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## Experimental Study and Analysis of Wing Structures Effect in Flapping Wings

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### *Abstract*

The objectives of this research were to study, design and develop wing structures of flapping wings that are suitable for practical use. Flapping wings is an imitation of nature, birds can fly with great agility. Each wing structures are designed with different angle between the leading edge blade and sub-blade structure which are 0 degree, 25 degrees, 35 degrees, 45 degrees, and 90 degrees respectively. The wing structures were tested in a wind tunnel at a proper wind velocity with flapping frequency 4 hz for all of wing type and 6 hz for the most suitable wing. This paper does not only study the development and design of wing structures but also study and develop a measurement system and software that is suitable for flapping wings experiments. The development of wing structures will be done by placing the leading edge blade and sub-blade at a various angle then observe how it affect the properties on each wing. By dividing wing into two parts : rigid wing area and flexible wing area, this will have resulted in different Lift and Drag force on each wing. From both inside and outside wind tunnel experiment, the result showed that the wing with 90 degrees angle between leading edge blade and sub-blade has the highest rigor and the wing with 0 degrees angle between leading edge blade and sub-blade has the highest flexibility. Overall, it can be concluded that the wing with 35 degrees angle between leading edge blade and sub-blade is the most suitable wing structure for flapping wing for both Lift and Drag force.

**Keywords:** Flapping Wings, Ornithopter, Wing, Structures, Wind Tunnel