Cones, Chutes, and Coils: Novel Proposals to Ebb Wingtip Vortices

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This project sought to investigate if, curvature forms of Cones, Chutes, and Coils could be better options than Winglets as wingtip devices that minimized wingtip vortices. Attempts also made to derive formula for the optimal diameter of the proposed wingtip devices. Test wings of equal length and airfoil shape were attached with crafted straight coils, straight chutes, descending-cones, ascending-cones, and winglets, each having the same weight but different sizes. I had built a wind tunnel test rig that equipped with lift and drag measurements. I recorded the lift and drag generated by each wings after an equal duration on the test platform. I also performed string tests and took vortex prints for each test wing, to show the extents of presence/absence of induced vortices. My experiment showed that Cones, Chutes, and Coils did reduce wingtip vortices. Largest Chutes achieved the highest L/D Ratio, and Coils produced the least Drag, while Descending-Cones, caused the most Drag, and the lowest L/D Ratio. From my Comparison Chart, Chutes increased 13% more Lift, and Coils raised 15% more L/D Ratio; and thereby saving at least 10% more fuel than Winglets, of the same weight. Chutes and Coils also generated Drag but much higher L/D Ratio than Winglets of the same size, and therefore proved to be better than Winglets in improving flight efficiency and saving fuel. Chutes were most effective in generating Lift, useful in high-lift mission. Coils were most effective in minimizing Drag, useful in low-drag operation. Chutes and Coils should be further studied for implementations in place of Winglets, as they could be smaller in sizes, easily fabricated separately perhaps by 3D printers, allowing economical retrofitting. Cones should be ruled out as wingtip devices.

Awards Won:

Fourth Award of $500