Performance of Pyramidal Airfoils With Wings in an Oscillating Wind Tunnel

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The purpose of this project is to discover which pyramidal airfoil design is the most effective in an oscillating wind chamber with additional mass, with four or six wings, and with a small, medium, or large surface area. Through the study of the flight of these foils, understanding how different wings and varying surface areas affect their ability to support different masses can be understood. Engineers and designers may design micro/nano air-vehicles, hovering craft, and parachutes based on the concepts developed through this research. Airfoils were placed in an oscillating wind tunnel. Each trial consisted of an airfoil being tested at different frequencies and with additional masses. Airfoils were observed during each of the trials to record a maximum height. Data was obtained and graphed from each trial. Data collected from this research indicates that there is a happy medium of pyramidal airfoil size. The medium-sized airfoil with six wings (airfoil 3), was the most successful in all of our trials. The larger airfoils did not allow air to oscillate around them due to the width of the wind tunnel, while the small and medium airfoils had a small enough surface area so the air could oscillate around them. Due to this observation, an additional graph was created and two new trials were added. Percent error was calculated. It was concluded that the airfoils with smaller surface areas fell nearer to the trend line, while the larger airfoils fell further off the line with a greater percent error.

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