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Measurement of circulation around wing-tip vortices and estimation of lift forces using stereo PIV SHINICHIRO ASANO, HARU SATO, JUN SAKAKIBARA, Meiji Univ — Applying the flapping flight to the development of an aircraft as Mars space probe and a small aircraft called MAV (Micro Air Vehicle) is considered. This is because Reynolds number assumed as the condition of these aircrafts is low and similar to of insects and small birds flapping on the earth. However, it is difficult to measure the flow around the airfoil in flapping flight directly because of its three-dimensional and unsteady characteristics. Hence, there is an attempt to estimate the flow field and aerodynamics by measuring the wake of the airfoil using PIV, for example the lift estimation method based on a wing-tip vortex. In this study, at the angle of attack including the angle after stall, we measured the wing-tip vortex of a NACA 0015 cross-sectional and rectangular planform airfoil using stereo PIV. The circulation of the wing-tip vortex was calculated from the obtained velocity field, and the lift force was estimated based on Kutta-Joukowski theorem. Then, the validity of this estimation method was examined by comparing the estimated lift force and the force balance data at various angles of attack. The experiment results are going to be presented in the conference.

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