed yes  
BFI (2013): BFI-level 2  
Scopus rating (2013): CiteScore 2.71 SJR 1.853 SNIP 1.88  
Web of Science (2013): Impact factor 2.294  
ISI indexed (2013): ISI indexed yes  
Web of Science (2013): Indexed yes  
BFI (2012): BFI-level 2  
Scopus rating (2012): CiteScore 2.47 SJR 1.678 SNIP 1.86  
Web of Science (2012): Impact factor 2.183  
ISI indexed (2012): ISI indexed yes  
Web of Science (2012): Indexed yes  
BFI (2011): BFI-level 2