The Affect of Airfoil Characteristics on the Laminarity of Fluid Flow

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The purpose of this experiment was to delve into the realm of laminar flow, a subject related to aerodynamics, which interested us both as a topic of study. The problem raised was how different characters of airfoils could affect the laminarity of a candle smoke. In the experiment, several characteristics of airfoils were altered: the shape of the airfoils, their orientations, and the textures of their surfaces.Additionally, there were airfoils that ejected air from the inside, we tested these through varying air speeds. First, a device was built to model laminar flow using a base surrounded by a window attached to a source of candle smoke and a vacuum pump pulling candle smoke across the device through many small tubes, creating laminar flow. Then, we inserted airfoils into the chamber to impede airflow, from the flow pattern of which the Reynolds number was able to be approximated and compared to theoretical values derived from calculation. After testing, it was apparent that airfoils oriented with a pointed-face towards fluid flow had a Reynolds number of approximately 200. However, shapes with added texture like ridging increased the turbulence due to the increased surface area, with an average Reynolds number of 1400 yet peaking at 2600. The shape of the airfoil that impeded fluid flow the least was the tapered sphere, having a low Reynolds number of under 100, yet on the other hand the square impeded flow greatly and had an average Reynolds number of 10,000. In conclusion, the airfoil resulting in the most laminar flow was a smooth, tapered sphere with the tapered end toward the fluid source. Such knowledge could be applied in the real world to evaluate which shapes in the real world would have the least drag, such as on the wings of aircraft.