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Aerodynamic force variation in an inclined hovering motion by kinematic and geometric controls[1] HYUNGMIN PARK, HAECHEON CHOI, Seoul National University — Due to the excellent flight capability with a high maneuverability, dragonfly flight has been a great interest in various fields. In the present study, we construct a one-paired dynamically scaled dragonfly wing model, perform an inclined hovering motion by wing flapping in a white-oil tank, and measure the normal and tangential forces on the wing. First, we investigate the effect of kinematic parameters of wing motion such as the attack angle (α), pitching duration, pitching timing, etc. The Reynolds number is 1,900 or 2,430 depending on the wing shape. We find that the aerodynamic forces vary greatly with these kinematic parameters. On the other hand, the corrugation on the wing surface has been found to increase the lift force in gliding flight. In this study, we investigate the effect of surface corrugation on the force of the flapping wing. With the corrugation, the drag force slightly increases during a downstroke (high α) and the lift force increases during an upstroke (small α), respectively, resulting in the increase of the mean vertical force by $10 \sim 30\%$ depending on the wing trajectory. We further investigate the force variation by kinematic and geometric controls using flow visualization and the result will be shown in the presentation.

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