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# *The Rotational Phenomenon of a Simple Wing*

The rotational phenomenon where a simple wing, flat and rectangular„will enter into a self-sustained, unidirectional rotation when flapped up and down in a fluid system was studied. A mechanical wave generator produced a sinusoidal flapping motion in a shaft connected to the center of a wing submersed in water in a cylindrical container. By investigating relatively thin and flexible wings allowed a substantial range of vertical play, insect-like characteristics were applied to wings of varying dimensions, which were investigated at a broad range of frequencies (2.5Hz-82.5Hz). Rotational speed (net thrust) of each wing was recorded for every frequency, and wing behavior was examined. Three important observations were made: 1) rotational velocity is not linear with frequency for frequencies >7.5Hz, though a linear relationship was previously reported for frequencies <6Hz; 2) the highest rotation rates (and thus the most net thrust) were observed for wings with the smallest dimensions of length, chord length, and thickness (on a specific frequency interval); and 3) wings were found to tilt vertically and to warp 3-dimensionally (presumably to take advantage of fluid flows), as has been observed in insect flight. Insect-like flight offers superior maneuverability over fixed wings, which is advantageous as an application in micro air vehicles (MAV′s) for militaristic (surveillance, etc.), rescue, and planetary exploration operations. Therefore, the wing found to provide optimal net thrust (on its corresponding frequency interval) provides a model for future exploration in the development of insect-like characteristics in wings, with the purpose of optimizing MAV flight capabilities.