Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

**Unsteady aerodynamic characteristics of large scale bird flapping flight** ZIFENG WENG, School of Mechanical Engineering, Shanghai Jiao Tong University, Shanghai, 200240, China, SUYANG QIN, YANG XIANG, HONG LIU, J. C. Wu Center for Aerodynamics, School of Aeronautics and Astronautics, Shanghai Jiao Tong University, Shanghai, 200240, China — Various unsteady aerodynamic mechanisms have been found in flapping flight especially at low Reynolds number (1E2-1E4). However, large scale bird flying at high Re (1E5) is mostly assumed to be quasi-steady. A two-jointed-wing robotic goose was built to carry out wind tunnel experiment. Force and PIV measurements were performed to study the unsteady force and flow field. Lift is found to change with average effective angle of attack and the average lift is close to that in cruising flight. Lift enhancement occurs in mid-downstroke, which is not induced by leading edge vortex but the result of enhacement of circulation. Thrust occurs in both upstroke and downstroke periods, and maximizes at mid-upstroke and mid-downstroke. Since flapping amplitude varies along wing span, thrust production is the overall result at different spanwise position. According to the flow field measurement, jet flow is found in the wake of handwing, but not in that of armwing. The phase difference between handwing and armwing results in larger flapping amplitude, i.e. higher St and thus enhances thrust production. In general, high Re flapping flight play its role mostly in propulsion, instead of producing high lift as that in low Re flight. And lift production might rely more on aerofoil and flow speed.

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Date submitted: 01 Aug 2019 Electronic form version 1.4