The Wingtip's Influence on the Efficiency of Airplane Wings, and Design and Test of the New Swift Wingtip

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Aviation is a vital part of modern infrastructure. It is, however, highly energy consuming and has a substantial climate impact since it is run almost entirely by fossil fuels. The purpose of this project is to investigate and reduce the drag on the wing caused by wingtip vortices by designing and testing the new so-called Swift Wingtip. The Swift Wingtip increases the efficiency, defined as the lift to drag ratio, of the wing by preventing high-pressure air below the wing from curling around the wingtip to the low-pressure area above the wing, thus reducing induced drag and preserving a high pressure difference between the lower- and upper surfaces of the wing and thereby increasing lift. Wind tunnel tests have been conducted in which four different wingtips were tested on the same base wing. These were a blank wingtip (no wingtip device), a winglet, a Boeing raked wingtip, and the Swift Wingtip. Lift and drag on the wing were measured for each wingtip in order to determine the efficiency relative to the baseline wing with a blank wingtip. The relative lift to drag ratio of the base wing with the different wingtips mounted were 1.00 for the blank wingtip, 1.51 for the winglet, 1.72 for the Boeing Raked Wingtip, and 2.01 for the Swift Wingtip, all at the wing’s optimal angle of attack of 6°. These results show that the Swift Wingtip significantly improves the efficiency of the wing, thus enabling a given wing to deliver the lift required by the airplane with lower drag. Therefore, implementation of the Swift Wingtip could drastically reduce fuel consumption and climate impact of aviation. Furthermore, lower drag means that less propulsion is needed, which eases the transition to sustainable fuels in aviation.

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